





# Chemical Abstracts

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# CHEMICAL ABSTRACTS

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No. 11

## 1—APPARATUS AND PLANT EQUIPMENT

W. L. BADGER

**Air separator for the laboratory.** R. E. ZINN. Victor Chem. Works, Chicago. *Ind. Eng. Chem., Anal. Ed.* 1, 112(1929). E. H.

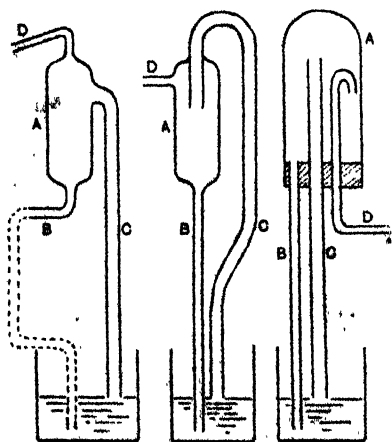
**Mixing apparatus suitable for laboratory use.** G. FRANK. *Chem.-Ztg.* 53, 259 (1929).—A vertical glass tube is provided with a stirrer consisting of a spiral flight on the lower end of a belt-driven shaft. A side-arm, extending from the bottom of the tube to a point just below the top of the flight, permits a circulation of the solns. to be mixed. J. H. MOORE

**Construction and operating principles of the Frederking apparatus.** H. WINKEL-MANN. *Chem. Fabrik* 1929, 111-3.—In the construction of app. for evapg., drying, distg., subliming, etc., the use of double walls gives rise to the hazards of ordinary boilers; hence these forms must comply with certain legal requirements. In the Frederking app. cast-iron construction is employed, with coils cast directly into the vessels in such a way that the walls of the app. are not subjected to strain thereby. Good heat transfer, economy, long life, adaptability to varied operating conditions, etc., are claimed. W. C. EBAUGH

**The lighting of balances.** J. A. M. VAN LIEMPT. Philips Gloeilamp-fabrieken, Eindhoven. *Chem. Weekblad* 26, 149(1929).—An oblong window display type of bulb and reflector are set on top of the balance case. G. CALINGAERT

**Light source devised by Auer von Welsbach.** K. WURM. *Z. wiss. Phot.* 25, 365-79(1928).—The older source of light used by Welsbach has been described in Kayser's *Handbuch der Spectroskopie*, Vol. 1. The present instrument consists of 2 electrodes, one of which is fastened to one arm of a lever, which vibrates in such a way that the spark gap is rapidly opened and closed. The instrument has been used with a concave grating and the spectra of various metals studied. No lines were found which had not already been observed in arcs and sparks. M. E. RUSSELL

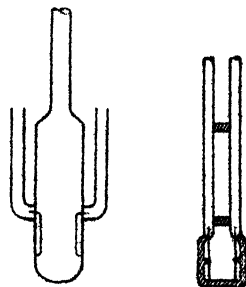
**A new type of conductivity cell.** A. LOTTERMOSER AND E. BUCHHOLZ. Tech. Hochschule, Dresden. *Z. angew. Chem.* 41, 1181-2(1928).—The type of cell especially suited for the detn. of the change of cond. of a soln. over a long period of time while maintained at const. temp. is described.



J. H. PERRY

**A motorless circulator for liquids.** CHARLES RECORD.

*J. Sci. Instruments* 5, No. 9, 299-300 (1928).—Three forms of app. suitable for circulating or agitating liquids without a motor or moving parts, but using a water suction pump, are described. The ends of the tubes B and C are placed in the liquid to be circulated, the end of B being lower than that of C. Upon aspirating through D, the liquid rises in B and C until its surface in the vessel is lowered to the bottom of C, the chamber A being partly filled. Air then enters through C, and continues to carry liquid up with it, the liquid returning down B. Liquids may be raised several feet to A. If B and C are of equal bore, the



then enters through C, and continues to carry liquid up with it, the liquid returning down B. Liquids may be raised several feet to A. If B and C are of equal bore, the

action is intermittent, which is satisfactory for agitation. For one-way circulation  $C = 8-10$  mm. and  $B = 5-6$  mm. diam.; the level in  $A$  remains const.

**A new melting-point apparatus.** F. KERCKOV. *Chem.-Zig.* 53, 219(1929).—A hard-glass tube bent at a right angle is placed with the short arm at the bottom. This arm is insulated and contains an elec. heating spiral over which air is blown. The thermometer with melting tube attached is immersed in a small glass tube contg. paraffin oil and lowered into the vertical arm of the app. The rate of heating is controlled by the current.

**Abolishing the Baumé hydrometer.** TH. WALLIS. *Chem. Fabrik* 1929, 135-6.—W. advocates replacing the Bé. with one giving sp. gr. readings, and proposes 20° as the standard temp.

**A modern factory refractometer.** W. EWALD. *Chem. Fabrik* 1929, 133-5.—The Askania universal refractometer is described with 2 cuts.

**A novel self-recording apparatus for determination of the expansion of solids.** WILLI M. COHN. Kaiser Wilhelm Inst. Silikatforschung Berlin-Dahlem. *Z. tech. Physik* 10, 103-6(1929).—The app. of Braun (*C. A.* 21, 343) for the detn. of thermal expansion was provided with a photographic recording device. By a suitable use of prisms and a mirror on the galvanometer, which registers the temp. of the object, direct photographic curves of expansion vs. temp. can be detd. in a range up to 800°. The app. is described in detail with photographs.

**Apparatus for the determination of benzene by the activated-carbon method.** HEINE. TRAMM. *Chem. Fabrik* 1929, 113-4.—A sturdy form of app., requiring little supervision, yet yielding accurate results, consists of a cylindrical vessel for contg. activated carbon, a steam generator and superheater and a condenser, all contained in a completely enclosed Al housing, which is supported by a frame of angle-iron. Gas to be tested is dried ( $\text{CaCl}_2$ ), purified from S (Fe-purifier) and then passed in measured quantities through the app. To recover the  $\text{C}_6\text{H}_6$ , superheated steam (about 200°) is passed through the activated C, the distillate condensed and the vol. of  $\text{C}_6\text{H}_6$  read from a buret. Built-in resistances provide elec. heating for boiler and evaporator.

**An apparatus for the combined determination of benzene and benzene in the atmosphere.** P. ANDREIEV. *Chem. Fabrik* 1929, 147-9.—Description and directions are given for operating an app. for recovering with great accuracy, by cooling and absorption, hydrocarbons from the air in practically unaltered condition so that they can be examd. and identified.

**Self-emptying suction flask for sugar determinations.** GILBERT PITMAN. Fruit Products Lab., Univ. Calif. *Ind. Eng. Chem., Anal. Ed.* 1, 112(1929).

**Contribution to the history of the counter-current cooling apparatus.** MAX SPETER. *Chem. App.* 16, 59-61(1929).—Numerous references are given.

**Gas-burner design.** WALTER SCHLECHTRIEM. *Gas u. Wasserfach* 72, 222-8(1929).—Gas-burner design is discussed with respect to the kinetic energy of the gas, injector action of the burner and gas velocity. Simple formulas are developed for the design of burner units and burner opening size, area of air inlets and pressure relations calcd. for a typical burner.

**Water heating by electricity at The Hague.** G. J. T. BAKER. *Elec. World* 93, 790-2(1929).—Six illustrations.

**Electric water-heating developments.** M. O. F. ENGLAND. *Electrician* 102, 385(1929).

**1000 kw. electric steam boiler for heating service.** J. B. KITCHEN. *Elec. News* (Toronto) 38, 45(1929).

**Utility shaking machine.** W. M. SHAW. *Ind. Eng. Chem., Anal. Ed.* 1, No. 2, 93(1929).—S. describes a shaking app. of simple construction and large capacity, adaptable to different types and sizes of containers. A system of trays and overhead clamps are arranged radially about a shaft every sixty degrees, propelled by a small electric or water motor with intervening countershaft.

**Spasskii's extraction apparatus.** A. MOSHKIN. (N. Novgorod.) *Masloboino Zhirovoe Delo* (Oil & Fat Ind. (Russia)) 1928, No. 1, 18-9.—Polemical (*cf. C. A.* 22, 4275).

**The steam pressure converter; an innovation in the field of heat technic.** J. HAUSEN. *Chem. App.* 16, 69-71(1929).—A discussion of some of the possibilities of E. Koenemann's process for utilizing the heat in exhaust steam (*cf. Chem. App.* 1926, 73).

**New construction of chlorine compressor, with elimination of the heretofore**

necessary confining liquid and gas loss, in multistage compressing operations. KIRSCH. *Chem. Fabrik* 1928, 547.—A 3-stage compressor built by Amag-Hilpert-Pegnitzhütte, Nürnberg, is described. J. H. MOORE

The treatment of metals and ores in a current of chlorine. ROLAND WASMUHT. *Tech. Hochschule, Aachen. Chem. Fabrik* 1929, 121-2.—A train of app. for the chlorination of ores and metals is described and illustrated. Cl and N are passed through drying and purifying trains and then led at will through a tube of glass or SiO<sub>2</sub> placed in an elec. furnace, mounted on rollers so that it can be used at any part of the tube, provided with 3 independent windings for the better regulation of temps., and then connected with condenser or sublimate chamber and an outlet to the hood. The said chamber is retort-shaped and so adjusted that the gas stream follows a circuitous path around its walls before reaching the exit tube, which is fused through the wall and projects into the chamber. The whole app. is built in duplicate so that 2 detns. can be carried out simultaneously. W. C. EBAUGH

Plastic cellulose in scientific research. K. HICKMAN AND D. E. HYNDMAN. *Kodak Research Lab. J. Franklin Inst.* 207, 231-44(1929).—Directions, with 24 cuts, for constructing app. from pyroxylin and cellulose acetate sheeting. J. H. MOORE

The dynamometer of Pierre Breuil. ANON. *Caoutchouc & gutta-percha* 26, 14405-34(1929) (In French and English); cf. following abstrs.—An illustrated description of the Breuil dynamometer, with the technic employed for stress, strain, compression, bending, abrasion, friction and puncture tests of various materials, particularly rubber goods and fabrics. Quant. data are given for tests of rubber and fabrics under various conditions, including stress-strain curves, and the influence of hot and cold conditions on the phys. properties of vulcanized rubber. In studying the influence of temp. (from -10° to 100°), static stress, momentary stress, alternating stress and release, static compression, momentary compression, elasticity, hardness and abrasion tests were made on the rubber samples. In general, the lower the temp. the harder and stronger the rubber and the less its extensibility. With a rubber-S (95-5) mixt., however, the greatest elongation was at 10°. The residual elongation after rupture varied little with the temp. After repeated stresses, rubber samples showed strains which diminished with increase of temp. The compressibility varied but little with temp., except for hard rubber. At 100° the latter softened and behaved like loaded rubber with a low S content. C. C. DAVIS

The elasto-durometer of Pierre Breuil. ANON. *Caoutchouc & gutta-percha* 26, 14434-42(1929); cf. preceding abstr.—An illustrated description of the app., with quant. data on the elasticity and hardness of rubber mixts. tested by this contrivance. With this elasticity test, the elasticity of soft vulcanized rubber samples diminished with lowering of the temp. The hardness diminished with increase in temp. This test is also capable of distinguishing between different grades of raw rubber. C. C. DAVIS

Use of the elasto-durometer of Pierre Breuil for determining the hardness of metals and other materials by the height of rebound of a steel ball. ANON. *Caoutchouc & gutta-percha* 26, 14442-6(1929); cf. preceding abstrs.—Small differences among various steels or other materials, which cannot be distinguished by the Brinell hardness test, are readily measured by the Breuil elasto-durometer. Quant. data on a large no. of samples are given to show the results obtained. C. C. DAVIS

Aging phenomena in quartz mercury-vapor lamps. W. MEYN. *Z. wiss. Phot.* 25, 345-53(1928).—The decrease of intensity of quartz lamps was investigated by a simple photometric method. This decrease depends on the no. of hrs. the lamp is used. The absorption is caused by a 0.1 mm. thick layer of colored quartz at the inner side of the lamp. A. P. H. TRIVELLI

Automatic control in the chemical industries. ISMAR GINSBERG. *Ind. Eng. Chem.* 21, 410-4(1929).—A discussion of different types of automatic indicating and controlling devices. M. C. ROGERS

Cylinder testing and I. C. C. regulations. H. E. STÜRCKE. *Bull. Compressed Gas Manufs. Assoc., Tech. Series* 1928, 347-58.—Test data and conclusions are given for testing gas cylinders. M. C. ROGERS

Cylinders for liquefiable gases. H. C. H. CARPENTER. *Dept. Sci. Ind. Research, 4th Rept. Gas Cylinders Research Committee*, 151 pp.—Recommendations for cylinders to be used with liquefiable gases are given. Methods of testing and data taken in tests are also given. M. C. ROGERS

Alloy-steel light cylinders. H. C. H. CARPENTER. *Dept. Sci. Ind. Research, 3rd Rept. Gas Cylinders Research Committee*, 74 pp.—Recommendations for light cylinders of nickel-chromium-molybdenum steel used for storing permanent gases are given with an appendix showing exptl. work. M. C. ROGERS

**New device favored for identifying colors.** W. C. HOLMES. *Am. Dyestuff Reprtr.* 18, 2-3(1929).—See *C. A.* 23, 736.  
T. G. HAWLEY, JR.

Molecular measurements by the optical lever (BOND) 2. Effective diameter and molecular structure of the pseudo-rare series:  $\text{Ne-HF-H}_2\text{O-NH}_2\text{-CH}_3$  (BRUCHÉ) 2. The metastability of the elements and compounds as a result of enantiotropy or monotropy. XIII. The differential gas dilatometer of C. J. Smith and its accuracy (COHEN, BRÉDÈS) 2. Estimation of unsaturated hydrocarbons in gases (DAVIS) 7.

FURTH, A.: *Die Werkstoffe für den Bau chemischer Apparate.* Leipzig: Otto Spamer. 220 pp. M. 18. Reviewed in *Génie civil* 93, 492(1928).

**Filters.** ÉDOUARD H. LABITOTIÈRE. Fr. 649,101, Feb. 15, 1928. A filter for liquids of high viscosity, particularly for substances used in the manuf. of synthetic textiles, consists of removable candle-shaped filtering elements, which can be removed for cleaning without stopping the operation of filtering.

**Filters.** LEONHARD KAISER. Swiss 129,269, Oct. 27, 1927. A filter mass is prepd. by mixing unvulcanized caoutchouc with a filling material such as prepd. chalk.

**Filters.** S. C. SMITH. Brit. 298,172, April 5, 1927. Filters such as those of the rotary drum type for filtering corrosive liquids in the treatment of complex ores (as described in Brit. 264,569, *C. A.* 22, 143) are formed with a protecting medium such as a perforated rubber sheet or a mesh fabric of rubber cords or rubber-coated wire. Various structural details are described.

**Rotary filter for liquids.** J. B. VERNAY. Brit. 297,394, Sept. 20, 1927. Structural features.

**Filter for viscous liquids.** ALFRED MAURER. Swiss 129,574, Nov. 23, 1927. The liquid passes along the small spaces left between the surfaces of groups of contiguous cylinders.

**Filter for oil.** SOC. ANON. DES ÉTABLISSEMENTS TECALEMIT (to Tecalemit, Ltd.). Brit. 298,197, Oct. 5, 1927. Structural features.

**Filter for oils, gasoline, or other liquids.** JOHN TEKAVEC. U. S. 1,709,237, April 16. Structural features.

**Filter press.** B. GOWSHALL. Brit. 298,282, July 12, 1927.

**Filter press.** PAUL G. HOLLSTEIN (to J. M. Lehmann Co.). U. S. 1,709,349, April 16.

**Filter press.** F. B. LEHMANN (trading as the firm of J. M. Lehmann). Brit. 297,354, Sept. 19, 1927.

**Filter presses.** SOC. E. GEOFFROY ET G. FERNIN. Fr. 648,118, Feb. 3, 1928. Construction of gratings.

**Apparatus for gravity separation of oil and water.** B. D. COMYN and L. ROTTENBURG. Brit. 297,936, Aug. 25, 1927.

**Apparatus for separating liquids such as oil and water by gravity.** B. D. COMYN and L. ROTTENBURG. Brit. 297,551, Aug. 10, 1927.

**Apparatus for gravity separation of liquids of different specific gravities such as oil and water.** HARRISON S. COE (to Dorr Co.). U. S. 1,709,971, April 23.

**Tank and baffle apparatus for separating oil and gas.** WILLIAM G. McMURRAY (to M. & V. Tank Co.). U. S. 1,710,178, April 23.

**Device for removing suspended particles from air or other gases by centrifugal action.** A. C. SPARK PLUG CO. Brit. 297,870, June 29, 1927.

**Filtering apparatus suitable for separating solids from gases.** CLARK C. BOARDMAN (to Theromatic Carbon Co.). U. S. 1,710,469, April 23.

**Device for distributing liquids to filter beds, etc.** W. W. LEINERT. Brit. 298,253, May 7, 1927.

**Apparatus for indicating the loss of head of liquids passing through filter beds, etc.** W. PATERSON. Brit. 298,170, April 4, 1927.

**Apparatus for separating materials of different densities by combined vibration and pneumatic pressure.** G. RAW. Brit. 297,757, May 26, 1927.

**Apparatus for separating different mineral particles by shaking and pneumatic treatment.** H. M. SUTTON, W. L. STEELE and E. G. STEELE. Brit. 297,876, June 30, 1927. An app. is described suitable for sepg. coal from slate.

**Apparatus for purifying air from compressors, fans, etc., by baffling and filtration.** W. H. TAYLOR and C. SHAW. Brit. 297,510, June 29, 1927.

**Apparatus for removing oil vapors, etc., from compressed air.** FERDINAND E. LAMBERT. U. S. 1,709,530, April 16.

**Rotary pulp-straining apparatus.** J. WHITE. Brit. 298,045, March 31, 1928. Structural features.

**Rotary pulp-straining apparatus.** J. WHITE. Brit. 297,649, March 31, 1928.

**Stainless-steel shaking sieve for separating solids from liquids as in coal washing or similar operations.** SIMONCARVES, LTD., and V. H. ADAMS. Brit. 297,511, June 30, 1927. Various structural features are described.

**Elutriation apparatus for testing samples of granular materials.** L. ANDREWS. Brit. 297,369, June 14, 1927.

**Hydrometer for testing the density of liquids.** CHARLES W. FOULK (to Kauffman & Lattimer Co.). U. S. 1,709,258, April 16. A calibrated tube open at its lower end contains a float, which has attached to it a chain, also attached to a projection from the lower end of the calibrated tube.

**Hydrometer and thermometer box and associated features for testing the specific gravity and temperature of circulating lubricating oil or other liquids.** ROBERT H. MANCHSTER and LEONARD W. ELY. U. S. 1,709,139, April 16. Structural features.

**Gas-stream protective device for radiation pyrometer lenses.** SIEMENS & HALSKE A.-G. Ger. 473,064, Sept. 18, 1927. Addn. to 392,571.

**Catalytic apparatus.** H. HARTER. Brit. 298,108, July 1, 1927. An app. for oxidation of  $\text{NH}_3$  for production of  $\text{CH}_4$  from  $\text{CO}$  and  $\text{H}_2$  for production of  $\text{H}$  and  $\text{CO}_2$  by decompn. of hydrocarbons with steam, or for production of  $\text{CH}_2\text{O}$  from  $\text{CH}_4$ , etc., consists of a rotary fan, bladed wheel, or impeller, which is formed of, or has applied to it, a catalyst such as Pt; it may be electrically heated and is supplied with pipes through which a reacting gas is introduced. Cf. C. A. 22, 3556.

**Photometric apparatus utilizing a photoelectric cell.** J. NEALE. Brit. 298,094, April 2, 1927.

**Röntgen-ray tube.** NAAMLOOZE VENNOOTSCHAP PHILIPS' GLOEILAMPENFABRIEKEN. Brit. 297,587, Oct. 31, 1927. Structural features.

**X-ray apparatus.** ARTHUR MUTSCHELLER (to Wappler Electric Co.). U. S. 1,709,866, April 23. Structural features.

**Thermionic valve.** SOC. FRANÇAISE DES LAMPES À INCANDESCENCE LUXOR. Brit. 298,083, Oct. 1, 1927. In a valve suitable for operation with a.c., a cathode comprises an inert filament coated with a suitable oxide or other material capable of emitting electrons at relatively low temp. •

**Thermionic valves.** FRANÇOIS PERI. Fr. 648,178, June 11, 1927.

**Electric discharge tubes for use as rectifiers.** A. GEHRTS. Brit. 298,120, June 29, 1927. Tubes comprise a filling of A, N, or other gas inert to the anode or Hg vapor at a pressure of "some hundredths of a mm. to 100 mm." and have a cathode of an alloy or mixt. of Mo with Th, U, Ti, or their compds. increasing electron emission as described in Brit. 230,492, Brit. 234,435 and Brit. 237,270. Zr, Ta, W and other suitable metals may be added to delay recrystn. of the Mo. Thoriated Mo, if used, requires no activation by heat treatment.

**Crystallizers.** AKTIESELSKAPET KRYSTAL. Fr. 648,701, Feb. 13, 1928. An app. for crystallizing salt, etc., is described in which a soln. supersaturated by evapn. passes down through a pipe and, along with an upwardly directed portion of the soln., which is not or only slightly saturated, passes through granules to deposit crystals and back to the heater.

**Wax sweating and crystallizing apparatus.** THE BURMAH OIL CO., LTD. Fr. 648,265, Dec. 28, 1927.

**Distillation plant.** STANDARD OIL DEVELOPMENT CO. Fr. 648,965, Feb. 14, 1928. Plant contg. corrosive substances to be treated at high temps. is lined with a corrosion-resisting alloy, such as an Fe alloy contg. Cr 16-18, Si 1.25-1.75 and C 0.1%, fused to the surface.

**Plant for distilling and concentrating liquids.** ALFREDO PONZINI. Swiss 129,573, Sept. 12, 1927. Details of arrangement.

**Condenser for vacuum drying plants.** THE GENERAL ENGINEERING CO. (RADCLIFFE), LTD., and SIDNEY TAYLOR. Ger. 473,133, Nov. 1, 1925. Corresponds to Brit. 244,233.

**Drying apparatus with endless conveying bands.** HERMANN HAAS. Ger. 473,130, Feb. 18, 1928.

**Endless band evaporating machine for producing dry products from liquids.** KARL W. PFEFFERKORN. Swiss 128,717, Nov. 17, 1927. Details of construction.

**Heating system for apparatus for drying sugar or other finely divided materials.**

EDWARD C. READER and VINCENT P. FINN. U. S. 1,709,154, April 16. Structural features.

Apparatus for drying fabrics, leather, yarns, etc. BARROW, HEPBURN & GALE, LTD., and ALBERT HAWKYARD. Ger. 473,150, Nov. 27, 1926. The materials are suspended in a reciprocated frame. Corresponds to Brit. 266,464 (C. A. 22, 517).

Apparatus for recovery of salts from solutions by evaporation. THE MARTIN-COLVIN Co. Fr. 648,271, Dec. 31, 1927.

Atomizer. HEINRICH JUNGHANS. Swiss 128,594, Sept. 16, 1927. Gaseous media are finely divided by introduction in liquid form into metal tubes with axial slits. The tubes are wrapped with fibrous material and wound with non-oxidizable wire.

Electric manometer for high vacuums. MASCHINENFABRIC OERLIKON. Swiss 128,768, Nov. 30, 1927.

Mercury-vapor pump for high vacuums. AKT. GES. BROWN, BOVERI & CIE. Fr. 649,061, Feb. 15, 1928. Constructional details.

Rectifying apparatus for liquids or gases. ARNOLD FREYMAN. Fr. 648,286, Jan. 5, 1928.

Apparatus for carbonating beverages or other liquids. HENRY J. IRWIN (to Crown Cork & Seal Co.). U. S. 1,709,579, April 16.

Atmospheric gas condenser. W. BLAKELEY. Brit. 298,143, June 28, 1927. Structural features.

Apparatus for purifying gases as by desulfurization with nickel or copper or metal oxides which may be regenerated with air. COMPAGNIE INTERNATIONALE POUR LA FABRICATION DES ESSENCES ET PETROLES (formerly Soc. internationale des procedes Prudhomme Houdry). Brit. 298,236, Oct. 6, 1927. An app. is described which is provided with large radiating surfaces to prevent overheating.

Apparatus for separating solids from distillation gases. TROCKNUNGS-VERSCHEWELUNGS-UND VERGASUNGS- G. M. B. H. Fr. 648,920, Feb. 6, 1928.

Apparatus for impregnating liquids with gases. MAX GUGGENBUHL. Swiss 129,314, Oct. 15, 1927. Details of construction.

Locking device for gas cocks. HARRY M. ROSENBERG. U. S. 1,709,594, April 16.

Automatic pressure-controlled valve suitable for gases or liquids. JACK C. CUNNINGHAM and WILLIAM S. NELSON. U. S. 1,709,119, April 16. Structural features.

Waterless gas holder with a concrete foundation and sealing medium such as sand or tar solution. R. & J. DEMPSTER, Ltd., H. S. KNIGHT, W. S. HUBBARD and WATERLESS GAS-HOLDER Co., LTD. Brit. 298,053, April 14, 1928. Structural features.

Tower gas-scrubber construction. S. E. SPENCER. Brit. 298,360, Oct. 3, 1927.

Metal containers for storing gases and liquids under pressure. R. H. CAMPBELL and SPARKLETS, LTD. Brit. 298,278, July 11, 1927. Structural features.

Safety gas valve. SIMON ROMAN. U. S. 1,710,515, April 23.

Pressure-controlled automatic carbide feed device for acetylene generators. ELMER H. SMITH. U. S. 1,709,885, April 23.

Apparatus for generating acetylene for use in internal-combustion engines. H. GEBHARDT. Brit. 297,337, June 27, 1927. Numerous structural details are described.

Furnace. HUGO BAUER. Ger. 473,046, July 25, 1925. An underfed furnace is described comprising several longitudinal feed troughs along which the fuel is fed by reciprocating bars. The ash is conveyed to the front of the furnace by a rocking chute.

Furnaces. Soc. GENEVE ET CIE. Fr. 649,013, July 4, 1927. Industrial furnaces are made to consume their own smoke by the introduction above the current of flame of either a current of hot air, hot air and steam, or steam alone.

Hearth furnace heated with powdered coal. WITKOWITZER BERGBAU UND EISENHÜTTEN-GEWERKSCHAFT and CARL SALAT. Fr. 648,463, Feb. 6, 1928.

Hearth furnace for melting blast-furnace dust or similar materials. A. DAWANS. Brit. 297,813, Sept. 30, 1927. Structural features.

Furnace for damp fuels. FRANZ HOF. Ger. 473,116, Jan. 25, 1928. Drying and distn. shafts are provided in advance of an inclined grate.

Automatically operated annealing furnace. AKT. GES. BROWN, BOVERI & CIE. Swiss 129,409, Nov. 2, 1927. Details of arrangement.

Crucible furnace and associated gas-burner construction. DEUTSCHE GOLD-UND SILBER-SCHNEIDANSTALT VORM. ROESSLER. Brit. 297,449, Sept. 23, 1927.

Furnace for heating steam generators, retorts, coke ovens, etc. R. HICKTON, W. W. GULEY, G. BIRKS and R. G. HICKTON. Brit. 297,395, March 18, 1927. Structural features.



**Furnace lining.** ARTHUR J. JACKMAN (to Vesuvius Crucible Co.). U. S. 1,709,350, April 16. Structural features.

**Heat-exchange apparatus.** R. SELIGMAN. Brit. 297,589, Nov. 3, 1927.

**Columnar heat-exchange apparatus.** J. HEIZMANN. Brit. 297,643, March 7, 1928.

**Tubular heat-exchange apparatus.** S. ROBSON. Brit. 297,509, June 28, 1927. Structural features.

**Heat-exchange columns for gases or liquids.** MENZEL A.-G. Fr. 649,147, July 8, 1927.

**Gas burner.** J. and C. G. BOLINDERS MEKANISKA VERKSTADS AKTIEBOLAG and E. A. BOLINDER. Brit. 297,647, March 26, 1928.

**Gas burner.** ANDREW CLARK. U. S. 1,710,012, April 23.

**Gas burner.** HERMAN C. DANIELS. U. S. 1,710,147, April 23.

**Gas burner.** PHILIP J. SONNER. U. S. 1,709,197, April 16.

**Combined coal-dust, gas and oil burner suitable for use with coke-oven or blast-furnace gas.** WITKOWITZER BERGHAU UND EISENHÜTTEN GEWERKSCHAFT and C. SALAT. Brit. 298,080, Oct. 1, 1927. Structural features.

**Oil cooler.** MASCHINENFABRIK OERLIKON. Swiss 129,687, Dec. 16, 1927. The oil is cooled by water, the pressure of which is dependent upon the oil pressure.

**Sectional retort.** E. G. BLACKWELL. Brit. 297,445, Sept. 22, 1927.

**Measuring device for benzene and other oils.** PAUL BREITSCHUH. Swiss 128,688, Nov. 28, 1927. To prevent the formation of bubbles and consequent delivery of inaccurate quantities, the measuring vessel is enclosed in an air jacket with an air outlet and is surrounded by a perforated cylinder. When the liquid reaches a certain height, it overflows through the perforation and prevents formation of bubbles.

**Storage tank for gasoline or other volatile liquids.** HART H. FLEMING. U. S. 1,709,257, April 16. A top and "false top" form a condensing chamber and trap for vapors rising to the upper part of the tank and may contain a sealing liquid.

**Device for heating liquids while preventing undue foaming or overflowing of liquid.** DIRK HEYNIS. U. S. 1,709,529, April 16. A heating app. is so constructed that rise of foam on liquid being heated serves to decrease the heat supplied by a heating burner.

**Apparatus for determining the hardness of metals and similar non-elastic materials.** JOHN A. CHAPPUIS. Swiss 129,625, Dec. 7, 1927.

**Apparatus for testing the bursting strength of materials such as sheet metal, paper, or cloth by penetration of a falling body through the sample.** CHARLES B. TEWING (to Thwing Instrument Co.). U. S. 1,709,638, April 16.

**Device for stripping plastic asbestos windings from tubes.** CARL HERZOG. Swiss 129,227, Nov. 22, 1927.

**Conveyer belts for handling chemicals, etc.** T. O. WILTON and CHEMICAL ENGINEERING & WILTON'S PATENT FURNACE CO., LTD. Brit. 297,630, Jan. 28, 1928. An endless-belt conveyer is formed of woven wire of corrosion-resisting material such as an alloy of Ni and Cu. Such a belt is suitable for carrying  $(\text{NH}_4)_2\text{SO}_4$  in an app., which is described.

**Thermostat for controlling electric circuits.** HUBERT R. LORANGER and DALLAS D. PARSHALL (Loranger to Automatic Freezer Corp.). U. S. 1,709,944, April 23.

**Thermostatic control apparatus for electric circuits.** EARL K. CLARK (to Westinghouse Elec. & Mfg. Co.). U. S. 1,709,656, April 16.

**Thermostatically controlled electric apparatus for operating furnace dampers, etc.** EDMOND VERSTRAETE. U. S. 1,708,980, April 16.

**Thermostatic control device for steam heating systems.** L. FRIEDMANN, M. FRIEDMANN and N. SCHOFF (trading as the Firm of A. Friedmann). Brit. 297,601, Dec. 2, 1927. Structural features.

**Thermostatic control for gas valves.** BRITISH BRASS FITTINGS, LTD., and G. N. SPERRY. Brit. 298,293, July 20, 1927.

**Thermostatically controlled gas valve.** RADIATION, LTD., and H. J. YATES. Brit. 297,917, Aug. 2, 1927.

## 2—GENERAL AND PHYSICAL CHEMISTRY

FREDERICK L. BROWNE

**Albert Einstein's fiftieth birthday.** M. V. LAUR. *Naturwissenschaften* 17, 173 (1929).  
B. J. C. VAN DER HOEVEN

**Homer J. Wheeler.** E. W. ALLEN. *Ind. Eng. Chem.* 21, 510-11(1929).—Biographical note with portrait.  
E. C. M.

**Measurements of the amount of ozone in the earth's atmosphere and its relation to other geophysical conditions. Part III.** G. M. B. DOBSON, D. N. HARRISON and J. LAWRENCE. *Proc. Roy. Soc. (London)* **A122**, 456-87(1929); cf. *C. A.* **21**, 2097.—Tables are given of daily ozone values for one station from Nov., 1926, for 4 stations from March, 1927, and 6 stations from April, 1927, to Oct., 1927; monthly mean values for 6 stations from July, 1926, to Oct., 1928; and monthly mean values for N. W. Europe for July, Aug. and Sept., 1926, and Mar. to Oct., 1927. It is concluded from observations in Chile that ozone values in the tropics must be nearly uniform. The ozone content is above normal ahead of a low pressure, and below normal ahead of a high-pressure area. There is no definite relation between ozone content and magnetic conditions. The authors conclude that the polar air currents are the source of the excess ozone, but do not offer any explanation for its formation. GREGG M. EVANS

**Additive and subtractive color mixing and decolorization.** HERBERT SCHÖNBORN. *Speersaal* **61**, 432-4(1928).—A discussion on color mixing according to triaxial diagram.

R. A. HEINDL

**A simple experiment on equivalent weight determination.** JOHN E. S. HAN. *Chemist. Analyst* **17**, No. 4, 6(1928).—The expt. is suitable as a lab. exercise. E. J. C.

**A simple method for the determination of  $C_p/C_v$  (as a lecture experiment).** E. RÜCHARDT. Univ. Munich. *Physik. Z.* **30**, 58-9(1929).—A glass tube 55 cm. long, and of a uniform 1.6-cm. inside diam., is passed through a rubber stopper into a 5-6-l. bottle with bottom tubulature, contg. the gas. On dropping a perfectly spherical steel ball of diam. appropriate to the tube into the latter, the ball oscillates in the tube with a period of about 1 sec. By measuring the period for one libration with a 0.1-sec. stop watch, and substituting in the formula (derived), the ratio  $C_p/C_v$  is detd.  

$$\frac{C_p}{C_v} = k = \frac{4\pi^2 m V}{q^2 p T^2}$$
 where  $m$  = mass of ball,  $V$  = vol. of bottle in cc,  $q$  = cross section of tube (in sq. cm.);  $b$  = bar. pressure (in cm.),  $T$  = period,  $g$  = gravitational const. The method provides a rapid and accurate means of measuring  $C_p/C_v$ , and also offers visible proof of the adiabatic elasticity of gases. For air,  $k$  = 1.39 instead of the usual 1.40; for wet  $\text{CO}_2$ ,  $k$  = 1.27 instead of 1.30. L. W.

**Molecular measurements by the optical lever.** W. N. BOND. *Nature* **122**, 169-70(1929).—A brief description of an optical lever of precision giving very large magnification. The instrument was applied to test (1) the accuracy with which a steel-to-steel contact will return after sepn. and (2) whether the thickness of a mica sheet can be detected as varying in multiples of the mol. "length." F. V. J., JR.

**Desiccchlora (anhydrous barium chlorate—Smith). II. Experiments in its use as an economical drying agent and ammonia absorbent.** G. FREDERICK SMITH. *Chemist-Analyst* **18**, 18-24(1929); cf. *C. A.* **23**, 53.—Detailed directions are given for the prepn. of  $\text{Ba}(\text{ClO}_4)_2 \cdot 3\text{H}_2\text{O}$ ; exptl. data comparing the efficacy of the anhyd. salt with that of  $\text{CaCl}_2$  tests of its stability in drying gases; details concerning its reversible absorption of  $\text{NH}_3$ ; and a discussion of the regeneration of the material and its porosity. W. T. H.

**The reduction to *in vacuo* of the weights of powdered substances weighed in air.** III. RUDOLF RUER and JOHANN KUSCHMANN. *Phys. Chem. Inst., Tech. Hochschule, Aachen. Z. anorg. allgem. Chem.* **173**, 233-61(1928); cf. *C. A.* **22**, 1074.—The adsorption by solids of air and other gases was investigated by outgassing the material *in vacuo* at const. temp. for varying periods of time and detg. the amt. of vapor adsorbed upon contact with the solid. Oxides of Cu, Fe, Ce and Si were prepd. by various methods and gave adsorptions dependent upon the mode of manuf.  $\text{SiO}_2$  outgassed at 600° adsorbed 164 mg. air/100 g.;  $\text{CeO}_2$ , 31 mg./100 g.;  $\text{CuO}$ , 31 mg./100 g.  $\text{SiO}_2$  adsorbs more  $\text{H}_2$  than  $\text{N}_2$ ,  $\text{CeO}_2$  less. Heating at higher temps. lessens the adsorption. Of  $\text{KCl}$ ,  $\text{PbSO}_4$ ,  $\text{CeSO}_4$ ,  $\text{CaCl}_2$  and  $\text{NaNO}_3$ , only  $\text{CeSO}_4$  adsorbed more than 1 mg. air/100 g. Investigations on Cu, Fe and Ag (after complete reduction from their oxides by  $\text{H}_2$ ) showed that 100 g. Cu takes up 10 mg.  $\text{H}_2$ ; 100 g. Fe, 30 mg.; and 100 g. Ag, 4 mg. Cu does not take up  $\text{CO}_2$ , while Fe and Ag take up 5 mg./100 g. Variations in adsorptions with time and temp. of outgassing have been detd. and the changes in weight of thin strips of metals placed in vapors have been measured. Much exptl. detail is given and possible errors due to incomplete outgassing are cited.

WILLIAM E. VAUGHAN

**Report of the German Committee on atomic weights.** M. BODENSTEIN, O. HAHN, O. HÖNIGSCHMID and R. J. MEYER. *Ber.* **62B**, 1-23; *Z. anorg. allgem. Chem.* **178**, 411-2(1929); cf. *C. A.* **22**, 1066.—A review of the most important detns. of at. wts. published during 1928. The following new values have been adopted: Ba 137.36,

Ce 140.13, Er 187.64, Ne 20.18, U 238.14. Ne, A, K, Cs, Cu, Ag, Ba, Ce, Er, Ti, U and Rh are discussed. The basis is O = 16. L. I. QUILL

A statistical periodic table. H. H. STEPHENSON. *Chem. News* 138, 129-30 (1929).—By arranging the elements in order of at. no. and then calcg. the percentage increase of at. wt. of each element over its predecessor, then arranging the nos. representing these increases in rows of 3, 4, 5, etc., up to 30, one finds that the sums of the vertical columns are in regular numerical order only for rows of 3 and rows of 6. With the elements arranged in rows of 6, excluding H and U, one finds certain chem. relationships between elements in the vertical columns. R. J. HAVIGHURST

Effective diameter and molecular structure of the pseudo-rare gas series: Ne-HF-H<sub>2</sub>O-NH<sub>3</sub>-CH<sub>4</sub>. ERNST BRÜCHE. Ger. Gen. Elec. Co. Res. Lab. *Ann. Physik* [5], 1, 93-134 (1929).—This gas series was examd. and new effective diam. curves were obtained for H<sub>2</sub>O and NH<sub>3</sub>. The latter curves deviate markedly from those for the rare gases. The assumption of the decisive significance of the number of outer electrons becomes untenable. Above 2.5  $\sqrt{\text{volt}}$  up to the exptl. limit 7  $\sqrt{\text{volt}}$ , the similarity of the curves of the pseudo-rare gas series indicates a confirmation of Grimm's hydride displacement law. Below 2.5  $\sqrt{\text{volt}}$ , the curves show specificity. The curve similarity for CH<sub>4</sub> and Kr indicates an outer shell in CH<sub>4</sub> similar to that of a rare gas. A new type of manometer suitable for vapors is described. FRANK URBAN

The general formulas for calculating the atomic or molecular heat as well as the specific heat of the elements in the solid state. J. MAYDEL. *Chem. Inst. Univ. Laibach. Z. anorg. allgem. Chem.* 178, 113-45 (1929).—Mathematical formulas are given for calcg. the at. and mol. heats as well as sp. heats of the elements in the solid state. Curves and tables are given from data obtained by many investigators. R. C. ROBERTS

The properties of the element 91 (ekatantalum) according to the periodic table. A. v. GROSSE. *J. Russ. Phys.-Chem. Soc.* 60, 843-5 (1928).—A general discussion of the probable physicochem. behavior of Pa as indicated by its position in the periodic table. The elements will possess certain sp. chem. properties which will facilitate its sepn. from the homologs (Ta, Nb). The pentoxide will probably be a white powder of high d. and m. p. and of basic properties. B. SOYENKOFF

The separation of the element 91 (protactinium). A. v. GROSSE. *J. Russ. Phys.-Chem. Soc.* 60, 847-54 (1928).—H<sub>3</sub>PO<sub>4</sub> ppts. Pa quant. from concd. acid soln. together with Zr or Hf, either in the presence or absence of H<sub>2</sub>O<sub>2</sub> (difference from Pa). On treatment of this ppt. with alk. carbonates it does not dissolve (difference from Pa). It is not pptd. by Hf (difference from Th), but seps. quant. on adding NH<sub>3</sub>. Pa can be sepd. from Zr and Hf by fractional crystn. of the chlorides in concd. HCl. It can be pptd. (although not completely) by H<sub>2</sub>C<sub>2</sub>O<sub>4</sub> in the presence of dil. HCl (difference from Zr and Hf). The method of sepn. of Pa used consisted of repetitions of the following cycle: pptn. by H<sub>3</sub>PO<sub>4</sub>, fusion with K<sub>2</sub>CO<sub>3</sub> to remove the acid, fractional crystn. of the chlorides from concd. HCl. Starting with 525 g. residues from the prepn. of Ra and U, 2 mg. of the oxide of Pa was obtained. (The original content of Pa by radiometric analysis was 3.74 mg.) This oxide was a white powder of high m. p. and  $\alpha$  activity 232,000 times that of an equal wt. of U I. Repetition of the purifying process did not increase the radioactivity. The time of half decompn. of Pa is 21,200 years. Or, for every g. of Pa the U ore should contain 0.4 g. Pa. B. SOYENKOFF

The viscosity of atomic hydrogen. PAUL HARTECK. Kaiser Wilhelm Inst., Berlin-Dahlem. *Z. physik. Chem., Aht. A*, 139, 98-106 (1928).—The viscosity of H after subjection to an elec. discharge by Wood's method was measured by the Poiseuille arrangement. Full details are given of the use of a manometer, which consists essentially of a hot-wire gage in which the temp. is measured by a thermocouple, by which the concn. of at. H in the viscosity tube and the pressure prevailing at the ends can be measured. Expts. were performed at the temp. of ether-solid CO<sub>2</sub> at 0°, and at 100°. Taking  $\eta_{25}$  at 0° =  $841 \times 10^{-7}$ , the value for the H at. at 0° is  $\eta_H = (690 \pm 25) \times 10^{-7}$ . The variation with temp. is small, indicating a small value of the Sutherland const., and the conclusion is drawn that the forces exerted by H atoms on one another are very small, as in the case of He and H<sub>2</sub> mols. The gas kinetic value for the mean free path at 0° is  $L_0 = 130 \times 10^{-7}$  cm.; the cross section of action of the atoms in 1 cc. under normal conditions is  $Q_0 = 1.36 \times 10^4$  sq. cm. The values for H<sub>2</sub> are  $L_0 = 112.3 \times 10^{-7}$  cm. and  $Q_0 = 1.57 \times 10^4$  sq. cm. W. WEST

Change of the antisymmetric hydrogen molecule into the symmetric one. A. EUCKEN. *Tech. Hochschule, Berlin. Naturwissenschaften* 17, 182 (1929).—It was expected that the 1:3 ratio at room temp. of transformation velocities of the two H<sub>2</sub>

modifications would change at sufficiently low temp. This would cause a noticeable increase in the sp. heat. A positive result has recently been obtained. The  $H_2$  was cooled in a 45-cc. steel vessel at 50 atm. to liquid air temp. for  $12\frac{3}{4}$  days and the sp. heat measured at 4 different temps. initially, after 6 days and at the end of the period. The molar sp. heat  $C_R$  was found to increase in each series of 3 observations: at  $106^\circ$  from 0.531 over 0.605 to 0.715, at  $147^\circ$  from 1.010 to 1.179 and 1.270. Values for  $C_R$  at these temps. calcd. on the assumption that the mol. fraction  $\gamma$  of the antisymmetric modification (ortho) is 0.750, 0.689 and 0.636, resp., agree well (in 10% of the change) with the data observed; the change of  $\gamma$  with time to a limiting ratio of 1 ( $\gamma = 0.5$ ) is assumed to follow  $\log(4\gamma - 2) = -kt$ . B. J. C. VAN DER HOEVEN

**Experiments on para- and ortho-hydrogen.** K. F. BONHOEFFER AND P. HARTECK. Kais. Wilhelm Inst. f. physik. Chem. u. Elektrochem., Berlin-Dahlem. *Naturwissenschaften* 17, 182(1929).—The two modifications of mol.  $H_2$ , para and ortho, occur in ratio 1:3 in ordinary  $H_2$  (Dennison) as found from the rotational sp. heat. Thermal-cond. measurements at low pressures showed that the half conversion by radiation takes more than one year. At high pressures (350 atm.), however, in metal vessels the change takes place rapidly, in one week at the temp. of liquid air. Para-hydrogen is a gas stable in glass vessels at room temp. and atm. pressure, changing little in one week. At 100 atm. in a metal vessel it has a half-conversion time into ordinary  $H_2$  of 5 hrs., the process is momentary in the presence of platinized asbestos or elec. discharge. Practically pure para- $H_2$  can be made by adsorption on C at liquid- $H_2$  temp. Liquid  $H_2$  one day old contains considerable para- $H_2$  (10% of the equil. proportion). Freshly solidified  $H_2$  still has a 1:3 ratio; synthesis of  $H_2$  from 2 H at the temp. of liquid  $H_2$  gives this same ratio. B. J. C. VAN DER HOEVEN

**The applicability of Smits' theory to the allotropic varieties of phosphorus.** PIERRE JOLIBOIS. *Compt. rend.* 188, 174-6(1929).—Polemical (cf. *C. A.* 17, 3278; 22, 337). Mostly a criticism of Smits and Bokhorst (*C. A.* 211, 737) with a discussion of the exptl. conditions. ALBERT L. HENNE

**The allotropic modifications of phosphorus.** A. SMITS. *Compt. rend.* 188, 390-2 (1929); cf. *C. A.* 23, 1320.—The graph given by Nicolaiev (*C. A.* 22, 3324) showing the relation between vapor pressure and d. could be interpreted as signifying either 3 or 4 allotropic forms of P. More exact data are needed to det. this definitely. AMY LEVESCONTE

**The transformations of liquid sulfur.** PAUL M. MONVAL AND PAUL SCHNEIDER. École Supérieure de Chimie de Mulhouse. *Bull. soc. chim.* 43, 1302-22(1928); cf. *C. A.* 22, 2299.—A study of the variations in the sp. heat, heat of cooling, d. and  $n$  of liquid S between  $120^\circ$  and  $200^\circ$ . All these curves show a particular phenomenon at  $160^\circ$ , indicating the presence between  $159^\circ$  and  $165^\circ$  of 2 allotropic forms of S which are completely miscible during this interval. Curves of d., sp. refraction, displacement of temp. of transformation of liquid S and reciprocal soly. of S and  $Ph_3CH$  are given together with tables and description of app. used. R. C. ROBERTS

**Thermal conductivity of solid and liquid sulfur.** G. W. C. KAYE AND W. F. HIGGINS. Nat'l. Phys. Lab. *Proc. Roy. Soc. (London)* A122, 633-46(1929).—By the same plate method as in former work (cf. *C. A.* 22, 2871) the cond. of S from  $20^\circ$  to  $210^\circ$  has been measured. Tables and curves are given showing the cond. in c. g. s. units of the rhombic form as decreasing from 0.000652 at  $20^\circ$  to 0.000547 at  $95^\circ$ ; monoclinic as between 0.00037 and 0.00040; and liquid as increasing from 0.000314 at  $115^\circ$  to 0.000378 at  $210^\circ$ , with a change of slope between  $160^\circ$  and  $170^\circ$ . Two specimens of plastic S were examd. which showed conductivities higher than that of rhombic. GREGG M. EVANS

**Realization of the black-body temperature at the melting point of palladium by the tube method.** G. RIZAUD AND S. NIKITINE. *Compt. rend.* 188, 618-20(1929).—A simple method for measuring the temp. of fusion of Pd with an error of only  $0.8^\circ$  is described. If the mech. tension is greater than 2.5 g./sq. mm., the m. p. is suddenly lowered  $8^\circ$ , probably because of an allotropic transformation of the metal. M. D.

**Crystal size and magnetic properties of pure nickel.** G. J. SZOZO. *Z. Physik* 53, 449-57(1929).—Conditions for recrystn. with Ni are detd. Only when the Mn content does not exceed 0.2% can recrystn. phenomena be obtained by the mech.-thermal method. Twinning occurs frequently. The magnetic properties are investigated as a function of crystal size. Similar results are obtained with Fe and with Ni (*C. A.* 23, 803). GEORGE GLOCKLER

**The dielectric constant of liquid hydrofluoric acid.** KARL FREDENHAGEN AND JOHANNES DAHMLOS. Chem. Inst. Greifswald. *Z. anorg. allgem. Chem.* 178, 272-4 (1929).—The dielec. consts. for HF at 5 diff. temp. are given:  $-73^\circ$ , 174.8;  $-70^\circ$ ,

174.9. —40°, 134.2; —27°, 110.6; 0°, 83.6. HF is comparable to H<sub>2</sub>O and HCN as a solvent with abnormal dielec. const. R. C. ROBERTS

Density, internal friction, dielectric constant, solvent qualities and dissociating power of hydrocyanic acid. KARL FREDERHAGEN AND JOHANNES DAHMLOS. *Chem. Just., Grosswald. Z. energ. allgem. Chem.* 179, 77-88(1929).—Contrary to predictions of Walden, *et al.*, Kahlenberg and Schmundt (*J. phys. Chem.* 6, 447(1902)) found that HCN is a poorly ionizing solvent in spite of its high dielec. const. F. and D. have repeated most of their work. The cond. of the HCN used was  $0.60 \times 10^{-9}$  mhos at 0°. For the dielec. const. measurements the method previously used for HF (cf. preceding abs.) was used with a Pt condenser of 1 sq. cm. surface at 0.5 cm. plate distance, a 300 m. wave length being used. The values were reproducible within 1%. At —13.4°  $\epsilon$  was 194.4, at —8.0° 175.0, at —1.0° 155.7, at 1.1° 149.8, at 10.2° 132.1, at 17.6° 120.5, at 23.1° 113.2. Above 10° the values agree with Bredig's measurements, lower temps. they are as much as 16% lower. The temp. coeff. of the dielec. const. with temp., the values of  $\epsilon$  are higher than those of any other substance.

HCN was detd. in a 2-cc. dilatometer, accurate to 0.001: at —13° 0.7326, 0.7230, at 0° 0.7150, at 10° 0.7017, at 20° 0.6884; it changes almost linearly in good agreement with results of other authors. The viscosity,  $\eta \times 10^5$  cts, was 269.1 at —7.5°, 232.3 at 5.0°, 218.4 at 10.8°, 211.2 at 15.1°, 201.4 *i. e.*, about  $\frac{1}{2}$  the viscosity of water. The soly. of KCN, KCl and KNO<sub>3</sub> (reported "trace" by K. and S.) in HCN and the cond. of the solns. was detd. At 0° the soly. is in moles per l. 0.10, 0.037 and 0.050, resp., with  $\chi$  in mhos of 0.0085, 0.0044 and 0.0103, values which are only  $\frac{1}{100}$  to  $\frac{1}{10}$  of those of water. The low cond. results with many acids and salts are discussed; AgNO<sub>3</sub> is almost insol., but is decompd. into AgCN and HNO<sub>3</sub>. Conclusion: HCN is a poor solvent for inorg. salts and does not give the extent of dissocn. expected from its high dielec. const.; the authors therefore agree with K. and S. that the cond. of a soln. depends not on the dielec. const. but on the sp. nature of complexes formed between solute and solvent (cf. F., C. A. 22, 7700).

B. J. C. VAN DER HOEVEN

The dielectric constant of methylene chloride and methylene bromide. P. C. MAHANTI AND D. N. SEN-GUPTA. *J. Indian Chem. Soc.* 5, 673-81(1928).—The theory that the dielec. const. of polar mols. decreases with the temp. has been confirmed with CH<sub>2</sub>Br<sub>2</sub> and CH<sub>2</sub>Cl<sub>2</sub>. The heterodyne beat method of loosely coupling 2 oscillating circuits was used. A temp. range of 303° to 430° K. was covered. The formation of mols. by attraction between positively charged org. radicals and negatively charged halogen ions is discussed. Because of the size of CH<sub>3</sub><sup>+</sup> as compared to H<sup>+</sup>, the org. halides and HCl are considered to be bound together by different mechanisms. It is believed that CH<sub>3</sub><sup>+</sup> retains its own electron orbits. The net dipole moment of CH<sub>2</sub>Br<sub>2</sub> is shown to be greater than that of CH<sub>2</sub>Cl<sub>2</sub>, thus causing the latter to be more stable. The vapor pressure of the iodide is so high and its instability so great even at room temp. that such a liquid cannot be studied by this arrangement.

RAYMOND H. LAMBERT

The Barkhausen effect. G. J. SZOO. Natuurk. Lab., Philips Gloeilampenfabrieken, Eindhoven. *Physica* 9, 43-50(1929).—The Barkhausen effect, that is discontinuity in the magnetization of iron (cf. B., *Physik. Z.* 20, 401(1919)) was studied in different parts of the hysteresis loop. A wire of electrolytic iron 20 cm. by 1 mm., ignited for 5 hrs. *in vacuo*, was placed in a 40-cm. magnetization coil with 3 independent windings. One winding provided the main field, a second one, activated by the variable current of 3 parallel triodes, provided a supplementary field, the third winding compensated the terrestrial field. A sep. coil connected to amplifiers and a loud speaker served to detect the Barkhausen effect. After complete demagnetization of the wire (Gumlich and Rogowski, *Ann. Physik* 34, 235(1911)) the field was gradually raised to 0.20 gauss; at 0.25 gauss the Barkhausen effect became audible, ceasing again on opening the circuit. It follows that for the re-orientation of coherent groups of elementary magnets in iron (theory of B. and of van de Pol) a field of at least 0.24 gauss (induction 200) is necessary. On the virginal hysteresis curve the effect was present in the region of induction from  $B = 200$  to  $B = 9200$ ; on the complete loop it was heard between +9200 and —9200 inductions. The min. value for the field change appeared also between 0.25 and 0.30 gauss on executing small loops at arbitrary points in the hysteresis figure, again requiring the same energy for dislocating the magnet groups (except above 9200 induction). Even below a range of 0.24 gauss, *i. e.*, without Barkhausen effect, the loops show a measurable width, indicating a non-reversible process of induction change before the Barkhausen effect appears. The small field strengths used in these expts. make it apparent that the effect cannot be caused by magneto-

striction stresses (theory of Gerlach, Leites and Zschiesche). For the influence of crystal size 2 electrolytic bars of 20 cm.  $\times$  1 mm. were recrystd. by alternate ignition and deformation (3 and 20%, resp.); their crystal size was about 10 and 0.1 mm., resp. (20 and 5000 crystals per wire). Oscillographic examn. of these wires with frequencies of 5 to 15,000 per sec., field 0 to 3 gauss, failed to show any difference in B. effect; similar results were obtained with monocrystal wires. Conclusion: The groups of elementary magnets are present regardless of the cryst. condition and probably are of purely magnetic nature.

**Magnetic susceptibility of sodium and potassium.** C. T. LANE AND E. S. BIELER. *Trans. Roy. Soc. Can.* [3], 22, III, 117-23 (1928); cf. *C. A.* 22, 1897.—The magnetic susceptibilities of Na and K were measured and found to be  $0.67 \times 10^{-6}$  and  $0.60 \times 10^{-6}$ , resp.

**The absence of effect of an electric field on the magnetic susceptibilities of hydrochloric acid and nitric oxide.** L. M. MOTT-SMITH. Rice Inst., Houston, Texas. *Phys. Rev.* 32, 817-23 (1928).—The magnetic susceptibilities of the polar gases NO and HCl were unaltered by the application of an elec. field of 8000 v. per cm. whether the measurements were made parallel or perpendicular to the elec. field. The method would have detected changes in the vol. susceptibilities as small as 0.18% for NO and 9.7% for HCl measured parallel to the field and 0.48% for NO and 22% for HCl measured perpendicular to the field. The classical theory predicts a change of 13% in the paramagnetic susceptibility of NO measured parallel to the field but no change when measured perpendicular to the field. No attempt was made to compute the theoretical change in susceptibility for the diamagnetic HCl, although a slight change was expected.

**The modification of Baeyer's strain theory.** F. E. AYLING. Univ. Coll., Swansea. *Chem. News* 138, 164-5 (1929).—The best value of the C-C angle is obtained when the d. figures of LeBas ("Molecular Values," 1915 pp. 20-1) are used in the formula of Ingold (*C. A.* 17, 977).

**The theory of complex compounds.** I. I. I. CHERNYAEV. *Ann. inst. platine* (Leningrad) No. 5, 118-56 (1927).—The varying mobility of groups connected with a central atom is explained by the "trans influence" or by the decrease in the magnitude of the passive resistance within the internal area opposed to the edge substituent and also by the simultaneous increase in the passive resistance of the side directed toward the edge substituent (according to the cosine law). The "trans influence" of the atoms is inversely proportional to their metallic character. Atoms with a smaller "trans influence" are arranged in the center of the mol., while those with larger "trans influence" are arranged on the periphery. The electronegative groups which are able to form complex compds. (NO<sub>2</sub>, NCS, F, Cl, Br, I) have a higher "trans influence" than substituents of a neutral character (NH<sub>3</sub>, amines, H<sub>2</sub>O, etc.); whence are deduced the rules of Jergenson, Peirone and Kurnakov as well as many features of the reactions of bivalent and quadrivalent Pt. Many inner mol. reactions of complex compds. of Cr, Co, Te and Os are investigated; their stereochem. similarity to Pt is shown by the fact that the no. of substituted groups and the shape of the complexes is due to the "trans influence." The ability of C to give chain-like configurations of atoms is due to the stability of the tetrahedral configuration of mols. contg. C; it can hardly be due to the "trans influence" on the central forces of the mol.

**Molecular refraction and number of molecules.** W. HERZ. *Z. anorg. allgem. Chem.* 179, 211-4 (1929).—According to Clausius-Mosotti the mol. refraction calcd. by means of the Lorenz-Lorentz formula represents the true vol. of one mol. This was substantiated by H. by calcg. for a large no. of compds. the product of mol. refraction and the no. of mols. per cc. at the b. p. With the exception of some low-boiling elements an approx. const. value of  $(1.2 - 2) \times 10^{23}$  was obtained for about 50 different compds.

**Molecular theory of the diffusion of light by fluids.** I. The intermolecular field is neglected. YVES ROCARD. *Ann. phys.* 10, 116-79 (1928).—Mathematical. A bibliography of 118 references is given, many of which are accompanied by an abstract of the work cited. The equation obtained for the total diffused intensity is,  $i = (\pi^2/2\lambda^4)(\epsilon - 1)\Gamma[(RT\beta'/N)c^2 + (1/\nu)\{K\rho_1(2 - c^2)/(2 - \rho_1) + c^2(K - 1)\}]$ . In deriving this equation use is made of a mol. model which enters into the equation by means of 2 characteristic const. besides the index of refraction, whereas the current mol. model (that of Langevin) introduces only one const., anisotropy. R.'s mol. model may be considered to be formed of oscillating, isotropic ions; if the ions do not oscillate the mol. model is the ordinary one of Langevin. There are reasons for thinking that the mols. of org. compds. are approx. of this type. A brief critical study of

Einstein's old theory of diffusion indicates the necessity of revising it. II. Intermolecular field; and résumé of results. *Ibid* 181-231.—Mathematical. Equations are derived for the total diffused intensity and the depolarization when the intermol. field is taken into consideration. The original paper should be consulted for the form of these equations because of their intricacy. The existence of the intermol. field and the exactness of its calcn. may be tested experimentally by measuring the slight depolarization which exists at the state of crit. opalescence when the diffused beam is viewed at 90°. In seeking to verify this general theory with gases it was found that the measurements of Daure on EtCl agree well with the theory, whereas the Einstein-Gaus theory fails by about 10%. With liquids where the ions in the mol. do not oscillate, as in H<sub>2</sub>O, or where their oscillation produces an *a priori* negligible diffusion, the theory and expt. are in good accord. When the oscillation of the ions of the mol. must be taken into account, the corresponding term in the diffusion equation cannot be calcd. theoretically, but may be arrived at satisfactorily from expt. This term is quite important for compds. of the aromatic series. This conception of mols. with oscillating ions has the merit of explaining the seeming disagreement in measurements made on the aliphatic series and aromatic series, when interpreted by aid of the older theories.

R. H. LOMBARD

Rayleigh-Jeans radiation law. K. C. KAR AND R. C. MAZUMDAR. *Z. Physik* 53, 308-11(1929).—Mathematical derivation.

GEORGE GLOCKLER

Physico-chemical studies on bioluminescence. VII. The solubility of Cypridina luciferin in organic solvents. S. KANDA. *Sci. Papers Inst. Phys. Chem. Res.* (Tokyo, Japan) 10, 91-8(1929); cf. *C. A.* 23, 1915.—Luciferin from *Cypridina hilgendorfi* is usually isolated by extn. of the crushed insects first with petroleum ether, and with Et<sub>2</sub>O and benzene, resp., to remove fats and similar substances, and then with MeOH to remove the luciferin. The concd. MeOH ext. is only partly sol. in abs. EtOH, the insol. portion being protein. Luciferin, which is sol. in the abs. EtOH soln., is now sol. in benzene, giving a non-colloidal soln. This soly. behavior indicates that luciferin is non-protein in nature, which conclusion is confirmed by the fact that the product gives no Millon or ninhydrin reaction. Luciferin thus prepd. is sol. also in CHCl<sub>3</sub>, Et<sub>2</sub>O and petroleum ether.

W. D. LANGLEY

Nomenclature of electric discharges in air at atmospheric pressure. MAX TOEPFLER. *Z. tech. Physik* 10, 73-81(1929).—Various types of discharges are reviewed as to their relation with time (discontinuous or continuous, hysteresis), their color, current d., active agents, spatial arrangement, etc. For d. c. the typical discharge forms on small cathodes with decreasing and increasing current are discussed and the spark distance is defined. Diagrams illustrate the different situations.

B. J. C. v. D. H.

Dissociation and the color of free radicals. CHARLES B. WOOSTER. *J. Am. Chem. Soc.* 51, 1163-5(1929).—The conclusion of Gomberg and Sullivan (cf. *C. A.* 16, 3479) that increase in color of diphenyl-β-naphthylmethyl in benzene, nitrobenzene, and cyclohexane is caused by increase in the proportion of the quinonoid tautomer upon diln. is incompatible with the evidence. For tautomeric equil.,  $C/C' = K$ . In ideal solns. the const. could not vary upon diln. Walden ("Chemie der freien Radikale, Leipzig 1924, 200, 294-7) found no satisfactory equil. const. on testing their cryoscopic data. The measurements do not give correct values for the dissocn. of ethane and so cannot be used as a basis for colorimetric comparison.

MARY E. LEAR

Ratio between the surface energies of different surfaces of rock-salt crystal. S. ARZYBISHEV. *Z. Physik* 48, 286-7(1928); *Science Abstracts* 31A, 600-1.—Remarks on papers by Kuznetsov and Bessonov (*C. A.* 21, 3543) are given. A. considers the assumption, that the work required to grind the different faces of the crystals is proportional to the surface energies of these faces, rests on a very uncertain basis, since in addn. to splitting off minute particles work is used in grinding up these particles; besides this it would be necessary to assume that the mean linear dimensions of the particles are inversely proportional to the surface energies. Some expts. are recorded in which the coeffs. of friction and the ratio between the work required to grind the (100) and (110) surfaces were detd. The values obtained differ greatly from those of Kuznetsov and Bessonov.

H. L. D.

Electrical conductivity as a criterion of the nature of chemical combination. G. v. HEYSEY. *Z. Elektrochem.* 34, 463-72(1928).—A review of recently published work on crystal structure and the nature of chem. combination. H. considers how much stress may be laid on kinetic processes and investigations of the velocity of the displacement of the particle groups of crystd. material as a means of explaining types of chem. combination. He also considers the conclusions which may be drawn from studies of the elec. cond. of molten substances. In the cryst. state, extreme types,

such as heteropolar compds., metals (ideal metallic mixed crystals), and mol. compds. are met with, and they are characterized by an extremely small displacement of the lattice groups. In the transition region between these types, very significant displacement velocities are observed. For example, in good heteropolar compds. of Ag on the one hand, and in metallic Ag on the other, there is a relatively small displacement velocity, whereas the effect in  $\alpha\text{AgI}$  and  $\alpha\text{AgS}$  attains an extraordinarily high value (over 1 cm.<sup>2</sup>/day). The same observation is made just before the ionic lattice is transformed into the hexagonal close-packed structure. The region of greatest lattice loosening, that is, the greatest displacement velocity of the  $\text{Ag}^+$ , occurs within the region of the polymorphic change since both of these effects are produced by a special favorable relation of ionic size and a greater polarizability of the anion. The disintegration curve of the  $\text{Ag}^+$ , which gives the displacement const. of the Ag as a function of the anion, shows a steeply rising and falling branch. The falling off of the curve may be understood more readily if the easier cleavage of the "loosened" ions is borne in mind. In the molten state, the decrease in the heteropolarity is not manifested immediately. The rising branch of the disintegration curve shows the same relationships as in the cryst. state. It emphasizes the 2 extreme groups of strong electrolytes on the one hand, and the isolated melts on the other, between which there exists a series of transition types.

L. L. QUILL

**Crystal structure and the types of chemical combination.** V. M. GOLDSCHMIDT. *Z. Elektrochem.* 34, 453-63(1928).—A review of recently published work on crystal structure and the nature of chem. combination. The crystal structure of a given substance is detd. by the properties of the individual atoms or ions which make up the crystal. Such properties are the no. of particles, which is given by the chem. formula; the size, which is given by the distance between atoms; and the polarizability of the atoms. Four classes of exply. detd. data on cryst. substances are discussed as being significant: (1) The geometrical arrangement of the atoms in the crystal, (2) the distance between at. centers in the crystal, (3) the solid properties of crystals, (4) the elec. and electro-optical properties of crystals. Coördination lattices and molecular lattices with the transition types are discussed under geometrical arrangement. In considering the distance between atoms, the method of measurement by x-ray means, the influence of neighboring particles, the size of the atoms or ions, coördination nos., etc. are mentioned. The hardness of chem. compds. of various types is given as an example of the solid properties of crystals. The nature and value of the elec. cond., the pyro- and piezo-elec. relations, refractivity, and dispersion as functions of the electrically charged particles in the crystal furnish data of significance for a knowledge of the various types of combination.

L. L. QUILL

**Electrical conductivity and diffusion in crystalline compounds.** ADOLF SMERKAL. *Z. Elektrochem.* 34, 472-83(1928).—A review of recently published work on crystal structure and the nature of chem. combination. The mechanism of elec. cond. and of the diffusion process in cryst. compds. is essentially bound up with the deviation of the actual crystal structure from that of the ideal lattice. From this idea may be formulated a relation showing the dependence of the cond. on the temp., and an insight gained into whether the cond. is ionic or electronic in nature. The accurate analysis of the temp. relations gives a quant. measure of the deviation of the actual from the ideal lattice, as well as a means of detg. the migration velocity and the degree to which the types of carriers of electricity concerned in the conductance are disocc. The migration velocity and the degree of disocc. are dependent primarily upon the deformation of the crystal structure described by Fajans. A direct conclusion on the nature of the cond. through solid substances is not possible because it is detd., in many cases, not only by the deformation relations of the "loosened" groups in the actual crystal, but also by each of its lattice groups.

L. L. QUILL

**The principles determining the structure of complex ionic crystals.** LINUS PAULING. Calif. Inst. Tech., Pasadena. *J. Am. Chem. Soc.* 51, 1010-26(1929).—Principles of structure of complex ionic crystals, a coördinated arrangement of anions being assumed about each cation, at the corners of an approx. regular polyhedron, are formulated with the aid also of considerations based upon the crystal energy. Only the crystals are considered which contain small cations with large valences, i. e., crystal radii not over 0.8 Å. U. and valence 3 or 4, and large anions (radii over 1.35 Å. U.) with small valences (1 and 2). Many complex crystals of known structures, particularly the complex silicates, satisfy the requirements of these principles. Some properties of the structures of the 3 forms of  $\text{Al}_2\text{SiO}_5$ , cyanite, and alusite, and sillimanite, are predicted, the use of the theory being illustrated. Structures of the Al silicates of bivalent metals should correspond to the formulas  $\text{R}_2^{++}\text{Al}_2\text{Si}_2\text{O}_7$  or  $\text{R}_2^{++}$ .



$\text{Al}_2\text{Si}_2\text{O}_7$ , a result in striking agreement with observation of the garnets and beryl, for example.

R. J. HAVIGHURST  
The space lattice of a monoclinic compound of the type of  $\text{MgWO}_4$ . EDGAR BROCH. *Z. physik. Chem.*, Abt. B, 1, 409-21 (1929).—X-ray data by the rotating crystal and powder methods have shown the space-lattice of  $\text{MgWO}_4$  to be simple monoclinic of the type ( $r_{11}$ ,  $r_{22}$ ,  $r_{33}$ ), according to Niggli's classification.  $\text{ZnWO}_4$ ,  $\text{FeWO}_4$ ,  $\text{MnWO}_4$ ,  $\text{NiWO}_4$ ,  $\text{CoWO}_4$ , and  $(\text{Mn}, \text{Fe})\text{WO}_4(\text{O} \text{ O } r_{12})$  have the same type of space lattice. The elementary cell of  $\text{MgWO}_4$  contains two mols. with a sp. gravity of 5.86. The lattice dimensions are  $a = 4.67$  A. U.,  $b = 5.66$  A. U.,  $c = 4.92$  A. U.  $B' = 89^\circ 35'$ ,  $B = 90^\circ 25'$ .

H. W. WALKER  
The preparation of large crystals of chrom-alum and interpretation of some etch-figures. FREDERICK A. ROHRMAN AND NELSON W. TAYLOR. Univ. of Minnesota. *J. Chem. Education* 6, 473-8 (1929).—Chrome-alum (violet  $\text{K}_2\text{SO}_4 \cdot \text{Cr}_2(\text{SO}_4)_3 \cdot 24\text{H}_2\text{O}$ ) was prepd. by bubbling  $\text{SO}_2$  through a concd. soln. of  $\text{K}_2\text{Cr}_2\text{O}_7$  below  $78^\circ$ . Small crystals were allowed to grow in satd. solns. of the alum, the crystals being transferred every day to fresh solns., and being turned over if their growth became unsymmetrical. A 16-months-old crystal weighs 700 g. When etched by an unsatd. aq. soln. of the alum at room temp., the crystals develop striations parallel to the bisectors of the angles of the equilateral triangles forming the octahedral faces (111). The striations possibly represent the appearance of pyritohedral planes (201) and (021).

R. J. H.  
The structure of diopside,  $\text{CaMg}(\text{SiO}_3)_2$ . B. WARREN AND W. L. BRAGG. *Z. Krist.* 69, 168-93 (1928). (English).—The space group and cell dimensions detd. by Wyckoff and Merwin (*C. A.* 19, 2007) are verified, the dimensions being  $a = 9.71$ ,  $b = 8.89$  and  $c = 5.24$ . There are 4 mols. in the unit cell, and definite positions for all of the atoms have been detd. A unique feature is the occurrence of chains of  $\text{SiO}_4$  groups running parallel to the  $c$  axis. Each Si atom is surrounded by 4 O atoms, nearly at the corners of a regular tetrahedron, the distances Si-O varying from 1.57 to 1.64 A. U. The distances between the O atoms vary from 2.48 to 2.66 A. U. The upper and the lower O atom of each  $\text{SiO}_4$  group is shared by the neighboring group, thus forming the chain. The 3 observed cleavages are all parallel to the chains, suggesting that the binding is strongest along the chain. The Ca and Mg atoms lie between the chains in such positions that each Ca is surrounded by 8 O atoms, and each Mg by 6 O atoms.

L. S. RAMSDELL  
Isodimorphism of sodium bromide and sodium chloride. Preparation of pure sodium bromide. A. V. RAKOVSKII AND V. V. POLYANSKII. *Trans. Inst. Pure Chem. Reagents* (Moscow) 1927, No. 6, 5-9.—By using aq. solns. of NaBr and NaCl, with the solute contg. less than 88% by wt. of NaBr, crystals are obtained at  $6^\circ$  to  $8^\circ$  which are of cubic system, contain less than 22% of NaBr and no water. With solns. contg. more than 88% of NaBr the pptd. crystals are monoclinic and they have the compn.  $\text{Na}(\text{Cl}, \text{Br})2\text{H}_2\text{O}$ . Conclusion: NaCl and NaBr are isodimorphs of the type of the 5th group of Roozeboom. The sepn. of NaBr from NaCl is possible by means of 99-100% MeOH. At  $15^\circ$  the solubilities are: 17.42 g. NaBr and 1.55 g. NaCl in 100 g. alc. From a mixt. of the 2 salts 17.04 g. are dissolved in 100 g. of alc. and the solute contains 99.68% NaBr.

G. B. KISTIAKOWSKY  
The crystal structure of anhydrous mesotartaric acid and of some mesotartarates. W. SCHNEIDER. *Z. Krist.* 69, 49-61 (1928).—Anhyd. mesotartaric acid could not be obtained in crystals good enough for crystallographic measurements, but the x-ray data indicate a triclinic cell, contg. 2 formula wts., with the dimensions  $a = 9.24$ ,  $b = 6.33$  and  $c = 5.45$  A. U.;  $\alpha = 70.5^\circ$ ,  $\beta = 78.0^\circ$  and  $\gamma = 79.5^\circ$ . There are 4 formula wts. of  $\text{Ti}_3\text{C}_2\text{H}_4\text{O}_4$  in the unit cell, occurring in pairs which are not equiv.—an unusual type of assocn. Partial dimensions of the cell are  $a = 1326$  and  $c = 7.63$  A. U.,  $\beta = 86^\circ 37'$ . For the direction and length of the third side there were several possibilities, with insufficient data for making a choice. Measurements on crystals of  $\text{K}_2\text{C}_4\text{H}_4\text{O}_6 \cdot 2\text{H}_2\text{O}$  gave  $a:b:c = 1.019:1:1.600$ ,  $\alpha = 95^\circ 44'$ ,  $\beta = 102^\circ 52'$ , and  $\gamma = 61^\circ 46'$ . The unit cell contains 2 formula wts., and partial dimensions are  $a = 7.02$  and  $c = 11.02$  A. U.,  $\beta = 102^\circ 52'$ .

L. S. RAMSDELL  
The crystal structure of pentaerythritol, pentaerythritol tetraacetate and dibenzal-pentaerythritol. F. A. VAN MELLE AND H. B. J. SCHURINK. *Z. Krist.* 69, 1-16.—The structure of pentaerythritol is discussed. The space group of the tetraacetate is  $C_{4h}$ , and  $a = 12.13$  and  $c = 5.55$  A. U. Dibenzal-pentaerythritol is hexagonal, occurring in plate-like crystals with good basal cleavage. It is optically neg., and may be either right- or left-handed, the optical rotation being  $2^\circ$  per mm. for Na light. The axial ratio varied from 6.08 to 6.11. A Bragg photograph gave  $d_{001} = 12.23$  A. U., but a rotation photograph gave  $d_{001} = 36.7$  and  $a = 6.03$  A. U., with  $c/a = 6.08$ .

There are 3 mols. in the unit cell, and the calcd. d. is 1.34; measured d. is 1.30. A Laue diagram showed a 6-fold axis of rotation and 6 planes of symmetry. The space group is  $D_6^4$ . The length of the mol. is about 12 A. U., while the value calcd. by the method used by Bragg, Mark, etc. would be at least 16 A. U. L. S. RAMSDELL.

**Crystal structure of solid mercury.** M. WOLF. *Z. Physik* 53, 72-9(1929).—See C. A. 22, 4288. GEORGE GLOCKLER

**The crystal structure of nickel.** L. MAZZA AND A. G. NASINI. *Phil. Mag.* [7], 7, 301-11(1929).—Ni obtained by electrodeposition, by decompn. of  $\text{Ni}(\text{CO})_4$ , and by reduction of the oxide crystallizes in face-centered cubes. Dimensions of crystal particles range from  $10^{-2}$  to  $10^{-3}$  cm. The edge of the elementary cell varies from 3.513 to  $3.515 \pm 0.001$  A. U., with a mean value  $3.514 \pm 0.001$  A. U. Pure cold-drawn Ni after various thermal treatments always crystd. in face-centered cubes. No confirmation was found of Hull's observation that Ni crystd. in body-centered cubes at ordinary temp. Pure cold-drawn Ni when annealed for a long time does not show recrystd. structures, detectable by x-ray analysis, for annealing temps. up to  $940^\circ$ . The appearance of characteristic recrystd. structures is only observed at  $1000^\circ$  and above. Annealing for 30 hrs. at  $1200^\circ$  produces recystn. in coarse grains which give rise to marked reduction in ductility and tensile strength. Quenching does not produce any change in the dimensions of the Ni lattice. The relative intensity of the lines is about the same in the photograms of all samples examd. and is in good agreement with the values deduced by the formula adopted in the investigation. L. H. REYERSON

**The preparation of single crystals of metals.** G. SACHS. *Metallwirtschaft* 7, 605-7(1928). A. J. KING

**Thermoelectric phenomena and electrical resistance in single metal crystals.** P. W. BRIDGMAN. Harvard Univ. *Proc. Am. Acad. Arts Sciences* 63, 351-99(1929); cf. C. A. 19, 425; 20, 326, 1939.—Single metal crystals were made by cooling the molten metal contained in a mold consisting of criss-cross arms of glass tubing coated on the inside with enamel. Crystn. starts at one point and proceeds throughout the tube, resulting in a single crystal which consists of a number of short crystal rods, each one differently oriented. The thermal e. m. f. of 16 rods could be measured simultaneously in the app. used, the only variable factor in the measurements being the crystal orientation. Thermal e. m. f. against Cu of single crystal Zn, Cd, Sb, Sn, and Bi was measured between  $20^\circ$  and  $88^\circ$ , and from the results the thermal e. m. f., Peltier heat, and difference of Thomson heats between rods of the same metal with different orientations were calcd. In the case of Sb and Bi the heat absorbed by an electron when its direction of motion changes from perpendicular to the crystal axis to parallel to the axis is very large, being resp. 0.2 and 0.4 of the energy of a gas mol. at the same temp. This is a difficult point for the recent Sommerfeld theory. The Kelvin-Voigt law that thermal e. m. f. is a linear function of  $\cos^2\theta$ ,  $\theta$  being the angle between the crystal axis and length of the rod, was verified for Zn, Cd, and Sb, but there were deviations for Sn and Bi. Within exptl. error the Thomson heat does satisfy the K.-V. law; it is only the contribution to the total e. m. f. made by the Peltier heat that fails to satisfy the law. In the case of Bi, it was found that the thermal e. m. f. shows rotational symmetry about the crystal axis. Sp. resistance of the metals was studied as a function of the orientation. The Kelvin-Voigt symmetry relation is satisfied. The previously found low value of the resistance perpendicular to the cleavage plane of Bi was verified. The pressure coeff. of resistance for Sb and Bi was obtained over the entire range of orientations. The third law of thermodynamics lends plausibility, though not certainty, to the theory that the symmetry of the Peltier heat and the Thomson heat must be the same. If this be true the apparent exptl. difference in the symmetry of the two heats is merely an effect of the much greater error in detn. of the Thomson heat. The author revises his previous discussion of Kelvin's axiom of the superposition of thermal effects of currents, concluding that the axiom is logically consistent, but pointing out that expt. seems to contradict it. The surface heat where a current leaves a metal crystal is a function both of the direction of flow with respect to the crystal axis within the crystal and of the orientation of the surface, contrary to the author's former statement. In the light of the present discussion, the crystal phenomena no longer offer a basis for a proof that the electrons move in the crystal along something analogous to fixed channels. R. J. HAVIGHURST

**Single crystals of silver.** E. W. R. STEACIE AND F. J. TOOLE. McGill Univ., Montreal. *J. Am. Chem. Soc.* 51, 1134-5(1929).—Single crystals of Ag were prepd. by slowly cooling a very pure sample of the metal from the molten state to  $940^\circ$ , which temp. was maintained for 48 hrs. There results a bar of Ag which, when treated with dil.  $\text{HNO}_3$ , develops prismatic faces. R. J. HAVIGHURST

**Elastic constants of monocrystalline aluminum and gold.** E. GOENS. Phys. tech. Reichsanstalt, Berlin-Charlottenburg. *Naturwissenschaften* 17, 180(1929).—From the modulus of elasticity  $E$  and of torsion  $G$  in various directions the Voigt moduli were found for monocryst. Al at room temp.  $E_{[111]}:E_{[100]} = 1.18:1$ ;  $G_{[111]}:G_{[100]} = 1:1.13$ ;  $s_{11} \cdot 10^{13} = 15.7$ ;  $s_{12} \cdot 10^{13} = -5.6$ ;  $s_{44} \cdot 10^{13} = 35.7$ . The corresponding values for Au are 2.7:1, 1:2.2, 24.5, —11.3, 25. The accuracy was 2% for Al, 5% for Au, the values are all in c. g. s. units. Bridgman's figures for the compressibility were used.

B. J. C. VAN DER HOEVEN

**The bending of an aluminum crystal plate.** YOICHI KIDANI AND SAKUTCHI TOGINO. *Bull. Inst. Phys. Chem. Research (Tokyo)* 8, 118–25(1929); *Abstract Ed.* 2, 18–9.—This is a description of the results of expts. on the form, slip-bands and Röntgen asterism when a plate of single crystals of Al is bent, as well as the method of detg. the direction of the crystal axis in the simplest manner, by using the radiograph together with a newly devised model. The results are as follows: (1) The form after bending, generally presents a saddle-shape whose curvatures depend upon the relation between the axes of the crystal and of the bending. As a special case, a right-circular cylinder may occur. These forms can be calcd. from the theory, by considering them to be due to slip in the cases of extension and compression. (2) The plane and direction of slip are common for the extension as well as compression sides, and these slips are oppositely directed in accordance with the results obtained by Taylor and Elam. (3) Röntgen asterism produced when single crystals of Al are bent, may be explained by the rotation of the crystal axis due to the extension of the inner and compression of the outer side. This may also be applied to the case of any other metal having a face-centered cubic lattice.

ALBERT L. HENNE

**Solubility in the gaseous phase, especially in the system:  $\text{NH}_3(1) \text{NH}_3(g), \text{H}_2(g), \text{N}_2(g)$ .** H. L. CUPPLES. *J. Am. Chem. Soc.* 51, 1026–33(1929).—Soly. effect in the gaseous phase is defined as a change in the activity of one component due to the presence of other components. Agreement between calcd. and exptl. concns. of  $\text{NH}_3$  in the gaseous phase shows the absence of such an effect in the above system.

J. FLEISCHER

**Stationary flow of very dilute gases.** P. CLAUSING. Nat. Lab., Philips Gloeilampenfabrieken, Eindhoven. *Physica* 9, 65–80(1929).—The Knudsen and the Smoluchowski general equation  $K = W \cdot S v_1$  for the no. of mols. flowing per sec. through a tube of cross section  $S$  to a bulb with pressure zero from a bulb where they exert  $v_1$  collisions per sq. cm. per sec. on the walls is surveyed for several cases using various values of  $W$  depending on the relative sizes of tube length and diameter. A partial soln. is offered for an integral equation including tubes of arbitrary form.

B. J. C. VAN DER HOEVEN

**Refractivity of gaseous compounds.** G. W. BRINDLEY. Univ. of Manchester. *Nature* 123, 165(1929).—Attention is called to certain simple numerical relations between the refractivities of several compds. in the gaseous state; e. g., the refractivity of  $\text{CCl}_4$  is 16/7 that of  $\text{Cl}_2$  and 4 times that of  $\text{HCl}$ ; and the refractivity of  $\text{CS}_2$  is 4/3 that of  $\text{S}_8$ . These same ratios hold for the nos. of loosely bound electrons, but this simple explanation seems applicable to only a few cases.

W. W. STIFLER

**The so-called sama-condition.** I. Previous work. E. A. HOLM. *Arkiv. Mat. Astron. Fysik* 19A, No. 34, 19 pp.(1927). (In German).—It has been suggested by Loschmidt (1876) and several later writers that a substance (especially a gas at low pressure) because of the influence of gravity should possess a temp. gradient (highest temp. at lowest pt. in substance) which does not cause a flow of heat. This condition has been called by v. Dallwitz-Wegner (*Z. Physik* 15, 280(1923)), the sama-condition. On theoretical grounds the existence of this phenomenon has been denied, since it would lead to a contradiction of the Second Law of Thermodynamics. The author attempted to measure the temp. diff. between the upper and lower ends of a long vertical column of air at 10–0.001 mm. pressures by means of a bolometer, but found that radiation between the parts of the bolometer masked any possible effect due to sama-condition. Only at very low temps. might this type of investigation succeed. However, there would be expected a flow of heat downward in a tube all parts of whose walls were originally at the same temp., and a vane placed perpendicular to this heat flow should experience a downward pressure. This downward pressure is called the *gravimolecular pressure*, different from the ordinary *thermomolecular pressure*. II. Investigations on gases. *Ibid* 20A, No. 1, 88 pp.—The gravimolecular pressures of air and  $\text{CO}_2$  at pressures of  $2 \times 10^{-4} - 15 \times 10^{-4}$  mm. Hg were measured with  $\text{H}_2$  at the same pressures as a comparison substance. In the middle of an 80-cm. brass tube was placed an Al vane, circular, of 4 cm. diameter and  $1 \times 10^{-3}$  cm. thickness. The vane was attached to a microbalance and its motion was measured as the tube was held at first vertical and then horizontal. Gravimolecular pressure should cause a greater deflection of the

vane when the tube is vertical, and this deflection should be greater for the heavier gas. The results show a gravimolecular pressure which increases with increasing gas pressure, and which cannot be explained as due to the thermomolecular pressure. In these expts. there was present an unknown gas with a pressure of  $6 \times 10^{-4}$  mm. Hg. III. Investigations on the vapor of diacetoneoxlyose. *Ibid* 21A, No. 12, 72 pp. (1928).—The saturation pressure of solid diacetoneoxlyose ( $C_{11}H_{18}O_8$ ) was detd. with a Knudsen manometer (C. A. 3, 1839; 8, 2831) to be  $1.0 \times 10^{-4}$  mm. Hg at  $15^\circ$ . Two different series of expts. were made with the vapor of diacetoneoxlyose, air at two diff. pressures being the comparison gas. In one case the air was at a higher pressure than the pressure of the diacetoneoxlyose vapor with air as impurity; in the other case the air was at a lower pressure. Values of the gravimolecular pressure obtained in the two sets of expts. agree well, and the pressure is 47% of the theoretical max., to be expected on the assumption that all mols. of the same kind have the same velocity (orientations haphazard). For air and  $CO_2$  the observed gravimolecular pressure was not more than 25% of the theoretical max. This difference is to be expected, because of the difference in wt. of the mols. The gravimolecular pressure of the diacetoneoxlyose is so great relative to its thermomolecular pressure, that its reality seems well substantiated. R. J. H.

Upper limit of energy density and the degradation of gas at high temperature. SEITARÔ SUZUKI. Kyushu Imp. Univ. *Proc. Imp. Acad. (Japan)* 5, 64-7 (1929).—Mathematical treatment. C. J. WEST

Method for determining vapor densities at room temperatures. ERWIN F. LINHORST. *J. Am. Chem. Soc.* 51, 1165-7 (1929).—The liquid is vaporized from a bulb inside one of two evacuated flasks of known vol. connected by an oil manometer. Calcd. values based on  $PV = WRT/M$  are given for  $C_6H_6$  and EtOH. The latter correspond closely to values by the Victor Meyer method. MARY E. LEAR

The gaseous state of low-boiling substances. KURT WOHL. Univ. Berlin. *Z. physik. Chem.*, Abt. B, 2, 77-114 (1929); cf. C. A. 22, 3074.—The calcn. of the van der Waals  $a$  and  $b$  for the permanent gases, He,  $H_2$ , Ne,  $N_2$ , A and  $O_2$  is discussed.  $CO_2$  is taken as representative of the normal substances. The corrected values for  $a$  and  $b$  are calcd. from equations deduced for the reduced second virial coeffs., with consideration of the temp. coeffs. of  $a$  and  $b$ . The second virial coeff. corresponds closely for Ne,  $N_2$  and  $O_2$  with reduced critical data; above the critical temp. there is a certain correspondence with normal substances. Below 1.6 times the reduced temp. the compressibility increases faster for permanent gases than for normal substances. Data for  $H_2$  and He do not agree well with A. Wohl's equation. This is due to the influence of the abs. zero energy on critical data. When this is taken into account in calcn. the reduced second virial coeff., good correspondence is shown. The old quantum theory leads to values of van der Waals  $a$  and  $b$  which do not agree with observed values. ARTHUR FLEISCHER

A new equation of state. HERBERT J. BRENNEN. Northwestern Univ. *Proc. Nat. Acad. Sci.* 15, 11-8 (1929).—The van der Waals' equation is of the 3rd degree in vol.  $V$  and therefore has 3 roots, 2 of which may be imaginary, at any given temp. and pressure. At the crit. point the 3 roots coincide. The equation must, therefore, contain 3 parameters. Apparently the equation satisfies this requirement since it has the 3 parameters  $a$ ,  $b$  and  $R$ . However, as  $V$  increases indefinitely it must reduce to the simple gas law  $PV = RT$ , where  $R$  is a natural const independent of the nature of the gas. Hence, van der Waals' equation, in reality, contains only 2 parameters  $a$  and  $b$  and must, in general, be mathematically absurd. The following modification of this equation is proposed  $[P + (ce^{A/T}/V^n)](V - b) = RT$ , where  $n$  is the missing parameter and  $ce^{A/T}$  replaces the van der Waals " $a$ ." Simple relationships between  $a_r$ ,  $b_r$  and  $n$  are shown to hold when the equation is written in the reduced state. E. R. SMITH

An equation of state for ethylene gas. LOUIS J. GILLESPIE. *J. Phys. Chem.* 33, 354-60 (1929).—The consts. in the equation of state of Beattie and Bridgeman (C. A. 21, 3146) have been detd. for ethylene gas from the data of Amagat. Using atms., l. per mol.,  $T = 273.13 + t^\circ C$ ,  $R = 0.08206$ , they are  $A_0 = 6.152$ ,  $a = 0.04964$ ,  $B_0 = 0.12156$ ,  $b = 0.03597$  and  $c = 22.68 \times 10^4$ . This equation is exact up to a d. of 7 moles per l. and approx. to 8, which is slightly above the crit. d., the av. deviation being 0.36 and 0.45%, resp. The normal d. calcd. from the equation agrees with the accepted value within 0.04%. A. WHITS

Vapor pressures of diethyl selenide, tetramethyl tin and tetramethyl lead. YOSHIO TANAKA AND YÔZABURÔ NAGAI. Tokyo Imp. Univ. *Proc. Imp. Acad. (Japan)* 5, 78-9 (1929).—V. p. detns. for  $SeEt_2$ ,  $SnMe_4$  and  $PbMe_4$  are given for  $25^\circ$  and  $35^\circ$  as follows: 28, —; 112, 168; 31, 51. The following equations are given for  $\log p$ :

SeEt<sub>2</sub>, 7.905 — 1924/T; SnMe<sub>4</sub>, 7.602 — 1655/T; PbMe<sub>4</sub>, 7.751 — 1865/T. These liquids are all normal. C. J. WEST

Condition for the equilibrium of a liquid with its vapor given by Boltzmann, and the relation between this condition and the thermodynamic potential. J. W. DEKKER. *Proc. Acad. Sci. Amsterdam* 31, 973-7(1928).—Boltzmann's expression for the condition of equil. between liquid and vapor of a simple substance, is shown to be incorrect. The expression  $e_{pot} - (\partial e_{pot}/\partial v)v - RT \log v$ , defines the condition correctly. In this expression,  $v$ , is the space available, per g. mol., for a last mol. center,  $e_{pot}$  is the potential energy of 1 mol. in relation to the others and the other symbols have their usual significance. ARTHUR GROLLMAN

The vapor density and pressure of ammonium iodide. RONALD H. PURCELL AND WILHELMUS DE LANGE. *J. Chem. Soc.* 1929, 275-9.—By the exptl. method employed by Smits and his co-workers (cf. *C. A.* 23, 1326), the vapor pressures and vapor ds. of NH<sub>4</sub>I were measured simultaneously between 300° and 436°. Log  $p$  is a linear function of  $1/T$ . It follows then, that the latent heat of evapn. between 300° and 436° is not a function of the temp. The mol. heat of evapn.  $(Q_{80})_{NH_4I} = 44 \times 10^3$  cal., was calcd. from the data. The vapor d. measurements based on observations of the pressure of the satd. and of the unsatd. vapor of a weighed quantity of salt in a known vol., indicated that the vapor was completely dissocd. at all temps. up to 400°. If the salt was perfectly dry there was hardly any decompn. of the HI. Furthermore, there was no tendency for the NH<sub>4</sub>I to be absorbed on the glass walls as was the case with NH<sub>4</sub>Br. W. C. FERNELIUS

The vapor pressures of binary systems; the aqueous solutions of orthophosphoric acid, sodium hydroxide and potassium hydroxide. UKITIRO NAKAYA. *Trans. Faraday Soc.* 24, 543-5(1928).—Empirical equations are constructed for vapor pressures of H<sub>3</sub>PO<sub>4</sub>, NaOH and KOH from Tammann's data in Landolt-Börnstein for a temp. of 100°. The mol. fractions at any concn. are represented by  $\mu_1$  for H<sub>2</sub>O and  $\mu_2$  for the solute. The H<sub>3</sub>PO<sub>4</sub> curve shows an inflection at  $\mu_1 = \mu_2 = 0.5$ , indicating a loose compd. of H<sub>3</sub>PO<sub>4</sub>. H<sub>2</sub>O in soln. For NaOH and KOH the curves indicate that beyond  $\mu_2 = 0.5$  all H<sub>2</sub>O mols. combine with the solute and show no sensible vapor pressure. H. R. MOORE

The vapor pressure and vapor density of intensively dried ammonium chloride. WORTH H. RODEBUSH AND JOHN C. MICHALEK. *J. Am. Chem. Soc.* 51, 748-59(1929); cf. *C. A.* 22, 1881.—The app. and exptl. methods used are discussed in detail as well as the conclusions drawn from the results obtained. A complete bibliography is included. W. C. FERNELIUS

The efficiency of liquefiers for hydrogen and helium. W. H. KEESOM. *Rapports et Comm. 5th Cong. intern. froid*, Apr., 1928; *Comm. Phys. Lab. Univ. Leiden*, Suppl. No. 65, 39-47.—The thermodynamic theory of liquefaction app. is discussed, and the efficiency is defined as the ratio of the wt. of gas leaving the app. (as liquid) to the total wt. of gas entering the app. The max. efficiency will be attained at pressures where  $(\partial T/\partial p)_H = 0$ , the subscript  $H$  denoting const. total heat. The efficiency will increase as the temp. of the entering gas decreases. Efficiencies of 0.171 for  $T_A = -193^\circ$  and 0.295 for  $T_A = -210^\circ$  are calcd. from the K.'s diagrams for H<sub>2</sub>.  $T_A$  is the temp. of entering gas. The pressure in both cases is 150 atm. Results are in agreement with those of Meissner (*C. A.* 18, 186). The Leiden app. gives 13 l. of H<sub>2</sub> per hr., as compared with 13.8 l. per hr. calcd. from the theoretical efficiency. For He liquefaction app. the agreement between actual and theoretical efficiencies is also satisfactory. C. Z. ROSECRANS

Raoult's law. WILDER D. BANCROFT AND H. L. DAVIS. *J. Phys. Chem.* 33, 381-70(1929).—The following modification of the Raoult equation was found to conform to exptl. data over a wide range of concn. for several pairs of liquids:  $(G_1/G_2)^a = K(p_1 - p'_1)/p'_1$ .  $G_1$  and  $G_2$  are the masses in grams of the 2 components in the soln.;  $p_1$  is the vapor pressure of the pure solvent;  $p'_1$  is the partial pressure of the solvent in the soln.;  $K$  is a const. and depends on the units used, the mol. wts. in the vapor phase, the soly., and perhaps on other factors; the exponent,  $a$ , is some function of the relative polymerization and is independent of the units. From the new equation it is possible to calc. the equation of the distribution of one liquid between 2 other liquids, each consolute with the first, provided these other 2 liquids are kept immiscible. Raoult's law is a special case under this equation for ideal solns. A. WHITE

Form and structure of sparks. T. TERADA AND U. NAKAYA. *Sci. Papers, Inst. Phys. Chem. Research (Tokyo)* 1928, 1-19, 65-82, 103-29(in English); *Science Abstracts* 31A, 715.—A description is given of an exhaustive exptl. investigation of the form and structure of sparks between electrodes of different shapes in various gases. The effects

of different circuit conditions, *e. g.*, introducing a series spark gap, varying the inductance and capacity, etc., are shown in a series of photographs. H. L. D.

**The kindling point of gaseous combustible mixtures.** M. PRETTRE AND P. LAFITTE. *Compt. rend.* **188**, 397-9(1929).—In his previous note, L. had emphasized the importance of a drastic evacuation of the reaction vessel after each run (*cf. C. A.* **23**, 1046). He now gives actual figures showing that the presence of small quantities of burned gases are capable of raising the kindling point by some 50°. A. L. H.

**Investigations of the kinetics of the combustion of carbon monoxide.** VLADIMIR S. FINKELSTEIN AND VADIM P. MASHOVETZ. Kiev. Polytechn. Inst. *J. Russ. Phys.-Chem. Soc.* **60**, 1601-28(1928); *Z. physik. Chem., Abt. A*, **138**, 369-78(1929).—The combination of CO with O in glass reaction bulbs was investigated at 500°. The progress of the reaction was followed by measuring the pressure at const. vol. The reaction was found to be of the 3rd order. Glass, considered as a catalyst, is poisoned by CO<sub>2</sub>. The mechanism of the catalytic action and of its poisoning is discussed from the standpoint of phys. and chem. adsorption. Preliminary expts. using Fe<sub>2</sub>O<sub>3</sub> as the catalyst at different temps. are mentioned. E. R. SMITH

**Equilibrium combustion of a mixture of carbon monoxide and hydrogen.** CLARK C. MINTER. *J. Soc. Chem. Ind.* **48**, 35T(1929).—Previous work has shown that at low temp. selective burning of the H<sub>2</sub> and CO in a mixt. of these gases with air takes place. The difference in rates depending on the catalyst used. At higher temp. this difference disappears and the rates of burning seem to become equal. Haslam (*C. A.* **17**, 2637) reports results obtained from data of Kreisinger, Augustine and Owitz (*C. A.* **12**, 1242). Gases giving these data were obtained by mixing air with the gas evolved from soft coal burning with insufficient air for complete combustion, and passing the gases through a 40-ft. flue arranged to take samples at four different places. H.'s conclusions are entirely at variance with the previous work. M. has taken the same data and plotted the percentages and the logarithms of the percentages against time for each of the points at which analyses were made, and shows that the equation for the compn. of the gas with time gives the same velocity coefficient for both H<sub>2</sub> and CO. As another proof that the reactions proceed at the same rate, M. takes the data and shows that the ratio of fractional changes in concn. are the same for both gases. H. in his calcs. has overlooked the fact that the water-gas equil. plays an important part in the reaction at high temps. M. C. ROGERS

**Binary solutions of consolute liquids.** WILDER D. BANCROFT AND H. L. DAVIS. Cornell Univ. *Proc. Nat. Acad. Sci.* **15**, 8-10(1929).—The empirical equation  $[(G_1/M_1)/(G_2/M_2)]^a = (N_1/N_2)^a = K(p_2 - p'_2)/p'_2$ , where  $M_1$  and  $M_2$  are the g. mol. wts. (in the vapor state) of the 2 components of a soln.,  $p_2$  and  $p'_2$  are the vapor pressure of the pure solvent and the partial pressure of the solvent in the soln., resp., and  $a$  and  $K$  are empirical const. obtained from the exptl. data, was found to represent the behavior of non-ideal solns. with unexpected precision. The equation was tested with data for mixts. of EtOH and H<sub>2</sub>O at 25° and mixts. of acetone and Et<sub>2</sub>O at 20° and 30°. The equation for the distribution of acetone between MeOH and H<sub>2</sub>O is stated to be  $G_1/G_2^{1.08} = \text{const.}$  The exponent  $a$  is some measure of the relative polymerizations. E. R. SMITH

**Derivation of the Einstein equations for Brownian motion by impulses of molecular collisions.** V. POSPIŠIL. *Physik. Z.* **30**, 82-3(1929). FRANK URBAN

**A critical consideration of some schemes of fractionation.** ARTHUR A. SUNIER. Univ. Rochester. *J. Phys. Chem.* **33**, 577-85(1929).—Four methods of fractionating in cuts of two are examd. from the point of view of yield, gs. evapd. per g. yield and quantity of original material needed to give the desired yield. These methods are designated (1) Zero included; (2) Zero not included; (3) Zero and L1 not included; (4) Zero, L1, and L2 not included. The terms, Zero, L1, etc., refer to columns in the scheme of fractionation and mean, resp.; material in the same column as the starting material, one arbitrary unit light, one arbitrary unit heavy, etc. To produce 100 g. of L8 and 100 g. of I/8, method 1 requires less starting material than 2, while method 2 requires less material to be evapd. than 1. The conclusions are that, in general (1) The fractionation should be carried in both directions as far as possible; (2) the number of rows worked should be large. The results should be applicable in fractional crystns. as well as distns. M. W. SEYMOUR

**Rapid dehydration of alcohol by means of barium oxide and metallic calcium.** G. FREDERICK SMITH. *Ind. Eng. Chem., Anal. Ed.* **1**, 72-4(1929).—Dehydration of alc. is accomplished with BaO in one-fifth the time required with CaO. The alc. may then be made abs. by further treatment with metallic Ca. J. FLEISCHER

**Alcoholometric tables.** A. V. RAKOVSKII. *Trans. Inst. Pure Chem. Reagents*

(Moscow) 1927, No. 5, 5-112.—R. calcs. new alcoholometric tables using critically the published data, mainly those of Mendelyev (St. Petersburg, 1865), Kreitling, and of Osborne, McKelvy and Bearce (C. A. 7, 2889). By comparing the data of Mendelyev and of Osborne, etc., smoothing out the differences by the method of least squares, R. arrives at an interpolation formula (a polynomial of the 8th order), which reproduces the d. of water-alc. mixts. at 15°. The calcn. of the ds. at other temps. is carried out by taking mean values from the data of Kreitling, of Osborne, etc., and of Mendelyev, assigning to the latter only half the statistical weight. The means are later smoothed out by 2 approximations and interpolated by means of higher-order polynomials. The final values for the d., reduced to water d. at 4° and using the H scale, are given in table I, in which the alc. concn. is in % by wt. The following tables

%	Density $\times 10^4$						
	0°	5°	10°	15°	20°	25°	30°
0	99987	99999	99973	99913	99823	99708	99568
5	99131	99135	99102	99036	98940	98817	98670
10	98477	98450	98391	98301	98184	98040	97872
15	97990	97912	97806	97675	97519	97339	97137
20	97567	97424	97260	97075	96870	96646	96402
25	97103	96893	96668	96427	96171	95900	95613
30	96522	96255	95976	95685	95383	95069	94744
35	95798	95486	95165	94835	94497	94150	93794
40	94941	94596	94245	93887	93522	93150	92772
45	93974	93609	93238	92861	92478	92089	91695
50	92932	92553	92169	91780	91385	90985	90579
55	91843	91455	91061	90663	90260	89852	89438
60	90726	90329	89928	89522	89112	88697	88277
65	89586	89183	88775	88363	87946	87525	87100
70	88427	88018	87605	87187	86765	86338	85907
75	87945	86833	86416	85993	85566	85134	84698
80	86035	85621	85202	84776	84346	83910	84471
85	84790	84375	83955	83528	83096	82659	82218
90	83495	83079	82657	82229	81797	81359	80918
95	82122	81703	81279	80851	80420	79985	79547
100	80627	80205	79782	79358	78932	78505	78075

of d. are given also II, d. of the mixts. in steps of one % by wt. and 5°; III, the same as II, except reduced to water d. at 15°; IV, the same as III, but concn. in vol. %; V, the same as IV, but in steps of one % and 1°. These tables are calcd. partly for the temp. range 0 to 30°, partly for the range -20° to +30°. J. B. KISTIAKOWSKY

**New and simple method for the determination of indexes of refraction of the immersion substances, usually molten mixtures, used in the Becke method.** ALBERT GOOSSENS. Univ. Ghent. *Natuurw. Tijdschr.* 11, 1-5(1929).—A substance of known index of refraction (liquid or molten solid) is examd. under the microscope between two glass plates maintained at an unvariable distance from each other—the microscope is focused on the lower, then the upper surface of the substance under examn. and the difference between the two graduations of the instrument is recorded. The known substance is then replaced by the one whose index is to be detd., and the same operations are performed. The desired index of refraction is then calcd. by the formula:  $n' = en/e'$ , where  $e$  and  $e'$  represent the differences of graduations of the microscope.

ALBERT L. HENNE

**The electrical strength of liquid dielectrics.** A. GYEMANT. *Physik. Z.* 30, 33-58 (1929).—A critical review, with bibliography, of the breaking down of liquid dielectrics under high voltages.

LOUIS WALDBAUER

**Osmosis of ternary liquids, general considerations.** VIII. F. A. H. SCHREINEMAKERS. *Proc. Acad. Sci. Amsterdam* 32, 23-31(1929).—A mathematical discussion of the isotonic and isentonic  $W$ -curves of ternary liquids. Similar relationships obtain for the isotonic  $X$ - and  $Y$ -curves.

ARTHUR GROLLMAN

**Friction constants and wall layer.** J. TAUSS AND F. VON KÖRÖSY. *Z. physik. Chem., Abt. A*, 140, 263-72(1928).—The observation of J. Traube and Siar-Hong Whang (C. A. 23, 749) that there is a decrease in the time of effluence of water from a viscometer whose walls were covered with a thin layer of various substances, especially polar substances, was due not to changes in viscosity of the effluent water, but to a neglect of changes in the initial height of liquid in the viscometer caused by changes in surface tension. The authors have repeated several of Traube's expts. in the Traube-Magasinik

viscometer wetted with various polar substances. In each case the zero point of the viscometer was corrected, the time of effluence of the water noted, and the calcd. viscosity found to be substantially that of pure water.

F. E. WALSH

Aluminum and its formation of mixed crystals with silicon. L. ANASTASIADIS. *Z. anorg. allgem. Chem.* 179, 145-54(1929).—Alloys of Al with 0.53, 0.79, 1.01, 1.27, 1.6% Si were heated for 50-74 hrs. at 570° and then quenched in water at 5°. These alloys were subjected to thermal analysis (Saladin app.), each alloy being heated slowly for about 6 hrs. until a discontinuous heating effect showed that the solidus curve was reached, and then cooled just as slowly past the point of unmixing. Elec. resistance was measured for the quenched alloys at room temp., the resistance being a linear function of the Si content until the end of the mixed-crystal series was reached at 1.48% Si. To confirm the results of the thermal analysis, the quenched alloys were heated slowly to the solidus temp. and cooled slowly past the temp. of unmixing while discontinuous changes of resistance were noted. At room temp. Al can hold 0.18-0.31% of Si in stable solid soln. Further evidence that there is no polymorphic transformation in Al is the constancy of the elec. resistance at room temp. for 99.94% Al, no matter whether the Al be quenched or cooled slowly from 630°. The elec. cond. of the 99.94% Al is  $36.8 \times 10^{-4}$ .

R. J. HAVIGHURST

The metastability of the elements and compounds as a result of enantiotropy or monotropy. XIII. The differential gas dilatometer of C. J. Smith and its accuracy. ERNST COHEN AND H. L. BREDÉ. Univ. of Utrecht. *Z. physik. Chem., A*, 140, 199-222(1929); cf. *C. A.* 21, 3492.—The dilatometer described by S. was found to be sufficiently accurate to measure the vol. change accompanying polymorphic transformations. XIV. Examination of potassium nitrate by means of the differential gas dilatometer. *Ibid* 391-405.—Samples of chemically and physically pure rhombic ( $\alpha$ ) and rhombohedral ( $\beta$ )  $\text{KNO}_3$  were prepd. and the coeffs. of expansion obtained for each. The transition point at 1 atm. pressure lies at  $127^\circ \pm 1$ . The vol. change accompanying the transition from the  $\alpha$ - to the  $\beta$ -form is 0.0049 cc./g. A monotropic form ( $\gamma$ ) of  $\text{KNO}_3$  was obtained by slowly cooling the  $\beta$ -form to a temp. a few degrees below the transition point. The d. of this form is greater than that of either the  $\alpha$ - or  $\beta$ - $\text{KNO}_3$ .

H. F. JOHNSTONE

Convenient method for preparing sodium-potassium alloy. THOMAS MIDGLEY, JR. AND ALBERT L. HENNE. *Ind. Eng. Chem., Anal. Ed.* 1, 75(1929).—Na-K alloy is prepd. by agitating freshly cut Na and K under slightly wet ether.

ROBERT F. MEHL

The Hall effect and other properties of the copper-antimony series of alloys. EMLYN STEPHENS AND E. J. EVANS. *Phil. Mag.* [7], 7, 161-76(1929).—The elec. resistivity, temp. coeff. of resistance, thermoelec. power, Hall effect, sp. heat and d. of a Cu-Sb series of alloys was detd. Elec. resistivity and thermoelectric power were detd. for the alloys as chilled cast plates. The other properties were measured after annealing had been continued until the elec. properties showed no further change. Singular points were found in the curves corresponding to  $\text{Cu}_2\text{Sb}$  and  $\text{Cu}_3\text{Sb}$  except in the case of the temp. coeff. of resistance. The elec. properties of  $\text{Cu}_2\text{Sb}$  were greatly modified by annealing, while those of  $\text{Cu}_3\text{Sb}$  remained practically unchanged.

L. H. REYHERSON

The theoretical potential of the alkaline earth metals. G. DEVOTO. *Z. Elektrochem.* 34, 326-7(1928).—The criticism by Drossbach (*C. A.* 23, 42) is answered. A recalcn. of the value for Ca gave an av. of 2.895 v.

A. L. HENNE

Internal friction in metals. R. H. CANFIELD. Johns Hopkins Univ. *Phys. Rev.* 32, 520-30(1928).

BERNARD LEWIS

Electrocapillary phenomena. IV. Role of the physical factors. W. ARCISZEWSKI, E. CZARNECKI, W. KOPACZEWSKI AND W. SZUKIEWICZ. *Lab. Med. Physics Paris. Protoplasma* 3, 345-56(1928).—Strips of filter paper were suspended in colloidal solns. The results of the expts. demonstrated the importance of phys. factors such as concn., viscosity, purity, surface tension and periodical variations on the penetration of the substances into capillary spaces. The authors question the application of data obtained *in vitro* to vital processes.

M. H. SOULE

The influence of surface tension on viscosity measurements. S. EKK. *Z. physik. Chem., A*, 140, 309-15(1929).—Basing his calcs. upon the Hagen-Poiseuille equation, E. derives an expression showing the influence of capillarity upon viscosity measurements made with the ordinary type of capillary viscometer; in his argument E. corrects the  $p$  term of  $\eta = (F^2 p / 8\pi V l) t$  by  $p = h_m p - p'$ , wherein  $p' = h' p$ ,  $h'$  being the capillary rise and  $p$  the density. The data of Traube and Whang (cf. *C. A.* 23, 749) are discussed and E. shows that their observed changes in viscosity are not due to



decreased viscosity on the walls, as explained by them, but to change in the capillary rise. The argument is supported by exptl. confirmation of this effect by actual measurement of the quantities  $h'$  and  $h_m$ .

WILLIAM E. VAUGHAN

**Equilibrium and reactions in systems of large specific surface.** N. V. RASCHEVSKY. *Z. Physik* 53, 107-29(1929); cf. *C. A.* 23, 748.—The earlier discussions on the spontaneous division of microscopic drops are continued. In regard to the periodicity of the division process during continued growth of the drop the following results are obtained: The state of the drop is completely defined by its total mass, if the drop consists of one component only. In case it consists of more than one component, then its state still depends on its total mass, if there exist stoichiometrical relations between the increases in mass of the various components. In this case it is possible to speak of a certain periodicity because after partition each partial drop will have the same constitution that the original drop had at the time it had the mass of the partial drop. With systems of large surface energy and any shape, the ordinary phase-rule restrictions do not hold. Various general properties of such systems are discussed. A most remarkable case is that of a system having several possible equil. positions or constitutions, which therefore shows hysteresis effects (cf. preceding abstr.).

GEORGE GLOCKLER

**Surface tensions of several molten metals against molten salts.** RICHARD LORENZ AND HANS ADLER. *Phys. Chem. Inst., Univ. Frankfurt a. M. Z. anorg. allgem. Chem.* 173, 324-36(1928); cf. *C. A.* 7, 3340; 18, 612, 1334.—By means of the capillary-height method using a transparent quartz app. (calibrated with water, pyridine, and Hg), the surface tensions of molten  $\text{CdCl}_2$  and of a 68 mole-%  $\text{KCl}$ —32 mole-%  $\text{CdCl}_2$  molten mixt. in air over a temp. range of from 600° to 750° were measured. The Eötvös-Ramsay-Shields const. is 0.1053 for the  $\text{CdCl}_2$ , a very small figure. The variation of interfacial tension of molten Cd and the 68 mole-%  $\text{KCl}$ —32 mole-%  $\text{CdCl}_2$  mixt. with temp. over a range of 150° has been followed; and at const. temp. with increasing KCl content of the molten salt phase the interfacial tension rises very rapidly from 4.0 dynes/cm. with 0%  $\text{KCl}$  to 131.4 at 69.9% at about 600°. The surface tension against air of various  $\text{PbCl}_2$ - $\text{CdCl}_2$  melts at about 600° increases from 75.8 at 0%  $\text{PbCl}_2$  to 143.7 at 100 mole-%  $\text{PbCl}_2$ ; the interfacial tension of the equil.  $\text{Pb} + \text{CdCl}_2 \rightleftharpoons \text{Cd} + \text{PbCl}_2$  at about 600° over a range of 0 to 100 mole-%  $\text{PbCl}_2$  and 0 to 100 mole-%  $\text{Pb}$  varies from 3.9 to 171.8 dynes/cm.

WILLIAM E. VAUGHAN

**Reversion of Traube's rule in the adsorption of homologous series by sugar charcoal.** TH. SARALITSCHKA. *Univ. Berlin. Pharm. Ztg.* 74, 382-4(1929).—The reversion of Traube's rule with respect to sugar C shows that adsorption of org. materials in  $\text{H}_2\text{O}$  increases markedly and regularly in an homologous series, but cannot be generalized. Adsorption of various materials, including members of homologous series, in aq. soln. is not always synbatic with the surface tension of such materials in aq. soln. Even with respect to 2 closely related adsorbents, as 2 charcoals, members of homologous series may show different adsorption capacities. These facts are also of biol. importance, since a marked symbasis has been observed between surface tension, adsorption capacity of materials and their biol. behavior not only toward microorganisms but also toward human beings. Reference is had particularly to Traube's surface-tension theory of narcosis and to the relations of the phys. properties of materials to lethal and inhibitory action on microorganisms.

W. O. E.

**The hydrolytic adsorption by humic acid.** ASHUTASH GANGULI. *Phil. Mag.* [7], 7, 317-21(1929).—The adsorption of electrolytes from solns of  $\text{NaCl}$ ,  $\text{KCl}$ ,  $\text{BaCl}_2$ ,  $\text{AlCl}_3$  and  $\text{K}_2\text{SO}_4$  by humic acid was measured and the H-ion concn. was detd. by the electrometric method: Free acid was liberated in each case and the H-ion concn. was found to be a function of the concn. of electrolyte and the nature of the electrolyte. The effect of valency was marked and a regular order,  $\text{Al} > \text{Ba} > \text{K} > \text{Na}$ , was observed for cations with a common anion. For anions the order was  $\text{Cl} < \text{SO}_4$ . G. explains the acidity of soils on the basis of this hydrolytic adsorption of electrolytes by humic acid.

L. H. REYERSON

**The effect of electrolytes upon emulsions.** Preliminary paper. H. V. TARTAR, C. W. DUNCAN, T. F. SHEA AND W. K. FERRIER. *J. Phys. Chem.* 33, 435-46(1929).—Emulsions of 12 cc. of  $\text{C}_6\text{H}_6$  and 2 cc. of aq. soln. of Na oleate as emulsifying agent are destroyed upon addn. of different acids, e. g.,  $\text{HCl}$ ,  $\text{AcOH}$ , oxalic acid, when approx. enough acid is added to decompose the emulsifier. Oleic acid, which does not decompose the soap, causes an inversion of the usual oil-in-water emulsion into a mobile though unstable water-in-oil emulsion.  $\text{NaOH}$  when added to similar emulsions does not increase their stability; on the contrary their stability decreases with the increasing concn. of the  $\text{NaOH}$  soln. Emulsions of  $\text{C}_6\text{H}_6$ ,  $\text{C}_6\text{H}_5\text{CH}_3$  and xylene with  $\text{H}_2\text{O}$  and Na oleate turn into the water-in-oil type when univalent cations equal to those

of the soap are added. The inversion zone is for  $C_6H_6$  between 0.25 *N* and 0.45 *N* NaCl, for toluene between 0.25 *N* and 0.40 *N* NaCl and for xylene between 0.30 *N* and 0.45 *N* NaCl. The inversion point in the case of  $C_6H_6$  shifted somewhat when NaOH soln. together with the NaCl soln. was used, whereas in toluene and xylene emulsions the breaking point was not markedly influenced by the adding to NaOH. K stearate is a better emulsifying agent than Na oleate; all emulsions produced with K stearate were of oil-in-water type and no inversion took place upon adding KCl or KOH solns. From other "oils" aniline gave permanent emulsions with NaOH concn. from 0.0002 *N* to 0.05 *N* and KOH solns. up to 0.01 *N*, when emulsified with Na oleate or K stearate, resp., but even small amts. of NaCl or KCl prevented the formation of emulsions. *o*-Toluidine gave similar oil-in-water emulsions, when no electrolyte other than the soap was present. Nitrobenzene and dimethylaniline formed readily very stable oil-in-water emulsions. In both cases NaCl produced a breaking zone in lower concns. than the KCl. The results indicate that the nature of the "oil" has also an important influence upon the type of the emulsion.

J. WIERTLAK

Sedimentation period of small particles in a liquid. W. WEAVER. *Z. Physik* 49, 311-14(1928); *Science Abstracts* 31A, 729-30.—This paper continues previous work (*C. A.* 21, 3510) and supplements Fürth's investigations (*C. A.* 21, 844; 22, 1713) by again discussing the upper limits of the sedimentation period of small particles. The formula previously obtained (*loc. cit.*) is now confirmed.

H. L. D.

Variation of the electrical charge of colloidal particles. III. The influence of non-electrolytes on the cataphoretic speed of colloidal particles and on the adsorption of ions by colloidal particles as indicated by such measurements. JNANDRA N. MUKHERJEE, SATYA PRASAD RAICHODHURY AND A. NAGARAJA RAO. *J. Indian Chem. Soc.* 5, 697-713(1928); cf. 22, 898.— $As_2S_3$  sols. contg. non-electrolytes were studied with respect to their cataphoretic speed. After correction for viscosity it was found that cane sugar reduces the speed much more than other non-electrolytes. Others compared were EtOH, MeOH, iso-BuOH, acetone and urea. The speed decreases irrespective of change in dielec. const. The theory is advanced that both the thickness of the double layer and dielec. const. change, with the former as the main factor. With increased concn. of KCl the speed drops continuously, while with addn. of definite amts. of EtOH the speed passes through a min. at 0.02 *N* KCl. A similar min. is found for MeOH but at about 0.003 *N* KCl. For MeOH and HCl the speed may even rise above that of the original sol. No definite critical potential characteristic of the coagulation by an electrolyte exists. The complex manner of variation in cataphoretic speed is due mainly to surface density and to a simultaneous entrainment of the ions of opposite charge necessary at time of contact to produce stable aggregation. IV. The effect of dilution on the charge of colloidal particles in the presence and absence of electrolytes. JNANDRA N. MUKHERJEE, SATYA P. RAI-CHOUDHURY AND ARDHEYU S. BHATTACHARYA. *Ibid* 735-51.—A study of the cataphoretic speeds of  $Fe(OH)_3$  and  $As_2S_3$  sols. with various concns. of HCl shows that for the latter the speed decreases and for the former it increases with increasing concn. of HCl. The results for  $Fe(OH)_3$  are somewhat inaccurate since the conditions for exact measurement have not as yet been carefully studied.

R. H. LAMBERT

The scattering of light in colloidal solutions and gels. I. Agar-sol and gel. K. KRISHNAMURTI. *Proc. Roy. Soc. (London)* A122, 76-103(1929).—A study has been made of light scattering in agar sols and gels in which the effect of temp. on intensity and depolarization was measured. At the same temp. gels are distinctly more opalescent than sols, thus giving evidence that the former have larger micelles. The size and no. of micelles appear to increase with concn. of gels. The intensity of light scattered by agar gels increases continuously with time at 30° and 35°, the rate decreasing with increase of temp. This would indicate that micellar growth is independent of gelation. The formation of gel on sudden cooling of agar sols is accompanied by a marked increase in the Tyndall no. The depolarization factor ( $\theta$ ) of light scattered by agar sols and gels below 35° increases with decreasing temp. for concd. sols and decrease for dil. sols (0.2%). Conclusion: Gel formation is essentially union of micelles, which in itself is both necessary and sufficient.

RAYMOND H. LAMBERT

The change of precipitating concentrations of electrolytes with the purity and temperature of some hydroxide sols. N. R. DEAR AND V. GORE. *J. Indian Chem. Soc.* 6, 31-43(1929).—Sols of  $Fe_2O_3$ ,  $Cr_2O_3$ , and  $ZrO_2$  of different degrees of purity (ratio of metal oxide to Cl) were prepd. by hot dialysis of solns. of the metal chlorides. The pptg. concns. of uni-, bi-, and ter-valent cations were detd.; they are seldom in the ratio 1: $x$ : $x^2$  as demanded by Whetham's rule and they decrease markedly with the purity of the sol. With sols of  $SnO_2$ ,  $ZrO_2$ , and  $CeO_2$  the ratios of pptg. concns. of uni-

and bivalent cations are smaller at 60° than at 30°. Conclusion: As the charge on a colloid decreases, or the temp. increases, the ratios of the pptg. concns. of uni-, bi-, and ter-valent ions decrease, tending toward the ratios  $1:1/2:1/4$  for sols that are not hydrolyzed. This relation is also deduced from theory. The ratios of pptg. concns. are always smaller for those sols that can be obtained readily in the pure state than for those stable only in the presence of large amts. of peptizing electrolytes. The coagulating powers of different ions for the same sol may vary with the nature of peptizing electrolytes present, for instance, HCl increases enormously the pptg. concn. of KCl but increases that of  $K_2SO_4$  only slightly. Such differences are greater for uni- than for multi-valent ions. For sols that have been exposed to light the ratios of pptg. concns. of uni-, bi-, and ter-valent ions are smaller than for sols kept in the dark. The viscosity of sols increases with their purity.

F. L. BROWNE

**Sensitization of sols of mastic, gum dammar, and Odèn sulfur in the presence of gelatin and some carbohydrates.** L. S. BRATTIA, S. GHOSH, AND N. R. DHAR. *J. Indian Chem. Soc.* 6, 129-42(1929).—Addn. of gelatin in small quantities to sols of mastic, gum dammar and Odèn S at first sensitizes them toward pptn. with KCl and then stabilizes them. The 3 sols are acidic, and the addn. of gelatin also increases their  $p_H$  values to a max. and then decreases it. The max. of sensitization occurs at the max.  $p_H$ . Undialyzed sols and sols exposed to sunlight are more sensitized by gelatin and they are also more acidic than dialyzed or unexposed sols. Odèn S sol is sensitized by gelatin to a greater extent in the presence of an acid and to a less extent in the presence of an alkali. "We are of the opinion that the phenomenon of sensitization as observed with proteins and some negatively charged sols is due to charge neutralization of the negatively charged colloid particles by positively charged proteins formed by the adsorption of some H ions present in the sols. Carbohydrates in smaller quantities have sensitized mastic and gum dammar sols and increase their  $p_H$  values. This is because the carbohydrates depress the hydrolysis of mastic and gum dammar and thus decrease the amt. of the complex org. acid, which stabilizes the sol. Larger amts. of carbohydrates stabilize the sols of mastic and gum dammar and decrease their  $p_H$  values because of the increase in the disintegration of the colloid particles of mastic and gum dammar. Odèn S sol is neither sensitized nor protected by carbohydrates. Tannic acid stabilizes this sol."

F. L. BROWNE

**The protective effect and ultrafiltration of silicic acid hydrosol.** WALTER KRONSBELN. *Sprechsaal* 61, 279-81, 296-9(1928).—The results obtained in an investigation in which was detd. the protective effect of 3 different hydrosols of silicic acid and the use of a colorimetric method confirmed the results obtained by ultrafiltration. R. A. HEINDL

**The colloidal behavior of antimony pentoxide.** S. GHOSH AND N. R. DHAR. *J. Indian Chem. Soc.* 6, 17-25(1929).—A negatively charged hydrosol was made by pptg.  $Sb_2O_5$  by adding dil.  $HNO_3$  to  $KSbO_3$ , washing the ppt., and dialyzing the suspended ppt. until it dispersed as a sol. The sol conforms to the Schulze-Hardy law of pptn. by electrolytes. It behaves "normally" on diln., that is, less electrolyte is required for coagulation the greater the diln. Coagulation by mixts. of electrolytes is additive; there is no pos. acclimatization when coagulating electrolyte is added in successive small increments. The sol does not adsorb cations. Aging or boiling the sol changes only slightly its viscosity, elec. cond., acidity and stability toward electrolytes. A coagulum made by pptg. with univalent ions is readily peptized again on washing, but a coagulum with multivalent ions is reprecipitated only with difficulty. The hydrate,  $Sb_2O_5 \cdot 4.7H_2O$ , obtained on drying the sol at ordinary temp. peptizes again on adding  $H_2O$ ; in other words the sol is reversible. About 0.5% of the  $Sb_2O_5$  in the sol is in true soln. The colloidal  $Sb_2O_5$  is believed to be less highly polymerized than colloidal  $SiO_2$ ,  $V_2O_5$  or  $MoO_3$ .

F. L. BROWNE

**The influence of colloids on the precipitation of salts.** ROBERT DICKINSON. Univ. Liverpool. *J. Chem. Soc.* 1929, 358-9; cf. Williams and Mackenzie, *C. A.* 14, 3009; Bolam and Mackenzie, *C. A.* 20, 2772; Bolam, *C. A.* 22, 2305, 4308.—The soly. of the Pb salt of sozoiodol (3,5-diiodo-4-hydroxybenzenesulfonate) is found to be 0.512 g. per 100 cc. of aq. soln., and 1.116 g. per 100 cc. of a 2% gum acacia soln. In the former case a ppt. appears at the end of 10 sec.; in the latter, no ppt. appears for at least 2 hrs. Gelatin reacts with Na sozoiodolate. The examn. of many other Pb salts gave no other example of this phenomenon.

CORNELIA T. SNELL

**Silver sols.** SIMON KLOSKEY. *J. Phys. Chem.* 33, 621-6(1929).—A method of prepn. and some of the properties of the sol are described. Detns. were made of approx. compn. of the micelle, viscosity and d. in aq. EtOH solns., migration velocities, boundary potential, coagulation values of K, Ca, Al ions and sensitizing effect of EtOH.

L. F. MARK

**Colloidal behavior of the sulfides and hydroxides of cadmium and zinc.** WILHELMINA DAUS AND OLIN F. TOWER. *J. Phys. Chem.* **33**, 605-12(1929).—Conditions for the formation of *Liesegang rings* of CdS and ZnS in gels of gelatin and agar-agar were investigated. It was found that the S ion must be present in the gel and the metallic ion above the gel. Adsorption of S ions by the ppt. is more pronounced than that of metallic ions. Conditions for the formation of Cd(OH)<sub>2</sub> and Zn(OH)<sub>2</sub> sols were studied. Gels of Cd(OH)<sub>2</sub> and Zn(OH)<sub>2</sub> were prepd. in glycerol sols.

L. F. MAREK

**A new method of preparation of aluminum hydroxide sols.** K. I. SHEIDT. Scientific Research Inst. of Crimea. *J. Russ. Phys. Chem. Soc.* **60**, 617-21(1928).—Al strips (or fine wire) were left in contact with Hg under distd. H<sub>2</sub>O for 12-24 hrs. The resulting clear yellow sols contained up to 2.383 g./l. solid matter and could be concd. by evapn. to 3.17 g./l. The particles migrated to the cathode. They contained Cl but no Hg (Cl was originally present as an impurity in Al). According to Bechhold's ultrafiltration scale, their size must lie between 20 and 340 $\mu$ . The cardiod ultra-microscope reveals silvery particles in Brownian movement. The sols remain stable for at least 3 months. HCl and AlCl<sub>3</sub> act as stabilizing agents, OH and CO<sub>3</sub> ions as powerful coagulants. The liminal values, as tabulated by S., appear to be detd. by the valence of + ion.

B. SOVENKOFF

**Conductance-diffusion method for studying the coagulation of colloidal ferric oxide.** C. HARVEY SORUM. *J. Am. Chem. Soc.* **51**, 1154-62(1929). L. F. M.

**Further studies on the Donnan theory of "membrane equilibria" (analysis of the electromotive force-time curves).** K. SHINGI. *Acta Schol. Med. Univ. Imp. Kioto* **10**, 325-32(1928).—The best equations (exponential, parabolic or hyperbolic) fitting the curves previously published by S. (*C. A.* **23**, 398) were calcd. by the method of least squares.

DAVID DAVIDSON

**Distribution of acetone through a rubber membrane.** D. S. MORTON. Cornell Univ. *J. Phys. Chem.* **33**, 384-97(1929).—M. has investigated by direct analysis the distribution of acetone between water and MeOH, the 2 sols. being sepd. by a rubber diaphragm which is readily permeable to acetone and but slightly so to MeOH. The distribution over a range of 0-70% acetone in water soln. is described by the equation  $G_{Ac}/G_{Alc} = 2.24(G_{Ac}/G_w)^{1.09}$ , where  $G_{Ac}/G_{Alc}$  and  $G_{Ac}/G_w$  represent resp. g. of acetone per g. of alc. and g. of acetone per g. of water. The diffusion of alc. through the rubber introduces a small error. The partial vapor pressures of solns. of acetone and alc. and of acetone and water were measured by use of an interferometer and the curves are given. This method of detn. checks the above equation satisfactorily. The partial pressures of acetone over acetone-MeOH solns. at 20° are represented fairly well by the expression  $(G_{Alc}/G_{Ac})^{0.83} = 1.38 (179.2 - p')/p'$ . From both of the above equations may be derived the formula  $2.655 (179.2 - p')/p' = (G_w/G_{Ac})^{1.1}$ , which describes the exptl. facts for intermediate concns. but not for very dil. or very concd. solns. Discrepancy may be due to exptl. error.

WILLIAM E. VAUGHAN

**The formation of thin films of organic colloids on mercury surfaces.** R. L. KERNAN. *J. Phys. Chem.* **33**, 371-80(1929).—Spreading effects on the surface of purified Hg as medium were carried out with solns. of cellulose nitrates and acetates (in acetone and CHCl<sub>3</sub>), rubber (in petr. ether) and isolec. gelatin (in H<sub>2</sub>O). By dropping a known amt. of the analyzed material on the Hg surface and measuring the area of the resulting films their thickness has been calcd. Cellulose esters and gelatin gave very irregular and rigid films, whereas those of rubber were elastic. In increasing the diln. of the solns. a limit film thickness was obtained indicating a monomol. layer, which increased with the increasing complexity of the atom groups as follows: rubber (C, H) thickness 1.5 A. U.; cellulose (C, H, O) thickness 2.5-5.0 A. U.; gelatin (C, H, O, N) thickness 7.0 A. U. With cellulose nitrates the limit film thickness varied in an inverse relation with the viscosity of the solns. The results seem to indicate that the analyzed films are composed of ribbons or chains of an indefinite length lying flat upon the Hg surface, their thickness being that of the measured films. Also in *Kolloid-Z.* **47**, 289-94(1929).

J. WIERTELAK

**Adsorptive stratification in gels.** V. SAMUEL C. BRADFORD. *Chemistry and Industry* **48**, 78-81(1929).—Objection is taken to Hedges' statement (*C. A.* **22**, 4314) that no completely satisfactory explanation of the phenomena of *Liesegang rings* has yet been advanced. B. maintains that "no serious objection to the adsorption theory (*C. A.* **10**, 3075; **11**, 2746) has been made, and study of my papers will show that the adsorption theory is capable of explaining qualitatively all the known facts connected with the occurrence of banded ppts."

F. L. BROWNE

**Periodic structures in gels.** ERNEST S. HEDGES. *Chemistry and Industry* **48**,

233-4(1929); cf. preceding abstr.—"The chief objection to B.'s theory is the lack of exptl. evidence on the adsorption of the reactants by the ppts." A banded ppt. difficult to explain by B.'s theory occurs when concd. HCl diffuses into 30% NaCl soln. contained in a tube 0.5 mm. in diam., because the few large crystals present a small specific surface for adsorption.

F. L. BROWNE

**Mechanism of the swelling of gels.** K. KRISHNAMURTI. *Nature* 123, 242-3(1929).—Work on the changes in the scattering of light during the swelling of gelatin and other gels has indicated that these systems contain, to some extent at least, colloidal micelles which act as units. Existing theories do not take into account the changes in these micelles during swelling.

FRANK V. JOHNSON, JR.

**Application of some physicochemical methods for the characteristics of solid fatty emulsions.** L. PICK AND K. SANDERA. *Chem. obzor* 3, 199-202(1928).—The detn. of elec. cond. of emulsions is informative only of the type (water in fat or fat in water). The stability of emulsion is detd. by measuring the time in which the emulsion is broken (by means of a c. 100 v., 50 cycles) between 2 electrodes and the cond. is changed (cf. *C. A.* 23, 2051). To det. the dispersion of an emulsion an objective photometer was used.

JAR. KUČERA

**Liquid ammonia as a solvent and the ammonia system of compounds.** IV. Experimental procedures involved in the manipulation of liquid-ammonia solutions. WARREN C. JOHNSON AND W. CONRAD FERNELIUS. *J. Chem. Education* 6, 441-50(1929); cf. *C. A.* 22, 3082, 3365; 23, 2090.—A short review of the technic employed by Franklin, Kraus and co-workers in their work with liquid  $\text{NH}_3$ .

W. C. F.

**The solubilities of lead phosphates.** HORACE MILLET AND MAURICE JOWETT. Univ. of Liverpool. *J. Am. Chem. Soc.* 51, 997-1004(1929).—Detns. of Pb-ion activities by means of a Pb electrode were made on solns. satd. with  $\text{PbHPO}_4$  and with  $\text{Pb}_2(\text{PO}_4)_2$ . These values are used together with  $p_H$  values on the same solns., and the ionization consts. of  $\text{H}_2\text{PO}_4$  (cf. succeeding abstract) to calc. the soly. products for the two salts. It is shown that  $\text{Pb}_2(\text{PO}_4)_2$  is the stable salt under body conditions.

T. H. CHILTON

**The ionization constants of phosphoric acid.** MAURICE JOWETT AND HORACE MILLET. Univ. of Liverpool. *J. Am. Chem. Soc.* 51, 1004-10(1929).—Detns. were made of  $p_H$  values in mixts. of primary and secondary phosphates. These were calcd. on the basis of the activity concept, giving the following values for the first two ionization consts. at 25° and 37.5°, resp.:  $pK_1$ , 2.10, 2.16;  $pK_2$ , 7.13, 7.06. Calcs. from previous data give for the third const. at 20°,  $pK_3 = 12.1$ , approx.

T. H. C.

**The solubility of galena and a study of some lead concentration cells.** LESLIE F. NIMS AND WALTER D. BONNER. Univ. Utah. *J. Phys. Chem.* 33, 586-90(1929).—The e. m. fs. of 25 cells formed by 3.3% Pb amalgam electrodes in satd. solns. of pairs of Pb salts were found to be: (1)  $\text{PbCl}_2$ ,  $\text{PbBr}_2$ , 0.0077; (2)  $\text{PbCl}_2$ ,  $\text{PbI}_2$ , 0.0495; (3)  $\text{PbBr}_2$ ,  $\text{PbI}_2$ , 0.0420; (4)  $\text{PbCl}_2$ ,  $\text{PbSO}_4$ , 0.1030; (5)  $\text{PbBr}_2$ ,  $\text{PbSO}_4$ , 0.0955; (6)  $\text{PbI}_2$ ,  $\text{PbSO}_4$ , 0.0530; (7)  $\text{PbSO}_4$ ,  $\text{PbS}$ , 0.0670. The e. m. fs. of 1, 2 and 3 were calcd. from the formulas: (1)  $E_o = RT/2F \ln a_2/a_1$ ; (2)  $E_L = \Delta_c/V_c - \Delta_d/V_d - \Delta_e + \Delta_d RT/F \ln a_2/a_1$ . Formula 2 was modified by replacing  $\Delta_d$  by  $\Delta_{d1} + \Delta_{d2}/2$ . Since the calcd. and observed values agreed well, such a modification is permissible where the valence of the anion is the same on both sides of the liquid junction. The e. m. fs. of 4, 5 and 6 could not be so calcd. The activity of PbS in satd. water soln. was calcd. from the e. m. f. of 7 by means of equations 1 and 2 (modified). The activity coeff. being assumed to be nearly unity, the soly. of PbS is  $0.94 \times 10^{-6}$  moles per 1000 g.  $\text{H}_2\text{O}$  at 25°. The error is probably not over 30%.

M. W. SEYMOUR

**The effect of one salt on the solubility of another in ethyl alcohol solution.** III. F. S. HAWKINS AND J. R. PARTINGTON. Univ. London. *Trans. Faraday Soc.* 24, 518-30(1928).—The solubilities of KI in alc. solns. of NaI and MgI of various concns. were measured. At concns. below 0.5 N the soly. in NaI + alc. solns. can be represented by the equation:  $-1/\log A. P. R. = 3\alpha(\sqrt{2\mu} - \sqrt{2\mu_0}) + \beta c$ . The symbols A. P. R. denote activity product ratio,  $\mu$  the ionic strength of a soln. of 2 salts,  $\alpha$  and  $\beta$  consts. For MgI + alc. solns. evidence for the formation in soln. of the complex  $\text{MgI}_2 \cdot \text{KI}$  is given, and the values of the "ionic radius" for each series of solns. are calcd. Cond. measurements were made for KI and  $\text{MgI}_2$  solns.

H. R. MOORE

**Concentration cells in ethyl alcohol: sodium and potassium iodides.** G. F. ISAACS AND J. R. PARTINGTON. *Trans. Faraday Soc.* 25, 53-9(1929).—The e. m. fs. of the cells,  $\text{Ag} | \text{AgI NaI}(c_1) | \text{NaI}(c_2) \text{AgI} | \text{Ag}$  and  $\text{Ag} | \text{AgI KI}(c_1) | \text{KI}(c_2) \text{AgI} | \text{Ag}$ , with ethyl alc. as solvent, were measured over the concn. ranges 0.5 N to 0.001 N for NaI and 0.05 N to 0.001 N for KI. The e. m. f. values satisfied Nernst's equation,  $E = 2(1 - n_a)RT/F \log_e \lambda_1 c_1 / \lambda_2 c_2$ .  $n_a$  was const. for all the cells involving concns. not greater than 0.1 N. Cells with 0.5 N NaI solns. gave abnormal results due to the

soly. of AgI in concd. NaI. The electrodes were strips of pure Ag foil cleaned with emery paper. These were used in preference to electrodes made by electrodeposition of Ag on Pt foil, either with or without electrolytic coating of AgI, since these failed to give const. potentials. The conds. for NaI were read from curves obtained by plotting the values of  $\lambda$  obtained by Robertson and Acree (*C. A.* 9, 2018) and by Goldschmidt and Dahll (*C. A.* 19, 922) against  $\sqrt{c}$ . Conds. for KI were obtained from the results of Hawkins and Partington (cf. preceding abstract). The mean values at 25° for  $n_a$  in NaI and KI are 0.5815 and 0.550, resp. M. W. SEYMOUR

The solubility of magnesium hydroxide at elevated temperatures. A. TRAVERS AND NOUVEL. *Compt. rend.* 188, 499-501(1929).—The soly. of  $Mg(OH)_2$  seems to diminish with temp., becoming inappreciable at 178°. Solubilities at various temps., from 35° to 200°, are recorded. FRANK V. JOHNSON, JR.

Solubility of carbon dioxide in water. KURT BUCH. III. *Nord. Kemistmötet.* (Finland) 1928, 184-92; cf. *Soc. Sci. Fennica Commentationes Phys.-Math.* II, 16, (1924).—The object of the investigation was to test the validity of Henry's law at low concns. and to det. whether the manner of mixing  $CO_2$ ,  $H_2O$  and air influence the soly. of  $CO_2$ . Conclusions: (a) Henry's law is valid from a  $CO_2$  pressure of 1 or more atm. down to approx.  $1/20,000$  atm. The absorption coeff. of  $CO_2$  is 0.83 at 20.8°. (b) The manner of mixing constituents does not influence the soly. of  $CO_2$ . O. A. NELSON

The solubility of carbon dioxide in vulcanized rubber. TAKEMARO YAMAMOTO. *Bull. Inst. Phys. Chem. Research (Tokyo)* 7, 999-1001(1928); *Abstr. Sect. 1*, 96-7 (In Esperanto).—The fact that rubber tubing through which  $CO_2$  flows is often seen to flatten soon after the gas stops flowing is ascribed to the soly. of  $CO_2$  in the rubber and its consequent escape. Specimens of tubing, cut into bits, dried, and tested for increase of wt. in 1 atm. of  $CO_2$  at 25°, show that black tubing,  $d_4^{25}$  0.9300, dissolved 0.146 g.  $CO_2$  per 100 g. (equiv. to 68.8 cc. per 100 cc. at 0° and 760 mm.) and bright brown tubing,  $d_4^{25}$  0.9380, 0.166 g.  $CO_2$  per 100 g. (78.5 cc. per 100 cc.). A. M. P.

Molecular structure in solution. IV. The densities, viscosities, and electrical conductivities of aqueous solutions of cobalt chloride and hydrochloric acid at different temperatures. OWEN R. HOWELL. Univ. of Manchester. *J. Chem. Soc.* 1929, 162-72; cf. *C. A.* 22, 712.—The curves obtained by plotting the ds., viscosities, and elec. conds. of solns. of  $CoCl_2 \cdot 6H_2O$  contg. HCl and of HCl alone against temp. show no irregularity between 0° and 80°. The 3 differences curves, unlike those obtained on addn. of HCl to  $CoCl_2$  soln. at const. temp., are also smooth. The change in color from red to blue with increasing temp., therefore, cannot be caused by a change in the no. of oppositely charged Co ions, as was the case with the increasing acid concn. On the other hand, it is probably due to the dehydration of the Co atom, leaving the charge of the ion unaltered. This change may be represented by,  $Co(H_2O)_6^{++} \rightleftharpoons Co(H_2O)_4^{++} + 2H_2O$  for the cation, and  $CoCl_4(H_2O)_2^{--} \rightleftharpoons CoCl_4^{--} + 2H_2O$  for the anion. The no. of groups surrounding the atom is 6 when red and 4 when blue. H. F. JOHNSTONE

The diffusion of substances in hydrotrope solutions. H. FREUNDLICH AND D. KRÜGER. Kaiser Wilhelm-Inst. für Physik. Chem., Berlin-Dahlem. *Biochem. Z.* 205, 186-93(1929).—The phenomenon described as "hydrotrope soln." is seen in the great increase (even a hundred-fold) in the soly. of a great variety of substances in the alkali salts of certain org. acids. The diffusion of BzOH was studied both in pure water and in hydrotropic solns. (Na benzenesulfonate, Na *p*-toluenesulfonate). In the latter the concn. of the BzOH is much greater than the satn. in pure water, but the diffusion coeffs. were not const., though of practically the same magnitude in both instances. Brucine studied under the same exptl. conditions gave sufficiently const. values for the diffusion coeff. S. MORGULIS

Activity coeffs. of ions in very dil. methanol solutions. JOHN W. WILLIAMS. *J. Am. Chem. Soc.* 51, 1112-19(1929).—The activity coeffs. of 3 complex cobaltammines in MeOH were detd. by the soly. method. The Debye and Hückel equation holds in very dil. soln. J. FLEISCHER

Partition coefficients of ions, their determination, theory and application. NIELS BJERRUM. III. *Nord. Kemistmötet* (Finland) 1928, 92-105; cf. *C. A.* 22, 1263.—The partition coeff. is defined as the relation between the concns. of a solute in different solns. in which it has the same activity, e. g., satd. solns. in different solvents. Each ion of an electrolyte has its sp. partition coeff. and the partition coeff. of the electrolyte lies between the coeffs. for the ions. The coeff. for a binary electrolyte is equal to the square root of the product of the coeffs. for the 2 ions. The sums of the partition exponents ( $P = \log V$ ), of a no. of electrolytes in alc. and  $H_2O$  are tabulated. The formula

for calcg. partition coeffs. at infinite diln. is  $V_0 = V(F_{H_2O}/F_{alc.})$ , where  $F_{H_2O}$  and  $F_{alc.}$  are the activity coeffs. of the electrolyte in  $H_2O$  and in alc. KCl has a partition exponent of 6.6. An aq. soln. of this salt must be  $10^{4.6/2} = 2000$  times as concd. as an alc. soln. before the 2 solns. are in equil. Li stearate (partition exponent = -1.2) must be 4 times as concd. in alc. as in  $H_2O$ . By measuring the e. m. f. of the cell  $H_2 | HCl$  aq.  $AgCl | Ag-Ag | AgCl, HCl$  alc.  $| H_2$ , the sums of partition coeff. of ions can be detd. The sum of the partition exponents for  $H^+$  and  $Cl^-$  is 4.8. For a weak acid the sum of ion partition exponents can be calcd. from the dissocn. const.  $K$  in the 2 media; thus  $p_H + P_{anion} - P_{undiss.} = \log K_{H_2O} - \log K_{alc.} = \Delta \log K$ . Partition exponents for a no. of acids are tabulated. Attempts at detg. partition exponents of individual ions were made on the assumption that a satd. soln. of KCl, which as is known has a very small diffusion potential with reference to dil. aq. solns. or dil. alc. solns., gives a potential approaching zero. From measurements of the potential of the cell  $H_2 | HCl$  aq.  $| 3.5 M KCl$  aq.  $| HCl$  alc.  $| H_2$ , the partition exponent of  $H^+$  was calcd. as 2.52;  $Ag^+ = 2.06$ ;  $Cl^- = 2.51$ , etc. Ions prefer  $H_2O$  because of this medium's high dielec. const. Born has shown that the work required to transfer a spherical  $z$ -valent ion of radius  $r$  from a dielectric to a vacuum is  $(ze)^2/2r[1 - (1/D)]$  ( $\xi$  = elec. charge and  $D$  = the dielec. const. of the liq.) The elec. work required to transfer a  $z$ -valent ion of radius  $r$  from  $H_2O$  to alc. ( $D_{aq.} = 81$ ,  $D_{alc.} = 26$ ) is  $(ze)^2/2r[(1/26) - (1/80)]$ . In the partition exponent between  $H_2O$  and alc. this work introduces an elec. factor  $P_0 = 3.15 (z^2/r)$ ; ( $z$  = valence,  $r$  = radius in A. U.). If the partition coeff. for the same atom group uncharged is expressed as  $P_u$ , one may express the partition exponent  $P$ , as  $P_0 + P_u = 3.15(z^2/r) + P_u$ . (1). For a large org. ion, e. g., benzoate, one may assume that the uncharged portion is about the same as the alc. itself, or  $P_{benzoate} = P_0 + P_{benzoic acid}$ . But  $P_H + P_{benzoate} = P_{benzoic acid} = \Delta \log K$ . Combining this with expression (1),  $P_H + P_0 = \Delta \log K$ .  $\Delta \log K$  for org. carboxylic acids is const. at about 6.0. For phenol it is smaller. When one considers that the elec. part of the partition exponent for carboxylate ion is about 3.5 while the whole of the stearate ion is only -3.9 one can well understand why paraffin shuns water. The contact potential between 2 immiscible liquids, and the diffusion potential are discussed from the point of view of partition coeff. O. A. NELSON

Activity coefficient of diacetone alcohol in aqueous salt solutions. GÖSTA ÅKERLÖF. *J. Am. Chem. Soc.* 51, 984-97(1929).—Measurements of the relative activity coeffs. of diacetone alc. in salt solns. were made by detg. the partition coeff. between the solns. and bromobenzene or cymene interferometrically. The results are discussed in relation to the decompn. velocity of diacetone alc. in hydroxide-salt solns. and to Brönsted's theory of velocity of reactions catalyzed by solns. of strong electrolytes. J. F.

The distribution law. I. The ideal distribution law in the form of molecular fractions. RICHARD LORENZ. *Univ. Frankfurt, a.M. Z. anorg. allgem. Chem.* 172, 346-52(1929).—Since the molar potentials (fugacities) of a substance distributed between 2 phases must be the same for each phase at equil., it follows by simple thermodynamic reasoning, that the ratio of the mol. fractions,  $x/y$ , of the substance in the 2 phases must be a const. for any given temp. If the substance exists in the 2 phases in unequal mol. size, the relation becomes  $x^{v_1}/y^{v_2} = \text{const.}$   $v_1$  and  $v_2$  represent the no. of simple mols. forming the mol. magnitude. These relations are independent of the ds. of the 2 phases and they are more exact than the more familiar forms of the distribution law in which a constancy of the ratio of concns. is expressed. II. The distribution law for condensed systems. *Ibid* 366-70.—For condensed systems the distribution law becomes  $x/y e^{\omega} = \text{const.}$   $x$  and  $y$  are the mol. fractions of the substance in the 2 phases, resp., and  $\omega$  is a function of  $x$  and  $y$  and the van der Waals consts.,  $a$  and  $b$ . This function is derived from the molar potentials of the solute and solvents.

H. F. JOHNSTONE

The nature of electrolytic dissociation. M. A. RABINOVICH. *Ukrainskii Khim. Zhurnal* 3, 237-434(1928).—The older and the modern theories of electrolytic dissocn. in aq. and non-aq. solns. are reviewed. The conductivities of the molten salts, of the pure liquids and of the solid electrolytes—crystals and cryst. aggregates—as well as the modern electronic theories of valency and of the structure of mols., are also discussed. R. outlines a theory of electrolytic dissocn. to account for both weak and strong electrolytes without assuming that the latter are completely dissoed. It is suggested instead that the observed deviations from the diln. law are due to solvation and to polymerization of electrolytes. Numerous exptl. data recorded in the literature are cited in support of this theory; it is able to account, qualitatively at least, for such exptl. facts as the presence of a min. in the concn.-mol. cond. curves and its position in relation to the dielec. const. of the solvent. G. B. KISTIAKOWSKY

**Hydrogen-ion concentration. Nature and estimation of  $p_H$ .** HANNS WILL. *Apoth. Ztg.* **44**, 400-2(1929). W. O. E.

The "natural" potential difference in the limit—cell-electrolyte. G. ERTSCH. *Z. physik. Chem., Abt. A*, **139**, 516-28(1928).—Measurements are made of concn. chain c. m. fs. for cells of the type Hg, HgCl, 0.1 N KCl | physiol. KCl || ameba cells | Hg, HgCl, 0.1 N KCl. The following facts are established: (1) The e. m. f. of cells in equil. is zero. (2) The addn. of a single NaCl crystal sets up a p. d. of 100 milli-v. in the chain. (3) If cells are not living, the e. m. f. due to change in outer concn. only decreases slightly. (4) Nonelectrolytes exert no influence on the same e. m. f. *Conclusion*.—Living amebae are in equil. state with electrolytic media, and this equil. is very quickly restored when disturbed by local changes in KCl concn. H. R. M.

The potential difference of dilute solutions. MAX PLANCK. *Sitzb. preuss. Akad. Wiss.* **1929**, 9 11; cf. *C. A.* **22**, 1717.—The formulas of Henderson and of Planck for the p. d. across a liquid junction are compared briefly. If a soln.  $c$  is prepd. by mixing 2 other solns.  $a$  and  $b$ , the p. d. of the chain  $a | b | c | a$  is zero according to Henderson's formula but is not zero, in general, according to Planck's formula. Expts. are in progress to det. which equation is correct. E. R. SMITH

Electroosmosis of mixtures of electrolytes. A. BOUTARIC AND M. DOLADILHA. *Compt. rend.* **187**, 1142-4(1928).—Through a porous vessel a soln. of  $\text{CuSO}_4$  undergoes an elec. transfer toward the cathode;  $\text{Cu}(\text{NO}_3)_2$  toward the anode. This transference has been studied for a soln. contg. both. The mixt. follows the same laws as the single solns. L. D. ROBERTS

The effect of diffusion at a moving boundary between two solutions of electrolytes. DUNCAN A. MACINNES AND IRVING A. COWPERTHWAIT. Rockefeller Inst. for Med. Research. *Proc. Natl. Acad. Sci.* **15**, 18-21(1929).—In the detn. of the transference no. of an electrolyte by the moving-boundary method, a sharp boundary is formed between the soln. to be studied and another "indicator" soln. contg. an electrolyte with a common ion and an ion of lower mobility. Such a boundary will move when current is passed. Since the plane of contact between solns. of 2 electrolytes is not, under usual conditions, either permanent or definite, the question arises as to whether the movement of the boundary is affected by diffusion of one electrolyte into the soln. of the other and *vice versa*. To obtain data upon the effect of such a diffusion, expts. were made of stopping the motion of the boundary, by stopping the current, during the progress of transference detns. Upon stopping the current, the boundary gradually faded out and at the end of about a min. no evidence of discontinuity between the 2 solns. could be observed. However, upon starting the current again the boundary slowly reformed and recovered its original sharpness even after an interruption of 30 min. The transference results showed that the diffuse zone moved at the same rate as the sharp boundary. The mechanism of the process tending to restore a boundary to its original condition if diffusion has been allowed to take place is discussed. The visibility of a boundary is probably detd. by the change of potential gradient at the plane of contact. *E. g.*, the  $\text{AgNO}_3$ ,  $\text{LiNO}_3$  boundary is readily observed but if the  $\text{LiNO}_3$  is replaced by  $\text{NaNO}_3$  the resulting boundary is very difficult to follow. The relatively slight difference in the  $n_s$  of the 2 indicator solns. is hardly sufficient to account for the large difference in visibility. The difference between the potential gradients in the leading and indicator soln. is, however, cut to less than half by the substitution of Na for Li in the latter soln. E. R. SMITH

The transference number of barium chloride as a function of the concentration. GRINNELL JONES AND MALCOLM DOLE. Harvard Univ. *J. Am. Chem. Soc.* **51**, 1073-91(1929).—Measurements were made of the transference no. of the Ba ion in  $\text{BaCl}_2$  solns. at  $25^\circ$  by the analytical method from 0.01 to 1.035  $M$  and by the e. m. f. method from 0.001 to 1.0  $M$ . By a new and more accurate method of calcn. the results of the e. m. f. method were shown to be the same as the data from the analytical method and a new relationship between the transference no. and the concn. is given, namely  $(t + 1)(\sqrt{c} + A) = B$ , where  $A$  and  $B$  are consts. MALCOLM DOLE

The deposition of radium and other alkaline earth metals at the dropping mercury cathode. J. HEYROVSKY AND S. BEREZICKY. Charles' Univ., Prague. *Collection Czechoslov. Chem. Comm.* **1**, 19-46(1929).—The "deposition potentials" from normal ionic concns. are estd. for Ra —1.718, Ba —1.761, Sr —1.964, Mg —1.996 and Ca —2.047 v. from the normal calomel zero. From the magnitude of the diffusion currents, Ra may be followed quant. in mixts. with Ba from the ratio Ra:Ba = 1:10 to 25:1, in concns.  $10^{-4}$   $M$ , 2 cc. being necessary for the detn. Traces down to  $10^{-8}$  g. equiv. per l. of Ra or Ba are detd. in the same way in any amt. of alkalies or alk. earths; Sr is detd. only in mixts. with alk. earths or Li. The applicability of the polarographic



method for the detn. of solubilities of sparingly sol. salts is tested and found comparable to the conduction method. The deposition of Mg and Be even from very small concns. is accompanied by an evolution of  $H_2$ . By means of this action small amts. of Mg may be roughly estd. "Adsorption currents" with well-defined max. are best shown on current-voltage curves of solns. of the heavy alk. earths. Examples are given of polarographic titrations of Ba, Sr and Ca ions. ALBERT L. HENNE

The effect of the addition of iodine on the conductance of the halogen salts of sodium, lithium and potassium in mixtures of alcohol and acetone. FR. NIES. Münster, Physik. Inst. *Z. physik. Chem.*, Abt. A, 138, 447-58(1928).—The addn. of I increases the cond. of solns. of NaI in alc.-acetone mixts. The increase in cond. becomes smaller with increasing proportion of alc. in the solvent. The cond. of LiBr in pure acetone is increased by the addn. of I. With solns. of KI and LiCl in pure alc. an increase of cond. after the addn. of I occurs only at the higher concns. while at lower concns. a decrease occurs. This decrease becomes larger with increasing content of I. These results are explained by the dissocg. effect of the I not only on complex but also on simple mols. Conclusion: Strong electrolytes cannot be completely dissocd. in all solvents. F. R. SMITH

The oxido-reduction potential of glucides. RENE WURMSER AND JEAN GELOS. *J. chim. phys.* 25, 743-4(1928).—See C. A. 22, 3343. FREDERICK C. HAHN

Theory of passivity. III. Current density-time curve in case of deposition passivity. W. J. MÜLLER AND K. KONOPICKY. Tech. Hochschule, Vienna. *Monatsh.* 50, 385-91(1928); cf. C. A. 22, 4346.—Further investigation of the c. d.-time curve shows that the pure deposition only occurs to about 99% according to the formula given earlier. The layer then grows in depth and a formula is developed which is proved for Cu and Pb, but only partly so for Al. E. SCHOTTE

Displacement of copper from neutral and acid copper sulfate solutions by hydrogen under pressure. V. IPAT'EV AND V. IPAT'EV, JR. Acad. Science, Leningrad. *Ber.* 62B, 386-90(1929); cf. C. A. 22, 4287.—Expts. on 1.0 and 0.5 N solns. of  $CuSO_4$  with  $H_2SO_4$  acidity 1.0 N show that the replacement of Cu is independent of the length of time of heating and of the same order, namely 10-25%. The concns. of  $Cu^{++}$  and  $Cu^+$  are practically const. There must be an equil. between those ions and the compressed  $H_2$ . The Cu must be dissolved by the  $CuSO_4$  and the velocity of replacing equal to that of dissolving. With increasing acidity the conditions become favorable for a high  $Cu^+$  concn. With the same acid concn. the replacement of Cu increases out of proportion with higher  $CuSO_4$  concn. and the influence of the increase of acidity diminishes. E. SCHOTTE

Displacement of metals and their oxides by hydrogen under pressure at high temperatures. Action on solutions of ruthenium salts. V. N. IPAT'EV AND O. E. SVYAGIN-ZEV. Academy of Science, Leningrad. *Ber.* 62B, 708-10(1929); cf. preceding abs.—The solns. of the salts  $(NH_4)_2RuCl_6$ ,  $K_2RuCl_6$ ,  $Na_2RuCl_6$  and  $H_2Ru(OH)_2Cl_4$  give the same reaction products with  $H_2$  under pressure. With increase of the pressure and of the temp. the hydrates first formed change to  $Ru(OH)_3 + H_2O$ . The following stages are  $Ru(OH)_3$ ,  $Ru_2O_3$  and Ru. The last stage occurs with a pressure of 125 atm. and 350° for 6 hrs. E. SCHOTTE

Influence of sucrose on the dissociation constant of weak acids in aqueous solution. I. M. KOLTHOFF. *Rec. trav. chim.* 48, 220-6(1929).—From potentiometric (by the  $H_2$  electrode) and cond. measurements, it is concluded that sucrose up to 40% has practically no influence on the dissocn. const. of weak acids in aq. soln., if the concn. of the acids is expressed as the mol. fraction with regard to the free  $H_2O$  and if in a 20% sucrose soln. a hydration of 1 mol. of sugar with 8 mols.  $H_2O$  is accepted. C. Z. R.

The effect of the position of substitution on the apparent dissociation constants of certain amino acids. CARL L. A. SCHMIDT, W. K. APPLEMAN AND PAUL L. KIRK. Univ. of Cal. Med. School. *J. Biol. Chem.* 81, 723-6(1929).—The apparent acid and basic dissocn. consts. of  $\alpha$ -aminovaleric acid,  $\beta$ -alanine,  $\gamma$ -aminovaleric acid and  $\delta$ -aminovaleric acid have been detd. If the logs of the apparent dissocn. const. of these amino acids are plotted against the reciprocal of distance of the amino groups the curves are straight lines. Similar results were obtained by MacInnes (C. A. 22, 4315) with certain hydroxyl- and halogen-substituted acids. A. P. LOTHEP

The influence of a high-potential direct current on the conductivity of an electrolyte. J. A. H. LEECH-PORTER. *Phil. Mag.* [7], 7, 153-9(1929).—The cond. of very dil. electrolytic solns. varied greatly when the electrolyte was subjected to a high-potential d. c. This variation occurs only in a limited range of cond. and is absent when the cond. is either too low or too high. It is most pronounced with HCl when the sp. cond. is about  $2 \times 10^{-4}$  ohm $^{-1}$ , in which case the cond. may vary as much as 600%. L.-P.

suggests that the high p. d. draws the ions toward the electrodes, where they remain. If the d. c. is reversed the concd. groups of ions moves across the cell as a unit. It is suggested that ionic mobility may be detd. by this method. L. H. REVERSON

The relation between the stationary state and equilibrium. EMIL BAUER. *Z. physik. Chem., Abt. A*, 140, 194-8(1929).—Dienger (*C. A.* 23, 1337) observed that with respect to the equil. point the velocity of transformation of tertiary butyl bromide into isobutyl bromide is much too small. B. shows that such breaks in the  $\Delta v$  curves are in harmony with the Guldberg relation,  $K = f_1/f_2$ , between the equil. const. and the velocity coeffs. H. F. JOHNSTONE

An ebullioscopic method for determining the equilibrium constant. W. SWIENOT-LAWSKI, Z. BLASZKOWSKA AND E. JÓZEFOWICZ. *Roczniki Chem.* 9, 1-17, 17-18(1929) (French).—Simultaneous observation is made of the changes in b. p. of 2 mixts. in each of which the same reaction is taking place, but in one of which the equil. is being approached from the direction of esterification while in the other it is being approached from the side of hydrolysis. For the reaction  $\text{AcOH} + \text{EtOH} \rightleftharpoons \text{AcOEt} + \text{H}_2\text{O}$  the equil. const. is 3.76. The b. p. of the equil. mixt. is 76.32°. The coeff.  $dp/dt$  is 27.21 and the heat of vaporization is 8.76 cal. per g. mol. for mixts. contg. the reactants in equiv. amts. JAROSLAV KUČERA

Rapid method for calculation of homogeneous dissociations. Application to carbon dioxide. PIERRE JOLIBOIS AND PIERRE MONTAGNE. *Compt. rend.* 187, 1145-7(1928).—By graphic means on a triangular figure equations  $f(Ldt/RT^2) + \log p + \log K = \text{const.}$ ,  $K = (y^2z/x^2)$ , and  $K = \alpha^2/(1 - \alpha)^2(2 + \alpha)$ , ( $\alpha$  = coeff. of disson.) can be quickly solved. L. D. ROBERTS

Decomposition of persulfates in aqueous solutions. A. KAILAN AND E. LEISEK. *Univ. Wien. Monatsh.* 50, 403-28(1928).—The velocity of the decompn. of  $\text{Na}_2\text{S}_2\text{O}_8$  alone and with the addn. of  $\text{NaHSO}_4$ ,  $\text{Na}_2\text{SO}_4$ ,  $\text{NaNO}_3$ ,  $\text{NaOH}$ ,  $\text{H}_3\text{PO}_4$ ,  $\text{Na}_2\text{HPO}_4$  and  $\text{Na}_2\text{PO}_4$  was investigated as well as the decompn. velocity of  $\text{K}_2\text{S}_2\text{O}_8$  with the addn. of  $\text{KNO}_3$  and  $\text{KOH}$ . Expts. were done at 99.4°. With increasing concn. of the persulfates the monomol. velocity coeff. decreases.  $\text{Na}_2\text{S}_2\text{O}_8$  decomposes more rapidly than the K salt.  $\text{H}$ ,  $\text{NO}_3$ ,  $\text{OH}$  and  $\text{HPO}_4$  ions accelerate the reaction.  $\text{K}$ ,  $\text{Na}$  and  $\text{SO}_4$  ions have a retarding effect,  $\text{K}$  more than  $\text{Na}$ .  $\text{H}_3\text{PO}_4$  and  $\text{H}_2\text{PO}_4$  ion have no effect. The decompn. of  $\text{H}_2\text{S}_2\text{O}_8$  to Caro's acid in solns. contg. 0.1 *N*  $\text{K}_2\text{S}_2\text{O}_8$  and 0.6 to 14 *N*  $\text{H}_2\text{SO}_4$  increases with increase of the acidity. E. SCHOTTE

The decomposition of nitrogen pentoxide. H. J. SCHUMACHER AND G. SPRENGER. *Phys. Chem. Inst., Univ. of Berlin. Z. physik. Chem., Abt. A*, 140, 281-90(1929); cf. following abs.—S. and S. have investigated the decompn. of  $\text{N}_2\text{O}_5$  and find that ozone exhibits no inhibitory effect, contrary to the work reported by Daniels, Wulf and Karrer (*C. A.* 17, 13). The velocity of reaction for the change of  $\text{N}_2\text{O}_5$  in the presence of small quantities of  $\text{O}_3$  was studied; also  $\text{NO}_2$  (or  $\text{N}_2\text{O}_4$ ) was slowly mixed with ozone; these reactions were investigated photometrically and manometrically. The reaction velocity const. is about  $8.4 \times 10^{-3}$  as compared to the  $9.1 \times 10^{-3}$  of Daniels and Johnson (*C. A.* 15, 976). Various mechanisms for the reaction are discussed. S. and S. favor  $\text{NO}_2 + \text{O}_3 \rightarrow \text{NO}_3 + \text{O}_2$  followed by  $\text{NO}_3 + \text{NO}_2 \rightarrow \text{N}_2\text{O}_5$  for the formation. They are strongly against a decompn. giving  $\text{NO}_3$ . WILLIAM E. VAUGHAN

Decomposition of nitrogen pentoxide. I. The monomolecular reaction and its cessation at low pressures. GERHARD SPRENGER. *Univ. Berlin. Z. physik. Chem.* 136, 49-76(1928).—The reaction of  $\text{N}_2\text{O}_5$  with  $\text{NO}$  or  $\text{N}_2\text{O}_4$  is practically instantaneous. In agreement with the results of Daniels and Busse (*C. A.* 21, 2212), the gross reaction is found to consist of the following chain reactions: (1)  $\text{N}_2\text{O}_5 \rightarrow \text{N}_2\text{O}_4 + \text{O}_2$  (slow); (2)  $\text{N}_2\text{O}_4 + \text{N}_2\text{O}_5 \rightarrow 4\text{NO}_2 \rightleftharpoons 2\text{N}_2\text{O}_4$  (fast), or  $\text{NO} + \text{N}_2\text{O}_5 \rightarrow 3\text{NO}_2 \rightleftharpoons 1\frac{1}{2}\text{N}_2\text{O}_4$  (fast). The speed of the gross reaction is therefore detd. by (1). At pressures between 0.001 and 0.005 mm., the reaction fades out. The results of Hirst and Rideal (*C. A.* 20, 536) are interpreted as indicating a similar cessation of reaction at low pressures. J. H. REEDY

The reaction between nitrogen pentoxide and ozone. HANS J. SCHUMACHER AND G. SPRENGER. *Univ. Berlin. Z. physik. Chem.* 136, 77-92(1928).—The reaction between  $\text{N}_2\text{O}_5$  and  $\text{O}_3$  is apparently bimol., though it probably consists of a chain of reactions. The speed may be represented:  $dC/dt = 8.7 \times 10^{11} e^{-2900/RT} \times C_1 \times C_3$ . Spectroscopic examn. shows that a new N oxide,  $\text{N}_2\text{O}_4$  or  $\text{NO}_3$ , is formed during the reaction, as reported by Warburg and Leithäuser (*C. A.* 1, 2673). Several schemes to explain the role of this higher oxide in the chain of reactions were discussed. J. H. REEDY

Kinetics of the thermal decomposition of sodium hypochlorite. FRANCESCO GIORDANI AND ELIODORO MATTIAS. *Rend. accad. sci. (Napoli)* [3], 34, 137-41(1928).—

The thermal decompn. of  $\text{NaOCl}$  is expressed by the reaction  $\text{NaOCl} + 2\text{HOCl} = \text{NaClO}_2 + 2\text{HCl}$  and by Foerster was considered independent of the alkyl. (*J. prakt. Chem.* [2], 63, 141-66(1901)). B. and M. have detd.  $K$  for the reaction at  $t = 31^\circ$  and  $t = 46^\circ$ , using 0.30 and 0.381  $N$   $\text{NaOH}$  soln. With the 0.3  $N$  soln.  $K_{t=31^\circ} = 0.0000$  and  $K_{t=46^\circ} = 0.0042$ ; with 0.381  $N$  soln.,  $K_{t=31^\circ} = 0.00035$ ,  $K_{t=46^\circ} = 0.0042$ . The rate of reaction with the more dil.  $\text{NaOH}$  does not increase as much with the same increase in temp.; also at the higher temp.  $K$  is independent of the alkyl. Foerster's work was carried out at  $50^\circ$ .

A. W. CONTIERI

The decomposition of triphenylacetic acid by sulfuric acid. HARRY R. DITTMAR. Univ. of Wis. *J. Phys. Chem.* 33, 533-56(1929).—The decompn. of triphenylacetic acid in concd.  $\text{H}_2\text{SO}_4$  was studied quantitatively to det. the mechanism of the reaction and its relation to the decompn. of oxalic, formic and malic acids. The rate of the reaction was detd. at  $12^\circ$  and at  $22^\circ$  by measuring the vol. of  $\text{CO}$  evolved. The decompn. is quant. and apparently is a first-order reaction. The inhibiting effect of a number of solutes that form addn. compds. with  $\text{H}_2\text{SO}_4$  was studied. The velocity const. fell off with the log of the concn. of the following inhibitors:  $\text{H}_2\text{O}$ ,  $\text{Na}_2\text{SO}_4$ ,  $\text{K}_2\text{SO}_4$ ,  $\text{AcH}$ , dimethylpyrone, phenol, acetone,  $p$ -cresol. The inhibiting effect of the following was demonstrated at one or two concns.:  $\text{EtOH}$ , benzoic acid, acetophenone, benzophenone, crotonic acid, coumarin,  $m$ -nitrophenol,  $o$ -toluic acid, triphenylcarbinol.  $\text{HCl}$  was without effect on the velocity, and  $\text{H}_3\text{PO}_4$  had less effect than the above inhibitors.  $\text{H}_3\text{PO}_4$  is not known to form addn. compds. with  $\text{H}_2\text{SO}_4$ , but all of the inhibitors are known to do so excepting  $\text{EtOH}$  and acetone. These substances form compds. with other acids, however. M. p. curves of the system, triphenylcarbinol and  $\text{H}_2\text{SO}_4$ , indicate a compd.,  $(\text{C}_6\text{H}_5)_3\text{COH} \cdot 4\text{H}_2\text{SO}_4$ , hygroscopic, orange-colored needles, m.  $39.0^\circ$ . On account of the low soly. of triphenylacetic acid in less than 70%  $\text{H}_2\text{SO}_4$ , and the decompn. in more than 70%, no direct evidence of compd. formation between these 2 substances could be found. Indirect evidence is adduced, however, and it is believed that the decompn. of triphenylacetic acid is a result of the formation of unstable addn. compds. The similarity of the decompns. of oxalic, malic, formic, and triphenylacetic acids suggests the same mechanism for each. The ease of decompn. of these substances is in the order expected from their critical increments. The fact that the inhibitors form compds. with  $\text{H}_2\text{SO}_4$  supports Taylor's theory of negative catalysis.

M. W. SEYMOUR

The effect of concentrated electrolytes on the course of chemical processes. Experiments with potassium permanganate.\* M. BOBELSKY AND D. KAPLAN. Hebräische Univ. of Jerusalem. *Z. anorg. allgem. Chem.* 177, 323-36(1928); cf. *C. A.* 22, 3816.—The velocity of decolorization of a small known amt. of  $\text{KMnO}_4$  in a large known excess of  $\text{H}_2\text{C}_2\text{O}_4$ - $\text{H}_2\text{SO}_4$  soln. was measured in the presence of various salts. The alkali chlorides exert a stronger accelerating effect than the nitrates or sulfates. Among the sulfates the order of decreasing acceleration is  $\text{Li} > \text{Mg} > \text{NH}_4 > \text{Na} > \text{K}$ . Of the nitrates,  $\text{NH}_4\text{NO}_3$  is markedly accelerating,  $\text{NaNO}_3$  is ineffective and  $\text{KNO}_3$  is retarding. The ratios of the acceleration or retardation of the sep. salts at  $5^\circ$ ,  $15^\circ$  and  $25^\circ$  are tabulated. Chlorides show the greatest temp. sensitivity and are arranged in the following order:  $\text{NH}_4\text{Cl} < \text{KCl} < \text{MgCl}_2 < \text{AlCl}_3$ . The nitrates are weakly sensitive towards temp. change while the sulfates seem to be partly weak and partly intermediate in temp. sensitivity. In this connection the character of the anion appears to be the chief factor. The salt effect almost without exception increases with rise in temp. above  $5^\circ$  and shows a max. between  $5^\circ$  and  $25^\circ$ . Salts which are very sensitive to temp. change also react markedly to concn. change.  $\text{NH}_4\text{NO}_3$  is an exception to this rule and is sensitive to concn. but only weakly so to temp. The following series is arranged in the order of decreasing concn. sensitivity:  $\text{AlCl}_3 > \text{CdSO}_4 > \text{MgCl}_2 > \text{ZnCl}_2 > \text{ZnSO}_4 > \text{KCl} > \text{NH}_4\text{Cl} > \text{NH}_4\text{NO}_3 > \text{NaCl} > (\text{NH}_4)_2\text{HPO}_4$ . The weakly concn.-sensitive salts can be put in the following series:  $\text{Li}_2\text{SO}_4 > \text{MgSO}_4 > \text{K}_2\text{SO}_4 > (\text{NH}_4)_2\text{SO}_4 > \text{Na}_2\text{SO}_4 > \text{KNO}_3 > \text{NaNO}_3$ . The alk. earth chlorides in  $\text{HCl}$  soln. show the order:  $\text{CaCl}_2 > \text{SrCl}_2 > \text{BaCl}_2$  and are intermediate between  $\text{MgCl}_2$  and  $\text{KCl}$  in the 2nd preceding series.

E. R. SMITH

The equilibrium in aqueous solution between ammonium acetate, acetamide, and water. EDGAR B. LINEKEN AND GEORGE H. BURROWS. Univ. of Vermont. *J. Am. Chem. Soc.* 51, 1106-12(1929).—The above equil. was measured at different concns. and temps. and it was concluded that the amide is formed through the ions of the salt.

MALCOLM DOLE

Velocity of saponification of mono- and dichloroacetic acid esters. A. SKRABAL AND M. RÜCKERT. Univ. of Graz. *Monatsh.* 50, 369-84(1928).—Velocity consts. for water ( $k_w$ ), acid soln. ( $k_a$ ) and basic soln. ( $k_b$ ) were detd. for  $\text{CH}_3\text{ClCOOCH}_3$ .  $k_w =$

0.0000123,  $k_a = 0.00507$ ,  $k_b = 8170$  and for  $\text{CHCl}_2\text{COOCH}_3$ ,  $k_w = 0.00092$ ,  $k_s = 0.0140$ ,  $k_a = 170,000$ . Consts. were detd. at  $25^\circ$  in aq. solns. Of the mono ester 0.1 *N* solns. were used. At a HCl concn. of 0.1 *N* and higher  $\text{CH}_2\text{ClCOOH}$ , that comes free, does not increase the velocity as it does at the lower concns. and the acid sapon. runs isolated. The basic sapon. is isolated by using a buffer of 0.2 *N*  $\text{NH}_4\text{Cl}$  and 0.1 *N*  $\text{NH}_3$ . To isolate the neutral sapon. a soln. of 0.2 mol. of ester and 0.1 of NaOH was prepd. For titration HCl or  $\text{NH}_4\text{OH}$  was used with alizarin as indicator. The values given for the dichloro ester are preliminary.

E. SCHOTTE

**The dialuric acid-alloxan equilibrium.** GEORGE M. RICHARDSON AND ROBERT K. CANNAN. Dept. of Biochemistry, Univ. Col., London. *Biochem. J.* **23**, 68-77(1929).—The equil. potentials of the reversible oxidation-reduction system dialuric acid-alloxan have been detd. for the  $pH$  range 1-6 and related to the equil. potentials of alloxantin (see *Ann. Chim.* [9], **19**, 137(1923)). The first acidic const. of dialuric acid and of alloxan have been detd.; the second const. for alloxan is inferred from the electrode behavior of the system.

BENJAMIN HARROW

**The hydrolysis of solutions of zinc sulfate and the presence of univalent zinc ions.** H. G. DENHAM AND N. A. MARRIS. Canterbury College, New Zealand. *Trans. Faraday Soc.* **24**, 510-5(1928).—The quinhydrone gives steady and reproducible values for the hydrolysis of  $\text{ZnSO}_4$  solns. With the H electrode the values of the e. m. f. are not const., because of the reduction of bivalent to univalent ions. The % hydrolysis of  $\text{ZnSO}_4$  solns. over the diln. range 16-256 was found to vary between 0.0042 and 0.169. In one expt a far-reaching reduction of  $\text{ZnSO}_4$  was accomplished with Pt black. It was then possible, with the quinhydrone electrode, to detect an increase in acid concn. to the extent of 500 times by the reduction of  $\text{Zn}^{++}$  ions in accordance with the equation  $\text{Zn}^{++} + \text{H} \rightarrow \text{Zn}^+ + \text{H}^+$ .

H. R. MOORE

**The hydrolysis of certain easily reducible metallic salts.** H. G. DENHAM AND N. A. MARRIS. *Trans. Faraday Soc.* **24**, 515-8(1928); cf. preceding abstr.—The quinhydrone electrode was used for detg. the hydrolysis of the solns  $\text{CdSO}_4$ ,  $\text{PbCl}_2$ ,  $\text{Pb(NO}_3)_2$ ,  $\text{Ti(SO}_4)_2$ . It is much more suitable for such work than the H electrode, which favors partial reduction of the salts. Thus with the H electrode one obtains 4.9%  $\text{H}_2$  as a consequence of the reduction of the thalious ion to the subvalent state.

H. R. MOORE

**Reduction of dichromates to basic chromic salts.** GEORGE GRATHER AND TOSHIO NAGAHAMA. Hokkaido Imp. Univ. *Hokkaido J. Agr.* **24**, 25-38(1928).—The authors previously showed that  $\text{K}_2\text{Cr}_2\text{O}_7$  is reduced by the addn. of  $\text{H}_2\text{SO}_4$  and glycerol. They next proceeded to find out if the reduction occurs in the absence of  $\text{H}_2\text{SO}_4$ , and whether HCl,  $\text{HCO}_2\text{H}$  or  $\text{AcOH}$  can be used instead of  $\text{H}_2\text{SO}_4$ , and also to find out the min. quantity of  $\text{H}_2\text{SO}_4$  necessary for reduction. All reducing agents tested except MeOH have a reducing action, the strength of the reducing action decreasing in the order lactic acid, tartaric acid, glucose, dextrose, tannin, glycerol,  $\text{CH}_2\text{O}$ ,  $\text{Na}_2\text{S}_2\text{O}_3$ ,  $\text{Na}_2\text{SO}_3$ ,  $\text{Na}_2\text{S}$ . HCl can be used in place of  $\text{H}_2\text{SO}_4$  in all cases. Lactic and tartaric acids are suitable as reducing agents when org. acids are used.

K. SOMEYA

**The rate of oxidation of hydrobromic acid by chromic acid in the presence of salts.** M. BOBELSKY AND A. ROSENBERG. Hebrew Univ., Jerusalem. *Z. anorg. allgem. Chem.* **177**, 137-44(1928).—The rate of removal of Br from a dil. soln. of alk. bromide by a stream of  $\text{CO}_2$  in the presence of alk. chromates and  $\text{H}_2\text{SO}_4$  is a function of the H-ion concn. and the concn. of other ions. Solns. of 5 cc. KBr (0.24 *N*), 5 cc.  $\text{K}_2\text{CrO}_4$  (1 *N*), 6.5 cc. concd.  $\text{H}_2\text{SO}_4$  + 15 cc. water, or various sulfate solns., were treated with  $\text{CO}_2$  at const. temp. ( $20^\circ$ ) and const. gas flow. The rate of Br removal was measured with 31 solns. of various concns. of the sulfates of Fe, Cr, Al, Mn, Zn, Ni, Cu, Mg, Cd,  $\text{NH}_4$ , K, and Na. The last four salts retarded the Br evolution, while varying degrees of acceleration were observed with other sulfates. The acceleration increased with increasing concn. A sp. effect was observed with Mn and Cr. The investigation bears upon the recovery of Br from the Dead Sea salt deposits.

R. L. DODGE

**Oxidation of stannous chloride in sulfuric acid solution by air, and the solution velocity of oxygen in sulfuric acid solution.** S. MRYAMORO. *Sci. Papers Inst. Phys. Chem. Research* **10**, 7-17(1929).— $\text{SnCl}_2$  in  $\text{H}_2\text{SO}_4$  soln. was oxidized by bubbling air through the soln. The rate of oxidation increased with increase in acidity until the acid concn. reached 0.8 *N*. Above this concn. the oxidation velocity became equal to the velocity of soln. of  $\text{O}_2$ . Under these conditions, change of temp. had little influence on the oxidation velocity. The rate of soln. of  $\text{O}_2$  in  $\text{H}_2\text{SO}_4$  soln. is approx. the same as that in HCl soln. under the same conditions. Also in *Bull. Chem. Soc. Japan* **4**, 48-56(1929).

C. L. READ

**The activation of chemical reactions by neutral salts. III. The activation of the**

reaction attending the solution of nickel. N. IZGARISHEV AND SOPHIE SHAPIRO. Moskau, Techn. Hochschule. *Z. physik. Chem.*, Abt. A, **140**, 223-6(1929); cf. *C. A.* **22**, 1519.—Sheets of pure Ni, 1.4 mm. thick and 400 sq. mm. in area, were immersed in solns. 3 *N* in  $H_2SO_4$  and *N* in various salts, at 70°, for 60, 90 and 120 min. The quantities of Ni dissolved were detd. and the velocity const. were calcd. for the rate of soln. The order of increasing accelerating effect of anions was found to be:  $Br < F < Cl < I < ClO_3 < IO_3 < BrO_3$ . For chlorides the order obtained was:  $NH_4 < Na < Li < K < Mg < Fe^{II} < Zn < Al < Cu < Fe^{III}$ . IV. The effect of neutral salts on the potential of oxidation-reduction systems. N. IZGARISHEV AND A. TURKOVSKII. *Ibid* 227-34.—The oxidation-reduction potentials of the system  $Fe^{++}-Fe^{+++}$  were measured in the presence of chlorides and nitrates with different cations and in the presence of Na salts with different anions. Curves were plotted showing the dependence of the potential on the concn. of the added salt. The results obtained lead to the conclusion that the effect of the salt cannot be due to a change in acidity. It is improbable that complex formation with  $Fe^{++}$  and  $Fe^{+++}$  takes part in the effect. A parallelism was found between the effect of a series of cations on this potential and on the oxidation of  $SnCl_2$  by  $FeCl_3$ . V. The effect of neutral salts on cathodic polarization. N. IZGARISHEV AND H. RAVIKOVICH. *Ibid* 235-40.—The effect of the addn. of salts to  $NiCl_2$  soln. was investigated with reference to the c. d.-voltage curves for the electro-deposition and current yield of Ni. Characteristic effects of different cations were noted.

E. R. SMITH

The decomposition of hydrogen peroxide at surfaces. W. M. WRIGHT AND E. K. RIDEAL. *Trans. Faraday Soc.* **24**, 530-8(1928); cf. *C. A.* **22**, 3568.—The rate of surface decompn. of  $H_2O_2$  was studied for a no. of surfaces. The addn. of alkalis and acids affects the rate of decompn. and the max. rates of decompn. are coincident with  $p_H$  values theoretically necessary to bring the surface to its isoelec. point. The abnormalities with tungstic acid are probably assocd. with the formation of a sol. per-tungstic acid. Alterations in reaction rate can be effected by multivalent ions such as  $AlCl_3$ . At high concns. the effect of poisoning by the absorbed salt can be observed.

H. R. MOORE

The thermal decomposition of hydrogen peroxide. W. M. WRIGHT. *Trans. Faraday Soc.* **24**, 539-42(1928); cf. preceding abstr.—It is shown that pure silica gel has only a slight catalytic activity for the decompn. of  $H_2O_2$ , but this activity is greatly increased in the presence of  $AgNO_3$ . The addn. of a trace of alkali increases the activity of the Ag salt several hundred times. Clean sheet Ag is a very feeble catalyst but if previously treated with  $HNO_3$  becomes very active because of the formation of an oxide of Ag.

H. R. MOORE

Acid catalysis in hydrolytic reactions. J. N. BRÖNSTED AND W. F. K. WYNN-JONES. Polytech. Inst., Copenhagen. *Trans. Faraday Soc.* **25**, 59-76(1929).—The extended theory of acid and basic catalysis was tested by means of the hydrolysis of the following substances: ethyl orthoformate,  $HC(OC_2H_5)_3$ ; ethyl orthoacetate,  $CH_3C(OC_2H_5)_2$ ; ethyl orthopropionate,  $CH_3CH_2C(OC_2H_5)_2$ ; ethyl orthocarbonate,  $C(OC_2H_5)_4$ ; acetal,  $CH_3CH(OC_2H_5)_2$ ; and ketal,  $(CH_3)_2C(OC_2H_5)_2$ . These hydrolyze, in the presence of minute amts. of acids, according to the typical equation,  $HC(OC_2H_5)_3 + H_2O \rightarrow HCOOC_2H_5 + 2C_2H_5OH$ . According to the extended theory, an *acid* is any substance that tends to split off protons, and a *base* is any substance that tends to add protons. The above reactions are suitable for testing this theory, because of (1) their great sensitivity to H ions, (2) their indifference to OH ions, and (3) the neutrality of the original substances and of the reaction products. Although the theory predicts the catalytic activity of acid mols. other than H ions, the effects of these mols. will be detectable only if  $x$  for the particular reaction is not too close to the limits 1 and 0 in the equation,  $k_A = GK_A$ , where  $k_A$  and  $K_A$  are the catalytic and dissocn. const. of the acid catalyst, resp., and  $G$  is a const. dependent only upon temp., pressure, medium, and the reacting substance, or "substrate." The following rule is laid down: "If in a reaction catalyzed by H or OH ions there is a detectable but not too large 'spontaneous' reaction, then the conditions are favorable for the detection of effects by acids and bases in general." Since the reactions studied are accompanied by considerable vol. changes, the rates were detd. by means of the dilatometer. The use of pressure, instead of suction, for filling the dilatometer enabled readings to be made within 5 mins. from the time of mixing the solns. Expts. showed that the velocity const.,  $k = -d \log c/dt$ , were independent of the concn. of the substrate. Buffers were made from nitrophenols, and cacodylic, acetic, and formic acids to maintain the desired concn. of H ion or uncharged acid mols. The "secondary salt effect" was minimized by maintaining const. total salt concn., necessary dilns. of buffer solns. being made

with NaCl or other uni-univalent salt soln. OH-ion catalysis was shown to be absent. For  $\text{HC}(\text{OC}_2\text{H}_5)_3$  and  $\text{CH}_3\text{CH}(\text{OC}_2\text{H}_5)_2$ , neither a "spontaneous" or water reaction nor the catalytic effect of mols. other than H ion was detectable. These substances are therefore suitable for the detn. of H ion and the study of salt effects. For  $\text{CH}_3\text{C}(\text{OC}_2\text{H}_5)_3$ ,  $\text{CH}_3\text{CH}_2\text{C}(\text{OC}_2\text{H}_5)_2$ , and  $\text{C}(\text{OC}_2\text{H}_5)_4$ , evidence for the catalytic activity of mols. of  $\text{H}_2\text{O}$ , *m*- and *p*-nitrophenols, and cacodylic and acetic acids was found in a decrease of the velocity const. with decrease of the concn. of the buffer soln. at const. H-ion concn. *E. g.*, with a salt concn. of 0.025 *N*, kept const. by the addn. of Na picrate, a decrease of 30% in the velocity const. for  $\text{CH}_3\text{C}(\text{OC}_2\text{H}_5)_3$  occurred when the *m*-nitrophenol buffer concn. was decreased to  $1/10$  its former value. From the data for the reaction velocities in different buffer solns., the dissocn. consts. of the buffer acids were calcd.

M. W. SEYMOUR

Decomposition of nitric oxide by platinum at elevated temperatures and its retardation by oxygen. PAUL W. BACHMAN AND GUY B. TAYLOR. *J. Phys. Chem.* 33, 447-55(1929).—From calcn. of the results of Green and Hinshelwood (*C. A.* 20, 3375) and from exptl. results with improved app. it is found that the decompn. of NO (on Pt and Pt-10% Rh wires above 1000° is bimol. with respect to NO and is retarded in proportion to the  $\text{O}_2$  concn. The heat of adsorption of NO on Pt is predicted to be a large positive value. It is indicated that bimol. reactions, when retarded by a product of the reaction, are similar to unretarded unimol. reactions in that the fraction reacting in any time is independent of the initial pressure.

COLIN W. WHITTAKER

The nature of the time-dilution curves in some hemolytic systems. K. C. SEW AND NARENDRA NATH MITRA. *J. Indian Chem. Soc.* 5, 683-95(1928).—Time-diln. curves of hemolysis of sheep erythrocytes have been obtained with HCl, NaOH, saponin, K oleate and Na taurocholate. Taurocholate gives an abnormal time-diln. curve. Contrary results reported by others are probably due to the use of lower concns. of both hemolyte and corpuscles. The first stage in hemolysis appears to be an autocatalytic reaction. At low concn. of oleate, alkali accelerates hemolysis while the reverse occurs at high concn. Alkali always has a retarding action in saponin hemolysis. Glycocholate appears to be a stronger hemolytic agent than taurocholate if compared at suitable concns.

RAYMOND H. LAMBERT

Hysteresis phenomena in physical-chemical systems. N. V. RASCHEVSKY. *Z. Physik* 53, 102-6(1929).—It is pointed out that the state of every system which may have several possible equil. positions for the same external conditions is dependent on its previous history. With this hysteresis effect there is further connected another property of such systems, namely, the fact that the state of such a system depends not only on the path taken by the detg. external conditions, but also on the velocity with which such external conditions change.

GEORGE GLOCKLER

The triple point of water as a fixed point. H. MOSER. *Phys. Tech. Reichsanstalt. Ann. Physik* [5], 1, 341-60(1929).—A thermostat is described which makes it possible to obtain the temp. of the triple point of water in a vol. of 10 ml. and to maintain it for some time. The factors governing max. temp. constancy are discussed. The temp. was kept const. for several hrs. to  $\pm 0.045^\circ$ . The lowering of the m. p. of ice in equil. with air-free water was experimentally detd. for a pressure increase from 0 to 1 atm. It was  $0.00748^\circ \approx 0.045^\circ$ . The temp. of the triple point is  $0.0098^\circ$ , if the water is satd. with air.

FRANK URBAN

The melting point of potassium chromate. DAVID F. SMITH AND F. A. HARTGEN. *Bur. Mines. Repts. of Investigations* No. 2017, 3 pp.(1929).—Exptl. results on 2 c. p. samples of  $\text{K}_2\text{CrO}_4$  as received and after several recrystns. are tabulated. High transition, low transition and m. ps. are indicated. Five or six recrystns. are necessary to secure a pure product. The m. p. of pure  $\text{K}_2\text{CrO}_4$  is  $968.3^\circ$  with a probable accuracy of  $0.5^\circ$ . Ordinary com. samples require considerable purification before their m. p. can be used as an accurate temp. indicator, such as the temp. to which a coal sample should be heated in the standard method of analysis to det. its content of volatile matter.

W. H. BOYNTON

Remarks on the fusion-pressure curve. FRANZ SIMON AND GUNTHER GLATZEL. *Univ. Berlin. Z. anorg. allgem. Chem.* 178, 309-16(1929).—The usual Traumann interpolation formula for representing the variation of the m. p. with pressure ( $T_p = T_0 + ap - bp^2$ , where  $T_0 = \text{m. p. at zero pressure}$ ,  $T_p = \text{m. p. at pressure } p$ , and  $a$  and  $b$  are consts.) reproduces exptl. results with only fair approximation, and also indicates a decrease in m. p. with increasing pressure at high pressures, a phenomenon which has never been observed. A new formula is proposed (developed from van der Waals' vapor-pressure formula)  $\log(a + p) = c \log T + b$ , in which  $a$ ,  $c$  and  $b$  are consts.,  $p$  is the pressure and  $T$  the temp. It is shown that the order of agreement of

this formula and exptl. results is higher than that of Tammann's. The consts. are evaluated for 19 substances measured by Tammann. The course of the melting curve at high pressures is discussed and views of various authorities are criticized.

ROBERT F. MEHL

**Solutions. II. The freezing-point diagrams and latent heats of evaporation of binary mixtures of volatile liquids.** WILFRED F. WYATT. Univ. Sheffield. *Trans. Faraday Soc.* 25, 43-8(1929); cf. *C. A.* 23, 24.—F.-p. diagrams and curves of the internal molal latent heats at the b. ps. were detd. for the following systems: (I) MeOH-CHCl<sub>3</sub>, (II) Et<sub>2</sub>O-CCl<sub>4</sub>, (III) EtOAc-CCl<sub>4</sub> and (IV) C<sub>6</sub>H<sub>6</sub>-EtBr. Systems with irregular molal latent heat curves have also complex f.-p. curves, but regular molal latent heat curves do not preclude the possibility of compd. formation, since compds. formed at low temps. may not be stable at the b. p. The latent heat curve for the system MeOH-CHCl<sub>3</sub> has 2 max. and 2 min., but the latent heat curves for the other systems are regular. The pos. deviations of the MeOH-CHCl<sub>3</sub> latent heat curve from the additive law indicate strong attractive forces between the 2 kinds of mols. at elevated temps. Cryoscopic evidence for the existence of the following compds. was obtained: MeOH.CHCl<sub>3</sub>, Et<sub>2</sub>O.CCl<sub>4</sub>, 2Et<sub>2</sub>O.CCl<sub>4</sub> and 2EtAc.CCl<sub>4</sub>. The latent heat curves for mixts. contg. CCl<sub>4</sub> indicate that the above compds. of CCl<sub>4</sub> are unstable at the b. p. A transition point at -48° was found in the CCl<sub>4</sub> systems. **III. The transition point of carbon tetrachloride, and compounds of carbon tetrachloride or chloroform with acetone, ether and benzene.** *Ibid* 48-53.—To study the transition pt. at about -48° in systems contg. CCl<sub>4</sub>, and to compare compds. of CHCl<sub>3</sub> and CCl<sub>4</sub> with (CH<sub>3</sub>)<sub>2</sub>CO, Et<sub>2</sub>O and C<sub>6</sub>H<sub>6</sub>, the f.-p. curves of the following systems were investigated: (I) (CH<sub>3</sub>)<sub>2</sub>CO-CCl<sub>4</sub>; (II) CS<sub>2</sub>-CCl<sub>4</sub>; (III) C<sub>6</sub>H<sub>6</sub>-CCl<sub>4</sub>; (IV) Et<sub>2</sub>O-CHCl<sub>3</sub>. A transition point having a mean value of -48.4°, and found in all systems contg. CCl<sub>4</sub> that freeze below this temp., represents an equil. between 2 cryst. forms of CCl<sub>4</sub>. It is suggested that binary mixts. of CCl<sub>4</sub> be used as a fixed pt. in thermometry. Evidence is found for the following compds. in addn. to those reported in parts I and II: C<sub>6</sub>H<sub>6</sub>.CCl<sub>4</sub>, C<sub>6</sub>H<sub>6</sub>.2CCl<sub>4</sub>, (CH<sub>3</sub>)<sub>2</sub>CO.CCl<sub>4</sub>, 3Et<sub>2</sub>O.CHCl<sub>3</sub>, 2Et<sub>2</sub>O.CHCl<sub>3</sub>, Et<sub>2</sub>O.CHCl<sub>3</sub>, Et<sub>2</sub>O.2CHCl<sub>3</sub>. The compds. of CHCl<sub>3</sub> and CCl<sub>4</sub> with (CH<sub>3</sub>)<sub>2</sub>CO, Et<sub>2</sub>O and C<sub>6</sub>H<sub>6</sub> are tabulated and the relative stabilities of these substances pointed out. CHCl<sub>3</sub> is more reactive than CCl<sub>4</sub> toward (CH<sub>3</sub>)<sub>2</sub>CO and Et<sub>2</sub>O. The compds. are assumed to result from a coördinate link formed by the O atom of the one substance donating a lone pair of electrons to the Cl atom of the other substance. Etheric O is a more powerful donor than ketonic. All 3 Cl atoms of CHCl<sub>3</sub> but only 2 of CCl<sub>4</sub> may act as acceptors. CCl<sub>4</sub> forms compds. with C<sub>6</sub>H<sub>6</sub>, but CHCl<sub>3</sub> does not. CS<sub>2</sub> forms no compds. with CCl<sub>4</sub>.

M. W. SEYMOUR

**Equilibrium studies in the systems cobalt-sulfur-oxygen and nickel-sulfur-oxygen.** RUDOLF SCHENCK AND ERNST RAUB. Univ. Münster, i. W. *Z. anorg. allgem. Chem.* 178, 225-51(1929); cf. *C. A.* 21, 3865.—In the system Co-S-O the reaction  $2\text{CoO} + \text{CoS} \rightleftharpoons 3\text{Co} + \text{SO}_2$  is found to be irreversible and proceeds quant. to the left. The equil.  $3\text{CoSO}_4 + \text{CoS} \rightleftharpoons 4\text{CoO} + 4\text{SO}_2$  is studied between 230° and 540°; the vapor pressure reached 1 atm. at 540°, the rise in pressure being very steep above 500°. The thermal dissocn. of CoSO<sub>4</sub> according to the equation  $2\text{CoSO}_4 \rightleftharpoons 2\text{CoO} + 2\text{SO}_2 + \text{O}_2$  is also measured between 700° and 1000°, the vapor pressure rising very rapidly above 900°. In the system Ni-S-O, the reactions  $2\text{NiO} + \text{NiS} \rightleftharpoons 3\text{Ni} + \text{SO}_2$  and  $3\text{NiSO}_4 + \text{NiS} \rightleftharpoons 4\text{NiO} + 4\text{SO}_2$  are studied. In the second the vapor pressure becomes appreciable only above 600°, reaching 1 atm. at about 660°. In the reaction between NiO and NiS, fine capillary crystals are formed, particularly when the S content is about 32%; they are probably  $\gamma$ -mixed crystals of Ni<sub>3</sub>S<sub>2</sub> and NiS. A complete phase diagram is shown. The heat of formation of the sulfates is calcd. to be: for CoSO<sub>4</sub>—228,800 cal.; for NiSO<sub>4</sub>—232,000 cal. The heat of the reaction  $2\text{NiO} + \text{NiS} = 3\text{Ni} + \text{SO}_2$  is found to be 61,700 cal.

H. STROETZ

**Equilibrium of sulfides and silicates in melts.** WILHELM JANDER. *Metallwirtschaft* 7, 580-5(1928).—Melts were heated by a Tammann carbon-tube short-circuit furnace. An empty graphite crucible was heated in a stream of N above the m. p. of the highest-melting component of the melt, and the charge added rapidly in small quantities to avoid chilling the crucible. The melt was stirred continually with a MgO rod until equil. was reached. In order to keep the rod from dissolving, it was periodically withdrawn and the adhering melt allowed to solidify. While the melt was still being heated, the rod was removed and the melt allowed to sep. into sulfide and silicate layers. The crucible was then chilled and shattered, and the layers sep'd. The results are expressed in terms of C and K for a given a. The following 3 equations define these symbols. (1):  $([\text{Fe}_s].[\text{Ni}_{300}])/([\text{Ni}_s].[\text{Fe}_{600}]) = C$ , where the brack-





The 3-component system  $(\text{NH}_4)_2\text{SO}_4$ ,  $(\text{NH}_4)_2\text{SO}_4$ ,  $\text{H}_2\text{O}$  was thoroughly studied at 15° and 30°, and the results are reported in figures and diagrams; it was shown that neither a double salt nor a solid soln. exists between the 2 salts. At other temps., only the univariant systems consisting of 2 solid salts, satd. soln., and vapor were examd. The comps. of the satd. solns. are given below: temp.: —21.5, —21.2, —11.52, 0, 15, 30, 50, 70, 80, 90, 100; compn. of soln. in g. %:  $(\text{NH}_4)_2\text{SO}_4$ : 10.89, 10.95, 12.88, 15.41, 19.72, 24.64, 32.75, 42.28, 48.26, 49.14, 50.53;  $(\text{NH}_4)_2\text{SO}_4$ : 30.57, 30.55, 29.85, 29.05, 27.20, 25.21, 21.89, 17.71, 15.13, 15.01, 14.80;  $\text{H}_2\text{O}$ : 58.54, 58.50, 57.27, 55.54, 53.08, 50.15, 45.36, 40.01, 36.61, 35.85, 34.67. The cryohydric point is at —21.5°. By combining these results with the ones listed above, a complete diagram was constructed.

ALBERT L. HENNE

The relationship between the various forms of calcium sulfate at high temperatures. P. N. LASHCHENKO AND D. I. KOMPANSKII. Physicochem. Lab. of Don Polytechnicum. *J. Russ. Phys.-Chem. Soc.* 60, 579-616(1928).—Samples of the anhydride and of the different hydrates were heated for 1 hr. in a Pt or Ag tube and allowed to cool in a Berthelot calorimeter, direct contact with the water being avoided. Other samples were cooled rapidly and ds. detd. in mixts. of EtOH, ligroin and  $\text{PhNO}_2$ . The sp.-heat curve of the mineral anhydride (total heat given off in cooling plotted against the initial temp.) shows a break at 958-984°, which corresponds to the beginning of dissocn. A zone of polymorphic transformation lies between 2 abrupt changes of slope, at 140° and 270°. The d. increases up to 140°, then declines in an irregular manner to the dissociation pt. The hemihydrate prepd. according to Armstrong (*Z. physik. Chem.* 45, 258, 274(1903)) contained 0.6% dissolved water, which it gave off below 164°. The sp.-heat curve changes slope at about 150°; the individual deviations are abnormally large between 150° and 260°. Above 260° the curve coincides with that of the anhydride. The conclusion is drawn that between 150° and 260° the hemihydrate loses water of crystn. and simultaneously undergoes a mol. transformation. The d. increases between 100° and 164° while between 164° and 260° it shows an irregular decrease and from there on a rapid increase to that of the anhydride. Sol. anhydride was prepd. according to van't Hoff; the sp.-heat curve is close to rectilinear to 440°, at which temp. a break occurs followed by an almost horizontal portion extending to 496°. Between 100° and 160° the curve coincides with that for the hemihydrate. Above 164° the hemihydrate is apparently transformed into a mixt. of the 2 anhydrides, while above 250° the sol. anhydride disappears. Starting with the sol. anhydride only (dry or moist) the transformation into the insol. form occurs at about 500°. Gypsum loses practically no water between 92° and 108°. At 108° (a max. on the sp.-heat curve) the loss of water becomes rapid until at 140° (a min.) the compn. of  $\text{CaSO}_4 \cdot \text{H}_2\text{O}$  is reached. From there on, a linear increase in the "heat of cooling" takes place until another nearly horizontal portion is reached at 640-700°. The dissocn. of the anhyd.  $\text{CaSO}_4$  is represented by a cusp at 985°. The d. rapidly increases up to 140° and remains fairly const. during the decompn. of hemihydrate, which is followed by another rise. The dehydration is probably accompanied by the polymerization of the labile monohydrate to hemihydrate and, eventually, soluble anhydride. The change in the slope between 640° and 700° is attributed to a mol. transformation.

B. S.

Indirect analysis of a chemical compound present as solid phase in a two-phase system. ERNST WEITZ. *Z. anorg. allgem. Chem.* 179, 193-210(1929).—The fact that certain unstable  $\text{NH}_3$  compds. could not be isolated necessitated the application of a method of indirect analysis. The methods of Bunge and Schreinemakers were less suitable for the systems studied by W. and Stamm ( $\text{AgNO}_3\text{-NH}_3\text{-H}_2\text{O}$ ,  $\text{Ag}_2\text{C}_2\text{O}_4\text{-NH}_3\text{-H}_2\text{O}$ ,  $\text{AgClO}_4\text{-NH}_3\text{-H}_2\text{O}$ ,  $\text{ZnCl}_2\text{-HCl-H}_2\text{O}$ ). When the compd. is present as a solid phase (I) in a liquid phase (II) consisting of at least 3 components A, B and C the compn. of the compd.  $A_pB_qC_r$  can be detd. by analyzing phase (II) and any mixt. of (I) and (II). Expressing the relative amts. of A, B and C in g.-atoms (or g.-mols. in case A, B and C are compds.) by  $a'$ ,  $b'$  and  $c'$  for the given mixt. and by  $a$ ,  $b$  and  $c$  for the soln. it is clear that  $(a' - \lambda a):(b' - \lambda b):(c' - \lambda c) = p:q:r$ , where  $\lambda$  is an unknown proportionality factor and  $p$ ,  $q$  and  $r$  are small whole nos. whose values are to be found. Elimination of  $\lambda$  gives the equation  $p(b'c - bc') + q(ac' - a'c) + r(a'b - ab') = 0$ . W. shows how the values of  $p$ ,  $q$  and  $r$  can be obtained geometrically from  $a$ ,  $b$ ,  $c$ ,  $a'$ ,  $b'$  and  $c'$  and illustrates his method for the systems mentioned above.

H. S. V. KLOOSTER

Action of air-carbon tetrachloride vapor mixtures on certain natural and artificial sulfides, selenides, and a telluride. K. BRADDOCK-ROGERS. Univ. of Penn. *Chem. News* 138, 147-52(1929).— $\text{CCl}_4$  is purified from S compds. by shaking with 2 vols. of

1:1  $\text{NH}_3\text{-H}_2\text{O}_2$  soln. It is tested for the absence of S by heating a  $\text{CCl}_4$ -air mixt. to  $750\text{--}800^\circ$ , absorbing the product in  $\text{NH}_3\text{-H}_2\text{O}_2$  and testing for  $\text{SO}_4$ . Sulfides are analyzed by heating in a current of  $\text{CCl}_4$ -air, and absorbing the products in a train of  $\text{HCl}$  and  $\text{Br}_2$  followed by  $\text{NH}_3\text{-H}_2\text{O}_2$ . The temp. and time of heating vary somewhat with the sulfide: sphalerite, 15 mins. at  $400^\circ$ , then 25 mins. at  $500\text{--}550^\circ$ ; pyrites, 40 mins. at  $450\text{--}500^\circ$ ; chalcopyrites or Cu mat, 15 mins. without heat, then 15 mins. at  $150\text{--}170^\circ$ , then 15 mins. at  $420\text{--}430^\circ$ ; cinnabar, 10–15 mins. at  $250\text{--}300^\circ$ , then  $400\text{--}450^\circ$ ; bismuthinite 10 mins. at  $200\text{--}250^\circ$ , then  $450\text{--}500^\circ$ ; Ni mat, 15 mins. at  $300\text{--}350^\circ$ , then 20 mins. at  $480\text{--}510^\circ$ ;  $\text{PdS}$ , 80 mins. at  $550^\circ$ , then 20 mins. at  $575\text{--}600^\circ$ . Selenides are analyzed in the same manner, the 2 absorbers being replaced by one with 1:1  $\text{HCl}$ . The  $\text{H}_2\text{SeO}_4$  formed is reduced by boiling to  $\text{H}_2\text{SeO}_3$ , and Se is pptd. by  $\text{SO}_2$ , filtered off and weighed. Berzeliantite in calcite, 10 mins. without heat, 10 mins. at  $250\text{--}300^\circ$ , then 20 mins.  $375\text{--}425^\circ$ ; zorgite, 10 mins. at  $200^\circ$ , then 20 mins. at  $400\text{--}450^\circ$ . A telluride (altaite in calcite) was analyzed in the same manner, 1:4  $\text{HCl}$  being used in the absorber. Heat: 30 mins. at  $250\text{--}275^\circ$ . Decompn. was observed but no quant. data were taken on several other S-, Se- and Te-bearing minerals. G. CALINGAERT

The dehydration of  $\text{CdSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$ . L. CONIGLIO. *Rend. accad. sci. (Napoli)* **34**, [3], 119–22 (1928).—The hydrated salt was gradually dehydrated by holding it in an oven at increasing temps., a current of dry air ( $\text{CaCl}_2$ ,  $\text{H}_2\text{SO}_4$  tubes to dry it) being drawn over it by means of a suction pump, and the compn. of the equil. product at each temp. detd. At  $74^\circ$ ,  $80^\circ$ ,  $90^\circ$ ,  $100^\circ$  and  $115^\circ$  the loss of  $\text{H}_2\text{O}$  was resp., 11.38, 11.39, 11.43, 11.49 and 11.54%. The reaction at  $74^\circ$  is, therefore  $3\text{CdSO}_4 \cdot 8\text{H}_2\text{O} = 3\text{CdSO}_4 \cdot 3\text{H}_2\text{O} + 5\text{H}_2\text{O}$ . At  $122^\circ$  the loss is 13.8% and the reaction  $3\text{CdSO}_4 \cdot 3\text{H}_2\text{O} = 3\text{CdSO}_4 \cdot 2\text{H}_2\text{O} + \text{H}_2\text{O}$ . At  $138^\circ$  the loss is 16.2% so that the reaction is  $3\text{CdSO}_4 \cdot 2\text{H}_2\text{O} = 3\text{CdSO}_4 \cdot \text{H}_2\text{O} + \text{H}_2\text{O}$ . At  $150\text{--}170^\circ$  the loss is 18.40% corresponding to complete dehydration. A. W. CONTIERI

Specific heats of sodium and potassium hydroxide solutions. THEODORE W. RICHARDS AND LAWRENCE P. HALL. Harvard Univ. *J. Am. Chem. Soc.* **51**, 707–12 (1929).—Improvements were made in the differential method for detg. sp. heats. The following values were found for sp. heats at  $18^\circ$ .  $\text{NaOH} \cdot 25\text{H}_2\text{O}$ , 0.9127;  $\text{NaOH} \cdot 50\text{H}_2\text{O}$ , 0.946;  $\text{NaOH} \cdot 100\text{H}_2\text{O}$ , 0.9690 and  $\text{KOH} \cdot 100\text{H}_2\text{O}$ , 0.9567. E. R. S.

Heats of dilution and heat capacities of hydrochloric acid solutions. T. W. RICHARDS, B. J. MAIR AND L. P. HALL. Harvard Univ. *J. Am. Chem. Soc.* **51**, 727–30 (1929).—The sp. heats of  $\text{HCl}$  solns. at  $18^\circ$  (referred to  $\text{H}_2\text{O}$  at the same temp.) were measured by the twin calorimeter method and found to be:  $\text{HCl} \cdot 25\text{H}_2\text{O}$ , 0.8766;  $\text{HCl} \cdot 50\text{H}_2\text{O}$ , 0.9337;  $\text{HCl} \cdot 100\text{H}_2\text{O}$ , 0.9651. Heats of diln. of  $\text{HCl}$  solns. were measured over the range  $\text{HCl} \cdot 25\text{H}_2\text{O}$  to  $\text{HCl} \cdot 800\text{H}_2\text{O}$  at  $16^\circ$  and  $20^\circ$ . The sp. heats of the dil. solns. were calcd. E. R. SMITH

The heats of dilution and specific heats of barium and calcium chloride solutions. THEODORE W. RICHARDS AND MALCOLM DOLE. Harvard Univ. *J. Am. Chem. Soc.* **51**, 794–802 (1929).—The sp. heat of  $\text{BaCl}_2 \cdot 99.97\text{H}_2\text{O}$  was found to be 0.8705 at  $20^\circ$  and 0.8721 at  $25^\circ$ . The sp. heat of  $\text{CaCl}_2 \cdot 100.13\text{H}_2\text{O}$  was found to be 0.9157 at  $20^\circ$  and 0.9173 at  $25^\circ$ . By the indirect method the sp. heats and heat capacities of  $\text{BaCl}_2$  and  $\text{CaCl}_2$  solns. were detd. over the range  $\text{BaCl}_2 \cdot 50\text{H}_2\text{O}$  to  $\text{BaCl}_2 \cdot 6400\text{H}_2\text{O}$  and  $\text{CaCl}_2 \cdot 50\text{H}_2\text{O}$  to  $\text{CaCl}_2 \cdot 3200\text{H}_2\text{O}$ . The heats of diln. and loss in heat capacity on diln. were calcd. from the observations. Qual. agreement with the Debye-Hückel theory was found in dil. solns. E. R. SMITH

Thermodynamics of mixtures. V. FISCHER. Frankfurt-a. M. *Z. Physik* **53**, 138–47 (1929); cf. *C. A.* **22**, 1892; **23**, 327.—F. discusses the heat of fusion and evapn. of binary mixts. and their relation to these quantities of the constituents. The change of m. p. of Hg with pressure is calcd. and compared with data by Bridgman (*C. A.* **6**, 1083). GEORGE GLOCKLER

The specific heat of manganese phosphide. B. G. WHITMORE. *Phil. Mag.* [7], **7**, 125–9 (1929).—W. measured the variation of the heat of Mn phosphide (probably a mixt.) in the neighborhood of its magnetic crit. temp. A small increase in sp. heat, of the order expected on the Weiss theory, was observed near the temp. at which the value of  $\partial I / \partial T$  was a max.  $I$  is the satn. magnetic intensity. The accuracy of expt. was not sufficient to decide whether the max. value of sp. heat coincided with the max. value of  $\partial I / \partial T$  or with that of  $\partial I / \partial T$ . L. H. REYNERSON

Thermal qualities of carbon dioxide in gaseous, liquid and solid state. R. PLANK AND J. KUPRIANOFF. Tech. Hochschule, Karlsruhe. *Z. tech. Physik* **10**, 93–101 (1929); cf. *Beihfte Z. ges. Kalte-Ind.* **1**, 1 (1929).—The behavior of  $\text{CO}_2$  is compiled from data of various authors. The liquid-vapor  $p$ - $T$  curve is given as  $p = a[(T/100) - b]^n$  in kg. per sq. cm. for  $a = 8.494$ ,  $b = 1.281$ ,  $n = 3.852$ , so that the crit. point is  $t =$

31.0°,  $p = 74.96$ , and the triple point  $t = -56.6^\circ$ ,  $p = 5.28$ . The solid vapor pressure from  $-100^\circ$  up is given as  $\log p = a - (C/T) - c \log T + dT$  with  $a = 58.36, 100, b = 2206.455, c = 21.431, d = 0.02527$  and with  $p$  in mm. Hg. The solid-liquid  $p$ - $T$  curve is given with tabulated values for  $p = 1000$  atm.,  $t = -37.3^\circ$  up to  $p = 12,000$  atm.,  $t = 93.5^\circ$ , i. e., a  $dp/dT$  of 52 kg. per sq. cm. per degree near the triple point. The sp. vol. of the dry satd. and superheated vapor is representable by  $v = (RT/P) - (0.0825 + 1.225 \cdot 10^{-7}P)/(T/100)^{10/3}$ , with  $R = 19.273$ ,  $P$  in kg. per sq. m. The crit. value of the sp. vol.  $v_k = 2.156$  l. per kg. The values for  $v$  liquid and solid are tabulated; also the thermal expansion coeff. of the liquid. From the thermal data the values of latent heat of vaporization can be calcd.; for  $r$  is given  $15.2 (304.1 - T)^{0.22}$ . The sublimation heat is calcd. in the same manner. At the triple point it is 46.76 kg.-cal. per kg. The "enthalpy" (internal energy) of the vapor is given as  $i = 169.34 + (0.1965 + 0.000115t)t - 8.3724[P/(T/100)^{1/3}](1 + 0.007424p)$  kg. cal. per kg. The entropy is  $s = 0.59100 + 0.30788 \log T + 0.00023T - 0.1039478 \log p - 6.44028 [P/T(T/100)^{10/3}](1 + 0.007424p)$ . All values are compiled in vapor tables for  $\text{CO}_2$ , including the equilibria of solid and liquid phases from  $+31^\circ$  down to  $-100^\circ$  by  $5^\circ$  steps with values for  $p, v, \gamma$  (sp. gr.),  $i$  and  $s$  for all phases and of  $r$  and  $r/T$ . In addn. to this a large-scale temp.-entropy ( $-100^\circ$  to  $+140^\circ$ ) diagram is given for  $\text{CO}_2$  with isobars, isochores, isenthalps and curves of const. vapor compn. B. J. C. v. D. H.

The heat of dilution of salts at very low concentrations. W. NERNST AND W. ORTMANN. *Z. physik. Chem.* 135, 199-208(1928); cf. *C. A.* 21, 3304.—With an extremely sensitive differential calorimeter the heats of diln. of  $\text{LiCl}$ ,  $\text{KCl}$ ,  $\text{CaCl}_2$ ,  $\text{Ca}(\text{NO}_3)_2$ , and  $\text{ZnSO}_4$  at low concns. deviated appreciably from the values calcd. according to Bjerrum and Debye. In some cases neg. values were obtained instead of the pos. ones postulated by the theory of Debye. H. S. v. KLOOSTER

The heat of dilution of dilute solutions. S. MEIRING NAUDÉ. *Z. physik. Chem.* 135, 209-36(1928); cf. preceding abstr., also *C. A.* 22, 717.—By means of the calorimeter of Nernst and Orthmann the heats of diln. of cane sugar, chloral hydrate, glycolcol, urea,  $\text{Hg}(\text{CN})_2$ ,  $\text{HCl}$ ,  $\text{HNO}_3$ ,  $\text{H}_2\text{SO}_4$ , salicylic acid, benzoic acid,  $\text{LiCl}$ ,  $\text{NaCl}$  and  $\text{NaNO}_3$  were detd. Whereas the heat of diln. of  $\text{HCl}$  approx. agrees with Debye's  $\sqrt{c}$ -laws,  $\text{H}_2\text{SO}_4$  gives values that are too high and  $\text{HNO}_3$  gives values that follow the theory only at low concns. The best agreement is obtained from  $\text{LiCl}$ . The heats of diln. of  $\text{NaCl}$  and  $\text{NaNO}_3$  are neg. at higher concns. and agree with the theory only when the concns. are below 0.01  $N$ . For  $\text{LiCl}$  at  $18^\circ$  the data obtained agreed with the theory on using the expression  $320\sqrt{c}$  instead of Bjerrum's value  $418\sqrt{c}$ . The factor 320 decreases 8 units per degree for  $\text{LiCl}$  when the temp. is lowered. The exptl. data confirm the theory of Nernst, which states that the heat of diln. results from the heat absorption accompanying the dissocn. of previously undissocd. mols. and the heat evolution caused by interionic forces (Debye effect, modified by using the factor 320). H. S. v. KLOOSTER

The heat capacities of isopropyl alcohol and acetone from  $16^\circ$  to  $298^\circ\text{K}$ . and the corresponding entropies and free energies. KENNETH K. KELLEY. Univ. of California. *J. Am. Chem. Soc.* 51, 1145-50(1929).—For 1 mol. of liquid at  $298.1^\circ\text{K}$ ., the entropies are, resp.:  $47.9 (\pm 0.3)$  and  $43.0 (\pm 0.3)$  cal. per degree. The free energies of formation at  $298.1^\circ\text{K}$ . are, resp.:  $-48,100$  and  $-36,700$  cal. per mol. The free energy change in the reaction,  $\text{CH}_3\text{CHOHCH}_3(\text{liq.}) = \text{CH}_3\text{COCH}_3(\text{liq.}) + \text{H}_2(\text{g.})$ , is recalcd. to be about 7000 cal. F. D. ROSSINI

The Majorana thermal effect. A. L. TH. MOESVELD. *Z. physik. Chem.*, Abt. A, 140, 423-8(1929); cf. *C. A.* 21, 851; 23, 1561.—Evidence is given to show that the Majorana thermal effect is due to the heat of transformation when the substance from a metastable to a stable form. F. D. ROSSINI

History and metallurgy of Pt (ACKERMAN) 9. Light source devised by Auer von Welsbach (WURM) 1. The preparation of quinydrone for potentiometric use (TRENEL, BISCHOFF) 10.

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### 3—SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

S. C. LIND

The modern conception of matter. CHARLES A. KRAUS. *Am. Dyestuff Repr.* 17, 839(1928).—A general review.

Nuclear motion associated with electron transitions in diatomic molecules. EDWARD U. CONDON. Princeton Univ. *Phys. Rev.* 32, 858-72(1928).—The question of nuclear motions assoc. with electron transitions is discussed from the standpoint of quantum mechanics. It appears that Heisenberg's indeterminate principle gives the clue to the inexactness of the earlier method based on Franck's postulate since its strict application calls for a violation of the principle. The existence of an entirely new type of band spectrum due to the wave nature of matter is predicted and the interpretation of Rayleigh's (C. A. 22, 2886) Hg band at 2476-2482 Å. U. as of this type is suggested. It is shown that while Franck's postulate is also true for electron jumps in atoms it is of but little interest because its inexactness is much greater for electrons than for heavy nuclei.

The theory of the Stark effect in hydrogenic atoms. VLADIMIR ROJANSKY. Washington Univ., St. Louis, Mo. *Phys. Rev.* 33, 1-15(1929).—The Stark effect of the fine structure of H atoms is discussed in the light of the quantum mechanics. Explicit formulas are given for the energy levels in either a weak or a strong elec. field including in each case both the relativity corrections and the Stark effect. The results are, except in form, similar to those recently given by Schlapp (C. A. 22, 2886). In the new

mechanics, in contradistinction to the old Bohr theory, there is a linear Stark effect even in weak fields, because of the identity of energy for the  $ns$  and  $np$ , levels in the absence of external fields. This degeneracy is shown to account for the results of the expts. of Ornstein, Zernike and Snoek (*C. A.* 22, 2109), who found that the  $2s$  level in H is not metastable. The coeffs. are found for the development of the "parabolic" eigenfunctions in terms of the "polar" ones, and a set of numerical values of these coeffs. is tabulated. Methods are given for the calcn. of the relative intensities in the Stark effect in terms of the already available theoretical fine-structure intensities in the absence of fields.

BERNARD LEWIS

**The existence of metastable molecules in active nitrogen.** JOSEPH KAPLAN. Univ. of Calif. *Phys. Rev.* 33, 189-94(1929).—It has been shown in the present expts. that active  $N_2$  contains, among other things, metastable mols. of N possessing about 8 v. of energy. The evidence that is presented to prove this statement is the excitation of the fourth pos. group of  $N_2$  simultaneously with the quenching of the afterglow by a mild elec. discharge. The main spectroscopic characteristics of a condensed discharge have been reproduced by simply introducing active N into a weak discharge. The mild discharge is unable to excite the  $D$  level of the N mol. except when active N is introduced. It is believed that the metastable N mols. present in active N are raised to the  $D$  level. Since these metastable mols. are entities involved in the emission of the  $\alpha$  bands or afterglow, the latter is thus weakened in such a discharge. The relation of these phenomena to the structure of the N mol. is discussed. B. L.

**Transmutation of elements.** L. THOMASSEN. Calif. Inst. of Tech. *Metallwirtschaft* 7, 703-8(1928); *Phys. Rev.* 33, 229-38(1929).—X-ray spectrograms of the W target of a deep-therapy x-ray tube were taken before and after it operated for 80 hrs. at 2-3 ma. and 207 kv. peak voltage. No lines other than those due to W were found before or after. The expts. of Smits and Karsen (*C. A.* 21, 855) with the Pb arc were duplicated as nearly as possible. Under no conditions of c. d. was there any spectroscopic evidence of a transmutation of Pb to Hg. The expts. of Smits and Karsen using a high potential discharge between Pb electrodes in  $CS_2$  were carefully repeated. Some evidence of Hg in the residue from the electrodes was found. The indications are, however, that the Hg comes from the electrodes, the  $CS_2$  or dust particles rather than from a transmutation of Pb.

BERNARD LEWIS

**Some recent developments of statistical mechanics.** J. E. LENNARD-JONES. *Proc. Phys. Soc. London* 40, 320-37(1928).—A new departure has been given to the statistical theory since the work of Bose in 1924. It is now possible to derive certain av. properties of the atom by statistical methods. Comparison is made of the new statistics, including the work of Bose-Einstein and the more recent work of Fermi-Dirac, with classical statistics. Interesting applications of the new ideas are shown in the work of Thomas and Fermi on the distribution of electrons in heavy atoms, and in the work of Pauli and Sommerfeld on the electron theory of metals. L.-J. and Woods (*C. A.* 23, 1346) have attempted to find the av. distribution of electrons in a metal. The statistics of gaseous mixts. have been studied by Jordon (*C. A.* 22, 1900) and others.

FRANK V. JOHNSON, JR.

**Quantum mechanics and radioactive disintegration.** R. W. GURNEY AND E. U. CONDON. Princeton Univ. *Phys. Rev.* 33, 127-40(1929); cf. *C. A.* 23, 329-30.—Application of quantum mechanics to a simple model of the nucleus gives the phenomenon of radioactive disintegration. The statistical nature of the quantum mechanics gives directly disintegration as a chance phenomenon without any special hypothesis. A presentation is given of those features of quantum mechanics which are used and also a simple calcn. of the disintegration const. The qual. application of the model to the nucleus is discussed and quant. calcns. are made amounting to a theoretical interpretation of the Geiger-Nuttall relation between the rate of disintegration and the energy of the emitted  $\alpha$ -particle. In obtaining this relation one arrives at the remarkable conclusion that the law of force between emitted  $\alpha$ -particle and the rest of the nucleus is substantially the same in all the atoms even where the decay rates stand in the ratio  $10^{22}$ . The model here used explains the paradoxical results of Rutherford and Chadwick (*Phil. Mag.* 50, 889(1925)) on the scattering of fast  $\alpha$ -particles by U. Limitations in the methods employed are discussed.

BERNARD LEWIS

**Adsorption of radon.** A. BECKER AND K. H. STEHBERGER. *Radiol. Inst., Heidelberg. Ann. Physik* [5], 1, 529-55(1929).—By using charcoal and silica gel as adsorbents, and employing a static method, it is shown that adsorption reaches a concn. equil. between the gaseous and the solid or liquid phase. The equil. coeff. is independent of the nature and pressure of the surrounding gases, the amount of adsorbent, vol. of container, and partial pressure of Rn, and dependent only on the character of

the adsorbent and the temp. The temp. coeff. follows the reaction isochore. It is concluded that dynamic methods are for the most part inaccurate. GREGG M. EVANS

Measurement of the short wave end of penetrating cosmic radiation. E. REGENER. *Naturwissenschaften* 17, 183-5(1929).—Measurement of ionization in a closed vessel 230 m. below the water level of the Bodensee (Lake Constance) by recording devices is described. The ionization chamber was a 39-l. steel bomb of 1-cm. wall filled with  $\text{CO}_2$  at 39 atm. The discharge curve of an electrometer initially charged to 600 v. was recorded hourly on a photographic plate by means of an elec. lamp inside the bomb. At 32.4 m. depth the uncorrected hourly decrease was 4.33 v., at 231 m. 0.83 v. The expt. lasted two days. Special precautions were taken by anchoring the bomb to the lake bottom and a float to hold it in position against mech. disturbances. It follows from the results obtained that even at 230 m. some radiation penetrates; the discharge rate decreases at 186 to 231 m. from 0.106 to 0.051 v. per hour (corrected). From the logarithmic curve follows a const. absorption coeff. of  $1.8 \times 10^{-4}$  per cm. for that depth, showing the homogeneous character of the radiation. From 79-m. depth upward the coeff. increases and approaches known values, calcd. for vertical incidence. The wave length corresponding to the deep absorption would be  $4.6 \times 10^{-13}$  cm. from the Compton equation; a lower value of  $0.6 \times 10^{-13}$  cm. follows from the recent equation of Klein and Nishina (*Z. Physik* 52, 853(1929)). It is comparable with that of the proton—electron radiation of  $1.3 \times 10^{-13}$  cm. Several influences of surroundings, etc., are discussed. B. J. C. VAN DER HOEVEN

The efficiency of electron impact leading to resonance in helium. GEORGE GLOCKLER. Univ. of Minnesota. *Phys. Rev.* 33, 175-88(1929).—The efficiency of resonance impact between electrons and He atoms has been studied as a function of the energies of the impinging electrons. The transition studied is  $1^1\text{S} \rightarrow 2^3\text{S}$  at 19.77 v. The range of energies is 0.8 v., i. e., from 19.77 to 20.55 v. The efficiency with which electrons make inelastic impacts rises to a max. 0.18 v. beyond the resonance potential of 19.77 v. and then decreases. The max. av. efficiency for electrons of 19.95 v. energy is estd. to be 0.002. The measurements were carried out by comparing the velocity distribution of the electrons leaving an equipotential surface with the drop in current as observed in the inelastic impact method of Franck, and similarly by comparing the velocity distribution of the electrons with the distribution of the positive current caused by them in a Lenard expt. Both types of measurements yield similar results. B. L.

Ion mobilities using the Erikson method on gases of controlled purity. J. J. MAHONEY. Univ. of Calif. *Phys. Rev.* 33, 217-28(1929).—Measurements of mobilities of ions in air and air mixed with known quantities of other gases were made with the Erikson blast method under conditions in which the nature of the purity of the gas could be reasonably controlled. The results do not show the aging effect observed by Erikson in air dried over  $\text{P}_2\text{O}_5$  and liquid air, or even in air passed slowly over  $\text{CaCl}_2$ . In these 2 cases the normal pos. and neg. ionic mobilities are observed. If air from the room at 60% or 90% relative humidity at  $20^\circ$  is used the aging effects of Erikson are observed. With mixts. of 5% and 25%  $\text{HCl}$  no aging effects are observed and the mobilities show the same general behavior observed by Loeb (*C. A.* 20, 1174) with the a. c. method. With 5%  $\text{NH}_3$  the pos. ion has the same mobility as the neg. ion, but at ages over about 0.01 sec. both pos. and neg. ions show an apparent aging, the pos. ion going over to the usual value observed while the neg. ion forms an ion having a mobility between the old and new pos. ions. In pure  $\text{C}_2\text{H}_2$  pos. and neg. mobilities were observed, while in dry air with 5%  $\text{C}_2\text{H}_2$  normal air mobilities were observed with no aging effect. Conclusion: The aging of pos. ions in dry air in general proceeds very much more rapidly than Erikson assumes and possibly consists in the attachment of the initial pos. ion to a bulky mol. of some impurity present. Water vapor and  $\text{NH}_3$  inhibit this action either by forming groups which delay attachment to mols. of impurities present or by removing the latter. Thus M. believes Erikson's aging effects not to be true aging effects but rather retarded aging effects due to the action of water vapor or other substances. BERNARD LEWIS

The mobility of positive ions in flames. H. E. BANTA. Rice Inst., Houston, Texas. *Phys. Rev.* 33, 211-16(1929).—Mobility of positive ions of K, Rb and Cs in the Bunsen flame.—The mobility was calcd. from measured values of the c. d., cathode drop of potential, and the thickness of the layer at the cathode in which the potential varies rapidly. The excess of ionization over recombination in the layer was assumed to be proportional to  $(1 - x/x_1)^m$ , where  $x$  is the distance from the cathode,  $x_1$  the thickness of the layer at the cathode, and  $m$  is a const. The value calcd. for the mobility depends on the value assumed for  $m$ . The results give, with  $m = 2$ , a value of 1.8; with  $m = 3$ , a value of 1.07 cm./sec. per v./cm. for the mobility. The mobility is the

same for salts of Rb, Cs and K and it does not depend on the concn. of the salt. A small increase of mobility with elec. intensity is indicated by the results. B. L.

**Oscillations in ionized gases.** LEWIS TONES AND IRVING LANGMUIR. General Elec. Co., Schenectady, N. Y. *Phys. Rev.* 33, 195-210(1929).—A simple theory of electronic and ionic oscillations in an ionized gas has been developed. The electronic oscillations are so rapid (about  $10^6$  cycles) that the heavier pos. ions are unaffected. They have a natural frequency  $\nu_e = (n_e^2/\pi m)^{1/2}$  and, except for secondary factors, do not transmit energy. The ionic oscillations are so slow that the electron d. has its equil. value at all times. They vary in type according to their wave length. The oscillations of shorter wave length are similar to the electron vibrations, approaching the natural frequency  $\nu_p = \nu_e(m_e/m_p)^{1/2}$  as upper limit. The oscillations of longer wave length are similar to sound waves, the velocity approaching the value  $v = (kT/m_p)^{1/2}$ . The transition occurs roughly (i. e., to 5% of limiting values) within a 10-fold wave-length range centering around  $2(2)^{1/2}/\pi \lambda_D$  where  $\lambda_D$  is the "Debye distance." While the theory offers no explanation of the cause of the observed oscillations, the frequency range of the most rapid oscillations, namely, from 300 to 1000 megacycles, agrees with that predicted for the oscillations of the ultimate electrons. Another observed frequency of 50 to 60 megacycles may correspond to oscillations of the beam electrons. Frequencies from 1.5 megacycles down can be attributed to pos.-ion oscillations. The correlation between theory and observed oscillations is to be considered tentative until simpler exptl. conditions can be attained. BERNARD LEWIS

**Electron diffraction by thin mica foils.** E. RUPP. A. E. G., Berlin. *Naturwissenschaften* 17, 174-5(1929).—A review of recent expts. of Kikuchi (C. A. 23, 1808) in which the diffraction patterns of electron streams through mica foils of varying thickness were studied. Much in the same manner as from the results of x-ray diffraction by crystals it is here conclusively shown that electrons have wave qualities and can be used for the study of crystal structure. Two types of interference occur (photographs are reproduced): for electrons of uniform speed and very thin mica ( $10^{-6}$  cm.) the pattern consists of points in a net of equilateral triangles; the second type of pattern is of the type of a Laue diagram, elliptic tracks and straight dark and light lines; it is obtained for elec. rays of variable speed and thicker foils ( $10^{-4}$  cm.) B. J. C. v. d. H.

**The ionization by slow electron impact of ammonia and hydrogen sulfides.** JAMES H. BARTLETT, JR. Inst. Theoretische Physik, Leipzig, *Phys. Rev.* 33, 169-74(1928).—The mols. of  $\text{NH}_3$  and  $\text{H}_2\text{S}$  have been studied by the usual method of pos.-ray analysis. With  $\text{NH}_3$ , 3 principal types of ion at  $m/e = 15, 16$  and  $17$ , resp., occurred. These are attributed to  $(\text{NH})^+$ ,  $(\text{NH}_2)^+$  and  $(\text{NH}_3)^+$  with ionization potentials of  $11.2 \pm 1.5$  v.,  $12.0 \pm 1.5$  v. and  $11.2 \pm 1.5$  v., resp. Since with increasing pressure, the  $(\text{NH})^+$  ion increases, the  $(\text{NH}_2)^+$  ion remains sensibly const. and the  $(\text{NH}_3)^+$  ion decreases, it is concluded that the  $(\text{NH})^+$  and  $(\text{NH}_2)^+$  ions result directly from the electron impact with the natural  $\text{NH}_3$  mol., while  $(\text{NH})^+$  ion is probably produced by breakdown of the  $(\text{NH}_3)^+$  ion by a reaction such as  $(\text{NH}_3)^+ + \text{NH}_3 = (\text{NH})^+ + \text{H}_2 + \text{NH}_3$ . For both  $\text{NH}_3$  and  $\text{H}_2\text{S}$ , very few, if any, H ions and no neg. ions were observed, showing that thermal dissocn. was of little importance in affecting the results. For  $\text{NH}_3$ , very small peaks at  $m/e = 14$  and  $18$ , resp., were observed. Their compns. are probably  $(\text{N})^+$  and either  $(\text{NH}_4)^+$  or  $(\text{H}_2\text{O})^+$ , and their origin is either secondary (from collisions of ions with neutral mols.) or they result from impurities. With  $\text{H}_2\text{S}$ , 3 principal types of ion were likewise observed. They occur at  $m/e = 32, 33$  and  $34$  and are interpreted as having the compns.  $(\text{S})^+$ ,  $(\text{HS})^+$  and  $(\text{H}_2\text{S})^+$ , resp. With Mackay's (*Phys. Rev.* 24, 319(1924); cf. C. A. 18, 352) value of the lowest ionization potential as a standard for the calibration of the voltage scale, the ionization potentials are approx.  $10.4$  v.,  $16.9$  v. and  $15.8$  v., resp. Variation of the pressure, at low pressures, indicates that no secondary processes occur, i. e., that the ions above named are all formed by the initial process of the electron colliding with the gas mol. No  $\text{S}_2^+$  ions were observed, nor any which could be due to isotopes of S. BERNARD LEWIS

**The effect of corona current on the cooling of a hot wire.** SAMUEL R. PARSONS. Univ. of Arkansas. *Phys. Rev.* 33, 75-80(1929).—An exptl. study is described of the cooling of a hot wire in air when the air is disturbed by a corona discharge to the wire. With Cu wire No. 30 B. and S. gage, in still air, no effect was found with corona current less than 3 microamps. per cm. of wire; but beginning with this value the cooling power of the wire increases, at first rapidly, and then more slowly, possibly passing through a weak max. A corona current as great as 12 microamps. per cm. is sufficient to give nearly the max. effect. With small currents of air past the wire, a gradual increase of corona current starting with zero, often shows first a heating retarded by the cross-

flow of the ions carrying the corona current. The no. of ions required for appreciable cooling is estd. to be considerably less than one ion per million mols. of the gas. B. L.

The behavior of glass as a dielectric in alternating current circuits: II. The effect of frequency and of temperature upon the power loss. LOUISE S. McDOWELL AND HILDA L. BEGEMAN. Wellesley College, Wellesley, Mass. *Phys. Rev.* 33, 55-65(1929); cf. C. A. 22, 1717. BERNARD LEWIS

The chemical interaction of ions and the "clean up" of gases at glass surfaces under the influence of the electrical discharge. JAMES TAYLOR. *Proc. Roy. Soc. (London)* A123, 252-7(1929); cf. C. A. 22, 2877, 4377. H. W. WALKER

Groups of electrons in Geissler discharge. K. G. EMELÉUS AND W. L. BROWN. Queen's Univ. of Belfast. *Phil. Mag.* [7], 7, 17-31(1929); cf. C. A. 21, 2221, 2425, 3553.—Measurements of collector characteristics were made in Geissler discharges from a cold cathode in A, Ne, H<sub>2</sub> and O<sub>2</sub>, at pressures of about 0.1 cm. Hg, for conditions not far from those at normal cathode fall of potential. Conclusion.—There is present in the neg. glow, and at low pressures in the Faraday dark space, a group of fast electrons with a distribution of velocities that is approx. Maxwellian. These electrons have an av. energy of 25 electron v. It is suggested that they are produced initially by electrons passing into the neg. glow from the cathode dark space, and that they are maintained by a process which is the reverse of ionization by collision. A possible effect of the Ramsauer min. of free paths of electrons is pointed out in the persistence of 2 groups of slow electrons in the discharge. L. H. REYERSON

Free and bound electrons in metals. RICHARD RUEDY. Univ. of Toronto. *Phys. Rev.* 32, 974-8(1928).—When the theory of dispersion in an absorbing medium is applied to the values published in recent years for the optical properties of different metals, it follows that bound electrons exist inside the metal comparable in no. with that of the free electrons. BERNARD LEWIS

Magnetic properties of complex compounds and their electronic constitution. PRIYADARANJAN RAY AND HARIGOPAL BIHAR. *J. Indian Chem. Soc.* 5, 497-511(1928).—The mass susceptibilities of 47 complex compds. were measured by means of a Curie's balance. The Weiss magneton no. and Bohr's magneton no. were found and Bohr's magneton no. was calcd. by means of Welo and Bose's rule for each of the 47 compds. The compds. were nearly all of the cobaltamine type and included 19 compds. of Co, 10 of Ni, 5 of Fe, 2 of Mn, 3 of Cu, 2 of Cr, 3 of Mo and 3 of W. Cabrera's scheme and Ray's scheme for explaining diamagnetism and paramagnetism are also discussed. Ray's view appears to explain satisfactorily the magnetic character of the largest no. of these 47 complexes. The carbonyls of Ni, Fe, Co and Mo are diamagnetic. Ordinary conductivity water must be further purified by fractional solidification before it is a sure standard for susceptibility measurement. F. E. BROWN

The ionization processes in methane interpreted by the mass spectrograph. T. R. HOGNESS AND H. M. KVALNES. Univ. of Calif. *Phys. Rev.* 32, 943-9(1928).—The ionization processes occurring when CH<sub>4</sub> mols. are ionized by controlled electron impact have been detd. with the aid of the mass spectrograph. CH<sub>4</sub><sup>+</sup> and CH<sub>3</sub><sup>+</sup> are the only ions formed and by a study of their relative intensities under different conditions of pressure and voltage, it was found that both these ions are formed directly by electron impact. The processes are: CH<sub>4</sub><sup>+</sup> = CH<sub>4</sub><sup>+</sup> + E<sup>-</sup> (14.5 v.); CH<sub>3</sub><sup>+</sup> = CH<sub>3</sub><sup>+</sup> + H + E<sup>-</sup> (15.5 v.). *Isotopes of Ne.*—It has been definitely detd. that besides the 2 isotopes of Ne, Ne<sub>20</sub> and Ne<sub>22</sub>, there exists a third, Ne<sub>21</sub>. BERNARD LEWIS

The ionization of carbon monoxide by controlled electron impact, interpreted by the mass spectrograph. T. R. HOGNESS AND R. W. HARKNESS. Univ. of Calif. *Phys. Rev.* 32, 936-41(1928).—By the use of a mass spectrograph, a study was made of the ionization processes occurring when CO mols. are ionized by electrons of definite energy. The variation of the relative intensities of the ions CO<sup>+</sup>, C<sup>+</sup> and O<sup>+</sup> with changes of pressure and with changes of the elec. fields has led to the conclusion that the principal processes occurring are: (1) CO = CO<sup>+</sup> + E<sup>-</sup>; (2) CO = O<sup>+</sup> + C + E<sup>-</sup>; (3) CO = C<sup>+</sup> + O + E<sup>-</sup>; (4) CO + CO<sup>+</sup> = CO<sub>2</sub> + C<sup>+</sup>. No neg. nor doubly charged pos. ions were found. BERNARD LEWIS

Secondary electron emission from molybdenum. J. M. HYATT AND H. A. SMITH. General Elec. Co., Schenectady, N. Y. *Phys. Rev.* 32, 929-35(1928).—The secondary electron emission from a very clean Mo plate in a simple 3-electrode tube has been studied. The no. of primary electrons striking the plate was calcd. by means of the pos.-ion calibration method previously reported. The no. of secondary electrons per primary reaches a max. of 1.15 at 600 v. and then decreases to 1.00 at 2000 v. One definite discontinuity in the secondary emission curve occurs at 13.5 v.; the others are very small and not reproducible. The emission increases about 3% within a few



mins. after heating if the gas pressure is very low and then remains quite const. for a long period of time. The emission decreases with time when there is more gas present. The secondary emission appears to increase by about 4% when the temp. of the target increases from the normal operating temp. to 1600° K. BERNARD LEWIS

**Secondary electron emission produced by positive cesium ions.** J. M. HYATT. General Elec. Co., Schenectady, N. Y. *Phys. Rev.* 32, 922-8(1928); cf. *C. A.* 22, 4054.—The source of the pos. Cs ions, a short W filament maintained at about 1200° K. in the presence of Cs vapor, was mounted on the axis of a long cylindrical grid and plate. The plate current and the total pos.-ion emission current were observed for each of several neg. grid potentials as the plate potential was varied from +50 to -650 v. From these observations the no. of electrons that were emitted from the Cs-covered grid and plate per pos. ion was calcd. This no. increased uniformly from 0.01 at approx. 100 v. to 0.15 at 600 v. After corrections for the emission of secondary electrons were made, the ratio of the pos. ion current to the plate to the total emission current was found to be independent of the plate and grid potentials for plate potentials greater than 0.2 of the grid potential. This ratio 0.72 is the same as the ratio between the total area of the plate less the projected area of the grid, and the total plate area. Assuming the same distribution of electrons as pos. ions, the ratio of the plate current to the grid current in this type of tube can be calcd. BERNARD LEWIS

**Experimental studies on form and character of sparks.** V. TORAHIKO TERADA, UKITIRŌ NAKAYA and RYŪZŌ YAMAMOTO. *Sci. Papers Inst. of Phys. and Chem. Research* (Tokyo) 10, 43-68(1929).—Very detailed descriptions and both stationary and moving-plate photographs are given of long sparks in SO<sub>2</sub>, C<sub>2</sub>H<sub>2</sub>, coal gas, O<sub>2</sub>, N<sub>2</sub>, CO<sub>2</sub> and air. The influence of pressure change, insertion of needle-point leakages and high resistances in the circuit is pointed out. The authors conclude that (a) a long spark is generally built up in definite steps, each requiring a definite time for completion; (b) only the middle part of a three-part spark is truly disruptive, the positive and negative parts being gradually built up; (c) with high resistance in circuit, a fine spark due to electrode capacity preps. the track for the slower discharge of the main capacity; (d) this initial track is analogous to a wire of conducting gas, and the following discharge to an electrically exploded wire. G. M. EVANS

**Luminous discharge in gases at low pressure.** HANS PETTERSSON. Lunds Fysiska Inst. *Nature* 123, 346(1929).—By using frequencies of 10<sup>8</sup> cycles per second, luminous discharges were obtained in transparent silica electrodeless discharge tubes only 5 mm. wide, and at pressures much below 10<sup>-5</sup> mm. Fluorescence and afterglow of silica were observed. A pressure increase in the excited tube when disconnected from the pump was found to be due to O<sub>2</sub> from decompn. of the silica. The band spectrum of O<sub>3</sub>, with some elementary O<sub>2</sub> lines, was observed. GREGG M. EVANS

**The thermionic emission from clean platinum.** LEE A. DUBRIDGE. Calif. Inst. of Tech. *Phys. Rev.* 32, 961-6(1928).—The thermionic emission from thoroughly outgassed Pt in high vacuum has been measured to 1/3% over the temp. range 1360° to 1750° K., the temps. being measured by careful optical pyrometry. The values obtained for the thermionic consts. of the T<sup>2</sup> law arc, when corrected for the Schottky effect,  $b = 72, 820^\circ \text{K.}$ ,  $\phi = 6.27 \text{ v.}$ ,  $A = 17,000 \text{ amp./cm.}^2 \text{ deg.}^2$ . The value of  $\phi$  is possibly in error by not more than 1% because of uncertainties in the temp. scale, and agrees within 1/2% of the value of the photoelec. work function. The data confirm the previous announcement that for clean Pt  $A$  is 250 times greater than the theoretical value of 60.2 amp./cm.<sup>2</sup> deg.<sup>2</sup> BERNARD LEWIS

**Critical photoelectric potential of clean mercury and the influence of gases and of the circulation of the mercury upon it.** WAYNE B. HALES. Calif. Inst. of Tech. *Phys. Rev.* 32, 950-60(1928).—In an app. in which precautions were taken against contaminations the long wave-length limit for running Hg was found to be 2735 Å. U. The crit. frequency for stationary Hg was found to be  $2735 \pm 10 \text{ Å. U.}$ , which is in agreement with Kazda (*C. A.* 20, 333) for flowing Hg. Certain results are noted in the present app. which are different from that of older app. (constructed with greased stopcocks). The long wave-length limit in the older app. at the max. sensitivity was 2850 Å. U.; in the present app. it is 2910 Å. U., which, once reached, remains const. H<sub>2</sub>, He, A, N<sub>2</sub> and H<sub>2</sub>O in extremely small quantities in contact with the surface and also, except with H<sub>2</sub>O, dissolved in the body of Hg, had no influence whatever upon the photoelec. behavior of the Hg or upon the rate of rise of sensitivity upon turning off the Hg still except that each had a marked cleansing effect in reducing the concn. of the impurity which slowly contaminates the surface. O<sub>2</sub> had a decided reducing effect upon the threshold value, reducing it to 2555 Å. U. in 18 hrs. BERNARD LEWIS

**Chemical analysis with x-rays.** P. GÜNTHER. *Metall. wirtschaft* 7, 437-40(1928);

cf. C. A. 22, 538; 23, 1572.—An outline of the application of x-ray emission and absorption spectra methods to chem. analysis.

Methods of study of the crystal lattice by means of x-rays. H. MARK. Ludwigshafen a. Rh. *Metallwirtschaft* 7, 370-3(1928); cf. C. A. 23, 1051.—A brief résumé of the various methods of detg. crystal structure.

\* The translation lattice of hydrated cellulose. KARL WEISSENBERG. Kaiser Wilhelm Inst. Faserstoffchemie, Berlin Dahlem. *Naturwissenschaften* 17, 181(1929).—By improvements on previous methods the lattice of hydrated cellulose can now be detd. quite accurately. Preps. of Herzog and Jancke were used (C. A. 23, 1790) with parallel orientation of the crystallites which allows a definite assignment of indices to the x-ray pattern; a focus method was employed for the x-ray photography consisting mainly of lengthening the prepn. in the direction of the incident rays to 15 mm. In this method the interferences close to the spot of the directly transmitted ray are amplified one to two orders of magnitude relative to the other parts of the pattern. Except for a few as yet unexplained effects, the most probable results are for hydrated cellulose a quadratic form of unit cell with  $a = 14.66$ ,  $b = 8.89$ ,  $c = 10.35$  A. U. (all  $\pm 2\%$ ) and  $\alpha = 90^\circ$ ,  $\beta = 90^\circ$ ,  $\gamma = 85^\circ \pm 5^\circ$ . This unit cell holds  $b$   $C_6H_{10}O_5$  units for a  $d$ . of 1.60. The same lattice type is assumed for true cellulose.

Absolute x-ray wave-length measurements. A. P. R. WADLUND. Univ. of Chicago. *Phys. Rev.* 32, 841-9(1928); cf. C. A. 22, 3831.—By means of a speculum metal grating, 50 lines to the mm. ruled over a length of 5 mm., the wave lengths of the  $K_\alpha$  line of Cu, Fe and Mo were detd. as  $1.5373 \pm 0.0008$ ,  $1.937$  (6)  $\pm 0.002$  (3) and  $0.708$  (3)  $\pm 0.001$  (1) A. U., resp. From the  $K_\alpha$  line of Cu the following consts. were calcd.: the grating space of calcite  $3.0290 \pm 0.0016$  A. U.; Avogadro's no.  $(6.061 \pm 0.009) \times 10^{23}$  mols. per g. mol. and the electronic charge  $(4.774 \pm 0.007) \times 10^{-10}$  e. s. u. A discussion is given of the sources of error involved of which the most important are those due to the settings on the lines of the diffraction pattern and those due to the inexact setting of the grating.

Dispersion of x-rays by single molecules. P. DEBYE, L. BEWILOGUA AND F. EHRLHARDT. Univ. Leipzig. *Physik. Z.* 30, 84-7(1929).—The dispersion of a beam of x-rays in air,  $CCl_4$ , and  $CHCl_3$  was studied and interference rings were detd. The distance between two Cl atoms was found to be 3.3 A. U.

Reflection of soft x-rays. S. D. GEHMAN. Univ. of Penn. *Phys. Rev.* 33, 141-4(1929).—Reflecting power of Al, C and Pt for non-characteristic soft x-rays (40-500 v.) as function of angle and voltage.—Non-characteristic soft x-rays of voltage range 40-500 were passed through a slit system and then reflected from the polished surfaces of various mirrors in a high vacuum. The reflecting power of the mirror was measured by a photoelec. method, as a function of the voltage for a given angle of incidence and as a function of the angle for a given voltage. The reflecting power-voltage curve for Al, angle of beam and mirror  $13^\circ$ , shows a broad max. between 68 and 140 v. and falls off rapidly as the voltage increases. The same curve for C, angle  $14^\circ$ , has a similar max. between 250 and 350 v. For a Pt mirror, same angle, the curve rises for voltages up to about 100, and then the reflecting power decreases very slowly for higher voltages. The reflecting power-angle of incidence curve shows a rapid decrease of the reflecting power as the angle of incidence decreases; its form appears to be practically independent of the voltage for the range used. The results appear to justify the conclusion that for Al and C, light elements, the reflecting power-plate voltage curve shows a max. related to a crit. potential but the resolving power of the method, as used here, is inadequate to locate these potentials with useful precision.

The duration of elementary light emission. J. STARK. *Ann. Physik* [5], 1, 323-40(1929).—Observations of von Traubenberg and Gebauer (C. A. 22, 18) were repeated. The effect of the elec. field on the  $H_\alpha$ ,  $H_\beta$  and  $H_\gamma$  of the moving particles is carried forward less than 0.1 mm. at a velocity of about  $7 \times 10^7$  cm. sec.<sup>-1</sup>. The time in which the H electron drops from equil. positions 3, 4 and 5 into position 1, during emission of  $H_\alpha$ ,  $H_\beta$  and  $H_\gamma$  lines, is less than  $10^{-10}$  sec. During their motion through a gas, the canal ray atoms of an element are not in the lowest energy state. Their upper electrons are distributed in the highest possible equil. positions.

The spectrographic detection of beryllium. H. FISERFELDT. *Z. physik. Chem.* Abt. A, 140, 254-62(1929).—The spectrographic detection of Be in C arcs was studied with a Hilger E 1 quartz spectrograph. The relative sensitiveness of different lines was detd. by examg. the spectra of ammoniacal soln. of  $Al_2O_3 + BeO$  in different concns. and the influence of foreign materials on the sensitivity was investigated by mixing the original substance with  $SiO_2$ ,  $Fe_2O_3$ ,  $CaO$ , or  $Na_2CO_3$ . The most sensitive Be line is at 2348.62 A. U.; the next are at 3130.42 A. U. and 3131.06 A. U. It appears that

0.00001 wt. % of BeO in  $Al_2O_3$  may be readily detected by this method. The addn. of large amts. of alkali reduces the sensitivity considerably. Ca addns., either in large or in small quantities, show about the same Be sensitivity; it is smaller than with the original material but not so low as with alkali addns. W. F. MEGGERS

**Measurement of the life of the metastable mercury atom.** M. L. POOL, Ohio State Univ., Columbus, Ohio. *Phys. Rev.* 33, 22-6(1929).—*Half value time for the  $2^1P_1$  state of Hg for various pressures of admixed  $N_2$ .*—A high-speed rotating disk has been used to interrupt the total radiation from a water-cooled and magnetically controlled quartz Hg arc before a quartz tube at room temp. contg. optically excited Hg vapor. In the neighborhood of  $10^{-4}$  sec. after the optical excitation a flash of visible radiation from another water-cooled and magnetically controlled Hg arc was passed through the quartz tube and the absorption spectrum photographed. The line 4047 ( $2^1P_1$ — $2^1S_1$ ) showed strong absorption when a few mm. of  $N_2$  was introduced into the tube. The lines 4077, 4358, 5461, 5770 and 5790 showed no measurable absorption under similar conditions. The rate of decay of the amt. of 4047 absorbed with respect to time elapsed after excitation of the Hg vapor was taken as the rate of decay of the metastable  $2^1P_1$  state. The life or half value time of the state varied markedly with the pressure of admixed  $N_2$ . The max. life  $4.2 \times 10^{-4}$  sec. occurred for 6.8 mm. of  $N_2$ . No absorption of 4047 was observed upon the introduction of  $H_2$ , A, Ne or He into the tube. BERNARD LEWIS

**Relation between doublets of stripped atoms in five periods of the periodic table.** R. C. GIBBS AND H. E. WHITE. Cornell Univ., Ithaca, N. Y. *Phys. Rev.* 33, 157-62 (1929); cf. *C. A.* 22, 4060.—*Principal and diffuse doublets of stripped atoms in five periods of the periodic table from Li I to O VI, Na I to Cl VII, KI to Mn VII, Rb I to Zr IV and Cs I to Pr V.* By combining the data now available for the one-electron systems of the 2nd, 3rd, 4th, 5th and 6th periods certain regularities are found to exist between successive elements in each period and between corresponding elements in successive periods. These regularities are found by the application of the regular and irregular doublet laws. For the long periods which involve more penetrating orbits extrapolations of  $Z_i$  and  $s_i$  (Lande's formula) prove to be better guides in identifying doublets of the higher members of a sequence although extrapolation of  $s$  (Sommerfeld's formula) is entirely satisfactory for the sequences in the short periods. Using the former G. and W. were led to correct their previous identifications of the principal doublet of Ce IV. The tighter binding of the  $d$  electron over both the  $s$  and  $p$  electrons starting with Sc III, Yt III and La III in the 3 long periods is especially well brought out by the Moseley type of diagram. Evidence is presented to indicate that the unexcited state of Ce IV involves a  $5d$  rather than a  $4f$  electron. New data are given for V V, Cr VI and La III. BERNARD LEWIS

**The origin of the aurora polaris.** S. CHAPMAN. Imp. Coll. of Science and Tech., London. *Phys. Rev.* 32, 993-5(1928).—Hulbert's new theory of the aurora polaris (*C. A.* 22, 2707) is criticized on the ground, principally, that free high-atm. ions in middle and low altitudes cannot travel far toward the poles along the earth's lines of magnetic force because they must at the same time descend into the lower levels where their motion is interrupted by collisions. Upward moving ions will travel toward the equator. BERNARD LEWIS

**Reply to S. Chapman's foregoing criticism.** E. O. HULBERT. (Naval Research Lab., Washington, D. C.) *Phys. Rev.* 32, 996(1928). BERNARD LEWIS

**Measurement of the intensity ratio of two lines (1 S-3 P and 2 S-3 P) emitted from the same initial state of the sodium atom, in respect to the ratio of the corresponding transition probabilities.** CARL FRIEDRICH WEISS. *Ann. Physik* [5], 1, 565-612 (1929). W. F. MEGGERS

**The furnace spectrum of beryllium.** R. F. PATON AND G. M. RASSWEILER. Univ. of Illinois, Urbana, Ill. *Phys. Rev.* 33, 16-21(1929).—A high-temp. vacuum furnace using W for container and heating elements has been designed to study the furnace spectra of high m. p. substances. The furnace spectrum of Be in both absorption and emission has been observed from  $\lambda$ 2150-7000 A. U. and over a range of temp. up to  $2500^\circ$  K. The prediction that the Be line 2348.62 A. U. is the first line of the principal series of singlets for the neutral atom has been confirmed and the diffuse and sharp series of singlets of this element discovered and tabulated. BERNARD LEWIS

**Quantum analysis of the beryllium oxide bands.** JENNY E. ROSENTHAL AND F. A. JENKINS. New York Univ., Univ. Heights, N. Y. *Phys. Rev.* 33, 163-8(1929).—New measurements of the structure lines in the (0,0), (1,1), (1,2), (1,0) and (2,1) bands of the visible BeO system are reported. Each band has P and R branches of almost equal intensity, the lines of which are strictly single. There is probably but

one missing line at the origin. This structure characterizes the system as  $S\ S$ , the odd multiplicity agreeing with the even no. of electrons in neutral BeO. The rotation terms are investigated by the combination principle, and can be represented by  $F(j) = B_j(j+1) + D[j(j+1)] + \dots$  with  $j$  integral as required for  $S$  states. One perturbation is found, consisting of a displacement of the line  $R$  (49) in the (1,0) band by  $0.45\text{ cm}^{-1}$  toward lower frequencies, with no sign of doubling. The following equation is obtained for the null lines:  $\nu_0 = 21,254.05 + 1370.81(n' + \frac{1}{2}) - 7.76(n' + \frac{1}{2})^2 - 1487.45(n'' + \frac{1}{2}) + 11.87(n'' + \frac{1}{2})^2$ . The principal mol. consts., evaluated from rotational term-differences, using the quantum mechanics energy formula, are:  $B_0' = 1.5771$ ,  $B_0'' = 1.6514$ ,  $\alpha' = -0.0160$ ,  $\alpha'' = -0.0186$ ,  $D_0' = -8.44 \times 10^{-6}$ ,  $D_0'' = -8.26 \times 10^{-6}$ ,  $\beta' = +0.03 \times 10^{-6}$ ,  $F_0' = 22 \times 10^{-12}$ ,  $F_0'' = 12 \times 10^{-12}$ . The zero subscripts refer to the vibrationless state. The nuclear sepn. in the final state is:  $r_0'' = 1.327 \times 10^{-8}\text{ cm}$ . BERNARD LEWIS

The excitation of the aurora green line in active nitrogen. JOSEPH KAPLAN. Univ. of Cal. at Los Angeles. *Phys. Rev.* 33, 154-6(1929); cf. *C. A.* 22, 2887.—The aurora green line has been excited in the N afterglow when O was present in the discharge in which the active N was produced and observed. The interpretation of the phenomenon is based on the recent analysis as to the nature of active N as presented by Kaplan and Cario (*C. A.* 22, 4036). BERNARD LEWIS

Absorption in excited krypton and xenon and the spectra of the inert gas type I. J. C. McLENNAN AND R. RUEDY. Univ. of Toronto. *Trans. Roy. Soc. Can.* [3], 22, III, 15-26(1928).—Absorption spectra from 20 exposures with Kr tubes and 60 with Xe tubes ranging in exposure from 20 to 180 sec were mapped and compared with the known absorption lines of He, Ne, Sr, Na and K. With Kr the component of shorter wave length of pairs of const. frequency representing the transition  $^3P_1 - h$  is absorbed while the unabsorbed component originates in the  $^1P_1$  level. A few lines indicate sepn. between the  $^3P_1$  and  $^1P_1$  levels, while for the ultra-violet the  $^3P_2/1P_1$  sepn. was shown for the strongest lines. All of the inert gases except He give intercombination lines between triplet and singlet systems, the distance between the systems decreasing as the deviation of the higher terms from the H terms decreases. The energy levels of Kr and Xe correspond to the higher energy levels in Ne and Ar. The Na<sup>+</sup> spark lines in the violet correspond to the red Ne lines  $2p_1 - S_1$ . J. W. SHIPLEY

Color temperature of burning magnesium. W. DRIEBEK. *Z. wiss. Phot.* 25, 287-90(1928).—The spectrum temp. of burning Mg is  $3700 \pm 75^\circ\text{K}$ . A. P. H. T.

Spectrum temperature of magnesium and flashlight. H. ARENS AND J. EGGERT. *Z. wiss. Phot.* 25, 95-6(1928).—The spectrum temp. of the Mg flame is  $3700^\circ\text{K}$ . and the spectrum temp. of flashlight,  $2900^\circ\text{K}$ . A. P. H. TRIVELLI

Arc spectrum of iron under reduced pressure over the range 2270-3900 A. U. P. MARING. *Z. wiss. Phot.* 26, 47-86(1928). The arc spectrum of Fe between 2370 and 3935 A. U. was measured and the pressure shifts were detd. The results of grouping of the lines of special interest, as the lines of Gale, the lines of Adams, and the multiples (the regularities of which were tested) A. P. H. TRIVELLI

Spectral excitation by recombination in the electric arc. JANE M. DEWEY. Princeton Univ. *Phys. Rev.* 32, 918-21(1928).—Recent measurements of electron velocities in arcs have made it probable that most of the light in the neg. glow is emitted as a result of recombination of pos. ions and electrons. Since the velocities of the pos. ions are high, spectral lines emitted in this way should show Doppler broadening. This broadening was measured photometrically for a hot cathode arc in He in which measurements of electron velocities were also made and results were obtained which can be explained by assuming that all of the light in the neg. glow is the result of recombination of ions having a temp. about  $1/10$  that of the electrons. BERNARD LEWIS

The arc spectrum of samarium. Measurements made at normal pressure between  $\lambda = 3100\text{ A. U.}$  and  $\lambda = 2750\text{ A. U.}$  PIÑA DE RUBIES. *Compt. rend.* 188, 780-1(1929).—The arc spectrum of Sm is obtained with pure oxide prep'd. by Urbain. In addn. to the lines first reported by Exner and Haschek, 120 new lines undoubtedly belonging to Sm are measured between 2750-45 A. U. and 3102.30 A. U. W. F. M.

Arcs with small cathode current density. J. SLEPIAN AND E. J. HAVERSTICK. W. E. & M. Co., East Pittsburgh, Pa. *Phys. Rev.* 33, 52-4(1929).—Arcs with cathode c. ds. of less than 100 amps. per sq. cm., have been found to exist at gas pressures of 10-50 mm. The theory that electrons are drawn from the cathode by intense elec. fields maintained by space charges cannot apply to these arcs. BERNARD LEWIS

Arc spectrum of nitrogen in the extreme ultra-violet. K. T. COMPTON AND J. C. BOYCE. Princeton Univ. *Phys. Rev.* 33, 145-53(1929).—Excitation of N by controlled electron impact was found to bring out many lines in the arc spectrum of N.

These were observed with a vacuum spectrograph in the region from 500 to 1200 Å. U. The lines thus found, together with the material of other workers in the extreme ultra-violet, in the visible and the multiplets, have led to a fairly complete analysis of the spectrum, in good agreement with the predictions of the Hund theory. The ionization potential is 14.48 v. and the at. metastable levels  $^2D$  and  $^2P$  have energies corresponding to 2.37 and 3.56 v., resp., in good agreement with the predicted values of Kaplan and Cario (*C. A.* 22, 4066) from a study of active N.

BERNARD LEWIS

**First spark spectrum of gold, Au II.** J. C. McLENNAN and A. B. McLAY. Univ. of Toronto. *Trans. Roy. Soc. Can.* [3], 22, III, 103–15 (1928).—Measurement of the first spark spectrum of Au was made between 2225 Å. U. and 1390 Å. U. The terms  $^2, ^1D$  ( $d^9s$ ),  $^3, ^1F$ ,  $\bar{D}$ ,  $P$  ( $d^9p$ ) and  $^3, ^1D$  ( $d^9s$ ) of Au II, were identified and compared with those most easily recognized in Cu II and Ag II. Tables of wave lengths accompany the paper.

J. W. SHIPLEY

**Second spark spectrum of cadmium, Cd III.** J. C. McLENNAN, A. B. McLAY and M. F. CRAWFORD. Univ. of Toronto. *Trans. Roy. Soc. Can.* [3], 22, III, 45–54 (1928).—The spark spectrum of Cd in air and in H was photographed and compared with the standard lines in Cu, Al and Zn spectra. The principal wave lengths result from an electronic transition in the  $Cd^{++}$  ion represented by  $d^9p - d^9s$ . A new multiplet,  $^2P(d^1s) - ^2D(d^9s^2)$ , has been discovered.

J. W. SHIPLEY

**Influence of argon on the spectrum of sulfur.** J. C. McLENNAN, R. RUEDY and L. HOWLETT. Univ. of Toronto. *Trans. Roy. Soc. Can.* [3], 22, III, 79–86 (1928).—The influence of A on the spark spectrum of S using  $SO_2$  gas was investigated. At low pressures the spark spectra of S was suppressed and the arc lines were brought out. Increase of current increased the intensity of the S lines, while those of A reached a max. at about 15 amps. An electrodeless discharge gave similar results but the arc lines were less intense.

J. W. SHIPLEY

**Structure of the first spark spectrum of silver, Ag II.** J. C. McLENNAN and A. B. McLAY. Univ. of Toronto, Can. *Trans. Roy. Soc. Can.* [3], 22, III, 1–13 (1928); cf. *C. A.* 20, 2456.—The structure of the spark spectrum of Ag is characterized by terms built on the  $d^9$  ion type of  $Ag^{++}$ . This term system corresponds to that predicted by the Hund theory. The deep-lying  $^2D$  ( $d^9s^2$ ) term of AgI was sepd. and identified. Calcs. of the screening consts. from optical data were made for orbits of the  $4s$  type.

J. W. SHIPLEY

**The first spark spectrum of mercury, Hg II.** F. PASCHEN. *Sitzb. preuss. Akad. Wiss.* 1928, 536–46.—The negative glow light of a discharge in pure Hg or in He mixed with Hg was investigated for the purpose of extending the description and analysis of the Hg II spectrum, concerning which very little is known. The wave lengths of 287 lines have been measured; they range from 893.107 Å. U. in the extreme ultra-violet to 8198 Å. U. in the infra-red. About half of these lines are classified as combinations of doublet-system terms. The largest term is  $1^3S = 151280 \text{ cm.}^{-1}$ , corresponding to an ionization potential of 18.672 v.

W. F. MEGGERS

**The spark spectra of iodine.** LÉON BLOCH and EUGÈNE BLOCH. *Ann. phys.* 11, 141–66 (1929).—The spectra of I have been among the least well known, partly on account of their complexity and partly on account of their sensitiveness to variations in the method of exciting them. By employing an oscillating discharge in a tube without electrodes the spectra of I have been photographed between 2220 Å. U. and 7350 Å. U. The wave lengths of more than 1800 lines, many of which are new, have been measured. Four successive stages of excitation are easily recognized; these are identified as the arc spectrum  $I_1$  and the successive spark spectra  $I_{II}$ ,  $I_{III}$  and  $I_{IV}$ .

W. F. MEGGERS

**The first spectrum of xenon.** WILLIAM F. MEGGERS, T. L. DE BRUIN and C. J. HUMPHREYS. *Science* 69, 406 (1929).—A new list of estd. intensities and measured wave lengths has been obtained for about 300 lines (3442.7 Å. U. to 9923.10 Å. U.) of the Xe I spectrum. Spectral terms which account for practically all of the lines have been identified. The largest term is  $^1S_0$  representing the normal state of the neutral atom; its value is 97835 and from it an ionization potential of 12.078 volts is derived.

W. F. MEGGERS

**The spectrum of ionized rubidium.** RAMES MAJUMDER. *Phys. Lab., Allahabad. Naturwissenschaften* 17, 198–9 (1929) (in English).—The spectrum of  $Rb^+$  was largely classified by comparison with spectra of the group  $Ge^+$  to  $Sr^+$ . The following lines served as a clue to the 5  $N_2$  lines ( $O_1 \leftarrow O_2$ ): 3  $P_2D_2$  with  $\nu = 23553$ , 3  $P_2P_1$   $\nu = 25370$ , 3  $P_2S_1$   $\nu = 20232$ . The 5  $N_2$  ( $O_4 \leftarrow P_1$ ) was traced, the 5  $N_2$  ( $N_3 \leftarrow O_2$ ) is in the infra-red. Lines of 5  $N_2$  ( $O_4 \leftarrow O_2$ ) were found. The fundamental differences 3  $P_2$ ,  $P_1$ ,  $P_0$  are 1528, 3925, 3  $P_1 - P_1 = 5740$ . B. J. C. VAN DER HOEVEN

**New results of the theory of band spectra.** R. DE L. KRONIG. *Physica* 9, 81-94 (1929).—A review with 22 literature references. B. J. C. VAN DER HOEVEN

**Revision of the value of  $e/m$  derived from measurements of the Zeeman effect.** HAROLD D. BABCOCK. Mt. Wilson Obs. *Astrophys. J.* 69, 43-8(1929).—Revision of the former calcn. (*C. A.* 18, 16) includes elimination of uncertain lines, the use of more recent analyses of Cr and Ti spectra, and the use of the latest value for the velocity of light. The weighted mean of 48 detns. is  $(1.7606 \pm 0.0012) \times 10^7$  e. m. u./g.

GREGG M. EVANS

**Spectrographic investigation of 2-ketogluconic acid in the ultra-violet.** P. NIEDERHOFF. Univ. Berlin. *Z. physiol. Chem.* 181, 83-7(1929).—The ultra-violet absorption curve for the K salt of 2-ketogluconic acid does not correspond to that expected for a substance of the formula  $\text{HO}_2\text{CCO}(\text{CHOH})_2\text{CH}_2\text{OH}$ , where 2 adjacent chromophore groups,  $\text{CO}_2\text{H}$  and  $\text{CO}$ , are present. Instead of the  $\text{CO}$  group there is probably a non-chromophoric O-bridge, such as is known to occur in various sugars. In alk. soln. the selective absorption of the so-called 2-ketogluconic acid indicates an opening of the ring structure with probable formation of an ethylene linkage, thus,  $\text{HO}_2\text{CC}(\text{OH})\text{:C}(\text{OH})(\text{CHOH})_2\text{CH}_2\text{OH}$ . For the acid soln. the curve is practically the same as that for the neutral soln. A. W. DOX

**The absorption of ultra-violet light by some albuminous substances.** LEON MARCHLEWSKI AND JADWIGA WIERZUCHOWSKA. *Bull. intern. de l'acad. Pol. Sci.* 1928A, 471-8; cf. *C. A.* 20, 2147.—Expts. are carried out by using Hilger's method and Jones' electrodes as a source of light. The results are: for egg albumin (in  $\text{H}_2\text{O}$ ) absorption band between  $\lambda$  3109 and  $\lambda$  2415, blood serum albumin ( $\text{H}_2\text{O}$ )  $\lambda$  2960-2411, egg globulin ( $\text{H}_2\text{O}$ )  $\lambda$  2975-2407, serum globulin ( $\text{H}_2\text{O}$ )  $\lambda$  3071-2434; caseinogen (in 0.02 N NaOH)  $\lambda$  3176-2628 and vitelin (in 0.04 N NaOH)  $\lambda$  3441-2645. Liver nucleoprotein (in 0.1 N NaOH) causing a faint band at  $\lambda$  3122-2295 differs considerably in this regard from proteins. J. WIERTELAK

**Band spectra in the extreme ultra-violet excited by active nitrogen.** HAROLD P. KNAUSS. Univ. of California. *Phys. Rev.* 32, 417-26(1928).—To det. the amt. of energy available in active N for the excitation of spectra, a vacuum grating spectrograph was used to observe spectra between 2500 A. U. and 1000 A. U. excited in certain gases in the after-glow. The gases were mixed with glowing N through a discharge tube contg. an oscillatory discharge.  $\text{H}_2$ ,  $\text{O}_2$ ,  $\text{N}_2$ , CO and NO were studied, of which only CO and NO showed bands in the region mentioned. In addn. to the  $\alpha$  and  $\beta$  bands of NO characteristic of the after-glow, a progression was found belonging to another system with the same final levels, i. e., levels assocd. with the normal electronic state of the mol. The initial level, identified from published absorption data as an electronic state with zero vibration, designated as level C, and the new system is the  $\delta$  band system of NO. The O-O  $\delta$ -band is at 1915.7 A. U. corresponding to 6.44 v. A few bands of the 4th positive group of CO were obtained in the after-glow corresponding to the excitation of vibration states  $n' = 1$  to 6 of electronic level A. The total energy of these levels is from 8.2 to 9.0 v. The results are discussed in the light of a possible mechanism proposed by Birge. It is assumed that atoms of  $\text{N}_2$  can combine to form an excited diatomic mol. if the encounter is such that the energy of formation and the relative kinetic energy of the atoms go over into electronic vibrational, and rotational energy of the mols. Such encounters will be rare, because both energy and momentum must be conserved in the recombination; therefore the active modification will have a relatively long life. On formation, the mols. have  $11.4 \pm 0.3$  v. of energy; part of this is lost immediately by radiation of the  $\alpha$  group bands leaving from 9 to 10 v. in a configuration which is strongly metastable with respect to the normal electronic state. This metastable mol. is considered responsible for the excitation of spectra in the after-glow. BERNARD LEWIS

**Visible absorption bands of colorless liquids and their relation to infra-red bands.** JOSEPH W. ELLIS. Univ. of California. *Phys. Rev.* 32, 906-12(1928).—The absorption of 10 representative org. liquids, hexane, cyclohexane, benzene, toluene, *m*-xylene, chlorobenzene, chloroform, acetone, ethyl acetate and aniline, has been studied in the visible region by photographic means. Cell lengths up to 6.5 m. were employed. The near infra-red spectra of these same substances have been obtained. A good correlation of the bands of the two regions is shown: the bands of the visible region seem to be higher members of series previously detected in the infra-red. BERNARD LEWIS

**Heats of linkage of C-H and N-H bonds from vibration spectra.** JOSEPH W. ELLIS. Univ. of Calif. *Phys. Rev.* 33, 27-36(1929).—The visible and near infra-red absorption data for several representative mols. are taken from a previous work (cf. preceding abstract) and fitted to the formula of an anharmonic vibrator  $\nu = \omega^n - b\nu^2$ .

The mech. frequencies,  $\omega^* = \omega - 2bn$  are evaluated and plotted. By assuming that these frequencies originate in oscillations between a H atom and the remainder of the mol., the restoring force residing in the C-H and N-H bonds, the heats of linkage of these bonds are calcd. The heats of linkage for a hexane C-H bond is calcd. to be 97,000 cal./mol. in fair agreement with value 92,500 cal./mol. obtained thermochemically for its homolog, methane. The values for the heat of linkage vary among the different types of mols., having the relatively high value of 117,000 cal./mol. for benzene C-H bonds. It evaluates as 113,000 cal./mol. and is believed to agree with the 101,000 cal./mol. obtained thermochemically for an ammonia N-H bond within the limits of detn. of the former value. A possible explanation of the doubleness of the absorption bands observed in the spectra of several substances, notably hexane and cyclohexane, is sought in 2 types of C valence. This doubleness indicates a slight inequivalence in the energy content of 2 types of C-H bond.

BERNARD LEWIS

The infra-red absorption spectra of the methyl halides. WILLARD H. BENNETT AND CHARLES F. MEYER. Univ. of Michigan. *Phys. Rev.* 32, 888-905(1928).—The mols. are symmetrical types having one low moment of inertia. Two types of bands are expected, one arising from vibration parallel to the axis of symmetry,  $\parallel$  bands, and the other from vibration perpendicular to the axis of symmetry,  $\perp$  bands; the appearance of each type is described. There are 7 bands for each of the 4 compds. The 28 bands fall into 7 series, A to G inclusive. 2 of the 4 bands of series A lie beyond the range of observation. Series A, C, E and F are made up of bands of the  $\parallel$  type, and series B, D and G, of bands of the  $\perp$  type. The series converge toward the known bands of methane with decrease in the at. wt. of the halogen in the halide. The envelopes of the  $\parallel$  type demonstrate the existence of P, Q and R branches. The doublet sepns. for the various bands of the same compd. appear to be the same; the chloride may present an exception to this rule. In passing from compd. to compd. the doublet sepns. increase with decrease in the at. wt. of the halogen in the halide. The band of series A for  $\text{CH}_3\text{F}$  has been resolved and it is revealed that the P and R branches consist of a single series of lines. Strong convergence in the spacing is present. The bands of the  $\perp$  type have all been resolved. Every third line is more intense than the others. The spacing converges in series B toward lower frequencies and in D and G toward higher frequencies. The mean frequency intervals from band to band of the same compd. are found to vary markedly. The explanation of this variation presents a theoretical problem of interest.

BERNARD LEWIS

Interpretation of the atmospheric absorption bands of oxygen. ROBERT S. MULLIKEN. New York Univ. *Phys. Rev.* 32, 880-7(1928); cf. C. A. 23, 32.—The atm.  $\text{O}_2$  absorption bands can be attributed to a  $^3\text{S} \rightarrow ^1\text{S}$  transition from the normal ( $^3\text{S}$ ) to a metastable  $^1\text{S}$  excited state of  $\text{O}_2$ . This accounts for all the strong lines, and explains missing lines without conflict with existing theory. Certain very weak lines such as the  $\text{A}^1$  bands are however not yet explained. Of the 3 rotational levels for each value of  $j_k$  in the  $^3\text{S}$  normal state, the 2 for which  $j = j_k \pm 1$  show only a very small sep., which increases slowly with  $j_k$ , while the third is sep. from the other two by an interval of about 2 wave nos., which does not change with  $j_k$ . The  $^3\text{S}$  and  $^1\text{S}$  states involved in the atm. bands may perhaps be attributed both to the same electron configuration. If this is the case it is likely that a metastable  $^1\text{D}$  state derived from the same configuration also exists, and that infra-red atm. bands corresponding to the transition  $^3\text{S} \rightarrow ^1\text{D}$  should be found.

BERNARD LEWIS

New features of the red band system of sodium. F. W. LOOMIS AND S. W. NILE, JR. New York Univ. *Phys. Rev.* 32, 873-9(1928).—The occurrence of an infra-edge to the red band system of Na is reported and is explained in terms of the Franck-Condon theory of intensity distribution when account is taken of the shape of the potential-energy curves as disson. is approached. The same theory explains a head of the red system in the yellow-green, the reappearance of the orange "cathode-ray fluorescence" series in the infra-red, and the observed asymmetry in the two branches of the Condon "parabola" (C. A. 21, 1062).

BERNARD LEWIS

Intensity measurements in the helium spectrum. CLARENCE HODGES AND W. C. MICHELS. Calif. Inst. of Tech. *Phys. Rev.* 32, 913-17(1928).—The abs. and relative intensities of 13 lines of the He spectrum, extending through the visible region, have been measured by a modification of the method developed by Ornstein (C. A. 20, 15) and Dorgelo (*Physik. Z.* 26, 1-39 (1925)). The change in the method consists in comparing each line directly with the known emission from a W filament, operated under const. conditions. The results for a discharge in a capillary tube with pressures from 1.92 to 34.3 mm. show that the abs. intensities increase rapidly to a max. for pressures in the neighborhood of 2 to 4 mm., below which they tend toward zero. The relative

intensities of the singlet system are favored by lower pressures, and the higher members of the triplet system are likewise favored over the lower members, while the relative intensities within the singlet series show little effect of pressure. BERNARD LEWIS

The ultra-violet absorption spectrum of nitrogen peroxide. MAURICE LAMBREY. *Compt. rend.* 188, 251-2(1929).—Gaseous N peroxide shows two absorption spectra, one attributable to  $N_2O_4$  and the other to  $NO_2$ . The first consists of two wide bands without apparent structure. The second is a band spectrum possessing complex structure extending from the yellow to 2000 A. U. and from 2490 A. U. to the limit of the spectrum near 2000 A. U. Wave lengths of 78 bands (4009 A. U. to 2881 A. U.) in the first group and 17 (2495 A. U. to 2083 A. U.) in the second are measured with a precision of about 1 A. U.

Diffuse bands and predissociation of iodine monochloride. G. E. GIBSON AND O. K. RICE. *Nature* 123, 347-8(1929); cf. *C. A.* 22, 354. W. F. MEGGERS

Combination frequencies of the infra-red bands of quartz. E. K. PLYLER. Univ. of N. Carolina. *Phys. Rev.* 33, 48-51(1929).—Previous observers have studied the infra-red absorption bands of quartz and have found regions of intense absorption at  $9\mu$ ,  $12.5\mu$ ,  $20\mu$  and  $26\mu$ . These regions of absorption are assumed to be the fundamental frequencies of quartz. By combining these assumed fundamental frequencies 6 bands in the region from  $3\mu$  to  $9\mu$  are accounted for. Also P. has exptly. located 2 bands at  $2.72\mu$  and  $3.18\mu$  which have not been observed previously. The frequencies of these 2 bands agree with 2 combinations of the fundamental frequencies. This gives a total of 11 absorption bands for the ordinary ray of quartz, extending from  $2.72\mu$  to  $26\mu$  whose frequencies agree with the calcd. values. BERNARD LEWIS

The absorption spectra of certain organic liquids in the near infra-red. JAMES W. SAPPENFIELD. Ohio State Univ. *Phys. Rev.* 33, 37-47(1929).—Absorption spectra have been studied in the region from 0.8 to  $2.5\mu$  with an accuracy of  $0.002\mu$  for 24 org. liquids, including 9 alcs., 6 esters, 2 ethers, 2 aldehydes and 5 miscellaneous compds. The C-H linkage and other similar ones are discussed as a probable source of absorption. Certain inconsistencies are pointed out but there appears to be no other explanation available. The relative intensities of the various bands are discussed. The bands at 1.4 and  $1.0\mu$  and the two bands at 1.2 and  $0.9\mu$  evidently arise from different sources. The effect of homology is slight. An attempt was made to obtain a relation between different band heads of a particular compd. The anharmonic series suggested by Ellis and the relation  $\nu_n = \nu_0(n)^{1/2}$  suggested by Capon (*C. A.* 21, 3829) were both used with moderate success. The latter equation was modified so as to read  $\nu_n = \nu_0/(n)^{1/2}$  and applied to part of the data of Weniger (*C. A.* 5, 21) with moderate success. BERNARD LEWIS

Incoherent scattering. R. M. LANGER. Bur. Standards. *Nature* 123, 345 (1929).—Use is made of Suckals' idea that a mol. can subtract from, or add to an incident quantum one of its characteristic energy quanta, and scatter the resultant sum or difference as a single quantum. An energy diagram is given showing infra-red wave nos. and the calcd. differences between certain of these. It is shown that lines corresponding to these differences, which have not been otherwise accounted for, have been observed. GREGG M. EVANS

Anomalous dispersion, absorption and Kerr effect in viscous dielectrics. DONALD W. KITCHIN AND HANS MÜLLER. Simplex Wire and Cable Co. Cambridge, Mass. *Phys. Rev.* 32, 979-87(1928).—The temp. variation of the dielec. const. and power factor of castor oil and rosin, measured at different frequencies from  $10^7$  to 60 cycles, shows that, in accordance with the Debye's theory of polar mols., the origin of anomalous dispersion of these very viscous liquids shifts with decreasing temps. into the long-wave radio region and even down to audio frequencies. The measurements qualitatively verify the theory. The influence of viscosity in solns. of rosin in different oils which have no polar mols. is found in agreement with the theory. The existence of anomalous dispersion in the audio and radio frequency region explains the complicated dielec. behavior of many insulated materials and makes it possible to observe an anomalous behavior of the Kerr effect, or elec. double refraction. According to Debye, this effect is due to the orientation of the mols. and should disappear at temps. and frequencies where the orientation of the dipoles is impossible. The regions of the anomalous Kerr effect and of anomalous dispersion coincide. BERNARD LEWIS

Secondary radiations observed in the molecular diffusion of light by fluids (Raman effect). PIERRE LAURE. *Compt. rend.* 187, 826-8(1928).—In the Raman effect, the frequencies of the neg. lines are designated by  $N - n_1$ , where  $N$  is the frequency of the excitation light, and  $n_1$  the characteristic frequency of the investigated compd. The corresponding pos. lines are designated by  $N + n_1$ . D. uses the Hg line 4358 A. U. as



excitation source and compares the intensities of the corresponding neg. and pos. Raman lines. The neg. line is always the brighter. For  $\text{AsCl}_3$  and  $n_1 = 15$ , the intensity ratio  $r = 41/100$ ; for  $\text{PCl}_3$  and  $n_1 = 19$ ,  $r = 30/100$ ; for  $\text{AsCl}_3$  and  $n_1 = 39.5$ ,  $r = 15/100$ ; for  $\text{PCl}_3$  and  $n_1 = 50$ ,  $r = 10/100$ . The 2 last results are in accord with the relation  $r = e^{-n_1/2.7}$  but the 2 first ones are too low. The secondary rays  $n_1 = 39.5$  of  $\text{AsCl}_3$  have been excited by means of 5460 and also 4358, and their intensities have been compared. If  $I_1$  and  $I_2$  represent the intensities of the exciting radiations,  $D_1$  and  $D_2$  the intensities of the radiations normally diffused by the fluid and  $S_1$  and  $S_2$  the intensities of the corresponding Raman rays, the following relations hold:  $D_2/D_1 : I_2/I_1 = 2.5$  and  $S_2/S_1 : I_2/I_1 = 1.5$ .

ALBERT L. HENNE

Secondary radiations observed in the molecular diffusion of light (Raman effect). PIERRE DAURE. *Compt. rend.* 188, 61-2(1929); cf. *C. A.* 23, 2104.—Sols. of halogenated compds. of metals and metalloids, and liquefied  $\text{NH}_3$  and  $\text{CH}_4$  are studied. Pure  $\text{SbCl}_3$  gives a spectrum with 4 lines,  $a$ ,  $b$ ,  $c$  and  $d$ , but its  $\text{HCl}$  soln. shows only  $a$ ,  $c$  and  $d$ . By increasing diln., the ray progressively broadens. From a 50% soln. down,  $a$  completely covers  $b$ . The resulting spectrum is thus comparable to the spectrum previously reported for  $\text{HCl}$  solns. of  $\text{BiCl}_3$ . Solns. of  $\text{MgCl}_2$ ,  $\text{AlCl}_3$  and  $\text{CaBr}_2$  did not exhibit any detectable Raman effect. Liquid  $\text{NH}_3$  exhibits a spectrum composed of broad bands: for  $n_1$  (characteristic frequencies in wave lengths per mm.)  $107 \approx 2$ ,  $158 \approx 1$ ,  $321 \approx 1$ ,  $330 \approx 1$ , and  $338 \approx 1$ , the corresponding intensities are: 1, 1, 10, 10 and 10. With liquid  $\text{CH}_4$ , only one ray ( $n_1 = 290.8$ ) appears. With liquid  $\text{O}$ , no Raman effect was detected.

ALBERT L. HENNE

Some experiments on fluorescence. A. C. S. VAN HEEL. *Comm. Phys. Lab., Univ. Leiden* No. 187, 3-14.—The fluorescence and absorption spectra of autunite and potassium uranyl sulfate have been observed at liquid-air and liquid- $\text{H}_2$  temps. A cryostat for use in obtaining low-temp. spectra is described.

J. B. AUSTIN

Fluorescence of benzene and its infra-red absorption. V. POSEPAL. *Compt. rend.* 187, 1046-8(1928).—An effect analogous to that of Raman exists in the domain of fluorescence spectra. From spectra of fluorescence of benzene result the same bands of infra-red absorption as of those spectra of Raman.

L. D. ROBERTS

Polarization of light emitted by fluorescence. PAUL SOLEILLET. *Compt. rend.* 187, 976-8(1929).—The quantities chosen for characteristics of a beam studied have been the 4 parameters used by Stokes. First the direction of the beam is varied without modification of the excitation. With certain hypotheses it has been shown that the characteristic parameters of emission in a direction can be expressed as a function of 9 quantities,  $L_1, L_2, L_3, C_1, C_2, C_3, S_1, S_2, S_3$ . Varying excitation can be characterized by 9 parameters.

L. D. ROBERTS

Theory of the polarization of light emitted by fluorescence. PAUL SOLEILLET. *Compt. rend.* 187, 1136-8(1928); cf. preceding abstract.—By using the parameters previously suggested results are obtained in certain problems. Formulas uniting the 2 groups of parameters are given. The study of anisotropic absorption has led to the introduction of 9 characteristic quantities.

L. D. ROBERTS

Luminescence of hydrogen canal rays. BALEBAIL DASANNACHARYA. Univ. of Chicago. *Ann. Physik* [5], 1, 74-92(1929).—A simplified derivation of the Wien equation (*C. A.* 17, 2391; *Ann. Physik* 76, 109) is given. The energy  $\sigma$  radiated by a neutral atom per sec. was detd. for  $\text{H}_\alpha$ . The mean free path of the total decay of the luminescence  $c^0$  was introduced and calcd. for  $\text{H}_\alpha, \text{H}_\beta$  and  $\text{H}_\gamma$ . An empirical decay equation was introduced.  $c^0 v_d(h\nu)^3 = C^0 = 0.994 \times 10^{-26}$ . ( $v_d$  = velocity of canal ray.) Values for  $1_1^0$ , the mean free path of excitation, were calcd. for  $\text{H}_\alpha, \text{H}_\beta$  and  $\text{H}_\gamma$ . An empirical excitation equation was developed,  $1_2^0(h\nu)/(n-2)^4 = A.U. = 8.58 \cdot 10^{-9}$  where  $n$  is the main quantum no. of the initial orbit of the electron in the emitting atom. By combining the decay and excitation equations, an emission equation was obtained. According to this equation, the ratio of intensities  $\text{H}_\alpha/\text{H}_\beta$  may lie between 8.4 and 21.5, of  $\text{H}_\beta/\text{H}_\gamma$  between 4 and 5.8, and of  $\text{H}_\gamma/\text{H}_\delta$  between 2.8 and 3.4. F. U.

Permanent luminescence of certain crystalline uranium salts. R. COUSTAL. *Compt. rend.* 187, 1139-40(1928).—The phenomenon is independent of previous exposure to sun and temp. Calcn. shows that the energy of radioactivity is more than sufficient to account for the phenomenon. The radioactivity excites the fluorescence.

L. D. ROBERTS

Determination of the role of light in thermal chemical reactions. JEAN PERRIN. *Compt. rend.* 187, 913-6(1928).—When a color is practically non-existent in the isothermal radiation, the mol. impacts capable of furnishing the same quantum are themselves practically non-existent. The yield of fluorescence is defined as equal to the quotient of the luminescent deactivations by the no. of quanta absorbed. The part which re-

ceives the light in a purely thermal reaction is, for each reactant, equal to the yield of fluorescence of that reactant under the conditions where it is found. L. D. R.

A further test of the radiation hypothesis. LOUIS S. KASSEL. Calif. Inst. Tech. *J. Am. Chem. Soc.* 51, 54-61(1929).—An expt. is carried out to test the idea that the rate of decompn. of  $N_2O_5$  at low pressures may be due to the supplementary action of radiation. A neg. result was obtained with radiation  $< 5\mu$ . There still remains the question of accounting for the 100-fold deficiency of collisions to maintain the rate. A possible resolution of the dilemma may consist in the adoption of  $10^{-4}$  cm. for the diam. of collisional deactivation, in spite of the inherent objection of using diams. for  $N_2O_5$  decompn. 15-20 times greater than for other substances showing unimol. decompn. H. R. MOORE

The reaction of ketones with alcohols under the influence of light. IV. The photoelectric effect of benzophenone. J. BÖESKEN AND G. H. VISSER. *Rec. trav. chim.* 47, 1037-41(1928); cf. *C. A.* 22, 761.—A detn. of the photoelec. threshold of  $(C_6H_5)_2CO$  was expected to throw light on the nature of the primary reaction involved in the photo-catalytic oxidation of alcs. in the presence of aromatic ketones. The threshold was found to lie between  $\lambda$  3025 and 2537 Å. U. An EtOH soln. gave the same result. The absorption band at  $\lambda$  2600 would seem, therefore, to correspond to ionization of the mol., while in most cases light changes are stimulated merely by removal of electrons to higher quantum states. No absorption bands were found in the spectral region 4070-3800 Å. U., the region of excitation. An ingenious application of the Geiger-point counter to photoelec. emission is described. It is necessary only to measure the ionization produced by a single electron. This is an ideal condition for insulators, whose increasing pos. charge would gradually prevent the escape of electrons. H. R. MOORE

Ozone formed by ultra-violet rays. M. J. DADLEZ. *L'Union pharm.* 69, 17(1928); *Quart. J. Pharm.* 1, 99-100.—In addn. to the well-known formation of  $O_3$  by elec. action, a notable proportion of atm.  $O_3$  is formed by the ultra-violet rays of the sun. The amt. present in the atm. varies at different times and places, ranging generally from 0.01 to 0.02 mg. per cu. m. This quantity is notably increased in the vicinity of a source of ultra-violet rays, so that its characteristic odor is soon apparent. Although a min. quantity of  $O_3$  is harmless to the human organism, a larger amt. occasions irritation of the respiratory organs. The presence of 4 mg. ozone per cu. m. of air renders the atm. insupportable. This fact indicates a possible source of danger in a confined space contg. an ultra-violet ray quartz lamp. In a recent investigation of the subject D'Arsonval has found that the av. amt. of  $O_3$  produced under ordinary conditions in the working of the Hg-quartz lamp in ultra-violet therapy does not exceed from 0.03 to 0.5 mg. per cu. m. This amt. presents no danger, but when the amt. rises to 1 mg. and more, discomfort and irritation will result. It is essential that rooms in which the ultra-violet installation is working should be well ventilated, especially when not spacious.  $O_3$  is very easily removed by efficient ventilation. When the amt. of  $O_3$  reaches 1 to 1.5 mg. per cu. m., symptoms of respiratory irritation will be apparent in about 30 mins. W. O. E.

The Budde effect in bromine. ERNEST MATTHEWS. *Trans. Faraday Soc.* 25, 41-3(1929).—Observations of the Budde effect were made on dry  $Br_2$  vapor + air, dry  $Br_2$  vapor only, and moist  $Br_2$  vapor + air. The gases were contained in pairs of glass bulbs connected by capillary tubes contg. liquid  $Br_2$ , the movement of which showed the vol. changes. The walls of the dry bulbs were coated with  $P_2O_5$  by sublimation, and the  $Br_2$ , dried over  $P_2O_5$ , was allowed to stand in these for as long as 8 weeks. One bulb of each pair was completely blackened, while the other was illuminated through a small aperture by a 100-c. p. "pointolite" lamp. Drying diminished the Budde effect but did not cause it to disappear over the period investigated. A greater effect was found in  $Br_2$  vapor + air than in  $Br_2$  vapor alone. M. W. SEYMOUR

The action of ionizing radiations on colloids. J. A. CROWTHER. Univ. of Reading. *Phil. Mag.* [7], 7, 86-97(1929); cf. *C. A.* 21, 3827; 22, 3422, 4057-8.— $\beta$ -Rays from Rn are compared with x-rays as to their action on a ceric hydroxide sol and a Bredig Cu sol. Measurements of viscosity changes up to 60% change show that a const. ratio exists between the quantity of  $\beta$ -rays and the quantity of x-rays required to produce a given decrease in the viscosity of the sol. A similar ratio of effectiveness of the two ionizing agents was found in the pptn. of Bredig Cu sols. Studies on these two sols showed that the ratio of the  $\beta$ -ray to the x-ray effects is independent of the nature of the sol. The changes are believed to be due to a discharge of the colloidal particles by the ions produced in the solvent by the ionizing agents. If the energy spent in producing a pair of ions in air is the same for both types of radiation the energy which must

be absorbed in a given vol. of sol to produce a given loss of charge by the colloidal particles is independent of the nature of the ionizing radiation. Only sols with positively charged particles are coagulated by ionizing agents. The negative ion (electron) produced by the ionizing agent appears to be the only effective agent in the process and the effect is therefore independent of the agent producing the ions. L. H. REYERSON

**Superdispersion.** T. TAKEUCHI, Göttingen. *Z. Physik* 53, 148-50 (1929).—Mass and size of photons are calcd. on the basis of wave-mechanics and a certain crit. frequency is discussed. GEORGE GLOCKLER

**The photosynthesis of hydrochloric acid at low pressures.** GERHARD K. ROLLEFSON. Univ. of Calif. *J. Am. Chem. Soc.* 51, 770-8 (1929).—Cl<sub>2</sub> (at either 1.4 or 13.7 mm.) and H<sub>2</sub> (at about 0.1 mm.) were exposed to the white light from a 100-watt tungsten-filament lamp; the HCl and Cl<sub>2</sub> were frozen out with liquid air periodically during a run and the residual pressure of H<sub>2</sub> measured. The rate of reaction follows the law  $d(\text{HCl})/dt = KI_0(\text{H}_2)(\text{Cl}_2)$ . R. postulates a chain mechanism wherein the primary step is the disson. of Cl<sub>2</sub> into a normal atom and one in the <sup>2</sup>P state; it is this latter atom that is supposed to actuate the reaction by formation of a complex with water, which in turn reacts with mol. H<sub>2</sub> to give HCl, H<sub>2</sub>O, and H, the H combining with a Cl<sub>2</sub> mol. to produce another mol. of HCl and another activated Cl atom. Reactions which may terminate the chain are also given. WILLIAM E. VAUGHAN

Light source devised by Auer von Welsbach (WURM) 1. The employment of radioactive substances in agriculture (DE VERA) 15. The deposition of Ra and other alkaline earth metals at the dropping Hg cathode (HEYROVSKY, BEREZICKY) 2. Superdispersion (TAKEUCHI) 2. The properties of the element 91 (ekatantam) according to the periodic table (GROSSE) 2. The separation of the element 91 (protactinium) (GROSSE) 2.

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#### 4—ELECTROCHEMISTRY

COLIN G. FINK

**Electric resistance furnaces for factory use.** H. TAMELE. *Siemens Z.* 9, 101-8 (1929); cf. *C. A.* 22, 2114.—The advantages of elec. furnace heating as compared with fuel furnaces are outlined. Numerous types of elec. furnaces are described and illustrated: muffle types for hardening and enameling in automobile industry, crucible furnaces, and melting furnaces for low m.-p. metals and alloys. M. MCMAHON

**Electric furnaces for metals.** M. TAMA. *Z. Metallkunde* 21, 77-88 (1929).—The use of elec. furnaces in metal industries is rapidly increasing because of their economical and efficient operation. Numerous types of industrial furnaces are described and illustrated: tube furnaces, ribbon, plate, etc. In the discussion addnl. special types are illustrated. M. MCMAHON

**Electric furnace for the treatment of gases.** O. SCARPA. *Chimie et industrie* Special No., 192 (May, 1927); cf. *C. A.* 21, 706.—The positive main is connected to a vertical electrode in the center of the furnace, the negative main to 4 horizontal electrodes in the same plane directed toward the center of the furnace and spaced 90° apart. The operation of the arc is similar to that of the previously described furnace. A voltage of 80-100 can be used. A. PAPINHAU-COUTURE

**Melting steel in the high-frequency furnace.** HEINZ NEUBAUSS. *Foundry* 57,

146-50(1929).—N. discusses the com. application of the high-frequency furnace to the melting of steel and stresses the importance of the violent stirring action which is obtained in this type of furnace. When the deoxidizers are added they are immediately distributed throughout the charge and the deoxidation products leave the bath quickly. In the steel baths of an open-hearth or arc furnace it is necessary to use a surplus of deoxidizers to secure the desired reactions. (Cf. Herty and Gaines, *C. A.* 22, 1562.) Up to the present only low-C steels have been studied in the Ajax furnace. An induction furnace of 5 tons' capacity, supplied from a 400-600 kw. generator, is capable of deoxidizing 4 charges of molten metal per hr. Data on a 240-lb. melt, in a 150 kw. unit, of low-C red-short-free Fe are given. The av. power consumption during a 15-minute deoxidizing period = 8.85 kw.-hrs. to furnace, or  $8.85/0.74 = 11.95$  kw.-hr. input to generator, or 111. kw.-hrs. per gross ton. For coppered iron the consumption is 140 kw.-hrs. per gross ton, and for commercially pure iron 224 kw.-hrs. per gross ton. Further expts. show that a stainless steel melt was decarburized from 1.15% C to 0.05% C in 59 mins. The 188 lbs. of commercially pure iron used required 108 kw.-hr. to melt, and the adds., including 52-lb. ferrochrome, required 35.7 kw.-hr. The result is 327 kw.-hrs. per gross ton. Addnl. data on corrosion-resisting irons are included. A. D. SPILLMAN

**Melting steel in the high-frequency induction furnace.** HEINZ NEUHAUS. *Fourdry* 57, 192-4, 218(1929); cf. preceding abstract.—The high-frequency furnace offers three possible methods for decreasing the cost of stainless steel. High-carbon ferrochrome, much cheaper than low-carbon ferrochrome, can be added to the Fe and the C oxidized; high-carbon ferrochrome can be decarburized; high-chromium pig can be made in the blast furnace and then decarburized; the essential point is that the temp. can be kept high enough so that C rather than Cr will be oxidized. Iron oxide or air blast or both may be used for decarburization. Preheated air is the preferred medium. In one experiment a pig containing 3.74% C and 12.89% Cr was blown down to .88% C and 11.33% Cr in 52 minutes. If chromium is absent, the time is much reduced; in 18 min. the carbon content of a charge was reduced from 3.25% to 0.04%, using air at approx. 400°. A duplex process is proposed in which steel scrap would be melted in the cupola, and the liquid metal contg. about 3% C would be transferred to the induction furnace for decarburization. The estd. energy consumption is 350-400 kw.-hrs. per ton. BENJAMIN MILLER

**The formation at relatively low temperatures of carbides yielding acetylene.** F. FISCHER. *Brennstoff-Chem.* 9, 328-33(1928).— $BaC_2$  is prepd. from BaO by heating with C in an elec. porcelain-tube furnace in a stream of  $CH_4$ , with or without the addn. of a small quantity of  $Fe_2O_3$  and CaO.  $BaC_2$  yielding 60% of the theoretical of  $C_2H_2$  was obtained by heating a mixt. of 2 g. BaO + 1 g. CaO + 0.2 g.  $Fe_2O_3$  for 30 min. at 1150° in  $CH_4$  at 35 mm. pressure. Carbides were not formed below 850° and yields fell off sharply above 1150°. The highest yields were obtained in an atm. of  $CH_4$ . The carbide formed at these low temps. yields both  $H_2$  and  $C_2H_2$  with  $H_2O$ . F. believes that free Ba is first formed by reduction and this is partly converted into  $BaC_2$  and partly into  $BaH_4$ . J. D. DAVIS

**Electrolysis with fluorine.** WILDER D. BANCROFT AND NEWTON C. JONES. *Trans. Am. Electrochem. Soc.* (preprint) 55(1929).—F was prepd. by electrolysis of fused  $KHF_2$  in the Mathers cell, with a Mg metal pot as cathode and a graphite rod as anode. About 250 cc. F is obtained per amp. hr. with a current efficiency of about 30%. Reactions of F with a variety of substances were studied. F oxidizes solns. of cobaltous, chromic, manganous and plumbic salts; it may be used in many cases of poorly conducting solns. and where it is not desired to deal with the cathode reaction products. F reacts explosively with  $C_6H_6$  vapor after an induction period. When this can be eliminated, F should react satisfactorily with org. substances. W. H. BOYNTON

**The use of a magnetic field in the measurement of the forces tending to orient an anisotropic liquid in a thin homogeneous layer.** V. FREDERICKSZ AND V. ZOLINA. *Trans. Am. Electrochem. Soc.* (preprint) 55, 8 pp.(1929).—Forces arising in a thin layer of the surface of an anisotropic liquid and to which the orientation of the drops in the form of a homogeneous layer is due, may be equilibrated by the effect of a magnetic field. It has been established that these forces do not depend on the kind of material on which the liquid is placed, that they are not subject to great variations with temp. changes and that they decrease with the distance of the orientated drops from the surface of the liquid. Expts. with *p*-azoxyphenetole and *anisaldazine* yielded similar results. W. H. B.

**Theory and practice in electroplating.** ANON. *Metalwaren-Ind. Galvano-Tech.* 25, 27-8, 47-8(1927).—The author shows how such theoretical considerations as the  $pH$  have been of great practical value to the nickel plater. Interfacial tension

is not something with which the practical plater is familiar and yet it explains why such a small amount of org. matter as one part in a million will cause pitting and rough deposits. The use of  $H_2O_2$  to destroy the org. matter is suggested. J. H. HOFFER

**Nickel solutions.** GEORGE B. HOGABOOM. *Metal Ind.* (N. Y.) 27, 172-5(1929).—An addn. agent giving a high-anode and a low-cathode efficiency is of little value. Exptl. data establish that the actual anode efficiency is low and that with either NaF or  $Na_2SO_4$  present, the character of the corrosion is affected. With neither salt present, the coating that forms on the anode is very adherent. When either salt is added to the soln., the anode coating becomes loosely adherent and when the cathode is removed, fine particles readily sep. from the anode and become suspended in the soln. Subsequent cathode deposits are covered with these fine metallic particles rendering it quite rough. Expts. show the beneficial effects of chlorides in Ni-plating solns. Several runs show that the rate of corrosion of the anode is not increased but that the character of the anode corrosion is materially changed with higher chloride content. A study of the effect of boric acid shows that the corrosion of a high-purity Ni anode in a Ni-soln. is different from that when no boric acid is used. In both cold and warm solns., without boric acid, the anode becomes covered with grooves extending from top to bottom. The effect is less evident in hot solns. With low chloride content the changes in metal concn. and  $p_H$  values are much less. W. H. BOYNTON

The causes and prevention of pitting in electrodeposited nickel. D. J. MACNAUGHTAN AND A. W. HOTHERSALL. *Trans. Faraday Soc.* 24, 497-509(1928).—A crit. survey and exptl. study are made of the various factors bearing on the formation of pits in Ni, Fe, Co, Zn and Cu deposits. Pits are due to the partial screening of the surface from the depositing current by solid particles and gas bubbles. H gas is one of the chief causes, and consequently the nature of the cathode surface as well as capillary and surface tension effects operative at the cathode have an important effect. An ingenious optical device is used to exam. the progress of growth of circular and tailed pits. The latter are due to the upward flow of electrolyte over the cathode surface. A sure way of avoiding pits is by the replacement of anodes and cathodes of com. purity by highly purified materials. A low acidity of soln., or high  $p_H$ , is also helpful. With Ni a good procedure is the plating of Cu over a preliminary Ni coating. The Cu eliminates areas of low over-voltage. The work is completed by a final coating of Ni. H. R. MOORE

The prevention of corrosion by electrodeposition. VI. Nickel plating as a corrosion preventative. S. WERNICK. *Ind. Chemist* 5, 106-10(1929).—A general review of expts. and improvements of recent years in Ni-plating. W. H. BOYNTON

Penetration of hydrogen into metal cathodes and its effect upon the tensile properties of metals and their resistance to repeated stresses; with a note on the effect of nonelectrolytic baths and nickel plating on these properties. F. C. LEE. *Proc. Roy. Soc. (London)* A123, 371-85(1929).—The expts. include static tensile tests, single-blow tests, repeated-stress tests and direct-stress tests of mild steel, Ni, brass, and stainless steel in alk. and acid baths, both when the current was and was not flowing. Examn. of the fractures seem to indicate that the cathodic H penetrates the crystal boundaries of the steels and Ni. The H effect and presence is only temporary. The cathodic H does not affect the tensile strength or the resistance to repeated stresses, but affects the elongation of the mild-steel specimen. Polishing the specimens prevents the H penetration and modifies its action. Acid corrosion affects the surface considerably and reduces accordingly the resistance to torsional stresses. NaOH soln., with or without the presence of H, protects the specimen and raises the fatigue range. Ni plating does not affect the tensile strength of the steel but it reduces the resistance to repeated stress considerably. L. describes his set-up for making these tests during the electrolysis and plating. F. A. ROHRMAN

Chromium plating. A survey of the published information. G. E. GARDAM. *Metal Ind.* (London) 34, 299-301(1929). E. H.

The chromium situation. A. KENNETH GRAHAM. Univ. of Penn. *Am. Metal Market* 35, No. 216, 18-22(1928).—A review of present technic in com. Cr plating. A curve is given on an enlarged scale of the density of  $CrO_3$  solns. up to 550 g/l. The maintenance of Cr plating baths in continuous operation is discussed along with the importance of anode material and anode area. Further details are given of the use of a porous cup and a sep. cathode compartment for re-oxidizing  $Cr^{+++}$ , as suggested by Lukens (C. A. 22, 1283, 3358). A table of Cr plating variables and their interdependence is given, in addn. to the detailed discussion of these matters. G. D.

Electrolytic deposition of chromium. D. T. EWING AND A. M. MALLOY. East Lansing, Michigan. Mich. Eng. Expt. Sta., *Bull.* No. 7 (Sept., 1926).—A brief review

is given of the historical development of Cr deposition and of the properties of Cr. Benzine and paraffin had a decided effect on the surface tension of  $\text{CrO}_3$  solns. and a decided improvement in the smoothness of deposits resulted. A soln. of 5%  $\text{H}_3\text{PO}_4$  and 20%  $\text{CrO}_3$  gave very smooth deposits at 65 amps./sq. dm. and  $27^\circ$ . Results are given of expts. with a soln. contg.  $\text{CrO}_3$ , 300 g./l.;  $\text{Cr}_2(\text{SO}_4)_3$ , 3 g./l.; Hg, 1 g./l. The best c. d. was found to be 20–27 amp./sq. dm. in this case. Benzene was added to a bath contg.  $\text{Hg}_2\text{SO}_4$ , but the effect of the benzene could not be definitely decided. Two g. of  $\text{CrCl}_3 \cdot 6\text{H}_2\text{O}$  and 3 g. of  $\text{Hg}_2\text{SO}_4$  were added to a bath of 300 g./l. of  $\text{CrO}_3$  and 3 g./l.  $\text{Cr}_2(\text{SO}_4)_3$ ; the best deposits were obtained at 20–24 amps./sq. dm., especially after the bath had been "worked" for a time. The soln. was first made up without the  $\text{Cr}_2(\text{SO}_4)_3$ , but the deposits were poor. Another bath contg.  $\text{CrO}_3$ , chrome alum and  $\text{Hg}_2\text{SO}_4$  gave good deposits at around 21 amps./sq. dm. but had a strong tendency to give dendritic deposits with peeling at the edge. A soln. contg. Cr acetate,  $\text{CrO}_3$  and com.  $\text{H}_2\text{O}_2$  gave erratic results and many deposits peeled badly. Addn. of PbO and of colloidal  $\text{MoO}_3$  to solns. of  $\text{CrO}_3$  and  $\text{Cr}_2(\text{SO}_4)_3$  gave good deposits. G. DUBPERNELL

**Chromium plating progress.** W. M. PHILLIPS AND M. F. MACAULAY. General Motors Corp. *J. Soc. Automotive Eng.* 24, 397–400; *Iron Age* 123, 269–71 (1929).—Progress in Cr and Ni deposition in recent years is reviewed in relation to Cr plating. In early test work it was found that  $\text{CrO}_3$  solns. to which a small quantity of  $\text{Cr}_2(\text{SO}_4)_3$  was added worked only for a short time; this was caused by impurities, for the most part by  $\text{Cr}_2(\text{SO}_4)_3$ , and it was decided to use c. p.  $\text{CrO}_3$ . The % of  $\text{SO}_4$  in the bath plays a very important part, and as a  $\text{SO}_4$  detn. takes 12 hrs., production is controlled by the trial-and-error method. The various difficulties encountered in putting Cr plating on a com. basis are described. Ni plating must be properly carried out in slightly acid soln. in order to be sufficiently adherent to withstand the pull exerted by the Cr plate and not to peel with the use of even very thin Cr deposits, which do not exert much pull. Ni must be more highly polished than ever before as the Cr plating brings out even the slightest irregularities. Tests have shown that Cr plate of more than 500 amp. min./sq. ft. at about 12% efficiency weakens rather than improves resistance to rusting. Expts. were tried with various anode materials such as Cr, Fe, steel, Pb and Al; low-carbon steel, fully annealed, is considered best. Methods of inspecting Cr-plated parts are discussed and some mech. applications are reviewed. G. DUBPERNELL

**Mechanical applications of chromium plating.** W. BLUM. *Mech. Eng.* 50, 927–30 (1928).—After giving particulars regarding the phys. properties of Cr such as hardness, thermal expansivity, density, m. p., elec. cond., and adherence, B. gives the results of a survey of the uses to which Cr plating, by reason of its wear-resisting qualities, has been more or less successfully put; namely, its application to gages and other measuring devices; to drawing, forming, stamping and molding dies; to rolls for forming metals; to tools for cutting metal; to bearing surfaces in machinery, etc. He shows how, in addn. to savings due to the longer life of Cr-plated tools and parts, there are savings much greater in amt. resulting from reducing the no. of times that machines must be stopped for their replacement. G. DUBPERNELL

**The bent cathode test for determining the optimum ratio of chromic acid to sulfate in chromium plating baths.** WALTER L. PINNER AND EDWIN M. BAKER. *Trans. Am. Electrochem. Soc.* (preprint) 55 (1929).— $\text{CrO}_3$  Cr-plating baths require strict adjustment of all operating conditions. A simple, rapid method for detg. the proper quantity of  $\text{H}_2\text{SO}_4$  or of  $\text{CrO}_3$  without quant. analysis is outlined. The bent cathode presents recesses and protruding sections, affording a good study of throwing power. The best results are obtained in a 2.5 M  $\text{CrO}_3$  bath with 0.05 N sulfate and no impurities. The temp. was  $48^\circ$ , current 5 amp., and c. d. 15.5 amp./sq. dm. over the entire piece. The bent cathode takes into consideration other acid radicals as well as  $\text{H}_2\text{SO}_4$ . A soln. contg. 6 g./l. of Fe possesses the widest range of  $\text{SO}_4$  ratio variation—70. Increasing amts. of  $\text{Cr}^{+++}$  increase the required  $\text{SO}_4$  ratio. Concns. of  $\text{CrO}_3$  of 1–3 increases the ratio, beyond 3 it decreases at the same rate. Increasing  $\text{Cr}^{+++}$  greatly decreases the throwing power as do amts. of Fe greater than 9 g./l. Bath resistance increases in direct ratio to the Fe in soln. W. H. BOYNTON

**The electroplating of cadmium from cyanide baths.** L. R. WESTBROOK. *Trans. Am. Electrochem. Soc.* (preprint) 55, 13 pp. (1929).—The compn. and operation of cyanide baths for Cd plating on a com. scale are outlined. The baths have been judged by the deposit produced by the elec. properties of the soln. and by the behavior of the bath under conditions of continuous or intermittent operation over an extended time. The baths contain varying amts. of  $\text{NaCd}(\text{CN})_2$ ,  $\text{NaCN}$ ,  $\text{NaOH}$ ,  $\text{Na}_2\text{SO}_4$  and  $\text{Na}_2\text{CO}_3$ —the latter in small quantities, which increases in concn. as the bath is operated. The functions and effects of variations in each constituent are considered. The effects of small quan-

ties of other metals in the bath are considered. A few hundredths of a percent of Ni, or larger amts. of Co or Cu, in the bath produces marked improvement in the deposit. Several org. addn. agents and two typical bath formulas are listed. W. H. BOYNTON

Cadmium plating in quantity production. CLAYTON M. HOFF. *Grasselli Chemical Co. Metal Ind.* (N. Y.) 26, 475-6(1928).—Polemic with Loven (C. A. 22, 3587). Loven's methods for the detn. of total cyanide and total alkali are satisfactory for Zn-(CN)<sub>2</sub> solns. but give only the free CN and an inaccurate result for total alkali in Cd baths. The method for Cd will give both Cd and Zn if Zn is present. The variations in corrosion resistance shown by Loven's curves are probably due to variations in the thickness of deposits. Higher cathode current efficiencies should be obtained, rather than using steel anodes to lower the av. anode current efficiency, as the latter may have a deleterious effect on the soln. Loven's production figures are rather low. Reply. OTTO H. LOVEN. *Ibid* 476-7.—AgNO<sub>3</sub> gives only a very slight ppt. of Cd hydrate after all the free cyanide has been used up, and the true end point for total cyanide is the appearance of the slightly yellowish AgI. Another method with a sharper end point is: Pipet 5 cc. of the Cd-plating soln. into a 100-cc. volumetric flask, dil. to the mark and pipet a 25-cc. aliquot into a 300-cc. Erlenmeyer flask. Add 50 cc. H<sub>2</sub>O, 3 cc. of 28% NH<sub>4</sub>OH and about 10 drops of KI soln. Titrate with AgNO<sub>3</sub> to the appearance of a turbidity due to AgI. The method for total alkali is sufficiently accurate for control work. Addn. agents give brittle Cd deposits and flaking, and better results are obtained without them. The need for using some steel anodes is pointed out; they have very little effect on the soln. The production figures given were low because the plant was not operating at full capacity. G. DUBERNELL

Copper-coated steel wires. E. SCHULZE. *Elektrotech. Z.* 49, 48-50; *Science Abstracts* 31B, 352-3(1929).—Results are recorded of tests upon Cu-coated wires for cond., self-induction and losses. They show that the losses are greater than with pure Cu wires, that cost of an overhead line is reduced because of cheaper metal and the possibility of using larger spans. Cu-coated wire has proved more suitable for long-span crossings and lightly loaded lines. W. H. BOYNTON

Improvements in accumulators and dry batteries. E. LIEDEL. *Z. angew. Chem.* 42, 301-7(1929).—A comprehensive review of literature and patents on developments and improvements in dry batteries. M. MCMAHON

Electric boilers and steam accumulators. C. J. WHARTON. *World Power* 9, 256-60(1928); *Science Abstracts* 31B, 411.—Conditions advantageous to the use of steam for steam generation and 2 types of elec. boiler are discussed. In the Swedish type, the electrodes enter the base of the vertical cylinder shell; the steam output and elec. input are controlled by raising or lowering vertical tubes round the electrodes. There is a const. water level. In the German type, the circuit leads at the top connect with hanging electrodes, with poled insulating disks surrounding them. Steam output is controlled by raising and lowering of the water level; 96% efficiency is guaranteed. Losses are confined to radiation and blow down. With feed water at 19° 1 kw. hr. will produce 2.75 lbs. (1.25 kg.) steam at 114 lbs. (51.7 kg.) gage pressure. In one instance an elec. boiler occupying 7 ft. (2.13 m.) square floor space, including switch-gear and accessories, did the same work as 3 Lancashire boilers. Repairs and maintenance costs are trifling, and no pitting or scale formation occurs. Ruth's steam accumulator and its use are outlined. W. H. BOYNTON

The electrical equipment of x-ray apparatus. L. G. H. SANSFIELD. *J. (Brit.) Inst. Elec. Eng.* 67, 437-74(1929).—A comprehensive exposition. C. G. F.

The operation of the cathodophone. ERWIN MEYER. *Elek. Nachr. Tech.* 6, 17-21 (1929).—The cathodophone is used in talking films and as pick-up transmitter in German broadcasting. The hot cathode of alk. earth oxides is heated from the inside by a Pt spiral; this cathode is fixed close to a perforated anode, which forms the small end of a horn. Current flows from cathode to anode corresponding with the direction of the sound. Current oscillations under the influence of sound are led to an amplifier in the cathodophone circuit through a high ohmic resistance. App. and circuits are illustrated. M. MCMAHON

The part played by Pitt in the invention of the carbon incandescent electric lamp. A. A. CAMPBELL SWINTON. *J. (Brit.) Inst. Elec. Eng.* 67, 551(1929). C. G. F.

The formation of ozone in the electrical discharge at pressures below three millimeters. JAMES K. HUNT. Univ. Wisconsin. *J. Am. Chem. Soc.* 51, 30-8(1929).—A study is made of the low-pressure synthesis of O<sub>3</sub> from O<sub>2</sub> within the range 0.2-2.8 mm. A more uniform distribution of ionization is obtained at low pressures, in spite of the fact that the p.-d. drop is greatest at the cathode and ionization is consequently more intense. Equil. is reached after 30 sec. operation. The O<sub>3</sub> yield is independent of the

electrode material. The  $M/N$  ratio is 1, suggesting the reaction mechanism  $O^+ + O_2 \longrightarrow O_3^+$ .  
H. R. MOORE

The solubility of galena and a study of some Pb concentration cells (NIMS, BONNER)  
2. S in electrolytic Fe and its removal (OMA) 9. The present status of electric furnace irons (SCHRECK) 9. The use of electric furnaces for the enameling of large and small articles (NATHUSIUS) 19. Rubber deposition from latex (Brit. pat. 298,117) 30. Moldable composition comprising asphalt and rubber (U. S. pat. 1,709,241) 13. Composition suitable for insulators or battery jars (U. S. pat. 1,709,242) 13. Detinning tinned scrap (Brit. pat. 297,528) 9. Iron and steel (Fr. pat. 648,235) 9. Electrophoretic deposition of rubber (Brit. pat. 297,780) 30.

SCHLOMANN, A.: *Technologisches Handbuch der Elektrotechnik und der Elektrochemie*. Berlin: Technische Wörterbücher, G. m. b. H. 1492 (half-pp.). Reviewed in *Chimie & industrie* 21, 678(1929).

THIELLESME, J. DE: Pour le doreur, l'argenteur, le nickeleur; recettes, formules, procédés, "trucs" et tours de main pour aciérage, aluminage, argenture, cobaltage, chromage, cuivrage, dorure, étamage, galvanoplastie, nickelage, patinage, platinage, plombage, zincage. Paris: Dunod. 194 pp.

Electric batteries. E. KLEINMANN. Brit. 298,376, Oct. 24, 1927. Structural features.

Electric batteries. L. A. LEVY and ALMEIDA ACCUMULATORS, LTD. Brit. 298,289, July 14, 1927. The pos. electrode of a primary or secondary cell consists at least partly of activated C (which may be satd. with Cl or Br) and the electrolyte comprises halides such as  $ZnCl_2$  or  $ZnBr_2$ . Ag or other metals in spongy form may be assocd. with the activated C. Various structural details of batteries are described.

Electric batteries with carbon-rod electrodes. F. KILIAN. Brit. 298,352, Sept. 20, 1927. Mech. features of manuf.

Dry-cell electric battery. C. F. BURGESS LABORATORIES. Brit. 297,400, June 13, 1927. Structural features.

Storage battery. W. HODDON and J. A. FULLILOVE. Brit. 297,904, July 15, 1927. Structural features.

Storage battery. E. PARVILLE. Brit. 297,406, June 21, 1927. Structural features.

Storage batteries. COMPAGNIE GÉNÉRALE D'ÉLECTRICITÉ. Fr. 648,256, Dec. 15, 1927. Construction of celluloid container. Fr. 648,257. Describes means for allowing escape of gas.

Storage batteries. ED. PARVILLÉ ET CIE. Fr. 648,197, June 14, 1927. Construction of plates.

Storage batteries. AKTIENGESSELLSCHAFT KUMMLER & MATTER. Fr. 648,927, Feb. 9, 1928. The interior heater for warm water elec. storage batteries are made of rustless steel or are Cr plated.

Storage battery with a window and specific gravity float. T. R. PALMER. Brit. 298,054, April 16, 1928. Structural features.

Alkaline storage batteries. J. F. MONNOT. Brit. 297,996, Nov. 4, 1927. Electrodes for alk. storage batteries comprise perforated steel tubes filled with layers of Ni hydroxide sepd. by disks of perforated Ni foil.

Storage-battery plates. WALTER HADDON and JAMES M. BURNETT. U. S. 1,710,617, April 23. A pasted plate is coated with a mixt. comprising rubber latex in admixture with a sol. salt; it is allowed to dry and the sol. salt is then washed out to leave an elastic and porous structure.

Contact plate for multiple storage batteries. CONCORDIA ELEKTRIZITÄTS-A.-G. Fr. 648,691, Feb. 13, 1928.

Composition for preventing corrosion of storage-battery terminal connectors. JOHN L. LANGE. U. S. 1,710,227, April 23. A mixt. of  $Na_2CO_3$ , 88 and  $(NH_4)_2SO_4$ , 12% is mixed with a heavy petroleum oil or product to form a pasty mixt.

Electrodeposition of metals such as iron in tubular form. THOMAS W. S. HUTCHINS. U. S. 1,709,268, April 16. Deposition of a metal such as Fe is effected on a tubular polished tapered cathode made of an alloy, which contains Fe and Cr (suitably in the proportions of 86-88 and 12-14%, resp.); the cathode and deposited metal are heated and then quickly chilled to effect sepn. of the electrodeposited tube from the cathode.

Apparatus for electrolytic deposition of chromium. F. LAUTERBACH (to W. G. Poetzsch). Brit. 298,226, Oct. 6, 1927. A centrifugal device is used to recover vapors from the gas passing off from the bath. Various structural details are described.



**Glass-lined metal tank for chromium-plating baths.** LEO D. JANSEN (to United Chromium, Inc.). U. S. 1,709,022, April 16. Structural features.

**Electroplating.** CHARLES H. R. GOWER and STAFFORD O'BRIEN and PARTNERS, LTD. Fr. 648,941, Feb. 14, 1928. See Brit. 290,903 (*C. A.* 23, 778).

**Anode for use in electroplating.** FRANK J. DELAVIE and HOWARD H. BLOUCH (to Grasselli Chemical Co.). U. S. 1,709,523, April 16. Anodes are formed of steel or other inert cond. material having a hook at one end and an eyelet at the other end; the main portion of the core is surrounded by a body of cast anodic metal such as Cd.

**Barrel apparatus for plating small articles with chromium.** F. LAUTERBACH (to W. G. Poetzsch). Brit. 298,225, Oct. 6, 1927. Undue rise of temp. is prevented by circulation of the electrolyte or by the use of an anode cooled by passage of liquid or of an anode formed in star shape to provide a large surface. Various structural features of app. are described.

**Electrolytic baths.** FRANZ VON WURSTEMBERGER. Swiss 129,293, Nov. 25, 1927. Small particles of metal, especially in Ni baths, are kept clear of the cathode by magnetic means. The anode may be made magnetic to attract the particles.

**Apparatus for conveying articles through electrolytic baths.** SIEMENS & HALSKE A.-G. Brit. 298,184, Oct. 5, 1927.

**Electrolytic process for detinning tin plate, etc.** F. RÉMY. Belg. 353,234, Aug. 31, 1928. The electrolytic soln. is regenerated by means of a current at a d. of the order of 1-1.2 amp. per cu. dm. of soln. under a potential of 32 v. The properties of the soln. can be kept const. by continuously passing an elec. current of 0.1 amp. per sq. dm. of the area of the vat contg. the soln. under 32 v. A small amt. of Hg bisulfide is added periodically to the bath. An Fe silicide tank is used.

**Electrolytic condenser.** SAMUEL RUBEN. U. S. 1,710,073, April 23. A paste electrolyte for condensers with film-forming electrodes comprises glycerol and a film-forming compn. of  $H_2BO_3$  and Na borate in such proportions that the mixt. has a comparatively high viscosity at ordinary temps. Various structural details are described.

**Preparing maleic and succinic acids by electrolysis of an acid solution of furfural.** TEIJIRO YABUTA (to Zaidan Hojin Rikagaku Kenkyujo). U. S. 1,709,297, April 16.

**Refining metals.** PAUL L. HULIN. Fr. 649,014, July 4, 1927. In an app. for refining metals such as Al, in which 3 fusion layers are superposed in known manner, the lining is divided into 3 distinct layers, (1) a horizontal frame in refractory material or C, contg. the anode, (2) a horizontal frame in insulating material contg. the electrolyte, and (3) a frame in C, insulated from the metallic envelope and contg. the cathode.

**Aluminum refining.** JULIUS WEBER and HANS HAUSER (to Aluminum Industrie A.-G.). U. S. 1,709,759, April 16; Swiss 128,513, Jan. 24, 1927. In the electrolytic purification of aluminum, an elec. current is passed from a solid anode of the metal to be purified through a molten electrolyte of material such as chlorides of Al and Na or K having a m. p. lower than that of either electrode and capable during electrolysis of dissolving the Al of the anode, while maintaining a temp. above the m. p. of the electrolyte but below the m. p. of either electrode. An app. is described. Cf. *C. A.* 22, 3359.

**Alumina.** ELEKTIZITÄTWERK LONZA. Swiss 129,878, Aug. 4, 1927. See Fr. 640,057 (*C. A.* 23, 779).

**Hydrogen peroxide.** I. G. FARBERIND. A.-G. Brit. 297,880, June 30, 1927. Water is satd. with O under superatm. pressure (suitably a pressure of 25 atm.) and the soln. is electrolyzed with the pressure released. A cathode of amalgamated Au and an anode of Pt may be used with a c. d. of 4 amps. per sq. dcm.

**Phosphorus from ferrophosphorus.** I. G. FARBERIND. A.-G. (Ernst Pokorny, inventor). Ger. 466,438, May 22, 1927. Fe-P is melted in an elec. furnace and  $SiO_2$  and C are added to produce P and Fe-Si.

**Weed killer.** JEAN SCHNEEBELI. Swiss 129,209, June 1, 1928. A weed killer is prepd. by the electrolysis and neutralization of a high percentage aq. soln. of  $NaClO_2$ .

**Treating gases.** OSKAR ARENDT. Fr. 649,272, Feb. 20, 1928. To bring about reactions between gases or vapors and solids by high-frequency currents a cloud of dust particles is produced between the high-frequency electrodes; these dust particles produce spark fields for the current. Examples of app. are described in detail.

**Apparatus for sterilizing liquids by heat produced by alternating electric current passed through the liquid.** A. H. W. ATEN and W. LULOFS. Brit. 297,669, Sept. 24, 1927. Structural features.

**Electric furnace.** AKT.-GES. BROWN, BOVERI & CIE. Swiss 128,846, Sept. 2, 1927. Details of operation and construction.

**Regulating electric furnaces.** SOC. ÉLECTROMÉTALLURGIQUE DE MONTECHER (SOC. ANON.). Fr. 648,473, Feb. 7, 1928.

Electric furnace suitable for dental uses. E. C. GLITZER. Brit. 298,001, Nov. 21, 1927. Various details are described of a muffle furnace provided with a fusible cut-out operating at 1260-1405° and which may be formed from alloys of Cu and Co, Ni, Si, or Fe; Ni and Sn or Pb; or Co and Cr. Use of Mn or Si is also mentioned.

Electric resistance furnace suitable for heat treatments in a non-oxidizing gas. ORA A. COLBY (to Westinghouse Elec. & Mfg. Co.). U. S. 1,709,658, April 16.

Electric resistance-heated furnace for heat treatment of metals or other materials. V. SORREL and L. A. LAFONT (to Infra Soc. Anon.). Brit. 297,826, Sept. 29, 1927. Devices are provided for checking or regulating the heating after a crit. temp. is reached.

Electric-resistance heated apparatus suitable for pot or crucible furnaces. PERCIVAL B. CROCKER (to Sentry Co.). U. S. 1,709,340, April 16. Structural features.

Electric resistance heater. FREDERICK D. PITT (to Anderson-Pitt Corp.). U. S. 1,710,512, April 23. Structural features.

Electric resistance heating unit. DAVID G. PETRIE (to Young, Osmond & Young). U. S. 1,710,511, April 23. Structural features.

Crucibles for electric induction furnaces. COMPAGNIE FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON. Fr. 649,371, Oct. 29, 1927. Crucibles are made by molding a refractory substance, such as refractory clay, and a powd. substance, such as charcoal or graphite, which will form an elec. heating resistance, baking in a reducing atm. and finally heating in air to burn the outer layer of graphite.

Furnace electrodes. JOSIAS REES. Ger. 473,142, Nov. 26, 1924. Addn. to 420,801. A freely hanging electrode of the kind comprising a hard core within a softer mass is surrounded by 2 wire gauzes with an interposed casing of fireproof porous material.

Carbon electrodes. BERTHOLD REDLICH. Ger. 473,143, April 7, 1925. Segmental pieces of C are arranged around a central core.

Incandescent cathodes. NAAMLOOZE VENNOOTSCHAP PHILIPS' GLOEILAMPENFABRIEKEN. Fr. 649,264, Feb. 18, 1928. In the manuf. of incandescent cathodes having on their surface one or more alk. earth oxides they are heated, e. g., to 1000°, in an oxidizing atm.

Hammer device for cleaning gas-purifier electrodes. SIEMENS-SCHUCKERTWERKE A.-G. (Heinrich Riedel, inventor). Ger. 473,030, Jan. 9, 1926.

Use of steel wool in electrodes of electrical condensers. VANNEVAR BUSH (to Raytheon, Inc.). U. S. 1,709,427, April 16.

Electric rectifier elements. DONALD G. ACKERLY (to Union Switch & Signal Co.). U. S. 1,709,830, April 23. A pair of flat Cu blanks are supported parallel to each other, the space between them is filled with C, and the blanks are then oxidized. Cf. C. A. 23, 1826.

Contact rectifiers for alternating current. PATENT-TREUHAND-GES. FÜR ELEKTRISCHE GLÜHLAMPEN. Brit. 297,822, Sept. 30, 1927. Dry rectifiers are formed by placing in contact 2 plates of dissimilar cond. materials which may be caused to react, or which naturally react, to produce an intermediate layer of poorly cond. material; e. g., a layer of Pb iodide may be formed between plates of Pb and Cu<sub>2</sub>I, contg. excess I; or, PbO<sub>2</sub> may be placed in contact with one of the lower W oxides (W<sub>2</sub>O<sub>3</sub> or WO<sub>3</sub>) so that the compds. PbO and WO<sub>3</sub> are formed, which further react to produce a poor conducting layer of PbWO<sub>4</sub>. Heat, pressure, or use of an elec. current may be utilized to promote the desired reaction.

Electrical discharge tube. NAAMLOOZE VENNOOTSCHAP PHILIPS' GLOEILAMPENFABRIEKEN. (Gustav L. Hertz, inventor.) Ger. 473,141, Feb. 8, 1925. An elec. discharge tube giving illumination from the pos. column has a filling comprising A and the vapor of Hg and (or) Cd.

Production of an insulating layer on parts for electrical equipment. P. BRABANT. Belg. 352,931, Aug. 31, 1928. Metal parts are coated with Al<sub>2</sub>O<sub>3</sub>, MgO, etc., by immersing cold in an oxidizing bath and passing an elec. current through the parts.

Electric cables. H. C. ANSTEV and T. BOLTON. Brit. 297,594, Nov. 15, 1927. The core of a cable is formed of seamed hollow tubes, which may be formed of Cu alloy of high tensile strength and which are stranded; the core may be formed of phosphor bronze or Al bronze, and solid wires of good cond. material such as Cu or Cd-Cu may surround the core.

Electric relays. O. MUCK. Brit. 297,882, July 1, 1927. In a-c. elec. relays, a permanent magnet of Co-Fe alloy is used to prevent any weakening by stray alternating flux. Various structural features are described.

Luminescent tube having a filling of neon, argon and mercury vapor. PAUL F. J. LEBRUN. U. S. 1,709,858, April 23.

## 5—PHOTOGRAPHY

C. E. K. MEES

**Photography in the infra-red.** M. CZERNY. *Z. Physik* 53, 1-12(1929).—The methods of photography used to date are only applicable to about  $2\mu$ . It does not seem possible to extend these processes because room-temp. radiation becomes noticeable in this region. C. develops a new method: On a thin celluloid membrane an extremely thin layer of naphthalene is deposited. This film is placed inside of a closed region. Infra-red radiation falling on certain portions of the film will by absorption be transformed into heat, causing the evapn. of the naphthalene layer. The limits and possibilities of the method are discussed.

GEORGE GLOCKLER

**Photochemistry of the silver halides. III. Relation between the gravimetrically determined silver and the lowering of sensitivity caused by dichromate-sulfuric acid reagent with subsequent chemical and primary and secondary physical development.** H. H. SCHMIDT. *Z. wiss. Phot.* 26, 86-95(1928).—The action of dichromate- $H_2SO_4$  on non-sensitized plates, before exposure to different light sources, is not a function of the analytically detd. Ag values, but it is a direct function of the sensitivity. Photographic plates sensitized with acid dyes act as high-sensitive plates. The sensitivity of plates sensitized with basic dyes is destroyed by the dichromate- $H_2SO_4$  action. In all these investigations different development methods are applied. IV. New method for determining excess of silver in unexposed photographic layers and the process of exposure. H. H. SCHMIDT AND F. PRETSCHNER. *Ibid* 259-74.—A new method of centrifuging in neutral soln. for the detn. of free Ag in photographic emulsions has been worked out. The Ag is considered present in several forms: (a) highly dispersed form in the gelatin; (b) adsorbed to the Ag halide grain and sol. in dichromate and  $H_2SO_4$  and (c) adsorbed to the AgBr grain and not sol. in dichromate and  $H_2SO_4$ . During exposure of AgCl emulsion the Cl ion moves in the gelatin. The photochemically formed Ag is strongly adsorbed in the AgCl and cannot be removed from it with  $HNO_3$  or with dichromate and  $H_2SO_4$ . There is no connection between the amt. of the free Ag in a photographic emulsion and its sensitivity.

A. P. H. TRIVELLI

**Sensitivity of photographic emulsions and the theory of the formation of the latent image.** S. E. SHEPPARD AND A. P. H. TRIVELLI. *Phot. Korrr.* 64, 145-9, 173-7, 242-6, 273-7(1928).—Methods used for measuring sensitivity are described briefly. The differences between the total sensitivity and the grain sensitivity are noted. Various theories of sensitivity, of L. Silberstein, W. Clark, F. C. Toy, The Svedberg, and others, are discussed. The original theory of sensitivity of Eder and Lüppo-Cramer (ripening-specks) is supported by the recent investigations. The nature of these specks was discovered by S. E. S. to be  $Ag_2S$ . A new theory of the formation of the latent image (photochem. orientation theory) is developed on the basis of these investigations. This theory is discussed in relation to many other photographic phenomena such as color sensitivity and the failure of the reciprocity law.

A. P. H. TRIVELLI

**Photographic applications of diazo compounds.** D. A. SPENCER. *Phot. J.* 68, 490-6(1928).—Green discovered that diazoprimumine was sensitive to light and was incapable of coupling to produce a dyestuff after exposure. Diazo compds. more stable to heat, time and shock, which are also more light-sensitive, have been described by Cross and Bevan, and by Kalle. Later workers have prepd. printing papers in which both sensitive material and coupler are combined but are kept apart by incorporation of acid. Development after exposure is secured by alk. soln. or by  $NH_3$ .

K. C. D. HICKMAN

**Photomicrographs taken directly on sensitive papers.** MASAO KURODA. *Bull. Inst. Phys. Chem. Research* (Tokyo) 8, 94-5(1929); *Abstract Ed.* 2, 12.—The method of directly printing the sensitive papers in the photomicrographic camera is recommended. The papers are treated by reversal development, using a dichromate soln. as the oxidizing agent.

ALBERT L. HENNE

**Green spots in toned bromide prints.** ANON. *Camera* 38, 51-2(1929).—Small green spots on sulfide-toned prints are usually attributed to particles of Fe in the  $H_2O$  used in the bleach bath. Local treatment with a soln. of 1 part of pure HCl to 3 parts of  $H_2O$  followed by thorough washing will usually remove such spots. Gray spots of various shapes and sizes are usually results of imperfect fixation. Toning renders such spots visible. (Fe spots may usually be avoided by adding 10%  $K_2C_2O_4$  and about 0.56% AcOH to the usual  $K_3Fe(CN)_6$ -KBr bleach bath.—*Abstr.*)

G. E. M.

**Poisoning action of dyes on specks.** LÜPPO-CRAMER. *Z. wiss. Phot.* 26, 45-6(1928).—Controversy between L.-C. and A. Steigmann concerning the priority of the discovery of the poisoning action of dyes on the activity of Ag specks.

A. P. H. T.

Coating composition containing celluloid in solution (U. S. pat. 1,709,056) 18.

VIAL, H.: *Manuel de photographie*. Paris: J.-Baillière et Fils. 276 pp. F. 16  
Reviewed in *Nature* 123, 524(1929).

**Photography.** FRIEDRICH BÜRKI. Swiss 120,610, April 1, 1928. Prints are toned with a soln. of Se in aq. soln. of Rongalite; viz. 1000 cc. of 20% Rongalite soln. contains 10 g. Se.

**Photography.** OTTO PILNY and ALEX PILNY. Swiss 129,321, Sept. 1, 1927. A pos. color film for cinematographic uses is prepd. by causing a pair of negatives to run side by side past a single light source, with prisms which project the light passing through the negatives on to the back and front of a sensitive film running in a plane at right angles to the negatives.

**Color photography.** SOC. CIVILE POUR L'ÉTUDE DE LA PHOTOGRAPHIE ET DE LA CINÉMATOGRAPHIE EN COULEURS. Fr. 648,997, July 2, 1927. See Brit. 293,306 (C. A. 23, 1579).

**Color photography on lenticular films.** SOC. FRANÇAISE DE CINÉMATOGRAPHIE ET DE PHOTOGRAPHIE FILMS EN COULEURS KELLER-DORIAN. Brit. 297,773, Sept. 27, 1927. Various optical features are specified.

**Apparatus for preparing lenticular films for color photography and cinematography.** SOC. FRANÇAISE CINÉCHROMATIQUE (procédés R. Berthon). Brit. 298,242, Oct. 6, 1927.

**Combined cinematograph and sound films.** SOC. DES ÉTABLISSEMENTS GAUMONT. Brit. 297,733, Sept. 26, 1927. In forming superposed sound and picture record films, it is stated that gelatin dichromated before exposure may be used for the sound record and after exposure may be treated with salts which are opaque to particular rays and impregnate only those parts of the film which are unaffected by sound, so that the sound reproduction from the film may be effected by use of suitably selected rays.

**Photographs in natural colors.** WERNER LANGGUTH and CHARLES HUMMEL. U. S. 1,710,455, April 23. Various details are specified of a system in which 3 component pictures in the fundamental colors are successively printed on the same support, azo-dye components being used as substances sensitive to light.

**Photographic diazotype process.** KALLE & Co. A.-G. Brit. 297,363, Sept. 19, 1927. A light-sensitive layer which yields a positive directly from a positive original is produced by employing a diazo compd. which is stable in neutral or acid condition but which is capable in alk. soln. of coupling directly with itself in the dark to form a dye; the compd. is applied in acid or neutral condition upon a base. Various examples are given. Cf. C. A. 23, 2380.

**Photographic-process screens.** HERMAN EWALD. U. S. 1,710,303, April 23. A glass plate is coated with a sensitized gelatin compn. which hardens on exposure to light, the coating is dried and exposed to light to harden it and is subjected to a 25% HOAc bath to cause the surface of the coating to become irregularly corrugated.

**Photographic copies.** HENRY M. BAKER. U. S. 1,709,600, April 16. A silver print is made from a negative and fixed so that it will be practically permanent; a suitable bleaching agent such as HgCl<sub>2</sub> soln. is applied which will not destroy the impregnating image so that the original white surface is practically restored to the silver print paper but the image is potentially retained; an image is then applied to the surface, as by ink drawing, and the potential image or desired parts of it are then redeveloped to give a desired background or shading effect.

**Photographic paper.** SOC. INDUSTRIELLE D'APPLICATIONS PHOTOGRAPHIQUES (Soc. anon.). Fr. 649,135, July 7, 1927. Photographic papers are developed by means of an atm. consisting of NH<sub>3</sub> alone, obtained from a suitable source such as a liquid NH<sub>3</sub> cylinder.

**Printing blocks.** K. H. SCHWIMMER and H. PAWECK. Brit. 297,806, Sept. 30, 1927. In a process such as described in Brit. 273,688 (C. A. 22, 1918), the photographic relief is rendered conductive before galvanization by electrode disintegration (suitably by a process such as described in Brit. 252,710 (C. A. 21, 2228)).

**Photomechanical printing plate.** AMOS H. SPALDING and JAMES M. CHANKALIAN (to Powers Photo-Engraving Co.). U. S. 1,709,327, April 16. A plate coated with a light-sensitive layer is exposed through a half-tone screen-figure negative and developed; an acid resist such as a resinous compn. is applied to the developed surface of the plate and it is preliminarily etched with dil. acid, and, subsequently, a strong etching acid is directly applied by friction on the surface of the plate.

**Photomechanical printing plates.** FRANK T. POWERS (to Powers Photo-Engraving Co.). U. S. 1,709,320, April 16. A wet, undried negative and a light-sensitized plate

are very slightly spaced apart by a thin spacing frame while exposing the plate in order to avoid necessity of drying the negative.

**Insoluble gelatin-relief images.** SERGE DE PROCOUDINE-GORSKY and NICOLAS POZNIAKOW (to Société de Photochimie "Elka"). U. S. 1,709,569, April 16. A prepriated Ag halide substantially free from colloidal substances is mixed with dissolved pure gelatin to form a light sensitive emulsion, the latter is exposed and is treated with a developer to reduce the exposed Ag halide, and the undeveloped portions of emulsion and halide are washed out.

**Heliographs.** I. G. FARBERIND. A.-G. Fr. 648,659, Feb. 11, 1928. 1,2-Naphthoquinone-4-sulfonates are used as sensitive material in the production of heliographs and photocopies, the image being developed with org. compds. contg. free amino groups such as 1-methyl-2,4-diaminobenzene or 1-amino-4-hydroxybenzene, or  $\text{PhNH}_2\cdot\text{HCl}$ .

## 6—INORGANIC CHEMISTRY

A. R. MIDDLETON

**Thallium. I. Double halides.** A. BENRATH and G. AMMER. Tech. Hochschule, Aachen. *Z. anorg. allgem. Chem.* 177, 129-36(1929).—The states of heterogeneous equil. with varying conditions of concn. of the components were detd. for the systems:  $\text{TlCl}-\text{H}_2\text{O}$ —and a third substance, e. g.,  $\text{CdCl}_2$ ,  $\text{HgCl}_2$ ,  $\text{ZnCl}_2$ ,  $\text{MgCl}_2$ ,  $\text{CaCl}_2$ ,  $\text{SrCl}_2$  or  $\text{BaCl}_2$ . In the presence of  $\text{H}_2\text{O}$  chlorides of the alkali earth metals do not form double salts with  $\text{TlCl}$ , but the following double salts formed with other chlorides could be detd.:  $\text{CdCl}_2\cdot\text{TlCl}$ ,  $\text{HgCl}_2\cdot\text{TlCl}$ ,  $\text{ZnCl}_2\cdot 2\text{TlCl}$ ,  $\text{ZnCl}_2\cdot 3\text{TlCl}$ ,  $\text{MgCl}_2\cdot 3\text{TlCl}$ . In addn. the double salts  $\text{CdBr}_2\cdot\text{TlBr}$ ,  $\text{ZnBr}_2\cdot 2\text{TlBr}$  and  $\text{ZnI}_2\cdot 3\text{TlI}$  have been proved to come from mixing solns. of their constituents.

W. C. EBAUGH

**The crystalline alumina hydrate of v. Bonsdorff.** II. R. FRICKE. Univ. Münster. *Z. anorg. allgem. Chem.* 179, 287-92(1929); cf. C. A. 23, 350.—Of several com. preps. of alumina made by the Bayer process, none gave exclusively the x-ray spectrogram identified in the previous article as that of "bayerite," and only one showed it at all. The pattern was that of the hydrargyllite which is the result of slow pptn., due to the long time actually allowed in practice, the high concn. of the solns., and the relatively high temp. Bayerite is metastable with respect to hydrargyllite. T. H. CHILTON

**New green compounds of cobalt.** II. A. BERNARDI. (In collaboration with GIUSEPPINA PAGANI and PIA ZAMBELLI.) Reale Univ. Bologna. *Gazz. chim. ital.* 58, 743-57(1928).—An elaboration of a previous paper (cf. C. A. 21, 1938), with extensive quant. exptl. data in tabular and graphical form, and a discussion of the possible mechanism of the formation of the green compds.

C. C. DAVIS

**A basic phosphate of calcium and of strontium and the adsorption of calcium hydroxide by basic calcium phosphate and by tricalcium phosphate.** JAMES R. LORAH, HERMAN V. TARTAR and LILLIAN WOOD. Univ. of Wash. *J. Am. Chem. Soc.* 51, 1097-106(1929).—The hydrolysis of  $\text{Ca}_3(\text{PO}_4)_2$  by  $\text{H}_2\text{O}$  yields a basic compd., the analysis of which corresponds to  $3\text{Ca}_3(\text{PO}_4)_2\cdot\text{Ca}(\text{OH})_2$ . The hydrolysis of  $\text{Sr}_3(\text{PO}_4)_2$  by  $\text{NaOH}$  soln. yields the analogous basic Sr compd. No evidence for the existence of a Ba phosphate more basic than  $\text{Ba}_3(\text{PO}_4)_2$  has been found.  $\text{Ca}(\text{OH})_2$  is slowly adsorbed by the basic phosphate to the extent of  $1/3$  mol. of the hydroxide to 1 mol. of phosphate in the most concd. solns. The adsorption of  $\text{Ca}(\text{OH})_2$  by  $\text{Ca}_3(\text{PO}_4)_2$  is greater than that by the basic phosphate. The adsorption affords a basis of explanation for the many conflicting statements in the literature regarding the basic phosphates of Ca.

H. F. JOHNSTONE

**The recovery of concentrated rubidium preparations from carnallite.** GERHART JANDER and HERMANN FABER. Univ. Göttingen. *Z. anorg. allgem. Chem.* 179, 321-31(1929).—Older methods for the recovery of Rb from carnallite, in which it is present in small quantities, included successive recrystns. depending on the smaller soly. of  $\text{RbCl}\cdot\text{MgCl}_2\cdot 6\text{H}_2\text{O}$  than of the corresponding K salt; recrystn. of the Rb alum; and continued pptn. of the chlorostannate. All these methods gave low yields. The method investigated and found to give good results embodies the following steps. (1) A single recrystn. of the technical carnallite. (2) Pptn. of the Rb as a silicomolybdate,  $\text{Rb}_4\text{H}_4(\text{Si}(\text{Mo}_2\text{O}_7)_4)_4$ , from a soln. satd. with KCl and 2 N in  $\text{HCl}$ . (3) Decompn. of the dried ppt. by sublimation of the Mo as oxychloride in a current of  $\text{HCl}$  gas. The chlorides dissolved from the residue may be further purified by a second pptn. Less satisfactorily, the ppt. may be treated successively with  $\text{NH}_3$  and  $\text{HCl}$  before decompn. A yield of 0.11%  $\text{RbCl}$  was obtained, 82% pure. Directions are given for prepn. of the Na silicomolybdate reagent.

T. H. CHILTON

**The action of phosphorus trichloride on formic acid and on acetic anhydride.** ALA. VAN DRUTEN. Univ. Leiden. *Rec. trav. chim.* 48, 312-23 (1929); cf. following abstr.—The expts. were designed to show which of the following equations represents the reaction between  $\text{PCl}_3$  and fatty acids: (1)  $3\text{RCOOH} + \text{PCl}_3 = \text{H}_3\text{PO}_3 + 3\text{RCOCl}$ . (2)  $3\text{RCOOH} + 2\text{PCl}_3 = \text{P}_2\text{O}_3 + 3\text{RCOCl}$ . For formic acid, the yields correspond to 2. For  $\text{Ac}_2\text{O}$ , 88% of the calcd. quantity of  $\text{AcCl}$  was formed, but no  $\text{P}_2\text{O}_3$ , the residue being a solid mixt. of complex compds.

LOUIS WALDBAUER  
Attempts to prepare phosphorus trioxide by another method than by burning phosphorus. W. P. JORISSEN AND A. TASMAN. Univ. Leiden. *Rec. trav. chim.* 48, 324 (1929); cf. preceding abstr.—Attempts to prepare  $\text{P}_2\text{O}_3$  by the action of  $\text{PCl}_3$  on  $\text{H}_3\text{PO}_3$ ,  $\text{AcOH}$ ,  $\text{BuOH}$  and trichloroacetic acid and on Na formate gave neg. results.

LOUIS WALDBAUER  
**The boric acids.** LIONEL F. GILBERT AND MIRIAM LEVI. Univ. Coll., Lond. *J. Chem. Soc.* 1929, 527-35.—Evidence is adduced for the existence of eight boric  $\text{nB}_2\text{O}_3 \cdot \text{H}_2\text{O}$ , where  $\text{n} = 1, 2, \dots$ . The heat of hydration of boric anhydride to  $\text{c}$  boric acid is 26,700 cal. An app. for the examn. of water of hydration equil. is scribed.

GERALD M. PETTY  
**The formation of hydrogen polysulfides.** ORTWIN VON DEINES. Univ. Berlin. *Z. anorg. allgem. Chem.* 177, 124-8 (1929).—On acidifying 100 cc. of a 3 *M*  $\text{Na}_2\text{S}_2\text{O}_4$  soln. with 100 cc. 3 *N*  $\text{HCl}$  a lemon-colored ppt. appears, coalescing into an oil drop in 30 mins. (3 to 4 g.). The oil becomes clear yellow on warming carefully and decomposes into a solid and  $\text{H}_2\text{S}$  after a day in air; boiling in water causes it to develop abundant  $\text{H}_2\text{S}$  and to leave S. With  $\text{NaOH}$  it gives yellow polysulfides. The oil is considered to be H persulfide and has up to 99% S. Lower persulfides (up to  $\text{H}_2\text{S}_8$ ) were formed by decompn. with soda; an ether ext. leaves monoclinic S crystals from the partial decompn. Concns. of thiosulfate and acid different from the ones here used give either  $\text{H}_2\text{S}$  (which with  $\text{SO}_2$  may form pentathionic acid) and S, or a sticky S mass which may contain some persulfide. A second method of prepn. is acidification of 13 g.  $\text{Na}_2\text{S}_2\text{O}_4 + 10$  cc.  $\text{H}_2\text{O}$  with a mixt. of 10 cc. concd.  $\text{HCl} + 5$  cc.  $\text{H}_2\text{O}$ . A deep-red color appears and  $\text{SO}_2$  is evolved; after decoloration of the soln. and cooling the yellow turbidity appears and a deposit of hyposulfite. After decantation and heating to  $40^\circ$  the turbidity again coalesces into oil drops of persulfide.

B. J. C. VAN DER HOEVEN  
A new isomorphous series of fluorine compounds. H. CARON AND L. VANBOCK-STAEL. *Compt. rend.* 188, 869-71 (1929).—Com. HF diluted with water left standing in a test tube formed a deposit contg. octahedra of the cubic system. An attempt to prep. these crystals to establish their compn. resulted in finding that silica and Ca or Sr salts could replace the glass, Al or ferric sulfate the  $\text{H}_2\text{SO}_4$ , and Na selenate and Al or ferric chloride the Al sulfate. E. g., 50 cc. pure  $10^\circ \text{Bé. H}_2\text{SiF}_6$  was added to 100 cc. 10%  $\text{Al}_2(\text{SO}_4)_3$  soln. 100 cc. 15%  $\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$  soln. and 200 cc. alc. at  $60^\circ$ . Microscopic examn. of the product revealed octahedra of the cubic system which were insol. in alc. and ether, very slightly sol. in water, but dissolved easily in dil. acids. Water was given off by heating and sili. deposited. With hot concd.  $\text{H}_2\text{SO}_4$ , HF and  $\text{SiF}_4$  were formed. The product is a triple salt whose formula, based on analysis and a study of the isomorphous substances, is,  $4\text{SiF}_6 \cdot \text{Ca}_3 \cdot 8\text{CaF}_2 \cdot \text{Al}_2(\text{SO}_4)_3 \cdot 45\text{H}_2\text{O}$ . Similarly,  $4\text{SiF}_6 \cdot \text{Sr}_3 \cdot 8\text{SrF}_2 \cdot \text{Al}_2(\text{SO}_4)_3 \cdot 45\text{H}_2\text{O}$ ;  $4\text{SiF}_6 \cdot \text{Ca}_3 \cdot 8\text{CaF}_2 \cdot \text{Al}_2(\text{SeO}_4)_3 \cdot 45\text{H}_2\text{O}$ ; and  $4\text{SiF}_6 \cdot \text{Sr}_3 \cdot 8\text{SrF}_2 \cdot \text{Fe}_2(\text{SeO}_4)_3 \cdot 45\text{H}_2\text{O}$ . Limited soly. of the salts of Ba and Cr prevents their substitution for Ca and Sr and Al and Fe, resp. The formation of these compds. may be used in micro-analysis and for detection of  $\text{H}_2\text{SO}_4$  and Al in com. HF and  $\text{H}_2\text{SiF}_6$ .

H. W. WALKER  
A new class of fluoroborates. A. TRAVERS AND MALAPRADE. *Compt. rend.* 187, 891-2 (1928); cf. *C. A.* 23, 1584.—When a warm concd. soln. of boric acid is treated with HF and KF, the soln. becomes alk. to methyl orange. The reaction is  $\text{H}_3\text{BO}_3 + 3\text{HF} + \text{n KF} \rightarrow \text{nKF} \cdot \text{BF}_3 + 3\text{H}_2\text{O}$ . No immediate ppt. of  $\text{KBF}_4$  is observable. If the soln. is strongly acidified  $\text{KBF}_4$  ppts. immediately. The reaction is reversible and is decreased by diln. The treatment of  $\text{KBF}_4$  with acids yields  $\text{HBF}_4$ , in which F cannot be detd. as  $\text{K}_2\text{SiF}_6$ . It is necessary to have an alk. fusion on a fluoroborate if the F is to be detd. by the fluosilicate method. The fact that  $\text{K}_2\text{SiF}_6$  can be pptd. from an acidified soln. of HF and  $\text{H}_3\text{BO}_3$  proves that the F does not exist as the stable fluoroborate,  $\text{BF}_4$ , but as some other fluoroborate less stable and sol. in water.

A. F.  
Attempts to isolate new fluoroborates. A. TRAVERS AND MALAPRADE. *Compt. rend.* 187, 982-4 (1928).—When  $\text{KBF}_4$  is heated to  $580^\circ$  a sol. salt is formed that reacts with  $\text{KOH}$ . Titration with  $\text{KOH}$  in presence of mannitol indicates the formula as  $\text{BF}_3 \cdot 2\text{KF}$ . Boric acid and KF react in cold concd. aq. soln. to form crystals with the ratios  $\text{B/K} = 1$  and  $\text{F/K} = 3$ .

AMY LEVESCONTE  
**Double sulfates and their components. III. A study of chromium<sup>III</sup> sulfates.**

F. KRAUSS, H. QUERENGÄSSER AND P. WEYER. Tech. Hochschule, Braunschweig. *Z. anorg. allgem. Chem.* 179, 413-7 (1929); cf. *C. A.* 22, 737.—The violet  $\text{Cr}^{\text{III}}$  sulfate is prepd. by dissolving 6 g. Cr alum in 45 g.  $\text{H}_2\text{O}$ , cooling and adding 45 g. concd.  $\text{H}_2\text{SO}_4$  and evapg. in a vacuum desiccator. Analysis showed it to have the compn.  $\text{Cr}_2(\text{SO}_4)_3 \cdot 18\text{H}_2\text{O}$ , and decompn. at const. pressure (10 mm.) showed the existence of 4 hydrates contg. 18, 9, 3 and 0 mols. of  $\text{H}_2\text{O}$ . Between  $30^\circ$  and  $100^\circ$  the 9-hydrate is stable, while the 3-hydrate has only a small range of existence. The residual 3 mols. of  $\text{H}_2\text{O}$  are combined as in zeolites, and are therefore given up slowly; complete dehydration does not occur until about  $325^\circ$  is reached. At  $100^\circ$  the violet color changes to green.  $\text{BaCl}_2$  ppts.  $\text{SO}_4$  completely from a cold soln., but if the soln. is warmed,  $\text{SO}_4$  is incompletely pptd. On boiling, however, complete pptn. with  $\text{BaCl}_2$  is obtained. The green, cryst. sulfate is prepd. by conducting  $\text{SO}_2$  into a concd. soln. of  $\text{CrO}_3$  in  $\text{H}_2\text{O}$  between  $0^\circ$  and  $5^\circ$  and crystg. in a vacuum. Analysis gives the compn.  $\text{Cr}_2(\text{SO}_4)_3 \cdot 12\text{H}_2\text{O}$ , and heating at const. pressure gives zeolitic decompn. down to 10 mols. of  $\text{H}_2\text{O}$ . The temp. then was const. down to 6 mols. of  $\text{H}_2\text{O}$ , after which zeolitic decompn. again prevailed down to the anhyd. condition at about  $400^\circ$ .  $\text{BaCl}_2$  ppts. the bulk of the  $\text{SO}_4$  immediately from a cold neutral soln., the remainder by heating to  $100^\circ$ . The green amorphous sulfate has the compn.  $\text{Cr}_2(\text{SO}_4)_3 \cdot 15\text{H}_2\text{O}$ , all the  $\text{H}_2\text{O}$  being held as in zeolites. Complete dehydration is attained at a const. pressure of 100 mm. by heating to about  $400^\circ$ . In a cold neutral soln.  $\text{BaCl}_2$  gives no ppt. After long standing at room temp. or after short boiling the sulfate is pptd. H. STOERTZ

A new series of double sulfates of the copper-magnesium group and the phosphonium bases. I. PRAFULLA C. RAY AND NIRMALENDUNATH RAY. Univ. College of Science, Calcutta. *J. Indian Chem. Soc.* 6, 27-30 (1929); cf. *C. A.* 21, 2622; 22, 3853.— $\text{Et}_4\text{PI}$  was rubbed with  $\text{Ag}_2\text{O}$  and  $\text{H}_2\text{O}$  to form  $\text{Et}_4\text{POH}$ , which on treatment with dil.  $\text{H}_2\text{SO}_4$  gave  $(\text{Et}_4\text{P})_2\text{SO}_4$  (I). By treating the soln. of I with solns. of other sulfates the following double salts were obtained:  $\text{CoSO}_4 \cdot (\text{Et}_4\text{P})_2\text{SO}_4 \cdot 8\text{H}_2\text{O}$ ,  $\text{ZnSO}_4 \cdot (\text{Et}_4\text{P})_2\text{SO}_4 \cdot 8\text{H}_2\text{O}$ ,  $\text{NiSO}_4 \cdot (\text{Et}_4\text{P})_2\text{SO}_4 \cdot 8\text{H}_2\text{O}$ ,  $\text{MgSO}_4 \cdot (\text{Et}_4\text{P})_2\text{SO}_4 \cdot 8\text{H}_2\text{O}$ ,  $2\text{MgSO}_4 \cdot (\text{Et}_4\text{P})_2\text{SO}_4 \cdot \text{H}_2\text{SO}_4 \cdot 2\text{MgSO}_4 \cdot (\text{Et}_4\text{P})_2\text{SO}_4 \cdot 2\text{H}_2\text{SO}_4 \cdot 2\text{H}_2\text{O}$ ,  $2\text{MgSO}_4 \cdot (\text{Et}_4\text{P})_2\text{SO}_4 \cdot \text{H}_2\text{SO}_4 \cdot \text{H}_2\text{O}$ ,  $2\text{MgSO}_4 \cdot (\text{Et}_4\text{P})_2\text{SO}_4 \cdot \text{H}_2\text{SO}_4 \cdot 2\text{H}_2\text{O}$ ,  $2\text{CuSO}_4 \cdot (\text{Et}_4\text{P})_2\text{SO}_4 \cdot \text{H}_2\text{SO}_4 \cdot 4\text{H}_2\text{O}$ . The Cu salt is light blue; the Ni salt green. LOUISE KELLEY

Combinations of salts of quadrivalent cerium and of thorium salts with sodium carbonate (sodium cericarbonate and thorcarbonate). LÉON LORTIE. *Compt. rend.* 188, 915-6 (1929).—L. has obtained a cericarbonate of Na corresponding to the formula  $\text{Na}_4\text{Ce}(\text{CO}_3)_3 \cdot 12\text{H}_2\text{O}$ . Fifteen g. of  $\text{NH}_4$  cerinitrate was dissolved in 25 cc. of cold  $\text{H}_2\text{O}$ . This soln. was poured drop, by drop, with const. stirring into a cold 25% soln. of  $\text{Na}_2\text{CO}_3$ . A ppt. was formed, nearly all of which redissolved in the excess of reagent. After filtering and evapg., yellow prismatic crystals of Na cericarbonate were obtained. These were washed with ice water. The crystals analyzed as follows:  $\text{CeO}_2$  21.75,  $\text{CO}_2$  27.85,  $\text{Na}_2\text{O}$  23.71,  $\text{H}_2\text{O}$  27.19%, which is very close to the theoretical compn. of the formula given above. By drying at  $100$ – $110^\circ$  the salt shows a loss in wt. of 24.5% which corresponds to the disappearance of 10 mols. of  $\text{H}_2\text{O}$ . The remaining 2 mols. of  $\text{H}_2\text{O}$  are not driven off until a temp. of  $200^\circ$  is reached. Treatment with  $\text{H}_2\text{O}_2$  showed that the salt was one of quadrivalent Ce. The ppt. obtained above in the  $\text{Na}_2\text{CO}_3$  soln. seems to correspond to  $\text{CeCO}_3(\text{OH})$ . Na cericarbonate decomposes rapidly in  $\text{H}_2\text{O}$ , losing all of its  $\text{Na}_2\text{CO}_3$  and becoming again Ce hydroxycarbonate. The cericarbonate is sol. in  $\text{Na}_2\text{CO}_3$  solns.  $\text{K}_2\text{SO}_4$  and  $(\text{NH}_4)_2\text{C}_2\text{O}_4$  do not react with it in  $\text{Na}_2\text{CO}_3$  soln. while  $\text{Na}_3\text{PO}_4$  and  $(\text{NH}_4)_3\text{PO}_4$  slowly ppt. it. It is pptd. instantly by soda in such solns. It is decompd. by acids, more or less stable Ce salts being formed. Na cericarbonate dissolves in liquids contg. one or several alc. OH groups, such as glycerol, glucose and mannitol. The cericarbonate is then completely resistant to pptn. by common reagents. Any tendency to hydrolyze in such solns. is retarded by adding  $\text{NaOH}$ . Na thorcarbonate has the formula  $\text{Na}_4\text{Th}(\text{CO}_3)_3 \cdot 12\text{H}_2\text{O}$ . At  $100$ – $110^\circ$  it also loses 10 mols. of  $\text{H}_2\text{O}$  and 12 mols. at  $300^\circ$ . The cericarbonate and thorcarbonate of Na are shown by L. to form isomorphous mixts. A. J. MONACK

Cyanogen compounds of the platinum metals. V. The cyanides and thiocyanates of rhodium. F. KRAUSS AND H. UMBACH. Tech. Hochschule, Braunschweig. *Z. anorg. allgem. Chem.* 179, 357-68 (1929); cf. *C. A.* 22, 3367, 4076, 4476.—The double cyanide  $\text{K}_3[\text{Rh}(\text{CN})_5]$ , (I), is prepd. by melting  $[\text{Rh}(\text{NH}_3)_5\text{Cl}]\text{Cl}$  with an excess of KCN in an Ag crucible. After the bright red mass is taken up in  $\text{H}_2\text{O}$ , the insol. residue is filtered out and the excess cyanide is destroyed by digestion with dil.  $\text{HCl}$ . Red crystals of I sep. on evapg., are recrystd. and dried in a vacuum. If I is warmed with concd.  $\text{H}_2\text{SO}_4$  it first goes into soln. with a yellow color, but on further heating a voluminous, yellowish brown compd. seps., which is filtered, washed with  $\text{NH}_4\text{Cl}$  soln., dil.

$\text{H}_2\text{SO}_4$ , and hot  $\text{H}_2\text{O}$ , and on analysis is found to be  $2\text{Rh}(\text{CN})_3 \cdot 7\text{H}_2\text{O}$ , (II). Decompn. at const. pressure shows the  $\text{H}_2\text{O}$  to be held as in zeolites. If II, while still moist, is digested with concd.  $\text{NH}_4\text{OH}$ , a bright yellow compd. is formed on evapn. which has the compn.  $4\text{Rh}(\text{CN})_3 \cdot 7\text{NH}_3 \cdot 7\text{H}_2\text{O}$ , (III). If a weakly acidified soln. of I is slowly added to a hot soln. of  $\text{CuSO}_4$ , a bright blue ppt. is formed having the following compn.  $\text{Cu}_3[\text{Rh}(\text{CN})_6]_2 \cdot 10\text{H}_2\text{O}$  (IV). This goes into soln. in  $\text{NH}_4\text{OH}$  with a deep blue color, and if  $\text{NH}_3$  gas is conducted into this soln. until crystn. occurs, the blue powder obtained by evapn. over  $\text{KOH}$  has the compn.  $\text{Cu}_3[\text{Rh}(\text{CN})_6]_2 \cdot 5\text{NH}_3 \cdot 5\text{H}_2\text{O}$  (V). This compd. cannot be completely dehydrated without decompn. If IV, freshly pptd., is treated with pyridine, or if I is added to a soln. of  $\text{CuSO}_4$  which has been treated with pyridine, a blue ppt. is formed which has the formula  $\text{Cu}_3[\text{Rh}(\text{CN})_6]_2 \cdot 5\text{Pyr} \cdot 5\text{H}_2\text{O}$  (VI). Analogous to the Cu compd.,  $\text{Ni}_3[\text{Rh}(\text{CN})_6]_2 \cdot x\text{H}_2\text{O}$  (green) is prepd. as well as the bright violet  $\text{NH}_3$  compd.  $\text{Ni}_3[\text{Rh}(\text{CN})_6]_2 \cdot 4\text{NH}_3 \cdot 10\text{H}_2\text{O}$ . With thiocyanates, in addn. to a few complex and poorly defined compds.,  $\text{Rh}(\text{SCN})_3 \cdot 2\text{H}_2\text{O}$  was prepd. It is sol. in hot concd. solns. of  $\text{KCN}$ ,  $\text{KSCN}$  and thiourea. It is decompd. by digestion with concd.  $\text{HCl}$ .  
H. STOERTZ

The theory of complex compounds (CHERNYAEV) 2. Desiccchlora. II. Experiments in its use as an economical drying agent and  $\text{NH}_3$  absorbent (SMITH) 2. Liquid  $\text{NH}_3$  as a solvent and the  $\text{NH}_3$  system of compounds. IV (JOHNSON, FERNELIUS) 2.

Gmelins Handbuch der anorganischen Chemie. XXI. Natrium. Berlin: Verlag Chemie G. m. b. H. 992 pp. M. 150. Reviewed in *Chimie & industrie* 21, 675 (1929).

## 7—ANALYTICAL CHEMISTRY

W. T. HALL

**Oxidation-reduction indicators.** J. GILLIS. *Naturw. Tijdschr.* 11, 15-20(1929).—A general article. ALBERT L. HENNE

**Diphenylamine as oxidation-reduction indicator in the indirect titration of cobalt.** J. GILLIS AND V. CUVELIER. Univ. Ghent. *Naturw. Tijdschr.* 11, 20-4(1929).—This is a modification of the method described by Willard and Hall (*C. A.* 16, 3827). Co is oxidized with Na perborate, the excess of which is decompd. by boiling. The soln. is treated in a  $\text{CO}_2$  atm. with a known excess of  $\text{SnCl}_2$ , which is titrated back with 0.05 N  $\text{K}_2\text{Cr}_2\text{O}_7$ , using diphenylamine as inside indicator. Only 0.2 cc. of the indicator is to be used, and it is to be added only when the end point is being reached, which is determined by a preliminary assay. The potentiometric titration is also satisfactory.

ALBERT L. HENNE

**Methods of analysis of ferrocyanides.** G. ZIMMER. *Rev. chim. ind.* 38, 37-8 (1929).—Details are given for an industrial method of analysis using  $\text{ZnSO}_4$  as precipitant. P. THOMASSET

**Method for the quantitative determination of cyanide in small amounts.** RALPH G. SMITH. Univs. of Chicago and Michigan. *J. Am. Chem. Soc.* 51, 1171-4(1929).—The method depends upon the formation of a reddish brown color which occurs when  $\text{CN}^-$  is added to an alk. picrate soln.; it is sensitive within 1% for 0.1 mg. The effects of time and temp. on the development of the color are discussed. The presence of certain reducing substances which cause the development of a red color in alk. picrate solns. may invalidate the method. Among these are sulfides, hydrosulfides, aldehydes and ketones, including the reducing sugars; the following percentages of substance necessary to give color comparable with the standard (0.011% KCN) are reported:  $(\text{NH}_4)_2\text{S}$ , 0.4; dextrose, 0.4;  $\text{AcH}$ , 15.0;  $\text{Me}_2\text{CO}$ , 20; furfural, 10-15; 40%  $\text{HCHO}$  does not interfere. Used qualitatively, the test is sensitive to 1 part CN in 50 million. C. J. W.

**A note on the determination of minute amounts of iodine according to the Dupré-Winkler method.** J. AXEL HÖJER. Med.-chem. Inst., Lund. *Biochem. Z.* 205, 273-96(1929).—In water analysis, take 500 cc., add 0.5 cc. of concd.  $\text{KOH}$  and evap. to dryness. Transfer the residue to a porcelain crucible or combustion boat if the amt. of org. matter is large, and ignite in air till the ash is white. Ext. the ash with 4 two cc. portions of alc. and evap. the ext. to dryness. Add 0.5 cc. of water, boil a few mins. and make acid to litmus with 0.5 N  $\text{H}_2\text{SO}_4$ , adding 0.1 cc. in excess. Add 1 drop of satd. Br water and evap. to 0.1 cc. Add 0.2 cc. of 2% starch soln. and 0.03



cc. of 0.4 N  $\text{H}_2\text{SO}_4$  and sat. with  $\text{CO}_2$ . Add 0.1 cc. of 5% KI and titrate with 0.008 N  $\text{Na}_2\text{S}_2\text{O}_3$ . The method is applicable to other materials besides water. S. M.

**Iodometric determination of chromic oxide in potash chrome alum.** JOHN E. S. HAN. *J. Am. Leather Chem. Assoc.* 24, 124-9(1929).—The soln. must be filtered after treatment with  $\text{Na}_2\text{O}_2$  and boiling, but before acidifying, to remove iron and insol. peroxides, which would otherwise cause the results to be high. To correct for small quantities of undecompd.  $\text{H}_2\text{O}_2$ , the  $\text{Na}_2\text{S}_2\text{O}_3$  soln. should be standardized by treating a sample of  $\text{K}_2\text{Cr}_2\text{O}_7$  exactly like the sample of chrome alum, i. e., treating with  $\text{Na}_2\text{O}_2$ , boiling and acidifying. H. B. MERRILL

**Volumetric determination of sulfur in pyrite residues.** V. ZEMLYANITZIN. *J. Chem. Ind. (Moscow)* 5, 1178-9(1928).—The procedure described is the well-known Eschka method except that the  $\text{SO}_4^{--}$  is pptd. by benzidine hydrochloride and the ppt. titrated alkalimetrically. BERNARD NELSON

**Differential potentiometric titration. III. An improved apparatus and its application to precision measurements.** DUNCAN A. MACINNIS and MALCOLM DOLE. Rockefeller Inst. for Med. Research, N. Y. *J. Am. Chem. Soc.* 51, 1119-27(1928); cf. *C. A.* 21, 367; 22, 740.—With an improved app. titrations of  $\text{FeSO}_4$  solns. with  $\text{K}_2\text{Cr}_2\text{O}_7$  and of KCl with  $\text{AgNO}_3$  were carried out with av. errors less than 0.01%. An analysis of const.-boiling HCl is also given. MALCOLM DOLE

**Sugar titration.** N. SCHOORL. *Chem. Weekblad* 26, 130-4(1929).—Using Luff's alk.  $\text{CuSO}_4$  soln. S. has worked out a table for the detn. of glucose, fructose, invert sugar, lactose and maltose. Luff's soln. was made up as follows: 25 g.  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ , 50 g.  $\text{C}_6\text{H}_5\text{O}_7 \cdot \text{H}_2\text{O}$ , 388 g.  $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$ . The cc. 0.1 N  $\text{Na}_2\text{S}_2\text{O}_3$  used for titration of the reduced Cu give the mg. of the above sugars directly, using 25 cc. Luff soln. and 10 mins. boiling. J. C. JURRIJENS

**Microchemical determination of iodine in organic materials.** J. F. REITH. Centraal Lab. Volksgezondheid, Utrecht. *Rec. trav. chim.* 48, 254-62(1929) (in German); cf. *C. A.* 23, 2122.—To eliminate the almost explosive combustion in the McClelland method of destroying org. material by  $\text{O}_2$  (*C. A.* 18, 2726), R. modified this procedure. A pyrex tube  $40 \times 3.5$  cm. is joined to a  $40 \times 1.5$ -cm. tube, which is bent around into a KOH absorption tube (2 cc. 1:1 KOH soln. + 50 mg.  $\text{NaHSO}_3$  in 80 cc. water). The two tubes lie in a gas furnace. A Ni boat in the first part of the wide one contains the material; the second part is heated.  $\text{O}_2$  is passed into it directed to the far side of the boat, the material is ignited by an alcohol flame. The gases are sucked off by a water-jet pump after passing the KOH absorption flask, a cotton wool filter, a filter-paper gas filter and a ten-bulb inclined absorption tube filled with KOH-bisulfite mixt. The  $\text{O}_2$  stream is regulated so as to prevent smoke from coming out of the open end of the tube. After complete combustion, the cotton wool and the paper filter are burned in the boat, the absorption liquids are evapd. in a Pt dish, and the ashes mixed with hot dil.  $\text{K}_2\text{CO}_3$  (ground and filtered) are added to it. After slight ignition to burn the C, the dry mass is extd. with EtOH 3 times, dissolved in water, evapd. and extd. with EtOH a fourth time; the total ext. is evapd. with water and 10 drops  $\text{K}_2\text{CO}_3$  soln. and ignited. Again the salt is extd. 4 times with EtOH, and the ext. evapd. and treated either by titration or colorimetry. For the colorimetric detn. the ext. is dissolved in 10 cc. water, 5 mg.  $\text{NaN}_3$  added, acidified with bisulfite-sulfuric acid to a noticeable odor of  $\text{HN}_3$ , then made alk. with  $\text{K}_2\text{CO}_3$ , evapd., ignited and extd. as before and evapd. The residue is dissolved in 0.50 cc. water; 0.20 cc. of the soln. is taken up in a pipet  $65 \times 3.2$  mm.,  $\text{I}_2$  is liberated by a drop of nitrite- $\text{H}_2\text{SO}_4$  and shaken with 0.01 cc.  $\text{CS}_2$ . The resultant color is compared with that of standards with O up to 0.5  $\gamma$  iodine prepd. in similar way. From a no. of analyses the accuracy of the method is shown; in milk, milk powder and flour the iodine addns. could be detected to about 95% and better. B. J. C. v. d. H.

**Method for the quantitative analysis of tin in organic compounds.** HENRY GILMAN and W. BERNARD KING. Iowa State Coll. *J. Am. Chem. Soc.* 51, 1213-5(1929).—The organo-tin compd. is treated with a 4%  $\text{Br-CCl}_4$  soln. with cooling and the decompn. product is then oxidized with  $\text{HNO}_3$ - $\text{H}_2\text{SO}_4$  to stannic acid. C. J. WEST

**Problems in the estimation of unsaturated hydrocarbons in gases.** HAROLD S. DAVIS. M. I. T. *Ind. Eng. Chem., Anal. Ed.* 1, 61-4(1929).—A chart is shown giving the atm. b. ps. of all of the known hydrocarbons which are gaseous at ordinary temps. A fractionating column is described which is composed of a narrow glass spiral surrounded by a silvered vacuum jacket in which liquefied gases can be fractionated almost as easily as ordinary liquids. M. C. ROGERS

**A rapid method for the precise estimation of alcohol.** WM. L. O. WHALEY. *Planter & Sugar Mfr.* 81, 321-3(1928).—Alc. is detd. by the lowering of the b. p. of its aq. soln. with the Juerst ebulliometer. Analysis of samples before and after addn. of known

ordinary analytical skill and cleanliness the b.-p. method is desirable. J. F. BREWSTER  
ples can be analyzed in about 3 hrs.

The iodometric determination of thiosemicarbazide. A. GAFFRE, Faculté de pharm. de Paris. *Ann. fals.* 22, 90-3(1929).—In iodometric detn. thiosemicarbazide was found to react like its two associated components, HCNS and  $(\text{NH}_2)_2$ . In the presence of  $\text{NaHCO}_3$ , after allowing to react for a sufficient length of time (at least 8 hrs.), on acidification each mol. of thiosemicarbazide requires 10 atoms of I; before acidification ICN is formed, but it is decomposed in acid soln. with regeneration of 2 atoms of I. In the presence of NaOH, after allowing to react for a sufficient length of time (at least 30 mins.), on titrating after acidification each mol. of thiosemicarbazide requires 12 atoms of I.

Note on the determination of tryptophan by means of *p*-dimethylaminobenzaldehyde. WILLIAM J. BOYD. *Biochem. J.* 23, 78-82(1929).—The method for tryptophan proposed by May and Rose (*C. A.* 17, 116) may give rise to errors because of unequal illumination of the reacting mixts., and because of the presence of reducing substances, such as  $\text{H}_2\text{S}$  or aldehydes.

Detection of lignified membranes by means of cobalthiocyanate. W. FEYER. *Apoth. Ztg.* 44, 334(1929).—This reagent (prepd. by the addn. of 9 g.  $\text{Co}(\text{NO}_3)_2$  crystals in 6 g.  $\text{H}_2\text{O}$  to 2.5 g. KSCN in 2.5 g.  $\text{H}_2\text{O}$ ) is more sensitive in testing cellular membranes for woody fiber than phloroglucinol-HCl.

Visual conductance titration of protocatechuic aldehyde and its monoalkyl ethers. O. PFUNDT AND C. JUNGE, Univ. Göttingen. *Ber.* 62B, 515-8(1929); cf. *C. A.* 23, 1363. —The Wheatstone bridge and telephone were replaced by a vacuum thermocouple and a mirror galvanometer. Protocatechuic aldehyde, vanillin, isovanillin, bourbonal and isobourbonal were titrated conductometrically. LiOH was used in place of NaOH.

FRANK URBAN

A new isomorphous series of F compounds [useful in analysis] (CARON, VAN-BOCKSTAEL) 6. Desicchlora (anhydrous Ba chloride-Smith). II. Experiments in its use as an economical drying agent and  $\text{NH}_3$  absorbent (SMITH) 2. Indirect analysis of a chemical compound present as solid phase in a 2-phase system (WEITZ) 2.

## 8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY AND J. F. SCHAIRER

Magnetic properties of some Swedish magnetites. GUST. G. BRING. *Jernkontorets Ann.* 82, 415-38(1927).—Magnetization curves are given. A. DROGNETH

Studies on hydrated aluminum silicates. I. The rehydration of metakaolin and the synthesis of kaolin. C. J. VAN NIEUWENBURG AND H. A. J. PIETRS. *Tech. Univ. Lab. for Analytical Chem. Delft. Rec. trav. chim.* 48, 27-36(1929).—A very pure sample of unburnt Zettlitz clay whose analysis was very close to the theoretical,  $2\text{SiO}_2 \cdot \text{Al}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$ , showed a loss in wt. when subjected to steam pressures of 50-125 atm. The rehydration of this clay after burning at various temps. was detd. in an autoclave. The real break in the curve occurs between  $1000^\circ$  and  $1050^\circ$ , the water content dropping from 11.0 to 3.0%. N. and P. claim a slight and sudden decrease at  $550^\circ$ - $600^\circ$  which continues from  $800^\circ$  to  $1300^\circ$ . Other clays showed similar results, with the exception of Neurode "pholerite" which when dehydrated below  $900^\circ$  took up 16.3% moisture. Alumina made by ignition of  $\text{Al}(\text{NO}_3)_3$  at  $1000^\circ$  absorbed 16.7-17.4%  $\text{H}_2\text{O}$ ; pptd. alumina ignited at  $950^\circ$  absorbed 16-17% moisture. Cryst.  $\text{SiO}_2$  absorbed no  $\text{H}_2\text{O}$ ; ignited silicas from silicates and from  $\text{SiCl}_4$  absorbed a max. of 5%  $\text{H}_2\text{O}$ . Artificial mixts. of  $\text{SiO}_2$  and  $\text{Al}_2\text{O}_3$  in the ratio of 2:1 absorbed only 10.5-11%  $\text{H}_2\text{O}$ . Metakaolin can thus not be considered as a mixture of alumina and silica. Kaolin was synthesized by heating under pressures of 200-260 atm. and the product pptd. from soln.; it contained silica and alumina in the ratio of 2:1. The phys. properties including the  $n$  agreed with the data for kaolin.

A pink kaolin, and ruthenium as a minor constituent of the Tanokami kaolins. SATOYASU IMORI AND JUN YOSHIMURA. *Inst. Phys. and Chem. Research, Tokyo. Bull. Chem. Soc. Japan* 4, 1-15(1929).—A description of a pink clay found in weathered granite. The rare earth content was 0.67% and included chiefly Yt. while traces of La, Dy, Nd, Sc, Ce, Yb and Tm were also present. The analysis agreed with a compn.

ARTHUR FLEISCHER

$2\text{Al}_2\text{O}_3 \cdot 7\text{SiO}_2 \cdot 7\text{H}_2\text{O}$ . The mineral is considered as a new species and is named *takisolite*. The x-ray absorption corresponds to the presence of an element 44 or 43 as minor constituent: in general pink kaolin gave results closer to 44 (Ru) than did green kaolin. The arc spectrum gave lines corresponding to Ru and Rh. A faint rhodanate reaction for Ru was obtained. Also in *Sci. Papers Inst. Phys. Chem. Research* (Tokyo) 10, 224-8 (1929).  
ALBERT L. HEWNE

The structure of crystalline uraninite from Belgian Congo. ASSAR HADDING AND RENÉ VAN AUBEL. *Compt. rend.* 188, 716-7(1929).—The specimens of uraninite were studied by the x-ray powder method and found to possess a face-centered cubic lattice, with  $a_0 = 4.67$  Å. U.  
H. W. WALKER

The significance of phosphorus content in explaining the formation of fusain. F. BÜCHLER. *Glückauf* 65, 161-4(1929).—B. reviews the most important previous results of research on the fusain question and gives original detns. of the P content of fusain. According to these the occurrence of phosphates in products of "coalification" is not due to accidental later deposits, but to the process and extent of "coalification." B. concludes that the P content is also significant for the explanation of the origin of coal. Phosphates are absent if (1) the "incoaling" process has led to the formation of humic acids (durain and vitrain), and (2) sufficient  $\text{H}_2\text{SO}_4$  has been liberated to dissolve the phosphates. The presence of phosphoric acid in fusain indicates a condition of equil. during its formation, whereby the  $\text{H}_2\text{S}$  was sufficient to prevent humic acid formation. From the association of fusain with primarily formed pyrite it may be concluded that the formation of fusain does not depend on outer conditions but results from the reducing medium created by the decompn. of the org. material itself.  
J. B. SHOHAN

Fushun coal and its geological significance. CHOZO IWASAKI. *Tech. Repts. Tohoku Imp. Univ.* 8, 99-126(1928); *Fuel in Science & Practice* 8, 133-43(1929).—The Fushun coal bed extends 13.5 km. east and west near Mukden, Manchuria. Its deposition probably occurred in the Eocene. This coal thickens from 9 m. at the eastern end to 100 m. at the western end of the bed. A higher fuel ratio and coking properties characterize the eastern coal. The western coal is non-coking. Kabary, belonging to the cannel coal series, and amber rock, coal rich in resin, ash and fusain, both occur in layers. Bright coal predominates in the east, dull coal increasing towards the west. Plant tissues are well preserved. Spores, arc-structure, cork, seed coat, cuticle, reticulated bodies and fusain are clearly observed in the coal of the central divisions.  
D. A. REYNOLDS

The microstructure of New Zealand lignites. W. P. EVANS. *Fuel in Science & Practice* 8, 54-8(1929); cf. *C. A.* 22, 1305, 4767.—E. concludes that the lignite-forming debris was not deposited *in situ*, and that the greater portion of it consisted of fragments of forest trees together with a few spores. The slight change in the org. S content of the coal as noted on passing through the seams towards the dolerite appears to indicate that the processes of coal formation were already far advanced before the intrusion of the dike folded and squeezed out the seams.  
D. A. REYNOLDS

The theory of petroleum formation. II. Composition of primary tars of Mata-y boghead coal. G. L. STADN'KOV AND Z. VOZZHINSKA. *Brennstoff-Chem.* 9, 100-1(1928).—Acids formed by oxidation of the individual fractions of a boghead coal-tar with  $\text{KMnO}_4$  were studied. They were found to be members of the fatty acid series from  $\text{C}_4$  to  $\text{C}_{21}$ . The original tar oils are, therefore, mainly of the paraffin series. The high-boiling tar fractions contain appreciable amts. of free acids and saponifiable anhydrides. On distn. of boghead coal acids and anhydrides are first formed and these then mostly decompose, forming oils, but part of them volatilize with the gases and vapors without decompn. It is concluded that boghead coal consists mainly of highly polymerized fatty acids, their esters and anhydrides.  
J. D. DAVIS

The presence of a variety of jumillite in the neighborhood of Calasparra, Province of Murcia. E. JÉRÉMINE AND P. FALLOT. *Compt. rend.* 188, 800-2(1929).—Chem. and mineralogical examn. of a rock from this locality classes it with jumillite, hitherto found only in the Spanish peninsula. The structure of the rock is described. J. F.

Lithology of the Carboniferous limestones of the Donetz basin. V. A. ZILBERMINTZ AND V. P. MASLOV. *Trans. Inst. Econ. Mineral. Met.* (Moscow) No. 35, 212 pp. (1928).—Chem. and microscopical examn. was made of Carboniferous limestones collected in different localities of the Donetz basin. The limestones were divided into the following types according to the percentage of org. remains as detd. by the microscope: detrital, muddy, algal and foraminiferal. The distribution of these types of org. remains in the basin is characteristic. The fact that the latter prevail in the northwest part of the basin is taken to be connected with a shallow bottom of this part of the Carboniferous sea. The first two types of limestone are distributed equally throughout

the basin; the third is present chiefly in the central region; and the fourth is found exclusively in the northern part. The presence of the muddy limestone is taken to indicate a shallow sea bottom, while the algal type, with very little insol. residue and small % of org. remains, indicates a deeper sea. Quant. analysis of 90 samples showed uniform chem. compn. of the limestones, with some running high in Mg. High content of  $P_2O_5$  was found to be associated with high insol. residue. J. FLEISCHER

History and metallurgy of Pt (ACKERMAN) 9. The relationship between the various forms of  $CaSO_4$  at high temperatures (LASHCHENKO, KOMPANSKII) 2. The principles determining the structure of complex ionic crystals (PAULING) 2. The preparation of large crystals of chrome-alum and interpretation of some etch-figures (ROHRMAN, TAYLOR) 2. The structure of diopside,  $CaMg(SiO_3)_2$  (WARREN, BRAGG) 2.

REIFENBERG, A.: Die Entstehung der Mediterran-Roterde (Terra Rossa). Ein Beitrag zur angewandten Kolloidchemie. Dresden and Leipzig: Verlag von Theodor Steinkopff. 94 pp. M. 5.

Structure of Typical American Oil Fields. A Symposium on the Relation of Oil Accumulation to Structure. Vol. I. Tulsa, Okla.; Amer. Assoc. Petroleum Geologists. 510 pp. \$5. Reviewed in *Econ. Geol.* 24, 339(1929).

## 9—METALLURGY AND METALLOGRAPHY

D. J. DEMOREST, R. H. ABORN

The function and organization of the metallurgical research department in large iron and steel plants. J. WELTER. *Rev. métal.* 26, 119-30(1929).—A general discussion of the considerations which should be taken into account in organizing a truly scientific research department and of its operation and function in a large modern plant, based on W.'s experience in such a department of a large plant in Lorraine. A. P.-C.

Present status of the metallurgy of lead. M. FOURMENT. *Rev. métal.* 26, 154-67 (1929).—A review. A. PAPINEAU-COUTURE

History and metallurgy of platinum. C. A. ACKERMAN. *The Mining J. (Arizona)* 12, 9, 57-8(1929).—Recent reports of the discovery of Pt have created greater interest in the history, mineralogy and metallurgy of Pt. E. M. SYMMES

Recent processes in the metallurgy of lead-tin and lead-antimony alloys. FRIEDRICH VOGEL. *Metallbörse* 18, 2161-2, 2273-4(1928).—Making Pb-Sn and Pb-Sb alloys often involves the working up of wastes and intermediate products from other industries rather than the direct smelting of ores to produce them. In processes for the recovery of these metals Cu may be looked upon as a valuable product, but As and Zn are considered as waste. Reduction in a blast or reverberatory furnace is used to give an alloy free from most impurities; attempts to effect a direct sepn. of Pb and Cu from Sn and Sb by a fusion with soda and S, or with  $Na_2SO_4$  and C, have not been successful commercially. The conversion of Sn and Sb into sol. stannates and antimonates by fusion with NaOH, etc., has not worked out well. But by smelting carefully, especially with attention to temps. maintained in the furnace and to "impregnating" with the eutectic desired, valuable alloys of Pb-Sn or Pb-Sb can be sepd. from the charge. If S be stirred into a bath of the metals Cu and Sn change quickly into sulfides, while Pb and Sb remain as an alloy. The Cu-Sn mat is roasted, the Cu changed to  $CuSO_4$ , which is then sepd. from the Sn residue, and the latter briquetted and smelted for pure Sn. Vaporization of the various metals as such, as oxides, sulfides or chlorides, perhaps with the aid of the elec. furnace, is suggested as a means of sepg. them. Cu contg. Sn, Pb or Sb can be added to the charge of a Cu converter; the fume is collected by the Cottrell process, but the method is not very successful commercially. More promising are electrolytic processes employing suitable electrolytes. The whole field still requires intensive investigation to develop really satisfactory methods of operation. W. C. E.

Coarse sand flotation classification and table concentration. A. W. FAHRENWALD AND CLARENCE THOM. *Bur. Mines, Repts. of Investigations* No. 2921, 7 pp.(1929).—The process described is applicable to simple ores comprising a single mineral to be recovered which is liberated wholly or to a large degree from the gang minerals at relatively coarse comminution. Flotation removes the fine and intermediate-sized mineral grains and the flotation tail is subjected to classification. The classifier sand is tailed with products of coarse mineral, middling and a coarse tail. The coarse mineral is generally cleaned on a second table and the middling is ground and returned to the

flotation machine. Tables show some metallurgical data on the treatment of Michigan amygdaloid Cu ores, also data on unclassified table feed from a Missouri plant treating a Pb ore. Comparison in the latter case with the conventional process favors the new treatment. The paper emphasizes the effectiveness of the new process in making low tailings at coarse grinds.

W. H. BOYNTON

**The microscopic composition and structure of different pretreated Thomas slags and their relation to citric acid solubility.** HANS SCHNEIDERHÖHN. Mineral. Inst. Univ. Freiburg. *Mitt. Kaiser-Wilhelm Inst. Eisenforsch. Düsseldorf* 10, 213-23 (1928).—Thomas slag was examd. in 3 different states of cooling, both with and without the addn. of silicic acid. The microscopically recognizable constituents of the mixt. were ascertained and noted. The structure and the texture of the individual samples were described and genetically explained. Tempering investigations showed that no decompn. occurred and that the existing parts of the mixt. are conceived as states of equil. which correspond to the concn. of substances concerned. Only the grain size of the samples without the addn. of silicic acid was essentially increased by the temper. In order to establish the nature of the parts of the mixt. suitable, soly. expts. were conducted and the sol. constituents analyzed. In the samples investigated the following parts of the mixt. were ascertained: *silicocarnotite*,  $5 \text{ CaO} \cdot \text{P}_2\text{O}_5 \cdot \text{SiO}_2$ , crystd. oxide of Ca, Mg,  $\text{Fe}^{++}$ ,  $\text{Fe}^{+++}$  and Al, as well as compds. and mixed crystals of these oxides, and finally (but only in samples without silicic acid added) *hilgenstockite*,  $4 \text{ CaO} \cdot \text{P}_2\text{O}_5$ . As the cause of the unequal citric acid soly. of the slags with and without silicic acid added is recognized first of all the presence of sol. Ca compds. in the samples without addn., whereby the soly. of silicocarnotite was repressed, while the dissimilar ions going into soln. in the sample with addn. increased the soly. of the silicocarnotite. The subsequent process for the detn. of the so-called free Ca in Thomas slag produced questionable results and is useless. A sepn. of the Ca combined with the various constituents of the mixt. from one another by chem. means is not possible. The decompn. phenomena are shown in the most rapidly cooled samples without addn. of silicic acid. Since carbonates can be detected in appreciable amts. with the microscope, the decompn. is due to the hydration and carbonization of the crystallized lime. Fifteen illustrations are given.

E. F. SNYDER

**Fusibilities of iron oxide-calcium oxide mixtures.** L. JACQUÉ. *Compt. rend.* 188, 917-9 (1929).—The methods used by previous investigators for establishing the equil. diagram for the system  $\text{CaO} \cdot \text{Fe}_2\text{O}_3$  are open to criticism when applied to the formation of slags in industrial processes because they attempted to prevent the formation of FeO and thus deviated from actual conditions of slag formation. The tests were carried out in a gas-fired furnace, heating 2 concentric tubes; this permitted a very regular temp. distribution along the interior tube and control of the furnace atm. The temp. of the sample could be controlled to within  $10^\circ$  at any temp. between  $1200^\circ$  and  $1500^\circ$ . When temp. equil. was reached the sample was introduced into the central zone of the tube very close to the junction of a well calibrated thermocouple. An optical pyrometer was used at the same time. The temp. was recorded when the first clear signs of fusion were found. The following data were obtained.

CaO, %	0	5	10	20	26	30	40	50	60	70
$\text{Fe}_2\text{O}_3$ , %	100	95	90	80	74	70	60	50	40	30
Temp. $> 1500^\circ$	1455'	1290	1230'	1220'	1220'	1245'	1370'	1430'	$> 1500^\circ$	

By holding at the temps. where fusion begins the sample is totally fused because a portion of the  $\text{Fe}_2\text{O}_3$  is dissocd. to form FeO and the fusion point is lowered. The lowering of the temp. of incipient fusion is directly related to the content of FeO found in the resulting slag. The following data were obtained:

Initial mixt.	30% CaO-70% $\text{Fe}_2\text{O}_3$			50% CaO-50% $\text{Fe}_2\text{O}_3$		
	(a)	(b)	(c)	(a)	(b)	(c)
% FeO after fusion	2.08	13.6	21.8	0.7	6.0	13.6
$\text{Fe}_2\text{O}_3:\text{FeO}$	33	4.8	2.15	70	7	2.7
Temp.	1230°	1220°	1170°	1415°	1370°	1350°

(a) oxidizing atm., (b) neutral atm., (c) prolonged heating. The ratio of  $\text{Fe}_2\text{O}_3$  to FeO seems to approach a value of 2.22 upon prolonged heating and the ratio of 2.22 corresponds to  $\text{Fe}_3\text{O}_4$ .

A. J. MONACK

**The reduction of fused silicates by oxides of carbon; the silicates of copper.** B. BOGRTCH. *Compt. rend.* 188, 633-5 (1929); cf. C. A. 22, 3118.—Mixts. of Cu and Na silicates, fused at  $1350\text{--}1400^\circ$ , change color on increasing the CO content of an imping-

ing gas from blue to green at 2.5%, to pale green at 4%, to opaque brick red at 11.5%, to transparent blood red at 21.5%, and finally to practically complete reduction at 26% CO. F. O. A.

The reduction of steel-works' costs by means of waste-heat boilers. J. ADAMSON AND F. JONES. *Proc. Inst. Mech. Eng.* (London) 1928, 453-63.—Details of various types of boilers are discussed. To enable the evaporative duty of any waste-heat boiler to be approx. estd., the following formula may be used:  $E = W/4080 (1 + 180/P) (t_1 - t_2)$ , where  $E$  = evapn. in lbs. per hr. from and at 212°F.,  $W$  = coal burnt per hr. per lb.,  $P$  = percentage of CO<sub>2</sub> by vol. in waste gases,  $t_1$  = temp. of gases entering waste-heat boiler, °F.,  $t_2$  = temp. of gases leaving waste-heat boiler, °F., usually 420° to 450°F. Three typical boilers installed on open-hearth furnaces, soaking pits and reheating furnaces, resp., show net annual returns of 58.5%, 74.6% and 85% on capital outlay. D. GORDON.

Evaluation of silver-containing wastes. HERBERT KURREIN. *Metallwirtschaft* 8, 205-8(1929).—Much information is given about wastes contg. Ag and methods for recovering Ag from these wastes. Ag wastes may be divided into two classes: (1) waste contg. metallic Ag (from silverware manuf., electroplating, gold and silversmiths); (2) wastes contg. Ag as insol. or sol. Ag salts (from photographic, chemical, pharmaceutical, film and mirror-making industries). E. G. R. ARDAGH.

The physics of charging zinc furnaces. A. ROITZHEIM. *Metallbörse* 18, 1993-4, 2049-50(1928).—Since Zn furnaces of the muffle or retort variety have their charges in a state of rest, rather than in motion as is the case with blast, reverberatory and other types of furnaces; have relatively small vols. of ore and fuel per charge; and have their rates of operation detd. by the conditions of the reaction  $n \text{ CO} + \text{CO}_2 + \text{C} = (n + 2) \text{ CO}$  and the equil. of the phase Zn·CO·CO<sub>2</sub>, it follows that briquetting or compressing the charge is not favorable, nor is the use of large particles of ore or fuel recommended, if max. efficiency is desired. There is needed a charge of fine-grained material, porous, yet with min. spaces between the particles; as the fuel tends to fill the spaces between the ore itself such porosity must be gained in another way, the simplest being by having the charge sufficiently moist in the first place so that the expulsion of steam leaves passages for the reducing gases to penetrate the mass. Ordinarily 10-12% by vol. of H<sub>2</sub>O added is enough. The amt. of fuel added is always more than that required for the reduction of the ore, and this excess also makes the mass remain porous, even though partial sintering may take place at the temps. used, i. e., up to 1300°. W. C. EBAUGH.

Mechanical strength and plasticity of metal crystals. E. SCHMID. *Metallwirtschaft* 7, 1011-5(1928); cf. C. A. 23, 1375.—The mech. properties of metal crystals are discussed, with particular reference to Zn, Cd, Bi and Te. The significance of mech. twin formation is considered. H. STORITZ.

The fatigue of metals. D. HANSON. *Proc. Staffordshire Iron and Steel Inst.* 42, 13-22(1926-27).—A lecture in which the theories of fatigue are discussed and a theory of fracture is formulated. DOWNS SCHAAF.

Recrystallization of metals. ULRICH DEHLINGER. Stuttgart. *Metallwirtschaft* 7, 1172-6(1928).—The mechanism and the theory of recrystn. are discussed. H. S.

Recrystallization of metals. G. SACHS. *Metallwirtschaft* 7, 1295-7(1928).—Recrystn. in metals and alloys is discussed with some attention to theoretical aspects. H. STORITZ.

The thermal improvement of heavy metals (copper, nickel, iron). P. SCHWERBER. *Metallwirtschaft* 7, 340-4(1928).—This is a brief survey of structural changes produced in steel by heat treatment; improvement in the phys. properties of Al by the addn. of alloying constituents; the hardening of steel compared to the age hardening of Al; the effect of small quantities of Ni<sub>2</sub>Si, Cr<sub>2</sub>Si, CoSi and FeSi in Cu; the effect of Mg in Cu alloys; and increasing the hardness of Be-Ni and Be-Co alloys by heat treatment. Sixteen references are cited. J. W. W. S.

High-speed cutting metals. G. J. WEISSENBERG. Berlin. *Metallwirtschaft* 7, 1031-6(1928); cf. C. A. 19, 2020; 20, 3149.—A review of the developments and properties of steels and non-ferrous alloys for use in high-speed cutting tools. *Stellite* and similar alloys such as *akrit*, *celsit* and *tizite*, as well as metallic carbides of the type of *volumit* and *widia* are discussed. H. STORITZ.

Testing of metals with x-rays. R. GLOCKER. *Metallwirtschaft* 7, 373-9(1928).—A review of the various methods by which x-rays are applied to the study of metals. Radiography, spectrum analysis and diffraction methods are discussed. A. J. KING.

The spectroscopic examination of the solution of metallic alloys and Tammann's

resistance boundaries. WALTHER GERLACH. *Z. anorg. allgem. Chem.* 179, 111-2 (1929).—In etching Au with  $\text{HNO}_3$  impurities of Pb, Cu and Ag were revealed at the grain boundaries. Hot concd.  $\text{HNO}_3$  dissolves out the Cu and Pb from the boundaries, but does not attack the Ag, which is "protected" by the Au. Further tests show that Ag and Cu, when alloyed with Au, are unattacked by  $\text{HNO}_3$ , except when Pb is present to alloy with the Cu. It seems that the spectroscopic examn. is a suitable exptl. method for the investigation of alloys.

FRANK V. JOHNSON JR.

Application of Herbert's hardness pendulum to the determination of surface hardness on the inside of cylindrical borings. O. SCHLIPPE. Berlin. *Metallwirtschaft* 7, 1130-4 (1928).—S. modifies Herbert's hardness pendulum so that the hardness of the inner surface of cylindrical borings can be detd. The app. is calibrated against standards, the hardness of which had been previously detd. in the usual form of Herbert's pendulum by the Kaiser Wilhelm Inst. for Iron Research. Fairly good agreement is obtained. Thus, the time hardness no. obtained on glass by the usual method is 100 and by the modified method 100.6. These values are as follows on various materials, the time hardness no. detd. by the usual method being given first: Al, 9.1, 9.0; Zn, 13.3, 11.0; brass, 20.8, 19.4; C steel, 23.1, 24.9; C steel, 27.6, 29.9; Mn steel, 38.2, 40.6; razor blade, 75, 78. By the time hardness no. is understood the time in secs. for 10 oscillations of the pendulum. Some measurements on cylindrical borings are given and show that as the diam. of the ball is increased the value obtained for hardness increases. H. S.

Causes of shaft failures in cane mills. N. A. HELMER. *Facts About Sugar* 24, 113 (1929).—H. criticises Scharnberg's article (*C. A.* 23, 1089).

M. J. PROFFITT

More about mill roll shaft failures. H. J. B. SCHARNBERG. *Facts About Sugar* 24, 326-31 (1929); cf. *C. A.* 23, 1089 and preceding abstract.—S. replies to Helmer's criticism of his previous article on cane mill roll shaft failures and presents some further data, illustrated with 3 figures, on the mech. details involved.

M. J. PROFFITT

Sulfur in electrolytic iron and its removal. KAZU-HIKO OMA. *Bull. Inst. Phys. Chem. Research Tokyo* 8, 126-30 (1929); *Abstract Ed.* 2, 19-20.—Electrolytic Fe deposited from a ferrous  $\text{NH}_4$  sulfate bath contains 0.001% S as sulfide and 0.02-0.03% S as sulfate. The former is derived from the anodic material and the latter from the electrolyte. When the Fe is treated at high temp., annealed or fused, most of the sulfate is reduced to the sulfide state or even to  $\text{H}_2\text{S}$ . The S removal is accomplished by heating above  $800^\circ$  in a H atm. The rate of desulfurization is a function of time, temp. and grain size. By heating Fe powder (50 mesh) 2 hrs. at  $800^\circ$ , 0.013% of the S was removed, and 0.028% at  $950^\circ$ . Heating the same powder at  $900^\circ$  removes 0.027% S after 2 hrs. and 0.030% after 4 hrs. By heating 50-mesh powder at  $950^\circ$  for 2 hrs., 0.028% S was removed; the same treatment on 30-mesh powder removes only 0.020%, and 0.012% with 5 mm. blocks.

ALBERT L. HENNE

Heat treatment and properties of cast iron. P. SCHOENMAKER. *Heat Treating and Forging* 15, 170-3 (1929).—See *C. A.* 23, 1852.

J. BALOZIAN

Contributions to the growth of gray cast iron with regard to the elements nickel and chromium. F. PIWOWARSKY AND WALTER FREYTAG. Tech. Hochschule, Aachen. *Die Giesserei* 15, 1193-1200 (1928); cf. *C. A.* 23, 1852.—The influence of Ni and Cr on the growth of gray cast Fe (I) was investigated. Both Ni and Cr favor growth. Ni hardens the ground mass by sorbite formation, this action being less pronounced with 2% or over Si content and with decreasing  $\text{Fe}_3\text{C}$ . Only in fusions with 5-6% Ni could a slight coarsening of the graphite be detected. A satisfactory influence of overheating (graphite refinement) on growth could be detected only when the melt is held at the highest temp. for a period of time. Shaking causes no marked lessening of growth. The length and wt. changes of specimens (even with high Cr) contg. fine flaky to eutectic graphite are considerably greater than those having graphite similar to fine temper C. Specimens prepd. in a vacuum (because of higher d. and lower gas content) show a smaller increase in wt. than those prepd. in a moderate amt. of air. Ni (or Ni and Cr) favorably influences the increase in wt. of cast Fe, while specimens contg. graphite of the character of temper C show the least. Growth in a steam current is very small at  $450^\circ$ , but is considerable at  $550^\circ$  (here all specimens show an increase in length). The expts. in the steam show clearly the favorable influence of overheating on the vol. sta-

J. BALOZIAN

the Si content is steeper than that calcd. from Köttschke and Piwowarsky (*Arch. Eisenhüttenw.*, 2, 333(1928)). The action of  $\text{HNO}_3$  (1%) is not as great as that of  $\text{AcOH}$ , probably because of passivity. In cast Fe, Cu is a difficultly sol. substance. J. B.

The present status of electric-furnace irons. W. SCHRECK. *Gießerei Ztg.* 26, 29-36(1929).—An "A E G" elec. furnace is used (a) to heat-treat cupola cast irons, and (b) to remelt cast iron and steel scrap under a basic carbide slag. The furnace and auxiliary app. are described in detail and illustrated. Four micrographs show the structure of 2 cast irons before and after heat treatment. One set of 24 remelted elec.-furnace irons has the following range of compn.: 2.5-4.0% C, 1.0-3.6 Si, 0.35-0.87 Mn, and in 1 case 2.0 Ni, and in 2 cases 2.0 and 4.0 Cr. The transverse breaking loads of these irons in bar form, 20 millimeters in diam. and 400 millimeters between supports, vary from 186 to 631 kg. A second set of 10 irons has the following compn.: 2.9-3.2% C, 0.9-1.8 Si, 0.50-0.95 Mn. The transverse breaking loads of these irons for the same size of specimen vary from 414 to 648 kg. The first set is designated as "worked" and the second as "unworked." A third set of 20 irons designated as "worked" has the following compn.: 2.8-3.2% C, 0.95-1.2 Si, 0.48-0.81 Mn. The transverse breaking loads of this set, for specimens 30 millimeters in diam. and 600 millimeters between supports, vary from 961 to 1295 kg. The influence of C plus Si content on the strength of cast irons of Mn contents of 0.35-0.45 and 0.5-0.95% is presented in graphical form. The log of 15 elec. furnace heats is given. The log includes cold cast iron and steel addns., hot addns., initial analysis of the heat, time of working the heat, furnace addns., type of slag, power consumption, transverse strength, and deflection at ultimate load.

JOHN W. W. SULLIVAN

Investigations on the pickling of steel sheets of low carbon content. PETER BARDEHEUER AND GUSTAV THANHEISER. *Mitt. Kaiser-Wilhelm-Inst. Eisenforsch., Düsseldorf* 10, 323-42(1928).—The blisters formed on sheet steel during pickling are due to the diffusion of H into the metal, where it tends to collect around included materials, such as slag until it develops very high pressures. Thus when H is evolved electrolytically on the outside of a heavy steel cylinder, it may diffuse through the wall and develop pressures up to 300 atms. The app. used in these investigations consisted of two steel bell jars pressed together over a piece of sheet steel. H was evolved by HCl and  $\text{H}_2\text{SO}_4$  poured in over the sheet and the rate of diffusion through the sheet measured by the displacement of mercury on the other side of the sheet. With increased temp. the amt. of H diffused per hr. increased but the proportion diffused became smaller. With increasing concn. of  $\text{H}_2\text{SO}_4$  up to 700 g. per l. the amt. of diffusion per hr. increased and then fell rapidly. In the concn. range ordinarily used for pickling the proportion of H diffused to that evolved decreases with increase in concn. With HCl the amt. of diffused and evolved H is considerably less than with  $\text{H}_2\text{SO}_4$ . Sheets of metal contg. gas bubbles before pickling are particularly prone to develop blisters during pickling. Consequently a high rolling temp. is desirable in preventing blisters. It is also desirable to pickle sensitive material in such a way as to permit only small quantities of H to come in contact with the metal. Heat, concd. acids, and acid inhibitors bring about this condition.

HANS C. DUUS

Influence of the rolling and annealing temperature on the hardness and structure of cold-rolled low-carbon ingot steel. ANTON POMP AND SIEGFRIED WEICHERT. *Mitt. Kaiser-Wilhelm-Inst. Eisenforsch., Düsseldorf* 10, 301-16(1928).—Samples of steel bands  $28 \times 2$  mm. with 0.08% C were rolled at temps. varying from  $-70^\circ$  to  $500^\circ$ . The samples were then heated for 3 hrs. at temps. varying from 100 to  $900^\circ$ . With increased rolling the tensile strength and hardness increased, while the dilatation and depth decreased. The structure likewise appeared more stretched. The structure was not influenced by heating but the hardness and tensile strength increased as the rolling temp. was increased. No change in the grain was noted below annealing temp. of  $600^\circ$ , but the mech. properties changed markedly before any change in grain was noticed. Numerous charts and photomicrographs are given.

HANS C. DUUS

Stability of steels at high temperatures. CLAUDE E. CLARKE AND ALBERT E. WHITE. Univ. of Mich. Dept. of Eng. Research, *Bull.* 11; *Heat Treating and Forging* 15, 190-5(1929).—No math. relation could be detd. between long-time creep and short-time tensile tests (made on 0.13% and 0.38% C steels) above the eutectic ( $e-c$ ) temp., while at or below it a limiting creep stress exists which lies either at or above the proportional limit. In detg. the factors affecting the stability of metals at elevated temps., the temps. above and below the  $e-c$  temp. must be considered. Below this, stability may be attained by the formation of a substance which (1) does not enter into solid soln. with the matrix, but interferes with the cryst. slippage, (2) tends to increase the amorphous material between the grains; (3) strengthens the amorphous



boundaries by interfering with plastic flow. The most accurate relation which could be detd. between the stress and time in long-time tests is  $v = ax^b$ , where  $x$  = duration in hrs.,  $v$  = stress in lb./sq. in.,  $a$  and  $b$  = const. J. BALOZIAN

**Mechanical characteristics of soft steel at elevated temperatures.** S. SHISHCHENKO. *Azerbejdj. Neftyanoe Khozyaistvo* No. 10, 71-6(1928).—Investigations conducted in connection with the explosion in the cracking plant built by Vickers, Ltd., indicated that the coil made from soft steel was weakened by high temp., decreasing the safety margin to 1.76 at a temp. of 620° and a pressure of 47.7 atm. The inner lining of metallic Al did not stand the stress and became cracked in the course of the operation. Analysis of the tube gave: C, 0.156%, Mn 0.47%, Si traces, P 0.026%, and S 0.026%. The outer diam. of the tubes was 43 mm. and the inner, 32.4 mm. Various tests were made on new tubes, as well as analyses of the coke deposited in the damaged tube.

A. A. BOERTLINGK

**The tempering of austenitic steels.** ANDRÉ MICHEL and PIERRE BENAZET. *Compt. rend.* 188, 912-5(1929).—Special steels retained in the austenitic state by quenching may show two different types of effect on tempering: (1) A strong dilation and large recalcence at a certain temp., giving the properties of alpha Fe on cooling; or (2) a gradual contraction, followed on cooling by a strong dilation at a relatively low temp., bringing the steel back to the magnetic state. The second type is caused by the pptn. of carbides during heating, so that on cooling the transformation is not restrained by so much of the dissolved compds. in the gamma Fe. A steel contg. 0.5% C, 0.27% Si, 0.45% Mn, 19% Cr, and 0.8% Ni was austenitic after an air quench from 1250°, and on heating between 680° and 700° for 11 hrs., a contraction occurred at first, followed by a strong dilation. When the tempering was at 520° to 550°, only a part of the contraction was obtained in 14 hrs., and on cooling a slight transformation occurred at 150°. Another steel contg. 0.94% C, 0.18% Si, 0.95% Mn, 5.8% Cr, 5.6% W and 2.5% Co was air-quenched from 1250°, and on heating to 700° showed a violent dilation. On tempering at 620° to 660°, the transformation did not occur in 17 hrs., but appeared on cooling at about 350°. The two tempering effects are thus not of different natures, but differ only in the passive resistance to the transformation, the presence of Cr being very effective in increasing this resistance. GEO. F. COMSTOCK

**Relation of nitrogen to blue heat phenomena in iron and dispersion hardening in the system iron-nitrogen.** R. S. DEAN, R. O. DAY and J. L. GREGG. *Am. Inst. Mining Met. Eng. Tech. Pub.* No. 193, 10 pp.(1929).—Forged bars of different kinds of iron, annealed at 980° in vacuum, were reduced 30% in thickness by cold rolling, reheated from 100° to 500° and the Rockwell hardness measured after each treatment. Under this treatment vacuum-melted electrolytic iron showed no increase in hardness upon reheating. Electrolytic iron melted in air showed a distinct increase in hardness at 250° to 350°. Armco iron hardened but not as much as electrolytic iron. A microscopic examn. showed that the electrolytic iron melted in air, contained nitride-like needles (analysis showed 0.07% N). This indicates that the hardening is due to nitrogen and that it might be due to soln. of pptd. nitride during low-temp. annealing. In order to check this soln. theory, Armco iron rod (0.25 in. diam.) was nitrided in  $NH_3$ , drawn to 16 gage, annealed in a vacuum and cold-drawn to 18 gage. Tensile tests after cold-drawing, and heating to 200° and to 300° for 2 hrs. gave, resp.: 69,000, 76,000 and 78,000 lbs. per sq. in.; resistance ohms per cc. 22.9°,  $10.93 \times 10^6$ ,  $11.06 \times 10^6$  and  $11.10 \times 10^6$ . An Armco iron wire freed from nitrogen by heating in hydrogen at 1100° for 12 hrs. did not show an increase in tensile strength. Temper brittleness then is apparently due to soln. of small amts. of iron-nitride present and is accelerated by cold work, since hardening of annealed material does not occur below a temp. of 350°. In order to det. if dispersion hardening is possible as suggested by Sawyer (*C. A.* 17, 3147) and indicated by the Fe-N diagram, a sample of electrolytic air-melted iron was heated to 500° and quenched. Rockwell hardness increased from 40 to 70 and on holding at room temp. 24 hrs., increased to 95. Aging at higher temps. decreased hardness by agglomeration of the nitride until 300° where hardness increased as a result of soln. The Fe-N system is then a typical dispersion-hardening system which shows room-temp. hardening to a marked degree. A. W. HOLMES

**Chromium alloys.** FREDERICK M. BECKET. Union Carbide & Carbon Research Labs., Inc., N. Y. *Mining and Met.* 9, 551-4(1928); 10, 10-5(1929).—An historical account is given of the development of chromium steels. Chromium steels are of three types, low, medium and high Cr content. Low-Cr steels (up to 5%) have enhanced strength, toughness and hardness as compared with plain C steels. Up to 0.3% V and Mo added to Cr steel improves its physical characteristics. In tool steel 3.5 to 5.0% Cr is necessary for retaining hardness when red-hot. Seven to eight % Cr produces

a steel suitable for valves in combustion engines. Proper heat treatment of steels contg. 0.25 to 0.4% C and 12 to 14% Cr produces non-corrodible or "stainless" steels. Rustless irons have a lower C content and from 12 to 18% Cr. Such steels are used in making turbine blades, in app. for the production of cellulose nitrate and of  $\text{HNO}_3$  from  $\text{NH}_3$ , in metal app. exposed to acid mine waters, in recuperators, heat exchangers, baffles, in power plants, in Cottrell precipitator plants and bins for holding hot calcines in the copper industry. Cr-Fe castings contg. 22 to 28% Cr combine remarkable heat resistance with excellent wearing qualities. Tubes of Cr-Fe have met with great success in the com. cracking of gases. Steels contg. 22% Cr and 10% Ni with Mn and Si in more than normal quantities are highly resistant to oxidation at high temps. Cr plating produces a surface exceedingly hard and resistant to wear. The plating of marine engine piston rods and cracking stills in the oil industry are recent applications of this development in the use of Cr.

J. W. SHIPLEY

The crystal structure of the non-ferrous metals. P. P. EWALD. *Metallwirtschaft* 7, 435-7(1928).—A brief review of the lattice structure of the metals and a few of their alloys.

A. J. KING

Nickel and its alloys. A. J. WADHAM. International Nickel Co. *Mining Met.* 10, 183-9(1929).—The early history of the metal, attempts to produce it commercially, and its importance in modern industry are reviewed.

E. H.

Heat treatment and mechanical properties of some copper-zinc and copper-tin alloys containing nickel and silicon. W. C. ELLIS AND FARLE E. SCHUMACHER. *Am. Inst. Mining Met. Eng. Tech. Pub.* No. 188, 17 pp.(1929).—Alloys of Cu-Zn contg. 3% Ni and Si in the proportion  $\text{Ni}_3\text{Si}$  were melted under charcoal in a graphite crucible and cast into plates 0.75 in. thick. These plates with frequent annealing were cold-rolled to 18- and 24-gage sheets. The alloys contained 10, 20 and 30% Zn. The quenching temp. giving the best results was  $800^\circ$ . After quenching, the alloys were aged 1 hr. at  $500^\circ$  for 10 and 20% Zn, and  $400^\circ$  for 30% Zn. After this heat treatment the properties of the 10, 20 and 30% Zn alloys were: Rockwell hardness "B," 86, 85, and 79; proportional limit, 44,500, 37,200 and 38,000 lbs. per sq. in.; ultimate strength, 90,000, 85,800 and 85,400 lbs. per sq. in.; elongation in 2 in. 14.0, 21.5 and 28.0%. The hardness and ultimate strength were further increased by cold-rolling. Variations in heat treatment showed that mech. properties could be varied over a large range. Incomplete tests of the fatigue behavior in reversed bending indicate an endurance limit about the same as high brass sheet. Some preliminary results with heat-treated phosphor-bronze contg. 3% Ni-Si showed what mech. properties can be varied by heat treatment.

A. W. HOLMES

Alloys of zirconium. II. C. SYKES. *J. Inst. Metals* (advance copy) No. 492, 11 pp.(1929); cf. *C. A.* 22, 1942.—Five partial series of Zr alloys, viz., Cu-Zr, Fe-Zr, Ni-Zr, Al-Zr and Ag-Zr, were examd., and in each case intermetallic compds. were formed with only a limited range of soly., thus making com. application of these alloys doubtful. Measurements of certain elec. and magnetic properties of Cu-Zr, Fe-Zr and Ni-Zr alloys and resistivity figures for Al-Zr alloys (1.2, 3.2, 6.0 and 9.4% Zr), are given, together with measurements of tensile strength, Brinell hardness, ductility and corrodibility of Al-Zr and Ag-Zr alloys.

DOWNS SCHAAP

The system magnesium-zinc. W. HUME-ROTHERY AND E. O. ROUNSEFELL. *J. Inst. Metals* (advance copy) No. 691, 20 pp.(1929).—Investigation was made of the equil. diagram of the Mg-Zn system, particular attention being paid to the structure of the solid alloys and the limits of solid soln. in the various phases. The solid soly. of Mg in Zn increases from 0.15 atomic % Mg at  $200^\circ$  to 0.3 atomic % at the temp. of the Zn-MgZn<sub>2</sub> eutectic, which was accurately detd. by cooling curves and quenching expts. to be  $364^\circ$ . A new compd. MgZn is shown to exist, and any Zn in alloys like Elektron present in excess of that contained in solid soln. in Mg will exist as MgZn and not, as previously supposed, as MgZn<sub>2</sub>.

DOWNS SCHAAP

The constitution of the cadmium-rich alloys of the system cadmium-gold. P. J. DURRANT. *J. Inst. Metals* (advance copy) No. 490, 33 pp.(1929).—Saldau's equil. diagram of the Cd-Au alloys contg. from 0 to 48 atomic % of Au has been modified in the following manner: (1) the liquidus from the eutectic point at 7.95 atomic % of Au and  $309^\circ$  rises not to a triple point at 25 atomic % of Au and  $495^\circ$ , but to a max. at 28.6 atomic % of Au and  $500^\circ$ , and thereafter falls to a eutectic point at 30 atomic % of Au at  $496^\circ$ ; between the compns. 30 and 48 atomic % of Au the form of the liquidus is not a smooth curve, but is broken by a sharp discontinuity at 39.4 atomic % of Au and  $540^\circ$ ; (2) a new area of solid soln. has been detected which lies in the field described by Saldau as contg.  $\beta + \gamma$ , and has been found to undergo two polymorphic changes—one at about  $500^\circ$ , and the other at  $375^\circ$ .

DOWNS SCHAAP

Influences related to the speed of deformation and to the temperature of the production of cold-hardening. ALBERT ROUX AND JEAN COURNOT. *Compt. rend.* 188, 631-3(1929).—Pure Al wires were treated with different loads and at different temps. and then tested spectrographically with x-rays. The speed of deformation has a great influence on the production of cold-hardening; too slow a speed allows annealing to destroy the cold-hardening.

MALCOLM DOLE

Equilibrium relations in aluminum-magnesium alloys of high purity. E. H. DIX, JR. AND F. KELLER. *Am. Inst. Mining Met. Eng., Tech. Publication* No. 187, 17 pp. (1929).—Al of high purity (analysis Cu 0.016%, Si 0.008% and Fe 0.020%) was melted in a crucible of Acheson graphite and alloys up to 20% Mg were made by adding pure Mg (analysis Si 0.00%; Cu 0.00%, other group II metals, 0.01%; Fe 0.00% and Al 0.01%). Some of the alloys above 10% Mg were made by adding a 20% Mg hardener. The alloys were chill-cast, then annealed for 168 hrs. at temps. ranging from 420° to 445° for various lots. Sections of each alloy were quenched at these temps. while other sections were cooled to a lower temp., held at these lower temps. and finally quenched. The sections were then polished, etched with 0.5 % aq. HF and examd. with the microscope to det. if the  $\beta$ -phase was present in the  $\alpha$ -phase. The  $\alpha$ -phase is defined as solid soln. of Mg in Al. As a result of these tests, values of temp.-solv. relations were detd.: 451° satn. limit (Mg%), 14.9; 400°, 11.5%; 350°, 8.7%; 300°, 6.4%; 250°, 4.9%, and 200°, 4.0%. The temp. of the eutectic arrest was detd. by cooling curves on alloy of 20% Mg and was 451°. In order to det. if the Al-Mg alloys were susceptible to pptn. heat treatment tests were made on 10% Mg-Al alloy. This alloy was not made of high-purity metal. The attempts to improve the properties of the quenched alloys by artificial aging were unsuccessful.

A. W. HOLMES

Experiments on the most suitable preparation of the "Y"-alloy (1.5% Mg, 2.0% Ni, 4.0% Cu, 92.5% Al). WILLI CLAUS AND E. KALAHEHNE. *Die Giesserei* 15, 1200-3 (1928).—The preliminary alloy (necessary for the prepn. of the "Y"-alloy) is so produced that the loss due to burning is reduced to a min. This alloy consists of 10% Ni, 20% Cu and 70% Al, the Ni and Cu being melted down first, and the Al then added. The burning loss in its prepn. is 6-8%, and the melting interval 580-710°. To prep. 10 kg. of the "Y"-alloy, 2.00 kg. of the preliminary alloy, 7.85 kg. Al and 0.15 kg. Mg are used. The Al is first fused, the preliminary alloy dissolved in it at 700° and the Mg finally added at 680°. The fusing temp. must be kept below 720°, as the "Y"-alloy absorbs gas strongly.

J. BALOZIAN

The age-hardening of some aluminum alloys. MARIE L. V. GAYLER AND G. D. PRESTON. *J. Inst. Metals* (advance copy) No. 499, 44 pp. (1929).—Five typical Al alloys contg. Cu, Mg, Si, or both, were examd. under similar conditions of heat treatment for Brinell hardness, tensile strength, d., elec. cond. and changes in the crystals as detd. by x-ray analysis. The changes in d. and in lattice size, which take place during aging, suggest that pptn. from solid soln. occurs. The results of the investigation may be regarded as strong confirmation of the theory that hardening is due to the pptn. of highly dispersed particles.

DOWNES SCHAAF

New aluminum alloys and beryllium. A. VOSMAER. *Chem. Weekblad* 26, 186 (1929).—Be bids fair to become as important as the various Al alloys.

G. C.

Duralumin experiments. E. SCHMID AND G. WASSERMANN. *Metallwirtschaft* 7, 1329-35(1928).—The purpose of this work was a study of the hardening of Al alloys to det. what constituent exerts the greatest influence. The alloys examd. were all Al alloys with the following compn. (the added metals only being given): 1, 0.23% Si; 2, 0.56% Mg; 3, 0.36% Fe; 4, 4.50% Cu; 5, 4.12% Cu, 0.35% Si; 6, 4.51% Cu, 0.51% Mg; 7, 4.07% Cu, 0.53% Mg, 0.31% Si; 8, 4.35% Cu, 1.28% Si, 1.07% Fe; 9, 3.79% Cu, 1.27% Si, 1.17% Fe; 10, 0.52% Mg, 0.29% Si; 11 (duralumin), 4.36% Cu, 0.54% Mg, 0.33% Si, 0.39% Fe, 0.77% Mn. Constitutional diagrams of the systems Al-Cu, Al-Mg, Si, Al-Si, Al-Mg and Al-Fe show that according to the sepn. hypothesis a hardening effect might be expected from either CuAl, Mg<sub>2</sub>Si, or Si. The specimens, in the form of 1 mm. wire, were heated for 2 hrs. at 210°, quickly quenched in cold H<sub>2</sub>O and then aged at 150° and at room temp., the progress of the hardening being measured by tensile strength and elongation detns. The results are given in tables and curves. In the binary alloys aged at 150°, Al-Cu shows an increase in tensile strength of about 45% in 20 hrs., while Al-Si, Al-Mg and Al-Fe show no hardening effect. At room temp. about the same amt. of hardening is shown with the Al-Cu alloy after 6 or 7 days, while the Al-Mg and Al-Fe are not affected. A slight hardening is indicated in Al-Si (5.1 to 5.6 kg./sq. mm.). In the ternary alloys aged at 150°, addn. of a small quantity of Si to the Al-Cu alloy has no harmful effect, but with a large amt. of both Si and Fe as in Nos. 8 and 9, the increase in tensile strength is much less (27 to 33 kg./sq. mm. in

48 hrs.). This is probably due to the Fe. At room temp. Nos. 8 and 9 are as good as No. 4. In the Al-Cu alloys, binary and ternary, the hardening is always rapid at first and then slows after a few hrs. at 150° or about 3 days at room temp. A Cu-free alloy contg. Mg<sub>2</sub>Si, however, shows a more gradual hardness increase at 150°, which continues at an almost linear rate for over 24 hrs. Thus the tensile strength of No. 10 increases from 12.3 kg./sq. mm. to 19.4 in 1 day, 20.9 in 2 days and 22.3 in 3 days. This same alloy shows only very slight hardening at room temp. At 150°, addn. of Mg to Al-Cu has only a slight effect, but on addn. of Si to the Al-Cu-Mg alloy a very favorable effect is obtained, due doubtless to Mg<sub>2</sub>Si. At room temp. Mg produces a greater increase than at 150° (28.4 to 39.6 kg./sq. mm. for No. 6), while addn. of Si to this produces still greater hardening (26.7 to 40.7 kg./sq. mm. for No. 7). Duralumin behaves more like the Al-Cu-Mg alloy (32 to 43.5 in 7 days for No. 11). Conclusion: CuAl<sub>2</sub> is the most effective hardening constituent, although both Mg<sub>2</sub>Si and Mg exert considerable influence. Röntgenographs of specimens aged at 150° or 200° give a faint indication of CuAl<sub>2</sub> sepn., but where the aging is at room temp., the method is not sufficiently sensitive to detect the extremely fine sepn. H. STOERTZ

Piston alloys. R. STERNER-RAINER. Frankfurt a. Main. *Metallwirtschaft* 7, 1228-30(1928).—A discussion of the requirements of piston alloys and the development and application of light metal alloys in piston manuf. Cast Al-Si alloys and pressed Mg-Al alloys are meeting with favor in Germany. H. STOERTZ

Supplementary information on the corrosion of brass. MAX HAAS. *Korrosion Metallschutz* 5, 25-35(1929).—A review of the literature on the effect of grain size and compn. on the corrodibility of brasses, followed by a series of tests under various conditions. Automobile radiators corroded in spots which showed evidences of dezincification primarily at the grain boundaries of large grains. Quenching of brass ordinarily in the  $\alpha$ -range from high temps. left free  $\beta$  particles; the resulting  $\alpha/\alpha + \beta$  brass corroded more rapidly.  $\alpha/\alpha + \beta$  brass having a uniform grain size is more corrosion-resistant than the same material having grains of different sizes; similarly c. m. f. measurements indicate that the former has a lower soln. pressure. B. E. ROETHLI

Methods of testing to determine the corrosion resistance to weathering and sea water. E. RACKWITZ AND ERICH K. O. SCHMIDT. *Korrosion Metallschutz* 5, 7-13 (1929).—Methods of testing Al and Al alloys are described, combining immersion in 3% NaCl solns. contg. 1% H<sub>2</sub>O<sub>2</sub> with physical tests. The methods give results which are in close agreement with those found in actual service tests in the atm. and in sea H<sub>2</sub>O. B. E. ROETHLI

The decreased attack on aluminum in alkaline solutions due to colloid additions. H. RÖHRIG. *Korrosion Metallschutz* 5, 41-3(1929).—Colloids, such as glue, agar agar, starch, gum arabic or gelatin, when added to 10% NaOH or 10% Na<sub>2</sub>CO<sub>3</sub> solns. markedly decrease the rate of soln. of Al. (Na<sub>2</sub>SiO<sub>3</sub> accelerates corrosion in the NaOH soln. while it affords 100% protection in the soda soln.) The rate of soln. remains const. with time. The proportional protection afforded is const. for different concns. of electrolyte. Protection is increased by increasing the concn. of colloid. The limiting concn. is detd. by the viscosity of the resultant soln. B. E. ROETHLI

Resistance of copper-silicon-manganese alloys to corrosion by acids. U. A. BEDWORTH. Am. Inst. Mining Met. Eng., *Tech. Publication No. 189*, 14 pp.(1929).—Alternate immersion tests at room temp. and at 60° of Cu-Si-Mn alloys varying in compn. from 0.5% Si, 0.2% Mn to 4% Si, 1.2% Mn in dil. HCl and H<sub>2</sub>SO<sub>4</sub> have shown that addns. of Si and Mn up to 3 and 1%, resp., materially increase the corrosion resistance of the alloy to these acids. Further addns. did not increase the resistance materially. Hard-drawn wires contg. more than 2% Si showed decidedly greater loss by corrosion than annealed wires of the same compn. The loss of annealed wire approached that of hard wire as Si decreased from 2.5 to 0.5%. Hard-drawn wires contg. 4% Si and 1.2% Mn showed greater loss in tensile strength than hard drawn wires contg. 3.2% Si and 0.9% Mn. It was found by examn. under the microscope that 4% alloy contained small undissolved particles of Mn<sub>2</sub>Si inclusions, but showed practically the same corrosion rate as 3% alloy. Annealing is believed to counteract the harmful effect of Mn<sub>2</sub>Si inclusions. Results are reported as wt. loss and loss in tensile strength and elongation. B. E. ROETHLI

The passivity of metals. II. The breakdown of the protective film and the origin of corrosion currents. ULICK R. EVANS. *J. Chem. Soc.* 1929, 92-110; cf. C. A. 22, 3575.—Corrosion commences at isolated points in consequence of breaks in the protective film. Tests on Fe, steel, Zn, and Al show that the breakdown of the film occurs where the surface has been bent or cut or where rolling or casting defects occur at the surface. Occasionally the O<sub>2</sub> dissolved in the water repairs the broken film and

corrosion does not occur. Pre-existing cavities may det. the sites of corrosion, but this cannot be the common cause of localized attack which can be obtained under anaerobic conditions if an external e. m. f. be applied. Internal stresses are important in character as to keep the film in a state of weakness.

e. m. is. approaching 0.0 and so off when a current actually flows. The extension of mechanism of the film can be followed by potential changes.

B. E. ROETHLI

**Some new developments in acid-resistant alloys.** BURNHAM E. FIELD. *Am. Inst. Mining Met. Eng., Tech. Publication No. 191*, 12 pp. (1929).—Ni-Mo alloys contg. more than 15% Mo are resistant to 10% HCl at 70°. In Ni-Mo-Fe alloys contg. 20% Mo and 0-40% Fe the corrodibility passes through a max. at 10% Fe and rises again at 25% Fe, after which the corrosion rate becomes high. C hardens and stiffens the alloy, and decreases acid resistance. Mn improves the workability and up to 3% does not decrease acid resistance. Mg counteracts S effects. Ni-Mo-Fe alloy is resistant to all cold mineral acids except HNO<sub>3</sub>. Penetrations in cold 37% HCl range as low as 0.00036 in. per year; at 70° in 10-37% HCl 50-80 times as much; in 10-77% H<sub>2</sub>SO<sub>4</sub> at 70° 30-70 times as much. The alloy is attacked by oxidizing agents such as moist Cl<sub>2</sub> and acids contg. oxidizing salts. Ni-Si alloys contg. above 10% Si and Ni-Al contg. above 20% Al are acid-resistant but brittle. Alloys contg. 10% Si and 5% Al are strong and acid-resistant. Cu between 2.5 and 3% give finer-grained and stronger alloys.

B. E. ROETHLI

**Corrosion of metals in the Lehigh Valley.** C. E. REINHARD. *Am. Inst. Mining Met. Eng. Tech. Publication No. 190*, 9 pp. (1929).—Test pieces exposed to weathering conditions in various localities in the Lehigh Valley showed different corrosion rates in different atms. The kinds of metal tested were not designated. B. E. ROETHLI

**Causes and prevention of corrosion.** C. R. TEXTER. *Boiler Maker* 28, 51-2; *J. Am. Water Works Assoc.* 20, 442 (1928).—A broad general survey, both practical and theoretical. D. K. FRENCH

**Corrosion of metals in sea water.** J. N. FRIEND. *Mettall.* 98, 9 (1928); *Wasser u. Abwasser* 25, 41.—In a 4 yr. test where Sn, Ni, Pb, Cu, Zn, Al, Ni and Pb were affected the least, Al was corroded to the greatest extent. C. R. F.

**Corrosion of machines in the viscose rayon industry, and its prevention.** JOHANN EGGERT. *Korrosion* 3, 45-6 (1928); 4, 13-4 (1929).—A dense, non-porous, homogeneous cast Fe is best to resist alkalis, alk. sulfides and acids. The best protection for cast Fe is a bituminous paint of high m. p., high free-C content (which is improved by adding the finest ground graphite), and freedom from mineral substances. The casting should be cleaned in a HCl bath followed by several days in a hot oleic-acid bath, then exposed to the air for several days, after which it is slowly raised to 200-50° and 2 or 3 coats of the melted paint applied and cooled slowly. The paint should not be dissolved before applying; the proper selection and compn. of the bitumen are of the utmost importance. The coating is very resistant and lasting. Wrought Fe and steel are best protected by several layers of suitable metals or alloys. The oil in bearings should be changed at least once a week. J. H. MOORE

**Mechanism of corrosion.** ULICK R. EVANS. *J. Chem. Soc.* 1929, 11-20.—The corrosion of half-immersed specimens of Zn, Al, Fe, steel and Cu commences at certain weak points, mainly along the bottom and cut edges, but frequently in the center also; in those cases where corrosion is very slow, it may occur along the water line. In Zn, Fe and steel in chloride or sulfate solutions, the attack spreads out from these points very rapidly, the greater part of the immersed area being finally attacked; the insol. corrosion products are of four different types, which appear according to the manner in which the anodic and the cathodic products come together; in Cu and Al one of these types is usually absent, but otherwise there is general correlation between the results with Zn, Fe and steel. Quant. expts. show that under conditions of differential aeration electrolytic Fe is attacked nearly as rapidly as steel, and K<sub>2</sub>SO<sub>4</sub> and KCl cause similar rates of corrosion, notwithstanding that the shapes of the corroded area are quite different; MgSO<sub>4</sub> causes much slower attack. Zn is attacked more quickly than Fe, and Al much more slowly. O<sub>2</sub> produces quicker attack on steel than air, but the attack is restricted to a smaller portion of the specimens; doubling the breadth of half-immersed specimens nearly doubles the rate of attack, but increase of the length of the immersed area has much less effect. All these results are understood if it is remembered that the corrosion current flowing between the cathodic and the anodic areas will depend on the e. m. f. of the cell (metal-O<sub>2</sub>) greatly reduced by polarization. With

Al, where the film repairs itself readily and the anodic areas remain small, the anodic polarization will be most important, but with Zn, Fe and steel, the cathodic polarization, which depends on the supply of  $O_2$  will det. the rate of attack; Fe is corroded less quickly by  $MgSO_4$  than by  $K_2SO_4$ , since the cathodic product,  $Mg(OH)_2$ , interferes with the access of  $O_2$  to the metal; Zn is corroded more quickly than Fe—even with the same facilities of  $O_2$  supply—because here the value of the unpolarized e. m. f. is higher. B. E. RORTHELI

**Electric behavior of surfaces of corroding iron.** A. L. MCAULAY AND S. H. BASTOW. *J. Chem. Soc.* 1929, 85-92.—Fe when immersed in  $O_2$ -free electrolyte tends to attain a reproducible e. m. f. after a certain variable time. Expts. on the behavior of the metal are reproducible under conditions of the reproducible e. m. f. The behavior of pure electrolytic Fe is also typical of that of mild steel and cast Fe. Compn. has little effect unless it is such as to produce "air passivity" (stainless Fe). Stainless Fe shows no very definite normal potential. Potentials of Fe in air-free 0.5 N  $K_2SO_4$  ranged between 0.75 and 0.80 on the satd.-calomel scale, the variations probably being due to differences in  $pH$ . The electrodes were exposed to air for varying lengths of time, re-immersed, potentials measured and e. m. f. change vs. time was observed. The protective power of the film formed was found to increase with time exposed up to a max. of 2 hrs. after which little increased protection was obtained. The Fe returned to the "standard state" after about 1 hr's. immersion. The film is destroyed by the electrolyte but not by leaving in contact with an inert gas. Anodic oxidation produces a much more resistant film than the air exposure. The passage of currents has no effect on the ennobling film that gives rise to potential differences which produce them. The e. m. fs. are modified temporarily by polarization effects, but these effects rapidly disappear when the current is stopped, leaving the film unchanged except for the action of the electrolyte. B. E. RORTHELI

**Electric welding in gas works and water works.** J. SAUER. *A E G Mitt.* 1929, 305-7. C. G. F.

**Louis Campredon (1863-1928).** LÉON GUILLET. *Rev. métal.* 26, 115(1929).—An obituary with portrait. A. PAPINEAU-COUTURE

A practical investigation of corrosion for the heating industries (BALCKE) 14. Collected colloid references. VIII. Flotation (KELLERMANN) 13. The preparation of single crystals of metals (SACHS) 2. The crystal structure of Ni (MAZZA, NASINI) 2. The Hall effect and other properties of the Cu-Sb series of alloys (STEPHENS, EVANS) 2. Equilibrium of sulfides and silicates in melts (JANDER) 2. Al and its formation of mixed crystals with Si (ANATASIADIS) 2. Photomicrographs taken directly on sensitive paper (KURODA) 5. Hearth furnace for melting blast-furnace dust, etc. (Brit. pat. 297,813) 1. Apparatus for determining the hardness of metals, etc. (Swiss pat. 129,625) 1. Casting brakeshoes (U. S. pat. 1,709,129) 18. Treating Co solns. (Brit. pat. 208,301) 18. Apparatus for testing the bursting strength of sheet metal (U. S. pat. 1,709,638) 1. Treating slag to form plaster, etc. (Brit. 298,141) 20. Apparatus for separating different mineral particles (Brit. pat. 297,876) 1. Oily flotation agent (U. S. pat. 1,709,447) 22.

**L'aluminium et ses alliages.** Paris, 23 Rue de Balzac: L'Aluminium français 124 pp. Reviewed in *L'eau* 22, 29(1929).

DESCROIX, L.: *Art de l'ingénieur et métallurgie: résistances des matériaux et données numériques diverses.* Paris: Gauthier-Villars & Cie. 169 pp. Bound. F. 100; paper, F. 82. Reviewed in *Chimie & industrie* 21, 672(1929).

GUILLET, LÉON: *L'évolution de la métallurgie.* Paris: Librairie Félix Alcan 196 pp. Reviewed in *Rev. métal.* 26, 116; *Chimie & industrie* 21, 672(1929).

*Handbuch des Eisenhüttenwesens. Band I. Walzwerkwesen.* Edited by J. PUPPE and G. STAUBER. Berlin: Julius Springer and Düsseldorf; Verlag Stahl Eisen m. b. H. 777 pp. Bound. M. 85.

**Pneumatic and reciprocating apparatus for dry separation of ore constituents, etc.** HENRY M. SUTTON, WALTER L. STEELE and EDWIN G. STEELE. U. S. 1,710,521, April 23.

**Settling and baffle apparatus for separating constituents of ore pulp.** THOMAS G. MARTYN. U. S. 1,709,676, April 16.

**Flotation process.** WILHELM SCHÄFER and SOC. ERZ- u. KOHLE-FLOTATION G. m. b. H. *Erz.* 649,270, Feb. 20, 1928. Polythionates or other derivs. of polythionic acids, particularly polythionates of multivalent metals, are used in the flotation process for

ore, coal, graphite, etc., treatment. Acids or alkalis which produce H ions or OH ions in the pulp may also be present and may be used for effecting differential flotation.

Ore concentrating apparatus utilizing a horizontal water stream carrying slimes and coarser material which settles by gravity. JOHN F. NEWSOM. U. S. 1,709,365, April 16.

Concentrating oxidized ores. JOSEPH T. TERRY (to Cordelia E. Terry). U. S. 1,709,329, April 16. Ores other than sulfides, and which may contain Pb, Zn, Ag, Hg and Bi, in the form of a finely ground pulp, are treated with a chromate soln. such as  $\text{Na}_2\text{CrO}_4$  to effect formation of Cr compds. of metal present in the ore, and then subjected to froth flotation to obtain a concentrate of the metal affected by the chromate treatment.

Concentrating manganese ore. HOWARD TRUMBO and ANDREW J. TRUMBO (to Manganese Patents Corp.). U. S. 1,710,522, April 23. Crude Mn ore is subjected to the action of a cleaning soln. such as  $\text{Na}_2\text{CO}_3$  and the Mn mineral is sepd. from gang by gravity concn. Various details of treatment are described.

Apparatus for amalgamating ores, etc. DANIEL H. KLEINSCHMIDT. U. S. 1,708,970, April 16.

Treating ores, etc. FRIED. KRUPP GRUSONWERK A.-G. Ger. 473,016, Dec. 8, 1923. Relates to processes of the kind in which ores, residues, etc., contg. volatilizable metals are mixed with C and conveyed through a furnace under such conditions that the metals volatilize and are then oxidized, the oxide fumes being collected. The improvement consists in conducting such processes so as to render them entirely or as far as possible thermally self-supporting. Cf. C. A. 23, 1861.

Treating sulfide ores. F. KRUPP GRUSONWERK A.-G. Brit. 297,597, Nov. 24, 1927. Sulfide ores or other sulfidic products are first roasted in an oxidizing atm. (suitably in a rotary tubular furnace) to remove a portion of the S present in the form of  $\text{SO}_2$ , so as to effect a saving in the quantity of binding material for the S necessary in a process such as that described in Brit. 234,826 (C. A. 20, 735). The material is then immediately subjected to a volatilizing operation with the addition of reducing agents and materials such as alk. earths to bind the remainder of the S present in the residue; waste gases from the preliminary roasting furnace may be combined with gases from the volatilization furnace or gases from the latter may be conveyed through the roasting furnace and air may be added to assist oxidation and form sulfates if desired and the product may be subsequently lixiviated. The process is especially suitable for use in connection with the manuf. of electrolytic Zn and any Pb sulfate assocd. with the  $\text{ZnSO}_4$  remains as an insol. residue on lixiviation.

Smelting zinc ores. RICHARD L. LLOYD (to Dwight & Lloyd Metallurgical Co.) U. S. 1,709,135, April 16. Receptacles such as condensers for use in smelting Zn ores are formed mainly of  $\text{ZnO}$  bonded with  $\text{ZnSO}_4$ .

Iron ores. ALLMÄNNA INGENJÖRSBYRÅN H. G. TORULF. Fr. 649,273, Feb. 20, 1928. Fe ores which are not or only slightly magnetic in the natural state are transformed into magnetic ores, e. g., by reduction of  $\text{Fe}_2\text{O}_3$  to  $\text{Fe}_3\text{O}_4$ , and then enriched by a magnetic process. An app. is described.

Roasting sulfur-containing materials. F. KRUPP GRUSONWERK A.-G. Brit. 297,419, Sept. 21, 1927. A tubular rotary furnace is used for roasting S-contg. materials and that part of the furnace in which the greatest heat is generated is cooled to prevent sintering of the material. Air or water may be used for the cooling or the thickness of the furnace wall may be such as to facilitate loss of heat by radiation.

Metallurgical process. VACUUMSCHMELZE G. m. B. H. Fr. 648,205, Sept. 15, 1927. Metals are obtained from their oxides or sulfides by submitting the latter in the solid or molten state at a sufficiently high temp. to a vacuum for sufficient time for the decompn. of the compd.

Casting slag. L. F. J. C. A. THIBAUDIER and G. V. E. VAGNE. Brit. 298,046, March 31, 1928. Blast-furnace slag is cast in small pigs or lumps in molds mounted on a rotary table which presents the molds successively to the tapping orifice. An app. is described.

Apparatus (with pivoted mold halves) for casting metal articles. I. D. TRAVIS. Brit. 298,355, Sept. 22, 1927.

Apparatus for casting metal articles in permanent molds. CHARLES L. LEE and THOMAS C. VANDERKRIEF (to General Motors Research Corp.). U. S. 1,709,317, April 16. Mech. features.

Permanent mold for casting cup-shaped articles from aluminum alloys, etc. JAMES J. DUNN (to Permold Co.). U. S. 1,709,249, April 16. Structural features.

Casting hollow articles around a meltable core. HERBERT E. FIELD (to Wheeling

Mold & Foundry Co.). U. S. 1,710,534, April 23. The metal such as iron or steel which is to form the cast article is poured around a core of material (such as brass) of sufficiently lower m. p. that the material of the core is melted by heat from the casting and flows from the mold after the casting has solidified.

Cores for use in making hollow metal bars. R. S. HADFIELD. Brit. 297,522, July 7, 1927. Metal cores for use in rolling or forging hollow billets into hollow steel rods for making drills, rifles, revolvers, etc., are formed of Mn steel such as that known as "Hadfield's manganese steel" and may be coated with graphite or like material. Various details of mech. procedure are described.

Renovating foundry sand by action of an air current, a brushing device and a screen, etc. W. J. BELL. Brit. 298,396, Nov. 24, 1927. An app. is described. The sand under treatment may be further mixed with fresh sand, molasses, flour or other binders, water, etc.

Purifying light metals such as magnesium and aluminum. HERMAN E. BAKKEN (to American Magnesium Corp.). U. S. 1,710,398, April 23. In order to remove entrained impurities from a readily oxidizable light metal such as Mg or Al the metal in liquid state is passed through a porous mass of metal substantially insol. in the molten metal, e. g., through steel wool, which retains the impurities. An app. is described.

Treating metals. SIEGFRIED JUNCHANS. Fr. 648,638, Feb. 10, 1928. Unfinished substances of crystalline structure, particularly metals or alloys, are treated with Foucault currents produced by high frequency to modify the properties thereof.

Separating metals. I. G. FARBENIND. A.-G. Fr. 648,947, Feb. 14, 1928. Metals such as Fe, Ni and Co are sepd. from mixts. contg. them by forming the carbonyl compds. at a high temp. and high pressure of CO, and submitting the carbonyls to a dephlegmation, fractional distn. or other method of sepn.

Flux for melting metals. G. W. WARDLE. Brit. 297,635, Feb. 17, 1928. A flux suitable for use in melting Al and other non-ferrous metals comprises cryolite, crushed, heated to the fusion temp. and formed into blocks.

Apparatus for treating molten metals and alloys with purifying reagents. F. W. CORSALLI. Brit. 297,759, June 23, 1927. Intermixture with reagents such as C, Al, soda, etc., is effected by flowing the materials in successively reversed directions to subject them to impact in a described app. and then subjecting them to vibration in a collecting app.

Mechanical working of metals such as lead or aluminum alloys while heated. JAMES ROSENBERG (to Metal Forming Process, Inc.). U. S. 1,709,323, April 16. In forming articles such as printing plates or phonograph records, the metal used is sufficiently heated materially to reduce its resistance to change in form and the maximum pressure of a forming tool is maintained on the material for a sufficient time to cause it completely to conform with the contour of the tool, but the tool is removed before it is itself affected in form. An app. is described.

Centrifugal apparatus for purifying molten metals such as steel or iron. EDWARD R. HEWITT. U. S. 1,709,939, April 23.

Heat treating metals such as iron or steel. GES. FÜR INDUSTRIEGASVERWERTUNG. Brit. 297,796, Sept. 28, 1927. The cooling stage is continued for the same length of time as that taken for the heating stage whether ordinary cooling agents such as water or oil or low-temp. cooling agents are used; when using water or oil, the cooling stage is interrupted from time to time. Use of liquid air as a cooling medium also is described.

Metallurgical furnace. HERMAN C. SIEBERT (to Bethlehem Steel Co.). U. S. 1,709,042, April 16. The fuel-supply valve of the furnace is controlled by a pyrometer in the furnace and the air-supply valve is controlled in accord with the compn. of the combustion products from the furnace. Various structural details are described.

Pot furnace suitable for melting metals. ADOLPH L. NELSON (to Bohn Aluminum & Brass Corp.). U. S. 1,710,234, April 23. Structural features.

Furnace (rotating on an inclined axis) for melting metals, etc. K. SCHMIDT GES (to K. Schmidt). Brit. 297,432, Sept. 21, 1927. The body of the furnace is in the form of an oblate spheroid and nozzles may be provided for blowing air into or onto the bath of metal. Various structural details are described.

Reversible regenerative furnace suitable for melting steel, etc. TOM WILSON (to Bethlehem Steel Co.). U. S. 1,710,242, April 23. Structural features.

Furnaces for sulfur ores. XAVIER DE SPIRLET. Fr. 648,097, Feb. 2, 1928. Construction of metallic scrapers.

Furnace for annealing metal sheets. WILLIAM ALFERINK (one-third each to Wilbert French and Joseph Weaver). U. S. 1,710,332, April 23. Structural features.

Furnace for the continuous treatment of steels or other magnetic materials. VIC-



TOR SORREL and LOUIS A. LAFONT. Fr. 649,268, Feb. 20, 1928. The pieces pass through the furnace under the influence of gravity and magnetic attraction.

**Blast supply for cupola furnaces.** CRIFFIN WHEEL CO. Brit. 297,715, April 20, 1927. Hot air is supplied to the zone of fusion of a remelting cupola at a plurality of points uniformly distributed around its circumference. Various structural features are specified.

**Air-cooled internal-combustion engine cylinders.** GLENN D. ANGLE and GEORGE E. A. HALLETT. U. S. 1,710,136, April 23. Various details are specified for bonding a steel cylinder lining to an Al head and casing carrying cooling flanges.

**"Rustless iron."** VERA B. BROWNE. U. S. 1,710,446, April 23. "Rustless iron" is prepd. by melting in a carbon-arc furnace a charge contg. a low-C Fe-Cr alloy, lime and Mn oxide, proportioned to yield a basic oxidizing slag capable of preventing substantial accession of C to the bath.

**Rustproofing iron and steel.** W. H. COLE. Brit. 298,328, Aug. 22, 1927. The process described in Brit. 289,906 (C. A. 23, 811) is carried out under superatm. pressure and at a temp. higher than the normal b. p. of the liquor used.

**Rust-preventing.** WILLIAM H. COLE. Fr. 648,106, Feb. 2, 1928. The process for proofing iron or steel against rust by treating it with a soln. of phosphates of Al, Zn, Fe or Cr is carried out under pressure at a temp. above the b. p. of the liquor in a stationary or movable autoclave. Cf. C. A. 23, 2415.

**Iron and steel.** ALBERT A. FREY. Fr. 648,235, Feb. 4, 1928. See Brit. 284,976, (C. A. 22, 4453).

**Pickling iron and steel.** L. B. SEBRELL (to Goodyear Tire & Rubber Co.). Brit. 298,390, Oct. 21, 1927. An inhibiting agent for addn. to acid pickling baths comprises the reaction product of an aldehyde with  $H_2S$  or alkali metal sulfide, such as may be prepd., e. g., by passing  $H_2S$  through a 40% soln. of  $CH_2O$  cooled to 0–10°.

**Steel.** HERMAN J. VAN ROYEN. Fr. 648,669, Feb. 11, 1928. See Brit. 285,814 (C. A. 23, 87).

**Steel.** THE INTERNATIONAL NICKEL CO. Fr. 649,214, Feb. 17, 1928. See U. S. 1,689,043 (C. A. 23, 87).

**Steel.** SCHWEIZ. IND.-GES. Swiss 129,352, Dec. 20, 1927. High-speed steel is hardened by heating in an elec. salt-bath and then plunging into a warm or cold bath of C-yielding material.

**Bessemer steel.** FRANK W. DAVIS (to Samuel G. Allen, trustee). U. S. 1,709,389, April 16. See Brit. 286,745 (C. A. 23, 1368).

**Steel ingots.** MIDWEST METALLURGICAL CORP. Fr. 648,146, Feb. 3, 1928. Formation of cavities in steel ingots is prevented by adding F compds. such as fluorspar (30–170 g. for 1350 kg. of steel) to the steel after flowing from the furnace or in the casting ladle or in the mold. Cf. C. A. 22, 2545.

**Apparatus for hardening and tempering steel.** HERBERT W. TINKER (to Federal Pressed Steel Co.). U. S. 1,709,160, April 16. A treating chamber for hardening and tempering automobile bumpers or springs or other steel articles by air and heat treatment has an artificially cooled bottom, side and top walls and specially formed air inlets which are described.

**Apparatus for case-hardening steel articles.** R. KAIER (to Singer Mfg. Co.). Brit. 298,132, Oct. 3, 1927.

**Apparatus for carburizing steel articles.** PETER CHAMBERS (to Security Mfg. Co.). U. S. 1,709,247, April 16. Structural details are described of an app. comprising a carburizing chamber and a briquet chamber arranged to communicate with each other so that gases from the briquet chamber effect carburization.

**Pot for holding carburizing baths of cyanide or other materials.** FREDERICK K. LANDGRAF and EDWARD S. FITZSIMMONS (to Flannery Bolt Co.). U. S. 1,709,729, April 16. The pot is formed of an inner layer of metal such as wrought iron or low-C steel which is resistant to the action of the contents of the pot and with an outer layer of metal such as a Cr-Fe-Ni alloy which is resistant to the action of heat. One of the layers is formed *in situ* by united beads of metal deposited by a welding operation.

**Thin metal foil.** CARL MÜLLER (to Karl Mey). U. S. 1,709,801, April 16. A foil-forming layer, which may be made from Ni by electrodeposition, is placed or formed between 2 layers of other material such as 2 Cu layers. The foil is formed by stamping or other mech. treatment and then the outer layers are removed by molecular decompn. (suitably by the action of an ammoniacal electrolyte in the case of layers of Cu); the outer protective layers are sufficiently thin as to avoid detrimental stress being exerted on the foil layer on their removal.

**Tin from cassiterite.** E. A. ASHCROFT. Brit. 297,784, June 24, 1927. Cassiterite

is heated with reducing agents comprising powdered iron, Al or Mg or powdered alloys of Fe and Sn, Ni and Sn or Ni, Fe and Sn. The Fe used may be produced *in situ* from Fe oxide and carbonaceous material, and when Fe is used the temp. is not allowed to exceed 900° to prevent sintering or slagging of the charge.

**Coating metals.** COMPAGNIE FRANÇAISE POUR DES L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON. Fr. 649,387, Dec. 31, 1927. Fe or steel, before plating with a metal such as Ni which readily alloys with the Fe on heating, is coated with a metal such as Cu which does not alloy so readily; after the 2nd coating the metal is heated in an inert or reducing atm. to the alloying temp. The Ni coating may be heavier than the Cu. Cr or W may also be coated on to a layer of Cu, and Ni on Ag, Ni on Cr, W on Ni or Cr on W.

**Treating ferrous metals from corrosion.** G. NOBILLEAU and J. GUIPET. Brit. 297,832, Sept. 29, 1927. Articles such as those of iron or steel are embedded in a mixt. of ZnCO<sub>3</sub>, powdered Zn, BaCO<sub>3</sub> and SiO<sub>2</sub> in boxes and the boxes and contents are heated in a gas or salt-bath furnace to a temp. somewhat below the m. p. of Zn. The articles may be suitably cleaned before this treatment, by successive treatment with boiling KOH soln., warm water and a 10% H<sub>2</sub>SO<sub>4</sub> soln.

**Surface treatment of magnesium or its alloys to form a protective coating.** EDWARD C. BURDICK (to Dow Chemical Co.). U. S. 1,709,894, April 23. The surface of articles is treated with a di-H phosphate such as that of Na or Mg.

**Apparatus for tinning brass strips, etc.** E. W. TAYLOR. Brit. 297,961, Sept. 15, 1927.

**Treating tinned scrap iron.** A. DOSSMANN. Brit. 298,103, June 29, 1927. The scrap is subjected to a preliminary pickling to remove Zn and then treated with a hot NaOH soln. contg. a sol. carbohydrate material such as molasses for removal of insol Pb compds. still adhering to the material. The cleaned scrap is then formed into briquets of such a d. that the penetration of the heating gas, during the subsequent heating which welds the briquets into billets, is reduced to a minimum. Substances which neutralize the oxidizing effect of the heating gases or reduce the oxides on the scrap, such as lubricating oils, smoke black, C<sub>10</sub>H<sub>8</sub>, or fluxes, etc., may be added to the scrap before or after its formation into briquets.

**Detinning tinned scrap.** T. TWYNAM. Brit. 297,528, July 11, 1927. Tinned scrap is immersed in HCl dild. with 3 or 4 times its vol. of water and heated, suitably to about 80-90°, to form a soln. of SnCl<sub>2</sub> practically free from Fe. The Sn may be pptd. from the soln. by use of Zn, and waste pickle liquor may be used as the source of the HCl for the process in which case either the Fe present or both the Sn and Fe may be electrolytically recovered. Lump coke may be added to accelerate the action of the HCl on the scrap. An app. is described.

**Aluminum alloy.** SAMUEL DANIELS. U. S. 1,710,148, April 23. An alloy which is suitable for use in aircraft or engine construction comprises Al together with Cu 2.25-3.0, Fe 0.75-1.5% and a "few tenths of a per cent" each of Mg and Si (the ratio of the Mg to Si being about 1.7 to 1.0).

**Magnetic alloys.** PAUL P. COFFI (to Bell Telephone Laboratories). U. S. 1,708,936, April 16. In order to obtain substantially constant permeability in a Ni-Fe-Co alloy over a wide range of field intensities, the alloy is heated (suitably to about 700-1100°) and while cooling is subjected to a field for substantially neutralizing the magnetizing effect of extraneous fields acting on the alloy.

**Magnetic alloys of cobalt and iron.** BELL TELEPHONE LABORATORIES. Brit. 297,938, Aug. 29, 1927. Magnetic alloys of high permeability contain iron and 40-60% Co and are heat treated to give them a permeability above that of Armco iron at a corresponding magnetizing force (suitably by heating at about 1100° 2-3 hrs. and then slowly cooling).

**Heat-resistant ferrous alloys.** H. G. A. VON KANTZOW. Brit. 298,408, Dec. 10, 1927. Fe alloys are formed contg. Al 0.5-14% and up to 6% of Co or of Co and Ti together, with or without addn. of Cr up to 30% or Mn up to 12% or both.

**Alloy of molybdenum, nickel and iron.** FREDERICK M. BECKETT (to Electro Metallurgical Co.). U. S. 1,710,445, April 23. An alloy which is acid-resistant comprises Ni at least 40, Mo 15-40 and a quantity of Fe not less than 10% nor greater than 5 times the amt. by which the Mo % exceeds 10.

**Iron alloys.** COMPAGNIE FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON. Fr. 649,369, Oct. 21, 1927. Hard alloys of Fe with at least 10% of W or Mo and not more than 0.1% of C are obtained by heating the metals closely assoc. to a temp. at which a solid soln. of W or Mo in the Fe is produced, then cooling rapidly and afterward heating to, and maintaining at, an intermediate temp. at which a pptn.

of a compd. contg. a relatively high proportion of the hardening metal takes place. Thus, an alloy contg. 10–14% of W is obtained by heating to about 1,500° in an atm. of H, cooling in water and afterwards heating to 700° for 10 hrs.

**Iron alloys.** TURK R. HAGLUND. Fr. 648,538, Feb. 8, 1928. Alloys of Fe or steel with Cr or Mn are obtained by the reduction of ores, etc., contg. oxides of Fe with the addn. of excess of an alloy of Cr or Mn, the excess being used for reduction of part or all of the Fe, a slag being obtained which is rich in oxides of Cr or Mn. Other reducing agents may also be used.

**Iron alloys.** THOMPSON PRODUCTS, INC. Brit. 298,250, April 8, 1927. Fe alloys contg. Cr, Ni, Si and C are obtained in non-austenitic form by heating to about 870–900° for more than 1 hr. and cooling slowly at the rate of not more than 28° per hr. for more than 3 hrs. Various details are given.

**Steel alloys.** F. KRUPP A.-G. Brit. 297,420, Sept. 21, 1927. Steel alloys are formed contg. Mn 9–17, C 0.8–1.7 and Al up to 5%, and other metals such as Ni, Cr, W, Mo or V also may be added.

**Alloy steel for rails.** GRANULAR IRON CO. Brit. 298,118, April 2, 1927. Iron produced as described in Brit. 284,040 (C. A. 22, 4101) is melted and combined with C and Mn in such proportions that the finished steel contains C 0.6–0.9 and Mn 0.7–1.25%.

**Material for use in making tungsten-containing alloy steels.** HILAND G. BACHELLER and JESS D. KELLEY (to Ludlum Steel Co.). U. S. 1,709,817, April 16. A frangible conglomerate suitable for use in making W-contg. alloy steels comprises partially reduced W oxide and slag material comprising fixation combinations of impurities such as Mn, Sn and As with soda or soda ash which do not enter the steel when the conglomerate is used in the steel-making process.

**Silver alloys.** I. G. FARBERIND. A.-G. Brit. 298,122, June 30, 1927. Ag alloys are formed contg. up to 22% of a mixt. of Mn with one or more of the elements Ti, Mg, Zn, As, Sb, Bi or Sn, or a mixt. of Mn, Ti and Si with one of the specified addns., or a mixt. of Mn and Si with As, Sb, Bi or Mg.

**Silver alloys resistant to chemical action.** I. G. FARBERIND. A.-G. Brit. 297,665, June 30, 1927. Ag, at least 78%, is alloyed with up to 22% of Ti or a mixt. of Ti with one or more of the elements Mg, Zn, As, Sb, Bi, Sn or Si. Cf. C. A. 23, 2414.

**Removing scale from metal bars and plates.** S. WILLIAMS. Brit. 297,526, July 8, 1927. An app. is described by which the material, while supported on a table with all surfaces exposed, is subjected to a water spray or sheet which moves across the table with a varying trajectory.

**Cooling tank for annealing copper wire.** R. SOBELIN. Belg. 352,807, Aug. 31, 1928. Constructional features.

**Electrodes for arc welding.** ALLOY WELDING PROCESSES, LTD. Fr. 648,545, Feb. 8, 1928. Electrodes for welding Al or alloys of Al consist of a core of Al or alloy coated with a flux contg. a reducing agent such as C, charcoal or sawdust so as to form a reducing atm. round the arc. The flux may also contain alkali chlorides, fluorides, borates, bisulfates, etc. The ingredients are ground to a fine powder and made into a paste with water which may contain dextrin, etc.

**Welding long seams of pipes, etc., by use of alternating electric current.** J. F. LAWSON. Brit. 298,273, July 8, 1927. An app. and various mech. features are described.

**Welding copper wires or rods.** BELL TELEPHONE LABORATORIES, INC. Brit. 297,493, June 23, 1927. The abutting surfaces of the parts are heated to above the welding temp., then cooled to welding temp. and percussively engaged with each other. An app. is described.

**Welding rod.** JOHN B. HAWLEY, JR. U. S. 1,709,474, April 16. A rod suitable for welding Cu to steel comprises a solid core which may be formed of solid Cu, a flux such as borax glass covering the core, and a metal jacket which may be formed of phosphor bronze around the flux with annular grooves rolled in the jacket to form pockets which serve to hold the flux.

**Solder flux.** JOHN D. RAYMOND. U. S. 1,709,542, April 16. HCl 3, oleic acid 2, rosin 2 and NaCl 1 part.

## 10—ORGANIC CHEMISTRY

CHAS. A. ROUILLER AND CLARENCE J. WEST

**Synthesis of aromatic hydrocarbons from methane at atmospheric pressure and without catalysts.** F. FISCHER. *Brennstoff-Chem.* 9, 309-16(1928); cf. *C. A.* 23, 1119.—Pure  $\text{CH}_4$  from various sources and  $\text{CH}_4$  with other gases (coal gas) is decompd. by passage through porcelain or quartz tubes heated  $900^\circ$  to  $1200^\circ$ . The tar formed is pptd. by a Cottrell precipitator and light oils are absorbed by active charcoal. The time of contact is fully as important as the temp. *E. g.*, 346 l.  $\text{CH}_4$  (89% with 8%  $\text{N}_2$ ) passed through the 1-mm. annular space between concentric 14- and 16-mm. tubes 22 cm. long at 63 l./hr. gave 7-g. oil, 3-g. tar and 0.2-g. C. Higher temps. with the same gas flow favor pptn. of C. Tar and oil do not form to an appreciable extent below  $900^\circ$ . The tar is aromatic, naphthalene, anthracene and phenanthrene being isolated. The oils contain mostly benzene with xylene and  $\text{C}_{10}\text{H}_8$ .  $\text{SiO}_2$ , W, Mo and Sn as catalysts did not favor oil yields; Fe, Cu and graphite favored C pptn. J. D. DAVIS

**Autoxidation of hydrocarbons.** P. DUMANOIS AND P. MONDAIN-MONVAL. *Ann. office nat. comb. liquides* 3, 761-78; *Compt. rend.* 187, 892-4(1929).—Mixts. with air of  $\text{C}_5\text{H}_{12}$ ,  $\text{C}_6\text{H}_{12}$  contg. 0.11% of  $\text{PbEt}_4$ , and  $\text{C}_6\text{H}_6$  are heated at temps. from  $20^\circ$  to  $300^\circ$  in a rotating cylindrical steel bomb of 700-cc. capacity under an initial pressure (at  $20^\circ$ ) of 5.3 kg. above atm. The temps. are measured by a Hg thermometer inserted into a specially constructed well in the axle of rotation which extends to the center of the bomb. No ignition takes place at temps. below  $300^\circ$  when the quantity of  $\text{C}_6\text{H}_{12}$  is about 10% less than the calcd. amt. for complete combustion. But with 0.5 cc. (the amt. of liquid  $\text{C}_6\text{H}_{12}$  calcd. as necessary for complete combustion) up to 10 cc., the curve connecting rise in temp. with pressure is at first practically linear, it bends at  $120^\circ$  corresponding to a less rapid rise in pressure, and continues in nearly a straight line until at  $10$ - $15^\circ$  below the ignition temp. the pressure increases very rapidly. The ignition temps. decrease from  $238^\circ$  to about  $220^\circ$  and the explosions of the  $\text{C}_6\text{H}_{12}$ -air mixts. become less violent as the proportion of  $\text{C}_6\text{H}_{12}$  increases. D. and M.-M. suggest that the less rapid rise of pressure above  $120^\circ$  may be due to the partial formation of oxygenated compds. of hydrocarbons analogous to the peroxides detected by Moureu and Dufraisse. In the presence of 0.11% of  $\text{PbEt}_4$  spontaneous ignition occurs below  $300^\circ$  only when the proportion of  $\text{C}_6\text{H}_{12}$  is above that required for complete combustion. The  $\text{PbEt}_4$  causes the bend in the curve to be less marked. Ignition is preceded by a slight increase in pressure and occurs at temps. which, for the same proportion of  $\text{C}_6\text{H}_{12}$ , are higher than when  $\text{PbEt}_4$  is absent ( $251$ - $230^\circ$  in comparison with  $238$ - $220^\circ$ ). The curves obtained for 1-5 cc. of  $\text{C}_6\text{H}_6$  under the same conditions of expt. show no particular bends, and no ignition takes place below  $300^\circ$  R. E. SCHAAD

**Production of isomers in the formation of the double bond by the dehydration of substituted alcohols.** WM. CHALMERS. Univ. of Brit. Columbia. *Trans. Roy. Soc. Can.* [3], 22, III, 69-78(1928); cf. *C. A.* 21, 2663.—A theoretical study of the dehydration compds. of secondary alcs. and an exptl. study of the formation of isomers in dehydrating chlorohydrins. All possible isomers are to be expected in some proportion, Saytzeff's rule notwithstanding. Steric hindrance phenomena were observed in the reaction of NaI with Cl-derivs. of  $\text{Me}_2\text{C}:\text{CHMe}$  and  $\text{Me}_2\text{C}:\text{CMe}_2$ . Apparently in a series of substituted alcs. a H atom will sep. most easily from the following groups in the order given:  $\text{CH}_3\text{CO}_2\text{H}$ ,  $\text{CH}_3\text{OEt}$ ,  $\text{CH}_3\text{Ac}$ ,  $\text{CH}_3$ ,  $\text{CHO}$ ,  $\text{CH}_3\text{CO}_2\text{Me}$ ,  $\text{CH}_2\text{Cl}$ , iso-Pr, iso-Bu, Et, Me. Saytzeff's rule is incapable of foretelling what isomer will be produced in the dehydration of compds. contg. the  $\text{ClCH}_2$  group. Dehydration of  $\text{ClCH}_2\text{C}(\text{OH})\text{MeEt}$  by distn. over anhyd. ( $\text{CO}_2\text{H}$ ), gave a mixt. of 44%  $\alpha$ -chloro- $\beta$ -methyl- $\Delta^2$ -butene, b.  $96$ - $7^\circ$ ,  $d_4^{20}$  0.9170, 15% *trans*- $\beta$ -chloromethyl- $\Delta^2$ -butene and 41% of *cis*- $\beta$ -chloromethyl- $\Delta^2$ -butene and  $\beta$ -chloromethyl- $\Delta^2$ -butene.  $\text{PCl}_5$  acting on *as*-methyl-*ethylethylene* oxide gives a mixt. of chloroamylenes and  $\alpha,\beta$ -dichloro- $\beta$ -methylbutene, b.  $133$ - $5^\circ$ ,  $d_4^{20}$  1.0785. Dehydration of  $\alpha$ -chloro- $\beta,\gamma$ -dimethylbutan- $\beta$ -ol, b.  $162$ - $4^\circ$ ,  $d_4^{20}$  1.049, gave 48%  $\alpha$ -chloro- $\beta,\gamma$ -dimethyl- $\Delta^2$ -butane, 20%  $\gamma$ -methyl- $\beta$ -chloromethyl- $\Delta^2$ -butene, and 32%  $\gamma$ -methyl- $\alpha$ -chloromethyl- $\Delta^2$ -butene. *as*-Methyl-*isopropylethylene* oxide, b.  $100$ - $1^\circ$ ,  $d_4^{20}$  0.8261. This oxide and the chlorohydrin (given above) have not been prepd. before. J. W. SHIPLEY

**Allylic transposition and addition compounds of erythronic hydrocarbons. I. Theoretical.** CHARLES PRÉVOST. *Ann. chim.* [10], 10, 113-46(1928).—P. has corrected the previously published work and his own results (*C. A.* 21, 3598; 22, 579, 2737;

3, 371) on the basis of his ionic theory of tautomerism. *Synonimie* of mobile groups (X) in the structure X-A-B-C is explained by ionization. **II. Experimental part** (1) **Preparation, allylic transposition and dehydration of vinylcarbinols.** *Ibid* 147-81.—Addn. of 1.2 moles of RBr in 5 vols. of Et<sub>2</sub>O to 25 g. of Mg in 200 cc. of Et<sub>2</sub>O at -10°, followed by 0.9 mole of pure *acrolein* (I) in 5-6 vols. of Et<sub>2</sub>O during 3-4 hrs. produced 16 g. compds. which were hydrolyzed after 18 hrs. standing to give the following yields of carbinols: *methylvinyl* (II) 60%, *ethylvinyl* (III) 65%, *propylvinyl* (IV) 60%, *butylvinyl* (V) 45%, *ethylpropenyl* (VI) 70% from *crotonaldehyde* instead of I. Dehydration of II over Al<sub>2</sub>O<sub>3</sub> gave *1,3-butadiene* and some isomerization to *2-butenol* (VII). With PBr<sub>3</sub> and C<sub>6</sub>H<sub>5</sub>N, II gave *1-bromo-2-butene* (VIII) which upon hydrolysis with dil. KOH gave 60% of II and 40% of VII and upon treatment with alc. KOH or EtONa gave *1-ethoxy-2-butene* and a small quantity of *3-ethoxy-1-butene*. With dil. HCl, partial isomerization of II took place, giving VII and in addn. the following ethers: *di[1-vinylethyl]* (IX), b. 123-5°, d<sub>4</sub><sup>20</sup> 0.7975, n<sub>D</sub><sup>20</sup> 1.4185; *2-butenyl[1-vinylethyl]* (X), b. 133-5°, d<sub>4</sub><sup>22</sup> 0.8075, n<sub>D</sub><sup>22</sup> 1.4245; and *di[2-butenyl]* (XI), b. 143-4°, d<sub>4</sub><sup>22</sup> 0.8138, n<sub>D</sub><sup>22</sup> 1.4275. The quantities of these ethers present in the mixt. were in the ratio 2:6:2. Esterification of II with AcOH (catalyzed by HCl) gave the corresponding *acetate*, b. 112°; with Cl<sub>3</sub>CCO<sub>2</sub>H, II gave *trichloroacetates* of II (55%), b<sub>12-5</sub> 74.0-4.5°, d<sub>4</sub><sup>22</sup> 1.2990, n<sub>D</sub><sup>22</sup> 1.4588, and of VII (45%), b<sub>12-5</sub> 89-9.5°, d<sub>4</sub><sup>22</sup> 1.3130, n<sub>D</sub><sup>22</sup> 1.4710, together with small quantities of IX and X. Hydrolysis of these acetates was normal resulting in the corresponding alcs. With PBr<sub>3</sub> and C<sub>6</sub>H<sub>5</sub>N, com. *geraniol* gave an unidentified *hydrocarbon*, b<sub>3</sub> 34°, b<sub>12</sub> 62°, d<sub>4</sub><sup>22</sup> 0.8175, n<sub>D</sub><sup>22</sup> 1.4780, and a *bromide* (XII), b<sub>12</sub> 101-2°, d<sub>4</sub><sup>22</sup> 1.0940, n<sub>D</sub><sup>22</sup> 1.4858, which decompd. upon distn. to yield a *hydrocarbon* (XIII), b<sub>12</sub> 65°, d<sub>4</sub><sup>22</sup> 0.8340, n<sub>D</sub><sup>22</sup> 1.4784. With NaOAc, XII gave XIII and also an *acetate*, b<sub>12</sub> 115°, d<sub>4</sub><sup>22</sup> 1.0004, n<sub>D</sub><sup>22</sup> 1.4500. Com. *linalool* gave XII together with a *hydrocarbon*, b<sub>3</sub> 37°, b<sub>12</sub> 100°, d<sub>4</sub><sup>22</sup> 0.8477, n<sub>D</sub><sup>22</sup> 1.4815. Over Al<sub>2</sub>O<sub>3</sub> at 360°, III gave 70% of *1,3-pentadiene*, b. 138-9°, d<sub>4</sub><sup>20</sup> 0.6830, n<sub>D</sub><sup>20</sup> 1.4280 (*tetrabromide*, m. 114°); isomers and 20% of *2-pentenol*, b. 138-9°, d<sub>4</sub><sup>20</sup> 0.8468, n<sub>D</sub><sup>20</sup> 1.4299, and other products, b. 118-250°. Under these conditions, IV gave *2-hexenol*, b. 154-6°; *1,3-hexadiene*, b. 72-5°, d<sub>4</sub><sup>13</sup> 0.7152, n<sub>D</sub><sup>12</sup> 1.4416 (*tetrabromide*, m. 91°); *2,4-hexadiene* (XIV), b. 82°, d<sub>4</sub><sup>22</sup> 0.7179, n<sub>D</sub><sup>22</sup> 1.4490 (*tetrabromide*, m. 185°), and an *isomer*, b. 77-8°, d<sub>4</sub><sup>13</sup> 0.7167, n<sub>D</sub><sup>12</sup> 1.4450 (*tetrabromide*, m. 162°). Dehydration of VI with ZnCl<sub>2</sub> at 100° gave XIV, *isomers* and *polymers*, the latter having unsatn. equiv. to about 1.45 C:C per C<sub>6</sub>. Dehydration of VI over Al<sub>2</sub>O<sub>3</sub> gave about 2% of XIV. An unidentified mixt. of isomeric hydrocarbons was obtained from V over Al<sub>2</sub>O<sub>3</sub>.

A. S. CARTER

The allylic transposition and the additive derivatives of the erythreic hydrocarbons. **III. Experimental part.** (2) Some derivatives of the erythreic hydrocarbons; some transpositions. CHARLES PRÉVOST. *Ann. Chim.* [10], 10, 356-439 (28).—This paper (cf. preceding abstr.) gives special attention to the exptl. details, a considerable no. of constts., some of which are new, the others being corrections. Possible stereochem. constitutions are listed. CH<sub>2</sub>:CHCH:CHCH<sub>3</sub> yields a solid *tetrabromide*, m. 114°, together with a liquid, b<sub>3</sub> 121-31°, d<sub>4</sub><sup>18</sup> 2.3195, n<sub>D</sub><sup>18</sup> 1.5915. MeCH:CHCH:CHMe yields the known *tetrabromide*, m. 185°, together with the 2 *tetrabromides*, m. 108° and 162°, and a mixt. of liquid *tetrabromides*, b<sub>3</sub> 128-33°, d<sub>4</sub><sup>16</sup> 1.5930, n<sub>D</sub><sup>16</sup> 1.5831; the *tetrabromides* m. 95-7° and 64-5° were never encountered. MeCBrCBr:CHMe has d<sub>4</sub><sup>22</sup> 1.8225, n<sub>D</sub><sup>22</sup> 1.5630. MeCH:CBrCBr:CHMe, b<sub>12</sub> 83-6°, d<sub>4</sub><sup>22</sup> 1.6700, n<sub>D</sub><sup>22</sup> 1.5400, treated with an excess of Br yields MeCHBrCBr:CBrCHBrMe, b. 12-3°. MeC≡CC≡CH, b. 54-6°, d<sub>4</sub><sup>21</sup> 0.7375, n<sub>D</sub><sup>21</sup> 1.4431, while ethyl- and propylstyrene have only been obtained as their Ag derivs. PhC≡CC≡CMe, m. 22.45°, b. 29°, d<sub>4</sub><sup>18</sup> 0.9745, n<sub>D</sub><sup>18</sup> 1.6368, adds only 2 mols. Br, yielding two *tetrabromides*, b. 27-31° and 98°, resp.; treated with aq.-alc. HgCl<sub>2</sub>, it yields PhCIC:C(HgCl)C(HgCl):CHMe. The *dibromides* of CH<sub>2</sub>:CHCH:CHMe, b<sub>11</sub> 70°, d<sub>4</sub><sup>18</sup> 1.6992, n<sub>D</sub><sup>18</sup> 1.5477 and b<sub>11</sub> 85-6°, d<sub>4</sub><sup>15</sup> 1.7482, n<sub>D</sub><sup>15</sup> 1.5523, resp.; these *dibromides* yield two *dibromides*, b<sub>11</sub> 112-5°, d<sub>4</sub><sup>23</sup> 1.0446, n<sub>D</sub><sup>23</sup> 1.4398, and b<sub>13</sub> 104-5°, d<sub>4</sub><sup>21</sup> 1.0386, n<sub>D</sub><sup>21</sup> 1.4365, the latter being probably the diacetate of EtCH:C(OH)CH<sub>2</sub>OH. The *dibromide* b<sub>12</sub> 87-8°, on hydrolysis yields 3 *glycols*, b<sub>14</sub> 109°, d<sub>4</sub><sup>17</sup> 1.0147, n<sub>D</sub><sup>17</sup> 1.4633, b<sub>14</sub> 117-109°, d<sub>4</sub><sup>17</sup> 1.4790, n<sub>D</sub><sup>17</sup> 1.4898, b<sub>14</sub> 120-109°, d<sub>4</sub><sup>20</sup> 1.4575, n<sub>D</sub><sup>20</sup> 1.4775. MeCH:CHCH:CHMe, b<sub>12</sub> 87-8°, on hydrolysis yields 3 *glycols*, b<sub>14</sub> 109°, d<sub>4</sub><sup>17</sup> 1.0147, n<sub>D</sub><sup>17</sup> 1.4633, b<sub>14</sub> 117-109°, d<sub>4</sub><sup>17</sup> 1.4790, n<sub>D</sub><sup>17</sup> 1.4898, b<sub>14</sub> 120-109°, d<sub>4</sub><sup>20</sup> 1.4575, n<sub>D</sub><sup>20</sup> 1.4775.

CHMe, two diacetates are obtained,  $b_{14}$  117–8°,  $d_4^{21}$  1.0247,  $n_D^{21}$  1.4460 (60% yield) and  $b_{14}$  106–9°,  $d_4^{21}$  1.0210,  $n_D^{21}$  1.4390 (35% yield). The corresponding glycols are, resp.: *trans*-MeCH(OH)CH:CHCH(OH)Me,  $b_{11}$  117–8,  $d_4^{21}$  0.9865,  $n_D^{21}$  1.4660, and MeCH(OH)CH(OH)CH:CHMe,  $b_{11}$  99–100,  $d_4^{21}$  0.9838,  $n_D^{21}$  1.4614. By the action of an excess of finely powd. KOH on the appropriate glycol in Et<sub>2</sub>O satd. with Br, the

following substituted erythrene oxides are obtained:  $\text{O} \cdot \text{CHMe} \cdot \text{CHCH} \cdot \text{CH}_2 \cdot \text{O}$ , b.

146°,  $d_4^{17}$  1.0813,  $n_D^{17}$  1.4382;  $\text{O} \cdot \text{CHMe} \cdot \text{CH}_2 \cdot \text{CH} \cdot \text{O} \cdot \text{CH} \cdot \text{CH}_2$ , b. 145°; a mixt. of

the stereoisomers of  $\text{O} \cdot \text{CHMe} \cdot \text{CHCH} \cdot \text{CHMe} \cdot \text{O}$ , b. 161°,  $d_4^{21}$  1.0312,  $n_D^{21}$  1.4375;

$\text{MeCH} \cdot \text{CH} \cdot \text{O} \cdot \text{CH} \cdot \text{CHMe}$ , b. 151°,  $d_4^{21}$  1.0373,  $n_D^{21}$  1.4350. By hydration, these

compds. yield erythritols, methylerythritol, m. 109.5°, and 1,4-dimethylerythritol, m. 172°.  $\text{BrH}_2\text{CCH:CHCH:CHCH}_2\text{Br}$  yields a mixt. of diacetates,  $b_{13}$  129–31°,  $d_4^{21}$  1.0700,  $n_D^{21}$  1.4760: they correspond to the glycols  $\text{CH}_2\text{:CHCH:CHCH(OH)CH}_2\text{OH}$  and  $\text{CH}_2\text{:CHCH(OH)CH:CHCH}_2\text{OH}$ . At the same time, another diacetate, m. 25°,  $d_4^{21}$  1.0762 (supercooled),  $n_D^{21}$  1.4350, is obtained: it corresponds to  $\text{CH}_2(\text{OH})\text{CH:CHCH:CHCH}_2\text{OH}$ . The spontaneous decompn. of  $\text{Me}_2\text{BrCCH:CHCBrMe}_2$  seems to yield  $\text{BrH}_2\text{CC(Me):CHCH:CMe}_2$ ,  $b_3$  64–7°,  $d_4^{18}$  1.2230,  $n_D^{18}$  1.5522; this is converted into the acetate,  $b_3$  77–9°,  $d_4^{18}$  0.9570,  $n_D^{18}$  1.4890; the latter hydrolyses to  $\text{Me}_2\text{C:CHCH:C(Me)CH}_2\text{OH}$ ,  $b_4$  77–8°,  $d_4^{17}$  0.9197,  $n_D^{17}$  1.5095, which is reduced to  $\text{Me}_2\text{CHCH}_2\text{:CH}_2\text{CH(Me)CH}_2\text{OH}$ .

ALBERT L. HENNE

**The preparation of allyl alcohol.** RAYMOND DELABY and PIERRE DUBOIS. *Compt. rend.* 188, 710–1(1929); cf. *C. A.* 23, 1107, 1867. The previous paper has shown that good yields of alc. are dependent upon the formation of the *disformate of glycerol*. This paper gives the exact conditions of temp., pressure and time necessary to obtain max. yields of this ester, and for its conversion into allyl alc. by heat. Yields are 70%, 15% higher than previous reports.

VALENTINE F. HARRINGTON

**Hydroxycitronellol.** R. SORNET. *Rev. chim. ind.* 38, 34–7(1929); cf. *C. A.* 22, 2738, 2754, 3113, 3417.—Hydroxycitronellol prepd. by 3 methods is odoriferous in one case only. S. attributes this to the position of the HO group, the tertiary compd. being odoriferous and the secondary odorless. The relative quantity of each depends on the concn. of the acid and the temp. during hydroxylation. The odoriferous compd. is more viscous and the b. p. is lower by 2° or 3°,  $b_{14}$  148–152°. Details are given for the prepn. in the lab. with abs. alc.; this is not practical on a large scale. S. has worked out a com. process but does not reveal the procedure. The odor of hydroxycitronellol is not immediately noticeable after distn. but develops on standing.

P. THOMASSET

**The so-called arachic acid and other acids of high molecular weight from peanut oil.** D. HOLDE, W. BLEYBERG and I. RABINOWITSCH. *Tech. Hochschule Berlin. Ber.* 62B, 177–83(1929).—Ehrenstein and Stuewer believe that Gossmann's "arachic acid," m. 74.5–5°, is isobehenic acid, m. 74.5°, while Cohen claims that the "crude arachic acid" is a mixt. of eicosanic acid, m. 74.5–5°, and lignoceric acid, m. 80.5°. The object of the present work was to clear up this lack of agreement. The com. peanut oil acids used as raw material were worked up as already described (*C. A.* 20, 1590) by combined high vacuum distn. and recrystn. of the acids or their esters and fractional pptn. of the Li salts. The presence of a docosanic acid (denied by C.) was established beyond doubt but mixed m. p. detns. showed that, contrary to E. and S., it is *n*-, not isobehenic acid. There were also obtained small quantities of an acid (I) with a mol. wt. (323–4) corresponding to  $\text{C}_{21}\text{H}_{42}\text{O}_2$ , whose homogeneity seemed established by the constancy of its m. p. (69–70°) and mol. wt. after pptn. with Li and repeated recrystn. but in view of the considerably higher m. p. (75–6°) given by Levene and Taylor for synthetic heneicosanic acid, I needs to be characterized more sharply. The eicosanic acid, whose presence in peanut oil was definitely proven by C., was entirely or almost entirely absent from the authors' "crude arachic acid," m. 73°, freed of unsatd. and lower satd. acids, but they believe it remained in the lower acids sep'd. by crystn. As regards the acid  $\text{C}_{20}\text{H}_{40}\text{O}_2$ , m. 79°, found by Holde and Godbole in Indian peanut oil, the highest fraction of the acids in the present work yielded 1.3 g.

of an acid of almost the same m. p. (78–8.8°) but whose mol. wt. (381–4) pointed rather to the compn.  $C_{20}H_{16}O_2$ . Although fractional pptn. with LiOAc effected no detectable sepn., cautious high vacuum distn. yielded a residue which, after 3 crysts. from  $C_6H_6$  and  $Me_2CO$ , m. 81–2.4° and showed a mol. wt. of 390. By analogy with the arachic and behenic acids, this acid is probably also of the normal series, although L. and T. give 88–9° as the m. p. of the synthetic acid. The m. ps. of some of L. and T.'s synthetic acids are strikingly higher than the values hitherto reported for the natural products; this may be due in part to the rapidity of heating (10° per min.) in their m. p. detns. C. A. R.

The mechanism of the reaction between mixed Grignard reagent and *N*-disubstituted crotonamides. NICOLAS MAXIM. *Bul. soc. chim. Romania* 10, 97–115 (1928).— $MeCH:CHCONEt_2$  (I),  $b_{23}$  113°,  $b_{766}$  224°, and  $MeCH:CHCONPh_2$  (II), m. 113–4°, were prepd. nearly quant. by dropping the acid chloride into the corresponding amine (1 mol. chloride in 200 cc. of benzene and 2 mols. amine in 500 cc. benzene). The *crotonyl chloride* was prepd. in 95% yield by heating the acid with  $SOCl_2$  (20% excess) for 4 hrs. at 60°.  $EtMgBr$  (III) and  $PhMgBr$  (IV) with I and II give complexes by 1,4-addn. These by hydrolysis with 20% KOH give enol forms which immediately give a satd. acid amide (following abstr.) exactly as with cinnamic acid (C. A. 22, 4114). I and III give quant.  $\beta$ -methylvaleric diethylamide (V),  $b_{23}$  123°,  $b_{766}$  224°. I and IV give 2 fractions, the one, b. 180–200°, yields 80%  $\beta$ -phenylbutyric diethylamide (VI),  $b_{23}$  184–5°. II and III give quant.  $\beta$ -methylvaleric diphenylamide (VIII), m. 76°,  $b_{18}$  267°. In the above condensations the Grignard and the amide are refluxed 4 hrs. After 12 hrs. excess 20% HCl is added, then  $NaHCO_3$ . The mixt. is dried with  $Na_2SO_4$ . VII and VIII are hydrolyzed by 40% HBr to give racemic acids. V and VI are not sapond. Quant. methods for prepg. substituted satd. acids and their amides are given. VALENTINE F. HARRINGTON

The mechanism of the reaction of Grignard reagents on *N*-disubstituted cinnamic anilides. N. MAXIM AND N. IOANID. *Bul. soc. chim. Romania* 10, 116–26 (1928).—Grignard reagents give with *N*-disubstituted cinnamic anilides (I) after hydrolysis either satd. acids or unsatd. ketones, depending on the reagent used (cf. C. A. 22, 4114).  $EtMgBr$  or  $PhMgBr$  gives only the former, but  $MeMgI$  gives the latter in 25% yield (cf. preceding abstr.). This last reaction can be only 1,2-addn. The first may be either 1,4 or 3,4. To decide this the I are condensed with  $PhMgBr$ , then with  $AcCl$ . Sapon. of 2 g. of this product with 20 g. of 20% alc. KOH gives the alc. which immediately changes to the keto form. This on hydrolysis with 40% HBr gives the satd. acid. If the addn. had been 3,4 a ketone would have resulted.  $PhMgBr$  with methyl-, ethyl- and phenyl-cinnamic anilides yielded 3,3-diphenyl-1-methylphenyl-amino- $\Delta^1$ -1-propenol acetate, m. 154°, 3,3-diphenyl-1-ethylphenylamino- $\Delta^1$ -1-propenol acetate, m. 138°, and 3,3-diphenyl-1-diphenylamino- $\Delta^1$ -1-propenol acetate, m. 148°. The Grignard was prepd. from 100 g. ether, 3 g. Mg and 20 g.  $PhBr$ ; 20 g. of the anilide was added, heated 3 hrs., and 20 g.  $AcCl$  in ether was added. V. F. H.

A crystallized acetin and diglyceride. M. BATTEGAY, H. BUSER AND E. SCHLAGER. *Compt. rend.* 188, 790–8 (1929).—Anhyd. glycerol (120 g.) and 200 g. of HOAc were heated below 135° with 2 g. of  $H_2SO_4$  (66 Bé.), distg. off the  $H_2O$  as formed; the HOAc was replaced 5 times in 20-cc. portions at 8-hr. intervals. Fractionation *in vacuo* gave 3 fractions: 40 g.  $b_{14}$  140–60°; 30 g.  $b_{16}$  160–90°; 10–20 g.  $b_{18}$  190–250° and a residue of 30–40 g. The 2nd fraction gave 4–8 g. of crystals, which were recrystd. from  $H_2O$  and found to be diglycerol diacetate (I),  $C_{21}H_{38}O_6(OAc)_2$ , m. 124°,  $b_{16}$  179° (cf. Rangier, C. A. 22, 4468). Boiling I in EtOH with HCl for 1 hr. and evapg. the EtOAc, EtOH and HCl gave diglycerol (II),  $C_3H_8O_3$ ,  $b_{16}$  173°, m. 96–7°. Acetylation of II gave I; benzooylation gave the dibenzoate, m. 138°, and fusing II with  $PCl_5$  gave diglycerol dichloride, m. 112°. II is either  $HOCH_2CH_2CH_2OCH_2CH(CH_2OH)CH_2O$  or



A. S. CARTER

The relation of chemical structure to the rate of hydrolysis of peptides. V. Enzyme hydrolysis of dipeptides. P. A. LEVINE, ROBERT E. STEIGER AND LAWRENCE W. BASS. Rockefeller Inst. *J. Biol. Chem.* 82, 155–66 (1929).—The action of erepsin on the following peptides was studied: glycylglycine, glycyl- $\alpha$ -aminoisobutyric acid, glycyl-*dl*-phenylaminoacetic acid, glycyl-*dl*-phenylalanine, glycyl-*dl*-phenylmethylaminoacetic acid, glycyl-*dl*-phenylalanine, glycyl-*dl*-phenylmethylaminoacetic acid and glycyl-*l*-phenylaminoacetic acid. The chem. structure of the substrate is shown to play a great part in enzymic hydrolysis. The disconn. cons. of the groups involved in the peptide linkage are also, in certain cases at least, a factor in this hydrolysis.

Peptides contg. one component enantiomorphous to the natural amino acids were not hydrolyzed by erepsin. Dipeptides, contg. one *d,l*-amino acid and one naturally occurring amino acid were hydrolyzed to the extent of 50%. Dipeptides in which the free  $\text{CO}_2\text{H}$  and the  $\text{NH}_2$  groups involved in the peptide linkage are attached to a tertiary C atom were not hydrolyzed in the time intervals of the expts. *Methods* for the *prepn.* of the above-mentioned peptides are given. **VI. Hydrolysis of dipeptides by alkali.** P. A. LEVENE, LAWRENCE W. BASS AND ROBERT E. STEIGLER. *Ibid* 167-70.—The alk. hydrolysis constns. of the first 5 peptides mentioned above and of glycyl-*dl*-alanine, *dl*-alanylglycine and *dl*-alanyl-*dl*-alanine, were detd. at  $25^\circ$ . These constns. varied widely according to the structures of the dipeptides. Unlike the case of acid hydrolysis, the rates of alk. hydrolysis are not a function of the intrinsic constns. of the groups involved in the peptide linkage. ARTHUR GROLLMAN

**Complex oxalates of scandium.** J. ŠTĚRBA-BOHM AND S. ŠKRAMOVSKÝ. Univ. Charles, Prague. *Collection Czechoslov. Chem. Comm.* 1, 1-18(1929).—Sc oxalate is obtained in a pure form only in the abs. absence of  $\text{NH}_4$  and K ions. It is highly desirable that Na ions be absent also.  $\text{Sc}_2(\text{C}_2\text{O}_4)_3 \cdot 6\text{H}_2\text{O}$  and also the dihydrate have been obtained. Sc oxalate easily forms ammoniated complexes, even in an acid medium. The literature data referring to a salt obtained by pptn. with  $(\text{NH}_4)_2\text{C}_2\text{O}_4$  really describe salts more or less soiled with ammoniated complexes. Sc oxalate absorbs gaseous  $\text{NH}_3$  readily. Only  $\text{NH}_4\text{ScC}_2\text{O}_4$  exists in the solid state, among the ammoniated derivs.  $(\text{NH}_4)_3\text{Sc}(\text{C}_2\text{O}_4)_3 \cdot 5\text{H}_2\text{O}$ , which is often mentioned, may exist in soln but cannot be isolated. Among the K derivs. it was possible to isolate  $\text{KSc}(\text{C}_2\text{O}_4)_2 \cdot 2\text{H}_2\text{O}$ , which has always been described erroneously as an anhyd. salt.  $\text{K}_3\text{Sc}(\text{C}_2\text{O}_4)_3 \cdot 4\text{H}_2\text{O}$  is easily formed but is not very stable and readily hydrolyzed.  $\text{NaSc}(\text{C}_2\text{O}_4)_2 \cdot 3\text{H}_2\text{O}$  has been isolated with difficulty, it hydrolyzes readily, it changes spontaneously into the dihydrate.  $\text{NaSc}(\text{C}_2\text{O}_4)_3 \cdot 6\text{H}_2\text{O}$  has been described, the literature considered it as a pentahydrated salt. ALBERT L. HENNE

**Adipic acid and its derivatives.** G. C. *Rev. prod. chim.* 32, 73 5(1929).—A review of the *prepn.*, properties and uses of these products. P. THOMASSET

**Conjugated double bonds. VII. Determinations of side-chains in bixin and crocetin.** RICHARD KUHN, ALFRED WINTERSTEIN AND LÁSZLÓ KARLOVITZ. *Helv. Chim. Acta* 12, 64 71(1929).—K., W. and K. give further evidence in favor of their formulas for bixin (I) and  $\alpha$ -crocetin (II) (cf. *C. A.* 22, 2950). The detn. of the oxidation no. (atoms of O required to oxidize 1 mol. of I completely to  $\text{AcOH}$ ,  $\text{CO}_2$  and water) of I gave 45.2 (theory 45). Titration of  $\text{AcOH}$  showed 3.97 mols. (theory 4.00) for each mol. of I. The criticism of their formula for I by Rinkes (cf. *C. A.* 23, 101) is not justified since the formation of the unsatd. aldehyde,  $\text{C}_8\text{H}_{10}\text{O}_3$ , from which R. obtained  $\beta$ -methyladipic acid, can readily be explained on the basis of the authors' formula for I. The oxidation nos. for II were 33.7 and 33.6 (theory 33). From the oxidation of II 2.95 mols. (theory 3.00) of  $\text{AcOH}$  was obtained for each mol. of II (cf. *C. A.* 22, 4464). FREDERICK C. HAHN

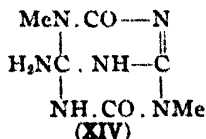
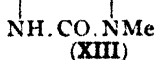
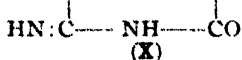
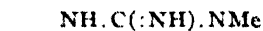
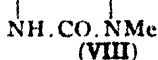
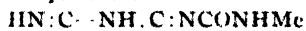
**A new case of Walden inversion in the hexose series.** P. A. LEVENE, A. L. RAYMOND AND A. WALT. Rockefeller Inst. *J. Biol. Chem.* 82, 191-5(1929).—Comparison of the 3,6-anhydroglucose osazone of Fischer and Zach (*C. A.* 6, 1295) and the osazone from fructose-3-phosphoric acid showed that the differences between them are analogous to those observed in the pair glucosazone and allosazone. The fructose-3-phosphoric acid is, therefore, regarded as 3,7-anhydroallosazone and the hydrolysis of the  $\text{PO}_4$  group during osazone formation is regarded as accompanied by Walden inversion. ARTHUR GROLLMAN

**Isocyanates. VI. Condensations of methyl isocyanate with cyanamide under the influence of triethylphosphine.** K. H. SLOTTA AND R. TSCHESCHKE. Univ. Breslau. *Ber.* 62B, 137-45(1929); cf. *C. A.* 21, 1232.—The structure of the substances formed by the condensation of  $\text{MeNCO}$  with  $\text{CNNH}_2$  has now been completely cleared up. In  $\text{Et}_2\text{O}$  there is no reaction but on addn. of  $\text{PEt}_3$  there begins to sep. a solid substance  $(\text{MeNHCO})_2\text{NCN}$  (I), irrespective of the relative quantities of  $\text{MeNCO}$  and  $\text{CNNH}_2$ , used although, of course, the yield varies. That I is not a deriv. of  $\text{C}(\text{:NH})_2$  is shown by the fact that one of the  $\text{MeNHCO}$  groups is held very loosely. This group is split off even by  $\text{CH}_2\text{N}_2$  in  $\text{Et}_2\text{O}$ , but the primary cleavage product  $\text{MeNHCONHCN}$  (II) is at once methylated to  $\text{MeNHCONMeCN}$  (III), which is obtained in small quantity, together with much resinous products. The II can be obtained almost quantitatively by treating I in  $\text{MeOH}$  at room temp. with  $\text{H}_2\text{S}$ ; if  $\text{H}_2\text{S}$  is again passed in and the soln. boiled a short time,  $\text{H}_2\text{S}$  adds to the II and  $\text{MeNHCONHCSNH}_2$  is formed. In all reactions of I the same phenomenon occurs: primary formation of II and further transformation of the latter. Thus, with  $\text{NH}_3$  is obtained  $\text{MeNHCONHC}(\text{:NH})\text{NH}_2$ .



(IV), with  $\text{HN}_2$ ,  $\text{MeNHCONHC}(\text{N}:\text{NH}:\text{N}:\text{N})$  (V). The 2nd cleavage product,  $\text{MeNCO}$ ,

was identified as  $(\text{NHCONHMe})_2$  (VI) in the reaction between I and  $\text{N}_2\text{H}_4 \cdot \text{H}_2\text{O}$ . As in the case of  $\text{MeNCO}$ , the polymerization of II proceeds differently according as  $\text{PEt}_3$  is or is not present. When I is simply boiled some hrs. in  $\text{AcOEt}$ , the  $\text{MeNCO}$  split off can be detected by its odor and there is obtained in good yield the normal polymerization product,  $\text{MeNHCON}(\text{CN})\text{C}(\text{NH})\text{NHCONHMe}$  (VII). If, however, there are a few drops of  $\text{PEt}_3$  in the  $\text{AcOEt}$  there is formed an abnormal polymerization product which is believed to have the structure VIII. VII is almost as labile as I; on boiling with  $\text{H}_2\text{O}$  it loses a  $\text{MeNHCO}$  group and yields  $\text{NCNH}(\text{NH})\text{NHCONHMe}$  (IX) which, however, is not the stable degradation product of VII, for with acids or alkalis VII yields directly a ring compd. which is certainly formed through IX and is doubtless *N*-methylammelene (X), as indicated by its amphoteric character and great stability. With  $\text{Ac}_2\text{O}$  it gives substances which are probably not normal acetylation products; perhaps a 2nd 6-membered ring is formed on acetylation. Concd. hot alkalis either do not attack X or completely decomp. it so that no further degradation product could be isolated. VIII yields a 1,3-di-Ac deriv. (XI). With hot concd. alkalis it loses both the 2-NH and 6-MeNHCON groups, yielding *N*-methylcyanuric acid (XII); by more cautious treatment (only short boiling with 2 *N* NaOH) it is possible to split off only the 2-NH group with formation of the ammeline XIII. If VIII is added to concd.  $\text{H}_2\text{SO}_4$  at  $100^\circ$ , about  $\frac{2}{3}$  is decompd. but about 20% of it can be recovered as the perchlorate of a base which, from its compn. and properties must have been formed by the longer side chain in VIII swinging about on C atom 6 and anchoring itself on C atom 2 with formation of the compd. XIV. Bis[methylcarbaminy]-cyanamide (I) (6 g. from 2 g.  $\text{CH}_2\text{N}_2$ , 6 g.  $\text{MeNCO}$  and 0.5 g.  $\text{PEt}_3$  in cold  $\text{Et}_2\text{O}$ ), decomp.  $124^\circ$ . *N,N'*-Dimethyl-*N*-cyanourea (III), m.  $114^\circ$ . *N*-Methyl-*N'*-guanlyurea (IV), decomp.  $165^\circ$ , gives a white Ag salt with aq.  $\text{AgNO}_3$ . *C*-[(Methylcarbaminy)amino]tetrazole (4-[*N*-methylureido]-1,2,3,5-tetrazole) (V), sinters  $265^\circ$  (incipient decompn.), carbonizes above  $300^\circ$ , dissolves in hot  $\text{H}_2\text{O}$  only with decompn. into  $\text{MeNCO}$  and *C*-aminotetrazole, m.  $203^\circ$ . *N,N'*-Bis[methylcarbaminy]hydrazine (VI), decomp.  $270^\circ$ . *N*-Methyl-*N'*-cyanourea (II), decomp.  $122^\circ$ , gives a white Ag and a green Cu salt. *N,N'*-Bis[methylcarbaminy]-*N*-cyanoguanidine (VII), begins to sinter  $190^\circ$ , m.  $280.5^\circ$  (decompn.). *N*-[Methylcarbaminy]-*N'*-cyanoguanidine (IX), microcryst. ppt., decomp.  $320.5^\circ$ . X, sol. in boiling alkalis, easily in acids, decomp.  $242.5^\circ$ . 5-Methyl-6-[methylcarbaminy]ammelene (VIII), easily sol. in acids, decomp.  $290^\circ$ . XI, m.  $214^\circ$ . 5-Methyl-6-[methylcarbaminy]ammelide, gradually turns brown and decomp. above  $300^\circ$ . XIV, easily sol. in acids, in alkalis only on heating, decomp.  $320^\circ$ .



C. A. R.

**New results in carbohydrate chemistry.** KARL JOSEPHSON. Stockholm's High-school. *Svensk. kem. Tids.* 41, 24-48(1929).—A review of recent expts. and speculations on the nature of carbohydrate structure, with 155 references. A. R. ROSE

**Sugar oxidation and decomposition. II. The influence of hydrogen peroxide on glucose, etc., in the presence of calcium carbonate.** K. BERNHAUER and J. NISTLER. Deutsche Univ., Prag. *Biochem. Z.* 205, 230-9(1929).—Glycerol under the action of  $\text{H}_2\text{O}_2$  in the presence of  $\text{CaCO}_3$  yields  $\text{HCHO}$ ,  $\text{HCO}_2\text{H}$ ,  $\text{AcOH}$ ,  $\text{CH}_3(\text{OH})\text{CH}(\text{OH})\text{CO}_2\text{H}$  and  $\text{HOCH}(\text{COOH})_2$ . It is also very probable that  $\text{HOCH}_2\text{CH}(\text{OH})\text{CHO}$  and  $\text{AcH}$  are formed first, the  $\text{HOCH}_2\text{CH}(\text{OH})\text{CHO}$  being either oxidized to glyceric and tartaric acid, or after changing to  $\text{AcCHO}$  it gives  $\text{HCO}_2\text{H}$  and  $\text{AcOH}$  or  $\text{AcOH}$  and  $\text{HCHO}$ . The formation of  $\text{AcCO}_2\text{H}$  as an intermediate step could not be corroborated. Lactic acid was not observed under these exptl. conditions, but on oxidation this yields more  $\text{HCO}_2\text{H}$  than  $\text{AcOH}$ .  $\text{AcOH}$  yields principally  $(\text{CO}_2\text{H})_2$ , but also  $\text{HCO}_2\text{H}$  and  $\text{CO}_2$ .  $\text{HCO}_2\text{H}$  is much more slowly oxidized than  $\text{AcOH}$ , yielding  $\text{CO}_2$ . From glucose under the same conditions were formed  $\text{HCHO}$ ,  $\text{HCO}_2\text{H}$ ,  $\text{AcOH}$ , also oxalic and sac-

charic acids. Many HO acids were produced but they were not identified. Pentoses were not formed. The formation of AcOH is explained as being possible so long as there are mol. groupings giving rise to AcCHO. For this reason gluconic and saccharic acids were studied. The former gave AcH as well as AcOH and other products just like glucose, but saccharic acid yielded only  $\text{HCO}_2\text{H}$  but no AcOH because apparently no fragment is formed suitable to the production of AcCHO. S. MORGULIS

**The absorption of formaldehyde by starch.** J. I. BLANKSMA. Univ. Leiden. *Rec. trav. chim.* **48**, 351-60 (1929).—Polyhydric alcs. and sugars easily react with aldehydes with the formation of acetals; in the present paper expts. are described on the reaction of polysaccharides with HCHO. According to Classen (*Therap. Monatsh.* **11**, 33-4 (1897)) amyloform contains a const. quantity of HCHO, viz., 1 mol. of starch to 1 mol. of HCHO, whereas Longard states that it is a mixt. of HCHO and starch (*Therap. Monatsh.* **11**, 34-5 (1897)). It is now shown that on heating 4 g. potato (wheat, maize, arrowroot) starch with 2 g. trioxymethylene in a sealed tube for 3 hrs. at  $160^\circ$ , a product is obtained with the same structure as the original starch, which is still colored blue by I. Further expts. carried out with varying quantities of starch and trioxymethylene, the vol. of the reacting tube being kept const. (50 cc.), showed that on heating 4 g. of starch with 40 mg. of trioxymethylene for 3 hrs. at  $160^\circ$  an amyloform with 0.65% HCHO was obtained; with 80 mg., a product with 1.2%; with 125 mg., 1.8%; with 250 mg., 3.2%; with 0.5 g., 5.0%; with 1.0 g., 9.7%; with 2 g., 15% and with 4 g., 21.2%; the quantity of HCHO in the reaction product was detd. according to Clowes' method (*Ber.* **32**, 2841 (1899)) by conversion into formaldehyde-phenylglucinol. An analysis of the product with 21.2% HCHO showed it to be formed without the elimination of water while in the formation of acetals from polyhydric alcs., sugars and aldehydes, water is formed simultaneously. Moreover an examn. of the curve, obtained on plotting the % of HCHO of the reaction product against the amt. of trioxymethylene used per 4 g. of starch, shows the great similarity between this curve and an adsorption curve and thus the conclusion is drawn that the products under consideration are not chem. compds. of starch and HCHO but adsorption compds. In accordance with this conception a straight line is obtained on plotting the logarithm of the quantity of HCHO taken up by 1 g. of starch ( $v\ m$ ) against those of the concn. Again, in accordance with this conception, the quantity of HCHO taken up by one g. of starch increases with decreasing vol. of the tube, the HCHO content of the reaction product being 10.3%, 9.7% and 7.7% when 4 g. of starch are heated for 3 hrs. at  $160^\circ$  with 1 g. of trioxymethylene in tubes of 25, 50 and 65 cc., resp. By special sets of expts. it was shown that the equil. is reached on heating trioxymethylene and starch during 2-3 hrs. at  $160-70^\circ$ , but that at  $120^\circ$  and  $140^\circ$  longer heating is necessary. The addn. of water has a great effect on the results obtained; the HCHO content of the reaction product decreasing with increasing quantity of water. With small quantities of water HCHO-starch is obtained which still retains a granular structure but the granules are swollen or ruptured. With more water gels are formed, which, on heating above  $130^\circ$ , are converted into sols completely miscible with water, and, on evapn. over concd.  $\text{H}_2\text{SO}_4$ , leave a residue of dextrin, free from HCHO. C. F. VAN DUIN

**The absorption of formaldehyde by cellulose.** J. J. BLANKSMA. Univ. Leiden. *Rec. trav. chim.* **48**, 361-2 (1929); cf. preceding abstr. Swedish filter paper, cut into small pieces, about a sq. mm. in area, degreased cotton wool, wood and viscose silk were heated with trioxymethylene for 3 hrs. at  $160^\circ$ ; from an analysis of one of the reaction products, contg. 14% HCHO, it appeared that the cellulose had taken up the HCHO without the elimination of water such as occurs in the formation of acetals. In the same way as is described in the preceding abstr. for starch, it was shown that the HCHO is adsorbed by the cellulose without the formation of a chem. compd. When not too great a quantity of HCHO is taken up, the reaction product retains the structure of the cellulose used; with high concns. of HCHO the cellulose swells, giving a clear, transparent jelly. C. F. VAN DUIN

**Some derivatives of cyclobutane.** I. BLANCHARD. *Compt. rend.* **188**, 503-4 (1929).—One mol. of  $\text{BrCH}_2\text{CH}(\text{OC}_2\text{H}_5)_2\text{CH}_2\text{Br}$  condenses with 1 mol. of  $\text{CN}_2(\text{CO}_2\text{Et})_2$  and gives  $\text{C}_8\text{H}_{14}\text{OCH}$   $\begin{matrix} \text{CH}_2 \\ \diagup \quad \diagdown \\ \text{CH}_2 \end{matrix}$   $\text{C}(\text{CO}_2\text{Et})_2$ ,  $b_p$   $175^\circ$ ,  $d^{25}_4$  1.011,  $n_D$  1.44361. By sapon.

with KOH, the corresponding di-acid is obtained; it is sol. in  $\text{H}_2\text{O}$ , and its Cu salt crysts. with 1  $\text{H}_2\text{O}$ , becoming anhyd. on heating at  $150^\circ$  and at the same time changing from blue to purple. By heating at  $155^\circ$ , the di-acid loses 1  $\text{CO}_2$  and yields 1-amyloxy cyclobutane-3-carboxylic acid, sol. in  $\text{H}_2\text{O}$ ,  $b_p$   $164-6^\circ$ ,  $d^{25}_4$  1.003,  $n_D$  1.45112, whose Ag salt has been prepd. ALBERT L. HENNE

The importance of the acetone and boric acid methods in the study of alicyclic 1,2-diols. CHR. J. MAAN. Techn. Univ., Delft. *Rec. trav. chim.* **48**, 332-50(1929).—The configuration of the cyclopentane- and hydrindene-1,2-diols was established by van Loon (*Diss. Delft*, 1919; cf. Böseken, *C. A.* **18**, 1281) by the acetone and  $H_2BO_3$  methods. The correctness of the result obtained by means of these methods was confirmed by the resolution of that cyclopentanediol which, according to the corresponding result of both methods, must be the *trans*-isomer, into its optical antipodes. With the cyclohexane- and cycloheptane-1,2-diols these methods are only partially applicable or useless; both cyclohexane-1,2-diols lower the cond. of  $H_2BO_3$  while only one gives an acetone compd., whereas both cycloheptane-1,2-diols furnish an acetone compd. and both increase the cond. of  $H_2BO_3$  (Böseken and van Giffen, *C. A.* **14**, 2472; Derrx, *C. A.* **16**, 3081). These results, which cannot be explained by Baeyer's ring-strain theory, are in harmony with the theoretical considerations of Sachse (*Ber.* **23**, 1363(1890); *Z. physik. Chem.* **10**, 203(1892)) and Mohr (*C. A.* **13**, 2661; **16**, 2850) which were more fully confirmed by the work of Hüchel (*C. A.* **19**, 1269; **21**, 1112, 2890, 2903) and Ruzicka (*C. A.* **20**, 1792, 2150, 2151). In the present paper substituted 5- and 6-rings are dealt with. The *cis*-diols were obtained by oxidizing the alc. solns. of the corresponding unsatd. hydrocarbons at  $-40^\circ$  to  $-50^\circ$  with 4.5%  $KMnO_4$  containing also 5% cryst.  $MgSO_4$  (cf. Straus and Rohrbacher, *C. A.* **15**, 1896) an excess of about 25%  $KMnO_4$  being used because the EtOH is also oxidized to some extent; yield 20-30%. Phenylcyclohexane-*cis*-1,2-diol was prepd. by hydration of the oxide, which gives a mixt. of the *cis*- and *trans*-isomerides. The *cis*-isomeride was then converted into the acetone compd. which was sepd. from the *trans*-diol by distn. with steam and then hydrolyzed. The *trans*-diols were prepd. by oxidation of the corresponding unsatd. hydrocarbons with *recrystd.*  $BzO_2H$  in  $CHCl_3$  to the oxides, which were hydrated by shaking with 10 vols. of 0.02 *N*  $HCl$  or, as in the case with 1-phenylcyclohexene 1,2 oxide, with 0.05 *N*  $H_2SO_4$ . 1-Phenylcyclopentene 1,2-oxide could not be converted into the diol. For details regarding the prepn. of these diols cf. Verkade, *et al.* (*C. A.* **23**, 2095). The *cis*-diols were converted into the acetone compds. by means of abs. acetone, contg. 0.25%  $H_2SO_4$ ; after standing at room temp. the soln. was neutralized with powd. lime, most of the acetone distd. off through a Vigreux column and the acetone compd. distd. with steam. In this way all the diols prepd. by oxidation of cyclic unsatd. hydrocarbons with  $KMnO_4$  gave an acetone compd., the following compds. being described: 1-Methylcyclopentane-*cis*-1,2-diol, m.  $23^\circ$ ; acetone compd.,  $b_{760}$  157.5-7.8°,  $n_D^{18}$  1.4300,  $d_4^{18}$  0.9409; 1-methylcyclopentane-*trans*-1,2-diol, m.  $65^\circ$ ; 1-phenylcyclopentane-*cis*-1,2-diol, m.  $65^\circ$ ; acetone compd., m. 52.5-3.5°; 1-methylcyclohexane-*cis*-1,2-diol, m.  $68^\circ$ ; acetone compd.,  $b_{760}$  183.5-84°,  $n_D^{16}$  1.4496,  $d_4^{16}$  0.9701; 1-methylcyclohexane-*trans*-1,2-diol, m.  $85^\circ$ ; 1-phenylcyclohexane-*cis*-1,2-diol, m.  $96^\circ$ ; acetone compd.,  $b_{15}$  155-7°,  $n_D^{16}$  1.5304,  $d_4^{15}$  1.066, *M. R.* 67.25, calcd. 66.76; 1-phenylcyclohexane-*trans*-1,2-diol, m.  $99^\circ$ . From the figures given for the mol. refractivities of the acetone compds. and the oxides, it appears that the observed values agree with the "theoretical" ones in the case of the unsubstituted compds. and the Me-substituted ones, but that in combination with the Ph group a noticeable exaltation occurs. This exaltation amounts to 0.49 for the acetone compd. of 1-phenylcyclohexane-*cis*-1,2-diol, to 0.79 with 1-phenylcyclopentene 1,2-oxide and to 0.74 with 1-phenylcyclohexane 1,2-oxide. Measurements of the change of the cond. of aq.  $H_2BO_3$  solns. by the addn. of these diols showed that the cond. was largely increased by 1-methylcyclopentane-*cis*-1,2-diol, and decreased to a small extent by 1-methylcyclopentane-*trans*-1,2-diol, by both the 1-methylcyclohexane-1,2-diols and the 1-phenylcyclohexane-1,2-diols. With 1-phenylcyclopentane-*cis*-1,2-diol 70% alc. had to be used as a solvent, with water even in very dil. solns. a complex compd. crystg. out; a small increase of the cond. was observed under these circumstances. *K* 1-methylcyclopentane-*cis*-1,2-diol borate,  $C_7H_{12}O_5BOK \cdot 4H_2O$ , is obtained by adding an excess of warm satd. aq.  $H_2BO_3$  to the diol, followed by a somewhat smaller vol. of 50%  $KOH$ ; in the same way *K* 1-methylcyclohexane-*cis*-1,2-diol borate,  $C_7H_{12}O_5BOK \cdot 4H_2O$ , was prepd. On dissolving 1-phenylcyclopentane-*cis*-1,2-diol (1 g.) in 100 cc. warm water and adding 3 g.  $H_2BO_3$ , 1-phenylcyclopentane-*cis*-1,2-diol boric acid,  $C_{11}H_{12}O_5BOH$ , m.  $107-10^\circ$ , is obtained. On extg. the soln. of this compd. in dil.  $KOH$  continuously with  $CHCl_3$ , a complex  $H_2BO_3$  compd. of the di-diol type,  $(C_{11}H_{12}O_5)_2BH$ , m.  $129^\circ$ , is obtained. The reaction with acetone, the influence on the cond. of  $H_2BO_3$  solns., and the complex compd. formation with  $H_2BO_3$  and *K* borate, taken in connection with the behavior of the unsubstituted compds., clearly prove the correctness of the stereochem. formulas assigned to the various diols, as given above.

M. has also carried out detns. of the hydrolysis const. of compds. derived from K borate and alicyclic 1,2-diols, the method of Walker and Robertson (*Proc. Roy. Soc. Edinburgh* **24**, 363(1903); *Z. physik. Chem.* **47**, 373(1904)) being used, starting from the following considerations: The K salts of both 1-methylcyclopentane-*cis*-1,2-diol boric acid and 1-methylcyclohexane-*cis*-1,2-diol boric acid undergo hydrolysis in  $H_2O$ , into K borate and the corresponding diol since both diols can be isolated from such a soln. by continuous extn. with  $CHCl_3$ . Whereas for the quant. extn. of the 6-ring diol, 24 hrs. are sufficient, the 5-ring diol requires 12 days; it is therefore highly probable that the complex borate compd. of the 5-ring diol is only slightly and that of the 6-ring diol strongly hydrolyzed. The sum of the degrees of hydrolytic and elec. dissocn. appeared to be 1.00 with the above-mentioned 5-ring diol borate and 1.74 with the 6-ring diol borate. Since the degree of elec. dissocn. of a K borate soln. of about the same concns. appeared to be 0.83 and 0.86, resp., the hydrolysis of the 5-ring diol complex amounts to 0.17 and of the 6-ring diol complex to 0.88. Now 1-methylcyclopentane-*cis*-1,2-diol increases the cond. of a  $H_3BO_3$  soln. considerably while 1-methylcyclohexane-*cis*-1,2-diol does not; it is, therefore, to be expected that both the corresponding *trans*-diols, which do not increase the cond. of  $H_3BO_3$  solns., will not undergo complex formation with  $H_3BO_3$  and indeed a hydrolysis 1.00 was found in these cases. The same difference which was noticed between the methylated 5- and 6-ring compds. was also found with the phenylated ones; with 1-phenylcyclopentane-*cis*-1,2-diol and K borate the sum of degrees of elec. and hydrolytic dissocn. was found to be 1.03 and with 1-phenylcyclohexane-*cis*-1,2-diol, 1.80. In connection with these results M. points out that in cases where the  $H_3BO_3$  method gives ambiguous results owing either to the small soly. of the diol or to the necessity of using alc.-water mixts. as a solvent, the detn. of the hydrolytic const. of the complex with K borate may give information as to the configuration of the diol.

C. F. VAN DUIN

**The ketone function.** R. CORNUBERT AND CHARLES BORREL. *Compt. rend.* **188**, 798-800(1929).—The following  $\alpha$ -substituted  $\alpha'$ -methylcyclopentanones were prepd.: *Me*, b. 147°; *Et*, b. 164-5°; *Pr*, b<sub>18</sub> 78-9°; *iso-Pr*, b. 178°; *Bu*, b<sub>16</sub> 93-4°; *iso-Bu*, b<sub>18</sub> 82-3°; *benzyl*, b<sub>18</sub> 150°. These were converted into the corresponding tetrahydropyronic derivs. (I) by treatment with  $BzH$  and  $HCl$ , in the following yields: *Me*, m. 127°, 73%; *Et*, m. 98-9°, 59%; *Pr*, m. 116-6.5°, 59%; *iso-Pr*, m. 125.5°, 10%; *Bu*, m. 101-2°, 54%; *iso-Bu*, m. 118°, 35%; *benzyl*, m. 156.5°, 77%. The marked difference in the formation of I from the *Me* and the *iso-Pr* derivs. is similarly noted in the formation of oximes from these compds. (Haller and C., *C. A.* **21**, 570), and the other members of the series bear out the variations, but no interpretation can be gained except that a relation exists between the ketonic properties and the substituents. This is also indicated by the failure to get I from  $\alpha, \alpha'$ -dibenzylcyclohexanone (II) as compared to a quant. yield with the  $\alpha, \alpha'$ -di-*Me* deriv. (*C. A.* **22**, 3146). An irregularity in the ketonic function is shown by II and  $\alpha, \alpha, \alpha', \alpha'$ -tetramethylcyclohexanone (III); II readily gives a semicarbazone (m. 190-1°), and an oxime only with difficulty; III gives no semicarbazone but readily forms the oxime, using the same conditions throughout.

A. S. CARTER

**Methylation of cycloheptanone.** MARCEL GODCHOT AND (MLLE.) GERMAINE CAUQUIL. *Compt. rend.* **188**, 794-6(1929).—Following the method of Haller (*C. A.* **21**, 1635, 2464), cycloheptanone (I) was methylated in dry  $Et_2O$  with an equiv. of  $NaNH_2$  followed by an excess of  $MeI$  with several hrs. heating. Uncombined I was sep'd. from the resulting mixt. of ketones, b. 179-92°, by pptn. with  $NaHSO_4$ . The resulting mixt. was next converted to semicarbazones and sep'd. into 2 pure fractions by crystn. from ligroin and  $Et_2O$ , giving a small quantity of  $\alpha, \alpha$ -dimethylcycloheptanone, b<sub>110</sub> 191-2° (cor.), d<sub>18</sub> 0.9221,  $n_D^{18}$  1.4565 (semicarbazone, m. 174.5°; oxime, m. 83°, *carbanilidoxime*, m. 93-4°), and considerable  $\alpha$ -methylcycloheptanone (II), b<sub>106</sub> 185-6° (cor.), d<sub>18</sub> 0.9395,  $n_D^{18}$  1.461 (semicarbazone (III), m. 117-8°; oxime, b<sub>116</sub> 126°; *carbanilidoxime*, m. 96-7°). III was previously reported as m. 129-31° by Wallach (*Ann.* **345**, 146), but the formula of II was established by its oxidation with  $KMnO_4$  to yield  $\epsilon$ -acetylcaproic acid, b<sub>20</sub> 186-7°, m. 29-30° (semicarbazone, m. 113-4°). A. S. CARTER

**The oxidation of unsaturated compounds by means of perbenzoic and peracetic acids.** J. BÖESEKEN AND G. ELSSEN. *Techn. Univ., Delft. Rec. trav. chim.* **48**, 363-9(1929); cf. *C. A.* **21**, 2877; **22**, 2549.—It has already been shown that the oxidation of a double bond by means of  $AcO_3H$  always gives a mixt. of the diol and its acetates (Böeseken, *C. A.* **22**, 2549) and the hypothesis had been put forward that this reaction consists of the addn. of a mol. of  $AcO_3H$  to the double bond with the formation of the monoacetate of the diol. On the other hand the oxidation with  $BzO_3H$

yields ethylene oxides, the velocity of the reaction being largely dependent on the groups attached to the unsatd. C atoms.  $\text{PhCH:CHMe}$  is oxidized much more quickly than  $\text{PhCH}_2\text{CH:CH}_2$ ,  $\text{PhCH:CHEt}$  more quickly than its isomers, etc. (Derr, *C. A.* 16, 3081; Böeseken and Blumberger, *C. A.* 19, 1260). The present paper deals with the oxidation of several unsatd. compds. with  $\text{AcO}_2\text{H}$ ; in connection with the considerations mentioned above, it is to be expected that the monoacetate is the principal product of the reaction when the oxidation proceeds quickly whereas in the case of a slow oxidation the formation of the diacetate is to be expected. *1,3-Diphenylpropene*, prepd. from cinnamyl bromide and  $\text{PhMgBr}$  (cf. Braun and Köhler, *C. A.* 12, 2197) was oxidized with a 100% excess of  $\text{AcO}_2\text{H}$ ; the reaction proceeds quickly and yields the nearly pure monoacetate and the same result was obtained on oxidizing *anethole* and  *$\beta$ -isosafole* with a 6% excess of  $\text{AcO}_2\text{H}$ . On the other hand allylbenzene and safole were oxidized only slowly; allylbenzene gave a mixt. of the mono- and diacetates in which the latter largely predominates, while safole was also oxidized in other directions. From these examples it was to be expected that in general unsatd. compds. having a double bond in conjugation with the benzene nucleus, are oxidized quickly while those, where the unsatd. center is removed further from the benzene nucleus, are oxidized far more slowly. It is therefore surprising that eugenol is oxidized quickly by  $\text{AcO}_2\text{H}$  with the formation of the monoacetate, contg. only a small amount of the diacetate. Indene is also oxidized quickly but the reaction product contains more of the diacetate than in the case of eugenol, although the monoacetate predominates. With cyclohexene the chief reaction product is the monoacetate; there is also formed a small amount of the diacetate and, by sapon., of the diol. These expts. show that the oxidation of unsatd. compds. with  $\text{AcO}_2\text{H}$  consists of an addn. of the reagent to the double bond, the monoacetate being acetylated further if the reaction only proceeds slowly, or being oxidized in other directions (safole).

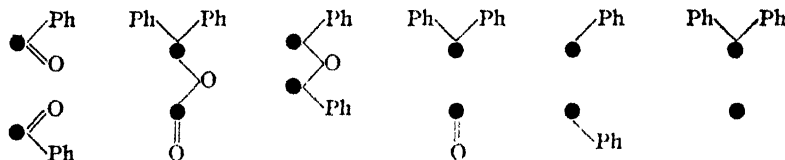
C. F. VAN DUIN

**The reaction between phenylmagnesium bromide and some alkyl esters of acids of the fifth group elements.** HENRY GILMAN AND JACK ROBINSON. *Chem. Dept., Ames, Iowa. Rec. trav. chim.* 48, 328 31 (1929).—Alkyl esters of  $\text{SO}_3\text{H}$  acids are unlike all other alkyl esters in their reaction with organomagnesium halides, showing an alkylating action, the course of which is probably:  $\text{RSO}_2\text{Alkyl} + \text{R'MgX} \rightarrow \text{R'Alkyl} + \text{RSO}_2\text{MgX}$  (I);  $\text{RSO}_2\text{MgX} + \text{RSO}_2\text{Alkyl} \rightarrow \text{AlkylX} + (\text{RSO}_2)_2\text{Mg}$  (II) (cf. Rossander and Marvel, *C. A.* 22, 2140; Gilman and Heck, *C. A.* 22, 3150). With aryl esters of sulfonic esters there is no arylation, sulfones and phenols being formed as follows:  $\text{RSO}_2\text{Aryl} + \text{R'MgX} \rightarrow \text{RSO}_2\text{R'} + \text{ArylOMgX}$  (III). This type of reaction (III) is the one observed with all esters other than the alkyl sulfonates, the only exception being the formation of  $\text{PhMe}$  from  $\text{Me}$  borate and  $\text{PhMgBr}$  (Khotinsky and Melamed, *C. A.* 3, 2947), which, however, could not be confirmed by Gilman and Vernon (*C. A.* 20, 1605). In the present communication it is shown that the interaction of  $\text{PhMgBr}$  and alkyl esters of acids of the 5th group elements also occurs in accordance with equation III, no alkylation taking place. *Butyl nitrite* (0.1 mol.) and 0.45 mol.  $\text{PhMgBr}$  gave 20.6%  $\text{Ph}_2\text{NH}$ , 63%  $\text{Ph}_2$  and 67.5%  $\text{BuOH}$ ; *Et nitrate* did not give any  $\text{PhEt}$  with 5.4 moles of  $\text{PhMgBr}$ ; from 0.3 mol. *tri-Me phosphite* and 0.9 mol.  $\text{PhMgBr}$  was obtained 42% of methyldiphenylphosphine oxide,  $\text{MePh}_2\text{PO}$ , m.  $110^\circ$ , which is formed by rearrangement of the primary reaction product,  $\text{Ph}_2\text{POMe}$  (cf. *C. A.* 5, 1397). *Tri-Ethyl phosphite* (0.2 mol.) and  $\text{PhMgBr}$  (0.57 mol.) gave 10% of  $\text{Ph}_2\text{PO}$ ; *tri-Me* and *tri-Et phosphates* did not give  $\text{PhEt}$  but after hydrolysis of the reaction product 16% of phenylphosphoric acid and 17% diphenylphosphoric acid were obtained; with *tri-Et vanadate* again  $\text{PhEt}$  was not formed, an extensive coupling reaction taking place with quant. formation of  $\text{Ph}_2$ . From *tri-Et arsenite* (0.2 mol.) and  $\text{PhMgBr}$  (0.6 mol.) 85% of  $\text{AsPh}_3$  was obtained, while *tri-Et arsenate*, on treatment with 3 moles of the Grignard reagent, gave a substance, m.  $270^\circ$ , which was not identified with certainty, but probably consists of  $\text{Ph}_4\text{AsCl}$ .

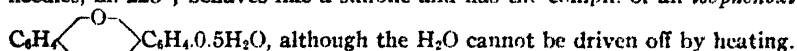
C. F. VAN DUIN

**Isophenyl sulfide and its derivatives.** O. HINSBERG. *Ber.* 62B, 127 35 (1929).— $\text{Ph}_2\text{S}$  and about 2 vols. 70%  $\text{HClO}_4$  on heating react quite vigorously even before the b. p. is reached and from the reaction mixt. can be isolated a faintly yellow amorphous substance (I). The reaction proceeds without any material oxidizing action by the  $\text{HClO}_4$ . A quant. expt. (detn. of the  $\text{HCl}$  in the  $\text{HClO}_4$  after the reaction:  $\text{HClO}_4 = \text{HCl} + \text{O}_2$ ) showed that only about  $1/16$  mol.  $\text{O}_2$  is consumed per mol.  $\text{Ph}_2\text{S}$ . As there is apparently no cleavage the chief reaction must be a rearrangement or polymerization or an addn. reaction. As a matter of fact it consists chiefly in a rearrangement of the  $\text{Ph}_2\text{S}$  into a quinoid sulfonium base with addn. of  $\text{H}_2\text{O}$  and formation of the compd.  $\text{PhS(OH):C(CH:CH)}_2\text{CH}_2$  (II). I is the basic perchlorate,  $\text{PhS(OCIO}_2)_2$ :

$C(CH_3CH)_2CH_2$ . II, and by double decompn. yields analogous salts of other acids, such as the *iodide* (III = I with I instead of  $OCIO_3$ ). III or the free II on distn. lose HI and  $H_2O$  to regenerate  $Ph_2S$ . With KOH in MeOH on the  $H_2O$  bath II yields an oil (IV), sol. in petroleum ether, with the same compn. and very nearly the same b. p. as  $Ph_2S$  but which with excess of  $H_2O_2$  gives a *sulfone*  $Ph_2SO_2 \cdot 0.5H_2O$  (V), m.  $81^\circ$ , while the ordinary  $Ph_2SO_2$  m.  $128^\circ$ , and more gentle oxidation gives an oily *sulfoxide* (VI) whereas the known sulfoxide m.  $70.5^\circ$ . IV is beyond doubt a new form of  $Ph_2S$  and is therefore designated as *isophenyl sulfide*. Although the isomerism of the sulfoxides could be explained on the same basis as the van't Hoff theory for C compds. by assuming that the S atom is at the center of a hexahedron toward whose corners its 6 valences are directed, in the sulfoxides, in which the S is quadrivalent, the S atom at the center of a tetrahedron would not be asym., and finally the sulfides cannot be represented by a space formula as the centers of gravity of the substituents always lie in a plane. It therefore seems permissible to make use, as has already often been done by H., of the atomic formula with 2 centers of valency for S; the isomers could then be represented by the accompanying formulas. *Basic isodiphenylsulfonium*



*perchlorate* (I), obtained in 9–10 g. yield from 10 g.  $Ph_2S$  by heating 5 cc. com.  $Ph_2S$  with 10 cc. 70%  $HClO_4$  and 0.3 cc.  $AcOH$  (finally to boiling after the 1st vigorous reaction has ceased), cooling to  $100^\circ$ , pouring into much  $H_2O$ , repeating the procedure 10 times, washing with  $H_2O$ , taking up in MeOH, filtering, evapg., again taking up in MeOH and evapg. and freeing from unchanged  $Ph_2S$  by kneading with petroleum ether, forms a yellowish or brownish mass gradually softening on warming and deflagrating on rapid heating, slowly decompn. on standing, dissolves in  $AcOEt-HClO_4$ , still contains about 0.5% of the substance VII (below) and a small quantity of firmly bound Cl. III, reddish, softens about  $80^\circ$ , dissolves in  $HI-AcOEt$ . *Basic chloroplatinate*,  $[(C_{12}H_{10}S)_2H_2O]_2 \cdot H_2PtCl_6$ , yellow-brown cryst. powder. *Isodiphenylsulfonium hydroxide* (II), faintly red amorphous mass, gradually softening on heating, extraordinarily stable toward reducing agents (unchanged by boiling 15 mins. with Zn, HCl and  $AcOH$ ), converted by oxidizing agents ( $CrO_3-AcOH$ ) into a yellow-red substance. IV, purified by converting it into VI and reducing back the latter in boiling MeOH with  $H_2SO_4-Zn$  dust, b.  $300-40^\circ$  (partial decompn.), rearranged into ordinary  $Ph_2S$  by repeated distn. or heating 3 hrs. at  $300^\circ$ . VI, gives a blue color with concd.  $H_2SO_4$ . V is unchanged by boiling 1 hr. with Zn,  $AcOH$  and HCl, by hot  $Ac_2O$  or by aq.  $KMnO_4$ , seps. from abs. MeOH in prisms with 0.25 mol. MeOH, m.  $83^\circ$ . VII, difficultly sol. needles, m.  $225^\circ$ , behaves like a sulfone and has the compn. of an *isophenoxin sulfone*,



C. A. R.

**Nitration of methane- and ethanesulfonyl-*p*-phenetidines.** FRÉDÉRIC REVERDIN. *Helv. Chim. Acta* 12, 113-21 (1929).—A no. of *nitro derivs.* of methane- (I) and ethanesulfonyl-*p*-phenetidine (II) were prepd. as follows: From I: 2-nitro (III), m.  $100^\circ$ , 81%, by heating I in alc. with  $HNO_3$  (d. 1.185) on the water bath; 2,6-dinitro, m.  $176-7^\circ$ , 40%, similarly to III except with  $HNO_3$  of d. 1.4; 2,3,6-trinitro, m. indistinctly at  $235^\circ$ , by treating I at  $20-5^\circ$  with  $HNO_3$  (d. 1.52). From II: 2-nitro, m.  $91-2^\circ$ , 52%, by treating II in  $AcOH$  with  $HNO_3$  (d. 1.4) at  $28^\circ$ ; 2,6-dinitro (IV), m.  $182^\circ$ , 81%; 2,5-dinitro, m.  $166-7^\circ$ , 43% (crude), by treating II with  $HNO_3$  (d. 1.52) at  $-5^\circ$  to  $15^\circ$ ; 2,3,6-trinitro, m.  $229^\circ$ , by heating IV with  $HNO_3$  (d. 1.52) on the steam bath. *Ac derivs.* of I and II m.  $112^\circ$  and  $81^\circ$ , resp.

FREDERICK C. HAHN

**The preparation of quinhydrone for potentiometric use.** M. TRÉNEL AND C. BISCHOFF. *Z. angew. Chem.* 42, 288-9 (1929).—The detn. of  $pH$  with the quinhydrone electrode depends upon the purity of the quinhydrone which often contains ferrous and ferric Fe as impurities. It is best prepd. in 21% yield by dissolving 115 g. ferric  $NH_4$  alum in 230 cc.  $H_2O$  at  $50^\circ$  and then adding with stirring to 25 g.  $p-C_6H_4(OH)_2$  in 100 cc.  $H_2O$  at  $60^\circ$ , then stirring and cooling with an ice bath; the crystals which sep. are filtered with suction, washed about 7 times with  $H_2O$  until the washings are free from  $Fe^{+++}$ , and dried between filter papers.

N. A. LANGR

**Chemical decompositions under high pressures.** N. A. ORLOV. *Metallbörse* 18, 565-6, 678(1928); cf. *C. A.* 22, 75, 396, 1151.—A review of the literature on chem. conversion caused by H at high pressures. The method can be used extensively for various reactions of org. substances, *e. g.*, alicyclic-aromatic ketones are reduced to the corresponding hydrocarbons. Some substituted benzenes formed from homologs of PhCOMe in theoretical yields have a very mild, sweet odor. E. M. SYMMES

**Nor- and nor- $\psi$ -ephedrine.** II. S. KANAO. *J. Pharm. Soc. (Japan)* 48, 1070-81 (1928); cf. *C. A.* 23, 2431.—Transformation of nor-*dl*-ephedrine into nor-*dl*- $\psi$ -ephedrine: Nor-*dl*-ephedrine (I) in Et<sub>2</sub>O with Ac<sub>2</sub>O in the presence of alkali gave *N*-acetyl-nor-*dl*-ephedrine (II), m. 135°. By boiling II with concd. HCl it gave nor-*dl*- $\psi$ -ephedrine (III). I in Et<sub>2</sub>O with an equal amt. of BzCl gave the *N*-Bz deriv. (IV), m. 143°. IV and excess concd. HCl gave nor-*dl*- $\psi$ -ephedrine benzoate-HCl (V), m. 220°. V is unstable and it changes into *N*-benzoyl-nor-*dl*- $\psi$ -ephedrine (VI) in the presence of alkali. Benzoylation of IV gave *O,N*-dibenzoyl-nor-*dl*-ephedrine (VII), m. 167-8°. This is in harmony with *O,N*-dibenzoyl-nor-*dl*- $\psi$ -ephedrine (VIII) (*J. Pharm. Soc. (Japan)*, No. 127, 832). Soln. of nor-*dl*-ephedrine-HCl (IX) and *p*-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>COCl in Et<sub>2</sub>O gave dark yellow crystals (X), m. 189°. By heating X with concd. HCl it changes into nor-*dl*- $\psi$ -ephedrine nitrobenzoate-HCl (XI), m. 221°. X is unstable and changes into *N-p*-nitrobenzoyl-nor-*d*-ephedrine (XII), m. 170°. Transformation of nor-*d*-ephedrine into *l*- $\psi$ -ephedrine: On heating *N-p*-nitrobenzoyl-nor-*d*-ephedrine (XIII), m. 175-6°, [ $\alpha$ ]<sub>D</sub><sup>20</sup> 49.95° (in CHCl<sub>3</sub>), with excess concd. HCl it gave nor-*l*- $\psi$ -ephedrine *p*-nitrobenzoate-HCl (XIV), m. 246°, [ $\alpha$ ]<sub>D</sub><sup>22</sup> 54.63° (in water). NH<sub>3</sub> with aq. XIV gave a substance, m. 199°, [ $\alpha$ ]<sub>D</sub><sup>21</sup> - 105.57° (in CHCl<sub>3</sub>), does not depress the m. p. of *N-p*-nitrobenzoyl-nor-*l*- $\psi$ -ephedrine (XV). Nor-*l*- $\psi$ -ephedrine and *p*-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>COCl in Et<sub>2</sub>O gave after recrystn. in alc. XV, m. 199°, [ $\alpha$ ]<sub>D</sub><sup>25</sup> - 104.89° (in CHCl<sub>3</sub>). Transformation of nor-*l*-ephedrine into nor-*d*- $\psi$ -ephedrine: By boiling *N-p*-nitrobenzoyl-nor-*l*-ephedrine (XVI), m. 175-6°, [ $\alpha$ ]<sub>D</sub><sup>23</sup> - 49.58° (in CHCl<sub>3</sub>) with concd. HCl it gave colorless needles (XVII), m. 246°, [ $\alpha$ ]<sub>D</sub><sup>22</sup> 54.63° (in water), does not depress the m. p. of nor-*d*- $\psi$ -ephedrine *p*-nitrobenzoate-HCl. NH<sub>3</sub> with aq. XVII gave crystals, m. 199.5°, [ $\alpha$ ]<sub>D</sub><sup>22</sup> 105.17° (in CHCl<sub>3</sub>), does not depress the m. p. of *N-p*-nitrobenzoyl-nor-*d*- $\psi$ -ephedrine (XVIII). *p*-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>COCl and nor-*d*- $\psi$ -ephedrine gave XVIII, m. 199.5°, [ $\alpha$ ]<sub>D</sub><sup>25</sup> 104.96° (in CHCl<sub>3</sub>). By boiling XVII with excess HCl it gave colorless crystals, m. 291°, [ $\alpha$ ]<sub>D</sub><sup>20</sup> 40.67° (in water), does not depress the m. p. of nor-*d*- $\psi$ -ephedrine-HCl. F. I. N.

**Tautomerism of diketones.** The two tautomeric forms of phenylbenzylglyoxal and phenylanisylglyoxal. HENRI MOURRET. Collège de France. *Compt. rend.* 188, 504-6 (1929); cf. *C. A.* 23, 1339.—The following forms of PhCH<sub>2</sub>(CO)<sub>2</sub>Ph have been sepd.: *A* $\alpha$ , yellow, m. 67°; *A* $\beta$ , yellowish white, m. 90°; *B*, lemon-yellow, m. 35-0°. Similarly, MeOC<sub>6</sub>H<sub>4</sub>CH<sub>2</sub>(CO)<sub>2</sub>Ph gives: *A* $\alpha$ , pale yellow, m. 70°; *A* $\beta$ , yellow, m. 82°; *B*, lemon-yellow, m. 23-4°. By heating at about 70° the first compd. (*A* $\alpha$ ) is transformed into the *A* $\beta$  form. The same result is obtained by seeding a satd. soln. of *A* $\alpha$  with a crystal of *A* $\beta$ . Distn. under 1 mm. transforms *A* into a mixt. of about 90% *A* and 10% *B*, which was previously described as the "liquid isomer." Alk. catalyzers are particularly active in the isomerization: heating in ordinary glass causes rapid transformation, but in quartz the reaction is slowed down to such an extent that it may become inappreciable. The formula RCH<sub>2</sub>:C(OH)COR' is assigned to the *A* forms and RCH<sub>2</sub>(CO)<sub>2</sub>R' to the *B* forms. ALBERT L. HENNE

**Synthesis of homogentistic acid.** GEORG HAHN AND WILLY STENNER. Univ. Frankfurt. *Z. physiol. Chem.* 181, 88-100(1929).—Homogentistic acid has hitherto been available only as a constituent of pathol. urine. The synthesis here described consists essentially in the mol. rearrangement of the monoallyl ether of *p*-C<sub>6</sub>H<sub>4</sub>(OH)<sub>2</sub>, whereby the allyl migrates to the nucleus, and subsequent oxidation of the allyl by O<sub>2</sub>, the OH groups meanwhile being protected by benzylation. The final yield of homogentistic acid is 26% on the basis of the C<sub>6</sub>H<sub>4</sub>(OH)<sub>2</sub> employed. The successive steps are: *p*-C<sub>6</sub>H<sub>4</sub>(OH)<sub>2</sub>  $\longrightarrow$  *p*-HOC<sub>6</sub>H<sub>4</sub>OBz  $\longrightarrow$  *p*-C<sub>6</sub>H<sub>4</sub>(OC<sub>6</sub>H<sub>5</sub>)OBz  $\longrightarrow$  1,2,4-HOC<sub>6</sub>H<sub>3</sub>(C<sub>6</sub>H<sub>5</sub>)OBz (which undergoes disproportionation into 1,2,4-(HO)<sub>3</sub>C<sub>6</sub>H<sub>3</sub>C<sub>6</sub>H<sub>5</sub> and 1,4,2-(BzO)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>C<sub>6</sub>H<sub>5</sub>)  $\longrightarrow$  1,4,2-(BzO)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>CH<sub>2</sub>CO<sub>2</sub>H  $\longrightarrow$  1,4,2-(HO)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>CH<sub>2</sub>CO<sub>2</sub>H. *p*-HOC<sub>6</sub>H<sub>4</sub>OBz was obtained in 68% yield by the slow addn. of BzCl over a period of 5 hrs. to *p*-C<sub>6</sub>H<sub>4</sub>(OH)<sub>2</sub> in Na<sub>2</sub>CO<sub>3</sub> with very rapid stirring. By shaking this for 24 hrs. with dry MeAc, dry K<sub>2</sub>CO<sub>3</sub> and C<sub>6</sub>H<sub>5</sub>Br in the presence of glass beads 70% of benzoylhydroquinone allyl ether (I), m. 71-2°, was obtained. The non-benzoylated hydroquinone under the same treatment yielded only 22% of hydroquinone monoallyl ether, m. 43°, and considerable hydroquinone diallyl ether, m. 36-7°. The rearrangement

of I was effected by boiling *in vacuo* 2-3 hrs. in a metal bath at 280° and finally distg. *in vacuo*. The distillate yielded crystals of *dibenzoylallylhydroquinone*, m. 107-8°, which resulted from disproportionation of the monoether first formed. The mixt. was then completely benzoylated by treatment in pyridine with BzCl, the yield of di-Bz deriv. being 82%. Oxidation of the di-Bz deriv. was effected by passing a stream of O contg. 2.5% O<sub>2</sub> into the AcOH soln. at 80° for 2 hrs. A yield of 83% of *dibenzoylhomogentisic acid*, m. 180-1°, was thus obtained; the *Me ester* m. 125°, and *Et ester*, m. 130-1°, were prepd. by esterification with HCl and the alc. *Homogentisic acid*, m. 146-7°, was obtained by sapon. of the di-Bz deriv. with 2 N NaOH on the water bath in a N atm., and acidifying with HCl; *Et ester*, m. 119-20°.

A. W. DOX

**Formation of acetaldehyde from alanine in the presence of pyrocatechol.** F. SCHAAF. Dermatol. Klinik, Univ. Zürich. *Biochem. Z.* **205**, 449-50(1929).—When 3,4-dihydroxyphenylalanine undergoes oxidation the 2 OH groups in the *o*-position are involved and NH<sub>2</sub> and CO<sub>2</sub> are produced in the process in a definite proportion to the destroyed 3,4-dihydroxyphenylalanine. It is supposed that when the *o*-OH groups react with O<sub>2</sub>, an *o*-quinone deriv. is first formed and that the quinoid system offers the necessary conditions for the oxidative destruction of the amino acid group with the formation of an aldehyde. As this could not be proved by direct evidence a model reaction has been devised to demonstrate this. Shaking equiv. amts. of pyrocatechol and alanine in H<sub>2</sub>O with O<sub>2</sub> in the presence of amidon a small yield of AcH is obtained.

S. MORGULIS

**Synthesis of  $\gamma$ -phenylglutaminic acid.** A. VON BEZNAK. Physiol. Inst. Univ. Debreczen. *Biochem. Z.* **205**, 414-9(1929).—The synthesis of  $\gamma$ -phenylglutaminic acid from ClCH<sub>2</sub>CHPhCO<sub>2</sub>H is described. This is possible through the condensation of ClCH<sub>2</sub>CHPhCO<sub>2</sub>H with malonic acid, the introduction of an oximine group into the ester and reduction to the NH<sub>2</sub> group.

S. MORGULIS

**Substitution capacity of aromatically bound hydrogen atoms.** JULIUS V. BRAUN, GOTTFRIED MANZ AND ERNST REINSCH. Univ. Frankfurt. *Ann.* **468**, 277-303(1929).—*m*-MeC<sub>6</sub>H<sub>4</sub>Bz, BrCH<sub>2</sub>CO<sub>2</sub>Et and Zn yield an unsatd. ester, b<sub>16</sub> 208-10° (not pure); sapon. gives  $\beta$ -*m*-tolylcinnamic acid, b<sub>17</sub> 229-32°, m. 114°; reduction gives  $\beta$ -*m*-tolylhydrocinnamic acid, b<sub>13</sub> 206-10°, m. 109°; chloride, b<sub>16</sub> 200°; AlCl<sub>3</sub> gives 60% of the ketone, MeC<sub>6</sub>H<sub>3</sub>.CO.CH<sub>2</sub>.CHPh, b<sub>16</sub> 210-5°, m. 61°; oxime, m. 163°. Oxidation

of the ketone with alk. KMnO<sub>4</sub> gives 2,5-benzophenonedicarboxylic acid, m. 285°. *Benzyl-m*-xylylmalonic acid, m. 168°; *Et ester*, b 231-3° (70% yield); *benzyl-m*-xylylacetic acid, m. 67-8°; the chloride with AlCl<sub>3</sub> gives the ketone MeC<sub>6</sub>H<sub>4</sub>.CO.CH(CH<sub>2</sub>Ph).CH<sub>2</sub>, b<sub>17</sub> 223-4°, m. 87-9°; oxime, m. 163°; semicarbazone,

m. 196°. The structure of the ketone was confirmed by synthesis from *m*-MeC<sub>6</sub>H<sub>4</sub>.CH<sub>2</sub>CH<sub>2</sub>CO<sub>2</sub>H.  $\beta$ -*o*-Tolylcinnamic acid, b<sub>14</sub> 218-20°, m. 114°; the hydro deriv., m. 129°, yields a chloride, b<sub>16</sub> 189°; AlCl<sub>3</sub> gives 80% of the ketone, C<sub>6</sub>H<sub>4</sub>.CO.CH<sub>2</sub>.CH-

C<sub>6</sub>H<sub>4</sub>Me, b<sub>14</sub> 195-6°, m. 87°; oxime, m. 166°; semicarbazone, m. 267°. Oxidation with HNO<sub>3</sub> gives 2,2'-benzophenonedicarboxylic acid, m. 148-50°, forming the anhydride, which m. 212°. Reduction gives a hydrindene deriv., C<sub>10</sub>H<sub>14</sub>, b<sub>14</sub> 160-2°, m. 57°.  $\beta$ -*p*-Tolylcinnamic acid, m. 140°; *Et ester*, b<sub>14</sub> 205-10°;  $\beta$ -*p*-tolylhydrocinnamic acid, b<sub>14</sub> 230-2°, m. 108-12°; chloride, b<sub>14</sub> 194°; AlCl<sub>3</sub> gives 70% of the ketone, C<sub>6</sub>H<sub>4</sub>O, b<sub>14</sub> 202-4°, m. 92°; oxime, m. 200°; semicarbazone, m. 219°; oxidation gives 2,4'-(HO<sub>2</sub>.CC<sub>6</sub>H<sub>4</sub>)<sub>2</sub>CO, m. 241°; reduction gives a hydrocarbon, C<sub>16</sub>H<sub>17</sub>(C<sub>14</sub>H<sub>16</sub>)<sub>2</sub>, b<sub>14</sub> 168-70°, d<sub>4</sub><sup>20</sup> 1.0455, n<sub>D</sub><sup>20</sup> 1.5878. *Benzyl-p*-xylylmalonic acid, m. 155-7° (decompn.); *Et ester*, b<sub>14</sub> 232-5°; *benzyl-p*-xylylacetic acid, b<sub>13</sub> 235-7°, m. 88-9°; amide, m. 131°; the chloride and AlCl<sub>3</sub> give 70% of the ketone, C<sub>17</sub>H<sub>16</sub>O, b<sub>14</sub> 221-3°; semicarbazone, m. 195-7°.

$\alpha$ -Hydrindone and *p*-MeC<sub>6</sub>H<sub>4</sub>CHO give the ketone, C<sub>6</sub>H<sub>4</sub> $\begin{matrix} \text{CH}_2 \\ \diagup \quad \diagdown \\ \text{CO} \end{matrix}$ C:CHC<sub>6</sub>H<sub>4</sub>Me, m. 138°; the reduced ketone, C<sub>17</sub>H<sub>16</sub>O, b<sub>18</sub> 223-6°; oxime, m. 132°; phenylhydrazone, m. 109°.

6-Methylhydrindone and BzH give the ketone, MeC<sub>6</sub>H<sub>4</sub> $\begin{matrix} \text{CO} \\ \diagup \quad \diagdown \\ \text{CH}_2 \end{matrix}$ C:CHPh, m. 165°;

reduction gives the ketone, C<sub>17</sub>H<sub>16</sub>O, b<sub>13</sub> 206-10°, m. 38-9°; oxime, m. 130-43°. *p*-Tolylphenylpropyl alc., b<sub>20</sub> 210-5°, by the reduction of *Et p*-tolylhydrocinnamate with Na and EtOH; bromide, b<sub>14</sub> 202-3°; nitrile, b<sub>14</sub> 211-22°; sapon. gives  $\gamma,\gamma'$ -phenyl-*p*-tolylbutyric acid, b<sub>14</sub> 238-9°; the chloride (b<sub>14</sub> 205-8°) gives with AlCl<sub>3</sub> 70% of the ketone C<sub>17</sub>H<sub>16</sub>O, b<sub>14</sub> 198-200°, m. 75°; semicarbazone, m. 204°; oxidation gives 2,4'-



(HO<sub>2</sub>CC<sub>6</sub>H<sub>4</sub>)<sub>2</sub>CO. 2-β-Naphthylcinnamic acid, m. 217°; the dihydro deriv., m. 132°; the chloride with AlCl<sub>3</sub> gives the ketone C<sub>19</sub>H<sub>14</sub>O, b<sub>13</sub> 257-9°, m. 119°; oxime, m. 190-2°; semicarbazone, m. 235-8° (decompn.); reduction gives 3-phenyl-6,7-benzohydrindene, b<sub>13</sub> 226-9°, m. 79°. α-C<sub>10</sub>H<sub>7</sub>MgBr and α-hydrindone give 1-β-naphthylindene, b<sub>14</sub> 246-50°, m. 88°; the dihydro product b<sub>13</sub> 229-30°, m. 47°. Oxidation of the ketone gives β-benzoyl-α-naphthoic acid, m. 139-40°. Benzyl-β-naphthylmethylmalonic acid, m. 111-3° (decompn.); Et ester, b<sub>0.3</sub> 225-30°; benzyl-β-naphthylmethylacetic acid, m.

103-4°; the chloride with AlCl<sub>3</sub> in PhNO<sub>2</sub> gives 70% of the ketone, C<sub>16</sub>H<sub>8</sub>  $\begin{matrix} \text{CH}_2 \\ \diagup \quad \diagdown \\ \text{CO} \end{matrix}$  CHCH<sub>3</sub>-

Ph, b<sub>0.5</sub> 205-10°, m. 72-4°; this was also obtained from benzylidene-6,7-benzoindanone, m. 166°, by catalytic reduction. Benzyl-α-naphthylmethylmalonic acid, oil; Et ester, b<sub>0.5</sub> 225-30°; benzyl-α-naphthylmethylacetic acid, b<sub>0.5</sub> 245-50°, m. 101-3°; the chloride with AlCl<sub>3</sub> gives 70% of a mixt. of ketones, from which was isolated benzyl-peri-naphthindanone, whose oxime m. 163-4°. Its structure was established by condensing peri-naphthindanone and BzH (the benzal deriv. m. 163°) and catalytically reducing the product. α-Hydrindone and α-C<sub>10</sub>H<sub>7</sub>CHO give the isomeric ketone, C<sub>20</sub>H<sub>16</sub>O, m. 87-8°. Et α-naphthylmethyl-β-naphthylmethylmalonate, b<sub>0.05</sub> 255-60°; the free acid is an oil; α-naphthylmethyl-β-naphthylmethylacetic acid, b<sub>0.05</sub> 280-90°; the chloride with AlCl<sub>3</sub> gives 25% of the ketone C<sub>24</sub>H<sub>16</sub>O, m. 138-9°; the remaining oily product could not be crystd. This ketone was synthesized by condensing 6,7-benzoindan-1-one and α-C<sub>10</sub>H<sub>7</sub>CHO and reducing the product.

C. J. WEST

Technical preparation of tannic acid and its derivs. ISAMU TAKINO. *J. Pharm. Soc. (Japan)* 49, 1-59(1929). Methods of techn. prepn. of tannic, gallic and pyrogallic acids are discussed thoroughly.

F. I. NAKAMURA

Condensation of phthalyl chloride and nitrobenzene. I. T. KONDO AND Y. MIYASHITA. Tokyo Imp. Univ. *J. Pharm. Soc. (Japan)* 48, No. 561, 1111-4(1928).--Condensation of phthalyl chloride and PhNO<sub>2</sub> with Zn dust as catalyst at 40-50° gave C<sub>17</sub>H<sub>9</sub>NO<sub>4</sub> (I), m. 196-7°. Decompn. of I with Na-Hg gave C<sub>6</sub>H<sub>7</sub>NO<sub>2</sub> (II), m. 70-1° (Ac deriv., m. 178-9°; benzal deriv., m. 192°; picrate, m. 185°) and MeOC<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>H (III), m. 123-4°. III on standing or by heating changes into a substance, C<sub>8</sub>H<sub>6</sub>O<sub>2</sub>, m. 73°.

F. I. NAKAMURA

Norcarane. FR. EBEL, R. BRUNNER AND P. MANGELLI. *Helv. Chim. Acta* 12, 19-26(1929).--Cyclohexene (I) and N<sub>2</sub>CHCO<sub>2</sub>Et (II) heated for 9 hrs. at 125° in a sealed tube give 10% of the Et norcaranecarboxylate (III). The treatment of I and Cu (catalyst) at 88° gradually with a mixt. of II and Et<sub>2</sub>O gives 53% of III, while heating a mixt. of all the ingredients to boiling gives 30% maleic acid but no III. Cu pptd. from CuSO<sub>4</sub> soln. by Zn gives the best form of catalyst. Sapon. of III with 7% alc.-KOH gives 61% of the free acid (IV), m. 97°. Salts of IV with alk. earth and heavy metals are insol. in water. IV does not add Br, and it is stable in alk. KMnO<sub>4</sub> soln. Dry distn. of IV with a mixt. of BaO and ZnO gives norcarane, b. 110°, mixed with an ethylene isomer from which it is sepd. by treatment with BzO<sub>2</sub>H.

F. C. H.

Reply to O. Aschan (pinene chlorine and bromine addition products). I. L. KONDAKOV. Revnice bei Prag. *Ber.* 62B, 151-2(1929); cf. A, C. A. 22, 1346.--Polymical.

C. A. R.

Chemistry of fenchene. I. L. KONDAKOV. Org. Chemistry Lab., Charles Univ., Prague. *Chem. Listy* 23, 49-54(1929).--d-Fenchene was reduced to dl-fenchyl alc. according to Wallach's and also Gardner-Cockburn's method, sepd. from the liquid products and purified. The remaining liquids were converted to dl-fenchyl alc. by repeated reductions. dl-Fenchyl alc. m. 45°, b<sub>750</sub> 201.5°, [α]<sub>D</sub><sup>20</sup> -12.3°. A mol. of H<sub>2</sub>O was removed with anhyd. KHSO<sub>4</sub> at a temp. not exceeding 180° and the mixt. was distd. The distillate contg. fenchyl alc., fenchene and SO<sub>2</sub> was neutralized by NaOH and redistd. 7 times (until the crystals of fenchyl alc. failed to appear in the condenser). The purified fenchene was fractionated and contained 2 fractions: I, b. 147.5-155°, d<sub>20</sub> 0.8574, [α]<sub>D</sub> 10.85°, [α]<sub>D</sub><sup>20</sup> 12.64°, n<sub>D</sub> 1.46278, M. R. 43.71 (43.51); II, b. 155-162°, d<sub>20</sub> 0.8558, [α]<sub>D</sub> 13.75°, [α]<sub>D</sub><sup>20</sup> 16.06°, n<sub>D</sub> 1.46771, M. R. 44.201 (43.511). With K.'s method, both fractions were converted to fenchene-HCl, and a fenchene isomer was regenerated which b. 152.5-157.5°; this fraction was refractionated into 2 liquids: I, b. 152.5-3.5°, d<sub>20</sub> 0.8600, [α]<sub>D</sub> 12.48°, [α]<sub>D</sub><sup>20</sup> 14.88°, n<sub>D</sub> 1.46667, M. R. 43.997 (43.511); II, b. 153.5-5°, d<sub>20</sub> 0.8621, [α]<sub>D</sub> 11.01°, [α]<sub>D</sub><sup>20</sup> 13.15°, n<sub>D</sub> 1.46973, M. R. 43.933 (43.511). The fenchene-HCl yielded a small quantity of insol. chloride. The finished product consisted of α-, β- and γ-fenchenes without any cyclofenchene, δ-fenchene, or any high-boiling isomer. Another product prepd. during the dehydration of fenchyl alc. is a cryst.

fenchyl alc., m. 48.5–9.0°. When this alc. is treated again with  $\text{KHSO}_4$ , the product m. 47°; when this is dehydrated 2 more times an alc., m. 49°, results which has the form of hexagonal plates and a sharp odor recalling borneols and fenchyl alc. The mixt. b. 48–48.5° showed in EtOH (c 5.1)  $[\alpha]_D -0.50^\circ$ ,  $[\alpha]_D^{20} -12.10^\circ$ ; the mixt. b. 48.5–49.0° showed: (1) in EtOH (c 6.56)  $[\alpha]_D 0.28^\circ$ ,  $[\alpha]_D^{20} -5.36^\circ$ ; (2) in  $\text{C}_6\text{H}_6$  (c 5.2)  $[\alpha]_D -0.30^\circ$ ,  $[\alpha]_D^{20} -6.6^\circ$ . The prepn. b. 48.5–49.0° is considered as pure  $\alpha$ -fenchyl alc. (exostereoisomer). The urethan of the  $\alpha$ -fenchyl alc., prepd. by treating with  $\text{PhNCO}$ , m. 80–2°. The  $\alpha$ -fenchyl alc. was treated with 1 mol.  $\text{C}_6\text{H}_4(\text{CO})_2\text{O}$  for 10 hrs. at 110° and 5 more at 125°. The resulting ether is a homogeneous cryst. mass, m. 145°. The prepn. b. 48.5–9.0° was converted to fenchyl chloride, b<sub>18</sub> 90°. Alcoholysis with KOH yields: fenchene, fenchyl alc., and the remaining fenchyl chloride. The fenchene b<sub>732</sub> 157.5–160°,  $d_4^{20} 0.8676$ ,  $\alpha_D^{20} -29.8^\circ$ ,  $[\alpha]_D -34.35^\circ$ ,  $n_D 1.46827$ , M. R. 43.64 (43.51) which correspond to the original fenchene. This pure *dl*- $\alpha$ -fenchene at room temp. with alk. 3%  $\text{KMnO}_4$  yielded *dl*- $\alpha$ -fenchocamphorone, which gave a semicarbazone, m. 210–1°, a Na salt of an  $\alpha$ -hydroxyfenchene, m. 153–4°, and a small quantity of  $\text{HCO}_2\text{H}$ . The pure  $\alpha$ -fenchene alc. yields a mixt. of fenchyl chlorides which contain an unstable deriv. in abundance and a stable deriv. in small quantity. Splitting off HCl yields clear homogeneous semicyclic  $\alpha$ -fenchene which confirms that homogeneous exofenchyl alc. yields a tertiary chloride corresponding to  $\alpha$ -fenchene hydrate without any of the  $\beta$ -isomer. Conclusion: The prepn. of Kenyon and Priston contained a certain quantity of the  $\beta$ -isomer. FRANK MARESH

**Organic sulfur compounds. XI. Comparison of the dissociation tendency of polymeric thioketones with the dissociation tendency of corresponding compounds of the ethane series.** ALEXANDER SCHÖNBERG. *Techn. Hochschule, Charlottenburg. Ber. 62B*, 195–9 (1929); *C. A.* 23, 579. By the recent prepn. of a no. of thioketones and a study of their ability to polymerize it has become possible to correlate the latter property with their constitution and to compare the dissocn. tendency of polymeric thioketones with that of the corresponding compds. of the  $\text{C}_2\text{H}_6$  series. In both the  $\text{C}_2\text{Ph}_6$  and (hypothetical) hexaphenyltrithiane series replacement of the Ph groups by H or Me has a stabilizing effect, H having the stronger influence. Again, in both series, replacement of 2 Ph groups by a substituted methylene residue gives radicals which are incapable of existence in the "free" state. Just as the partial or complete replacement of the Ph groups in  $\text{C}_2\text{Ph}_6$  by the groups *o*- and *p*- $\text{MeOC}_6\text{H}_4$ ,  $\text{PhC}_6\text{H}_4$ ,

$\text{Me}_2\text{NC}_6\text{H}_4$ ,  $\text{C}_6\text{H}_4 \begin{array}{c} \diagup \diagdown \\ \text{X} \end{array} \text{C}_6\text{H}_4$  (X = O or S) gives compds. having a similar or greater dissocn. tendency than  $\text{C}_2\text{Ph}_6$  itself, so also the compds.  $(\text{MeOC}_6\text{H}_4)_2\text{CS}$ ,  $(\text{PhC}_6\text{H}_4)_2\text{CS}$ ,  $(\text{Me}_2\text{NC}_6\text{H}_4)_2\text{CS}$ ,  $\text{C}_6\text{H}_4 \begin{array}{c} \diagup \diagdown \\ \text{S} \end{array} \text{C}_6\text{H}_4$  and  $\text{C}_6\text{H}_4 \begin{array}{c} \diagup \diagdown \\ \text{O} \end{array} \text{C}_6\text{H}_4$  have no more tendency to

polymerize than  $\text{Ph}_2\text{CS}$ . As in the  $\text{C}_2\text{H}_6$  series, substituted vinyl groups have the same influence as Ph groups in thioketones. From all the data available, the following law can be formulated: The same constitutional changes which strengthen (weaken) the polymerization tendency of "free" methyls also strengthen (weaken) the polymerization tendency of monomol thioketones. The same constitutional changes which strengthen (weaken) the dissocn. tendency of ethanes also strengthen (weaken) the dissocn. tendency of polymeric thioketones. C. A. R.

**The dehydration of some symmetrically disubstituted  $\alpha$ -glycols and the isomerism of the corresponding ethylene oxides. The orienting influence of some cyclic and acyclic radicals.** JEANNE LÉVY AND FRAJDA GOMBIN-KA. *Compt. rend.* 188, 711–3 (1929).—L. and G. have studied 8  $\alpha$ -glycols of the type  $\text{ArCH}(\text{OH})\text{CH}(\text{OH})\text{R}$  (Ar is cyclic and R acyclic), also the corresponding ethylene oxides. The results confirm the theory that the OH group next to the cyclic group is eliminated on dehydration. The product is  $\text{ArCH}_2\text{COR}$ . Heat with catalysts (not mentioned) causes the ethylene oxides to rearrange to the same products as dehydration of the glycols. This is also evidence of the weakness of the same O bond. VALENTINE F. HARRINGTON

**Oximes and the Beckmann rearrangement. IX. Oximes of the three methylbenzils.** JAKOB MEISENHEIMER, OTTO BEISSWENGER, HANS O. KAUFFMANN, UDO V. KUMMER AND JAKOB LINK. *Univ. Tübingen. Ann.* 468, 202–58 (1929); cf. *C. A.* 22, 3887.—Condensation of 11.2 g. BzH and 15.5 g. *o*- $\text{MeC}_6\text{H}_4\text{CH}_2\text{NO}_2$  with 0.3 g.  $\text{Na}_2\text{CO}_3$ , 0.75 g.  $\text{MeNH}_2$ , HCl and 20 drops EtOH gives 98% of 2-methyl-7-nitrostilbene, yellow, m. 92°, and a little *by-product*,  $\text{C}_{11}\text{H}_{11}\text{O}_2\text{N}$ , m. 195° (decompn.). The stilbene, treated as described in *C. A.* 2, 78, gives 60–5% of  $\alpha$ -2-methylbenzil 7-oxime 7',7'-dimethylacetal,

m. 179°; concd. HCl gives quant.  $\alpha$ -2-methylbenzil 7-oxime ( $\alpha_1$ -monoxime) (I), m. 117–8°; warming with concd. HCl at 100° causes about 30% decompn.; 8 hrs.' heating with EtOH in a sealed tube causes no rearrangement but partial decompn. Heating I with 15% NaOH on the H<sub>2</sub>O bath for 3 hrs. causes decompn. into *o*-MeC<sub>6</sub>H<sub>4</sub>CONH<sub>2</sub>, BzOH and *o*-MeC<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>H. The Bz deriv. of I m. 110°; sapon. with dil. EtOH-NaOH gives 99% of BzOH and 85% of *o*-MeC<sub>6</sub>H<sub>4</sub>CN. The *o*-tolyl deriv. m. 82–3°. I and NH<sub>2</sub>OH give quant.  $\alpha$ -2-methylbenzil dioxime (II), m. 250° (quick heating, 260°); this is not rearranged by heating with 15% NaOH for several hrs.; *di*-Ac deriv., m. 139°; *di*-Bz deriv., m. 162–3°. Condensation of *o*-MeC<sub>6</sub>H<sub>4</sub>CHO and PhCH<sub>2</sub>NO<sub>2</sub> gives nearly quant. 2-methyl-7'-nitrostilbene, m. 99°, and a little of the by-product, m. 195°, but which analyzes for C<sub>21</sub>H<sub>13</sub>NO<sub>2</sub>.  $\alpha$ -2-Methylbenzil 7'-oxime 7',7'-dimethyl acetal ( $\alpha_1$ -acetaloxime), m. 174°.  $\alpha$ -2-Methylbenzil 7'-oxime ( $\alpha_1$ -monoxime) (III), m. 119°; NH<sub>2</sub>OH gives II; Bz deriv., m. 87–8°. If the  $\alpha_1$ -acetaloxime is allowed to stand several days with concd. HCl, there results  $\beta$ -2-methylbenzil 7'-oxime ( $\beta_1$ -oxime) (IV), m. 121°; with C<sub>6</sub>H<sub>6</sub> of crystn., m. 88–90°; Bz deriv., m. 129°. IV and NH<sub>2</sub>OH give  $\gamma$ -2-methylbenzil dioxime (V), m. 188.5° (decompn.); slow heating converts V into II; *di*-Bz deriv., m. 127–8°; heating with excess 15% NaOH 5 hrs. gives 98% of phenyl-*o*-tolylfuran, m. 49°. Oxidation of V with NaOCl gives 95% of  $\alpha$ -phenyl-*o*-tolylfuroxan, m. 103°. Heating 2-methyl-7-nitrostilbene with 50% NaOH at 150–60° for 0.75 hr. gives nearly quant.  $\beta$ -phenyl- $\alpha$ , $\gamma$ -di-[*o*-tolyl]isoxazole (VI), m. 111.5°;  $\alpha$ , $\gamma$ -diphenyl- $\beta$ -[*o*-tolyl]isoxazole (VII), m. 126°, results similarly from 2-methyl-7'-nitrostilbene. Oxidation of VI by O<sub>3</sub> gives not over 25% of *o*-tolyl- $\beta$ -2-methylbenzil 7-oxime (VIII), m. 114°. Oxidation of VII gives IV. Sapon. of VIII gives 95% of  $\beta$ -2-methylbenzil 7-oxime ( $\beta_1$ -monoxime) (IX), m. 124°. IX and NH<sub>2</sub>OH give quant.  $\delta$ -2-methylbenzil dioxime (X), m. 184°, then solidifies and m. 250–60° (decompn.); *di*-Bz deriv., m. 112–3°; sapon. gives 86% of phenyl-*o*-tolylfuran. Oxidation of X gives  $\beta$ -phenyl-*o*-tolylfuroxan, m. 80–7°. Condensation of 3-MeC<sub>6</sub>H<sub>4</sub>CH<sub>2</sub>NO<sub>2</sub> and BzH with MeNH<sub>2</sub>.HCl gives 3-methyl-7-nitrostilbene, yellow, m. 82°; with MeOH-KOH this yields 85% of  $\alpha$ -3-methylbenzil 7',7'-dimethylacetal, m. 176°, yielding with concd. HCl (10 mins.) a poor yield of  $\alpha$ -3-methylbenzil 7'-oxime ( $\alpha_1$ -monoxime) (XI), m. 83°, or, after 24 hrs, the  $\beta$ -oxime ( $\beta_1$ -monoxime) (XII), m. 122°; Bz deriv., m. 136°; Ac deriv., m. 67°. The  $\alpha$ -dioxime, from XI, m. 216°; *di*-Bz deriv., m. 185° (decompn.); heating 2 hrs. at 170–5° gives the  $\beta$ -dioxime, m. 150°, crystg. also with 1 mol. C<sub>6</sub>H<sub>6</sub>; *di*-Bz deriv., m. 141.5°. XII gives a mixt. of the 2 oximes. XII in the cold gives the  $\delta$ -dioxime (XIII), m. 141°; Na salt; *di*-Bz deriv., m. 152°, sapon. by boiling 10% NaOH to phenyl-3-tolylfuran, b. in high vacuum 175–85°, m. 37°. Oxidation with NaOCl gives  $\beta$ -phenyl-3-tolylfuroxan, m. 77.5°. 3-Methyl-7'-nitrostilbene, pale yellow, m. 51°, b<sub>14</sub> 195° (65% yield). 3-Methylbenzil 7'-oxime 7,7'-dimethylacetal ( $\alpha_1$ -acetaloxime), m. 214° (decompn.); sapon. gives  $\alpha$ -3-methylbenzil 7'-oxime ( $\alpha_1$ -monoxime) (XIV), m. 113°. Na salt, orange; the C<sub>6</sub>H<sub>5</sub>N soln. and Co salts give an intense yellow-brown color; Bz deriv., m. 91°. If the sapon. mixt. stands 24 hrs., there results the  $\beta$ -oxime (XV), m. 134°; Bz deriv., m. 120°. XV and NH<sub>2</sub>OH give the  $\gamma$ -dioxime, crystg. with 1 mol. C<sub>6</sub>H<sub>6</sub>, m. 126.5°; this is unstable and rearranges to the  $\beta$ -dioxime on recrystn. from C<sub>6</sub>H<sub>6</sub> (1 expt.) but normally into the  $\alpha$ -dioxime; *di*-Bz deriv., m. 108–16°. Oxidation with NaOCl gives  $\alpha$ -phenyl-3-tolylfuroxan, m. 75.5°. 4-Methyl-7-nitrostilbene, yellow, m. 75–6°. 4-Methylbenzil 7-oxime 7',7'-dimethylacetal, m. 217°;  $\alpha$ -4-methylbenzil 7-oxime (XVI), m. 115° (Bz deriv., m. 118°); cold concd. HCl (20 hrs.) gives the  $\beta$ -oxime (XVII), m. 134° (Bz deriv., m. 156°); the  $\alpha$ -dioxime, from XVI, m. 223–4°; 12 hrs.' heating with 5 parts of EtOH gives quant. the  $\beta$ -dioxime, crystg. with 0.5 mol. C<sub>6</sub>H<sub>6</sub>, m. 184° (*di*-Bz deriv., m. 140°). XVII and NH<sub>2</sub>OH give the  $\delta$ -dioxime, m. 160° (*di*-Bz deriv., m. 119°). NaOH (10%) gives phenyl-4-tolylfuran, m. 80°; NaOCl gives  $\beta$ -phenyl-4-tolylfuroxan, m. 117°. 4-Methyl-7'-nitrostilbene, yellow, m. 79° (85% yield); 1 by-product, C<sub>21</sub>H<sub>13</sub>O<sub>2</sub>N, m. 108°; a 2nd is 1-phenyl-2-[4-tolyl]-2-methoxy-1-nitroethane, yellow, m. 93°. 4-Methylbenzil 7'-oxime, m. 120–1°; 7,7'-dimethylacetal, m. 215° (decompn.); Bz deriv., m. 94°.  $\gamma$ -Dioxime, crystg. with 1 mol. CHCl<sub>3</sub>, m. 150°; *di*-Bz deriv., m. 137°. NaOCl gives  $\alpha$ -phenyl-4-tolylfuroxan, m. 121°.  $\alpha$ , $\gamma$ -Diphenyl- $\beta$ -[3-tolyl]isoxazole, m. 156°. 1-Phenyl-2-[*m*-tolyl]-2-methoxy-1-nitroethane, m. 89°.

C. J. West

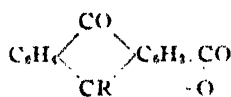
Relative ease of formation of five, six- and seven-membered carbon rings. JULIUS V. BRAUN AND GOTTFRIED MANZ, Univ. Frankfurt. Ann. 468, 258–77 (1929); cf. C. A. 22, 1153, 1972.—PhCH: CPhCO<sub>2</sub>H yields an *Et* ester, b<sub>14</sub> 192°, m. 33–4° which is reduced by a large excess of Na to a mixt. of PhCH<sub>2</sub>CHPhCO<sub>2</sub>H, PhCH<sub>2</sub>CHPhMe, b<sub>13</sub> 145–8°, m. 50°, and  $\beta$ , $\gamma$ -diphenylpropyl alc., b<sub>13</sub> 185–8° (60% yield); bromide, b<sub>13</sub> 188–90°; KCN gives about 50% of PhCH<sub>2</sub>CHPhCN, b<sub>13</sub> 204–6°, which is easily sapond.

to the acid.  $\text{PhCH}_2\text{CHPhCOCl}$ ,  $\text{AlCl}_3$  and  $\text{CS}_2$  give 75% of 3-phenyltetral-1-one,  $b_{13}$  213-5°,  $m$ . 65-6°; *oxime*,  $m$ . 190°; *semicarbazone*,  $m$ . 208°. Reduction gives *phenyltetralin*,  $b_{13}$  180-1°,  $d_4^{18}$  1.0579,  $n_D^{18}$  1.5980; its constitution follows from the production of  $\beta\text{-C}_{10}\text{H}_7\text{Ph}$  on passing over dark red  $\text{PbO}$ . *Et benzyl- $\gamma$ -phenylpropylmalonate*,  $b_{13}$  244-7° (70% yield); the free acid  $m$ . 96° and on heating gives 80% of *benzylphenylpropylacetic acid*,  $b_{13}$  243-5°; the chloride with  $\text{AlCl}_3$  gives 60% of 2- $\beta$ -phenylpropyl-1-hydrindone (I),  $b_{13}$  227-9°; *semicarbazone*,  $m$ . 172°; *p-nitrophenylhydrazones*, orange,  $m$ . 161°; *oxime*, oily, reduced by Na and EtOH to 1-amino-2- $\gamma$ -phenylpropylhydrindene,  $b_{13}$  217° (*picrate*,  $m$ . 203°). Reduction of I gives 2- $\gamma$ -propylhydrindene,  $b_{13}$  197°,  $d_4^{18}$  1.0128,  $n_D^{18}$  1.5667, whose mol. refraction proves that it is a 5-ring compd.; Br deriv.,  $m$ . 82°. *Cinnamalhydrindone*, yellow,  $m$ . 124°, from  $\alpha$ -hydrindone and  $\text{PhCH}:\text{CH}:\text{CHO}$ ; catalytic reduction gives I.  $\text{PhCH}_2\text{CH}(\text{CO}_2\text{Et})_2$ ,  $\text{ICH}_2\text{CH}_2\text{CO}_2\text{Et}$  and Na give 85% of *Et  $\delta$ -phenyl- $\gamma,\gamma$ -dicarboxyvalerate*,  $b_{13}$  219-21°; sapon. gives  $\delta$ -phenyl- $\gamma,\gamma$ -dicarboxyvaleric acid,  $m$ . 166°; heating *in vacuo* gives  $\alpha$ -benzylglutaric acid,  $m$ . 76°;  $\text{SOCl}_2$  gives the *anhydride*,  $m$ . 81°, which gives with  $\text{AlCl}_3$  30% of 2- $\alpha$ -hydrindonyl- $\beta$ -propionic acid,  $b_{14}$  238-43°,  $m$ . 103-5°; *oxime*,  $m$ . 145°; *semicarbazone*,  $m$ . 244-6°. Dry distn. with soda lime gives  $\alpha$ -hydrindone. (with R. MURJAHN.) *o-PhC}\_6\text{H}\_4\text{NH}\_2*, through the Sandmeyer reaction, gives 50% of the *cyanide*,  $b_{14}$  163°,  $m$ . 36°; sapon. is very difficult but catalytic reduction readily gives 45% of *o-phenylbenzylamine*,  $b_{12}$  163°; *HCl salt*,  $m$ . 212°; *picrate*,  $m$ . 188°; *acetate*,  $m$ . 125°; *Bz deriv.*,  $m$ . 95°.  $\text{NaNO}_2$  gives *o-phenylbenzyl alc.*,  $b_{13}$  174°; *chloride*,  $b_{12}$  154°; *bromide*,  $b_{12}$  166°. *Dithiourethan*,  $m$ . 106°; warming with dil. KOH gives the *mercaptan*,  $b_{12}$  160°. The bromide and Na give 2,2'-dibiphenylethane,  $b_{12}$  260°. *o-Phenylbenzyl cyanide*,  $b_{12}$  182°; sapon. with concd. HCl at 120° gives *o-biphenylacetic acid*,  $m$ . 114°. *Et o-phenylbenzylmalonate*,  $b_{12}$  245-50° (80% yield); the free malonic acid loses  $\text{CO}_2$  on heating with  $\text{H}_2\text{O}$  and gives 2- $\beta$ -phenylpropionic acid,  $m$ . 125°; the chloride with  $\text{AlCl}_3$  gives 4-phenylhydrindone,  $b_{11}$  200-5°, *semicarbazone*,  $m$ . 192°. C. J. WEST

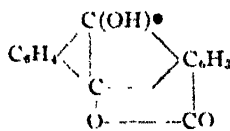
**Derivatives of Bz-tetrahydrocoumarone.** FR. EBEL, F. HUBER AND A. BRUNNER. *Helv. Chm. Acta* 12, 16-9 (1929).— $\alpha$ -Chlorocyclohexanone condenses with  $\text{AcCHNa}:\text{CO}_2\text{Et}$  giving  $\alpha$ -cyclohexanonylacetoacetic ester (I) which exists in 2 forms. 24% keto form,  $b_{13}$  110-3°, decomp. 150°, and enol form,  $b_{13}$  119-22°. Boiling 2.5% alc. KOH converts I into *acetonilycyclohexanone* (II),  $b$ . 112° (3% yield). Attempts to prep. the furan deriv. by treating II with  $\text{P}_2\text{O}_5$ ,  $\text{POCl}_3$  or  $\text{H}_2\text{SO}_4$  were not successful because of complicated side reactions. II and  $\text{PhMNH}_2$  give violet red crystals of a *quinoline deriv.*,  $m$ . 87°. I and boiling 15% HCl give 72% *Et 1-methyl-Bz-tetrahydrocoumarone-2-carboxylate* (III),  $b$ . 134°. III with boiling 7% alc. KOH gives 50% of the corresponding acid,  $m$ . 156°. FREDERICK C. HAHN

**Anthraquinone-1,5-dicarboxylic acid and some simple and mixed anthraquinone-carboxylic acid anhydrides.** ROLAND SCHOLL, SIGFRID HASS AND HANS K. MEYER. *Tech. Hochschule, Dresden. Ber.* 62B, 107-15 (1929).—*Anthraquinone-1,5-dicarboxylic acid* (I) had been prepd. 15 yrs. previously from 1,5- $\text{H}_2\text{NC}_6\text{H}_3(\text{CO})_2\text{C}_6\text{H}_4\text{NH}_2$  (II) but the yield was so poor that the prepn. was not described. It can also be made from 5,1- $\text{H}_2\text{NC}_6\text{H}_3(\text{CO})_2\text{C}_6\text{H}_3\text{CO}_2\text{H}$  (III). Both methods have been used for the present work and the 1st has been so improved that I can now easily be obtained in 60% yield from II. When heated with  $\text{Ac}_2\text{O}$  I changes into a mixed anhydride (IV) which, unlike I, is relatively easily sol. in org. solvents. Anthraquinone- and 2-methylantraquinone-1-carboxylic acids behave in the same way toward  $\text{Ac}_2\text{O}$  while 2- $\text{C}_6\text{H}_4(\text{CO})_2\text{C}_6\text{H}_3\text{CO}_2\text{H}$  recryst. unchanged from boiling  $\text{Ac}_2\text{O}$ . On heating, these mixed anhydrides decomp. into  $\text{Ac}_2\text{O}$  and the simple anhydride of the corresponding anthraquinone-carboxylic acid, and with boiling concd. AcOH they yield the free anthraquinonecarboxylic acid. They are light yellow, like most of the free acids, while the arylated lactones of type V (to be described in a later paper) are white. Moreover these mixed and simple anhydrides give like anthraquinone in abs. alc. with Na-Hg olive-green solns. sensitive to the air and very readily converted into vat dyes by alk.  $\text{Na}_2\text{S}_2\text{O}_4$ .  $\text{Na}_2\text{S}_2\text{O}_4$  in AcOH or  $\text{H}_2\text{O}$  converts them into the characteristic red anthrahydroquinone- $\alpha$ -carboxylic acid lactones (VI) and in dil.  $\text{NH}_4\text{OH}$  into the corresponding blue  $\text{NH}_4$  salts, compds. to be reported on in the near future. At the same time are formed the free anthrahydroquinone- $\alpha$ -carboxylic acids. The behavior of these anhydrides toward  $\text{Na}_2\text{S}_2\text{O}_4$  is similar to that of the anthraquinonecarboxylic esters for which the normal structure  $\text{C}_6\text{H}_4(\text{CO})_2\text{C}_6\text{H}_3\text{CO}_2\text{R}$  has been made very probable by their prepn. from the corresponding anthracene- $\alpha$ -carboxylic esters. The mixed anhydrides are therefore believed to have the normal anhydride  $\text{C}_6\text{H}_4(\text{CO})_2\text{C}_6\text{H}_3\text{C}(\text{O})\text{OAc}$  (VII) structure rather than the HO lactone form VIII. The structure and mol. wt. of the simple anthraquinone-

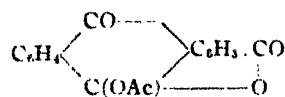
**1,5-dicarboxylic anhydride (IX)** obtained by heating the mixed anhydride could not be detd. because of its slight soly. in even high-boiling solvents. The relatively low m. p. (around 336°) speaks in favor of the simplest mol. wt., *i. e.*, of a formula with an O bridge between the C atoms of the 1- and 5-CO groups or the normal anhydride structure. For the prepn. of I the II must be perfectly pure. The product obtained from the com. di-NO<sub>2</sub> compd. can be purified through the sulfate or the pure II, m. 318-9° (cor.), can be obtained by treating K<sub>2</sub>SC<sub>6</sub>H<sub>3</sub>(CO)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>SO<sub>2</sub>K with NH<sub>3</sub> and an appropriate oxidizing agent under pressure. Previously, it had been prepd. (with WILLY WINKLER) through **1,5-di-*p*-toluenesulfonamidoanthraquinone** (from the di-Cl compd., MeC<sub>6</sub>H<sub>4</sub>SO<sub>2</sub>NH<sub>2</sub> and a little Cu(OAc)<sub>2</sub> in PhNO<sub>2</sub>), needles with golden luster, m. 310-1°, converted into II by concd. H<sub>2</sub>SO<sub>4</sub> at 50-60°. **1,5-Dicyanoanthraquinone**, obtained by diazotizing II in concd. H<sub>2</sub>SO<sub>4</sub> with solid NaNO<sub>2</sub>, treating the pptd. yellow bisdiazonium bisulfate in H<sub>2</sub>O suspension with CuSO<sub>4</sub>-KCN, boiling the ppt. with H<sub>2</sub>O and then 10% HNO<sub>3</sub> until free of Cu and crystg. from quinoline and PhNO<sub>2</sub> or subliming *in vacuo*, yellow, begins to darken 370°, m. about 390° (decompn.), forms with alk. Na<sub>2</sub>S<sub>2</sub>O<sub>4</sub> a green vat which with air gives a violet ppt. Refluxed with moderately concd. H<sub>2</sub>SO<sub>4</sub> 5 mins. it gives I. The final purification of the nitrile involves great losses but the crude product (about 150 g. from 150 g. II after boiling with H<sub>2</sub>O and HNO<sub>3</sub>) can be sapond. directly with concd. NaOH, yielding about 60% I (purified by boiling with HNO<sub>3</sub> of d. 1.35). I, yellowish needles, does not m. 390° but gradually reddens above 300° with partial autoreduction and formation of anthrahydroquinone-1,5-dicarboxylic dilactone. Solns. of I in alkalis are almost colorless. **K salt**, almost colorless; **pyridine salt**, yellowish; **Ca salt**, yellowish. **Dichloride**, from I refluxed with POCl<sub>3</sub>-PCl<sub>5</sub>, pale yellow, m. 260-3° (decompn.). (With SOLON BRISSIMDJI AND WILH. MESSE.) **5-Cyanoanthraquinone-1-carboxylic acid** (29 g. from diazotized III (35 g.) with CuSO<sub>4</sub>-KCN), yields I with boiling 20% NaOH. (With CHR. SEER.) **1,5-Diidoanthraquinone**, from diazotized II and KI, yellow, m. 308-9°, difficultly sol. in concd. H<sub>2</sub>SO<sub>4</sub> with yellow color, in alk. Na<sub>2</sub>S<sub>2</sub>O<sub>4</sub> with red color. **Acetic anthraquinone-1,5-dicarboxylic anhydride**, AcOC(:O)C<sub>6</sub>H<sub>2</sub>(CO)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>C(:O)OAc (IV), pale yellow, m. about 202°. **Acetic anthraquinone-1-carboxylic anhydride**, m. 188-90°, begins to give off Ac<sub>2</sub>O at about 220°; **anthraquinone-1-carboxylic anhydride**, m. 285-7°. **Acetic 2-methylantraquinone-1-carboxylic anhydride**, begins to m. 173°; **2-methylantraquinone-1-carboxylic anhydride**, m. 298-5° (darkening), becomes dark brown in 1 day in the light.



(V)



(VI)



(VIII) C. A. R.

**Derivatives of 2-methylantraquinone and anthraflavone.** PAUL RUGGLI AND EMIL MERZ. *Helv. Chim. Acta* 12, 71-99(1929). **1-Iodo-2-methylantraquinone** and Br in PhNO<sub>2</sub> at 160-70° give 20% of the crude **1-iodo-2-dibromomethyl deriv. (I)** contg. some **mono-Br (II)** from which I, m. 210°, was sepd. by crystd. from AcOH, or by forming the water-sol. **pyridinium salt (IV)** of II by treating the mixt. of Br derivs. with pyridine (III). The treatment of IV in H<sub>2</sub>O with HNO<sub>3</sub>, KI, KSCN, NaClO<sub>3</sub>, or picric acid gives the corresponding pyridinium salts. The **pyridinium salt (V)** of 1,2-C<sub>6</sub>H<sub>4</sub>(CO)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>(NO<sub>2</sub>)CH<sub>2</sub>Br, m. 262-9° (decompn.). The Br in V is easily replaced with other anions by treating the water soln. with a salt contg. the resp. anion. **5,6,7,8-Tetrachloro-2-dibromomethylantraquinone** heated with Cu in PhNO<sub>2</sub> gives **5,6,7,8,5',6',7',8'-octachloroanthraflavone**, m. above 300°. **1,4,2-C<sub>6</sub>H<sub>4</sub>(CO)<sub>2</sub>C<sub>6</sub>H(NH<sub>2</sub>)-BrMe (VI)**, diazotized with concd. H<sub>2</sub>SO<sub>4</sub> and NaNO<sub>2</sub>, and then treated with alc. gives 77% of **4-bromo-2-methylantraquinone (VII)**, m. 199-200°. VII and **p-MeC<sub>6</sub>H<sub>4</sub>SO<sub>2</sub>NH<sub>2</sub>** heated with AmOH, NaOAc and Cu(OAc)<sub>2</sub> give 88% **4-*p*-toluenesulfonamido-2-methylantraquinone (VIII)**, m. 232-3°. Treatment of VIII with concd. H<sub>2</sub>SO<sub>4</sub> gives 100% **4-amino-2-methylantraquinone**, m. 193°. VII and **p-MeC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub>** heated with KOAc gives 100% **4-*p*-toluino-2-methylantraquinone**, m. 174-5°. Refluxing VII and Na<sub>2</sub>S in alc. gives the Na salt of **2-methyl-4-mercaptoanthraquinone (IX)**. Oxidation of the soln. of IX with air gives 60% **2,2'-dimethyldiantraquinonyl 4,4'-disulfide (X)**. The gradual addn. of X to boiling concd. HNO<sub>3</sub> gives **2-methylantraquinone-4-sulfonic acid (XI)**. Treatment of XI with HCl and KClO<sub>3</sub> gives **4-chloro-2-methylantraquinone**, m. 186-8°. VII heated with Cu in PhNO<sub>2</sub> gives 50-70% of **3,3'-dimethyl-1,1'-di-anthraquinonyl (XIII)**, m. 354-5°. **3,3'-Dimethyl-meso-benzodianthrone** is obtained by heating XIII with concd. H<sub>2</sub>SO<sub>4</sub> in the presence of Cu. VII and Br in PhNO<sub>2</sub> at 160-70°

give 80% 4-bromo-2-dibromomethylanthraquinone (XIV), m. 214-5°. Heating XIV in PhNO<sub>2</sub> in the presence of Cu gives 52% 4,4'-dianthraflavone, m. above 300°. Bromination of XII yields 4-chloro-2-dibromomethylanthraquinone (XV), m. 223-4°. XV in PhNO<sub>2</sub> contg. Cu gives 4,4'-dichloroanthraflavone. Diazotization of VI in concd. H<sub>2</sub>SO<sub>4</sub> with NaNO<sub>2</sub>, and treatment of the resulting diazo salt with KSCN gives 50-60% of 2-methylanthraquinone 1,4-dithiocyanate (XVI), m. 250-1°. XVI with boiling alc.-KOH yields the K salt of 2-methyl-di-thioquinizarin (XVII) which was not isolated in its free form because of its ready oxidizability. A soln. of XVII and EtBr yields 2-methylanthraquinone 1,4-dithioethyl ether, m. 195-205°. Similarly XVII and PhCH<sub>2</sub>Cl give the corresponding dithiobenzyl ether. Oxidation of XVI with boiling concd. HNO<sub>3</sub> yields 2-methylanthraquinone-1,4-disulfonic acid (XVIII). The treatment of XVIII with HCl and KClO<sub>3</sub> gives 90% 1,4-dichloro-2-methylanthraquinone (XIX), m. 185-6°. XIX and Br in PhNO<sub>2</sub> at 160° gives 1,4-dichloro-2-dibromomethylanthraquinone, m. 172-5°. XIX and *p*-MeC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub> heated with amyl alc., NaOAc and a trace of Cu give 80% 1,4-di[*p*-toluenesulfonamido]-2-methylanthraquinone (XX), m. 204-5°. XX and concd. H<sub>2</sub>SO<sub>4</sub> give the corresponding diamino deriv., m. 246-8°. F. C. H.

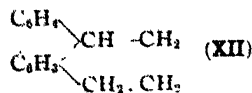
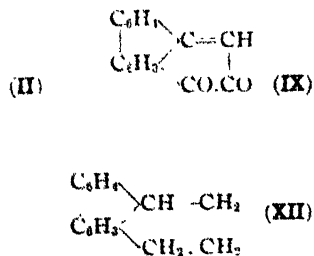
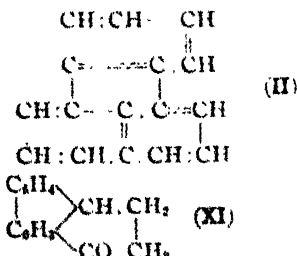
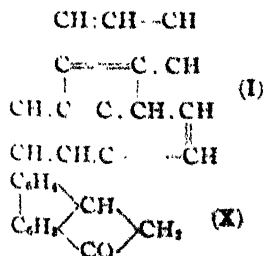
**Bamba oil and the terpenes and higher-boiling fraction of Cajeput oil.** D. B. SPOELSTRA. Amsterdam, Colonial Inst. *Rec. trav. chim.* **48**, 372-6 (1929). —A. *Bamba oil*.—The Bamba oil (called "Laurel oil" in British Guiana) investigated by S., showed  $d_{15}^{20}$  0.9326,  $[\alpha]_D$  33.6,  $n_D^{20}$  1.4816, and was sol. in 0.5 vol. 80% alc. and in 9 vols. 70% alc.; acid no., 1.8; ester no., 3.0; OMe, 6.79%. The ester no. after acetylation, detd. after diln. with 4 vols. of xylene showed the presence of 15.3% of an alc. C<sub>10</sub>H<sub>18</sub>O. (On fractionation of 325 g. under 18 mm. the following fractions were obtained: (1) 49-58°, 175 g.; (2) 58-71°, 16 g.; (3) 71-105°, 42.5 g.; (4) 158-61°, 70 g. Fraction 1 on refractionation gave 152 g.  $b_{760}$  52-4°,  $b_{760}$  155-7°,  $d_{15}^{20}$  0.8622,  $\alpha_D$  40.4,  $n_D^{20}$  1.4661, which was identified as *pinene* by the prepn. of the semicarbazone of pinonic acid, m. 204°. Fraction 2 was mixed with 10 g. higher-boiling residue of fraction 1 and refractionated over Na; the chief fraction, thus obtained,  $b_{760}$  170-7°,  $d_{15}^{20}$  0.8500  $[\alpha]_D$  43.7,  $n_D^{17}$  1.4728, and on bromination in AcOH gave a mixt. of *d*-limonene tetrabromide, m. 104°, and dipentene tetrabromide, m. 124°. On sapon. and fractionation fraction 3 yielded *d*- $\alpha$ -terpineol, which was converted into the phenylurethan, m. 111°, and the nitroso-chloride, m. 108°, whereas fraction 4, on refractionation, gave 55 g. of a compd.  $b_{16}$  161-2°,  $n_D^{17}$  1.5305,  $d_{15}^{20}$  1.1598,  $[\alpha]_D$  -0.07°, which could be identified as *dillapiol* by the OMe content of 27.25%, the formation of the tribromide, m. 108°, by bromination in AcOH and the conversion into *dill-iso-apiol*, m. 44°, by means of alc. KOH; the latter compd. was also converted into *dill-iso-apiol picrate*, m. 81.5°. The compn. of Bamba oil is therefore: *d*- $\alpha$  pinene, 47%; *d*-limonene and dipentene, 5%; *d*- $\alpha$ -terpineol, 15%; *dillapiol*, 24%. B. *The terpenes and higher-boiling fractions of Cajeput oil*.—According to Gildemeister and Hoffmann (*Die aetherischen Oele*, III, 312 (1916)) Cajeput oil contains cineole, *i*- $\alpha$ -terpineol, *l*- $\alpha$ -pinene, BuCHO, BzH, HCO<sub>2</sub>H, PrCO<sub>2</sub>H and BuCO<sub>2</sub>H and chlorophyll. In the present paper it is shown that limonene, dipentene and sesquiterpenes and sesquiterpene alcs. of the cadaline type are also present. The cineole fraction was treated repeatedly with a 50% resorcinol and the terpenes isolated in this way were fractionated, *l*- $\alpha$ -pinene being obtained together with a fraction, showing  $b_{760}$  174-6°,  $d_{15}^{20}$  0.8496  $n_D^{20}$  1.4746,  $[\alpha]_D$  -33.4°. On bromination in AcOH this fraction gave a cryst. product which could be sepd. into *l*-limonene tetrabromide, m. 104°, and dipentene tetrabromide, m. 124°. The fractions with a  $b_{16}$  higher than 85° were sapond. and fractionated repeatedly, *i*- $\alpha$ -terpineol being obtained and the fractions: (1)  $b_{16}$  122-45°; (2) 145-56°; (3) 156-65° under 25 mm. On refractionation fraction 1 gave a middle fraction with  $d_{17}^{20}$  0.9054,  $n_D^{20}$  1.5023,  $[\alpha]_D$  4.3°,  $M_D$  66.7 (calcd. for C<sub>15</sub>H<sub>24</sub>, 66.1 and for C<sub>15</sub>H<sub>24</sub>, 67.8), thus showing the presence of mono- and bicyclic sesquiterpenes. With HCl a cryst. addn. product could not be obtained but on dehydrogenation with 3 atoms of S (cf. Ruzicka and Meyer C. A. 15, 3476) a blue reaction product was obtained, which, on treatment with H<sub>3</sub>PO<sub>4</sub>, gave a small amount of azulene, the picrate and styphnate of which m. 114-5° and 127°, resp. The part of the reaction product which had not reacted with H<sub>3</sub>PO<sub>4</sub>, contained cadaline (picrate, m. 114°; styphnate, m. 138°). Fraction 2, consisting of a mixt. of sesquiterpenes and sesquiterpene alcs., was not investigated further; fraction 3 on refractionation  $b_{16}$  160-5°,  $d_{15}^{20}$  0.9758,  $n_D^{17.5}$  1.5086, and chiefly consists of an alc., C<sub>15</sub>H<sub>24</sub>O, on dehydration with HCO<sub>2</sub>H a hydrocarbon, C<sub>15</sub>H<sub>24</sub>, being obtained, which, on dehydrogenation with S, yields cadaline.

C. F. VAN DUIN

**Synthesis of 1,5-naphthyridine.** B. ROBRANSKI AND K. SUCHARDA. *Rozprawy*

*Chem.* 7, 241-5(1927); cf. *C. A.* 22, 777.—In this abst. the reference was incorrectly given *Roczniki Chem.* 7, 192-203(1927). E. J. C.

**Benzopolymethylene compounds. XV. Composition, constitution and synthesis of fluoranthene.** JULIUS V. BRAUN AND ERNST ANTON. Univ. Frankfurt a. M. *Ber.* 62B, 145-51(1929); cf. *C. A.* 22, 2748.—The experimentally confirmed theory that tricyclic systems can be formed by fusion onto a  $C_6H_6$  nucleus of adjacent 5- and 6-, 6- and 7- or two 6-membered rings but not of two 5-membered rings is based on the assumption, now firmly established, that the distance between adjacent C atoms in  $C_6H_6$  nuclei is almost the same as in aliphatic chains. It can furthermore be deduced that ring structures such as I would have an extremely small tendency to be formed and a correspondingly slight stability whereas it should not be very difficult to obtain substances with the structure II. Two facts did not agree with these deductions: (1) the existence of fluoranthene (III),  $C_{18}H_{10}$ , to which, from the work of Fittig and Goldschmidt, hardly any other structure than I could be assigned, and (2) the observation of Mayer that neither 9-fluorenylacetyl (V) nor  $\beta$ -6-fluorenylpropionyl chloride (VI) undergoes an intramol. Friedel-Crafts reaction with  $AlCl_3$ , whereas according to the above theory V should, indeed, not be capable of ring formation but VI should be able to form a ring with not much greater difficulty than  $\beta$ -hydriindylpropionyl chloride. Now, the calcd. C and H values for  $C_{18}H_{10}$  and  $C_{18}H_8O_2$ , the formulas hitherto assigned to III and its oxidation product, the so-called fluoranthenequinone (VII), differ but slightly from the values calcd. for formulas with 1 more C atom ( $C_{19}H_{10}$  and  $C_{19}H_8O_2$ ), and it occurred to v. B. and A. that III might really not be an indene but a naphthalene deriv. (II); that oxidation should give, together with the quinone, which would then have the structure IX, fluorenone-1-carboxylic acid can be explained just as well on the basis of formula II as of I. M.'s work was accordingly repeated and it was found that whereas V gives not a trace of the cyclic ketone X, VI undergoes cyclization to about the same extent as  $\beta$ -hydriindylpropionyl chloride; the resulting ketone (XI) can be smoothly reduced to XII which on dehydrogenation yields quant. a compl.  $C_{18}H_{10}$ , identical in all respects with III; IX is likewise identical with VII. This seems to solve definitely the fluoranthene question and also to throw light on the formation of III in the distn. of coal; it is very probable that it is formed by the combined pyrogenic dehydrogenation of  $C_{10}H_8$  and  $C_8H_6$ , perhaps through  $\alpha$ - $C_{10}H_7$ Ph. It also shows why Graebe was unable to synthesize it by the dehydrogenation of 9-ethylfluorene. (With H. WAGNER.) In the prepn of V the Et dibenzofulvenecarboxylate can be reduced much more rapidly and smoothly with Ni and  $H_2$  than with Al Hg, 100 g. requiring only about 5 mins. at  $230^\circ$  for complete satn. of the double bond; the resulting satd. ester,  $b_D^{20}$  193-3°, is entirely homogeneous and on sapon. gives the perfectly pure acid,  $b_D^{20}$  218-20°. The fluorenylpropionic acid (XIII) is smoothly obtained from Et 9-fluorene-carboxylate with  $ICH_2CH_2CO_2Et$  or  $ClCH_2CH_2CO_2Et$ . V, from the acid and  $SOCl_2$  at  $100^\circ$ ,  $b_D^{20}$  194-6°.  $\beta$ -9-Fluorenyl ethyl alc., obtained in about 40% yield from Et fluorenylacetate reduced by the Ladenburg method, is a thick, almost odorless oil; it is very difficult to completely replace the HO group by Br and furthermore to convert the bromide into the cyanide with KCN, so this method of prepg. XIII was abandoned. VI,  $b_D^{20}$  180-5°, m.  $58-9^\circ$ . 4-Keto-1,2,3,4-tetrahydrofluoranthene (XI), m.  $98^\circ$ ; semicarbazone, m.  $250-1^\circ$ ; oxime, m.  $170-1^\circ$ . 1,2,3,4-Tetrahydrofluoranthene (XII), from XI by the Clemmensen method,  $b_D^{20}$  152-60°, m.  $69^\circ$ . 9,10-Benzoaacenaphthylene (II = III), from vapors of XII in  $CO_2$  passed over red hot  $PhO$ -pumice, m.  $110^\circ$ .

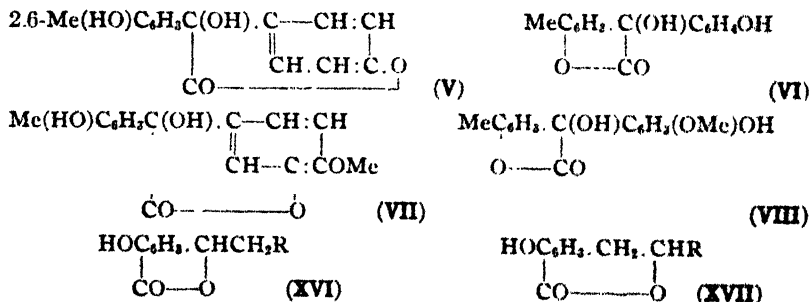


C. A. R.

**Rubrene. Action of acids.** CHARLES MOUREU, CHARLES DUFRASSE AND LÉON FENDRIAN. *Compt. rend.* 188, 873-5(1929); cf. *C. A.* 22, 4521.—Rubrene is decolorized by acids. In most solvents with HI the product is a colorless isomer, m.  $276-8^\circ$ .

Some I is also liberated. In ether much I is liberated and a colorless compd., m. about 230°, has been isolated, probably a hydrogenation product. This is being investigated. HNO<sub>3</sub> gives a colorless oxidation product which is also being studied. V. F. H.

**Constitution of hydrangenol and phyllodulcin.** YASHUIKO ASAHINA AND JUNTARO ASANO. Univ. Tokyo. *Ber.* 62B, 171-7(1929); *J. Pharm. Soc. (Japan)* 49, 117-28 (1929).—Hydrangenol, C<sub>16</sub>H<sub>12</sub>O<sub>4</sub> (I), obtained from the blossoms of *Hydrangea opuloides*, Steud. var. Otakusa, Maxim., had been shown to be a lactone with two HO groups which is converted by heating with alkalis into an isomeric isohydrangenol (II); on fusion with KOH it gives 2,6-Me(HO)C<sub>6</sub>H<sub>3</sub>CO<sub>2</sub>H and *p*-HOC<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>H. At the same time were studied the specific, sweet constituents, phyllodulcin, C<sub>16</sub>H<sub>14</sub>O<sub>8</sub> (III), and its isomer, isophyllodulcin (IV), of the leaves of *H. opuloides*, Steud. var. Thunbergii, Makino, which, unlike I, are optically active and are ketones with 2 HO and 1 MeO group; both are converted by alkalis into the *dl*-isophyllodulcin and on fusion with KOH give 2,6-Me(HO)C<sub>6</sub>H<sub>3</sub>CO<sub>2</sub>H and 3,4-(HO)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>CO<sub>2</sub>H. Since the hydrangenols and phyllodulcins occur in 2 closely related plants and show almost the same chem. properties it was concluded that they have the same skeletal structure and the formulas V-VIII were suggested for I, II, III and IV, resp. In order to det. whether these structures are correct, attempts were made to synthesize substances with a similar structure for comparison with the natural products. 2-MeOC<sub>6</sub>H<sub>4</sub>COCOPh was accordingly demethylated with HBr; the resulting HOC<sub>6</sub>H<sub>4</sub>COCOPh is easily rearranged by alkalis into the amorphous 2-hydroxybenzilic acid (IX) which is converted by hot Ac<sub>2</sub>O into the cryst. lactone acetate (X). X is even more readily obtained from the lactone of 2-HOC<sub>6</sub>H<sub>4</sub>CHPhCO<sub>2</sub>H with Br and KOAc. Both IX and X give a deep violet color with concd. H<sub>2</sub>SO<sub>4</sub> while I-IV dissolve without color. 2,4'-Dihydroxybenzilic acid (XI) and its lactone diacetate (XII), similarly prepd. from 2,4'-dimethoxybenzil, likewise gave the characteristic Ph<sub>3</sub>C(OH)CO<sub>2</sub>H color reaction with H<sub>2</sub>SO<sub>4</sub>. Furthermore, IV easily forms a *mono-Me ether* (XIII) which gives a red-violet color with FeCl<sub>3</sub>, indicating the presence of a HO group in the *o*-position to the C:O group. These results make the old formulas for I-IV wholly untenable. Reduction of XIII with Na-Hg in acid soln. gives the mono-Me ether (XIV) of desoxyphyllodulcinic acid (XV), also obtained by methylation of XV. XIV also gives a red-violet color with FeCl<sub>3</sub> and with KMnO<sub>4</sub> yields 3,4-(MeO)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>CH:CHCO<sub>2</sub>H. XIV, III and IV can therefore be assigned the structures 3,2-HO(HO<sub>2</sub>C)C<sub>6</sub>H<sub>3</sub>CH<sub>2</sub>CH<sub>2</sub>C<sub>6</sub>H<sub>3</sub>(OMe)<sub>2</sub>, 3,4, XVI and XVII (R = 3,4-HO(MeO)C<sub>6</sub>H<sub>3</sub>), resp., and it may be stated with great probability that the hydrangenols are desmethoxyphyllodulcins. 2-Hydroxybenzil (4.2 g. from 8 g. of the Me ether in AcOH with 48% HBr heated in a current of CO<sub>2</sub> at 140-50°), yellowish, m. 74°, somewhat sol. in Na<sub>2</sub>CO<sub>3</sub>, easily in alkalis with yellow color, gives a red-violet color with alc. FeCl<sub>3</sub>, has a somewhat sweet and at the same time biting taste. X, m. 115°, insol. in Na<sub>2</sub>CO<sub>3</sub> and cold alkalis. 2,4'-Dihydroxybenzil, m. 164°, is faintly sweet, dissolves in Na<sub>2</sub>CO<sub>3</sub>, gives a blood-red color with H<sub>2</sub>SO<sub>4</sub> and red-violet with alc. FeCl<sub>3</sub>. XII, m. 215°, mol. wt. (Rast) 351. XIII, from IV and alk. Me<sub>2</sub>SO<sub>4</sub>, m. 115°; acetate, m. 141°. With alk. KMnO<sub>4</sub> XIII yields 3,4-(MeO)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>CO<sub>2</sub>H. XIV, m. 133°. Benzylphthalide and 3-phenylhydroisocoumarin with Na-Hg, just as with HI and P, although much less readily, give *o*-HO<sub>2</sub>CC<sub>6</sub>H<sub>4</sub>CH<sub>2</sub>CH<sub>2</sub>Ph which on heating with alkalis smoothly yields, through *o*-HO<sub>2</sub>CC<sub>6</sub>H<sub>4</sub>CH:CHPh, *o*-MeC<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>H and BzOH; it is therefore easy to see how IV (= XVII) yields 2,6-Me(HO)C<sub>6</sub>H<sub>3</sub>CO<sub>2</sub>H and 3,4-(HO)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>CO<sub>2</sub>H on fusion with KOH.



C. A. R.  
**Existence of dihydro- and octahydro-*p*-indole.** ERWIN FERRER. Tech. Hochschule, München. *Ber.* 62B, 183-95(1929).—v. Braun and Gawrilow believed that

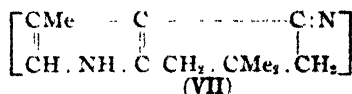
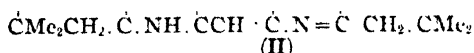
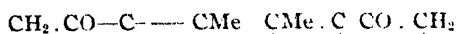


they had proved that  $p\text{-H}_2\text{NC}_6\text{H}_4\text{CH}_2\text{CH}_2\text{Cl}$  (I) under certain conditions undergoes ring closure in the  $p$ -position with formation of  $p$ -dihydroindole,  $\text{NH}\cdot\text{C}_6\text{H}_4\cdot\text{CH}_2\cdot\text{CH}_2$

(II), but this is doubted by Willstätter on the basis of work of his own in the tropine series and also on theoretical considerations involving ring tension. With the object of settling this point experimentally F. has repeated v. B.'s work and concludes that II cannot be obtained by his method. In spite of the great care with which he carried out his expts. he appears to have obtained  $o$ -dihydroindole (III) instead of II. III is formed with extraordinary ease by mere distn. of  $o\text{-H}_2\text{NC}_6\text{H}_4\text{CH}_2\text{CH}_2\text{Cl}$  (IV) with steam. v. B.'s statement that nitration of  $\text{PhCH}_2\text{CH}_2\text{Cl}$  at  $-15^\circ$  gives  $p\text{-O}_2\text{NC}_6\text{H}_4\text{CH}_2\text{CH}_2\text{Cl}$  (V) exclusively is also erroneous; as a matter of fact there are formed at the same time about 30% of the  $o$ -isomer (VI) and also a di- $\text{NO}_2$  compd. (VII), m.  $136^\circ$ , which can be only  $2,4\text{-(O}_2\text{N)}_2\text{C}_6\text{H}_3\text{CH}_2\text{CH}_2\text{Cl}$ . The HCl salts of  $p$ - and  $o\text{-H}_2\text{NC}_6\text{H}_4\text{CH}_2\text{CH}_2\text{Cl}$  are described as m.  $205^\circ$  but F. found the  $p$ -compd. really m.  $209\text{--}10^\circ$ . This was perhaps because in the reduction with  $\text{SnCl}_2$  he isolated the  $p\text{-H}_2\text{NC}_6\text{H}_4\text{CH}_2\text{CH}_2\text{Cl}$  (VIII) as the difficultly sol. and well-crystd. double salt. The properties of the free VIII also differ from those given in the literature; it can be boiled without change in  $\text{Et}_2\text{O}$  or alc. for hrs. and even for several hrs. in alc. contg. 1.2% KOH; under the conditions given by v. B. for the ring closure it remains unaltered and can be recovered quantitatively. More vigorous treatment (heating at  $110^\circ$  or with strong alkali) always gives the amorphous products of extramol. condensation described by v. B. Nitration of  $\text{PhCH}_2\text{CH}_2\text{OAc}$  at  $-15^\circ$  gives 86% of a mixt. of the  $o$ - and  $p\text{-NO}_2$  derivs. which on sapon. yields 74%  $p\text{-O}_2\text{NC}_6\text{H}_4\text{CH}_2\text{CH}_2\text{OH}$  (IX), m.  $60\text{--}1^\circ$ ; the  $p$ -position of the  $\text{NO}_2$  group was proved by the prepn. of IX from pure  $p\text{-O}_2\text{NC}_6\text{H}_4\text{CH}_2\text{CH}_2\text{Cl}$ , and by oxidation of IX with  $\text{KMnO}_4$  to  $p\text{-O}_2\text{NC}_6\text{H}_4\text{CO}_2\text{H}$ , m.  $237.5^\circ$ . Reduction of IX, best with Zn dust in the presence of  $\text{CaCl}_2$ , yields 90%  $p\text{-H}_2\text{NC}_6\text{H}_4\text{CH}_2\text{CH}_2\text{OH}$  (X), converted through the diazonium compd. into tyrosol,  $p\text{-HOC}_6\text{H}_4\text{CH}_2\text{CH}_2\text{OH}$  (XI), m.  $92\text{--}3^\circ$ . As primary amines are probably intermediate products in the fermentation of  $\text{NH}_2$  acids, F. attempted to convert X into XI by phytochem. means but neither by adding it all at one time nor slowly to the fermenting soln. was the X altered. Considerations of ring tension make it probable that if a ring can be formed at all by closure in the  $p$ -position, it should be formed most readily in perhydrogenated systems, especially as some alkaloids contain such rings, but all attempts to effect such a ring closure in *hexahydro- $p$ -aminophenylethyl chloride* (XII) have thus far failed, although some interesting compds. were formed. Catalytic hydrogenation of X or V in strong HCl by the Skita method gives chiefly XII; there is only very little dehalogenation, resulting in the formation of 6.5% of  $(\text{CH}_2\text{CH}_2\text{C}_6\text{H}_{10}\text{NH}_2)_2$  (XIII). There is also always formed a certain amount of a tertiary base. XII exerts a remarkably severe action on the skin; the smallest amounts produce violent itching and after several days, without any visible corrosion, blisters appear. All attempts to close the ring gave a solid trimol. product  $(\text{HN}\cdot\text{C}_6\text{H}_{10}\cdot\text{CH}_2\cdot\text{CH}_2)_3$  (XIV). *p*-Aminohexahydrophenylethyl alc. (XV) was likewise prepd. from IX or X. X m.  $108^\circ$  (Pistschimuka, probably by mistake, gives  $171^\circ$ ).  $\alpha,\delta\text{-Bis}[p\text{-aminocyclohexyl}]$ butane (*p,p'*-diaminoperhydrodiphenylbutane) (XIII), yellowish oil of characteristic basic odor, attracts  $\text{CO}_2$  from the air, blues litmus,  $b_{710}$  about  $312^\circ$  (decompn.), mol. wt. (Rast)  $246\text{--}62$ ,  $n_D^{19}$  1.5077,  $d_4^{19}$  0.9774; HCl salt, m.  $207^\circ$ , gives a white amorphous ppt. with phosphotungstic acid.  $\beta\text{-}[p\text{-Aminocyclohexyl}]$ ethyl chloride (XII), yellowish viscous oil of overpowering, conine-like odor causing headache, quickly darkens in the air, b. about  $136^\circ$  and solidifies to a white substance,  $d_4^{20}$  1.0332,  $n_D^{20}$  1.5036; chloroplatinate, yellowish white, m.  $231^\circ$  (decompn.). XIV, flocks, mol. wt. (Rast) 365.3, dissolves in HCl; the faintly acid soln. gives with dil.  $\text{HNO}_3$  a voluminous white ppt., with  $\text{CrO}_3$  a red-brown ppt., with  $\text{FeCl}_3$  a red color, with picric acid a yellow amorphous ppt., m. around  $143^\circ$ , with phosphotungstic acid a white ppt., with  $\text{HNO}_3$  an intense red color and then red flocks.  $\beta\text{-}[p\text{-Aminocyclohexyl}]$ ethyl alc. (XV), begins to m.  $77^\circ$ , m. completely  $85^\circ$ . C. A. R.

**Derivatives of Bz-tetrahydroindole.** I. COSTIN D. NENITZESCU *Bul. soc. chim. România* 10, 131-3(1928).— $\alpha$ -Bromcyclohexanone condensed with  $\text{AcCHNaCO}_2\text{Et}$ , then boiled with HOAc and  $\text{NH}_4\text{OAc}$  yields 4,5,6,7-tetrahydro-2-methyl-3-carbethoxyindole, m.  $132^\circ$ . Yields are less than 1%. II. Some derivatives of 4,5,6,7-tetrahydro-3,6,6-trimethyl-4-ketoindole. COSTIN D. NENITZESCU AND VIRGINIE SCORTZEANU. *Ibid* 134-40.— $\text{AcCH}(\text{NH}_2)\text{CO}_2\text{Et}$  condenses with 1,1-dimethylcyclohexane-3,5-dione (IV) to give "satisfactory" yields of 4,5,6,7-tetrahydro-3,6,6-trimethyl-4-keto-2-carbethoxyindole (I) by loss of 1 mol.  $\text{H}_2\text{O}$  from the O on the 3-C atom in IV and the H on the  $\text{NH}_2$  group and another from the H on the 4-C atom in IV and the O of

the Ac group in  $\text{AcCH}(\text{NH}_2)\text{CO}_2\text{Et}$ . I on hydrolysis gives the free 2-carboxylic acid (II), m. 235°, which on melting gives the tetrahydrotrimethylketoindole (III), m. 162°, by loss of  $\text{CO}_2$ . Br with I gives a red condensation product, m. 132°, with 2.5 Br atoms for each mol. of I. It loses Br spontaneously to give I. This product boiled with HOAc gives on addition of water a white ppt., a Br deriv., m. 202° (violent decompn.). To 93 g.  $\text{AcCH}_2\text{CO}_2\text{Et}$  in 230 cc. HOAc add 49 g.  $\text{NaNO}_2$ , 100 g. of IV in 440 cc. HOAc and 150 g. Zn dust, boil 1 hr., add water, recrystallize from 50% alc. Yield 100 g., m. 171°. III with  $\text{HNO}_3$  gives colorless crystals, m. 193°. III boiled with excess alc. aq. KOH for 3 hrs. and neutralized with HCl gives II, m. 235°. III. Some polynuclear derivatives of 4,5,6,7-tetrahydro-3,6,6-trimethyl-4-ketoindole. COSTIN D. NENITZESCU. *Ibid* 141-8.—Two mols. of 4,5,6,7-tetrahydro-3,6,6-trimethyl-4-ketoindole (III) condense with 1 mol.  $\text{H}_2\text{CO}$  with loss of 1 mol.  $\text{H}_2\text{O}$  to give di[ $\beta$ -tetrahydrotrimethylketoindyl]methane (I) and 1 mol. of III with 1 of  $\text{ClN:NPh}$  gives 4,5,6,7-tetrahydro-3,6,6-trimethyl-4-ketoindole-2-azobenzene (VI). Attempts to condense III with  $\text{HCO}_2\text{H}$  to give [4,5,6,7-tetrahydro-3,6,6-trimethyl-4-ketoindyl][4,5,6,7-tetrahydro-3,6,6-trimethyl-4-ketoindenyl]methene (II) were unsuccessful. III with  $\text{HC}(\text{OR})_3$  gives tri[4,5,6,7-tetrahydro-3,6,6-trimethyl-4-ketoindyl]methane (IV) which with concd. HCl gives II, colored. The inaptitude of the pyrrole to change to the



pyrrole may be due to the ketone group. To test this the O was replaced by H by the Kischner-Wolff reaction. The product, 4,5,6,7-tetrahydro-3,6,6-trimethylindole (V), colorless, is very sensitive to oxidation but its picrate is easily handled. Some di[4,5,6,7-tetrahydro-3,6,6-trimethylindyl]azine (VII) also was formed. V has not been condensed with  $\text{HCO}_2\text{H}$  as was hoped. To 5 g. III in alc. add 1.5 mol. of 40%  $\text{H}_2\text{CO}$  and 2 drops concd. HCl and boil 15 mins. The product, I, m. 267°. To 3.6 g. III in dil. alc. add 2 g. aniline as  $\text{PhN:NCl}$ . Neutralize with NaOH. The VI, yellow, m. 224°. To 3 g. I in 15 cc.  $\text{Ac}_2\text{O}$  add excess  $\text{HC}(\text{OEt})_3$  and boil. IV, m. 284°. II, m. 264°. To 3 g. of III in 5 cc. alc. add 5 g.  $\text{N}_2\text{H}_4 \cdot \text{H}_2\text{O}$ . Heat 8 hrs. Add 3 g. Na in 40 cc. MeOH, heat 12 hrs. at 150°. V, m. 63°. This cannot be purified. The picrate, m. 140°. VII, m. 300°.

VALENTINE F. HARRINGTON

**Derivatives of 2,5-diphenyloxazole.** STEFAN MINOVICI, COSTIN D. NENITZESCU and BARBU ANGELESCU. *Bul. soc. chim. România* 10, 149-59 (1928).—2,5-Diphenyloxazole (I) and its derivs. are prepd. by condensation of a cyanohydrin of an aromatic aldehyde with an aromatic aldehyde (*Ber* 29, 205, 2103 (1896)). Why such reactions occur only with aromatic compds. has not been explained. This paper concerns the effect of negative groups on the condensation. The cyanohydrin of BzH (I), anisaldehyde (II),  $p\text{-MeC}_6\text{H}_4\text{CHO}$  (III), and  $p\text{-O}_2\text{NC}_6\text{H}_4\text{CHO}$  have been condensed with I, II, III, piperonal,  $o$ - and  $m\text{-O}_2\text{NC}_6\text{H}_4\text{CHO}$ ,  $p\text{-O}_2\text{NC}_6\text{H}_4\text{CHO}$  (IV),  $o$ - and  $m\text{-ClC}_6\text{H}_4\text{CHO}$  and  $o\text{-BrC}_6\text{H}_4\text{CHO}$ . In all cases an oxazole results except that II with IV gives only  $p$ -nitrobenzal(methoxymandelic)amide (V). I with IV gives both an oxazole and a mandelic amide. The basic nature of the compds. diminishes with the negative nature of the substituting group. The compds. were all prepd. by adding 0.1 mol. of the aldehyde and of the cyanohydrin to 50 cc. of dry ether and passing in dry HCl. The base is pptd. by adding water. All yields are 80%. 2- $p$ -Tolyl-5-phenyloxazole, m. 74° (HCl salt, m. 160-1°); 2-phenyl-5- $p$ -tolylloxazole, m. 81° (HCl salt, m. 180°); 2- $p$ -methoxyphenyl-5- $p$ -tolylloxazole, m. 88° (HCl salt, m. 100°); 2-piperonyl-5-phenyloxazole, m. 116-7° (HCl salt, m. 193°); 2- $o$ -nitrophenyl-5-phenyloxazole, m. 132° (125°), m. ps. in parentheses are those of materials prepd. by another method (HCl salt unstable); 2- $m$ -nitrophenyl-5-phenyloxazole, m. 154-5° (149°); 2- $p$ -nitrophenyl-5-phenyloxazole, m. 208° (204°); nitrobenzal-mandelic amide, m. 168°; 2- $o$ -chlorophenyl-5-phenyloxazole, m. 83°; 2- $m$ -chlorophenyl-5-phenyloxazole, m. 107°; 2- $p$ -tolyl-5- $p$ -methoxyphenyloxazole, m. 90° (HCl salt, m. 179°); 2-methylenedioxyphenyl-5- $p$ -methoxyphenyloxazole, m. 145°; 2- $o$ -nitrophenyl-5- $p$ -methoxyphenyloxazole, m. 116°; 2- $m$ -nitrophenyl-5- $p$ -methoxyphenyloxazole, m. 163°; 2- $o$ -chlorophenyl-5- $p$ -methoxyphenyloxazole, m. 108° (HCl salt, m. 128°); 2- $m$ -chlorophenyl-5- $p$ -methoxyphenyloxazole, m. 123° (HCl salt, m. 162°); 2-phenyl-5- $p$ -nitrophenyloxazole, m. 187° (HCl salt unstable); V, m. 168°.

VALENTINE F. HARRINGTON

**A diacetylenic heterocyclic compound.** LESPICHAU. *Compt. rend.* 188, 502-3 (1929).— $\text{CH}_2 \cdot \text{C} \cdot \text{C} \cdot \text{CH}_2 \cdot \text{O} \cdot \text{CH}_2 \cdot \text{C} \cdot \text{C} \cdot \text{CH}_2 \cdot \text{O}$ , m. 180° (Maquenne block) is formed

in minute quantities from  $\text{ClCH}_2\text{OCH}_2\text{Cl}$  and a Grignard deriv. of  $\text{C}_2\text{H}_5$ . It gives a ppt. with aq.  $\text{HgCl}_2$ .

Constitution of kikokunetin. SHIZUO HATTORI. Tokyo Imp. Univ. *J. Pharm. Soc. (Japan)* 48, 561, 1064-70(1928).—H. extd.  $\text{C}_{19}\text{H}_{11}\text{O}_4(\text{OMe})$  (I), kikokunetin, m. 194-5° from the dry flower of *Pseudoclea triflora*.

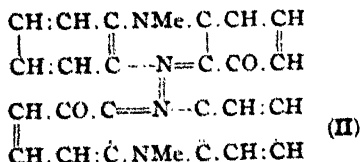
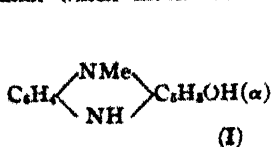
117-8°.

F. I. NAKAMURA

The occurrence of euxanthone in the heart wood of *Platonia insignis* Mart. ("Geelhart" or "Pakoeli"). D. B. SPOELSTRA AND MISS M. J. VAN ROYEN. Amsterdam, Colonial Inst. *Rec. trav. chim.* 48, 370-1(1929).—On extn. with petr. ether, benzene or alc., the heart wood of *Platonia insignis* gives a residue of 1.0%, 1.5% or 11%, resp. The product obtained by extn. with benzene appeared to be euxanthone; m. p. after 3 recrystns. from alc. 239°. The product was identified by comparison with an authentic specimen, prepd. from "Indian Yellow," as well as by comparison of the Ac deriv., m. 185°, and the di-Br compd., m. 278°, prepd. from both specimens. When the wood was first extd. with benzene and then with alc., the residue of the alc. extn. consisted of a brown powder, m. 205-25°, from which, however, a cryst. substance could not be obtained.

C. F. VAN DUIN

Pyocyanin, the blue pigment of *Bacillus pyocyaneus*. IV. The constitution and synthesis of pyocyanin. FRITZ WREDE AND ERICH STRACK. Univ. Greifswald. *Z. physiol. Chem.* 181, 58-76(1929); cf. *C. A.* 22, 3891.—Pyocyanin,  $\text{C}_{26}\text{H}_{26}\text{N}_4\text{O}_2$ , the blue  $\text{CHCl}_3$ -sol. pigment produced by *Bacillus pyocyaneus*, yields 80%  $\alpha$ -hydroxyphenazine (I) by alk. cleavage in the presence of O. The O consumption is 3 atoms per mol. If the oxidation is performed by  $\text{H}_2\text{O}_2$  instead of atm. O,  $\text{CH}_2\text{O}_2$  is also formed. Treatment with HI yields MeI in addn. to the phenazine, and at higher temps. a 2nd mol. of MeI is formed (MeN detn.). Acetylation in alk. soln. even with exclusion of O gives only derivs. of I. In acid soln. ( $\text{Ac}_2\text{O}$  + concd.  $\text{H}_2\text{SO}_4$ ) however, 2 Ac groups may be introduced without cleavage of the mol., the  $\text{H}_2\text{O}$ -sol. product forming cryst. salts with picric acid,  $\text{AuCl}_3$  and  $\text{PtCl}_4$ . This Ac deriv. is instantaneously sapond. by free bases but not by carbonates. When hydrogenated in the presence of Pt, pyocyanin adds 4 H and yields a product with 0.5 the original mol. wt. Hydrogenation of the Ac deriv. takes place in the same manner, yielding an Ac deriv.,  $\text{C}_{13}\text{H}_{11}\text{N}_2\text{OAc}$ , which is sol. in alkali and reppd. by acid. When this is methylated with  $\text{CH}_3\text{N}_2$  the product is no longer sol. in alkali. Concd. HCl sapons the hydrogenated Ac deriv. and addn. of alkali then gives back the original pyocyanin in good yield. On the assumption that pyocyanin contains 2 phenazine groupings, the formation of  $\text{CH}_2\text{O}_2$  and MeI accounts for the remaining 2 C as Me groups. The 2 O atoms in the mol. must be so placed that reduction yields 2 OH groups without removal of C, as shown by the soly. of the reduction product in alkali. The most satisfactory assumption is therefore 2 CO in the pyocyanin mol., and the resulting quinonoid structure also accounts for the color. The lability of the Me attached to N may seem surprising, but the same behavior has been observed with other alkylated phenazine derivs. The reduction product, with 0.5 the mol. wt. of pyocyanin, would then have the structure I and 2 mols. of this when oxidized should yield pyocyanin. The synthesis was performed by addn. of  $\text{Me}_2\text{SO}_4$  to  $\alpha$ -hydroxyphenazine and treatment of the resulting methosulfate with alkali. A nearly quant. yield of pyocyanin was thus obtained. A formula for pyocyanin which meets all requirements indicated by the above reactions is II.

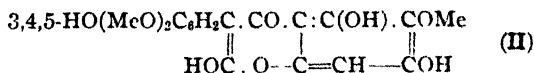
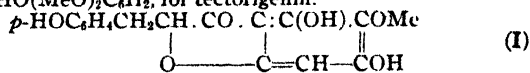


New substances described are pyocyanin perchlorate and chloroplatinate, *N*-acetyl- $\alpha$ -hydroxyphenazine, m. 123°, *N*-benzoyl- $\alpha$ -hydroxyphenazine, m. 176°; *N*-acetylhydroxy-*N'*-methyl- $\alpha$ -ketophenazine picrate, m. 167° (decompn.), chloroaurate, chloroplatinate; *N*-acetyl-*N'*-methyl- $\alpha$ -hydroxyphenazine, m. 125-7°; dibenzoyldihydrophenazine, m. 206°; acetyl- $\alpha$ -methoxydihydrophenazine, m. 175°; *Bz* deriv. of reduced pyocyanin, m. 150° and its picrate.

A. W. DOX

Constitution of tectoridin. Y. ASAHINA, B. SHIBATA AND Z. OGAWA. *J. Pharm. Soc. (Japan)* 48, 1087-93(1928).—B. Shibata (*C. A.* 21, 3050) has extd. from *Iris*

*tectorum* Maxim the glucoside tectoridin,  $C_{22}H_{34}O_{11}$  (I). I on hydrolysis gave  $C_6H_{12}O_6$  and tectorigenin.  $C_{16}H_{14}O_6$  and the structure I was proposed. Recently Baker (C. A. 22, 2356) has shown that irigenin, the aglucone of iridin, is an isoflavanone deriv. and proposed the structure II. In order to study the relationship between tectorigenin and irigenin the authors undertook the study and proposed the structure II with  $p$ - $HOC_6H_4$  instead of  $HO(MeO)_2C_6H_2$  for tectorigenin.



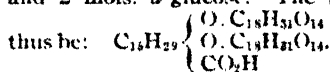
F. I. NAKAMURA

**Constitution of daphnin.** F. WESSELY AND K. STURM. Univ. Wien. Ber. 62B, 115-9(1929).—Leone (C. A. 20, 1070) recently obtained by coupling daphnetin (7,8-dihydroxycoumarin) (I) with  $\beta$ -acetobromoglucose a glucodaphnetin which, according to him, is identical with natural daphnin (II). This synthesis, however, does not permit of deciding whether II is an 8- or 7-glucoside deriv. of I. Although a repetition of his work confirmed his statements on the whole, the results of W. and S. hold strictly only for the synthetic II which they have not yet been able to compare with the natural product. The synthetic II was treated with  $CH_2N_2$  and the crude methylation product was hydrolyzed. The resulting *monomethyldaphnetin* (III) with  $MeCHN_2$  gave a *methylethyldaphnetin* (IV) decompd. by  $NaOMe$  into  $EtI$  and a  $MeO(EtO)_2C_6H_2CH-CHCO_2H$  (V) oxidized to 4,2,3- $MeO(EtO)_2C_6H_2CO_2H$  (VI), identical with the acid obtained by exhaustive ethylation of 4,2,3- $MeO(HO)_2C_6H_2CO_2Me$ . The synthetic II is, therefore, an 8-glucoside-7,8-dihydroxycoumarin. This method of detg. the structure of II is valid only if the methylation with  $CH_2N_2$  proceeds in only 1 direction and others than the free HO group of the  $C_6H_6$  nucleus are not methylated in side reactions. No indications of any such side reactions were noted, however. In the methylation of both II and its tetra-Ac deriv. the homogeneous 7-methoxy-8-hydroxycoumarin (III) was obtained almost quantitatively. Moreover, 7-ethoxy-8-methoxycoumarin (VII), obtained by successive alkylations in an order the reverse of that used in prep. the 7-methoxy-8-ethoxy compd. (IV), is different from IV. No by products were found in these alkylations but they did appear in working up the methylation mixt. of crude tetraacetyldaphnin. In the condensation of I with acetobromoglucose there is formed, along with the cryst. *tetraacetyldaphnin* (VIII), a sirup which on treatment with excess of  $CH_2N_2$  and subsequent hydrolysis with acids gives chiefly I; this sirup seems to be a diglucodaphnetin. VIII, m. 217° (L., 220°),  $[\alpha]_D^{17} -31.64^\circ$  for 0.0190 g. in 3.1924 g. abs. MeOH (L. gives  $-52.52^\circ$  for a 2.98% soln. but W. and S. were unable to obtain a soln. of so high a concn.). II, m. 216-7°,  $[\alpha]_D^{17} 29.36^\circ$  (the rotation of the natural product is not given in the literature). III was obtained, not quite pure, in 0.16 g. yield from 0.5 g. VIII in MeOH treated with twice the calcd. quantity of  $CH_2N_2$  in  $Et_2O$ , freed after 45 mins. from the  $Et_2O$ , excess of  $CH_2N_2$  and most of the MeOH by distn. under atm. pressure, heated a short time *in vacuo* at 100°, hydrolyzed by heating 15 mins. on the  $H_2O$  bath with 1:8  $H_2SO_4$  and finally evap. to dryness, extd. with  $Et_2O$  and distd. under 0.2 mm. at 180°, m. 175° (all m. ps. cor.). 7-EtO homolog, similarly prepd. with  $MeCHN_2$ , b.<sub>4</sub> 160-70°, m. 145°. IV, b.<sub>4</sub> 190°, m. 85.5°. VII, m. 80.5°, depresses the m. p. of IV 20°. 4-Methoxy-2,3-diethoxycinnamic acid (V), m. 157-8°. 4-Methoxy-2,3-diethoxybenzoic acid (VI), m. 74-6°. C. A. R.

**Constitution and properties of fraxin.** F. WESSELY AND E. DEMMER. Univ. Wien. Ber. 62B, 120-6(1929).—After it had been shown that fraxetin (I) is 6-methoxy-7,8-dihydroxycoumarin (C. A. 22, 4115) there remained of the 24 possible structures for fraxin (II) only that of an 8- or 7-glucoside deriv. of I. It was at first attempted to det. which of these structures is correct by a method similar to that used for daphnin (preceding abstr.), but although the degradation reactions were already known the synthesis of the compds. necessary for comparison with the degradation products offered unexpected difficulties. Bargellini had obtained by oxidation of dimethyldaphnetin with  $K_2S_2O_8$  a compd. (III) which he considered to be the mono-Me ether of I or an isomer. The work of W. and D. has shown that the latter is correct, since III on methylation gives dimethylfraxetin (IV), showing that the new HO group in III is adjacent to the old HO groups. Diethyldaphnetin with  $K_2S_2O_8$  gives a hydroxydiethoxycoumarin (V) yielding on methylation diethylfraxetin (VI), which on the one hand shows that the MeO group in I is in the 6-position and on the other hand, confirms Thoms' formula,

2,5,3,4-(MeO)<sub>2</sub>(CH<sub>2</sub>O)<sub>2</sub>C<sub>6</sub>HCO<sub>2</sub>H, for apioleic acid (VII), since if it had the 2,3,4,5-structure VI would have to be 8-methoxy-6,7-diethoxycoumarin, a compd. which could never be produced by the simple introduction of a MeO group into diethyl-daphnetin. The 7-methoxy-8-ethoxycoumarin described in the preceding abstr. gives with K<sub>2</sub>S<sub>2</sub>O<sub>8</sub> a 6-*HO* deriv. (VIII) yielding on methylation the fraxetin deriv. 6,7-dimethoxy-8-ethoxycoumarin (IX). Now, if II is methylated, hydrolyzed to the monomethylfraxetin (X) and ethylated, it gives IX, showing that II is the 8-glucose deriv. of I. The reverse order (ethylation → hydrolysis → methylation) gives a compd. (XI) different from IX. The sugar component of II is *d*-glucose (identified as the osazone); since II is hydrolyzed by emulsin, the sugar probably belongs to the  $\beta$ -series. The II, obtained from the bark of *Fraxinus excelsior*, seps. from abs. alc. in yellow needles, from 80% alc. in smaller crystals, with about 14% H<sub>2</sub>O which it loses completely only at 120–30° under 0.2 mm. and it then m. 205° (all m. ps. cor.) on slow heating; it shows a beautiful blue-green fluorescence, especially in very weak alk. soln. 6,7-Dimethoxy-8-hydroxycoumarin (X), m. 195° (darkening). IX, m. 108.5°. 6-Methoxy-7-ethoxy-8-hydroxycoumarin, from II ethylated with MeCHN<sub>2</sub> and hydrolyzed with H<sub>2</sub>SO<sub>4</sub>, m. 153–4° (darkening), gives with CH<sub>2</sub>N<sub>2</sub> 6,8-dimethoxy-7-ethoxycoumarin (XI), m. 82°. 6-Hydroxy-7,8-dimethoxycoumarin (III), m. 184°. Diethyl-daphnetin, from daphnetin and MeCHN<sub>2</sub>, m. 67–8°. 6-Hydroxy-7,8-diethoxycoumarin (V), faintly yellow, m. 149–50°. VIII, faintly yellow, m. 150–7°. C. A. R.

**Rhamnoconvolvulic acid.** ÉMILE VOTOČEK AND F. VALENTIN. École polytech., tchéque, Prague. *Collection Czechoslov. Chem. Comm.* 1, 47–54 (1929).—The acid described in the literature as convolvulic acid is not a chem. species. This is demonstrated by its fractional pptn. from alc. by means of Et<sub>2</sub>O. Besides a little purgic acid, an acid, C<sub>32</sub>H<sub>42</sub>O<sub>32</sub>·7H<sub>2</sub>O, [ $\alpha$ ]<sub>D</sub> –35.31°, was isolated and has been named rhamnoconvolvulic acid. It loses its water of crystn. at 100°. Its hydrolysis with 6 mols. H<sub>2</sub>O gives 1 mol. of a non-glucosidic acid (dihydroxypalmitic acid (cf. following abstr.)), 4 mols. of *d*-glucose and 2 mols. of *l*-rhamnose. Since rhamnoconvolvulic acid has still an acid function, the sugar elements must be linked on the HO groups of the substituted palmitic acid. It is admitted that the 6 monose mols. are distributed sym., i. e., that they form 2 triglucosidic radicals, C<sub>18</sub>H<sub>31</sub>O<sub>14</sub>, corresponding to 1 mol. *l*-rhamnose and 2 mols. *d*-glucose. The formula postulated for rhamnoconvolvulic acid would



ALBERT L. HENNE

**3,12-Dihydroxypalmitic acid, a component of rhamnoconvolvulic acid.** ÉMILE VOTOČEK AND V. PRELOG. École polytech. tchéque, Prague. *Collection Czechoslov. Chem. Comm.* 1, 55–64 (1929); cf. preceding abstr.—The formula of the di-HO acid obtained by hydrolysis of rhamnoconvolvulic acid is demonstrated. Me(CH<sub>2</sub>)<sub>8</sub>CH(OH)(CH<sub>2</sub>)<sub>2</sub>CH(OH)CH<sub>2</sub>CO<sub>2</sub>H, m. 84°, is reduced by HI and I to palmitic acid, and oxidized by CrO<sub>3</sub> to a mixt. of AcOH, Me(CH<sub>2</sub>)<sub>8</sub>CO(CH<sub>2</sub>)<sub>8</sub>COMe, CO<sub>2</sub> and Me(CH<sub>2</sub>)<sub>8</sub>CO(CH<sub>2</sub>)<sub>8</sub>CO<sub>2</sub>H, m. 69°; the oxime of the latter decompd. into BuNH<sub>2</sub>, HO<sub>2</sub>C(CH<sub>2</sub>)<sub>8</sub>CO<sub>2</sub>H, m. 133°, BuCO<sub>2</sub>H and NH<sub>2</sub>(CH<sub>2</sub>)<sub>8</sub>CO<sub>2</sub>H. ALBERT L. HENNE

**The natural porphyrins. XXIII. Bromoporphyrin I and its conversion into deuteroporphyrin.** H. FISCHER AND G. HUMMEL. Tech. Hochschule Munich. *Z. physiol. Chem.* 181, 107–29 (1929); cf. C. A. 22, 2382.—The bromoporphyrin (I) obtained by the action of Br on hematoporphyrin-HCl in AcOH is now believed to be identical with dibromodeuteroporphyrin (II) (C. A. 21, 591). Oxidation of the former by CrO<sub>3</sub>, H<sub>2</sub>O<sub>2</sub> or HNO<sub>3</sub> yields 1 mol. of bromocitraconimide, and reduction by N<sub>2</sub>H<sub>4</sub> and Pd in alc. KOH converts it into deuteroporphyrin, identified by the m. p. of its Me ester and mixed m. p. of this with the known substance. The same product is obtained by removal of Br from the ester of I by heating with succinic acid at 220°. Reduction of the ester of II with N<sub>2</sub>H<sub>4</sub> and Pd in alc. KOH gives only a recovery of the original substance. The tetra-Br derivs. obtained from I, II, deuteroporphyrin and deuterohemin by heating with PBr<sub>5</sub> are all identical, since their esters show the same m. p., 262°, with no depression when mixed together. Treatment of the Me ester of I with MeMgI converts it into the phyllin of a ditertiary alc., m. 289°, the analysis of which is in agreement with a structural formula applicable to both I and II. Schumm's pyroporphyrin (C. A. 23, 152), obtained by fusion of hemin with resorcinol is identical with deuteroporphyrin, since the esters of their complex Fe derivs., pyratin and deuterohemin, resp., show no m. p. depression when mixed. The resorcinol fusion also converts tetramethylhematoporphyrin Fe salt into deuterohemin. A. W. DOX

**Porphyrins and their metal salts.** FELIX HAUROWITZ AND KONRAD ZIRM. Deut. Univ. Prag. *Ber.* 62B, 163–70 (1929).—Like Fischer and his collaborators, H. and Z.

find that the Zerevitinov method of detg active H gives inconstant results with derivs. of the blood pigment. This they ascribe chiefly to the spontaneous change in the compn. of the Grignard reagent, the concn. of which rapidly decreases in contact with  $O_2$ . With most org. compds. this is immaterial, for according to Flaschenträger they react quantitatively, with evolution of  $CH_4$ , as long as the reagent is at least 0.8 N; only hydrated compds., according to F., require a 1.5 N reagent for quant. reaction of both H atoms of the  $H_2O$  of crystn. The porphyrins and their metal derivs. behave like hydrated compds.; they apparently contain H atoms which react only with a concd. reagent. Thus, chlorohemin gave 2-3 active H atoms with a weak and 3-6 active H atoms with a strong reagent. These H atoms cannot belong to  $H_2O$  ( $EtOH$ ,  $AcOH$ ) of crystn., for the preps. had been dried at  $110^\circ$  and 12 mm. over  $P_2O_5$  and soda-lime and analysis showed they were free of solvent of crystn. Nor do active H atoms on the N or C of the pyrrole nucleus have any peculiar property as compared with the H of HO groups, for pyrroles, malonic esters, fluorene and indene show no appreciable difference in their behavior toward a strong or weak reagent. A large series of analyses showed that detns. of active H atoms in blood pigment derivs. are comparable only when carried out with the same Mg soln. and at as nearly as possible the same time. When these precautions were observed the following results were obtained: (1) The change of chloro- into hydroxyhemin results in no increase of active H atoms; the FeOH groups cannot, therefore, be ascribed any acid property and, contrary to the prevailing view, the formation of tri-K salts of hydroxyhemin cannot be considered as consisting of a change of FeOH into FeOK; the 3rd acid group (along with the two  $CO_2H$  groups) is perhaps the NH group of a pyrrole ring. (2) In the formation of complex metal compds. with Cu, Zn or FeCl the no. of active H atoms in the porphyrins decreases by 1 equiv. at most. To avoid disturbing salt formation on the  $CO_2H$  groups, these expts. were made with the di-Me ester (I) of mesoporphyrin. The complex metal compds. are therefore not formed, like K pyrrole, by simple salt formation at 2 pyrrole H atoms. The org. porphyrin skeleton must be materially altered in combining with the metals. (3) The FeCl compd. of I contains as many active H atoms as the Zn or Cu salt. This suggests that the FeCl group is bivalent, i. e., that the Fe is trivalent. Now, H. recently showed that porphyrins in general form hemins with  $Fe^{+++}$  salts only if a reducing agent is added. The question of the valency of the Fe in hemins was therefore taken up again to det. whether the  $Fe^{++}$  to be introduced may not be converted into  $Fe^{+++}$  by reduction of the solvent, but no reduction of the  $H_2O$  to  $H$ , nor of valeric acid (to the aldehyde or alc.) could be detected. The reverse process (splitting out of Fe with acids according to Küster) was then followed, mesohemins being used instead of chlorohemin to exclude the reducing action of the side chains; in full agreement with K., cleavage of  $Fe^{+++}$ , without formation of  $Fe^{++}$ , was observed. The discordance between the cleavage of  $Fe^{+++}$  from hemins and the formation of the same hemins from porphyrins and  $Fe^{++}$  (e. g., in a  $H_2S$  atm.) cannot be fully explained. Perhaps in the latter process there is first formed a  $Fe^{++}$  compd. (hemo-chromogen?) which is so labile in acid soln. that even in the presence of  $H_2S$  it changes into the  $Fe^{+++}$  compd. (hemin), at the same time reducing the solvent to a compd. of unknown constitution.

C. A. R.

**Racemization.** VIII. The action of alkali on proteins; racemization and hydrolysis. P. A. LÉVENE and LAWRENCE W. BASS. Rockefeller Inst. *J. Biol. Chem.* **82**, 171-90(1929); cf. *C. A.* **22**, 2748.—The rates of racemization of albumin, casein, edestin, fibrin and gelatin by 0.2, 1.0 and 5.0 N NaOH were studied. The results with the first 4 mentioned proteins offer no evidence in favor of the ketopiperazine structure of the protein mol. With gelatin, the results indicate that it, at least, is not composed of ketopiperazines only. The relation of recent studies on hydrolysis and racemization of proteins to the elucidation of their structure is discussed. A. G.

**Autracemization.** RICHARD KUHN and THEODOR WAGNER-JAUREGG. Eidgen. Tech. Hochschule, Zürich. *Naturwissenschaften* **17**, 103-4(1929).—The Walden autoracemization of bromosuccinic ester is actually caused by traces of HBr that can be completely eliminated by repeated distns. in a high vacuum. The pure ester is very stable and the constn. of racemization are therefore to be revised. After double vacuum distn., shaking of the acetone soln. with animal C and again distg., bromosuccinic di-Me ester showed after 4.5 hrs. heating in acetone at  $52^\circ$  only a decrease in rotation of  $[\alpha]_D = 3.13^\circ$  to  $3.05^\circ$ . Other bromides also accelerate the racemization (cf. Holmberg, *C. A.* **8**, 1576) and the solvent has considerable influence. In acetone soln. ( $k = 0.00058$  at  $52^\circ$ ) a trace of KBr, not detectable by  $AgNO_3$ , gave a  $k$  of 0.0018; in MeOH 0.5 to 1.0 N bromide soln. was required for the same effect. Animal carbon, AgBr, PbBr<sub>2</sub>, PbO and  $CuSO_4$  retard the racemization, probably by adsorptive or

chem. action. Of the metals, Ag, Hg, Cu and Zn retard the racemization; Mg has no influence. Other accelerating substances are chlorides and iodides.  $\text{ZnBr}_2$  is exceptional among the halides; it retards the action of other halides. Other cases of autoracemization may also be attributed to catalysis. A soln. of mononitrodiphenic acid in cyclohexanone racemized at  $60^\circ$  in glass with a  $k$  of 0.0038, in quartz with  $k = 0.00077$ , indicating traces of alkali catalysis.

**Autoracemization.** Remark on the note of Richard Kuhn and Th. Wagner-Jauregg. F. WEDSKIND. Forstl. Hochschule, Hannover-Münden. *Naturwissenschaften* 17, 199 (1929); cf. preceding abstr.—Other cases of racemization by halogen catalysis (cf. Z. *Elektrochem.* 12, 330(1906); C. A. 22, 4527; 23, 1641) are recalled.

**Guaninedesoxypentoside from thymus nucleic acid.** P. A. LEVENE AND E. S. LONDON. Rockefeller Inst. J. *Biol. Chem.* 81, 711-2(1929).—Thymus nucleic acid was digested by intestinal juice obtained from dogs and the guanine nucleoside was isolated from the products of hydrolysis. It was purified by the usual Pb process. The nucleoside is very unstable and is completely hydrolyzed by 0.025 N  $\text{H}_2\text{SO}_4$  in 10 mins.,  $[\alpha]_D^{20}$   $-37.5^\circ$ , contracts at  $200^\circ$  in a sealed capillary tube and does not m.  $290^\circ$ .

**The oxidation of cholesterol.** Mechanism of the oxidation with chromic acid. STEFAN MINOVICI AND M. VANGHELOVICI. *Bul. soc. chim. Romania* 10, 91-6(1928).—Mauthner and Suida (*Monatsh.* 17, 584(1896)) obtained by this oxidation an alc. The structure and formula were not fixed. M. and V. find the formula to be  $\text{C}_{27}\text{H}_{44}\text{O}_3$ . The mechanism is given without proof. Cholesterol (I) acetylates in glacial HOAc to give  $\text{CH}_2\text{CH}(\text{OAc})\text{CHCH}:\text{CH}$  which is attached to the rest of the mol.,  $\text{C}_{22}\text{H}_{39}$ , at the points indicated. Addn. of  $\text{CrO}_3$  gives  $\text{CH}_2\text{CH}(\text{OAc})\text{CHCH}(\text{OH})\text{CHOH}$ , then  $\text{CH}_2\text{CH}(\text{OAc})\text{CHCOCO}$ . Hydrolysis yields the alc., m.  $217^\circ$ . The chloride of I yields by the same treatment  $\text{C}_{27}\text{H}_{44}\text{OCl}$ , m.  $137^\circ$ , which is a ketone. Its *p*-nitrophenylhydrazone m.  $200^\circ$ . The only formula possible is  $\text{CH}_2\text{CHClCHCOCH}_2$ . Windaus (*Ber.* 37, 3702(1904)) has prepd. a similar isomer of known structure  $\text{CH}_2\text{CHClCHCH}_2\text{CO}$ , m.  $180^\circ$ . Mauthner obtained still another, m.  $129^\circ$  (*Monatsh.* 24, 656(1903)). The possible isomers are  $\text{CH}_2\text{CH}(\text{a})\text{Cl}(\text{b})\text{CH}(\text{b})\text{CH}_2\text{CO}$ ,  $\text{CH}_2\text{CH}(\text{b})\text{Cl}(\text{a})\text{CH}(\text{a})\text{CH}_2\text{CO}$ ,  $\text{CH}_2\text{CH}(\text{a})\text{Cl}(\text{b})\text{CH}(\text{b})\text{COCH}_2$  and  $\text{CH}_2\text{CH}(\text{b})\text{Cl}(\text{a})\text{CH}(\text{a})\text{COCH}_2$  (a means above the plane of the paper and b, below).

VALENTINE F. HARRINGTON

**Synthesis of high hydrocarbons with water gas** (BUYLLA, PERTIERRA) 21. Muscle adenylic acid and yeast adenylic acid (EMDEN, SCHMIDT) 11A. The dialuric acid-alloxan equilibrium (RICHARDSON, CANNAN) 2. Rapid dehydration of alcohol by means of BaO and metallic Ca (SMITH) 2. Spectrographic investigation of 2-ketogluconic acid in the ultra-violet (NIEDERHOF) 3. The crystal structure of anhydrous mesotartaric acid and of some mesotartarates (SCHNEIDER) 2. The crystal structure of pentaerythritol, pentaerythritol tetraacetate and dibenzalpenterythritol (VAN MELLE, SCHURINK) 2. Isoprene and rubber (STAUDINGER, *et al.*) 30. Solubilizing organic compounds (*Fr. pat.* 648,119) 25.

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**System der organischen Verbindungen. Ein Leitfaden für die Benutzung von Beilsteins Handbuch der organischen Chemie.** Edited by B. Prager, D. Stern and K. Ilberg. Berlin: Julius Springer. 246 pp. Bound, M. 24.

**Catalytic oxidation of organic compounds.** ALPHONS O. JAEGER (to Selden Co.). U. S. 1,709,853, April 23. In effecting production of  $\text{CH}_2\text{O}$  by the oxidation of vapors

of  $\text{CH}_3\text{OH}$  by the action of an oxidizing gas such as air or in similar oxidations, a catalyst is used which comprises an alkali metal, alk. earth metal or earth metal the oxide of which is not readily reducible by H, and catalysts such as Mo or V compds. Numerous details and examples are given. Cf. C. A. 23, 2185.

**Hydrocarbons.** SOC. POUR L'IND. CHIM. A. BALE. Brit. 298,090, Oct. 1, 1927. Vapors of MeOH are passed in contact with an alk. earth metal carbide at 200–300° and the  $\text{C}_2\text{H}_2$  produced may be caused to react with compds. present in the reaction chamber and catalysts such as carbides, metals, metal oxides or hydroxides or salts, C, silicates or other materials resistant to high temps. may be used, to form products such as dimethylacetylene and ethylacetylene, isoprene, dimethylallene and higher homologs and polymers up to cinene.

**Hydrocarbons.** I. G. FARBENIND. A.-G. Fr. 648,946, Feb. 14, 1928. See Brit. 293,572 (C. A. 23, 1648).

**Organometallic compounds.** MICHAEL MELAMID. Fr. 648,102, Feb. 2, 1928. Organometallic compds. are obtained by heating naphthene acids in the presence of water with oxides or hydrates of As, Sb or Bi, or by reacting salts of naphthene acids with halogen compds. of the metals, or by melting naphthene acids with oxides or hydrates of the metals. Thus, naphthene acid in suspension in water is heated with  $\text{BiO}_3$  for several hrs. on the water bath. On purification the product is a white amorphous substance sol. in  $\text{CHCl}_3$ ,  $\text{CS}_2$ , etc. Other examples are given.

**Organometallic compounds.** CARL OECHSLIN. Fr. 648,325, June 14, 1927. An arsenical compd. of Bi is obtained by the action of isohydroxypropyldiarsenic acid on an O compd. of Bi or by double decompn. between a salt of this acid and a salt of Bi. The product contains an atom of Bi for 2 atoms of As.

**Organic bases.** I. G. FARBENIND. A.-G. Brit. 296,423, Sept. 2, 1927. See Fr. 646,711 (C. A. 23, 2185).

**Salts of halogen-substituted aliphatic tetraammonium bases.** E. GLUCKSMANN. Brit. 297,839, Sept. 29, 1927. Salts such as those of  $(\text{C}_2\text{H}_5)_3\text{N}(\text{OH})(\text{C}_2\text{H}_4\text{Br})$  are made reaction of a salt of the base with a metal salt of the desired acid (preferably one which forms an insol. salt with the anion of the initial tetraammonium salt). The use of salts of Ag and of Ba is described.

**Olefins and diolefins.** I. G. FARBENIND. A.-G. Brit. 297,398, May 16, 1927. Mineral or artificially prepd. hydrocarbons contg. more than 4 C atoms in the mol. are converted into olefins and diolefins contg. a smaller number of C atoms in the mol. by bringing their vapors, at a temp. of 600° or higher, into contact with catalysts formed at least mainly of difficultly reducible metal oxides or their compds. or mixts. such as alk. earth metal oxides or oxides of Sc, Ti, Yt, Zr, La, W, Mo, Th or U. Numerous details and modifications are described.

**Amines.** I. G. FARBENIND. A.-G. Brit. 297,484, May 23, 1927. Cyclohexylethanolamine together with some diethanolcyclohexylamine is obtained by the action of glycol chlorohydrin or ethylene oxide on cyclohexylamine, or by the action of cyclohexanone on ethanolamine with simultaneous or subsequent reduction with H in the presence of Ni. Homologs of the reacting substances also may be similarly used as starting materials, e. g., methylcyclohexanone, propanolamine and butanolamine. Tetrahydrobenzene oxide may be condensed with aliphatic amines contg. OH groups; or, hydroxyaldehydes and hydroxyketones, such as aldol or sugars, may be treated with hydroaromatic amines, followed by hydrogenation. The products may be used as insecticides, bactericides or fungicides and as preservatives for proteins or similar compds. Their acidyl compds. may be used as softening agents or camphor substitutes.

**Double salts of arylenediamines and halides of zinc, cadmium and mercury.** IMPERIAL CHEMICAL INDUSTRIES, LTD., and A. RILEY. Brit. 297,989, Oct. 17, 1927. Compds. which are sparingly sol. and stable in air are prepd. by adding an aq. soln. of the halide to a soln. of the diamine or by neutralizing the soln. obtained by reduction of nitrosoalkyldialkylanilines or toluidines with Zn and HCl. Examples are given of the prepn. of compds. from *o*-, *m*- and *p*-phenylenediamine and  $\text{ZnCl}_2$ , *p*-phenylenediamine and  $\text{HgCl}_2$ , *m*-phenylenediamine and  $\text{CdBr}_2$ , *p*-aminoacetanilide and  $\text{ZnCl}_2$ , *p*-aminodiphenylamine and  $\text{ZnCl}_2$ , 1,2-naphthylethylenediamine and  $\text{ZnCl}_2$  and 4-chloro-*m*-phenylenediamine and  $\text{ZnCl}_2$  (prepd. by the first-mentioned method) and the compd.  $(\text{C}_2\text{H}_5)_2\text{NC}_6\text{H}_4\text{NH}_2 \cdot \text{HCl} \cdot 0.5\text{ZnCl}_2$  (prepd. by reduction of *p*-nitrosodiethylaniline with Zn and HCl).

**Concentrating fatty acids.** SOC. DES ÉTABLISSEMENTS BARBET. Fr. 649,121, Feb. 16, 1928. In the app. described in Fr. 620,332 for the concn. of acids such as acetic or butyric, a concd. boiling soln. of  $\text{CaCl}_2$  is used instead of anhydrous  $\text{CaCl}_2$ , and the distg. column has a reflux, the dild. acid being fed in at a lower point. The



$\text{CaCl}_2$  soln. is concd. from time to time and when it becomes too colored it is heated to a temp. at which the tars are destroyed.

**Carboxylic acids of  $\omega$ -aminoalkylaminonaphthalenes.** I. G. FARBERNIND, A.-G. (Winfrid Hentrich, inventor). Ger. 468,811, Oct. 24, 1926. Addn. to 467,626. To prep. carboxylic acids of  $\omega$ -aminoalkylaminonaphthalenes, the process of Ger. 467,626 (C. A. 23, 848) is modified by using hydroxy- or aminonaphthalenecarboxylic acids not having the OH or  $\text{NH}_2$  group in the  $\alpha$ -position to the COOH group, instead of the substituted naphthalenesulfonic acids specified therein. According to the examples, (1) 2- $\omega$ -aminoethylaminonaphthalene-6-carboxylic acid is prepd. from 2-hydroxy-naphthalene-6-carboxylic acid,  $\text{C}_2\text{H}_4(\text{NH}_2)_2$ , and  $\text{NaHSO}_3$ , and (2) 2- $\omega$ -aminobutylaminonaphthalene-6-carboxylic acid is prepd. by substituting 1,4-butylenediamine for  $\text{C}_2\text{H}_4(\text{NH}_2)_2$  in example 1. The products are useful as *intermediates for dyes*, and reference is made to the coupling of the products prepd. in the examples with diazotized 4-nitro-1-aminobenzene-2-sulfonic acid.

**Ketonic compounds.** H. LEGERLOTZ. Brit. 297,756, April 22, 1927. *p*-Hydroxybromoacetophenone is treated with methylamine in alc. soln. to produce *p*-hydroxymethylaminoacetophenone which may be purified by recrystg. from alc. or by converting it into the hydrochloride and then pptg. the base with  $\text{NH}_3$ . The benzoate of *p*-hydroxy- $\alpha$ -bromopropiophenone, similarly treated, yields *p*-hydroxy- $\alpha$ -methylaminopropiophenone. These products may be used as *intermediates in making pharmaceutical compds.* *p*-Hydroxybromoacetophenone is formed by brominating *p*-hydroxyacetophenone acetate in  $\text{CS}_2$  soln. and boiling the *p*-hydroxybromoacetophenone acetate thus formed with aq. alc. contg. a small quantity of HBr. *p*-Hydroxy- $\alpha$ -bromopropiophenone benzoate is formed by benzoylating *p*-hydroxypropiophenone and brominating the benzoyl deriv. in  $\text{CS}_2$  soln.

**Anthraquinone derivative.** SOC. ANON. POUR L'IND. CHIM. À BÂLE. Swiss 129,471, Feb. 10, 1927. Addn. to Swiss 126,195 (C. A. 23, 715). The deriv. is prepd. by treating 1,5-nitrochloroanthraquinone with conc.  $\text{HNO}_3$ . The product, 1,8-dinitro-5-chloroanthraquinone, is a yellow powder, m.  $337^\circ$ .

**Isatin derivatives.** KALLE & CO. A. G. (Maximilian P. Schmidt and Otto Herrmann, inventors). Ger. 473,090, June 7, 1925. Water-sol.  $\alpha$ -derivs. of isatin are prepd. by treating isatin- $\alpha$ -chloride or its substitution products with sulfites. The products are distinguished from the known bisulfite addn. products of isatin by their deeper color and their sensitiveness to light. The prepn. of a water-sol. deriv. from 5-chloroisatin- $\alpha$ -chloride is described by way of example. The derivs. from 2,5-dibromoisatin- and naphthisatin- $\alpha$ -chloride are mentioned also. Cf. Brit. 282,863 (C. A. 22, 3906).

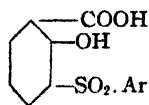
**Morpholines.** IMPERIAL CHEMICAL INDUSTRIES, LTD., J. B. PAYMAN and H. A. PIGGOTT. Brit. 298,336, Sept. 1, 1927. Morpholine and its derivs. are prepd. by condensing alkylene or arylkylene halohydrins with aromatic sulfonamides to form *N*-di( $\beta$ -hydroxyethyl)arylsulfonamides which when treated with  $\text{H}_2\text{SO}_4$  yield a morpholine and an arylsulfonic acid. Arylsulfonylmorpholines may be isolated as intermediate products and treated subsequently with  $\text{H}_2\text{SO}_4$  to form morpholines and arylsulfonic acids. Toluene-*p*-sulfonamide is condensed with ethylene chlorohydrin to form *N*-di-( $\beta$ -hydroxyethyl)toluene-*p*-sulfonamide from which morpholine and toluene-*p*-sulfonic acid are produced. Some monohydroxyethyltoluene-*p*-sulfonamide is formed as an intermediate product. Propylene- $\alpha$ -chlorohydrin and  $\beta$ -chloro- $\beta$ -phenyl- $\alpha$ -hydroxypropionic acid (obtained from glycidic acid and HCl), yield, resp., 2,6-dimethylmorpholine and 3,5-diphenylmorpholine-2,6-dicarboxylic acid. Toluene-*p*-sulfonylmorpholine is prepd. from *N*-di( $\beta$ -hydroxyethyl)-*p*-toluenesulfonamide by heating with  $\text{H}_2\text{SO}_4$ .

**1,8-Naphthoxypenthiophen compounds.** JENS MÜLLER and MAX SCHUBERT (to Grasselli Dyestuff Corp.). U. S. 1,709,277, April 16. In the production of compds. such as 1,8-naphthoxypenthiophen a 1,8-naphthothioglycolic carboxylic acid compd. such as the acid itself is heated in the presence of water to temps. of  $150$ – $200^\circ$ . Monobromo-1,8-naphthoxypenthiophen, m.  $130^\circ$ , is described.

**Mononitrated dipthaloylacridones.** WALTER MIEG and ALBERT JOB (to Grasselli Dyestuff Corp.). U. S. 1,709,945, April 23. 1,2,5,6 (or 3,4,5,6)-Dipthaloylacridone is treated with  $\text{HNO}_3$ - $\text{H}_2\text{SO}_4$  contg. slightly more than 1 mol. proportion of  $\text{HNO}_3$  (80%) at temps. of about  $5$ – $10^\circ$  and the temp. is increased to  $40^\circ$ , in order to form the mononitro deriv.

**Arylated azotized, diaminopyridines.** IVAN OSTROMISLENSKII (to Pyridium Corp.). U. S. reissue 17,281, April 23. See original pat. No. 1,680,108 (C. A. 22, 3736).

**Nitro- and amino-diarylsulfones.** BRITISH DYE STUFFS CORP., LTD., and M. MENDOZA. Brit. 297,855, May 27, 1927. 5-Substituted and 5,6-benzo-substituted



aminodiaryl sulfones of the type in which "Ar" represents an aromatic residue contg. at least one amino group, are made by reduction of the products of condensation of the corresponding sulfinic acids with an aromatic nitro compd. carrying labile H, such as 1-chloro-2-nitrobenzene and its 4-sulfonic acid, 1-chloro-4-nitrobenzene and its 2-sulfonic acid, 1-chloro-2,4-dinitrobenzene, 1-chloro-2,4-dinitronaphthalene, 4-chloro-3-nitrobenzaldehyde, 4-chloro-3-nitrobenzoic acid and its nitrile and 5-nitrobenzoic acid and its nitrile. The products may be used as dye intermediates and numerous examples are given.

**Vinyl esters.** GEORGE O. MORRISON (to Canadian Electro Products Co., Ltd.). U. S. 1,710,181, April 23. By using the process described for the prepn. of vinyl acetate from HOAc (C. A. 23, 1909) other vinyl esters can be obtained from the corresponding carboxylic acids.

**Vinyl esters.** FREDERICK W. SKIRROW and GEORGE O. MORRISON (to Canadian Electro Products Co., Ltd.). U. S. 1,710,197, April 23. See Can. 287,494 (C. A. 23, 1908).

**Concentrating acetic acid.** A. WACKER GES. FÜR ELEKTROCHEMISCHE INDUSTRIE GES. Brit. 298,137, Oct. 3, 1927. Dil. HOAc is concd. by distn. with an acetic ester of b. p. between 105° and 135° such as BuOAc, iso-BuOAc or iso-AmOAc, using a still connected to a distn. column and dephlegmator. After a final addn. of a small proportion of water to the residue to facilitate distn. of remaining ester, a residue of 95% HOAc may be obtained.

**Cholic acid.** CHEMISCHE FABRIK VORM SANDOZ. Swiss 128,727, April 21, 1927. Cholic acid is prepd. from the sapond. product of gall. The fatty acid is treated with a mixt. of water and a fat solvent in presence of a salt of a weak acid. The crude cholic acid so obtained is purified by recrystn.

**Humic acid.** MICHAEL MELAMID. Fr. 648,139, Feb. 3, 1928. Humic acid is made sol. in water for various industrial purposes by treatment with (1) urea, molten or in aq. soln., (2) pyrogallol or like substances, (3) formic acid, (4) formic acid. after dissolving humic acid, (5) oxide of Hg, (6) oleum, (7) HNO<sub>3</sub>, (8) diazobenzenesulfonic acid, (9) a fusion bath of potash, preferably in the presence of saltpeter.

**Mercury compounds of humic acid.** MICHAEL MELAMID. Fr. 648,141, Feb. 3, 1928. Humic acid is dissolved with alkali, Hg oxide is added and the mixt. boiled while air or O is passed through. The product obtained on evapn. may be used for treating seeds.

**Maleic acid and anhydride.** A. BOEHRINGER (trading as C. H. Boehringer Sohn). Brit. 297,667, Sept. 24, 1927. In the catalytic oxidation of furan or its derivs. as described in Brit. 285,426 (C. A. 22, 4539), a large excess of O or air is used (suitably 20-100 times the quantity theoretically required). Steam may be used to assist in vaporizing the furfural, and vanadic acid on pumice may be used as the catalyst at a temp. of 180°.

**Phthalic anhydride.** COMPAGNIE NATIONALE DE MATIÈRES COLORANTES ET MANUF. DE PRODUITS CHIM. DU NORD RÉUNIES, ÉTABLISSEMENTS KUHLMANN. Fr. 648,163, May 13, 1927. Phthalic anhydride obtained by the catalytic oxidation of C<sub>10</sub>H<sub>8</sub> is purified by distn followed by dissolving in toluene, xylenes or mixts. of these solvents and filtering. C<sub>10</sub>H<sub>8</sub>,  $\alpha$ -naphthoquinone and benzoic acid are recovered from the residue.

**Trichloroethane.** I. G. FARBENIND. A.-G. Brit. 298,084, Sept. 30, 1927. 1,1,2-Trichloroethane is obtained by direct addn. of vinyl chloride and Cl gases without use of a solvent, by influence of light or heat energy. Various details are given.

**Aniline and other arylamines.** WILLIAM J. HALE and JOSEPH W. BRITTON (to Dow Chemical Co.). U. S. reissue 17,280, April 23. See original pat. No. 1,607,824 (C. A. 21, 249).

**Racemic phenylpropanolmethylamine.** I. G. FARBENIND. A.-G. Brit. 297,385, Sept. 20, 1927. This compd. is resolved into its optical components by means of *l*-tartaric acid; the *l*-tartrate of the *l*-base seps. first from solu. The *l*-base, which is identical with natural *l*-ephedrine, has a greater physiol. efficacy than either the racemic or *d*-modifications.

**Ethylene glycol.** EDGAR C. BRITTON (to Dow Chemical Co.). U. S. 1,709,805, April 16. An ethylene dihalide contg. 2 different halogens such as ethylene chlorobromide is heated in the presence of water and Na<sub>2</sub>CO<sub>3</sub> or other suitable salt of a strong base and a weak acid at a temp. (suitably about 145°) at which no substantial decomposition of glycol occurs.

**Ethylene glycol.** BRITISH DYESTUFFS CORP. LTD. Fr. 648,157, Feb. 3, 1928. See Brit. 286,850 (C. A. 23, 397).

**Trimethylamineglycol monoborate.** KARL LÜDECKE. Fr. 649,221, Feb. 17, 1928. See Brit. 293,438 (C. A. 23, 1652).

**Polyalkylene glycol esters.** OSKAR LOEHR (to I. G. Farbenind. A.-G.). U. S. 1,701,424, April 23. See Can. 285,358 (C. A. 23, 610).

**Aldol.** I. G. FARBENIND. A.-G. Brit. 298,349, Sept. 19, 1927. Aldol is made by passing a mixt. of acetaldehyde and a condensing agent such as NaOH through reaction chambers provided with cooling devices. The product may be sepd. by first distg. off water and part of the assocd. acetaldehyde by heating under reduced pressure and then raising the temp. to distil remaining acetaldehyde. Various details of app. and procedure are given.

**Thymol and menthol.** SCHERING-KAHLBAUM A.-G. Fr. 648,319, Feb. 4, 1928. See Can. 283,943 (C. A. 23, 611).

**Camphor from borneols.** HERMANN GAMMAY. U. S. 1,710,573, April 23. A borneol such as isoborneol is heated in the presence of a substance of alk. reaction such as Ca(OH)<sub>2</sub> and of graphite, in order to produce camphor of 97–98% purity.

**Thiourea.** I. G. FARBENIND. A.-G. Brit. 297,999, Nov. 9, 1927. Ca cyanamide is treated with an NH<sub>4</sub> sulfide in the presence of water and of an NH<sub>4</sub> salt of an acid forming a Ca salt which is practically insol. in water such as an NH<sub>4</sub> carbonate, sulfate or oxalate.

**Lactones.** M. NAEF & Co. Swiss 128,466, July 27, 1927. The lactone of 14-hydroxytetradecane-1-carboxylic acid is prepd. by heating cyclopentadecanone with H<sub>2</sub>S<sub>2</sub>O<sub>8</sub>. The lactone, m. about 30°, b<sub>1</sub>, 175° and has a mol. refraction of 70.5.

**1,4-Diaminoanthraquinones, etc.** I. G. FARBENIND. A.-G. Brit. 298,279, July 11, 1927. 1,4-Diaminoanthraquinone and its homologs and derivs., including alkyl-amino and hydroarylamino derivs., are obtained in the form of the free bases by oxidation of the corresponding leuco-bases with a substance yielding O in the presence of a catalyst having an acid or basic reaction such as triethylamine, piperidine, thionyl chloride or benzoyl chloride. If an acid catalyst is used it is of such character and quantity that no substantial quantity of a salt of the leuco-base is formed. Mention is made of the use of trichlorobenzene as a solvent and of PhNO<sub>2</sub> as an oxidizing agent.

**Indanthrone.** NEWPORT CO. Brit. 297,602, April 25, 1927. Pure indanthrone is obtained by dehalogenating haloindanthrones such as dibromoindanthrone formed by condensation of 1,3-dibromo-2-aminoanthraquinone. In effecting the dehalogenation, alc KOH, Na amalgam, glucose and caustic alkali, and Cu, with or without a dissolving or diluting agent or catalyst, may be used.

**4-Methyl- and β-methylisatin.** I. G. FARBENIND. A.-G. Swiss 126,719, Jan. 27, 1927. Addn. to Swiss 125,475. The Na deriv. of *N-p*-tolylsulfonyl-*m*-toluide is transformed with oxalyl chloride and the oxyamino acid chloride treated with an acid condensing agent to give a mixt. of *N-p*-tolylsulfonyl-4- and 6-methylisatin, which is then sapond. The crystals, m. 143–145°.

**4-Chloro- and 6-chloro-5-methylisatin.** I. G. FARBENIND. A.-G. Swiss 126,721, Jan. 27, 1927. Addn. to Swiss 125,475. The Na deriv. of *N-p*-tolylsulfonyl-2-chloro-*p*-toluide is transformed with oxalyl chloride and the oxyamino acid chloride treated with an acid condensing agent to give a mixt. of *N-p*-tolylsulfonyl-5-methyl-4- and 6-chloroisatin, which is then sapond. to give the desired product.

**Styrene.** O. H. SMITH (to Naugatuck Chemical Co.). Brit. 298,152, Oct. 4, 1927. See U. S. 1,687,903 (C. A. 23, 156).

**Naphthostyrls.** I. G. FARBENIND. A.-G. Fr. 647,020, Jan. 12, 1928. Naphthostyrls halogenated in the ring are prepd. by treating naphthostyrl or its derivs. with a halogen or halogenating agents in sufficient quantity to form a monohalogen deriv., or by treating naphthostyrls with salts of HOCl or HOBr to form *N*-halogen naphthostyrls which are then heated or treated with acid condensing agents. In examples, a chloro-naphthostyrl, m. 266°, is obtained (1) by dissolving naphthostyrl in concd. H<sub>2</sub>SO<sub>4</sub> contg. a little I and passing in Cl at 15–20°, or (2) by dissolving naphthostyrl in hot HCl and cooling whereby a suspension of the HCl compd. is obtained and adding an aq. soln. of Na<sub>2</sub>ClO<sub>4</sub>, or (3) by adding SO<sub>2</sub>Cl<sub>2</sub> to a soln. of naphthostyrl in tetrachloroethane, or (4) by adding naphthostyrl to a soln. of NaOCl, to form *N*-chloronaphthostyrl, m. 132°, which is converted to chloronaphthostyrl by contact with concd. H<sub>2</sub>SO<sub>4</sub> or by boiling under reflux with PhCl, or by heating alone to 140°. 5-Ethoxy-naphthostyrl (by treating 8-cyanonaphthalene-1,5-disulfonic acid with alk. agents and ethylating the 8-hydroxynaphthostyrl) is suspended in NaOCl soln. and boiled, *N*-chloro-5-ethoxynaphthostyrl, m. 117°, being formed, which is transformed to chloro-

5-ethoxynaphthostyryl, m. 246°, by heating alone to 160° or under reflux with glacial AcOH. Cf. C. A. 23, 2190.

## 11—BIOLOGICAL CHEMISTRY

PAUL E. HOWE

A—GENERAL

FRANK P. UNDERHILL

The constitution of silk fibroin. R. O. HERZOG. *Ber.* 61B, 2431(1928).—H. and others (C. A. 18, 2712; 22, 2955) treated silk fibroin with resorcinol at 120° for 30 mins., not 30 hrs. as stated by Meyer and Mark (C. A. 23, 1145). This treatment is not considered excessive in view of the results with peptides. DAVID DAVIDSON

Paths and goals of physiologicocochemical research. OTTO FÜRTH. *Wiener klin. Wochschr.* 42, 161-4(1929).—A lecture. D. B. DILL

Further studies on the relations between substrate and enzyme complex based on determination of the influence of erepsin and trypsin-kinase on polypeptides and related compounds. EMIL ABDERHALDEN AND ERNST SCHWAB. *Univ. Halle. Fermentforschung* 10, 305-18(1929).—The selective hydrolysis of polypeptides by erepsin and by trypsin-kinase bears no relation to the length of the peptide chain. Trypsin-kinase hydrolyzes the dipeptides, *dl*-phenylalanyl-*l*-tyrosine and *l*-tyrosyl-*l*-tyrosine, which are not attacked by erepsin. On the other hand, erepsin hydrolyzes the longest known synthetic polypeptide contg. 19 amino acids, while trypsin-kinase is without action. Certain tripeptides, *e. g.*, *d*-leucylglycyl-*l*-leucine and *l*-leucylglycyl-*l*-tyrosine, are attacked by trypsin-kinase but not by erepsin. A whole series of halogenacyl derivs. of amino acids and peptides undergoes hydrolysis by trypsin-kinase but not one is attacked by erepsin. Chloroacetyl-*l*-tyrosine is especially suitable for demonstrating tryptic action because of the rapidity with which the liberated tyrosine crystallizes out. Not all halogenacyl derivs. are attacked by trypsin-kinase, *e. g.*, *dl*- $\alpha$ -bromoisocaprolyl-*dl*-phenylalanine is resistant, whereas the lower homolog *dl*- $\alpha$ -bromopropionyl-*dl*-phenylalanine undergoes extensive hydrolysis. Waldschmidt-Leitz's view that the electroneg. character of a substrate detrs. its amenability to cleavage by trypsin-kinase is invalidated by the fact that the above bromoisocaprolyl deriv. is more strongly electroneg. than certain dipeptides which are easily hydrolyzed. An accumulation of glycol groupings in these halogenacyl derivs. tends to make the mol. more resistant. Halogenacyl groups not related to naturally occurring amino acids, *e. g.*, *l*- $\alpha$ -bromoisocaprolyl and  $\beta$ -chlorobutyryl, do not necessarily interfere with tryptic cleavage. Acyl derivs. of amino acids, *e. g.*, formyl-*l*-leucine, palmityl-*l*-phenylalanine and stearyl-*d*-glutamic acid, are hydrolyzed by trypsin-kinase, provided the amino acid component is the naturally occurring one. *dl*-Leucine Et ester is attacked by both trypsin and erepsin, while *dl*-tyrosine Et ester is attacked only by trypsin-kinase. Specificity of enzyme action is considered as a matter of sensitivity of the enzyme-substrate complex toward a given H-ion concn. New derivs. not previously described are  $\beta$ -chlorobutyryl-*dl*-phenylalanine, m 130°,  $\beta$ -chlorobutyrylglycyl-*dl*-phenylalanine, m 174°,  $\beta$ -chlorobutyrylglycyl-*dl*-leucine, m 139°, all prepd. from MeCHClCH<sub>2</sub>COCl and the corresponding peptide; also *dl*-phenylalanyl-*l*-tyrosine decomp. 269-70°, by coupling PhCH<sub>2</sub>CHBrCOCl with *l*-tyrosine and treating the oily intermediate with NH<sub>4</sub>OH.

A. W. DOX

Plant proteases. XII. The natural activation of proteases of plant latexes. OTTO AMBROS AND ANNA HARTENECK. I. G. Farbenind. Ludwigshafen. *Z. physiol. Chem.* 181, 24-41(1929); cf. C. A. 22, 2381.—Commercial papain obtained from the pawpaw, *Carica papaya*, hydrolyzes proteins but not peptones or protamines. Treatment of this enzyme with HCN not only activates its cleavage of proteins but also confers the property of hydrolyzing peptones and protamines. A surprising observation now reported is the fact that fresh latex obtained by lacerating the rind of the fruit contains the enzyme in its activated form. In the fresh material an activator is present which does not occur in the com. dried prepsns. In proportion to its activity toward peptone, the enzyme of fresh latex is less amenable to further activation by HCN. The natural activator is not HCN, since all tests for this substance were negative. It is a kinase, for which the name *phylokinase* is proposed on account of its analogy to the enterokinase of trypsin. The extent of activation of the enzyme varies with the stage of maturity of the fruit. The cell juice from the interior contains relatively little enzyme but considerable activator, especially in the later stages of maturity.

Pineapple protease (bromelin) is in most respects similar to papain. It seems probable that all plant proteases capable of activation by HCN are one and the same enzyme, the apparent differences in specificity being due merely to variations in the amt. of natural activator present. When fully ripe the pawpaw fruit no longer yields a latex. From the nearly ripe fruit a latex is obtained which contains the non-activated enzyme specific for the higher proteins. Addn. of press juice from the interior, which itself has little if any proteolytic activity, brings the latex enzyme up to the full activity of papain-HCN. The more immature the fruit the less marked is this sepn., the latex contg. more activated enzyme and the press juice more protease. No erepsin is present as was shown by negative tests with leucylglycine and alanylglycine. Gelatin and peptone cleavage show the same  $p_H$  optimum of 6, a further evidence that the same enzyme hydrolyzes both. The fruit juice and also the seeds, however, contain some erepsin which can be demonstrated in a 16 hr. but not in a 2 hr. digestion of dipeptide. The activator is thermolabile and is destroyed by boiling. As is the case with enterokinase its effect varies with the duration of contact with enzyme and the amt. of activator. In general the activation of pineapple protease is similar to that of pawpaw. The juice from the green fruit is inert toward peptone until after activation by HCN, and then also its activity toward gelatin is doubled. The ripe fruit yields the completely activated enzyme, and HCN is without effect. A sepn. of enzyme and activator is more difficult here because of the peculiar structure of the fruit.

A. W. Dox

**Muscle adenylic acid and yeast adenylic acid.** GUSTAV EMBDEN AND GERHARD SCHMIDT. Univ. Frankfurt. *Z. physiol. Chem.* **181**, 130-9(1929).—On the basis of their difference in behavior toward the deaminase present in muscle, Schmidt (*C. A.* **23**, 853) concluded that adenylic acid obtained from muscle is not identical with that obtained from yeast. Further proof of the non-identity of these 2 substances is now presented. Yeast adenylic acid (I) m. 193-4° and muscle adenylic acid (II) m. 197-200°, both with decompn.; a mixt. of the 2 shows a depression of m. p. to 183° (decompn.). I is difficultly sol. in hot H<sub>2</sub>O and tends to form supersatd. solns.; II is readily sol. and crystallizes rapidly when the soln. is cooled. In 2% NaOH,  $[\alpha]_D^{20}$  for I is -56°, for II -47.5°; in 10% HCl  $[\alpha]_D^{20}$  for I is -36.5°, for II -26°. HNO<sub>2</sub> converts II but not I into inosic acid. Hydrolysis by 0.1 N H<sub>2</sub>SO<sub>4</sub> liberates H<sub>3</sub>PO<sub>4</sub> more rapidly from I than from II, and steam distn. of a soln. in 20% HCl yields much more furfural from I than from II.

A. W. Dox

**Influence of structure on the kinetics of desmolases. II. Uricase. System:** uric acid, liver and kidney pulp. ST. J. V. PRZYŁECKI. Univ. Warsaw. *Z. physiol. Chem.* **181**, 234-54(1929); cf. *C. A.* **23**, 1911.—In studying the kinetics of uricase action in biological material, other factors must be considered besides those entering into the equation for a heterogeneous medium where enzyme and substrate are adsorbed. Colloidal adsorbents occur in a labile sol or gel state in this very complex medium, and activating and inhibiting substances are present. It is almost certain that an alteration of the adsorbent must occur due to the development of acidity from autolysis. The surface becomes diminished; a portion of the enzyme and substrate is included; there is a diminution in the no. of contact groups, an alteration in the surface structure; the plasma movement is retarded and there occurs a mingling of cell content with extracellular medium. Thus a structural disintegration does not always bring about the same effects. A cell membrane which is impermeable to the enzyme and difficultly permeable to the substrate is often the factor which regulates the velocity of the enzyme reaction. The paper deals with the velocity changes in uric acid decompn. caused by mech. agencies (trituration with quartz sand) and chem. agencies (addn. of PROH), the adsorption of uric acid, the state in which the uricase occurs in the cells, and finally P. attempts to analyze the mechanism of the reaction from the mathematical standpoint.

A. W. Dox

**Alcohol fermentation. XVIII. The behavior of yeast toward glyceraldehyde and glyceric acid.** S. KOSTYCHEV AND K. JEGOROVA. *Z. physiol. Chem.* **181**, 264-80(1929); cf. *C. A.* **22**, 3186-7.—The hexose mol. is commonly supposed to break down into a triose, OHCH(OH)CH<sub>2</sub>OH or CO(CH<sub>2</sub>OH), as an intermediate product in the fermentation by yeast. Such an intermediate has never been demonstrated by actual isolation and identification. If it is actually formed during the fermentation, its failure to accumulate in demonstrable quantities can be explained only by the extreme rapidity with which it must undergo further breakdown to the final products EtOH and CO<sub>2</sub>. It is now shown that glyceraldehyde is not fermentable by yeast, nor does it undergo dismutation to glycerol and glyceric acid, although it has no inhibitory effect on the fermentation of sucrose. Its immediate oxidation product glyceric acid is fermentable

only in mere traces even under the optimum conditions of abundant aeration. The only intermediate products actually isolated thus far from alc. fermentation are  $\text{AcH}$ ,  $\text{AcCO}_2\text{H}$  and  $\text{AcCHO}$ . There is no exptl. evidence whatever in support of the intermediate formation of a triose. A. W. DOX

**Musk odor and ring-ketone configuration.** G. MALCOLM DYSON. *Perfumery Essential Oil Record* 20, 75-8(1929).—The paper, mainly discursive, deals under the caption: Synthetic processes with several methods for the prepn. of cyclic ketones which are intimately related to natural musk and civet. In this connection the general properties of certain of the higher cyclic ketones are given in tabular form, the lower no. of the series possessing a pleasant smell somewhat resembling that of peppermint in attenuated diln. The 13th member of the series (cyclotridecanone) has in its concd. form an odor resembling that of cedar wood, but when highly dild. a faint smell resembling musk is observable. This musk odor is, however, more readily perceptible with the 14th member, and reaches a max. in the 15th member (cyclopentadecanone), a substance which resembles highly, so far as its odor is concerned, natural musk, and has been used to a limited extent as a musk substitute. The musk odor of the series decreases again as the size of the ring increases, becoming quite faint with the 18th member, and with higher members disappearing altogether. The odorous principles of natural musk, muscone, and of civet, civetone, are discussed in connection with their probable formulas. Under musk, odor and constitution are considered at some length. It is pointed out that odor in the musk range is by no means confined to many-membered ketone rings as evidenced by the various musk substitutes placed on the market from time to time, notably certain nitro derivs. of butyltoluene and -xylene, so also of isobutyl-*m*-cresolmethyl ether. It seems clear that the olfactory vibrations assocd. with the musk odor are capable of being engendered by 2 entirely different types of mols., a nitrated alkyl-substituted benzene nucleus and a many-membered ketonic ring. W. O. E.

**Physico-chemical properties of the cell membrane. VI. Transition of the chlorine ion through the corpuscular membrane.** SHIROKICHI MORI. *J. Biophysics (Japan)* 2, 165-72(1927); *Collected Papers in Physiology and Biol. Physico-chem.* 4.—The permeability of the cell membrane of the red blood corpuscles to  $\text{Cl}$  ion has been confirmed by the electrometric measurement of the  $\text{Cl}$ -ion concn. in the medium in which the corpuscles were suspended. When the corpuscles are suspended in an isotonic soln. of  $\text{NaCl}$  or  $\text{NaCl} + \text{NaHCO}_3$ , the  $\text{Cl}$  ion comes out from the corpuscles into the medium, even when the medium is more concd. in  $\text{Cl}$  ion than the serum in which the corpuscles were previously suspended. This passage of  $\text{Cl}$  ion is reversible. The corpuscles swell in an isotonic soln. of  $\text{NaCl}$  or  $\text{NaCl} + \text{NaHCO}_3$ . This swelling is also reversible. VII. Does the Donnan equilibrium apply to the cell membrane of the erythrocytes? SATORU KATO. *Ibid* 251-6.—Red corpuscles of horse blood were suspended in an isotonic soln. of  $\text{NaCl} + \text{sucrose}$ , or of  $\text{NaCl} + \text{NaHCO}_3$ . After about an hr., the corpuscles were sepd. from the soln. by centrifuging, and they were laked by repetition of freezing and thawing. The  $\text{H}$ -ion exponent,  $p_{\text{H}}$ , and the  $\text{Cl}$  ion exponent,  $p_{\text{Cl}}$ , of the laked corpuscles as well as of the soln. in which the corpuscles had been suspended, were measured potentiometrically. The concns. of the  $\text{Cl}$  ions and of the  $\text{H}$  ions in the red corpuscles,  $(\text{Cl})_i$  and  $(\text{H})_i$ , as well as in the suspension medium,  $(\text{Cl})_e$  and  $(\text{H})_e$ , were measured, and the following facts were observed: The ratio  $(\text{H})_i/(\text{H})_e$  is a const. while  $(\text{Cl})_i/(\text{Cl})_e$  is an increasing function of  $(\text{Cl})_e$ .  $(\text{Cl})_i > (\text{Cl})_e$  in the isotonic  $\text{NaCl}$  soln.,  $(\text{Cl})_i < (\text{Cl})_e$  when  $(\text{Cl})_e$  is very small, and  $(\text{Cl})_i = (\text{Cl})_e$  at a certain intermediate value of  $(\text{Cl})_e$ . In every case the elec. charge of the corpuscles is negative. The Donnan theory of membrane equil. is not applicable to the ionic distribution between the corpuscles and the suspension medium. C. R. FELLERS

**The photochemical action of sterols from different sources.** L. HOUGOUNENG AND F. COUTURE. *Compt. rend.* 188, 742-3(1929); cf. *C. A.* 23, 1944.—Sterols obtained from ox blood and from snails had no action on a photographic plate even when in direct contact. Sterols extd. from silk worm moths gave a positive impression after 15 days' exposure. A pure specimen of ergosterol from beer yeast (m. 154-155°) produced a spot on sensitized gelatin after 15 days' exposure by direct contact, or when sepd. by either a 3-mm. layer of air or a thin film of cellophane. S. B. FOSTER

**The catalase activity of organically combined iron.** HANS V. EULER and HARALD NILSSON. *Arkiv. Kemi Mineral. Geol.* 10B, 1-6(1929) - Pyratin,  $\text{C}_{30}\text{H}_{48}\text{O}_4\text{N}_4\text{FeCl}$ , obtained by the action of resorcinol on hemin, has catalase activity that is destroyed by  $\text{H}_2\text{S}$ . ARTHUR GROLLMAN

**Chemical equilibrium at an interphase and its importance for the physical chemistry of the cell.** D. DEUTSCH. *Metallbörse* 18, 989, 1157(1928).—An address dealing

with the application of Gibbs' adsorption formula to the living cell. An attempt is made to explain certain simple physiol. activities of the cell in terms of surface phenomena.

ARTHUR GROLLMAN

An inherent defect in the theory that growth rate is controlled by an autocatalytic process. GEORGE D. SNELL. Harvard Univ. *Proc. Natl. Acad. Sci.* 15, 274-81 (1929).—Because of the expanding vol. of the growing organism, the usual equations derived from the law of mass action cannot be applied to the processes involved in the synthesis of new protoplasm. This fact renders invalid the hypotheses put forward, according to which growth is controlled by a single or master autocatalyzed monomol. reaction.

ARTHUR GROLLMAN

The question of "active" iron. HELMUT PETOW AND HANS KOSTERLITZ. *Klin. Wochschr.* 8, 600-1 (1929).—The conversion of benzidine into benzidine blue by Fe salts is always greater, except with ferric salts, than one would expect from their mol. concn. The mol. conversion index is 7 for ferrous salts, 27-37 for complex Fe salts and 490 for hemoglobin. This converting ability is markedly enhanced by  $H_2O_2$  in the hemoglobin and complex Fe salts, but not in the ferrous salts. *Bacillus influenzae* (Pfeiffer) and *B. hemoglobinophilus* (Friedberger) could not be grown in a medium contg. "active" Fe other than hemoglobin.

MILTON HANKE

Some advances in the colloid chemistry of the proteins and their biological significance. WOLFGANG PAULI. *Klin. Wochschr.* 8, 673-9 (1929).—A review.

MILTON HANKE

Egerton Charles Grey (1887-1928). A. H. *Biochem. J.* 23, 1-2 (1929).—Obituary.

BENJAMIN HARROW

Diarmid Noël Paton (1859-1928). E. P. C. *Biochem. J.* 23, 3 (1929).—Obituary.

BENJAMIN HARROW

Chemical action of quinones on proteins. II. EVELYN ASHLEY COOPER AND RAYMOND B. HAINES. Chem. Dept., Univ. Birmingham. *Biochem. J.* 23, 4-9 (1929); cf. *C. A.* 22, 2960.—The saline constituents of Ringer's soln. considerably accelerate the reaction between benzoquinone and glycine, but have only a slight effect with toluquinone. The chem. interpretation already put forward does not at the present time account for the high temp. coeff. for germicidal action.

BENJAMIN HARROW

Denaturation of proteins. V. Denaturation by acid. HENRY K. CUBIN. Lab. of Physical Chem., Univ. Liverpool. *Biochem. J.* 23, 25-30 (1929); cf. Lewis, *C. A.* 21, 1994.—In the region of moderate acidity the critical increment of denaturation, both for oxyhemoglobin and for egg albumin, is very much lower than it is in the neighborhood of the neutrality point of water, in which region the process is known as heat denaturation. The  $pH$  range over which pptn. occurs is greater in the absence of formaldehyde than in its presence. This confirms the view that flocculation involves the amino groups.

BENJAMIN HARROW

Relativity applied to biological problems. IV. Ammonia. I. TIXIER. *Bull. sci. pharmacol.* 35, 648-52 (1928); cf. *C. A.* 22, 3927; 23, 884.—The ratios of total acidity, various acidity fractions,  $NH_3$  elimination and overproduction of  $NH_3$  are discussed with reference to their diagnostic bearings.

E. H.

Recent researches on the biochemistry of the nitrogen cycle. GILBERT J. FOWLER. *J. Indian Chem. Soc.* 6, 1-15 (1929).—Presidential address to the Indian Chem. Soc., delivered at Madras.

W. D. LANGLEY

Rennin action in relation to enterokinetic phenomena. G. A. RICHARDSON AND L. S. PALMER. *J. Phys. Chem.* 33, 557-76 (1929).—"The chemistry of pure casein is almost identical with that of pure paracasein, but synthetic caseinate and paracaseinate 'milks' have always shown significant differences, especially with regard to their sensitivity to electrolytes." These differences are studied by use of electrophoresis measurements upon the "milks" with and without added phosphate. The first set of measurements is of the actual migration and subsequent distribution of the protein along a tube after the current has passed for a definite period; the second, of the linear migration of the column of sol along a tube, measurements being made at definite intervals of time. The action of rennin is related to the elec. charges on the caseinate micellae. The isoelec. point of rennin lies between  $pH$  values of 6.9 and 7.0. The addn. of rennin to caseinate solns. having  $pH$  values between 6.1 and 6.9 reduces the rate of migration, to caseinate between 7.0 and 7.25, increases the rate, and between 7.5 and 7.69, has no appreciable effect upon the rate of migration. The migration velocities depend somewhat upon the previous heat treatment of the sols.

W. D. LANGLEY

Oxidation-reduction systems of biological significance. III. The mechanism of the cysteine potential at the mercury electrode. E. S. GUZMAN BARRON, LOUIS B. FLEXNER AND L. MICHAELIS. Johns Hopkins Univ. *J. Biol. Chem.* 81, 743-54 (1929);

cf. *C. A.* 23, 1424.—"Cysteine reacts in the same way as cyanide with metallic Hg. Both form reducing systems with the metal consequent upon this sort of reaction:  $2\text{XH} + \text{Hg} \rightleftharpoons \text{HgX}_2 + 2\text{H}$ . The correct formula for the cysteine potential at Hg is therefore:  $E = E_0 - (RT/F) \ln ([\text{RSH}]/\sqrt{[(\text{RS})_2\text{Hg}]}) + (RT/F) \ln [\text{H}^+]$ . The concn. of  $(\text{RS})_2\text{Hg}$  is so little altered by reaction between RSH and metallic Hg in the absence of  $\text{O}_2$ , that it can be included in the const. of the equation when exptl. results are evaluated. It is improper to speak of a 'cysteine-cystine system' at Hg. It is the 'cysteine-mercuric cysteinate system' which det. the potential. This system is not related to the problem of cysteine oxidation in metabolism." A. P. LOTHROP

**The non-toxicity of carbon monoxide for non-differentiated cells.** SUZANNE LALLEMAND. *Bull. sci. pharmacol.* 36, 65-72(1929).—Fresh hen eggs are kept in the gas in question for a certain time, then left for 24 hrs. in air and put in the incubator for 48 hrs. After this time, the development of the germ was observed. The time required for a certain gas to produce a visible injury in the germ was considered as toxic time. It was found to be for  $\text{H}_2\text{S}$  3 mins., for  $\text{NH}_3$  3 mins., for  $\text{SO}_2$  2 hrs., for  $\text{HCl}$  2 hrs., for  $\text{Cl}$  5 hrs., for  $\text{C}_2\text{H}_2$  2 days, for  $\text{CO}_2$  3 days, for illuminating gas 6 days.  $\text{CO}$  behaved absolutely like an inert gas; its poisonous action depends on the presence of hemoglobin.

A. E. MYER

**Studies on the hydrolytic products of proteins by the acidimetric method.** J. TILLMANS, P. HIRSCH AND F. STRACHE. Univ.-Inst. für Nahrungsmittelchemie, Frankfurt a. m. *Biochem. Z.* 199, 399-433(1928).—The dissociation const. of various di- and tripeptides as well as that of asparagine were detd. by the electrometric measurements of  $p_{\text{H}}$  at  $20^\circ$ . The values thus obtained for both acid and basic const. are greater than those found for simple amino acids (asparagine  $k_a = 1.41 \times 10^{-9}$ ,  $k_b = 1.41 \times 10^{-12}$ ; leucylasparagine  $k_a = 5.9 \times 10^{-9}$ ,  $k_b = 5.7 \times 10^{-12}$ ; leucylisoserine  $k_a = 6.2 \times 10^{-9}$ ,  $k_b = 1.33 \times 10^{-11}$ ; alanylalanine  $k_a = 4.6 \times 10^{-9}$ ,  $k_b = 1.43 \times 10^{-11}$ ; aminobutyryl- $\alpha$ -aminobutyric acid  $k_a = 4.1 \times 10^{-9}$ ,  $k_b = 9.2 \times 10^{-12}$ ; alanylglycylglycine,  $k_a = 7.1 \times 10^{-9}$ ,  $k_b = 1.35 \times 10^{-11}$ ; triglycine  $k_a = 8.53 \times 10^{-9}$ ,  $k_b = 1.55 \times 10^{-11}$ ; leucyloctaglycylglycine  $k_a = 1.44 \times 10^{-8}$ ,  $k_b = 1.47 \times 10^{-12}$ ). For tripeptides the values are even greater than those for dipeptides. The strength of the acidic and basic properties changes most abruptly between the amino acid and dipeptide, and becomes progressively less with the enlargement of the mol. Simple diketopiperazines in either acid or alk. medium bind neither acid nor base, so that the peptide linkage in the anhydride ring within the range of electrometrically determinable  $p_{\text{H}}$  has no acid- or base-binding capacity. This is also true for the  $\text{CONH}_2$  group of the asparagine. Therefore, diketopiperazines are not suitable for acidimetric studies, and in a mixt. of peptides and diketo-piperazines the former alone are thus measured. The protein hydrolysis with acid and more particularly with alkali proceeds in a number of stages of different velocities. The first attack by the alkali proceeds very easily and quickly, but subsequent attacks are much slower. In hydrolysis at boiling temp with 0.5 *N* NaOH the reaction slows down very considerably after the initial effect. This is interpreted to show that some of the bonds in the protein mol. are weak and some are firm. Simple diketopiperazines are most easily attacked by the alkali and hydrolyzed. Peptides as a rule are hydrolyzed with much greater difficulty. The condition of the protein in its native state as well as the product of its complete hydrolysis by  $\text{HCl}$  have not contributed much to the characterization and identification of the protein mol. because the former is too labile, while in the latter the identity of the protein is really lost. A middle ground was sought by employing a 4 hrs. hydrolysis with 0.5 *N* NaOH at  $100^\circ$ , and a 24 hrs. hydrolysis with 0.5 *N*  $\text{HCl}$  at  $100^\circ$ . The titration curves were detd. for a variety of proteins, but they all show the same characteristics and are of little value for analytical differentiation in some cases though in others the curves may be helpful (differentiation of gelatin from other proteins).

S. MORGULIS

**Hydrolysis of proteins by ammonia under pressure. Preparation of peptones.** V. S. SADIKOV. Univ., Leningrad. *Biochem. Z.* 205, 360-8(1929).—Various proteins upon heating in an aq. soln. of  $(\text{NH}_4)_2\text{CO}_3$  or of  $\text{NH}_4\text{OH}$  at  $150$ – $180^\circ$  in an autoclave for 2–12 hrs. yield hydrolyzates consisting chiefly of peptones. Dried, these form a residue which is easily pulverized. The powder is not hygroscopic, is almost colorless, and reacts acid. Fibrin peptone obtained after hydrolyzing 2 hrs. gives solns. of considerable viscosity, and furnishes a very favorable bacteriol. medium. After 24 hrs. hydrolysis of casein several amino acids were obtained that do not correspond to the usual hydrolytic products. Furthermore, among the crystallizable products no peptide- or piperazine-like compds. have been found.

S. MORGULIS

**Chemistry of bilirubin. II. Colored oxidation products of bilirubin and their**



behavior under changed hydrogen-ion concentration. WILLIAM KERFFOLA AND ERKKI LEIKOLA. Univ. Helsinki. *Skand. Arch. Physiol.* 55, 70-77(1929); cf. C. A. 22, 4549.—During the oxidation of bilirubin in its various solvents under the influence of the  $\text{NaNO}_2\text{-HCl}$  mixt. various colors appear in regular succession reproducing the order of the solar spectrum changing from reddish yellow to reddish violet then to rose-red, violet-ocher, red-ocher, gold-ocher, and ocher-yellow, then finally becomes colorless. The color resulting from the Ehrlich diazo reaction is partly due to a simple oxidation product of bilirubin and partly to the sulfanilic acid. III. Influence of radiant energy on bilirubin. *Ibid* 78-86.—Bilirubin does not change in color in the dark; this has been found to hold true with a range of  $p_H$  7 to 14. Ultra-violet rays cause a change in color of bilirubin regardless of the solvent. In acid solns. the colors change over the entire gamut of the solar spectrum, turning to rose-red, then yellowish brown, and finally fade out entirely. In basic solns. the color changes from greenish brown to water-blue, yellow-green and finally disappears. Similar results are obtained with various other radiation systems (daylight, x-rays, Ra radiation). IV. The solubility of bilirubin and of its colored oxidation products and treatment with reduction and condensation reagents. *Ibid* 87-90.—The soly. of the colored oxidation products of bilirubin as well as of bilirubin in various solvents is closely associated with the H-ion concn. The various products differ somewhat in their behavior towards the solvents. Peculiar changes with a variety of reagents are fully described. V. Some further observations on the properties of bile pigments. *Ibid* 258-9.—Bile pigments are oxidized by atm.  $\text{O}_2$  in alk. soln. Bilirubin in strongly alk. soln. gives a rich blue or green-blue color with an excess of phosphotungstic acid, whereby the tungstic acid becomes reduced to  $\text{W}_2\text{O}_5$ . Alk. Fehling soln. as well as Almén-Nylander reagents is likewise reduced. The migration of bilirubin in the elec. field was also studied but only in alk. soln. since it is insol. in acid. In a medium of  $p_H$  10 to 11 the bilirubin rapidly oxidizes to biliverdin. The migration within the  $p_H$  range 6 to 11 is always to the anode so that it must be negatively charged. VI. The demonstration of bilirubin and of its colored oxidation products and their determination. *Ibid* 260-6.— $\text{SCl}_3$  and  $\text{CCl}_3\text{COOH}$  color bilirubin pure red; biliverdin is recognized by its green color, the shade of which varies according to the degree of acidity or alk.; bilicyanin is greenish violet in neutral soln. but assumes characteristic blue tints in acid or alk. media, and with condensation reagents becomes blue-green; bilipurpurin has different colors in neutral, acid or alk. soln. which also vary according to the bilipurpurin (I, II or III); and finally the color of bilitecin is most variable. Methods are given for the detn. of these various pigments.

S. MORGULIS

The nature of the factors which determine the sequence of growth-cycles and its relationship to the differentiation of tissues. T. BRAILSFORD ROBERTSON. Univ. of Adelaide, Australia. *J. Gen. Physiol.* 12, 329-44(1929).—Growth in animals and plants is an autocatalyzed process; in animals it usually occurs in several superimposed autocatalytic cycles. In many cases the velocity const. of the unimol. growth formula falls as growth proceeds, at first rapidly, then more slowly. In the white mouse the fall in the velocity const. is directly proportional to the fall of the ratio,  $NC/CY$ , in which  $NC$  is the mass of the nucleic acid contained in the nuclei of all the tissues, and  $CY$ , the mass of the tissue protein. This ratio is obtained by the chem. method of LeBreton and Schaeffer (Trav. Inst. Physiol. Faculté Med. Strasbourg, Paris, 1923). On the assumption that this relationship is generally applicable to animals and plants, the following deductions are made: (1) Increase of protoplasm in any given growth cycle is proportional to the concurrent increase of nuclear material; (2) growth of cytoplasm takes place in accordance with a unimol. formula in which the velocity const. varies directly as the mass of the nucleus. On the basis of the hypothesis that each growth cycle represents the growth of a sep. group of cells within the animal, it is concluded that: (a) the cells which participate in growth during any cycle have initially lower  $NC/CY$  ratios than the cells which participated in the preceding cycles; (b) cells having large  $NC/CY$  ratios in multicellular animals inhibit the growth of cells having smaller ratios. The deductions imply that the nucleus has a predominant part in detg. the development of the cell in which it resides.

C. H. RICHARDSON

The thermic effect of death. V. V. LEPESHKIN. Univ. of Ill. *J. Gen. Physiol.* 12, 345-53(1929).—See C. A. 23, 854.

C. H. RICHARDSON

The influence on the fermentation process of the antiseptics in use for enzyme studies (based upon experiments with saliva diastase). EMANUEL PRECHTL. Tierärztliche Hochschule, Wien. *Biol. generalis* 4, 181-90(1928).—Investigations were made on the question whether  $\text{MePh}$  (I),  $\text{CHCl}_3$  (II),  $\text{Cl}_3\text{CCH}(\text{OH})_2$  (III),  $\text{NaF}$  (IV) and thymol (V) have an inhibitory influence on the enzymic activity of saliva diastase.

Biedermann's method was used for the detn. of the diastatic power ( $D$ ). The expts. were carried out at 16–8°. Three cc. of a 1% amylose soln. was added to 5 cc. of dil. saliva (1 : 200) and the occurrence of the achromic point established by means of I-KI.  $D$  was calcd. from the values obtained; it was greatly influenced by the degree of satiation of the organism, the greatest value being obtained shortly after the principal meal. With the same individual the const. value of  $D = 3600$  was found 1 hr. after the principal meal. Increasing amts. of the antiseptics were added to the saliva-amylose mixt. with care that the antiseptic was always in intimate contact with the mixt. Then the degree of inhibition was calcd. from  $D$ . I was absolutely innocuous in a concn. of below 0.2% of the total vol.; II below 2.0%; III below 1.5%; IV below 1.0% and V (in aq. soln.) in any quantity. A 100% inhibition of the diastatic activity was obtained with the following concns.: I 9.77%, II 57.37%, III 5.78%. With IV no complete inhibition could be produced; the presence of 2.85% caused 80% inhibition.

G. SCHWOCH

Remarks on O. Gerngross' article on the "chemistry of the proteins." R. O. HERZOG. Kaiser Wilhelm-Inst. Faserstoffchem. Dahlem. *Z. angew. Chem.* **41**, 426 (1928).—Criticism of Gerngross' statements on the chemistry and mol. wt. of proteins, especially of collagen and gelatin (cf. *C. A.* **22**, 4269).

G. SCHWOCH

Remarks on the preceding article of R. O. Herzog. O. GERNGROSS. *Tech. Hochschule Berlin-Charlottenburg. Z. angew. Chem.* **41**, 426–7 (1928).

G. SCHWOCH

Hydrolysis of the protein of hen's eggs. JUNIRO MOTOMURA. *Bul. Sci. Fakultatu Terkultura, Kjusu Imp. Univ.* **3**, 182–6 (reprint).—The whole protein of the hen's eggs was hydrolyzed with HCl and the monoamino acids were isolated, thus: glycocoll 0.2, alanine 3.9, valine 13.2, leucine 6.5, phenylalanine 1.6, proline 3.6, aspartic acid 4.2 and glutaminic acid 4.6.

M. H. SOULE

Isoelectric point of crystalline urease. JAMES B. SUMNER AND DAVID B. HAND. Cornell Univ. *J. Am. Chem. Soc.* **51**, 1255–60 (1929).—Cryst. urease undergoes electrophoresis toward the anode in buffered solns., varying from neutrality to  $p_H$  5.5. In buffered solns. more acid than  $p_H$  5.5 no migration could be observed. Urease begins to ppt. with K acid phthalate at  $p_H$  5.3 and the pptn. is almost complete at 4.6; it is pptd. by buffered Pb(OAc) at  $p_H$  4.7 and the pptn. is almost complete at 5.6. The regions for pptn. by phthalate and Pb overlap at  $p_H$  4.95, where 20% of the urease is pptd. by either ion. Urease is pptd. by  $Hg^{++}$  and  $Cu^{++}$  ions over a much wider range than for Pb ions. Dil. electrolytes have 3 effects on the soly. of urease: a pptn. by certain ions such as phthalate and Pb, over a certain range of  $p_H$ ; a solvent effect on urease; a pptg. action where the dil. salts bring the soln. to the  $p_H$  of the isoelec. point of urease. The isoelec. point of urease as detd. by the point of min. soly. in dil. acetate buffer is at  $p_H$  5.0 to 5.1. This point is far to the acid side of the  $p_H$  of optimum activity for urease. Urease is active on both sides of its isoelec. point. C. J. WEST

Reversion of Traube's rule in the adsorption of homologous series by sugar charcoal (SABALITSCHKA) 2. The absorption of ultra-violet light by some albuminous substances (MARCHLEWSKI, WIERZUCHOWSKA) 3. The "natural" potential difference in the limit—cell-electrolyte (ETTSCHE) 2. Electrocapillary phenomena. IV. Role of the physical factors (ARCISZEWSKI, *et al.*) 2. Physico-chemical studies on bioluminescence. VII. The solubility of *Cypridina* luciferin in organic solvents (KANDA) 2. Racemization. VIII. The action of alkali on proteins; racemization and hydrolysis (LEVENE, BASS) 10. Porphyrins and their metal salts (HAUROWITZ, ZIRM) 10. The relation of chemical structure to the rate of hydrolysis of peptides. V. Enzyme hydrolysis of peptides (LEVENE, *et al.*) 10. Guaninedesoxypentose from thymus nucleic acid (LEVENE, LONDON) 10.

MITCHELL, H. H. AND HAMILTON, T. S.: *The Biochemistry of the Amino Acids*. Monograph No. 48 of Am. Chem. Soc. New York: The Chemical Catalog Co., Inc. 619 pp. Reviewed in *J. Franklin Inst.* **207**, 710 (1929).

## B—METHODS AND APPARATUS

STANLEY R. BENEDICT

Localization of a lesion in the brain by differential staining of blood smears. The 20th report of the peroxidase reaction. (The fourth report of the same title.) KAZUO SUZUKI. *Tohoku J. Exptl. Med.* **11**, 618–25 (1928).—A large no. of substances, the majority in the colloidal state, were injected intravenously into rabbits in an attempt to produce the "striatal blood picture" (myeloid leucocytes negative to the peroxidase, but positive to the oxidase, tests). Though the peroxidase reaction was always posi-

tive, yet in some cases it was much weaker, the oxidase reaction always remaining normal.

B. C. BRUNSTETTER

**Examination of lobulation of nuclei of neutrophile leucocytes by modified copper peroxidase stain.** The 21st report of the peroxidase reaction. KAZUÉ SUZUKI. *Tohoku J. Exp. Med.* 12, 224-34(1929).—The Cu peroxidase method, in conjunction with safranin, stains neutrophiles distinctively and requires only a short stain time. Even in cell counts of 200, it checks fairly well with results obtained by the Giemsa stain.

B. C. BRUNSTETTER

**The benzidine reaction in urine.** ROAS. Kommunehospitals in Kopenhagen. *Wiener klin. Wochschr.* 42, 368-9(1929); cf. *C. A.* 22, 4139.—The interference of urine with the test as usually performed may be avoided by filtering the specimen and dropping the benzidine reagent directly onto the residue on the filter paper. D. B. DILL

**Spiritus etheris B. P. as substitute for absolute alcohol in microscopy.** D. S. SPENCE. *Microscope Record* 13, 27(1928); *Quart. J. Pharm.* 1, 115(1928).—Spiritus etheris B. P. may satisfactorily replace the more costly abs. alc. for most microscopical work. The spirit should be dehydrated by treatment with anhyd.  $\text{CuSO}_4$  or  $\text{K}_2\text{CO}_3$  before use.

W. O. E.

**Preservation of urine with nipagin.** GIACOMO TELLERA. *Pharm. Ztg.* 74, 366 (1929); cf. *C. A.* 23, 1430.—This deriv. of *p*-hydroxybenzoic acid is regarded as the best all-round preservative for samples of urine.

W. O. E.

**A note on the purification of picric acid for creatinine determination.** STANLEY R. BENEDICT. Cornell Univ. *J. Biol. Chem.* 82, 1-3(1929).—Two methods are described for purifying picric acid. The first method consists in the crystn. of thoroughly dried technical picric acid from glacial AcOH. In the second method, sodium picrate is first formed and the free acid liberated with HCl.

ARTHUR GROLLMAN

**The use of molybdic acid as a precipitant for blood protein.** STANLEY R. BENEDICT AND ELEANOR B. NEWTON. Cornell Univ. *J. Biol. Chem.* 82, 5-10(1929).—Molybdic acid may be entirely substituted for tungstic acid as a blood protein precipitant. In detns. of uric acid in filtrates from molybdic acid pptns. the modified indirect method should be employed because of the presence of larger amts. of thionine in such filtrates. Details of the prepn. and technic for using molybdic acid are given.

A. G.

**The occurrence and determination of thionine (ergothionine) in human blood.** JEANETTE ALLEN BEHRE AND STANLEY R. BENEDICT. Cornell Univ. *J. Biol. Chem.* 82, 11-5(1929).—A method for the detn. of thionine in blood is described in which NaOH is substituted for NaCN as the alkali. Results are given for 15 samples of human blood. A comparison is made between the results obtained using tungstic acid as a precipitant with those in which molybdic acid is used.

ARTHUR GROLLMAN

**The determination of carbon and carbon dioxide.** THEODORE E. FRIEDEMANN AND ARTHUR I. KENDALL. Northwestern Univ. *J. Biol. Chem.* 82, 45-55(1929).—An app. and procedure for detg. C and  $\text{CO}_2$  are described. The method involved wet combustion which is shown to be better adapted for biol. materials than the dry combustion method. If proper attention is paid to the total acid concn., even substances such as AcOH or fats can be completely oxidized without the use of catalysts.

ARTHUR GROLLMAN

**A specific color reaction for ergosterol.** OTTO ROSENHEIM. Natl. Inst. Med. Research, London. *Biochem. J.* 23, 47-53(1929).—When a few crystals, 1 mg. or less, of ergosterol are added to about 0.5 g. chloral hydrate, liquefied by warming in a water bath, they dissolve and immediately give rise to a carmine-red soln., showing a broad absorption band at  $50\ \mu$ . The red color changes within a min. into a green and finally a deep blue, which persists for a considerable time. The esters of ergosterol react similarly. An aq. soln. of  $\text{CCl}_3\text{CO}_2\text{H}$  (9 acid : 1 water) added to ergosterol dissolved in a few drops of  $\text{CHCl}_3$  gives an immediate red soln. (band at  $500\ \mu$ ) and this changes gradually into a clear blue (bands at 570-580 and 650-680  $\mu$ ) without showing any intermediate green phase. An immediate red color with the above reagents is sp. for those sterol derivs. which possess the  $\Delta^{1,2}$  (or  $\Delta^{1,12}$ ) linkage. It is suggested that the primary reaction in all sterol color reactions consists in the shifting of the double linkages into the  $\text{C}_{1,2}$  (or  $\text{C}_{1,12}$ ) position and the subsequent formation of colored carbonium salts.

BENJAMIN HARROW

**Cholesterol and phytosterol and the spectroscopy of the color reactions of the sterols in general.** JAMES MOIR. *J. South African Chem. Inst.* 12, 16-20(1929).—The known color reactions of cholesterol are enumerated. The same reactions are performed with ergosterol, zymosterol, coprosterol and stigmaterol. By examn. with a spectroscope, faint differences in the location of the bands are sometimes observed.

ALBERT L. HENNE

**Detection of dried saliva on cloth.** B. MUELLER. Univ. Frankfurt a. M. *Deut. Z. ges. gericht. Med.* 11, 211-24(1928).—The material is examd. 1st under an analytical quartz lamp. The pale border of the stain is discerned. Then a drop of  $\text{FeCl}_3$  soln. is placed on the skin. If this spot darkens more than a control spot treated with a drop of water, KCNS is considered present and saliva indicated. Tests for ptyalin are made.

FRANCES KRASNOW

**Demonstration of nitrites in forensic judgment of damage from shooting.** G. GORONCY. Univ. Königsberg. *Deut. Z. ges. gericht. Med.* 11, 482-6(1928). F. K.

**The glass electrode and its use in measuring hydrogen-ion concentration.** A. F. MIRSKY AND M. L. ANSON. Rockefeller Inst. *J. Biol. Chem.* 81, 581-7(1929).—A glass electrode and the app. needed for its use are described. The glass electrode is as accurate as the H electrode within the  $p_H$  range of biol. significance, is as rapidly operated as the quinhydrone electrode and is more widely applicable than either.

A. P. LOTHROP

**Observations on the reaction of M. Weiss.** PIETRO BERRI. *Boll. soc. ital. biol. sper.* 3, 1002-8(1928).—Chlorates, hypochlorites, perborates, and peroxides were used as oxidizing agents to see whether they would give the same yellow color to Weiss-positive urine as  $\text{KMnO}_4$ . They all failed to produce the color. A Weiss-positive urine was placed into a U tube and a current of 3-5 v. was passed through it; Pt electrodes were used. After 30 mins. a marked yellow color formed around the anode. No color formed at the cathode. A normal urine which was Weiss-neg. failed to produce a color at the anode. An oxidation reaction apparently took place in the Weiss-positive urine around the anode. This shatters the hypothesis that the yellow color in the positive urines is due to some chem. combination brought about by the  $\text{KMnO}_4$ . In order to ascertain the chem. nature of the substance in urine which gives the color, numerous compds. were tested *in vitro* in aq. soln. or suspension, or mixed with normal urine. The diazo reaction was run simultaneously. The results showed that only the true phenols and certain phenolic substances gave a positive Weiss and diazo reaction. Substances contg. alc. hydroxyls were negative. Pyrrole also gave a positive reaction. There was not a strict agreement between the diazo reaction and the Weiss reaction.

PETER MASUCCI

**Clinical microdetermination of the  $p_H$  of blood with an antimony electrode.** R. BRINKMAN AND F. J. J. BUYTENDIJK. *Physiol. Inst. Univ. Groningen. Biochem. Z.* 199, 387-91(1928).—The method depends upon the facts that the e. m. f. of Sb in an aq. soln. is detd. by the  $p_H$ , and that the direct proportionality holds also for the blood. Pure Sb is not suitable; a deposit of the metal upon a Pt electrode is used. A few crystals of  $\text{SbCl}_3$  are dissolved in celluloid (Durofix of the Rawlplug Co.) to give a 5-10% soln. A 0.2 mm. Pt-iridium wire fused into a glass tube is attached to the cathode and is placed in a drop of the  $\text{SbCl}_3$ -celluloid mixt. put on a piece of Sb which is attached to the anode of an 8-v. battery. The properly coated electrode is dried 12 hrs. in the air and is rinsed for 1.5 mins. with a boiling phosphate mixt. (4 parts 0.067 N  $\text{Na}_2\text{HPO}_4$  and 1 part  $\text{NaH}_2\text{PO}_4$ ). The electrode is standardized against 3 mixts. of the Sorensen phosphate salts with  $p_H = 7.73, 7.38$  and  $7.17$ , resp. At  $18^\circ$  the e. m. f. against a normal calomel electrode should be 450 mv., 435 mv. and 426 mv., resp. The relation between  $p_H$  and e. m. f. is thus linear and the e. m. f. difference for a unit  $p_H$  difference is 43 mv. The electrode is very sensitive to temp. changes increasing by  $\pm 0.5$  mv. per degree. In carrying out a  $p_H$  detn. on finger blood, the electrode is first checked up against the 3 buffer mixts. of the above indicated  $p_H$  values; the electrode should give const. results. The finger blood is sucked into a capillary tube, which is bodily transferred to a tube completely filled with a 0.1%  $\text{Na}_2\text{C}_2\text{O}_4$  soln. adjusted to a  $p_H = 7.5$  with a trace of NaOH. The tube is at once closed and shaken to permit the hemolysis of the blood and its uniform distribution. The Sb electrode is now immersed in the tube contg. the hemolyzed blood and the e. m. f. against a normal calomel electrode is measured. In as much as the same linear relationship between  $p_H$  and e. m. f. exists in blood as in the phosphate mixt. the  $p_H$  of the former is obtained directly by interpolation. S. M.

**An iodometric microchemical method for the determination of chlorides.** S. PRIKLA-DOVITZKII AND A. APOLLONOV. *Military Med. Acad., Leningrad. Biochem. Z.* 200, 135-44(1928); *Zhurnal expil. Biol. Med.* 10, 448-57(1929).—One-tenth of a cc. of blood is measured with a pipet calibrated in 0.001 cc. into 2-3 cc. Cl-free  $\text{H}_2\text{O}$  in a small Erlenmeyer flask. Now, 2 cc. of dil. (1 : 3)  $\text{HNO}_3$  is added in case of blood, or only 1 cc. if plasma has been used, and 2 cc. of 0.01 N  $\text{AgNO}_3$ , and the flask is heated on a sand bath to boiling, when 15-20 drops satd.  $\text{KMnO}_4$  is added and the heating continued for 10 min. The color must be retained. After heating the soln. is decolorized by adding drop by drop a satd. glucose soln. until a clear colorless fluid is

obtained. After cooling this is filtered into another small flask through a small wad of washed cotton. The first flask is washed twice with 3 cc.  $H_2O$  which is also poured through the filter. The excess of  $AgNO_3$  is detd. by titrating the filtered soln. with  $I_2-KI$ , 3-4 drops of starch being used as indicator. S. MORGULIS

**A new microchemical method for the determination of adrenaline.** Its application to studies on the intermediary metabolism. M. CHIKANO. Med. Acad., Osaka. *Biochem. Z.* 205, 166-75(1929).—The method depends upon the reaction of adrenaline with  $HIO_3$ . The reaction, however, is not sp. In analysis of serum the proteins must be removed with 5% metaphosphoric acid. Various substances in the blood have a very slight effect upon the reaction except uric acid which, especially in pathol. sera, may be a serious source of error. Certain other end and intermediary products of protein metabolism also react with the reagent. The method is therefore primarily a measure of the protein metabolism. S. MORGULIS

**Sources of error in the tyrosine, phenol and uric acid determination with phosphotungstic acid.** E. SCHIRMER. Psychiatrische Universitätsklinik, Florenz. *Biochem. Z.* 205, 245-55(1929).—The methods developed by Folin and his school utilize labile complex polyphosphotungstic acids which are easily reduced with the formation of the blue  $W_2O_8$ , but this oxidizing property is nonspecific and therefore leads to errors. All inorg. reducing substances, with the exception of  $HNO_2$ , produce a blue coloration,  $H_2O_2$  behaving likewise as a reducing substance. Bivalent Fe compds. even in extreme diln. reduce the phosphotungstic acid. Among the aliphatic compds. the unsatd. compds. give an intense coloration. Although  $HCHO$  or  $CH_3CHO$  does not reduce the reagent, aldehyde condensation products cause blueing even in dilns. in which only tyrosine or adrenaline is effective. Apart from the phenols, the reaction is given by aromatic amines, the reduction being proportional to the number of  $NH_2$  groups. The leucobases of the triphenylmethane dyes, various animal and plant pigments, hemoglobin and chlorophyll all reduce strongly. Colored products obtained in protein hydrolysis cause great errors in detns. by Folin's method even if the hydrolyzate had been completely decolorized with charcoal since the latter contains Fe which is reduced to bivalent Fe in the decolorization process. Furthermore, urea gives a strong blueing of the phosphotungstic reagent and thus interferes with the detn. of uric acid or phenol in urine. S. MORGULIS

**Determination of hippuric acid in urine.** A. VON BEZNÁK. Univ. Debreczen. *Biochem. Z.* 205, 409-13(1929).—The hippuric acid is extd. from the urine with ether in a specially devised extractor suitable for any liquid heavier than ether. The hippuric acid is then hydrolyzed in the presence of 10%  $H_2SO_4$  for 1.5 hrs. at 2.5 kg. pressure per sq. cm., which liberates the glycine quantitatively. Actually, 10-20 cc. urine acidified with 1 cc.  $H_2SO_4$  and 3 cc. 10% Na tungstate is extd. for 1-2 hrs. with 80 cc. ether. After adding 10 cc.  $H_2O$  to the ether ext., the ether is driven off, the remaining soln. is acidified with 1 cc.  $H_2SO_4$ , autoclaved and finally dild. to 25 cc. In 2 cc. aliquots the amino-N is detd. by Van Slyke's method. S. MORGULIS

**The determination of silver in biological fluids and tissues.** E. I. STERKIN. State Med. Inst., Charkow. *Zhurnal expl. Biol. Med.* 10, 423-30(1929); cf. *C. A.* 23, 175.—The material to be analyzed for Ag is oxidized in  $H_2SO_4$  and every trace of Cl is removed by adding towards the end of the combustion pieces of metal Zn. The  $H_2$  set free reacts with the Cl, which is driven off as  $HCl$  gas. The actual combustion is carried out in a test tube in which, in addn. to the blood, are placed 0.5 g.  $Na_2SO_4$ , 0.25 g.  $CuSO_4$ , 4 cc.  $H_2SO_4$  and 2 cc. satd.  $KMnO_4$ . The tube is heated on a sand bath and more  $KMnO_4$  added until the mixt. is decolorized. Then, after diln. 3-4 times with  $H_2O$ , the Zn is added. The liberated Ag is titrated with a 0.01 N  $NH_4SCN$  with Fe alum as indicator. Intravenous injection of Solargentum leads to such rapid disappearance of the Ag that it cannot be detected in the blood even soon after the injection. When the dose is sufficiently large to cause death or symptoms of toxicity, Ag is always found in the blood. S. MORGULIS

**The examination of sperm stains by ultra-violet light.** C. SIMONIN. *Ann. méd. légale criminol. police sci.* 9, 60-2(1929).—Dried sperm becomes fluorescent under ultra-violet light (Wood's light); but the brilliant white fluorescence can be modified according to the nature of the base on which the stain has been applied. Moreover, it is not specific, as other org. liquids can give a similar or identical fluorescence. The fluorescence of sperm stains seems to be due to the presence of choline. A. P.-C.

**A specific color reaction for ergosterol and its transformation products.** E. P. HAÜSSLER AND E. BRAUCHLI. Chem. Labor. F. Hoffmann-La Roche & Co., Basel. *Helv. Chim. Acta* 12, 187-93(1929).—According to Tortelli and Jaffe (*C. A.* 9, 1255) the presence of cod-liver oil in fats or oils can be detected by the green color developed

upon addn. of 2.5 cc. of a 10% soln. of Br in  $\text{CHCl}_3$  to 5 cc. of the oil or fat in 10 cc.  $\text{CHCl}_3$  + 1 cc.  $\text{AcOH}$ . H. and B. found the development of the color due to the presence of ergosterol (I). Solns. of 1 g. pure cholesterol or 1 g. pure phytosterol in 10 cc.  $\text{CHCl}_3$  + 5 cc. olive oil gave a negative reaction. With pure I in 10 cc.  $\text{CHCl}_3$  + 5 cc. olive oil, 1.0 mg. gave a distinctly positive, and 0.5 mg. a weakly positive reaction. In presence of 1.3 g. cholesterol or 1.3 g. phytosterol, the min. amts. of I to be detected were 1.5 and 1.0 mg., resp. In presence of 1.0 g. cholesterol oleate, 0.25 g. cholesterol digitonide gave a negative reaction, while with 1 mg. ergosterol acetate, 1 mg. ergosterol monosuccinate or 4.0 mg. ergosterol digitonide a distinctly positive reaction was obtained. Smedley McLean (C. A. 22, 1985) has stated that her purest zymosterol (II) ( $[\alpha]_D^{20} = +34.1$ ) still contained I, though less than 5%. The impure II (m. 108-9°;  $[\alpha]_D^{20}$  in  $\text{CHCl}_3 = +17.0$ ) prepd. by H. and B. gave a green color, being about 5 times weaker than that obtained with pure I. This impure II could be purified by 4 different methods, namely, by repeated crystn. from  $\text{Et}_2\text{O}$ ; by oxidation with  $\text{KMnO}_4$ , which oxidizes I more easily than II; by irradiation of a 1% soln. in pure  $\text{EtOH}$ ; by allowing it to stand in  $\text{CHCl}_3$  soln. for 2 weeks. The final product m. 105-7°,  $[\alpha]_D^{20}$  in  $\text{CHCl}_3 = +44.0$ . The intensity of the coloration given by the purified II amounted to about  $1/10$  to  $1/20$  of that given by I. With iso-ergosterol acetate the reaction was about  $1/2$  as strong as with I; with dehydro-ergosterol (III) or the acetate of III the reaction was about 2 to 4 times stronger than with I. The color reaction slowly lost in intensity on irradiating 0.3 g. of I in olive oil in PhH soln. Since in the latter soln. the  $l$ -rotation disappeared after  $1/2$  hr., while the decrease in the color intensity only amounted to  $1/4$ , H. and B. assume also that the first transformation products give the color reaction. After 16 hrs. the intensity of the color was reduced to  $1/10$ . I was not present in the following oils: olive, cotton-seed, sesame, peanut, walnut, peach kernel, sweet almond, soy bean, castor, croton, hydnocarpus and rape-seed. Negative results were also obtained with neat'sfoot fat, with 0.5 g. of the crude stearins isolated from adeps lanae anhydr., which contain ischolesterol, and with 0.1 g. cholic acid, 0.1 g. glycocholic acid, 0.1 g. taurocholic acid and 0.3 g. cholates of the gall from ox, swine and humans. A color developed with poppy-seed, linseed and chaulmoogra oil, the  $\text{Et}_2\text{O}$  exts. from meconium and the stearins extd. by  $\text{Me}_2\text{CO}$  from gallstones of females. G. SCHWOCH

**Preparations of pepsin and trypsin from *Acanthias vulgaris*.** H. J. VONK, JR. *Arch. néerland. physiol.* 11, 437-9(1926).—The mucosa of the shark's stomach was treated with 0.35%  $\text{HCl}$  for several days under toluene. Pepsin was detected in the filtrate. When dialyzed with  $\text{H}_2\text{O}$  the pepsin was pptd. A small quantity of enzyme remained unpptd. and could be isolated by concn. and pptn. with basic lead acetate and  $\text{NH}_4\text{OH}$  followed by treatment with oxalic acid and dialysis. The pancreas was ground with sand plus  $\text{H}_2\text{O}$  and  $\text{CHCl}_3$ ; the filtrate contained trypsin which was obtained by pptn. when the  $p_{\text{H}}$  was adjusted to 4. M. H. SOULE

**Determination of choline.** J. W. LE HEUX. *Arch. néerland. physiol.* 12, 313-8 (1927).—Choline is converted into acetylcholine and assayed biologically against a known amount of the latter. At present 3 methods are available: the perfused frog heart, error of 12% (the organ increases in sensitiveness to a const. level; summer hearts cannot be used since they are not sensitive); the rabbit's small intestine, error 8.3%; the blood pressure of the decapitated cat. For this last-named test adrenaline is infused at a const. rate to maintain a higher blood pressure than normally occurs in this prepn. (1 cc. 1:50,000 every 5 min.) and thus make the acetylcholine fall more definite; error 4.4%. One should give alternate doses of standard and unknown. If the presence of choline is questionable the effect before and after acetylation must be compared with the action of choline and acetylcholine on the same tissue. M. H. S.

**The use of the antimony electrode in the determination of  $p_{\text{H}}$  in vivo.** F. J. J. BUYTENDIJK. *Arch. néerland. physiol.* 12, 319-21(1927).—The Sb electrode was used to det. the  $p_{\text{H}}$  of a drop of blood and of tissues and the circulating blood. Frog muscle at rest gave a  $p_{\text{H}}$  of 8, active  $p_{\text{H}}$  6.9. The  $p_{\text{H}}$  of circulating rabbit blood was 7.35. It was necessary to standardize the electrode with buffer mixts. The  $p_{\text{H}}$  was recorded photographically if desired by connecting the electrode with a galvanometer. M. H. SOULE

**The effect of amino acids upon the methods for determining sugar with especial reference to cysteine and cystine.** YUZURU OKUDA AND KITARO KATAI. *Bul. Sci. Fakultato Terakultura, Kjusu Imp. Univ.* 3, 182-6(reprint).—A study was made of the effects of cysteine, cystine, tryptophan, glycine, aspartic acid, tyrosine, alanine, leucine and histidine, and also of gelatin cleavage-products, which contain all amino acids except cysteine, cystine, tyrosine and tryptophan, upon sugar detns. By Bang's

method cysteine, cystine and tryptophan behaved as glucose. The other amino acids had little or no action. Cystine and cysteine influenced the methods of Folin-Wu, Benedict, Hagedorn and Shaffer-Hartmann.

M. H. SOULÉ

BARRAL, ET., AND BARRAL, PH.: *Précis d'analyse biologique clinique urine*. Paris: J. B. Baillière et Fils. 527 pp. F. 40. Reviewed in *Chimie & industrie* 21, 677-8(1929).

## C—BACTERIOLOGY

CHARLES B. MORREY

Biochemical method for preparing fats. V. KULIKOV. *Oil and Fat Ind.* (Russia) 1928, No. 4, 21-3.—K. succeeded in obtaining a non-virulent strain of the tubercle bacillus which formed a complete membrane during a growth of 3-4 days in molasses in broth. This culture contained 22-36% of fatty substances sol. in ether, and contained glycerides of the palmitic and stearic acids m. about 66° and waxes (ethers of higher alcs.) m. 70°. Solid fats of the type of coconut oil could be obtained by this method.

A. A. BOEHLINGK

Comment on the paper by Chikano: The preparation of *d*-tyrosine from racemic tyrosine by means of *Oidium lactis*. FELIX EHRLICH. Univ. Breslau. *Z. physiol. Chem.* 181, 140(1929); cf. *C. A.* 23, 1924.—C. has overlooked E.'s paper (*C. A.* 21, 2715) where a method is described which gives a better yield of *d*-tyrosine in a shorter time.

A. W. DOX

Further studies on the disinfection of dried anthrax films. G. POHL. *Z. Inf. parasit. Krankh. u. Hyg. d. Haustiere* 32, 304-38(1928); *Wasser u. Abwasser* 25, 163.—Chloramine,  $\text{Ca}(\text{OCl})_2$  with an active Cl content of 25%,  $\text{Na}_2\text{S}$ , Sulfo-liquid DS, tetralol, bromotetralol, tetralresorcinol,  $\text{NaCl}-\text{HCl}$ ,  $\text{HgCl}_2-\text{CH}_3\text{O}$ , and  $\text{NaOH}-\text{NaCl}$  were used in various concns. on exposed anthrax films. Only the  $\text{Na}_2\text{S}$ , 50-62% and the  $\text{NaCl}-\text{HCl}$  mixts. proved effective. Both chloramine and  $\text{Ca}(\text{OCl})_2$  contg. 25% active Cl were satisfactory surface disinfectants but did not possess good penetrating power.

C. R. F.

Bactericidal action of the nitroso compounds. EVELYN A. COOPER AND RAYMOND B. HAINES. Univ. Birmingham. *Biochem. J.* 23, 10-16(1929).—Nitroso compds. owe their slow germicidal action and marked inhibitory power to their gradual chem. interaction with the nuclear constituents of the cell, thus interfering with and retarding the biochem. mechanism of growth.

BENJAMIN HARROW

Relation of the growth of certain microorganisms to the composition of the medium. IV. The addition of mannitol. VERA READER. Oxford Univ. *Biochem. J.* 23, 61-7 (1929); cf. *C. A.* 22, 2960.—The increased weight of bacteria grown in the presence of mannitol is not due to increased fat production. Treatment with charcoal at various pH values and subsequent recrystn. failed to remove any growth-promoting factor from the mannitol. Mannitol prepd. from mannose (which has no growth-promoting effect) was found to be equally active. Dulcitol, sorbitol, glycerol and inositol cannot be substituted for mannitol.

BENJAMIN HARROW

Reduction potential, energy exchange and cell growth. Experiments with *B. coli*. JUDA HIRSCH QUASTEL AND WALTER REGINALD WOOLDRIDGE. *Biochem. Lab., Cambridge. Biochem. J.* 23, 115-37(1929).—Succinate and cysteine (or —SH) inhibit the anaerobic growth of *B. coli* in lactate-fumarate medium. Formate at low concns. increases the rate of proliferation of *B. coli* in this medium. The rate of growth is not dependent on the oxidation or reduction intensity of the environment.

B. H.

Antiseptic power of certain essential oils. A. MOREL AND A. ROCHAIX. Univ. Lyon. *Bull. sci. pharmacol.* 35, 631-4(1928); cf. *C. A.* 21, 3046, 3928.—The power of certain essential oils toward certain organisms such as the bacilli of Eberth or Loefler and staphylococci is not always superposable upon their disinfectant actions. Thus lemon oil which is active as a disinfectant has but slight antiseptic power. Thyme from thymol has 3 to 5 times the antiseptic power of thyme from carvacrol. Oil of *Eucalyptus citriodora* has about 10 times the antiseptic power of the oil of *E. globulus*. There is a diminution in the antiseptic power of essential oils on passing from the mol. state to the colloidal micellary state. This is attributed to the degree of dispersion and changed amt. of contact between the oil and the organism.

E. H.

Tests with the nutrient medium of Muller for the examination of feces. H. G. HOFERRE. Inst. for Tropical Hyg., Amsterdam. *Geneeskund. Tijdschr. Nederland. Indië* 69, 125-31(1929).—Growth of *B. coli* was very much inhibited. Typhoid and salmonella bacilli and proteus and paracoli bacteria grow well, but *B. dysenteriae* and *B. paratyphosus* are very much inhibited in growth. The use of the nutrient medium of Muller

is recommended for typhoid and salmonella bacteria in feces, in conjunction with an Endo plate. J. C. JURRIENS

**Proteolysis by *Streptococcus lactis*.** L. T. ANDEREGG AND B. W. HAMMER. *J. Dairy Science* 12, 114-28(1929).—Certain cultures of *S. lactis* showed a definite proteolytic activity in milk, while others did not. The butter cultures studied showed proteolysis in milk regularly.  $\text{CaCO}_3$  added to the milk showed more pronounced proteolysis than without addn. Sterile lactic acid added to milk in quantities approximating those developed by *S. lactis* cultures did not increase the amt. of sol. N at room temp. An increase of sol. N through the growth of *S. lactis* in milk usually caused an increase in amino N as detd. by the Van Slyke method. Addn. of peptone appeared to retard protein decompn. rather than accelerate it. In general, protein decompn. with *S. lactis* occurred with cultures coagulating milk rapidly, while no decompn. took place with cultures coagulating slowly. *S. citrovorus* and *S. paracitrovorus* did not cause proteolysis when grown in milk. J. C. JURRIENS

**Bacteria which oxidize indole to indigo.** A. J. KLUYVER. *Nederland. Tijdschr. Hyg. Microbiol. Serol.* 3, 308-13(1929).—A lecture demonstration with discussion. J. C. JURRIENS

**Bacterium gluconium, an organism present in the so-called Kombucha (a mold of the Japanese or Indian tea).** SIEGWART HERMANN. Deutsche Univ., Prague. *Biochem. Z.* 205, 297-305(1929).—A morphological and physiol. study. S. MORGULIS

**Enzymic dismutation through the ketone-aldehyde mutase of *B. subtilis*.** ANTONIO GUALDI. Kaiser Wilhelm Inst. für Biochem., Berlin-Dahlem. *Biochem. Z.* 205, 318-9(1929).—The dismutation of phenylglyoxal hydrate by *B. subtilis* has been investigated. An almost 100% yield of mandelic acid was obtained, of which 84% was the *l*-form. S. MORGULIS

**Increased sensitivity of microbes toward proteolytic enzymes.** P. V. SMIRNOV. State Microbiol. Inst., Narkonizdrav, Moscow. *Zhur. expl. Biol. Med.* 10, 637-40(1929).—As a result of repeated treatment of *B. dysent.* Shiga cultures with small quantities of trypsin the organisms show an increased sensitivity toward proteolytic enzymes, and the cultures undergo autolysis more readily. S. MORGULIS

**The formation of uric acid by bacteria.** K. SCHLOSSMANN. *Centr. Bakt., Parasitenk.*, I Abt., 110, 78-84(1929).—A no. of common bacteria can produce uric acid in peptone media. It is the result of enzyme action on purine bases. The substances which give the uric acid reaction with phosphotungstic acid can be removed from filtrates with ether or  $\text{CHCl}_3$ . Uric acid may also be formed in purine-poor solns., indicating that it may be synthesized by bacteria. This property is species const. and may be utilized in identifying closely related species. JOHN T. MYERS

**The problem of bacterial variation.** V. MELNYK. Bact. Inst. zu Kiew. *Centr. Bakt., Parasitenk.*, I Abt., 110, 113-20(1929).—Seventeen strains of staphylococci were grown on agar contg. from 0.1% to 0.55% of phenol. All grew immediately at 0.1%; 16 strains grew at 0.15 and 0.2%; 15 at 0.25%; 12 at 0.3%, and 2 at 0.35%. None grew at higher concns. One strain acquired the ability to grow at 0.1% after 78 transfers on phenol agar. Phenol changed the colony form to small streptococcus-like colonies. About 20 transfers on standard agar restored the original form. Ability to grow in the presence of phenol had no appreciable effect on sensitivity to higher temperatures. JOHN T. MYERS

**Bacteriophage in the water of the Don.** D. BUYANOVSKII. Staat. Microbiol. Inst. Rostow and Don. *Centr. Bakt., Parasitenk.*, I Abt., 110, 120-5(1929).—The water of the Don has a bactericidal effect on most members of the intestinal group. The effect is destroyed by boiling. This property is probably due to a bacteriophage, whose action is best explained on the theory of d'Herelle. JOHN T. MYERS

**The biological difference between heated and unheated pneumococcus-antigens.** III. **The toxicity of normal culture filtrate (NF), of heated culture filtrate (FK), and standard vaccine, as used for animal immunization.** S. YAMAMOTO. Der kais. Univ. zu Kyoto. *Centr. Bakt., Parasitenk.*, I Abt., 110, 151-5(1929). IV. **Interference with spontaneous phagocytosis of pneumococci by unheated culture filtrate (NF), and heated filtrate (FK).** *Ibid* 156-60.—The relative toxicity of "NF," "FK" and vaccine for rabbits is in the ratio of 1:2:6. Both filtrates interfere with phagocytosis, but this property is independent of toxicity. Active immunity decreases with decreasing phagocytosis. "NF" decreases phagocytosis and increases the leucytosis. J. T. M.

**Decolorization, growth inhibition and bactericidal effects of dyes on the tubercle bacillus.** GERTRUD MEISSNER. *Centr. Bakt., Parasitenk.*, I Abt., 110, 172-8(1929).—Tubercle bacilli were grown by Wright's method, suspensions being made in guinea-pig blood plus the substance to be studied, sealed in capillary pipets and incubated.



A group affinity exists between tubercle bacilli and certain chem. substances. A thousand org. and inorg. substances were studied. Substances which inhibit in the tubes also inhibit in guinea pigs.

JOHN T. MYERS

**Demonstration of a new culture medium (heated blood plates).** WETHMAR. *Centr. Bakt., Parasitenk.*, I Abt., 110, 190-2(1929).—Blood-agar plates were heated 1.5 hrs. at 60°. They assumed a Burgundy-red color. Influenza bacilli and others grow readily.

JOHN T. MYERS

**Studies on the physical affinity of bacterial cells to the dyestuffs.** I. The behavior of bacterial cells toward dyes as influenced by the hydrogen-ion concentration. ETSUO YURI. Univ. Kyoto. *Acta Schol. Med. Univ. Imp. Kioto* 11, 75-95(1928).—The adsorption of dyes occurring on addn. of a dye soln. to a suspension of bacteria at various H-ion concns. was followed microscopically and colorimetrically. The bacteria used for the expts. were: *Bacillus typhosus*, *B. coli*, *B. pyocyaneus*, *B. cholerae*, *B. subtilis*, *B. anthracis*, *B. prodigiosus*, *Sarcina* and *Staphylococcus*. More than 300 dyes were tested. All expts. were carried out in buffered solns. Conclusions: It is confirmed that the affinity between bacterial cells and dyes is controlled largely by the  $p_H$  of the fluid. There are 3 types of behavior of the bacteria cells toward the dyes, the different behavior depending solely on the nature of the dye and not at all on the types of bacteria used. Basic dyes combine with bacterial cells only in alk. or slightly acid soln.; acid dyes combine only in strong acid soln. There were a few dyes that stained only very little or not at all, irrespective of the  $p_H$ . Y. believes that the electrostatic affinity plays the most important role in the adsorption processes. The value of dye therapy may be increased by proper control of the  $p_H$ . Numerous references are given. II. **The mode of combination of bacterial cells with dyestuffs.** *Ibid* 97 115.—Y. investigated the question whether bacterial cells combine with dyes on account of chem. affinities or on account of a mere phys. adsorption. About 60 acid and some basic dyes were employed. *B. anthracis* and *Sarcina lutea* were used in most of the expts. A 0.05 mol. soln. of secondary Na citrate served as the buffer soln. for the acid dyes, a 0.033 *N* soln. of acid phosphate was used for the basic dyes. Different quantities of the dye soln. adjusted to the  $p_H$  desired were added to 1 cc. of the bacteria suspension contg. about 1 mg. of organisms. The resulting solns. were made up to a const. vol. by adding buffer soln. Then the solns. were kept at 37° for 30 mins. and the adsorbed amts. of dye were detd. colorimetrically. As to the acid dyes, it was observed that the combination with bacteria occurs exactly according to the formula of the adsorption isotherm of Freundlich, the exponent  $\alpha$  and the const.  $k$  in the formula being characteristic for the types of bacteria and dyes employed.  $\alpha$  has a positive sign and varies between 0.03 and 1.0, while the values for  $k$  vary between 0.26 and 9.8 ( $p_H$  3.0). With increasing H-ion concn.  $k$  becomes greater, while  $\alpha$  decreases. With some dyes  $\alpha = 1$ , i. e., the relative amt. of the dye fixed by the bacterial cells remains const. at various concns. of the dye. In these cases only  $k$  varies and  $\alpha$  remains const. irrespective of the  $p_H$  and the types of bacteria used. With basic dyes the adsorption processes are much more complicated. In some cases the adsorption law seemed to be valid within certain limits of the dye concn.

G. SCHWOCH

CARTER, CHARLES F.: **Bacteriology for Nurses.** St. Louis: C. V. Mosby Co. 213 pp. \$2.25. Reviewed in *Am. J. Pub. Health* 18, 1440(1928).

## D—BOTANY

THOMAS G. PHILLIPS

**The ergosterol content of yeast.** A. HEIDUSCHKA AND H. LINDNER. Tech. Hochschule Dresden. *Z. physiol. Chem.* 181, 15-23(1929).—For the prepn. of ergosterol from yeast the method of Windaus and Grosskopf (*C. A.* 17, 2417) gives the best yield. Their procedure consists in sapong. the yeast mass with alc. KOH and extg. the dild. filtrate with Et<sub>2</sub>O. A simplification of this procedure now obviates the necessity of shaking a large vol. of soap soln. with Et<sub>2</sub>O. Two kg. of yeast are stirred in a porcelain dish with 1750 cc. of 96% EtOH, transferred to a 5-l. flask and 400 g. KOH added. The mixt. is refluxed 6 hrs. on a water bath, then filtered and the residue again boiled with 3 l. EtOH and 100 g. KOH and filtered as before, and the final residue washed with 250 cc. EtOH. The combined filtrates are evapd. to 800 cc. and cooled to 0° for 25 hrs. The crystals which sep. are filtered off, and a 2nd crop is obtained in the same manner after concg. the mother liquor to 1/3 its vol. These crystals of ergosterol are now placed in a Soxhlet app. and extd. with Et<sub>2</sub>O, the solvent is evapd. and the residue recrystd. from EtOH. For detn. of ergosterol 2 g. of the fresh yeast are rubbed with 2 g. of sand, and the mass is sapond. by boiling 1 hr. with 40 cc. of 25% aq. KOH.

After cooling, the soap soln. is shaken 5 times with 75-cc. portions of  $\text{Et}_2\text{O}$ , the solvent evapd. and the residue taken up in 50 cc.  $\text{C}_6\text{H}_6$ . Five cc. of this  $\text{C}_6\text{H}_6$  soln. is treated with a freshly prepd. mixt. of 2 cc.  $\text{Ac}_2\text{O}$  and 6 drops concd.  $\text{H}_2\text{SO}_4$ . The mixt. is placed in a thermostat at  $18^\circ$  for 2 mins. and then compared in a colorimeter in monochromatic light with a standard. The latter is an aq. soln. of naphthol green B which has been standardized against ergosterol solns. of known concn. By this method the ergosterol content of 10 organisms, including baker's yeast, brewer's yeast, *Torula* yeast and several molds, was detd. On the dry basis the ergosterol content ranged from 0.20% in *Torula pulcherrima* to 1.17% in a press yeast. There was less variation in different yeasts under uniform culture than in the same yeast (*Sacch. cerevisiae*) under different conditions of culture medium, aeration, etc. The highest value, 1.10%, was obtained by growing the organism on a wort medium and passing in O at frequent intervals. Addn. of 5%  $\text{EtOH}$  increased the yield of ergosterol to 0.92%, while addn. of 0.15%  $\text{Na}_2\text{HPO}_4$  decreased it to 0.34%.

A. W. DOX

**Physiological shrinkage of potatoes in storage.** C. O. APPLEMAN, W. D. KIM-BROUGH AND C. L. SMITH. Md. Agr. Expt. Sta., *Bull.* 303, 159-75(1928).—The ratio between loss in wt. of potatoes and wt. of  $\text{H}_2\text{O}$  evapd. from atmometers was detd. for different varieties and conditions during the storage season. Variations of these ratios from a certain const. indicate that internal factors such as respiration are influencing loss in wt. Internal factors are especially effective in the early and late storage periods, and much less so during the middle of the storage season. Varietal differences appeared only during early and late storage. The more rapid loss of wt. of immature potatoes at low temp. is probably due to delayed cork formation at the lower temp. C. R. F.

**Determination of small quantities of starch in vegetable tissue.** ERNEST J. B. BISH. Univ. Bristol. *Biochem. J.* 23, 31-4(1929).—The method depends upon the principle of relating the Cu-reducing power of the hydrolyzed starch in the plant material to the reducing power of known quantities of a carefully purified starch prepn.

BENJAMIN HARROW

**Note on the characterization of the anthocyanins and anthocyanidins by means of their color reactions in alkaline solutions.** ALEXANDER ROBERTSON AND ROBERT ROBINSON. Univ. Manchester. *Biochem. J.* 23, 35-40(1929).—The colors of several of these compds. are described.

BENJAMIN HARROW

**Nature of the unsaponifiable fraction of the lipid matter extracted from green leaves.** EDITH CLENSHAW AND IDA SMEDLEY-MACLEAN. Lister Inst., London. *Biochem. J.* 23, 107-109(1929).—From spinach was obtained hentriacontane,  $\text{C}_{31}\text{H}_{64}$ . Green leaves and fish-liver oils both give (1) a highly unsatd. hydrocarbon, (2) products which may be regarded as obtained from the higher fatty acids by processes of condensation and reduction, and (3) sterols.

BENJAMIN HARROW

**Biochemistry of dry-rot in wood.** EUSTACE C. BARTON-WRIGHT AND JAMES G. BOSWELL. King's College, London. *Biochem. J.* 23, 110-4(1929).—The effect of the fungus *Merulius lachrymans* (the cause of dry rot in wood) is to remove the galactan, mannan and cellulose fraction in spruce-wood. The hemi-celluloses and lignin are not affected.

BENJAMIN HARROW

**Studies in the wilt disease of cotton in the Bombay Karnatak. III. The pathogeny of wilting in cotton plants.** G. S. KULKARNI AND B. B. MUNDKUR. Agr. Research Inst., Pusa. *Memoirs Dept. Agr. India, Botanical Ser.* 17, 21-7(1928).—The active factor causing wilt in cotton plants appears to be a chem. compd. or compds. occurring in the liquid in which the fungus (*Fusarium vasinfectum*) has grown. This compd. is not destroyed by boiling and is not removable by filtration through porcelain filters. It is not destroyed by heating the filtrates in an autoclave at  $110-115^\circ$ . The nature of the compd. was not detd., but lactic and oxalic acids are definitely excluded and nitrates do not appear to be the cause of the result noted. The solns. in which the fungus had grown were not only fatal to susceptible types of cotton but they also caused wilt symptoms in resistant types and even in types which are considered to be immune.

K. D. JACOB

**Proteins of the avocado (*Persea americana* Mill).** D. BREESE JONES AND CHARLES E. F. GERSDORFF. Bur. of Chem. and Soils. *J. Biol. Chem.* 81, 533-9(1929).—Ripe avocados contain 3 different types of proteins: a globulin contg. 15.31% of N, coagulating at  $68^\circ$ , sol. in 10%  $\text{NaCl}$  and pptd. both by addn. of  $\text{AcOH}$  and by making the soln. 67% satd. with  $(\text{NH}_4)_2\text{SO}_4$ ; a 2nd protein contg. 13.42% of N is obtained by acidifying a 0.1 N, 60% alc.  $\text{NaOH}$  ext. of the residue remaining after the extrn. with  $\text{NaCl}$ ; the 3rd protein contg. 16.23% of N is pptd. by dilg. the slightly acidified alc. filtrate with several vols. of  $\text{H}_2\text{O}$ . The 3 proteins contain the following % of amino acids, resp.: arginine 7.94, 4.46, 12.94; histidine 0.59, 2.04, 0.99; lysine 7.06, 6.71,

2.95; cystine 2.03, 1.84, 1.80; tryptophan 2.12, 0.38, 1.07; tyrosine 7.01, 4.92, 2.81.

A. P. LOTHROP

Studies on plant colloids. XXII. Potato amylopectin, prepared according to different methods. M. SAMEC. Univ. Laibach. *Biochem. Z.* 205, 104-10(1929); cf. *C. A.* 22, 4863; 23, 1931.—The physico-chem. properties of amylopectin prep'd. from potato by the methods of Gruzewska, Tanret, Zwicker, Ling-Nanji, Pringsheim-Wolfsohn, or by the baryta method have been compared, and were found to be practically identical.

S. MORGULIS

Characterization of *Aspergillus niger* strains. II. The significance of acid substrates for the characterization and propagation of fungi. K. BERNHAUER. Deutsche Univ., Prag. *Biochem. Z.* 205, 240-4(1929); cf. *C. A.* 23, 179.—The addn. of acids makes it possible to differentiate strains of fungi characterized by large acid production by their acid resistance. Furthermore, different strains manifest variable resistance toward different acids. Thus some are much more resistant against HCl than  $H_2PO_4$ .

S. MORGULIS

Chemistry and physiology of plant phosphatides. VIII. The phosphatides of yeast. V. GRAFE. Neue Wiener Handelsakad. *Biochem. Z.* 205, 256-8(1929).—When yeast is autolyzed under sterile conditions at 28-30° and is then dialyzed against cold distd. water, the dialyzate contains no protein (protein is present if the dialysis is at a temp. above 15°) but shows much N and P. By various tests it has been established that the N and P are components of phosphatides. The phosphatides cannot be removed from unautolyzed yeast. It is therefore concluded that in the yeast the phosphatide forms a complex with the protein. When this is destroyed by enzyme action the phosphatide becomes dialyzable.

S. MORGULIS

The loss of nitrogen in the process of drying plants. NICOLAI IVANOV and M. I. LISHKEVICH. *Biochem. Z.* 205, 329-48(1929).—The compn. of the dry substance of plants varies according to the method of drying, the dry wt. being a function of the temp. After a const. wt. has been attained at 75°, *in vacuo*, a new const. wt. can be produced at 105°, but at this higher temp., also some N in the form of  $NH_3$  is lost. The loss at 105° is very slight or actually nil in the case of plants contg. their N chiefly in the form of protein, but material contg. labile N products, as for instance mushrooms, loses 18% of its total N, so that when dried at 75° these possess 11.76% of the dry substance in the form of N and only 10.65% N when dried at 105°.

S. MORGULIS

Can dead leaves still assimilate? OLUFSEN. *Mikrokosmos* 22, 50-1(1928).—A review of the work of H. Molisch (*Z. Botan.* 17, 577-93(1925)) which shows that green leaves dried at a low temp., and then moistened, give off O on exposure to light.

GEO. W. MUHLEMAN

The composition of spinach fat (SPEER, *et al.*) 27. The unsaponifiable fraction from spinach fat (HEYL, *et al.*) 27. The occurrence of euxanthone in the heart wood of *Platonia insignis* Mart (SPOELSTRA, VAN ROYEN) 10.

## R.—NUTRITION

PHILIP B. HAWK

Comparative study of the value of biological and physical tests of irradiated ergosterol. RENÉ FABRE and HENRI SIMONNET. *Compt. rend.* 188, 424-6(1929); cf. *C. A.* 23, 421.—According to the light treatment to which ergosterol has been submitted the product may consist of a mixt. of vitamin D and ergosterol or of vitamin D and its degradation products, and, while having the same antirachitic action, will have entirely different ultra-violet absorption curves.

DAVID DAVIDSON

The effect of diet upon reproduction. D. MACOMBER. *J. Am. Dietet. Assoc.* 3, 57-67(1927); *Expt. Sta. Record* 58, 691.—M. summarizes briefly the literature on the effect of dietary deficiencies in protein, mineral elements, and vitamins on the reproductive processes, and discusses what should be included in a normal balanced diet from the point of view of reproduction. Such a diet should include meat once a day as a source of animal protein and Fe; sea fish once or twice a week to supplement the meat proteins and to supply I; one egg a day for its protein, fat-sol. vitamins, and Fe; from 2 to 4 glasses of milk daily for protein, Ca, P and vitamins; fresh fruits once a day as a source of vitamin C; liberal amts. of butter for vitamin A; and some whole grain cereals for vitamin B. In addn. there should be liberal amts. of leafy vegetables, some one of which should be eaten raw, and occasionally root vegetables, seeds such as peas and beans, and nuts. Modifications of such a diet for overweight and underweight subjects are discussed.

H. L. D.

Results of vitamin investigation. FREITAG. *Pharm. Ztg.* 74, 317-9(1929).—A

general discussion of the subject in connection with the practical importance of the several vitamins in our food products. W. O. E.

**An experiment in the free-choice feeding of mineral supplements to dairy cattle.** W. B. NEVENS. Ill. Agr. Expt. Sta., *Bull.* 316, 118-24(1928).—No particular craving or desire for mineral supplements other than for common salt was demonstrated in the dairy cattle kept under the conditions of this expt. The cattle were kept in barns and dry lots, under ordinary herd conditions, and were fed rations consisting of well-cured legume hay, corn silage, and a grain mixt. contg. protein feeds rich in P. In addn. common salt, finely ground limestone, and bone meal of feeding grade were supplied free-choice. Almost insignificant amts. of the limestone and bone meal were consumed when offered in this manner. Feeding common salt at the rate of 1% of the grain mixt. is insufficient to satisfy the desires of dairy cattle for this compd. When additional salt was supplied in feed boxes in the exercising yards, larger amts. were consumed. C. R. F.

**Investigations in poultry nutrition.** A. R. LEE. "O. K." *Poultry J.* 18, 70(1929); *Squibb Abstr. Bull.* 2, A-69.—In growing chicks on a ration of yellow corn, meat meal or dried milk and minerals, increasing the cod-liver oil above 2%, the use of yeast, and variation of the proportions of Ca and P in the mineral mixt., did not prevent leg weakness; the pathol. condition was, however, largely prevented by the addn. of 15% of either bran or middlings to the ration, in addn. to the use of cod-liver oil. The value of cod-liver oil in the feeding of young chicks confined to the brooder house was estd. In hens receiving no direct sunlight, much better laying and more healthy birds resulted under the influence of cod-liver oil addn. Sunlight was shown to be vital in hatchability, egg wt. and shell wt. Where it was lacking, cod-liver oil was of material help. C. R. F.

**Effect of fluorine in dairy cattle ration.** GEO. E. TAYLOR. Mich. Agr. Expt. Sta., *Quart. Bull.* 11, 101-4(1929).—In view of the occasional substitution of raw rock phosphate for steamed bone meal as a mineral supplement in the animal ration, expts proved the decided inferiority of the former. Its continued use had a very detrimental effect on the health of dairy animals. In a 20-day feeding test where  $\text{Ca}_3(\text{PO}_4)_2$  constituted 3% of the grain mixt., the appetites were poor, there was a loss in flesh, the coat was rough and the animals were irritable. A 5-yr. feeding test using 1.5% rock phosphate showed similar results. In an attempt to det. the reason for the inimical effect of the raw rock phosphate, the rock was analyzed and found to contain 3% of F.  $\text{CaSiF}_6$  was then fed to animals with results similar to the rock phosphate expts. As little as 0.125% F in the ration was decidedly detrimental to the animals' health. F interfered with the normal development of the teeth of dairy cows. C. R. F.

**Iron in nutrition; a new inorganic factor as a supplement to iron in hemoglobin building.** E. B. HART. Univ. of Wisc. *Wisc. Med. J.* 28, 60(1929); *Squibb Abstr. Bull.* 2, A-163.—Expts. were performed which assign to Cu a definite and sp. role as a supplement to Fe in the synthesis of hemoglobin in the mammal. Profound anemia produced in young rats by a whole milk diet could not be corrected by the daily feeding of 0.5 mg. of Fe administered as the chloride, sulfate, acetate, citrate or phosphate, but when this same level of Fe was obtained from dried liver or the ash of dried liver, corn grain, or lettuce, the hemoglobin titer regained a normal level accompanied by normal growth and restoration to normal vigor.  $\text{CuSO}_4$  was tried as a supplement to pure  $\text{FeCl}_3$  which in a daily dose of 0.5 mg. was potent in conjunction with the Eli Lilly liver prepn. for pernicious anemia or the ash of the latter or lettuce, in correcting the anemia produced in rats. The striking, consistent and thus far always successful results are illustrated by the fact that in an animal with a hemoglobin titer of approx. 2.5 g. of hemoglobin per 100 cc. of blood, the daily addn. of either 0.01 mg., 0.05 mg., 0.10 mg., or 0.25 mg. of Cu as pure  $\text{CuSO}_4$  plus 0.5 mg. of Fe as  $\text{FeCl}_3$  progressively restored the hemoglobin level to normal. The ash of the (Eli Lilly) liver prepn. used in the treatment of pernicious anemia owes its potency in the treatment of 1 type of anemia, when fortified with Fe, to its Cu content as demonstrated by fractionation with  $\text{H}_2\text{S}$  in HCl soln. No evidence of the existence in liver of an indispensable org. factor for hemoglobin building of anemia exists. This same statement is true concerning the ash of lettuce. C. R. F.

**Studies of inorganic salt metabolism. I. The ward routine and methods.** W. BAUER AND J. C. AUB. *J. Am. Dietet. Assoc.* 3, 106-15(1927); *Expt. Sta. Record* 58, 690-1.—A detailed description is given of the routine developed in the Mass. General Hospital for the study of Ca and P metabolism. Two specimen low-Ca diets are given, together with a tabulation of the Ca and P content of all of the foods used. Figures for Ca not hitherto reported are as follows: milk-free bread 0.011, chicken (white meat)

0.016, chicken (dark meat) 0.02, graham crackers 0.025, Uneeda crackers 0.022, gingerale 0.0006 and 0.0005, ham 0.022, lactose 0.0004, liver, 0.006, low-calcium fudge 0.003, steamed potato 0.011, cooked rice 0.006, round lean steak 0.008, canned tomatoes 0.005, turkey 0.008, goose 0.012, cranberries 0.013, Klim 0.996, and Vegex 0.019 per cent. New figures for phosphorus are broiled bacon 0.096, milk-free bread 0.082, chicken (white meat) 0.164, chicken (dark meat) 0.158, graham crackers 0.111, gingerale 0.001, lactose 0.004, liver 0.275, low-calcium fudge 0.008, steamed potato 0.0475, cooked rice 0.075, fat round steak 0.172, lean round steak 0.172, canned tomatoes 0.042, turkey 0.212, and Vegex 1.17%.

H. G.

**Some sources of vitamin C in India.** R. C. WATTS. *Indian Med. Gaz.* **64**, 79-85 (1929).—The results of a group of expts. in which the basal diet was supplemented by "standard" milk prove that 15 g. of vegetable marrow and 10 g. of pumpkin and melon pumpkin are capable of protecting guinea pigs from scurvy. The effect of feeding various materials low in vitamin C content is discussed. Charts are given in which the dietetic value of *Citrus medica var-acida* for guinea pigs is shown to be capable of protecting these animals from the disease discussed. Post-mortem examns. are fully described. This work is most complete.

FREDERICK G. GERMUTH

**Researches on the phosphoamino lipoids and the sterols of blood plasma and serum.** M. A. MACHEBOEUR. *Compt. rend.* **188**, 109-11 (1929).—By a series of pptns. and solns. of blood plasma or serum, with  $(\text{NH}_4)_2\text{SO}_4$  at varying  $p_{\text{H}}$  values, a fraction was obtained whose compn. remained const. on further treatment. This fraction contained 22.7% phosphoamino lipoids, 17.9% cholesterol esters and 59.1% protein. It was sol. in neutral or alk.  $\text{H}_2\text{O}$ . The physico-chem. properties of the substance, which the author considers as a definite *protein-lipoid* complex, differed markedly from the properties of its constituents.

ARTHUR GROLLMAN

**Liver therapy in scurvy.** H. ARON, H. HIRSCH-KAUFFMANN AND E. SCHÄDRICH. *Klin. Wochschr.* **7**, 2484 (1928).—A freshly prepd. liver ext. contains vitamin C and protects guinea pigs against scurvy. The liquid exts. found on the market do not contain vitamin C.

MILTON HANKE

**Antirachitic action of irradiated ergosterol and its effect upon the arteries.** WOLFGANG HEUBNER. *Klin. Wochschr.* **8**, 407-8 (1929).—The fact that excessive doses of irradiated ergosterol may lead to arteriosclerosis seems to be well established. Adam (*Klin. Wochschr.* **7**, 1825-8 (1928)) claims that the toxic action upon the arteries may be due to impurities and that the prepn., Präformin, has no toxic action. Präformin is, however, highly toxic, and large doses—40 mg. per day to large rabbits—are fatal in 9-10 days. The arteriosclerosis is marked. This prepn. has an antirachitic action of only 0.1 that of Vigantol.

MILTON HANKE

**The factor that protects rats against pellagra.** WERNER KOLLATH. *Klin. Wochschr.* **8**, 408-9 (1929).—K. concludes, from expts. on rats, that alk. hematin supplies the P-P factor and thus protects rats against pellagra. The rats die, after 4-6 weeks, with typical symptoms of beriberi.

MILTON HANKE

**The assay of vitamin D preparations by the protection method.** ARTHUR SCHEUNERT AND MARTIN SCHIEBLICH. *Klin. Wochschr.* **8**, 699 (1929).—White rats weighing 35 g. are placed on McCollum's rickets-producing diet. The animals are divided into groups of 10. The diet of each group is augmented with a known amt. of the ergosterol prepn. The dose is graded. Röntgenographic examns. are made after 14 days. Nine or all of the 10 animals receiving no vitamin D must, at this time, show unmistakable signs of scurvy in the knee joints. The protective unit (S E D) is represented by that quantity of the prepn. that will show normal bone development in 8 of the 10 animals of that group. This method is exact and rapid. An assay on 3 commercial preps. is reported. Vigantol is said to be a 1% soln. of irradiated ergosterol. One cc. of Vigantol contains 25,000 S E D. Radiostol and Präformin contain 2000 and 800-1000 S E D, resp., per cc.

MILTON HANKE

**Vitamins in canned foods. VII. Effect of storage on vitamin value of canned spinach.** WALTER H. EDDY, E. F. KORMAN, AND NELLIE HALLIDAY. *Ind. Eng. Chem.* **21**, 347 (1929); cf. *C. A.* **19**, 683.—The quantity of vitamins A and C in spinach stored 3 years was practically the same as that in freshly canned. The 2 factors in vitamin B were not known when the first tests were made, so no comparison of this could be made. Cooked spinach is probably richer in the antipellagric vitamin which is not easily destroyed by heat.

AMY LEVESCONTE

**Superiority of whole wheat bread.** J. F. LYMAN. Ohio State Univ. *Am. Med.* **34**, 794-8 (1928).—Whole wheat is favorable in its action on the elimination of intestinal waste. It promotes the utilization of the protein of the diet, maintains a healthy condition, produces larger adult animals and larger litters of young.

F. K.

The residue, high-caloric diet. GEORGE E. KNAPPENBERGER. Univ. of Kansas. *Am. Med.* 34, 890-5(1928).

FRANCES KRASNOW

The vitamin A, B and C contents of artificially versus naturally ripened tomatoes. MARGARET C. HOUSE, P. MABEL NELSON AND E. S. HABER. Iowa Agr. Expt. Sta. *J. Biol. Chem.* 81, 495-504(1929).—The vitamin A, B and C contents of green and air-, ethylene- and vine-ripened tomatoes were compared. The method of ripening does not alter the vitamin B content of the green fruit. Ripened tomatoes are richer in vitamin A than the green mature fruit irrespective of the method of ripening. Green tomatoes are relatively poor in vitamin C. Vine-ripened tomatoes contain more vitamin C than the artificially ripened fruit which in turn is considerably superior to the green fruit. The com. method of ripening tomatoes in an air-ethylene mixt. produces fruit which is equally as rich in vitamins A, B and C as fruit which has been picked green and ripened in air.

A. P. LOTHROP

The association of vitamin A with greenness in plant tissue. II. The vitamin A content of asparagus. JOHN W. CRIST AND MARIE DYE. Michigan State Coll. *J. Biol. Chem.* 81, 525-32(1929); cf. *C. A.* 21, 2921.—Sufficient vitamin A to promote health and growth in rats is furnished by 0.1 g. daily of green asparagus, whether fresh, freshly cooked or canned. When as much as 0.5 g. of bleached asparagus is fed, the animals died as rapidly as the negative controls. The poor quality of bleached asparagus as food may not be due alone to vitamin A deficiency as cooking in open-kettle fashion effected an improvement in its nutritive value though not rendering it comparable to the green product similarly cooked. Green asparagus contains less H<sub>2</sub>O and Fe than bleached but more ash, N, S, Ca, P and probably Mn. These data support the conclusion that the vitamin A content of plant tissue is associated with its greenness.

A. P. LOTHROP

Amino acid catabolism. II. The fate of  $\beta$ -alanine and  $\epsilon$ -aminocaproic acid in the phlorhizinized dog. RALPH C. CORLEY. Tulane Univ. Med. School. *J. Biol. Chem.* 81, 545-9(1929); cf. *C. A.* 20, 3724.—The  $\omega$ -amino acids,  $\beta$ -alanine and  $\epsilon$ -aminocaproic acid, are not sugar formers in the completely phlorhizinized dog. A. P. L.

The influence of diet on the body fat of the white rat. H. C. ECKSTEIN. Univ. of Michigan Med. School. *J. Biol. Chem.* 81, 613-28(1929).—"Lipids obtained from rats on diets devoid of preformed 'fat' were analyzed and compared with those obtained from animals ingesting fatty substances of known compn. Lipids obtained from animals on a diet consisting almost entirely of protein were similar to those secured from animals on diets contg. the usual amts. of protein, large amts. of carbohydrate, but free from preformed 'fat.' A definite change in the nature of the lipids was obtained as the result of the ingestion of myristic acid, olein and Na butyrate. The butyryl radical was apparently not deposited in the tissues, while the other 2 were. Arachidonic and linoleic acids were always present in the tissues of the rat and while the contents of the total lipids were found to vary considerably with the diets the amt. of more highly unsatd. acids was appreciably altered only by the feeding of olein. The % of cholesterol in the rats was found to be const. and independent of the diets used."

A. P. LOTHROP

Vitamin B terminology. R. ADAMS DUTCHER, et al. *Science* 69, 276(1929); cf. *C. A.* 22, 4155.—The Committee on Vitamin B Nomenclature of the Am. Soc. Biol. Chemists after much correspondence with various investigators decided to make the following recommendations: (1) That the term "bios," as suggested by the British workers, be retained to denote the factor or factors encouraging the rapid growth of yeast cells; (2) that the term "B" be restricted to designate the more heat-labile (antineuritic) factor; (3) that the term "G" be used to denote the more heat-stable water-sol., dietary factor, called the P-P (pellagra-preventive) factor by Goldberger and associates, and which also has to do with maintenance and growth; and (4) that the naming of newly discovered dietary factors, by other than descriptive terms, should be discouraged until their identity is established beyond question. G. H. W. LUCAS

Seasonal variations in basal metabolism. FLORENCE L. GUSTAFSON AND FRANCIS G. BENEDICT. Wellesley College and Carnegie Inst., Washington. *Am. J. Physiol.* 86, 43-58(1928).—Detns. on 20 college women indicate that basal metabolism tends to be at a low level in the winter and to rise to a higher level during spring and summer. In many of the results there was a hint that metabolism is lowered during the menstrual period.

J. F. LYMAN

Factors which determine renal weight. V. The protein intake. HAYON M. MACKAY, LOIS L. MACKAY AND T. ADDIS. Stanford Univ. *Am. J. Physiol.* 86, 459-65(1928).—A linear relationship between renal wt. and protein intake for 70-day-old rats was demonstrated. VI. Influence of age on the relation of renal weight to

the protein intake and the degree of renal hypertrophy produced by high-protein diets. *Ibid* 466-70.—The relation between renal wt. and protein intake was the same for adult as for young rats.

J. F. LYMAN

The nervous system in rats fed on diets deficient in vitamins B<sub>1</sub> and B<sub>2</sub>. RUBY O. STERN AND G. MARSHALL FINDLAY. Lab. of the Imperial Cancer Research Fund, London. *J. Path. Bact.* 32, 63-9(1929).—Rats fed on a diet deficient in both vitamin B<sub>1</sub> and B<sub>2</sub> exhibit only slight chromatolytic changes in the ganglion cells of the cord. If only B<sub>1</sub> is deficient the same changes occur but to a less extent for the same duration of life. In addn., when symptoms of paralysis are of long standing, early degeneration may be found in the myelin of the peripheral nerves when one or both factors are missing. If only B<sub>2</sub> is lacking there is swelling and vacuolization of the anterior horn cells of the cord with deposition in them of lipochrome pigment, a noticeable increase in the surrounding satellite cells, and an increase in the no. of  $\pi$  granules in the peripheral nerves.

JOHN T. MYERS

Utilization of sulfur by animals. T. BRAILSFORD ROBERTSON. Australia Council Sci. Ind. Research, *Bull.* 39, 5-51(1928).—A detailed review of the literature with complete bibliographical references. The article contains an excellent review of the history of cystine and other S-contg. amino acids, and the relation of these S-compds. to the nutrition of sheep, with especial emphasis on the importance of S-contg. amino acids in the growth of wool.

N. M. NAYLOR

Cod-liver oil and the antimony trichloride reaction for vitamin A. PHILIP B. HAWK. *Science* 69, 200(1929).—A preliminary report. Observations initiated in Norway and continued in this country indicate that cod-liver oil exposed to air, etc., shows a deeper blue color with the SbCl<sub>3</sub> reagent than the oil kept in the dark in order to preserve the vitamin A. This together with other observations causes H. to question the validity of the SbCl<sub>3</sub> reaction for this vitamin. The animal assay according to H. is the only accurate method by which cod-liver oil may be assayed for vitamin A.

N. M. NAYLOR

Influence of vitamin A on hypercholesterolemia. HIDEO KIMURA. Univ. Kyoto. *Acta Schol. Med. Univ. Imp. Kyoto* 11, 319 24(1928).—Hypercholesterolemia was produced in rabbits by daily feeding them with an emulsion of 0.5 g. cholesterol in 2.5 g. olive oil for 5 days in addn. to their diet. The return of the cholesterol to the normal level, which in the controls occurred after several weeks, was not accelerated by adding 0.5 cc. of a 1.5% soln. of *bioslerin*, a purified vitamin A prepn., to the standard diet. On the contrary, the hypercholesterolemia persisted in the test animals for a slightly longer period than in the controls. Similarly, an addn. of 10 cc. cod-liver oil to the diet of hypercholesterolemic rabbits failed to influence the content of the blood cholesterol as compared with that of the controls receiving 10 cc. of olive oil in addn. to the diet.

G. SCHWOCH

The absorption spectrum of vitamin D. T. A. WEBSTER AND R. B. BOURDILLON. Nat. Inst. Med. Research, Hempstead. *Nature* 123, 244(1929).—Solns. of ergosterol were irradiated with ultra-violet rays under various conditions and in various solvents and the unchanged ergosterol was removed by means of digitonin. The sp. absorption of these solns. was measured between 2700 and 2900 Å. U. and the antirachitic properties were examd. It was found that the intensity of the sp. absorption ran parallel with the intensity of the antirachitic power. The substance (I) present in the solns. is assumed to be identical with vitamin D. When these solns. were irradiated through a filter of an alc. CoCl<sub>2</sub> soln. in order to exclude wave lengths below 2600 Å. U. they yielded solns. showing only slight absorption at 2700-2900 Å. U., but strong absorption at 2400 Å. U.; the substance (II) contained in them had no antirachitic properties. W. and B. believe they have confirmed their theory (*C. A.* 23, 616) that by ultra-violet radiation of ergosterol 3 substances are formed in succession, namely, I, II and the final product, which has no antirachitic activity and only a very slight absorption.

G. SCHWOCH

A case of cystinuria and studies of the influence of diet on the cystinuria and on the sulfur metabolism in this case. HIROTADA MISAWA. Univ. Tokyo. *Japan. J. Med. Sci.* 1, 193-202(1927); *Ber. ges. Physiol. exptl. Pharmacol.* 46, 659.—The case reported was the first one observed in Japan and was studied in 4 periods on different diets. In the first 4-day period the patient received ordinary food, the total N was 6.91-9.65 g., cystine (Gaskell method) 275-330 mg. which corresponds to 8.3-10.6% of the total S or 15-25% of the neutral S. In a 5-day period in which a rice-vegetable diet was given, the total N was 6.95-7.88 g., cystine 40 mg. which is equal to 1.5% of the total S or 2% of the neutral S. In a 3-day period on rice and meat the total N was 7.99-8.45 g., cystine 298 mg. equal to 9.5% of the total S and 21% of the neutral S.

In a 3-day period on ordinary diet the total N was 6.38–9.60 g., cystine 245–291 mg. The largest part of the eliminated cystine in this case was of an exogenous nature. Tyrosine and leucine could not be detected in the urine. The mineral content of the blood was normal except that the K content was a little higher (26–26.5–27.1%); similarly the globulin content of the serum (51.5–54.2% of the total protein). R. C. WILLSON

The composition of spinach fat (SPREER, *et al.*) 27. The unsaponifiable fraction from spinach fat (HEYL, *et al.*) 27. Mn in cereals and cereal mill products (DAVIDSON) 12.

PRYDE, JOHN: **The A B C of Vitamins**. London: John Hamilton, Ltd. 128 pp. 2s. 6d., net. Reviewed in *Nature* 123, 380(1929).

## F—PHYSIOLOGY

E. K. MARSHALL, JR.

**Degradation of fatty acid in surviving dog muscle.** W. GRIESBACH. *Z. ges. exp. Med.* 59, 123–32(1928).—The lower extremities and the liver of dogs were perfused with blood to which isovaleric and *n*-butyric acid were added. Only in liver perfusion were acetic and  $\beta$ -hydroxybutyric acids formed; the acids formed were rapidly decomposed when the liver-perfusion blood was passed through the lower extremities.

B. C. A.

**The effect of parathyroid extract on certain factors underlying the production of edema.** ABRAHAM CANTAROW AND BURGESS GORDON. *Arch. Internal Med.* 42, 939–52 (1928).—An extended review of the subject with bibliography is given. The effect of an increase in available circulating Ca, as produced by the injection of parathyroid hormone, is shown to be a slight but constant inhibition of inflammatory edema. Ca decreases the affinity of the tissue colloids for water.

J. B. BROWN

**The  $p_H$  of arterial and venous blood.** AUGUSTE LUMIÈRE, MME. R. H. GRANGE AND R. MALAVAL. *Compt. rend.* 188, 364–7(1929); cf. *C. A.* 22, 4613.—By means of the  $H_2$  electrode it was found that the  $p_H$  of the sera of the arterial blood of horses varied from 7.72 to 7.86, while that of the venous blood varied from 7.35 to 7.50. The difference varied from 0.29 to 0.40. Measurements on oxalated whole blood gave the corresponding mean values of 7.85, 7.50 and 0.35.

D. D.

**A hormone of the thyroid regulating cerebral excitability.** (Mlle.) G. FUCHS, J. RÉGNIER, D. SANTENOISE AND P. VARE. *Compt. rend.* 188, 419–21(1929).—Extn. of the swollen thyroid glands of dogs "vagotonique ou vagotonisés d'escrine" yields an active substance which, injected into the skull of an anesthetized dog, rapidly causes a lowering of the "chronaxie" of the center of extension of the left anterior paw. No success was had in the extn. of the principle active on the "chronaxie" of the psychomotor centers.

DAVID DAVIDSON

**Bile-pigment formation.** F. ROSENTHAL AND H. LICHT. *Klin. Wochschr.* 6, 2076–81(1927); *Physiol. Abstracts* 13, 242.—The evidence concerning the site of formation of bilirubin is discussed and expts. are described on the formation of bilirubin in dogs after the intravenous injection of hemoglobin soln. If the dog liver be removed, the amt. of bilirubin formed may only be  $\frac{1}{5}$  of the amt. formed in dogs with liver in tact but bile ducts ligatured. The authors conclude that 20 to 33% only of the total bile pigment formed in the intact animal is produced outside the liver. It is also suggested that tolylenediamine and phenylhydrazine poisoning do not give rise to bilirubin production in dogs after hepatectomy, because the destruction of blood corpuscles pursues a course different from that produced by simple laking of blood *in vitro*.

H. L. D.

**Parathyroid hormone and calcium metabolism.** G. HERXHEIMER. *Klin. Wochschr.* 6, 2268–71(1927); *Physiol. Abstracts* 13, 254.—The rate of change of blood Ca following hypodermic injection of parathyroid hormone (prepd. by Collip's method) was followed in cats, dogs and rabbits. In cats the Ca increases to a max. within 10 mins. of the injection, and thereafter falls to normal within about 5 hrs. In dogs the blood Ca rises slowly during the course of several hrs. and then falls, but it may take 2 days to return to the normal level. In rabbits the max. is reached within an hr. and the normal value is again found after 24 hrs. These differences in behavior between cats, dogs and rabbits were observed when solns. of  $CaCl_2$  were injected hypodermically. Collip's results on the ineffectiveness of parathyroid hormone in reducing the toxicity of dimethylguanidine were confirmed.

H. L. D.

**The iron content of the albino rat at different stages of the life cycle.** C. V. SMYTHE AND R. C. MILLER. Penn State College. *J. Nutrition* 1, 209–16(1929).—The av.



Fe content of rats at birth is 0.0055%. A decrease to 0.0026% occurs during the suckling period. A pronounced increase, to 0.0045%, takes place between the ages of 20 and 40 days, after which only slight variations occur. This increase in Fe content apparently results from the taking of solid food. The abs. amt. of Fe present increases very slowly during the suckling period, but more rapidly thereafter, and at a rate closely proportional to the increase in body wt. The Fe content of females is depleted through the growth of the litter during pregnancy; but the analysis of a single individual after the weaning of the young indicates that the Fe content of the female returns to the normal during lactation. C. R. F.

**The female (sex) hormone.** E. LAQUEUR. *Med. Soc. Kiel. Rept. of Meeting*, Dec., 1928; *Squibb Abst. Bull.* 2, A-201; cf. *C. A.* 23, 424.—The biological activity of *menformone*, which is up to the present moment the purest prepn. of female hormone, may be said to consist in its action on the rut and on growth. According to the latest reports, the effect of the hormone in developing the mammary gland and its function may be accepted as valid. It is possible that the prevention of milk secretion in humans and animals or the continuation of stimulation of milk production may depend upon the use of hormone substance during pregnancy. With respect to metabolism, *menformone* is of possible therapeutic value in the female, especially climatic obesity; as for antilimatic influence, that concerns only the testes. Therapeutic interest in the use of *menformone* in prostatic hypertrophy has waned, but its use for temporary sterilization is still disputable. Not only is the action of *menformone* specific in a definite system, but its origin, etc., in definite tissues is unquestionable. Information was imparted from as yet unpublished investigations on the storage of *menformone*. C. R. F.

**Dependence of vagus tonus upon the concentration of adrenaline in the blood.** G. VIALE. *Klin. Wochschr.* 8, 73-4(1929).—Severance of both vagi in dogs that have been adrenalectomized either has no effect upon the heart rate or depresses it. The same is true of normal animals in which the vagi have been cut after the animals have been treated with a quantity of ergotoxine or ergotamine sufficient to overcome the action of the ever-present adrenaline. Severance of the vagi in normal dogs leads to a marked increase in heart rate. This can be depressed by injecting ergotoxine or ergotamine. MILTON HANKE

**Decomposition of stercobilin in vitro.** D. SCHRIJVER. *Klin. Wochschr.* 8, 312-3(1929).—Stereobilin (urobilin) disappears rapidly from undiluted feces. Diln. of feces with 2 or more parts of water markedly decreases the rate of destruction. The decompn. occurs even under strictly anaerobic conditions, but is most rapid in the presence of O. MILTON HANKE

**The significance of the kidney for the acid-base equilibrium of the organism.** FRITZ MAINZER. *Städt. Krankenhaus, Altona. Naturwissenschaften* 17, 196-8(1929).—A short review. B. J. C. VANDERHOEFEN

**The potassium-calcium quotient in normal pregnancy.** R. SPIEGLER AND W. SCHOL. *Arch. Gynäkol.* 135, 461-6(1929).—In pregnancy there is a slight decrease in the Ca content of the blood while the K content is increased, particularly in the second half of pregnancy. The quotient K:Ca, however, shows no great change. While there is a slight decrease in Ca and increase in K in pregnancy, they both remain within physiologic limits. HARRIET F. HOLMES

**The biochemistry of ovarian lipids.** O. FLÖSSNER. *Arch. Gynäkol.* 135, 474-7(1929).—The analysis of 1000 swine ovaries proved choline to be the N-containing base in the ovarian lipids. Other bases are present in traces only. HARRIET F. HOLMES

**The "hormone" of spontaneous contractions of the uterus.** I. VÖGEL AND N. MARGOLINA. *Arch. Gynäkol.* 135, 478-84(1929).—An isolated horn of rabbit uterus suspended in Ringer-Locke solution with free access of air or O<sub>2</sub> after 10-12 mins. of normal rhythmic contractions begins to give stronger and more frequent contractions, at times approaching tetany. Replacement of the soln. by fresh Ringer-Locke soln. brings back the rhythmic contractions. Rabbit uterus in constantly flowing Ringer-Locke soln. will continue in rhythmic contraction for hrs. Ringer-Locke soln. in which rabbit uterus has been actively contracting for 2 or 3 hrs. stimulates the contraction of an isolated piece of uterus. This Ringer-Locke soln. in which the uterus has been contracting has no individual specificity in the nature of a hormone produced by the uterus but chemical analysis indicates there is a decrease in alk. reaction, a decrease in glucose content and an increase in Ca content. HARRIET F. HOLMES

**Histochemical evidence concerning the site of the formation of bile pigment.** P. CORR. *Arch. Path.* 7, 84-100(1929).—A study of the literature and the material from 71 autopsies, with use of the ferrocyanide reaction to differentiate catabolic products of hemoglobin giving the reaction of Fe from bilirubin, which does not contain Fe,

was undertaken in an attempt to throw additional light on the site of the formation of the biliary pigment. The histochem. evidence pointed to the probability that the reticulo-endothelial cells, particularly those of the spleen and the bone marrow, with the Kupffer cells and the large wandering phagocytes being the chief cell reserve, break down the hemoglobin into bilirubin and transfer it to the hepatic cells, where it is excreted into the biliary canaliculi. It could not be said with certainty that catabolism of the pigment does not take place to some small degree in the hepatic cells. The hepatic cells have a definite threshold for hemosiderin as well as for bilirubin, and for both of these substances the threshold is lower than that of the kidney. This occurrence of the bilirubin and the hemosiderin in the same hepatic cell is an overlapping dependent on a concomitant hyperactivity of hemoglobin catabolism with the consequent storage of hemosiderin in the liver and on an interference with the excretion of the biliary pigment from the hepatic cells.

HARRIET F. HOLMES

Some suggestions on reactivation and rejuvenation experiments. ALBERT SCHNEIDER. *Am. Med.* 34, 722-36(1928).

FRANCES KRASNOW

Gastric secretion by histamine and by food. PIETRO MOLINARI-TOSATTI. *Arch. sci. biol.* 13, 97-108(1929); cf. *C. A.* 23, 2492.—This paper gives a more complete description of the methods used and the details of the exptl. results.

P. M.

The influence of thyroid extracts on the sexual maturity of the albino rat (*Epimys norvegicus* Erxl). F. DULZETTO. *Boll. soc. ital. biol. sper.* 3, 941-5(1928).—Female rats, 25-30 g. wt., received daily an injection of 0.4 cc. of thyroid ext. until the animals reached sexual maturity. Control animals reached sexual maturity in 44.73 days on an av.; those receiving thyroid ext. reached it in 48 days.

PETER MASUCCI

The action of thyroid extracts on the somatic growth of the albino rat. F. DULZETTO. *Boll. soc. ital. biol. sper.* 3, 945-8(1928).—Female rats 20-25 days old were injected daily with 0.4 cc. thyroid ext. until the vaginal membrane disrupted. The animals were fed with milk, bread, meat and greens. The wt. of each rat was taken before and after the treatment. The av. increase in wt. of the control rats was 65.18 mg. per g., and that of the treated ones was 66.77 mg. per g. No toxic symptoms were noted.

PETER MASUCCI

Acetaldehyde formation from pyruvic acid in the autolysis of red and white muscles. A. UTEVSKI. *Ukraina Biochem. Inst., Charkow. Biochem. Z.* 204, 81-7(1929).—In white muscles of rabbits, chickens and roosters much smaller quantities of AcH (about 1 mg. per 100 g. tissue) are formed than in red muscles. The white muscles cannot transform Na pyruvate into acetaldehyde. On the contrary the red muscles of these animals as well as the breast muscles of pigeons possess this ability.

S. M

Studies on the blood-sugar regulation in mammals. I. The influence of cold and fasting on the blood sugar. BRUNO KISCH, A. SIMONS AND P. WEYL. *Univ. Köln a. Rh. Biochem. Z.* 204, 179-91(1929).—Prolonged exposure to a temp. of about 0° for many hrs. or even days had no effect on the blood-sugar concn. in dogs or rabbits, when these animals are enjoying freedom. Confined in a cold box, dogs show an initial rise in blood sugar of 10-30% followed by a fall below normal. In rabbits fasting about 15 hrs. under similar exptl. conditions there was found only a diminution in the blood sugar, but in rabbits placed in the cold box immediately after feeding a primary hyperglucemia was likewise noticed. In the fed rabbits the blood-sugar curve follows an irregular course so that even the primary hyperglucemia can hardly be attributed to the influence of the cold. In all animals the blood sugar increased to the normal level in a very short time as soon as they were put in the warm (23-26°) again. Fasting (without or with water) even at the end of 10½ days causes only a slight fall in the blood-sugar concn. which, however, occurs already at the end of 24-48 hrs. of fasting and does not after much later.

S. MORGULIS

The physiology of the surviving mammalian heart. V. Sugar consumption of the surviving heart of normal cats. GEORG AMBRUS. *Königl. ungar. Univ., Budapest. Biochem. Z.* 204, 467-73(1929); cf. *C. A.* 22, 4633.—Small hearts utilize relatively much more sugar than large hearts.

S. MORGULIS

Metabolism of frog retina at different temperatures and the Meyerhof quotient at different temperatures. F. KUROWITZ. *Kaiser Wilhelm-Inst. für Biologie, Berlin-Dahlem. Biochem. Z.* 204, 475-8(1929).—Between 15° and 35° respiration and anaerobic glucolysis both increase, but the aerobic glucolysis is well within that temp. range. With further rise in temp. the respiration falls, and then very suddenly glucolysis under aerobic conditions appears and at 40° attains the same degree as the anaerobic glucolysis. Meyerhof's quotient which measures the effect of respiration on fermentation rises considerably with increase in temp. within the non-injurious range, but this is not peculiar to the retina as it is found also in yeast cells.

S. MORGULIS

**The effect of thyroxine on the metabolism of surviving tissues.** K. J. ANSELMINO, O. EICHLER AND H. SCHLOSSMANN. Med. Akad. Düsseldorf. *Biochem. Z.* 205, 481-8 (1929).—One to 7 days after an injection of thyroxine, liver, spleen and kidney tissues show no increase or only a very slight increase in respiration measured by the Warburg method. The anaerobic glucolysis of the kidney increases the more the higher the metabolism of the whole organism is raised by the thyroxine, while the anaerobic glucolysis of the liver and spleen is not affected. It is suggested that the thyroid hormone acts primarily on the anaerobic phase of the metabolism.

S. MORGULIS

**The glycogen and bile formation in the liver.** ERIK FORSGREN. Karolinsches Inst., Stockholm. *Skand. Arch. Physiol.* 55, 144-61 (1929); cf. *C. A.* 22, 2780.—In a number of rabbits on an unrestricted diet of hay, oats and water, the glycogen content of the liver was studied simultaneously with its histological changes. The liver of a normal rabbit contains 3.75 glycogen per kg. of body wt., so that a rabbit of medium size (2.25 kg.) contains on the av. 8.3 g. liver glycogen, but the variations are really very large (0.9 to 8.6 g. per kg. body wt. or 1.3 to 13.1% of the liver wt.). Both the glycogen content and glycogen % undergo regular changes in the course of the 24 hrs. with 2 maxima, at night and in the day, and with 2 minima, in the morning and in the evening. The liver wt. varies parallel to the glycogen content, increasing approx. 1% for every extra 4-5 g. glycogen. These regular variations in both the amt. and % of liver glycogen cannot be attributed entirely to the state of nutrition or to muscle work; they are due to rhythmic changes in the function of the liver, which is alternately assimilatory or dissimulatory. During the assimilatory phase of the liver activity glycogen is deposited probably together with H<sub>2</sub>O and protein and the wt. of the liver may be almost doubled. During the dissimulatory phase bile products and possibly also urea and other catabolic products appear; at the same time the glycogen content diminishes and the liver wt. decreases. The liver activity is detd. by its own rhythm and by its relation to other organs.

S. MORGULIS

**Studies on the behavior of potassium in the organism. I. The potassium and calcium contents of various organs.** MOGENS NORN. Univ. Copenhagen. *Skand. Arch. Physiol.* 55, 162-83 (1929).—The K content of the heart per 100 g. fresh substance is lower than that of skeletal muscle, whereas the reverse is true for the Na. This manifests itself in the K/Na ratio, which in all organisms studied is much lower for the heart than for the skeletal muscle. Per 100 g. by substance the following av. values can be calcd.:

	Rabbit	Pig	Horse	Goat	Man	Dog	Cow
Heart { K	1.195	1.57	1.44	1.49	1.39	1.38	1.35
Na	0.585	0.45	0.34	0.57	0.52	0.49	0.45
Muscle { K	1.595	1.65	1.50	1.83	1.58	1.45	1.66
Na	0.175	0.19	0.22	0.30	0.29	0.28	0.36

In the organs of the same species, however, the individual variations in the K content are not very large. Thus in the rabbit heart the K per 100 g. dry substance varied from 1.14 to 1.47 and in the skeletal muscles from 1.33 to 1.66 g. The variations in various species were from 1.14 g. in the rabbit to 1.57 g. in the pig for the heart K or from 0.34 g. in the horse to 0.65 g. in the rabbit for the heart Na, while for the skeletal muscles the variations were from 1.33 g. in the dog to 1.83 g. in the goat for the K and from 0.17 g. in the rabbit to 0.36 g. in the cow for the Na content per 100 g. dry tissue. The K content of the heart is thus below that of the skeletal muscles, while the Na content is higher. The av. K/N in the heart is 3.0 and in skeletal muscles 6.6. K and Na are not principally components of the liquid portion of the muscles. In the kidneys the Na content unlike that of the muscles is relatively large. Furthermore under experimentally induced excretion of Na and K salts these elements are found in the kidney cells in increased amts. II. Variations in the potassium, sodium and chloride excretion through the kidneys in the course of the day. *Ibid* 55, 184-210.—These expts. the author performed chiefly on himself. The hourly K, Na and Cl elimination through the kidney is not dependent principally upon the amt. of these elements ingested but is lower during the night than during the day, and when the person sleeps in the daytime and works at night the condition is reversed. By dividing the 24 hrs. into 8 three-hour periods, all similar to each other so far as eating and drinking are concerned, and spending 3 periods sleeping in bed and the rest of the time being occupied with the ordinary activities, the following rhythmicity was observed in the course of the 24 hrs.: During the middle night period (3 to 6 hrs.) the excretion of K, Na and Cl is lowest but rises during the last night period (6 to 9 hrs.) and especially the first waking period, reaching the max. value in the second day period (12 to 3) and then

declines gradually so that in the last waking period (9-12 hrs.) it is not much greater than during the first sleep period (12-3). This rhythm depends upon the degree of activity or inactivity. Narcosis seems to have the same effect in man, though not in the rabbit. The night changes are not occasioned either by position or by diminished diuresis. Yet, the changes in the excretion of K, Na and Cl are not apparently due to alterations in muscle activity, since even intense muscle work has no effect on this. The same rhythmicity is observed in a state of inanition and is therefore not associated with changes in absorption of mineral substances. Obviously these changes cannot be due to depression of kidney function during sleep, because the excretion of Ca is the same during the sleeping or waking hrs., while that of Mg is actually greater during sleep. Furthermore, the K concn. of plasma is the same during these nocturnal and diurnal alterations in elimination. III. The variations in the potassium concentration of the plasma following administration of potassium salts and in different types of diuresis and their relation to the potassium excretion in the urine. *Ibid* 211-29.—In expts. on rabbits it was found that oral administration of 2-2.5 g. KCl causes a very appreciable increase, even of more than 100%, in the plasma K within a few hrs. These results were further corroborated in expts. by the author upon himself who took 12 g. KCl in the morning and had no food all through the expt. This caused a quick rise in plasma K, which reached a max. in about 2.5 hrs., returning to normal after 6.5 hrs. In the meantime the Na concn. was practically unaffected. In the urine there was a greatly increased excretion of K but the Na excretion was likewise considerably greater. The max. K excretion coincided with the time when the plasma K has reached its highest value. The ingestion of K salts (or K-rich foods) in more or less large measure causes always an increase in the plasma K concn., which leads to an increased elimination of K through the urine. There is, however, at the same time a definite diuresis and also considerable increase in the Na excretion. The large variations in K excretion during the day and night are not correlated to any changes in the plasma K, and it is, therefore, questionable if there is any const. relationship between the plasma K concn. and urinary K excretion. At any rate, expts. with theophyllin show that a very great excretion of K may actually be accompanied by a fall in the plasma K concn. Likewise, in expts. on water diuresis there is no connection between the degree of the diuresis and the amt. of K excreted in the urine or the changes in the plasma K concn.

S. MORGELIS

**Reaction of human bile and its relation to gall-stone formation.** JOHN G. REINHOLD AND L. KRAAER FERGUSON. Univ. of Pennsylvania. *J. Exptl. Med.* **49**, 681-94 (1929).—The human gall bladder acidifies the bile. In this respect its action is similar to that of the gall bladders of lower animals, previously described by other workers. The H-ion concn. of gall bladder bile is increased considerably in cases of obstruction of the common or cystic ducts. The highest values were found following complete obstruction. The occurrence of gall-stones was not associated with a consistent change in the H-ion concn. of the gall-bladder bile.

C. J. WEST

**Determination of the "acetone bodies" in the blood of pregnant and non-pregnant cows.** ANTON CHRISTALON. Tierärztl. Hochschule, Wien. *Arch. wiss. prakt. Tierheilk.* **57**, 507-13 (1928); *Ber. ges. Physiol. exptl. Pharmakol.* **46**, 700. —It has been reported by other authors that the "acetone body" content of the human blood increases during pregnancy. The values lie between 2.16 and 10.4 mg. per 100 cc. blood, while in non-pregnant women they vary between 1.77 and 4.47 mg. Similar increases were recorded in pregnant cows; in a series of 27 pregnant cows the acetone body values were 5.35-9.75 mg./ (av. 7.45 mg.), while the non-pregnant values were 5.20-7.25 mg. (av. 6.27 mg.). The increases are irregular. There is no relation between the duration of the pregnancy and the increase. The detns. were made according to Engeld's method: blood is treated with K oxalate, deproteinized with Na tungstate, acidified with  $\frac{1}{2}$  N H<sub>2</sub>SO<sub>4</sub>, filtered, the filtrate treated with dichromate-H<sub>2</sub>SO<sub>4</sub>, and the acetone sepd. with suction filtration. It is absorbed in 0.01 N I soln. and alkali, the unused I being titrated back with 0.01 N thiosulfate soln.

R. C. WILLSON

**The influence of the sexual glands on the oxidases in the organs. I. The effect of the testicles.** T. YASUDA. Imp. Univ., Kyoto. *Folia endocrinol. japon.* **3**, 1412-77 (1928); *Ber. ges. Physiol. exptl. Pharmakol.* **45**, 686.—If male rabbits which have reached puberty are castrated there appears within 2-3 months thereafter a definite reduction in the amt. of oxidase in the heart and kidneys. In normal growing male rabbits daily feeding of testicular powder produces a slight general increase in the oxidase. Vasoligation causes a remarkable increase in the oxidase within 2-3 months. Intravenous injections into normal rabbits of ext. from the testicles of normal rabbits effect a slight increase in the cardiac oxidase. If the ext. is from a vasoligated testicle, the

increase is general and very extensive. Y. concludes that the oxidase increase observed after vasoligation is not an effect of the absorption of the semen elements, but is due to an increased activity of the intermediate cells. The intermediate glands appear to play a certain role in intracellular oxidation.

R. C. WILLSON

**Experimental studies of the production of choline from the suprarenal capsule.** SHIRO ONO. Univ. Fukuoka. *Fukuoka-Ikwadaigaku-Zasshi* 20, 1187-1212(1927); *Ber. ges. Physiol. exptl. Pharmacol.* 46, 247.—Studies of rabbits showed that the blood in the veins of the suprarenal capsule had a higher choline content than the blood of any other abdominal organ. That the formation of choline is regulated by the nervous system is shown by the fact that stimulation of the vagus nerve or an injection of pilocarpine causes an increase of the choline, while resection of the vagus causes a decrease in the formation of choline. After the injection of larger amts. of atropine, smaller amts. of choline are formed, while smaller amts. of atropine increase the formation of choline. Stimulation of the splanchnic nerve or adrenaline injections have no effect on the formation of choline. A mono- or bi-lateral extirpation of the suprarenal capsule decreases the choline content of the serum.

R. C. WILLSON

**Salts and blood sugar.** H. MASAMUNE. Univ. Fukuoka. *Fukuoka-Ikwadaigaku-Zasshi* 20, 1437-1522(1927); *Ber. ges. Physiol. exptl. Pharmacol.* 46, 89.—The action of cations and anions on the blood sugar was studied. Na salts have no effect. K salts: acetate, chloride and sulfate have no effect; phosphate causes a decided hyperglucemia. Mg salts all produced a hyperglucemia, which was readily decreased by splanchnicotomy. Ca salts produced a slight centrally limited hyperglucemia. Simultaneous studies of the alkali reserve showed that  $\text{NH}_4\text{Cl}$  produced an acidosis while Mg salts caused an alkalosis. An antagonism between Ca and Mg salts as regards the regulation of the blood sugar could not be detected.

R. C. WILLSON

**Experimental studies of the influence of blocking of the reticulo-endothelial system on the tissue respiration and the glucolysis of the liver and spleen.** YOSHICHI OKAMOTO, FUJIRO AMAKO AND HARUYOSHI IWASAWA. Univ. Tokyo. *Japan. J. Med. Sci.* 1, 413-24(1927). *Ber. ges. Physiol. exptl. Pharmacol.* 46, 184.—Blocking of the reticulo endothelial system with Indian ink has very different effects in the dog and the rabbit. This procedure on the dog weakens the liver, especially the oxidizing phase in the sugar metabolism, while the anaerobic phase remains undisturbed. This inhibition of the oxidizing phase can be relieved by insulin. The rabbit liver, on the other hand, shows an original increase in the oxidizing phase and later a reduction. The spleen remains unchanged at first and shows a decrease in the oxidizing phase only with an increased frequency of injections.

R. C. WILLSON

**The relations of the pituitary gland to the carbohydrate metabolism.** A. PICKAT. Komm. Akad., Moscow. *Med.-biol. zhurnal* 3, 40-62(1927); *Ber. ges. Physiol. exptl. Pharmacol.* 45, 777(1928). Extirpation of the pituitary is regularly followed by a hypoglucemia which continues for months, returning to normal only very slowly. After subcutaneous injections of an ext. of the posterior lobe of the pituitary there results in both normal and hypophysectomized dogs a temporary increase in this blood factor; this is more pronounced in the dogs deprived of the pituitary. The same effect is produced by the injury of the tuber cinereum. Glucosuria is observed only for 1-3 days after extirpation of the pituitary; P. assumes that this is due to the narcosis and the stimulation of the base of the brain. This assumption is supported by the fact that puncture of the tuber cinereum results in a prolonged glucosuria. Carbohydrate tolerance is decidedly increased in the first months after extirpation of the pituitary; later it returns to normal. The regulation of the retention of sugar is probably a function not of the pituitary but of the tuber cinereum. It is concluded that the pituitary secretion exerts a stimulating action on the sugar metabolism and its deficiency checks the sugar metabolism on account of a disorder of the hormonal equilibrium in the organism.

R. C. WILLSON

**The action of bile and the bile acids on the serum lipase.** A. BACULO AND E. LANTIRIA. *Riv. patol. sper.* 3, 52-60(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 45, 688.—If dog or ox bile is added to dog serum, *in vitro*, its lipolytic action is inhibited. In moderate concn. it neutralizes the inhibiting action of quinine. Similar action follows the intravenous injection *in vivo*. The bile of the dog is much more active than that of the ox. If solns. of Na glycocholate or Na taurocholate are introduced into the circulation, these act the same on the serum lipase as does bile, in that they neutralize quinine. Na taurocholate is much more active than Na glycocholate which shows why the bile of the dog which is rich in taurocholic acid is more active than ox bile in which glycocholic acid predominates.

R. C. WILLSON

**The carbon dioxide tension in the blood, acidosis and their connection with the**

metabolism during pregnancy. H. R. SCHMIDT. Univ. Bonn. *Zentr. Gynäkol.* 52, 346-50(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 46, 121.—Using the Barcroft method as modified by Verzar, S. detected a reduction in the  $\text{CO}_2$ -combining power during pregnancy, amounting to  $1/8$  to  $1/6$ , produced by the acid products of metabolism. Thus there is an acetoneemia that can be traced only to a shifting in the intermediary metabolism. In pregnancy carbohydrates are used more extensively and the liver is low in carbohydrates. There is an augmented fat migration into the liver, where the fat can be transformed into carbohydrate. To this end a certain amt. of glycogen is necessary and lacking this the synthesis is incomplete and the intermediate products, even the ketone bodies, enter the blood and seize a part of the alkali. Thus S. argues that the diet in pregnancy should consist of protein, a little fat and high carbohydrates.

R. C. WILLSON

DEJUST, *et al*: *Études sur la chimie physiologique de la peau*. Paris: Legrand. 384 pp. F. 55. Reviewed in *La nature* 59, 522(1928).

## G—PATHOLOGY

H. GIDEON WELLS

**Nephrosis in children.** GLADYS L. BOYD. *Can. Med. Assoc. J.* 19, 555-8(1928).—Examn. of a no. of cases emphasizes the following points: albuminuria, absence of gross hematuria, presence in urine of large nos. of casts and frequently white blood cells and of a doubly refractile body, low blood protein with altered albumin-globulin ratio, lowered surface tension with more or less lipemia, especially cholesterolemia. The concn. test is the only functional test which gives any reliable aid to prognosis.

A. T. CAMERON

Some properties of serum albumin—its crystallization in the absence of all elementary ionogens. MAURICE PIETRE. *Compt. rend.* 188, 463 5(1929).—Serum globulin is sepd. from the whole protein by neutralization of the  $\text{Na}_2\text{CO}_3$  entrained therein with HCl. The remaining serum albumin is then given at least 4 acetone pptns. A 3.5% soln. is then evapd. in a vacuum over  $\text{H}_2\text{SO}_4$ , leaving a gummy mass which, when cooled to  $0^\circ$  and given a sudden blow, crystallizes explosively in long microscopic prisms, decompn.  $225-30^\circ$ . The purified protein is rapidly absorbed in horses and causes no anaphylaxis.

DAVID DAVIDSON

**Subacidity and duodenal ulcer.** GIANNINI GIOVANNI. Med. Univ.-klinik in Wien. *Wiener klin. Wochschr.* 42, 102-3(1929).—In 35 cases of duodenal ulcer, 8 at least occasionally showed subacidity. Subacidity therefore does not include the possibility of duodenal ulcer.

D. B. DILL

**Ammonia of normal and pathological human blood.** MARCEL LABRÉ, F. NEPVEUX AND HEJDA. *Compt. rend.* 188, 738-40(1929).—The Parnas and Heller method for the detn. of blood  $\text{NH}_3$  is shown to have an error of 1.5%. Normal blood contains an av. of 0.047 mg. per 100 cc. and this value is not increased in cirrhosis of the liver, icterus or diabetic acidosis. In pulmonary tuberculosis, blood  $\text{NH}_3$  was found to average 0.109 mg. per 100 cc. in mild cases and 0.305 mg. in severe cases. No explanation is given for this last high value, but it is probably not due to a disturbance of the acid-base balance since there is no change in  $\text{NH}_3$  content of the blood in the most severe cases of acidosis. The authors believe that the source of the blood  $\text{NH}_3$  is in some unknown nitrogenous compd. rather than in urea or amino acids, as is the general belief.

H. G. SMITH

**The colon bacillus in pernicious anemia.** A. ENGEL AND G. OLIN. *Klin. Wochschr.* 8, 552-3(1929); *Acta Med. Scand.* 70, 150-66(1929).—The serums of normal persons will seldom (6%) agglutinate colon bacilli. The serums of patients with achylia gastrica are more frequently (17%) and with pernicious anemia still more frequently (55%) agglutinating. Patients with achylia gastrica or pernicious anemia usually have colon bacilli in the stomach.

MILTON HANKE

**Protein metabolism in cystinuria.** WM. ROBSON. Dep't. Therapeutics, Univ. Edinburgh. *Biochem. J.* 23, 138-48(1929).—Neither tyrosine and leucine nor putrescine and cadaverine could be found in the urine of the patient under observation. Giving  $\text{NaHCO}_3$  (but not  $\text{Na}_2\text{HPO}_4$ ) to the cystinuric is accompanied by a disturbance in the S fractions of the urine.

BENJAMIN HARROW

**Antigen structure and specificity.** J. J. VAN LOGHEM. *Verslag. Akad. Wetenschappen Amsterdam* 37, 898-906(1928).—Bacteria have a complex antigen structure. Some components conform to the genus, while others have a sp. character. Genus antigens can predominate to such an extent that a serological test for differentiation with the species fails. There are also differences in antigen structure in members of

the same species, which can be called intraspecific differences. They are quite common and can even be found in very homogeneous kinds like the *B. typhosus*; in other kinds they show themselves in the form of serological types (*B. pneumococcus*, *B. meningococcus*, *B. tetanus*, etc.). Further can be distinguished the adaptive and regressive tendencies of the intra-clonal changes of the antigen structure. The former are physiologic reactions of individuality to normal excitations, of which the different atoxic *B. dysenteriae* and *B. coli* are examples. The regressive changes are pathological manifestations caused by abnormal excitations from outside. Numerous changes in cellular form, kind of growth, biochem. function, antigen structure, etc., lately referred to as mutation, "dauer-modifikation" and "dissociation," are better to be understood as degeneration or atrophy of mishandled individualities.

J. C. JURRIJENS

**Serum and hemoglobin precipitin reaction in blood investigation for forensic purposes.** K. FUJIWARA. Inst. Med. Fakultät zu Niigata, Japan. *Deut. Z. ges. gericht. Med.* 11, 253-63(1928).—The hemoglobin precipitin reaction may be used instead of the serum precipitin reaction when proper precautions are used. FRANCES KRASNOW

**"Filterable viruses."** A review. J. JACKSON CLARKE. *J. Trop. Med.* 31, 254-7 (1928); cf. C. A. 4621.

FRANCES KRASNOW

**Comparative study on the production of hemolysin through the injection of red blood corpuscles into the normal and pathologic tissues. I. Comparison of the production of hemolysin through the injection of red blood corpuscles into the normal and tumor tissues.** RET'SU TOYOSHIMA. *Sei-I-Kwai Med. J.* 47, No. 9, Eng. Abs. 5-6 (1928).—Sarcoma tissue was transplanted subcutaneously into rabbits which were then injected with red cells from goats' blood. The extent of formation of hemolysin was roughly measured. There was no marked difference between the amt. of hemolysin of normal and of sarcomatous rabbits.

W. D. LANGLEY

**Excretion and absorption of pigments.** IWAO MATSUO. *Acta Schol. Med. Univ. Imp. Kioto* 10, 385-453(1928).—A report on the work of the past 5 years carried out by 25 research workers on the excretion and absorption of some 300 pigments. The toxicity, ionization, diffusibility and adsorption of these pigments together with their soly. in lipoids have been carefully followed. Full details of the operative technic employed are given and the clinical aspect of the use of pigments in diagnosis of disease is discussed. Exception is taken to Rosenthal's expt. on the increased excretion of methylene blue by the liver in pathol. conditions; it is shown in this work that excretion is hindered in an organ during inflammation or degeneration and that the methylene blue in Rosenthal's expt. was excreted by the stomach and not the liver. The *absorption of pigments* is less applicable in clinical practice than the *excretion of pigments* with few exceptions.

G. H. W. LUCAS

**The gaseous exchange of tissues in inflammation.** MARIO GIANOTTI. *Arch. sci. biol.* 13, 73-95(1929).—In order to study the local changes produced by an inflammatory stimulus, the ear of the rabbit was selected as a suitable organ; the normal ear of the same rabbit served as a control. Barcroft's method was used for studying the gaseous exchange; detns. were made for the amt. of gases in the arterial and venous blood, the vol. per min. carried by the vascular area, and the wt. of the organ. Inflammation was produced by applying heat according to Samuel's technic; the ear was immersed for 5 mins. in water heated to 50°. The results are given in tabular form and include the gaseous exchange of the normal unheated ear. The data are expressed as O<sub>2</sub> consumed per min. per 100 g. of organ, the ratio CO<sub>2</sub>/O<sub>2</sub>, and the time in hrs. elapsed since the application of heat to the ear. Conclusions: (1) there is a large increase in O<sub>2</sub> consumed in an organ which is influenced as a result of a burn; (2) this increase compared to the unit of wt. of the normal ear reaches its max. during the first 8 hrs. (740 mm. O<sub>2</sub> per min. per 100 g.) and then drops, following closely a hyperbolic curve, until the value becomes const. (166 mm. O<sub>2</sub>) 72 hrs. after the beginning of the inflammation; (3) the cause of the increased exchange is due either to an increased metabolism of the tissues of the organ, or, to oxidations which take place in the edematous liquid on account of the exchange products that accumulate in the tissues. PETER MASUCCI

**Technic for the preparation of precipitating serums with heated antigens.** AMADRO DALLA VOLTA AND IDEALE DEL CARPIO. *Boll. soc. ital. biol. sper.* 3, 935-7(1928).—Human blood serum is diluted with distd. H<sub>2</sub>O 1:10, 5 g. (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> added per 100 cc. of the diln., followed by a few drops (5-6) of acetic acid. The mixt. is heated on the water bath until the protein is pptd., filtered on paper, and the ppt. dried in the incubator. The dried protein is preserved under toluene until ready for use; it is then freed from toluene and emulsified in a mortar with warm physiol. salt soln. The rabbits are then given only 1 intraperitoneal injection of the emulsion contg. 1 to 1½ g. of protein. After 7 days, the animals are bled and the serum is tested. The antibodies can be

demonstrated in a titer as high as 1:1000. Later the titer then increases and may reach a value of 1:100,000. The antibodies disappear 25 to 30 days after the injection. The high titer serum is well adapted for identifying human blood serum or blood spots.

PETER MASUCCI

**The velocity of sedimentation of the erythrocytes, complement value of the serum, and the enzyme reaction in pulmonary tuberculosis.** PIETRO BERRI. *Boll. soc. ital. biol. sper.* 3, 997-1001(1928).—The velocity of sedimentation (*V. S.*) and the alexin value of the serum were detd. in 50 tuberculous patients. Although the value of the complement (*V. C.*) was low there was no relation between this and the general and local condition of the patient. There was no const. relation between *V. S.* and *V. C.* There was some relation between the enzyme reaction and *V. S.* or *V. C.* but was not const.

PETER MASUCCI

**The influence of antituberculosis vaccination on certain biochemical components of the blood.** MARIO BARBARA. *Boll. soc. ital. biol. sper.* 3, 1014-7(1928).—Children that showed an hereditary predisposition to tuberculosis were vaccinated cutaneously with Maragliano's preventive vaccine (organisms killed with heat and suspended in sol. tuberculous toxin); 30-40 days after the vaccination, the various components of the blood were detd. In the vaccinated subjects, certain biochem. characteristics remained unaltered: in 94.7% of the cases the uric acid content remained high; in 61.1% the K content and in 66.6% of the cases the Ca content remained also at high levels. Hyperglucemia was reduced in 52% of the cases. In all the subjects cholesterol was present in high concns. Therefore, the effect of antituberculosis vaccination was to decrease hyperglucemia and bring about a hypercholesterolemia. The lipoids apparently play an important role in the development of immunity. PETER MASUCCI

**Sedimentation of the blood corpuscles in various internal diseases and the result of correction of this value for the variations of the hemoglobin percentage.** H. C. GRAM. Univ. Med. Clinic B., Copenhagen. *Acta Med. Scand* 70, 242-75(1929).—Curves are published which allow an approx. correction of the sedimentation values, all being reduced to a basis at 100% hemoglobin. With this correction the highest normal sedimentation is 5 mm. for males and 11 mm. for females. The importance of this correction is shown by the following example: In 2 individuals with 96 and 117% hemoglobin, resp., which is the normal range of variation, a sedimentation of 4 mm. is found. The corrected values are 3.5 and 15 mm., resp., the latter representing a frank increase over the normal. It is thought that the sedimentation test calls attention to more or less occult blood diseases of infectious and toxic origin. S. M.

**Studies on cytolysis in carcinoma. III.** N. WATERMAN, L. DE KROMME AND J. F. LEMMENS. Lab. A. van Leeuwenhoekhuis, Amsterdam. *Biochem. Z.* 205, 1-20(1929); cf. *C. A.* 22, 628.—Lyses, which is very important as an immunity phenomenon, also plays a significant part in the biology of cancer. In the latter a certain amt. of lysis occurs spontaneously which, however, can be stimulated by various means. In infectious disease the causative factor is sometimes protected against the immune reactions of the organism, as for instance the non-agglutinability of certain typhus or cholera strains. Likewise in tumors where there is extensive lysis the peripheral cells are protected, which leads to the conclusion that there must be present some protecting substances. Experimentally it was actually shown that in the destruction of pure cancer cell suspensions substances are formed which increase the resistance of other fresh cells both toward agglutination and to lysis. Furthermore, there is also an analogy in the place of origin of both substances. It has always been assumed that immune bodies are formed in the spleen or rather in the entire reticulo-endothelial system, and the same holds true also for cancer. Lytic substances were obtained from all normal organs and serum but mostly from the organs of the reticulo-endothelial system, the lymph glands, spleen and thymus. The manner in which the lytic or the protecting factors act is not known. It is thought that the lytic substances are bound to some lipoproteins, but are not to be identified with known enzyme systems, though a certain relationship cannot be denied. The lytic power is affected in a peculiar way by x-rays, which can both activate and destroy this power. Apparently the pure lytic system is not at all or only slightly radiosensitive, the x-ray effect being greater in relatively impure preps. than in lipid-free preps. Conclusion: The therapeutic effectiveness of radiation is also an indirect action, since this causes cell death when either lytic factors have been activated or protective factors destroyed in the system. S. MORGULIS

**The behavior of the blood sugar in experimentally produced adrenaline insufficiency.** HERMANN LANGE AND ERICH GROSSMANN. Med. Universitätsklinik, Leipzig. *Biochem. Z.* 205, 306-17(1929).—Removal of one adrenal does not cause a lowering of the blood sugar in cats which prior to the expt. were on a const. diet and during the



expt. were fasting. Removal of both adrenals under similar exptl. conditions leads to a permanent fall in the blood sugar to 0.05% and even lower. The convulsions occurring at this stage can generally be controlled with intravenous glucose injections.

S. MORGULIS

Basal metabolism and the specific dynamic action following adrenalectomy in rats. A. V. ARVAY. *Physiol. Inst. Univ. Debreczen. Biochem. Z.* 205, 441-8(1929).—Expts. on rats with double adrenalectomy show that the basal metabolism diminishes until the sixth day, the max. diminution being 26%. It then rises again and, provided that the animal survives, returns to the normal level. The specific dynamic action likewise diminishes to about half its original value, reaching a max. reduction in about 3 days. It then also increases and returns to the normal condition at about the same time when the normal basal metabolism is restored.

S. MORGULIS

The origin of epileptic attacks. K. A. EFIMOV. *Inst. Chirurg. Neuropathology, Leningrad. Zhur. expil. Biol. Med.* 10, 458-68(1929).—Subarachnoid injections of undiluted Sepia ink call forth in dogs clonic and tonic contractions which are very similar to epileptic attacks, which is not the case when the material has been subjected to a preliminary dialysis.

S. MORGULIS

Blood nitrogen in sensitized animals. Z. M. DIENERSTEIN AND S. GUENES. *Physiol. Lab. Ukrglavnauki, Chaskow. Zhur. expil. Biol. Med.* 10, 520-9(1929).—Anaphylactic shock does not of itself produce a marked disturbance in the N balance of the blood. A slight rise in the non-protein N at the height of shock is not specific, neither can the increase in the total N be attributed to the small quantity introduced into the blood stream with the serum injection (0.25 cc.) No matter what disturbance in the N of the tissues may occur, it is not reflected in the total or non-protein N of the blood.

S. MORGULIS

The effect of heated cholera bouillon cultures on the vessels of the isolated rabbit ear. A. M. SKORODUMOV. *Bacteriol. Inst., Irkutsk. Zhur. expil. Biol. Med.* 10, 540-6(1929).—Heated cholera bouillon cultures cause constriction of the ear vessels. Perfusion of the isolated rabbit ear with cholera bouillon cultures of different ages causes no alteration in the vessel walls which are manifested in the pharmacodynamic effect of adrenaline and caffeine.

S. MORGULIS

Transmission of acquired immunity against hydrophobia through the germ plasma. O. A. HERMAN. *State Clinical Inst., Kasan. Zhur. expil. Biol. Med.* 10, 547-56(1929).—Rabbits frequently lose their acquired immunity sooner than their young in whom, even  $6\frac{1}{2}$ - $8\frac{1}{2}$  months after birth, there is still relatively good immunity. Females have occasionally transmitted their acquired immunity even when pregnancy occurred  $6\frac{1}{2}$  months after immunization treatment, while males have transmitted their immunity  $1\frac{1}{2}$ - $7\frac{1}{2}$  months later. When both parent rabbits are immune there seems to be a greater no. of immune young than when only one of the parents is immune. It seems that the immunity can be transmitted also to the third generation. S. M.

Amines as antigens. Z. YERMOLYEVA AND I. BUYANOVSKII. *Biochem. v. Inst., Narkomzdrav, Moscow. Zhur. expil. Biol. Med.* 10, 641-6(1929).—Expts. show that many amines possess antigenic properties.

S. MORGULIS

The condition of antigens in phagocytosis. G. V. VIGODCHIKOV. *Microbiol. Inst., Narkomzdrav, Moscow. Zhur. expil. Biol. Med.* 10, 656-63(1929).—The tropine reaction is subject to the same physico-chem. laws as is the agglutination reaction. Variations in the tropine titer and of the agglutination titer of an immune serum run parallel. Single strains which are excellently tropinogenic are poorly phagocytized in the presence of immune sera obtained by immunizing animals with other strains of the same bacteria. Both agglutination and tropine reactions are dependent upon the physico-chem property of the antigen.

S. MORGULIS

Investigations on the structure of bacterial antigens. WALTER LEVINTEAL. *Centr. Bakt., Parasitenk., I Abt., Orig.* 110, 31-44(1929).—A review with a very complete bibliography.

JOHN T. MYERS

Contributions to the knowledge of bacterial antigen functions. E. WITTEBAY AND E. KRAH. *Centr. Bakt., Parasitenk., I Abt., Orig.* 110, 44-7(1929).—During immunization with diphtheria bacilli, antibodies appear which react specifically with the lipoids of the diphtheria bacillus as shown by absorption methods, and also others which react with the lipoids of pseudodiphtheria bacilli and of tubercle bacilli. Antitoxic diphtheria serum may contain lipid antibodies. The serum of diphtheria patients contains antibodies sp. for the lipoids of the diphtheria bacilli.

JOHN T. MYERS

Investigations on the avidity (rate of reaction) of diphtheria sera. BÄCHER AND KRAUB. *Centr. Bakt., Parasitenk., I Abt., Orig.* 110, 143-6(1929).—The flocculation titration of Ramon is a useful method. Flocculation does not depend on the antitoxin

content, but on other properties of the serum, perhaps the relationship of the protein fractions. Those sera which flocculate rapidly will neutralize the larger amts. of toxin. There are differences in the *in vivo* protective power which do not parallel *in vitro* rates of reaction.

A microchemical method for the demonstration of alexin in the blood. O. HUNTE-MÜLLER. *Centr. Bakt., Parasitenk.*, I Abt., Orig., 110, 150-2(1929). JOHN T. MYERS

Specific and non-specific immunity. L. K. WOLFF. *Arch. néerland. physiol.* 12, 254-7(1927).—The injection of a bacterin is followed in a few hrs. by an increase in the non-specific resistance of an animal, perhaps because of the presence of some substance secreted by the leucocytes into the serum. This form of immunity lasts only a couple of days. It can be produced by the injection of milk, horse serum, I<sub>2</sub> solns., etc., or by the application of any of these substances to the shaved skin. A few days after the injection or application of a bacterin, an increase in the specific bactericidal power of the blood occurs due to an increase in the specific activity of the leucocytes.

M. H. SOULE

Experimental extracorporeal thrombosis. V. Influence of certain chemical substances on extracorporeal thrombosis, with special reference to the efficacy of a combination of heparin and magnesium sulfate. T. SHONOYA. *J. Exptl. Med.* 46, 963-78(1927).—Distd. H<sub>2</sub>O dialyzes through the collodion tube and causes hemolysis, the hemolyzed blood then clotting. Bile salts accelerate clotting in heparinized blood. White thrombi are formed, which contain little fibrin and are fragile, easily breaking down into platelets. Despite the no. of white thrombi, normal clotting does not occur. Surrounding the collodion tube with 1 to 2 cc. of *d*-glucose causes the formation of numerous white thrombi which are fragile but clotting is not accelerated. With 1 to 2% of CaCl<sub>2</sub> outside the tube the clotting is accelerated; white thrombi are rapidly formed; sedimentation occurs and the white thrombi quickly become red. MgSO<sub>4</sub> (10%) outside the tube retards clotting in the non-heparinized animal and also retards it in the heparinized animal by preventing white and red thrombus formation. It has a similar effect if given intravenously, 50 mg. per kg.

C. J. WEST

Blood chlorides in conditions associated with pneumonia. CARL A. L. BINGER, RONALD V. CHRISTIE, JOHN STAIGE DAVIS, JR., AND ALMA HILLER. Rockefeller Inst. Med. Research. *J. Exptl. Med.* 49, 603-14(1929).—Attempts have been made in dogs to lower the serum chlorides by means of various procedures. Of these the withholding of food, anoxemia, tissue destruction, anaphylactic shock, leucocytosis and fever yielded neg. results. Ingestion of large amts. of H<sub>2</sub>O lowered the chloride level independently of body temp. The chloride drop under these circumstances could not be accounted for by excretion and appeared to run parallel with an increase in the serum H<sub>2</sub>O content. Exptl. pneumococcus infection in 2 animals reduced the serum chloride concn.

C. J. WEST

Differentiation between some toxic substances in anaerobically produced autolyzates of pneumococci (Types I and II). JULIA T. PARKER. Columbia Univ. *J. Exptl. Med.* 49, 695-700(1929).—The necrotizing and lung-toxic principles present in certain anaerobically prepd. autolyzates of pneumococcus types I and II are similar in respect to extreme sensitiveness to heat and to oxidation and to their ability to be neutralized by the same anti-autolyzate serums. These 2 poisons differ, however, in their ability to be adsorbed or inactivated by red cells, the lung-toxic principle being adsorbed or inactivated by such procedure while the necrotizing principle is not. It is believed that the necrotizing and lung-toxic principles, and probably the pneumococcus hemotoxin also, are all sep. entities in the anaerobically produced autolyzates described.

C. J. WEST

## H—PHARMACOLOGY

A. N. RICHARDS

Peroxide treatment of mouse carcinoma. J. MAGAT. Kaiser Wilhelm Inst. Biol., Berlin. *Z. Krebsforsch.* 27, 378-9(1928).—Mice inoculated with Ehrlich's adenocarcinoma, which never retrogresses spontaneously, were treated with org. peroxides combined with phosphatides. (Details of composition and methods are not given.) Healing was obtained in about 20%, and there were marked reactions in many others. Elective localization of the peroxide was demonstrated in the tumor tissue. H. G. W.

The effect of insulin administration upon the adrenaline content of the suprarenal body in rabbits. SHIZUKA SAITO. *Tôhoku J. Exptl. Med.* 12, 263-9(1929).—Insulin was given (in amts. sufficient to cause convulsions) to rabbits whose left suprarenals had been previously denervated. The adrenaline content decreases unless the gland

is protected by denervation. Glucose simultaneously given in sufficient amts. with the same dose of insulin prevents this loss of adrenaline in the intact gland. B. C. B.

**Depilation with thallium acetate in the treatment of ringworm of the scalp in children.** GEORGE V. BEDFORD. Univ. Manitoba. *Can. Med. Assoc. J.* 19, 660-2 (1928).—Good results are claimed in 18 of 21 cases. A. T. CAMERON

**Pharmacological and toxicological aspects of thallium.** M. J. ORMEROD. Univ. Manitoba. *Can. Med. Assoc. J.* 19, 663-5 (1928).—A review. A. T. CAMERON

**Progress and results in forty-one cases of paresis and tabo-paresis treated with tryparsamide.** E. C. MENZIES. *Can. Med. Assoc. J.* 20, 242-6 (1929).—Of 41 treated with tryparsamide and Hg alone 10 have been brought back to sanity of at least 4 years' standing and have had physical health restored. Of 40 similar cases treated with malaria and tryparsamide 16 were restored to like degree and more quickly. A. T. CAMERON

**An unusual case of diabetes and gout.** I. M. RABINOWITCH. Montreal General Hosp. *Can. Med. Assoc. J.* 19, 682-6 (1928).—Insulin pptd. attacks of gout in this patient. Synthalin treatment was successful in controlling the diabetes without inducing gout, but did not reduce the high plasma cholesterolemia. A second case exhibiting both gout and diabetes did not present this idiosyncrasy even with much larger doses of insulin. A. T. CAMERON

**The glucosides of Digitalis purpurea L.** RAYMOND-HAMET. *Compt. rend.* 188, 461-3 (1929).—From toxicity tests made by intravenous injection into unanesthetized dogs, it was found that the toxic dose is the same for pure digitalin (Cloetta) and for digitalin crystg. in needles (Nativelle) or in platelets (Nativelle). D. D.

**Effect of intravenous injection of ephedrine on blood sugar and blood pressure in man compared with the adrenaline effect.** C. RADOSLAV AND C. STOICESCU. *Kliniko-Med. Inst. B. in Bukarest. Wiener klin. Wochschr.* 41, 1775-6 (1928).—Ephedrine in 1000 times the usual dose has an effect on blood sugar and blood pressure similar to that of adrenaline. The blood sugar effect has about the same duration but the blood pressure effect lasts for two hrs. with no subjective or objective disturbance. D. B. DILL

**Paraldehyde poisoning.** PHILIPP SCHNEIDER. Univ. Inst. Gerichtliche Med. in Wien. *Wiener klin. Wochschr.* 42, 357-60 (1929).—S. reviews the literature and describes the microscopic picture of portions of the gastrointestinal tract of dogs poisoned with paraldehyde. D. B. DILL

**Cholecystography: toxic effects of the dyes.** B. M. DICK AND V. G. H. WALLACE. *Brit. J. Surg.* 15, 360; *Quart. J. Pharm.* 1, 131-2 (1928). The use of Na tetraiodophenolphthalein in the radio-diagnostic investigation of cholecystic disease is not uncommonly attended with toxic symptoms such as upper abdominal pain, nausea, vomiting, diarrhea and pyrexia. Three examples of the effects of excessive doses on human subjects are described. An exptl. analysis of the effects of Na tetraiodophenolphthalein was undertaken on cats and rabbits. Some of the substance is excreted in the pancreatic juice, but only when the common bile duct is ligatured. Perfusion of the pancreas with saline solns. of the drug resulted in diffuse hemorrhagic extravasation. Injection in the pancreatic duct had similar effects. A single intravenous injection of 0.05 g. per kg. produced no abnormal appearances in the pancreas. When the common bile duct had previously been ligatured, however, such an intravenous dose usually produced acute hemorrhagic pancreatitis. Degenerative changes in the liver, following intravenous administration, were also much more extensive if the common bile duct had previously been ligatured. Only slight changes in the kidney were produced by diagnostic doses. When the biliary route of excretion was not available, the drug was almost entirely eliminated by the kidneys. Excretion was slow, continuing some 18 days. From 5 to 10% of the salt was excreted in the urine during the 1st 24 hrs. after an intravenous injection. W. O. E.

**Synthalin for diabetes.** N. PARISE. *H. Moragni* 1927, 1921; *Quart. J. Pharm.* 1, 145-6.—Sixteen cases of diabetes in out-patient practice, treated with synthalin, are recorded. Ten of these were mild; 6 were of moderate severity. Two of the latter had previously received insulin. All the patients showed a considerable diminution of polyuria under synthalin, but no marked changes were found in the chem. compn. of the urine. Thirst was much reduced and in some cases disappeared. Hunger was also modified, and the general symptoms improved. Symptoms of intolerance were not infrequent, especially at the commencement of the treatment. The author considers that synthalin can be generally of benefit only in mild cases of diabetes, and only exceptionally in those of moderate severity. It is contra-indicated in severe cases, since the necessary doses cannot be tolerated. Good results have been obtained by the

alternate use of synthalin and insulin, the latter being substituted for a period of 10 to 15 days every 30 or 40 days. Synthalin is specially suited for treatment of mild outpatient cases; it does not require medical supervision except at the start. W. O. E.

Synthalin in diabetes. R. CARRASCO. *Rev. med. (Barcelona)* 7, 246(1927); *Quart. J. Pharm.* 1, 146.—Previous reports indicating that the chief advantage of synthalin lies in its ability to act when administered orally are confirmed by C. Its toxicity, however, may give rise to disturbances, and its slow action is against its use in emergencies. It cannot be regarded as more than a partial substitute for insulin in moderate and severe cases; in mild cases of diabetes, however, it may prove to be very useful. It is thought that cases refractory to insulin will be even more so to synthalin.

W. O. E.

Sodium salicylate in large doses, alone, and associated with sodium bicarbonate. D. LIOTTA. *Rev. méd.* 1927, 985; *Quart. J. Pharm.* 1, 145(1928).—Expts. on rabbits show that Na salicylate administered alone may cause serious changes in the kidney, liver and heart, and to a less degree in the pancreas and suprarenals. The most marked changes are seen in the kidney. In animals treated with a mixt. of Na salicylate and bicarbonate none of these changes was noted.

W. O. E.

Sodium thiosulfate in arsenical poisoning. T. D. HUGHES. *Med. J. Aust.* 1927, 543; *Quart. J. Pharm.* 1, 145(1928).—In a case of arsenical neuritis following a single large dose taken accidentally, As was present in the urine 6 months later. After 16 intravenous injections of 0.75 g.  $\text{Na}_2\text{S}_2\text{O}_3$  in 10 cc.  $\text{H}_2\text{O}$  given on alternate days the urine was free from As. The patient's clinical condition rapidly improved during the treatment. The later injections were followed by a reaction which, however, passed off in about 12 hrs.

W. O. E.

Incompatibility of tincture of iodine and cherry laurel water. LEMANSKI, ROUQUIÉ AND JARMON. *L'Union Pharm.* 68, 306(1928); *Quart. J. Pharm.* 1, 118.—Allusion to the incompatibility of cherry laurel water is made in some Continental formularies. It is doubtful, however, if they are likely to be prescribed in the same mixt. The question has arisen, however, if there may not be a physiol. incompatibility, when, as frequently happens, as for instance, in the treatment of tuberculosis, a few drops of tincture of I are administered in the morning, and a mixt. contg. cherry laurel water as an ingredient is taken subsequently during the day. The possible reaction between the HCN and I,  $\text{HCN} + \text{I} = \text{ICN} + \text{H}$  is considered to be without danger, and any secondary reaction which might occur resulting in the formation of oxamide and  $(\text{NH}_4)_2\text{C}_2\text{H}_2\text{O}_4$  would result in the formation of such small traces from the therapeutic doses present, that they may be ignored. CNI itself is less toxic than its constituent. From expts. on guinea pigs, Jarmon has proved that no ill-effects follow the administration of cherry laurel water after doses of tincture of iodine given in therapeutic doses in the usual manner.

W. O. E.

Quinic acid in uremia. ARTAULT DE VEVEY. *L'Union Pharm.* 69, 16(1928); *Quart. J. Pharm.* 1, 143.—V. has obtained good results in reducing the amt. of urea in the blood by administering quinic acid in cachets, in daily doses of 4 to 16 grains, given in 2 portions, one at 10 A. M. and the other at 5 P. M. At the same time the patient takes infusion of elder flowers, or of birch flowers.

W. O. E.

The chemistry of ergot. H. LANGECKER. *Arch. expil. Path. Pharm.* 138, 117 (1928); *Squibb Abst. Bull.* 2, A-31-2(1929).—An alkaloid fraction of ergot displaying acid properties when extd. with  $\text{Et}_2\text{O}$  gives a fraction that acts upon the uterus of animals and that influences the action of adrenaline in the same way as does ergotamine. The treatment of this fraction by  $\text{H}_3\text{PO}_4$ ,  $\text{NaH}_2\text{PO}_4$  and  $\text{Na}_2\text{HPO}_4$  gave various substances that displayed the following comparative reactions: The  $\text{H}_3\text{PO}_4$  (15 mol.,  $p_H < 1$ ) ext. was  $\frac{1}{6}$  as active as the  $\text{Na}_2\text{HPO}_4$  ext. ( $p_H = 8.2$ ); the  $\text{NaH}_2\text{PO}_4$  compd. ( $p_H 4.4$ ) was  $\frac{1}{3}$  as active as the  $\text{Na}_2\text{HPO}_4$  ext. The cornutine reaction was more effective with the acid-reacting fraction than with the alk. Physico-chem. examns. indicated that the base is the active part of the compd. and not the salt and, by neutralizing or slightly acidifying, a considerable portion of the base is set free through hydrolysis; the base being lipid-sol. can penetrate the cells and there produce its action. When the alkaloid portion of the ergot ext. is sepd. from the non-alkaloid part and the 2 are compared in activity with the original fraction, there is a 30-60% loss in activity: a value beyond exptl. error; when the 2 fractions are combined, however, the resulting substance displayed its full action upon the uterus.

C. R. F.

Chronic lead poisoning. KOCKEL AND TIMM. *Centr. Gew.-Hyg.* 15, 243-5(1928); *Wasser u. Abwasser* 25, 162.—A histological study showing the differences between chronic Pb poisoning and arteriosclerosis.

C. R. F.

Lead treatment in malignant tumors. M. M. DATNOW. *Monatsschr. f. Geburtsh.*

80, 243(1928); *Squibb Abst. Bull.* 2, A-212-3(1929).—The results of Pb therapy in 227 patients with cancer are reported. Nine of these patients would not consent to intensive treatment but were able to go about as usual; in 10 the growth was stopped completely; and 31 were discharged as cured. This treatment was used only in inoperable cases of cancer, and was preceded if possible by excision of the largest part of the tumor, and examn. of the urine, the blood and the functions of the liver. The same examns. were made after each injection of Pb which was used in colloidal form. Röntgen or Ra treatment may be combined with the Pb treatment. The therapeutic effect of Pb is more certain and differs from the action of other metals because it inhibits the cellular growth but does not destroy the cells. C. R. F.

Notes on the use of certain preparations in leprosy. JOHN M. HENDERSON AND S. P. CHATTERJI. *Indian Med. Gaz.* 63, 620-4(1928).—The relative merits of Cu chloride-*p*-diazoinimbenzene hydrochloride, Succinol and Fibrolysin as remedies in the treatment of leprosy are considered. None of the preps. has any direct action on the organism causing the malady, *M. leprae*. Succinol and the Cu compd. appear to have some power inducing the onset of leprous reactions when employed in relatively small doses. Fibrolysin appears to lack this "lytic" effect. F. G. G.

Plasmochin in the treatment of malaria. PASAPUTI BHATTACHARYYA AND S. P. ROY CHOWDHURY. Police Hospital, Calcutta. *Indian Med. Gaz.* 63, 630-3(1928).—Plasmochin has its own sphere of action in the treatment of malaria, although it cannot claim to replace quinine. Plasmochin has no action on the asexual forms of malignant tertian infection super imposed upon a benign tertian or quartan infection, as has quinine. FREDERICK G. GERMUTH

A preliminary note on the action and uses of pseudoephedrine. R. N. CHOPRA, B. B. DIKSHIT AND K. VENKATACHALAM PILLAI. School of Tropical Med. and Hyg., Calcutta. *Indian Med. Gaz.* 64, 1-4(1929).—The pseudo compound is claimed to possess most of the actions and properties of ephedrine while its toxicity is much lower. Graphs are presented. FREDERICK G. GERMUTH

The treatment of filariasis. R. N. CHOPRA. Calcutta School of Tropical Med. and Hyg. *Indian Med. Gaz.* 64, 130-9(1929).—Experimentation has developed the fact that there are remarkable variations in the nos. of microfilariae circulating in the peripheral blood; these variations are quite independent of the drug that is being administered. Bismene, antimosan, stibosan, neostibosan, stiburea, novostiburea, Sb-sulfur compd., mercurochrome, plasmochin, emetine and tryparsamide produce no effect on the microfilariae circulation in the peripheral blood and, it is therefore presumed, have no effect on the adult parasites. Tryparsamide, like some of the arsenobenzenes compds., produces disappearance of chyluria, and the effect with this drug often lasts for prolonged periods. This compd. also decreases the frequency of attacks of lymphangitis. Numerous tables and several graphs accompany this most interesting report. FREDERICK G. GERMUTH

Berberine sulfate in Oriental sore. A. LAKSHMI DEVI. *Indian Med. Gaz.* 64, 139-40(1929).—Application of Sb ointment or methylene blue in the treatment of Oriental sore is of doubtful success. Acid berberine sulfate in 2% soln. is preferable in that it produces marked improvement, in the average patient, of a permanent character, in a relatively short period. Seldom are more than 3 injections necessary to effect a complete cure. FREDERICK G. GERMUTH

A new carbohydrate substitute for the treatment of diabetes. E. KAUFMANN. *Klin. Wochschr.* 8, 66-9(1929).—*d*-Sorbitol is recommended as a carbohydrate substitute in the treatment of diabetes. It is sweet, easily absorbed, can be oxidized by the diabetic organism, hence spares the protein, leads to glycogen formation and does not elevate the blood sugar. MILTON HANKE

The significance of "internal circulation" for crystalloids, particularly iodide. WERNER LIPSCHITZ. Univ. Frankfurt. *Klin. Wochschr.* 8, 116-7(1929).—The injection of NaI into dogs—20 mg. per kg. body wt.—gives an initial concn., in the blood, of 5 mg. % which slowly decreases. The I is concd. 10-15 times in the gastric secretion (Pavlov stomach) and 1.5 to 7 times in the secretion from the parotid gland. Injection of 50 to 120 mg. NaI per kg. body wt. gives rise to initial blood values of 15-30 mg. % NaI. With high blood concns. of NaI the stomach loses its ability selectively to conc. the NaI in the gastric secretion. The I concn. of the gastric juice may be identical with or only slightly greater than that of the blood. The I content of the aq. humor lags considerably behind that in the blood and, as the I content of the blood decreases, becomes higher than that in the blood. It is a case of slow transfer. Injection of 50-100 mg. Na salicylate into dogs leads to a blood concn. of 6-16 mg. %, a salivary concn. of 3-11 mg. % and none in the gastric juice. Most of the salicylic acid is excreted into

the urine. Injection of  $\text{Na}_2\text{Fe}(\text{CN})_6$  (250-300 mg. per kg. body wt.): blood concn. 55-75 mg. %; none in the gastric juice or in the saliva. 80-90% is eliminated in the urine in concns. as high as 990-1200 mg. %. Injection of Na lactate (1-2 g. per kg. body wt.): initial blood concn. 70-209 mg. %. This falls off rapidly. None is excreted into the gastric juice or into the saliva. It is concd. by the kidney. The urine may contain 285-980 mg. % lactic acid.

MILTON HANKE

**Treatment of Basedow's disease.** WILLY KÖNIG. *Klin. Wochschr.* 8, 634-6 (1929).—The buffering ability of the body tissues is reduced in Basedow's disease. The administration of alkali is recommended as an adjunct to the customary treatment.

MILTON HANKE

**Action of thyroxine on the heart.** M. NOTHMANN AND G. W. PARADE. *Klin. Wochschr.* 8, 699-700 (1929).—Thyroxine, administered either intravenously or by mouth, has no effect upon the pulse rate or upon the electrocardiographic curve. The intravenous dose was 5 mg. (duration of expt. not specified) and the peroral dose was 1 mg. 3 times a day for 2-4 weeks. The basal metabolic rate was increased.

MILTON HANKE

**Studies on the relationship between chemical constitution and physiological action.** II. The miotic activity of urethans derived from the isomeric benzyldimethylamines. EDGAR STEDMAN. Univ. Edinburgh. *Biochem. J.* 23, 17-24 (1929); cf. *C. A.* 21, 962.—The miotic activity was confined to the methylurethans of the isomeric hydroxy-benzyldimethylamines (1), the urethans of choline iodide and tropine being inactive in 2% solns. This confirms the view that activity is associated with the fact that the miotics are substituted phenyl, as distinguished from alkyl, esters of carbanic acids. The activities of (1) are estd. to be in the order *ortho*- > *para*- > *meta*-. Conversion of the tertiary basic group into the quaternary ammonium group increased the activity of the *ortho*-compound, diminished that of the *meta*- and abolished that of the *para*-.

BENJAMIN HARROW

**Action of insulin in normal young rabbits.** MAURICE W. GOLDBLATT. St. Thomas' Hospital, London. *Biochem. J.* 23, 83-98 (1929).—The glycogen content of rabbits, starved for 24 hrs. and treated with insulin, shows a large rise in liver glycogen. Treated with insulin, young rabbits may die of hypoglycemic convulsions and still possess increased liver glycogen and considerable muscle glycogen. The theory is proposed that the immediate effect of insulin is to inhibit the release of liver glycogen.

B. H

**Antistaphylococcic effects of the intraarterial injection of certain dyes.** Report of intraarterial injections of mercurochrome 330- soluble, gentian violet and acriflavine in the treatment of experimental staphylococcic infections in dogs. ZUNG DAT ZAI AND FRANK L. MELENEY. *Ann. Surgery* 88, 961-74 (1928).—Intraarterial injection of these dyes in doses of 5 mg. per kg. body weight given 24 hrs. after local injection of organisms into the leg does not affect the course of a local exptl. hemolytic *Staphylococcus aureus* infection. Injection of these dyes in larger quantities injures the kidneys and liver.

FRANCES KRASNOW

**Acute copper sulfate poisoning.** M. MEEROVICH AND L. MOISEYEV. Obukhov Netschaew-Hospital, Leningrad. *Deut. Z. ges. gericht. Med.* 11, 189-92 (1928). Case report showing gastrointestinal disturbances, icterus, anemia, kidney changes and nervous disorders.

FRANCES KRASNOW

**A case of scopolamine hydrocyanic acid poisoning.** L. VAN ITALLIE AND U. G. BIJLSMA. *Deut. Z. ges. gericht. Med.* 11, 468-77 (1928).

FRANCES KRASNOW

**The biological influence of various colloidal metals. I. The influence of these on the frog's heart.** YOSHIKIMI SASAKI. *Acta Schol. Med. Univ. Imp. Kioto* 11, 335-47 (1929).—Colloidal metals which affect the isolated frog heart act directly on muscle. Colloidal Fe, Pt and Sn in Ringer soln. without  $\text{NaHCO}_3$  up to 0.04 or 0.05% show no effect; in the same concn. colloidal Ni and Co weaken diastole while colloidal Au and Pb decrease the contractility but do not cause arrest of the beat. The smallest effective concn. of these latter is 0.005%. Colloidal Cu, Ag and Zn decrease contractility but do not change the rate noticeably. Cu and Ag bring the heart to systolic arrest but Zn causes it to stop in diastole. The min. Cu strength is 0.0002%; Ag and Zn, 0.001%. The dialyzate from these colloidal preps. acts similarly to the colloidal metals but the residue which contains the colloidal metal is much stronger in its action. 20 references are given. II. **The influence of these on the vessels.** *Ibid* 349-58.—Perfusion expts. on frog vessels with colloidal metals in Ringer soln. show that colloidal Cu, Ag, Zn, Ni, Co and Pb have a constricting action on the frog vessels; zinc salts, however, dilate the vessels. Expts. with atropine indicate the muscle in the vessel walls is directly affected. III. **The influence of these on the isolated rabbit intestine.** *Ibid* 359-64.—Expts. on isolated rabbit intestine according to the Magnus method

employing colloidal metals in Locke soln. less  $\text{NaHCO}_3$  show that colloidal Cu, Ag, Zn, Ni, Co and Pb increase tonus and decrease the amplitude of the movements. Colloidal Au, Pt, Fe and Sn even in high concn., 0.012%, show no noticeable effect on movement. The muscle is directly affected by colloidal Cu, Ag, Zn, Ni, Co and Pb.

G. H. W. LUCAS

The action of ions and isotonic Ringer solution on the strip of inner and outer layers of the heart ventricle. MASARU SATO. *Acta Schol. Med. Univ. Imp. Kyoto* 11, 403 23(1929).—According to Schmedberg there are inner and outer layers of heart muscle which are functionally quite different; if the outer layer, which carries the diastolic action, be affected, diastolic standstill follows and *vice versa*. Frog hearts were divided into left inner strips and right outer strips according to the Takahashi method—in the left inner portion it has been found that the impulse-conducting bundles of the frog heart are more strongly developed also into left outer and right inner strips. The movements of these strips of muscle together with the movements of undivided strips were followed when  $\text{CaCl}_2$ ,  $\text{KCl}$ ,  $\text{NaCl}$  and  $\text{NaHCO}_3$  were added to Ringer soln. and when hypotonic and hypertonic Ringer were employed. The action of the drugs, whether inhibitory or stimulant, appeared earlier and more strongly in the left inner strip or left half piece than in the right outer or right-half piece in the same concn. of drug. In the left outer layer of ventricular muscle the action of the drug appeared either later or at the same time and more weakly than in the right inner strip or equally strong with the same concn. of drug. The action of the drugs is closely associated with the no. of impulse conducting bundles present as well as with the difference in properties of the strips.

G. H. W. LUCAS

The inhibiting action of polysaccharides (starches, inulin) on the hyperglucemia of glucose. GIUSEPPE SOLARINO. *Arch. sci. biol.* 13, 31-8(1929).—Sol. rice and corn starch administered to starved dogs in 25-g quantities produced a variable hyperglucemia (0.012 to 0.048%). Inulin in 5 g quantities also produced a hyperglucemia. Rice and corn starch administered orally soon after glucose, or  $\frac{1}{2}$  hr. before, inhibited the glucose hyperglucemia; the glucemic titer was always less than that produced by glucose alone, but higher than that produced by starch alone. Inulin acted similarly except that its inhibiting action was more marked, being comparable to that of levulose.

PETER MASUCCI

The formation of lactose in the functioning mammary gland under the action of insulin. ORONZIO MACCHIARULO. *Boll. soc. ital. biol. sper.* 3, 973 6(1928).—The relation between glucemia and the concn. of lactose in milk was studied. This was done by producing hyperglucemia in a milch goat with injections of glucose. Expts. were also made to show whether a simultaneous injection of insulin would cause a greater utilization of the glucose injected and transform it into lactose. The normal glucemic titer of the animal under test was 0.09% g., and the concn. of lactose was 4.3% g. The injection of 30 units of insulin subcutaneously reduced the blood sugar to 0.046% and the lactose to 3.80%. If the hypoglucemia was sufficient to cause convulsions, the concn. of lactose decreased still more, while an intravenous injection of glucose increased the glucemic titer and also the lactose content. Hyperglucemia was first induced in the goat by injecting 200 cc. of a 15% soln. of glucose. This resulted in an increase of lactose in the milk. If, however, insulin was injected simultaneously, the glucose injected was rapidly consumed, hypoglucemia was produced, and the lactose diminished correspondingly. Expts. were then made by using artificial circulation in a functioning but isolated mammary gland. Defibrinated blood from the same animal was used as the circulating fluid. Blood sugar and lactose were detd. and later 20 units of insulin injected. The lactose decreased from 3.25% to 2.50% one hr. after the insulin was injected. These results indicate that the mammary gland can synthesize lactose in an amt. which depends on the quantity of glucose circulating in the blood, but insulin plays no part in this transformation.

PETER MASUCCI

The mechanism of action of colloidal sulfur. RENZO AGNOLI. *Boll. soc. ital. biol. sper.* 3, 992-6(1928).—The aim of this investigation was to det. whether the toxicity of colloidal S was due to other causes in addn. to the formation of  $\text{H}_2\text{S}$ . Guinea pigs and rabbits were injected with colloidal S intracardially and intravenously. In each case the animals died of symptoms typical of shock. These symptoms were attenuated if the animal was desensitized by injecting small amts. of S intraperitoneally. If the S was injected into dogs, the animals did not die from shock but presented characteristic colloid disturbances, hypotension and vasomotor reactions. The death of the guinea pigs and rabbits by colloidal S was, therefore, due to the toxic action of  $\text{H}_2\text{S}$  formed and to the colloidal state of the S.

PETER MASUCCI

Effect of insulin on the liver. ERIK FORSGREN. Karolinsches Inst., Stockholm.

*Acta Med. Scand.* 70, 139-49 (1929).—The glycogen of the liver of normal animals varies within wide limits, the chief reason for this being the fact that the liver with a rhythmic function changes from assimilatory to secretory activity. During the assimilatory phase the glycogen content increases, and during the secretory phase it diminishes. Insulin exerts no noticeable effect on the liver glycogen content and does not influence its rhythmic activity. The sensitivity to insulin seems to vary with the rhythmicity of the liver activity, and is greatest during the secretory phase when the glycogen supply is lowest.

Clinical studies on the action of synthalin. EJNAR JARLØV. *Acta Med. Scand., Suppl. XXVI*, 48-51 (1928). S. MORGULIS

Experience in the treatment of diabetes mellitus with synthalin. FINAR RUD. *Acta Med. Scand., Suppl. XXVI*, 52-4 (1928).—The use of synthalin in certain cases is recommended, though intoxication occurs frequently. S. MORGULIS

Experience with the synthalin treatment in diabetes mellitus. J. E. HOLST. Copenhagen. *Acta Med. Scand., Suppl. XXVI*, 55-60 (1928).—The favorable effect of the synthalin can best be judged by the glucosuria rather than the glucemia. S. MORGULIS

The effect of decholin on the respiratory metabolism of rats. HOKAN RYDIN. Univ. Bern. *Biochem. Z.* 200, 401-6 (1928).—Enteral or parenteral administration of decholin increases the basal metabolism of rats 12%. Decholin is a relatively innocuous substance with powerful cholagog action. This leads to the view that the observed effect it produces on basal metabolism is an argument in favor of the participation of the liver in the specific-dynamic action. S. MORGULIS

The physiological action of salicylic acid derivatives. I. K. KASE. Imp. Univ., Tokyo. *Biochem. Z.* 205, 21-6 (1929).—Esters and acid amides of hydroxybenzoic acid are more toxic than hydroxybenzoic acid itself. They have a more or less injurious effect on the kidneys and produce a phenol-like poisoning. II. K. KASE AND KAKJIRO SEKI. *Ibid.* 27-30.—The relative non-toxicity of hydroxybenzoic acid as compared to the phenol is attributed to the presence of the carboxyl group. This is proven indirectly since salicylic acid derivs. without the free carboxyl group have the same toxic effect on the organism as phenol. S. MORGULIS

Influence of amino acids and their derivatives on adrenaline hyperglucemia. M. CHIKANO. Med. Acad., Osaka. *Biochem. Z.* 205, 154-65 (1929); cf. *C. A.* 22, 266.—Certain amino acids strengthen the effect of adrenaline or produce hyperglucemia. These amino acids generally contain a benzene ring and structurally are closely related to adrenaline. In fact, their hyperglucemic action is greater the more nearly related they are to adrenaline. Especially dihydroxyphenylalanine behaves like adrenaline not only biologically but also in its color reactions with  $\text{HgCl}_2$  or  $\text{HIO}_4$ . S. M.

The effect of adrenaline on the creatine-phosphoric acid content of muscles. O. FEINSCHMIDT AND D. FERDMANN. Ukraina Biochem. Inst., Charkow. *Biochem. Z.* 205, 325-8 (1929).—Adrenaline causes an increased destruction of creatine-phosphoric acid in muscles. The amt. of  $\text{H}_3\text{PO}_4$  after adrenaline injection is greatly increased but this could not come entirely from the creatine- $\text{H}_3\text{PO}_4$  compd. In pigeons adrenaline causes a great rise in  $\text{H}_3\text{PO}_4$  compds. which are split into inorg.  $\text{H}_3\text{PO}_4$  in a 2-hour autolysis in 2%  $\text{NaHCO}_3$  at 40-45°. The injection of adrenaline causes increased lactic acid formation at the same time as it promotes the cleavage of the creatine- $\text{H}_3\text{PO}_4$ , but apparently there is no direct relationship between the 2 phenomena. S. MORGULIS

Stimulation of resorption by yeast extract. III. HSTER V. KOKAS AND GEORG GAL. Physiol. Inst. Univ., Debreczen. *Biochem. Z.* 205, 380-7 (1929).—Yeast ext. (Harris' powder) stimulates strongly the contraction of intestinal villi and it also greatly promotes the resorption of glucose. Thus, whereas 37.3% was absorbed per hr. from a definite amt. of glucose, 46.8% was absorbed in the presence of the yeast ext. or actually 56 mg. more. Still more striking was the effect of resorption of peptone solns. (increase in  $\frac{1}{2}$  hr. from 31.5% to 57.6%). S. MORGULIS

Toxic properties of the active principle of the beetle *Paederus fuscipes* (fam. Staphylinidae) in relation to human skin. E. PAVLOVSKII AND A. STEIN. State Inst. Med. Sci., Leningrad. *Zhur. ekspl. Biol. Med.* 10, 440-7 (1929).—The autumn beetles are as poisonous as spring beetles, causing a vesicular dermatitis. Rapidly dried beetles retain their toxicity, but heating the beetles for 30 min. at 100° destroys this action. The active principle can be extd. with alc. and  $\text{CHCl}_3$ , and a soln. of the dry residue in oil is poisonous to the human skin. The extd. beetle no longer contains substances injurious to the skin. Reasons are given for regarding the toxic substance of *Paederus* as different from that of *Lytta vesicatoria*. S. MORGULIS

Changes in the alkali reserve of the blood in nicotine poisoning. S. W. WOLTER.



Ukraina State Inst. for Hygiene and Pathology of Labor, Odessa. *Zhur. expl. Biol. Med.* 10, 470-83(1929).—See C. A. 23, 1682. S. MORGULIS

**Bismuth therapy in Weil's disease.** UHLENHUTH AND SEIFFERT. *Centr. Bakt., Parasitenk.*, I Abt., Orig., 110, 47-53(1929).—Bi has a sp. effect on the spirochetes of Weil's disease in exptl. guinea pig infections. The preps. tried were: bismuto-yatren, Bismogenol, and the French tryparsol preps. The effect seems to be indirect. *i. e.*, a mobilization of natural defenses. Bi is stored in the liver and spleen, and its slow liberation continues its effect. JOHN T. MYERS

**Non-specific therapeutic experiments on trypanosome-infected animals, and the possibility of increasing the effect of germanium.** PFANNENSTIEL AND B. SCHARLAU. *Centr. Bakt., Parasitenk.*, I Abt., Orig., 110, 84-7(1929).—Dried human serum has a trypanocidal effect in dourine-infected mice. This effect is enhanced when combined with Ge. JOHN T. MYERS

**Procedures for the choice of substances in the chemotherapy of tuberculosis.** HESSE. *Centr. Bakt., Parasitenk.*, I Abt., Orig., 110, 170-2(1929).—There are special affinities between tubercle bacilli and chem. substances in the sense of Ehrlich. The cultivation method of Wright is satisfactory. JOHN T. MYERS

**The trypanosomes of the marmot, *Cricetus frumentarius*.** CARLOS ZOZAYA. Inst. für Schiffs- und tropenkrankheiten zu Hamburg. *Centr. Bakt., Parasitenk.*, I Abt., Orig., 110, 187-9(1929).—These trypanosomes respond to the same chemotherapy as does *Tr. lewesi*, *i. e.*, arsenophenyglycine but not Bayer 205, Sb, or neosalvarsan. They seem identical in other ways also. JOHN T. MYERS

**The reticulo-endothelial system and chemotherapy.** H. SCHLOSSBERGER. *Centr. Bakt., Parasitenk.*, I Abt., Orig., 110, 210-19(1929).—Studies based on splenectomy, and on blocking the reticulo-endothelial system do not prove that chemotherapeutic effect depends on activation of this system. JOHN T. MYERS

**Determination of the coefficient of carbon monoxide poisoning in blood undergoing putrefaction.** C. SIMONIN. *Ann. méd. légale criminol. police sci.* 9, 11-4(1929); cf. C. A. 22, 820.—Blood taken from a corpse 3 days after death from CO poisoning, in which putrefaction had set in, gave a coeff. (ratio of CO actually present in the blood to that present after satn. with CO) 0.85. As the putrefaction gases were partly counted as CO in consequence of their reducing action, they were eliminated by placing the sample under vacuum for 1 min., and the detn. was then carried out in an atm. of CO, and gave a coeff. of 0.77. A. PAPINEAU-COUTURE

**The action of lecithin in the metabolism of the carbohydrates.** A. CRUTO. *Nat. Med. Pharmacol. Inst. "Serrano," Rome. Rass. clin. terap. sci. affini* 28, 24-6(1929).—Three groups (II, III and IV) of male rabbits of the same age and wt. received subcutaneous injections of an emulsion of lecithin, lutein and cholesterol esters in physiol. serum; another group (I) served as the control. For the different groups the total doses of lecithin injected during a period of 54 days were: 1.24 g., 6.20 g., and 12.40 g., resp., while the total doses of lutein and cholesterol esters amounted to 0.5 g., 2.50 g. and 5.00 g., resp. Blood samples taken at various intervals revealed the presence of a slight hyperglucemia in the animals receiving the lipid mixt. After 54 days the av. glycogen contents of the liver were I 4.317%, II 1.172%, III 0.657%, IV 0.650%; of the muscles I 0.480%, II 0.467%, III 0.388% and IV 0.402%. Conclusion: Lecithin injections caused an increase in the catabolism of the carbohydrates. G. SCHWOCH

**Variation of acetone bodies in the living organism.** KAKUZO WATANABE. *Aichi Med. Col. Aichi J. Med.* 35, 381-534(1928).—In normal rabbits the concn. of acetone bodies in blood is increased on administering butyric, valeric and isovaleric acids, and the acetone bodies make their appearance in urine. The influence of isovaleric acid is especially large, accompanying the increase in the blood sugar concn. Poisoning by yellow P also causes an increase in the acetone concn. in blood and in urine, but no remarkable change in the concn. of blood sugar. When fat is given to the phosphorus-poisoned rabbit, the concn. of acetone bodies is a little smaller than when given to a normal rabbit, the influence of isovaleric acid being most remarkable also in this case. Adrenaline alone has no effect on acetone bodies in blood. The increase in the content of acetone bodies by the combined use of adrenaline and butyric acid is especially marked when the butyric acid injection is made in 2 hrs. after the injection of adrenaline. With seriously poisoned rabbit no change of blood sugar concn. appears, the concn. of acetone bodies remaining the same as in the normal rabbit. The effect on the content of acetone bodies is not changed when adrenaline is given during the period of poisoning and then butyric acid is injected after 2 hrs. Adrenaline decreases the acetone concn. which had been increased by fatty acid, and also the excretion of acetone in urine. A comparatively large quantity of insulin decreases the concn. of blood sugar and acetone.

But by the combined use of fatty acid and insulin an increase of acetone concn. can be obtained which compares very well in amt. with the case of the injection of a fatty acid alone, the excretion in urine being small. Insulin does not inhibit the formation of acetone bodies. When a mixt. of Na butyrate and glucose is injected into the vein in the normal rabbit there is an increase of acetone bodies similar to that caused by Na butyrate alone, although the recovery is more rapid. In phosphorus-poisoned rabbit, the velocity of increase in the blood acetone is retarded, its excretion in the urine being small. Since the formation of acetone bodies is not much retarded during the phosphorus poisoning, W. concludes that the acetone body formation is not a function peculiar to the liver.

K. SOMEYA

The toxicity of cocaine and borocaine for the isolated heart. J. BOER. *Arch. néerland. physiol.* 12, 284 (1927).—Cat hearts were perfused by means of Langendorff's app. The drug soln. was injected into the inlet tube; 1:500 cocaine or 1:50 borocaine reduced the amplitude of the beats 50%; 1:1000 or 1:100, respectively, 80%; 1:200 borocaine 98% while 1:4000 cocaine and 1:200 borocaine increased the amplitude 150%. The toxicity of cocaine was reduced by diln. much more slowly than that of borocaine.

M. H. SOULE

Studies of the uric acid elimination through the kidneys and observations on the salt and water elimination. I. KAJ LINDBERG. *Finska läkaresällskapets handl.* 69, 899–936(1927); *Ber. ges. Physiol. exptl. Pharmacol.* 46, 716.—The elimination of endogenous uric acid in man is lowest during the night and attains its max. between 3 and 6 p. m., at which time the amt. of urine and the output of NaCl are also greatest. Polyuria was observed after the intramuscular injection of 0.1 or 0.3 mg. *adrenaline*; this continued as long as the blood pressure was decreased. When the blood pressure returned to normal oliguria appeared. Immediately after the injection NaCl elimination was reduced; this continued for 6 hrs. The *adrenaline* injection had no influence on the elimination of uric acid. When 1 mg. *atropine* was injected subcutaneously at 9 a. m., an abnormally small elimination of endogenous uric acid was observed during the 3 hr. period from 12 noon to 3 p. m. In an expt. in which no diuresis occurred slight, transient increase in uric acid was observed 90 min. after the intramuscular injection of 3 cc. of *pituglandol*. After injections of 2 and 3 cc. *pituglandol* a slight initial increase in uric acid elimination was observed. In another expt. in which increased diuresis was observed before the injection, the injection of 1.4 cc. *hypophysin* effected an expressed oliguria persisting at least 6 hrs. An influence on the elimination of endogenous uric acid was not noted. II. Experiments with intravenous calcium chloride injections and with cinchophen. *Finska läkaresällskapets handl.* 69, 993–1023(1927); *Ber. ges. Physiol. exptl. Pharmacol.* 46, 717.—In 3 expts.  $\text{CaCl}_2$  was injected intravenously into human subjects; in 2 of these 1 g. cinchophen had been given 4 hrs. before the  $\text{CaCl}_2$  injections. In each case there followed an increase in blood pressure (12–16 mm. Hg) lasting 8–9 mins. and a bradycardia which persisted for several hrs. A polyuria or short duration appeared at the same time as the blood pressure increase and was followed by a period of low urine elimination which in turn was followed by a large increase in the diuresis. In 2 cases the injection was followed by a large influx of  $\text{H}_2\text{O}$  from the tissues into the blood and in all cases by a large increase of the NaCl elimination which in 2 cases reached a remarkable amt. In the case which had not received cinchophen there was a slight increase in the uric acid elimination lasting for 30–60 mins. which was followed by a 5-hr. period in which this value sank below normal. In 4 expts. 1 g. cinchophen alone was given. Even in the first hr. following the ingestion of the drug higher values of the endogenous uric acid in the urine were observed. The serum during the first hr. after the cinchophen showed an increased uric acid content which gradually decreased so that in 1 case 9 hrs. after the cinchophen had been given the uric acid content of the serum was only 50% of the pre-exptl. value.

R. C. WILLSON

Pharmacological study of the adnexa uteri in different physiological conditions, with consideration of the attending uterus. MASAO FUJITA. Univ. Okayama. *Okayama-Igakkaï-Zasshi* 39, 2025–48(1927); *Ber. ges. Physiol. exptl. Pharmacol.* 45, 539.—F. examd. the freshly isolated ligamentum rotundum, tube and uterus of virgin, non-virgin non-pregnant rabbits, animals in the first and last stages of pregnancy and those in puerperium. Locke's soln. was used as the base soln. to which the following substances were added: *adrenaline*, *pilocarpine*, *quinine*, *nicotine*, *pituitrin*, *strophanthin*, *morphine*, *eserine*, *atropine*, *cocaine*, *Ba*, *papaverine* and *Ca* and *K* salts. *Adrenaline* nearly always had an irritating effect on the lig. rot. during the puerperium, in the last stage of pregnancy and usually in the first stage of pregnancy. On the virgin and non-virgin non-pregnant ligament its effect was inhibiting. The action of *adrenaline* on the

tube and uterus differs only in the virginal condition; the virginal tube is inhibited by a small amt. of adrenaline and is stimulated by a large amt.; adrenaline usually stimulates the uterus in every stage except in the puerperium. In the tube and the lig. rot. the inhibiting sympathetic fibers during virginity are much more sensitive, while later the proportion is inverted and becomes the same as in the tube and uterus. Effects on the lig. rot. in every condition: pilocarpine, Ca and papaverine, inhibiting; atropine, strophanthin, eserine, Ba and morphine, irritating. On the tube, adrenaline, quinine, cocaine and K have different effects in the different physiological conditions. Eserine, atropine, morphine, Ba, papaverine and strophanthin have the same action on the tubes and uterus as they have on the lig. rot. The effects of the other substances that were studied were varying, although those of adrenaline, quinine, nicotine, and cocaine did not differ very much from each other. In the virginal condition the inhibiting sympathetic fibers are sensitive while during pregnancy and puerperium the reverse is true. In the adnexal organs there is either no supply of parasymphathetic fibers present or these are less sensitive than those in the uterus. Eserine seems to exert an action on the muscles in addition to that on the nerves. R. C. WILLSON

The rhizome of iris (NIGRISOLI) 17. *Terminalia arjuna*; its chemistry, pharmacology and therapeutic action (CHOPRA, GHOSH) 17. The solubilities of Pb phosphates (MILLET, JOWETT) 2. O<sub>2</sub> formed by ultra-violet rays (DADLEZ) 3. New results of the chemistry of curare (FIRBAS) 10.

## 12—FOODS

F. C. BLANCK AND H. A. LEPPER

**Food preservation by canning.** C. O. BALL. Am. Can Co., Maywood, Ill. *Food Industries* 1, 262-3(1929).—A brief survey of the application of chem. and phys. factors to the com. canning industry. C. R. F.

**Food packing in glass.** S. HENRY AYERS. Glass Container Assoc., New York. *Food Industries* 1, 264-5(1929).—Chem. and phys. factors are described as applied to the preservation of food in glass containers. C. R. F.

**Cold packing of small fruits.** P. F. NICHOLS. Univ. Calif. *Food Industries* 1, 252-5(1929).—Fruits such as peaches, cherries or berries are packed with sugar in the ratio by wt. of 2:1 or 3:1, in bbls. or tins, quickly frozen at a temp. of about -13°, and maintained below -9.3° until used in such products as ice cream, jams, jellies, preserves or pies. C. R. F.

**Hygroscopy in flour ash and a discussion of direct ash weighing.** L. URNER LINDEL. *Cereal Chemistry* 6, 134-9(1929).—Uniformity of results is the aim of every analyst. The elimination of factors interfering with this is desirable. Variations in the weight of crucibles introduce errors. Direct weights of the ash would eliminate this, if direct weights are reliable. The reliability of these weights is shown in graphs and tables. The hygroscopic tendencies of flour ash affect the results very little in the period of time required for weighing the ash. L. thinks there is the possibility of the development of a rapid and accurate method of technic in the detn. of ash in flour by direct weighing. L. H. BAILEY

**The relation of hydrogen-ion concentration and buffer value to the baking quality of flour.** II. E. A. FISCHER AND P. HALTON. Research Assoc. Brit. Flour Millers, St. Albans, England. *Cereal Chemistry* 6, 97-115(1929); cf. C. A. 23, 1693.—Extensive baking tests have been carried out with a great variety of flours over wide ranges of H-ion concn. (from  $p_{H}$  7.80 to 4.20) and varying periods of fermentation. The results of the work appear to confirm the conclusion reached in an earlier investigation that H-ion concn. is not a factor of great importance in detg. dough or loaf quality. Alterations of H-ion concn., brought about in doughs by addns. of acid several times greater than those brought about by prolonged over-fermentation, appear to have singularly little effect on dough or loaf characters. Moreover, the effects observed are not always in the same direction, e. g., slight improvement of some characters and slight damage to others may result from increased H-ion concn. The effects most commonly but by no means invariably noticed are: (1) Increased dough toughness. Stability appears to be little affected, if at all. (2) More pronounced flavor (taste). (3) Often an improved color of crumb. L. H. BAILEY

**Correlation between diastatic power of flour and crust color in the test loaf and its significance.** M. J. BLISH, R. M. SANDSTEDT AND H. PLATENIUS. Univ. Nebraska, Lincoln, Neb. *Cereal Chemistry* 6, 121-7(1929).—When all flours are experimentally baked by the same specified and fixed procedure, in which all environmental factors are

precisely controlled, depth of crust color is positively and definitely correlated with residual sugar in the baked loaf on the one hand and with relative diastatic power and fermentation tolerance of the flour on the other.

L. H. BAILEY

Correlation studies with diverse strains of spring and winter wheats, with particular reference to inheritance of quality. H. K. HAYES, F. R. IMMER AND C. H. BAILEY. Minn. Agr. Expt. Sta., St. Paul, Minn. *Cereal Chemistry* 6, 85-96(1929).—The data from milling and baking trials of wheats of diverse nature were studied by means of correlation coefficients. Inter-annual correlation coefficients were computed for protein content, loaf volume, flour percentage, color score and texture score of loaf and kernel texture. Neither protein content nor kernel texture was significantly and consistently related to loaf vol. as detd. by calcd. correlation coeffs. With wheats of diverse nature, there was no indication of a significant positive relation between protein content and kernel texture.

L. H. BAILEY

Manganese in cereals and cereal mill products. JERHIEL DAVIDSON. Bur. of Chemistry and Soils, U. S. Dept. Agr. *Cereal Chemistry* 6, 128-33(1929).—Mn, ash and protein were detd. in 5 varieties of each of the following cereals: hard winter wheat, soft winter wheat, red spring wheat, white spring wheat, rye, corn, rice, oats and barley. Similar detns. were made on some of their extrn. products. No correlation was found between the Mn and the ash content either in the varieties of one cereal or in different cereals. Neither was any correlation found between Mn and protein except when the types of wheat are considered collectively. In that case, the relation was inverse, the hard winter and red spring wheats being higher in protein and lower in Mn than the 2 types of soft wheat. The Mn content of Red Rustproof oats grown in Arlington was several times higher than that of oats of the other varieties studied. There was no distinct correlation between the Mn content and the protein content of the cereal products, with the exception of the milling products of wheat. The products having a low ash content also had a low Mn content, both being due to the low degree of extrn. The results indicate that there is no correlation between the Mn content and the diastatic properties of the cereals studied. Corn and uncoated rice, which are assocd. with nutritional deficiency diseases, were both low in Mn.

L. H. BAILEY

The nutritive value of peanut meal. MAURICE BOIGEY. *Bull. acad. méd.* [3], 101, 284-6(1929).—Peanut meal has the following compn.:  $H_2O$  9.40, protein 58.20, fat 6.09, glucose 5.05, other carbohydrates 17.25, cellulose 0.49, ash 3.52. Comparative tables show that the digestibility is equal to that of meat. B. recommends that it be mixed with other flours.

A. E. MEYER

The effect of dry skim milk upon the water absorption of doughs and the plasticity of flour suspensions. J. L. ST. JOHN AND C. H. BAILEY. Agr. Expt. Sta., St. Paul, Minn. *Cereal Chemistry* 6, 140-50(1929).

L. H. BAILEY

Something about the constitution of Balata milk from Suriname. W. SPOON. *Ber. Afdel. Handelsmuseum Ver. Koloniaal Inst.* 33, 3-12(1927).—The sample of Balata milk received was preserved with  $NH_3$  water which gave it a slight pink color. The total solids were 53.8% on this sample and 56.0% without the diln. with the preservative. In general the  $H_2O$  content varies with the atm. at the time of tapping. The dry residue had the appearance of a dark brown skin of a rather tough texture, although more pliable than, e. g., Tjipetr gutta-percha. Analysis showed: ash 0.88, acetone ext. 41.5,  $H_2O$  ext. 11.7, total N 1.23, water-sol. N 0.26, xylene insol. 14.5, gutta 39.2, albuminoid substances 6.1%. The ash contained  $SO_4$ ,  $P_2O_5$  and Cl about in equal proportions, Ca, Mg and a little Na.

J. C. JURRIENS

Provisional definitions for preserved milk products. F. E. NOTTBOHM, Z. *Untersuch. Lebensm.* 56, 63-72(1928).—Criteria and methods of evaluation of preserved milk products are discussed. The provisional definitions drawn up by the Commission of the Ver. deut. Nahrungsmittelchemiker and the Verbands deut. Dauermilchfabrikanten are given.

C. R. F.

Evaporated milk a ready source of supply. FRANK E. RICE. Evapd. Milk Assoc., Chicago. *Food Industries* 1, 258-9(1929).—No new data are presented. It is claimed that the Ca and P in evapd. milk are assimilated as readily as these minerals in fresh milk. The protein and fat of evapd. milk are more readily digested than if obtained from fresh milk.

C. R. F.

The estimation of fat in malted milk. C. W. BALLARD. *J. Am. Pharm. Assoc.* 18, 122-3(1929).—Of several methods tried the Rose-Gottlieb method modified gave the best results. Because of the difficult and imperfect soly. of malted milks and the difficulty of measuring aliquot portions accurately the official method gives erroneous results. The app. is modified by using a Röhrig tube larger than the standard size and having the lower 25 mm. detachable and fitted on with a ground-glass joint.

The detachable portion is used as a weighing tube or capsule. One g. of the sample is weighed in the detachable tube and 10 cc. of warm  $H_2O$  is added. The tube is shaken thoroughly to insure soln. of the material and the assay completed by the A.O.A.C. method for milks. Four samples yielded from 0.44 to 0.90% of fat.

L. E. WARREN

**Improving the quality of cheddar cheese by pasteurizing the milk.** J. C. MARQUARDT. *Food Industries* 1, 305-7(1929).—In 186 comparisons of cheddar cheese made from raw and pasteurized milk, there was slight but distinct improvement in score in favor of the pasteurized product. Both flash and holding methods of pasteurization were successfully used. Besides the technical advantages which render the quality of milk for cheese purposes more nearly uniform, pasteurization of milk for cheese-making purposes possesses the addnl. advantage of being conducted at a temp. high enough to destroy pathogenic organisms present in milk.

C. R. F.

**The chemical constitution of buffalo flesh (*Bos bubalus*).** C. COLELLA AND M. NAPOLI. *Arch. sci. biol.* 13, 235-40(1929).—Buffalo flesh contains in %:  $H_2O$  75.96, total solids 24.04, ash 1.15, total N 3.49, fatty acids 1.11, total P 0.186, inorg. P 0.142, lipid P 0.033, and nucleic acid P 0.11. The fat m. 36-37°, I no. 41-42, sapon. no. 198. According to these results, therefore, there is no marked differences between the nutritive value of bovine and of buffalo flesh.

PETER MASUCCI

**Infected ice causes discoloration of halibut.** F. C. HARRISON AND W. SADLER. McGill Univ. *Food Industries* 1, 308-12(1929).—Yellow discoloration of halibut was proved to be due to the growth of *Ps. fluorescens*. The principal source of this bacteria was infected ice, and fresh wash water on the fishing boats. The organism was not present in sea water or on freshly caught halibut. Chlorination of water for ice-mfg. purposes is advocated.

C. R. F.

**The determination of roasted sugar beet in a mixture with chicory.** J. VONDRÁK. *Listy cukrovar.* 47, 363-4(1929).—Ten g. of dried sugar-beet powder was boiled with 50 cc. water, made up to 100 cc. and left standing overnight. The vol. was corrected to 100 cc. and filtered. Ten cc. (1 g. of solid matter) was dild. to 100 cc. and the degree of coloring was read on a Stammer colorimeter. The coloring matter in the ext. increases with the roasting, passes through a max., and decreases with overroasting. The N present in chicory as total N per specimen, total N in ext., N in betaine and N in choline was detd. As roasting progresses, the extractable N decreases and is distributed to volatile N compds. or to coagulated albumins, etc., whose N increases correspondingly. The N content of combined choline and betaine mixts. remains const. for chicory, but is 7 times as high for beets. The chicory showed no betaine and 13 mg. choline N per 100 g. of original chicory. Beets showed 91. mg. N as betaine and 4 mg. N as choline per 100 g. of original beet. The betaine results are quant.; the choline does not represent the total choline present, for not all of it is pptd. V. considers the detection of betaine as an indication of the presence of roasted sugar beets in chicory; the quantity of betaine is not an index as to the quantity of beets added, for the betaine content of beets changes with seasons. Raw sugar contains betaine and will give betaine tests if used in the adulteration of chicory. Roasted carrots are free of betaine and cannot be detected by this method.

FRANK MARESH

**New grape beverages.** H. B. FARLEY. Fruit Products Lab., Univ. Calif. *Glass Packer* 2, 163-6(1929).—Carbonated, blended grape juices, concd. grape sirups for soda fountain and table use, and grape-citrus juice beverages were prepd. from Calif. grown fruits. Some of these products possess merit and are being investigated more thoroughly.

C. R. FELLERS

**How maple sirup is made.** F. S. MEYER. *Glass Packer* 2, 160-2(1929).—The standard wt. for maple sirup is 11 lb. per gal. Approx.  $\frac{1}{2}$  of the total production is crystd. into maple sugar. A huge amt. of the low-quality sugar is used for tobacco curing.

C. R. FELLERS

**Processing and packaging California raisins.** P. D. V. MANNING. *Food Industries* 1, 316-8(1929).

C. R. F.

**Self-emptying suction flask for sugar determinations (PITMAN) 1.** Rennin action in relation to enterokinetic phenomena (RICHARDSON, PALMER) 11A. Physiological shrinkage of potatoes in storage (APPLEMAN, et al.) 11D. Caffeine [removal from bean] (Swiss pat. 128,984) 17. Drying cellulosic tubing [sausage casings] (U. S. pat. 1,708,937) 23. Apparatus for carbonating beverages or other liquids (U. S. pat. 1,709,579) 1.

**Food product from vegetable oils.** ROBERT B. CHAMBERLAIN (to Vegetable Products Inc.). U. S. 1,710,403, April 23. A product which is suitable for use in cooking foods

comprises a suitable vegetable oil such as coconut oil in aerated condition and having a relatively high m. p. and a minor proportion of another vegetable oil such as peanut oil also aerated and having a lower m. p.

**Preserving foods.** C. MOHRENWEISER AND J. MOHRENWEISER (trading as C. Bertram). Brit. 298,061, Feb. 4, 1928. Various food products such as fruits, sausages, hams, eggs, cheese, chocolate and confections are coated or sprinkled with a "base material" such as paraffin, neat's-foot oil, beef tallow or a powdered material such as lime, chalk, dolomite or talcum to which is added a small quantity of a mixt. of colophony, Na benzoate, benzoic acid, salicylic acid, spiraein and  $(\text{NH}_4)_2\text{CO}_3$ . The treating substances may be washed off the food before use.

**Apparatus for preserving foods in sealed containers in closed retorts by steam treatment.** GEORGE W. MULLEN (to Anchor Cap and Closure Corp.). U. S. 1,709,481, April 16.

**Process, apparatus and products for the preparation, coating and wrapping of foodstuffs for their preservation.** P. T. VENAIL. Belg. 353,641, Sept. 30, 1928. The products (e. g., pieces of meat) are placed in a cylindrical, hermetically sealed container filled with an atm. of  $\text{CO}_2$ , which can be recovered in the course of the treatment. The  $\text{H}_2\text{O}$  contained in the meat is entrained by the  $\text{CO}_2$  and is removed by a chem. absorbent. The dried and sterilized products are coated with a mixt. of  $\text{H}_2\text{O}$ , gelatin, NaCl, gum arabic, glycerol, alkali salicylate and a coagulant.

**Extraction and transformation of harmful substances contained in foodstuffs.** G. ORESPIN. Belg. 352,826, Aug. 31, 1928. The foodstuff is placed in contact with a liquid which is very sol. in water, preferably an acid or a neutral liquid; e. g., raw coffee beans are immersed in hot benzoic acid, preferably at  $50^\circ$ .

**Heat treatment of flour.** CHARLES W. CHITTY and DOUGLAS W. KENT-JONES (to Woodlands, Ltd.). U. S. 1,710,472, April 23. By heating flour (suitably at about  $85^\circ$  or somewhat lower for 8-10 hrs.), a product is obtained which forms a plastic mass when mixed alone with water but which is suitable for admixture with ordinary flour to increase the "strength" of the flour for baking purposes. U. S. 1,710,503 specifies a generally similar heat treatment of wheat previous to manuf. of flour from it.

**Ferments for bread making.** THE BRITISH ARKADY CO., LTD. Fr. 648,077, Feb. 1, 1928. A ferment for bread making is prepd. by mixing yeast and an enzyme-producing fungus such as *Aspergillus oryzae* or *Penicillium*. Yeast cultivated on a paste of wheat, maize or rice flour may be incorporated in the fungus, or the fungus cultivated on rice, barley, etc., may be added to yeast.

**Apparatus for pasteurizing milk or other liquids in bulk.** CREAMERY PACKAGE MFG. CO. Brit. 298,379, Sept. 23, 1927.

**Apparatus for sterilizing liquids such as milk by heating in cans.** FREDERIC C. HUYGEN. U. S. 1,709,175, April 16. Structural features.

**Device for heating milk to ripen it for churning.** OLIVE B. STRANGE. U. S. 1,709,287, April 16.

**Fermented food product from milk.** GUSTAV WINKLER (to Alfred Zierer). U. S. 1,710,133, April 23. Milk is fermented with yoghurt bacteria, acid- and rennet-producing cocci and yeasts which do not produce alc. or  $\text{CO}_2$ .

**Beverages formed with milk, cocoa and agar, etc.** CHARLES E. NORTH (to Dairy Drink Co.). U. S. 1,710,504, April 23. A mixt. comprising milk, cocoa and agar is heated under pressure to coagulate the milk and effect such a correlated thickening by the heating and by the agar that a product is produced of such viscosity as to hold substantially all the cocoa particles in suspension. U. S. 1,710,505 relates to a similar compn. in which a vegetable gum such as gum arabic or tragacanth is used instead of agar. U. S. 1,710,506 specifies the use of milk, cocoa and gelatin. U. S. 1,710,507 specifies milk, cocoa and a thickener such as corn starch. U. S. 1,710,508 specifies heating milk to about  $115^\circ$  under a pressure of about 15 lbs. per sq. in. for about 30 mins. to coagulate and thicken and increase the normal friction of the milk, and then adding cocoa and sugar; the cocoa is held in suspension. Cf. C. A. 23, 1185.

**Butter and margarine.** E. GFELLER. Brit. 297,457, Sept. 22, 1927. To improve their keeping qualities, butter and margarine are melted by heat which is applied to destroy bacteria; sepg. of watery constituents incidental to the melting is prevented by energetic agitation which is continued until the melted fat has resolidified.

**Cheese.** L. H. STEDFORD. Brit. 298,174, July 1, 1927. Curd formed as in ordinary cheese manuf. which may be ripened for about 24 hrs. is ground and then pasteurized and simultaneously emulsified while mechanically agitated in a thin layer (with or without addn. of an emulsifying salt). A product is obtained which on cooling and solidifying in packages assumes a condition which permits heating or melting with-

out material sepn. of butter fat. Sour milk, ground mature cheese or lactic acid culture may be added to modify the flavor. An app. is described.

**Cereal meal.** WALTER N. BOYES. Australia 13,142, May 4, 1928. Cereal meals are produced by cooking cleaned air-washed grain in a digester at 212–215° F. for 2 2½ hrs. at a pressure of 4–15 lbs. per sq. in., cooling to 60° F., mixing with 6% NaCl, drying and baking at 135–145° F. for 1¼–1¾ hrs., cooling to 60° F., grinding and sifting.

**Preserving sugar and confectionery compositions by adding a small proportion of ethyl alcohol.** H. MAUTNER. Brit. 297,338, June 15, 1927. Ordinary crystd. "starch sugar" may be re-crystd. from alc. or a normal starch-sugar soln. may be thickened and mixed with EtOH, seed crystals added and the mass stirred and allowed to solidify. The process is applicable to crystd. invert sugar, levulose, maltose and to sugar solns. mixed with flavoring substances. Volatilization of the alc. may be prevented by coatings such as chocolate, icing sugar, fondant paste, tragacanth or gelatin, or by molding under pressure so that the surface of the sugar melts and forms a non-porous coating.

**Packaging jelly powders with flavoring materials.** W. M. SHIRKIFF, F. W. SHIRKIFF and C. H. SHIRKIFF. Brit. 298,123, Oct. 3, 1927. A flavoring material such as a coned, highly flavored sugar sirup may be dropped into molds made of starch or similar material to form coated globules suitable for placement in a package of unflavored jelly powder.

**"Crystallized fruits."** B. GERNHARDT. Brit. 297,927, Aug. 15, 1927. Fruit is stewed with water in a closed vessel and then treated in the same vessel with CO<sub>2</sub> under high pressure and with a sugar soln. contg. 66 percent sugar and formed by dissolving sugar in cold water. An app. is described.

**Conditioning tea by suitable heating and air treatments.** CARRIER ENGINEERING CO., LTD. and K. J. R. ROBERTSON. Brit. 297,900–1, July 7, 1927. App. and various details of procedure are described.

**Artificial production of coffee aroma.** INTERNAT. NAHRUNGS- U. GENUSSMITTEL A.-G. Swiss 128,720, Sept. 16, 1926. The colorless oil produced by the action of furfuryl-2 mercaptan on diacetyl has a coffee-like aroma. Cf. C. A. 23, 916.

**Foods for animals.** C. N. KJÆRGAARD. Brit. 297,596, Nov. 23, 1927. Waste materials contg. binding or adhesive substances such as waste from breweries, sugar factories or canning factories or stalks and roots of plants are dried until they contain not more than about 16% water and are then compressed under high pressure and heated to about 55° to form a solid cake which is held together by the binding or adhesive substances. Cf. C. A. 23, 1968.

### 13—GENERAL INDUSTRIAL CHEMISTRY

HARLAN S. MINER

**The theory of dust removal from gases by dry methods.** BRUNO WAESER. *Metallbörse* 18, 1573–4(1928).—The literature and patents for mech. and electrostatic dust removal methods are reviewed in detail.

E. M. SYMMES

**Purification of gases, particularly chlorine, by repeated liquefaction.** ROLAND WASMUTH. *Chem. Fabrik* 1929, 145–7, 158–9. Cl b. –33.5°. Since this point is higher than the point at which impurities such as CO<sub>2</sub>, HCl, O<sub>2</sub>, CO, N<sub>2</sub> and H<sub>2</sub> boil, evapn. of liquid Cl at low temp. and re-liquefaction purify it to a point where no traces of foreign gases can be detd. by absorption in Hg in a Winkler buret or by passing it at 1150° over dried, de-aerated charcoal, with detn. of loss of wt. of the charcoal. Other gases can be purified similarly. An app. is described.

E. M. SYMMES

**Storage of acetylene.** J. HAUSEN. *Metallbörse* 18, 593–4, 706–8, 930–1(1928).—A review of literature, safety tests and regulations governing acetylene cylinders.

E. M. SYMMES

**The use of the Degea carbon monoxide apparatus.** KARL WOLLIN. *Gas u. Wasserfach* 72, 210–13(1929).—The construction and use of the Degea CO mask are described. The canister incorporates a warning agent which gives warning of the approaching exhaustion of the active agent (metallic oxides). This mask can be used in atms. contg. up to 1.8% CO and as low as 18.5% O. Novel methods of fitting the mask to the individual face are described.

R. W. RYAN

**Method for the classification of the hazards of liquids.** A. B. NUCKOLLS. *Underwriters' Labs.*, Mar. 1929, 20 pp.—The hazard of a liquid is obviously dependent on the various chem., phys. and physiol. properties it possesses. The relative hazards of different liquids depend on the differences of their various properties. Evidently rating these liquids from comparison of such numerous and varied data requires unusual expert

knowledge but the appraiser and others rating a fire risk must take account of such relations. N. has, therefore, devised a plan of rating through which the results are entered on an arbitrary scale for use of the appraiser. The method is described and discussed at length.

CHARLES E. MUNROE

**Dewatering and drying in some manufacturing processes.** MARTIN L. GRIFFIN. *Am. Dyestuff Repr.* 18, 29-33(1929).—Possible research problems and desirable operating conditions are suggested in connection with the use of squeeze rolls and driers.

ARTHUR K. JOHNSON

**Collected colloid references. VIII. Flotation.** KARL KELLERMANN. *Kolloid Z.* 47, 268-78(1929).—A literature survey with numerous references. General theories are mentioned and the role of capillary and surface forces is discussed. Foam-producing materials and foam stabilizers are reviewed, and the mechanism of foam production from both practical and theoretical viewpoints is discussed.

L. F. MAREK

**Infringement solids.** GHEURV DE BRAY. *Chemistry and Industry* 48, 332-4(1929).—Sometimes—especially in the interpretation of patent specifications—it is necessary to delineate the boundary sepg. certain limiting proportions in which 3 substances are brought together to form a mixt., compd. or alloy, from all other possible proportions. A graphic solution of this problem is offered, the final figure taking the shape of a solid. Not always can one tell at a glance whether a given proportion of a certain component would be within the specified limits, and then a second field would have to be mapped out within the first; the intervening shell then constitutes the author's "infringement solid."

W. C. EBAUGH

**Can cheaper power be obtained by pretreating coal?** WALTER R. KNAPP AND PAUL McMICHAEL. E. L. Phillips Co., N. Y. City. *Power* 69, 665-9(1929).—On the basis of 8 studies the following conclusions were reached: (1) With a combined coke-oven power-generating plant it is possible to generate power with coke and breeze more cheaply than in a straight steam-generating plant but the returns on addnl. investment are only 5 to 10%. (2) With a combined complete gasification retort power-generating plant it is possible to generate power more cheaply than in a straight steam plant but not so cheaply as in a combination coke-oven power-generating plant using coke and breeze. (3) Any combined gas-elec. plant depending on sale of by-product coke is unprofitable because of a large increase in capital investment and difficulty in disposition of coke. (4) Building a combined gas-elec. plant dependent on the sale of gas as a by-product is unsound because of the large increase in capital expenditure. (5) A combined gas-elec. plant is profitable only when its cost equals or only slightly exceeds the cost of a straight steam-generating plant. (6) The capital required for any combined gas-elec. plant where provision is made for recovery of all by-products so greatly exceeds that required for a straight steam-generating plant that the possibility of cheapening elec. power generation by processing bituminous coal appears remote. Also in *Chem. Met. Eng.* 36, 281-5(1929).

D. B. DILL

**Waste heat recovery.** W. GREGSON. *Proc. Inst. Mech. Eng. (London)* 1928, 169-236; cf. *C. A.* 22, 3281, 3938.—G. discusses the main aspects of waste heat recovery by steam-raising in connection with steel plants, the carbonizing industry and marine oil engines. Typical performance figures are given.

D. GORDON

**The conversion of batch into continuous processes.** J. V. N. DORR. *Ind. Eng. Chem.* 21, 465-71(1929).—Dorr equipment made the conversion feasible not only in metallurgy but also in the chem. manuf., sewage and water treatment, in the sugar, iron and paint manuf.

R. D. BUMBACHER

**Untreated fabrics for electrical purposes.** A. R. DUNTON AND A. W. MUIR. *Electrician* 102, 439-41(1929).—Special needs of the elec. industry are discussed and the characteristics of some materials available enumerated. There has been an increasing use of fine silks and asbestos. The ideal elec. fabric would have min. thickness, abs. uniformity, sufficient mech. strength to ensure tight and clinging application and good aging properties, even at high temp. Standard specifications are suggested.

C. G. F.

**Renaissance of the absorption refrigeration cycle.** FREDERICK G. KEYES. *Mass. Inst. Tech. Ind. Eng. Chem.* 21, 477-80(1929).—Different types of absorption cycles are, (a) gas-liquid; (b) gas-solid: (1)  $\text{NH}_3 + \text{BaCl}_2 \longrightarrow \text{BaCl}_2 \cdot 8\text{NH}_3$ ; and (2) gas-gel. The advantages and disadvantages of each type are discussed. Curves giving the cost of operation of standard manufactured units are given.

J. H. FERRY

**The efficiency of liquefiers for H and He (KEESOM) 2.** Porous  $\text{SiO}_2$  (Fr. pat. 648,390) 18.



**Better Production Methods in Chemical Engineering Industries.** New York: Chemical and Metallurgical Engineering. 256 pp.

**Drying and Processing of Materials by means of Conditioned Air.** Edited by D. C. Lindsay. Newark, N. J.: Carrier Engineering Corp. 208 pp. \$3.

**HIRSCH, MORITZ:** *Die Trockentechnik.* Berlin: Julius Springer. 366 pp. M. 31.80. Reviewed in *Giorn. chim. ind. applicata* 10, 539(1928).

**LE WITA, HENRI:** *Autour de la guerre chimique; comment éviter de fléau.* Paris: Tallandier. 220 pp. F. 10. Reviewed in *Génie civil* 93, 444(1928).

**MACINTYRE, H. J.:** *Handbook of Mechanical Refrigeration.* London: Chapman & Hall. 37s. 6d. Reviewed in *Engineer* 146, 579(1928).

**PACORET, ÉTIENNE:** *Traité théorique et pratique des distributions et canalisations d'électricité, d'eau, de vapeur et de gaz.* Paris: Vial. Vol I, 337 pp.; Vol. II, 426 pp. F. 40 each. Reviewed in *Bull. Internat. Railway Congress Assoc. (English Ed.)* 1928, 897.

**RASSOW, B., AND LOESCHE, A.:** *Jahresbericht über die Leistungen der chemischen Technologie für das Jahr 1928. Abteilung I. Unorganischer Teil.* Leipzig: J. A. Barth. 514 pp. M. 36; bound, M. 39.

**WALLER, PETER:** *Probleme der deutschen chemischen Industrie.* Halberstadt: H. Meyer. 241 pp.

**Purifying gases.** **KALI-INDUSTRIE A.-G.** Fr. 649,220, Feb. 17, 1928. Gases are passed through a vessel in which hollow cylinders are caused to rotate and through which cooling liquids pass. Impurities from the gases condense on the cylinders and are withdrawn at the base.

**Purification of gases.** **GEORGES L. É. PATART.** Fr. 648,516, Feb. 7, 1928. S compds. contained in gases to be used in catalytic reactions, particularly CO gases, are removed by washing the gases by means of the liquid products obtained by the catalytic reaction, such as alcs. or liquid CO<sub>2</sub>.

**Liquefaction of gases.** **JOSEPH BLERVACQ.** Fr. 649,361, Feb. 22, 1928. In the liquefaction of gases a part of the liquefied gas is evapd. to produce further condensation by difference of pressure.

**Treating gases with finely divided substances.** **METALLBANK UND METALLURGISCHE GESELLSCHAFT A.-G.** Fr. 648,525, Feb. 8, 1928. See Brit. 285,038 (C. A. 22, 4678).

**Separating oil from gases.** **H. A. FRAGER, W. L. PRICE and J. HETHERINGTON.** Brit. 297,622, Jan. 12, 1928. Gases such as those carrying lubricating oil are passed over small sheet-metal baffles on which the oil deposits and whence it passes to a collection chamber. An app. is described.

**Heat-transfer system for separating gases by liquefaction.** **GES. FÜR LINDE'S EISMASCHINEN A.-G.** Brit. 297,842, Sept. 30, 1927. A system is described in which, for the rectification of a mixt. of methane, ethylene and propylene, an auxiliary mixt. of CH<sub>4</sub> and C<sub>2</sub>H<sub>6</sub> may be used which by condensation and vaporization conveys heat to and from the gas mixt. undergoing liquefaction and rectification. Cf. C. A. 23, 2023.

**Revaporizing liquefied gases.** **GES. FÜR INDUSTRIEGASVERWERTUNG.** Brit. 297,384, Sept. 20, 1927. To produce gas under a pressure greater than the critical pressure, the container is heated internally or externally. An app. is described.

**Separator system for removing dust from blast-furnace gases, etc.** **C. T. MORSE and E. L. HOGAN** (to American Blower Corp.). Brit. 297,446, Sept. 22, 1927. Various structural details are given of a system comprising at least 2 dust separators and an intervening disintegrator into which water is sprayed.

**Gas storage.** **FIRM OF P. LECHLER.** Brit. 297,671, Sept. 24, 1927. In storing gas in liquid-sealed gasometers, contamination of the gas with the vapor of the sealing liquid is prevented by coating the liquid with a soln. of a solid bitumen, ozokerite, paraffin or the like in a mineral oil.

**Cyclic system for recovering oil vapors from gases by adsorption.** **SAKAO YAMAMOTO.** U. S. 1,710,284-5, April 23. Both patents describe various details of app.

**Producing foam from liquids and gases.** **R. SCHNABEL, J. JACOBSON and EXCELSIOR FEUERLOSCHGERÄTE A.-G.** Brit. 297,782, May 24, 1927. Both the gas and soln. used are subdivided and intermingled by passing them under pressure, preferably together, through porous material such as ceramic material, stacked sieves or plates of asbestos, textile fabric, sponge, gravel, or other filtering materials. An app. is described.

**Grinding horn, casein, resins, cellulose derivatives, glass and other materials.** **H. OERMANN.** Brit. 297,841, Sept. 30, 1927. A flour-fine product is obtained by intermittent dry grinding. Various mech. details are described.

**Moldable composition comprising asphalt and rubber.** HERBERT A. WINKELMANN (to Philadelphia Rubber Works Co.). U. S. 1,709,241, April 16. A compn. suitable for molded insulators or battery jars is prepd. by heating and blowing with air a mixt. comprising an asphalt, an oil flux and rubber.

**Closed-circuit respirators.** DEUTSCHE GASGLÜHLICHT-AUER-GES. AND HANSEATISCHE APPARATEBAU GES. FORM. L. VON BREMEN & Co. Brit. 297,808, Sept. 29, 1927. Structural features.

**Refrigerators.** WILLIAM A. McNUTT and RICHARD P. LAWRENCE. Australia 10,815, Dec. 9, 1927.

**Refrigerating machine.** GEBRÜDER SULZER A.-G. Swiss 129,379, Aug. 11, 1927.

**Refrigerating plant with multi-stage condenser.** AKT.-GES. DER MASCHINEN-FABRIK ESCHER WYSS & CIE. Swiss 129,380, Oct. 1, 1927.

**Absorption refrigerating apparatus.** WILLIAM M. BAXTER (to Wayne Home Equipment Co.). U. S. 1,708,998, April 16.

**Absorption refrigerating machine.** GEBRÜDER SULZER A.-G. Swiss 128,818, Aug. 6, 1927.

**Absorption refrigerating machine with intermittent action.** GEBRÜDER SULZER A.-G. Swiss 128,557, Dec. 8, 1926. Details of construction.

**Refrigerating system of the absorption type.** PLATEN MUNTERS REFRIGERATING SYSTEM AKTIEBOLAG (to Electroflux, Ltd.). Brit. 297,836, Sept. 29, 1927. Structural features.

**Refrigerating apparatus of the absorption type.** SULZER FRÈRES SOC. ANON. Brit. 297,451, Sept. 22, 1927.

**Refrigerating system of the absorption type.** MAX ALEX. U. S. 1,710,333 4, April 23.

**Refrigerating system of the absorption type.** ANDREW J. SWEENEY U. S. 1,710,438, April 23. Structural features.

**Refrigerating system of the absorption type.** ALVAR LENNING (to Electroflux Servel Corp.). U. S. 1,709,588, April 16. A liquid such as  $\text{NH}_3$  is vaporized in the presence of a non-condensable gas such as H by a mixt. of refrigerant such as  $\text{NH}_3$  and entrained vapor of absorption liquid such as water to sep. the absorption liquid from the refrigerant while maintaining the first-mentioned liquid and refrigerant in sep. closed systems. An app. is described. Cf. C. A. 23, 2514.

**Refrigerating system of the compression type.** WILLIAM DUNKERLEY U. S. 1,710,300, April 23.

**Condenser for refrigerating apparatus.** ROLLIN M. HYDE (to McCord Radiator & Mfg. Co.). U. S. 1,709,176, April 16. Structural features.

**Insulating material.** EMIL HAEFELY & CIE A. G. Swiss 128,831, July 19, 1927. Artificial resin and wood shavings are subjected to pressure and heat to make hard, porous, damp-free insulating material.

**Insulating materials.** GEORG J. MEYER. Ger. 473,111, Feb. 7, 1928. In prepg. plates, tubes, etc., for insulating purposes from synthetic resins, the resin is caused to harden from within outwards by periodically cooling the outer parts relatively to the inner parts.

**Electric insulation.** I. G. FARRENIND. A. G. Brit. 297,749, Sept. 26, 1927. Insulation suitable for use on wires is prepd. by satg. paper or textile material with a soln. of a cellulose ester of a higher aliphatic acid (suitable as an acid contg. over 10 C. atoms). Mixed esters, ether-esters, or insol. esters which are plastic under pressure when warmed also may be used.

**Insulating and protective coverings for electric cables.** SIEMENS BROS. & Co., LTD. and A. E. FOSTER. Brit. 298,318, Aug. 9, 1927. Cables, the cores of which are insulated by paper or similar hygroscopic material, with a covering of Pb or Pb alloy, have the latter further covered with layers of a rubber compn. or "rubber bitumen" which are sepd. from each other by layers of adhesive material, consolidated by heat and pressure. Various details are described.

**Composition suitable for insulators or battery jars comprising asphalt, rubber and pine tar.** HERBERT A. WINKELMANN (to Philadelphia Rubber Works Co.). U. S. 1,709,242, April 16. A heated mixt. comprising a petroleum-oil flux, pine tar, an asphalt and rubber is blown with air.

**Joining metal veneers to thick slabs or tiles for heat or sound insulating, etc.** A. A. MEAD and MEAD, McLEAN & Co., LTD. Brit. 297,867, June 29, 1927. Veneers such as thin iron sheets are united to thick tiles or the like by an intermediate layer such as paper impregnated with glue or cement. Various structural details are described.

**Plastic substances.** PAUL E. BASSET. Fr. 649,152, July 8, 1927. A plastic

substance having heat and elec. insulating properties is prepd. by condensing glutens, or generally, vegetable proteins, with simple or substituted phenols in the presence of catalysts. Residues from starch works and ordinary phenol dissolved in formol may be used, and the most suitable catalysts are NaOH or  $ZnCl_2$  or the hydrate obtained by treating  $ZnCl_2$  with excess of NaOH.

## 14—WATER, SEWAGE AND SANITATION

EDWARD BARTOW

**A troublesome water supply.** R. H. ALEXANDER. *Zentr. ges. Hyg.* 18, 323(1928); *Wasser u. Abwasser* 25, 170. — A 320 ft. well from which water was raised by air pressure yielded a dirty, peat-colored water. Filters quickly clogged with the fine particles of suspended matter, thus seriously cutting down their efficiency. Treatment with  $Al_2(SO_4)_3$  and filtration corrected the trouble. C. R. F.

**Water-supply chemistry on the Florida East Coast Railroad—its cost and benefits.** W. H. HOBBS. *J. Am. Water Works Assoc.* 21, 337–45(1929).—One of the greatest results of the use of water chemistry has been the discovery of improved supplies. Most of the waters are soft and of good quality and the problem of further treatment is not a serious one. D. K. FRENCH

**Operating experiences with the water purification plants of the East Bay Water Company.** WILFRED F. LANGELIER AND JOSEPH D. DeCOSTA. *J. Am. Water Works Assoc.* 21, 318–30(1929).—The 2 plants under discussion supply impounded waters of high mineral and org. content. Plankton and algae grow readily.  $CuSO_4$  treatment is necessary. The methods of coagulation, filter handling and sedimentation are described, as well as rearrangements of the flow, which have greatly increased the plants' efficiency. D. K. FRENCH

**City of Hamburg waterworks.** W. HOLTHUSEN AND R. SCHIRÖDER. *Separate from "Industrie Bibliothek"* in 25 vols. M. Schroder, Berlin. 14 pp; *Wasser u. Abwasser* 25, 168–9(1929).—An historical survey of Hamburg's water supply from 1370 to the present time.  $Cl$  is added to the sedimented water at the rate of 0.4–0.8 g. per cu. m. and also to the filtered water at the rate of 0.15–0.6 g. per cu. m. The purified water is often sterile and is always of excellent bacteriol. and phys. quality. Cf. C. A. 23, 224. C. R. F.

**Suitable and simple methods of potable water analysis.** J. KABELIK AND H. KABELIKOVA. *Centr. Bakt. Parasitenk.* 1 Abt., Ref. 90, 130–40(1928); *Wasser u. Abwasser* 25, 161(1929).—A treatise on water analytical methods including treatment, classification and disinfection rules. C. R. FELLERS

**New method for determining small amounts of dissolved oxygen.** F. R. McCURM AND W. R. KENNY. *J. Am. Water Works Assoc.* 21, 400–7(1929).—A colorimetric method, using *o* tolidine as the indicator, is described. The reasons for its development, as well as some of the problems encountered, are given in considerable detail. D. K. FRENCH

**Determination of dissolved oxygen in water.** BACH. *Gesundh. Ing.* 52, 36–7(1929).—The detn. of dissolved O is becoming very important in modern water analysis. The following method was devised to simplify the detn. so that non-chemists might use it. The probable error is not more than 0.25 mg. per l. The theory of this method is relatively simple. A dye which is decolorized by reducing agents is employed. At first the reducing agent is oxidized by the dissolved O. When all of the O has been used, the dye is decolorized. Hence the dye serves as an indicator. The reducing agent is  $Fe(NH_4)_2(SO_4)_2 \cdot 7H_2O$ , and the dye is phenosafranine. Five cc. of alk. tartrate soln. (350 g. Rochelle salt and 100 g. pure NaOH dissolved in water and diluted to 1 l.) and 2 or 3 drops of phenosafranine (0.5 g. per l.) are added to 50 cc. of water. Standard ferrous  $NH_4$  sulfate (2.15 g. per l.) is added until the dye is decolorized. Care should be taken to prevent absorption of O. One cc. is equiv. to 0.05 mg. O. W. L. D.

**Spray aerator for filtered water at Waterford, N. Y.** R. G. YAXLEY. *Eng. News-Record* 102, 498–9(1929).—Installation of a 1.5-mg. d. spray-type aerator at Waterford, N. Y., has reduced tastes and odors in the filtered water and also reduced the amt. of  $Na_2CO_3$  required to render the water non-corrosive. The supply is drawn from the Hudson River and is soft, highly-colored and badly polluted with paper-mill waste and sewage. The high dosage of alum required for coagulation, together with 4–5 p. p. m. free  $CO_2$  in the river water, renders the water unsuitable for use without treatment to reduce its corrosiveness. The reduction in  $CO_2$  effected by aeration is shown graphically, the percentage removal varying from 56 to 84%, being lower with cold water. It is

reported that the "soap hardness" of the water is reduced as the water passes through the aerator, the reduction being as high as 37%. R. E. THOMPSON

**Mechanical agitators for the Knoxville water works.** W. W. MATHEWS. *J. Am. Water Works Assoc.* 21, 235-40(1929).—The Knoxville supply is taken below the junction of 2 rivers, one of which is soft, colored and turbid. Tannery wastes are largely responsible. The other is hard and clear. The mixed waters are easier to handle than either one separately. Mech. agitators are used to simplify control in treatment and to make uniform the mixt. to be treated. D. K. FRENCH

**The stability of mineral waters.** K. HARPUDE. *Z. wiss. Bäderkunde* 2, 968-70 (1928); *Wasser u. Abwasser* 25, 165.—Losses in storage result from (1) loss of certain volatile constituents such as CO<sub>2</sub> and Ra emanation; (2) chem. reactions like oxidations, decompn. of sulfides and formation of insol. compds.; (3) phys.-chem. processes such as the formation of colloidal particles or visible ppts. and the formation or splitting up of complex compds.; (4) the absorption of foreign substances like atm. O and bacteria; and (5) certain phys. influences as, for example, temp. The stability is dependent upon several factors. Insol. carbonates of Ca or Ba as well as Cu, Mn, or Fe salts may ppt. or lose their catalytic properties on long storage. Loss of Ra emanation is sometimes very marked in long stored samples of radioactive mineral water. C. R. F.

**A survey of the important mineral water groups.** P. PICCINI. *Giorn. reale soc. ital. d'igiene* 50, 66-73(1928); *Wasser u. Abwasser* 25, 165.—A description and classification of the mineral water sources of Italy and Europe. C. R. F.

**Mineralogy of Caucasian mineral water districts.** N. PLATONOW. *Verh. Balneolog. Inst. nordkaukas*; *Mineralwasser* 5, 38-43(1927); *Wasser u. Abwasser* 25, 165.—A description of the minerals commonly found in the plains and mountains of N. Caucasus. Their close relationship to the compn. of the mineral waters is pointed out. C. R. F.

**The mineral waters of Salins-Moutiers and of Bride-les-Bains (Savoie).** D'ARSONVAL, F. BORDAS AND F. TOUPLAIN. *Ann. fals.* 22, 70-6(1929).—The compn. has not varied appreciably since the analysis published by Willm in 1888. The most important characteristic of these waters is the fact that in contact with the atm. there seps. out a highly ferruginous deposit, contg. 8-9% As and 0.1% Li<sub>2</sub>O, while the water itself contains only very slight traces of these two elements. A. PAPINEAU-COUTURE

**Chlorination of drinking water.** G. NACHTIGAL AND P. KEIM. *Tech. Gemeindeblatt* 30, 329(1928); *J. Am. Water Works Assoc.* 20, 444.—Chlorination practice in Europe and America is reviewed. Prechlorination of raw water is commended and the effect of temp. on the chlorination process is pointed out. A. I. ELDER

**Accidental over-chlorination of water.** ULSAMER. *Z. Desinfektionswesen* 20, 182-3 (1928); *Wasser u. Abwasser* 25, 175.—Melting snow may cause over-chlorination because of the low org. content of snow water. Since a slight excess of free Cl in water readily unites with org. matter in the stomach, no harm results to the human organism. It is better to err on the side of safety than to allow infected water to be used. C. R. F.

**Chlorination of deep well supply for taste and odor removal.** M. F. TRICE. *J. Am. Water Works Assoc.* 21, 255-7(1929).—Iron bacteria in the distributing system were found to be responsible for the taste and odor complained of. As flushing was ineffective, the mains were sterilized with Cl, the work being done at night. D. K. FRENCH

**Chlorination of coagulated water.** J. S. WHITENER. *J. Am. Water Works Assoc.* 21, 258-61(1929).—Prechlorination is considered to have been responsible for many savings in filter operation as well as for improvements in the quality of the treated supply. D. K. FRENCH

**Chlorophenol tastes and abnormal absorption of chlorine in the Chicago water supply.** H. H. GERSTEIN. *J. Am. Water Works Assoc.* 21, 346-57(1929).—During a short period in the winter of 1927-8, unusual wind conditions carried a large area of contaminated water by the cribs supplying water to Chicago. Prompt recognition and warning to the pumping stations on shore are considered to have prevented a serious typhoid outbreak. Details of the situation are recorded. D. K. FRENCH

**A simple apparatus for the sterilization of water by Caporit or by chlorine.** C. P. MOM. *Waterslaats-Ing.* No. 5, page not stated (1928); *Wasser u. Abwasser* 25, 44.—The use of Cl gas and also Caporit for water purification in the Dutch East Indies has given excellent results. A simple concrete dosing tank with a guarded outlet is described. C. R. FELLERS

**Judging the purifying effect of biological clarification plants on the basis of chemical tests.** E. REMY. *Metalibryse* 18, 120-1, 232-3(1928).—A large no. of chem. methods are available for the detn. of the clarifying effect of biologically purified effluent waters, which make it possible to follow the course at any time and simultaneously to test the

efficiency of any biological installation. In continuous works control the technique of analysis has been simplified by experience. The question as to which method is most suitable in practice depends mainly upon the av. observed compn. of both raw and purified effluent. The finer the technical methods of chem. tests the more closely is the judgment of the biological purifying effect connected with the utility of the purified effluent for industrial purposes.

E. M. SYMMES

**Algae in filtration plants and their effect on the oxygen balance.** P. KEIM. *Techn. Gemeindeblatt* 30, 332-36, 346-51 (1928); *J. Am. Water Works Assoc.* 20, 444.—A review of American and European studies of water-works algae; fluctuations in oxygen content of water filtrates; and O balance in filters.

A. L. ELDER

**Automatic water works and deferrization plant.** O. KOHLER. *Techn. Gemeindeblatt* 30, 336 (1928); *J. Am. Water Works Assoc.* 20, 444.—Water from wells showed 1.9% of  $\text{Fe}_2\text{O}_3$ . A deferrization filter is described and the cost of deferrization is discussed.

A. L. ELDER

**Protozoa in the water tanks of steamships.** N. L. WIBAUT-ISEBREE MOENS. *Nederl. and Tijdschr. Hyg., Microbiol. Serol. Leyden* 2, 24, 43 (1927); *Pub. Health Eng. Abstr.* E-785c, 44.—Epidemics of gastro-intestinal infections occur much more rarely on board large steamers, where drinking water is stored in huge tanks for a long journey, than on board small boats, which have small reservoirs from which the water is usually consumed at once. An investigation of the water from the tanks of 5 steamers of a Dutch line showed that the self-purification which occurred was due to the presence of bacterioplagic protozoa, including *Cyclidium glaucoma* and *Glaucoma scintillans*. The period required for self-purification depends on the temp. of the water and on the relation between the no. of bacteria and the type and number of protozoa. As further multiplication of bacteria often occurs in chlorinated water, while protozoa are nearly always killed by that process, the author's opinion is that it would be better not to chlorinate the water in the tanks, but to treat only the quantity of water used daily.

C. R. FELLERS

**Design and practical test of integrating flume meter.** J. W. LEDOUX. *Eng. News-Record* 102, 428-30 (1929).—An illustrated description of a meter designed by L. for measuring the discharge through flumes by means of a function of depth of water in the flume. When checked with measurements by a rectangular weir with end contraction the max. apparent error was about 6% and the av. error throughout the range of the expts. was 0.55%. The only limitation occurs when conditions downstream from the meter are permitted to cause backwater.

R. E. THOMPSON

**Combining the zeolite softener and deconcentrator gives improved boiler water.** LUCIUS A. FRITZE and ELWOOD W. SCARRIT. Elgin Softener Corp., Elgin, Ill. *Power* 69, 392-5 (1929); cf. *C. A.* 23, 1973.—Use of zeolite alone increases alk. and concn. of Na and K. Deconcentrator equipment is designed to mix zeolite softened water from the boiler with raw water in suitable proportion to form a sludge. After settling of the sludge, the clarified water is returned to the boiler. Four charts and a figure illustrate the application of the plan.

D. B. DILL

**Softening of water for boiler purposes.** W. J. PITT. *Chem. Eng. Mining Rev.* 21, 188-90 (1929).—Ca is pptd. in a sample of the boiler water with a known wt. of  $(\text{NH}_4)_2\text{C}_2\text{O}_4$ . The  $\text{CaC}_2\text{O}_4$  is filtered and washed and the filtrate titrated with  $\text{KMnO}_4$  soln. which has been standardized against  $(\text{NH}_4)_2\text{C}_2\text{O}_4$ . Formulas are given for the total wt. of  $\text{Ca}(\text{OH})_2$  to be added to the boiler supply. Mg is weighed as  $\text{MgO}$  after its pptn. with  $\text{NH}_4\text{OH}$  in another sample and formulas for the wt. of  $\text{Na}_2\text{CO}_3$  are given. Ca is then detd. by  $\text{KMnO}_4$  soln. as above in the same sample and the wt. of  $\text{Na}_2\text{CO}_3$  needed is combined with that used for Mg and added to the supply.

C. H. BADGER

**Scale formation in central heating plants.** W. BLEYERT. *Gesundh. Ing.* 52, 58-61 (1929).—Boiler scale results in a loss of heat because it conducts heat only  $\frac{1}{2}$ , as well as Fe. In this work removal of boiler scale has been effected by solvents. The action of "Groeck boiler scale solvent" and HCl has been compared. This solvent was found to be as effective as HCl in removing scale and its corrosive action on Fe was much less than HCl.

WAYNE L. DENMAN

**Scale formation in hot and cold water.** M. GROECK. *Gesundh. Ing.* 52, 97-102 (1929).—Scale formation in cold and hot water is dependent on the disturbance of the equil. between  $\text{CaCO}_3$  and  $\text{H}_2\text{CO}_3$ , on the presence of O and on the reactivity of the metal present.

WAYNE L. DENMAN

**A practical investigation of corrosion for the heating industries.** H. BALCKE. *Gesundh. Ing.* 52, 49-53 (1929).—The older or acid theory is incorporated in the modern electrochem. theory of corrosion. According to this theory, the metal goes into soln. in the form of ions by virtue of its soln. pressure. The presence of acid merely increases the rate of soln. Fe goes into soln. in the form of ferrous ions, which are oxidized to the

insol. ferric Fe by O. Hence O is an important factor in metallic corrosion. The temporary hardness of a boiler-feed water is rapidly pptd. under the influence of heat. However, the mineral-acid hardness is not removed and concentrates in the boiler and often causes much damage. The salt blamed more than any other is  $MgCl_2$ . It is claimed that  $MgCl_2$  hydrolyzes, giving  $Mg(OH)_2$  and HCl. The HCl reacts with the Fe, forming  $FeCl_2$ . HCl is sometimes added to prevent carbonate scale. Such a practice is to be discouraged because much  $MgCl_2$  is formed from the Mg present as  $Mg(HCO_3)_2$ .

WAYNE L. DENMAN

**Purification of sewage and drinking water in the United States.** W. H. BITTERFELD. *Gesundh. Ing.* 52, 182 (1929).—Biological and chem. processes are used in sewage treatment. Among the biological processes may be mentioned the decompn. of org. matter while the conversion of S to sulfate and N to nitrate are chem. processes. For sewage treatment, one must differentiate between filtration processes and activated sludge. The filters are made of coke, stone, etc., and the org. material is removed by filtration and biological action. In the activated-sludge process, air is blown through the sewage. Cl, when used in conjunction with sewage treatment, results in (1) freedom of odor (oxidation of  $H_2S$ ), (2) disinfection of the sewage, and (3) prevention of septic action for some time. Many American cities simply dil. sewage by passage into a flowing stream. Chief among the American cities using activated-sludge process are Indianapolis, Milwaukee and Chicago. In Milwaukee the sludge is dried and disposed of by selling as a com. fertilizer. It contains 6.5 to 7.5%  $N_2$  and 2.5% phosphoric acid. Activated sludge usually contains about 99% water. Treatment with  $FeCl_3$  or  $Al_2(SO_4)_3$  will lower this figure to 82% and greatly increase the rate of filtration.  $pH$  is also important in the case of filtration. Several cities obtained their drinking waters from impounding reservoirs in mountains, lakes, etc. Usually this is merely chlorinated. However, most cities must use clarification and filtration processes. The chemicals most commonly used in these are  $FeSO_4$ ,  $Al_2(SO_4)_3$  and CaO. Cl is always used in connection with these processes. For purification of cu. m. of water (from the Missouri River), St. Louis used 81 g. CaO, 18 g.  $FeSO_4$ , 20 g.  $Al_2(SO_4)_3$  and 67 g. Cl. W. I. D.

**The problem of sewage purification.** P. M. GREMPF. *Stadtereinigung* 20, 453-4 (1928); *Wasser u. Abwasser* 25, 51.—A discussion of modern methods of sewage disposal.

C. R. FELLERS

**Economical use of the settling room of a two-storied treatment tank.** F. PREUSS. *Gesundh. Ing.* 52, 37-8 (1928); cf. *C. A.* 22, 2019.—This type of treatment tank may be constructed with a free water surface or submerged under the surface. Illustrations of both types are given. It is claimed that the submerged structure is better.

WAYNE L. DENMAN

**Economic features in design of sewerage systems.** GEORGE O. CONSOER. *Eng. News-Record* 102, 463-4 (1929).—A general discussion.

R. E. THOMPSON

**Edmonton's (England) successful sewage scheme.** ANON. *Munic. Eng. Sanit. Record* 82, 339-41 (1928).—The original works and farm occupied 230 acres. The new works provide for a dry-weather flow of 4,000,000 gals. daily, including 50,000 gals. of waste gas liquor for considerable periods. A 4-ft. deep level outfall sewer discharges into 2 detritus tanks, used alternately; it is emptied by an elec. grab crane. The sewage passes through 2 screening chambers provided with inclined bar screens 8 ft. wide with  $5/8$ -in. openings. The screenings are raked directly into tip wagons. Four sedimentation tanks, each contg. 500,000 gals., are operated on the continuous-flow principle. No chemicals are used. The sludge is dried on 5 acres of prep. land. A 3-ft. main leads from the sedimentation tanks to 4 rectangular filter beds, each contg. 12,500 cu. yds. of graded clinker, av. depth 6 ft. Four humus tanks of the inverted type, each contg. 60,000 gals., are arranged in 1 block with division walls.

C. H. BADGER

**The utilization of city sewage under special conditions and the collection of gas from the sludge tanks.** A. HEILMANN. *Z. Kommunalwirtsch.* No. 19, 1911 (1928); *Wasser u. Abwasser* 25, 185.—It is only under exceptional conditions that reclamation of sewage can be made to yield a profit. Since the cost of collection of gas from digestion tanks is small, this operation is usually profitable. By mixing ripe and fresh sludge and warming up the sludge chambers, good yields of gas having a heating value of 7000-8000 cal. per cu. m. were obtained. This gas was suitable for light, heat, or power. In Stuttgart, with 350,000 population, approx. 1 million cu. m. of gas is produced per yr. Approx. 3-8 cu. m. of gas is obtained per capita per yr. An av. cost of the gas for domestic purposes is 5 Pf. per cu. m.

C. R. FELLERS

**Sludge-cake production at Tri-Cities activated-sludge plant.** W. C. EARLE. *Eng. News-Record* 102, 512 (1929).—The output of the sludge drier at the sewage works in Pasadena, Cal., has been increased from 4 to 10-12 tons per 24 hrs., without increase

in labor or fuel, by the use of diatomaceous earth. The earth is applied at the rate of 11 lbs. per 1000 gals. of sludge in 2 mixing tanks providing 3 hrs. agitation by compressed air before the sludge is discharged on to the filters. The moisture content of the filter sludge cake is reduced from about 80% to approx. 5% in the drier. A contract has been made to sell the entire output of dried filter cake, f. o. b. at \$25.25 per ton, which is expected to yield a revenue of \$75,000 per year. All the sludge produced can now be handled by the drier, whereas in 1927 the cost of burying the excess sludge totaled approx. \$37,000.

R. E. THOMPSON

**Imhoff and activated-sludge treatment of sewage in the last 22 years.** F. FRIES. *Gesundh. Ing.* 52, 92-3(1929); cf. C. A. 22, 4689.—A short review of sewage treatment during this period.

WAYNE L. DENMAN

**Purification of swimming pools by chlorine.** W. HILLAND. *Gesundh. Ing.* 51, 510-1(1928); *Wasser u. Abwasser* 25, 43.—The usual brownish color of swimming-pool water was entirely removed by the use of Cl. Although  $\text{Ca}(\text{OCl})_2$ ,  $\text{NaOCl}$ , Caporit, Cl gas and chloramine were all good water disinfectants, the hypochlorites gave a troublesome and objectionable turbidity. Chloramine has 3 times the bactericidal efficiency of Cl gas and is particularly efficient in destroying organisms of the colon group. Chloramine is less odorous and is handled more readily than Cl gas. C. R. F.

**The hygiene of bathing, swimming ponds and waters.** A. L. THOMSON. *Munic. Eng. Sanit. Record* 82, 253(1928); cf. C. A. 23, 1708.—A pond, capacity 100,000 gals., contained 500 bacteria per cc. when freshly filled but after use by 380 bathers, the count was 342,000 per cc. Intelligent control of a continuous purification plant together with the systematic cleansing of filters will maintain swimming-pond water in a hygienic condition.

C. H. BADGER

**Smoke pollution.** W. A. BRISTOW. *Munic. Eng. Sanit. Record* 82, 291-2(1928).—Atmospheric pollution in metric tons of solid impurities is given for certain mfg. towns; London (City) 18,594, Burnley 34,880, Newcastle-on-Tyne (City) 34,247, and St. Helens 22,876.

C. H. BADGER

**Treatment of industrial residues.** MARTINO B. FRONTINI. *Chimica industria* 3, 504-6(1928).—The following residues are prejudicial to fish life: cotton fibers, jute, paper, dairy waste, meat and fish preservation products, vegetables, flour, gelatin, margarine, amyl acetate, metallurgical and mineral products, sugar, etc. Putrescible substances remove O from waters; this is vital for fish and aquatic plants. S. L. B. E.

**Bleachery waste water purification.** GEIJA. *Z. ges. Textil Ind.* 31, 174-5(1928); *Wasser u. Abwasser* 25, 56.—Chem. treatment and disposal methods are considered.

C. R. F.

**Sewage pollution (of a stream) punishable if contrary to legal stipulations.** J. GENNERICH. *Mitt. Fischereier. Prov. Brandenburg* No. 17, 395(1928); *Wasser u. Abwasser* 25, 178.—Following the bestowal of right for the use of water from a brook, an industrial manuf. plant discharged acid waste into the streams thus destroying several hundred fish. The Court held that this action constituted a negligent transgression of the Water Laws and imposed a fine.

C. R. FELLERS

Infected ice causes discoloration of halibut (HARRISON, SADLER) 12. The filtration of water for textile purposes (TROTMAN) 25. Corrosion of metals in sea water (FRIEND) 9. Causes and prevention of corrosion (TEXTER) 9. Determination of minute amounts of I according to the Dupré-Winkler method (HÖJER) 7. Further studies on the disinfection of dried anthrax filus (POHL) 11C. Apparatus for indicating the loss of head of liquids passing through filter beds, etc. (Brit. pat. 298,170) 1.

KOEHN, WERNER: **Grundwasserkunde.** Stuttgart: Schweizerbart. 291 pp. M. 18. Reviewed in *La nature* 59, 428(1928).

KULKA, H.: **Der Eisenwasserbau.** Berlin: Ernst und Sohn. 323 pp. M. 29. Reviewed in *Génie civil* 93, 368(1928).

THIENEMANN, AUGUST: **Die Binnengewässer. Band IV. Der Sauerstoff im eutrophen und oligotrophen See.** Stuttgart: Schweizerbart. 175 pp. Reviewed in *Science* 68, 430(1928).

ing nozzle area is varied according to load conditions. Various structural features are described.

**Water softening.** WILHELM J. HELLENBROICH. Swiss 128,483, Jan. 25, 1927. The filter mass of a water-softening app. is regenerated in a rotating device, which enables the regenerating liquid to flow to and fro thru the mass.

**Apparatus (with inclined trays and baffles) for softening water.** G. W. CONDUIT. Brit. 297,943, Feb. 18, 1928. An app. is described which is suitable for mounting in the steam space of a boiler.

**Electric water-treating system for preventing formation of scale in boilers.** JOHN W. FOWLER. U. S. 1,710,535, April 23.

**Waste water purification.** A.-G. FÜR SPEZIALBAUTEN. Swiss 129,595, Nov. 1, 1927. The impurities are oxidized by agents led through the water in porous tubes placed therein.

## 15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER

**Chemical properties of forest-soil profiles.** ANTONIN NEMEC AND KAREL KVAPIL. *Z. Forst. Jagdwesen* 58, 461-9 (1926); *Wasser u. Abwasser* 25, 58.—The acidity, humus (org.) content, and N were detd. in various forest-soil profiles and found to be always higher than in corresponding meadow soils. The N content is highest at the surface. Increase in total acidity parallels increased H-ion concn. and low  $\text{NO}_3^-$  in the org. matter. There was a definite relation between the H-ion concn. and org. content in the humus layers of soil overgrown with pines or firs. C. R. F.

**The flora of soils derived from rocks containing iron carbonate.** FELIX GOHLERT. *Biol. generalis* 4, 333-6 (1928).—The analysis of the soil of the Erzberg (Steiermark) revealed that by weathering the siderite is quantitatively converted into  $2\text{Fe}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$ ; no Fe ions could be detected in the filtrate sepd. by filtration through an Ostwald collodion filter. Since calcite was always present, the flora of these soils was typical for lime soils. Algae, lichens and mosses contg. Fe as well as iron bacteria were absent. G. S.

**The employment of radioactive substances in agriculture.** JOSÉ A. DE VERA. *Quim. e ind.* 6, No. 62, 55-61 (1929).—Monazite worked up as a radioactive fertilizer is better than one contg. U salts. The latter are as poisonous as As salts, are very dear, and difficult to obtain. V. suggests the addn. of monazite during the manuf. of superphosphate. Th does not have a direct action on plants but favors assimilation of nutritive elements, and makes plants invulnerable to attack by microorganisms. Expts. on potatoes, vines, tomatoes, wheat, barley, oats, beet and maize are given where the fertilizer used has a U mineral base with pure Th salts as the radioactive material. The effects of monazite fertilizer upon the growth of maize, winter cabbage, pimiento, kidney beans, potatoes and lettuce are described. The economics of the proposal is discussed in some detail. S. L. B. EHTERTON

**Nitrification of calcium cyanamide in some Indian soils.** J. H. WALTON. *Mem. Dept. Agr. India, Bacteriol. Ser.* 2, 35-64 (1928).—A comparative study was made of the rate of nitrification of Ca cyanamide in various types of Indian soils. When cyanamide was applied at the rate of 30 mg. of N per 10 g. of soil, nitrification started in 8 weeks in some soils while in others it was delayed for more than 30 weeks. Nitrification of  $(\text{NH}_4)_2\text{SO}_4$  and of mustard cake was always more rapid than that of Ca cyanamide except in an acid soil where good nitrification of Ca cyanamide was obtained while there was practically no nitrification of the other N materials. This was apparently due to the effect of the lime in the Ca cyanamide in correcting soil acidity. When the amt. of Ca cyanamide was reduced to 5 mg. of N per 100 g. of soil more rapid nitrification was obtained in all soils. The Ca cyanamide used in the expts. was free from dicyanodiamide. K. D. J.

**The anaerobic spores found in earth.** JOSEPH BIRGER. *Klin. Wochschr.* 8, 598-9 (1929).—The anaerobic spores of the soil appear to be identical in all sections of central Europe. The soil at Altona contained *B. welchii*, *B. tertius*, *B. oedematiens*, *B. bifurmentans*, *B. sporogenes*, tetanus bac. and *B. cochlearius*. From this it is clear why gas edema may occur at any time and any place. MILTON HANKE

**The chemical investigation of the leaves as a diagnostic means for the determination of the nutrient requirements of grape vines.** A. JACOB. *Z. angew. Chem.* 42, 257-62 (1929).—The grape yield is related to the total nutrient content of the leaves as well as to the mutual relation of the quantity of these nutrients during the course of the growth period. The quant. relation of the nutrients is chiefly of influence on the grape yield, while the abs. quantity of the absorbed nutrients stands in closer relation



to the general development of the vine. If 1 of the 3 nutrients in the fertilization is missing, while the other 2 are supplied by fertilizing, then the absorption of the latter will be increased beyond the amt. which is absorbed when the plant receives an appropriate complete fertilizer application suited to the needs of the vines. Such excess is always of harm either to the yield or the sound development of the vine. If in fertilizing the vine one nutrient is omitted, then the vine can utilize the supply of this nutrient in the soil only in a lesser degree than it would if it were not fertilized at all. The most favorable relation of nutrients for the production of grapes prevails then, when the  $K_2O$  content of the leaves during the entire period of development exceeds the N content. E. F. S.

**Influence of the nitrate-ion-concentration of nutrient solutions on the growth of summer wheat.** M. A. J. GOEDEWAAGEN. *Proc. Acad. Sci. Amsterdam* 32, 135-50 (1929).—Good growth of wheat plants is possible in nutrient solns. with strongly divergent  $NO_3$  content. The max. N concn. for good growth was found between 182 and 238 p. p. m. while the lowest concn. which permits of rather good growth appeared to lie below 5 p. p. m. In order to det. this min. concn. more accurately one must account for the decrease experienced by the  $NO_3$  concn. of the solns. with an amt. of N of 5 p. p. m. during the intervals of growth. This decrease was not detd., but from the table it may be inferred that the N content of these solns. has decreased during the 2 last intervals of growth at least to 2.5 p. p. m., i. e., to a value below the initial concn. of the adjacent cultures with lower N content. As with the plants cultivated in solns. with an initial N concn. of about 5 p. p. m. rather good growth was stated, it may be approx. accepted, that the min. N concn. for satisfactory growth lies below 2.5 and probably above 1.5 p. p. m. The nitrate N concns. which render good or at least satisfactory growth possible cover a broad range, the limits of which were found at an amt. of about 2 and about 200 p. p. m. of nutrient soln. in the exptl. conditions described. E. F. SNYDER

**The phosphorus of grains.** J. E. GREAVES AND C. T. HIRST. *Agr. Expt. Sta., Logan, Utah. Cereal Chemistry* 6, 115-20 (1929).—The P content of wheat, oats, and barley progressively increases as the irrigation water applied increases. The extra P removed from the soil by a 50-bushel crop of wheat was 4.9 lbs., by a 100-bushel crop of oats 2.9 lbs., and by a 75-bushel crop of barley 4.2 lbs. The production of irrigated grains removes greater quantities of P from the soil than does the production of a similar quantity of dry-farm grain. From a consideration of the P-Ca ratio and the P-N ratio it may be concluded that the increase in P due to irrigation water is primarily inorg. There is a marked uniformity between the increase in Ca and the increase in P. The wheat showed an increase in total P as the irrigation water applied increased up to 35 in. Between 5% and 6.3% of the total P of wheat is inorg. The oats also increased in P as the irrigation water applied increased. In oats an av. of 11.2% of the P is in the inorg. form. The inorg. P in barley varied from 6.3% to 9.4% of the total. From 12.2% to 15.6% of the total P in the corn kernel is in the inorg. form. The total P of grains also varies with the soil on which the grain was grown. The addn. of barnyard manure to soil increases the proportion of inorg. P in the corn kernel. L. H. BAILLY

**The influence of the hydrogen-ion concentration of the culture media on the development of the coffee tree (*Coffea arabica* L.).** THEODURETO DE CAMARGO, R. BOLLIGER AND PAULO CORREA DE MELLO. *Compt. rend.* 188, 878-80 (1929).—Five months' old plants of the variety *C. Bourbon* which had been grown on quartz sand were transferred to water cultures and grown for 7 months at  $pH$  7.2, 6.8, 5.8, 5.1 and 4.2. The optimum degree of acidity as detd. by the wt. of the plants was between  $pH$  4.2 and 5.1. Under field conditions the soils rarely have an acidity lower than  $pH$  6.5 and an addn. of lime has harmful effects. The absorption of Ca, Mg and Na ions was not influenced by the  $pH$  of the media. The K absorbed was greater in the acid range and decreased with increasing acidity. J. T. SULLIVAN

**Foot-rot and wilt of antirrhinums caused by *Phytophthora pini* var. *antirrhini*, n. v.** S. SUNDARAMAN AND T. S. RAMAKRISHNAN. *Memoirs Dept. Agr., India, Botanical Ser.* 16, 83-100 (1928).—The best growth of the fungus was obtained on French bean agar having an acid reaction of +5 to +15 on Fuller's scale. No growth was obtained in cultures exposed to direct sunlight while good growth was obtained in cultures exposed to diffused light or kept in the dark, and low temps. favored growth. There was a progressive decrease in the no. of sporangia formed when the percentages of  $CaCl_2$ ,  $MgCl_2$ , or NaCl in the media were increased from 0.25 to 2.0. Numerous sporangia were formed when bits of culture were placed in 0.5 and 1.0% lactose solns. but none was formed in the same strengths of glucose and maltose. K. D. JACOB

**Problems with artificial manures. III. Phosphoric acid fertilizer.** A. V. SABASHNIKOV. *Mill. modernen landw. Technik* (Russia) 1927, No. 6, 166-70.—A review of the value of the different phosphoric acid carriers as fertilizers in Germany for the post-

war period. IV. Liming soil. A. V. SABASHNIKOV. *Ibid* No. 7, 194-9.—A discussion of the lime problem in Germany, and a review of the subject of the influence of lime on the chem., phys. and biol. properties of the soil.

J. S. JOFFE

The phosphoric acid question in the cultivation of sugar cane in Java. O. ARRHENIUS. *Arch. Suikerind.* 37, 77-96(1929).—The necessity of  $P_2O_5$  fertilization in Java is detd. by the combined results of soil analyses ( $P_2O_5$  in 2% citric acid) and field tests. In this way the empirical formula is found: soil contg. less than 0.009%  $P_2O_5$  is poor in phosphoric acid; soils between 0.009 and 0.027 will sometimes react on phosphoric fertilization and sometimes not; and soils above 0.027% do not require fertilization. The very large no. of field tests during the latter years has shown that this law is valuable in only 90% of the cases. To come to a closer relation between soil analysis and field tests A. has detd. the  $P_2O_5$  content in a great number of soils by water extrn. Three hundred g. soil is shaken 48 hrs. with 1500 cc. 1% NaCl soln. and 3 drops of  $H_2SO_4$  added. In 50 cc. of the filtrate  $P_2O_5$  is detd. by the molybdenum blue method. The results are given in tables. The figures indicate 0.01 mg.  $P_2O_5$  per 200 g. soil. All soils giving a positive reaction on fertilization have a content of 7 or lower. Soils not reacting on fertilization show high results for a part and low results for a part, and soils rich in phosphates show high results by water extrn. Pot tests with sand, water and varying  $P_2O_5$  concns. are made.

P. R. P.

The use of coal as a fertilizer. A. D. KISSEL. *Palmira Tropen* 10, 169-74(1929). Field expts. show that the introduction of finely powd. (0.25 mm.) brown coal into layers of loam stimulates plant growth. No changes in the chem. compon. of the soil were noted, but the temp. of the upper layers of the soil did not fluctuate as in untreated control soil. The addn. of 10,000-20,000 kg. coal per hectare increased the yield of the grains 54-55%; a further increase to 30,000-40,000 kg. per hectare lowers this increase in yield to 20-30% above the control, an addn. of 1400-2500 kg. per hectare increases the yield 2-10%. Exts. of humin substances were added to soils and showed a favorable influence in grain, beets, grapes and hops. When the soil was treated with a carbo. humin prepn. the sugar content was increased 1%.

FRANK MARESH

The microscopic composition and structure of different pretreated Thomas slag; and their relation to citric acid solubility (SCHEIDEGGER) 9. The conversion of cyanamide to  $NH_3$  (MOLITOR) 18. Treating slag [to form fertilizer] (Brit. pat. 298,141) 20. Weed killer (Swiss pat. 129,200) 4. Purifying petroleum oils and distillates [to obtain insecticidal compositions] (Brit. pat. 297,111) 22. Ammon. [for insecticides, bactericides or fungicides] (Brit. pat. 297,484) 10. Hg compound of humic acid [for treating seeds] (Fr. pat. 648,141) 10.

CHANCIN, E. *Chimie agricole*. Paris: Librairie Hachette 264 pp. Reviewed in *Chimie & Industrie* 21, 672-3(1929)

Reagent kit with test tubes and case for use in making soil tests. MARVIN H PEDDERSEN. U. S. 1,710,156, April 23

Mixed fertilizers. STOCKHOLMS SUPERFOSFAT FÄBRIKS ABTEDELING. Brit. 298,196, Oct. 5, 1927. A mixed fertilizer contg.  $NH_4NO_3$  and  $NH_4$  phosphate, with or without a third  $NH_4$  salt such as the sulfate, is prepd. by simultaneously pptg. the salts from a soln. contg. them, by evapn. of such a soln., or by passing  $NH_3$  into a mixt. of  $HNO_3$  and  $H_3PO_4$  so concd. that a solid mixt. is obtained directly, or by passing  $NH_3$  into a soln. of  $NH_4$  phosphate in  $HNO_3$  or of  $NH_4NO_3$  in  $H_3PO_4$ .

Fertilizer comprising potassium nitrate and diammonium phosphate. I. G. FARBERNIND, A.-G. Brit. 297,900, Sept. 15, 1927.

Fertilizer from spent sulfite liquors. GEORGE A. RICHTER (to Brown Co.). U. S. 1,710,272, April 23. A fertilizer is prepd. from the spent liquor resulting from the digestion of cellulosic material such as wood in a sulfurous acid soln. of  $NH_4$  salts, contg. substantially all the org. matter removed from the cellulosic material.

Nitrophosphates. ELEKTIZITÄTWERK LONZA and EMIL LÜSCHER. Swiss 129,011, July 14, 1927. Nitrophosphates suitable for scattering on land are prepd. by decomposing crude phosphates by  $HNO_3$  and adding 2% of urea.

Nitrophosphates. ELEKTIZITÄTWERK LONZA, EMIL LÜSCHER and SAMUEL RUOSCH. Swiss 129,891, July 14, 1927. Nitrophosphates suitable for agriculture are prepd. by treating the crude phosphates with  $HNO_3$  under conditions such that the crystals contain less water than normally.

## 16—THE FERMENTATION INDUSTRIES

C. N. FREY

**Furfuroles in fermentation products.** MASAKAZU YAMADA. *Bull. Chem. Soc. Japan* 4, 31-5(1929).—Furfurole is not found in the Et<sub>2</sub>O ext. of the saké, soy sauce or other fermented liquids at the end of fermentation, but occurs after pasteurization or distn. Starch, maltose and glucose were found to yield hydroxymethylfurfurole on heating their aq. solns. Repeated distn. transformed this product to furfurole. Pentosans and pentoses gave furfurole directly, while methylpentosans and methylpentoses gave methylfurfurole on heating. The furfurole of fermented products is a mixt. of furfurole, hydroxymethylfurfurole and methylfurfurole. In saké, beer, soy sauce and some distd. wines the main component is hydroxymethylfurfurole; in impure alc. and fusel oil the main product is furfurole. J. G. McNALLY

**Alcohol in solid form.** F. WEISS. *Apoth. Ztg.* 44, 423-4(1929).—The earlier forms of so called solid alc. are discussed, together with the various vehicles proposed or used in making the product, as soaps, nitrocellulose, or acetylcellulose, stearin, paraffin, shellac, rosin, Na silicate, etc. The product under immediate consideration is that under D. R. P. 461,303 and consists of a soln. of K diacetonefructosesulfate in alc. Suggestions are given for detecting the several components, as acetone, fructose and sulfuric acid. W. O. E.

**Drying of hops in vacuo.** K. BEHRENDT. *Wochschr. Brau* 46, 86-7(1929).—Hops, which were dried for 5-8 hrs. at 100 mm. and about 25°, contained the same amount of humulone and resin as samples dried in air for 2-3 days and 3-30% more than kiln-dried ones. A. SCHULTZ

**Structure and semipermeability of the testa of the barley corn.** J. GRÜSS. *Wochschr. Brau* 46, 61-6, 71-80(1929). The testa of the barley corn is semipermeable, which prevents diffusion of acids and salts used in steeping. Steep waters diffuse through a small opening at the base of the corn or dents and fissures in the pericarp caused by variations of temp. and moisture. A. SCHULTZ

**Influence of formaldehyde on the germination of steeped grain.** B. LAMPE. *Z. Spiritusind.* 51, 343-4(1928). Steep water contg. 0.15-0.20% of formalin did not lower the germination of the grain. A. SCHULTZ

**Defective attenuation of the mash.** E. LÜHDEY AND B. LAMPE. *Z. Spiritusind.* 51, 335-6(1928). Incomplete fermentations of mashes made with malt and potatoes may be due to a deficiency of amylase in the malt, to using a too highly coned mash or to bacterial infection. A. SCHULTZ

**Formation of ammonia during brewing processes.** W. WINDISCH AND P. KOLBACH (WITH K. BAUMANN). *Wochschr. Brau* 46, 41-5(1929).—Ammonia N was detd. by distg. with excess Al(OH)<sub>3</sub> *in vacuo* at 40°. Calculated on the original dry matter of the barleys there was found in the barleys 0.0053, 0.0054, malts 0.0063, 0.0053; unboiled worts 0.0083, 0.0090, boiled worts 0.0207, 0.0196; and beers 0.0133, 0.0168% ammonia N. By prolonging the mashing period at 15° from 0.5 to 3 hrs. the ammonia N obtained by boiling increased uniformly. This increase did not result when the mash was previously boiled and thus the action is enzymic. A. SCHULTZ

**Separation of fusel oil from the first distillate.** B. LAMPE AND W. KILP. *Z. Spiritusind.* 51, 351-2(1928). The factors which govern the sepn. of fusel oil from low wines by the addition of water are the relative vols. of water and alc., the proportion of EtOH to fusel oil, and the temp. of the mixt. The best results are obtained by adding equal vols. of cold water to the cooled distillate, which should not contain a greater ratio of fusel oil to EtOH than 1:3.1. A. SCHULTZ

**Adaptation of the cuprometric method to the determination of sugars and dextrin in beers in three different operations.** MARIO TAVEIRA. *Rev. chim. pharm. militar* (Rio de Janeiro) 4, 53-6(1928).—Evap. 1% of 100 cc. of beer on a water bath, add 10 cc. of Courtonne's soln. (30% Pb acetate), eliminate excess of Pb with Na<sub>2</sub>SO<sub>4</sub>, and fill to 100 cc. Treat part with animal charcoal, filter and fill in a buret. Titrate in Fehlings soln. in the usual way. The result gives the maltose calcd. as glucose. Evap. 50 cc. of beer, add EtOH to make 70%, filter, wash with EtOH, evap. to sirup consistency, dissolve in H<sub>2</sub>O, evap. again, invert with 2 cc. of HCl for 20 mins., neutralize with NaHCO<sub>3</sub>, and titrate with Fehlings soln. This gives maltose and saccharose. For the detn. of dextrin, evap. 50 cc., dil. and invert with 15 cc. HCl during 2 hrs. Titrate the total of sugars and calc. the dextrin by subtracting the sugars. A. E. MEYER

**Determination of nitrogen in yeast and molasses.** M. S. FILOSOFOV. *Nauchniss. Zapiski* 7, 185-7(1928).—The detn. of N by the Kjeldahl method is not always conven-

ient and F. gives a new method: 0.3-0.5 g. of yeast thoroughly mixed with 1 g. NaOH and 2 g. Na acetate is placed in a brass retort 18 cm. long and 2.5 cm. in diam. The retort is connected with an Erlenmeyer flask contg. 25 cc. 0.1 N  $H_2SO_4$  by a bent glass tube. When the retort is heated 20 mins. all  $NH_3$  and  $CH_4$  pass into the receiving flask. The app. must be thoroughly washed with distd. water into the receiving flask, then excess of 0.1 N  $H_2SO_4$  is titrated by NaOH with litmus as indicator. For the molasses the design of the retort used is somewhat altered. V. E. BARKOW

Generation and regeneration of warm-stored bottom- and top-fermentation yeasts. F. WINDSCH. *Wochschr. Brau.* 46, 71-4, 81-6(1929).—A top- and bottom-fermentation yeast whose fermentative and reproductive powers were weakened by four successive periods of storage under beer at 18-20° fully regained its former strength by three days' storage under beer at 2-6°. The weakened condition of the warm-stored yeast is not due to the slightly higher proportion of dead cells. A. SCHULTZ

DES OMBIAUX, MAURICE: Le vin. Paris: La nouvelle société d'édition. 116 pp.

Alcohol from burned sugar-cane stalks. JOAQUIN J. DE LA ROZA (to Bagasse Products Corp.). U. S. 1,709,610, April 16. Alc. is distd. from the fermented extd content of burned green sugar cane which has been exposed to ordinary atm. conditions in cane-growing localities until an inversion of the sugar content has occurred.

Enzymes by bacterial action. KALLE & Co. A.-G. Brit. 297,684, Sept. 24, 1927. Lactose, maltose or dextrin (or substances such as milk contg. them) is added to mashies such as those prep'd. as described in Brit. 16,198 of 1914. The enzymes may be sepd. as described in Brit. 251,405 (C. A. 21, 1282).

Malt extract. AUGUST E. NIENSTADT (to A. F. STOEGER, INC.). U. S. 1,709,366, April 16. A heavy, viscous and not readily sol. malt ext. is converted into a potable form easily sol. in aq. media by dissolving in water an edible albuminous material coagulable at moderate temps. (such as whites of eggs) and mixing with the malt ext. of about 40° Bé., heating to about 70°, and filtering.

Yeast. ZELLSTOFFFABRIK WALDHOF and OTTO LÜHRS. Fr. 648,151, Feb. 3, 1928. See Brit. 287,052 (C. A. 23, 472).

## 17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

On the stability of adrenaline hydrochloride and epinephrine extracted from bovine suprarenal medulla by Folin in various media and of epinephrine liberated from suprarenal glands of dogs and cats in defibrinated blood. TADASHI SUGAWARA. *Tohoku J. Exptl. Med.* 12, 97-118(1928); cf. C. A. 23, 2199.—Deterioration took place most rapidly in Tyrode's fluid, less rapidly in Locke's fluid and in dogs' defibrinated blood. B. C. BRUNSTETTER

Microchemical reactions for cinchonidine. M. WAGENAAR. *Pharm. Weekblad* 66, 261-4(1929).—The sensitivity of various reactions in terms of min. concn. and min. quantity of alkaloid detectable is: pptn. of free base, 1:1000, 2 mg.;  $K_2CrO_4$ , 1:1000, 5 mg.; aliphatic acids, 1:1000, 5 mg.;  $BzOH$ , 1:500, 10 mg.;  $o-HOC_6H_4CO_2H$ , 1:1000, 2 mg.; phenols, 1:500, 10 mg.;  $NH_4SCN$ , 1:100, 50 mg.; picric acid, 1:1000, 2 mg.;  $PtCl_4$ , 1:2000, 2 mg.;  $C_6(CO_2H)_6$ , 1:1000, 5 mg.;  $p-O_2NC_6H_4CH_2CH_2CO_2H$ , 1:2000, 2 mg.;  $K_3Fe(CN)_6$ , 1:1000, 5 mg. A. W. DOX

The behavior of arspenamine and neoarsphenamine toward aldehydes. H. W. VAN URK. *Pharm. Weekblad* 66, 297-8(1929).—The color reactions may be performed (1) by evapn. of the substance with an alc. soln. of the reagent contg. a little  $H_2SO_4$ , (2) by warming the substance with a  $H_2SO_4$  soln. of the aldehyde, (3) as a ring reaction by dissolving the substance and the aldehyde in EtOH and allowing  $H_2SO_4$  to flow to the bottom. The following aldehydes give yellow, orange, or red colors:  $o$ -,  $m$ - and  $p$ - $O_2NC_6H_4CHO$ ,  $CH_2O$ ,  $p-HOC_6H_4CHO$ , furfural,  $BzH$ , vanillin,  $p-Me_2NC_6H_4CHO$ . Arspenamine and neoarsphenamine may be distinguished by their color reactions with  $o-O_2NC_6H_4CHO$ ; the 1st gives a yellow, the 2nd a fiery red color; also by their reactions with furfural, the 1st giving a yellow-red, the 2nd a brown-yellow color. For the  $o-O_2NC_6H_4CHO$  test the substance is added to a 1% soln. of the aldehyde in dil. EtOH.  $H_2SO_4$  is added to make 2%, and the soln. evapd. on the water bath; for the furfural test the substance is warmed with  $H_2SO_4$  contg. a few drops of 1% furfural. A. W. DOX

New reactions for cantharidin. H. W. VAN URK. *Pharm. Weekblad* 66, 313-7

(1929).—Color reactions for cantharidin are not very characteristic, the best thus far described being that of David (*C. A.* 21, 1328) in which the sample is nitrated and then treated with vanillin-HCl, whereupon an orange-red to brown-red color develops. Two new reactions are now described. The 1st consists in nitrating the cantharidin, reducing to the  $\text{NH}_2$  deriv., diazotizing with  $\text{NaNO}_2$  and coupling with  $\alpha\text{-C}_6\text{H}_4\text{OH}$ , whereby a violet-red azo dye is formed. The 2nd is a condensation of the  $\text{NO}_2$  deriv. with  $p\text{-Me}_2\text{NC}_6\text{H}_4\text{CHO}$  in the presence of 2%  $\text{H}_2\text{SO}_4$ , the product having a yellowish red color. The 1st will detect 0.1 mg., the 2nd 0.5 mg., whereas the David reaction requires 5 mg. of cantharidin. The 2 tests are performed as follows: (1) Evap. the sample in a porcelain dish with 5 cc. of 50%  $\text{HNO}_3$ . Treat the residue with 2 drops of freshly prepd.  $\text{SnCl}_2$  in concd.  $\text{HCl}$  and warm 2-3 min. on the water bath. Cool, add a few drops of 1%  $\text{NaNO}_2$ , 1 more drop of  $\text{SnCl}_2$ , destroy the excess  $\text{NaNO}_2$  with a little urea or by careful evapn., and add a freshly prepd. 1% soln. of  $\alpha\text{-C}_6\text{H}_4\text{OH}$  in 10%  $\text{NH}_4\text{OH}$ . A violet-red color indicates the presence of cantharidin. (2) Evap. the sample with 5 cc. of 50%  $\text{HNO}_3$ . Add 10 drops of 1%  $p\text{-Me}_2\text{NC}_6\text{H}_4\text{CHO}$  in dil.  $\text{EtOH}$  and sufficient  $\text{H}_2\text{SO}_4$  to make 2%. Evapn. on the water bath leaves a yellowish red residue which dissolves in  $\text{H}_2\text{O}$  with an intense yellow color.

A. W. DOX

An improvement in the Dafert method for the estimation of essential oils in drugs. R. FISCHER. Univ. Innsbruck. *Apoth. Ztg.* 44, 435-7(1929).—In detg. the essential oil content of drugs *via* Dafert, the addn. of  $\text{NaCl}$  or satd.  $\text{NaCl}$  soln. may be advantageously employed. The method thus modified is applicable to essential oils having a d. = to or greater than 1; the sepn. of  $\text{H}_2\text{O}$  is more quickly effected and soly. therein measurably decreased. The results obtained compare favorably with those obtained by the official German method.

W. O. E.

Estimation of theobromine in diuretin, calcium diuretin, iodocalcium diuretin and rhodan-calcium diuretin. HEINRICH BOER AND ALOIS LINDNER. Ludwigshafen a/R. *Pharm. Ztg.* 74, 418-20(1929).—The method and technic developed by Emery and Spencer (cf. *C. A.* 12, 1907) and modified by Brukeleveen (cf. *C. A.* 21, 2165) are followed by B. and L. The essential modification consists in dissolving the sample in normal  $\text{NaOH}$  soln. instead of glacial  $\text{AcOH}$ , prior to the addn. of  $\text{HCl}$ .

W. O. E.

Cystinol. C. A. ROJAHN AND MAX HERTER. Univ. Halle-Wittenberg. *Apoth. Ztg.* 44, 424(1929).—A liquid prepn. contg. among other ingredients about 20% indifferent plant exts. (including *Succus Juniperi*), 10-17% alc. and the remainder  $\text{H}_2\text{O}$ .

W. O. E.

Sediment formation in citrate of magnesia prevented. H. A. BARNBY AND E. L. VOIGHT. Research Lab., Glass Container Assn., N. Y. *Glass Container* 8, No. 6, 10-22(1929).—A troublesome sediment or deposit  $\text{Mg}_2(\text{C}_6\text{H}_5\text{O}_7)_2 \cdot 14\text{H}_2\text{O}$  settles out during storage of this U. S. P. prepn. Expts. proved that this ppt. is caused by a lack of excess citric acid necessary to hold the  $\text{Mg}$  citrate in soln. In order to reclaim unsalable  $\text{Mg}$  citrate, it is recommended that the clear supernatant liquid be decanted and carbonation effected by the use of a small hand outfit.

C. R. FELLERS

The pentavalent antimony compounds in tropical medicine. HANS SCHMIDT. *Indian Med. Gaz.* 63, 643-50(1928).—A complete and comprehensive historical review with bibliography.

FREDERICK G. GERMUTH

*Terminalia arjuna*: its chemistry, pharmacology and therapeutic action. R. N. CHOPRA AND SUDHAMOY GHOSH. Calcutta School of Tropical Med. and Hyg. *Indian Med. Gaz.* 64, 70-3(1929).—The liquid ext. of the bark of *T. arjuna* is recognized as a cardiac tonic. It contains tannins, org. acids, an ester and sugars, but no alkaloid glucoside or essential oil. No physiol. action could be detected either in animals or patients.

FREDERICK G. GERMUTH

Does antirrhincic acid exist in digitalis? A. FOURTON. *Bull. sci. pharmacol.* 35, 689-91(1928).—Antirrhincic acid, prepd. first by P. L. Morin (*J. Pharm. chim.* [3], 7, 294(1845)) from digitalis leaves, was split up by fractional distn., giving the following acids: formic, acetic, butyric and isovaleric.

A. E. MEYER

The neutralization of hydrogen peroxide for therapeutic use. V. ZOTIER. *Bull. sci. pharmacol.* 36, 17-20(1929).—The addn. of 4% of  $\text{NaHCO}_3$  causes complete decompn. within less than 1 hr., smaller quantities in 1-6 hrs.  $\text{Na}$  borate causes decompn. of 50% in 66-90 days, and 100% in 100-164 days.

A. E. MEYER

The most important methods of determination of the total alkaloids in cinchonas. R. DUBREUIL. *Bull. sci. pharmacol.* 36, 20-5, 79-85(1929); cf. *C. A.* 23, 668.—The method of Yvon gives low results to the limit of 40% less. The extn. should be made with hot  $\text{HCl}$ . The  $\text{Et}_2\text{O}$  should be substituted by  $\text{Et}_2\text{O} \cdot \text{CHCl}_3$ . In the method of the Belgian Pharm., the extn. is incomplete if the powder is not dried. By the use of hematoxylin in the titration and back titration, the method is inexact. The method of the

Swiss Pharm. is considered as the most reliable. The French Pharm. makes use of Et-OH; this is inconvenient, as the rosins are dissolved. It causes an incomplete extn. and the alkaloids, when weighed, are not pure.

A. E. MEYER

**The determination of pilocarpine.** P. BOURGET. *Bull. sci. pharmacol.* **36**, 26-7 (1929).—Twenty-five g. Jaborandi leaves are passed through a sieve of 30 meshes per cm., moistened with 200 cc. of 10% soln. of  $\text{Na}_2\text{CO}_3$  and extd. with benzene in a Soxhlet app. for 3 hrs. The cooled soln. is shaken out with 1%  $\text{H}_2\text{SO}_4$ ; the acid soln. is filtered, neutralized against Congo red with  $\text{NH}_3$ , and oxidized with 1% soln. of  $\text{KMnO}_4$ . Add more  $\text{NH}_3$  and shake out 10 times with  $\text{CHCl}_3$ . Filter the  $\text{CHCl}_3$  soln. over anhyd.  $\text{Na}_2\text{CO}_3$ , neutralize exactly with very dil.  $\text{HNO}_3$ , evap. to dryness. Ext. the impurities with acetone and collect the pilocarpine in a Gooch crucible. It melts not below 165°. In certain lots of leaves, the benzene soln. deposits pilocarpine when left standing. A previous extn. with petroleum ether or benzene, followed by the regular treatment with  $\text{Na}_2\text{CO}_3$ , will avoid this difficulty.

A. E. MEYER

**The most important active constituents and the biologic titration of digitalis.** JEANNE LEVY. *Bull. sci. pharmacol.* **36**, 28-51 (1929). A survey of the different compds. isolated from digitalis including phys., chem. and physiol. properties is given. The different methods of biologic assay are described and discussed.

A. E. MEYER

**The chemical composition of the ash of the flower of the fig tree of the Berbery.** H. WUNSCHENDORFF. *Bull. sci. pharmacol.* **36**, 133-6 (1929).—The flowers of *Opuntia vulgaris* Mill. without ovary. Against enteritis. The ash of the flower contains:  $\text{SiO}_2$  29.88%,  $\text{CaO}$  14.30,  $\text{MgO}$  5.62,  $\text{Fe}_2\text{O}_3$  1.68,  $\text{MnO}$  0.45, total ash in the flowers 8.837%. In the ovary total ash 18.75, in the ash of its  $\text{SiO}_2$  11.12,  $\text{CaO}$  22.98,  $\text{MgO}$  4.20,  $\text{Fe}_2\text{O}_3$  0.76,  $\text{MnO}$  0.80. Mn and Fe vary much in the different parts of the plant.

A. E. MEYER

**The preparation of pure emodin.** R. DUPONCH and C. ROCHER. *Bull. sci. pharmacol.* **36**, 136-9 (1929).—The drug is extd. with  $\text{CHCl}_3$  according to Danc's method (C. A. 7, 4042). Wash the soln. with 10% soln. of  $\text{NaHSO}_4$  and a 1%  $\text{HCl}$  filter and evap. to 2% of the original vol. After 24 hrs. crystals are formed. Wash with cold  $\text{CHCl}_3$ . The product is sol. in 3% soln. of  $\text{NaOH}$ . M.p. 254°.

A. E. MEYER

**Tests on some samples of commercial cod-liver oil.** M. S. GUNDEL. *chim. pharm. militar* (Rio de Janeiro) **4**, 8 (1928). *Bol. Assoc. Brasil. p.* Aug. 1927.—Identification tests from several pharmacopoeias and phys. consts. are compared. Some reactions are not obtained with oils prep'd by modern methods; others vary with the age of the oil, provenience and methods of conservation. More than one test should always be made.

A. E. MEYER

**Detection of antipyrine in pyramidone.** The cause of a grave error in the French Pharmacopoeia. VIRGILIO LUCAS. *Rev. chim. farm. (Rio de Janeiro)* **4**, 140-1 (1928).—The detection of antipyrine in pyramidone is based on the formation of diantipyrine-methane. Before the compd. is pptd. with  $\text{NH}_4$  water should be added, as otherwise a compd. of  $\text{NH}_4\text{Cl}$  with pyramidone is pptd. As more reliable, the method of Bourget (U.S.P.) is described.

A. E. MEYER

**Visnagol.** LUIS FLORES. *Rev. farm. (Buenos Aires)* **3**, 2, 14-5 (1929). Visnagol is the oily principle from *Amma visnaga* L. Umbelliferae. The powder fruit was extd. with petroleum ether. The purified oil has the following const.: color yellow, not drying,  $d_{20} 0.9125$ ,  $n_D^{20} 1.47$ , f.p. 4°, neutral reaction, sapon. value 188, I value 2.21, acidity as oleic acid 2.21%, Heydenreich's reaction yellow, turning into reddish yellow, Hauchecorne's reaction dirty green.

A. E. MEYER

**Atlas cedar (*Cedrus atlantica*) and the therapeutic products which it gives.** R. A. MASSY. *Parfumerie moderne* **22**, 177-97 (1929), cf. C. A. **23**, 1993. A review with bibliography of 62 references.

A. PAPINEAU-COUTURE

**Decolorizing essential oils with ultra-violet rays.** A. QUILICO. *Rivista ital. essenze profumi* **10**, 148-68 (1928). Distd. lavender oil (*Lavandula officinalis*) and eucalyptus oil (*Eucalyptus globulus*) were exposed in an enameled-iron container to the rays from a Bach lamp using a c. at 110-30 v. The lavender oil had  $d_{20} 0.885$ ,  $[\alpha]_D^{20} 5.3^\circ$ ,  $n_D^{20} 1.4661$ , esters as linalyl acetate 27.5%, soly. at 20° 1-2.3 in 70% alc., and was dark yellow. Twenty cc. of the oil after exposure to the light for 1 hr. was equiv. in a Duboscq colorimeter to 19.5 cc. of the original oil. After 7 hrs. it was equiv. to 11.5; after 14 hrs. to 2.5; and after 21 hrs. to 0.5 cc. The decolorized oil maintained its original fragrance.

decolorization of the lavender oil. The eucalyptus oil contained besides cineole (53%) traces of alcs., eudesmol, etc.

**The rhizome of iris.** VITTORIO NIGRISOLI. *Boll. chim. farm.* 68, 203-8(1929). — Notes on the therapeutic effect of the rhizome of iris, the chem. properties of the compds. isolated from it and the compn. of some preps. contg. it.

**The nicotine content in fresh tobacco leaves.** SHIYOJI NISHIYAMA. *Bul. Sci. Fakultato Terakultura, Kjusu Imp. Univ.* 3, 10-5(reprint). — Green leaves were selected and the nicotine content was detd. in various parts of the stems by the method of Shedd. In order to avoid the loss of nicotine during the drying process the leaves were ground with gypsum and desiccated in *vacuo*. Conclusions: The nicotine content increases from the lower to the higher leaves.

**Comparison of methods for the determination of nicotine in tobacco.** MUNEKUMA SAMEJIMA AND KITARO KATAI. *Bul. Sci. Fakultato Terakultura, Kjusu Imp. Univ.* 3, 112-6 (reprint). The methods of Toth, Kissling, Chapin, and Fodor-Reifenberg for the detn. of nicotine were compared with the method of Okuda. The methods of Kissling, Chapin and Okuda were similar in accuracy. Toth's method gave high results and the Fodor-Reifenberg method gave low results.

**The stability of anesthetic ether.** F. W. NITARDY AND F. W. TAPLEY. E. R. SQUIBB AND SONS. *J. Am. Pharm. Assoc.* 17, 966 8(1928). See C. A. 23, 1215.

**An interesting emulsion.** W. L. SCOVILLE. Parke, Davis and Co. *J. Am. Pharm. Assoc.* 17, 1119 20(1928). — An emulsion of cod-liver oil was encountered that was much more limpid and capable of diln. with H<sub>2</sub>O than expected. Its reaction was slightly acid; EtOH broke up the emulsion only partially, but HCl broke it readily. The usual emulsifiers, such as gums, soaps, saponin, or albuminous substances, were absent. The ash contained SiO<sub>2</sub>. Many expts. were conducted in an effort to duplicate the product. The best results were obtained with cod liver oil 40 cc., soln. of Na<sub>2</sub>SiO<sub>3</sub> 2 cc., Al<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub> 0.9 g. and H<sub>2</sub>O to make 100 cc.

**Differential characters of three common Chinese species of Ephedra.** J. C. LIU AND B. E. READ. Peking Union Medical College. *J. Am. Pharm. Assoc.* 18, 328-34 (1929). The three chief species of *Ephedra* collected for medicinal purposes are *Ephedra sinica*, *E. distachya* and *E. equisetina*. The gross and histological structures are given in detail and the distinguishing difference for each indicated. The ash also affords some differential evidence. *E. sinica*, ash 9.77%, acid insol. 2.73, *E. distachya*, 8.20 and 0.42, *E. equisetina* 6.55 and 0.28%.

Muck odor and ring ketone condensation (DEYSON) 11A. Incompatibility of tincture of I and cherry laurel water (LI, ANSKI, *et al.*) 11H. Ketonic compounds [for intermediates in making pharmaceutical compounds] (Brit. pat. 297,756) 10.

MALMANCHEL, M. **Formulaire des pharmaciens français.** Paris: Association Générale des Syndicats Pharmaceutiques de France. 340 pp. Paper, F. 7; bound F. 10. Reviewed in *Chimie et Industrie* 21, 673(1929).

WHITA, R. **Formulaire des médicaments nouveaux, pour 1929.** Paris: J. B. Baillière et Fils. 444 pp. F. 24. Reviewed in *Chimie et Industrie* 21, 674(1929).

**Medicines.** SOC. ANON. POUR L'IND. CHIM. À BÂLE. Swiss 129,489, Aug. 23, 1927. Addn. to Swiss 105,814. A solvent for medicines which are insol. in water is prepd. by mixing water sol. alkylated urea with the water sol. amides of fatty acids and their derivs. Thus, ethylurea acetamide or ethylurea acetiethylamide forms a good solvent for derivs. of barbituric acid and other insol. medicines.

**Therapeutics.** ALBERT AMREIN. Swiss 129,729, Mar. 14, 1927. A specific for leucorrhoea is prepd. by heating CH<sub>3</sub>O soln. with insufficient H<sub>2</sub>O<sub>2</sub> for complete oxidation to 75-80°, and cooling to 60°.

**Therapeutics.** SOC. ANON. POUR L'IND. CHIM. À BÂLE. Swiss 128,855, Feb. 23, 1927. Therapeutic preps. are made by extg. pulverized female inner secretory organs, such as the ovary, placenta, or corpus luteum. The fresh organs are cooled to temps. low enough to cause them to congeal before pulverizing. Cf. C. A. 23, 483.

**Therapeutic salts of aromatic bases.** I. G. FARHENND, A.-G. Brit. 298,240, Oct. 6, 1927. Examples are given of the combination of 3 phenylidihydroquinazoline with *p*-hydroxybenzoyl-*o*-benzoic acid, 2,4-dihydroxybenzoyl-2'-benzoic acid and 4-hydroxy-naphthoyl-2-benzoic acid; combinations of hydrastinine, orexin and quinine with the same or similar acids are also referred to. The products may be made by melting the

components together, by interaction in mol. proportions in an org. solvent, or by double decomn. of their compds.

**Therapeutic antimony compounds.** I. G. FARBENIND. A.-G. Brit. 298,234, Oct. 6, 1927. *N*-Methylsulfitcs of Sb aminoaryl compds. are prepd. by treating the Sb compd., e. g., pure *p*-aminophenylstibonic acid, dissolved in NaOH, with CH<sub>3</sub>O and bisulfite. Stable products are obtained, which are suitable for use by interjection. Partially deacylated acylaminoarylstibinic acids or compds., such as aminoarylstibinoxides, also may be used as starting materials.

**Therapeutic mercury compounds.** MAX BOCKMÜHL and ADOLF SCHWARZ (to Winthrop Chemical Co.). U. S. 1,693,432, Nov. 27. Therapeutic compds. are prepd. by mercurating aromatic substances which contain an unsatd. alkyl radical and a group which renders the substance sol. in water, so that addn. compds. are formed with the Hg and the double bond is opened. The products may be converted into their salts. Examples are given of the production of Hg derivs. from eugenolacetic acid, Na *p*-allyloxybenzenesulfonate, 4-allyloxy-3-bromobenzoic acid, 3-chloro-4-allyloxybenzoic acid, 3,5-dibromo-4-allyloxybenzoic acid, *N*-allylacetylsalicylamide, 1-allyl-4-diethylaminoethoxy-5-methoxybenzene, *N*-methyl-8-hydroxytetrahydroquinoline allyl ether, allyl *p*-diethylaminoethoxybenzoate and the tartrate of the allyl ether of *p*-hydroxybenzoic acid diethylaminoethyl ester. Numerous details of procedure are described. Cf. C. A. 23, 1995.

**Therapeutic composition comprising iron and yeast.** CORNELIUS MASSATSCH (to Matro, G. m. b. H.). U. S. 1,710,584, April 23. A colloidal basic Fe salt soln. such as liquor "ferri oxychlorati" is introduced into an aq. suspension of yeast; the solid substances are filtered out and are dried.

**Solvent for quinine.** CARL WEILL. Swiss 129,123, Mar. 4, 1927. A solvent for basic quinine is prepd. by mixing quinine-dissolving agents sol. in oil with oil. Thus, benzyl alcohol is mixed with olive oil or oil of eucalyptus.

**Caffeine.** FRITZ KÜNDIG, SR. Swiss 128,984, Dec. 8, 1927. Caffeine is extd. from the coffee bean by subjecting the steeped beans to pressure and heat and by treating with a solvent, the last traces of which are removed by an air current contg. a little steam.

**Alkaloids from ergot.** CHEMISCHE FABRIK VORM. SANDOZ. Ger. 473,151, Mar. 18, 1926. Addn. to 439,042. Ger. 439,042 describes the extn. of the total alkaloid content of ergot by means of a 45-60% acetone soln. This method is now modified by substituting 45-60% EtOH soln. for the acetone soln.

**Ergosterol from fungi.** SOC. ANON POUR L'IND. CHIM. A BÂLE. Swiss 129,870, June 14, 1927. The fungi are heated under pressure with aq. solns. of alk. substances, and the ergosterol is extd. from the product.

**Iodine values from seaweeds.** PAUL GLOESS. U. S. 1,710,255, April 23. Seaweeds are repeatedly leached with water with intermediate pressing sufficiently rapid not to allow time for absorption and swelling; an I-contg. org. substance is pptd. from the liquid obtained by the use of Cu or Pb salts; the ppt. is then treated with Fe filings to form an Fe salt and the latter is treated with Na<sub>2</sub>CO<sub>3</sub> to form an I-Na salt, which is suitable for therapeutic uses.

**Tuberculosis serum.** REISBACH & Co. Ges. Brit. 297,675, Sept. 24, 1927. In prepg. a serum for the prevention or treatment of tuberculosis, living tissue such as lung or other tissues of infected cattle, which has been disintegrated by the action of tubercle bacilli, is used for prepg. an inoculation material for treating animals to obtain blood or milk serum for therapeutic purposes. Various details are given.

**Hormones.** SOC. ANON POUR L'IND. CHIM. A BÂLE. Brit. 298,080, Sept. 30, 1927. Extracts of male organs such as testicles are treated by a process employing a saponifying agent with exclusion of O such as that described in Brit. 265,567 (C. A. 22, 261).

**Hormones.** SOC. ANON POUR L'IND. CHIM. A BÂLE. Brit. 298,092, Sept. 30, 1927. Two physiologically active substances, one water-sol. and the other lipid-sol., are obtained from male generative glands such as bull testicles by extg. the glands with water-sol. and water-insol. solvents, preferably after concg. the water-sol. ext., and sepg. the mixt. into 2 layers (adding water if necessary). Alc. and ether may be used as solvents; details of procedure are given. Cf. C. A. 23, 1474.

**Ointment or pomade.** J. PERRET. Brit. 298,167, Oct. 4, 1927. An ointment suitable for use on the hair as a pomade or for greasing the hoofs of animals is formed by melting together olive oil, lard, soap, white pitch and virgin wax.

**Disinfectant.** S. EDLMAN. Brit. 298,393, Nov. 16, 1927. A disinfectant suitable for use in veterinary medical practice against intestinal parasites and which is a deriv. of 1-methyl-3-hydroxy-4-isopropylbenzene is obtained by heating for several hrs.



under reflux in a water bath equimol. proportions of 1-methyl-3-hydroxy-4-isopropylbenzene and freshly distd. and neutralized trichloroacetaldehyde.

"Latherless" shaving cream. CHARLES H. CASHEAT. U. S. 1,709,460, April 16. A mixt. is formed of swollen starch, water and a thick, viscous mixt. of hydrocarbons such as vasoline. A small proportion of borax and soap may be added.

## 18—ACIDS, ALKALIES, SALTS AND SUNDRIES

E. M. SYMMES

Hydrochloric acid synthesis. B. WASSER. *Metallbörse* 18, 1182-3(1928).—A literature review of methods of HCl synthesis, with cost estimates, with particular reference to the coke process used in the United States (Gibbs, *C. A.* 14, 2238; Hirschkind, *C. A.* 19, 3382).

Production of nitric acid from ammonium nitrate and attempts to use ammonium hydrogen sulfate for the manufacture of ammonium superphosphates. JOZEF ZAWADZKI AND TADEUSZ KISLANSKI. Warsaw Polytech. *Przemysl Chem.* 11, 121-34(1927).—By treating 1 mol.  $\text{NH}_4\text{NO}_3$  with at least 1 mol.  $\text{H}_2\text{SO}_4$  under a pressure of 400 mm. Hg, 98% yield of  $\text{HNO}_3$  can be obtained, of which 85% will be 99% strength, and the balance over 80% strength, provided the reaction is conducted slowly and unnecessary superheating and pressure variations are avoided. Heating too high, about  $200^\circ$ , as well as an insufficient supply of  $\text{H}_2\text{SO}_4$  tends to lower the yield and the strength of acid produced. Diminution of pressure helps increase both the purity and strength of acid obtained, principally because they lower the temp. applied. The more concd. the  $\text{H}_2\text{SO}_4$  used in the reaction the more concd. the  $\text{HNO}_3$  produced. Under the exptl. conditions studied here the action of the acid sulfates on the powdered phosphates is not so rapid as that of  $\text{H}_2\text{SO}_4$ . It would be possible to obtain products with no free acid, and with  $\text{P}_2\text{O}_5$  practically completely sol. in  $\text{H}_2\text{O}$  by better mixing and longer digestion. A. C. ZACHLIN

Silicic acid gels and silica gel. I, II. KUNO WOLF. *Metallbörse* 18, 453-5, 789-90 (1928). III, IV. KUNO WOLF AND MAX PRAETORIUS. *Ibid* 1293-4, 2245-6.—A detailed review of the different processes and products.

Nitrogen oxides. F. RASCHIG AND W. PRAHL. *Z. angew. Chem.* 42, 253-7(1929).—In an old controversy between Lunge and Berl (*Z. angew. Chem.* 17, 1659(1904)) and the authors in which the theory of the Pb chamber was discussed, the claim was made that in the red gases, with O in excess, there were present higher oxides of N, like  $\text{ON}_2\text{O}$  (isomeric nitrogen tetroxide) up to  $\text{N}_2\text{O}_7$ . These gases were said to act differently when dissolved in NaOH or  $\text{H}_2\text{SO}_4$  than when treated with  $\text{SnCl}_2$ . To test the latter point the present investigation has been made, using Ti sulfate (ous) as an absorbent, and  $\text{N}_2\text{O}_4$ ,  $\text{NaNO}_2$  and  $\text{H}_2\text{SO}_4$ , and nitrous gases, i. e., equimol. mixts. of NO and  $\text{NO}_2$ , as oxidants. Results show that the anomalous behavior of the oxides is due to the action of free O in the mixts., and is catalytic in nature. The existence of the assumed higher oxides of N is therefore disproved, and references to them are to be stricken from the literature. The thermal disocn. of  $\text{N}_2\text{O}_4$  into  $2\text{NO}_2$  by Bodenstein's measurements (*C. A.* 3, 2079; 16, 1896) was checked by a much simpler method involving the use of weighed amts. of  $\text{N}_2\text{O}_4$  volatilized in a closed tube heated in an elec. furnace, and later expelled into NaOH soln. for the absorption of acid and detn. of residual O, much like the detn. of N by the abs. method. Results checked to temps. of  $320^\circ$ , but showed deviations above that point, probably due to the fact that the products of decompn. had an opportunity to recombine before they reached the absorption tube. Early investigators showed that equimol. mixts. of NO and  $\text{NO}_2$  acted always as though  $\text{N}_2\text{O}_4$  were present, in spite of Avogadro's law. Attempts to find a reaction in which these two oxides acted as a mixt. rather than as a compd. gave Schaarschmidt (*C. A.* 21, 3055) one with  $\text{C}_2\text{H}_4$  in the presence of  $\text{AlCl}_3$ , for only the  $\text{NO}_2$  reacted to form complex compds. Because of the similarity of the reactions of  $\text{NO}_2$  and the halogens—especially Br—expts. were carried out with  $\text{NO}_2$ ,  $\text{KNO}_3$  and HCl, and  $\text{NO} + \text{NO}_2$  in the presence of KI, with varying  $p_{\text{H}}$  conditions, e. g.,  $\text{N}_2\text{O}_5 + 2\text{NaOH} = 2\text{NaNO}_3 + \text{H}_2\text{O}$  and  $\text{NO}_2 + \text{NO} + \text{KI} = \text{KNO}_3 + \text{I} + \text{NO}$ ; actual detns. showed that an equimol. mixt. of NO and  $\text{NO}_2$  reacts with KI soln. not as  $\text{N}_2\text{O}_5$  but as  $\text{NO}_2$  and NO.

The effect of gas admixtures upon the volumetric and equilibrium relations in ammonia synthesis. R. NITTSCHMANN. *Metallbörse* 18, 341-2, 679-81, 846-7(1928); cf. *C. A.* 23, 1997.—Mathematical and graphical treatment.

Vapor pressure of salt solutions important in the ammonia-soda process. BRAN-HARD NEUMANN, RICHARD DÖRKE AND ERNST ALTMANN. *Z. anorg. Chem.* 42, 279-83 (1929).—A slight  $\text{NH}_3$  pressure exists at  $30^\circ$  above the triple salt mixt., 12.9 mg. per l.

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measured in air, 6.4 mg. per l. in a  $\text{CO}_2$  current. With increasing temp. the  $\text{NH}_3$  content of the gas phase rises rapidly. Detn. of the pressure of  $\text{H}_2\text{O}$  vapor shows that undissoc.  $\text{NH}_4\text{HCO}_3$  is in the gas phase, which begins to dissoc. strongly above  $35^\circ$  in measurements in air or above  $30^\circ$  in  $\text{CO}_2$ ; in both cases dissocn. is almost complete at  $40^\circ$ . Previous detns. have shown that 1.2 atm.  $\text{CO}_2$  pressure was the point at which  $\text{NaHCO}_3$  and  $\text{NH}_4\text{Cl}$  were in soln. at  $25.9^\circ$ . Below this there was also  $\text{NaCl}$ ; above it  $\text{NH}_4\text{HCO}_3$ . At 2.5 atm.  $\text{CO}_2$  pressure this point became  $27.8^\circ$ . In the temp. region below these limits there should be no partial  $\text{NH}_3$  pressure in the gas phase. The present detns. under  $\text{CO}_2$  show that from  $30^\circ$  up there was a rapid rise of  $\text{NH}_3$  content in the gas phase; at  $0^\circ$ ,  $10^\circ$  and  $20^\circ$  the  $\text{NH}_3$  content was 0.4, 0.8 and 1.7 mg., resp. Since in these cases only  $\text{NaCl}$ ,  $\text{NaHCO}_3$  and  $\text{NH}_4\text{Cl}$  were in equil. in the soln. the only salt responsible for the  $\text{NH}_3$  content was  $\text{NH}_4\text{Cl}$ . Tests gave direct proof of the partial  $\text{NH}_3$  pressure at  $20^\circ$  over satd  $\text{NH}_4\text{Cl}$  solns. In practice pptn. of  $\text{NH}_4\text{HCO}_3$  must be done at as near  $30^\circ$  as possible. Above this temp.  $\text{NH}_3$  is increasingly volatile; below it there is more and more undecompd.  $\text{NH}_4\text{HCO}_3$  in the gas phase, leading to stoppages. E. M. SYMMES

**Production of ammonium chloride by evaporation from a sal ammoniac solution in an ammonia-soda factory.** ALFONS KRAUSE. Poznan Univ. *Przemysl Chem.* 11, 625-8(1927).—The relation of the temp. of satn. ( $t$ ) to the ratio  $\text{NaCl}/\text{NH}_4\text{Cl}$  ( $a/b$ ) expressed in % in  $\text{NH}_3$ -free soln. can be represented by the parabola  $t = 5(23 - 12\sqrt{3(a/b - 0.247)})$ . The solubilities of  $\text{NaCl}$  and  $\text{NH}_4\text{Cl}$  at  $18-115^\circ$  are shown in a table, with the aid of which, together with the above equation, the temp. of satn. can be calcd. Max. yield, about 69%, can be obtained only when  $a/b$  is 0.247 at most. In such a case from 100 kg. soln.  $100 - [a + (173/73)b]$  kg. of  $\text{H}_2\text{O}$  must be evapd.

A. C. ZACHLIN

**The conversion of cyanamide to ammonia.** HEINRICH MOLITOR. *Metallhorte* 18, 397-8, 506-7(1928).—A review of the many methods of conversion. The final solution of the question has not yet been reached, because decompn. proceeds slowly and a certain high temp. is required, which must not be exceeded to avoid decompn. of a substantial part of the  $\text{NH}_3$  formed. Also dusting of the cyanamide plugs up the app., requiring special construction. Production of  $\text{NH}_3$  from cyanamide has therefore not reached the quantities desirable in the interests of agriculture. The residue may be made into portland cement (Baumann, C. A. 14, 3304). Recently cyanamide has been converted on a large scale into urea:  $\text{CaCN}_2 + \text{H}_2\text{O} + \text{CO}_2 = \text{CaCO}_3 + \text{C}(\text{NH}_2)_2$ ,  $\text{C}(\text{NH}_2)_2 + \text{H}_2\text{O} = \text{NH}_2\text{CONH}_2$ . Fusion of urea with  $\text{NaCl}$  forms cyanide.

E. M. SYMMES

**Calcination of metallic salt hydrates in theory and practice.** M. A. RAKUZIN. *Metallhorte* 18, 2357-8(1928).—A review of the literature, with particular reference to borax.

E. M. SYMMES

**Salt beds, brine wells and caving in the district between Kassel and Karlshafen.** O. VON LINSTOW. *Kali* 23, 54-6, 71-4, 86-8(1920).—Zechstein salts are known in the northern part at Karlshafen. This may be connected with the presence of salts further east at Volpriehausen and in the north at Laintal. The large cavings at Treudelburg point to salts which are or were at depths. On the other hand, there are probably no Zechstein salts at Wilhelmshöhe near Kassel, certainly not at Sooden Allendorf in the Werratal further east. The southern part contains brine wells. Tests show definitely that not all impurities in the Weser River district originate in the potash industry in the upper Werra and Fulda fields, but that there are natural flows from brine wells through faults, as shown by the Cl content of the Weser. There is a 1% brine well in the Weser bed.

E. M. SYMMES

**Natural Glauber salts in Canada.** ANON. *Chem.-Ztg.* 53, 226(1929).—Many million tons of crude Glauber salts are available very cheap in Canada at a purity of 96.5%; on calcining they give a salt contg. 98-99%  $\text{Na}_2\text{SO}_4$ . Solar evapn. is used. Extension of railroads and proximity of fuel are advantages. The process  $\text{Na}_2\text{SO}_4 + \text{BaCO}_3 = \text{Na}_2\text{CO}_3 + \text{BaSO}_4$  has long been known, but equil. is reached at 50% conversion. Use of a catalyst (not stated) makes possible a 90% yield. Then  $\text{BaSO}_4$  reacts with C to produce BaS and CO; CO is oxidized in air to  $\text{CO}_2$ ; BaS reacts with  $\text{H}_2\text{O}$  and  $\text{CO}_2$  to give  $\text{H}_2\text{S}$  and  $\text{BaCO}_3$ ;  $\text{H}_2\text{S}$  and air give S or  $\text{SO}_2$ . The  $\text{BaCO}_3$  acts as a carrier.

E. M. SYMMES

**Manufacture of Epsom salts.** N. N. EFREMOV AND M. M. NARKEVICH. Northern Chem. Trust. *J. Chem. Ind. (Moscow)* 5, 1179-83(1928).—In the manuf. of Epsom salt often instead of the standard crystals,  $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ , other hydrates are apt to be formed, which give crystals of the same degree of purity but of different shapes and cause the product to have a different appearance. While crystals contg.  $7\text{H}_2\text{O}$  do not weather at ordinary temp., other hydrates are apt in course of time to lose most of the  $\text{H}_2\text{O}$  of crystn. and turn into powder. The latter really ought to be preferred in the manuf., since by

losing  $H_2O$  they lower the freight cost, but as the demand is for the product contg.  $7H_2O$ , expts. were instituted to find the most favorable conditions of producing the latter. Solns. of  $MgSO_4$  should be prepared at  $80-82^\circ$  and should at this temp. be concd. to 33.5° Bé., then be put into crystallizers and cooled as slowly as possible, particularly after the temp. has dropped to  $30-35^\circ$ . During cooling the hot solns. down to beginning crystn., viz.  $35^\circ$ , stirring is advisable in order to cool uniformly the whole liquid and obtain crystals of homogeneous compn.; below  $35^\circ$  stirring should be discontinued. When the soln. reaches  $30^\circ$  a few large crystals from a previous batch should be introduced to form centers of crystn. After completion of the crystn. it is advisable to leave the crystals in the mother liquors a few more days, as during this period small crystals have a tendency to agglomerate into larger ones.

BERNARD NELSON

The influence of temperature on the precipitation of nickel carbonate. M. SERGEYEV. *Oil and Fat Ind.* (Russia) 1928, No. 11, 15.—A soln. of  $NiSO_4$  contg. 6.47 g. Ni per l. and a 10% NaOH was used in various proportions to det. the most favorable conditions for  $NiCO_3$  pptn., which proved to be when a small excess (equimol.) of NaOH was present and the liquid was kept at boiling temp. The ppt. was then reduced for use as catalyst.

A. A. BOEHTLINGK

Continuous or intermittent carbide nitrogenation? HEINRICH PINCASS. *Metallbörse* 18, 1181-2(1928).—A review of the various processes and patents, showing the pros and cons of each. The problem of continuous cyanamide production still awaits solution.

E. M. SYMMES

Rational cyanamide manufacture. R. KAHN. *Metallbörse* 18, 1295-6, 1406-8, 1463-5(1928).—A detailed review of literature and patents for various processes.

E. M. SYMMES

The Dutoit process. HEINRICH PINCASS. *Metallbörse* 18, 2189-90, 2246-7 (1928).—The Dutoit (cyanamide) granulating process comprises treating finely ground cyanamide with about 7%  $H_2O$  at a max. of  $160^\circ$  for 1-2 hrs., spreading it out in a layer 15 cm. thick to cool at room temp., mixing it with 10-20%  $H_2O$  to a homogeneous mass, and granulating it at a pressure of 300 kg./sq. cm. between rolls, one of which is perforated. The first moistening converts the free CaO almost completely into  $Ca(OH)_2$ , giving 2%  $NH_3$  loss according to Dutoit, more according to others. Higher pressures than 300 kg./sq. cm. cause more dicyanodiamide formation; lower pressures give more fragile grains. Drying temp. should not exceed  $85^\circ$ , and an inert atm. is used. The cyanamide should contain no  $CaCl_2$  catalyst, because decompn. is thus favored. Formation of dicyanodiamide should not exceed 1-1.5% of the N present.

E. M. SYMMES

A few applications of ozone. A. VOSMAER. *Compagnie de l'Ozone, Bruxelles. Chem. Weekblad* 26, 184-6(1929).—An enumeration of the well-known uses of ozone, particularly as a bleaching agent.

G. CALINGAERT

Antichlor. (I), (II). WILHELM KOLB. *Metallbörse* 18, 1237-8, 1294-5, 1351-2, 1408, 1461-2, 1518-9, 1743-5(1928).—Antichlor,  $Na_2S_2O_4$ , is produced mainly by the Ba industry, absorbing the  $H_2S$  evolved from BaS by HCl in  $NaHSO_3$ . All steps of the process are described in great detail.

E. M. SYMMES

Pressure in containers filled with phosgene. R. NITZSCHMANN. *Metallbörse* 18, 1517-8(1928); cf. C. A. 22, 4330.—As soon as the residual space in a container is filled with gaseous  $COCl_2$  the pressure corresponds to the tension at that temp. Detn. of this pressure at subsequent temp. rise is more difficult if foreign gases are present in the residual space, which is a possibility. This question is solved by a mathematical treatment.

E. M. SYMMES

The mechanical separation and flotation of Koureika's graphite. V. I. TRUSHEVICH. *Trans. Inst. Econ. Mineral. Met.* (Moscow) No. 39, 47 pp.(1928).—A study of the conditions of elimination of S and ash from graphite of the Touroukhansk region of Siberia by wet concn. and flotation methods. Pyrite, calcite and quartz are the most undesirable mineral impurities. All-flotation of 150-mesh material, flotation of coarse material, and tabling and flotation of high-S graphite were studied. The all-flotation process, after necessary recleaning, gave a concentrate with 6.5% ash and 0.35% S. Flotation of coarser material showed that Koureika's graphite is easily floatable in grains up to 1 mm. size. Other graphites with higher S content should be concd., ground and then floated. The general flowsheet for Koureika's graphite is (1) crushing to —1.5 mm., (2) screening to sizes +0.5 mm., +0.15 mm. and —0.15 mm., (3) tabling of each size, (4) grinding rough table concentrates, of sizes 0.5 mm., +0.15 mm., —0.1 mm., (5) tabling of material —0.1 mm., with size —0.15 mm., (6) flotation of rough table concentrate of size —0.15 mm. with following recleaning. With high-grade concentrates of 1-2% ash content and 0.1% S, dry-air sepn. methods may be necessary for final flotation concentrates.

W. H. BOYNTON

**Regeneration of decolorizing agents.** BATAAFSCHE PETROLEUM MAATSCHAPPIJ. *Petroleum Z.* 25, Special section No. 12, 11(1929).—A process to regenerate decolorizing powders such as fuller's earth, decolorizing C, silica gel, etc., has been worked out in the labs. of the Bataafsche Petroleum Maatschappij. The absorbents were treated with a mixt. of one or several chlorinated hydrocarbons and one or several other solvents at ordinary or elevated temps. The chlorinated compds. used were  $\text{CH}_2\text{Cl}_2$ ,  $\text{CH}_2\text{ClCH}_2\text{Cl}$ ,  $\text{CHClCCl}_2$ ,  $\text{CCl}_4$ , etc.; the second part of the mixt. consisted of various hydroxylated compds. such as light aliphatic alcs.,  $(\text{CH}_3)_2\text{CHOH}$ , benzyl alc., terpene alcs., etc. Particularly good results were attained when the extn. with a mixt. of chlorinated hydrocarbons and other solvents was followed by extn. with the other solvents only. The regenerated decolorizing materials are almost as good as new ones. Extn. at higher temps. is recommended. A. A. BOERTLINGER

**Diatomaceous earth.** J. H. FRYDLENDER. *Rev. prod. chim.* 32, 145-50, 181-7 (1929).—The sources, prepn., properties and uses of these products are discussed. P. THOMASSET

**Chemical protection against fire.** A. EICHENGRÜN. *Z. angew. Chem.* 42, 214-7 (1929).—Of the many materials proposed as "fire-proofing chemicals" some cause destruction or discoloration of the materials treated; others dust out or sep. as crystals, leaving the material unprotected; and some of the best fire-proofing agents will protect only against low temps. and not against the intense heat of a conflagration. Among the better known agents are Na silicate, stannate, tungstate, etc. The author's "Celon-Feuerschutz" is proposed as the best. Bromides, especially  $\text{NH}_4\text{Br}$ , have proved especially valuable for fire-proofing all kinds of flammable substances. Ger. pats. 355,107 and 390,840 claim the use of  $\text{NH}_4\text{Br}$ , alone and admixed with other substances. W. C. EBAUGH

**Rennin action in relation to enterokinetic phenomena (RICHARDSON, PALMER) 11A.** The rate of oxidation of HBr by chromic acid in the presence of salts (BOBTELSKY, ROSENBERG) 2. Reducing gases (Brit. pat. 298,190) 21.

BLANC, F.: Étude analytique et comparative des charbons au point de vue de leurs impuretés. Paris: Ch. Béranger. 65 pp. F. 10. Reviewed in *Rev. gen. chemins fer* 1928, 377.

**Niter-oven for producing nitrogen oxides for sulfuric acid manufacture.** EDMOND B. RUPARD (to Armour Fertilizer Works). U. S. 1,709,880, April 23. An oven compartment is connected by a conduit to a combustion flue and has in its lower part a refractory vessel below the conduit adapted to contain  $\text{NaNO}_3$  and  $\text{H}_2\text{SO}_4$ ; this vessel has a safety overflow passage through the wall of the oven at a level below the conduit with an automatically outwardly-opening valve normally closing the outer end of the passage.

**Solid carbon dioxide.** WALDEMAR HESSLING. Swiss 129,688, Oct. 15, 1927, and 129,690, July 27, 1927. Liquid  $\text{CO}_2$  is subjected to reduced pressure to produce solid  $\text{CO}_2$ . The arrangement of the app. for producing the reduced pressure is described.

**Alkali metal and ammonium phosphates.** I. G. FARBENIND. A. G. Brit. 297,546 July 27, 1927. Di-Ca phosphate is agitated with  $\text{NH}_4\text{F}$  or an alkali metal fluoride in the presence of water, the soln. is filtered and the filtrate is concd. and may be treated with MeOH to ppt. the alkali metal or  $\text{NH}_4$  phosphate or may be treated with  $\text{H}_3\text{PO}_4$  or an alkali to obtain a phosphate of the desired compn. The mother liquors are returned to the process after sepn. of the phosphate.

**Decomposition of complex salts of hydrofluoric acid.** ALBERT F. MEYERHORN. Swiss 128,463, Feb. 12, 1927. The salts are heated with volatile fluoride and metal fluoride with diminution of the partial pressure of the volatile fluoride.

**Treating lithia-containing silicates.** CONWAY VON GISESWALD. U. S. 1,710,556, April 23. Li-contg. silicates such as lepidolite are treated with a neutral alkali metal salt such as  $\text{K}_2\text{SO}_4$  or  $\text{KCl}$  at a temp. of 600-950°, in order to form a sol. Li salt.

**Treating cobalt solutions.** S. C. SMITH. Brit. 298,301, July 25, 1927. Solns. contg. a Co salt such as the sulfate are treated with  $\text{PbO}_2$  in the presence of a sol. Ni compd. The Co and Pb together form a ppt. which is sepd. and leached with  $\text{H}_2\text{SO}_4$  to dissolve the Co and the residus is reconverted into  $\text{PbO}_2$  for further use. The process may be used for sepg. Co and Ni from solns. obtained from ores.

**Rapid evaporation and dedecation of natural salt waters by concentration of solar rays.** C. MARÉCHAL. Belg. 353,051, Aug. 31, 1928. The evap. basin is covered by a

tunnel, the top of which is covered with glass to conc. the rays of the sun. The evaporative surface is increased by means of a sailcloth supported on rolls that are alternately immersed in the salt water and at some distance above it. When sufficient concn. has taken place the top of the tunnel is removed and the sailcloth is wound on a mandrel and at the same time scraped with a metal blade.

**Phosphates.** I. G. FARBERIND. A.-G. Fr. 648,231, Feb. 4, 1928. Ammoniacal phosphates are obtained by treating mono- or dicalcium phosphates with  $\text{NH}_3$  in the presence of water, whereby a mixt. of  $\text{Ca}_3(\text{PO}_4)_2$  and  $(\text{NH}_4)_2\text{HPO}_4$  is obtained, the latter being sol. is filtered off and the  $\text{Ca}_3(\text{PO}_4)_2$  is reconverted with acids to the mono- and di-phosphates which are added to a fresh charge. Fr. 648,232 describes the prepn. of alkali or ammoniacal phosphates from Ca phosphates by reacting with the latter and alkali or  $\text{NH}_4\text{F}$ .

**Alumina.** JEAN SEAILLES. Fr. 649,027, July 5, 1927. See Brit. 203,392 (C. A. 23, 1727)

**Ammonium alum.** CHARLES M. BROWN. U. S. 1,709,166, April 16. Aluminous material contg. Fe is heated to a temp. (suitably about  $450^\circ$ ) at which sulfuric acid salts of Fe are unstable and then mixed with previously melted acid  $\text{NH}_4$  sulfate and further heated to prevent the temp. from falling sufficiently for formation of sol. Fe salts.

**Calcining limestone.** KISSAG M. NAHIKIAN, ROBERT W. FOSTER and EDGAR T. BELDEN (to Brewer & Co.). U. S. 1,709,226, April 16. A spray comprising water together with an alk. earth metal oxide or hydroxide such as  $\text{Ca}(\text{OH})_2$  is introduced into the bottom of a kiln so as to come into contact with the products of combustion from the fuel before these products reach the limestone to be treated; hard and non-plastic products are pptd. by this method and do not contaminate the lime produced.

**Magnesium chloride and hydroxide from dolomite.** I. G. FARBERIND. A.-G. Brit. 297,381, Sept. 20, 1927. Dolomite is calcined sufficiently to convert all of its Mg content to  $\text{MgO}$  and then treated with  $\text{CaCl}_2$  soln. and  $\text{CO}_2$  to obtain a soln. of  $\text{MgCl}_2$  and a residue of  $\text{CaCO}_3$ .  $\text{Mg}(\text{OH})_2$  may be prepd. from the  $\text{MgCl}_2$  soln.

**Magnesium sulfate.** SHELDON B. HEATH (to Dow Chemical Co.) U. S. 1,709,398, April 16. In making  $\text{MgSO}_4$  from  $\text{Mg}(\text{OH})_2$  contg. chloride impurities, an excess of  $\text{H}_2\text{SO}_4$  is intermixed with concd.  $\text{MgSO}_4$  mother liquor from a previous run and the acid and liquor are heated; gaseous  $\text{HCl}$  is evolved, and the liquid mixt. is added to  $\text{Mg}(\text{OH})_2$ .

**Potassium manganate.** SOC. CHIM. DES USINES DU RHÔNE. Fr. 648,968, June 29, 1927. See Brit. 292,991 (C. A. 23, 1480).

**Sodium bicarbonate and ammonium chloride.** WILHELM GLUUD and BERNHARD LOPMANN. U. S. 1,710,636, April 23.  $\text{NaHCO}_3$  and  $\text{NH}_4\text{Cl}$  are formed by acting first with  $\text{CO}_2$  and  $\text{NH}_3$  and then with  $\text{NaCl}$  on a soln. contg. bicarbonates and chlorides of Na and  $\text{NH}_4$  together with a readily sol. auxiliary salt (other than a chloride or carbonate) such as  $\text{NaNO}_2$ .

**Sodium perborate.** ROESSLER & HASSELACHER CHEMICAL CO. Brit. 297,777, Sept. 27, 1927. A borax soln. is treated first with  $\text{Na}_2\text{O}_2$  (suitably at a temp. of about  $15^\circ$ ) until metaborate and some perborate are formed, and then further treated with  $\text{H}_2\text{O}_2$  (preferably at a temp. of about  $10^\circ$ ) to complete the oxidation. The mother liquor, after sepn. of the perborate formed, may be used in a succeeding operation.

**Caustic soda.** GRUSPEPE DONAGEMMA. Fr. 648,584, Feb. 9, 1928.  $\text{NaOH}$  formed as a residue in chem. treatments, particularly in the artificial silk industry, is purified from org. material by osmosis through diaphragms formed of volcanic stone or conglomerates of volcanic stone.

**Porous silica.** COMPAGNIE FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON. Fr. 649,390, Dec. 31, 1927. A porous  $\text{SiO}_2$  is obtained by heating  $\text{SiO}_2$ , e. g., quartz sand to  $1700^\circ$ , cooling and mixing with an org. material such as shellac soln. The mixt. is molded and heated slowly to  $400^\circ$ , then rapidly to  $1750^\circ$  to expel any residue of the binder and to seal the outer surface. The material has a sp. gr. of 0.6 or less and may be used as a heat insulator for refrigerators, etc.

**Carbon disulfide.** I. G. FARBERIND. A.-G. (Eberhard Legeler and Paul Esselmann, inventors). Ger. 473,189, Nov. 16, 1927. In the manuf. of  $\text{CS}_2$  by passing superheated S vapor over wood charcoal, the latter is maintained at an approx. const. temp. in a reaction retort to which S vapor from a sep. superheating retort is supplied as required. Suitably, a furnace comprising 3 sep. retort spaces is used, the end spaces enclosing the reaction retorts and the middle space the superheaters, which may comprise tubes of elliptical cross section made of cast steel and lined with brick and contg. fillers resistant to S. Cf. C. A. 23, 1481.

**Treating chromite.** HUNT, HARR. Fr. 648,658, Feb. 11, 1928. Chromite is attacked by mixing it with  $\text{NaOH}$  or  $\text{KOH}$  in such proportions that absorption of O from

the surrounding air takes place automatically, the mixt. being heated to above  $800^{\circ}$ , under pressure or not. The operation may be repeated, Fe being eliminated between the operations.

**Bleaching raw heavy spar.** KARL FIBERS. U. S. 1,709,612, April 16. White heavy spar is prepd. from the raw material by treating it with  $H_2SO_4$  in the presence of  $CaF_2$  and washing with water. Cf. C. A. 22, 1659.

**Precipitating hafnium and zirconium on incandescent bodies.** JAN H. DE BORR and ANTON E. VAN ARKEL (to Naamlooze Vennootschap Philips' Gloeilampenfabrieken). U. S. 1,709,781, April 16. Hf and Zr, in ductile form, are deposited from an atm. contg. their iodides and substantially free from impurities, on an incandescent body such as a W wire.

**Mercury.** WALTER GLAESER (to Glaeser Research Corp.). U. S. reissue 17,276, April 23. See original pat. No. 1,637,481 (C. A. 21, 3040).

**Phosphorus, etc.** I. G. FARBERIND. A.-G. Brit. 297,416, Sept. 21, 1927. The process described in Brit. 285,055 (C. A. 22, 4738) for producing P,  $H_3PO_4$  and a slag having latent hydraulic properties is modified by forming the charge of a mixt. of crude Al phosphate and crude Ca phosphate in such proportions that, without addn. of other mineral substances, a slag having a compn. similar to blast-furnace slag is produced.

**Sulfur from gases containing carbonyl sulfide.** RAYMOND C. BENNER and ALFRED P. THOMPSON (to General Chemical Co.). U. S. 1,710,141, April 23. Gases contg. carbonyl sulfide together with an oxidizing gas such as O or  $SO_2$  are brought into contact with activated bauxite.

**Active carbon.** JULIUS DRUCKER and HEINZ THIENEMANN (to I. G. Farbenind. A.-G.). U. S. 1,709,611, April 16. Carbon such as that prepd. from pine wood is activated by treatment with S vapors at a temp. of about  $800^{\circ}$  ( $1000^{\circ}$ ).

**Activation of carbon.** SOCIÉTÉ ANON. DES CHARBONS ACTIFS ÉDOUARD URBAIN. Fr. 649,043, July 7, 1927. Activated C is obtained by treating a C from a simple calcination, preferably at a temp. below  $600^{\circ}$ , either (1) by vapors of phosphoric anhydrides or metaphosphoric acid dild. or not by inert gases at a temp. between  $500^{\circ}$  and  $700^{\circ}$  and washing the C obtained to eliminate phosphoric acid, or (2) by a mixt. of vapors of phosphoric acid and P and steam, dild. or not, at a temp. between  $500^{\circ}$  and  $700^{\circ}$  and washing C already activated by any other process may be so treated. Cf. C. A. 23, 2000.

**Decolorizing carbon.** ÉDOUARD URBAIN. U. S. 1,709,503, April 16. Finely powdered vegetable material such as pear, wood, vegetable ivory nuts or starch is mixed with powdered di-Ca phosphate and  $H_2SO_4$ , and the mixt. is shaped and calcined with elimination of H, P and H phosphide. Cf. C. A. 23, 1492.

**Revivifying, purifying, filtering or decolorizing materials such as decolorizing carbon.** JOHAN N. A. SAUER (to Naamlooze Vennootschap Algemeene Norit Maatschappij). U. S. 1,709,284, April 16. Material such as carbon which has been used for decolorizing sugar solns. is heated sufficiently to effect carbonization of at least some of the adsorbed substances and the carbonization products are then extd. with an alk. liquid such as a 10% NaOH soln.

**Catalysts.** MONSANTO CHEMICAL WORKS. Brit. 298,142, May 25, 1927. Catalysts are prepd. by forming by a wet process a complex silicate contg. V in non-exchangeable form (of which at least part is less than pentavalent), with or without other chem. groups such as boric, phosphoric, tungstic, molybdic and other weak acids, and stearic and plumbic acids and Zn, Al, Cr and other amphoteric hydrates, and subjecting the solid complex silicate to the action of an acid and an oxidizing agent to convert the V into  $V_2O_5$  and pyrovanadates embedded in the rigid framework of the silicate. Catalysts thus prepd. are suitable for the oxidation of inorg. substances such as S oxide and of org. substances such as toluene to produce benzaldehyde and benzoic acid, cresol to produce salicylaldehyde and salicylic acid and MeOH or EtOH to produce  $CH_3O$  or acetaldehyde. Numerous details and examples are given.

**Artificial gems.** FRITZ FROELICH. Swiss 128,888 to 128,891, Sept. 20, 1925. Addns. to Swiss 125,709. Chrysoberyl and magnesia-spinell of the formulas,  $BeO \cdot Al_2O_3$  and  $MgO \cdot Al_2O_3$ , resp., are prepd. by heating the Be and Al, or Mg and Al sulfates to a temp. sufficiently high to decompose the sulfates and melt the oxides with the aid of a flux. Beryl of the formula,  $3BeO \cdot Al_2O_3 \cdot 6SiO_2$ , is prepd. by heating the sulfates of Be and Al with  $H_2SiO_3$ ; and sillimanite of the formula,  $Al_2O_3 \cdot SiO_2$ , by heating  $Al_2(SO_4)_3$  with  $H_2SiO_3$ .

**Dispersion agents.** J. R. GRIGY. A.-G. Swiss 128,441, June 3, 1927. Preps. which disperse in water are prepd. by milling org. substances which are not readily sol. in water with a dispersion agent such as soap, for a considerable time. Examples of the org. substances are aminoazobenzene, dianisidine and phenol.

**Detergents.** R. R. CRITCHLOW. Brit. 297,508, June 28, 1927. Detergents suitable for use with water in washing pottery, tiles, marble, domestic utensils, etc., may comprise: (a) borax 2 and soda 1 part; or, (b) borax 24, "common soda" 8 and NaOH 1 part; or, (c) borax 24, NaOAc 8 and NaOH 1 part. The compn. may be pressed into tablets.

**Polishing composition for use on glass, metal, furniture or other surfaces.** WILLIAM BREITZKE. U. S. 1,709,819, April 16. A dil. mixt. of the juices of partly decayed oranges, lemons, pineapples and bananas is mixed with small proportions of borax, HCl and ether.

**Polish for metals.** H. F. DOWNS. Brit. 297,566, Sept. 9, 1927. Neuberg chalk is mixed with a hydrocarbon distillate such as "white spirit," "petrol" or "Glico" and "brown soap oil" (which consists of a mixt. of hydrocarbon oils and fatty oils or free fatty acids).

**Plastic compositions.** LÁSZLÓ BOLGÁR. Swiss 129,309, April 11, 1927. Bituminous material, such as asphalt, is mixed with an inorg. acid, such as  $H_2SO_4$ , and heated to above its m.p. till the acid is decomposed and the mass is homogeneous. Filling material, such as sand, is then stirred in.

**Plastic compositions.** JACQ GREUTERT. Swiss 129,495, Jan. 22, 1928. Finely ground cork sawdust, peat fibers and similar org. materials are stirred into pitch or asphalt thinned with benzene, or xylene. The mass is then thickened and molded.

**Decorating plastic substances.** SOC. CHIM. DES USINES DU RHÔNE. Fr. 648,152, Feb. 3, 1928. A decorative effect is obtained on sheets of plastic substances by uniting one or more colored or decorated cloths made of threads of cellulose material which is plastic when heated, to one or more sheets of substances plastic when heated, so that the structure of the cloth disappears completely into the complex sheet obtained.

**Moldable plastic compositions containing urea-formaldehyde condensation products, etc.** K. RIPPER. Brit. 297,433, Sept. 21, 1927. Casein may be added to a urea- $CH_2O$  condensation mixt. or to a urea- $CH_2O$  product still contg. free  $CH_2O$ , or urea or its derivs. such as thiourea may be mixed with a casein paste which is then molded and treated with  $CH_2O$ , or a casein paste may be simultaneously treated with a reagent such as thiourea and a solid polymer of  $CH_2O$  and the mixt. shaped by pressure, with or without heating. Condensing agents, fillers and coloring substances may be added.

**Ornamenting buttons, etc., formed from powdered plastic materials.** H. OEXMANN. Brit. 298,135, Oct. 3, 1927. Powdered substances such as albuminous material, cellulose derivs., horn, bone, ivory or wood are mixed with coloring materials before pressing and hardening and may be subsequently further decorated as by spraying with addnl. coloring materials.

**Casein compositions ("artificial horn").** I. G. FARBENIND. A.-G. Brit. 297,483, May 23, 1927. Casein is treated with a small proportion of compds. such as cyclohexylmonoethanolamine or cyclohexyldiethanolamine or mixts. of these compds. or their salts or acyl derivs. or similar compds. and the mixt. is moderately heated under pressure. Cf. C. A. 23, 1729.

**Phenol-aldehyde condensation products.** LEONHARD DEUTSCH and ISAK THORN (to Selden Co.). U. S. 1,710,045, April 23. Materials such as  $PhOH$  and  $CH_2O$  are subjected to condensation in the presence of an alkali such as  $Na_2CO_3$ , and then hardened by the action of a phosphoric compd. of hygroscopic character such as Na phosphate and lactic acid. Cf. C. A. 22, 3498.

**Coating composition containing celluloid in solution.** MICHELE BLANCATO (to Kent-Blancato Co.). U. S. 1,709,056, April 16. A coating compn. which is suitable for use on cinematograph films or documents is formed of celluloid, HOAc, acetone,  $Et_4SO_4$ ,  $MgCl_2$  and  $AmOAc$ .

**Foliated material.** BAKELITE CORP. Fr. 648,962, Feb. 14, 1928. Fibrous sheets of paper, asbestos, cloth, etc., are impregnated with a resin of the glycerol-phthalic anhydride type, dried, placed together with interposing layers of a reactive phenolic resin and solidified under heat and pressure. The material may be used for silent gearing, tight linings, piston segments, clutch linings, etc.

**Laminated boards formed with sodium silicate adhesives.** CHARLES D. WOOD (to Grasselli Chemical Co.). U. S. 1,709,893, April 23. In cementing together plies of material such as paper under pressure, a concd. Na silicate soln. is applied to the material at a temp. substantially above room temp. but not exceeding  $65^\circ$ .

**Sound records.** C. BANCAREL. Brit. 297,866, Oct. 31, 1927. In a process of making disk sound records as described in Brit. 295,228 (C. A. 23, 2258), wood or open fibrous sheet material such as woven fabric is used instead of cardboard in forming the record blanks.

Gramophone records. H. OEXMANN. Brit. 297,358, Sept. 19, 1927. Disk records are formed of finely powdered horn to which may be added a binder such as natural or artificial resins, casein, cellulose derivs. or albuminous substances and fillers such as cotton, asbestos or BaSO<sub>4</sub>. The entire record may be formed of such compns. or they may be used as a facing on cardboard or other suitable backing.

Use of a juxtaposed annular disk of nitrocellulose composition to modify the tone of metal sound-reproducing diaphragms. HAROLD W. MOURAR. U. S. 1,709,276, April 16. Structural features.

Metal transfer material for hot stamping. WILLIAM F. GRUPE (to Peerless Roll Leaf Co.). U. S. 1,710,309, April 23. A paper carrier is coated with a continuous coating of material such as beeswax and resin of adherent character and metal particles such as bronze powder are placed over this coating.

Protective covering for sheet metal. BELL'S UNITED ASBESTOS CO., LTD., E. R. HARRAP and J. A. CANN. Brit. 297,336, May 17, 1927. Sheet metal for constructional work is covered with asbestos sheeting contg. a cementitious material formed by the interaction of a Zn salt with an alkali metal silicate. The asbestos and Zn salt may be applied to the metal, then moistened with the silicate soln. and subjected to hot pressing.

Friction clutch ring. LESTER KIRSCHBRAUN (to Raybestos Co.). U. S. 1,710,004, April 23. A substantially incombustible unwoven facing which may be formed of asbestos is satd. with a material such as a heavy Mexican asphalt and treated (suitably by baking) to render it substantially insol. in usual asphalt solvents, to give it a hardness in excess of 15 and a tensile strength above 2000.

Casting brakeshoes. JOHN D. HAY (to Bendix Brake Co.). U. S. 1,709,129, April 16. Friction material such as a flexible brake lining is placed in a mold so that the body of the brake shoe, which may be formed of an Al alloy, may be simultaneously cast and united with the friction material.

Paper hood cap for bottle tops, etc. WILBUR L. WRIGHT (to Oswego Falls Corp.). U. S. 1,709,511, April 16. A rubber emulsion or soln. is deposited on the annular radially expandible hood-cap skirt and permitted to cure to form an elastic permanent adhering binder.

Fumigating candles. COÖPERATIVE WHOLESALE SOCIETY, LTD., and C. W. COUCHE. Brit. 297,489, June 22, 1927. Carbolic acid, cresol, thymol or their mixts. suitably with a solvent or substance assisting volatilization, are incorporated in the wax or other material of which candles are mainly composed; e. g., carbolic acid 1.5% together with a light mineral oil may be used.

## 19—GLASS, CLAY PRODUCTS, REFRACTORIES AND ENAMELED METALS

G. E. BARTON AND C. H. KERR

Corner and auxiliary firing in glass-melting furnaces. ERICH FELSNER. *Keram. Rundschau* 35, 126-7(1927).—Methods of auxiliary heating for pot furnaces are described. The purposes for which such methods are needed are, (1) continuous heating of specific spots in the furnace during the working out, (2) periodic heating of furnace corners during the melting and working out, and (3) continuous heating of furnace corners or specific spots during the melting and working out.

The plasticity of clays. GUSTAV KEPPELER. *Keram. Rundschau* 35, 157-8 (1927).—A general discussion of the colloidal properties of clays. Clays depend not only upon their fineness of grain for their plasticity, since quartz ground to the same fineness is much less plastic, but also upon the shape and nature of the grains. The platy character of the crystals probably has a marked effect on the plasticity.

The question of plasticity of clays. W. MISER, H. IMMER AND J. KRAVETZ. *Sprechsaal* 61, 319-21(1928); cf. C. A. 22, 3503.—The two views held at present as to the cause of plasticity are: that it is due to (1) chem. reactions between the clay and certain impurities and (2) a phys. reaction. The authors discuss a theory based on (2).

Should plastic pyritic clay be wintered? ANON. *Tonind.-Ztg.* 53, 315(1929).—If pyritic clay is not weathered, the pyrite burns at 600-700° and forms black pits in the brick. It is necessary to burn with an excess of air. If firing is done rapidly, too much gas may be developed. All these disadvantages can be overcome by weather-



ing and in addn. several advantages are gained. Although sol. sulfates of Fe are formed, they are broken up in the firing. With lime-free, plastic, pyritic clay, weathering is, without exception, necessary. R. F. F.

The properties of clay and its preparation for use in brick making. HANS HIRSCH. *Tonind.-Ztg.* 53, 407. R. F. F.

Researches on the vitrification and burning of ferruginous clays. PIERRE BÉMOND. *Brit. Clayworker* 37, 422-3(1929).—The results show marked differences in vitrification of 3 clays and 2 sands, high in  $\text{Fe}_2\text{O}_3$ , under reducing vs. oxidizing conditions of firing. R. A. HEINDL

Effect of water vapor and sulfur dioxide on the firing of clays. J. KONARZEWSKI AND B. KRYNSKI. *Trans. Ceram. Soc. (Eng.)* 28, 18-25(1929).—See C. A. 22, 4217. H. F. K.

The manufacture of dry press face brick. ANON. *Tonind.-Ztg.* 53, 428(1929). R. F. FERGUSON

Coöperative research on crushing strength of fire brick at room temperature. GROOTHOFF. *Tonind.-Ztg.* 53, 430-4(1929); cf. C. A. 22, 3503. R. F. FERGUSON

S-cracks and how to overcome them. F. NIEBLING. *Tonind.-Ztg.* 53, 409(1929). R. F. FERGUSON

The procedure incident to the drying of unfired ceramic articles. W. PUKALL. *Sprechsaal* 61, 430-2, 450-3(1928).—Conclusions. (1) The drying of clay and clay bodies at ordinary temps. is essentially carried on from the surface with non-uniform drying of the inner layers. (2) Under these circumstances strains are introduced. (3) These strains are measurable and were found in both lean and fatty clays. (4) They are independent of the strength of the wares and as a rule reach their max. before the ware is completely air-dried. R. A. HEINDL

The resistance to fracture (breaking strength) of unburned ceramic bodies. OTTO BARTSCH. *Keram. Rundschau* 35, 121-4(1927).—In general, bodies of different types show the following av. breaking strengths: stone ware bodies, 7-8; porcelain bodies, 4-5; saggars, 5-7 kg per sq. cm. Cast bodies generally show somewhat higher values. Hand-made glass pot bodies average 10-19 kg. per sq. cm. while cast bodies average about 40% higher. The breaking strength is of theoretical importance because it is one of the few consts. measurable in the unburned state which are suitable as a basis of classification of clays. The method of drying has a great effect on the strength. The method giving the highest values is drying for 7 days in air, drying to const. wt. at 70° and finally drying at 110°. Heating above 110° gives low values. The usual stationary lever app. for measuring cross-breaking strength is described. Aging of the clay has considerable effect, the cross-breaking strength generally reaching a max. after 10 to 30 days' aging. The breaking strengths of clays appear to show some parallelism with their plasticities but there appears to be no close relation between breaking strengths and content of fine clay (as measured by elutriation), ignition loss, porosity, drying shrinkage, or  $\text{H}_2\text{O}$  content at normal consistency. There appears to be some relation between breaking strengths and water vapor adsorption. Addn. of non-plastic material generally causes a decrease in breaking strength although the curve is very irregular. H. INSLAY

The importance of the glaze as affecting the quality and breakage in manufacture of porcelain insulators. H. HANDREK. *Keram. Rundschau* 35, 144-7(1927).—The glaze has little effect on the electrical properties of glazed insulators. Insulator test pieces having a thickness of 2.3 mm. comprising a body thickness of 2.0 mm. and a glaze thickness of 0.3 mm. showed a break down voltage of 27.6 kv./mm. An unglazed body of the same thickness gave 31.1 kv./mm. and a piece of glaze of the same thickness, 19.0 kv./mm. For resistance to flash-over the nature of the surface of the glaze is of much more importance than the compn. of the glaze. The nature of the glaze has much greater effect on the mech. than on the electrical properties. The relative tensile strengths of glazed and unglazed insulators depend to a great extent upon the character of the surface layer. Transverse strength is related to tensile strength and those glazed insulators which have a higher tensile strength than unglazed will also show a higher transverse strength. Compressive strength is usually markedly higher on glazed than on unglazed insulators. The glaze is of great importance in the resistance to change in temp. The tensile strength and elasticity of the glaze and the relative coeff. of expansion of glaze and body are mainly responsible for the resistance to temp. changes. H. INSLAY

The significance of iron oxide in the firing losses of ceramic bodies. FRIEDRICH DERRMANN. *Sprechsaal* 61, 318-9(1928).— $\text{Fe}_2\text{O}_3$  is not stable above 1300°; it is converted to  $\text{Fe}_3\text{O}_4$  with loss of O. Since most ceramic bodies contain  $\text{Fe}_2\text{O}_3$  and are sintered at

this temp. a swelling will result (air pockets). Since the O compds. of Fe are reducible to the lower (ous) form by means of excess gases, it is possible through reduction at the proper time to avoid the gas pockets in pottery. C does not color ceramic bodies yellow, but will sometimes lead to small blisters. S has an active coloring power especially for glasses and glazes; bisqueware (bodies), on the contrary, is only slightly affected with the exception of certain susceptible porcelain bodies. R. A. HEINDL

The homogenizing of frit. F. H. ZSCHACKE. *Sprechsaal* 61, 321-4, 344-5, 367-70, 386-7 (1928).—A study of a series of commercially prep'd. glaze mixts. gave frits which exhibited inhomogeneities caused by: deficient mixing; faulty weighing or measuring of the raw materials; influence of moisture present in the raw materials; variable sp. gr. and particle size; variations in wt. per vol. and tendency to pulverize; too short mixing periods. R. A. HEINDL

A standard valuation of the common stoneware tiles. OTAKAR KALLAUNER. *Sprechsaal* 61, 485-90 (1928).—The less the absorption, the less as a whole the abrasion loss. Of different colored tiles, the gray ones appear to be most dense, strongest, most resistant to abrasion and most resistant to acids. R. A. HEINDL

Some problems encountered in roofing-tile manufacture. L. TIMMIS. *Trans. Ceram. Soc. (Eng.)* 28, 1-5 (1929). H. F. K.

The periodic kiln. R. NIEBLING. *Tonind.-Ztg.* 53, 353 (1929). R. F. F.

The present state of operation control in the German refractory industry. H. KNUTH. *Tonind.-Ztg.* 53, 316, 331 (1929); cf. C. A. 23, 2261. R. F. F.

The testing of refractory materials under load at high temperatures. BERNARD LONG. *Science & Ind.* 13, 75-7 (1929).—L. describes a new type of load test furnace which operates on the high-frequency induction principle and is direct loading. The tests and results fall into 3 classes: (1) *Silico-aluminous refractories*.—Two bricks were tested. Brick A contained:  $\text{SiO}_2$ , 69.10;  $\text{Al}_2\text{O}_3$ , 27.80;  $\text{Fe}_2\text{O}_3$ , 1.50;  $\text{TiO}_2$ , 1.30;  $\text{Na}_2\text{O}$ , 0.23%. Brick B contained  $\text{SiO}_2$ , 53.92;  $\text{Al}_2\text{O}_3$ , 42.00;  $\text{Fe}_2\text{O}_3$ , 1.95;  $\text{TiO}_2$ , 1.85; alkalis, 0.28%. The results are expressed by stating the temps. at which the settling or bending attains 2, 5 and 10% of the length of the specimen just before deformation begins. Brick A had been burned to 1220° and brick B to 1200°. Both carried a load of 2 kg. per sq. cm. The temps. and amts. of settle were: Brick A—2%, 1430°; 5%, 1450°; 10%, 1470°; Brick B—2%, 1430°; 5%, 1480°; 10%, 1530°. To det. the effect of temp. of burning, a sample of brick A was fired to 1320°, another to 1460°. Brick B was given a similar treatment. The results were: Brick A, 1320° burn—2%, 1455°; 5%, 1475°; 10%, 1485°; 1460° burn—2%, 1480°; 5%, 1490°; 10%, 1500°; Brick B, 1320° burn—2%, 1440°; 5%, 1490°; 10%, 1540°; 1460° burn—2%, 1480°; 5%, 1500°; 10%, 1550°. The results show that resistance to deformation under load at high temps. is increased by burning the refractory to a higher temp. (2) *Siliceous refractories*.—Brick I had a true sp. gr. of 2.34 and was well inverted. Deformation started at 1580° and crushing occurred at 1585°. Brick II had a true sp. gr. of 2.45 and contained considerable free quartz. The expansion increased suddenly at 1425° and continued at the same rate to 1525°, showing the inversion of the quartz. Crushing took place at 1590°. Brick III had a true sp. gr. of 2.32 and was well inverted. Deformation started at 1645° and crushing occurred at 1650°. Siliceous products are preferable to silico-aluminous refractories for temps. above 1450°. However, loads of 2 kg. per sq. cm. are rare in industrial furnaces and when lower than 2 kg. it is possible to use silico-aluminous refractories. (3) *Special refractories*.—A bauxite brick (61.20  $\text{Al}_2\text{O}_3$ , 6.95%  $\text{Fe}_2\text{O}_3$ ) showed a deformation of 5% at 1400°. A SiC brick bonded with clay and burned to 1200° showed a deformation of 5% at 1470°. Another SiC brick made of 75 parts SiC and a special bond, and burned to 1450°, showed a 5% deformation at 1780°, crushing following soon after. A zircon brick showed 5% deformation at 1550°. A. J. MONACK

Highly refractory silicon-free crucibles. R. WEBER. *Glas. u. App.* 9, 117 (1928); *J. Soc. Glass Tech.* 12, 288.—Suitable Si-free materials are  $\text{ZrO}_2$ ,  $\text{Al}_2\text{O}_3$ , and  $\text{MgO}$  or spinel, but the working of these presents great difficulties because of their lack of plasticity. H. L. D.

The use of electric furnaces for the enameling of large and small articles. HANS NATHUSIUS. *Keram. Rundschau* 35, 124-6 (1927).—Modern furnaces use an 80% Ni-20% Cr alloy as the resistor. H. INBLEY

Studies on hydrated Al silicates. I. The rehydration of metakaolin and the synthesis of kaolin (VAN NIEUWENBURG, PIETERS) 8. New developments in gas-works carbonizing plant, with special reference to refractory materials (GRIJL) 21. Artificial stone (Fr. pat. 648,544) 20. Disintegrating and mixing apparatus for soft

masses such as peat and clay (Ger. pat. 473,029) 21. Crucibles for electric induction furnaces (Fr. pat. 649,371) 4.

BENISCHKE, G.: Les isolateurs en porcelaine. PARIS: Ch. Béranger. Translated by J. Godin. 154 pp. F. 40. Reviewed in *La nature* 59, 381(1928).

Ceramic Products Cyclopedica, 1928. Chicago: Industrial Publications, Inc. \$12. Reviewed in *Ceramic Abstracts* 7, 730(1928).

Owens type apparatus for making glass bottles. LAX & SHAW, LTD., J. F. SHAW and J. E. BRANFORD. Brit. 297,481, April 21, 1927.

Apparatus for forming glass bottles or similar articles. S. HUNT. Brit. 297,763, June 22, 1927. Structural features.

Apparatus for making blown glass articles. S. HUNT. Brit. 297,490-1, June 22, 1927.

Apparatus for making bottles or similar blown glass articles. S. HUNT. Brit. 297,700, June 22, 1927.

Glass-melting furnace with a channelled fore-hearth through which the glass is circulated by a paddle. UNITED-GLASS BOTTLE MANUFACTURERS, LTD., and T. C. MOORHEAD. Brit. 297,856, June 1, 1927. Various structural details are described.

Rotary suction-gathering apparatus for making glassware. S. HUNT. Brit. 297,340, June 17, 1927.

Furnace for making plate-glass. JEAN HENRI LEMAIRE. Fr. 648,225, Feb. 4, 1928.

Glass furnace with movable hearth. MARCEL FOURMENT and JEAN J. LADURÉE. Fr. 648,943, July 1, 1927.

Muffle leer for annealing glassware. BRITISH HARTFORD-FAIRMONT SYNDICATE, LTD., T. WARDLEY and H. V. F. M. RENN. Brit. 297,865, June 29, 1927. Structural features.

Colored glass. SOC. ANON. DES MANUF. DES GLACES ET PRODUITS CHIM. DE SAINT-GOBAIN, CHAUNY ET CIREY. Fr. 648,999, July 2, 1927. Violet colored glass is made by adding  $TiO_2$  to glass having a base of phosphoric oxide, or of oxides of P and B,  $SiO_2$  being absent. The color is deeper if C or a C compd. is added. A light filter with a nearly constant transparency for all the visible rays is made by combining a violet glass as above with a silicate glass colored green by oxide of Fe.

Silvering glass. CARL GRAMBACH. Swiss 129,233, Jan. 14, 1928. Plate glass is silvered by first coating it with a layer of liquid enamel, drying, and coating with a layer of readily fusible metal.

Composite spectacle lenses. K. MARTIN. Brit. 297,627, Jan. 20, 1928. Multifocal lenses comprise a "distance piece" of lower softening temp. than the "reading piece" and the latter is formed of highly refractive baryta glass which has been previously treated for removal of blisters or bubbles.

Uniting sheets of glass, etc. RÖHM & HAAS A.-G. Brit. 297,413, Sept. 21, 1927. In uniting glass sheets to form "splinterless" composite sheets or in uniting other materials, there is used a polymerized or polymerizable material such as methyl cinnamate (which may be polymerized by the action of light after placement between 2 glass sheets) or a sheet of polymerized ethyl crotonate (which may be united with 2 glass sheets by pressure at a temp. of  $90^\circ$ ). Azo dyes, metal powders or other suitable substances may be added to the compns. used.

Uniting glass sheets to a sheet of cellulose acetate or similar composition. N. B. MATTINGLEY and A. REA. Brit. 298,423, Jan. 27, 1928. Joining of the sheets is effected by use of an adhesive comprising rubber with or without gum dammar and gum mastic and suitable volatile solvents, with gradually increasing heat and pressure in a hydraulic press, the platens of which are heated by steam or hot water. Various details are given.

Non-splintering glass. JOHN NEWTON. Fr. 648,085, Feb. 2, 1928. One face of each of 2 glass sheets is coated with a soln. of albumin in distd. water and dried. Pyroxyl in ether, alc. or amyl acetate is applied and dried, and the coated surfaces are united to a celluloid sheet which has been immersed in a soln. of dimethylamine in spirit. The edges of the compd. sheet may be sealed by celluloid or collodion soln.

Reinforced glass. PERCY H. HEAD and SAFETY GLASS AND METAL PRODUCTS, LTD. Fr. 648,301, July 2, 1927. In making reinforced glass of several sheets cemented together, 3 or more of the sheets have a thickness which contrasts with the other sheet or sheets. Thus, 2 thin sheets are joined to one thick middle sheet.

**Reinforced glass.** JACQUSS DUCLAUX. Fr. 648,990, July 1, 1927. Between 2 sheets of glass is placed a layer of cellulose, methyl- or ethyl-cellulose or caroubine. If celluloid is used a layer of a substance which will prevent access to the celluloid of light rays having a wave length less than 0.00033 mm. is interposed. Such substances include stannates, molybdates, tungstates, colloid salts of Pb, Hg or Bi, benzophenone, aromatic hydrocarbons such as stilbine or dibenzyl. PrOH, iso-PrOH, BuOH or AmOH is used instead of MeOH or EtOH in the baths into which the celluloid is passed.

**Coatings for vignetting or shading glass, celluloid, etc.** J. J. ROWS. Brit. 297,699, June 22, 1927. A coating for preventing "glare" or dazzling effects is formed by spraying the surface with a cellulose deriv. contg. a dye or other sol. coloring substance and, after drying, applying to the surface a clear soln. of a cellulose deriv. to dissolve or disperse globules of coloring matter which are caused to flow and unite. The inner faces of glass sheets used in forming "non-splintering" glass may be coated with the clear soln. and the interposed sheet such as cellulose deriv. or clear rubber with the colored soln.

**Rotating disk fuel charger for brick kilns.** INGENIEUR GAIRING, MASCHINEN-FABRIK G. M. B. H. Ger. 473,079, Oct. 6, 1926.

**Pottery kiln.** ALBERT C. WARD. U. S. 1,710,558, April 23.

**Drying and burning clayware.** WILLIAM E. CRAMER (to Harrop Ceramic Service Co.). U. S. 1,709,063, April 16. A plant is described comprising drying units of successively increasing height, and a tunnel kiln, with tracks extending through them, so that a partial setting of ware in the plastic state can be sent on kiln cars through the drying unit of lesser height, addnl. ware then set on the ware so dried, the dried and undried ware sent through the drying unit of next greater height, and the whole setting then sent through the kiln for burning.

**Ceramics.** MAX HAUSER. Swiss 128,404, April 28, 1926. A mixt. of powd. metals or alloys and ceramic raw material, such as silica, alumina, kaolin or quartz, is molded and burned to produce durable ware.

**Ceramics.** SCHEIDHAUER & GIESING A.-G. Swiss 129,228, Dec. 13, 1926. Ceramic objects are formed from aluminiferous binding material to which a colloidal electrolyte is added together with a sufficient quantity of granular deplasticizing agent to render the mixt. uncastable. The substance is mechanically molded. The electrolyte may be alkali, alkali carbonate or alkali silicate.

**White ceramic products.** I. G. FARBENIND. A.-G. Brit. 297,939, Aug. 29, 1927. Ceramic products (e. g., a vessel of unglazed clay) having pure white shades are obtained by heating the shaped ceramic materials to redness (or suitably to 1000°) in Cl or a gas contg. Cl.

**Ornamenting pottery surfaces.** J. F. GIMSON and BAKER & Co., LTD. Brit. 298,018, Jan. 18, 1928. The surfaces are made with slight indentations, recesses or irregular cavities, painted in ceramic colors while the articles are in the clay or bisque state and then glazed and fired. A preliminary glazing also may be followed by painting in colored slip and further glazing.

**Abrasive wheel bonded to face plates with vulcanized rubber.** JOHN R. GAMMETER (to George W. Perks Co.). U. S. 1,709,820, April 16.

**Clouded enamels.** I. KRIDL. Brit. 297,724, Sept. 26, 1927. Substances are added to enamels which produce a clouded effect by evolution of finely distributed gas bubbles during the firing of the enamel. Formic or acetic acids or their salts, naphthol, benzdine, starch, flour or other suitable org. substances, or "inorg.-org." substances, or mixts. such as C and an oxidizing agent, may be used, and the use of carbides also is mentioned. Addn. of an oxidizing agent such as KNO<sub>3</sub> may be made to prevent discoloration of the enamel due to the presence of C or C compds. Clouding of glass may be similarly effected. Brit. 297,725 specifies addn. of inorg. substances such as "metals, metalloids, and their compds."

**Clouded enamels and glasses.** I. KRIDL. Brit. 297,737, Sept. 26, 1927. Clouding is effected by adding substances such as org. compds. of Sn, Ti, Zr or Sb which effect clouding during melting by forming fine gas bubbles within the molten mass.

## 20—CEMENT AND OTHER BUILDING MATERIALS

J. C. WITT

Testing of small samples of cement. HANS KÜHL, Hochschule, Berlin. *Tonind.-Ztg.* 53, 374-7(1929); cf. C. A. 22, 2042.—The carborundum furnace is now being used, and in addn. to small bars for flexure tests, small cubes are being made for compressive strengths. F. O. A.

Measurement of the expansion of cement at high temperatures. SHICHIRO UCHIDA, Sendai Higher Tech. School. *Bull. Reconstruction Bureau* [II], 10, 1-25(1927).—In a mixt. of cement and volcanic ash a second expansion in the first heating does not occur, a marked contraction taking place instead. The linear expansion depends upon the volcanic ash content, there being no marked variation of the expansion up to 20%. Above 30% the linear expansion decreases. The linear expansion extending over the temp. range of 0-900° was measured with various samples contg. up to 50% of the ash; the results are shown by curves and tables. In blast-furnace cement the second expansion is not pronounced in the first heating, but the expansion coeff. is great at higher temp., being almost the same as that of portland cement. In Onoda white cement the second expansion does not appear at the first heating, and the expansion coeff. is greater the higher the temp., being little higher than that of portland cement. For cement, mortar and concrete, up to 100° the expansion coeffs. are almost the same as that of iron, so that they are thermally safe when used in an iron-frame building. K. SOMEYA

Influence of the waterproofing material (asphalt emulsion) upon the time of setting and the strength of cement. SHICHIRO UCHIDA, Sendai Higher Tech. School. *Bull. Reconstruction Bureau* (Tokyo) [II], 9, 106-10(1927).—When the soln. made by dilg. asphalt emulsion with H<sub>2</sub>O is used instead of H<sub>2</sub>O in gaging cement, some increase in the setting time and a 0.4% decrease of strength are brought about. The effect of preventing the penetration of water at 1 atm. pressure is sufficiently great when the gaging soln. is made by dilg. asphalt emulsion with 15 vols. of water; when the emulsion is dild. with 20 vols., the penetration of water is entirely prevented under 2 atm. pressure, and for a considerable length of time even under 4 atm. pressure. K. SOMEYA

Weathering test of portland cement and blast-furnace cement. KOJI OHAZAMA, JIRO KASAWARA AND SAKAE SAGAWA, Reconstruction Bureau (Tokyo). *Bull. Reconstruction Bureau* [II], 10, 108-9(1927).—The change of the properties of portland cement (A) and of blast-furnace cement (B) due to weathering has been measured for 6 months, the measurements mentioned below being made 16 times within that period. The ignition loss increased with weathering, from 2.14 to 7.98% in A, from 1.16 to 6.5% in B. The tensile strength of A changed from 30.1 kg./cc. to 32.3 kg./cc. in 28 days, of B from 34.6 kg./cc. to 20.8 kg./cc. The resistance to pressure showed almost no decrease in A, while in B the decrease was remarkable, i. e., from 238 kg./cc. to 41 kg./cc. While the setting time in B is sometimes markedly lengthened, no such phenomenon is observed in A. B is inferior to A in many respects, especially in strength. K. SOMEYA

Mechanical tests of solidit and blast-furnace cement. KOJI OHAZAMA, JIRO KASAWARA AND SAKAE SAGAWA, Reconstruction Bureau (Tokyo). *Bull. Reconstruction Bureau* [II], 10, 97-9(1927).—Tests on 1:3 mortar using solidit, blast-furnace cement and portland cement, after one year, show that the first is weakest and the third is strongest. K. SOMEYA

Action of acids upon cement and mortar. SHOICHIRO NAGAI, Tokyo Imp. Univ. *J. Ceramic Ind. (Japan)* 36, 382-94(1928).—A portland cement (from Iwaki), a blast-furnace cement and "solidit" were compared as to their resistance to the action of H<sub>2</sub>SO<sub>4</sub>, (COOH)<sub>2</sub>, AcOH and HCl. The strength of samples after dipping in the acids was compared with that of samples dipped in H<sub>2</sub>O. The degree of corrosion as expressed by the decrease of resistance is 46% for blast-furnace cement, 94.2% for "solidit" and 78% for Iwaki cement. In "solidit" the attack extends to the innermost portion, while in portland cement there is first formed a thin layer of CaSO<sub>4</sub>, which retards the penetration of the acid soln., but this layer finally falls off and the corrosion continues. In blast-furnace cement the CaSO<sub>4</sub> layer is also formed but it does not fall off. In 0.3 N H<sub>2</sub>SO<sub>4</sub> less corrosion is obtained than with 0.1 N H<sub>2</sub>SO<sub>4</sub>; this is explained as due to the greater protecting action of the layer formed by the more conod. acid. With HCl, sol. Ca salts are formed, so that the corrosion is greatest with portland cement and least in the blast-furnace cement. When the basic slag is added to the clinker to obtain greater strength so that the compn. approximates that of iron-portland cement, susceptibility toward salts and acid becomes less pronounced. K. S.

Old mortars. KARL BIEHL. Wickings Inst., Lengerich i. W. *Towind.-Ztg.* 53, 449-51 (1929).—Analyses of Roman mortars from the St. George wall in Cologne and from the crypt of the minster in Bonn showed that the Romans used both high-Ca and high-Mg limes in 1:3 mortars together with trass. A mortar from a Dresden fortification erected in 1760 had similar properties. F. O. A.

Physico-chemical correlation between aggregate and cement in mortar and concrete. G. KATHREIN. *Mitt. staatl. tech. Versuchsanst. (Wien)* 17, 106-13 (1928).—The amt. of mixing water is the most important factor in detg. setting time, strength, absorption, shrinkage, etc. Portland cements tend to shrink while aluminous cements tend to expand on storage. Kaolin promotes marked shrinkage and expansion when added, while finely ground marble has little effect. Portland cement specimens shrink in lime water, while those made from aluminous cements expand. Brimstone and, to a lesser extent, kaolin, combine with the lime set free from portland cement, lying intermediate between the reactive trass and the inert quartz. At higher temps. orthoclase, quartz and augite react with lime, while calcite, even at the temp. of the autoclave, remained inactive. Lack of sufficient water during storage often has an adverse effect on the reaction with lime. F. O. ANDERREGG

Concrete. NATHAN C. JOHNSON. I. Difficulty of standardization. *Eng. News-Record* 102, 128-30 (1929). II. Commercial production of concrete. *Ibid* 172-5. III. Simplifying quality production. *Ibid* 263-8. IV. Effecting economies by study of cements. *Ibid* 314-8.—A lengthy discussion of the factors affecting the quality and uniformity of concrete, the adequacy of present standards and the reliability of specimen cylinder strength tests as an index of the quality of field concrete, together with suggestions for prepg. more uniform concrete. The following outline specification is considered suitable: 1 part of cement, not over 2 parts of sand if the sand is coarse and less if the sand is fine, as much stone as the mix will carry and only sufficient water to give a workable consistency without sepn. A study of the properties of the "cement pulp" between the sand grains of concrete indicates economies and improvements which may be effected. This cement pulp absorbs water regardless of phys. pores. Concrete exposed to water should therefore be protected irrespective of the quality of the product. Oil is ineffective for this purpose, as it will penetrate only the phys. pores of the mass and not the pulp itself and the latter will continue to absorb water. Evapn. of the absorbed water brings to the surface dissolved salts and results in the efflorescences frequently observed on concrete. Set and hardened cement pulp will not bond with new cement mixts. except for a very limited time. If the surface of the aggregate of set concrete is washed free of cement pulp a reasonably effective bond may be expected. In the "mother liquor," a strongly alk. soln., which is formed as soon as cement and water are mixed, the secondary products of the hydration of cement diffuse and spread. Much depends on the concn. of this mother liquor. If pure mother liquor is added to a normal cement-sand-stone mixt., the rate of hardening can be increased 300-400%. The alk. mother liquor attacks the resins of wooden forms, causing warping and weakening. Application of an impermeable coating retards this action and considerably increases the life of the forms. R. E. THOMPSON

Composition of concrete. JUNKICHI KATO AND YAJIRO NAGAYAMA. Reconstruction Bureau (Tokyo). *Bull. Reconstruction Bureau* [II], 10, 26-40 (1927).—N. and K. have prepd. a table showing the relation between the strength of concrete and the water-cement ratio. The relation between the materials required and the compn. as well as that between the compn. and cost are shown graphically. K. SOMEYA

Protection of concrete. R. GRÜN. *Bauingenieur* 9, 350-2 (1928); *Wasser u. Abwasser* 25, 204; cf. C. A. 22, 3030.—Clinker facings give very little or no protection to concrete unless the former are laid in asphalt plastered on the surface. Various methods of detg. quality of asphalt for protective purposes are described. Artificial aging of coating materials is attained by irradiation with ultra-violet light or by ozone treatment. C. R. F.

Corrosion of concrete. CHUICHI HARI. *Kogyoshiyo* (Miscellaneous Data for Mining Industry) 16, 1340-52 (1928).—When a suitable amt. of  $H_2O$  is used and care is taken in gaging to make a compact concrete, the penetration of  $H_2O$  and gas is made difficult and corrosion is lessened. The corrosion of the concrete used in the walls of a building, gas pipe, irrigation canals, etc., is chiefly due to the porosity of the material. By virtue of the difference of pressure or humidity on the two sides,  $H_2O$  flows from one side of the wall to the other, and in all cases the  $H_2O$  which has passed through the cement is alk. On coming into contact with  $CO_2$ ,  $H_2SO_4$ , and  $HCl$ , it forms carbonates, chlorides or sulfates, which deposit at the surface or in the pores. In the case of reinforced concrete buildings, the concrete deteriorates when  $H_2O$  and gas penetrate

to the steel. The rusting of reinforcing steel at the seashore is probably due to the entrance of sea water, while in tunnels it is due to the action of  $\text{CO}_2$  and  $\text{H}_2\text{SO}_4$ . To prevent corrosion H. recommends that a mixt. of petroleum benzine and 30-40% paraffin be blown on to the surface to make a thin coating. When the color is not important an asphalt solution is also good. In sewer pipe, coal tar is sometimes recommended but it is not effective, because the coating is removed by the mechanical action of flowing  $\text{H}_2\text{O}$ . K. SOMEYA

Concrete's 15-year record on New York subways. GEO. L. LUCAS. *Eng. News-Record* 102, 380-5(1929).—Records of 15-years' concreting practice on New York City subways are presented graphically and discussed in some detail. The mix employed is 1:2:4, proportioned by vol. on the basis of  $7/8$  cu. ft. per 94-lb. bag of cement, the max. amt. of water permitted, including moisture in aggregates, being  $6\frac{1}{4}$  gals. per bag of cement, equiv. to a water-cement ratio of 0.875. Although the specified proportions of cement and aggregate have been changed in only a minor degree since 1914, improvements in practice as a result of research have increased 89% the yearly av. strength of the concrete produced since that date. Practice has shown conclusively that, other factors being equal, the water-cement ratio is the controlling factor in the strength of the concrete produced. Tests have indicated that 55-min. haul after mixing in revolving drums mounted on motor trucks reduces the strength of the concrete 10%. The graphs given include: grading requirements of fine and coarse aggregates, yearly av. strength of concrete for the periods 1914-8 and 1926-8, characteristics of the cement used during the period 1913-27, effect of time of haul on the strength of concrete and influence of type of sand on the strength of concrete. R. E. THOMPSON

Study of mixing action in large concrete mixers. A. N. TALBOT. Univ. of Illinois. *Eng. News-Record* 102, 394-6(1929).—Data are given from an extensive report to the Kochring Co. of Milwaukee, for details of which the original must be consulted. Two forms of mixing action are necessary: (1) intermingling of the ingredients, and (2) rubbing or scrubbing action among the particles themselves. The slower speeds of rotation give a better mixing action; dry and medium mixes need a slower speed than do wet ones. A fine sand mixt. requires more vigorous action than one of coarse sand. R. E. THOMPSON

Effect of sugar on concrete in large-scale trial. MILES N. CLAIRE. *Eng. News-Record* 102, 473(1929).—Data are given on tests made on a large floor slab in which 0-1 lb. of sugar per bag of cement had been added to retard setting. The deleterious effect of the sugar was very apparent for 0.5 lb. of sugar and over, the concrete at the age of 25 days being easily scratched with a blunt instrument. The concrete to which about  $1/8$  lb. of sugar had been added was only slightly less hard than the slab without sugar. After 8 months, examn. of the slab showed appreciable wear on the section contg. 0.5 lb. sugar, slight wear on the 0.25-lb. section and none elsewhere, the slabs with greater amts. of sugar than 0.5 lb. having been replaced. R. E. THOMPSON

Tensile test of centrifugal reinforced concrete pipe. YAJIRO NAGAYAMA AND JUNKICHI KATO. Reconstruction Bureau (Tokyo). *Bull. Reconstruction Bureau* [II], 10, 57-75(1927).—Seven samples were tested. The d. and the strength are greater than those for ordinary concrete pipe. K. SOMEYA

A source of error in determination of the plasticity of hydrated lime. FRANK C. MATHERS AND EVERETT C. GOSNELL. *Ind. Eng. Chem., Anal. Ed.* 1, 59-61(1929).—Present specifications for the use of the Emley plastometer do not fix the time of stirring of the sample to be tested. This factor is important and the time of 2 mins. is recommended. Other possible factors are discussed. EUGENE C. BINGHAM

Indiana limestone. I. Efflorescence and staining. F. O. ANDEREGG, H. C. PFEFFER, PAUL R. JUDY AND LEE HUBER. *Eng. Expt. Sta., Purdue Univ., Bull. No. 33*, 84 pp. (1928).—A study of the nature, causes, consequences, prevention and removal of efflorescence and staining that sometimes appear on Indiana limestone. The nature of the efflorescence was detd. by analyzing numerous samples from various parts of the country and it was found that sulfates of Ca, Mg and Na predominated. For efflorescence to occur, sol. salts, moisture and capillary passage through the wall must be present. As most building materials contain an appreciable amt. of sol. salts the best way is to design and build the wall so as to keep moisture out. That means that all capillary contact with the ground, open porches, etc., must be broken. Rain water alone contains sol. salts during most of the year and, in addn., free  $\text{H}_2\text{SO}_4$  in the winter, so that it must not have the opportunity of soaking into the wall. Efflorescence is best removed by washing, especially with a steam jet, at intervals. Several kinds of stain may appear on Indiana limestone. A brown stain giving the most trouble is caused

by sol. Na and K salts coming in contact with org. matter in the stone, residual from the original organisms. The  $\text{CaCO}_3$  forms  $\text{Na}_2\text{CO}_3$  or  $\text{K}_2\text{CO}_3$ , which peptizes some of the partially oxidized org. materials, which then are carried to the surfaces as moisture evaps. and deposited as an unsightly varnish. This will gradually disappear on exposure to the weather. It is similar to and usually accompanied by efflorescence, the chief difference being the Na or K salt action. These salts come most often from the cements used in setting the stone or backing, so that the prevention requires the use of cements low in sol. alkalis, of which there are several, in addn. to the usual methods of efflorescence prevention. Soot stains and soil stains are best removed by use of a steam jet. Green Cu stains are sol. in NaCN soln. Tannic acid stains from hardwoods may be removed with formic acid. Rust stains usually yield to hot oxalic acid. The removal of the brown alkali stains is difficult. In the hands of a skilled operator, it is possible to remove them from the dry wall by treatment first with  $\text{Na}_2\text{CO}_3$  soln. or pulp followed by a formic acid and washing. The most important thing for long life is to build and maintain the wall dry.

F. O. ANDEREGG

Tar and asphalt, the best means of combating dust. ED. SCHNEIDER. *Städt. Tiefbau* 19, 129-34(1928); *Wasser u. Abwasser* 25, 64.—Asphalt roads produced the least amt. of dust while macadam produced most. Crushed stone or macadam highways may be made dust-free by treatment with asphalt or tar.

C. R. F.

Use of mixtures of petroleum products and creosote for preservation of timber. A. I. VORONOV. *J. Chem. Ind. (Moscow)* 5, 1227-30(1928).—Bateman and Henningsen (*C. A.* 19, 3578) having shown that satisfactory wood preservers can be obtained by using mixts. of hydrocarbon oils and creosote provided these liquids form, on mixing, not more than 1 1/2% of tarry ppt., an investigation was made of the conditions of formation of this ppt., particularly when Russian heavy oils and mazouts are utilized. Exptl. data show that the stability of different creosote fractions in benzene increases with the decrease of the b. ps. of these fractions; thus the creosote fractions which boil below 350° dissolve in benzene without forming a noticeable ppt., whereas higher-boiling creosote fractions produce pptn. When hydrocarbon oils heavier than benzene are used it is found that the higher the b. p. of the petroleum product the greater the stability of its soln. in creosote. As the miscibility of the 2 liquids depends not only on the b. p. of the fractions but also on their chem. compn., and as the latter is not known, various mixts. of Russian petroleum product are prepd. and the percentages of tarry pptn. were detd. in each particular case. It was found that purely naphthenic petroleum, as well as hydrocarbon oils of the  $\text{CH}_4$  series, give, on being mixed with creosote, the largest quantity of tarry ppt. Naphtheno-aromatic petroleum give, on the contrary, the least pptn. Thus the best petroleum for this particular purpose are those which consist largely of aromatic and naphthenic hydrocarbons and contain no hydrocarbons of the  $\text{CH}_4$  series. The presence in petroleum of a large quantity of aromatic compds. and of tars contributes to the stability of its mixts. with creosote, whereas a large content of  $\text{CH}_4$  hydrocarbons and of naphthenes in the absence of aromatic compds. and in the presence of but a small quantity of tars are factors causing tarry pptn. Timber is permeated by these mixts. in autoclaves at 90-100°, the pressure being 10 atm. Different kinds of wood are permeated at a different rate of speed; thus pine is permeated twice as easily as oak. As a whole, Russian mazouts and heavy oils are very well applicable for use in mixt. with creosote as wood preservers and give no more than 1 1/2% of tarry ppt. Exptl. data are presented in form of 2 tables.

BERNARD NELSON

Lumber treating by non-pressure process. T. A. WILSON. *Elec. World* 17, 823-6 (1929).—It is possible by the non-pressure process to secure full sapwood penetration in practically every species of wood in com. use. The equipment described consists of a large cold-storage tank, a hot-storage tank, 2 open-top treating tanks for butt-treating of poles, and one for treating lumber and timbers. The latter tank has a removable cover and a motor-driven derrick handles the material in and out of the tank, and a gasoline crawler-crane performs the yard work. Steam is supplied by a 50 h. p. boiler to a circulating heater, the preservative, creosote, is forced by motor pump through the heater to the hot-storage tank and each of the treating tanks, as required. A uniform and const. temp. is assured during the treating cycle, with thorough agitation of the preservative. By substitution of water for steam the heater is converted to a cooler for the cool treatment with preservative, without exposing the material to the air. With uniform temps. under pos. control, it has been possible to det. the most desirable temp. to be used for a given charge.

W. H. BOWYER

Tests of the reagents used for preventing the decay of wood. III. KAWAKUCHI TANAKA, SHINJI SHOJI AND NAMIO FUKAKOSHI. *Reconstruction Bureau (Tokyo).*



*Bull. Reconstruction Bureau* [II], 2, 125-7(1927).—The corroding action upon iron of the reagents used for prevention of decaying of wood was studied for 10 kinds of the reagents sold in the market. A definite quantity of Fe was suspended in the liquid reagents and the increase of the Fe content in the soln. was taken to indicate the degree of corrosion of iron. Of the reagents tested, creosote was found to be least corrosive.

K. SOMEYA

**Test of fire-resisting reagents for wood.** KATSUJI TANAKA AND SHINJI SHOJI. *Reconstruction Bureau* (Tokyo). *Bull. Reconstruction Bureau* [II], 9, 111-8(1927).—Among the reagents tested the mixt. of  $(\text{NH}_4)_2\text{HPO}_4$  and  $\text{H}_3\text{BO}_3$  (I),  $\text{Mg}_2(\text{BO}_3)_2$ , (II) and the mixt. of  $(\text{NH}_4)_2\text{SO}_4$  and  $\text{H}_3\text{BO}_3$  (III) were found to be most effective as fire-resisting material. But since I has a tendency to dissolve when the wood is placed in  $\text{H}_2\text{O}$  after it is soaked in the soln. of I, its effect decreases on keeping the wood in  $\text{H}_2\text{O}$ . (II) is free from such defect, and the wood which has been soaked in II may be employed outdoors.

K. SOMEYA

On the relationship between the various forms of  $\text{CaSO}_4$  at high temperatures (Lashchenko, Kompanski) 2. The conversion of cyanamide to  $\text{NH}_3$  (MOLTOR) 18. Biochemistry of dry-rot in wood (BARTON-WRIGHT, BOSWELL) 11D. Purifying petroleum oils and distillates [for wood preserving] (Brit. pat. 297,414) 22.

SCHNEIDER, EDUARD: *Modernen Strassenbau; Steinstrassen, Teer- und Asphaltstrassen*. 2nd ed. Berlin: Allgemeiner Industrie. 479 pp. M. 15. Reviewed in *Eng. News-Record* 101, 928(1928).

**Oxy-sulfate cements.** E. R. HARRAP, J. A. CANN and BELL'S UNITED ASBESTOS CO., LTD. Brit. 298,270, July 7, 1927.  $\text{FeSO}_4$  is used for all or part of the sulfate component with an oxide such as  $\text{MgO}$ . Retarders such as  $\text{H}_3\text{BO}_3$  or accelerators such as alum may be added. The mixt. can be prepd. and kept dry ready for admixture with water when desired for use.

**Apparatus for forming cellular cement composition by use of a froth-flotation agent.** G. B. HINTON. Brit. 297 638, Feb. 27, 1928.

**Enameling fibro-cement.** N. ZAVARO and A. SPLINQUEZ. Belg. 351,025, June 30, 1928. Two coats are applied by spraying, the first having a turpentine vehicle and the second being mixed with water before application. After the application of each coat the object is heated progressively, baked and then cooled very gradually.

**Molding concrete.** CHEM. FAB. GRÜNAU LANDSHOFF & MEYER A.-G. Ger. 473,022, Nov. 6, 1927. The appearance of molded concrete objects is improved by smearing the interior of the mold with a soln. of decompn. products of albuminoids, e. g., a soln. of alkali salts of protalbinic and lysalbinic acids.

**Waterproofing mortars and plasters.** O. SIMON and M. KÖLLER. Brit. 298,034, Feb. 29, 1928. A waterproofing paste for addn. to mortars and plasters is prepd. by reacting on limestone, marly limestone, marly clay, a mixt. of white limestone and white clay or other suitable lime-contg. material with  $\text{HCl}$  and then incorporating paraffin oil or other light-colored oil or fat with the product while heating.

**Treating slag to form plaster, etc.** M. ODLING and A. A. STRAGER. Brit. 298,141, May 4, 1927. Blast-furnace slags or natural rocks or slags of similar character are crushed or granulated and heated with relatively concd.  $\text{H}_2\text{SO}_4$  with or without addn. of oxidizing agents such as nitrates or peroxides. The product is then lixiviated to remove  $\text{Al}_2(\text{SO}_4)_3$  and the residue, consisting mainly of silica and  $\text{CaSO}_4$ , may be used as a *fertiliser* or calcined at a relatively low temp. to produce a hard *wall plaster*. The soln. of  $\text{Al}_2(\text{SO}_4)_3$  may be evapd. or lime or limestone may be added to it to produce basic Al sulfate.

**Artificial stone.** ROBERT H. ABREY. Fr. 648,544, Feb. 8, 1928. Raw or calcined magnesite is heated with a flux such as  $\text{Na}_2\text{SiO}_3$  or borax and the resulting clinker is ground and mixed with a soln. of  $\text{MgCl}_2$ ,  $\text{AlCl}_3$  and  $\text{BaCl}_2$  as well as waterproofing materials, and filling materials may be added. Tiles, basins, etc., may be produced by molding.

**Artificial marble.** GEORGES MOLLIER-BILLIET. Fr. 648,186, June 13, 1927. Objects resembling marble are made by mixing  $\text{MgO}$ , powd. quartz and  $\text{BaSO}_4$ , treating the mixt. with a soln. of  $\text{MgCl}_2$  to which  $\text{Pb}(\text{AcO})_2$  has been added, and molding.  $\text{CH}_3\text{O}$  and glycerol may be added to render the final product impermeable.

**Bricks, etc.** EUGENIO D. ROLANDO. Fr. 649,248, Feb. 18, 1928. Bricks, etc., are made from powd. stone and granulated stone and cement or lime or other binding agent.

**Laminated blocks for building purposes.** CALEB PAYNE (to Gypsum Engineering & Mfg. Co.). U. S. 1,709,035, April 16. Blocks are formed with thin side walls of gypsum stucco or other veneer bonded to a central layer of foamaceous cellular material.

**Bituminous compositions for paving blocks, etc.** MUSAG GES. FÜR DEN BAU VON MÜLL- UND SCHLACKEN-VERWERTUNGSANLAGEN A.-G. and A. GROTE. Brit. 298,159, Oct. 4, 1927. An aggregate of graded grains of hard slag of various sizes up to 6 mm. (mixed to reduce voids to a minimum) is used with a bituminous binder. The slag may be prepd. by sintering house refuse.

**Compositions for flooring, paving, etc.** J. MACDONALD (representative of D. Macdonald) and R. F. MACDONALD. Brit. 298,290, July 15, 1927. A granular material is made from a mixt. such as silica 25, Fe oxide 3, alumina 15, CaO 35, MgO 12 and coloring material 10 parts, by fusing the mixt. to form a brick-like product and grinding to the desired size. Dolomite may be used in making the compn. if desired and it may be otherwise varied but the Ca content must not be sufficiently high to cause the material to set like cement when mixed with water. The particles may be further colored with a glaze-like coating compn. which is hardened by firing.

**Floor composition.** K. SCHNEBLE. Brit. 297,750, Sept. 26, 1927. A compn. for covering floors is formed of cork 40, pumice stone 40 and kieselguhr 20 parts, with a binder formed of cement and water. Various modifications are described.

**Flooring.** LOUIS M. CHESSEX-CORBAZ. Swiss 128,659, Nov. 28, 1927. Reinforced concrete flooring has blocks which have interfitting flanges with grooves for the iron rods.

**Flooring.** JAKOB RÜGG and FRITZ SCHMUTZ. Swiss 128,658, Jan. 13, 1927. Flooring is made from magnesite-free mineralized sawdust, sand and portland cement pressed between boards and placed between the beams.

**Floor covering.** PIERO COLOMBI. Swiss 129,312, Jan. 9, 1928. Cork waste is cemented together by a soln. of casein in  $\text{NH}_4\text{OH}$ , or in  $\text{NaOH}$ , or by an aq. soln. of silicate.

**Process and autoclave for impregnating wood by forced rising circulation of the impregnating agent.** C. DE ZUTTERE. Belg. 353,076, Aug. 31, 1928. Constructional features.

**Drying lumber and similar materials.** H. W. COWAN. Brit. 297,480, Sept. 23, 1927. The material is treated in a chamber, suitably of a temp. of about  $95^\circ$ . At first the temp. falls somewhat due to evapn. of moisture from the material but is then raised to about  $95^\circ$  after which the air is withdrawn from the chamber and replaced by fresh heated air. Various structural features of a kiln contg. a turntable on which the lumber is stacked are described.

## 21—FUELS, GAS, TAR AND COKE

A. C. FIELDNER

**Different methods for calculating the calorific power of solid fuels.** PAUL JARRIER. *Chaleur et ind.* 10, No. 107, 107-12(1929).—The bomb calorimeter must be used when accuracy is desired but it is often sufficient to calc. the calorific power from the elementary or from the proximate analysis or from Berthier's method based upon the amount of  $\text{O}_2$  necessary to burn the fuel. Let  $C$ ,  $H$ ,  $O$  and  $S$  be the percentage wts. of these elements, let  $a$ ,  $b$ ,  $c$ ,  $d$  be the heats of combustion of  $C$ ,  $H$ ,  $S$  and  $\text{CO}$ , resp., in kg.-cal./kg. Then from six equations the general formula may be written  $Q_d = aC + bH + cS - dO$  kg.-cal./kg. Values are given for the consts. and values of  $d$  are discussed. The formulas of Mahler, Dulong, Mendelyeev, and Langbein, Steuer and Vondracek and their applicability to different types of solid fuels are discussed. Dulong's formula is good enough for coals, much less satisfactory for lignites and inexact for peat, wood and cellulose.  $S$  and  $M$ . formulas are too high;  $V$ 's formula is most exact. The three formulas ( $S$ .,  $M$ . and  $V$ .) give results within 1%. The formulas of Goutal, Kent, Saillard and Schmit are discussed for calorific value calcd. from proximate analysis and this method is often quite satisfactory. A formula for Berthier's method is given.

S. L. B. ETHEARTON

**Reduction of fuel values to standard conditions of temperature and pressure.** W. C. BUELL, JR. *Fuels and Furnaces* 7, 559-62, 571(1929); cf. C. A. 23, 2327.—Oil and gas fuels when being tested should be corrected for changes in sp. heat, temp., pressure and vapor tension. The standard is taken as  $32^\circ\text{F}$ ., 30 in. Hg and 100%

satn. For liquid fuels the formula  $V_{22} = V_1 \left( \frac{1}{1 + \frac{K(t - 32)}{(10)}} \right)$  may be used for temps. above 32°F., while  $V_{22} = V_1 \left( \frac{1}{1 - \frac{K(32 - t)}{(10)}} \right)$  will be used for temps. below 32°F.  $V_{22}$  = vol. at 32°F.,  $V_1$  = vol. at metered temp.,  $t$  = fuel temp. at meter,  $K$  is a const. = 0.0033 (Bé - 10) 0.00004. For reducing gas vols. to the standard conditions the formula  $V_{22/30} = V_1 P \left( \frac{1}{1 + \frac{(t - 32)}{(492)}} \right) \left( \frac{P \cdot a}{(30 - 0.164)} \right)$  is used, in which  $V_{22/30}$  = vol. of satd. gas at standard conditions,  $V_1 P$  = vol. of gas as metered,  $t$  = temp. of gas as metered,  $P$  = abs. pressure of gas as metered in in. Hg,  $a$  = vapor pressure at observed temp. and pressure and 0.164 = vapor tension at 32°F. To correct to a dry gas basis the formula becomes  $V_{22/30} = V_1 P \left( \frac{1}{1 + \frac{(t - 32)}{(492)}} \right) (P/30)$ . Tables and charts accompany the paper.

J. W. SHIPLEY

The national interest in low-temperature distillation of fuels. CH. ROSZAK. *Chaleur et ind.* 10, No. 107, 119-28(1929).—The Salerno furnace consists of a series of adjacent troughs, heated from below, with scrapers rotating 14 times per min. moving the fuel to the adjacent trough. The heating gas dries the incoming fuel, which is on an endless chain. A rich gas and an excellent tar are obtained. The capacity is great and the vol. of the plant is relatively small and the cost of the installation is relatively moderate. The Cantieny furnace is discussed in some detail and the financial considerations are taken up. The Pintsch and the Merz and McLellan retorts are adapted for use in central power stations. In the first, the hopper of a mechanical grate is transformed into a carbonization chamber by leading back part of the hot waste gas from the boilers. Condensable matter is removed and uncondensed gas is led below the boilers. The semi-coke falls upon the chain grate from the hopper and is immediately burned. The process is simple but the tar yield is 60% of the theory and recovery of spirit is very difficult because of the large vol. of gas. In the Merz and McLellan process, the coal, dried at 120°, and preheated by combustion products from the boiler, falls into a hopper where it is distd. by a mixt. of steam and burnt gases generated in a sep. and small combustion chamber. Other details and a balance sheet are given. The André Aereng (French) processes are discussed with diagrams and photographs. The coal is dried and is distd. by internal heat and various combinations can be carried out; e. g., the semi-coke and rich gas may be burned and the tar and spirit extd., or the gas may be also removed or the coke may be removed in the pulverized or in the briquetted form. A discussion of the economics of these processes is added.

S. L. B. ETHERTON

The Bussey coal distillation process. H. B. CRONSHAW. *Engineering* 127, 409-11(1929).—The low-temp. coal distn. plant at Glenboig, near Glasgow, Scotland, said to be the largest erected so far, is described. It will have a throughput of 500-600 tons of coal per day, and a daily output of 300-400 tons of smokeless fuel (semi-coke), 15,000 gal. crude oil and 15,000,000 cu. ft. of gas. The Bussey retort is of the stationary, vertical shaft and internally heated type. It consists of a simple steel shaft lined with fire brick, supported on a concrete base. Its form is that of a truncated cone of oval cross section 30 ft. high, 2 ft.  $\times$  2 ft. at the top and 8 ft.  $\times$  3 ft. at the bottom. The grate or multiple tuyère is hollow and divided into sections through which air, gas and steam in controlled amts. are injected into the charge. A cutter-bar above the grate pushes the coke off from either end of the grate alternately, allowing it to fall into cooling hoppers where it is steam-quenched, and then passes to a second hopper below and finally discharged through a chute. As mech. charging devices are used, the operator's duty is mainly that of controlling temp. and pressure at various parts of the retort. Incoming coal is heated to about 150° by gaseous products from below, and in it some oil condensation occurs; this oil is revaporized when the charge descends. In the second zone the temp. ranges from 150° to 425°, and distn. takes place. In the third zone hardening of the residue occurs, combustion goes on and the semi-coke is then discharged. Floor space for each 50-ton unit is 425 sq. ft. W. C. EBAUGH

The Yorkshire, Nottinghamshire and Derbyshire coal field. South Yorkshire area. The Parkgate seam. C. H. LANDER. *Department of Scientific and Industrial Research* (London) 1928, 64 pp.—Results of analyses, phys. and microscopic examn. and carbonization assays of samples from 16 different locations in the Parkgate seam. No marked gradations in the property of the seam are found. The values are as follows, all in %: (a) proximate analysis—moisture 1.7, volatile matter (less moisture) 31.7, "fixed C" 59.6, ash 7; (b) ultimate analysis—(dry coal) ash 7.1, C 79.7, H 4.7, N

1.5, S 1.8, P 0.0078; (c) calcd. to dry ashless coals C 85.75, H 5.15, N 1.63, S 1.94, calorific value (air-dried) 14,470 B. t. u./lb., m. p. of ash 1325°. Carbonization assay at 600° gave the following yield per 100 g. dry coal: coke 78.25, tar 10.85, liquor 3.3, gas at 60°F. and 30" (satd.) 9080 cc., temp. of decompn. 425°, type (a) coke is a weak, friable, swollen coke; type (b) is a firm, shrunken coke; and type (c) is between (a) and (b). The analysis of the banded structure of coal is given. The S is never below 1% and may rise to 3%. Some samples are high in P; it varies between 0.0035 and 0.03%. High calorific value is uniform at 14,000 B. t. u./lb. The m. p. of the ash is high at 1300–1400°. Cokes are uniform. Tops contain less volatile than bottoms; moisture is fairly const. from top to bottom; and the ash and volatile matter are generally higher in tops and bottoms than in middles. Hards have less S than tops or bottoms but the reverse is the case for P, an important fact in metallurgical operations. Fusain usually has higher ash and perhaps S; therefore the removal of fines improves the coal for coking. Observations are made in coking, gas making, steam raising, low-temp. carbonization, special metallurgical processes and locomotive fuels. The tables of index, diagrams and photographs are excellent. S. L. B. ETHERTON

**Hydrogenation:** The hydrogenation of coals in the presence of catalysts. BŘETISLAV HLAVICA. Inst. for the Economic Utilization of Combustibles, Prague. *Paliva a Topeni* 9, 57–61, 74–81, 89–97, 105–111, 117–26(1927); *Brenstoff-Chem.* 9, 229–31 (1928).—H. studies the action of catalysts upon the hydrogenation of coals with the view of reducing the reaction time, lowering the optimum temp., and decreasing the pressure of H<sub>2</sub>. The mols. of coal crack into numerous products which in the nascent state attack H<sub>2</sub>, but the rate of hydrogenation is not only increased by true hydrogenating catalysts Ni, Co, etc., but also by those which hasten the cleavage of the mol. and are used for cracking the heavier oils as AlCl<sub>3</sub>, FeCl<sub>3</sub>, ZnCl<sub>2</sub>. Hydrogenating catalysts accelerate the decompn. of org. mols. at a high temp., while the cracking catalysts favor the hydrogenation of aromatic compds., providing the optimum temp. is not exceeded. Five varieties of coal were studied and catalyzed with Fe<sub>2</sub>O<sub>3</sub> for controls. The elementary analyses and yields at a low (550°) temp. distn. are given. A 1.8 l. rotating autoclave was filled with 150–200 g. of dry coal, a catalyst and steel balls. H was allowed to enter until the pressure of H<sub>2</sub> remained const. After the autoclave was cooled the gas within was measured and analyzed. A portion of the H<sub>2</sub> is fixed to the gas; the remaining H is attached to the solid and liquid residue. The H attached to the gas is computed from the gas analysis. In the course of hydrogenation, the catalysts influence not only the H absorbed but also the distribution between the gas, liquid and solid. After hydrogenation, the liquid and solid residue was sepd. into 3 fractions by distg. at 450°: (1) fraction contg. H<sub>2</sub>O, (2) an oil distg. below 300° and (3) a residue. The phenols in the oil were detd. with the aid of 5% NaOH and the pyrimidine bases with 10% H<sub>2</sub>SO<sub>4</sub>. The oil freed of phenols and bases was rectified, and the sp. gr. and refractive indices of all fractions are given. The residue which distd. over above 300° was sepd. into 2 fractions with petroleic ether: (1) that sol. in the ether and upon which the paraffin was detd., (2) an asphaltous residue insol. in ether. Another sample of hydrogenated coal was extd. with alc. and CHCl<sub>3</sub> and sepd. into sol. and insol. portions. In some cases, 70% of the org. bodies was dissolved in CHCl<sub>3</sub>, but the proportion of org. bodies sol. in CHCl<sub>3</sub> is no indication of the amt. of tar. All coals were hydrogenated with Fe<sub>2</sub>O<sub>3</sub> for a control. Dried lignite from the mine Karolina in Northern Bohemia contg. 8.2% ash was hydrogenated with Fe<sub>2</sub>O<sub>3</sub>, the mixts. Fe<sub>2</sub>O<sub>3</sub> + anhyd. ZnCl<sub>2</sub>, Fe<sub>2</sub>O<sub>3</sub> + ZnCl<sub>2</sub> + AlCl<sub>3</sub>, and Co<sub>2</sub>O<sub>3</sub> + CuO being used as catalysts. Calling the activity of Fe<sub>2</sub>O<sub>3</sub> = 1, that of Fe<sub>2</sub>O<sub>3</sub> + ZnCl<sub>2</sub> = 1.43, and Co<sub>2</sub>O<sub>3</sub> + CuO = 1.65. The phenol and crude oil content was increased 33% in these last 2 cases. The addn. of AlCl<sub>3</sub> to the catalytic mixt. produced a deep cleavage of mols. in which the yield of tar compared to that of Fe<sub>2</sub>O<sub>3</sub> alone is not increased, but the coke and gases increased greatly. The Co<sub>2</sub>O<sub>3</sub> + CuO mixt. yielded 6.8% gasoline and 5.0% of oil, b. p. above 300°; it shortened the time of reaction from 16 to 9 hrs. The ZnCl<sub>2</sub> yielded the best quality of lubricating oils; Co<sub>2</sub>O<sub>3</sub> increased the formation of phenols in the crude oil. Lignite from the mine Hedvika contg. 9.0% ash was hydrogenated with FeCl<sub>3</sub>, anhyd. NiCl<sub>2</sub>, anhyd. CuCl, the mixt. ZnO + KOH, and CaO + Fe<sub>2</sub>O<sub>3</sub> being used as catalysts. The NiCl<sub>2</sub> was best fitted for hydrogenating this lignite, for after a const. H<sub>2</sub> pressure the residual product was entirely liquid, the absorption of H<sub>2</sub> was maximal, and the liquid yielded good lubricating oils. The product contained 8.7% gasoline, 9.7% oil, b. p. above 300°. The CuCl is less influential than NiCl<sub>2</sub>; the absorption of H<sub>2</sub> is lower; the quality of the oil is poorer; more cracking occurs; and the yield of gas is higher and that of paraffin is lower. The ZnO + KOH mixt. is inferior to CuCl but is better than Fe<sub>2</sub>O<sub>3</sub> used alone; the KOH has no effect upon the hydrogenation of phenols. CaCl<sub>2</sub>

has no effect upon the hydrogenation of coal. Lignite from the mine Handlova located in Slovakia contg. 5.1% ash was hydrogenated with  $\text{Fe}_2\text{O}_3$ , the mixts.  $\text{ZnCl}_2 + \text{NiCl}_2$ ,  $\text{ZnO} + \text{NiO} + \text{NaOH}$  and  $\text{CoCl}_2 + \text{CuCl}$  being used as catalysts. With the  $\text{ZnCl}_2 + \text{NiCl}_2$  mixt. of catalysts,  $\text{H}_2$  was introduced in 8 phases. During the 1st stage, lignite absorbed 3.7%  $\text{H}_2$  on the basis of org. matter, of which 1.8% remained in the solid and liquid residue. In the 2nd stage, 1.5%  $\text{H}_2$  was absorbed; 0.6% was absorbed by the solid and liquid residue. In the 3rd stage 0.68%  $\text{H}_2$  was absorbed and 0.65% was absorbed by the gas. During the 2nd and 3rd periods, a deep cleavage of molecules occurred with the formation of gaseous and liquid hydrocarbons having a low b. p. During the 3rd period, hardly any hydrogenation occurred. The activity of the catalysts is:  $\text{Fe}_2\text{O}_3 = 1$ ,  $\text{ZnCl}_2 + \text{NiCl}_2 = 1.12$ ,  $\text{ZnO} + \text{NiO} + \text{NaOH} = 1.31$  and  $\text{CoCl}_2 + \text{CuCl} = 1.66$ . In a 9-hr. period the  $\text{ZnCl}_2 + \text{NiCl}_2$  catalytic mixt. yielded 7% gasoline, 2.3% oil, b. p. over  $300^\circ$  and paraffin 0.06%. The coal Prago from Kladno in Northern Bohemia was hydrogenated with the catalysts  $\text{Fe}_2\text{O}_3$ , the mixt.  $\text{NiO} + \text{Al}_2\text{O}_3$ , the mixt.  $\text{Fe}_2\text{O}_3 + \text{SnCl}_4$ , anhyd.  $\text{ZnCl}_2$  at 93 atms. pressure and anhyd.  $\text{ZnCl}_2$  at 114 atms. The relative activities are 1.00, 1.33, 1.27, 1.54, 2.21. The  $\text{SnCl}_4$  shows an excessive tendency toward cracking. The  $\text{ZnCl}_2$  functions best at high pressure and yields the highest amount of gasoline (14.1%) of all expts. and absorbs 6.5%  $\text{H}_2$ .  $\text{ZnCl}_2$  favors hydrogenation more than  $\text{SnCl}_4$ . The optimum temp. for hydrogenating coal is much higher for coal than for lignite; for brown coal  $430^\circ$  is a satisfactory temp. coal from the mine Jaroslav located in Moravian Ostrava was not fitted for hydrogenation on account of a high C content. The relative activity of the catalysts tried was  $\text{Fe}_2\text{O}_3 = 1$ ,  $\text{FeCl}_3 \cdot 4\text{H}_2\text{O} = 1$ ,  $\text{MnCl}_2 = \text{below } 1$  and  $\text{SnO} + \text{NaOH} = 1.3$ . In one attempt  $\text{H}_2$  was replaced by  $\text{N}_2$ . This process is useless for liquefying coal, for the catalysts are without any action upon the decompn. of mols. when subjected to a  $\text{N}_2$  pressure. The hydrogenation works in 3 phases: (1) A rapid absorption of  $\text{H}_2$  is accompanied by a reduction and conversion of the coal to an asphaltous mass. (2) The asphaltous mass becomes soft and plastic (almost a fluid). (3) Cracking of the hydrocarbons occurs with the formation of gases and liquids. The best catalysts tried were:  $\text{ZnCl}_2$ ,  $\text{ZnO}$ ,  $\text{NiCl}_2$ ,  $\text{NiO}$ ,  $\text{CoCl}_2$ ,  $\text{Co}_2\text{O}_3$  and  $\text{CuCl}$ ; all of these were better than  $\text{Fe}_2\text{O}_3$ ; they doubled the yield of tar and diminished the time of reaction by  $1/2$ . These catalysts do not permit the temp. or pressure to be lowered without affecting the yield of products but influence (1) the intensity of the reaction, (2) the rate of decompn. of the coal mols. and (3) the rate of hydrogenation only secondarily. All expts. were made without a previous addn. of oils; oils hasten and favor hydrogenation and increase the yield of gasoline. In general, the yields obtained in hydrogenating coal by a continuous process with an addn. of tar oils having a high b. p. and  $\text{Fe}_2\text{O}_3$  are the same as those obtained with the above catalysts without the previous addn. of oils. F. M.

The present condition of low-temperature carbonization of coal and lignite in different countries. DAVID BROWNLEE. *Chaleur et ind.* 9, 222-33(1928). S. L. B. E.

Low-temperature carbonization of Brazilian bituminous coals. F. W. FRIGSE. *Brennstoff-Chem.* 9, 385-7(1928).—Proximate and ultimate analyses are given of coals from 12 Brazilian mines. These coals are carbonized in a rotary retort (after Fischer) holding 15 kg. of coal. Analyses of the coke, tar and gas are given. J. D. DAVIS

The swelling of bituminous coal (on coking). G. LAMBRIE. *Brennstoff-Chem.* 9, 341-6(1928).—The swelling of coals as judged by their behavior during the detn. of volatile matter by various available methods is discussed. Different methods give different degrees of swelling and L. proposes a thermal explanation of this. If the heating conditions are such that the coking mass is quickly and uniformly enclosed in an envelope of coke, this tends to keep the plastic mass within from expanding. If, however, heat does not penetrate uniformly—if the heating of the crucible, e. g. is one sided—the coking mass will grow in the direction opposite to the slowly heated side. L. proves this by insulating the bottom of his Pt crucible (Bochumer method) with a layer of kieselguhr. The degree of swelling with kieselguhr is 35.7 as compared with 7.6 when the Bochumer method as ordinarily applied is used. L. uses other substances than kieselguhr and finds that the degree of swelling is inversely proportional to the cond. of the material used. J. D. DAVIS

Low-temperature coking of Chelyaba brown coals. N. N. ROGATKIN. *Ural Polytech. J. Chem. Ind.* (Moscow) 5, 1278-9(1928).—Tests show that in the coking of Chelyaba coals the yield of liquid products has but a slight increase above  $400^\circ$  and that the max. is attained at  $470^\circ$ . The yield of gas begins to grow rapidly above  $450^\circ$  at the expense of the yield of coke. The speed of heating the still has no essential influence on the yields of the decompn. products. Twelve kg. of Chelyaba brown coal contg. 15.52% moisture, 7.31% ash and 1.20% S were coked in a F. Fischer's revolving

furnace, the max. temp. reached being 450°, and the total duration of the distn. being 4 hrs. Under those conditions the liquid distillate represented 17.8% of the dry coal (7.6% being tar); the coke represented 72.5% of the dry coal; and the gas amounted to 7150 l. per 100 kg. of coal. The coke contained 0.55% moisture, 12.95% ash and 0.5% S. The gas, after being freed from H<sub>2</sub>S, had the following compn.: CO<sub>2</sub> 16.6%, unsatd. hydrocarbons 2.4%, CO 8.6%, H 12.5%, CH<sub>4</sub> and homologs 46.1%, O 2.5% and N 11.3%. The calorific capacity of the gas was from 6589 to 7089 cal. B. N.

**Primary tar of Chelyaba brown coals.** I. YA. POSTOVSKII. *J. Chem. Ind. (Moscow)* 5, 1279-80(1928).—The tar obtained by Rogatkin (cf. preceding abstr.) with an av. yield of 6.5% on the weight of crude Chelyaba coal had the following characteristics: solidification point below 0°, d<sub>25</sub> 1.0350, mech. impurities 4.6%, moisture 12.3%, ash 2.46%, phenols 40.0%, calorific capacity 8873 cal. The elementary compn. was C 73.36, H 7.86, N 1.42, S 0.25 and O 17.11%. The chief characteristics of the tar are the low paraffin contents and the high phenol contents. The tar water, which was obtained in the quantity of 23.5%, is brown colored and is characterized by an unusually high NH<sub>3</sub> content, namely 0.3%. BERNARD NELSON

**How to sample coal from unit pulverizers.** R. S. JULESRUD. *Paper* 62, 673-4 (1929).—Various types of sampling methods were tried but with discordant results. A standard type of sampler and of procedure should be adopted. D. B. DILL

**Average composition of the ash of Ruhr coals.** D. J. W. KREULEN. *Brennst.-ff. Chem.* 9, 399(1928).—Ash residues from 4000 com. samples of Ruhr coals were combined, sampled and analyzed. The compn. of the composite sample was: SiO<sub>2</sub> 41.5, SO<sub>3</sub> 0.4, P<sub>2</sub>O<sub>5</sub> 0.5, Fe<sub>2</sub>O<sub>3</sub> 18.4, Al<sub>2</sub>O<sub>3</sub> 31.5, MnO 0.7, CaO 1.2, H<sub>2</sub>O-sol. (mainly CaSO<sub>4</sub>) 4.8%. In CO atm. an ash cone began to fuse at 1180°, bent over at 1215° and was wholly fused at 1230°. 4.8% of the ash was sol. in H<sub>2</sub>O, 41.0% in HCl and 54.2% insol. in HCl. J. D. DAVIS

**Chart for determining loss by combustible in refuse.** C. A. KULMANN. 69, 712-3(1929).—A d'Ocagne nomograph is devised based upon the relation, loss in B. t. u. per lb. dry fuel = 14,600 .1C (1 - C), where .1 is the ash content per lb. of dry coal and C the carbon content of the refuse. D. B. DILL

**Notes on peat bitumens.** G. I. STADNIKOV AND N. G. TITLOV. *Brennst.-ff. Chem.* 9, 357-8(1928).—Various peat samples are extd. with C<sub>2</sub>H<sub>5</sub> EtOH soln., a yield of 8.0 to 20% of bitumen, on the basis of org. peat substance, being obtained. This bitumen can be sepd. into cryst. wax and insol. amorphous resin by extn. with alc. ether soln. Successive extn. with benzine and benzene also serves to sep. waxes and resins. Bitumens consist of about 45 pts. wax and 55 pts. resin. The resins are easily polymerized by heating to 180° and rendered insol. in CS<sub>2</sub> and CHCl<sub>3</sub>. Comparative distn. of the peat and bitumens indicates that in the initial stages of destructive distn. of peat polymerization of the resins is involved. J. D. DAVIS

**Comparative activity of bromine on cellulose, lignin, wood, brown coal and bituminous coal.** W. FUCHS. *Brennst.-ff. Chem.* 9, 348-50(1928).—Br in CCl<sub>4</sub> soln. acts on lignin, wood and brown and bituminous coals both by addn. and substitution, but not at all on cellulose. It does not, however, act on wood that has been completely dried over P<sub>2</sub>O<sub>5</sub>. Total Br taken up (air-dried substances) was 9.2, 11.4, 0.0, 10.8, 12.0 for pine wood, lignin, cellulose, brown coal and bituminous coal, resp. J. D. DAVIS

**Modern views on the evaluation of gas coal; the specific quality index.** G. A. BRENDER A BRANDIS AND H. J. A. DE GOEY. Lab. Gemeentelijk Gasbedrijf's Gravenhage. *Het Gas* 49, 91-103(1929). The method of Geipert (*C. A.* 21, 196) was examd. and compared with the crucible method and the one of B. and Vlugter (*C. A.* 22, 2651). It detcs. the volatile in coal samples under approx. technical conditions (cold coal dropped in a hot oven) and at the same time allows detn. of tar and gas qualities and quantities. Five or 6 little briquets (total wt. about 10 g.) of pressed powd. coal are dropped in a quartz tube kept at 1100°, the tar is caught in a tube with cotton wool and the gas is collected in a graduated cylinder. The expt. takes 12 mins.; by repeating it twice enough gas (10 l.) is gathered to permit a direct detn. of calorific value and an analysis. From the results obtained and tabulated for 12 gas and coke coals it is found that the "quality index" of them (calorific value of gas times vol. produced per g. coal) in cal. per g. does not run parallel at all with the volatile matter, detd. as usual per crucible. This indicates an inferiority of the latter method; for certain classes of coal (Yorkshire, Ruhr) the ratio of the 2 figures seems to be more or less const. For volatile matter, gas yield, quality index and ratio of quality index and volatile matter was found, resp.: for German gas coal (all results on dry coal) 32.6%, 0.2764 cu. m. per kg., 1273 cal. per kg., 39.0; in Yorkshire coals: Hatfield 39.0, 0.3286, 1700, 43.6; mixed 36.2, 0.3126,

1630, 45.0; Firbeck, Markham 37.6, 0.3205, 1704, 45.3; Rossington mixt. 26.3, 0.3242, 1715, 47.2; Firbeck 35.8, 0.3215, 1751, 48.3; in Ruhr coals: Bismarck nut 35.0, 0.3342, 1805, 51.6; Constantin der Grosse nut 33.8, 0.3560, 1860, 55.0; Mt. Ceniz nut 32.8, 0.3400, 1830, 55.8; in Natal coal (S. Africa) 25.5, 0.3278, 1539, 60.4; in coking coals: Emma fat fine 23.5, 0.3334, 1597, 68.0; Shamrock fat fine 23.2, 0.3494, 1683, 72.5. Similar variations were previously observed with the modified Bähr method. Gasification expts. were further made with several other materials: for cellulose was found (cotton wool) volatile matter 92.8%, gas yield 0.6041, quality index 2603; for lignite 51, 0.5216, 1737; and for anthracite 6.64, 0.2859, 891. The quotient of quality index and volatile matter both related to dry coal is named the "specific quality index"  $\Omega$  and indicates the no. of calories per hundred volatile, i. e., the quality of the volatile of the coal. It varies considerably with the type of coal; its value is for cellulose, lignite, German gas coal, Yorkshire coal, Bismarck nut, Emma coke coal, Shamrock coal and anthracite, resp.: 29.1, 34.2, 47.7, 58.3, 64.4, 76.7, 84.3 and 129.1. The value of  $\Omega$  is found by  $\Omega = W_D/V_D = W_v/(V_v - f)$  for  $W_D$  and  $W_v$  the quality index on dry and moist coal, resp., as detd. by the Geipert method,  $V_D$  and  $V_v$  the corresponding values for the volatile matter,  $f$  the percentage moisture. Obviously the value of  $\Omega$  is independent of the ash content of the coal. Generally  $\Omega$  decreases with increasing  $V_R$  (volatile of ash-free), as shown in a curve. The cause for the considerable variation in the  $\Omega$  values for various coals is found in their O content. Data of St. Claire Deville and of the author, the latter by direct O detn. in the coal (ter Meulen method), show this relation conclusively. For the same 8 samples as used before the O on ash-free was 49.4, 26.58, 12.7, 6.4, 5.6, 4.2, 2.9 and 1.50, the O/H quotient: 8.00, —, 2.41, 1.15, 1.00, 0.93, 0.63, —. It is apparent that coals of high volatile can at the same time have a low quality index due to excessive  $H_2O$  production. Anthracite compares in this respect favorably with gas coal; coking coal with 22% volatile gives the same quality index as Yorkshire gas coal with 33% volatile. For economic reasons considering the coke yield, this difference is very significant and should be carefully considered in the purchase of coals. The "isotherm" of  $\Omega$  versus the O/H quotient is discussed and several theoretical cases are considered. It is finally remarked that the Geipert method cannot be used for detn. of the caking quality of coal; the crucible test is necessary for that.

B. J. C. VAN DER HOEVEN

Study of gasification and practical operation of producers. H. GUILLON *Chaleur ind* 10, 37-43 (1929), cf. C. I. 23, 2272. A discussion of the use of charcoal, anthracite coal and coke in gas producers, and their operating characteristics.

S. L. B. ETHERTON

Welded pipe for long-distance gas transmission. LIPPERT *Gas u. Wasserfach* 72, 267-71 (1929). Various types of welded joints used on steel tubes for high-pressure gas transmission are illustrated and discussed. Welded joint failures are usually due to poor welding of the lower part of the joint. Oxy acetylene flames are used and soft pure (Swedish) iron welding rods were found to be most satisfactory. Five men lay about 4000 ft. of 4 in. pipe per week. Pipe over 10 in. in diam is welded in place, but smaller pipe is welded outside the ditch. Pipe lines are tested under 5 to 10 atm. pressure with compressed air. Above 6 atm. pressure a whistling sound is noted at leaks. The use of compressed O for the test caused several accidents. Joints are asphalted and covered with jute. Drips are constructed by welding short pipe sections. Naphthalene appears to be efficiently removed by the lubricating oil used in the compressor. Expansion bends are not used but pipes are laid at least 3 ft. deep to avoid violent temp. changes.

R. W. RYAN

New developments in gas-works carbonizing plant, with special reference to refractory materials. G. M. GILL. *Trans. Ceram. Soc. (Eng.)* 28, 7-14 (1929).—The general practices are discussed; the tendency is toward higher carbonizing temps. Siliceous and fireclay refractories are giving way to silica linings for the hotter zones.

H. F. K.

Cleaning gas for flue-gas testers. CARL HÜTTER *Feuerungstech.* 16, 214 (1928).—Stoppages in  $CO_2$  recorders due to  $H_2S$ , which corrodes the lines and the Hg, may be avoided by putting 2 wash bottles, contg.  $CuSO_4$  and  $H_2SO_4$ , respectively, in the line.

ERNEST W. THIELE

Modern methods for producing illuminating gas. R. GEIPERT *Gas u. Wasserfach* 72, 169-74, 205-10 (1929). Methods for producing the largest vol. of gas from a given oven or retort system are discussed. Such methods are: increasing inerts, adding water gas directly or steaming in the retorts. The ash of the larger coke sizes is only slightly increased by steaming as the greatest effect is on the fines. Condensing, waste heat boilers, water gas generators and the addn. of water gas to coal gas are

discussed, as well as the influence of water gas production on the amt. of salable coke. R. W. RYAN

**Water-gas practice.** W. SCHWEDER. *Gas u. Wasserfach* 72, 261-3(1929).—Although gas analyses are essential in maintaining water-gas generators at peak efficiency automatic gas analysis app. requires so much supervision as frequently to render their use impractical. An app., consisting of 6 or more water-jacketed gas-measuring burets, attached to manifolds, and provided with suitable absorption pipets, is described; it permits the rapid procurement of successive samples. This app. is especially adapted to CO<sub>2</sub> detns., and a series of results is given. The efficiency of the water-gas operation can best be studied by sampling directly at the generator. Difficulties due to tar and undecompd. water vapor as well as dust are encountered. A small baffle plate tar separator is described and illustrated. This is said to permit almost complete removal of tar fog. In a typical case analytical results indicated that the valve between superheater and boiler did not close tightly. When this was remedied the efficiency of gasification was increased from 62 to 67%. R. W. RYAN

**Synthesis of high hydrocarbons for water gas.** BENITO A. BUYLEA AND J. M. PERTIERRA. *Anales soc. españ. fís. quim. (tecnica)* 27, 23 38(1929).—In the catalytic reduction of CO contained in water gas by CuO, Co<sub>3</sub>O<sub>4</sub> and MnO<sub>2</sub>, a test was made at 254°, lower than any previous temp. Here the contraction was less than at higher temp. but the yield of liquid and solid hydrocarbons was higher. The necessity of extreme purification of water gas to maintain activity of a catalyst activated by successive oxidations and reductions is shown. E. M. SYMMES

**Improvement in the recovery of benzene from coke-oven gases.** M. MINOT. *Chimie et industrie* 21, 252(1929).—Benzene-extrn. efficiency can be appreciably increased by continuous purification of the oil by centrifuging before returning into the extrn. cycle. The merits of this improvement are briefly discussed. A. P.-C.

**Continuous distillation of tars or crude mineral oils by means of superheated steam.** HENRI J. V. WINKLER. Cie. des Mines de Vicoigne, Noeux et Drocourt. *Chimie et industrie* 21, 466-72(1929).—A description of the Abder Halden process (C. A. 16, 1498; Brit. pat. 239,841, C. A. 20, 2244). A. PAPINRAU-COUTURE

**Formation of sulfur-rich carbons by the action of sulfur dioxide.** F. FISCHER AND A. PRANSCHKE. *Brennstoff-Chem.* 9, 361 3(1928). Low temp. cokes prepd. at 500° from briquets, pine wood, cellulose and activated charcoal were treated at 300° to 500° in a stream of SO<sub>2</sub>. The product contained from 1.4 to 37.5% S which could not be extd. by solvents. With wood and filter paper where the carbonization was carried out in SO<sub>2</sub>, 37.5 and 35.5% S were found, resp., in the carbonaceous residues. When the precarbonized material was treated with SO<sub>2</sub>, the S taken up was 1.4 and 2.7%, resp. Carbon pptd. from CO took up 8.1% S at 450°. F and P state that while the S may not be in true chem. combination with the C it certainly does not behave as though it were physically adsorbed. J. D. DAVIS

Collected colloid references. VIII. Flotation (KELLERMANN) 13. Can cheaper power be obtained by pre-treating coal? (KNAPP, McMICHAEL) 13. Tar and asphalt, the best means of combating dust (SCHNEIDER) 20. Apparatus for the determination of C<sub>2</sub>H<sub>4</sub> by the activated-C method (TRAMM) 1. Kinetics of the combustion of CO (FINKELSTEIN, MASHOVETZ) 2. The microstructure of New Zealand lignites (EVANS) 3. Fushun coal and its geological significance (IWASAKI) 8. The significance of P content in explaining the formation of fusain (BECHLER) 8. The utilization of city sewage under special conditions and the collection of gas from the sludge tanks (HEILMANN) 14. Oily flotation agent (U. S. pat. 1,709,447) 22. Apparatus for separating [coal from slate] (Brit. pat. 297,876) 1. Furnace for heating steam generators, retorts, coke ovens, etc. (Brit. pat. 297,395) 1. Flotation process (Fr. pat. 649,270) 9. Oil refining (Fr. pat. 649,203) 22.

THOM, W. T., JR. *Petroleum and Coal, the Keys to the Future.* Princeton, N. J.: Princeton Univ. Press. 223 pp. \$2.50.

**Apparatus for briquetting fuel.** LUCIEN LIAIS. Fr. 649,070, Feb. 15, 1928.  
**Method of delivering liquid fuel to vapor burners.** JOSEF FETTER. Fr. 649,245, Feb. 18, 1928.

**Destructive hydrogenation of coal.** KARL SCHÖENEMANN. U. S. 1,709,957, April 23. Liquid products obtained by treatment of coal with H are freed from water and components of relatively low b. p., admixed with an aliphatic hydrocarbon material



such as gas oil and the pptd. mixt. of asphalt and solid insol. substances is sepd. from the dissolved mixt. of coal oil and pptn. oil.

**Apparatus for drying coal or other materials.** MICHAEL D. JONES (to Fuller-Lehigh Co.). U. S. 1,709,351, April 16. An app. is described in which the material to be dried is passed downwardly while heated by drying gases.

**Apparatus for distilling coal or other solid materials by conveying them adjacent to the surface of a bath of molten lead or similar material.** EMIL PIRON and VIRGINIUS Z. CARACRISTI (to Piron Coal Distillation Systems, Inc.). U. S. 1,709,370-1, April 16.

**Still for distillation of gases from coal or other materials with steam.** ELMER H. RECORDS. U. S. 1,710,070, April 23.

**Oven for the carbonization of coal or lignite at high or low temperature.** H. HARDY. Belg. 353,484, Sept. 30, 1928. Constructional features.

**Cooler for dried brown coal.** "EINTRACHT" BRAUNKOHLENWERKE UND BRIKETT-FABRIKEN. Ger. 473,028, Dec. 2, 1928.

**Plant for drying peat and similar fuel.** FRABA A.-G. Swiss 129,794, Feb. 3, 1928. Addn. to Swiss 124,804.

**Disintegrating and mixing apparatus for soft masses such as peat and clay.** EDWARD W. C. PIERING. Ger. 473,029, Feb. 21, 1922. Addn. to 353,739.

**Distillation of wood or coal.** GASPARD JAKOVA-MERTURI. Fr. 648,978, June 30, 1927. Heated deoxygenated air along with steam is passed through the charge. A suitable app. is described.

**Production of a combustible vegetable agglomerate from wood or other ligneous material.** C. DEMOULIN and A. DETOMBAY. Belg. 353,367, Sept. 30, 1928. Ground charcoal or other fuel is mixed with a binder such as ground pitch obtained by the carbonization of wood. The resulting mixt. is pressed into the desired shape.

**Treating carbonaceous matters for the production of distillation products such as hydrocarbons, metallized coke, etc.** FABRIQUE NATIONALE PROD. CHIM. ET D'EXPLOSIFS. Belg. 353,599, Sept. 30, 1928. Improvement on 344,817. Before carbonization the carbonaceous material is mixed with oxidizing agents such as nitrates, carbonates or oxides. The product of carbonization is used as fuel in water-gas producers. The resultant gas is made to react with the volatile carbonization products after the latter have been passed through a condenser to remove the tar, which is similar to crude petroleum.

**Process and apparatus for the production of light hydrocarbons (benzine, gasoline) during the low-temperature carbonization of solid fuels.** A. MEIRO. Belg. 353,736, Sept. 30, 1928. The powdered fuel is passed successively by means of horizontal worm conveyors through 5 horizontal retorts, which are maintained at increasing temps., and then through an unheated inclined retort, which discharges it into a hermetically sealed container. The distn. products are passed through a condensing tower. Part of the uncondensed gases are burned in the furnace supplying heat to the retorts, and the remainder is sent back into the retorts. The products condensed in the lower portion of the tower are sent back to the first retort (which is at the lowest temp.). Cf. C. A. 22, 313.

**Bleaching montan wax.** I. G. FARBENIND. A.-G. Fr. 648,230, Feb. 4, 1928. Montan wax is put in suspension in a soln. of a chromic salt and afterward treated with chromic acid in the presence of  $H_2SO_4$ , preferably a  $H_2SO_4$  soln. of chromic acid which has already been used for oxidation is used for suspending the wax. A soln. of chromic acid which has been regenerated by electrolysis is used in the process, in which a temp. above  $100^\circ$  is used. Cf. C. A. 23, 1253.

**Drying fuel gas.** C. COOPER, D. M. HENSHAW and W. C. HOLMES & Co., LTD. Brit. 208,097, May 2, 1927. Gas such as city gas is dried, preferably by contact with hygroscopic material in the liquid state, while under a pressure (suitably up to 50 lbs. per sq. in. or higher) higher than that necessary for securing its delivery at suitable pressure to distant points of the distributing system. The gas also may be cooled to dissipate compression heat or to a further degree as described in Brit. 285,936 (C. A. 23, 265), and the drying agent may be concd. for reuse, periodically or continuously as described in Brit. 248,841 (C. A. 21, 815). After treatment with the liquid drying agent, the gas may be brought into contact with a solid drying material such as  $CaCl_2$ , which forms a gas by reaction with water. Cf. C. A. 23, 2278.

**Combustion gases.** VINCENT SCHOBHENS. Fr. 649,213, Feb. 17, 1928. Gases such as  $C_2H_2$  or  $CH_4$  to be used as motor fuel are improved by bubbling them through liquids such as  $MeOH$ ,  $EtOH$ , masout, petroleum, tar,  $C_6H_6$  or  $C_{10}H_8$ .

**Reducing gases.** KALI-INDUSTRIE A.-G. and T. THORSSALL. Brit. 208,190, Oct. 5, 1927. To enable poorer gases, such as coke- or blast-furnace gases, lignite-

distn. gases or waste-reducing gases from the process, to be used as reducing gases in the process of prepg. gases for  $\text{NH}_3$  synthesis described in Brit. 288,154 (C. A. 23, 486), the gases are passed through a layer of glowing carbonaceous material such as coke so that the ratio  $\text{CO}_2:\text{CO}$  in the treated gases is at most 0.4 and the ratio  $\text{CO}:\text{CH}_4$  is at least 1.5. Various details and modifications are described.

**Water gas.** CHARLES W. ANDREWS. U. S. 1,709,107, April 16. In making water gas from a fuel bed in a dry bottom-closed chamber having a stationary grate, with alternate blasting of the fuel bed by air and steam, there are maintained upper fuel zones, an intermediate clinker formation zone and a lower ash zone; the walls of the clinker formation zone are water-cooled and large masses of clinker which form are broken up by grinding them against each other and against the walls of the chamber by up and down agitation of the fuel and ash beds and continuous agitation of the ash bed from the center outward. An app. is described.

**Water-gas producer with a distillation zone above the main fuel bed and with fuel agitators.** A. V. TULLY. Brit. 297,568, Sept. 12, 1927. Various structural details are described.

**Automatic gas producer.** A. JADOUX. Belg. 352,779, Aug. 31, 1928. Constructional features.

**Generating gas.** CHARLES W. ANDREWS and WILLIAM B. CHAPMAN (one-half each to H. A. Brassert & Co. and Western Gas Construction Co.). U. S. 1,709,335, April 16. In making water gas in a generator having a relatively thin firebed, the firebed is air-blasted and an intermediate zone in it is maintained at a sufficiently high temp. to liquefy a substantial portion of its ash content; the liquefied ash is passed downwardly to a solidifying zone and an agitating device is passed through the solidifying zone to break up the clinkers before large masses are formed; steam passed through the heated firebed serves to form water gas. An app. is described.

**Gas generator.** CHARLES W. ANDREWS and WILLIAM B. CHAPMAN (one-half each to Chapman Engineering Co. and Charles W. Andrews). U. S. 1,709,334, April 16. A generator is described having a grate to support an ash bed, a pressure equalizing chamber underlying the grate, inlet and outlet connections for gases leading to the chamber, and an ash pit surrounding the pressure chamber.

**Apparatus for discharging the contents of gas retorts.** GAS, LIGHT & COKE CO. and S. HOLDWAY. Brit. 298,093, March 28, 1927.

**Synthetic tar.** ANTHIME J. DURIEUX. Fr. 648,985, July 1, 1927. A tar is made by mixing empyreumatic oil, resin oil and black pitch with or without colophony.

**Separating phenols and hydrocarbon materials from low-temperature tar.** ADOLF CORRELL (to Zeche Mathias Stinnes). U. S. 1,709,309, April 16. Low temp. tar or tar distillates after being mixed with dil. alc. are treated with  $\text{NH}_3$  gas while cooling until the mixt. is satd. with  $\text{NH}_3$ ; on settling, 2 layers are formed; the upper layer consists mainly of neutral oils and the lower layer contains the phenols. These layers are sep'd.

**Apparatus for emulsifying tars or bitumen.** JONAS H. DUSSEAUX. Fr. 648,275 and 648,276, Jan. 3, 1928.

**Process for treating coke-oven gases and the like.** UNION CHIMIQUE BELGE. Belg. 353,020, Aug. 31, 1928. The cold gases from the tar and ammonia water condensers are washed with a soln. rendered alk. by absorption of  $\text{NH}_3$ . They are then washed with a cold neutral liquid which may consist of  $\text{H}_2\text{O}$  or of  $(\text{NH}_4)_2\text{SO}_4$  soln.

**Coke-oven by-product recovery system.** S. P. MILLER (to Barrett Co.). Brit. 298,153, Oct. 4, 1927. Recovery of pitch from hot coke oven gases is effected by cooling them to such a temp. that particles of pitch of a desired compn. are formed and scrubbing the gases at such temp. with hot pitch of similar compn. to that carried in suspension in the gases. The gases are then further cooled to effect direct recovery of oils. An app. and various details of procedure are described.

**Coke-oven structure with transverse regenerators and vertical flues.** SIMON CARVES, LTD. and J. H. BROWN. Brit. 298,285, July 14, 1927. Various structural details are described.

**Coke-oven construction with a steam injection device.** LOUIS WILPUTTE (to Wilputte Coke-Oven Corp.). U. S. 1,710,464, April 23.

**Universal oven for the production of semi-coke in graded sizes.** A. F. A. CHAROT. Belg. 352,923, Aug. 31, 1928, and 353,482, Sept. 30, 1928. Constructional features.

**Method of charging coke furnaces.** PAUL TRIGRET. Fr. 648,535, Feb. 8, 1928.

## 22—PETROLEUM, LUBRICANTS, ASPHALT AND WOOD PRODUCTS

W. P. FARAGHER

**Formolite analysis of petroleum.** JAROSLAV HOŠEK. *Chem. Obzor* 4, 67-70 (1929). A critical analysis of the Nastukov reaction (*Zhurnal Russ. Fiz. Khim. Obshchestva* 36, 881 (1904); *C. A.* 6, 150; 20, 496).

**Cracking in the petroleum industry.** LEOPOLD SINGER. *Metallbörse* 18, 901-2, 1014-5, 1071-2 (1928). An elementary description of distn. and the most common cracking processes.

**Standardization of conditions for measuring the detonation characteristics of motor fuels.** R. STANSFIELD AND F. B. THOLE. *Ind. Eng. Chem., Anal. Ed.* 1, 98-105 (1929). Tests made by the Engine Research Department of the Anglo-Persian Oil Co. in an effort to standardize the methods for measuring detonation show that comparable results can be obtained from any of the different types of engines if comparisons are made in terms of equiv. blends of standard spirits and if test conditions are suitably controlled. Of the latter the most significant variables are the air-fuel and the compression ratios. There is urgent need for the development of manufg. methods for a pure and cheap detonating hydrocarbon to replace the costly heptane now used as a reference fuel, and for the international adoption of a standard method for making the detonation tests.

**Knock ratings of pure hydrocarbons.** S. F. BIRCH AND R. STANSFIELD. *Nature* 123, 490-1 (1929). Commenting on the statement of Nash and Howes (*C. A.* 23, 2561) that pseudocumene is proknock in tendency, B. and S. point out that it is only less antiknock than benzene, which is also true of Edlar's octane (1,1,3-trimethylpentane). Objection is also made to Nash and Howes' figures ranking diamylene above trimethylethylene in antiknock properties. All previous refining experience confirms the authors' findings by engine tests, that polymerization tends to lower the antiknock properties. The rating of cyclohexene depends upon whether cyclohexene peroxide has formed in it or not. Ultra violet light favors the formation of peroxide. Cyclohexene contg. peroxide does not deposit gum. The more compact the mol., the better the antiknock quality of the hydrocarbon. Conjugated double bonds are accompanied by high antiknock properties. Diolefins, in which the double bonds are not conjugated, as diallyl, are not good antiknock compds. It is well recognized that increase in length of a side chain reduces antiknock properties, yet the contrary is true for benzene itself.

EMMA E. CRANDAL

**The cracking of paraffin oils and crude petroleum of Gbely in the presence of catalysts.** J. KORDIČEK. *Petro. i. Tvor.* 10, 115-9, 135-41, 145-7 (1929). K. studied the effect of numerous catalysts upon the cracking of paraffin oils with special attention to the Czechoslovakian crude petroleum from Gbely. Three apps. were built for the purpose. The best results were obtained in an inverted sheet-iron cone 11 m. high, upper diam. 30 cm. and lower diam. 8 cm. with a cock at the bottom. A conical cover was fitted with a cylindrical column 50 cm. high and 10 cm. in diam. that connected with a condenser. The oil for cracking was introduced through a ring of perforated tubing so placed at the top that the oil dripped down the wall of the cone and cracked in vapor phase. The catalyst was contained in a conical, perforated iron basket, which fitted into the outer cone so that the walls were 0.75 cm. apart. Into the column above the cone was inserted a smaller cylinder with a perforated bottom, which was filled with reftning earth so that the cracked oil vapors left the apparatus refined. The conical portion was placed in a furnace and heated so that the apex of the cone was at 500° and the base at 250°. The temp. of the vapors leaving the app. was usually 100°. The process is carried out at atm. pressure. The app. cracks 2 l. of crude oil per hr. Investigations were made on the following oils: paraffin oil, crude petroleum of Gbely, and a low temp. tar from Zahořany. The properties of the oils follow:

Oil	Sp. gr. at 15°	First drop at	Engler Distn.				
			200	250	300	Percent to C.	400
Paraffin oil	0.865	297	—	—	—	24.8	64.2
Gbely crude	0.933	218	—	8.2	34.1	64.4	97.2
Low-temp. tar from Zahoř. any brown coal	1.037	35	22.5	25.6	35.7	residue above 300	68.8

The runs were carried out at different temps. in order to find the optimum temp. for each catalyst; the optimum for the paraffin oils and the crude was 500°, and for the low-temp. tar, 450°. Among the most satisfactory catalysts were  $\text{Ni}_2\text{O}_3$ ,  $\text{SnO}_2$ , and a compn. of Pflbram Ag-slag mixed and roasted with clay and burned fireclay, and ground fine. From 60 expts., the following are typical:

Oil for cracking	Catalyst	Temp.		Engler distillation										Gasoline or cracked oils in vol % of in-going material
		In the cracking vessel	Vapors leaving cracking vessel	Yield of cracked prod in vol. % of input at °C.	Volume percent to °C.									
1 Crude of Ghely	SnO <sub>2</sub> + SiO <sub>2</sub>	500	125	75	60	1.1	5.7	20	0	28.6	—	to 220°	21.5%	
2 Residue b above 220° from Expt 1	SnO <sub>2</sub> + SiO <sub>2</sub>	500	120	72	4	68	1.4	7.7	14.4	15.8	—	to 220°	11.4	
3 Residue b above 220° from Expt 2	SnO <sub>2</sub> + SiO <sub>2</sub>	500	120	62	5	80	1.6	5.1	10	1	13.9	to 220°	8.7	
4 Crude of Ghely		500	120	43	2	60	7.5	23.2	53.6	65.3	—	to 220°	24.2	
5 Residue b above 220° from Expt 4	Ag-slag, clay, and burned fire clay 1:1	500	120	53	6	60	2.2	8	8	22	6	to 220°	16.3	
6 Residue b above 220° from Expt. 5		500	120	58	3	75	1.4	6.2	10	5	16.3	to 220°	9.5	
7 Paraffin oil	Pumice	500	100	85	4	56	2	7	30	6	53	to 300°	70.9	
8 Crude of Ghely		500	100	45	2	55	6.8	37.0	68	8	86.2	to 220°	38.0	
9 Paraffin oil	Ag slag and burned fire-clay 1:1	500	100	82	3	55	3.0	30	6	53	0	to 300°	70.1	
10 Crude of Ghely		500	100	46	1	50	5.9	42.7	77	3	85.1	to 220°	39.2	
11 Low temp. tar from Zahofany Residue above 200°	Ag slag and burned fire-clay 1:1	410	105	83.1	62	1.5	3.5	9.0	—	—	—	to 200°	7.4	
12 Residue b above 200° from Expt. 11		410	110	86	5	67	0	4	1.4	2.0	—	to 200°	1.4	
13 Low-temp. tar from Zahofany Residue b above 200°	Ag slag and burned fire-clay 1:1	450	100	61	5	55	5	7	16	5	26	to 200°	16.2	
14 Residue b above 200° from Expt 12		450	100	64	7	58	3.2	9	5	17	5	to 200°	11.3	
15 Low-temp. tar from Zahofany Residue b above 200°	Ag slag and burned fire-clay 1:1	500	100	39	5	57	4	7	20	0	34.0	to 200°	13.7	
16 Residue b above 200° from Expt 15		500	100	47	2	60	3.3	9	3	21	0	to 200°	5.26	

Other catalysts tried were: crushed fireclay bricks; pumice before and after burning; coke; Ag slag, clay, and fireclay in the ratio 2:1:1; org. Sn +  $\text{SiO}_2$ ; Ni pptd. upon pumice;  $\text{SnO}$  deposited upon pumice from the oxalate;  $\text{Al}_2\text{O}_3$  pptd. upon pumice;  $\text{B}_2\text{O}_3$  pptd. on pumice;  $\text{Ni}_2\text{O}_3$  +  $\text{B}_2\text{O}_3$  pptd. on pumice;  $\text{MnO}$  +  $\text{SnO}$  +  $\text{B}_2\text{O}_3$  on pumice;  $\text{CN}_2\text{O}_2$  +  $\text{NiO}$  on pumice,  $2\text{SnO}_2 \cdot \text{P}_2\text{O}_5 \cdot 10\text{H}_2\text{O}$  on pumice;  $\text{Na}_2\text{SnO}_3$  on pumice; the products were refined by the Gray method. These refined products remained water-white even after 4 yrs.

The production of gasoline by cracking. F. KOUDELAK *Paliva a Topeni* 10, 119-26(1929); cf. *C. A.* 23, 694.—Numerous commercial processes and installations are reviewed.

The present methods of determining the constituent classes of hydrocarbons in gasoline. DONALD A. HOWES. *J. Inst. Petroleum Tech.* 15, 101-4(1929).—A review of the chem. agencies proposed for sepg. the 4 main classes of hydrocarbons, with reasons for the unsatisfactory results produced.

The refining of oils in the vapor phase. F. KOUDELAK. *Paliva a Topeni* 10, 148-53(1929).—A review of present-day processes.

Constitution of certain Japanese pine oils. I. SABURO AKIYAMA. *Osaka Ind. Research Inst. Bull. Osaka Ind. Research Inst.* 9, No. 10(1929).—By fractional distn. of pine tar A. obtained the following fractions: I, 0-150° (yield about 4-8%), II, terpene fraction, 150-200° (yield about 40-70%), III, terpene-alcohol fraction, 200-230° (yield

about 4-5%), IV, sesquiterpene fraction  $b_{1.5}$  100-140° (yield about 10-25%) and V, higher terpene fraction  $b_2$  above 120° (yield about 10-30%).  $I_a$ ,  $d_4^{20}$  0.8689,  $n_D^{20}$  1.4756, and  $I_b$ ,  $d_4^{20}$  0.9135,  $n_D^{20}$  1.4986, were again fractionated and the following constituents were found: benzene, toluene, furan, methylfuran,  $\alpha,\alpha'$ -dimethylfuran, diacetyl, acetylpropionyl, etc. Among the chief constituents of II are *l*- $\delta$ -pinene, dipentene,  $\beta$ -pinene, camphene and limonene.  $\alpha$ -Terpineol seems to be the only constituent of III. IV was washed with alkali and distd. under reduced pressure with Na. Certain sesquiterpenes were found. V was treated like IV and abietene, retene, or *methylinisopropylphenanthrene* and resin seem to be the chief constituents. The results of further study are to be published.

F. I. NAKAMURA

**Transformer oils and their hydrogenation.** ERWIN FERBER. Tech. Hochschule, München. *Metallbörse* 18, 2301-2(1928).—Transformer oil is hydrogenated over a Ni catalyst under 10 atm. at 170-190°. All the properties of the oil are practically unchanged, except that the I no. is lowered from 16 to 7. The hydrogenated oil is more resistant to heating than the original; it remains transparent and free from tar after heating for 110 hours at 105°.

G. CALINGAERT

**Methods for evaluating used transformer and switch oils.** TYPKE. *Brennstoff-Chem.* 9, 346-8(1928).—Available phys. and chem. methods are discussed. The breakdown voltage (not less than 80 kv./cm.) and the acid no. (upper limit 1.0%) are the values that give most information about the condition of the oil.

J. D. DAVIS

**The properties and analysis of used crank-case oils.** D. G. PIDGEON AND H. E. TESTER. *J. Inst. Petroleum Tech.* 15, 91-99(1929).—The results of a study of the effects of diluents in crank-case oil are given. Samples of a medium-grade oil diluted in use were distd. with slightly superheated steam at 150°. This gave the amt. of diluent. A composite of diluent made up from a no. of such distns. had a sour smell, contained 0.13% of S, and boiled at 108-300°. Considerable unsatn. was shown by its absorbing the Br from half its own vol. of satd. Br water. Portions of new oil were blended with 3, 5, 7½, 10 and 15%, resp., of the combined diluent, and sp. gr., flash pt., C residue, and viscosity at 70°, 100°, 140° and 200°, of the blends were detd. Diln. flash p., diln.-sp. gr. and diln.-viscosity curves were plotted. From the last, change in viscosity from diln. alone could be read. Thus, a used oil whose actual viscosity at 140° was 127 sec. would have had a viscosity of 90 sec. had not the effect of diln. been counteracted in part by oxidation. Data from the examn. of 37 samples of used crank-case oil from 9 engines as to diln., viscosity, sp. gr., flash pt., etc., are given for comparison with the curves.

EMMA E. CRANDAL

**Cylinder stocks of high quality from lubricating-oil residues.** V. L. GURVICH AND M. A. PENGU. *Neftyanoye Khozaystvo* 15, 55-64(1928).—A residue, warmed by steam coils, was pumped through a tube still heated by an oil burner, without direct contact of the flame with the coil, at a rate of flow so adjusted as to prevent the oil from being over 400°. The hot residue was injected and atomized by superheated steam (420-440°) into the upper part of an electrically heated (about 10-20° below the temp. of the mixt.) vertical cylindrical evaporator with the lower end open. The evaporator was placed in a jacket that had plates acting as a dephlegmator. The atomized hot mixt. passed the evaporator downwardly and the dephlegmator upwardly. The heavy part of the residue was collected on the bottom and discharged into a container after passing through a condenser. The light fraction was sent through an opening in the top cover into an air-cooled dephlegmator connected to an air and water cooler and finally discharged into a receiver. Up to 60% of the distillates could be recovered by this operation. The distillates on treatment with 3%  $H_2SO_4$  at 50-75° lost 5-10%, depending on the sp. gr.; they were blown at 260-270° and acid-free oils were obtained. They are superior to the "viskosines" of the "Azneft;" they are green in reflected light, low in carbon, free from asphalts and have a higher flash. The other qualities are equal to those of the standards. A similar run was made without atomizing the hot residue in the evaporator; the yield on distillates was less than one-half of the previous runs, the distillate being of a lower sp. gr., and the amount of steam used was twice as much calcd. on the distillate obtained. The residue left from this distn. was not suitable for a second distn., since it is easily decompd. at 400°; when it is mixed with solar-oil distillate, a quite satisfactory fuel oil of a viscosity of  $E_{40} = 12.5$  is obtained. A sepn. of oils was tried on a mfg. scale, with a vacuum equipment for the evaporator and addnl. dephlegmators with filling elements. Three different fractions could be sepd. A yield of 20-25% was obtained with the first and 55% with the second; distn. was at the rate of 2.5-2.8 metr. tons per hr. 225% and 150-200% of steam calcd.

on the distillate obtained and 1.6% and 1.8-2.0% of fuel calcd. on the residue heated were used. Distillates of similar high quality were obtained. Tables of phys. properties of various cuts and products at different stages of refining are given; also, a layout for the equipment are given.

**The determination of free sulfuric acid in light-oil sludge.** F. S. BACON. *Ind. Eng. Chem., Anal. Ed.* 1, 89-92(1929).—Five methods have been developed for estg. the  $\text{H}_2\text{SO}_4$  in light-oil sludges. (1) The sludge is extd. with  $\text{H}_2\text{O}$  and the  $\text{H}_2\text{SO}_4$  pptd. in the cold with  $\text{BaCl}_2$  strongly acidified with  $\text{HCl}$ . It is uncertain whether the sulfuric esters are hydrolyzed in the operation or not. (2) The sample is weighed on a very thick pad of asbestos in a Gooch crucible. The tar and alkyl esters are washed through with  $\text{CHCl}_3$ , leaving the  $\text{H}_2\text{SO}_4$  in the asbestos to be washed through with hot  $\text{H}_2\text{O}$  and titrated with standard alkali. The acid which escapes with the  $\text{CHCl}_3$  is also titrated and the 2 results are combined. (3) The sludge and  $\text{CHCl}_3$  are thoroughly mixed and the mixt. is emptied into ice water and titrated. This gives the free  $\text{H}_2\text{SO}_4$  plus 1 unreplaced H atom in the alkyl sulfuric acid. The neutralized soln. is boiled 30 mins. or more and again titrated. The result is the equiv. of one replaceable H set free in the hydrolysis. Subtracting this from the previous figure gives the figure for free  $\text{H}_2\text{SO}_4$ . (4) The heat of diln. of the  $\text{H}_2\text{SO}_4$  present is measured and the concn. estd. from a curve obtained by plotting against concn. the rise in temp. from dilg. various known concns. to twice the original vol. The results are fairly accurate for high percentages of acid. A correction must be made for the tar present, and it is assumed that the sp. heat of the tar is 0.5 and the sp. gr. 0.9; and that the  $\text{H}_2\text{SO}_4$  after diln. is 30% of the mixt. (5) Aniline sulfate is formed by treating the sludge with 10% of  $\text{C}_6\text{H}_5\text{NH}_2$  in boiling  $\text{CHCl}_3$ . The ppt. is collected on a Gooch crucible and dissolved with boiling  $\text{H}_2\text{O}$ . The  $\text{C}_6\text{H}_5\text{NH}_2$  in an aliquot of this filtrate is titrated with 0.5 N  $\text{KBr-KBrO}_3$  soln. Careful expts. showed that only aniline sulfate is formed when  $\text{C}_6\text{H}_5\text{NH}_2$  in boiling  $\text{CHCl}_3$  is added to acid sludge, and that only the free acid reacts. The results obtained by methods (1), (3) and (5) agree very closely. E. E. C.

**Naphthene sulfonic acids.** STANISLAW PILAT AND E. DAVIDSON. *Lwow Polytech. Przemysl Chem.* 11, 141-6(1927).—In the acid refining of oils, compds. approaching the formula  $\text{C}_{24}\text{H}_{33}\text{SO}_3\text{H}$  are formed. These compds. do not lose the sulfo group even on prolonged boiling with alcoholic alkali; their Ba salts are sol. in ether but can be pptd. from this soln. by alc. The Na salts of these compds. show an exceptional propensity to produce very permanent foam in water soln., a property which they retain even in fairly acid solns.

A. C. ZACHLIN

**The desulfurizing action of silica gel.** III. H. I. WATERMAN AND M. J. TUSENBROEK. *Brennstoff-Chem.* 9, 397-8(1928); cf. *C. A.* 21, 1540.—The following S. compds. were separately dissolved in kerosene: 1.012%  $(\text{C}_6\text{H}_5)_2\text{S}$ , 1.117%  $(\text{C}_6\text{H}_5\text{CH}_2)_2\text{S}$ , 0.794%  $\text{C}_6\text{H}_5\text{CH}_2\text{SH}$ . The solns. were treated with 20% silica gel for 6 hrs. at 31-32° with removal of S as follows: 0.138, 0.300 and 0.225%, resp. Silica gel removed neither colloidal (suspended) nor dissolved S from kerosene.

J. D. DAVIS

**Graphite as a lubricant.** H. KARPLUS. *Z. Maschinenbau* 5, 1122-8(1928).—There are 3 stages of lubrication: (1) the perfect fluid-film stage, (2) the broken-film stage, and (3) dry friction. Close to the crit. point between 1 and 2, the friction is a minimum. Current specifications are faulty in that they apply only to the first stage. For the 2nd stage, improvements could be made by means of substances ruled out in current specifications. Near the crit. point *adhesion* is much more important than *viscosity*. The adhesion may be measured calorimetrically as the heat of moistening of a surface. Oils of good lubricating quality have a high heat of moistening. Fatty acids increase the heat of moistening. Colloidal graphite forms a thin film of excellent lubricating quality. Steel balls on a babbitt-metal surface show a friction of 0.515, but on graphite, 0.140. The film of colloidal graphite builds up slowly, first on the "high" places where the friction is greatest. It is found that the heat of moistening of graphite is greater than that of metals; the heat of moistening of good oils is 7-10 times higher on graphite than on copper. Additions of graphite cause good and bad lubricating oils to have the same heat of moistening. It is claimed that much thinner oil layers can exist on a graphite surface than on a metal. The result is that higher pressures, thinner oils and a smaller quantity of oil of inferior grade may be used. Several bearings were tested on a Richle machine. A normal motor oil ran hot at 7.03 kg. per  $\text{cm}^2$ ; it ran cool when graphite was added to the same oil. Finally, with 0.25% of colloidal graphite, the load was increased to 12.66 kg. per  $\text{cm}^2$ .

E. C. B.

**New asphalt theories.** F. J. NELLENSTEYN. *Intern. Congress Testing Materials*, 1927, II, 684-8.—The older ideas about the nature of asphalts are mentioned. The new conception that a soln. of asphalt in  $\text{C}_6\text{H}_6$  is a two-phase colloidal system is re-

viewed. The explanation of the flocculation of the dispersed phase (Asphaltmizell) of a benzene-asphalt soln. on addn. of benzene as a process involving the elec. properties of the particles and therefore similar to coagulation in an aq. emulsion, is considered untenable since pptn. of the asphalt cells occurs in a system entirely organic. An explanation is presented of asphalt pptns. and reactions based upon differences between the surface tensions of the protective bodies and other components and phases present in the system. The crit. surface tension for flocculation of the asphalt cells given is approx. 24-25 dyne/cm. Expts. on treating asphalts with  $\text{CCl}_4$ , I, Cl, O, are described briefly and the relative stability of the colloidal particles (the carbon) and the protective bodies is discussed. The possibility is suggested of sepg. petroleum asphalts from coal-tar products by utilizing differences in the surface tensions. Products obtained on treating asphalt with  $\text{KMnO}_4$  were: org. acids, always a small quantity of mellitic acid, some compds. of the aromatic series, but mostly of the aliphatic series. The "filler" and the protective bodies are held to play an important role in the technical application of asphalts through absorption, cementing together the mineral constituents in the mixts. The investigation is not sufficiently advanced to draw final conclusions, but in the discussions following the paper, the protective bodies are described as being liquid and having a fluid film over the nucleus; consequently, the asphalt can absorb a great many other materials. W. W. HODGE

**Turpentine obtained as by-product in the manufacture of cellulose by the sulfate method.** I. YA. POSTOVSKII AND V. G. PLUSNIN. *J. Chem. Ind. (Moscow)* 5, 1161-5 (1928).—In the manuf. of cellulose by the sulfate method,  $\text{Na}_2\text{S}$  formed as a by-product reacts with  $\text{MeOH}$ ; the resultant methyl mercaptan ( $\text{MeSH}$ ) and methyl sulfide ( $\text{Me}_2\text{S}$ ) contaminate the turpentine liberated as a vapor, with the result that it becomes so malodorous as to render the factory neighborhood uninhabitable. This can be prevented in part by liquefying the emitted gases with the recovery of about 11-12 kg. of oil per ton of cellulose when operating with pine wood. This impure turpentine has no commercial value. Filtration through sawdust did not completely deodorize the oil. Better results were obtained by oxidizing the S compds. by chloride of lime. When operating with concd.  $\text{Ca}(\text{ClO})_2$ , the temp. rose to  $90^\circ$  and the odor disappeared. The sp. gr. of the oil increased, however, from the original value of 0.861 to 0.9621, and the product contained but 30% of pinene, the remainder of the pinene having been oxidized. By using weaker solns. of  $\text{Ca}(\text{ClO})_2$  better results were obtained, but this method of purifying requires that action be checked as soon as the S compds. are completely oxidized. To deal with the problem on a factory scale, the main portion of the S compds. may be removed by any good method, and the traces remaining taken out by cautious treatment with very dilute  $\text{Ca}(\text{ClO})_2$ . When steam distg. the crude turpentine obtained by the cellulose-sulfate method, the first 15% which passes over contains 86% of the S impurities; when 50% of the oil has distd., the remainder contains but 2% of the impurities and they may be removed by dilute  $\text{Ca}(\text{ClO})_2$ . The purified turpentine is a colorless liquid, possessing a pleasant odor, a sp. gr. ( $15^\circ$ ) of 0.8645;  $n_D^{20}$  of 1.46728; and  $[\alpha]_D^{20}$  of 14.47. BERNARD NELSON

Use of mixtures of petroleum products and creosote for preservation of timber (VORONOV) 20. Tar and asphalt, the best means of combating dust (SCHNEIDER) 20. The theory of petroleum formation. II. Composition of primary tars of Matagonsky boghead coal (STADNIKOV, VOZHINSKA) 8. Mechanical characteristics of soft steel at elevated temperatures (SHISHCHENKO) 9. Regeneration of decolorizing agents (BATAAFSCHE PETROLEUM MAATSCHAPPIJ) 18. Continuous distillation of tars or crude mineral oils by means of superheated steam (WINKLER) 21. Separating oil from gases (Brit. pat. 297,622) 13. Storage tank for gasoline (U. S. pat. 1,709,257) 1. Treating gases with finely divided substances (Fr. pat. 648,525) 13. Oil cooler (Swiss pat. 129,687) 1. Apparatus for gravity separation of oil and water (U. S. pat. 1,709,971) 1. Tank and baffle apparatus for separating oil and gas (U. S. pat. 1,710,178) 1. Filter for oil (Brit. pat. 298,197) 1. Olefins and diolefins (Brit. pat. 297,398) 10. Hydrometer and thermometer box and associated features for testing the specific gravity and temperature of circulating lubricating oil (U. S. pat. 1,709,139) 1. Filter for gasoline (U. S. pat. 1,709,237) 1. Apparatus for separating liquids such as oil and water by gravity (Brit. pat. 297,551) 1. Apparatus for gravity separation of oil and water (Brit. pat. 297,936) 1. Mixtures of oils (Fr. pat. 648,143) 27.

**Purifying petroleum oils.** JOHN C. BLACK, WIRT D. RIAL and RAYMOND T. HOWES (to Pan American Petroleum Co.). U. S. 1,709,203, April 16. Oil such as

lubricating-oil stock is treated with a 2-5° Bé. NaOH soln. or other relatively weak alk. soln. of suitable character under pressure and agitation with live steam; the aq. soln. is sepd. from the oil; soap-forming compds. are then removed by converting them into oil-insol. compds. as by the use of  $\text{Ca}(\text{OH})_2$ ; the oil is filtered after addn. of a suitable clay.

**Refining petroleum oils with sulfuric acid.** ERNEST B. PHILLIPS and JAMES G. STAFFORD (to Sinclair Refining Co.). U. S. 1,709,149, April 16. Streams of oil and acid are intermingled in regulated quantities and supplied to the upper surface of a rapidly rotating disk on which the mixt. spreads as a film and from which it is discharged and subjected to impact before sepn. of the acid tar from the oil. An app. is described.

**Purifying petroleum oils and distillates.** F. R. MOSER. Brit. 297,414, Sept. 21, 1927. Preliminary to purification with strong  $\text{H}_2\text{SO}_4$ , basic substances are removed from the oil by treatment with an acid which will not form a sludge, *e. g.*,  $\text{H}_2\text{SO}_4$  of less than 50% strength. The bases may be isolated from the resulting acid ext. by neutralizing with  $\text{Na}_2\text{CO}_3$  and may be used in *wood preserving or insecticidal compns.*, or the acid ext. itself may be used as a bactericide or vermicide. Cracked distillates and exts. obtained by the use of liquid  $\text{SO}_2$  yield large proportions of bases.

**Treatment of acid sludge from the refining of petroleum oils by means of sulfuric acid.** J. MAST. Belg. 353,487, Sept. 30, 1928. Improvement to 351,175 (C. A. 23, 2565). After addn. of cold  $\text{H}_2\text{O}$  or dil.  $\text{H}_2\text{SO}_4$ , cold air is passed through the sludge. The  $\text{SO}_2$  evolved is sent to a condenser to remove the water vapor and hydrocarbon vapors.

**Oily flotation agent.** BURNELL R. TUNISON. U. S. 1,709,447, April 16. A sulfurous petroleum oil such as a cracked naphtha is washed with an alkali soln. such as 18° Bé. NaOH soln.; the mixt. seps. into layers contg., resp., alkali-sol. and alkali-insol. substances; these layers are sepd. and the alkali layer is neutralized (suitably with  $\text{H}_2\text{SO}_4$ ) to cause sepn. of an oily material, which is sepd. and used as a flotation agent.

**Breaking emulsions of oil and water.** CHARLES FISCHER, JR., and WARREN T. REDDISH (to Kontol Co.). U. S. 1,710,159, April 23. Emulsions such as those of petroleum oils are treated with a reagent comprising "sludge layer mineral oil aluminum sulfonate" and NaOH.

**Flue-gas-recirculating system for petroleum-cracking stills.** HARRY A. ATWATER (to Combustion Equipment Co.). U. S. 1,709,764, April 16.

**Dissociation of hydrocarbons.** MICHAEL MELAMID. Fr. 648,625, Feb. 10, 1928. Mineral oils, tar oils and other hydrocarbons are converted into products having a slightly raised b. p. by injecting them in the state of a very fine division and mixed with H into reaction chambers contg. catalysts or dissocn. agents, or they are pulverized in the chambers by mech. means, the reaction products being submitted to the same treatment. Cf. C. A. 23, 264.

**Converting hydrocarbons into products of lower boiling point.** GUSTAV EGLOFF (to Universal Oil Products Co.). U. S. 1,710,152, April 23. Oil is heated in a still under vapor pressure; vapors thus produced are passed in relatively small sepd. streams through tubes passing through the body of oil in the lower part of the still and thence to a reflux condenser from which reflux is returned to the still. An app. is described.

**Fractionating hydrocarbons.** JOHN C. BLACK and JAMES W. WEIR. U. S. 1,709,518, April 16. Mixed hydrocarbons are vaporized and the vapors are passed through the lower part of a fractionating tower to condense the higher b.-p. fractions as the vapors rise in the tower; some of the condensed liquid hydrocarbons are withdrawn from an outlet at the bottom of the fractionating tower and the condensates are circulated back to the upper part of the tower and allowed to flow down through the tower in intimate contact with the vapors; mixed vapors are liquefied and sepd. having substantially the same compn. as the circulated hydrocarbons; resultant excess sepd. and condensed hydrocarbons not used in circulation are refluxed back to the still from which the mixed oil vapors were obtained. An arrangement of app. is described. Cf. C. A. 22, 865.

**Purifying hydrocarbon oils with liquid sulfur dioxide.** JOHN C. BLACK and MARVIN L. CHAPPELL (to Pan American Petroleum Co.). U. S. 1,710,143, April 23. Only sufficient liquid  $\text{SO}_2$  is used to dissolve a portion of the constituents to be sepd.; after sepn. of the liquids, the partly purified hydrocarbon oil is treated, at a temp. below 0°, with fuming  $\text{H}_2\text{SO}_4$ , in the presence of dissolved  $\text{SO}_2$ , to convert other constituents to be sepd. into sulfo-acids; the oil is then sepd. from assocd. substances. An arrangement of app. is described.



**Treating hydrocarbon oils with sulfuric acid and liquid sulfur dioxide.** JOHN C. BLACK and MARVIN L. CHAPPELL (to Pan American Petroleum Co.). U. S. 1,710,200, April 23. Oil contg. added liquid  $\text{SO}_2$  is commingled with a suitable quantity of  $\text{H}_2\text{SO}_4$  and the oil is subsequently sepd. from the assocd. reagents and reaction products. An arrangement of app. is described. U. S. 1,710,201 specifies treating oil with liquid  $\text{SO}_2$  at a low temp. to dissolve a portion of the constituents to be sepd., sepg. the 2 liquids and then treating the partially purified oil at low temp. with  $\text{H}_2\text{SO}_4$  in the presence of dissolved  $\text{SO}_2$ , to convert the remainder of the constituents to be sepd. into sulfoacids, and then effecting sepn. of the assocd. materials. An arrangement of app. is described.

**Fractionating hydrocarbon oils.** GUY B. BOGART. U. S. 1,709,304, April 16. Vapors from a fractionating column are taken off and led to a final condenser and while on their way to the condenser are subjected to a partial intermediate condensation, the cooled condensate from which is introduced into the fractionating column. An arrangement of app. is described.

**Cracking hydrocarbon oils.** GUSTAV EGLOFF and HARRY P. BENNER (to Universal Oil Products Co.). U. S. 1,710,153, April 23. The lower still of a pair of superimposed stills is charged with a bulk supply of oil; heating gases are passed through a closed conduit within the still; vapors generated in the lower still are passed to the upper still where they are superheated by passing the combustion gases through a closed conduit located in the upper still; a spray of preheated oil is continuously introduced into the bulk supply of oil, and vapors from the upper still are led to a dephlegmator from which reflux condensate is returned to the bulk supply of oil in the lower still; heavy residuum is continuously withdrawn from the bulk supply and the treatment is carried out under superatm. pressure. Various details of app. are described. Cf. C. A. 23, 273.

**Cracking hydrocarbon oils.** GASOLINE PRODUCTS Co. Brit. 297,949, Sept. 5, 1927. Oil in liquid phase is passed through a heating zone (such as a pipe coil in a furnace) and thence to a conversion chamber from which the cracked products pass to an evapg. chamber through a reducing valve; vapor is further treated in a dephlegmator. A cooling oil is supplied to the evapg. chamber which mixes with the cracked products and prevents excessive vaporization and formation of coke-like or asphaltic "bottoms." Various details of app. are described. Cf. C. A. 23, 2290.

**Cracking and distilling hydrocarbon oils.** ROBERT T. POLLOCK (to Universal Oil Products Co.). U. S. 1,710,068, April 23. Oil is heated in a coil under conditions of temp. and pressure which effect cracking and the heated oil is passed to a vapor chamber where vaporization is permitted; vapors are led to a dephlegmator and vapors passing from the dephlegmator are condensed and collected as a pressure distillate; the latter is returned to a zone of redistn. surrounding the dephlegmator and heated from the vapors within the dephlegmator; by-products of combustion from the cracking still and vapors from the redistn. zone are condensed and collected. An app. is described.

**Distilling hydrocarbon oils.** OTTO BEHMER (to Texas Co.). U. S. 1,709,302, April 16. An app. is specified comprising a charging line and pump for forcing oil through it and a heater for the oil, a still and a fractionating tower. A surge pump and surge line are also provided for pumping hot condensate from the fractionating tower back to the heater; a cooling medium such as fresh charging stock is introduced into the surge line of the surge pump to maintain liquid in it cooler than the oil being pumped.

**Distilling hydrocarbon oils.** ALBERT G. PETERKIN, JR., WILLIAM F. STROUD, JR., and RICHARD B. CHILLAS, JR. U. S. 1,709,874, April 23. The oil is rapidly heated to a temp. above its normal cracking temp.; vapors thus formed are sepd. immediately from liquid oil, and, before substantial cracking occurs, the liquid oil is passed into a zone substantially free of the sepd. vapors and treated with steam to effect further vaporization and to prevent cracking. An arrangement of app. is described.

**Pressure distillation of hydrocarbon oils.** EDGAR M. CLARK and FRANK A. HOWARD (to Standard Oil Development Co.). U. S. 1,710,404, April 23. A body of oil is maintained in a distn. system under pressure and at a temp. suitable for effecting distn.; evolved vapors are passed through a body of oil to heat the latter and to condense a part of the vapors. Heated oil and condensate are refluxed from the second-mentioned body of oil, and a stream of oil is passed in indirect heat-conductive contact with the second body of oil to cool the latter and to heat the stream of oil; heated oil from this stream is fed into the second body of oil. Various details of app. are described.

**Refining hydrocarbon oils.** JACQUE C. MORRELL (to Universal Oil Products Co.). U. S. 1,710,063, April 23. The S content of an oil is reduced by treatment with a

plumbite soln.; the treated oil is distd., and the recovered distillate in admixture with the residue obtained in the initial distn. is subjected to a redistn.

**Revivifying fuller's earth after use in refining hydrocarbon oils.** FRANK W. HALL (to Texas Co.). U. S. 1,709,261, April 16. Occluded asphaltic substances are removed by washing with a mixt. of gasoline and alc.

**Oxidation products of hydrocarbon oils.** GUSTAV EGLOFF and JACQUE C. MORRELL (to Universal Oil Products Co.). U. S. 1,710,155, April 23. Vapors from a hydrocarbon material, such as gas, oil, or kerosene, and wax distillate are mixed with an oxidizing medium such as ozone,  $\text{Cl}_2$ , or a N oxide; the mixt. is passed through a reaction zone where it is subjected to a high potential elec. discharge in the presence of a catalyst such as  $\text{AlCl}_3$  or  $\text{Fe}_2\text{O}_3$  under regulated pressure. An app. is described.

**De-watering hydrocarbon-oil emulsions.** IGNACY MOSCICKI. U. S. 1,710,374, April 23. An emulsion such as a natural petroleum emulsion is introduced as a continuous stream at high velocity tangentially into a heating chamber below the surface of a body of the emulsion which is maintained in the chamber; the emulsion is slowly drawn from a point slightly below the surface of this body of emulsion and passed to a separator, where water and oil are sepd. Various details of app. are described.

**Apparatus for de-emulsifying hydrocarbon oils.** GUSTAV EGLOFF and Harry P. BENNER (to Universal Oil Products Co.). U. S. 1,710,154, April 23. The oil is subjected to the action of a piston fitted within a treating cylinder and provided with restricted passageways through which the emulsified oil is forced in one direction only by check-valve control. Various details of the app. are described.

**Apparatus for treating hydrocarbon oils with hydrogen in a high-frequency, oscillating, non-discharging, non-sparking, hot magnetic field to combine with carbon.** IRA W. HENRY (to Ionizing Corp. of America). U. S. 1,709,813, April 16. A metallic catalyst may be used to facilitate the hydrogenation; various structural details of the app. are described. U. S. 1,709,814-15 also describe somewhat similar app. suitable for the hydrogenation of carbonaceous or hydrocarbonaceous materials of various kinds.

**Dissociation of oils.** MICHAEL MELAMID. Fr. 618,141, Feb. 3, 1928. Mineral oils are dissoed. at relatively low temps. in the presence of catalysts, liquid at the temp. of the reaction, and in the presence of H or protective gases contg. it, with continual flowing off of the non-dissoed. parts, so that dissoen. of the elements of low b. p. alone takes place.

**Oil cracking apparatus.** H. WOLF. Brit. 297,829, Sept. 30, 1927. A valve mechanism is described suitable for use in an oil cracking plant of the type in which expanded cracked products are directly mixed with liquid.

**Oil refining.** JULIEN CORNET. Fr. 649,203, Feb. 17, 1928. The residual acid mud obtained in refining mineral oils is distd. in enclosed vessels at progressively increasing temps., whereby  $\text{SO}_2$  and oils are obtained and the tar remaining is redistd. to obtain lighting gas and a chemically pure coke.

**Refining mineral oils.** ARTHUR LACHMAN (to Richfield Oil Co. of Calif.). U. S. 1,709,315, April 16. Heated vapor from an oil such as crude gasoline is passed into contact with  $\text{H}_3\text{PO}_4$  of high maintained concn. with continuous addn. of water; the oil vapor is then condensed. The  $\text{H}_3\text{PO}_4$  serves to produce a stable decolorized product. An app. is described. In some cases,  $\text{H}_2\text{SO}_4$  or  $\text{NaOCl}$  also may be used.

**Hydrocarbon lubricating oils.** ALBERT G. PETERKIN, JR., WILLIAM F. STROUD, JR., and RICHARD B. CHILLAS, JR. U. S. 1,710,240, April 23. In distg. a hydrocarbon oil, which leaves a residue of at least 20% when distd. to  $340^\circ$  under an abs. pressure of 10 mm. Hg, the oil is mixed with a petroleum distillate substantially all of which will distil below  $260^\circ$  under atm. pressure; the mixt. is rapidly heated to a temp. in excess of that at which substantial cracking of the oil would occur if the mixt. were permitted to remain at such temp. for a prolonged period of time; vapors are immediately sepd. from the remaining liquid portion of the oil, and then, before substantial cracking occurs, the sepd. liquid is passed into a zone free from the vapors and cooled to prevent cracking. An app. is described.

**Lubricating and insulating oils.** I. G. FARBERNIND. A. G. Brit. 297,798, Sept. 28, 1927. Hydrocarbon oils contg. dispersed particles of solid carbonaceous materials such as lignite, coal or charcoal, or colloidal or powdered metals, or metal oxides are subjected to high-frequency elec. currents (suitably in a "Voltol" app.).

**Renovating journal-box oil.** THOMAS W. POTTER, LEO C. McNAMARA, CHARLES N. LAMMERS and JOHN R. McLAVY (to Journal-Box Servicing Corp.). U. S. 1,709,230, April 16. A body of the oil is heated with steam in a closed tank under such pressure and other conditions that the oil is substantially vaporized without cracking, leaving

lint and assocd. particles in the tank; the vaporized oil is led off and condensed. An app. is described.

**Lubricant.** CHARLES B. DEHART. U. S. 1,709,311, April 16. A mixt. of jefferisite, Al stearate and a hydrocarbon lubricating oil is heated to slightly below the flash point of the oil and then allowed slowly to cool. The product is suitable for use in automobile engines.

**Extracting entrained matter from filter cakes.** HUGH H. CANNON. U. S. 1,710,343, April 23. A cake, such as clay, used for filtering lubricating oil is treated with a solvent for the entrained matter, such as petroleum naphtha, which is passed through the cake together with filtering clay or other suitable finely pulverized insol. material in sufficient quantity to fill shrinkage cracks formed in the cake by the withdrawal of the entrained matter by the solvent.

**Emulsifying agents.** MICHAEL MELAMID. Fr. 648,138, Feb. 3, 1928. Hydrocarbons, fatty substances, etc., are emulsified by means of  $\text{PhNH}_2$  or its homologs, either alone or mixed with hydrocarbons, soaps, or soap substitutes, or other emulsifying agents such as alcs., phenols, cresols, naphthols, cyclic hydrocarbons, or pyridic bases.

**Motor fuel; emulsifying agents.** MICHAEL MELAMID. Fr. 648,142, Feb. 3, 1928. The mixing capacity of alc. with hydrocarbons for motor fuels is increased by the addn. of small amts. of esters of naphthene acid, such as the amyl, cresylic, or cyclohexanolic esters. These esters also act as *emulsifying agents* for boring, milling, or textile oils in water, or for soaps or soap substitutes.

**Motor fuel.** MICHAEL MELAMID. Fr. 648,145, Feb. 3, 1928. The explosion hazard is reduced by adding to a fuel such as gasoline small amts. of carefully purified tar oil having a b. p. higher than that of  $\text{C}_6\text{H}_6$ , e. g., 215–230°.

**Apparatus for heating asphalt or similar materials to prepare them for use.** NATHAN V. HENDRICKS. U. S. 1,709,016, April 16.

**Oven for the production of charcoal by the partial combustion of wood with recovery of the by-products.** C. DEMOULIN and A. DETOMBAY. Belg. 353,457, Sept. 30, 1928. Constructional features.

**Oils from wood-spirit.** HOLZVERKOHLUNGS-INDUSTRIE. A.-G. Fr. 648,505, Feb. 7, 1928. Colored and malodorous substances are removed from oils obtained from wood-spirit by passing them at 400–500° over oxides of heavy metals such as Ni, Mn, or Fe.

## 23 - CELLULOSE AND PAPER

CARLETON E. CURRAN

**Low-viscosity nitrocellulose.** ERNST VON MÜHLENDahl. *Farben-Ztg.* 34, 1063–5 (1929).—A review with 57 references, mainly patents.

**New machines and equipment for the manufacture of celluloid.** A. BAHLS. *Celluloid Ind.* 29, 1381–3 (1929).—An illustrated review.

**Viscose silk.** J. C. MEISS. *Chem. Weekblad* 26, 170–6 (1926).—The manuf. of viscose silk is described.

**Artificial silk.** K. VENKATARAMAN. *Indian Textile J.* 30, 175–7 (1929).—A general article, reviewing the development of rayon and describing the chemical and physical changes taking place in its production.

**Comparative activity of Br on cellulose, lignin and wood (FUCHS) 21.** Application of nitrocellulose in the varnished leather industry (ALVAREZ) 29. Corrosion of machines in the viscose rayon industry, and its prevention (EGGERT) 9. The translation lattice of hydrated cellulose (WEISSENBERG) 3. Rotary pulp-straining apparatus (Brit. pat. 297,049) 1. Apparatus for testing the bursting strength of paper (U. S. pat. 1,709,638) 1. Rotary pulp-straining apparatus (Brit. pat. 298,045) 1. Filters [for substances used in the manufacture of synthetic textiles] (Fr. pat. 649,101) 1.

**SUTERMEISTER, EDWIN.** *Chemistry of Pulp and Paper Making.* 2nd ed., revised. New York: J. Wiley & Sons. 565 pp. \$0.50. Reviewed in *Pulp Paper Mag.* 27, 659 (1929).

**Cellulose from plant materials.** HORACE WALKER (one-half to Gilbert H. Walker and one-half jointly to Morris H. Epstein and Elly Marks). U. S. 1,709,824, April 16. Material such as the stems, roots or tops of potato plants or other plants of the

family Solanaceae are subjected to heating with steam at 45° for a predetd. period (suitably about 12 hrs.), then exposed to the atm. and bleached and digested (suitably for 12 hrs. more at 45°) and finally treated to sep. the cellulose from the mass, as by beating.

**Cellulose derivatives.** I. G. FARBENIND. A.-G. Fr. 648,675, Feb. 11, 1928. Elastic masses, films, threads, sizes, dressings, coatings, etc., are prepd. by drying emulsions which consist of solns. in org. solvents of cellulose derivs. insol. in water, and solns. in water of cellulose derivs. that dissolve or swell in water. Softening agents, pigments, dyes, filling materials, etc., may be added to the emulsions.

**Molded masses from cellulose derivatives.** I. G. FARBENIND. A.-G. Fr. 648,154, Feb. 3, 1928. Cellulose esters of higher fatty acids, mixed esters and ether-esters are worked up into molded articles without solvents by using mech. pressure at a raised temp., e. g., 100–150°. In examples the following materials are employed: cellulose laurate, elaidic ester of cellulose, the cellulose ester of the acid from coconut oil, cellulose acetate-stearate and ethylcellulose laurate.

**Aminocellulose derivatives.** I. G. FARBENIND. A.-G. (Max Hagedorn and Armin Ossensbrunner, inventors). Ger. 473,097, Oct. 31, 1926. Corresponds to Brit. 279,801 (C. A. 22, 3044) but gives addnl. examples.

**Drying cellulosic tubing.** CLARENCE E. COLEMAN, HAROLD F. WHITTAKER and THOMAS E. SHARPE (to duPont Cellophane Co.). U. S. 1,708,937, April 16. Wet sections such as those formed from viscose for use as *sausage casings* are closed at one end and air or other gas is introduced under moderate pressure into the sections while they are suspended and the free end of each section is weighted to prevent excessive longitudinal shrinking while drying.

**Films, artificial threads, etc., from cellulose ethers.** I. G. FARBENIND. A.-G. Brit. 297,676, Sept. 24, 1927. Coagulation of a cellulose ether is effected by use of a hydrocarbon which is readily miscible with the solvent or solvent mixt. of the cellulose ether soln. used but which does not dissolve the cellulose ether itself. CS<sub>2</sub> or ethyl ether or their mixts. may be used as the solvent and among the hydrocarbons which may be used are: paraffin oil, petroleum jelly and other petroleum fractions of high b. p., "petrol," shale oil and hydrocarbon fractions of Bergination oil. Films thus formed are repellant to water.

**Colored films, etc.** CAMILLE DREYFUS. Fr. 648,137, Feb. 3, 1928. Colored films, etc., of cellulose acetate or other ester or ether of cellulose are obtained by prepg. a mixed org. soln. of the cellulose deriv. and one or more colors insol. in water, and afterwards forming the film, etc.

**Cellulose esters.** HEBERLEN & Co. A.-G. Brit. 298,087, Sept. 30, 1927. Cellulose to be used in the production of cellulose carboxylic esters such as cellulose acetate is pretreated with acid or neutral swelling agents and after swelling has been effected the excess of swelling agent is removed by pressure, centrifuging or washing. As swelling agents there may be used concd. H<sub>2</sub>SO<sub>4</sub>, H<sub>3</sub>PO<sub>4</sub> or HCl, ZnCl<sub>2</sub> or Ca(CNS)<sub>2</sub> or mixts. of such compds. Various details are given.

**Cellulose esters of higher aliphatic acids.** I. G. FARBENIND. A.-G. Brit. 297,706, Sept. 27, 1927. The process described in Brit. 283,181 (C. A. 22, 3088) is modified by effecting the first stage of the reaction at a temp. somewhat below 100° and then heating the esterification mixt. to above 100° (suitably about 135–40°). An example is given of the use of lauryl chloride as an esterifying reagent. Cf. C. A. 23, 1749.

**Acetylcellulose.** NAAMLÖÖZE VENNOOTSCHAP NEDERLANDSCHE KUNSTZIJDEFABRIEK. Dutch 19,509, Mar. 15, 1929. The viscosity of the soln. is greatly affected by letting the acetylation bath stand for 2 hrs. or more in a dry atm. with or without the condensing agent. An initial water content of the reagents in the bath (Ac<sub>2</sub>O + AcOH), which disappears on standing, was found to give a viscosity of the acetylated products of 65 (relative measure) if the bath was used immediately, 277 if used after 24 hrs. standing.

**Acetylnitrocellulose.** HARRY P. BASSETT and THOMAS F. BANIGAN (to Meigs, Bassett & Slaughter, Inc.). U. S. 1,709,513, April 16. An acetylizing soln. contg. acetylnitrocellulose is brought to a consistency just above the pptg. point of the acetylnitrocellulose, and then submitted to a finishing step such as extrusion to produce filaments or films.

**Cellulose nitrate plastic.** GEORGE L. SCHWARTZ (to E. I. duPont de Nemours & Co.). U. S. 1,710,078, April 23. Cellulose nitrate is used with di-Bu phthalate or other suitable non-volatile neutral ester of phthalic acid and a non-solvent softener such as Et palmitate. Other ingredients such as liquid petrolatum, castor oil, etc., may also be used.

**Viscose.** LEON LILIENFELD. Swiss 128,743, Dec. 27, 1926. Objects are made from viscose by causing the substance to pass through holes into a coagulating but non-plasticizing bath and then treating the coagulated material with a plasticizing mineral acid contg. liquid.

**Artificial silk from viscose.** I. G. FARBENIND. A.-G. Brit. 298,138, Oct. 3, 1927. To the acid-salt baths used for coagulation of viscose in manuf. of artificial silk there is added a sulfonic acid which can be made by sulfonating a mineral oil such as brown coal-tar oil or products such as yellow oil and solar oil sepd. therefrom. Addn. of the sulfonic acid avoids the necessity of maintaining an exact proportion between the acid and salt in the bath. Details of prepg. the sulfonic acids are given.

**Artificial silk.** E. HEYMANN. Brit. 297,364, March 15, 1927. See Fr. 637,309 (C. A. 23, 563).

**Artificial silk.** LEON LILIENFELD. Swiss 128,364, Dec. 23, 1926. Addn. to Swiss 122,788. Fibers of increased strength in the dry state are prepd. from viscose by treating it with a coagulating and plasticizing agent, such as a mineral acid, and arresting the action of the latter before it softens or decomposes the fibers.

**Artificial silk.** OTTO SINDL. Fr. 648,224, Feb. 4, 1928. Spinning app. is described in which the spinning nozzles are integral with the pump compressing the spinning soln.

**Centrifuge spinning-frame apparatus for manufacture of "cuprammonia silk."** J. P. BEMBERG A.-G. Brit. 297,117, Sept. 21, 1927. Structural features.

**Apparatus for making artificial silk filaments.** J. P. BEMBERG A.-G. Brit. 297,424, Sept. 21, 1927. Various structural details of centrifuge and stretch-spinning app. and assoc'd. devices are described.

**Washing and removal of acid from freshly formed filaments of artificial silk.** O. SINDL. Brit. 297,618, Jan. 19, 1928. An app. is described.

**Centrifugal box and associated apparatus for producing artificial silk by the dry-spinning process.** I. G. FARBENIND. A.-G. Brit. 297,744, Sept. 26, 1927.

**Boxes or bowls for spinning artificial silk.** NAAMLOOZE VENNOOTSCHAP NEDERLANDSCHE KUNSTZIJDEFABRIEK. Brit. 297,450, Sept. 22, 1927. The bowl may consist of a shell of drawn Al and the usual chrome lining may be dispensed with. Various structural details are described.

**Spinning bowls or boxes for artificial silk.** NAAMLOOZE VENNOOTSCHAP NEDERLANDSCHE KUNSTZIJDEFABRIEK. Brit. 297,468, Sept. 22, 1927. Structural features.

**Spinning nozzles for artificial silk.** HENRI COLOMB. Swiss 128,689, 128,690 and 128,691, Nov. 25, 1927. The holes for the fibers are made larger than desired and reduced to the correct size by compression of the plate. The holes may be divided into sections by partitions.

**Cellulose pulp.** I. G. FARBENIND. A.-G. Brit. 298,333, Aug. 30, 1927. Materials such as wood, straw or grasses are treated at a temp. not exceeding 45° with a quantity of alk. earth hypochlorite just sufficient for the complete oxidation of the lignin (the soln. used originally contg. at least 2% available Cl and being maintained slightly alk. as with Ca(OH)<sub>2</sub>). The raw material may be preliminarily treated with hot dil. NaOH soln. and washed. The hypochlorite treatment is continued until the product shows no lignin reaction with phloroglucinol.

**Wood pulp.** GEORGE A. RICHTER (to Brown Co.). U. S. 1,709,322, April 16. A pulp of high whiteness having an  $\alpha$ -cellulose content of 93.5-96%, a  $\beta$ -cellulose content of 2-4%, a  $\gamma$ -cellulose content of 2-3%, and a pentosan content not exceeding 2.4% (and of other specified characteristics) is obtained by a special described treatment of sulfite pulp.

**Reducing the swelling tendency of paper or other cellulosic materials.** I. G. FARBENIND. A.-G. Brit. 297,463, Sept. 23, 1927. The material is treated with aq. or alk. solns. of resinous condensation products or materials capable of forming such condensation products and the products are subsequently hardened by heat, with or without treatment with CH<sub>2</sub>O. Condensation products of S and phenol, phenol and CH<sub>2</sub>O or urea and CH<sub>2</sub>O may be used. Catalysts to accelerate the condensation or softening agents to reduce the brittleness of the products also may be added.

**Paper.** GASTON A. MOURLAQUE. U. S. 1,710,375, April 23. See Fr. 639,900 (C. A. 23, 982).

**Device for removing condensate from steam-heated rollers used for treating paper or for other purposes.** GEORGE S. JOHNSON (to C. F. Burgess Laboratories). U. S. 1,709,581, April 16.

**Use of high-frequency electromotive force to facilitate digestion in making paper pulp.** S. MULNE. Brit. 297,713, March 20, 1927. A system is described by which it

is proposed to use transmissions from broadcasting stations in producing paper pulp, *e. g.*, in digestion of raw materials such as esparto grass, for shortening the time required for the treatment, reducing the quantity of reagent used, effecting more complete removal of non-cellulosic materials and avoiding undesired reactions.

**Apparatus for shredding and screening paper stock to form pulp.** FAY KERR and MAX ZIMMERMAN. U. S. 1,709,133, April 16. Structural features.

**Apparatus for handling paper-making pulp.** HERMAN L. KUTTER (to Black-Clawson Co.). U. S. 1,709,026, April 16. Structural features.

**Devices for regulating the consistency of the "stuff" used by paper-making apparatus.** J. ARNOT. Brit. 298,337, Sept. 6, 1927.

**Paper-making apparatus.** A. ALDRICH and E. E. BERRY (to Beloit Iron Works). Brit. 298,072, Oct. 1, 1927. Structural features.

**Paper-making apparatus.** A. N. RUSSELL. Brit. 297,642, March 6, 1928. Structural features.

**Paper-making apparatus.** SYDNEY C. WENTZ (to Paper Machinery Corp.). U. S. 1,709,760, April 16. Structural features.

**Paper-making apparatus.** FRITZ WYSS (to A.-G. der Maschinenfabriken Escher Wyss & Cie.). U. S. 1,709,296, April 16. Mech. features.

**Beater roll for paper-making apparatus.** ADAM E. BRIDGE (to Black-Clawson Co.). U. S. 1,709,112, April 16.

**Color-depositing apparatus for paper-making machines.** CHARLES G. BRIGHT (to Paper Patents Co.). U. S. 1,709,969, April 23.

**Colors for wall papers, etc.** J. EHRENWERTH. Belg. 353,812, Sept. 30, 1928. The colors are dild. with a soln. of alk. silicate to which is added a salt to render it more fluid (*e. g.*,  $K_2CrO_4$  or  $K_2Cr_2O_7$ ) and glycerol.

## 24—EXPLOSIVES AND EXPLOSIONS

CHARLES E. MUNROE

**High explosives.** C. J. BAIN. *Army Ordnance* 9, 269-70(1929).—Military high explosives as used in high explosives shell and drop bombs are discussed as to the requirements that render them satisfactory, the part each of the several different explosive components in these devices plays and the test of each by means of the Explosives Efficiency Testing Fixtures, a design of one being given. Formerly the efficiencies of the explosive components were believed to be detd. by the wt. employed but their test shows the form and confinement of the charge to produce a marked effect. The manuf. of tetryl has been so improved that it is produced almost *c. p.* and in a granular dustless form especially convenient in the pressing of booster pellets. C. E. M.

**The Bureau of Explosives.** BEVERLY W. DUNN. *Army Ordnance* 9, 324-8 (1929).—This is an historical review of the origin, purpose, development and functions of the Bureau of Explosives of the American Railway Assoc., which serves the I. C. C. in the formulation of its regulations governing the safe transportation of explosives and other dangerous articles and likewise serves the I. C. C. as its inspection division. Among other interesting statements it is said that just before the signing of the Armistice we were producing over 80,000,000 lbs. of military explosives monthly and that there was in transit on the railroads, during these busy days of 1918, not less than 50,000 cars bearing the explosive label at any one time.

**Report of the Chief Inspector of the Bureau for the Safe Transportation of Explosives and Other Dangerous Articles.** B. W. DUNN. 1929, 90 pp.; cf. C. A. 22, 1686.—During 1928 over 500,000,000 lbs. of explosives were transported over the railroads of the U. S. and Canada with but 12 accidents, involving a property loss of \$77, and with no loss of life or injury to person. This is the second year in succession in which the record for explosives is practically perfect. There is a decided improvement shown for  $HNO_3$  but accidents from other corrosive or inflammable liquids are much too numerous, many of them being found due to neglect to conform to the I. C. C. regulations. These many accidents are discussed statistically and in detail so that chemical manufs. have a full opportunity to become familiar with hazards of their products and how they may be safeguarded. CHARLES E. MUNROE

**The important techno-explosive properties of explosive gas mixtures and the effect of high compression on increase of explosive effect.** A. HAID and A. SCHMIDT. Chem. Tech. Reichsanstalt. *Z. angew. Chem.* 41, 1309-12(1928).—The brisance of highly compressed explosive gas mixts. reaches values closely approaching or equalling those

of solid explosives. The most effective gas mixt. may be compared in its action to liquid O explosive. Its com. use as an explosive is hindered by inconvenience and danger in handling. A spark or small flame suffices to start explosion. Values of explosion pressure are calcd., simultaneous combustion being assumed throughout the entire space. This is approx. true with gas mixts., since combustion turns to detonation only over long paths, to which the Becher formula applies. With solid and liquid explosives detonation occurs regularly with sufficient initial impulse. The brisance of uncompressed gases is small on account of the low d., below that of com. explosives. The destructiveness of gas explosions is due to the ready dissemination of the gas mixt. and the exposure of large surfaces to explosion pressures, even though the latter be low.

E. M. SYMMES

Detection and determination of nitrogen oxides in gases from explosives. L. WEIN. *Gluckauf* 64, 409-11(1928).—In gases from explosives the N oxides occurring particularly on incomplete detonation are mainly NO<sub>2</sub>. Sensitive reagents are ZnI<sub>2</sub>-starch soln., which turns violet with traces of NO<sub>2</sub>, and the Griess sulfanilic acid- $\alpha$ -naphthylamine soln., which turns red. The percent of NO<sub>2</sub> by wt. or vol. can be detd. by these 2 reagents.

E. M. SYMMES

The ignition of fire damp by explosives. A. SEGAY. *Compt. rend.* 188, 867-8 (1929); cf. C. A. 22, 1239.—The addn. of sea salt to "amatol" (NH<sub>4</sub>NO<sub>3</sub>-80 and TNT-20) lowers the temp. of the detonation flame and velocity of the reaction, but the vol. of flame and the total heat given off remain the same and the duration of the flame is lengthened. Certain explosive flames that do not ignite fire damp are of short duration. The principal factor that diminishes the capacity of explosives to cause ignition is the compn. of the gases constituting the flames following a detonation. Liquid CO<sub>2</sub> placed in a cartridge shell vaporized during detonation and had a large extinguishing effect. Therefore, in order to prevent ignition of fire damp it is essential to develop means for rapid formation of compds. like CO<sub>2</sub>, N and H<sub>2</sub>O in the gases emitted following a detonation.

H. W. WALKER

Gaseous combustion at high pressures. XI. Further experiments on the influence of hydrogen and steam on the explosion of carbonic oxide-air, etc., mixtures. WM. A. BONE, DONALD T. A. TOWNEND AND GORDON A. SCOTT. *Proc. Roy. Soc. (London)* A120, 546-63(1928); cf. C. A. 22, 3992.—The observations of Bone and Howard (C. A. 16, 189) on the influence of successive replacements of CO by H on the explosion of theoretical  $2(m\text{H}_2 + n\text{CO}) + \text{O}_2 + 4\text{N}_2$  mixts. at initial pressures of 50 atm. and room temp. have been confirmed. This effect is now shown to appear abruptly when the H content of the mixt. exceeds about 0.65%; it is of the nature of a "knock" effect, and can be eliminated by raising the bomb temp. to 100° without altering the charge-density. When such "knock" effect has been thus eliminated, effects of successive replacements of CO by H<sub>2</sub> upon explosions of the mixts. are two-fold; namely, initially and up to a certain point, which is reached when about 1.0% of H is present, the effect is definitely "catalytic," but afterward purely "additive." The second phase is attributable merely to a speeding-up of the flame propagation resulting from the concurrent combustions of a relatively fast-burning theoretical H<sub>2</sub>-air and a relatively slow-burning theoretical CO-air mixt., the O<sub>2</sub> supply being always sufficient for complete combustion in the system. The effect of successive small additions of steam to a theoretical CO-air mixt. on explosion at initial pressures of 32.2 and 64.4 atm., resp., and with the bomb chamber at 100° was to promote combustion, but without the steam intervening chemically in the sense of its being continuously decomposed and regenerated; "optimum" conditions were nearly reached in each case when but 1% of steam was present. It is the initial small addn. of steam that has the greatest effect. Actually, and apart altogether from the "knock" effect, the addn. of a small quantity of hydrogen had a greater effect than its equiv. of steam in speeding up the explosion of a CO-air mixt. at high pressures; which of the two effects of H was responsible for this result is perhaps not yet altogether certain, though the evidence seems distinctly in favor of the view that what may be termed the purely "catalytic" effect of H exceeds that of steam in like circumstances. Certainly, the reverse is not the case. Apart altogether from any influence that mere "dryness" may have during the explosion of a theoretical CO-air mixt. at high initial pressures, the progressively increasing "lag" in  $t_m$  (time in seconds for the attainment of max. pressure after commencement of the pressure rise) observed as the initial pressure rises is principally, and for the most part, an effect of N because it is not observed at all when the N is replaced by its vol. equiv. of either CO<sub>2</sub> or A.

XII. Influence of steam and temperature, respectively, upon the "explosion limits" of carbon monoxide-air mixtures. WM. A. BONE, D. M. NEWITT AND C. M. SMITH. *Ibid* 563-72.—The drying of CO-air mixts. narrows their explosion ranges at the high

initial pressures employed. The explosion range (difference in upper and lower percent of CO in the limit mixts.) at 32.2 atm. for dry gas is 44.6; for gas 80% satd. at 100°, 50. The ranges at 64.4 atm. for dry and for 80% satd. gases are, resp., 40.4 and 50.1. In the moist mixts. the influence of increasing pressure (charge density) was slightly to shift each limit downwards without narrowing the explosion range at all; but with the dry mixt. the explosion range was definitely narrowed by doubling the initial pressure. The influence of temp. *per se* is to widen the explosion range because the charge density at 18° and 25 atm. is the same as at 100° and 32.2 atm., while at 18° and 50 atm. it is the same as at 100° and 64.4 atm.

G. CALINGAERT

The spark ignition of a hydrogen-air mixture. KIVOHKO YUMOTO. *Bull. Inst. Phys. Chem. Research Tokyo* 8, 131-42 (1929); *Abstract Ed.* 2, 20-1. —The influence of the nature of the spark upon the ignition of a mixt. of 5% H and air was investigated. For the production of the spark, a d. c. through the primary of a 1-kw. transformer was interrupted by a snap-switch, and the resulting secondary high voltage was applied to the spark gap. The conditions of the secondary were varied (1) by disconnecting, (2) by connecting a capacity in parallel with the spark gap, or (3) by using the capacity and adding a variable resistance (water tube) in series with the gap. In case (1), the spark has a faint luminosity, but a greater igniting power than in case (2), which exists as a brilliant spark. In case (3), the luminosity of the spark is faint, but its igniting power is max. In this last case, the igniting power is still increased by increasing the water resistance in series with the gap.

ALBERT L. HENNE

Further experiments on the combustion of well-dried carbon monoxide and oxygen mixtures. III. WM. A. BONE, FRANK R. WESTON AND DENNIS A. WINTER. *Proc. Roy. Soc. (London)* A123, 285-91 (1929). —The results are similar to those of I and II (cf. *C. A.* 20, 2414) and show that the presence of water vapor is not essential to the ignition and explosion of  $2\text{CO} + \text{O}_2$  mixts. Highly purified gaseous mixts. rigidly dried with redistd.  $\text{P}_2\text{O}_5$  for 555 to 1005 days were exploded with flame propagation, but they required a condenser discharge of 1.0 microfarad at 1000 v. The resulting combustion was always less than 90% complete. The limit of the drying power of  $\text{P}_2\text{O}_5$  is believed to lie between 120 and 240 days. The min. spark energy required for firing depends on the character of the discharge, material and shape of electrodes, compn. of  $\text{CO}-\text{O}_2$  mixt. and the gaseous pressure.

H. W. WALKER

Apparatus for the stability test of smokeless powder at 135° or 120°. J. VON MEERSCHIEDT-HULLESSEM. *Z. ges. Schiess-Sprengstoffe* 24, 10-5 (1929). A heating bath made of Cu is provided with a reflux condenser and 2 rows of 10-12 Cu tubes soldered to the bottom of the cover, for receiving the test tubes contg. 2.5 g. samples of powder. The bath is filled with the proper glycerol  $\text{H}_2\text{O}$  mixt. to maintain the desired temp., (0.1-1.24 for 135° and 1.20 for 120°). Provision is made for simultaneously withdrawing all of the tubes for observation of the litmus paper placed above the powder and for noting evolution of  $\text{NO}_2$  fumes. A shield of heavy glass furnishes protection from possible explosions.

C. G. STORM

Gauze heating in miner's safety lamps. E. J. GLEIM, A. B. HOOKER AND P. G. GUEST. *Bur. Mines, Repts. of Investigations* No. 2013, 7 pp (1929). The results of this investigation confirmed the previously expressed opinion that a double-gauze, bonneted, flame safety lamp properly assembled, with the gauzes intact and clean, is incapable of igniting  $\text{CH}_4 + \text{air}$  atm. under any of the conditions, as to percentage and velocity, likely to be encountered and that the max. temp. reached allows a margin of safety in mines.

CHARLES E. MUNROE

A new permissible blasting device. J. E. TIFFANY. *Bur. Mines, Repts. of Investigations* No. 2920, 8 pp. (1929). —There is described a device styled Cardox, employing liquid  $\text{CO}_2$ , which has been approved as permissible for use in blasting coal. The device consists of a stout steel cylinder having at its lower end a hole which is covered hermetically with a stout steel diaphragm. There is placed in the cylinder a heater element contg. a combustible mixt. which is ignited from without by an elec. current. The cylinder is then charged with liquid  $\text{CO}_2$  and placed in the bore hole in the coal and tamped as a charge of explosion usually is. On the ignition of the combustible the heat generated expands the  $\text{CO}_2$  until the pressure becomes sufficient to shear a disk out of the steel diaphragm through which the gaseous  $\text{CO}_2$  escapes to throw down the coal. The steel cylinder is recovered, refilled, recharged and reused.

C. E. M.

The condenser chronograph. HANS RUMPF. *Z. ges. Schiess-Sprengstoffe* 24, 13-7 (1929). —The condenser chronograph described by Jones (*C. A.* 20, 3237) was modified in several respects so as to give quite consistent results in detg. the velocity of detonation of high explosives in columns only 1 to 5 cm. long. A tolerance of  $\pm 1$  mm. being allowed in measuring the distance between the 2 points which det. the length of



column, the method is accurate to 2%. Because of the impulse imparted by the initiating detonator, the rate of detonation is greatest for the first 3 cm. (approx.) of the column. TNT detonating fuse gave approx. a 6000 m./sec. rate when measured for 1–2 cm., and approx. 5000 m./sec. when measured on a column 5–6 cm. long. With such short columns the time interval measured is of the order of  $1.10^{-5}$  sec. In the usual spark chronograph method the time required for the rupture of the thin Cu wire is about  $1.10^{-4}$  sec., with a tolerance of about  $\pm 2.10^{-6}$  sec.; hence much longer columns of explosives are required.

C. G. STORM

**The delay period in spontaneous ignitions and explosions.** MAX BRUNNER. *Helv. Chim. Acta* 12, 295–304 (1929).—The delay period observed before the occurrence of actual spontaneous ignition and explosion can be explained on the basis of the modern conception of the mechanism of chain reactions in which the delay is caused by original de-activation of reaction centers by active points on the surface of the reaction vessel to such an extent that the "yield" of new reaction centers during the delay period may not rise above the value 1 without spontaneous ignition or explosion taking place. Since the activity of the de-activated points is reduced by adsorption reaction products formed during the slow reaction, the formation of new reaction centers finally overtakes de-activation, whereupon spontaneous ignition of explosion occurs. The theories developed are in accord with exptl. observations.

E. M. SYMMES

#### Method for the classification of the hazards of liquids (NUCKOLLS) 13.

**Explosive.** ERIC SORENSON. U. S. 1,709,498, April 16. An explosive which is suitable for blasting comprises  $\text{NH}_4\text{NO}_3$  800,  $\text{KNO}_3$  100, S 16,  $\text{MnO}_2$  15, paraffin 6, petroleum naphtha 6, rosin 15, potato flour 8, Al 30 and nitroglycerin 100 parts.

**Explosives.** J. P. NICHOLS. Brit. 297,365, March 17, 1927. Oil pitch or asphalt pitch or like material, with or without a substance such as charcoal, is used with  $\text{KNO}_3$  and S to form a powder suitable for fuses and for blasting or military operations where slow action is required. Proportions and details of manuf. are given.

**Explosives.** IMPERIAL CHEMICAL INDUSTRIES, LTD., and T. J. R. ALEXANDER. Brit. 297,375, June 20, 1927. A very intimate mixt. of  $\text{NH}_4\text{ClO}_4$  and  $\text{NaNO}_3$  suitable for use in explosives is obtained by double decompn. of concd. solns. of  $\text{NaClO}_4$  and  $\text{NH}_4\text{NO}_3$  at a relatively high temp (suitably about  $140^\circ$ ).

**Explosive for signalling.** WALTER O. SNELLING (to Trojan Powder Co.). U. S. 1,709,636, April 16. In signalling, a compn. is detonated which contains nitrated starch together with a non-explosive signalling material such as coloring substances. Various other ingredients may also be added.

**Propellant explosive.** ARTHUR S. O'NEIL (to Western Cartridge Co.). U. S. 1,709,868, April 23. A progressively burning charge is formed of blended grains of different characteristics such as grains of different sizes. U. S. 1,709,869 specifies blended grains, the ds of which are so chosen as to produce a progressively burning charge. U. S. 1,709,870 specifies blended grains, the compns. of which are such as to produce a progressively burning charge, e. g., nitrocellulose grains of high and low nitration.

**Electrically fired fuse heads for explosives.** W. O. LITTLEBURY and IMPERIAL CHEMICAL INDUSTRIES, LTD. Brit. 297,869, June 29, 1927. Basic dinitrosalicylates of Pb are used in fuse heads and other co-pptd. basic Pb salts also may be present. Directions for prep. the salts are given.

**Smokeless powder.** WILLIAM T. INGRAHAM. U. S. 1,710,024, April 23. After forming the powder in a usual manner, it is gelatinized, grained and dried, and the grains are then dipped in acetone or other solvent for nitrocellulose in order to reduce hygroscopicity and alter the ballistic properties.

**Composition for pyrotechnic "sparklers."** CHARLES D. MILLER. U. S. 1,709,033, April 16. A compn tip for "sparklers" is formed of glue, water,  $\text{KClO}_3$ , amorphous P, powdered glass,  $\text{MnO}_2$ , particles of metal such as Mg and Al and S.

**Detonators for blasting purposes.** NOBEL'S EXPLOSIVES CO., LTD., and G. MORRIS. Brit. 297,853, April 1, 1927. Detonators for blasting purposes and for shells, mines, etc., are provided with a main charge of explosive of high d. (such as erythritol tetranitrate or a mixt. of "tetryl" and trinitrotoluene) by loading the charge into the detonator casing in molten condition (or in powdered form followed by melting after its introduction). A priming charge of Pb azide and Pb styphnate may then be placed in the detonator on the main charge.

## 25—DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

Interesting sources of natural dyestuffs. C. D. MELL. *Textile Colorist* 51, 257-62 (1929); cf. C. A. 23, 1507.—The production and the use are described of West African camwood, which earlier was used almost exclusively for dyeing bandana handkerchiefs. The jack tree (*Artocarpus integrifolia*), from which a yellow dye is obtained, is among the minor dye-yielding plants used in India. In South America, the bark of the Lingue tree (*Persea lingue*) is an important source of tannin. The *Mimosa mellii*, a tree discovered by the author in southern Mexico about three years ago, and the *Datura fastuosa trombeta* are described.

RUBY K. WORNER

New development in vat colors. EUGENE SCHWARZ. *Am. Dyestuff Repr.* 18, 67-70(1929).—A general survey is given of about 30 new vat colors which have been introduced in the last 10 years. Nekal BX is used to give brighter shades. The yellows as a class have a destructive influence in regard to light fastness upon the blue in a green combination. Indanthrene Yellow 3GF is the least destructive in this respect. Properties of dyeing and fastness of these colors on cotton and rayon are discussed.

E. W. CLARK

Problems in dyeing sulfur blues. WALTER F. HASKELL. *Am. Dyestuff Repr.* 18, 42-4(1929).—The faults of sulfur blue dyes as encountered by the warp, beam, package, skein and piece goods dyers are discussed.

R. HOUGHTON

Dyeing in India: vat dyes. G. H. DYER. *Leeds Univ. Indian Textile J.* 39, 135-6(1929).—General.

RUBY K. WORNER

Optical heterogeneity and its influence on the fastness to light of vat dyeings. B. WUTH. *Am. Dyestuff Repr.* 18, 117-20(1929).—Optical heterogeneity obtains when light travels to the eye from reflecting or transparent objects which contain solids, suspensions or colloids in every degree of dispersity, with varying degrees of reflection, and ordinary or selective absorption, and refraction, polarization, phosphorescence, etc. This heterogeneity varies according to the phys. or chem. state of the object, decreasing in colloidal solns. in proportion to their higher dispersion nearing mol. solus., and increasing with lower dispersion to suspensions and solids. The degree of dispersion of a body in an indifferent solvent is closely related to the mol. wt. of this body. The dividing line between mol. dispersoids and colloids of org. dyes has been drawn at a mol. wt. of about 250 to 300 and therefore with very few exceptions, all dyes in practical use are colloids. Refraction, optical resonance, interference, chromolysis, bichroism, dichroism, poikilochroism, intussusception and apposition are defined. A marked relationship exists between optical heterogeneity and the fastness to light of vat dyeings. Apposition dyeings in which the dye particles are large, because of the many and greater surfaces exposed to heterogeneous light, are less fast than those in which the dye particles are small and the surface of the mass is more even. Slow oxidation and thorough soaping favor the latter type of dyeing.

E. W. CLARK

Laboratory dyeing in relation to bulk dyeing. J. MOFFAT. *Dyer, Calico Printer* 61, 72-3(1929).—The testing of dyes for the woolen and worsted industries is discussed.

RUBY K. WORNER

The human factor in dyeing. FRANK PLATT. *J. Soc. Dyers Colourists* 45, 42-4 (1929).—This article is concerned with the relation between the dyer, the dye machine operator and quality of work.

ROBERT HOUGHTON

Apparatus for the examination of dyed materials in artificial light. ANON. *Dyer, Calico Printer* 61, 108(1929).—An instrument devised by the British Dyestuffs Corp., Ltd., has two compartments so arranged that the material can be seen simultaneously illuminated by daylight and by artificial light.

RUBY K. WORNER

Comparative outputs and costs of dyeing wool with four special process machines and with eleven open tubs. A. C. NIELSEN COMPANY. *Textile Colorist* 50, 690-2 (1928).—The installation of Franklin Process Dyeing Machines by the Worcester Woolen Mill Company has brought about a saving of \$0.01706 per lb. as compared with the tub process and a net annual return on the investment of 135%.

RUBY K. WORNER

Dyeing silk with sulfur dyes. J. CLAROU. *Russa* 4, 225, 227(1929).—F. Grove-Palmer protects the fiber from the action of the alkali in the dyeing bath by adding Na acid lactate. The results obtained can be improved by facilitating reduction of the dye by replacing part of the Na<sub>2</sub>S by Na hyposulfite, and by dyeing in the presence of a good dyeing oil to obtain better dispersion of the dye. After dyeing, it is preferable first to rinse with a soln. contg. 1 g. Na<sub>2</sub>S, 2 g. Na sulfonate and 4-5 g. coconut oil soap per l., at 35°.

A. PAPINEAU-COUTURE

Dyeing cotton yarn in the cop. H. MARSDEN. *Dyer, Calico Printer* 60, 162-3, 180-1, 224-5, 248-9(1928); 61, 28-9, 76-8, 94-5(1929). RUBY K. WORNER

The behavior of cellulose acetate toward amino derivatives of anthraquinone. HERMAN M. BURNS AND JOHN K. WOOD. *J. Soc. Dyers Colourists* 45, 12-5(1929).—Expts. are described giving evidence that the dyeing of cellulose acetate silk by means of aq. suspensions of bases such as the amino derivs. of anthraquinone is an adsorption phenomenon. T. G. HAWLEY, JR.

Indigosol resists on Prud'homme aniline black. J. BERT. *Dyer, Calico Printer* 61, 150(1929).—Formulas are given. RUBY K. WORNER

Application of Indigosols in printing. W. H. COTTON. *Am. Dyestuff Repr.* 18, 33-6(1929).—General properties and methods of application are described. In the nitrite and chromate method the oxidizing agent is included in the color paste, development taking place after printing in  $H_2SO_4$  soln. Steaming after printing gives considerably darker shades. The Indigosols may be printed in combination with Aniline Black and with the Rapid Fast Colors. The production of green, violet and chocolate shades is described. They may be resisted with  $NaOAc$ ,  $Na_2S_2O_3$  or with rongalite. The insol. azo colors, Rapid Fast colors or nitrosamines, also act as resists for Indigosols. The ordinary vat color printing pastes discharge them. They may themselves be used as resists under Aniline Black and in chlorate discharges since they stand chlorate well. They are suitable for both weighted and unweighted silk. For the former, development in dichrome and  $H_2SO_4$  soln. is recommended. Rayon and viscose are treated in the same way as cotton. Celanese differs from cotton and requires steaming for some time before developing in the acid soln. E. W. CLARK

Bleaching, dyeing and finishing, modernized. THOMAS B. EVERIST. *Am. Dyestuff Repr.* 17, 805-8(1928).—A description is given of modern machinery used in bleaching, dyeing and finishing cotton piece goods, with illustrations. H. F. LEUPOLD

The effect of  $pH$  in scouring and dyeing upon resulting shades on viscose. CHAS. E. MULLIN. *Am. Dyestuff Repr.* 18, 64-6(1929).—A paper which explains the results obtained upon sample skeins of viscose yarn dyed with direct colors, the skeins having been scoured at various  $pH$  values and temps. and dyed at const.  $pH$  values. R. H.

Discharge and resist printing on Celanese dyed with S. R. A. colors. J. BERT. *Dyer, Calico Printer* 61, 75(1929).—Formulas are given. RUBY K. WORNER

Calico printing in Ahmedabad. H. B. SHROFF. *Indian Textile J.* 39, 132-4(1929).—Methods are described. RUBY K. WORNER

Some observations on the suitability of various metals and alloys for dyeing machines. J. G. GRUNDY. *J. Soc. Dyers Colourists* 45, 39-42(1929).—The effects of various metals upon dyestuffs of the following classes are shown: acid, chrome, direct, diazo, basic, sulfur, vat and azoic. The metals tested were cast iron, wrought iron, copper, nickel, monel, lead, stainless steel, Firth Staybrite, Dyebrite, Silverite, phosphor bronze and brass. The tests were made with solns. such as would be used in the application of each class of dyes to various fibers. ROBERT HOUGHTON

Suggested method of choosing dyeing and bleaching machinery in your plant. HENRY B. BURKE. *Am. Dyestuff Repr.* 18, 1-2(1929).—An outlined system of checking the selection of equipment. STEPHEN K. FORD

The influence of light in fading tests. Use of artificial light. OTTO MERZ. *Farben-Ztg.* 34, 1117-9(1929).—M. reviews briefly the elements of light transmission, absorption, reflection, etc. The results of exposure of 16 dyes and pigments (names not given) to midday sunlight, midday diffused light and to the light from a "natural light lamp" are tabulated. G. G. SWARD

Color science applied to textiles. WALTER M. SCOTT. *Am. Dyestuff Repr.* 18, 60-4(1929).—Examples are given to prove that uniform mixts. of pigments do not necessarily produce an even progression of colors to the eye. Photometer reflection measurements are given to show the color changes on cotton produced by different concns. of caustic in the kier boil, and those produced by the various processes in the bleach house. The correlation between spectral reflection measurements and values of hue, value and chroma is pointed out. T. G. HAWLEY, JR.

Practical hints on the production of bright colors on textile fabrics. RAFFAELE SANBONE. *Am. Dyestuff Repr.* 18, 95-8(1929); cf. C. A. 23, 280.—The production of stripe effects in printing is discussed. A printing and aging machine is described. ROBERT HOUGHTON

The textiles of the north. A frontier novelty: Afridi wax cloth. SHRIPAD R. TIKKAR. *Indian Textile J.* 39, 122-3(1929).—An illustrated description is given of the making of this fabric. RUBY K. WORNER

Cross-sectioning of textiles. ARTHUR K. JOHNSON. *Am. Dyestuff Repr.* 18,

37-40(1929).—Suggestions are given to assist the operations of prep. materials for sectioning and for the cutting of sections by simple and rapid methods. A. K. J.

A study of the "direct or rational method" for the conditioning of textiles. ETIENNE BURLET. *Chambre de Commerce de Roubaix. Russa* 3, 1471-9(1928); 4, 51, 53 (1929); cf. *C. A.* 22, 1048.—In conditioning textiles by exposing to a standard atm. (18°, 65% relative humidity) to const. wt., the final wt. depends on the previous hygrometric condition of the sample and is higher when it is brought from higher to lower H<sub>2</sub>O content than conversely. The max. difference in the const. wt. attained from satn. and from oven dryness, resp., is approx. 2.5% for artificial textiles and 2% or less for natural textiles; the true normal wt. of the material lies just half-way between the two. The max. error in detg. the normal wt. by exposing to a normal atm. to const. wt. would therefore be 1-1.25%, and in practice the actual error due to this cause would generally not be more than half these values. The true normal wt. can be detd. with a high degree of accuracy by taking 2 equal samples, exposing them for 8 hrs. to air at 85-8°C and 35-40% relative humidity, resp., then exposing to a standard atm. (as above defined), plotting the wt. curves, and taking the mean. A. PAPINEAU-COUTURE

The filtration of water for textile purposes. S. R. TROMAN. *Dyer, Calico Printer* 61, 120-2(1929).—Methods of treating water are considered with regard to the type of water and the requirements of the textile process concerned. R. K. W.

Cellulose and its importance to the textile industry. JOHN E. JACKSON. *Am. Dyestuff Repr.* 17, 816-9(1928).—J. notes the numerous forms in which cellulose finds service—cotton, linters, cellulose flour, rayons and plastics, ramie, pita fiber.

A. K. JOHNSON  
Some notes on phorium (New Zealand flax). FRED. GROVE-PALMER. *Am. Dyestuff Repr.* 18, 115-6, 132-3(1929).—The good strength, luster and possible softness possessed by this fiber make its extended use desirable. Increased cultivation and continued improvements in mech. methods for sepn. of the fiber will accomplish this. The dyeing of the fiber presents no special difficulty. Preliminary treatments may include boiling out in very dil. soda ash, or bleaching under properly controlled conditions with H<sub>2</sub>O<sub>2</sub> followed by washing and then treatment with H<sub>2</sub>SO<sub>4</sub>. Direct, Acid, Basic or Sulfur colors may be used. No record of the com. application of Vat colors has been found.

A. K. JOHNSON  
Relation between cystine yield and total sulfur in wool. CLAUDE RIMINGTON. *Biochem. Dept., Brit. Research Assoc. Woolen Industries, Leeds. Biochem. J.* 23, 41-6(1929).—Wools differing in S content from 3.34 to 4.08%, and fine and coarse samples of Turkey mohair, are all capable of yielding their entire S as cystine when hydrolyzed by acids.

BENJAMIN HARROW  
Silk and its processing. THOMAS F. HUGHES. *Am. Dyestuff Repr.* 18, 100-11 (1929).—An article which describes general methods of dyeing on piece goods, skeins and cold dyeing with acid colors. A distinction is made between wild silk and spun silk.

R. HOUGHTON  
The bleaching of silk. THOMAS F. HUGHES. *Textile Colorist* 51, 248-52(1929).—The use of peroxides, perborates, aqua regia, H<sub>2</sub>SO<sub>4</sub>, Na<sub>2</sub>S<sub>2</sub>O<sub>4</sub>, and KMnO<sub>4</sub> in the bleaching of silk is described. Several methods are given for bleaching Tussah silk.

RUBY K. WORNER  
Scrooping silk. FRED. GROVE-PALMER. *Indian Textile J.* 39, 163-4(1929).—General. Cf. *C. A.* 22, 321.

RUBY K. WORNER  
Estimating the luster of silk fabrics. N. BOURGUIGNON. *Russa* 4, 199-203 (1929).—A brief discussion of the problem, with a description of the principle and construction of the Goerz lustometer.

A. PAPINEAU-COUTURE  
Use of ultra-violet rays for distinguishing between different types of rayon. H. LE TRAYAS. *Russa* 4, 171-7(1929).—A review of the work of Nopitsch (*C. A.* 22, 3049) and W. Weltzien (*Seide* 33, 306-11(1928)).

A. PAPINEAU-COUTURE  
The tensile strength of rayon fibers. FRED. GROVE-PALMER. *Am. Dyestuff Repr.* 18, 79-85(1929).

A. K. JOHNSON  
Drying artificial silk. GUSTAV KIPPE. *Chem. App.* 16, 57-9(1929).—Descriptions and directions are given for operating chamber and channel dryers, with 3 cuts of each type showing directions of air currents and location of heating pipes.

J. H. MOORE  
Present practice in warp mercerization. JOHN H. SKINKLE. *Lowell Textile Inst. Textile World* 75, 2377-8, 2427(1929); cf. *C. A.* 23, 1274.—Prepn. of the yarn, make-up of the set, boiling-out, impregnation or primary mercerization, washing or secondary mercerization, scouring or neutralization of the excess caustic, after-treatment of the yarn and drying are considered.

RUBY K. WORNER

**Structure of cotton fiber.** WACŁAW KACZKOWSKI, I. FEFERMAN AND S. ZABICKI. Warsaw Polytech. *Przemysł Chem.* 11, 205-8(1927).—Cotton is not uniform in its chem. compn. throughout, but consists of at least 3 portions: the cuticle, the inside and the outside portions. Schweitzer's reagent differentiates between the cuticle and the outside portion. The curve for loss in wt.—time of boiling in alkali rises rapidly at first, reaching 4% in the first 30 mins., then remains without change for at least 2½ hrs. and rises again after 7 hrs., showing the beginning of a new reaction. This can be checked with raw unbleached cotton.

A. C. ZACHLIN

**The shrinkage of cotton cloth.** H. D. CLAYTON. *Am. Dyestuff Repr.* 18, 40 2 (1929).

H. H. MOSHER

**Kieropon—new method for bleaching and mercerizing cotton goods containing vat, naphthol and sulfur colors.** A. R. THOMPSON. *Am. Dyestuff Repr.* 18, 5-11 (1929); cf. C. A. 22, 689.—New uses for Kieropon and some of its properties are described. Kieropon functioning as an oxidation agent protects vat and naphthol colors on cotton from bleeding while the colored stripe material is in NaOH soln. during prepn. for the bleaching process, these colors being fast to the Cl bleach and subsequent operations. It is possible to use Naphthol Reds (AS-SW with KB base and AS with TR base) to replace Turkey red when using the Kieropon-Cl bleach. The naphthol colors which are not fast to the peroxide bleach can be used with this process. The use of Kieropon in the bath prevents these colors as well as S colors from marking off or bleeding in the mercerizing process. Curves showing the stability of Kieropon-NaOH solns. are given. Kieropon may also be used as a resist for vat colors. The material is printed with the Kieropon, dried and dyed on the pad with either vat or S colors, then washed and soaped. Several formulas are given for the use of Kieropon in bleaching and mercerizing processes.

E. W. CLARK

**Influence of sodium silicate on bleaching by hypochlorite.** WALTER TAUTE. *Rev. gen. mat. color* 31, 279 80, 320 1(1927). *Chem. Zentr.* 1928, I, 415.—The addn. of Na<sub>2</sub>-SiO<sub>3</sub> to NaOCl solns. in the absence of materials to be bleached does not affect the NaOCl decompn. The presence of goods to be bleached retards the decompn. Na<sub>2</sub>-SiO<sub>3</sub>, when added to NaOCl solns. increases the latter's bleaching power and gives a whiter and cleaner fabric. This action was observed even after repeated use of the bleaching soln. NaOCl solns. rapidly destroy tissue of fabrics and Na<sub>2</sub>-SiO<sub>3</sub> acts as a distinct protection agent. Considerable silicate adheres to cloth or other material which is being bleached and thus greatly increases the ash content of the fiber. The loss in Cl during successive treatments of cellulose was 2.9-7.1% at 25° and 21.7-36.8 at 82°. The amt. of Na<sub>2</sub>-SiO<sub>3</sub> present did not greatly affect the results. The silicate that is deposited upon the fibers was shown not to affect the strength of the fibers, even when exposed to high temps. or to repeated pressings.

C. R. F.

**Investigations on the action of oxidizing agents in kier boiling.** HALLER AND PAUL SEIDEL. *Am. Dyestuff Repr.* 18, 85 9(1929); cf. C. A. 22, 4209.—The use of *Aktivin* is compared with standard practice.

STEPHEN K. FORD

**Soap applications and textile processes.** W. W. BRAY. *Am. Dyestuff Repr.* 18, 174 6(1929); cf. C. A. 22, 2468. A discussion of the function of soap in boiling-out cotton, rayon scouring and silk degumming with arguments for the superiority in these operations of an oleate type of soap.

E. M. SHELTON

**Solvents in soap and their subsequent effect on the properties of soap solution.** ROBERT W. JAEGER. *Am. Dyestuff Repr.* 17, 811 3(1928).—In tests on removal from woollen flannel samples of an artificial soil composed of ceresin, lanolin, cylinder oil, and roofing tar it is reported that effectiveness of soap soln. decreases with addn. of hexalin, tetralin and pine oil. Surface-tension lowering is less and handle of goods is not improved.

E. M. SHELTON

**Potash or soda soaps which?** W. W. BRAY. *Am. Dyestuff Repr.* 18, 24-8 (1929).—Potash and soda soaps of identical fatty acid content (particularly oleates) are compared for textile purposes. Although potash soap is slightly more sol., no advantage is found over Na oleate under conditions of use in textile processing. K soaps are hydrolyzed appreciably more than Na soaps and wool is shown to remove by preferential absorption less alkali from a Na soap than from a K soap, from which it is concluded that wool loses less in softness, elasticity and strength when processed in Na soap. There is no difference in rinsibility and ability to form stable fatty acid emulsions on acidification. Stored in an atm. of high humidity K oleate becomes rancid more quickly.

E. M. SHELTON

**Solubilized starch in finishing mixings.** W. TRAUTMANN. *Dwr., Calico Printer* 61, 83-8(1929).—Photomicrographs of cross-sections of sized thread obtained by Kraus

are reproduced and described. The effect of adding Aktivin to the mixture is shown. Formulas are given. Cf. *C. A.* 22, 2063.

Points about drying machines (for textiles). C. PRIMROSE. *Dyer, Calico Printer* 61, 4-5, 50-1, 74-5 (1929).  
RUBY K. WORNER

The constitution of silk fibroin (HERZOG) 11A. Dyeing and finishing hat leathers (LAMB) 29. Anthraquinone-1,5-dicarboxylic acid and some simple and mixed anthraquinonecarboxylic acid anhydrides (SCHOLL, *et al.*) 10. Apparatus for testing the bursting strength of materials such as cloth (U. S. pat. 1,709,638) 1. Colors for wall papers, etc. (Belg. pat. 353,812) 23. Apparatus for drying fabrics, yarns, etc. (Ger. pat. 473,150) 1.

DARBY, WILLIAM: Rayon and Other Synthetic Fibers. A brief account of the origin, development, use and manufacture of rayon. New York: Dry Goods Economist. 65 pp.

LEHNE, A.: *Textilchemische Erfindungen*. Part II, July 1 to Dec. 31, 1927. Wittenberg, Halle: A. Ziemsen. M. 6. Reviewed in *Bull. soc. ind. Mulhouse* 95, 116 (1929).

Dye. W. SMITH, J. THOMAS and SCOTTISH DYES, LTD. Brit. 298,248, April 1, 1927. A dye which is apparently 3,3'-dichloroanthraquinonehydroazine and which dyes cotton bright reddish blue from a hydrosulfite vat is obtained by brominating 2-amino-3-chloroanthraquinone, m. 310-12° (which may be obtained by the process described in Brit. 264,916 (*C. A.* 22, 244)) and condensing the product in the presence of an acid absorber such as NaOAc, a Cu salt such as the acetate and a diluent such as o-nitrotoluene.

Dye composition. EUGENE R. SCHLATTER (to Dip-It Inc.). U. S. 1,710,076, April 23. A compn. suitable for household use comprises a glycerol soln. of acid and basic coal-tar dyes such as diamine fast yellow G, orange 2 R, orange Y and malachite green.

Dyes. J. R. GEIGY A.-G. Brit. 297,441, Sept. 21, 1927. Acid dyes fast to alkali are prep'd. by the further sulfonation of phenonaphthosafranine-16-sulfonic acids (such as those prep'd. as described in Brit. 265,986; *C. A.* 22, 503). A suitable starting material is the phenonaphthosafranine-16-sulfonic acid prep'd. by coupling 6-sulfo-3-ethylbenzylisorosinduline with Na 1-methyl-2-ethylamino-5-amino-4-sulfonate. The 6-sulfo-3-ethylbenzylisorosinduline is prep'd. by coupling 2-phenylnaphthylamine with 4-nitroso-1-ethylbenzylaniline, sulfonating with alkali sulfite and oxidizing.

Dyes. I. G. FARBENIND. A.-G. Fr. 648,633, Feb. 10, 1928. 2-Thionaphthene-3-indolindigoid dyes are prep'd. by condensing 6-aminohydroxythionaphthene with a 5,7-dihaloisatin and then introducing 2 Cl atoms into the 5,7-positions on the thionaphthene side, or by condensing 5,7-dichloro-6-aminohydroxythionaphthene (from 2-amino-4,6-dichloro-5-acetyl-amino-1-thioglycolic acid by the process of Fr. 366,611) with a 5,7-dihaloisatin. Examples are given of both methods using 5,7-dibromoisatin. The products dye cotton from the vat in fast brown shades.

Dyes. SOC. ANON POUR L'IND. CHIM. A BALE. Swiss 128,904 to 128,913, Dec. 4, 1926. Addns. to Swiss 127,259 (*C. A.* 23, 1281). Diazotized 4-(alkyl- or arylamino)-2-amino-1-benzenesulfonic acid is coupled with pyrazolone derivs. Thus, diazotized 4-acetamido-2-amino-1-benzenesulfonic acid coupled with 1-(2'-methyl-4'-sulfo-phenyl)-5-pyrazolone-3-carboxylic acid gives a dye which colors wool a fast greenish yellow in an H<sub>2</sub>SO<sub>4</sub> bath. Also, 4-benzoylamino-2-amino-1-benzenesulfonic acid coupled with 1-phenyl-3-methyl-5-pyrazolone gives a red-yellow dye fast to light, water, washing and alkali. Other examples occur in each patent.

Dyes. SOC. ANON POUR L'IND. CHIM. A BALE. Swiss 129,265, June 24, 1927. A dye prepn. is obtained by mixing sym. 1,2-naphthothioindigo with its sym. 2,1-isomer.

Dyes. SOC. ANON POUR L'IND. CHIM. A BALE. Swiss 129,267, July 12, 1927. A dye prepn. is obtained by mixing isoviolanthrone with its dichloro deriv.

Dye. SOC. ANON POUR L'IND. CHIM. A BALE. Swiss 129,472, Dec. 4, 1926. Addn. to Swiss 127,259 (*C. A.* 23, 1281). Diazotized 4-acetamido-2-amino-1-benzenesulfonic acid is coupled with the pyrazolone deriv. obtained from crude xylydine by sulfonating, diazotizing, reducing and condensing with acetoacetic ester. The resulting dye is fast to light, water and alkali.

Azo dyes. L. B. HOLLIDAY & Co., LTD., and C. SHAW. Brit. 298,008, May 28, 1927. Azo dyes are formed by condensing aminoozo compds. such as aminoozobenzene, aminobenzeneazodiphenylamine or p-nitrobenzeneazo-β-naphthylamine with phthalic

acid or a deriv. Dyes are obtained which give orange dyeings on cellulose acetate, wool, silk and cotton.

**Azo dyes.** LEOPOLD LASKA, FRIEDRICH KRECKE and FRITZ WEBER (to Grasselli Dyestuff Corp.). U. S. 1,709,989, April 23. Monoazo dyes are formed by combining 2,6-naphtholcarboxylic acid with diazotized compds. such as those of aniline, *p*-chloro-aniline-*o*-sulfonic acid, *p*-nitro-*o*-aminophenol, *o*-nitro-*o*'-aminophenol-*p*-sulfonic acid (or other components which are listed in a table of properties of the dyes formed). These dyes give yellowish red to brown tints on wool, turning to blue to violet to black when after-chromed, and dye cotton reddish to brownish shades by the chrome-printing process and are also suitable for producing good lakes. Cf. C. A. 23, 2299.

**Azo dyes.** LEOPOLD OSWALD (to J. R. Geigy Akt.-Ges.). U. S. 1,709,734, April 16. See Fr. 637,867 (C. A. 23, 286).

**Azo dyes.** J. R. GEIGY A.-G. Swiss 129,179 to 129,190, July 8, 1927. Addns. to Swiss 127,529 (C. A. 23, 1276). Monoazo dyes are prepd. by combining aminosulfocarboxylic acids of chlorobenzene or benzene with naphthol or pyrazolone derivs. Thus, 1-amino-2-sulfo-5-chlorobenzene-4-carboxylic acid and  $\beta$ -naphthol give a red dye. The same carboxylic acid with 1-(2'-chloro-5'-sulfophenyl)-3-methyl-5-pyrazolone gives a yellow dye. Also, 1-amino-2-sulfo-5-chlorobenzene-5-carboxylic acid with the same pyrazolone deriv. gives another yellow dye. Further, 1-amino-2-sulfo-5-chlorobenzene-5-carboxylic acid in acid soln. with 2-amino-8-naphthol-6-sulfonic acid gives a red dye. Other examples occur in the series of patents.

**Azo dyes.** I. G. FARBERIND A.-G. Brit. 297,362, Sept. 19, 1927. Dyes producing tints tending more toward bordeaux in color than the dyes made as described in Brit. 210,081 (C. A. 18, 1755) are produced in substance or on the fiber by coupling with an arylide of 2,3-hydroxynaphthoic acid a diazotized alkyl-, aryl- or aralkylamide of 3-aminobenzoic acid having in the 4-position an alkyloxy, aryloxy or aralkyloxy group and in the 6-position an alkyloxy, aryloxy or aralkyloxy group or halogen. Several examples are given.

**Azo dyes.** I. G. FARBERIND A.-G. Brit. 297,884, July 1, 1927. Azo dyes are produced by reducing to an azoxy or azo group the nitro groups from 2 mols. of a dye obtained by coupling diazotized 5-nitro-2-aminobenzoic acid with a component such as 2-amino-8-naphthol-6-sulfonic acid, 2-amino-5-naphthol-7-sulfonic acid, 2-phenyl-amino-5-naphthol-7-sulfonic acid or 1- $\beta$ -naphthyl-3-methyl-5-pyrazolone-6'-sulfonic acid. The products give dyeings which are rendered fast to light and to washing by after-treatment with metal salts such as those of Cu, and the dyes contg. diazotizable amino groups may be further diazotized and coupled either in substance or on the fiber. Several examples are given of dyes giving different colors.

**Azo dyes.** SOC. ANON POUR L'IND. CHIM. A BALE. Swiss 129,473 to 129,482, Dec. 24, 1926. Addns. to Swiss 127,260 (C. A. 23, 1281). New azo dyes are produced by coupling 3-methyl-5-pyrazolone with diazotized benzene derivs. Examples of the benzene derivs. mentioned are 2-nitro-1-aminobenzene, 4-aminoazobenzene,  $\text{PhNH}_2$  and  $\alpha$ -naphthylamine.

**Azo dyes.** SOC. ANON POUR L'IND. CHIM. A BALE. Swiss 129,790 to 129,792, Oct. 7, 1924. Addns. to Swiss 113,867. New dyes are produced by coupling 1 mol. of 2,5-aminonaphthol-7-sulfonic acid and 1 mol. of cyanurictricarboxylic acid chloride with 1 mol. of diazobenzene. The dye colors wool a wash-fast orange. Or, 1 mol. of the diazotized condensation product of 1 mol. of 1,4-phenylenediamine-3-sulfonic acid and 1 mol. of cyanurictricarboxylic acid chloride is coupled with 1 mol. of 2,5-aminonaphthol-7-sulfonic acid. The product dyes wool red. If *m*-tolylenediamine is used instead of diazobenzene, an orange dye is obtained.

**Vat dye.** SOC. ANON POUR L'IND. CHIM. A BALE. Swiss 128,370, Oct. 20, 1926. Addn. to Swiss 125,480. A new vat dye of the anthraquinone series is prepd. by sulfonating 6,6'-dimethylviolanthrone, melting the sulfonic acid so obtained with caustic alkali and treating the product with a methylating agent. The product colors cotton a grey-blue in a red-violet bath. The color is fast to Cl.

**Vat dyes.** SOC. ANON POUR L'IND. CHIM. A BALE. Swiss 128,648 and 128,649, Apr. 1, 1927. Addns. to Swiss 128,007 (C. A. 23, 2042). New dyes of the pyranthrone series are prepd. by condensing trichloropyranthrone or dibromopyranthrone with guaiacol in presence of fixed alkali. The dyes color cotton in very fast red-brown tones.

**Vat dyes.** SOC. ANON POUR L'IND. CHIM. A BALE. Swiss 129,589, June 8, 1927. Derivs. of vat dyes are prepd. by treating leuco thioindigo with monohaloacetic acid. The new compds. are red-brown powders which are converted back to the thioindigo on oxidation.

**Vat dyes of the anthracene series.** GEORG KRÄNZLEIN and RALF EBERT (to I. G.

Farbenind. A.-G.). U. S. 1,709,985, April 23. Purified dyes giving purer tints of a more reddish hue than the parent material are obtained by treating with strong  $H_2SO_4$  (suitably with use also of  $H_3BO_3$ ) at 75–110° the vat dyes obtainable by oxidizing the condensation products produced by fusing an  $\alpha,\alpha$ -polyanthrimide with a condensing agent, pptg. the product from the  $H_2SO_4$  soln. and oxidizing (suitably with hypochlorite).

Vat dyes of the anthracene series. HEINZ SCHEYER (to Grasselli Dyestuff Corp.). U. S. 1,709,956, April 23. Glyoxaldianthraquinone compds. in which the anthraquinone nuclei may be substituted by univalent substituents such as halogen, alkyl or aryl groups (and which may be produced as described in U. S. 1,646,782 (C. A. 22, 323)) are treated with alk. condensing agents such as KOH and EtOH, to form dyes which are red to violet powders, difficultly sol. in org. solvents, dyeing cotton fast red to violet shades. Several examples are given.

Anthraquinone vat dyes. I. G. FARBENIND A.-G. Brit. 298,284, July 12, 1927. *N*-*Bz*-1-Benzanthronylpyrazol anthrones are obtained by the action of *Bz*-1-haloben-zantrones on pyrazoleanthrones, and by alkali fusion they yield vat dyes. Several examples are given.

Dyes of the indigo series. I. G. FARBENIND A.-G. Brit. 297,376, June 20, 1927. Dihaloalkylisatins, substituted in the benzene nucleus, or their reactive  $\alpha$ -derivs. are condensed with cyclic ketomethylene compds. such as naphthols, anthrols, oxythionaphthenes, oxynaphththiophenes, indoxyls and naphthindoxyls, or the reactive  $\alpha$ -derivs. are reduced to the corresponding indigo derivs. Several examples are given.

Dyes of the thiondigo series. ERWIN HOFFA and HANS HEYNA (to Grasselli Dyestuff Corp.). U. S. 1,709,982, April 23. Dyes are formed by condensing naphthalene-3,2-(3'-acetoxy-1'-thiophene) or other compds. of the general formula  $R.C(OCOR').CH_3$  (in which R stands for an aryl residue which may be substituted

and R' stands for H, an alkyl or aryl group) with 4-methyl 6-chloro 2-dichloro-3-ketodi-hydro-1-thionaphthene, 5,7-dichloroisatin or other suitable compds. contg. a 5-membered ring at least 4 atoms of which are C and the fifth either S, N or C and of similar character. Dyes are obtained which, according to several examples given, dye cotton various bluish and red shades.

Indigoid dyes. JOSEF HALLER (to Grasselli Dyestuff Corp.). U. S. 1,709,977, April 23. Compds. such as 9-chloro 1,2-naphthhisatin, 6,9-dichloro 1,2-naphthhisatin or 9-chloro-4-bromo-1,2-naphthhisatin by reaction with thionaphthene, oxindole, indoxyl, acenaphthenone,  $\alpha$ -anthrol,  $\alpha$ -naphthol,  $\alpha$ -hydroxyanthranol, carbazole or their substitution products, form dyes of which several examples are given which dye cotton violet, olive and blue shades.

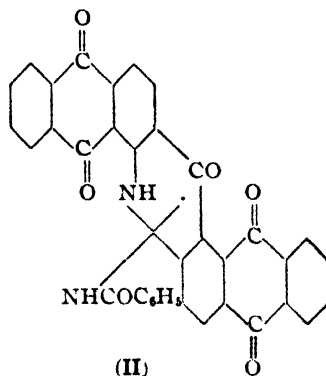
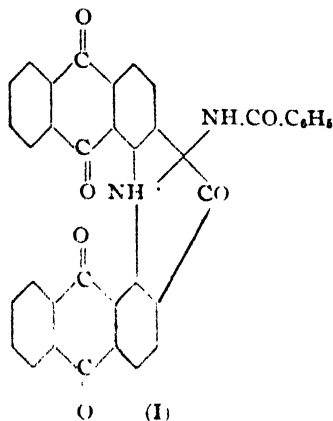
Dyes of the triarylmethane series. I. G. FARBENIND A.-G. Brit. 298,101, June 29, 1927. A basic dye of the triarylmethane series such as fuchsin hydrochloride, *p*-triaminodiphenyl *m*-tolylecarbinol, methyl violet or benzal green is combined with 2,3-hydroxynaphthoic acid or its Na salt or other suitable hydroxynaphthoic acid compd. not contg. a sulfonic group. The products are insol. in water but are sol. in alc. and are suitable for use as printing colors.

Dihydro-*p*-thiazines of the anthraquinone series. GEORG KRÄNZLEIN and MARTIN CORELL (to Grasselli Dyestuff Corp.). U. S. 1,709,986, April 23. 2-( $\beta$ -Bromoethyl-mercapto)-1-aminoanthraquinone, m. 145–8°, is heated to the b. p. in  $C_6H_5Cl$  with addn. of a small quantity of Cu and, when the color of the soln. has changed from red to violet-red, the  $C_6H_5Cl$  is distd. off with steam and the residue is recrystd. from MeOH and  $CHCl_3$ . Anthraquinone-1,2-dihydro-*p*-thiazine is thus obtained, m. 168–70°. A similar product is obtained by heating the  $\beta$ -hydroxyethyl deriv. to 70–100° with oleum, pouring into water and washing. When the ring of 2-chloro 3-( $\beta$ -hydroxyethyl-mercapto)-1,4-diaminoanthraquinone is closed a blue dye is formed and a bordeaux-red dye is produced by ring closure of *o*-bis( $\beta$ -hydroxyethylmercapto)-1,5-diamino-anthraquinone. 2-( $\beta$ -Bromoethylmercapto)-1-amino-4-*p*-tolylaminoanthraquinone when heated with  $C_6H_5Cl$ , dehydrated NaOAc and Cu forms a base contg. the dihydro-*p*-thiazine ring. Dihydro-*p*-thiazine heated with  $H_2SO_4$  and oleum forms a dye producing reddish brown tints on wool. 2-( $\beta$ -Hydroxyethylmercapto)-1-amino-4-*p*-tolylaminoanthraquinone when sulfonated by heating with oleum forms a dye giving green tints on wool in an acid bath.

Aroyl aminodiphthaloylacridones. WALTER MIEG and ALBERT JOB (to Grasselli Dyestuff Corp.). U. S. 1,709,993, April 23. Monoamino-3,4,5,6-diphthaloylacridone obtainable by nitrating 3,4,5,6-diphthaloylacridone and reducing with aq. sodium hydrosulfite solns., is boiled with  $PhNO_2$  and  $BzCl$  until the formation of the violet *Bz* compd. is complete. The benzamido-3,4,5,6-diphthaloylacridone is isolated by



filtration after cooling. It dyes cotton from the hydrosulfite vat violet-grey shades of excellent fastness, especially to light. It has the probable formula I. The monoamino compd. of 1,2,5,6-diphthaloylacridone obtainable by nitrating 1,2,5,6-diphthaloylacridone and reducing the mononitro compd. with alk. hydrosulfite, is dissolved in  $\text{PhNO}_2$  and boiled. After the addition of  $\text{BzCl}$  a cryst. benzamido-1,2,5,6-diphthaloylacridone is obtained in hone shaped (prismatic) leaflets possessing a bronze luster, sol. in concd.  $\text{H}_2\text{SO}_4$  with an orange color, and dyeing cotton from a violet vat in strong olive-grey shades of excellent fastness. It dissolves in boiling  $\text{PhNO}_2$  with violet shades. It has the probable formula II.



In the same manner the amino compds. can also be acylated with other aroyl halides for instance *o*- or *p*-chlorobenzoyl chloride. From the monoamino compd. of 1,2,5,6-diphthaloylacridone and *o*-chlorobenzoyl chloride a vat dye is thus obtained which dyes cotton from violet vat in greenish shades very fast to chlorine and to light.

**Dinitrohaloaryl compounds.** ERICH FISCHER (to Grasselli Dyestuff Corp.). U. S. 1,709,256, April 16. Halodinitrobenzenesulfonic or carboxylic acids (e. g., 4-chloro-3,5-dinitro-1-benzoic acid) are converted into the corresponding acid chlorides and the latter are condensed with secondary aromatic amines such as monomethylaniline (which is either used in excess or together with some other acid-binding substance), to obtain products which may be used as *intermediates for making dyes* or other compds. The compd.  $(\text{NO}_2)_2\text{C}_6\text{H}_3\text{SO}_2\text{N}(\text{CH}_3)\text{C}_6\text{H}_5$  when recrystd. from toluene is colorless and m.  $161^\circ$  (uncorrected). The starting materials also may be condensed with  $\text{PCl}_5$  without intermediate formation of the acid chloride.

**Dinitroarylamino diarylamines.** HERMANN WAGNER (to Grasselli Dyestuff Corp.). U. S. 1,709,292, April 16. Dyes are obtained by condensing *p*-aminodiphenylamine or a homolog or substitution product with a dinitrohaloaryl compd. such as described in U. S. 1,709,256 (cf. preceding abstract). These dyes give yellow to reddish brown tints on animal fibers and generally yield fast dyeings also on cellulose esters and ethers. Several examples are given.

**Dye intermediates.** I. B. ANDERSON, R. F. THOMSON, J. THOMAS and SCOTTISH DYES, LTD. Brit. 297,366, March 18, 1927. Pyrazoleanthrones are made by condensation of  $\alpha$ -haloanthraquinones with hydrazine or its salts in the presence of an oxide, hydroxide or carbonate of an alkali or alk. earth metal or an alkali salt of a weak volatile org. acid such as  $\text{NaOAc}$ . Examples are given of the prepn. of pyrazoleanthrone and 2-methylpyrazoleanthrone from 1-chloroanthraquinone and 1-chloro-2-methylanthraquinone, resp. Anthraquinone- $\alpha$ -hydrazines are obtained as intermediate products in the process and may be isolated if a properly limited quantity of alk. earth oxide is used; and example is given of the prepn. of 1-hydrazinoanthraquinone.

**Metal compounds of dyes.** SOC. ANON. POUR L'IND. CHIM. A BAËLE. Brit. 297,687, Sept. 24, 1927. Azo dyes contg. metals (other than Cr) such as Cu or Co are obtained by treating azo dyes contg. one or more groups capable of combining with metal, with metal compds. formed by reaction between a caustic alkali, an org. OH-contg. compd. such as glycerol and a hydroxide of the metal such as Cu or Co. Several examples are given. Cf. C. A. 23, 2579.

**Metal compounds of azo dyes.** SOC. ANON POUR L'IND CHIM. A BÂLE. Brit. 297,478, Sept. 23, 1927. Azo dyes contg. metal such as Cr and which give fast dyeings on wool and silk and are suitable for coloring varnishes are obtained by treating with reducing agents, such as an alkali soln. of Na sulfide, the products of nitrosation of a dye such as is formed from 1,2-aminonaphthol-4-sulfonic acid and  $\alpha$ -naphthol. The Cr compd. thus obtained from these components, after treatment as specified followed by neutralizing and salting out, gives fast steel-blue dyeings on wool and silk.

**Chromium dye compound.** I. G. FARBENIND. A.-G. Brit. 297,722, June 25, 1927. The monoazo dye from diazotized 4-chloro-2-aminophenol-6-sulfonic acid and 2,4-dihydroxyquinoline is converted into a complex Cr compd. which dyes fast bordeaux shades. Cf. C. A. 23, 2042.

**Solubilizing organic compounds.** DANIEL GARDNER. Fr. 648,119, Feb. 3, 1928. See Brit. 291,827 (C. A. 23, 1276).

**Dyeing.** DANIEL GARDNER. Fr. 648,120, Feb. 3, 1928. See 291,828 (C. A. 23, 1286).

**Dyeing.** I. G. FARBENIND. A.-G. Brit. 297,959, Sept. 14, 1927. In printing with vat and sulfur dyes and others requiring alkali, such as indanthrene brilliant violet 2R paste or indanthrene blue GCD double paste, a vegetable mucilage is used which coagulates with alkali, but coagulation to fix the print is effected in a sep. operation after the printing. The mucilage may be prepd. from ground carob seeds or salep bulbs. Details of procedure are given.

**Dyeing.** I. G. FARBENIND. A.-G. Fr. 649,083, Feb. 15, 1928. Blue shades are produced by treating with Cu salts fiber dyed with trisazo dyes which contain in the 1st. position an aminosalicylic acid or aminocresotinic acid or one of their derivs. and in the last position 2-amino-5-naphthol-7-sulfonic acid or one of its derivs. Thus, cotton is dyed in a bath contg. salicylic acid-azo-1-naphthylamine-7-sulfonic acid-azo-1-naphthylamine-azo-2-amino-5-naphthol-7-sulfonic acid and  $\text{Na}_2\text{SO}_4$  and after rinsing is treated with  $\text{CuSO}_4$ , giving a clear fast blue shade.

**Dyeing and printing fabrics.** DURAND ET HUGUENIN SOC. ANON. Brit. 298,088, Oct. 1, 1927. In dyeing or printing with esters of leuco compds. as described in Brit. 220,964 (C. A. 19, 1058) or Brit. 281,336 (C. A. 22, 3536), glycol, ethylglycol or a similar compd. is added to the dye bath or printing color; more uniform and intense dyeings and printings are thus obtained. Examples are given.

**Dyeing with mixed compounds of azo dyes.** SOC. ANON POUR L'IND CHIM. A BÂLE. Brit. 298,091, Sept. 30, 1927. Mixed dyes contg. metal such as described in Brit. 297,331 (C. A. 23, 2579) are produced in the dyebath or on the fiber. Several examples are given.

**Dyeing cellulose esters and ethers.** BRITISH DYESTUFFS CORP. LTD., L. G. LAWRIE, F. W. LINCH and E. H. RODD. Brit. 297,897, July 5, 1927. Cellulose esters and ethers are dyed in green shades fast to alkalies by salts such as oxalates of unsulfonated triarylmethane derivs. such as the 2,4 dimethyl deriv. of malachite green obtained by oxidizing the product of condensation of 4,4'-tetramethyldiaminobenzohydrol with *m*-xylene or similar compds. the prepn. of which is described.

**Coloring cellulose esters and ethers.** W. WHITEHEAD and C. DRYFUS (to British Celanese, Ltd.) Brit. 297,848, Sept. 30, 1927. The materials are printed or stenciled by the application of coloring pastes or preps. contg. Cl substitution products or addn. products of aliphatic hydrocarbons such as dichloroethylene, trichloroethylene or ethylene dichloride, a thickening gummy or starchy substance and a suitable azo dye soln. Colophony and Ca resinate also may be used with xylene or alc. Several examples are given.

**Dyeing threads.** CHARLES D. SILAS. Fr. 649,071, Feb. 15, 1928. Construction of bobbins.

**Printing with vat dyes mixed with cellulose esters or ethers.** ERNST PFEFFER (to Grasselli Dyestuff Corp.). U. S. 1,710,007, April 23. Fabrics are printed with vat dyes mixed with cellulose derivs. such as methylcellulose and the material is subsequently treated with a reducing agent such as "Rongalite C" and an alkali such as  $\text{K}_2\text{CO}_3$  and finished by a usual method, *e. g.*, drying, steaming, washing and soaping.

**Printing or mordant dyes.** I. G. FARBENIND. A.-G. Fr. 648,005, Feb. 2, 1928. Printing or mordant dyes are obtained by coupling 2 mol. proportions of the same or different diazo compds. of the benzene series contg. the residue of an  $\alpha$ -hydroxyaryl-carboxylic acid with 1 mol. proportion of a 1,3-dihydroxy compd. of the benzene series. Thus, (1) 1 mol. of diazotized 4-amino-1-hydroxybenzene-2-carboxylic acid is coupled with 1 mol. of the monoazo dye from the same diazo compd. and resorcinol or 1,3-dihydroxybenzene-4(or 5)-carboxylic acid, (2) 4-amino-1-hydroxybenzene-2-carboxylic

acid  $\rightarrow$  3-amino-4-methoxy-1-methyl-benzene or 1-aminonaphthalene is diazotized and coupled with 4-amino-1-hydroxybenzene-2-carboxylic acid  $\rightarrow$  resorcinol, (3) 2 mols. of diazotized 4-amino-1-hydroxybenzene-2-carboxylic acid  $\rightarrow$  3-amino-4-methoxy-1-methylbenzene is coupled with 1 mol. of resorcinol.

**Mordants.** I. G. FARBENIND. A.-G. and A. THAUSS. Brit. 298,280, July 11, 1927. PhOH or one of its homologs or substitution products (other than phenols contg. N) is heated with S and a small quantity of a salt, neutral in aq. soln. to phenolphthalein paper, of an org. carboxylic or weak inorg. acid such as Na formate, nitrate, hydrosulfite or sulfite, to obtain a nearly colorless or colorless product of good affinity for cotton and suitable for use as a mordant for basic dyes.

**Colloidal mordant bath.** LYTLE R. PARKS. U. S. 1,710,000, April 23. A mordant bath is formed comprising a colloidal soln. of a metal salt such as Al acetate and a fixing agent such as Na oleate.

**Forming azo dyes on "acetate silk."** I. G. FARBENIND A.-G. Brit. 297,374, June 20, 1927. The fabric is printed with a paste contg. a soln. of the amine and coupling component in an org. solvent (e. g., 2-naphthylamine and resorcinol in thiodiglycol, 1-methoxy-2-chloro-4-aminobenzene and 2,3-hydroxynaphthoic acid in cyclohexyldiethanolamine or dianisidine and 2,3-hydroxynaphthoic acid in cyclohexyldiethanolamine) and the print is developed in an acid bath contg. a nitrite.

**Dyeing apparatus.** MME. ESTERLÉ NEE MARIE L. MOTHU. Fr. 649,225, Feb. 17, 1928. An envelope of light metal of spiral form contains the dye bath, and a double-acting pump gives a gyratory movement to the bath in the envelope.

**Apparatus for dyeing yarn on the cone.** HERBERT T. BALLARD. U. S. 1,710,443, April 23.

**Apparatus for dyeing hanks or yarn, artificial silk, etc.** W. TREYOW. Brit. 297,774, Sept. 27, 1927.

**Hank dyeing apparatus.** K S MILLS. Brit. 297,755, March 22, 1927. Structural features.

**Dyeing vat and paddle wheel.** HARRY E. BREWIN and ALEXANDER C. MACKAY (to Smith, Drum & Co.). U. S. 1,710,607, April 23.

**Solutions for use in dyeing.** ALFRED GUENTHER, ALFRED THAUSS and GUSTAV MAUTHKE (to Grasselli Dyestuff Corp.). U. S. 1,709,976, April 23. A sulfonated fatty acid derived from wool fat is used in prep. stabilized solns. of  $\beta$ -hydroxynaphthoic arylides such as  $\beta$ -hydroxynaphthoic acid  $\beta$ -naphthalide.

**Stripping dyes from fibers.** EDWARD L. HELWIG (to Rohm & Haas Co.). U. S. 1,710,310, April 23. Wool shoddy or other fibrous material from which dyes are to be stripped is treated in a bath comprising Zn hydrosulfite and the hydrosulfite of Na or other alkali forming metal in equil. with a sol. Zn salt such as  $\text{ZnSO}_4$  and  $\text{Na}_2\text{SO}_4$  or other salt of the alkali forming metal. Cf. C. A. 23, 993.

**Preparing fibers for dyeing.** CHEMISCHE FABRIK VORM. SANDOZ. Fr. 648,026, Jan. 31, 1928. Fibers having a basis of cotton or artificial silk are prepd. for direct dyeing with acid dyes by acting on the fibers with aliphatic or aromatic sulfonylhalides (e. g., sulfonylchlorides or sulfonylbromides of toluene,  $\text{C}_6\text{H}_5$ ,  $\text{C}_{10}\text{H}_7$  or benzyl) and tertiary bases (e. g., pyridine and its homologs, quinoline, triethylamine, etc.). Thus, non-mercerized cotton is heated for 1 hr. to 110° in a closed vessel with benzenesulfonylchloride and pyridine, the resulting material being dyed fast shades with acid dyes; mercerized cotton is heated in the same way with toluenesulfonylchloride and pyridine in  $\text{PhNO}_2$ ; viscose silk is heated with toluenesulfonylchloride and pyridine and afterward dyed with lanafuchsine, acid violet, patent blue or naphthalene green.

**Dye resist for wool and silk.** I. G. FARBENIND. A.-G. (Alfred Thauss and Alfred Guenther, inventors) Ger. 469,232, June 20, 1923. Addn. to Ger. 432,111. The absorptiveness of wool or silk for acid and neutral dye baths is decreased by the employment of sulfonated rosin instead of sulfurized phenol. Thus, the wool of a wool-artificial silk fabric is treated with the dye obtained from benzaldehyde and ethylbenzyl-m-toluidinesulfonic acid, and the silk with the azo dye obtained from benzidine-2-naphthylamine-5,7-disulfonic acid and 2-amino-5-naphthol-7-sulfonic acid, with addn. of colophonylsulfonic acid. The two-color effect is heightened by the addn. of the latter acid. (Other examples are given.)

**Textiles.** CHEMISCHE FABRIK VORM. SANDOZ. Swiss 128,440, June 1, 1927. A moistening and permeating agent for use in mfg. textile and similar goods is prepd. by mixing a phenol such as cresol, with a hydrogenated phenol, such as methylcyclohexanol.

**Stretching textile threads.** OTTO SINDL. Fr. 648,127, Feb. 3, 1928. A frame is described for stretching skeins of threads, particularly artificial silk.

**Wetting agents for use with textile materials.** H. T. BÖHME A.-G. Brit. 297,382, Sept. 20, 1927. The wetting power of liquids such as those used for mercerizing or washing is increased by the addn. of a mixt. of phenols and sulfonated oils, such as a mixt. of tricresol with a product prepd. by sulfonating oleic acid with  $H_2SO_4$  in the presence of  $Ac_2O$ . Brit. 297,383, specifies generally similar compns. contg. an org. sulfonic acid, e. g., a mixt. comprising sulfonated ricinoleic acid, dipropynaphthalene-sulfonic acid and tricresol. Cf. C. A. 23, 1228.

**Finishing pile fabrics.** W. WIEGHORST. Brit. 297,727, Sept. 26, 1927. The pile of a fabric is colored differently from the base and pressed down in certain parts according to a desired design, and the upright pile is sheared off to expose the base coloring, and the pressed-down pile is then raised.

**Ornamenting pile fabrics.** H. LIVSEY, G. E. HOLDEN and J. and J. M. WORRALL, LTD. Brit. 297,607, Dec. 17, 1927. Pattern effects or other ornamentation of pile fabrics are produced by applying to the fabric a soln. such as viscose or a cuprammonium cellulose soln. and then regenerating the cellulose (suitably by use of dil. acid) upon and within the pile. The fabric may be heated or steamed before regeneration of the cellulose.

**Charging silk.** RÉNÉ CLAVEL. Fr. 648,508, Feb. 7, 1928. Natural or artificial silk is charged with metallic compds. such as  $SnCl_4$  by applying a paste of the compd. with thickeners such as gum arabic, dextrin, starch, flour or sugar on one or both faces of the cloth to cover it wholly or in a design. Substances such as phosphates or phosphoric acid for the transformation of the metallic compd. may be added to the paste as well as substances such as silicates. Fr. 648,509 describes the production of a mat surface simultaneously with charging of the silk by introducing it into solns. of metallic compds. such as  $SnCl_4$  or  $(AcO)_2Pb$ , and then into solns. of alk. earth phosphates. The silk may be first treated with acids or acid salts in the presence of protective colloids.

**Degumming materials comprising natural silk.** GEORGE H. ELLIS (to Celanese Corp. of America). U. S. 1,709,662, April 16. The goods are subjected to the action of a strong aq. soln. of the Na salt of sulfuricinoleic acid or other suitable sulfo-fatty acid salt of a univalent inorg. base and then scoured with a soap soln.

**Treating flax fibers to simulate silk.** VICKERS, LTD., and O. D. LUCAS. Brit. 298,178, July 5, 1927. The scutched fiber, which may be previously retted, is treated with a cellulose solvent (such as a cuprammonium soln.) of such strength as to exert a selective dissolving and hydrolyzing action without actually dissolving or gelatinizing the fiber. The material may be preliminarily boiled in a dil. NaOH soln. to which sulfonated castor oil or a similarly acting substance may be added. Cf. C. A. 23, 1514.

**Artificial silk.** SOC VALENCIN, CHARPY ET BESACIER. Fr. 648,973, June 29, 1927. Artificial silk is made capable of standing twisting with strong torsion to produce crêpe threads by immersing the skeins in a bath of "mousse perlée," sulfuricinate, dyers green soap (from pure olive pulp) and olive oil.

**Cellulose acetate artificial silk.** ARCHIBALD J. HALL (to Celanese Corp. of America). U. S. 1,709,470, April 16. The artificial silk is stretched in the set condition beyond the elastic limit to render it more resistant to deterioration by hot aq. liquids.

**Apparatus for pasting or sizing treatments of artificial silk.** SONDERMANN & Co. Brit. 297,778, Sept. 27, 1927.

**Ribbons formed of cellulose derivatives.** C. DREYFUS (to British Celanese, Ltd.). Brit. 297,712, July 15, 1927. A fabric of material such as cellulose acetate, formate, propionate or butyrate or methyl or ethyl cellulose is severed into strips to form ribbons and the edges of the latter are sealed to prevent fraying or ravelling by treating them with a solvent or softening agent and then permitting the edges to solidify.

**Fabric with an edging of soluble threads.** WILHELM SPONHOLZ. U. S. 1,709,887, April 23. A fabric is formed with a body of threads such as cotton insol. in org. solvents and with an edging of threads such as artificial silk sol. in org. solvents and which are caused to adhere to each other and to the body fabric by treatment with acetone or other solvent.

**Sealing the edges of cellulose derivative fabrics to prevent fraying.** C. DREYFUS (to British Celanese, Ltd.). Brit. 298,207, Oct. 5, 1927. The edges are subjected to a fusing, dissolving or softening treatment and then permitted to solidify.

**Apparatus for washing silk in scouring solutions.** CHARLES G. SARGENT (to C. G. Sargent's Sons Corp.). U. S. 1,709,158, April 16. Structural features.

**Apparatus for washing, desulfurizing and bleaching artificial silk.** GIUSEPPE DONAGEMMA. Fr. 648,622, Feb. 10, 1928.

**Apparatus for washing threads wound on bobbins.** RUDOLF HAAS. U. S. 1,709,215, April 16. Structural features.

**Gas-tight fabric.** HANS STROBL (to Luftschiffbau Zeppelin G. m. b. H.). U. S. 1,709,499, April 16. A substance such as glue is applied to animal skin and the latter is then united with a layer of fabric such as linen, cotton or silk and a substance such as glycerol is applied to render the glue elastic. The product is suitable for balloons or other aircraft. Cf. *C. A.* 23, 1860.

**Carrotting animal hair and wool.** ERICH BÖHM. U. S. 1,710,565, April 23. See Brit. 285,028 (*C. A.* 22, 4836).

## 26—PAINTS, VARNISHES AND RESINS

A. H. SABIN

**Paint testing.** HANS WOLFF, W. TOELDTE AND G. ZEIDLER. *Farben-Ztg.* 34, 1179-81 (1929).—In the testing of paints, precision of measurements is often so stressed that the use of the proper method is often overlooked. Since the majority of tests are not very critical, the results are better expressed in steps than continuously. *E. g.*, the authors use a sand resistance test in which 16 l. of sand are dropped through a funnel from a height of 1.30 m. onto the film. The results are expressed as one of 5 steps; (1) film made mat only; (2) film cut through to surfaces with less than 16 l.; (3) film cut through to primer with less than 16 l.; (4) film cut through to panel with 16 l.; (5) film cut through to panel with less than 16 l. A rust-evaluating test is carried out by detg. the elec. cond. of a film 0.3 mm. thick. One pole of the battery is connected to the panel, the other pole through the ammeter to Hg in contact with the film. The Hg 20 sq. cm. cross section is contained in a rubber ring. The results are expressed in 5 steps; 1 to 5 millamp., 5 to 15 millamp.; 15 to 25 millamp.; 25 to 50 millamp.; over 50 millamp. G. G. SWARD

**Natural and artificial (weathering) experiments in testing the durability of paints.** A. HIRNER. *Farben-Ztg.* 34, 1222-6 (1929). Natural weathering tests are subject to the accidental variations of climate and weather. Artificial tests, on the other hand, are capable of exact control and may be varied to correspond to the climate in which the product being tested is to be used. G. G. SWARD

**Determination of chromate in paints.** EDWARD J. DAVIS. *Chem. News* 138, 214 (1929).—The following method is valuable for chromate in the presence of sublimed lead and Prussian Blue. After sepn. from the vehicle, a 1-g. sample is extd. by boiling for 5 mins. with 6 g. of KOH in 50 cc. H<sub>2</sub>O, dild. to 300 cc., filtered and washed with hot H<sub>2</sub>O. The filtrate is dild. to 400 cc., heated to 60°; HOAc is added to 15 cc. in excess of neutrality. PbO<sub>2</sub> remains in soln. while PbCrO<sub>4</sub> is pptd.; after 30 mins. it is filtered off through a Gooch crucible, washed, dried and weighed. When ZnCrO<sub>4</sub> is originally present, 2 g. of PbCl<sub>2</sub> is added before the HOAc. The method is accurate to  $\pm 0.1\%$ . A. S. CARTER

**Addition of lead oxide to paints.** W. VAUBEL. *Farben-Ztg.* 34, 563 (1929).—Free glycerol in white lead paints tends to induce rusting. This condition may be prevented by the addn. of litharge or red lead, which combines with the glycerol. White lead, lead carbonate, lead sulfate and basic lead chloride do not react in this way. G. G. S.

**The red lead question.** HANS WOLFF AND GERHARD ZEIDLER. *Farben-Ztg.* 34, 1309-10 (1929).—Polemical with Junk (cf. *C. A.* 23, 1291). Particle-size detns. should be made in the vehicle in which the pigment is to be used. *E. g.*, the polar liquid linseed oil disperses red lead to a greater extent than does the non polar liquid paraffin oil. Photomicrographs illustrating this point are shown. G. G. SWARD

**Examination of red lead.** W. LÖTV. *Farben-Ztg.* 34, 1310-3 (1929).—Polemical with Junk (cf. *C. A.* 23, 1291, also preceding abst.). G. G. SWARD

**The lithopone industry.** WALTER BARNARD. *Chemistry and Industry* 48, 335-8 (1929).—A general statement concerning the compn., prepn., mfg. processes and uses of lithopone. Among more modern forms of this pigment are "zinc anhydride" or "zinc barytes," made by heating equiv. quantities of chalk, or witherite (BaCO<sub>3</sub>), and finely divided ZnSO<sub>4</sub> in a specially designed furnace; "sulphophone," in which CaS instead of BaS is used as a precipitant for ZnSO<sub>4</sub>; and "cadmium lithopone," in which Cd replaces more or less of the Zn, with corresponding alterations in color from white to yellow. W. C. EBAUGH

**The fading of aniline dyes in the presence of titanium white.** EBERHARD KEIDEL. *Farben-Ztg.* 34, 1242-3 (1929).—Paints were prepd. with TiO<sub>2</sub>, ZnO, lithopone and white lead tinted with Permanent Red R extra and other azo dyes which contained no sulfo groups and also with some basic dyestuffs, *e. g.*, Madder lake K, etc. The vehicles

were a 12% dextrin soln. with and without 5% glycerol, casein soln. and oil. Films of these paints were exposed to the sun and to ultra-violet light. The  $\text{TiO}_2$  paints faded more rapidly than the others. G. G. SWARD

**Titanium white catalysis.** HANS WAGNER. *Farben-Ztg.* 34, 1243-5(1929); cf. preceding abstr.—Expts. similar to those of Keidel were carried out using Milori blue and Helio fast red RL. The results were similar. W. ascribes the fading of dyes in the presence of  $\text{TiO}_2$  to the residual  $\text{H}_2\text{SO}_4$  in  $\text{TiO}_2$ . In some cases the bleaching may be due to the formation of Ti sulfate, in others to  $\text{TiO}_3$ . Addn. of ZnO in proper amts. produces a "neutral pigment," which does not bleach the dyes. G. G. SWARD

**Systematic (classification) of adhesives and paint vehicles.** ERNST STERN. *Farben-Ztg.* 34, 1312-3(1929).—S. considers that the classification proposed by Wagner and Kesseling (cf. C. A. 23, 2307) is too complex and submits the following: (1) aq. reversible, (2) aq. non-reversible, (3) non-aq. reversible, and (4) non-aq. non-reversible. Reply. HANS WAGNER. *Ibid.*—W. claims that the 4 simple classes of Stern do not cover technical conditions and offers a scheme for aq. systems. These may be divided into 2 classes, (1) mobile, and (2) immobile. (1) does not require an increase in pressure or temp. to effect a change of form. (2) may or may not undergo a change of form when the temp. or pressure is increased. After a change has taken place and the stress has been removed (2) may or may not recover. G. G. SWARD

**Systematic formulation of nitrocellulose lacquers.** S. DE LANGE. *Farben-Ztg.* 34, 1245-6(1929).—L. shows how the graphs of Hoffmann and Reid (cf. C. A. 22, 2849) may be extended to a third dimension, thus increasing their usefulness. G. G. S.

Application of nitrocellulose in the varnished leather industry (ALVAREZ) 29. The influence of light in fading tests (with pigments) (MERZ) 25. Additive and subtractive color mixing and decolorization (SCHONBORN) 2. Untreated fabrics for electrical purposes (DUNTON, MUIR) 13. Insulating materials (from synthetic resins) (Ger. pat. 473,111) 13.

CURTIS, C. A.: *Künstliche organische Pigmentfarben und ihre Anwendungsgebiete.* Berlin: J. Springer. 230 pp. Paper, M. 22.50; bound, M. 24. Reviewed in *Chimie & industrie* 21, 675; *Tiba* 7, 341(1929).

WOLFF, H.: *Monographien aus dem Gebiete der Fett-Chemie. Bd. X. Die natürlichen Harz.* STUTTGART. Wissenschaftliche Verlagsgesellschaft m. b. H. 379 pp.

**Paint.** ANDRÉ P. GESNEL. Fr. 648,615, Feb. 10, 1928. The solid constituent of paint consists of an Fe alloy, particularly Fe-Si, which is not attacked by air or chemicals.

**Paint.** ALBERT MORÉROD-TRIPION. Swiss 128,475, Oct. 5, 1927. A thick lead-less paint is composed of drying oil, resin and zinc white. It may also contain alc.

**Bituminous paint.** S. FOWLER and E. EDSER. Brit. 298,256, June 8, 1927. A bitumen and a neutral soap-free wool fat are dissolved in a volatile solvent such as "white spirit" with or without pigments such as red Fe oxide. Wool fat purified as described in Brit. 253,995 (C. A. 21, 2569) is especially suitable for this purpose and is preferably used in the proportion of about 10% the wt. of the bitumen.

**Heat-resisting paint.** J. C. CARROLL. Brit. 297,342, June 18, 1927. See Fr. 645,440 (C. A. 23, 2049).

**Lithopone.** WILLIAM J. O'BRIEN. U. S. 1,700,999, April 23. A soln. contg. Ti sulfate and free  $\text{H}_2\text{SO}_4$  is neutralized by ZnO in excess of the quantity required to neutralize the free  $\text{H}_2\text{SO}_4$ ; the resulting product is combined with Ba sulfide, heated and treated to obtain a lithopone contg. Ti oxide.

**Oxidizing drying oils.** I. G. FARBENIND. A.-G. Ger. 473,115, Oct. 26, 1926. Addn. to 472,111. The method of Ger. 472,111 (C. A. 23, 2584) is modified by atomizing or spraying the suspended or emulsified oil into air or O-contg. gases.

**Coating compositions.** D. CARNEGIE (to Atlas Powder Co.). Brit. 297,681, Sept. 23, 1927. Drying or semi-drying oils, such as linseed, soy-bean, china wood, perilla, or menhaden oils, are rendered miscible in all proportions with nitrocellulose solns., by a treatment which suitably modifies the oil, such as by treatment with air or other O-contg. gas at a temp. not above  $250^\circ$  so that the oil is oxidized but not polymerized. The viscosity of the modified oil should be between 20 and 80 secs. when a steel ball of 0.25-in. diam. is permitted to fall 12 in. through the oil.

**Varnish.** ELEKTRIZITÄTSWERK LONZA. Swiss 128,476, May 25, 1927. A varnish contg. nitrocellulose is rendered light-resisting by addn. of a substance such as diphenylamine, which is stable against the influence of light.

**Varnish.** ELEKTRIZITÄTWERK LONZA. Swiss 129,307, Feb. 12, 1927. A glossy-drying prepn. is obtained by mixing nitrocellulose varnish with the wood-oil varnish resulting from the melting of wood oil with resin.

**Production of colors and varnishes.** DE KEYN FRÈRES. Belg. 353,329, Sept. 30, 1928. The varnish consists of a mixt. of gums, resins and similar substances, palm oil and spirits of turpentine or similar products.

**Coloring lacs and varnishes.** SOC. ANON POUR L'IND. CHIM. A BALE. Fr. 648,087, Feb. 2, 1928. Lacs and varnishes are dyed with dyes having the formula  $R^1-N=R^2-R^3-R^4$ , in which  $R^1$  is an aromatic ring,  $R^2$  an aromatic ring capable of coupling in the position 4 to the  $R^1-N-R^4$  group, and  $R^3, R^4$  are H, alkyl, aralkyl, or aryl groups. Examples are given of dyeing cellulose acetate varnish red with *p*-nitraniline  $\rightarrow$  cresidine, and 4-nitro-4'-aminoazobenzene. Yellow colors are obtained with 2,5-dichloro-4'-aminoazobenzene or 2,5-dichloro-4'-amino-3-methylazobenzene, orange with 3-nitro-4'-aminoazobenzene, clear red with 4-nitro-4'-amino-2'-acetylaminazobenzene, and violet red with 4-nitro-2-alkyloxy-4'-dialkylaminazobenzenes.

**Lacquers.** COMPAGNIE FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON. Fr. 649,384, Dec. 28, 1927. Metal surfaces which are to be lacquered with cellulose lacquers are given a primary coating of a polyhydric alc.-polybasic acid resin such as a glycerol-phthalic acid resin. Suitable resins are described in Fr. 604,198 and its addn. 31,805 and they may be applied in soln., which should contain little or no pigment or filler. Plasticizers such as indene and its polymers, glycoldiacetate, diethyl phthalate, tricresylphosphate, triacetin, or anisol may be added to the resin during manuf.

**Lacquering.** ELEKTRIZITÄTWERK LONZA. Brit. 297,711, Sept. 25, 1927. A nitrocellulose lacquer or similar compn. is applied in the form of drops to form surfaces somewhat resembling leather, linoleum, or granite in appearance. It is stated that the lacquer is preferably applied under reduced pressure "so that the sprayers act as roses and not as atomizers."

**Drying lacquered articles.** HUNDT & WEBER GES. Brit. 297,411, Sept. 21, 1927. Air is circulated through a drying chamber and through a separator where solvent is sep'd. by centrifugal action. Various structural details are described.

**Synthetic resin lacquers for coating cans.** H. H. HOPKINS (to E. I. Du Pont de Nemours & Co.). Brit. 297,418, Sept. 21, 1927. Cans, such as those formed of sheet iron, or the sheets of metal from which the cans are made, are coated with lacquers of which various formulas are specified, e. g., a lacquer comprising the reaction products from heating together glycerol, phthalic anhydride and acids obtained by the hydrolysis of linseed oil in  $CO_2$  at  $220^\circ$ , or other similar reaction products.

**Coating composition comprising nitrocellulose.** MAURICE V. HITT (to E. I. Du Pont de Nemours & Co.) U. S. 1,710,453, April 23. A low-viscosity nitrocellulose (for which tests are given) is used with about 15-45% its quantity of a solvent softener such as di-Bu phthalate and with less than half its quantity of a resin or varnish gum.

**Refining rosin.** A. LANGMEIER (to Hercules Powder Co.) Brit. 298,214, Oct. 6, 1927. Refining is effected by melting the rosin at a temp. sufficient to vaporize components of low volatility and by causing the melted rosin to flow in contact with a heating surface so that the rosin is finally vaporized and condensed to obtain high-grade rosin and rosin oil. An app. and various details of procedure are described. Cf. C. A. 23, 970.

**Cellulose ester compositions.** E. C. DESTUBNER. Brit. 297,679, Sept. 24, 1927. Resins or gums such as Congo copal or other fossil or semi fossil resins are rendered compatible with cellulose esters, such as nitrocellulose or cellulose acetate, in compns. such as lacquers, by subjection to a treatment similar to that applied to other constituents of the compn., such as nitration, acetylation, or phosphatization.

**Condensation products of phenols and aldehydes.** LEONHARD DEUTSCH and ISAK THORN (to Selden Co.). U. S. 1,710,019, April 23.  $PhOH$  and  $CH_2O$  or other phenols and aldehydes capable of forming resins, which can be hardened by heat, are subjected to condensation in the presence of a non-volatile alkali such as  $Na_2CO_3$ , free water is volatilized and there is subsequently added to the product a compd. such as Na benzoate or salicylate or benzoic acid or other suitable compd. contg. the carboxylic radical; the product is hardened by heat. Cf. C. A. 22, 3498.

**Artificial resins.** I. G. FÄRRENIND. A-G. Brit. 298,085, Sept. 20, 1927. Phenol-formaldehyde condensation products contg. carboxylic groups are produced by the reaction of a phenol- $CH_2O$  resin with a halogen aliphatic acid or its salt such as chloroacetic acid or by the reaction of a phenoxyaliphatic acid such as cresoxyacetic acid with  $CH_2O$  or a substance yielding  $CH_2O$ . Hardened masses are produced by heating an  $HH_2$  or amine salt of the resin acid with or without a polyhydric alc. or by heating

the resin with a polyhydric acid to above 100°. The compns. may be used with various fillers, for forming laminated products of impregnated paper, for lacquers, etc. Various details and modifications are given.

**Synthetic resins.** MEILACH MELAMID (to Canadian Electro Products Co., Ltd.). U. S. 1,710,266, April 23. Reaction, in the presence of an acid such as  $H_2SO_4$  and of Hg and Fe salts or other suitable catalyst, is effected between  $C_2H_2$  and aromatic coal-tar components such as cresol, or sulfonated derivs. from naphthalene.

**Synthetic resin complex.** ISRAEL ROSENBLUM (to Varnol Chemical Corp.). U. S. 1,709,490, April 16. A phenol-aldehyde condensation product is reacted upon with a partially esterified polyhydric alc. such as mixed glyceridic abietates to produce a product which is suitable for making varnishes.

## 27—FATS, FATTY OILS, WAXES AND SOAPS

E. SCHERUBEL

**The composition of spinach fat.** JOHN H. SPEER, EDWIN C. WISE AND MERRILL C. HART. The Upjohn Co., Kalamazoo. *J. Biol. Chem.* **82**, 105-10(1929).—Sixty-eight kg. of spinach yielded 550 g. of fatty acids, of which 47% were glycerides and 53% were free. Of these, 26.5 g. of solid acid was isolated, which consisted chiefly of palmitic and stearic acids, with 3% of cerotic acid. One hundred forty-five g. of liquid acids were recovered, which contained 12.7% linolenic acid, 34.7% linoleic acid and 26.3% oleic acid.

ARTHUR GROLLMAN

**The unsaponifiable fraction from spinach fat.** FREDERICK W. HEVL, EDWIN C. WISE AND JOHN H. SPEER. The Upjohn Co., Kalamazoo. *J. Biol. Chem.* **82**, 111-6(1929).—From the unsaponifiable fraction of spinach fat were isolated a hydrocarbon,  $C_{20}H_{42}$  (possibly *petroselinene* or *laurane*); a phytosterol,  $C_{27}H_{46}O$ , m. 165-167°; 2 alcs.,  $C_{22}H_{40}O$  and  $C_{24}H_{40}O_2$ ; and an unsatd., oily compd. whose formula was  $C_{27}H_{44}O$ .

ARTHUR GROLLMAN

**The hydrogenation of oils.** H. I. WATERMAN AND S. H. BERTRAM. *J. Soc. Chem. Ind.* **48**, 79-80T(1929). The detn. of the thiocyanogeniodine value combined with the I no. offers the possibility of obtaining an insight into the linoleic acid and linoleic glyceride content of fats which are free from linolenic acid. Soy-bean oil was hydrogenated by a method resembling that of Willbushewitsch. The lowering of the I no. is accompanied by a lowering of the thiocyanogen I value. The total decrease of the I no. is 71.8; that of the thiocyanogen I no. is 26.5 or 35%. The decrease of the diff. between the I no. and the thiocyanogen I no. is 45.3 or almost 80% calcd. on the initial diff. This diff. from Kaufmann's results may be due to the diff. method of hydrogenation or to the oil used. However, in accordance with Kaufmann, it is noted that the hydrogenation of those unsatd. compds. which are not satd. by thiocyanogen, but are satd. by ICl, dominates. The hydrogenated products contain much less linoleic acid than the original soy-bean oil.

E. SCHERUBEL

**Determination of organic sulfur in sulfonated oils.** K. H. BAUER. *Chem. Umschau Fette, Oele, Wachse Harze* **35**, 280 1(1928); cf. *C. A.* **22**, 2074; **23**, 2052.—B. shows that Herbig's proposal (*C. A.* **23**, 1519) to multiply by 2 the results in the org.  $SO_2$  detn. of sulfonated oils, since  $ISO_2 = 2KOH$ , is incorrect, because the detn. refers to the group  $HSO_4$  instead of  $SO_2$  and  $1HSO_4 = 1KOH$ . Expts. by boiling  $N H_2SO_4$  and  $N HCl$  for 1 hr. in various types of glass vessels and by adding broken glass to the acid solns. showed a varying loss in the strength of the acid, reaching up to 0.75 cc. per 50 cc.

P. ESCHER

**The determination of organic  $SO_2$  in sulfonated oils.** C. RIESS. *Colloquium* **1929**, 657-61.—The volumetric method (Herbig, *C. A.* **23**, 1519) with either  $H_2SO_4$  or  $HCl$  gives as good results with normal sulfonated oils as the gravimetric method. I. D. C.

**Fruits and seeds of *Aleurites fordii* from Kenya Colony.** ANON. *Bull. Imp. Inst.* **27**, 10-2(1929).—Seeds of *A. fordii* trees grown in Kenya Colony from seed from Hankow were composed of 37.9% shell and 62.1% kernel. The kernels contained 4.9%  $H_2O$  and on extn. with petr. ether gave 60.4% (63.5% on dry basis) of oil having the following const., as compared with those of the original Hankow seeds from which the Kenya Colony trees were grown, and with a sample of oil received from China: d<sub>4</sub><sup>20</sup> 0.9433, 0.9405, 0.9414; acid value 0.52, 0.63, 0.43; sapon value 192.7, 193.5, 195.3; I value (Hübl, 17 hrs.) 172.8, 174.8, 172.0%; unsapon. matter 0.4, 0.3, 0.4%;  $n_{20}^D$  1.512, 1.513, 1.513.

A. PAPINEAU-COUTURE

**Fruits and seeds of *Hydnocarpus woodii* from North Borneo.** ANON. *Bull.*



*Imp. Inst.* 27, 12-6(1929).—Kernels of two batches of seed of *H. woodii* from North Borneo contained 7.8 and 8.1% H<sub>2</sub>O after air-drying, and on extg. with petr. ether yielded 62.3 and 60.3% of a hard, cream-colored, solid oil. The constns. of the oil obtained from the first batch of seeds were  $d_{15}^{100}$  0.8989, acid value 32.8, sapon. value 202.4, I value (Hübl, 17 hrs.) 85.8, unsapon. matter 0.5%,  $n_D^{20}$  1.471, m. p. 28.5°,  $\alpha_D^{20}$  (in CHCl<sub>3</sub>) +53.1°, solidifying pt. of fatty acids 44.6°,  $\alpha_D^{20}$  of fatty acids +54.4°. Both hydro-carpic and chaulmoogric acids were identified.

A. PAPINEAU-COUTURE

The determination of the iodine value. R. DELABY AND R. CHARONNAT. *Bull. sci. pharmacol.* 35, 692-8(1928).—The results obtained by the method of Hanus with a soln. of BrI in AcOH are lower than the values obtained by the Hübl method. If the AcOH is not anhyd., the strength of the soln. decreases on standing, and the I is not in excess sufficient to sat. the second double linkages, within the conditions of the test. Therefore, the same soln. gives lower values with the same oil some weeks later. The method of Wijs with CHI is more reliable.

A. E. MEYER

The practical application of the salt-rubin method. A. BEYRODT. *Prague. Seifenforsch.* 1, 38-42(1928).—Results on protective colloids in soaps, obtained with Ostwald's salt rubin method (*C. A.* 13, 2625; 14, 1774), show that this method is well adapted for testing soaps.

P. ESCHER

Biochemical method for preparing fats (KULIKOV) 11C. The so-called arachic acid and other acids of high molecular weight from peanut oil (HOLDE, *et al.*) 10. The influence of temperature on the precipitation of NiCO<sub>3</sub> (SERGEYEV) 18. A specific color reaction for ergosterol and its transformation products (HÄUSSLER, BRAUCHLI) 11B. Emulsifying agents (Fr. pat. 648,138) 22. Motor fuel; emulsifying agents (Fr. pat. 618,142) 22. Apparatus for gravity separation of oil and water (Brit. pat. 297,936) 1. Apparatus for separating liquids such as oil and water by gravity (Brit. pat. 297,551) 1. Filter for oils (U. S. pat. 1,709,237) 1. Filter for oil (Brit. pat. 298,197) 1. Tank and baffle apparatus for separating oil and gas (U. S. pat. 1,710,178) 1. Apparatus for gravity separation of oil and water (U. S. pat. 1,709,971) 1. Oil cooler (Swiss pat. 129,687) 1.

MORPURGO, G. Corso di lezioni sui gliceridi; i grassi vegetali ed i grassi animali; loro origine ed impiego nell'economia. PADUA: Ed. Milani. 188 pp. L. 30. Reviewed in *Giorn. chim. ind. applicata* 10, 489(1928).

Apparatus for rendering fats by treatment with steam. M. GEARIN & SONS, LTD., and J. R. CULLEN. Brit. 297,728, Sept. 26, 1927. Various details of construction and use of a steam-jacketed and direct steam digestion app. are described.

Device for drawing off thick or thin oils and liquid fats in measured quantities from a reservoir. PETER HUBER. Swiss 129,779, Sept. 29, 1927. Addn. to Swiss 126,559. Details of arrangement

Mixtures of oils. MICHAEL MELAMID. Fr. 648,143, Feb. 3, 1928. Mixts. of mineral oils with fatty oils sol. in alc., such as castor oil, are obtained by heating them with catalysts such as Ni, Sn, Bi, or alloys of these metals. The fatty oil may be heated with the catalyst and then mixed with the oil.

Apparatus for extracting oil from seeds, etc., by use of solvents. F. KRUPP GRÜSONWERK A. G. Brit. 297,816, Sept. 30, 1927. Horizontal extractors are used in an app. generally similar to that described in Brit. 272,118 (*C. A.* 22, 1502).

Extracting oil from grain. SYNDICAT D'ÉTUDES DES MATIÈRES ORGANIQUES. Fr. 638,909, Dec. 29, 1926. The oil is extd. from grain by hydrogenated hydrocarbons, such as cyclohexane and its homologs, leaving a flour from which starch may be obtained.

Fish oil. MANUF. DE MACHINES AUXILIAIRES POUR L'ÉLECTRICITÉ ET L'IND. Fr. 648,961, Feb. 14, 1928. Oil is extd. from fish livers by grinding them in the presence of water and passing the semi-liquid mud to a centrifuge.

Soap. PAUL A. AKARDI. Fr. 648,936, Feb. 13, 1928. A soap, which may be used in salt or pure water, contains various oils 50, NaOH 25, Na<sub>2</sub>SO<sub>4</sub> 5, K 5, potash 15%.

Soap. OSCAR SCHÜPFER. Swiss 128,740, Mar. 6, 1928. A soap prepn. contains a mixt. of sawdust, sand, soda, soap, waterglass, vegetable fat, terpentine and citronella oil.

Soap paste. JOHN M. WEISS and CHARLES R. DOWNS (to Weiss & Downs, Inc.). U. S. 1,709,294, April 16. A soap paste suitable for removing grease from the hands

or other surfaces contains a neutral fatty acid soap, water, an ester of a dibasic org. acid such as dibutyl phthalate and a colloidal clay such as bentonite, which is capable of swelling by absorption of a large quantity of water.

## 28—SUGAR, STARCH AND GUMS

J. K. DALE

**Cold-water starch.** S. R. TROTMAN. *Ind. Chemist* 4, 399-400(1928).—Cold-water starches are prepd. in the form of powder that gives a paste when stirred into cold water. They are made in general by the action of acids, alkalies or other hydrolyzing agents on dried starch. Numerous ingenious methods and recipes are given, some in detail. E. G. R. ARDAGH

Self-emptying suction flask for sugar determination (PITMAN) 1. The  $H_2PO_4$  question in the cultivation of sugar cane in Java (ARRHENIUS) 15. Determination of N in molasses (FILOSOFOV) 16. Causes of shaft failures in cane mills (HELMER) 9. Treating gases with finely divided substances [conversion of starch into sugar by HCl gas] (Fr. pat. 648,525) 13. Extracting oil from grain [leaving a flour for starch manufacture] (Fr. pat. 638,909) 27. Heating system for apparatus for drying sugar (U. S. pat. 1,709,154) 1.

HOLLOWAY, T. E.: **Sugar Cane Insects Around the World.** Honolulu: Honolulu Iron Works. Reviewed in *J. Econ. Entomol.* 21, 793(1928).

**Sugar.** RAFFINERIE TIRLEMONTAISE SOC. ANON. Fr. 648,507, Feb. 7, 1928. Sugar is extd. from sirup or molasses by mixing the sirup, etc., with crystals of pure sugar and centrifuging. Cf. C. A. 23, 540.

**Sugar.** TROFILS GASPAR Y ARNAL. Swiss 128,983, June 23, 1927. Molasses and sugar juices contg. K are refined by treatment with ferrocyanide to eliminate the K. Preferably an alk. earth ferrocyanide is employed.

**Removing suspended organic matter from liquids such as sugar juices.** MORRILL B. SPAULDING. U. S. 1,709,286, April 16. The liquid is passed through a reciprocating screen which intercepts the suspended material. An app. is described.

**Apparatus for separating scum from sugar juices or solutions.** JAMES C. ETHEREDGE. U. S. 1,709,783, April 16. Scum is carried off from collecting floats provided with deflectors and placed in different compartments which communicate at their lower portions.

**Purifying solutions such as cane juice and molasses.** G. E. VAN NES. Brit. 297,430, Sept. 21, 1927. Colloids such as albumin, starch or water glass are added to the soln. and a coarsely dispersed ppt. is produced (at a suitable temp. and  $pH$ ) as by the addn. of lime and  $CO_2$  or of magnesia, baryta or Al oxide and  $SO_2$  or  $H_2PO_4$ . Cf. C. A. 23, 2319.

**Purifying molasses or other sugar solutions.** T. GASPAR Y ARNAL. Brit. 297,482, May 23, 1927. See Fr. 636,112 (C. A. 23, 223).

**Dextrin.** K. PERL & FR. STRINITZER CHEM. TECH. INSTITUT. Fr. 649,285, July 5, 1927. In the manuf. of dextrin by roasting starch, or substances contg. it, with the addn. of acids, a small amt. of a metallic salt such as a chloride or nitrate of Mn, Al, Fe or Pt is added to the acid.

**Crystallized dextrose.** RAYMOND E. DALY (to American Maize-Products Co.). U. S. 1,708,940, April 16. A sugar liquor derived from converted starch is brought to a d. of about 37-42° Bé. and the temp. is reduced to about 50°; dried seed crystals are added and the temp. is further reduced to about 38° and the liquor is introduced into a crystallizer contg. wet seed crystals in a quantity equal to substantially half that of the introduced liquor; the material is slowly agitated and the temp. further reduced to about 32-35° and the liquor is maintained at this temp. until it is permeated with crystals; the temp. is then raised to about 45-50° to cause the finer crystals to go into soln., the magma is slowly cooled to about 32-35° to cause the unmelted crystals to develop into crystals of relatively large size, and the magma is maintained at this temp. for about 12 hrs. while slowly agitating, and the crystals are then sep'd. from mother liquor by centrifuging.

## 29—LEATHER AND GLUE

ALLEN ROGERS

**Tanning barks of Madagascar.** F. HEIM DE BALSAC, *et al.* *Bull. agence gén. col.* 21, 935(1928); *Bull. Imp. Inst.* 27, 114-5(1929); cf. C. A. 22, 1055.—"Lalona" (*Weinmannia bojeriana*, Tul.) bark, which appeared to be derived from the trunk or the larger branches, furnished 13.7% tannin and 3.7% sol. non-tannins. A tanning ext. prep'd. from the bark quickly penetrated sheep skin and produced a fairly plump, pliable, soft leather, of a rather dark brown color. A. PAPINEAU-COUTURE

**Larch as a tanning material.** A. GOLOVIN AND N. IGNATOW. *Lederlech. Rundschau* 21, 25-6(1929).—Analyses of root and trunk barks of Siberian larch from Irkutsk showed only 4 to 6% tannin and 1 to 7% non-tannin. The tannin content is usually higher in larger trees; bark from a tree over 34 cm. in diam. is best for tanning. Although the tannin content is lower than reported by others the supply is abundant. I. D. C.

**The tanning value of "neb-neb" (*Acacia arabica*, var. *Adansonia*, Dubard) pods from Senegal.** F. HEIM DE BALSAC, A. DEFORGE AND H. HEIM DE BALSAC. *Bull. agence gén. col.* 21, 595(1928); *Bull. Imp. Inst.* 27, 115-6(1929).—All parts of "neb-neb" contain tannin except the wood. The roots, 3-10 mm. in diam., have a bark which furnishes 35% tannin; the old trunk bark, 5 mm. thick, furnishes 13% in the outer layer and 25% in the inner; the branch bark, 2 mm. thick, contains 29%. Pods weighing an av. of 0.2 g. and consisting of 72% pod case and 28% seed yielded 24.1% tannin and 18.0% sol. non-tannins, while the pods free from seeds furnished 36.8% tannins and 18% sol. non-tannins. Ext. prep'd. from the pods quickly penetrated sheep skin and produced a soft, pliable leather of very satisfactory appearance. "Neb-neb" pods are very similar to "Gonakié" (*Acacia arabica*, Willd.) from the tanning point of view, and the tannin content depends more on the degree of ripeness of the pods than on their botanical origin. A. PAPINEAU-COUTURE

**Adsorption and tanning power of synthetic tannins.** J. BERKMANN. *Collegium* 1929, 49-54.—Only syntans of sulfaromatic compds. are discussed. These contain sulfo acids, sulfo salts and mineral salts. Hide powder adsorbs most of the sulfo acid, very little of the mineral salt and variable quantities of the sulfo salt, depending on the nature of the org. part and the metal. Adsorption should be measured on the completely neutralized syntan. The order of increasing adsorption of syntan salts is: Na, K, NH<sub>4</sub>, (Ba, Ca, Mg) (Fe, Cr, Al, Cu). There is selective pos. adsorption of the org. portion and neg. of the metal by hide powder; neither hydrolysis nor adsorption of the larger mols. seems to be the explanation of this. The adsorption depends on the method of neutralization of the raw product. Analytical figures sometimes agree for different products when an adsorption curve, with different ratios of hide powder to tannin, shows that they have different adsorption capacities. I. D. C.

**Contribution to the study of the acidity determination in the tanning liquors.** G. H. BRAVO. *Ist. Nazion. ind. cuoio*, Torino. *Boll. ufficiale staz. sper. ind. pelli mat. concianti* 7, 45-52(1929). B. reviews the methods used for detg. the total acidity of tanning liquors and concludes that most of them are not fully satisfactory. He attempts to develop a method based on that of Seymour-Jones and Procter, in which fluorescent indicators are used. Although the new method was not, as yet, applicable for detg. the acidity of tanning liquids on account of the weak acids present, good results were obtained in the estn. of strong acids or alkalies in the presence of suspended or colored material. The detn. is carried out in the following way: A beaker contg. the soln. is placed under a Wood lamp at a distance not exceeding 30-40 cm. The ultra-violet rays should meet the surface of the soln. almost vertically. Two cc. of a 1% soln. of dichlorofluorescein is added per 100 cc. soln. On addn. of alkali a bright yellowish green fluorescence appears; the change, which is very distinct, occurs between  $p_H$  4.0 and 6.6. The titration has to be carried out in camera obscura. Eosin as a fluorescent indicator is of lesser value because of its color change between  $p_H$  0.0 and 3.0. G. SCHWOCH

**A simple and rapid method for determining the volatile acids in the tanning baths.** ANDREA PONTE. *Labor d. Soc. Nazion. Ind. Conciarie*, Corsico (Milano). *Boll. ufficiale staz. sper. ind. pelli mat. concianti* 7, 57-63(1929).—Rota has found that on distg. 100 cc. of wine, until the distd. vol. was exactly 72 cc., the distillate contains 50% of the volatile acids present in the original sample. Based on this method a new procedure for detg. the volatile acids in tanning baths was elaborated. Solns. obtained in the detn. of the tannins according to Löwenthal-Hunt may be used for this purpose. Twenty cc. of 96% EtOH is added to a liquor sample and the soln. dild. to 200 cc. The d. of

the final soln. should be between 0.5 and 1.0° Bé. One hundred cc. of this soln. is distd. until the recipient contains exactly 72 cc.; then the vol. of the distillate is made up to 100 cc. with H<sub>2</sub>O of 15°. The total acidity (*A*) is detd. by titrating 50 cc. of the distillate with 0.1 *N* NaOH and phenolphthalein; it is expressed in g. of AcOH by multiplying the no. of cc. used by 0.006. Since SO<sub>2</sub> may be present in the distillate, dil. H<sub>2</sub>SO<sub>4</sub> and starch soln. are added to the same sample and the SO<sub>2</sub> is estd. by titration with 0.02 *N* I; its acidity (*B*) is expressed in g. of AcOH by multiplication with 0.0012. The amt. of volatile acids in 100 cc. of the dil. liquor is  $4 \times (A - B)$ . The values for volatile acids will be somewhat higher if H<sub>2</sub>O only, instead of EtOH + H<sub>2</sub>O, is used for dilg. the original sample. G. SCHWOCH

**Tannery waters.** E. MEZEY. *Collegium* 1929, 55 68. Buffer action, measured by  $dA/dpH$ , where *A* is the quantity of added acid or alkali, is briefly discussed. Titration and buffer curves of 4 waters (river, spring and tap) are given. The buffer curve is of value in detg. the suitability of a water for tannery use. I. D. C.

**Periodic and continuous tanning in factories.** B. SCHWARZBERG. *Collegium* 1928, 661-5.—By the ordinary method of periodic additions of tannin to tan liquors the speed of tanning is at first rapid, then drops practically to zero just before the next addn. This is caused by the decrease in tannin concn., purity and no. of large tannin particles. By the continuous method the hides remain in one of a series of connected vats, reels or drums, and the tan liquor circulates so that the concn. of tannin in each vat constantly increases. I. D. C.

**Influence of lactic acid and hydrochloric acid in deliming.** R. VON DER HEIDE. *Ledertech. Rundschau* 21, 49 53 (1929).—Two 4-kg. portions of hide were delimed with 2 l. of H<sub>2</sub>O and 5 kg. of lactic acid or 2.5 kg. of HCl. *pH* measurements were made every 5 mins. Lactic acid was much milder than HCl, the final *pH* with lactic acid was 6.6 and with HCl 4.3. I. D. C.

**Application of nitrocellulose in the varnished-leather industry.** JULIAN ALVAREZ. *Quim e ind* 6, 62-3 (1929).—The old varnish for the manuf. of varnished leather was usually made by prolonged boiling of linseed oil with about 10% of Prussian blue. The thick black varnish obtained was thinned with turpentine. The modern varnish is made by mixing a soln. of nitrocellulose and amyl acetate with the elements of the old varnish, and slowly incorporating colloids until a limpid and brilliant layer is produced upon the leather. The varnish thus obtained has the thickness, flexibility and brilliance of the old varnish. It is also indifferent to temp. changes and it neither breaks nor sticks. S. L. B. ETHERTON

**Dyeing and finishing hat leathers.** J. W. LAMB. *Leather, Cultiv. Printer* 61, 16 7, 36-7, 81 (1929); cf. *C. A.* 22, 486. Procedures are described. RUTH K. WORTER

**Chemistry of the proteins [especially of collagen and gelatin] (HERZOG) 11A. Iodometric determination of chromium by a potash-chrome alum (HAN) 7. Further studies on the disinfection of dried anthrax film (FOLL) 11C. Apparatus for drying leather (GER. pat. 473,450) 1.**

SCHINDLER, W. *Die Grundlagen des Fettlickerns.* Leipzig: Sachsische Verlagsgesellschaft m. b. H. 239 pp. Reviewed in *Chemie et industrie* 21, 688 (1929).

VON SCHINDLER, J. *Gebereichemische Untersuchungen. III.* Leipzig: Sachsische Verlagsgesellschaft m. b. H. 188 pp. Reviewed in *Chemie et industrie* 21, 675 (1929).

**Tanning.** I. G. FARBENING, A. G. Brit. 297,830. Synthetic tanning materials in solid form and giving with water a tanning bath of requisite acidity are prepd. by the addn. of solid org. or inorg. acids or acidic substances to alkali salts of phenol condensation products contg. S which are not pptd. by dil. acids, such as are formed by the action of CH<sub>2</sub>O and a neutral sulfite or bisulfite on a phenol condensation product contg. S or by the action of a neutral sulfite and air on a phenol-S condensation product. Oxalic acid, KHSO<sub>4</sub> and 2-naphthalenesulfonic acid are among the substances which may be used. Cf. *C. A.* 23, 2319.

**Tanning with rare earth compounds.** F. W. WEBER. Brit. 297,754, March 21, 1927. Tanning may be effected by pptg. in the hide basic compds. such as those of Th, Ce, La, Er, didymium, Sc, Yt or Sa; the leather may be subjected to a double tanning by a further treatment with compds. of other metals such as Fe, Cr, Al or Mn. Various details and modifications are given.

**Artificial tannins.** MICHAEL MELAMID. Fr. 648,140, Feb. 23, 1928. Artificial

tannins are obtained by heating humic acid to about 180° with dil.  $\text{H}_2\text{SO}_4$  or dil.  $\text{HCl}$ , sepg. the liquid and heating to 110° with 20% oleum.

**Vegetable extracts.** ROBERTO LEPETIT. *Fr.* 648,546, Feb. 8, 1928. Tanning and coloring agents are obtained by treating vegetable exts., particularly from the chestnut tree, with solns. of sol. sulfides and sol. silicates with the subsequent addn. of acid salts or acids.

**Imitation leather.** J. S. MILLER. *Brit.* 297,916, Aug. 2, 1927. Stout muslin or other suitable fabric is impregnated and coated with bitumen, one of the faces is embossed with a grain, and a flexible pyroxylin varnish is applied. An app. is described.

### 30—RUBBER AND ALLIED SUBSTANCES

C. C. DAVIS

**Isoprene and rubber. XIII. Constitution of rubber** H. STAUDINGER, M. ASANO, H. F. BONDY AND R. SIGNER. *Ber.* 61B, 2575-95(1928); cf. *C. A.* 21, 1371.—The evidence in favor of the Pummerer and the Staudinger views on the constitution of rubber is briefly reviewed. Against P.'s views the authors contend that: (1) Crystn. of a compd. is no proof that it is homogeneous and of low mol. wt.; the mixt. of polymeric-homologous polyhydroxymethylenes crystallizes just like homogeneous polyhydroxymethylene diacetates of low mol. wt. (2) A hydorrubber,  $(\text{C}_5\text{H}_{10})_n$ , distg. without decompn. does not exist; on distn. of the hydorrubber, which has a much higher av. mol. wt. (3000-5000), it undergoes cracking with the formation of a mixt. of unsatd. hydrocarbons. (3) Repetition of the mol.-wt. detns. in menthol shows that mol.-wt. detns. can be carried out only with great difficulty in this solvent with its extraordinary slowness in crystn.; crystn. after addn. of the substance under investigation must be approx. as rapid as that of the pure solvent and care must be taken that the outside temp. remains const., whereas addn. of rubber slows up the velocity of crystn. extraordinarily and considerable heat is lost to the surrounding bath, after the supercooling, so that very widely varying depressions of the m. p. are obtained. Similar observations were made on a cyclorubber having in  $\text{C}_6\text{H}_6$  an av. mol. wt. of 8500; in menthol it gave a value of 150. Expts. with paraffin hydrocarbons and paraffin hydrocarbon mixts. of high mol. wt. showed that the Rast method is well adapted to the detn. of the mol. wt. of such stable hydrocarbons and hydrocarbon mixts. The values obtained by Pummerer, Nielsen and Gündel with rubber were in the main confirmed, i. e., values between 1000 and 2000 were obtained, but that slight decomps. occur at these high temps. was shown by the fact that the camphor subliming over has a lower m. p. than pure camphor; moreover, cyclorubbers, whose mol. wts. in  $\text{C}_6\text{H}_6$  agree with their phys. properties (m. p., solv., viscosity of the soln.) show in camphor appreciably lower values. Association in  $\text{C}_6\text{H}_6$  seems excluded by the fact that the same values are obtained at different concns., and when these cyclorubbers are recovered from the camphor, they show in  $\text{C}_6\text{H}_6$  the same values as before, the viscosity of the  $\text{C}_6\text{H}_6$  solns. is likewise not altered by previously dissolving the cyclorubbers in camphor. The lowering in the m. p. of the sublimed camphor is ascribed to contamination by volatile products of low mol. wt. resulting from the breaking down of O contg. impurities in the camphor; when the rubber is recovered from the camphor, these volatile products remain dissolved in the alc. and therefore do not affect the mol. wt. in  $\text{C}_6\text{H}_6$  of the recovered rubber. (4) Isorubber-nitrone is not, as assumed by P., a homogeneous substance but a mixt. of polymeric-homologous products resulting from the breaking down of the rubber with  $\text{PhNO}$ . (5) Röntgenographic investigations cannot prove the existence of a small basic mol. The authors therefore held to their view that rubber consists of macromol. polymeric-homologous polyprenes. The results of mol. wt. detns. of cetel alc., cholesterol, cyclorubber and rubber in menthol, and of paraffins, paraffin mixts., rubber and gutta-percha in camphor are reported.

C. A. R.

**Natural and synthetic rubber. I. Products of the destructive distillation of natural rubber.** THOMAS MIDDLEY, JR. AND ALBERT L. HENNE. Cornell Univ. *J. Am. Chem. Soc.* 51, 1215-26(1929). Light pale crepe rubber was destructively distd. at atm. pressure, the temp. of the bath being raised as quickly as possible to 700° (to obtain a favorable yield of isoprene). Addn. of Mg to the rubber greatly increased the yield of substances other than isoprene and dipentene; Zn, Fe and Al have a similar effect but to a very much smaller extent; Cu is without effect; brass is the same as Fe. In the distns. the same components were found but in different proportions. A table gives the yields of the 2 distns. No fully satd. compd. was detected. The follow-

ing compds. were isolated by fractional distn. of the reaction product after the removal of the isoprene (the phys. const. and methods of identification are given): 3-methyl-1-butene, 2-methyl-1-butene, isoprene, 2-methyl-2-butene, a 2-methylpentene, b. 59–60°,  $d_{20}^{20}$  0.730,  $n_{20}$  1.4117; 3-methyl-2-pentene; a 3-methylpentadiene, b. 76–9°,  $d_{20}^{20}$  0.742,  $n_{20}$  1.4346;  $C_8H_8$ , a compd. b. 93–5°,  $d_{20}^{20}$  0.744,  $n_{20}$  1.422;  $\Delta^1$ -tetrahydrotoluene,  $\Delta^1$ -tetrahydrotoluene; a fraction b. 109–10°,  $d_{20}^{20}$  0.783,  $n_{20}$  1.4413;  $\Delta^1$ -tetrahydrotoluene, PhMe; a fraction b. 121–2°,  $d_{20}^{20}$  0.765,  $n_{20}$  1.4287, probably 2-methylheptene;  $\Delta^1$ ,  $\Delta^2$ -dihydro-*m*-xylene, b. 129–30°,  $d_{20}^{20}$  0.795,  $n_{20}$  1.4451; *m*- $C_6H_4Me_2$ , *p*-tetrahydroethyltoluene; a fraction b. 158–9°,  $d_{20}^{20}$  0.834,  $n_{20}$  1.4665; *p*-Et $C_6H_4Me$ ; a fraction b. 162–3°,  $d_{20}^{20}$  0.828,  $n_{20}$  1.46, analyzing for  $C_{10}H_{18}$ ; a dimethyloctadiene, b. 162–3°,  $d_{20}^{20}$  0.8105,  $n_{20}$  1.456; dipentene. Assuming that the Staudinger formula is correct, that the single bonds farthest from the double bonds are the weaker spots and that the formation of 6-C rings is favored, it has been shown that nearly all of the compds. actually isolated could be predicted. II. Reduction of isoprene by Na-NH<sub>3</sub>. *Ibid* 1293–4.—Reduction of isoprene with Na in liquid NH<sub>3</sub> gives 60% of 2-methyl-2-butene. High mol.-wt. hydrocarbons were formed but were not investigated. III. Dimethyloctadiene. *Ibid* 1294–6.—Well purified isoprene, active toward polymerization, was placed in contact with metallic K; EtOH was added slowly at a rate just sufficient to give a moderate evolution of H at the surface of the K; there resulted a mixt. of 2,6-, 2,7-, and 3,6-dimethyl-2,6-octadienes, b. 163–7°,  $d_{20}^{20}$  0.769,  $n_D^{20}$  1.4457. The constitution of the mixt. was detd. by oxidation with CrO<sub>3</sub> in AcOH. This reaction indicates that the mechanism of the polymerization of isoprene to synthetic rubber is the joining of many isoprene mols. by linkage of the 1,1-, the 1,4-, or the 4,4-C atoms to produce a long chain mol

C. J. West

The physical properties of rubber. MARTIN RUHEMANN AND FRANZ SIMON. Berlin. *Z. physik. Chem., Abt., 138A*, 1–20(1928).—The change of a supercooled liquid to an amorphous solid is not continuous, but occurs within a definite temp. interval. With glycerol, for example, this is shown by an anomaly in the sp.-heat curve, the value of the sp. heat falling off much more rapidly within this interval than in the neighboring temp. regions. This same anomaly in the sp.-heat curve, which R. and S. call the  $\alpha$  anomaly, was found in smoked sheet, where the change to a "glassy" solid with falling off of elasticity took place between  $-65^\circ$  and  $-80^\circ$ . With synthetic rubber the change was between  $+5^\circ$  and  $-12^\circ$  for methyl rubber II, and between  $-5^\circ$  and  $-22^\circ$  for methyl rubber W. A second anomaly, referred to as  $\beta$ , was found as a peak in the sp.-heat curve for natural rubber at about  $0^\circ$ , and was not easily reproducible. The behavior of the coeff. of expansion in this temp. range showed that this could not be due to the presence of H<sub>2</sub>O. "Patent rubber," pure, raw rubber, masticated, pressed several days at 150 atm. at  $-15^\circ$ , gave the same  $\alpha$  and  $\beta$  anomalies, though  $\beta$  was less pronounced. "Frozen" smoked sheet and "patent rubber" gave the  $\alpha$  and  $\beta$  effects, also peaks (called the  $\gamma$  anomaly) at  $+25^\circ$  and  $+17^\circ$ , corresponding to 4 cal. and 6 cal. per g. of rubber, resp. Since the opalescence vanished, and immediate cooling and re-warming showed no  $\gamma$  effect, this is taken as the heat of fusion of the crystallites shown by x-ray photographs to be present in frozen rubber. Smoked sheet, racked 500% at  $55^\circ$ , showed  $\alpha$  and  $\beta$  anomalies, but up to  $35^\circ$ , no  $\gamma$ , though the opalescence of the sample indicated that the "m. p." had not been reached. A sample racked 400% at  $35^\circ$  gave the  $\gamma$  effect, the max. of the peak being at  $34^\circ$ ; the rubber thus "melted" was clear and elastic. The total-, gel- and sol-rubbers of Pummerer (C. A. 22, 885) showed the  $\alpha$  and  $\beta$  anomalies. Rubber as a 2-phase system might be expected to show 2  $\alpha$  anomalies. The absence of a second anomaly is explained by the fact that the more viscous phase is in the "glass" state to above  $30^\circ$ , and hence the second  $\alpha$  effect was not detected in these expts. The (purely speculative) explanation advanced for the  $\beta$  anomaly is a further polymerization and attending solidification to the "glass" state.

G. R. Y.

The "degree of devulcanization" and the evaluation of reclaimed rubbers. HERNRICH LORWEN. *Kautschuk* 5, 61–2(1929).—Comments on an article by Lindmayer (cf. C. A. 23, 2069). So-called reclaiming does not represent true devulcanization, but plasticization, for devulcanization would involve the complete removal of combined S. The concept of devulcanization of L., whereby vulcanized rubber splits into a component rich in S and a component free of S, is contrary to all facts of org. chemistry and is not supported by exptl. data. All that can be said is that an increase in the CHCl<sub>3</sub>-sol. component is accompanied by an increase in plasticity. The "degree of devulcanization" on the basis proposed by L. is fallacious, for it signifies that only 0.5

of the rubber can become sol., an assumption without foundation. The suggestion of L. is of more practical than of theoretical significance. C. C. DAVIS

The use of "Catalpo" in the rubber industry. A. D. LUTTRINGER. *Caoutchouc & gutta-percha* 26, 14389-90(1929).—A description of the characteristics of "Catalpo" clay. C. C. DAVIS

The aging of rubber. Its preservation. F. JACOBS. *Caoutchouc & gutta-percha* 26, 14382-3(1929); cf. C. A. 22, 4876.—A review with special reference to work by Villey and Vernotte (cf. C. A. 19, 1208). No artificial aging method duplicates natural aging in darkness. Furthermore, it is considered that the deterioration of vulcanized rubber is an unnecessary change, in that mixts. of suitable compn. and vulcanized to the proper condition deteriorate little or not at all. C. C. DAVIS

Ornamented rubber. JOSEPH ROSSMAN. *India Rubber World* 80, 61-4(1929).—An illustrated review of U. S. patents relating to methods of designing and coloring. C. C. DAVIS

The cleavage of stretched rubber and the distortion of its cleavage planes by compounding. M. LE BLANC AND M. KRÖGER. Leipzig. *Z. Elektrochem.* 34, 725-34 (1928).—Whereas a cryst. substance undergoes a distortion of lattice on stretching, rubber must first gain a cryst. structure, which may then undergo distortion and breakage. The introduction of compounding ingredients causes a distortion of the lattice; at low temp. in rubber not contg. compounding ingredients, part of the rubber itself may act in this capacity. A microscopic examn. of the cleavage faces of various rubbers shows that: (1) the finer the compounding ingredient, the more the places of distortion of the planes, and (2) the greater the energy of adsorption of the compounding ingredient, the greater is this distortion. A scheme is given showing the interrelation of various forms of rubber (raw, compounded, vulcanized, etc.) Stress-strain data at various temps. are given for artificial isoprene rubber, and for 15 and 30% admixts. of KCl,  $\text{NH}_4\text{Cl}$ ,  $\text{B}_2\text{O}_3$ , KBr, KSCN, ZnO,  $\text{MgCO}_3$ ,  $\text{BaO}_2$ ,  $\text{BaSO}_4$  and for 15% admixts. of methylene blue, eosin, furrol B, furrol GB and rhodulin orange. The diam. of the testing ring has an influence on the stress-strain curves and breaking point, the breaking value being greater for a smaller ring than for the usual 44.6 mm. ring of the Schopper machine. Tables show results of these tests. G. R. Y.

A temperature-recording micropress for studying the course of vulcanization. JAMES C. WALTON. Boston Woven Hose & Rubber Co., Cambridge, Mass. *Ind. Eng. Chem., Anal. Ed.* 1, 106-8(1929).—A new temp.-recording electrically-heated micropress for use in studying vulcanization microscopically is described and illustrated (cf. Dannenberg, C. A. 21, 3764; Hauser and Hünemörder, C. A. 22, 4876; 23, 2070). This instrument permits the duplication of press cures on a very small scale and makes it possible to det. the temps. at which various changes take place during the progress of vulcanization. With the aid of this app., the vulcanization of several rubber mixts. with and without S was studied microscopically. It was found that after curing a rubber-S-PbO mixt. there is no crystn. of the free S, even when the cure is very brief. Both  $m\text{-C}_6\text{H}_4(\text{NO}_2)_2$  and benzyl peroxide vulcanize rubber in the absence of S. The former requires an activator like PbO (diphenylguanidine being ineffective), and does not crystallize from vulcanized mixt., where benzoyl peroxide does not require an activator, and it crystallizes from the vulcanized mixt. in a manner very similar to S. Photomicrographs of rubber before and after vulcanization by  $m\text{-C}_6\text{H}_4(\text{NO}_2)_2$  are included. C. C. DAVIS

The vulcanization of rubber by sulfur chloride. J. SOUDIER. *Caoutchouc & gutta-percha* 26, 14389(1929).—It is claimed that substances have been found which in very small proportions will accelerate the cold vulcanization of rubber by  $\text{S}_2\text{Cl}_2$  and give products of superior quality. They are not named. C. C. DAVIS

Plasticization and plasticizing agents. PAUL BARY. *Caoutchouc & gutta-percha* 26, 14464-8(1929).—A discussion of the phenomena and of the mechanism of plasticization in its relation to the chem. theory of colloids. Swelling of a colloid involves 2 distinct phases, (1) penetration of the liquid, accompanied by an increase of vol., and (2) solvation, which may proceed as far as complete colloidal soln. The mols. of the colloid are highly polymerized, and are previously solvated. Penetration, therefore, is aided by this initial solvation, though the liquid has insufficient affinity to rupture the mols. and to produce further solvation. For plasticization to accompany swelling it is necessary that: (1) the colloid be swollen enough to be elastic and deformable under pressure; (2) the liquid contain the elements of solvation to such a degree that the jelly fuses at a definite temp. and (3) this m. p. is close to the working temp. Plasticization requires the expenditure of energy corresponding to the depolymerization which takes place, and this expenditure is counterbalanced (in part or wholly) by the

heat evolved in the partial combination of the solvent at the points of mol. rupture. When the heat of solvation exceeds that of depolymerization, there is a reduction in the degree of polymerization, even to complete soln. However, liquids which swell colloids best are not always those with the greatest solvating power, but those which, without solvating the colloid appreciably at ordinary temp., begin their action at slightly elevated temps. On recooling, there should be repolymerization and desolvation. Assuming that rubber is solid  $\alpha$  form and a liquid  $\beta$  form dissolved in the  $\alpha$  form to produce a jelly, rubber may be considered to be an auto-plasticized substance. When polymerization of the isocolloid reduces the proportion of the  $\beta$  form, the plasticity diminishes. There is no essential difference in this rubber jelly and other jellies of 2 dissimilar components unless, as seems probable, there are solvating agents present in the rubber, viz., its resinous and protein impurities. If these impurities act as solvating agents, it is one of the reasons why synthetic rubbers have not so much elasticity as natural rubbers. In general, then, a substance is plastic only if it has 2 components: (1) a colloid capable of swelling and (2) a liquid sol. in this colloid and with the power of solvating the latter. This liquid can be a mixt. of 2 or more liquids, with differing powers of solvation, and therefore, lending different degrees of elasticity to the resulting plastic mixt. C. C. DAVIS

The dynamometer of Pierre Breuil (ANON) 1. The solubility of  $\text{CO}_2$  in vulcanized rubber (YAMAMOTO) 2. Abrasive wheel bonded to face plates with vulcanized rubber (U. S. pat. 1,709,820) 19.

**Rubber.** THE ANODE RUBBER CO. (ENGLAND), LTD. Fr. 648,631 Feb. 10, 1928. Aq. dispersion of org. substances, particularly vulcanized or unvulcanized or regenerated rubber or factis, is obtained by mixing the solid constituent after mastication successively with at least 2 auxiliary substances, at least one of which presents to the solid constituent and at least one to the liquid constituent a high physical affinity (solv., miscibility, swelling capacity and adsorption capacity) and at least one of the substances added first combining chemically with one of the substances added afterward under the conditions of working. Thus, regenerated rubber is treated in mixing cylinders, NaOH lye is added and afterward oil. Water contg.  $\text{NH}_3$  is added until reversion, and the dispersion of rubber obtained may be dild. as desired, preferably with feebly alk. water. Casein may be added with the NaOH.

**Rubber.** SOC. ANON DES CHAMIONS ACTIFS EDOUARD URBAIN. Fr. 648,194, June 14, 1927. A charge is used in the making of rubber consisting of an active or activated porous absorbent substance, which has absorbed vulcanizing substances. In examples, C, having served for the purification of coal gas and contg. 6-7% of S, thiols, thiophene, different amines and oxamides, is ground and dried and mixed with rubber and vulcanized. C used for coal gas purification is caused to absorb vapors of piperidine and  $\text{CS}_2$  and used as before. Cf. C. A. 23, 2963.

**Rubber.** SYNDICAT FRANCO NEUTRIANDAIS. Fr. 649,006, July 4, 1927. Waste vulcanized rubber, contg. no charge, after removal or destruction of any fabric, is regenerated by treating it with latex, giving a rubber equal to plantation rubber. Fr. 649,007 describes the coagulation of latex by means of waste vulcanized rubber, contg. no charge, and after removal or destruction of any fabric.

**Rubber composition.** HARRY H. KELLER. U. S. 1,710,181, April 23. A vulcanizable compn. which is suitable for tire treads, floor coverings, shoe soles, etc., is formed of rubber 100, S 3, ZnO 26.5 and Al oxide 26 parts and an accelerator.

**Liquefied rubber composition.** HAROLD P. BUTLER. U. S. 1,710,470, April 23. In prepg. a product which may be used with a brush or as a spray, rubber is placed in a still together with  $\text{C}_6\text{H}_6$ , toluene, or  $\text{CCl}_4$  and refluxed for several hrs. Cf. C. A. 22, 2291.

**Rubber deposition from latex.** P. KLEIN, A. SZEGVARI, R. P. MCKAY, C. HAYES and G. W. TROBRIDGE. Brit. 298,117, March 26, 1927. The properties of rubber produced by direct deposition from aq. dispersion are improved by submitting the surfaces not in contact with the deposition strata to the action of coagulating agents before drying. The treatment may take place alternately with the deposition of layers and coagulation may be effected by the application of a heated liquid such as hot water, hot moist air, steam, liquid coagulants such as  $\text{HOAc}$  or  $\text{CaCl}_2$  soln. or coagulating vapors.

**Electrophoretic deposition of rubber.** P. KLEIN, A. SZEGVARI, R. P. MCKAY, C. HAYES and G. W. TROBRIDGE. Brit. 297,780, March 26, 1927. In the deposition of



rubber from dispersions contg. insufficient OH ions to cause gas formation on the anode, as described in Brit. 257,885 (C. A. 21, 3141), the cond. of the dispersion is altered by the addn. of electrolytes free from OH ions or by removing electrolytes from the dispersion and replacing them by electrolytes free from OH ions. This treatment enables the OH concn. to be increased above the limit otherwise possible without gas formation. In using Zn anodes, alkali metal chlorides serve to prevent sticking of the rubber at the anodes and to produce softer deposits.  $\text{CaCl}_2$  increases coagulation and substances such as an alkali metal ferrocyanide or phosphates increase the toughness of the deposits.

**Coloring rubber.** I. G. FARBENIND. A.-G. Brit. 298,364, Oct. 6, 1927. Rubber is colored orange-red by mixing it, before vulcanization, with the Ca salt of benzeneazo-2-hydroxynaphthalene-6-sulfonic acid (Schultz No. 37).

**Forming rubber articles by dipping.** DUNLOP RUBBER CO., LTD., and D. F. TWISS. Brit. 297,911, July 25, 1927. A non-porous mold such as one of glazed porcelain, metal, or rubber is moistened with a coagulant liquid such as  $\text{CaCl}_2$ , K alum, or formic or acetic acid soln. and dipped in a coned dispersion, which may contain fillers and vulcanizing ingredients and which may include "mineral rubber" and reclaimed rubber and a salt such as  $\text{NaCl}$ ,  $\text{Na}_2\text{SO}_4$ , or  $\text{CaSO}_4$ .

**Rubber-filament formation by extrusion.** M. DRAEMANN. Brit. 297,912, July 25, 1927. Filaments are formed from a soln. of unmodified rubber, which is maintained at a temp. above the b. p. of the solvent used. The filaments after formation are carried by a belt conveyor through a chamber where they are vulcanized by molten S or hot air, and, before, during or after vulcanization, the filaments may be stuck together to form a band by use of liquid S, glue, casein or other suitable material. App. and various other details of procedure also are described.

**Molding rubber tires.** W. J. FILLMORE. Brit. 297,590, Nov. 9, 1927. The outer covering of a cushion tire is molded over the core portion by an extrusion process. An app. is described.

**Molding inner tire tubes or other hollow rubber articles.** T. L. FAWICK. Brit. 298,139, Oct. 3, 1927. Mech. features. Brit. 298,140 describes a special form of tire vulcanizing app.

**Forming endless circular rubber inner tire tubes for vulcanization.** OTTO J. KUHLE (to Kuhle Machine Co.). U. S. 1,709,795, April 16. Mech. features.

**Forming "punctureproof" tire tubes by conjoint use of slow curing and fast curing rubber compositions.** OTTO J. KUHLE. U. S. 1,709,797, April 16. Various mech. details are described.

**Progressive refrigeration of rubber straps to facilitate cutting.** JOHN R. GAMMETER (to A. G. Spalding and Bros.). U. S. 1,710,211, April 23. An app. is described.

**Reclaiming rubber.** JOHN J. MORIAKIS (CO. to James H. S. Kerr). U. S. 1,710,100, April 23. Effected and vulcanized material is ground, incorporated with a plasticizing material such as "mineral rubber," the material is milled with the further addn. of a reclaiming reagent such as a 20%  $\text{H}_2\text{SO}_4$  soln. and is then treated with steam under pressure.

**Forming and vulcanizing cored rubberized belting.** JOHN R. GAMMETER (to B. F. Goodrich Co.). U. S. 1,709,299, April 16. Mech. features.

**Vulcanizing rubber.** W. C. GRAY, B. DAVES and B. F. GOODRICH CO. (to Anode Rubber Co., Ltd.). Brit. 297,850, March 28, 1927. In the direct production of rubber goods on deposition strata or molds by dipping or electrophoresis, "ultra accelerators" are used, which effect complete vulcanization of the products during or before completion of drying, and at temps. below  $112^\circ$  or even below the b. p. of water. Suitable substances are diethylammonioethylthiocarbamate, dithiofuroic (dithiopropionic) acid and dithiofurates and mercaptobenothiazole. The vulcanization may be effected in heated air, heated moist air, or by dipping in hot water. Various natural or artificial rubber dispersions and compns. may be used.

**Vulcanizing rubber.** W. SWIFT (to Rubber Service Laboratories Co.). Brit. 297,726, Sept. 26, 1927. A vulcanizing accelerator is made by treating an aldehyde- $\text{NH}_2$  with a further quantity of the same or a different aldehyde, preferably by heating in a closed vessel to 90–95°. Examples are given of the use of the reaction products of various proportions of butylaldehyde and butylaldehyde ammonia, butylaldehyde and croton aldehyde ammonia and croton aldehyde and butylaldehyde ammonia.

**Vulcanization of rubber.** THE RUBBER SERVICE LABORATORIES CO. Fr. 648,239, Oct. 8, 1926. Accelerators for the vulcanization of rubber are obtained by reacting a mercaptan or compd. of mercaptan contg. a CSH group on a completely saturated org. base. The products obtained may be condensed with an aldehyde such as crotonic aldehyde. Suitable bases include hexamethylenetetramine, biguanide, triphenyl

biguanide, guanyl ureas, isoureas, thioureas, piperazine, trimethylsulfonium hydroxide and  $N(CH_3)_4OH$ . Mercaptan compds. include ethylmercaptan, thiophenol, thiocresol, mercaptobenzothiazoles, 2-mercaptothiazoline and its derivs., thioanilides, 2-mercaptobenzimidazole, mercaptoiminazole, thioamides and thioammeline. Cf. C. A. 23, 732.

Vulcanizing apparatus for pneumatic tubes. GILLETTE RUBBER CO. Fr. 648,504, Feb. 7, 1928.

Devulcanizing rubber. R. R. GROSS (to Firestone Tyre & Rubber Co. (1922), Ltd.). Brit. 297,817, Sept. 29, 1927. Rubber scrap such as that contg. textile reinforcements is treated with steam under a pressure of 400-1000 lbs. per sq. in. for 1-15 mins.; the pressure is then suddenly released; the scrap is thus disintegrated, the textile material is charred or hydrolyzed and free S is stated to be removed.

# CHEMICAL ABSTRACTS

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## 1—APPARATUS AND PLANT EQUIPMENT

W. L. BADGER

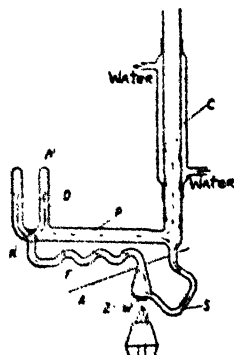
**Works control and laboratory equipment.** ARTHUR SCHRODER. Fisher Scientific Co., Pittsburgh, Pa. *Ind. Eng. Chem.* 21, 481-5(1929).—Uniform quality of products, as demanded by the customer, can be insured only by const. testing of material during production. Plant control equipment is becoming more and more standardized and specialized. A brief description of some of the control instruments recently developed is given. The American scientific instrument industry is no longer a matter of mere merchandising but has become outstanding in design, manuf. and supply of instruments.

**Laboratory filtering device.** KARL-IVAR SKAERBLUM. *Tek. Tid., Uppl. C. Kemi* 58, 23-4(1928).—The described app. is particularly helpful in the slow vacuum-filtering of colloids through a Zsigmondy-Bachmann filter. The top opening of a bell jar is fitted with a stopper carrying the filter funnel. The filtrate is received in a flask placed under the jar. The flask contg. the liquid to be filtered is inverted with the top dipping into the liquid on the filter to maintain a const. level. The bell jar and the inverted flask are fixed to a ring stand in such a manner that they can be raised and lowered as a unit.

**A new self-adjusting pipet.** E. G. BILHAM. *J. Sci. Instruments* 6, 119-20(1929).—By means of an inner tube forming an extension of the ordinary discharge jet of a pipet, a fixed quantity of liquid is retained and can be recovered by pouring out from the top of the pipet. Pipets of this pattern have been found useful for purposes where definite fixed quantities of water or other liquid have to be measured rapidly and accurately.

**A new adiabatic calorimeter.** SEIJIRO UCHIDA. Imperial Fuel Research Inst. *J. Fuel Soc. (Japan)* 8, 306-16(1929).—U. designed a new adiabatic calorimeter the novel features of which are: The detn. is made independent of the room temp. The proper but delicate selection of the bucket, jacket and room temp. and rapid and accurate reading of a Beckmann thermometer in the bucket may be dispensed with. Delicate skill such as required in a bomb calorimeter is unnecessary. Correction for radiation is also unnecessary. It saves time; several detns. may be carried out side by side. An ordinary bomb calorimeter can easily be changed into an adiabatic calorimeter.

**A new ebullioscope for determining molecular weights using small quantities of substances.** EDWARD SUCHARDA AND BOGUSLAW BOBRANSKI. *I. w. ow Polytech. Przemysl Chem.* 11, 371-3(1927); cf. Swietoslowski, *Roczniki Chem.* 5, 96(1925).—Liquid (3-5 cc.) enough to fill the reservoir Z and the wavy tube F up to its outlet to the cup K is introduced through the condenser C. Enough Hg is introduced into the vessel N so that when a thermometer is introduced into it the level of Hg is the same as that of the cup K. At the beginning of the detn. the jacket D and the tubes P and F are carefully heated with a moving flame; then the solvent in the reservoir Z is heated to boiling, heat by a microburner provided with a chimney. It should be boiled fast enough to keep up a steady overflow over the cup K. Glass powder on the bottom of the reservoir steadies the boiling. After 5-7 mins. the b. temp. becomes steady to within 0.001°, and at that time the sample (10-50 mg.) may be added through the cooler C. The second reading is obtained in 2 or 3 mins. To avoid the complication of rapidly changing atm. pressure two simultaneous b.-p. detns. should be conducted, one with the solvent alone and the other with the solvent and the sample.



A. C. ZACHLIN

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**The efficiency of absorption apparatus.** E. ÖMAN. *Tek. Tid., Uppl. C, Kemi* 58, 89-94(1928).—A theoretical consideration of the different conditions governing the technical process of absorption of gases in liquids. A simple app. for detg. the absorption coeffs. is described.

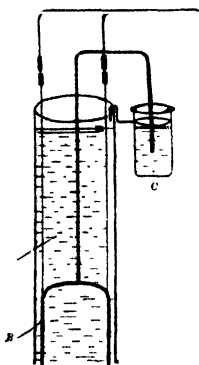
A direct-reading thermocouple temperature indicator for electrical machinery. F. S. STICKNEY. *Instruments* 2, 135-40(1929). E. H.

**Manometer with mercury and oil.** R. DARBORD. *Compt. rend.* 188, 50-2(1929).—Hg and an oil with low vapor pressure are used. The Hg surfaces are large. The pressure is on a small surface of oil. The new manometer is more sensitive than the Hg manometer.

A super-micromanometer. JOHN L. HODGSON. *Instruments* 2, 125-8(1929). E. H.

**Device for the preparation of solutions of constant density.** J. HAMOUS. *Z. Zuckerind. Tschoslovak. Rep.* 52, 448(1928).—An app. for dilg. a liquid to const. d. consists of a cylindrical vessel contg. a float carrying a graduated spindle, which, according to its rise or fall, actuates a mechanism controlling the entrance of the dilg. liquid at the point where the denser liquid is admitted.

A new electrolytic gas apparatus. ROBERT MAND. *Z. physik. chem. Unterricht* 40, 305(1927)(Munich).—The new apparatus combines inexpensiveness, simplicity and safety. It requires either 110 or 220 v. d. c. The gas is let through soap soln. and the bubbles can be ignited within 1 or 2 mins. without interrupting the electrolysis. Into a cylinder is placed the gas cell into which 2 Ni electrodes are set. A glass tube leads from the cell into the soap soln.



A flow meter for gases. A. V. SIVOLOBOV. *J. Chem. Ind. (Moscow)* 5, 1429-31(1928).—To permit passing gases in definite quantities per unit of time, S. constructed a sort of a manometer, which represents an improvement over Riesenfeld's apparatus (*C. A.* 22, 187). The manometer, called *capillary tachimeter*, is described in detail and a drawing is appended.

Apparatus for thermomagnetic analysis. RAYMOND L. SANFORD. *Bur. Standards J. Research* 2, 659-70(1929). E. H.

**Electrically heated thermocirculator for hot leaching and digesting.** M. G. RAEDER. *Ind. Eng. Chem., Anal. Ed.* 1, 88(1929).—The reference in *C. A.* 23, 1532 should have been *Ind. Eng. Chem., Anal. Ed.* 1, 88.

**Mechanical dispersion by means of the colloid mill (TRAVIS) 2.** Some sources of error in determining the drop-point according to Ubbelohde, and their avoidance (NAUMANN) 2.

TRINKS, W.: *Industrie-Öfen*. Band I. Berlin: VDI-Verlag, G. m. b. H. 348 pp. M. 14.40; bound, M. 16.

**Mixing and agitating apparatus.** I. G. FARBENIND. A.-G. (Hermann Sturm and Karl Fierz, inventors). Ger. 473,404, May 24, 1925. Stationary guides having curved surfaces are arranged in advance of the stirrers, and the arrangement is such that vertical currents are produced in the mixt.

**Helical stirring apparatus.** MASCHINENFABRIK AUGSBURG-NÜRNBERG A.-G. Ger. 474,801, June 14, 1928.

**Apparatus for indicating pressures or temperatures.** L. DE FLOREZ. Brit. 299,008, Oct. 19, 1927. Structural.

**Penetrometer (with a blunt-nosed plunger) for testing the hardness of fruit and substances of similar consistency.** E. GRIFFITHS and E. A. GRIFFITHS. Brit. 298,662, July 12, 1927.

**Calorimeter for steam.** HERMANN SANDVOSS. Ger. 473,433, Dec. 4, 1926.

**Safety device for Bunsen burners.** NILS T. SELLMAN (to Spencer Thermostat Co.). U. S. 1,711,398, April 30. A thermostatic device closes the gas supply when the flame is extinguished.

**Ball mill construction, etc.** S. BRAMLEY-MOORE. Brit. 298,899, Oct. 15, 1927.

**Liquid-level indicator or regulator** (utilizing electrical conductivity of liquid in a gage glass). NAAMLooZE VENNOOTSCHAP MACHINEFABRIEK G. DIKKERS & Co. and W. LULOFS. Brit. 299,012, Oct. 19, 1927.

**Filters.** ALFRED SCHOLZ. Ger. 472,901, Nov. 25, 1926. Compressed filter cakes for acids are completely leached out by treating with substances which cause  $\text{CO}_2$  to be developed within their mass, so neutralizing the acid and producing a network of capillary pores, which facilitates the leaching. The process is continued until the washings from the mass give a neutral reaction. Thus, filter cake contg.  $\text{HCl}$  is leached with  $\text{Na}_2\text{CO}_3$  until the washings are only slightly acid. The leaching is then continued with water until the washings are neutral.

**Filter drum.** EUGEN GEIGER. Ger. 474,358, Aug. 19, 1926. Addn. to 472,181 (C. A. 23, 2328).

**Filter for milk or other liquids.** KIRK K. WRIGHT. U. S. 1,710,758, April 30. Structural features.

**Apparatus for separating benzine, etc., from water.** JOSEF MUCHKA. Austrian 112,646, Nov. 15, 1928. Sieves, fillers, or the like are arranged above the inlet for the mixt. so as to break up eddies in the incoming stream.

**Apparatus for the gravity separation of gasoline and water or other mixed liquids of different specific gravities.** JEAN SCHÄFER. U. S. 1,711,428, April 30.

**Apparatus for gravity separation of oil and water or other liquids of different densities.** F. PINK. Brit. 298,683, June 29, 1927.

**Apparatus for removing dust and other suspended particles from air or other gases by centrifugal action.** HUNDT & WEBER GES. Brit. 298,855, Nov. 10, 1927.

**Centrifugal apparatus for removing dust from gases.** ARTHUR STIEVENART. Fr. 649,470, Feb. 3, 1928.

**Gas-purification apparatus.** PAUL SCHMIDT. Ger. 473,878, Feb. 13, 1927. App. for sepp. vaporized liquids, such as oils, from gas currents, such as flue gases, is described.

**Dry-gas purifying apparatus.** RUDOLF GRIPERT. Ger. 473,987, Nov. 15, 1927. The purifying material is spread along the gas passage in thick layers in chambers bounded by cross walls.

**Spray apparatus for washing gas, moistening air, evaporating, drying, etc.** FERDINAND WREESMANN. Ger. 473,455, Nov. 14, 1924. App. is described in which liquid is fed centrally to a rapidly rotating vessel together with air or gas under pressure, the liquid escaping through peripheral openings.

**Gas washer with a spiral surface within a tower.** I. G. FARBENIND. A.-G. Brit. 299,075, June 20, 1927. Structural features.

**Apparatus for the recovery of gases or vapors from adsorbent substances.** NORIT-VEREENIGING VERKOOP CENTRALE. Fr. 648,775, Jan. 9, 1928.

**Safety valve for gas conduits.** GOTTFRIED BORNEFELD. U. S. 1,711,133, April 30. A valve is described, which closes if the conduit behind the valve leaks or is not fully open.

**Gas holder of the "waterless" type.** PAUL M. KUEHN (to Bartlett-Hayward Co.). U. S. 1,711,392, April 30. Structural features.

**Column of perforated plates for impregnating liquids with gases.** L'AIR LIQUIDE SOC. ANON. POUR L'ÉTUDE ET L'EXPLOITATION DES PROCÉDÉS GEORGES CLAUDE. Ger. 472,749, Jan. 28, 1926. Details of arrangement.

**Acetylene generator.** KARL KAHN. Ger. 474,145, Apr. 8, 1928. Water supplied to the generator under pressure actuates the carbide feed and also a stirrer serving to maintain the sludge in a thin liquid state.

**X-ray apparatus.** NAAMLooZE VENNOOTSCHAP PHILIPS' GLOEILAMPENFABRIEKEN. Fr. 649,940, Feb. 25, 1928.

**Röntgen-ray apparatus.** PHÖNIX RÖNTGENROHRENFABRIKEN A.-G. Ger. 473,929, Aug. 6, 1925. A screen surrounding the cathode is made with a layer of material opaque to the rays and a layer of gas-absorbing material to preserve the vacuum.

**Röntgen-ray apparatus.** SIEMENS-REINIGER-VEIFA GES. FÜR MEDIZINISCHE TECHNIK M. B. H. Ger. 473,930, Oct. 27, 1925. The tube has a screen arranged near the focus.

**Röntgen-ray tube.** W. D. COOLIDGE (to British Thomson-Houston Co., Ltd.). Brit. 298,987, Oct. 18, 1927. In making tubes with a metal window close to the target, the window is electrostatically protected from electrons passing from the target. A tube is described having a window about a half mil in thickness and formed of ferrochrome contg. about 25% Cr, secured to the metal portion of the tube, with a metal grid interposed between the anode target and the window. Various structural details are described.

**Thermionic rectifier for Röntgen-ray apparatus, etc.** NAAMLOOZE VENNOOTSCHAP PHILIPS' GLOEILAMPENFABRIEKEN. Brit. 299,098, July 22, 1927. Structural features.

**Thermionic valves.** FRANÇOIS PERI. Fr. 648,357, June 18, 1927.

**Thermionic valves.** MARCONI'S WIRELESS TELEGRAPH CO., LTD. Fr. 650,079, Feb. 23, 1928.

**Electron discharge tubes.** COMPAGNIE FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON. Fr. 648,859, Oct. 14, 1927.

**Electric discharge device (gaseous glow lamp).** A. W. HULL (to British Thomson-Houston Co., Ltd.). Brit. 298,906, Oct. 15, 1927. An indirectly heated cathode is used, which may comprise a Ni cylinder contg. heating coils and coated with BaCO<sub>3</sub> is heat-treated at temps. up to 1300° to render it active. Ba-coated Ni may be heated to near the m. p. of Ni. Various structural and elec. features are described.

**Incandescent cathode discharge tubes.** C. H. F. MÜLLER A.-G. Fr. 649,358, Feb. 21, 1928.

**Anti-cathodes.** WESTINGHOUSE LAMP CO. Ger. 472,661, Dec. 18, 1921. Anti-cathodes for Röntgen-ray tubes are made from U or Th or their alloys, with or without other heavy metals, by heating the metals or their salts for a long period in powd. form in a high vacuum in a high-frequency induction furnace.

**Automatic tilt-start device for mercury-vapor rectifiers.** "ELIN" A.-G. FÜR ELEKTRISCHE IND. (Wilhelm Ganster, inventor). Austrian 112,317, Oct. 15, 1928.

**Multistage mercury-vapor pump for high vacuums.** AKTIEN-GESELLSCHAFT BROWN, BOVERI & CIE. Swiss 130,468, Feb. 1, 1928.

**Burner for mercury-vapor lamps.** QUARZLAMPEN-GESELLSCHAFT. Fr. 649,672, Feb. 24, 1928.

**Furnace.** WM. BROWN. Ger. 473,932, May 2, 1926. A smoke-consuming furnace has a gas flame inserted in the conduit leading off the smoke and flue gas.

**Furnace.** WALTHER & CIE. A.-G. Ger. 472,856, July 18, 1924. A furnace for damp fuel has a mechanically operated fire chamber, a drying shaft and air conduits.

**Furnace.** SOCIÉTÉ "SIDÉROFOURS." Ger. 472,920, July 19, 1925. A regenerative gas furnace with a reversible flame direction and an artificially increased air velocity is described.

**Furnace.** ERNST VÖLCKER. Ger. 474,302, Jan. 1, 1926. A furnace having a stepped or inclined grate is provided with means for feeding a supplementary supply of powd. fuel along the length of the grate and means for supplying air under pressure below the lowest part of the grate.

**Furnace.** CATO VAN VOLLENHOVEN GEB. JONKERS. Ger. 472,926, Feb. 10, 1926. Gas, coal dust and like fuels are burned in a cylindrical chamber into which they are led by tubes tangential to the chamber.

**Furnaces.** EUGEN ROOSCHÜZ. Ger. 474,684, May 18, 1927. Addn. to Ger. 473,747. A series of disks in the central canal arrest the smoke and enable it to be removed.

**Furnaces.** WILHELM SCHUSTER. Ger. 472,917, June 13, 1928. A shaft or roasting furnace has a pyrometer built into a recess in the walls.

**Furnaces.** ALLGEMEINE ELEKTRICITÄTS-GES. (Friedrich Reinhardt, inventor). Ger. 474,596, May 7, 1926. The fire chamber walls of a coal-dust furnace are water cooled.

**Furnaces.** LOUIS E. PINOCHE. Fr. 649,915, Aug. 1, 1927. A description is given of a continuous rotating furnace in which the material is passed through by means of a screw; it is indirectly heated.

**Furnaces.** HEINRICH KOPPERS A.-G. Fr. 649,471, Feb. 3, 1928. Construction of hearth for gas and coke furnaces.

**Furnaces.** M. H. DETRICK CO. Fr. 649,418, Jan. 18, 1928. Construction of suspended roof in independent sections.

**Furnace with observing window.** VASTINE ENGINEERING PRODUCTS CORP. Ger. 474,617, Aug. 8, 1926.

**Furnace with a series of fixed and a series of movable rods.** MANUEL E. IRIZAR. Ger. 472,773, Nov. 4, 1926.

**Furnace with cooling chambers in the walls.** STETTINER CHAMOTTE-FABRIK A.-G. VORM. DIDIER. Ger. 474,616, June 30, 1926.

**Annealing furnace.** OTTO BASSON. Ger. 474,940, Aug. 25, 1927. The doors are coupled so that on opening one, the other is automatically closed.

**Annealing furnace.** HIRSCH, KÖPFER-UND MASSENGWERKE A.-G. and MANUEL TAMA. Fr. 649,816, Feb. 25, 1928. Charging frame on wheels.

Annealing and hardening furnace. AKTIEN-GESELLSCHAFT BROWN, BOVERI & CIE. Swiss 130,010, Nov. 4, 1927.

Automatically acting annealing furnace. AKTIEN GESELLSCHAFT BROWN, BOVERI & CIE. Fr. 650,005, Nov. 7, 1927.

Revolving tube furnace. JOHN KEITH. Ger. 473,506, July 14, 1925. Details of construction.

Shaft furnace with a flat fire chamber. JOSEF KNOTHE. Ger. 472,695, Sept. 9, 1925. Details of arrangement.

Shaft furnace for powdered fuel. ERNST C. LOESCHE. Ger. 474,727, Oct. 20, 1926. Details of construction.

Refuse-destructer furnace. C. H. WECK COMM.-GES., MASCHINENBAU-ANSTALT HUMBOLDT and MUSAG GES. FÜR DEN BAU VON MÜLL- UND SCHLACKENVERWERTUNGS-ANLAGEN A.-G. Ger. 473,482, Sept. 23, 1925. A horizontal grate is arranged in advance of a mechanically moved inclined grate. The horizontal grate comprises longitudinal stepped parts moved independently of the inclined grate.

Radiation furnace. ELEKTRISCHE KOCH- UND HEIZAPPARATE H. & S. STEINBERGER. Ger. 474,092, Dec. 9, 1927.

"Soaking-pit" furnaces. FORREST W. MANKER (to Surface Combustion Co.). U. S. 1,711,273-4, April 30. Structural features.

Furnace for generator gas. GIULIO ALLIATA. Swiss 130,112, Dec. 1, 1927.

Furnace for burning, roasting and sintering operations. E. C. LOESCHE. Brit. 298,651, Oct. 14, 1927. The flame from a burner is directed onto a heap of material which is continuously maintained and renewed by an underfeed device.

Furnace burning finely powdered fuel. PEABODY ENGINEERING CORP. Fr. 649,809, Feb. 25, 1928. The fuel is caused to traverse a spiral path in the tube leading to the combustion chamber and enters the chamber in a relatively thin layer round the periphery of the end of the tube.

Burner for powdered coal. JAY G. COUTANT. Fr. 649,680, June 16, 1927.

Burner for powdered fuel. CARL HOLD. Ger. 473,340, May 22, 1924; 473,341, Oct. 11, 1924; 473,342, Oct. 14, 1924; 473,343, Nov. 23, 1924 and 473,344, Nov. 23, 1924. Addns. to 472,412. The burner described in Ger. 472,412 (C. A. 23, 2329) is modified in that (1) a no. of supplementary, individually regulable, air-addn. nozzles is provided in the upper part (473,340); (2) the bottom of the combustion chamber is closed by a rotating perforated hollow drum (473,341); (3) an internally cooled breast piece extends into the combustion chamber (473,342); (4) plates corresponding in shape to the combustion chamber are arranged between the chamber and the surrounding masonry (473,343); (5) the lower part of the combustion chamber wall is made hollow and cooled with air or water (473,344).

Burner for oil and powdered fuel. SOC. FRANÇAISE DES CONSTRUCTIONS BABCOCK ET WILCOX. Fr. 649,509, Feb. 14, 1928.

Burners for liquid or gaseous fuel. PAUL LINKE. Fr. 648,839, June 29, 1927.

Oil furnace with an electrically operated burner. WILLIAMS OIL-O-MATIC HEATING CORP. Ger. 473,748, Dec. 8, 1926.

Oil burner. AKTIEN GESELLSCHAFT PRIOR PATENTVERWERTUNGS-GES. Ger. 473,481, July 5, 1927. Air is admitted to a cup-shaped oil burner through 2 superposed series of holes in the side wall, each hole in the upper series being horizontal and each in the lower series inclined so that its axis meets the bottom of the burner.

Oil burner. WILLIAMS OIL-O-MATIC HEATING CORP. Ger. 473,233, Aug. 21, 1926. See Brit. 268,209.

Gas-supply control for oil burners. WALTER W. WILLIAMS (to Williams Oil-O-Matic Heating Corp.). U. S. 1,711,436, April 30. An app. is described suitable for controlling gas supply for ignition of the oil.

Gas furnaces. STEIN- UND THON-IND.-GES. "BROHLTHAL" A.-G. Ger. 474,816, June 6, 1926. Burners for industrial gas furnaces are formed with gas nozzles at an angle to the axis of the burner, and surrounding the air nozzle.

Gas burner. WM. A. BECKETT. U. S. 1,710,964, April 30.

Gas burner. THEODORE A. SALA. U. S. 1,710,841, April 30.

Gas burner. REONIER EICKWORTH. U. S. 1,710,726, April 30.

Gas burner. FREDERICK H. WILCOX (to Fryn Engineering Co.). U. S. 1,711,256, April 30. A burner is described suitable for blast-furnace stoves or gas-fired boilers.

Compressed gas burner. SELAS A.-G. Ger. 474,788, Dec. 16, 1925. Addn. to Ger. 419,471.

Spray burner. ERIC S. DREW and ALEXANDER B. S. LAIDLAW. Ger. 473,232, Aug. 14, 1926. See Brit. 260,668.

**Spray burner for liquid hydrocarbons.** FIRMA J. AICHELIN and CARL HUMMEL. Ger. 474,685, May 24, 1927.

**Furnace-efficiency indicator.** CARL M. GRISAR. Ger. 473,241, July 21, 1926. A scale is described on which the CO and CO<sub>2</sub> contents of the waste gases and the excess of O or air are mech. indicated in accordance with analyses of the gases.

**Furnace-efficiency indicator.** GUSTAV ROTH. Ger. 474,348, Nov. 1, 1925. An indicator moves over a table in accordance with impulses received from 2 independent measuring instruments, *e. g.*, from meters for the fuel supply and the CO<sub>2</sub> content of the flue gases, or, more simply, from meters for the draft and the resulting temp. The app. described includes elec. recording means.

**Method of regulating furnaces by means of pressure.** SMOOT ENGINEERING CORP. Fr. 649,304, Dec. 16, 1927.

**Device for regulating the cooling of furnace parts.** ERICH ROUCKA. Ger. 473,531, Apr. 29, 1926.

**Apparatus for controlling combustion in furnaces.** WM. M. HEPBURN (to Surface Combustion Co.). U. S. 1,710,772, April 30. The presence of unconsumed air in the furnace flue gas serves to actuate a control device restricting the air supply to the furnace, and the presence of unconsumed fuel in the flue gas serves to increase the air supply. Various details of the app. are described.

**Apparatus for damping the fuel in a charging funnel of a furnace.** ERICH ROUCKA. Ger. 473,529, Sept. 4, 1926 and Ger. 473,530, Sept. 3, 1926.

**Mechanical stoker.** C. H. WECK COMM.-GES. Ger. 473,484, Dec. 16, 1926.

**Loading device for furnaces.** EDGAR E. BROSIUS. Ger. 472,921, Feb. 12, 1926.

**Loading device for annular kilns.** THOMAS STÖLZLE. Ger. 473,507, Mar. 18, 1927. Details of construction.

**Discharging means for tubular driers for brown coal, etc.** JOSEF KÜPPER. Ger. 474,070, Mar. 17, 1928.

**Stirrer for step grates.** THEODOR LANG. Ger. 474,446, Feb. 9, 1928.

**Construction of furnace walls.** ERNST JÜRGES. Ger. 474,420, Sept. 27, 1925.

**Water-tube boiler.** CHRISTOPH HERMANN & SOHN and JOSEPH JÜNGER. Ger. 472,745, Mar. 16, 1927. The lower series of tubes are coated with fireproof material.

**Heat-exchange apparatus.** T. R. CAVE-BROWNE-CAVE. Brit. 299,085, July 21, 1927. A construction is described suitable for heating of a boiler or the like by waste gases from an internal-combustion engine.

**Heat regenerators.** HEINRICH SCHMIDT. Ger. 474,142, Apr. 24, 1927. Regenerators are packed with fillers sufficiently light to be fed in by compressed air and removed, when required, by suction.

**Regenerative chamber kiln.** C. OTTO & CO., G. M. B. H. Ger. 472,678, Mar. 15, 1927. Addn. to 466,752 (C. A. 23, 1535).

**Reaction chambers.** SOC. GÉNÉRALE METALLURGIQUE DE HOBOKEN. Fr. 649,664, Feb. 24, 1927. Filling material for reaction towers, etc., consists of bricks or the like having a cross section between the top and bottom surfaces less than these surfaces, the sides being provided with grooves.

**Apparatus for effecting catalytic reactions.** ASSOC. PARISIENNE POUR L'IND. CHIM. (Edouard Desparmet, inventor). Fr. 650,099, Aug. 8, 1927. An app. is described for constantly renewing the surface of contact of the catalyst; it consists of paddles rotating on a central axis in a cylinder.

**Hydraulic closing device for a vertical distilling retort.** JULIEN PIETERS. Ger. 474,877, Mar. 23, 1928. Details of arrangement.

**Apparatus for reflux distillation, evaporation, or rectification.** I. G. FARBERIND. A.-G. Brit. 299,084, July 20, 1927. Structural features.

**Apparatus for spray-dsecication of liquids.** D. M. A. G. HAWES. Brit. 298,524, July 8, 1927. Structural features.

**Apparatus for making solid carbon dioxide.** DRYICE CORP. OF AMERICA. Fr. 649,483, Feb. 7, 1928.

**Apparatus for producing solid carbon dioxide.** JEAN H. J. VIEILLARD. Fr. 649,395, Oct. 27, 1927 and Fr. 649,396, Oct. 28, 1927.

**Valve for regulating the removal of oxygen from liquid-air apparatus.** FRANKFÜRTER MASCHINENBAU A.-G. VORM POKORNY & WHITTEKIND and VIKTOR FISCHER. Ger. 473,864, Sept. 12, 1925.

**App. for the rectification of liquid air and other liquefied gases.** E. BARDET & FILS & CIE. Ger. 472,950, Feb. 11, 1921.

**Cooling apparatus.** SIEMENS-SCHUCKERTWERKE A.-G. (Edmund Altenkirch,



inventor). Ger. 473,729, April 21, 1923. A natural cooling app. is described having a number of small interconnected evap. chambers.

Cooling flask for the preparation of lampblack. HERM. F. WELLHAUSER. Ger. 474,568, Oct. 23, 1927. The flask has thick conical interfitting plates mounted on parallel axes, for splitting up the flame.

Pressure regulator in a closed circuit crystallization plant. METALLBANK UND METALLURGISCHE GESELLSCHAFT A.-G. Fr. 650,067, Feb. 16, 1928.

Air and furnace gas circulating system for drying chambers. N. G. MOREIRA (to B. Penteado & Co.). Brit. 298,916, Oct. 14, 1927.

Apparatus for drying macaroni or other materials. JOSEPH TRIULZI (to Braly Mfg. Co.). U. S. 1,711,188, April 30. Structural features of a rotatable drum app.

Kiln for drying lumber or other materials. HENRY H. PAYZANT. U. S. 1,711,100, April 30. Structural features.

Device with a manometer and electrical connections for controlling vacua. GENERAL ELECTRIC CO., LTD., and E. WEINTRAUB. Brit. 298,875, Jan. 5, 1928.

Automatic neutralizing machine for fuller's earth. OSKAR BURGHARDT. Ger. 472,958, March 3, 1928. The fuller's earth and lime are ground up and mixed in a milling machine.

Apparatus for mixing foundry sand, clay, or other materials. A. B. SMITH and C. R. SMITH. Brit. 298,929, July 16, 1927.

Centrifugal apparatus for treating metal articles coated by immersion. HANS HOFER (to Verzinkerei Zug A.-G.). U. S. 1,711,389, April 30. An app. is described suitable for removing surplus coating metal.

Thermostatic signal device. CARL F. WENTZEL. U. S. 1,711,335, April 30. Structural features of an elec. signal system.

Thermostatic electric switch. ALLGEMEINE ELEKTRICITÄTS-GES. (to International General Electric Co.). Brit. 298,897, Oct. 15, 1927. Structural features.

Thermostatic plug for electric appliances. GEORGE W. UFFORD and HARALD E. ALLEN (to Safegard Electric Appliance Co.). U. S. 1,710,955, April 30. Structural features.

Thermostatic valve suitable for use with heating radiators. FRANK L. HUTCHINSON. U. S. 1,710,875, April 30.

Thermostatic device for control of gas supply to gas jets. JOHN A. SPENCER (to Spencer Thermostat Co.). U. S. 1,711,400, April 30.

Thermostatic pilot cut-off for gas burners. ROBERT F. BOGER (to Spencer Thermostat Co.). U. S. 1,711,443, April 30. Structural features.

Thermostatic pilot cut-off for gas burners. JOHN A. SPENCER (to Spencer Thermostat Co.). U. S. 1,711,430, April 30. Structural features.

Thermostatic control and pilot cut-off for gas burners such as those of water heaters. RUFUS H. MAURER (to Spencer Thermostat Co.). U. S. 1,711,420-1, April 30. Structural features.

Thermostatic control for fuel such as gas supplied to the burner of refrigerating or other apparatus. ROBERT F. BOGER (to Spencer Thermostat Co.). U. S. 1,711,403, April 30. Structural features.

## 2—GENERAL AND PHYSICAL CHEMISTRY

FREDERICK L. BROWNE

Christian Friedrich Schönbein. II. Experimental labors. RALPH E. OESPER. *J. Chem. Education* 6, 677-85(1929); cf. *C. A.* 23, 2079. E. H.

Ernst Twitchell. M. B. GRAFF. *Ind. Eng. Chem.* 21, 607-8(1929).—A brief biography, with portrait. E. J. C.

The Heidelberg chemical laboratory for university instruction in the last hundred years. AUGUST BERNTHSEN. *Z. angew. Chem.* 42, 382-4(1929). E. H.

An investigation of types of classrooms for chemistry and other sciences in small high schools. J. H. JENSEN AND EARL R. GLENN. *J. Chem. Education* 6, 634-64(1929). E. H.

Of what value is the high-school course in chemistry to those students continuing the subject in college? MURRAY A. HINES. *J. Chem. Education* 6, 697-707(1929). E. H.

Some relations of agricultural chemical research to national prosperity. C. A. BROWNE. *J. Chem. Education* 6, 665-76(1929). E. H.

Evolution and dynamics in science and industry. V. NJEGOVAN. *Arh. hem. farm.* 3, 45-53(1929).—Presidential address given before the Yugoslav Chem. Society.

JAROSLAV KUČERA

William Higgins, a pioneer of the atomic theory. J. REILLY AND D. T. MAC-SWENEY. *Sci. Proc. Roy. Dublin Soc.* 19, 139-57(1929).—Historical. E. H.

Nomography. Nomogram for English and metric measures. OTTO LIESCHKE. *Chem. Fabrik* 1929, 124-5; cf. *C. A.* 23, 1536.—Parallel scales are shown with a guide line between them upon which are indicated points through which lines may be drawn to find such eqivs. as sq. ft.—sq. cm., barrels—cu. m., miles—km., etc.

W. C. EBAUGH

New regularities among the ionic radii of the elements. A. M. BERKENHEIM. *Z. physik. Chem., Abt. A*, 141, 35-40(1929); cf. *C. A.* 22, 4338.—By comparing the ionic dimensions (detd. by Goldschmidt) of those elements occurring in the same series of the periodic table, B. ascertained certain regularities which are virtually a quant. extension of Mendelyev's periodic law. The ionic radii of elements (pos. as well as neg. ions) occurring in the same horizontal period appear as an arithmetical series with a const. difference between the values for the different elements. This const. difference has a different value for each series. E. g.: to the ions  $C^{4+}$ ,  $B^{3+}$ ,  $Be^{2+}$ ,  $Li^{+}$  corresponds the series 1, 2, 3, 4; to Ne and the ions  $F^{-}$ ,  $O^{2-}$ , the series 10,  $9\frac{1}{2}$ ,  $8\frac{1}{2}$ , etc.; also to the ions  $C^{4+}$ ,  $Si^{4+}$ ,  $Ti^{4+}$ ,  $Zr^{4+}$ ,  $Ce^{4+}$ , the series 1,  $2\frac{1}{2}$ , 4,  $5\frac{1}{2}$ ,  $6\frac{1}{2}$ . B. plans to use these relationships to calc. undetd. ionic radii and from these values, the energy of electrostatic attraction in binary compds.

W. C. FERNELIUS

Researches on the melting curves of helium. I. FRANZ SIMON, MARTIN RUHEMANN AND W. A. M. EDWARDS. *Z. physik. Chem., Abt. B*, 2, 340-4(1929).—The  $p$ - $t$  diagram for solid He-liquid He was detd. from  $T = 12.15$  to  $20.20^{\circ}$  K., for which  $p$  varies from 827 to 1826 kg./sq. cm. The m. p. was very definite. The equation  $\log_{10} p$  (in kg./sq. cm.) =  $1.5537 \log_{10} T + 1.233$  satisfies the exptl. values to within 0.3%. Extrapolation to lower temps. gives values differing from those of Keesom by 10% (*C. A.* 21, 1386). (This may be due to the 2 phases of liquid He observed by Keesom.) The equation  $\log_{10} (p + 17) = 1.5544 \log_{10} T + 1.236$  agrees within 1% with both the present work and Keesom's data. Heats of fusion/cc. are 3.7 at  $16^{\circ}$  K.; 4.2 at  $17^{\circ}$  K.; 4.2 at  $18.6^{\circ}$  K. Further work is now in progress. W. E. V.

The specific heat of molybdenum from  $250^{\circ}$  to  $-40^{\circ}$ . D. COOPER AND G. O. LANGSTROTH. Dalhousie Univ., Halifax. *Phys. Rev.* 33, 243-8(1929).—By the use of a long covered tube in the calorimeter proper of an ordinary Richards adiabatic calorimeter, values for the heat capacities of metals from high temps. may be obtained, even when the falling body is not protected from radiation losses by a metal jacket. The exptl. procedure for such a detn. is given. A calorimeter arrangement in which the metal was first partially cooled in the calorimeter and then allowed to come into contact with the water of the calorimeter proved unsuitable as is shown. The sp. ht. of Mo between the temps. of  $-30^{\circ}$  and  $300^{\circ}$  are given by the following equation with an accuracy of about 1%:  $C_p = 0.0593 + 0.000013 (T + 40) - 0.0265/(T + 40)^{1.66}$ . Stern's (*C. A.* 23, 326) equation, which is linear, agrees with the values given between  $50^{\circ}$  and  $300^{\circ}$ . Below  $50^{\circ}$  the curve shows a decided bend. BERNARD LEWIS

Thermal conductivity of lead and of single- and poly-crystal zinc. C. C. BIDWELL AND E. J. LEWIS. Lehigh Univ. and Cornell Univ. *Phys. Rev.* 33, 249-51(1929).—The thermal conductivities of Pb and of single- and poly-crystal Zn over the temp. range  $-250^{\circ}$  to  $100^{\circ}$  detd. by a method previously described by Bidwell (*C. A.* 21, 355) are reported upon. The thermal cond. increases for these metals as the temp. is lowered but shows no extraordinary increase at extremely low temps. as was found for Li. The single-crystal Zn shows about 18% better thermal cond. than the poly-crystal sample. A Zn sample cast in open air showed about 7% poorer cond. than a sample prepd. *in vacuo*. The data are in agreement with the law  $k/aC = K/T + K'$ . B. L.

Electrode potential of nickel. III. Mechanism of the re-activation of the passive state of nickel. KWANJI MURATA. *Tech. Repts. Tohoku Imp. Univ.* 8, 209-20(1929).—See *C. A.* 23, 1558. E. C. M.

The change of electrical conductivity in strong magnetic fields. I. Experimental results. P. KAPITZA. *Proc. Roy. Soc. (London)* A123, 292-341(1929).—The change of resistance in a transverse magnetic field up to 300,000 gaussas at room temp., at the temp. of solid  $CO_2$  and ether and at the temp. of liquid N was measured in metals of each of the groups of the periodic table which include: Li, Na, Cu, Ag, Au, Be, Mg, Zn, Cd, Hg, Al, Ga, In, Tl, C, Ti, Ge, Zr, Sn, Pb, Th, V, As, Sb, Bi, Ta, Cr, Mo, Te, W, Mn, Fe, Ni, Pd and Pt, in a Au-Ag alloy and in CuAs. The app. was similar to that used in earlier expts. (cf. *C. A.* 22, 3342), with a specially wound transformer added to the

circuit when the resistance of the conductor was too small to obtain larger deflections in the oscillograph with the same current. The change of resistance in a parallel field was measured for Cu, Cd, Al, Ga and Mo. The increase of resistance,  $\Delta R/R$ , in all the metals is proportional to the square of the magnetic field in fields up to 60,000 to 100,000 gauss, and in stronger fields follows a linear law,  $\Delta R/R$  being proportional to  $H$ . The sources, analyses, and details of prepn. of the sep. metals for measurement are given. Phys. change produced in a conductor by hardening and annealing and by transformation to polymorphic modifications influences the change of resistance as well as other properties. Impurities tend to reduce the change of resistance. II. The analysis and the interpretation of the experimental results. *Ibid* 342-72.—The change of resistance follows the linear law with increasing magnetic field and is masked in weaker fields by initial disturbances in the metal distributed at random throughout the conductor. When the disturbance produced by the outside field grows larger than that of the inside field, there is a gradual approach to a linear law. Corresponding to the external and internal disturbances are the ideal and addnl. resistances, resp. Formulas are deduced, agreeing with the exptl. facts, which permit an evaluation of these sep. resistances and it is shown that while the addnl. resistance is independent of temp. the ideal resistance has a const. value for a given temp. for each metal. The addnl. resistance is equal to the residual resistance which is observed close to abs. zero. A periodicity appears in the variation of the coeff. of the linear law with the position of the metal in the periodic system. The observed phenomena are not adequately explained by the existing theories for change of resistance such as deflection of the paths of free electrons, alteration of the no. of free electrons, irregularity in the crystal lattice, and disturbance of crystal lattice due to foreign atoms. K. favors the hypothesis that the magnetic field increases the scattering power of each atom by disturbing the symmetry of its structure which decreases the free path of an electron and thus increases the resistance.

H. W. WALKER

**Magnetic susceptibility of certain praseodymium sulfate solutions.** ORAZIO SPECCHIA. *Nuovo cimento* [N. S.] 5, 432-40(1928); cf. C. A. 22, 3823.—S. describes an interference method for the measurement of magnetic susceptibility. Two vessels connected by a tube contain the soln. under examn. which rises to a common height in each. One vessel is placed between the poles of an electromagnet. When a magnetic field is induced there is a movement of the liquid from one vessel to the other. The resulting change in the liquid level is measured by interference methods. In this the magnetic susceptibility of various solns. of  $\text{Pr}_2(\text{SO}_4)_3$  was measured and the no. of Bohr magnetons of  $\text{Pr}^{+++}$  found by calcn. from the results to be 3.56.

L. T. FAIRHALL

**Rotatory magnetic power in an anisotropic medium.** R. DE MALLEMANN. *Compt. rend.* 188, 863-5(1929); cf. C. A. 20, 1556; 21, 2419, 3014.—A theoretical discussion. The anisotropic rotatory magnetic power results from the anisotropy of refraction of the electrons, atoms, or mols. The relations of the 3 principal rotations are functions of the intermol. birefringence.

H. W. WALKER

**The electric dipole moment of pentaerythritol by means of the molecular ray method.** J. ESTERMANN. *Univ. Hamburg. Z. physik. Chem., Abt. B*, 2, 287-8 (1929); cf. C. A. 23, 2081.—Because of the insufficient soly. of pentaerythritol in dipole-free solvents, it could not be investigated by the usual method. However, by comparison of the deflections in a non-homogeneous elec. field of mol. beams of both the pentaerythritol and benzophenone, the dipole moment of the former has been found to be in the neighborhood of  $2 \times 10^{-18}$  c. g. s. units.

WILLIAM E. VAUGHAN

**The electromotive force of the reversible cell in a non-aqueous solution.** TAKEKO YOSHIDA. *Science Repts. Tôhoku Imp. Univ.*, 1st. ser. 17, No. 7, 1279, 87(1928).—See C. A. 22, 1893.

E. C. M.

**The structure of crystals.** J. M. BIRVOGT. *Chem. Weekblad* 26, 158-63(1929).—A lecture.

B. J. C. VAN DER HOEVEN

**Crystallization at the surface of fused masses.** A. SHUBNIKOV AND G. LÄMMLIN. *Z. Krist.* 67, 329-38(1928).—When seed crystals are introduced at a point on the surface of supercooled fused phenyl salicylate they spread rapidly with increasing velocity and at the same time develop into spherulites. An explanation is given.

L. S. RAMSELL

**Recrystallization of single crystals of aluminum.** W. G. BURGERS AND J. C. M. BASART. *Z. Physik* 54, 74-91(1929); cf. C. A. 23, 806.—Small Al single crystals are deformed by rolling. The crystal structure so produced is studied by Debye-Scherrer pictures. The relative position of the single crystal and the application of the deforming force det. the resulting structure after rolling. Heating for a few seconds (600°) produced a definite crystal system with a preferred orientation.

G. G.

**An experimental study of the growth of zinc crystals by the Czochralski-Gomperz method.** A. G. HOYEM AND E. P. T. TYNDALL. Univ. of Iowa. *Phys. Rev.* **33**, 81-9(1929).—The conditions necessary to grow Zn single crystals of 2.7 mm. diam. and of any desired orientation are detd. experimentally. When a const. rate of growth is used and the crystal is initially given the desired orientation by starting it on a suitable nucleus the detg. factor for the successful growth of a single-crystal rod 10 cm. or more in length is found to be the temp. gradient existing in the column of liquid Zn just below the growing crystal. The appropriate temp. gradient is a function of the orientation of the crystal. It is depicted graphically in a figure which shows the upper and lower limiting curves for the region of successful growth when the rate of growth is 1.2 cm./min. Attempts to grow crystals outside of the appropriate region result in sudden or gradual changes to new orientation. In the latter the orientation shifts gradually through a considerable range. Illustrations are given of such changes.

BERNARD LEWIS

**The crystal form of magnesium tungstate.** F. MACHATSCHKI. *Z. Krist.* **67**, 163-5(1928).— $\text{MgWO}_4$  is isomorphous with Mn and Fe tungstates. Crystals with a prismatic development several mm. long and 0.5 mm. wide were measured with the following results: monoclinic prismatic,  $a:b:c = 0.8263:1:0.8703$ ,  $\beta = 89^\circ 40'$ . The most common forms were 100, 010, 110, 011, 121 and  $\bar{1}21$ . L. S. RAMSDELL

**Crystalline structure of some phosphides of bivalent and of tervalent metals.** L. PASSERINI. Reale Politecnico, Milano. *Gazz. chim. ital.* **58**, 655-64(1928).—The present work is part of a systematic series of expts. dealing with (1) the variations in the cryst. structure of compds. of the  $A_2B_3$  type when A or B is replaced by another element with a different atomic diam., and (2) the relations between the structure of  $A_2B_3$  compds. and the diams. of the substituent atoms. The present paper is also of importance because of the data obtained on the diameter of the neutral P atom. The phosphides examd. by x-rays included  $\text{Zn}_3\text{P}_2$ ,  $\text{Cd}_3\text{P}_2$ ,  $\text{Mg}_3\text{P}_2$  and  $\text{AlP}$ .  $\text{Zn}_3\text{As}_2$ ,  $\text{Cd}_3\text{P}_2$  and  $\text{Mg}_3\text{P}_2$  crystallize in the cubic system, with a non-ionic structure of the  $\text{Zn}_3\text{As}_2$  type, the coordinates being: metal:  $(\frac{1}{2}, \frac{1}{2}, 0)$ ;  $(\frac{1}{2}, 0, \frac{1}{2})$ ;  $(0, \frac{1}{2}, \frac{1}{2})$ ;  $(\frac{1}{2}, 0, 0)$ ;  $(0, \frac{1}{2}, 0)$ ;  $(0, 0, \frac{1}{2})$ . P:  $(\frac{1}{4}, \frac{1}{4}, \frac{1}{4})$ ;  $(\frac{3}{4}, \frac{1}{4}, \frac{3}{4})$ ;  $(\frac{1}{4}, \frac{3}{4}, \frac{3}{4})$ ;  $(\frac{3}{4}, \frac{3}{4}, \frac{1}{4})$ . The elementary cells contain 2 mols. For  $\text{Zn}_3\text{P}_2$ ,  $a = 5.68$  A. U., the calcd. d. is 4.678, the distance between the Zn and P atoms is 2.46 A. U., and on the assumption that the radius of a Zn atom is 1.33 A. U., the radius of the neutral P atom is 1.13 A. U. For  $\text{Cd}_3\text{P}_2$ ,  $a = 6.06$  A. U., the calcd. d. is 5.956, the distance between the Cd and P atoms is 2.46 A. U., and on the assumption that the radius of a Cd atom is 1.49 A. U., the radius of the neutral P atom is again 1.13 A. U. For  $\text{Mg}_3\text{P}_2$ ,  $a = 5.92$  A. U., the calcd. d. is 2.162, the distance between the Mg and P atoms is 2.56 A. U., and if the radius of a Mg atom is 1.62 A. U., the radius of a neutral P atom is 0.94 A. U.  $\text{AlP}$  belongs to the cubic system, with a structure of the blende type. Its  $a$  value is 5.42 A. U.; the calcd. d. is 2.424; the distance between an Al and a P atom is 2.34 A. U., and if the radius of an Al atom is 1.43 A. U., the radius of a neutral P atom is 0.91 A. U. C. C. DAVIS

**X-ray analyses of cadmium arsenide and of arsenious anhydride.** L. PASSERINI. Reale Politecnico, Milano. *Gazz. chim. ital.* **58**, 775-81(1928); cf. preceding abstr.—The expts. are a continuation of a study to det. the structural changes in  $A_2B_3$  compds. brought about by substitution of A or B by elements of different at. diams. and the relations between the dimensions of the substituent atoms and the cryst. structure. X-ray examn. of  $\text{As}_2\text{O}_3$ , already studied by Bozorth (C. A. **17**, 3434) in a different way, gave the opportunity to det. the sensitivity of the powder method for a structure with elementary cells of very large dimensions, to confirm the size of the cells of the metallic arsenides, and to det. precisely the lattice dimensions of  $\text{As}_2\text{O}_3$ .  $\text{Cd}_3\text{As}_2$  crystallizes in the cubic system, with a non-ionic structure of the  $\text{Zn}_3\text{As}_2$  type, defined by the coordinates: Cd:  $(\frac{1}{2}, \frac{1}{2}, 0)$ ;  $(\frac{1}{2}, 0, \frac{1}{2})$ ;  $(0, \frac{1}{2}, \frac{1}{2})$ ;  $(\frac{1}{2}, 0, 0)$ ;  $(0, \frac{1}{2}, 0)$ ;  $(0, 0, \frac{1}{2})$ . As:  $(\frac{1}{4}, \frac{1}{4}, \frac{1}{4})$ ;  $(\frac{3}{4}, \frac{1}{4}, \frac{3}{4})$ ;  $(\frac{1}{4}, \frac{3}{4}, \frac{3}{4})$ ;  $(\frac{3}{4}, \frac{3}{4}, \frac{1}{4})$ . The dimension of the elementary cell  $a$  is 6.29 A. U. The cell contains 2 mols. and the calcd. d. is 6.495. The distance As-Cd is 2.723 A. U. With the powder method, the structure of the cubic modification of  $\text{As}_2\text{O}_3$  was found to be the same as that found by the Laue method and by the rotating-crystal method of Bozorth. The dimension of the elementary cell is 11.08 A. U. The cell contains 16 mols. of  $\text{As}_2\text{O}_3$ , and the calcd. d. is 3.851. The distance As-O is 2.016 A. U. Based on these data and a radius of 1.32 A. U. for the O ion, calcns. show that the radius of the  $\text{As}^{+++}$  ion is 0.666 A. U.

C. C. DAVIS

**Importance of crystal-structure imperfections in understanding the technical properties of industrial materials that are alterable.** ADOLF SWEHAL. *Metallwirtschaft* **7**, 776-82(1928).—The elastic and thermal properties and a series of optical

regularities of materials are the result of the lattice arrangement of the atoms in crystals. The modulus of elasticity, sp. heat and energy of chem. cohesion can be detd. simply from the properties of the lattice. In no case as yet is it possible to interpret those technical properties that can be altered by the use of the lattice theory. The ideal crystal possesses technical properties that cannot be influenced in any way. Deviations from the ideal lattice structure can be concerned with only a proportionally small fraction of the crystal atoms. Such deviations are detected by optical and elec. cond. methods. There are 2 kinds of crystal structure formations for every crystal: first, the lattice atom formation, and second, a far less frequent kind which is identical with the first only from a chem. viewpoint. The latter atoms show a much greater energy content than the lattice atoms because of the looseness with which they are bound to the lattice structure. These atoms are called loose atoms and their orbits "loose positions" or voids of the crystal. In such an orbit the ideal regularity of the space lattice structure is distorted. Every real crystal must be built of lattice and loose atoms. The rupture strength of an imperfect real crystal is 100 to 1000 times smaller than for an ideal crystal, since it lacks homogeneity due to voids. The strain distribution in the immediate region of the voids is not uniform; the notch effect of the voids results in high local strains. Premature rupture of the real crystal is conditioned by the voids. When a real crystal is plastically deformed the no. of loose atoms in the deformed portion of the crystal is increased about tenfold. Loose atoms which are most weakly bound wander into regions of greater bonding strength, where they become part of the lattice structure when the temp. is raised during the recryst. process. Minute addns. of foreign matter favor crystal imperfections by increasing the no. of voids. 0.001 to 0.01 atom % of the foreign atoms is distinctly effective in the wedging action to prevent slip within the crystal. C. H. LORIG

The change in lattice spacing at a crystal boundary. J. E. LENNARD-JONES and BERYL M. DENT. Univ. Bristol. *Proc. Roy. Soc. (London)* A121, 247-59(1928); cf. C. A. 22, 1258.—Davisson and Germer (cf. C. A. 22, 350) have found it necessary to postulate a contraction of as much as 30% at the surface of a crystal in order to interpret the results of their expts. on the reflection of electrons from crystals. In view of this the authors have calcd. by an independent method the contraction at the boundary of several crystals of the NaCl type. The upper limit of contraction was found to be of the order of 5%. The results of D. and G. are more satisfactorily explained by supposing that the electrons are refracted in the crystal in an optical sense with an index of refraction greater than unity. A. J. KING

Test of crystals for piezoelectricity. S. B. ELINGS AND P. TERPSTRA. *Z. Krist.* 67, 279-84(1928).—The piezoelec. effect should be observed only in those symmetry classes lacking a center of symmetry. Crystals from 16 different classes were tested. Neg. results were obtained with diamond, zincite, benitoite, wulfenite, carborundum, S and  $K_2Cr_2O_7$ . Pos. results were obtained from sphalerite, boracite, K and Na bromate,  $KLiSO_4$ , nephelite, cinnabar,  $Hg(CN)_2$ ,  $KH_2PO_4$ ,  $KH_2AsO_4$ ,  $NH_4H_2AsO_4$ , strychnine and strychnine sulfate, willemite, melinophane, hexamethylenetetramine, Na santonate, benzophenone, cinchonidine, glutamic acid, hippuric acid,  $NaSO_4 \cdot 7H_2O$ , Sr, Ba and Pb formates, iodic acid, tartar and tartar emetic, lactose,  $\alpha$ -rhamnose, glucosamine-HCl, scolecite, hematoxylin trihydrate,  $SrH_2(C_4H_4O_6)_3 \cdot 4H_2O$ . L. S. RAMSDELL

The behavior of insulating ionic crystals in electric fields. ADOLF SNEKAL. *Ans. Akad. Wiss. Wien* 64, 115-7(1927).—When an elec. field is applied to insulating ionic crystals (alkali halides, etc.), electrostatic expansion of the crystal lattice takes place, also electrolytic or electronic conduction. This latter is connected with the loosening of the space lattices. Both phenomena increase with increasing fields. S. contends that the elec. field causes a plastic deformation of the space lattice, producing more "loosening" of the ions in the space lattice (analogous to mechanical plastic deformation), which would lead to the known fact that the cond. of ionic crystals increases exponentially with the elec. field applied. I. J. PATTON

A method of increasing the accuracy of Debye-Scherrer photographs. A. E. VAN ARKEL. *Z. Krist.* 67, 235-8(1928).—The film is so placed that the higher-order lines are recorded near the middle of the film, and all measurements are made from these lines. By this method the following values were obtained: the side of the unit cube for C = 3.606, Ag = 4.077, Au = 4.070, Pt = 3.914, Rh = 3.794 and Si = 5.418. In a series of W-Mo alloys the values were W-100%, 3.1583; W-82.4%, 3.1551; W-73.2%, 3.1540; W-33.5%, 3.1460; W-0%, 3.1401. L. S. RAMSDELL

The determination of the thermal coefficient of expansion of crystallized salts. WILHELM KLEMM. *Z. Elektrochem.* 34, 523-8(1928); cf. C. A. 23, 746.—Preliminary

values for the expansion coeff. of 32 salts are given. These values are compared with those calcd. from the lattice theory. The deviation from expt. depends on coordination no. The product of the expansion coeff. and melting temp. is const. for salts of the same valence type. The ratio of the coeffs. of the crystal and its melt is const., for salts 0.39 and for metals 0.7.

F. R. BICHOWSKY

Physical purity and x-ray spectrograms. N. H. KOLKMEIJER. *Proc. Acad. Sci. Amsterdam* 31, 1028-9; *Verslag Akad. Wetenschappen Amsterdam* 37, 745-6; *Z. physik. Chem.*, Abt. A, 138, 311-12(1928); cf. *C. A.* 22, 1066.—Polemical in reply to Levi (*C. A.* 23, 745).

A. J. KING

Alums of organic bases. I. Alums of methylamine. A. QUILICO. Reale Politecnico, Milano. *Gazz. chim. ital.* 58, 682-90(1928).—The alums are peculiar in their isomorphic properties in that the isomorphism is retained even with the introduction of very heavy groups, e. g.,  $\text{NH}_4$  alum and tribenzylammonium alum are isomorphous. It was therefore thought that x-ray examn. of alums of org. bases would be especially fruitful in studying the effects of substitution. In the present work, the structures of  $\text{NH}_4$  alum and of  $\text{MeNH}_2$  alum were compared by the x-ray powder method and by the method of Laue. These alums have similar cryst. structures, with dimensions of the elementary cells of  $a = 12.16 \pm 0.02$  A. U. and  $12.44 \pm 0.02$  A. U., resp. The increase in the dimension of the cell on introducing the Me group makes doubtful the existence of some of the alums of org. bases described in the older literature.  $\text{MeNH}_2$  alum has accordingly a larger cell than that of any alum so far examd. by x-rays. The elementary cells of  $\text{NH}_4$  alum and of  $\text{MeNH}_2$  alum contain 4 mols. of  $\text{M}^+\text{M}^{++}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$ , from which the calcd. densities are 1.674 and 1.614, resp. Based on the increase of 0.28 A. U. in the dimension of the elementary cell by the substitution of Me for H, calcns. show a mol.-vol. of 18.67 cc. for the Me group, a value which agrees well with the data of Klemm and Klemm (cf. *C. A.* 21, 2824) on the mol. vols. of methyluric acids.

C. C. DAVIS

A quantitative study of the reflection of x-rays by sylvine. R. W. JAMES AND G. W. BRINDLEY. Manchester Univ. *Proc. Roy. Soc. (London)* A121, 155-71(1928); cf. *C. A.* 22, 2692.—The variation of the intensity of reflection of x-rays from KCl has been shown to be in quant. agreement with the Debye-Waller law from the temp. of liquid air to about  $400^\circ$  abs. At higher temp., the decrease of intensity with increasing temp. is much more rapid than the law indicates. The value of the temp. factor based on observations at room temp. and at liquid-air temp. agrees very well with that calcd. by Waller from the elastic consts. of the crystal, and also with the value calcd. from the Debye-Waller law using the characteristic temp. The abs. values of the intensity of reflection are in good agreement with those calcd. from the Schrödinger density distribution for  $\text{K}^+$  and  $\text{Cl}^-$  obtained by Hartree's method, if each element of the distribution is assumed to scatter classically, and if, in correcting for temp., the existence of zero-point energy is assumed.

A. J. KING

How does carbon dioxide behave under pressure? NORMAN W. KRASE AND J. B. GOODMAN. Univ. of Ill. *Chem. Met. Eng.* 36, 162-3(1929); cf. *C. A.* 22, 4284.—The use of compressed  $\text{CO}_2$  as an acid offers interesting possibilities. At moderate pressures and temps. it is possible to produce approx. 10%  $\text{AcOH}$  by displacement from a salt. There are possibilities for the use of carbonic acid in the prepn. of pure glucose, as well as other reactions involving H ions.

J. H. PERRY

The specific heat of gases and vapors. A critical review of methods and results. A. LEDUC. Univ. of Paris. *Chem. Reviews* 6, 1-16(1929).

ARTHUR FLEISCHER

Certain immediate thermodynamic consequences of quantitation of the ideal monatomic gas. G. POLVANI. *Nuovo cimento* [N. S.] 5, 256-64(1928).—P. explains the results obtained by the application of general equations of thermodynamics to Fermi's new equation of state for the ideal monatomic gas. In an adiabatic reversible transformation the internal energy of the gas is proportional to the abs. temp. In general the internal pressure to which the gas is subjected is always neg. The Joule-Thomson effect is independent of the sp. vol. and inversely proportional to the  $3/2$  power of the abs. temp. The difference between the sp. heat at const. pressure and that at const. vol. approaches zero proportionately to the cube of the abs. temp.

L. T. FAIRALL

The new quantistic theory of the ideal monatomic gas and Avogadro's law. G. POLVANI. *Nuovo cimento* [N. S.] 5, 307-9(1928).—Deviations from Avogadro's law in gas degeneration have been calcd. If 2 ideal monatomic gases occupy equal vols. under equal pressures at an infinitely low temp. the numbers of their mols. are related to the  $3/5$  power of their mol. (at.) wts., thus:  $N_1/N_2 = (m_1/m_2)^{5/4}$ .

L. T. F.

General form of the characteristic equation for the ideal monatomic gas. G.

POLVANI. *Nuovo cimento* [N. S.] 5, 331-40(1928).—P. derives the equation  $pV = NkT\theta$  as the characteristic equation for the ideal monatomic gas. In this  $p$ ,  $V$ ,  $N$ , and  $T$  have their usual significance,  $k$  is a const. and  $\theta$  is the total action possessed by the gas (that is, the product of the sum of the quantity of motion possessed by the mols. by the radius cubed of vol.  $V$ ) and  $\varphi$  is a function depending upon the statistical laws for the gas considered. Calc. shows that with different gases constituted of the same no. of mols. acquired by infinitely great degeneration ( $T, V \rightarrow 0$ ), the total action becomes equiv.

L. T. FAIRHALL

The thermodynamics of gases which show degeneracy (Entartung). GILBERT N. LEWIS AND JOSEPH E. MAYER. *Univ. Cal. Proc. Natl. Acad. Sci.* 15, 208-18 (1929).—Math. demonstration of the invalidity of Boltzmann's equation for distribution with respect to energy.

J. H. PERRY

The calculation of van der Waals' constant  $a$  from Dühring's specific factor  $q$  according to van Laar's vapor pressure relation. RICHARD LORENZ. *Z. anorg. allgem. Chem.* 179, 293-6(1929).—Van Laar has shown that the const. of van der Waals' equation can be derived from the expression for the vapor pressure of pure substances  $\ln p = -(A/T) - B \ln T + C - DT$ . This equation simplifies in a great many cases to:  $\ln p = -(A/T) + C$ . The abs. b. p. at pressure  $p_1$  is then  $T_1 = A/(C - \ln p_1)$  and for a pressure  $p_2$ ,  $T_2 = A/(C - \ln p_2)$ . For a second substance the resp. b. ps.  $\theta_1$  and  $\theta_2$  at the same pressures are  $\theta_1 = A'/(C' - \ln p_1)$  and  $\theta_2 = A'/(C' - \ln p_2)$ . Hence  $(T_2 - T_1)/(\theta_2 - \theta_1) = A(C' - \ln p_2) \times (C' - \ln p_1)/A'(C - \ln p_2) \times (C - \ln p_1)$ . For substances with approx. the same values of the  $C$  const. this last equation reduces to  $(T_2 - T_1)/(\theta_2 - \theta_1) = A/A' = q$ , which is Dühring's law of corresponding b. ps. For the alkali metals the  $C$ -values fluctuate between 12 and 11.55 and for the alkali halides between 7.74 and 8.95. Knowing  $A'$  for one substance one can find  $A$  by means of the equation  $A/A' = q$  and hence  $a$ .

H. S. v. K.

The viscosity of gases. S. S. KISTLER. *College of Pacific. J. Franklin Inst.* 207, 389-96(1929).—An error in the customary derivations of the equation for the viscosity of gases is pointed out in which the counting of momentum is at fault.

J. H. PERRY

The rare gases. RICHARD B. MOORE. *Purdue Univ. Chem. Bull.* (Chicago) 16, 151-2, 157-8, 178-80(1929).—A review.

E. H.

Distillation in gas currents. S. L. LIBINSON AND A. B. PAKSHVER. *Chem. App.* 15, 277-8(1928); 16, 25-6, 47-8, 71-4(1929).—This is a mathematical discussion of the distn. of 1 substance, and of pairs of substances when insol., partly sol., and completely sol. in each other, with formulas for calcg. the vol. of gas and the heat required for a few substances.

J. H. MOORE

A viscosity formula for binary mixtures, the association degrees of constituents being taken into consideration. II. TETSUYA ISHIKAWA. *Bull. Chem. Soc. Japan* 4, 25-31(1929); cf. C. A. 23, 2339.—A formula for the viscosity of binary mixts. is proposed in the form:  $(1) \eta = \eta_1 + (\eta_2 - \eta_1) [k a_2 z_m / k_1 a_1 (1 - z_m)] + k a_2 z_m$ , where  $\eta$ ,  $a$  and  $k$  with the suffixes 1 and 2 signify the viscosities, the assoc. degrees and the field-const. for components 1 and 2, resp.;  $z_m$  is the molar fraction of component 2. It is shown that in 2 homologous series (alcs. and esters of AcOH)  $k$  is proportional to the product of the mol. diam. and the dielec. const. For gaseous mixts., equation (1) is transformed into an expression closely resembling Thiesen's equation. The failure of equation (1) in cases where a chem. reaction occurs between the 2 components is discussed. The hydrates AcOH.  $H_2O$ , MeOH.  $2H_2O$ , EtOH.  $3H_2O$ , and EtOH.  $2H_2O$  are postulated.

J. G. McNALLY

Effect of temperature and concentration on viscosity of salt solutions. WALTER BÜCHE. *Z. ges. Kälte-Ind.* 34, 143-4(1927).—B. calcs., in the m.-kg.-sec. system, viscosity tables for brines according to the interpolation formulas of Jessup. These formulas are derived from known data in the literature. B. calcs. values for NaCl at  $-10^\circ$  and  $CaCl_2$  at  $0^\circ$ .

L. C.

The nature of Kucera anomalies in electrocapillary curves. KAREL TEIGR. *Charles IV Univ., Prague. Chem. Listy* 23, 54-8(1929).—An electrocapillary curve obtained by weighing the drops exhibits a discontinuity at a definite electromotive potential which was observed by Kucera. T. shows that all of the present theories accounting for this anomaly are inadequate and proposes a concept which considers a replacement of nonelectrolytes by electrolytes from the surface of the cathode within certain ranges of the electromotive polarizing potential. This explains the max. in the polarographic curve. Three other stages of the curve are considered; an extended paper is promised.

FRANK MARSH

Crystal climbing. II. HANS ERLENMEYER. *Inorgan. Chem. Inst., Basel. Helv.*

*Chim. Acta* 12, 264-9(1929); cf. *C. A.* 22, 1071.—Capillary-active substances like glycerol, sugar, and thymol prevent the climbing of KCl on glass rods. Urea delays the climbing. The thicker the glass rod the higher the soln. will climb on the rod.

ARTHUR FLEISCHER

**Adsorption of gases by glass walls. V. Carbon dioxide.** M. CRESPI. *Anales soc. españ. fis. quim.* 27, 108-19(1929).—The system of tubes used heretofore has been replaced by a system of small ampoules having a total vol. equal to the vol. of the largest ampoule used for comparison. Detns. were made with very pure CO<sub>2</sub>, giving for adsorption per cc.  $A_s = 0.93 \times 10^{-3} \times p^{0.444}$  g. between 1 and 0.25 atm. at 13° and  $A_s + 0.025 \times 10^{-3} = 1.77 \times 10^{-3} \times p^{0.877}$  between 1 and 0.062 atm. At low pressures there is deviation from the exponential law. With a 1 l. bulb under ordinary conditions the CO<sub>2</sub> adsorbed is 0.000086 g. Expressed in mols, this is of the same order as was found for CHCl<sub>3</sub>. It was again verified that the error in d. detns. increases the less the vol. of the container and the less the pressure.

E. M. SYMMES

**Adsorption of gases by metals.** LUDWIG KAUL. *Metallborse* 18, 1883-4(1928).—Controversial with Sieverts (*Metallborse* 18, 1717; cf. *C. A.* 23, 2401). Sprouting of molten Ag is connected with the existence of an equil. of at. O with at. Ag, which is disturbed by change of temp. To bring about combination of active O and Ag a pressure must be exerted which causes "agglomeration" of the O atoms in the space, thereby rendering combination possible. Freezing Pt and Pd show similar sprouting tendencies. The action of N on heated Fe is peculiar. At the  $\gamma$ -point a state is reached at which N is fixed by the release of at. energy. Further heating alters conditions so that the then highly active N is no longer fixed. On cooling below the  $\gamma$ -point the freed energy is again required for cohesion and the N given up.

E. M. SYMMES

**An optical study of absorbed films.** J. H. FRAZER. Johns Hopkins Univ. *Phys. Rev.* 33, 97-104(1929).—The optical method of Rayleigh (*Phil. Mag.* 23, 431(1903)) and Drude (*Lehrb. d. Optik*) for the study of surface "transition layers" was experimentally modified so as to give greater accuracy, and was applied to the study of adsorption on glass. Various substances were investigated, and of these only 2, water and MeOH, showed definite absorption. Curves for these, plotting thickness of absorbed layer against partial pressure, are given. Up to 5 or 6 mm. pressure, there is no detectable adsorption of H<sub>2</sub>O (apart from the probable presence of the first monomol. layer). From then on there is a cluster formation which results in a gradual covering of the surface until at 12.5 mm. pressure there is another monomol. layer present. Above 13 mm. there is strong condensation. The results for MeOH were similar. Adsorption began at 30% satn. and continued linearly up to 90% satn. pressure when strong condensation set in. It is pointed out that the method is applicable to the study of surface conditions at the interface between any 2 phases.

B. L.

**The adsorption of phenols at the interface of water-air, water-carbon and water-mercury.** A. FRUMKIN. *Rec. trav. chim.* 48, 288-90(1929).

A. WHITE

**Adsorption of acetic and propionic acids in the presence of salts with common anion.** E. ANGELESCU AND V. N. COMANESCU. *Bul. soc. chim. România* 10, 170-82(1928).—The adsorption on charcoal of acetic and propionic acids from aq. solns. and from solns. contg. the Na and K salts was studied. The adsorption of the acids was slightly decreased in the presence of the salts. Detns. of the partition of AcOH between benzene and water and between benzene and 1 N AcOK indicate a tendency for greater soly. of the AcOH in the salt solns., a result parallel to that of the adsorption detns. Similarly a decrease in the soly. of AcOH in 1 N NaCl, as detd. by the same method, is parallel to the increased adsorption of AcOH on charcoal in the presence of NaCl, as previously reported by Wiegner. Therefore, a decrease in adsorption is accompanied by a tendency toward greater soly. in the solvent, and *vice versa*.

J. FLEISCHER

**The adsorption of hydroxybenzenes and other aromatic compounds and their displacement of each other at the interface water-charcoal.** I. M. KOLTHOFF AND ELS VAN DER GOOT. *Rec. trav. chim.* 48, 265-87(1929).—A study was made of the adsorption of hydroxybenzenes and other benzene derivs. with polar groups from aq. soln. by "Carbo medicinalis neu Merck." Purification of the charcoal by the HF method of Miller does not influence the shape of the adsorption isotherm. It is doubtful whether the adsorption of strong electrolytes depends upon the properties of the charcoal in the same way as that of nonelectrolytes. With respect to the adsorption of hydroxybenzenes and other derivs. of benzene with polar groups, the water-charcoal interface and the water-air interface behave just oppositely. At the water-air interface, the capillary activity decreases rapidly with the no. of polar groups, whereas at the water-charcoal interface the adsorbability increases with the no. of polar groups (this rule, of course, holds only for the benzene derivs. studied). Di- and trihydroxybenzenes



have practically no influence upon the surface tension of a phenol soln. On the other hand, at a charcoal-water interface the phenol is replaced by bi- and tervalent phenols. The polar groups of the benzene derivs. are directed to the charcoal side and not to the bulk of the soln. It is suggested, that the adsorbed water layer on the charcoal is responsible for this phenomenon. The change of the adsorption with the concn. can be expressed satisfactorily by the equation of Freundlich.  $x/m = x C^{1/n}$  although the shape of the adsorption isotherm is somewhat dependent upon the amt. of charcoal taken and the diln. of the soln. There is a regular decrease in the value of  $1/n$  with increasing no. of polar groups. The ratio is approx. 3:2:1 for univalent: bivalent: tervalent phenols. Expression of the amt. adsorbed in terms of the no. of millimoles per g. charcoal does not give a real measure of the adsorbability. The no. of milliequivalents adsorbed should be used instead. For the benzene derivs. with nonelectrolyte (or very weak electrolyte) character the equiv. no. is equal to the no. of polar groups in the mol. The influence of NaCl upon the adsorption of different aromatic compds. was investigated. The salt has a tendency to increase the adsorption. This rule does not hold generally. Moreover the effect seems to depend upon the properties of the charcoal used.

A. WHITE

The decomposition of aqueous bromine and of bromic acid solution by charcoal. I. M. KOLTHOFF. Univ. of Minn. *Rec. trav. chim.* **48**, 291-7(1929); cf. preceding abstr.—Br in aq. soln. is rapidly decompd. in contact with charcoal, introducing errors into the detn. of the adsorption isotherm when the usual procedure is followed. An analytical procedure has been developed for studying this decompn. An I soln. under similar conditions is not decompd. A soln. of Br in  $CCl_4$  is not decompd. Hypoiodite and hypobromite are very rapidly decompd. in the presence of charcoal. Bromic acid in the adsorbed state on charcoal is decompd. with the formation of HBr.

LOUIS WALDBAUER

The adsorption of phosphoric acid by iron hydroxide in the presence of changing amounts of ammonia. F. ANGELESCU AND GR. BĂLĂNESCU. *Kolloid-Z.* **47**, 207-21 (1929).—Complete simultaneous pptn. of Fe and P is possible at a ratio of Fe/P greater than 2 and at a  $p_H$  less than 7. The temp. and the anion of the ferric salt are without effect on the pptn. In alk. soln. the P is no longer completely adsorbed. The amt. of sol. P depends upon the Fe/P ratio and the concn. at the start. The coagulation of the ppt. changes with the ammonia concn. and with the ratio Fe/P at the start. Two regions of peptization were observed: in acid solns. with large Fe/P ratios and in alk. solns. with small Fe/P ratios. The different behavior in acid and alk. solns. is explained by a surface dissocn. of the  $Fe(OH)_3$  which is influenced by the  $p_H$  of the soln. As an application of the results the methods for the detn. of P, Fe and Al in soil analysis are discussed and corrected.

L. F. MAREK

The binding of alkali metals by carbon. II. KARL FREDENHAGEN AND HERMANN SUCK. *Z. anorg. allgem. Chem.* **178**, 353-65(1929); cf. *C. A.* **21**, 1582.—The method used previously was improved by the use of a temp. regulator, by sealing off part of the reaction vessel, contg. the K-C compd. after the reaction has been completed, and by detg. the amt. of K by a gravimetric method instead of the volumetric method used previously. Expts. were carried out with graphite and K at 400° and 450°, and with soot and K at 400°. Graphite and soot, though different in their adsorption characteristics, show the same behavior toward K. Heated at the same temp. and pressure they take up the same amt. of K. Na combines with soot, but not with graphite. Diamond does not react with K, or with Na. The taking up of K by graphite occurs in 2 steps. The expts. with the graphite side of the reaction vessel at 400° are evaluated in the form of a curve, plotting the vapor tension of K, calcd. according to Fiock and Rodebusch (cf. *C. A.* **20**, 3600), against the mol. K per mol. C. Increasing the temp. of the K from 200° to 256°, corresponding to an increase of the K vapor pressure from 0.006 to 0.06 mm., the amt. of combined K increases from 0.032 mol K pro mol C to 0.049. Increase of the temp. to 284° (0.17 mm.) does not materially increase the amt. of K combined. A further increase of the temp. with 17°, corresponding to an increase of the K vapor pressure from 0.17 to 0.29 mm., doubles the amt. of combined K. Similar curves were obtained with graphite at 450° and with soot at 400°. With graphite equil. is attained after 22 hrs., with soot only after 60 hrs. The previous treatment of the soot influences its taking up of K. The color of the graphite-K is at first dark blue-black, after the great increase in K content the color changes to copper-red (Siemens graphite being used). If a coarsely cryst. graphite, such as Ceylon graphite, is used, the color is at first steel-blue with a distinct metallic gloss, followed by a bronze coloration after the amt. of K increases. This change in color seems to occur suddenly after the great increase in K content.  $K_4C_4$  could not be detected by passing over

graphite-K, H<sub>2</sub>O vapors contg. H, then collecting the gas in a soln. of 1 g. Cu(NO<sub>3</sub>)<sub>2</sub>, 4 cc. of concd. HCl and 3 g. hydroxylamine salt in 50 cc. H<sub>2</sub>O. J. A. SEILARD

**Contradictions in the physico-chemistry of colloids.** AUGUSTE LUMIERE. *Chimie et industrie* 21, 223-6(1929); cf. C. A. 21, 3375.—The definitions of Francesco Selmi (1846), Graham (1864), Loeb, and Kruyt (C. A. 23, 4305) are discussed, showing that none of them embraces all of the substances which are generally recognized as colloids. The structure and function of mol. colloids and of micellar colloids are discussed and contrasted. Conclusion: Monomol. protein colloids behave like crystalloids of very high mol. wt., and there is no valid reason for classifying them apart from the crystalloids, while substances exhibiting micellar arrangement have entirely different characteristics and behavior, and it is not rational to designate such dissimilar substances by the same name. It is suggested that the term colloid be discarded altogether.

A. PAPINEAU-COUTURE

**Differential equation of physical chemistry.** H. FAXEN. *Arkiv Mat. Astron. Fysik.* 21B, No. 3, 6 pp.(1929).—The general equation for the rate of sedimentation in an ultracentrifuge is integrated. The equation includes terms for diffusion and specific sedimentation.

F. R. BICHOWSKY

**Mechanical dispersion by means of the colloid mill.** PIERCE M. TRAVIS. *Ind. Eng. Chem.* 21, 421-5(1929); cf. C. A. 22, 897.—Colloid mills are classified as (1) beater type, (2) smooth surface type, (3) rough surface type, (4) turbine type. Uses of the mill are described and emphasis is placed upon control of H-ion concn., temp. and use of a protective material.

L. B. MILLER

**The stability of colloidal solutions.** A. BOUTARIC. *Rerue gén. colloides* 7, 49-52 (1929); cf. C. A. 22, 3080.—Electrification of the micelle is only one factor in stability of the colloid. During slow coagulation of a dispersion by a low concn. of electrolyte, the charge on the micelle is neutralized so slowly that a reorganization takes place within the micelle, forming a new product having different properties from the original dispersion. During rapid coagulation by a high concn. of electrolyte there is not time enough for reorganization within the micelle and the character of the product remains unchanged.

L. B. MILLER

**Taktosols.** H. ZOCHER AND K. JACOBSON. Kaiser-Wilhelm-Inst. *Kolloid-chem. Beihefte* 28, 167-206(1929); cf. C. A. 19, 3401.—A no. of colloidal solns. have been found which contain non-spherical particles. In these *taktosols*, as distinguished from ordinary sols, or *ataktosols*, the individual microscopic particles are called *taktoids*. Rod-shaped taktoids arrange themselves spontaneously with their long axes parallel. Taktoids are optically anisotropic. On aging, certain sols split into taktosol and ataktosol in a manner analogous to the pptn. of a 2nd phase from a mol. soln. The taktosol settles to the bottom. In cataphoresis, the taktoids of a V<sub>2</sub>O<sub>5</sub> sol prepd. by the method of Biltz have their long axes parallel to the lines of force in a d. c., perpendicular to them in an a. c., and parallel to them in a magnetic field. In a sol of benzopurpurin the rod-shaped taktoids arrange themselves in a magnetic field, with their long axes perpendicular to the lines of force. A sol of WO<sub>3</sub> contains disk-shaped particles which are colloidal in one direction only. The taktoids from chrysophenin solns. consist of anisotropic crystals having their long axes parallel. They are colloidal in one direction and are destroyed by shaking. The pptd. mass of taktoids has the character of a gel.

CORNELIA T. SNELL

**New studies on the preparation and properties of colloidal metals and their compounds.** J. REITSTÖTTER. *Oesterr. Chem.-Zig.* 30, 217-20(1927). E. C. M.

**Studies on the dispersoidal synthesis of gold by means of alkaline formaldehyde.** P. P. VON VEHMARN. *Bull. Chem. Soc. Japan* 4, 35-47(1929).—New expts. are described to show that the size of the particles of Au suspension prepd. by the action of alk. HCHO on AuCl<sub>3</sub> may be predicted by the well-known rule of V. J. G. M.

**The manganese equilibrium in glasses.** WILDER D. BANCROFT AND R. I. NUGENT. *J. Phys. Chem.* 33, 481-97(1929).—Information on the coloring effect of Mn was obtained from quant. expts. on the chem. behavior of Mn in the borax bead. The pink-violet color of Mn is due to tervalent Mn; Mn in the colorless bead is bivalent. The equil. of bivalent and trivalent forms is affected by temp., O<sub>2</sub> pressure and acid or alk. quality of the melt. Litharge-boric acid-Mn system examd. quant. also showed definite shift of color like that with the borax bead. The Na<sub>2</sub>O-P<sub>2</sub>O<sub>5</sub> system gave a qual. indication of color shift. The study was extended to reactions in glass; prolonged exposure to light produces violet color in glass which may be due to the shift of Mn<sup>++</sup> to Mn<sup>+++</sup> under the influence of light. The coloration of rose quartz is also considered.

M. McMAH

**Colloidal potassium ferrocyanide solutions.** ARTHUR KUTZLEW.

47, 221-2(1929).—Colloidal systems of  $K_4Fe(CN)_6$  are obtained by treating the solid salt with mixts. of water and EtOH, MeOH, PrOH, acetone, etc., *e. g.*, by shaking 0.1 g. of salt with 100 ml. of EtOH and 50 ml. of water. L. F. MAREK

Some sources of error in determining the drop-point according to Ubbelohde, and their avoidance. E. NAUMANN. *Chem. Fabrik* 1929, 136-8.—The errors are due to the glass tips, 80-90% of those on the market being of faulty construction. N. proposes making the tips of brass. J. H. MOORE

The number of nuclei in the crystallization from gels. P. A. THIESSEN and E. TRIEBEL. Göttingen Univ. *Z. anorg. allgem. Chem.* 179, 267-76(1929).—Count was made of the no. of nuclei which appear under definite conditions in the crystn. of Na oleate. The no. increases with the time of supercooling, the degree of supercooling, increase of concn. of the gel from 0.43 to 0.6 N, and the extent to which the soap is in the form of colloidal micelles. CORNELIA T. SNELL

Some caseinates and the theory of the lyophilic colloids. MARTIN H. FISCHER and MARIAN O. HOOKER. *Kolloid Z.* 47, 193-206(1929).—The formation of gels from "neutral" casein by the action of acids and bases in different concns. does not depend solely upon  $p_H$  but varies specifically. The acids and bases combine with casein to form salts, such as casein acids or metal caseinates, resp. The colloidal properties of these compds. in water depend upon their soly. and hydration. The general theory for solvated colloids (*C. A.* 12, 2327) describes the behavior of the casein compds. Salts may affect casein acids or metal caseinates in aq. soln. in two ways: (1) the salt may react with the casein compd. to form a new compd. having different soly. and degree of hydration, or (2) the salt may combine with the solvent, thereby changing such colloidal properties as viscosity, gelatinization, syneresis and final sepn. into solid and liquid phases. L. F. MAREK

Solubilities of alkali nitrates. FRIEDRICH. *Metallbörse* 18, 1966-7(1928); cf. *Caliche* 10, 5(1928).—The soly. relations of salts resulting from combinations of the ions K, Na, Cl,  $NO_3$  and  $SO_4$ , which apply also to other salts of interest in the manuf. of Chile salt-peter, are shown. E. M. SYMMES

The solubility of iodine in solutions of halides. JOHN S. CARTER and CHARLES R. HOSKINS. Govt. Lab., London. *J. Chem. Soc.* 1929, 580-5.—The soly. of  $I_2$  was measured at 25° in aq. HCl, KCl,  $MgCl_2$ ,  $BaCl_2$  and HI, and was recalcd. in NaBr and KBr (cf. *C. A.* 6, 567). The influence of 2 inert salts,  $NaNO_3$  and  $Na_2SO_4$ , was detd. Soly. of  $I_2$  in halides is the resultant of the tendency to form polyhalides and of simple salting out. Polyhalide formation increases, and salting out decreases, with increasing at. wt.  $I_2$  in aq. fluorides gave iodides and acid. GERALD M. PETTY

Structure of plant compounds and solubility. R. H. CARR. *Science* 69, 407(1929).—The relationship between structure and soly. of carbohydrates and related compds. is discussed. Formic acid dissolves sugars, dextrans, starch, inulin, glycogen, agar, chlorophyll, glucosides, pigments, but not much mucilage, lignin, gum, cellulose or proteins. The carbohydrates that are sol. are the ones easily hydrolyzed, yielding aldehyde or ketone groups. From the known structure of the mols., this soly. seems to decrease as the active hydroxyl groups in the mol. decrease and as C atoms increase. A further correlation between structure and soly. lies in the fact that sugars and org. acids are mentioned as polar compds. and these are the ones which dissolve in formic acid, a polar compd. Non-polar compds. like fats and cellulose are insol. N. M. NAYLOR

Osmotic and activity coefficients. R. C. CANTELO. *J. Phys. Chem.* 33, 627-32(1929).—The mathematical theory of elec. cond. of electrolytes developed by Debye and Hückel (*C. A.* 18, 190) may be tested by deriving expressions for activation and osmotic coeff. of an electrolyte. A method for deriving these mathematical equations is described. M. MCMAHON

The boiling points of aqueous solutions. WILDER D. BANCROFT and HERBERT L. DAVIS. *J. Phys. Chem.* 33, 591-604(1929).—Data on abnormalities of f. ps. of concd. and dil. solns. with their bearing on the disscn. theory are reviewed. Similar abnormalities were found in the b. ps. of solns. of KCl, KBr, KI and  $KNO_3$ . A specially devised app., a modification of the Cottrell app., designed to prevent superheating of pure  $H_2O$  is described and illustrated. The investigation of the effect of higher pressures and temps. on b. ps. was begun; the pressure app. used is described in detail. B. ps. were observed under 10 to 20 atm. pressure. M. MCMAHON

Heitler's theory of concentrated solutions. LEO VIETH. *Physik. Z.* 30, 126-39(1929).—A thorough discussion of Heitler's theory (*C. A.* 20, 3371) is presented. The results of the theory are compared with exptl. values for heats of mixing and vaporization for a no. of mixts. E. R. SMITH

**Oxygen-compound formation with acetaldehyde at low temperature.** D. L&B. COOPER. *Chem. News* 138, 264(1929).—See *C. A.* 23, 2093. E. C. M.

**Reactions carried out under high pressure.** ERNEST BERL. *Chimie et industrie* 21, 452-65(1929).—The work of B. and co-workers on the limits of combustibility of mixts. of air with inflammable gases and vapors at higher pressures (B. and Werner, *C. A.* 21, 1884) and on corrosion phenomena at high pressures (B. and von Taack, *C. A.* 22, 4445) is outlined. A. PAPINEAU-COUTURE

**The theory of chemical reaction velocity.** N. SEMENOV. *Z. physik. Chem., Abt. B*, 2, 161(1929).—A chain-mechanism theory is developed to account for both slow reactions and explosions. The probability  $\delta$  of a collision between an activated reaction product and one of the reactants with sufficient energy to start branching of the stoichiometric chain increases with the temp. If  $\nu$  is the number of single reactions in the simple chain and  $n_0$  is the sp. rate of the endothermic reaction, the velocity =  $n_0\nu$ . When secondary activation is considered, the velocity =  $w = n_0\nu/(1 - \nu\delta)$ . When  $\nu\delta = 1$ ,  $w = \infty$ , and the reaction is an explosion. The alterations in  $\nu$  resulting from admixture of an inert gas and from collisions with the vessel walls are discussed. A relation is derived between the min. explosion pressure and temp. which is identical with that derived from the author's heat theory of explosion (cf. *C. A.* 22, 2842). A correction is made to the earlier paper extending the validity of the relation to chain reactions. In agreement with Franck, S. finds the probability of a transfer of excitation energy into kinetic energy is  $10^{-4}$ . These considerations are most important for fast reactions in which  $w$  is commensurable with the rates of activation and deactivation. L. W. ELDER, JR.

**The kinetics of the combination of hydrogen and oxygen.** N. SEMENOV. *Z. physik. Chem., Abt. B*, 2, 169(1929).—The investigations of Hinshelwood (*C. A.* 22, 4324) on the homogeneous reaction  $2H_2 + O_2 = 2H_2O$  are discussed on the assumption that it is a chain reaction of such a nature that the chains formed by the energy-rich intermediate products undergo branching, in consequence of secondary activation (cf. preceding abstract). Hinshelwood's observations agree satisfactorily with this view, but expts. in progress in the author's laboratory are contradictory.

L. W. ELDER, JR.

**Nature of unstable intermediates in chemical kinetics.** ANTON SKRABAL. Univ. Graz. *Monatsh.* 51, 93-156(1929); cf. *C. A.* 23, 1338.—The supposition that the concn. of the intermediates of a chem. reaction become const. is not correct. In a math. discussion a theory is developed for monomol. reactions. The concn. of the intermediates changes with time; only the concn. relations become stationary. The "Arrhenius" type of intermediate is in equil. with the initial product and the intermediate of the "van't Hoff" type is in equil. with the end product. A reversible reaction goes in one direction over the "A." type and in the other over the "H." type. Catalytic acceleration of a reaction may change the nature of the type of intermediate. The acceleration of a reaction with an intermediate of the "H." type may lead to a less stable end product. The velocity regulates the order of the stages of a reaction ("regulation law"). E. SCHOTTE

**Kinetic salt effect. II. Velocity of ionic reactions at great dilutions.** A. N. KAPPANNA. Univ. of Dacca, India. *J. Indian Chem. Soc.* 6, 45-52(1929); cf. *C. A.* 23, 21.—The kinetics of the reaction between  $BrCH_2CO_2Na$  and  $Na_2S_2O_8$  were investigated over a range of total ionic concn. from 0.0025 to 0.10. The reaction is bimol.  $K$  (30°) varies from 0.196 to 0.494;  $K$  (40°), 0.440 to 0.989; and  $K$  (50°), 0.986 to 2.250. Part of the exptl. data are given in detail; the remainder are summarized. The data serve to test the validity of the Debye-Hückel limitation law for strong electrolytes on the basis of both Brønsted's and Soper's theories and are found to satisfy the course of the reaction as predicted by Debye's equation up to an ionic strength of 0.015. The temp. coeff. of the reaction rate is about 2.2 to 2.3 and is the same for all ionic concns. at the temps. investigated. WILLIAM E. VAUGHAN

**The oxidation of iodide ion by persulfate ion. I. Effect of tri-iodide ion formation on the reaction velocity.** ERIC JETTE AND CECIL V. KING. *J. Am. Chem. Soc.* 51, 1034-47(1929).—The velocity of the reaction between iodide and persulfate ions was reinvestigated from the standpoint of tri-iodide ion formation. Expts. were made in solns. contg. no iodine in the initial mixt. and in solns. satd. with iodine. The observed reaction velocity is attributed to two influences, (1) the iodide ion and (2) the tri-iodide ion. The rate of reaction of the persulfate ion with the tri-iodide ion is half as fast as that with the iodide ion. The results contradict those of Kiss and his co-workers concerning the influence of the tri-iodide ion (cf. *C. A.* 21, 2593, 3523; 22, 2700). II. The effect of removing the products of the reaction on the reaction velocity.

CECIL V. KING AND ERIC JETTE. *Ibid* 1048-57.—The preceding conclusions as to the reaction of tri-iodide ions as well as of iodide ions with persulfate ions were confirmed at higher concns. than those previously used. Removal of iodine by org. solvents as soon as formed generally produced uniform reaction velocity constns. differing but little from previously obtained values for the reaction in the absence of the org. solvent. Removal of the sulfate ion by Ba and Ca salts did not materially affect the reaction rate.

PAUL H. EMMETT

The reaction between nitrogen pentoxide and ozone. II. H. J. SCHUMACHER AND G. SPRENGER. Univ. Berlin. *Z. phys. Chem.*, Abt. B, 2, 267-81(1929); cf. *C. A.* 23, 2636.—S. and S. have further investigated this reaction over a range of pressures of  $N_2O_5$  ranging from about 0.2 to 67 mm. and pressures of  $O_3$  ranging from about 100 to 300 mm. at 20° and 30°. The empirical reaction rate equation is  $dp/dt = k[N_2O_5]^{1/2}[O_3]^{1/2}$ . The temp. coeff. of the rate is 2.07 for 10°. The disappearance of the ozone is marked by the formation of  $NO_2$ . A series of four reactions is postulated and from them, with several assumptions, may be derived the exptl. result; these equations are: (1)  $N_2O_5 \longrightarrow 2 NO_2 + \frac{1}{2}O_2$  ( $k_1$ ); (2)  $NO_2 + O_3 \longrightarrow NO_3 + O_2$  ( $k_2$ ); (3)  $NO_3 + NO_2 \longrightarrow 2 NO_2 + O_2$  ( $k_3$ ); (4)  $NO_3 + NO_2 \longrightarrow N_2O_5$  ( $k_4$ ). The results are said to be in accord with previous expts. and tend to clarify former work. The postulated  $NO_3$  is a point for consideration. Exptl. data and derivations of equations are given.

WILLIAM E. VAUGHAN

A study of nitric acid. IV. The special behavior of the system nitric acid-nitrous acid in oxidation reactions. The activation of nitric acid. ALFONS KLEMENC AND LUDWIG KLIMA. Univ. Wien. *Z. anorg. allgem. Chem.* 179, 379-412(1929).—In a freshly prepd. soln. of the system  $HNO_3$ - $HNO_2$ , an oxidizing action is obtained upon  $Sn^{++}$  ions, which however gradually decreases to zero. Numerical data show that (a) with equal  $HNO_3$  concn. the oxidation value at a given time is increased by increasing the concn. of  $HNO_2$ , (b) with equal  $HNO_2$  concn. the oxidation value at a given time is increased by increasing the concn. of  $HNO_3$ , (c) the addition of  $NO$  causes the oxidation value to decline much more rapidly as time passes, (d) a slight increase in  $HNO_3$  concn. causes the oxidation value to decline less rapidly. When the oxidation value against  $Sn^{++}$  has fallen to zero, diln. with  $H_2O$  again produces activation and oxidizing action. The oxidizing value of  $HNO_3$  in this system is ascribed to an activation by the reaction  $3HNO_2 \rightleftharpoons HNO_3 + 2NO + H_2O$ . This reaction produces activation in either direction, and it is concluded that the formation or decompn. of  $NO$  in this manner converts a definite portion of the  $HNO_3$  present into an active form.

The extent of this activation appears to be conditioned by a reaction which takes place through  $NO_2$  or  $N_2O_4$ . The activated  $HNO_3$  decomposes according to the equation  $HNO_3 \longrightarrow NO_2 + \frac{1}{2}O_2$ . In this system it can be assumed that a direct relation exists between reaction and activation, according to which one reaction can be regarded as the catalyst for the other. In the reaction between the activated  $HNO_3$  and  $Sn^{++}$ , amt. of  $Sn^{++}$  not oxidized is detd. by titration with a nitrite soln. using KI and  $FeCl_3$  as indicator.  $HNO_3$  oxidizes  $Sn^{++}$  salts instantly.

H. STOERTZ

Activity of certain acid-base indicators. JULIUS SENDROY, JR. AND A. BAIRD WIGGS. Rockefeller Inst., N. Y. *J. Biol. Chem.* 82, 197-244(1929).—The effect of  $NaCl$ ,  $KCl$ ,  $Na_2SO_4$ ,  $K_2SO_4$ ,  $MgCl_2$ ,  $CaCl_2$ ,  $MgSO_4$ , acetate and phosphate buffers on glucose on the activity coeffs. of bromocresol green, bromocresol purple and phenol red was studied by means of electrometric  $p_{aH^+}$  detns., and color readings against bicolor standards. The value of  $pK'$  for these dyes is shown to be dependent on the total electrolyte concn., the relation of ionic strength to  $pK'$  being expressed by the Debye and Hückel's equation. Other factors than ionic strength have a relatively small influence on the relation between  $p_{aH^+}$  and indicator color. Tables and equations are given for detg.  $p_{aH^+}$  colorimetrically. The various phases of recent work in the field of  $p_{aH^+}$  detns., are discussed.

ARTHUR GROLLMAN

Lithium compounds of hydrogen chloride with ether and acetone. D. MCINTOSH. *News* 138, 214-5(1929); cf. *C. A.* 22, 2308.—A check of previous work indicates that  $Et_3O \cdot HCl$ ,  $Et_3O \cdot 2HCl$ ,  $Et_3O \cdot 5HCl$ ,  $Me_3CO \cdot HCl$  and  $Me_3CO \cdot 5HCl$  are formed as described. Hirai's failure to obtain the compds. contg.  $5HCl$  is probably due to a high degree of supercooling.

A. S. CARTER

Autooxidation of hydroquinone catalyzed by manganous salts in acid solutions. In whose velocity is proportional to the driving force. VICTOR K. LAMER AND J. TEMPLE. Columbia Univ. *Proc. Natl. Acad. Sci.* 15, 191-4(1929).—With

$H_2O_2$

$Hg$ ,  $HgCl$  | satd.  $KCl$  | Buffer Soln. |  $Au$ , in which the hydroquinone ( $H_2Q$ ),  $O_2$  (1 atm.)

and quinone (Q) are satd. with mol.  $O_3$ , the kinetics of the oxidation of  $H_2Q$  were studied. Denoting by  $x$ , the %  $H_2Q$  oxidized,  $E = K - 0.0296 \log (100 - x)/(x)$ , where  $K$  is a const. evaluable for any given buffer by detg. the e. m. f. with quinhydrone ( $x = 50\%$ ).  $dx/dt = A + B \log (100 - x)/x$ , where  $A$  and  $B$  are consts. In order to avoid side reactions, it is necessary to work in a  $pH$  range of 5.3 to 6.3 and to use small amts. of  $MnCl_2$  as a catalyst to obtain a suitable velocity. The rate of reaction in this  $pH$  range is directly proportional to the  $[Mn^{++}]$ , and inversely proportional to  $[H^+]$ . This is the first case in which the rate of a homogeneous chem. reaction is proportional to the logs of the initial and final concns., or what is the same thing, the energy levels of the system. It is suggested that the reaction proceeds by the following steps: (1)  $H_2Q \longrightarrow Q + 2H^+ + 2E$ ; (2)  $2E + O_3 \longrightarrow O_3^{--}$ ; and (3)  $2H^+ + O_3^{--} \longrightarrow H_2O_3$ .

J. H. PERRY

The theory of heterogeneous catalytic reactions. The multiplet hypothesis. Model for dehydrogenation catalysis. A. A. BALANDIN. *Z. physik. Chem.*, Abt. B, 2, 289-316 (1929).—A theory of dehydrogenation catalysis is developed and application made to numerous reactions and catalysts. The basic idea is that underlying the "spacing theory" of catalysis advanced by Langmuir, Adkins and Burk. Catalytic dehydrogenation occurs when a group of surface atoms appropriately spaced and of the necessary activity adsorb the reactant in a definitely oriented position. Because simultaneous action on the part of several surface atoms is postulated the theory is called the "multiplet hypothesis." The multiplet for the dehydrogenation of a mol. may consist of two, three, four or more surface atoms. For example, the hexagonal cyclohexane mol. is pictured as being adsorbed upon the network of atoms of a 111 face of a face-centered metal catalyst in such a way that each pair of C atoms in the ring straddles and is held to one of the three metal atoms located at the corners of a unit triangle in the crystal face. Dehydrogenation occurs as a result of half of the H atoms from two such adjacent pairs of C atoms being drawn together and caused to unite by the nearest surface metal atoms unoccupied by the C atoms. From geometrical considerations of an adsorbed mol. oriented in such a fashion the distance  $\Delta$  between the H atoms of cyclohexane and the metal atoms to which they are drawn can be calcd. in terms of the diam.  $R$  of the C atom, and the diam.  $K$  of the metal atom. A plot of the value of  $\Delta$  vs.  $K$  for all face-centered and hexagonal metals gives a straight line. All of the metals upon that portion of the line extending from  $\Delta = 1.00$  A. U. to  $\Delta = 0.79$  A. U. and from  $K$  values of 1.397 A. U. to 1.236 A. U. are catalytically active in the dehydrogenation of cyclohexane. The metals having face-centered or hexagonal structures lying within this "square of activity" are Pd, Pt, Ir, Rh, Cu, Co, Ni, Fe, Zn, Os and Ru, while Ca, Ce, Th, Pb, Ag, Au, Al, Sn, Ce, Cd, Zr, Mg, Ti and Be of these systems lie without. This is in agreement with the fact that all of the metals in the first, but none of the latter group is active in the dehydrogenation. All the metals having a body-centered structure when plotted in the same manner as above outlined fall upon a line not touching the "square of activity" and as would be predicted are not good dehydrogenation catalysts for cyclohexane. This group includes K, Na, Li, Ta, W, Mo, V, Cr, Ge and Si. The remaining metals, As, Sb, Bi, Hg, In and gray Sn belong to rhombohedral or to tetragonal lattice, neither of which possesses trigonal symmetry on any face; accordingly none of these can be active catalysts for the dehydrogenation reaction. The following further predictions that would be made from the theory are in accord with exptl. facts: (1) cyclopentane and cycloheptane, being 5- and 7-membered rings, should not be dehydrogenated by metal catalysts. (2) Cyclohexene and cyclohexadiene should not be obtainable as products of partial catalytic dehydrogenation of cyclohexane. (3) Disubstituted cyclohexanes should not be dehydrogenated when the substituted groups are on the same C atom. Miscellaneous applications are also made to hydrogenation and decompn. reactions other than dehydrogenations. The viewpoint of the present theory is somewhat different from that of Taylor, inasmuch as it centers most of the catalytic activity in groups of normal surface atoms of certain crystal faces rather than in edges and corners of crystals. The multiplet theory as a whole, however, is compatible with Taylor's theory of active centers.

P. H. ENNERT

The influence of charcoal upon the velocity of the reaction between iodide-iodate and hydrogen ions, the decomposition of thiosulfuric acid and the reaction between phenol and bromine. I. M. KOLTHOFF. *Rec. trav. chim.* 48, 298-309 (1929).—HI in the adsorbed state on the surface of charcoal does not react with iodate and hydrogen ions in aq. medium. From a mixt. of an aq. soln. of alkali iodide and iodate only HI is adsorbed by ash-free charcoal. Charcoal apparently inhibits the reaction between iodate-iodide and hydrogen ions in aq. soln. If, however, the part of the hydrogen

and iodide ions removed by adsorption is accounted for, the charcoal accelerates the reaction, as it is a powerful adsorbent for the reaction product, iodine. The decompn. of a weakly acid soln. of thiosulfate is very much accelerated in the presence of charcoal. From a neutral buffer soln.  $\text{Na}_2\text{S}_2\text{O}_3$  decomposes rapidly in the presence of charcoal. The decompn. of thiosulfate with acid is due to the formation of the undissocd.  $\text{H}_2\text{S}_2\text{O}_3$ , which is unstable. Bromine and phenol adsorbed from aq. soln. on the surface of charcoal do not react with each other or react very slowly in the adsorbed state. Iodine and hydroquinone adsorbed from aq. soln. react very rapidly on the surface of the charcoal.

A. WHITE

The surface chemistry of catalytic hydrogen peroxide decomposition by mercury and the  $p_{\text{H}}$  value necessary for pulsation. G. BRÉDIG AND AD. STARR. *Z. physik. Chem.*, Abt. B, 2, 282-86(1929).—The observations of v. Antropoff (cf. *C. A.* 2, 2186) show that the pulsating decompn. of  $\text{H}_2\text{O}_2$  by a Hg surface is a typical case of catalysis in an interface region. Prolonged pulsation of the Hg surface during the decompn. can be obtained only if the  $p_{\text{H}}$  value is  $7.00 \pm 0.02$ . Gradual addition of a 10:1 mixt. of  $N$  NaOAc and 0.01  $N$  HOAc to commercial preps. is recommended as a means of obtaining a  $p_{\text{H}}$  value appropriate for the pulsating decompn. P. H. EMMETT

The heterogeneous catalysis of hydrogen peroxide by copper compounds. E. I. SHPITALSKIĬ, N. N. PETIN AND B. A. KONOVALOVA. Moscow State Univ. *J. Russ. Phys.-Chem. Soc.* 60, 1237-70(1928).—The reaction velocity was detd. gasometrically (cf. *C. A.* 19, 1924). The mixt. was kept at  $25^\circ$  and stirred continuously. The ppt. was analyzed according to Moser (cf. *C. A.* 1, 2782). The velocity const.  $K$  (calcd. from the equation of 1st order) was negligibly small in the presence of even  $2N$   $\text{CuSO}_4$ . On adding NaOH,  $K$  increased slowly at first and then, in the neighborhood of  $p_{\text{H}}$  12, rapidly and with simultaneous pptn. of  $\text{Cu}(\text{OH})_2$ . When this ppt. was filtered off,  $K$  again decreased to about 0.01 of its highest value. The residue, when washed free of Cu and transferred to a neutral soln. of  $\text{H}_2\text{O}_2$ , exerted a similar catalytic effect. The variation in  $K$  with  $p_{\text{H}}$  is, therefore, due to heterogeneous catalysis by the ppt. During the reaction  $K$  changed with time; in neutral soln. it passed through a min., in faintly acid soln. it passed through a max. With small concns. of  $\text{H}_2\text{O}_2$  the reaction velocity declined approx. linearly with time; in the case of higher concns. of  $\text{H}_2\text{O}_2$  the initial velocity was smaller, and there was a rapid decrease followed by a slow rise. The velocity of decompn. in alk. media also decreased with time, at first rapidly and then more slowly. It is concluded that a change took place in the catalyst during the decompn. of  $\text{H}_2\text{O}_2$ , namely the transformation of hydrated  $\text{CuO}$  into  $\text{CuO}_2$ . Analysis of the ppt. formed in the presence of large concns. of  $\text{H}_2\text{O}_2$  showed that it contains as much as 85%  $\text{CuO}_2$ . When  $\text{CuSO}_4$  was pptd. with NaOH from soln. weaker than 0.1  $N$   $\text{H}_2\text{O}_2$ , the ppt. contained 6-25%  $\text{CuO}_2$ . The peroxide content of the solid phase increased gradually while in contact with even dil.  $\text{H}_2\text{O}_2$  solns.; in concd. solns. the equil. was reached more rapidly (before the  $\text{H}_2\text{O}_2$  is used up). The disappearance of free  $\text{H}_2\text{O}_2$  was followed by the decompn. of  $\text{CuO}_2$  which proceeded very slowly (0.4 cc.  $\text{O}_2$  in 25 hrs.) in neutral media, while in alk. soln. it was complete in 1.5 hrs. The velocity of catalytic decompn. of  $\text{H}_2\text{O}_2$  in neutral media was 5 times that of the catalyst. The catalytic properties of the residue were influenced also by its state of dispersion, i. e., there was an aging process accompanied by a decrease in reaction velocity which could be largely prevented by continuous stirring. The authors conclude that the solid phase contains passive  $\text{CuO}$ , and another highly active intermediary product. The latter is formed instantly and  $\text{CuO}_2$  gradually, depending on the concn. of  $\text{H}_2\text{O}_2$ . The decompn. of each of the intermediary products is a time reaction;  $\text{CuO}_2$  decomposes much more slowly than the catalyst. In either case the concn. of  $\text{H}_2\text{O}_2$  has no influence. The velocity of the catalyzed decompn. of  $\text{H}_2\text{O}_2$  is directly proportional to the concn. of the catalyst which, again, depends on formation and decompn. velocity of  $\text{CuO}_2$ .

B. SOYENKOFF

The promoter action of copper and copper oxide on the reaction  $2\text{H}_2 + \text{O}_2 = 2\text{H}_2\text{O}$ .

I. Oxidation velocity of copper. YOSHIO OKAYAMA. *J. Soc. Chem. Ind. (Japan)* 31, 300-6(1928); Suppl. binding 31, 74.—The velocity of oxidation of Cu in an atm. of  $\text{O}_2$  at a pressure of 0.12 mm. Hg was investigated. The surface of the bulb of a Hg thermometer was covered with a thin layer of Cu. Through the bulb a thin capillary tube of glass was passed in a spiral form, and sealed at its ends to the wall of the bulb. A capillary tube carried in it a spiral of platinum wire 0.1 mm. in diam. and 10 cm. g. which served as a heating element. Thus the Hg in the bulb, together with the layer of copper on it, could be heated to any desired temp. The reaction velocity was detd. by the change of pressure, which was measured by means of a McLeod manometer. It was found that the velocity of oxidation increases with time, following

the equation  $-dp/dt = kp/t$ , where  $p$  and  $t$  are the pressure and time, resp. This increase is thought to be caused by the catalytic action of CuO formed by the reaction, the action taking place at the Cu-CuO interface. After some time, the velocity of oxidation decreases, as a result of the decrease in the surface of Cu and in the pressure of  $O_2$ . The relation between the velocity of oxidation and temp. is given by the equation  $\log k = -3823/T + 5.5$ , where  $k$  and  $T$  are the velocity const. and the abs. temp. resp. II. The reduction of CuO. *Ibid* 399-406; Suppl. binding 31, 93-4(1928).—The reduction of CuO by H is autocatalytic even at temps. above  $200^\circ$ . The reaction is retarded by the presence of water vapor. When H was passed over CuO the weight of the latter increased at first and then decreased. This initial increase in weight was found to be due to adsorption on the surface of CuO of water vapor, formed by the reaction. This adsorption made it impossible to study the velocity of reduction by measuring the rate of decrease in weight of CuO or by measuring the amt. of water formed and liberated. Therefore the decrease in pressure was measured by means of the app. described in the first report of this series, and condensing the water vapor formed by liquid air. The velocity of reduction is given by the equation  $-dp/dt = kpt/(p_0 - p)$ , where  $p_0$  and  $p$  are the initial pressure of H and the pressure at the time  $t$ , resp. The velocity const.  $k$  at the abs. temp.  $T$  is given by the equation:  $\log k = -5257/T + 7.38$ . III. The autocatalytic action in heterogeneous system. *Ibid* 407-10; Suppl. binding 31, 95 (1928).—Autocatalysis in the heterogeneous reaction can be easily explained by Volmer's nucleus theory. But it still remains in question, whether all autocatalytic actions in heterogeneous system are due to the removal of the difficulty of the formation of nuclei. There are two possibilities for the autocatalysis: (1) facilitating the rate of the mol. change in question, and (2) the removal of the difficulty of nucleus formation.

Y. NAGAI

Physicochemical investigation on the casein-splitting action of papain with special reference to the fundamental properties of its action as well as to the mechanism of the acceleration of hydrocyanic acid solution upon its action. MASAKASU SATO. *Separate* (1928).—Papain was prepd. from the milky latex of the green fruits of papaya tree produced at Heito, Formosa, and purified. The chief results of the investigation are as follow: (1) The quantity of casein digested by papain during unit time is directly proportional to the concn. of papain, in the range of the reaction which does not approach its equil. Schütz's law cannot be applied. (2) The law of mass action is not applicable and the value  $K$  corresponding to the const. in the monomol. reaction increases gradually as the reaction proceeds. (3) The temp. coeff. in this case becomes smaller as the range of temp. becomes higher. This fact agrees with that shown by the equations proposed by van't Hoff, Arrhenius, and Kooy. (4) The optimum temp. was found to be about  $80^\circ$  with some variation. (5) The optimum H-ion concn. was found to be at  $p_H = 6.5$ . (6) The action is retarded by various concns. of NaOH soln. and its action is entirely stopped at the concn.  $N/125$  to  $N/75$ . (7) Papain forms mainly polypeptides in its casein-splitting action and it has little or no ability to form amino acids. (8) The marked acceleration of HCN soln. upon the casein-splitting action of papain is due mainly to the undissocd. HCN, and not to  $H^+$  or  $CN^-$  ions.

F. I. NAKAMURA

Theory of passivity. IV. The relation between the specific passivity time and the concentration and nature of the electrolyte with iron. W. J. MÜLLER and O. LÖWY. *Techn. Hochschule, Wien. Monatsch.* 51, 73-85(1929); cf. *C. A.* 23, 2635.—In the formula  $t_p = B(i_0/F_0)^n$  (cf. *C. A.* 22, 4246),  $B$  is the sp. passivity time for c. d. = 1 amp. per sq. cm. For a small  $H_2SO_4$  concn.,  $B$  is small. With 2-3  $N$   $H_2SO_4$  the value is about 15 times that with  $1/18$   $N$  and then decreases with increasing concn. at 13  $N$  being about  $1/3$  of the value at 2-3  $N$ . The change in  $B$  at high  $H_2SO_4$  concn. is due to the decrease in soly. of  $FeSO_4$ . The sp. passivity time of  $N$   $H_2SO_4$  is 2.19 at  $20^\circ$  and 6.9 at  $40^\circ$ . For  $N$   $H_2SO_4$  half and fully satd. with  $FeSO_4$ ,  $B$  is resp. 1.04 and 1.7 at  $20^\circ$  and 1.04 and 2.3 at  $40^\circ$ . The first phase of the passivification of iron is followed by a coating with a layer of salt.

E. SCHOTTE

Circuit transmission and interference of activation waves in living tissues and in passive iron. RALPH S. LILLIE. *Science* 69, 305-8(1299).—When irritable tissue is stimulated the reaction never remains localized but tends automatically to spread in the form of a wave, often rapidly and to an indefinite distance, as in a nerve; and the tissue is always inert and unresponsive for a brief period after excitation. If the anatomical relations are such that the excitation wave can return to its starting point, as by passing around a continuous circular path, it may continue its motion indefinitely, provided the tissue has recovered sufficiently between successive circuits. Such circuit transmission is not normally found in the intact animal, but can be obtained



exptly., several instances of which are described. Trapped excitation waves of this kind may become a source of deranged coördination in organs whose normal activity depends on regular transmission in one direction. Cardiac fibrillation is probably an example of this. Two chief conditions for circuit transmission are: (1) The excitation wave must be of limited length, so that at any instant it occupies only a restricted portion of the circuit; and (2) its rate of movement must be relatively slow so that the time required for the wave front to travel the distance of the circuit (less the wave length itself) is greater than that occupied by the recovery process of the tissue. Circuit transmission of a similar kind has been obtained in passive iron wires in  $\text{HNO}_3$  as follows: A ring, 22 cm. in diam., of electrolytic or Armco Fe wire, 2 mm. in diam., is suspended by thin glass hooks in a circular trough 2 cm. in diam. in 76-80 vol.-%  $\text{HNO}_3$  (sp. gr. 1.42). The ends of the wire may be welded or hooked together. In the latter case a piece of Pt wire inserted at the junction prevents rythmical waves of activity from spreading along the wire in both directions. When the passive wire is held at one region with Pt-tipped forceps and is touched at a neighboring point with Zn, the activation wave thus started is blocked at the Pt while its progress in the other direction is unhindered. If the Pt is withdrawn before the circuit is completed an isolated activation wave is left in the wire; this continues in movement in a manner analogous to the trapped excitation waves in living tissues. Progress of the wave can be stopped by contact with Pt; the whole wire then becomes passive. The activation wave under these conditions is 12-15 cm. in length and its speed about 15 cm./sec. Any single region of the metallic surface passes through a cycle of chem. change lasting about 1 sec. consisting in a reduction and soln. of the passivating surface film, followed by its re-formation under the oxidizing influence of the acid and local elec. circuit. If the passive wire is touched with Zn at any point, 2 activation waves are started which travel in both directions; they meet on the opposite side of the ring and there extinguish one another, the whole wire becoming again passive. A similar interference of excitation waves in living tissue has long been known. Electrochem. interference of this type is a possibility in any reaction occurring at an interface under the influence of a local circuit. The fact that it is equally characteristic of activation waves in living tissues constitutes further evidence that the primary chem. reactions of excitation and transmission in protoplasm are surface reactions controlled by local biolec. circuits. From a consideration of the chem. aspects of the phenomenon it would appear that in both the living and the non-living systems the removal of the chemically reactive surface layer in which the essential process of activation occurs, depends on the formation of some oxidation product or products. The sp. nature of the chem. processes assocd. with excitation and transmission in living tissues, such as nerve, can be detd. only by special investigations on the metabolism of these tissues during rest and activity.

R. H. LOMBARD

**The reduction of tungsten by hydrogen.** G. A. MEERSON, Moscow Techn. School. *J. Russ. Phys.-Chem. Soc.* 60, 1217-28(1928).—Reduction of  $\text{WO}_3$  with moist  $\text{H}_2$  yields large crystals of W (cf. *C. A.* 16, 1530). The effect of  $\text{H}_2\text{O}$  on the size of crystals was studied. W from recrystd.  $\text{Na}_2\text{WO}_4$  was heated in a stream of moist  $\text{H}_2$  for several hrs. The crystals of the metal were then moistened with turpentine, spread on a slide to dry, and their size detd. under a microscope. Below  $1050^\circ$  there was no loss in wt. nor change in cryst. size. Above this temp. sublimation took place; some of the crystals increased from 2-4 to 6-8  $\mu$  in diam. The partial pressure of  $\text{H}_2$  corresponded to the formation of  $\text{WO}_2$ . Moist  $\text{H}_2$  and  $\text{WO}_3$  below  $800^\circ$  gave small crystals (1-4  $\mu$ ) of W or  $\text{WO}_2$ . Above  $850^\circ$   $\text{WO}_3$  volatilized and the crystals grew.  $\text{W}_2\text{O}_6$  apparently sublimates with  $\text{H}_2$  above  $900^\circ$ . The cryst. size of  $\text{WO}_3$  does not influence that of the resulting W.

B. SOYENKOFF

**Volumetric and thermic relations in the reaction  $\text{CH}_4 = \text{C} + 2\text{H}_2 + 20,540$  calories.** R. NITZSCHMANN. *Metallbörse* 18, 2025, 2081, 2136-7(1928).—A purely mathematical treatment.

H. M. SYMMES

**Mixed crystals, solutions and fusions in the system  $(\text{K}, \text{NH}_4)(\text{Cl}, \text{NO}_3)$ .** ERNST JÄNECKE. *Z. angew. Chem.* 42, 318(1929); cf. *C. A.* 23, 744.—An error in the original calcn. gave a false graph. The correct one is shown.

E. M. SYMMES

**Equilibrium between two liquid phases. V. Aniline-propionic acid-water.** E. ANGELESCU. *Bul. soc. chim. România* 10, 160-9(1928); cf. *C. A.* 22, 192.—The isotherms at  $0^\circ$  and  $20^\circ$  were detd. by the same technic as previously, and also the partition coeff. of propionic acid between the two liquid layers at  $30^\circ$ . The variation of equil. with temp. was studied by detg. the soly. curves at definite propionic acid concns. (24.56, 26.48, 28.55 and 30.16%). The curves show only upper crit. soln. temps.; therefore the existence of a lower crit. soln. temp. cannot be due to the hydrolysis of

in water is lactic, acetic and propionic acid. VI. *o*-Toluidine-propionic acid. *Ibid* 183-91.—The isotherms at 0° and 20° were detd. as previously, and also partition coeff. at 20° of the acid between the two liquid layers. Soly. curves w detd. at definite propionic acid concns. (30.61, 32.07 and 34.10%), the curves show upper crit. soln. temps. Solns. contg. about 20% acid also showed indications of lower crit. soln. temp., which could not be detd., as the mixt. crystd. at the low ten Propionic acid increases the soly. of *o*-toluidine more than AcOH. J. FLEISCHER

The ternary system: mercuric chloride-mercuric iodide-water. RUTH SUGG Univ. of Melbourne. *J. Chem. Soc.* 1929, 488-91. —The system was examd. at 25° and 70°. Suitable mixts. were heated to 100°, filtered, sealed and brought to eq Solid and soln. were weighed and analyzed. The two salts are mutually sol., there is no evidence of compd. formation. GERALD M. PERRY

The system aluminum nitrate-potassium nitrate-water between 0° and 60°. G. MALQUORI. Reale Univ., Roma. *Gazz. chim. ital.* 58, 781-91(1928). —In continuation of earlier expts. (cf. *C. A.* 23, 1561), data were obtained with which the peritectic thermic diagram of the system  $\text{Al}(\text{NO}_3)_3$ - $\text{KNO}_3$ - $\text{HNO}_3$ - $\text{H}_2\text{O}$  could be constructed, and from this the conditions of fractional crystn. of the reaction liquor from the attack of leucite by  $\text{HNO}_3$  by the Blanc process could be defined. To construct this diagram, data on the ternary systems  $\text{Al}(\text{NO}_3)_3$ - $\text{KNO}_3$ - $\text{H}_2\text{O}$ ,  $\text{KNO}_3$ - $\text{HNO}_3$ - $\text{H}_2\text{O}$  and  $\text{Al}(\text{NO}_3)_3$ - $\text{HNO}_3$ - $\text{H}_2\text{O}$  must be known. The isotherms of the 1st at 0°, 25°, 40° and 60° and of the 2nd at 25°, 40° and 60° have already been obtained (cf. *C. A.* 21, 2108; 23, 757), besides a few other scattered data. The data which were lacking were, therefore, obtained by the same method used in the previous work. To fix the points of the quaternary isotherms, the solns. corresponding to the triple points of each ternary system were employed, adding the 4th components to obtain the satd. acid soln. of the 3 salts. The results are given in complete form in tables and 3-dimensional diagrams. In the Blanc process, the whole process of fractional crystn. is effected in the space situated to the right of the surfaces of coexistence of  $\text{KNO}_3$  and  $\text{Al}(\text{NO}_3)_3$ ,  $6\text{H}_2\text{O}$ ,  $\text{Al}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$  and  $\text{Al}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$ , and with the low soly. of  $\text{Al}(\text{NO}_3)_3$  and the great soly. of  $\text{KNO}_3$  in concd.  $\text{HNO}_3$ , the closer to the  $\text{KNO}_3$ - $\text{HNO}_3$  face and particularly to the curve representing the soly. of  $\text{KNO}_3$  in pure  $\text{HNO}_3$ , the more complete is the sepn. of  $\text{KNO}_3$  and  $\text{Al}(\text{NO}_3)_3$ . Because of the high acidity of the solns. in this zone,  $\text{Al}(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}$  seps.; this is of great importance, for this salt decomp. at 140° to a basic salt which decomp. in turn at 200° to  $\text{Al}_2\text{O}_3$ . C. C. DAVIS

Energies of dissociation of cadmium and zinc molecules. J. G. WINANS. *Nature* 123, 279(1929). —From spectroscopic data W. finds the heats of dissoen. of  $\text{Cd}_2$  and  $\text{Zn}_2$  to be 0.2 and 0.246 v., resp. GEORGE GLOCKLER

The dissociation pressure of vanadium pentoxide. E. F. MILAN. *J. Phys. Chem.* 33, 498-508(1929). —Pure  $\text{V}_2\text{O}_5$  was prepd. from ammonium vanadate and its dissoen. pressure was measured over the temp. range 700-1125°.  $\text{V}_2\text{O}_5$  dissociates into  $\text{V}_2\text{O}_4$  and  $\text{O}_2$  at temps. only slightly above its m. p. Small amts. of  $\text{V}_2\text{O}_4$  have an enormous effect on dissoen. pressures. Pressure-temp., pressure-compn. and temp.-compn. diagrams are plotted. M. McMAHON

The heat of dissociation of nitrogen. JOSEPH KAPLAN. Univ. Cal. *Proc. Natl. Acad. Sci.* 15, 226-9(1929). —The heat of dissoen. of  $\text{N}_2$  is calcd. to be 9.0 abs. volt-electrons. J. H. PERRY

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### 3—SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

S. C. LIND

An atomic model for the chemist. X. FLORENCE LANGWORTHY. *Chem. News* **138**, 225-7(1929); cf. *C. A.* **22**, 3826. E. H.

The distribution of electrons in atoms. I. M. ALEXANDER. Univ. of Cincinnati. *Phil. Mag.* [7], **7**, 517-22(1929).—A. proposes a distribution of electrons in the sub-levels of the atoms on the basis of the idea that there is an increase in the potential necessary to remove successive electrons in a given sub-level. Whenever a decrease in the potential is found a new sub-level has started. A table is presented showing the distribution of electrons for the various electron levels in the atoms of a no. of the elements, based on Bohr's general scheme and A.'s proposal. L. H. REYERSON

Paramagnetism and structure of combined atoms. B. CABRERA. *Anales soc. españ. fis. quim.* **27**, 73-107(1929).—When passing from simple systems constituted of free atoms to more complex systems represented by mols. it does not suffice to renounce the idea of rigidity of atoms. Experience so far shows that paramagnetism owes its existence, in the interior of the atom, to imperfectly satd. electronic configurations. According to quantum mechanics these configurations have a definite magnetic moment, whose natural unit is the Bohr magneton. By the Langevin formula, whose theoretical validity has been recognized, exptl. values are obtained which contradict theory, but which on the contrary confirm the existence of the Weiss magneton, which up to the present time has not had a satisfactory theoretical interpretation. The problem suggests that the Weiss magneton denotes the existence of a new principle which regulates the at. configurations when they combine to form mols. It is almost certain that on this same principle depends the problem of chem. valence, the actual interpretation of which is simple. The at. linkage is by a kind of assemblage of their superficial layers. It is incorrect to speak of valence of a single atom. The general nature of certain facts is explained by the analogies in the structure of atoms, which has been translated into the periodic system, and by the existence of the above principle. Study of paramagnetism is assuming a greater importance. In comparing the exptl. and theoretical magnetic moments it can be appreciated to what point the organization of atoms is modified by chem. bonds. The very close value of the 2 moments in the rare earths proves that the deformation produced is not profound, in spite of the fact that it is very intense on the surface of Fe, Pd and Pt. The inorg. complexes are of special

interest. The theory established by Sidgwick, which assumes the creation of new layers or electronic stages in the at. nucleus of the complex, offers many difficulties, particularly from the magnetic point of view. The influence of the surroundings of an atom upon it is represented by the const.  $\Delta$  of the Curie-Weiss law. In this const. there are no changes of value of magnetic moment, but only the probability which corresponds to each possible position on the axis of said moment. When the variation is considered as a function of the 2 factors it can be seen clearly that the changes are due to the paramagnetic atom and of the mol. in which it lies. A true interpretation of the phenomenon lies in the future.

E. M. SYMMES

**Electronic symmetry and polyatomic moles.** P. VINASSA. *Atti accad. Lincei* [6], 7, 975-9(1928).—In representing the electronic structure of atoms,



Muller gives  $F_2$  and  $Cl_2$  structures  $\cdot\ddot{F}:\ddot{F}\cdot$  (Cl the same), with 2 electrons in common and giving a perfect equil. of the type with 8 electrons, like the noble gases. If this were the case, then  $N_2$  should have the structure  $\cdot\ddot{N}:\ddot{N}\cdot$  which is not the 8 towards which mols. are supposed to tend. Con-

clusion: A mol. such as  $F_2$  does not have 2 electrons in common, but rather there is an internal couple of electrons common to the 2 nuclei as shown.

A. W. CONTIERI

**Ionic arrangement.** H. J. KIST. *Rec. trav. chim.* 48, 310-1(1929).—K. discusses, on the basis of Kossel's theory, the space distribution of 2, 3, 4, 6, 8 equal neg. ions surrounding a pos. nucleus. He calculates the potential for alternative arrangements of 8 ions, and finds the more probable arrangement to be, not a cube, but a tetragonal trapezohedron.

LOUIS WALDBAUER

**Magneto-optical determination of the intensities of the first two lines of the main potassium series, and of the vapor pressure of potassium.** J. WEINER. Univ. Tubingen. *Ann. Physik* [5], 1, 361-99(1929), cf. C. A. 23, 36. The abs. no. of dispersing electrons in non-luminescent K vapor was detd. This no. is characteristic for the intensity of the absorption lines. The intensity ratio for the first and second doublets is 2:1 ( $\pm 4\%$ ). Between 150° and 375°, it is independent of the temp. The ratio of the red and violet lines is 98.5:1 ( $\pm 5\%$ ) between 250° and 295°. The vapor pressure may be represented by the equation  $\log p/T = - (20590/455.1 T) - 10.133$ , on the assumption that the no. of dispersing electrons involved is equal to the total no. of atoms in the vapor state.

FRANK URBAN

**Compressibility of crystals and exponent of repulsive force between atoms.** N. v. RASHEVSKY. *Nature* 123, 448-9(1929).—It is well known that a real crystal has many submicroscopic cracks between the large no. of perfect crystals of which it is made up. The presence of the cracks is made responsible for the tremendous difference between the exptl. and calcd. values of the tensile strength. As is well known the calcd. value is several hundred times larger. R. now claims that the compressibility of real crystals may be due only to the closer packing of the small perfect crystals, and that a perfect crystal may have no compressibility at all. The exponent in the force equation of repulsion as calcd. by Born (*Atom Theorie des festen Zustands*, pp. 734-5) may really be much higher than 9, which is calcd. from ordinary compressibility. GEORGE GLOCKLER

**The coloration of deformed rock salt crystals by radium rays.** ADOLF SMEKAL. *Anz. Akad. Wiss. Wien* 64, 22-4(1927).—The coloration of rock salt crystals (bent under water) by means of radiations from Ra was more intense for the plasticized parts of the crystals, and persisted longer in these parts. This was due to the appreciable increase in the no. of places where the space lattice had been "loosened." I. J. PATTON

**Further investigations on deformed rock salt crystals.** ADOLF SMEKAL. *Anz. Akad. Wiss. Wien* 64, 46-8(1927); cf. preceding abstract. When irradiated crystals were bent, and subsequently exposed to light, the plasticized parts of the crystals decolorized more rapidly than the elastically strained parts. This proves S.'s hypothesis (C. A. 20, 1385) that the "slipping" of deformable crystals takes place at the "loosening" points, and that new centers of coloration are formed by the slipping process.

I. J. PATTON

**The one-dimensional relativistic Kepler problem in wave mechanics.** V. S. VRKIJAN. *Z. Physik* 54, 133-6(1929).—It is shown that the one-dimensional relativistic Kepler problem when treated by the methods of wave mechanics give energy term values as calcd. by Bohr and Sommerfeld in 1915.

GEORGE GLOCKLER

**Wave mechanics of an alkali metal atom in an electric field.** F. RABETTI. *Atti accad. Lincei* [6], 7, 1010-6(1928).—A mathematical paper in which it is shown that the dielectric const. of vapor of alkali metal can be calcd. by means of the expression  $E$

$= 1 + 4\pi NP = 1 + 3.5 \cdot 10^{-23} N$ , where  $P$  is the polarizability and  $N$  represents the density of the atom. Precise values for dielectric const. of these vapors have not been detd., but the above expression is at least of the correct order of magnitude.

A. W. CONTIERI

**Breadth of some lines of the mercury spectrum.** A. CARRELLI. *Atti accad. Lincei* [6], 7, 1013-8(1928).—The width of some lines in the Hg spectrum has been measured by the interferometer method of Buisson and Fabry. They vary from a min. of 0.013 Å. U. to the max. of 0.05 Å. U.

A. W. CONTIERI

**Synthesis of the elements.** G. I. POKROVSKII. *Z. Physik* 54, 123-32(1929).—The question of the synthesis of a few elements from protons is discussed. The energies and frequencies of radiation emitted during such synthesis are considered. It is thought that the frequencies emitted are whole no. multiples of a fundamental frequency ( $\lambda_0 = 1.33 \times 10^{-13}$  cm.) which depends upon the structure of time. The frequencies of the cosmic rays recently studied by Millikan and Cameron (*C. A.* 22, 3093) are compared with the theoretical frequencies and fair agreement is claimed. P.'s speculation lead to the notion that the abs. value of the gravitational potential cannot be greater than  $c^2$  anywhere ( $c$  = velocity of light). The energy of a proton cannot then be greater than  $c^2 H$  ( $H$  = mass of proton). On the other hand the max. energy residing in a proton must be  $(hc)/\lambda_0$  ( $\lambda_0$  = fundamental wave length); from which  $H = 1.667 \times 10^{-24}$  g. as compared with  $1.662 \times 10^{-24}$  g.

GEORGE GLOCKLER

**Atomic disintegration. Ionization method for the detection of corpuscular rays.** A. WEGERICH. *Z. Physik* 53, 729-46(1929).—The construction and behavior of an ionization cell filled with a rare gas are described. It was used in expts. on at. disintegration with Ru as a source of  $\alpha$  particles. H atoms were shown to be products of disintegration in C, Al, Fe, Cu and Zn. The results are in substantial agreement with the Vienna expts. Cf. *C. A.* 21, 2219.

GEORGE GLOCKLER

**H-particles made visible.** HANS PETTERS-ON. *J. Sci. Instruments* 6, 130-2(1929). E. H.

**Range fluctuations of  $\alpha$ -rays.** P. PREISLER. *Z. Physik* 53, 857-86(1929).—The fluctuations in range of the  $\alpha$ -particles from Th C in air, mica and Bi are studied by the aid of a Geiger counter. The dispersion in range is considerably larger than can be calculated with the present theories. However, it is shown that the present measurements and other known irregularities of the at. stopping powers can be explained in a satisfactory manner if it is assumed that not only no. and position of the electrons of a scattering substance have a bearing upon its stopping power, but that the speed of electrons within the atoms has also an influence upon its behavior as a scatterer for  $\alpha$ -rays.

GEORGE GLOCKLER

**$\alpha$ -Ray disintegration.** D. ENSKOG. *Z. Physik* 53, 639-45(1929); *C. A.* 23, 764.-It is assumed that the constituents of the nucleus have magnetic moments and that an  $\alpha$ -particle changes from 2 magnetons to one during the process of at. disintegration. This quantum change needs additional energy for the emission of the fastest  $\alpha$ -particles known, but can proceed with energy liberation in the slower  $\alpha$ -particles.

GEORGE GLOCKLER

**Permeability test with radioactive indicators.** K. LARK-HOROVITZ. *Purdue Univ. Nature* 123, 277(1929).—By using radioactive indicators for testing the permeability of single cells of *Valonia macrophysa* it was found that  $Pb^{++}$  ions do not enter the sap of living cells even if the cells are kept for several months in  $Pb(NO_3)_2$  soln.  $Pb^{++}$  ions enter readily the sap of dead cells. Ru, being a rare gas, is after 1 hr. evenly distributed between the cell sap of living cells and the surrounding sea water. G. G.

**Physical methods in chemical laboratories. IX. The use of radioelements as indicators.** FRITZ PANETH. *Univ. Berlin. Z. angew. Chem.* 42, 189-92(1929).

MARIE FARNSWORTH

**Researches on the radioactivity of wines.** A. NODON AND G. CUVIER. *Compt. rend.* 187, 725-7(1928).—Measurements were made with a Nodon electrometer. The radioactivity varies from year to year, and also depends on the manner of prepn. The white wines differ more from year to year than do the red wines. The radioactivity varies from 0.006 to 0.030 microcuries per l.

L. D. ROBERTS

**The gamma rays of potassium.** A. KARSTEN-SALMONY. *Chem.-Ztg.* 53, 137(1929).—Hypothetical.

MARIE FARNSWORTH

**Mass spectrum of uranium lead and the atomic weight of protactinium.** F. W. ASTON. *Nature* 123, 313(1929).— $Pb(CH_3)_4$  prepd. by Piggot (*C. A.* 22, 2511) was ed. The Pb was U Pb from Norwegian broeggerite. The mass spectrum consists of a strong line at 206, a faint one at 207 and a still fainter one at 208. The impossibility of eliminating Hg limits the search for lighter isotopes but there is not the least

indication of 203 or 205. The mean at. wt. deduced is 206.19, rather higher than that detd. for other samples of U Pb by chem. methods. The line 207 is of peculiar significance. It cannot be due to the presence of Pb as an impurity for in ordinary Pb 208 is about twice as strong as 207; neither can it be the product of Ra or Th. It is difficult to resist the conclusion that it is the end-product of the only other known disintegration family, that of Ac. If this is so it settles the mass numbers of all the members of this series, that of Pa being 231. Extrapolation of the packing fraction curve suggests an at. wt. of 231.08 for O = 16.

GEORGE GLOCKLER

**Origin of actinium and age of the earth.** E. RUTHERFORD. *Nature* **123**, 313-4 (1929).—Speculation regarding the isotope 207 of Pb due to actinium Pb (see preceding abstr.). The probable mass of the new isotope, which R. calls for convenience *actino-uranium*, is discussed. It seems simplest to suppose that its mass is 235 and that it undergoes first an  $\alpha$  and then a  $\beta$  transformation into protactinium. Other possibilities are mentioned. An est. of the period of transformation of the new isotope of U can be deduced on certain probable assumptions. If the half value period of transformation of U is  $4.5 \times 10^9$  years, then the period for Ac U is  $4.2 \times 10^8$  years. If the U in the earth had its origin in the sun and if it is supposed that the production of U ceased as soon as the earth sepd. from the sun it follows that the earth cannot be older than  $3.4 \times 10^9$  years.

GEORGE GLOCKLER

**The problem of the interaction of radiation and the electron.** R. D. KLEEMAN. *Science* **69**, 380-1 (1929). The electron possesses the following properties: (a) It may possess internal energy apart from kinetic energy, and (b) it can radiate in 2 entirely different ways: (1) while undergoing accelerations, and (2), on emitting a part of its internal energy as radiation. (c) The surrounding radiation gradually slows down its motion, which is attended by an increase in internal energy. (d) The force acting upon it in an elec. field depends on its internal energy. These deductions have been proved thermodynamically. The inherent difficulties of the Bohr atom and its antagonism to the Lewis-Langmuir atom completely disappear.

J. H. PERRY

**Thermodynamical properties of the electron, and atomic theory.** R. D. KLEEMAN. *Phil. Mag.* [7], **7**, 493-504 (1929). K. applies the ideas previously given (cf. preceding abstr.) to the deduction of the equation of state of an electron gas. He claims that the velocity of an electron in an electronic gas decreases gradually between 2 consecutive collisions and increases during a collision. K. further considers the effect of radiation surrounding an electron on its kinetic energy and its internal energy and as a result finds that the internal energy of an electron in an electron gas increases between 2 consecutive collisions and decreases during a collision. The elec. field surrounding an electron may undergo an increase, during which it radiates some of its internal energy into space. The equil. between the emission and absorption by electrons in electron gas is considered. From this deduction K. considers the formation of atoms and applies the ideas to the Bohr-Lewis-Langmuir atom.

L. H. REYERSON

**Atmospheric electricity. LXX. A study of the fluctuation of the cosmic ultra-gamma rays on Sonnblick (3100 m.) and in the Tyrol.** VICTOR F. HESS AND OSKAR MATHIAS. *Sitzb. Akad. Wiss. Wien, Abt. IIa*, **137**, 327-40 (1928). In the summer and autumn of 1927, measurements of cosmic rays were made at 4 different sea levels: Graz (380 m.), Lans in Tyrol (890 m.), Patscherkofel (1910 m.) and the Sonnblick (3106 m.), a Kolhorster app. (C. A. **21**, 1054) protected by 5 cm. of Fe being used. In all 4 places there was an irregular small fluctuation of the ionization; an increase in the amplitude of the fluctuation with the height was not observed. There was no definite evidence of a daily fluctuation as found by Kolhorster and Buttner. Expts. on a glacier on Sonnblick gave  $2.07 \times 10^{-3}$  sq. cm. g. as the mean mass absorption coeff. of the cosmic rays between 0 and 10 m. of ice and a definite hardening of the rays with increasing thickness in agreement with others. Expts. with and without the covering plate of Fe in Graz and Sonnblick gave mass absorption coeffs. in Fe  $\mu/\rho = 4.5 \times 10^{-3}$  and  $8 \times 10^{-3}$  sq. cm./g., resp.; in air the value was  $3.9 \times 10^{-3}$  sq. cm./g. The differences can be explained by scattering and the relative preponderance of the weaker ray component in the higher place.

MARIE FARNSWORTH

**Electron and ion currents in gases at low pressure.** G. SPIVAK. *Z. Physik* **53**, 805-39 (1929).—Starting with the fundamental equations of electrostatics and the condition of stability G. considers the reactions that take place between 2 plane parallel electrodes when an ionized gas is present at low pressure (0.001 mm. Hg). The ionization is brought about by electron impact. The electrons come from a hot cathode. The influence of the initial velocity distribution (Maxwellian due to hot filament) of the electrons is studied in its effect upon the ionization produced in the gas. Expressions are obtained which are the analogs for the case at hand to the Child-Langmuir

law. While the latter applies to the case of an electron stream in vacuum, the present equations apply where there are charges of 2 kinds carrying current between the electrodes. The potential distribution in the region between the 2 electrodes is detd. Cf. *C. A.* 22, 2319.

GEORGE GLOCKLER

**A criticism of the electron theory of metals.** H. MONTEAGLE BARLOW. *Phil. Mag.* [7], 7, 459-70(1929).—B. criticizes Sommerfeld's attempt to reinstate the electron theory of metallic conduction on the basis of a degenerate electron gas. B. cites various examples where the electron gas hypothesis is unsatisfactory and then carries out a series of expts. using 3 different methods. The 3 methods of investigation are (1) expts. on the elec. effect of accelerating a conductor, (2) expts. on the total displacement of electricity in an insulated conductor subjected to an induced e. m. f. and 131 expts. on the resistance of a charged conductor. B. claims that the results of these expts. prove that the assembly of electrons in the interior of a conductor behaves like a perfectly incompressible fluid and in no way resembles a gas. The fundamental hypothesis of the Sommerfeld theory of conduction cannot, therefore, be maintained.

L. H. REYERSON

**Electrons that are "pulled out" from metals.** EDWIN H. HALL. Harvard Univ. *Proc. Nat. Acad. Sci.* 15, 241-51(1929); cf. *C. A.* 17, 22-19, 1371; 21, 2416. H. upholds his former ideas, that there are 2 kinds of electrons in metals, differing in the mean kinetic and the mean potential energy. On the basis of data provided by Colpitts (*C. A.* 23, 333) he calculates that there is one thermion (those electrons that share in the energy of thermal agitation) for every  $10^6$  atoms. From data by Eyring and Millikan (*C. A.* 22, 2318) he concludes that valence (or "free") electron conduction is effected by the intermittent movements of trains of electrons, each train extending, perhaps, over many atoms. The essential requirements for the movement of a train are a potential gradient and a vacant space, i. e., an ion at the forward end of the train.

LOUIS WALDBAUER

**Production of the normal cathode drop.** MAX STEENBECK. Berlin-Siemensstadt. *Z. Physik* 53, 192-7(1929).—The postulate of Compton and Morse (*C. A.* 22, 3350) that in a normal stationary luminous discharge there exists such a potential distribution that an electron leaving the cathode will make a max. no. of collisions in the gas is discussed. The change of the Townsend discharge to the normal luminous discharge is caused by the concn. of the discharge in a region of high space charge. The c. d. increases until the most favorable potential distribution for ionization has been reached. The change from Townsend to luminous discharge shows many analogous features to the change from luminous to arc discharge.

GEORGE GLOCKLER

**Exponential yield of positive ions in argon.** KATHARINE B. BLODGETT. *Proc. Nat. Acad. Sci.* 15, 237-4(1929).—B. studied A under various pressures, using a W hot cathode and a Mo anode, the app. being so arranged that the temp. of the cathode could be measured with a pyrometer. At high pressures, the current rises so rapidly that at 5-cm. pressure and 90 v., the total arc current is 13 times the satn. electron emission from the filament. This can be explained on the basis of the pos. ion sheath surrounding the cathode (*C. A.* 19, 1531 *et seq.*). In the A tube the sheath was known to be of the order of 0.5 mm. When the mean free path of the electron is sufficiently short compared to the sheath thickness, the electron can make several ionizing collisions before reaching the boundary of the sheath, and Townsend ionization by collision occurs. If the field is sufficient for this process to be repeated  $n$  times,  $(2^n - 1)$  pos. ions will be formed. If the sheath is thin, the electron merely passes through. Thus the magnitude of the pos. ion current is, to a considerable extent, detd. by the relation of the sheath thickness to the distance which an electron must travel from the cathode before it ionizes.

LOUIS WALDBAUER

**Possible role of diffusion by electrons in the propagation of short waves.** PONTE AND Y. ROCARD. *Compt. rend.* 187, 942-3(1928).—The diffusion of short waves in the H layer should be analogous to that of light in a perfect gas. Calcn. shows the diffusion too weak to be observed. For reception the calcd. result must be multiplied by  $10^4$ . The H layer should not be like a gas of electrons. It is constituted of small relatively dense clouds, with diams. a little below  $\lambda$ . The problem is considered analogous to x-rays with  $h = 360$  km.,  $\lambda = 14$  m., conforming to expt. Diffusion seems to account for the facts.

L. D. ROBERTS

**Laws of photoelectric emission.** R. SUHRMANN. *Z. Physik* 54, 99-107(1929).—There are 2 ways to det. the photoelec. emission of a metal surface: First, measure the current  $i$  due to photoelectrons produced by black body radiation of temp.  $T$  falling upon the surface. Second, measure the photoelec. sensitivity curve  $f(\nu)$  as a function of the frequency  $\nu$ . The ordinates are multiplied by  $E(\nu, T)$  from Planck's radiation

formula and the total emission curve is thereby obtained, from which the total photoelec. current  $i$  may be deduced. The second method is the more accurate. The const.  $r$  in Richardson's equation for photoelec. total emission  $i = M.T.e^{-r/T}$  can be calcd.  $M$  and  $n$  are const. From a knowledge of  $r$ ,  $n$  can be detd. and then the long wave length limit can be found. This limit is found to be displaced toward the violet when compared with the exptl. limits.

GEORGE GLOCKLER

**The magnetic moment of the lithium atom.** O. STERN. *Z. Physik* **54**, 158 (1929).—Stern replies to D. A. Jackson (*C. A.* **23**, 2359) regarding the work of J. B. Taylor (*C. A.* **23**, 1568). J. assumes that the magnetic moment of the Li kernel must be  $1/2000$  of the value of a Bohr magneton. However, if one wishes to explain the fine structure of Li by assuring an appropriate value for the magnetic moment of the kernel then it is seen that nearly a whole magneton is necessary to explain the situation. Taylor's work has therefore definite basis and justification and Jackson's remark is beside the point.

GEORGE GLOCKLER

**Anomalous magnetic rotation of excited neon.** R. N. JONES. Drexel Inst., Phila. *Nature* **123**, 278(1929).—Values of the dispersion const. detd. from the anomalous dispersion of excited Ne given formerly (*C. A.* **23**, 764) are in error. The factor  $\pi/180$  was omitted from equation  $\alpha$ . This error is now corrected and a table of new values given.

GEORGE GLOCKLER

**Crystallographic optics of x-rays.** W. EHRENBERG, P. P. EWALD AND H. MARK. *Z. Krist.* **66**, 547-84(1928).

E. C. M.

**Soft x-rays of the lighter elements.** B. B. RAY AND R. C. MAJUMDAR. *Z. Physik* **53**, 646-57(1929).—Two electron jumps are assumed to be responsible for some critical potentials in the soft x-ray region (40-200  $\mu$ ). The monochromatic radiation sent out by the atom would have a frequency equal to the sum of the frequencies of the electron jumps when occurring singly. The elements Fe, Co, Ni and Cu are studied. Some of the crit. potentials of Mn and Cr can also be treated in the manner outlined.

GEORGE GLOCKLER

**Measurement of the size of crystal particles by x-rays.** A. L. PATTERSON. *Z. Krist.* **66**, 637-50(1928).

E. C. M.

**Precision measurements of x-ray reflection from crystal powders. The lattice constants of zinc carbonate, manganese carbonate and cadmium oxide.** J. BRENTANO AND J. ADAMSON. Manchester Univ. *Phil. Mag.* **17**, 7, 507-17(1929).—Exact detus of the spacing and of the rhombohedral angle of  $ZnCO_3$  and  $MnCO_3$  were made from x-ray measurements on cryst. powders. The results were used to verify the calcd. lattice const. of the carbonate series. With the values of the authors it was found that calcns. in which a fixed parameter for the  $CO_3$  group was assumed gave good approxn. but do not quite agree with the observed data. This indicates that terms characteristic of the various elements must be considered. The method as previously described (cf. *C. A.* **21**, 1384) gives uniformly spaced lines of const. width. A standardizing substance of great vol. absorption was introduced and the lattice const. of  $CdO$  was detd. so that it could be used as a standard.

L. H. REYERSON

**Newer measurements in the L-series of x-ray spectra.** H. BRAUNS. *Z. wiss. Phot.* **25**, 325-44(1928).—The various methods of measuring the L series in x-ray spectra (those of Bragg, Siegbahn and Seeman) are critically discussed. The differences between abs. and relative methods of measurement are pointed out and the errors involved in each method are reviewed. Several examples are included to illustrate how wave lengths are measured.

M. E. RUSSELL

**Polarization and Compton effect.** P. LUKIPSEK. *Z. Physik* **53**, 792-804(1929); cf. *C. A.* **22**, 4060.—The known properties of the Compton effect lead to the notion that the relative probability of the Compton scattering as compared with classical scattering increases with decreasing wave length. Hard x rays scattered on light elements should show mostly Compton's scattering. Expts. on paraffin show that the wave length of x-rays ( $\lambda = 0.1$  A. U.) scattered at right angles increases by 0.022 A. U. A purely Compton scattering should produce a wave length change of 0.0243 A. U. This agreement shows that the scattering is actually mostly of the Compton type. Study of the scattered (tertiary) radiation showed the same to be polarized as demanded by classical theory. It follows that the intensity of the Compton radiation in a given direction depends upon the projection of the elec. vector in that direction. The Compton electrons must have a favored direction if produced by linearly polarized rays which lies in the plane which contains the magnetic vector of the incident rays. This phenomenon is known in a qual. way. Quantitatively the problem could be solved by studying the Compton effect with hard, linearly polarized  $\gamma$ -rays in a Wilson cloud chamber.

GEORGE GLOCKLER



**Series in the arc spectrum of bromine.** T. L. DE BRUIN AND C. C. KIESS. Bur. of Standards. *Science* 69, 360-1(1929).—The arc spectrum of Br has been photographed out to 9300 Å. U. in the infra-red. These new lines together with those observed in the Schumann region by Turner have permitted the detection of terms in the doublet and quartet systems which characterize the spectrum emitted by a neutral halogen atom. Certain of these terms form Rydberg series and are used to calc. an ionization potential of 12.2 v. for the neutral Br atom. C. C. KIESS

**The spectrum of hydrogen. The bands analogous to the parhelium line spectrum.** I. O. W. RICHARDSON AND P. M. DAVIDSON. *Proc. Roy. Soc. (London)* A123, 54-80 (1929).—A detailed analysis is given of 2 band systems in the  $H_2$  spectrum which are analogous to the singlet system of He. Most of the strong lines of the secondary H spectrum from 8902 Å. U. in the infra-red to 3394 Å. U. in the violet are included in these bands. The final states of all these bands belong to the electronic state  $2^1S$ . The first system of 4 bands is designated as  $3^1B - 2^1S$ , each band consisting of only one single Q branch, and the lines of each band alternating in intensity and exhibiting no Zeeman effect. The second system of bands is designated as  $3^1C - 2^1S$ . Each band of this system consists of a strong R branch and a weak P branch, the individual lines showing Zeeman effect. From the analysis of the bands it is shown that the lower states are single, with the rotational terms given by  $Bm^2 - Cm^4$  where  $m = 1/2, 3/2, 5/2, \dots$ . The initial states designated as  $1^1B$  and  $1^1C$  have the electronic quantum no. 3. They are neither typical  $3^1S$  nor  $3^1P$  levels but have properties which suggest both types of levels. C. C. KIESS

**Patterns and Paschen-Back analog in the Stark effect for neon.** J. S. FOSTER AND W. ROWLES. McGill Univ. *Proc. Roy. Soc. (London)* A123, 80-103(1929).—Measurements of the Stark effect are presented for about 150 Ne lines. The source was a modified Lo Surdo discharge tube operated by d. c. at high potential. Observations were made at field strengths of 70,600 and 100,000 v/cm. The patterns observed for the sharp, diffuse and combination lines are never more complex, and in most cases are identical with those observed for singlet system lines of He. Many of the diffuse and combination lines present a simple pattern consisting of but 1 parallel and 1 normal component. These observations show that in high fields what may be termed the Paschen-Back analog in the Stark effect appears and is characterized by 2 main features: (1) the normal fine structure of a complex term fuses to form a characteristic Stark pattern which lacks symmetry; (2) the group pattern presented by the groups of combination lines brought out by the field are symmetrical. C. C. KIESS

**Stark effect in a violet region of the secondary spectrum of hydrogen.** J. K. L. MACDONALD. McGill Univ. *Proc. Roy. Soc. (London)* A123, 103-7(1929).—Twenty lines of  $H_2$  between 3980 and 4080 Å. U. have been examd. for Stark effect. A table presents the measured displacements of the normal and parallel components for a field of 95 kv/cm. Lines in the violet half of this region are displaced toward the violet while those in the long wave half are displaced redward. Five of the lines exhibit a very close structure not previously reported. C. C. KIESS

**Relative intensities of Stark components in hydrogen.** J. STUART FOSTER AND LAURA CHALK. McGill Univ. *Proc. Roy. Soc. (London)* A123, 108-18(1929).—A method of photographic photometry was used to det. the relative intensities of the Stark effect components of  $H_\alpha$ ,  $H_\beta$ ,  $H_\gamma$  and  $H_\delta$ . The sources were modified forms of Lo Surdo tubes, the advantages and disadvantages of which are described. The observed results are found to be in excellent agreement with those calcd. by Schrödinger on the basis of the wave-mech. theory. C. C. KIESS

**Polarization of scattered light quanta.** C. V. RAMAN AND K. S. KRISHNAN. *Nature* 122, 169(1928).—The recent discovery of a new type of light scattering with altered frequency makes it of importance to ascertain whether a light quantum which is scattered with diminished energy is less perfectly polarized than in the ordinary case. A brief report is made of an investigation of the question. FRANK V. JOHNSON, JR.

**Light scattered by a potassium carbonate solution.** M. LEONTOVICH. *Z. Physik* 54, 155-7(1929).—A modified scattered line is found in the scattered light of the soln. of  $K_2CO_3$  which corresponds to the infra-red frequency of 9.26  $\mu$ . GEORGE GLOCKLER

**Intensity measurements in the helium spectrum.** M. G. PETERI AND W. ELENBAAS. *Z. Physik* 54, 92-8(1929).—The intensity of He lines is measured as a function of pressure and electron velocity and it is found that the selection rules that hold for radiation also hold for electron excitation although not as rigidly. G. G.

**Interference fringes in light rays passing over a liquid surface.** Z. VALKOVA. *Z. Physik* 53, 708-18(1929).—When a parallel ray passes over a liquid surface there is produced a double system of interference fringes upon stirring the liquid. Both these

systems of fringes disappear in a period of from 1 to 3 mins. after the disturbance but they can be reproduced upon further agitation of the surface. The situation can be understood if it is assumed that there exists at a certain distance from the surface a layer or region of condensed droplets or particles which is being destroyed above and below by diffusion.

GEORGE GLOCKLER

**Simple relations between more intense and higher radiations of chemical elements in the bright atmosphere of the sun.** H. DESLANDRES. *Compt. rend.* **188**, 20-4(1929); cf. *C. A.* **18**, 2840; **19**, 606. The simple relation (ultimate radiations of atoms, last to disappear in mixts., are in general multiples of a same elementary frequency = 1062.5) announced in 1924 by D. for 20 simple substances has been verified. It is especially true with He and of simple substances of which the at. wt. is a multiple of 4. Study has been made of spectra of substances illuminated in the lab. and of large masses, of gas observed in celestial space, especially the chromosphere. The results are given in a table.

L. D. ROBERTS

**Molecular constants of hydrogen.** H. H. HYMAN AND R. T. BIRGE. *Nature* **123**, 277-8(1929). The B-A system of  $H_2$  mol. spectrum has been photographed with a ten-foot vacuum spectrograph and the photograph shows clearly that the bands of this system consist of P and R branches only. The lines show clearly the alternating intensity expected from a symmetrical mol. on the basis of the old quantum mechanics. The zero vibrational level of the B state is  $B_0 = 19.46 \pm 0.04$  giving  $b_0 = 1.423 \pm 0.003 \times 10^{-49}$  g. sq. cm.

GEORGE GLOCKLER

**Sulfur in gaseous nebulae.** I. S. BOWEN. *Nature* **123**, 150(1929). The analysis of the S II spectrum by Ingram (*C. A.* **23**, 36) makes it possible to identify certain S lines with lines in gaseous nebulae. It may be noted that all the elements thus far found in the nebulae—namely, H, O, He, C, N, S—are gases or have stable compds. that are gases at low temps.

GEORGE GLOCKLER

**Helium lines in stellar spectra.** OTTO STRUVE. *Nature* **122**, 994-5(1928). The intensity of He lines from various stars is estd. and compared with results from lab. expts. (cf. Ornstein, Burger and Kapuscinsky, *C. A.* **23**, 40). While the relative abundance of atoms in the m p and m P levels is subject to considerable variations in different stars, the av. ratio triplet: singlet in stellar spectra is not very different from that observed in the lab. under normal pressure.

GEORGE GLOCKLER

**Anomalous dispersion of lithium and mercury.** F. SEGRE AND E. AMALDI. *Atti accad. Lincei* [6], **7**, 919-21(1928). The intensity of the absorption bands of Li at 2S - 2P (6708 Å. U.) and 2S - 3P (3232 Å. U.) as well as for Hg 6S<sub>1/2</sub> - 6P<sub>1</sub> (2537 Å. U.) and 6S<sub>1/2</sub> - 6P<sub>3/2</sub> (1849 Å. U.) has been detd. With Li a thin Fe tube was placed inside the quartz oven since Li attacks quartz at high temps.; thus photographs of the spectrum at 1200°C. could be taken, a C arc being used. Thus it was detd. that the relation between the electrons at the above wave lengths for Li was 135, with a possible error of 20%. With Hg, Fe electrodes were used, and the absorption between the lines 2537 Å. U. and 1849 Å. U. was photographed. The results indicate that at 2537 Å. U. the no. of electrons dispersed is about  $\frac{1}{100}$  of the no. of atoms. From the mech. wave-motion theory Rasetti had calcd. the ratio for Li was about 2, which is very far from the exptl. value obtained above.

A. W. CONTIERT

**Sebor's method of quantitative spectral analysis.** J. KNOP. *Chem. Abstr.* **1**, 253-6(1926). The method whereby it is sought to det. the concn. of dyes by measurement of the width of the absorption bands is inexact.

B. C. A.

**Second spark spectrum of potassium (K III).** T. L. DE BRUIJN. *Z. Physik* **53**, 678-64(1929); cf. *C. A.* **23**, 2361.

GEORGE GLOCKLER

**Mechanism of spark discharge.** LEONARD J. NEUMAN. *Univ. of Calif. Proc. Nat. Acad. Sci.* **15**, 259-65(1929). Using a Ni anode and a Na cathode, N. was able to confirm previous work showing that in A at low pressure, the cathode material plays an important part in the spark discharge. Under these conditions, the principal mechanism by which pos. ions liberate electrons from the cathode depends on the velocity or energy of impact of the pos. ions with the cathode. The liberation of electrons from the cathode by photoelec. action of the radiation produced by the neutralization of slowly moving pos. ions near, at or on the cathode is not the primary mechanism. As the pressure increases, the predominating mechanism of electron production changes from that in which the electrons are liberated from the cathode by the bombardment of swiftly moving pos. ions, to that in which the electrons are generated in the gas by collision between swiftly moving ions and neutral mols. At pressures above 20 mm., the spark potential becomes independent of the cathode material.

L. W.

**Intercombinations in the arc spectrum of carbon.** D. S. JON. *Nature* **123**,

318(1929).—Certain intercombination lines in the arc spectrum of C have been observed for the first time.

GEORGE GLOCKLER

**Arc spectrum of germanium.** C. RICHTER. *Z. wiss. Phot.* 25, 380-93(1928).—The previous methods of measuring Ge arc spectrum are reviewed. In spite of all the previous measurements almost none of them has yet been incorporated in the international tables. Consequently R. has carefully measured the spectrum down to about 200  $\mu$ . The dispersion was about 1.97 A. U./mm. The spark spectrum will be measured later.

M. E. RUSSELL

**Perturbation in helium band spectrum.** G. H. DIEKE. *Nature* 123, 446-7 (1929).—Kronig's theory (C. A. 23, 32) of perturbation in band spectra predicts that if 2 mol. terms with the same  $j$ , which besides have to fulfil certain other conditions, come close together, their mutual influence has the effect that they seem to repel each other. ( $j$  = magnetic quant. no.) D. tests this theory on certain He bands and finds it works satisfactorily.

GEORGE GLOCKLER

**Band systems of the hydrogen molecule.** R. MECKE AND W. FINKELNBURG. Physik. Inst., Bonn. *Naturwissenschaften* 17, 255-6(1929).—The dominating systems of the  $H_2$  band spectrum were found to be a singlet and a triplet system; the Balmer band spectrum ( $\alpha, \beta, \gamma$  and  $\delta$  bands) is taken to be the singlet system contrary to Richardson and Birge. In this system 550 lines have been classified; a further 725 lines have been classified in 60 bands and 179 branches of a new triplet system. These bands have 3 intensive branches of  $\Delta m = 0$ , 2 weaker ones of  $\Delta m = \pm 2$ . Term, nucleus vibration no. and moment of inertia were found for  $2^3S, 3^3P, 4^3P$  and  $3^3D$ ; the  $2^3S$  term is the common end term for all new bands; it is the initial term of the ultra-violet Lyman bands ( $1^1S$  to  $2^3S$ ). A table is given, surveying the terms found. It is taken to be proved that  $H_2^+$  and  $H_3$  play an insignificant role if any at all in the emission of the line spectra of  $H_2$ .

B. J. C. VAN DER HOEVEN

**Band spectrum of chlorine or hydrogen chloride.** E. B. LUDLAM. Univ. of Edinburgh. *Nature* 123, 414(1929).—The bands described (C. A. 23, 1816) were caused by traces of S introduced into the  $H_2$  stream by the  $H_2SO_4$  wash bottles.

G. C.

**Ferrous nitroso compounds.** H. I. SCHLESINGER AND H. B. VAN VALKENBURGH. *J. Am. Chem. Soc.* 51, 1323-31(1929). The compd.,  $FeSO_4 \cdot NO$ , is formed when NO is passed into solns. of  $FeSO_4$ . It has been shown that  $FeCl_2$  in alc. soln. reacts with NO. Curves are used by S. and V. to show the absorption spectra of  $FeCl_2 \cdot NO$ . An absorption band extending approx. from oscillation frequencies 1920 to 2330 is shown in 30, 70 and 90% alc. mixts. with  $H_2O$ . In aq. soln. the band is somewhat narrower but its right-hand margin and the region of max. transmission are the same as those for the alc.- $H_2O$  mixts. When abs. alc. is used the band is definitely different, showing with respect to the others a displacement toward the red of both margins and of the region of max. transmission. The spectra of the dil. alc. solns. of the complex  $FeCl_2 \cdot NO$  are practically identical, so far as location of the band is concerned, with those of the less strongly acid solns. of  $FeSO_4 \cdot NO$ . The compd.  $FeHPO_4 \cdot NO$  was studied and a table shows the soly. of NO in concd. phosphoric acid solns. of  $FeHPO_4$ . The absorption spectra of  $FeHPO_4$  satd. with NO in solns. contg. various amts. of  $H_2PO_4$  are shown graphically. The shift of the absorption band towards the violet end of the spectrum, which occurs with increasing diln. of  $H_2SO_4$  solns. of  $FeSO_4$  satd. with NO, also occurs on dilg.  $H_3PO_4$  solns. of  $FeHPO_4$  and alc. solns. of  $FeCl_2$  satd. with NO. S. and V. conclude that the transition in the 3 pairs of compds. having, resp., the empirical formulas  $FeSO_4 \cdot NO$ ,  $FeHPO_4 \cdot NO$  and  $FeCl_2 \cdot NO$  is not related to the nature of the neg. ion but is detd. by the activity of the  $H_2O$  in the soln. The methods and app. described by Schlesinger and Salathe (C. A. 17, 3835) were employed. A. J. M.

**The Raman effect in diatomic gases.** F. RASETTI. Calif. Inst. Tech. *Proc. Nat. Acad. Sci.* 15, 234-7(1929).—The Raman effects for  $O_2$ ,  $N_2$  and CO have been detd. at atm. pressure in a glass tube of 4-cm. diam., a quartz Hg arc 12 cm. long and a cylindrical Al reflector. The light scattered by the gas was collected by a lens and projected on the slit of a spectrograph. All of the gases gave Raman lines, excited by  $\lambda$  4047 and 4358 of Hg. The results obtained are:

	$\nu$	$\lambda Hg$	$\Delta$	$\nu_{osc.}$
$O_2$	21384	4358	1553	1552
$N_2$	22374	4047	2330	2332
	20598	4358	2330	
CO	20781	4358	2156	2133
	22550	4047	2154	

J. H. PERRY

**Resonance impacts in fluorescence and chemi-luminescence.** H. BEUTLER AND B. JOSEPHY. *Z. Physik* 53, 747-65(1929).—The energy of an excited atom is transferred during impact of the second kind to another normal atom with great selectivity. This means that those impacts are most likely wherein the energy level of the atom to be activated is nearest to the energy level of the exciting atom. The tendency is to transfer as little as possible of the energy of activation into kinetic energy. Radiation of a Na-Hg vapor mixt. with the resonance line 2537 Å. U. of Hg brings out the Na transition  $1^2S - 7^2S$  which is nearest to the Hg transition  $2^3P_1 - 1^1S_0$ . This resonance phenomenon is measured experimentally by detg. the intensity of the lines by photographic photometry. If the exciting Hg atoms are brought down from the  $2^3P_1$  state (by means of added  $N_2$  causing more impacts) to the  $2^3P_0$  then the resonance takes place in such a way as to produce the Na transition  $1^2S - 5^2S$  which is nearest to the Hg transition  $2^3P_0 - 1^1S_0$ . The D-lines of Na appear only as a secondary phenomenon. In chemi-luminescence similar resonance phenomena are found. Transition probabilities due to this resonance phenomenon are quite different from the probabilities as calcd. from thermal statistical considerations. GEORGE GLOCKLER

**Average life of excited molecules in fluorescing water solutions.** S. I. VAVILOV. *Z. Physik* 53, 665-74(1929).—The idea that extinction of fluorescence in liquid media is due to impacts of the second kind is tested on the expts. of Jette and West (*C. A.* 23, 1352). New expts. concerning the influence of temp. upon the extinction process are described and they confirm the theory. The av. life ( $\tau$ ) calcd. is found to agree (with uranin, etc.) with the direct detns. made by Gaviola (*C. A.* 21, 3022).  $\tau$  is independent of the exciting wave length  $\lambda$ . This fact is discussed in relation to the depolarization of fluorescence shown by Lewschin and Froehlich (*C. A.* 19, 3222; 20, 1952) as a function of wave length. GEORGE GLOCKLER

**Monatomic hydrogen, oxygen and nitrogen.** E. WREDE. *Z. Physik* 54, 53-73 (1929).—Two glass spheres are connected by a very small hole. In one of the spheres at  $H_2$ ,  $N_2$  or  $O_2$  is produced by a discharge. In the second recombination only happens. A difference in pressure will be developed which can be used as a measure of at. concn. With  $H_2$  the conditions were found to be very reproducible so that the concn. of atoms in the discharge as a function of the current could be deduced. In  $N_2$  activated in the usual manner it was found possible to prove the existence of a few percent of N atoms. Spark discharges lead to increased at. concns. up to 30 to 40%. However, a recombination effect in the discharge is a hindering effect for the attainment of high atomic concns. Small glowing particles of dust could be used to indicate the life of the at. state.  $O_2$  dissociates in the discharge easier than does  $H_2$ ; however, increasing c. d. leads to greater recombination. GEORGE GLOCKLER

**Intensity measurements of molecular rays of gases.** F. KNAUER AND O. STERN. *Z. Physik* 53, 766-78(1929).—A method to measure the intensity of mol. rays is developed. The ray of mol. passes through a slit into an otherwise closed vessel and causes therein an increase in pressure until as many mols. leave as enter through the slit. The pressure is measured by a hot wire manometer. The accuracy reached is about one per mille. The mean free path of  $H_2$  mols. is detd. GEORGE GLOCKLER

**Reflection of molecular beams.** F. KNAUER AND O. STERN. *Z. Physik* 53, 779-91(1929).— $H_2$  and He beams are reflected from highly polished surfaces at nearly glancing angle. The behavior of these rays upon reflection is in accordance with ideas obtained for such phenomena from the de Broglie wave theory. Expts. to show diffraction on ruled gratings gave no results. Also in rock salt surfaces there is found specular reflection. The observations made on crystal cleavage planes are probably due to diffraction phenomena although their complete interpretation has as yet not been given. GEORGE GLOCKLER

**Photochemical preparation of optically active substances.** WERNER KUHN AND E. BRAUN. Univ. Heidelberg. *Naturwissenschaften* 17, 227-8(1929).—K. and B. succeeded in sepg. optically active isomers from their racemic mixt. by irradiation with circularly polarized light (Cotton effect). For the purpose  $MeHCBBrCO_2Et$  was used; expts. had shown that its bands in the ultra-violet range (2450 Å. U.) are closely related to its optical activity (ultra-violet irradiation causes first a rise in rotation to  $4000^\circ$ , then a reversal). From 4 to 8% solns. of the racemic ester in abs. EtOH were sealed in quartz flasks and exposed to left or right circular monochromatic Mg light (2800 Å. U.). From a simultaneous expt. with a soln. of active ester in the same but nonpolarized light the amt. of ester could be detd. which had reacted (by decrease in rotation); the irradiation of the solns. was stopped at 50% reaction. After removal of the solvent, the rotation of both ester samples corresponded to the direction of rota-

tion of the light employed in the irradiation. The best result obtained was  $0.05^\circ$  rotation to either side.

B. J. C. VAN DER HOEVEN

**Kinetics, quantum efficiency and temperature coefficients of the decomposition of ferric thiocyanate and the bleaching of neocyanin and some other photochemical reactions in radiations of different frequencies.** A. K. BHATTACHARYA AND N. R. DHAR. Allahabad Univ., India. *J. Indian Chem. Soc.* 6, 143-54(1929); cf. *C. A.* 23, 772.—The unimol. decompn. of ferric thiocyanate has temp. coeffs. of 2.12 at 4725 A. U., 2.3 at 5650 A. U., and 2.5 at 7304 A. U. and quantum efficiencies varying from 4 to 12. For the bleaching of neocyanin, which is monomol., the temp. coeffs. are 1.29 (4725 A. U.), 1.2 (5650 A. U.), and 1.12 (7304 A. U.) and the yield varies from 1 to 5. Reaction between Na lactate and I is bimol.; temp. coeffs. are 2.49 (dark); 2.02 (4725 A. U.); 2.11 (5650 A. U.); 2.21 (7304 A. U.); the yield varies from 4 to 16. Na tartrate and I reaction is bimol.; temp. coeffs. are 2.51 (dark); 2.11 (4725 A. U.); 2.2 (5650 A. U.); 2.26 (7304 A. U.); yield changes from 4 to 18. The reaction of chromic and citric acids has temp. coeffs. of 3.73 (dark); 2.59 (4725 A. U.); 2.66 (5650 A. U.); 2.89 (7304 A. U.) and quantum efficiencies of from 2 to 8. Chromic and tartaric acids react with a high quantum yield and temp. coeffs. of 2.13 (dark); 1.9 (4725 A. U.); 1.95 (5650 A. U.); 2.0 (7304 A. U.). Reaction of chromic and lactic acids has quantum yields of from 2 to 8 and temp. coeffs. of 1.8 (dark); 1.62 (4725 A. U.); 1.7 (5650 A. U.); 1.75 (7304 A. U.). Exptl. details and many tables are given. W. E. V.

**Inhibition of certain photochemical reactions by oxygen.** H. B. DUNNICLIFF AND JANKI NATH JOSHI. Gov. Coll., Punjab Univ., Lahore. *J. Indian Chem. Soc.* 6, 121-7(1929).—Air, O, H<sub>2</sub>O<sub>2</sub>, and O<sub>2</sub> inhibit the reaction  $2\text{HgCl}_2 + (\text{NH}_4)_2\text{C}_2\text{O}_4 \longrightarrow 2\text{HgCl} + 2\text{NH}_4\text{Cl} + 2\text{CO}_2$ , under the radiation of a C arc. O<sub>2</sub> was found to be a neg. catalyst in the oxidation of lactic acid by Br water. The photochem. reduction of ferric oxalate to ferrous oxalate under the influence of visible light is retarded by O<sub>2</sub> as is the decompn. of Ag halides.

WILLIAM E. VAUGHAN

**Temperature coefficients of some photochemical reactions.** GEO. B. KISTIAKOWSKY. Princeton Univ. *Proc. Natl. Acad. Sci.* 15, 194-7(1929).—Reaction velocities were detd. by heating stoichiometrical mixts. of (1) H<sub>2</sub> and O<sub>2</sub> and (2) CO and O<sub>2</sub> in a quartz vessel, and illuminating the gases by means of the radiation obtained by passing a high-power condensed spark between Al electrodes. The temp. coeffs. were at great variance with Arrhenius' equation, increasing with temp., and at a rate the greater the higher the temp. Two mols. of H<sub>2</sub>O or CO<sub>2</sub> are formed per absorbed quantum, and the conclusion is that at 500°, long chains of activated mols. are formed in both gaseous mixts. (cf. *C. A.* 22, 2842). The total rate of a photochem. reaction consists of 2 parts, (a) the immediate processes following light absorption and requiring for their completion either none or a very small addnl. thermal activation energy, and (b) the secondary chain mechanism, which may be started by some of the primary processes if a sufficient thermal agitation energy is supplied. The second reaction may be identical in mechanism with the normal thermal reaction. LOUIS WALDBAUER

**The decomposition of nitrous oxide in the silent electric discharge.** II. SHRIDHAR SARVOTTAM JOSHI. *Trans. Faraday Soc.* 25, 108-17(1929).—Expts. on the decompn. of N<sub>2</sub>O (*C. A.* 21, 2613) are continued. An equation derived for velocity of chem. reaction in the silent elec. discharge is examd. for applicability to the initial stages of decompn. of N<sub>2</sub>O in the discharge. Tables are given showing values of O, percentage decompn. of N<sub>2</sub>O, in a specially designed ozonizer for different conditions of gas pressure, applied potential and duration of exposure. It is assumed that effects of wall catalysis and ultra-violet light, produced during discharge, on rate of decompn. are negligible. III. **The variation of the current and of the power during the reaction.** *Ibid* 118-28.—During the decompn. of N<sub>2</sub>O in silent discharge in an ozonizer, current flowing through the ozonizer is characterized by remarkable variations seemingly closely related to corresponding stages of the reaction. This phenomenon was investigated in detail: measurements of energy consumed in an ozonizer show that current and power consumed diminished during the first part of the reaction and finally increased with completion of change. Data on the reactions are tabulated. The decompn. of N<sub>2</sub>O started at given pressure and definite alternating potential takes place in 3 stages; N<sub>2</sub>O<sub>4</sub> is an intermediate product of the decompn.

M. McMAHON

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French by Walther Becker. Leipzig: Akad. Verlag. 88 pp. M. 5.80. Reviewed in *Phys. Rev.* **31**, 911(1928).

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**Handbuch der Experimentalphysik. Band VII. Teil 2. Strukturbestimmung mit Röntgeninterferenzen.** H. OTT. pp. 1-320. Gittertheorie der festen Körper. K. F. HERZFELD. pp. 322-419. M. 37; bound, M. 39. Reviewed in *Mineral. Abstracts* **4**, 1(1929). **Band XIII. Teil 2. Physik der Glühelktroden.** W. SCHOTTKY AND H. ROTHE. pp. 1-283. Herstellung der Glühelktroden. H. SIMON. pp. 284-340. Technische Elektronenröhren und ihre Verwendung. H. ROTHE. pp. 341-482. M. 44; bound, M. 46. **Band XIV. Kathodenstrahlen.** P. LENARD AND A. BECKER. **Kanalstrahlen.** WILHELM WIEN. 788 pp. M. 70; bound, M. 72. Reviewed in *Nature* **121**, 450(1928). **Band XVIII. Wellenoptik und Polarisation.** Edited by K. F. BOTTLINGER, R. LADENBURG, M. V. LAUE AND HANS SCHULZ. pp. 1-616. **Photochemie.** E. WARBURG. pp. 617-74. M. 61.80; bound, M. 63.50. **Band XIX. Dispersion und Absorption.** GEORGE JAFFÉ. pp. 1-342. Medien mit veränderlichem Brechungsindex. RICHARD GANS. pp. 343-60. **Lichtzerstreuung.** RICHARD GANS. pp. 361-408. M. 39; bound, M. 41. Reviewed in *J. phys. radium* **9**, 322D(1928). **Band XXI. Anregung der Spektren.** GEORG JOOS. pp. 1-201. **Apparate und Methoden der Spektroskopie.** E. v. ANGERER. pp. 205-396. **Starkeffekt.** JOHANNES STARK. pp. 399-548. M. 47; bound, M. 49. Reviewed in *J. chim. phys.* **25**, 326; *Science Progress* **22**, 713; *Nature* **121**, 741(1928). **Band XXIII. Teil 2. Phosphoreszenz und Fluoreszenz.** P. LENARD, FERD. SCHMIDT AND R. TOMASCHKE. pp. 745-1038. **Lichtelektrischen Wirkung.** P. LENARD AND A. BECKER. pp. 1039-1514. M. 70; bound, M. 72. Reviewed in *Mineral. Abstracts* **4**, 2(1929). Leipzig: Akademische Verlagsgesellschaft m. b. H.

STARK, JOHANNES: **Die Axialität der Lichtemission und Atomstruktur.** Berlin: Polytechnische Buchhandlung. A. Seydel. 124 pp.

WORSNOP, B. L.: **x-Rays.** London: Methuen & Co., Ltd. 2s. 6d. net.

**Radium.** OTTO HAHN. Ger. 472,857, Aug. 16, 1924. Stable Ra preps. with high emanating properties are prepd. by treating Ra salt solns. with soln. of substances which, with a common pptg. agent, give a ppt. with a greater surface. Thus,  $\text{RaBr}_2$  is mixed with  $\text{La}(\text{NO}_3)_3$  and HF added. The  $\text{RaF}_2$  produced is stable and of good emanating quality.  $\text{FeCl}_2$  and  $\text{RaBr}_2$  may be pptd. with  $\text{NH}_4\text{OH}$ . Other examples are given.

**Treating water or other liquids with radium emanation.** SPA MONOPOLAR COMPANY, PAGNIE FERMIERE DES EAUX ET DES BAINS DE SPA. Brit. 298,915, Oct. 15, 1927. The emanation is conveyed by a current of gas (such as purified air) circulating in a closed system in an app. which is described. A potash bulb removes  $\text{CO}_2$  and any explosive gas which may be formed is destroyed by Cu oxide or platinized asbestos in a heated tube.

**Röntgen-ray screen.** RUDOLF MANNL. Swiss 130,019, April 25, 1927. The screen is provided with concentric series of radial projections for trapping the secondary rays.

#### 4—ELECTROCHEMISTRY

COLIN G. FINK

**Electric furnace increases production.** W. J. WYLIE. *Elec. News* **37**, No. 21, 49-50(1928).—A 35-kw. 220-v. "Homo" elec. drawing furnace with elements connected for 3-phase operation is described. It is used for heat treating of gears, jack shafts, studs and other parts of transmissions. The charge can be brought to the desired temp. more rapidly than by any method in which heating by radiation is used. Other advantages include uniformity of temp., reduction in time for the drawing cycle, elimination of salt replacement and greater flexibility of furnace operation. The unit cost should be materially reduced, though definite figures are not available. W. H. B.

**Recent developments in electric furnaces.** D. F. CAMPBELL. *World Power* **11**, 363-5(1929). See C. A. **23**, 2369.

**Some advantages of the electric furnace for heat treatment.** P. C. KELLY. *Elec. West* **62**, 204-5(1929).—Economics effected by elec. heat treatment of hand tools are

indicated by comparative costs. Similar economies were effected in treating ball bearings.

W. H. BOYNTON

**Electrolytic oxidation and reduction in the presence of some gases.** V. SIHVONEN. *Ann. acad. sci. Fennicae* 29A, 19 pp.(1927).—A study was made of electrolysis with a. c. of dil. solns. of  $\text{H}_2\text{SO}_4$  and of  $\text{NaOH}$  with Pt-gauze electrodes in the presence of gases. The results are explained in accord with theories previously suggested (SiHVonen, *Ann. acad. sci. Fennicae* 28A, 1) in which the existence of bivalent ionic forms of O and  $\text{O}_2$  adsorbed on the cathode were postulated, which are in equil. on the one hand with gaseous  $\text{O}_2$  and on the other with an electrolyte. The gases studied were air,  $\text{N}_2$ ,  $\text{CO}_2$ , CO and  $\text{SO}_2$ . For air,  $\text{N}_2$  and  $\text{CO}_2$  the influence on the current potential was analogous to the thermal dissocn. of the gases and the recombination of the atoms to form new mols. CO and  $\text{SO}_2$  because of their action as reducing agents depolarized the originally  $\text{O}_2$  laden electrodes.

F. L. BROWNE

**The electric cleaning of blast-furnace gas.** ANON. *Feuerungstech.* 16, 260-1 (1928).—A new plant of the Cottrell type is briefly described and illustrated. The tubes are cleaned by reversing the gas flow and by mech. knocking. ERNEST W. THIELE

**Investigation on the theory of chromium deposition.** E. A. OLLARD. *Electroplat. Deposit. Techn.* 5-24(Nov. 9, 1927); *Chimie et industrie* 21, 321; cf. C. A. 22, 4068.—A study of the chem. properties of chromic acid shows that the electrolyte used in electroplating should contain  $\text{H}_2\text{Cr}_2\text{O}_7$ ,  $\text{Cr}_2(\text{Cr}_2\text{O}_7)_3$  and a chromic salt such as  $\text{Cr}_2(\text{SO}_4)_3$ . A small proportion of colloids may also be present. Under the action of the elec. current the Cr ions go to the cathode and pass to the metallic state. The most important factors are the  $\text{Cr}^{+++}$  and  $\text{H}^+$  concns. and the current d. The compn. of the electrolyte may be selected to work at either high or low current d., as desired. The  $\text{Cr}^{+++}$  concn. can vary according to the nature and amt. of the other acid added, while the  $\text{H}^+$  concn. depends on the degree of reduction of the soln.

A. P.-C.

**Automatic plating machinery.** EDWIN M. BAKER. Univ. of Mich. *Ind. Eng. Chem.* 21, 400-4(1929).—B. discusses the different types of plating equipment and the various handling methods in use. Where automatic electroplating methods can be adopted the following advantages may be gained: (1) saving of labor, eliminating up to 90% of that required for hand methods; (2) insuring more nearly uniform quality than can be had by other methods; (3) reducing required size of generating equipment, since this can be continuously under full load, with the resultant elimination of peak or overload capacity; (4) reduction of percentage of work rejected; and (5) predetd. productive capacity for a fixed working period. On the other hand automatic methods are advantageous only where production is reasonably uniform and the vol. of work large enough to warrant the expense.

M. C. ROGERS

**A table of electrochemical equivalents. Based on 1929 atomic weights.** G. A. ROUSH. *Trans. Am. Electrochem. Soc.* 55 (preprint) 11 pp.(1929)(also in pamphlet form).—The last complete table of electrochemical equivalents is that calcd. by Hering based on 1917 atomic weights. Since that time there has been a large number of revisions in atomic weights, some of them of considerable magnitude. The entire list was therefore recalculated to 5 decimal places on the basis of the 1929 atomic weights.

C. G. F.

**Formation of ozone by an electric discharge of high frequency.** WLÓDZIMIERZ DANIŁEWSKI. *Roczniki Chem.* 9, 83-96(1929).—Using an "MTI" Marconi tube as generator of a. c. of high frequency the efficiency of an ozonator was studied and found to be independent of the frequency between 290,000 and 1,250,000 cycles. The efficiency of an ozonator without the dielectric and high frequencies was found to be equal to that with the dielectric at low frequencies.

JAROSLAV KUČERA

**The electrical equipment of scientific laboratories.** LEOPOLD FINK. *Elektrochem. Maschinenbau* 47, 258-60(1929).

C. G. F.

**Modern methods of teaching electrochemistry.** ROY L. DORRANCE. *Am. Electrochem. Soc. Pamphlet*, May, 1929, 3 pp.—There is considerable diversity, both in methods of teaching and in subject matter included, in the courses in electrochemistry given at the various colleges. The importance of a thorough grounding in physical chemistry and mathematics is emphasized. The history of electrochemistry should be included in any well-rounded course.

C. G. F.

**The importance of electrochemistry in the teaching of analytical chemistry.** N. HOWELL FURMAN. *Am. Electrochem. Soc. Pamphlet*, May, 1929, 6 pp.—In analytical chemistry it is essential and important to have the students fully conversant with the laws of electrolysis. Electroanalysis should include a study of the changes occurring at the anode and cathode during electrolysis. The theory of volumetric analysis rests on an adequate foundation only when it is discussed throughout from an electrochemical

viewpoint. The electronic viewpoint of oxidation-reduction reactions appears to be useful to students in mastering the more difficult processes. Much of the recent development in analytical methods is directly traceable to advances in understanding of electrochemical principles. C. G. F.

**Electrical measuring instruments for use in teaching electrochemistry.** HENRY C. PARKER. *Am. Electrochem. Soc. Pamphlet*, May, 1929, 12 pp.—Various electrical measuring instruments are described that can be used in the electrochem. lab. Especial emphasis is laid upon the instruments which are also suitable for industrial measurements. Most of these instruments are simple to manipulate, and several are direct reading. C. G. F.

**The teaching of electro-organic chemistry.** C. J. BROCKMAN. *Am. Electrochem. Soc. Pamphlet*, May, 1929, 4 pp.—In most of the North American universities the teaching of org. electrochemistry forms but a small part (at most 10%) of the lectures and lab. expts. in electrochemistry. This is ascribed partly to the complexity of the subject, and partly to the fact that there are in America today very few industrial applications. A survey of the courses in electrochemistry given in South America and in Europe indicates conditions similar to those in the United States and Canada with the two exceptions, Germany and Switzerland. These two countries have contributed more to the advancement of organic electrochemistry than all other countries combined. The value and importance of organic electrochemistry is emphasized, and a closer and wider study of this branch of electrochemistry is strongly recommended. C. G. F.

**Electrochemical engineering at the Massachusetts Institute of Technology.** M. DEKAY THOMPSON. *Am. Electrochem. Soc. Pamphlet*, May, 1929, 4 pp.—Massachusetts Institute of Technology has offered a regular four-year course in electrochem. engineering ever since 1900. Instruction in electrochemistry begins in the first term of the third year and continues for two years. Besides the lecture courses, there are laboratory periods, which include expts. with elec. furnaces, storage batteries and electrolytic alkali cells. C. G. F.

**The teaching of electrochemistry.** LOUIS KAHLENBERG. *Am. Electrochem. Soc. Pamphlet*, May, 1929, 6 pp.—General training in chemistry and physics should precede a course in electrochemistry. It is a mistake to present to the student at the outset current electrochemical theories and then proceed from these in a deductive manner. The student should learn all of the current conceptions. He should know these thoroughly. The great importance of thorough lab. instruction is emphasized. Lab. exercises are far more essential than lectures. Based on first hand lab. experience, theoretical conceptions should be developed, and their value and also their shortcomings should receive consideration. C. G. F.

Use of simple metallic electrodes in the potentiometric titrations of acids and bases (CLOSS, KAHLENBERG) 7. New rustproofing materials (MARTELL) 9. Manufacture of steel (by electric process) (CAZAUD) 9. Effecting chemical reactions (production of O<sub>2</sub>) (Ger. pat. 474,075) 13. Oxidations and reductions and other reactions (prior to electrolysis) (Brit. pat. 298,461) 13. Fatty acids produced by oxidation of paraffins (Brit. pat. 299,149) 27. Printing plates (electrodeposition of Cu) (Australian pat. 11,115) 18. Montan wax (purification with electric current) (Brit. pat. 299,133) 21. Preserving milk, etc., (by electric treatment) (Austrian pat. 112,466) 12. Fertilizers (reduction and volatilization in electric furnace) (Fr. pat. 618,831) 15. Electric glass melting furnace (Ger. pat. 472,780) 19.

BILLITER, J.: Technische Elektrochemie. Band I. Elektrometallurgie wässriger Lösungen. M. 9.60; bound, 10.70. Band II. Elektrolysen mit unlöslichen Anoden ohne Metallabscheidung. M. 15.60; bound, M. 17.80. Band III. Elektrolyse feuerflüssiger Schmelzen. M. 10; bound, M. 11. Band IV. Elektrischen Öfen. M. 17.50; bound, M. 19.50. Halle (Saale): Verlag von Wilhelm Knapp.

GÜNTHERSCHULZE, A.: Monographien über angewandte Elektrochemie. Band 48. Galvanische Elemente. Halle (Saale); Verlag von Wilhelm Knapp. M. 13; bound M. 14.80.

PAGÉ, VICTOR W.: Storage Batteries Simplified. New York: N. W. Henley Pub. Co. 258 pp. \$2. Reviewed in *Elec. World* 91, 1354(1928).

PAULING, H.: Monographien über angewandte Elektrochemie. Band 49. Elektrische Luftverbrennung. Halle: (Saale): Verlag von Wilhelm Knapp. M. 15.80; bound, M. 17.50.



**Practical Handbook on Electroplating.** 10th ed., revised. Birmingham, Eng.: W. Canning & Co., Ltd. 298 pp. Reviewed in *Brass World* 24, 156(1928).

**Electric dry cell batteries.** ELEKTROTECHNISCHE FABRIK SCHMIDT & Co. Ges. and O. TANNERT. Brit. 298,844, Feb. 24, 1928. Mech. features of manuf.

**Dry cell (with disruptable electrolyte container).** MANNESMANN LICHT A.-G. Ger. 473,474, April 13, 1924.

**Storage batteries.** JOSEPH BOUTEILLE. Fr. 648,382, June 21, 1927. Improved insulation.

**Storage batteries.** SOC. DES ACCUMULATEURS ÉLECTRIQUES (Anciens Établissements Alfred Dinin). Fr. 649,841, July 21, 1927. Activated charcoal is used in place of the usual powd. C.

**Galvanic cells.** SOC. ANON. LE CARBONE. Ger. 472,966, Jan. 9, 1924. Porous bodies for use as depolarizing elements in galvanic batteries are prep'd. from wood charcoal impregnated with a colloid such as starch or fish glue, with or without addn. of glycerol.

**Apparatus for concentrating dry galvanic battery constituents.** WILHELM HASSE. Ger. 472,616, Mar. 3, 1928. Details of arrangement.

**Thermoelectric battery.** CARL E. STEPHAN. Ger. 473,475, Oct. 21, 1926. Each element is shaped like a hair-pin and comprises 2 wires of suitable metals soldered together at the apex of the pin. A no. of such elements is affixed to an insulating plate in such a way that all the apices lie on 1 side while the adjacent ends of different elements are joined by metal sheets bent so as to provide radiating surfaces. The battery comprises several such plates of elements, suitably connected, and includes an elec. heater in proximity to which the apices of the elements are disposed.

**Electrometallurgy.** OTTO NIELSEN. Ger. 474,790, Nov. 30, 1926. The lower part of a large cathode for the electrodeposition of metals is composed of a channeled plate.

**Electrodeposition of cadmium.** THE GRASSELLI CHEM. CO. Ger. 474,211, Nov. 5, 1925. See Brit. 265,292 (*C. A.* 22, 196).

**Electroplating.** SIEMENS & HALSKE A.-G. (Georg Erlwein and Martin Hosenfeld, inventors). Ger. 474,311, Jan. 15, 1927. Coatings of Cr, Ni, W, or Nb are produced by electrolysis of a fused bath contg. a comp'd. of the metal and a sulfate or bisulfate of an alkali or alk. earth metal or Mg. In the example, a mixt. of NaHSO<sub>4</sub>, 1000 and Cr<sub>2</sub>O<sub>3</sub>, 90 parts is electrolyzed at 730° with a cathode c. d. of 2500 amp./sq. m.

**Electroplating metal tubes internally.** F. G. MARTIN and W. RAMSEY. Brit. 299,071, April 22, 1927. Flexible anodes are used in processes such as internal coating of long and narrow condenser tubes or the like with Cr. An app. and various mech. details are described.

**Chromium plating of non-ferrous tubes of heat exchange apparatus.** F. G. MARTIN and W. RAMSEY. Brit. 299,100, April 22, 1927. An electrolytic deposit of Cr is applied to the interior or to both the interior and exterior of metal tubes.

**Chromium.** HARRY SCHMIDT. Ger. 472,663, Nov. 10, 1926. Cr is deposited by electrolyzing a fused mass of chromite.

**Electrolytically coating metals.** J. STONE & Co., LTD. Ger. 472,937, Sept. 13, 1927. App. for electrolytically coating the inner surfaces of metal tubes, such as condenser or superheated tubes, with a layer of such metal as Cr is described.

**Metal coatings.** SIEMENS & HALSKE A.-G. (Georg Erlwein and Martin Hosenfeld, inventors). Ger. 474,902, Mar. 9, 1927. A coating of metal is obtained by the electrolysis of a molten mass contg. more than twice as much silicate as comp'd. of the desired metal. Thus, for a coating of Cr, a molten mass contg. 1000 g. Na<sub>2</sub>SiO<sub>3</sub>, 100 g. NaCl and 350 g. CrF<sub>3</sub> is electrolyzed.

**Metal coatings deposited from ionized metal vapors.** FRANKLIN SMITH (to American Machine & Foundry Co.). U. S. 1,710,747, April 30. A metal such as Pb is vaporized by heating and the vapor is ionized (suitably by glow discharge); the ionized vapor is then electrically deposited and condensed on a metal to be coated, e. g., on a ferric wire. An app. is described.

**Treating aluminum surfaces.** CHARLES H. R. GOWER and STAFFORD O'BRIEN & PARTNERS, LTD. Fr. 650,059, Feb. 10, 1928. A resistant coating is obtained on surfaces of Al or Al alloys by anodic treatment of the surfaces in an electrolytic bath contg. H<sub>2</sub>SO<sub>4</sub>, e. g., 150–200 g. of H<sub>2</sub>SO<sub>4</sub> to 1 l. of water. Coloring agents such as K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>, (AcO)<sub>2</sub>Pb, or KCNS may be added to the bath and NH<sub>3</sub> or NH<sub>4</sub> salts to deepen the colors.

**Electrolytic extraction of metals.** JOHANN C. F. A. SCHÜTTE. Swiss 130,480, Dec. 5, 1927. The metal-contg. raw material is placed in a rotary anode cage through which the electrolyte can pass.

**Metallurgy.** TURE, R. HAGLUND. Ger. 474,518, Aug. 13, 1925. Metal is extd. from sulfide ores by smelting in an elec. furnace with briquettes contg. C and oxides difficult to reduce, such as  $\text{CaO}$ ,  $\text{MgO}$ ,  $\text{BaO}$  and  $\text{Al}_2\text{O}_3$ . Siliceous oxides, such as kaolin, clay, or bauxite, may be used, in which case the reduced Si forms an alloy with the metal from the ore.

**Metals.** HAMPUS G. CORNELIUS. Ger. 472,918, Nov. 13, 1925. Fe and other metals and their alloys, contg. a predetd. quantity of C, are produced directly from oxidized ores in an elec. furnace by the aid of reducing material such as C briquettes.

**Aluminum.** SOCIETÀ ITALIANA DI ELETTROCHIMICA. Ger. 472,006, May 21, 1927. Agglomerated  $\text{Al}(\text{OH})_3$  is dissolved in a bath of fused fluorides, e. g., cryolite, with or without chlorides, and the melt is electrolyzed. The  $\text{Al}(\text{OH})_3$  may be agglomerated by compression and (or) by addn of binders, and may be dried after agglomeration.

**Bismuth hydroxide and carbonate.** R. S. CARRERAS. Brit. 208,587, July 7, 1927. Bi hydroxide is produced by electrolysis of a dil. soln. (suitably a 3% soln.) of  $\text{NaClO}_4$  charged with  $\text{CO}_2$ , anodes of Bi and cathodes of C, Zn, Fe, Al, or other suitable metal being used. Mention is also made of the production of Bi carbonate when a high proportion of  $\text{CO}_2$  is employed. Various details are given. Cf. C. A. 23, 779.

**Electrolytic production of white lead.** R. S. CARRERAS. Brit. 208,520, July 7, 1927. The process described in Brit. 277,723 (C. A. 22, 2517) is modified by using a very dil. soln. of the electrolyte, such as  $\text{NaClO}_4$ , which serves as a catalytic agent, with  $\text{CO}_2$ , which is the sole reactive substance. The electrodes are spaced widely apart to permit pptn. of the basic Pb carbonate as a cloudy slime away from the surface of the electrodes.

**Alloys.** CARL SCHANTZ. Ger. 472,850, Feb. 7, 1926. Alloys and the like are refined electrolytically in a cell wherein the anode is a base metal receiving current from an outer cell. The pole anode contains a considerable amt. of base metal and is sepd. from the pole cathode by a diaphragm.

**Aluminum-silicon alloys.** METALLURGES A. G. Ger. 474,186, June 11, 1921. Al-Si alloys contg. more than 5% Si and suitable for use without further treatment are prep'd by electrolysis of a fluoride melt such as is normally used in the manuf. of Al and to which sufficient  $\text{SiO}_2$  has been added. The  $\text{SiO}_2$  may be added as Fe-free sand or silicious bauxite.

**Electrolytic condensers.** L. SZILARD. Brit. 208,950, Oct. 17, 1927. Blocking condensers are made with electrolytically conducting dielectrics to lower the a. c. resistance, the polarizing voltage being utilized to prevent the passage of d. c. Paper dielectrics may be impregnated with electrolyte or the condenser plates are given oxide or sulfide coatings. Water, ales. and  $\text{PhNO}_2$  may be used for impregnating liquids; the condenser plates are preferably Al or Sn.

**Electrolytic rectifier.** CLARENCE W. BALKE (to Fansteel Products Co.). U. S. 1,710,806, April 30. The output of a Ta-Pb  $\text{H}_2\text{SO}_4$  electrolytic rectifier unit is stabilized by controlling the c. d. at about 1 amp. for every 0.5 to 1.5 sq. in. of active Ta surface exposed.

**Electric furnace.** HAMPUS G. E. CORNELIUS. Ger. 473,784, May 12, 1926. An elec. furnace for the refining of iron has electrodes, which can be raised or lowered.

**Electric furnaces for high temperatures.** COMPAGNIE FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON. Fl. 648,871, Nov. 10, 1927.

**Electric furnace for metallurgy.** EMILIEŃ BORNAND and HANS A. SCHLAEFFER. Swiss 130,562, Dec. 8, 1927.

**Electric furnace for hardening metals.** ALLGEMEINE ELEKTRIZITÄTS GES. Ger. 474,606, Feb. 16, 1927.

**Electric furnaces for tempering metals, etc.** MAURICE RIPOCHE. Fr. 648,330 and 648,331, June 15, 1927.

**Electrical heating of drums for roasting, etc.** SIEMENS ELEKTROWARME G. M. B. H. (Stephan Schneider, inventor). Ger. 474,140, Dec. 25, 1924. Elec. features.

**Electric arc furnace suitable for calcium carbide production.** HILLIARY ELDRIDGE (to Martha K. Eldridge). U. S. 1,711,088, April 30. Structural features.

**Electric resistance furnace of the bath type suitable for hardening steel articles.** CHARLES A. CADWELL (to Electric Railway Improvement Co.). U. S. 1,710,763, April 30. Structural features.

**Electric resistance heater.** O. L. PEARD and A. F. HARRISON. Brit. 208,695, July 18, 1927. In making elec. heaters to be operated at a temp. not over about 95°, wire of low resistance, such as Al or Cu, insulated by cotton or enamel, is wound on hollow cylinders such as Zn covered with asbestos paper or other non-magnetic material having a coeff. of expansion greater than that of the wire, so that by its expansions lackness produced in the wire by heating is taken up.

**Device for adjusting the electrodes of an electric arc furnace.** ALLGEMEINE ELEKTRICITÄTS-GES. (Ernst Riecke and Max Herklotz, inventors). Ger. 474,814, Jan. 21, 1926.

**Furnace electrodes.** SIEMENS-PLANTAWERKE A.-G. FÜR KOHLEFABRIKATE. Ger. 474,441, Mar. 21, 1925. Electrodes cased in metal are prep'd. by inserting the burnt or semi-burnt electrode into a metal casing fitting as closely as possible, and filling any space between the electrode and the casing with crude electrode material. This may be done by using a perforated casing contg. an excess of the crude material, the excess being extruded through the perforations when the electrode is pressed into place.

**Arc-lamp electrodes.** COMPAGNIE FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON. Fr. 649,401, Jan. 7, 1928. The life and luminous intensity of arc electrodes are increased by the addn. of ilmenite 67.5-76.5, magnetite 20.65-17.22, chromite 3-5.5, NaF 0.15-0.28, with or without Ti carbide 8.2 or Fe-Ti 12.8, and with or without LiF 0.5%.

**Arc generator electrode cooled by circulating liquid.** HANS O. STORM (to Federal Telegraph Co.). U. S. 1,711,185, April 30. Structural features of an electrode which may be rapidly rotated.

**Copper oxide electrode.** ERNEST W. WESCOTT (to Comstock & Wescott, Inc.). U. S. 1,711,462, April 30. An electrode for batteries comprises granular Cu oxide and fine soft Cu, which serves as a bonding agent and which is flowed into coherent form under heavy pressure.

**Anodes of electric discharge devices.** L. SMEDÉ (to Metropolitan-Vickers Electrical Co., Ltd.). Brit. 298,572, Oct. 11, 1927. Anodes of discharge devices such as Hg-vapor rectifiers are formed of a metal of the Fe group such as iron itself, which has been case-hardened with powd. C or, preferably, by a suitable C-contg. gas.

**Electrical purification of gases.** "ELGA" ELEKTRISCHE GASREINIGUNGS-GES. M. B. H. Ger. 474,483, July 12, 1924. The gases traverse a channel the walls of which constitute the pptg. electrodes; discharge electrodes are suspended at intervals along the middle of the channel. The improvement consists in arranging the discharge electrodes at decreasing intervals in the direction of flow of the gases.

**Electrical purification of gases.** OSKI A.-G. (Erich Oppen, inventor). Ger. 474,177, Jan. 22, 1924. The high-tension coil of a single transformer is tapped to give the voltage required to operate simultaneously a no. of elec. gas-purification plants operating at different voltages, a sep. rectifier being provided for each plant.

**Purification of gases.** SIEMENS-SCHUCKERTWERKE A.-G. (Moritz Schenkel, inventor). Ger. 472,902, Sept. 6, 1922. Addn. to Ger. 354,783. An insulating arrangement for a plant for the elec. pptn. of solid particles from gases is described.

**Device for the separation of gases produced in a bipolar electric gas generator.** MASCHINENFABRIC OERLIKON. SWISS 130,144, Dec. 15, 1927.

**Electric gas-purifying apparatus.** METALLGESELLSCHAFT A.-G. Ger. 474,857, July 14, 1920. The electrodes are endless bands passing over rollers.

**Means for cleaning electrical gas-purifier electrodes.** MASCHINENFABRIK BETH A.-G. Ger. 474,265, Dec. 19, 1926.

**Apparatus for electrically forging iron and steel bars.** EZIO GIACCHINO. SWISS 129,940, Oct. 24, 1927. Details of arrangement.

**Electric apparatus for the air-tight fusing of metal caps on glass tubes.** SIEMENS-SCHUCKERTWERKE A.-G. (Werner Espe, inventor). Ger. 474,947, Oct. 21, 1925. Details of arrangement.

**Electro-endosmosis.** VINCENT A. LAPENTA. U. S. 1,711,416, April 30. An app. suitable for treating serums or other liquids comprises a membranous bag for holding the substance to be treated, a pair of porous cells one of which contains a pos. and the other a neg. electrode, an outer vessel in which the bag and cells are positioned and which may hold an electrolyte serving to collect material passing from the bag by the action of an elec. current. Various details of the app. are described.

**Mercury-vapor lamp suitable for therapeutic uses, etc.** G. PHILIP. Brit. 298,903, Oct. 15, 1927.

**Vacuum lamps, etc.** SIGMUND LOEWE. Fr. 648,731, Oct. 24, 1927. For the production of a high vacuum in lamps, etc., by the vaporization of Mg, the Mg is movably mounted on a support fixed to the anode support.

# **PHOTOGRAPHY**

C. E. K. MEES

**The silver iodide problem.** A. STEIGMANN. *Phot. Ind.* **27**, 375(1929).—Supplementing his previous expt., S. has added colloidal AgI to emulsions in place of KI. AgI exerts a restraining action on the ripening of the emulsion both in regard to the size of grain and to the sensitizing proclivity of the gelatin. C. E. MEULENDYCKE

**Photolysis of medium-free silver bromide—determination of silver.** H. KIESER. *Z. wiss. Phot.* **26**, 1-45(1928).—A method of analysis for the detn. of the photolytically formed Ag in the Ag halide has been worked out, a soln. of 5%  $\text{Na}_2\text{S}_2\text{O}_3$  with 0.07%  $\text{Na}_2\text{CO}_3$  being used. AgBr was pptd. and exposed as: (1) a Br compd. (pptd. in excess of Br ions) and placed in a  $\text{NaNO}_2$  soln.; (2) a Br compd. in  $\text{H}_2\text{O}$ ; and (3) a Ag compd. (pptd. in excess of Ag ions) in a  $\text{AgNO}_3$  soln. The Ag formation in nitrite is independent of the washing of the ppt. and of the concn. of the Br absorbed. For  $\lambda = 436 \text{ m}\mu$ , AgBr gives in  $\text{NaNO}_2$  a quantum effect; in  $\text{H}_2\text{O}$ , only 1 atom of Ag per 15-20 quanta. The energy of blue radiation absorbed by the Ag atoms is transferred to the Br ions of the AgBr lattice. With longer exposures the quantum effect in  $\text{NaNO}_2$  diminishes irregularly in accordance with the sensitizing and screening action of the sepd. Ag. The absorption of blue, green, and red by AgBr and its increase with increasing exposure were detd. by measurements of reflected light. A. P. H. TRIVELLI

**Negative developers for contrast.** J. SOUTHWORTH. *Brit. J. Phot.* **75**, 689-91, 706-8(1928).—The merits of several contrast developers for process and line work are discussed. A new metol-hydroquinone-soda formula is given which is claimed to give high contrast, and good shadow detail in high speed plates under conditions of min. exposure. Development fog is classified as follows: (1) intrinsic fog formed latently during manuf. or on subsequent aging of the emulsion, and (2) extrinsic fog, which is not latent before development but is produced by the action of the developer upon the emulsion. In the absence of bromide, extrinsic fog increases in proportion to the development time. With a metol-hydroquinone developer, and at high gammas, KBr depresses such fog more than intrinsic fog or the light-image. Sol. KI in minute concn. (0.02 g. per l.) assists the action of KBr. Yellow stain produced by contrast developers is usually dichroic fog and is composed of deposited colloidal Ag. The importance of rinsing in a stop bath between development and fixation is stressed as a preventive of stain in the fixing bath. G. E. M.

**Evolution of the latent image.** G. JAUSSEAN. *Compt. rend.* **188**, 783-4(1929).—By making successive exposures over a period of 7 hrs. on different parts of the same plate, which he developed immediately after the last exposure, J. has obtained new evidence of an alteration in the latent image with time. Apparently the latent image of the lower light-exposures diminishes and that of higher exposures increases, and const. values are not reached for several hrs. Each of 4 kinds of plates studied showed the effect, though in varying degree. E. R. BULLOCK

**Is the silver germ theory of the latent image still tenable?** F. WEIGERT. *Phot. Korr.* **65**, 65-70(1929).—From evidence arrived at in his discovery and investigations of the Weigert effect, especially the absence of any recognizable increase in the free Ag content of an emulsion during exposure for this effect, W. concludes that the Ag germ theory of the latent image is no longer tenable. The evidence of post fixation physical development is easily explicable on the assumption that the latent image contains metallic Ag; and chem. development shows that it must also contain Ag halide. W. considers that a system of Ag and Ag halide is present in the unexposed sensitive material, and that the action of light on this system, to form the latent image, is of an intimately mech., rather than of a chem., nature. E. R. BULLOCK

**New investigations of bleach-out reactions.** LUTPO CRAMER. *Phot. Ind.* **27**, 129-31(1929); cf. *C. A.* **22**, 3102.—Work with metallic salts and desensitizing dyes is continued. The latent image is more readily destroyed when treatment with Cu and Fe salts or desensitizing dyes has been made before exposure. This has been especially shown in an expt. with phenosafranine. With latent image formed in presence of dyes, the Ag nuclei formed are more readily attacked because of the higher dispersity and greater tendency to form at surface of grains. Salts of heavy metals other than Cu and Fe do not appear to have desensitizing properties. Salts of Cu and Fe appear to be able to destroy latent image without light-action; desensitizing dyes have little or none of this property. C. E. MEULENDYCKE

**Transferring bromoil prints on to lithographic stone or zinc.** C. DE SANTUL. *Phot. Korr.* **65**, 78-80(1929).—After pointing out the need for a process by which a

number of identical copies of a bromoil print may be obtained, de S. gives a summary of the chemistry of lithography and then describes the dyeing of a bromoil print, its transfer-printing on to stone, and the intensification, etching and retouching.

E. R. BULLOCK

**The value of sulfur toning as a method of intensification.** O. CROY. *Das Atelier* 35, 128-9 (1928).—S. toning, by the method of bleaching in  $K_3Fe(CN)_6$ -KBr and then darkening in  $Na_2S$  soln., affords a useful degree of intensification of a well-developed negative. The contrast to be obtained may be accentuated or subdued by a blue or yellow filter, resp., a color-sensitive make of paper being used in the latter case.

E. R. BULLOCK

**Jahrbuch für Photographie, Kinematographie und Reproduktionsverfahren für die Jahre 1921-1927.** Bd. XXX. Edited by J. M. EDER and F. KUCHINKA. Halle (Saale): Verlag von Wilhelm Knapp. In 3 parts, part 3 containing whole index. Each part, M. 19; bound, M. 21.

**Photography.** AKTIEN-GESELLSCHAFT FÜR ANILIN FABRIKATION. Fr. 649,758, Nov. 12, 1925. In the "reflection" process the treatment of the sensitive material which follows the exposure is confined to the surface of the sensitive layer, which may be from 0.001 to 0.1 mm. thick. Sensitized films may have an anti-curling layer on the back and this layer is used for retouching the negative obtained. As colloids, gelatin, gum arabic, sugar, etc., may be used and as sensitizing agents chromates, Fe salts, U salts, etc. If Ag halide emulsions are used they are developed by physical means such as selective deposition from supersatd. solns.

**Color photography.** KALLE & Co. A.-G. Brit. 299,010, Oct. 19, 1927. Superposed color record positive images are printed on layers contg. stable diazo compds. which lose their color under the action of light. For a 3-color record, the sensitizing baths may comprise aq. solns. of (1) borofluoride of 1-diazo-4-ethylamino-3-methylbenzene, tartaric acid and PhOH, for yellow, (2) the same diazo compd. with tartaric acid and Na 1-amino-8 naphthol-3,6-disulfonate, for blue, and (3) 1-diazo-2-naphthol-4-sulfonic acid, Al sulfate and resorcinol, for red. Baths for a 2-color record, and various other modifications are also described.

**Color photography.** SOC. CIVILE POUR L'ÉTUDE DE LA PHOTOGRAPHIE ET CINÉMATOGRAPHIE. Fr. 649,817, July 22, 1927. The selector filter used with films having microscopic refracting elements has, in addn. to the red, green, and violet areas, 2 compensating zones on the outsides which are, respectively, green-yellow and orange-yellow. This prevents color overlap of red on blue-violet between 2 refractive elements and produces neutral gray edges.

**Lenticular films for color photography and cinematography.** SOC. FRANÇAISE DE CINÉMATOGRAPHIE ET DE PHOTOGRAPHIE FILMS EN COULEURS KELLER-DORIAN. Brit. 298,951, Oct. 17, 1927. Optical features.

**Photographic materials.** ERNST WALTMANN. Ger. 473,285, Jan. 26, 1928. Salts of  $\alpha$ -hydroxyglutacondialdehyde dianil or of like compds. prepd. from substitution products of the dialdehyde or from other amines are used in the prepn. of layers for color photography. The layers are capable of being bleached out.

**Photographic materials.** I. G. FARBENIND. A.-G. (Otto Matthies and Bruno Wendt, inventors). Ger. 473,000, Feb. 1, 1928. Addn. to Ger. 445,753. To a light-sensitive emulsion of a Ag salt are added org. compds. whose Ag salts are not more sol. than  $AgCl$ . Thioglycolic acid, thiolactic acid, tetrazole, allylaminothiodiazole sulphydrate and 2,6-dimercapto-4-keto-3,5-diphenylpenthiophene, are given as examples of the added org. compds.

**Photographic films.** JULES ROUSSET. Fr. 649,694, July 12, 1927. The usually mat surface of photographic films is made smooth and polished by passing the film into a soln. of alc. contg. 5% formol, and passing the film after drying to polishing wheels, the peripheries of which are impregnated with a colloidal powder mixed with a lubricant.

**Photographic plates.** I. G. FARBENIND. A.-G. (Ernst Leupold, inventor). Ger. 472,890, June 30, 1927. Addn. to 472,115. The method of prepg. anti-halation plates described in Ger. 472,115 (C. A. 23, 2381) is modified by using a coating prepd. by treating an alk. soln. of casein with  $CH_3O$  and a dye. An example is given.

**Photographic developers containing a selenium salt and sodium thiosulfate.** GEVAERT PHOTO-PRODUCTEN NAAMLOOZE VENNOOTSCHAP. Brit. 298,953, Oct. 17, 1927. Blue to violet images are obtained if KBr also is used, and if  $Na_2CO_3$  is added instead (or a sufficient quantity of Na thiosulfate used) brown to red images are obtained.

**Light-sensitive papers.** COMPAGNIE FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON. Fr. 649,490, Feb. 8, 1928. Light-sensitive papers such as "blue prints" have a sensitive layer on both sides and are made sufficiently thick to prevent light on one side affecting the other.

**Photographic dye images.** F. LIEKG. Brit. 298,979, Oct. 18, 1927. Dye components necessary for forming the image are embodied in a silver emulsion in a water insol. condition (such as in the form of urates, sebatos or rosins acid or similar insol. salts of the dye components) and, after the silver image is produced, the dye image is developed from its components as by oxidation or diazotization. In addn. to the dye components there may also be introduced in the emulsion layer a water-insol. substance which yields  $\text{HNO}_2$  on treatment with acids or acid vapors such as the double salts of luteo Co chloride with diammino Co nitrite or with Co nitrite; by treatment with a neutral salt this substance is destroyed by oxidation at the parts occupied by the Ag image when the latter has been developed and fixed, leaving the nitrite compd. unchanged at the parts free from Ag so that afterward at these parts a positive azo dye image may be developed. Various details and other modifications are described.

**Photo-copying.** I. G. FARBERMAN, A. G. OTTO Siebert and Gustav Reddehen, inventors). Ger. 473,445, Mar. 11, 1928. Photographic copies and prints are prepd. with the use of the chromate of unilaterally diazotized *p*-phenylenediamine as light-sensitive material. Fixing is effected by washing with ordinary water.

## 6-- INORGANIC CHEMISTRY

A. K. MIDDLETON

**Basic lead acetate.** E. SOMMER. *Z. Zuckerind. u. choslovak Rep.* 52, 644-51 (1928).

—A series of solns. of basic Pb acetate was prepd., all in the usual manner, but from different grades of com. litharge. The most striking result was obtained with a grade of flake litharge, a soln. contg. 34.2% PbO (basic), with only 7.2% of residue resulting. In the other solns. the content in basic PbO varied from 15.0 to 34.2%. By using 1 pt. of the normal acetate and 2 pts. of litharge, a soln. contg. as much as 66.66% PbO (basic) was prepd., but it was not possible further to increase the basicity by using more litharge. From "superbasic" solns. thus made it was possible to ppt. the dibasic Pb compd. quantitatively by the addn. of alc. (9.1), ordinary basic Pb acetate remaining in soln.

B. C. A.

**Basic chlorides and addition compounds from metallic chlorides and hexamethylenetetramine.** Exceptional behavior of nickel chloride. JAMES C. DUFF AND EDWIN J. BILLS. Central Tech. College, Birmingham. *J. Chem. Soc.* 1929, 411-9.  $\text{CaH}_2$ ,  $\text{Ni}_2\text{I}$  in  $\text{H}_2\text{O}$  does not react with the chlorides of Mg, Ca, Sr and Ba when the solns. are boiled; Zn,  $\text{Fe}^{++}$ , Cr, Al, Sb and Sn all yield the corresponding hydroxides; Cd, Pb and Bi give the resp. basic chlorides.  $\text{MgCl}_2$  gives the compd.  $\text{MgCl}_2 \cdot 2\text{L} \cdot 10\text{H}_2\text{O}$ ,  $\text{MnCl}_2$  gives the basic chloride and from the hot filtrate, the addn. compd.  $\text{MnCl}_2 \cdot 2\text{L} \cdot 10\text{H}_2\text{O}$ ,  $\text{FeCl}_2$  gives  $3\text{Fe}(\text{OH})_2 \cdot \text{FeCl}_2$ ,  $\text{NiCl}_2$  gives a pale green powder,  $\text{N}(\text{CH}_2\text{OH})_4 \cdot 3\text{Ni}(\text{OH})_2$ ; when dried at  $100^\circ$  it loses 3 mols.  $\text{H}_2\text{O}$ . Cold solns. of chlorides in abs. EtOH added to I in abs. EtOH give the following addn. compds.:  $\text{SnCl}_4 \cdot 2\text{L}$ ,  $\text{SnCl}_4 \cdot 4\text{L}$ ,  $\text{SbCl}_3 \cdot 3\text{L}$ ,  $\text{SbCl}_3 \cdot 6\text{L}$ ,  $\text{BiCl}_3 \cdot \text{L}$ ,  $\text{ZnCl}_2 \cdot 2\text{L}$ . In  $\text{H}_2\text{O}$  the following addn. compds. were prepd.:  $3\text{ZnCl}_2 \cdot 2\text{L} \cdot 6\text{H}_2\text{O}$ ,  $\text{CaCl}_2 \cdot 2\text{L} \cdot 10\text{H}_2\text{O}$ ,  $\text{SrCl}_2 \cdot 2\text{L} \cdot 9\text{H}_2\text{O}$ ,  $\text{FeCl}_2 \cdot 2\text{L} \cdot 9\text{H}_2\text{O}$ ,  $\text{Cu}(\text{OH})\text{Cl} \cdot \text{CuCl}_2 \cdot \text{L} \cdot 2\text{H}_2\text{O}$ ,  $2\text{CuSO}_4 \cdot \text{L} \cdot 2\text{H}_2\text{O}$ .

C. J. WEST

**The preparation of phosphenyl chloride.** J. A. C. BOWLES AND C. JAMES. Univ. New Hampshire. *J. Am. Chem. Soc.* 51, 1406-8 (1929). An app. is described in which good yields were obtained of phosphenyl chloride from  $\text{PCl}_3$  and benzene, and of acetamide from  $\text{NH}_4$  acetate. It consists of a boiling flask and reflux condenser connected to a reaction vessel heated by a nichrome winding inside a quartz tube. T. H. C.

**The rapid concentration of germanium and gallium contained in the zinc oxide carrying them.** C. JAMES AND H. C. FOGG. Univ. of N. H. *J. Am. Chem. Soc.* 51, 1459-60 (1929).—Dissolve the sample in excess concd.  $\text{HCl}$ . Filter off  $\text{PbCl}_2$ . Add some of the original sample to the hot soln., while stirring, until it is basic. Continue the stirring some time. Filter off Ge and Ga, and sep. in the usual way. G. M. P.

**Oxides of the noble metals.** GULBRAND LUNDE. *Metallwirtschaft* 7, 417-8 (1929).—Although the Pt metals, Ag and Au are considered "noble" metals, they form many compds. with O, either directly or indirectly. The following compds. are known,  $\text{Pt}_2\text{O}$ ,  $\text{Ag}_2\text{O}$ ;  $\text{Au}_2\text{O}$  and  $\text{AuO}$  ( $\text{Au}_2\text{O}_3$  could not be confirmed);  $\text{PdO}$ ; ( $\text{PtO}$ )  $\text{PtO}_2$ ;  $\text{Rh}_2\text{O}_3$ ,  $\text{IrO}_2$ ;  $\text{RuO}_2$ ,  $\text{RuO}_3$ ;  $\text{OsO}_2$ ,  $\text{OsO}_4$ . The crystal structures of  $\text{PdO}$ ,  $\text{Rh}_2\text{O}_3$ ,  $\text{IrO}_2$ ,  $\text{RuO}_2$  and  $\text{OsO}_2$  are known, the last 3 being isomorphous.

W. C. BRAUGH

**The constitution of boron hydrides.** EGON WIBERG. Chem. Inst. Tech. Hochschule, Karlsruhe. *Helv. Chim. Acta* 12, 225-7(1929).—Ephraim's (*C. A.* 23, 785) structural formula for diborane differs from W.'s only by the symmetry of the H atom distribution. W. has 2 H atoms sharing an electron pair with B. The proof of W.'s unsymmetrical formula is that pentaborane,  $B_5H_9$ , adds 4 mols. of  $NH_3$  as predicted by W.'s formula, whereas E.'s formula predicts the addn. of 5 mols. of  $NH_3$ . A. F.

**The constitution of boron hydrides.** EGON WIBERG. Chem. Inst. Techn. Hochschule, Karlsruhe. *Z. anorg. allgem. Chem.* 179, 309 20(1929); cf. following abstr.—Polemical with Müller (*C. A.* 20, 2625). W.'s hypothesis that electron pairs can hold more than one atom is found to be true not only for B compds. but also in compds. like  $PCl_5$ , acetone-HCl and  $CH_3I.Cl_2$ . His formulas for B compds. are in accordance with Grimm's displacement rule. His formulas also predict the chem. behavior and stability, e. g., the reaction with  $NH_3$  or  $Cl_2$ . W.'s formula gives the correct coordination no. for B, while M.'s formula for pentaborane shows 2 B atoms with coordination nos. of 5, which is impossible. M.'s comparison of B and Fe is unfair since in the hydrides B retains its valence and coordination no. and is not reduced as Fe changing from  $Fe^3$  to  $Fe^{2+}$ . ARTHUR FLEISCHER

**Valency chemistry of boron and the constitution of the simplest boron hydride.** E. WIBERG. *Z. anorg. allgem. Chem.* 173, 199-221(1928).—An electronic formulation of boron hydride,  $B_2H_6$ , is derived by postulating that (1) the octet rule is valid for B compds., (2) the B atom cannot combine by covalencies with more than 4 atoms, (3) H is combined by electrovalencies only in the metallic hydrides, and in all other cases by covalencies. Conclusion: In all electrovalency compds. B is trivalent and in all covalency compounds, quinquivalent. Quadivalent boron, in the sense of quadri-valent C, does not exist. The formula derived is consistent with the addn. of Na and  $NH_3$  to the hydride, its reactions with water and the H halides, and the formation of hypoborates. B. C. A.

**Heterotri salts. V. The existence of heterotriborates and their isomorphism with the other heterotri series.** G. CANNERI. Reale Univ. Firenze. *Gazz. chim. ital.* 58, 840-4(1928); cf. *C. A.* 21, 1233. — Because of the isomorphism and the close similarity of constitution and cryst. form of certain borotungstates, silicotungstates and phosphotungstates, expts. were carried out to det. whether borotungstovanadates could be found, which are similar to silico- and phosphotri salts, and if so, what rela-

tions exist among them. Assuming the general structures:  $R_4 \left[ Si \begin{smallmatrix} (W_2O_7)_x \\ (V_2O_6)_y \end{smallmatrix} \right] nH_2O$  and  $R_7 \left[ P \begin{smallmatrix} (W_2O_7)_x \\ (V_2O_6)_y \end{smallmatrix} \right] nH_2O$ , where  $x + y = 6$ , the substitution of a Si or P atom by a B atom should not modify essentially the structure, for several reasons, which are discussed. These reasons apply in turn to the replacement of Si or P by B, and so attempts were made to prep. borotungstovanadates similar to silicotungstovanadates and phosphotungstovanadates. The method of prepn. was that used for previous heterotri salts, attempts being made to condense the  $W_2O_7$  and  $V_2O_6$  by using a large excess of  $H_3BO_3$  with the hot mixt. of alk. tungstate and vanadate and by removing by filtration the products which sep. by cooling and which comprise alk. polyborates and excess  $H_3BO_3$ . The condensation of the tungstate by  $H_3BO_3$  was shown by the formation of borotungstates. The variation in the color of the mixed tungstate and vanadate solns. supersatd. with  $H_3BO_3$  indicated a similar polymerizing action of  $H_3BO_3$  on vanadates, such solns. having a ruby-red color characteristic of the ions of hexavanadic acid. In the initial expts., the solns. were allowed to evap. with  $H_3BO_3$ , small quantities of alk. polyborates first sepg. followed by orange-red crystals of tungstovanadates, which are much less sol. than the heterotri salts, and finally large brown cubic or octahedric crystals with the same crystallographic characteristics as phospho-, arseno- and silicotri salts. The quantity of these crystals in the different preps. was in all cases so disproportionately small that it appeared as if their formation might arise from impurities rather than from a main coordinating reaction. Repeating the expts. with highly purified  $H_3BO_3$ , no brown cryst. products with the chem. or cryst. properties of heterotri salts were obtained. An investigation proved that phosphates and silica were the impurities which promoted the coordination, and P and Si were found in the heterotri salts. Such a power of Si to induce coordination has already been described by Péchard (cf. *Compt. rend.* 117, 788(1893)). The expts. in general indicate that B does not coordinate  $W_2O_7$  or  $V_2O_6$  groups with the formation of heterotri salts, and that there are boroheterotri salts corresponding to phospho- and silicotri salts. In the presence of similar groups where the coordinating function is exercised by elements with similar ionic diams.,

such heteropoly compds. of B are stabilized in the form of mixed crystals. The following data give the color and the % of  $\text{WO}_3$ ,  $\text{V}_2\text{O}_5$ ,  $\text{SiO}_2$ ,  $\text{P}_2\text{O}_5$ ,  $\text{H}_3\text{BO}_3$ ,  $\text{NH}_3$  and  $\text{H}_2\text{O}$ , resp., in mixed crystals, the 1st 5 being *mixed crystals of heterotrisilicates and heterotriborates*, and the last 5 *mixed crystals of heterotriphosphates and heterotriborates*: orange-red, 65.9, 14.34, 1.42, —, 0.65, 5.38, 13.2; brick-red, 56.7, 19.6, 1.36, —, 0.82, 5.61, 14.1; ruby red, 53.3, 22.3, 1.55, —, 0.75, 6.1, 14.31; brown-red, 47.1, 26.8, 1.81, —, 0.66, 7.12, 15.4; pitchy brown, 42.06, 31.4, 1.42, —, 0.88, 7.4, 16.1; orange-red, 63.4, 15.82, —, 1.62, 0.41, 5.5, 1.9; brick-red, 57.8, 19.1, —, 1.88, 0.55, 6.42, 1.8; ruby-red, 52.9, 22.8, —, 1.91, 0.64, 6.63, 1.2; brown-red, 48.3, 25.9, —, 1.82, 0.75, 7.51, 1.8; pitchy brown, 40.2, 32.02, —, 1.08, 0.61, 8.81, 1.9. The detn. of B in these salts was very difficult until it was found that the method of Copaux (*C. A.* 3, 2098) was very effective.

C. C. DAVIS

**Sulfito salts.** G. JANTSCH AND K. ABRESCH. Univ. of Bonn. *Z. anorg. allgem. Chem.* 179, 345-56 (1929).—A study of the sulfito salts of tervalent metals was made to det. the stability of the complex  $[\text{M}(\text{SO}_3)_3]^{3-}$ . Na and Li trisulfitocobaltates were pptd. by pouring a soln. of the hexanitritocobaltate into a boiling soln. of the alkali sulfite. The Na salt is stable in air. The Li salt appeared to be moderately sol. but the elec. cond. of the soln. indicated that most of the salt was in colloidal suspension. This was confirmed by the use of the ultramicroscope. After subjecting the soln. to ultrafiltration the Tyndall cone disappeared and the soly. was very slight. The cond. measurements and migration of Co to the anode during electrolysis indicate that the  $[\text{Co}(\text{SO}_3)_3]^{3-}$  is stable. The insol.  $\text{K}_3[\text{Co}(\text{SO}_3)_3] \cdot 6\text{H}_2\text{O}$  was prepd. by metathesis with the Li complex. Attempts to prep. the salts from the oxalato and cyano complexes were unsuccessful. This was true also of the attempted prepn. of the  $\text{Me}_3\text{N}$ ,  $\text{PhMe}_3\text{N}$  and guanidine sulfitocobaltates from the nitrito complexes. The far-reaching analogy between the nitrito and the sulfito complexes points to the non-existence of salts of this type of Fe, Al, Cr and Bi. Those of Rh and Ir, however, should be stable. H. F. J.

**Complex oxalates of quinequevalent molybdenum.** HENRY M. SPITTLE AND WM. WARDLAW. Univ. of Birmingham, Edgbaston. *J. Chem. Soc.* 1928, 2742-56.—According to Werner's theory, Bailhache's compds (*Bull. soc. chim.* 29, 161 (1903); 33, 439 (1905))  $\text{Mo}_2\text{O}_7(\text{OH})_6(\text{C}_2\text{O}_4)_2 \cdot \text{H}_2\text{Ba} \cdot \text{H}_2\text{O}$  and  $\text{Mo}_2\text{O}_7(\text{OH})_4(\text{C}_2\text{O}_4)_2(\text{OH})_2\text{R}_2 \cdot 2\text{H}_2\text{O}$  (R = K or  $\text{NH}_4$ ) may be considered as members of a series  $\text{R}[\text{MoO}_2(\text{C}_2\text{O}_4)_2 \cdot x\text{H}_2\text{O}]$  (R = K,  $\text{NH}_4$ ,  $\frac{1}{2}\text{Ba}$ , etc.). The authors have justified this hypothesis by prepg. new members of the series and by detg. the mol. wts. and conductivities. The following compds. were prepd. and studied: *quinolinium molybdenum dioxoxalate*,  $(\text{C}_9\text{H}_7\text{N})[\text{MoO}_2(\text{C}_2\text{O}_4)_2 \cdot \text{H}_2\text{O}]$ , yellowish brown, from  $(\text{C}_9\text{H}_7\text{N})_2[\text{MoOCl}_5] \cdot \text{H}_2\text{O}$  and  $\text{H}_2\text{C}_2\text{O}_4$ , or from  $\text{Ba}[\text{MoO}_2(\text{C}_2\text{O}_4)_2 \cdot 5\text{H}_2\text{O}]$  and  $(\text{C}_9\text{H}_7\text{N})_2\text{SO}_4$ ; *complex acid pyridinium molybdenum oxoxalates*,  $(\text{C}_5\text{H}_5\text{N})_3\text{H}[\text{Mo}_2\text{O}_7(\text{C}_2\text{O}_4)_2 \cdot 6\text{H}_2\text{O}]$  or  $(\text{C}_5\text{H}_5\text{N})_3[\text{Mo}_2\text{O}_7(\text{OH})(\text{C}_2\text{O}_4)_2 \cdot 6\text{H}_2\text{O}]$ , orange-yellow, from  $(\text{C}_5\text{H}_5\text{N})_2[\text{MoOCl}_5]$  and  $\text{H}_2\text{C}_2\text{O}_4$ , on further treatment with pyridine it gives a pale yellow compd.  $(\text{C}_5\text{H}_5\text{N})[\text{MoO}_2(\text{C}_2\text{O}_4)_2 \cdot \text{C}_5\text{H}_5\text{N}]$ , sol. in  $\text{H}_2\text{O}$ ; normal *pyridinium molybdenum oxoxalate*,  $(\text{C}_5\text{H}_5\text{N})[\text{MoO}_2(\text{C}_2\text{O}_4)_2 \cdot \text{H}_2\text{O}]$ , chrome-yellow, from  $\text{Ba}[\text{MoO}_2(\text{C}_2\text{O}_4)_2 \cdot 5\text{H}_2\text{O}]$  and  $(\text{C}_5\text{H}_5\text{N})_2\text{SO}_4$ , decompd. by boiling  $\text{H}_2\text{O}$ , gives the acid salt on steam distn. in an atm. of N; *barium molybdenum dioxoxalate*,  $\text{Ba}[\text{MoO}_2(\text{C}_2\text{O}_4)_2 \cdot 5\text{H}_2\text{O}]$ , red, from  $\text{BaCl}_2$  and a mixt. of  $\text{H}_2\text{C}_2\text{O}_4$  and  $(\text{NH}_4)_2[\text{MoOCl}_5]$ ; *potassium molybdenum dioxoxalate*,  $\text{K}[\text{MoO}_2(\text{C}_2\text{O}_4)_2 \cdot 3.5\text{H}_2\text{O}]$ , yellow, and  $\text{K}[\text{MoO}_2(\text{C}_2\text{O}_4)_2 \cdot 2.5\text{H}_2\text{O}]$ , red (cf. Bailhache) from  $\text{Ba}[\text{MoO}_2(\text{C}_2\text{O}_4)_2 \cdot 5\text{H}_2\text{O}]$  and  $\text{K}_2\text{SO}_4$ , gives, in *vacuo* over  $\text{H}_2\text{SO}_4$ ,  $\text{K}[\text{MoO}_2(\text{C}_2\text{O}_4)_2 \cdot 1.5\text{H}_2\text{O}]$ , yellow; concn. of soln. of any of these hydrated salts at  $100^\circ$  in *vacuo* gives  $\text{K}[\text{MoO}_2(\text{C}_2\text{O}_4)_2 \cdot \text{H}_2\text{O}]$ , red; *ammonium molybdenum dioxoxalate*, small quantity of golden yellow needles, insufficient for analysis, and  $(\text{NH}_4)[\text{MoO}_2(\text{C}_2\text{O}_4)_2 \cdot 2.5\text{H}_2\text{O}]$ , red, from  $\text{Ba}[\text{MoO}_2(\text{C}_2\text{O}_4)_2 \cdot 5\text{H}_2\text{O}]$  and  $(\text{NH}_4)_2\text{SO}_4$ , in an atm. of N, gives a yellow powder,  $(\text{NH}_4)[\text{MoO}_2(\text{C}_2\text{O}_4)_2 \cdot 1.5\text{H}_2\text{O}]$ , when dried in *vacuo* over  $\text{H}_2\text{SO}_4$ , and a brittle red crust when its soln. is evapd. to dryness in *vacuo* at  $100^\circ$ ; and an *oxoxalate of quinequevalent molybdenum*,  $\text{Mo}_2\text{O}_7(\text{C}_2\text{O}_4)_2 \cdot 4\text{H}_2\text{O}$ , pale yellow, from  $\text{Ba}[\text{MoO}_2(\text{C}_2\text{O}_4)_2 \cdot 5\text{H}_2\text{O}]$  and  $\text{H}_2\text{SO}_4$  in an atm. of N. The last compd. corresponds to the hypothetical parent acid,  $\text{H}[\text{MoO}_2(\text{C}_2\text{O}_4)_2 \cdot x\text{H}_2\text{O}]$ ; it is insol. in cold  $\text{H}_2\text{O}$  or in cold concd.  $\text{HCl}$  or in  $\text{HNO}_3$ , stable in air, sol. in hot  $\text{H}_2\text{O}$ , it gives green solns. with warm  $\text{HCl}$ , and red solns. with dil.  $\text{NH}_4\text{OH}$  or alkalis. Valency detns. were carried out by dissolving a weighed amt. of the substance in air-free 2 N  $\text{H}_2\text{SO}_4$ , titrating cold with standard  $\text{KMnO}_4$  in a N atm. until colorless, heating the soln. to  $70^\circ$  and continuing the titration until a permanent pink color was obtained. The amt. of permanganate necessary to oxidize the Mo to the sexavalent state was obtained by subtracting from this reading the amt. necessary to decomp. the oxalate radical. General properties of the complex oxalates are: in air, they are stable in the dry condition, but slowly oxidize in aq. soln.; concd. aq. solns. are blood-red, becoming brownish yellow to yellow on diln.; they are insol. in such org. sol-



vents as alc., ether and benzene; they give with HCl, green solns. of the complex chlorides  $R_2[MoOCl_3]$ , with  $H_2SO_4$ , a green soln., and with HCNS, a red soln.

RUBY K. WORNER

**Coördination compounds of quinquevalent molybdenum: complex thiocyanates.** ROBERT G. JAMES and WM. WARDLAW. Univ. of Birmingham, Edgbaston. *J. Chem. Soc.* 1928, 2726-39; cf. *C. A.* 22, 201.—The reaction between salts of the type  $R_2[MoOCl_3]$  and  $NH_4CNS$  gives rise in aq. soln. to salts of the type  $R_2[MoO_2(CNS)_3]$ , and in the presence of excess HCNS to salts of the type  $R_2[MoO(CNS)_4]$ . The formation of the compds.  $R_2[MoO_2(CNS)_3]$  is addnl. evidence for the previously proposed scheme of ionization and hydrolysis. When  $[(CH_3)_3NH]_2MoOCl_6$  or  $[(CH_3)_4N]_2MoOCl_6$  reacts with  $NH_4CNS$ , salts of the type  $R_4Mo_2O_7(CNS)_8$  are produced. The following compds. were prepared and studied: *dipyridinium molybdenum dioxytrithiocyanate*,  $(C_5H_5N)_2[MoO_2(CNS)_3]$ , bright reddish brown crystals, from  $(C_5H_5N)_2[MoOCl_3]$  and  $NH_4CNS$ , m.  $181^\circ$ , sol. in acetone, and sol. in boiling alc., giving a red soln.; *diquinolinium molybdenum dioxytrithiocyanate*,  $(C_8H_8N)_2[MoO_2(CNS)_3]$ , brownish red crystals, sol. in boiling alc., but almost insol. in  $H_2O$ ; *dihydrogen molybdenum dioxytrithiocyanate*,  $H_2[MoO_2(CNS)_3]$ , anhyd. and with  $2H_2O$ , black, from  $(NH_4)_2[MoOCl_3]$  and  $NH_4CNS$  in an atm. of N, purple-red in concd. aq. soln.; *dihallous molybdenum dioxytrithiocyanate*,  $Tl_2[MoO_2(CNS)_3 \cdot H_2O]$ , bluish purple, made by pouring a warmed purple-red soln. of  $H_2[MoO_2(CNS)_3]$  into a satd.  $TlNO_3$  soln.; *tetra-trimethylammonium dimolybdenum trioxoacthithiocyanate*,  $[(CH_3)_3NH]_4[Mo_2O_7(CNS)_8]$ , purple with greenish luster, from  $[(CH_3)_3NH]_2[MoOCl_3] \cdot H_2O$  and  $NH_4CNS$ , sparingly sol. in cold  $H_2O$ , but more so in hot, due to hydrolysis, leaving a bluish purple streak on unglazed porcelain, purple in concd. soln., turning blood-red, then orange and finally bright yellow on diln., with  $TlNO_3$  pptg. impure  $Tl_2[MoO_2(CNS)_3 \cdot H_2O]$ ; *tetra-tetramethylammonium dimolybdenum trioxoacthithiocyanate*,  $[(CH_3)_4N]_4[Mo_2O_7(CNS)_8]$ , bluish purple, from  $[(CH_3)_4N]_2MoOCl_6$  and  $NH_4CNS$ , with properties similar to the trimethylammonium analog (an attempt to prep. the diethylammonium analog was unsuccessful); *tetrapyridinium dimolybdenum trioxosulfatohexathiocyanate*,  $(C_5H_5N)_4[Mo_2O_7(SO_3)(CNS)_6]$ , purple, from  $(C_5H_5N)_2[MoO_2(CNS)_3]$  and  $H_2SO_4$  by slightly modifying the method of Sand and Burger (*Ber.* 39, 1761 (1903)), almost insol. in alc., sparingly sol. in cold water, but dissolving on continued contact and forming a brown soln., which changes to yellow on diln., producing on prolonged action of  $H_2SO_4$  dark-brown cryst. substances in which probably some of the thiocyanate groups have been replaced by sulfate; *dipyridinium molybdenyl pentathiocyanate*,  $(C_5H_5N)_2[MoO(CNS)_4]$ , greenish black, from  $(C_5H_5N)_2[MoO_2(CNS)_3]$  and HCNS, making a red mark on unglazed porcelain; *diquinolinium molybdenyl pentathiocyanate*,  $(C_8H_8N)_2[MoO(CNS)_4]$ , greenish black crystals, from HCNS and  $(C_8H_8N)_2[MoO_2(CNS)_3]$ ; *ditrimethylammonium molybdenyl pentathiocyanate*,  $[(CH_3)_3NH]_2[MoO(CNS)_4]$ , greenish black crystals, from HCNS and  $[(CH_3)_3NH]_2[Mo_2O_7(CNS)_8]$ ; and *ditetramethylammonium molybdenyl pentathiocyanate*,  $[(CH_3)_4N]_2[MoO(CNS)_4] \cdot H_2O$ , reddish brown crystals, from  $[(CH_3)_4N]_2[Mo_2O_7(CNS)_8]$  and HCNS, sparingly sol. in  $H_2O$  more so in alc. and chloroform, giving with aq. alc. a magenta-colored ppt., probably the octathiocyanate. The prepn., by a method involving electrolytic reduction and the use of alc. HCl, of the following compds. used in this investigation is described: ditrimethylammonium molybdenyl pentachloride,  $[(CH_3)_3NH]_2[MoOCl_5] \cdot H_2O$ , bisdiethylammonium molybdenyl pentachloride,  $[(C_2H_5)_2NH]_2[MoOCl_5]$ ; and ditetramethylammonium molybdenyl pentachloride,  $[(CH_3)_4N]_2[MoOCl_5]$ , together with pure *monotetramethylammonium molybdenyl tetrachloride*,  $(CH_3)_4N[MoOCl_4 \cdot H_2O]$ . The above formulations according to Werner's theory were confirmed directly by detns. of the mol. wts. and conductivities of all the compds. and indirectly by the methods of prepn. and by the reactions. In some of the formulations, O has been assigned one position in the coördination sphere, in others 2 positions.

RUBY K. WORNER

**The stability of complex cobalt and chromium salts as solid phases. I.** ALFRED BENRATH. Aachen Tech. Hochschule. *Z. anorg. allgem. Chem.* 177, 286-302 (1928).—**Cobalt pentammines.**—The pure salts were shaken with various solns. and transformations of the solid phase investigated.  $[Co(NH_3)_5H_2O]Cl_2$  is stable in contact with neither  $H_2O$  nor dil. HCl. The rate of conversion to  $[Co(NH_3)_4Cl]Cl_2$  is inversely proportional to HCl concn. because of the decreased soly. of the aquochloride (cf. *C. A.* 20, 2128). The soly. curves of  $[Co(NH_3)_5H_2O](NO_3)_2$  and  $[Co(NH_3)_4NO_2](NO_3)_2$  must intersect since the first goes to the second with hot dil. or concd.  $HNO_3$ , but in cold dil.  $HNO_3$  the reaction is reversed (cf. *C. A.* 18, 3152). At  $25^\circ$   $[Co(NH_3)_5H_2O](C_2O_4)_2$  and  $[Co(NH_3)_4(C_2O_4)](C_2O_4)_2$  are stable in  $H_2O$  for 8 days. At  $50^\circ$  and  $75^\circ$  in satd.  $(CO_2H)_2$  the aquooxalate slowly forms the acid oxalooxalate.  $[Co(NH_3)_4NO_2](NO_3)_2$  is converted to  $[Co(NH_3)_4](NO_3)_3$  at a rate proportional to the concn. of

$\text{NH}_3$ .  $[\text{Co}(\text{NH}_3)_6\text{Cl}]\text{Cl}_2$  gives the same reaction more slowly at  $25^\circ$  but readily at  $50^\circ$ .  $[\text{Co}(\text{NH}_3)_5\text{H}_2\text{O}](\text{NO}_3)_3$  reacts more slowly than the nitratonitrate. At  $50^\circ$  and  $75^\circ$   $[[\text{Co}(\text{NH}_3)_5]_2\text{SO}_4](\text{SO}_4)_2$  reacts more readily than the nitrate. *Chromium pentammines*.— $[\text{Cr}(\text{NH}_3)_6\text{Cl}]\text{Cl}_2$  shaken 5 days with  $\text{HCl}$  or water remains unchanged but the  $\text{Cr}$  dissolved decreases from 0.1499% in water to 0.0162% in 16.15%  $\text{HCl}$  at  $25^\circ$ . Similar treatment of  $[\text{Cr}(\text{NH}_3)_5\text{H}_2\text{O}]\text{Cl}_3$  gives the chloro deriv.  $[\text{Cr}(\text{NH}_3)_5\text{NO}_3](\text{NO}_3)_2$  at various concns of  $\text{HNO}_3$  is converted to  $[\text{Cr}(\text{NH}_3)_5\text{H}_2\text{O}](\text{NO}_3)_3$ . Treatment of  $[\text{Cr}(\text{NH}_3)_5\text{Cl}]\text{Cl}_2$  with  $\text{H}_2\text{SO}_4$  gives at 15–70%  $\text{H}_2\text{SO}_4$   $[\text{Cr}(\text{NH}_3)_5\text{Cl}]\text{SO}_4$  and at 70–80%  $[[\text{Cr}(\text{NH}_3)_5\text{Cl}]\text{SO}_4]_2 \cdot 3\text{H}_2\text{SO}_4$ .  $[\text{Cr}(\text{NH}_3)_6\text{Cl}]\text{Cl}_2$  is slightly hydrolyzed by  $\text{NH}_3$  to give  $\text{Cr}(\text{OH})_3$ , but even with 30%  $\text{NH}_3$  and at  $75^\circ$  no hexammine is formed. Concd.  $\text{KCl}$  soln gives  $[\text{Cr}(\text{NH}_3)_6]\text{Cl}$  very slowly at  $25^\circ$  but within 8 days at  $50^\circ$ . The  $\text{Br}$  and  $\text{I}$  derivs. behave similarly but then change slowly to the aquo salt.  $[\text{Cr}(\text{NH}_3)_6](\text{NO}_3)_3$  in concd.  $\text{HNO}_3$  gives  $[\text{Cr}(\text{NH}_3)_6](\text{NO}_3)_3 \cdot \text{HNO}_3$ . From  $\text{NH}_3$  soln. of  $[\text{Cr}(\text{NH}_3)_5\text{H}_2\text{O}](\text{NO}_3)_3$ ,  $\text{HNO}_3$  ppts.  $[\text{Cr}(\text{NH}_3)_6](\text{NO}_3)_3$ . In concd.  $(\text{CO}_2\text{H})_2$  soln.,  $[\text{Cr}(\text{NH}_3)_5\text{H}_2\text{O}](\text{NO}_3)_3$  gives  $[\text{Cr}(\text{NH}_3)_5(\text{C}_2\text{O}_4)](\text{NO}_3)_2 \cdot \text{H}_2\text{O}$ . *Cobalt tetrammines*.—At 0–35%  $\text{H}_2\text{SO}_4$ ,  $[\text{Co}(\text{NH}_3)_4(\text{H}_2\text{O})_2](\text{SO}_4)_3 \cdot 3\text{H}_2\text{O}$  is stable but at 35–80%  $\text{H}_2\text{SO}_4$ ,  $[\text{Co}(\text{NH}_3)_4(\text{H}_2\text{O})_2]_2(\text{SO}_4)_3 \cdot 2\text{H}_2\text{SO}_4 \cdot 4\text{H}_2\text{O}$  is formed. Above 80%  $\text{H}_2\text{SO}_4$ , on cooling,  $[\text{Co}(\text{NH}_3)_4(\text{H}_2\text{O})\text{SO}_4]_2\text{SO}_4 \cdot \text{H}_2\text{SO}_4$  is formed.  $[\text{Co}(\text{NH}_3)_4(\text{H}_2\text{O})_2]_2(\text{SO}_4)_3$  in 30 days at  $25^\circ$  in 25%  $\text{NH}_3$  gives  $[\text{Co}(\text{NH}_3)_5\text{OH}]\text{SO}_4 \cdot 2\text{H}_2\text{O}$ .  $[\text{Co}(\text{NH}_3)_4(\text{H}_2\text{O})_2](\text{NO}_3)_3$  at  $25^\circ$  in  $\text{HNO}_3$  reacts more rapidly with increasing concn. of acid to give  $[\text{Co}(\text{NH}_3)_4\text{NO}_3(\text{H}_2\text{O})](\text{NO}_3)_2$ .  $[\text{Co}(\text{NH}_3)_4(\text{H}_2\text{O})_2]\text{Cl}_3$  in  $\text{HCl}$  changes slowly, more rapidly with high concn. of acid, to  $[\text{Co}(\text{NH}_3)_4(\text{H}_2\text{O})]\text{Cl}_2$ . The same product results from  $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]\text{Cl} \cdot \text{H}_2\text{O}$  in  $\text{HCl}$ . Probably a similar reaction occurs with  $[\text{Co}(\text{NH}_3)_4\text{Cl}](\text{H}_2\text{O})\text{Cl}_2$ .  $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]\text{Cl} \cdot \text{H}_2\text{O}$  or  $[\text{Co}(\text{NH}_3)_4(\text{H}_2\text{O})]\text{Cl}_3$  with  $\text{NH}_3$  gives a mixt. of  $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{Cl}_2$  and  $[\text{Co}(\text{NH}_3)_5\text{OH}]\text{Cl}_2 \cdot \text{H}_2\text{O}$ . At 25% from less than 12.5%  $\text{HCl}$  the neutral 1,2-dichlorochloride and above 12.5% the acid 1,6-dichlorochloride are formed. An equil. must be present, the soly. being affected by acid. In every case of transformation above, the metal content of the soln. is decreased, indicating that the changes are due to soly. and not to formation of a slightly ionized complex. FOSTER DEE SNELL.

**Cobaltic derivatives of  $\beta, \beta', \beta''$ -triaminotriethylamine.** FREDERICK GEORGE MANN, Univ. of Cambridge. *J. Chem. Soc.* 1929, 409–11. A mixt. of roseo-cobaltic chloride and  $(\text{H}_2\text{NCH}_2\text{CH}_2)_3\text{N} \cdot 3\text{HCl}$  added to  $\text{H}_2\text{O}$ , boiled, cooled and dil. with concd.  $\text{KCN}$  soln., gives *dithiocyanatotriaminotriethylaminocobaltic monothiocyanate monohydrate*,  $[(\text{SCN})_2\text{Co}(\text{tren})\text{SCN} \cdot \text{H}_2\text{O}]$ , deep red,  $m. 208–10^\circ$  (decompn.); a cold supersatd. soln. and very dil.  $\text{HNO}_3$  give the *mononitrate monohydrate*, deep red,  $m. 226^\circ$  (decompn.); dil.  $\text{HCl}$  gives the *monochloride*, deep red,  $m. 225^\circ$  (decompn.), the *chloroplatinate* is deep brick-red,  $m. 203–4^\circ$  (decompn.). The base is coordinated by all 4  $\text{NH}_2$  groups and the complex ion, having a plane of symmetry, cannot be resolved into optically active forms. C. J. WEST.

**Complex metallic cyanides. II.** HANS REIHLEN AND U. V. KUMMER, Univ. Tübingen. *Ann.* 469, 30–44 (1929); cf. *C. A.* 21, 3324. Further support is deduced in favor of the polynuclear structure of complex metallic cyanides. The compd.  $\text{FePb}_2(\text{CN})_6 \cdot 5.5\text{H}_2\text{O}$  (I), black to deep brown red, results from  $\text{K}_2\text{Fe}(\text{CN})_6$  and  $\text{Pb}(\text{NO}_3)_2$ ; 100 g.  $\text{H}_2\text{O}$  at  $0^\circ$  dissolves 5.23 g., with  $d = 1.037$ ; the compd.  $\text{CoPb}_2(\text{CN})_6 \cdot \text{NO}$   $\cdot 5\text{H}_2\text{O}$  (II) is colorless. From these were prepd. the complex salts  $[\text{Fe}(\text{CN})_6\text{Pb}(\text{H}_2\text{O})_2]\text{Cl}$  (Cs) and  $[\text{Co}(\text{CN})_6\text{Pb}(\text{H}_2\text{O})_2]\text{Cl}$  (Cs) by the action of  $\text{TiNO}_3$  or  $\text{CsNO}_3$ . These salts have relatively high solubilities and at  $v = 100$  l. per mol. the mol. cond. is only about 60% that of  $\text{K}_3\text{Fe}(\text{CN})_6$ . Further diln. causes an anomalous increase in the cond., presumably because of further dissocn. of the complex ion into  $\text{Fe}(\text{CN})_6^{4-}$  and  $\text{Pb}^{2+}$ . The compds. I and II are formulated with homopolar linkings in the complex. The salt  $\text{K}[(\text{NO}_3)_2\text{Pb}_2\text{Fe}(\text{CN})_6]$  could not be obtained in the solid form but the soly. of  $\text{KNO}_3$  and I in the presence of one another are much greater than for each salt alone. The salts  $\text{FePbK}(\text{CN})_6 \cdot 3\text{H}_2\text{O}$  and  $\text{Fe}_2(\text{CN})_6 \cdot 2\text{H}_2\text{O}$  are also described. C. J. WEST.

Purity of  $\text{S}_2\text{Cl}_2$  (KRETOV) 7.

## 7—ANALYTICAL CHEMISTRY

W. T. HALL.

**Experimental notes on quantitative emission spectral analysis. II. Determination of zinc in solutions and of molybdenum in steel by the test method of quantitative spectral analysis.** HILDE THURNWALD, Tech. Hochschule, Prague. *Z. anal. Chem.* 76, 335–47 (1929); cf. *C. A.* 23, 2387. The method described permits the detn. of an element with considerable accuracy without it being necessary to pay undue attention

to strict reproducibility of the spark or other exptl. conditions. As *test soln.* is understood a soln. of some metal salt which possesses at least 1 ultimate line which can be used for comparison with the element that is to be detd. The so-called "test method" depends upon a comparison of the intensities of such lines produced by the element to be detd. and by the test soln. suitably diluted. Thus Zn shows a characteristic line at 3345 which is suitable for comparison with a line at 3383 which is characteristic of Ag. A table is given showing the wt. of Ag per 100 cc. which is necessary to give the same intensity line as that produced by a given wt. of Zn and the table shows that the wt. of Ag is  $0.05 \times$  the wt. of Zn. This ratio permits the detn. of quantities of Zn ranging from 5 to 500 mg. with an accuracy of 20–25% of the actual Zn content. To carry out an analysis it is only necessary to mix 2-cc. portions of a suitable series of Ag solns. with 2-cc. portions of the Zn soln. and det. the spectra. The detn. of 0.1–1% of Mo in steel can be detd. similarly by comparison with Pb lines. By dissolving the steel in acid and pouring the acid soln. into NaOH soln. a suitable  $\text{Na}_2\text{MoO}_4$  soln. is obtained which can be mixed with  $\text{Pb}(\text{NO}_3)_2$  solns. and the Mo line at 2816 compared with the Pb line at 2832. The results can be obtained quite rapidly. W. T. H.

**Thermometric titration methods.** C. MAYR AND J. FISCH. Univ. Wien. *Z. anal. Chem.* 76, 418–38(1929).—Dutoit and Grobet have found that certain titrations can be made by adding small, equal portions of reagent and measuring the temp. change by means of a very sensitive thermometer. Curves are drawn with the temps. as ordinates and the vols. of reagent as abscissas. Dean and Watts later applied this method to the titration of  $\text{SO}_4^{--}$  with 0.5 *N*  $\text{BaCl}_2$  and of halides with  $\text{AgNO}_3$ . These expts. being repeated it is now claimed that these methods for detg.  $\text{SO}_4^{--}$  and halogen are not always applicable because of interference of other cations which are likely to be present. Good results were, however, obtained with the following thermometric titrations: (1) detn. of Ca and Sr by titration with  $(\text{NH}_4)_2\text{C}_2\text{O}_4$ ; (2) titration of Hg with  $(\text{NH}_4)_2\text{C}_2\text{O}_4$ , an empirical factor being used for computing the results; (3) titration of Pb with oxalic acid; (4) titration of arsenite with  $\text{KBrO}_3$ , provided care is taken to adjust the acidity and an empirical factor is used for the calcn; (5) titration of available Cl in bleaching powder with arsenite; (6) titration of oxalic acid,  $\text{H}_2\text{O}_2$ ,  $\text{FeSO}_4$  and  $\text{Fe}(\text{CN})_6^{--}$  with  $\text{KMnO}_4$ . W. T. H.

**Notes on the detection of aluminum by dyestuff reagents.** EDWIN ECGRIWE. Univ. Riga. *Z. anal. Chem.* 76, 438–43(1929).—Expts. are described which indicate that of the 4 dyestuffs tested, morin is the most characteristic reagent for Al but is easily influenced by the presence of Fe. Alizarin S is the most sensitive to Al but also the most sensitive to the injurious effect of Fe. Alizarin red P S is sensitive and shows a fluorescent as well as color effect. Eriochromocyanin R is sensitive and the best reagent of the 4 to use in the presence of Fe. W. T. H.

**Use of simple metallic electrodes in the potentiometric titrations of acids and bases.** J. O. CLOSS AND L. KAHLENBERG. *Trans. Am. Electrochem. Soc.* 54, 369–92(1928).—The single potentials of the metals W, Mo, As, Sb, Bi, Al and Sn in 0.1 *N* acids differ greatly from their potentials in 0.1 *N* alkalis. All these metals yield sharp end points in titrations with *N* NaOH. The change at the end point in some cases is much greater than with a H electrode. Except with Sn in oxalic acid solns. and with Cd electrodes, the potential always changed towards baser values at the end point. With Sn electrodes a second discontinuity was generally observed in the alk. region of the curve, but its position depends on the acid being titrated and is influenced by shaking the electrode. The potentials of the metals in general become const. within 1 min. after each addn. of alkali. Satisfactory results were similarly obtained with platinized Pt electrodes, but Th, Pb and Zn electrodes gave anomalous results. The theory of the method is discussed and the conclusion drawn that the observed potentials arise from the adsorption of O or H by the metal surface. W. H. BOYNTON

**Use of cresol red in acid solutions.** F. R. McCrUMB AND W. R. KENNY. La-Motte Chem. Products Co. *J. Am. Chem. Soc.* 51, 1458–9(1929).—The color change is from red at  $p_H$  0.2 to yellow at  $p_H$  1.8, with half-point at  $p_H$  1.0. It is more stable in soln. than methyl violet. GERALD M. PETTY

**The use of yatren, a single-color, amphoteric indicator.** H. W. VAN URK. Marine hospital at Helder, Holland. *Z. anal. Chem.* 77, 12–4(1929).—Yatren, 7-iodo-8-hydroxy-5-quinoline-sulfonic acid, a yellow powder, is an amphoteric electrolyte. The ions of the salts in both forms are colorless; the color is due to the undissociated substance. In alk. solns. the color is very faint even when near the neutral point at  $p_H = 8$ . Then, as acid is added, the color increases and reaches a max. at  $p_H' = 4$  but fades when more acid is added. It may serve, therefore, to mark end points at about  $p_H = 8$ . W. T. H.

**A berry-juice indicator.** L. MOSENDZ. Ukrainian Agr. Acad. *Z. anal. Chem.* 77, 37-8(1929).—Directions are given by which an indicator can be prepd. from the juice of the chokeberry, *Morus nigra* L. The color is green with bases and light red with acids. With  $H_2SO_4$  and NaOH the end points checked those obtained with phenolphthalein in titrations. W. T. H.

**The Prussian blue and Turnbull's blue tests.** H. W. VAN URK. Marine hospital at Helder, Holland. *Z. anal. Chem.* 77, 39-41(1929).—Szebellédy has recently shown that the blue tests for Fe are influenced by the presence of  $NH_4F$ ; the explanation is vouchsafed that this is due to the diminution of the acidity of the soln. In fact, by adding  $NH_4F$  to a soln. of  $FeCl_3$  or  $FeSO_4$ , expts. show that the  $pH$  values are increased. W. T. H.

**Determination of halogen by the method of O. Gasparini.** KURT HELLER. Univ. Prague. *Z. anal. Chem.* 76, 408-18(1929).—In 1905 and 1907, Gasparini (*C. A.* 2, 238) proposed a method for the destruction of org. substances by electrolysis of  $HNO_3$  solns. and in some of his expts he reduced chlorates to chloride by passing the gases evolved during electrolysis into the aq. soln. If an inorg. chlorate is subjected to electrolysis in  $HNO_3$  soln. and the evolved gases are passed through  $AgNO_3$  soln. the Ag halide subsequently obtained gives results 6-10% too low but with  $KBrO_3$ ,  $KBr$ ,  $KI$ ,  $KIO_3$  and  $KIO_4$  it is possible to get correct results. The app. recommended consists of 2 electrolyzing tubes with a dropping tube connected to the first one and a Pélégot tube to the second, all connections being of ground glass. The lower electrodes serve as anodes. The method is useful for the detn. of I and Br in org. substances except when the substance sublimes too readily. From 0.15 to 30 g. of the substance is introduced into the first electrolyzing tube and 15-20 cc. of 0.1 N  $AgNO_3$  soln. into the Pélégot tube. Conc'd.  $HNO_3$  is added from the dropping funnel and the soln. is electrolyzed with gradually increased current so that not more than 1 bubble per sec. of gas is evolved. The electrolysis is continued for 4-5 hrs. and the current is raised to 4 amp. during the last 15 mins. The contents of the entire app. are then collected and 1.2 g. of Na sulfite crystals is added to make sure that all iodate and periodate are reduced. After 15 mins. add perhydrol until no more sulfite is present, or boil off the  $SO_2$  in the case of Br compds. Finally weigh the Ag halide or det. the excess Ag by the Volhard method. The results obtained in the analysis of more than 25 substances are given. W. T. H.

**Determination of small quantities of nitrate nitrogen.** B. G. ŠIMEK. *Chem. Listy*, 22, 353-7, 473-6(1928).—The reduction methods of Devarda and of Ulsch are unsuitable for the detn. of small quantities of nitrate N (less than 2 mg.), while that of Arnd gives an av. error of only about 1% when duraluminum is used for reduction. The Gladstone-Tribe colorimetric method gives results on the av. 10% below the actual values. The Marx-Trommsdorff titration method gives good agreement for quantities of N within the limits 0.1-0.5 mg.; this method cannot, however, be applied in the presence of NaCl. B. C. A.

**Determination of nitrogen in nitro compounds by reduction with stannous chloride and subsequent titration with iodine.** COSTA WALLERUS. *Tek Tid, Uppl. C (Kem)* 58, 33-5(1928).—The method described is a modification of that developed by E. De W. S. Colver and E. B. R. Prideaux (*C. A.* 11, 2277). The nitro compds., particularly explosives and related substances, are reduced to primary amines by boiling with  $SnCl_2$  in conc'd. HCl and titrating the excess  $SnCl_2$  with  $I_2$ . The N detns. are carried out as follows: Weigh out 0.020 g. equivs. of the compd. in question, in a 100-cc. Kjeldahl flask and pour in 20 cc. of approx. N  $SnCl_2$  soln. Connect to a reflux cooler and boil gently. Place an asbestos sheet between flame and flask with a 2.5-cm. hole in the center which is filled out by the bottom of the flask, in order to avoid any destruction of nitro compds. sticking to the flask walls above the surface of the liquid. Continue the boiling for about 20 mins. The nitro compds. are dissolved in the form of amine hydrochlorides and the soln. is taking a light yellow to dark brown color. Cool rapidly in water, add starch soln. and titrate the excess  $Sn^{++}$  with standard  $I_2$  soln. The more volatile nitrohydrocarbons such as nitro-benzene, -toluene and -xylene should preferably be subjected to a sulfonation before the N detn. since the unsulfonated compds. are likely to be retained to a certain degree in the reflux cooler. The sulfonated compds. are very stable at the temp. in question and good results are obtained in this way. The sulfonation is carried out in the reduction flask by adding 3-4 g. of oleum and heating for about 30 mins. on a boiling water bath. Cool and add a few drops of  $H_2O$  under shaking and continued cooling to convert  $SO_3$  into  $H_2SO_4$ . The N detns. can be carried out in 30 mins. and the results are accurate. C. A. ROBAK

**Determination of traces of phosphorus in ammonia and other combustible gases.** WITOLD HENNEL. *Przemysl Chem.* 11, 634-7(1927).— $NH_3$  is burned in O by an elec.

discharge passing from one gas to the other. Water produced in the reaction is collected and then analyzed for P by the colorimetric vanado-molybdate method. Cf. Schröder, C. A. 14, 1795. A. C. ZACHLIN

**Determination of sulfur (prismatic, cubic) in pebble powder.** VALTER ÖHMAN. *Tek. Tid., Uppl. C (Kemi)* 58, 49–50 (1928).—The extn. of S by  $\text{CS}_2$  in a Soxhlet app., after dissolving out the saltpeter and drying, gives too low results even after extg. for 7 hrs. The following oxidation method which is essentially the same as that used for many years in coal analysis gives good results. Boil 0.5 g. of powder with 50-cc.  $\text{H}_2\text{O}$  to dissolve the saltpeter, wash with boiling  $\text{H}_2\text{O}$ , transfer the residue to a 7-cm. filter and dry carefully on a watch glass on a boiling water bath. Bind up the filter with a cotton thread and place it in a quartz crucible in a Berthelot-Maler calorimeter bomb of non-corroding steel. Place 10 cc. of  $\text{H}_2\text{O}$  in the bomb and introduce 30 atm. of  $\text{O}_2$ , taking care that the filter is not wet. After the combustion, cool for 5–10 mins. Pass the bomb gases through a soln. 10 cc. of 3%  $\text{H}_2\text{O}_2$  in 50 cc. of  $\text{H}_2\text{O}$ . Wash out the bomb and the valves carefully with hot water, and titrate the  $\text{H}_2\text{SO}_4$  with  $\text{NaOH}$ . C. A. ROBAK

**New blowpipe tests for metals.** OTTO PRÖSCHOLD. *Z. physik. chem. Unterr.* 41, 40–4 (1928).—By heating metals to a glowing molten mass and letting them fall on a piece of paper, characteristic designs are obtained as the mass jumps about. Those for Sb, Bi, Woods metal, Cd, Pb, Sn, Zn and Ag are described. M. BEBER

**Standard methods of analysis of aluminum alloys.** A. E. LEIGHTON. *Dept. of Defence Munitions Supply Board*, May, 1926, 7 pp. Correction to C. A. 23, 58–9.—*Detn. of Si.*—Use 1.2 l. of 10 N  $\text{H}_2\text{SO}_4$  (not 2.5 N). *Detn. of Cu, Pb, Fe, Mg and Ni.*—Treat the  $\text{NaOH}$  soln. with  $\text{H}_2\text{S}$  (not  $\text{NaOH}$ ) to see if Zn is present. *Detn. of Pb* "lead acid" should read "lead acid." *Detn. of Ni.*—Citric acid is added to prevent the pptn. of Fe, etc. W. T. H.

**Estimation of carbon in steel wire.** H. N. MARR. *Iron & Steel Ind.* 2, 184–5 (1929).—It is desirable to use millings of mild steel as a flux and a Morganite combustion tube rather than one of fused  $\text{SiO}_2$ . The furnace must be maintained at a higher temp. than that ordinarily used. Thoroughly mix the drillings of mild steel and det. C by combustion. Weigh out a factor wt. (2.727 g.) into a Morganite combustion boat and place a weighed piece of the wire on top of this. See that the wire is resting on, and is surrounded by, the flux at all points. Introduce the boat into the hottest part of the furnace, close the tube and allow the contents of the boat to get hot for 2–3 mins. before turning on the  $\text{O}_2$ . Then turn on a liberal supply of  $\text{O}_2$  for 7 mins. and sweep out the train by passing  $\text{O}_2$  for another 5 mins. Absorb the  $\text{CO}_2$  in ascarite contained in a Midvale tube. W. T. H.

**A sensitive test for magnesium.** WM. L. RUGH. Princeton Univ. *J. Am. Chem. Soc.* 51, 1456–7 (1929); cf. C. A. 20, 3000.—*o,p*-Dihydroxyazo-*p*-nitrobenzene will give a blue color with 0.002 mg. Mg. GERALD M. PETTY

**Notes on the detection of magnesium by dyestuff reagents.** EDWIN EGRIWE. Univ. Riga. *Z. anal. Chem.* 76, 354–9 (1929).—Recently several tests for Mg have been recommended which depend upon the adsorption of a dyestuff by  $\text{Mg}(\text{OH})_2$  and a change in color. Thus quinalizarin and titanium yellow A have been recommended in particular. For such a test it is necessary not only that the dyestuff should be adsorbed but that a change of color should make the fact at once evident to the eye. In the latter respect most dyestuffs adsorbed by magnesia fail but the disazo dyes are likely to prove successful. Moreover, a sym. constitution seems favorable. In this paper the following dyestuffs are shown to be sensitive toward traces of Mg in alk. soln.: (1) Toluylene-orange R(S) and Direct Orange R(J); (2) Benzopurpurin 4 B (Gr-E); (3) Titanium yellow A and thiazole yellow (A); (4) Azo-Blue (By); (5) Diamine pure blue and Chicago blue 6 B (A); (6) 1,2,5,8-tetrahydroxyanthraquinone and alizarincyanin 3 R (By). To carry out a test for Mg, add 1–2 drops of 0.01% aq. dye soln. and follow with an excess of 2 N  $\text{NaOH}$ . All of these dyestuffs are sensitive to Mg in the absence of Ni, Co or Cr. The presence of colored ions like those of Cr interferes with the test. Nos. 2 and 5 of the above dyes are effected least by colorless ions other than Mg. W. T. H.

**Volumetric determination of magnesium.** J. VONDRÁK. *Z. Zuckerind. Czecho-slov.* 52, 113–9 (1927).—The method depends on the conversion of the Mg salt into  $\text{NH}_4\text{AsO}_4$  reduction of this with sulfite, and titration with 0.1 N I at 37–50°; re- 99–99.5% of the theoretical value were obtained. B. C. A.

**An ultramicrochemical method for the determination of mercury.** J. BODNÁR, EDMUND SZÉP. Univ. Debrecen. *Biochem. Z.* 205, 219–29 (1929).—The Hg is d. from its soln. in 10% KCl very easily and quantitatively by means of "nascent

**Cu.** This is accomplished by placing a piece of pure iron wire in the Hg soln. to which a small amt. of  $\text{CuSO}_4$  has been added. The Cu is deposited on the Fe wire, carrying the Hg with it. The Hg is then distd. off from the iron wire; the Hg droplets are formed into a single mass by centrifuging with alc. The diam. of the Hg drop is measured under the microscope and its wt. is calcd. from this. By this procedure Hg can be accurately detd. in amts. of 0.04 to 10  $\gamma$ . S. MORGULIS

**The titration of tin with chloramine-T.** E. RUPP AND F. LEWY. Pharm. Universitätsinstitut Breslau. *Z. anal. Chem.* 77, 1-3 (1929). -For the reduction of  $\text{Sn}^{++++}$  to  $\text{Sn}^{++}$  it is convenient to use shavings of commercial, electrolytic Fe. To prevent oxidation, it is necessary to maintain an atm. free from  $\text{O}_2$ . This can be accomplished with the aid of a Göckel valve contg.  $\text{NaHCO}_3$  soln. or by using a 100 cc. dropping funnel pushed down as far as it will go into the one-hole rubber stopper that closes the reaction flask and with the stem of the funnel cut off flush with the bottom of the stopper. To the slightly acid soln. contg. 0.05-0.15 g. of Sn in a 300 cc. Erlenmeyer flask, add 30 cc. of 6 N HCl and about 3 g. of finely cut Fe. Close the flask with the stopper carrying the cut-off dropping funnel which has been filled with 70 cc. of water contg. 3 g. of  $\text{NaHCO}_3$ . Open the stopcock slightly, so that when there is no pressure from below there will flow out about 1 drop in 2-3 secs. Heat carefully. As the Fe dissolves, the escaping  $\text{H}_2$  will force its way through the opening and prevent the  $\text{NaHCO}_3$  soln. from dropping into the flask. When all of the Fe has dissolved, remove the flame, open the stopcock and cool to room temp. Then add some starch soln. and a little KI to the  $\text{NaHCO}_3$  soln. By opening and closing the stopcock from time to time and applying gentle suction, cause  $\text{NaHCO}_3$  to flow into the flask which is inclined so that the walls are thereby washed down. Finally remove the stopper and titrate with 0.1 N chloramine or with 0.1 N  $\text{I}_2$  soln. W. T. H.

**The determination of vanadium in special steels.** CARLOS GALLEGO. *Quim. ind.* 6, No. 62, 53-4 (1929). -The chief difficulty is to sep. Cr from V. The following method gives excellent results: Treat 2 g. of the metal with hot  $\text{H}_2\text{SO}_4$  (d. 1.60) to form  $\text{V}_2\text{O}_5(\text{SO}_4)_2$ . If W is present, it will be pptd. as hydrated  $\text{WO}_3$  in the concd.  $\text{H}_2\text{SO}_4$ , and it is better to filter it off, or it will be converted into tungstate by the  $\text{NaHCO}_3$  to be added and interfere with the gravimetric detn. of the V. Dil. the soln. to 200 cc., heat to boiling and add  $\text{NaHCO}_3$  until a permanent ppt. is obtained. Filter and wash the ppt. with hot water. Calculation then gives an impure mixt. of Cr and V oxides. Fuse with 4 parts of  $\text{Na}_2\text{CO}_3$  and 1 part by wt. of  $\text{KHC}_4\text{H}_4\text{O}_6$  to convert the V to  $\text{Na}_2\text{VO}_4$  sol. in hot water, leaving insol.  $\text{Cr}_2\text{O}_3$  behind. Take of the aq. ext. of the melt as much as represents 1 g. of the sample and add an excess of solid  $\text{NH}_4\text{Cl}$  to ppt.  $\text{NH}_4\text{VO}_3$ . Filter, wash with 5%  $\text{NH}_4\text{Cl}$  soln. and calcine to  $\text{V}_2\text{O}_5$ . Another method is to take an aliquot part of the aq. soln., add 25 cc. of sirupy  $\text{H}_3\text{PO}_4$  and 0.5 g. of  $(\text{NH}_4)_2\text{SO}_4$ . Add 2 g. of KI and titrate with 1 N  $\text{Na}_2\text{S}_2\text{O}_3$ . S. L. B. ETHERTON

**Detection of vanadium and cerium by hydrogen peroxide.** JOHANN LUKAS AND ANTON JILEK. Tech. Hochschule, Prague. *Z. anal. Chem.* 76, 348-51 (1929). The  $\text{H}_2\text{O}_2$  test for V is extremely sensitive but sometimes fails when V is known to be present. To detect V in the presence of tungstates and molybdates in not too great concn., add solid  $\text{H}_3\text{BO}_3$  and  $\text{H}_2\text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$  in excess to the alk. soln. and then some 30%  $\text{H}_2\text{O}_2$ . When the alk. soln. is made acid in this way, the brown color characteristic of V is obtained without much interference of W and Mo. The yellow color characteristic of the reaction between  $\text{Ce}^{+++}$  and  $\text{H}_2\text{O}_2$  can be obtained both in faintly alk. and in weakly acid soln. or even in neutral soln. if quinine HCl is added and the  $\text{Ce}^{+++}$  salt is the nitrate, but the test is often faulty in the presence of salts which hydrolyze strongly like Th and Zr. To test for Ce with  $\text{H}_2\text{O}_2$  it is recommended to proceed as follows: To the neutral  $\text{Ce}(\text{NO}_3)_3$  soln. add some 30%  $\text{H}_2\text{O}_2$  and then an excess of solid quinine HCl, or drop 30% peroxide soln. on solid  $\text{Ce}(\text{NO}_3)_3$  and add some solid quinine-HCl; in either case the characteristic yellow or reddish yellow color will be obtained. W. T. H.

**The uses of mixed bromides in place of chlorides in the determination of alkalis.** E. SPENCER AND K. B. SEN. *Analyst* 54, 224-6 (1929). The J. L. Smith and the Berzelius methods for detg.  $\text{Na}_2\text{O}$  and  $\text{K}_2\text{O}$  in minerals call for the weighing of NaCl and KCl, the detn. of the  $\text{K}_2\text{O}$  by weighing as  $\text{KClO}_4$  or as  $\text{K}_2\text{PtCl}_6$ , and the detn. of  $\text{Na}_2\text{O}$  by difference. Data are given here showing that good results can be obtained by substituting HBr for HCl in the analysis and weighing a mixt. of NaBr and KBr instead of chlorides. It is also shown that  $\text{K}_2\text{PtBr}_6$  can be pptd. advantageously with  $\text{H}_2\text{PtBr}_6$  and the relative solubilities of the Na and K salts are favorable. W. T. H.

**Carbon dioxide determination in air by titration.** A. KROGH AND P. BRANDT REHBERG. Univ. Copenhagen. *Biochem. Z.*, 205, 265-72 (1929). -The app. consists

of 3 parts: (1) An absorption tube made of Pyrex glass with a diam. of 5 mm. is drawn out at one end and bent upwards, and at 1.5 cm. from the other end it has a bulb 1.5 cm. in diam. The total length of the tube is 15 cm. This tube is filled with 0.4–0.5 cc.  $\text{Ba}(\text{OH})_2$  soln. Air is drawn through the tube at such a rate that it takes an air bubble 15 secs. before it reaches the bulb and bursts. (2) A suction pipet with a capacity of 120 or 60 cc., the upper narrow portion of which is calibrated in cc. (25 and 15 cc., resp.), is provided with a 30-cm. tube of 2-mm. internal diam. attached to a 2-way stopcock. The latter ends in 2 tubes, of which one is a short capillary while the other is long and of ordinary size. (3) A bottle of about 150 cc. capacity is provided with a rubber stopper. The long tube reaches through the stopper to the bottom of the bottle. The capillary branch is of such internal diam. that 110 cc. will flow through it in 15–20 mins. The suction produced by the outflow of water from the pipet into the bottle draws air through the absorption tube contg. a known amt. of  $\text{Ba}(\text{OH})_2$ , colored red with an alc. soln. of cresolphthalein. The unused  $\text{Ba}(\text{OH})_2$  is titrated with standard HCl. With practice an accuracy of 1 part in 100,000 is possible.

S. MORGULIS

**Improved rapid method for the determination of gases in metals, particularly oxygen in steel.** W. HESSENBRUCH. *Rev. métal.* **26**, 93–114 (1929).—See II. and Oberhoffer (*C. A.* **22**, 2525). A bibliography of 147 references is given.

A. P.-C.

**Metallic cyanates. VI. (1) New reactions of cyanic acid. (2) Qualitative test for cobalt. (3) New test for cobalt in the presence of iron.** R. RIPAN. *Univ. Cluj. Bul. soc. stiinta Cluj* **4**, 144–53 (1928).—Eleven new tests are proposed for the detection of the  $\text{OCN}$  ion. They are: (1) Add  $\text{AlCl}_3$  soln. to a hot soln. of  $\text{KNCO}$ ;  $\text{Al}(\text{OH})_3$  is pptd. (2) Add  $\text{FeCl}_3$ ; a reddish color is obtained, or  $\text{Fe}(\text{OH})_3$  is pptd. when hot, accompanied by evolutions of gas. (3)  $\text{CrCl}_3$  gives a  $\text{Cr}(\text{OH})_3$  ppt. These 3 reactions require a 2% soln. of cyanate, while the reagents should contain 0.5% metal. (4) Add a few cc. of  $\text{Ni}(\text{NO}_3)_2$  or  $\text{NiSO}_4$ , then a few drops of pyridine to the  $\text{KNCO}$  soln.; avoid an excess of reagent; blue  $[\text{NiPy}](\text{NCO})_2$  ppts. immediately, or after a few hrs. when the soln. is very dil.; 0.01 g.  $\text{KNCO}$  can be detected. (5)  $\text{Co}^{++}$  salts give blue  $[\text{Co}(\text{NCO})_4]\text{K}_2$  with as little as 0.02 g. cyanate. For smaller concns. add one drop of  $\text{Co}(\text{NO}_3)_2$  in  $\text{Me}_2\text{CO}$  to one drop of tested soln. on a watch glass; a blue coloration is observed at the time the two drops meet, providing 0.0004 g. cyanate is present. (6) To the soln., add  $\text{Co}(\text{NO}_3)_2$ , then pyridine; pink crystals of  $[\text{CoPy}_4](\text{NCO})_2$  ppt. with as little as 0.001 g. of cyanate. (7) To a 2% cyanate soln., add a few cc.  $\text{Zn}(\text{NO}_3)_2$  soln., then pyridine until the ppt. no longer redissolves. Avoid an excess of cyanate, which redissolves  $[\text{ZnPy}_2](\text{NCO})_2$ . (8) Add 1 cc.  $\text{CuSO}_4$  and 1–3 drops picoline; if a large quantity of cyanate is present, blue  $[\text{Cu}(\text{C}_6\text{H}_7\text{N})_2](\text{NCO})_2$  ppts.; otherwise add 2–3 cc.  $\text{CHCl}_3$  and shake, obtaining a blue coloration in  $\text{CHCl}_3$ . (9) Add 2–3 cc. dibenzylamine in  $\text{AmOH}$  (3 cc. amine per 10 cc.  $\text{AmOH}$ ), then 2–3 cc. of 1%  $\text{CuSO}_4$ , and rotate the test tube slowly; the alc. layer is colored violet by cyanate; 0.0001 g. can be detected. (10) Add the cyanate soln. to  $\text{Cd}(\text{NO}_3)_2$  soln., pptg. colorless  $[\text{Cd}(\text{NCO})_2]\text{K}$ ; this reaction detects 0.01 g. cyanate. (11) Add 2–3 cc. of 1%  $\text{Cd}(\text{NO}_3)_2$  soln., then a few drops of pyridine, pptg. cryst.  $[\text{CdPy}_2](\text{NCO})_2$ ; 0.01 g. cyanate is detectable. The following reaction is proposed to detect Co: add 1–2 cc. of 4%  $\text{KNCO}$  soln. freshly prepd., then one drop of concd.  $\text{AcOH}$ . A blue color is obtained with as little as 0.00004 g. Co. If  $\text{Me}_2\text{CO}$  is added (2–4 cc.) without stirring, the supernatant soln. will color it blue with as little as 0.00002 g. Co. The following reaction is proposed to detect  $\text{Co}^{++}$  in the presence of  $\text{Fe}^{++}$ : add 2–4 cc.  $\text{NH}_4\text{Cl}$  or  $\text{NH}_4\text{NO}_3$  soln.; boil; add 2–4 cc. of 4%  $\text{KNCO}$  soln.; a gaseous evolution occurs and  $\text{Fe}(\text{OH})_3$  ppts.; filter while hot; the filtrate is blue if Co is present; if colorless, add a little  $\text{KNCO}$  soln. to compensate decompn. of the cyanate by boiling. As little as 0.0005 g. of Co will give a blue color. If  $\text{Fe}^{++}$  is present, it should be oxidized with  $\text{HNO}_3$ , then neutralized with  $\text{CaCO}_3$  before testing with cyanate. Two new amines have been prepared:  $[\text{Cu}(\text{C}_6\text{H}_7\text{N})_2](\text{NCO})_2$ , blue crystals from 2 g.  $\text{CuSO}_4$  in 100 cc.  $\text{H}_2\text{O}$  and 2-cc. picoline in 50 cc.  $\text{H}_2\text{O}$ ; purified from alc. or  $\text{CHCl}_3$ .  $[\text{Cu}(\text{C}_6\text{H}_7\text{N})_2](\text{NCO})_2$ , violet crystals from 4 g.  $\text{CuSO}_4$  in 100 cc.  $\text{H}_2\text{O}$  + concd.  $\text{KNCO}$  (enough for complete soln.) and an emulsion of 3 cc. dibenzylamine in 100 cc.  $\text{H}_2\text{O}$ , with efficient shaking; purification by recrystn. from  $\text{Et}_2\text{O}$  and washing with  $\text{Et}_2\text{O}$  on the filter.

ALBERT L. HENNE

**Use of liquid amalgams in volumetric analysis. XI. Determination of phosphoric acid by using zinc or cadmium amalgam.** KIN'ICHI SOMEYA. *Sci. Repts. Tôhoku Imp. Univ.*, 1st ser., **17**, No. 7, 1289–98 (1928).—See *C. A.* **23**, 60.

E. C. M.

**Analytical studies on pyrophosphoric acid.** RUDOLF DWORZAK and WILHELM REICH-ROHRWIG. *Univ. Vienna. Z. anal. Chem.* **77**, 14–37 (1929).—The transformation of  $\text{Na}_2\text{HPO}_4$  into  $\text{Na}_4\text{P}_2\text{O}_7$  begins to take place at about  $220^\circ$ , a lower temp. than

has been given hitherto. To det.  $H_3PO_4$  in the presence of  $H_4P_2O_7$ , the method of Berthelot and André gives good results when approx. equal quantities of each acid are present but when  $H_3PO_4$  predominates the following modified procedure is recommended: Add the soln. of phosphate to a mixt. of 100 cc. of acid magnesia mixt. (55 g.  $MgCl_2 \cdot 6H_2O$ , 105 g.  $NH_4Cl$  per l. and enough  $HCl$  to make the soln. acid to methyl red) 20 cc. of cold, satd.  $NH_4Cl$  soln. and 20 cc. of cold, satd.  $NH_4OAc$  soln. Dissolve the resulting ppt. in 40 cc. of 2 N  $AcOH$ . Heat the soln. (200-400 cc.) on the water bath in a covered beaker for 4-5 hrs., filter off the ppt. of  $Mg_3P_2O_7$  and wash with hot water contg.  $NH_4Cl$  and  $NH_4OAc$ . Evap. the filtrate somewhat to secure a second crop of these crystals. Filter again through a small filter. Then, if no further pyrophosphate ppt. appears, ppt. the  $H_3PO_4$  by the method of Schmitz. Dissolve the pyrophosphate ppt. in hot, dil.  $HNO_3$ , digest on the water bath to convert all  $P_2O_7^{4-}$  to  $PO_4^{3-}$  and ppt. by the method of Schmitz. Further expts. were carried out in the search for a new titration method for detg.  $P_2O_7^{4-}$  in the presence of  $PO_4^{3-}$  based on the soly. of heavy metal pyrophosphates in an excess  $Na_2P_2O_7$  soln. Expts. with  $SnCl_4$  proved futile but with the aid of  $UO_2(OAc)_2$  a titration method was developed which permits the ready detn. of  $P_2O_7^{4-}$  in the presence of  $PO_4^{3-}$  with sufficient accuracy except when the preponderance of pyrophosphate is very great. If a soln. of  $Na_2P_2O_7$  is treated dropwise with a soln. of  $UO_2(OAc)_2$  a ppt. is produced which redissolves instantly at first and more slowly as the end point is approached when the ratio  $UO_2 : 2P_2O_7$  is reached. With  $Na_2HPO_4$ , on the other hand, the first drop of  $UO_2^{++}$  soln. produces a permanent ppt. The best way to carry out the titration is as follows: As titrating soln. use 2%  $UO_2(OAc)_2$  soln. Fifty cc. of such a soln. reacts with 1.25 g. of  $Na_2P_2O_7$ . To 25 cc. of phosphate soln. contg. about this quantity of pyrophosphate, add 1.5 cc. of concd.  $NH_4OH$  and water to make 150 cc. Titrate, dropwise, while stirring constantly, until a permanent turbidity is obtained. Carry out about 10 similar expts., each time adding a little more or less of the reagent. Allow all of the tests to stand 6 hrs. and then det. in which cases the ppt. was permanent. The method of Aoyama was tested. It depends upon the treatment of a soln. contg.  $PO_4^{3-}$  and  $P_2O_7^{4-}$  with a measured excess of 0.1 N  $AgNO_3$ , titration of the excess with  $KCN$  by the method of Volhard, suspending the original ppt. in water, saturate with  $H_2S$ , ppt. all of the  $Ag$  as  $Ag_2S$  and finally titrating with 0.1 N  $KOH$  using methyl orange first and the phenolphthalein as indicators. The original directions proved faulty but the following method gave good results. To the phosphate soln. which is faintly alk. to phenolphthalein, add a measured excess of  $AgNO_3$  and enough alc. to make the soln. contain 50% of this reagent. Filter, and treat the filtrate, which now shows an acid reaction, with 0.1 N  $NaOH$  until the newly formed  $Ag$  ppt. shows a distinct gray tint, due to the pptn. of  $Ag_2O$  which is formed when all phosphate is pptd. Filter through the same filter as that used before and titrate the excess  $Ag$  in the filtrate. Rinse the  $Ag$  ppt. into a stoppered bottle, add a measured vol. of 0.1 N  $HCl$  and shake about 30 mins. in the dark. Filter off the  $AgCl$  and titrate with 0.1 N  $NaOH$  to a methyl orange end point and then, after adding salt and cooling to 0°, to an end point with phenolphthalein. From these data the content of  $H_3PO_4$ ,  $H_4P_2O_7$  and  $HPO_3$  salts can be computed by the 3 equations given by Aoyama.

W. T. H.

**A new sensitive reaction for the detection of silicic acid.** F. OBERHAUSER AND J. SCHÖRMULLER. *Techn. Hochschule München, Z. anorg. allgem. Chem.* 178, 381-8 (1929).—The new method is based on the formation of a stable hetero poly acid of the compn.  $SiO_2 \cdot 12MoO_3 \cdot xH_2O$  of yellow color and corresponding to the well-known As and P acids, first isolated by Parmentier (cf. *Compt. rend.* 94, 213 (1882)). This yellow acid is reduced in alk. or acid soln. by  $SnCl_2$  to an acid of a lower grade of oxidation of an intensive blue color, of unknown compn. In a strongly alk., above 7.7 N  $NaOH$ , or strongly acid soln., above 5.21 N  $HCl$ , a dirty brown and yellowish brown color, resp., are obtained, instead of the pure blue. Best results are obtained with the following method: To the soln. contg.  $Si$  in sol. form, possibly obtained through fusion with  $Na_2CO_3$  in a Ni crucible or with  $NaOH$  in a Ag crucible, are added 10 cc. of a 10% neutral soln. of  $(NH_4)_2 \cdot 7MoO_3 \cdot 4H_2O$ , then the soln. is slightly acidified by slowly adding  $AcOH$ ,  $HCl$  or  $H_2SO_4$ . To this a freshly prepd. cold soln. of  $SnCl_2$  contg.  $NaOH$  in excess is added quickly until a clear soln. is obtained. A few drops of a 5%  $SnCl_2$  soln. are sufficient; on the other hand as much as 20-30 cc. is not harmful. The intensive blue color obtained may change into a dirty blue after some time. The sensitiveness of the reaction is 1:1,000,000.

J. A. SZILARD

**Detection of sulfides and thiosulfates by the iodine-azide reaction.** L. METZ. *Chem.-Tech. Reichsanstalt, Berlin. Z. anal. Chem.* 76, 347-51 (1929).—Comments on the paper by Feigl, *C. A.* 22, 4083, showing that the test is a reversal of the well-known



azide test of Raschig and that it is not characteristic of thiosulfate because quite a no. of other substances such as sulfides and polythionates show a similar catalytic effect.

W. T. H.

**The detection, determination and oxidation of sulfur dioxide.** DOUGLAS HENVILLE. *Analyst* 54, 228-31(1929).—A two-bulb tube is shown which is to be fastened to the top of a reflux condenser when  $\text{SO}_2$  is evolved by boiling a sample with dil.  $\text{HCl}$ . The lower bulb serves to prevent any liquid being drawn back into the flask and the upper one to absorb the bulk of the  $\text{SO}_2$ . Ten ml. of  $\text{H}_2\text{O}_2$  is placed in the lower bulb; 2 drops of bromophenol blue and enough  $\text{NaOH}$  to make the color blue are added; the vent in the tube is then closed with a stopper. When the app. is set up and  $\text{CO}_2$  introduced to remove air, the gas flowing from the top of the condenser enters the lower bulb through tubing that extends nearly to the top of the bulb. The gas then pushes the  $\text{NaOH-H}_2\text{O}_2$  soln. up into the upper bulb through a curved piece of tubing that reaches nearly to the bottom of the lower bulb and rises to the middle of the upper bulb with the exit near the bottom of this bulb. The  $\text{SO}_2$  is oxidized to  $\text{H}_2\text{SO}_4$  by the  $\text{H}_2\text{O}_2$  and the acid formed is indicated by a color change. Moreover, the absorption of small quantities of  $\text{SO}_2$  is complete and the soln. in the bulbs can be titrated with  $\text{NaOH}$  as the test proceeds so that a quant. measurement can be obtained. In making such an analysis the chief danger to guard against is loss of  $\text{SO}_2$  by volatilization. The expts. here described show that the expulsion of air to prevent atmospheric oxidation is probably unnecessary.

W. T. H.

**Determination of sulfuric acid in a mixture of sulfuric acid, acetic and acetic anhydride.** TAKAYUKI SOMIYA. *J. Soc. Chem. Ind. (Japan)* 31, 306-10(1928); suppl. binding, 31, 74-5; cf. *C. A.* 23, 1840.—When  $\text{Ba}(\text{OAc})_2$  was dissolved in  $\text{AcOH}$  contg. a little  $\text{Ac}_2\text{O}$ , and the resulting soln. was used as a standard, sulfacetic acid could be easily titrated thermometrically in the presence of  $\text{Ac}_2\text{O}$  according to the following equation:  $\text{Ba}(\text{CH}_3\text{CO}_2)_2 + 2\text{HSO}_3\text{CH}_2\text{CO}_2\text{H} = \text{Ba}(\text{SO}_3\text{CH}_2\text{CO}_2\text{H})_2 + 2\text{HCH}_3\text{CO}_2$ .  $\text{Ba}(\text{CH}_3\text{CO}_2)_2 + 2\text{CH}_3\text{CO}\cdot\text{O}\cdot\text{SO}_3\text{H} = \text{Ba}(\text{CH}_3\text{CO}\cdot\text{O}\cdot\text{SO}_3\text{H})_2 + 2\text{HCH}_3\text{CO}_2$ . The amt. of heat developed by these reactions was far greater than that developed by the reaction:  $\text{Ba}(\text{CH}_3\text{CO}_2)_2 + \text{Ba}(\text{SO}_3\text{CH}_2\text{CO}_2\text{H})_2 = 2\text{BaSO}_3\text{CH}_2\text{CO}_2 + \text{HCH}_3\text{CO}_2$ . The standardization of the  $\text{Ba}(\text{OAc})_2$  soln. could be carried out thermometrically by titrating against  $\text{H}_2\text{SO}_4$  dissolved in  $\text{AcOH}$  soln., which was equally good whether or not it contained a little  $\text{Ac}_2\text{O}$ .

Y. NAGAI

**Purity of sulfur monochloride.** A. E. KRETOV. *J. Chem. Ind. (Moscow)* 5, 1268-73(1928).—On the basis of K.'s detns. made on 10 different recently purified samples, the sp. gr. of  $\text{S}_2\text{Cl}_2$  is 1.6824 at  $\frac{20^\circ}{20^\circ}$ ; the sp. gr. of  $\text{SCl}_2$  is 1.6222 at  $\frac{20^\circ}{20^\circ}$ . For

purposes of factory control it is sufficient to det. the sp. gr. in order to form an idea of the degree of purity of  $\text{S}_2\text{Cl}_2$ . The analytical methods based on distg. and fractionating com.  $\text{S}_2\text{Cl}_2$  cannot be employed for the detn. of its purity, particularly with older samples. As  $\text{S}_2\text{Cl}_2$  used for vulcanization must be very pure, it is necessary to det. either its Cl or both Cl and S. Of the numerous methods which have been proposed, the best are those based on hydrolysis of  $\text{S}_2\text{Cl}_2$  by alkalis;  $\text{NH}_4\text{OH}$  can be used for the detn. of Cl, whereas 2 N  $\text{NaOH}$  can be used for the detn. of both Cl and S. The latter method is very exact when operating as follows: Place 50 cc. of 2 N  $\text{NaOH}$  (free from halogens) in a round-bottom flask with a long narrow neck, and add about 0.2 g. of the sample contained in a small, thin-walled sealed tube. Stopper the flask with a rubber stopper and break the tube by gently striking the flask. After 30 mins. action in the cold, heat 4-4½ hrs. on a water bath if both Cl and S are to be detd. or 1.5 hr. if Cl alone is required. Cool, at with 3-4 cc. of perhydrol added in small portions, which does not affect Cl but quantitatively oxidizes S to  $\text{H}_2\text{SO}_4$ . Then heat on a water bath not longer than 0.5 hr., eat first with concd., and then with dil.,  $\text{HNO}_3$  till weakly acid, pour into a 250-cc. measuring flask and fill with  $\text{H}_2\text{O}$  to the mark. Take 50-100 cc. of this liquid for Cl by the Volhard method, and use 50-100 cc. for the detn. of S and  $\text{BaSO}_4$ .

BERNARD NELSON

**Sanio's potassium dichromate test for tannins.** CHRISTINA M. FEAR. *Bristol rev. Analyst* 54, 227(1929).—One cc. of satd.  $\text{K}_2\text{Cr}_2\text{O}_7$  prepd. according to Sanio's ctions was added to 1% aq. solns. of 23 substances. Gallic acid gallotannin, pyrool, phloroglucinol, maclurin, cinchonine sulfate, and the hydrochlorides of berberine, nine, strychnine, papaverine, narcotine and narceine all gave ppts. The remaining substances, namely  $\beta$ -resorcylic acid, veratric acid, salicylic acid, vanillic acid, oxalic acid, phenol, quercitrin, rhamnetin and the hydrochlorides of betaine, caffeine and pilopine, gave no pptn. It is obvious that no reliance can be made upon the Sanio test for tannins.

W. T. H.

**The contribution of organic chemistry to mineral analysis.** LOUIS GUGLIAMELLI. *Rev. centro estud. farm. y bioquím.* 16, 360-6(1927).—A list of org. reagents used in analytical chemistry and a brief discussion of their applications. J. L. POWERS

**A simple method for the determination of acetaldehyde.** YOSHINORI TOMODA. Tokyo Imperial Univ. *J. Soc. Chem. Ind.* 48, 76-7T(1929).—Ripper's bisulfite method (*Monatsh* 21, 1079) for the detn. of AcH is frequently in error because of loss of  $\text{SO}_2$ . A direct method has been developed for the I titration of combined  $\text{SO}_3$  ion upon dissocn. in a  $\text{NaHCO}_3$ -buffered soln. A slight excess of  $\text{NaHSO}_3$  or  $\text{KHSO}_3$  is added to an aq. soln. of AcH and after 15 min. standing the mixt. is titrated with 0.1 N  $\text{I}_2$  to a blue color with starch;  $\text{NaHCO}_3$  is then added until there is an excess of the solid and after the blue color reappears, it is again titrated with  $\text{I}_2$  until the blue persists for a few sec. The last addn. of  $\text{I}_2$  is equiv. to the combined  $\text{SO}_3$  ion (equiv. to the AcH present); 1 cc. 0.1 N  $\text{I}_2$  = 0.0022 of AcH. The relation between  $p_{\text{H}}$  and the dissocn. of AcH-bisulfite in aq. soln. is discussed, showing that at  $p_{\text{H}}=8$  ( $\text{NaHCO}_3$  buffer) the compd. is slightly dissocd. and combined  $\text{SO}_3$  ion is completely oxidized by  $\text{I}_2$ . A. S. CARTER

**Estimation of alcohol.** WILLIAM L. O. WHALEY. *Planter Sugar Mfr.* 82, 61-5(84-100)(1929); cf. *C. A.* 23, 2675.—A continuation of the study of alc. detn. in complex com. mixt. such as beverages, lotions, flavoring exts., photographic developers, antifreeze preps., etc., by densimetric, refractometric and ebulliometric methods, comparative results of which are given. Oils are removed by diln. or salting out followed by shaking with kerosene or other petroleum oil and centrifuging, the supernatant oily layer being removed by absorption in filter paper. The aq. soln. may then be clarified by shaking with  $\text{MgCO}_3$ , "Kieselguhr," active carbon or other inert substance. Satisfactory results are obtained where only water and alc. are present in the soln. examd. with an instrument. The presence of methanol and other substances influencing sp. gr.,  $n$  or b. p. lead to erroneous results. J. F. BREWSTER

**Determination of ethylene by absorption in a solution of silver nitrate.** V. N. MORRIS. *J. Am. Chem. Soc.* 51, 1460-2(1929).—A 20 to 40% soln. of  $\text{AgNO}_3$  is recommended. The  $\text{C}_2\text{H}_4$  may be recovered by evacuation.  $\text{C}_2\text{H}_2$  and  $\text{C}_2\text{H}_6$  may be detd. in a gas mixt. GERALD M. PETTY

**Colorimetric microchemical determination of furfuraldehyde.** K. SUMINOKURA AND Z. NAKAHARA. *Trans. Tottori Soc. Agri. Sci.* 1, 158-9(1928). Xylidine in presence of AcOH gives with furfuraldehyde a red color stronger and more stable than the corresponding color with aniline. The color with xylidine has the added advantage of being sp. for furfuraldehyde, and enables accurate detns. of the latter to be made in aq. or ethereal soln. B. C. A.

**Detection of gallic acid and tannin.** S. A. CELSI. *Rev. centro estud. farm. y bioquím.* 16, 642-50(1928). Gallic acid, tannin, etc., which yield pyrogallol when heated, are detected by the production of a cherry red color when a trace of the latter in concd. AcOH is heated with a few drops of  $\text{CH}_3\text{O}$  soln. and concd. HCl. B. C. A.

**New reactions of leucine or aminoisocaproic acid.** JUAN SANCHEZ. *Rev. centro estud. farm. y bioquím.* 16, 244-5(1927). Leucine was heated in a test tube until it decompd. into isoamylamine. Upon adding 10% Na nitroprusside a violet color was produced which disappeared when AcOH was added and reappeared when made alk. with  $\text{NH}_4\text{OH}$ . J. L. POWERS

**Colorimetric determination of turpentine vapors in air.** P. N. ANDREEV AND A. A. GAVRILOV. Obukh Inst. *J. Chem. Inst. (Moscow)* 5, 1282-7(1928). The concn. of turpentine vapors in the atm. is often detd. by their absorption in concd.  $\text{H}_2\text{SO}_4$  followed by an oxidation with a  $\text{CrO}_3$  mixt., yielding definite quantities of  $\text{CO}_2$ . In absence of other hydrocarbons in air this method is fairly reliable, but requires much time. A. and G.'s rapid method is based on the intensity of the color produced with concd.  $\text{H}_2\text{SO}_4$ . The results obtained vary between 99.9 and 101.6% of the real turpentine contents of the samples, provided the colorimetric comparison is made after 1-3 hrs. from the time the samples were made. On keeping the samples a longer time the intensity of the coloration increases more rapidly in the more concd. solns. of turpentine in  $\text{H}_2\text{SO}_4$  than in dil. solns. The presence of fairly large quantities of benzene and  $\text{C}_6\text{H}_6$  has practically no effect upon the results. BERNARD NELSON

**Highly accurate method for the analysis of urea.** MILLICENT TAYLOR. Univ. of Bristol, Eng. *J. Am. Chem. Soc.* 50, 3261-5(1928); cf. *C. A.* 23, 579.—For the titration, Miss Taylor used methyl red and not methyl orange and she meant by "soda"  $\text{NaOH}$  and not  $\text{Na}_2\text{CO}_3$ . W. T. H.

**Applications of the nitrile method. III. The hydrocyanic acid and formaldehyde numbers of sugars. 2. Their analytical significance. 3. Determinations of sugar.** FRITZ LIPPICH. Univ. Prague. *Z. anal. Chem.* 76, 401-8(1929); cf. *C. A.* 23,

3029.—The HCN no. of milk has been shown to be a definite characteristic due to the lactose and casein content. The no. is also characteristic of other sugars. To make the detn. dissolve 5 g. of sugar in 90 cc. of water in a graduated cylinder, bring the temp. to 19° and pour the soln. into 20 cc. of approx. 0.25 *N* KCN soln. and rinse out the cylinder with 10 cc. of water. After 10 min. distil off the excess cyanide as previously described. The following results were obtained; dextrose, 9.14; fructose, 16.77–18.46; levulose, 13.41; lactose, 3.54; maltose, 5.10. To det. the HCHO no., prepare a soln. of the same wt. of sugar and add 1 cc. of approx. 1.7 *N* HCHO soln. After 4 min. at 19°, add the KCN soln. as before and continue as usual. Deduct from the result the value found for the KCN alone. The results were: dextrose 2.91, fructose, 6.71, levulose 5.15, lactose 1.94, and maltose 2.22. Curves are given showing how these values depend upon the sugar concn. and from these plotted curves it is possible to est. the sugar content of solns. IV. 1. The significance of the hydrocyanic number of sugars in the analysis of sugar mixtures. 2. Determination of sugars in marmalade. *Ibid.*—Expts. were carried out with mixts. of *d*-glucose and *l*-glucose, cane sugar and either *d*- or *l*-glucose, and cane sugar mixed with both of these other sugars. Samples of marmalade were also analyzed for cane sugar and invert sugar. The results show that the effect of the fruit pulp in evapg. sugar solns. has little influence upon the HCN nos. of the sugars present and, although these expts. are not perhaps to be regarded as final, they indicate that the nitrile method may find some practical application in this field. W. T. H.

The importance of electrochemistry in the teaching of analytical chemistry (FURMAN) 4. The activity of certain acid-base indicators (SENDROV, HASTINGS) 2. Gossypol. VI. The action of boiling HI as used in the Zeisel method upon gossypol and some of its derivatives. A semi-micro Zeisel methoxyl method (CLARK) 10.

KOLTHOFF, I. M. AND MENZEL, H. *Die Massanalyse*. Pt. 2. Berlin: J. Springer. 512 pp. M. 20.40. Reviewed in *Chem. News* 136, 318(1928). Cf. *C. A.* 21, 3328; 22, 2340.

NEGRESO, T.: *Recherches expérimentales d'analyse spectrale quantitative sur les alliages métalliques*. Paris: Presses Universitaires. 120 pp. Reviewed in *Chemistry & Industry* 47, 466(1928).

## 8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY AND J. F. SCHAIRER

A crude copper mat containing oldhamite. C. W. CARSTENS. *Norsk Geol. Tids.* 10, (No. 1-2) 39-47(1928). Chem., mineralogical and x-ray investigations have proved that 2 of the chief minerals occurring in a raw Cu mat contg. Cu are oldhamite (CaS) and troilite (FeS). In all probability the other minerals present in the mat are sphalerite and chalcocite, or a mineral resembling chalcocite. O. A. NELSON

A new etching solution for chalcopyrite. WALTER FACKERT. *Univ. of Freiburg. Metallwirtschaft* 7, 1172(1928).—The soln. recommended is 2.5 parts by vol. HNO<sub>3</sub> sp. gr. = 1.2), 4 parts by vol. HCl (sp. gr. = 1.19), 10 parts by vol. H<sub>2</sub>O and a pinch of KClO<sub>3</sub>. The smallest possible vol. of this soln. is used, and best results are obtained by several treatments with intervening polishing. The soln. is ready for use when the evolution of free Cl occurs. The reaction is slow in the presence of bornite; in this case it is recommended that the bornite be coated with a suitable lacquer. Photomicrographs are shown of etched specimens from various localities. H. STOERTZ

A genesis of some types of feldspars from granite pegmatites. OLAF ANDERSEN. *Norsk Geol. Tids.* 10, (No. 1-2) 116-205(1928); cf. *C. A.* 22, 2126.—At first there was probably simultaneous crystn. of Na-K feldspar and plagioclase from a magmatic soln. rich in volatile constituents, the 2 feldspars sepg. in individual crystals. The Na-K feldspar may have been a homogenous variety; the plagioclase was usually a soda-rich one, sometimes pure albite. Often there was formed antiperthitic intergrowths by a sythetical simultaneous crystn. of plagioclase and small quantities of K feldspar in parallel orientation. Exsolution, giving rise to perthite, went on at an early period and orption and replacement phenomena may have begun to play a part. Occasionally there was a simultaneous (not eutectic) crystn. of both feldspars, the plagioclase in the examples of this being an andesine. The second stage was characterized by a more active process of resorption and replacement. The platy variety of albite (cleavelandite) some of the pegmatites may belong in this stage, although its recrystn. may have begun earlier. A peculiar recrystn. of the microcline along incidental mech. cracks has

been going on during this stage and probably continued into the next. Sometimes this recrystn. has involved considerable parts of the feldspar. The effect of this recrystn. has been to destroy the regular cross-twinning of the microcline, either single crystals or irregularly twinned ones being produced. A const. feature of this stage, as of the next, is the continued formation of contraction cracks. Through many of these cracks communication with the remaining magmatic soln. has been established and the various fluids or gaseous emanations derived from the magmatic soln. has exerted their influence on the feldspar with which they may have come in contact. At first they have had a resorbing action, dissolving principally microcline, but also to some extent albite and poikilitic inclusions of quartz. Then they have effected the recrystn. of the microcline and have been agents of a replacement by which microcline, as a rule, has been carried away to be more or less replaced by albite. The replacement at this stage has not been carried to the extreme of removing all microcline; it has been confined to the production of perthitic veins of albite. During the closing of this stage the formation of film perthite through exsolution may have begun, and this process may have continued also through the next stage. The third stage is characterized by the extensive replacement of microcline by albite, giving rise to such peculiar feldspars as the chessboard albite and to the beautiful crystals of albite growing into cavities and often covering the outside faces of microcline-perthite. This replacement process is probably only an intensified continuation of the process leading to the formation of the perthite veins. O. A. N.

**Researches on the chemical composition of liparite.** C. CARONNI. Istituto di Chimica Generale, Reale Univ. Napoli. *Gazz. chim. ital.* 58, 801-8 (1928). Although liparite was discovered and analyzed long ago by Casoria (*Rel. soc. reale Borbonica* 3, 13, 325 (1844)); *Atti 7. adunanza straordinaria. Napoli*, II, 1156 (1846) there are no later data as to its compn. in the literature. A new sample from Lipari gave on analysis:  $\text{SiO}_2$  33.08,  $\frac{1}{2}\text{Fe}_2\text{O}_3$  1.79,  $\frac{1}{2}\text{Al}_2\text{O}_3$  1.19,  $\text{CaO}$  0.81,  $\text{MgO}$  2.07,  $\text{CuO}$  35.10,  $\text{H}_2\text{O}$  9.52,  $\text{H}_2\text{O}$  (by  $\text{CaCl}_2$ ) 16.98%,  $\text{CO}_2$  trace. The formula of the mineral dried over  $\text{CaCl}_2$  is essentially  $\text{CaO} \cdot \text{SiO}_2 \cdot 11\text{H}_2\text{O}$ , whereas in contact with air at  $25^\circ$  it is  $\text{CaO} \cdot \text{SiO}_2 \cdot 31\text{H}_2\text{O}$ . Analyses of various samples show, however, that the  $\text{H}_2\text{O}$  removable by  $\text{CaCl}_2$  varies considerably. A study of the rate of evolution of water over  $\text{CaCl}_2$  and of its reabsorption indicates that it is not  $\text{H}_2\text{O}$  of crystals but water such as that in zeolites. The liparite is strongly birefringent, has  $d_o = 2.080$ , and  $n_g = 1.51$ . The chem. compn. and particularly the character of the  $\text{H}_2\text{O}$  suggest that the liparite under investigation is like the type of chrysocolla termed *Asirolite* by Hermann (*Bull. soc. nat. Moscou* 30, 32 (1896); *Z. Krist.* 17, 625 (1900)). The term liparite should be confined to the mineral occurring on the Island of Lipari. C. C. DAVIS

**The Frood ore deposit:** a suggestion as to its origin. C. V. CORLESS. *Mining J.* 165, 281-2 (1929). The Frood ore body consists of mixtures of sulfides of Fe, Cu and Ni with small quantities of Au, Ag and platinum together with gangue. Pentlandite occurs in an almost const. ratio to pyrrhotite throughout the whole section. Below 800 ft. the ore can be directly smelted. From 800 to 1100 ft. depth the ore averages 2.1% Cu and 2.4% Ni, and increases gradually in tenor with depth. Cu enrichment below 2000 ft. is marked. On the 3100 ft. level the ore averages 21% Cu and 1.7% Ni, chalcopyrite here forms 65% of the ore. C. postulates this to be caused by the sudden injection of a large body of highly fluid magma, very rich in sulfides, along some local plane of weakness, which could easily have been caused by the intrusion of the Sudbury norite laccolith. Settling of the heavy sulfides and rise of the gangue caused the present vertical arrangement. ALDEN H. EMERY

**Notes on the nickel and copper deposits in the norite complex, west of the Pilansberg district, Rustenburg, Transvaal.** EDWARD R. SACHCH. *J. Chem. Met. Mining Soc. S. Africa* 29, 150-7 (1929).—Ni and Cu deposits occur as pipes (10 to 50 ft. in diam.) in a narrow zone following the base of the Pilansberg complex. The chief minerals are pyrrhotite, pyrite, pentlandite, chalcopyrite and malachite; all but the last are primary. Primary chromite, magnetite, Au, Ag and Pb and secondary sulfates of Fe, Ni and Cu occur as accessory minerals. The country rock is chiefly ironzinitite. The Ni is uniform in distribution; Cu is very irregular. The tenor is about 3.5% Ni and 1.0% Cu. There are 3 classes of ore: (1) massive sulfides, (2) coarsely disseminated ore, and (3) finely disseminated ore. These grade in this order from the center outward. A. H. E.

**An interesting mine in the Zoutpansberg.** O. SACERDOTE. *Mining J.* 165, 279-80 (1929).—The S. S. mine, producing Au and W, is described. Highly mineralized lodes occur in an area of schists and quartzites intruded by granite. ALDEN H. EMERY

**The radioactive ores of Britain.** A. WOKSLEY. *Mining J.* 164, 201-2 (1929).—The possibility of establishing a plant for producing Ra in Great Britain is considered. The compn. and occurrence of pitchblende, torbernite, autunite, bassettite, urano-

spathite, carnotite and a columbo-titanate of U from Madagascar are given. Devon and Cornwall are the districts in which search should center. ALDEN H. EMERY

**Radium and uranium ores in Portugal.** ANON. *Mining J.* 165, 279(1929).—Within one basin near the eastern boundary of Portugal, 90 concessions of 125 acres each have been granted in an area of proven U ore deposits. ALDEN H. EMERY

**Mining in Greenland.** S. O. CORP. *Tek. Tid., Uppl. C., Bergsvetenskap* 58, 33-9(1928).—An illustrated review. Greenland is rich in minerals, there being deposits of limestone, dolomite, asbestos, talc, coal, copper ore, graphite, cryolite, etc. Cryolite is so far the only mineral which is being exploited on a com. scale, about 25,000 tons being exported annually. C. A. ROBAK

**The deposits of ores, oil and precious stones of Birma (Burma), British India.** H. FOLKE SANDELIN. *Tek. Tid., Uppl. C., Bergsvetenskap* 58, 73-7(1928).—An illustrated review. C. A. ROBAK

**Tin ore deposits and tin mining in Siam.** W. GREDNER. Bangkok. *Mining J.* 165, 333-4(1929).—Siam produces about 5% of the world's Sn. This occurs as a primary deposit in pegmatite veins in granite outcrops, too low in grade to be com. The placer deposits formed by the weathering of these veins are the source of the production. Seventy % of the Siamese Sn output comes from 2 lines of granite. Wolframite occurs in these same districts and was mined during the war. Strip mining is customary, but hydraulic mining is sometimes employed. Underground mining is practiced only where the overburden is thick (over 12 m.) or the Sn content is low. Numerous small shafts are sunk about 12 m. apart and the miners work out from the bottom. Dredging now recovers 40% of the Sn from the harbor bottoms. ALDEN H. EMERY

**Notes on the theory of petroleum formation. III. The composition of primary tar from Chachareisky boghead coal.** G. STADNIKOV AND N. PROSKURNINA. *Brennstoff-Chem.* 9, 358-61(1928), (cf. C. J. 22, 4117-8).—The tar (495 g.) obtained by distn. with steam was freed from acids and bases and fractionated; 25° cuts were taken up to 200°, the largest amt. (42.5%) distg. between 15° and 200°. All fractions were highly unsatd. (I No 98 to 146), contained from 3.5 to 6% of O<sub>2</sub>, and oxidized readily on exposure. They also gave resinous polymerization products on standing. All fractions were oxidized with KMnO<sub>4</sub> and fatty acids were formed. Those from C<sub>2</sub> to C<sub>10</sub> were isolated as Ag salts. The small quantity of tar oils not oxidized by KMnO<sub>4</sub> was sepd. from the reaction products by distn. with steam; 13.3% of paraffin and 0.31% of asphaltenes were recovered from the tar oils not volatile with steam. The remainder was fractionated and found to consist mainly of oxygenated unsatd. compds. S. and P. conclude that this boghead coal is the product of an extensive polymerization of fats, waxes and fatty acids of algae. The process has produced compds. which are insol. in all org. solvents. Heating to 400° partly depolymerizes the coal, forming acids and anhydrides. These substances further decomp. into unsatd. hydrocarbons and oxygenated compds., probably ketones. J. D. DAVIS

**Optical analysis of volcanic rocks as a means of studying their genetical relationships.** S. TSUBOI. *Bull. Tokyo Univ. Earthquake Research Inst.* 4, 131-8(1928). (In English.) *Science Abstracts* 31A, 665.—The processes occurring when crystn. takes place on a solid magma and the successive changes occurring in the compn. of the liquid outlined. A curve is constructed called the paragenetic relation of the minerals in rocks, but as a preliminary, it is necessary to find the compn. of plagioclase and "mafic" material assocd. as phenocrysts in each of the rocks. An optical dispersion method is the most suitable. Actual examples of the results obtained by optical analysis are given. The advantage of this optical method of analysis is that, petrographically, similar rocks can be differentiated into genetically distinct groups. H. L. D.

**The clays of East Prussia and their properties.** PAUL G. KRAUSE. *Tonind. Ztg.*, 529-32(1929).—A description is given of the loams, clays and shale of East Prussia. R. F. FERGUSON

**The chemistry and biology of the clay pits and the distribution of the larvae of *Anopheles maculipennis* in them.** B. M. SEBENTZOV AND A. N. ADOVA. *Arch. Hydrobiol.* 20, 81-7(1929).—The water of 2 clay pits, a recent one (I) and an older one (II), subjected to chem. and biol. analysis. Though there was a difference in quantity of org. constituents present, the cond. was disproportionately greater in II than in I. A. assume that besides other factors the greater content of electrolytes was responsible for the abundance of larvae of *Anopheles maculipennis* in II and their only porary presence in I. G. SCHWOCH

**Correlation between the adsorption capacity of coals and peats and their other characteristics (PENTZOV) 21.**

AUDIBERT, PAUL: *Causeries sur les filons métalliques*. Paris: Dunod. 240 pp. Paper, F. 33.

HATCH, F. H.: *An Introduction to the Study of Ore Deposits*. London: Geo. Allen and Unwin, Ltd. 117 pp. 7s. 6d. net. Reviewed in *Eng. Mining J.* **127**, 730 (1929).

HOLMES, ARTHUR: *Nomenclature of Petrology*. Revised ed. London: Thomas Murby & Co. 284 pp. 7s. 6d. Reviewed in *Mineral. Abstracts* **4**, 7 (1929).

SUTTON, J. R.: *Diamond: a descriptive treatise*. New York: D. Van Nostrand Co. 114 pp. \$6. Reviewed in *Mining Met.* **10**, 266; *Mineral. Abstracts* **4**, 6 (1929).

## 9—METALLURGY AND METALLOGRAPHY

D. J. DEMOREST, R. H. ABORN

**The chemistry of the cyanide lixiviation of silver ores.** F. P. RASCHIG. Bergakademie Freiberg. *Metall u. Erz* **25**, 467-72, 525-9 (1928).—A theoretical discussion based on the literature. J. BALOZIAN

**Briquetting and sintering of ore slime and similar iron-containing pulverulent materials in Germany.** SVEN LIND. *Tek. Tid., Uppl. C (Bergsv.)* **58**, 27-32 (1928).—An illustrated review. C. A. ROBARK

**The working of Bolivian bismuth ore.** C. FRICK. *Metall u. Erz* **25**, 550-2 (1928).—The method of O. Wiegand developed in 1882 for working in the shaft furnace the Bi ores from the Tasna mine is described. J. BALOZIAN

**The secondary tin ore deposits in Chorolque (Bolivia).** HANS BORNITZ. *Metall u. Erz* **25**, 635-7 (1928).—Up to the present about 2000 tons of 60% Sn concentrates have been obtained from the secondary Sn deposits in Chorolque, the ore reserves amounting to 1900 tons of fine Sn. J. BALOZIAN

**The ore deposits at Schauinsland in southwestern Schwarzwald.** H. SCHNEIDERHÖHN. Univ. of Freiburg. *Metall u. Erz* **26**, 161-6 (1929).—A lecture in which the important references are tabulated. J. BALOZIAN

**Anticlinal ore mantel in Siegerland.** H. QUIRING. *Metall u. Erz* **25**, 519-25 (1928).—A study of the ore formation of the district. J. BALOZIAN

**The South African platinum deposits, their present and future significance for the world market.** BAHR. *Metallhose* **18**, 929 (1928). E. M. SYMMES

**Platinum in southwestern Oregon.** A. E. KELLOGG. *Mining J. (Arizona)* **12**, 5 (1929). E. M. SYMMES

**Methods proposed and in use for refining aluminous ores.** C. L. MANTELL. Pratt Inst. *Chem. Met. Eng.* **35**, 746-50 (1928). For the production of alumina from ores 12 processes are briefly described, Bayer, Hall, Pedersen, Haglund, Berger, Serpek, Svendsen, Blanc, Halvorsen, Sherwin, Laist and Speketer. Of these the Bayer is most widely used. Bauxite is the principal raw ore. Not much progress has been made in treating clay, feldspar, etc. G. B. TAYLOR

**What demands are placed on minerals, which are used in dressing experiments?** H. SCHNEIDERHÖHN. *Metall u. Erz* **25**, 499-504 (1928).—A theoretical paper in which the principal appearances and characteristics of inhomogeneity and mixed crystal formation, as occur in the most important ores and gangs capable of being dressed, are described. J. BALOZIAN

**Liquation phenomena and sampling.** C. STIELER. *Metall u. Erz* **25**, 540-50 (1928).—Analyses of a speiss from a Pb smelter (one set of samples being crushed and another from drillings) show the importance of liquation phenomena on the uniformity of the results. J. BALOZIAN

**Investigations on the theory of flotation.** WALTER LUYKEN and ERNST BIERBRAUER. *Mitt. Kaiser Wilhelm Inst., Eisenforsch., Düsseldorf*, **11**, No. 3, 37-52 (1929); cf. *C. A.* **23**, 2399.—It has been found possible to recover apatite by flotation with Na palmitate as a reagent. The authors believe this is due to the adsorption of the palmitate radical at the carboxyl end on the Ca of the mineral. The hydrocarbon chain of palmitate by virtue of its incompatibility with water attaches itself to the air bubble and carries up the solid particle. Adsorption measurements were made on several minerals by noting the change in the no. of drops per unit wt. of soln. before and after adsorption. The layer of adsorbed material was held very tenaciously and could not be washed off with water. When the layer was dissolved off in HCl or H<sub>2</sub>SO<sub>4</sub>, the resulting soln. showed no Na, but considerable palmitate, indicating that metathesis had taken place on the surface, resulting in the formation of an insol. palmitate. If the Ca is more insol. than its palmitate no adsorption takes place. This seems to be

the case with blende, but not with galena. The wetting of the minerals, as measured by the contact angles of a drop of the soln. with a flat surface of the mineral before and after adsorption, showed an inverse correlation between change in wetting power and amt. of palmitate adsorbed. Flotation expts. showed that minerals very slightly wetted gave the best concentrates. Cassiterite does not adsorb palmitate, but after a preliminary treatment with  $\text{Ca}(\text{OH})_2$  it adsorbs well and very good recovery may be obtained. An analogous role is played by the use of Na sulfide in the flotation of oxide ores, and various reagents used in selective flotation processes. A page of excellent photographs shows the results of various treatments on wetting power.

HANS C. DUUS

**The influence of adsorption on flotation processes.** E. PEETZ. *Metall u. Erz* 25, 494-9(1928).—The adsorption power of quartz and galena (as representative hydrophile and hydrophobe minerals, resp.) in aq. capric acid is studied, a relation between the adsorption and floating powers of the minerals in these systems being detd. In the quartz/capric acid system, quartz adsorbs capric acid only in an unmeasurable degree. However, because of the peptizing action of the acid, some of the quartz goes into soln. as a colloid and adsorbs a part of the acid. In the galena/capric acid system, galena is a good adsorbant of the acid. Orientation expts. show that the surface tension of capric acid increases on addn. of galena. In the dry state, galena possesses less adsorptive power than in the moist; the greater the no. of dryings, the greater is the loss in adsorbing power. In every adsorption process, the relation between the adsorbed material and that remaining in soln. is:  $\alpha = \beta \cdot c^{1/n}$ , where  $\alpha$  = the amt. adsorbed by the boundary faces,  $c$  = the equil. concn. in the soln., and  $\beta$  and  $1/n$  = consts. (are 67 and 0.5, resp., in the system galena/capric acid).

J. BALOZIAN

**Wetting and adsorption in relation to flotation.** E. BIERBRAUER. Kaiser Wilhelm Inst., Eisenforschung, Dusseldorf. *Z. tech. Physik* 10, 139-41(1929).—Recently the flotation of nonsulfidic minerals, e. g., apatite (*Mitt. K. W. Inst. Eisenf.* 10, 317(1928); *Arch. Eisenhüttenw.* 2, 355(1928/9)) has been successfully performed by means of Na palmitate. It is, therefore, concluded that previous theories of wetting and oil adsorption as criteria for flotation are incomplete. It was shown by Traube's method (drop counter) that Na palmitate is adsorbed by apatite because of the attraction of Ca ions in the apatite for the palmitate radical. A mol. model on the basis of the Langmuir and Harkins theories shows that the wetting ability of apatite must therefore decrease when Na palmitate is present (alkyl radical turned outward). Measurements of the capillary angles of water drops on apatite, calcite and quartz showed this influence on the first 2 minerals. The same quality of decreased wetting ability is conducive to flotation of the mineral (concn. of particles around air bubbles) as shown from comparative flotation curves of the same three. A practical application of the theory was obtained by flotation of  $\text{SnO}_2$  with Na palmitate after previous treatment of this mineral with  $\text{Ca}(\text{OH})_2$  to coat it superficially with Ca ions.

B. J. C. VAN DER HOEVEN

**Selective flotation.** HARALD CARLBORG. *Tek. Tid., Uppl. C (Bergsv.)* 58, 49-55 (1928).—A review.

C. A. ROBAK

**Introduction of selective flotation methods at the Sulitjelma mines (Norway).** KJELL LUND. *Tek. Tid., Uppl. C (Bergsv.)* 58, 65-71(1928).—The ore in question consists chiefly of cupriferous pyrite mixed with some zinc blende.

C. A. ROBAK

**Contribution to the theory of the Chance process.** HARALD CARLBORG. *Tek. Tid., Uppl. C (Bergsv.)* 58, 81-7(1928).—A mathematical treatise on the theory of the Chance sand flotation process.

C. A. ROBAK

**Flotation agents.** HANS C. SEEBOHM. *Tech. Hochschule, Charlottenburg. Metall u. Erz* 25, 505-12(1928).—Over 100 agents are listed, their compns., methods of prepn., use, consumption and present price being given in many cases.

J. BALOZIAN

**The century of metal.** L. PERSOZ. *Aciers spéciaux* 4, 3-13(1929).—P. briefly discusses the properties and uses, and gives statistics on the production of each of the following: Fe, Ra, Ag, Au, Pt, Hg, Sn, Pb, Cu, Mn, Cr, Ni, W, Co, V, Mo, Ti, U, Zr, Ce, Al, Zn, Mg, Sb and Be.

A. J. MONACK

**The metal smelting industry in 1928.** V. TAFEL. *Metall u. Erz* 26, 166-9(1929).—A review.

J. BALOZIAN

**Recent developments in the refinement of secondary aluminum.** D. R. TULLIS. *Metal Ind.* (London) 34, 339-41, 371-2(1929).

E. H.

**Timken Steel and Tube Company plant.** CHARLES LONGENECKER. *Blast Furnace & Steel Plant* 17, 698-715(1929).

E. H.

**The steel industry in South America.** GUNNAR HERLIN. *Tek. Tid., Uppl. C (Bergsv.)* 58, 89-92(1928).—A brief review of the ore deposits, mines and steel works of the South American countries.

C. A. ROBAK

**A new method of direct steel production.** ASSAR GRÖNWALL. *Tek. Tid., Uppl. C*

(*Bergsv.*) 58, 25-6(1928).—In 1884 a patent was taken out by Siemens for the mfg. of steel in Martin furnaces from briquets made from slime ore and coke and charcoal powder with a small addn. of metallic Fe in the powder form. However, the idea was not carried into practice because at that time they were not able to make briquets which could stand the heat without crumbling. A briquetting process has been worked out by Kippe and Grönwall with a view to this development. Good briquets are obtained from a mixt. of 78% ore slime, 18% coke powder and 4% Fe powder, or 76% slime, 18% charcoal powder and 6% Fe powder. The Fe powder is obtained from granulated pig iron and may also be partly replaced by granulated Fe. Eventually some  $MgCl_2$  is added. For reduction in Martin furnaces the C content has to be increased by 10% to cover the loss by oxidation. A rough estn. of the smelting costs shows a decided economical advantage of using such briquets in Martin furnaces for replacing all or part of the pig iron.

C. A. ROBAK

**Formation of gas during solidification of steel.** T. HAGLUND. *Tek. Tid., Uppl. C (Bergsv.)* 58, 19-21(1928).—H. believes that the CO gas formed in solidifying steel is produced by a reaction between C and FeO and not by sepn. of dissolved CO. One reason supporting this theory is the fact that Bessemer steel which may be supposed to contain more FeO than Martin steel and very little if any dissolved CO usually develops much more gas during solidification than does Martin steel which should be likely to contain less FeO and more dissolved CO. There is very little reason, according to Haglund, to presume any considerable soly. of CO in liquid steel.

C. A. ROBAK

**Process and apparatus for cooling steel-plant molds.** SCHAEFER. *Metallhørse* 18, 2387-8(1928).—A process for cooling molds is given, designed to cool the inside more rapidly than the outside. It consists of a series of outlets, in the bottom of a cooling tank, provided with openings so arranged that the cooling water supplied through them is forced against the interior of the molds set over them, and then flows out to cool the exterior surface.

W. C. EBAUGH

**Nitrogen in iron and steel.** HIALMAR BRAUNE. *Industritidningen Norden* 44, 19-20(1928).—B. points to various problems concerning the detrimental effect of N in pig iron for the manuf. of quality steel. In pig iron from charcoal blast furnaces N is usually present in amts. of about 0.002-0.003% if the furnace is worked at moderate speed and without too hot blast. However, with hot blast and high-speed working the N content will be much higher, often 0.020-0.025%, because of the increased formation of CN compds. in the furnace. It has always been almost impossible to make a first-grade steel from hot-blast iron, a fact that is recognized as a function of the N content which causes brittleness in the hardened steel. Buyers of Swedish quality pig iron therefore often used to stipulate that the iron should be produced under certain fixed working conditions such as cold blast (not above 150°), moderate speed, etc., conditions which cannot easily be controlled by the consumer. It is recommended, therefore, in such cases to adopt the analytic detn. of the N content as the standard specification test since this can easily be detd. by either party and will give a clear evidence of the furnace-working conditions.

C. A. ROBAK

**Blast furnace plant at Hamilton.** O. F. CLARK. *Blast Furnace & Steel Plant* 17, 690-3(1929).

E. H.

**The charging of cupola furnace.** L. SCHMID. *Die Giesserei* 16, 335-53(1929).—A lecture.

J. BALOZIAN

**Coal-dust firing in metallurgical furnaces.** LOUIS ARFWEDSON. *Tek. Tid., Uppl. C (Bergsv.)* 58, 4-7(1928).—An illustr. review pointing to the different advantages of coal-dust firing as compared with grate firing.

C. A. R.

**Productivity of labor in merchant blast furnaces.** ANON. U. S. Dept. of Labor, *Bur. of Labor Statistics Bull.* No. 474, 145 pp.(1929).

E. H.

**The reduction of silicon, manganese and phosphorus in the blast-furnace process.** IVAR BOHM. *Tek. Tid., Uppl. C (Bergsv.)* 58, 9-11(1928).—Investigations carried out under actual (charcoal) blast-furnace working show that Si, Mn and P are reduced and obtained in the Fe before the m. p. of Fe has been reached, partly also during the passing of the drops of Fe and slag downward through the shaft above the tuyère level and in the contact surface of Fe and slag in the bottom of the furnace.

C. A. ROBAK

**Diffusion in metals in the solid state.** J. A. M. VAN LIEMPT. *Metallwirtschaft* 7, 558-9(1928).—A review of investigations on the diffusion velocities of solid Mo in W, C in W and Th in W. Diffusion coeff. depends on the method of prep. W and on the state of metal, whether it is in the single or polycryst. form. References are given for work reviewed.

C. H. LORIG

**Textures of cold-worked metals.** W. E. SCHMID. Kaiser Wilhelm Inst. Eisenforsch. Düsseldorf. *Z. tech. Physik* 10, 141-3(1929).—A short review of work on cold



deformation of metals (cf. Wever, *C. A.* 22, 519). The texture of compressed test pieces (in shape of parallel pipeds) was detd. Pole diagrams are given for various sections of the deformed metals (Al and Fe). The general conclusion is that on axial symmetrical deformation (compression or elongation) the crystallites will orient themselves so as to give a max. no. of closely packed lattice planes in a direction perpendicular to the flow.

B. J. C. VAN DER HOEVEN

Some magnetic properties of Monel metal. DAVID R. INGLIS. *Instruments* 2, 129-32 (1929).

E. H.

Orientation of crystals through deformation and recrystallization. G. SACHS. *Metallwirtschaft* 7, 258-61 (1928).—The investigations on this subject of the last 2 or 3 years are reviewed in a condensed illustrated article. Cf. *C. A.* 22, 2731. R. D. B.

Measuring grooves and scratches on metal surfaces. O. SCHLIPPE. *Metallwirtschaft* 7, 931-6 (1928).

R. D. BUMBACHER

Tempering and cold-hardening. L. GRENET. *Aciers spéciaux* 3, 293-9 (1928).—The term "tempering" is used to designate rapid cooling whether or not hardening of the metal or alloy results. Thus, it is not sufficient to say that an alloy is tempered, and the term "tempered" is not used at the present time. The usual meaning of "tempered" implies a condition without evil. The maintenance by rapid cooling of the distribution of mols. obtained by heating to high temps. is not in itself the cause of hardening. Three cases are recognized and discussed. (1) The metal does not undergo any transformation with change of phase between room temp. and the temp. to which it is heated before tempering. Such metals are nickel, copper, aluminum, ferro-nickels rich in Ni, bronzes and brasses rich in Cu. (2) The metal, cooled slowly from a high temp., undergoes a transformation with change of phase but tempering prevents the transformation and maintains the metal at room temp. in the state in which it exists at the high temp. In this class are certain manganese steels, certain bronzes and brasses, and certain aluminum alloys. Metals in this class are said to be hypertempered. In some cases the hardness is increased and in others the metal becomes softer. (3) The metal, cooled slowly, undergoes a transformation with change of phase at a relatively high temp. but the same metal cooled rapidly undergoes the same transformation at a temp. much lower than if cooled slowly. Tempering or rapid cooling produces 2 effects: (a) The pre-existing state is partly retained and generally this is a softening effect. (b) The temp. of transformation is lowered and this causes systematic hardening. G. discusses in detail the parallelism between the action of tempering and that of cold-working or cold-hardening.

A. J. MONACK

The influence of finely divided precipitates on the coercive force (of alloys). W. KÖSTER. Vereinigte Stahlwerke, Dortmund. *Z. anorg. allgem. Chem.* 179, 297-308 (1929).—The magnetic properties, especially the coercive force, of ferromagnetic alloys depend particularly upon the size and arrangement of the fine particles which result from the decompn. of the supersatd. solid solns. The influence of quenching and annealing temp. on the magnetic properties of iron-carbon and iron-nitrogen alloys was studied. The change in the coercive force during crystal formation is independent of the change in hardness.

H. F. JOHNSTONE

The causes of failure of wrought-iron chain and cable. H. J. GOUGH AND A. J. MURPHY. *Proc. Inst. Mech. Eng.* (London) 1928, 293-352.—A series of tests disclosed three main causes of failure of wrought-Fe chain and cable. In the first case, a brittle state may be set up as a result of overheating or burning during one of the stages of manuf. Second, service shocks and strains tend to bring about a progressive deterioration of the weld. Heat treatment cannot cure either of these two types of defect. The third and most important cause of brittleness is a local hardening, with loss of ductility on the surface of the link, due to inter-link action, hammering on the ground, rattling through hawse pipes, etc. Either annealing at a dull red heat or normalizing at 1000° will restore the ductility by effecting recrystn. of the hardened surface layers of the chain links.

D. GORDON

Properties of cast iron are related to its structure. EDWARD E. MARBAKER. Mellon Inst. *Foundry* 56, 979-80 (1928).—Gray Fe contg. fine graphite uniformly distributed is of superior quality. With low Si and slow cooling, this may be attained in pearlitic Fe. A low total-C content gives similar results, as does also superheating of the liquid Fe. The details of these processes, and reasons for their effectiveness, are discussed.

GEO. F. COMSTOCK

Nickel-alloyed cast iron. HERMANN UNGER. *Giesserei Ztg.* 26, 181-8 (1929).—This is a survey of the improvement of cast iron by Ni, such as grain refinement, increased strength and hardness, and improved machinability. Micrographs show the effect of 0.73 and 3.13% Ni on the structure of cast iron contg. 3.5% C, 1.0% Si and 0.6%

Mn. Curves show the suitable ratio between Ni and Si contents of cast iron contg. 3.10-3.60% C for wall thicknesses of 3-65 mm. The reduction of combined C by 0.67-4.00% Ni in cast iron contg. 1.25 and 1.40% Si and 3.15 and 3.60% total C is shown in tabular form. For cast iron contg. 1.40% Si and 3.50% total C, 0-3.88% Ni increases the bending strength from 2.37 to 3.00 kg. per sq. mm. and increases the breaking strength from 15.3 to 23.2 kg. per sq. mm. The Brinell hardness of sand-cast specimens, 12.5 by 20 mm., containing 3.50% C and 1.40% Si is increased from 174 to 269 by the addn. of 0.459% Ni; and the specimens have good machinability. But 9.00% Ni, which raises the Brinell hardness to 350, renders the machinability poor. The uses of Ni cast iron, particularly in the automotive industry, are described.

**Cast iron for automobile engines.** JOHN W. W. SULLIVAN *Foundry Trade J.* **40**, 204 (1929) - The limits for Fe in most general use are: total C 3.0-3.9, Mn 0.70-1.0, P 0.2-0.6%, S 0.12% max., Si 1.4-2.0%. An Fe is also used for motorcycle cylinders contg. 2.90 to 2.50% Si. H. C. PARISH

**Test and research on iron and steel.** W. B. TIMM AND F. W. HARDY. *Iron & Steel Can.* **12**, 134-6 (1929). E. H. STOERTZ

**Harmful and useful effects of gases in steel.** F. RAPATZ. *Z. Metallkunde* **21**, 89-93 (1929) - An address in connection with the symposium on "gases in metals," held by the Deutschen Gesellschaft für Metallkunde at Dortmund in 1928. R. reviews the effect of O<sub>2</sub>, N<sub>2</sub>, H<sub>2</sub> and CO upon steel, with particular reference to "hardness sensitivity" and soft spots. Discussion is included. H. STOERTZ

**Thermal treatments—practical information macrographic tests.** L. PERSOZ. *Aciers spéciaux* **3**, 300-7 (1928) - Steel is often reheated to remove partially the effects of tempering. Tempering liquids in the order of decreasing intensity of tempering are: Cold H<sub>2</sub>O, hot H<sub>2</sub>O, lime water, kerosene, boiling H<sub>2</sub>O, rape oil, tallow, boiling brine soln. (saturated) and air. Saturation is defined and the proper thermal treatment described. The action of several metallic coatings (Zn, Cr, Mo, etc.) in case-hardening is discussed with respect to hardness, resistance to oxidation at high temps. and resistance to corrosion by acids. In regard to the regeneration of steel which has been overheated, 5 cases are considered with the proper thermal treatment for each case. Various macrographic tests are described and formulas are given for the solns. commonly employed. A. J. MONACK

**Diffusion of impurities in steel according to the investigations of K. Ziegler and his students.** P. SLAVINSKII. *Metallurgiste (Russia)* No. 2, 1926; *Rev. métal.* **26** (Extraits), 70-3 (1929) - S. reviews a whole series of investigations on the diffusion of impurities in steel which were interrupted by Z.'s death on Jan. 20, 1925. Z. considered diffusion as a reversible phenomenon, and if the impurities in the grains could be held in solid soln., their harmful effect was destroyed and the mech. properties of the steel improved. Each impurity has its own diffusion temp., which depends on the nature of the impurity and its soln. in the allotropic form of Fe which exists at that temp. The heat treatment suitable for a given impurity varies with the rate of diffusion of that impurity. The diffusion temp. of any given impurity cannot be found on the Fe-C heat diagram, but belongs to a more complex Fe-C-X diagram. When Fe is put in contact with Al, alloying begins as low as 650°, its compn. approximating or corresponding to Al<sub>3</sub>Fe, which can diffuse in Fe. The diffusion reaches an appreciable velocity at about 1000°. As the distribution of Al in Fe takes place in 2 stages, photomicrographs of the alloy show a banded or zoned structure. Tests on the diffusion of Mg into Fe gave neg. results, even at 1300° with an Fe contg. 0.15-0.30% C. MnO also gave neg. results. From his investigation of the diffusion of Fe phosphide, Z. concludes that: (1) In the diffusion of P and its alloys in soft Fe, the grains of solid soln. which are formed have a basaltic structure and acquire a considerable size. (2) The rate of diffusion of the phosphide, i. e., its depth of penetration, varies with the temp. (3) The film of phosphide existing between the grains of an ordinary metal can go into solid soln. and be kept in that condition by quenching. The time and temp. of decarburization was studied on steel contg.: C 1.03, Si 0.14, Mn 0.11, P 0.021, S 0.035%, in the form of cylinders 26 mm. in diam. and 100-mm. high; decarburization by atm. O does not set in at 650° but visible superficial decarburization is apparent after 8 hrs. at 750°. The explanation of the phenomenon is as follows: if oxidation of the cementite is theoretically possible below point A<sub>1</sub>, it can only be superficial because at this temp. fresh particles cannot diffuse to take the place of those that have been destroyed by oxidation; it is only above A<sub>1</sub>, when the pearlite has gone into soln., that diffusion of the cementite can occur from the center toward the outer layers. The depth of decarburization is almost directly proportional to the time of heating; up to 1000° it increases rather slowly with

rise in temp., from  $1000^{\circ}$  to  $1100^{\circ}$  it increases rapidly, and it is practically const. above that temp. Investigations on burnt steel seem to indicate that the outer layer of burnt steel can contain  $\text{FeO}$  in solid soln., the  $\text{FeO}$  sepg. out on cooling as a network and inclusions. There ensues the formation of several zones: from the outside inward, there is first a layer of Fe oxides, then ferrite with a network of oxides toward the edge of the zone, the network losing itself as points embedded in the mass of ferrite; finally there appear isolated spots of pearlite, gradually increasing in numbers till the normal steel structure is reached at a certain depth from the surface. A. PAPINEAU-COUTURE

**X-ray investigation of the internal stress of carbon steels.** SINKITI SEKITO. *Science Repts. Tôhoku Imp. Univ.* 1st ser. 17, No. 7, 1227-36(1928).—See C. A. 22, 4433. E. C. M.

**Standard specifications for quenched and tempered carbon-steel axles, shafts and other forgings for locomotives and cars.** Serial designation A19-27. BUR. OF FOREIGN AND DOMESTIC COMMERCE, *Industrial Standards* No. 12, 20 pp.—Text as adopted by the American Society for Testing Materials. Revised 1927. E. J. C.

**Standard specifications for quenched and tempered alloy-steel axles, shafts and other forgings for locomotives and cars.** Serial designation A63-27. BUR. OF FOREIGN AND DOMESTIC COMMERCE, *Industrial Standards* No. 62, 22 pp.—Text as adopted by the American Society for Testing Materials. Revised 1927. E. J. C.

**Standard specifications for carbon-steel bars for railway springs.** Serial designation A14-27. COMMERCE DEPT., *Industrial Standards* No. 10, 10 pp.(1928) (Spanish-English Ed.).—Text as adopted by the American Society for Testing Materials. Revised 1927. E. J. C.

**Relation of sampling to annealing temperature with respect to the mechanical properties and structure of cold rolled steels.** ANTON POMP AND LUDWIG WALTHER. *Mitt. Kaiser-Wilhelm Inst., Eisenforsch. Dusseldorf* 11, No. 2, 31-5(1929).—Samples taken at various times from refined sheet steels were cold-rolled and heat-treated for 3 hrs. at  $650^{\circ}$ ,  $750^{\circ}$  and  $920^{\circ}$ . The mech. and microscopic tests showed that annealing at  $920^{\circ}$ , regardless of the degree of working, resulted in the best mech. properties and the most uniform structure. Heat treatment at  $750^{\circ}$  gives nearly the same results as treatment at  $920^{\circ}$ , if a 20% excess cold working is employed. A 3-hr. heat treatment at  $650^{\circ}$  is insufficient to obviate cold hardening. It was found that the no. of samples taken was without influence on the results. HANS C. DUUS

**Grain size controls toughness.** THOMAS W. HARDY. Dept. of Mines, Ottawa, Canada. *Iron Age* 122, 1557-62(1928).—The basic elec. furnace is useful for making high-grade reliable steel for special engineering purposes. It permits the close chem. control of the steel that has recently become so necessary. Chem. analyses do not det. the quality of steel in all respects. The McQuaid-Ehn carburizing test often develops differences in grain-size between heats of steel of similar analysis, and hardenability, machinability and mech. properties vary in the same way as the grain-size after carburizing. When the latter was fine, the hardenability and machinability were inferior, and the notch-toughness as shown by the Izod impact test was greater, though heat-treatment, yield point, tensile strength and elongation were practically const. The addn. of 0.25% Mo to steels contg. about 1.5% Mn increased the impact value. Fine-grained steels give more latitude in heat-treating temp., without danger of inferior results, and when carburized, may be refined in both case and core by one operation. Photomicrographs are exhibited showing that the microstructure as rolled or quenched did not correspond in many instances with the grain-size revealed by the McQuaid-Ehn carburizing test, which alone gave evidence as to the phys. quality. G. F. C.

**Stainless steel in small arms.** HERBERT O'LEARY. Springfield Armory, Springfield, Mass. *Army Ordnance* 9, 172-6(1928).—Stainless steel or Fe contains 10 to 20% Cr; the former contains over 0.12% C, and the latter less. The former is too difficult to machine to be useful for barrels of small arms. Stainless Fe contg. 0.09 to 0.11% C and 11 to 14% Cr could be used for pistol barrels by drilling, reaming and rifling in the hardened condition, and leaving only the final machining until after drawing at  $1100^{\circ}$  F. There was greater wear on the tools, however, than with plain steel; so the cost of the finished barrel of stainless Fe was over 50% higher. Corrosion resistance was tested by intermittent salt spray, or by firing service ammunition followed by exposure to steam. The former test showed great, and the latter slight, superiority for the stainless Fe. The protective effect of polishing is lost sooner in the latter method. Tests for erosion caused by firing gave very poor results for a bronze barrel, and slightly better results for a steel barrel contg. 2.85% W, than for a standard barrel from stock. The stainless-Fe and steel barrels were about the same as the standard in the erosion test, but Cr-plated barrels were much better. In 0.50 caliber machine-gun barrels, and 0.30 caliber rifle and

machine-gun barrels erosion gives more trouble than corrosion, and the use of stainless Fe would not be worth while on account of its cost; but in 0.22 rifle barrels and 0.45 pistol barrels corrosion is the chief cause of deterioration, and the pistol barrels may be machined cheaply enough so that the use of stainless Fe in them would be economically advantageous to secure longer life.

GEO. F. COMSTOCK

**High-strength structural steels.** E. E. THUM. *Iron Age* 123, 797-800 (1928).—Higher-Mn alloys are being marketed in increasing tonnages in America since 1924 in competition with other low alloy steels. Nearly all tonnage steels now contain more than 0.30% Mn, and medium and hard grades are essentially alloys of Fe, C and Mn. The 1927 A. S. T. M. specifications for 60-lb. rails limit the C between 0.50 and 0.60%, Mn 0.6 and 0.9% and Si to a min. of 0.15%. For 85-lb. rails the limits for Mn and Si are the same as for 65-lb.; C is held between 0.62 and 0.77%; for 120- to 140-lb. rails C 0.72-0.89%, Mn 0.5-0.9 and Si 0.15% min. Experience with about 250,000 tons of rails contg. 0.53 to 0.65% C and 1.3 to 1.5% Mn shows that they have superior strength and wearing properties, lasting up to twice as long as the conventional analyses under heavy traffic. All portions of the hull contributing to the girder strength of British warships built in the last 8 years have used "D Steel" contg. about 0.33% C, 0.12% Si and 1.1 to 1.4% Mn with a min. proportional limit of 38,000 lbs. per sq. in. No defects have developed in service. Indications are that it is better to get added strength from Mn than C as the proportional limit, ductility and impact strength are better. A high-strength boiler plate is marketed in the U. S. as "Silicon Steel." Its chem. limits are 0.35% C max., Si 0.20 to 0.30 and Mn 0.60 to 0.90%. It is used for high-pressure work, as its ultimate strength is 70,000 to 83,000 lbs. per sq. in. A steel contg. 0.5% C and 1.25% Mn has been marketed for compressed-gas cylinders for many years. H. C. P.

**The process of manufacture of steel and the characteristics of endurance to alternate stresses.** R. CAZARD. *Aciers spéciaux* 4, 14-22 (1929).—C. discusses the differences between elec. and converter low Ni-Cr steels and lists the advantages of the elec. process of manuf. Differences in the 2 types of steel as shown by microscopic examn. after etching are explained and illustrated by photomicrographs. The fatigue tests were performed by the cantilever method. The results indicate a marked superiority of electric over converter low Ni-Cr steels.

A. J. MONACK

**Blister formation in the pickling of steel sheets by diffusion of hydrogen.** GUSTAV THANHEISER. Kaiser Wilhelm Inst. Eisenforsch., Dusseldorf. *Z. tech. Physik* 10, 143-6 (1929).—Several expts. are described to show the penetration of hydrogen in atomic form through steel; pressures of 300 atm. inside a steel bomb used as cathode in H<sub>2</sub>O electrolysis were measured. The same effect causes gas blisters to form under a metallic layer during the acid pickling of steel sheets. The influence of various factors on the H diffusion was examd. in a simple expt. with an iron sheet between two glass bells; the lower bell was filled with Hg and connected to a manometer tube; the upper bell contained acid. After satn. of the sheet with H, its diffusion increased linearly with time and was inversely proportional to the thickness of the sheet (0.75 to 8 mm). The amt. of H diffused increases with temp.; the percentage H diffusing of the total H evolved decreases with temp. Pickling admixts. which diminish the H evolution also cause a decrease in diffusion. Increase in C content of the steel causes the H diffusion to decrease. For the same C content spherical cementite allows considerably more diffusion than lamellar pearlite.

B. J. C. VAN DER HOEVEN

**Surface hardening of steel by nitrogen.** H. W. MCQUAID. *J. Western Soc. Eng.* 34, 239-48 (1929).—McQ. discusses nitriding in its successes, failures and shortcomings. Nitriding consists in general of heat-treating Al-Cr or Al-Mo steels in an atm. of NH<sub>3</sub>. Nitriding steels contain 0.30-0.50% C. The core strength of the nitrided pieces depends upon the alloy and the content. The cost of steels used in the nitriding process is greater than that of steel used for case-hardening, but nitrided steel lacks soft spots, warp and is much more resistant to corrosion. A curve shows the depth and hardness of nitride case obtained at temps. from 482° to 676° compared with a combination cycle. As the temp. increases between these temps. the surface hardness decreases but the depth of the nitriding effect is greatly increased for a given time. Circulation of the NH<sub>3</sub> during the nitriding reduces the time cycle. Nitriding increases the size of the piece 0.001 in. per in. of diam. and hardness is maintained at elevated temps. Mo tends to improve the toughness of the finished article. Elements which form carbides in steel apparently also form nitrides with a resultant increase in hardness.

W. H. BOYNTON

**High-quality chromium-nickel-steel castings.** VIKTOR ZSÁK. *Die Giesserei* 16, 193-205 (1929).—The effect of heat treatment on tensile properties and microstructure of Cr-Ni-steel castings with 0.55-0.95% Cr and 3-3.75% Ni was studied. Specimens solidifying with transcryst. fracture possess satisfactory properties on annealing at

sufficiently high temps. (best at 900°). Unannealed specimens show a ferrite-martensite structure (resembling the Widmannstätten), which begins to decompose at 650° (troostite appearing), consists entirely of peralite on annealing above 820°, and from which ferrite seps. at the grain boundaries on annealing at 1000°. Those which solidify with granular fracture show unfavorable properties on annealing, the structure consisting of pearlite with ferrite at the grain boundaries. Castings which have been hardened and then tempered show a sorbitic structure and properties which are much better than those simply annealed. The importance of the initial structure on the strength of the finished product is seen. Numerous micrographs are given. J. BALOZIAN

**A historical point in connection with the invention of high-speed tool steels.** L. DEMOZAY. *Rev. métal.* 26, 115-6(1929). L. DESCROIX. *Ibid* 117-8.—Credit is given to H. A. Brustlein, of Jacob Holtzer & Cie., for the invention of W and Cr high speed tool steels, which were used by Taylor and White in their investigations on the cutting of metals. A. PAPINEAU-COUTURE

**Medium-manganese rail a success.** E. E. THUM. *Iron Age* 123, 940-2(1929).—Open-hearth steel with C 0.550-0.70% and Mn 1.25-1.50% made in good rail practice makes much better rails than does the standard open-hearth C steel. While rejects are higher, there are fewer second-grade rails produced. Steels near the top limits on both C and Mn contents are likely to be brittle, while those with both elements near the lower limits will probably flow under traffic. W. H. BOYNTON

**Nickel as an alloy element with iron.** E. PIWOWARSKY. *Metallwirtschaft* 7, 530-5(1928).—A summary of the properties of Ni-Fe alloys and a discussion of the advantages of Ni in steel, cast iron, hard iron and malleable cast iron are given. Addns. of Ni to Fe confer a variety of properties to the resulting alloys. In no other binary series is there a summation of such differences in the physical consts. such as coeff. of expansion, heat and elec. cond., sp. heat and magnetic properties. C. H. LORIG

**Iron-beryllium and iron-boron alloys; the structure of iron boride.** FRANZ WEVER. Kaiser-Wilhelm Inst. Eisenforsch., Düsseldorf. *Z. tech. Physik* 10, 137-8 (1929).—The phase diagrams of the systems Fe-Be, Fe-B and Fe-C are compared. Whereas C enlarges the range of  $\gamma$  iron considerably, the action of B or Be is the reverse, the cause of these differences being found in the increasing atom radius of these elements. B in the range of its soly. in Fe gives a contraction of the Fe lattice parameter from  $2.856$  to  $2.854 \times 10^{-8}$  cm., which indicates that B forms a solid soln. by lattice substitution with  $\alpha$ Fe; the same holds for Be. With  $\gamma$ Fe the substitution is considered probable, although experimentally difficult to investigate. As a parallel to  $\text{Fe}_3\text{C}$  the compd.  $(\text{Fe}_2\text{B})_2$  occurs in Fe-B alloys; it is of the tetragonal scalenohedral space group  $V_6$  with internally centered translation group  $\gamma'$  and 4 mols.  $\text{Fe}_2\text{B}$  in the basis. The unit cell dimensions are  $a = 5.078 \times 10^{-8} \pm 0.005$  cm.,  $c = 4.223 \times 10^{-8} \pm 0.005$  cm. The av. distance of one Fe atom from its 5 neighbors is  $2.41 \times 10^{-8}$  cm.; it is an example of the relation of atom radius and coordination no. (Goldschmidt theory).  $\gamma$ Fe has 2.53 (coordination no. 12);  $\alpha$ Fe has 2.48 (coordination no. 8). Two parameters are necessary to locate the Fe atom positions. The B atoms are assumed to lie at (000) and  $(\frac{1}{2}, \frac{1}{2}, \frac{1}{2})$  or  $(00\frac{1}{2})$  and  $(\frac{1}{2}, \frac{1}{2}, 0)$ , thus giving a mol.  $\text{Fe}_2\text{B}_2$  with two non-equiv. B atoms. The structure of  $\text{Fe}_2\text{B}_2$  can be logically related to that of  $\gamma$ Fe with  $\text{Fe}_2\text{N}$  as intermediary step. B. J. C. VAN DER HOEVEN

**Applications of stainless iron in nitric acid industry.** WALTER M. MITCHELL. *Chem. Met. Eng.* 35, 734-6(1929).—Alloys of Fe-Cr resist corrosion by  $\text{HNO}_3$  if above 14% Cr. Carbon content must be 0.1% or less to secure proper working qualities in sheets, tubes, rivets, etc. For casting 0.3% C is used. Si up to 1% is an advantage; also Ni 8%, in fabricating equipment. For welding, Ni imparts desirable characteristics. G. B. TAYLOR

**Brass for lathe work.** P. DEJEAN. Établissements Schneider. *Rev. métal.* 26, 45-67(1929).—This grade of brass (sometimes improperly called 60-40 brass) contains approx. 60% Cu, 1.5% Pb and the rest Zn. It is a relatively cheap product obtained by remelting the scrap metal from lathes to which is frequently added a certain amt. of waste of higher grade brass together with the required amt. of Zn to give it the required compn. During the war the Creusot works undertook the manuf. of this product, preceding it by a thorough investigation of the optimum manufg. conditions, which is described at length in the article. The various operations to which the ingots are subjected are: hot rolling, annealing before drawing, drawing either with or without intermediate annealings. Hot rolling of brasses contg. over 61.5-62% Cu is very delicate and causes a high proportion of rejects. Cold drawing of brasses contg. less than 57.5-58% Cu causes considerable trouble through the formation of cracks during drawing or of season cracks. The optimum Cu content is therefore 58.5-61%. Curves are given showing

the effect of annealing on the mech. properties of such brasses contg. 56.8-61.4% Cu. Annealing gives fairly good results at 500°, best results at 600°, and should not be carried out above 700°. The presence of Pb is essential to proper working in the lathe, and should not fall below 1% or go above 2%.

**A. PAPINEAU-COUTURE**  
**The role of nickel in the automobile industry.** GALIBOURG. *Actes spéciaux* 3, 308(1928).—The properties and uses of nickel steels, cast nickel and nickel-chrome steels, and special alloys are discussed in detail.

**A. J. MONACK**  
**Heat treatment of standard silver.** MAX HAAS AND DENZO UNO. *Z. Metallkunde* 21, 94-6(1929); cf. C. A. 22, 2543, 3874. The effect of quenching and annealing upon standard Ag (92.5% Ag, 7.5% Cu) is studied by photomicrographic and differential dilatometric methods. The alloy was prepd. in wire form, cold rolled and given the heat treatment, elongation being followed by means of the *Chevenard differential dilatometer*. The solid soln. formed at high temps. is maintained when the material is suddenly quenched. By suitable annealing, sepn. of the excess Cu in a highly dispersed form occurs, the extent of the sepn. being greatest at about 240-300°. On extended annealing at 300° agglomeration of these Cu particles takes place and the specimen softens. The most favorable temp. for the heat treatment is 720 to 800°. Photomicrographs are included.

**H. STOERTZ**  
**Soft solders.** EDMUND R. THEWS. *Z. Met.* 26, 189-97(1929).—This is a survey (with data in tabular form) of solders contg. combinations of Pb, Sn, Cd, Zn, Bi, Sb and in some cases small amounts of Fe and As. The work of the following investigators is discussed: Saposhnikow, Calvert and Johnson, Long and Kuffer, Schwartz, Parkes and Martin, British Engineering Standards Association and Westinghouse Electrical and Manufacturing Company. There are also discussed the properties of soft solders, the impurities in Sn solders and the influence of the method of casting upon the appearance of Sn solders.

**JOHN W. W. SULLIVAN**  
**Light aluminum alloys of technical importance.** TORSEL BERGLUND. *Tek. Tid. (Uppf. C (Bergsvetenskap))* 58, 57-64(1928). A review on the manu. and properties of these alloys. The influence of certain methods of heat treatment upon the mech. properties is considered.

**C. A. ROBAK**  
**Aluminum-alloy pistons for oil motors.** ROBERT I. ANDERSON. *Metallwirtschaft* 7, 167-73(1928).—The main advantages of Al alloy pistons over cast iron pistons are low sp. gr. and high heat cond., the tensile strength of Al alloy "Y" permanent mold casting (Al-Cu-Mg-Ni, 92.5-4-1.5-2) after heat treatment may be as high as 35 kg./sq. mm. (duralumin, 42, gray cast iron, 15, cast steel, 12 kg./sq. mm.) with a Brinell hardness 120-130. By a special heat treatment a hardness of 180 can be obtained. Addns. of Fe, Mg and Ni to Al-Cu alloys tend to increase hardness at elevated temps. The conductivities of several Al alloys at 300° are given. Mg, Cr and Fe lower the cond. of an Al-Cu alloy; Ni raises it. The expansion coeff. varies between 0.000020 and 0.000033 (20-100°); cast iron 0.00009 (20-100°), and the sp. gr. from 2.65 to 3.00. Permanent-mold alloy castings possess higher mech. qualities than sand castings, they are much improved by a heat treatment. For the effect of heat treatment on Al alloy castings cf. C. A. 22, 2537. Photomicrographs of the more common Al alloys and their changes after heat treatment are given.

**R. D. BUMBACHER**  
**Development and future problems of the aluminum chill casting process.** H. OBERMÜLLER. *Metallwirtschaft* 7, 782-3(1928). Dimensions of Al chill castings are within the limits of 0.1 to 0.3 mm. The metal is dense and has physical properties superior to those of sand-cast metal. Lessening the time for making molds, reducing the oxidation losses in metal bath, adopting automatic methods of casting, and choosing suitable casting alloys are future problems.

**C. H. LORIG**  
**The development of magnesium alloys.** K. I. MEISSNER. *Metallwirtschaft* 7, 128-36, 252-8(1928).—Technically important Mg alloys and their properties are reviewed. References, tables, photomicrographs and curves accompany the article.

**R. D. BUMBACHER**  
**The binary system calcium-sodium.** RICHARD LORENZ AND ROBERT WINZER. *Inst. phys. Chem. Frankfurt a. M. Z. anorg. allgem. Chem.* 179, 281-6(1929).—Ca-Na alloys were investigated in steel bombs which were sealed in order to avoid the formation of Ca nitrides and Ca hydrides. Pure Na was used while the Ca contained 1.2% impurities, mainly SiO<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub> and Fe<sub>2</sub>O<sub>3</sub>. The m. p. of Na was 97°, that of Ca 809°. The limit of soly. of Na in liquid Ca is 16 at. % Na at 700° while the amt. of Ca dissolved in liquid Na at 700° is 0.8 at. % Ca. The Na freezes out pure from all alloys studied at 97°. Attempts to det. the mutual soly. above 700° failed.

**H. S. V. KLOOSTER**  
**Microstructure of electric arc welds in structural steel.** H. L. PULLOW AND F. L. REYNOLDS. *Univ. of Mich. Mich. Expt. Sta. Bull. No. 21, 22 pp.*(1929).—The

various methods of elec. welding are described. Expts. on arc-welding structural steel plates, using direct current with the plate positive and using bare metallic electrodes, are described. The skill of the welder is of paramount importance. Photomicrographs are given of typical weld structures, both before and after annealing. Under the best conditions the deposited metal is very porous, with a tensile strength not more than one-fourth that of low-carbon cast steel.

ROBERT F. MEHL

**Welding in the chemical and process industries.** W. SPRARAGEN. *Ind. Eng. Chem.* **21**, 425-31 (1929).—A brief description is given of the following welding methods: forge, elec. arc, gas, resistance and aluminothermic. Some materials can be more satisfactorily welded than others. The structure should be designed for welding. Examples of welding in chem. industry are vessels for high temp. and pressure, as oil-cracking stills and piping systems.

A. W. HOLMES

**Autogenous welding with coal gas.** A. MÜLLER AND B. BIBUS. *Gas u. Wasser-fach* **71**, 566-9 (1929).—A flame temp. of  $1980^{\circ}$  is obtained when coal gas of a calorific value of 4230 kg.-cal. per cu. m. (444 B. t. u. per cu. ft.) is burned with O, as compared with a flame temp. of  $3200^{\circ}$  for the oxy-acetylene flame. The useful heat in kg.-cal. per cu. m. is about 2600 (max.) for the former and 3850 for the latter, with O consumptions per cu. m. of gas of about 0.45 and 1 cu. m., resp. Sheet iron up to 6 or 8 mm. may be welded with the oxy-coal gas flame as compared to about 100 mm. for oxy-acetylene in the same burner. Oxy-coal gas may be used for autogenous cutting up to 50 mm. and gives a very clean cut. It is especially useful in welding brass and Al and competes with the H flame for welding Zn, Sn and Pb, but is not adapted to cast Fe or Cu.

R. W. R.

**Welding copper and its alloys.** KALISCH. *Metallwerke* **18**, 933 (1928).

R. M. S.

**European hot sheet galvanizing.** HEINZ BABLIK. *Iron Age* **123**, 811-2 (1929); cf. following abstr. Al is added to the bath and no flux is used on the Zn bath. The product has the best bending qualities. It can be bent in every direction without damage to the Zn coating. The sheets are pickled in a highly concd. HCl bath, then washed in water and dipped in a highly concd. warm soln. of  $ZnCl_2$ . Next the sheets are dried and dipped into the molten-Zn bath. The Al content increases resistance to corrosion.

H. C. PARISH

**Acids used in galvanizing work.** HEINZ BABLIK. *Iron Age* **123**, 879-80 (1929); cf. preceding abstr. Scale consists of 2 compds.,  $Fe_2O_3$  and  $FeO$ , the proportion being detd. by the temp. and time of oxidation. When oxidation becomes stronger the scale layer becomes richer in  $FeO$ . Presumably the scale at the lower temps. of rolling and annealing contains more  $Fe_2O_3$  than 36.70%. The attack of the pickling acid is distributed on 3 compds. of different soly., i. e.,  $Fe$ ,  $Fe_2O_3$  and  $FeO$ . The soly. in HCl is different from that in  $H_2SO_4$ . A part of the scale is dissolved and a part removed mechanically by acid, which penetrates the pores and dissolves the Fe to which it adheres. With growing concn. of HCl there is a decrease in that part of scale removed mechanically and an increase in that dissolved, the soly. of the oxides in weak HCl being low. In  $H_2SO_4$  the soly. of Fe in all acid concns. is far higher than that of the oxides. The attack is therefore concd. on the Fe base. At the high temps. usually employed for  $H_2SO_4$  the attack is almost entirely on the metallic Fe. In pickling with 14%  $H_2SO_4$  the scale removed mechanically is 20 times that with 14% HCl, making it necessary to use an inhibitor with  $H_2SO_4$ .

H. C. PARISH

**Molecular structure and fatigue tests of steam boilers.** LUDWIG KAUL. *Metallwerke* **18**, 932-3 (1928).

E. M. SYMMES

**Galvanizing and tinning iron and steel wires.** P. KRUMME. *Metallwaren-Ind. u. Galvano-Tech.* **25**, 7-9 (1927).—A review of current practice.

J. H. HOEFER

**Metal decorating and etching.** G. BINDHARDT. *Metallwaren-Ind. u. Galvano-Tech.* **25**, 129-30 (1927).—A description of the three essential phases of damascening or metal etching.

J. H. HOEFER

**Metal etching.** H. WERNER. *Metallwaren-Ind. u. Galvano-Tech.* **25**, 48-50, 67-8 (1927).—Metal etching is reviewed as applied to (1) type setting, (2) photographic and lithographic work, (3) aluminum etching for making copies in printing work and (4) making reprints.

J. H. HOEFER

**Metal corrosion and metal etching.** RÖMER. *Metallwirtschaft* **7**, 535-8 (1928).—Corrosion and etching of metals are of importance in metallographic studies and in the coloring of metal surfaces. A soln. of  $(NH_4)_2S$  will develop a brown surface on bronze and red brass. To color Zn (or alloys high in Zn) a deep black soln. of 70 parts HCl, 25 parts  $H_2O$  and 5 parts  $SbCl_3$  is used. An elec. method of etching which has had no practical application as yet is described as follows: The object to be etched is put into a glass tube; this is filled with H at 1 mm. pressure. An elec. current is passed between the electrodes. The anode is of Al wire, and the cathode is a Cu tube arranged

to support the object. The charged electrons from the gas mols. unite with positive ions, which are swept back to the cathode and there, through their impact, remove metal atoms or even larger particles. C. H. LORIG

**Hot-wall effect as a cause of corrosion.** (BRNEDICKS. *Tek. Tid., Uppl. C (Bergsvetenskap)* 58, 17-9(1928).—The problem of explaining certain cases of local corrosion occurring in the cellulose industry has been studied. Local corrosion appears near the upper closed end of the so-called caloriser tubes used in sulfate cellulose plants for the heating of the black liquor. Steam at  $100-80^{\circ}$  ( $10-5$  kg. per sq. cm.) flows through an inner tube reaching forward to the closed top end of the caloriser tube, and since the liquor is flowing upward the top of the tube is at a higher temp. than the rest of the tube. Lab. expts. carried out in autoclaves with two tubes of the materials used in practice, one tube being heated internally by means of elec. heating elements, both tubes being heated in black liquor, showed clearly the corroding effect on local spots of higher temp. When the temp. in the autoclave was maintained at  $215-65^{\circ}$  for 65 hrs. the local corrosion appearing on the separately heated tube was found to resemble that which occurs in actual practice. So-called non-corroding Ni and Cr steels were not found superior to soft C steel in this respect, on the contrary they were attacked more severely than the C steel in the autoclave expts. C. A. ROBAK

**Corrosion tests.** J. M. POLYREAC. *Actes symposium* 4, 23(1929).—P. briefly reviews the subject of corrosion and corrosion tests. A. J. MONACK

**Corrosion of metals.** C. FROELICH. *Gesundh. Ing.* 52, 33-6(1929).—In pure water Fe goes into soln. but equil. is soon attained and very little corrosion takes place. However, in the presence of  $O_2$ , the slightly sol. ferrous ions are oxidized to the very slightly sol. ferric ions, and the reaction proceeds to a measurable extent.  $CO_2$  is also important in the corrosion of metals. When a metal is in contact with any soln. a definite potential, depending on the nature and the concn. of the soln., is set up. A table is given of the e. m. f. of various metals from Au to K in N, 0.1 N and 0.01 N solns. compared to the normal H electrode as zero. If the potential is less than the equil. value, the metal comes out of soln. but if the potential is greater than the equil. value, the metallic electrode goes into soln. Whether or not corrosion is stopped by polarization depends on (a) the difference in potential between the pair of electrodes, (b) the concn. of H ions and (c) the overvoltage of the metal. Two different metals are not necessary for electrolytic corrosion. Most metals have areas of different electrode potentials and these act as two metals. Such areas tend to cause local action with the result that pitting takes place. Protection can be obtained by use of a small elec. current whereby the metal is made the cathode. The creation of a passive state results in decreased corrosion. This is often accomplished by the use of chromates. Al forms a passive coat of  $Al_2O_3$ . The addition of Cr, Ni and Co to steels increases the resistance to corrosion. Oils have been used to protect against corrosion as also have tar and waxy substances. Hard rubber gives a very good protection against acids. W. L. DENMAN

**Anode and cathode elements in corrosion.** M. GROECK. *Gesundh. Ing.* 52, 53-8(1929).—All metals have areas of different potential. In any pair, one is anodic and the other cathodic. An elec. current is set up between these points and electrolysis takes place. The electrolyte has much to do with the extent of corrosion. W. L. D.

**Bureau of Standards soil-corrosion investigation.** K. H. LOGAN. *J. Am. Water Works Assoc.* 21, 311-7(1929); cf. *C. A.* 22, 3619. It was found impossible to distinguish between electrolytic and soil corrosion by observation, though it was thought that variation in  $pH$  of the adjacent soil might have some significance. More or less current was found flowing nearly everywhere and this was considered to be more the result of soil action than the cause of corrosion. D. K. FRENCH

**A new method for testing the porosity of anti-corrosion coatings.** J. COURNOT. *Rev. métal.* 26, 76-7(1929).—Filter paper is moistened with a soln. of  $K_3Fe(CN)_6$  and alkali chloride and applied immediately to the surface to be tested. Defects in the coating produce stains (the color depending on the nature of the metal to which the coating was applied) on the paper; and by washing out the  $K_3Fe(CN)_6$  and drying the paper, a permanent record of the test is obtained. The test can also be used on thin Al or Sn foil, by first placing the latter on a clean, polished steel plate and then applying the  $K_3Fe(CN)_6$  paper. A. PAPINEAU-COUTURE

**New rustproofing materials.** P. MARTELL. *Metalloberw.-Ind. u. Galvano-Tech.* 25, 32-4(1927).—A résumé of researches undertaken to find a chem. or electrochem. method of producing a protective layer of ferrous oxide, ferric phosphate or similar rust-resisting compds. on the metal surface. J. H. HOFFER

**Increasing the resistance to corrosion by means of protective coatings.** E. RIMY. *Gesundh. Ing.* 52, 234-6(1929).—The protective coating "Gabrit" is applied in solution



and the protective film is formed on drying. It protects against attack in acid, salt and alk. solns. It was proved in this work that protection is obtained in water and active-Cl preps. such as antiformin, hypochlorites and chloramines. However, if an imperfect film is obtained, immediate corrosion results. W. L. DENMAN

The electric cleaning of blast furnace gas (ANON) 4. W as a chemico-technical raw material (ALTERTHUM) 13. The deposits of ores of Birma, British India (SANDELIN) 8. Reactions carried out under high pressure [corrosion] (BERL) 2. Apparatus for mixing foundry sand clay, etc. (Brit. pat. 298,929) 1. Ornamental coatings on metal (U. S. pat. 1,711,330) 26. Electric resistance furnace of the bath type suitable for hardening steel articles (U. S. pat. 1,710,763) 4. Removing grease from metal objects (Ger. pat. 474,825) 18. Annealing and hardening furnace (Swiss pat. 130,010) 1. Testing metal blocks under stress (U. S. pat. 1,711,347) 13.

KRÖHNKE, O., MAASS, F. AND BECK, W.: *Die Korrosion. Band I. Allgemeiner und theoretischer Teil.* Berlin: VDI-Buchhandlung. Bound, about M. 22.

MEYERSBERG, G.: *Perlitguss.* Berlin: J. Springer. 111 pp. M. 7.50. Reviewed in *Iron Age* 121, 1194(1928).

**Metals and Alloys.** A new technical journal to be published monthly by The Chemical Catalog Co., Inc., of New York. One year, \$3; two years, \$5.

**Ores.** STEIN- UND THON-IND. GES. "BROTHAL." Ger. 474,939, Jan. 12, 1927. Refined ores and fuel are loaded in alternate layers for smelting in a blast furnace with a traveling grate.

**Ore treatment.** LUCIEN P. BASSET. Ger. 474,784, June 8, 1924. Fe and Fe alloys are produced from ores in a rotary furnace by mixing with C and flux and blowing in fuel and air so mixed that the chief combustion product is CO.

**Rotary-cage ore classifier.** KARL VIERTEL. Ger. 474,273, June 23, 1926.

**Cleaning device for ore-classifying grates.** FRANZ MESSNER. Ger. 474,491, May 31, 1927.

**Concentrating ores, coal, etc., by flotation.** I. G. FARBENIND. A.-G. Brit. 298,736, Aug. 19, 1927. Flotation agents are used which may be prepd. by oxidizing paraffin or montan waxes or similar materials by blowing air through the molten material at a temp. not exceeding 200° so that substantially no cracking occurs. A mixt. of acids and esters and unidentified compds. is produced which is preferably neutralized, at least in part, by NH<sub>3</sub>.

**Flotation reagent.** THOMAS H. DONAHUE and FREDERICK F. FRICK. U. S. 1,711,087, April 30. An aq. soln. of Na xanthate or other xanthate is treated with an excess of Cl<sub>2</sub> to prep. a reagent suitable for use in flotation of minerals.

**Ore treatment.** EISEN- UND STAHLWERK HOESCH A.-G. Ger. 474,594, Dec. 19, 1923. The temp. and reducing power of converter waste gas are raised by adding O and combustible materials containing C and H to the blast air.

**Ore roasting.** COMPAGNIE DES MÉTAUX D'OVERFELT-LOMMEL ET DE CORPHALIE. Belg. 354,465, Oct. 31, 1928. Relatively cold gases are introduced into the roasting furnace at the points most liable to be overheated, the SO<sub>2</sub> content increasing with the degree of cooling required.

**Device for taking samples of ore, etc., as it passes through a hopper.** W. DRYDEN and L. KNIGHT. Brit. 298,655, June 11, 1927.

**Tower for sintering earthy ores and foundry products.** ALBERT DAUB. Ger. 472,916, Jan. 25, 1927. Details are given of the arrangement of the ore, fuel, sintering material and air current.

**Preparing ore dust for treatment in a blast furnace.** CHARLES V. MCINTIRE (to Consolidation Coal Products Co.). U. S. 1,711,153, April 30. Ore dust such as that from blast furnace flue gas is mixed with coal and the mixt. is heated and agitated in a retort to form agglomerates of ore dust and semi-coke.

**Smelting non-ferrous ores.** THE BARRETT CO. Ger. 474,571, Dec. 2, 1924. The blast pressure required for smelting non-ferrous metals, such as Cu or bronze, in a cupola furnace is reduced by using coal-tar pitch as fuel.

**Treating lead ores, etc.** S. C. SMITH. Brit. 298,684, April 5, 1927. The process described in Brit. 264,569 (C. A. 22, 143) is carried out with the use of an app. having filters formed of, or protected by, perforated rubber material or woven rubber cord fabric which resists corrosion and erosion. The filtering may be assisted by air pressure and the process may comprise treating Pb ore or concentrate with HCl to effect chloridizing,

filtering, introducing further acid, followed by washing liquors and solvents for leaching out the Pb chloride. Various details of procedure and app. construction are described.

**Iron ore.** THE CROWELL & MURRAY CO. Ger. 472,631, Apr. 22, 1926. Iron ore contg. Cr, Al and Ni is subjected to a succession of operations. First the pulverized ore is roasted with  $\text{Na}_2\text{CO}_3$  to  $750-950^\circ$  in an oxidizing atm. until the Cr and Al are changed to water-sol. compds. The mass is then lixiviated with water. The residue is then roasted to  $460-700^\circ$  in an oxidizing atm. with pyrites or other S-containing material in order to convert the Ni into sol.  $\text{NiSO}_4$ . Finally, the Ni is removed by lixiviation and the ore, now free from valuable metals, is smelted in the usual way.

**Tin ore.** ZINNWERKE WILHELMSBURG, G. M. B. H. (Andreas Mertens, inventor). Ger. 472,515, Mar. 30, 1926. Sn ore contg. Sb is purified by lixiviating with acid which contains a reducing agent such as ferrous salt.

**Metallurgy.** WOLFGANG JOB. Ger. 471,759, July 3, 1925. The upper part of a shaft furnace for smelting ores of metals such as Pb and Zn, in which the metal is obtained as the oxide, is barrel-shaped and the lower part rectangular with nozzles 60-70 cm. apart.

**Metals.** HEINRICH THOLEN. Ger. 472,919, Aug. 5, 1926. Alloys and molten metals, especially Fe, are refined by a process involving stages whereby the scum from one stage acts on the metal at the next stage. The app. is described.

**Metals.** DEUTSCHE EDELSTAHLWERKE A. G. Ger. 472,859, Apr. 24, 1926. Metal objects, especially of Fe or steel, are burned by subjecting their surfaces to the action of alkali or alk. earth peroxides.

**Hardening metals.** AUBERT & DUVAL FRERES. Ger. 473,681, May 11, 1927. In hardening single parts of metal objects by nitrification, the parts not desired to be hardened are given a protective coating of a metal or alloy, such as Sn or Sn alloy, which does not permit the N to make contact with the object. A further coating of water glass or Al powder may be added, and the whole dipped into a bath of alkali nitrate soln., prior to the hardening.

**Zinc.** METALL-GES. A. G. (formerly Metallbank und Metallurgische Ges. A. G.). Brit. 298,636, Oct. 13, 1927. Reduction of ZnO or Zn oxide ores is effected under reduced pressure with a metal such as Cu or Mn, or, preferably, Fe, at a temp. of about  $800-900^\circ$  in the absence of C or other materials yielding gaseous reaction products. When Fe is used it may be converted into ferrous ferric oxide which is reduced for obtaining Fe for reuse in the process.

**Zinc.** HENRY J. STEHLI. Fr. 650,078, Feb. 22, 1928. In de-sulfurizing Zn ores the ore is roasted to a point where the S remaining in the ore is insufficient to effect conversion of the ore, mixed with a sufficient quantity of Zn residues to furnish the C necessary to liberate the heat and the reduction agent to decompose the sulfates contained in the ore, and an internal combustion of the S and the C matter is then brought about, e. g., by roasting in an oxidizing atm. to eliminate the sulfate and concrete the mass.

**Distilling zinc.** NEW JERSEY ZINC CO. Brit. 298,921, July 8, 1927. A charge comprising agglomerates such as sintered ore and a coked mixt. of ore and bituminous coal is passed progressively through a relatively long retort of large capacity without substantial breaking down or fusion of the agglomerates. The retort is externally heated, and the process may be conducted for the production of spelter, Zn dust or ZnO. Various details of the app. and of procedure are described.

**Distilling zinc.** NEW JERSEY ZINC CO. Brit. 298,922, July 8, 1927. In producing spelter without fusing the charge, a porous charge of agglomerates of zinciferous material and reducing agent is passed through an externally heated reducing chamber (such as an electrically heated vertical retort formed of a Ni-Cr-Fe alloy) at a temp. not exceeding  $1150^\circ$ . Zn vapor is withdrawn to a condenser such as described in Brit. 295,115 (C. A. 23, 1861). Various details of app. are described. Brit. 298,923 relates to an externally heated vertical retort for reduction of zinciferous material formed in sections (which may be made of Carborundum, alumina or Zr oxide) with the joints filled with Carborundum cement. Brit. 298,924 specifies inducing flow of gaseous products of reduction, in Zn-reducing app., by a controlled stack draught. Various structural features are described.

**Metal founding.** ERICH WILL. Ger. 474,621, Aug. 6, 1927. A founding machine has a mold cooled by an air current circulated by suction app.

**Molding.** JOHN BROWN & CO., LTD. Ger. 472,905, June 26, 1925. Hollow metal ware with thick walls is molded by means of a centrifugal app. with a rotary channel carrying many nozzles.

**Molding metals.** ELEKTRONMETALL, G. M. B. H. Fr. 648,718, Feb. 14, 1928. In molding metals, particularly Mg or its alloys such as electron, the tapping channel is in

the interior of the fusion heater and surrounded by molten metal to prevent oxidation of the metal.

**Molding sand.** FRANK G. BROTZ (to Kohler Co.). U. S. 1,711,136, April 30. A molding sand for general use (not limited to core material) comprises sharp sand and approx. 20% in vol. of wood fiber such as sawdust and a bonding agent such as fireclay and water.

**Foundry sand.** LE MAGNÉSIUM INDUSTRIEL. Fr. 649,683, July 5, 1927. Powd. graphite is mixed with foundry sand, particularly in casting easily oxidized metals such as Mg. The graphite may be mixed with aq.  $\text{NH}_3$ , and a mixt. of powd. graphite in aq.  $\text{NH}_3$  may be painted on to the finished mold.

**Ingot mold.** MARCEL BLAGÉ AND SOC. ANON. DES FORGES DE VIREUX-MOLHAIN. Ger. 474,045, Jan. 21, 1928.

**Ingot mold.** FRIEDRICH KLEIN (to Benjamin Hirsh). U. S. 1,710,931, April 30. A mold is provided with a separator of fusible material such as sheet metal bent upon itself so as to be retained against opposite internal walls of the mold by the resiliency of the material of which the separator is made. Different metals may be poured to form composite ingots.

**Steel ingots.** EMIL GATHMANN. U. S. 1,711,052, April 30. After the desired chem. analysis of the molten metal is attained, it is deoxidized, transferred to a pouring ladle and subjected to a further deoxidizing or finishing treatment, and then teemed into a mold for forming an ingot. Radiation of heat from the forming ingot is progressively accelerated by absorption from the bottom of the ingot towards the top for approx. 90% of the mass of the molten metal, and the absorption of heat from the ingot at its upper portion is substantially suspended and radiation of heat from the upper 5-10% is positively retarded, thus causing the upper portion of the mass to feed deoxidized molten metal to the forming ingot to compensate for shrinkage in the body of the ingot while the metal is cooling and solidifying, and to cause the physically defective or porous portion of the ingot to be confined within its upper 5-10%. A mold construction is described.

**Cast metal.** MECHANITE METAL CORP. Fr. 649,674, Feb. 24, 1928. In making cast metal by adding a graphitization agent to the molten mass, metallic Ca is added according to the degree of graphitization desired. Another graphitization agent such as metallic Mg, Bi, Sr or Li may be added as well. Cf. C. A. 22, 3876.

**Manufacture of internally flanged hollow cylinders, tubes, etc., by centrifugal casting.** OSTERMANN & FLÜS A. G. Ger. 474,240, Mar. 18, 1927.

**Die-casting machine.** ECKERT & ZIEGLER, G. M. B. H. Ger. 474,646, Apr. 12, 1927. Details of mold parts.

**Die-casting machine with a plurality of molds.** RICHARD TIETZ. Ger. 474,030, May 5, 1926.

**Charger for blast furnaces.** BUDERUS'SCHE EISENWERKE and MAX ZILLGEN. Ger. 474,367, Nov. 5, 1927. A charging hopper is constructed so that the finer parts of the charge are fed in towards the sides of the shaft while the coarser parts are fed in centrally.

**Tap-hole stopping apparatus for blast furnaces.** EDGAR E. BROSIUS. Ger. 474,563, May 26, 1927.

**Air-tight slag chamber for cupola furnaces.** JOSEF FRITZ. Ger. 474,303, Dec. 24, 1927.

**Furnace for annealing metal objects in an atmosphere of protective gas.** AKTIEN-GESELLSCHAFT BROWN, BOVERI & CIE. Swiss 130,213, Dec. 8, 1927.

**Furnace for pig iron.** FRANKEL & VIEBAHN. Ger. 474,528, Oct. 28, 1927. Addn. to Ger. 438,842. Details of arrangement.

**Rotating furnace for liquid steel.** SOC. TUBALCAIN. Fr. 648,895, Dec. 27, 1927.

**Reverberatory furnace suitable for heating steel bars.** D. WILLIAMS. Brit. 208,507, July 9, 1927. Structural features.

**Laboratory muffle suitable for metal recovery operations.** EDWIN B. FORSE (to Carborundum Co.). U. S. 1,710,870, April 30. That part of a muffle which is more directly exposed to the action of oxidizing or easily reducible materials is formed of refractory oxide material such as a fused  $\text{Al}_2\text{O}_3$  compn. and the principal heat-transfer portion of the muffle is formed of Si carbide.

**Treating cast iron.** THE OHIO BRASS CO. Ger. 474,368, July 25, 1923. See Brit. 227,873 (C. A. 19, 2632).

**Uniting steel stems to tappet valves of cast iron, etc.** GEORGE R. RICH (to Wilcox-Rich Corp.). U. S. 1,710,996-7, April 30. Mech. features.

**Steel.** EDMOND DOPPEL. Fr. 649,689, July 11, 1927. The final addn. of metals

or metalloids to steel or special casts is made by adding these before casting in the form of Al compds. which are absolutely free from S, P or C. Fe itself being present in only very small proportions; the content of Al is preferably above 9%. Cf. *C. A.* 23, 1611.

**Alloys.** HUBERT J. OVERALL. Australia 10,334, Nov. 10, 1927. An alloy suitable for bearings, etc., contains, *e. g.*, Sb 12, Sn 12, Cu 6-7%, the remainder Pb.

**Alloys.** MAX E. ROCK. Ger. 474,887, July 17, 1927. Alloys for dental work contain Cr 23-40, Ni 13-24, Cu 6.5-13, Au about 33.4, Ag, 3.5, and Mo 3.5%.

**Alloys.** THE INTERNATIONAL NICKEL CO., INC., AND EDWARD J. BOTHWELL. Fr. 649,574, Feb. 22, 1928. A Cu-Ni alloy which has special phys. properties and is resistant to acid and alk. corrosion and not affected by superheated steam contains Si 0.5-5%. Suitable compns. are Ni 55-80, Si 0.5-5, Fe 0.5-5, C 0.0-0.5, Mn up to 3% and the remainder Cu. The properties are improved by sudden cooling from about 1038°, followed by drawing at 482-870°.

**Alloys.** THE INTERNATIONAL NICKEL CO., INC. AND PAUL DIOR MERICA. Fr. 649,575, Feb. 22, 1928. Alloys which do not rust and are particularly suitable for food utensils contain, *e. g.*, Fe 0.82, Cr 10.99, C 0.11, Si 0.22, Mn 1.56% and the remainder Ni, or Ni 77.8, Fe 0.52, Cr 19.48, C 0.06, Si 0.18 and Mn 1.84%.

**Alloys.** COMPAGNIE FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON. Fr. 649,658, Feb. 24, 1928. "Resistance" alloys particularly suitable for machines and elec. app. contain Al 90, Mn 6 and Zn 4%.

**Magnetic alloy.** FELTEN & GUILLEAUME CARLSWERK A.-G. Ger. 472,623, Aug. 22, 1926. A magnet core is made from small strips of Fe-Ni alloy contg. 5-15% Ni and covered by a layer of acetylcellulose.

**Alloy particularly suited for the manufacture of cutting tools.** A. E. G. T. VON VEGESACK (to Uddeholms Aktiebolag). Swed. 64,369, Jan. 4, 1928. An alloy contains C 0.7-1.1, Cr 9-16, Mn 0.75-2.0% and the rest Fe without other constituents than the usual contaminations in technical iron of this C content.

**Iron alloys.** THE AMERICAN ROLLING MILL CO. Fr. 649,562, Feb. 22, 1928. Alloys of Fe having a small content of C are obtained by 1st making a bath of molten Fe contg. little C and little metalloids, pouring the Fe in the pure and molten state into an elec. furnace and deoxidizing to remove the O. completely or almost so, then forming a reducing slag on the surface of the Fe, and, while maintaining the heat, adding to the Fe an alloying metal free from C.

**Brazing iron-carbon alloys.** I. G. FARBENIND. A.-G. Ger. 474,460, Sept. 26, 1926. Fluxes for use in brazing Fe-C alloys comprise mixts. of alkali chlorides, borates and carbonates with acid oxides of Mo, Ce, Ti, Si or like alloy-forming elements, with or without powd. metals of high m. p. or alloy-forming non-metals. A suitable compn. comprises alkali borate 45, alkali chloride 25, alkali carbonate 25 and Ti(OH)<sub>4</sub> 5%.

**Refining nickel alloys.** WILLOUGHBY S. SMITH, HENRY J. GARNETT and JOHN A. HOLDEN. U. S. 1,710,846, April 30. In order to "minimize" the S content of alloys contg. over 50% Ni, the furnace charge is melted in the presence of a slag and an atm. of H, and, after removal of the reducing atm., an oxide of one of the constituent metals such as Fe<sub>2</sub>O<sub>3</sub> or Cu oxide is added to take up the absorbed H. Cf. *C. A.* 23, 2111.

**Coating metals.** AMERICAN MACHINE AND FOUNDRY CO. Ger. 472,888, Dec. 7, 1926. Metal objects are coated with molten Pb, which contains Sn and P. Cf. *C. A.* 22, 2352.

**Drum apparatus for galvanizing goods in bulk.** LANGBEIN-PEFANHAUSER-WERKE A.-G. Ger. 474,628, Feb. 9, 1928.

**Centrifugal apparatus for tinning goods by plunging them in molten metal.** ARTUR REICH. Ger. 472,710, May 28, 1927. Details of arrangement.

**Rust preventing.** WILLIAM H. COLE. Fr. 649,775, Feb. 1, 1928. Fe or steel is heated in the presence of electrically neutral dry powders such as a mixt. contg. emery, Zn, Sn and Al, to which finely ground CoCl<sub>2</sub>, NiSO<sub>4</sub> and SbCl<sub>3</sub> may be added. Cf. *C. A.* 23, 2691.

**Coating bands with lead.** MARTINSWERKE, G. M. B. H. Ger. 472,858, June 3, 1926. Bands are coated unequally at each side with Pb by passing them through an app. including a vat of molten Pb with scrapers adjacent to the vat at adjustable distances from the band surfaces.

**Leading iron.** AKTIEN-GESELLSCHAFT KÜHNLE, KOPP & KRAUSCH. Ger. 474,766, Oct. 27, 1927. A homogeneous coating of lead is applied to both sides of hollow iron objects, by using a perforated metal holder which allows the lead to flow to both sides.

**Coloring the surface of aluminum articles.** ALADAR PACZ. U. S. 1,710,743, April 30. Articles formed at least in part of Al are dipped in a soln. of sol. F compds. such as fluosilicates and a salt of one of the metals Ag, Ni, Sn, Co, Zn, Cd, Fe, Mn, Pb, Sb or Cu. A soln. contg. Zn and Sb produces a black coating.

**Crate for use in pickling metal plates and sheets.** CHARLES W. HALLER (to Wheeling Bronze Casting Co.). U. S. 1,711,054, April 30. Structural features.

**Decarbonizing ferrochromium.** FRIED. KRUPP A.-G. (Benno Strauss and Paul Klinger, inventors). Ger. 473,415, Oct. 9, 1926. A finely ground mixt. of ferrochromium and  $\text{Fe}_2\text{O}_3$  is heated to sintering and the CO produced by the decarbonization is continuously withdrawn or replaced by indifferent gas.

**Worming connecting rods or other articles of wrought metal.** CHARLES R. SHORT (to general Motors Research Corp.). U.S. 1,711,000, April 30. A blank of metal such as Al alloy is cast in a chill mold that is approx. a counterpart of, but somewhat larger than, the desired article, the cast blank is removed and it is then reduced to final size by working it under pressure.

**Tungsten tools.** OSCAR DIENER. Fr. 649,093, Feb. 15, 1928. Hard tools of W contg. more than 3% combined C are made by taking W powder of high C content produced in known manner and contg. C in combination, pressing it into refractory molds, heating it rapidly to about  $2000^\circ$  and applying pressure of 150–200 kg. per sq. cm. The tools may contain B up to 0.6, and B and Si together up to 1.5%. Cf. C. A. 23, 1863.

**Apparatus for cutting metals by flame fusion.** L. J. HANCOCK. Brit. 298,885, Sept. 28, 1927. Structural features.

**Blowpipe apparatus for cutting metals by fusion.** L. J. HANCOCK. Brit. 299,166, Sept. 28, 1927. Structural features.

**Welding cast iron.** INTERNATIONAL NICKEL CO. Brit. 298,781, Oct. 27, 1927. In welding cast iron or cast iron contg. Ni, a filler rod is used of a ferrous alloy contg. Ni 1–40% (suitably a Ni steel wire of low C content contg. Ni). Some of the Ni may be replaced by Cu. Various details and proportions are given.

**Electrodes for electric welding machines.** ALLGEMEINE ELEKTRICITÄTS-GES. (Hermann Blomberg, inventor). Ger. 474,780, May 7, 1927. The electrodes are formed from a Cu-Ag alloy, suitably from one contg. about 6% Ag.

**Electrodes for arc welding.** F. DWORZAK. Brit. 298,598, Oct. 12, 1927. Metal electrodes are provided with cores of substances for reducing the welding voltage and giving the weld the necessary properties. The cores may be formed of: (a) CaO 80, borax 10,  $\text{CaF}_2$  5 and  $\text{FeSiO}_3$  5%; or (b)  $\text{FeSiO}_3$  15, CaO 50,  $\text{SiO}_2$  10,  $\text{CaF}_2$  10, NaCl 10 and chrome iron ore 5%; or (c)  $\text{MnO}_2$  13, CaO 85 and  $\text{SiO}_2$  2%.

**Electrodes for arc welding.** B. TURNER AND FERRO-ARC WELDING CO., LTD. Brit. 299,163 Sept. 24, 1927. A twin electrode for welding and depositing metal by a. c., one phase of which is connected to the work and the other 2 to the electrode, is formed by use of a core-wire coating of highly elec. insulating Na silicate (such as so-called "adhesive silicate") or a soln. of shellac in "methylated spirit," and applying around the core a coating of flux or slag-forming material. Cf. C. A. 23, 2148.

**Device for regulating the length of the electric arc in welding apparatus.** ALEXANDER PERRIG. Swiss 129,941, Dec. 16, 1927.

**Flux for welding and soldering.** LEOPOLD ROSTOSKY. Ger. 472,711, Jan. 25, 1928. Addn. to Ger. 452,239. A non-hygroscopic flux for light metals contains mainly complex Be salts.

**Solder for aluminum.** ALUMINIUM-WALZWERKE SINGEN DR. LAUBER NEHER Co. G. m. b. H. (Felix Thomas, inventor). Ger. 474,597, Apr. 5, 1924. A solder for Al contains mineral or animal grease solvents which do not act on the Al, and org. acids which dissolve the thin film of oxide. Suitable mixts. are colophony, stearic acid, palmitic acid or  $\text{HCOOH}$ , with  $\text{C}_6\text{H}_6$  and methylhexaline and AcOH with tetraline.

## 10—ORGANIC CHEMISTRY

CHAS. A. ROUILLER AND CLARENCE J. WEST

**Friedrich Kehrman.** H. DECKER. *Chem.-Ztg.* 53, 277(1929).—Obituary. E. H.

**Mechanism of the thermal decomposition of the normal paraffins.** ERNEST NOEL HAGUE AND RICHARD VERNON WHEELER. Univ. of Cambridge. *J. Chem. Soc.* 1929, 378–93.—A study is made of the 1st 6 hydrocarbons, using the stream method, in which large vols. of each gas were passed at a const. rate through a tube of quartz heated at a const. temp. Results are given of the gas analysis, the total liquid formed and the % of  $\text{C}_6\text{H}_6$ .  $\text{CH}_4$ : At  $1000^\circ$   $\text{C}_{10}\text{H}_8$  was formed; the liquids distg. below  $170^\circ$  consisted of 90% of  $\text{C}_6\text{H}_6$ ; the higher boiling liquids contained  $\text{C}_{10}\text{H}_8$  and  $\text{C}_{14}\text{H}_{10}$ .  $\text{C}_2\text{H}_6$ : There were no liquid products at  $700^\circ$ ; at  $800^\circ$   $\text{C}_{10}\text{H}_8$  was formed; at  $900^\circ$

the liquids contained much heavy oil, only about 50% distg. between 80-100°; at 950° much  $C_{10}H_8$  was formed and more than half of the liquid was  $C_6H_6$ . At 700° about 90% of the  $C_2H_6$  decompd. into  $C_2H_4$  and  $H_2$ .  $C_3H_8$ : At 750° a mobile liquid, d. 0.635, was obtained; the yield of liquid products reached a max. at 850°, representing 23% of the  $C_3H_8$  passed; the proportion of  $H$  increased continuously with the rise of temp. of decompn.; the proportion of  $CH_4$  reached a max. at 850° and of  $C_2H_4$  at 750°.  $C_4H_{10}$ : At 650° traces of a low-boiling oil were obtained; the gases contained a high % of  $C_2H_6$ ; at 700° an unsatd. oil, liquid at -80°, was produced; at 750° the bulk of the liquids boiled between 80-120°, the total yield of oils reached a max. at 850°, corresponding to 24.6% of the  $C_4H_{10}$  passed; at temps. above 750°  $C_6H_6$  was the chief liquid product.  $C_5H_{12}$ : At 750° decompn. of the  $C_5H_{12}$  appeared to be complete, most of the oil distg. between 80-4°; at 800° and 850°, also, the liquid distillate was mainly  $C_6H_6$ ; the chief constituent of the gases at all temps. was  $CH_4$ .  $C_6H_{14}$ : Decompn. was apparently complete at 725°, the yield of liquids increased to a max. at about 850°, 33.8% by wt. of the  $C_6H_{14}$  passed being transformed into liquid hydrocarbons (chiefly aromatic) at that temp. Results are also given for  $C_3H_4$  and  $C_2H_2$ . T. M. LOWRY points out an analogy with the mechanism of reversible isomeric changes.

C. J. WEST

**Preparation and properties of the isomeric heptanes. I. Preparation.** GRAHAM EDGAR, GEORGE CALINGAERT AND R. E. MARKER. Ethyl Gasoline Corpn. *J. Am. Chem. Soc.* **51**, 1483-91 (1929). The 9 isomeric  $C_7H_{16}$  have been prepd. and their phys. properties detd. (see part II below). The properties of the intermediates indicate distn. cuts rather than actual phys. properties.  $BuMgBr$  and  $Me_2CO$  give 92% of  $C_7H_{16}C(OH)Me$ , b. 137-41°, d.<sub>4</sub><sup>20</sup> 0.815, distn. with  $I$  gives 95% of  $C_7H_{16}CH_2CMe_2$ , b. 94.5-6°; catalytic reduction gives 82% of  $C_7H_{16}CHMe$ , b.<sub>760</sub> 89.7-90°. Similarly there were prepd.:  $PrEtC(OH)Me$ , b. 137-9°, d.<sub>4</sub><sup>20</sup> 0.823 (64% yield);  $Et_3COH$ , b. 140-2°, d.<sub>4</sub><sup>20</sup> 0.839 (83%);  $MeCHCHC(OH)Me$ , b. 127-9° (54%);  $EtMeCHC(OH)Me$ , b. 129-30.5°, d.<sub>4</sub><sup>20</sup> 0.805 (35%);  $MeCC(OH)Me$ , b. 130° (28%);  $PrC(:CHMe)Me$ , b. 93-6° (93%);  $EtCCHMe$ , b. 95-7° (95%);  $Me_2CCHCMe_2$ , b. 81-3° (91%);  $MeEtC:CMe_2$ , b. 92-5° (54%);  $Me_2CCMeCH_2$ , b. 76-8° (95%);  $PrCHMeEt$ , b.<sub>760</sub> 91.4-17° (87%);  $CH_3Et$ , b.<sub>760</sub> 93.2-3.5° (80%);  $CH_2(CHMe)_2$ , b.<sub>760</sub> 80.5-11° (81%);  $EtMeCHCHMe$ , b.<sub>760</sub> 98.5-9.9° (87%);  $Me_2CCHMe_2$ , b.<sub>760</sub> 80.9-12° (86%). The reaction product from  $PrMgBr$ ,  $Me_2CCl$  and  $HgCl_2$ , decompd. as usual, gives 21% of  $MeCPr$ , b.<sub>760</sub> 78.2-9.5°. Similarly  $EtMgBr$  and  $EtMe_2CCl$  give 13% of  $Et_2CMe_2$ , b.<sub>760</sub> 85.7-6.1°. The last 2 hydrocarbons could not be obtained from the corresponding alcs., because of rearrangements which took place on dehydration. A comparison of the phys. data with those in the literature is given. **II. Physical properties.** G. EDGAR AND G. CALINGAERT. *Ibid.* 1540-50. The following phys. properties of the 9 isomeric  $C_7H_{16}$  listed above are reported:

No.	Name	B. p., °C (760 mm.)	M. p., °C	$\Delta d/\Delta t$ (20 °C.)
1	Heptane	98.4	90.1	0.6836
2	Methylhexane	90.0	119	0.6789
3	Methylhexane	91.8		0.6870
4	Ethylpentane	93.3		0.6984
5	2-Dimethylpentane	78.9	125.6	0.6737
6	3-Dimethylpentane	89.7		0.6952
7	4-Dimethylpentane	80.8		0.6745
8	3-Dimethylpentane	86.0		0.6934
9	2,3-Trimethylbutane	80.9	25.0	0.6900

No.	$n_D^{20}$	$M_{rD}$	$M_{rV} - M_{rL}$	Dielec. const., $\epsilon$ , at 20°	$t_c$ , °C	$P_c$ , atm.	$T_c/T_B$	$a \times 10^{-3}$ (van d Waals)
1	.38777	34.54	0.84	930	269.5	27.65	.400	3.025
2	.38509	34.57	0.85	922	257.9	27.2	.402	2.945
3	.38873	34.45	0.83	930	262.4	28.1	.407	2.900
4	.39366	34.27	0.82	942	267.6	28.6	.479	2.905
5	.38233	34.61	0.86	915	247.7	28.4	.480	2.727
6	1.39201	34.31	0.83	942	264.6	29.2	.493	2.814
7	1.38233	34.57	0.85	917	247.1	27.4	1.470	2.813
8	1.39114	34.32	0.83	1.940				
	1.38940	34.35	0.84	1.930	258.3	29.75	1.407	2.697

No.	b(cc.) (van d. Waals)	a/V <sup>2</sup>	Vel. of sound at 20°		$\beta_P(20^\circ)$ atm. $\times 10^6$	$\beta_T(20^\circ)$ $\times 10^6$	$\alpha \times 10^6$	$\alpha/\beta_T \times 203$	(5200+ 30t <sub>B</sub> )/V
	m/sec.								
1	201.4	1415	1154.0	111.4	142.37	122.2	2513	55.73	
2	200.3	1358	1120.0	110.05	152.20	125.9	2424	53.62	
3	195.5	1368	1135.5	114.45	145.62	122.8	2471	54.64	
4	193.9	1417	1169.5	106.15	136.46	122.2	2621	55.87	
5	188.1	1232	1080.0	128.90	162.79	126.8	2282	50.98	
6	188.9	1360	1148.5	110.70	140.68	122.0	2541	54.86	
7	194.8	1280	1083.5	128.00	161.85	126.8	2296	51.42	
8	...	...	1129.5	114.55	145.13	122.3	2467	53.95	
9	183.2	1284	1101.5	121.05	151.44	121.5	2351	52.63	

No	Surf. tens. 20°		C.T.S. aniline, °C.	$\eta$ 20°	Mol diam., cm $\times 10^8$	Mol length, cm. $\times 10^8$	Ht of comb., cal/g.
	$\gamma$ , dynes/cm.	$\gamma/V^{1/3}$					
1	20.28	3.848	70.0	0.00409	4.64	11.38	11490
2	19.37	3.668	71.1	0.00378	4.84, 5.25	10.47, 8.87	11480
3	19.56	3.718	70.5	0.00372	5.68	7.46	11480
4	20.16	3.854	66.3	0.00377	5.51	7.84	11490
5	17.80	3.362	77.7	0.00385	5.68	7.61	11470
6	19.65	3.750	68.1	0.00406	5.68	7.38	11480
7	17.93	3.388	78.8	0.00361	5.68	7.61	11480
8	19.63	3.743	71.0	0.00454	5.68	7.38	11470
9	18.60	3.541	72.4	0.00585	5.69	7.45	11470

In the above table,  $MR = (n^2 - 1)/(n^2 + 2) \times 1/d$ ;  $MR_\gamma - MR_\alpha =$  mol. dispersion for the H  $\alpha$  and  $\gamma$  lines;  $V =$  mol. vol.;  $B =$  adiabatic compressibility in cc./cc./atm.;  $\beta_T =$  the isothermal compressibility in cc./cc./atm.;  $\alpha =$  coeff. of thermal expansion in cc./cc./°C.; C.T.S. in PhNH<sub>2</sub> = the crit. soln temp in PhNH<sub>2</sub> at the concn giving the max temp. Tables are also given of data from the literature for isomeric C<sub>7</sub>H<sub>16</sub>, C<sub>8</sub>H<sub>18</sub>, C<sub>9</sub>H<sub>20</sub>, and C<sub>10</sub>H<sub>22</sub>. Certain definite regularities are found relating the phys. properties of these isomers to their structure and these relationships enable the phys. properties of paraffin hydrocarbons to be predicted with reasonable assurance from their structure. The original should be consulted for these discussions.

C. J. WEST

**Stereoisomeric carbonization theory.** D. WIELUCH. *Z. Oberschles. Berg- u. Hüttenmännisch. Ver. Katowice* No. 3, 6 pp (1928). The theory postulates that the mols. of carbonized substances contain "inorg." as well as "org." C linkings. Graphite belongs to the hydroaromatic series. Carbonization is not assocd. with aromatic structure.

B. C. A.

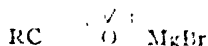
**The condensation of ethylene under the influence of sulfuric acid in the presence of mercurous and copper sulfates.** J. BÖRSEKEN AND N. MAX. *Techn. Univ., Delft. Rec. trav. chim.* 48, 486-8 (1929). - According to Damiens and Lebeau (*Bull. soc. chim.* [4], 33, 76 (1923)) the condensation of C<sub>2</sub>H<sub>4</sub> under the influence of 95% H<sub>2</sub>SO<sub>4</sub> contg. 5% anhyd. CuSO<sub>4</sub> and 2% Hg<sub>2</sub>SO<sub>4</sub> gives rise to the formation of a mixture of aliphatic and cyclic hydrocarbons. The formation of the cyclic compds. (naphthenes) may be explained easily by assuming the formation of a chain from the activated C<sub>2</sub>H<sub>4</sub> mols., which passes into cyclic compds. by catalytic cyclization. For the formation of paraffins, however, 2 atoms of H must be captured from other mols. and thus the formation of mols. more unsatd. than C<sub>2</sub>H<sub>4</sub> is also to be expected. In accordance with these considerations it was found that the reaction product contains a considerable amount of more unsatd. hydrocarbons, resembling the aliphatic and alicyclic terpenes. The expts. were carried out in the way described by D. and L., H<sub>2</sub>SO<sub>4</sub> of 93-95% being used. After some time, the oil floating on the surface, which consists of the satd. hydrocarbons, was decanted, the acid dild. with water and the unsatd. hydrocarbons distd. with steam; in this way only a part of the unsatd. compds. is obtained, a highly unsatd. black residue in the flask being not volatile with steam. The yield of satd. and unsatd. hydrocarbons was 25 and 20% resp. Fractionation of the satd. hydrocarbons and analyses of the several fractions showed the lower-boiling fractions (b<sub>10</sub> < 45°) to consist chiefly of paraffins with a small amount of cyclanes, whereas the higher-boiling fractions consist chiefly of cyclanes. The lower-boiling fractions of the unsatd. hydrocarbons contain alcs., the higher-boiling fractions having the character of aliphatic terpenes.

C. F. VAN DUIN

**Chemical products of ethylene and technical gases containing ethylene.** KAZI-

**MIERZ SMOLENSKI.** Warsaw Polytech., *Przemysl Chem.* 11, 146-82(1927).—In pyrogenating 100 kg. crude naphtha at 600° there is obtained 15 m.<sup>3</sup> of olefinic hydrocarbons, principally propylene, ethylene, and butylene; at 700° 15 kg. of mostly C<sub>3</sub>H<sub>4</sub>. The concn. of C<sub>3</sub>H<sub>4</sub> in the gas at 600° amounts to 35-7%, and at 700° to 20-2%. When the content of olefinic hydrocarbons is appreciable they can be obtained in a pure state by liquefaction from technical gases *e. g.*, oil gas. For obtaining chem. products according to methods here described, however, technical gases with a 20% by vol. content of C<sub>3</sub>H<sub>4</sub> are sufficient. In presence of Fe and Ni as contact agents C<sub>3</sub>H<sub>4</sub> at 700° decomps. to C (soot) and H<sub>2</sub> (80-50%). Technical gases with about 20% C<sub>3</sub>H<sub>4</sub> undergo a similar decompn. giving soot and 75% H<sub>2</sub>. At 700-50° without contact agents ethylene decomps. more slowly and in place of soot yields 60% of liquid and solid hydrocarbons. Researches on the industrial synthesis of *glycerol* from gases contg. *propylene* are continued. A method has been worked out for obtaining 1,2-dichloroethane by chlorinating technical gases contg. about 20% C<sub>3</sub>H<sub>4</sub>. The reaction is conducted in packed vertical columns, with the gas and Cl<sub>2</sub> passing downward. A scrubber using anthracene oil serves for washing out the vapor of C<sub>2</sub>H<sub>4</sub>Cl<sub>2</sub> from the escaping gases. The yield from 100 l. of gas amounts to 75 g. of crude chlorides. 100 kg. crude, subjected to pyrogenation yields 45 kg. raw chlorides from which 40 kg. pure C<sub>2</sub>H<sub>4</sub>Cl<sub>2</sub> is obtained. The reaction of sapon. C<sub>2</sub>H<sub>4</sub>Cl<sub>2</sub> by means of H<sub>2</sub>O, aq. Na<sub>2</sub>CO<sub>3</sub> of various concns., aq. soda, HCO<sub>2</sub>Na with MeOH, etc., was investigated from the kinetic point of view. Investigations were made on obtaining *ethylene glycol* by sapon. of C<sub>2</sub>H<sub>4</sub>Cl<sub>2</sub> by (a) Na<sub>2</sub>CO<sub>3</sub> at 140° for 6 hrs. whereby a 55% yield of pure glycol was obtained, (b) aq. Na<sub>2</sub>CO<sub>3</sub> at 120° for 3 hrs. with 64% yield, (c) HCO<sub>2</sub>Na with MeOH at 15° for 10 hrs. with a 78% yield. By splitting off HCl from C<sub>2</sub>H<sub>4</sub>Cl<sub>2</sub> in "chlorol", a gas b. 17° is obtained. This polymerizes under light and in the dark in presence of catalysts like BCl<sub>3</sub>. Polymerization was studied as influenced by various factors, and is found to stop at 50-55% yield. The properties of the polymer (C<sub>2</sub>H<sub>4</sub>Cl<sub>2</sub>)<sub>n</sub> were especially studied, and suitable solvents for it have been found. *Lanterns* can be obtained from its solns. In checking up Gomberg's method of prep. *ethylene chlorohydrin* through the action of Cl<sub>2</sub> and H<sub>2</sub>O on C<sub>2</sub>H<sub>4</sub> a yield of about 85% chlorohydrin, and about 8% *dichloroethane* was obtained. Concn. of weak solns. of chlorohydrin up to about 40% presents no difficulty. *Anhyd. chlorohydrin* can be obtained from a 50-40% product by salting out and extg. with ether (with light b.). In studying the kinetics of sapon. of the chlorohydrin a method was worked out for prep. *ethylene glycol* from it. Concd. Na<sub>2</sub>CO<sub>3</sub> is slowly added dropwise to the boiling chlorohydrin, yield about 90%. By adding dropwise concd. NaOH to a cooling soln. of the chlorohydrin about 90% *ethylene oxide* is obtained.

**α-Diacetylenic hydrocarbons.** V. GRISSARD and T. CHOUTAKI. *Compt. rend.* 188, 357-61(1929).—In 1925 G. and Perrichon (C. 20, 1782) prepd. 2 α-diacetylenic hydrocarbons, and G. and T. have now prepd. others by the same method. Under strictly limited conditions 1 mol. of acetylene Mg compds. (2 mols.) react as follows: RC·CMgX + I<sub>2</sub> → RC·CI + RC·CC·CMgX → RC·CC·CR. To the org. Mg deriv. (free of excess EtMgBr) is added rapidly, while shaking, a concd. Et<sub>2</sub>O soln. of I. The product is hydrolyzed after a moment. Possibly the reaction



takes place as follows:



G. and T. prepd., in the aliphatic

series, 4,6-decadiene, b<sub>p</sub> 88°; 5,7-dodecadiene, b<sub>p</sub> 103°; and 6,8-tetradecadiene, b<sub>p</sub> 118-9°, the yields being 70-2%. These liquids slowly become yellow in the light. G. and T. prepd., in the aromatic series, 70% of 1,4-diphenyl-1,3-butadiene, m. 86.5-7.0°, previously prepd. by Strauss; 84% of 1,4-bis [2',4'-dimethylphenyl]-1,3-butadiene, m. 145-5-6.0°, previously obtained by G. and Perrichon, but less pure; 57% of 1,6-diphenyl-2,4-hexadiene, m. 101°; 62% of 1,8-diphenyl-3,5-octadiene, m. 118°. The mol. refractivities, normal for the aliphatic compds., are elevated for the aromatic compds.; the 2 triple bonds, conjugated with each other, become conjugated also with the aromatic nuclei. The di Mg deriv. (I) of CH<sub>2</sub>=CH is interesting. (1) I (1 mol.) and I (1 mol.) give a small quant. of IC·CH (II), b. 32°, and 65% of IC·CC·CH, (III) b. 71°, d<sub>4</sub><sup>20</sup> 1.824, n<sub>D</sub><sup>20</sup> 1.5058, unstable in the light. (2) With I (0.5 mol.) the yield of III is lower and half of the HC:CH is recovered unchanged. (3) With I (1.5 mol.) the products are a small amount of unchanged I, II, III, IC·CC·CI (IV), m. 101-5° (de-





16.08 g.  $\text{CH}_2\text{I}_2$  with 4.76 g. purified Sn sawings in a sealed tube at  $170-80^\circ$  for 26 hrs., 12.5 g.  $\text{SnI}_4$  were obtained. The reaction of dihalogen derivs. of  $\text{CH}_4$  with Sn also takes place in presence of high-boiling esters as solvents, at their b. p.

BERNARD NELSON

**Production of alcohols from the butenes and pentenes through interaction with sulfuric acid.** JAMES F. NORRIS and HAROLD S. DAVIS. Mass. Inst. Tech. *J. Soc. Chem. Ind.* **48**, 70-1T(1929).—Polemic; see Ormaudy and Craven, *C. A.* **22**, 2919, 1929.

A. S. CARTER

**Symmetrical tetrabromoethyl ether and "so-called" tetrabromobutyraldehyde.** HAROLD HIBBERT, STANLEY Z. PERRY and K. AUSTIN TAYLOR. McGill Univ. *J. Am. Chem. Soc.* **51**, 1551-5(1929). The cryst. product obtained by Freundler (*Compt. rend.* **140**, 794, 1693(1905)) in the bromination of paraacetaldehyde and described by him as  $\text{BrCH}_2\text{CHBrCBr}_2\text{CHO}$  is shown to be  $(\text{BrCH}_2\text{CHBr})_2\text{O}$ . The latter has been synthesized from divinyl ether by bromination in  $\text{CHCl}_3$ . Condensation with  $(\text{CH}_2\text{OH})_2$  gives 57.2% bromoethylidene glycol, b. p.  $80-82^\circ$ . Divinyl ether is simply prepd. in 54.9% yield by dropping 50 g.  $(\text{CICH}_2\text{CH}_2\text{O})_2$  onto 200 g. heated KOH during 12 hrs.

C. J. WEST

**Alkyl peroxides. II. Methyl ethyl peroxide and refractometric investigations on alkyl peroxides.** ALFRED RIECHE (with FRITZ HITZ). Univ. Erlangen. *Ber.* **62B**, 218-25(1929); cf. *C. A.* **22**, 951. *Methyl ethyl peroxide* ( $\text{EtO-O-Me}$ ) was obtained in good yield from  $\text{EtO}_2\text{H}$  and  $\text{Me}_2\text{SO}_4$  ( $\text{CH}_3\text{N}$  gives only traces of it) under the same conditions as  $\text{Me}_2\text{O}_2$ ; here, too, is obtained some  $\text{Me}_2\text{O}$ , and also some  $\text{Me}_2\text{O}_2$ , which are readily removed by fractionation.  $\text{I}$  is a colorless mobile liquid, b. p.  $19.1^\circ$ , d. 0.8327 (extraordinarily volatile, with an odor similar to but more penetrating than that of  $\text{Et}_2\text{O}$ , has a normal mol. wt. in vapor form, has only a weak oxidizing power, only slowly liberates traces of  $\text{I}$  from acidified KI soln.) and the peroxide O must therefore be detd. with  $\text{TiCl}_3$ . In all its properties it stands midway between  $\text{Me}_2\text{O}_2$  and  $\text{Et}_2\text{O}_2$ , especially in its sensitivity to heat and shock. Thrown to the ground in a test tube, it deflagrates and burns with a yellow flame, forming much  $\text{HCHO}$ . The peroxide O is also sensitive to shock and explode violently on superheating in a test tube without, however, shattering the glass; on a watch glass it deflagrates when a hot wire is brought near and it exploded violently in an attempt to burn it from a dish. In  $\text{N}$  although the part of the combustion tube in front of the mouth of the combustion tube is well cooled,  $\text{Et}_2\text{O}_2$  near its b. p. is exploded by shock but the velocity of decomposition is small and there is practically no noise. Solid  $\text{Me}_2\text{O}_2$  is not sensitive to shock and at  $-50^\circ$  it decomps. not much more violently than  $\text{Et}_2\text{O}_2$  at the b. p. A new detn. on  $\text{Me}_2\text{O}_2$  gave d. 0.848; it solidifies at  $-100^\circ$  to  $-105^\circ$ .  $\text{Et}_2\text{O}_2$  can be more conveniently prepd. with turbinol. When pure it b. p.  $64^\circ$ , d. 0.8267. The fractions near the b. p. of the pure product still contain considerable  $\text{Et}_2\text{O}$ . A fraction b. p.  $63^\circ$  could not be sep'd. by distn. or evapn., in *vacuo*, at room temp., and although its d. and  $\rho$  pointed to the presence of about 15%  $\text{Et}_2\text{O}$  analysis showed that it contained 9% at most, indicating the formation of a mol. compd. between the  $\text{Et}_2\text{O}$  and the  $\text{Et}_2\text{O}_2$ . The refractometric measurements show that the peroxide O cannot be present in pure ether-like combination; they give for the peroxide ( $\text{O}_2$ ) group the values  $M. R. \text{NaD}$  1.099,  $M. D. H_\beta \rightarrow H_\alpha$  0.053,  $M. D. H_\gamma \rightarrow H_\alpha$  0.095, the  $M. R.$  value agreeing with that for mol.  $\text{O}_2$ . The alkyl peroxides can therefore be better formulated as  $\text{R-O-O-R}$  than as  $\text{R-O-O-R}$ . An interesting fact is the difference in the exaltation value from that found by Bruhl for  $\text{H}_2\text{O}_2$ . For  $\text{I}$   $M. R.$  increases slightly with the temp., from 20.02 at  $10^\circ$  to 20.13 at  $28^\circ$ . Below are the values of  $n$  for  $\text{H}_\alpha$ ,  $\text{NaD}$ ,  $\text{H}_\beta$  and  $\text{H}_\gamma$ , resp.:  $\text{Me}_2\text{O}_2$  1.34843, 1.35029, 1.35440, 1.35788 at  $0^\circ$ ;  $\text{I}$ , 1.35723, 1.35898, 1.36336, 1.36703 at  $17^\circ$ ;  $\text{Et}_2\text{O}_2$  1.36971, 1.37156, 1.37615, 1.37997 at  $17^\circ$ .

C. A. R.

**Chlorination products of  $\alpha,\alpha'$ -dichlorodiethyl sulfide. II.** JOHN W. C. PHILLIPS, JOHN S. H. DAVIES and STANLEY A. MUMFORD. Expt. Sta., Porton. *J. Chem. Soc.* **1929**, 535-49; cf. *C. A.* **22**, 1325. An extended study of the chlorination of  $(\text{CICH}_2\text{CH}_2)_2\text{S}$  with 2 or more mols. of  $\text{Cl}$  has confirmed the view, previously advanced and independently of the work of Lawson and Dawson (*C. A.* **22**, 381) that the tri- and tetra- $\text{Cl}$  derivs. of Mann and Pope are vinyl derivs. and that the formation of chlorodiethyl sulfides, which are the 1st but less stable products of chlorination. Contrary to previous views, chlorination is not confined to 1 chain, as is proved by the isolation from among the products of direct chlorination of new tetra- and pentachlorinated ethyl vinyl sulfides and hexachlorodiethyl sulfides. Results are given for 16 quant. chlorination expts. Chlorination of  $(\text{CICH}_2\text{CH}_2)_2\text{S}$  with 2 mols.  $\text{Cl}$  gives  $\text{CICH}_2\text{CCl}_2\text{SCH}_2\text{CH}_2\text{Cl}$ ,

which, freed from HCl, has  $d_4^{20}$  1.53; heating at 90–100° at 2 mm. gives 80–90% of  $\beta$ -chloroethyl  $\alpha,\beta$ -dichlorovinyl sulfide (I),  $b_{15}$  107°,  $d_4^{20}$  1.4315,  $d_4^{25}$  1.4255,  $\eta^{20}$  0.028 dyne/sq. cm.,  $n_D^{20}$  1.5562; further chlorination of I gives  $\text{Cl}_2\text{CHCCl}_2\text{SCH}_2\text{CH}_2\text{Cl}$ , an unstable yellow liquid, losing HCl on heating and giving  $\beta$ -chloroethyl  $\alpha,\beta,\beta$ -trichlorovinyl sulfide (II),  $b_{15}$  122–4°,  $d_4^{20}$  1.5425,  $d_4^{25}$  1.5361,  $\eta^{20}$  0.039 dyne/sq. cm.,  $n_D^{20}$  1.5700. II and 1 mol. Cl give 90% of  $\text{CCl}_2\text{CHCl}_2\text{SCH}_2\text{CH}_2\text{Cl}$ ,  $b_{15}$  158–9°,  $d_4^{20}$  1.6849,  $d_4^{25}$  1.6794,  $\eta^{20}$  0.254 dyne/sq. cm. and  $n_D^{20}$  1.5683; further chlorination gives  $\text{C}_2\text{Cl}_6$ .  $(\text{ClCH}_2\text{CH}_2)_2\text{S}$  and 3 mols. Cl give the pentachlorodiethyl sulfide,  $d_4^{20}$  1.57. An unsatd. tetra-Cl fraction was always obtained when more than 2 mols. Cl were used and the product was subsequently decompd. by heating, but out of 20 expts., in 1 case only did this fraction appear to be identical with II; the higher-boiling fraction appears to be  $\beta$ -[ $\beta$ -chloroethylthiol]ethyl trichlorovinyl sulfide, m. 70.5°. In 5 other expts. there was formed  $\alpha,\alpha,\beta$ -trichloroethyl  $\beta$ -chlorovinyl sulfide (III),  $b_{15}$  122–3°,  $d_4^{20}$  1.5404,  $d_4^{25}$  1.5342,  $\eta^{20}$  0.057 dyne/sq. cm.,  $n_D^{20}$  1.5661. In the other 14 cases there appeared to be formed  $\alpha,\beta$ -dichloroethyl  $\alpha,\beta$ -dichlorovinyl sulfide,  $b_{15}$  120–1°,  $d_4^{20}$  1.544,  $d_4^{25}$  1.5378,  $d_4^{25}$  1.5315,  $\eta^{20}$  0.046 dyne/sq. cm.,  $n_D^{20}$  1.5673. The rate at which the chlorination was carried out did not, apparently, influence the course of the reaction to any great extent but the data indicate that production of unsatd. tetra-Cl fractions was favored by the employment of comparatively low pressures during the preliminary decompn. process. Chlorination of III (1 mol. Cl) gives  $\alpha,\alpha,\alpha',\beta,\beta',\beta'$ -hexachlorodiethyl sulfide,  $b_{15}$  159–60°,  $d_4^{20}$  1.6841,  $d_4^{25}$  1.6783,  $\eta^{20}$  0.204 dyne/sq. cm.,  $n_D^{20}$  1.5681; heating at 200° and 100–120 mm. for 3–4 hrs. gives 65–70% of  $\alpha,\beta,\beta$ -trichloroethyl  $\alpha,\beta$ -dichlorovinyl sulfide,  $b_{15}$  134–5°,  $d_4^{20}$  1.6293,  $d_4^{25}$  1.6236,  $\eta^{20}$  0.065 dyne/sq. cm.,  $n_D^{20}$  1.5778; addn. of 1 mol. Cl to this deriv. gives 60–70% of  $\alpha,\alpha,\alpha',\beta,\beta,\beta',\beta'$ -heptachlorodiethyl sulfide,  $b_{15}$  170–2°,  $d_4^{20}$  1.7473,  $d_4^{25}$  1.7415,  $\eta^{20}$  0.427 dyne/sq. cm.,  $n_D^{20}$  1.5471. Chlorination of certain intermediate tetra Cl fractions and repeated fractionation finally gives, presumably,  $\alpha,\alpha,\alpha',\beta,\beta,\beta',\beta'$ -hexachlorodiethyl sulfide,  $b_{15}$  157–9°,  $d_4^{20}$  1.6825,  $d_4^{25}$  1.6763,  $\eta^{20}$  0.273 dyne/sq. cm.,  $n_D^{20}$  1.5681; heated at 200° and 100–10 mm. for 3 hrs., this lost HCl giving possibly  $\alpha,\beta$ -dichloroethyl  $\alpha,\beta,\beta$ -trichlorovinyl sulfide,  $b_{15}$  133–4°,  $d_4^{20}$  1.6190,  $d_4^{25}$  1.6131,  $\eta^{20}$  0.063 dyne/sq. cm.,  $n_D^{20}$  1.5770; this adds Cl, giving possibly  $\alpha,\alpha,\alpha',\beta,\beta,\beta,\beta'$ -heptachlorodiethyl sulfide,  $b_{15}$  132–4°,  $d_4^{20}$  1.743,  $d_4^{25}$  1.737,  $\eta^{20}$  0.382 dyne/sq. cm.,  $n_D^{20}$  1.5741. Chlorination of  $(\text{ClCH}_2\text{CH}_2)_2\text{S}$  with 4 mols. Cl caused partial destruction of the hexachloro sulfides already formed, low-boiling chlorinated hydrocarbons and other degradation products being obtained on subsequent distn., together with a residual tetra Cl fraction. Among the products isolated were trichloroethyl sulfur chloride,  $b_{15}$  53–8°; a heptachlorodiethyl sulfide,  $b_{15}$  144–6°,  $d_4^{20}$  1.7373,  $d_4^{25}$  1.7325,  $n_D^{20}$  1.5739; and a compd.,  $\text{C}_4\text{H}_5\text{Cl}_5\text{S}$ ,  $b_{15}$  134–5°,  $d_4^{20}$  1.6248,  $d_4^{25}$  1.6195. A mechanism of the course of the chlorination is suggested.

C. J. WEST

**Non-existence of isomerism among the dialkyltelluronium dihalides.** HARRY D. K. DREW, Univ. of Birmingham. *J. Chem. Soc.* 1929, 560 9. —Vernon (C. A. 14, 1815, 2018, 15, 2413) obtained 2 forms of  $\text{TeMe}_2\text{I}_2$  and 2 distinct bases, and postulated planar distribution of the valencies of the Te atom. Lowry (C. A. 22, 1899) extended the theory to the di-Et homologs and appears to attribute the isomerism to the non-equiv. from the point of view of electron structure, of the halogen-Te linkings. D. believes that the compds. of the  $\alpha$ -series are of the normal types, in which Te has probably a tetrahedral valency distribution; they are broadly non-polar in character. The compds. of the  $\beta$ -series are not isomeric with the corresponding members of the  $\alpha$ -series but are complex substances of salt-like character, having the same empirical formula. The  $\beta$ -base is a mixed anhydride,  $\text{TeMe}_2\text{O} \cdot \text{TeMeO}$ , which reacts with HI to give  $\text{Me}_2\text{TeI}$  and *Me hydroxytellurium oxide*, or 1 of its anhydrides. The latter is readily converted by excess of HI into *methyltelluronium triiodide*,  $\text{MeTeI}_3$ , indigo-colored, hydrolyzed by hot  $\text{H}_2\text{O}$  but broadly non polar in character. These 2 iodides readily unite (in mol. proportions) in  $\text{Me}_2\text{CO}$  to give Vernon's  $\beta$ -iodide,  $\text{Me}_2\text{TeI} \cdot \text{MeTeI}_3$ . Warming the  $\beta$ -iodide with  $\text{Na}_2\text{CO}_3$  gives a chocolate-colored ppt., from which some  $\alpha$ -iodide was obtained; the filtrate from this gave a black ppt., analyzing for  $\text{TeMe}_2\text{O} \cdot \text{TeI}_3$ , and finally the compd.  $\text{TeMe}_2\text{I} \cdot 2\text{TeMeI}_3$ ,  $\text{KMnO}_4$  in color. Small quantities of  $\alpha$ -iodide are also obtained by treating the  $\beta$ -iodide with boiling  $\text{H}_2\text{O}$  alone. *Trimethyltelluronium bromide*, from the  $\beta$ -base and HBr, decomp. between 250–80°;

*methylytelluronium tribromide*, yellow, m. 156°. The following mixed "*β*-dihalides" were prepd. from their constituents:  $\text{TeMe}_2\text{I} \cdot \text{TeMeBr}$ , orange-brown, m. 120° (decompn.);  $\text{TeMe}_2\text{Br} \cdot \text{TeMeI}$ , purple-red with golden luster, decomps. below 90°. The work shows that the supposed isomerism of the dimethylytelluronium dihalides has no existence.

C. J. WEST

**Effect of rapid addition of halide on the yields of some Grignard reagents.** HENRY GILMAN, E. A. ZOELLNER AND J. B. DICKEY. Iowa State College. *J. Am. Chem. Soc.* 51, 1583-7 (1929).—A study of the drop in yield of Grignard reagents when the halide is added very rapidly to Mg in  $\text{Et}_2\text{O}$  is reported; this drop varies from 0.3 to 17.8%. In general the alkyl halides show a greater drop in yield on rapid addn. than do the aryl halides; with the alkyl halides the iodide shows a greater drop than the bromide and the bromide, in turn, shows a greater drop than the chloride; with an R group of a given wt., the branched-chain isomers show a greater drop than the straight-chain compd.

C. J. WEST

**Yields of some Grignard reagents. Alternating properties of normal alkyl halides.** HENRY GILMAN, E. A. ZOELLNER AND J. B. DICKEY. Iowa State College. *J. Am. Chem. Soc.* 51, 1576-83 (1929).—Using a standard procedure, the following yields of  $\text{RMgX}$  were obtained.  $\text{EtBr}$  93.1,  $\text{PrBr}$  91.7,  $\text{Me}_2\text{CHBr}$  84.0,  $\text{BuBr}$  94.0,  $\text{Me}_2\text{CHCH}_2\text{Br}$  87.2,  $\text{MeEtCHBr}$  77.7,  $\text{Me}_2\text{CBr}$  25.1,  $\text{AmBr}$  88.6,  $\text{Me}_2\text{CHCH}_2\text{CH}_2\text{Br}$  88.0,  $\text{PrMeCHBr}$  66.8,  $\text{Me}_2\text{EtCBr}$  23.7,  $\text{C}_6\text{H}_{13}\text{Br}$  92.0,  $\text{C}_7\text{H}_{15}\text{Br}$  88.8,  $\text{C}_8\text{H}_{17}\text{Br}$  88.4,  $\text{BuCl}$  91.2,  $\text{BuI}$  85.6,  $\text{PhCH}_2\text{Cl}$  93.1,  $\text{PhBr}$  94.7, *o*- $\text{MeC}_6\text{H}_4\text{Br}$  92.7, *m*- $\text{MeC}_6\text{H}_4\text{Br}$  88.0, *p*- $\text{MeC}_6\text{H}_4\text{Br}$  86.9,  $\alpha$ - $\text{C}_{10}\text{H}_7\text{Br}$  94.8,  $\beta$ - $\text{C}_{10}\text{H}_7\text{Br}$  83.8. The even-numbered halides give higher yields than the preceding halides with an odd no. of C atoms; with a given series, the order of decreasing yield is *n*-, *sec*-, and *tert*-. The lowest yields are with the iodide and the highest with the bromide of a given R group.

C. J. WEST

**Preparation of aldehydes and ketones with the help of the degradation of quaternary bases.** JULIUS V. BRAUN AND WILHELM TEUFELER in part with G. MANZ. Univ. Frankfurt a. M. *Ber.* 62B, 235-41 (1929). The reaction leading from isocampholic acid,  $\text{RCH}_2\text{CO}_2\text{H}$ , through the alc.  $\text{RCH}_2\text{CH}_2\text{OH}$ , its bromide and the quaternary base  $\text{RCH}_2\text{CH}_2\text{NMe}_3\text{OH}$  to the olefin  $\text{RCH}=\text{CH}_2$  and thence by oxidative degradation to the aldehyde  $\text{RCHO}$  (*C. A.* 23, 1405) is of general applicability and has been tested in a no. of cases where it seemed that it would be especially valuable (e. g., where acids or alcs. of the above type are readily available while the aldehydes and ketones with one C atom less are not, and in the prepn. of mixed ketones,  $\text{RCOR}'$ ). *d*-Dihydrocitronellol, prepd. from *d*-citronellol with Pd and  $\text{H}_2$ ,  $d_4^{20}$  0.835,  $[\alpha]_D^{20}$  3.85° (the greater rotation, as compared with that of the product formerly prepd. with Ni at 150°, confirms the suspicion, expressed at the time, that partial racemization occurs at 150°). The 2,6-dimethyloctyl bromide reacts quite rapidly with  $\text{NMe}_3$  in  $\text{C}_6\text{H}_6$  at 100°, giving in 5 hrs. 82% of the quaternary bromide,  $\text{C}_{10}\text{H}_{19}\text{NMe}_3\text{Br}$ , m. 255°, which, with  $\text{Ag}_2\text{O}$  and KOH and subsequent distn., yields 20% *β*-dimethyl-ethylidimethylamine,  $b_{11}$  95-8°,  $d_4^{20}$  0.7757,  $n_D^{20}$  1.4302,  $[\alpha]_D^{20}$  -4.70° (note: *lit.*, m. 241°, and 65% *β*-dimethyl-7-octene,  $b_7$  45-6°,  $b_7$  154°,  $d_4^{20}$  0.7921,  $n_D^{20}$  1.476,  $[\alpha]_D^{20}$  12.38°. The octene with  $\text{O}_3$  yields more than 50% isononylaldehyde (2,6-dimethyl-7-heptanal),  $b_{11}$  72-4°,  $b_{12}$  185-6°,  $d_4^{20}$  0.819,  $n_D^{20}$  1.4203,  $[\alpha]_D^{20}$  -9.1°, has an odor similar to but more pleasant than that of the isomeric *n*-nonylaldehyde, changes in the air into the acid,  $b_9$  127-30°,  $d_4^{20}$  0.837,  $n_D^{20}$  1.4287,  $[\alpha]_D^{20}$  -14.1°. Et octyl ketone (I) is described in the literature as a liquid, b. 227° (prepd. from  $\text{EtCO}_2\text{Et}$  and pelargonic acid vapors passed over  $\text{ThO}_2$ ), and as a solid, m. 4.5° (prepd. from  $\text{MeC}(\text{CC}_6\text{H}_5)_3$  by the addn. of  $\text{H}_2\text{O}$ ). Neither prepn. was pure. *Di-Et ethyloctylmalonate* (85% from  $\text{EtCH}(\text{CO}_2\text{Et})_2$ , Na and octyl bromide),  $b_{12}$  171-80°, free acid, m. 72°, gives on decarboxylation ethyloctylacetic acid,  $b_{12}$  186°, whose Et ester,  $b_{12}$  135-7°, gives with Na and alc. 60% of *β*-ethyl-*β*-octyl alc.; this and the bromide both boil at the same temp. as the ester. The quaternary bromide,  $\text{EtCH}(\text{C}_8\text{H}_{17}\text{CH}_2\text{NMe}_3\text{Br})$ , markedly hygroscopic, m. 225-7°, yields with  $\text{Ag}_2\text{O}$  and KOH 92% of a mixt. of [*β*-ethyl-*β*-octylethyl]dimethylamine,  $b_{11}$  124,  $d_4^{20}$  0.7913, and *asym*-ethyloctylethylene,  $b_{11}$  91-3°,  $d_4^{20}$  0.7703; the latter with  $\text{O}_3$  yields 85% of I (purified through the semicarbazone),  $b_{11}$  112°, m. 12.5°,  $d_4^{20}$  0.8272,  $n_D^{20}$  1.4306; semicarbazone, m. 91-2°. Unlike Mannich's prepn. the ketone has a considerably weaker odor than the isomeric Me nonyl ketone. *Di-Et [γ-phenylpropyl][β-phenylethyl]malonate* (45% from  $\text{PhCH}_2\text{CH}_2\text{CH}_2\text{CH}(\text{CO}_2\text{Et})_2$  and  $\text{PhCH}_2\text{CH}_2\text{Br}$ ), b. 216-7°; free acid, m. 124°. [*γ*-Phenylpropyl][*β*-phenylethyl]acetic acid,  $b_{11}$  203-5°; Et ester, boils about 10° lower, is reduced by the Ladenburg method to *β*-[*γ*-phenylpropyl]-*β*-[*β*-phenylethyl]ethyl alc.,  $b_{12}$  242-5°; bromide; quaternary bromide, unusually hygro-

scopic, yields, together with only a little  $[\beta-(\gamma\text{-phenylpropyl})-\beta-(\beta\text{-phenylethyl})\text{ethyl}]\text{dimethylamine}$ ,  $b_{\text{p}}$  200° (picrate,  $m$ . 109°), about 70% of *asym*- $[\gamma\text{-phenylpropyl}][\beta\text{-phenylethyl}]\text{ethylene}$ ,  $b_{\text{p}}$  199–200°,  $d_4^{25}$  0.915,  $n_D^{25}$  1.5517, which with  $O_3$  gives  $\beta\text{-phenylethyl } \gamma\text{-phenylpropyl ketone}$ ,  $b_{\text{p}}$  213–5°,  $m$ . 31°, has a very faint but pleasant odor.

C. A. R.

**Action of aromatic acid chlorides on vinylidiacetonamine.** JOHN GRAYMORE. Univ. College, Nottingham. *J. Chem. Soc.* 1929, 587–8.—Pure dry vinylidiacetonamine (I), freshly distd. under reduced pressure, condenses in the cold in the expected manner with *m*- and *p*- $O_2NC_6H_4COCl$ , 4,2-Me( $O_2N$ ) $C_6H_3COCl$  and *p*-Me $C_6H_4SO_2Cl$  to give the *N*-acyl deriv. *N-m-Nitrobenzoylvinylidiacetonamine*,  $m$ . 159–60° (75% yield); *p*-deriv.,  $m$ . 170° (yield, theoretical); *N-o-nitro-p-toluyol deriv.*,  $m$ . 150–1°; *N-p-toluenesulfonyl deriv.*,  $m$ . 184° (yield, 75%). A concd. aq. soln. of  $NH_4OH$  and  $EtNH_2$  reacts with  $BzCl$  in the expected manner but in less than 5% soln. the *Bz* compds. do not form readily. It seems probable that I in  $H_2O$  combines with  $H_2O$  to form the  $NH_4OH$  deriv. and that a H atom in such a quinquivalent  $NH_4$  group is not displaceable, as is the case with certain  $HCl$  derivs.

C. J. WEST

**Process for the extraction and concentration of acetic acid from dilute aqueous solutions.** H. GUINOT. Distilleries des Deux-Sèvres. *Chimie et industrie* 21, 243–51 (1929); cf. Ricard, *C. A.* 22, 2170; Ricard and G., *C. A.* 22, 2754.—This is an adaptation and improvement of Suida's process (extg. the  $AcOH$  by means of cresol, extn. being carried out directly on the  $AcOH$  vapors, and the soln. being evapd. to drive off and recover the  $AcOH$ ), in which the cresol is replaced by a medium-boiling solvent (*b. p.* at least as high as that of  $AcOH$ , but such that it can be distd. at atm. pressure by means of steam at 95–110 lbs.; *e. g.*,  $BuOAc$ , mesityl oxide, iso- $AmOAc$ ). The extn. is carried out in a series of agitating tanks in which the  $AcOH$  soln. is intimately mixed with the solvent; with each agitating tank is associated a decantation tank in which the liquids are allowed to sep., and they travel in counter-current through the app. The method of calcg. the no. of elements required to obtain a given degree of extn. under given conditions is explained and illustrated by means of examples. In order to obtain max. efficiency in the extractor, the solvent should be de-acidified as completely as possible in the distn. stage of the process. Owing to the closeness of the *b. ps.* of the solvent and  $AcOH$  (usually a difference of about 7–9°) they cannot be sepd. by ordinary rectification; but with petroleum hydrocarbons *b.* 114–6° there is formed an azeotropic mixt. giving a const.-boiling (110.5°) distillate contg. 45%  $AcOH$ , and addn. of a very small amt. of  $H_2O$  causes it to sep. into 2 layers of practically pure hydrocarbons and  $AcOH$ . In carrying out the process, the  $AcOH$ -solvent mixt. is introduced toward the middle into a rectifying column contg. a suitable amt. of petroleum hydrocarbons (*b.* 114–6°). The completely de-acidified solvent is drawn off at the bottom, ready for re-use. The vapors at the top consist of  $H_2O$ ,  $AcOH$  and hydrocarbons, which, if condensed, would sep. into 2 layers giving a 70–5%  $AcOH$ . As  $H_2O$  and the hydrocarbons give a mixt. having a const. *b. p.* of 86.5°, which is 15° lower than the const. *b. p.* of the  $AcOH$ -hydrocarbon mixt., sepn. of the  $AcOH$  and its dehydration can be obtained simultaneously by withdrawing a binary mixt. having approx. the compn. of the azeotropic  $AcOH$ -hydrocarbon mixt. some distance below the top of the top column, while nearly all of the  $H_2O$  passes off at the top. The  $AcOH$ -hydrocarbon mixt. contains a trace of  $H_2O$  which makes it sep. into 2 layers, the lower one consisting of 90–7%  $AcOH$  contg. a small amt. of hydrocarbon. The  $H_2O$  and hydrocarbons are removed in a small auxiliary column, to yield strictly anhyd.  $AcOH$ ,  $m$ . 16.5°, while the recovered hydrocarbons contg. a little  $AcOH$  are returned to the main distg. column. The process has been successfully used in an exptl. app. (25 kg.  $AcOH$  per hr.): starting from 30%  $AcOH$ , the steam consumption is 3.5–4 kg. per kg. of anhyd.  $AcOH$  with a recovery of 97–8% of the acid, and with a 10%  $AcOH$  the steam consumption would be about 50% greater. The loss of solvent is very small. The method is particularly suitable for the recovery of  $AcOH$  from the acetylation of cellulose. It can be used also for the treatment of pyroigneous distillate, provided the tar is previously extd.: this can be done in an app. similar to that used for the extn. of the  $AcOH$ , using butylcresol as solvent.

A. PAPINEAU-COUTURE

**Properties of butyrates and isobutyrate.** F. KJELSBORG AND A. MÜLLER. *Deut. Parfümerieztg.* 14, 235–6 (1928).—Isobutyrate have smaller *d.* and *n* than the corresponding butyrates; differences in the odors of esters and in the ease of hydrolysis of esters are recorded. Terpinyl isobutyrate is specially resistant to hydrolysis.

B. C. A.

**Action of metallic sodium on the chloride of trimethylacetic acid.** V. I. EGOROVA. Leningrad State Univ. *J. Russ. Phys.-Chem. Soc.* 60, 1199–1210 (1928).—By the action

of Na on acid chlorides one used hitherto to obtain esters of the formula  $[\text{RC}(\text{CO}_2\text{R})]_2$  which, on being saponified, gave  $\alpha$ -HO ketones  $\text{RCOCH}(\text{OH})\text{R}$ . As a by-product, a small quantity of the corresponding  $\alpha$ -diketone usually accompanied the HO ketone, except in the case of  $\text{Me}_3\text{CCOCl}$  which always yielded the HO ketone free from diketone. E., however, obtained a totally different result by operating as follows: *Action of Na on the chloride of trimethylacetic acid*.—The chloride, twice the theoretical quantity of Na cut in thin plates, and 5 vols. of moist ether are placed in a flask connected with a reflux condenser. The reaction is started by heating slightly and then continues by its own heat; toward the end it is completed by heating to the b. p. of the ether. The expt. lasts 10–20 hrs., in the course of which the colors of the soln. and of the ppt. formed undergo several changes. When the reaction is ended the ether soln. is filtered, washed with  $\text{Na}_2\text{CO}_3$ , or with  $\text{NaOH}$ , and  $\text{H}_2\text{O}$  and dried with fused  $\text{Na}_2\text{SO}_4$ . After driving off the ether a yellow liquid is obtained which is first distilled *in vacuo* to get rid of tarry admixts., then fractionated at ordinary pressure, whereupon fractions 160–172° and 230–245° are obtained. The 1st of these fractions ppts. the diketone  $(\text{Me}_3\text{CCO})_2$ , yellow substance with camphor odor, b. 165–8°. The 2nd fraction is fractionated again, yielding a yellow fraction 226–238° which crystals after being cooled in a refrigerating mixt., and a colored fraction 238–245° which crystals at ordinary temp. All the crystals are pressed out and recrystd. from ether, colorless crystals with camphor odor, m. 37°. Composition  $\text{Me}_3\text{CCOCH}(\text{O}_2\text{CCMe}_3)\text{CMe}_3$  (ester of the HO ketone and of the trimethylacetic acid). A colorless cryst. substance, m. 180–1°, is obtained as a ppt. from the ether soln. before its decompn. with water; some more of the same substance ppts. after the decompn. of the ether soln. with  $\text{H}_2\text{O}$  during the evapn. of the ether; finally some of it is also recovered from the tarry admixt. The substance is poorly sol. in cold ether and is insol. in cold  $\text{C}_6\text{H}_6$ ,  $\text{CHCl}_3$  or  $\text{AcOH}$ , but readily dissolves in all these solvents on warming. After being recrystd. from ether it m. 178–9°. Its compn. is  $(\text{C}_{10}\text{H}_{18}\text{O}_2)_n$  (polymer of the diketone), where  $n$  could not be detd. The yield of all the enumerated pure products is not above 30–40%, on account of the formation of a large quantity of tar and of some intermediate fractions. The relative proportions of the pure products obtained are: diketone 70%, ester of the HO ketone 15%, polymer of the diketone 15%. The mechanism of the reactions according to Bouveault and Locquin is:  $2\text{RCOOR}' + 4\text{Na} \longrightarrow 2\text{NaOR}' + \text{RC}(\text{ONa})\cdot\text{C}(\text{ONa})\text{R}$ ; then, by the action of water,  $\text{RC}(\text{OH})\cdot\text{C}(\text{OH})\text{R} \longrightarrow \text{RCH}(\text{OH})\text{COR}$  (HO ketone), the formation of the diketone being due to oxidation of the HO ketone in presence of alkali. Since E. obtained the diketone as the main product of reaction, these views have to be revised, particularly as the HO ketone cannot be oxidized in presence of alkalies and only oxidizes on passing its vapor over Cu, or else with  $\text{KMnO}_4$  in acid soln. To obtain further confirmation of the suspicion that the diketone is obtained as a primary product of the reaction, E. repeated the reaction without access of air in a current of H and with the theoretical quantity of Na which was introduced in small portions, the subsequent decompn. being carried out in a current of N; the products obtained were the same. To establish the real mechanism of the reactions, E. made the following expts: *Action of Na on the diketone  $(\text{Me}_3\text{CCO})_2$* .—Na in thin slices and the diketone dissolved in 5–6 times its vol. of slightly moist ether were heated in a flask. The reaction lasted 10–12 hrs., after which the ether soln. was filtered, decompd. by  $\text{H}_2\text{O}$  and dried. After evapn. the ether the liquid was distilled at ordinary pressure. At 170° crystals began to distill and the distn. was discontinued. After cooling, the whole contents of the flask crystd. out, the crystals being the HO ketone. The residue obtained after filtering the ether soln. was freed from pieces of unreacted Na and decompd. by  $\text{H}_2\text{O}$ , whereupon crystals of the HO ketone pptd. The aq. soln. was extd. with ether and the ext. consisted of  $\text{CMe}_3\text{CO}_2\text{H}$ . When the reaction was repeated with exclusion of air by a current of H, only the HO ketone was obtained,  $\text{CMe}_3\text{CO}_2\text{H}$  being present only as a trace. The action of Na on the HO ketone  $\text{Me}_3\text{CCH}(\text{OH})\text{COCMe}_3$  was tried under the same conditions as that of Na on the diketone; it was also tried by varying the quantities of Na and the humidity of the ether and by introducing Pt black as catalyzer. The result, however, was the same: the HO ketone remained unchanged. These expts. tend to show that the real mechanism of the reaction between Na and the  $\text{Me}_3\text{CCOCl}$  is:  $2\text{Me}_3\text{CCOCl} + 2\text{Na} \longrightarrow 2\text{NaCl} + (\text{Me}_3\text{CCO})_2$ ; then part of the diketone formed reacts with Na, forming  $[\text{Me}_3\text{CC}(\text{ONa})]_2$  which, on being decompd. by  $\text{H}_2\text{O}$ , may yield the HO ketone, but may also react thus:  $[\text{Me}_3\text{CC}(\text{ONa})]_2 + \text{ClCOCMe}_3 \longrightarrow \text{NaCl} + \text{Me}_3\text{CC}(\text{ONa})\cdot\text{C}(\text{O}_2\text{CCMe}_3)\text{CMe}_3$ , and the latter compd. may, by the action of  $\text{H}_2\text{O}$ , give  $\text{CMe}_3\text{COCH}(\text{O}_2\text{CCMe}_3)\text{CMe}_3$  (ester of the HO ketone). The formation of  $\text{CMe}_3\text{CO}_2\text{H}$  from the diketone can be explained thus:  $(\text{Me}_3\text{CCO})_2 + \text{KOH} \longrightarrow \text{Me}_3\text{C}-$

$\text{CO}_2\text{K} + \text{OHCCMe}_3; \text{OHCCMe}_3 \longrightarrow \text{HO}_2\text{CCMe}_3$ . To find out whether another diketone would, under the same conditions, yield an acid, the action of Na on benzil was investigated. When refluxing 5 g. Bz<sub>2</sub>, 4 g. Na in thin slices and 30 cc. dry ether there was no reaction, but when 2–3 cc. moist ether were added, the reaction took place and, after 24 hrs., the products were found to be BzOH and Bz<sub>2</sub> contg. a trace of benzoin.

BERNARD NELSON

**Manufacture of ethylene chlorohydrin.** E. A. SHILOV. Ivanovo-Voznesensk Polytech. *J. Chem. Ind. (Moscow)* 5, 1273–6(1928).—Expts. were instituted by S. for the purpose of working out an industrial method of manufg.  $\text{CH}_2(\text{OH})\text{CH}_2\text{Cl}$ . It is best to manuf. chlorohydrin by addn. of  $\text{C}_2\text{H}_4$  to  $\text{HClO}$ . Ethylene is best manufd. conforming to Moser and Lindberger (*C. A.* 18, 49) by passing EtOH vapors through a tube filled with pumice moistened by  $\text{H}_3\text{PO}_4$  at  $250^\circ$ ; fused  $\text{HPO}_3$  cannot be used, at least not at this temp. The gas thus obtained contains 95%  $\text{C}_2\text{H}_4$ . To obtain  $\text{HClO}$  it is advisable to operate with Cl and alkali soln.  $\text{Cl}_2 + 2\text{NaOH} = \text{NaOCl} + \text{NaCl} + \text{H}_2\text{O}$ ;  $\text{Cl}_2 + \text{NaOCl} + \text{H}_2\text{O} = 2\text{HOCl} + \text{NaCl}$ . When thus decomp.  $\text{NaOCl}$  by Cl or by acid, the loss of active Cl has hitherto always been considerable, but S. found that the theoretical yield of  $\text{HClO}$  can be attained if instead of passing Cl into the alkali soln., the latter is added to a soln. into which Cl is being passed: the acidity which in that case is maintained in the soln. prevents the formation of  $\text{HClO}_2$ . The operation is effected by first passing Cl into a flask cooled by ice and contg. a little  $\text{H}_2\text{O}$ ; after the formation of a Cl hydrate ppt., a NaOH soln., or better a  $\text{NaClO}$  soln., is added with good stirring from a separatory funnel at such a rate that Cl always remains in excess; after the decompn. is ended, the excess of Cl is removed either by blowing air or by treating with a small quantity of  $\text{CaCO}_3$ . Thus 150 cc. of a soln. contg. 0.207 moles  $\text{NaClO}$  are dild. by 200 cc.  $\text{H}_2\text{O}$  and introduced during 55 min., while cooling with ice, to 50 cc.  $\text{H}_2\text{O}$  in which an uninterrupted current of Cl is passing; after blowing in  $\text{CO}_2$ , the soln. is found to contain 0.407 moles  $\text{HClO}$ , i. e., a 98% yield on the Cl. By this method S. obtained solns. contg. up to 1 mole  $\text{HClO}$  per l., i. e., 5.25%, and these solns. are at around  $0^\circ$  stable enough for the chlorohydrin synthesis. If the absorption of  $\text{C}_2\text{H}_4$  is begun immediately after the decompn. of  $\text{NaClO}$ , only 8%  $\text{HClO}$  turns into  $\text{HClO}_2$ . Expts. show that the velocity of  $\text{C}_2\text{H}_4$  absorption in  $\text{HClO}$  increases with the rate of stirring. It is established that  $\text{H}^+$  acts as a catalyst in the formation of the chlorohydrin. When the  $\text{H}^+$  concn. (and consequently also the  $\text{HClO}$  concn.), drops below the point of neutral reaction, the reaction slows down, and in alk. (to phenolphthalein) solns.  $\text{C}_2\text{H}_4$  absorption is very slow. The chlorohydrin formed is stable towards  $\text{HClO}$ , as the latter oxidizes it only to a slight extent. The chlorohydrin yield is about 80% (calcd. on the  $\text{HClO}$  present) when operating with dil solns. Dil solns. of chlorohydrin can be concd. by distn., in which case the chlorohydrin concentrates in the first fractions until they reach the compn. 41% chlorohydrin and 59%  $\text{H}_2\text{O}$ .

BERNARD NELSON

**Enzymic synthesis of  $\beta$ -hydroxyethyl dihydrogen phosphate.** HERBERT DAVENPORT KAY. London Hospital. *J. Chem. Soc.* 1929, 524–7. —The action of the esterase from the duodenal mucosa of a cat upon  $(\text{CH}_2\text{OH})_2$  and  $\text{Na}_2\text{HPO}_4$  caused the decrease in inorg. P from 3.27 to 2.06 and an increase in the ester P from 0.04 to 1.21 mg. per cc. of reaction mixt. in 21 days; the synthetic ester was identical with that prepd. from  $(\text{CH}_2\text{OH})_2$  and  $\text{POCl}_3$ . The identity was further confirmed by following the rate of enzymatic hydrolysis of the 2 products.

C. J. WEST

**Action of metallic sodium on brominated cyclic acetals.** HAROLD S. HILL AND G. J. C. POTTER. McGill Univ. *J. Am. Chem. Soc.* 51, 1509–14(1929); cf. Hill and Fidgeon, *C. A.* 22, 4467. —The results of this and earlier work indicate that the position of the halogen in brominated cyclic acetals has a marked influence on the course of their reaction with Na. If the Br is on the  $\alpha$ -C atom a vinyl deriv. is formed almost exclusively; a Br attached to the  $\beta$ -C atom, however, causes more complicated changes, for in addn. to the latter reaction, a Wurtz synthesis takes place. A Br on a  $\gamma$ -C atom would presumably still further increase the tendency toward the linking up of 2 mols.  $(\text{CH}_2\text{OH})_2$  and  $\text{CH}_2\text{:CHCHO}$  are condensed by  $\text{HBr}$  at  $0^\circ$  to give 65% of  $\beta$ -bromopropylideneglycol (I),  $b_{10}$  72–3°; using  $\text{MeCH:CHCHO}$  there results 56% of  $\beta$ -bromobutylideneglycol (II),  $b_{10}$  76–8°. I (54 g.) in 100 cc. abs.  $\text{Et}_2\text{O}$  and 14 g. Na give 7 g. propylideneglycol,  $b_{100}$  106–7°; 2 g. hydroxyethyl  $\beta$ -methylvinyl ether,  $b_{18}$  60–1° (the former is a secondary rearrangement product of the latter); 5 g. *di*-1,6-hexylideneglycol,  $b_{10}$  139–40°, and 5 g. of a residue. Similarly II and Na give 3 products: butylideneglycol,  $b_{100}$  132–3°; hydroxyethyl  $\beta$ -ethylvinyl ether,  $b_{18}$  60–5°; dimethyl*di*-1,6-hexylideneglycol,  $b_{18}$  150–70°. The mechanism of these reactions is discussed.

C. J. WEST

**Diamines and the amino alcohols.** NIK. PUTOKHIN. *Trans. Inst. Pure Chem. Reagents* (Moscow) No. 6, 10-21 (1927).—Gabriel (*Ber.* 20, 2224 (1887); 21, 566 (1888); 22, 1137 (1889)) developed a method for the prepn. of diamines by heating  $C_6H_4(CO)_2NK$  (I), with a dibromide of the corresponding hydrocarbon yielding a *N*-substituted phthalimide, which at 200° with concd. HCl in an autoclave is decompd. into phthalic acid and a diamine. P. obtained equal results at lower temp. and atm. pressure by substituting NaOH for HCl. This method had been tried by Gabriel (*Ber.* 21, 2670 (1888); 20, 2226 (1887)), Braun (*Ber.* 37, 3586 (1904)), Michels (*Ber.* 25, 3048 (1892)) with unsatisfactory results. P. employed more highly concd. lye, and on completion of sapon. the liquid was distd. to dryness giving nearly theoretical yields of diamines. Others than the I method result in mixts. of products often derived from materials difficult to obtain. This method of sapon. was also applied to monophthalimide substitution products,  $C_6H_4(CO)_2NCH_2CH_2CH_2Br$ , expecting to obtain trimethyleneamine; however, instead 90% of  $HOCH_2CH_2CH_2NH_2$  was obtained. This reaction was developed into a convenient method for prepn. of primary hydroxyamines previously not readily obtainable. Thus were prepd.  $HOCH_2CH_2NH_2$ ,  $HO(CH_2)_3NH_2$ , and the hitherto unknown 1,5-hexanediolamine, yields 80-90%, without by-products. Gabriel (*Ber.* 38, 2880 (1905)) studied these reactions and formulated the stages, but did not, as also in the case of diamines, carry the reaction to the end. The intermediate products are stable enough against strong alkalis even on heating. He used alc. 2 N KOH, extd. the product with  $H_2O$  or  $AcOH$ , or evapd. part of the alc. to crystn. As in the case of diamines, P. attained complete sapon., the KOH soln. was distd. to dryness, whereby the reaction was carried to the end, giving smoothly amino alcs. of high purity and yield. Gabriel (*Ber.* 21, 2670 (1888)) also synthesized amino alcs. with  $C_6H_4(CO)_2NBr$  using  $H_2SO_4$  instead of alkali with high temp. and pressure, obtaining poor yields requiring difficult purification. The common method—action of  $NH_3$  on halohydrins—produces a mixt. of primary, secondary and tertiary hydroxyamines (Wuerts, 121, 228; Morlog, *Ber.* 13, 222; Ladenburg, *Ber.* 14, 1877, 2406; Berend, *Ber.* 17, 511; Knorr, *Ber.* 22, 2088, 30, 900, 916, 918; Fournalau, *Compt. rend.* 138, 799), the same results are obtained with  $NH_3$  and organic oxides (Wuerts, *Ann.* 114, 51, 121, 227; Knorr, *Ber.* 30, 900; Krassusky, *J. prakt. Chem.* [2], 77, 87, 93); somewhat better results are given by Henry (*Ber.* 33, 3169) in the reduction of nitril and nitrile alcs. with Zn and HCl, or with metallic Na in alc. *Exptl. part.*—**Ethylendiamine** (II). Fraction of I: to 70 g. of  $C_6H_4(CO)_2NH$  in 1 l. of 96% alc. is added 24 g. KOH in 150 cc. of 96% alc., whereby there instantly sep. scales of I, which are rapidly cooled to avoid sapon., filtered by suction, washed with alc., and dried in the air, yield 50-55 g., or 85%. Prepn. of ethylenediphthalimide: 47 g. (0.25 mol.) of  $CH_2Br$  is poured over 92 g. (0.5 mol.) of powd. I and refluxed at 160-70°; after 3 hrs. of heating the reaction mass is allowed to cool, is broken up, and the heating contd. for 2 hrs. longer. The cooled contents are treated with 150-200 cc. of  $H_2O$  on the water bath to leach out the KBr and unchanged I, filtered on a Buchner, washed with  $H_2O$ , dried, and refined by refluxing with  $CH_2Br$  for about 30 mins. to remove  $C_6H_4(CO)_2NCH_2CH_2Br$ ; yield 65-70 g. or 85%, gray powder, recrystd. from glacial  $AcOH$ , m. 252°. Prepn. of II: 64 g. (0.2 mol.) of  $[C_6H_4(CO)_2NCH_2]_2$  in a cork-sealed flask is dissolved in 190 g. of KOH in 300 cc. of  $H_2O$  on standing 2 days at room temp., when the soln. is distd. to dryness. The 1st fractions with any  $NH_3$  odor are discarded, for only the later fractions with the increased concn. of KOH in the liquid contain appreciable quantities of II. The last traces of II are obtained by adding  $H_2O$  to the dry mass in the flask and distg. The joint fractions are exactly neutralized with dil. HCl, evapd. to 150 cc., filtered from brown flakes, the filtrate evapd. to 60 cc. when crystn. begins, 50 cc. of alc. are added, and the cryst. HCl salt of II after cooling is filtered, washed with alc. and dried; yield 15 g. The mother liquor on concn. and addn. of 25 cc. of alc. ypts. 10 g. more of pure crystals; total yield 25 g. or 95% based on  $[C_6H_4(CO)_2NCH_2]_2$ . The free base is obtained when 10 g. of the HCl salt is ground with 7.5 g. of NaOH, to which is added 10-12 g. of soda lime, and distd. over a direct flame. The base is freed from moisture with solid KOH and distd.; yield 5.5 g. or 85-90% of the hydrate of II,  $NH_2CH_2CH_2NH_2 \cdot H_2O$ , m. 118°. *Utilization of by-products.* **Phthalimide.**—The dry residue left in the flask after distn. of II consists of K phthalate and free KOH; it is dissolved in  $H_2O$ , filtered, acidified with excess of HCl, filtered, washed with  $H_2O$  and dried; yield of phthalic acid, 10 g.; this is evapd. with 100 cc. of 25%  $NH_4OH$ , the dry  $NH_4$  phthalate is heated in a flask over a direct flame until  $NH_3$  and  $H_2O$  are expelled, the melted I is poured in a tray, cooled and ground; yield 45 g. KBr. The aq. soln. obtained by leaching the product of interaction of  $(CH_2Br)_2$  and I contains



KBr contaminated with org. matter. The soln. is evapd. to dryness, incinerated, leached with  $H_2O$  and crystd. *Trimethylenediamine* (III) (1,3-diaminopropane) and *pentamethylenediamine* (IV) (1,5-diaminopentane) are prepd. by the same method as II. The proportions of the components are for III 92 g. (0.5 mol.) of I and 46 g. (0.25 mol.) of  $CH_2(CH_2Br)_2$ , and for IV 92 g. (0.5 mol.) of I and 50 g. (0.25 mol.) of  $CH_2(CH_2CH_2Br)_2$ , heated to 190–200°; 67 g. (0.2 mol.) of  $[C_6H_4(CO)_2NCH_2CH_2]_2CH_2$  and 100 g. of KOH in 250 cc. of  $H_2O$ ; 72 g. (0.2 mol.) of  $[C_6H_4(CO)_2NCH_2CH_2]_2CH_2$  and 110 g. of KOH in 300 cc. of  $H_2O$ . The HCl salts of the bases are obtained in the same way as in the case of II, however, the salt of IV is more hygroscopic, thus a higher concn. of the soln. of the salt is required to cause crystn. with alc. The yields are nearly theoretical, the III b. 135–6°, and IV b. 178–80°. *Amino alcs.— $\gamma$ -Hydroxypropylamine* (V).  $C_6H_4(CO)_2NCH_2CH_2CH_2Br$  was prepd. by the method of Gabriel (*Ber.* 21, 2671 (1888)); 60 g. of this with 80 g. of KOH in 350 cc. of  $H_2O$  as heated until dissolved, and then distd. As in case of diamines, the first 200 cc. is distd. with a dephlegmating column, the slightly alk. fractions are discarded, the distn. is continued without the column to dryness, the dry residue is treated with 40 cc. of  $H_2O$  and distd., this is repeated once more. 250 cc. of joint distillate contg. the entire hydroxylamine is obtained and is freed from  $H_2O$  by distn. (the amino alcs. are not volatile with steam) first with dephlegmator at 100° and then without the latter at 185–6°; yield 13.5–14 g. or 80–85%,  $d_4^{26.5}$  0.9824,  $n_D^{26.5}$  1.4570, M. R. 20.79 (calcd. 21.). *Hydroxyethylamine* (VI).  $C_6H_4(CO)_2NCH_2CH_2Br$  was prepd. by the method of Gabriel; 60 g. of this with 75 g. of KOH in 300 cc. of  $H_2O$  was converted to VI by the method described for V; yield 11.5 g., or 80%, b. 171–2°,  $d_4^{27}$  1.0111,  $n_D^{27}$  1.4508, M. R. 16.26 (calcd. 16.38). *1,5-Hydroxypentamethylenamine* (VII).  $Br(CH_2)_5Br$  was prepd. by the method of Braun (*Ber.* 37, 2915 (1904)); C. A. 2, 118, 130 g. of which with 32 g. of I was refluxed for 3 hrs. at 190–5° with frequent shaking. the excess of dibromide was expelled with steam, leaving a heavy oil which was dissolved in  $Et_2O$ , filtered, dried with calcined  $Na_2SO_4$ , the  $Et_2O$  evapd. resulting in a brown heavy oil of crude  $C_6H_4(CO)_2N(CH_2)_5Br$  (yield, 45 g., or 80%); 40 g. of this with 35 g. of KOH in 180 cc. of  $H_2O$  when treated in the manner described for V results in VII (yield about 6 g., or 55–60%), a colorless glycerol-like liquid with a faint  $NH_3$  odor, on standing solidifies to a cryst. mass, m. 26°, readily absorbs  $H_2O$  and  $CO_2$  from the air, miscible with  $H_2O$  and alc., in all proportions, sparingly sol. in  $C_6H_6$  and  $Et_2O$ , b. 221–2°,  $d_4^{17}$  0.9488,  $n_D^{17}$  1.4618, M. R. 29.85 (calcd. 30.24); chloroplatinate forms scales from alc. on addn. of  $Et_2O$ , m. 180°.

CHAS. BLANC

**Mechanism of organic reactions. I. Wandering of acyl groups in glycerol esters.** HAROLD HIBBERT and NEAL M. CARTER. McGill Univ. *J. Am. Chem. Soc.* 51, 1601–13 (1929). A review of the literature shows that the  $\beta$ -acyl group in  $C_6H_4(OH)_2$  derivs. readily undergoes migration to the  $\alpha$ -position. The mechanism of such migration is apparently that first proposed by E. Fischer, namely, the intermediate formation of an unstable cyclic acetal. There does not appear to be any reliable evidence in the literature indicating the migration of a Me or other alkyl group in the case of  $C_3H_7(OH)_2$  and other alkyl ethers. 1,3-Benzylideneglycerol 2-benzoate, m. 103°, on acid hydrolysis yields glyceryl  $\alpha$ -benzoate. 1,3-Benzylideneglycerol 2-*p*-nitrobenzoate (I), straw-colored, m. 156°; 1,2-benzylideneglycerol 3-*p*-nitrobenzoate, straw-colored, m. 90–1°. Hydrolysis of these gives the same compd., an  $\alpha$ -deriv., showing that in the case of I a migration of the  $\beta$ -acyl group has occurred. 1,3-Benzylideneglycerol 2-*p*-bromobenzoate, m. 146° (80% yield); 1,2-benzylideneglycerol 3-*p*-bromobenzoate, m. 72°; acetoneglyceryl  $\alpha$ -*p*-bromobenzoate, m. 39–40° (70% yield); hydrolysis of each of these gives glyceryl  $\alpha$ -*p*-bromobenzoate, m. 70°. Glyceryl  $\alpha,\alpha'$ -diisobutyl- $\beta$ -methyl ether, m. 158.5°, in 97% yield from  $CH(OH)(CH_2OCPh_3)_2$  and MeI, on hydrolysis yields  $MeOCH(CH_2OH)_2$ .

C. J. WEST

**Claisen ester condensation with ethyl thiolacetate.** R. B. BAKER and E. HENNET REID. Johns Hopkins Univ. *J. Am. Chem. Soc.* 51, 1567–70 (1929).—AcSEt, b. 116–7°,  $d_4^0$  1.0008,  $d_4^{25}$  0.9755,  $n_D^{25}$  1.4503. AcSEt condenses with Na to give 15% of *Et acetothiolacetate*, b. 60°,  $d_4^0$  1.0917,  $d_4^{25}$  1.0684,  $n_D^{25}$  1.4885; Br titration indicates 30.8% of the enol form; the Cu salt, bright green, decomps. 110° and is the only stable metallic salt. This shows the ketone and acid hydrolysis as does  $AcCH_2CO_2Et$ ; upon heating it decomps. to form dehydracetic acid. An equal mol. mixt. of AcSEt and AcOEt condenses with Na to form 98% of  $AcCH_2COSEt$  and 2%  $AcCH_2CO_2Et$ . AcSEt and  $Me_2CO$  do not condense with Na to form  $Ac_2CH_2$ ; MeCN condenses to form  $NCCH_2Ac$  (7% yield).

C. J. WEST

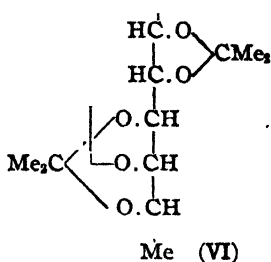
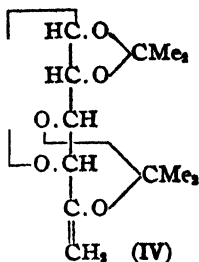
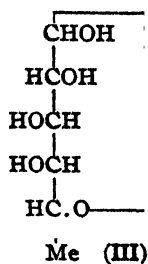
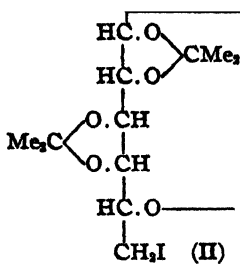
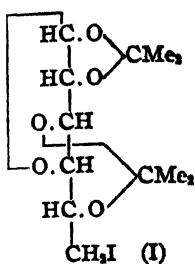
**Acetonesugars. XVI. *l*-Altromethylose, quinovose and digitoxose.** The system

of the methylpentoses. KARL FREUDENBERG AND KLAUS RASCHIG. Univ. Heidelberg. *Ber.* 62B, 373-83 (1929); cf. *C. A.* 23, 107.—It had been shown that diacetonegalactose 6-iodohydrin (I or II) in Et<sub>2</sub>O with Na and H<sub>2</sub>O gives the diacetone deriv. of *d*-fucose, thus establishing that the configuration of the latter is III. In this connection it was important to prove that the I is replaced directly by H; if the reaction proceeded through the unsatd. compd. IV (or the analogous compd. derived from II) the mixt. of diacetone compds. would give 2 methylpentoses differing in the configuration about C atom 5. This possibility was excluded by showing that alkalis do not split off HI from the iodohydrin even at 100°, and furthermore the sugar on evapn. of its alc. soln. crysts. quickly and completely, *i. e.*, is homogeneous. F. and R. have now succeeded in prepg. IV from I with NaOMe at 130°; hydrogenation of this IV with Pt and H gives a mixt. of diacetone-methylpentoses, 1 of which (V) is diacetone-*d*-fucose (I or II with H instead of I) and the other has the structure VI (or the corresponding structure derived from II), *i. e.*, is the diacetone deriv. of a new methylpentose designated *l*-altromethylose (VII). The mixt. contains about 70-80% V and 20-30% VI, and as its sp. rotation is -61° and that of pure V is -52.4°, VI must have a rotation of about -90°. As the crude V obtained from I with Na and H<sub>2</sub>O has a rotation of only -43° (probably because of slight contamination with inactive material), this is further evidence that it contains no VI. The same is true of a crude V, with a rotation of -45.6°, obtained from I with Zn dust and AcOH. The sepn. of VII from III offered difficulties which were finally overcome by removing most of the III as its difficultly sol. *p*-toluenesulfonylhydrazone (VIII) and isolating the VII as its *p*-bromophenylhydrazone (IX). As about 3 parts of III to 1 of VII are obtained, this series of reactions through IV affords a better method of synthesizing III. VII, which is *l*-rotatory, has not yet been obtained in cryst. form; it yields a hitherto unknown phenylosazone (X) and *p*-bromophenylosazone, and two IX, the higher-melting of which can be converted into the other. VII must have the same osazone as the still unknown epimeric *l*-allomethylose (XI). The osazones of the 3 other epimeric pairs, rhamnose-epirhamnose, fucose-epifucose, gulomethylose-idomethylose, are known and as they are apparently different from that of quinovose (XII) Votoček classified XII as VII or XI, but its phenylosazone, m. 191°, is certainly different from X. On converting a sample of  $\beta$ -quinovin, 1 of the cinchona bark glucosides from which XII has been obtained, into the Et quinoviside, distg. this in a high vacuum and hydrolyzing it, pure *d*-epirhamnose was obtained and no other sugar was present in the mother liquors. The name quinovose should therefore be stricken from the literature. Windaus and Schwarte obtained from the anhydride of digitoxose a cryst. methylpentose (XIII) to which they assigned the structure XII. Seeding of the sirupy VII with XIII, however, did not induce crvstn., the rotation of XIII is different from that of VII and its *p*-bromophenylosazone (XIV), while it melts at about the same temp. as that of VII and depresses the m. p. of the latter only slightly, is *l*-rotatory whereas that of VII is about as strongly *d*-rotatory. VII and XIII are therefore certainly different and the configuration of digitoxose remains as uncertain as ever. Accepting (7), in the accompanying table, as the configuration of III, and adopting the nomenclature suggested by Votoček, the methylpentoses can be arranged as follows (the symbols (+) and (-) represent the direction of the rotation of the equil. sugar, and the names in parentheses are the old names): (1) *d*-Allomethylose, (2) *d*(+)-altromethylose, (3) *d*(+)-glucumethylose (*d*(+)-epirhamnose, quinovose, isorhodeose, *d*-isorhamnose), (4) *d*(-)-mannomethylose (*d*(-)-rhamnose, epiisorhodoce), (5) *d*(-)-gulomethylose, (6) *d*-idomethylose, (7) *d*(+)-galactomethylose (*d*(+)-fucose, rhodoese), (8) *d*(+)-talomethylose (*d*(+)-epifucose).

OH	H	OH	H	OH	H	OH	H
OH	OH	H	H	OH	OH	H	H
OH	OH	OH	OH	H	H	H	H
OH	OH	OH	OH	OH	OH	OH	OH
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)

*Diacetone-d-galacto-5,6-enose* (diacetone-*d*-galactoseene) (IV) (yield, 20-70%), m. 85°, b<sub>18</sub> 133°, easily volatile with steam, sublimes below 100° with partial decompn., immediately decolorizes Br in Me<sub>2</sub>CO, [ $\alpha$ ]<sub>D</sub><sup>20</sup> -128° in (CHCl<sub>3</sub>)<sub>2</sub>, mol. wt. in camphor 243. VII, from IX with BzH in H<sub>2</sub>O under CO<sub>2</sub> at 90°, sweet sirup, [ $\alpha$ ]<sub>D</sub><sup>23</sup> -18° (H<sub>2</sub>O). *Phenylhydrazone*, m. 132°, [ $\alpha$ ]<sub>D</sub> about -1° (C<sub>6</sub>H<sub>5</sub>N). IX, unstable prisms, m. 178°, rearranged by boiling AmOH into leaflets, m. 155° (the *p*-bromophenylhydrazone of III seps. from boiling AmOH unchanged in needles, m. 183°). *p*-Bromophenylosazone, obtained from IX on attempted recrystn. from 50% AcOH, m. 203° depresses

the m. p. (205°) of the III deriv. to 190°. X, light yellow, m. 185°,  $[\alpha]_D$  about 75° (2% soln. in  $C_6H_5N$ -EtOH (2:3 by vol.)). VIII, m. 175°,  $[\alpha]_D^{17}$  17.1° ( $C_6H_5N$ ); *l*-*glucose deriv.*, m. 174°,  $[\alpha]_D^{19}$  -17.0° ( $C_6H_5N$ ).



C. A. R.

Organic catalysts. III. Formation of oxamide from dicyanogen in the presence of aldehydes. WOLFGANG LANGENBECK. Univ. Münster i. W. *Ann.* 469, 16-25 (1929); cf. C. A. 22, 2749.—The formation of  $(CONH_2)_2$  from  $C_2N_2$  by the action of  $H_2O$  in the presence of AcH and EtCHO at the ordinary temp., followed by heating, is due to the aldehyde reacting in the enolic form. AcH in the presence of dil. AcOH, HCHO, BzH, chloral hydrate and dextrose does not promote the change. When a mixt. of AcH,  $C_2N_2$ , and  $H_2O$  is allowed to remain at 15° for some days and then evapd. at 30° and 15-7 mm., the intermediate compd.,  $H_2NCOC(:NH)OCH:CH_2 \cdot H_2O$ , m. 150° (decompn.) on rapid heating, is produced. This is decompd. by warming with dil acids into  $(CONH_2)_2$ ,  $(CO_2H)_2$ , and AcH, while decompn. with a few drops of 0.1 N NaOH causes immediate production of AcH and  $(CONH_2)_2$ . When heated at 150° *in vacuo* the above intermediate yields  $(CONH_2)_2$ . C. J. WEST

Action of semicarbazide hydrochloride and of 2,4-dinitrophenylhydrazine hydrochloride on aldoximes and their derivatives. OSCAR L. BRADY AND FRANK H. PEAKIN. Univ. College, London. *J. Chem. Soc.* 1929, 478-9.—Aldoximes in soln., treated at room temp. with a soln. of an equiv. amt. of  $H_2NNHCONH_2 \cdot HCl$ , are slowly converted into the semicarbazones, which crystallize; the conversion is almost complete. This replacement does not lead to the production of stereoisomeric semicarbazones when stereoisomeric oximes are employed. Apparently the formation of the semicarbazone is preceded by hydrolysis of the oxime to the aldehyde. *N*-Me derivs. react more rapidly than the oximes themselves. 2,4-( $O_2N$ ),  $C_6H_3NHNH_2 \cdot HCl$  reacts somewhat readily at room temp. with aldoximes and their derivs., giving practically quant. the 2,4-dinitrophenylhydrazones of the corresponding aldehydes; the reaction provides a method for the quant. detn. of small quantities of oximes. PhCH:NOMe reacts quant. with this reagent; BzH can be obtained by warming the hydrazone with  $H_2SO_4$ . C. J. WEST

Synthesis of a new methylcytosine. FRANCIS H. CASE AND ARTHUR J. HILL. Yale Univ. *J. Am. Chem. Soc.* 51, 1590-2 (1929).—2-Ethylmercapto-6-chloropyrimidine, heated with 4 mol. proportions of MeNH<sub>2</sub> in abs. EtOH at 150°, gives the HCl salt, m. 262°, of 2,6-di[methylamino]pyrimidine, m. 132°. Using 3.5 mols. MeNH<sub>2</sub>, at 50-60° there results the HCl salt, m. 216°, of 2-ethylmercapto-6-methylaminopyrimidine, m. 58°. Digestion of the latter with concd. HCl gives the HCl salt, decomps. 320°, of 2-keto-6-methylaminopyrimidine, m. 270°; the *picrate*, m. 220-5°. C. J. W.

Sugars. J. MIRSIC. *Vestník Král. Čes. Spol. Nauk. Cl. II*, 18 pp. (1928).—The following compds. of importance in sugar syntheses are described: *rhamnohexon*—

amide, m. 194°,  $[\alpha]_D^{20}$  -47.26°, after 2 days unchanged, after 2 hrs. on the water bath -21.48°; rhamnohexonic acid, m. 151° (NH<sub>4</sub> salt; nitrile, m. 145°,  $[\alpha]_D^{20}$  -23.47°). Mannoheptononitrile, CH<sub>2</sub>(OH)[CH.OH]<sub>5</sub>CN, m. 121-2°,  $[\alpha]_D^{20}$  31.4 to 23.11° (final); mannoheptonamide, m. 188-9° (slow heating), 200° (rapid heating); NH<sub>4</sub> mannoheptonate, m. 154°,  $[\alpha]_D^{20}$  31.31° to 7.22° (final).  $\alpha$ -Pentaacetylglucose, m. 111.5-2°,  $[\alpha]_D^{20}$  101.4°; tetraacetyl-d-gluconolactone, m. 103°,  $[\alpha]_D^{20}$  13.46°. Acetylation of NH<sub>4</sub> rhamnohexonate affords tetraacetyl-rhamnohexonolactone, m. 128.5-9°,  $[\alpha]_D^{20}$  9.66°. Hexaacetyl- $\alpha$ -rhamnohexonamide, m. 71-2°; pentaacetyl- $\alpha$ -rhamnohexononitrile, m. 85-6°,  $[\alpha]_D^{20}$  76.43°; heptaacetyl- $\alpha$ -galactheptonamide, m. 125.5-6°,  $[\alpha]_D^{20}$  21.79° to 23.86° (after 24 hrs.); hexaacetyl- $\alpha$ -mannoheptononitrile, m. 124.5-5°,  $[\alpha]_D^{20}$  31.45°. B. C. A.

An attempt to transform pentaacetyl- $\alpha$ -glucose into pentaacetyl- $\beta$ -glucose. ALFRED GEORG. *Helv. Chim. Acta* 12, 261-3(1929).—G. reviews the recorded cases of the transformation of pentaacetyl- $\beta$ -glucose (I) into pentaacetyl- $\alpha$ -glucose (II) and observes that no method is available for the reverse transformation. Since the acetylation of  $\alpha$ -glucose (III) with Ac<sub>2</sub>O in the presence of NaOAc yields more I than II, he attempts to carry out the transformation of II into I by this reagent; but "within the limit of the precision of my observations," no I is formed, but practically all the II is recovered unchanged. G. therefore concludes that the formation of I by the acetylation of III must be due to a change from  $\alpha$  to  $\beta$  after the acetylation of some or all of the alc HO groups but before the acetylation of the pseudo-aldehydic hydroxyl. M. A. D.

New compounds of glucose with phosphoric acid. B. HELFERICH AND H. DU MONT. Univ. Greifswald. *Z. physiol. Chem.* 181, 300-8(1929).—A new type of glucose phosphoric acid ester is obtained by esterification of acetylated glucose derivs. in which a free OH is present in the 6-position. 1,2,3,4-Tetraacetyl- $\beta$ -glucose (I) in pyridine reacts with POCl<sub>3</sub> at a low temp. to yield 52% of cryst. tri[1,2,3,4-tetraacetyl- $\beta$ -d-glucose]-6-phosphate (II), m. 236-7°, sol. in pyridine and CHCl<sub>3</sub>, difficultly sol. in EtOH, insol. in Et<sub>2</sub>O, H<sub>2</sub>O and ligroin. Sapon. to remove the Ac groups converts it into tri-d-glucose phosphate (III), amorph. and hygroscopic. It reduces Fehling soln., and during the prepn. of the osazone it splits off H<sub>3</sub>PO<sub>4</sub>. Reacetylation gives only a small yield of II. In the reaction between I and POCl<sub>3</sub> if the proportions are 1:1 instead of 3:1 as above, the product is 1,2,3,4-tetraacetyl- $\beta$ -d-glucose 6-chlorohydrin, previously described. 2,3,4-Triacetyl- $\alpha$ -methyl-d-glucoside in pyridine reacts with POCl<sub>3</sub> at -20° to yield 62% of tri[2,3,4-triacetyl- $\alpha$ -methyl-d-glucoside]-6-phosphate (IV), m. 185°,  $[\alpha]_D^{18}$  in CHCl<sub>3</sub> 151.9°. Heating in a sealed tube with NaI in MeAc at 135-40° for 15 hrs. converts it into 30% of the corresponding iodohydrin. Removal of the Ac by sapon. converts IV into 68% tri[ $\alpha$ -methyl-d-glucoside]-6-phosphate, amorph. and somewhat hygroscopic, with no characteristic m. p. It reduces Fehling soln. only after hydrolysis by mineral acid,  $[\alpha]_D^{20}$  in H<sub>2</sub>O 145.7°. Reacetylation gives a much better yield (56%) of IV, compared to the yield of II from III. A. W. D.

New unsaturated anhydrosugars. II. KURT MAURER. Univ. Jena. *Ber.* 62B, 332-8(1929); cf. C. A. 21, 2880.—Although his investigation has not been completed, M. reports the results he has obtained so far because of the appearance of the paper of Zemplén and Bruckner (C. A. 23, 1622). In accordance with Helferich's proposed nomenclature (C. A. 23, 104), the anhydrosugar obtained from acetobromoglucose with aliphatic secondary amines is designated tetraacetyl-1,2-glucoseene (I). As was to be expected, it rapidly decolorizes KMnO<sub>4</sub> in Na<sub>2</sub>CO<sub>3</sub> and under the proper conditions gives K triacetyl-d-arabonate almost quant., thus proving the 1,2-position of the double bond. Long heating in AcOH with PhNHNH<sub>2</sub> gives oily products, but if the mixt. is boiled only a short time and then allowed to stand at room temp. the yellow needles of glucosazone sep. in about 20 mins., the Ac groups being smoothly split off, which does not occur with tetraacetylglucose. In spite of many attempts by different methods it has not been possible to obtain the free 1,2-glucoseene (II) in cryst. form. With NH<sub>3</sub> in MeOH the amorphous sapon. products contain N, with NaOMe, Na; with NaOH 5, not 4, mols. NaOH are consumed per mol. sugar, the 5th being fixed in some way on the sugar. That an enolate is not formed is indicated by the complete neutrality of the aq. soln. of the sapon. product which cannot be reacetylated and with KMnO<sub>4</sub> (which it immediately decolorizes) gives only sirups. I cannot be catalytically hydrogenated under the most varied conditions, nor can H<sub>2</sub>O be added at the double bond. It adds 2 atoms of halogen but no cryst. products are obtained as halogen acid is always split off in a secondary (apparently substitution) reaction; if dry Cl is passed into the soln. in abs. Et<sub>2</sub>O as long as the Cl color disappears and

the soln. is then evapd. there is obtained a light sirup of penetrating odor which splits off HCl on standing and completely decomps. in a few days; in Et<sub>2</sub>O with Ag<sub>2</sub>CO<sub>3</sub> and a few drops of H<sub>2</sub>O it evolves CO<sub>2</sub> vigorously and in a few min. there seps. a finely cryst. substance C<sub>14</sub>H<sub>20</sub>O<sub>11</sub> (III) which contains four Ac groups and is apparently a partially acetylated glucosone hydrate, HOCH<sub>2</sub>.C(OH)(OAc).CH(OAc).CH(OAc).CH(CH<sub>2</sub>OAc).O, formed by replacement

of the Cl atoms in the di-Cl addn. product by HO groups. The part of the sirup which does not react with Ag<sub>2</sub>CO<sub>3</sub> contains very firmly bound Cl which it loses only to hot NaOMe or to PhNHNH<sub>2</sub> (with formation of PhNHNH<sub>2</sub>.HCl). III reduces cold Fehling soln., quickly decolorizes KMnO<sub>4</sub> but not Br, and shows mutarotation. It does not react with PhNHNH<sub>2</sub> in AcOH but if previously treated with alkali it gives glucosazone even in the cold. Acetylation gives a beautifully crystd. product, whose mol wt., however, is smaller than that of the original III. Under special conditions short chlorination of I gives another cryst substance. On longer chlorination the substitution reaction predominates and from the sirup can be isolated a cryst. product which apparently contains to each sugar complex three Cl atoms which, however, are so firmly held that it has thus far not been possible to remove or replace them. When I is heated in aq. phosphate soln. the amount of inorg. phosphate decreases in a certain relation to that of I present; parallel expts. with pure glucose or tetraacetylglucose showed no decrease of phosphate. Na<sub>4</sub>P<sub>2</sub>O<sub>7</sub> gave the best results in the addn. expts. The method of prep. I has been somewhat improved; from 40 g. acetobromoglucose with 12 g. NH<sub>4</sub>Et<sub>2</sub> in 20 cc. C<sub>6</sub>H<sub>6</sub> at 60° is obtained 17 g. I, m. 65–6°, [α]<sub>D</sub><sup>20</sup> –20.71° (abs. alc.). III m. turbid 116°, clear 118°, [α]<sub>D</sub><sup>21</sup> in H<sub>2</sub>O 14.2° immediately after soln., 54–45° (const.) after 5 days. C. A. R.

**The preparation of mixed acylated sugars.** MAX BERGMANN AND F. K. V. KOCH. Kaiser-Wilhelm Inst. f. Leder-Forschung, Dresden. *Ber.* 62B, 311–3(1929); cf. Ohle and Spencker, *C. A.* 21, 63.—Just as O. and S. obtained from triacetyllevoglucosan with HBr-AcOH an acetobromoglucose which with MeOH and Ag<sub>2</sub>CO<sub>3</sub> gave the known tetraacetyl-β-methylglucoside, so tribenzoyllevoglucosan gives an *acetyltribenzoylglucose bromohydrin* (I) (not isolated), yielding with MeOH and Ag<sub>2</sub>CO<sub>3</sub> 6-acetyl-2,3,4-tribenzoyl-β-methylglucoside (II). On the other hand, with AgOAc was obtained 1,6-diacetyl-2,3,4-tribenzoylglucose (III). The proof of these structures is given in the following abstr. II (yield, 65%), m. 150–1° (cor.), [α]<sub>D</sub><sup>17</sup> –5.15° in (CHCl<sub>3</sub>)<sub>2</sub>, [α]<sub>D</sub><sup>20</sup> –6.5° in CHCl<sub>3</sub>, does not reduce Fehling soln. III, m. 172–3° (cor.), [α]<sub>D</sub><sup>17</sup> 24.75° in (CHCl<sub>3</sub>)<sub>2</sub>. C. A. R.

**Constitution of levoglucosan.** KARL JOSEPHSON. Kaiser-Wilhelm Inst. f. Leder-Forschung, Dresden. *Ber.* 62B, 313–6(1929); cf. preceding abstr.—It seemed possible that in the long continued reactions, carried out in the heat, by which Irvine and Oldham and Karrer and Smirnov apparently confirmed the structure assigned by Pictet to levoglucosan (I), there might have occurred a shifting of the O bridge and of a Me or Ac group which would invalidate the conclusions drawn as to the structure of I. In connection with certain investigations on some new acyl derivs. of glucose prep. from I (see following abstr.) it seemed desirable to establish as definitely as possible, by an independent method, the structure of I and the monoacetyltribenzoylmono-methylglucose (II) (see preceding abstr.) obtained from it. The new method, which confirmed the earlier formulation of I with a 1,6-O bridge, is based on the use of Helferich's Ph<sub>3</sub>C compds. of sugars. The trityl group was introduced into β-Me glucoside and the resulting 6-trityl deriv. (III) benzoylated to 6-trityl-2,3,4-tribenzoyl-β-methylglucoside (IV) from which the Ph<sub>3</sub>C group was removed by treating some hrs. at 0° with HBr in AcOH-CHCl<sub>3</sub>. Into the tribenzoylmethylglucoside thus obtained an Ac group was introduced in the 6-position with Ac<sub>2</sub>O in C<sub>6</sub>H<sub>6</sub>N, the product proving to be identical with II, which is therefore in all probability 6-acetyl-2,3,4-tribenzoyl-β-methylglucoside, as the danger of an acyl migration under such mild conditions must be very small; assuming that in the formation of II from I no unknown interchange of position of the groups has occurred, it may be concluded that I itself, in addn. to the 1,5-O bridge probably present in the β-Me glucoside, contains a 1,6-O bridge and is therefore glucosan- < 1,5 > < 1,6 >. IV, crystals with 1 MeOH, m. 99–100°. C. A. R.

**New acyl derivatives of glucose and of the β-methyl glucoside from levoglucosan.** KARL JOSEPHSON. Kaiser-Wilhelm Inst. f. Leder-Forschung, Dresden, and Univ. Stockholm. *Ber.* 62B, 317–21(1929); cf. preceding abstrs.—In attempts to split off the 6-Ac group only of 6-acetyl-2,3,4-tribenzoyl-β-methylglucoside (I) by treatment

with 1 or slightly more than 1 mol. alkali, about 0.5 of the I was recovered unchanged and from the sapon. products could be isolated only a *disbenzoyl-β-methylglucoside* (II). Probably, in the 2,3,4-tribenzoyl-β-methylglucoside (III), which is perhaps formed primarily, 1 of the Bz groups is very loosely held and rapidly split off by the alkali. The structure of II was established by analysis and by conversion with  $\text{Ac}_2\text{O} \cdot \text{C}_6\text{H}_5\text{N}$  into *diacetyldibenzoyl-β-methylglucoside* (IV) and with  $\text{BzCl} \cdot \text{C}_6\text{H}_5\text{N}$  into the tetra-Bz deriv. (V). The 6-acetyl-2,3,4-tribenzoylglucose bromohydrin obtained from levoglucosan with  $\text{HBr} \cdot \text{AcOH}$  gives with  $\text{BzOAg}$  a 6-acetyl-1,2,3,4-tetrazobenzoylglucose (VI); attempts to remove the 6-Ac group by mild acid hydrolysis resulted in the splitting off also of a Bz group (certainly that in position 1), giving a compd. (VII) which, if no migration has occurred in the acid hydrolysis, must be 2,3,4-tribenzoylglucose; with  $\text{Ac}_2\text{O} \cdot \text{C}_6\text{H}_5\text{N}$  it yielded a *diacetyltribenzoylglucose* (VIII) which, however, was apparently not homogeneous. II, m.  $167.5-8.5^\circ$  (cor.). IV, m.  $166^\circ$ , depresses the m. p. of II to  $150-1^\circ$ . VI, m.  $183-4^\circ$  (cor.). VII, m.  $189-91^\circ$  (cor.). VIII, sinters about  $167^\circ$ , m.  $178-83^\circ$ . C. A. R.

**Results of recent researches on the chemistry of natural humic acids.** BRETISLAV G. SRMEK. *Brennstoff-Chem.* 9, 381-5(1928).—A new method for sepn. and grouping of natural humic acids is developed. The groups are: (1) Ether-sol. resin acids, (2) EtOH-sol. hymatomelanic acid, (3) EtOH-insol., pyridine-sol. humus acids, (4) insol. residue. Relatively well defined nitro, halogen, amino and azo derivs. were prepd. The latter were coupled with β-naphthol and  $\text{PhNMe}_2$  to form dyes. The chem. behavior of natural humic acids studied indicates that they have aromatic structure.

J. D. DAVIS

**Progress in the chemistry of lignin and humic acids.** WALTER FUCHS. *Brennstoff-Chem.* 9, 363-5(1928); cf. C. A. 23, 1623.—Recent methods of attack involve direct treatment of the impure lignin without isolation from the wood in which it occurs, with such reagents as  $\text{Ac}_2\text{O}$ , Br and  $\text{HNO}_3$ . Derivs. are thus formed without destroying the original wood structure. By treating wood with  $\text{Ac}_2\text{O}$ , triacetylcellulose together with lignin acetate are formed. By complete bromination and isolation of the lignin by hydrolysis, it is found that practically all the Br originally entering the wood which is not removed by  $\text{AcONa}$  soln. is combined with the lignin. Stoichiometric relationships between Br compds. of lignin in which the Br is removable [by  $\text{AcONa}$ ] and those in which the Br is not removable indicate a tetrahydrobenzene ring as one of the elements of its structure. The mol. wt. of lignin is approx. 800. In the light of recent work lignin may be looked upon as a HO-rich (7-8 free groups) reduction product of wood-cell walls. The mol. also contains 4-5-MeO groups and one  $\text{CH}_2\text{C}=\text{O}$  group. The largest structural elements probably are: an unsatd. hexose complex, a p-substituted guaiacol complex, and tetrahydrobenzene. The fact that lignin and humic acids yield similar nitration products indicates that the latter was formed from the former in accord with the Fischer-Schrader theory of the lignitic origin of coal.

J. D. DAVIS

**Artificial humification of carbohydrates, particularly the conversion of cellulose into humic acids.** W. FUCHS. *Brennstoff-Chem.* 9, 400-2(1928).—Data available in the literature on humification of carbohydrates are assembled in tabular form. F. concludes from a critical study thereof, that by powerful chem. agents carbohydrates can be converted into humin-like compds. with good yields, but that yields of compds. similar to humic acids are small. The humic acids so obtained show little similarity to natural humic acids. Furthermore, it seems probable that the former were formed from simple sugars (e. g., glucose), present as decompn. products of cellulose, rather than from the cellulose itself or from "oxycellulose."

J. D. DAVIS

**Gossypol. V. Action of chromic acid upon some gossypol derivatives.** E. P. CLARK. U. S. Dept. Agr. *J. Am. Chem. Soc.* 51, 1475-8(1929); cf. C. A. 22, 2753.—Oxidation of 2 g. hexaacetyl-gossypol (I) in 50 cc. boiling AcOH with 10 cc. of a 10% aq.  $\text{CrO}_3$  by boiling 1 min. and then adding 100 g. ice gives 1.6 g. amorphous and 0.6 g. cryst. *tetraacetyl-gossypolone*,  $\text{C}_{33}\text{H}_{30}\text{O}_{12}$ , bright yellow, darkens  $210^\circ$ , and becomes a black mass at  $230^\circ$  without melting;  $n_D$  1.559,  $n_D$  1.676; the  $\text{PhNH}_2$  condensation product, chocolate-colored, m.  $255-6^\circ$  (cor.). Oxidation of I with Kiliani's  $\text{CrO}_3$  mixt. gives 29% of *tetraacetyl-pogossypolone*,  $\text{C}_{30}\text{H}_{28}\text{O}_{10}$ , sinters  $220^\circ$ , m.  $230^\circ$  (cor.).  $n_D$  1.530,  $n_D$  1.645. Oxidation of apogossypol hexa-Me ether with Kiliani's mixt. gives *tetramethoxypseudogossypolone*,  $\text{C}_{28}\text{H}_{34}\text{O}_8$ , yellow, m.  $210^\circ$  (cor.),  $n_D$  1.585,  $n_D$  1.700. VI. The action of boiling hydriodic acid as used in the Zeisel method upon gossypol and some of its derivatives. A semi-micro Zeisel methoxyl method. *Ibid* 1479-83.—In the Weishut-Zeisel MeO detn., gossypol and some of its derivs., although contg. no alkoxy groups, yield upon prolonged boiling a small quantity of AgI. The AgI thus

formed is responsible in some cases for the abnormally high values obtained in the Zeisel detn. of the MeO groups in several oxymethylgossypol derivs. The explanation is advanced that under the conditions of the Weishut-Zeisel detn. the gossypol nucleus is disrupted in such a manner as to yield an alkyl iodide, which, however, is not MeI. An app. is described and a procedure outlined for the detn. of MeO groups in samples of the order of 20 mg. In this method an ordinary anal. balance sensitive to 0.1 mg. is employed.

C. J. WEST

**Influence of sugars on the stability of bisulfite solutions.** ERIK HAGGLUND, with T. JOHNSON AND S. SILANDER. *Akad. Åbo (Finland). Ber.* 62B, 84-90(1929).—The influence of sugars on the stability of sulfites was briefly mentioned in a preliminary communication (*Ingeniörsvetenskaps-Akad. meddelanden* 1928, No. 86); 2 g. glucose in 100 cc. of  $\text{NaHSO}_3$  ( $\text{Na}_2\text{O}$  1%,  $\text{SO}_2$  4%) was found to accelerate the decompn.  $3\text{H}_2\text{SO}_3 = 2\text{H}_2\text{SO}_4 + \text{S} + \text{H}_2\text{O}$ . In the sulfite cooking of cellulose it is important that the sulfite should remain as stable as possible in order that the acidity of the cooking acid shall not become too high. It is therefore to be feared that with cooking acids produced partly from "wet relief" liquor, which may contain more or less large quantities of sugar, the quality of the cellulose may under certain conditions suffer, as has been verified (*C. A.* 23, 701). To study the influence of sugars sealed tubes contg. 3 g. glucose and 150 cc.  $\text{NaHSO}_3$  soln. (4.02 g.  $\text{SO}_2$ , 1.00 g.  $\text{Na}_2\text{O}$  or 0.082 g.  $\text{H}_2\text{SO}_4$ ) were heated to 135° and the contents analyzed at the end of 6 hrs. (when the max. temp. was attained), 9, 12, 15 and 18 hrs. After 10-12 hrs. (4-5 hrs. after the max. temp. had been reached) the content of  $\text{SO}_2$  suddenly decreased and that of  $\text{H}_2\text{SO}_4$  increased and at this point there was also a rapid increase in "loosely bound"  $\text{SO}_2$  which, however, greatly decreased later. At this stage considerable quantities of dithionic and polythionic acids are present in the soln. Control tubes without sugar also showed a decrease in  $\text{SO}_2$  after 18 hrs. but only about as much as after 6 hrs. in the sugar tubes. The sugar content, as measured with Fehling soln., continuously decreases to hardly more than 0.5 after 18 hrs. but there is every reason to believe that the decrease is only apparent and due to an oxidation, not a degradation, of the sugar. Expts. in which the "total"  $\text{SO}_2$  was kept const. and the  $\text{Na}_2\text{O}$  increased showed that the greater the sulfite concn., the more unstable is the bisulfite soln., just as would have been expected had there been no sugar present. The concn. of the sugar influences the velocity of the decompn., as was also to be expected. Mannose, xylose and arabinose have about the same effect as glucose, while fructose has a considerably weaker effect, noticeable only about 3 hrs. later than that of glucose. The acceleration of the sulfite decompn. very probably depends on the reactive C:O group of the sugars. That the  $\text{H}_2\text{SO}_4$  is not produced by reduction of the sugars by the  $\text{SO}_2$  is certain. The "catalytic" action probably consists chiefly in the increased ease of formation of those intermediate products (especially thiosulfate ions) in the sulfite transformation which make possible and accelerate the decompn., reduction of 1 part, with oxidation of another part, of the  $\text{SO}_2$  or  $\text{HSO}_3$  ion being necessary; it is conceivable that the reaction is facilitated by the formation of bisulfite compds. of the sugar.

C. A. R.

**Composition of gum arabic.** C. L. BUTLER AND LEONARD H. CRETCHER. *Mellon Inst. J. Am. Chem. Soc.* 51, 1519-25(1929).—Analysis of arabic acid (the ash-free gum from gum arabic cordofan from *Acacia senegal* (L.) Willd.) gave the following results: galacto-glucuronic acid 28.3%, hexose (as galactose) 29.5%, pentose (as arabinose) 34.4%, methylpentose (as rhamnose hydrate) 14.2%. Hydrolysis of 500 g. gum arabic,  $[\alpha]_D^{25} = -34.05^\circ$ , with 2%  $\text{H}_2\text{SO}_4$  by heating 20 hrs. and adding  $\text{CaCO}_3$  gave 64 g. of the Ca salt,  $[\alpha]_D^{25} 1.8^\circ$  (1.25 g. in 25 cc.  $\text{H}_2\text{O}$ ), of aldobionic acid; the liberated acid contained 79.5% acid and 20.5% lactone. Hydrolysis of the acid indicated that it was galactosoglucuronic acid. Rhamnose, *d*-galactose and *l*-arabinose have been identified in the sugar fraction of the hydrolysis product.

C. J. WEST

**The behavior of polysaccharides in solution. I. The solutions of glycogen in resorcinol.** R. O. HERZOG AND W. REICH. *Ber.* 62B, 495-9(1929).—Glycogen forms opalescent solns. in  $\text{H}_2\text{O}$ , but dissolves quickly at 120° in resorcinol, forming solns. which show no Tyndall effect. Quant. measurements show a particle size  $(\text{C}_6\text{H}_{10}\text{O}_5)_4$ . Glycogen recovered from its resorcinol soln. by dissolving out the resorcinol with alc. shows no difference from the original product used for the expts. The similar properties were checked by the degree of polarization in  $\text{H}_2\text{O}$ , non-reduction of Fehling soln., color with I, and diastase cleavage.

ARTHUR FLEISCHER

**The production and uses of tartaric acid.** G. MALCOLM DYSON. *Chem. Age (London)* 20, 331-3(1929)

E. H.

**Synthesis of truxinic and truxillic acids.** F. BACHM. *Univ. Rostock. J. prakt.*

*Chem.* **120**, 301-38(1929); cf. *C. A.* **22**, 2147.—Attempts to synthesize truxinic and truxillic acids by direct methods have generally been unsuccessful. Thus, attempted condensation of  $(\text{PhCHBr})_2$  and  $[\text{KC}(\text{CO}_2\text{Et})_2]_2$  yields  $(\text{PhCH:})_2$ ;  $\text{Bz}_2$ ,  $(\text{BrCHCO}_2\text{Et})_2$  with Zn give  $[\text{PhCH}(\text{OH})_2]_2$ ;  $\text{PhCH}[\text{CNa}(\text{CO}_2\text{Et})_2]_2$  and  $\text{PhCHCl}_2$  give  $\text{PhCH:C}(\text{CO}_2\text{Et})_2$ . Reduction of  $\text{PhCH:C}(\text{CO}_2\text{Me})_2$  with Al-Hg in MeOH gives about 20% of the 2 forms of  $[\text{PhCHCH}(\text{CO}_2\text{Me})_2]_2$ , m. 163-4° and 167-8°, resp. Di-Me di-H 3,4-diphenylcyclobutane-1,1,2,2-tetracarboxylate, m. 203-5°, after elimination of  $\text{C}_1$ , at 210°, gives, in addn. to Me  $\gamma$ -truxinate, a small amt. of Me  $\delta$ -truxinate, m. 75-6°. Thus, 2 of the 3 theoretically possible truxinates are obtained from the *dl*-diphenylbutanetetracarboxylates. The Me ester, m. 167-8°, is not convertible into a cyclobutane deriv., but on hydrolysis and elimination of  $\text{CO}_2$  it yields the high-melting (*meso*) form of  $\beta,\gamma$ -diphenyladipic acid, thus demonstrating that the original ester is probably the *meso*-form and that ring formation is not possible unless there is a swinging of the spatial configuration. Addn. of K to  $\text{PhCH:C}(\text{CO}_2\text{Me})_2$  in PhMe in a H atm. and decompn. of the resulting product with HCl, gives, in addn. to oily products, some  $[\text{PhCHCH}(\text{CO}_2\text{Me})_2]_2$ , m. 165-7°. The intermediate K deriv. does not appear to be identical with that derived from the ester and KOMe. Condensation of  $\text{Bz}_2$  with  $\text{CNCH}_2\text{CO}_2\text{Et}$  with piperidine or  $\text{Et}_2\text{NH}$  gives *Et desyldenecyanoacetate* (I), m. 141° (*Me ester* (II), m. 125°), also from  $\text{Bz}_2$  and  $\text{NCCHBrCO}_2\text{Et}$  with Zn in  $\text{C}_6\text{H}_6$ . When a relatively large amt. of base is used in the above condensation, by-products are obtained, 1 of which is probably *Et  $\alpha,\alpha'$ -dicyano- $\beta$ -benzoyl- $\beta$ -phenylglutarate*, m. 172°. Hydrolysis of I or II with  $\text{EtOH-KOH}$  affords *desyldenecyanoacetic acid* (III), m. 135°, while catalytic reduction with H in  $\text{EtOH}$  gives *Et(IV)* and *Me  $\alpha$ -cyano- $\beta$ -benzoyl  $\beta$ -phenylpropionate*, m. 83° and 118°, resp. Similar reduction of the Na salt of III in  $\text{H}_2\text{O}$  gives  *$\alpha$ -cyano- $\beta$ -benzoyl  $\beta$ -phenylpropionic acid*, m. 190° (decompn.). When bromodeoxybenzoin is condensed with  $\text{NCCHNaCO}_2\text{Et}$  IV results. IV, dissolved in piperidine or  $\text{Et}_2\text{NH}$ , gives a *compd.*, m. 150°, having the same compn. as IV. The analogous *compd.* from the Me ester, m. 152°. *Et  $\alpha,\beta$ -dibenzoylthane- $\alpha,\alpha,\beta,\beta$ -tetracarboxylate*, m. 91°. Attempts to reduce this caused elimination of the Bz groups. Both forms of  $(\text{PhCH}(\text{OH})\text{CH}_2)_2$  give with  $\text{PBr}_5$  the same Br deriv., m. 139°; the I deriv., m. 140°. The di-Br deriv., reduced with Zn with or without KI, gives KI, 1,2-diphenylcyclobutane (?).

C. J. WEST

**Anomalies of condensation and cyclization.** R. CORNUBERT AND CH. BORREL. *Compt. rend.* **188**, 919-21(1929).— $\alpha$ -Methyl- $\alpha'$ -benzyladipic acid is prepd. and sepd. by fractional crystn. into 2 isomers, m. 133-5° and 103-6°. Upon treating the first with  $\text{Ac}_2\text{O}$ , an almost theoretical yield of  $\alpha$ -methyl- $\alpha'$ -benzylcyclopentanone (I) is obtained. The 2nd treated in the same manner also yields I but a considerably greater time is required for the reaction. These 2 ketones, treated with  $\text{BzH}$  under the influence of HCl, give an excellent yield of the same pyrone deriv., m. 156.5°. The 2 ketones also yield the same semicarbazone, m. 188-9°, when treated in the cold.

R. P. WALTON

**Chemistry of the three-carbon system. XX. Cyclopentylidenemethyl ethyl ketone and cyclopentylidenemethyl ethyl ketone.** ALFRED H. DICKINS, WILFRED F. HUGH AND GEORGE A. R. KON. Imp. College Sci. Tech., London. *J. Chem. Soc.* **1929**, 572-80; cf. *C. A.* **23**, 96.—Cyclopentylidenemethyl *Et ketone* (I),  $b_{20}$  96°,  $d_4^{22.9}$  0.93179,  $n_D^{22.9}$  1.47801,  $[R_L]_D$  41.96 (calcd., 41.21), is obtained in about 30% yield, and isolated as the semicarbazone, m. 174°, the semicarbazidosemicarbazone, m. 215° (decompn.), also being formed.  $\Delta^1$ -Cyclopentenylmethyl *Et ketone* (II),  $b_{21}$  90°,  $d_4^{22.5}$  0.92429,  $n_D^{22.5}$  1.46509,  $[R_L]_D$  41.31 (calcd., 41.21), again isolated as the semicarbazone, m. 135°; condensation with  $\text{CHNa}(\text{CO}_2\text{Et})_2$  and hydrolysis give *cyclopentane-spiro-4-methylcyclohexan-3,5-dione*, m. 174-5°. The equil. mixt. of I and II contains 89.5% of the  $\alpha,\beta$ -ketone, which is probably too high because any error due to impurity of the  $\alpha,\beta$ -ketone would have a considerable effect. With  $\text{N-EtOH-EtONa}$ , equil. is reached in about 20 mins. The 2 Me ketones give an equil. mixt. contg. about 84% of the  $\alpha,\beta$ -ketone; the equil. is reached in about 10 mins.

C. J. WEST

**New phenolic combinations obtained by coupling chaulmoogric acid with resorcinol.** W. S. HINEGARDNER AND TREAT B. JOHNSON. Yale Univ. *J. Am. Chem. Soc.* **51**, 1503-9(1929).—Fusion of chaulmoogric acid (I) and  $m\text{-C}_6\text{H}_4(\text{OH})_2$  with  $\text{ZnCl}_2$  gave only 6% of an impure chaulmoogrylresorcinol (II). The dihydro deriv. of I gave 50% of dihydrochaulmoogrylresorcinol, m. 89.5°; using the acid chloride in the Friedel-Crafts reaction gave 70% of the same product; *oxime*, m. 169-70°. The acid chloride of I and  $m\text{-C}_6\text{H}_4(\text{OMe})_2$  with  $\text{AlCl}_3$  in  $\text{CS}_2$  give a mixt. of 1-chaulmoogryl-2-hydroxy-4-methoxybenzene (III), m. 65°, and -2,4-dimethoxybenzene (IV), m. 46°, sepd. by crystg. from EtOH and  $\text{Me}_2\text{CO}$ . III has  $[\alpha]_D^{25}$  6.98° (1.2967 g. made up to 50.1 cc.  $\text{CHCl}_3$ );



IV has  $[\alpha]_D^{25}$  18.78° (1.2470 g. made up to 27 cc.  $\text{CHCl}_3$ ); if the reaction temp. is kept at 30–5° and  $\text{AlCl}_3$  is added to the mixt., 40% of IV is obtained. The reaction between  $m\text{-HOC}_6\text{H}_4\text{OK}$  and the chloride of I gave *resorcinol dichaulmoograte*, b. 270–81°, m. 51°,  $[\alpha]_D^{25}$  45.93°. The chloride of I and  $m\text{-C}_6\text{H}_4(\text{OH})_2$  with  $\text{AlCl}_3$  in  $\text{CS}_2$  gave II, m. 83°,  $[\alpha]_D^{25}$  1.38° (1.284 g. made up to 50.8 cc.  $\text{CHCl}_3$ ); *oxime*, m. 161°. Reduction of I by the Clemmensen method gives *1-cyclopentyl-13-[2,4-dihydroxyphenyl]tridecane*, b. 245–7°, m. 68°; *4-Me ether*, m. 47.5°,  $[\alpha]_D^{25}$  6.15° (0.3890 g. made up to 27.1 cc.  $\text{CHCl}_3$ ); *2,4-di-Me ether*, b. 250–2°,  $d_4^{25}$  0.955,  $n_D^{25}$  1.5414,  $[\alpha]_D^{25}$  9.53° (1.070 g. made up to 10 cc.  $\text{CHCl}_3$ ). *1-Cyclopentyl-13-[2,4-dihydroxyphenyl]tridecane*, m. 73–4°. Preliminary expts. with I indicate a very low toxicity when given by mouth to rabbits or intramuscularly to rats; I exerts little bactericidal or antiseptic action against *B. thypusum*.

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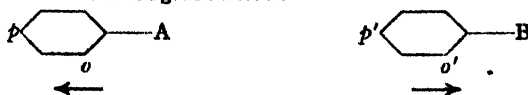
**Synthesis of chaulmoogric acid from hydnocarpic acid.** W. M. STANLEY AND ROGER ADAMS. Univ. of Illinois. *J. Am. Chem. Soc.* 51, 1515–8(1929).—Hydnocarpic acid was converted into the Et ester, b. 143–4°,  $d_4^{25}$  0.9087,  $n_D^{25}$  1.4582,  $[\alpha]_D$  70.5° (0.5186 g. made up to 25 cc. in  $\text{CHCl}_3$ ); reduction gave hydnocarpyl alc., b. 144–5°, m. 23°,  $d_4^{25}$  0.8022,  $n_D^{25}$  1.4709,  $[\alpha]_D$  75.2° (0.8592 g. made up to 15 cc. in  $\text{CHCl}_3$ ); the bromide, b. 156–7°,  $d_4^{25}$  1.0763,  $n_D^{25}$  1.4857,  $[\alpha]_D$  27.4° (0.7604 g. made up to 15 cc. in  $\text{CHCl}_3$ ); *di-Et hydnocarpylmalonate*, b. 182–3°,  $d_4^{25}$  0.9519,  $n_D^{25}$  1.4601,  $[\alpha]_D$  25.6° (0.6717 g. made up to 15 cc. in  $\text{CHCl}_3$ ); hydrolysis and splitting off of  $\text{CO}_2$  gives hydnocarpylacetic acid, identical with natural chaulmoogric acid.

C. J. WEST

**Nitration of phenylcyclohexane and of its *p*-halogen derivatives.** HORACE A. MAYES AND EUSTACE E. TURNER. Univ. of London. *J. Chem. Soc.* 1929, 500–8.—Cyclohexyl chloride (62 g.), 160 g.  $\text{PhCl}$  and 14 g.  $\text{AlCl}_3$  give 74 g. *p*-chlorophenylcyclohexane (I), b. 134°, b. 140°, b. 145°,  $d_4^{25}$  1.065,  $n_D^{25}$  1.5386. Oxidation gives *p*- $\text{ClC}_6\text{H}_4\text{CO}_2\text{H}$ . The *p*-Br deriv. (II), b. 160°,  $d_4^{25}$  1.283,  $n_D^{25}$  1.5584, results similarly in 65% yield. The *p*- $\text{NH}_2$  deriv., through the diazo reaction, gives the *p*-I deriv. (III), b. 185°, b. 174°,  $d_4^{19}$  1.448,  $n_D^{25}$  1.5900. Nitration of phenylcyclohexane in  $\text{AcOH}$  at 0° gives 62.2% of the *p*- $\text{NO}_2$  deriv., m. 57.5–8.5°; the *o*- $\text{NO}_2$  deriv., b. 174°,  $d_4^{23}$  1.111,  $n_D^{25}$  1.5472. With  $\text{HNO}_3$  (d. 1.5) at 0° there results the *p*- $\text{NO}_2$  deriv. and the *2,4-di-NO}\_2 deriv., pale yellow, m. 57°. *p*-Aminophenylcyclohexane, m. 55°, results almost quantitatively by reducing with Fe and very dil.  $\text{HCl}$ ; *Ac deriv.*, m. 129°; *2-NO}\_2* deriv., yellow, m. 65°, reduced to the *2,4-di-NH}\_2* deriv., m. 108° (*Ac deriv.*, m. 268°). I, added to 8 times its wt. of  $\text{HNO}_3$  (d. 1.5) at 0° to –5°, gives the *2,5-di-NO}\_2* deriv. (IV), m. 92°; *1-piperidino deriv.*, orange-yellow, m. 108°. Nitration of I in  $\text{AcOH}$  at 5–10° gives about 56% of the *3-NO}\_2* deriv. Nitration of II gives 38% of the *3-NO}\_2* compd. III and  $\text{HNO}_3$  give *p*- $\text{IC}_6\text{H}_4\text{NO}_2$ . *p*-Acetylphenylcyclohexane, m. 68–9°, in 60% yield from phenylcyclohexane,  $\text{AcCl}$ ,  $\text{AlCl}_3$  and  $\text{CS}_2$ ; *phenylhydrazone*, yellow, m. 105°. Oxidation gives *p*-cyclohexylbenzoic acid, m. 199° (*Na salt*, needles). Reduction of IV gives *1-chloro-2,5-diaminophenylcyclohexane*, m. 95–6°.*

C. J. WEST

**The ortho-para ratio in aromatic substitutions.** A. LAPWORTH AND R. ROBINSON. *Memors Proc. Manchester Lit. Phil. Soc.* 72, 43–52(1927).—A consideration of factors affecting the ortho-para ratio in aromatic substitutions; relation between constitutional conditions and rate of substitution in the *o*- and *p*-positions and cognate phenomena. It is assumed that the reaction of the reagent is cationoid and accordingly seeks the anionoid centers in the mol. of the aromatic substance; substitution will occur more rapidly at centers of relatively high electron density and availability. Highly negatively charged centers are not necessarily the more powerful anionoid centers because electrons may not tend to associate with sp. foreign nuclei. It is assumed that the ratio of the rates of completed substitution in 2 positions is equal to the ratio of electron availabilities in these positions. The elec. field in the mol. or surrounding medium due to the presence of the substituents control to a certain extent the availability of the electrons as shown in the diagram below.



If A is a group exerting a smaller attraction on electrons than H does, then, as the result of the potential gradient in the mol. field, the electron availability in the *o*-position will be greater than in the *p*-position; group B attracting electrons more strongly

than H will be the converse. Groups (e. g., Me) of the type A have a tendency to yield *o*-substitution products; groups (e. g., Cl, OMe) of the type B tend to form *p*-substitution products. If the side chain is modified in the direction of group A or group B the *ortho-para* ratio is correspondingly altered. Several reactions supporting these principles are cited.

J. T. WOLF

**Mobile anion tautomerism. III. Comparison of the activation of three-carbon anionotropic systems by alkyl and by aryl groups.** HAROLD BURTON. Univ. of Leeds. *J. Chem. Soc.* 1929, 455-8; cf. *C. A.* 22, 3403.—B. has shown that the activation of the 3-C anionotropic system (I)  $\text{PhCHXCH:CH}_2 \longrightarrow$  (II)  $\text{PhCH:CHCH}_2\text{X}$  by the Ph group causes a complete conversion of I into II in suitable solvents; the conditions for the change are dependent on the anionic stability of X and also on some mol. property of the solvent closely related to its dielec. const. In the system  $\text{MeCHXCH:CH}_2 \rightleftharpoons \text{MeCH:CHCH}_2\text{X}$  the mobility of X is much smaller; each alc. yields its own Ac deriv.; the *p*-nitrobenzoates resemble the acetates in their stability;  $\alpha$ -methylallyl *p*-nitrobenzoate, m. 43-4°, is unchanged after boiling for 6 and 24 hrs. with  $\text{Ac}_2\text{O}$ .  $\alpha$ -Phenyl- $\gamma$ -methylallyl alc.,  $b_{14}$  121.5-3.5°, results in 70% yield from  $\text{PhMgBr}$  and  $\text{MeCH:CHCHO}$ ; the *p*-nitrobenzoyl deriv. was an ill-defined solid, m. about 60°, which is also true of the deriv. from  $\text{PhCH:CHCH(OH)Me}$  (III); either alc. gives  $\gamma$ -phenyl- $\alpha$ -methylallyl acetate,  $b_{14}$  141-4°; hydrolysis gives III. This behavior shows the remarkable property of activating anionotropic systems possessed by the Ph group.

C. J. WEST

**The action of acetylene on benzene in the presence of aluminum chloride.** J. BÖRSEKEN AND A. A. ADLER. Techn. Univ., Delft. *Rec. trav. chim.* 48, 474-85 (1929).—The object of this research was to investigate whether a substance with a triple bond behaves like a substance with 2 sepd. or as one with 2 conjugated double bonds, when acted upon by benzene in the presence of a powerful catalyst such as  $\text{AlCl}_3$ . In this reaction with alkynes an addn. occurs:  $\text{C}_6\text{H}_6 + \text{C}_n\text{H}_{2n} \longrightarrow \text{C}_6\text{H}_5\cdot\text{C}_n\text{H}_{2n+1}$  while with unsatd. compds. with 2 sepd. double bonds the formation of diphenylalkylanes is to be expected. On the other hand, unsatd. compds. with conjugated systems undergo polymerization without reacting with the benzene (cf. B. and Bastet, *C. A.* 8, 1270; B. and Noorduyne, *C. A.* 10, 188). The results of the investigations, published already, on the interaction of  $\text{C}_2\text{H}_2$  with benzene in the presence of  $\text{AlCl}_3$ , are in contradiction with one another. Varet and Vienne (*Compt. rend.* 164, 1375 (1886)) obtained 80% styrene and 15%  $\text{Ph}_2\text{CHMe}$ ; while Cook and Chambers (*C. A.* 15, 1526) obtained only traces of these compds. and *meso*-dimethyldihydroanthracene as the principal product. Expts., carried out with  $\text{Al-HgCl}_2$  as a catalyst gave a small quantity of an oil,  $b_{760}$  265-85°, which behaved like the reaction product described by Cook and Chambers (l. c.). With  $\text{AlCl}_3$  prepd. from Al and HCl, the reaction always was very slow, an active catalyst, which provoked an energetic reaction, only being obtained from Al and dry  $\text{Cl}_2$ . On passing  $\text{C}_2\text{H}_2$  at about 20° during 5 hrs. through 110 cc. benzene contg. 30 g.  $\text{AlCl}_3$ , a reaction product was obtained, consisting of 50 cc. benzene and 65 g. of a bright yellow mass, contg. 4.9%  $\text{Al}_2\text{O}_3$ , and also some O, which is present in the form of water, which has entered the reaction product on decomp. this with water. The first mentioned results show already that 1 mol.  $\text{C}_2\text{H}_2$  has been fixed on 1 mol. benzene; this result was confirmed by analysis which showed an at. relation C:H = 6.7:6.6, allowance being made for the  $\text{Al}_2\text{O}_3$  and the water, bound chem in the reaction product. The latter being completely insol. in all org. solvents, its mol. wt. could not be detd. but interesting results were obtained on distg. it in a cathodic vacuum at 310°. Only during the beginning of the distn. a small amount of styrene may be collected in a receiver cooled with liquid air, while during the whole course of the distn. a brown viscous oil is collected in a receiver cooled with water. As styrene itself is polymerized in a quite different way in benzene under the influence of highly active  $\text{AlCl}_3$ , this compd. cannot be the intermediate compd. in the condensation process of benzene and  $\text{C}_2\text{H}_2$ , and B. and A. conclude, that under the influence of the  $\text{AlCl}_3$  a very active combination  $\text{C}_8\text{H}_8$  is formed which polymerizes to the reaction product obtained. This highly reactive compd.  $\text{C}_8\text{H}_8$ , called *protostyrene*, is still present in the reaction product in small quantity and is obtained as *styrene* by distn. in a high vacuum. This course of the reaction only takes place with a highly active catalyst; with less active catalysts the *protostyrene*, first formed, passes into *styrene* which polymerizes to polystyrenes while in the first case the *protostyrene* at once passes into *polyprotostyrenes*. It was expected, that, on replacing the benzene by a less reactive compd., e. g.,  $\text{PhCl}$ , the initial product of the reaction, the *protochlorostyrene*, would have time to pass into *chlorostyrene*, which condenses further to *polychlorostyrenes*, analogous to the products obtained from  $\text{C}_2\text{H}_2$  and benzene under the influence of mod-

erately active catalysts; i. e., these reaction products should be sol. in org. solvents, have a low mol. wt. and should *not* give any chlorostyrene on distillation. All these presumptions were verified by condensation expts. under the same conditions as those between benzene and  $C_6H_2$ , mentioned above, the mol. wt. of various reaction products being 713 and 295, resp., while not even a trace of chlorostyrene was obtained on distn. When *p*-chlorostyrene polymerizes in  $PhCl$  under the influence of  $AlCl_3$ , a quite analogous product was obtained with a mol. wt. of about 600. From these results it follows that the triple bond is to be compared in this respect with a single double bond.

C. F. VAN DUIN

Highly polymerized compounds. XIV. Polystyrene, a model of rubber. H. STAUDINGER, M. BRUNNER, K. FREY, P. GARBSCH, R. SIGNER AND S. WEHRLI. Eidgenöss. Tech. Hochschule Zürich and Univ. Freiburg i. B. *Ber.* 62B, 241–63 (1929); cf. C. A. 23, 822.—The investigation of polystyrene (previously designated as metastyrene) was undertaken because it promised to serve as a model for the structure of rubber, just as polymeric  $HCHO$  does for that of cellulose. Rubber and polystyrene must both be built up in the same way; both are hydrocarbons forming in org. solvents ( $C_6H_6$ ,  $CHCl_3$ ) highly viscous colloidal solns. In the solid state they are different, to be sure; polystyrene at room temp. is a hard tenacious glass extraordinarily difficult to work but at 100–20° becomes elastic and pliant; it may be compared to rubber cooled to a low temp. A direct elucidation of the constitution of rubber is difficult for a no. of reasons: (1) The possible relation between the most important properties of rubber and impurities (e. g., proteins); these are difficult to remove and there is no way of judging if the structure of the rubber is altered in the process of purification. (2) The differences between synthetic and natural rubber, possibly because in the polymerization of isoprene the isoprene mols. add to each other unsym. or, especially in the presence of catalysts, are altered by cyclization. (3) The autooxidizability of rubber. These complications are not to be feared with polystyrene; it is a pure hydrocarbon and its colloid nature can be due only to the peculiar structure of the mol., not to impurities; its mols. have a very simple structure as the individual mols. can combine with each other only in long chains; it is not autooxidizable. Contrary to Stöbke, there is not only 1 polystyrene; depending on the conditions of formation there are obtained products which are mixts. of members of a polymer-homologous series, i. e., of mols. of the same structure but of different lengths, having different phys. but the same chem. properties. Styrene polymerizes very slowly in the cold (months or yrs.) but more rapidly at higher temps. (in a few hrs. at 180°); even at 250° polymers can still be obtained, since depolymerization occurs only above 300°. The products obtained at the higher temps. have not the same properties as those prepd. in the cold. As the temp. of prepn. increases the products become more brittle (that prepd. at 240° can be powd. readily); the hardness changes very little, if at all, but the breaking strength is extraordinarily affected; the soly. is increased, the pulverizable products dissolving easily in  $Et_2O$  without previously swelling; the viscosity of the solns. decreases; the mol. wt. (in freezing  $C_6H_6$ ) decreases (values up to 8000–10,000 can be detd. with an accuracy of about 15%). Below are the properties of the products obtained at 240°, 190°, 160°, 130°, 75°, 15° (initial product of polymerization), 15° (copolystyrenes whose properties vary widely with their source), resp.: av. mol. wt. 3500, 6000, 6500, 10,000, 16,000, 20,000, about 100,000; av. degree of polymerization 33, 38, 62, 100, 150, 200, about 1,000; liquefying temp. 120–60°, 130–80°, 130–80°, 145–90°, 170–250°, 200–70°, 250–300°; time of flow of a 0.5 *N*  $C_6H_6$  soln. ( $t_f$  38.4 sec.) 59, 73, 81, 114, 356, 1000, not determinable;  $\eta$  in 0.2 *N* soln. ( $C_6H_6$  = 1) 1.22, 1.32, 1.38, 1.65, 3.19, about 7, 50–600; soly. in  $Et_2O$ , easily, easily, partially, partially, difficultly, difficultly, almost insol. The first 4 dissolve in  $C_6H_6$  without swelling, the next 2 swell somewhat, the last swells greatly. The first 3 are easily powd., the next 2 form a more viscous powder, the 6th viscous flocks which cannot be powd., the last an extraordinarily viscous mass. The first 5, which are classified as hemi-colloids, can also be obtained by polymerization in dil. soln. in the cold with  $SnCl_4$  and similar acid halides. A product so obtained, with av. mol. wt. 2500 and  $\eta$  1.16, was sep'd. by means of solvents into 5 fractions ranging from av. mol. wt. 1100,  $\eta$  1.09, to av. mol. wt. 13,000,  $\eta$  1.45. It might be concluded, from the soly. of the above products with mol. wts. 3000–10,000, i. e., contg. 30–100 *Ph* groups, that they are not mol. dissolved but as assocn. products of smaller mols. Their soly. is explained, however, by the fact that they are amorphous and cannot be compared with the paraffins; moreover they show the same mol. wts. in solns. of different concns. and also, as recently found by W. HILBER, in camphor as well as in  $C_6H_6$ ; finally, their sep'n. into different fractions shows that they are not assocn. products. The mols. of the eucolloids (estd.

mol. wt. 100,000–200,000), formed at the lowest temps., are assumed to be identical with the primary colloid particles and are designated macromols. The construction of polystyrene from such macromols. explains its peculiar phys. properties, as the macromols. possess especially powerful intermol. forces. As the result of their size they are unstable; heating "cracks" them. Thus, the viscosity of the 0.2 *N*  $C_6H_5$  soln. of such a product diminished from 370 to 108, 85, 30, 1.8 ( $C_6H_5 = 1$ ) on heating 60 hrs. at 130° and 160° and 24 hrs. at 187° and 240°, resp. This change in viscosity is irreversible. On the other hand, the viscosity of solns. of the hemi-colloids, whose mols. are relatively stable, does not change on heating. With the hemi-colloids of relatively low mol. wt. the viscosity of the solns. is proportional to the concn. whereas with those of mol. wt. 10,000 and higher the viscosity increases much more rapidly than the concn.; the mols. of the solute are so long that they obstruct the normal motions of the solvent mols. With polystyrene it has been possible for the first time to confirm experimentally Katz' views that swelling depends on the existence of large mols. and to follow quant. the relation between swelling and mol. wt.; the phenomenon of swelling is, as suggested by K., an intermol., not an intermolecular process. Polystyrene likewise affords for the first time a means of establishing that tenacity depends on mol. wt. As to the definite structure of the mols. nothing can as yet be said. The authors are inclined to believe that they are made of strings of styrene mols., the end valences of which unite to form a ring:  $CH_2 \cdot CHPh \cdot (CH_2 \cdot CHPh)_x \cdot CH_2 \cdot CHPh$ . Rubber is thought to be

similarly made of strings of some 1000 polyprene mols. bound to each other by normal covalences. **XV. Reduction of polystyrene.** H. STAUDINGER, E. GEIGER AND E. HUBER. *Ibid* 263–7.—From the fact that, unlike aliphatic polyvinyl compds and rubber, polystyrene depolymerizes on heating chiefly into monomeric styrene, it might be concluded that the individual styrene mols. in it are not bound to each other by normal valences but by supermol. forces, as assumed by Bergmann for polymeric carbohydrates. Such a conception is improbable in view of the existence of a whole series of polystyrenes with characteristic differences (see preceding abstr.) and the easy decompn. by heat can readily be explained in another way. Double bonds, as is well known, loosen substituents on an adjacent C atom and it is easy to see why

$CH:CH \cdot CH:CH \cdot CH:CCH_2 \cdot \vdots R$  should be more unstable than  $RCH:CHCH_2 \cdot \vdots R$ .

In harmony with this is the fact that hexahydropolystyrene (I) is much more stable than polystyrene and does not decomp. in as simple a manner. The I was prepd., like hydorrubber, from polystyrene with Ni at 250° and is a white powder with the properties of a hydroaromatic compd. (is not attacked by concd.  $H_2SO_4$  and gives no color with  $C(NO_2)_4$ ). It decomp. only at 350–400°, giving a mixt. of hexahydrostyrenes from which can be isolated a small quantity of the monomer but which consists chiefly of the di-, tri- and tetramers. Mol. wt. detns. indicate that I is a hemi-colloid with an av. mol. wt. of 3000–4000. It can be sep'd. into a more and a less easily sol. part, differing in mol. wt. and in the viscosity of their solns. C. A. R.

**Tetra-*p*-tolylethylene.** HENRY GILMAN AND FULTON B. FLICK. Univ. of Ames, Iowa. *Rec. trav. chim.* 48, 461–3 (1929).—In a reaction between toluene,  $CHCl_3$  and  $AlCl_3$ , Schwartz (*Ber.* 14, 1516 (1885)) obtained a hydrocarbon, m. 215°, to which he assigned the structure of tetra-*p*-tolylethylene. Later Elbs and Wittich (*Ber.* 18, 347 (1885)) showed that S.'s compd. must be a dimethylantracene, inasmuch as it could be readily and almost quant. oxidized to a dimethylantraquinone. Another compd., m. 151°, called tetra-*p*-tolylethylene, was obtained by Staudinger and Goldstein (*C. A.* 11, 597–8) when (*p*- $MeC_6H_4$ ) $_2CN_2$  was allowed to decomp. at room temp. in  $CS_2$ . It is now shown by G. and F. that the hydrocarbon of St. and G., m. 151°, is really tetra-*p*-tolylethylene; on oxidation with  $CrO_3$ - $AcOH$  it gave 67% of di-*p*-tolyl ketone and it was identical with the tetra-*p*-tolylethylene prep'd. in the following ways: (a) By heating the reaction product of (*p*- $MeC_6H_4$ ) $_2CHOH$  and  $HCl$  or  $HBr$ , alone or with pyridine; (b) By heating the blue thioketone from di-*p*-tolyl ketone and  $P_2S_5$  with  $Cu$ ; (c) By treating the di-*p*-tolyl ketene-quinoline compd. (cf. following abstr.) with di-*p*-tolyl ketene; (d) By reduction of di-*p*-tolyl ketone and *p*-tolylpinacol according to the method of Steinkopf and Wolfram. The structure of the compd., m. 151°, as tetra-*p*-tolylethylene is thus definitely established. C. F. VAN DUIN

**Di-*p*-tolyl ketene.** HENRY GILMAN AND CHESTER E. ADAMS. Univ. of Ames, Iowa. *Rec. trav. chim.* 48, 464–5 (1929); cf. preceding abstr.—In connection with the study on tetra-*p*-tolylethylene the prep'n. of di-*p*-tolyl ketene by means of a standard reaction had to be carried out. *p*-Tolualdehyde (*Ber.* 30, 1622 (1897); 31, 1149 (1898))

was converted into *p*-toluoin, which again was oxidized to *p*-tolil (cf. *Ber.* 22, 380 (1889)). By means of a slight excess of  $N_2H_4$  the *p*-tolil was converted into hydrazo-*p*-tolil (cf. Curtius and Kastner, *C. A.* 5, 2649 (1911)), which was oxidized to azo-*p*-tolil (cf. *Ibid.*). The benzene soln. of azo-*p*-tolil was dried and the benzene distd. off in a vacuum; the residue was then heated up to 80–90° until the evolution of N ceased. The reaction product was identified as di-*p*-tolyl ketene by its conversion into  $(p-MeC_6H_4)_2CHCO_2H$  by means of water and into  $(MeC_6H_4)_2CHCO_2Et$  with alc. The quinoline compd. of the reaction product yielded tetra-*p*-tolylethylene on treatment with di-*p*-tolyl ketone (cf. preceding abstr.).

C. F. VAN DUIN

**Nature of the alternating effect in carbon chains. XXX.** Nitration of phenylbromocyanonitromethane, with special reference to an alleged example of intramolecular *m*-rearrangement. JOHN WM. BAKER AND CHRISTOPHER K. INGOLD. Univ. of Leeds. *J. Chem. Soc.* 1929, 423–47; cf. *C. A.* 22, 4502.—The theoretical discussion shows that Flurschein and Holme's alleged evidence that  $PhCBr(NO_2)CN$  passes by intramol. migration of Br into *m*- $BrC_6H_4CH(NO_2)CN$  is valueless, that free Br is present under all conditions in which *m*-Br products, including *m*- $BrC_6H_4CBr(NO_2)CN$ , are formed, and that a large body of cogent evidence exists which points unmistakably to the conclusion that these *m*-Br products are formed by extramol. bromination of the nucleus. It follows from this that no "proved case" of the intramol. *m*-migration of a substituent from a side chain has as yet been discovered. The intramol. *m*-migration of a side-chain substituent and indirect *m*-substitution dependent upon this mechanism, are conceptions foreign to a theory of aromatic substitution, which postulates inductive *m*-deactivation in *m*-orientation. The formation of *o,p*-products through an internal change involving the migration of a substituent from a normally *m*-directing side chain is, however, possible on this theory, since it envisages tautomeric *o,p*-activation (but not *m*-). The available evidence favors the suggestion that in the lateral decompn. of  $PhCBr(NO_2)CN$  *p*- $NO_2$  products are formed in this way, the alleged contrary evidence of F. and H. having been controverted. The original should be consulted for the mass of exptl. evidence, presented in the form of tables. *m*-Bromobenzyltrimethylammonium bromide, m. 216°; picrate, m. 150°. Benzyltrimethylammonium bromide, m. 235°. *p*-Nitrophenylbromoacetone, m. 96°.

C. J. WEST

**Preparation of  $\beta$ -phenylethylamine derivatives (synthesis of 3-methoxy-4-ethoxy-1- $\beta$ -aminoethylbenzene).** T. KONDO, Y. SHINOZAKI AND S. ISHII. *J. Pharm. Soc. Japan* 48, 1166–9 (1928).—With K.'s method for the prepn. of homoveratrylamine (*C. A.* 22, 3414) good yields of 2,4-(MeO) $_2$ C $_6$ H $_3$ (CH $_2$ ) $_2$ NH $_2$ , 3,4-MeO(EtO)C $_6$ H $_3$ (CH $_2$ ) $_2$ NH $_2$  (I) and 4-MeOC $_6$ H $_4$ (CH $_2$ ) $_2$ NH $_2$  were obtained. The synthesis of I is given as an example. Twenty-seven g. 3,4-MeO(EtO)C $_6$ H $_3$ CHO and 9.2 g. MeNO in 100 cc EtOH are mixed with 14 g. KOH in 30 g. cold MeOH. After 1 hr. the above mixt. is poured into 10% HCl contg. some ice. Twenty-eight g. of 3,4-MeO(EtO)C $_6$ H $_3$ CHCHNO $_2$  (II), m. 150°, are obtained. Electrolytic reduction of II. Cathode, Pb plate. Cathodic fluid, 200 cc. 5% HCl to which a little EtOH and 5 g. of II are added. Anodic fluid, 20% H $_2$ SO $_4$ . Temp. 65°, 12 v., 5 amps. After the reduction is complete (3 hrs.), the soln. is made alk. and 3,4-MeO(EtO)C $_6$ H $_3$ (CH $_2$ ) $_2$ NH $_2$  is extd. with EtO and purified as the oxalate (III), decomp. 195°. Yield of the free base, obtained by the decompn. of III, 3 g. Chloroplatinate, decomp. 204°. Chloroaurate, m. 209° (decompn.).

NAO UYEI

**Action of acetic anhydride on Schiff bases.** M. PASSERINI AND M. PIA MACEN-TELLI. Reale Univ. Firenze. *Gazz. chim. ital.* 58, 641–6 (1928).— $PhCH:NPh$  (10 g.) boiled 6 hrs. with Ac $_2$ O (10 g.), cooled, a slight excess of satd. aq. Na $_2$ CO $_3$  added, filtered, washed with water and then with a little Et $_2$ O, and the residue crystd. from Et $_2$ O, yields 8 g. of the compd.  $PhAcN(:CHPh)OAc$ , m. 127–9°. It is easily decompd. by boiling with alkalis in MeOH, with aq. alk. carbonates, with dil. EtOH or even with water to BzH, PhNHAc and AcOH. At room temp. the dry compd. slowly hydrolyzes in air. Anisalaniline (5.5 g.) refluxed 2 hrs. with Ac $_2$ O (5.5 g.), cooled, satd. Na $_2$ CO $_3$  added, filtered, washed and recrystd. from EtOH, yields the compd.  $PhAcN(:CHC_6H_4OMe)OAc$ , m. 89–91°, hydrolyzes like the preceding compd. to PhNHAc, AcOH and anisaldehyde. The reaction between the 2-hydroxynaphthyl-1-glyoxal dianil and Ac $_2$ O was so slow that only after boiling for 8 hrs. did the reaction proceed far enough for analysis of the products. The initial product was an uncrystallizable pitch which, extd. with petr. ether and recrystd. from C $_6$ H $_6$ , yielded the compd. C $_{20}$ H $_{18}$ O $_3$ N, m. 155–7°. The yield was too small for extensive study, but its constitution was probably AcOC $_{10}$ H $_7$ C(:NPh)CHO or AcOC $_{10}$ H $_7$ C(:O)CH:NPh. The brown resin left from the petr. ether extrn. was extd. with C $_6$ H $_6$ , which yielded a small quantity of a rose-colored compd., m. 155–6°, which could not be identified. The residue from the C $_6$ H $_6$  extrn.,

treated with hot EtOH, and the EtOH ext. let stand several days, yielded a substance which recrystd. repeatedly from EtOH, yielded the *acetyl-2-hydroxynaphthyl-1-glyoxal dianil*,  $\text{AcO}(\text{C}_6\text{H}_4)_2\text{C}(\text{NPh})\text{CH}(\text{NPh})$ , m.  $185^\circ$ . In this reaction therefore the result hoped for was not obtained, the reaction with  $\text{Ac}_2\text{O}$  being only partial, with attack of only 1 of the 2 anil groups. C. C. DAVIS

**Elimination of the nitroso group from nitrosoamines.** WM. G. MACMILLAN AND THOMAS H. READ. Univ. of Aberdeen. *J. Chem. Soc.* 1929, 585-6.—The use of  $\text{CO}(\text{NH}_2)_2$  or  $\text{CS}(\text{NH}_2)_2$  is recommended for the removal of the NO group; 20 g. *m*- $\text{O}_2\text{NC}_6\text{H}_4\text{NMeNO}$  and 15 g.  $\text{CO}(\text{NH}_2)_2$  in 75 cc.  $\text{H}_2\text{O}$  and 75 cc.  $\text{H}_2\text{SO}_4$  at  $50^\circ$  give 90-95% of the sec. amine; the *p*-deriv. is obtained in 80-90% yields;  $\text{CS}(\text{NH}_2)_2$  also gives 80-90% yields. Nuclear NO compds. were recovered unchanged. C. J. WEST

**New method for preparing substituted diphenylamines.** ARTHUR WM. CHAPMAN, Univ. of Sheffield. *J. Chem. Soc.* 1929, 569-72.—The method consists in hydrolysis of the acyl compds. obtained by heating *N*-arylaryliminoaryl ethers at  $200-300^\circ$  ( $\text{RC}(\text{OR}')\text{:NR}' \rightarrow \text{RC}(\text{NR}')\text{R}' \rightarrow \text{NHR}'\text{R}'$ ). The presence of "negative" substituents in the phenol facilitates the rearrangement of the imino ether, whereas in the amine their presence retards the change. When possible, it is preferable to employ the more acidic phenol and the more basic amine, so that the rearrangement may occur at the lowest possible temp. *N*-*o*-Chlorophenylbenziminio-2,4,6-trichlorophenyl ether (I), m.  $99-100^\circ$ ; heating for 2 hrs. at  $250-70^\circ$  gives the *Bz* deriv., m.  $131-2^\circ$ , of 2,4,6,2'-tetrachlorodiphenylamine, m.  $87-8^\circ$ . The *p*-Cl deriv. of I, pale yellow, m.  $121-2^\circ$ , rearranged after 2 hrs. at  $250-70^\circ$  to the *Bz* deriv., m.  $154^\circ$ , of 2,4,6,4'-tetrachlorodiphenylamine, m.  $63-4^\circ$ . *N*-2,4-Dichlorophenylbenziminio-2,4-dichlorophenyl ether, viscous oil, rearranged after 2 hrs. at  $280-300^\circ$  to the *Bz* deriv., m.  $153-4^\circ$ , of 2,4,2',4'-tetrachlorodiphenylamine, m.  $141-2^\circ$ . 2,4,6-Trichlorodiphenylamine, m.  $43-4^\circ$ . Chlorination of 50 g.  $\text{Ph}_2\text{NH}$  in 250 cc. AcOH until the gain in wt. is 40 g. gives 55 g. of (2,4- $\text{Cl}_2\text{C}_6\text{H}_3$ ) $_2\text{NH}$ ; if the gain in wt. is 60 g., there results a *hexa-Cl* deriv., m.  $138-9^\circ$ , probably the 2,4,6,2',4',6'-compd. C. J. WEST

**Influence of some substituent groups in the aniline molecule on the formation of isonitriles.** M. PASSERINI AND G. BANTI. Reale Univ. Firenze. *Gazz. chim. ital* 58, 636-40 (1928).—The influence of substituent groups in the  $\text{C}_6\text{H}_5$  nucleus on the formation of isonitriles by the Hofman reaction ( $\text{CHCl}_3$ , KOH and aromatic amines) was studied. It is already known that some groups, e. g., alkyl chains, do not influence the reaction, and *vice versa*. In the present work, the effects of  $\text{CO}_2\text{H}$ , OH,  $\text{NO}_2$ , CO, Br and arsonic acid groups were studied.  $\text{CHCl}_3$  (16 g.) added at  $60^\circ$  to a mixt. of *o*- $\text{H}_2\text{NC}_6\text{H}_4\text{CO}_2\text{H}$  (6 g.) and KOH (20 g.) in EtOH, the excess  $\text{CHCl}_3$  evapd., EtOH added, filtered, evapd. to dryness, dissolved in water, acidified with dil.  $\text{H}_2\text{SO}_4$  and filtered, leaves a small residue of *o*- $\text{HO}_2\text{CC}_6\text{H}_4\text{NHCHO}$ . Following the same procedure, but extg. the ppt. (by acidification) with  $\text{Et}_2\text{O}$ , and purifying with  $\text{Et}_2\text{O}$ , *p*- $\text{HOC}_6\text{H}_4\text{NH}_2$  yields a very little *p*- $\text{HOC}_6\text{H}_4\text{NHCHO}$ .  $\text{CHCl}_3$  (8 g.) added to *p*- $\text{O}_2\text{NC}_6\text{H}_4\text{NH}_2$  (3 g.) in alc. KOH (10 g.), the excess  $\text{CHCl}_3$  and EtOH evapd., water added and extd. with  $\text{C}_6\text{H}_6$ , yields no reaction product, but only the original compds. in the  $\text{C}_6\text{H}_6$  ext. and in the  $\text{C}_6\text{H}_6$ -insol. part. Following the same procedure  $\text{CHCl}_3$  (5 g.), atoxyl (2 g.) and alc. KOH (7 g.) failed to react.  $\text{CHCl}_3$  (20 g.) refluxed with *p*- $\text{H}-\text{NC}_6\text{H}_4\text{Ac}$  (15 g.) in alc. KOH (25 g.), the excess  $\text{CHCl}_3$  and EtOH evapd., water added, extd. with  $\text{Et}_2\text{O}$ , the ext. agitated with dil. HCl, sepd., concd., the residue fractionally distd. *in vacuo*, yields *p*- $\text{AcC}_6\text{H}_4\text{NC}$  and diphenylformamidine. With the foregoing procedure, *o*- $\text{BrC}_6\text{H}_4\text{NH}_2$  (20 g.), KOH (48 g.), EtOH (120 g.) and  $\text{CHCl}_3$  (30 g.) were recovered for the greater part unaltered, with a very little liquid with odor of an *isonitrile*,  $b_{34}$   $125-7^\circ$ . The results show that  $\text{CO}_2\text{H}$ , OH,  $\text{NO}_2$  and arsonic acid groups inhibit the formation of isonitriles by the Hofman reaction, whereas the CO group has no influence on the reaction. A halogen group impedes but does not inhibit the reaction. C. C. DAVIS

**Nitration of *m*-acetamino-*tert*-butylbenzene.** JOHN B. SHOSMITH AND ALEXANDER MACKIE. Edinburgh Univ. *J. Chem. Soc.* 1929, 476-7; cf. Gelzer, *Ber.* 21, 2949 (1888).—*m*- $\text{Me}_2\text{CC}_6\text{H}_4\text{NHAc}$  and  $\text{HNO}_3$  (d. 1.46) at  $25-30^\circ$  during 15 mins. give the 4- $\text{NO}_2$  deriv., pale yellow, m.  $116^\circ$  (G. states that the 2- $\text{NO}_2$  deriv., m.  $105.5^\circ$ , results); hydrolysis gives 4,3- $\text{O}_2\text{N}(\text{H}_2\text{N})\text{C}_6\text{H}_3\text{CMe}_3$ , m.  $91-2^\circ$  (G. gives  $124^\circ$ ); reduction to the diamine and condensation with phenanthraquinone gives phenanthra-*tert*-butylphenazine, yellow, m.  $148.5-9^\circ$  (G. gives  $144^\circ$ ), also obtained from 3,4- $\text{H}_2\text{N}(\text{O}_2\text{N})\text{C}_6\text{H}_3\text{CMe}_3$ . C. J. WEST

**Formation of heterocyclic compounds from ethylxanthicformate.** PRAPHULLA CHANDRA GUHA AND DEVENDRA NATH DUTTA. Dacca Univ. and Indian Inst. of Science, Bangalore. *J. Indian Chem. Soc.* 6, 65-82 (1929).— $\text{EtO}_2\text{CSCSOEt}$  (I) in

EtOH was cooled to 0° and PhNH<sub>2</sub> added. After standing 2-3 hrs. and after removal of excess PhNH<sub>2</sub>, there was obtained *thiodicarboxymonothiodiphenylamide*, PhNHCS-CONHPh, m. 63-4°, sol. in dil. alkali, insol. in dil. acid, decompd. by boiling with concd. HCl. Heated with FeCl<sub>3</sub> it forms an Fe salt. *Di-o-tolylamide*, from I and *o*-MeC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub> in EtOH, m. 205°. *Di-p-tolylamide*, m. 85°, sol. in dil. alkali, insol. in dil. acid. *Di-m-nitranilide*, m. 105°, sol. in dil. alkali, insol. in dil. acid; *di-Ac deriv.*, m. 114-5°. *Di-p-nitranilide*, m. 95-6°, sol. in dil. alkali, insol. in acid. *Di-β-naphthylamide*, m. 90°, insol. in acid, sol. in alkali. H<sub>2</sub>NNHPh reacts with I in EtOH to give *Et monothiodiphenylcarbazinate* (II), PhNHNHCSOEt, m. 73-4°, sol. in alkali, insol. in acid. Heated with concd. HCl II gave NH.CO.S.CO.S (III), m. 135°, sol.

in alkali, pptd. by acid. II was decompd. when heated alone at 140-50° or when boiled with aq. KOH (20%). *p-Nitrophenylcarbazinate*, m. 108-9°, sol. in alkali, insol. in acid. When heated with concd. HCl it gave III. *Ethylphenylcarbazinate*, m. 242°. Reaction of *o*-C<sub>6</sub>H<sub>4</sub>(NH<sub>2</sub>)<sub>2</sub> with I in EtOH gave *N-carbethoxy-o-phenylene-thiourea* (IV), m. 93-4°, sol. in dil. acid and caustic alkali, insol. in dil. NH<sub>4</sub>OH. Steam was passed through the filtrate from IV for 3-4 hrs. to remove oily matter; on cooling there sepd. *o*-phenyleneurea (V). Reaction of *o*-C<sub>6</sub>H<sub>4</sub>(NH<sub>2</sub>)<sub>2</sub> with I at room temp. without any solvent gave *N-thiocarbethoxy-o-phenyleneurea* (VI), m. 122-3°, sol. in dil. alkali. Addn. of dil. NH<sub>4</sub>OH to the filtrate from VI gave a ppt. of IV. IV heated with 20% KOH for 30 mins. gave *o*-phenylenethiourea, m. 301-2°. VI heated with 20% KOH for 30 min. gave V. 1,2-C<sub>10</sub>H<sub>6</sub>(NH<sub>2</sub>)<sub>2</sub> (1.5 g.) was added to 2 g. I and the mixt. cooled with ice. After 15 mins. EtOH was added. The mixt. was allowed to stand at room temp. 3-4 hrs. The product was *4,5-naphthylene-2,7-endoxy-1,3,6-thioheptadiazine*, m. 250°, insol. in dil. acid and dil. alkali. With the same method, except that after 1 hr. the mixt. was heated for 2 hrs., the product was *1-carbethoxy-amtmonaphthyl-4,5-naphthylene-2,7-endoxy-1,3,6-heptatriazine*, m. 304°, insol. in dil. acid and in alkali. Action of 8 g. I with 2.4 g. C<sub>6</sub>H<sub>4</sub>(NH<sub>2</sub>)<sub>2</sub> (VII) in EtOH with cooling gave *ethylene monothiodiurethan* (VIII), m. 110-1°, insol. in dil. acid and alkali. Reaction of I with VII without a solvent and at room temp. gave *ethylenethiourea* (IX), m. 193-1°, sol. in alkali; *HCl salt* m. 304-5°. Addn. of EtOH to the oily filtrate from IX gave VIII. VIII heated with concd. HCl for 30 min. or heated with aq. KOH (20%) at 60-70° gave IX. NH<sub>2</sub>CONHNH<sub>2</sub>. HCl dissolved in the least quantity of H<sub>2</sub>O was treated with anhyd. Na<sub>2</sub>CO<sub>3</sub> to liberate the free base. EtOH was added, and the soln. was then added to I. After 2 hrs. at room temp. the mixt. was heated 30 mins. The product was *Et semicarbazidemonothiocarboxylate*, H<sub>2</sub>NCONHNHCSOEt, m. 161°, sol. in dil. acid and alkali, decompd. by boiling with concd. HCl. I and H<sub>2</sub>NCSNHNH<sub>2</sub> were heated 1 hr. in alc. On cooling there sepd. *Et thiosemicarbazidecarboxylate* (X), m. 155-6°, sol. in dil. alkali, insol. in dil. acid. Heated with concd. HCl for 30 mins. X gave *2-amino-4-carboxylic-5-keto-4,5-dihydro-1,3,4-thiadiazole*, H<sub>2</sub>NC:N.N(CO<sub>2</sub>H).CO.S,

m. 189°, *benzylidene deriv.* m. 158-9°. I was allowed to react with NH<sub>2</sub>NHCSNHNHPh at room temp. for 2 hrs., then EtOH added and the mixt. heated 30 mins. The product was *Et 4-phenylthiosemicarbazidecarboxylate*, PhNHCSNHNHCO<sub>2</sub>Et, m. 149-50°, sol. in dil. alkali, pptd. by dil. acid. Prepd. in a similar way were the following: *Et p-tolylthiosemicarbazidecarboxylate*, m. 183-4°, insol. in dil. acid, sol. in alkali. *Et β-naphthylthiosemicarbazidecarboxylate*, m. 287-8°, sol. in alkali, pptd. by acid. I in EtOH was added to benzidine cooled in ice. The mixt. was allowed to stand at room temp. 2-3 hrs. and then heated for 30 mins. The product was *p,p'-diphenylmonothiodiurethan*, m. 211°, sol. in dil. alkali, insol. in dil. acid. I with tolidine gave *p,p'-ditolidylmonothiodiurethan*, m. 125-6°, sol. in alkali, insol. in acid.

LOUISE KELLEY

Preparation of *p*-azoxyanisole and derivatives. WM. DAVIES and RALPH A. R. DOWNS. Univ. of Melbourne. *J. Chem. Soc.* 1929, 586-7.—MeOH-MeONa (contg. 100 g. Na per l.) (69 cc.) and 31.5 g. *p*-ClC<sub>6</sub>H<sub>4</sub>NO<sub>2</sub> boiled 12 hrs., 51 cc. MeOH-MeONa added, MeOH distd. off, and the residue again boiled 12 hrs., give 64% of *p*-azoxyanisole. Similarly prepd. is 3,3'-dichloro-*p*-azoxyanisole, yellow, m. 182° (yield, 10.5 g. from 19.2 g. 1,2,4-Cl<sub>3</sub>C<sub>6</sub>H<sub>3</sub>NO<sub>2</sub>).

C. J. WEST

Formation of di-*p*-tolyl incidental to the preparation of benzylmagnesium chloride. The probable preliminary formation of free radicals in the preparation of Grignard reagents. HENRY GILMAN and JAMES E. KIRBY. Iowa State College. *J. Am. Chem. Soc.* 51, 1571-6 (1929).—Decompn. of a 1 mol. prepn. of PhCH<sub>2</sub>MgCl by iced HCl gives 72.1% PhMe, 3.1% (PhCH<sub>2</sub>)<sub>2</sub>, and 0.3% (*p*-MeC<sub>6</sub>H<sub>4</sub>)<sub>2</sub>. PhCH<sub>2</sub>Cl and *p*-MeC<sub>6</sub>H<sub>4</sub>Cl (0.1 mol. each) with 0.2 mol. Mg gave, after decompn. of the reagent with CO<sub>2</sub>, 51% of PhCH<sub>2</sub>CO<sub>2</sub>H and 87.3% *p*-MeC<sub>6</sub>H<sub>4</sub>Cl. PhCH<sub>2</sub>MgCl and CuCl<sub>2</sub> give

70% of  $(\text{PhCH}_2)_2$  and a trace of  $(p\text{-MeC}_6\text{H}_4)_2$ ; 1 mol.  $\text{PhCH}_2\text{MgCl}$  and 0.44 mol.  $(\text{PhN})_2$  give 53.2%  $(p\text{-H}_2\text{NC}_6\text{H}_4)_2$  and 37% of  $(\text{PhCH}_2)_2$ ;  $\text{PhCH}_2\text{MgCl}$  and  $\text{HCHO}$  give 26.9%  $o\text{-MeC}_6\text{H}_4\text{CH}_2\text{OH}$  and a little  $(p\text{-MeC}_6\text{H}_4)_2$ . The presence of  $(p\text{-MeC}_6\text{H}_4)_2$  is advanced as additional evidence for the preliminary formation of free radicals in the prepn. of Grignard reagents.

C. J. WEST

**Diphenylaminearsonic acid. I. Derivatives of diphenylamine-4-arsonic acid.** HARRY J. BARBER. May and Baker, Ltd., Wandsworth. *J. Chem. Soc.* 1929, 471-6.—4- $\text{ClC}_6\text{H}_4\text{AsO}_3\text{H}_2$  with  $\text{H}_2\text{SO}_4$  and  $\text{HNO}_3$ , heated 1 hr. on the  $\text{H}_2\text{O}$  bath, gives 85% of the 3- $\text{NO}_2$  deriv. (I); Ca salt, needles; Ba salt, plates. Heating 28 g. I in 2 N  $\text{NaOH}$  (50 cc.) and  $\text{H}_2\text{O}$  (150 cc.) with 10 g.  $\text{PhNH}_2$  16-20 hrs. on a steam bath gives nearly quant. 2-nitrodiphenylamine-4-arsonic acid, purified through the Na salt, fine yellow needles; reduction with  $\text{Fe}(\text{OH})_2$  at 80-90° gives 80% of the 2- $\text{NH}_2$  deriv. (II), m. 170.5°, turns blue in the air; HCl salt, needles, readily hydrolyzed by  $\text{H}_2\text{O}$  and slowly loses HCl in air; attempts to recryst. from  $\text{Me}_2\text{CO}$  gives the compd.  $\text{C}_{16}\text{H}_{17}\text{O}_3\text{N}_2\text{As}$ , which is either the 2-isopropylidene deriv. or *N*-phenyl-2,2-dimethyl-2,3-dihydrobenzimidazole; treatment of the base with  $\text{HNO}_2$  gives quant. *N*-phenylbenzotriazole-5-arsonic acid. The Ac deriv. (III) of II, diamond-shaped plates, on boiling with 2 N HCl gives *N*-phenyl-2-methylbenzimidazole-5(6)-arsonic acid. I and  $p\text{-H}_2\text{NC}_6\text{H}_4\text{OH}$  give 2-nitro-4'-hydroxydiphenylamine-4-arsonic acid, reddish brown needles; 2- $\text{NH}_2$  deriv., gray needles very susceptible to atm. oxidation; 4'-hydroxy-1-phenyl-1,2,3-benzotriazole-5-arsonic acid, needles. 2-Nitro-4'-acetamidodiphenylamine-4-arsonic acid, red needles; 2- $\text{NH}_2$  deriv., flat needles; this yields a di-Ac deriv., needles. Hydrolysis gives the 2,4'-di- $\text{NH}_2$  deriv., slender prisms. 2-Nitro-3'-acetamido-4'-hydroxydiphenylamine-4-arsonic acid, yellow needles; 2- $\text{NH}_2$  deriv., needles. 2'-Carboxy-2-nitrodiphenylamine-4-arsonic acid, yellow needles. *o*- and *p*- $\text{O}_2\text{NC}_6\text{H}_4\text{NH}_2$  do not condense with I. Nitration of III gives a 2',4'(?)-di- $\text{NO}_2$  deriv., yellow needles. 3,3'-Diamino-4,4'-dianilinoarsenobenzene and the 4,4'-di-*p*-Ac deriv. were prepd. by reduction of the arsonic acids; they are both yellow amorphous powders, which oxidize rapidly in the air. A table is given of the tolerated dose and the curative dose for the above compds. The introduction of an unsubstituted Ph group in the 4- $\text{NH}_2$  group of 3,4-( $\text{H}_2\text{N}$ ) $_2\text{C}_6\text{H}_3\text{AsO}_3\text{H}_2$  results in a very marked increase in toxicity, despite the lower As content and somewhat greater trypanocidal effect. Substitution in the non-arsenated Ph nucleus results in modification of the toxicity and curative action, which follows, in general, that of similar substitutions in  $\text{PhAsO}_3\text{H}_2$ . The introduction of an Ac group in the  $\text{NH}_2$  group results in a decrease of both toxicity and curative action.

C. J. WEST

**Organic derivatives of silicon. XXXVIII. Formation of tri- and tetraphenylsilicane and complex synthetic products from octaphenylcyclotetrasilicetetrane.** FREDERICK S. KIPPING AND ARTHUR G. MURRAY. Univ. College, Nottingham. *J. Chem. Soc.* 1929, 360-7; cf. *C. A.* 22, 3401.—Destructive distn. of cryst. octaphenylcyclotetrasilicetetrane gave tetraphenylsilicane, m. 235.6°, and triphenylsilicane, oil which does not solidify at 0°. The residue of the distn. contains about 20% Si (2Si:3Ph) and with the aid of solvents may be sepd. into fractions having graded properties, some of which have mol. wts. probably exceeding 4000. Octaphenylsilicetetrane, treated as above, also yields  $\text{Ph}_4\text{Si}$  and  $\text{Ph}_3\text{SiH}$  but does not yield the cyclic isomer.

C. J. WEST

**Compounds of the tryparsamide type. I. Resolution of *N*-phenylalanine-4-arsonic acid and of its amide.** CHARLES S. GIBSON, JOHN D. A. JOHNSON AND BARNETT LEVIN. Univ. of London. *J. Chem. Soc.* 1929, 479-88.—dl-*N*-Phenylalanine-4-arsonic acid (I), decomp. 207-10°, is obtained from  $\text{EtCHBrCO}_2\text{H}$  and atoxyl; soly. 0.5% in cold, 6% in boiling  $\text{H}_2\text{O}$ ; Et ester, m. 175.7° (decompn.); Me ester, m. 181° (slight decompn.); amide, m. 233-40°. Attempted reduction of I gave no definite products. Brucine salt, crystals with 7  $\text{H}_2\text{O}$ ,  $[\alpha]_{5461}^{20}$  -10.61° ( $\text{H}_2\text{O}$ , *c* 1.1446); decompn. of this salt gives d-I, m. 220-1° (decompn.),  $[\alpha]_{5461}^{20}$  -56.40° (as di-Na salt, *c* 0.8562); the mother liquors of the brucine salt gave the l-I, with  $[\alpha]_{5461}^{20}$  -55.94° (di-Na salt, *c* 0.8942). d-Et ester, decomp. 275-6°,  $[\alpha]_{5461}^{20}$  127.9° (EtOH, *c* 0.4464), 103.0° (as Na salt, *c* 0.4118); l-Et ester,  $[\alpha]_{5461}^{20}$  -125.8° (EtOH, *c* 0.7132), -102.8° (Na salt, *c* 0.3960). d-Me ester, m. 277-8° (decompn.),  $[\alpha]_{5461}^{20}$  117.6° (Na salt, *c* 0.6194); l-Me ester,  $[\alpha]_{5461}^{20}$  -116.3° (Na salt, *c* 0.4982). The Me esters were converted into the amides; l-amide, m. 242-3° (decompn.);  $[\alpha]_{5461}^{20}$  -13.3° (Na salt, *c* 0.6114); d-amide acid,  $[\alpha]_{5461}^{20}$  13.9° (Na salt, *c* 0.6536). The quinine salt of the amide acid has  $[\alpha]_{5461}^{20}$  -123.8° ( $\text{H}_2\text{O}$ , *c* 0.2412); decompn. of the salt gave an amide acid



with  $[\alpha]$   $-17.88^\circ$  and the mother liquor an amide acid with  $[\alpha]$   $16.5^\circ$ . These results indicate that racemization takes place during the conversion of the active ester into the amide and also during the hydrolysis of the amide to the acid. C. J. WEST

**Action of aromatic Grignard reagents on arsenic trioxide.** F. F. BLICKER AND F. D. SMITH. Univ. of Michigan. *J. Am. Chem. Soc.* **51**, 1558-65 (1929).—A reaction mechanism has been suggested to account for the products which are formed from the interaction of aromatic Grignard reagents and  $As_2O_3$ . Improved methods have been described for the prepn. of  $(Ph_2As)_2O$ ,  $[(p-MeC_6H_4)_2As]_2O$ ,  $[(p-MeOC_6H_4)_2As]_2O$  and  $[(\alpha-C_{10}H_7)_2As]_2O$ . *Tetra-p-biphenylarsyl oxide*, m.  $150-2^\circ$ . In the reaction of  $PhMgBr$  and  $PhAsO$ , a large excess of  $PhMgBr$  favors the formation of  $Ph_3As$ . The following new halides were prepd.: *di-p-tolylarsyl bromide*, m.  $65-6^\circ$ ; *iodide*, m.  $64-5^\circ$ ; *di-p-anisylarsyl bromide*, m.  $60-2^\circ$ ; *iodide*, m.  $40-2^\circ$ ; *di- $\alpha$ -naphthylarsyl bromide*, m.  $172-3^\circ$ ; *iodide*, m.  $140-1^\circ$ ; *dibiphenylarsyl chloride*, m.  $145-7^\circ$ ; *bromide*, m.  $147-9^\circ$ ; *iodide*, m.  $140-1^\circ$ . C. J. WEST

**Reaction of organic mercury compounds with organic halides.** II. FRANK C. WHITMORE AND E. N. THURMAN. Northwestern Univ. *J. Am. Chem. Soc.* **51**, 1491-503 (1929); cf. *C. A.* **17**, 2276.—Org. halides (32) of widely varying types have been treated with  $(p-MeC_6H_4)_2Hg$  and some of them with  $Bu_2Hg$  and  $Ph_2Hg$ . In general the Hg compds. are extraordinarily unreactive toward the halides studied. With the 5 halides which gave definite reactions the behavior of the Hg compds. was analogous to that of other types of bases with the same halides. In most cases it was necessary to heat the solns. at  $110^\circ$  for about 300 hrs. to bring about the reactions; even under these conditions 18 of the halides were recovered unchanged, while 7 others gave tarry products which could not be purified.  $CHBr(CO_2Et)_3$  and  $(p-MeC_6H_4)_2Hg$  give  $p-MeC_6H_4HgBr$ ,  $CH_2(CO_2Et)_2$ ,  $p-MeC_6H_4Br$  and a small quantity of an ester  $b_p$  205-10°; the products sepd. accounted for 91% of the starting materials.  $Ph_2CHBr$  and  $(p-MeC_6H_4)_2Hg$  give 80% of  $p-MeC_6H_4CHPh_2$ ; with  $Ph_2Hg$ , 90% of  $Ph_3CH$  was obtained; with  $Bu_2Hg$  there results  $BuHgBr$ , Hg, a trace of  $HgBr$ , a little  $(Ph_2CH)_2$  and 35% of  $Ph_2CHBu$ .  $Me_3CBr$  and  $(p-MeC_6H_4)_2Hg$  in  $CCl_4$  react almost quant. to give  $p-MeC_6H_4HgBr$ ,  $PhMe$  and  $Me_2C:CH_2$ ;  $Ph_2Hg$  gave similar results but seemed to react slightly more rapidly than the tolyl compd.  $EtMe_2Cl$  gave similar results with  $(p-MeC_6H_4)_2Hg$  and  $Ph_2Hg$ ; when an excess of iodide was used with  $(p-MeC_6H_4)_2Hg$  the products were  $HgI_2$ ,  $PhMe$  and  $Me_2C:CHMe$ .  $(EtO_2C)BrCHCH(CO_2Et)_2$  and  $(p-MeC_6H_4)_2Hg$  give  $(EtO_2C)_2C:CHCO_2Et$ , 9-Bromofluorene and  $(p-MeC_6H_4)_2Hg$  give  $p-MeC_6H_4HgBr$  and bisdiphenylacetylene;  $Ph_2Hg$  behaves similarly.  $PhCH=CHBrPh$  and  $(p-MeC_6H_4)_2Hg$  give  $PhCH:CHPh$ ,  $p-MeC_6H_4Br$  and  $p-MeC_6H_4HgBr$ . 2,4,6-( $O_2N$ ) $_3$  $C_6H_2HgCl$  and I give picryl iodide as does  $[2,4,6-(O_2N)_3C_6H_2]_2Hg$ . C. J. WEST

**Rearrangement of phenyl benzyl ethers.** WALLACE F. SHORT AND MARTIN L. STEWART. Univ. of New Zealand. *J. Chem. Soc.* **1929**, 553-9; cf. *C. A.* **22**, 1966.—van Alphen (*C. A.* **22**, 410) considers that the rearrangement of  $PhOCH_2Ph$  is intramol. but S. and S. consider it to be intermol. because (a) 2,4-( $PhCH_2$ ) $_2$  $C_6H_3OH$  is one of the main products under all the conditions tried; (b)  $PhOCH_2Ph$  is attacked by  $HCl$  at  $100^\circ$ , forming  $PhCH_2Cl$  and  $PhOH$ ; the necessity for a catalyst and the absence of  $(PhCl)_2$  show that the  $PhCH_2$  does not migrate as a free radical; (c) when the rearrangement is carried out in the presence of  $PhOMe$ , more than half of the  $PhCH_2$  becomes attached to the  $PhOMe$  nucleus.  $PhONa$  and  $PhCH_2Cl$  in dry  $PhMe$  give  $PhOH$ , 2- $HOC_6H_4CH_2Ph$  (I),  $PhOCH_2Ph$  and 2,6-dibenzylphenol,  $b_p$  237.5-8° (benzyl ether, m.  $65^\circ$ ;  $\alpha$ -naphthylurethan, m.  $165-6^\circ$ ). A modified method is given for the prepn. of 4- $HOC_6H_4CH_2Ph$  (II). The benzyl ether of I m.  $38^\circ$ ; of II,  $49.5^\circ$ . II, Na,  $PhCH_2Cl$  and  $PhMe$  give 36% of 2,4-dibenzylphenol (III),  $b_p$  252-4° ( $\alpha$ -naphthylurethan, light yellow, m.  $143-4^\circ$ ).  $PhOCH_2Ph$  was rearranged under 3 conditions; heating 100 g. with 40 g.  $ZnCl_2$  at  $160^\circ$ , with 2 g.  $ZnCl_2$  and  $HCl$  at  $100^\circ$  and with  $HCl$  alone at  $100^\circ$ , the 1st for 1 hr., the last 2 for 3 hrs. The following products, in g., were obtained:  $PhOH$ , 23.8, 13.4, 25.0;  $PhCH_2Cl$ , —, —, 9.0; I, 9.0, —, 7.6; II, 19.4, 28.4, 12.6; III, 40.4, 15.0, 12.6; resinous material, 27.4, 36.6, 33.2. Condensation of  $PhOMe$  and  $PhOH$  with  $PhCH_2Cl$  and rearrangement of  $PhOCH_2Ph$  in the presence of  $PhOMe$  give the following products: I and II, 17.0, 14.0; III, 6.6, 12.6; 4- $MeOC_6H_4CH_2Ph$ , 21.7, 28.5; 2,4-( $PhCH_2$ ) $_2$  $C_6H_3OMe$ , 1.9, 3.4; partition of  $PhCH_2Cl$ ,  $PhOMe/PhOH$ , 1.07, 1.35. 2- $HOC_6H_4OMe$  and  $PhCH_2Cl$  with  $ZnCl_2$  give 2-hydroxy-4-methoxydiphenylmethane, m.  $77^\circ$ ,  $b_p$  200°. C. J. WEST

**Some aromatic compounds containing tellurium.** F. P. MAZZA AND E. MELCHIONNA. Inst. of Org. Chem. and Pharm. of R. Univ. Naples. *Rend. accad. sci. Napoli* [3], **34**, 54-9 (1928).—Org. Te compds. are of interest because of their possible

application in therapy. Org. compds. of S, Se and Te are chem. very similar. Selenoindigo, prepd. by Lesser and Weiss (C. A. 6, 2737) by oxidation of 3-hydroxyselenonaphthene, resembled Friedländer's thioindigo. M. and M. could not obtain telluroindigo similarly. They found the prepn. of  $K_2Te$  inconvenient and the yield poor from KOH and  $H_2Te$  (made by Ernyei's method, Z. anorg. Chem. 25, 314, by electrolysis of 50%  $H_2SO_4$  with a Te cathode). Hence they made  $Na_2Te$  by Hugot's method (Compt. rend. 134, 1209; 136, 1709). Six g. powd. Te, 3 g. Na and excess liquid  $NH_3$  were cooled in liquid air and left 24 hrs. with frequent agitation in a large test tube closed with glass wool in a steel autoclave with a side tube. The excess  $NaNH_3$  was filtered through the glass wool into the side tube. The cooling and filtering were repeated 2-3 times. The  $Na_2Te$  in the tube was quickly dissolved in  $H_2O$  deprived of air and to it were added the calcd. amt. of  $Na_2CO_3$  (no air), and, shaking in a current of  $H_2$  and cooling with ice, a soln. of diazotized anthranilic acid (6 g. acid in 11 cc. concd. HCl and 3 g.  $NaNO_2$  in the smallest amt. of  $H_2O$ ). The red soln. was heated to the b. p. a few mins., filtered hot and acidified with HCl.  $H_2Te$  was evolved, and *diphenyl-tellurodi-o-carboxylic acid* (I),  $(HOOCCH_2)_2Te$ , yellow microcrystals, m.  $215^\circ$ , sep'd. *Di-Na salt*, white anhyd. prisms. I reduced with excess of hot 10% KOH and powd. Zn, filtered into the calcd. amt. of  $CH_2ClCO_2Na$ , heated 15 mins. to the b. p., acidified with  $H_2SO_4$ , gave *phenyl-telluroglycolic-o-carboxylic acid* (II),  $HOOCCH_2TeCH_2COOH$ , m.  $195^\circ$ . Refluxed 2 hrs. with  $NaOAc$  (equal wt.) and  $Ac_2O$  (8 parts), the  $Ac_2O$  distd. off, the residue boiled with 10% NaOH, filtered, cooled, acidified with HCl, (II) lost  $CO_2$ , forming 3-hydroxytelluronaphthene (telluro-2-hydroxybenzofuran),  $C_8H_7TeCH_2COH$ ,

yellowish white powder, decomp. at  $160^\circ$  and m.  $200^\circ$ , sol. in alk. hydroxides and yielding an Ac deriv. It could not be oxidized to telluroindigo. J. D S

Study of the germicidal activity of diaryl sulfide phenols. GUIDO E. HILBERT AND TREAT B. JOHNSON. Yale Univ. J. Am. Chem. Soc. 51, 1526-36 (1929). —  $p$ - $MeOC_6H_4SPh$  (cf. Hinsberg, Ber. 36, 107 (1903)),  $b_p$   $194-5^\circ$ , results in 10% yield from  $PhOH$  and  $PhSO_3H$ , followed by  $Me_2SO_4$ ; demethylation by  $HBr$  and  $Ac_2O$  gives 68.5% of  $p$ - $HOC_6H_4SPh$ ,  $b_p$   $164-5^\circ$ , monoclinic, m.  $50-1^\circ$ , soly. in  $H_2O$  34 parts in 100,000; *nitrobenzoate*, yellow, m.  $74-5^\circ$ . The structure was established by heating with 21%  $HBr$ - $AcOH$  at  $60^\circ$  for 20 hrs., giving  $p$ - $BrC_6H_4OH$  and  $Ph_2S_2$ . Heating 32 g.  $PhSO_3H$  and 11.5 g.  $PhOH$  on the water bath for 2 hrs., shaking with  $Na_2CO_3$ , steam distg. to remove  $PhOH$ , acidifying with  $HCl$ , extg. the oil which seps. with  $Et_2O$  and distg., gives directly 30% of pure  $p$ - $HOC_6H_4SPh$ . Oxidation of  $p$ - $MeOC_6H_4SPh$  with  $H_2O_2$  in  $AcOH$  gives 52% of the sulfone, m.  $90-1^\circ$ , hydrolyzed by  $HBr$  in  $Ac_2O$  to the  $p$ - $HOC_6H_4SO_3Ph$ , m.  $136-7^\circ$ .  $p$ - $MeOC_6H_4SPh$  is also obtained from  $PhSO_3Cl$  and  $p$ - $MeOC_6H_4MgBr$  in 31.6% yield and in 66% yield by a modification of Ziegler's method (Ber. 23, 2469 (1890)).  $o$ - $MeOC_6H_4SPh$ ,  $b_p$   $150-2^\circ$ ;  $o$ - $HOC_6H_4SPh$ ,  $b_p$   $140^\circ$  (*p*-nitrobenzoate, yellowish green, m.  $72-3^\circ$ ). *m*-Methoxydiphenyl sulfide, from  $PhSNa$  and *m*- $MeOC_6H_4N_2X$ ,  $b_p$   $156^\circ$  (34.7% yield). *m*-Hydroxydiphenyl sulfide,  $b_p$   $159-61^\circ$  (*p*-nitrobenzoate, yellow, m.  $103^\circ$ ). *p*-Methoxy-*p'*-methylidiphenyl sulfide,  $b_p$   $181-2^\circ$ , m.  $45-6^\circ$ ; *p*-HO deriv., m.  $67-8^\circ$ . The comparative  $PhOH$  coeffs. are:  $p$ - $HOC_6H_4SO_3Ph$ ,  $< 10$ ;  $o$ - $HOC_6H_4SPh$ , 33;  $p$ - $HOC_6H_4SC_6H_4Me$ , 50; *m*- $HOC_6H_4SPh$ , 68;  $p$ - $HOC_6H_4SPh$ , 115. The min. lethal dose of  $p$ - $HOC_6H_4SPh$  for small rabbits is 1.5 g. per lb. A comparison is given of the antiseptic strength of  $PhOH$  and  $p$ - $HOC_6H_4SPh$ . C. J. WEST

Salicylaldehyde and its methyl ether. MAURICE COPISAROW. Univ. of Manchester. J. Chem. Soc. 1929, 588-9. — (*o*- $MeC_6H_4$ ) $_2CO_3$  (in 83% yield from passing  $COCl_2$  into 108 g. *o*- $MeC_6H_4OH$  and 42 g.  $NaOH$  in 300 cc.  $H_2O$  at  $70-5^\circ$ ) gives a di-Cl deriv. which could not be purified; 380 g. of this product, 1200 cc.  $MeOH$  and 260 g.  $NaOH$  in 500 cc.  $H_2O$ , heated 1 hr. at  $100^\circ$ , give 50% of *o*- $HOC_6H_4CHO$ . Combined hydrolysis and methylation gives 38% *o*- $MeOC_6H_4CHO$  and 13% of *o*- $HOC_6H_4CHO$ . C. J. WEST

Polyhydroxychalcones, polyhydroxyhydrochalcones and polyhydroxyflavanones. II. Synthesis of naringenin and sakuranetin. J. SHINODA AND S. SATO. Tokushima Higher Tech. School. J. Pharm. Soc. Japan 48, 933-7 (1928). — In a previous publication (C. A. 23, 836) S. and S. reported on the synthesis of polyhydroxyflavanones. Employing the same method S. and S. succeeded in synthesizing naringenin (I) and sakuranetin (II).

gave naringenin di-Me ether (III), m.  $118^\circ$ , which did not depress the m. p. ( $117^\circ$  of sakuranetin mono-Me ether (Asahina, Shinoda and Inubuse, C. A. 22, 1692). and  $NH_2OH \cdot HCl$  gave an oxime, m.  $231^\circ$ . I (1 mol.) in  $Et_2O$  and  $CH_3N_2$  (1 mol.)

gave sakuranetin (IV), m. 150°, which did not depress the m. p. of natural sakuranetin. The oxime of IV, m. 195–6°, did not depress the m. p. of the oxime prepd. from natural sakuranetin. III. Synthesis of hesperetin. J. SHINODA AND M. KAWAGOE. *Ibid* 938–41.—Isovanillin in NaOH and  $\text{ClCO}_2\text{Et}$  gave isovanillin Et carbonate (I), m. 61–2°. I, malonic acid, pyridine and piperidine gave  $\text{EtO}_2\text{COC}_6\text{H}_4\text{MeCH:CHCO}_2\text{H}$  (II), m. 199°. II and  $\text{SOCl}_2$  gave the chloride (III), of II. III and phloroglucinol in  $\text{PhNO}_2$  with  $\text{AlCl}_3$  gave a compd. (IV), m. 227–8°, which did not depress the m. p. of natural naringenin, m. 225°. The oxime of IV, m. 229–30°, gave a dark violet color with  $\text{FeCl}_3$ .

F. I. NAKAMURA

**Influence of substituents on the Reimer-Tiemann reaction.** HERBERT H. HODGSON AND THOMAS A. JENKINSON. Tech. College, Huddersfield. *J. Chem. Soc.* 1929, 469–71; cf. *C. A.* 22, 949.—With 2 methods of isolating the HO aldehydes (in the 1st, the *o*-deriv. was removed by steam and detd. as the *p*-nitrophenylhydrazone, while the *p*-deriv. was detd. in the residue in the same manner; in the 2nd method, the reaction mixt. was dissolved in AcOH and divided into 2 parts, 1 of which was steam distd and the *o*-deriv. detd., while the total aldehydes were detd. in the 2nd half (the 2nd method is considered more reliable)), the following ratios of *o*/*p*-HO aldehydes were found: PhOH, 0.72, 0.6; *o*- $\text{MeC}_6\text{H}_4\text{OH}$ , 0.56, 0.48; *m*- $\text{MeC}_6\text{H}_4\text{OH}$ , 0.52, 0.46; *o*- $\text{ClC}_6\text{H}_4\text{OH}$ , 2.1, 1.6; *m*- $\text{ClC}_6\text{H}_4\text{OH}$ , 0.79, 0.71; *m*- $\text{BrC}_6\text{H}_4\text{OH}$ , 0.94, 0.72; *m*- $\text{IC}_6\text{H}_4\text{OH}$ , 0.94, 0.78. These results indicate that the *p*-position in PhOH is more reactive than the *o*. The influence of Cl in the 5-position is probably exerted in its combined general (direct) and inductive effects, since then the 4-position would be deactivated more than the 2-position; this view is supported by the behavior of *m*- $\text{MeC}_6\text{H}_4\text{OH}$ .

C. J. WEST

**Scission of diaryl ethers and related compounds by means of piperidine.** II. The nitration of 2,4,4'-trichlorodiphenyl ether and of 2,4-dichlorodiphenyl *p*-toluenesulfonate and benzoate. LESLIE G. GROVES, EUSTACE E. TURNER AND GLADYS IRENE SHARP. Univ. of London. *J. Chem. Soc.* 1929, 512–24; cf. *C. A.* 21, 2673.—2,4- $\text{Cl}_2\text{C}_6\text{H}_3\text{OH}$  is obtained in 80% yield from *p*- $\text{ClC}_6\text{H}_4\text{OH}$ ; the *p*-toluenesulfonate, m. 125°; nitration gives 2,4-dichloro-5-nitrophenyl *o*-nitro-*p*-toluenesulfonate (I), m. 103°; reduction with Fe and a little AcOH gives the diamino deriv., m. 159–61°; the diazo soln., with  $\text{CuCl}\cdot\text{HCl}$ , gives a red gum which, refluxed 3 hrs. with piperidine, gives 2,4,5- $\text{Cl}_3\text{C}_6\text{H}_2\text{OH}$ , m. 66–7°. 1-*p*-Toluenesulfonylpiperidine, m. 103°; *o*- $\text{NO}_2$  deriv. (II), pale greenish yellow, m. 112°. Heating I with  $\frac{1}{2}$  of its wt. of piperidine for 1.5 hr. at 100° gives II and 2,4-dichloro-5-nitrophenol (III), m. 105–6°. *N*-2,4-Dichlorophenylphthalimide, m. 155°;  $\text{HNO}_3$  in concd.  $\text{H}_2\text{SO}_4$  gives the 5- $\text{NO}_2$  deriv., pale yellow, m. 217–9°, saponif. by 90%  $\text{H}_2\text{SO}_4$  to 2,4,5- $\text{Cl}_2(\text{O}_2\text{N})\text{C}_6\text{H}_2\text{NH}_2$ . 2,4- $(\text{O}_2\text{N})_2\text{C}_6\text{H}_3\text{Cl}$  and 2,4- $\text{Cl}_2\text{C}_6\text{H}_3\text{OH}$  in KOH give 2,4-dichloro-2',4'-dinitrodiphenyl ether, pale greenish yellow, m. 118–9°; nitration gives the 5,2',4'-tri- $\text{NO}_2$  deriv., m. 128°; scission with piperidine gives III, while  $\text{PhNH}_2$  gives III and 2,4- $(\text{O}_2\text{N})_2\text{C}_6\text{H}_3\text{NHPH}$ . 4,4'-Dichloro-2-aminodiphenyl ether, m. 67°, results in 90% yield by reduction of the  $\text{NO}_2$  deriv. with Fe and a little AcOH; through the diazo reaction there results 2,4,4'-trichlorodiphenyl ether,  $b_p$  183°, m. 54–5°; 2'- $\text{NO}_2$  deriv., m. 86–7°, decompd. by piperidine into 2,4- $\text{Cl}_2\text{C}_6\text{H}_3\text{OH}$  and 4-chloro-2-nitrophenylpiperidine. The 5,2'-di- $\text{NO}_2$  deriv., pale yellow, m. 103–4°, is decompd. by piperidine to give III. 2,4,4'-Trichloro-5,2'-diaminodiphenyl ether, m. 93–4°. 2,4,4'-Trichloro-5,2,5'-trinitrodiphenyl ether, yellowish green, m. 155–7°; piperidine gives III and 4-chloro-2,5-dinitrophenylpiperidine, red, m. 70–1°. 4-Chloro-2,6-dinitrophenylpiperidine, golden, m. 165–6°, results from 4,2,6- $\text{Cl}(\text{O}_2\text{N})_2\text{C}_6\text{H}_2\text{OMe}$ . 2,4-Dichloro-5-nitrophenyl *m*-nitrobenzoate, m. 154°; 2,4-dichlorophenyl *m*-nitrobenzoate, m. 115–6°, gives the same product on nitration. 2,4-Dichloro-6-nitrophenyl *m*-nitrobenzoate, m. 149–50°, was prepd. for purposes of comparison. Chlorination of *m*- $\text{O}_2\text{NC}_6\text{H}_4\text{OH}$  gives 2,4-dichloro-3-nitrophenol, pale yellowish green, m. 85–7°; *p*-5-chloro-2-nitrophenyl deriv., m. 122°, reduced by Fe and a little AcOH to the 3- $\text{NH}_2$  deriv., m. 113–14°; the diazo soln., treated with  $\text{CuCl}\cdot\text{HCl}$  and the crude product heated with piperidine, gives 2,3,4-trichlorophenol, m. 80–1°, identical with that obtained by chlorinating 3,4- $\text{Cl}_2\text{C}_6\text{H}_3\text{OH}$ . III does not react with  $\text{SOCl}_2$  and gave no definite product with  $\text{PCl}_5$ . 4,5,1,2- $\text{Cl}_4\text{C}_6\text{H}_2(\text{NO}_2)_2$  and  $\text{PhOK}$  give 4,5-dichloro-2-nitrodiphenyl ether, yellow, m. 69–70°. 4,5,4'-Trichloro-2-nitrodiphenyl ether, pale yellow, m. 131–2° decompd. by piperidine, giving 4-chloro-2-nitrophenylpiperidine. 4,5,2',4'-Tetrachloro-2-nitrodiphenyl ether, pale yellow, m. 125–6°; the 2- $\text{NH}_2$  deriv. m. 97–8°.

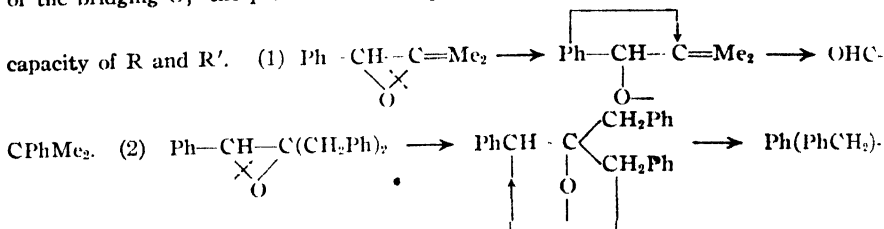
C. J. WEST

**The products of autocondensation of the ethyl esters of hexahydro- and  $\Delta^4$ -tetrahydroanthranilic acid.** F. P. MAZZA (with MARIA FERRAJOLO). Univ. Naples. *Rend. accad. sci. Napoli* [3], 33, 229–36(1927); cf. *C. A.* 21, 2468.—By autocondensation the

Et esters of hexahydro- and  $\Delta^4$ -tetrahydroanthranilic acid give products similarly as  $H_2NCH_2CO_2H$  gives diketopiperazine. *Anhydride of the dipeptide of hexahydroanthranilic acid (I)* (by allowing Et hexahydroanthranilate to stand for several weeks), colorless, fatty to the touch; *Ag salt*, white, giving Ag hexam. 300–5° (decompn.), boiling with  $H_2O$ ; *Cu salt*, azure; *di-Ac deriv.*, m. 210–1°. By hydroanthranilate on boiling with  $H_2O$ ; *Cu salt*, azure; *Et ester-HCl*, m. 210–1°. By boiling with 25% KOH for 5 mins. I was transformed to hexahydroanthranilic acid. *Dipeptide of hexahydroanthranilic acid (II)* (from I with 10 parts of N NaOH at room temp. for 15 to 20 mins. and acidifying with 10 parts of N HCl), decomp. about 250°, temp. for 15 to 20 mins. and acidifying with 10 parts of N HCl, decomp. about 200°; *free ester*, m. 102°; *Cu salt* (with 2  $H_2O$ ), azure; *Et ester-HCl*, decomp. about 200°; *free ester*, m. 102°, giving I on heating to about 150° or allowing it to stand in  $H_2O$ . On boiling I with fuming HCl for 2 or 3 mins. the HCl salt of II (with 1  $H_2O$ ), m. about 200°, was obtained. *Anhydride of the dipeptide of  $\Delta^4$ -tetrahydroanthranilic acid (III)* (prepd. similarly to I), m. 280°, white; *Ag salt*, white, decomp. on boiling with  $H_2O$ , giving Ag anthranilate; *Cu salt*, azure. By boiling with 25% NaOH in a  $H_2$  current, III was decompd. to  $\Delta^4$ -tetrahydroanthranilic acid. *Dipeptide of  $\Delta^4$ -tetrahydroanthranilic acid*, m. 270°, colorless, was prepd. similarly to II; *Cu salt*, azure; *Et ester-HCl*, m. 220–5° (decompn.); *free ester*, m. 106–8°, colorless, giving III by heating it to 110–5°. Et  $\Delta^2,6$ -dihydroanthranilate did not undergo autocondensation.

**Relative affinitive capacities of several radicals as exhibited in the rearrangement of trisubstituted ethylene oxides.** JEANNE LÉVY AND A. TABART. *Compt. rend.* 188, 402–4 (1929); cf. C. A. 20, 2850.—L. and T. detd. the relative affinitive capacities of certain radicals by studying the rearrangement by heat of several trisubstituted ethylene oxides,  $PhCH.O.CRR'$ . This rearrangement follows the rupture of one of the bonds

of the bridging O; the position of the rupture is detd. by the value of the affinitive capacity of R and R'. (1)  $Ph-CH-C=Me_2 \rightarrow Ph-CH-C=Me_2 \rightarrow OHC-$



In (2) one of the radicals, R and R', migrates exclusively or in large part. The rearrangement products have been isolated and identified by comparison with synthetic substances of known constitution. Following are the rearrangements. Relative affinitive capacities of radicals are indicated in parentheses and the migrating radicals are in italics.  $PhCH.O.CMe_2$  gives  $PhMe_2CCHO$ ; ( $Ph + H < Me +$

$Me$ ).  $PhCH.O.CEt_2$  gives  $PhEt_2CCHO$  and  $PhEtCHCOEt$ ; ( $Ph + H = Et + Et$ ).

$PhCH.O.CMeEt$  gives  $PhMeEtCCHO$  and  $PhEtCHCOMe$ ; ( $Ph + H = Me + Et$ ).

$PhCH.O.CMePr$  gives  $PhMePrCCHO$  and  $PhMcCHCOPr$ ; ( $Ph + H = Me + Pr$ ).

$PhCH.O.C(CH_2Ph)Me$  gives  $Ph(PhCH_2)CHCOMe$ ; ( $Ph + H > Me + PhCH_2$ ).

$PhCH.O.C(CH_2Ph)Et$  gives  $Ph(PhCH_2)CHCOEt$ ; ( $Ph + H > Et + PhCH_2$ ).

$PhCH.O.C(CH_2Ph)Pr$  gives  $Ph(PhCH_2)CHCOPr$ ; ( $Ph + H > Pr + PhCH_2$ ).

$PhCH.O.C(CH_2Ph)_2$  gives  $Ph(PhCH_2)CHCO(CH_2Ph)$ ; ( $Ph + H > PhCH_2 + PhCH_2$ ).

The affinitive capacity of Ph associated with H is less than that of 2 Me radicals, about equal to that of 2 Et radicals or of Me and Et or of Me and Pr, greater than that of 2 acyclic radicals of which one or both are  $PhCH_2$ . The acyclic radicals which migrate by preference (2) are always those of low affinitive capacity.

**Mobility of symmetrical triad (prototropic) systems. IV. Mobility in the simple three-carbon system terminated by aryl groups.** CHRISTOPHER K. INGOLD AND CHARLES W. SHOPPEE. Univ. of Leeds. *J. Chem. Soc.* 1929, 447–55; cf. C. A. 23, 121.— $p$ -MeOC<sub>6</sub>H<sub>4</sub>CH<sub>2</sub>CH·CHPh (I),  $b_p$  211 3°,  $n_{D_{461}}^{26}$  1.60194;  $p$ -MeOC<sub>6</sub>H<sub>4</sub>CH·CHCH<sub>2</sub>Ph

(II),  $b_{14-18}$  211–5°,  $n_{D_{461}}^{26}$  1.60659; no interconversion occurs in the presence of hot dil. alkali; on ozonolysis each isomer yields exclusively products corresponding to its constitution. Interconversion was effected in 1.45 *N* EtOH-NaOEt at 85°; the equil. mixt. contains 29.5% I and 70.5% II; velocity coeff. ( $k_1 + k_2$ ) = 0.79 hr.<sup>-1</sup>;  $k_1/k_2$  = 0.42;  $k_1$  = 0.23;  $k_2$  = 0.56. *p*-MeOC<sub>6</sub>H<sub>4</sub>CH<sub>2</sub>C(CO<sub>2</sub>H):CHPh (III), m. 165.5°; *p*-MeOC<sub>6</sub>H<sub>4</sub>CH: C(CO<sub>2</sub>H)CH<sub>2</sub>Ph (IV), m. 171.5°; interconversion was effective by heating either acid with NaOEt for various times up to 48 hrs. The equil. mixt. contains 44% III and 56% IV; f. p. of mixts. of III and IV are given. Since the numerical data cannot be expressed as velocity coeffs., the Me and Et esters were studied. *Me α-p-methoxybenzylcinnamate*,  $b_{14-18}$  237–8°,  $n_{D_{583}}^{19}$  1.58904,  $n_{D_{583}}^{19}$  1.59084,  $n_{D_{461}}^{19}$  1.60221; *Et ester*,  $b_{14-18}$  235°,  $n_{D_{583}}^{22}$  1.58334,  $n_{D_{461}}^{22}$  1.58972; *Me p-methoxy-α-benzylcinnamate* (V),  $b_{11-12}$  245°, m. 55°; *Et ester* (VI),  $b_{10-11}$  240–1°, m. 45°; alk. hydrolysis of the esters showed that no interconversion of isomers takes place in the presence of HO ions at 100°. The interconversion of the Me esters was slow, so that the Et esters were studied. The Et esters gave an equil. mixt. contg. 43.5% V and 56.5% VI; velocity coeff.,  $k_1 + k_2$  (mean) 0.0585 hr.<sup>-1</sup>;  $k_1/k_2$  = 0.770;  $k_1$  = 0.0255;  $k_2$  = 0.0330.

C. J. WEST

**Phenylhydroxymaleic anhydride.** J. BOUGAULT AND BL. LEROY. *Compt. rend.* 188, 921–3(1929); cf. *C. A.* 10, 1984.—PhC:C(OH).CO.O.CO, (I), reacts with amines

giving products only slightly sol. in ether. These combinations are all cryst. and have a definite m. p. Accordingly, I constitutes a valuable reagent for the characterization of amines.

R. P. WALTON

**1,3-Dimethyl-2-phenoxyacetic acid.** RALPH L. BROWN AND BRIANT F. BRANTING. Bureau of Mines. *Reports of Investigations, Dept. of Commerce*, No. 2912 (1929).—Hydroxyacetic acid derivs. of phenols are easily prepd. in good yield and are useful in studying mixts. of phenols. 1,3-Dimethyl-2-phenoxyacetic acid (I) is the 5th of 6 isomeric derivs. to be reported in the literature. The consts. of all 5 isomers are given. To 3 g. of 2,6-Me<sub>2</sub>C<sub>6</sub>H<sub>3</sub>OH, of which the constitution had been definitely established, was added 3.3 g. ClCH<sub>2</sub>CO<sub>2</sub>H and 11 cc. of 25% NaOH. The mixt. was refluxed 2 hrs., acidified with HCl and filtered. On cooling, the filtrate gave 3.9 g. of I, m. 141° after recrystn.

MARGARET W. MCPHERSON

**Coumarin condensations. I. Condensation of allylacetoacetic ester with phenols.** KIRVERJI GOSAI NAIK, RANCHHODJI DAJIBHAI DESAI and HARIBHAI RANCHHODJI DESAI. The College, Baroda. *J. Indian Chem. Soc.* 6, 83–7(1929); cf. *C. A.* 20, 1965.—Condensation of phenols with allylacetoacetic ester (I) gave the following *benzo-α-pyrone*s: 7-hydroxy-3-allyl-4-methyl, 3.8 g. from 2 g. *m*-C<sub>6</sub>H<sub>4</sub>(OH)<sub>2</sub> (II), 3 g. I and 20 g. concd. H<sub>2</sub>SO<sub>4</sub>, m. 221–2° (*Ac deriv.*, m. 152–3°); 3-allyl-4,7-dimethyl, 3.2 g. from 3 g. *m* cresol, 3 g. I and 10 g. concd. H<sub>2</sub>SO<sub>4</sub>, yellowish white, m. 126–7°; 5,7-dihydroxy-3-allyl-4-methyl, 2 g. from 1.5 g. anhyd. 1,3,5-C<sub>6</sub>H<sub>3</sub>(OH)<sub>3</sub>, 1.5 g. I and 10 g. H<sub>2</sub>SO<sub>4</sub>, pale brown, m. 207–8° (*Ac deriv.*, m. 130–1°); 7,8-dihydroxy-3-allyl-4-methyl, 2.5 g. from 2 g. 1,2,3-C<sub>6</sub>H<sub>3</sub>(OH)<sub>3</sub>, 2 g. I and 1.5 g. POCl<sub>3</sub>, m. 175–6° (*Ac deriv.*, m. 145–6°). The product obtained by condensing II with I in AcOH with dry HCl as condensing agent m. 200–1° and is probably 7-hydroxy-3-chloropropyl-4-methylbenzo-α-pyrone; *Ac deriv.*, m. 122–3°; *Bz deriv.*, m. 193°. Condensation of α-C<sub>10</sub>H<sub>7</sub>OH (2 g.) with I (2 g.) in the presence of concd. H<sub>2</sub>SO<sub>4</sub> (20 g.) gave 3 g. 3-allyl-4-methyl-5,6-naphtho-α-pyrone, yellowish white, m. 155–6°. PhOH gave with I no solid product; *o*-C<sub>6</sub>H<sub>4</sub>(OH)<sub>2</sub>, guaiacol, thymol, β-C<sub>10</sub>H<sub>7</sub>OH and quinol did not undergo condensation with I.

LOUISE KELLEY

**Menthol studies. II. Menthyl esters of the 2-nitro-4-carboxyphenylarsonic and phenylarsenious acids.** K. LUCILLE MCCLUSKEY. Chicago Municipal Tuberculosis Sanitarium. *J. Am. Chem. Soc.* 51, 1462–5(1929); cf. *C. A.* 21, 907.—Directions are

1. the arsonic acid in H<sub>2</sub>O by SO<sub>2</sub>-KI gives 2-nitro-4-carboxyphenyldihydroxyarsine, light yellow, does not melt or decomp. below 290°. Refluxing I with SOCl<sub>2</sub> for 1 hr. and treating the chloride with menthol gives the menthyl 2-nitro-4-carboxyphenylarsenite, light yellow, which does not melt sharply but evolves a gas above 100°. Oxidation of this ester with H<sub>2</sub>O<sub>2</sub> in Me<sub>2</sub>CO gives the corresponding arsonate, decomp. 210–1°; Na salt crystallizes with 4 H<sub>2</sub>O; both the hydrated and anhyd. forms are very sol. in H<sub>2</sub>O.

C. J. WEST

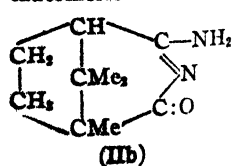
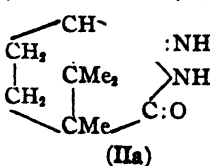
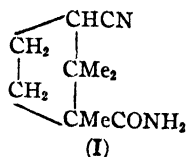
Optical activity and the polarity of substituent groups. X. Influence of ionizable

groups on the rotatory power of *l*-menthyl benzoate. H. GORDON RULE and W. EOGHAN MACGILLIVRAY. Univ. of Edinburgh. *J. Chem. Soc.* 1929, 401-9; cf. *C. A.* 22, 3405.—*l*-Menthyl salicylate, from the acid chloride and menthol in 60% yield,  $b_{D,1}$  156°; the *m*-hydroxybenzoate,  $b_{D,1}$  182° (20% yield); *p*-hydroxybenzoate, pale yellow,  $b_{D,1}$  178° (10% yield); reduction of the *o*-nitrobenzoate gives the *anthranilate*,  $b_{D,1}$  156°,  $m$ . 62.5-3.5°; *HCl* salt,  $m$ . 150-70°; the EtOH soln. has a violet fluorescence; *m*-aminobenzoate,  $b_{D,1}$  168° (40% yield); *p*-aminobenzoate,  $b_{D,1}$  175° (10% yield); *o*-dimethylaminobenzoate,  $m$ . 36-7°,  $b_{D,1}$  170°. Rotatory powers are given for the homogeneous salicylate and for the HO esters in EtOH, EtOH + NaOEt and KOEt and piperidine and for the NH<sub>2</sub> esters in EtOH and EtOH + HCl. The compds. exhibit normal and complex dispersion. The *o*-derivs. differ considerably in rotatory power from the unsubstituted ester. In these compds. the introduction of an *o*-CO<sub>2</sub>H group results in a marked rise in rotation, which is changed to a fall when the substituent ionizes to -COO'. On the other hand, an *o*-Me<sub>2</sub>N group depresses the rotatory power of the benzoate but raises the value in the presence of acids and NMe<sub>2</sub>H<sup>+</sup>. The optical changes are, therefore, related to the orienting power of the groups in C<sub>6</sub>H<sub>5</sub> substitution, the *m*-directive CO<sub>2</sub>H and NMe<sub>2</sub>H radicals raising the rotation and the *o*,*p*-directive Me<sub>2</sub>NH and COO' anion lowering the value. The exceptional behavior of the HO and NH<sub>2</sub> derivs. is ascribed to the chelated condition of these compds. C. J. WEST

Irreversible catalysis of unsaturated cyclic hydrocarbons. VI. Contact transformations of nopinene, terpinene and terpinolene. N. D. ZELINSKII and R. J. LEVINA. I. Univ. Moskau. *Ber.* 62B, 339-43 (1929); cf. *C. A.* 21, 2469.—It was shown in earlier papers that irreversible catalysis is general not only for the simplest unsatd. derivs. of cyclohexane but also for some mono- and bicyclic terpenes (limonene, pinene, thujene) and the results in the present paper show that this is also true for other terpene hydrocarbons. The nopinene used  $b_{742}$  163.5 5.5° almost completely,  $n_D^{20}$  1.4766. On 1 hydrogenation over Pd-charcoal at 170-5° it gave a completely hydrogenated product, whose  $n$  did not change on a 2nd hydrogenation. The part remaining adsorbed on the Pd-charcoal was displaced with H at 240° and also showed the same  $n$ . The dihydro product was indifferent towards KMnO<sub>4</sub>,  $b_{737}$  167-7.5° completely when distd over Na,  $d_4^{20}$  0.8521,  $d_4^{16}$  0.8563,  $n_D^{16}$  1.4628,  $M_D$  43.76 (calcd. 43.93). Nopinene, therefore, gives but 1 product on reduction whereas the reduction mechanism of pinene has been shown to depend on the temp. and the nature of the catalyst. When nopinene is slowly passed (6-8 drops per min.) over Pd-asbestos at 190° there is obtained a catalyzate whose  $n$  does not change on repeating the operation; it has the characteristic odor of cymene and when it is shaken with fuming H<sub>2</sub>SO<sub>4</sub> (7%) to remove the cymene there remains about 50% of dihydronipene,  $b_{732}$  166-8°,  $d_4^{21}$  0.8447,  $d_4^{18}$  0.8470,  $n_D^{21}$  1.4554. Like pinene, then, nopinene in contact with Pd smoothly changes into cymene and dihydronipene, probably first isomerizing into  $\alpha$ -pinene. Terpinene and terpinolene, similarly passed slowly in CO<sub>2</sub> over Pd-asbestos at 190° and 160-70°, resp., gave cymene and menthane. The position of one of the double bonds (within or without the nucleus) in monocyclic terpene hydrocarbons has no influence, therefore, on the end result. Pd-charcoal can also be used instead of Pd-asbestos, but on account of the greater adsorptive power of the latter a considerable part of the hydrocarbon is retained within the micellae and thus protected from contact with the active surfaces of the catalyst so that it must be passed over the catalyst repeatedly.

C. A. R

Some new camphor bases. HANS W. EGLI. *Helv. Chim. Acta* 12, 270-7 (1929).—A by-product of the prepn. of isonitrosocamphor, reported by Bredt (cf. *C. A.* 12, 902) is identical with the product obtained by Tiemann (cf. *Ber.* 33, 2960 (1900)) by treating camphoric  $\alpha$ -nitrile  $\beta$ -amide (I) with alkali. E. assigns the tautomeric formulas IIa



and IIb to this compd., *camphoric imide  $\alpha$ -ketimide*,  $m$ . 278°; *HCl* salt,  $m$ . 250°; *picrate*, yellow,  $m$ . 269°; *phenylthiourea*,  $m$ . 234°; *Bz* deriv.,  $m$ . 204°. Similarly, from camphoric  $\alpha$ -amide  $\beta$ -nitrile, E. preps. *camphoric imide  $\beta$ -ketimide*,  $m$ . 238°; *HCl* salt,  $m$ . 230°; *picrate*,  $m$ . 293°.  $\alpha$ -Aminocamphor condensed with AcCH<sub>2</sub>CHAcCO<sub>2</sub>Et in

glacial AcOH yields  $\alpha$ -[2-methyl-4-carbethoxymethyl-1-pyrryl]camphor (III), m. 139°. Sapon. of III with alc. KOH yields  $\alpha$ -[2-methyl-4-carboxymethyl-1-pyrryl]camphor (IV), m. 232°. Heating IV above its m. p. yields  $\alpha$ -[2,4-dimethyl-1-pyrryl]camphor (V), m. 90°, b<sub>0</sub> 176°, which is also formed in poorer yield by condensing (AcCH<sub>3</sub>)<sub>2</sub> with  $\alpha$ -aminocamphor. V reduced with Sn and HCl yields a Sn double salt of  $\alpha$ -[2,4-dimethyl-1-pyrrolino]camphor (VI), (C<sub>10</sub>H<sub>15</sub>ON·HCl)<sub>2</sub>·SnCl<sub>2</sub>, m. 149°; HCl salt, C<sub>10</sub>H<sub>15</sub>ON·HCl, m. 232°; picrate, m. 194°, yellow. Attempts to prep. condensed ring systems of camphor by the action of MeCOCH<sub>2</sub>Cl failed to yield the desired products, but gave small yields of a white, cryst., indifferent substance, m. 226°, and a basic compd., m. 186°, together with some camphorquinone.

M. A. DAHLEN

**Phytochemistry.** V. Allobetulin. O. DISCHENDORFER AND O. POLAK. *Techn. Hochschule, Graz. Monatsh.* 51, 43-58 (1929).—Oxidation of allobetulin C<sub>28</sub>H<sub>46</sub>O·CH(OH)·CH<sub>2</sub> (I) with a mixt. of fuming HNO<sub>3</sub> and AcOH below 0° gives

oxyallobetulinic acid, C<sub>28</sub>H<sub>44</sub>O<sub>2</sub>(CO<sub>2</sub>H)<sub>2</sub> (II), m. 283-4°, [ $\alpha$ ]<sub>D</sub> about 57°. The same acid may be obtained in a similar way from allobetulone, C<sub>28</sub>H<sub>44</sub>O·CO·CH<sub>2</sub> (III), and

from oxyallobetulin, C<sub>28</sub>H<sub>44</sub>O<sub>2</sub>·CH(OH)·CH<sub>2</sub> (IV). Heating II with Ac<sub>2</sub>O forms an

anhydride, m. 290-2°, [ $\alpha$ ]<sub>D</sub> about 86°, and this reverts to the original when heated with dil. AcOH or alkali. When II is distd. at 300° it loses H<sub>2</sub>O and CO<sub>2</sub>, and forms a ketone (C<sub>28</sub>H<sub>44</sub>O<sub>2</sub>)<sub>2</sub>CO (V), [ $\alpha$ ]<sub>D</sub> about 153°.

J. J. WILLAMAN

**New derivatives of diphenyl.** A. ANGELETTI AND D. GATTI. *Reale Univ., Torino. Gazz. chim. ital.* 58, 630-5 (1929); cf. C. A. 21, 578.—Six new Ph<sub>2</sub> derivs. were prepd. For the partial diazotization of [H<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>]<sub>2</sub>, the method of Täuber (cf. *Ber.* 1894, 2627) was found to give a higher yield than that of Bamberger (cf. *Ann.* 390, 160). The product, C<sub>12</sub>H<sub>9</sub>NC<sub>6</sub>H<sub>4</sub>C<sub>6</sub>H<sub>4</sub>N<sub>2</sub>Cl, heated on a water bath for 1 hr. with aq. CuCN, filtered, washed with water, dissolved in dil. HCl, repptd. with NH<sub>4</sub>OH, the purification repeated, and the compd. recrystd. from PhMe, yields 4-cyano-4'-aminodiphenyl, red, m. 157°, burns with great difficulty. 4-Iodo-4'-aminodiphenyl (cf. *Ber.* 39, 4177 (1906)) (2.5 g.) in dil. HCl (20 g. 5 N HCl + 500 cc. water) diazotized at 5° by concd. NaNO<sub>2</sub> (0.65 g.), heated 1 hr. on a water bath, the ppt. dissolved in hot dil. NaOH, dil. HCl added, and the ppt. purified by sublimation, yields 4-iodo-4'-hydroxydiphenyl, pale yellow, m. 194°. From all solvents it seps. as a yellowish, amorphous powder. It was also prepd. by diazotizing 4-amino-4'-hydroxydiphenyl and subsequent formation of the I deriv. 4-Chloro-4'-aminodiphenyl (cf. *Ber.* 39, 4177 (1906)) (2 g.) in dil. HCl (10 g. 5 N HCl + 350 cc. water) diazotized with concd. NaNO<sub>2</sub> (0.75 g.), filtered, the soln. heated 1 hr. on a water bath, the ppt. dissolved in dil. NaOH, repptd. with dil. HCl and crystd. successively from water and from petr. ether, yields 0.8 g. of 4-chloro-4'-hydroxydiphenyl, m. 146-7°. 4-Bromo-4'-aminodiphenyl (cf. *Ber.* 39, 4177 (1906)) (2 g.) in dil. HCl (10 g. 5 N HCl + 300 cc. water), diazotized with concd. NaNO<sub>2</sub> (0.65 g.) and the same procedure followed as before, yields 0.5 g. of 4-bromo-4'-hydroxydiphenyl, iridescent, silky, pale yellow, m. 155-6°. By further concn. of the petr. ether, a trace of an unidentified halogenated, HO compd., m. 108-9°, was obtained. 4-Chloro-4'-aminodiphenyl (2 g.) in dil. HCl (10 g. 5 N HCl + 350 cc. water) diazotized with concd. NaNO<sub>2</sub> (0.75 g.), filtered, the filtrate poured slowly, with continuous agitation, into hot 50% aq. CuBr (strongly acidified with H<sub>2</sub>SO<sub>4</sub>), boiled, let stand overnight, filtered, the residue washed with H<sub>2</sub>SO<sub>4</sub> (1:2), then with warm, dil. NaOH (to remove a little 4-chloro-4'-hydroxydiphenyl which is also formed), with water and with hot EtOH, and the product sublimed, yields 0.5 g. of 4-chloro-4'-bromodiphenyl, pale yellowish, m. 151-2°. Following the same procedure in the diazotization of 4-chloro-4'-aminodiphenyl, and then pouring the soln. into 30% KI, boiling, decolorizing with SO<sub>2</sub>, and crystg. the product from EtOH by diln. with water, yields 0.6 g. of 4-chloro-4'-iododiphenyl, light yellow, m. 147-8°. In the prepn. of 4-iodo-4'-nitrodiphenyl (cf. C. A. 21, 578), a HO compd., m. 170-1°, was obtained which was apparently identical with the compd. considered by Schmidt and Schultz to be 4-hydroxy-4'-nitrodiphenyl (cf. *Ann.* 207, 347 (1881)). By fractional crystn. from EtOH was also obtained an unidentified hydroxynitrodiphenyl deriv., m. 200-1°. Bell and Kenyon (cf. *J. Chem. Soc.* 1926, 3044) have prepd. 4-nitro-4'-hydroxydiphenyl, m. 203°, and have furthermore concluded that the compd. of Schmidt and Schultz was the 3,4'-dinitro-4-hydroxydiphenyl, m. 172°, obtained by B. and K. Expts. by A. and G. on these compds. show that the compd., m. 171°, is 3,4'-dinitro-4-hydroxydiphenyl as believed by B. and K., while the compd. previously described by Angeletti (cf. C. A. 21, 578) which m. 200-1° is 4-hydroxy-4'-nitrodiphenyl.

C. C. DAVIS

**Orientation effects in the diphenyl series. VII. The effect of substituents in one nucleus on the ratio *ortho*-*para* nitration in the other.** The nitration of 2- and 4-nitro- and 2,4- and 2,4'-dinitrodiphenyl and of diphenyl-4-carboxylic acid. HERBERT C. GULL AND EUSTACE E. TURNER. Univ. of London. *J. Chem. Soc.* 1929, 491-500; cf. *C. A.* 22, 2377.—4-NO<sub>2</sub>C<sub>6</sub>H<sub>4</sub>Ph, on nitration, gives 37 and 63%, resp., of the 2',4'- and 4',4'-di-NO<sub>2</sub> derivs.; the 2-NO<sub>2</sub> deriv. gives 39 and 61%, resp., of the 2',2'- and 2,4'-di-NO<sub>2</sub> derivs. In neither case was the 2,4-di-NO<sub>2</sub> deriv. formed; its formation was not expected in view of the known retarding influence of the NO<sub>2</sub> group on further substitution in the same nucleus. Ph<sub>2</sub>, nitrated at 50°, gives 29.8% of the 4,4'-di-NO<sub>2</sub> deriv., (4-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>)<sub>2</sub> and HNO<sub>3</sub> give 2,4,4'-trinitrodiphenyl, pale yellow, m. 176°; further nitration gives [2,4-(O<sub>2</sub>N)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>]<sub>2</sub>. F. p. curves are given for the 2,2'- and 2,4'-di-NO<sub>2</sub> derivs. (eutectic with 39% of the 2,2'-deriv.). 2,4-Dinitrodiphenyl, golden yellow, m. 110°, results from PhI and 2,4-(O<sub>2</sub>N)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>Cl with Cu bronze at 225-30°; nitration gives a mixt. of 55% of 2,4,4'- and 45% of 2,4,2'-tri-NO<sub>2</sub> derivs., for which mixt. a f. p. curve is given. Nitration of (2-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>)<sub>2</sub> gives 80-5% of 2,4,2'-trinitrodiphenyl, pale yellow, m. 150-1°; further nitration gives [2,4-(O<sub>2</sub>N)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>]<sub>2</sub>. Nitration of the 2,4'-di-NO<sub>2</sub> deriv. gives 52.5% of 2,4,4'- and 47.5% of 2,4,2'-tri-NO<sub>2</sub> deriv. Picryl chloride and PhI with Cu bronze at 205° give 2,4,6-trinitrodiphenyl, pale yellow, m. 130°. 4-HO<sub>2</sub>CC<sub>6</sub>H<sub>4</sub>Ph, on nitration in concd. H<sub>2</sub>SO<sub>4</sub>, yields sulfonation products; nitration is complete in AcOH only when 4 mols. HNO<sub>3</sub> are used at the b. p. In HNO<sub>3</sub> (d. 1.5) at -15° only di-NO<sub>2</sub> derivs. result; the mixt. contains 49% of the 2,4'-di-NO<sub>2</sub> deriv., m. 265°; the other product is the 2,2'-di-NO<sub>2</sub> acid, m. 194-5°. Their structure was detd. by removal of the CO<sub>2</sub>. C. J. WEST

**Diphenyl and its derivatives (and dinaphthyls). Cleavage into optical antipodes of compounds which do not contain asymmetric atoms. II.** L. MASCARELLI. Reale Univ. Torino. *Gazz. chim. ital.* 58, 627-30(1928).—Establishment of the principles governing the existence of optical isomers (cf. M., *C. A.* 22, 68) suggested that  $\beta,\beta$ -diamino- $\alpha,\alpha$ -dinaphthyl (I) might also be subject to the same rules and throw further light on the subject. Besides having the theoretical structure to give the isomers in question, its 2 NH<sub>2</sub> groups allow, by salification with optically active acids, the completion of the cleavage into antipodes. Scarcity of I and difficulties of crystn. and purification of the salts prevented anything more than indications of all the results hoped for, but did prove conclusively that I can be resolved into 2 optical antipodes. On the other hand  $\alpha,\alpha$ -diamino- $\beta,\beta$ -dinaphthyl (II) gave no evidence of the existence of optically active forms, which conforms to the theory that mol. asymmetry is absent because rotation of the 2 naphthyl nuclei around their axis of conjugation is not prevented by the presence of the 2  $\alpha$ -NH<sub>2</sub> groups. It is intended to expt. with a larger quantity of II or with  $\alpha,\beta$ -dinaphthyl derivs., for the latter should show interesting phenomena of isomerism. It is also suggested that dipyrrolyl, dipyridyl, diquinolyl, diindyl, dicarbazolyl, diacrydyl, dianthracyl, dianthraquinonyl and diphenanthryl derivs. should behave like Ph<sub>2</sub> derivs., and even some aliphatic compds. should show a suppressed rotation, with consequent mol. asymmetry. C. C. DAVIS

**Constitution of Bandrowski's base.** JOHN J. RITTER AND GUNTHER H. SCHMITZ. New York Univ. *J. Am. Chem. Soc.* 51, 1587-9(1929).—Bandrowski (*Monatsh.* 10, 123(1889)) obtained on oxidation of *p*-C<sub>6</sub>H<sub>4</sub>(NH<sub>2</sub>)<sub>2</sub> with K<sub>3</sub>Fe(CN)<sub>6</sub> a base to which he assigned the structure [2,5-(H<sub>2</sub>N)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>N:]<sub>2</sub>C<sub>6</sub>H<sub>4</sub>; since there is the possibility that the isomer 2,5,1,4-C<sub>6</sub>H<sub>2</sub>(NH<sub>2</sub>)<sub>2</sub>:(NC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub>(*p*))<sub>2</sub> might be formed, the base was oxidized with PbO<sub>2</sub> and H<sub>2</sub>SO<sub>4</sub>. The yield of O:C<sub>6</sub>H<sub>4</sub>:O confirms the structure first assigned to the base; this structure can yield but 1/3 of a mol. of O:C<sub>6</sub>H<sub>4</sub>:O on oxidation, while the 2nd formula should yield 2/3 mol. C. J. WEST

**Nitration of 4-chloro-4'-bromobenzophenone and -diphenyl sulfone and the attempted nitration of 4-chloro-4'-bromodiphenyl.** LESLIE G. GROVES AND EUSTACE E. TURNER. Univ. of London. *J. Chem. Soc.* 1929, 509-11.—PhCl (32 g.), 50 g. *p*-BrC<sub>6</sub>H<sub>4</sub>COCl and 32 g. AlCl<sub>3</sub> in 100 cc. CS<sub>2</sub>, boiled 2 days, give 25 g. 4-chloro-4'-bromobenzophenone, very pale brown, m. 150° (all m. ps. cor.); nitration with KNO<sub>3</sub> in H<sub>2</sub>SO<sub>4</sub> gives 51% of the 3-NO<sub>2</sub> and 49% of the 3'-NO<sub>2</sub> deriv., the mixt. being analyzed by means of piperidine. 4-Chloro-4'-bromodiphenylsulfone, m. 157°; nitration gives 34% of the 3-NO<sub>2</sub> and 66% of the 3'-NO<sub>2</sub> deriv.; HNO<sub>3</sub> gives the 3,3'-di-NO<sub>2</sub> deriv., pale yellow, m. 219°. 4-Chloro-4'-bromodiphenyl, m. 147°, was prepd. from the 4,4'-ClC<sub>6</sub>H<sub>4</sub>C<sub>6</sub>H<sub>3</sub>NH<sub>2</sub> through the diazo compd.; HNO<sub>3</sub> causes degradation. C. J. W.

**Constitution of phenol-formaldehyde condensation product. II. When an acid is used as a condensing agent.** SHUNZO SUGIMOTO. *Repts. Imp. Ind. Research Inst. Osaka* (Japan) 9, No. 2, 1-28(1928); cf. *C. A.* 22, 142.—The condensation of PhOH and HCHO is greatly accelerated by the presence of a small amt. of acid. The condensa-



tion takes place even at room temp. if the reaction mixt. is left standing for a long time. When the amt. of acid is small, the rate depends on the H ion concn., whereas in presence of a greater quantity of acid, the reaction becomes complicated due to the presence of the undissociated acid. The application of heat also accelerates the reaction. Due to the difference in the mode of application of heat, sometimes sol. and sometimes insol. condensation products are obtained. This is due to the difference in the proportion of HCHO which combines with PhOH. PhOH and HCHO were condensed by using an acid (HCl) as a condensing agent. The oily product thus obtained was steam distd. From the residual fluid pure cryst. *o*- and *p*-dihydroxydiphenylmethane were isolated. The resinous residue left after repeated steam distn. has a definite compn.,  $n(C_7H_6O)$ , and is free from PhOH, HCHO or  $CH_2(C_6H_4OH)_2$ .  $HNO_3$ ,  $H_2SO_4$  and  $H_2C_2O_4$  gave practically the same results as HCl. From the above facts, it is concluded that the condensation of PhOH and HCHO when an acid is used as a condensing agent proceeds as follows:  $PhOH + HCHO \rightarrow HOC_6H_4CH_2OH$ . The hydroxybenzyl alc. (I) thus formed dehydrates itself to form a resinous substance (II) with the compn.  $n(C_7H_6O)$ . It also combines with PhOH and gives *o*- and *p*-dihydroxydiphenylmethane (III) and a mol. of  $H_2O$ . Thus,  $PhOH + HOC_6H_4CH_2OH \rightarrow (HOC_6H_4)_2CH_2 + H_2O$ . In the beginning of the reaction, I is not dehydrated and since it is sol. in  $H_2O$ , no oily product is obtained, but as the reaction proceeds, the formation of II and III takes place with an increased production of  $H_2O$ . Both II and III are slightly sol. in hot  $H_2O$ , but they are more sol. in PhOH and HCHO. The mixt. of II, III, PhOH and HCHO forms an oily phase which seps. from the  $H_2O$  layer. When the amt. of II reaches about 40% of the total oily product the reaction mixt. becomes emulsified and henceforth the sepn. of the oily layer takes place. Thus the oily product which heretofore was thought to be an intermediate product of condensation is not such but is a mixt. of II and III in PhOH and HCHO. On the 2nd stage of heating a further reaction of the free PhOH and HCHO takes place to give an increased production of II and finally these condensation products form a transparent resinous solid soln. If excess of PhOH is present, III combines with it to form an insol. substance, but if an excess is not present III exists in a free state and can be isolated from the alc. soln. of the sol. condensation product. From the above it is seen that the main constituent of the sol. condensation product is II mixed with a small amt of III, PhOH and HCHO.

NAO UYEI

**Aldehydophenolphthalein and dyes derived from it.** RAJENDRA NATH SEN AND KALI CHARAN KAR. Presidency College. *J. Indian Chem. Soc.* 6, 53-63(1929).—Phenolphthalein (12.5 g.) in 16 g. NaOH and 32 cc.  $H_2O$  heated on the  $H_2O$  bath and treated during 12 hrs. with 14 cc.  $CHCl_3$  gave 20% of aldehydophenolphthalein (I), yellowish, m. 97-99°, sol. in NaOH and glacial AcOH, insol. in dil. acids. Phenylhydrazone, yellow, m. 148°, sol. in NaOH and  $Na_2CO_3$  with violet color. Dioxime, yellow, decomp. 235°. Phenolphthaleinoin, yellow, m. 152°. By the condensation of I with amines the following azomethin dyes were prepd.: phenolphthaleinal-*p*-toluidine, 90% yield, light orange, m. 140°;  $\beta$ -naphthylamine, 90% yield, yellow, m. 154°, dyes wool and silk light yellow; aminoazobenzene, 90% yield, red, decomp. 235°, dyes wool and silk yellow; diphenolphthaleinalbenzidine, 80% yield, orange, m. 191°, dyes wool and silk orange; *p*-phenylenediamine, 70% yield, yellowish brown, softens 230°, dyes wool and silk light orange; *o*-phenylenediamine, 80% yield, yellow, m. 218°, dyes wool and silk straw-yellow; chrysoidine, 90% yield, red, dyes wool and silk yellowish brown; safranin, 90% yield, red, dyes wool and silk scarlet-red; triphenolphthaleinalrosaniline, 85% yield, violet-red, dyes wool and silk brilliant red. These dyes are in general hydrolyzed by hot mineral acids. By condensation of I with phenols in the presence of concd.  $H_2SO_4$ , the following pyronine dyes were obtained: diresorcinolphthaleinein, 60% yield, orange, with a green fluorescence in alk. or EtOH solns.; tri-K salt, red, dyes wool and silk deep yellow; di- $\beta$ -naphthol deriv., 80% yield, grayish, decomp. 260; mono-K salt, red; dihydroquinone deriv., 80% yield, grayish black, decomp. 250°, shows slight yellow-green fluorescence in alk. soln., dyes wool and silk light brown; tri-K salt; dipyrrogallol deriv., 65% yield, grayish black, decomp. 260°, dyes Al-mordanted wool dark brown and Fe-mordanted wool grayish black; phenolphthaleinalrhodamine, 90% yield, violet, dyes wool and silk red. The following triphenylmethane dyes were prepd.: I and  $PhNMe_2$  heated on the  $H_2O$  bath for 24 hrs with the addn. of concd. HCl gave tetramethyldiaminodiphenylphenolphthaleinmethane, 90% yield, greenish white, softens 187°. Oxidation with  $PbO_2$  gave the carbinol, the HCl salt of which is a deep bluish green, producing a bluish green shade on wool, silk and tanned cotton. A paste made from 3 g. I, 1.5 g. *o*-cresotinic acid and 2 cc. concd.  $H_2SO_4$  was allowed to stand overnight. From it was obtained di-

*methyl-dihydroxydicarboxylicdiphenylphenolphthaleinmethane*, 80% yield, yellow, softens 215°. Oxidation with nitrosyl sulfate at 50–60° gave a red product which dyes wool red, deepening to black when after-chromed. LOUISE KELLEY

**Hydroxyhydroquinonesulfonephthalein**, 2',4',5'-trihydroxybenzoylbenzene - *o* - sulfonic acid (the intermediate acid) and some of their derivatives. W. R. ORNDORFF AND MARY L. WILLARD. Cornell Univ. *J. Am. Chem. Soc.* 51, 1466–74 (1929).—1,2,4-C<sub>6</sub>H<sub>3</sub>(OH)<sub>3</sub> (100 g.) and 36 g. *o*-sulfobenzoic anhydride, heated at 100° for 8 hrs., give 2',4',5'-trihydroxybenzoylbenzene-2-sulfonic acid, crystals of tabular to thin platy habitus, rhomboidal, probably triclinic (NH<sub>4</sub>, Ba, Zn and Na salts; tetra-Ac deriv.). Heating the above mixt. 30 hrs. at 130° gives 30% of hydroxyhydroquinonesulfonephthalein (I) (also obtained in 40% yield from C<sub>6</sub>H<sub>3</sub>(OH)<sub>3</sub> and *o*-ClSO<sub>2</sub>C<sub>6</sub>H<sub>4</sub>COCl and in 80% yield from the anhydride and C<sub>6</sub>H<sub>3</sub>(OAc)<sub>3</sub>; ZnCl<sub>2</sub> gives only 15% yield), green, forming a reddish orange powder; the H<sub>2</sub>O or 2% NaOH soln. is red with green fluorescence; concd. H<sub>2</sub>SO<sub>4</sub> gives a yellow soln.; there was a change from OY to R at *p*<sub>H</sub> 7.2 and from VR to RV at 12.0. I absorbs 4 mols. NH<sub>3</sub>, giving a bluish brown powder; over H<sub>2</sub>SO<sub>4</sub> a stable red mono-NH<sub>4</sub> salt results; Ba salt, red; Zn salt, orange-red; K salt, red; tetra-Ac and tetra-Bz derivs., colorless. I, MeI and MeCO give a mixt. of the *di*-Me and *tri*-Me ethers, red (Na salt of the latter, red). I gives a PhNH<sub>2</sub> salt, red needles, do not m. 300°. In abs. EtOH I yields a *di*-Br deriv., green, crystg. with 2.5 H<sub>2</sub>O; the dil. NaOH soln. is red, a more concd. soln., blue; a color change is noted at *p*<sub>H</sub> 6.4 from RO to VR. The tri-NH<sub>4</sub> salt and tetra-Ac deriv. were prepd. I and concd. H<sub>2</sub>SO<sub>4</sub> give sulfoneviolet, C<sub>15</sub>H<sub>10</sub>O<sub>7</sub>S, green. Reduction of I gives hydroxyhydroquinonesulfonephthalein, which is colorless; tetra-Ac deriv. (Ag salt). These are easily oxidized in the air. C. J. WEST

**Employment of pyridine as catalyst in production of dimethyl- $\alpha$ -naphthylamine.** FREDERICK G. GERMUTH. Bureau of Standards, Baltimore. *J. Am. Chem. Soc.* 51, 1555–7 (1929).—The employment of C<sub>5</sub>H<sub>5</sub>N as catalytic agent in the production of  $\alpha$ -C<sub>10</sub>H<sub>7</sub>NMe<sub>2</sub> from  $\alpha$ -C<sub>10</sub>H<sub>7</sub>NH<sub>2</sub> and Me<sub>2</sub>SO<sub>4</sub> increases the yield from an av. of 51.3% to 65.8%, when the base is utilized in the proportion of 4 cc. of C<sub>5</sub>H<sub>5</sub>N per mol. of  $\alpha$ -C<sub>10</sub>H<sub>7</sub>NH<sub>2</sub>. Larger amts. do not increase the yield. C. J. WEST

**Reduction of naphthol yellow by means of stannous chloride.** J. G. F. DRUCE. *Chem. News* 138, 209 (1929).—Addn. of 5 g. of naphthol yellow to a hot soln. of 5 g. of SnCl<sub>2</sub> in 50 cc. of concd. HCl and 50 cc. of H<sub>2</sub>O gave a colorless soln., which upon cooling pptd. crystals of the stannichloride of 3,4,6-diamino-8-naphtholsulfonic acid, m. 112°, insol. in Et<sub>2</sub>O and CCl<sub>4</sub>, slightly sol. in H<sub>2</sub>O and hot EtOH. A. S. CARTER

**Dyes derived from acenaphthequinone. Acenaphthimidazoles and acenaphthoxazoles.** ANUKUL C. SIRCAR AND NIRMAL C. GUHA-RAY. Dacca Univ. and B. N. College, Patna. *J. Indian Chem. Soc.* 6, 93–8 (1929); cf. C. A. 17, 2880; 19, 2335.—Acenaphthequinone (I) was thoroughly mixed with m-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>CHO and dissolved in hot AmOH. Dry NH<sub>3</sub> was passed through the hot soln. for 2 hrs. On cooling there sepd. 3'-nitro-2-phenylacenaphthimidazole, orange, does not m. 220°. Conc'd. H<sub>2</sub>SO<sub>4</sub> gives a reddish brown soln. Cr-mordanted and unmordanted wool is dyed orange-yellow from an acid bath. 2-Phenylacenaphthimidazole (II), prep'd. in the same way, dark red, does not m. 290°. Conc'd. H<sub>2</sub>SO<sub>4</sub> gives a blood-red soln. with reddish violet fluorescence. Wool is dyed red from an acid bath. The following derivs. of II were prep'd. by the same method: 2'-HO, yellow, m. 268° (decompn.), sol. in warm dil. alkali or conc'd. H<sub>2</sub>SO<sub>4</sub> with yellow color; 4'-MeO, red, m. 268°, sol. in conc'd. H<sub>2</sub>SO<sub>4</sub> with deep red color; 3'-methoxy-4'-hydroxy, rose-colored, m. 263°, sol. in conc'd. H<sub>2</sub>SO<sub>4</sub> with orange-red color, dyes wool light red from an acid bath; 4'-Cl, rose-colored, m. 264°, sol. in conc'd. H<sub>2</sub>SO<sub>4</sub> with brownish red color; 3,4-dinitro-2'-hydroxy-5'-bromo (III), does not m. 290°, sol. in conc'd. H<sub>2</sub>SO<sub>4</sub> with dark red color, dyes wool chocolate-brown from an acid bath; 3,4-dinitro-4'-methoxy, resembles III; 3-nitro-2'-hydroxy, resembles III; 3-nitro-3'-methoxy-4'-hydroxy, dyes wool light brown, resembles III. Dry NH<sub>3</sub> was passed through a soln. of I and *o*-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>CHO in hot AmOH for about 2 hrs. On standing 5 days a ppt. sepd. which was 2'-nitro-2-phenylacenaphthoxazole, orange-red, does not m. 290°. Conc'd. H<sub>2</sub>SO<sub>4</sub> gives a dark red soln. Wool is dyed orange-yellow from an acid bath. The following derivs. of 2-phenylacenaphthoxazole were prep'd. in the same way: 4'-dimethylamino, rose-colored; 3,4-dinitro-3'-nitro, dark brown, dyes wool a dark chocolate shade; 3,4-dinitro-3',5'-di-hydroxy, dyes wool a chocolate-brown; 3',5'-di-HO, dyes wool light brown; 3-nitro-3',5'-di-hydroxy, dyes wool brown. LOUISE KELLEY

**Constituents of the kawa root. VII. Pseudomethysticin.** W. BORSCHKE AND W. PERTSCH. Univ. Frankfurt a. M. *Ber.* 62B, 380–7 (1929); cf. C. A. 22, 404.—In the *Ber.* J. D. Riedel A.-G. there is a report on the existence in kawa root, besides

(V), then tetrahydromethysticinic acid (VII),  $\text{CH}_2\text{O}_2\text{C}_6\text{H}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{C(OMe):}-\text{CHCO}_2\text{H}$ , and finally the hexahydro acid (VIII). Under proper conditions the reduction to V takes place in a few mins. Like I, V is optically active and chem. neutral but is rearranged by alkalis into the optically inactive VI, which on fusion loses  $\text{CO}_2$  and on heating with  $N \text{ H}_2\text{SO}_4$  yields dihydropiperinoylacetic acid or dihydromethysticic acid (6-[methylenedioxyphenyl]- $\Delta^8$ -hexen-2-one) (IX). In the change from I to V, therefore, the H adds on the CH:CH group joining the 2 halves of the mol. and not on the C(OMe).CH grouping. I can never be reduced quantitatively to V, however; some VII is always formed even when the quantity of  $\text{H}_2$  consumed is strictly limited to 1 mol. With 2 mols.  $\text{H}_2$  the I can be completely converted into VII but after the disappearance of the I the formation of VII is slowed up extraordinarily. The catalytic reduction of I or V is, therefore, not practical for the prepn. of VII. On heating with  $\text{H}_2\text{O}$  under pressure or with dil. mineral acids, VII gives tetrahydromethysticic acid,  $\text{CH}_2\text{O}_2\text{C}_6\text{H}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{C(OMe):}-\text{CHCO}_2\text{H}$  (X), whereas on distn., *in vacuo*, it loses only  $\text{CO}_2$ , forming the pure enol-tetrahydromethysticic acid Me ether (6-[methylenedioxyphenyl]-2-methoxy- $\Delta^1$ -hexene) (XI), which is likewise readily demethylated to X by acids. Although VII has an ethylene union adjacent to the  $\text{CO}_2\text{H}$  group it can be reduced to VIII only with the greatest difficulty; the same passive resistance to catalytic hydrogenation has been encountered in XI, kawaic acid and MeC(OMe):CHCO $_2\text{H}$  and its Et ester. The method of prepn. V has been somewhat modified. It is obtained in 4.5 g. yield from 5 g. I and 0.05 g. colloidal Pd in 150 cc. MeOH shaken about 20 mins. with  $\text{H}_2$  under a slight overpressure and seps. in prisms, m.  $117-8^\circ$ ,  $[\alpha]_D^{25} 20.57^\circ$  (MeOH, 0.729% soln.); at the same time is formed about 0.5 g. VII. VI forms colorless prisms, m.  $146-7^\circ$  (decompn.) (Goebel's product, m.  $133-4^\circ$ , was evidently impure and he did not recognize its true compn. any more than that of VII). IX, yellowish, strongly refractive oil,  $b_D 196-8^\circ$ ; 2,4-dinitrophenylhydrazide, ruby-red, m.  $147-8^\circ$ . Methysticic acid, 2,4-dinitrophenylhydrazide, red-brown, m.  $236-7^\circ$  (gas evolution). XI, refractive oil,  $b_D 176-7^\circ$ . 2,4-Dinitrophenylhydrazide of X, cinnabar-red, m.  $129-30^\circ$ . VIII (2.5-3 g. from 5 g. VII in 120 cc. MeOH and 0.1 g. colloidal Pd in 5 cc.  $\text{H}_2\text{O}$  shaken under a slight overpressure with  $\text{H}_2$  until no more is absorbed (if 0.1 g. fresh catalyst is added every 24 hrs., this requires about 70 hrs.)), m.  $66-7^\circ$ , dissolves unchanged in  $\text{NH}_4\text{OH}$  or alkali carbonates, gives no color with  $\text{FeCl}_3$  even after several days and can be heated to  $220^\circ$  without any visible change. VIII. Kawaic acid. *Ibid* 368-73.—The product  $\text{C}_{11}\text{H}_{12}\text{O}_3$ , m.  $164-5^\circ$ , and designated as kawaic acid (I), which B. and Roth obtained from crude kawa resin, was not pure but admixed with nearly related acids, the sepn. of which has finally been effected only after many unsuccessful attempts. The pure I m.  $185-6^\circ$  and has the compn.  $\text{C}_{11}\text{H}_{14}\text{O}_4$ ; it is evidently the  $\text{CH}_2\text{O}_2$ -free mother substance of methysticinic acid (II), i. e.,  $\gamma$ -cinnamal- $\beta$ -methoxycrotonic acid. Its Me ester on partial sapon. with alc. HCl gives the same PhCH:CHCH:CHCOCH $_2$ CO $_2$ Me as is obtained by deacetylation of PhCH:CHCH:CHCOCHAcCO $_2$ Me. On catalytic reduction with colloidal Pd, I behaves just like II, taking up at first only 2 mols.  $\text{H}_2$  and giving tetra-

*hydrokawaic acid* (III), which on distn. *in vacuo* smoothly yields *6-phenyl-2-methoxy- $\Delta^1$ -hexene* (IV), with acids is decompd. into MeOH, CO<sub>2</sub> and *6-phenyl-2-hexanone* and on further shaking with H<sub>2</sub> and Pd is only very slowly reduced to *hexahydrokawaic acid*. III has been synthesized by treating PhCH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>COCH<sub>2</sub>CO<sub>2</sub>Me with a large excess of CH<sub>3</sub>N<sub>2</sub> and sapon. the alkali-insol. part of the product with NaOH. A similar synthesis of I has not yet been effected because the double bonds in PhCH<sub>2</sub>:CHCH:CHCOCH<sub>2</sub>CO<sub>2</sub>Me react too easily with CH<sub>3</sub>N<sub>2</sub> to form stable addn. products contg. N. I is obtained by B. and R.'s method from the kawa resin under exactly the same conditions as II from methysticin and it is, therefore, quite possible that I also does not exist in the resin as such but as a doubly unsatd. lactone, *kawain*, PhCH<sub>2</sub>:CHCH:CH<sub>2</sub>.C(OMe):CH.CO.O. I seps. from Et<sub>2</sub>O in yellow, elongated, 6-cornered

tablets, sol. in concd. H<sub>2</sub>SO<sub>4</sub> with purple color, gives in MeOH with FeCl<sub>3</sub> a faint brown color only after several hrs.; heated at 190° until the evolution of CO<sub>2</sub> ceases, it yields a brown, glassy resin whose MeO content corresponds approx. to *6-phenyl-2-methoxy- $\Delta^{1,3,5}$ -hexatriene* but which decomp. on attempted distn. under 14 mm. In N H<sub>2</sub>SO<sub>4</sub> on the H<sub>2</sub>O bath I gives cinnamalacetone whose *2,4-dinitrophenylhydrazone*, which can be obtained directly from I with HCl in boiling MeOH, brown-red, m. 218-20°. III, m. 109-10°, begins to evolve CO<sub>2</sub> about 125°, gives no color in alc. with FeCl<sub>3</sub>. IV, refractive oil of faint odor, b<sub>16</sub> 136-8°.


C. A. R.  
Is *2,3-diphenylindone* resolvable into optically active antipodes? JAKOB MEISENHEIMER and WALTER THEILACKER. Univ. Tübingen. *Ann.* **469**, 26-30 (1929).—M. and T. have been unable to repeat Schlenk, Bergmann and Müller's resolution of *2,3-diphenylindone* (C. A. **22**, 4493). The small rotation observed by these authors is probably due to impurity. *N*-Diphenylindenylidenebornylamide, m. 126°,  $[\alpha]_D^{232}$  (0.2456 g. in 10 cc. CHCl<sub>3</sub>); S. gives 124°.

C. J. WEST  
The development of the catalytic oxidation of anthracene to anthraquinone. HORST BRÜCKNER. *Chem. Ztg.* **53**, 258 (1929).—A review with literature and patent references is given of the various methods for oxidation of anthracene to anthraquinone.

N. A. LANGE  
**1,2,5,6-Tetrahydroxyanthraquinone and 1,2,7,8-tetrahydroxyanthraquinone.** GUSTAV HELLER. *Z. angew. Chem.* **42**, 170-5 (1929).—The sulfonation of anthraflavic acid with 15% oleum followed by a treatment with a mixt. of HNO<sub>3</sub> and H<sub>2</sub>SO<sub>4</sub> gives *1,8-dinitro-2,6-dihydroxyanthraquinone-3,7-disulfonic acid* (I) sepd. as the Na salt (II). Heating II with dil. H<sub>2</sub>SO<sub>4</sub> in a sealed tube for 6 hrs. at 170° gives *1,8-dinitro-2,6-dihydroxyanthraquinone* (III). Reduction of III with Na<sub>2</sub>S yields *1,5-diamino-2,6-dihydroxyanthraquinone*; Na salt, forms violet crystals which in weak AcOH dye wool a wine-red color. I and Na<sub>2</sub>S give *1,5-diamino-2,6-dihydroxyanthraquinone-3,7-disulfonic acid* (IV); di-Na salt, forms red needles. Diazotization of IV in concd. HCl yields *1,5-dinitrosamino-2,6-dihydroxyanthraquinone-3,7-disulfonic acid* (V). The addn. of Cu<sub>2</sub>Cl<sub>2</sub> to V in concd. HCl gives *1,5-dichloro-2,6-dihydroxyanthraquinone-3,7-disulfonic acid* (VI), which dyes wool an orange-red, and brown-orange with a Cr mordant. V treated with boiling CuSO<sub>4</sub> gives *1,2,5,6-tetrahydroxyanthraquinone-3,7-disulfonic acid* (VII), which in acid bath dyes wool a bright orange. Heating VII with dil. H<sub>2</sub>SO<sub>4</sub> in a sealed tube for 4 hrs. at 175-85° yields *1,2,5,6-tetrahydroxyanthraquinone* (VIII) which dyes Cr-mordanted wool red-violet; Ac deriv., m. 260-3° (decompn.). VIII and 20% oleum at 135-40° for 0.5 hr. give VII. VII in AcOH with Br gives *3,7-dibromo-1,2,5,6-tetrahydroxyanthraquinone*. **1,2,7,8-Tetrahydroxyanthraquinone** (IX), prepd. by the alk. fusion of chrysazindisulfonic acid, forms red prisms, m. 315° (darkening and sublimation); di-Ac deriv., m. 242° (decompn.); tetra-Ac deriv., m. 236-8° (decompn.). Sulfonation of IX gives *1,2,7,8-tetrahydroxyanthraquinone-3,6-disulfonic acid* (X). X and Br in alc. yield *dibromo-1,2,7,8-tetrahydroxyanthraquinone*.

FREDERICK C. HAHN  
**Polynuclear aromatic hydrocarbons and their derivatives. I. Dibenzanthracenes and their quinones.** F. CLAR. Tech. Hochschule Dresden. *Ber.* **62B**, 350-9 (1929).—For a systematic study of the condensed aromatic hydrocarbons, of which those with 4 condensed C<sub>6</sub>H<sub>6</sub> nuclei are all known, it was first undertaken to prep. the as yet mostly unknown 5-ring compds. *1,2,7,8-* (I) and *1,2,5,6-Dibenzanthracene* (II) were obtained by heating *2-methyl-1,1'* (III) and *2-methyl-1,2'-dinaphthyl ketone* (IV) which were readily prepd. by the Friedel-Crafts reaction from 1- and 2-C<sub>10</sub>H<sub>7</sub>COCl with 2-C<sub>10</sub>H<sub>7</sub>Me. That the C<sub>10</sub>H<sub>7</sub>CO group enters the C<sub>10</sub>H<sub>7</sub>Me in the  $\alpha$ -position adjacent to the Me residue is rendered very probable by the directing influence of the Me group and confirmed by the fact that if 2-C<sub>10</sub>H<sub>7</sub>COCl should condense in the  $\beta$ -position, it would yield *1,2,6,7-dibenzanthracene* (V) whereas the actual condensation product

(IV) gave only 1 compd. (II), identical with that obtained by Weitzenböck and Klingler by a method excluding the possible formation of V. The similarity of I and II to each other is remarkable. While the ketones III and IV differ considerably in their consts., I and II show no appreciable differences in soly. and fluorescence, their m. ps. differ by only 1°, the mixed m. p. is intermediate, the m. ps. of the picrates are within 2° of each other, those of the quinones (VI and VII) within 1°. In ultra-violet light, however, the green-yellow I has an intensely green-yellow emission while the very faintly greenish yellow II shows the phenomenon to a much less degree. The absorption in ultra-violet light, on the other hand, is the same for I and II. VI and VII were readily obtained with  $\text{CrO}_3\text{-AcOH}$ . They show the characteristic property of anthraquinones of forming with alk.  $\text{Na}_2\text{S}_2\text{O}_4$  vats from which they are reprecipd. unchanged by the air. The product obtained by Homer (C. A. 5, 1076) from  $(\text{CHBr})_2$ ,  $\text{C}_{10}\text{H}_8$  and  $\text{AlCl}_3$  and to which she assigns the structure I bears no similarity to C.'s compd. Comparison of its absorption curve with that of the true I indicates that she had an impure product, probably a mixt. of isomers. The reaction whereby Hönig obtained a "dicarbonyldinaphthylene or naphthanthraquinone" (fusion of 1- $\text{C}_{10}\text{H}_7\text{OH}$  with  $(\text{CO}_2\text{H})_2$ ) is represented in Houben-Weyl's *Methoden d. org. Chem.* as resulting in the formation of VI. A repetition of his work, however, gave a product (VIII) having none of the properties of an anthraquinone. Treatment with  $\text{PhMgBr}$  showed the presence of only one C:O group. The other O atom can, therefore, be present only in ether combi-

nation and the VIII must be 1,2,7,8-dibenzoanthrone,  $\text{C}_{10}\text{H}_6$    $\text{C}_{10}\text{H}_6$ . The 9-phenyl-

dibenzoanthranol (IX) formed with  $\text{PhMgBr}$  can form oxonium salts with mineral acids. The product obtained from *p*- $\text{MeC}_6\text{H}_4\text{COCl}$ , phenanthrene and  $\text{AlCl}_3$  is not homogeneous but consists for the most part of *o*-tolyl 9-phenanthryl ketone. Condensation by heating gives a mixt. of hydrocarbons, the largest, most easily sol. and lowest-melting part of which is 1,2,3,4-dibenzanthracene (X) as seems established by the fact that even with an excess of an oxidizing agent it forms only a monoquinone, 1,2,3,4-dibenzanthraquinone or 9,10-phthaloylphenanthrene (XI), while the higher-melting isomers give diquinones (phthaloylphenanthrenequinones). The phthaloylphenanthrene ("phenanthraquinone") prepd. according to Ger. pat. 194,328 from *o*-phenanthrolylbenzoic acid and  $\text{P}_2\text{O}_5$  is not homogeneous but a mixt. of isomers in which XI may well predominate. III (yield, 90%), faintly greenish yellow, m. 140–1° sol. in concd.  $\text{H}_2\text{SO}_4$  with orange-red color. The crude product, freed from Al salts by repeated washing in  $\text{C}_6\text{H}_6$  with dil. HCl, when gently boiled about 20 mins., gives around 20% of I, m. 260–1°, shows green-blue fluorescence in soln., dissolves in concd.  $\text{H}_2\text{SO}_4$  with faint red color; picrate, red, m. 212°. Quinone (VI), obtained almost quant., orange, m. 243–4°, sol. in  $\text{H}_2\text{SO}_4$  with deep violet color, forms a red vat in alk.  $\text{Na}_2\text{S}_2\text{O}_4$ . IV, m. 170–1°. II, m. 262°; dipicrate, m. 214°. Quinone (VII), m. 244–5° (W. and K., 249°). VIII, m. 297°, seps. from  $\text{PhNO}_2$  in solvated leaflets, becomes faintly brown and then dirty green in the air, does not dissolve in cold concd.  $\text{H}_2\text{SO}_4$ . IX, leaflets with 1 mol.  $\text{C}_6\text{H}_5\text{N}$  from which it cannot be freed by heating without decompn., begins to decomp. 175°, m. 195°, sol. in concd.  $\text{H}_2\text{SO}_4$  with blue-violet color (red in thick layers),  $\text{H}_2\text{O}$  pptg. a red substance. X (20 g. from 60 g.  $\text{MeC}_6\text{H}_4\text{COCl}$  and 100 g. phenanthrene), yellow, m. 196–7°, shows yellow fluorescence (blue in soln.) in the light of a quartz-Hg lamp, slowly dissolves in concd.  $\text{H}_2\text{SO}_4$  with faint violet-red color; picrate, red, m. 207°. XI, yellow, m. 179°, sol. in  $\text{H}_2\text{SO}_4$  with bluish green color, forms a red vat in alk.  $\text{Na}_2\text{S}_2\text{O}_4$ .

C. A. R.

**Thermochemical studies in the furan series.** PHILIPPE LANDRIEU, FRANÇOIS BAYLOUQ AND JOHN R. JOHNSON. *Bull. soc. chim.* 45, 36–49 (1929).—L., B. and J. measured the heats of combustion of furan and typical derivs. and of corresponding members of the benzene series, and thereby detd. the thermochem. increment involved in passing from the furan ring to the benzene ring. App. employed was the Landrieu calorimeter (C. A. 20, 1748), the Moureu bomb (C. A. 19, 2284) and a specially calibrated Baudin thermometer. The heat capacity of the calorimeter system was detd. by the method of Moureu, Dufraisse and Landrieu (C. A. 18, 933) and by the combustion of a standard sample of BzOH from the U. S. Bur. of Standards. The mean value found was 2463 cal. (20°). The combustion of liquids required special technic. Furfurylthylene was weighed in ampoules having a capillary neck; a ring of  $\text{C}_{10}\text{H}_8$  around the neck served as an auxiliary combustible. Other liquids were weighed and sealed in short neck ampoules; these, with a wick of guncotton, were set in a weighed amount of melted paraffin in a recess in the combustion cup. Consists. of the substances employed were: furan,  $b_{754}$  31–2°,  $n_D^{19.3}$  1.4217,  $n_D^{20.3}$  1.4214,  $d_4^{20}$  0.9026,  $d_4^{19.7}$  0.9388; feryl-

ethylene,  $b_{760}$  99–100°,  $n_D^{18.5}$  1.4992,  $d_4^{18.5}$  0.9445; furfuryl alc.,  $b_{16}$  74–5°,  $n_D^{20}$  1.4876,  $d_4^{20}$  1.1330; tetrahydrofurfuryl alc.,  $b_{16}$  72–3,  $n_D^{20}$  1.4530; furfural,  $b_{16}$  60–1°,  $n_D^{20}$  1.5261,  $d_4^{20}$  1.1756,  $d^{20}$  1.1612; furoic acid, m. 133–4°; furylacrylic acid, m. 140–1°; benzyl alc.,  $b_{28}$  105–6°,  $n_D^{20}$  1.5403,  $d^{20}$  1.0638,  $d^{20}$  1.0498; hexahydrobenzyl alc.,  $b_{28}$  91–2°,  $n_D^{20}$  1.4654,  $d^{20}$  0.9470,  $d^{20}$  0.9360; BzH,  $b_{28}$  78–9°,  $n_D^{20}$  1.5450,  $d^{20}$  1.0626,  $d^{20.1}$  1.0463; cinnamic acid, m. 134–5°. Mol. heats of combustion at const. vol.,  $Q_v$ , at const. pressure,  $Q_p$ , and mol. heats of formation,  $Q_f$ , in 20° cal., for comparable substances in the 2 series are, (1) furan, 500.1, 500.4, 14.8; benzene, 782.9, 783.8, —11.0, (data for benzene from Richards and Davis, *C. A.* 14, 2881); (2) furylethylene, 767.9, 768.5, 4.3; styrolene, 1052.0, 1052.5, —22.5; (3) furfuryl alc., 608.5, 609.0, 69.5; benzyl alc., 891.1, 891.9, 44.2; (4) furfural, 560.3, 560.3, 49.2; BzH, 844.3, 844.8, 22.4; (5) furoic acid, 488.4, 488.1, 121.4; BzOH, 772.6, 772.9, 94.2; (6) furylacrylic acid, 755.6, 755.6, 111.5; cinnamic acid, 1040.6, 1041.1, 83.6; (7) tetrahydrofurfuryl alc., 708.6, 709.5, 107.0; hexahydrobenzyl alc., 1046.6, 1048.4, 94.7, resp. Detus. were precise to about 1 part in 1000. At. wts. O = 16, H = 1.008, C = 12, and heats of combustion,  $C \rightarrow CO_2 + 94.3$  cal.,  $H_2 \rightarrow H_2O + 69$  cal. were used in computations. For the above pairs of substances  $\Delta Q_p$  and  $\Delta Q_f$  are: (1) 282.8, 283.4, —25.8; (2) 284.1, 284.0, —26.8; (3) 282.6, 282.9, —25.3; (4) 284.0, 284.5, —26.8; (5) 284.2, 284.8, —27.2; (6) 285.0, 285.5, —27.9; (7) 338.0, 338.9, —12.3, resp. When cor. for the difference of 2 H in the rings  $\Delta Q_p$  and  $\Delta Q_f$  for substances (7) become 283.0 and 283.9, resp. (cf. *Compt. rend.* 137, 979(1903)). The difference in heats of combustion of similar substances in the furan series and in the benzene series is 284 cal. This figure may safely be used to calc. heats of combustion of furan compds. from those of benzene.

MARGARET W. MCPHERSON

**Secondary valence forces of pyrrole nitrogen.** O. SCHMITZ-DUMONT. Univ. Bonn. *Ber.* 62B, 226–34(1929).—Very few mol. compds. of pyrrole derivs. are known, and in spite of its interest for the understanding of the blood pigment and chlorophyll no systematic study has been made of the secondary valence forces of pyrroles. S.-D. has, therefore, undertaken a study of the reaction of pyrroles with Sn tetrahalides. Pyrrole itself with SnCl<sub>4</sub> gives a light yellow compd. SnCl<sub>4</sub>.2C<sub>4</sub>H<sub>5</sub>N, from which, if it were a pure addn. product, it should be possible to recover the pyrrole unchanged and quantitatively. This, however, could in no way be effected and it may be assumed that, for lack of basic properties of its N, pyrrole cannot add SnCl<sub>4</sub>, but rather undergoes polymerization to a compd., the hitherto unknown *dipyrrole*, which can form such an addn. product. In attempts to isolate this dipyrrole, it at once changed into a black resin in the air, but it must be relatively strongly basic since it cannot be displaced from its SnCl<sub>4</sub> compd. by C<sub>4</sub>H<sub>5</sub>N. Tripyrrole gives both a SnCl<sub>4</sub> and a SnBr<sub>4</sub> compd., having the compns. SnCl<sub>4</sub>.(C<sub>4</sub>H<sub>5</sub>N)<sub>3</sub> and SnBr<sub>4</sub>.2(C<sub>4</sub>H<sub>5</sub>N)<sub>3</sub>, resp. Introduction of Me groups can so increase the additive power of pyrrole that SnCl<sub>4</sub> is added directly to form a stable product, without previous polymerization. Thus, 2,4-dimethylpyrrole gives a crvst. compd. SnCl<sub>4</sub>.2Me<sub>2</sub>C<sub>4</sub>H<sub>3</sub>N, from which the base can be recovered quant. Replacement of the imido H atom apparently does not materially increase the additive power; from *N*-methylpyrrole could be obtained no SnCl<sub>4</sub> compd. from which the base could be recovered.  $\alpha,\beta$ -Bis-*N,N'*-[2,5-dimethyl]pyrrolethane (I), however, when treated in CS<sub>2</sub> with SnCl<sub>4</sub> and evapd. *in vacuo* yields a yellowish crst. product I.2SnCl<sub>4</sub>, from which the I can be recovered quant. The above pyrrole derivs. do not add SnBr<sub>4</sub> but  $\alpha$ -acetylpyrrole (II) forms both SnCl<sub>4</sub> and SnBr<sub>4</sub> compds. of the type SnX<sub>4</sub>.2II, and so does 2,5-diacetylpyrrole; it seems, therefore, that the addn. takes place on the N, not the O of the C:O grouping. Bis[2,4-dimethyl-3-carbethoxy-pyrrol]methene (IV) adds 1 mol. SnCl<sub>4</sub>, indicating that both N atoms are completely equiv. to each other in filling the 2 free coordination positions of the SnCl<sub>4</sub>. From analogy it was to be expected that the 4 imido N atoms in the 16-membered ring compd. obtained by Chelintzev by the condensation of pyrrole with Me<sub>2</sub>CO would add 2 mols. SnCl<sub>4</sub> but the substance does not add SnCl<sub>4</sub> at all, indicating the necessity of assuming in the blood pigment pyrroline along with pyrrole N to explain its inner complex nature. The presence of 2 imido N atoms over against each other, as in C.'s compd., does not prevent the addn. of SnCl<sub>4</sub> for the pyrrole-cyclohexanone condensation product likewise prepd. by C. forms a normal 1:1 addn. product with SnCl<sub>4</sub>. With SnBr<sub>4</sub> the reaction is more complicated, both addn. and substitution products being formed. The HBr thus set free conditions the compn. of the addn. product, 3C<sub>6</sub>H<sub>5</sub>N<sub>2</sub>.2HSnBr<sub>4</sub>. These results show that the coordinative valence of the pyrrole compds. studied (except tripyrrole) is equal to the no. of their N atoms.

C. A. R.

**Action of sulfur on heptane and butane.** R. B. BAKER AND E. EMMET REID.

Johns Hopkins Univ. *J. Am. Chem. Soc.* **51**, 1566-7(1929).— $C_7H_{10}$  (40 g.) and 12.8 g. S, heated at 300–50° for 24–48 hrs., give 2 g. of a thiophene of the formula  $C_7H_{10}S$ , b. 160–1°,  $d_4^{20}$  0.9332,  $d_4^{25}$  0.9221.  $C_8H_{10}$  (32 g.) gives 1 g. of thiophene. These results are analogous to those of Friedmann for  $C_8H_{12}$  (*C. A.* **11**, 940). C. J. WEST

Removal of thiophene from benzene and a new method for the preparation of thiophene-free benzene on a laboratory scale. E. G. R. ARDAGH AND C. M. FURBER. Toronto Univ. *J. Soc. Chem. Ind.* **48**, 73–5T(1929).—A check of 13 recommended methods for the removal of thiophene (I) showed them all to be unsatisfactory; passing  $C_6H_6$  contg. I over Ni with  $H_2$  gave a product free from I, but the catalyst failed rapidly. It was found impossible to make this method successful by varying the temp. or catalyst. To detect I, a trace of isatin was mixed with 1 cc. of the  $C_6H_6$  in a test tube followed by 2 cc. of concd.  $H_2SO_4$ . In the presence of I a deep blue develops upon standing; with small amts. of I, the color becomes pale green or greenish yellow. A. and F. found that on heating  $C_6H_6$  contg. I with red HgO and stearic acid and distg. off the  $C_6H_6$ , it was freed of I and a *Hg-stearic acid compd.* of I remained. Stirring was found to reduce the necessary period of heating from 3 hrs. to 90 mins. at 80°. A trace of moisture was found necessary, but more than that usually present in the reagents and  $C_6H_6$  slowed up the reaction. Expts. on the optimum mol. ratios indicated that 8 mols. of HgO and 10 mols. of stearic acid per mol. of I should be used. MgO, PbO and ZnO in place of HgO gave negative results. Bibliography.

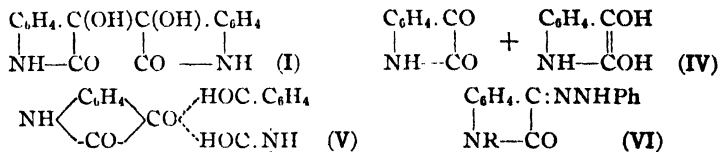
A. S. CARTER

Phenylisatogen. M. BAKUNIN AND T. VITALE. Eng. School Naples. *Rend. accad. sci. Napoli* [3], **33**, 270–8(1927).—As has been shown in earlier expts., phenylisatogen (I), m. 186–7°, red, is obtained as a by-product in the prepn. of  $o$ - $O_2NC_6H_4$ -CH  $CHPhCO_2H$  by Perkin's synthesis. While with  $H_2NOH \cdot HCl$  and I in EtOH the *C*-oxime, m. 236°, and the *N*-oxime, m. 167–8°, were obtained (Pfeiffer, *C. A.* **10**, 1334), mainly formation of 3-nitroso-2-phenylindole took place when using  $H_2NOH \cdot HCl$  and an excess of alc. NaOH. With NaOH in boiling EtOH, I was decompd. BzH and a compd.  $C_{14}H_{12}ON_2$ , m. 209–10°, could be isolated from the reaction product. A nitrophenylisatogen, m. 220°, golden yellow, with the  $NO_2$  group in the 5-, 7-, 3'- or 4'-position was obtained by action of concd.  $HNO_3$  on I in  $CHCl_3$ , with  $H_2SO_4$ ,  $FeCl_3$  or  $P_2O_5$  as a catalyst.

G. SCHWOCH

Isatide or isatin pinacol. GUSTAV HELLER AND HELLMUTH LAUTH. Univ. Leipzig. *Ber.* **62B**, 343–50(1929).—Hantzsch observed some yrs. ago that dioxindole dissolves in alkalis, in absence of O, without color and that a violet color appears only when air is admitted; hence the colored solns. contain isatide salts. The color reaction is best obtained in  $C_6H_5N$  on addn. of 10%  $Ba(OH)_2$ . He correlates this peculiar halochromism phenomenon with Schlenk's metal ketyls and believes that halving of the mols. and formation of radicals is the common cause of color in both cases, although S. states expressly that with his substances the appearance of color depends on the complete exclusion of  $H_2O$ . That H.'s views, which are supposed to prove the pinacol structure (I) of isatide, have no significance is shown by the fact that not only the isatide of phenyldioxindole but the oxindole itself forms vividly colored salts in the complete absence of O, and with *N*-diacetyl isatide the violet color with  $Ba(OH)_2$  is stable for about 2 days. Kohn and Osterstetzer's tetraacetyl isatide (II), unlike isatide, is unchanged by long treatment with Zn dust and AcOH, which led to the suspicion that in the acetylation the isatide may undergo rearrangement and the II have a structure different from that of isatide. With AcOH and HCl at 50°, II first loses two Ac groups, yielding a substance (III) isomeric with the *N*-diacetyl isatide obtained by cautious reduction of *N*-acetyl isatin. III is also obtained from II in hot alc. with  $PhNHNH_2$ . On long standing in AcOH-HBr or on soln. in concd.  $H_2SO_4$  the remaining Ac groups are removed; the resulting product is not homogeneous and, because of its insol., cannot be recrystd. but by cautious addn. of HCl to its  $C_6H_5N$  soln. it can be made to sep. gradually in needles which are not yet quite homogeneous and consequently only partly regenerate II under the same conditions as III (boiling with  $Ac_2O$  or treatment in cold  $C_6H_5N$  with  $AcCl$ ). Dithioisatide, which from its close relationship to isoinidigo must certainly have the pinacol structure (I) with SH instead of OH, has properties quite different from those of isatide, and H. and L. conclude isatide has not the pinacol structure (I) but is a quinoxaline-like compd. (IV or V) which on acetylation probably rearranges into the pinacol; II would then be tetraacetyl isatin pinacol. The hydrazones (VI) formed by the action of  $PhNHNH_2$  on *N*-acetyl- and *N*-benzoyl isatin yield on longer treatment with  $PhNHNH_2$  w substances having the compn. of osazones but lacking their color and still longer treatment they decomp. into the original VI and isatin phenyl-

hydrazone. Heller had previously obtained a similarly almost colorless compd. from *N*-hydroxyoxindole and  $\text{PhNHNH}_2$ ; possibly they are osotetrazines. Provisionally they are designated as *isoacylisatin osazones*. H.'s *O*-benzoyldioxindole can also be obtained from K dioxindole with  $\text{BzCl}$  in  $\text{C}_6\text{H}_6$ , and the same is true of Suida's *O*-Ac compd.; with  $\text{PhNHNH}_2$  at room temp. they give isatin  $\beta$ -phenylhydrazones and are, therefore, not *N*-acyl derivs. *Diacylisatin pinacol* (III), begins to darken  $280^\circ$ , m. about  $317^\circ$  (evolution of gas, depending on the manner of heating), sol. in alkalies and recovered practically unchanged if at once pptd. with acids but if the soln. is allowed to stand, acids ppt. increasing amounts of isatin. The non-homogeneous *isatin pinacol* obtained from III and concd.  $\text{H}_2\text{SO}_4$  or  $\text{AcOH-HBr}$  (or still better  $\text{AcOH-H}_3\text{PO}_4$  at  $125^\circ$ ) is a violet-gray powder, decomps. about  $265\text{--}70^\circ$ , sol. in cold alkalies without color and without conversion to any great extent into an isatin; it is also obtained, but even less smoothly, from isatyde and concd.  $\text{H}_2\text{SO}_4$ . In  $\text{C}_6\text{H}_5\text{N}$  in a current of  $\text{H}_2$ , III with 10%  $\text{Ba(OH)}_2$  gives a faint pink color which, on stratifying with more  $\text{Ba(OH)}_2$ , becomes red-violet and soon after lighter again. III and the Ac-free product become only faintly red, the rearranged isatyde yellow. It was confirmed that in the absence of *O* dioxindole gives no color with  $\text{C}_6\text{H}_5\text{N-Ba(OH)}_2$  while isatyde gives a very vivid violet color. With *N*-diacylisatyde is obtained an intense steel-blue color which persists 2 days, while the deacetylated isatin pinacol and dithioisatin pinacol give no color. With *N*-dibenzoylisatyde the blue-violet color is also very intense but less stable. Acetyldioxindole gives no color. *Iso-N-benzoylisatin osazone*, from *N*-benzoylisatin refluxed 2.5 hrs. in alc. with  $\text{PhNHNH}_2$  or from *N*-dibenzoylisatyde in alc. heated 3 hrs. on the  $\text{H}_2\text{O}$  bath with an excess of  $\text{PhNHNH}_2$ , m.  $211\text{--}2^\circ$ , difficultly sol. in aq., more readily in hot alc. alkali, sol. in concd.  $\text{H}_2\text{SO}_4$  with blood-red color, mol. wt. in camphor 429, unchanged by cold  $\text{HBr-AcOH}$ , apparently brominated in the nucleus on heating. *Ac analog*, prisms with 1 mol.  $\text{Me}_3\text{CO}$ , m. about  $130^\circ$ .

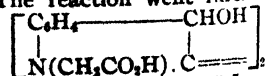


C. A. R.

**Isatin derivatives and their isomerization to quinoline.** N. I. PUTOKHIN. Samara Rural Econ. Inst. *J. Russ. Phys.-Chem. Soc.* **60**, 1179-90(1928); cf. C. A. **22**, 77, 3409.—*Na isatin*, which is easily prepd. with a 91.6% yield by Heller's method (C. A. **1**, 1703) and presents a fine black powder, was made to react with different esters. The condensation with *Et chloroacetate* was effected by refluxing 8 g. of the latter with 10 g. *Na isatin* and 50 cc. absolutely dry  $\text{C}_6\text{H}_6$  for 4 hrs. The ppt. having turned from black to orange, 5 g. of the ester was added and the heating was continued 5 hrs. When the liquid became orange and acid to litmus, 300 cc.  $\text{C}_6\text{H}_6$  was added and the mixt. was heated to dissolve as much of the ppt. as possible, after which the  $\text{C}_6\text{H}_6$  soln. was filtered and the residue was again extd. with 200 cc.  $\text{C}_6\text{H}_6$ , which was also filtered. Both  $\text{C}_6\text{H}_6$  solns. were united, the solvent was driven off by evapn. till the vol. was reduced to 40-50 cc., and the latter was left to cryst. *Et isatin-N-acetate*,  $\text{C}_6\text{H}_4 \cdot \text{CO} \cdot \text{CO} \cdot \text{NCH}_2\text{CO}_2\text{Et}$ , crystd. in spherically disposed needles, m.  $114^\circ$ . The

yield was 7 g. The product obtained was very stable and not hydrolyzable either by  $\text{H}_2\text{O}$  or by acids. It was, however, hydrolyzed on heating 4 g. of it on a steam bath for 2 hrs. with 30 g. of aq.  $\text{HI}$  (d. 1.6) in presence of 3 g. red P. At the end of the reaction 30 cc.  $\text{H}_2\text{O}$  was added, the liquid was heated and filtered hot; on standing, the filtrate yielded 2-2.5 g. crystals which, on being recrystd. from alc. with the addn. of petroleum ether, were pink and m.  $219\text{--}20^\circ$ . The reaction went further

than mere hydrolysis, and partial reduction took place,



being formed. For the condensation of *Na isatin* with *di-Et chloromalonate* 10.5 g. of the former, 12.5 g. of the latter and 50 cc. absolutely dry  $\text{C}_6\text{H}_6$  were refluxed 10 hrs., viz., till the color of the ppt. changed to orange. The hot liquid was filtered by suction, most of  $\text{C}_6\text{H}_6$  was distd. off, and crystals, m.  $82^\circ$ , sepd. overnight; 5.2 g. of *di-Et isatin-N-malonate* were thus obtained. The ester could not be hydrolyzed on being heated with  $\text{H}_2\text{O}$  or with acids; heating with aq. alkali gave no definite result. The ester was sol. in  $\text{CHCl}_3$ ,  $\text{EtOH}$ ,  $\text{C}_6\text{H}_6$ , insol. in  $\text{H}_2\text{O}$  or in petroleum ether. To condense *Na*



*isatin with ethylene bromide* 12.5 g. of the former and 30 cc. absolutely dry  $C_6H_6$  were refluxed 20 hrs., then 4 g. of the bromide and 20 cc.  $C_6H_6$  were added and the refluxing continued. After that, 3 more addns. of bromide, 4 g. each, were made every 20 hrs., ( $C_6H_6$  not being added again). Altogether 23.5 g. bromide were introduced: a large excess over the theoretically needed. Refluxing, which had to be carried on until the ppt. became orange, lasted 60–80 hrs. more. Three g. dark orange crystals of *isatin-N-ethylbromide* was obtained which, after recrystn. from  $C_6H_6$ , m.  $130^\circ$ . After filtering off the  $C_6H_6$  soln. of the latter substance, the residue, on being extd. in a Soxhlet app., yielded 2.5 g. light orange needles, m.  $190^\circ$ , of *ethylenediisatin*, ( $C_6H_4 \cdot CO \cdot CO \cdot NCH_2$ )<sub>2</sub>. *Condensation of isatinethyl bromide with sodiomalonic ester.*

$NaCH(CO_2Et)_2$  (prepd. from 3.5 g.  $CH_2(CO_2Et)_2$  and 0.6 g. Na in 25 cc. abs. EtOH) was added to a soln. of 5 g. isatinethyl bromide in 40 cc. abs. EtOH and the mixt. was refluxed 6 hrs. on a water bath. At the end of the reaction the excess of Na was neutralized by  $H_2SO_4$ , the dark liquid obtained was filtered and the EtOH was distd. off, leaving behind a dark sirup which could neither be crystd. nor distd. On decomp. the sirup with  $Ca(OH)_2$  and heating above  $230^\circ$ , an oil distd. accompanied by abundant  $CO_2$  evolution; the oil apparently presented a mixt. of *N-propylaniline* with an unidentified substance which strongly reduced  $PtCl_4$  and easily resinified with evolution of  $CO_2$  by the action of HCl. Dry distn. of *ethylenediisatin* with  $Ca(OH)_2$  was carried out after triturating in a porcelain mortar 5 g. of the former with 50 g. of the latter. An oil passed accompanied by an evolution of  $CO_2$ . The oil consisted chiefly of *aniline* and contained some *quinoline*. To prove the presence of the latter, P. worked out a method of sepg. *quinoline* from *aniline* based on the property of *quinoline* (not possessed by *aniline*) of giving a cryst. compd. with  $AgNO_3$ . BERNARD NELSON

**Structure of furazan oxides. II.** CORLISS R. KINNEY. Univ. of Utah. *J. Am. Chem. Soc.* **51**, 1592–600 (1929); cf. *C. A.* **21**, 908.—It is shown that the isomeric oxides of phenyl-*p*-methoxyphenylfurazan (I) are not isomorphous; the structural differences between them have been clearly demonstrated by the reaction with  $O_3$  followed by a stepwise decompn. The detn. of the individual structures of the oxides by means of the  $O_3$  reaction gives further proof that the configuration of the oximes, to which the oxides are closely related, are correct as set forth by Meisenheimer (*C. A.* **19**, 2819). *p*-MeOC<sub>6</sub>H<sub>4</sub>COCH(OH)Ph results in 100–10 g. yields from 272 g. *p*-MeOC<sub>6</sub>H<sub>4</sub>CHO, 212 g. BzH and 50 g. KCN in 350 cc.  $H_2O$  and 700 cc. 95% EtOH; oxidation to BzCOC<sub>6</sub>H<sub>4</sub>OMe (II) was best carried out with  $C_6H_5N \cdot CuSO_4$ . II (40 g.) and slightly less than 1 equiv. of  $NH_2OH \cdot HCl$ , refluxed in EtOH for 1.5 hrs., give 25 g. of the  $\gamma$ -dioxime, from which the  $\alpha$ -oxide of I was prepd. according to M. Details of the prepn. of the  $\beta$ -oxide from the mixed dioximes are given. An alternative method for the  $\beta$ -oxide consists in prepg. BzCH<sub>2</sub>C<sub>6</sub>H<sub>4</sub>OMe, transforming this into the  $\beta$ -monoxime of II, m.  $169–70^\circ$  (yield), and oxidizing. Diphenylfurazan reacted slowly with  $O_3$  and did not produce acids as did the oxides. Upon treating the oxides of I with  $O_3$  and decomp. the ozonides, the  $\alpha$ -oxide yielded anisic acid, while the  $\beta$ -oxide yielded BzOH. The oxides of I and PhMgBr both yield PhOH and Ph<sub>2</sub>. C. J. WEST

**N-Alkyl- and aryl-4,5,6,7-tetrahydroindazoles.** K. v. AUWERS, J. CONRAD, A. ERNECKE AND B. OTTENS. Univ. Marburg. *Ann.* **469**, 57–82 (1929); cf. *C. A.* **18**, 834, 20, 389.—Condensation of substituted Et cyclohexanone-2-oxalates with alkyl- and arylhydrazines affords a mixt. of 1- and 2-alkyl- or aryl-4,5,6,7-tetrahydroindazole-3-carboxylates. When  $N_2H_4$  is used tetrahydroindazole-3-carboxylates result. Subsequent alkylation of these affords mixts. of the 1- and 2-derivs. Elimination of  $CO_2$  from the alkylated indazolecarboxylic acids gives the corresponding indazoles. Et cyclohexanone-2-oxalate and  $H_2NNHMe \cdot AcOH$  in EtOH and NaOH give a mixt. of esters which, after hydrolysis with EtOH-NaOH, affords 2-methyl- and 1-methyl-4,5,6,7-tetrahydroindazole-3-carboxylic acids, m.  $205–6^\circ$  and  $207.5–8.5^\circ$ , resp. These acids are sepd. by partial esterification with 3% MeOH-HCl; the former is unaffected and the Me ester from the latter is then rehydrolyzed. Thermal decompn. of the acids yields 2

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after

hydroindazole-3-carboxylic

m.  $103–4^\circ$  and  $150–1^\circ$ , resp., have been described previously as the 1- and 2-derivs., resp. 2-Benzyl-, m.  $187–7.5^\circ$ , and 1-benzyltetrahydroindazole-3-carboxylic acid, m.  $157.5–8.5^\circ$  (Me ester, m.  $69–70^\circ$ ) are obtained similarly. The corresponding indazole picrates m.  $132–3^\circ$  and  $128–9^\circ$ , resp. Et 4-methylcyclohexanone-2-oxalate and  $N_2H_4 \cdot H_2O$  give Et 5-methyl-4,5,6,7-tetrahydroindazole-3-carboxylate (I), b<sub>1</sub>  $208–10^\circ$ ,

m. 110–1° (free acid, m. 274°), while condensation with MeNHNH<sub>2</sub> in AcOH gives, after hydrolysis, 2,5-dimethyltetrahydroindazole-3-carboxylic acid, m. 195–5.5°, as the principal product. If the condensation with MeNHNH<sub>2</sub> is effected by H<sub>2</sub>SO<sub>4</sub> at 0°, 5-dimethyltetrahydroindazole-3-carboxylic acid, m. 185–6° (Me ester, m. 114–5°), is the main product. Methylation of I (MeI and alkali) gives about equal quantities of the 1,5- and 2,5-derivs. 1,5-Dimethyltetrahydroindazole, b<sub>11</sub> 115–6° (picrate, m. 155°). Ethylation of I gives 5-methyl-2-ethyl-, m. 184–5°, and 5-methyl-1-ethyltetrahydroindazole-3-carboxylic acids, m. 147.5–9.5° (Me ester, m. 44.5–5.5°); the m. p. of the corresponding indazole picrates should be interchanged. Benzoylation of I gives 40% of 2-benzyl-5-methyl-, m. 186–7°, and 60% of 1-benzyl-5-methyltetrahydroindazole-3-carboxylic acids, m. 142.5–3.5° (Me ester, m. 98–9°), which, on loss of CO<sub>2</sub>, yield 2-benzyl-5-methyl-(picrates, m. 115–6° and 135–6°) and 1-benzyl-5-methyltetrahydroindazoles, b<sub>11</sub> 191–2° (picrate, m. 128–9°). Condensation of the above oxalate with PhNHNH<sub>2</sub> gives 80% of Et 1-phenyl-5-methyl-4,5,6,7-tetrahydroindazole-3-carboxylate, m. 128–9° (Me ester, m. 119–20°; free acid, m. 196.5–8.5°), and 20% of 2-phenyl-5-methyl-4,5,6,7-tetrahydroindazole-3-carboxylic acid, m. 202–3°. Et 6-methylcyclohexanone-2-oxalate and N<sub>2</sub>H<sub>4</sub>·H<sub>2</sub>O give 43% of Et 7-methyl-4,5,6,7-tetrahydroindazole-3-carboxylate, b<sub>11</sub> 182°, m. 87–8° (free acid, m. 212–4°); MeI and MeONa give approx. equal quantities of 2,7-dimethyl-, m. 128–30°, and 1,7-dimethyltetrahydroindazole-3-carboxylic acids, m. 169.5–70.5° (Me ester, b<sub>11</sub> 185–7°). 1,7-Dimethyltetrahydroindazole, b<sub>11</sub> 111–2° (picrate, m. 155.5°). Ethylation gives about equal quantities of 7-methyl-2-ethyl-, m. 43–9°, and 7-methyl-1-ethyltetrahydroindazole-3-carboxylic acids, m. 94° (with 1 mol. H<sub>2</sub>O), m. 127.5–8.5° (anhyd. Me ester, b<sub>10</sub> 182–3°, d<sub>4</sub><sup>25</sup> 1.0899, n<sub>D</sub><sup>20</sup> 1.50485). 7-Methyl-1-ethyltetrahydroindazole, b<sub>10</sub> 111–1.5° (picrate, m. 136–7°). Benzoylation gives 80% of 1-benzyl-7-methyltetrahydroindazole-3-carboxylic acid, crystg. with 1 H<sub>2</sub>O, m. 119–21° (Me ester, b<sub>11</sub> 242–6°), and 20% of the 2-benzyl deriv., m. 154–5°. 1- and 2-Benzyl-7-methyltetrahydroindazoles, b<sub>11</sub> 188–91° and b<sub>12</sub> 189–90°, resp., are obtained in the usual manner. Condensation of the above oxalate with PhNHNH<sub>2</sub> in HCl or AcOH gives 65% of 1-phenyl-7-methyltetrahydroindazole-3-carboxylic acid, m. 177–8° (Me ester, b<sub>12</sub> 238–40°), and 35% of the 2-Ph acid, m. 180–1°. Methylation of Et 4,6-dimethyl-4,5,6,7-tetrahydroindazole-3-carboxylate, b<sub>12</sub> 197° (Me ester, b<sub>12</sub> 197°, m. 90–1°; free acid, m. 269–70°), affords 83% of 1,4,6-trimethyltetrahydroindazole-3-carboxylic acid, m. 176–7° (Me ester, m. 73–5°), together with 17% of the 2,4,6-tri-Me deriv., m. 179–80°. The picrates of 1,4,6- and 2,4,6-trimethyltetrahydroindazoles, m. 175–6.5° and 145–6°, resp., have been previously described as the 2,4,6- and 1,4,6-derivs. 4,6-Dimethyl-1-ethyltetrahydroindazole-3-carboxylic acid, m. 141–1.5° (Me ester, b<sub>11</sub> 188–9°, m. 64.5–5.5°), gives 4,6-dimethyl-1-ethyltetrahydroindazole, b<sub>11</sub> 126° (picrate, m. 137–8°, previously named 2-picrate), and 4,6-dimethyl-2-ethyltetrahydroindazole-3-carboxylic acid, m. 145–6.5°, yields the corresponding indazole (picrate, m. 117–8°, previously termed the 1-picrate). 2-Benzyl-4,6-dimethyl-, m. 159.5–60.5°, and 1-benzyl-4,6-dimethyltetrahydroindazole-3-carboxylic acids, m. 137–8° (Me ester, b<sub>11</sub> 242–3°, m. 112–3°) are also described. 1-Phenyl-4,6-dimethyltetrahydroindazole-(perchlorate, m. 183–4°) is obtained from the corresponding 3-carboxylic acid, m. 192.5–3.5° (Me ester, b<sub>11</sub> 240°, m. 87–8°). 2-Phenyl-4,6-dimethyltetrahydroindazole-3-carboxylic acid, m. 223° (decompn.). Spectrochem. data are given for 14 of the above derivs. (1-Me, 1,5-di-Me, 1-benzyl-5-Me, 1,7-di-Me, 1-Et-7-Me, 2-Et-7-Me, 1-benzyl-7-Me, 2-benzyl-7-Me, 1-Ph-7-Me, 2-Ph-7-Me, 1,4,6-tri-Me, 1-Et-4,6-di-Me, 1-benzyl-4,6-di-Me, 2-benzyl-4,6-di-Me).

C. J. WEST

**Synthesis and fission of quaternary tetrahydroindazolium salts.** K. v. AUWERS, J. CONRAD and A. ERNECKE. Univ. Marburg. *Ann.* **469**, 82–92(1929).—The following substituted 4,5,6,7-tetrahydroindazolium iodides have been prepd. from the requisite indazole and alkyl or aralkyl iodide at 100°: 1,2-dibenzyl-, m. 153°; 1-benzyl-2-ethyl-, m. 125–7°; 1,2,5-trimethyl-, m. 137.5° (bromide, an oil); 1,5-dimethyl-2-ethyl-, m. 84°; 2,5-dimethyl-1-ethyl-, m. 67–9°; 5-methyl-1,2-diethyl-, m. 115–7°; 2-benzyl-1,5-dimethyl-, m. 139–40°; 1-benzyl-2,5-dimethyl-, m. 175–6°; 2-benzyl-5-methyl-1-ethyl-, m. 167–8°; 1-benzyl-5-methyl-2-ethyl-, m. 142–4°; 1,2,7-trimethyl-, m. 121–3°; 7-methyl-1,2-diethyl-, oily; 2-benzyl-1,7-dimethyl-, m. 175°; 1-benzyl-2,7-dimethyl-, m. 175–6°; 1,2,4,6-tetra-methyl-, m. 155°; 1,4,6-trimethyl-2-ethyl-, oily; 2,4,6-trimethyl-1-ethyl-, m. 116–8°; 2-benzyl-1,4,6-trimethyl-, oily; 1-benzyl-2,4,6-trimethyl-, m. 119.5–20.5°. The compds. previously described as 1-benzyl-1-ethyl- and 2-benzyl-2-ethyltetrahydroindazolium iodides are the 1-benzyl-2-ethyl and 2-benzyl-1-ethyl derivs., resp. The methiodide of 7-methyl-2-ethyltetrahydroindazole, m. 102–3°, is the quaternary 2,7-dimethyl-1-ethyl salt. The methiodide, m. 175°, from 2-benzyl-7-methyltetrahydroindazole is also obtained from 1,7-dimethyltetrahydroindazole and PhCH<sub>2</sub>I, and is, therefore,

2-benzyl-1,7-dimethyltetrahydroindazolium iodide. Fission of the above salts is accomplished by heating in a vacuum above the m. p. and converting the bases formed into the picrates. With the 1,2-dimethyl, 1,2-diethyl and 1,2-dibenzyl derivs., approx. equal quantities of the 1- and 2-alkyltetrahydroindazoles are produced; occasionally an excess of the 2-derivs. results. When dissimilar groups are attached to the 1- and 2-positions the 1 with the least affinity demand (e. g., benzyl) is eliminated, in agreement with the results previously obtained. In some of the decompns. a partial wandering of an alkyl group occurs. Thus, 1-benzyl-2,7-dimethyltetrahydroindazolium iodide affords in addn. to 2,7-dimethyltetrahydroindazole a small amt. of the 1,7-di-Me deriv. 1,4,6-Trimethyl-2-ethyltetrahydroindazolium iodide gives 1,4,6-trimethyl-, 4,6-dimethyl-1-ethyl- and 4,6-dimethyl-2-ethyltetrahydroindazoles in the ratio of 2:1:3. Similarly, 2,4,6-trimethyl-1-ethyltetrahydroindazolium iodide yields 1,4,6-trimethyl-, 4,6-dimethyl-1-ethyl-, and 2,4,6-trimethyltetrahydroindazoles in the proportion 3:3:1.

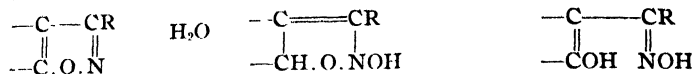
C. J. WEST

**Aminobenzothiazoles. XI. Synthesis of 5,4'-disubstituted 1-anilinobenzothiazoles from nuclear substituted thiocarbonylides.** GEORGE M. DYSON, ROBERT F. HUNTER AND CHARLES SOYKA. Imp. College Sci. Tech., London. *J. Chem. Soc.* 1929, 458-66; cf. *C. A.* 23, 835.—(*p*-BrC<sub>6</sub>H<sub>4</sub>NH)<sub>2</sub>CS and Br in CHCl<sub>3</sub> yield a perbromide, which, on heating, gives a *hydropentabromide*(I), C<sub>12</sub>H<sub>8</sub>N<sub>2</sub>Br<sub>5</sub>S.HBr.Br., orange-red needles, m. 170° (decompn.) and rapidly loses Br on exposure to moist air; suspended in H<sub>2</sub>SO<sub>4</sub> and treated with SO<sub>2</sub>, there results *5,4'-dibromo-1-anilinobenzothiazole*(II), m. 221°; *Ac deriv.*, m. 205-6°; *HBr salt*, m. 250° (decompn.); Br gives I. *1-Chloro-5-bromobenzothiazole*, m. 89°, b<sub>11</sub> 157-9°, results by heating *p*-BrC<sub>6</sub>H<sub>4</sub>NCS and PCl<sub>5</sub> 30-40 hrs. at 170-80°; warming with *p*-BrC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub> gives II. *p*-BrC<sub>6</sub>H<sub>4</sub>NHCSNHPH and Br in CHCl<sub>3</sub> give the *hydrotribromide*, m. 148° (decompn.), which is reduced to *4'-bromo-1-anilinobenzothiazole*(III), m. 214-5°, also obtained from 1-chlorobenzothiazole and *p*-BrC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub>. Bromination of III gives II. 1-Anilinobenzothiazole yields a *hexabromide*, m. 140°, which yields II on being dissolved in boiling abs. EtOH. Hagershoff's dibromoanilinobenzothiazole (*Ber.* 36, 3121(1903)) appears to consist mainly of II, although the m. p. could not be raised above 200°. Bromination of II gives an unstable orange *hexabromide*, m. 254°, which gives with hot abs. EtOH a *tetra-Br substitution deriv.*, m. 196-8°. (*p*-ClC<sub>6</sub>H<sub>4</sub>NH)<sub>2</sub>CS and Br in CHCl<sub>3</sub> yield a *hydrotribromide*, orange, m. 165-7° (decompn.); reduction gives *5,4'-dichloro-1-anilinobenzothiazole*, m. 224°; *Ac deriv.*, m. 186-7°; *HBr salt*, yellow, m. 217°; *hexabromide*, orange, m. 253° (decompn.). *p*-ClC<sub>6</sub>H<sub>4</sub>NHCSNHPH yields a *Br addn. compd.*, orange, m. 130° (decompn.); *4'-chloro-1-anilinobenzothiazole*, m. 196°; this is also obtained from 1-chlorobenzothiazole and *p*-ClC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub>. (*p*-IC<sub>6</sub>H<sub>4</sub>NH)<sub>2</sub>CS and Br in CHCl<sub>3</sub> yield a red *bromide*, m. 185°, and a yellow, m. 211°; both, on reduction, yield *5,4'-diiodo-1-anilinobenzothiazole*, m. 193° (decompn.); this also results by treating 1-anilinobenzothiazole in AcOH with ICl, warming the soln. and dilg. with H<sub>2</sub>O. (*p*-FC<sub>6</sub>H<sub>4</sub>NH)<sub>2</sub>CS gives a *hydrotribromide*, orange, m. 150-2° (decompn.); *5,4'-difluoro-1-anilinobenzothiazole*, m. 227-8°. *5,4'-Dinitro-1-anilinobenzothiazole*, brilliant yellow, m. 280°; this also results on nitration of 1-anilinobenzothiazole. (*p*-NCC<sub>6</sub>H<sub>4</sub>NH)<sub>2</sub>CS and Br give an *addn. product*, golden, m. 159-60° (decompn.); *5,4'-dicyano-1-anilinobenzothiazole*, m. 222°. (*p*-EtO<sub>2</sub>CC<sub>6</sub>H<sub>4</sub>NH)<sub>2</sub>CS yields a *hydropentabromide*, orange, m. 110° (decompn.); reduction gives *Et 1-anilinobenzothiazole-5,4'-dicarboxylate*, m. 190-2°; hydrolysis gives the free acid, does not m. 290°. (*p*-MeOC<sub>6</sub>H<sub>4</sub>NH)<sub>2</sub>CS yields a brick-red *bromide*, m. 137° (decompn.), reduced to a *dibromo-5,4'-dimethoxy-1-anilinobenzothiazole*, m. 240°. PhNHCSNHPH yields a *hydrotribromide*, orange, m. 167° (decompn.); the same compd. is obtained from 1-acetanilinobenzothiazole, HBr and Br (Hagershoff, *Ber.* 36, 3136(1903)); Br in CHCl<sub>3</sub> gives an orange *hexa-Br addn. compd.*, m. 163° (decompn.).

C. J. WEST

**Fission of the benz- $\alpha,\beta$ -isoxazole ring.** HANS LINDEMANN AND HANS CRÄGE. Tech. Hochschule Braunschweig. *Ann.* 469, 44-57(1929).—Me 6-nitrobenzisoxazole-3-carboxylate (Borsche, *C. A.* 6, 2422), when heated with slightly dild. H<sub>2</sub>SO<sub>4</sub> 20 mins. on the H<sub>2</sub>O bath, gives *6-nitrobenzisoxazole-3-carboxylic acid*(I), m. 189-90° (evolution of CO<sub>2</sub>), alk. hydrolysis gives a I which crysts. with 1 H<sub>2</sub>O, lost in vacuo over P<sub>2</sub>O<sub>5</sub>. I and N<sub>2</sub>H<sub>4</sub>.H<sub>2</sub>O in EtOH give the corresponding *hydrazide*, m. 170° (*Ac deriv.*, m. 213-4°), converted by HNO<sub>3</sub> into the corresponding *amide*, m. 135° (decompn.) Decompn. of this with AcOH gives *di[6-nitrobenzisoxazole-3]carbamide*, m. 342°, while with Ac<sub>2</sub>O and a little concd. H<sub>2</sub>SO<sub>4</sub> there results a mixt. of *6-nitro-3-acetamido-*, m. 230° (not sharp), and *6-nitro-3-diacetamidobenzisoxazole*, m. 133°. Warming either *Ac deriv.* with 2 N NaOH gives *3,4'-nitro-2'-hydroxyphenyl-5-methyl-1,2,4-oxadiazole*, m. 124° (*Ac deriv.*, m. 162°), thus demonstrating fission of the isoxazole ring and

subsequent reaction between the oximino and acetamido groups. Hydrolysis of the Ac derivs. with fairly concd.  $\text{H}_2\text{SO}_4$  gives 6-nitro-3-aminobenzisoxazole(II), m.  $234^\circ$ , converted by  $\text{HNO}_2$  into 6-nitro-3-hydroxybenzisoxazole(III), m.  $85-8^\circ$  (decompn.). Treating III with AcOH or II with  $\text{HNO}_2$  in AcOH gives 4-nitro-2-hydroxybenzacetilhydroxamic acid, m.  $184^\circ$ , then at  $241^\circ$ , hydrolyzed by 10% NaOH to the corresponding hydroxamic acid, m.  $214^\circ$ . Either acid, heated with MeOH-KOH, gives 6-nitrobenzoxazol-2-one, m.  $241^\circ$ . The mechanism of the fission is explained by assuming the addn. of 1 mol.  $\text{H}_2\text{O}$ :



If the group R has no depressant action (e. g., HO, NHAc) on the conjugated system fission occurs, but when R depresses the conjugation (e. g., alkyl,  $\text{NH}_2$ ) fission is inhibited.

C. J. WEST

***o*-Benzidine rearrangement of 3-methyl-4-phenylhydrazo-5-phenylisoxazole.** G. WITTIG, H. KLEINER AND J. CONRAD. Univ. Marburg. *Ann.* **469**, 1-16(1929).—Reduction of 3-methyl-4-phenylazo-5-phenylisoxazole either electrolytically or with Al powder in EtOH contg. a small amt. of NaOH gives 3-methyl-4-phenylhydrazo-5-phenylisoxazole, m.  $136^\circ$  (decompn.). Warming with *N* HCl causes rearrangement, giving a mixt. of 3-methyl-5-gem-phenyl-5-anilinoisoxazole-4-one(I), m.  $130^\circ$  (decompn.) and 3-methyl-5-gem-phenyl-5-*o*-aminophenylisoxazole-4-ketimine(II), m.  $179-80^\circ$  (decompn.). Thermal decompn. of I at  $130^\circ$  gives CO and BzNHPh, while acid or alk. hydrolysis gives BzOH and PhNH<sub>2</sub>. I does not react with  $\text{KMnO}_4$  or with  $\text{NH}_2\text{OH}$ . Br gives 2,4-Br<sub>2</sub>C<sub>6</sub>H<sub>4</sub>NHBz, m.  $139.5^\circ$ . PhMgBr and I give 4-hydroxy-5-anilino-4,5-diphenyl-3-methylisoxazoline, m.  $173.5^\circ$ , hydrolyzed by *N* AcOH in Me<sub>2</sub>CO to  $\alpha$ -isomitosoethylbenzoin, m.  $179-80^\circ$  (decompn.), further hydrolyzed by mineral acid to Bz<sub>2</sub>. MeMgI and I give 4-hydroxy-5-anilino-5-phenyl-3,4-dimethylisoxazoline, m.  $201^\circ$  (slight decompn.), hydrolyzed by 2*N*  $\text{H}_2\text{SO}_4$  to 2-benzoyl-3-isonitrosobutan-2-ol, m.  $145^\circ$ . II does not react with *p*-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>NHNH<sub>2</sub>; Br gives the HBr salt, m.  $172.5^\circ$ , of 5-phenyl-5-*p*-bromo-*o*-aminophenyl-3-methylisoxazole 4-ketimine, m.  $175^\circ$ . II yields an Ac deriv, m.  $254^\circ$ , and a benzylidene deriv, m.  $195.5-6^\circ$ . SnCl<sub>2</sub> gives an addn. product, 2II.SnCl<sub>4</sub>, m.  $127^\circ$ . II is hydrolyzed by 30% KOH to 2-amino-3-hydroxy-3-phenylindole, m.  $204^\circ$ , also formed by the action of an excess of MeMgI on II; fusion with alkali gives *o*-H<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>Bz, m.  $104-5^\circ$ , and HCN. Boiling II with dil. AcOH 5-6 hrs. gives 2,3-dihydroxy-3-phenylindole, m.  $209-10^\circ$ .

C. J. WEST

**Ring closure of hydrazomonothiodicarboxamides with acetic anhydride. Formation of iminothiodiazolones and iminothioltriazoles.** PRAPHULLA C. GUHA AND TARINI K. CHAKRABORTY. Dacca Univ. and Indian Inst. of Science, Bangalore. *J. Indian Chem. Soc.* **6**, 99-110(1929); cf. *C. A.* **17**, 2286.—This paper gives the results of a study of the ring-closing action of Ac<sub>2</sub>O on substituted hydrazodicarboxamides prepd. by the action of  $\text{H}_2\text{NCONHNH}_2$  with mustard oils.  $\text{H}_2\text{NCONHNH}_2 \cdot \text{HCl}$  was dissolved in the least quantity of H<sub>2</sub>O, and Na<sub>2</sub>CO<sub>3</sub> added to liberate the free base. A mol. proportion of MeNCS in EtOH was added and the mixt. warmed, whereupon there sepd.  $\text{H}_2\text{NCONHNHCSNHR}$  (I, R = Me) (II), m.  $212^\circ$ . Heated with Ac<sub>2</sub>O I gave 2-methylimino-4-acetyl-5-keto-2,3,4,5-tetrahydro-1,3,4-thiodiazole (III), m.  $197^\circ$ . Hydrolyzed by boiling with concd. HCl this gave the free thiodiazole, m.  $232^\circ$ . I, (R = C<sub>6</sub>H<sub>5</sub>), m.  $202^\circ$ , gave when heated with Ac<sub>2</sub>O on a water bath the 2-allyliminoanalog of III, m.  $171^\circ$ . Heated with moderately concd. HCl this gave the free thiodiazole, m.  $210^\circ$ . I, (R = Ph) heated with Ac<sub>2</sub>O and AcONa gave the 3-Ac deriv, m.  $173^\circ$ , and the 3,4-di-Ac deriv., m.  $213^\circ$ , of 2-phenylimino-5-keto-2,3,4,5-tetrahydro-1,3,4-thiodiazole (IV). Hydrolyzed by concd. HCl both Ac derivs. gave IV, m.  $206^\circ$ , sol. in cold dil. alkali with a pale green color. I, (R = *o*-MeC<sub>6</sub>H<sub>4</sub>), m.  $201^\circ$  (decompn.), gave with Ac<sub>2</sub>O and AcONa the 2-*o*-tolyliminoanalog of III, m.  $183^\circ$ . Hydrolyzed by fuming HCl this Ac deriv. gave the free thiodiazole, m.  $210^\circ$ . I (R = *p*-MeC<sub>6</sub>H<sub>4</sub>), m.  $192^\circ$ , reacted with Ac<sub>2</sub>O to give (1) 2-*p*-tolylimino-5-keto-2,3,4,5-tetrahydro-1,3,4-thiodiazole, m.  $247^\circ$ , insol. in alkali, unchanged by boiling with fuming HCl, and (2) 2-*p*-tolylimino-3-acetyl-5-thiol-2,3-dihydro-1,3,4-triazole, m.  $154^\circ$ , sol. in alkali, acted on by FeCl<sub>3</sub>, H<sub>2</sub>O<sub>2</sub> and I<sub>2</sub> soln. I (R = Me<sub>2</sub>C<sub>6</sub>H<sub>3</sub>), m.  $200^\circ$  (decompn.), reacts with Ac<sub>2</sub>O in the presence of AcONa to give the 2-xylimino analog of III, m.  $218^\circ$ . Boiled with fuming HCl it gave the free thiodiazole, m.  $232^\circ$ , sol. in cold dil. alkali with a pinkish color. I (R =  $\beta$ -C<sub>10</sub>H<sub>7</sub>), m.  $210^\circ$  (decompn.), when heated with Ac<sub>2</sub>O is decompd. completely. H<sub>2</sub>NCSNHNHCONHPh (V), heated with Ac<sub>2</sub>O and AcONa gave both the 3-Ac deriv., m.  $275^\circ$ , and the 3,4-di-Ac deriv., m.  $160^\circ$ , of 2-imino-5-keto-2,3,4,5-tetrahydro-1,3,4-

*thiodiazole*. Boiled with excess  $\text{Ac}_2\text{O}$ , **V** was decompd. into  $\text{CO}(\text{NHPh})_2$ .  $\text{AcNHPh}$ , a trace of acetylminothiodiazolone and 2 more compds., m.  $92-3^\circ$  and  $115^\circ$ .  $\text{PhNH}\cdot\text{CONHNHCSNHPh}$ , m.  $208^\circ$ , heated with excess  $\text{Ac}_2\text{O}$  10 mins. gave as the main product  $\text{CO}(\text{NHPh})_2$ .  $\text{H}_2\text{NCSNHNHCONHC}_{10}\text{H}_7\cdot\alpha$ , m.  $213^\circ$ , heated with  $\text{Ac}_2\text{O}$  and  $\text{AcONa}$  gave sym.  $-(\alpha\text{-C}_{10}\text{H}_7\text{NH})_2\text{CO}$ .  $(\text{NHCONH}_2)_2$ , heated with  $\text{Ac}_2\text{O}$  in a sealed tube at  $200^\circ$  for 2 hrs., gave sym.  $-(\text{NHAc})_2$ , m.  $138^\circ$ ; *di-HCl salt*, m.  $200^\circ$ . L. K.

The condensation of dichloroacetaldehyde with phenols. FREDERICK D. CHATTAWAY AND ALEXANDER A. MORRIS. *J. Chem. Soc.* 1928, 3241-6.—The condensation of phenols with aldehydes to form a dioxin ring,  $\text{C}_6\text{H}_4\cdot\text{O}\cdot\text{CH}_2\cdot\text{O}\cdot\text{CH}_2$ , is not confined

to chloral.  $\text{Cl}_2\text{CHCHO}$  reacts more readily when its alcoholate is added slowly to a cool soln. of  $p\text{-O}_2\text{NC}_6\text{H}_4\text{OH}$  in concd.  $\text{H}_2\text{SO}_4$ , and yields 6-nitro-2,4-bis(dichloromethyl)-1,3-benzodioxan, (**I**), m.  $113-5^\circ$ ,  $\text{C}:\text{CH}\cdot\text{C}(\text{NO}_2):\text{CH}\cdot\text{CH}:\text{C}\cdot\text{O}\cdot\text{CH}(\text{CHCl}_2)\cdot\text{O}\cdot\text{CHCHCl}_2$ .

**I** is converted by alc.  $\text{KOH}$  into  $\text{C}:\text{CH}\cdot\text{C}(\text{NO}_2):\text{CH}\cdot\text{CH}:\text{C}\cdot\text{O}\cdot\text{CH}(\text{CHCl}_2)\cdot\text{O}\cdot\text{C}:\text{CHCl}$

or  $\text{C}:\text{CH}\cdot\text{C}(\text{NO}_2):\text{CH}\cdot\text{CH}:\text{C}\cdot\text{O}\cdot\text{C}:(\text{CHCl})\cdot\text{O}\cdot\text{CHCHCl}_2$ , (**II**), m.  $108^\circ$ , which does

not react with  $\text{Br}$  in spite of its unsatn. If the temp. is not controlled, 5-nitro-2'-ethoxymandelic acid is obtained. **I** is reduced by  $\text{Fe}$  and  $\text{HCl}$  to the corresponding amino deriv., m.  $108.5-9.5^\circ$ , (*HCl salt*, m.  $210^\circ$  (decompn.)); *Ac deriv.*, m.  $149-50^\circ$ ; *di Ac deriv.*, m.  $145^\circ$ . From this amine, the diazonium chloride was prepd., and this was converted into the *perbromide*, which decompd.  $128-9^\circ$  or when heated with

$\text{AcOH}$ , to give  $\text{C}:\text{CH}\cdot\text{CBr}:\text{CH}\cdot\text{CH}:\text{C}\cdot\text{O}\cdot\text{CH}(\text{CHCl}_2)\cdot\text{O}\cdot\text{CHCHCl}_2$ , m.  $91.5^\circ$ . When

$\text{PhOH}$  is dissolved in concd.  $\text{H}_2\text{SO}_4$  and treated with the alcoholate of  $\text{Cl}_2\text{CHCHO}$ ,

$\text{C}:\text{CH}\cdot\text{C}(\text{SO}_3\text{H}):\text{CH}\cdot\text{CH}:\text{C}\cdot\text{O}\cdot\text{CH}(\text{CHCl}_2)\cdot\text{O}\cdot\text{CHCHCl}_2\cdot\text{H}_2\text{O}$  (**III**), m.  $150-5^\circ$  (de-

compn.), is obtained, and its  $\text{NH}_4$  salt has been prepd. When **III** is dissolved in  $\text{H}_2\text{SO}_4$

and nitrated  $\text{C}:\text{CH}\cdot\text{C}(\text{NO}_2):\text{CH}\cdot\text{C}(\text{NO}_2):\text{C}\cdot\text{O}\cdot\text{CH}(\text{CHCl}_2)\cdot\text{O}\cdot\text{CHCHCl}_2$ , m.  $133.5-$

$4.5^\circ$ , is obtained. The nitration of the mononitro deriv. gives the same dinitro compd.

Alc.  $\text{KOH}$  reacts with the dinitro compd. to give  $\text{C}:\text{CH}\cdot\text{C}(\text{NO}_2):\text{CH}\cdot\text{C}(\text{NO}_2):\text{C}:-$

$\text{O}\cdot\text{C}(\text{CHCl})\cdot\text{C}\cdot\text{CHCHCl}_2$  or  $\text{C}:\text{CH}\cdot\text{C}(\text{NO}_2):\text{CH}\cdot\text{C}(\text{NO}_2):\text{C}\cdot\text{O}\cdot\text{CH}(\text{CHCl}_2)\cdot\text{O}\cdot\text{C}:-$

$\text{CHCl}$ , m.  $144^\circ$ , which does not react with  $\text{Br}$  despite its unsatn. **III** is converted by  $\text{PCl}_5$  into the corresponding sulfonyl chloride, m.  $105-6^\circ$ , from which the *Me* and *Et* sulfonates, m.  $110-5^\circ$  and  $148-9.5^\circ$ , resp., have been obtained, while  $\text{NH}_4\text{OH}$  or  $\text{PhNH}_2$  gave the sulfonamide, m.  $175.5^\circ$ , and the sulfonanilide, m.  $166-7^\circ$ , resp. A. L. H.

Plant colors. **XI**. The lycopins. P. KARRER AND W. F. BACHMANN. *Chem. Inst. Univ. Zurich. Helv. Chim. Acta* 12, 285-91 (1929).—The constitution and properties of lycopins are considered. The prepn. of alkali lycopin compds. and the reaction of (1)  $\text{Na}$  lycopin with  $\text{CO}_2$ , (2)  $\text{Li}$  lycopin with  $\text{H}_2\text{O}$ , (3)  $\text{K}$  lycopin with  $\text{MeI}$  and (4)  $\text{K}$  lycopin with dry  $\text{O}_2$  are described. Analyses of some of the compds. are given. **XII**. The constitution of the monardaeins and salvianins. P. KARRER AND ROSE WIDMER. *Ibid* 292-5.—Exptl. evidence is given to prove that monardacin (the coloring matter of golden balm) and salvianin (from *Salvia coccinea* L.) are one and the same compds. A possible structural formula is suggested. M. H. SOULE

Nitration of benzylpyridines and the oxidation of benzylpiperidines. FRANK BRYANS AND FRANK L. PYMAN. *Univ. of Manchester. J. Chem. Soc.* 1929, 549-53.—In continuing the work of Forsyth and Pyman (*C. A.* 21, 585) on the nitration of phenylpyridines, the corresponding benzylpyridines were nitrated; the proportion of the *m*-isomer produced (in the case of the 2- and 4-substituted compds.) was greatly diminished in the benzyl- as compared with the phenylpyridines. 1-Benzenesulfonyl-2-benzylpiperidine, m.  $65^\circ$  (all *m*. ps. cor.); 1-Bz deriv., m.  $68^\circ$ ; 1-benzenesulfonyl-4-benzyl-

*piperidine*, m. 118°. 2-Benzyl-1-methylpiperidine,  $b_{760}$  30–510°, yields a *picrate*, yellow, m. 181°. 2-Benzylpyridine *nitrate*, m. 116°; nitration gives 10.4% of 2-*m*-NO<sub>2</sub> and 66.7% of 2-*p*-NO<sub>2</sub> derivs. 2-*m*-Nitrobenzoylpyridine, m. 122°. Nitration of 3-benzylpyridine (*nitrate*, m. 140°) gives 63.1% of the *p*-NO<sub>2</sub> deriv., m. 88° (*picrate*, m. 145–6°; *nitrate*, m. 157°) and a trace of the *m*-isomer. 3-*p*-Nitrobenzoylpyridine, m. 106° (*picrate*, m. 185–7°). 4-Benzylpyridine (*nitrate*, m. 110°), on nitration, gives 70.2% of the *p*-NO<sub>2</sub> and 4.8% of the *m*-NO<sub>2</sub> deriv. 4-*m*-Nitrobenzoylpyridine, m. 129°. 2- and 4-Benzylpiperidines and 2-benzyl-1-methylpiperidine do not undergo the same type of fission on oxidation with H<sub>2</sub>SO<sub>4</sub> and MnO<sub>2</sub> as the 1-benzyltetrahydroisquinolines or 1-benzyl-2-methyltetrahydroisquinolines. C. J. WEST

**2,6-Dibromopyridine-4-carboxylic acid, 2,6-dichloropyridine-4-carboxylic acid and some of their derivatives.** W. H. LEVELT AND J. P. WIBAUT. Univ. Amsterdam. *Rec. trav. chim.* **48**, 466–73 (1929).—CO<sub>2</sub>H acids of the pyridine series with the CO<sub>2</sub>H group in position 4 are only prepd. with difficulty; thus 4-C<sub>5</sub>H<sub>4</sub>NCO<sub>2</sub>H (isonicotinic acid) is prepd. mostly from 2,3,4-C<sub>5</sub>H<sub>3</sub>N(CO<sub>2</sub>H)<sub>3</sub>, which may be prepd. by oxidation of cinchona alkaloids. Several methods were tried by L. and W. in order to prep. this acid in satisfactory yield from 4,4'-dipyridyl; however, the oxidation by means of KMnO<sub>4</sub> in acid and alk. media, CrO<sub>3</sub> in AcOH or H<sub>2</sub>SO<sub>4</sub>, fuming HNO<sub>3</sub>, a mixt. of HNO<sub>3</sub> and KClO<sub>3</sub> or H<sub>2</sub>O<sub>2</sub> only gives the desired product in very small yields. For the prepn. of substituted 4-C<sub>5</sub>H<sub>4</sub>NCO<sub>2</sub>H, L. and W. started from 2,6,4-C<sub>5</sub>H<sub>3</sub>N(OH)<sub>2</sub>CO<sub>2</sub>H (citrazinic acid) which was prepd. from citric acid (cf. *Ber.* **17**, 2687 (1884)); yield 190 g. from 1 kg. of citric acid. On heating 30 g. citrazinic acid with 90 g. POCl<sub>3</sub> in an autoclave at 200° for 3.5 hrs., 2,6-dichloropyridine-4-carboxylic acid, m. 208–9°, was obtained in a 34% yield (cf. *Ber.* **35**, 2933 (1902)). The acid chloride of this acid, prepd. in the usual way with SOCl<sub>2</sub>, was converted into the amide with (NH<sub>4</sub>)<sub>2</sub>CO<sub>3</sub> at 100°, m. 207–8°; the acid chloride,  $b_{760}$  243–6°, m. 25–7° (cf. *J. Chem. Soc.* **71**, 1076 (1897)). On heating the amide with SOCl<sub>2</sub> in a sealed tube at 120°, it is converted into 2,6-dichloro-4-cyanopyridine, m. 94–6°. On treatment with POBr<sub>3</sub> in the same way as with POCl<sub>3</sub>, citrazinic acid is converted into 2,6-dibromopyridine-4-carboxylic acid, m. 184–5°, from water; yield 25%. This acid yields the chloride,  $b_{21}$  160°,  $b_{760}$  256–8°, m. 9–11°, on heating with thionyl chloride; on treatment with (NH<sub>4</sub>)<sub>2</sub>CO<sub>3</sub> at 100°, this acid chloride is converted into the amide, m. 202–4°. When this amide is heated in a sealed tube with SOCl<sub>2</sub> at 140°, 2,6-dichloro-4-cyanopyridine is formed. According to Rosenmund (*C. A.* **12**, 2569; **15**, 2569, 2852), 2,6,4-C<sub>5</sub>H<sub>3</sub>NCl<sub>2</sub>COCl could not be reduced to the aldehyde, using boiling xylene as a solvent and Pd-BaSO<sub>4</sub> as a catalyst; only a small amount of 2,6-dichloropyridine, m. 84–6°, was obtained, the same result being obtained with 2,6,4-C<sub>5</sub>H<sub>3</sub>NBr<sub>2</sub>COCl, where a very small amount of a compd., m. 107–10°, was obtained. Probably this substance is 2,6-dibromopyridine, m. 118–9°, which was prepd. in 16% yield by heating 2,6,4-C<sub>5</sub>H<sub>3</sub>NBr<sub>2</sub>CO<sub>2</sub>Ag. Other reduction expts., viz. with Ni-asbestos as a catalyst at 300° or with xylene contg. a trace of sulfuretted quinoline, did not give the desired result. C. F. VAN DUIN

**Action of organomagnesium compounds on the anhydrides of asymmetric polycarboxylic acids: the action of ethylmagnesium iodide on cinchomeronic anhydride.** F. P. MAZZA. Inst. of Org. Chem. and Pharm. of R. Univ., Naples. *Rend. accad. sci. Napoli* [3], **34**, 59–65 (1928).—Grignard and Tissier (*Compt. rend.* **132**, 683, 1182) found that anhydrides react with 3 mols. RMgX to form tertiary alcs. and RCO<sub>2</sub>MgX. Succinic anhydride yields a glycol, and camphoric anhydride 2 isomeric lactones (Houben and Hahn, *C. A.* **2**, 2380). C<sub>6</sub>H<sub>4</sub>(CO)<sub>2</sub>O forms a dialkylphthalide (Bauer, *Ber.* **37**, 735), or with C<sub>10</sub>H<sub>7</sub>MgBr, C<sub>6</sub>H<sub>4</sub>(COC<sub>10</sub>H<sub>7</sub>)CO<sub>2</sub>H (Pickles and Weizmann, *Chem. News* **90**, 746). Simonis and Arand (*C. A.* **4**, 207) obtained from phthalic acid and RMgBr the keto acid and the dialkylphthalide. Tetrachlorophthalic anhydride gave the monoethylphthalide (Bauer, *loc. cit.*). Berlingozzi and Mazza (*C. A.* **20**, 2489) noted that RMgI with Δ<sup>2</sup>-tetrahydrophthalic anhydride gave chiefly the monoalkyl-Δ<sup>2</sup>-tetrahydrophthalide. M. with Ornella Fici found that cinchomeronic anhydride (I) reacts like C<sub>6</sub>H<sub>4</sub>(CO)<sub>2</sub>O. EtMgI (1 g. Mg and 5.8 g. EtI in 150–200 cc. ether) and I (3 g.) heated and shaken 6 hrs., left overnight, decompd. with ice and dil. H<sub>2</sub>SO<sub>4</sub>, and extd. with ether, yielded 0.25 g. of brown oil, which was distd. The fraction  $b_{90}$  132–3° was a slightly yellow liquid, C<sub>11</sub>H<sub>13</sub>NO<sub>2</sub>, of terpene odor, the lactone of diethyl-2-methylol-3-pyridinecarboxylic acid (3,3-diethyl-1,3-dihydro-1-keto[3,4-*c*]furopyridine), C<sub>8</sub>H<sub>9</sub>N(CEt<sub>2</sub>)OCO, as

shown by its hydrolysis with concd. KOH to Et<sub>2</sub>CO and isonicotinic acid. The fraction  $b_{90}$  165° solidified to a mass of pale yellow needles, m. 65°, of the lactone of diethyl-3-methylol-2-pyridinecarboxylic acid (1,1-diethyl-1,3-dihydro-3-keto[3,4-*c*]furopyridine), as shown by its hydrolysis to Et<sub>2</sub>CO and nicotinic acid. JANET D. SCOTT

**Mercury compounds of quinoline. III.** T. UKAI. *J. Pharm. Soc. Japan* **48**, 1175-8(1928); cf. *C. A.* **23**, 839.—Since U.'s 8-chloromercuquinoline (I) (*C. A.* **22**, 785) is little sol. in  $C_6H_6$  and other org. solvents, the more sol. 8,8'-mercuribisquinoline (II) was synthesized. The addn. of I in small amts. to 50%  $Na_2S_2O_3$  gave II, m. 178-82° (decompn.), quant. Dry distn. of the mixt. of II and Cu powder gave quinoline, Hg and von Niementowski's (*Ber.* **38**, 764) 8,8'-diquinolyl, showing that the HgCl group in I is at position 8.

**1,3,4-Oxdiazines. IV.** J. VAN ALPHEN. Univ. Leiden. *Rec. trav. chim.* **48**, 417-21(1929).—Previously (cf. *C. A.* **22**, 2566; **23**, 145, 1904) were described the

prepn. and properties of various 1,3,4-oxdiazines contg. the nucleus

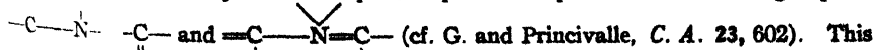


in which the Ph group was always present in position 4. The present paper deals with  $\Delta^2$ -5-ketooxdiazines in which the Ph group in position 4 is missing, this position being occupied by a H atom. These compds. were prepd. in a similar manner to that described for 5-ketooxdiazines, viz., by the action of the chloride of an aromatic or aliphatic  $\alpha$ -Cl-acid on a monoacylhydrazine and the subsequent removal of a mol. of HCl from the  $\alpha$ -[ $\alpha$ -chloroacyl]- $\beta$ -acylhydrazine, so formed. On adding 10 g.,  $ClCH_2COCl$  in  $C_6H_6$  to a suspension of 22 g.  $BzNHNH_2$  in 80 cc. of boiling benzene,  $\alpha$ -chloroacetyl- $\beta$ -benzoylhydrazine, m. 165°, is obtained; on heating this compd. for 3 hrs. in a sealed tube at 100° with acetone and  $K_2CO_3$ , it is converted into  $\Delta^2$ -2-phenyl-5-keto-1,3,4-oxdiazine (II), m. 161°, which is easily decompd. on boiling with 20 times its wt. of 10%  $H_2SO_4$  with the formation of  $N_2H_4$ ,  $H_2SO_4$ . In an attempt to prep. triphenyloxidiazine by boiling 13 g.  $Ph_2CClCOCl$  with 20 g.  $BzNHNH_2$  in 40 cc. benzene,  $\alpha$ -diphenyl- $\beta$ -benzoylhydrazine  $Ph_2C(CONHNHBz)NHNHBz$  (III), m. 217°, was obtained; it remains unchanged on boiling for 0.5 hr. with 10%  $H_2SO_4$ . The desired triphenyloxidiazine,  $\Delta^2$ -2,6,6-triphenyl-5-keto-1,3,4-oxdiazine (IV), m. 185°, was obtained, however, on adding 9 g.  $BzNHNH_2$  in small quantities at a time to 13 g.  $Ph_2CClCOCl$  in 40 cc. boiling benzene. IV again is stable toward boiling 10%  $H_2SO_4$ . From  $ClCH_2COCl$  and cinnamic hydrazide,  $\alpha$ -chloroacetyl- $\beta$ -cinnamylhydrazine, m. 185°, was obtained; on heating in acetone with  $K_2CO_3$ , it is converted into  $\Delta^2$ -2- $\beta$ -phenylvinyl-5-keto-1,3,4-oxdiazine (V), m. 190°, which was not changed on boiling with 10%  $H_2SO_4$ . These results and those published previously throw more light on the factors governing the hydrolysis of oxdiazines. While  $\Delta^2$ -2-methyl-4-phenyl-5-ketooxdiazine is hydrolyzed on boiling with 10%  $H_2SO_4$ , the corresponding 2,4-di-Ph compd. is not; this hindrance of ring opening is the consequence, however, of the combined action of the Ph groups in position 2 and 4, for, if the latter is missing as in II, described in this paper, hydrolysis again takes place by means of this agent. At least 2 Ph groups appear to be necessary to prevent hydrolysis; it is not essential, however, for position 4 to be occupied by a Ph group, IV being stable to hydrolysis. The effect of the  $PhCH:CH$  group is comparable with that of 2 Ph groups, since V cannot be hydrolysed.

C. F. VAN DUIN

**Constitution of Sonn's phloracetophenonemonomethyl ether and Hattori's kikokunetin.** J. SHINODA. *J. Pharm. Soc. Japan* **48**, 1178-9(1928).—Sonn (*C. A.* **20**, 375) obtained 2 kinds of phloracetophenone mono-Me ether, one, m. 136-7° (I) and the other, m. 205-6° (II). Recently (*C. A.* **23**, 1403) he assigned the structure 4,2,6-MeO(HO) $_2$ C $_6$ H $_2$ COME to I, and 2,4,6-MeO(HO) $_2$ C $_6$ H $_2$ COME to II. Attention is called to the fact that the structures of these substances have already been established in another way by S. (*C. A.* **22**, 2947). Hattori recently isolated 4-methoxy-5,7-dihydroxyflavanone from *Pseudaegle trifoliata* and called it *kikokunetin* (*C. A.* **23**, 2717). Since this is identical with S. and Sato's synthetic *isosakuranetin* (*C. A.* **23**, 836), S. proposes that the latter name should be used and the former as a synonym. N. U.

**The reaction of Rung, Behrend and Pinner. II.** G. GASTALDI and Q. TALU. Reale Univ. Sassari (Sardinia). *Gazz. chim. ital.* **58**, 664-6(1928).—The similarity in the behavior of salts of quaternary  $NH_4$  bases of imidoazolic and of hydroxypyrazinic compds toward alk. hydroxides depends upon the equivalence of the 2 groups:



hypothesis is strengthened by new researches on hydroxypyrimidines. Salts of the tertiary  $NH_4$  bases which are formed from them by the action of alkyl halides are decompd. by alk. hydroxides, 2 N atoms being eliminated from the pyrimidine nucleus (as alkylamine and  $NH_3$ , resp.). There is, however, one difference, for from imidoazolic and hydroxypyrazine compds. 2 mols. of alkylamine are obtained, but from hydroxy-

pyrimidinic compds. 1 mol. of alkylamine and 1 mol. of  $\text{NH}_3$ . This difference depends upon the fact that in the 1st case alkyl iodides but in the 2nd case hydriodides of the resp. bases undergo cleavage. Having proved that *N*-alkyl derivs. do not add alkyl halides to give salts of the corresponding quaternary  $\text{NH}_4$  bases, the decompn. of hydroxypyrimidine compds. was studied. 2,4-Dimethyl-6-hydroxypyrimidine (1 mol.) in MeOH, KOH (1 mol.) and MeI (4 mols.) heated 10 hrs. at  $100^\circ$  in a sealed tube, evapd. at room temp., and recrystd. from EtOH, yields *N*-methyl-2,4-dimethyl-6-keto-1,6-dihydropyrimidine-III,  $\text{O}:\text{C}:\text{CH}:\text{CMe}:\text{NH}:\text{CMe}:\text{NMe}$ , m.  $215^\circ$  (decompn.). Heated

with 33% KOH, it evolves  $\text{MeNH}_2$  and  $\text{NH}_3$ .

C. C. DAVIS

**Quinoxaline synthesis: some derivatives of 2,3-dimethylquinoxaline.** STANLEY T. HENDERSON. *J. Chem. Soc.* 1929, 466-8.—The synthesis of 2,3-dimethylquinoxaline (I) from  $\alpha\text{-C}_6\text{H}_4(\text{NH}_2)_2$  and  $\text{AcCMe}:\text{NOH}$  (Gabriel and Sonn, *C. A.* 2, 851) involves the formation of an intermediate compd., the I deriv. of dimethylglyoxime,  $\text{C}_6\text{H}_4\text{N}:\text{CMe}:\text{CMe}:\text{NHON}:\text{CMe}:\text{CMe}:\text{NOH}$ , lemon-yellow, m.  $182^\circ$ ; this also

results from I and dimethylglyoxime(II) in EtOH; concd. HCl gives  $\text{Ac}_2$  and a salt of I, while alkali gives I itself. In EtOH this deriv. shows as sensitive a color reaction as II with Ni salts. 2,3-Dimethylnaphthaquinoxaline likewise gives an intermediate compd.,  $\text{C}_{22}\text{H}_{20}\text{O}_2\text{N}_6$ , light orange, m.  $123^\circ$ . Excess of Br and I in EtOH give the 5,6,7,8-tetra-Br deriv., m.  $234^\circ$  (decompn.); the Br is not removed by aq. alkali or boiling  $\text{AgNO}_3$  in EtOH, nor is the compd. appreciably attacked by boiling  $\text{CrO}_3\text{-AcOH}$  or alk.  $\text{KMnO}_4$ . Bromination of I in  $\text{CHCl}_3$  gives as the chief product a compd.,  $\text{C}_6\text{H}_8\text{N}_2\text{Br}_2$ , m.  $150^\circ$ ; this Br is partly removed by hot aq. alkali.

C. J. WEST

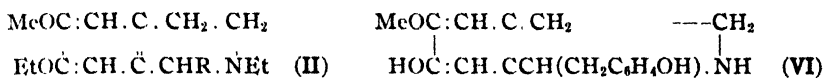
**Solanine.** GIUSEPPE ODDO. *Ber.* 62B, 267-71 (1929).—Zemplén and Gerecs (*C. A.* 23, 1412) do not seem to be adequately acquainted with the numerous papers of O. and his collaborators on solanine. They quote only 1 of these and in a manner which is entirely misleading. They did their work with a com. solanine which was probably prepd. from *Solanum tuberosum*, as the com. article usually is, while the work of O. and Cesaris which they criticize was done with solanine from *S. sodomaeum* and these 2 products have been shown to be quite distinct from each other.

C. A. R

**Alkaloids of Sinomenium and Cocculus. XXII. Alkaloids of Stephania japonica,** Miers. IV. H. KONDO AND T. SANADA. Tokyo Imp. Univ. *J. Pharm. Soc. Japan* 48, 1141-56 (1928).—In paper III (*C. A.* 22, 965), it was concluded, after comparing the sp. rotation of desoxydehydroepistephanine-MeI (I) and dimethylapomorphine-MeI (II), that these compds. are optical antipodes. Since I was obtained in an amorphous state, however, its complete racemization with II was impossible. K. and S. have now succeeded in prepg. I in a pure cryst. state from MeOH and thus its complete racemization was possible. I decomps.  $165^\circ$ ,  $[\alpha]_D^{23}$   $42.28^\circ$ . II, m. and decomps.  $190\ 5^\circ$ ,  $[\alpha]_D^{26}$   $-42.03^\circ$ . Equal quantities of I and II in MeOH gave the *dl*-compd., m.  $214^\circ$ . The above facts show that I is of the tetrahydroisoquinoline type belonging to the phenanthrene group. There is no doubt that its 2 MeO groups are present on  $\text{C}_3$  and  $\text{C}_4$ . There still remain 2 points to be cleared in the structure of epistephanine (III), *i. e.*, (a) the position of the  $>\text{CO}$  group, and (b) whether it possess a nucleus of a perfect isoquinoline type or a bridged structure like thebaine. In order to solve the first point the properties of isostephanine (IV), a phenolic compd. obtained either by a reduction of III by Clemmensen's method or by heating III with concd. HCl, were studied in detail. It has the compn.  $\text{C}_{19}\text{H}_{21}\text{NO}_8$ , m.  $160\text{--}85^\circ$ ,  $[\alpha]_D^{20}$   $169.16^\circ$ , and contains 2 MeO groups. Dimethyl-methosulfate (V), m.  $245^\circ$ . Hofmann's decompn. of V gave the methinmethiodide, m.  $210^\circ$  (decompn.), and *des*-*N*-methylisoeptistephanine (VI), m.  $60\text{--}1^\circ$ . Picrate, yellow, m.  $125\text{--}30^\circ$ . Morphothebaine and  $\text{Me}_2\text{SO}$  gave dimethylmorphothebaine methylmethosulfate, (VII), m.  $212^\circ$ ,  $[\alpha]_D^{23}$   $-73.7$ . VII and KI gave dimethylmorphothebaine-MeI (VIII), m.  $187$ ,  $[\alpha]_D^{25}$   $-97.8$ . VII and VIII belong to the apomorphine group and have a MeO group at  $\text{C}_6$  so that they are isomeric with methylisoeptistephanine- $\text{Me}_2\text{SO}_4$  (IX) and methylisostephanine-MeI (X), resp. If the sp. rotations of IX and X had been compared with those of VII and VIII, the position of the  $>\text{CO}$  group on  $\text{C}_6$  could have been established with certainty on the ground that these compds. are optical antipodes. Unfortunately IX and X are amorphous and this method could not be applied. Hofmann's decompn. of VIII gave 3,4,6-trimethoxy-8-vinylphenanthrene (XI), m.  $60\ 1^\circ$ . Picrate, reddish violet, m.  $125\text{--}6^\circ$ . The mixed m. p. of VI and XI was not depressed, but the mixed m. p. of their picrates was  $112^\circ$ , showing the identity of these compds. is still questionable. There is another substance which might be useful in proving the position of the  $>\text{CO}$  group in III. This



is *ψ*-epistephanine (XIII)  $C_{16}H_{11}(OMe)_2(OH)NMe$  (decomps.  $257^\circ$ ,  $[\alpha]_D^{27}$   $174.56^\circ$ ), which was recently isolated from the ext. of *Stephania japonica* (XIV). It is isomeric with III, the only difference being that the third O is in the form of OH instead of CO. Besides XIII, 2 other phenolic bases were isolated from the same ext., making a total of 8 bases which have thus far been isolated from the ext. of XIV. Two new bases are *stephanoline*,  $C_{27}H_{22}N_2O_2(OH)(OMe)_4$ , m.  $186^\circ$ ,  $[\alpha]_D^{17}$   $-255.37^\circ$  (HCl salt, m.  $230^\circ$ ) and *homostephanoline*,  $C_{33}H_{44}N_2O_7$ , m.  $232^\circ$ ,  $[\alpha]_D^{28}$   $-255.6^\circ$  (HCl salt, decomps.  $238^\circ$ ). XXIII. Constitution of coclaurine. IV. H. KONDO AND T. KONDO. *Ibid* 1156 63.—In the structure of coclaurine (I) proposed in the previous paper (C. A. 22, 3414), there remained only one point of uncertainty. This was the position of the OH group in the tetrahydroisoquinoline nucleus. This point has now been made clear to complete the structure of I. I and EtBr give triethylcoclaurine (II) ( $R = p\text{-CH}_2\text{C}_6\text{H}_4\text{OEt}$ ). HCl salt, m.  $162^\circ$ ,  $[\alpha]_D^{29}$   $0.66^\circ$ ; chloroplatinate, m.  $130\text{--}1^\circ$ ; chloroplatinate of the methochloride, m.  $175^\circ$ . II and  $\text{Me}_2\text{SO}_4$  give the methylmethosulfate, m.  $122^\circ$ , which with KOH gives the methin base (III) (chloroplatinate, decomps. about  $190^\circ$ ). Oxidation of III with  $\text{KMnO}_4$  gives  $p\text{-EtOC}_6\text{H}_4\text{CO}_2\text{H}$  and an amino acid,  $\text{MeO}(\text{EtO})(\text{NMeEtCH}_2\text{CH}_2)\text{C}_6\text{H}_4\text{CO}_2\text{H}$  (IV). IV and  $\text{Me}_2\text{SO}_4$  give the methylmethosulfate which with KOH and heating gives  $\text{EtNMe}_2$  and an acid (V), m.  $165^\circ$ , which was later proved to be  $3,4,6\text{-EtO}(\text{MeO})(\text{CH}_2\text{:CH})\text{C}_6\text{H}_4\text{CO}_2\text{H}$ . Reduction of VII with Pd-C gives an acid which is identical with synthetically prepd.  $3,4,6\text{-EtO}(\text{MeO})\text{-EtC}_6\text{H}_4\text{CO}_2\text{H}$ , m.  $137.5\text{--}8.5^\circ$  (cf. following abstr.). The above facts show the OH group in the tetrahydroisoquinoline nucleus of I must be located at C<sub>7</sub> and the structure of I is represented by VI.



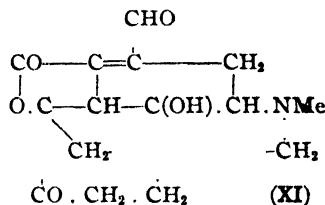
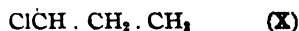
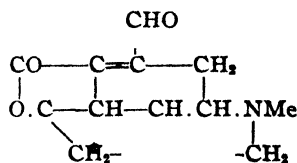
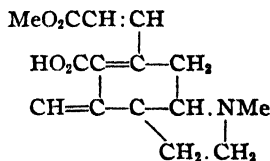
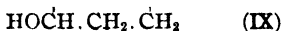
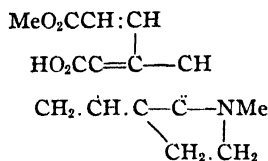
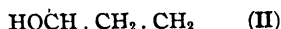
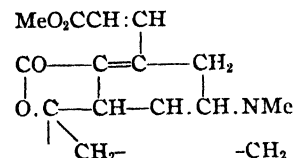
NAO UYEI

Synthesis of 3-ethoxy-4-methoxy-6-ethylbenzoic acid. T. KONDO, T. NOTO AND S. TANAKA. *J. Pharm. Soc. Japan* 48, 1163-6(1928).—One mol. each of  $o\text{-MeO-C}_6\text{H}_4\text{OEt}$  and  $\text{AcCl}$  give 2 Ac derivs., one of which is  $4,5\text{-EtO}(\text{MeO})\text{C}_6\text{H}_3\text{Ac}$  (I), m.  $79^\circ$ . Reduction of I with Zn-Hg gives  $4,5\text{-EtO}(\text{MeO})\text{C}_6\text{H}_3\text{Et}$ , b.  $95^\circ$ , which with  $\text{AcCl}$  gives  $3,4,6\text{-EtO}(\text{MeO})\text{EtC}_6\text{H}_2\text{Ac}$  (II), m.  $50^\circ$ . Oxidation of II with  $\text{NaOI}$  gives  $3,4,6\text{-EtO}(\text{MeO})\text{EtC}_6\text{H}_2\text{CO}_2\text{H}$ , m.  $137.5^\circ$ .

NAO UYEI

Ozone cleavages in the morphine series (preliminary communication). EDMUND SPEYER Univ. Frankfurt A. M. *Ber.* 62B, 209-18(1929).—The results thus far obtained in this work are reported now because of the appearance of Wieland and Small's paper (C. A. 23, 1642). Their thebaizonedicarboxylic acid (I) had already been prepd., at Speyer's suggestion, by ROELL; the results obtained agree with those of W. and S.; furthermore, the presence of two  $\text{CO}_2\text{H}$  groups was shown by potentiometric titration. It had been found that  $\text{O}_3$  with dihydrocodeine and ethyldihydromorphine ruptures the double bonds between C atoms 3 and 4 of the  $\text{C}_6\text{H}_6$  nucleus with formation of an ester lactone (II). S. has now found with H. MOLZAHN (*Diss. Frankfurt a. M., 1927*) that further ozonization of  $\alpha$ -ozodihydrocodeine (II) and  $\alpha$ -ozodihydroethylmorphine (III) ruptures the 1,2-double bond, splitting off Me or Et glyoxylate and giving an aldehyde, dihydrocodinal (IV) (II, with  $\text{CHO}$  instead of  $\text{CH:CHCO}_2\text{Me}$ ). Analogous results were obtained with chloroozodihydrocodeine (V). A direct splitting off of  $\text{OHCCO}_2\text{R}$  and formation of derivs. of V was effected by ozonization of dihydrohydroxycodeinone (VI) and, with H. VOGT, of dihydromorphine and dihydrochlorocodide (VII). Furthermore, it was shown with Vogt (*Diss. Frankfurt a. M., 1928*) that II with  $\text{NaOEt}$  gives, depending on the temp., a  $\beta$ - or  $\gamma$ -isomer to which are provisionally assigned the structures VIII and IX. The development of these structures, based on the Scheopff *m*-thebainone formula, will be given in detail in a later communication. There are furthermore 2 other isomers of II whose study has not been completed. The ozonization of the *des*-bases of hydrogenated codeines has also been successfully undertaken. I, crystals with 1  $\text{H}_2\text{O}$ , decomps.  $208\text{--}10^\circ$  (W. and S.,  $189\text{--}90^\circ$ ). HCl salt, leaflets with 1  $\text{H}_2\text{O}$ , m.  $242^\circ$  (decompn.). IV, from II in 6 parts  $\text{H}_2\text{O}$  ozonized 26 hrs. with 3%  $\text{O}_3$ , was isolated in 40% yield as the yellow phenylhydrazone-HI,  $\text{C}_{21}\text{H}_{21}\text{O}_3\text{N}_3$ , III, decomps.  $247^\circ$ ; semicarbazone, decomps.  $278^\circ$ . Chlorodihydrocodinal perchlorate, obtained in 2 g. yield from 6 g. V in  $\text{HClO}_4$ , EtOH and AcOH ozonized 24 hrs. with 8%  $\text{O}_3$ , hydrated rodlets, sinters  $165^\circ$ , decomps.  $270^\circ$ ,  $[\alpha]_D^{20}$   $-19.74^\circ$  ( $\text{H}_2\text{O}$ ); free base, reddish yellow, m.  $206\text{--}7^\circ$  (decompn.). On ozonization of V in 10% AcOH for 14 hrs. the lactone union was ruptured and there was obtained about 30% of chloro-

*dihydrodiconal* (X) as the perchlorate, octahedrons with 1 H<sub>2</sub>O, decomp. 266°,  $[\alpha]_D^{20}$   $-31.08^\circ$  (H<sub>2</sub>O). VI (12 g.) with O<sub>3</sub> in 10% AcOH gives about 1 g. of the compd. XI, decomp. 285°. From 5 g. of dihydromorphine in 10% HCO<sub>2</sub>H was obtained IV (1 g. of the semicarbazone). VII in 20% HClO<sub>4</sub> and alc. gave 40% chlorodihydrocodinal and in 25% HCO<sub>2</sub>H it yielded X. VIII, obtained in 93% yield from 2 g. Na in 30 cc. abs. alc. at 10° added to 7 g. II. HCl and allowed to stand 15-30 mins. at 10-5°, m. 170.5°, easily sol. in dil. acids, pptd. from AcOH by NH<sub>4</sub>OH or dil. NaOH, reacts alk. to litmus in aq. alc., hydrolyzes on long standing in NaOH,  $[\alpha]_D^{18}$  24.4° (abs. alc.). IX (36% from II added to NaOEt in EtOH at 45-50°, cooled with ice when the brown soln. has changed to lilac (10-20 secs.) and treated with HCl gas), m. 175°, depresses the m. p. of VIII to 163°, easily sol. in dil. acids, pptd. by dil. NaOH as an oil which after a time sapons. and dissolves,  $[\alpha]_D^{18}$   $-8.2^\circ$  (abs. alc.). IX is also obtained by dissolving VIII in alc. with enough alc. HCl to form the salt, treating at 50° with alc. NaOEt and allowing to stand 15 mins. at room temp.



C. A. R.

**Synthesis of *dl*-apomorphine dimethyl ether.** H. AVENARIUS AND R. PSCHORR (in part with H. HERZ). Techn. Hochschule Charlottenburg. *Ber.* 62B, 321-5 (1929).—The constitution of apomorphine was established by P. and his collaborators by the degradation of its di-Me ether (I). The evidence has now been completed by the synthesis of I.  $\alpha$ -[Benzoylamino]-2-nitro-3,4-dimethoxycinnamic lactone, from 2,3,4-O<sub>2</sub>N(MeO)<sub>2</sub>C<sub>6</sub>H<sub>2</sub>CHO, BzNHCH<sub>2</sub>CO<sub>2</sub>H, Ac<sub>2</sub>O and NaOAc, yellow needles with 1 EtOH, m. 169°, hydrolyzed by boiling N NaOH or 75% AcOH to the free acid, decomp. 215°; *Et ester*, m. 149°. With 7 N aq. alc. HCl at 100°, however, the lactone gives 2-nitro-3,4-dimethoxyphenylpyruvic acid, yellow, m. 172°; *Bt ester*, yellow, m. 109° (oxime, m. 108°). The oxime, m. 156-7°, of the acid at 160° loses CO<sub>2</sub> and H<sub>2</sub>O and forms 2-nitro-3,4-dimethoxybenzyl cyanide (II), m. 66°. PhCH<sub>2</sub>CH<sub>2</sub>NH<sub>2</sub> with anhyd. HCO<sub>2</sub>H at 150-80° gives, through the formate, the *formyl deriv.*, b<sub>35</sub> 210-4°, which in PhMe with K and MeI yields *N*-formyl-*N*-methylphenethylamine, isomerized by refluxing in PhMe with SOCl<sub>2</sub> into  $\alpha$ -hydroxy-*N*-methyltetrahydroisoguinoline (III), m. 110-1°. When mol. amounts of II and III (or its methiodide) and 1 (or 2) atoms Na in alc. are boiled about 15 mins., allowed to stand 24 hrs. at room temp., heated with concd. HCl to sapon. the CN group and split off CO<sub>2</sub> and reduced by heating with Sn and more concd. HCl, there is obtained  $\alpha$ -[2-amino-3,4-dimethoxybenzyl]-*N*-methyltetrahydroisoguinoline, isolated as the di-HCl salt, m. 198-9°; this, treated in dil. H<sub>2</sub>SO<sub>4</sub>

with a slight excess of  $\text{NaNO}_2$ , then gradually with Cu powder, gives I, isolated as the methiodide, m.  $195^\circ$ . C. A. R.

**Opium alkaloids. X. Synthesis of *dl*-apomorphine dimethyl ether.** HARNSTADT AND OTTO HROMATKA. Univ. Wien. Ber. 62B, 325–32 (1929); cf. C. A. 22, 1781.—Kay and Pictet attempted to synthesize apomorphine di-Me ether (I) by converting 2,3,4- $\text{O}_2\text{N}(\text{MeO})_2\text{C}_6\text{H}_2\text{CH}_2\text{CO}_2\text{H}$  (II) into the chloride (III) with  $\text{PCl}_5$  in  $\text{CHCl}_3$  and adding this in  $\text{C}_6\text{H}_5$  alternately with dil.  $\text{NaOH}$  to an emulsion of  $\text{PhCH}_2\text{CH}_2\text{NH}_2$  in a little  $\text{H}_2\text{O}$  but when the product so obtained (IV), m.  $98^\circ$ , was boiled 15–30 mins. in  $\text{PhMe}$  with  $\text{P}_2\text{O}_5$ , they obtained, instead of the expected dihydroisoquinoline deriv. (V), no basic product from the  $\text{H}_3\text{PO}_4$  part of the reaction mixt. while the  $\text{PhMe}$  part yielded, together with unchanged IV, a compd.  $\text{C}_{18}\text{H}_{18}\text{O}_4\text{N}_2$  (VI), which was insol. in acids and formed no methiodide and was, therefore, certainly not an isoquinoline; they, therefore, had to give up their attempt to synthesize I. Kondo was likewise unable to convert his amide (VII), which he reports as m.  $119^\circ$ , into an isoquinoline with  $\text{P}_2\text{O}_5$ ,  $\text{POCl}_3$ ,  $\text{PCl}_5$  and  $\text{AlCl}_3$ . S. and H., however, have now been able to effect the synthesis along these lines. At first they attempted to prep. the amide  $\text{O}_2\text{N}(\text{MeO})_2\text{C}_6\text{H}_2\text{CH}_2\text{CONHCH}_2\text{CH}_2\text{Ph}$  (VIII) by K. and P.'s method but later they made it by treating II with  $\text{SOCl}_2$  and the resulting III with 2 mols.  $\text{PhCH}_2\text{CH}_2\text{NH}_2$  in  $\text{C}_6\text{H}_5$  without an alkali. By the K. and P. method and once by their modified process they obtained a product, m.  $79^\circ$  and again, by their modified method, a compd., m.  $117^\circ$ . Both, however, gave the same dihydroisoquinoline deriv. (IX). They first tried to prep. the IX by converting the VIII with 1 mol.  $\text{PCl}_5$  into the imide chloride and then treating this with  $\text{AlCl}_3$  but they obtained no basic product. They then boiled the VIII in xylene (later in  $\text{PhMe}$ ) 1–2 hrs. with  $\text{P}_2\text{O}_5$ , and from the  $\text{H}_3\text{PO}_4$  part of the reaction mixt. obtained 30% of basic compds. yielding on recrystn. 10–5% of a pure cryst. base, which, from its properties, was shown beyond doubt to be VIII, whereas the xylene yielded a yellow, cryst., non-basic compd. (X), m.  $124\text{--}5^\circ$ , which was probably the same as K. and P.'s VI. VIII was converted through the methiodide into the methochloride, which with Zn and concd.  $\text{HCl}$  was both reduced to the  $\text{NH}_2$  compd. and converted into the tetrahydroisoquinoline compd. (XI) and this on diazotization and condensation with Cu powder gave *dl*-I. The sepn. of I from the by-products met with great difficulties, especially as the properties of the *dl*-form were unknown. Attempts to racemize *l*-I by long heating failed, and alc. I with subsequent hydrogenation as well as oxidation with  $\text{Hg}(\text{OAc})_2$ , likewise did not give optically inactive products. In order, therefore, to obtain derivs. which could be compared directly, both the synthetic *dl*- and the natural *l*-I were boiled with  $\text{BzCl}$ , which ruptures the N ring at the asym. C atom and gives the optically inactive *N*-Bz deriv. (XII); the products so obtained from the two I were identical in m. p., mixed m. p. and soly. The nature of the isomerism between the 2 forms of nitrohomoveratroyl- $[\beta\text{-phenylethyl}]$ amide (VIII) has not yet been investigated. IX becomes yellow on long standing in the air, m.  $129^\circ$  (evacuated capillary). Methiodide of VIII, m.  $203^\circ$  (decompn.) in evacuated tubes, methochloride, light yellow varnish. XI, brown sirup. XII, b.  $250\text{--}70^\circ$ , m.  $165\text{--}5^\circ$ . C. A. R.

**Sarmentocymarin and sarmentogenin.** WALTER A. JACOBS AND MICHAEL HEIDELBERGER. Rockefeller Inst. J. Biol. Chem. 85, 765–80 (1929).—*Strophanthus sarmentosus* seeds (2500 g.) were ground, defatted with gasoline, dried and extd. 3 times with 70% EtOH. The filtrates were pptd. with basic Pb acetate, the excess Pb was removed with  $(\text{NH}_4)_2\text{SO}_4$  and the soln. concd. under diminished pressure to about 1 l. The aq. soln. was extd. with  $\text{CHCl}_3$  and the  $\text{CHCl}_3$  soln. poured into petroleum ether. The ppt. obtained weighed 5.1 g. From its soln. in  $\text{Me}_2\text{CO}$  was obtained sarmentocymarin (I),  $\text{C}_{30}\text{H}_{46}\text{O}_8 \cdot 2\text{H}_2\text{O}$ , m.  $130^\circ$ ,  $[\alpha]_D^{20} -12.5^\circ$  (c 1.043 in MeOH). From the original aq. fraction was obtained 21 g. more of I. I (1.95 g.) in 20 cc. EtOH was treated with 40 cc. of 10%  $\text{HCl}$ . After 6 hrs. at room temp. sarmentogenin (II) crystd. out slowly, m.  $265\text{--}6^\circ$ ,  $[\alpha]_D^{20} 21.5^\circ$  (c 0.515 in 95% EtOH). Occasionally II was obtained in a form contg. solvent of crystn. and m.  $243^\circ$ . Covered on a watch glass with concd.  $\text{H}_2\text{SO}_4$ , II dissolves with a bright golden color and slowly develops around the edges a greenish color which deepens to indigo. II crystals from  $\text{C}_6\text{H}_5\text{N}$  as  $\text{C}_{28}\text{H}_{44}\text{O}_8 \cdot \text{C}_6\text{H}_5\text{N}$ , m.  $258^\circ$ . Dibenzosalt, m.  $281^\circ$ ,  $[\alpha]_D^{20} 14^\circ$  (c 1.000 in  $\text{Me}_2\text{CO}$ ). Dihydro deriv., prepd. by hydrogenation of II in MeOH with Pt black, crystals from EtOH as  $\text{C}_{28}\text{H}_{46}\text{O}_8$ , EtOH, effervesces  $142^\circ$ . Sarmentogenone, prepd. by oxidation of II in AcOH with Kiliani  $\text{CrO}_3$  soln., m.  $226^\circ$ . Semicarbazone, m.  $200^\circ$ . Isosarmentogenin was prepd. by suspending 0.5 g. II in 2.5 cc. anhyd.  $\text{C}_6\text{H}_5\text{N}$  and treating the mixt. at  $0^\circ$  with 2.5 cc. of a soln. of 4.8 g. KOH in 100 cc. dry MeOH (25–30% yield).  $\text{C}_{28}\text{H}_{44}\text{O}_8$ .

EtOH, m. 248°. *Dibenzozote*, m. 297°. *Isosarmentogenic acid*, m. 212°. *Me ester*, m. 274° (effervescence).  
LOUISE KELLEY

**Constituents of *Alectoria sulcata* Nyl.** Y. ASAHINA AND H. HAYASHI. *J. Pharm. Soc. Japan* **48**, 1094-8(1928).—By extn. of *Alectoria sulcata* with ether A. and H. obtained a cryst. substance, which, by treatment with soda soln., was sepd. into 2 parts, I sol. and II insol. in soda soln. I,  $C_{23}H_{20}O_{10}$ , m. 263-4°, was named *sulcatic acid*. It is almost insol. in all org. solvents except  $Me_2CO$ . With  $FeCl_3$  it gives a wine-red color. It does not contain the  $OCH_3$  group. Heating alc. soln. of I and  $PhNH_2$  gave yellow crystals, m. 290°. II, m. 195-6°, resembles *atranorin*,  $C_{15}H_{18}O_8$ . Anil. of *atranorin*,  $C_{25}H_{23}O_7N$ , m. 166°. II and aniline in abs. alc., heated, gave yellow crystals, m. 130°. From the mother liquid above A. and H. obtained yellow and white crystals. The white crystals m. 143° and their properties resemble *atraric acid* (decompn. product of *atranorin*). The yellow crystals m. 130° and have the compn.  $C_{17}H_{17}O_4N$ .  
F. I. NAKAMURA

**The components of Caucasian eucalyptus oils.** B. N. RUTOVSKII AND I. V. VINOGRADOVA. *Trans. Sci. Chem.-Pharm. Inst. (Moscow)* **1927**, No. 17, 39-68.—A sample of oil contg. 2% aldehyde and sol. in 70% alc., when distd. over metallic Na gave fraction I with the following consts.:  $d_{20}^{20}$  0.9101,  $[\alpha]_D + 10.63^\circ$ ,  $n_D^{20}$  1.4600. On oxidizing with  $KMnO_4$ , pinonic acid (semicarbazone, m. 263-4°) was obtained. Pinene nitroschloride could not be sepd., showing the presence of cineole. From fraction II cineole was sepd. with the following consts.: m. 175-176°,  $d_{20}^{20}$  0.9232,  $n_D^{20}$  1.4590. In fraction III globulol (m. 86-88°,  $[\alpha]_D$  32.68° in chloroform at  $c = 16.77$ ) was demonstrated. With  $NaHSO_3$  the aldehydes which were recognized showed  $d_{20}^{20}$  0.8745,  $[\alpha]_D = 0^\circ$ ; upon oxidation it gave liquid acids with the odor of valeric acid and a solid acid which indicated the presence of cuminaldehyde. The oil contains  $\alpha$ -pinene about 5, cineole 82, aldehyde 2, alcs. about 5.5% and globulol. The oil from a sample of leaves of *Eucalyptus pulverulenta* Sims gave 4 fractions: I from which nitroschloride and pinonic acid were sepd. after removing the cineole. Fraction II consisted primarily of cineole ( $d_{20}^{20}$  0.9267,  $[\alpha]_D = 0^\circ$ ). From fraction IV an alc. mixt. was obtained from phthalic acid ester ( $d_{20}^{20}$  0.9444,  $[\alpha]_D + 4.8^\circ$ ;  $n_D^{20}$  1.4913), which upon sepg. the residues by distg. over Na gave the following consts.:  $d_{20}^{20}$  0.9368,  $[\alpha]_D - 12.48^\circ$ ,  $n_D^{20}$  1.4876. An aldehyde was sepd. with  $NaHSO_3$  and proved to be isovaleraldehyde. The quant. compn. of this sample was:  $\alpha$ -pinene about 8%, cineole 78%, aldehyde about 5%, alcs. about 13%. Another sample of oil from *Eucalyptus viminalis* Labill was investigated. The  $NaHSO_3$  compds. sepd. optically inactive aldehydes, contg. primarily isovaleraldehyde. From fraction I *d*- $\alpha$ -pinene was obtained, no camphene or phellandrene was obtained. Fraction II consisted primarily of cineole. The color reaction with Br vapor in fraction III indicates the presence of aromadendrene. Eudesmol could be obtained from the residue. The compn. of this sample is: *d*- $\alpha$ -pinene about 5, cineole about 65, aldehyde about 4, eudesmol about 10, other alcs. about 11%. Another sample, from *Eucalyptus maideni*, has the following compn.:  $\alpha$ -pinene about 3, cineole about 64, aldehyde (valeraldehyde and isovaleraldehyde) about 3, alcs. about 8 and eudesmol about 5%.  
J. S. JOFFE

**Dry distillation of abietic acid with activated carbon.** T. TSUKAMOTO. Tokyo Imp. Univ. *J. Pharm. Soc. Japan* **48**, 1169-75(1928).—By dry distn. of cholesterol with activated C (I), T. previously (*C. A.* **22**, 2361) obtained *d*-rotatory oil and chrysene due to the dehydrogenating property of the I. Adsol (II) (Japanese fuller's earth) gave similar results except for the fact that II had a greater cracking action and injurious effect on the optical activity than I. The dry distn. of colophony (III) and of abietic acid (IV) showed the same dehydrogenating action of I and II as well as the injurious action of II on the optical activity. In the high-boiling fraction of the dry distn. product of III by using I, *retene*, *phenanthrene* and *anthracene* were identified, while among the gaseous products of the dry distn. of IV,  $H_2$ ,  $CH_4$  and  $MeCH:CH_2$  were identified. These facts show that the side chains ( $Me$ ,  $Me_2CH$  groups) of *retene* are broken off during the reaction.  
NAO UYEI

**Hadromal, lignin and coniferaldehyde; preparation and identification of the last.** H. PAULY AND K. FEUERSTEIN. Privatlab. H. Pauly, Würzburg. *Ber.* **62B**, 297-311 (1929).—Coniferaldehyde (I) plays a special role in the present-day chemistry of lignin. Hoffmeister claims to have identified Czapek's hadromal (II) as being I and Klason believes he has proved that his " $\alpha$ -lignohydrosulfonic acid" (III) is a  $SO_3H$  acid of "coniferylparaldehyde." I was rendered somewhat more readily available some yrs. ago by P. and Wäscher's method of prepn. but even with this method the

prepn. depends on the strict observance of certain conditions. Nevertheless P. and his associates are so well acquainted with the possibilities of formation and properties of **I** that they can assert with all certainty that neither H. nor K. had, in their alleged syntheses, the least trace of **I** in any form, and therefore their work contributes nothing to the question whether **I** plays a part in the building up of lignin. An investigation of **II** showed that it is *not* identical with **I**, in fact, does not contain a trace of it, but in full agreement with Grafe, that along with much wood gum, tannin (oak), pyrocatechol (pine) and small quantities of other phenolic substances, it contains chiefly vanillin (**IV**) (yield of pure product from oak 0.05%, from pine 0.04%). H. describes his hadromal, for which he gives the elementary compn. and a mol. wt. detn. (184), as m.  $86^\circ$  but becoming yellow so that this m. p. cannot be considered as quite exact. As a matter of fact the purest **I** melts at the same temp. ( $82.5^\circ$ ) as **IV** and only by mixed m. ps. can the 2 be distinguished from each other. The fact that his product adds 2 atoms of **I** (which he considers important) shows that it is not **I**, for even under the conditions employed by him, **I** cannot add **I**. The other properties of his compd. likewise do not agree with those of **I**; **I** forms S-yellow crystals (not "almost white") sol in  $H_2O$  with lemon-yellow color, gives with phloroglucinol-HCl a Bordeaux-red, not a red-violet ppt., does not form a pyrocatechol-like substance on standing with  $H_2O$ , etc. Likewise, in his alleged synthesis of **I**, he does not seem to be aware that Tiemann states expressly that **IV** cannot be condensed with AcH nor that the synthesis of **I** is possible only if the phenolic HO group in the **IV** is etherified with a glucose or other residue. His crude product is a "yellowish white" residue, which after 3 recrystns. from alc. forms "very fine, greatly felted needles" m.  $85^\circ$  (becoming yellow), having the same soly. and odor and giving the same phloroglucinol-HCl reaction as the natural hadromal; he also gives an analysis but no other proofs of identity. Repeated trials with his method of condensation have given entirely negative results. The **IV** is recovered unchanged in yields of at least 97% and **I** is not formed in the slightest traces, as shown with a reagent (described below) with which **I** can be detd. gravimetrically in dilns. of 0.06% and colorimetrically in dilns. of 1:40,000. Again, the m. p. diagram for mixts. of **I** and **IV** shows that if **I** contains more than 3% **IV** its m. p. cannot be raised to  $80^\circ$  by 2-3 recrystns.; while **IV** can be sepd. rapidly from small quantities of **I** the sepn. of **I** from small quantities of **IV** is very difficult; if his product had really been **I** it would mean that his yield was at least 97%. Furthermore, his failure to observe the formation of a difficultly sol.  $NaHSO_3$  compd. likewise indicates that his product was unchanged **IV**. K. in his "synthesis" modified the P. and W. method in that, starting with a 3,4-MeO(MeOCH $_2$ O) $C_6H_3$ CHO (**V**) contg. 15% free **IV**, he effected the condensation with AcH and splitting off of the MeOCH $_2$ O group in 1 operation, and on extg. the product with  $C_6H_6$ , evapg., treating with  $SO_2$  and removing the unchanged **IV** he obtained his synthetic **III** in the form of an amorphous  $C_{10}H_7NH_2$  salt (**VI**). Repetition of his work showed that the **V** does not react quant. with the AcH and although there is obtained a product with the properties he gives and having approx. the compn. of **VI**, it is not formed from an intermediate **I** but from a mixt. chiefly of 2 hitherto unknown *unsald. aldehydes*,  $C_8H_7O_2$  (**VII**) and  $C_{10}H_{14}O_2$  (**VIII**), formed as by-products by autocondensation of the AcH. Pure **I** in aq.  $SO_2$  does not give the K. product but the mixt. of **VII** and **VIII** does. P. and F. never observed K.'s "coniferylparaldehyde"; **I** does not readily polymerize spontaneously, at least not in the course of 2 yrs., but its m. p. slowly falls as the result of the liberation of small quantities of **IV**. K.'s failure to effect a condensation with AcH was due to his use of a **V** contg. free **IV**. With a perfectly pure, freshly prepd. **V**, m.  $40^\circ$ , **I** can be obtained, with some practice, in 40% yield. As others besides K. have been unsuccessful with the method of prepn. it is described in greater detail than in the original paper. Under the same pressures, **I** boils about  $28^\circ$  higher than **IV** ( $157^\circ$ ,  $158^\circ$ ,  $160^\circ$ ,  $162^\circ$ ,  $169^\circ$ ,  $175^\circ$  under 2.5, 2.6, 2.8, 3, 4, 5 mm.); its alkali salts are egg-yellow and color the skin an intense brown-yellow; it dissolves in concd.  $H_2SO_4$  with orange color and  $H_2O$  ppts. blue flocks; it gives a blue-green color with  $FeCl_3$  only on heating; it is easily reduced by yeast fermentation to the alc. (**IX**). Refractometric consts. (by v. AUWERS):  $d_4^{20.5}$  1.1562,  $n_D^{20}$  1.63973,  $n_D^{25}$  1.65635, EM 8.32, 9.12. *Methoxymethyloconiferyl alc.*, from the aldehyde and a fermentation product, which at  $100^\circ$   $8^\circ$ ; *phenylurethan*, *Coniferal-diphloro-*

powder, m. above  $300^\circ$ , sol. in alkalis with purple color. *Diconiferalbenzide(X)*, from **I** and 0.5 mol. ( $C_6H_5NH_2$ ), in MeOH on the  $H_2O$  bath, brown-red, m.  $216^\circ$ ; *di-HCl salt*, red-brown, decomp. at high temps., dissociates completely in boiling  $H_2O$ . *Divanillalbenzide(XI)*, yellow, m.  $225.5^\circ$ ; *di-HCl salt*, cinnabar-red powder,

decomps. at high temps., dissociates (turning yellow) in boiling  $H_2O$ . Boiling  $C_6H_6$  (100 g.) dissolves 2.67 g. XI and only 0.064 g. X, so that as little as 0.06% I can be detected in mixts. with IV by extg. the benzidides with limited quantities of  $C_6H_6$ .  $(C_6H_5NH_2)_2$  (2%) in 50% AcOH gives with IV an orange color changing to yellow on adding glacial AcOH, with I a blood-red color up to 1:40,000, red-orange up to 1:80,000 and orange up to 1:100,000. From 1.5 l. 6% AcH heated 6 hrs. at  $66-8^\circ$  with 40 cc. of 5% KOH, 25 cc. more of KOH being added in 5-cc. portions as the alkyl. of the soln. disappeared, then cooled, neutralized with AcOH, salted out with NaCl, extd. with  $C_6H_6$  and fractionated *in vacuo* were obtained 26 g. aldehyde resin and 12 g. distillate which yielded VII,  $b_{14} 72-4^\circ$ ,  $b. 176-8^\circ$ , light yellow refractive oil of penetrating and at the same time sweetish odor and burning sharp taste, immiscible with  $H_2O$ , reduces  $NH_3-AgNO_3$ ,  $d_4^{20} 0.9767$ ,  $n_D^{20} 1.4909$ ,  $n_{H_2O}^{20} 1.4967$  (semicarbazone, yellowish, m.  $195^\circ$ ), and VIII,  $b_{12} 116-20^\circ$ ,  $d_4^{20} 1.035$ ,  $n_D^{20} 1.5370$ ,  $n_{H_2O}^{20} 1.5447$  (semicarbazone, m.  $133^\circ$ ). Both VII and VIII give with phloroglucinol-HCl deep red colors and ppts., with benzidine-AcOH orange shades. In the air they have a tendency to darken and resinify. C. A. R.

The preparation of hemin derivatives by thermal reactions. III. 1a. A new procedure for decarboxylation of porphyrins and iron-porphyratins; preparation of etiopyroporphyrin and etiomesoporphyrin. Preparation of etioporphyrins from hemin by the paraffin-phenol-oxalic acid method. b. A new procedure for conversion of hemin into pyroporphyrin. c. Decomposition of hematoporphyrin-Nencki, hemateric acid, uroporphyrin, dimethoxyhemin dimethyl ester and hematohemin by resorcinol, of hemin by hydroxyhydroquinone. 2. Bacteriochemical preparation of copratoporphyrin. O. SCHUMM. Hamburg Univ. *Z. physiol. Chem.* **181**, 141-75 (1929); cf. C. A. **23**, 153.—Removal of  $CO_2H$  groups from free porphyrins and from their Fe complexes can be effected by simply heating in liquid paraffin at  $340-60^\circ$ . Meso-porphyrin and pyroporphyrin are thus converted directly into etioporphyrins. Pyratin, hemin and mesohemin by this treatment yield Fe complexes from which the etioporphyrins can then be obtained by treatment with  $N_2H_4-AcOH$  or with  $PhOH-C_6H_5O_4$ . If the heating is continued for several hrs. at a higher temp.,  $385-8^\circ$ , further decompn. occurs. Hemin then yields not only etiomesohemin but also a product from which etiopyroporphyrin is obtained by the  $PhOH-C_6H_5O_4$  treatment. Besides the loss of  $CO_2H$  groups there occurs here either a satn. or a splitting off of the unsatd. side chains according to the temp. employed. The higher the temp. the more the compn. of the final product diverges from that of etiomesoporphyrin and approaches that of etiopyroporphyrin. Hemateric acid (protoporphyrin) and Nencki's hematoporphyrin likewise yield etioporphyrins. There is evidence here of an intermediate product whose soly. and spectrum differ from the original substance and from both etioporphyrins. Uroporphyrin and coproporphyrin undergo decarboxylation, yielding a product sol. in  $CHCl_3$  and insol. in KOH, and showing the spectrochem. behavior of etiomesoporphyrin, but lack of material prevented complete identification. Decarboxylation of porphyrins and porphyratins into their etio-derivs. can also be accomplished by refluxing with anthracene or phenanthrene. The yield of etiopyroporphyrin, either from pyroporphyrin directly or from pyratin with subsequent removal of Fe by  $PhOH-H_2C_2O_4$  or by  $N_2H_4-AcOH$ , is 5-10%. It is sol. in most org. solvents and in acids, but not in KOH. By fusion with resorcinol hemin is converted into a pyratin, an Fe-porphyratin, which is identical with copratin, the product of natural putrefaction of hemin in the intestine. The pyroporphyrin obtained by removal of Fe from pyratin is identical with copratoporphyrin obtained in the same way from copratin. A new procedure by which hemin can be converted into pyroporphyrin in a single step consists in dissolving the hemin in fused  $PhOH$  and adding small portions of  $KHSO_4$ , while heating to the b. p., until a test portion dissolved in  $N_2H_4$ -contg. pyridine shows only the porphyrin spectrum. The melt is then poured into  $H_2O$ , and excess KOH added, and the reaction product pptd. by AcOH. After repeated reppts. it may be crystd. from  $Et_2O$  or converted into its cryst. Me ester. The resorcinol fusion is applicable also to hemateric acid, Nencki's hematoporphyrin, dimethoxyhemin di-Me ester and hematohemin. It is not successful with mesoporphyrin and mesohemin. The reaction requires the presence of one or more multiple linkages in the side chains of the basic pyrrole groups. Uroporphyrin yields coproporphyrin, but its Me ester undergoes complete decompn. Fusion of hemin with  $1,2,4-C_6H_3(OH)_3$  converts it into pyratin, from which pyroporphyrin and its Me ester can be obtained in the usual way. The prepn. of pyroporphyrin, which is identical with copratoporphyrin, by the resorcinol treatment of hemin is far superior to the bacteriochem. method, where the process is time-consuming, the yield small and the putrefaction odors are highly offensive. A. W. DOX

**The bile acids. XXIII.** MARTIN SCHENCK AND HENRY KIRCHHOF. Univ. Leipzig. *Z. physiol. Chem.* 181, 185-98(1929); cf. *C. A.* 23, 1646.—In continuation of a study of the NO and NO<sub>2</sub> derivs. of bile acids, the action of HNO<sub>3</sub> on desoxybilanic acid oxime (I) and dehydrocholic acid trioxime (II) was examd. I gives a yellow soln. in which a transient green color is recognizable, then the color changes to brown and crystals of desoxybilanic acid sep. The transient green color would indicate the intermediate formation of a NO compd. which possibly undergoes further oxidation to a colorless NO<sub>2</sub> deriv., the NO group eventually being split off and replaced by O. This behavior suggests the presence of a double bond adjacent to the C to which the NO is attached. Replacement of the NO by OH would then yield an enolic deriv. capable of immediate transformation to the keto form. A soln. of I in 25% HCl, on the other hand, gives a cryst. deposit of the HCl salt of the oxime while the filtrate gradually splits off NH<sub>2</sub>OH. HNO<sub>3</sub> dissolves II with immediate development of a blue color and evolution of gas. The color gradually changes to green and finally brown with sepn. of crystals. These crystals after purification by recrystn. from 50% AcOH gave the empirical formula C<sub>24</sub>H<sub>42</sub>N<sub>2</sub>O<sub>8</sub> and decompn. p. 280°. When heated with Ph<sub>2</sub>NH and concd. H<sub>2</sub>SO<sub>4</sub> the substance gives a blue color and with PhOH and H<sub>2</sub>SO<sub>4</sub> a dark green color, indicating the presence of a NO<sub>2</sub> group. An intense brownish red color reaction with FeCl<sub>3</sub> indicates a hydroxamic acid structure. The NO<sub>2</sub> group is loosely bound, since it is easily split off by NaOH, yielding bilanic acid. In the reaction between HNO<sub>3</sub> and II all 3 oxime groups behave differently; one is split off by hydrolysis, another is oxidized to NO<sub>2</sub>, and the 3rd (isoxime) by rupture of the ring goes into a hydroxamic acid grouping. A. W. Dox

Manufacture of anthracene in U. S. S. R. (SOKOLOV) 21. Behavior of *N* alkali, erepsin and trypsin-kinase toward polypeptides containing 3,5-halogen substituted tyrosine, and toward glycyl-*D*-tyrosine, glycyl-*DL*-nitrotyrosine and glycyl-*DL*-*o*-tyrosine (ABDERHALDEN, SCHMITZ) 11A. Specificity of enzyme complexes which split polypeptides (ABDERHALDEN, SCHWEITZER), (ABDERHALDEN, REICH) 11A. Reactions of CO with metal compounds of cysteine (CREMER) 11A. Relations between substrate and enzyme complex based on the influence of erepsin and trypsin-kinase on polypeptides of definite composition (ABDERHALDEN, VLASSOPOULOS) 11A. Relations between substrate and enzyme complex based on the influence of erepsin and trypsin-kinase on polypeptides and related compounds (ABDERHALDEN, BROCKMANN) 11A. Chemical examination of  $\alpha$ -phenyl- $\beta$ -aminoethanol sulfate (GORDON) 17. Structure of plant compounds and solubility (CARR) 2. Relation between the physiological action and the chemical constitution of 2-methylisoquinoline derivatives (TAKASE, TERAUCHI) 11H. Addition compounds of HCl with Et<sub>2</sub>O and acetone (McINTOSH) 2. Allylcellulose (SAKURADA) 23. Cellulose-xanthamides (NAKASHIMA) 23.

LOCKEMANN, GEORG. Ernst Beckmann, Sein Leben und Wirken. Berlin: Verlag Chemie, G. m. b. H. 65 pp. M. 2.50.

**Oxidation of organic compounds.** THE SELDEN CO. Fr. 649,292, Nov. 7, 1927. In the catalytic oxidation of org. compds. for the production of intermediate oxidation compds. or for the purification of mixts. contg. org. impurities, the compds. are brought, preferably in the state of vapor mixed with gases contg. O, into contact at a high temp. with contact substances which contain at least one catalyst assocd. with at least one stabilizer other than a strong alkali, with or without stabilizer promoters. The catalyst may contain a non-siliceous base-exchange substance or deriv. or product of reaction of such a substance, and a 2- or multi- component zeolite or deriv. or product of reaction of such a substance. The base-exchange substance is intimately assocd. with a diluting agent to form a homogeneous product, the diluting agent being either catalytically active or inactive and contg. stabilizers or stabilizer promoters or both. The contact mass is preliminarily calcined or treated with acid gases at a high temp. The process is of very wide application and several examples are given.

**Halogenating organic compounds.** COMPAGNIE NATIONALE DE MATIÈRES COLORANTES ET MANUP. DE PRODUITS CHIM. DU NORD RÉUNIES, ÉTABLISSEMENTS KUHLMANN. Fr. 649,851, July 23, 1927. Halogen compds. are prepd. by halogenating the arylides of mono- or poly-sulfonic acids of aromatic, cyclic or heterocyclic compds. and sapon. In examples, (1) 5-chloro-*o*-toluidine is prepd. by condensing *o*-toluidine with *o*-toluene-sulfonylchloride, suspending the product in glacial AcOH, adding HCl and NaClO<sub>2</sub>, and sapon. (2) 3-chloro-4-aminotoluene by condensing *p*-toluidine with 3-nitro-4-methylbenzenesulfonic acid, passing Cl through a suspension of the product in tetrachloro-

ethane and sapon., (3) 2,4-dichloroaniline by condensing  $\text{PhNH}_2$  with *p*-toluenesulfonylchloride, chlorinating with gaseous  $\text{Cl}_2$  and sapon., (4) 1-chloro- $\beta$ -naphthylamine by condensing  $\beta$ -naphthylamine with *p*-toluenesulfonylchloride, chlorinating with  $\text{SO}_2\text{Cl}_2$  and sapon.

**Separation of organic gases or vapors.** I. G. FARBERIND. A.-G. (Hanns Carstens, inventor). Ger. 472,804, March 1, 1921. Addn. to Ger. 310,092. Org. gases and vapors are sepd. from mixts. contg. air or other slightly absorbable gases such as  $\text{H}_2$ , by using water-impregnated C. Thus, an open cylinder full of wood charcoal is placed in a current of steam at  $100\text{--}110^\circ$  until the charcoal is at the same temp. as the steam. The charcoal is cooled by blowing through air and then com.  $\text{C}_6\text{H}_6$  vapor at  $15^\circ$ . The  $\text{C}_6\text{H}_6$  is absorbed, with a rise of temp. to  $38^\circ$ . When the absorption of  $\text{C}_6\text{H}_6$  reaches satn., the substance is blown out by steam and sepd. therefrom by condensation. The charcoal is then ready for further use. A charcoal contg. 19.8% water, will absorb 69% of its weight of  $\text{C}_6\text{H}_6$  from an air and  $\text{C}_6\text{H}_6$  current contg. 92%  $\text{C}_6\text{H}_6$ .

**Olefins.** HENRI SPINDLER. Fr. 649,687, July 11, 1927. Satd. hydrocarbons are converted into  $\text{C}_2\text{H}_4$ , propylene, butylene, etc., by heating them with  $\text{CS}_2$  from  $400^\circ$  to  $800^\circ$  according to the mol. wt. of the hydrocarbon treated. The heated tube may contain pumice stone, bauxite, etc., and a catalyst.

**Aromatic hydrocarbons.** CHEM. FABRIK POTT & CO. and FRIEDRICH POSPIECH. Ger. 474,658, Nov. 29, 1922. Hydrogenated aromatic hydrocarbons and their derivs. such as tetrahydronaphthalene, cyclohexanol and methylcyclohexanol, in which a small amt. of aromatic sulfo acid is dissolved, form clear liquids, which give a colloidal soln. on addn. of water. Thus, Na propylnaphthalenesulfonate is mixed with tetrahydronaphthalene and warmed. The product is a clear soln., which, with water, gives a highly dispersed emulsion. Another example is given.

**Hydrogenating hydrocarbons.** COMPAGNIE DE PRODUITS CHIMIQUES ET ÉLECTRO-MÉTALLURGIQUES ALAIS, FRÖGES & CAMARGUE. Ger. 473,457, May 7, 1925. The hydrogenation of  $\text{C}_{10}\text{H}_8$ ,  $\text{C}_{14}\text{H}_{10}$  and other hydrocarbons is effected with the use of Na-K alloys as catalysts. Careful preliminary purification of the hydrocarbon is then unnecessary. Suitable alloys are NaK and  $\text{NaK}_2$ . The catalysts should be used in finely divided state on a support such as kieselguhr, and the reaction mixt. should be strongly agitated. Examples are given.

**Benzanthrone hydrogenation products.** LEOPOLD CASSELLA & CO., G. M. B. H. (Otto Bayer, inventor). Ger. 473,456, Dec 4, 1925. Addn. to 453,578. Ger. 453,578 describes the manuf. of a tetrahydrobenzanthrone by treating benzanthrone with H under pressure in the presence of a Ni catalyst. It is now found that higher hydrogenation products are obtained if the hydrogenation is effected under more energetic conditions. According to the example, tetrahydrobenzanthrone is first prepd. by hydrogenating benzanthrone at about  $120^\circ$ , and is then heated at  $160\text{--}200^\circ$  in the presence of H under pressure until 4 more atoms of H have been taken up. The product is  $\text{C}_{17}\text{H}_{18}\text{O}$ , m.  $137^\circ$  and b.  $250^\circ/15\text{ mm.}$  If the temp. is allowed to rise above  $200^\circ$  or if the process is allowed to continue, a hydrocarbon of the formula  $\text{C}_{17}\text{H}_{18}$ , b.  $228\text{--}230^\circ/15\text{ mm.}$  is obtained.

**Hydrogenated acids and esters.** I. G. FARBERIND. A.-G. Fr. 649,626, Feb. 23, 1928. Hydrogenated carboxylic acids and esters are prepd. by heating to  $120\text{--}150^\circ$  esters of aromatic acids with H under pressure and in the presence of a Ni catalyst with or without a solvent. The esters are finally sapond. if desired. In an example hexahydrobenzoic acid ethyl ester is prepd. by treating benzoic acid ethyl ester at  $130\text{--}150^\circ$  under  $30\text{--}40\text{ atm.}$  of H in an autoclave in the presence of Ni. Examples are also given of the prepn. of hexahydrophenylacetic acid ethyl ester, hexahydrocyclic acid methyl ester, hexahydrophthalic acid diethyl ester, hexahydroterephthalic acid methyl ester, 5,6,7,8-tetrahydro-1-naphthoic acid ethyl ester,  $b_{12}\ 156\text{--}159^\circ$ , 5,6,7,8-tetrahydro-2,3-hydroxynaphthoic acid ethyl ester,  $b_{17}\ 170^\circ$ , 5,6,7,8-tetrahydro-2,3-amino-naphthoic acid ethyl ester, m.  $55\text{--}58^\circ$ , which on sapon. gives the acid, m.  $178^\circ$ .

**Mixed esters.** PAUL F. H. SCHVING. Fr. 650,100, Aug. 8, 1927. Mixed esters of carbonic acid are prepd. by the action of a chloroformic soln. of ethyl chlorocarbonate on alc. solns. in the presence of pyridine, or on the Na deriv. of a tertiary alc. The ethyl carboxylic derivs. of phenylethyl, benzyl, cinnamic and anisic alc. and of geraniol, citronellol and linalool may thus be prepd.

**Esters of vinyl alcohol.** CONSORTIUM FÜR ELEKTROCHEMISCHE INDUSTRIE, G. M. B. H. Fr. 649,455, Feb. 1, 1928. See Brit. 285,095 (C. A. 22, 4537).

**Alkamine esters of *N*-substituted  $\alpha$ -aminobenzoic acid.** I. G. FARBERIND. A.-G. (Otto Eisleb, inventor). Ger. 473,216, Oct. 29, 1925. Addn. to 431,166. This corresponds to Brit. 260,605 (C. A. 21, 3425) but gives an addnl. example.



**Basic ethers of resorcinol.** HANS HAHN (to Winthrop Chemical Co.). U. S. 1,711,020, April 30. Twenty parts Na is dissolved in 400 parts alc. and treated with 100 parts resorcinol monomethyl ether. The reaction mixt. is heated for about 2 hrs. to about 100–20° with 125 parts diethylaminoethyl chloride. After distg. off the alc. the residue is treated with water, the resulting oil sepd., dried and fractionated. The compd. thus obtained,  $b_{12}$  160–6°, is a colorless liquid. It gives with HCl a cryst. salt, m. 138–140°. Forty parts resorcinol monomethyl ether is treated with a soln. of 8 parts Na in 300 parts alc. and heated for about 3 hrs. to about 80–100° after the addn. of 60 parts 1-dimethylamino-2-methyl-3-chlorobutane. After distg. off the alc. the new basic ether,  $m\text{-MeOC}_6\text{H}_4\text{OCHMeCHMeCH}_2\text{NMe}_2$ , is sepd. with water and fractionated after drying. It  $b_{12}$  170–2°, and is a colorless oil. 3.5 parts Na is dissolved in 100 parts alc. and heated together with 20 parts resorcinol monoethyl ether and 20 parts diethylaminoethyl chloride for about 5 hrs. to about 100–10°. When the reaction is complete the product is worked up as in the case of the first product described. The new base,  $b_{12}$  171–9°, is a yellow liquid which is easily sol. in acids. These new products are vasoconstrictive and excite labor pains. They are of basic odor, difficultly sol. in water and easily sol. in acids.

**Carbohydrate derivatives.** WILLIAM HARRISON. Fr. 650,004, Oct. 29, 1927. See Brit. 286,331 and 286,332 (C. A. 23, 155).

**Derivatives of aminohydroxybenzenes.** I. G. FARBENIND. A.-G. Fr. 649,761, Oct. 10, 1927. *N*-Hydroxyethyl derivs. of 4-amino- and 2-amino-1-hydroxybenzene are prepd. by condensing the 4- or 2-amino compd. with glycol halohydrins or with ethylene oxide, at ordinary or raised temp. and pressure, preferably in the presence of solvents or diluents or acid-binding agents, and, if necessary, in the presence of catalysts. In examples, 4-amino-1-hydroxybenzene is heated with ethylene chlorohydrin and  $\text{Na}_2\text{CO}_3$ , yielding 4-[di(hydroxyethyl)amino]-1-hydroxybenzene, m. 140°. The following are also prepd.: 4-(hydroxyethyl)amino-1-hydroxybenzene, m. 96–97°. 2-[di(hydroxyethyl)amino]-1-hydroxybenzene, which decomposes slowly above 240°, and 2-(hydroxyethyl)amino-1-hydroxybenzene, m. 80–81°.

**Anthracene derivatives.** I. G. FARBENIND. A.-G. (Georg Kränzlein and Wilhelm Fekert, inventors). Ger. 472,825, Oct. 18, 1925. Anthracene derivs. are prepd. by reducing the corresponding anthraquinone deriv. at temps. over 300° with H or other reducing gas, in the presence of a catalyzer. Thus, 2-aminoanthraquinone is mixed with Cu or Zn dust in a tube and sublimed at 460–475° in a current of H. In the cool part of the tube, yellow-green crystals of 2-aminoanthracene, m. 235°, appear.

**$\alpha$ -Naphthylamine derivative.** SOC. ANON. POUR L'IND. CHIM. A BÂLE. Swiss 130,423, April 8, 1927. Tetrahydro-*N*-ethyl- $\alpha$ -naphthylamine is prepd. by the catalytic hydrogenation of *N*-ethyl- $\alpha$ -naphthylamine. The process is carried out under 30 atm pressure at 130° with Ni as the catalyzer.

**Tertiary nitriles.** I. G. FARBENIND. A.-G. (Max Bockmühl and Gustav Ehrhardt, inventors). Ger. 473,329, June 23, 1925. This corresponds to Brit. 253,950 (C. A. 21, 2478) but gives addnl. examples describing the prepn. of triethylacetone nitrile, b. 60–64°/10 mm., isopropylethylallylacetone nitrile, b. 78–81°/7 mm., and triallylacetone nitrile b. 100 120°/4 mm. Cf. C. A. 23, 396.

**Ureides.** J. D. RIEDEL-E. DE HAËN, A.-G. Ger. 473,519, June 17, 1926. Addn. to Ger. 461,814. Acids of the general formula  $\text{EtMeCH.CHR.CO.NH.CO.NH}_2$ , where R is an unsatd. residue, are converted to their ureides. Thus, Na and diethyl *sec*-butylmalonate are dissolved in abs. alc. and heated for some hours with allylbromide. The alc. is distd. off and the residue is dissolved in water, extd. with ether and dried over  $\text{Na}_2\text{SO}_4$ . On distg. off the ether, *sec*-butylallylmalonate remains. This malonate is sapond., acidified and heated to give *sec*-butylallylacetic acid. This is heated with thionyl chloride until no further HCl is evolved, and fractionated, to produce *sec*-butylallylacetyl chloride. This is heated with urea for several hrs. in a steam bath, and the product extd. with water and recrystd. with alc. giving *sec*-butylallylacetylureide.

***N*-Substituted diaminopropanols.** I. G. FARBENIND. A.-G. (Otto Eisleb, inventor). Ger. 473,219, Aug. 4, 1926. See Brit. 275,622 (C. A. 22, 2171).

**Propyl- and dipropylcresols and similar compounds.** RHEINISCHE KAMPFER-FABRIK GES. Brit. 298,600, Oct. 12, 1927. Propylene is condensed with *o*-, *m*- or *p*-cresol by the action of catalysts to attach a Pr or iso-Pr group at the nucleus or at the O atom or both. There may be used as catalysts: alumina, Al phosphate and Th oxide or W oxide, alone or on carriers such as pumice, kieselguhr, asbestos, silica gel and active charcoal, dried kaolin, brick clay, fuller's earth and similar materials,  $\text{ZnCl}_2$ , anhyd. acids and acid chlorides such as  $\text{H}_3\text{PO}_4$  and  $\text{H}_2\text{SO}_4$ , sulfonic acids,  $\text{P}_2\text{O}_5$ ,

or mixts. of these or similar substances. A compd. such as thymol, dipropyl-*m*-cresol, *m*-cresol isopropyl ether or thymol isopropyl ether may be used instead of all or part of the propylene. Numerous details and modifications of the process are described.

**Carboxylic acids.** KALLÉ & Co. A.-G. (Wilhelm Neugebauer, inventor). Ger. 472,606, Oct. 20, 1925. Carboxylic acids contg. S are prep'd. by the action of isatin, its substitution products, homologs, analogs or 2-derivs., on thioglycolic acids, especially in presence of a condensing agent. Thus, 15 parts of isatin and 17 parts of phenylthioglycolic acid are heated for 20 hrs. in a reflux condenser with 25 parts of anhyd. AcONa and 20 parts of glacial AcOH. The soln. is then diluted and filtered. The new acid is pptd. from the filtrate by HCl. It melts with decompn. at 293°, uncorrected. Other examples are given.

**2-Hydroxy-3-sulfo-6-naphthalenecarboxylic acid.** I. G. FARBENIND. A.-G. (Friedrich Krecke, inventor). Ger. 473,218, June 27, 1926. See U. S. 1,676,698 (C. A. 22, 3171).

**Substitution products of quinolinecarboxylic acids.** SCHERING-KAHLBAUM A.-G. (Max Dohrn and Albrecht Thiele, inventors). Ger. 472,821, May 23, 1926. Di- and poly-iodo substitution products of quinolinecarboxylic acids are prep'd. by the action of I on the acid in the presence of fuming H<sub>2</sub>SO<sub>4</sub>. Thus, a dry mixt. contg. 1 mol. of 2-phenylquinoline-4-carboxylic acid and 3 mols. of I is added to fuming H<sub>2</sub>SO<sub>4</sub> contg. 50% SO<sub>3</sub>, cooled, and placed for 9-10 hours in a water bath. Cooling yields triiodo-2-phenylquinoline-4-carboxylic acid contg. 60.8% I. If 1 mol. I is used, the diiodo product is formed. If 4 mols. of I are added, a pentaiodo product is formed. Monosulfo-2-phenylquinoline-4-carboxylic acid treated in the same way gives a similar series of iodo substitution products.

**Monocarboxylic acids from aldoses.** CHEM. FABRIK VORM. SANDOZ. Ger. 473,261, July 3, 1927. Addn. to 461,370. The method of Ger. 461,370 (see Brit. 289,280, C. A. 23, 606) is modified by treating the aldoses in alkali carbonate soln. with Cl in the presence of small amts. of compds. of Br or I. Cooling is then unnecessary. The prepn. of lactobionic and gluconic acids, which are isolated as Ca salts, is described by way of example.

**Salts of *o*-aminophenylpropionic acids.** I. G. FARBENIND. A.-G. (Fritz Mayer, inventor). Ger. 474,221, April 7, 1925. This corresponds to Brit. 250,250 (C. A. 21, 916) but gives addnl. examples describing the prepn. of Na 6-methyl-1-aminophenyl-2-propionate, 1- $\beta$ -aminophenylbutyrate and 5,6-diaminophenyl-1,4-dipropionate.

**Nitrophenyloxamic acids.** COMPAGNIE NATIONALE DE MATIÈRES COLORANTES ET MANUF. DE PRODUITS CHIM. DU NORD RÉUNIES, ÉTABLISSEMENTS KUELMANN. Fr. 649,328, Feb. 20, 1928. Nitrophenyloxamic acids are prep'd. by heating nitroanilines (*o*-, *m*- or *p*-) or nitroanilines substituted in the ring, with an excess or anhydrous oxalic acid, taking care to eliminate from the reaction water as it is formed and to have the reagents carefully mixed. Thus, *p*-nitroaniline is carefully mixed with anhydrous oxalic acid and heated to 125-135° for 12 hrs. with constant stirring. The *p*-nitrophenyloxamic acid may be reduced to the amino compd. The *o*- and *m*- compds. and *p*-amino-*m*-chlorophenyloxamic acid may be prep'd. in the same way.

**Sulfonic acids.** I. G. FARBENIND. A.-G. (Karl Daimler and Gerhard Balle, inventors). Ger. 472,959, April 16, 1926. Aralkyl-aryl sulfonic acids are prep'd. by the interaction of aromatic hydrocarbons, aralkyl halides and H<sub>2</sub>SO<sub>4</sub>. Thus, molten naphthalene, benzyl chloride and H<sub>2</sub>SO<sub>4</sub> at 80-85° give benzylnaphthalenesulfonic acid. Other examples are given.

**Sulfamic acids.** I. G. FARBENIND. A.-G. Brit. 298,550, July 8, 1927. See Fr. 638,175 (C. A. 23, 154).

**Diazosulfamic acids.** I. G. FARBENIND. A.-G. (Karl Schirmacher and Werner Schirmacher, inventors). Ger. 473,217, Feb. 23, 1926. This corresponds to Brit. 266,388 (C. A. 22, 690) but gives addnl. examples.

**Adipic acid.** DEUTSCHE HYDRIERWERKE A.-G. Ger. 473,960, Feb. 13, 1926. Adipic acid and its alkyl substitution derivs. are prep'd. by oxidizing hydrogenated phenols in the presence of O carriers in the usual way. Thus, cyclohexanol is dropped slowly into 50% HNO<sub>3</sub> contg. a small quantity of NH<sub>4</sub>VO<sub>3</sub> at 50°. The mother liquor contains a good yield of adipic acid and small quantities of succinic and glutaric acids. Also, an air current contg. methylcyclohexanol is passed over HVO<sub>2</sub> at 300-400°. A good yield of methyladipic acid is produced. Other examples are given.

**Hydroaromatic dicarboxylic acids.** DEUTSCHE HYDRIERWERKE A.-G. Ger. 474,985, June 23, 1926. Addn. to Ger. 473,960 (cf. preceding abstr.). Hydrogenated phenols are substituted by wholly or partially hydrogenated cyclic alcs. or ketones and the oxidation is continued until the corresponding dicarboxylic acid is formed. Thus,

800 g. decahydronaphthol is warmed to 50° with 3.5 kg. 60%  $\text{HNO}_3$  and  $\text{NH}_4$  vanadate. The product contains a mixt. of *cis*- and *trans*-hexahydro-*o*-phenylenediacetic acid of m. p. 164 and 151°, and octahydrocinnamic-*o*-carboxylic acid.

**Barbituric acid.** F. HOFFMANN-LA ROCHE & Co. A.-G. Ger. 474,664, Dec. 7, 1924. Addn. to Ger. 471,655 (C. A. 23, 2449). A deriv. of isopropylallylbarbituric acid is prepd. by mixing the acid with 1-phenyl-2,3-dimethyl-4-dimethylamino-5-pyrazolone in suitable solvents in mol. proportions, and crystallizing out. Thus, the two substances are dissolved in  $\text{C}_6\text{H}_6$  and heated in a reflux condenser. The new deriv. appears as yellow crystals on cooling. Other solvents mentioned in examples are water, alc. and acetone.

**Succinic acid.** VEREIN FÜR CHEM. IND. A.-G. Ger. 473,262, Dec. 19, 1926. Succinic acid is prepd. by oxidizing butyrolactone, valerolactone, or a mixt. of the 2 lactones with  $\text{HNO}_3$  in great excess at a temp. below 20°.

**Tartaric acid.** ALFRED NOWAK. Austrian 112,461, Aug. 15, 1927. Tartaric acid is extd. from crude aq. solns. by means of a water-insol. org. solvent, e. g.,  $\text{C}_6\text{H}_{11}\text{OH}$ ,  $\text{C}_6\text{H}_{13}\text{OH}$ ,  $\text{Pr}_2\text{O}$ ,  $\text{Bu}_2\text{O}$ ,  $(\text{C}_6\text{H}_{11})_2\text{O}$ , or a high-boiling fatty acid, and the acid is re-extd. from this soln. by means of water. A purer product is obtained if the org. solvent soln. is dried before re-extg. with water.

**Naphthylthioglycolic acid.** SOC. ANON POUR L'IND. CHIM. À BAËLE. Ger. 474,560, Oct. 15, 1926. The chloro substitution products of a halide of this acid are prepd. by treating with Cl or such substances as  $\text{SO}_2\text{Cl}_2$ . Thus, 218 parts of 1-naphthylthioglycolic acid is suspended in 600 parts of  $\text{PhCl}$  and 140 parts  $\text{PCl}_5$  added. The mixt. is maintained at 70–80° for some hours. The 1-naphthylthioglycolyl chloride soln. obtained is diluted with 400 parts of  $\text{PhCl}$ , and 3 parts  $\text{SbCl}_5$  added. The temp. is kept at 0–5° while 140 parts of  $\text{SO}_2\text{Cl}_2$  is added in drops and the chloro-1-naphthylthioglycolyl chloride so formed removed by  $\text{Na}_2\text{CO}_3$  soln. The excess of  $\text{PhCl}$  is removed by steam. Another example is given.

**2,3-Aminonaphthoic acid.** I. G. FARBENIND. A.-G. Fr. 648,803, Feb. 7, 1928. See Brit. 284,998 (C. A. 22, 4540).

**2,4'-Dihalo-5'-methyl-*o*-benzoylbenzoic acids.** ROGER ADAMS (to Newport Co.). U. S. 1,711,164, April 30. These compds., e. g., the dichloro compd., may be formed by condensing a 2,4-dihalotoluene with phthalic anhydride (suitably with  $\text{AlCl}_3$  or  $\text{FeCl}_3$ ); they are dye intermediates. The dichloro compd. m. 140° and forms white crystals.

**Saponification of ethylsulfuric acid.** COMPAGNIE DE BÉTHUNE. Ger. 474,502, July 31, 1924. The process is carried out in a continuous distn. column. Steam and  $\text{NH}_3$  are admitted in the lower half of the column and  $\text{EtHSO}_4$  in the upper half, so that the acid and saponig. agents flow in opposite directions in the column.

**Acetic anhydride and similar anhydrides.** BRITISH CHELANESE, LTD., H. DREYFUS and C. I. HANEY. Brit. 298,667, July 14, 1927.  $\text{Ac}_2\text{O}$  and other aliphatic anhydrides are formed by heating the vapors of the corresponding acids (which may be dil.) and the anhydrides are condensed and sepd. from assocd.  $\text{H}_2\text{O}$  by passing the vapors under the surface of a cooled "extraction liquid" such as  $\text{C}_6\text{H}_6$ ,  $\text{CHCl}_3$ , mixts. of ether,  $\text{CHCl}_3$ , and gasoline or similar hydrocarbon material. Various details are given and an app. is described.

**Alcohols.** DEUTSCHE ERDÖL A.-G. (Wilhelm Roederer, inventor). Ger. 474,640, Dec. 31, 1921. High-mol. alcs. are obtained from lignite bitumen by treating with aq. alkali soln. with or without pressure, and extg. Thus, 100 kg. montan wax is heated for 2 hrs. under a pressure of 2 atm. with  $\text{NaOH}$ . On cooling, the mass is ground up and extd. with  $\text{C}_6\text{H}_6$ . On evapg. the  $\text{C}_6\text{H}_6$ , montan alcohol remains as a brown plastic mass, m. 60°.

**Alcohols and ammonia.** SOC. CHIM. DE LA GRANDE PAROISSE, AZOTE ET PRODUITS CHIM. Fr. 649,711, July 15, 1927. A mixt. of CO, N and H is passed to a plant for producing alc. (e. g.,  $\text{MeOH}$ ), then to an  $\text{NH}_3$  plant and the residual gases are returned to the stream of gas to the alc. plant.

**Ethylene.** LOUIS AGNUS. Fr. 648,340, June 16, 1927.  $\text{C}_2\text{H}_4$  is obtained by passing a mixt. of  $\text{CS}_2$  and  $\text{CH}_4$  through a heated zone, preferably over pumice stone or active C and substances which will combine with S, such as Cu or Zn.

**Acetylene.** ALFRED SCHROEDER. Ger. 472,976, May 13, 1927. A safety app. for the drying and purification of  $\text{C}_2\text{H}_2$  is described.

**Terpene.** WALTHER STRAUB. Ger. 472,540, Dec. 18, 1927. Terpene-like hydrocarbons are extd. from juniper-berry oil by 65% alc. The alc. ext. is sepd. from the residue by fractional distn.

**Acetone.** I. G. FARBENIND. A.-G. Brit. 299,048, Oct. 21, 1927.  $\text{C}_2\text{H}_5$  and steam

are passed over catalysts comprising metals or compds. of metals, the acetates of which produce acetone when heated and the rate of flow of the gaseous mixt. is kept lower than that which yields  $\text{AcH}$  as the main product. As catalysts, there may be used oxides, carbonates and acetates of the alk. earth metals, Zn, Sn, Al and Mg, or basic salts of these metals or compds. which during the reaction are converted into oxides, carbonates or acetates, these metals themselves, or finely divided Pb or Fe, calamine or bauxite,  $\text{V}_2\text{O}_5$ ,  $\text{MnO}_2$ , Cr-Tl compds., or various mixts. of these. Catalyst poisons such as P and As compds. should be excluded as should also  $\text{Fe}_2\text{O}_3$ , Th oxide and double salts of Th with alkali and alk. earth metals. The catalyst may be regenerated by use of air or O and steam. A temp. of 400-450° is suitable for the acetone-producing reaction.

**Aminoanthraquinone.** I. G. FARBENIND. A.-G. (Hermann Berthold, inventor). Ger. 473,871, Dec. 3, 1925. See U. S. 1,691,428 (C. A. 23, 395).

**1-Methyl-2,4-dihaloanthraquinone.** ROGER ADAMS (to Newport Co.). U. S. 1,711,165, April 30. These compds., e. g., the dichloro compd., may be formed by treating 2',4'-dihalo-5'-methyl-*o*-benzoylbenzoic acid with  $\text{H}_2\text{SO}_4$  at 100°; they are dye intermediates. The dichloro compd., m. 155°.

**Dinaphthylene dioxide quinone.** I. G. FARBENIND. A.-G. Brit. 298,640, Oct. 13, 1927. An oxidation product of 1,1'-dinaphthylene 2,8',8,2'-dioxide, apparently the 4,4'-quinone, is obtained as a red-brown powder (giving a yellow leuco compd with alkali hyposulfite) by oxidizing the dinaphthylene dioxide with chromic acid (which may be formed from  $\text{K}_2\text{Cr}_2\text{O}_7$  and  $\text{H}_2\text{SO}_4$ ) in aq. suspension.

**5-Iodo-2-aminopyridine.** SCHERING-KAHLBAUM A.-G. (Otto von Schickh, inventor). Ger. 473,213, Apr. 13, 1927. See Brit. 288,571 (C. A. 23, 613).

**Dimethyl, methylene, and chloromethyl sulfates; chloromethyl sulfate chloride; dichlorodimethyl ether, etc.** K. FUCHS and E. KATSCHER. Brit. 299,064, Oct. 21, 1927. Halogen or sulfuric acid or halogen and sulfuric acid derivs. of "functional derivs." of  $\text{CH}_2\text{O}$  (which are defined as substances contg.  $\text{CH}_2$  not directly combined with C such as methylene ether, dichlorodimethyl ether, methylene esters such as the dichloride, sulfate and acetate, and Schiff's bases of  $\text{CH}_2\text{O}$ ) are produced by treating  $\text{CH}_2\text{O}$  or its polymers or "functional derivs." with halosulfonic acid, preferably chlorosulfonic acid or its salts, esters or components. Numerous details of procedure are given.

**Cysteine hydrochloride.** SCHERING-KAHLBAUM A.-G. Ger. 472,822, June 9, 1927. Cysteine-HCl, entirely free from metal, is prepd. by repeatedly triturating the crystals of the substance with acetone. Thus, cystine is reduced with Sn and  $\text{H}_2\text{S}$ . The soln. is then freed from the reducing agents and the cysteine-HCl crystd. out. The crystals are ground in a mortar with pure acetone until the acetone remains colorless.

**Pinene sulfate.** GEZA AUSTERWEIL. Ger. 473,330, Jan. 31, 1926. Turpentine oil or nopinene is treated with aq.  $\text{H}_2\text{SO}_4$  at a low temp. and the reaction mixt. is poured into water. An oily hydrate seps. and is removed, and the ester is then salted out from the aq. residue.

**Chloranil and bromanil.** L. B. HOLLIDAY & Co., LTD. and CECIL SHAW. Fr. 648,850, Sept. 5, 1927. See Brit. 274,700 (C. A. 22, 2172).

**Yellow phenolphthalein.** JOSEPH EBERT (38.33% to Whitney Payne, and 38.33% to Randall Anderson). U. S. 1,711,048, April 30. A yellow amorphous phenolphthalein having an ash content not exceeding 0.05% and a m. p. of not less than 256° is obtained by extg. partially purified yellow amorphous phenolphthalein with a solvent such as  $\text{AmOH}$  or  $\text{BuOH}$ .

**Films from urea-aldehyde condensation products.** WOLFF & Co. and R. WEINGAND. Brit. 298,631, Oct. 14, 1927. Films or "foils" are formed from a mixt. of a plasticizing agent such as glycerol or glycol with a condensation product of an aldehyde and urea or a deriv; the mixt. while liquid is applied to a suitable base and removed after solidification.

**Condensation products of hydroaromatic ketones.** I. G. FARBENIND. A.-G. Fr. 648,940, Feb. 11, 1928. New condensation products are obtained by heating to high temps. and in the presence of an acid condensing agent, primary, secondary or tertiary aromatic amines having the position *p*- to the N free, or their substitution products, with cyclic hydroaromatic ketones or their substitution products. The products obtained have in general 3 rings, but further heating gives products having only 2 rings. Thus, cyclohexanone is heated to 140-150° with  $\text{PhNH}_2$  and  $\text{HCl}$  or  $\text{H}_2\text{SO}_4$ , yielding a compd. having 3 rings, m. 111° and  $b_D^{25}$  275-276°. On further heating with  $\text{H}_2\text{SO}_4$  an insol. sulfate is obtained, the base of which contains 2 rings,  $b_D^{170}$  170-171°.

and can be diazotized and coupled with 2-naphthol-3,6-disulfonic acid to give a red-violet *azo dye*. Examples are also given of the production of compds. when  $\text{PhNH}_2$  is replaced by *o*-chloroaniline, *o*-toluidine, *o*-anisidine, monoethyl-*o*-toluidine,  $\text{PhNMe}_2$ , and when methylcyclohexanone is used.

## 11—BIOLOGICAL CHEMISTRY

PAUL E. HOWE

A—GENERAL

FRANK P. UNDERHILL

**Enzymic oxidation of oxalic acid by higher plants.** V. ZALESSKII AND A. KUKHAR-KOVA. *Ukrainskii Khim. Zhurnal* 3, Pt. sci. 139-52(1928).—The velocity of aerobic or anaerobic oxidation of oxalic acid by wheat seeds, as measured by the quantity of  $\text{CO}_2$  produced, is unaffected by the addn. of H acceptors, such as methylene blue,  $\text{KNO}_3$  and  $\text{H}_2\text{O}_2$ , while quinone and hydroquinone have a distinctly inhibitory influence on oxalase, the enzyme responsible for this oxidation. The inhibitory action of the latter is due probably to their greater affinity for O, the supply of which is thereby greatly diminished for the oxidation of oxalic acid. Cyanides and ethyl urethan do not inhibit the action of this enzyme, showing that neither surface action nor active centers contg. Fe are responsible for its action. KI has a marked inhibitory influence, probably as a result of combination with the enzyme. It is concluded that, in spite of the above observations, oxalase is a dehydrogenase, able to use only mol. O as a H acceptor.

B. C. A.

**Living matter.** WM. B. HARDY. *Colloid Symposium Monograph* 6, 7-16(1928).—Nothing is gained by claiming living matter as colloidal, for at present the colloidal kingdom "seems to be an Alsatia wherein difficult states of matter find refuge from a too exacting inquiry." After reviewing some of the aspects of living matter, H. suggests that the ideal "biological college" should have departments of mol. physics, cell mechanics, and biophysics, the last being the connecting link between the others.

JEROME ALEXANDER

**Cataphoresis of blood cells and inert particles in sols and gels and its biological significance.** HAROLD A. ABRAMSON. *Colloid Symposium Monograph* 6, 115-30 (1928). The following were experimentally followed: cataphoresis of single cells in horse serum; influence of particle shape on cataphoresis; relationship between endosmotic and cataphoretic velocity, migration of inert particles and blood cells in gelatin sols and gels; adsorption of proteins by quartz and glass.

JEROME ALEXANDER

**Continued studies on the problem of the specificity of enzyme complexes which split polypeptides.** EMIL ABDERHALDEN AND FRITZ REICH. *Univ. Halle. Fermentforschung* 10, 319-29(1929).—Several peptides contg.  $\beta$ -alanine were prepd. to det. the influence of this biologically foreign (fremdartig) amino acid on enzymic cleavage. The models studied include peptides representing both types of acid amide linkage of the  $\beta$ -alanine to the natural amino acid component, *i. e.*, through the amino and through the carboxyl of the  $\beta$ -alanine. Previous expts. have shown that these 2 types behave differently toward trypsin-kinase, those in which the foreign component carries the free carboxyl being resistant to enzymic cleavage. *Chloroacetyl-dl-leucyl- $\beta$ -alanine*, m. 124-6°, was prepd. in the usual way by coupling *dl*-leucyl- $\beta$ -alanine with  $\text{ClCH}_2\text{COCl}$  in the presence of NaOH. Treatment of this with 25%  $\text{NH}_4\text{OH}$  4 days at 37° yielded 60% of *glycyl-dl-leucyl- $\beta$ -alanine*, m. 160°, which gave both ninhydrin and biuret reactions.  *$\beta$ -Alanyl-dl-leucine*, m. 245-6° (decompn.), was obtained by coupling *dl*-leucine with an impure prepn. of  $\text{ICH}_2\text{CH}_2\text{COCl}$  and treating the crude intermediate with  $\text{NH}_4\text{OH}$ . Ninhydrin reaction was positive; biuret and carbonyl reactions were negative.  *$\beta$ -Alanylglycyl-dl-leucine*, which sinters 60° and decompn. 125°, was prepd. by coupling *glycyl-dl-leucine* with  $\text{ICH}_2\text{CH}_2\text{COCl}$  and aminating the intermediate iodo-propionyl deriv. (m. crude 170°). It gave positive ninhydrin and biuret reactions. The tetrapeptide,  *$\beta$ -alanyl-dl-leucylglycyl-dl-leucine*, amorphous, sinters 60°, decompn. 125°, was prepd. in the same way from *dl*-leucylglycyl-dl-leucine and  $\text{ICH}_2\text{CH}_2\text{COCl}$  and treatment of the intermediate viscous product with  $\text{NH}_4\text{OH}$ . Biuret and ninhydrin reactions were positive. All of these peptides with the exception of  *$\beta$ -alanyl-dl-leucine* were hydrolyzed by *N* NaOH at 37-40°; *glycyl-dl-leucyl- $\beta$ -alanine* more rapidly than its isomer  *$\beta$ -alanylglycyl-dl-leucine*. All were completely resistant to erepsin. Trypsin-kinase gave an appreciable hydrolysis only with the tetrapeptide. A. W. Dox

Further studies on the relations between substrate and enzyme complex based on the influence of erepsin and trypsin-kinase on polypeptides and related compounds. EMIL ABDERHALDEN AND HANS BROCKMANN. Univ. Halle. *Fermentforschung* 10, 380-40 (1929).—In general it appears that erepsin hydrolyzes only those peptides which carry a free  $\text{NH}_2$  group, and trypsin-kinase only those in which a free  $\text{CO}_2\text{H}$  group is present. New peptides are now described in which the  $\text{NH}_2$  group bears a substituent acyl or alkyl, or the  $\text{COOH}$  is present as an anilide grouping. In one instance both  $\text{NH}_2$  and  $\text{COOH}$  groups are thus substituted. These derivs. were examd. with respect to their behavior toward enzymes. *Butyldiglycylglycine*, m.  $231-2^\circ$ , was obtained by acylation of the tripeptide with  $\text{PrCOCl}$ . *N-Methyl-dl-leucyldiglycylglycine* (I), m.  $238^\circ$  (decompn.), was prepd. in 63% yield from *dl*- $\alpha$ -bromoisocapronyldiglycylglycine by 3-day treatment at  $37^\circ$  with 25%  $\text{MeNH}_2$ . It gives a red biuret reaction and is acid to litmus. *d*- $\alpha$ -Bromoisocapronylglycyl-*d*-alanyl-*l*-leucylglycyl-*d*-alanine (II), m.  $206-7^\circ$ ,  $[\alpha]_D^{20} -9.95^\circ$ , was obtained by acylation of the pentapeptide with *d*- $\text{Me}_2\text{CHCH}_2\text{CHBrCOCl}$ . *dl*- $\alpha$ -Bromoisocapronyltriglycylaniline, m.  $220-30^\circ$  (decompn.), was prepd. by shaking *dl*- $\alpha$ -bromoisocapronyltriglycyl chloride 2 hrs. with  $\text{PhNH}_2$ . Amination by a satd. soln. of  $\text{NH}_3$  in a mixt. of pyridine and  $\text{MeOH}$  5 hrs. at  $70^\circ$  and then 14 hrs. at  $38^\circ$  converted it into *dl*-leucyltriglycylaniline (III), m.  $160^\circ$  (decompn.). This gives positive ninhydrin and biuret reactions, and forms an oily picrate. Benzoyl-*dl*-leucylglycylaniline, m.  $197.5^\circ$ , was prepd. by refluxing the benzoyldipeptide 10 hrs. with  $\text{PhNH}_2$ ; butyryltriglycylaniline, m.  $231-2^\circ$ , by a similar treatment of the butyryltripeptide. Erepsin at  $p_{\text{H}}$  7.8 and  $38^\circ$  hydrolyzed III but not I and II. Trypsin-kinase at  $p_{\text{H}}$  8.4 and  $38^\circ$  hydrolyzed II but not I and III. Enzyme expts. with the other new derivs. are not reported. A table summarizes the results of expts. with a no. of previously described peptide derivs., mainly halogenacylpeptides, which as a rule are attacked by trypsin-kinase but not by erepsin. A. W. Dox

Continued studies on the problem of the specificity of enzyme complexes which split polypeptides. EMIL ABDERHALDEN AND FRIEDRICH SCHWETZER. Univ. Halle. *Fermentforschung* 10, 341-64 (1929).—The following polypeptides and derivs. thereof were prepd. by the customary methods, those with stated m. p. being new substances: *dl*-leucylglycylglycine (I) (Bz deriv., m.  $175^\circ$  with decompn., *PhNCO* deriv., m.  $185^\circ$ ,  $\beta\text{-C}_{10}\text{H}_{17}\text{SO}_2$  deriv., m.  $175^\circ$  with decompn.); glycyl-*dl*-phenylalanine (II); diglycyl-*dl*-phenylalanine (III); chloroacetyldiglycyl-*dl*-phenylalanine, m.  $184-5^\circ$  (decompn.); diglycylglycyl-*dl*-phenylalanine (IV), m.  $223^\circ$  (decompn.); *dl*-phenylalanylglycine (V); *dl*-phenylalanylglycylglycine;  $\beta$ -phenyl- $\alpha$ -bromopropionylglycylglycine, m.  $278-9^\circ$  (decompn.); *dl*-phenylalanyldiglycylglycine (VI), m.  $207^\circ$  (decompn.); *PhNCO* deriv. of VI, m.  $296^\circ$  with gas evolution;  $\beta$ -phenyl- $\alpha$ -bromopropionylglycylphenylalanine, m.  $187^\circ$  (decompn.); *dl*-phenylalanyltriglycyl-*dl*-phenylalanine (VII); *dl*-leucylglycyl-*dl*-phenylalanine (VIII), m.  $235^\circ$ ; *dl*- $\beta$ -phenyl- $\alpha$ -bromopropionylglycyl-*dl*-leucine (IX), m.  $161^\circ$ ; *dl*-phenylalanylglycyl-*dl*-leucine (X), m.  $210^\circ$  (decompn.); *dl*- $\beta$ -phenyl- $\alpha$ -bromopropionylglycyl-*dl*-phenylalanine, m.  $174-5^\circ$ ; *dl*-phenylalanylglycyl-*dl*-phenylalanine (XI), m.  $236^\circ$  (decompn.); *dl*- $\beta$ -phenyl- $\alpha$ -bromopropionyl-*dl*-phenylalanine (XII), m.  $69-70^\circ$ ; *dl*-phenylalanyl-*dl*-phenylalanine (XIII). I is hydrolyzed by erepsin but not by trypsin-kinase; all 3 of its derivs. are hydrolyzed by trypsin-kinase but not by erepsin. *N* NaOH at  $37^\circ$  attacks the *PhNCO* deriv. most readily, then the Bz deriv., while the  $\beta\text{-C}_{10}\text{H}_{17}\text{SO}_2$  deriv. is hydrolyzed only slowly. Substitution in the  $\text{NH}_2$  group of a polypeptide alters the character of the whole mol., but the effect varies with different substituents and with different peptides. *N* NaOH scarcely affects XII and XIII in 5 days, hydrolyzes II slowly, III more rapidly, and IV very much more rapidly. Of those peptides with a terminal phenylalanyl V is most slowly and VI most rapidly hydrolyzed. VII is also hydrolyzed rapidly. Of the 2 isomers, VIII and X, the latter undergoes cleavage somewhat more readily. Although XIII is very resistant, this is not true of XI with its intermediate glycyl. Erepsin attacked all the polypeptides contg. phenylalanine (XIII) was not tested because of its insol., but not the haloacyl derivs. Trypsin-kinase attacked IV, VII, IX, X, XI, and XII. No polypeptide in which glycine carried the free  $\text{COOH}$  was attacked by trypsin-kinase. A. W. Dox

Further studies on the relations between substrate and enzyme complex based on the influence of erepsin and trypsin-kinase on polypeptides of definite composition. EMIL ABDERHALDEN AND VLASSIOS VLASSOPOULOS. Univ. Halle. *Fermentforschung* 10, 365-95 (1929).—Three series of glycine polypeptides contg., resp.,  $\alpha$ -aminobutyric acid, valine and norvaline were prepd. by the usual methods and subjected to tests of enzymic hydrolysis. *dl*- $\alpha$ -Bromobutyrylglycine, m.  $106.5^\circ$ , was prepd. by coupling glycine with  $\text{EtCHBrCOBr}$ . A much better yield was consistently obtained from synthetic glycine than from the glycine of hydrolyzed silk. Amination with 25%

NH<sub>4</sub>OH converted it into 60% *dl*- $\alpha$ -aminobutyrylglycine (I) (*PhNCO* deriv. m. 188°;  $\beta$ -C<sub>10</sub>H<sub>7</sub>SO<sub>2</sub> deriv. m. 165.5°). In the same way glycylglycine was coupled with EtCHBrCOBr to *dl*- $\alpha$ -bromobutyrylglycylglycine, m. 147°, and the latter aminated to 40% *dl*- $\alpha$ -aminobutyrylglycylglycine (II) (*PhNCO* deriv. m. 172°,  $\beta$ -C<sub>10</sub>H<sub>7</sub>SO<sub>2</sub> deriv. m. 140°); and diglycylglycine yielded 75% *dl*- $\alpha$ -bromobutyryldiglycylglycine, from which 60% *dl*- $\alpha$ -aminobutyryldiglycylglycine (III) was obtained (*PhNCO* deriv. m. 193°). Glycyl-*dl*- $\alpha$ -aminobutyric acid (IV) has previously been described (*PhNCO* deriv. m. 195°;  $\beta$ -C<sub>10</sub>H<sub>7</sub>SO<sub>2</sub> deriv. m. 112-4°). This was coupled with ClCH<sub>2</sub>COCl to form *chloroacetyl-glycyl-dl*- $\alpha$ -aminobutyric acid, m. 120-1°, and the latter aminated to diglycyl-*dl*- $\alpha$ -aminobutyric acid (V) (*PhNCO* deriv. m. 208°). Norvaline was coupled with PrCHBrCOCl to an almost quant. yield of *dl*- $\alpha$ -bromovaleryl-*dl*-norvaline, m. 124-5°, and this was aminated to the dipeptide *dl*-norvalyl-*dl*-norvaline (VI), m. 270° with decompn. (*PhNCO* deriv. m. 206°;  $\beta$ -C<sub>10</sub>H<sub>7</sub>SO<sub>2</sub> deriv. m. 177°). Further coupling with ClCH<sub>2</sub>COCl yielded *chloroacetyl-dl*-norvalyl-*dl*-norvaline, m. 147.5, which was aminated to glycyl-*dl*-norvalyl-*dl*-norvaline (VII), m. 238-40° (*PhNCO* deriv. m. 156°;  $\beta$ -C<sub>10</sub>H<sub>7</sub>SO<sub>2</sub> deriv. m. 195°). Condensation of *d*-valine with *d*-PrCHBrCOCl yielded 93% *d*- $\alpha$ -bromovaleryl-*d*-valine, m. 137°, [ $\alpha$ ]<sub>D</sub><sup>20</sup> 13.1°, which on amination with 25% NH<sub>4</sub>OH gave 40% of the racemic dipeptide and from the mother liquor 50% *dimethylacrylvaline*, m. 137°, was obtained. The yield of active dipeptide, *d*-valyl-*d*-valine, (VIII), m. above 300° [ $\alpha$ ]<sub>D</sub><sup>20</sup> -54°, was only 2%. By the use of liquid NH<sub>3</sub> in a sealed tube the yield of active dipeptide was increased to 6% and finally 10%, but here also there was considerable racemization (30%) and a 35% yield of *dimethylacrylvaline*. Attempts to obtain the active peptide through the ester and anhydride were unsuccessful, the intermediate Me ester, b<sub>17</sub> 58°, being optically inactive, and the yield of anhydride, m. 290°, very small. *PhNCO* deriv. of VIII, m. 184°;  $\beta$ -C<sub>10</sub>H<sub>7</sub>SO<sub>2</sub> deriv. m. 213-5°; *PhNCO* deriv. of racemic dipeptide m. 188-9°;  $\beta$ -C<sub>10</sub>H<sub>7</sub>SO<sub>2</sub> deriv. m. 208°. Condensation of the active dipeptide with ClCH<sub>2</sub>COCl and amination of the oily product gave 43% glycyl-*d*-valyl-*d*-valine (IX), m. 220°, [ $\alpha$ ]<sub>D</sub><sup>20</sup> -32°, and 25% of the racemic tripeptide. The  $\beta$ -C<sub>10</sub>H<sub>7</sub>SO<sub>2</sub> deriv. of IX was prep'd. but its m. p. was not stated; prep'n. of the *PhNCO* deriv. was unsuccessful. Erepsin hydrolyzed the peptides I, IV, VI, VII, VIII, and IX, also the racemic forms of VI, VII and VIII, but II, III and V only very slightly. None was attacked by trypsin-kinase, and only the *PhNCO* deriv. of IV. *N* NaOH at 37° hydrolyzed I, II, III, IV and V; their *PhNCO* derivs. more readily but their  $\beta$ -C<sub>10</sub>H<sub>7</sub>SO<sub>2</sub> derivs. less readily than the free peptides. VIII and the corresponding *dl*-form remained unaltered, while their *PhNCO* and  $\beta$ -C<sub>10</sub>H<sub>7</sub>SO<sub>2</sub> derivs. showed cleavage. IX was hydrolyzed by NaOH. The *dimethylacrylvaline* was resistant to both NaOH and trypsin. In contrast to VIII the unbranched isomer VI was slowly attacked by NaOH, also its *PhNCO* and  $\beta$ -C<sub>10</sub>H<sub>7</sub>SO<sub>2</sub> derivs. Contrary to the general rule, the *PhNCO* deriv. of VII was hydrolyzed less rapidly than the free peptide or even its  $\beta$ -C<sub>10</sub>H<sub>7</sub>SO<sub>2</sub> deriv. A striking observation was the fact that the  $\alpha$ -bromoisovaleryl derivs. were far more difficult to aminate than the corresponding  $\alpha$ -bromonorvaleryl derivs., their reaction with NH<sub>4</sub>OH being much slower and less complete. A. W. DOX

Studies on the behavior of *N* alkali, erepsin and trypsin-kinase toward polypeptides containing 3,5-halogen substituted tyrosine, and toward glycyl-*d*-tyrosine, glycyl-*dl*-nitrotyrosine and glycyl-*dl*-*o*-tyrosine. EMIL ABDERHALDEN AND ADOLF SCHMITZ. *Univ. Halle. Fermentforschung* 10, 428-39 (1929).—New peptide derivs. described are glycyl-*d*-tyrosine, amorphous, sinters 120° m. 160° with foaming, which was obtained by coupling *d*-tyrosine ester with ClCH<sub>2</sub>COCl, saponig. and aminating; *chloroacetyl-dl*-3,5-dichlorotyrosine, m. 195°, obtained in 65% yield from the dichlorotyrosine Me ester and ClCH<sub>2</sub>COCl in CHCl<sub>3</sub> and aq. NaHCO<sub>3</sub>; glycyl-*dl*-3,5-dichlorotyrosine, m. 237°, in 60% yield by amination of the preceding with 25% NH<sub>4</sub>OH; and by analogous reactions, *chloroacetyl-dl*-3,5-dibromotyrosine, m. 207° (yield 55%); glycyl-*dl*-3,5-dibromotyrosine, m. 222-3° with decompn. (yield 70%); *chloroacetyl-dl*-3-nitrotyrosine, m. 166° (yield 60%); glycyl-*dl*-3-nitrotyrosine, m. 240° (decompn.); *chloroacetyl-dl*-*o*-tyrosine, amorphous, in 50% yield, from the free amino acid and ClCH<sub>2</sub>COCl; glycyl-*dl*-*o*-tyrosine, amorphous, sinters 120°, m. 150° (yield 40%); and by similar reactions between these glycyl-dihalotyrosines and *dl*-Me<sub>2</sub>CHCH<sub>2</sub>CHBrCOCl, and the usual amination; *dl*- $\alpha$ -bromoisopronylglycyl-*dl*-3,5-dichlorotyrosine (yield 65%); *dl*-leucylglycyl-*dl*-3,5-dichlorotyrosine, m. 210 with decompn. (yield 50%); *dl*- $\alpha$ -bromoisocapronylglycyl-*dl*-3,5-dibromotyrosine (yield 70%); *dl*-leucylglycyl-*dl*-3,5-dibromotyrosine, sinters 190°, m. 220° (decompn.); *dl*- $\alpha$ -bromoisocapronylglycyl-*dl*-3,5-diiodotyrosine (yield 60%); *dl*-leucylglycyl-*dl*-3,5-diiodotyrosine, darkens, 180°, m. 205° (foaming). All of these derivs. are hydrolyzed by *N* NaOH at 37°; those which contain 3 units are hydrolyzed most rapidly.

Glycyl-*l*-tyrosine is very slowly hydrolyzed, as is also glycyl-*o*-tyrosine. The rate of hydrolysis of substituted dipeptides follows the order:  $\text{NO}_2 < \text{Cl} < \text{Br} < \text{I}$ . Erepsin attacks only the dipeptides contg. the natural *l*-tyrosine or its halogen-substituted derivs. Trypsin-kinase attacks only the tripeptides. In general, substitution on the nucleus of tyrosine does not protect the peptide from enzymic hydrolysis. Chloroacetyl-*o*-tyrosine is attacked by trypsin-kinase but not by erepsin. A. W. DOX

Further observations on the relations between the enzyme complexes erepsin and trypsin-kinase and the polypeptides and derivatives which they hydrolyze. Attempt to isolate erepsin from intestinal secretion and trypsin from pancreatic juice. EMIL ABDERHALDEN AND ERNST SCHWAB. Univ. Halle. *Fermentforschung* 10, 440-5 (1929).—Haloacyl derivs. of  $\alpha$ -amino acids are hydrolyzed by trypsin-kinase but not by erepsin which has been freed from trypsin. A surprising observation is that such derivs. are hydrolyzed more readily by erepsin contg. a small amt. of trypsin than by the same amt. of trypsin alone. Addn. of erepsin to the trypsin-kinase hastens the onset of hydrolysis so that during the first few hrs. the extent of cleavage is much greater, but gradually the control expt. with trypsin-kinase alone gains in velocity and the final result is the same in both cases. Chloroacetyl-*l*-leucine is slightly attacked by erepsin preps. in which trypsin cannot be demonstrated; hence the latter is presumed to be present in traces insufficient to hydrolyze the other less sensitive halogenacylamino acids. Several possible explanations of this phenomenon are suggested: the formation of an erepsin-trypsin-kinase complex with heightened activity, the destruction of inhibitory substances by the erepsin, and a coenzymic action. Certain exts. of powdered pancreas, pancreatin and especially pancreatic juice obtained by means of a fistula were found to be more active than purified trypsin-kinase toward acyl derivs. of amino acids. This also suggests the activation by erepsin. The difficulties experienced in isolating erepsin from intestinal secretion and trypsin from pancreatic juice are discussed. A. W. DOX

Continued studies on the problem of the specificity of enzyme complexes which split polypeptides. Experiments with polypeptides containing histidine. EMIL ABDERHALDEN, RICHARD FLEISCHMANN AND WILHELM IRION. Univ. Halle. *Fermentforschung* 10, 446-54 (1929).—The  $\text{HgCl}_2$  method of prepg. *l*-histidine from hydrolyzed blood corpuscles is considered more satisfactory than the recently described  $\text{Ag}_2\text{O}$  method of Vickery and Leavenworth (*C. A.* 22, 4140). It is less costly, less devious and time-consuming, and gives a better yield. From 5 l. of horse blood 58 g. histidine-HCl was obtained. A redetn. of the diamino acids in crystd. oxyhemoglobin gave the values: histidine 7.5-7.6%, lysine 8.15-8.25% and arginine 3.45-3.60%. These values should supersede those previously reported (*Z. physiol. Chem.* 37, 484). *l*-Histidine Me ester was coupled with *d*- $\text{Me}_2\text{CHCH}_2\text{CHBrCOCl}$  and the resulting ester sapond. to *d*- $\alpha$ -bromoisocapronyl-*l*-histidine (I), which was then aminated by 25%  $\text{NH}_4\text{OH}$  to *l*-leucyl-*l*-histidine (II), by the procedure of Fischer and Cone (*C. A.* 3, 314). I is quite unstable to alkali and the yield is much improved by sapon. the ester with 0.1 *N* instead of *N* NaOH. Both erepsin and trypsin-kinase hydrolyze the dipeptide II. I is slightly attacked by trypsin-kinase but not by erepsin. The relative stability toward trypsin-kinase of this bromoisocapronyl deriv. and of the bromoisovaleryl derivs. of other amino acids, as compared to the corresponding chloroacetyl and bromopropionyl derivs., suggests a stabilizing influence due to the branching of the chain. On the other hand, this substance is hydrolyzed by *N* and even by 0.1 *N* NaOH with unusual rapidity, although the dipeptide is quite resistant. The *dl*-bromoisocapronyl and *dl*-leucyl derivs. of *l*-histidine showed the same behavior toward enzymes and alkali as the optical forms above mentioned. A. W. DOX

The influence of formalin fixation of organs on the extractability of the lipids. MILOŠ MLADENović AND HANS LIEB. Univ. Zagreb and Univ. Graz. *Z. physiol. Chem.* 181, 221-6 (1929).—The Soxhlet extn. of  $\text{Et}_2\text{O}$ -sol. substances from dried powd. liver is complete in 8 hrs., whether the powder is prepd. from fresh tissue or from tissue preserved in formalin; a 50-hr. extn. does not increase the yield. Preps. from fresh liver, however, may yield 33% more  $\text{Et}_2\text{O}$  ext. and 100% more EtOH ext. than similar preps. from liver preserved in formalin. The N, P, cholesterol and neutral fat contents of the  $\text{Et}_2\text{O}$  ext. from untreated liver are also considerably higher. However, the  $\text{Et}_2\text{O}$  ext. from  $\text{CH}_2\text{O}$ -fixed tissue is completely sol. in MeAc while that from the non-treated tissue contains as much as 10% of material insol. in MeAc. Probably the  $\text{CH}_2\text{O}$  treatment results in some decompn. of phosphatides. A. W. DOX

The nature of the proteases. II. Relation between the chemical properties of a series of pepsin preparations and their activity toward various proteins. I. A. SMORODINTSEV AND A. N. ADOVA. Univ. Moscow. *Z. physiol. Chem.* 182, 1-7 (1929); cf. *C. A.* 22, 3671.—The relationship, previously reported, between the  $\text{NH}_2 : \text{CO}_2\text{H}$



ratio in pepsin preps. and their activity toward casein holds also for edestin, gelatin, egg albumin and muscle protein. All pepsin preps., whether strongly or feebly active, digest casein 10–20 times as readily as edestin. Muscle protein is digested 3–4 times as readily as egg albumin under identical conditions. A. W. DOX

**The influence of hydrogen peroxide on peroxidase activity of water extract from plant material.** A. I. SMIRNOV. *Trudi Kuban. Selsk. Khoz. Inst. (Arb. Kuban. Landw. Inst.)*, **4**, 11–20 (1926); *Expt. Sta. Record* **58**, 624.—Five cc. of a 1% soln. of  $H_2O_2$  is detrimental when used all at once on 50 cc. of reaction material for the detn. of peroxidase, particularly when the reaction material itself contains even small portions of peroxidase. The detrimental influence of  $H_2O_2$  on peroxidase depends not upon the abs. amt. of peroxide but upon its concn. The effects of time and concn. are detailed. H. L. D.

**Prof. Dr. Oskar Loew. On his eighty-fifth birthday, April 2, 1929.** A. JACOB. *Z. angew. Chem.* **42**, 369–70 (1929). E. H.

**The influence of cholates and other capillary active substances on "Electrotonus."** N. SCHEINFINKEL. Univ. Bern. *Z. Biol.* **88**, 407–18 (1929).—Na cholate and decholin weakened the elec. flow at the cathode, while the flow at the anode remained unchanged. Similar results were obtained with caprylic alc. and optochin. Cholate increases the sensitivity in the cathode region of a polarized current. F. K.

**Oscar Loew.** F. MERKENSCHLAGER. *Ernähr. Pflanze* **25**, 145–8 (1929).—Biography with portrait. LAWRENCE P. MILLER

**The precipitation of casein at the isoelectric point.** FERDINAND LEBERMANN. Univ. Basel. *Biochem. Z.* **206**, 56–9 (1929).—The buffering effect of cow milk is so great that it must be properly considered in pptg. the casein at the isoelec. point. Casein partly pptd. by means of standard acetate soln. removes H ions from the milk. The opt. pptn. of casein from skimmed milk takes place with an acid acetate mixt. of  $pH$  3.74, the final  $pH$  of the soln. being quite different from the isoelec. point ( $pH$  4.7) of pure casein. S. MORGULIS

**Mechanism of inhibition by fluoride and the dissociation curve of fluoromethemoglobin.** F. LIPMANN. Kaiser Wilhelm-Inst., Berlin-Dahlem. *Biochem. Z.* **206**, 171–85 (1929).—The inhibition of fermentation by F is reversible; the degree of inhibition at different F concns. agrees with the requirements of the mass-action law; and, finally, the inhibition increases with acidity. These findings are in agreement with the inhibition of the lipase, and are easily interpreted on the assumption of a chemical, easily dissociable combination between enzyme and F. It is shown, furthermore, that muscle respiration is much more sensitive to F than the lactic-acid formation. A study of the F methemoglobin dissocn. reveals that this follows the monomol. reaction methemoglobin + F ion  $\rightleftharpoons$  MF, the affinity increasing on the acid side as in the case of the enzyme. The oxidation of oxalic acid by  $KMnO_4$  is slowed down by the formation of complex Mn fluorides, also the decompn. of  $H_2O_2$  by tervalent Fe. S. MORGULIS

**Reactions of carbon monoxide with metal compounds of cysteine.** WERNER CREMER. Kaiser Wilhelm-Inst., Berlin-Dahlem. *Biochem. Z.* **206**, 228–39 (1929); cf. *C. A.* **23**, 1655.—Fe in an alk. soln. of cysteine forms a carbonyl compd., whereby 1 g. atom Fe combines with 2 mols. CO. Fe forms a similar combination with isocysteine. Co forms under these conditions a carbonyl compd. in which 1 g. atom CO combines with 1 mol. CO.Co-Fe-cysteine and the CO-Fe-isocysteine dissoc. in the light, the CO being reversibly split off. CO-Co-cysteine under the same conditions is not light sensitive. CO-Fe cysteine prepd. from *d*-cysteine rotates light to the right, the sp. rotation for the D-line being about  $600^\circ$ , or nearly 60 times as great as that for cysteine. CO-Co-cysteine has no measurable rotating power. The  $O_2$  transfer to cysteine by Fe is inhibited by the CO. S. MORGULIS

**The effect of caffeine on the water-binding capacity of colloids.** JÁNOS SZELŐCZÉY. "Pazmány Péter" Univ., Budapest. *Biochem. Z.* **206**, 290–300 (1929).—See *C. A.* **22**, 1078. S. MORGULIS

**The assumed salt hydrolysis of starch.** N. MALYSHEV. Karls-Univ., Prague. *Biochem. Z.* **206**, 401–9 (1929).—In sterilized starch solns., whether in water or in salt soln. of different concns., there has never been observed any hydrolysis. In unsterilized starch solns. there was occasionally a hydrolysis found, but usually when the sol starch in the prepn. of the starch soln. was greatly boiled for less than  $1/2$  hr. or was not boiled at all. The presence of  $O_2$  or passing air through the starch soln. for 15–60 mins had no effect on the hydrolysis. It is concluded that salt does not function as a diastatic enzyme but may play a role as coenzyme or complement. S. MORGULIS

**A note on Ammon's paper on the permeability of surviving animal membranes.** MATRICE JOWETT. Univ. Liverpool. *Biochem. Z.* **206**, 503–4 (1929).—Errors in com-

puting the diffusion coeffs. in Ammon's paper (*C. A.* 23, 164) are pointed out which have led to the conclusion that glucose diffuses 250-5000 times slower than water. By making proper corrections in Ammon's data, J. shows that the diffusion of glucose through muscle as compared to its diffusion into water is of the same order of magnitude as that of the lactate ion.

S. MORGULIS

Comparative studies on the influence of the mountain climate on the blood catalase. A. I. ALEKSEEV. Biochem. Inst. State Univ., Tashkent. *Biochem. Z.* 207, 28-38(1929); cf. *C. A.* 22, 4545.—After a 2 months' sojourn in the mountains (1500 m.) the blood catalase content and the no. of erythrocytes diminish in comparison with those expected at a low altitude. The diminution in catalase is especially marked in the first week after return from the mountains. The no. of erythrocytes diminishes regularly during 4 months.

S. MORGULIS

Salkowski's color test for cholesterol. V. I. NIKOLAEV AND S. A. KRASILEVSKA. Vsesoyuz Acad. Sci. *J. Russ. Phys.-Chem. Soc.* 60, 1211-6(1928).—The appearance of a red coloration on agitating a cholesterol soln. in  $\text{CHCl}_3$  with concd.  $\text{H}_2\text{SO}_4$  (Salkowski test) is due to the formation of cholesteryl acid sulfate. Equiv. wts. of 95%  $\text{H}_2\text{SO}_4$  and cholesterol dissolved in dry  $\text{CHCl}_3$  were mixed, dried first in an oven at 50-60°, then in a desiccator *in vacuo* over concd.  $\text{H}_2\text{SO}_4$ . After 2 days the ester obtained presented under the microscope a dark red, brittle, cryst. mass, m. 160°. A few crystals were redissolved in  $\text{CHCl}_3$ , the excess of the latter was removed by evaporation *in vacuo*, and the remaining thick, dark red soln. was placed in a crystallizer which was stoppered and paraffined. After several days the ester recrystd. in dark red plates, the m. ps. of the binary system cholesterol- $\text{H}_2\text{SO}_4$  were taken (with varying quantities of  $\text{H}_2\text{SO}_4$ ) by the capillary-tube method and also by a thermocouple; the *liquidus* and *solidus* lines were detd. It is a case of fusion of the first type (conforming to Roozeboom) which corresponds to solid solns. of 2 components. The reaction of ester formation from its components is slow; it can be accelerated by heating. The gradual discoloration of the crystals is due to absorption of atm. moisture and the consequent hydrolysis of the ester. If the partly discolored ester is dried, the dark red coloration reappears.

BERNARD NELSON

Effect of internal secretion and of vegetative poisons on the permeability of animal membranes. I. ERNST GELLHORN AND HILDE GELLHORN. Univ. Halle a. S. *Arch. ges. Physiol.* (Pflüger's) 221, 247-63(1928).—The permeability of muscle and skin membranes for sugar is increased by 1 to 1 million *l*-adrenaline, and by thyroxine and insulin. Pilocarpine increases, and atropine diminishes permeability.

G. H. SMITH

Some further experiments on the effect of radiation on dissolved substances. M. C. REINHARD AND K. L. TUCKER. *J. Cancer Research* 12, 289-93(1929).—Radiation of solns. causes changes in those solns. which cannot be ascribed entirely to the effect of the solvent because the amt. of change in a  $\text{CHCl}_3$  soln. of cholesterol depends on the state of the solute. Radiation produces in a water soln. of quinol more profound changes than would be expected by simple oxidation action of the solvent. Radiation of aq. sucrose solns. indicates that the effect is more complicated than simple inversion of sucrose to invert sugar.

H. G. WELLS

Lipase. H. V. RULER AND SVEN GARD. Stockholm Högskola. *Arkiv Kemi, Mineral. Geol.* 10A, No. 2, 1-7(1928).—Preliminary results are given which demonstrate the presence of lipase in horse and in rat serum acting on glycerol monobutyrates, and of lipase in rat liver acting on Et glycololate, Et acetate, and glycerol monobutyrates. Some preliminary results are given which indicate that hemolysis is a lipase action.

J. J. W.

Malt pectinase. J. J. WILLAMAN. N. Y. Expt. Sta., Geneva. *Arkiv Kemi, Mineral. Geol.* 10A, No. 3, 1-4(1928).—By use of the same methods on malt that had been used on fungi (cf. *C. A.* 21, 2916), several samples of pectinase were prepd. The most active prepn. was made by extg. with water, centrifuging, dialyzing through collodion, centrifuging, pptg. at 50% alc., making the filtrate up to 85% alc., filtering, and drying with acetone. The filtrate from the 85% alc. still contained pectinase precipitable by acetone.

J. J. WILLAMAN

Chemical studies on the denaturing of proteins. I. T. TADOKORO AND K. YOSHIMURA. *J. Faculty Agr. Hokkaido Imp. Univ.* 25, 117-32(1928).—(a) The oryzenin of rice was prepd., and then denatured in soln. by boiling and by freezing. The ash and S were less in the boiled, but greater in the frozen, than in the original part. Max. turbidity and surface tension were obtained at different acidities in the denatured part. The  $[\alpha]$  was lower, and the rate of destruction by ultra-violet light was greater, in the original. The amide and histidine N were high, and the lysine N was lower in the denatured. (b) The glycinin of soy bean was prepd. and then denatured in soln.

by boiling, by freezing, by super-heated steam, by gasoline and by benzine. The P was higher in the boiled and frozen than in the original, but lower in the others. The S was higher in the boiled and super-heated, but lower in the others, than in the original. The free amino N was greater in all the denatured, and especially so when denatured by super-heated steam, gasoline and benzine. The amide, arginine and histidine N were higher in all the denatured, and especially the arginine in the frozen. The soly. of glycinin in NaOH and in  $\text{Na}_2\text{CO}_3$  solns., acid and salt solns. decreased in the following order: original, frozen, boiled, benzine, gasoline, super-heated. (c) Whole soy beans were denatured by heating dry, by boiling, by freezing and by soaking in gasoline, and the distribution of the N was studied. Those heated dry showed a great increase in N insol. in water and in NaCl. The frozen showed a decrease in the N sol. in water and in NaCl, but an increase in the N sol. in NaOH. The boiled showed a decrease in N sol. in water and in NaCl, and an increase in N sol. in NaOH. Those treated with gasoline and with benzine showed about the same changes as the boiled, but to a less degree. II. T. TADOKORO AND S. WATANABE. *Ibid* 133-49.—Four pairs of Japanese river salmon were used in a study of their muscle proteins. One pair was kept in a cooler, one was frozen 3 times, one was salted for 6 months, one was smoked in the ordinary way, and the proteins were prepd. The myosin and myogen were decreased in all 3 denatured samples, and in the salted and smoked they existed to the extent of only 10% of the original. The muscle fiber (sarkolemma) from the denatured part contained less ash and P. The  $\text{NH}_2$ , arginine and histidine N were decreased in the denatured. The myosin and myogen from the denatured muscle in NaOH soln. required greater addn. of acid to produce max. turbidity and surface tension. These proteins also had a greater  $[\alpha]$ .

J. J. WILLAMAN

The chemical composition of wool with especial reference to the protein of wool-fiber (keratin). HEDLEY R. MARSTON. *Australia Council Sci. Ind. Research Bull.* No. 38, 36 pp. (1928).—Wools grown under a great variety of conditions in Australia, from various breeds of sheep, having spinning counts varying from 48 to 74, were investigated. No correlation was found between the nature of the fiber and the percentage or nature of the accompanying fats. In order to avoid errors in the analysis due to cleavage of S from wool by scouring, incomplete dehydration or inconstant salt formation, the wool samples (approx. 25 g.) were purified prior to the analysis by dehydration in abs. a.c., continuous extn. with abs. ether for 48 hrs., thorough washing in 95% alc., vigorous shaking in a 2-l. Erlenmeyer flask with at least 15 changes of tap water, drying for 24 hrs. at 40°, combing the fibers with a fine comb, equilibration with about 2 l. 0.01 N HCl for 12 hrs., washing with several changes of distd. water, oven drying at 100°, washing in 2 changes of abs. alc. and finally oven drying for 96 hrs. at 100°. The compns. of all the wool keratins were found to be identical within the limits of exptl. errors. Alterations in the exptl. technic of the Van Slyke method used in this work for sepg. the nitrogen of the keratin are described. Because of inherent errors in the method, the quantities of monamino acids thus estd. must be considered relative rather than abs. values. Therefore, in the following results, the figures for the cystine, tyrosine and tryptophan contents of wool keratin are considered exact; those for arginine, histidine and lysine, a very close estimate: cystine, 13.1%; tyrosine, 4.8%; tryptophan, 1.8%; arginine, 10.2%; histidine, 6.9%; lysine, 2.8%; "amide" N, 1.2%; S, 3.58%; and total N, 17.8%. For detg. the acid-combining power of wool keratin by the quinhydrone electrode, the potential difference between the hydrogen electrode and the quinhydrone electrode at normal (760 mm. Hg) pressure of hydrogen was measured at temps. varying between 0° and 40°. The isoelec. point, estd. by extrapolation, is  $\text{pH}$  3.4, which agrees well with the value of Meunier and Rey. RUBY K. WÖRNER

The value of different types of glass for transmitting ultra-violet light (WYMAN, *et al.*) 19. The chemistry and biology of the clay pits and the distribution of the larvae of *Anopheles maculipennis* in them (SEBENTZOV, ADOVA) 8. Physicochemical investigation on the casein-splitting action of papain (SATO) 2. Circuit transmission and interference of activation waves in living tissues and in passive Fe (LILLIE) 2. Enzymic synthesis of  $\beta$ -hydroxyethyl dihydrogen phosphate (KAY) 10. The preparation of hemin derivatives by thermal reactions (SCHUMM) 10. The bile acids (SCHENCK, KIRCHHOFF) 10. Permeability test with radioactive indicators (LARK-HOROVITZ) 3.

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## B—METHODS AND APPARATUS

STANLEY R. BENEDICT

**Iodometric determination of homogentisic acid in the urine.** HANS LIEB AND FRANZ LANYAR. *Univ. Graz. Z. physiol. Chem.* 181, 199–207(1929).—The method of Metz (*C. A.* 22, 4557), based on the oxidation of homogentisic acid to quinoneacetic acid in  $\text{NaHCO}_3$  or borax soln. by I and reversal of the reaction by acidifying, so that I consumption can be detd. by  $\text{Na}_2\text{S}_2\text{O}_3$  titration, is modified to overcome certain errors. It is important that the oxidation be performed in the presence of a considerable excess of pure  $\text{NaHCO}_3$  free from  $\text{Na}_2\text{CO}_3$ . If no other I-consuming substances are present, direct titration with I and starch indicator gives satisfactory results. In urine, however, such interfering substances are usually present and it is best to reverse the reaction by acidifying and titrate the liberated I. It is important here to use a considerable excess of acid, also an addn. of KI if only a small quantity of homogentisic acid is present, and to allow the mixt. to stand 15 mins. before titration. 0.05 N or even 0.01 N  $\text{Na}_2\text{S}_2\text{O}_3$  is recommended in place of 0.1 N. A correction of 0.2 cc. of 0.05 N  $\text{Na}_2\text{S}_2\text{O}_3$  per 10 cc. of urine is also added. The homogentisic acid content does not change in 24 hrs. if the urine sample remains slightly acid, but in alk. urine there is a distinct decrease on standing. The following technic is recommended: Dil. 10 cc. of the urine in a 0.5-l. flask with 90 cc.  $\text{H}_2\text{O}$ , add 2 cc. of 2% starch soln. and 1 g. pure  $\text{Na}_2\text{CO}_3$ -free  $\text{NaHCO}_3$ , and titrate immediately with 0.05 N I. As soon as the blue color appears add  $\text{NaHCO}_3$  from a spatula tip, shake and wait 0.5 min. If the blue color disappears add more I dropwise. Now add 100 cc. of dil.  $\text{H}_2\text{SO}_4$  (1:5) and 5 cc. of 4% KI, shake, let stand 15 mins. and titrate with 0.05 N  $\text{Na}_2\text{S}_2\text{O}_3$ . The no. of cc. of  $\text{Na}_2\text{S}_2\text{O}_3 + 0.20 \times 0.0042016 =$  the no. of g. of homogentisic acid in 10 cc. urine. The max. error is usually less than 0.5 mg. per 10 cc. urine. A. W. DOX

**An apparatus for the automatic and continuous determination of alveolar carbon dioxide.** REGELSBERGER. *Z. ges. expil Med.* 61, 747–56(1928). F. L. DUNN

**Acetone or acetoacetic acid?** HORKHIMER. *Pharm. Ztg.* 74, 499–500(1929).—In urine contg. AcMe it appears that as a rule only very small quantities of this substance are actually present, so that its recognition by the usual tests is practically impossible. That such samples do yield pos. tests for AcMe is due not to the latter, but rather to the presence of acetoacetic acid. The Lange ring test, that of Legal, as also the ethylenediamine reaction as modified by Kraft, recognize minute amts. of acetoacetic acid, and AcMe only when present in much greater quantity. The urine of healthy persons is believed to contain min. traces of acetoacetic acid. W. O. E.

**Method of estimating cysteine, cystine and their derivatives in tissues and biological fluids, and the application of the method.** YUZURU OKUDA AND KITARO KATAI. *J. Dept. Agr. Kyushu Imp. Univ.* 2, No. 5, 133–48(1929) (reprint); cf. *C. A.* 21, 3212. In this method, the proteins are first removed by sulfosalicylic acid pptn. and cysteine compds. are estd. in the filtrate by titration with standard iodate soln. in the presence of a fixed quantity of iodide. Cystine compds. after being reduced to cysteine compds. are run the same way. With normal blood serum and boiled milk either only traces or no cystine, cystine and their derivs. were obtained. On adding these amino acids to blood or milk, they were recovered quantitatively. The quantity of these amino acids in animal tissues decreases rapidly upon standing at room temp., but slowly in a frozen state or in strong acid soln. Roots and seeds contain cysteine or cystine compds. although some fruits were evidently free from cysteine compds. During the maturation of peas the quantity varies. RUSSEL C. EBB

**Two revised copper methods for blood-sugar determination.** OTTO FOLIN. Harvard Univ. *J. Biol. Chem.* 82, 83–93(1929); cf. *C. A.* 22, 2762.—A revised technic is described for the Folin and Folin-Wu methods for detg. blood sugar. Details are

given for the prepn. of the Cu reagent, the acid molybdate reagent, and the standard glucose solns. as well as the time of heating and the use of the colorimeter. A. G.

**The determination of true sugar in blood.** EDWARD S. WEST, FREDERICK H. SCHARLES and VERNON L. PETERSON. Wash. Univ., St. Louis. *J. Biol. Chem.* **82**, 137-53(1929).—Sugar analyses on blood filtrates obtained by pptn. with  $\text{Hg}(\text{NO}_3)_2$  and neutralization with  $\text{BaCO}_3$  to  $p_H$  6.3 gave values which agreed with those obtained by yeast fermentation. Normal, diabetic, uremic and diabetes-nephritic bloods behaved in this manner, but a case of cardiac hypertension with high N retention proved an exception. Some pig bloods also contained a non-fermentable reducing substance not removed by the  $\text{Hg}(\text{NO}_3)_2$ - $\text{BaCO}_3$  treatment. A  $\text{HgSO}_4$ - $\text{BaCO}_3$ -Zn technic is also described which is somewhat more accurate because the salt error is avoided. A. G.

**Difficulties and the overcoming of them in the determination of iodine in urine by means of palladous chloride after administration of iodine preparations.** HUGO BERNHARDT. Univ. Kiel. *Z. anal. Chem.* **76**, 351-4(1929).—To det. I in organic materials, *e. g.*, in the residues obtained by evap. urine, it is customary to heat with KOH and  $\text{Na}_2\text{O}_2$ , the latter being added to lower the m. p. and thus prevent volatilization of I. Such treatment, however, is likely to result in the formation of a little iodate so that the subsequent detn. of the  $\text{I}^-$  by means of  $\text{PdCl}_2$  often gives low results. This difficulty can be overcome by making the aq. ext. of the melt slightly acid with HCl and adding a little  $\text{Na}_2\text{SO}_3$ . Then, on heating, the  $\text{IO}_3^-$  will be reduced. By adding more HCl and boiling, the excess  $\text{SO}_3^{--}$  can be removed and then the  $\text{PdCl}_2$  pptn. will give all of the I. W. T. H.

**The estimation of the protein content of the urine by the Esbach process.** HANS SCHULTEN. *Klin. Wochschr.* **8**, 446-8(1929).—The drawbacks, advantages and instructions for avoiding gross errors are discussed in detail. A possible inaccuracy of 25% is to be expected under the very best conditions. MILTON HANKE

**An application of the method of Hagedorn and Jensen to the determination of larger quantities of reducing sugars.** CHARLES S. HANES. Botany School, Cambridge. *Biochem. J.* **23**, 99-106(1929).—The range of the Hagedorn and Jensen sugar method (*C. A.* **17**, 2721) has been extended to enable the estn. of 10 times the amt. of reducing sugar. BENJAMIN HARROW

**The preparation of lysine, histidine and arginine from hydrolyzed blood corpuscle paste by electrical transport.** GERALD J. COX, HARRIETTE KING AND CLARENCE P. BERG. Univ. of Ill. *J. Biol. Chem.* **81**, 755-64(1929).—The app. and procedure are modifications of the Foster and Schmidt method (*C. A.* **20**, 2311) for the prepn. of the basic amino acids by elec. transport. The yields of the pure final products from 1 kg. of blood corpuscle paste were as follows: *l*-histidine.HCl 51, *d*-arginine.HCl 21, *d*-lysine 2HCl 62, *l*-leucine 58, and *l*-tyrosine 22 g. A. P. LOTHROP

**Procedure of identification of stains of human blood by the method of deflection of complement using antisherp serum from guinea pig.** HECTOR DIACONO. *Bull. sci. pharmacol.* **36**, 72-7(1929).—The antihuman complex consists of human serum or a suspension of the blood stain and antihuman rabbit blood, inactivated at 56°. The hemolytic system was antisherp blood from guinea pig and red corpuscles from sheep. The hemolytic serum is titrated first, 0.02-0.008 cc. being used. In the test, the human serum is dild. from  $1/_{500}$  to  $1/_{2000}$ . It was found that a stain, dild. to  $1/_{2000}$  with saline, can be identified with reliability. Controls with blood from sheep, hog, beef, etc., are made. A. E. MEYER

**Determination of uric acid alone.** L. TIXIER. *Bull. sci. pharmacol.* **36**, 77-9(1929).—The method depends upon the pptn. of the uric acid by an ammoniacal  $\text{CuSO}_4$  soln., treatment of the filtrate with excess KCN to convert the excess Cu  $(\text{NH}_3)_4^{++}$  to  $[\text{Cu}(\text{CN})_4]^{--}$  and titration of the excess  $(\text{CN})^-$  with  $\text{Ag}^+$  by the Liebig method. Treat 50 cc. of urine with a soln. prepd. by dissolving 4 g. of blue vitriol in 500 cc. of water, and dilg. to 1 l. with concd.  $\text{NH}_4\text{OH}$ . Filter after standing 1 hr., wash with 5 cc. of 10%  $\text{NH}_3$  soln. and add to the filtrate 5 cc. of the following soln.: 20 g. KCN, 10 cc. concd.  $\text{NH}_4\text{OH}$ , 60 g. of KI and water to make 1 l. Titrate with 0.1 N  $\text{AgNO}_3$  soln. of which 1 cc. is equiv. to 0.01 g. of uric acid. A. E. MEYER

**The preparation of a solution isotonic with serum, for use in determining the relative osmotic pressure of the cations in serum and the volume index of the blood corpuscles in cutaneous blood.** INGVAR CHRISTENSEN AND ERIK J. WARBURG. *Acta med. Scand.* **70**, 286-302(1929).—An aq. soln. contg. per l. 11.300 g.  $\text{Na}_2\text{C}_2\text{O}_4$ , 0.315 g.  $\text{KH}_2\text{PO}_4$  and 1.265 g.  $\text{Na}_2\text{HPO}_4$  is isotonic with serum. With this fluid the relative osmotic pressure of the serum cations can be measured with an error of 0.86% in duplicates, and in 23 detns. the max. deviation from the mean value of the cation concn. was 2.4-3.0%. The erythrocytes shrank 4% if suspended in a large vol. of non-buffered

1.3%  $\text{Na}_2\text{C}_2\text{O}_4$  soln. and if not protected against  $\text{CO}_2$  loss. No variation in the serum cation concn. through the day was found nor was any variation observed after a sweating bath.

S. MORGULIS

The ammonia formation in muscle and its relation to changes in function and state.

VI. Connection between ammonia formation and the transformation of adenine nucleotide to inosinic acid. J. K. PARNAS. Univ. Lemberg. *Biochem. Z.* 206, 16-38 (1929).—Methods are described for the detn. of aminopurines and oxypurines as well as of aminopurine and oxypurine nucleotides in small quantities of muscle. The muscle is quickly rubbed up with sand and 1%  $\text{H}_2\text{SO}_4$ , the resulting pulp is dild. to 25 cc. It is then autoclaved 4 hrs. at  $115^\circ$ , made slightly alk. and again slightly acidified with AcOH and filtered hot. The purine is detd. in the filtrate by the method of Krüger and Schmidt. A procedure is described for sepg. 3 fractions: total purine N, adenine N and hypoxanthine N. In fresh muscle (frog) prepd. with every precaution to avoid traumatic  $\text{NH}_3$  formation the purine bases are present almost entirely as free nucleotides; only 4% of the aminopurine N can be a component of true nucleic acid, while free amino purine bases and nucleotides are altogether absent. In the fresh muscles of winter frogs 82% of the purine N is adenine and 18% hypoxanthine N; in muscles of summer frogs the corresponding quantities are 89 and 11%. The guanine makes up only about 1.4% of the total purine N. Mech. destruction of the muscle which causes the formation of  $\text{NH}_3$  brings about the transformation of most of the adenine nucleotide to inosinic acid. A few min. after the muscle is rubbed up there is only 23% adenine and 77% hypoxanthine N of the total purine. The deamination of adenine nucleotides in winter is equiv. to the traumatic  $\text{NH}_3$  formation, but during the summer it does not seem that this is the only source of  $\text{NH}_3$ . When frog muscle is fatigued by stimulation of the nerve under anaerobic conditions the conversion of adenine to hypoxanthine is equiv. to the  $\text{NH}_3$  formation, but when the fatigue is produced under a plentiful  $\text{O}_2$  supply the  $\text{NH}_3$  formation exceeds the conversion of adenine to hypoxanthine. This is attributed to a resynthesis of adenine nucleotide from inosinic acid. S. M.

Studies on iodine metabolism. II. The iodine content of normal and pathologically altered thyroids. GULBRAND LUNDE, KARL CLOSS AND K. WÜLFERT. Univ. Oslo. *Biochem. Z.* 206, 248-60 (1929); cf. *C. A.* 22, 2956.—A relatively large piece of thyroid under investigation is digested on the water bath with at least  $\frac{1}{2}$  its wt. of KOH and a little  $\text{H}_2\text{O}$ , subsequently also EtOH, until a homogeneous soln. results, from which an aliquot is taken for analysis. This is ashed in an iron crucible with a little  $\text{K}_2\text{CO}_3$ , the ash repeatedly extd. with alc. and the exts. are evapd. to dryness with a few drops of satd.  $\text{K}_2\text{CO}_3$  in a gold dish. The residue is carefully heated to a glow and again extd. with alc. The exts. (without the addn. of  $\text{K}_2\text{CO}_3$ ) are again evapd. in a gold-platinum dish, carefully heated over the flame, transferred quantitatively to a 50 cc. Erlenmeyer flask and titrated. Normal, Norwegian thyroids of an av. wt. of 24.66 g. contain 9.86 mg.  $\text{I}_2$ . The relative content is 0.043% of the fresh gland or 0.1553% of the dry substance. The  $\text{I}_2$  content of atoxic goiters is very variable, but greater than is stated in the literature. In secondary hyperthyreosis very high  $\text{I}_2$  values were found in colloid goiters (toxic adenomas), even more than in normal glands. In primary hyperthyreosis (Basedow) the goiter is poor both in colloid and in  $\text{I}_2$ , but on treatment with  $\text{I}_2$  the goiter becomes colloid- and  $\text{I}_2$ -rich.

S. MORGULIS

A simplification of the freezing-point determination on small quantities of biological fluids. E. FROMM AND TH. LEIPERT. Univ. Wien. *Biochem. Z.* 206, 314-8 (1929).—The app. consists of a small Dewar flask into which a centrifuge tube is fitted. The latter is closed with a stopper and serves as the cooler. It is filled with a mixt. of a const. f. p. This is prepd. by dissolving 6.54 g.  $\text{K}_2\text{SO}_4$  in 93.46 g.  $\text{H}_2\text{O}$ , which has a const. f. p. of  $-1.55^\circ$ . This mixt. can be kept indefinitely in a frozen condition but before needed the cooler is filled with this and by undercooling and const. stirring it is converted into a mass of fine crystals. Through the stopper which closes the cooler are inserted directly into this crystal mass a thermometer and a cryoscope tube (plain test tube). An ordinary N-filled thermometer is used to det. the lowering of the f. p. which is calibrated from  $+1$  to  $-3^\circ$  over a distance of 12 cm. This allows accurate reading to  $0.005^\circ$ . So long as a freezing bath of const. temp. is employed, the f. p. of pure water detd. by this inexpensive thermometer undergoes no changes and need not be redetd.

S. MORGULIS

Determination of protein fractions of blood by the gravimetric and nephelometric method. ST. RUSZNYÁK AND J. ERDÖS. Kgl. Univ., Budapest. *Biochem. Z.* 206, 482-4 (1929).—The nephelometric detn. of the various protein fractions of blood gives results very closely parallel to the gravimetric detn.

S. MORGULIS

Studies on the methylene blue method for the investigation of biological dehydro-

genation. I. Measurements of  $p_H$  with the quinhydrone electrode at  $37^\circ$  in succin-dehydrogenase solutions in the presence of methylene blue. JÖRGEN LEHMANN. Univ. Lund. *Skand. Arch. Physiol.* 55, 307-15(1929).—The  $p_H$  was measured up to  $p_H = 8.0$  and at  $37^\circ$  with an accuracy of 0.01  $p_H$  with the quinhydrone electrode in the presence of methylene blue-leucomethylene blue, and of succinic acid-fumaric acid. In the presence of methylene blue generally const. potentials were obtained where, without the dye, usually a drifting potential was found. Furthermore, with methylene blue the measurable range extended further on the alk. side. The  $p_H$  detns. were unaffected by concn. of the methylene blue.

S. MORGULIS

Substances preventing biological reactions in the detection of blood and of copper. G. CARPENTIER. *Union pharm.* (May, 1928) 193-4; *Chimie et industrie* 21, 261.—In addn. to org. compds. (polyphenolic complexes and aldehydes) certain inorg. compds. can prevent the biol. reactions for the detection of blood and of Cu. They are compds. having a high affinity for O and which absorb the available O of  $H_2O_2$  before the latter can be fixed by the blood or the Cu (e. g., sulfites, hydrosulfites and hyposulfites). C has observed that these compds., and particularly hyposulfites, interfere with the guaiacol (Weber) reaction, pyramidone (Escaich) reaction, and benzidine reaction. When only a small quantity of hydrosulfite is present, excess of  $H_2O_2$  and reagent (e. g., in Meyer's phthalein reaction) can be added. The question as to whether the above-mentioned salts also react with blood would require investigation. A. P.-C.

A new method for the ascertaining of death. STEFANO MARRADI FABRONI. Univ. Adriatica "Benito Mussolini," Bari. *Arch. farmacol. sper.* 46, 177-88(1929).—In expts. with guinea pigs and rabbits F. worked out the following method for ascertaining the death. Immediately before the test a satd. soln. of  $Na_2S_2O_4$  was added to an aq. 2% soln. of methylene blue, until complete decolorization occurred. An excess of  $Na_2S_2O_4$  has to be avoided. The mixt. was filtered and immediately after the animal was killed, 1 cc. was injected under a shaved area of the skin. The syringe used has to be perfectly dry. While in the live animal the skin in the vicinity of the place of injection assumed an intense bluish color, which does not change its hue for several hrs., no color appeared in the dead animal. In a few cases a very faint localized color was observed. These results were verified with human cadavers. The method is said to be rapid, simple and reliable. Numerous references are given. G. SCHWOCH

Hg-vapor lamp suitable for therapeutic uses, etc. (Brit. pat. 298,903) 4.

## C—BACTERIOLOGY

CHARLES B. MORREY

*Vibrio agarliquefaciens* Gray. J. B. VAN DER LEK. *Nederland Tijdschr. Hyg. Microbiol. Serol.* 3, 276-80(1929).—This bacterium isolated by Leeftang is similar to the *Microspira agarliquefaciens* of Gray and Chalmers, but it attacks agar much more energetically. Cellulose is also attacked, and if a nitrate is used as source of N, the action is much faster than with an  $NH_4$  salt. A good growth was obtained with starch and glucose, but not with xylose and glycerol. In the attack on agar a little acid is formed, and the liquefied agar does not show reduction with Fehling soln., and no coloration with I.

J. C. JURRIJENS

Tryptophan-peptone solution prepared from casein as medium for fecal coli bacteria at  $45-46^\circ$ . T. FOLPMERS. *Nederland. Tijdschr. Hyg. Microbiol. Serol.* 3, 281-4 (1929).—A description of the method is given in detail. After 6 hrs. it shows an indole reaction. F. has used this soln. daily for over a year in conjunction with the Eykman test for river water, while for drinking water the MacConkey test is added with lactose as sugar. Neither *aerogenes* nor *cloacae* influences the reaction. It is advisable to apply the above-mentioned 3 tests at the same time. Positive results indicate the amt. of fecal coli in the sample. Sugars and also mannitol added in low concn. to the tryptophan soln. prevent the formation of indole.

J. C. JURRIJENS

Researches in vitro on the nature of the antiviral of Besredka. H. ALDERSHOF. The Govt. Serol. Inst. at Utrecht. *Nederland. Tijdschr. Hyg. Microbiol. Serol.* 3, 285-97(1929).—The factor, in the antiviral of Besredka, inhibiting growth, is non-specific. For the production of this factor bacterial growth is not necessary, as it is produced by filtration through Chamberland or EK filters even from uninoculated bouillon. The strength of the factor is proportional to the amt. of filtration. The factor obtained from inoculated and filtered bouillon does not differ from the one obtained from uninoculated and filtered bouillon; both are thermostable. The filtration effect is not due to the removal from the bouillon of colloidal substances, nor of fats, sugars or salts, but probably to a colloidal-chem. change of part of the albumin, causing

these bacteria not only to become immune from attack, but also to be inhibited in their growth.

J. C. JURRËNS

**The nitrogen metabolism of *Bacillus mycoides*. I. Influence of the nutritive medium on the growth and nitrogen metabolism of *B. mycoides*.** HELENE GLINKA-CHERNORUTSKII. Med. Inst., Leningrad. *Biochem. Z.* 206, 301-7(1929).—*B. mycoides* cultures on 1% peptone decomp. protein quickly and produce appreciable quantities of  $\text{NH}_3$ . The addn. of 1% glucose has a protein-sparing effect. The formation of amino acids and  $\text{NH}_3$  does not change the peptone fraction precipitable through  $(\text{NH}_4)_2\text{SO}_4$ . The biuret reaction does not disappear even after many inoculations of the same medium. Media consisting only of monoamino acids inhibit the development and growth of *B. mycoides*. **II. Proteolytic enzymes.** *Ibid* 206, 308-13(1929).—The proteolytic enzymes of *B. mycoides* are principally intracellular and resemble the trypsinases in their action. The addn. of 1% glucose to the nutritive medium has no effect on the development of the enzymes, nor does this diminish their activity. The protein-sparing action of the glucose is therefore due to the fact that glucose as a highly potent energy source for bacteria makes the utilization of much protein superfluous.

S. MORGULIS

**Oxidation-reduction equilibria in biological systems. II. Potentials of aerobic cultures of *B. typhosus*.** CALVIN B. COULTER AND MOSES L. ISAACS. Columbia Univ. *J. Exptl. Med.* 49, 711-25(1929); *C. A.* 22, 4550.—The reduction potentials of *B. typhosus* in culture in bouillon which is given access to atm. O show a neg. drift that attains the values found in sterile bouillon when deaerated with N:  $E_h$  —0.085 to —0.095 v. at  $p_{\text{H}}$  7.6. The potential reaches that level after 6 to 8 hrs. incubation, and is maintained at this point for several hrs. A slow decline to more neg. values is then observed and continues for at least 48 hrs., when a potential of —0.145 v. may be attained. The bacteria influence the potentials in the first period of their growth by exhaustion of O from the culture, thus permitting the characteristic potential of the culture medium to become manifest and do not contribute the substances responsible for the observed potentials. The decline in potential to values more neg. than those of the culture medium occurs during the time that the rate of dyeing of the bacteria approaches and exceeds the rate of multiplication. Cultures in 0.5% dextrose medium show a somewhat more neg. potential after 18 hrs. growth than cultures in medium without dextrose. This may be due to the more rapid "turn-over" of the bacteria and the liberation of larger amts. of reductive material from soln. of larger nos. of bacteria. The potential of cultures through which O is passed continuously does not show a neg. drift at any time. This indicates that reductive substances of bacterial origin at least in the typhoid bacillus do not influence the electrode potentials in the presence of O.

C. J. WEST

**"Soluble specific substance" derived from gum arabic.** MICHAEL HEIDELBERGER, OSWALD T. AVERY AND WALTHER F. GOEBEL. Rockefeller Inst. Med. Research. *J. Exptl. Med.* 49, 847-57(1929).—By partial acid hydrolysis a sp. carbohydrate may be isolated from gum arabic. This carbohydrate is comparable in its pptg. activity for Type II (and Type III) antipneumococcus serum with the bacterial sol. sp. substances themselves. On hydrolysis this fraction yields galactose and 2 or more complex sugar acids, 1 of which appears to be a disaccharide acid comparable with those isolated from the sp. polysaccharides of the Type III pneumococcus and the Type A Friedländer bacillus. The significance of these findings is discussed.

C. J. WEST

## D—BOTANY

THOMAS G. PHILLIPS

**The photochemical yield of chlorophyllic assimilation with complex and intermittent light.** M. PADOA AND NERINA VITA. *Gazz. chim. ital.* 58, 647-54(1928); cf. *C. A.* 23, 1058.—In studying the influence of colored and of white light on *Elodea canadensis* immersed in water satd. with  $\text{CO}_2$ , the quantity of O evolved was used as a measure of assimilation, correction not being made, however, for the O consumed in respiration which proceeds at the same time. The sum of the components of white light gave far higher yields than did the integral white light, the av. additive yield of yellow, green and red light being 21.8 times that of the integral white light, showing as in earlier expts. that, in assimilations reactions, photochem. interference exists in white light. In comparative expts. with continuous and pulsating white light, as the frequency of the pulsations increased, there were several points of max. yields, between which were regions of smaller yields, each with a corresponding min. These max. yields were 1.5-2.7 times those of continuous light, the highest occurring at 650 pulsations per sec. With con-



tinuous and pulsating red light, there were also maxima and minima as the frequency of the pulsations increased, but the relative changes with respect to the yields with continuous red light were far less than with continuous and pulsating white light.

C. C. DAVIS

**Physiological function of magnesium in plants.** E. CANALS. *Bull. soc. chim. biol.* 10, 1260-1276 (1928).—The Mg and Ca contents of the ash from various parts of a large no. of plants show wide variations (Ca 2.2-35.5, Mg 0.8-5.7%; Ca:Mg 0.81-32.2). Except in herbaceous plants, the leaves contain more Mg than the stems and the amt. of Ca generally increases with the age of the tissue. Dialysis of the juices of fungi and potato shows that a large proportion of the Mg and Ca exists in an inorg. form, probably as phosphate.

B. C. A.

**Carbon dioxide assimilation of the sugar beet.** H. LUNDEGÅRDH. *Flora* 21, 273-300 (1927).—An app. is described for measuring C assimilation of leaves with varying partial pressures of CO<sub>2</sub>. The following results are reported for sugar beet leaves:

Light intensity	CO <sub>2</sub> in air used	Optimum CO <sub>2</sub> assimilation at:
1. Full sunlight	0.03% by vol.	19°
2. 1/2 full sunlight	0.03% by vol.	11°
3. Full sunlight	0.84% by vol.	35°
4. 1/2 full sunlight	0.84% by vol.	20°

Twelve tables of results are included. Attention is called to the fact that in the artificial addn. of CO<sub>2</sub> to air, the most significant increases in C assimilation take place at relatively high temps. The differing optima for hardy and semi-tropical plants are discussed from the standpoint of plant geography. Thus, as may be seen from the following table, the potato is best adapted to a high assimilation temp.; the sugar beet may succeed over a wide range; while the anemone is an outstanding cold weather plant.

	Mg. CO <sub>2</sub> assimilated per 50 sq. cm. leaf area in 1 hr. from air contg. 0.57 mg. CO <sub>2</sub> per l.				
	0°	10°	20°	30°	40°
Potato	0.9	4.2	9.5	4.6	
Tomato	3.3	6.0	8.4	3.9	
Sugar beet	3.0	6.0	8.5	7.0	3.8
Anemone nemorosa	2.8	5.5	5.2	3.2	

R. C. BURRELL

**Studies on top yeast.** HANS V. EULER AND HARALD NILSSON. *Univ. Stockholm. Z. physiol. Chem.* 181, 281-90 (1929).—Top yeast R was suspended in 3% sucrose, the soln satd. with H<sub>2</sub>S and left 24 hrs. at room temp. The yeast, which had now become black-gray and developed a garlic odor, was then centrifuged. Fermentation tests showed that this treated yeast was about 1/4 as active as the untreated yeast, both in terms of CO<sub>2</sub> production and O consumption. In the dried state, however, the ratio of O consumption was only 1:14. It is probable that the drying of the H<sub>2</sub>S-yeast converted a considerable portion of the Fe catalysts into FeS, thereby causing inactivation. Ordinarily, top yeasts differ from bottom yeasts in the difficulty of removing cozymase from their dried preps. by washing. After the H<sub>2</sub>S treatment, however, the cozymase is easily washed out from the dried prepn. of top yeast.

A. W. DOX

**Plasmolysis produced by concentrated sugar and salt solutions.** B. BRILLIANT. *Compt. rend. acad. sci. U. R. S. S.* 1927, 155-60; *Physiol Abstracts* 13, 332.—Unilateral plasmolysis results when leaves of *Catherinea undulata* or *Mnium spp.* are placed in a 1 to 1.5 M soln. of maltose. In concd. glucose unilateral plasmolysis is observed only in those cells nearer the midrib than the margin of the leaf. The form of plasmolysis in salt solns. varies with the salt and its concn.

H. L. D.

**The effect of some growth conditions on chemical composition and metabolism in the sugar-cane leaf.** R. R. FOLLETT-SMITH. *Minutes of Proc. Froghopper Investigation Committee*, 17 pp. (1928); *Physiol Abstracts* 13, 331.—Analyses of the leaves of sugar canes growing in alk. and acid regions are given. Diurnal variations in ash and sugars of the 2 kinds of leaves are recorded.

H. L. D.

**The determination of manganese in vegetable ashes.** MAURICE GARNIER. *Bull. sci. pharmacol.* 36, 140-6 (1929).—The method of Gabriel Bertrand is used. A table gives the analytical findings of Mn in 45 different plants. The soil, where the plant has grown, has no influence on its Mn content.

A. E. MEYER

**Note on coumarin plants.** C. WIMMER. *Ber. deut. botan. Ges.* 47, 119-20 (1929); cf. C. A. 23, 1155.—A discussion of the occurrence of coumarin among the Compositae.

L. P. MILLER

Conditions for the germination of the spores of the fungus *Dasyscypha wilkoniai*. N. MALYCHEV. *Rev. gén. botan.* 41, 185-90(1929).—These spores germinate in an agar medium if ext. of fresh larch branches is added or if it contains 13-35% glycerol or 7-13% sucrose. The ext. of dried larch cannot be used. Germination takes place in the dark in 7-30 days. L. P. MILLER

The production of fumaric acid in sugar cultures of *Mucor stolonifer* (*Rhizopus nigricans*) and its relation to pyruvic acid. VL. S. BUTKEVICH AND M. V. FEDOROV. Timirjazeff-Forschungs-inst., Moscow. *Biochem. Z.* 206, 440-56(1929).—In sugar cultures of *Mucor stolonifer* under the condition of a relative N lack and in the presence of  $\text{CaCO}_3$  there is a considerable accumulation of fumaric acid, which may amount to 30-40% of the total consumed sugar. If the sugar used up in the production of alc., etc., is taken into consideration the estd. yield of fumaric acid equals nearer 50% of the sugar decompd. In the absence of  $\text{CaCO}_3$  the accumulation of fumaric acid is very much less, and its max. content does not exceed 0.5%. Evidently the acidity limits the formation of fumaric acid. An increased acidity also diminishes the sugar consumption by the molds, but this can be enhanced at once by the addn. of  $\text{CaCO}_3$ . Besides the fumaric acid, succinic acid is found, nearly 10% of the total acid production. The molds develop very well in a medium of proper acidity where fumaric acid, as the sole source of C, is present together with  $\text{NH}_3$ , which indicates that the fumaric acid is utilized further in the metabolism of the molds, and is merely an intermediate step in the sugar metabolism. S. MORGULIS

Starch formation and its relation to acid production by the mold *Penicillium* Link. T. CHRZASZCZ AND D. TIUKOW. Inst. f. landwirtschaftl. Technologie, Poznań. *Biochem. Z.*, 207, 39-52(1929); cf. *C. A.* 23, 1927.—Production of starch-like substances by *Penicillium* is an entirely normal process, which, however, requires special conditions in some molds. Among these molds 2 groups may be distinguished: the starch producers and the acid producers; the starch-like substances and the org. acids play the part of nutritive reserves. The former group produces less org. acid than the latter. It is suggested that the starch-forming organisms in an evolutionary sense are the older, whereas the formation of starch in those molds which ordinarily produce some other substances is to be regarded as an atavistic reversion. The starch is formed in varying quantities and generally in layers. S. MORGULIS

The color reactions of lignin. FRAN PODBREZNIK. Institut du Pin, Bordeaux, France. *Pulp Paper Mag. Can.* 27, 229-33, 246-8(1929).—See *C. A.* 23, 863.

A. PAPINEAU-COUTURE  
The death wave in *Nitella*. II. Application of unlike solutions. W. J. V. OSTERHOUT AND E. S. HARRIS. Rockefeller Inst. *J. Gen. Physiol.* 12, 355-61(1929); cf. *C. A.* 22, 4580.—The hypothesis that protoplasm is composed of an outer and an inner non-aq. layer between which is an aq. layer enables one to predict the bioelec. behavior of a cell under a variety of conditions. In this paper prediction of behavior is made when a death wave in the cell of *Nitella* passes through different points in contact with unlike solns. of KCl. C. H. RICHARDSON

The relation between the production of lactic acid and the growth of yeast. E. AUBEL. *Compt. rend.* 188, 578-80(1929).—Referring to a former study (*C. A.* 20, 2869), A. attempts to solve 2 problems that have remained unexplained in the earlier expts. The 1st problem concerns the inconsistency of the results obtained with the growth of yeast on lactic acid. The presence or absence of nitrates had no influence on the outcome of the results. A. is now convinced that the yeast itself contains a substance necessary for its growth. Possibly this is glycogen. Yeast does not grow on lactic acid in the absence of air even in the presence of nitrates. As to the 2nd problem, the hypothesis that nitrates play a role in the synthesis of glucose at the expense of lactic acid was investigated. It was observed that under anaerobic conditions the presence of nitrates did not alter to a noteworthy degree the quantities of lactic acid and alc. produced by the yeast with glucose as the substrate. There was no relation between the amt. of lactic acid and the no. of yeast cells formed. Conclusion: The energy required for the growth of yeast is not furnished by the cleavage of glucose into lactic acid. G. SCHWOCH

Changes in the cells and tissues of root tips induced by the absence of calcium. HELEN SOROKIN AND ANNA L. SOMMER. Univ. of Minn. *Am. J. Botany* 16, 23-39(1929).—Plants of *Pisum sativum* grown in culture soln. without Ca usually die within 2 or 3 weeks. The first visible effect of the absence of Ca may be detected in a decrease in the amt. of cytoplasm and in the appearance of large vacuoles in the meristematic cells. In the absence of Mg, microorganisms accelerating the disintegration of the tissues are excluded and there is better development of the pathological tissue, which undergoes a

slower solution than does tissue in which the presence of microorganisms has been observed. The cell wall was never found to be underdeveloped or disintegrating in the apical portion of the roots nor in the region of elongation of plants deprived of Ca. It appears that the absence of Ca does not have a direct effect on the disintegration of tissues due to the sepn. of the cells, because of the absence of Ca pectate, as held by some previous writers. The effect of the absence of Ca is on the meristematic cells, either because it is a necessary chemical constituent of the protoplast and therefore in its absence the mitotic divisions are disturbed, or because its absence so affects the physical condition of the colloidal system that normal mitoses are not possible. J. J. SKINNER

A physicochemical study of the leaves of three medicinal plants in relation to evergreenness. GEORGE B. RIGG AND RUSSELL A. CAIN. *Am. J. Botany* 16, 40-57 (1929).—Metabolic processes seem to play more or less important roles in the plant which enable it to withstand extreme cold. Factors which tend to hold the water in the cell will prevent freezing. These factors may be in the form of decreased moisture content, anatomical structure, increased amt. of hydrophilic colloids, acidity changes, increased salt content, or accumulation of sugars. The increased oil or fat content may also serve as a protecting factor. The moisture content varies inversely as the degree of hardness. There is a gradual increase in the amt. of total sugars present in the leaf of evergreens during the winter. The starch and pentosans decrease during the winter. The amt. of press-juice varies inversely with the hardness of the leaves. A close relationship exists between the amt. of pentosans and press-juice obtained in the *Arctostaphylos uva-ursi* and *Digitalis purpurea*, though the opposite was true with *Atropa belladonna*. No relationship was found between the amt. of starch and press-juice in the leaves. The metabolic conditions present in the 2 evergreen species and not present in the non-evergreen are similar to those present in hardened and not present in non-hardened plants. J. J. SKINNER

The influence of boron on the chemical composition and growth of the tomato plant. EARL S. JOHNSTON AND W. H. DORE. Univ. of Maryland and Univ. of California. *Plant Physiology* 4, 31-62(1929); see C. A. 22, 1994. WALTER THOMAS

Some critical comments on the methods employed in the expression of leaf saps. BERNARD S. MEYER. Ohio State Univ. *Plant Physiology* 4, 103-12(1929).—Methods (C. A. 9, 475; 10, 2904; 21, 3651) which have been used in the treatment of leaves for studies on leaf sap are summarized and evaluated. A field method of freezing leaf samples in solid CO<sub>2</sub> is described. Details are given for the construction of a press which embodies certain principles in design not hitherto adopted. Papers reporting the results of detns. of the physico-chemical properties of expressed plant saps should include the following information: water content of the tissue, exact treatment and method of handling the tissue, magnitude of the pressure employed, and the vol. of sap expressed as a percentage of the fresh wt. or water content of the tissue. Only with such information available can the reader reconstruct for himself a reasonably accurate picture of the exact effects of the treatment and pressure upon the tissue and only if such information be supplied can the detns. be duplicated. WALTER THOMAS

Origin and evolution of mannitol in plants. F. OBATON. *Compt. rend.* 188, 77-9(1929).—When *Sterigmatocystis nigra* is grown in a medium contg. NH<sub>4</sub>NO<sub>3</sub> and sucrose, mannitol is produced continuously up to about 48 hrs. At this time fructification begins, and the mannitol diminishes. Under other circumstances it diminishes when the available C becomes low. Its formation seems to be independent of that of trehalose. In the celery (*Apium graveolens*) mannitol is found in leaves, stems and roots, and is produced only during high chlorophyll activity. J. J. WILLAMAN

Proteolysis and proteogenesis in ligneous plants at the beginning of vegetative activity. R. COMBES AND M. PINNEY. *Compt. rend.* 188, 79-81(1929).—Trichloroacetic acid being used to distinguish between protein and non-protein N, the roots, twigs and leaves of beech were examd. monthly from December through July. In the roots and twigs, proteolysis begins in February in anticipation of the opening of the buds in March, and continues to April. Proteogenesis then begins in all 3 organs, and continues through June. During July proteolysis again obtains. J. J. WILLAMAN

Comparative plant chemistry. XXI. Milk-bearing plants. 4. J. ZELLNER. *Monatsh.* 50, 211-5(1928); cf. C. A. 22, 446.—From *Campanula trachelium* there was isolated a glucoside, (C<sub>12</sub>H<sub>22</sub>O<sub>11</sub>)<sub>n</sub>, named "campanulin" by the authors. It is the main constituent of the juice of this plant. From *Lactarius rufus* there was isolated lactic acid, C<sub>12</sub>H<sub>22</sub>O<sub>11</sub>, mannitol and glucose. J. J. WILLAMAN

Chemistry of the higher fungi. XIX. *Polyporus pinicola* Fr. E. HARTMANN AND J. ZELLNER. *Monatsh.* 50, 193-200(1928).—The following substances were isolated: cerebrine; trehalose; ergosterol; fungisterol; several unidentified sterols;

AcOH, butyric acid, glycerol and choline in the sapond. fat; a resin acid. These results definitely differentiate this fungus from *Polyporus officinalis*. XX. *Omphalia campanella*, *Marasmius scorodonius*, *Boletus canipes* and *Calocera viscosa*. N. FRÖSCHL AND J. ZELLNER. *Ibid* 201-10.—From the first-named fungus were isolated mannitol, glucose, choline and a phlobaphene. From the second, a new substance, marasmin (possibly identical with betonicin),  $C_7H_{11}NO_3$ , which browns at  $195^\circ$  and m. with decompn. at  $242^\circ$ ; choline; glucose; while mannitol and trehalose were absent. From the third, mannitol and glucosan were isolated. From the fourth, trehalose, ergosterol, fungisterol, palmitic, stearic and isovaleric acids, calocerol, a new substance of sterol nature,  $C_{22}H_{38}O_8$ , and glucose and choline were isolated. J. J. WILLAMAN

The speed of absorption of ions in plants. M. v. WRANGELL. *Z. physik. Chem.* Abt. A, 139, 351-67(1928).—Maize seedlings were used to det. the rate of absorption of  $PO_4$  ions and of  $NH_4$  ions from very dil. solns., less than 0.1 mg. per l. The former is absorbed rather slowly, but the latter very rapidly. Within short exptl. periods of time, the absorption of either was independent of light and of other nutrient salts, but was much influenced by temp. and the reaction of the medium. It seemed to follow the law of mass action fairly well, but still better the adsorption isotherm. J. J. W.

Photosynthesis of naturally occurring compounds. IV. The temperature coefficient of the photosynthesis of carbohydrates from carbonic acid. E. C. C. BALY AND N. R. HOOD. Liverpool Univ. *Proc. Roy. Soc. (London)* A122, 393-8(1929); cf. C. A. 21, 3649.—Ni carbonate free from alkali was prepd. by electrolysis of carbonated cond. water with Ni electrodes. The dry carbonate was activated by white light. It was then suspended in carbonated water under const. conditions of illumination by white light, and the amt. of carbohydrates produced at  $5^\circ$  to  $41^\circ$  was detd. The yields increased linearly up to  $31^\circ$ , after which there was a rapid decline. The temp. coeffs. for each  $10^\circ$  were remarkably close to those which have been found for photosynthesis in plants, and the yield-temp. curves were very similar in the 2 cases. The authors offer these results as further support to the view that the complete photoactivation of  $CO_2$  is achieved in 2 stages: partial activation by adsorption on the surface of the catalyst, and further activation by the action of visible light on the absorbed surface. J. J. WILLAMAN

The relation of plants to the mercury disinfection of the seeds. WOLFGANG HEUBNER. *Pharmakol. Inst., Göttingen. Z. Physik. Chem.* Abt. A, 139, 198-210(1928).—Two org. Hg prepn., Germisan and Uspulun, were used to disinfect wheat seeds, and the rate of germination and Hg content of the seedlings noted. No stimulative action in germination was found. Hg was found in the sprouts, roots and cotyledons to the extent of 0.66, 0.74 and 0.75 mg. Hg per 100 g., indicating that the Hg was absorbed into the living tissue in appreciable amts. J. J. WILLAMAN

The electromotive force of alkaline and of acid plant tissues. KURT STERN. Frankfurt a. M. *Z. Physik. Chem.* Abt. A, 139, 224-34(1928).—The petals of the cornflower were taken as an alk. tissue, the petals of a red rose, as an acid tissue. In both cases either mech. irritation (pressure between thumb and finger) or chem. irritation (KCl solns.) gave rise to an e. m. f. of 0.1 v. The affected side was electronegative to the normal side. The significance of these findings is discussed in relation to muscle excitation. J. J. WILLAMAN

Chemical composition of the oil in relation to the morphological and physiological characters of the plant (FACHINI, DORTA) 27. I value of fatty acids from plant phosphatides (WEBSTER) 27. Structure of plant compounds and solubility (CARR) 2. Plant colors. XI. The lycopins (KARRER, BACHMANN) 10. Plant colors. XII. The constitution of the monardaieins and salvanins (KARRER, WIDMER) 10. The effect of cutting Garnet wheat at different stages of maturity and on consecutive dates after the occurrence of frost (DELONG) 12.

## E—NUTRITION

PHILIP B. HAWK

The calcium and phosphorus concentration in the intestinal contents of rats in relation to rickets. ANGELIA M. COURTNEY, F. F. TISDALL AND ALAN BROWN. *Can. Med. Assoc. J.* 19, 559-62(1928).—Normal rats have an acid reaction at the beginning of the small intestine and the reaction becomes more alk. throughout the tract. Rats on rachitogenic diet, whether exposed to the sun or not, have a more alk. reaction at the beginning of the small intestine than the normal rats. With rats not exposed to sunshine the reaction begins at once to increase in alk. With rats exposed to sunshine the contents remain at practically the same reaction throughout the length of the

intestine. The total Ca content of the cecum of rats fed on McCollum's rachitogenic diet and kept inside was much higher than that of rats fed the same diet and exposed to sunshine. Ca bound with P was practically the same in the cecum of both groups; hence the difference in Ca content is due to Ca not bound with P. No essential difference was found in the P concn. in the large intestines of the 2 groups. Ca absorption or excretion in relation to rickets may not be so intimately assocd. with P as is generally supposed.

A. T. CAMERON

The relation of the altitude of the sun to its antirachitic effect. F. F. TISDALL AND ALAN BROWN. *Can. Med. Assoc. J.* 20, 253-9(1929).—A marked increase occurs in the antirachitic effect of sunshine when the sun reaches an altitude of 35° or more. Study of the geographical distribution of rickets shows that rickets is uncommon, or exists chiefly in a mild form, in those places where the min. seasonal altitude of the sun is not below 35°. Conversely severe rickets is chiefly encountered in those cities where the altitude of the sun is below 35° for some months of the year. The period of the year during which rickets will probably develop can be calcd. for any city in the world. The duration of this period may be altered by the prevention of exposure of patients to highly effective sunshine through inclement spring weather or other factors.

A. T. CAMERON

Some organ alterations by large doses of vigantol in the rat. FR. HOLTZ AND TH. V. BRAND. Univ. Göttingen and Univ. Erlangen. *Z. physiol. Chem.* 181, 227-33(1929).—"Vigantol," a vitamin-D prepn. supplied by Merck, was dissolved in olive oil and fed to rats in doses as high as 100,000 times the therapeutic dose. The animals receiving this high dosage (10 mg. per day) made much smaller gains in wt. than the control animals or those receiving 0.1 mg. Histological examn. of the organs showed calcification in the kidney, lung and occasionally aorta, but not in the heart, liver, spleen or suprarenals. These alterations may possibly be due not so much to hypervitaminosis as to chem. substances present in the prepn., since aldehydes, lactic acid, pyruvic acid, H<sub>2</sub>O<sub>2</sub>, B<sub>2</sub>O<sub>3</sub>, etc., are known to produce similar effects.

A. W. DOX

The distribution of fecal sterols of man on mixed diet. M. BÜRGER AND W. WINTERSEEL. Univ. Clinic Kiel. *Z. physiol. Chem.* 181, 255-63(1929).—It has been generally assumed that the sterols of human feces consist almost wholly of coprosterol, this substance being formed by bacterial hydrogenation of cholesterol in the intestine. By detn. of their Br-adding capacity it is now shown that only 50% of the fecal sterols is present as coprosterol, the remainder being chiefly cholesterol. From 10 to 30% of these sterols are excreted as esters. The ratio of cholesterol to coprosterol is fairly const. for normal subjects, whether on milk diet, mixed diet, or after a 5 g. dose of cholesterol in 100 g. olive oil. Detn. of the sterol balance shows that only about half of the 5 g. dose is eliminated during the first 6 days. The relatively const. ratio of the 2 sterols, despite wide variations in abs. amts. and dietary factors which would influence the bacterial flora, makes it appear probable that the hydrogenation of cholesterol is not due entirely to intestinal bacteria. Moreover, patients with impaired fat and cholesterol absorption (liver cirrhosis) excrete relatively less of the alimentary cholesterol as coprosterol although the bacterial flora remains normal.

A. W. DOX

Relative energy value of alfalfa, clover and timothy hay for the maintenance of sheep. H. H. MITCHELL, W. G. KAMMLADE AND T. S. HAMILTON. Univ. of Ill. Agr. Expt. Sta., *Bull.* No. 317, 127-67(1928).—Two expts. were carried out with 35 sheep. In the first expt. 0.15 lb. linseed meal plus sufficient of the 3 hays under investigation to maintain body wt. were fed. The av. amt. of feed per day per 100 lb. live wt. was, for alfalfa 1.92, clover 1.59 and timothy 1.82 lb. The av. amts. of metabolizable energy per day per 100 lb. live wt. required for maintenance were 1864 cal. for alfalfa, 1521 cal. for clover and 1507 cal. for timothy. Clover hay has a slightly higher net energy value than alfalfa hay. The net availability of the metabolizable energy of alfalfa was distinctly lower than that of the clover or timothy hays. No differences were noted between the latter 2 hays. Both control and surviving animals were subjected to chem. analysis. Emaciation increased the H<sub>2</sub>O content of all tissue samples above that of well-nourished tissues. In the emaciated sheep the ratio of protein to moisture in the flesh was 1:4.13, while in the well-fed animals this ratio was 1:3.8. The losses of constituents from well-fed to under-nourished sheep carcasses, expressed as percentages of the losses in live wt., averaged 24.8 for H<sub>2</sub>O, 4.6 for protein and 72.3 for fat. The av. loss contained 3.05 therms of gross energy per lb. The metabolizable energy of timothy hay is considerably better utilized in the maintenance of sheep than is the metabolizable energy of alfalfa hay. Since, in general, the metabolizable energy per unit of dry matter is nearly the same for the 3 hays, the net energy content of timothy hay will average considerably higher than that of alfalfa hay, in accordance with the

results of Armsby's calorimetric expts. on steers. Undernutrition withdraws fat from the muscular and glandular tissues before the marrow fat is affected. The withdrawal of fat from all tissues is accompanied by an increase in the ratio of protein to moisture. Neither the compn. of the wool nor its chem. growth is greatly affected by under-nutrition. C. R. F.

**Vitamin D content of the liver oil of the dogfish.** H. N. BROCKLESBY. *Can. Chem. Met.* 13, 74-7 (1929).—Liver oils from dogfish caught in various localities have been examd. for vitamin D to find a possible substitute for cod-liver oil in poultry and animal feeding. Vitamin D was found in all samples examd., the values varying with the locality from less than 10% to about 30% of the potency of medicinal cod-liver oil. Poultry-grade cod-liver oil has approx. half the vitamin D potency of the medicinal grade. The course of the expt. rickets was followed by means of x-rays and fecal pH. S. B. FOSTER

**The nephropathogenic action of cystine.** GERALD J. COX, C. V. SMYTHE AND C. F. FISHBACK. Univ. of Ill. *J. Biol. Chem.* 82, 95-103 (1929).—Young rats developed acute toxic nephrosis when restricted to synthetic diets. contg. 0.3 to 0.9% cystine. Such rats may, at times, recover and grow normally without any change in the ration. ARTHUR GROLLMAN

**Vital staining and vital accumulation in experimental pigeon beriberi.** WERNER KOLLATH. *Klin. Wochschr.* 8, 444-5 (1929).—The oxidation-reduction potential of the living tissue appears to be definitely reduced in beriberi. Methylene blue and trypan blue are reduced less completely in beriberi animals than is the case in normal animals. Starvation markedly increases the reducing ability of the tissues. Beriberi appears also to increase tissue permeability. Thus a piece of beriberi tissue, from a pigeon that had been treated with methylene blue, immersed in  $(\text{NH}_4)_2\text{MoO}_4$  becomes blue in the interior more rapidly than does a piece of tissue from a normal pigeon. M. H.

**Has irradiated ergosterol been administered in unnecessarily large doses?** P. GYÖRGY. *Klin. Wochschr.* 8, 684-91 (1929).—The heretofore prescribed doses of irradiated ergosterol have been excessive. The max. therapeutic dose need not exceed 1 mg. per day. Recovery from rickets is, perhaps, slower than with the larger doses but the therapy is certain and harmless. Very severe cases of rickets, with tetany, should be given 2-3 mg. daily for a short time. It appears as if 0.1-0.5 mg. per day was an ample prophylactic dose. Administration of 2-4 mg. per day does not elevate the Ca content of the serum and does not produce deleterious effects. Injury from this treatment has been due entirely to excessive dosage. MILTON HANKE

**Vitamin content of honey.** EDWARD HOYLE. Lister Inst., London. *Biochem. J.* 23, 54-60 (1929).—Fresh samples of English comb honey and West Indian honey are deficient in vitamins A, B<sub>1</sub>, B<sub>2</sub>, C and D. BENJAMIN HARROW

**Experimental infection of young hogs with ascarides with special attention to A-avitaminosis.** TEIICHI HIRAIISHI. *Arch. Schiffs-Tropen Hyg.* 32, 519-21 (1928).—Animals fed with a vitamin-A-poor diet are more easily infected. FRANCES KRASNOW

**Physiological action of extract of vitamin B.** MARIE SKARZYŃSKA-GUTOWSKA. *Med. Doswiadzalna i Spoieczna* 9, 1-16, 161-77, 181-2 (Polish), 177-81 (French) (1929); cf. C. A. 23, 867.—The action of vitamin B, extd. from wheat bran, on secretory phenomena of digestive glands, on kidney, on circulatory phenomena and respiration is described. The secretion of salivary glands and pancreas does not change after intravenous introduction of exts. of vitamin B. In chronic cases the intensity of secretion of stomachal glands after introduction of 2 cc. per kg. wt. of vitamin B ext. is  $5\frac{1}{2}$ -6 times weaker than after introduction of 0.5 mg. of histamine. Atropine diminishes the effect of the ext. In vivisections no effect was observed. The secretion of kidney increases slightly. The diuretic bodies are found in the crystals of exts. obtained by dialysis. The secretion takes place in 2 phases: immediately after introducing the ext. the vessels of the kidney are contracted and dilatation follows after 2-3 mins. This period corresponds with vit amin diuresis. After intravenous administration of 0.5-1 cc. per kg. wt. in dogs (vivisection) a decrease and later an increase of blood pressure are observed. The dog dies after doses larger than 3 cc. Atropine decreases this action. The action of vitamin B ext. on isolated organs as the heart, vessels of the kidney and intestines was studied and the presence of biologically active substances in the ext. as choline, K salts and probably histamine is proved by methods of Le Heux, Kramer and Tisdall (cf. C. A. 22, 3200, 3437). The expts. are accompanied by 20 photographs. J. K.

**The influence of food upon longevity.** H. C. SHERMAN AND H. L. CAMPBELL. *Proc. Nat. Acad. Sci.* 14, 852-4 (1928).—The influence of 2 diets upon the longevity of the albino rat has been detd. Diet A consisted of  $\frac{1}{2}$  dried whole milk and

$\frac{1}{4}$  whole wheat while diet B contained  $\frac{1}{3}$  dried whole milk and  $\frac{2}{3}$  whole wheat. In each case NaCl to the extent of 2% of the weight of the wheat was added; distd. water was given *ad libitum*. The rats were kept until death from natural causes. With males and females on diet B the av. duration of life was almost 10 per cent longer than with diet A. The attainment of definite degrees of longevity was in favor of diet B. It is suggested that food plays a very important role in the longevity of man.

G. H. W. LUCAS

**A contribution to the antimony trichloride reaction for the detection of vitamin A.** PAUL KARRER, BETH VON EULER AND HANS VON EULER. *Arkiv Kemi, Mineral Geol.* 10B, No. 2, 6 pp. (1928).—Since exts. do not give a consistent or const. color reaction with  $\text{SbCl}_3$  reagent, the application of the reagent is limited. If 10 animals are used in an expt., the results come within 30–50% of the results obtained by pure biol. methods. This leads to the belief that the reaction with  $\text{SbCl}_3$  is not due to a single substance but to a group as carotinoids or polyenes.  $\text{SbCl}_3$  was dried and dissolved in anhyd.  $\text{CHCl}_3$  to make a 30% soln.; the reading was made 10 secs., after mixing, in a tintometer. The substances used were recrystd. until a const. m. p. was attained. Relative readings of the blue color formed show the distribution as: carotin 100, bixin 160, xanthophyll 41,  $\gamma$ -crocetin 350, and dihydro- $\alpha$ -crocetin 240. Absorption spectra show: bixin in  $\text{CHCl}_3$  has 2 bands  $\lambda = 510\text{--}492$  and  $479\text{--}467$  with max. at 506.5 and 472.0  $\mu$ . The first max. is the most intense. A weak band lies at  $452\text{--}442$   $\mu$ . Bixin in  $\text{CS}_2$  shows the same form as in  $\text{CHCl}_3$  but is shifted toward the red. Absorption bands were at  $528\text{--}507$ ,  $494\text{--}483$  and  $464\text{--}455$   $\mu$  with max. at 518 and 488  $\mu$ . Xanthophyll in  $\text{CHCl}_3$  0.0355 mg. % and in a layer 7.93 mm. thick shows 3 bands at  $489\text{--}475$ ,  $460\text{--}445.5$  and  $435\text{--}427$   $\mu$  with max. at 482, 452.5 and 430  $\mu$ . The first band is most intense; the last is weak. Dihydro- $\alpha$ -crocetin 0.0036 mg. per cc. and in a layer 20.04 mm. thick shows 3 bands at  $380\text{--}388$ ,  $359\text{--}368$  and  $340\text{--}349$   $\mu$  with max. at 386, 365 and 346  $\mu$ . With greater concns. a 4th band appears at  $324\text{--}332$   $\mu$  with a max. at 329  $\mu$ . After an addn. of 0.2 cc. of a dihydro- $\alpha$ -crocetin soln. (4.5 g. in 25 cc.  $\text{CHCl}_3$ ) to 2 cc. of the 30%  $\text{SbCl}_3$  soln., an intense absorption band appeared in the red  $621.5\text{--}586$   $\mu$  with a max. at  $604.5$   $\mu$  in a layer 5 mm. thick. Bixin showed a band in the red extending to  $\lambda = 610$ . Xanthophyll (0.205 mg. per cc. alc.) in a layer 5.03 mm. thick shows a band in the ultra-violet ( $321\text{--}341$   $\mu$ ) with a max. at  $\lambda = 330$   $\mu$ .

FRANK MARESH

**Vitamin A in animal bodies.** BETH VON EULER AND HANS VON EULER. *Arkiv Kemi, Mineral Geol.* 10B, No. 3, 6 pp. (1928).—Vitamin A occurs in measurable quantities in the serum of bovines as indicated by the  $\text{SbCl}_3$  reagent. Ox blood (100 cc.) was extd. with an excess of ether; the collected exts. were distd. to a small vol. The small vol. was dried with anhyd.  $\text{Na}_2\text{SO}_4$  and the remaining  $\text{Et}_2\text{O}$  was evapd. The fat residue was dissolved in 2.5 cc.  $\text{CHCl}_3$ . To 0.2 cc. of this soln. was added 1.8 cc. 30%  $\text{SbCl}_3$  soln. and the resulting color showed 7 Lovibond (blue) units. Carotin, lycopin, capsanthin and xanthophyll give a blue color with  $\text{SbCl}_3$  in much greater dilm. Capsanthin shows a wide absorption band in the green. The reaction is characteristic for carotinoids and the  $\text{SbCl}_3$  is attached to the conjugated double bond (polyene group). The intensity and color reaction are displaced with the change in structure of the polyene group and may be influenced by other portions of the mol. The color reaction is a group reaction, and not all of the carotinoids can be vitamin-A precursors. Ox blood showed 17 Lovibond units per 10 cc. serum; hog blood contained 0.9 unit per 10 cc. of serum; black-tailed rats contained 1.6 units per 10 cc. of serum; and human blood showed 2.3 units per 10 cc. of serum. An ext. of 10 cc. of serum from a guinea pig which had been fed on carrots for 14 days showed no blue coloration after the addn. of the  $\text{SbCl}_3$  reagent. A human subject 64 years old, anemic: hemoglobin  $\frac{36}{100}$ , erythrocytes 3,250,000, S R = 30, showed no measurable blue coloration from 6 cc. of serum and the total amount of carotinoids was  $\frac{1}{8}$  of the carotinoid content of normal serum. This shows a relationship between the lipochromes and anemia or high-fat deposits. The lipochromes function as oxidation-reduction catalysts and participate when an aldehyde is added, or the polyene acids of the crocetin stearin ester type may give rise to ergosterol esters. Liver is a storehouse for fat-sol. vitamins, and with the  $\text{SbCl}_3$  reagent, ox liver showed 168 Lovibond units per g., pale-red rat liver 230, and brown-red rat liver 33. The pale-red liver is seldom found in rats and is higher in carotinoids than the normal brown-red liver. Dry livers also show an important carotinoid content. The above probable relation between anemia and carotinoid content on the one hand, and the definite therapeutic function of dry liver preps. on the other, render possible the belief that carotinoids function with the anti-anemia agent in the liver.

FRANK MARESH

The reversibility of the alterations in the experimental beriberi of the pigeon. II.

**RICCARDO REITANO.** *Boll. soc. ital. biol. sper.* 3, 960-5(1928).—The pigeons were kept under observation and killed after 4, 6, 7 and 9 avitaminosis attacks. The results showed that the animals gained their former wt. rapidly after each attack when yeast and corn were fed to them for 8 days. Paralysis of the lower limbs, anorexia and diarrhea also disappeared. Previous attacks did not render the animal more susceptible to the later attacks. The changes caused by feeding polished rice are, therefore, reversible if an adequate amt. of yeast and corn is administered to the animals. Details are given touching upon certain anatomic-pathological changes observed in the central and peripheral nervous system, heart, intestine, liver, pancreas, kidneys, spleen lungs and the suprarenals of pigeons afflicted with exptl. beriberi. **PETER MASUCCI**

Is avitaminosis a sufficient explanation for beriberi in man? **J. TRABAUT.** *Bull. acad. méd.* [3], 101, 47-9(1929).—A report of sporadic cases of beriberi when enough mixed food was given to counterbalance the rice. **A. E. MEYER**

The antiscorbutic factor. Its relations to the drying process. **P. LAVIALLE.** *Bull. sci. pharmacol.* 36, 129-33(1929).—Adult dogs were fed with a meal prepd. from biscuit powder and milk by evapn. at low temp. The addnl. food was overheated for a time. During 18 months no symptoms of scurvy appeared. A young dog, subjected to the test after weaning, developed scurvy after 6 months. **A. E. MEYER**

Comparative variations of the water content of the blood and the globular resistance in the normal guinea pig and in the guinea pig kept on a diet free from antiscorbutic vitamin. **L. RANDOIN AND A. MICHAUX.** *Compt. rend.* 188, 729-31(1929); cf. *C. A.* 22, 3913.—The method of Widal and Abrami with red corpuscles freed from plasma was used. The blood of normal guinea pigs contains 81.4 g.  $H_2O$  in 100 g. In animals nourished with a diet free from vitamin C, the  $H_2O$  content is increased after 3 weeks. It is 91% after 28-32 days, when death occurs. In scurvy, the resistance of the red corpuscles against hemolysis is diminished, if the limit of beginning hemolysis is considered; total hemolysis is obtained sooner in the blood of normal animals. This is due to the presence of young corpuscles in larger amt., by consequence of the frequent hemorrhages connected with scurvy. **A. E. MEYER**

Alimentation and nutrition. **H. ROGER.** *Presse méd.* 1929, 65-7.—A report concerning the progress in alimentary research of the last years. **A. E. MEYER**

The characteristic of the alimentary glucemia curve. IV. Sucrosemia. **V. V. OPPEL.** *Metchnikoff Hospital, Leningrad. Biochem. Z.* 205, 31-46(1929).—The introduction of 2-4 g. of sucrose per kg. by means of the stomach tube causes glucemia with a slight fructosemia (not exceeding 12 mg. per 100 cc. blood), but the presence of a sucrosemia cannot be demonstrated. This is not due to the impermeability of the intestinal wall because when sucrose is introduced directly into the jejunum there is occasionally sucrosemia. When sucrose is injected intravenously, there is a curve showing the regular disappearance of the sucrose from the system, the time of its disappearance depending upon the initial level. V. Fructosemia. *Ibid* 47-62.—Fructose administered to rabbits by means of the stomach tube can be detected in the blood, the concn. of the fructose in the peripheral blood depending upon the degree of loading. The first traces of fructose appear in 5 mins.; the disappearance comes  $2\frac{1}{2}$  to 3 hrs. later (when 2-3.5 g. per kg. have been administered), but the max. rise in the blood is not very striking and is 8-10 mg. per 100 cc. blood. Following the intravenous injection of 0.2-0.4 g. fructose, it disappears from the blood in 30-60 mins. Part of the injected fructose is retained by the liver while another part escapes into the general blood stream through the larger circulation. The max. fructosemia depends upon the mode of the introduction of the fructose, i. e., whether through the stomach or through the intestine. The stomach protects the organism against a too rapid absorption. The fructosemia curve is detd. by a variety of conditions: the function of the stomach, small intestine, liver and of the various tissues; a disturbance of any of these affects the character of the fructosemia curve. **S. MORGULIS**

Studies on the blood-sugar regulation in mammals. II. The effect of fasting on alimentary hyperglucemia. **BRUNO KISCH, A. SIMONS AND P. WERYL.** *Univ. Köln a. Rh. Biochem. Z.* 205, 349-59(1929); cf. *C. A.* 23, 2748.—In rabbits which fasted 9 days the glucemic reaction produced by feeding 6-20 g. oats or 1.5 g. glucose dissolved in 30 cc.  $H_2O$  is about the same, or if anything, somewhat less than in rabbits fasting only 16 hrs. In dogs this glucemic reaction following feeding of glucose is greater in animals that fasted 2-11 days, and lasts longer than in normal dogs. The hypoglucemia following the hyperglucemia is very marked in dogs fasting 1-3 $\frac{1}{2}$  days, is slight in dogs fasting 16 hrs. and does not appear at all in dogs after 7 $\frac{1}{2}$ -10 $\frac{1}{2}$  days of fasting. **S. MORGULIS**

The effect of thyroxine and of prephyson on the basal metabolism and the specific



**dynamic action following thyroidectomy or in avitaminosis.** A. V. ÁRVAY. Univ. Debreczen. *Biochem. Z.* 205, 433-40(1929).—In the matter of lowering the basal metabolism or the specific dynamic effect and of the influence of thyroxine there is a striking parallelism between the behavior of thyroidectomized rats or of rats on a vitamin-A- and B-free diet. Prephyson has absolutely no effect on the basal metabolism or specific dynamic action of thyroidectomized rats or of rats suffering from avitaminosis. Thyroxine raises the basal metabolic rate and the specific dynamic effect in both types of rats above the normal level. In 2 avitaminosis rats with hypertrophied adrenals, adrenalectomy caused rapid death, whereas 3 control rats survived the operation.

S. MORGULIS

**The effect of large amounts of iron. II. The effect of iron on blood, growth, fertility and lactation.** K. WALTNER. Univ. Kinderklinik, Szeged. *Biochem. Z.* 205, 467-72(1929).—The addn. of 2% reduced Fe to a complete diet has no effect upon the blood of exptl. animals (hemoglobin, no. of erythrocytes). But when this amt. of Fe is added to a rachitic diet it causes a marked anemia, and, furthermore, it shows a tendency to stunt the growth of the animals susceptible to rickets. Older animals do not suffer this effect of the added Fe. The reduced Fe in the proportion of 2% of the total food damages the fertility of both sexes, but this effect is offset by vitamin D. The Fe likewise exerts an unfavorable action on lactation which is again remedied by vitamin D.

S. MORGULIS

**Studies on carbohydrate-poor nutrition.** PAUL GYÖRGY AND HERMANN KELLER. Kinderklinik, Heidelberg. *Biochem. Z.* 206, 120-35(1929).—Young rats (15-25 days old) show practically the same rate of growth on a practically carbohydrate-free diet as do others on a similar synthetic diet contg. carbohydrate. Both kinds of diet, however, are inferior to a normal mixed diet. The practically carbohydrate-free diet has no hypoglycemic effect on the young growing rats or even a tendency to a lowering of the blood sugar. The fat and protein metabolism must therefore completely satisfy the body's requirement for carbohydrate. Protein-rich feeding leads to a relative kidney hypertrophy. It is cautioned against applying the results of these studies to the feeding of infants since the age of the exptl. rats did not correspond to that period of growth.

S. MORGULIS

**The specific dynamic action and the vegetative nervous system.** STEFAN ÉDERER AND JOSEF WALLERSTEIN. Univ. Pécs. *Biochem. Z.* 206, 334-9(1929).—Since the specific dynamic action can be completely suspended through paralysis of the sympathetic nervous system it is concluded that the N. sympathicus must play a dominant role in the mechanism of the specific dynamic action. The degree of the specific dynamic action depends upon the tone and irritability of the sympathetic. Furthermore, since the specific dynamic effect appears immediately after the consumption of food before any absorption of food could exert any influence it is also concluded that the depots of the organism must be at once mobilized. This depot may be glycogen since after depletion of the liver glycogen there is no specific dynamic action exerted by sugar. Evidently the organism avails itself of the reflex paths of the sympathetic system to effect a quick mobilization, the reflex ensuing from the intestinal mucosa. The process may be similar to the alimentary hyperglucemia which can be repressed through ergotamine. All sympathetic stimuli should therefore increase the specific dynamic action, and the different specific dynamic type curves are nothing but an expression of the constitutional vegetative balance.

S. MORGULIS

**Experimental studies on rickets. I.** E. M. LEPSKII, S. A. YEGOROVA AND E. E. MICHLINA. Lenin-Inst., Kasan. *Zhur. Exptl. Biol. Med.* 10, 501-6(1929).—Under special precautions it is possible to produce regularly rickets in young rats on a definite diet if they are kept in the dark. The usual tests for the identification of rickets were employed. McCollum's "line test" was employed in the recovery study. **II.** Antirachitic effect of dolphin oil. *Ibid* 508-13.—The oil of *Delphinus delphis* contains considerable amts. of the antirachitic protective substance, and 0.01 cc. is sufficient to prevent rickets in young rats on a Pappenheimer-Sherman rachitic diet. In animals with rickets the "line test" betrays definitely signs of healing after 8 days of administering 0.01 cc. of dolphin oil. **III.** The antirachitic effect of seal oil. *Ibid* 514-9.—Seal oil also offers protection to young rats in doses of 0.01 cc. per day. After 7 days' treatment with 0.04 cc. per day rachitic rats show definite results of healing in their bones.

S. MORGULIS

**Influence of the periodic administration of a vitamin-containing food (cabbage) on the development of scurvy.** K. M. MICHAÏLOV. State Univ., Moscow. *Zhur. exptl. Biol. Med.* 10, 618-20(1929).—The daily feeding of cabbage (40 g.) is not essential for guinea pigs and may be replaced by an intermittent feeding. Guinea pigs receiving

this amt. of cabbage every third day have thrived well for half a year, gaining 23-33% in wt. Feeding cabbage every fourth day, on the other hand, caused the development of scurvy in a no. of the exptl. animals.

S. MORGULIS

**The digestion of lignin by ruminants.** F. ROGOZINSKI AND MLE. M. STARZEWSKA. *Bull. intern. acad. polonaise* 1927B, 1243-52; *Acta Biol. Expt. Warsaw* 1, No. 8, 1-9 (1928).—The chemistry of lignin and its physiol. aspects in metabolism have been studied by many investigators since the beginning of the last century. König and Honcamp's methods of study are faulty. Lignin plays no part in the formation of hippuric acid. The ruminant used was the sheep. The first ration was 400 g. dried potato, 140 g. flax cake, 6 g. NaCl, 6 g. hay ash, 340 g. oat straw (according to Beckmann). The second ration was the same as the first plus 500 g. oats straw and 40 g. lignin from oats straw (according to Beckmann). Each period of experimentation lasted 10 days. Feces was collected during the last 5 days; the first 5 days were periods of transition. To prep. lignin 500 g. chopped straw mixed with 4 l. 1.8% NaOH stood 72 hrs. at room temp. The brown ext. was decanted and neutralized with HCl, heated to boiling and placed in an autoclave for 2 hrs. The soln. was evapd. and desiccated at 100°. The residue formed homogeneous powder free from pentosans. The analysis showed ash 0.64%, C 62.42, H 6.25, CH<sub>3</sub>O 12.11, as the mean av. The amt. of lignin ingested was practically the same in weight as the amt. eliminated in the feces; therefore the conclusion is drawn that it is indigestible.

GEO. W. MUHLEMAN

**Relative vitamin A content of four oriental foods.** HARTLEY E. SHERMAN. *Philippine J. Sci.* 38, 1-7(1929).—By using white rats on a diet lacking vitamin A, and supplementing the diet with varying quantities of the following foods, it was detd. that Chinese persimmon and the flower of a day lily (*Henierocallis flava* L.) are rich in vitamin A, and bean curd contains a moderate amt.

N. M. NAYLOR

**Relative content of water-soluble vitamin B in 30 oriental foods.** HARTLEY E. SHERMAN. *Philippine J. Sci.* 38, 9-36(1929).—By using white mice and later checking the expts. with white rats, on a diet lacking vitamin B, supplemented with varying quantities of the following foods, it was detd. that Chinese persimmon, water chestnut (*Eleocaris tuberosa* Naves), fermented rice (*Oryza sativa* L.) and locust seed (*Robinia pseudoacacia*) do not protect from beriberi at any feeding level; lettuce (*Lactu sativa* L.), chrysanthemum (*coronarium* L.) and kohlrabi (*Brassica campestris* L.) are not growth-promoting at high feeding levels. Other foods which are sources of vitamin B are mung bean sprouts (*Phascolus aureus*), soy bean and sprouts (*Soya max* L.), sorghum (*vulgare* Persoon), arrowhead (*sagittaeifolia* L.), pumpkin (*Cucurbita pepo* L.), day lily, kohlrabi, gourd (*Lagenaria vulgaris* Ser. and *Luffa cylindrica* L.), a green leaf vegetable (*Ipomoea reptans* Poiret), chico (*Achras sapota* L.), melon (*Benincasa hispida* Cogniaux) and pawpaw (*Carica papaya* L.).

N. M. NAYLOR

**Relative water-soluble vitamin C content of 9 oriental fruits and vegetables.** HARTLEY E. SHERMAN. *Philippine J. Sci.* 38, 37-46(1929).—By using guinea pigs on a diet lacking vitamin C, and supplemented with varying quantities of the following fruits and vegetables, it was detd. that pomegranate, Chinese cabbage and coriander (*sativum* L.) are rich in vitamin C; water chestnut and lotus (*Nelumbium speciosum* Willdenow) are good sources of vitamin C; kohlrabi, princes feather (*Polygonum orientale* L.) and lettuce are low in vitamin C.

N. M. NAYLOR

**Certain proteins added to mung bean, or to white or red Sorghum vulgare, increase the fertility of mice.** HARTLEY E. SHERMAN. *Philippine J. Sci.* 38, 47-67(1929); cf. *C. A.* 16, 1467.—It was shown that a diet consisting of mung bean or of white or red *Sorghum vulgare* as the only protein gave normal wt. of white mice but subnormal reproduction. To increase fertility, the best supplements for a mung bean diet are fat-free peanut, gelatin or casein; supplements for white sorghum diet are mung bean, fat-free soy bean or peanut; supplement for red sorghum diet was difficult to det., though casein gave the most satisfactory results.

N. M. NAYLOR

**Stimulation of metabolism by alcohol.** L. D. SEAGER, D. J. VERDA AND W. E. BURGE. *Science* 69, 383(1929).—Expts. are described to det. whether alc. serves any purpose in the body other than as a source of heat and energy. Goldfish were allowed to live in the following solns., to which air was admitted: (1) 0.1% dextrose (control), (2) 0.1% dextrose with (a) a mixt. of amino acids, (b) a mixt. of fatty acids and glycerol, (c) abs. alc. Sugar detns. were made at the beginning of the expt. and again 30 hrs. later. Thus the effects of alc., fats and amino acids upon sugar metabolism were detd. directly. It was found that alc. stimulated sugar metabolism as much as fat and protein.

N. M. NAYLOR

**Investigation of the food value of fresh grape juices and wines from the standpoint of their vitamin contents.** (MRS.) LUCIE RANDOIN. *Bull. soc. hyg. aliment.* 16, 464-86

(1928).—The expts. on vitamin C were carried out on guinea pigs, and on vitamin B on pigeons, guinea pigs and rats. Fresh grape juice contains vitamin C, but the antiscorbutic power of this juice is considerably less than that of orange or lemon juice. For financial reasons the amt. of grape juice required to produce the same effects as lemon or orange juice was not detd. Fresh grape juice contains only a small quantity of antineuritic vitamin B, while the pulp and seeds contain even less, and possibly none at all. Expts. on pigeons indicated that fresh grape juice probably contains appreciable amts. of antiberiberi vitamin B, but confirmation would require carrying out expts. on white rats or further expts. on pigeons with products freed from antiberiberi vitamin B but contg. antineuritic vitamin B. Wine exhibited antiscorbutic properties with certain individual animals, but only to a very slight extent in every case; and these were destroyed by cong. in vacuum at low temp. to remove EtOH. Wine apparently contains only very small quantities of antineuritic vitamin B, but appreciable amts. of antiberiberi vitamin B; and again they are partly or totally destroyed by removal of EtOH. On cong. at low temp. in vacuum to  $\frac{1}{3}$  of its original vol. and filtering, wine gives a thick liquid which prevents the occurrence of the accidents due to total absence of vitamin B in the ration of rats. The expts. are not yet finished, the prolongation of life having reached 5 months at the time of publication. A. P.-C.

Colorimetric determinations of vitamin A. BETH VON EULER AND HANS VON EULER. *Svensk Kem. Tid.* 40, 242-4(1928) (In German); cf. C. A. 16, 3113; 17, 3527; 20, 222; 22, 4591.—The crude fat from ox-blood serum reacts positively to the Carr-Price vitamin A test (C. A. 20, 3020). Et<sub>2</sub>O ext. from carrots yields red crystals which were recrystd. and gave characteristic color with the Carr-Price reagent.

A. R. ROSE

The relation of antimony chloride reaction to vitamin A and carotin. BETH VON EULER, HANS VON EULER AND HARRY HELLSTRÖM. *Svensk Kem. Tid.* 40, 256-62 (1928) (In German).—The carotinoids from ox blood and carrots were prepd. by Et<sub>2</sub>O extn, crystn. from Et<sub>2</sub>O, washing with petroleum ether and recrystn. from CS<sub>2</sub> by adding absolute alc. Their identity was established by spectrophotometric measurements. Spectrophotometric and colorimetric (Lovibond) values on ox blood are in good agreement. One l. serum contains 9-10 mg. carotin and the red cells from 1 l. blood gave 6.4 mg. carotin by the Lovibond system and 5.2 spectrophotometrically. The Carr-Price SbCl<sub>3</sub> reagent for vitamin A was positive for these materials and these blue solns. were studied spectrographically. The pure carotin CHCl<sub>3</sub> soln. + SbCl<sub>3</sub> did not give a curve similar to one on cod-liver oil + SbCl<sub>3</sub> but when the carotin was dissolved in peanut oil a similarity became apparent. The positive SbCl<sub>3</sub> reaction, carotin content and vitamin A potency are all definitely related. Cf. C. A. 23, 3009. A. R. ROSE

The increase in virulence of the germs of swine erysipelas in pigeons suffering from avitaminosis. DINO NAI. *Biochim. terap. sper.* 15, 325-37(1928).—Pigeons on a normal diet and pigeons in which beriberi had been produced by a diet of 30 g. of polished rice per day were used for the expts. The bacilli of swine erysipelas were of Budapest stock; they were grown on agar contg. a small quantity of horse serum. A suspension of the bacilli in physiol. NaCl soln. was inoculated in 2 groups of pigeons, which died after a certain no. of days. The necropsy and the bacteriol. examn. revealed that erysipelas actually was the cause of their death. The max. dose not producing death of the animals was found to be 700,000 germs for the normal pigeons and 600,000 germs for the pigeons with avitaminosis. After the death of the latter animals, blood was taken from the heart and the bacilli present in it were grown on agar. When suspensions of these bacilli were inoculated in normal pigeons, the death of the animals was caused by doses being considerably smaller than the original fatal doses. Bacilli obtained by the same technic from normal pigeons and inoculated in normal pigeons caused the death of the animals in doses only slightly smaller than the initial fatal doses. Conclusion: The virulence of bacilli of swine erysipelas is increased at least 10-30 times by their passage through the organism of pigeons suffering from beriberi. By the passage through normal pigeons, the virulence of the bacilli is augmented 1-2 times.

G. SCHWOCH

The chemical composition of the tissues in avitaminosis A: phosphorus, lipid extract and cholesterol. M. JAVILLIER, Mlle. S. ROUSSEAU AND Mlle. L. ÉMERIQUE. *Compt. rend.* 188, 580-2(1929); cf. C. A. 22, 2399.—In expts. with mice which lack vitamin A in their diet, the animals were analyzed for lipid ext., fatty acids, cholesterol and lipid P. Compared with the controls, lipid ext. and fatty acids were greatly decreased, cholesterol remained approx. the same and lipid P was somewhat increased. In further expts., different organs of white rats were analyzed for the same constituents when the animals afflicted with xerophthalmia had lost 10% of their original wt.

In comparison with the controls, the lipid ext. was decreased in skin, liver and muscle; it remained approx. the same in spleen, lungs, kidney and heart, and it was greater in brains and bone. With the exception of the skin the organs examd. contained less cholesterol than did the controls. With the exception of skin and muscles the fall of the values for fatty acids and lipid P was not very pronounced. G. SCHWOCH

**Acidified milk in infant feeding.** F. I. KRAUSS. *J. Med. Soc. New Jersey* 25, 792-7(1928).—K. points out the value of cow milk acidified with HCl or org. acids. The advantages are: A pptn. of fine, flocculent curds occurs, which act as a mech. aid to digestion. On account of the reduced buffer action the enzymes and the HCl of the stomach are enabled to exert their max. activity. The fat digestion and the food and fluid absorption are increased. The growth of pathogenic bacteria is inhibited. The caloric content of this milk may be increased by addn. of carbohydrates. G. S.

**Significance of mineral metabolism. I. Preliminary report on the calcium and phosphorus contents of some Porto Rican food materials.** D. H. COOK and TRINITA RIVERA. Univ. Porto Rico. *Porto Rico Rev. Pub. Health Trop. Med.* 4, 65-9(1928).—Porto Rico imports about 50% of the energy required to furnish an adequate diet of 2800 cal. daily per capita. The Ca and P contents of the imported foods for 1926 were calcd., the calcs. being based on the ash analysis taken from Sherman's "Chemistry of Food and Nutrition." The imports furnished only 14-32% of the Ca and 40-71% of the P that they should contain in proportion to the energy they furnish. The other 50% of the energy requirement is met by Porto Rican foods. While the foods available to the poor population contain an adequate amt. of P, their Ca supply is too low to make up for the shortage in the imports. The values for Ca and P are given for a few Porto Rican foods analyzed by C. and R. Breadfruit contained 0.017% Ca, gaudules 0.041% Ca, white yautia 0.004% Ca and 0.36% P, yellow yautia 0.014% Ca and 0.41% P. G. SCHWOCH

**Tissue changes associated with vitamin A deficiency in the rat.** M. DAWSON TYSON and ARTHUR H. SMITH. Yale Univ. *Am. J. Path.* 5, 57-69(1929).—The principal changes assocd. with vitamin A deficiency in rats are (1) a metaplasia of cuboidal or columnar epithelium in certain parts of the body (sublingual glands, submaxillary glands, epithelium of the renal pelvis and of the trachea and bronchi); (2) epithelial hyperplasia in the tongue and renal pelvis; and (3) infection. Xerophthalmia, if not too severe, will clear rapidly with the administration of cod-liver oil and the weight curve rises abruptly. Following cod-liver oil administration abnormal epithelium and chronic or acute infection persist in the tongue and renal pelvis when the rat is apparently healthy. F. B. SEIBERT

**Paralysis and muscular degeneration in guinea pigs on a rice diet.** E. BROUWER. *Arch. néerland. physiol.* 11, 403-10(1926).—Guinea pigs were fed a synthetic diet consisting of 77 parts of polished rice, 10 parts of pure casein, 10 parts of sucrose, 2 parts of  $\text{CaHPO}_4 \cdot 2\text{H}_2\text{O}$ , 1 part of NaCl and filter paper for roughage. In the beginning the animals received 40 g. of grass daily to accustom them to the synthetic diet; then the grass was gradually diminished. On 1 g. of grass daily the animals died in 6 days; 2 g. kept them alive for 7 days; on 5 g. they died in 23 days; 30 g. of grass prolonged life still more. When 5 cc. of orange juice was given to supplement the diet, death occurred in 5 to 10 days. The animals all appeared quite well until shortly before death when paralysis of the fore limbs and neck appeared. Death was not due to intestinal stoppage and was not prevented by giving liquid paraffin, or 0.5 g. of cod-liver oil daily; from 1 to 2 g. of dried brewer's yeast sometimes prolonged life. Wheat straw plus 5 g. of orange juice daily prolonged life to 70 days. At post-mortem no degeneration of the peripheral nerves was detected but some of the cells of the anterior horn showed disintegration of the Nissl granules. Hyaline degeneration and calcification were present in many of the muscular fibers, and was more pronounced in animals which lived longer. The cause of this condition is at present unknown. M. H. SOULE

Liver oil of the basking shark (SCHMIDT-NIELSEN, SCHMIDT-NIELSEN) 27.

## G—PATHOLOGY

H. GIDEON WELLS

**Experimental studies on indican formation.** I. YOSHIO KIMAI. *Tohoku J. Exptl. Med.* 11, 504-44(1928).—Indican in the urine of guinea pigs increases after only a few hours' fasting; fasting for 10 days increases indican about 10 times in the urine of rabbits. The state of the appetite of exptl. animals and the amt. of indican in their urine are inversely related. Disinfection of the intestinal canal or administration of laxatives increases the amt. of indican in the urine. **Hyperindicanemia in nephritis**

is the result of increased formation as well as retention of indican. Indicanuria may be partly due to increased decompn. of body protein as a result of poor appetite and partly due to metabolic anomalies. II. *Ibid* 12, 75-80.—Previous work with rabbits in the early stage of U acetate nephritis showed that the total amt. of indican in the blood and urine is less than in the normal state. The expts. were repeated, guinea pigs being used. The indican retained in the body was measured and added to the indican excreted. Indican formation in nephritis increases. III. *Ibid* 81-7.—Fifty-nine indican detns. on 14 children, with details on clinical symptoms, are reported. Conclusion: Indican originates abacterially. B. C. BRUNSTETTER

The localization of a lesion in the brain by differential staining of blood smears. KENJI SHOJI. *Tohoku J. Exptl. Med.* 11, 604-11(1928).—Bilateral brain lesions produced in 223 rabbits caused in 7 cases a neg. peroxidase reaction of the myeloid leucocytes in the blood (the oxidase reaction was pos.). This picture developed 1.5-24 hrs. after the operations. The smallest lesion assocd. with the "peroxidase puncture" extended as far cranial as the foremost part of the Aqueductus Sylvii and includes in it the parts near the oculomotor nuclei. B. C. BRUNSTETTER

Cerebroside storage in Gaucher's disease. III. HANS LIEB AND MILOŠ MLADENOVIC. Univ. Graz. *Z. physiol. Chem.* 181, 208-20(1929); cf. C. A. 22, 261.—A case of splenohepatomegaly that had been diagnosed as Gaucher type showed the typical Gaucher lipid cells not only in the liver, spleen, lymph glands and marrow, but also in other organs where such cells had not been known to occur. It was therefore suspected that the case was not the Gaucher but rather the Niemann-Pick type where the stored lipoids are phosphatides instead of cerebroside. The fact that the  $\text{Et}_2\text{O}$  ext. contained considerable P had been interpreted as evidence of a high lecithin content. Examn. of the same material by L. and M. now shows that no phosphatides were present and that the lipid material was chiefly kersin. This is cited as an instance where an uncertain diagnosis on the basis of morphological findings may be definitely decided by chem. analysis. A. W. DOX

The blood sugar and diabetes. ISRAEL S. KLEINER. *J. Am. Inst. Homeopathy* 22, 322-7(1929).—A review with bibliography. JOSEPH S. HEFURN

Blood as a physicochemical system. VIII. Diabetic coma. D. B. DILL, A. V. BOCK, J. S. LAWRENCE, J. H. TALBOTT AND L. J. HENDERSON. Mass. Gen. Hosp. and Harvard Univ., Boston. *J. Biol. Chem.* 81, 551-74(1929); cf. C. A. 22, 2782.—"This paper illustrates the value of systematically studying the interrelation of the important variables in the blood, 3 at a time, and then seeking to coördinate the results into a coherent system. Facts which at first are bewildering and seem inexplicable can be fitted into a consistent pattern. If one is guided by certain established generalizations, chief among which is the mutual dependence of the important variables studied, it is possible in unforeseen ways to evaluate exptl. observations, by discarding those which are inaccurate and using those which are accurate. Thus from a few exptl. observations it has been possible in this instance to synthesize a physicochem. description of blood in diabetic coma, which the authors believe to be not far inferior to the best nomogram based upon full and accurate information." Bibliography and 2 case histories are appended. J. A. KENNEDY

The origin of malarial pigment. W. WARASI. *Arch. Schiffs-Tropen Hyg.* 32, 513-7(1928).—The pigment is not a simple excretion of the parasites which remains in the protoplasm as a nutrient residue. The malaria parasite manufactures its pigment either from assimilated foodstuffs or from body constituents. F. K.

Mercuric chloride as a diagnostic agent for trypanosomiases in camels. S. C. J. BENNETT AND P. A. C. KENNY. Veterinary Research Lab., Khartown. *J. Comp. Path. Therap.* 41, 341-53(1928).—Dil. solns. of  $\text{HgCl}_2$  are reliable in detecting trypanosoma soudanense infection in camels. One drop of serum is added to 1 cc. of 1-20,000 or greater diln. of  $\text{HgCl}_2$ . A pos. reaction is denoted by an opacity within  $\frac{1}{4}$  hr. This is more reliable than the formal-gel test. FRANCES KRASNOW

Some points in the chemical and biochemical side of cancer. ALBERT WILSON. *J. Trop. Med.* 31, 321-6(1928).—Review. FRANCES KRASNOW

Acid-base metabolism. Effects of administration of salt and of restriction of water. LUDWIG SCHOENTHAL. Washington Univ. School of Med., St. Louis. *Am. J. Diseases Children* 37, 244-51(1929).—The administration of NaCl with the feedings of infants, with no restriction of water, results in the following changes in the blood plasma: an increase in the concn. of base chloride; a moderate reduction of bicarbonate; a tendency for the reaction to shift to the acid side, and changes in both directions in water content as indicated by the protein concn. The corresponding urinary changes are: an increase in excretion of fixed base over fixed acid, and a decrease in György's

coeff. A slight or moderate febrile reaction may accompany these changes. The administration of concd. food with restriction of water produces similar changes and, in addn., an increase in serum protein concn. and a marked febrile reaction. E. R. M.

**Chemical changes occurring in the body as a result of certain diseases. IV. Primary pneumonia in children.** DAN C. DARROW AND ALEXIS F. HARTMANN. Washington Univ. School of Med., St. Louis. *Am. J. Diseases Children* 37, 323-34(1929).—The chief changes in the character of the blood plasma which may accompany primary pneumonia in children are: a decrease in the concns. of chloride, bicarbonate and total base; a low f.-p. depression, and a high normal  $p_H$ . The decrease in concn. of electrolyte with no compensatory increase in nonelectrolyte may account for the decrease in osmolar concn. indicated by the f.-p. depression. E. R. MAIN

**Determination of the amounts of base, chloride, free and total acidity in the gastric contents of children on whom gastrostomy had been performed and in the gastric contents of fasting, new-born infants.** JOSEPH STOKES, JR., GEORGE W. STEPHENSON AND THOMAS C. GARRETT. School of Med., Univ. of Penna. *Am. J. Diseases Children* 37, 565-72(1929).—The gastric contents of children on whom gastrostomy has been performed contain little free HCl, have a low total acidity and show a tendency for the concn. of base to exceed that of chloride. The gastric contents of new-born infants may contain from 14.4 to 57 milliequivs. per l. of free HCl, and from 17.4 to 67 milliequivs. per l. of total acid; they may have a concn. of chloride approximating that of the plasma, and a concn. of base much lower than that of the plasma. E. R. M.

**The elimination of oxalic acid in phlorhizin glucosuria.** G. VIALE, L. NAPOLEONI AND D. ROSSELLI. *Arch. sci. biol.* 13, 206 9(1929).—The expts. were made on 3 dogs kept on a const. diet of 40 g. meat per kg. body wt. and water as desired. One week after the diet was used, the urine was collected for 24 hrs. and assayed for oxalic acid. Then phlorhizin, 35 cg. dissolved in a bicarbonate soln., was injected subcutaneously for 3 successive days. The urine was assayed again for oxalic acid and for glucose. The av. amt. of oxalic acid eliminated before the injection of phlorhizin was 12.2 mg.; after the phlorhizin injections it was 12.2 mg. Phlorhizin, therefore, does not modify in any const. manner the amt. of oxalic acid eliminated by dogs kept on a fixed meat diet. PETER MASUCCI

**The diazo test in nephritis.** ROBERT A. KILDUFFE (with ELEANOR G. SPRINGER). Atlantic City Hosp., N. J. *J. Med., Soc. New Jersey* 26, 150(1929).—The diazo test was carried out in various diseases and always found to be neg. in syphilis, diabetes, acute CO poisoning, myocarditis, intestinal obstruction, septic arthritis, fractures, salpingitis, tuberculosis, acute cardiac failure, HgCl<sub>2</sub> poisoning, hydronephrosis, acute appendicitis and cerebral concussion. In the nephritis cases no relation was observed between the degree of nitrogenous retention and pos. diazo reaction. G. SCHWOCH

**The effect of parathyroid hormone and increased calcium metabolism on the growth of tumor tissue.** ALFRED GOERNER AND BENJAMIN G. P. SHAFIROFF. *J. Cancer Research* 12, 294-300(1929).—The effect of parathyroid ext. and increased serum Ca has been studied on the growth of Flexner Rat Carcinomas (F. R. C.) and the Crocker Fund Sarcoma No. 10. The Ca content of the F. R. C. has been increased but no inhibitory effect due to Ca was effected. The growth chart showed the tumor to be rapidly growing, 3 cases of metastases being recorded. The Ca content of Sarcoma No. 10 has not been increased, no difference of growth from the control being recorded. H. G. W.

**The carbohydrate metabolism of tumors. III. The rate of glucolysis of tumor tissue in the living animal.** CARL F. CORI AND GERTY T. CORI. *J. Cancer Research* 12, 301-13(1929); cf. C. A. 20, 238.—The tolerance limit of normal rats for intravenously injected Na *d*-lactate, the lactic acid content of blood and urine being used as an index, was at a rate of infusion of  $95 \pm 5$  mg. of lactic acid per 100 g. of body weight per hr. Rats with tumors weighing from 14.2 to 21% of their body weight showed a marked increase in the lactic acid content of the blood. When the tumors corresponded to less than 10% of the body weight, the lactic acid content of the blood was within normal limits. The intravenous lactic acid tolerance of tumor-bearing rats was decidedly lower than that of normal rats and the decrease in tolerance was fairly proportional to the size of the tumor. The lower tolerance is ascribed to the fact that the tumor produces a certain amt. of lactic acid which adds itself to the amt. of lactic acid which is being infused. By detg. the difference in the lactic acid tolerance between normal and tumor-bearing rats it was possible to ext. the rate of lactic acid production of the tumor tissue in the living animal. The values obtained varied between 570 and 800 mg. lactic acid per 100 g. of fresh tumor per hr. with an av. of 690 mg. The rate of glucolysis of the tumor *in vivo* depends on the blood sugar concn. At a normal blood sugar level of the tumor-bearing animals the glucolysis corresponds to one half the maximal

possible glycolysis of the tumor. The intravenous glucose tolerance of tumor-bearing rats is the same as that of normal rats.

H. G. WELLS

The metabolism of the chorionic epithelium, the maternal decidua and other tissues. W. BLAIR BELL, J. BROOKS AND M. JOWITT. *J. Cancer Research* 12, 369-91(1929).—An investigation of respiration and glycolysis of tissues has shown that the human decidua at full-term and the maternal rabbit mucosa underlying the implantation site show positive  $U$  values defined by Warburg as  $U = Q_M^{N_2} - 2Q_{O_2}$  in connection with which the following terms are defined.  $Q_{O_2}$  (respiration) cu. mm. of O taken up per hr. per mg. dry weight of tissue.  $Q_M^{N_2}$  (aerobic glycolysis) cu. mm.  $CO_2$  produced by glycolysis under aerobic conditions, calcd. for a medium showing no retention of  $CO_2$ , and stated per hr. per/mg. dry weight of tissue.  $Q_M^N$  (anaerobic glycolysis) is an analogous quantity to the above measured under anaerobic conditions. The human chorionic epithelium at full term and the rabbit chorionic epithelium earlier in pregnancy probably have a high glycolytic metabolism and positive  $U$  values. Dila. of the epithelium in the placenta makes it impossible to obtain definite figures for its metabolism. Other workers have not attempted to analyze placental metabolism. A review of the subject of glycolysis shows that positive  $U$  values are not assoc. with malignant tissues only. Various points relating to the subject are discussed.

H. G. WELLS

Physical-chemical observations on the problem of the malignant cell. G. I. ROHDENBURG AND A. BERNARD. *Z. Krebsforsch.* 28, 301-10(1929).—Malignant tissues suspended in certain salt solns. take on less wt. than benign tissue. In the majority of cases malignant cells lose weight if suspended  $1\frac{1}{2}$  hrs. in a salt soln. corresponding to the blood of animals bearing retrogressing tumors. The addn. of colloids to such a salt soln. causes loss of wt. in benign tissues. Analysis of salt solns. after use for suspension of tissue fragments shows no marked changes, beyond that the tumor tissue gives up somewhat less N than normal tissue, and that despite the loss of wt. tumor tissue takes up Na from the soln. and gives off K. Electrodialysis in a simple system shows that the ion migration is not proportional to the total salt content of the dialysis fluids, nor to the relation of the single salts or iqns. The addn. of a colloid to different solns. has a small but distinct action on the migration of ions, sometimes increasing, sometimes depressing. An attempt is made to apply these observations to the behavior of tumor tissues in the body.

H. G. WELLS

The diagnostic value of Botelhos' reaction and Roffo's neutral red reaction in malignant tumors. B. S. ACEVEDO. *Z. Krebsforsch.* 28, 311-5(1299).—Neither reaction is sp. although they give 55-72% pos. reactions, for they give from 9 to 25% pos reactions with non-cancerous serum. They are not cachexia reactions, there being no relation between the condition of the patient and the result of the reaction. There may be a relation to the altered globulin-albumin ratio.

H. G. WELLS

The influence of avitaminosis on inoculated mouse tumors. OTTO THIES. *Z. Krebsforsch.* 28, 338-55(1929).—No definite effects were observed under the conditions of the expts.

H. G. WELLS

Carcinoma, plant growth, surface tension and permeability. J. TRAUBE. *Z. Krebsforsch.* 28, 356-61(1929).—Substances are present in tumors and the blood of tumor patients that affect surface tension and which may be a factor in the growth and behavior of tumor cells. This article consists of a discussion of this factor and of permeability augmentation, and their relation to the effects of radiation and other agents on tumor growth.

H. G. WELLS

Blood-calcium distribution in anaphylaxis in the guinea pig. HERMAN BROWN AND SUSAN GRIFFITH RAMSDELL. Research Inst. Cutaneous Med. *J. Exptl. Med.* 49, 705 9(1929).—The results for total Ca and the membrane-diffusible fraction in the serum of the guinea pig, taken at various intervals during anaphylactic shock, confirm the findings of previous workers that the total Ca is essentially unchanged. The diffusible fraction is considerably increased over that found for the animal similarly treated but not manifesting characteristic symptoms.

C. J. WEST

Precipitable substances of bacilli of the salmonella group. J. FÜRTH AND K. LANDSTEINER. Rockefeller Inst. Med. Research. *J. Exptl. Med.* 49, 727-43(1929); cf. C. A. 22, 986.—Sp. precipitable substances rich in carbohydrates, contg. very little protein and small quantities of a material apparently of fatty nature, have been prepd. from the main serological types of the typhoid-paratyphoid groups. The preps. in their present state of purity do not exhibit very pronounced chem. differences in spite

of serological dissimilarity. In this respect the results differ from those observed with the polysaccharides of pneumococci. The specificity of the precipitin reactions of these substances parallels in a general way the so-called small flaking agglutination. Attempts to sep. different fractions from the active substance serologically by means of pptn. with antibody solns. were on the whole unsuccessful. The differences in resistance to the action of acid and alkali were found to be characteristic for various sp. carbohydrates. C. J. WEST

**Production of partial liver insufficiency in rabbits.** PHILIP D. MCMASTER AND D. R. DRURY. Rockefeller Inst. Med. Research. *J. Exptl. Med.* 49, 745-58(1929).—A rapid and simple method for the production of marked liver insufficiency in rabbits has been described. The changes as concern blood sugar, urea formation and uric acid metabolism would appear to be the same in the rabbit suffering from hepatic insufficiency as in the dog. C. J. WEST

**Total surgical removal of the liver in rabbits.** D. R. DRURY. Rockefeller Inst. Med. Research. *J. Exptl. Med.* 49, 759-64(1929).—Rabbits deprived of the liver in the manner described if given glucose live for varying periods up to 40 hrs. Before death they show the same disturbances as do hepatectomized dogs. They die early, of hypoglycemia, unless provided with sugar. C. J. WEST

## H—PHARMACOLOGY

A. N. RICHARDS

**Influence of ethyl alcohol on the excretion of purine substances.** L. LA GRUTTA. *Riv. patol. sper.* 2, No. 3, 185-96(1927).—Large doses of EtOH cause an increase in the destruction of proteins and nucleins, and hence an increase in the amt. of their decompn. products in the urine. Moderate and small doses reduce the excretion of total and purine N and of P. Immediately after the ingestion of moderate or large doses of alc. a temporary disturbance of the ratio urea N/purine N is observed. B. C. A.

**The hypertensive action of ephedrine.** TATSUKE SUZUKI. *Tohoku J. Exptl. Med.* 12, 87-96(1928).—Ephedrine in dosages of 0.03 g. per kg. body wt. was intravenously injected into rabbits. The av. increase in blood pressure in 18 expts. on 6 normal rabbits was 33 mm. Hg (10-60 mm.); the av. duration of the increase was 35 mins. (6-76 mins.). In a series of 13 expts. on 4 rabbits with cut splanchnic nerves, the av. increase in blood pressure was 15.4 mm. Hg (5-30 mm.), lasting on the av. 8 mins. (1-27 mins.). The blood pressure was lowered in one expt. In a third series of 17 expts. on 5 adrenalectomized rabbits, the blood pressure fell in 3 cases; the av. of the increases was 24 mm. Hg (10-60 mm.), with an av. duration of 23 mins. (1-68 mins.). B. C. B.

**The autonomic nervous system in the regulation of blood sugar.** J. P. ALVAREZ. *Rev. méd. Barcelona* 8, 235-84, 344-63(1927); *Physiol. Abstracts* 13, 310.—Pilocarpine increases the blood sugar, but after adrenalectomy increases the hypoglycemia. Choline chloride causes a fall in blood sugar in man and rabbit, but not in the dog. When the nervous connections between adrenal and liver are destroyed, asphyxia causes a fall in blood sugar, which reaches a min. after 1 hr. Recovery is very slow. H. L. D.

**The action of quinine stovarsolate on Plasmodium falciparum infections.** F. VAN DEN BRANDEN. *Bull. soc. path. exot.* 20, 727-8(1927); *Rev. hyg. méd. prév.* 51, 309.—The action upon the gametes is more marked than quinine and not as active as plasmoquine but action is practically nil against the schizonts. Quinine stovarsolate is better tolerated by the circulatory system than plasmoquine. C. R. F.

**A new treatment of malaria by plasmochine.** F. VAN DEN BRANDEN AND E. HENRY. *Bull. soc. path. exot.* 20, 728-37(1927); *Rev. hyg. méd. prév.* 51, 310.—Plasmochine is a salt of alkylamino-6-methoxyquinoline. It is not a deriv. of quinine. Its administration may sometimes produce tachycardia which disappears after rest. The dose is 0.02 grain thrice daily for 4 days, followed by 4 days of rest, then a repetition of the treatment for 4 more days. Cure is consummated in from 4 to 6 weeks. Plasmochine has no action on the schizonts of *P. falciparum* but it causes the disappearance of gametes from the blood. It also acts similarly on all forms of *P. malariae*. The action on *P. vivax* was not studied. C. R. FELLERS

**Role of the tertiary amine function in the bipiperidine nucleus.** RENE HAZARD AND MICHEL POLONOVSKI. *Compt. rend.* 188, 822-4(1929); cf. *C. A.* 22, 1402.—*Granatoline* prepd. by the demethylation of the N-oxide (*C. A.* 22, 429) exercises a strong hypertensive action which appears to depend upon the peripheral vasoconstriction of the kidney. This action cannot be overcome by adrenaline. The action is equally intense following double suprarenalectomy. If the cardiac vagi are intact, there is an inotropic action and an accentuated negative chronotropic action. Small repeated



doses slightly diminish the amplitude of the heart contractions and slow down their rhythm; the pressure is slightly lowered. Larger doses decrease the excitability of the vagus. *N*-oxy-*N*-methylgranatoline injected intravenously into a dog (dose, several cc.) was practically without effect on the heart. The secondary non-methylated granatoline produced a physiol. action at least equal in intensity to that of the tertiary methylated base, i. e., *N*-methylgranatoline (tervalent N). The passage to the amine oxide (quinquevalent N) greatly decreases and practically nullifies physiol. activity. C. R. F.

**Demonstration of the action of lobeline and carbonic acid on the respiration of man in narcosis.** HERMAN FRANKEN. Univ.-Frauenklinik, Freiburg. *Klin. Wochschr.* 8, 439-42(1929).—A method is described for the graphic representation of respiration in man. The intramuscular injection of the customary dose of lobeline—0.01 g.—is not very effective as a respiratory stimulant. This is no reflection upon the effectiveness of this dose as a respiratory initiator in the new born. Lobeline is very effective in the new born. The action on the respiratory center is instantaneous when lobeline is injected intravenously. A dose of 0.0015 g. acts for 1 min. A single intravenous injection of 0.003 g. stimulates the vagus and leads to strangulation, coughing and intestinal contraction. These symptoms have been misinterpreted as signifying an awakening from the narcosis. CO<sub>2</sub> in concns. of 2-8% is a powerful respiratory stimulant. It can be administered at this level indefinitely. The action is persistent. MILTON HANKE

**The biological inactivity of ergosterol peroxide.** WOLFGANG HEUBNER AND FRIEDRICH HOLTZ. *Klin. Wochschr.* 8, 456-7(1929).—Ergosterol peroxide, irradiated or otherwise, does not possess antirachitic properties and has no effect upon the arteries.

MILTON HANKE

**The center that is acted upon by analgetics.** H. HOFF AND P. WERMER. *Klin. Wochschr.* 8, 488-91(1929).—Atophanyl or pyramidone reduces the sensitiveness to pain on both sides of the body in normal individuals and in most persons that are afflicted with nervous disorders. These analgetics do not elevate the pain threshold on the affected side in persons with a diseased thalamus, but show their normal action on the unaffected side. Morphine is uniformly effective in the latter cases. Pyramidone and atophanyl act upon the thalamus.

MILTON HANKE

**Poisoning with dimethyl sulfate.** H. STROTHMANN. *Klin. Wochschr.* 8, 493-6(1929).—Symptoms, prognosis, treatment and case reports are given. Poisoning (more properly called corrosion) is usually due to the vapor. The mucous membranes are the ones affected. The symptoms may vary from a slight conjunctivitis and a raw throat to a complete asphyxia due to a swelling of the bronchi. The active agent is probably the H<sub>2</sub>SO<sub>4</sub> that is produced from the (CH<sub>3</sub>)<sub>2</sub>SO<sub>4</sub> by hydrolysis. MILTON HANKE

**Carbohydrate metabolism and the catabolism of the glucose molecule.** I. ERICH SCHNEIDER AND ERNST WIDMANN. *Klin. Wochschr.* 8, 536-41(1929).—Dihydroxyacetone, injected intravenously into rabbits, is oxidized immediately. The reducing power and the lactic acid content of the blood are not increased. The respiratory quotient goes from 0.81 to 0.92. Lactic acid, injected intravenously, acts primarily as an acid and reduces the alkali reserve. The animal dies if the amt. injected exceeds 350 mg per kg. body wt. A single, sub-lethal dose leads to an immediate but transient elevation in the lactic acid content of the blood. Blood sugar is not affected. Repeated sub-lethal doses elevate the lactic acid content of the blood and, after a time, the blood sugar is also markedly increased. The lactic acid is, at first, synthesized to glycogen. The glycogen storage capacity of the liver is, however, limited so that, after a time, glucose is produced from the glycogen and appears in the blood. Methyl glyoxal is highly toxic. The lethal dose is 0.3 g. per kg. rabbit. The lactic acid content of the blood rises instantaneously after the injection of methyl glyoxal. Methyl glyoxal is converted instantaneously into lactic acid. The animal dies if the amt. of lactic acid produced is sufficiently high. Repeated sub-lethal doses of methyl glyoxal lead first to lactic acid formation, then to glycogen formation, etc., as in the case of lactic acid.

MILTON HANKE

**Chronic mercury poisoning.** ARTHUR HERTZ. *Klin. Wochschr.* 8, 541-4(1929).—Extensive bibliography of the recent literature. Hg was always found in the feces or urine of persons whose teeth were filled with amalgam. The feces always contain more than the urine. Curiously, however, 11 out of 15 patients that did not have amalgam fillings and had not, to their knowledge, ever been in contact with Hg, gave a pos test for Hg in the feces. Symptoms of poisoning were never noted in any of these cases. (Ag amalgam could hardly be a source of Hg. Most dentists, however, compound their amalgam by guess rather than by wt. and squeeze out the excess of Hg. The amalgam filling would, in such cases, be a source of Hg for a considerable period time.)

MILTON HANKE

The therapeutic influence of metal salts on infectious diseases. H. LYDING. *Klin. Wochschr.* 8, 553(1929).—Walburn (*C. A.* 21, 963) claims that 90% of infectious diseases in mice can be cured by administering CsCl. I. finds that CsCl, Hg(CN)<sub>2</sub>, ZnO and CdCl<sub>2</sub> have no effect upon mouse infections. MnCl<sub>2</sub> has a beneficial action upon poisoning due to diphtheria or tetanus toxin. MILTON HANKE

Genesis of the eosinophilia associated with ascaris infection and eventually also with other diseases due to worms. I. The action of aliphatic aldehydes. W. BORCHARDT. *Klin. Wochschr.* 8, 591-4(1929).—Very small doses of simple aliphatic aldehydes (excepting AcH) give rise to an eosinophilia. Larger doses lead to hyperneutrophilia. These aldehydes are normal constituents of ascaris and other worms. M. H.

Comparative effect of adrenaline on the blood pressure and intestinal motility in the dog. C. A. DRAGSTEDT AND J. W. HUFFMAN. *Am. J. Physiol.* 85, 129-34(1928); *Physiol. Abstracts* 13, 466-7. E. H.

Investigations on the toxicity of Ascaris. TAKEO SAKAGUCHI. Keiō Univ. *Arch. Schiffs-Tropen Hyg.* 32, 517-8(1928). FRANCES KRASNOW

Treatment of African sleeping sickness with germanin (Bayer 205). Critical discussion of results and proposals. MARTIN MAYER. Institut für Schiffs- und Tropenkrankheiten zu Hamburg. *Arch. Schiffs-Tropen Hyg.* 32, 528-42(1928).—The drug is very beneficial for early cases. FRANCES KRASNOW

Results of therapeutic research with plasmochin in Bulgarian villages suffering from malaria. A. KIR DRENOWSKY. *Arch. Schiffs-Tropen Hyg.* 32, 575-80(1928).—Patients take plasmochin more readily than quinine. The former drug is effective in daily dose of 0.01 g. per 10 kg. body fat. It is especially valuable in quinine resistant cases. Plasmochin seems to have a specific action on the sexual form of all malarial parasites, which within 3 days after treatment disappear from the peripheral blood. F. K.

The question of secondary effects due to phasmochine. O. FISCHER AND G. RHEINDORF. Inst. Schiffs- und Tropenkrankheiten zu Hamburg. *Arch. Schiffs-Tropen Hyg.* 32, 594-7(1928).—No untoward effects have thus far been noticed. F. K.

Plasmochine as an active antimalaria remedy. L. I. LEISERMANN. Ukrainischen Inst. Protozoenforchung. *Arch. Schiffs-Tropen Hyg.* 32, 598-605(1925).—Cases are too few for final conclusion. In acute malaria, phasmochine brings about rapid cure. FRANCES KRASNOW

Distribution of arsenic in the body after repeated poison potions. S. SCHÖNBERG. Institut für ger. Med. Basel. *Deut. Z. ges. ger. Med.* 13, 111-4(1929).—Arsenic was found in the liver, kidneys, brain, skin and fur of the exptl. animals (rabbits). F. K.

The use of intramine in therapeutics. HERBERT H. HODGSON. Tech. College, Huddersfield. *J. Comp. Path. Therap.* 41, 164-5(1928).—Correction in regard to credit due to priority. FRANCES KRASNOW

Phytopharmacological and photopharmacological studies on leprosy blood serum. DAVID I. MACHT. Johns Hopkins Univ. *J. Philippine Islands Medical Assoc.* 8, 523-4(1928).—The serum of leprosy sufferers is markedly toxic for *Lupinus albus*. Exposure to ultra-violet irradiation did not detoxify it. FRANCES KRASNOW

Omnadin in whooping cough. RAYM. OZYNULA. *J. Philippine Islands Med. Assoc.* 9, 61-3(1929).—Good results in 60 cases. FRANCES KRASNOW

Granuloma venereum—its diagnosis and treatment. Notes of fifteen cases treated with "stibenyli" Heyden in British Guiana. GEORGE GIGLIOLI. *J. Trop. Med.* 31, 245-54(1928).—Stibenyli Heyden is a powerfully active drug for the treatment of granuloma. It is efficient in cases resisting tartar emetic, brings about a rapid cure with courses of 6 to 10 intravenous injections on alternate days and is well tolerated. FRANCES KRASNOW

Eserine and the thyroid apparatus. J. RÉGNIER, D. SANTENOISE, P. VAVÉ AND H. VERDIER. *Bull. acad. méd.* [3], 101, 109(1929).—The gland is first contracted, then expanded, and later contracted again. A. E. MEYER

Colloidal copper morrhuate in the treatment of tuberculosis. J. MOUZON. *Presse méd.* 1929, 358-9.—Report of results obtained with colloidal Cu morrhuate in South America. A. E. MEYER

The association of iodine and sulfur in therapeutics. M. ARMINGEAT. *Rev. méd.* 45, 967-9(1928).—S and I are used against rheumatism and sclerosis; separately they have little effect. Their action is a supplementary one. S must be applied in compd. but not oxidized; a compd. of S with I gives the best results. A. E. MEYER

The effect of glycooll and of *d*-glutamic acid on the non-fermentable reducing substances of the blood. FOLKE NORD. *Acta Med. Scand.* 70, 277-85(1929).—The reducing substances in the blood of rabbits were detd. after parenteral administration of glycooll and glutamic acid. The blood sugar was detd. by Folin's method either

in the usual way, or by substituting a 10% yeast suspension for the water and leaving the mixt. of blood and suspension to stand 10 mins. before adding the other reagents. In the normal rabbit there is 29 mg. % residual reducing substance (calcd. as glucose). Following an injection of 1-4 g. glycocoll per kg. of body wt. the residual reduction is on the av. 24 mg. % higher than before. After the injection of 2-3 g. glutamic acid per kg. body wt. the residual reducing power of the blood is practically unchanged although the total reducing power is enormously increased. Both amino acids, therefore, administered intravenously or subcutaneously give rise to sugar. S. M.

The carbohydrate balance of starving rats following insulin and adrenaline injections. CARL F. CORI AND GERTY T. CORI. State Inst. for Cancer Research, Buffalo, N. Y. *Biochem. Z.* 206, 39-55(1929).—Between 24 and 48 hrs. of fasting the total glycogen content of rats diminishes 22 mg. per 100 g. The constancy of the glycogen is attributed to the fact that fat oxidation furnishes the energy necessary to resynthesize the lactic acid formed in muscular activity. The av. respiratory quotient of rats fasting 24 hrs. is 0.715, and is not altered through the injection of adrenaline, although the  $O_2$  consumption is increased corresponding to the av. increase of 17.3% in the calories. Adrenaline thus increases the heat production of fasting rats at the expense of fat oxidation. Following insulin injections the respiratory quotient is somewhat raised while the  $O_2$  consumption is unchanged if the dose is carefully chosen. An overdose of insulin causes first a rise and later a fall in the  $O_2$  consumption. Three hrs. after an adrenaline injection (0.02 mg. per 100 g.) the av. muscle glycogen is 57 mg. less per 100 g. while the liver glycogen is 36 mg. higher. The increase in liver glycogen is interpreted as resulting from a synthesis of lactic acid derived from muscle glycogen. The muscle glycogen must, therefore, be considered an important, though indirect source of blood sugar. It is suggested that the adrenaline secretion makes muscle glycogen available to the organism in the form of blood sugar which is especially important for the fasting condition. Following insulin injection the muscle glycogen diminishes 34 mg., yielding a part of the total oxidized carbohydrate (56 mg.), but the liver glycogen already very low does not undergo any significant alteration. It is not to be expected that the carbohydrate combustion will be markedly raised in fasting animals whose liver glycogen is low, since insulin increases preferentially the consumption of blood glucose, or indirectly of liver glycogen in the peripheral tissues. S. M.

The mechanism of synthalin action. GUNNAR AHLGREN. *Biochem. Z.* 206, 99-108(1929).—Synthalin does not affect the methylene blue reduction reaction of animal tissues as does insulin, which alone slows the reaction and in combination with glucose causes acceleration. Synthalin, on the contrary, accelerates the reaction but in combination with glucose produces inhibition. This suggests that insulin and synthalin produce their effects at different points in the metabolic mechanism. A combination of synthalin with insulin produces no effect or an inhibition like synthalin + glucose, whereas all three substances together accelerate the methylene blue reaction even more than insulin + glucose alone. S. MORGULIS

Experimental studies on the insulin reaction. J. M. MACGILLIVRAY AND RICHARD WAGNER. Univ.-Kinderklinik, Wien. *Biochem. Z.* 206, 136-49(1929).—In diabetic children the blood-sugar curve, upon the administration of 10 insulin units, falls slower and to a much smaller extent when the patients are on a carbohydrate-poor and fat-rich diet than when their diet is one with a high-carbohydrate and low-fat content. S. MORGULIS

Comparative studies on the binding of some narcotics by lipid-rich and lipid-poor tissues. S. LOEWE AND P. MOLJAWKO-WYSSOTZKI. *Pharmakolog. Inst., Dorpat. Biochem. Z.* 206, 194-211(1929).—The adsorption of chloral and bromal hydrates by nerve and muscle tissue was studied and certain corrections were found necessary because the nerve tissue swelled while the muscle tissue tended to shrink. The use of salt soln as a solvent for the narcotics did not prevent the swelling phenomenon. Furthermore, an equil. state was established only after several days. Brain tissue binds more of the narcotics than muscle, though the difference is much less than a schematic lipid-selectivity would make one expect. S. MORGULIS

Observations on arsine poisoning. ERICH MEYER AND WOLFGANG HEUBNER. *Biochem. Z.* 206, 212-22(1929).—No methemoglobin could be found in the blood of the organism dead from arsine poisoning. The connective tissue appeared in various places filled with methemoglobin. The As content of the liver and kidney was 0.1 g., but the concn. in the organ was 10 mg. % in the kidney, and 3 mg. % in both liver and spleen. In a case of very severe poisoning the blood contained on the second day 13 mg. % As but the blood cells were free from As. The blood contained no methemoglobin while the urine contained much hemoglobin and methemoglobin. However, as soon

as the blood was exposed to the air for a few minutes the hemolyzed fluid portion showed the presence of methemoglobin but the cells were still free from this. Treated with arsine *in vitro* the corpuscles quickly acquire methemoglobin. The regular symptoms of the poisoning are painful sensation in the upper abdominal and lower chest region, vomiting and collapse. The urine contains albumin and granular casts even when there is no hemoglobin; also peculiar white cells appear in the blood. The As is excreted in amts. of 0.5-2.0 mg. per day, but is eliminated only partly. S. M.

Relation between the physiological action and the chemical constitution of 2-methylisoquinoline derivatives. T. TAKASE AND K. TERAUCHI. Tohoku Imp. Univ. Japan. *J. Pharm. Soc. (Japan)* 48, 978-81(1928).—2-Methylisoquinoline derivs., without an aromatic group on the side chain, whether or not they give phenylethylamine derivs. on cleavage, have similar physiol. action. The degree of physiol. action depends upon their chem. constitution. F. I. NAKAMURA

The comparative action of hypertonic solutions of the chlorates and chlorides of potassium, sodium, calcium and magnesium. JOHN I. ULRICH AND VLADIMIR A. SHTERNOV. Plant Research Lab., New Jersey. *J. Pharmacol.* 35, 1-15(1929).—The compds. were given *per os* and intraperitoneally to rats and guinea pigs. With each cation the chlorides were more toxic than the chlorates. The order of toxicity of the various compds. was as follows: Given *per os* or intraperitoneally  $\text{Ca}(\text{ClO}_3)_2 > \text{Mg}(\text{ClO}_3)_2 > \text{KClO}_3 > \text{NaClO}_3$ ; given intraperitoneally  $\text{MgCl}_2 > \text{CaCl}_2 > \text{KCl} > \text{NaCl}$ ; *per os*  $\text{KCl} > \text{MgCl}_2 > \text{CaCl}_2 > \text{NaCl}$ . No differences in toxicity were observed between KCl and  $\text{KClO}_3$ , or between NaCl and  $\text{NaClO}_3$ , when given intravenously to cats and rabbits. C. RIEGEL

The effect of drugs on the secretion of uric acid in the fowl. O. S. GIBBS. Dalhousie Univ., Nova Scotia. *J. Pharmacol.* 35, 49-62(1929).—The excretion of uric acid in the urine of the fowl is a good criterion of renal function because the hourly output is const.; any disturbance of renal function such as clamping of the ureters leads to prompt increase in uric acid in the blood; there is no storage of uric acid in the kidney, as evidenced by the fact that the amt. of uric acid secreted after clamping of the ureters is the same as before, that the blood uric acid rises immediately on clamping the ureters and that injected uric acid is recovered promptly in the urine. Drugs which act on the autonomic nervous system (atropine, pilocarpine, adrenaline, physostigmine) cause no change in blood uric acid content, or in mg. uric acid excreted, indicating that secretory processes in the kidney are not controlled by a nervous mechanism. That there is no relation between uric acid excretion and water excretion is shown by the fact that pituitrin decreases the vol. of urine while the amt. of uric acid excreted is increased, and that cinchophen causes no change in vol. of urine, while the output of uric acid is markedly decreased. This supports Mayrs' suggestion that uric acid is secreted as an active process, and not by a process of filtration-reabsorption. C. R.

Action of certain heterocyclic compounds on the autonomic nervous system. REID HUNT AND R. R. RENSHAW. Harvard Med. School and New York Univ. *J. Pharmacol.* 35, 75-98(1929).—The effect on blood pressure in cats and the fatal dose for mice of the following compds. are reported: (carboxymethyl)pyridinium bromide, (carbethoxymethyl)pyridinium bromide, (carbethoxymethyl)- $\alpha$ -picolinium bromide, (carbethoxymethyl)lepidinium bromide, (acetoxymethyl)pyridinium chloride, nicotinic acid hydrochloride, nicotinic acid Me ester,  $\beta$ -carbomethoxy-*N*-methylpyridinium iodide (cesol iodide),  $\beta$ -carbomethoxy-*N*-methyl-*N*-ethylpiperidinium bromide (neu-cesol), arecoline hydrobromide (*N*-methyltetrahydronicotinic acid Me ester), (carbethoxymethyl)piperidinium bromide, (carbethoxymethyl)methylpiperidinium iodide, (carbethoxymethyl)ethylpiperidinium bromide, acetoxyethylmethylpiperidinium iodide, diethylpyrrolidinium bromide, *N*-methyl- $\alpha$ -pyridone hydrobromide, *N*-ethyl- $\alpha$ -pyridone hydrobromide, *N,N*-dimethylhexamethylene ammonium bromide. The results indicate that the muscarine action (stimulation of parasympathetic nerves, a vasodilatation which is abolished by atropine) is independent of the presence of a quaternary N atom; addn. of an Ac group (as in acetoxyethylmethylpiperidinium iodide) or esterification (carboxymethylpyridinium bromide to carbethoxymethylpyridinium bromide) increases muscarine action; addn. of a Me group in the *o*-position to the N atom greatly reduces toxicity and physiol. activity (as in carbethoxymethyl- $\alpha$ -picolinium bromide); complete reduction of the ring (as in formation of carbethoxymethylpiperidinium bromide) causes lowering of toxicity and physiol. activity. C. RIEGEL

Some effects of derivatives of betaine amide and of choline ethers on the autonomic nervous system. REID HUNT AND R. R. RENSHAW. Harvard Med. School and N. Y. Univ. *J. Pharmacol.* 35, 99-128(1929).—The effect on blood pressure of cats, either anesthetized or with brain and upper cord destroyed, and the toxicity for mice, of the

following compds. is reported: betaine chloride, carbamylmethyltrimethylammonium chloride, *N*-methylcarbamylmethyltrimethylammonium chloride, *N*-ethylcarbamylmethyltrimethylammonium chloride, *N*-propylcarbamylmethyltrimethylammonium chloride, *N*-butylcarbamylmethyltrimethylammonium chloride, *N*-phenylcarbamylmethyltrimethylammonium chloride, *N*-*p*-hydroxyphenylcarbamylmethyltrimethylammonium chloride, *N*-*o*-methoxyphenylcarbamylmethyltrimethylammonium chloride, *N*-*p*-methoxyphenylcarbamylmethyltrimethylammonium chloride, *N*-*o*-ethoxyphenylcarbamylmethyltrimethylammonium chloride, *N*-*p*-ethoxyphenylcarbamylmethyltrimethylammonium chloride, *N*-*p*-tolylcarbamylmethyltrimethylammonium chloride, *N*- $\alpha$ -naphthylcarbamylmethyltrimethylammonium chloride, *N*- $\beta$ -naphthylcarbamylmethyltrimethylammonium chloride, carbipiperidinotrimethylammonium chloride, carbureidomethyltrimethylammonium bromide, carbphenylureidomethyltrimethylammonium bromide, phenoxyethyltrimethylammonium bromide, phenoxypropyltrimethylammonium bromide, dimethylphosphatoethyltrimethylammonium chloride, choline sulfuric acid ester, *N*-phenylcarbamylmethyltri-*i*-amylammonium bromide. When a phenyl group was substituted in the amide group of betaine amide (carbamylmethyltrimethylammonium chloride to *N*-phenylcarbamylmethyltrimethylammonium chloride) the muscarine action (fall in blood pressure which was prevented by a small dose of atropine and which occurred after a large paralyzing dose of nicotine) diminished, and the stimulating nicotine action (rise in blood pressure in a pithed and atropinized animal, which was prevented by a large dose of nicotine) increased. Substitution of a phenyl group in betaine ethyl ester or in choline also abolished muscarine action and in the latter compd. increased the blood-pressure-raising action. When the side chain was lengthened (phenoxyethyltrimethylammonium bromide to phenoxypropyltrimethylammonium bromide) nicotine action diminished. When a substituted phenyl group (as hydroxyphenyl, methoxyphenyl or ethoxyphenyl) was introduced (*N*-phenylcarbamylmethyltrimethylammonium chloride to *N*-*p*-hydroxyphenylcarbamylmethyltrimethylammonium chloride) the nicotine action was diminished or abolished, but muscarine action did not return. Compds. with substituted phenyl groups were more toxic than the phenyl deriv. When the H of the amide group in betaine amide was substituted by a Me (and to a less extent by an Et) group, or by a piperidino or carbureido group, muscarine action increased, while if the Me group was substituted in the methylene group of the esters of betaine the muscarine action diminished. Toxicity was parallel to increase in muscarine action. When a Ph group was substituted in the methylene group of betaine esters the muscarine action was depressed, but the stimulating nicotine action was not increased as it was by substituting the Ph group in the amide group of betaine amide. Most of the compds. had a paralyzing nicotine action. C. RIEGEL.

Changes in the tonicity of smooth muscle produced by toxins of *Ascaris lumbricoides*. CHESTER A. HERRICK AND FREDERICK E. EMERY. Univ. of Wisc. *J. Pharmacol.* 35, 129-41(1929).—Segments of intestines of rats, guinea pigs, cats and rabbits were placed in a bath of Locke's soln. and contractions recorded. To the bath were added small quantities of exts. prepd. from *Ascaris lumbricoides* of the pig. The exts. were made by treating either whole worms, various organs or dried worms, with water or physiol. saline soln. Very small quantities of the exts. (0.05 cc. or 5 mg. of dried material) caused increased tonus of the muscle and usually an increase in rate of contraction. Large amts. up to 600 times the smaller dose did not cause paralysis, but after the 1st addn. response of the muscle decreased. Washing with fresh Locke's soln. restored the original sensitivity. The rat intestine was the least sensitive, guinea pig the most. There was little difference in the intestine of cat or rabbit. Uteri of rabbits and cats gave the same type of response as intestinal segments. C. RIEGEL.

Quantitative measurements on the dilatation of pial blood vessels after the administration of nitrites in dogs. CHAUNCEY D. LEAKE, A. G. KAMMER AND J. B. HIRZ. Univ. of Wisc. *J. Pharmacol.* 35, 143-6(1929).—Intravenous injections of alc. solns. of glyceryl trinitrate were made into trephined anesthetized dogs. The area of the brain under observation was photographed before the injection and after at a time when the fall in blood pressure was at a max., and the size of the blood vessels measured on the photographs. The increase in size was 14-40% (av. 21%). An increase in the no. of vessels visible was noticeable after injection. C. RIEGEL.

The employment of strontium thioacetate as an antidote in poisoning by mercuric chloride. CHAS. C. HASKELL AND J. C. FORBES. Medical Coll. of Va. *J. Pharmacol.* 35, 147-53(1929).—Dogs were given HgCl<sub>2</sub> intravenously or orally followed by Sr thioacetate. In every instance the supposed antidote shortened the time of survival. Sr thioacetate alone, given intravenously, caused marked gastrointestinal disturbances. C. RIEGEL.

Some relative physiological properties of certain new 5,5-dialkyl- and 1-aryl-5,5-dialkylbarbituric acids. AXEL M. HJORT AND ARTHUR W. DOX. *J. Pharmacol.* **35**, 155-64(1929); cf. *C. A.* **22**, 1626.—The anesthetic actions of 5,5-dialkylbarbituric acids (5,5-ethylamyl, 5,5-diamyl, 5,5-ethyltetrahydrofurfuryl, and 5,5-dibenzyl derivs.), and of 1-aryl-5,5-dialkylbarbituric acids (1-phenyl-5,5-diethyl, 1-*p*-tolyl-5,5-diethyl, 1-*p*-anisyl-5,5-diethyl, 1-*p*-phenetyl-5,5-diethyl, 1-*p*-chlorophenyl-5,5-diethyl, 1-*p*-bromophenyl-5,5-diethyl, 1-phenyl-5,5-ethylpropyl, 1-phenyl-5,5-ethylbutyl, 1-phenyl-5,5-ethylisobutyl, 1-phenyl-5,5-ethylisoamyl) were studied on mice, the drugs being given intraperitoneally. Of the aryl derivs. all except 1-phenyl-5,5-ethylbutylbarbituric acid were obtained in cryst. form. The results were compared with the action of 5,5-ethylisoamylbarbituric acid, which had a min. anesthetic dose of 1.3-1.5 mg. per 20 g. and a M. L. D. of 3.75, the ratio of the 2 being 1:2.9. Of the 4 dialkyl derivs. only the ethylamyl deriv. was equal to the isoamyl deriv. in potency, the M. A. D. being 1.75-2.0 mg. per 20 g., the M. L. D. 4 mg. and the ratio 1:2.5. The other 3 derivs. were unsatisfactory because of a high M. A. D. and development of convulsions and paraplegia. None of the 1-aryl derivs. of 5,5-diethylbarbituric acid was of value as an anesthetic. All of the 1-phenyl 5,5-dialkyl compds. had higher M. L. D. and lower M. A. D. than the corresponding 5,5-dialkyl compds., the most favorable as an anesthetic being 1-phenyl-5,5-ethylbutylbarbituric acid with M. A. D./M. L. D. 1:15. 1,3-Diphenyl-5-ethylbarbituric acid and the *p*-phenetylmonouride of ethylbutylmalonic acid were found to have no anesthetic action. C. RIEGEL

The effect of peptone upon the hepatic veins in the dog. J. P. SIMONDS AND W. W. BRANDES. Northwestern Univ. *J. Pharmacol.* **35**, 165-70(1929).—Liver removed from dogs was placed in a closed box having inflow and outflow tubes, and an opening at the top for connection with a tambour to record changes in pressure in the chamber, and hence changes in liver vol. The outflow tube was connected with a manometer so that changes in perfusion rate could be recorded. Oxygenated defibrinated blood was used as the perfusion fluid. When the vol. and outflow became const., 0.2 to 1.0 g. Witte's peptone was introduced into the inflow tube. Perfusion pressure was kept const. throughout the expt. When perfusion was made through the portal vein, the vol. of the liver increased and the outflow decreased  $\frac{1}{2}$ , after peptone. When perfusion was made through the hepatic veins both liver vol. and outflow decreased after peptone was introduced. Conclusion: Peptone has a specific effect on the hepatic veins, causing an obstruction, probably the result of constriction. C. RIEGEL

The use of magnesium as an aid in anesthesia. ISAAC NEUWIRTH AND GEORGE B. WALLACE. N. Y. Univ. *J. Pharmacol.* **35**, 171-87(1929).—MgSO<sub>4</sub> was given subcutaneously to dogs in doses of 0.25-2.7 g. per kg. When the serum Mg rose above 5 mg. per 100 cc. the animal showed signs of depression, and these symptoms of depression increased with increasing size of dose (hence increasing serum Mg) until complete anesthesia was obtained with a serum Mg of 19.8 to 23.2 mg. per 100 cc. Serum Ca was sometimes decreased. Dogs given Mg lactate or rabbits given MgBr<sub>2</sub> by stomach tube showed no signs of anesthesia, and the Mg of the serum did not increase above normal. Dogs given by rectum a mixt. of Mg lactate, mineral oil and ether, or of MgSO<sub>4</sub>, Mg stearate, cottonseed oil and ether, showed no increase in serum Mg, nor was an increase in serum Mg noted in any of 3 patients given by rectum an aq. soln. of MgSO<sub>4</sub> (8 g.), morphine sulfate, chloral hydrate and glucose. In obstetrical analgesia 2 or 3 intramuscular injections of 2 cc. of 50% MgSO<sub>4</sub> failed to increase the Mg in the serum above 3 mg. Conclusion: The addn. of MgSO<sub>4</sub> to colonic anesthesia mixts., or its use in obstetrical analgesia in the doses advised, is useless. C. RIEGEL

Sterilizing action of repeated, fractional doses of arsphenamine in experimental syphilis. CARL VOEGTLIN. Hygienic Lab., U. S. Public Health Service. *J. Pharmacol.* **35**, 189-92(1929).—Rabbits infected with *T. pallidum* could be sterilized by repeated fractional doses of arsphenamine. C. RIEGEL

Studies on compensatory hypertrophy of the thyroid gland. VIII. A comparison between the effect of administration of thyroxine, thyroid and anterior pituitary substance on the compensatory hypertrophy of the thyroid gland in the guinea pig. LEO LOEB. Wash. Univ. Med. School. *Am. J. Path.* **5**, 71-8(1929); cf. *C. A.* **20**, 2201.—The inhibiting effect of feeding anterior pituitary substance on compensatory hypertrophy of the thyroid gland previously found by Loeb and Kaplan (*J. Med. Research* **44**, 557 (1924)) is confirmed. Anterior pituitary substance, thyroid substance and thyroxine all produce similar effects, not only preventing compensatory hypertrophy of the thyroid gland but also tending to produce changes in the gland that signify a resting condition. The anterior pituitary ext. is probably somewhat less potent than the others. IX. The influence of variations in size of the remaining part of the gland, in mode of adminis-

tration and in quantity of potassium iodide, on the hypertrophy of the thyroid in the guinea pig. *Ibid* 79-86.—Notwithstanding complicating factors, which are listed, it is probable that the administration of KI intensifies rather than diminishes compensatory hypertrophy. This is true even if only  $\frac{1}{4}$  of one lobe is left behind, and also whether the I is fed or injected intraperitoneally. F. B. SEIBERT

The effect of intraperitoneal injection of potassium iodide on the proliferative activity of the thyroid gland in guinea pigs. JACOB RABINOVITCH. Wash. Univ., Med. School. *Am. J. Path.* 5, 91-7(1929).—The intraperitoneal injection of KI for 10 days causes a very rapid increase in proliferation of the thyroid epithelium, as evidenced by the great increase in the no. of mitoses observed at this time. The increase is greater the larger the amt. of KI administered, within the range of the doses used. In these changes there is a characteristic difference from the corresponding changes in guinea pigs fed with KI. F. B. SEIBERT

Fate of acetylcholine in the blood. G. VIALE AND J. M. SONCINI. *Physiol. Inst. in Rosario. Arch. ges. Physiol.* (Pflüger's) 221, 594-8(1929); cf. *C. A.* 23, 646.—Acetylcholine and vagus substance are probably not identical. G. H. SMITH

The toxicity of thallium sulfate. J. C. MUNCH. *J. Am. Pharm. Assoc.* 17, 1086-93(1928).—Rats were fed with  $Tl_2SO_4$  and the M. L. D. was detd. as 0.0250 g. per kg. of body wt. This is about the same toxicity as strychnine for the rat. Tl is a certain but not a rapid rat poison. The M. L. D. for rabbits intravenously is about 0.025 g. per kg. It is toxic to children in doses of 0.008 g. per kg., and toxic symptoms have developed with half that dosage. Tl affects the sympathetic nervous system, causing alopecia, pains in the muscles and nerves of the legs, and disturbances of the endocrine glands, particularly the ovaries or testicles. L. E. WARREN

An unusual factor influencing action of some drugs on smooth muscle. DAVID I. MACHT. *J. Am. Pharm. Assoc.* 17, 1192(1928).—The tests consisted in suspending a healthy *vas deferens* freshly dissected from a rat in oxygenated Locke's soln. at 37-8° and recording its normal contractions. The activity with standard adrenaline soln. is first observed. After washing the organ, it is again tested with a soln. of a glandular product, e. g., corpus luteum. Marked contraction of the organ is caused by corpus luteum but it was observed that the same quantity of ext. did not always cause the same amt. of contraction on organs from different animals. Further study demonstrated that the *vas deferentia* of animals which had been kept in proximity to female rats and therefore in a continuous state of sexual excitement were more sensitive than were the organs of animals which had been kept far away from females for several weeks preceding the expts. L. E. WARREN

The effect of histamine on the secretion of gastric juice. F. GALLART MONES, JACINTO VILARDELL AND PEDRO BABOT. *Anales acad. med.-quirurg. españ.* 14, 907-8(1927); *Ber. ges. Physiol. exptl. Pharmacol.* 46, 231.—One mg. histamine (1:1000) causes no unpleasant symptoms when given to fasting subjects. Only transitory appearances were noted, as congestion of the face, decided vaso dilatation of the conjunctiva, fall of the arterial pressure and sometimes pain in the epigastrium. R. C. W.

The effect of histamine on the secretion of gastric juice. MOGENA. *Anales acad. med.-quirurg. españ.* 14, 683-707(1927); *Ber. ges. Physiol. exptl. Pharmacol.* 46, 230, cf. preceding abstr. and *C. A.* 22, 1804.—Intravenous injections of histamine have no effect on the secretion of gastric juices. The symptoms of peripheral vasodilatation were quickly removed by 0.25 mg. adrenaline. Subcutaneous injections of 0.5-1.0 mg. in 1 cc.  $H_2O$  decreased the amt. of gastric juice. The amt. of acid did not exceed 3.5% and after 250 cc. of tea was below 2%. The action of histamine was studied in cases of peptic ulcer, carcinoma, achlorhydria, colitis, pulmonary tuberculosis and gall stones. R. C. WILLSON

The parenteral ingestion of nitrogen and the elimination of nitrogen through the bile. ARNALDO BIASOTTI. Univ. Rome. *Arch. biol.* 5, 43-54(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 45, 783.—Witte's peptone in sterile NaCl solns. caused no local irritation when injected into dogs with biliary fistulas. The amino acid N of the bile at first showed a slight increase but later sank; the highest elimination was 0.00076 g. per kg. per hr.; the later av. was 0.0005. Protein injections are not injurious to either man or the dog, as the injected proteins decomp., as they do in the gastrointestinal tract. The parenteral addn. of peptone is not injurious when it does not exceed 0.3 g. per kg., the kidneys being intact. R. C. WILLSON

Changes in the secretion and motility of the stomach through the influence of insulin and synthalin. LUIS G. BUSTAMANTE. Hosp. gen., Madrid. *Arch. endocrinol. y nutric.* 6, 295-333(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 45, 791.—In a series of 29 cases which received 10 units insulin, 23 showed increased HCl, 3 a decrease

and 3 no change. Of 20 cases receiving insulin and 1 mg. atropine, there was 1 with an increase in HCl, 13 with decreases and 6 with no changes. Synthalin (25 mg.) caused an increase in 2 cases, a decrease in 4 cases and no change in 4 cases. Motility was studied fluoroscopically, 7 of 8 cases showing an increase after insulin. After insulin-atropine the motility was unchanged in 2 cases and decreased in 1 case. R. C. WILLSON

**The importance of the placenta for the neutralization of poisons.** G. DE LAURETIS AND S. MARTINES. Univ. Bologna. *Arch. ostetr. e ginecol.* 14, 489-522(1927); *Ber. ges. Physiol. exptl. Pharmacol.* 46, 142.—Lethal doses of different poisons and the poisons plus finely divided placenta tissue were injected into frogs of equal wt. When placenta tissue is added to strychnine the convulsions appear late but the subsequent action of the poison is unchanged; however, there was no strychnine action when the placenta of an eclamptic patient was used. The effect of liver and kidney tissue on the action of strychnine is the same as that of placenta. There is no reaction when a fatal dose of quinine is administered with placenta, thymus or spleen; kidney and uterus do not have this effect. The action of nicotine was irregular. R. C. WILLSON

**The importance of the suprarenal capsule for the sedative action of morphine on the intestine.** I. Studies on the intestine of the rabbit in situ. TSUNEMICHI HAYAMA. Univ. Kyoto. *Folia pharmacol. japon.* 7, 128-36(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 46, 284.—The subjects were laparotomized rabbits in the Trendelenburg position. Intravenous injection of 0.005-0.01 g. morphine intravenously inhibits the motor function of the intestine. In the absence of the suprarenal function or after splanchnicotomy, morphine has no action on the intestine except in rare instances when it is irritating. II. Studies of the adrenaline secretion in the rabbit. *Ibid* 137-45.—In normal rabbits the intravenous administration of 0.005-0.01 g. morphine-HCl per kg. — which has an inhibiting action on the motor function of the intestine—effected a large increase in the adrenaline content of the blood (Trendelenburg method) and a sharp rise in the blood pressure (carotid artery). In the absence of suprarenal function or after splanchnicotomy these increases were absent. R. C. WILLSON

**The reticulo-endothelial apparatus.** IV. The changes of the blood picture in animals receiving injections of trypan blue and ferrum oxidatum saccharatum. MARIO CAPOCACCIA. *Haematologica* 8, 321-48(1927); *Ber. ges. Physiol. exptl. Pharmacol.* 46, 236.—After the injection of toxic amts. of trypan blue and ferrum oxidat. sacch. an oligocythemia appears. This is proportionate to the amt. and concn. of the injected soln., but is not related to a cell-destroying function of the reticulo-endothelial system, since it enters only after toxic doses and since histologically no traces of an increased cell-destroying activity are found in the cells of the reticulo-endothelial system. The monocytosis which is present is limited by an increase in the normally present monocytes and through the formation of large, free endothelial cells. The latter cells are differentiated in morphology and in their behavior from the true monocytes and must be regarded as a deriv. of the reticulo-endothelium irritated by the injections. R. C. WILLSON

**So-called water intoxication.** HIROTADA MISAWA. Imp. Univ., Tokio. *Japan. J. Med. Sci.* 1, 355-83(1927); *Ber. ges. Physiol. exptl. Pharmacol.* 45, 693.—At intervals of 30 mins., 50 cc. tap H<sub>2</sub>O per kg. body wt. was given to rabbits. This caused restlessness, polyuria, diarrhea, salivation, dyspnea and tremor. After about 4 hrs., the administered H<sub>2</sub>O amounting to about 1/3 of the total body wt., convulsions appeared. Blood tests at this time showed a decrease in the dry substance to about 15%; decrease of 23.5% in the serum protein, the protein quotient remaining unchanged; reduction of Cl, P, Na, K, Ca and Mg to about 20%; slight reduction in the residual N, hemoglobin and red cells; increase in the blood sugar, f. p. (0.14°) and white cells and a percentage increase in the leucocytes. The animals were killed by bleeding and the results of tests on the organs compared with controls. The H<sub>2</sub>O content of all organs in the test animals was increased; Cl content of the liver increased but decreased in all other organs, the greatest increase showing in the skeletal muscles. The urine Cl, Na, Ca, P and N were increased; Mg was unchanged and K decreased. Further H<sub>2</sub>O administration caused death. Body temp. decreased 2° when convulsions appeared. R. C. WILLSON

**The influence of various drugs on the internal pressure of the bladder.** SH. UCHIGAKI. Imp. Univ., Kyoto. *Japan. J. Obstet. & Gynecol.* 10, 47-50(1927); *Ber. ges. Physiol. exptl. Pharmacol.* 45, 813.—After laparotomy a manometer was attached to the bladder of rabbits and the intravesicular pressure recorded. Drugs were given intravenously. Pilocarpine-HCl (0.25 mg.) caused sustained increase in pressure and frequency of movements. This effect was abolished by atropine sulfate (0.25 mg.). Physostigmine sulfate (0.1 mg.) caused transient increase in pressure; 0.2 mg. caused



brief violent movement followed by sharp rise in pressure. This is abolished by morphine. The chief effect of adrenaline is a decrease in pressure and movement. Nicotine tartrate (0.1–1.0 mg.) caused alternate rise and fall in pressure. Morphine-HCl (0.1–0.3 mg.) caused a temporary increase, 2.5 mg., a slight decrease. Cocaine-HCl (2.5–25 mg.) caused a rise in pressure and movement. Quinine-HCl (5 and 25 mg.) caused a brief rise followed by a sharp fall in pressure.  $\text{BaCl}_2$  did not influence the lowered pressure.  $\text{BaCl}_2$  (2.5 mg.) increased movement and pressure. Strychnine nitrate (0.002 mg.) increased pressure and periodic movement; 0.2 mg. caused spasms and great increase in pressure. Pituitrin (5 mg.) effected increase in pressure. Urotropine (5 cc. 40%) decreased and then increased pressure and increased movement. The urine following urotropine was strongly alk. and increased in vol. R. C. WILLSON

Active glucosides from *Adonis vernalis*. K. FROMHERZ. F. Hoffmann-La Roche, A.-G., BASEL. *Münch. med. Wochschr.* 75, 818–20 (1928).—Two highly active, digitalis-like glucosides were isolated from *Adonis vernalis*. Both possessed all known characteristics of glucosides. They differed in their action on the heart. The one which has a weak action on the heart has a sedative action and is a strong diuretic. Their action is not cumulative. R. C. WILLSON

The active constituent of *Rhododendron hymenanthos* Makino, "Rhodotoxin." II. Further studies of the pharmacological action. MAKATO MAKINO. Univ. Okayama. *Okayama-Igakkai-Zasshi* 40, 138–54 (1928); *Ber. ges. Physiol. expil. Pharmacol.* 46, 287.—Continuing former studies (cf. C. A. 23, 1691) M. studied the action of rhodotoxin on some lower animals. Small doses of rhodotoxin produce a diminution of the respiratory frequency and of the depth of the respiratory movements in the rabbit. The respiratory vol. per time unit is lowered. As the dose is increased the decrease of the respiratory frequency and vol. becomes more marked and finally there is respiratory depression with Cheyne-Stokes breathing. Larger intravenous doses cause a transient acceleration of the respiration. The emetic action of the poison is not influenced by severance of both vagi in the cat. It thus appears that there is no central action. The poison lowers the blood pressure in the rabbit, but after larger doses there is an increase which is regarded as secondary to the respiratory disturbance and the muscular spasm. When applied to the peripheral vessels, as the femoral vessels of the frog and the aural vessels of the rabbit, the poison causes a dilatation. In the frog studies, when higher concns. are used a slight constriction follows this dilatation. When applied to the frog heart, either isolated or *in situ*, rhodotoxin in small doses has a slight stimulating action, while larger doses paralyze. The resected small intestine and uterus of the rabbit and earthworm muscles, the nerve cords having been removed from all, are stimulated by the poison. The tonus is increased and the amplitude enlarged. The skeletal muscles are resistant to its action. Small doses increase the urinary output; larger ones inhibit it. Rhodotoxin is not very active on earthworms and infusoria. A hemolytic action was not observed. Concns. less than 0.5% cause no local irritation of the mucous membrane. R. C. WILLSON

The action of adrenaline on the isolated frog heart. S. V. ZIGNOV. *Med. Staatsinst., Odessa. Zhur. expil. biol. med.* 8, 437–49 (1928); *Ber. ges. Physiol. expil. Pharmacol.* 45, 560.—Hearts of *R. esculentae* were perfused with isotonic sea water. The min. effective concn. of adrenaline is 1:5 billion. The action consists in increased frequency, increased systole, decreased diastole; hence decreased pulse vol. Cardiac output usually is decreased but may be increased or unchanged. The reaction is greater at 18–23° than at 7–15°. Straub's method gives lower results when used to test sensitivity to adrenaline. R. C. WILLSON

New phenolic combinations obtained by coupling chaulmoogric acid with resorcinol (HINEGARDNER, JOHNSON) 10. Diphenylaminearsonic acid. I. Derivatives of diphenylamine-4-arsonic acid (BARBER) 10. The Landecker (thermal) springs in the light of the latest balneological investigations (LACHMANN) 14. Germicidal activity of diarylsulfide phenols (HILBERT, JOHNSON) 10.

## 12—FOODS

F. C. BLANCK AND H. A. LEPPER

Technical aids in the preparation of food products. I. A. BEHRE. *Altona. Chem.-Ztg.* 53, 217–8 (1929).—A review of the various factors bearing upon the com. prepn. of foods. The addn. of colloidal substances to foods in the course of pres improves their general condition. The "added-substances" discussed are flour,

and vegetable albumin, sugar or Ca succinate, tragacanth, egg yolk, agar, gelatin, pectin, etc. Meat products, mayonnaise, milk products, bread and egg-dough products are included. II. *Ibid* 238-9. A study of confectionery, molasses and table sirup, marmalades, jellies, ices and ice cream, "march-pane," chocolate and alc. beverages.

RUSSELL C. ERB.

**Chemical analyses of 37 oriental foods.** HARTLEY E. SHERMAN AND TSAN CH'ING WANG. *Philippine J. Sci.* 38, 69-79(1929).—Analyses for water, fat, ash, protein, carbohydrate, crude fiber and fuel value are tabulated for 37 native Chinese foods. This group of foods consists of most of those mentioned in this series of articles, also wild rice, eggs, squash, burdock, yam, rape, certain sirups made from fermented grains, and a variety of seeds.

N. M. NAYLOR

**A calcium, iron and magnesium content of 16 Chinese foods.** HARTLEY E. SHERMAN AND TSAN CH'ING WANG. *Philippine J. Sci.* 38, 81-2(1929).—A tabulation is given showing the Ca, Fe and Mg content of certain dry seeds, of the seed sprouts from hydrant water and from distd. water. The Ca content of sprouts from distd. water is lower than that of sprouts from hydrant water. The seeds and plants tested are those mentioned in these papers, including green beans, mung beans, wild rice, rape, chrysanthemum, kohlrabi and squash.

N. M. NAYLOR

**Fluorescence-analysis from the standpoint of testing materials especially in regard to foods and condiments, etc.** MAX HARTINGER. *Mitt. staatl. tech. Versuchsanst. (Wien)* 17, Nos. 1, 2, 3, 147-56(1928).—Whole milk fluoresces a canary-yellow, but upon standing, this color centers in the cream and the rest of the milk finally ceases to fluoresce, becoming white. Normal skimmed milk likewise fluoresces yellow so that no analytical application is made. Filter paper and cotton take up this yellow fluorescence; very quickly the color is diluted and the adsorbent becomes white after a time. *Salicylic acid* (as an example of a preservative) in heated milk (0.5 g./l.) shows blue on filter paper. *Dried milk* fluoresces lighter than fresh milk; whole milk powder cannot be differentiated from skimmed milk powder. *Butter* fluoresces like milk; *artificial fats*, in masses, show white or yellow mostly with a blue luster and often a direct blue. In thin layers such fats are blue entirely. Different fat solvents yield different fluorescence. *Eggs and albumin* from fresh eggs, when raw, show nil, but upon heating, a canary-yellow fluorescence is obtained. Old egg albumin yields a blue. The *shells of eggs* are rose to dark red under the quartz lamp. Other colors given are: *French olive oil*, bluish white; *Dalmatian olive oil*, weak rose; *Italian olive oil*, silver-gray; *technical olive oil*, red to rose-yellow; *sesame oil*, lustrous lilac; *soy bean oil*, light lilac; *peanut oil*, light gray; *castor oil* (first press), light blue and (second press), yellow; *refined oils*, lilac; *technical refined or exld. oils*, yellow; *raw oils*, dark with a faint blue. Mineral oils cannot be confused with such oils, as mineral oils give other characteristic reactions. A large number of other food substances are listed and described with fluor-analytic possibilities.

R. C. E.

**Manganese in foodstuffs.** CLIVE NEWCOMB AND G. SANKARAN. Pasteur Inst., Coonoor. *Indian J. Med. Research* 16, 788-98(1929).—Mn is detd. as follows: The ash is dissolved in  $\text{HNO}_3$  (1 in 5), insol. matter is filtered off,  $\text{AgNO}_3$  and  $\text{H}_2\text{PO}_4$  are added (10 cc. and 2.4 cc. per 100 cc. final vol., resp.), and the pink color is matched against standard  $\text{KMnO}_4$ . Mn is widely distributed in foodstuffs. Oils contain little.

FRANCES KRASNOW

**Milling and baking experiments with crossbred wheats.** W. R. JEWELL AND MARY SIMPSON. *J. Dept. Agr. Victoria* 27, 65-70(1929).—The usual milling, baking and analytical tests were made on 12 varieties of crossbred wheats grown for exptl. purposes. The majority of the flours contained less than 10.5% protein and were inferior in strength as indicated by loaf vol. Yields of flour varying from 69.75 to 75.31% were obtained.

K. D. JACOB

**The effect of cutting Garnet wheat at different stages of maturity and on consecutive dates after the occurrence of frost.** GEORGE E. DELONG. Dominion Expt. Sta., Lacombe, Alta. *Sci. Agr.* 9, 566-74(1929).—In frosted wheat, moisture is retained longer than in immature wheat and the grade is reduced. Though the protein content is high, the flour is of poor milling quality in frosted wheat. Ash content is decreased as the kernel attains maturity but the change is slight after the soft dough stage is reached.

C. R. F.

**The toxicity of wheat flour for yeast.** R. LECOURT. Thesis, Univ. Paris and Inst. Pasteur. *Ann. Brasserie* 26, 14-5, 72-7, 87-91, 102-7, 119-21, 134-7, 153-7(1927).—Hayduck's investigations (*Ibid* 11, 142, 150; 13, 179) were checked and elaborated upon. When flour is mixed with a small quantity of  $\text{H}_2\text{O}$  and immediately filtered, a clear, toxic ext. is obtained. Of all the constituents of flour, only the gluten is toxic to bakers' or brewers' yeast. The method of testing toxicity was the detn. of evolved  $\text{CO}_2$ .

from the inoculated dough held in a thermostat at 25–30°. Gluten exts. obtained by the use of acidulated  $H_2O$  (1:1000) were extremely toxic. The toxic property is definitely assocd. with the glutenin, yet the latter is readily freed from the poisonous principle by decreasing the acidity of the water. The toxin is adsorbed by the dead yeast cells, starch grains, talc, Kaolin, norit, from neutral solns. and from nitrocellulose in weakly alk. solns. It is not adsorbed by silica or albumin. The poisonous principle is very potent, only minute quantities being necessary to destroy the action of yeasts; it is comparable in a measure to toxins and diastases. Zymase is unaffected by the toxin. In the presence of sugar, yeast cells are rapidly destroyed, but the toxicity decreases with increasing titratable acidity of the soln. The rapid action of the toxin manifests itself only in the presence of a fermentable carbohydrate and appears to be a function of the sugar concn. In the absence of sugar, the poisonous action is *nil* at 2°, but at 27° there is a slight action on both bakers' and brewers' yeast. Dil. concns. of  $NaCl$ ,  $K_2SO_4$ , or  $CaCl_2$  did not greatly affect the toxicity of gluten, but all salts except  $CaCO_3$  proved toxic when present in relatively concd. solns. Brewers' yeast when grown on media other than malt did not lose its sensitivity to the wheat-flour toxin. Bakers' yeast, if cultivated on yeast or malt exts., lost, to a degree, its resistance to the toxin, but aerobic cultivation retarded this loss of resistance. Aerobic growth tended slowly to increase the resistance to toxin of brewers' yeast. Some races of yeast are less sensitive than others to the poisonous principle of the flour. C. R. FELLERS

The role of carbohydrates and proteins in the staling of bread. L. KARACSONYI. Tech. Hochschule Budapest. *Z. Untersuch. Lebensm.* 56, 479–84 (1928).—Using 12 samples of wheat bread made from flour,  $H_2O$ ,  $NaCl$  and yeast, K. detd. the amts. of  $H_2O$ -sol. and  $EtOH$ -sol. carbohydrate and protein in both freshly baked loaves and bread, which had aged for 48 hrs. Dry matter as well as  $EtOH$ -insol. glucose and protein was similarly estd. The chem. differences found between fresh and stale bread were very slight.  $H_2O$ -sol. carbohydrates increased slightly during the staling process. It could not be experimentally proved that the water of syneresis liberated from the starch gel was absorbed by the protein gel. Katz's contention (*C. A.* 9, 1808) that there is a considerable decrease in both  $H_2O$ -sol. and  $EtOH$ -insol. carbohydrates during staling is partially supported. The swelling or absorption of  $H_2O$  by the proteins shows probably that their hydration occurs. The conclusions are tentative. C. R. FELLERS

The direct determination of the chlorine ion in milk with the aid of the visual conductivity titration. H. SCHORSTEIN, G. JANDER AND O. PFUNDT. Univ. of Göttingen. *Z. angew. Chem.* 42, 335–6 (1929).—It is possible to det. the  $Cl$  ion content of milk by electrometric or conduction titrations using quinhydrone, and Pt and calomel electrodes. The chief advantage of this method is the lower time factor. Three titration curves are shown. RUSSELL C. ERB

The cryoscopic method for the detection of added water in milk. R. L. ANDREW. Govt Lab at New Zealand. *Analyst* 54, 210–6 (1929).—The lab. method employed in New Zealand for the detn. of the f. p. of milk is explained in detail and values are given, which show that, in spite of wide variations in fat and in solids-not-fat, the f. p. of unwatered milk almost invariably lies between  $-0.545^\circ$  and  $-0.565^\circ$ . The cryoscopic method for the detection of watered milk has, therefore, proved useful. W. T. H.

Investigations on the relations between the acidity and freezing point of milk. ALFRED J. PARKER AND L. S. SPACKMAN. Public Analyst's Lab. at New Zealand. *Analyst* 54, 217–23 (1929).—The f. ps. of milk samples were detd. in both fresh and adulterated samples with increasing acidities and the results show that the cryoscopic method for detg. watering in milk is reliable only when the samples are quite fresh. The value 0.20% acidity as given by the Conn. Agr. Station is criticized and the value 0.14% is suggested as being more nearly the normal acidity of fresh milk. A correction factor of  $0.003^\circ$  for each 0.01% excess acidity holds in the f. p. detn. between acidities of 0.17 and 0.60%; a value of  $0.010^\circ$  is suggested for 0.14–0.17% acidity. W. T. H.

Applications of the nitrile method. II. 1. The hydrocyanic acid binding by milk, milk sugar and milk sugar-casein mixtures. 2. The hydrocyanic acid number of milk and its analytical significance. 3. Detection of watering of milk. 4. Formaldehyde binding in milk sugar and milk sugar-casein mixtures. 5. Binding of formaldehyde and determination of formaldehyde in milk. FRITZ LIPPICH. Univ. Prague. *Z. anal. Chem.* 76, 321–35 (1929); cf. *C. A.* 23, 2393.—HCN combines with milk sufficiently to permit the application of L.'s nitrile method. There is, therefore, what can be called the "HCN no." of milk, which is a characteristic that can serve for the detection of watering in milk. The quantity of HCN taken up by milk, however, varies with the time. Thus, on treating 100 cc. of milk with 15 cc. of 0.25 N KCN soln.,

there is taken up 0.151 milli-equiv. of HCN in 1 min., 0.75 in 10 mins. and 1.155 in 1 hr. It is recommended to work at a temp. of 19°. A study of the amts. of HCN taken up by casein, milk sugar and milk itself shows certain peculiarities. At first the HCN is taken up to a greater extent by milk sugar than by milk itself, but as the digestion with KCN proceeds, the milk begins to absorb considerably more HCN than the sugar and, in fact, during a 10-min. period it absorbs more than the casein and the milk-sugar contents would indicate when measured separately, although it seems certain that only these 2 constituents take part in the reaction. It is probably due to the degree of dispersion of the colloids. To carry out the detn. of the HCN no., heat 20 cc. of 0.25 N KCN on a water bath to 19° and do the same with 100 cc. of milk. As soon as the temp. is const., add the milk as quickly as possible to the KCN soln. and count the time from this moment. After 10 mins. pour the mixt. into a soln. of 40 g. tartaric acid in 70 cc. of water, wash out the flask and connect with a condenser. Connect the condenser with a receiver contg. 50 cc. of 10% KOH. Heat carefully to boiling and conduct a stream of CO<sub>2</sub>-free air through the app. for 2.5 hrs. Then dil., add NH<sub>4</sub>OH and KI and titrate as previously described. With respect to the binding of HCHO by milk, it seems certain also that milk sugar and casein alone participate; the proposal is made to have a "formaldehyde no." as a characteristic of milk. An HCN no. of about 9 and a formaldehyde no. of about 4 indicates a mixt. of approx. 4 casein to 5 milk sugar in milk.

W. T. H.

**Cotrone cheese.** E. DE'CONNO AND M. FRATTURA. *Ann. chim. applicata* 19, 65-76 (1929).—This goat-milk cheese has been examined and submitted to a complete chem. analysis. Its characteristics are fat content 22.3-23.4%, proteins 32.5-33.5% and NaCl in the ash over 50%. This NaCl is added to the cheese.

A. W. CONTIERI

**The Schmid-Bondzynski-Ratzlaff method for the determination of fat in cheese.** B. C. VAN BALEN WALTER. *Chem. Weekblad* 26, 164(1929).—By using an extn. flask of special design, the author claims greater accuracy with this well-known method.

J. C. JURRIENS

**Scientific aspects of packaging and quick-freezing perishable flesh products.** CLARENCE BIRDSEYE. *Ind. Eng. Chem.* 21, 414(1929).—Expts. indicate that slow freezing of meats forms large ice crystals, which compress and rupture the tissues. Foods quickly frozen by direct or indirect contact with the refrigerant have the following advantages: the small ice crystals thus formed do not injure the tissues; the texture, flavor, color and odor of the product are retained; there is no shrinkage from loss of water.

N. M. NAYLOR

**The chemical change in the heat-drying of fish muscle.** I. (Japanese with English résumé.) SHOKICHI YAMAMATO AND SHIGESHI MASUDA. *J. Imp. Fish. Inst. (Tokyo)* 22, 53-5, 188-97(1926); *Biol. Abstracts* 2, 202.—Insuring freshness of fish is essential to successful drying. Moisture in the product may be limited to 14-23%. When fish muscles are dried by heating for a long time, monoamino acid N is in most cases gradually decomposed, chiefly due to the action of heat. It is advisable to keep the drying process within the limit of 30-70°, and probably best to dry as rapidly as possible at the relatively low temp. of 25-69° in order to preserve the natural flavor. From many exptl. results, it was found that during heat-drying the diamino acid N does not decrease like the monoamino acid N, but rather increases. Such a substance as "Ajinomoto," which contains a large amt. of monoamino acid, imparts a fine fresh meat flavor. The flavor of fish food may be said to accompany the presence of a fresh extractive.

H. L. D.

**Freezing storage of fruit and vegetables for retail distribution in paraffined paper containers.** M. A. JOSLYN AND W. V. CRUESS. *Univ. Calif. Fruit Products J. Am. Vinegar Ind.* 8, No. 7, 9-12; 8, No. 8, 9-12(1929).—In general the packing of fruit in sirup was found superior to the dry-pack and the sugar-pack methods. The paper "bottle" was found to be an ideal container. The freezing method has been extended to the packing of vegetables, which, when blanched and packed in brine in paper "bottles" and stored at 0-15° F., are equal to fresh even after several months' storage. J. A. K.

**Determination of oxymethylfurfural in honey and artificial honey.** J. FIEBE AND W. KORDATZKI. *Preussischen Hygiene-Inst. Landsberg. Z. Untersuch. Lebensm.* 56, 490-2(1928); cf. *C. A.* 23, 1965.—Comparative expts. on genuine and artificial invert sugar honeys were conducted by 3 methods. Troje's method (*C. A.* 20, 3753) of titration with an alk. soln. of I, Lank's method (*C. A.* 12, 1556) and detn. by pptn. with phloroglucinol were carefully tested. Only the phloroglucinol and Lank methods gave reliable results, i.e., both gave heavy ppts. and strongly reduced dil. alk. Cu solns. with artificial honeys only. Genuine honeys gave neg. results. Troje's method was distinctly unreliable in differentiating genuine from artificial honeys. The sample was

prepd. as follows for the comparative tests: A soln. of 100 g. of sample was pptd. with  $ZnCl_2 \cdot H_2O$  and  $K_4Fe(CN)_6$  and the filtered liquid thrice extd. with  $Et_2O$  in 12 hrs. The  $Et_2O$  ext. was well shaken with alk.  $Na_2SO_4$  and an equal vol. of petroleum ether, and after 24 hrs. filtered and evapd. at a low temp. The residue was extd. with 20 cc. of cold  $H_2O$  and 5 cc. of the filtered ext. used for each detn. C. R. F.

Applications of the nitrile method. III. The HCN and  $CH_2O$  numbers of sugars. 2. Their analytical significance. 3. Determinations of sugar. IV. 1. The significance of the hydrocyanic number of sugars in the analysis of sugar mixtures. 2. Determination of sugars in marmalade (LIPPICH) 7. Significance of mineral metabolism. I. Ca and P contents of some Porto Rican food materials (COOK, RIVERA) 11E. Determination of starch in grain and milling products (VON SCHEELE, SVENSSON) 28. Apparatus for drying macaroni, etc. (U. S. pat. 1,711,188) 1. Treating cannery waste (U. S. pat. 1,711,105) 14. Filter for milk or other liquids (U. S. pat. 1,710,758) 1. Penetrometer for testing the hardness of fruit, etc. (Brit. pat. 298,662) 1.

RENNES, J.: *La question du lait*. PARIS: Masson et Cie. 222 pp. F. 18. Reviewed in *Bull. soc. chim. Belg.* 37, 317(1928).

Food. FIRMA W. MASEBERG and EDUARD NEHRING. Ger. 474,633, Dec. 1, 1925—The removal of skin or peel from transported fruit is facilitated by a brief contact with concd.  $H_2SO_4$  prior to transportation. Light rubbing with water then removes the skin.

Food. OTTO STRÜBER, JR. Ger. 474,767, April 8, 1926. Dried meats are preserved by packing in powder consisting of 80 parts dry peat dust, 10 parts deciduous tree ash, 8 parts gypsum and 2 parts pepper.

Preserving milk, etc. FRANZ SEIDEL and ROMAN HELLER. Austrian 112,466, Oct. 15, 1928. Milk and other beverages are sterilized and preserved by degasifying and heating to below  $63^\circ$  and then subjecting the liquid in thin layers and *in vacuo* to elec. treatment. A magnetic field may act on the liquid during the elec. treatment.

Apparatus for cooling and aerating milk. LORENZ C. JORGENSEN. Fr. 650,049, Feb. 4, 1928.

Apparatus for pasteurizing milk in bulk. NOKMAN B. GARDINER. U. S. 1,710,771, April 30.

Treating milk with ultra-violet radiations to develop antirachitic properties. DRY MILK Co. Brit. 298,585, June 11, 1927. The intensity of the radiations and the duration of treatment are controlled to avoid the production of an unpleasant odor or taste while developing at least 75% of the producible antirachitic property. Either milk or milk powder may be treated. An app. is described.

Cheese. WM. D. RICHARDSON (to Swift & Co.). U. S. 1,711,032, April 30. Dried milk powder is mixed with whole milk to form a mixt. of approx. the moisture content desired for the finished cheese; the concd. product is coagulated.

Cheese. THE SOUTH AUSTRALIAN FARMERS' COÖPERATIVE UNION, LTD. Australia 11,258, Jan. 13, 1928. The keeping qualities and taste of cheese (Edam, Gruyere, Gouda, or Cheddar) are improved by milling, mixing with water or an alk. soln. of Na biphosphate, heating to  $120$ – $160^\circ F.$ , and then boiling in a vacuum pan, with agitator means, at  $182^\circ$  down to  $115^\circ F.$

Bakers' ovens. NICOLAS NAVROTZKY. Fr. 649,460, Feb. 2, 1928. An app. is described for the recovery of alc. produced in baking bread.

Curing meats and fish. M. M. HERIOT. Brit. 298,802, Dec. 2, 1927. An app. is described by which the material (such as hams, bacon, or fish) is treated with a brine preserving soln. and alternately subjected to vacuum and pressure.

Apparatus for drying flaked cereals. P. TURNER. Brit. 299,134, Aug. 20, 1927.

Treating cereals such as wheat with heated air and steam. J. A. HALL and W. F. C. GEORGE. Brit. 298,700, July 19, 1927. The grain is subjected for 4–10 hrs. to circulated heated air at a temp. of  $100^\circ$  or somewhat higher with which sufficient steam is mixed to cause the air to be satd. if cooled to a temp. of  $60^\circ$ . The treated grain is ground and 3% or less of the product is mixed with ordinary flour.

Fruit juice beverages. G. SCHICHT A.-G. Brit. 299,043, Oct. 21, 1927. Sterilization and clarification of fruit juice is effected by passage through sterilizing filters before concn. by evapn. at a low temp. in high vacuum to obtain a sirup, which retains the color, taste and vitamins of the original juice.

Preparations with an artificial coffee aroma. INT. NÄHRUNG -U. GENUSSMITTEL-

A.-G. Swiss 130,605 to 130,608, Sept. 16, 1926. Addns. to Swiss 128,720. Prepn.s with a coffee-like aroma are obtained by the action of furfural, acetylpropionyl, or methyl-ethylacetaldehyde on furfuryl-2-mercaptan or by the action of acetylpropionyl on hydroxymethyl-5-furfuryl-2-mercaptan.

### 13—GENERAL INDUSTRIAL CHEMISTRY

HARLAN S. MINER

Italian chemical industry, 1928. BUR. OF FOREIGN AND DOMESTIC COMMERCE. *Trade Information Bull.* 577, 48 pp. E. J. C.

Mechanical handling of materials in and about the chemical plant. I. A. K. BURDITT AND W. F. SCHAPHORST. *Ind. Eng. Chem.* 21, 489-93(1929).—The application of mech.-handling equipment includes the unloading; the bulk storage of materials; the withdrawal of materials from storage; handling of materials through process; storage of finished products; and loading or shipment of products. Production and material handling can be synchronized to best advantage when the building is designed to provide this synchronization. This first article describes representative types of conveyors. G. H. VON FUCHS

Tungsten as a chemico-technical raw material. H. ALTERTHUM. *Z. angew. Chem.* 42, 275-8, 308-14(1929).—A comprehensive presentation of the importance of W in industry, its occurrence and prepn., uses (a) in the pure state for plating, surface-hardening, chemico-technical purposes, electrodes and as a catalyst; (b) in alloys with Cu, Pb, Ni, acid-resistant substances, W steel; (c) in W carbide alloys such as stellite, sintered materials or refractories like "Widia" (W carbide and Co), etc.; and (d) in tungstic acid and tungstates. A bibliography of 84 titles is included. W. C. E.

Chemical prices react to technical advances. WM. HAYNES. *Ind. Eng. Chem.* 21, 485-8(1929).—New improved mfg. processes have directed chem. prices downward. Technical advances in other fields create new markets for new chem. products, thereby having an opposite effect. Chem. prices will continue to decline as a result of successful chem. research in industrial fields. Price charts of the most important chemicals together with brief descriptions of the price movements of the last decade are given. G. H. VON FUCHS

Elements in patent law. K. D. McELROY. *Ind. Eng. Chem.* 21, 608-9(1929). Patents and procedure. FORD W. HARRIS. *Ibid* 609-11. E. J. C.

Electrical insulating papers for the manufacture of power cables. T. N. RILEY AND T. R. SCOTT. *Electrician* 102, 441-2(1929).—Impregnated paper is thus far the only practical dielectric for high voltages. The physical and elec. characteristics of such papers are reviewed; the optimum type has low bulk combined with high oil absorbency. Problems requiring further research are indicated. M. McMAHON

The prevention of ionization in impregnated paper dielectrics. S. G. BROWN AND P. A. SPORING. *Electrician* 102, 443(1929).—The effect of ionization of entrapped air upon elec. properties of a dielectric is considered. The abs. potential rather than the potential gradient is the deciding factor in detg. whether a dielectric will fail. Ionization of entrapped air is possible only when the voltage applied to electrodes exceeds min. sparking potential, approx. 300 v. in air at 1 atm. Inserting a guard strip produces a marked protective effect. Power factor-vs.-voltage curves taken with a dielectric impregnated but not evacuated serve as a reliable test. In testing a finished product a curve should be taken of a sample length of cable or a condenser placed in a vacuum. M. McMAHON

Flashpoints of solvents and plasticizers. ERNST VON MÜHLENDahl. *Farben-Ztg.* 34, 1427-9(1929).—The author lists the flash points of 110 pure solvents and plasticizers, of 7 binary and 2 ternary systems. A bibliography of the sources of the data is given. G. G. SWARD

Distillation in gas currents (LIBINSON, PAKSHVER) 2. Effect of temperature and concentration on viscosity of salt solutions (BÜCHE) 2. Importance of crystal structure imperfections in understanding the technical properties of industrial materials that are alterable (SMEKAL) 2. How does CO<sub>2</sub> behave under pressure? (KRASE, GOODMAN) 2. Thermostatic control for gas supplied to the burner of refrigerating apparatus (U. S. pat. 1,711,403) 1.

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**Purification of gases.** CARL WELLER. Ger. 474,800, Oct. 9, 1926. Dust is extd. from gases by passing the gas through a plant comprising successive series of oblique tubes.

**Purification of gases.** METALLGESELLSCHAFT A.-G. Ger. 474,935, Aug. 9, 1925. Gases are led through narrow curved passages, moistened with washing liquid, to remove suspended particles and constituents sol. in the liquid, and to cool them.

**Washing gases.** CHARLES É. GOENAGA. Fr. 649,633, Feb. 24, 1928. Impurities are removed from gases by blowing them on to the surface of a suitable liquid, the emulsion produced being removed and dried for the recovery of the impurities.

**Liquefaction of gases.** RUDOLF K. E. MEWES. Ger. 472,951, July 15, 1924. A single stage method of splitting up a mixt. of gases difficult to liquify, such as air, by rectification, is described.

**Mixing gases and liquids.** PAUL OSTIER. Fr. 648,462, Feb. 6, 1928. An app. similar to a vacuum pump worked by a flow of water is used for mixing gases with liquids, e. g., treating water, wine, or alc. with  $O_3$ , or sugar juices with  $SO_2$ .

**Clarifying liquids.** MANUF. DES GLACES ET PRODUITS CHIMIQUES DE SAINT-GOBAIN. Ger. 472,948, May 29, 1925. Solid material in turbid liquids is deposited and graded by an app. having successive vats for receiving the liquid.

**Sterilizing liquids or plastic materials.** HERBERT J. KRATZER. U. S. 1,711,097, April 30. The material to be sterilized is circulated in a closed system so that it is alternately subjected to a pressure of approx. 75 lbs. per sq. in. and to a pressure less than atm. pressure; it is aerated in the portion of the app. used where it is subjected to pressure, and introduced into the reduced pressure zone in such a manner as to effect its agitation. An app. is described.

**Separation of liquids.** I. G. FARBENIND. A.-G. Fr. 649,429, Jan. 27, 1928. Liquids are continuously sep'd. by distn. and fractional condensation under ordinary, slightly raised, or reduced pressure, by treating the mixt. of vapors formed successively by washing liquids, which may be the condensed liquids themselves, the temps. of which are situated between the dew points of 2 consecutive fractions of the mixt. and the amt. of which suffices to absorb and eliminate the heat produced by the condensation.

**Separating impurities from liquids such as wax from oils by centrifuging and heating.** CYRUS H. HAPGOOD (to DeLaval Separator Co.). U. S. 1,711,315, April 30. An app. is described in which a heating medium such as steam may be used for heating the material treated out of contact with the latter.

**Evaporating liquids from solids.** HEINRICH V. DAHLEM, CARL SCHMIDT and NIKO DE KOZMITZA. Fr. 649,663, Feb. 24, 1928. Liquids are evap'd. in a vessel having a double walled conical cover, which becomes heated by the steam passing between the walls. When the contents become very concd., they are blown by steam pressure through a pipe at the base to the top of the outside of the cover and lose the remaining liquid as they descend the cover.

**Reactions between solids and liquids.** ASSOCIATION PARISIENNE POUR L'IND. CHIM. (Georges Baumé, inventor). Fr. 650,098, Aug. 8, 1927. Intimate contact between solids and liquids entering into reaction is obtained by evacuating the vessel contg. the solid, allowing the liquid to flow in and then applying pressure. Substances

such as saponin, certain soaps and animal or vegetable oils, which allow the liquid to spread into layers of a thickness of mol. order, may be added to the liquids.

Oxidations and reductions and other reactions. SIEMENS & HALSKA A.-G. Brit. 298,461, Oct. 8, 1927. Reagents in powd. form are introduced into liquids to be treated, in perforated containers; e. g., Na peroxide in a perforated metal box may be added to a soln. of Na stannite to oxidize it to stannate prior to electrolysis, or Zn solns. may be similarly oxidized before electrolysis.

Effecting chemical reactions. WILHELM KOCHMANN. Ger. 474,075, May 6, 1914. The reagents are passed through a reaction space in a uniform thin layer at a const. velocity. Reference is made to the *oxidation of NH<sub>3</sub>*, the *hydrolysis of starch*, the *production of ozone*, and to nitration, sulfonation and hydrogenation, but no example is given.

Dialysis. GIUSEPPE DONAGEMMA. Fr. 648,721, Feb. 14, 1928. An app. is described for the continuous sepn. on an industrial scale by dialysis of crystallizable substances from colloids with which they are mixed.

Sublimation. SOC. POUR L'EXPLOITATION DES PROCÉDÉS AB-DER-HALDEN. Fr. 649,974, Feb. 27, 1928. C<sub>10</sub>H<sub>8</sub> and other substances are sublimed by passing a current of air through the heated material then through cooling chambers, and back in a closed cycle.

Testing metal blocks or other materials under stress. LUDWIG HÄRTER. U. S. 1,711,347, April 30. The surface of a section of material to be tested, such as a block of metal, is dotted, parallel to the direction of the stress, by a dye, which appears in sufficient relief; the body is subjected to increasing stress, as by compression, and a photographic plate is exposed during the time of application of the stress to obtain a record of the paths of the dots.

Protective mask for use in noxious gases. ALEXANDER B. DRÄGER. U. S. 1,710,813, April 30. Structural features.

Refrigerating. CHICAGO PNEUMATIC TOOL CO. Ger. 473,414, Jan. 21, 1927. A compression machine working in a closed cycle is described in which the refrigerant, e. g., CH<sub>2</sub>Cl<sub>2</sub>, forms a vehicle for the lubricant. An inert gas may circulate with the refrigerant and the lubricant.

Refrigerating apparatus. HANS LÜTZENBURGER. Swiss 129,986, Nov. 30, 1927. Details of the arrangement of the compressor, suction and pressure pumps, evaporator and condenser.

Refrigerating machine. AKTIEN-GESELLSCHAFT DER MASCHINENFABRIKEN ESCHER WYSS & CIE. Swiss 129,987, Dec. 30, 1927. The machine has an automatic elec. regulating device.

Refrigerating machine. GEBRÜDER SULZER A.-G. Swiss 130,240, Sept. 22, 1927.

Refrigerating machine. AUDIFFREN REFRIGERATING MACHINE CO. Ger. 474,266, Mar. 7, 1924. A compression refrigerating machine has a rotary condenser and evaporator provided with radial blades to facilitate exchange of heat.

Periodically acting refrigerating machine. HUPERT HEMPEL. Ger. 473,730, Jan. 1, 1927.

Refrigerating plant. CHARLES DELAYGUE. Fr. 650,087, Aug. 5, 1927.

Refrigerating system. P. SCHLUMBOHM. Brit. 299,052, Oct. 21, 1927. Refrigerants of low vapor pressure such as water, pyridine, or octane are used in vacuum refrigerating app. having a Hg-vapor injector pump. An arrangement of app. is described.

Detection of methyl chloride in refrigerating systems, etc. GEORGE S. LOBDELL and HENRY J. KAUTH. U. S. 1,710,933, April 30. MeNO<sub>2</sub> is added to a refrigerant such as MeCl<sub>3</sub> or the like to be tested; by the reaction of the MeNO<sub>2</sub> with  $\alpha$ -naphthylamine acetate and sulfanilic acid, the mixt. is detected; this test serves to det. the presence of leakage vapors.

Method of assisting the absorption liquid in a refrigerating machine. PLATEN-MUNTERS REFRIGERATING SYSTEM AKTIEBOLAG. Ger. 473,834, Dec. 5, 1926. A pressure equalizing gas assists the circulation of the liquid.

Continuously acting absorption refrigerating apparatus. SIEMENS-SCHUCKERTWERKE A.-G. Brit. 298,603, Oct. 12, 1927. Liquid refrigerant is used to rectify the vapor passing from the generator. Various structural details are described.

Refrigerating system of the absorption type. PLATEN-MUNTERS REFRIGERATING SYSTEM AKTIEBOLAG (to Electrolux, Ltd.). Brit. 298,574-5, Oct. 11, 1927.

Refrigerators. FRIGIDAIRE CORP. Fr. 650,047, Feb. 2, 1928.

Absorption refrigerating machine. GEBRÜDER SULZER. Swiss 130,531, Sept. 22, 1927.



**Absorption refrigerating apparatus.** PLATEN-MUNTERS REFRIGERATING SYSTEM AKTIEBOLAG (Alvar Lenning, inventor). Ger. 472,751, May 28, 1927. Details of arrangement.

**Absorption refrigerating apparatus.** PLATEN-MUNTERS REFRIGERATING SYSTEM AKTIEBOLAG (Alvar Lenning, inventor). Ger. 473,835, July 22, 1927. Details of construction.

**Refrigerators, absorption type.** GUIDO MAIURI and RAOUL F. BOSSINI. Fr. 649,331 and 649,333, Feb. 20, 1928.

**Refrigerating apparatus of the compression type.** H. B. HULL (to Frigidaire Corp.). Brit. 299,028, Oct. 20, 1927. Structural features.

**Insulating material.** BATTERIEN-U. ELEMENTE-FAB. SYSTEM ZEILER. A.-G. Ger. 472,614, Mar. 25, 1925. Insulating material for protecting batteries, cables and the like, is prepd. by sapon. montan wax, ozocerite and bituminous material with alkali.

**Electrical insulating material comprising rubber.** A. R. KEMP and WESTERN ELECTRIC CO. Brit. 298,694, July 18, 1927. A process is described for compounding rubber compns. of different S content (one of which may contain 5% and the other 20% S) to produce an insulating material, which has mech. properties similar to the product described in Brit. 246,663 but which may have approx. the same thermoplastic properties as gutta percha and which has elec. properties rendering it more suitable for use in submarine cables than the product described in Brit. 246,663.

## 14—WATER, SEWAGE AND SANITATION

EDWARD BARTOW

**Factors contributing to quality of public water supplies.** H. E. JORDAN. *Ind. Eng. Chem.* 21, 152-6(1929).—In the abstract of this title in C. A. 23, 1703 the first word in the 4th line should read "service" and the first figure in the last line should be "22"

E. B.

**The new water supply system of Parkersburg, West Virginia.** M. G. MANSFIELD AND F. C. FOOTE. *W. Va. Univ. Coll. of Eng. Tech. Bull.* No. 2, 85-101(1928).—A history of the sources of water supply from about 1884 is given. A referendum vote in 1925 showed that a well supply was preferred to the filtered Ohio River water. The new water supply system consists of 12 drilled wells (Layne patent gravel wall) 51 to 61 ft. deep, 38 in. in diam. with an 18-in. inside pipe. A detailed description of the wells and the method of sinking is given. The 12 wells yielded over 6 m. g. d. Free CO<sub>2</sub> in the untreated water varied from 20 to 65 p. p. m. and Fe from 0.1 to 3.4 p. p. m. The CO<sub>2</sub>-removal plant is described in detail. Provision is made for Fe removal if necessary in the future. Steam can be used in place of electricity in an emergency. Total cost of the plant will approx. \$292,000.

C. H. BADGER

**The problem of water supply in Cochin China.** A. MACHIN. *L'Eau* 22, 19-22 (1929).—Sanitary engineering data are discussed.

C. R. FELLERS

**Pregel water supply of Königsberg.** R. BRÜCHE AND G. SATTLER. *Gas u. Wasserfach* 72, 237-43, 263-7, 287-91(1929).—Water from the Pregel River, after a preliminary sedimentation, is treated simultaneously with alum and chlorine to clarify it and to remove color; it is then passed through a rapid filter and again chlorinated to destroy bacteria. The treated water is satisfactory from the bacteriol. and chem. viewpoints, being practically colorless, tasteless and without after-taste.

R. W. RYAN

**Underground water—its formation and modes of appearance.** F. RÖHRER. Univ. Heidelberg. *Gas u. Wasserfach* 72, 174-80, 199-205(1929).—Theories as to the formation of ground water are critically reviewed with the conclusion that the larger part of the ground water is due to infiltration. Water-bearing strata and the formation and characteristics of springs are also discussed in detail and applications to water supply noted.

R. W. RYAN

**The graphical representation of the chemical constituents of mineral waters.** Z. DALMADY. *Z. ges. physik. Therap.* 34, 144-7(1927); *Wasser u. Abwasser*, 25, 101.—The ions and cations are graphically located on a circular diagram to show at a glance their true relationships.

C. R. FELLERS

**The thermal waters of Vichy and their important physical and chemical properties.** MANCRAU. *Zentr. ges. Hyg.* 16, 690-1(1928); *Wasser u. Abwasser* 25, 103.—Of the numerous springs of the Vichy basins only 14 are utilized. Of these 5 are natural and 9 are bored. The flow of these 14 springs per 24 hrs. is approx. 700,000 l. The water is very sparkling and alk. The underlying collecting basins lie in tertiary strata, the

layers, direction and cleavages of which are discussed. Typical analysis giving sp. gr., pH, cond., gas content, minerals and radio-activity is tabulated. C. R. FELLERS

The Landecker (thermal) springs in the light of the latest balneological investigations. LACHMANN. *Z. wiss. Bäderkde* 2, 611-8(1928); *Wasser u. Abwasser* 25, 104.—These thermal waters act on all the body functions, particularly on the secretive and nervous processes. Because of the content of Rn, these waters are excellent in the treatment of rheumatism and diseases of the joints. The S compds. such as  $H_2S$ , colloidal S and polythionic acids, penetrate the skin and favorably influence the body metabolism and joint action. C. R. FELLERS

Alkaline sulfur waters. A. ASTRUC. *Bull. soc. sci. méd. biol. Montpellier* 8, 483-506(1927); *Wasser u. Abwasser* 25, 102.—In the French Pyrenees many waters contain S in forms other than oxidized S, such as  $H_2S$ , sulfides, free S and acids. Silicic acid and certain S-algae often occur together in hot springs. Remedial treatment measures are of little avail in these waters. C. R. FELLERS

The determination of sulfate in natural waters and in soil extracts. B. SAPROMETOV. *Bull. Univ. Asie Centrale*. Tashkent, Russia; *Wasser u. Abwasser* 25, 40 (1928).—A comparison was made of the gravimetric pptn. as  $BaSO_4$ , of the benzidine and the titrimetric I methods. For routine work sufficient accuracy was given by the modified rapid benzidine method of Raschig (cf. *C. A.* 21, 3242) to recommend it. C. R. F.

The stratification of oxygen in lakes. L. L. ROSSOLIMO. *Biol. Station, Kossino. Arch. Hydrobiol.* 19, 731-41(1928). G. SCHWOCH

Dependence of oxidizability on the fluctuation of the ground-water level. BR. PUCHOWSKI. *Zentr. ges. Hyg. Grenz.* 17, 801(1928); *Wasser u. Abwasser* 25, 113.—No correlation could be observed in 4 wells between the oxidizability of the water and the water level in the wells. C. R. FELLERS

Water purification problems in Ohio. THOMAS R. LATHROP. *W. Va. Univ. Coll. of Eng. Tech. Bull.* No. 2, 12-21(1928).—The pollution of Lake Erie and the Ohio and Mahoning Rivers, the purification methods employed at the different plants, odors due to chlorophenols and depleted O, recarbonization of treated waters, trouble with algae clogging filters, Fe removal, incrustation of Mn on sand in filters, and the municipal softening of water supplies are briefly discussed. C. H. BADGER

Aeration in the purification of water. N. T. VRATCH. *Can. Eng.* 56, 430(1929).—Aerator devices in common use are of four general classes: (1) air-lift pumps, (2) injector aerators, (3) gravity aerators, (4) fountains. To satisfy most general purposes, whether it be to remove  $CO_2$ , odors, or iron and manganese, aeration should be carried through until the water is satd. with  $O_2$ . E. HURWITZ

Purification problems of the Williamson Water Works. PAUL C. LAUX. *W. Va. Univ. Coll. of Eng. Tech. Bull.* No. 2, 123-8(1928).—The main intake consists of a concrete pit in the Tug River filled with gravel and sand, in which are located 10 infiltration wells 10 ft. deep and 2 ft. in diam. It is subject to pollution from the city and from coal mines. The water is pumped to the mixing tank, where alum is added at the entrance and lime at the outlet by dry-feed machines. It flows to 2 sedimentation basins, capacity 270,000 gals., and then to 4 filters each 176 sq. ft. in area, capacity 500,000 gals. per 24 hrs. The plant is operated intermittently every 12 hrs. The count on the applied water is sometimes higher than on the raw water in hot weather; gas forms in the filters. It is suspected this gas is due to bacterial decompn. of org. matter in the settling basins while they are idle. Although 1 p. p. m. Cl is added, 10-cc. portions of water show gas after 48 hrs., but none after 24 hrs. and no confirmatory tests. Fine coal dust in the water forms a crust with the sand on the filters, which holds back the wash water and prevents gas escaping. Raking has corrected this trouble. Prechlorination has apparently not been successful in eliminating gas formation but has improved plant conditions. C. H. BADGER

The possibilities of Clenzal in the purification of water in country homes. - ALFREDO PIO DE RODA. *Univ. of the Philippines. J. Philippine Is. Med. Assoc.* 9, 1-4(1929). - Clenzal is uniformly effective in reducing the bacterial count and in killing *B. coli* in water artificially inoculated with it. FRANCES KRASNOW

Laboratory control of filter plants. GERRITT S. BUCHANON. *W. Va. Univ. Coll. of Eng. Tech. Bull.* No. 2, 63-70(1928).—The quality of well water in western Penna. is unsatisfactory; therefore surface water supplies must be treated and used. The dividing line between a hard and a soft water in Penna. is about 100 p. p. m. hardness. A general review and discussion of rapid sand filtration, chem. and phys. control tests, hardness, corrosion and algae are given. C. H. BADGER

Experimental filtration plant, Ottawa. ANON. *Can. Eng.* 56, 359(1929).—An

experimental plant to det. the best method of treatment of the Ottawa River water has been built on Lemieux Island. The capacity of the plant is 48,000 gal. per day. Detailed description of the general plan and operation of the plant is given. E. H.

**Water filtration plant at Picton, Ont.** W. TARR. *Can. Eng.* 56, 465(1929).—The water supply of Picton, Ont., has been improved by the addition to the old system of two pressure filters, 8 ft. in diam. by 20 ft. long, with one 300-gal.-per-min. motor-driven pump, one 600-gal.-per-min. gasoline-engine-driven pump and a chlorinating unit. Detailed descriptions with drawings are given in the article. E. HURWITZ

**Deep sand-rapid filters.** A. GRAUMANN. *Pumpen u. Brunnenbau Bohrentechnik* 1928, 397-9; *Wasser u. Abwasser* 25, 127.—The operation and cleaning of the "Bollmann-Schnellfilter" are described. C. R. FELLERS

**Sterilization of new water mains.** E. C. SULLIVAN. *Can. Eng.* 56, 371(1929).—Sterilization of newly laid water mains is imperative. It can be accomplished with either liquid Cl or  $\text{CaOCl}_2$  or  $\text{NaOCl}$ , care being taken to assure high residual Cl. E. HURWITZ

**The history of the chlorination of drinking water.** SPITTA. *Reichs-Gesundheitsblatt* 33, 533-5(1928); *Wasser u. Abwasser* 25, 120.—A critical review of the development of chlorination in Germany for the past 35 yrs. Recent developments in American water treatment are largely ignored. C. R. FELLERS

**Chlorination of water. II.** L. W. HAASE. *Preuss. Land. für Wasser, Boden u. Luft hygiene. Gas u. Wasserfach* 72, 217-22(1929); cf. *C. A.* 22, 2421.—Chlorination of water for  $\frac{1}{2}$  to 1 hr. reduces the content of org. substances, especially humins, which give the water a yellow color, and also facilitates the later removal of iron, which is difficult to remove in untreated waters contg. humins. Both hard and soft waters become more acid, with a further increase in acidity on dechlorination. The water may become sufficiently acid to cause active corrosion unless it is treated in a deacidifier. Org. substances in sewage can only be slightly destroyed by intensive chlorination. R. W. RYAN

**A new formula of the reagent for the detection of nitrites in water.** STÉPHANE VERGNOUX. *Bull. sci. pharmacol.* 36, 146-7(1929).—Dissolve 2 g. neutral red in 18 cc. of  $\text{H}_2\text{O}$ , filter, cool and add 80 g.  $\text{H}_2\text{SO}_4$ . Use 100-150 cc. of the  $\text{H}_2\text{O}$  to be tested, and add 5 drops of the reagent. After stirring, a blue color appears if more than one mg. of N in the form of  $\text{HNO}_2$  is present. A. E. MEYER

**A rapid method for estimation of the total hardness by the separate estimation of the lime and magnesia hardness.** KURT V. LUCK AND HANS J. MEYER. *Z. angew. Chem.* 41, 1281-4(1928).—After testing the method of Berg (cf. *C. A.* 21, 2449) a rapid method for sep. detn. of the Ca and Mg hardness is outlined as follows: Precipitate Ca as the oxalate and titrate the ppt. with  $\text{N}/28 \text{ KMnO}_4$ . To the cooled filtrate carefully add 2 cc. of 2% alc. 8-hydroxyquinoline on the surface of the filtrate. After 5 mins. heat the soln. to boiling. If the yellow color vanishes, add more of the soln. until the liquid is definitely colored yellow. After boiling for a short time, allow to cool and stand for about an hour. Filter the ppt. Wash the beaker with 2.5% ammonia water. After washing 3 times on the filter with ammonia water, dissolve in 8-10% HCl in the original beaker. Add 2 or 3 drops of aq. indigo-carmin soln. to the HCl soln. in a stoppered Erlenmeyer flask. Titrate the blue liquid with bromate-bromide soln. ( $\text{N}/14$ ) to a yellow color. Add 2-3 cc. of 20% KI soln. and, using starch as an indicator, titrate the excess of bromate soln. with standard thiosulfate ( $\text{N}/140$ ). If 50 cc. of water is used, the number of cc. of bromate-bromide soln. used gives the Mg hardness. Satisfactory results are obtained by this method; 6 detns. of lime and magnesia hardness can be made in 1.5 hrs. EDWARD BARTOW

**Bacterial after-growths in water-distribution systems.** JOHN R. BAYLIS. *Trans. Am. Soc. Munic. Improvements* 34, 265-6(1928).—"There is no need of being alarmed at bacterial aftergrowth where it is known that pollution cannot gain entrance to the supply." A table shows the summarized records, for 1 yr., of the bacteria in the water supply of a large city. W. H. BOYNTON

**Bacterium coli in iced and uniced samples of water.** GAYFREE ELLISON, H. W. HACKLER AND W. ALFRED BUICE. *J. Am. Water Works Assoc.* 21, 528-30(1929).—See *C. A.* 23, 1974. E. C. M.

**The iodine content of tap-waters in goitrous districts.** G. H. BECKWITH. *Zentr. ges. Hyg.* 17, 878(1928); *Wasser u. Abwasser* 25, 113; cf. *C. A.* 22, 2629.—The I content of a no. of water supplies from goitrous districts in the U. S. was detd. The following amts. were found (p. p. b.): Chicago, Lake Michigan, 0.13; Litchfield, Ill., 0.17; Peru, Ill., hard ground water 0.31; Peoria, Ill., deep well, 0.15; LaSalle, Ill., deep well, 18.00;

E. St. Louis, Mississippi River, 0.29; Springfield, Ill., 50-52; Duluth, Minn., 0.014; Grantsville, Utah, 1.33. C. R. FELLERS

The "goiter-spring" in Hallstatt. FRIEDRICH MORTON. Botan. Station, Hallstatt. *Arch. Hydrobiol.* 19, 742-3(1928).—The water of the so-called "goiter-spring" in Hallstatt contains in addn. to small amts. of Ca and Mg. carbonate, phosphate and sulfate, 0.00025 mg. I as iodide, 0.00031 mg. I as iodate, 0.00012 mg. I organically bound and 0.0125 mg. F per l. Nitrite and nitrate were detected. The sediment contained a relatively large amt. of Mn. G. SCHWOCH

The use of lime in water treatment. PAUL C. LAUK. *W. Va. Univ. Coll. of Eng. Tech. Bull.* No. 2, 109-18(1928).—The value of lime in waterworks operation depends on its CaO content. Smaller plants can more easily use hydrated lime, while larger plants will economize on the use of quicklime. Roughly, the dividing line is a consumption of 100 tons. Since lime tends to settle out of suspension, dry-feed machines are more satisfactory than soln.-feed machines. The feed line for milk of lime should be large, straight and short as possible. In case of longer lines, curves, horizontal flow, etc., rubber hose should be used since lime will tend to stick to any metal surface. C. H. BADGER

Zeolite softening plant at Sewickley, Pa. D. E. DAVIS. *W. Va. Univ. Coll. of Eng. Tech. Bull.* 2, 71-7(1928).—The 2,000,000-gal. plant supplies about 5000 people. The water is taken from a crib buried in a gravel bed in the Ohio River. The clear water is sterile and about twice as hard as the river water. A typical analysis is given. An 18-in. suction line laid in a concrete tunnel connects the supply to a low service well. It is pumped to an equalizing basin. The water passes to four 500,000-gal. open concrete tubs having a false bottom arrangement of cast-bronze umbrella strainers spaced on 6-in. centers surmounted by 18 in. of graded gravel and 30 in. of sand. Greensand (glauconite) is used in 3 beds and quartz filter sand in the 4th. Filtration is downward at the rate of 2 gals. per sq. ft. per min. Brine soln. for regeneration, which takes 0.5 hr., is pumped to the top of the beds. Washing is upward at a max. rate of 15 gals. per min. Each bed delivers water of 0 hardness for 4.5 hrs., water of increasing hardness for 2 hrs. and completely hard water for 0.5 hr. The quartz sand filter furnishes wash water and filtered unsoftened water to make the final product 60 p. p. m. hardness. There are 3 clear wells under the filters, resp. used for hard, soft and mixed waters. The arrangement of the plant is described. The contract cost is \$158,659. A zeolite plant is particularly adapted to clear waters contg. relatively high  $\text{SO}_4$ ; the advantages are simpler storage and handling of salt over lime and soda, greater compactness, definite routine scheduling, and max. flexibility in operating methods. C. H. BADGER

The use of chemically prepared feed-water for high-pressure boilers. A. SPLITTGERBER. *Wärme* 51, 733-9(1928); *Wasser u. Abwasser* 25, 207. C. R. FELLERS

The classification and evaluation of boiler-feed water. R. STUMPFER. *Wärme* 51, 717(1928); *Wasser u. Abwasser* 25, 207.—Detns. of Ca, Mg,  $\text{HCO}_3$  and total hardness of boiler-feed waters give important data on scale formation in boilers and aid greatly in evaluating a water for steam generation. C. R. FELLERS

The influence of magnesium content on the hardness of boiler-feed waters. P. HERMANN. *Wärme* 51, 755-7(1928); *Wasser u. Abwasser* 25, 207.—Mg in water cannot be removed by chem. means. Large amts. of Mg cause scale formation. C. R. F.

New boiler-scale preventive. E. HERMS. *Wärme & Kälte Tech.* 30, 1-4(1928); *J. Am. Water Works Assoc.* 20, 442(1928).—H. describes the effect and mode of the use of the patented solid compd. "Hydrotor," alleged to dissolve old boiler scale and to prevent the formation of new. ERNEST W. THIELE

A review of sewage treatment. H. BACH. *Gesundh.-Ing.* 52, 241-3(1929).—In the past few years much time has been given to the question of two-storied treatment plants vs. sep. sludge digestion. Either process will give a well-digested sludge. It is difficult to form a final opinion on the relative merits of the two. Local conditions will play an important role in the selection of the best process. Sewage sludges are of considerable importance as fertilizers. The activated-sludge process is in great favor today. Several modifications of this process are mentioned. Only slight treatment of industrial sewage has been effected. WAYNE L. DENMAN

Theory and practice in the sewage profession. H. KESSENER. *Gesundh.-Ing.* 52, 248-50(1929).—In sewage treatment complicated and expensive installations such as the activated-sludge process are frequently encountered. the other hand, simple, cheap and well-designed plants often give excellent results. Poor construction does not result in any saving as inferior results are obtained. The designing of a plant should be made by competent consulting engineers, who are able to coordinate the improvements

of pure science with the operation of actual processes, which have been found to work well.

**Ballarat sewerage system.** A. FARRAR. *Australian Municipal Officers' J.* 1928, 11-7; U. S. Bur. Public Health Eng. Abstracts E-637a, 57-8.—A sep. sludge-digestion plant has been built for the greater city of Ballarat, Victoria. The plant consists essentially of 1.5-in. bar screen, 3 grit chambers (40 ft. long), Venturi meter, primary sedimentation tank (50 × 50 ft.) with sloping sides and rectangular sub-sump from which fresh solids are discharged as frequently as necessary to keep material fresh, automatic siphon, sprinkling filter beds (5'6" deep), secondary sedimentation tank used only when effluent is turbid, and 3 sep. sludge-digestion tanks (9 more planned) 25 ft. sq. and sludge drying beds 30 × 16 ft. The no. of sludge beds will be 12. Supernatant liquid of digestion tanks is discharged on trickling filters. Up to the present the effluent from the filter bed, as well as the sludge, has been highly satisfactory. Chem. analyses show that the available O in the effluent is from 4 to 6 times greater than that of the water of the town supply, and that the effluent delivered to the creek is better than is required by the British Standard for effluents. Analyses of the water in the creek above and below the plant show that the water below the point of entry is much improved when compared with that above it. O absorption in 4 hrs. of crude sewage is 5.3 grains per 100,000; of the effluent, 0.33. The sludge contains 90% water, and has a fertilizer value of £3/10/— per ton.

WAYNE L. DENMAN

H. L. D.

**Sewage and sewage purification.** REICHEL. *Deut. Korrespondenz Gesundh. u. Sozialvers.* 1928; *Wasser u. Abwasser* 25, 210.—History, development and operation of modern German sewage works are discussed.

C. R. FELLERS

**Experiences in aerating sewage.** W. H. MAKEPEACE. *Can. Eng.* 56, 379(1929); cf. C. A. 23, 1456.—Avoidance of short circuiting and thorough mixing are vital to the efficient operation of aeration tanks. Partial pre-aeration is suggested to remove load from bacteria beds.

E. HURWITZ

**Systems of sewage aeration.** GEORGE B. GASCOIGNE. *Trans. Am. Soc. Munic. Improvements* 34, 201-9(1928).—The paper deals with the activated-sludge process of sewage treatment and particularly with "the various systems of sewage aeration now used or seriously contemplated for use, either abroad or in this country." Three classes of aeration are given: (1) aeration by air diffusion; (2) surface aeration; and (3) combined aeration. Operating data in full-sized units are needed.

W. H. BOYNTON

**New sewage treatment works of Manasquan, N. J.** LOUIS L. TRIBUS. *Proc. Am. Soc. Munic. Improvements* 34, 211-8(1928).—The plant provides a single-compartment chamber having two screens arranged for alternate hoisting, later replaced by a rigid sloping bar screen, and a circular deep pumping station divided into two compartments, one dry for the pumps, the other wet for the roughly screened sewage. The sewage is pumped through a cast-iron system into one or all of four sedimentation tanks, settled and passed over weirs into a tank. An automatic recording gage registers the flow. The cast-iron outfall to the ocean is of universal type with a double outlet to partially discount choking. Bacterial purity was secondary to the avoidance of nuisance in the design and operation of this plant.

W. H. BOYNTON

**The oxidation of sewage when "hard" and "soft" waters are the carriers.** J. E. PURVIS. *J. Roy. Sanit. Inst.* 49, 587(1929).—The permanganate method for O consumed was used to det. the rate of oxidation of sewage. Oxidation was performed by aerating the sewage for several hrs. The rate of oxidation was less the larger the inorg. salt content of the sewage. This factor should be considered in the design of activated-sludge plants.

A. L. E.

**Determination of solid material deposited from sewage.** H. VAN DER ZEE. *Gesundh.-Ing.* 52, 243-6(1929).—The usual method of detg. the amt. of deposited material by means of glass sedimentation vessels is inaccurate and yields values, which after concn. of the sewage, are more or less in error. Thick sewage shows greater differences. The error of observation is caused by the packing of the already deposited sludge produced during the detn. The extent of this deposition is detd. by the shape of the vessels and by the nature of the sludge. Gravimetric detns. seem to be more accurate.

W. L. D.

**Digestion of fine screenings.** WILLEM RUDOLFS. *Proc. Am. Soc. Munic. Improvements* 34, 161-71(1928).—Results are given of digestion on a semi-plant scale of fine screenings, for a half-yr. period. Solids were reduced by 61% and the volatile matter by 66.8%. Decompn. of nitrogenous substances was 59.5% and of fatty substances 56%. The digested material dried readily and was spadeable in 3-4 days. Pressing of the material 2-5 hrs. yielded a cake contg. 66-69% moisture. The digested sludge was black and had no odor other than the ordinary gas odor. The relation be-

tween C:N in sewage solids varies from 6:1 to 13:1, which on the dry basis is 3.5-4% N, and 25-30% C. In the fine screenings the N figure is lower and the C figure higher.

W. H. BOYNTON

**Large-scale experimental and demonstration plant for the digestion of sewage screenings at Milwaukee, Wisconsin.** DARWIN W. TOWNSEND. *Proc. Am. Soc. Munic. Improvements* 34, 173-99(1928).—Basic considerations affecting the design of the plant, the digestion compartments, gasometer and gas metering equipment, facilities for charging tank compartments with screenings, glass-covered screenings, sludge beds, and the housing structure for tanks and control equipment are emphasized. A brief discussion is included.

W. H. BOYNTON

**The efficiency of settling tanks.** M. B. TARK. *Trans. Am. Soc. Munic. Improvements* 34, 225-36(1928).—Settling tanks are divided into 3 classes: (1) primary tanks, (2) final tanks for the effluent from sprinkling filters, and (3) final tanks for the effluent from activated-sludge plants. The essential features of design for continuous flow tanks are: (1) means for decreasing the velocity of flow so that the solids can settle out, (2) a zone of quietness where the settled solids can accumulate, and (3) means of removing the accumulated solids or sludge. For highest efficiency the flow should be distributed equally between the several tanks in a plant and uniformly across the section of each individual tank. The removal of the settled sludge also affects the efficiency of a settling tank. Different means of sludge removal are mentioned. A well-designed settling tank will remove 60-75% of the suspended solids. A table shows the efficiency of various tanks in the reduction of suspended solids in several New Jersey plants. Discussion brought out the factors controlling the settling capacity or ability of a continuous flow tank to produce an effluent of predetd. acceptable standard: (1) period of mixed liquor aeration before settling, (2) % of solids concn. in the liquor—a factor dependent upon the vol. of activated sludge maintained in circulation, (3) the characteristics of the sewage flow curve, and (4) the effectiveness of continuous settled and concd. sludge removal from a tank bottom particularly regarding minimizing the disturbing effect of mech. sludge-removing app. Also curves are shown, which indicate graphically the effect upon settling rates and settled-solids concn., due to various % of increase in solids content (on the dry basis) in mixed liquors. Settled sludge should be removed as speedily as possible to minimize the agitation. The sludge should be removed in as fresh a condition as possible, tanks should be provided with skimming devices and the sludge should be removed from the tank with as little moisture as possible.

W. H. BOYNTON

**Sewage purification in industrial plants.** A. PRITZKOW. *Werksleiter* 1928, 256-60; *Wasser u. Abwasser* 25, 58.—General description of well-known disposal systems.

C. R. FELLERS

**Sewage management and dry-sludge removal in Breslau.** TRAUER. *Städtereinigung* 1928, 278-9; *Wasser u. Abwasser* 25, 58.—An address discussing in detail the sewage fields, sewage-irrigated meadows and stone and rubble filters used in the Breslau disposal works.

C. R. FELLERS

**Activated sludge: its production, composition and value as a fertilizer.** O. J. NOERR. *Zentr. Bakt.* II, 73, 419(1928); *Wasser u. Abwasser* 25, 126.—Approx. 20% of the total N is recovered in the sludge. Imhoff-tank residue contained only 4% of the original N. Field and pot expts. showed excellent utilization by plants of the N in activated sludge. Analysis of dried sludge gave N, 4.7-6.5% and  $P_2O_5$ , 2.3-4%. The value assigned the dried sludge was \$25 per 1000 kg. The material is particularly adapted for meadow fertilization.

C. R. FELLERS

**An activated-sludge system of sewage disposal (followed by rapid sand filtration) for Grand Cañon National Park.** M. R. TILLOTSON. *Trans. Am. Soc. Munic. Improvements* 34, 253-6(1928).—All water used at the hotels and residences in the National Park is delivered by tank car. The activated-sludge system was adopted for sewage disposal due to the following factors: (1) the degree of purification required in order that re-use might be had of the effluent, (2) the lack of natural filtration beds, (3) the lack of necessity of de-watering sludge, (4) the degree to which control of the character of effluent might be had, and (5) coöperation from the railroad by furnishing power and operating labor. Operating results have been satisfactory and economically profitable.

W. H. BOYNTON

**Various methods of sewage disposal.** E. A. FAWCETT. *Can. Eng.* 56, 437(1929).—A careful study of conditions peculiar to a given area should be made before decision on the type of sewage treatment to be used is made. The principal methods of sewage treatment where the outfall is in the sea or in the tidal estuary are by discharging sewage (a) without treatment, (b) after screening, (c) after treatment in sedimentation tanks, (d) after sedimentation followed by filtration. Where the outfall is into a non-tidal river,

stream or other fresh-water body, the principal methods are by discharging sewage after treatment by (a) irrigation, (b) screening followed by irrigation, (c) sedimentation, (d) sedimentation filters and humus tanks, (e) activated sludge without filtration or irrigation, (f) activated sludge followed by filtration with or without irrigation. E. H.

**Continued study of gas collection in sewage-disposal plants.** JERRY DONOHUE. *Trans. Am. Soc. Munic. Improvements* 34, 219-24(1928); cf. C. A. 22, 1642.—The sewage-disposal plant at Antigo, Wisconsin, is a sep. sludge-digestion plant consisting of a screen and grit chamber, a clarifier or sedimentation tank, a sludge-digestion tank, a sludge-drying bed and a trickling filter unit. Operation during the past year demonstrates that the sep.-sludge-digestion type of plant utilizing mech. equipment, in both digester and clarifier, offers some advantages in small plant design for overcoming some of the difficulties usually encountered. The fresh sludge at the Antigo plant has 97.8% moisture and the digested sludge 98.9% moisture. The gas contains 58%  $\text{CH}_4$  and has a B. t. u. value of 645 per cu. ft., which is equiv. to  $7\frac{1}{2}$  tons (6818 kg.) of coal per thousand population.

**Home sewage disposal.** O. MOHR. *Stadt. Tiefbau* 19, 232-3, 308-12, 361-4 (1928); *Wasser u. Abwasser* 25, 219.—The transportable OMS fresh-water type of disposal plant with mech. cleaning devices is advocated where sewers are not available.

W. H. BOYNTON  
C. R. FELLERS

**A study of factors affecting the efficiency and design of farm septic tanks.** E. W. LEHMANN, R. C. KELLEHER AND A. M. BUSWELL. *Ill. State Water Survey Bull. No. 27*, 45 pp.; cf. C. A. 22, 3250.—Inasmuch as the flow of sewage per person from farm homes is subject to wide variation, the tank should be so designed as to make an av. allowance for sewage flow of 18-25 gals. per person per day depending upon the size of the family. Ordinarily it is not practical to build a tank smaller than the size required for 7 people. In a single-chamber tank a 72-hr. retention period should be provided. In a two-chamber tank a 72-hr. retention period should be provided in the 1st chamber and an additional retention period of 36 hrs. in the 2nd chamber (capacities being in the ratio of 2 to 1, or a total retention period of 108 hrs.). When properly designed, the two-chamber tank is more efficient than the one-chamber tank, particularly if the two-chamber tank is provided with 50% larger capacity. Recommendations for the design of simple farm septic tanks are given in detail.

J. A. KENNEDY

**Disposal of septic-tank effluent (at Dacca) by dilution, irrigation and digestion.** F. C. GRIFFIN. *Inst. Civil Eng., Selected Eng. Papers*, No. 65, 13 pp.(1928).—A general description of the disposal of sewage at Dacca is given.

B. C. A.

**Proof of water pollution by a simple method.** CH. GAUSSEN. *Zentr. ges. Hyg.* 18, 394(1928); *Wasser u. Abwasser* 25, 213; cf. C. A. 22, 3007.—On the basis of the observation that most pathogenic bacteria to be found in water not only form indole from peptone solns. but decolorize toluidine blue, G. uses this combination of tests to detect pollution of water. The data and conclusions are not entirely convincing.

C. R. FELLERS

**Pollution in the Monongahela River basin and its effect on public water supplies.** L. V. CARPENTER. *W. Va. Univ. Coll. of Eng. Tech. Bull. No. 2*, 27-38(1928).—Above Morgantown, W. Va., the greatest single waste is acid water from coal mines. Tabulations show the relation between gals. of acid water per acre per day of coal exhausted and % of rainfall, and between acidity and  $p_H$  values for 6 drift mines in Monongahela County. The acidity varied from 89.2 to 1300.0 grains per gal. and the  $p_H$  value from 2.0 to 3.1. An analysis of 1 of the mine waters is given. A comparison between low  $p_H$  value and low bacteria count at  $37^\circ$  is shown for 3 sampling stations located near Morgantown. Several sterile samples adjusted to  $p_H$  7.2 with lime showed bacteria at  $37^\circ$  after standing 24 hrs. and gas formation but no *B. coli* after 48 hrs., proving bacterial growth had only been inhibited.

C. H. BADGER

**The treatment of city wastes by the Beccari closed-vessel method.** JEAN BORDAS. *Station recherches agron. d'Avignon. Bull. soc. encour. ind. natl.* 128, 170-2(1929).—City waste freed from glass, tin, wood, rags and paper was filled into closed chambers of 20 cu. m. capacity. Dung was treated in smaller chambers of 5 cu. m. capacity. Fermentation and decompn. of org. matter proceed slowly with evolution of  $\text{CO}_2$ ,  $\text{NH}_3$ ,  $\text{PH}_3$ ,  $\text{CH}_4$ ,  $\text{H}_2\text{S}$  and  $\text{H}_2\text{O}$  vapor, which pass out through a chimney.  $\text{NH}_3$  is fixed and recovered in this chimney by means of argillaceous earth with  $\text{FeSO}_4$  or acid Ca phosphate. The temp. obtained is  $70-75^\circ$ . Since denitrification cannot take place at this elevated temp., there should be full conservation of N. It required 40 days for the city waste and 60 days for the dung completely to ferment and to become deodorized by the Beccari process. Night soil fermented in piles in the open air gave an analysis as follows. total N 0.45%,  $\text{P}_2\text{O}_5$  0.59% and  $\text{K}_2\text{O}$  0.52%. Night soil treated by the Bec-

carb process gave an alk. reaction and contained 0.83% N, 0.63%  $P_2O_5$  and 0.72%  $K_2O$ . A notable conservation of N is indicated by the use of the process. C. R. FELLERS

The waste plant for the town of Tours (France). A. JOULOT. *Chaleur et ind.* 10, 113-8(1929).—The plant for destroying town waste, recovery of by-products and generating power is described. The ashes are used in working up for fertilizer; they have the compn.  $SiO_2$  56.7,  $Al_2O_3$  +  $Fe_2O_3$  19.5,  $CaO$  9.6,  $MgO$  1.5,  $SO_2$  3.5,  $P_2O_5$  1.3,  $K_2O$  +  $Na_2O$  2.1%. The clinkers have the compn.  $SiO_2$  46.0,  $Al_2O_3$  16.6,  $Fe_2O_3$  8.6,  $MnO_2$  0.4,  $CaO$  21.0,  $MgO$  2.1,  $K_2O$  0.4,  $Na_2O$  3.2 with a fusion point of  $1200^\circ$  and in brick form fractures at 130 kg./cm.<sup>2</sup>. S. L. B. ETHERTON

Waste disposal—a description of the Pennsylvania study. E. G. BOYER. *Am. Gas Assoc. Monthly* 11, 201-4(1929).—This is a report on the extension of the "Pennsylvania Plan" of waste disposal by the Penna. Gas Assoc. in cooperation with the Penna. Sanitary Water Board to include effluents from gas plants. A. S. CARTER

Phenol recovery and treatment works of the Hamilton Coke and Iron Company. B. F. HATCH. *Ind. Eng. Chem.* 21, 431-3(1929).—Inert gas satd. with steam is passed in a closed cycle round and round through the hot, partially distd.  $NH_3$  liquor. At 1 point in the gas cycle there is placed a scrubbing section contg. hot  $NaOH$  soln. The phenol passes from the  $NH_3$  liquor into the steam and gas mixt. by virtue of its vapor pressure; in the caustic section it is converted into Na phenolate, which by reason of its much lower vapor pressure, remains in the caustic soln. Since the  $NH_3$  liquor and the caustic soln. are both held at or immediately below their b. p., and since the tower and piping are covered with insulating material, there are virtually no heat losses. The phys. equipment consists of a steel tower 7 ft. in diam. and 95 ft. high, a small blower, 4 small liquor pumps, 2 storage tanks and the necessary piping. The operation temps. are automatically controlled. This process can be used at any coke plant which is located on a stream or body of water of sufficient size to afford the necessary diln. for the small amt. of phenol contained in the resultant waste. The efficiency of phenol removal is high, the operation of the works is simple, the ground space required is small, the costs of operation appear to be attractive; and since this process is essentially one of steam distn., the phenol obtained should be of exceptional quality. C. R. FELLERS

What amounts of nutrient substances present in the effluent of a potato-starch factory are adapted to meadow irrigation? Are these poisonous to fish? EBELING. *Mitt. Fisch. Ver.* 32, 521-2(1928); *Wasser u. Abwasser* 25, 214.—Following up the observation of Parow (C. A. 22, 2218) to the effect that effluents from potato-starch factories are destructive to fish, E. proves that because of the high content of nutritive substances in this waste water, decompn. and fermentation occur. The high org. content consumes the O present, gives rise to prolific mold growths and contains saponin. The latter causes death to fish by its action on the gills. Waste waters from potato-starch factories should be well dild. before use in meadow irrigation projects. Serious pollution and injury to fish-life occur unless the sewage is first treated so as to eliminate the sol. and suspended solids. C. R. FELLERS

Progress in the treatment of paper-mill and tannery wastes. W. W. HODGE. *W. Va. Univ. Coll. of Eng. Tech. Bull.* No. 2, 47-61(1928).—H. reviews work done in Wis. and Mass. (cf. C. A. 21, 3996; 23, 1707, 1709). In W. Va. several tanneries, pulp and paper mills, saw mills, etc., have installed waste-treatment units. One tannery after neutralizing acid waste with alk. wastes, and after sedimentation, runs the clear neutral liquor into the stream. The progress made in the last 5 yrs. indicates that objectionable wastes from industrial plants can be better treated before going into streams. C. H. BADGER

Smoke abatement problem in Osaka. KENOSUKE TSUJIMOTO. *J. Fuel Soc. (Japan)* 8, 253-68(1929).—A review and discussion. F. I. NAKAMURA

Bureau of Standards soil-corrosion investigation (LOGAN) 9.

GHOSE, SUSHIL C.: Waste Water Control. 2nd. ed. Calcutta: Modern Art Press. 91 pp. 2 rupees. Reviewed in *J. Roy. Sanit. Inst.* 48, p. 21 of suppl. for Aug., (1928).

IMHOFF, KARL.: The Arithmetic of Sewage Treatment Works. Translation from German by Gordon M. Fair. New York: J. Wiley & Sons, Inc. 99 pp. \$2.

Sand filter for water, etc. B. BRAMWELL. *Brit.* 298,835, Feb. 7, 1928. Structural features.

Apparatus for softening water with base-exchange material. W. NEUMANN. *Brit.* 298,997, July 19, 1927. Structural features.



**Preventing incrustation in boilers.** J. GORDON. Brit. 299,073, May 17, 1927. A sol. carbonate is added to the boiler water in such proportions that Ca is pptd. as carbonate, which forms a non-adherent sludge. The conditions of the treatment are also favorable for the pptn. of Mg and Fe salts, silicates and some other impurities in non-adherent form.  $\text{Na}_2\text{CO}_3$ ,  $\text{NaHCO}_3$ , or  $\text{BaCO}_3$  may be added, the latter serving to reduce the  $\text{SO}_4$  content of the water by pptn. of  $\text{BaSO}_4$ . A chart of different concns. suitable for avoiding pptn. of  $\text{CaSO}_4$  is given. Brit. 299,074 specifies adding a sol. phosphate to the boiler water to ppt. Ca phosphate as a sludge. A fluoride or arsenate also may be used for the production of a non-adherent ppt. Most of the Ca and Mg are preferably removed by a preliminary treatment with lime and  $\text{Na}_2\text{CO}_3$ . A chart of appropriate concns. of reagent is given.

**Preventing or removing boiler incrustation.** J. D. RIEDEL-E. DE HAËN A.-G. Ger. 474,272, Nov. 21, 1922. Water-insol. inorg. substances, e. g., alumina, kaolin, or graphite, are kept in colloidal suspension in the water.

**Treating cannery waste.** JOHN T. TRAVERS. U. S. 1,711,105, April 30. To avoid stream pollution by cannery waste, the waste is rendered alk. (suitably by  $\text{Ca}(\text{OH})_2$ ) and treated with a sol. Ca salt, such as  $\text{CaSO}_4$ , and with sulfate of Al or Fe or other suitable coagulating agent and a primary Ca phosphate.

## 15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER

**American soils as seen by Russian investigators.** J. S. JOFFE AND I. ANTIPOV-KARATAEV. *Soil Science* 27, 159-66(1929). J. J. SKINNER

**Lime penetration resulting from surface application to pasture land.** P. R. NELSON. Mass. Agr. Expt. Sta. *Soil Science* 27, 143-6(1929).—From a study of the Ca content and the  $p_H$  values of the treated and untreated pasture soils it has been found that the greater part of the Ca has remained at the point of application and exerted its influence there. The  $p_H$  values show a trend toward a gradual penetration as indicated by a slight, though consistent, neutralization of the soil acidity to a depth of 9 in. The only fertilizer which has had the slightest neutralizing effect upon the soil is gypsum and its effect has not influenced the change in acidity caused by the application of lime alone.

J. J. SKINNER

**Effect of crop growth on the replaceable bases in some California soils.** J. C. MARTIN. Univ. of Calif. *Soil Science* 27, 123-36(1929).—The quantities of exchangeable bases in clay or silty clay loam soils are generally much higher than in the sandy loam soils. When the soils were subjected to a prolonged period of cropping annually to barley or were cropped twice with a long fallow period intervening, there were no appreciable changes in the content of total replaceable bases. There were significant decreases of replaceable K in all soils cropped annually for 12 years. Nine of the 12 soils, which supported 2 barley crops with a 10-year fallow period intervening, show significant decreases in K. The content of total bases is not significantly altered by these decreases in K, because Ca and Mg, which comprise 90% of the total, remain const. The loss of K from the entire group of soils supporting an annual crop of barley for 12 successive years is 32% of that contained in these soils at the beginning of the expt. and is 82% of the K removed in the crops from these soils. The losses of K from the same original group of soils which have supported 2 crops of barley with an intervening fallow period of 10 years, are of questionable significance in several cases, but for the entire group, make up 13% of the original content and constitute 64% of the crop withdrawal. The data seem to be significant, since this expt. has been conducted under conditions which preclude the loss of any of the 4 bases from the soil except by crop withdrawals. These relations between losses of K and crop withdrawals of this constituent suggest the importance of the replaceable base complex with respect to available K in soils. The 0.05 N HCl extractable bases in these soils are compared to the  $\text{NH}_4$  acetate replaceable bases and their relations discussed briefly.

J. J. SKINNER

**Microbiological activities in the soil of an upland bog in Eastern North Carolina.** IVAN V. SHUNK. North Carolina State Coll. *Soil Science* 27, 283-303(1929).—Nitrification did not occur in a bog soil under natural conditions. It was made to occur by liming and drainage as detd. by pot expts., but only after an interval of 6 to 10 weeks. No leguminous plants are found growing on the bog and yet the soil contains 0.24% of total N. The addn. of enough lime to the soil to neutralize the acidity results in a great increase in the nos. of bacteria, but does not appreciably change the nos. of fungi. Lim-

ing the soil markedly increases the rate of  $\text{CO}_2$  production by the soil microorganisms. When the soil is neutralized with lime and allowed to become quite dry, *Actinomyces* becomes abundant. Cellulose added to the soil in the form of filter paper is very slowly decompd. on account of the lack of available N. J. J. SKINNER

Studies on the periodicity of the soil respiration and the microbe activity of the forest soil. D. FÉHÉR. Botan. Inst., Sopron, Hungary. *Biochem. Z.* 206, 416-35 (1929).—The bacterial activity of the soil stands in direct relation to the solar energy. The bacterial content as well as the soil and air temp. together with the light intensity reach a min. value during the winter months, and then a max. value in June and July. The soil respiration is generally completely suspended at temps. below  $0^\circ$ . The respiration as manifested in the  $\text{CO}_2$  production varies parallel with the aerobic organisms. The activity and no. of soil protozoa have no noticeable influence on the soil respiration. The total no. of cellulose-hydrolyzing bacteria (aerobes and anaerobes) varies with the total no. of organisms in the soil, which is more or less also true for the bacteria that ferment butyric acid and urea. The distribution of nitrifying and of denitrifying organisms is likewise affected seasonally. No direct connection could be demonstrated between the variations in  $\text{pH}$  and in the humus content and the no. of bacteria. S. MORGULIS

Dispersing soil conglomerates and a new method of isolating particles smaller than 0.001 mm. V. A. SIBIRSKII, with an introduction by M. KH. PIGULEVSKII. *Ann. of the Division of Agr. Machinery, State Inst. Expt. Agron.* (Russian) [2], 2, 129-54 (1927).—Three soil types were used in the expts.: 2 chernozems and 1 podzolized. The fractions 0.25 to 0.01 mm. were sepd. (1) Ten-g. samples were mixed with 100 cc. 1.0  $N$   $\text{NH}_4\text{Cl}$ , filtered, washed with a 80 cc. 0.5  $N$   $\text{Na}_2\text{CO}_3$  soln., then with 25 cc. 0.25  $N$   $\text{KOH}$ . After each treatment the soils were washed with  $\text{H}_2\text{O}$  until no coloration was apparent. The soil fraction was heated with a dil. soln. of  $\text{H}_2\text{O}_2$  and decanted in a Sabanin app. The differences in the weight of the soil before and after treatments gave the amt. of material removed. (2) The fraction 0.25-0.01 mm. was treated as in (1) with  $\text{NH}_4\text{Cl}$ , transferred into a beaker and boiled with 30 cc. of distd.  $\text{H}_2\text{O}$  for 1 hr., then it was decanted in a Sabanin app. The soil was then treated with  $\text{H}_2\text{O}_2$  as in (1) and decanted. The weight of the fraction was detd. before and after each treatment. The substances removed by the  $\text{NH}_4\text{Cl}$ ,  $\text{Na}_2\text{CO}_3$  and  $\text{KOH}$  treatment were considered as the amt. of colloidal humus; the substances removed by the  $\text{H}_2\text{O}_2$  treatment were considered as the oxidized humus. The amt. of substance thus suspended when compared with the amt. obtained by boiling, was less. The amts. of the resp. fractions lower than 0.001 mm. as detd. in the Sabanin app. by the 2 methods did not correspond. An approach to study the problem was also made in a different way: 3.75 g. of chernozem was mixed with 50 cc. of  $\text{H}_2\text{O}$  and sieved through a 0.25-mm. sieve. To the mixt. 50 cc. of 0.1  $N$   $\text{NaOH}$  was added, heated and dry  $\text{Cl}$  gas free from  $\text{HCl}$  was passed into the mixt. for 10 mins. The rich chernozem gave a dark-yellow supernatant liquid; the poor chernozem gave a light-yellow liquid. The liquid was removed by siphoning. 50-100 cc. of 0.1  $N$   $\text{NaOH}$  was added again and heated on the bath.  $\text{Cl}$  gas passed again and decanted as before. The soil was then placed on a funnel and washed to remove the electrolytes until no  $\text{Cl}$  could be detected. The soil was then transferred to a Sabanin app. and the various fractions were sepd. The org. material because of this treatment goes through the following changes: At first the color is black, changing to dark brown and then to yellow. With the increase of the electrolytes the colloidal substances settle and the liquid remains yellowish green because of some colloidal soln. of the humus complex fraction. In the alk. medium satd. with  $\text{Cl}$  gas 3 products are found:  $\text{NaOCl}$ ,  $\text{NaCl}$  and  $\text{H}_2\text{O}$ ; the org. substances are converted into new compds., which are peptized in the presence of the  $\text{OH}$  ions. A comparison of this method with the Sabanin and the  $\text{H}_2\text{O}_2$  methods shows that it disperses the soil more efficiently, not influencing the mineral fraction. J. S. JOFFE

Relation of temperature to the amount of nitrogen in soils. HANS JENNY. Univ. of Missouri. *Soil Science* 27, 169-88(1929).—See *C. A.* 22, 4702. J. J. SKINNER

Some observations on the effect of the high concentration of organic or ammoniacal nitrogen on nitrification in soil. N. V. JOSHI. *Agr. J. India* 23, 473-81(1928).—In lab. nitrification expts., with soil taken from fields recently brought into cultivation it was found that when more than 90 mg. of N from  $(\text{NH}_4)_2\text{SO}_4$  or oil cake were used per 100 g. soil there was no accumulation of nitrates but large quantities of  $\text{NH}_3$  and sometimes nitrites were present. However, when the soil was first incubated with 90 mg. of N from oil cake or  $(\text{NH}_4)_2\text{SO}_4$  for about 6 weeks and then washed free of nitrates, it was found that the washed soil could nitrify as much as 120 mg. of N per 100 g. of soil without the accumulation of  $\text{NH}_3$ , indicating that the soil treated in this way was activated in

such a manner as to be able to nitrify large quantities of org. or ammoniacal N. J. attributes this phenomenon to a large increase in the no. of nitrifying organisms and a proportionate decrease in the no. of non-nitrifying organisms. This was borne out by expts. in which relatively pure cultures of organisms capable of forming nitrites and nitrates were added to 100-g. samples of soil contg. 120 mg. of org. or ammoniacal N, the rate of nitrification being appreciably increased in each case. The rate of nitrite formation was not appreciably increased. In comparative expts. with oil cake,  $(\text{NH}_4)_2\text{SO}_4$ ,  $\text{NaNO}_2$  and  $\text{KNO}_3$ , it was found that recovery of N in the form of  $\text{NH}_3$ , nitrite and nitrate was lowest with  $\text{NaNO}_2$ , followed in order by  $(\text{NH}_4)_2\text{SO}_4$ . This is explained on the assumption that the N is converted into org. N or else escapes as free N. When active nitrification was going on the no. of organisms in the soil was maintained at a higher level for a longer period of time than in those cases where nitrification did not proceed.

K. D. JACOB

**Influence of various forest types on nitrate content and formation in forest soils.** A. NEMEC AND K. KVAPIL. *Z. Forst- u. Jagdwesen* 1927, 322-412.—The nitrate content of different soil horizons under various types of forest was studied, and nitrifying ability correlated with the type of vegetation. Nitrifying ability was detd. from the rate of accumulation of nitrate in samples of soil. Nitrate content varied with the depth of the horizon, surface litter and mold being generally richest. In both coniferous and deciduous forests free from undergrowth there was little or no nitrification at any horizon, and even a tendency to denitrification when the surface layer was highly acid. The existence of an undergrowth was accompanied by considerable nitrifying power in the humus layers; certain plants were suggested as indicators of nitrifying ability in forest soils. In clearings there was a striking increase in nitrifying ability, attributed to the accelerating action of direct sunlight on the decompn. of litter material.

B. C. A.

**The influence of manganiferous soils on the accuracy of the quinhydrone electrode.** W. T. MCGEORGE. Hawaiian Sugar Planters' Assoc. Expt. Sta. *Soil Science* 27, 83-8 (1929).—The accuracy of the quinhydrone for the detn. of soil reaction is greatly affected by the presence of small quantities of  $\text{MnO}_2$ . The drift shown by the potentiometer with manganiferous soils is sufficiently rapid and characteristic to warn the analyst against reporting erroneous results on such types.

J. J. SKINNER

**The effect of moisture content and cropping on exchangeable calcium and magnesium, with particular reference to rice soil.** W. H. METZGER. Arkansas Agr. Expt. Sta. *Soil Science* 27, 305-18 (1929).—The results of a study of the exchangeable Ca and Mg of a soil cropped to rice for a long period of time are reported. Crowley silt loam cropped to rice for 15 of the past 20 years showed considerably more exchangeable Ca and Mg in the surface soil than in the sub-surface horizon. Clarksville silt loam kept at a moisture content of 20% with distd.  $\text{H}_2\text{O}$  for a period of 75 days increased the exchangeable Mg as compared to the same soil kept air-dry. Exchangeable Ca was not appreciably changed. Flooding with distd.  $\text{H}_2\text{O}$  for the same period of time depressed the amt. of exchangeable Ca, but increased the amt. of exchangeable Mg.

J. J. SKINNER

**The influence of organic matter and lime on soil moisture and on the percentage of carbon and nitrogen in field plots.** J. F. MULLER. Rutgers Coll. *Soil Science* 27, 137-41 (1929).—In all cases but one, those soils from exptl. plots receiving an annual application of org. matter show a higher moisture content than those receiving no treatment or only minerals. In all cases but 2, those soils receiving lime show a lower moisture content than the corresponding soils receiving no lime. The addn. of org. matter increases the moisture content approx. twice as much as the addn. of lime decreases it. The soils receiving annual applications of org. matter, as manure or straw, show an increase in total C over the amt. originally present. Those receiving manure show an increase in total N also. All other plots show a decrease in these 2 elements.

J. J. SKINNER

**The influence of the distance between rows of sugar beets upon the absorption of nutrition from the soil.** J. SOUČEK. *Listy Cukrov. 47*, 365-8 (1929).—Beginning in June, the wt. of the individual green and the av. wt. of the beet root increases with an increasing distance between rows. The percent of dry matter was the same for all widths of rows with a minor exception in the root of the wider rows, where a decrease occurred from Aug. 28. The av. wt. of dry matter increased with the wide rows from Aug. onward for both root and green. With the progress in ripening the quantity of dry matter increased chiefly in the most widely spaced rows. On June 26, the sugar contents of all the rows were the same; during July and Aug., the narrowest row showed the highest sugar content, and the widest row the lowest; the last (Nov.) analysis showed the highest (19.90%) sugar content for the 45-cm. row, 19.65% for the 35-cm. row, 19.18% for the 55-cm. row. The yield of sugar per plant remained the same for all rows

until Aug.; the 35-cm. row yielded the least in Aug; in Nov. the yield for the 55-cm. row was 162.6 g., 45-cm. row 125.2 g. and 35-cm. row 87 g. The percentage of ash remained about the same for greens and roots during the early part of the season but became highest in the widest rows at the close of the season. During the month of July, the 55-cm. rows showed the highest av. ash content which persisted to the end of the season. The % N was the same for all rows throughout the entire season; the av. N content became the largest for the widest row from July to Sept.; the lowest N content at the end of the season is found in the 45-cm. row and is compensated for by a higher sugar content. The quantity of N absorbed from the soil by an individual plant increased with a greater distance between rows. The percentage content of  $P_2O_5$  was the same for the 3 rows throughout the entire season; the total content of  $P_2O_5$  began to increase in the 55-cm. row in Aug. and continued until the end of the season—the greatest yield being in the 55-cm. row and the least in the 35-cm. row. The %  $K_2O$  was the same for all 3 rows and remained equal throughout the season; the av.  $K_2O$  content per plant increased with a widening of the rows. Although the distances between the rows of beets were variable, the absorption of nutrition from the soil was the same per 100 kg. of beets grown.

FRANK MARSH

A new cycle of phosphate digestion with acid. S. I. VOLFKOVICH AND V. P. KAMZOLKIN. *Trans. Sci. Inst. Fertilizers* (Moscow) 1928, No. 55, 121-37.—The reactions theoretically possible between raw phosphates,  $H_2SO_4$  and  $(NH_4)_2SO_4$ , have been tested experimentally. Low-grade phosphates (21.5%  $P_2O_5$ , 14.3%  $(Al, Fe)_2O_3$  and 3.2%  $CO_2$ ) were mixed with a 20% soln. of  $(NH_4)_2SO_4$  and to this mixt. concd.  $H_2SO_4$  was added with stirring. The quantities of  $(NH_4)_2SO_4$  and  $H_2SO_4$  were calcd. from the equations:  $2Ca_3P_2O_8 + 5H_2SO_4 + (NH_4)_2SO_4 = 6CaSO_4 + 2NH_4H_2PO_4 + 2H_3PO_4$ ;  $Ca_3P_2O_8 + 2H_2SO_4 + (NH_4)_2SO_4 = 3CaSO_4 + 2NH_4H_2PO_4$ . The concn. of the liquid phase was made up so that the soln. should contain 15-20% free  $H_2SO_4$ . The soln. was sepd. from the sediment by filtration; the sediment (phosphogypsum) was washed with water equal in weight to  $\frac{1}{2}$  that of the phosphate. The temp. at the time of mixing never went beyond 36-42°. By using a 10% excess of  $H_2SO_4$ , 90% of the phosphate decomposed. The concn. of the ext. from the first leaching was: 8.0-8.3%  $P_2O_5$  and 3.1% ammonia. The sesquioxide content in the ext. varied from 1.4 to 1.8%. The phosphogypsum was (1) treated with  $NH_3$  water and then  $CO_2$  passed through the suspension; (2) mixed with water and then  $CO_2$  and  $NH_3$  gas passed through the suspension. Higher yields of  $(NH_4)_2SO_4$  were obtained by the first method. With a 10% excess of  $NH_3$  and  $CO_2$  (above the stoichiometric) as high as 95.5-97.6% of the  $SO_3$  has been recovered from the phosphogypsum. The temp. range was 12-47°. Natural gypsum when treated in the same manner did not decompose as rapidly as the gypsum from the phosphoric acid process. A 78% soln. of  $H_2SO_4$  was dild. to 28-35% with a 20-26% soln. of  $NH_4H_2PO_4$ , mixed with raw phosphates and kept for 3 hrs. at 90-120° in a kettle as in the chamber process of acid phosphate manuf. The product contained 25%  $P_2O_5$ , of which 90-95% was available, and 70-73%  $H_2O$ -sol., with 3% N. The product is dry, mellow and upon storing does not revert. Another method of utilizing low-grade phosphates is to neutralize the weak soln. of  $H_3PO_4$  obtained from them with  $NH_3$  gas. A German summary is given.

J. S. JOFFE

The precipitation of phosphoric acid with lime water. E. V. BRITZKE AND S. S. DRAGUNOV. *Trans. Sci. Inst. Fertilizers* (Moscow), 1928, No. 55, 7-28.—Citrate-sol. phosphate can easily be prepd. from phosphoric acid by the addn. of lime water by observing the following: the  $CaO$  is to be pure, added slowly with stirring to a reaction point at which methyl red turns from its red coloration to orange. All the phosphoric acid is then pptd. Such ppt. may be dried satisfactorily at 60-70°. Solns. with less than 1%  $P_2O_5$  are not pptd. completely. Such a ppt. is sol. in  $NH_4HSO_4$ . J. S. J.

Laboratory experiments on the utilization of fluorine in the manufacture of superphosphate. S. I. VOLFKOVICH. *Trans. Sci. Inst. Fertilizers* (Moscow) 1928, No. 55, 29-71.—The optimum conditions for the production of  $Na_2SiF_6$  by treating  $H_2SiF_6$  with  $NaCl$  in connection with the recovery of F in the process of mfg. acid phosphate were: 9-12% of  $H_2SiF_6$  and 20%  $NaCl$ , mixing 10 mins. and allowing to settle 25-30 mins. Expts. on the production of  $NaF$  from  $Na_2SiF_6$  and a soln. of  $Na_2CO_3$  show that the amt. of  $Na_2CO_3$  has to exceed the stoichiometric value by 10%. For a high yield of ppt. 8% concn. of  $Na_2CO_3$  is desirable, but the total yield is low. In order to get the max. yield of  $NaF$ , 5-6% of  $Na_2CO_3$  is better. The temp. of the reaction was kept at 90-105°. The method of fusing  $Na_2SiF_6$  with  $Na_2CO_3$  and leaching the fused mass was also tried. It was possible to obtain 92.2% of  $NaF$  (from the theoretical in respect of the  $Na_2SiF_6$ ) by using water at the boiling temp. The product is purer than that obtained by using  $Na_2CO_3$  soln. The third method investigated was to heat  $Na_2SiF_6$  to a high temp.

thereby decompg. it into  $\text{NaF}$  and  $\text{SiF}_4$ , the latter being absorbed again to form  $\text{H}_2\text{SiF}_6$ . At  $600-830^\circ$  the  $\text{Na}_2\text{SiF}_6$  decomposes fast enough on a large factory scale. The evolution of  $\text{SiF}_4$  begins at  $580-590^\circ$ . Lab. expts. show that with a 3-mm. layer of  $\text{Na}_2\text{SiF}_6$ , the decompn. may be completed in 15-20 mins. with a temp. of  $620-640^\circ$ . This leaves a residue with 0.1-0.7%  $\text{SiF}_4$ . For the production of cryolite the optimum conditions in respect of temp., concn. of reagents, time and quant. relations of the reagents were: the highest yield (86.4%) was obtained at  $90^\circ$ ; the optimum concn. of the solid phase was 8%; the optimum time was 60 mins.; an increase of 10% of  $\text{Al}_2\text{O}_3$  above the stoichiometric value increased the yield by 3% only; addnl. increases of  $\text{Al}_2\text{O}_3$  gave no yield increase above the 3%. The  $\text{SiO}_2$  in soln. was found to be in the colloidal state. A German summary is given.

J. S. JOFFE

The moisture content and hygroscopicity of superphosphate. S. I. VOLFKOVICH AND L. V. VLADIMIROV. *Trans. Sci. Inst. Fertilizers* (Moscow) 1928, No. 55, 73-98.—An excess of acid in superphosphate under humid conditions increases its moisture content. In the semi-arid regions an excess of acid has no effect on the moisture content. To decrease the moisture content the superphosphate should be spread out in thin layers while still hot and piled up when cold. Artificial drying causes slight reversion of phosphates, but this reversion becomes const. and does not increase upon further storing. High moisture content and acidity and low temps. of storing reduce the amount of reversion. A German summary is given.

J. S. JOFFE

The free phosphoric acid in low-grade superphosphate and methods of determining it. S. I. VOLFKOVICH AND L. V. VLADIMIROV. *Trans. Sci. Inst. Fertilizers* (Moscow) 1928, No. 55, 99-120.—By using acetone instead of water, alc. or ether the free phosphoric acid can easily be titrated with methyl red as an indicator. The acetone has the advantage over the other extn. materials that no hydrolysis of the Fe and Al compds. takes place; neither does the monophosphate decompose to give free  $\text{H}_3\text{PO}_4$ .

J. S. JOFFE

Investigations on decomposition and action of nitrogen and carbon compounds contained in stable manure. KURT SCHEIBE. *Landw. Vers. Sta.* 108, 61-114(1929).—The N loss of the uppermost layers can be essentially reduced by covering the manure piles with soil. With hot manure the action of the 3-months-old manure was about 26-31% better than with comparison material stored only 4-6 weeks; with immediately compactly stored manure on the other hand the action declines in the same time about 14%. In small quantities of soil 35.2% of the total N of the stable manure in loosely packed material was converted into saltpeter, with immediately compactly stored manure 27.9% and with farm manure 18.2%. The max. saltpeter formation was attained sooner with hot manure. The carbonic acid production in the soil was increased about 43% in a field expt. with carrots by fertilizing with farm manure, with hot manure on the other hand about 160%. With potatoes the carbonic acid increased about 23% with fertilization with farm manure, with compactly stored manure about 41% and with hot manure about 102%. Further field expts. are described. E. F. SNYDER

Recent developments in practical plant feeding. C. HEIGHAM. *Proc. Univ. Durham. Phil. Soc.* 8, Pt. 1, 25-39(1927-28).—A general article on fertilizers.

ALBERT L. HENNE

Potato fertilizer experiments. J. H. STALLINGS. Penney Farms, Florida. *Soil Science* 26, 351-62(1928).—The 2000 lb. rate application of fertilizer was the most economical rate used.  $\text{K}_2\text{SO}_4$  has no decided advantage over  $\text{KCl}$  as a source of  $\text{K}_2\text{O}$  on potato yield. The present practice of supplying, in potato fertilizers, N from several sources, including expensive org. materials, may be ill-founded.  $\text{NaNO}_3$ ,  $(\text{NH}_4)_2\text{SO}_4$ , 10% blood and bone tankage,  $\text{Ca}(\text{NO}_3)_2$  when used singly and in the combinations reported, were about as satisfactory as sources of N for potatoes as the combination used in the standard potato fertilizer mixt. Ammo-phos was unsatisfactory as a source of N for potatoes.  $\text{K}_2\text{SO}_4$  and  $(\text{NH}_4)_2\text{SO}_4$  increased potato yields when used as top dressers.

E. F. SNYDER

The pot culture method of Prof. Mitscherlich for the determination of potash requirements. LAMBERG. *Ernähr. Pflanze* 25, 169-73(1929).—The results of field tests on soils of which the potash requirements had been detd. by the Mitscherlich method, show the practical usefulness of this method (cf. C. A. 18, 2053). L. P. M.

Minimum potassium level required by tomato plants grown in water cultures. EARL S. JOHNSTON AND D. R. HOAGLAND. Univ. of Maryland. *Soil Science* 27, 89-106(1929).—With a newly devised flowing soln. app., expts. were undertaken to det. the min. K level requirement of the tomato plant. Under the given exptl. conditions, which were kept within a range for good growth, it was found that opt. growth was maintained at a K concn. of approx. 5 p. p. m. at the intake. The rate of flow for such a soln. averaged

8 cc. per min. per plant. The plants were grown for a period of 45 days. In expts. where the initial K concn. of 3.7 p. p. m. was reduced to 0.7 p. p. m. or even to 1.4 p. p. m., actual analysis of the plants showed a marked decrease in K absorbed and a tendency toward increased Ca, Mg and P absorption as compared with check plants. A characteristic spotting of leaves indicating "potash hunger" is very marked in tomato plants grown in solns. in which the K concn. is maintained below a certain level. Attention is called to certain interesting relations between K concns. and light values, as suggested by one of the expts. J. J. SKINNER

**Chemical weed killers.** S. H. VIGOR. Sask. Dept. Agr. Regina. *Sci. Agr.* 9, 587-93(1929).—FeSO<sub>4</sub> (20% soln.) sprayed at the rate of 100 lb. per acre on oats or barley fields badly infested with wild mustard, destroyed the latter without great injury to the grain crops. A spray consisting of NaClO<sub>3</sub> 25%, CaCl<sub>2</sub> 14%, and H<sub>2</sub>O 61% effectively destroyed perennial sowthistle and dandelion. C. R. FELLERS

**The use in agriculture of copper thiocyanate.** A. PAILLOT AND R. PUSSARD. *Compt. rend. acad. agr. France* 15, 501-5(1929).—The thiocyanate can be employed in the same conditions as the ordinary Cu mixts. for treatment of fruit trees. The prepn. of the mixt. or emulsion is very simple, since it suffices to mix the thiocyanate in water; this diln. should be made at first in a small quantity of water to avoid the formation of lumps. One should add Pb or Ca arsenate to the mixt. so as to make it sufficiently insecticidal; where one uses Ca arsenate it is wise to add some lime to avoid the burning of the foliage. E. F. SNYDER

**A preliminary report on experiments in the control of grain smut of jowar (Andropogon sorghum).** B. N. UPPAL AND J. S. MALELU. Dept. Agr. Bombay Presidency. *Agr. J. India* 23, 471-2(1928).—Seeds of *Andropogon sorghum* were artificially infected with spores of *Sphacelotheca sorghi* at rates varying from 1 part by wt. of smut spores to 250 parts of seed down to 1 to 3000, and were treated with Cu carbonate (53% Cu), 100-mesh S, 200-mesh S, CuSO<sub>4</sub> (coarse powder), and CuSO<sub>4</sub> (200-mesh), resp., all fungicides being applied as dry dusts. Cu carbonate at the rate of 1 ounce per 60 lb. of wheat gave complete control of smut in seed contg. 1 part of spores to 1000 parts of seed, infection being very slight with heavier spore loads. Similar results were obtained with 200-mesh S applied at the rate of 2 ounces per 60 lb. of wheat. The results with 100-mesh S were less satisfactory. Control of smut was not obtained in any cases with the coarsely ground CuSO<sub>4</sub>, but almost complete control was obtained with 200-mesh CuSO<sub>4</sub> except at the heaviest infection. K. D. JACOB

**Effect of carbon disulfide treatment of soil for the Japanese beetle on the abundance of microorganisms and on the ammonia and nitrate content.** WALTER E. FLEMING. U. S. Dept. Agr. *Soil Science* 27, 153-8(1929); cf. *C. A.* 23, 1206.—A Sassafras loamy sand was treated with the concn. of gaseous and of emulsified CS<sub>2</sub> used for the immature stages of the Japanese beetle, and observations were made on the effects on the microorganisms and on the concn. of NH<sub>3</sub> and NO<sub>3</sub> in the soil. Treatment with 0.05% CS<sub>2</sub> (1 lb. to 1 cu. yd.) did not affect the density of the bacterial population appreciably, but it stimulated the development of fungi. It also caused an accumulation of NH<sub>3</sub>. Treatment under lab. conditions with 0.05% CS<sub>2</sub> emulsion was not satisfactory. The detrimental effect on the bacteria and fungi, the accumulation of NH<sub>3</sub>, and the decrease in the concn. of NO<sub>3</sub> in the soil are probably factors involved in causing the injury following treatment of ornamentals in poorly drained fields, or in fields puddled by the application of large vol. of water. It is probable that the results of treatment of well-drained, fertile soils with this concn. of CS<sub>2</sub> emulsion are very similar to those of fumigation when the same quantity of the gas is used. Treatment with 0.05% CS<sub>2</sub>, either as gas or as emulsion, results in an accumulation of NH<sub>3</sub> and in a change in the nos. of microorganisms. Care should be taken to aerate the soil after fumigation, and the emulsion treatment should be used only in well-drained soil, so as to avoid, as far as possible, excessive accumulations of NH<sub>3</sub>. J. J. SKINNER

Some relations of agricultural chemical research to national prosperity (BROWNE) 2. The clays of East Prussia and their properties (KRAUSE) 8. The chemistry and biology of the clay pits (SEBENTZOV, ADOVA) 8. Activated sludge: its production, composition and value as a fertilizer (NOERR) 14. The waste plant for the town of Tours (JOULOT) 14. The determination of sulfate in natural waters and in soil extracts (SAPROMETOV) 14. Aqueous emulsions of insecticides (Brit. pat. 298,823) 17.

MITTASCH, A.: *Über Misch- und Volldünger*. Berlin: Verlag Chemie, G. m. b. H. 48 pp. M. 2.

TROUVELOT, E.: and WILLAUME, F.: *Manuel-guide des traitements insecticides*

et fongicides des arbres fruitiers. 2nd ed. Paris: Lechevalier. 179 pp. Reviewed in *Bull. soc. encour. ind. nat.* 1928, 179.

**Fertilizer.** I. G. FARBERIND. A.-G. (Hugo Weitzel, inventor). Ger. 474,972, Sept. 16, 1924. A fertilizer consists of a mixt. of  $\text{NH}_4\text{NO}_3$  and  $\text{K}_2\text{SO}_4$  in the mol. proportions of about 4 to 1. Cf. *C. A.* 23, 2238, 2239.

**Fertilizers.** Soc. D'ÉLECTROCHIMIE, D'ÉLECTROMETALLURGIE ET DES ACIÉRIES ÉLECTRIQUES D'UGINE and THÉODORE HÆGE. Fr. 648,834, June 28, 1927. A fertilizer contg. phosphates of K and  $\text{NH}_4$  is prepd. by combining a reduction of the Ca phosphate with  $\text{SiO}_2$  and charcoal with a volatilization of the potash contd. in the rocks the  $\text{SiO}_2$  of which is used in the reduction, then transforming, after oxidation, into a mixt. of phosphates of K and  $\text{NH}_4$  the vapors of P and potash liberated. The reduction and volatilization take place in an elec. furnace.

**Anti-parasite preparation for seed goods and the like.** PERMUTT A.-G. (Otto Liebknecht, inventor). Ger. 472,738, Jan. 20, 1926. Dairy and horticultural materials are protected from damage by animal and vegetable parasites by volatile or gaseous Cr compds. These compds. may be used with other volatile or gaseous compds. An example is chromyl halide, with or without, halogenated hydrocarbon.

## 17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

**Chemical and physical incompatibilities of antipyrine.** VIRGILIO LUCAS. *Rev. chim. pharm. militar Rio de Janeiro* 4, 142-3 (1928).—Antipyrine should not be mixed with one of the following substances:  $\text{FeCl}_3$ , picric acid,  $\text{CCl}_3\text{CO}_2\text{H}$ , salicylic acid,  $\text{HgCl}_2$ ,  $\text{I}$  and its prepn., tannin and its prepn., sweet spirit of nitrous ether, Na salicylate with Mg salts, asapol, aspirin, acetanilide, thymol, naphthol, menthol. The reactions with these substances are explained.

A. E. MEYER

**Caffeine-salicylic acid, a molecular compound.** N. SCHOORL. Univ. Utrecht. *Pharm. Weekblad* 66, 357-8 (1929).—Regenbogen and Schoorl (*C. A.* 18, 880) showed that caffeine and salicylic acid form a mol. compd. with m. p.  $137^\circ$ , and suggested that the greatly increased soly. of caffeine in the presence of Na salicylate was due to the formation of the Na salt of this complex. The Na salt,  $\text{C}_8\text{H}_{10}\text{N}_4\text{O}_2\cdot\text{HOC}_6\text{H}_4\text{CO}_2\text{Na}\cdot 5\text{H}_2\text{O}$ , has now been prepd. in cryst. form. It is stable in the air and loses  $\text{H}_2\text{O}$  only slowly on the water bath, but it can be dehydrated completely in a desiccator. Most pharmacopeias allow only 4-5% for the  $\text{H}_2\text{O}$  content of *Salicylas natricus cum caffeineo*, whereas the stable air-dry salt actually contains 20%  $\text{H}_2\text{O}$ .

A. W. DOX

**Preliminary note on the chemistry of concrete otto of *Boronia megastigma* (Nees).** A. R. PENFOLD. *J. Roy Soc. West. Australia*, 14, 1 (1927); *Australian Science Abstracts* 7, 27. The results of the examn. of com. samples of concrete otto of *Boronia megastigma* are given: m. p.  $35-40^\circ$ , sp. gr. 0.9091-9173,  $n$  ( $38-40^\circ$ ) 1.4752-1.4852, acid no. 24-30, ester no. 96-110, acetyl no. 140-148. Constituents identified: triacontane, m.  $64^\circ$ , a glyceride of palmitic and stearic acids, phytosterols, free palmitic, formic and caprylic acids. These constituents form excellent fixatives for odoriferous components consisting of unknown alc. with  $\beta$ -ionone.

H. L. D.

**Essential oils of Caucasian and Crimean Thymus.** B. N. RUTOVSKII and I. V. VINOGRADOVA. *Trans. Sci. Chem.-Pharm. Inst. (Moscow)* 1927, No. 17, 98-108.—A sample of oil from *Thymus vulgaris* L. was extd. with 8% NaOH and the phenols thus obtained were treated with  $\text{Pb}(\text{OAc})_2$ , giving compds. of thymol and carvacrol. The former m.  $48-50^\circ$  and gave *o*-thymolcarboxylic acid, m.  $123^\circ$ ; the latter gave nitrosocarvacrol, m.  $151-2^\circ$ . The ratio of thymol to carvacrol was 2:1. The oil from the alkali extn. was fractionally distd. The various const. for the fractions are given. No  $\alpha$ -pinene was found in fraction Ia. Fraction Ib upon oxidation gave *p*-hydroxyisopropylbenzoic acid, which indicates the presence of *p*-cymene. No ketones or aldehydes were present in fraction II. It gave citral upon oxidation with chromic acid; this indicates the presence of *l*-linalool, which was sepd. from fraction III by phthalic acid ester and its const. are:  $d_{20}^{20}$  0.8698;  $[\alpha]_D -12.75^\circ$ ;  $n_D^{20}$  1.4687. In fraction IV borneol could be demonstrated. Upon sepn. with phthalic acid anhydride, it m.  $201-2^\circ$ ; phenylurethan, m.  $138^\circ$ . The sesquiterpene fraction gave no nitrosochloride or nitrosate.

J. S. J.

**Urea-stibamine: its preparation and composition.** SUDHAMOY GHOSH, R. N. CHOPRA and NIHAR RANJAN CHATTERJEE. Calcutta School of Trop. Med. *Indian J. Med. Research* 16, 461-8 (1929).—Sodium antimonate is prepd. by dissolving  $\text{Sb}_2\text{O}_3$

(7.2 g.) in HCl (34 cc. of d. = 1.23 at 15.50). This soln. is gradually added, with stirring, to warm 20% NaOH (30 g. in 150 cc. H<sub>2</sub>O). The resulting slightly opalescent soln. is kept at 0°. *p*-Aminoacetanilide is gradually added to cooled dil. H<sub>2</sub>SO<sub>4</sub> (4 cc. concd. H<sub>2</sub>SO<sub>4</sub> in 50 cc. H<sub>2</sub>O). NaNO<sub>2</sub> (4 g.) is added cautiously (without allowing the soln. to become warm). The diazotized amine soln. (bright cherry-red color after the operation is finished) is slowly added to the Na antimonite and vigorously stirred for 2 hrs., the temp. regulated at 1 to 2° C. When evolution of N ceases, 500 cc. H<sub>2</sub>O is added, neutralized with dil. H<sub>2</sub>SO<sub>4</sub> (1 in 10), CO<sub>2</sub> is passed through and the unchanged Sb<sub>2</sub>O<sub>3</sub> filtered off. The red-brown filtrate is satd. with NaCl and the resulting Na salt sepg. as a flocculent ppt. is air-dried and purified from MeOH. Acetyl-*p*-aminophenylstibinic acid is pptd. by treating an aq. soln. with dil. HCl. This ppt. is dissolved in 5% NaOH at 60° and an equal wt. of urea is added, heated on a water bath and concd. to 1/2 vol. After the concd. soln. is cooled it is treated with abs. alc. Urea stibamine is pptd. The N and Sb contents vary greatly from different samples on the market. FRANCES KRASNOW

Simple and quick microchemical methods for tobacco analysis. II. A titration procedure for determining nicotine in fresh green tobacco. J. BODNAR AND VITÉZ LADISLAUS NAGY. *Biochem. Z.* 206, 410-5(1929); cf. *C. A.* 22, 4720.—Fresh green tobacco is dried in a steam oven at 95-97° and powdered. The powder is moistened with an aq. 20% NaOH soln. The drying causes no loss of nicotine. One g. of the powder is weighed in a glass-stoppered 50-cc. flask and is thoroughly mixed with 1 cc. of the alkali. To this is then added 20 cc. of a mixt. of equal vols. of ether and petroleum ether and the ext. is filtered after 2 hrs. Ten cc. of the filtrate is transferred to a 100-cc. Erlenmeyer flask and NH<sub>3</sub> is driven off by passing a current of air. Then, 10 cc. H<sub>2</sub>O, 10-15 cc. 0.01 N HCl and a drop of methyl red are added and the mixt. is titrated with 0.01 N NaOH, each cc. 0.01 N HCl corresponding to 1.62 mg. nicotine. S. MORGULIS

A new reagent for the qualitative and quantitative (nephelometric) determination of quinine. E. I. STERKIN AND J. I. HELFGAT. *Med. Inst., Charkov. Biochem. Z.* 207, 8-24(1929).—Giemsa's reagent is not suitable for the nephelometric detn. of quinine. A new reagent is prepd. by mixing Na<sub>2</sub>AsO<sub>4</sub> and (NH<sub>4</sub>)<sub>2</sub>MoO<sub>4</sub> and acidifying with HCl (equal vols. of 0.12% Na<sub>2</sub>AsO<sub>4</sub>, 2% (NH<sub>4</sub>)<sub>2</sub>MoO<sub>4</sub> and 2% HCl). This reagent is the most sensitive known, giving permanent opalescence even with dilns. of 1:2,000,000. One cc. of the reagent is to be added to 5 cc. of the slightly acidified quinine soln. The reagent keeps 4-5 months if preserved in the dark, and it produces no opalescence with blood or tissue exts. free from quinine. With quinine the opalescence is reproducible and proportional to the concn. No opalescence is produced up to the following concns. of various alkaloids: caffeine 1:200,000; apomorphine 1:300,000; morphine 1:6000; cocaine 1:300,000; atropine 1:40,000; plasmochine 1:100,000. S. MORGULIS

Poisonous constituents of *Ryania acuminata*. S. NAKARAI AND T. SANO. *J. Pharm. Soc. (Japan)* 48, 1102-10(1928).—La Cointe extd. from *Ryania acuminata* a poisonous substance, which he named ryanin. Hydrolysis of ryanin gave a glucone which La Cointe has named ryanitin. Root of *Ryania acuminata* (dried at 100°, loses about 20% wt.) was digested on the water bath with water as solvent. The red-brown liquid was clarified with lead acetate, freed from excess Pb by means of H<sub>2</sub>S, concd. and extd. with CHCl<sub>3</sub>. Evapn. of the CHCl<sub>3</sub> left a glass-clear substance which reduced Fehling soln. and probably was identical with ryanin of La Cointe. It is sol. in hot water. To this soln. NaCl was added and the soln. was used for toxicological study by injection into frog, mouse, rabbit, cat, dog and certain fishes. Ryanin has first a stimulating, and then a paralyzing effect on respiration. The action of strychnine is not affected by simultaneous injection of ryanin. F. I. NAKAMURA

Purification of extracts containing the growth-promoting principle of the anterior hypophysis. HAROLD M. TEEL. *Science* 69, 405(1929).—The growth-promoting principle of the anterior hypophysis may be pptd. by the addn. of anhyd. Na<sub>2</sub>SO<sub>4</sub> to a neutralized alk. ext. of the glands. The ppt. is lower in protein content, and sugar, phosphates, uric acid and non-protein N are reduced to traces. An aq. soln. (filtered) is used for injection. Expts. further to fractionate the globulin group of proteins, in which the growth-promoting principle comes down, resulted in a division of the substances between the fractions. N. M. NAYLOR

Estimation of acetylsalicylic acid tablets. AXEL HOFFMAN. *Dansk Tids. Farm.* 3, 82-102(1929).—Acetylsalicylic acid tablets often contain quantities of MgO to remove bitter taste. Four methods of analysis are given: (1) Warm a tablet with 12 cc. 0.5 N NaOH and allow to cool, after which titrate the excess alkali with 0.1 N HCl (indicator, alizarin yellow, *pH* range, 12.1-10.1) The titration must be done rapidly; otherwise some MgO reacts with the HCl. The end point remains for about 1/2-1 min. (2) Extn. with ether.—Place 1 tablet, finely ground, in a 100-cc. long-necked flask fitted



with a glass stopper. Add 50 cc. ether by means of a pipet and shake the mixt. for 5 mins. Allow to stand for 10 mins., and pipet off 25 cc. of the soln. Evap. ether and hydrolyze the acetylsalicylic acid with 0.5 *N* NaOH. Titrate the excess alkali with 0.5 *N* HCl with phenolphthalein as indicator. (3) Bromometric detn. Hydrolyze acetylsalicylic acid with NaOH and later add a slight excess HCl and heat to decomp. MgO. After cooling make up to 100 cc. and allow to stand until most of the talc has settled. Pipet off 10 cc. and add 80 cc. 0.1 *N* KBrO<sub>3</sub>, 1 g. KBr and 5 cc. 4*N* HCl and let the mixt. stand for 20–30 mins., after which add 1 g. dissolved KI and allow to stand for 5 mins. Titrate the excess I<sub>2</sub> with 0.1 *N* Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub> (indicator, starch); 1 cc. 0.1 *N* KBrO<sub>3</sub> = 0.0030 g. acetylsalicylic acid. (4) Det. the color intensity of the reaction between salicylic acid and Fe<sup>+++</sup> salts by means of the spectrophotometer. Break up the tablets in the presence of 1 cc. 4*N* H<sub>2</sub>SO<sub>4</sub> to prevent hydrolysis, and then shake with 10 cc. of a 1–1 mixt. of ether and pentane. Pipet off 5 cc. of the clear liquid and carefully evap. on a steam bath. Dissolve the residue in 20 cc. 25% EtOH and add 0.5 cc. 2% FeCl<sub>3</sub> soln. Then compare the color intensity with that of standard solns.

O. A. NELSON

A study of belladonna. ANGEL TERREL CURVAS. *Mon. farm. therap.* 35, 36–8, 59–63, 81–6(1929).—A complete study of belladonna including a compilation of available information concerning the chemistry of its active constituents. J. L. POWERS

Mayer's reagent and its modifications with alkali and alkaline earth cations. Influence on the sensitivity for the precipitation of strychnine. RAUL GIORDANO, CESARINA RUSSO AND MARIA TERESA LUQUE LOBOS. *Rev. centro estud. farm. y bioquim.* 16, 85–98(1927).—The limit of sensitivity to strychnine of Mayer's reagent prepd. by substituting NH<sub>4</sub>, Na or Rb for K was 1 to 70,000. When Li, Sr and Ba were substituted for K, the sensitivity was 1 in 120,000. Li is recommended as being most satisfactory. J. L. P.

Chemical examination of  $\alpha$ -phenyl- $\beta$ -aminoethanol sulfate. SAMUEL M. GORDON. *Am. Med. Assoc. J. Am. Pharm. Assoc.* 17, 1195–9(1928).—Adrenaline, ephedrine, tyramine and  $\alpha$ -phenyl- $\beta$ -aminoethanol are closely related. The side chain of adrenaline contains 3 C; the others 2; the former is a deriv. of propylbenzene; the others are derivs. of ethylbenzene. Adrenaline and tyramine contain OH in the nucleus, thus rendering them more prone to oxidation than the others. Ephedrine may be removed from solns. by shaking with immiscible solvents; phenylaminoethanol decomps. into C<sub>6</sub>H<sub>5</sub>CHO. The sulfate forms fine, white, odorless crystals; taste bitter; sol. in hot H<sub>2</sub>O; m. 250–4°; optically inactive. The aq. soln. with CuSO<sub>4</sub> and NaOH gives a purple color which is discharged by acids and is insol. in Et<sub>2</sub>O. It gives the carbylamine reaction, thus differing from ephedrine; yellow ppt. with Millon's reagent, which is unchanged by heating; aq. soln. pptd. by PdCl<sub>2</sub> and phosphotungstic acid but not by other common alkaloidal reagents; *picrotonate* m. 200–1°; *monobenzoil compd.* m. 149.5–50°. The substance is anhyd. at 100° and stable. L. E. WARREN

The *Camphorosma monspeliacum* of S. Cesarea (Lecce). F. P. MAZZA AND G. SPAGNOLO. *R. Univ., Naples. Rend. accad. sci. (Napoli)* [3], 34, 51–4(1928).—From *Camphorosma monspeliacum* of the family Chenopodiaceae Cassan obtained by steam distn. 0.2% of a greenish essential oil with an odor of bitter almonds, solid at +4°, *n* = 1.3724. Warmed with KOH it evolved C<sub>6</sub>H<sub>5</sub>NH<sub>2</sub>, being the only essential oil known contg. amino N. M. and S. extd. the upper part of the plant with C<sub>6</sub>H<sub>6</sub>, distd. off the C<sub>6</sub>H<sub>6</sub>, steam distd., and on extn. of the distillate with ether obtained about 0.03% of a yellow oil of strong odor, not crystallizable, decomposing on distn. even at low pressure, and having different characters from Cassan's oil. N could not be detected. The residue from the steam distn. refluxed with alc. KOH yielded about 0.15% of *camphorsmol*, C<sub>15</sub>H<sub>22</sub>O<sub>2</sub>, a yellow powder, m. 74–5°. It is an optically inactive, dihydric alc., perhaps the same as Euler's (C. A. 2, 833). *Diacylcamphorsmol*, C<sub>18</sub>H<sub>24</sub>O<sub>2</sub>(COCH<sub>3</sub>)<sub>2</sub>, flaky white crystals, m. 80°. JANET D. SCOTT

POUCHER, WM. A.: *Perfumes, Cosmetics and Soaps, with Especial Reference to Synthetics*. Vol. II. 2nd ed. New York: D. Van Nostrand Co. 406 pp. \$5. Reviewed in *Druggists Circ.* 72, 64(1928); *Perfumery Essential Oil Record* 20, 123; *Chem. Trade J.* 84, 374 (1929).

Liver oil of the basking shark (SCHMIDT-NIELSEN, SCHMIDT-NIELSEN) 27. Active glucosides from *Adonis vernalis* (FROMHERTZ) 11H. Electro-endosmosis (apparatus for treating serums) (U. S. pat. 1,711,416) 4. Basic ethers of resorcinol (U. S. pat. 1,711,020) 10. The *Camphorosma monspeliacum* of S. Cesarea (Lecce) (MAZZA, SPAGNOLO) 11D.

**Medicine.** CHEM. FAB. VON HEYDEN A.-G. (Curt Philipp, inventor). Ger. 474,689, Nov. 1, 1925. Org. medicines, normally insol. or only slightly sol. in water, are made sol. by treatment with aq. solns. of salts of alkylated, arylated or aralkylated hydroxy fatty acids. Thus, powd. thymol is warmed with a 20% aq. soln. of Na thymylhydroxyacetate, giving a 5% aq. soln. of thymol. Carvacrol is rendered sol. by Na carvacrylhydroxyacetate.

**Medicines.** FRIEDRICH PASSEK. Ger. 474,620, Feb. 4, 1927. Colloidal Au for physiol. purposes is prepd. by the action of an alkali hydroxide or silicate soln. on a soln. of a Au salt. The liquid is allowed to stand for some days and is purified centrifugally.

**Solvents for medicaments.** SOC. ANON. POUR L'IND. CHIM. A BÂLE. Ger. 474,343, Sept. 16, 1923. See Brit. 218,982 (C. A. 19, 560).

**Aqueous emulsions of medicines, insecticides, etc.** I. G. FARBENIND. A.-G. Brit. 298,823, Jan. 11, 1928. A mixt. of Turkey-red oil 40, K ricinoleate 10, paraffin oil 5-10, an alkali salt of a alkylnaphthalenesulfonic acid 3-5 and water 10-20 parts is used for forming aq. emulsions of substances such as tetrachloroethylene, eucalyptus oil or menthol for various purposes, such as fat-dissolving or greasing agents, insecticides, cosmetics, medicines or perfumery.

**Alkaloids from plant materials.** NAAMLOOZE VENNOOTSCHAP CHEMISCHE FABRIEK DELTA. Brit. 298,787, Nov. 4, 1927. The finely divided plant material may be mixed with milk of lime and is then extd. with steam counter-currentwise.

**Glucosides.** CHEMISCHE FABRIK VORM. SANDOZ. Swiss 130,021, May 23, 1927. Strongly active glucosides are prepd. from squills by extn. with org. solvents which are non-miscible with water, in presence of readily sol. salts. The ext. is evapd. *in vacuo* and washed out with fat-extg. solvent. The residue is dissolved in a mixt. of water and org. solvent and treated with insol. tannin precipitant. The filtrate is carefully evapd. to dryness, leaving the glucoside. Thus, 2 kg. squills is ground with  $\text{NaH}_2\text{PO}_4$  and  $\text{AcOEt}$ , and filtered. The filtrate is evapd. to dryness, *in vacuo* at low temps., and the residue dissolved in ether. Salicylic acid is added to ppt. the tannin, which is then filtered off. The filtrate is evapd. to give the pure glucoside.

**Glucosides.** I. G. FARBENIND. A.-G. Brit. 298,674, July 14, 1927. In obtaining water-sol. anthraquinone glucosides from drugs such as cascara sagrada or cortex frangula, the exts. are treated with a metallic hydroxide, such as freshly pptd.  $\text{Al}(\text{OH})_3$  or Fe hydroxide, to ppt. impurities.

**Cinchonine.** CHEMISCHE FABRIK VORM. SANDOZ. Swiss 130,093, Feb. 10, 1927. Addn. to Swiss 126,502. Cinchonine and cholic acid are allowed to react to produce cinchonine cholate. The substance is a powerful microbicide.

**Quinine and hydroquinone desoxycholates.** CHEMISCHE FABRIK VORM. SANDOZ. Swiss 130,091 and 130,092, Feb. 10, 1927. The desoxycholates of quinine and hydroquinone are prepd. directly by reaction with cholic acid in mol. proportions. The salts are strong microbicides. Cf. C. A. 23, 612.

**4-Aminopentene-2 and its derivatives.** I. G. FARBENIND. A.-G. (Karl Böttcher, inventor). Ger. 473,215, Mar. 28, 1925. 4-Halopentene-2 is treated with  $\text{NH}_3$  or with primary or secondary alkyl, aryl or aralkyl amines. The 4-aminopentene-2 and its derivs. so obtained are new compds. useful as *intermediates in the manuf. of drugs*. Examples are given describing the prepn. of (1) 4-diethylaminopentene-2, b. 148-151°; (2) 4-dipropylaminopentene-2, b. 182-183°; (3) 4-propylaminopentene-2, b. 145-150°; (4) pentenylaniline, b. 112°/9 mm.; (5) pentenylmethylaniline, b. 115°/7 mm.; (6) pentenyldiphenylamine, b. 190°/10 mm.; (7) pentenylbenzylamine, b. 110°/8 mm.; (8) pentenyl- $\beta$ -naphthylamine, b. 190°/10 mm.

**Phosphatide preparations.** J. D. RIEDEL-E. DE HAËN A.-G. Ger. 474,269, July 21, 1923. Stable phosphatide prepn. which are liquid at moderate temp. are prepd. by mixing the phosphatides with fats derived from acids having less than 16 C atoms in the mol. A mixt. of lecithin 2 and palm-kernel oil 1 part is mentioned by way of example.

**Bandages containing therapeutic materials in a film of cellulose gel.** WOLFF & Co., E. CZAPEK AND J. REITSTOTTER. Brit. 298,606, Oct. 12, 1927.

**Hormones.** SCHERING-KAHLBAUM A.-G. Brit. 298,610, Oct. 12, 1927. Sexual hormones are obtained from human or animal urine by extn. with an org. solvent such as ether, removal of the solvent, sapon. of the residue and isolation of the hormone from the unsaponifiable portion by treatment with a suitable solvent. Several examples are given. Cf. C. A. 23, 2252.

**Hormones.** SOC. ANON. POUR L'IND. CHIM. A BÂLE. Brit. 299,060, Oct. 20, 1927. Water-sol. and lipidol-sol. hormones are obtained separately from sexual glands by use of chem. reagents or ferments to effect hydrolysis, extn. with a water-insol. solvent such

as ether, sepg. the soln. of the lipoid-sol. hormone thus obtained and recovering the water-sol. hormone from the aq. fraction. Various details of procedure are described. Cf. C. A. 23, 2786.

**Drying biological products.** MARIUS E. POZZI-ESCOR. Fr. 648,359, June 18, 1927. The N escaping from liquid-air rectifying columns is used for drying exts. from organs, scrums, vaccines, etc.

**Disinfectants and germicides.** ELEKTRO-OSMOSE A.-G. (Graf Schwerin Gesellschaft). Fr. 648,749, Dec. 8, 1927. A strongly disinfectant or germicidal soln. is obtained by adding 0.85% of NaCl, KCl, CaCl<sub>2</sub>, or NaHCO<sub>3</sub> to solns. of acids, bases or salts such as HCl, NaOH, Na<sub>2</sub>CO<sub>3</sub>, Na<sub>2</sub>PO<sub>4</sub>, the concn. of which is below 1/50 N. The above salts may be replaced by small amts., ineffective in themselves, of AgNO<sub>3</sub>, derivs. of acridine, salts of Cu or Hg to increase the action of the acids or bases.

**Apparatus for treating tobacco with air currents.** UNITED CIGARETTE MACHINE CO. A.-G. Brit. 299,039, Oct. 20, 1927.

**Cosmetics.** PIETER GOENEE. Ger. 474,690, Sept. 10, 1926. A body powder is prepd. by mixing stable org. peroxides, such as benzoyl peroxide, with a weakly alk. substance such as Ca<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub>.

## 18—ACIDS, ALKALIES, SALTS AND SUNDRIES

E. M. SYMMES

**Recent developments in the manufacture of sulfuric acid.** S. F. SPANGLER. Chem. Construction Co., Charlotte, N. C. *Ind. Eng. Chem.* 21, 417-21 (1929).—Recent increases in the demand for H<sub>2</sub>SO<sub>4</sub> have been for higher strengths, making the contact process relatively more important. Developments in the chamber process mentioned include NH<sub>3</sub> oxidation, and intensive methods of working. In the concn. of weak acid, the drum type of concentrator is described. In the contact process, the chief developments have been the use of V catalysts, in specially designed converters, and the burning of molten S with pre-dried air.

T. H. CHILTON

**The preparation of selenic acid and its salts.** ERNEST R. HUFF AND C. R. McCROSKY. Syracuse Univ. *J. Am. Chem. Soc.* 51, 1457-8 (1929).—SeO<sub>2</sub> was refluxed 2 hrs. with 30% H<sub>2</sub>O<sub>2</sub>, giving 90% of the theoretical yield of H<sub>2</sub>SeO<sub>4</sub>. Selenates of Cu, Ni, Co, Al and Mg also were prepd. There are 11 references. G. M. P.

**Stainless-iron nitric acid equipment.** W. M. MITCHELL. *Ind. Eng. Chem.* 21, 442-5 (1929).—The manuf. of stainless iron for equipment used to make HNO<sub>3</sub> from NH<sub>3</sub> is discussed. About 500 tons has been used for this purpose since 1923.

G. B. TAYLOR

**Preparation of a solution containing phosphoric acid direct from bone ash for the impregnation of match sticks to render them non-glowing.** R. L. DATTA AND T. BASU. Dept. Industries, Bengal, *Bull.* 27, 6 pp. (1928).—The sticks are impregnated with a soln. contg. P<sub>2</sub>O<sub>5</sub> obtained by extg. 3 pts. of bone ash with 3 pts. of com. H<sub>2</sub>SO<sub>4</sub> (d. 1.55). A suitable d. for this soln. is 1.035; it then contains 3.78% P<sub>2</sub>O<sub>5</sub> and 0.19% H<sub>2</sub>SO<sub>4</sub>, of which 0.05% is free acid. This free acid turns the splints brown but neutralizing the acid with NH<sub>3</sub> soln. overcomes this defect where necessary. B. C. A.

**Poupin process (extraction of sodium nitrate).** DELCOURT, B. PINILLA, J. LATORRE AND J. BANCELIN. *Caliche* 10, 299-311 (1928).—Official Chilean reports on a 4-month expt at Oficina Iberia. A small works plant was made by raising the false bottom of a Shanks process leaching tank to 1 m. and replacing its vertical row of steam coils by 2 systems of horizontal coils under the false bottom, one under each half. The leaching tanks were not connected with each other. Caliche was reduced by jaw and gyratory crushers to 1 in. Screened charge was placed at the bottom, then unscreened, then fines. Hot concd. liquor was withdrawn from the bottom when of desired d. Treating liquor was heated in interchangers, stored in concentric tanks, then sprayed over the charge intermittently, first mother liquor at 60°, then dil. washes at 60°, 50° and 35°, resp., and finally water at 30-40°. The fines accumulating under the false bottom were withdrawn between charges. Recovery was about 80% (Shanks, 50-60%), discharged ripio, about 2 1/4% NaNO<sub>2</sub> (Shanks, 6-8%); fuel and installation somewhat less than in the Shanks process; evapn. loss 730 l. (Shanks 900 l.)/ton NaNO<sub>3</sub> obtained. The time of treatment was limited by the rate of heat penetration of charge. Improvement was attributed to intermittent application of liquids. J. H. F.

**Removal of ferrous chloride from solutions of commercial zinc chloride.** N. N. EFREMOV AND A. M. ROZENBERG. Severochem. *J. Chem. Ind. (Moscow)* 5, 1280-2, 1431-4 (1928).—FeCl<sub>2</sub>, which usually contaminates com. solns. of ZnCl<sub>2</sub>, is a trouble-

some impurity, as it tends slowly to oxidize continually, forming a brown ppt. The best means of removing  $\text{FeCl}_2$  from  $\text{ZnCl}_2$  solns. is by pptn., using an oxidizing agent. Tests were made with various oxidizing agents to find the best one.  $\text{Cl}$  gas acts at first very energetically, but the action slows down gradually as the  $\text{FeCl}_2$  content decreases.  $\text{Cl}$  only acts at the rate at which it dissolves; therefore, to avoid considerable losses of  $\text{Cl}$ , a slow current of the gas and very good stirring must be used. After the operation the dissolved  $\text{Cl}$  may be removed by blowing in air, or better by heating. The use of  $\text{Ca}(\text{ClO})_2$  is very effective, but it introduces  $\text{CaCl}_2$  instead of  $\text{FeCl}_2$ . To remove  $\text{CaCl}_2$  it has been proposed to treat the soln. by  $\text{ZnSO}_4$ :  $\text{CaCl}_2 + \text{ZnSO}_4 \rightleftharpoons \text{CaSO}_4 + \text{ZnCl}_2$ . The objection is that it is a reversible reaction and that it is not easy to remove  $\text{CaSO}_4$  which, in the presence of  $\text{ZnCl}_2$ , has a considerable soly. in  $\text{H}_2\text{O}$ . Oxidation by  $\text{MnO}_2$  is effective only in acid solns. and requires heating. If an excess of  $\text{HCl}$  is used,  $\text{Cl}$  is omitted and poisons the atm. Another disadvantage is the formation in the soln. of  $\text{MnCl}_2$ , which can only be pptd. by  $\text{Cl}$  as  $\text{MnO}_2$ .  $\text{KClO}_3$  acts theoretically according to the equation  $6\text{FeCl}_2 + \text{KClO}_3 + 6\text{HCl} = 3\text{H}_2\text{O} + \text{KCl} + 6\text{FeCl}_3$ , but in reality much less  $\text{HCl}$  is used up than would appear from this equation. There is no need of adding  $\text{HCl}$ , on account of the reaction  $\text{ZnCl}_2 + 2\text{H}_2\text{O} \rightleftharpoons \text{Zn}(\text{OH})_2 + 2\text{HCl}$ ;  $\text{Zn}(\text{OH})_2$  formed soon disappears because of the reaction  $3\text{Zn}(\text{OH})_2 + \text{Fe}_2\text{Cl}_6 \rightleftharpoons 3\text{ZnCl}_2 + \text{Fe}_2(\text{OH})_6$ . An excess of  $\text{KClO}_3$  is not needed. The soln. must be boiled some time after introducing  $\text{KClO}_3$ . The advantage of this method is that it only introduces a little  $\text{KCl}$  into the soln.; the disadvantage is that it requires boiling the soln. for some time. Oxidation by  $\text{HNO}_3$  is extremely slow and incomplete, unless either prolonged boiling or addn. of  $\text{HCl}$  is practiced. Even a prolonged current of air passed through the soln. oxidizes but an insignificant quantity of  $\text{FeCl}_2$ . The use of  $\text{H}_2\text{O}_2$  gives excellent results, but the reagent is too expensive. Electrolytic oxidation is the best and cheapest method. Const. stirring should be practiced, particularly in the anode zone, to avoid volatilization of  $\text{Cl}$ . The electrolyte must not contain an excess of acid to avoid electrolysis of  $\text{ZnCl}_2$ .

BERNARD NELSON

Extraction of bromine and iodine by solvents. III. Extraction of iodine. B. G. PANTELEIMONOV. *J. Chem. Ind. (Moscow)* 5, 1220-7(1928); cf. *C. A.* 22, 4731.—The extn. of  $\text{I}$  by kerosene, benzine or vaseline is similar to that of  $\text{Br}$ . When extg.  $\text{Br}$  the solvent power of kerosene becomes great only when  $\text{Br}$  (or even  $\text{Cl}$ ) compds. accumulate in it; with  $\text{I}$ , the dissolving power of kerosene decreases considerably with the accumulation of  $\text{I}$  compds. in soln.  $\text{I}$  forms with kerosene a certain quantity of a compd. not sol. in  $\text{H}_2\text{O}$  or in kerosene. The effects of time, light and temp. on extn. are the same with  $\text{I}$  as with  $\text{Br}$ . With increase of temp. the quantity of  $\text{HI}$  formed decreases as the surface tension weakens.  $\text{HI}$  is not formed during the extn. to the same extent as  $\text{HBr}$ .

BERNARD NELSON

Bleaching earths. L. KALUSKY. *Seifensieder-Ztg.* 56, 18-9, 27-8, 34-5, 43-4, 52-3, 58-9, 71-2, 80-1, 87-8, 96-7(1929).—The bleaching power of earths depends upon the interstices left in minerals when one or more of their constituents are removed by weathering,  $\text{H}_2\text{O}$  or heat. Brucite, koenenite, briotite and zeolites are examples of minerals which lose part or all of their base, with part substitution by other bases or by  $\text{H}_2\text{O}$ . When hydrated they form those natural deposits of bleaching earths that cannot be improved by treatment. If part of the hydrate  $\text{H}_2\text{O}$  has again been replaced by a base, the latter can be improved by treatment. Active earths are hygroscopic up to 31.21%;  $\text{CaCl}_2$  in *vacuo* reduced the  $\text{H}_2\text{O}$  to 0.45%. The dried earths also absorbed some of the fat used for lubricating the desiccator. Chem. compn. is no criterion for bleaching quality. Purification usually removes all  $\text{CaO}$  and some  $\text{Mg}$  and alkalies. Even by eliminating  $\text{H}_2\text{O}$  and loss by ignition from the calcn., no chem. compn. could be formulated that would predict bleaching quality. The criterion is the shape of the skeleton left behind. Some 37 analyses of earths are tabulated (sources not stated) and 7 are compared in compn. before and after processing. Removal of oxides by treatment causes a corresponding increase in  $\text{SiO}_2$ , which, reduced to a dry basis, permits the calcn. of shrinkage by purification. By use of the ratio of %  $\text{SiO}_2$ : % sesquioxides: % loss by ignition K. shows that those earths which bleach different oils markedly differently, show a high sesquioxide no. and a correspondingly high loss on ignition. The ratio  $\text{SiO}_2$ : sesquioxides varies in raw earths between 1:0.479 and 1:0.615, while the purified earths vary between 1:0.169 and 1:0.888, indicating in some cases an excessive removal of oxides during treatment. One foreign earth in the raw state decolorized the easily bleached soy-bean oil 72.01% and in the purified state 88.65%. The raw earth contained 17.88%  $\text{CaO}$ , equal to 31.93%  $\text{CaCO}_3$ . Mineral oil was bleached better by this raw earth than by the purified earth, indicating that the removal of  $\text{CaCO}_3$  destroyed the fine interstitial structure of the original earth, diminishing its bleaching

power. Results with soy-bean oil, linseed oil and mineral oil are tabulated; the bleaching power is expressed in % by the Lovibond tintometer, both % total color and % individual red and yellow. Two % of prep'd. earths removed from soy-bean oil at 90° in 20 mins. 73.34–88.63% color; from linseed oil at 95° in 30 mins. with 4% earth 23.83–73.26%, and from mineral oil at 90° in 30 mins. with 5% earth 13.49–66.01%. Addn. of CaO for neutralization is detrimental; earths so treated lose some bleaching power when moist, while properly prep'd. earths regain their full power when dried after moistening. Well-made earths stand a temp. of 400° without loss of bleaching power.

P. E.

The problem of determining the bleaching power of fuller's earth. E. SCHILD. *Seifensieder-Ztg.* 56, 86–7(1929).—The present comparative methods of bleaching an unknown oil with a "standard earth" of known effect or of bleaching a "standard" oil with the unknown earth lead to erroneous results, since both standards are subject to aging, involving a change in the supposed standard of comparison. The Lovibond tintometer works best for abs. color detns., while the Duboscq and the Autherried colorimeters are better suited for relative color detns.

P. ESCHER

Infusorial earth from Lüneburger Heide. W. PRYER. Halle a/Saale. *Apoth. Ztg.* 44, 448(1929).—The occurrence of infusorial earth at 4 points in this heath is discussed in connection with the mining and refining operations incidental to its production. The phys. characters of the crude and calcined products are, resp.: appearance, gray to greenish, gray to rose or nearly white; smell, peculiarly strong, ditto; moisture, 7.6, 6.0%; d. (in alc. after elimination of air) 1.85, 2.25; ash, 70.4, 93.6%; insol. in 10% HCl, 85.5, 92.5%; H<sub>2</sub>O-sol., 4.3, 4.7%; EtOH-sol., 3.2, 3.0%; Et<sub>2</sub>O-sol., 1.4, 0.4%; adsorption capacity —, about 20; SiO<sub>2</sub>, 68.2, 91.4%; N substance (0.95% N) = 5.93%. During the 30 Years' War, as also in 1719 and 1733 (and even today in Sweden and Finland) kieselguhr was and is used in bread.

W. O. E.

Bleaching of gangwa wood (*Excoecaria agallocha*) in the manufacture of matches. R. L. DATTA AND T. BASU. Dept. Industries, Bengal. *Bull.* 18, 6 pp.(1928).—In the bleaching of gangwa wood so as to render it suitable for match splints, a cold, alk. aq. soln. of bleaching powder contg. 0.20% of available Cl gave the best results. Boiling with water or treatment with H<sub>2</sub>SO<sub>4</sub> or KMnO<sub>4</sub> soln. was unsuitable.

B. C. A.

Basic industrial minerals. VI. Magnesite. G. MALCOLM DYSON. *Chem. Age* (London) 20, 376–7(1929).—A review.

E. H.

Bentonite, its occurrence, properties and uses. C. C. O'HARRA. *Black Hills Engineer* 17, 39–48(1929).

S. L. B. ELBERTON

Tripoli: Its properties, occurrence, history, preparation and uses. P. B. BUTLER. *Metal Ind.* (London), 34, 149–50, 251–2(1929); cf. C. A. 23, 671.

E. H.

W as a chemico-technical raw material (ALTERTHUM) 13. Systematic classification of adhesives and vehicles (WAGNER) 26. The deposits of precious stones of Burma, British India (SANDELIN) 8. Applications of stainless Fe in HNO<sub>3</sub> industry (MIRCHELL) 9. Effecting chemical reactions [oxidation of NH<sub>3</sub>] (Ger. pat. 474,075) 13. Sterilizing liquids or plastic materials (U. S. pat. 1,711,097) 13. Alcohols and NH<sub>3</sub> (Fr. pat. 649,711) 10.

CALVERT, A. F.: Salt and the Salt Industry. London: I. Pitman & Sons. 151 pp. 3s. Reviewed in *Chemistry & Industry* 48, 378(1929).

TEEPLE, JOHN E.: The Industrial Development of Searies Lake Brines with Equilibrium Data. Monograph No. 49 of Am. Chem. Soc. New York: The Chem. Catalog Co., Inc. 162 pp. 83. Reviewed in *J. Franklin Inst.* 207, 714; *Chem. Trade J.* 84, p. iv of issue for April 26 (1929).

Iodine extract from sponges. WILHELM HARGELE. Ger. 474,820, June 26, 1926. An alc. ext. of I is obtained from bath sponges by steeping them in inorg. base solns. and extg. with alc.

Hydrochloric acid. LOUIS TOCCO. Fr. 649,930, Aug. 3, 1927. Chlorides such as CaCl<sub>2</sub>, MgCl<sub>2</sub>, BaCl<sub>2</sub>, NaCl and KCl are treated at a sufficiently high temp. with H for the production of HCl, the hydrides of the metals being formed. For NaCl, KCl and MgCl<sub>2</sub> the temp. should be above 700°, and for CaCl<sub>2</sub> and BaCl<sub>2</sub> above 900°.

Hydrocyanic acid. P. T. DOLLEY (to Calif. Cyanide Co.). Brit. 299,019, Oct. 19, 1927. HCN is formed by treating with steam (to which CO<sub>2</sub> or SO<sub>2</sub> may be added) dry powd. cyanogen compds. of alkali or alk. earth metals (such as the compd. produced by melting Ca cyanamide with NaCl). An app. is described.

**Phosphoric acid.** SOC. DES PHOSPHATES TUNISIENS. Fr. 649,497, Feb. 11, 1928. Phosphoric acid is recovered from gases coming from the fusion of phosphatic materials by passing the gases through a granular filtering layer, then either removing the acid by a current of air passed through the filter, or using the filter contg. the acid as a charge for the furnace.

**Production of phosphoric anhydride and its derivatives.** G. TABOURIN and G. BRACO. Belg. 353,251, Oct. 31, 1928.  $\text{Ca}_3(\text{PO}_4)_2$  minerals are treated at high temp. with  $\text{SiO}_2$  and coal, the latter acting only as fuel and being burned in an oxidizing atm. Forced draft is used so as to fuse the silicate slag and remove the volatilized  $\text{P}_2\text{O}_5$ .

**Sulfuric acid.** THE SELDEN CO. Fr. 649,525, Feb. 16, 1928.  $\text{SO}_2$  is oxidized to  $\text{SO}_3$  by passing  $\text{SO}_2$  and O at reaction temp. over a contact mass contg. a catalytically inactive base-exchange substance, siliceous or not, physically combined with an active catalytic diluent preferably as a homogeneous structure. Stabilizers and stabilizer promoters may be mixed or combined with the base-exchange substance. The catalytically active constituents may be vanadates of Fe, Ag, Mn, Cu, Ti, Co or Ni. Several examples are given. Fr. 649,526 describes a similar contact process for  $\text{H}_2\text{SO}_4$  in which  $\text{SO}_2$  and O are passed at a high temp. over a contact mass contg. at least one non-siliceous, catalytically active base-exchange substance, dild. or not, in which at least one catalytically active constituent is chemically combined in or with the base-exchange substance in an exchangeable or non-exchangeable form, with or without the presence of stabilizers or stabilizer promoters chemically combined or physically assocd. with it. At least part of the dild. substance may be a non-siliceous or zeolitic base-exchange substance. The principal catalytically active element in the contact mass is V.

**Sulfur oxides.** CHARLES S. ROBINSON. Ger. 474,925, May 23, 1925. See Brit. 239,252, C. A. 20, 2051.

**Nitric oxide.** ELEKTRIZITÄTWERK LONZA. Ger. 473,601, May 1, 1927. See Brit. 289,412 (C. A. 23, 676).

**Solid carbon dioxide.** DRYICE CORP. OF AMERICA. Brit. 298,792, Nov. 15, 1927. Large blocks of solid  $\text{CO}_2$  of high density are obtained by freezing the liquid under a pressure of 1500-2500 lbs. per sq. in. and continuously pumping the liquid into the freezing chamber during freezing to compensate for contraction. An app. is described in which  $\text{CO}_2$  from flue gases may be sep'd. and used.

**Silicic acid esters.** I. G. FARBENIND. A.-G. Brit. 298,778, Oct. 24, 1927. Production of silicic acid esters by interaction of  $\text{SiCl}_4$  and alcs. such as EtOH, MeOH or benzyl alc. is effected in the presence of inert diluents such as  $\text{C}_6\text{H}_6$ , which avoids the need of dehydrating the alcs.

**Ammonia.** VEREIN FÜR CHEMISCHE UND METALLURGISCHE PRODUKTION. Fr. 648,458, Feb. 6, 1928. In the prepn. of  $\text{NH}_3$  from coke-oven gas or other gaseous mixts. of like compn., the gas is carefully freed from substances such as CO,  $\text{CH}_4$ , etc., which would hinder the reaction and after the synthesis and elimination of the  $\text{NH}_3$  formed, the residual gases are only taken into the reaction mixt. after the latter has passed through the liquefying plant. Purification of the gas may be assisted by treating it with liquid N.

**Synthesis of ammonia.** HANS HARTER. Fr. 648,434, Feb. 4, 1928. To produce exothermic reactions between gases, particularly in the synthesis of  $\text{NH}_3$  under high pressure, the entrance of gas is divided and the inflow of gases is uniformly spread over the length of the contact tube so that contact tubes as long as possible may be used. The tube may be divided into sep. compartments. Cf. C. A. 23, 1222.

**Synthesis of ammonia.** MARIA CASALE SAACHI. Fr. 648,844, June 8, 1927. A mixt. of H and N for the synthesis of  $\text{NH}_3$  is prepd. by incompletely burning hydrocarbons in the presence of steam with O obtained by the distn. of liquid air; the mixt. of gases thus obtained with added steam is catalyzed to convert CO into  $\text{CO}_2$ , and cooled to eliminate  $\text{CO}_2$ , and N from the liquid air distn. is then added.

**Bromides.** JOHANNES H. VAN DER MEULEN. Fr. 649,329, Feb. 20, 1928. See Brit. 285,915 (C. A. 23, 244).

**Metal chlorides.** R. B. GOLDSCHMIDT. Belg. 353,967, Oct. 31, 1928. Finely ground ores, rocks or metal compds. in suspension in a suitable liquid are treated with Cl, and the films of chlorides formed on the metallic particles are removed as they are formed, either mechanically or by dissolving.

**Metal polysulfides.** IGNAZ KREIDL. Austrian 112,335, Oct. 15, 1928. Addn. to 93,927. Austrian 93,927 describes the manuf. of polysulfides of the alk. earth metals, As, Pb and Cu by heating the corresponding oxides, hydroxides or sulfides at about  $100^\circ$  with S in the presence of a S-contg. catalyst, e. g., an alkali sulfite, sulfide, or thio-sulfate and, if desired, of small amts. of water. This method is now modified by adding

in addn. to water, a stable hygroscopic substance such as glycerol in sufficient amt. to form a paste.

**Molybdates.** I. G. FARBENIND. A.-G. Ger. 473,991, Apr. 7, 1925. Molybdates of the alk. earths and heavy metals, especially Ca, are prepd. by heating to bright redness roasted molybdenite with the oxide of the metal whose molybdate is desired. Instead of the oxide, an oxide-yielding compd. of the metal, such as  $\text{CaCO}_3$ ,  $\text{FeCO}_3$ , or caustic lime may be used.

**Nitrates.** JEGOR BRONN, CONCORDIA BERGBAU A. G. and GEORG FISCHER. Fr. 650,030, Jan. 10, 1928. Nitrates, particularly of K and Na, are obtained by treating the corresponding chlorides with vapors of  $\text{HNO}_3$  in the presence of a large amt. of steam (10–15 times the wt. of  $\text{HNO}_3$  vapors). The lumps of salt used may be sprayed with a salt soln. during the reaction.

**Alkali oxides.** DEUTSCHE GOLD- UND SILBER-SCHNEIDANSTALT VORM. ROESSLER. Ger. 473,832, June 9, 1925. In the prepn. of oxides of the alkali metals by the action of O, or O-contg. gases such as air, on the metals at high temps., the metal is mixed with a considerable excess of diluent and treated with the oxidizing gas with agitation as in a rotary furnace. The diluent may be alkali oxide.

**Oxide mixtures.** I. G. FARBENIND. A.-G. (Alwin Mittasch, Richard Lucas and Robert Griessbach, inventors). Ger. 474,416, Jan. 9, 1925. Addn. to 422,269. Finely divided and intimate mixts. of  $\text{Fe}_2\text{O}_3$  with other oxides, such mixts. being useful, *e. g.*, as *catalysts* and *pigments*, are prepd. by the combustion of mixts. of  $\text{Fe}(\text{CO})_5$  with other suitable elements or compds. Such addnl. substances may be volatile and oxidizable, *e. g.*, other carbonyls, organo-metallic compds.,  $\text{CrO}_2\text{Cl}_2$ , or  $\text{SiCl}_4$ , or they may be non-volatile, non-oxidizable substances, *e. g.*,  $\text{Bi}_2\text{O}_3$  or  $\text{Al}_2\text{O}_3$ , added in gaseous suspension. Examples are given.

**Alkaline earth salts.** SOC. MINIERE "LA BARYTINE." Fr. 649,928, Aug. 3, 1927. Alk. earth sulfates are converted into sol. salts such as chlorides, bromides, etc., by passing a current of HCl or HBr on to the sulfate heated to redness, the  $\text{SO}_4$  displaced being recovered in water or  $\text{H}_2\text{SO}_4$ ; or steam may be passed over a mixt. of the sulfate and NaCl heated to redness, giving a mixt. of the alk. earth chloride and NaOH.

**Calcining alkaline earth carbonates.** WALLER CROW (to Dittlinger-Crow Co.). U. S. 1,710,967, April 30. Materials such as calcite and magnesite are first subjected to superheated steam of a pressure of about 100 lbs. per sq. in. and a temp. of about  $320^\circ$  and then to the action of air heated to a temp. sufficiently high to decompose the hydroxide formed by the action of the superheated steam.

**Separating alkaline earth phosphates.** T. BENCKISER, A. REIMANN and A. REIMANN (trading as the Firm of J. A. Benckiser) and F. DRAISBACH. Brit. 298,436, Feb. 21, 1928. Crude phosphates are treated with  $\text{H}_2\text{SO}_4$  and the soln. is neutralized (suitably with  $\text{Na}_2\text{CO}_3$ ) to form a monophosphate soln. contg. some alk. earth monophosphates which may be converted into di-alk. earth phosphates by adding a suitable excess of di-alkali phosphate and heating in an autoclave to  $150\text{--}200^\circ$  under 5–15 atm. pressure. The di-alk. earth phosphates are pptd. in readily filterable form and are easily sep'd., leaving a mono-alkali phosphate soln.

**Colloidal metal silicates.** MARIA GRÄFIN. Ger. 474,501, Dec. 18, 1925. Highly coned colloidal metal silicate solns. are prepd. by treating a metal salt soln. with water glass, with a non-electrolyte, such as glycerol, as the dispersion agent. Thus, powd.  $\text{CuSO}_4$  is ground with  $\text{Na}_2\text{SiO}_3$  and glycerol. After standing for some time, a deep blue soln. of colloidal  $\text{CuSiO}_3$  is obtained and a gel-like residue remains at the bottom. Other examples are given.

**Alumina.** ELEKTIZITÄTSWERK LONZA. Swiss 130,145, Aug. 4, 1927. Fused alumina is finely divided by rapid cooling, as by spraying into water.

**The simultaneous production of pure alumina and pure carbon dioxide.** C. D'ASSEVE. Belg. 354,141, Oct. 31, 1928. A soln. of crude  $\text{Al}_2(\text{SO}_4)_3$  is treated with a soln. of  $\text{Mg}(\text{HCO}_3)_2$ , causing evolution of  $\text{CO}_2$ . The pptd. basic Fe and Al carbonates are heated, evolving pure  $\text{CO}_2$  and yielding Fe and Al hydroxides; these are treated with a hot NaOH soln. The Na aluminate is treated with the  $\text{CO}_2$  evolved in the 1st reaction.

**Alumina, potash, etc.** "MONTECATINI" SOC. GÉNÉRALE PER L'IND. MINERARIA ED AGRICOLA. Fr. 649,503, Feb. 13, 1928.  $\text{Al}_2\text{O}_3$  and K salts are obtained by treating rocks contg. silicates of Al and K with  $\text{HNO}_3$  of medium concn. The nitrates obtained are dried and the  $\text{HNO}_3$  is recovered by dry distn.

**Baryta.** VICTOR PIVERT. Fr. 649,732, July 19, 1927. Natural baryta is wholly converted to com. extra-white baryta by adding the granulated baryta to an acid soln.,

e. g., HCl, H<sub>2</sub>SO<sub>4</sub>, or HF if the baryta contains quartz, heating to a moderate temp. in thin layers until it becomes a saffron-yellow, pptg. in water and washing.

**Purifying ammonium bicarbonate.** GES. FÜR KOHLENTCHNIK M. B. H. (Wilhelm Glud and Wilhelm Riese, inventors). Ger. 474,082, Sept. 12, 1928. See Can. 281,357 (C. A. 22, 3024).

**Beryllium oxide.** ROBERT C. PRICE and HUGH S. COOPER (to Beryllium Corp. of America). U. S. 1,710,840, April 30. A mineral such as beryl is heated with a flux contg. a Ca compd. such as lime and CaF<sub>2</sub>; H<sub>2</sub>SO<sub>4</sub> is added to the resulting product; the sulfate produced is dissolved in water, evapd. to a d. of about 1.31, pptd. CaSO<sub>4</sub> is sepd., and sulfates of Be and Al are sepd. and calcined.

**Separation of calcium chloride from calcium hypochlorite.** THE MATHIESON ALKALI WORKS. Ger. 473,925, May 24, 1927. The hypochlorite is treated with an alkali hypochlorite. Thus, 47 parts NaOCl and 73 parts water are mixed with 500 parts of filter cake contg. about 50.1% Ca(OCl)<sub>2</sub>, 6.9% CaCl<sub>2</sub>, 5.7% Ca(OH)<sub>2</sub>, 0.3% NaCl and 37% water. The mixt. is well stirred and dried without pressing. The product contains less than 0.5% CaCl<sub>2</sub>.

**Calcium hypochlorite.** THE MATHIESON ALKALI WORKS. Ger. 473,924, May 24, 1927. Ca(OCl)<sub>2</sub> is freed from CaCl<sub>2</sub> by treating it with an amount of caustic alkali equivalent to the CaCl<sub>2</sub> content. Thus, 200 parts of filter cake contg. Ca(OCl)<sub>2</sub> and about 20 parts CaCl<sub>2</sub> are treated with 14.4 parts NaOH and 11 parts water, well mixed, and dried.

**Calcium hypochlorite.** THE MATHIESON ALKALI WORKS. Ger. 473,975 and 473,976, May 24, 1927. Ca(OCl)<sub>2</sub> is prepd. by chlorinating lime in the presence of water and an alkali compd. Thus, milk of lime is mixed with an equiv. amt. of NaOH and chlorinated. Ca(OCl)<sub>2</sub> is also prepd. by chlorinating a soln. of caustic alkali and mixing the alkali hypochlorite with CaCl<sub>2</sub>.

**Calcium hypochlorite.** THE MATHIESON ALKALI WORKS. Ger. 474,080, May 24, 1927. A mixt. of Ca(OH)<sub>2</sub> with NaOH in excess is chlorinated in the presence of water, and the chlorinated mass is treated with sufficient CaCl<sub>2</sub> to react with the NaOCl. A stable mixt. of Ca(OCl)<sub>2</sub> with NaCl is obtained on drying.

**Calcium hypochlorite.** THE MATHIESON ALKALI WORKS. Ger. 474,220, May 24, 1927. An aq. suspension of an excess of Ca(OH)<sub>2</sub> in caustic alkali soln. is chlorinated and the Ca(OCl)<sub>2</sub> then sepd. The sepn. may be effected by filtering and pressing, or by filtering and treating with NaOCl, or by treating with NaOCl and then filtering. Ca(OCl)<sub>2</sub> free from CaCl<sub>2</sub> is so obtained.

**Cobalt carbonyl.** I. G. FARBERIND. A.-G. Brit. 298,714, July 28, 1927. The process of prepg. Fe carbonyl described in Brit. 250,132 (C. A. 21, 994) is applied to the prepn. of Co carbonyl. CO or a gas contg. it is passed under pressure over metallic Co (which may be prepd. by reduction of Co oxide or Co ores with H) and the Co carbonyl is sepd. by cooling before releasing the pressure. Various details are given.

**Iron oxide.** I. G. FARBERIND. A.-G. Brit. 298,926, July 14, 1927. In order to produce finely divided Fe oxide, Fe(OH)<sub>3</sub> is heated under pressure in the presence of water to 110–150°. A ferric salt such as FeCl<sub>3</sub> may be heated with lime, chalk or Na<sub>2</sub>CO<sub>3</sub> in an autoclave, and the product filtered, washed and dried. Oxides ranging in color from yellowish red to dark violet are obtained. Cf. C. A. 23, 245.

**Potassium nitrite.** GEWERKSCHAFT SACHTLEREN and HERMANN PÖTZER. Ger. 472,605, Sept. 12, 1926. KNO<sub>2</sub> is recovered from Fischer's salt in the sepn. of Co and Ni in soln. The ppt. obtained is melted with caustic alkali and the CoO in the smelt sepd. from the sol. part. Thus, a soln. of CoSO<sub>4</sub> and NiSO<sub>4</sub> is mixed with KNO<sub>3</sub> and stirred. The pptd. K cobaltinitrite is filtered off, mixed with caustic alkali and heated until it melts. The mass is treated with water and the CoO sepd.

**Separating sodium sulfate from sulfuric acid.** VEREINIGTE GLANZSTOFFFABRIKEN A.-G. Brit. 298,639, Oct. 13, 1927. In regenerating coagulating baths for viscose or other operations, sepn. of Na<sub>2</sub>SO<sub>4</sub> from H<sub>2</sub>SO<sub>4</sub> is effected by concg. the soln., preferably to an acid content of about 75–80%, cooling and sepg. the crystd. salt.

**Freezing mixture comprising ammonium nitrate and crystallized soda.** L. A. GARCHÉY and B. GARCHÉY. Brit. 298,623, Oct. 14, 1927. These substances are mixed with each other and with water at the time of use.

**Hydrogen.** JOHN S. BEEKLEY (to Lazote, Inc.). U. S. 1,711,036, April 30. A mixt. of steam and a gaseous hydrocarbon such as CH<sub>4</sub> is submitted to the action of a heated catalyst (suitably a Ce-Ni catalyst at a temp. of about 500°) together with an addn. of O and a reducing gas such as recirculated gas already treated which serve to check loss of activity of the catalyst. Cf. C. A. 23, 1225.



**Hydrogen.** L'OXHYDRIQUE FRANÇAISE. Fr. 649,724, July 18, 1927. See Brit. 294,110. (C. A. 23, 1999).

**Hydrogen from mixed gases.** I. G. FARBENIND. A.-G. Brit. 299,167, Sept. 29, 1927. Pure H is recovered from mixts. such as those also contg. CH<sub>4</sub> by scrubbing the mixts., at temps. below -60° (and preferably under high pressure, suitably about 50 atm.) with benzines which do not freeze under such conditions. The recovered H is free from catalyst poisons such as ether, CO, H<sub>2</sub>S and CS<sub>2</sub>.

**Hydrogen and carbon monoxide.** I. G. FARBENIND. A.-G. Fr. 649,296, Nov. 14, 1927. A mixt. of H and CO is obtained by introducing gaseous hydrocarbons or gases contg. them tangentially into a vessel and adding O or gases contg. it, preferably also tangentially to the circulating gases with a view to their partial combustion.

**Hydrogen and sulfur.** WERSCHEN-WEISSENFELSER BRAUNKOHLN A.-G. Ger. 473,770, Jan. 14, 1927. H and S are prepd. from iron pyrites from which the total S has not been extd. during smelting, by passing steam over the heated material. Half the S may be removed by distn. and the raw material then heated and subjected to the action of the steam.

**Colloidal sulfur.** I. G. FARBENIND. A.-G. (Fritz Winkler and Fritz Giller, inventors). Ger. 472,913, Nov. 29, 1927. Addn. to Ger. 358,700. Colloidal or highly dispersed S is prepd. by allowing yellow (NH<sub>4</sub>)<sub>2</sub>S<sub>2</sub> soln. mixed with a protective colloid to flow down the inner walls of an upright or inclined tube and exposing the mixt. to the action of a current of steam.

**Dissociating sulfur vapor.** I. G. FARBENIND. A.-G. Brit. 298,599, Oct. 12, 1927. See Ger. 468,506 (C. A. 23, 1226).

**Iodine from crude sodium nitrate.** I. G. FARBENIND. A.-G. Brit. 298,670, July 14, 1927. Crude Na nitrate is heated to 200-250° to liberate free I, which vaporizes and is condensed. The process may be facilitated by use of a current of gas or vapor such as SO<sub>2</sub>, NO, air or water vapor. The residual material may be heated to a higher temp. to form N oxides as described in Brit. 266,744 (C. A. 22, 848) or may be treated by leaching or otherwise to sep. the nitrate.

**Oxygen.** GEORG LESCHIK. Swiss 130,403, June 27, 1927. See Fr. 636,108 (C. A. 23, 245).

**Phosphorus.** SOC. ANON. DES CHARBONS ACTIFS ÉDOUARD URBAIN. Fr. 649,937, Aug. 4, 1927. P is extd. from gaseous mixts. contg. it by means of active charcoal at a temp. of 150-200°. The P is recovered from the charcoal by steam at a temp. of 200-350°.

**Active carbon.** SOC. ANON. DES CHARBONS ACTIFS ÉDOUARD URBAIN. Fr. 649,746, July 20, 1927. See Brit. 294,214 (C. A. 23, 2000).

**Active carbon.** VEREIN FÜR CHEMISCHE UND METALLURGISCHE PRODUKTION. Fr. 648,709, Feb. 13, 1928. See Brit. 285,386 (C. A. 22, 4738).

**Gas carbon.** IMRE SZARVASY. Ger. 474,081, May 1, 1928. The thermal decompn. of CH<sub>4</sub> or natural gas to produce a graphitic C and soot is conducted in the presence of soot obtained in a preceding operation, the soot being compressed to suitable shapes and fed to the reaction chamber. It is then found that the graphitic C deposits on the compressed soot, which also is converted to a like product, while the soot newly generated in the decompn. passes away with the residual gases. This soot is sepd., compressed, and used in the next decompn. step.

**Active masses.** I. G. FARBENIND. A.-G. Fr. 649,826, Feb. 25, 1928. Active masses contg. C are made by mixing irreversible colloids and addnl. substances which may be charcoal, particularly activated, or substances contg. charcoal or capable of being carbonized but with the exception of carbonizable substances still having a cellular structure. If the colloid is used in the form of a sol, carbonizable substances having a cellular structure may be used provided the sol is taken in amt. more than necessary to imbibe them. The mixts. after elimination of liquid are submitted to mech. treatment such as grinding, beating, malaxing, etc.

**Adsorbent agents.** I. G. FARBENIND. A.-G. Fr. 649,794, Feb. 24, 1928. See Ger. 469,653 (C. A. 23, 1728).

**Carbonaceous adsorption material.** O. SCHÖBER. Brit. 298,546, June 9, 1927. An adsorption agent contg. at least 10% free C and over 20% (e. g., 30-40%) of ash sol. in HCl is formed from starting materials such as coal, brown coal, peat or coke with oxidizing gases or vapors such as O or air which may be admixed with combustion gases, steam, CO<sub>2</sub>, N or Cl. Numerous details of the activation process are given and an app. is described. The process may be carried out in either a continuous or a non-continuous manner, and the app. used may also be used for regenerating used activated material. S and P may be removed by passing the activated material through

a magnetic field in which the Fe compds. of S and P are retained. Fe may be added if necessary to facilitate this operation. Sulfides and phosphides may also be removed by use of acids or acid salts or  $\text{CO}_2$ . The product may be sepd. by a powerful magnetic field into fractions having different ash contents in one of which fractions the S- and P-contg. impurities may be concd. for further purification. Cf. C. A. 22, 4739.

**Adsorbent for separating gases and vapors.** C. F. BOEHRINGER & SOEHNE, G. M. B. H. and E. WILKE. Ger. 473,783, Nov. 4, 1924. Gases and vapors are extd. from mixts. by the employment of a gel of  $\text{H}_2\text{SiO}_3$ , which is obtained by bubbling  $\text{CO}_2$  into a soln. of alkali silicate, washing and drying the ppt. and dehydrating it at 200–500°.

**Catalyzers.** DEUTSCHE GASGLÜHLICHT-AUER-G. M. B. H. Ger. 473,824, Dec. 30, 1925. See Brit. 263,758 (C. A. 22, 144).

**Hydrogenation catalysts.** GEORGES HUGEL, MARCEL PAUL, and MAURICE BOISHEL. Fr. 649,976, Feb. 27, 1928. Hydrides of Na, K, Rb, Cs, Ca, Sr, Li or Ba are used as hydrogenation catalysts in the treatment of *hydrocarbons* or *coal-distn. products*. They may be stabilized by impregnating them with org. solvents such as tetralin, or by using them in combination with CO, or mixed with metallic amides.

**Removing catalyst poisons and other impurities from gases such as nitrogen-hydrogen mixtures.** I. G. FARBENIND. A.-G. Brit. 298,726, Aug. 10, 1927. The gases are treated with reactive metals such as the alkali or alk. earth metals, Pb, Cd, Sn or Bi dissolved or finely distributed in melts of salts, oxides, hydroxides or other metals. An example is given of the treatment of a N-H mixt. with Na and a small quantity of Fe in a NaOH melt.

**Condensation products.** SOC. ANON. POUR L'IND. CHIM. À BÂLE. Swiss 130,420, July 25, 1927. A mol. of benzoin and a mol.  $\beta$ -naphthalenesulfonic acid are allowed to react in the presence of a condensing agent. The product can be used as a distributing agent for insol. substances.

**Phenol condensation products.** J. KARPATI and M. G. HUBSCH. Brit. 298,968, Oct. 18, 1927. Products resembling natural asphalt mineral wax or resins are formed by reaction of phenols or phenolic compds. and finely divided cellulosic material, *e. g.*, by reaction at a temp. of about 110–120° between air-dried sawdust and crude brown-coal-tar creosote in the presence of a small proportion of  $\text{H}_2\text{SO}_4$ . The reaction may require 2–3 hrs. and the properties of the product may be modified by subsequent heat treatment or by admixt. with a previously obtained condensation product, tar oil or other substances. By suitably varying the proportions of the reacting substances and using HCl as a reaction accelerator, products of high m. p. are obtained which may be used in road making, roofing or in the manuf. of insulating material, lacquers, etc.

**Viscous phenol condensation product.** RICHARD GÜNTZEL (to the Firm Schieferwerke Ausdauer A.-G.). U. S. 1,711,411, April 30. A mixt. comprising phenol, *p*-dichlorobenzene and  $\text{CH}_2\text{O}$  is heated in the presence of a mixed salt comprising NaCl,  $\text{NH}_4\text{Cl}$  and  $(\text{CH}_2)_6\text{N}_4$ , water is sepd., volatile vapors are driven off, and the product may then be washed with water, and if desired may be hardened.

**Phenolic condensation product.** OSCAR A. CHERRY and FRANZ KURATH (to Economy Fuse Mfg. Co.). U. S. 1,710,722, April 30. A phenolic compd. is heated with  $\text{CH}_2\text{O}$  in the presence of furfuralamide, while the phenolic compd. is maintained in excess of the combining proportion with the  $\text{CH}_2\text{O}$ , to form a product which is suitable for use in making molded articles. Cf. C. A. 22, 3056.

**Phenol-aldehyde condensation products.** BRITISH DYESTUFFS CORP., LTD. and E. E. WALKER. Brit. 298,680, July 15, 1927. In forming condensation products by condensing a phenol first with an aliphatic ketone such as acetone and then with an aliphatic aldehyde (the second or both reactions being effected in an alk. medium), the alkali is neutralized with acid after the second condensation until the aq. layer after agitation with the oily layer has a  $\text{pH}$  of between 5 and 7, and the oily product is then sepd. and crystd. and may be used in various mixts. for making molded products. Various details and examples are given.

**Formaldehyde-albumin derivs.** HERMANN REIL. Ger. 472,820, Feb. 7, 1926. Powd.  $\text{CH}_2\text{O}$ -albumin derivs. are prepd. from animal blood or its constituents by treating carefully with the correct quantity of  $\text{CH}_2\text{O}$  completely to sat. the amino acid groups of the albumin. The product flakes and is allowed to stand for several days at 42°, when it is dried and powd.

**Moldable composition.** SIDNEY M. HULL (to Western Electric Co.). U. S. 1,711,025, April 30. Condensation of a substantially dry protein material such as casein and substantially anhyd. furfural is effected in the presence of a waterproofing material such as a rosin-glycerol ester to form a product suitable for molding. Cf. C. A. 22, 484.

**Moldable composition containing nitrocellulose and a phenol-aldehyde condensation product.** STABILIMENTI CHIMICI INDUSTRIALI. Brit. 298,793, Nov. 15, 1927. Cellulosic material is treated with  $\text{H}_2\text{SO}_4$  or  $\text{HNO}_3$ , washed, dried, soaked in phenol and then treated with  $\text{CH}_2\text{O}$  and may be further treated with a neutralizing agent such as  $\text{Na}_2\text{CO}_3$ , drained, dried and mixed with *p*-dichlorobenzene. The product may be roughly shaped at  $60^\circ$  and molded under pressure at  $160^\circ$ .

**Molding casein compositions.** A. ZSIGMONDY. Brit. 298,815, Dec. 22, 1927. Buttons or other molded articles are formed by punching or cutting out rough blanks from a casein compn. in unhardened condition, hardening the blanks and shaping and finishing under a very high pressure (suitably 400–500 atm.) at a temp. of  $90\text{--}100^\circ$ . An app. is described.

**Plastic compositions.** BUTO-WERKE G. M. B. H. Ger. 474,851, Aug. 3, 1926. Plastic masses are prepd. from horn, ivory and neats-foot chippings by softening the outer layer with alkali, removing it mechanically and treating to the usual pressing operations.

**Plastic compositions.** ELECTRICAL RESEARCH PRODUCTS, INC. Ger. 474,624, Dec. 3, 1924. Addn. to Ger. 457,698. Plastic masses are prepd. from rubber, guttapercha, balata and similar substances by mixing with filling material, such as  $\text{H}_2\text{SiO}_3$ , which has been previously heated, without sublimation, to a temp. below the sintering temp., *e. g.*,  $900\text{--}1000^\circ$ .

**Coloring horn.** H. OEXMANN. Brit. 298,946, Oct. 17, 1927. Coloring of horn with dyes is rendered more permanent by treating the horn with  $\text{CH}_2\text{O}$  or adding the latter to the dye compn. used for the coloring.

**Cement.** HUGO VIERHELLER. Ger. 473,702, Mar. 22, 1928. Fusible cement made from phosphates is purified by subjecting it in a finely ground condition to an oxidizing glowing process.

**Cements.** SOC. D'ÉTUDES CHIM. POUR L'IND. Swiss 130,107, Oct. 13, 1927. Liquid cements are purified by oxidizing the impurities by gaseous or solid oxidizing agents.

**Shaft kiln with annular combustion chamber for lime, cement, etc.** AXEL HERMANSEN. Ger. 474,067, Jan. 21, 1926.

**Outlet lock for shaft kilns for lime, cement, etc.** ALBIN B. HELBIG. Ger. 474,022, Aug. 20, 1927.

**Furnace for producing phosphoric acid, etc.** STETTINER CHAMOTTE-FAB. A.-G. VORM. DIDIER. Ger. 473,410, Sept. 22, 1925. See Brit. 289,128 (*C. A.* 23, 678).

**Peat composition.** BOHUMIL JIROTKA. Ger. 474,821, Aug. 14, 1921. Material for making objects by pressing is made from moist, ground peat. Filling or binding material,  $\text{H}_2\text{SO}_4$ ,  $\text{HNO}_3$ ,  $\text{NaOH}$ , sawdust or dyes may be admixed.

**Gramophone disks.** THE GRAMOPHONE CO., LTD. Fr. 649,964, Feb. 27, 1928. A conducting layer is obtained on wax or the like in making gramophone disks, by creating a vacuum over the wax, introducing a gas such as  $\text{H}_2\text{S}$  and then dipping the wax in a soln. of a salt such as  $\text{SnCl}_2$  or  $\text{AgNO}_3$  to obtain a film of sulfide of Ag or Sn.

**Gramophone disks.** THE GRAMOPHONE CO., LTD. Fr. 649,820, Feb. 25, 1928. In the production of gramophone records the matrix of wax or soap-like material is brushed with finely divided Cu or Cu and graphite and a mirror of Ag is deposited on the bronzed surface by a reduction process.

**Gramophone records.** H. LAFFON. Brit. 298,434, Feb. 16, 1928. Foundation layers and coatings of records are each formed of compns. contg. a cellulose ester and a plasticizing agent and may contain condensation products and fillers, which if desired may be applied as coatings on paper. Various details are given.

**Adhesives and sizes.** I. F. LAUCKS, INC. Brit. 298,511, March 28, 1927. Vegetable protein material such as soy-bean flour is treated with a S-contg. agent in which the S is bonded to C but not to O, such as *n*-propyl disulfide, methyl disulfide, allyl sulfide, benzyl sulfide and disulfide,  $\text{CS}_2$  or thiocarbonates. Alk. base compds. such as  $\text{NaOH}$  or  $\text{Ca(OH)}_2$  may be added, as may also "retarders" such as alkali metal or alk. earth metal chlorides such as  $\text{NaCl}$  or  $\text{CaCl}_2$ . Protein material from cottonseed, linseed or peanuts also may be used. Various compns. are described in some of which rosin and other auxiliary ingredients are used.

**Gelatin threads, tubes, ribbons, etc.** P. HIRSCH. Brit. 299,105, July 25, 1927. Violin strings or other products made from gelatin solns. are treated with germ-killing rays, preferably ultra-violet rays, or the soln. from which the products are formed are similarly treated.

**Chewing gum.** HENRY M. MOWREY (to United Chicle Co.). U. S. 1,711,281, April 30. A tacky binder such as a rubber or chicle compn. is mixed with powd. sugar

at such a temp. that the sugar remains in its solid form, and powd. yeast is added at intervals in equal quantities of approx. 20% of the entire quantity.

**Mineral wool.** ISOLA-G. M. B. H. Ger. 473,821, April 30, 1926. Mineral wool is manufd. by a device in which a stream of molten mineral flows into a current of compressed air from a nozzle with a trough-shaped orifice.

**Emulsion.** HANS SCHENK. Swiss 130,100, June 21, 1928. A soln. of *p*-dichlorobenzene in  $C_6H_6$ , water and an emulsifying agent are mixed.

**Purification of gases.** I. G. FARBENIND. A.-G. Fr. 649,444, Jan. 31, 1928. Gases or vapors such as CO,  $H_2S$ ,  $AsH_3$ , steam, etc., are removed from gases to be used in catalytic reactions by passing the gases over alkali or alk. earth metals or very reactive compds. free from O, on finely divided or porous substances. Thus, a mixt. of H and N for the production of  $NH_3$  is washed with liquid  $NH_3$  and passed over one of the substances referred to. Spongy Fe dipped into a soln. of NaCN and heated to 550–600° in a stream of H may be used.

**Stencil sheets.** A. DE WABLE. Brit. 298,705, July 22, 1927. Yoshino paper or similar material is coated with a compn. comprising gelatinizing org. colloids such as nitrocellulose which do not dissolve in water, converted into weak gels or viscous sols by use of org. liquids (such as AmOAc and castor oil with nitrocellulose) and then formed into emulsions with aq. media such as gelatin or agar. Sulfonated sperm oil may be used as an emulsifying agent and bentonite may be added. Cf. C. A. 22, 2645.

**Transparent sheets.** SOC. ANON. POUR L'IND. CHIM. A. BALE. Fr. 649,602, Feb. 23, 1928. Transparent sheets for motor car screens, etc., are formed by uniting sheets consisting of condensation products of urea and  $CH_2O$  or their derivs. The compd. sheet may consist of a central sheet of softer compn. with outer sheets of harder compn.

**Finely divided substances.** BRITISH DYE STUFFS CORP., LTD. Fr. 649,551, Feb. 22, 1928. Finely divided substances are treated in suitable app. in mixt. with an amt. of dispersion agents and dispersion fluid such that at the end of the operation it forms a viscous paste which solidifies in a permanent manner. Thus, 25 parts of sulfite cellulose pitch are worked in a mixer with 100 parts of a paste of indigo and water. Other examples are given.

**Dispersion agents.** BRITISH DYE STUFFS CORP., LTD. Fr. 648,728, Sept. 28, 1927. Derivs. of ligninsulfonic acid (sulfite cellulose pitch) are obtained by treating it at a raised temp. with an  $NH_3$  soln. or with a hydroxide or carbonate of an alkali metal with or without pressure and final acidification. The products are dispersion agents particularly for vat dyes or in dyeing acetate silk.

**Disperse systems.** J. R. GEIGY A.-G. Ger. 474,284, Apr. 20, 1926. See U. S. 1,696,374 (C. A. 23, 921).

**Porous fillers.** ANDRÉ SOLIGNAC. Fr. 649,755, July 21, 1927. Cork charcoal obtained by heating pieces of cork to a temp. not above 600° is used as filling material for vessels contg. dissolved  $C_2H_2$ , etc.

**Artificial fog.** HANSEATISCHE APPARATEBAU-GES. VORM. L. VON. BREMEN & CO. Brit. 298,980, Oct. 18, 1927. In atomizing under pressure a fog-forming acid material such as  $SO_2$  dissolved in chlorosulfonic acid, the pressure is produced at the time of use by the generation of gases by the dehydrating reaction of the fog-forming acid on org. substances such as formic or oxalic acid.

**Photomechanical reproduction.** ART. INSTITUT ORELL FÜSSLI. Ger. 473,856, Oct. 11, 1927. Prints are transferred from low-pressure plates to stone or metal by coating the object with coloring material and a transparent layer, and etching with  $FeCl_3$  or citric acid. The transparent layer may be celluloid or collodion soln.

**Printing plates.** NEW CENTURY PRESS, LTD. Australia 11,115, Jan. 5, 1928. An ordinary cast plate is allowed to cool, dipped in a weak soln. of KCN and then in a bath of Ni. The plate is washed in KOH soln. and Cu is deposited by electrolysis on the printing face.

**Printing plates and foils.** I. G. FARBENIND. A.-G. (Hugo Dibelka, inventor). Ger. 472,750, July 14, 1927. See Brit. 293,834 (C. A. 23, 1730).

**Coating materials with metal foil.** ALUMINIUM-WALZWERKE SINGEN, DR. LAUBER, NEHER Co. GES. Brit. 298,593, Oct. 12, 1927. Foil such as that of Al is secured to paper, textiles, celluloid, glass, metal, leather, masonry, wood or other materials by an adhesive which is insol. in water and does not fuse or soften when heated to temps. used in working the material coated with the foil and that sets by an "irreversible" setting process. Among the adhesives that may be used are: cellulose ester varnishes, solns. of resins or rubber, metal soaps, ordinary varnishes and artificial resin varnishes. Various examples and modifications are described.

**Metal-foil substitute.** CHEM. FABRIK VON HEYDEN A.-G. Ger. 473,919, April 3,

1924. A metal-foil substitute is formed by a layer of cellulose ester soln. and bronze powder. The solvent is allowed to evap. at a temp. at least  $25^{\circ}$  below its b. p.

**Metallic paper.** HERBERT GLOOTZ. Ger. 472,714, July 19, 1927. Addn. to Ger. 401,514. Metallic powder is sprinkled on paper coated with adhesive. The sheet is then wound on a roller and the metallic surface produced by pressing or heating the powder to cause it to cohere.

**Coating compositions.** GEORGE KING and RICHARD THRELFALL. Fr. 649,782, Feb. 14, 1928. See Brit. 290,717 (C. A. 23, 942).

**Removing grease from metal objects.** ALEXANDER WACKER, GES. FÜR ELEKTROCHEM. IND. G. M. B. H. Ger. 474,825, Dec. 19, 1926. Grease is removed from metal objects before subjecting them to further manufg. processes, in a device comprising two superposed chambers, the lower one contg. a non-inflammable solvent of low b. p., such as  $C_2HCl_3$  or  $CCl_4$ . The lower chamber is kept at the b. p. of the solvent and the upper one is kept cooled.

**"Antifreezing" composition for cooling systems of engines, etc.** ARTHUR H. OSTERLUND. U. S. 1,711,324, April 30. Glycerol is used with Na glycerophosphate, which serves to form a mixt. permanently miscible with water.

**Chiolite.** I. G. FARBENIND. A.-G. (Fritz Sander and Erich Kayser, inventors). Ger. 473,511, May 25, 1924. Addn. to Ger. 473,408. Chiolite is prepd. by heating cryolite, obtained as in the way described in the prior patent, with aq. mineral acid solns. with or without addn. of Al salt soln.

**Utilizing fish fins.** WALTER THORMÄHLEN. Ger. 474,065, Mar. 20, 1927. The fins are rendered suitable for hat trimming and other decorative purposes by cutting them to suitable shapes, washing in lukewarm soda soln., steeping for some hrs. in a soln. of 1 kg. alum and 0.5 kg. NaCl in 30 l. water, drying, steeping for 30 mins. in a soln. of an aniline dye and drying again. They may then be tipped with Au or Ag or otherwise decorated, e. g., by electroplating.

**Carbon tetrachloride.** FÉLIX NEUVILLE and LUCIEN MAUGÉ. Fr. 649,934, Aug. 4, 1927. Decompn. of  $CCl_4$  in fire extinguishers is retarded by adding dehydrating substances such as  $ZnCl_2$  or  $CaCl_2$ , which may be coated with paraffin or stearin.

**Foam for fire-extinguishing.** R. SCHNABEL and EXCELSIOR FEUERLÖSCHGERÄTE A.-G. Brit. 299,097, July 22, 1927. A foam-generating liquid such as a saponin soln. is supersatd. under pressure with a gas such as  $CO_2$  in a closed container and the container is sealed until the material is desired for use.

**High-pressure gas cartridge suitable for fire-extinguishing purposes.** G. SCHWORETZKY and EXCELSIOR FEUERLÖSCHGERÄTE A.-G. Brit. 299,096, July 22, 1927. Structural features.

## 19—GLASS, CLAY PRODUCTS, REFRACTORIES AND ENAMELED METALS

G. E. BARTON, C. H. KERR

Some interesting physicochemical phenomena exhibited by minor constituents in glass. W. E. S. TURNER. *J. Soc. Chem. Ind.* 48, 65-7T (1929).—If the glass batch is wet before being melted the glass is stiffer and sets more quickly. It is likely that the moisture retained to a late stage of the melting process or even permanently does not exceed 0.05% of the glass. Arsenic is either wholly or mainly retained in both Na Ca silicate and K Pb silicate glasses. When 250 parts  $As_2O_3$  per 1000 sand was used, the amount retained at  $1350^{\circ}$  was 78% and at  $1400^{\circ}$  was 53% of the total added, although the amounts varied somewhat as the result of difference of charging conditions. Instead of a tendency to reduction at  $1350$ – $1400^{\circ}$  the  $As_2O_3$  tends to form  $As_2O_5$  and from 40 to 70% of the total may be present as  $As_2O_5$ . This change occurs in the absence of oxidizing agents. The stability of  $As_2O_3$  soln. in glass at high temps. is remarkable. The transmission of short wave lengths of light by a glass is closely connected with the iron oxide content and with the relative proportions of  $FeO$  and  $Fe_2O_3$ . For satisfactory transmission the  $Fe_2O_3$  should not exceed 0.03%. For any iron oxide content the transmission of the  $FeO$  glass is wider. A diagram gives a comparison of the effects of  $Fe_2O_3$  and  $FeO$  on the limit of transmission in the ultra-violet of a glass of approx. compn.  $SiO_2$  75,  $CaO$  10,  $Na_2O$  15 melted in platinum. Glasses contg. 92–94% of iron as  $FeO$  undergo no change in transmission with irradiation. By heating at about  $600$ – $700^{\circ}$  in a gas flame, irradiated glass with impaired transmission can be rejuvenated.

D. E. SHARP

The value of different types of glass for transmitting ultra-violet light. EDWIN T. WYMAN, ARTHUR D. HOLMES, LAWRENCE W. SMITH, DONALD C. STOCKBARGER AND MADELINE G. PIGOTT. *Am. J. Diseases Children* 37, 473-82(1929).—Corning glass is practically transparent to the ultra-violet radiations which are effective in the treatment of rickets. Vitaglass is comparatively less transparent, and ordinary window glass, opaque. E. R. MAIN

Influence of boric oxide on the dispersion of optical glasses in the near infra-red. T. DREISCH AND P. LUED. *Z. Physik* 49, 380-5(1928).—The  $n$  to 6 significant figures has been detd. for a no. of optical glasses, with and without a  $B_2O_3$  content, in the range  $0.5-2.5 \mu$ ; the difference between the index for  $1.47$  and  $2.39 \mu$  is approx. proportional to the boric acid content. B. C. A.

Absorption of ultra-violet glasses. C. WINTHER. *Z. wiss. Phot.* 25, 230-2(1928).—Curves given show the ultra-violet transmission for a no. of specimens of ultra-violet glass and of ordinary plate glass. Variation of thickness of the glass specimens was adjusted by altering the exposure time according to the method of Henri. B. C. A.

Signal green and the absorption of copper oxide in glasses of various compositions. E. ZSCHIMMER. *Sprechsaal* 62, 169(1929).—The permeability factors for signal green specified previously (cf. C. A. 21, 2768) should have the following values. Blue, wave length  $444 \mu\mu$ , lower limit 0.29; green, wave length  $528 \mu\mu$ , lower limit 0.30; red, wave length  $656 \mu\mu$ , upper limit 0.025. C. H. LORIG

Composition and hydrolytic stability of household pressed glass. C. A. BECKER AND CH. KRAFT. *Sprechsaal* 62, 261-2(1929).—Chem. analyses were made of 11 household pressed glasses and their hydrolytic properties were detd. by the standard grit method and by a rapid method. The comps. of these glasses fall within the range of 74.5-76.0%  $SiO_2$ , 4.5-8.5%  $CaO$  and 14.0-20.0% alkalies. A favorable compn. for this glass should contain at least 5%  $CaO$  and as a max. 19% alkalies. The soly. of the glass as detd. by the standard grit method amounts to 0.03-0.08 g.; in the rapid method 1.8-7.2 cc. 0.01  $N$   $HCl$  was required for 50 cc. of soln. C. H. LORIG

The compressive and transverse strength of brick. J. W. MCBURNEY. *Bur. Standards J. Research* 2, 821-35(1929).—See C. A. 23, 2543. E. H.

The petrography of some magnesite bricks. C. W. CARSTENS AND KR. KRISTOFERSEN. *Norsk Geol. Tids.* 10, 1-13(1928).—The article records results of chem. analysis of magnesite bricks from 3 different localities, one being Austria. Compression tests at different temps. up to  $1730^\circ$  are discussed. Expts. on some of the minerals used in making magnesite bricks gave the following results: On heating to its m. p. ( $1500^\circ$ ) serpentine ( $H_4Mg_3Si_2O_{10}$ ) gives  $Mg_2SiO_4 + MgSiO_3 + H_2O$ . Talc ( $H_2Mg_3Si_4O_{12}$ ) heated to  $1500-1550^\circ$  gives  $3MgSiO_3 + SiO_2 + H_2O$ . Enstatite ( $MgSiO_3$ ) heated with  $MgO$  gives  $Mg_2SiO_4$ . O. A. NELSON

The mathematical basis of burning brick. II. W. SCHUEN. *Tonind.-Ztg.* 53, 532-4(1929); cf. C. A. 23, 2260.—The formula for the rate of heat flow into the ware is:  $Q = \lambda F(T_1 - T_2)/\delta$ .  $Q$  is the quantity of heat in kg.-cal. transferred in 1 hr. from the surface to the middle of the body.  $\lambda$  is a const. depending on the property of the substance; for clay burned at  $900^\circ$  it is 1.115.  $F$  is the surface in sq. m.  $T_1 - T_2$  is the temp. difference between the surface and the center of the body.  $\delta$  is the distance the heat must travel. Curves show the speed of ignition of acetylene, ethylene, methane, H and CO at various dilns. A table shows the cal. per l. of mixts. of the same gases with O at  $0^\circ$ ,  $1400^\circ$  and  $1800^\circ$ . R. F. FERGUSON

Economies in crucible manufacture. E. PROBST. *Sprechsaal* 62, 243-4(1929). C. H. LORIG

Standardization of wall tile and stoneware tile. ANON. *Tonind.-Ztg.* 53, 503-5(1929).—Glazed wall tile are tested for water absorption and resistance to acids as follows: After drying at  $100^\circ$ , to const. wt., the pieces are placed in water to  $1/4$  their depth for 1 hr. and to  $1/2$  their depth for another hr. At the end of the 2nd hr., they are immersed to  $3/4$  their depth for 22 hrs. and then fully covered for 24 hrs. The wt. of absorbed water is expressed in % of the dry wt. Resistance to acids is detd. by exposing the glazed surface for 24 hrs. to concd.  $HCl$  at room temp. Mosaic tile are tested for bulk sp. gr., water absorption, frost resistance, resistance to abrasion and resistance to acids. Bulk sp. gr. is detd. by weighing suspended in water, or by measuring. Water absorption is obtained as described. Resistance to freezing is detd. by cooling the satd. piece to  $15^\circ$  for 2 hrs. Resistance to abrasion is detd. by exposing the samples to a sand blast operating at a pressure of 3 kg./sq. cm. Resistance to acids is detd. by soaking for 7 and 14 days in 10%  $HCl$  and 10%  $NaOH$ . R. F. FERGUSON

Kaolins of Ukraina. V. I. LUCHITZKII. *Trans. Inst. Econ. Mineral. Met.* (Moscow) 1928, No. 41, 3-244.—Ukrainia possesses 43,151,000 tons residual kaolin deposits

and 5,897,300 tons sedimentary kaolin deposits; only 25,312,000 tons of the former and 2,143,700 tons of the latter have an industrial value. The m. p. of the purified Ukrainian sedimentary kaolin is close to normal, namely, 1830°. The quantity of feldspar admixed is not excessive; quartz is present in quantities less than 1-2%; mica is rare; the % of SiO<sub>2</sub> and Al<sub>2</sub>O<sub>3</sub> is close to normal; Fe oxides are, in the majority of cases, not above 1%; CaO is mostly less than 0.5%; MgO usually fluctuates between a trace and 0.3%; TiO<sub>2</sub> usually fluctuates between 0.36 and 1.5%; Mn oxides and org. substances occur only in exceptional cases and in very small quantity. This compn. compares favorably with that of the best foreign kaolins. The process of kaolinization of the Ukrainian cryst. formation took place in 2 stages: (1) In Pre-Cambrian times the kaolinization was started by the pneumatolytic process not very far under the surface of the earth; (2) in the Pre-Devonian period the kaolinization was completed by the process of erosion.

BERNARD NELSON

**The formation of magnesium ferrite in sintered magnesite.** W. WEYL. *Tonind.-Ztg.* 53, 559-62(1929).—A compd. of the formula MgO.Fe<sub>2</sub>O<sub>3</sub> was prepd. by sintering equal mol. quantities of MgO and Fe<sub>2</sub>O<sub>3</sub> to 1200° and then heating with 3 times its wt of KCl in a Pt crucible at 1200° for 40 hrs. By this method, crystals were obtained of sufficient size to be positively identified as spinel. By comparing the x-ray spectrum of this compd. with that of calcined magnesite, the conclusion was reached that, at least in the case of low-silica magnesites, the iron after calcining is in the form of magnesium ferrite, a compd. of the spinel type.

R. F. FERGUSON

**Coated abrasive products, 1928.** Simplified Practice Recommendation R89-28, Elimination of Waste Series. U. S. Bur. of Standards. 20 pp.

E. J. C.

**The corrosion of refractory material.** W. NEIMANN. *Tonind.-Ztg.* 53, 484 (1929).—The usual method is to place slag in a hollow test piece or a brick into which a hole has been drilled. The m. p. of the slag used should be detd. and a temp. used in the test sufficiently higher to insure fluidity. Slag with too high a m. p. is not advisable, as the brick might vitrify in the test. Usually a slag melting at 1350° is employed. In refractories for special purposes, such as crucibles and glass-house material, it is best to use temp. and fluxing agents similar to those encountered in service.

ROBERT F. FERGUSON

**The enameling of cast iron.** A. MÜLLER. *Giesserei-Ztg.* 26, 158-60(1929).—Cast iron that is to be enameled should analyze: Si 2.3-2.6, Mn 0.6-0.9, P 0.6-0.9, S 0.08-0.1, C 3.6-3.7%. Of these, C has the greatest influence on enameling. The influence of C, P, Si, S and Mn is discussed briefly.

J. W. W. SULLIVAN

**Refractories in the gas industry (SMITH, SPIERS) 21.** The clays of East Prussia and their properties (KRAUSE) 8. The chemistry and biology of the clay pits (SEBENTZOV, ADOVA) 8. Annealing and hardening furnace (Swiss pat. 130,010) 1.

ANSELL, H. AND SEARLE, A. B.: **The Making and Burning of Glazed Ware.** London: H. Greville Montgomery. 268 pp. 12s. 6d.

**Glass.** GLASSFABRIK A.-G. (Gerhard Stein, inventor). Ger. 473,458, June 26, 1925. Molds or molding tools for use with glass in a thermoplastic state are prepd. from a relatively soft material, e. g., soft Fe, and are then coated on the working surface with Cr. Molds with sharply defined patterns can be so obtained.

**Electric glass-melting furnace.** AKTIESELSKAPET RÆDERS ELEKTROGLASOVEN. Ger. 472,780, Sept. 19, 1925. Details of construction.

**Furnace tanks for molten glass and associated apparatus.** LEONARD D. SOUBIER (to Owens Bottle Co.). U. S. 1,710,789-90, April 30. Structural features.

**Furnace with cooling canals for table glass.** PILKINGTON BROS., LTD. Ger. 472,781, Nov. 13, 1924. Details of arrangement.

**Apparatus for forming glass tubes and rods.** R. SALOMON. Brit. 298,561, Oct. 11, 1927.

**Device for rolling glass sheets into cylinders.** NAAMLÖÖZE VENNOOTSCHAP MIJ. TOT BEHEER EN EXPLOIT VAN OCTROOIEN. Ger. 474,754, Mar. 16, 1927.

**Device for conveying glass plates to the annealing furnace.** NAAMLÖÖZE VENNOOTSCHAP MIJ. TOT BEHEER EN EXPLOIT VAN OCTROOIEN. Ger. 474,755, May 31, 1927.

**Plate glass.** COMPAGNIES RÉUNIES DES GLACES ET VERRES SPECIAUX DU NORD DE LA FRANCE. Brit. 299,034, Oct. 21, 1927. The entire contents of glass in a melting pot are poured into the receiver of a rolling app. and heated in the receiver, and the

glass strip formed in the rolling app. is thence passed to an annealing lecr provided with conveying rollers.

Glass transparent to ultra-violet rays. H. P. HOOD (to Corning Glass Works). Brit. 298,908, Oct. 15, 1927. Details are given for the production of glasses such as described in Brit. 263,410 (C. A. 22, 148), batch materials which are free from Fe and Ti being used. Details of purifying the batch materials are specified. Glasses which transmit ultra-violet rays lose their transmitting power gradually on continued exposure to ultra-violet rays or sunlight but by heating (suitably to about the annealing temp.) their transmitting power may be restored.

Composite sheets of glass and cellulose nitrate or cellulose acetate. J. J. ROWE. Brit. 298,888, June 22, 1927. A clear cellulose deriv. varnish which may contain cellulose nitrate or acetate is applied to the glass and allowed to dry and the glass is then united by heat and pressure to a sheet of celluloid or like material.

Porcelain and glass. DEUTSCHE GOLD- UND SILBER-SCHNEIDANSTALT VORM. ROESSLER. Fr. 649,666, Feb. 24, 1928. Combinations of porcelain and glass are made by fusing together glass, the coeff. of expansion of which does not pass about  $5.10^{-4}$  and the softening point of which is the same as that of the porcelain glazing, and a porcelain, the coeff. of expansion of which is as high as possible. Silicate or borate glasses such as those called "Pyrox" and "Supremax" are particularly suitable.

Inspection glass for ceramic and like kilns. JEAN HEINSTEIN. Ger. 474,414, Oct. 16, 1927.

Continuous tunnel kiln for burning ceramic wares. TAINÉ G. McDOUGAL (to A. C. Spark Plug Co.). U. S. 1,710,995, April 30. Structural features.

Ceramic furnaces. EDWARD G. SPENCER-CHURCHILL. Fr. 649,971, Feb. 27, 1928. Ceramic furnaces are arranged in a group around a common chimney and have means for passing the hot gases from one furnace to the next so that they may be used in a cycle.

Ceramics. HARRY ZIMMER. Ger. 472,743, April 24, 1927. Porcelain objects are made by pouring layers of varying granular texture into the mold.

Ceramics. "SFINX" SPOJENÉ SMALTOVNÝ A TOVÁRNÝ NA KOVOVÉ ZBOŽÍ, AKCIOVÁ SPOLEČNOST. Ger. 472,583, Oct. 2, 1926. Decorative effects are produced on ceramic and metal-coated ware by applying glazing material contg. water or salt soln. in the form of drops, in the rough glazing process, and then firing in the usual way.

Molds for pottery. WILLIAM J. MILLER. Fr. 648,899, Dec. 30, 1927.

Abrasives. SOC. ANON. DES MANUF. DES GLACES ET PRODUITS CHIM. DE ST.-GOBAIN, CHAUNY ET CIRÉY. Fr. 648,402, June 23, 1927. See Brit. 292,611 (C. A. 23, 1486).

Artificial sharpening stones. C. BORODAY. Belg. 354,120, Oct. 31, 1928. Two plastic masses are prepd. consisting, resp., of (1) abrasive powder, talc, S, glycerol, dye,  $MgCl_2$  and calcined  $MgO$ ; and (2) corundum, S, glycerol, dye,  $MgCl_2$  and calcined  $MgO$ . A layer of one of the compns. is placed in a mold, and a layer of the 2nd placed over the 1st so as to obtain a 2-face stone.

Refractory materials. SOC. ANON. DES MANUF. DES GLACES ET PRODUITS CHIM. DE ST.-GOBAIN, CHAUNY ET CIRÉY. Fr. 649,736, July 19, 1927. See Brit. 294,179 (C. A. 23, 2007).

Refractory masses. G. POLYSIUS EISENGIESSEREI. Ger. 470,422, Oct. 9, 1925. Addn. to 464,312. Ger. 464,312 describes the manuf. of refractory masses, intended particularly as furnace linings, by calcining a mixt. of a fusible cement with suitable addns. such as corundum. Such products are now improved by providing a dense surface on the fire side and a porous surface on the side away from the fire. This is done by using coarse granules of corundum for the side away from the fire and finer granules for the fire side. Cf. C. A. 22, 2449.

Porous refractory bricks. IVAR SETTERBERG. Ger. 474,021, July 1, 1927. See Brit. 281,254 (C. A. 22, 3505).

Refractory bodies. HERMANN SALMANG and FLORENZ GOETH. Ger. 474,415, May 28, 1927. Refractory bodies of improved properties are prepd. by heating the initial materials to softening temp. under strong pressure, *e. g.*, a refractory clay is heated in a C mold to  $1450^\circ$  under a pressure of 4 kg. per sq. cm.

Casting refractory materials. G. S. FULCHER (to Corning Glass Works). Brit. 298,983, Oct. 18, 1927. See U. S. 1,700,288 (C. A. 23, 1487).



## 20—CEMENT AND OTHER BUILDING MATERIALS

J. C. WITT

**Electric investigation of the setting and hardening of rapid-hardening cements.** YOSOMATSU SHIMIZU. *Science Repts. Tôhoku Imp. Univ.* 1st. ser. 17, No. 7, 1218-25 (1928).—See C. A. 23, 1237. E. C. M.

**The production of slag cements.** CLERET DE LANGAVANT. *Ciment* 34, 150-7 (1929).—General. F. O. A.

**Action of sulfur in slag cements.** JEAN CLERET DE LANGAVANT. *Rev. matériaux construction trav. publics* 1929, 41-4.—The action of S in the slag on the Fe compds. in the cement to form FeS, which is later oxidized to FeSO<sub>4</sub>, is probably without serious harmful effect. F. O. A.

**The manufacture of supercement.** N. C. KYRIACOU. *Rev. matériaux construction trav. publics* 1928, 417-20, 451-6; 1929, 16-20; cf. C. A. 22, 3276; 23, 496.—Machinery is described. A cement made in Chalkis, Greece, has the compn.: SiO<sub>2</sub> 20, Al<sub>2</sub>O<sub>3</sub> 3, Fe<sub>2</sub>O<sub>3</sub> 8, CaO 65%; it gives very high early strengths. F. O. ANDEREGG

**Resistance to deterioration.** MAURICE NOYER. *Rev. matériaux construction trav. publics* 1928, 461-4; 1929, 21-3.—A description of the action of phys., chem. and atm. agents upon the materials used in masonry and in reinforced concrete and their control by means of tests in the lab. and on the job. F. O. A.

**Waterproofing concrete extracts of marine algae.** G. BELAY. *Ciment* 34, 177-82 (1929).—It is claimed that concrete is made more impermeable and durable if a suitable amt. of ext. of marine algae is added to the gaging water. The hydration and workability are said to be improved. F. O. A.

**The determination of the specific gravity of trass.** A. STROPOR. *Inst. Ind. Chem. Bucharest. Tonind.-Zig.* 53, 618-20 (1929).—The sp. gr. of trass depends upon whether it has been heated and upon the liquid used. The sp. gr. of dried trass increases as kerosene is added to C<sub>2</sub>H<sub>5</sub>, while with raw trass the change is in the other direction. Standard specifications are needed. F. O. A.

**Commercial manufacture of Carborundum, Elektrokorund and Elektroschmelzement.** SCHNEIDLER. *Metallbörse* 18, 708 (1928).—Elektrokorund is cryst. Al<sub>2</sub>O<sub>3</sub>; Elektroschmelzement consists mainly of CaO and Al, instead of silicates like portland cement. E. M. SYMMES

**A new apparatus for burning gypsum.** L. MARTIN. *Tonind.-Zig.* 53, 655-6 (1929).—In the app. developed by Hermann Völker of Munich, the raw gypsum comes in contact with a coil filled with oil heated to the proper temp. F. O. A.

**History of plaster of Paris.** TATE. *Ciment* 34, 158-62 (1929). F. O. A.

**The production of dry hydraulic, hydrated lime.** WALTER MARSCHNER. *Tonind.-Zig.* 53, 669-70 (1929). F. O. A.

**Testing method for roofing felt.** P. W. CODWINE. *Paper Mill* 52, No. 8, 46, 48, 154, 156; *Paper Trade J.* 88, No. 9, 43-5 (1929).—A survey and discussion of the methods for the following detns., as applied to roofing felts: wt., thickness, strength test, tensile breaking strength, bursting strength, tearing strength, ash, fiber compn., satg. characteristics, kerosene test, oil penetration test and xylene test. A. P.-C.

**The Kyan method of impregnating coniferous wood.** WILLY KINBERG. *Tek. Tid., Uppl. C, Kemi* 58, 94-6 (1928).—K. has patented an improvement of the Kyan method. The new feature is a preliminary treatment of the wood with vapors of chem. solvents. While still hot, the wood is treated with the soln. of HgCl<sub>2</sub> at a temp. of 80°. The soln. of HgCl<sub>2</sub> penetrates the wood to a depth of 30-40 mm.; by the original Kyan method the depth of penetration does not usually exceed 5 mm. C. A. R.

**The fiber saturation point of wood as obtained from electric conductivity measurements.** ALFRED J. STAMM. *Ind. Eng. Chem., Anal. Ed.* 1, 94-7 (1929).—The elec. resistance of wood changes very rapidly with changes of its moisture content up to a certain value (cf. C. A. 22, 858); a linear relationship exists in this space between the log of the elec. cond. and the moisture content. This linear relationship is the same in all species studied (8 softwoods and 1 hardwood). In the region above the limiting value where the elec. cond. increases in a parabolic way with the increase of the moisture content, the values for different species are different. The point of tangency of the parabolic curve with the straight line may be considered as the fiber satn. point, that is, the limit of the water absorption by the fiber walls. This point differs slightly among the species studied, varying from 28.5 to 31.5% of H<sub>2</sub>O, in good agreement with results obtained by measurements of other phys. properties of the wood.

Resoaking does not influence the fiber satn. point, whereas extn. raises it in redwood.

**Laboratory methods of testing the toxicity of wood preservatives.** HENRY SCHMITZ. *Ind. Eng. Chem., Anal. Ed.* 1, 76-9(1929).—Methods of testing the toxicity of wood preservatives are reviewed. Both the impregnated-wood methods and the nutrient-agar methods show specific disadvantages. To prevent losses of preservatives due to the volatilization during the sterilization process, it is proposed to seal the preservative in a weighed glass bulb and to place it in the Erlenmeyer flask before the latter is sterilized. By breaking it afterward with a glass rod the desired preservative-agar mixt. can be prepd. J. WIERTELAK

**The structure of soft woods as revealed by dynamic physical methods.** ALFRED J. STAMM. *Colloid Symposium Monograph* 6, 83-108(1928).—Studies of electroendosmotic flow were used to det. the total effective capillary cross section of several soft woods. App. is described and the formulas used are given. From the rate-change of flow with changing thickness of transverse section, the max., min., and av. tracheid lengths were detd., as well as the effective continuous pit-communication cross section. By combining the data on electroendosmotic flow with those obtained from studies of hydrostatic flow, detns. were made of av. effective diam. for pit-membrane pores and lumens. The latter agree well with microscopic measurement, while the former are of the same order of magnitude as the pores in other natural and artificial membranes. Max. tracheid values from both methods agree well. The repellent effect of surface tension to permeability was overcome by pressure, from which the same two diams. were detd. Lumen values check with the microscope, but pit-membrane values for pore diams. were 4-8 times greater than those from other methods. Max. tracheid length values calcd. from surface tension data agree with those from other methods. Western red and Alaska cedars, Sitka spruce, Western yellow pine and Douglas fir (Rocky Mt. type) were all partially permeable to colloidal mercury and to India ink sols, but also acted as partial ultrafilters. JEROME ALEXANDER

**CHILDE, H. L.: Manufacture and Uses of Concrete Products and Cast Stone.** London: Concrete Publications, Ltd. 5s. net. Reviewed in *Engineering* 125, 361, *Rock Products* 31, 87(1928).

**Ornamental coatings on wood (U. S. pat. 1,711,330) 26.** Kiln for drying lumber (U. S. pat. 1,711,100) 1. Treating petroleum residues (with production of paving) (Austrian pat. 112,441) 22. Shaft kiln with annular combustion chamber for lime, cement, etc. (Ger. pat. 474,067) 18. Outlet lock for shaft kilns for lime, cement, etc. (Ger. pat. 474,022) 18.

**Portland cement.** I. G. FARBENIND. A.-G. Brit. 298,943, Oct. 17, 1927. Ca sulfide 5% or less is added during grinding of the cement, to improve its hydraulic properties.

**Fused cements.** SOC. D'ÉTUDES CHIMIQUES L'INDUSTRIE. Brit. 298,637, Oct. 13, 1927. Reducing impurities in fused cements prepd. from bauxite or from slags produced in the manuf. of P or  $H_3PO_4$  from mineral phosphates are removed by treating the melted mass with oxidizing agents, such as O,  $CO_2$ ,  $MnO_2$ , or Fe oxide.

**Forming hollow articles such as columns or pipe from cement compositions.** JOHN A. CARR. U. S. 1,710,919, April 30. A plastic compn. such as a cement mixt. is deposited in a vertical mold and the mold and contents are subjected to a repeated, partial and reciprocated rotation, which serves to produce a dense uniform product. An app. is described.

**Lightweight concrete.** ROY CROSS and WM. A. COLLINGS (to Silica Products Co.). U. S. 1,710,921, April 30. A product, which in the air-dried condition weighs 85-130 lbs. per cu. ft., is formed from a bath comprising hydraulic material such as portland cement together with cinder screenings and kieselguhr or other suitable mineral filler and a gelatinizing clay such as bentonite adapted to expand when brought into contact with moisture and to hold the aggregate in suspension in the aq. vehicle.

**Road treatment with sulfite cellulose lyes.** SOC. ANON. DES USINES DIOR. Fr. 650,107, Aug. 9, 1927. These lyes, concd. or not, or mixed with bitumen, tar, pitch, etc., are used for waterproofing roads.

**Bituminous composition for roads, etc.** F. MORTON. Brit. 298,812, Dec. 20, 1927. Pitch (suitably having a "twisting point" between 40° and 65°) is mixed with a pure bitumen (suitably 5-25% the quantity of the pitch) and with mineral aggregate

(forming 80–90% of the final mixt.) such as broken granite or slag and stone dust or sand. Cf. C. A. 23, 2568.

**Bitumen emulsions.** VICTOR WINTSCH, JR. Fr. 648,917, Feb. 4, 1928. Latex is used in making emulsions of bitumen or asphalt for roads, etc.

**Paving materials.** CYRIL E. RAMSDEN. Ger. 473,250, Aug. 13, 1925. A paving and surfacing material suitable for tennis courts comprises granular silicious material, e. g., flint, colored green by treatment with Cr compds. followed by firing. Binding mediums, e. g., rubber, latex, fatty oils and oxidized fatty oils, may be used in laying the material.

**Rubber-faced paving blocks.** M. HOLMES. Brit. 298,457, June 18, 1928. Structural features are described of blocks, which may be formed of metal coated with asphalt or the like to which the rubber facing is in turn attached.

**Building stone.** ARTHUR TETZNER. Ger. 473,822, June 25, 1927. Building stone is made from loam, sand and cement, the loam and sand being intimately mixed as a gravelly mass by milling and pulverizing.

**Artificial stone.** ROBERT SCHERER. Austrian 112,627, Nov. 15, 1928. Layers of paper or the like coated with a Sorel cement, e. g., a mixt. of MgO with MgCl<sub>2</sub>, are superposed, pressed and dried.

**Artificial marble.** LOUIS TOCCO. Fr. 649,931, Aug. 3, 1927. Objects are molded in Ca(OH)<sub>2</sub> alone or mixed with sand, etc., and coloring or other substances and heated in an oven contg. CO<sub>2</sub> under pressure to about 200°.

**Cinder block for building construction.** EMIL LUZZATTI and HARRY M. SCHLOSS. U. S. 1,711,027, April 30. A "ground material" comprising cinders of about 0.06–0.25 in. in size 75% and finely ground shell or lime 25% is used with about 1/3 its quantity of cement and with sufficient water to form a properly bonding mixt.

**Building sheets.** SIDNEY J. HIPPER. Australia 16,936, Nov. 21, 1928. Building sheets or slabs, which may be sawed and nailed like timber, are composed of plaster of Paris, coke breeze, cement, flax or fiber and water.

**Porous plaster composition.** C. GAMARRA. Brit. 298,607, Oct. 12, 1927. Calcined gypsum contg. carbonate is mixed with reagents which react with each other or with the carbonate assocd. with the gypsum to liberate CO<sub>2</sub> and to form insol. compds. such as CaCl<sub>2</sub> and tartaric acid.

**Roofing felt, paper or floor covering material.** C. A. E. LEECH and D. LEECH. Brit. 298,862, March 29, 1928. Fibrous reinforcing material such as cotton, hessian, or string is embedded in the material while in the soft pulpy state.

**Floor covering compositions.** D. L. IRWIN and R. E. TIPPINS. Brit. 299,178, Oct. 13, 1927. A felted fibrous material is coated with a compn. contg. a solid filler such as red slate flour and Fe oxide together with pitch, rosin and a dispersion of casein, which may comprise borax and ammonia; over this a top coating of a linoleum compn. may be applied.

**Composite tiles of wood and rubber.** H. P. STEVENS. Brit. 298,522, July 8, 1927. A layer of plywood is united by vulcanization with a powerful accelerator at a low temp. with a rubber compn. such as may be formed from rubber 75, tire reclaim 50, S 4, ZnO 20, clay 50, "mineral rubber" 10 and Zn diethyldithiocarbamate 0.5 part.

**Impregnation of woods.** E. DAL. Belg. 354,606, Oct. 31, 1928. The preserving agent is creosote to which is added one or more powerful toxic compds., particularly Pb resinates. A typical formula is: Pb(OAc)<sub>2</sub> 2.5, resin oil 2, bitumen 5, anthracene 5, tar 5, heavy benzene 20, heavy creosote oil 40.5, cresylic acid 20.

**Treating wood.** UNTERNEHMUNG FÜR HOLZIMPRÄGNIRUNG G. LOEWENFELD. Austrian 112,636, Nov. 15, 1928. The impregnation of wood is facilitated by first subjecting it while damp to a temp. sufficiently low to freeze the contained water, and thereafter drying it at an elevated temp.

## 21—FUELS, GAS, TAR AND COKE

A. C. FIELDNER

**Gasification of fuel with pure oxygen.** J. GWOSDZ. *Feuerungstech.* 16, 241–6 (1928).—A critical review of various proposals, calcns. and pieces of exptl. work.

ERNEST W. THIELE

**The treatment of coal.** C. H. LANDER. *Gas J.* 185, 344–5, 412–3, 608–9 (1929).—A series of lectures covering microscopic examn. of coal, the use of powdered fuel, the decompn. point of coal, high-temp. and low-temp. carbonization, the development of the

continuous vertical retort, heating of retorts, clean raw material and hydrogenation.

**F. S. G.**  
**Manufacture of anthracene in U. S. S. R.** P. I. SOKOLOV. *J. Chem. Ind. (Moscow)* 6, 22-4 (1929).—The coal region of Donetz has colossal potential anthracene resources. The Kuznetsk coal region in Siberia possesses potential anthracene resources which are not inferior to the Donetz region. Anthracene manufactured in the Kuznetsk region analyzes: anthracene 43-8%, carbazole 34-6%, moisture 5-11%, ash 0.3-0.5%, phenanthrene 12-14%; it contains no methylanthracene and gives anthraquinone and alizarin of good quality. Donetz anthracene differs from it by contg. more phenanthrene and less carbazole; it is not suitable for the manuf. of anthraquinone by oxidation with chromic mixt.

**BERNARD NELSON**  
 Remarks on the present status of the manufacture of coal products. *F. MÜLLER. Erdöl u. Teer* 5, 102-4, 118-9, 136-7 (1929).—A review. **F. S. GRANGER**

**Correlation between the adsorption capacity of coals and peats and their other characteristics.** B. P. PENTEGOV. Vladivostok Univ. *Publ. Far Eastern State Univ. Vladivostok* [7], No. 12, 3-28 (1929).—The extent of maturity of coal, *i. e.*, the degree of fossilization, or metamorphosis, is characterized by its colloidal state; the more it is advanced, the greater the decrease of unsatd. non-oriented C atoms, as well as the decrease of the colloidal phase, whereas the oriented C atoms, and consequently the cryst. phase, is enhanced. As adsorption is a property of colloids, the younger the coals the more hygroscopic moisture they contain. On this principle is based a *method of coal classification* according to the extent of their adsorptive capacity. The other existing methods of coal classification only permit crudely to distinguish typical coals from typical brown coals; they are not reliable and give indefinite results with coals of intermediate groups. Hence Stadnikov and Proskurnina (*C. A.* 20, 3342) proposed to distinguish coals according to the nos. of mg. of  $\text{Fe}_2\text{O}_3$  they can adsorb from 75 cc. of 0.1% aq.  $\text{FeCl}_3$  solns. P. altered this method by taking equal weights (1 g.) of coals, brown coals, peats, etc., at a definite state of pulverization (70-mesh sieve) and detg. their adsorptive capacity by contact with 50 cc. of 0.1% solns. of  $\text{FeCl}_3$ , methylene blue, and oxalic acid. In various Siberian coals the adsorption nos. change inversely with the degree of maturity of the coals taken. The influence of the extent of air exposure to which the coals were subjected must be taken in consideration, since weathering off considerably decreases the adsorption capacity. The oxalic acid adsorption no. is less affected than that of the 2 other reagents by the action of air on coal. The adsorptive nos. of the cokes are just as characteristic as those of the respective coals from which they were obtained. The ratio of the adsorptive no.  $A_1$  of the coal to that,  $A_2$ , of its coke, is usually less than 1 for coal, almost equal to 1 for anthracite, less than 1 for peat, and more than 1 (sometimes more than 2) for brown coals. Weathering off lowers the value  $A_1/A_2$ , as the effect of exposure is to lower the adsorption power of a coal much more than that of its coke. From the effect of the exposure on the ratio  $A_1/A_2$  it is easy to see that the latter is also connected with the occurrence of coals. In fact,  $A_1/A_2$  increases with the depth of the coal stratum. The gas content of coals is also a function of their adsorptive capacity. *Spontaneous combustion* of coals, which is sometimes blamed on their pyrite contents, in reality results from their great adsorption capacity: after adsorbing sulfates from aq. solns., and after reducing the sulfates into sulfides, they are naturally apt to become self-inflammable. As the *coking process* consists in the decompn. of coal with formation of the solid, liquid, and gaseous phases, and as this decompn. is followed by the adsorption and decompn. of the liquid and the gaseous phases by the solid phase, it is evident that the greater or less adsorptive capacity of the solid phase affects the character of the coke obtained. The *hydrogenation of various coals* by F. Fischer's method by means of  $\text{HCO}_2\text{Na}$  in presence of  $\text{H}_2\text{O}$  at  $400^\circ$  also depends on the adsorption no. of the coals; the greater the latter, the better the yield of ether-sol. hydrogenation products. **BERNARD NELSON**

The determination of the degree of decomposition of peat. (The determination of cellulose.) VASSILI I. KOMAREVSKII. *Z. angew. Chem.* 42, 336-8 (1929).—Air-dried samples of peat were ground in a hand mill and sieved; the ash and water contents were then detd. Ten-g. samples were extd. in a Soxhlet with  $\text{Et}_2\text{O}$  (27 hrs.),  $\text{EtOH}-\text{C}_6\text{H}_6$  (1:2) (24 hrs.), and with  $\text{Et}_2\text{O}$  (2 hrs.) to remove wax, resin and their bituminous decompn. products. Adhering solvent was removed in a vacuum desiccator. Treatment with 200 cc. of 1% soln.  $\text{NaOH}$  (12 hrs.), in a centrifuge flask, was followed by 20 mins' centrifuging at 2000 r. p. m.; the operation was repeated twice, and then alkali removed by washing with  $\text{H}_2\text{O}$ . Alternate treatment with  $\text{ClO}_2$  (1.5 and 10% soln.) and  $\text{Na}_2\text{SO}_3$  (2% soln.) was made to remove humic substances and lignin, leaving crude cellulose of about 4% ash content. The residue was washed with  $\text{H}_2\text{O}$ ,  $\text{EtOH}$  and  $\text{Et}_2\text{O}$ .

parisons with Cross and Bevan's method indicate that their results are higher for crude cellulose, and that when their cellulose is purified as above their results fall slightly below those found by the present author.

**Carbonization in vertical retorts.** Some working experiences. W. C. EBAUGH Neath Corp. Gas Wks., Wales. *Gas J.* 186, 32-4 (1929).—Advantages of downward heating, uniformity of blending, cleaning of fires, dust removal, life of retorts, scurrying, control of calorific value and fuel consumption, with reference to Woodall-Duckham retorts, are discussed.

**By-product coke plant at Hamilton.** C. I. HALDEMAN. *Blast Furnace & Steel Plant* 17, 688-90 (1929).

The new central coking plant at the Emil Mine, Essen-Altenessen. R. GAU. *Z. Vcr. deut. Ing.* 73, 437-40 (1929).—Old coking plants with 260 furnaces and 520,000 tons (coke) per yr. capacity have been replaced by 3 batteries of 39 furnaces each, having an output of 800,000 tons per yr.; provision is made for a fourth battery of 39 furnaces also. Each chamber has a capacity of 17.8 tons moist coal (12%  $H_2O$ ), is 12 m. long, 3.6 m. high and has a width (center) of 0.475 m. Time of heating is usually 20-21 hrs., but is sometimes reduced to 18-19 hrs. From the 117 furnaces about 1650 tons of coke, 75 tons of tar, 26 tons  $NH_3$  sulfide, and 16 tons  $C_6H_6$  are obtained daily. The dry coal mixt. used yields about 75.5% of dry coke. The construction and operation of the plant are outlined. Through complete mechanization the output per man is about 8 times as great as it was at the older plants, the heat economies are much greater, and the recovery of by-products through the Feld process is much better. W. C. E.

**Recovery of phenol from the wash water of coking plants.** PAUL HOENING. *Z. angew. Chem.* 42, 325-31 (1929).—Compelled to remove  $C_6H_5OH$  from wash water because it created a nuisance in the rivers into which it was drained, coking plants in the Ruhr district will soon be adding 5000-6000 tons of this material per year to the 11,000 tons now brought upon the (German) market. Pyridine will also be recovered in quantity. The wash water contains only 2-3 g./l., and the discharge into the rivers must not run more than 0.6-0.8 g./l. The Pott-Hilgenstock process is used, *vis.*, extn. of the wash waters with an immiscible solvent like  $C_6H_6$  or its homologs, sepn. of the aq. and  $C_6H_5OH$ -contg. layers by gravity, and recovery of the  $C_6H_5OH$  by distn. of this soln. or by treatment with alkali. Diagrammatic plans of the pilot plants used for this purpose, together with descriptions of processes and data of exptl. runs are presented. Treatment with alkali proves to be preferable to distn., both because of the cost of recovery and the quality of the material made. It is calcd. that 100 kg. of  $C_6H_5OH$  recovered by distn. cost 28.07 M., and by the alkali process 17.67 M. In the Ruhr district alone more than 30,000 tons of  $C_6H_5OH$  is available annually.

**Complete gasification.** Humphreys & Glasgow combination plant. ANON. *Gas J.* 185, 727-9 (1929).—The plant layout and working results and the economic advantages of complete gasification are outlined.

**Dehydration of gas efficiently accomplished at low cost.** G. A. BRAGG, Koppers Co. *Chem. Met. Eng.* 35, 731-3 (1928).—Cost ests. are presented for reducing the humidity of coal and water gas by (1) scrubbing with cold  $CaCl_2$  soln., (2) refrigerated water, and (3) compression above distributing pressure. Costs range from 5.8 to 10.4 mills per M.

**The future type of gas supply.** J. BUIJS. *Het Gas* 49, 215-9 (1929).—A discussion of the economical advantages of vertical inclined and horizontal chamber ovens for gas plants. A detailed table is given of the cost of production including by-products, coke, wages, etc., of 1000 cu. m. gas in 6 large gas plants, 2 of each type, in Holland. For coal the price is fl. 10 (guilders) per ton (gas coal) for vertical or inclined ovens; it is fl. 9 per ton for horizontal ovens (coking coal); the coal cost per 1000 cu. m. gas is fl. 20.94-26.96 fl., with a by-product yield of 19.50 to 28.82; the av. net gas price per 1000 cu. m. amounts to fl. 1.24 for vertical ovens (intermittent), fl. 2.51 for inclined ovens and fl. 0.91 for horizontal ovens. The coke price assumed of fl. 13.50 per ton for all 3 types of ovens would be considerably better (fl. 19) for horizontal ovens if special attention is paid to its production. All figures indicate the superiority of the horizontal oven type for plants of daily production more than 50,000 cu. m.; the central gas supply from coke-oven plants at the mines will in many cases be the most economical soln.

B. J. C. VAN DER HORVEN

**Manufacture and condensation of carbureted water gas.** TERENCE H. MADDEN. *Gas J.* 185, 748-9; *Gas World* 90, 290-2(1929).—The Humphreys and Glasgow plant and practice, at the Grangetown Wks. of the Cardiff Co., are discussed generally, with special reference to tar removal, describing particularly the Cascade tar-fog separator described in *C. A.* 22, 2455.

**Making carbureted water gas.** M. BARIL. *Gas World* 90, 251(1929).—It was found experimentally that cracking of gas oil starts at about 500°. The thermal efficiency passes through a max. at about 650°. The vol. of cracked gas increases continuously from 550° to 900°, while its heating value decreases. Benzene increases up to 900°, while toluene and xylene diminish. Naphthalene is at a max. at 750°. On the whole, the most effective temp. range is 650 to 700°. Differences in results in cracking oil alone and in presence of blue gas, as in practice, are attributed to certain light hydrocarbons escaping condensation, in consequence of diln. No reaction between water gas and the products of cracking was observed. Thermal efficiency is improved by bubbling the blue gas through the gas-oil tars.

**Generator for double-gas.** E. LANGTHALER. *Feuerungstech.* 16, 246-8(1928).—L. describes a water-gas generator for coal in which the gases pass around a retort in the generator and carbonize the fuel.

**Hydraulic mains. Theory and practice.** S. L. WRIGHT. Colne, Eng. *Gas J.* 186, 151-2(1929).—A general discussion.

**Observations on American gas engineering practice.** S. G. WATSON. W. C. Holmes & Co., Ltd., London. *Gas J.* 185, 860-2; 186, 29-32, 93-6(1929).—A general survey covering factors influencing methods of gas manuf. cooling and condensation, exhausters, ammonia recovery, removal of H<sub>2</sub>S, water, naphthalene, etc., and metering.

**Low-temperature tars.** MAILHE. *J. usines gaz* 53, 103-10(1929).—Tars of good quality were obtained by distg. specimens of lignite and bituminous coal with a little superheated steam at temps. below 460°. The phenols from lignite, distg. below 240°, on treatment with SnCl<sub>2</sub>, lost most of their S, were decolorized and acquired a pure phenolic odor. This reagent, however, had little effect on the neutral oil. By treatment of the bituminous coal tar with MeOH, EtOH or iso-PrOH, dild. to densities between 0.85 and 0.86, neutral oil was obtained almost free of phenols, but the phenols contained proportions of neutral oil ranging from 2% for MeOH, to 20% for iso-PrOH. The latter, however, extd. the phenols most completely from the neutral oil. The neutral oil was cracked in the liquid state with AlCl<sub>3</sub>, FeCl<sub>3</sub>, ZnCl<sub>2</sub> and SnCl<sub>2</sub> and in the vapor state with Cu or Ni. In the former case, H and, in the latter, olefins and paraffins predominated in the gases obtained, and the percentage of lower-boiling liquids increased considerably. The phenols, b. above 250°, distd. with ZnCl<sub>2</sub>, yielded 35% of liquid products, contg. considerable proportions of hydrocarbons b. 100-350°, cresols and xylenols, gas, in which H predominated, and a residue of C.

KLEIN, G.: *Handbuch für den deutschen Braunkohlenbergbau.* Teil 1. Berlin: VDI-Buchhandlung. 511 pp. Bound, M. 43.

NAPHTALI, MAX: *Die Kohle und ihre Wandlungen.* Berlin: Ullstein. 136 pp.

Chemical products of C<sub>2</sub>H<sub>4</sub> and technical gases containing C<sub>2</sub>H<sub>4</sub> (SMOLENSKI) 10. Artificial humification of carbohydrates, particularly the conversion of cellulose into humic acids (FUCHS) 10. The chemistry of natural humic acids (SIMEK) 10. Progress in the chemistry of humic acids (FUCHS) 10. Waste disposal (effluents from gas plants) (BOYER) 14. Phenol recovery and treatment works of the Hamilton Coke and Iron Co. (HATCH) 14. Determination of the dew point of flue gases (DEN HAAN) 28. Concentrating coal by flotation (Brit. pat. 298,736) 9. Hydrogenation catalysts (for treatment of coal-distillation products) (Fr. pat. 649,976) 18. Alcohols (from lignite bitumen) (Ger. pat. 474,640) 10. Dry gas purifying apparatus (Ger. pat. 473,987) 1. Discharging means for tubular driers for brown coal, etc. (Ger. pat. 474,070) 1.

**Fuel.** DURNFORD & ELLIOTT (SHEFFIELD), LTD. Ger. 474,592, Aug. 18, 1923. App. for obtaining oil, gas and smokeless fuel from coal, shale, peat or wood comprises a barrel-shaped distg. chamber rotating about a radial axis. Openings are provided in the bearings for loading, and side outlets with valves for the escape of the volatile products of the distn.

**Fuel.** JULES J. DESCHAMPS. Ger. 472,812, May 25, 1923. The combustion of solid and liquid fuels is facilitated by introducing them into the firing chamber as small particles suspended in an air charge.

**Fuel. GES. FÜR MASCHINELLE DRUCKENTWÄSSERUNG M. B. H.** Ger. 474,558, Mar. 16, 1927. Peat is dried by grinding it to particles of the order of 0.3–0.2 mm. and mixing with peat powder which has been dried to hardness.

**Fuel. GES. FÜR MASCHINELLE DRUCKENTWÄSSERUNG M. B. H.** Ger. 474,860, Feb. 17, 1927. Mechanically pressed, dried and powd. peat is coked and mixed with peat powder.

**Fuel. I. G. FARBENIND. A.-G.** (Martin Müller-Cunradi, inventor). Ger. 472,855, Feb. 5, 1924. A fuel for lighting, heating and smelting comprises butylene or butane or a mixt. of these with each other or with other readily liquefied substances of which they form the principal part.

**Fuel. SOC. DE RECHERCHES ET DE PERFECTIONNEMENTS INDUSTRIELS.** Ger. 474,499, Oct. 12, 1926. A fuel resembling anthracite is prepd. by compressing and degasifying the compn. obtained by adding non-caking coal, especially anthracite, to the coal-oil mixt. obtained in the Trent process of purifying coal. (Cf. U. S. 1,420,164, (C. A. 16, 1928).)

**Gasifying bituminous fuels. ALBERT BREISIG.** Austrian 112,342, Oct. 15, 1928. Addn. to 107,421. The method of Austrian 107,421 (C. A. 22, 4778) is modified by extending the blasting period so as to increase the flow of heat to the accumulators. A large removable excess of coke is so obtained, and the CO content of the gases is reduced. Cf. C. A. 23, 1249.

**Filter for separating powdered fuel from air, etc. J. J. C. BRAND and B. LAING.** Brit. 299,080, July 19, 1927.

**Treating powdered fuel for internal-combustion engines. I. G. FARBENIND. A.-G.** (Josef Jannek and Gerhard Hofmann, inventors). Ger. 474,181, May 8, 1926. Brown-coal dust or like powd. fuel for Diesel or other internal-combustion engines is pretreated with HF, preferably in the dild. gaseous state, to remove SiO<sub>2</sub>.

**Distilling powdered fuel. TROCKNUNGS-, VERSCHWELUNGS-, UND VERGASUNGS G. M. B. H.** Fr. 649,479, Feb. 6, 1928. See Brit. 285,015 (C. A. 22, 4777).

**Destructive distillation. ALLGEMEINE VERGASUNGS-GES. M. B. H.** Ger. 474,357, Feb. 11, 1926. Fine coal or the like descends a shaft and is heated by hot inert gases both directly and indirectly. The shaft is traversed by hollow bars through which the heating gases pass, each alternate bar having openings in the bottom.

**Destructive distillation. FIRMA CARL STILL.** Ger. 474,356, Nov. 6, 1925. In distg. solid fuels in horizontal, externally heated ovens, the yield of by-products, particularly hydrocarbons, is improved by withdrawing all the distn. products through the surfaces of doors at the ends of the oven, the doors lying below the surface of the fuel.

**Destructive distillation of bituminous materials. KOHLENVEREDLUNG A.-G.** Ger. 474,339, Mar. 18, 1924. The finely granular or powd. materials are carried by a gas stream through a series of heating zones. Gas and solid may be sepd. on leaving each zone.

**Destructive distillation of coal. KURT BEUTHNER.** Ger. 473,844, Feb. 7, 1928. The lower closing door of the distg. app. can pivot about a frame after it is opened.

**Distillation retorts. ARTHUR V. ABBOTT.** Ger. 473,212, July 25, 1926. The distillation products from a rotary coal-distn. retort are cooled by a conical cooler arranged near the outlet of the retort.

**Oven for the low-temperature distillation of coal or lignite. H. HARDY.** Belg. 353,911, Oct. 31, 1928. Constructional features.

**Liquefaction of coal. MICHAEL MELAMID.** Fr. 649,474, Feb. 3, 1928. Coal is finely powd., mixed with a powd. catalyst or dissocn. agent and injected by means of H or a protection gas contg. H into the reaction vessels under pressure.

**Apparatus for separating materials such as pulverized coal and slate by flotation. WALTER L. REMICK.** U. S. 1,711,326, April 30. Structural features.

**Synthesis of hydrocarbons. ALFRED UHLMANN.** Fr. 650,029, Jan. 5, 1928. Hydrocarbons are obtained by passing a mixt. of substances contg. C and H, such as charcoal, graphite or coke and water made into a paste, through a high-frequency field. O and CO<sub>2</sub> formed are combined by adding metallic powders and CaO or MgO to the materials. H may be passed through the material being treated and the hydrocarbons obtained may be treated with a catalyst such as Ni. A suitable app. is described.

**Destructive hydrogenation. I. G. FARBENIND. A.-G.** Brit. 299,020, Aug. 7, 1926. Catalysts are used contg. the metalloids B, Si, P, As, Se or Te in free or combined state, preferably in conjunction with elements of the 2nd to 8th groups of the periodic system (particularly those of the 6th group); e. g., there may be used Si carbide, alderwood charcoal glowed at 800° and treated with H<sub>3</sub>PO<sub>4</sub> or Ca phosphate, Mo

phosphate, W phosphate or Fe phosphate;  $As_2O_3$  alone or preferably with Mo or W; silicides such as Fe silicide contg. 15% Si; active silica hydrosilicates; borides such as those of Ti or Fe; or molybdic acid contg. Na selenite. Brit. 299,021 specifies catalysts contg. halogens in either free or combined state, preferably in combination with elements of the 2nd to 8th groups and most suitably the 6th group of the periodic system, *e. g.*,  $CaF_2$ , Mo together with 10%  $AlCl_3$  or  $CdCl_2$ .

**Destructive hydrogenation of carbonaceous materials.** I. G. FARBERIND. A.-G. Brit. 298,584, June 9, 1927. Products of destructive hydrogenation of carbonaceous materials are polymerized (suitably after a preliminary treatment to increase their content of unsatd. compds.) to form hydrocarbons of high mol. wt. and especially to produce rubber-like substances. The preliminary treatment may include cracking, dehydrogenation, thermal or elec. treatment. Halogens may be introduced into the hydrocarbon mol. and halogen acids subsequently split off. A product of the destructive hydrogenation of oil is treated with  $SO_2$ ; the solid products which settle are heated or treated with alkalis and substances thus obtained can be polymerized with metallic Na into rubber-like substances. A coal hydrogenation product, dehydrogenized by passing over Cr oxide at  $500^\circ$  may be treated with HCl and distd. to yield  $AmCl$ , which may be treated with  $BaCl_2$  at  $400^\circ$  to form trimethylethylene, which is further treated with Cl, *in vacuo*, to form chloroamylene, and HCl is split off with production of isoprene, which is then polymerized with  $SnCl_4$ . A coal hydrogenation product may be cracked at redness in the presence of quartz or Pt to form butadiene, which may be polymerized with Na. Cf. C. A. 23, 2276.

**Reduction furnaces.** PAUL L. J. MIGUET. Fr. 648,813, June 25, 1927. The smoke products and dust from reduction furnaces are incorporated with coal-dust to be used for making coke for the reduction process.

**Recovery of motor fuel from crude oil, coal, etc.** ERNEST SCHULTZ and ERNEST L. SCHULTZ. Australian 9,692, Oct. 4, 1927. A high percentage of light oil is recovered from org. materials such as crude oil, shale, coal, etc., by vaporizing the raw material in a still, passing the vapors to a converter contg.  $CaO$  and  $ZnCl_2$  or  $ZnO$ , which are agitated by paddles and cause the gases to react under pressure that gradually increases; so that after the gases have been condensed an odorless high-grade oil is produced.

**Eliminating corrosive properties of benzene.** THEODORE R. TRAINOR (one-half to Joseph A. Kelly). U. S. 1,711,367, April 30. A lime soln. is added to the benzene and the mixt. formed is forcibly circulated in a closed system, a  $NaHCO_3$  soln. is added and the mixt. is further circulated. An app. is described.

**Montan wax.** I. G. FARBERIND. A.-G. Brit. 299,133, Aug. 20, 1927. Montan wax is purified by treatment with an elec. current in an aq. medium, *e. g.*, a soln. contg.  $H_2SO_4$  and Cr sulfate, or compds. of Mn, V or Ce, with or without org. acids and org. solvents. Various details of the treatment are described.

**Drying gases.** W. C. HOLMES & Co., LTD. Fr. 648,739, Nov. 21, 1927. Coal gas is dried at about atm. temp. by contact with liquid absorbents and then by contact with cooled absorbents preferably liquid, the absorbents being regenerated either continuously or periodically. Cf. C. A. 23, 2513.

**Purification of gases.** SOC. INTERNATIONALE DES PROCÉDÉS PRUDHOMME-HOUDRY. Fr. 650,101, Aug. 8, 1927. In the manuf. of liquid fuels the hot distn. gases are purified by metals or oxides, *e. g.*, an oxide of Ni, in 2 series of purifiers alternately placed out of circuit for regeneration and by a pair of check purifiers following the main app. and put in and out of circuit at much longer intervals and contg. metals such as Cu oxides which form sulfides stable at the operative temp. of about  $250^\circ$ .

**Combustible gases.** I. G. FARBERIND. A.-G. Fr. 649,301, Dec. 3, 1927. Combustible gases are produced from moist granular fuel, such as crude friable lignite, by drying the latter in the lower part of the furnace or outside this, preferably by means of the warm gases themselves and mixing the charge of fuel by an agitator, which may be cooled.

**Generator gas.** C. OTTO & Co. G. M. B. H. Ger. 474,569, May 26, 1928. Generator gas is cooled and purified by passing it through an oppositely flowing stream of such substance as sand, or ceramic or metallic powder.

**Water gas and hydrogen.** IMPERIAL CHEMICAL INDUSTRIES, LTD. Fr. 649,780, Feb. 9, 1928. See Can. 281,814 (C. A. 22, 4235).

**Purifying furnace gases.** DAN RADULESCU. Fr. 648,773, Jan. 7, 1928. App. for purifying furnace gases comprises a conduit in which a no. of radial agitators rotate at high speed, dividing the conduit into chambers. Supersatd. steam and water or other liquid are injected through nozzles.



**Recovery of ammonia from gases.** ALLGEMEINE VERGASUNGS G. M. B. H. Ger. 473,986, July 9, 1926.  $\text{NH}_3$ -contg. gases formed in the burning of N-contg. fuels are extd. by adding to the blast of air, vapor at such a high temp. that the final temp. of the mixt. is at least  $200^\circ$ ; the  $\text{NH}_3$  content is absorbed directly from the waste gases.

**Gas producer.** FRANZ ENDRES. Ger. 473,486, Mar. 6, 1927. A vertical retort for the manuf. of coal gas is adapted for the simultaneous manuf. of oil gas by arranging an oil gasification chamber between the heat regenerators and the outlet pipe for the coal gas.

**Gas producer suitable for motor vehicles.** M. DELVAUX. Belg. 354,149, Oct. 31, 1928. Device for removing dust from gas, particularly producer gas. Belg. 354,150, Washer for producer gas for motor vehicles. Belg. 354,151. Constructional.

**Inverted gas producers.** PAUL HEUMEZ and EDMOND HUBERT. Fr. 649,927, Aug. 3, 1927. Means are provided for preventing tars and other liquids from entering the gas stream.

**Suction gas producer with annular boiler.** MOTORENFABRIK DEUTZ A.-G. Ger. 473,405, Dec. 23, 1924.

**Water-jacketed gas-producer construction.** MOTORENFABRIK DEUTZ A.-G. Brit. 298,649, Oct. 13, 1927.

**Cooler for viscous liquids.** GABRIEL SZIGETH and JOSEF BECKKÓY. Ger. 473,793, May 1, 1926. A cooling app. for such liquids as coal tar has a vertical cooling element with upstanding plates with horizontal troughs in which the tar flows.

**Purifying oils and tars from coal distillation, etc.** F. HOFMANN and C. WULFF. Brit. 298,484, Oct. 6, 1927. Coal distn. products are refined by treatment with a soln. of HCl in an org. solvent such as benzine,  $\text{C}_6\text{H}_6$ , "light oil," MeOH, EtOH or  $\text{CCl}_4$ ; the process may be applied to low-temp. tar, tar oils, oils obtained by the destructive hydrogenation of coal, etc., benzene and lubricating oils obtained as described in Brit. 299,086 (cf. C. A. 22, 3079). After the HCl treatment the oil is washed with water and caustic alkali soln. and then distd.

**Purifying oils containing tar acid.** SOLOMON CAPLAN (to Combustion Utilities Corp.). U. S. 1,710,764, April 30. In order to remove color-producing impurities from oils such as tar or shale oils, the oils are extd. with a soln. of a "buffer" agent such as a 1% aq.  $\text{NH}_3$  soln. and the ext. is sepd. from the residual oil. Cf. C. A. 22, 2457.

**Tar distillation.** THE BARRETT Co. Fr. 649,528, Feb. 17, 1928. The gases from tar distn. by contact with part of the hot gases from a coal distn. battery are mixed with the remaining gases which have been cooled to remove heavy tar constituents, and the mixt. obtained is cooled to recover condensable constituents.

**Tar distillation.** THE BARRETT Co. Fr. 649,533, Feb. 18, 1928. See Brit. 286,278 (C. A. 23, 266).

**Apparatus for the distillation of tar.** THE BARRETT Co. Fr. 648,796, Feb. 2, 1928.

**Decolorizing waste water from crude tar-extracting plant.** FRITZ SEDENSCHNUR. Ger. 472,519, May 27, 1925. Addn. to Ger. 401,467. The water is decolorized by the  $\text{H}_2\text{SiO}_3$ - and Fe-contg. clinker from generators or furnaces.

**Sulfonated tar.** ORIN D. CUNNINGHAM (to Peter C. Reilly). U. S. 1,711,448, April 30. In treating coal tar for the production of a material suitable as a base to be employed as a filler or pigment or for decolorizing material the tar is mixed with more than its own wt. of cold strong  $\text{H}_2\text{SO}_4$  and the mixt. is heated (suitably at a temp. of about  $100$ – $70^\circ$ ) to effect sulfonation. Claim is made to a completely sulfonated tar as a new product.

**Sulfonated pitch.** ORIN D. CUNNINGHAM (to Peter C. Reilly). U. S. 1,711,449, April 30. Coal-tar pitch in the solid state is mixed with strong  $\text{H}_2\text{SO}_4$  and agitated, and the mixt. is heated to about  $160$ – $70^\circ$  and then cooled and run into water, the mass removed from the water and free acid removed (suitably by washing with water). A sulfonated pitch is obtained which has decolorizing properties and is suitable for use in treating solns. of glucose or other substances.

**Coking.** KOHLENSCHIEDUNGS-G. M. B. H. Ger. 473,709, June 11, 1921. A rotary drum app. for the destructive distn. of coal, peat and lignite, has a tube entering well into the drum to lead away the tar-oil vapors.

**Dry cooling of coke.** KOHLENSCHIEDUNGS-G. M. B. H. Ger. 472,803, Oct. 7, 1923. The glowing coke is mixed with cooling material which absorbs the heat and is then sepd. from the coke.

**Calcing coke.** ALUMINUM Co. OF AMERICA. Ger. 474,359, Jan. 15, 1927. See U. S. 1,671,673 (C. A. 22, 2657) and Brit. 269,849 (C. A. 22, 1286).

**Coke oven.** EVENCE COPPÉE & Cie. Ger. 472,679, Mar. 17, 1928. Addn. to Ger. 455,419. Details of construction.

**Coke oven.** C. OTTO & Co. G. M. B. H. Ger. 473,782, April 4, 1926. Details of arrangement.

**Coke-oven construction.** H. KOPPERS A.-G. (to Koppers Coke Oven Co., Ltd.) Brit. 298,945, Oct. 17, 1927. Coke ovens with passages in their foundations have the ferroconcrete flooring divided into slabs with expansion joints between them and these slabs are supported by iron shoes on pillars and struts from which they may be sepd. by heat-insulating material.

**Regenerative coke oven with vertical heat blast.** GUTEHOFFNUNGSHÜTTE OBERHAUSEN A.-G. Ger. 473,959, Oct. 21, 1925.

**Plant for using the maximum heat from refined coke.** COLLIN & Co. and JOSEF SCHÄFER. Ger. 472,510, May 13, 1925. The coke is dry-cooled by gases which absorb the heat and are afterwards used in the combustion of the coke.

**Utilizing waste heat from coke ovens for other carbonization processes.** NAAM-LOOZE VENNOOTSCHAP SILICA EN OVENBOUW MIJ and W. HIBY. Brit. 298,547, June 30, 1927. Heat contained in the hot coke discharged from coke ovens or like app. is used (suitably for low-temp. carbonizations) for the carbonization of materials such as coal, lignite, peat, or wood, by bringing the materials into direct contact and afterward sepg. by screening or otherwise (or the mixt. may be used as a composite fuel without sepn.). The process may be used to obtain semi-coke dust, 15-25% of which may be mixed with a coking coal to improve the quality of coke or which may be used for making briquets. An app. is described.

**Apparatus for mixing coke with wet coal.** ILLINGWORTH CARBONIZATION CO., LTD., and S. R. ILLINGWORTH. Brit. 298,658, June 15, 1927.

## 22—PETROLEUM, LUBRICANTS, ASPHALT AND WOOD PRODUCTS

W. F. FARAGHER

**Petroleum refineries in the United States, January 1, 1929.** G. R. HOPKINS AND E. W. COCHRANE. U. S. Bur. Mines. *Bur. Mines Circ.* 6116, 21 pp. (1929). E. H.

**A method of distinguishing American from Russian petroleum.** THEODORA P. RAIKOVA. *Z. anal. Chem.* 77, 42-6 (1929).—American kerosene reacts with  $I_2$  in the presence of  $HNO_3$  almost instantaneously, whereas the Russian product reacts very slowly. The following qual. test is proposed. Take 2 cc. of 0.2%  $I$  in  $CHCl_3$ , 2 cc. of 20% aq.  $NaNO_2$  soln. and 2 cc. of the kerosene. Shake well and add 9  $N$   $H_2SO_4$  until the  $I_2$  color of the mixt. disappears or, if that does not take place, until further addition of acid causes no further evolution of nitrous fumes. With American kerosene, the  $I$  color will disappear after the addition of a few drops of acid but it will persist for hrs. in the Russian product. Expts. to det. which fraction of the American kerosene contains a substance that reacts with the  $I_2$  led to the surprising discovery that every fraction of the distillate reacted.

W. T. H.

**Some experiments on vacuum distillation.** C. R. BURCH. *Proc. Roy. Soc. (London)* A123, 271-84 (1929).—Products of petroleum of very high mol. wt. can be distd. without decompn. by the method of evaporative distn. used by Brönsted and Hevesy to sep. isotopes of Hg. A condensing surface is placed a short distance above the evapg. liquid so that the vapor mol. makes no collision during its passage to this surface. The still is shown by a diagram. Dissolved gases are removed by reducing the pressure in stages and by heating, to prevent splashing the condensing surface by bursting gas bubbles. Ordinary distn. is compared with evaporative distn. from a theoretical point of view. A lubricating oil from viscous fuel oil distd. between 300° and 360° at 25 mm. pressure, a cylinder-oil fraction steam-distd. at 345°, a heavy machine-oil fraction produced at 335°, petroleum jelly, pump oil and common paraffin wax were distd. without decompn. Petroleum derivs. of extremely low vapor pressure are prepd. which can be used instead of Hg in condensation pumps in high-vacuum systems ( $10^{-6}$  mm.) with ground joints.

H. W. WALKER

**The practical significance of the various crystalline forms of paraffins in the production of paraffin wax.** E. PYHÄLÄ. *Metallbörse* 18, 2134-5, 2248-9 (1929); cf. C. A. 23, 2282.—The Scotch method of dry-sweating crude paraffin wax is successful only if the crystals have the needle form.

G. CALINGAERT

**The nature and properties of fuel oil.** J. S. SCHOFIELD. *Blast Furnace & Steel Plant* 17, 721-3 (1929).

E. H.

**Natural emulsions in crude oils from Boryslaw-Tustanowic.** I. TADRUSZ KUC-

ZYNSKI. *Przemysl Chem.* 11, 188-97(1927); cf. *C. A.* 23, 1255.—In natural crude-oil emulsions, the sign of the charge on the water droplets depends only on the reaction of the water. If the reaction is acid, the charge is positive; if alk., neg. A. C. Z.

**Thermal transference in transformer oils.** ANON. *J. Inst. Elec. Eng.* (London) 67, 527-37(1929).—An investigation was made of the cooling power of transformer oils when used without forced flow and an attempt to correlate the cooling power with the phys. properties of the oil. Attention was given to the temp. rise of the oil and to that of the windings. Classification according to temp. rise of the oil does not necessarily rank the oils in the same order as classification according to temp. of the windings. The combination of variables,  $ac/v$ , is important;  $a$  is the coeff. of expansion,  $c$ , the heat capacity of unit vol. and  $v$ , the kinematic viscosity. The temp. rise of the windings differs from that of the oil, because it is influenced by the thermal cond. of the oil, an influence greater, probably, than the influence of the combination of properties,  $ac/v$ . Conclusion: To produce the best cooling effect, an oil should have high sp. heat, coeff. of expansion, and thermal cond. and low viscosity. Four oils were tested. The app. and the exptl. methods are described and curves and tables are given. W. H. BOYNTON

**Charcoal production methods in the United States.** K. N. CEDERQUIST. *Tek. Tid., Uppl. C (Kemi)* 58, 45-8(1928).—A illustrated review presenting a detailed report on a study travel made in 1927. C. A. ROBAK

**Industrial extraction of acetic acid from dilute solutions.** S. P. NASAKIN. *J. Chem. Ind.* (Moscow) 5, 1149-57, 1369-76(1928).—Acetic acid obtained in the distn. of wood is best extd. by org. solvents that are insol. in  $H_2O$  and boil considerably lower or higher than  $AcOH$ . Ether is not suitable on account of large loss, fire danger, etc. N. proposes as a new solvent, a fraction from crude wood alc. and coal tar. It consists of 80-85% of esters of lower fatty acids and low-boiling alcs., the remainder being ketones. Its  $d_{20}^4$  is 0.905-0.920, b. 50-70°, soly. in dil.  $AcOH$  11-15%,  $AcOH$  extn. coeff. 0.52-0.57%, heat of evapn. 100 cal. Excellent results were obtained with this solvent in lab. tests; expts. are now being made on a factory scale. Numerous drawings of app., diagrams, tables and calcs. are included. BERNARD NELSON

The deposits of oil of Burma, British India (SANDELIN) 8. The clays [and shales] of East Prussia and their properties (KRAUSE) 8. Composition of sugar obtained by complete hydrolysis of pine wood (HÄGGLUND) 28. Theory of petroleum formation. III. The composition of primary tar from Chachareisky boghead coal ((STADNIKOV, PROSKURNINA) 8. Colorimetric determination of turpentine vapors in air (ANDREEV, GAVRILOV) 7. Bureau of Standards soil-corrosion investigation (LOGAN) 9. Action of  $Ac_2O$  on Schiff bases (PASSERINI, MACENTELLI) 10. Extraction and concentration of  $AcOH$  from dilute aqueous solutions (GUINOT) 10. Hydrogenation catalysts [for treatment of hydrocarbons] (Fr. pat. 649,976) 18. Purifying oils and tars from coal distillation, etc. (Brit. pat. 298,484) 21. Destructive hydrogenation of carbonaceous materials (Brit. pat. 298,584) 21. Apparatus for the gravity separation of gasoline and water (U. S. pat. 1,711,428) 1. Separating impurities from liquids such as wax from oils (U. S. pat. 1,711,315) 13. Apparatus for gravity separation of oil and water (Brit. pat. 298,683) 1. Purifying oils containing tar acid (U. S. pat. 1,710,764) 21. Gas-purification apparatus (Ger. pat. 473,878) 1.

RINGELMANN, MAX: *Le charbon de bois; fabrication en forêt, pars les procédés ordinaires et avec les appareils actuels.* PARIS: Librairie Agricole. 125 pp. F. 6. Reviewed in *La Nature* 58, 328(1928).

WILLIAMSON, J. W.: *In a Persian Oil Field; A Study in Scientific and Industrial Development.* London: Ernest Benn, Ltd. 189 pp. 7 s. 6 d., net. Reviewed in *Chem. Age* (London) 18, 217; *Engineering* 125, 456; *J. Sci. Instruments* 5, 110(1928).

**Petroleum.** PAUL DVORKOVITZ. Fr. 648,705, Feb. 13, 1928. Petroleum is extd. from bituminous material by a preliminary distn. to remove part of the org. material followed by an extn. with a liquid or vapor solvent which will dissolve the remaining org. material. Thus, bituminous coal contg. 30% org. material is heated to 500°, and 20-40% gas tar or petroleum is then added to dissolve out the remaining org. material.

**Treating petroleum residue.** JULIUS MODERN, FRITZ NEUBER and FRIEDRICH ZIFFER. Austrian 112,441, Oct. 15, 1928. The extn. of lubricating oils from petroleum residues by means of solvents is improved by adding powd. stone to the residues. This addn. facilitates the extn. and also gives a final residue suitable for use as paving material.

**Subdividing paraffin or similar materials.** HAROLD GROSSMAN. U. S. 1,711,482, April 30. The material is melted and formed into a hot emulsion with an aq. liquid contg. about 2% of Na oleate, HCl is added to the emulsion and the emulsified material is pptd. in the form of fine particles by mixing the emulsion with water.

**Separating paraffins from liquid hydrocarbons.** N. O. BACKLUND (to Aktiebolaget Separator-Nobel). Swed. 64,383, Jan. 4, 1928. Asphalts which impede the crystn. are first eliminated by centrifugalizing; then the paraffins are sepd. By this procedure the paraffins can be more completely removed from highly viscous oils and the output of high-grade lubricating oils is increased. Cf. C. A. 23, 1136.

**Apparatus for the destructive distillation of bituminous materials.** ELEKTROWERKE A.-G. Ger. 472,657, Feb. 13, 1924. Details of arrangement.

**Catalytic oxidation of hydrocarbons.** I. G. FARBENIND. A.-G. Brit. 298,704, July 22, 1927. Oxidation of paraffin or similar hydrocarbon materials with O-contg. gases such as air is effected in the presence of inorg. catalysts such as metals, metallic oxides or salts, including salts of org. acids, and may be accelerated by the conjoint use of org. nitrogenous bases such as  $(CH_3)_3N$ , aniline, pyridine, quinoline, toluidine, butylamine, amylamine and hexylamine, which may be used with substances such as Mn soap, Ce oxide or Ce stearate. The products consist mainly of mixts. of aliphatic carboxylic acids, alcs. and esters. Cf. C. A. 23, 1364.

**Apparatus for pressure cracking of liquid hydrocarbons.** SAMUEL J. M. AULD, ALBERT E. DUNSTAN and PERCY H. HERRING (to Anglo-Persian Oil Co., Ltd.). U. S. 1,711,219, April 30. An app. is described comprising a preheater, a plurality of sep. and relatively short "thermalizing tubes" into which the liquid passes from the preheater, a "reactor" surmounting the thermalizing tubes into which the liquid passes from the latter, and a setting in which this app. is mounted. The thermalizing tubes are placed within a flue of the setting and may be subjected to a regulated heating and valves are provided in a wall of the setting which serve for regulating the flow of heating

**Cracking hydrocarbons.** STANDARD OIL DEVELOPMENT CO. Fr. 649,348, Feb. 21, 1928. A current of petroleum oil is heated to cracking temp. in a single passage through a heating zone, the heated oil passing to a digestion zone in which part, at least, of the oil vaporizes and is partly condensed. The condensate is mixed with the oil passing from the heating to the digestion zone, the amt. of condensate being sufficient to regulate the temp. in the digestion zone. An app. is described.

**Cracking hydrocarbon oils.** S. M. NORWOOD (to Electro Metallurgical Co.). Brit. 298,556, Oct. 11, 1927. Cracking is effected in an app. made of, or lined with an alloy contg. Cr 15-40, Ni 2-15, Si 0.7-3.0, Mn 0.7-3.0% and the remainder mainly Fe, with not more than 1% C.

**Cracking hydrocarbon oils.** EDWARD W. ISOM (to Sinclair Refining Co.). U. S. 1,711,351, April 20. Oil is heated in the vapor phase to a high cracking temp. and, before condensation of the desired lighter oil of lower b. p., the vapors from the cracking operation are subjected to a fractionation in which there is introduced into direct contact with the vapors, as a cooling and condensing agent, an oil of boiling range corresponding to that of the desired lighter oil of lower b. p. but substantially free from unsatd. components unstable at the temps. prevailing in the fractionating operation. An arrangement of app. is described. Cf. C. A. 23, 2566.

**Apparatus for cracking oils, etc.** PETROLEUM PROCESS CO. Fr. 648,832, June 28, 1927. The oil is caused to descend in an ascending current of gaseous heating agent.

**Distillation of heavy oils.** LEO STEINSCHNEIDER. Austrian 112,348, Oct. 15, 1928. See Brit. 264,476 (C. A. 22, 163).

**Extracting oils from sands.** STANDARD OIL DEVELOPMENT CO. Fr. 649,571, Feb. 22, 1928. Oils are extd. from sands contg. them by displacement by means of electrolytes such as  $Na_2CO_3$ ; an effective concn. is maintained during its passage through the sand by the introduction of concd. soln. at the sides. A suitable app. is described.

**Oil-gas-producing apparatus.** AUGUST SCHILLING, RICHARD SACHSE, DIMITRI LIAMIN and THEOPHIL CALLAERT. U. S. 1,710,900, April 30. The gas-generating chamber is provided with a checkered hearth from which a wall of refractory material rises concentrically, dividing the interior into concentric chambers; near its base the wall is provided with apertures affording communication between the chambers, and a combustible mixt. of oil, air and steam is discharged axially in a downward direction into the inner chamber and toward the checkered hearth. A jet stream of oil and steam is delivered against the outer surface of the refractory wall above the apertures, and gases produced are withdrawn through the checkered hearth. Various structural details are described.

**Hydrocarbon oils.** I. G. FARBERIND. A.-G. Brit. 299,086, July 21, 1927. Oils of high viscosity and flash point suitable for use in the production of lubricating oils are obtained by passing gases rich in lower olefins such as  $C_3H_6$ ,  $C_4H_8$ ,  $C_5H_{10}$ , and  $C_6H_{12}$  (which may be obtained by cracking tar or mineral oils or as a by-product from other industrial processes) into hydrocarbon mixts. which are liquid at ordinary temps., in the presence of catalysts of the Friedel-Crafts type such as  $AlCl_3$ ,  $ZnCl_2$ , or  $FeCl_3$ , the action of which may be improved by the further addn. of  $HgCl_2$  or uranyl chloride. Temps. up to  $200^\circ$  are suitable. Various details and modifications are described.

**Mineral oils.** ADOLPHE A. F. M. SEIGLE. Ger. 472,734, Dec. 20, 1922. A plant for distg. and sepg. mineral oils and similar hydrocarbons is described.

**Lubricants.** GEORG SCHICHT. Austrian 112,631, Nov. 15, 1928. Products useful as lubricants are obtained by heating drying oils in the presence of mineral oils or like hydrocarbons to above  $200^\circ$  until a satd. but still sol. product is obtained. The drying oils may be partly polymerized or oxidized before treatment.

**Bituminous emulsions.** CHEMISCHE FABRIK BUCKAU. Brit. 298,842, Jan. 26, 1928. Bituminous substances are emulsified by use of "boron acids in alk. soln." (such as a soln. formed from  $H_3BO_3$  and caustic alkali) in a quantity of 2% or less of the finished emulsion.

**Furnace for carbonizing wood and recovering by-products.** ÉMILE TRIHAN. Fr. 648,756, Dec. 22, 1927.

## 23—CELLULOSE AND PAPER

CARLETON E. CURRAN

The estimation of alpha-cellulose. CARL G. SCHWALBE. Forstl. Hochschule, Eberswalde, bei Berlin. *Pulp Paper Mag. Can.* 26, 1863-4(1928); 27, 11-3, 41-2(1929); *Paper Trade J.* 88, No. 3, 61-5(1929).—See C. A. 23, 699. A. PAPINEAU-COUTURE

Determination of  $\alpha$ - and of  $\beta$ -cellulose. RAGNAR BERGGVIST. *Svensk Pappers-Tid.* 31, 814-8(1928); cf. C. A. 22, 1678.—From a critical study of the Jentgen method for detg.  $\alpha$ -,  $\beta$ -, and  $\gamma$ -cellulose compared with a parallel detn. of a control sample of known compn. B. concludes that with certain precautions the Jentgen method gives results which do not need the usual corrections. B. suggests the following precautions: The analysis should be conducted in a thermostat at  $20^\circ$ , or a correction of 0.1% to the  $\alpha$ -cellulose value should be added for each degree under  $20^\circ$  and subtracted for each degree above  $20^\circ$ ; an equal but reverse correction should be applied to the  $\beta$ -cellulose value; the temp. of the wash water should be kept at  $20^\circ$ . Washing and filtering must be done as rapidly as possible after diln., and a Büchner funnel is recommended. Dilution with water between the mercerizing and filtering should always be done with the const. quantity 300 cc. Grinding of material should be done with light blows and 5 mins. pounding should suffice. Careful work along the above lines should give an  $\alpha$ -cellulose content value with an error not greater than  $\pm 1\%$ . WILHELM SÖGERBLOM

Cellulose from cornstalks. H. A. WEBBER. Iowa State College, Ames, Iowa. *Ind. Eng. Chem.* 21, 270-5; *Paper Mill* 52, No. 1, 4, 6, 8; No. 2, 24-5(1929).—A review of the structure and chem. compn. of the corn plant, with a brief summary of the work carried out at Iowa State College on the economic possibility of producing sufficient cellulose of satisfactory quality from cornstalks. The NaOH cooks give best results when everything is considered, although pulps made with halogens require less bleach. In general, the bleach consumption of the NaOH cooks amounts to 20% of the wt. of the dry pulp and there is a loss of about 10% of the pulp during the bleaching process, or about 3-3.5% of the original wt. of stalk, giving an over-all yield of good paper-grade pulp amounting to 30-32% of the original wt. of the stalks, with an  $\alpha$ -cellulose content of 70-75%. The soda, kraft and halogen processes make pulps suitable for magazines, books and writing paper; the lime-soda and sulfite processes give a weaker paper, suitable perhaps for toilet paper and similar grades; while the lime pulp seems suitable for boxboard and similar grades where an unbleached pulp can be used. Cornstalks are more easily reduced to pulp than are woods, but they are more bulky, and give lower yields of cellulose which requires slightly more bleach. The fibrous outer shell used alone makes the strongest paper; the pith used alone gives a translucent parchment-like paper; while paper varying between these two extremes is obtained when the entire stalk is used. The pulp made from the fiber requires less bleach than that from the pith, although the fiber is more colored in the raw state. The leaves and husks produce the weakest paper. When the entire stalk is used, a good paper can be produced if the cook is relatively short (1.5-2 hrs.) and the beating is not too severe, as in this case the entire

pith is not reduced to a colloidal condition, but some of it is drawn out into fibrous forms which interweave with the more resistant fibers. A. PAPINEAU-COUTURE

**Chemical examination of the tissue of the cornstalk.** C. J. PETERSON AND R. M. HIXON. *Ind. Eng. Chem., Anal. Ed.* 1, No. 2, 65-7 (1929).—Examn. of cornstalk for chem. constituents showed it to contain primarily lignin, pentosans and cellulose in the approx. amts. of 30, 27 and 36%, resp. Alk. hydrolysis caused the soln. of approx. 46% of the stalk, of which lignin and hemicelluloses constituted approx. 27 and 17% (based on stalk), resp. Acid hydrolysis dissolved approx. 41% of the stalk, of which lignin and hemicelluloses constituted approx. 14 and 26% (based on stalk), resp. Pectin or pectic acid could not be definitely identified. Three structural tissues, shell, pith and vascular bundles, each having characteristic phys. properties, were sepd. from the stalk and by chem. analysis found to be practically identical with the entire stalk. E. R. SCHAFER

**The x-ray diagram of cellulose.** R. O. HERZOG AND W. JANCKE. *Z. physik. Chem., Abt. A*, 139, 235-62 (1928).—Examg. various natural and hydrated celluloses H. and J. detd. that the cellulose crystallites have their principal axes in the fiber axis, or with a spiral fiber, tangential to the spiral. The slopes of the spirals agree, within the exptl. error as indicated by double refraction, with striations or cleavage of the crystals disclosed through microscopical data. The diagrams of all natural celluloses are the same while those of the products resemble that of hydrated cellulose. The differences are explained by the existence of 2 modifications of cellulose in which possibly the natural cellulose crystallizes in the monoclinic system and the hydrated cellulose in the rhombic system. Natural as well as mercerized fibers show fiber diagrams with the same periodicity in the fiber direction. On doubling the *a*-axis of natural cellulose, assuming  $(C_6)_8$  as an elementary body, all points fitted into a quadratic form. The same was true of the hydrated cellulose when the *b*-axis was doubled. According to Weissenberg the micro-building unit is at most half the wt. of the elementary body. The formulas for natural and hydrated cellulose are the same when both horizontal axes are doubled. Here the elementary body contains 16  $(C_6)$ -groups. It is thought that the micro-building units, the largest stoichiometrical groups, are parallel to the fiber axis, and linked to one another according to a diagonal screw-axis and so form a chain building-unit. The chem. problem is whether this linkage occurs through a principal valence (chain theory of valence) or a secondary valence (van der Waals' force theory). Some of the theories of this linkage are given. Cellobiose anhydride gives a diagram similar to the cellulose hydrates; also those of acetyl- and methylcellulose show no difference when compared with acetyl- and methylbiocellulose anhydride. The authors believe that the proof for the cellulose formula is essentially whether one and the same chain building-unit is present as an individual group and how the mutual ratio of these building units in the anhydride differ from that in the cellulose, and that research on other phys. properties is required to solve the problem. F. A. SIMMONDS

**The oxidation of cellulose under the influence of light.** II. V. V. SHARVIN AND A. PAKSHVER. *Z. angew. Chem.* 41, 1159-61 (1928).—When cotton fabric that has been bleached, ether-extd., washed and dried is sealed in a glass tube in an atm. of dry  $CO_2$  and placed in the sunlight, there is at first a simultaneous formation of oxycellulose,  $CO_2$  and  $H_2O$ . The amt. of  $CO_2$  formed bears a definite relation to the amt. of oxycellulose formed but, as yet, this cannot be expressed by a const. stoichiometrical proportion. Upon continued exposure to the light, there is a gradual decrease to no  $CO_2$  formation while the oxycellulose oxidizes further. Besides  $CO_2$  and  $H_2O$ , compds. are formed that have an odor resembling furfural, but do not give furfural reactions. There is a loss of wt. and strength in the fabric. When the  $O_2$  is replaced by  $N_2O$ ,  $CO$ ,  $NH_3$  or  $H_2$ , there is no oxycellulose or  $CO_2$  formed. If, however, cotton dyed with an organic dye is placed in the sunlight in an atm. of O-contg. gases ( $NO$ ,  $N_2O$ , etc.),  $CO_2$  is formed as a product of the oxidation of the dye. C. E. HRUBESKY

**The reaction of cellulose with phenylhydrazine.** C. J. STAUD AND H. LEB. GRAY. *Ind. Eng. Chem., Anal. Ed.* 1, 80-1 (1929).—A comparison is made between the Cu no. and the phenylhydrazine no. as methods for evaluating the amt. of reducing substances in a cellulose. There is a general trend of agreement between the methods but the phenylhydrazine no. appears to give the better index. F. A. SIMMONDS

**Studies on cellulose and its derivatives.** J. J. TRILLAT. *Rev. gén. colloïdes* 6, 177-92 (1928); cf. *C. A.* 23, 971.—X-ray spectrography was used to study different transformations of cellulose and the phenomena of acetylation. Cellulose, oxycellulose and hydrocellulose give identical diagrams except that different orientations are observed. Hydro- and alkali-cellulose yield different results. The cellulose form is changed into the hydrocellulose form each time that it undergoes swelling (acetylation followed by sapon., viscose silk, etc.). The study of acetylation indicated that the

structure of the acetylic compds. varied with the proportion of fixed AcOH. Also cryst. and amorphous phases were detected. It is possible to calc. the approx. dimensions of the elementary groupings comprising the solid colloidal gel. A good description of the app. is given. The radiations employed were the K  $\alpha$ -rays of Cu and Cr.

F. A. SIMMONDS

**Action of light on celluloid stained with malachite green.** RAYLEIGH. *Nature* 122, 645-6(1928).—Celluloid stained with malachite green acts as a light filter according to the relative time of exposure to sunlight. When new, it passes wave lengths of 4750-5700 A. U. and 6900-7500 A. U.; upon prolonged exposure, wave lengths of 6250-7500 A. U., while the intermediate stage passes those of 6830-7500 A. U. By making up various films dyed with malachite green R. finds that the phenomenon is due to some definite reaction between nitrocellulose and the dye.

F. A. SIMMONDS

**Cellulose formate. II. Formation of cellulose formate.** Y. UYEDA AND K. KATO. *Cellulose Ind.* (Tokyo) 4, 203-205(1928); cf. C. A. 22, 4792.—Cellulose formate is prepd. from regenerated cellulose, 100% formic acid, and H<sub>2</sub>SO<sub>4</sub>. The formic acid content of the ester increases with the reaction period to a max. and subsequently decreases. Similar variations occur with increasing proportions of H<sub>2</sub>SO<sub>4</sub>. In both cases the max. figures are slightly below the theoretical for the triformate.

B. C. A.

**Allylcellulose.** ICHIRO SAKURADA. Kyoto Imp. Univ. *J. Soc. Chem. Ind.* (Japan) 31, 638-42; Supplemental Binding 31, 157B(1928).—By treating tissue paper with 40-50 vol. % NaOH soln. and allyl bromide, the higher cellulose-allyl ethers (tri- and di-ether of C<sub>6</sub> unit) were directly obtained. The halogen absorption power of the resulting ether was quite concordant with the result of elementary analysis, and it has been ascertained that the double bond remains quite intact in the above etherification treatment. The tetrabromide of cellulose-diallyl ether was isolated in almost pure state. The higher allyl ether is partly sol. in alc., C<sub>6</sub>H<sub>6</sub> and CCl<sub>4</sub> but its soly. is not so great as would be expected.

Y. TOMODA

**The hemicellulose of spruce wood and its condition during sulfite digestion.** ERIK HAGGLUND. *Svensk Pappers-Tid.* 31, 572-6(1928).—H. compares critically the methods used by Schulze, Klingstedt, König and Becker, Thomsen, Heuser and Schmidt for sepg. and detg. hemicellulose. The detn. of sugar is rendered unreliable because of incomplete pptn. by  $\alpha$ -naphthylamine sulfate, and of passage of part of the lignosulfonic acid with the sugar through the dialysis membrane. The method used by H. for purifying the sugar soln. and detg. the substances present therein is described in detail. The easily hydrolyzed part of spruce hemicellulose contains pentoses 17, mannose 42.7, galactose 4.2, galactonic acid 3.2, fructose 4.0, glucose 28.9%. Not all the hemicellulose goes into soln. during the sulfite digestion. Of the approx. 50% yield of strong sulfite pulp from the wood only about 80% is pure cellulose; the remainder is lignin and the more difficultly hydrolyzed hemicellulose. Errors in prevailing methods for examg. the difficultly hydrolyzed part of spruce hemicellulose are pointed out and suggestions made for obviating these errors. Sulfite cellulose contains lignin 4.4, ether-sol. part 1.0, ash 0.4, carbohydrates 94.2%. The compn. of spruce wood, based on the improved hemicellulose methods, is cellulose 41.5, hemicellulose 24.3, lignin 28.0, AcOH, etc., 2.3, resin, ash, protein and undetd. 3.9%. The hemicellulose is made up as follows: (1) easily hydrolyzed part: mannose 2.9, xylose 2.2, fructose 1.2, sum 6.3%; (2) difficultly hydrolyzed part: mannose 7.7, glucose 5.2, galactose, 0.7, fructose 0.7, xylose 3.1, galactonic acid 0.6, sum 18.0%; total hemicellulose 24.3%. The actual cellulose content in spruce wood is therefore smaller than usually thought. During digesting of strong sulfite pulp the hemicellulose divides itself so that three-quarters go into soln. and one-quarter remains in the pulp. The relation of the above investigation to mercerizing is discussed. H. concludes that the lignin is chemically combined with the carbohydrates in the wood rather than being mechanically mixed therewith. W. SEGERBLOM

**Cellulose-xanthogenamides.** TADASHI NAKASHIMA. Kyoto Imp. Univ. *J. Soc. Chem. Ind.* (Japan) 31, 629-33; Supplemental Binding 31, 155B(1928).—Cellulose-xanthogenamides were obtained by the interaction of the Na salt of cellulose-xanthogenacetic acid and NH<sub>3</sub> or amines. The analyses of the products are given. Y. TOMODA

**Relation between swelling, salt formation and microstructure in the cellulose fiber.** C. TROGUS. Kaiser-Wilhelm Inst. Chemie. *Papier-Fabr.* 27, 55-60(1929).—A discussion correlating x-ray, microscopic and chem. studies on normal and mercerized cellulose and artificial fibers. Illustrations and numerous references are included.

R. H. DOUGHTY

**Manufacture and properties of regenerated cellulose films.** WM. L. HYDEN. *Ind. Eng. Chem.* 21, 405-10(1929).—The history and manuf. of cellophane are described and the reactions occurring in prepn. of alkali-cellulose, aging, xanthation and ripening

are discussed. Cellophane possesses certain phys. properties such as strength, permeability, optical, dielectric and physiol. properties which adapt the material to a no. of varied uses.

E. R. SCHAFER

**Acetylcellulose film and its fiber.** I. Relation between the quality of acetylcellulose and its film strength. G. KITA AND G. KANNO. Kyoto Imp. Univ. *J. Sec. Chem. Ind. (Japan)* 31, 730-2; Supplemental Binding 31, 176-7B(1928).—The acetylcellulose obtained by acetylation at 25° gave a weaker film than those obtained by acetylation at lower temps. It is not always true that the acetylcellulose of higher viscosity gives a weaker film. II. Relation between the conditions of film preparation and the quality of the resulting film. G. KITA AND G. KANNO. *Ibid* 733-8; Supplemental Binding 31, 177-8B(1928).—In prepn. of acetylcellulose film, the optimum pressure during the solvent evapn. is about 70 cm. of Hg, and the optimum concn. of acetylcellulose (in acetone soln.) is about 12%. The influence of diluents such as H<sub>2</sub>O and C<sub>6</sub>H<sub>6</sub> in the acetone soln. upon film quality has been examd. III. Spinning of acetylcellulose fiber. G. KITA, T. UEMATSU AND S. MASUDA. *Ibid* 739-45; Supplemental Binding 31, 178-9B(1928).—Exptl. results of dry spinning of acetylcellulose are described.

Y. TOMODA

**Characterization of spruce wood for groundwood and for cellulose.** E. MORK. *Papir-Journalen* 16, 40-4, 54-8, 64-9, 79-83, 88-91, 101-4, 111-4(1928).—The author's purpose is to attempt to show anatomical differences in the structure of the wood in different parts of the tree and in annual rings of various widths in order to account for the greater dry weight and consequently higher yields of wood with narrow annual rings. From a study of the % of summerwood, the fiber length and the fiber thickness on 5 specimens of spruce it was found that (1) other conditions being equal, wood with narrow annual rings has a higher percentage of summerwood and contains longer fibers than wood with broad rings, except that in the case of rings of less than 1.0 mm. width deviations from this rule may be found; (2) there is no regularity in the relation between width of annual rings and cell wall thickness and there is no indication that broad rings have larger cell spaces. Since summerwood yields the same amount of pulp as springwood on a weight basis (according to Kinman) it is evident that wood with narrow annual rings and having as high as twice the percentage of summerwood as wood with broad annual rings will yield more pulp per cord.

C. E. PETERSON

**New investigations in wood and cellulose chemistry.** ERIK HAGGLUND. Univ. of Åbo, Finland. *Tek. Tid., Uppl. C (Kemi)* 58, 25-8(1928).—By the regeneration of black (sulfate) liquor by means of the high-pressure decompn. method a substance which resembles pitch is obtained in amts. of about 25% of the wood weight. It has been proved that this substance can be almost completely converted into oils of different b. ps. by means of high-pressure hydrogenation in the presence of catalysts. The output of bleached alk. pulp from coniferous woods will usually be low, at best about 40%, because the usual bleaching methods are not applicable to pulp produced with a higher yield. Expts. have shown that it is possible to bleach distinct kraft pulps obtained with a yield of 50% and more to complete whiteness under maintenance of a high mech. strength with a total consumption of 15% Cl and an output of 45-7% of bleached pulp. The chemistry of the sulfite cellulose boiling processes has been studied, particular interest being taken in the question of the sulfonation of lignin isolated by means of highly concd. HCl. It is a well-known fact that this lignin is not readily dissolved by sulfite liquor. The expts. have not verified the statement of Kirschnner that the reaction of soln. is accelerated by the presence of cellulose. By examg. the lignosulfonic acid obtained in soln. it was found to be quite different from that obtained by direct decompn. of spruce wood, particularly as regards the S content which in the former is slowly increasing to about 50% above the usual value. The low soly. of HCl-lignin is explained by assuming that it is present in a highly assocd. form. The stability conditions of the sulfite in the boiling liquid have been studied and it was found that sugars, too, can considerably accelerate the decompn. of the sulfite. Two liquids, contg. 1% Na<sub>2</sub>O and 4% SO<sub>2</sub>, one with, the other without, an addn. of 2 g. sugar per 100 cc. were heated to 135°. After 4-5 hrs., after the max. temp. had been reached, a rapid decompn. of the sulfite was observed in the liquid contg. sugar while in the sugar-free liquid no appreciable decompn. could be noticed. Extensive investigations of the method of digesting wood with aq. SO<sub>2</sub> alone at low temps. gave only unfavorable results. Even at the low boiling temp. of 90° it was observed that the solid lignosulfonic acid present in the wood is undergoing a resinification and dark-coloring. The method is not likely to have any practical importance. The so-called Keebra method of boiling red fir wood (*Pinus sylvestris*) has been examd. according to the patent description. Heart-wood of red fir was boiled for 4 hrs. with a soln. of Na<sub>2</sub>SO<sub>3</sub>, 40% of the wood



weight, at 8.5 atm. and the residue was boiled again for 4 hrs at the same pressure with a liquid contg. 25%  $\text{Na}_2\text{SO}_3$  and 3%  $\text{NaOH}$ . The weight of the wood was reduced to about 55% of the original but the residue still contained 19.2% lignin and consisted in solid chips, no usable pulp being obtained.

C. A. ROBAK

**Pine-wood lignin.** ERIK HÄGGLUND AND HELMUT URBAN. Inst. für Holzchemie, Academie Abo. *Biochem. Z.* 207, 1-7(1929).—Lignin prepd. by brief action of concd.  $\text{HCl}$  on pine wood freed from resins still contains considerable amts. of carbohydrates that can be removed without injury to the material by boiling for 1-2 days with 4-5% mineral acid. Ligninsulfonates yield on distn. by the Tollens method substances which form condensation products with barbituric acid. Am or Pr lignin prepd. either from wood or from  $\text{HCl}$ -lignin or from  $\text{AcOH}$ -lignin yields practically no  $\text{HCHO}$  in the Tollens distn. No  $\text{HCHO}$  is split off in the prepn. of lignin by  $\text{AmOH}$  and no  $\text{AcOH}$  by piperonylic acid. In the reaction with  $\text{AmOH}$  the  $\text{HCHO}$  is converted into diamyl methylal.

S. MOROGLIS

**Viscose. V. Quality of caustic soda, manufactured in Japan, from the point of view of the viscose industry.** M. NUMA. *Cellulose Ind.* (Tokyo) 4, 82-94(1928); cf. C. A. 21, 3458; 22, 2055.—The dissolving power of  $\text{NaOH}$  for the modified cellulose contained in pulp is diminished by the presence of  $\text{Na}_2\text{CO}_3$ . Small quantities of both  $\text{Na}_2\text{SO}_4$  and  $\text{NaCl}$  behave catalytically in assisting soln., but in large quantities their action is deleterious; the presence of sulfate, even in small quantity, renders the viscose film brittle. More than half the total quantity of  $\beta$ -cellulose in the original pulp is retained by the alkali cellulose after removal of the excess  $\text{NaOH}$ . The most satisfactory film is given by use of a  $\text{NaOH}$  soln. contg. the min. amts. of carbonate and sulfate and no insol. impurities such as alumina, Fe, silicates, etc.  $\text{NaCl}$  present to the extent of 3-5% has a beneficial effect on the film. Specifications for the compn. of  $\text{NaOH}$  to be used in the production of viscose are laid down. VIII. Effect of dialysis in relation to viscosity. T. MUKOYAMA. *Ibid* 109-12.—Viscose soln. (cellulose 4.03%, alkali 3.74%) which had ripened for 24 hrs. was subjected to dialysis, water or varying concns. (up to 6%) of caustic soda being used in the dialyzer. With water alone the viscose rapidly gelatinized, but with increasing concns. of caustic soda the viscosity of the viscose soln. fell progressively. X. G. KITA, R. TOMIHISA, K. SAKURADA AND H. KONO. *Ibid* 3, 27-31(1927); cf. C. A. 21, 2383.—The influence of the temp. in the prepn. and maturing of the alkali-cellulose was studied. The viscose from alkali-cellulose treated at  $25^\circ$  is easily spread on a glass plate, but the film becomes detached in the setting bath, whereas the viscose from alkali-cellulose prepd. at  $0^\circ$  is not easily spread. The tenacity and especially the extension of the film are adversely affected by storage of the alkali-cellulose at  $25^\circ$ , whereas they are not affected by storage at  $0^\circ$  and in both cases they increase similarly to a certain extent during the ripening of the viscose. With alkali-cellulose treated at  $8-10^\circ$  the viscose ripened at  $0^\circ$  is not easily spread, and requires some time in the setting bath, giving a white translucent film, whereas viscose ripened at  $20^\circ$  is readily coagulated, giving a semi-transparent film. Ripening at  $20^\circ$  induces spontaneous coagulation of the viscose after 5 days. When the viscose is ripened at  $0^\circ$  the tenacity and extension do not as a rule increase with the time of ripening. Alkali-cellulose aged for 5 days gives the highest results. Ripening the viscose at  $20^\circ$  gives films equal in tenacity and extension to those from viscose ripened at  $0^\circ$ . Alkali-cellulose prepd with 13% caustic soda lye gives inferior films to that prepd. with 25% or 30% lye; the viscose does not spread easily; the films are less transparent; and the tenacity and extension are poor. XI. G. KITA, R. TOMIHISA, K. SAKURADA, Y. NAKAMURA AND H. KONO. *Ibid* 117-25.—Viscose contg. 6% of cellulose was spun into a coagulating bath contg. 17.5% of  $(\text{NH}_4)_2\text{SO}_4$ , 8% of  $\text{H}_2\text{SO}_4$  and 7.5% of glucose, the influence of the time of aging of the alkali-cellulose and ripening of the viscose and the alk. of the viscose being studied. The viscose from alkali-cellulose aged only for a short time spins more easily under a high pressure, whereas that from more seasoned alkali-cellulose spins under a lower pressure. The viscose spins more easily as its ripening advances. The ease of spinning is measured by the speed; a speed of 57 m./min. is not easily obtainable when the alkali-cellulose has been aged for too short or too long a time, but is readily obtained with viscose from moderately aged alkali-cellulose. With the same viscose, differences in tenacity and elongation of the thread may be produced by differences in spinning speed and pressure owing to variations in the coagulation conditions, i. e., the velocity of the action of the bath on filaments of different thickness. The tenacity and elongation increase with the times of aging of the alkali-cellulose and ripening of the viscose up to a certain point, beyond which they remain constant or decrease slightly. It would not be right, however, to conclude that the increase in tenacity and elongation is dependent on the decrease in viscosity of the viscose which takes

place at the same time. XII. G. KITA, R. TOMIHISA, K. NAKAHASHI AND J. ONOHARA. *Ibid* 265-73.—In the progressive stages of ripening, the capacity of the viscose to give a continuous thread varies with the temp. of the coagulating bath between 30° and 60° in the sense that the ability to spin at the lower temps. covers a much smaller range of ripeness than at the higher temps. With under-ripe viscose this is due to difficulty of coagulation, whereas with over-ripe viscose, with rapid coagulation the threads become too fine to withstand the tension. A high temp. lowers the viscosity and facilitates the extrusion, but at the same time it increases the rate of coagulation so that the filaments may be finer. The tenacity of threads from the same viscose is generally greater the finer the filament, but the extensibility varies in the contrary direction. The properties of the thread change with the degree of ripening, for which there is an optimum point. In an  $(\text{NH}_4)_2\text{SO}_4$ -glucose bath, with  $\text{H}_2\text{SO}_4$  ranging from 4 to 12%, an under-ripe viscose first becomes capable of spinning with the higher concn. of acid, and with the higher concns. an over-ripe viscose first ceases to give a thread. The threads spun from under-ripe viscose in strongly acid baths are lusterless and voluminous. A similar relation exists with high concns. of  $(\text{NH}_4)_2\text{SO}_4$  as with high concns. of  $\text{H}_2\text{SO}_4$ , except that the threads spun from under-ripe viscose with strongly saline baths are lustrous; they have also good tenacity. With weaker concns. of  $(\text{NH}_4)_2\text{SO}_4$  the quality of the threads depends more intimately on the attainment of the optimum degree of ripening. XIII and XIV. G. KITA, K. NAKAHASHI, R. TOMIHISA AND J. ONOHARA. *Ibid* 4, 25-30, 31-4 (1928).—By the addn. of glucose, viscose may be spun after a longer ripening than when  $(\text{NH}_4)_2\text{SO}_4$  is used in the bath, while slightly increasing the quantity of glucose shortens the necessary time of ripening. Over-ripe viscose cannot be spun from a bath contg. a large quantity of glucose, the action of the latter being affected by the degree of ripening. For viscose spun from such a bath the tensile strength of the fibers is increased but the extensibility is diminished. In a bath contg. 8% of  $\text{H}_2\text{SO}_4$  a less ripe viscose may be spun than in one contg. much  $\text{Na}_2\text{SO}_4$ , while if 12% of  $\text{H}_2\text{SO}_4$  is used the opposite is the case.  $\text{Na}_2\text{SO}_4$  has no effect on the tensile strength and extensibility of the fibers. No special influence is exerted by  $\text{MgSO}_4$  of 6% concn., while with under-ripe viscose, in the initial stages of spinning, a 12% soln. increases the tensile strength. Fibers from a bath contg.  $\text{ZnSO}_4$  are at first colored yellow, but afterward decolorized. When 1-3% of the salt is present a less ripe viscose may be spun than when no  $\text{ZnSO}_4$  is added, but for a 5% soln. the opposite holds, *i. e.*, a less ripe viscose is more difficult to spin than when the salt is absent. The influence of  $\text{ZnSO}_4$  on the properties of the fibers depends on the properties of the viscose, but with a moderately ripened viscose fibers of increased extensibility and tensile strength may be obtained. XVI. Spinning. 6. Maturing of alkali-cellulose and its effect on spinning and on the properties of the threads. R. TOMIHISA. *Ibid* 113-6. — Alkali-cellulose which had matured at 12°, 20° and 25° for varying periods up to 3 days was xanthated and the resulting viscose solns., after ripening for varying periods, were spun into a bath contg.  $\text{H}_2\text{SO}_4$  10, dextrose 7.5, crystalline  $\text{MgSO}_4$  25.54, crystalline  $\text{ZnSO}_4$  5.34 and water 52.62 pts. at 45°. A study of the phys. properties of the filaments thus obtained indicates that (a) the longer the period of maturing of the alkali-cellulose, particularly at the higher temps., the longer must the viscose soln. be allowed to ripen to make it spinnable and the thicker are the filaments; (b) at the lower temps. the time of maturing of the alkali-cellulose has no great influence on the max. strength of the thread, but at higher temps. the more highly matured alkali-celluloses give a markedly weaker thread; (c) for the production of the strongest threads the alkali-cellulose should be matured for a moderate time at a medium temp.; (d) a less ripe viscose is required for the production of threads of max. stretch than is necessary for threads of max. strength; and (e) of two spinning speeds (23 and 46 m./min.) the higher gave the stronger threads. XVIII. Spinning. 8. G. KITA, R. TOMIHISA AND J. ONOHARA. *Ibid* 235-7.—Results are given showing that by maturing alkali-cellulose in H instead of air the viscose prepd. shows a higher viscosity, is more easily spun, and is capable, after suitable ripening, of giving stronger threads (2 g. per denier). Attempts to produce viscose threads of equal strength by shortening the time of maturing in air to 6 hrs at 25° were not successful. 9. G. KITA, J. ONOHARA AND K. MASUI. *Ibid* 237-41 — The time of maturing of the alkali-cellulose for the production of the strongest viscose threads depends on the duration of the steeping operation. Thus, with a steeping time of 3, 7, 14 days (at 7-11° in each case), the optimum maturing time of the alkali-cellulose at 25° was, resp., 3, 12 and 4 hrs. Under these conditions it is possible to prep. viscose threads of as high strength as is shown by viscose prepd. from alkali-cellulose matured in an atm. of H. B. C. A.

Turbidity and gelatinization of viscose caused by addition of chemicals. T. MUKOYAMA. *Cellulose Ind.* (Tokyo) 4, 170-7 (1928).—A viscose soln. (4.1% of cellulose

and 3.4% of alkali) was treated with various salt solns. and changes in turbidity and rate of gelatinization were examd. The  $\text{NH}_4^+$  ion tends to accelerate turbidity formation and gelatinization proportionally to the concn. used.  $\text{NaCl}$ ,  $\text{Na}_2\text{SO}_4$ , and glycerol are much slower in their action, and their effect is less sensitive to change in concn. Sulfate and sulfite ions restrain the gelatinizing effect of salt, especially when the Na salts are used.

B. C. A.

**New materials for the manufacture of artificial silk.** ANON. *Bull. Imp. Inst.* 27, 1-9(1929).—Results are given of an investigation into the suitability of *bagasse*, *sulfite pulp from Tasmanian stringy-bark* and *Phormium tenax* fiber as sources of cellulose for rayon. Bagasse from Trinidad in the form of fibrous chips and crushed cane in pieces of irregular size up to 5 in. in length contained  $\text{H}_2\text{O}$  10.8, ash 1.2 and cellulose 51.2 (57.4% on the dry basis). The fiber length was 0.6–5.0 mm. (av. 1.95) and the fiber diam. was 0.0152–0.0508 mm. (av. 0.0264). Cooking 3 hrs. at  $140^\circ$  with 20%  $\text{NaOH}$  at a concn. of 3% yield 48% of unbleached pulp, which furnished a pale grayish brown paper of excellent strength, contg. a no. of noticeable fibrous specks, probably derived from the nodes of the cane. With a light bleaching treatment, the yield was reduced to 40% (on the original material) of pulp which furnished a very pale cream-colored paper of similar character and strength to the unbleached paper; the small specks were only partially affected by the bleaching treatment. The paper in both cases exhibited the "rattly" character of paper produced from fibrous material contg. pithy matter. By mech. sepn. of the pith from the fibrous material, it would no doubt be possible to produce paper of very good quality. Cooking as above after removal of 33% of pithy material by mech. treatment yielded approx. 29% (43.5% on the mechanically treated material) of pulp contg. 0.22% ash and 78.75%  $\alpha$ -cellulose. Pulp of satisfactory quality for rayon manuf. was obtained by first freeing the air-dried bagasse as far as possible from pith by rubbing and sieving and then treating the material to a preliminary process of fractional digestion as follows: (a) Boil with water with continuous agitation, then filter through a coarse sieve; repeat the operation; this removes starches, sugars, sol. gums and other water-sol. matter, together with some more finely divided pith. (b) Boil with 1%  $\text{NaOH}$ ; the pith matter attached to the fibers swelled and could be fairly readily sepd. by agitation; repeat this operation and remove resins, fats, waxes, etc., together with pectose. (c) Wash further in water and finally free the material from almost the whole of the remainder of the pith by a light beating in the hollander. Cooking under the previously stated conditions yielded 68% of dry bleached pulp on the dry prep'd. material (approx. 26% on the dry original bagasse) which gave the following results on analysis:  $\text{H}_2\text{O}$  7.7, ash 0.14,  $\alpha$ -cellulose 86.1,  $\beta$ -cellulose 12.6,  $\gamma$ -cellulose 1.3%, Cu no. (by Braid's method) 0.56, phloroglucinol absorption 1.19%, soda absorption value 215,  $\text{Me}_2\text{CO}$  ext. 0.26%. Bleached sulfite pulp prep'd. in Australia from Tasmanian stringy-bark had the following compn. on the dry basis: ash 0.32%,  $\alpha$ -cellulose 88.6,  $\text{Me}_2\text{CO}$  ext. 0.44%, Cu no. (by Braid's method) 1.9, which indicates it would be suitable for rayon manuf. *Phormium tenax* fiber from New Zealand cooked under the previously stated conditions gave a 70.5% yield of dry bleached pulp (on dry fiber) which gave: ash 0.09,  $\alpha$ -cellulose 89.8,  $\beta$ -cellulose 7.0,  $\gamma$ -cellulose 3.1,  $\text{Me}_2\text{CO}$  ext. 0.12%, Cu no. 0.824. The compn. of the pulp compares very favorably with that of bleached sulfite wood pulp commonly used for rayon manuf.; but it seems doubtful whether it could compete with wood pulp, because of the value of *Phormium* tow for other purposes.

A. PAPINEAU-COUTURE

**Determination of the viscosity of pulp for rayon manufacture.** ERIK ÖMAN. *Tech. Hochschule, Stockholm. Papier-Fabr.* 26, 770-8(1928).—Pulp for this purpose is tested by prepg. viscose experimentally and detg. its viscosity. The viscosity of any sol depends upon the degree of dispersion of the colloidal particles which it contains. Hence the prepn. of the viscose for testing must be carried out in a standard manner such that all factors, other than the nature of the pulp tested, which might influence the degree of dispersion of the cellulose, are avoided or maintained const. Otherwise concordant results cannot be obtained. After careful tests the following method has been adopted, and is recommended: The sample of (sheet) pulp is cut in 0.5 cm. squares. An air-dry sample equal to 0.900 g. oven-dry is treated with 10–20 cc. of 18%  $\text{NaOH}$  in a 25-cc. weighing bottle, and allowed to stand 2 hrs. in a thermostat at  $20^\circ$ . It is then sucked as dry as possible on a glass filter and pressed between linen cloths backed with filter paper, with a total pressure of 2000 kg. The cake is broken up and spread on the bottom of a 350-cc. bottle, in which is put an evapg. dish contg.  $\text{CS}_2$ . Bottle and dish should sit perfectly level, and the amt. of  $\text{CS}_2$  present should be such that some remains unevapd. after the treatment. The stoppered bottle with its contents are kept at  $20^\circ$  for 6 hrs., when the dish is removed and 100 cc. of 4%  $\text{NaOH}$  soln. contg. 0.40 cc. of  $\text{CS}_2$  is added

to the pulp. After standing for 17 hrs. the bottle is strongly shaken and allowed to stand 28 hrs. more. This latter time can probably be much reduced. The viscosity is detd. at  $20^\circ = 0.05$ , in an Ostwald pressure viscometer of the influx type; the use of an efflux viscometer may introduce a large mech. error due to adherence in the upper capillary and bulb. It was found experimentally that drying the pulp at  $130^\circ$  decreases the viscosity, while soaking increases it. Rapid cutting in the beater gives a considerable increase in viscosity. The pressing is important; if 7 g. of mercerizing soln. were left in the pulp the viscosity obtained was 6, whereas if all but 2 g. were pressed out the viscosity rose to 12. It is also necessary that the soln. be evenly distributed through the pulp. This effect of NaOH is ascribed to a rather mech. protective action on the fibers. Treatment with  $\text{CS}_2$  gas gives more uniform results than the use of liquid. If the bottle used is too large or the amt. of  $\text{CS}_2$  too small, low values are obtained. The directions given should be followed closely.

R. H. DOUGHTY

Proposed method for the quantitative determination of pitch in wood pulp. ROGER C. GRIFFIN. Arthur D. Little, Inc. *Paper Trade J.* 88, No. 9, 45; *Paper Mill* 52, No. 8, 38(1929).—A detailed description of the method which is being worked upon with a view to developing an official method to be adopted by the Tech. Assoc. of the Pulp and Paper Industry.

A. PAPINEAU-COUTURE

The Keebra process. LINN BRADLEY AND EDWARD P. MCKEEFFE. Bradley-McKeeffe Corp., New York. *Paper Trade J.* 88, No. 8, 131-3(1929).—A brief general discussion of the process (in which wood is pulped with a liquor contg.  $\text{Na}_2\text{SO}_3$  as the main chem. constituent) and its various modifications (addn. of one or more of the following chemicals:  $\text{NaHSO}_3$ ,  $\text{Na}_2\text{S}$ ,  $\text{NaOH}$ ,  $\text{Na}_2\text{S}_2\text{O}_8$ ,  $\text{Na}_2\text{CO}_3$ ,  $\text{NaHCO}_3$ ,  $\text{Na}_2\text{SO}_4$ ,  $\text{NaCl}$ ).

A. PAPINEAU-COUTURE

Observations on spruce "bull wood" and on sulfate and sulfite pulp made therefrom. S. ULFSPARRE. *Svensk Pappers-Tid.* 31, 642-4(1928).—"Bull wood" differs from ordinary wood in having a darker and brownish color and in being harder. The annual rings are relatively wide with light colored spring growth and reddish summer growth. Sp. gr. is 0.72. Analysis shows that spruce bull wood has a higher lignin content than ordinary spruce wood with consequent greater soly. in alkali and a lower resin content; it contains 52.30% C and 6.01% H against 50.05% C and 6.08% H for ordinary spruce. The cellulose content of bull wood is only 41%. In the sulfate pulping trials 155 g. of chips contg. 6-8% moisture were put in a rotating, electrically heated, Fe autoclave of about 1 l. capacity. To this was added 775 cc. of liquor contg. 175 cc. of NaOH soln. equiv. to 84.6 g.  $\text{Na}_2\text{O}$  per l.,  $\text{Na}_2\text{CO}_3$  2 g. per l.,  $\text{Na}_2\text{S}$  33.0 g. per l. and 600 cc. distd. water. The NaOH was purified by alc., and the  $\text{Na}_2\text{S}$  was c. p. as com. white liquor attacked the digester and gave a colored pulp. The digesting was continued for 30 mins. at  $20-100^\circ$ , 90 mins. at  $100-170^\circ$ , and 105 mins. at  $170^\circ$ . The digester was given half a turn every 7.5 mins. The resulting pulp was washed free from alkali and then dried. The quality of the yield from the bull wood was poorer than that from the ordinary spruce or pine wood. The sulfite test was conducted partly in a rotating electrically heated steel digester of 55 l. capacity, and partly in a Pb-lined 1 l. autoclave similar to that used in the sulfate digestion. Other treatment was about the same as in the sulfate process. The steel digester yielded bull wood pulp of darker color, of poorer yield, of less strength and of greater ash content than pulp from ordinary spruce wood. The pulp from the Pb-lined autoclave showed similar results. Tables give detailed numerical data. Pulp made from wood contg. 10% bull wood had a characteristic grayish brown color.

W. SEGERBLOM

Utilization of wood waste and "waste" woods through the semi-chemical pulping process. C. E. CURRAN. Forest Products Lab., Madison, Wis. *Paper Trade J.* 88, No. 5, 66-8(1929).—Expts. are described in the application of the semi-chem. process (impregnating the chips under pressure with a soln. of  $\text{Na}_2\text{SO}_3$  and  $\text{NaHCO}_3$ , removing the excess liquor, and cooking only with the reagents absorbed, the softened chips being then reduced to pulp by appropriate refining). Semi-chem. pulps from these sources are suitable for incorporation in various types of paper boards, including insulating boards, replacing more expensive pulps and thus offering an outlet for raw materials that at present are largely economic wastes.

A. PAPINEAU-COUTURE

Determination of the chlorine consumption number (of pulp). M. KLEINSTUCK. *Wochbl. Papierfabr.* 59, 666-9(1928).—Directions for the prepn. of a standard NaOCl soln. for this purpose are given.

R. H. DOUGHTY

Physical standards for pulp. H. A. ROTHCHILD. Kimberly-Clark Corp. *Paper Mill* 52, No. 8, 118, 120(1929); *Paper Trade J.* 88, No. 11, 52-3(1929).—The large variety of testing methods and varied preferences of different operators make the general adoption of a definite standard method almost impossible. It is therefore suggested

that pulps be evaluated by comparing with a standard sample which is subjected to the same testing procedure as the pulps which are to be evaluated. A. P.-C.

The proposed standard method of pulp evaluation. H. AINSWORTH HARRISON. *World's Paper Trade Rev.* 91, 1016, 1022-6, 1194-1206, 1282-96(1929); *Paper Maker & Brit. Paper Trade J.* 77, 368-74(1929).—A description of the method for detg. the initial, or unbeaten, strength of pulp proposed for adoption as international standard by the Technical Section of the Paper Makers' Assoc. of Gt. Britain, followed by a discussion by the members present at the meeting. A. PAPINEAU-COUTURE

Factors in the sizing of paper pulp. RENÉ ESCOURROU. *Chimie et industrie* 20, 1039-42(1928).—A brief discussion of the effects of the chief factors involved in sizing: water,  $p_H$  value, rosin, stock and impurities. A. PAPINEAU-COUTURE

Further research and experiment in pulp drying. R. D. KEOH. *Pulp Paper Mag. Can.* 27, 273-6(1929).—A discussion of the merits of the Fidalgo Drying System, which consists in sheeting the pulp on a Kamyrt wet machine, shredding the moist sheet, drying the shredded pulp and baling it for shipment. A. PAPINEAU-COUTURE

A semi-automatic sheet machine for pulp strength testing. HELLM. SCHWALBE. *Paper Trade J.* 88, No. 5, 63-5(1929).—In order to obtain the thorough mixing required for the production of a uniform and satisfactory test sheet, a stirring chamber is mounted directly over the wire on which the sheet is formed and is provided with an electrically driven agitator. In order to transfer the stock from the round stirring chamber on to the rectangular wire, the 2 are connected by a suitably shaped connecting chamber inside which are vanes which in the upper part are parallel to the short side of the wire and in the lower part are parallel to the long side. While the pulp is being stirred in the stirring chamber, the connecting chamber is filled with water; and when stirring is completed (5 mins.), the slide between the mixing chamber and connecting chamber and the drain valve are opened simultaneously. At the end of 5 mins. the underframe of the sheet machine is lowered, the sheet mold is taken out and the sheet is couched off with only the wt. of the sheet mold, no hand pressure being applied. Results of tests made on sheets prepd. with this machine are given, showing that the sheets are much more uniform than with other sheet machines, the deviation of individual tests from the mean very seldom exceeding 5%. A. PAPINEAU-COUTURE

Testing the strength of pulp. GOSTA HALL. *Svensk Pappers-Tid.* 32, 151-8(1929).—A résumé of methods used in America and a report on standardizing the methods used in Sweden. WILHELM SEGERBLOM

Strength testing of chemical pulp. Comparison of beating tests with the Abbé pebble mill and a new metal ball mill. GOSTA HALL, Korsnas Wood Pulp Mills, Gefle, Sweden; AND WILLIAM S. WOODSON, JR., Albemarle Paper Mfg. Co., Richmond, Va. *Paper Trade J.* 88, No. 4, 51-5(1929).—Results are given of comparative beating tests on strong unbleached sulfate and bleached sulfite pulps with the Abbé pebble mill and the new Abbé metal ball mill. In order to be able to replace the pebble mill directly with the ball mill without requiring any change in the drive of the app., the new mill was adjusted to 60 r. p. m.; but this speed proved unfavorably slow, because in order to get a sufficiently quick beating action it was necessary to use very large metal balls (25 1-in. and 10 1.25-in. balls) which caused excessive shortening of the fibers in the beating. The temp.,  $p_H$  and freeness of the stock were detd. at the beginning and end of each run, and the test sheets were tested with the Gurley densimeter, Schopper folding and tensile strength testers and Elmendorf tearing tester. The action in the pebble mill is characterized as primarily a tearing-up of the fibers, while that of the ball mill is a crushing and shortening of the fibers. Ball-mill beating therefore gives a paper of higher d. than pebble-mill beating, although higher degrees of beating (as measured in the Williams freeness tester) are reached with the pebble mill at all beating intervals; the same pulp beaten in the ball mill gives constantly a paper of higher d. With continued beating the ball-mill beaten pulp is throughout superior to the pebble-mill beaten pulp as regards both bursting strength and breaking length, in the case of both sulfate and sulfite pulps, showing that the d. follows the changes in strength more closely than the degree of beating. The tensile and bursting strength curves accompany each other closely, and these 2 strength properties can be considered parallel functions of the beaten conditions; and it is shown that if a paper of high bursting and tensile strength is wanted the beating should aim at a combination of crushing and moderate shortening of the fibers, the small fiber fragments which form an unavoidable by-product in any beating probably contributing to a high tensile and bursting strength by closing the paper structure and cementing the fibers together. The losses of fiber fragments on the sheet mold often affect the max. in bursting and tensile strength which the beating curves show, so that it is necessary to standardize both the fineness of the wire cloth and the suction

applied in order to get concordant results. The folding-strength curves of the sulfate pulp show that pebble-mill beating gives a more pliable paper than ball-mill beating; but the bleached sulfite did not show the same results because, due to the rubbing between the pebbles, the fibers are curled and kneaded together into lumps and knots which lower the strength. Judging from the tearing-strength curves the heavy balls of the bronze mill caused a pronounced shortening of the fibers; but this was not revealed in the photomicrographs. No final conclusions as to beating action of the metal ball mill can be drawn from these preliminary tests, because too large balls were used. Further expts. in Sweden have shown that excessive shortening of the fiber can be avoided and the beating action modified by using smaller balls (e. g.,  $\frac{3}{8}$  in. diam.) and running at higher speeds. The increase in ash was 0.1% in the ball mill and 0.4% in the pebble mill, which could have no influence on the results of the strength tests. An av. of 7° F. rise in temp. was measured in a 4-hr. ball-mill run with sulfate pulp as against 5° F. in the corresponding pebble-mill run. The  $p_H$  value changed from 7.6 to 7.8 in the pebble mill and from 7.6 to 8.0 in the ball mill during the same 4-hr. run with unbleached sulfate, the difference being attributed to more thorough "squeezing" of the fibers in the ball mill, whereby a larger portion of the alkali absorbed by the pulp is brought into soln. From a general comparison between the variations of individual strength properties, the bursting strength appears to be the most consistent exponent of the strength, the bursting test giving the most concordant results, while the folding endurance shows the largest deviations between duplicate detns.

A. P.-C.

**Utilizing groundwood rejections.** W. E. BROWN. Pejepscot Paper Co., Brunswick, Me. *Paper Mill* 52, No. 8, 142-6; *Paper Trade J.* 88, No. 11, 63-4; *Pulp Paper Mag. Can.* 27, 353-5(1929).—A brief discussion pointing out certain paths of investigation for elimination and greater utilization of groundwood rejections. Tailings utilization eliminates a source of stream pollution, conserves raw materials and tends to extra profits for the mill. The first step in the utilization of tailings is to study the mill operation in detail and keep all forms of rejections down to a min. Studies should be made into more efficient methods of handling rejections, both for use in the mill and for shipment to distant points. Further investigation is necessary to find addnl. uses to which tailings may be put. Various types of groundwood tailings refiners are available, and these are briefly described.

A. PAPINEAU-COUTURE

**Invisible shrinkage (in pulp and paper mills).** A. W. PESCH. Falls Mfg. Co. *Paper Mill* 52, No. 8, 42, 158, 168; *Paper Trade J.* 88, No. 12, 61-2(1929).—"Shrinkage" (or more accurately "waste") through loss of fiber in white water should be detd. directly as accurately as possible, and not merely estd. by assuming a certain yield of pulp per "cord" or per cook and considering that the difference between the fiber production estd. in this manner and the amt. of fiber in the finished paper is lost in the white water. Any appreciable difference between the estd. and directly detd. white water loss should be carefully investigated to ascertain the cause of the discrepancy. The estd. loss is frequently much too high because the assumed yields are too high.

A. PAPINEAU-COUTURE

**Measurement of white-water flow with V-notch weirs and white-water analysis.** H. L. JOACHIM. Container Corp. of America, Philadelphia, Pa. *Paper Trade J.* 88, No. 1, 61-3(1929).—A brief discussion of the construction and use of V-notch weirs for measuring white-water flow in pulp and paper mills, and of the methods and value of white-water analysis, the detns. of greatest value to paper mills being total solids, total suspended material, total sol. material, sol. org. material, sol. mineral material, suspended org. material and suspended mineral material.

A. PAPINEAU-COUTURE

**Slime control (in pulp and paper mills) with chlorine and compounds of chlorine.** C. M. BAKER. Am. Paper and Pulp Assoc., Madison, Wis. *Paper Trade J.* 88, No. 2, 50-2(1929).—Concrete examples are given of the manner in which slime troubles were eliminated in 12 mills mfg. various grades of paper and board by judicious use of Cl. A review is given of the literature dealing with slime in pulp and paper mills. Conclusion: Chlorination is practical, effective and apparently inexpensive for a given operation, but owing to differences in the conditions in different mills, each mill is a sep. problem and should be studied individually.

A. PAPINEAU-COUTURE

**Artificial plastics in pulp and paper.** CHARLES W. RYVISE. *Paper Mill* 52, No. 8, 148-52; *Paper Trade J.* 88, No. 12, 62-4(1929); *Plastics* 5, No. 5, 261-2, 269-71(1929).—A brief review of the uses of artificial plastics in the paper industry, particularly for sizing.

A. PAPINEAU-COUTURE

**Research in pulp and paper work.** B. A. MELBY. *Paper Industry* 10, 1940-3(1929).—Report of the research committee of the Technical Society of the Norwegian Paper industry, describing the work done during 1923-28.

A. PAPINEAU-COUTURE

**Pulp and paper research in Canada.** E. P. CAMERON. Forest Products Labs. of Canada, Montreal. *World's Paper Trade Rev.* 91, 582-8(1929). A. P.-C.

**Sulfite pulp manufacture from sawmill waste.** ANON. *Wochbl. Papierfabr.* 59, 1395-6(1928).—Experience showed that such wood (slabs and edgings) was entirely unsuited for the manuf. of high-grade pulp, even though it was sorted by hand to remove all bark. R. H. DOUGHTY

**Bleaching sulfite pulp.** L. Rys. Eichmann & Co., Sandhübel, Schliesen, Czechoslovakia. *Paper Trade J.* 88, No. 1, 65-72(1929).—See C. A. 22, 3526. A. P.-C.

**Alkali-soluble components of sulfite pulp and artificial silk.** W. WELTZIEN. *Russä* 4, 367-73(1929).—See C. A. 22, 4802. A. PAPINEAU-COUTURE

**Washing and treatment of sulfite pulp.** ERIK ÖMAN. *Papier-Fabr.* 26, Fest-u. Auslands-Heft, 92-6(1928).—The pH of water used for washing was controlled between 5.3 (the normal value) and 8.1, by the continuous addn. of milk of lime soln. of 2° Bé., in a series of mill-scale expts. A pulp which had been given an alk. wash gave a better sized paper, and one which was somewhat softer and better in color than that washed on the acid side. The latter was, however, much more suitable for conversion to grease-proof paper. R. H. DOUGHTY

**The distribution of steam and warm water in sulfate pulp plants.** JONAS BOJJA. *Svensk Pappers-Tid.* 32, 49-52(1929).—Four uses for warm water and 9 sources of warm water in sulfate pulp plants are enumerated. The calcn. of the distribution of heat in these sources and uses is described. Similar data are given for the steam requirements. W. SÖGERBLÖM

**Chemistry of sulfite pulping. X. Determination of the degree of pulping.** ERIK HÄGGLUND. *Papier-Fabr.* 26, Fest-u. Auslands-Heft, 88-92(1928); cf. C. A. 23, 701 and following abstr.—The true measure of the degree of pulping (conversion) of an unbleachable sulfite pulp is the lignin content. It is shown that when the Sieber or Enso Cl no., or the Tingle Br. no. of several pulps are plotted against the lignin content, a straight line relation is obtained, over the range 2-7% lignin. The Roschier KMnO<sub>4</sub> no. gives a linear relation between 4 and 7% lignin, while the Björkmann KMnO<sub>4</sub> no. gives a curved line relation through the range studied. This behavior indicates that the ease with which a lignin is oxidized depends upon the degree of sulfonation, and also that the reaction of bleaching with hypochlorites is more than a simple oxidation effect. Under const. pulping conditions there is a definite relation between strength and lignin content of pulps. In those studied, a pronounced strength max. was found at about 5% lignin content. R. H. DOUGHTY

**Studies on the chemistry of sulfite pulping.** ERIK HÄGGLUND. *Papier-Fabr.* 27, 49-54(1929); cf. preceding abstr.—An address, reviewing and summarizing the published work of H. and his associates on this subject. R. H. DOUGHTY

**(Sulfite) pulping with hot water as a heating agent.** LEO FRIEDLÄNDER. *Papier-Fabr.* 26, 789-91(1928).—Indirect heating with H<sub>2</sub>O at 6-8 atm. under forced circulation is compared with direct and indirect heating with steam. The use of water should give the advantages of both the Mitscherlich and quick-cook sulfite processes, while avoiding many of their disadvantages. R. H. DOUGHTY

**Straw and the monosulfite process.** RAYMOND FOURNIER. *Papeterie* 51, 14-8 (1929).—A brief description and discussion of the Braun process (cooking with Na<sub>2</sub>SO<sub>3</sub>, NaOH and Na salts of weak acids such as Na borate or preferably silicate). F. considers that, although the process gives a fine pulp, it is questionable whether it is any more economical than, or possesses other advantages over, the de Vains and other halogen processes. A. PAPINEAU-COUTURE

**Paper pulp and cellulose from the eucalypts by the sulfite process.** L. R. BENJAMIN AND J. L. SOMERVILLE. *Australia Council Sci. and Ind. Res. Bull.* No. 37, 5-67 (1928); cf. C. A. 22, 3776.—The production of pulp from several species of *Eucalyptus* suitable for newsprint was studied on a lab. scale. The best pulp was produced by cooking for 5½-6 hrs. at 140° with liquor contg. 1.6% of combined and 3% of free SO<sub>2</sub>, using 1000 Imperial gallons of liquor per 2000 lbs. of oven-dry chips. *E. regnans* and *obliqua* were most satisfactory for yield and strength of newsprint. The latter, properly cooked, yields a pulp, when bleached, of 88.6% α-cellulose and 0.24% ash content suitable for viscose. *E. delegantensis* (gum top) was less satisfactory for newsprint but suitable for other purposes. The shorter cooking period compared with spruce, fir, etc., is attributed to the lower lignin contents of the eucalyptus and to the greater accessibility of the lignin to the liquor since the ultimate cells are shorter, finer and thinner-walled. Details of tests with *Pinus insignis* and *Acacia dealbata* (silver wattle) and photomicrographs of the various pulped fibers are given. F. A. SIMMONDS

**Sulfite digester operation.** F. HAYWARD JOHNSON, JR. Cherry River Paper Co.

*Paper Mill* 52, No. 8, 170-4(1929); *Paper Trade J.* 88, No. 11, 57-9(1929).—A discussion of the cooking schedule followed at the Richwood mill of the Cherry River Paper Co., explaining the reasons of the various steps. A. PAPINEAU-COUTURE

Conical covers of digesters. F. VON ZEIPPEL. *Svensk Pappers-Tid.* 31, 820-2 (1928); cf. *C. A.* 20, 3813; 22, 1849, 2083, 4809, 4810.—Four diagrams and 9 formulas are given for conical covers. W. SEGERBLOM

Sixty years' operating advancement in the sulfite industry. T. L. DUNBAR. Canadian Stebbins Engineering and Manufacturing Co. *Pulp Paper Mag. Can.* 27, 317-9(1929); *Paper Trade J.* 88, No. 9, 46-8(1929).—A brief outline of the progress and development of the sulfite pulp industry since its inception by Tilghman, with a short discussion of 3 recent improvements in sulfite equipment: digester fillers, liquor circulating systems and hot liquor and gas recovery. A. PAPINEAU-COUTURE

The chemical reactions during pulping by the alkali method. H. E. WAHLBERG. *Svensk Pappers-Tid.* 32, 44-9(1929).—A résumé of the equations which have been proposed by various investigators to show the reactions involving cellulose, lignin and hemicellulose in the alkali pulping process. Several graphs and illustrations of mol. structure accompany the article. W. SEGERBLOM

Control of the progress of the cooking processes in the pulping industries. ERIK HÄGGLUND. *Svensk Pappers-Tid.* 32, 84-8(1929).—The properties of both the cooking liquor and of the pulp must be controlled. Various methods in general use for the taking of samples and for their examn. are described briefly. Conclusion: The Bjorkman modification of the Roschier method gives the best results. W. SEGERBLOM

The dependence of hardness of sizing on the degree of beating. JOHANNES BERGER. *Paper Maker & Brit. Paper Trade J.* 76, Annual No. 59-61(1928).—The hardness of sizing of a no. of papers of different degrees of beating was compared with a no. of groundwood-free printing papers of different degrees of sizing. The floating method was used in every case to det. the degree of sizing, and each sample was subjected to 4 tests, using, resp., (1) 0.1% NaOH and dry phenolphthalein indicator, (2) 1%  $\text{NH}_4\text{CNS}$  and  $\text{FeCl}_3$  indicator, (3) tannic acid soln. with powd.  $\text{FeCl}_3$  indicator and (4) a soln. of ink. The quarter- and half-sized papers are surpassed in hardness of sizing by papers of a lower degree of beating. Resistance to penetration by ink increases with increase in beating, especially between the degrees of beating of 50-70 (Schopper-Riegler), where the slump character of the mucilage begins to be manifested. As the degree of beating increases from 10 to 94, the capacity for resisting penetration by the testing liquid increases approx. 365, 98, 90 and 10,000 times, resp., by the different methods used; while the completely sized printing paper was 27, 33, 18 and 1500 times more resistant than the unsized paper, when tested by the 4 methods, resp. The method using NaOH initially gives more favorable results than with ink, but with a more lengthy contact with the testing liquid the values become inferior, because of the detrimental action of the NaOH on the sizing of the paper, the alkali apparently having a solvent action on both rosin and cellulose-mucilage sizing. Methods (2) and (3) differ considerably in the results compared with the method using ink, and it is considered that the use of either ink or NaOH with phenolphthalein as indicator affords the best means of gaining an insight into the extent of sizing. A. PAPINEAU-COUTURE

Pulping of annual grasses, etc., by the chlorine process. J. L. SOMERVILLE AND L. R. BENJAMIN. *J. Council Sci. Ind. Research* 1, 217-26(1928).—A comparison is made of the soda, de Vains and Cataldi processes as applied to the pulping of annual grasses. In the de Vains process the best cooking and chlorination conditions were: NaOH equiv. as a % of the oven-dry pulp, 0.192; initial concn. of  $\text{Cl}_2$ , 5 g. p. l.; consistence of pulp during chlorination, 4.1; cooking time, 2.5 hrs.; yield of bleached pulp, 51.4% of oven-dry cane; cellulose content, 73.3%; Cu. no. 0.67. The alk. treatment of the chlorinated pulp consisted of washing and heating with about 0.06 g.-equiv. of NaOH or  $\text{Na}_2\text{CO}_3$ . The consumption of alkali was nearly 0.03 g.-equiv. of NaOH per 100 g. of oven-dry cane. The use of black liquor for this alk. treatment resulted in an increase of 50% in the  $\text{Cl}_2$  consumption during the bleaching. The pulp thus produced is very white, contains 71%  $\alpha$ -cellulose, and a very low Cu. no. The paper made from the unbeaten pulp has properties of rattle, hardness, translucency, lack of absorbency, close texture and a bursting strength of 82 points per lb. per ream due to great fiber length. Screening the pulp on a 60-in. sieve reduced the yield but gave a softer and more pliable paper. Bond paper made from the pulp had a bursting strength of 110 points per pound per ream ( $25 \times 40-500$ ), excellent color, good formation, but is hard and insufficiently pliable. In view of these tests the authors are doubtful that de Vains straw pulp will be extensively used in newsprint. F. A. SIMMONDS

Relation of pulp-stone grit to quality of fiber. LANGDON S. SIMMONS AND BERNARD



**BORNSTEIN.** The Norton Co., Worcester, Mass. *Paper Mill* 52, No. 8, 100-4; *Paper Trade J.* 88, No. 10, 50-2(1929).—A discussion of the influence of the size of grit of natural sandstone and of Norton artificial pulp stones together with the type of burring on the quality of the fibers produced. **A. PAPINEAU-COUTURE**

**Pulp-stone grit in mechanical pulp.** EDWIN A. RILEY. Pejepscot Paper Co., Brunswick, Me. *Paper Trade J.* 88, No. 8, 171(1929).—A brief discussion of the degree of contamination of groundwood by grit from the stones, and of its elimination from pulp required for semi-fine papers. **A. PAPINEAU-COUTURE**

**Mill research.** VANCE P. EDWARDS. Northwestern Pulp & Paper Co., Astoria, Ore. *Pulp Paper Mag. Can.* 27, 69-70(1929).—The possibilities of mill research are strikingly exemplified by listing the results actually accomplished in a particular sulfite mill by keeping a continuous record of operating conditions and carefully studying the results. The strength of the finished pulp was shown to vary as the  $H_2O$  content of the chips, which varied according to the relative soundness of the wood, the older wood being the drier. Increasing chip length of both hemlock and spruce from  $\frac{1}{2}$  to 1 in. reduced sawdust loss and correspondingly increased digester yield, the approx. saving being \$0.23 a ton.  $SO_2$  consumption varied inversely as the  $SO_2$  concn. of the burner gases. By studying the relationship between the degree of pulping (as measured in the lab.) and yield, cost and bleachability of the pulp, standard cooking conditions were worked out which reduced the cost of pulp \$1.85 per ton and increased the mill output over 1 ton per day. Adoption of arbitrary standards of pulp quality in connection with digester control brought the pulp rating from an av. of 70% to 95% in less than 1 yr., and digester steam consumption was reduced about 40%, reducing steam cost per ton and increasing the boiler plant efficiency. **A. PAPINEAU-COUTURE**

**Alternating current motors in the paper industry.** ERNST BLAU. *Papier-Fabr.* 26, 791-3(1928).—General. **R. H. DOUGHTY**

**Air in steam, and a new apparatus for removing air from drier cylinders.** v. LASSBERG. *Papier-Fabr.* 27, 33-9(1929).—Data are given illustrating the fact that boiler water may contain considerable dissolved gas, and that the accumulation of this gas in the driers is detrimental to proper operation. A new app. (Lütschen-Entlüfter) for venting steam lines and driers is described. **R. H. DOUGHTY**

**Removal of condensate from rapidly revolving drying cylinders by means of centrifugal force.** E. ÖMAN, N. SUNDSTEDT AND E. ÖSTNÄS. Royal Technical High School, Stockholm. *Svensk Pappers-Tid.* 31, 710-2, 746-8(1928).—The interior of the drying cylinder is supplied with longitudinal grooves sloping toward a circular chamber on the outlet side, from which the condensate is removed through the trunnion by means of a scoop. The theory of action is shown by several diagrams. Approx. the same temp. of the drying cylinder's surface resulted whether the water was removed as rapidly as possible or whether the inner surface of the cylinder was covered with a film of water. **W. SEGERBLOM**

**Recent developments in the use of chain-grate stokers.** PRADEL. *Papier-Fabr.* 27, 8-13(1929).—P. considers this type of boiler firing as superior to the use of powd. coal. Notes on proper plant construction and operation are given. **R. H. DOUGHTY**

**Multi-motor drive for a fine-paper machine.** HEINRICH KUHN. *Papier-Fabr.* 27, 17-22(1929).—A general discussion. Curves are given showing the relations between speed and voltage, paper weight and power consumption, also the power consumption of the sep. parts for several weights of paper, as detd. on a typical machine. **R. H. D.**

**Bibliography of paper making for 1928.** CLARENCE J. WEST. Natl. Research Council, Washington, D. C. *Paper Trade J.* 88, No. 8, 173-231(1929). **A. P.-C.**

**The importance of aluminum sulfate in paper manufacture.** HELM. ROSCHNER. *Papier-Fabr.* 26, 757-61(1928).—See C. A. 22, 3776. **R. H. DOUGHTY**

**Bamboo (for papermaking).** W. RAITT. *Proc. Tech. Sect. Papermakers' Assoc.* 8, 89-98(1927).—Claims that bamboo is a practically inexhaustible source of paper pulp are advanced. The earlier difficulties of prepg. bleached bamboo pulp have been overcome and the waste due to nodes has been eliminated by crushing. By adopting fractional digestion in conjunction with the sulfate-soda process it is possible using 16% of soda for 5 hrs. at 24 lbs. per sq. in. to obtain a 45% yield of pulp requiring only 8% of bleaching powder (yield of bleached pulp 42%). It is estd. that unbleached bamboo pulp could be delivered at British ports for about \$56 per ton. **F. A. SIMMONDS**

**Colloids in paper making.** J. CHARVET. *Papeterie de Rives. Papier* 32, 41-52(1929).—A brief discussion of the properties of colloids used in paper making, particularly gelatin and also fillers. **A. PAPINEAU-COUTURE**

**Pine wood for paper making.** J. A. FOURMYER. *Bull. Inst. pin.* No. 57, 82-4(Feb.,

1929).—A brief discussion of the advantages of the production of groundwood and newsprint in the Landes from maritime pine.

A. PAPINEAU-COUTURE

(The paper-making qualities of) *Pinus hamiltoni* (Corte's Pino maritimo). IGNACIO ECHEVERRIA and SIMÉON DE PEDRO. *Bull. inst. pin.* No. 57, 55-7 (Feb., 1929).—This is a variety of *P. maritimus*. The av. of 4 analyses gave:  $H_2O$  59.60,  $EtOH-Et_2O$  ext. 0.688 (1.699 on dry basis), cellulose 21.55 (53.36% on dry basis). Cooking 2 kg. of wood for 14 hrs. at a pressure of 4 kg. per sq. cm. with 400 g. NaOH and 200 g.  $Na_2S$  in 8 l. of water gave a 23% yield of hard pulp, which was difficult to bleach. The fiber length was 3 mm. and diam. 0.045 mm.

A. PAPINEAU-COUTURE

Paper-making qualities of mangrove wood. L. VIDAL and M. ARIBERT. *École Française de Papeterie, Grenoble. Agronomie Coloniale* 17, 203 (1928); *Bull. Imp. Inst.* 26, 493 (1928).—Three species of mangrove from Madagascar were studied, the pulping tests being carried out with 25% NaOH (on the wt. of the wood) at a concn. of 18° Bé. for 8 hrs. under a pressure of 5 kg. *Rhizophora mucronata* ("Honkolahy") had a d. of 0.94, cellulose 48.2% and  $EtOH-Et_2O$  ext. of 4.5%, and gave 47% of pulp which was very difficult to bleach (yielding 42% of bleached pulp). *Bruguiera gymnorhiza* ("Tsilolona") had a d. of 0.95, cellulose 46.0% and  $EtOH-Et_2O$  ext. 2.9%, and yielded 46% of pulp which was extremely difficult to bleach (yielding 39% of bleached pulp). *Ceriops boiviniana* ("Honkovavy") had a d. of 1.03, cellulose 45.0% and  $EtOH-Et_2O$  ext. 4.9%, and yielded 47.5% of pulp which was even more difficult to bleach than the preceding ones. Satisfactory pulping of these woods would demand such severe treatment that the cost would be prohibitive, and the papers which they furnish are very weak. The manu. of bleached pulp would be impracticable; but it might be possible to produce a coarse unbleached pulp suitable for wrapping paper.

A. PAPINEAU-COUTURE

Improvements in coated paper manufacture. FRANK W. EGAN. John Waldron Corp. New Brunswick, N. J. *Paper Mill* 52, No. 8, 128-34; *Paper Trade J.* 88, No. 10, 53-6 (1929).—A brief outline of the improvements which have been made in paper coating method and equipment during the last 30 yrs or so.

A. PAPINEAU-COUTURE

Mill water supplies and waste (in the paper industry). C. M. BAKER. American Paper and Pulp Assoc. *Paper Mill* 52, No. 8, 40, 44, 176, 178; *Paper Trade J.* 88, No. 12, 64-6 (1929).—From a discussion of the relation between white water utilization and quality and quantity of the mill water supply, B. concludes: (1) The recirculation and utilization of white water directly affects water supply developments and purification in that it materially reduces the amt. of fresh water required, thus resulting in a substantial saving in pumping costs, capital investment and the cost of treatment. (2) The first step in any water supply development or improvement should involve a careful study or survey in white water utilization in order to reduce the quantity of water necessary to a min. (3) Reduction in water consumption correspondingly reduces the vol. of wastes that it is necessary to discharge into water courses, thus improving stream conditions, and should this improvement be inadequate, the cost of treatment of the residual wastes would be proportionately less.

A. P.-C.

Stuff preparation. J. J. O'CONNOR. Mead Pulp and Paper Co. *Paper Mill* 52, No. 8, 108, 110 (1929).—A brief discussion of the importance of devising tests which will give a practical valuation of the raw material, as such and in the course of prepn., for any particular grade of paper.

A. PAPINEAU-COUTURE

The Delthirna sizing process. P. DELCROIX. Papeteries Navarre. *Papier* 32, 73-83 (1929); cf. *C. A.* 22, 1853.—An account of the results obtained in the actual application in mill operations of the process, which consists essentially in treating lump rosin with a dil. NaOH soln. (about 15 g. per l.) at not less than 15°. The equipment of the exptl., semi-com. unit at the French School of Paper Making, Grenoble, and of the com. unit at the Papeteries du Pont-de-Claix are described. The process gives automatically a size soln. of practically const. compn. without requiring any attention other than filling the rosin towers, and superior sizing is obtained with an approx. 20% lower rosin consumption.

A. PAPINEAU-COUTURE

Rosin sizing by the Delthirna process. E. ÖMAN. *Pulp Paper Mag. Can.* 27, 282, 304-6 (1929); *Svensk Pappers-Tid.* 31, 637-41 (1928).—A discussion of the results obtained in the application of the process (covered by Swedish patent 63,230), which possesses the following advantages: it is automatic and continuous; the soln. has a const. compn.; the app. does not require any attention other than to be charged with rosin once a day; the size soln. is highly concd. (40 g. per l.); troubles from clogged pipes, dirty floors, etc., are eliminated. The mechanism of rosin sizing is discussed to explain the superiority of the Delthirna process over the ordinary process.

A. P.-C.

The effect of heat on rosin sizing in the drying of the wet paper sheet. E. ÖMAN. *Svensk Pappers-Tid.* 31, 536-9, 570-2 (1928); cf. *C. A.* 23, 976.—Samples of pulp were

sized according to a standard procedure and the wet hand sheets were heated between two iron plates in a temp.-controlled oven for predetd. periods and then air-dried. The degree of sizing was detd. by the "ink streak" method. The effects of the following variables were detd.: temp., time of heating, moisture in the sheet and the hydrogen-ion concn. ( $p_H$ ) of the sized pulp. The critical temp. was found to be 73–75° and the critical moisture content about 50%. Higher values had a harmful effect on the degree of sizing unless the heating time was very short, less than one minute. With shorter heating time the sizing is better in all cases.  $p_H$  had no effect on sheets air-dried only, but  $p_H = 5.0$  was found to be best for sheets with 75% moisture heated to 85° for either 15 or 30 secs. Alk. conditions ( $p_H = 8.0$ ) gave extremely poor results.

W. SEGERBLOM

**Further experimental facts connected with rosin sizing.** S. R. H. EDGE. *Paper Makers' Monthly J.* 67, 50–3(1929); cf. *C. A.* 22, 1684.—When the  $p_H$  value was controlled by adding successive amts. of 5% alum soln. after adding the rosin, max. sizing was obtained at a  $p_H$  value of 5.0; when 75 cc. of alum soln. was added after the rosin, and the  $p_H$  value was then adjusted with 5% NaOH or 3%  $H_2SO_4$ , max. sizing was obtained at a  $p_H$  value of about 4.0. There is much more rapid falling off in the sizing with excess acid than with excess alum. In the lab. the easiest way to get the highest comparative sizing figures is to add the rosin, then bring the stock to a  $p_H$  of 5.0 with acid and then add alum 5 or 10 cc. at a time and make a series of sheets. Addn. of an excess of rosin over that required to obtain the full sizing effect acts like loading and reduces the sizing. With lab.-made sheets, 85 appears to be the max. possible comparative sizing figure; in mill-made paper, with rosin content up to 4% and different beating and calendering conditions, only 2 cases were discovered higher than 85 (93 and 86), which seems to indicate that this figure may have a real significance. For mill-made waterleaf rag papers, the max. appears to be 20, and the av. 10–5. Pulp as received, after treating with  $H_2SO_4$ , and after treating with alum, did not show any difference in comparative sizing. The theory of Thiriet and Delcroix (*C. A.* 20, 286, 2071) requires that other salts, which buffer a soln. at the  $p_H$  values from which alum readily gives sized sheets, should also be sizing agents, and also that the retention of rosin should be greater within the sizing range of  $p_H$  values. Using a mixt. of NaOAc and AcOH to buffer the soln. and adding AcOH slowly to vary the  $p_H$  value right through the usual sizing range failed to produce a single sized sheet; the rosin contents of the series of sheets made at different  $p_H$  values were invariably the same within the errors of detn., whether the sheets were sized or not. The theory thus fails completely. According to the literature, the range of  $p_H$  values produced by adding alkali to Th sulfate soln. is very close to that given by alum, the buffering action being slightly on the acid side of that given by alum. Sizing expts. with Th sulfate gave a max. comparative sizing of 42.5 (instead of 85 as with alum), and from 4 to 5 times as much Th sulfate as alum was required to give the max. Cr, Fe and Na sulfates were tried at various  $p_H$  values, but entirely without success. The results are considered to justify the conclusion that, under the conditions of the expts., there is a peculiar efficiency about alum as a sizing agent not possessed by any other metal, and not due to its buffer action alone, its valency alone, or its very weak basicity. It seems to be a property of the metal rather than of the salt, since the chloride dissolved in water or the acetate dissolved in AcOH is just as effective as the sulfate.

A. PAPINEAU-COUTURE

**The effect upon rosin sizing of heating the moist paper sheet.** ERIK ÖMAN. *Tech. Hochschule, Stockholm. Papier-Fabr.* 26, 705–7(1928).—See *C. A.* 23, 976.

R. H. DOUGHTY

**Proposed method for the analysis of rosin size (for paper making).** E. FRANK WHITTINGTON. Sutherland Paper Co., Kalamazoo, Mich. *Paper Trade J.* 88, No. 8, 231. *Paper Mill* 52, No. 8, 136(1929).—The method eliminates the necessity of using Pt ware for the alkali detn., and is based on the fact that the amt. of acid necessary to liberate the combined rosin is directly proportional to the amt. of alkali combined with the rosin. Det. total solids by heating to const. wt. at 230° F., weighing at the end of 30 mins. and then at 10-min. intervals. To det. free rosin, dissolve 2 g. in neutral alc. and titrate with 0.1 N alc. KOH, using phenolphthalein indicator. To det. total rosin, work up the residue from the total solids detn. into a paste with boiling water, and gradually add water to a total of about 100 cc., add 40 cc. 0.1 N  $H_2SO_4$ , ext. with  $Et_2O$  with the usual precautions as regards washing, etc., evap. the  $Et_2O$  and weigh the residue of rosin. To det. total alkali, titrate the excess  $H_2SO_4$  in the soln. and washings from which the total rosin was extd.

A. PAPINEAU-COUTURE

A new  
discussion of the merits

J. DUCHAILLUT. *Papier* 32, 95–103(1929).—A  
Schilde drying system, in which the sheets of board are

passed through a drying chamber or tunnel where they are supported flat on a suitable endless flat porous conveyor, instead of being hung up by clips. Heating coils extend throughout the whole length of the tunnel, both above and below the boards. The ventilation system is designed to ensure even and uniform impingement of air perpendicularly to the surface of the board, both from above and below, and the air is used repeatedly by reheating it to increase its drying power. A. PAPINEAU-COUTURE

**Corrosion in paper mills.** I. R. MCCALL. Detroit Graphite Co., Milwaukee, Wis. *Paper Trade J.* 88, No. 8, 157-67(1929).—A brief survey of the various points where corrosion can occur and of the means of preventing it, bringing out particularly the efficiency of properly selected and properly applied paint. A. PAPINEAU-COUTURE

**A natural system for the analysis and classification of paper.** A. S. HAMMOND. Western Waxed Paper Co., North Portland, Ore. *Paper Trade J.* 88, No. 7, 55-8(1929).—The system proposed consists in detg. the "bulk index" (the caliper of the paper for a given base wt.), the porosity (by measuring the amt. of paraffin oil which the paper will absorb) and the apparent d. of the fiber substance (obtained by dividing the wt. of the paper by the vol. of the fibers, which is found by subtracting the vol. of the voids from the vol. of the paper). It is based on the following laws: (1) In the gelatinization (which is taken to include all "hydration" effects produced by mech. and (or) chem. reactions) of paper fibers the percentage of apparent voids in the sheet progressively decreases, and this decrease is at a const. ratio to the relative bulk index of the finished sheet, this ratio being designated as the "H-factor." (2) In ideal calendaring (calendering in which the fibers are neither crushed nor gelatinized) of paper the percentage of apparent voids remains const. The bulk index of cellophane is about 0.45, which is taken as the lowest possible one for a sheet of cellulose; and relative bulk index is defined as the bulk index of the paper under consideration less the bulk index of cellophane. The H-factor varies according to the characteristics of the fibers used in the furnish, but is a const. for any given kind of fiber. In applying the method to the comparison of papers, the samples tested must have the same base wt. or a correction must be made to allow for the variation of voids and of bulk index with base wt. The method of making the detns. is described and the applications of the test are discussed. A. P.-C.

**Kraft paper.** R. DULOU. *Bull. inst. pin.* No. 57, 84-8(Feb., 1929).—A description of its manuf. A. PAPINEAU-COUTURE

**Fire-resistant papers.** WALTER OBST. *Wochbl. Papierfabr.* 59, 1270-2(1928).—Methods of prepn. are mentioned. R. H. DOUGHTY

**Wood paper from the eighteenth century.** TORSTEN ALTHIN. *Svensk Pappers-Tid.* 32, 14-17(1929).—A. describes early attempts in Sweden to make paper and mentions the work of H. Stakel in Helsingland in 1751 and refers to samples of his paper from sawdust and other materials. He refers especially to books of samples of old paper in the Royal Library of Sweden, gives six cuts of watermarks and illustrations, and adds a list of reference books on early paper making. W. SEGERBLOM

**Paper tests.** ROGER C. GRIFFIN. Arthur D. Little, Inc. *Paper Mill* 52, No. 7, 10, 12, 34(1929).—An address briefly outlining the chief tests which are applied to paper. A. PAPINEAU-COUTURE

**Study of the Weller brittleness test for paper.** R. L. PEEK, JR., AND J. M. FINCH. Bell Telephone Labs., New York. *Paper Trade J.* 88, No. 6, 56-62(1929).—In this test a sample of paper 0.25-1 in. wide and about 6 in. long is bent over the edge of a steel plate ground to form the half-circumference of a circle of about 0.005 in. radius, the plate forming the bar of a stirrup which is held in one jaw of a tensile testing machine, the 2 free ends of the sample being clamped together in the other jaw. The sample thus held is stretched by operating the testing machine in the usual way, and the load at which fracture occurs is noted. The difference between the load required to fracture a sample of the same dimensions in the ordinary tensile test and half the load required for fracture in the Weller test is supposed to be a measure of the brittleness of the paper; Bachman (*C. A.* 19, 1628) expresses this difference as a % of the load required for fracture in the tensile test and designates the result as % brittleness. In order that the best use may be made of the test in predicting the behavior in service of the material tested, P. and F. have made a theoretical and mathematical analysis of the test and for this purpose have assumed for the paper an ideal structure having properties which have been shown to be similar to those of paper. An equation is developed which theoretically relates the properties of the idealized paper to the conditions of the test. The expl. results conform sufficiently to those theoretically predicted to indicate that the treatment relates the quantities measured by the test to the factors upon which they are principally dependent and thus makes possible an interpretation of the relationships involved, approx. correct in essentials, although many minor factors are concededly

neglected. The complexity of the structure of paper suggests that any more accurate treatment would be exceedingly difficult, while the variability of the material is so great as to make it futile to attempt too precise a detn. of any of its properties. A. P.-C.

**Lithographic paper problems.** ROBERT F. REED. Lithographic Technical Foundation, Inc., Univ. of Cincinnati, Cincinnati, Ohio. *Paper Trade J.* 88, No. 10, 57-60; *Paper Mill* 52, No. 8, 76-88(1929).—The difficulties encountered in the lithographing of paper are discussed under the 4 headings: register troubles, greasing or scumming, difficulties related to the securing of satisfactory printing, problems in the application of adhesives. The difficulties are discussed from the point of view of the causes to which they may be traced, the known means by which they may be controlled, and the unknown factors involved. A program of research on the problems related to paper for lithographic purposes is suggested. A. PAPINEAU-COUTURE

**Notes on the coloring of paper.\*** J. NIEDERHAUSER. Établissements Kuhlmann. *Papier* 32, 85-7(1929).—A brief discussion of the merits of various dyes of French manuf. for the coloring of paper, particularly of the Diazol Lumière, Solanthrene and Luminol colors of the Établissements Kuhlmann. A. PAPINEAU-COUTURE

**The coloring of paper.** G. MARTIN. *Papeterie Special* No., 17-21(1928).—A brief review of the properties of the various classes of coloring matters used for coloring papers, and of the process of coloring paper. A. PAPINEAU-COUTURE

**The coloring of paper.** M. GOTTLÖBER. *Papier-Fabr.* 26, 577-81, 630-3, 679-81, 710-12, 783-7, 799-801(1928); 27, 3-8(1929); cf. C. A. 21, 1709.—A simple treatise on practical paper coloring. The Ostwald color theory (cf. C. A. 14, 492) is explained in detail, and its use as an aid in practical color work is discussed. The behavior of numerous common dyes in the beater, and the best methods for obtaining desired effects, are described. R. H. DOUGHTY

**The deterioration of paper.** W. F. HOFFMAN. Northwest Paper Co. *Paper Mill* 52, No. 8, 66, 68; *Paper Trade J.* 88, No. 12, 59-60(1929).—Attention is called to several factors in the manuf. of paper in which the alum content and the acidity of the furnish or the finished paper play a part. The optimum alum content of the furnish or the acidity as represented by the  $pH$  value cannot, in many cases, be based on any one factor, but must be based on all of the factors which enter into the manuf. of that particular paper, including: deterioration of the paper on aging, sizing, coloring, retention of filler, phys. properties of the finished paper, difficulties in operating the paper machines and effects of varying acidities on the paper mill equipment. A. P.-C.

**Fastness to light of colored paper.** WM. D. APPEL AND TH. C. BENTZEN. Whiting-Plover Paper Co., Stevens Point, Wis. *Paper Trade J.* 88, No. 9, 42(1929).—The relative fastness to light of colored papers can be detd. either by exposing them to sunlight or to C arc light, the Atlas Fade-ometer being probably as satisfactory as any instrument so far devised for the purpose, particularly the latest type which is provided with a fan to prevent excessive heating of the sample. For the quant. measurement of fading, the simplified method described previously (Appel, C. A. 22, 1043) can be used. A. PAPINEAU-COUTURE

**Retention of filler in paper.** G. K. SPENCE. New York and Pennsylvania Co. *Paper Mill* 52, No. 8, 50-4; *Paper Trade J.* 88, No. 12, 58-9(1929).—Detailed instructions are given as to the procedure which should be followed so as to obtain reliable results in making filler retention tests. The retention can also be obtained with much less trouble and with a satisfactory degree of accuracy from the following data: moisture, fiber and clay contents of the finished sheet; of the sheet passing from the wire to the first press (dry basis); of the stock in the water leaving the first press (dry basis); of the stock in the white water from the wire (dry basis); of the stock in the head box (dry basis); of the stock in the machine chest (dry basis); combined water content of the clay used and natural ash in the fiber mix. The method of calcn. is explained in detail by means of an example. A. PAPINEAU-COUTURE

**Action of liquids on paper.** JAMES STRACHAN. *Paper Mill* 52, No. 3, 24-6; No. 4, 24-6(1929).—A discussion of the penetrability of paper by liquids, more particularly from the standpoint of the penetration of writing ink and of printing inks into tub-sized and into engine-sized papers. A. PAPINEAU-COUTURE

**Report on permeability of paper to liquids.** ALLEN ABRAMS. Marathon Paper Mills Co., Rothschild, Wis. *Paper Mill* 52, No. 8, 112-6, 120; *Paper Trade J.* 88, No. 9, 40-2; *Pulp Paper Mag. Can.* 27, 423-5(1929).—A collaborative comparison of the curl test and of the dry indicator test, for measuring the degree of internal sizing. indicated that, on thin paper, either test may be used with reasonably concordant results; but the curl test made with the Carson curl sizing tester seems to give the most uniform data. Two methods for measuring greaseproofness along the lines of those

suggested by Smith (C. A. 22, 1853) gave results which varied widely on the same paper and by the same method.

**Decreasing two-sidedness of paper.** IVAR EKHOLM. National Aniline Co. *Pulp Paper Mag. Can.* 27, 283-4(1929).—A discussion of the causes of two-sidedness in paper, during the formation of the sheet at the wet end of the paper machine, during the drying process and on the calender, together with indications of how to eliminate or minimize it.

**Influence of pressing on the strength (of paper sheets).** ANON. *Papier-Fabr.* 26, 754-7(1928).—An unbleached Mitscherlich pulp was beaten to freenesses of 25, 50 and 75° Schopper, hand-dipped sheets were made, pressed between felts at pressures ranging from 0 to 130 atm. in steps of 10 atm. (method not stated), dried on an electrically heated cylinder and tested for breaking length. The strength increased about 15% between 0 and 60 atm., falling off again to about 10% below the original value at 130 atm. There is a marked break between 60 and 70 atm. pressure. The data are given in detail.

**Some lesser-known paper-making fibers.** J. STEWART REMINGTON. *Ind. Chemist* 5, 115-8(1929).—Lalang grass (*Imperata Cylindrica* Cyr), 47.41% cellulose, cooked with 15% NaOH for 10 hrs. at 135° gave a pulp yield of 48.21%. The pulp is suitable for printing purposes. Salt marsh grass (*Spartina juncea*), 36.16% cellulose, cooked with 12% NaOH for 10 hrs. at 60 lbs. pressure, gave a pulp yield of 37%. An alk. bleach gave the best results. The pulp is suitable for good wrapping paper; when mixed with 50% sulfite pulp and loaded, a good writing paper results. Fresh water cord grass (*Spartina cynosuroides*), 53.47% cellulose, cooked with 10% NaOH for 8 hrs. at 130°, gave a pulp that bleached easily in an acid bleach. The pulp is easily beaten, and makes a high-grade printing paper. Loaded pulp yields magazine stock. Combined with groundwood the pulp gives a good printing paper. The inner bark of *Adonsonia digitata*, 56.96% cellulose, cooked with 5% NaOH for 6 hrs. at 90 lbs. pressure, gave a pulp yield of 53%. The pulp is easily bleached. The pulp produces paper of excellent strength, good softness, rattle and feel. It mixes well with sulfite pulp. Delta grass was suitable for only low-grade papers where strength is unimportant.

**Quality of purified wood fibers.** ROYAL H. RASCH. Research Assoc., Bureau of Standards, Washington, D. C., for the Brown Co., Berlin, N. H. *Paper Trade J.* 88, No. 8, 233-63(1929).—The qualities of purified wood fibers and com. papers prepd. from these fibers have been investigated from the standpoint of chem. purity, color, durability and permanence and compared with other typical papers and paper-making fibers. In order to simulate as closely as possible the deteriorating effects of natural aging, and thus det. the probable relative permanence of various types of paper and paper-making fibers, accelerated aging treatments involving the exposure of samples to an elevated temp. were made and the extents of phys. and chem. degradation compared. It is not known how accurately such tests can reproduce the effects of natural aging; it seems reasonable, however, to suppose that materials possessing a high degree of stability toward the heat test would be correspondingly more permanently durable than those which manifest greater changes in chem. and phys. properties. The data obtained thus far point to the following general conclusions: (1) Accurate evaluation of the quality of papers or of the suitability of a pulp or half-stock for conversion into a given type of paper must be based on observations as to their performance under specified tests. Fiber compn. cannot be taken as a criterion of the excellence of a paper. The all-rag papers and wood-fiber papers which have been studied cover similar wide ranges of durability and permanence. (2) While it is desirable that the  $\alpha$ -cellulose content of a paper-making fiber intended for permanent uses should be as high as possible, conclusions based on this detn. alone may be in error because the non- $\alpha$ -cellulose constituents of different types of fibers vary, wt. for wt., in the extent to which they influence the permanence quality of these fibers. Modified celluloses are known to be active in causing rapid deterioration of cellulose; pentosans, on the other hand, appear to be relatively inert in this respect. (3) The decrease in the  $\alpha$ -cellulose content of a cellulose material caused by artificial aging is considered an indication of relative permanence. Purified wood pulps resemble the best grades of rag half-stock in suffering but slight changes in  $\alpha$ -cellulose after an exposure to a temp. of 100° for 72 hrs. In this respect purified wood fibers are considerably superior to poorer grades of rag fibers, such as old No. 1 white rag half-stocks. (4) Changes in the  $\alpha$ -cellulose content of papers brought about by artificial aging are accompanied by fairly proportionate changes in phys. properties, such as folding endurance and tearing resistance. It is therefore probable that the paper-making wood pulp and rag half-stocks which drop appreciably in  $\alpha$ -cellulose on heating would be unsuited for conversion into permanent

types of papers. (5) Purified wood fibers have excellent color characteristics, comparing favorably with half-stocks prepd. from the best grades of new white rags. Since they are relatively very resistant to the effects of artificial aging, it is indicated that they would show similar good resistance to the yellowing effect of natural aging. (6) Ordinary grades of sulfite pulps must be considered unsuited for conversion into highly permanent types of papers. Although such papers may have a degree of durability sufficient for most purposes, the character of the impurities present in the fibers is such as to cause relatively rapid deterioration and a consequent decrease in the initial strength qualities. (7) The better grades of soda pulps and the papers prepd. from them appear to be considerably more permanent than the ordinary sulfite pulps and papers. It is probable that high-grade soda pulp may be safely used in certain printing book papers where high-strength qualities are not essential, but where a fair degree of permanence is required. (8) A high degree of hydration appears to be detrimental to the permanence of a paper. (9) Mineral fillers may be safely added to furnishes for permanent papers, and probably aid to some extent in preventing deterioration. (10) High strength imparted by glue sizing is rapidly lost when the paper is heated. It is probable, however, that the surface coating of glue protects the individual fibers from deterioration somewhat by retarding oxidation, and thus increases the permanence of the paper. (11) The manner in which the purified wood fibers, and papers prepd. from them, reacted to the various tests which were applied, indicated that they were well adapted for use in high-quality bond and permanent-record papers, which have hitherto been made exclusively from furnishes of high-grade rag half-stock.

A. PAPINEAU-COUTURE

**Vulcanized fiber board.** JOSEPH ROSSMANN. U. S. Patent Office, Washington, D. C. *Paper Trade J.* 88, No. 5, 69-71(1929).—A brief description of the process of manuf. of vulcanized fiber board, together with abstracts giving a survey of the U. S. pats. for making vulcanized fiber board consisting of a no. of layers united together.

A. PAPINEAU-COUTURE

The color reaction of lignin (PODBREZNIK) 11D. Progress in the treatment of paper-mill wastes (HODGE) 14. Composition of sugar obtained by complete hydrolysis of pine wood (HÄGGLUND) 28. Hot-wall effect as a cause of corrosion (BENEDICKS) 9. Hadromal, lignin and coniferylaldehyde; preparation and identification of the last (PAULY, FEUERSTEIN) 10. Extraction and concentration of AcOH from dilute aqueous solutions (GUINOT) 10. Influence of sugars on the stability of bisulfite solutions (HÄGGLUND, *et al.*) 10. Progress in the chemistry of lignin (FUCHS) 10. Treating oil-soaked hemp waste (for production of fiberboard) (U. S. pat. 1,710,914) 25. Metallic paper (Ger. pat. 472,714) 18. Dispersion agents (from sulfite cellulose pitch) (Fr. pat. 648,728) 18. Road treatment with sulfite cellulose lyes (Fr. pat. 650,107) 20.

**Manufacture of Pulp and Paper.** Vol. IV. New 2nd ed. Prepared under direction of Joint Executive Comm. on Vocational Education, Representing the Pulp and Paper Industry of the U. S. and Canada. New York: McGraw-Hill Book Co., Inc. 598 pp. \$6.

**Cellulose.** I. G. FARBENIND. A.-G. Fr. 648,706, Feb. 15, 1928. Cellulose free from lignin is obtained by treating cellulose material suitably divided with the exact amt of a soln. of an alk. earth hypochlorite, contg. 2% active Cl, necessary to produce complete oxidation of the lignin, the process being carried out at a temp. not above 45° without external heating.

**Films of cellulose.** OTTO SINDL. Fr. 648,425, Feb. 4, 1928. In the production of films of cellulose, the soln. of cellulose comes in contact on one face with a surface in movement of the coagulating liquid so that coagulation takes place on this face before the other.

**Treating films, filaments and the like formed from cellulose solutions.** WOLFF & Co. and R. WEINGAND. Brit. 298,609, Oct. 12, 1927. Products such as those obtained from cuprammonium cellulose, viscose and like solns. are freed from hemicellulose, wood gum and like substances by treatment with alkali soln. and, to prevent after-formation of hemicellulose due to the alkali, may be treated with salt solns. or alc. before washing. Washing with water may be assisted by electroendosmosis with or without use of diaphragms and after washing the films may be neutralized with dil. acid and are suitable as supports for light-sensitive layers. Filaments thus treated have improved dyeing properties.

**Films, filaments, etc., from cellulose solutions or derivatives.** WOLFF & Co. and R. WEINGAND. Brit. 298,605, Oct. 12, 1927. The water-absorbent properties of

products formed from cellulose solns., such as cuprammonium cellulose and viscose or from cellulose ethers, are decreased by treating the film or other product with an org. liquid such as HOAc or formic acid and then applying a coating of a cellulose ester soln. such as collodion or cellulose acetate soln. The preliminary treatment insures the continuity of the coating. Alternatively, a water-immiscible softening agent may be incorporated in the film or other product by dissolving the softening agent in the org. liquid. Examples are given of the treatment of cellulose hydrate "foil," "viscose silk" and plates of regenerated cellulose.

**Cellulose and furfural from straw and similar materials.** VICKERS, LTD., and O. D. LUCAS. Brit. 298,800, Nov. 29, 1927. Material such as flax straw or wheat straw is first digested with water (suitably at 180° and under a pressure of 135 lbs. per sq. in. for 1-2 hrs.), and the resulting aq. soln. which contains furfural is drawn off and the furfural recovered from it by distn. The residue of cellulosic material may be used for making paper or other products.

**Elimination of the lignified portion of flax by chemical means in the manufacture of cellulose.** L. DE PESTELE and A. DUJARDIN. Belg. 353,112, Oct. 31, 1928. The material is cleaned, cut, heated to 100° in a weak alk. soln., pressed, subjected to intimate contact with Cl gas, washed with cold water, heated to boiling in a soln. of antichlor, made alk. and washed with boiling water.

**Acetylcellulose soluble in chloroform.** WOLFGANG GRUBER (to Alexander Wacker Ges. für elektrochemische Industrie). U. S. 1,711,314, April 30; Fr. 649,623, Feb. 23, 1928. Cellulosic material such as cotton, wood pulp or paper is treated with an acetylizing agent contg. ZnCl<sub>2</sub> (and which may also contain HOAc and Ac<sub>2</sub>O) at a relatively high temp. (suitably about 55-60°) until the cellulosic fibers have lost their structure, and the treatment is then continued at a lower temp. (suitably about 40°).

**Recovery of acetic acid in the preparation of acetylcellulose.** ALEXANDER WACKER GES. FÜR ELEKTROCHEM. IND. G. M. B. H. (Wolfgang Gruber, inventor). Ger. 473,833 Jan. 10, 1926. In the prepn. of acetylcellulose sol. in acetone, the AcOH is recovered by treating the AcOH liquor with mixts. of hydrocarbons or their chlorinated derivs. which ppt. the acetylcellulose and dissolve the AcOH, and which are non-miscible with concd. AcOH or glacial AcOH. The AcOH is removed by the addn. of the latter. The AcOH may also be removed from the hydrocarbon by fractional distn. Examples of hydrocarbons and concns. of AcOH with which they are non-miscible are given.

**Cellulose esters.** I. G. FARBENIND. A.-G. Fr. 649,576, Feb. 22, 1928. Esters of cellulose with higher homologs of AcOH are prepd. by causing cellulose to react with the anhydride of a halogen acetic acid in the presence of higher homologs of AcOH and a catalyst and hydrolyzing the esters obtained if necessary. In an example cellulose is added to a soln. of monochloroacetic anhydride and monochloroacetic acid in propionic acid. The mixt. is heated to 50-55° till a sample is sol. in C<sub>6</sub>H<sub>6</sub>. The ester of butyric acid made in the same way but hydrolyzed has the same qualities of soly.

**Cellulose esters.** HENRY DREYFUS. U. S. 1,711,110, April 30. In order to render cellulosic material, such as chem. wood pulp, more uniformly esterifiable to produce aliphatic acid esters such as cellulose acetate, the material is treated with a soln. of an alk. compd., such as dil. NaOH soln., previous to treatment with a lower aliphatic acid such as HOAc. U. S. 1,711,111 specifies pretreating the cellulosic material with a gas carrying vapors of a lower aliphatic acid such as HOAc and then esterifying the material in the presence of less than 3% the wt. of the cellulose of a condensing agent, such as H<sub>2</sub>SO<sub>4</sub>, and in the presence of HOAc in a quantity less than 6 times the wt. of the cellulose.

**Cellulose acetate.** J. W. BULMER. Brit. 298,819, Jan. 2, 1928. After-hydrolysis of cellulose acetate is effected in 2 stages, in the first of which there is added to the acetylation mixt. sufficient water to produce a mild hydrolysis of the cellulose acetate, which is then pptd., while in the second stage the pptd. material is treated with dil. acid for further hydrolysis.

**Coating surfaces with nitrocellulose and cellulose acetate compositions.** W. H. MOSS (to British Celanese, Ltd.). Brit. 298,608, Oct. 12, 1927. Metal, glass, wood or other surfaces are coated with a compn. contg. nitrocellulose and then with a compn. contg. cellulose acetate or other org. ester or ether of cellulose. Various details are given.

**Sodium cellulose waste.** VITTORIO CASABURI and ENRICO SIMONCINI. Ger. 472,680, Feb. 12, 1925. Condensation products, which have a tanning action, and their metallic salts are produced from the waste of Na cellulose by treating it with aromatic sulfo acids, hydroxysulfo acids, or aminohydroxysulfo acids. Aldehyde may be present. The products so obtained may then be treated with hydroxides of metals, such as Cr or Al, if required as salts. Thus, 25 kg.  $\beta$ -naphthol and 35 kg. H<sub>2</sub>SO<sub>4</sub> are



heated to 100–110° until a water-sol. compd. is produced. The soln. is diluted with 40 l. water and added to 150–160 kg. Na cellulose waste. The mass is stirred at 80–90° and 6 kg. of 40% of  $\text{CH}_3\text{O}$  added. The product contains 24–25% tanning material. Other examples mention 1-amino-8-hydroxynaphthalene-3,6-disulfonic acid, cresol and  $\text{H}_2\text{SO}_4$ , and naphthalene and  $\text{H}_2\text{SO}_4$ , as the aromatic acids to be used. The addn. of  $\text{Al}(\text{OH})_3$  or  $\text{Cr}(\text{OH})_3$  converts the tanning material into salts more suitable for certain kinds of tanning processes.

**Charging cellulose digesters.** P. A. FRÉSK. Swed. 64,364, Dec. 28, 1927. The charge is introduced into the digester by means of and together with a current of air, gas or steam. A rotary spreading device secures an even distribution of the materials in the vessel. Cf. C. A. 22, 3300.

**Mouth pieces for cigaret holders.** I. G. FARBENIND. A.-G. (Emil Schnabel, inventor). Ger. 473,701, Dec. 17, 1926. Cellulose derivs., such as acetylcellulose, are mixed with at least the same quantity of tobacco powder.

**Artificial silk from viscose.** K. LEUCHS. Brit. 298,688, June 18, 1927. Spun threads from viscose are supported on a foraminated Al carrier through which are successively passed liquids for desulfurizing and other treatments.  $\text{Na}_2\text{SO}_3$  is the preferred desulfurizing agent but various others are mentioned and details of the app. are given.

**Artificial silk.** ACÉTA G. M. B. H. Ger. 474,043, Mar. 4, 1927. The vertical cells used in the downward dry spinning of artificial silk are divided into 2 sections by a horizontal partition having a small aperture through which the filaments pass. The ascending currents of warm air in the 2 sections are drawn off independently through adjustable connections to a suction pipe, the chief portion being withdrawn at the upper part of the lower section. Perforations may be made in the walls sepg. adjacent cells, either in the upper section only or in both sections. The 2 sections may be heated to different temps.

**Artificial silk.** ACÉTA G. M. B. H. Fr. 649,334, Feb. 20, 1928. In dry spinning artificial silk downward against an ascending current of air, a spinning chamber is employed which is divided by an adjustable constriction into 2 compartments which both communicate at their upper ends in an adjustable and independent manner with the aspiration tube.

**Artificial silk.** BERGMANN ELEKTRICITÄTS-WERKE A.-G. Fr. 648,457, Feb. 6, 1928. An elec. centrifuge for spinning is described.

**Artificial silk.** MELITTA KLEIN. Fr. 648,379, July 6, 1927. The section of the orifices for the threads may be varied at will.

**Artificial silk.** MELITTA KLEIN. Fr. 648,397, June 22, 1927. Cellulose esters or ethers are spun downward in a closed chamber, fresh air entering at the top around the spinning nozzles. The chamber may be divided into 2 compartments sepd. by a diaphragm.

**Artificial silk.** Fr. KÜTTNER A.-G. Ger. 474,789, Mar. 15, 1927. The silk is spun into flat hanks which are pressed and washed.

**Artificial silk.** L. LILIENFELD. Brit. 298,548, May 6, 1927. "Viscose silk" having a high dry tenacity is formed by conducting a thread-like stream of viscose into a bath contg. instead of strong inorg. acids as used in the processes described in Brit. 274,521 and Brit. 274,690 (C. A. 22, 2273) an agent capable of coagulating viscose and an agent (which may be the same as the coagulating agent) capable of dissolving, swelling or plasticizing the coagulated thread. Various examples are given.

**Artificial silk.** ALPHONSE VERGÉ. Fr. 648,403, June 23, 1927. Stretching of artificial silk fibers is prevented by surrounding them with a rigid or elastic sheath, obtained by dipping the fibers in a bath contg. either (1) casein,  $\text{NH}_3$ , carob flour,  $\text{CH}_3\text{O}$  and water, (2) casein,  $\text{NH}_3$ , sebacic acid,  $\text{CH}_3\text{O}$  and water, (3) linseed oil, sebacic acid,  $\text{PhNH}_2$  or other amine and  $\text{C}_6\text{H}_6$  or tetrachlorethane or (4) solns. of rubber or artificial resins.

**Artificial silk from cuprammonia cellulose solutions.** LONZAWERKE ELEKTRO-CHEMISCH FABRIKEN GES. Brit. 299,022, Oct. 19, 1927. Artificial threads produced by the cupra-ammonia process are reduced in diam. by subjection to a drawing process while in a plastic condition obtained by washing with water or with a soln. of a suitable salt such as  $\text{MgSO}_4$  while the threads still contain Cu, as after coagulation in an alk. bath. Various mech. details of the drawing operation are described.

**Artificial threads from ammoniacal-copper cellulose solutions.** J. P. BEMBERG A.-G. Brit. 299,038, Oct. 20, 1927. The stretch-spinning method is so conducted that the threads leave the spinning funnel in a plastic condition and are subjected to a second considerable stretching after leaving the funnel. An arrangement of app. is described.

**Artificial fibers.** I. G. FARBENIND. A.-G. (Totila Madlung, inventor). Ger.

473,749, Sept. 16, 1927. The spinning head for artificial fibers is provided with an inflated rubber structure on which the fiber is wound as it is spun.

**Spinning artificial silk.** OSCAR KOHORN & Co. and ALFRED PERL. Fr. 649,087, Feb. 15, 1928. Means for cleaning the spinning nozzles are provided. Cf. C. A. 23, 982.

**Spinning artificial silk.** RAYMOND A. J. THÉNOZ and HENRY L. BARTHELÉMY. Fr. 649,126, July 6, 1927. Means are provided either in the interior or around the spinning head for circulating a liquid or gas at constant temp. to maintain a constant temp. in the collodion coming from the spinning nozzles. Cf. C. A. 23, 514.

**Preventing fraying of edges of cellulose derivative fabrics.** H. PLATT (to British Celanese, Ltd.). Brit. 299,042, Oct. 20, 1927. Edges, such as those of perforations for buttonholes or ornamental effects, in fabrics formed of cellulose derivs., are sealed to prevent raveling or fraying, by fusing, dissolving or softening the material at the edges and then permitting it to solidify.

**Multiple filament spinning nozzle for artificial silk.** HENRI COLCOMB. Swiss 130,382, Nov. 25, 1927.

**Rotary nozzle spinning for artificial silk.** THE NEURA ART-SILK Co., LTD. Ger. 473,935, Feb. 6, 1927.

**Wood-pulp material.** JOSEPH H. WALLACE (to Pine Waste Products, Inc.). U. S. 1,710,752, April 30. Pulp mill chips are prepd. from coniferous wood and contain a substantial proportion of the original resinous content of the wood distributed throughout the wood substantially uniformly (suitably by use of a solvent evenly to distribute the residual resin).

**Paper pulp.** PAPETERIES NAVARRE. Fr. 648,385, June 21, 1927. A paper pulp of superior quality is prepd. from colonial plants such as the *Cyperus papyrus* by submitting them to 2 distinct treatments, the 1st being confined to a mech. grinding with washing of the products with water, the 2nd being a light extn. with steam under atm. of slightly raised pressure with a small consumption of chem. agents, such as soda.

**Beater for paper pulp.** J. R. HAPPER. Brit. 299,150, Sept. 8, 1927. Structural features.

**Paper-making apparatus.** F. O. L. CHORLTON. Brit. 298,853, March 13, 1928. Structural features.

**Paper-making apparatus.** A. KOLITSCH. Brit. 298,653, Oct. 13, 1927. Variation in "vacuum" in the suction devices due to variation in the thickness of the paper being made serves automatically to regulate the supply of pulp stock to the flow box and to the wire cloth.

**Paper- and board-making apparatus.** ST. ANNE'S BOARD MILL Co., LTD., and R. B. HEYS. Brit. 298,671, July 14, 1927. Structural features.

**Apparatus for seasoning paper by treatment with electrically heated air.** GEORGE E. MAXNER. U. S. 1,710,706, April 30. An elec. heater is mounted within the air discharge nozzle.

**Drying plant for paper and fibrous materials.** WILLIAM B. FULTON. Ger. 474,829, July 11, 1926. The plant has groups of drying cylinders.

**Drying cylinder for paper and textiles.** EWALD LÜTSCHEN. Ger. 472,713, Mar. 15, 1927.

**Drying apparatus for pasteboard sheets.** "REFORM" FÜR HEIZ- U. TROCKENANLAG M. B. H. (Max Sauer, inventor). Ger. 474,905, Dec. 29, 1925. Details of arrangement.

**Means for dewatering paper and cardboard sheets.** FRIEDRICH DETTELBACH. Ger. 474,106, Oct. 1, 1925, and 474,107, May 2, 1926, addn. to 474,106. The means comprise a suction couch roll, a sec. couch roll, a perforated conveying band and, in 474,107, an auxiliary band.

**Device for testing the water-absorbing power of paper.** EUGEN STOTZ. Ger. 473,618, Mar. 5, 1927.

**Centrifugal machine for purifying paper-making materials.** HERMANUS THOMASSEN. Ger. 472,517, May 28, 1924. Addn. to Ger. 469,318 (C. A. 23, 1270). Details of construction.

**Apparatus for making coreless rolls of paper, etc.** CARL NEBRICH. Ger. 472,844, Dec. 25, 1927. Addn. to 469,675 (C. A. 23, 1270).

**Apparatus for preparing paper glazed on one side.** F. H. BANNING & SEYBOLD MASCHINENBAU-G. M. B. H. Ger. 472,842, July 2, 1926.

**Fireproofing paper, textiles, etc.** WESTFÄLISCH-ANHALTISCHE SPRENGSTOFF-A.-G. CHEM. FABRIK. Ger. 474,186, Mar. 1, 1925. The material is impregnated with a soln. of  $ZnNH_4$  chloride, a 30% soln. being suitable.

## -EXPLOSIVES AND EXPLOSIONS

C. E. MUNROE

**Striations in explosive flames.** G. B. MAXWELL AND R. V. WHEELER. *Nature* 122, 995(1928).—M. and W. observe, as have Egerton and Gates (*C. A.* 21, 2555), bands on photographs taken of flames propagated in cylinders. These bands indicate a vibratory nature of the combustion and may be due to a set of stationary waves compounded from sound waves reflected from opposite walls of the cylinder. G. G.

**Chemical composition for matches.** R. L. DATTA AND T. BASU. Dept. Industries, Bengal. *Bull.* 23, 4 pp.(1928).—Unsuccessful attempts were made to form a damp-proof compn. for matches by rendering the glue in it insol. by treatment with  $\text{CH}_3\text{O}$  or tannin before the remaining components were added. Compns. contg.  $\text{K}_2\text{Cr}_2\text{O}_7$  gradually became damp-proof as a result of the oxidation of the glue by this ingredient. B. C. A.

**Explosion limits of technical gas mixtures.** K. BUNTE AND A. STEDING. *Gas J.* 184, 728(1928).—Translation of an article reported in *C. A.* 23, 983. F. S. G.

**Explosion regions of some gas and vapor mixtures in which carbon monoxide is the only or the principal inflammable gas.** J. H. A. P. LANGEN VAN DER VALK. *Rec. trav. chim.* 48, 201-19(1929).—Explosion limits were detd. in a glass buret, ignition being by jump spark. Elaborate precautions were taken to insure purity of gases and cleanliness of app. (A) Explosion limits of CO and air mixts. were narrowed by the addn. of increasing amts. of trichloroethylene, perchloroethylene, tetrachloroethane, and pentachloroethane. The explosion limits of dichloroethylene are 3.25% and 15% (vol.) at 14° and 760 mm. The explosion limits of CO and air mixts. are widened by addn. of dichloroethene; therefore this compd. may be dangerous in some industrial applications. (B) In the presence of 3%  $\text{CCl}_4$  no explosion occurs with mixts. of CO and air from 20 to 45% CO. Thus, somewhat more than 1%  $\text{CCl}_4$  will prevent explosions of CO and air. Four %  $\text{CHCl}_3$  prevented explosions of CO and air mixts. between 5 and 40% CO; 3%  $\text{CHCl}_3$ , between 25.5 and 38.5% CO; 2%  $\text{CHCl}_3$ , between 22.5 and 45.5% CO. Methylene dichloride lowers both explosion limits of CO and air mixts., no explosion being possible above 20% methylene dichloride. The explosion limits of  $\text{MeCl}$  are 16.3 to 24.4% with air. The compd. narrows the explosion limits of CO and air mixts. to 2.35% to 28.95% CO with 22%  $\text{MeCl}$ . (C) Mixts. of CO,  $\text{CH}_4$ , air, and a fourth "extinguishing" substance such as  $\text{CCl}_4$  were investigated. (D) Tests were made on the influence of excess  $\text{O}_2$  and  $\text{N}_2$ , leading toward the detn. of a closed explosion region. The results of parts C and D can be given only by data in the original paper. C. Z. ROSECRANS

Reactions carried out under high pressure (BERL) 2. Preparation of a solution containing  $\text{H}_3\text{PO}_4$  direct from bone ash for the impregnation of match sticks to render them non-glowing (DATTA, BASU) 18.

**Smokeless propellant explosives.** F. I. DUPONT, E. DUPONT and U. S. F. POWDER CO. *Brit.* 298,543, April 7, 1927. A substantially dry finely divided mixt. of oxidizing substance such as  $\text{KNO}_3$  or  $\text{K}_2\text{Cr}_2\text{O}_7$  and an oxidizable substance such as charcoal is intimately mixed with nitrocellulose before or during gelatinization or before the gelatinized nitrocellulose has become hardened, with or without nitroglycerin and other ingredients. From 0.5 to 25% of the added oxidizing and oxidizable substances may be used and these may be supplied in the form of black powder if desired.

**Explosives comprising 2,4,6-trinitro-1,3,5-triazidobenzene.** O. TUREK. *Brit.* 298,629, Oct. 13, 1927. This compd. is used either alone or with other substances as an explosive charge in blasting cartridges, percussion caps, detonators, detonating fuses and projectiles. A layer of Pb azide may be pressed on the charge.

**2,4,6-Trinitro-1,3,5-triazidobenzene as an explosive.** O. TUREK. *Brit.* 298,981, Oct. 18, 1927. This compd. is formed by treating 2,4,6-trichloro-1,3,5-trinitrobenzene with an alkali azide in a solvent such as alc., acetone or water. It is an active explosive and when melted is converted into hexanitrosobenzene.

**Trinitrotoluene.** AKTIENGESSELLSCHAFT LIGNOSE. *Fr.* 649,345, Feb. 21, 1928. See *Brit.* 294,625 (*C. A.* 23, 2036).

**Nitroglycerin.** ARNOLD SCHMID. *Fr.* 649,452, Jan. 31, 1928. For the sepn. of nitroglycerin and residual acid, the operation is carried out in thin layers, the liquid being either stagnant or in slow movement in the layers. *Fr.* 649,453 describes an app. for washing nitroglycerin and like esters.

**Nitroglycerin.** ARNOLD SCHMID. Fr. 649,774, Jan. 31, 1928. In the nitration of glycerol the reaction mixt. is given an intense circulation through 2 successive compartments which are sepd. but communicate at 2 points. One of the compartments has cooling coils with narrow spaces through which the liquid is driven. The 2nd chamber has no coils but contains an agitator which causes the circulation through the 2 chambers.

Use of bakelite or similar moldable composition for making projectile fuzes. Soc. ITALIANE POLVERI ESPLODENTI. Brit. 298,948, Oct. 17, 1927.

**Denitrating residual nitrating acids, etc.** A. SCHMID and J. MEISSNER. Brit. 298,894, Oct. 15, 1927. Residual  $\text{H}_2\text{SO}_4$  mixt. such as that from manuf. of nitroglycerin is denitrated by heating in a vacuum such that most of the  $\text{HNO}_3$  is sepd. before a temp. is reached at which org. substances are acted on. Subsequent reaction with org. substances serves to remove remaining  $\text{HNO}_3$  and leave pure  $\text{H}_2\text{SO}_4$ . A vacuum of 190–200 mm. Hg and a temp. of  $120^\circ$  are suitable for the first stage of the process and a temp. of  $145\text{--}50^\circ$  may be attained in the second stage. An app. is described.

## 25—DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

**History of the development of fast dyeing and dyes.** JAMES MORTON. *J. Roy. Soc. Arts* 77, 544–74 (1929).—See *C. A.* 23, 2574. E. H.

**Method of preparation of salts of naphtholsulfuric acid with organic bases (aromatic series), and their application in dyeing wool and silk by diazotization on fiber.** E. I. ORLOV. *Ukrainskii Khim. Zhurnal* 3, Tech. part, 181–2 (1928).—Seventy-two parts of  $\beta$ -naphthol are mixed with 110 parts of  $\text{H}_2\text{SO}_4$ , d. 1.84, and the resulting naphthol-sulfuric acid is combined with an org. aromatic base to a salt, from which by subsequent diazotization is obtained a dyestuff. The prepd. salt is dissolved on boiling in  $\text{H}_2\text{O}$ , some Na acetate is added, the soln. is filtered boiling hot, and wool or silk (fabric or yarn previously washed with 1%  $\text{Na}_2\text{CO}_3$  or soap) is steeped in the hot bath, the fiber is removed and wrung out, and diazotized on fiber in a cold  $\text{NaNO}_2$  bath, after which it is rinsed in a 1% AcOH bath, washed thoroughly in boiling  $\text{H}_2\text{O}$ ; this is repeated 2–3 times to remove the yellow tinge from the fiber. The bases and the corresponding proportions used are: 70 parts of *p*-nitroaniline-red, 72 parts of  $\alpha$ -naphthylamine-brown, 61 parts of dianisidine-lilac, safranine-violet,  $\beta$ -naphthylamine. This method is of interest because the usual method of dyeing vegetable matter by direct diazotization on the fiber is not applicable to animal fiber as  $\text{HNO}_3$  has a destructive action on it.

CHAS. BLANC

**Preparation of new nitro colors.** P. P. KARPUGHIN. *Ukrainskii Khim. Zhurnal* 3, Tech. part, 233–5 (1928).—To 100 g.  $p\text{-ClC}_6\text{H}_4\text{NO}_2$  in 100 g.  $\text{H}_2\text{SO}_4$ ,  $\text{H}_2\text{O}$  at  $50^\circ$  was added 80 g. of oleum contg. 25% of  $\text{SO}_3$  and the mixt. heated for about 2 hrs. to  $110^\circ$  until completely sol. in  $\text{H}_2\text{O}$ , giving mainly  $2,5\text{-O}_2\text{NCIC}_6\text{H}_3\text{SO}_3\text{H}$ . To this was directly added 70 g. of  $\text{HNO}_3$  (d. 1.4) at a temp. not over  $60^\circ$ ; then the mixt. was heated for 30 mins. to  $120^\circ$ , cooled, 250 g. of ice and 300 cc. of  $\text{H}_2\text{O}$  were added, the dinitrochlorobenzenesulfonic acid (I) was salted out with 200 g. of NaCl, filtered and dried.  $m\text{-C}_6\text{H}_4(\text{NH}_2)_2$  (10.6 parts, 0.1 mol.) was dissolved in 200 parts of  $\text{H}_2\text{O}$ ,  $1/8$  mol. of I was introduced, then  $1/4$  mol. of  $(\text{NH}_4)_2\text{CO}_3$  to neutralize freed HCl, and the mixt. was heated at  $60^\circ$  for 3 hrs. and the color salted out with 40 g. of NaCl. The color dyes wool in acid bath 5% with golden brown color. Under similar conditions 2,4-diaminodiphenylamine gives a color that dyes wool in acid bath 4% with reddish brown color. The condensation of I with aniline produces a yellow color that dyes wool 10% with poor fastness to light and washing. With increasing size of mol. and accumulation of diphenylamine groups the color deepens and the fastness is augmented.

CHAS. BLANC

**Woolen and worsted cloth analysis.** III. GEORGE PRIESTLEY. Univ. of Leeds. *Textile Recorder* 46, 49–50 (1929); cf. *C. A.* 23, 2575.—The use of cotton, rayon, linen, jute and ramie in admixture with wool is considered. RUBY K. WORTNER

**Bleaching of muslin.** HARUKAJE UTAKE. Osaka Industrial Research Laboratory. *Repts. Imp. Ind. Research Inst., Osaka, Japan* [9], 8, 70 pp.—Two bleaching agents were employed:  $\text{NaHSO}_3$  and  $\text{H}_2\text{O}_2$ , different concns. being used. In order to test the effect of different bleaching methods, bleached muslin was dyed with several dyes. The amount of dye used was calcd. Other physical properties of bleached muslin were also examd.

F. I. NAKAMURA

**Transverse sections of artificial silk. II. Changes in section during moistening with water.** Y. KAMI AND S. NAKASHIMA. *Cellulose Ind.* (Tokyo) 4, 206-9 (1928); cf. C. A. 22, 163, 1047.—The cross-sectional area of filaments of well-known brands of artificial silk increased by 50-60% after soaking in water, while the periphery alters but little. The filament tends to regain its original form when first coagulated. Reverse changes occur during drying. B. C. A.

**The strengthening of viscose.** L. MEUNIER and R. GUYOT. *Rev. gén. colloïdes* 7, 53-66 (1929).—The hydrophylic properties of cellulose fibers are a function of the no. of free hydroxyl groups, which, because of their strongly polar character, react readily with water. The variations of the hydrophylic properties of viscose have been studied when the alc. hydroxyl groups are transformed by pairs in groups  $O-CH_2-O$  by means of formaldehyde. The removal of these groups affects the strength of the viscose absorption of substantive dyes and resistance to alkalis. L. B. MILLER

**Manufacture of atracene in U. S. S. R. (SOKOLOV) 21.** The chemical composition of wool (MARSTON) 11A. The oxidation of cellulose under the influence of light (SCHARVIN, PAKSCHVER) 23. Šebor's method of quantitative spectral analysis [of concentration of dyes] (KNOP) 3. Chemistry of natural humic acids [dye preparation] (SIMEK) 10. 1,2,5,6-Tetrahydroxyanthraquinone and 1,2,7,8-tetrahydroxyanthraquinone (HELLER) 10. Dyes derived from acenaphthenequinone. Acenaphthiminazoles and acenaphthoxazoles (SIRCAR, GUHA-RAY) 10. Aldehydophenolphthalein and dyes derived from it (SEN, KAR) 10. Detergent suitable for laundering purposes (U. S. pat. 1,710,974) 27. Drying cylinder for textiles (Ger. pat. 472,713) 23. Dispersion agents [for vat dyes or dyeing acetate silk] (Fr. pat. 648,728) 18. Treating films, filaments and the like formed from cellulose solutions (Brit. pat. 298,609) 23. Fireproofing textiles (Ger. pat. 474,186) 23. Condensation products of hydroaromatic ketones [azo dye] (Fr. pat. 648,940) 10.

BERGMANN, JOSEF: *Handbuch der Appretur*. Berlin: J. Springer. 321 pp. Bound, M. 36.

**Textile Educator.** Edited by L. J. MILLS. New York: Pitman. 1460 pp. \$17.50. Reviewed in *Textile World* 73, 117 (1928).

**Verfahren, Normen und Typen für die Prüfungen der Echtheitseigenschaften von Färbungen auf Baumwolle, Wolle, Seide, Viscosekunstseide und Azetatseide.** Edited by Echtheitskommission der Fachgruppe für Chemie der Farben- und Textilindustrie im Verein deutscher Chemiker. Berlin: Verlag Chemie, G. m. b. H. 64 pp. M. 3.60.

**Dyes.** BRITISH DYESTUFFS CORP., LTD., and JAMES BADDILEY. Fr. 648,843, May 24, 1927. Cotton and regenerated artificial silk are dyed with secondary disazo dyes obtained by coupling a diazotized nitroarylamine or a homolog or deriv. thereof, free from sulfo or carboxy groups, with a coupling component, diazotizing and coupling in alk. soln. with a 1,8-aminonaphtholsulfonic acid or a *N*-substituted deriv. thereof. The nitro group may be reduced. The following dyes are specified in examples: *p*-nitroaniline + 1-naphthylamine-6 (and 7)-sulfonic acid + 1,8-aminonaphthol-4-sulfonic acid gives a dull blue shade; *p*-nitroaniline + *m*-amino-*p*-cresol Me ether + 1,8-aminonaphthol-3,6-disulfonic acid, and reduction of the nitro group, yields a greenish black shade, the fastness of which to washing may be increased by diazotizing on the fiber and developing with *m*-tolylene diamine. A table of suitable primary, middle and final constituents and the colors obtained with the dye produced are given. Cf. C. A. 22, 3994

**Mordant dye.** DURAND & HUGUENIN AKT.-GES. Swiss 130,615, July 7, 1926. Addn to Swiss 123,930. A mordant dye is prepd. by diazotizing the amino group in *p*-amino-*m*-sulfo benzeneazosalicylic acid and coupling with *m*-cresotinic acid. With a Cr mordant, the dye colors cotton a fast brownish orange. Cf. C. A. 23, 2303.

**Dyes.** I. G. FARBENIND. A.-G. Brit. 298,545, June 7, 1927.  $\mu$ -Anthraquinonyl-anthraquinoneoxazoles are prepd. by condensation of  $\alpha$ -aminohydroxyanthraquinones with anthraquinone aldehydes or compds. capable of furnishing them such as azomethine of anthraquinone aldehydes or  $\omega$ -dichloromethylanthraquinones, or by condensation of the anthraquinonyl amides of anthraquinone carboxylic acids or components furnishing them such as an anthraquinone isoxazole and an aminoanthraquinone substituted in the  $\alpha$ -position to the amino group by OH or a neg. substituent. Either of the anthraquinone residues may contain addnl. substituents. The products which contain at least 1 free amino group may be converted into dyes of deeper color by

treatment with oleum, with or without addn. of catalysts such as S or I. The resulting compds. change color by the action of alkalis but this may be avoided by alkylation (suitably with *p*-toluenesulfonic acid methyl ester). Numerous examples are given of the production of dyes by this method. 2,3-Aminohydroxyanthraquinone is formed by treating 2,3-bromohydroxyanthraquinone with concd.  $\text{NH}_3$  at  $130^\circ$ . Reference is made to condensation products from anthraquinone-2-carboxylic chloride and 2-amino-1,3-dibromoanthraquinone and from 1-aminoanthraquinone-3-carboxylic chloride and 2,3-bromoanthraquinone.

**Dyes.** I. G. FARBERIND. A.-G. Brit. 298,696, July 18, 1927. Dianthraquinonylamines contg. a benzoylamino group in each anthraquinone nucleus, and also at least one alkoxy group, are prepd. by processes of which several examples are given, among which are the following: (1) a halobenzoylaminoanthraquinone is condensed with an aminohydroxybenzoylaminoanthraquinone and the product alkylated; (2) a halo-hydroxybenzoylaminoanthraquinone is condensed with a benzoylaminoanthraquinone contg. at least 1 free amino group, and the product is alkylated; (3) a haloalkoxybenzoylaminoanthraquinone is condensed with an aminobenzoylaminoanthraquinone; (4) a halo-hydroxybenzoylaminoanthraquinone is condensed with an aminohydroxybenzoylaminoanthraquinone and the product is alkylated; (5) a haloalkoxybenzoylaminoanthraquinone is condensed with an aminoalkoxybenzoylaminoanthraquinone. Numerous specific examples are given. 1-Benzoylamino-4-hydroxy-5-chloroanthraquinone and 1-benzoylamino-4-methoxy-5-chloroanthraquinone are formed by benzoylation of the corresponding amino derivs. 1-Benzoylamino-4-hydroxy-5-aminoanthraquinone is formed by partial hydrolysis of 1,5-dibenzoylamino-4-hydroxyanthraquinone. 1-Benzoylamino-4-methoxy-5-aminoanthraquinone is formed by condensation of 1-benzoylamino-4-methoxy-5-chloroanthraquinone with *p*-toluenesulfonamide and hydrolysis of the sulfonamido group. 1-Amino-4-hydroxy-5-chloroanthraquinone is made by the reduction of 1-nitro-5-chloroanthraquinone with "S sesquioxide" or by rearrangement of 1-hydroxyamino-5-chloroanthraquinone or by nitration and reduction of 1-hydroxy-8-chloroanthraquinone. 1-Methoxy-8-chloroanthraquinone is made by the action of  $\text{MeOH-KOH}$  on 1,8-dichloroanthraquinone or 1-nitro-8-chloroanthraquinone. 1-Amino-4-methoxy-5-chloroanthraquinone is made by nitration and reduction of 1-methoxy-8-chloroanthraquinone.

**Dyes.** I. G. FARBERIND. A.-G. (Arthur Lüttringhaus, Hugo Wolff and Heinrich Neresheimer, inventors). Ger. 473,163, Feb. 23, 1926. Benzanthrone or a deriv. having the *Bz*-1-position either free or substituted with halogen or with a group contg. O or S is treated with an acid halide in the absence of strong catalysts or condensing agents, and the halogenated products so obtained are sapond. under acid conditions and, if desired, simultaneously or subsequently oxidized. Dyes of the dibenzanthrone or isodibenzanthrone series dyeing cotton in violet shades are so obtained. According to the examples: (1) benzanthrone is treated with  $\text{PhCOCl}$  and the product is sapond. with  $\text{H}_2\text{SO}_4$ ; (2) the product of (1) is oxidized with  $\text{HNO}_3$ , Br or  $\text{MnO}_2$ ; (3) benzanthrone is treated with  $(\text{COCl})_2$  and the product is sapond. with  $\text{H}_2\text{SO}_4$ ; the 2,2'-dibenzanthronyl so obtained may be treated directly with  $\text{MnO}_2$ , yielding a dihydroxybenzanthrone, or with  $\text{HgO}$ , yielding dibenzanthrone or a dibenzanthrone sulfonic acid; (4) as in (1), using *Bz*-1-thiocresylbenzanthrone or 6-chloro-*Bz*-1-thiocresylbenzanthrone and *o*-chlorobenzoyl chloride; (5) as in (1), using *Bz*-1-chloro- or bromobenzanthrone and  $\text{POCl}_3$ ; (6) as in (1), using *Bz*-1-phenoxybenzanthrone and *o*-chlorobenzoyl chloride.

**Soluble dyes.** I. G. FARBERIND. A.-G. Fr. 649,219, Feb. 17, 1928. Dyes sol in water are obtained by condensing in the 2 amino groups diaminodiphenyl, its derivs. or substitution products, with a halonitrosulfonic acid of the  $\text{C}_6\text{H}_5$  or  $\text{C}_{10}\text{H}_7$  series contg. replaceable halogen atoms. In examples, benzidine (1 mol.) is heated with K 1-chloro-2,6-dinitrobenzene-4-sulfonate (2 mols.) and calcined soda in water. The product dyes wool orange shades. Dyes are also obtained from (1) 2,4'-diaminodiphenyl and 1-chloro-2,6-dinitrobenzene-4-sulfonic acid, (2) dianisidine and 1-chloro-2,6- (or -2,4-) dinitrobenzene-4-sulfonic acid, (3) 4,4'-diamino-2-nitrodiphenyl, or benzidine, or dianisidine and 1-chloro-2,6-dinitrobenzene-4-sulfonic acid, (4) benzidine or nitrobenzidine or *o*-dianisidine and 1-chloro-2-nitrobenzene-4-sulfonic acid. In each case the 2 amino groups become substituted with elimination of  $\text{HCl}$ .

**Dyes.** IMPERIAL CHEMICAL INDUSTRIES, LTD., R. W. PORG and M. WYLER. Brit. 299,152, Sept. 8, 1927. Oxyphenazines, naphthophenazines and dinaphthazines are treated with an alkali bicarbonate or with  $\text{CO}_2$  in the presence of an alkali and the resulting oxycarboxazines may be thionated to form S dyes.

**Dyes.** KURT LINDNER. Ger. 472,975, Dec. 22, 1925. A finely ground body

dye is prepd. with coal-tar, animal or vegetable dyes as the foundation, by the addn. of finely powd.  $\text{H}_2\text{SiO}_3$  obtained from the decompn. of sol. fluosilicates or  $\text{SiF}_4$ .

**Dyes.** SOC. ANON. POUR L'IND. CHIM. À BÂLE. Swiss 130,317, Dec. 4, 1926. Addn. to Swiss 127,259 (C. A. 23, 1281). Diazotized 4-acetamino-2-amino-1-benzenesulfonic acid is coupled with 1-(2'-methyl-5'-sulfonic acid)-phenyl-5-pyrazolone-3-carboxylic acid. The new dye colors wool in fast green-yellow tones in  $\text{H}_2\text{SO}_4$  baths.

**Dye.** SOC. ANON. POUR L'IND. CHIM. À BÂLE. Swiss 130,616, July 21, 1927. Addn. to Swiss 119,986. A vat dye of the dibenzanthrone series is prepd. by treating dibenzanthrone with  $\text{FeCl}_3$ . The dye colors cotton a wash-fast blue.

**Dyes.** SOC. ANON. POUR L'IND. CHIM. À BÂLE. Swiss 130,620 and 130,621, Feb. 12, 1927. Addns. to Swiss 127,530 (C. A. 23, 1284). New dyes of the anthraquinone series are prepd. by the action of 1-methoxy-4-aminoanthraquinone on dimethyl-*p*-phenylenediamine or on *m*-phenylenediamine. Thus, 25.4 parts of 1-methoxy-4-aminoanthraquinone are heated with 40 parts of *m*-phenylenediamine and 100 parts of dimethylaniline at  $180^\circ$  until a test in alc. showed no further change in color. MeOH at  $100^\circ$  is added. On cooling and filtering, the dye 1-(3'-amino)-phenyl-4-aminoanthraquinone is obtained. It colors acetate silk blue.

**Dyes.** SOC. ANON. POUR L'IND. CHIM. À BÂLE. Ger. 469,248. June 3, 1925. Addn. to Ger. 425,352. Indigoid dyes and their intermediate products are prepd. by a modification of the process described in the prior patent and in Ger. 427,905, by first prepg. the corresponding anil of thiofuran-1,2-dione by the action of an aromatic nitroso compd. on 2,3-anthraquinone or 2,3-anthraceneoxythiophene, and then condensing the anil of 2,3-anthracenethiofuran-1,2-dione with 2,3-anthraquinoneoxythiophene, or the anil of 2,3-anthraquinonethiofuran-1,2-dione with 2,3-anthraceneoxythiophene. Thus, 2,3-anthraquinoneoxythiophene, alc., water and 30% NaOH were warmed together to  $40^\circ$  and a soln. of nitrosodimethylaniline in alc. was added. Blue crystals of 2,3-anthraquinonethiofuran-1,2-dione are formed. Another example is given.

**Dyes.** SOC. ANON. POUR L'IND. CHIM. À BÂLE. Ger. 469,249. May 23, 1923. Indigoid dyes are prepd. by condensing the halogen substitution products of 2,1-naphthoxythiophene with 2-anil or 2-halide cyclic *o*-diketone, and, if desired, halogenating the product. Thus, dibromoisatin is suspended in chlorobenzene and heated with  $\text{PCl}_5$ . The resulting soln. of dibromoisatin chloride is stirred with a soln. of 7-chloro-2,1-naphthoxythiophene in chlorobenzene. The dye is pptd. as brown powder which, in a yellow vat, colors cotton gray-brown and silk red. With isatinilide, a product which colors cotton violet-red is obtained. Other examples are given.

**Azo dyes.** BRITISH DYESTUFFS CORP., LTD., JAMES BADDILEY, PERCY CHORLEY and RAINALD BRIGHTMAN. Ger. 474,301, Nov. 19, 1926. See Brit. 270,446 (C. A. 22, 1691).

**Azo dyes.** I. G. FARBERIND. A.-G. Brit. 298,697, July 18, 1927. Azo dyes insol. in water are formed in substance, on the fiber or on a substratum by coupling diazotized unsulfonated aminofluorenes with components such as naphthols, 2,3-hydroxynaphthoic arylides, hydroxynaphthocarbazoles or diacetoacetyl or like derivs. of aromatic diamines. Several examples are given.

**Azo dyes.** I. G. FARBERIND. A.-G. Brit. 298,907, Oct. 13, 1927. Azo dyes are formed in substance, on a substratum or on the fiber by coupling a diazotized 2,5-dimethyl-4-halogenaniline with an arylide of 2,3-hydroxynaphthoic acid or an arylide of a  $\beta$ -ketocarboxylic acid. Cotton is dyed red by padding with a soln. of the 4'-aniside or 2',5'-dimethoxy-1'-anilide of 2,3-hydroxynaphthoic acid and developing with a soln. of diazotized 2,5-dimethyl-4-chloroaniline or of 2,5-dimethyl-4-bromoaniline.

**Azo dyes.** I. G. FARBERIND. A.-G. Brit. 298,518, July 6, 1927. Many examples are given of the manuf. of tetrakisazo dyes of the type  $\text{R}^1\text{—R}^2\text{—R}^3\text{—R}^4\text{—X}$  and of octakisazo dyes of the type  $\text{R}^1\text{—R}^2\text{—R}^3\text{—R}^4\text{—Z—R}^5\text{—R}^6\text{—R}^7\text{—R}^8$ , in which  $\text{R}^1$  is an aromatic amine,  $\text{R}^2$  is a diazotizable middle component of the naphthalene series,  $\text{R}^3$  is a deriv. of a sulfonated or unsulfonated 1-naphthylamine, coupled in *p*-position to the amino group and contg. a free or substituted OH group,  $\text{R}^4$  is a deriv. of 2,5,7-aminonaphtholsulfonic acid contg. a diazotizable amino group in the heteronuclear side chain (or a deriv. thereof substituted also in the 1-position), and X and Z are one of the following coupling components: methyl ketol or a substitution product, a pyrazolone, a deriv. of a  $\beta$ -ketoaldehyde, 6,8-dihydroxyquinoline, a sulfazone of the type

$\text{CH}_3\text{—SO}_2\text{—CH}_2\text{—CO—NH}$  or salicylic acid or a deriv. capable of coupling.

**Azo dyes.** I. G. FARBERIND. A.-G. (Hans Krzikalla, inventor). Ger. 474,997, Aug. 29, 1926. Complex metal compds. of *o*-hydroxyazo dyes are formed by treating

the dye with compds. of such metals as Cr. Thus, 41 parts of the dye obtained by diazotizing 4-chloro-2-anisidine and 2,6-naphtholsulfonic acid are heated to 125–130° under pressure for 7 or 8 hrs. with 600–700 parts water, 40 parts  $\text{Cr}_2\text{O}_3 \cdot n\text{H}_2\text{O}$  contg. 26%  $\text{Cr}_2\text{O}_3$  and 20–25 parts 80%  $\text{CH}_2\text{O}$  in an autoclave. The Cr compd. is salted out in the usual way and colors wool a wash- and light-fast violet. Other examples are given.

**Azo dye.** SOC. ANON. POUR L'IND. CHIM. A BÂLE. Swiss 130,425, July 26, 1927. Diazotized 2-naphthylamine-1-sulfonic acid is coupled with 5-pyrazolone-3-carboxylic acid. The dye colors wool yellow. Cf. C. A. 23, 2833.

**Azo dye.** SOC. ANON. POUR L'IND. CHIM. A BÂLE. Ger. 474,746, Sept. 30, 1923. An *o*-hydroxyazo dye is prepd. by sapong. the reaction product of 1 mol. of unnitrated *o*-diazophenolsulfonic acid or one of its hydroxyacid derivs., and 2 mols. of unsulfonated  $\beta$ -naphthylamine. Thus, 189 parts *o*-aminophenolsulfonic acid are diazotized and stirred with 359 parts of  $\beta$ -naphthylamino-HCl at 40–85°. The product is treated with cold NaOH. The *o*-aminoazo dye produced colors wool orange in an acid bath. Cf. C. A. 23, 2577.

**Azo dyes for cellulose esters.** OSKAR KNECHT (to Chemische Fabrik vorm. Sandoz). U. S. 1,711,390, April 30. In prep. dyes contg. neither  $\text{CO}_2\text{H}$  nor  $\text{SO}_3\text{H}$  groups and suitable for dyeing cellulose acetate or other cellulose esters, diazotized glycol 2-amino-4-nitrophenyl ether or other suitable diazo compd. having at least one H atom of its aromatic nucleus substituted by a radical of glycol is coupled with an azo component such as *m*-toluidine; the dye may be developed with  $\beta$ -naphthol. U. S. 1,711,391 specifies a like process, using compds. with a radical of glycerol such as glycerol 2-amino-4-nitrophenyl ether.

**Azo dyes containing chromium.** SOC. ANON. POUR L'IND. CHIM. A BÂLE. Swiss 130,155, June 24, 1927 and 130,156, July 28, 1927. The dye obtained from the nitrated diazo compd. of 1-amino-2-hydroxynaphthalene-4-sulfonic acid and  $\beta$ -naphthol is heated with  $(\text{HCOO})_3\text{Cr}$  in presence of  $\text{AcONa}$  to give a Cr-contg. azo dye. In the second patent, a Cr-contg. azo dye is prepd. by treating the dye obtained from diazotized 6-sulfo-4-chloro-2-amino-1-phenol and  $\beta$ -naphthylamine with an org. Cr salt in the presence of an org. acid.

**Azo dye containing chromium.** SOC. ANON. POUR L'IND. CHIM. A BÂLE. Ger. 473,527, Jan. 26, 1926. An azo dye contg. Cr is prepd. by treating the azo dye obtained from 6-nitro-2-amino-1-phenol-4-sulfonic acid and  $\beta$ -naphthol with Cr-yielding materials, such as  $\text{CrF}_3$ ,  $(\text{AcO})_3\text{Cr}$  or freshly pptd.  $\text{Cr}(\text{OH})_3$ .

**Metal compounds of azo dyes.** SOC. ANON. POUR L'IND. CHIM. A BÂLE. Brit. 298,494, Oct. 8, 1927. Azo dyes contg. metal such as Cu or Cr, with or without other suitable compds., are condensed with cyanuric halides. A very large no. of examples are given of dyes producing different shades and suitable for use on various materials including cotton, wool and silk. Cf. C. A. 23, 2833.

**Vat dyes.** I. G. FARBENIND. A.-G. (Karl Schirmacher, Hans Tampke and Wilhelm Schaich, inventors). Ger. 472,772, Oct. 22, 1926. Addn. to 470,809. The method of Ger. 470,809 (C. A. 23, 2043) for the manuf. of vat dyes from the 9,10-disulfuric acid esters of certain anthrahydroquinones is now found to be applicable to the corresponding 9,10-diethers. In 1 example,  $\beta$ -acetaminoanthraquinone is reduced catalytically with H and the product etherified with  $\text{Me}_2\text{SO}_4$ . The  $\beta$ -acetaminoanthrahydroquinone-9,10-dimethyl ether, m. 253°, so obtained is sapon. to give  $\beta$ -aminoanthrahydroquinone-9,10-dimethyl ether, m. 235°, and the hydrochloride of the ether is then oxidized by boiling in aq. HCl suspension with  $\text{FeCl}_3$ . Finally, the oxidation product is warmed with  $\text{H}_2\text{SO}_4$  to split off the ether groups. The product is a vat dye giving blue shades on cotton. In another example, the same product is obtained starting from  $\beta$ -formylaminoanthraquinone and effecting the oxidation of the ether with  $\text{NaOCl}$ .

**Vat dye.** I. G. FARBENIND. A.-G. (Max A. Kunz and Karl Köberle, inventors). Ger. 473,664, July 6, 1927. Vat dyes are prepd. by the action of alcs., phenols or mercaptans on neg. substituted *allo*-*ms*-naphthodianthrone, with or without solvent or suspension agent, and, if desired, in the presence of agents with an alk. reaction. The product may be halogenized. Thus, 100 parts dichloro-*allo*-*ms*-naphthodianthrone are stirred with 200 parts KOH and 1000 parts PhOH and boiled until the soln. is violet-red. The liquid is cooled to 80–100°, and 2000 parts spirits added. A blue-red product is formed and is filtered off and recrystd. from  $\text{PhNO}_2$  as red needles m. about 315°. If the PhOH is replaced by other substances contg. the OH or SH groups, such as *p*-cresol,  $\beta$ -naphthol,  $\beta$ -hydroxyanthraquinone, or  $\text{PhSH}$ , a dye with similar properties is obtained. Other examples are given. Cf. C. A. 23, 2042.

**Vat dyes.** I. G. FARBENIND. A.-G. Fr. 648,861, Oct. 21, 1927. Compds. of the



formula  $2,3\text{-MeXC}_6\text{H}_3\text{SCH}_2\text{CO}_2\text{H}$  (I), where X is either CN,  $\text{CONH}_2$  or  $\text{COOH}$ , are condensed to obtain the corresponding hydroxythionaphthene and the latter is transformed by the usual methods into vat dyes. In examples, 3-methylbenzene-2-cyano-1-thioglycolic acid (6-nitro-*o*-toluidine by converting the  $\text{NH}_2$  into CN, reducing the  $\text{NO}_2$  group and introducing the thioglycolic acid group by diazotizing) is heated with NaOH soln. and the Na salt of 4-methyl-3-amino-1-thionaphthene-2-carboxylic acid is pptd. by the addn. of NaCl, and this is treated with NaOH and  $\text{NaHSO}_4$ , filtered and acidified and heated on the water bath until the hydroxythionaphthene is formed and this is transformed into 4,4'-dimethylbisthionaphthene indigo in known manner. 3-Methylbenzene-2-carboxy-1-thioglycolic acid (by transforming 6-chloro-*o*-toluidine into the CN compd. by way of the diazo compd., sapong. the CN group to  $\text{COOH}$  and substituting the Cl by  $\text{S.CH}_2\text{COOH}$  in the manner described in Ger. 189,200) may also be used as starting material. 4-Methyl-6-chloro-2,3-dihydro-3-keto-2-(*p*-dimethylaminophenylimino) thionaphthene is heated to boiling with 4-methyl-3-hydroxythionaphthene in glacial AcOH, yielding a dye which gives fast red shades on cotton. Dichloroisatin is heated in  $\text{C}_6\text{H}_6$  with  $\text{PCl}_5$  and 4-methyl-3-hydroxythionaphthene, yielding a dye which gives fast violet shades on cotton.

**Vat dye.** SOC. ANON. POUR L'IND. CHIM. À BALE. Swiss 130,074, Sept. 9, 1927. Addn. to Swiss 125,480. A vat dye is prepd. by sulfonating benzanthrone with fuming  $\text{H}_2\text{SO}_4$  at ordinary temps., treating the product with caustic alkali at  $250\text{--}310^\circ$ , and methylating. The dye colors cotton a fast gray-blue in a red-violet bath. Cf. C. A. 23, 2833.

**Vat dyes.** ERWIN HOFFA, HANS HEYNA, ERWIN THOMA and OTTO HIRSCHL (to Grasselli Dyestuff Corp.). U. S. 1,710,981, April 30. Indigoid dyes dyeing cotton fast red to bluish red tints are formed by oxidation (suitably with a soln. of  $\text{K}_2\text{FeC}_4\text{N}_6$  or with air in the presence of  $\text{CuSO}_4$ ) of hydroxynaphthenes prepd. from the 3,5-dialkyl-4-halogenphenyl-1-thioglycolic acids and from 3,4-dialkyl-5-halogenphenyl-1-thioglycolic acids and their derivs. which are substituted in the 2-position by the nitrile group,  $\text{CONH}_2$  or  $\text{COOH}$ . The dyes obtained may be further halogenated. Several examples are given.

**Derivatives of vat dyes.** DURAND & HUGUENIN A.-G., MARCEL BADER and CHARLES SUNDER (Wilhelm Bauer and Alfred Herre, inventors). Ger. 474,036, Oct. 27, 1925. Addn. to 424,981. Ger. 424,981 describes the manuf. of solid, stable, water-sol. derivs. of vat dyes by treating the corresponding leuco compds. with  $\text{HClSO}_3$ , while excluding  $\text{H}_2\text{O}$ . This method is now modified by using pyrosulfuryl chloride ( $\text{ClSO}_2\text{OSO}_2\text{Cl}$ ) instead of  $\text{HClSO}_3$ . The presence of a little  $\text{H}_2\text{O}$  is not harmful, since  $\text{H}_2\text{O}$  reacts with  $\text{ClSO}_2\text{OSO}_2\text{Cl}$  to give  $\text{HClSO}_3$ . Examples are given describing the manuf. of products from dibromoindigo white and the leuco compd. of 4,5',7'-trichloroindigo (prepd. by treating 5,7-dichloroisatin- $\alpha$ -chloride with monoacetyl-4-chloroindoxyl).

**Anthraquinone vat dye.** BRITISH DYESTUFFS CORP., LTD., and S. THORNLEY. Brit. 298,928, July 15, 1927. Vat dyes obtained by alkali fusion of sulfonic acids prepd. by direct sulfonation of homologs or derivs. of benzanthrone such as *Be*-1-chloro- and 2-methyl-benzanthrones are condensed with hydroxylamine or its salts with or without the use of  $\text{FeSO}_4$ ; vat dyes obtained by alkali fusion of the benzanthrone-sulfonic acids prepd. from anthraquinonesulfonic acids may be similarly treated. Dyes are produced giving bluish or grayish dyeings.

**Readily soluble vat color preparations.** WILHELM BAUER, ALFRED HERRE and ALBERT FUNKE (to Grasselli Dyestuff Corp.). U. S. 1,711,008, April 30. Di(*p*-chloroanilino)benzoquinone is treated with monople soap or other suitable dispersing agent and an alkali such as soda in the presence of water, and the mixt. is dried and mixed with a reducing agent such as hyposulfite which is capable of reducing the insol. vat color to its leuco form. U. S. 1,711,009 relates to similar products.

**Cloth-printing dyes.** I. G. FARBENIND. A.-G. (Martin Hankel, inventor). Ger. 474,659, Sept. 1, 1927. Pure nitrosoamine print dyes are prepd. by dissolving the components in the min. amt. of water and alkali, filtering, concg. or evapg. to dryness, and, if desired, adding more alkali. The components are thus brought to such concn. that, on mixing, no undesirable dye formation occurs. Thus, 100 kg.  $\beta$ -hydroxynaphthoaniline is dissolved in 300 kg. water and 110 kg. NaOH at  $60\text{--}80^\circ$  and filtered. Also, 200 kg. of a wet paste of the nitrosoamine Na salt of *o*-nitroaniline contg. 26.3% *o*-nitroaniline and 4% NaOH is dissolved in 200 kg. water at  $60^\circ$  and filtered. The two filtrates are poured together at  $30^\circ$  and evapd. *in vacuo*. Other examples are given.

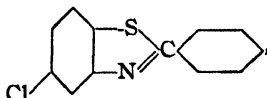
**Benzanthrone dyes.** BRITISH DYESTUFFS CORP., LTD., J. BADDILEY, A. SHEP-

HERDSON and S. THORNLEY. Brit. 298,931, July 16, 1927. 2-Methylbenzanthrone or a chlorobenzanthrone or other simple homolog or substitution product of benzanthrone is sulfonated (preferably with oleum), with or without the use of catalysts such as Hg, and the sulfonic acids thus formed are subjected to alkali fusion to produce dyes of reddish blue color. Cf. C. A. 22, 3534.

**Benzanthrone dyes.** I. G. FARBENIND. A.-G. Brit. 298,583, May 12, 1927. The conversion products obtained by treating Bz-1-phenylbenzanthrones with  $\text{AlCl}_3$  (as described in Brit. 297,129; C. A. 23, 2579) are converted into vat dyes by melting them with a caustic alkali or other alk. condensing agent such as an alkali metal amide, anilide or alcoholate. An example is given of the production of a dye from Bz-1-phenylbenzanthrone which dyes cotton fast bluish green shades from a blue vat. Cf. C. A. 23, 991.

**Sulfur dyes.** SOC. ANON. POUR L'IND. CHIM. À BAËLE. Ger. 474,786, April 8, 1923. The leuco compd. of indophenol is sulfurized in the presence of benzidine. Thus, 27.2 parts indophenol, obtained by the condensation of nitrosophenol with carbazole, is melted and mixed with 29 parts powd.  $\text{Na}_2\text{S}$  and 36 parts powd. S. The mixt. is allowed to stand until the reduction of the indophenol is complete. It is then dried *in vacuo*, powd. and mixed with 9.2 parts benzidine. The product is baked at 180–190° until no further  $\text{H}_2\text{S}$  is evolved, after which it is cooled, ground up and extd. with  $\text{Na}_2\text{S}$  to remove the excess of S. The resulting S dye colors cotton an indigo-blue tone fast to washing, to light and to Cl. Other examples are given.

**Thiazoles; dyes.** COMPAGNIE NATIONALE DE MATIÈRES COLORANTES ET MANUF. DE PRODUITS CHIM. DU NORD RÉUNIES, ÉTABLISSEMENT KUHLMANN. Fr. 648,405, June 23, 1927. Thiazoles of the formula



in which the 2nd benzene ring may be substituted, are obtained by treating, with BzCl or its derivs., an aminothiophenol obtained by nitrating 1,4-dichlorobenzene, converting this into dichlorodinitrophenylbisulfide and transforming the latter. By treating the aminothiophenol with *o*-, *m*- or *p*-nitrobenzoyl chloride, *o*-, *m*- or *p*-nitrothiazole is obtained which can be reduced with Sn or Fe, HCl and alc. to the corresponding aminothiazoles, which products or their sulfo derivs. or oxidized sulfo derivs. can be diazotized and coupled with known coupling agents to form valuable dyes for wool and silk. Fr. 648,406 describes a process in which aminothiophenols are obtained by the action of  $\text{S}_2\text{Cl}_2$  on *o*-toluidine, *p*-phenetidine, *o*-anisidine, *o*-chloraniline in accordance with Ger. 360,690, 367,344, 367,345, 367,346, 364,822 and 370,854, and the aminothiophenols are then treated with BzCl or its derivs. as in Fr. 648,405.

**Sulfonic acids.** I. G. FARBENIND. A.-G. (Arthur Lüttringhaus and Paul Nawiaskey, inventors). Ger. 472,925, Nov. 4, 1925. Sulfonic acids are prepd. from the hydro compds. of vat dyes by treating the condensation products of these compds. with halohydroxyalkyl compds. in the presence of chlorosulfonic acids or substances with an analogous action. Thus, pyridine is dropped into a chlorosulfonic acid, and the condensation product of glycol chlorohydrin and the hydro compd. of *N*-dihydro-1,2,1',2'-anthraquinoneazaine added. NaOH is added and the pyridine distd. off by steam. The product is washed and the filtrate salted out, giving a dye which colors wool red in an acid bath. Instead of pyridine, dimethylaniline may be used.

**Nitro-2-amino-1-benzoic acids.** I. G. FARBENIND. A.-G. Fr. 649,324, Feb. 20, 1928. Nitro-2-amino-1-benzoic acids and their alkyl, aryl or aralkyl derivs. in the amino group are prepd. by submitting 2-chloro-4(or 6)-nitro-1-benzoic acid to a reaction with  $\text{NH}_3$ , an alkylamine, an arylamine or aralkylamine in the presence of a catalyst. Thus, 4-nitro (or 6-nitro)-2-chloro-1-benzoic acid is heated under pressure to about 120° with  $\text{NH}_3$  soln. in the presence of finely divided Cu. The products, 4-nitro-(m. 279°) and 6-nitro-2-chloro-1-benzoic acid (m. 184–185°), are thus obtained cheaply and easily for the prepn. of dyes of various groups.

**2', 4'-Dichloro-*o*-benzoyl-benzoic acid.** IVAN GUBELMANN, HENRY J. WEILAND and OTTO STALLMANN (to Newport Co.). U. S. 1,711,144, April 30. This compd. forms white crystals, m. 100–101°. It may be used as a dye intermediate and may be made by condensing *m*-dichlorobenzene and phthalic anhydride.

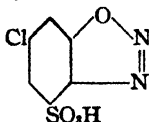
**3'-Nitro-4',6'-dichloro-*o*-benzoyl-benzoic acid.** IVAN GUBELMANN, HENRY J. WEILAND and OTTO STALLMANN (to Newport Co.). U. S. 1,711,145, April 30. This compd. is made by treating 2',4'-dichloro-*o*-benzoylbenzoic acid in sulfuric acid mono-

hydrate at 10° with mixed nitrating acid and dilg. with cold water. It is a cryst. compd. m. 174° and suitable for use in making dyes.

**3'-Amino-4',6'-dichloro-*o*-benzoylbenzoic acid.** IVAN GUBELMANN, HENRY J. WEILAND and OTTO STALLMANN (to Newport Co.). U. S. 1,711,146, April 30. This compd. is made by reducing the corresponding nitro compd. with Fe and HOAc at 90–95°, rendering the reaction mass alk., filtering and acidifying. It m. 164° and may be used as a dye intermediate.

**Condensation products of the anthraquinone series.** GEORG KRÄNZLEIN and MARTIN CORELL (to Grasselli Dyestuff Corp.). U. S. 1,710,992, April 30. Compds. which may be used as *dye intermediates* or directly as *dyes for dyeing "acetate silk"* are formed by subjecting a compd. of the general formula  $\text{NH}_2\text{ASR}$ , in which A stands for an anthraquinone residue (which may be substituted) and R stands for H or an alkali metal, the  $\text{NH}_2$  and SR groups standing in *o*-position to each other and in an  $\alpha$ - and  $\beta$ -position, and, when R represents H, in the presence of an acid-binding substance, to reaction with compds. of the general formula  $\text{Hlg. CH}_2\text{CH}_2\text{X}$ , in which Hlg stands for halogen and X for a halogen or OH. Examples are given of the production of 1-aminoanthraquinone-2-( $\omega$ -hydroxy)-ethylthio ether, m. 171–3°, 1-aminoanthraquinone-2-( $\omega$ -bromo)-ethylthio ether, m. 145–7°, 1-amino-4-(*p*-tolyl)-aminoanthraquinone-2-( $\omega$ -bromo)-ethylthio ether and some similar compds.

**Dyes and intermediates.** COMPAGNIE NATIONALE DE MATIÈRES COLORANTES ET MANUF. DEP. PRODUITS CHIM. DU NORD RÉUNIS, ÉTABLISSEMENTS KUHLMANN. Fr. 650,086, Aug. 5, 1927. **4-Chloro-6-sulfo***benzenediazo oxide* of the formula



is obtained by the action of NaOAc on diazotized 2-nitro-4-chloro-6-sulfo-1-amino-benzene. This product couples with azo components to give mordant dyes dyeing wool directly in an acid bath which may be after-chromed or coppered. They yield metal compds. when treated in substance with metallic salts, *e. g.*, Cr salts. Examples of azo components are: resorcinol, 1-(4'-sulfophenyl)-5-pyrazolone-3-carboxylic acid, 1-(4'-sulfophenyl)- and phenyl-3-methyl-5-pyrazolone,  $\alpha$ - and  $\beta$ -naphthol and acetoacetanilide. The prepn. of sol. Cr compds. is also given. Cf. C. A. 23, 714.

**Dyes and intermediates.** I. G. FARBENIND. A.-G. Brit. 298,493, Oct. 8, 1927. Alkoxy-3-hydroxythionaphthenes are made by treating an alkoxyarylthioglycolyl halide of the benzene or naphthalene series (such as 1-methyl-6-chloro-4-methoxybenzene-3-thioglycolyl chloride or 6-ethoxynaphthalene-2-thioglycolyl chloride—prepd. from the acids by the action of  $\text{SOCl}_2$  and  $\text{PCl}_5$ , resp., in  $\text{PhCl}$  soln.) with an Al halide such as  $\text{AlCl}_3$ , preferably in the presence of a solvent which may be that used in forming the halide employed as starting material. 6-Ethoxynaphthalene-2-thioglycolic acid is prepd. by reducing 6-ethoxynaphthalene-2-sulfonyl chloride to the mercaptan and condensing with chloroacetic acid. 4-Ethoxynaphthalene-1-thioglycolic acid, 7-methoxynaphthalene-1-thioglycolic acid, 4-ethoxynaphthalene-2-thioglycolic acid and 7-methoxynaphthalene-2-thioglycolic acid may also be used as starting materials.

**Dyes and intermediates.** I. G. FARBENIND. A.-G. Brit. 298,775, Oct. 21, 1927. Pyrazoleanthrone derivs. are formed by reaction of pyrazoleanthrone, or substitution derivs., with nuclear halogenated aromatic compds. of the benzene, naphthalene or anthracene series, with or without use of a diluent, catalyst or acid-binding substance. Among the starting materials which may be used are: bromobenzene, *o*-bromo- (or chloro)benzoic acid, *Bs*-1-bromobenzanthrone (or its nitrated deriv.),  $\alpha$ -chloroanthraquinone, 1,5-dichloro-2,4-dinitrobenzene, 2-chloro-3-naphthoic acid,  $\alpha$ -bromonaphthalene, *o*-chloronitrobenzene and similar compds. V salts may be used as catalysts and pressure may be employed. *Bs*-1-chloro-*Bs*-2-phenylbenzanthrone (one of the starting materials mentioned) is made by substituting  $\text{NH}_2$  for OH in *Bs*-1-hydroxy-*Bs*-2-phenylbenzanthrone, diazotizing and replacing the diazo group by Cl by the Sandmeyer method.

**Dye intermediates.** I. G. FARBENIND. A.-G. Brit. 298,955, Oct. 17, 1927. Oxythionaphthenes are prepd. from thioglycolic acids of the benzene series having a CN,  $\text{COOH}$  or  $\text{COO-metal}$  group in the 2-position, an alkyl group in the 3-position and which may have a halogen atom or an alkyl group in the 4-, 5- and 6-position, by merely heating with water under pressure. The products are washed with  $\text{Na}_2\text{CO}_3$ , dissolved in alc. NaOH and reprecipitated with HCl. Examples are given of the treatment of: 3-

methyl-5-chlorophenyl-1-thioglycolic-2-carboxylic acid, 3,6-dimethyl-5-chlorophenyl-1-thioglycolic-2-carboxylic acid, 2-cyano-3-methyl-5-chlorophenylthioglycolic and 2-cyano-3,6-dimethyl-5-chlorophenylthioglycolic acid.

**Dye intermediates.** I. G. FARBENIND. A.-G. (Karl Schirmacher, Wilhelm Schaich and Karl Eishold, inventors). Ger. 473,471, Nov. 4, 1926. Anthrahydroquinone-9,10-disulfuric acid esters or their salts are prepd. by treating anthraquinone or such substitution products thereof as are not vat dyes with a halogen sulfonic acid, or an ester or salt of such acid, and a metal in the presence of a tertiary base. According to example 1, anthraquinone (20.8 parts) is added to a cooled mixt. of pyridine (200 parts) and  $\text{HClSO}_3$  (50 parts) or  $\text{MeClSO}_3$  (56 parts), and after stirring the temp. is allowed to rise to  $65^\circ$ , when Cu bronze (30 parts) is gradually added. The mixt. is cooled to  $30$ – $35^\circ$  and poured into NaOH soln. The pyridine is removed by steam distn. and the residue filtered and concd. The di-Na salt of anthrahydroquinone-9,10-disulfuric acid ester crystallizes out. Other examples, conducted similarly, describe the manuf. of products from  $\beta$ -acetaminoanthraquinone,  $\beta$ -formylaminoanthraquinone,  $\beta$ -aceto-hydroxyanthraquinone and 2,6-diacetaminoanthraquinone; the Ac or formyl group is split off during the reaction.

**Lakes.** I. G. FARBENIND. A.-G. (Leo Rudolf and Bodo Zschimmer, inventors). Ger. 474,381, July 23, 1925. Lakes are prepd. from the condensation products obtained by the interaction of a halogenated aromatic compd. contg. nitro or quinone groups with an aromatic amine. The amine may contain substituents such as  $\text{HSO}_3$ ,  $\text{COOH}$  or  $\text{OH}$ . Examples are given corresponding to those in Brit. 274,627 (C. A. 22, 2278).

**Dyeing.** I. G. FARBENIND. A.-G. Brit. 299,069, Oct. 20, 1927. Fast dyeings and prints are produced by applying an alkali soln. of an arylthioglycolic- $\alpha$ -carboxylic acid amide (such as a bath formed with NaOH and 5-chloro-1-methylbenzene-3-thioglycolic-2-carboxylic acid amide), drying if necessary, steaming and oxidizing as with  $\text{K}_3\text{FeC}_6\text{N}_6$  or bleaching powder. Various details and examples are given.

**Dyeing.** SOC. ANON. POUR L'IND. CHIM. À BÂLE. Swiss 130,406. Previously dyed delicate animal filaments such as down and fur are discharged by Zn aldehydesulfoxylate in the presence of an acid. Thus, down previously dyed, and dischargeable with a hydrosulfite prepn., is treated with basic Zn formaldehydesulfoxylate, gum and tartaric acid.

**Dyeing artificial silk.** BRITISH DYESTUFFS CORP., LTD., JAMES BADDILEY, PERCY CHORLEY and CARLTON BUTLER. Ger. 474,430, Mar. 4, 1927. See Brit. 276,450 (C. A. 22, 2471).

**Dyeing artificial silk.** I. G. FARBENIND. A.-G. (Rudolf M. Heidenreich, inventor). Ger. 473,454, Sept. 25, 1925. Fast shades are obtained in dyeing cellulose ester or ether silk with aminoanthraquinones or their derivs. when the dyeing is performed in the presence of a sulfurized phenol. An example is given.

**Dyeing cellulose acetate, etc.** BRITISH CELANESE, LTD., G. H. ELLIS and H. C. OLFIN. Brit. 298,699, July 19, 1927. Dyeing, printing or stencilling is effected by oxidation of one or more amines on the material by the action of a chloramide. Numerous details and examples are given. 4-Chloro-2-amino-4'-ethoxydiphenylamine (one of the starting materials used) is made by reduction of the nitro compd. obtained from 2,5-dichloronitrobenzene and *p*-phenetidine.

**Dyeing cellulose acetate and other cellulose derivatives.** BRITISH CELANESE, LTD., G. H. ELLIS, H. C. OLFIN and E. W. KIRK. Brit. 298,993, July 19, 1927. Dyeing, printing or stencilling is effected by the application of unsulfonated azo dyes obtained from aminonaphthols or their nuclear substitution products and having the azo group linked to the naphthalene nucleus in a position ortho or peri to an auxochromic group, such as (1) the dye obtained from aniline and 1,8-aminonaphthol, solubilized by Na ricinoleate; (2) the dye *p*-aminobenzene-azo-1,8-aminonaphthol, suitably solubilized by a dispersing agent, further diazotized on the fiber and coupled with 2,3-hydroxynaphthoic acid; or (3) the dye formed from dianisidine and 2 mols. of 1,8-aminonaphthol developed with a soln. of *p*-nitrobenzenediazonium acetate. These three dyes produce red, black and dark brown dyeings, resp. Dyes of various other similar specified groups also may be used.

**Facilitating dyeing of hydrated cellulose, etc.** I. G. FARBENIND. A.-G. Brit. 298,491, Oct. 6, 1927. Treatment of hydrated cellulose to reduce its tendency to swell as described in Brit. 278,684 (C. A. 22, 2663) is carried out in the presence of an "indifferent" water-sol. salt such as NaCl and a mordant may also be used simultaneously or in a preceding treatment. Use of  $\text{CH}_3\text{O}$ , urea,  $\text{NH}_3$  and NaCl in the treatment of hydrated cellulose such as artificial silk is described. Dyeing may be further facilitated by subjecting the material to a final feeble bleach.

**Dyeing and printing mixed fabrics.** ALFRED THAUSS and ALFRED GUENTHER (to Grasselli Dyestuff Corp.). U. S. 1,711,002, April 30. In dyeing or printing mixed fabrics contg. animal fibers with dyes to be employed in acid or neutral baths, a sulfonation product such as may be obtained from resins (suitably "colophony sulfonic acid") is used for reducing or preventing absorption of dyes by wool and silk.

**Apparatus for dyeing, especially hanks of yarn.** HANS WAGNER. Ger. 473,609, Mar. 18, 1927.

**Dyeing machine for textile goods, especially hanks of yarn.** ROBERT HAMPE. Ger. 473,610, Mar. 20, 1926. The dye liquid can be transferred from vat to vat.

**Material printing.** CANTASILVA, G. M. B. H. Ger. 472,957, Nov. 29, 1927. Material is sized, or rubberized on one side only and printed on the opposite side.

**Printing woolen fabrics with ester salts of leuco compounds of vat dyes.** I. G. FARBENIND. A.-G. Brit. 298,648, Oct. 13, 1927. The goods are developed, after printing and steaming, with a soln. contg. a persulfate and a free acid. Examples are given.

**Textiles.** C. H. BOEHRINGER SOHN. Ger. 472,604, Dec. 28, 1927. Cotton and artificial silk are given a crackling feel by treating with a bath of soap and org. acid. A preferable mixt. is soap and lactic and tartaric acids, the latter being present in quantities between 5 and 50%.

**Flexible fabric coated with cellulose ester composition.** G. A. LANGVERTE ET CIE. Brit. 298,982, Oct. 18, 1927. A material suitable for automobile upholstery comprises a base of heavy closely woven fabric coated with a thick layer of a nitrocellulose or cellulose acetate compn. which may weigh 400–800 g. per sq. meter if desired. An app. and mech. details of coating are described.

**Treating fabrics of cellulose derivatives to render them more susceptible to ironing.** H. PLATT and C. M. CROFT (to British Celanese, Ltd.). Brit. 299,058, Oct. 21, 1927. Fabrics formed of, or contg., thermoplastic materials, such as cellulose acetate, formate, butyrate or propionate or methyl, ethyl or benzyl cellulose, are treated with an aq. soln. of an Al salt such as a soln. formed of basic Al acetate, together with HOAc or  $\text{NH}_4\text{CNS}$  to enable the fabric to be ironed without sticking to the iron. The treatment also serves to waterproof the fabric.

**Fibers from viscose or like materials.** I. G. FARBENIND. A.-G. Brit. 298,492, Oct. 7, 1927. In prepg. lustrous wool-like fibers by a process in which the material before cutting is treated with liquids, drained and centrifuged, the parallel character of the original winding and a practically uniform length and quality of fiber are obtained by winding the threads from the nozzle onto hollow perforated drums of metal, ceramic ware or other material which is chemically stable. Various details of an app. used and of procedure are described.

**Treatment of fibers.** I. G. FARBENIND. A.-G. Ger. 474,557, Feb. 22, 1927. Cloth fibers, animal or vegetable, are treated with halogenizing or oxidizing agents after treatment with org. sulfo acids or their salts. Thus, 50 kg. worsted goods are treated for 10 minutes with 1000 l. of water contg. 1 g. active Cl and 4 g. chlorinated isopropyl naphthalenesulfonic acid per l. This gives the goods an improved gloss and touch. Other examples are given.

**Liquefaction of silk.** KANEGAFUCHI BOSEKI KABUSHIKI KWAISHA. Fr. 649,979, Feb. 28, 1928. A colloidal soln. of crude natural silk or waste silk threads is made by means of a soln. of  $\text{Mg}(\text{NO}_3)_2$  or other sol. salt of Mg, and the Mg salt is sepd. The product may be used for making threads or plastic materials. Fr. 649,980 describes a process for spinning the liquefied silk.

**Artificial silk.** FRANZ J. GAHLERT. Ger. 472,113, June 10, 1925. See U. S. 1,666,090 (C. A. 22, 2056).

**Artificial silk, films, etc.** COURTAULDS, LTD. Fr. 648,704, Feb. 13, 1928. Centrifuges for the treatment of cakes of artificial silk with washing, dyeing or soaping liquids are described.

**Treating artificial silk or other threads with liquids while wound on a perforated drum.** M. SCHOENFELD. Brit. 298,721, Aug. 5, 1927. An app. is described which is provided with devices which project through the drum to lift the threads from the surface of the drum as the latter revolves and thus facilitate penetration of the treating liquid.

**Device for straining skeins of artificial silk.** OTTO SINDL (to the Firm Nuera Art-Silk Co., Ltd.). U. S. 1,711,465, April 30. Structural features are described of a device suitable for handling "viscose silk" skeins.

**Washing artificial silk.** HERMINGHAUS & Co., G. M. B. H. Ger. 474,442, Sept. 23, 1927. Addn. to 464,016. According to Ger. 464,016, artificial silk and like cellulosic products are washed while wound on perforated or imperforated bobbins coated with a

water-sol. layer, the soln. of which allows the fibers to swell. This method is now applied with bobbins which, besides having a water-sol. layer, are porous or provided in addn. with a porous layer. Cf. C. A. 23, 2569.

**Washing textiles.** THE DE LAVAL SEPARATOR Co. Ger. 473,807, May 13, 1925. Washing liquids, such as  $C_6H_6$ , from dyed textile fabrics and the like, are purified and decolorized by an app. which pumps the liquid through a filter and a decolorizing agent.

**Damping agent.** CHEMISCHE FABRIK VORM. SANDOZ. Swiss 130,604, June 1, 1927. Addn. to Swiss 128,440 (C. A. 23, 2837). A penetrating moistening agent for textiles and similar goods is formed by mixing a phenol with hydrogenated naphthalene. Thus, 92 kg. crude cresol and 8 kg. tetrahydronaphthalene form a suitable mixt.

**Wetting agents.** H. T. BÖHME A.-G. Brit. 298,559, Oct. 11, 1927. Products suitable for use in the *textile* and *leather industries* as wetting, cleaning and emulsifying agents, and which appear to be true sulfonic acids, are formed by treating aliphatic acids of high mol. wt. such as oleic acid or linoleic acid with  $H_2SO_4$  in the presence of org. acid anhydrides or chlorides such as  $Ac_2O$  or acetyl chloride. The alkali salts of the sulfoacids may be dried without loss of their wetting properties, etc. The alk. earth metal salts are sol. and the products may be used with hard water.

**Wetting agents.** H. T. BÖHME A.-G. Brit. 298,560, Oct. 11, 1927. An aromatic sulfoacid, preferably having an aliphatic side chain of at least 3 C atoms, such as dipropyl-naphthalenesulfoacid, is mixed with a product formed by treating a higher unsatd. aliphatic acid such as oleic acid with  $H_2SO_4$  in the presence of aromatic acid chlorides or anhydrides. Hydrocarbons and halogenated hydrocarbons may also be added. The product serves both as a wetting and softening agent for *textile materials*. Cf. C. A. 23, 1228.

**Apparatus for the wet treatment of open-width fabrics in endless lengths.** ZITTAUER MASCHINENFABRIK A.-G. Ger. 473,466, May 13, 1927.

**Apparatus for the wet-treatment of goods, especially dyeing hat shapes.** SOC. DES CONDENSEURS DELAS. Ger. 473,608, Oct. 14, 1927.

**Bleaching.** I. G. FARBENIND. A.-G. (Helmuth Korte, inventor). Ger. 473,869, Nov. 20, 1925. Wool and wool mixts. are bleached by treating with acidified hypochlorite lye contg. a permanganate.

**Mercerizing.** HECTOR LOBRY. Fr. 648,413, June 24, 1927. Cotton goods, particularly when knitted, are placed on forms without tension and put between fine metallic gratings and plunged into the mercerizing bath above which a vacuum has been created.

**Mercerizing cotton.** CAMILLE BUREL. Fr. 649,889, July 29, 1927. The cotton is first boiled in an autoclave under pressure, dried and but into the mercerizing bath, over which a high vacuum is created, and finally air under pressure is introduced.

**Apparatus for drying and steaming tubular fabrics.** MAURICE M. KASANOF. U. S. 1,711,094, April 30.

**Treating oil-soaked hemp waste.** CHANNING C. BEETH. U. S. 1,710,914, April 30. The waste is soaked in a soln. of NaOH and live steam is passed through the material to cook it, the liquid is removed, and the product is pressed into sheets, such as *fiber-board*.

**"Mothproofing" wool, fur, etc.** I. G. FARBENIND. A.-G. Brit. 299,055, Oct. 20, 1927. The material is treated with a cold aq. soln. of a non-halogenated non-sulfonated hydroxycarboxylic acid or a substitution product such as 2-hydroxybenzoic acid, methylhydroxybenzoic acid or resorcylic acid, and an org. or inorg. acid or salt may also be added.

**Protecting wool, fur or hair from insects.** I. G. FARBENIND. A.-G. Brit. 298,538, Oct. 10, 1927. The material is treated with a complex compd. of B fluoride with an org. acid such as HOAc. Water or org. solvents such as alc. or acetone may be used as solvents or diluents and wet treatment may be carried out in the dye bath or by steeping or spraying or dry treatment may be carried out in the fulling vessel. K borofluoroacetate may be used and mention is also made of the use of compds. of B chloride with org. acids.

## 26—PAINTS, VARNISHES AND RESINS

A. H. SABIN

**Prussian blue and titanium white in light.** GEORG ZERR. *Farben-Ztg.* 34, 1430-1 (1929).—After 35 days' exposure the color of paints prepd. from linseed-oil varnish and the following pigments tinted with Prussian blue were:  $ZnO$ , slightly reddish;

lithopone, slightly greenish; titanium white, considerably bleached; white lead, slightly greenish. The effect of titanium white cannot be explained by the presence of  $H_2SO_4$  for lithopone which may develop acid on weathering does not bleach Prussian blue.

G. G. SWARD

**Systematic classification of adhesives and vehicles.** HANS WAGNER. *Farben-Ztg.* 34, 1430(1929); cf. C. A. 23, 2840.—W. modifies the previous arrangement as follows: (1) mobile at room temp. (viscous systems); (2) immobile at room temp. but, *a*, becoming so at slight pressures, *e. g.*, stirring (plastogels), *b*, mobile at slight elevation of temp. slightly elastic (normal gels), *c*, those which offer considerable resistance to change of form (elastogels).

G. G. SWARD

**The manufacture of oil for lead whites.** H. HELLER. *Farben-Ztg.* 34, 506(1928).—This is a brief review on the refining of linseed oil by means of  $H_2SO_4$  for use in white lead paints.

G. G. SWARD

**The Florida tung-oil project.** B. F. WILLIAMSON. *Ind. Eng. Chem., News Ed.* 7, No. 9, 5-6(1929).

E. H.

**East Indian copals and damars.** A. F. SUTER. *J. Roy. Soc. Arts* 77, 577-98 (1929).

E. H.

**Copal melting; obtaining copals in easily soluble forms.** EWALD PYHÄLÄ. *Farben-Ztg.* 34, 1552-3(1929).—Powdered Zanzibar copal mixed with 20-30% mineral oil, the b. p. of which was higher than the m. p. of the copal, was melted in an enameled vessel. To avoid local overheating a metallic Zn bath was used. The fusion was continued until the mineral oil was evapd. The losses ranged from 12.7 to 31.2%. The product was comparable in color to W rosin, was sol. in turpentine, benzine, etc. Varnishes can be prepd. by the addn. of hot previously bodied oils to the molten resin or by mixing solns. of the resins with such oils.

G. G. SWARD

**Colorimetric determination of turpentine vapors in air** (ANDREEV, GAVRILOV) 7. Sulfonated tar (U. S. 1,711,448) 21. Coating compositions (Fr. pat. 649,782) 18. Oxide mixtures [for pigments] (Ger. pat. 474,416) 18.

**Paint.** WALTER ENGEL. Ger. 474,917, Mar. 24, 1927. Paint and similar viscous and inflammable materials are satd. with  $CO_2$  under pressure to render them non-inflammable and to enable them to be obtained as a jet from a container.

**Paint composition.** HOWARD W. MATHESON (to Can. Electro Products Co.). Can. 288,642, April 9, 1929. A compn. of matter for lacquer, varnish, enamel or paint includes a product resulting from the treatment of a vinyl ester with an aldehyde, a volatile solvent therefore, and a varnish resin or gum.

**Water-paints.** A. KNAPP. Brit. 298,843, Feb. 24, 1928. A paste of pigment, glue and water is mixed with an emulsion of linseed oil or other drying oil and  $NH_4$  resinate in aq. soln.

**Nitrocellulose paints, etc.** R. T. HUCKS (to Imperial Chemical Industries, Ltd.). Brit. 298,914, Oct. 15, 1927. Pulp pigments or the like (of which various examples are given) contg. water are mixed with a nitrocellulose plastic contg. a substance miscible with nitrocellulose but immiscible with water, so that the water seps. and may be removed. The sepn. of the water may be hastened by addn., during the mixing, of an active nitrocellulose solvent such as EtOAc, BuOAc, AmOAc or similar solvents. The products may be used for forming sheets or in solns. as coating compns.

**Preparation of white lithopone by means of incompletely purified zinc solutions.** M. BIDAINE. Belg. 353,936, Oct. 31, 1928. The yellowish or reddish yellow tint of impure lithopone is counteracted by addn. of blue or blue-green coloring matter.

**Drying oil and oil varnish coating compositions.** J. SCHREIBER (to Chemische Fabriken Dr. J. Wiernik & Co. A.-G. and Bakelite Ges.). Brit. 299,024, Oct. 19, 1927. The durability of coatings having a basis of drying oil or oil varnish is improved by treating them, after the usual drying, with deoxidizing substances such as multi-valent phenols or  $\alpha$ -naphthol or their mixts. in a volatile solvent which softens but does not dissolve the coating, *e. g.*, solvent naphtha. Urea derivs. also may be used and a small proportion of wood oil with or without stand oil may be added to maintain the surface gloss of the coating.

**Varnish.** SCHERING-KAHLBAUM A.-G., ERICH FREUND and HANS JORDAN. Ger. 474,683, Aug. 23, 1922. Lacs and varnishes are prepd. by dissolving the resinous mass obtained by adding 0.5%  $Fe_2O_3$  to chlorinated naphthalene, as described in Ger. 466,262 (C. A. 23, 1000) in  $CCl_4$  or acetone.

**Varnish for shoes.** COURT BROMA. Swiss 130,137, Sept. 14, 1928. A prepn. for

varnishing shoes comprises 60 parts of a solvent b. 80–90°, such as amyl or butyl acetate, 7 parts of a softening material such as tricresylphosphate, 5 parts of pyroxylin and 0.5–2 parts of dye.

**Polymerized vinyl acetate.** WILLY O. HERRMANN and WOLFRAM HÄHNEL (to Consortium für elektrochemische Industrie). U. S. 1,710,825, April 30. Vinyl acetate is polymerized in EtOH (suitably by heating with benzoyl peroxide) to form a compn. which is sol. in alc. and suitable for use as a lacquer.

**Ornamental coatings on wood, metal or other surfaces.** LEO L. SIMON. U. S. 1,711,330, April 30. Crackle enamel is placed over a multi-colored design (which may be formed with a metal paint) with an intervening layer of binder material, such as transparent varnish or lacquer.

**Molding composition.** HOWARD W. MATHESON (to The Can. Electro Products Co., Ltd.). Can. 288,641, April 9, 1929. Reaction products result from the treatment of vinyl esters with aldehydes, particularly those resulting from the treatment of vinyl acetate with acetaldehyde, and are useful as substitutes for shellac and other resinous binders.

**Esters of resin acids.** A. C. JOHNSTON. Brit. 298,972, Oct. 18, 1927. A resin acid such as abietic acid or a resin such as wood rosin or a resin contg. pimaric acid is treated with an alkyl halide such as EtCl, AmCl, EtBr or BuBr in the presence of an alkali, such as NaOH, KOH, Ca(OH)<sub>2</sub>, or Na<sub>2</sub>CO<sub>3</sub>, preferably in soln. in alc. Various details and examples are given.

**Resin.** CHEM. FABRIK KURT ALBERT, G. M. B. H. Ger. 474,787, Feb. 15, 1923. Addn. to Ger. 440,003. Natural resins are improved by adding phenol-alc. compds instead of phenolaldehyde condensation products. Thus, 100 parts colophony are heated with 10 parts *p*-cresol-dialc. for 10 hours at 80–90°. The m. p. of the mixt. rises gradually from 60–70° to 100–110°. Other examples are given.

**Resinous compositions.** I. G. FARBENIND. A.-G. (Arthur Voss, inventor). Ger. 473,411, Jan. 9, 1926. The products obtained by energetic oxidation of natural resins such as colophony are condensed with aldehydes in the presence of alkali. The condensation products, either as such or after esterification with glycerol, phenol, carbohydrates, etc., are suitable for use in varnishes, etc. In one example, colophony is oxidized with O under pressure and the oxidation product is treated with CH<sub>2</sub>O and NaOH. The condensation product is sepd. by acidification. Other examples are given describing condensation with AcH and BzH.

**Resinous products.** P. KRISHNAMURTHY. Brit. 298,939, Oct. 17, 1927. Benzyl chloride is formed by chlorinating toluene in the presence of sunlight or of a catalyst, the purified product is dissolved in CS<sub>2</sub>, a small proportion of ZrCl<sub>4</sub> is added, HCl is evolved, and a reddish brown liquid is formed which is mixed with water and treated with steam to remove CS<sub>2</sub>, boiled with water and dried. A yellow solid product is thus obtained which is powdered, extd. repeatedly with C<sub>6</sub>H<sub>6</sub> or coal-tar naphtha, the clear soln. is evapd. and the residue heated to 260°. It may be used as a substitute for shellac and may be mixed with a condensation product obtained from the same starting material by the action of AlCl<sub>3</sub> or may be mixed with rubber, gutta-percha or similar materials. FeCl<sub>3</sub> may be used instead of Zr chloride but in that case the Fe should be removed from the product by repeated treatment with acids.

**Condensation products of aromatic amines and formaldehyde.** I. G. FARBENIND. A.-G. (Willi Hildebrand, inventor). Ger. 472,824, May 18, 1926. Addn. to Ger. 453,276. Resin-like condensation products of aromatic amines and CH<sub>2</sub>O are produced by preheating the alc. amino soln. and the acidified CH<sub>2</sub>O and allowing them to react. The exothermic production of the resinous mass maintains the high temp. of the reaction mixt. Thus, 100 kg. *o*-toluidine and 70 kg. 94% alc. are heated to boiling in a reflux condenser and 115 kg. 30% CH<sub>2</sub>O with 0.4 kg. HCOOH added. After a short time, the heat generated by the reaction is sufficient to maintain the temp. of the reagents. A bright yellow resin which softens at 80–85° is produced.

**Condensation products of phenols and carbonyl compounds.** CHEM. FABRIK KURT ALBERT, G. M. B. H. Ger. 474,561, Feb. 26, 1925. Ester-like derivs. of the condensation products of phenols and carbonyl compds. are prepd. by esterifying those products which contain free phenolic and alc. OH groups and which are not readily melted. The alc. OH groups may be directly esterified by high mol. org. acids with resulting production of acid resins. Thus, cresol-dialcohol is heated with linoleic acid at 180–200° for some time. At this temp. the escape of water can be clearly observed, giving an indication of the course of the esterification. The product may be distd. *in vacuo* or esterified with glycerol, glycol or other alcs.

**Condensation products of phenols and formaldehyde.** BAKELITE, G. M. H.



(Fritz Seebach, inventor). Ger. 474,729, June 17, 1925. The crude resinous products are purified by heating with aq. alk. solns., such as lime water, Na lye or  $\text{NH}_4\text{OH}$ .

**Synthetic gummy or resinous materials.** HOWARD W. MATHESON and FREDERICK W. SKIRROW (to The Can. Electro Products Co., Ltd.). Can. 288,644, April 9, 1929. A compd. contg. an ethylene linkage is heated under pressure with a satd. aliphatic aldehyde in the presence of oxygen.

**Artificial resins.** ROBERT ARNOT. Fr. 648,906, Jan. 13, 1928. See Brit. 290,327 (C. A. 23, 1002).

**Artificial resins.** COMPAGNIE FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON. Fr. 649,657, Feb. 24, 1928. Synthetic resins such as obtained from polyhydric alcs. and polybasic acids are hardened by heating the fusible resin at 220–300°, then at 170–200° or for a longer time at 135–170°, the product being molded under pressure at 120–170°. The heating prior to molding may be 1st at 170–200°, or for a longer time at 135–170° and then at 220–300°. Molds of Al or stainless steel or lined with vitreous enamel are preferred. Cf. C. A. 23, 293.

**Synthetic resins.** I. G. FARBERNIND. A.-G. (Arthur Voss, inventor). Ger. 473,171, Sept. 30, 1927. The products obtained by condensing phenolaldehyde resins with halogen fatty acids are themselves condensed with polyhydric alcs., *e. g.*, glycol, glycerol, polyvinyl alc. and water-sol. carbohydrates. An example is given in which an alk. soln. of a condensation product from tricresol and  $\text{CH}_2\text{O}$  is treated with  $\text{ClCH}_2\text{COONa}$ . The resinous product is pptd. by acidification and is then condensed with glycerol, yielding a resin which becomes insol. and infusible but remains elastic when heated to 150–170°. In another example, a product from  $\text{PhOH}$ ,  $\text{CH}_2\text{O}$ , and  $\text{ClCH}_2\text{COOH}$  is condensed with polyvinyl alc. Cf. C. A. 23, 2309.

**Synthetic resins.** W. H. MOSS (to British Celanese, Ltd.). Brit. 299,065, Oct. 21, 1927. One mol. of a phenol-ketone condensation product is further condensed with less than 2 mols. of an aldehyde. An example is given of the heating of diphenylol-propane with an equimol. or slightly greater proportion of  $\text{CH}_2\text{O}$  to above 100° with a catalyst such as  $\text{H}_3\text{PO}_4$ , washing the lower layer which seps., with water or  $\text{Na}_2\text{CO}_3$  soln. (with or without various other addns.), and subjecting to steam or vacuum distn. to remove impurities, followed by final washing and melting and heating to 180–200°. The product thus formed, m. 140–50°.  $\text{H}_3\text{BO}_3$ ,  $\text{HCl}$  or  $\text{H}_2\text{SO}_4$  may be used instead of  $\text{H}_3\text{PO}_4$ , and other starting materials may be used such as those derived from ethyl-methyl ketone or diethyl ketone and cresol. The products are suitable for use in cellulose ester lacquers and plastic compns. Brit. 299,066 specifies the production of phenol-ketone resins by condensing a ketone such as acetone or Me-Et or di-Et ketone with a phenol-ketone such as diphenylol-propane, to produce a fusible, sol. resinous product suitable for use in lacquers with various cellulose esters or ethers or for making plastic compns. Brit. 299,067 specifies production of phenol-ketone-aldehyde resins by condensing a phenol-ketone resin such as diphenylol-propane-acetone resin with an aldehyde such as  $\text{CH}_2\text{O}$  (suitably by heating in the presence of an acid).

**Coating surfaces with synthetic resins, cellulose derivatives, etc.** W. H. MOSS (to British Celanese, Ltd.). Brit. 298,616, Oct. 12, 1927. Surfaces such as iron, glass or wood are coated, preferably with a compn. contg. a synthetic resin and which may also contain an org. cellulose deriv. such as a cellulose ether, and are then further coated with a cellulose ester or ether compn. Resins, dyes, pigments, oils, etc., also may be used in various compns. of which examples are given.

## 27—FATS, FATTY OILS, WAXES AND SOAPS

E. SCHERUBEL

**Observations on the examination of fatty substances under the Wood light.** A. G. NASINI AND P. DE CORI. *Ann. chim. applicata* 19, 46–54 (1929).—Olive oils, virgin as well as refined, were examd. under the Wood light. Refined oils show a blue fluorescence whereas, the virgin oils all show orange to red. Chlorophyll in EtOH as well as in refined oil soln. also shows red fluorescence, so that this substance may be added as an adulterant to a refined oil, to imitate a virgin oil. The Wood light, therefore, is not reliable under these conditions. Cholesterol from various sources was found to give fluorescence, but the pure compound is opaque to the light, so that the fluorescence is due to some impurity.

**The total fat determination in sulfonated oils.** H. POMERANZ. *Seifensieder-Ztg.* 56, 95–6 (1929).—A discussion on the evaluation of Turkey-red oils for total fat, org. SO<sub>3</sub>, hydroxy acids and stability toward Ca and Mg.

A. W. CONTIERI

P. ESCHER

**Researches on fats of birds of Japan. I.** RYOSEI KOYAMA. *J. Soc. Chem. Ind. (Japan)* 31, 292-6(1928); Suppl. Binding 31, 72-3(1928).—K. studied the fats obtained from Daurian tern (*Sterna longipennis*, Nordmann), Japanese snipe (*Gallinago mibuto*, Koyama), and Javan buzzard (*Bulastur indicus*, Gmelin). These specimens were treated separately according as they were male or female, and chickens or grown. These fats were yellow or pale brownish white in color, and m. 29.8-41.9°,  $d_{40}$  0.887-0.912,  $n_D^{20}$  1.464-1.471, sapon. values 179-196, acid values 0.08-2.67, I values 61-103, unsaponifiable matter 0.53-7.94%, and insol. Br compds. 1.88-31.08%, the Br contents of which ranged from 52.51 to 71.53%. Conclusion: The fats of these birds contained some higher unsatd. fatty acids. The satd. fatty acids of the fats seemed to be chiefly palmitic and stearic acids. The quantity of higher unsatd. fatty acids seemed to increase with the growth of the birds. The properties of the fats of the birds varied over their breeding season. Y. NAGAI

**The heat consumption in the stearin industry.** K. E. SKÄRBLÖM. *Tek. Tid. Uppf. C (Kemi)* 58, 73-5(1928).—In a factory working with the Twitchell method the heat consumption has been calcd. per 100 kg. raw fat: Coal burned in the steam boiler plant amounted to 607,200 cal.; 425,300 of this accompanied the steam, giving a loss of 181,900 in the fire-boxes. Coal burned in the fire-boxes of the fatty acid distn. plant amounted to 105,900 cal.; 24,200 of this was absorbed by the fatty acids, loss 81,700. Coal burned in the fire-boxes of the glycerol distn. plant amounted to 16,150 cal. Since the feed water for the steam boilers was preheated from 0° to 60° by means of waste steam the total heat absorbed by the steam was 425,300 + 40,000 = 465,300 cal. These were distributed in the different departments of the factory in the following proportions, calcd. per 100 kg. raw fat: Melting and purification 20,900 cal., second purification and decompn. 73,000, treating of the impure fat 4000, extn of the impure fat 9100, distn. of fatty acids 68,500, acidification 45,600, refining of glycerol water 7000, cong. the glycerol water 32,300, distn. of glycerol 3500, washing the fatty acid distillate 19,300, hot presses 18,400, melting of stearin 5800, boiling of stearin 8300, molding of stearin products (candles, etc.) 35,300, drying of wickings 2000, departments not directly concerned with the manuf. 20,800, converted into mech. energy 6 kw.-hr. 5200, preheating of the feed water 40,000, undeterminable losses 46,300, sum 465,300 cal. C. A. ROBAK

**Thiocyanometry and olein.** M. DITTMER. *Seifensieder Ztg.* 56, 109-11(1929).—Polemical answer to Keller (*C. A.* 23, 2051). P. ESCHER

**Distillate olein and saponification olein.** E. SCHLENKER. *Seifensieder Ztg.* 56, 42-3, 50-2(1929); cf. *C. A.* 22, 1697.—Sapon. olein refers to the product obtained by the splitting of fats by the autoclave, Twitchell or enzyme methods, which may or may not be followed by steam distn. Distillate olein refers to fats split by  $H_2SO_4$  which yields a dark-colored product that requires subsequent distn. Formerly the distillate olein contained considerable unsapon. matter but today a properly conducted distn. furnishes a good product. The literature is contradictory as regards the definition of the 2 oleins; the usual distinguishing characteristics refer to methods of manuf. and are now only of historic value; the distinction in trade between distillate and sapon. olein should be abolished, because neither the kind of fat from which it is made, nor the method of its manuf. should be made a criterion of its quality; of sole importance are its properties and the use to which the olein is to be put. P. E.

**The occurrence of odd-number fatty acids in natural fats, oils and waxes. I.** Oil of *Datura stramonium* L. P. E. VERKADE AND J. COOPS, JR. *Niederlandische Handelshochschule, Rotterdam. Biochem. Z.* 206, 468-81(1929).—A careful study of the oil from *Datura stramonium* shows that it does not contain a 17-carbon fatty acid or its isomers. S. MORGULIS

**Iodine value of fatty acids from plant phosphatides.** J. E. WEBSTER. *Okl. Expt. Sta. Ohio J. Sci.* 29, 39-42(1929).—Acetone-insol. phosphatides from wheat, corn, soy beans and oats were prepd. The % of N was 0.99, 1.14, 0.70, 1.61; of P, 1.26, 1.65, 0.495, 0.535; the I values (Hanus) were 81.49, 65.30, 92.48, 88.80. J. J. W.

**The determination of iodine number.** J. J. A. WIJS. *Z. Untersuch. Lebensm.* 56, 488-90(1928).—See *C. A.* 23, 2052. C. R. F.

**The determination of organically combined sulfuric acid in sulfonated oils.** K. H. BAUER. *Chem. Umschau Fette Oele Wachse Harze* 36, 102(1929); cf. *C. A.* 23, 2842.—Comparative detn. of org.  $SO_3$  in sulfonated oils by the volumetric and gravimetric method showed good agreement except in one sample, contg. 10.71%  $SO_3$  (volumetric) and 10.22% (gravimetric), a difference of 0.49%. P. ESCHER

**Determination of organic sulfur trioxide in sulfonated oils.** C. RIESS. *Chem. Umschau Fette Oele Wasche Harze* 36, 77-8(1929).—See *C. A.* 23, 2842. P. E.

**Chemical composition of the oil in relation to the morphological and physiological characters of the plant.** S. FACHINI AND G. DORTA. *Giorn. chim. ind. applicata* 10, 460-2(1928).—Olive oils from the northern parts of Italy (Lake Garda, Liguria) contain only small proportions (2-6%) of linoleic acid, whereas certain oils from Southern Italy, Greece, and Northern Africa contain considerable quantities, even as much as 17%, of this acid, together with a high percentage of satd. fatty acids. This result appears to be opposite to that found by Ivanov (*C. A.* 21, 2294) for seed oils. The compn. of olive oil seems to be influenced by the age and degree of acclimatization of the plant. The characteristics of an oil depend largely on the biol. and morphol. factors of the plant furnishing it. B. C. A.

**Kenaph-seed oil.** M. R. BAUMAN. Oils and Fats Tech. Lab. *Separate* 5 pp. (1926).—The seeds of kenaph (*Hibiscus cannabinus* L., Malvaceae) of Persian origin contain 6.5% moisture, 17.9% fats (oil). The extd. oil is dark amber-yellow transparent, possesses a fairly pleasant aroma, has a fairly thick consistency and is remarkably stable, d<sub>4</sub> 0.9261, m. 6°, flame point 277.4°, sapon. coeff. 194.2, unsapon. 0.4%, Hübl I no. 100.1, glycerol contents 10.45%. The acids are palmitic 14, stearic 6, oleic 45.3, linoleic 23.4%. After refining, it will find a technical utilization as food product. BERNARD NELSON

**A preliminary note on the liver oil of the basking shark.** SIGNE SCHMIDT-NIELSEN AND SIGVAL SCHMIDT-NIELSEN. *K. Norske Videnskab. Selskab Forhandl.* 1, 5-6(1927); *Biol. Abstracts* 2, 85.—From a female of *Cetorhinus maximus* liver oil was obtained by heating the liver on a water bath in an atm. of CO<sub>2</sub> and sepg. it from the tissue. Phys. and chem. characters are given. The vitamin A content was found (by feeding rats) to be 10,000 units (U. S. P. X) while the best cod-liver oil yields only 500-1000 units. This high value may be connected with the basking habit of this species with resulting sun exposure. H. L. D.

**Studies on soap. VIII. Adsorption of soap at the contact surface of two liquid phases.** MASAO NONAKA. *J. Soc. Chem. Ind. (Japan)* 31, 297-300(1928); Suppl. Binding 31, 73; cf. *C. A.* 22, 1865.—The adsorption of the soap at the contact surface between benzene or toluene and the aq. soln. of Na oleate or palmitate was studied, Donnan's pipet being used. The adsorbed quantity is larger than the value calcd. on the basis of the theory of the monomol. layer. Therefore N. considered that the adsorbed layer is not monomol., but a monomolecular layer. The adsorbed layer consisted of the neutral soap, while the free fatty acids were dissolved in the adsorbents. When air was used as an adsorbent instead of benzene or toluene, the adsorbed layer consisted of the neutral soap plus the free fatty acids. Thus N. concluded that the aq. soap soln. consisted of aggregates of hydrated soap mols. mixed with an emulsion of the free fatty acids formed by the hydrolysis of the soap, the fatty acid being a primary adsorbate, while the aggregates of soap mols. are a secondary one. In other words, the fatty acid is first adsorbed, and when it is dissolved in the adsorbent, or is insufficient to cover the contact surface, then the aggregates are adsorbed. The adsorption phenomenon is not the same when the adsorbent is changed. Therefore the washing property of the soap, which is caused by the adsorption, will vary with the kind of the material washed. Y. NAGAI

**Recommended specification for quicklime and hydrated lime for use in soap making.** ANON. Bur. Standards, *Circ. No.* 372, 6 pp.(1929). E. H.

**Grained alabaster soft soaps.** F. S. *Seifensieder Ztg.* 56, 101-2, 111-2(1929).—A discussion of the prepn. of K soaps from soy-bean oil and tallow, and from cottonseed oil (65, 60, 65 parts) and tallow (35, 40, 45 parts), giving details of factory operations. P. ESCHER

**Method for the detection of rosin in soap.** N. SCHAPIRO. *Z. anal. Chem.* 77, 41 (1929).—The fatty acids of soap do not reduce ferricyanide but the rosin acids do. Dissolve a sample of the soap in alc., make acid with HCl and add a few drops of dil. K<sub>3</sub>Fe(CN)<sub>6</sub> soln. Heat to boiling, cool and add a drop or two of dil. FeCl<sub>3</sub> soln. A blue color indicates the presence of rosin. W. T. H.

**Soap lather.** L. ZAKARIAS. *Z. phys. chem. Seifenforsch.* 2, 18-22(1929); cf. *C. A.* 23, 1519.—Exptl. results are tabulated for several com. soaps in which the soap soln. below the lather (in a lather detn.) was made up again to the original vol., reshaken and this operation repeated until little or no lather could be produced. Total lather in mm. and total soap soln. used up by the lather in cc. are the criteria from which it was concluded that 0.15% soap is the optimum concn. for best lathering and that the "active" soap can be removed from soln. by repeated shaking as above. P. E.

**Turbidity point and hard water.** F. ENDLER. *Z. phys. chem. Seifenforsch.* 2, 34-6 (1929).—The turbidity point of a soap soln. in distd. H<sub>2</sub>O was 36°; it increased to

62° when H<sub>2</sub>O of 6° hardness (German °) was used; when H<sub>2</sub>O of 12° hardness was used no clear soln. could be obtained.

P. ESCHER

**Studies on soap solution. VI. Composition of substances adsorbed by various adsorbents.** JIRO MIKUMO. *J. Soc. Chem. Ind. (Japan)* 31, 410-6(1928); Suppl. Binding 31, 95-7; cf. *C. A.* 21, 1041.—A soln. of Na oleate was shaken with various adsorbents, then settled and filtered. The filtrate was analyzed for oleic acid and total alkali, and the av. compns. of the adsorbed matter were calcd. Carbon, fibers of filter paper, silk, artificial silk, wool, hide powder, kaolin and Japanese acid clay were used as the adsorbents. All these adsorbents react with soap, the reaction being partially chem., but generally the hydrolytic adsorption. The adsorbed matter is a mixt. of Na oleate, acid Na oleate, NaOH and their dissoecn. products. It is really neither the simple acid soap nor the simple basic soap, but only appears so as the av. of all compns. of the above constituents. The compn. of the adsorbed matter varies with the conditions of the expt. Carbon has a very large adsorbing capacity, and adsorbs only acid soap, even from alk. soln., while the others adsorb basic substances. K oleate behaves quite similarly to the Na salt. The mechanism of the washing action of the soap soln. has been derived from the results of M.'s studies of this series. It has been considered to be due mainly to 2 factors: namely, wetting and peptizing. The cleansing action is the result of coöperative action of all constituents of the soap soln., although the principal part is to be ascribed to the action of simple soap mols., simple soap ions and acid soap sol.

Y. NAGAI

**Fluorescence-analysis from the standpoint of testing materials (HAITINGER) 12. Bleaching earths (KALUSKY) 18.**

**Apparatus for extracting fats from fish meal, linseed or other materials by use of solvents.** G. W. BRADSHAW and E. R. JACKSON, *Brit.* 298,675, July 15, 1927.

**Fatty acids produced by oxidation of paraffins.** I. G. FARRENIN. A.-G. *Brit.* 299,149, Sept. 7, 1927. Dark-colored fatty acids produced by oxidation of paraffins are purified and bleached by treatment with oxidizing agents such as chromic acid, KMnO<sub>4</sub> and H<sub>2</sub>O<sub>2</sub>, suitably by heating and in stages or in an electrolytic cell contg. O-transfer agents such as chromic or ferric sulfate. KMnO<sub>4</sub> and H<sub>2</sub>SO<sub>4</sub> may be used together.

**Oils, fats, etc.** PHILIPP L. FAUTH. *Fr.* 648,707, Feb. 13, 1928. An app. is described for the sepn. of solvents from oils, fats, etc., which they contain, in which the solvent contg. the oil, etc., is sprayed into a space suitably heated and is immediately vaporized, while the sepd. oil, etc., is sprayed into another space and meets a current of steam or gas for the removal of odor or taste.

**Olive oil.** CALIFORNIA PACKING CORP. *Fr.* 649,760, Sept. 6, 1927. Olive oil is extd. by grinding and pressing the fruit so as to obtain a mixt. of oily liquid and solids in suspension, the mixt. being submitted to a pressure sufficient to bring the oil into a free state to be sepd. by centrifuging.

**Treating palm fruit to obtain oil and other products.** RUBBER CULTUUR MAATSCHAPPIJ AMSTERDAM. *Brit.* 299,061, Oct. 20, 1927. Palm fruit is subjected to low pressure to obtain oil and then passed through a drying drum and treated with an air blast to sep. nuts and pericarp.

**Thickened oil.** FERDINAND PALLAUF. *Ger.* 474,546, Jan. 14, 1926. Pure thickened oil is prepd. by maintaining wood oil, linseed oil or impure thickened oil prepd. from wood oil at 330-340° and continuously stirring. As the pure thickened oil is tapped off, an equal amt. of crude oil is admitted.

**Emulsion.** HERMANN BOLLMANN. *Ger.* 474,879, Jan. 14, 1927. An emulsion with a high m. p. is prepd. by melting 25 parts coconut oil with 25 parts of soy-bean phosphatide and stirring into 50 parts water.

**Emulsions.** FRIEDRICH BRAÜNLICH. *Fr.* 649,675, Feb. 24, 1928. See *Brit.* 285,880 (*C. A.* 23, 222).

**Soap.** SOC. ANON. POUR L'IND. CHIM. A BÂLE. *Fr.* 649,731, July 19, 1927. Insol. substances such as kaolin, kieselguhr, fuller's earth, etc., in a very fine state of division are added to soap or to the washing water. They prevent the harmful action of salts of Ca and Mg by a phys. action of a colloidal nature.

**Soft soap.** LOUIS G. LEFFER (to Hermann Bachstein). U. S. 1,710,799, April 30. Coconut oil, palm-kernel oil and rape-seed oil are caused to react with potash lye under pressure and the setting point is regulated by the addn. of hydrocarbon material such as benzene or paraffin oil during the sapon. process.

**Detergent suitable for laundering purposes.** LEE HAGER and JOHN POPPERMAN

(to Pine-O-Pine Co.). U. S. 1,710,974, April 30. Rosin is caused to react with a soln. of NaOH contg. sufficient NaOH to saponify the rosin together with a quantity of pine oil greater than the combined quantities of the rosin and NaOH. U. S. 1,710,975 specifies a compn. suitable for dry-cleaning comprising reaction products of a small quantity of NaOH, a larger quantity of rosin and a still larger quantity of pine oil at least sufficient to dissolve the rosin, mixed with a much greater bulk of gasoline.

## 28—SUGAR, STARCH AND GUMS

J. K. DALE

**Experimental sugar factory.** WALTER SCOTT. Imp. Coll. of Tropical Agr., Trinidad, B. W. I. *Sugar* 30, 550(1928); cf. C. A. 23, 2314.—The college factory is operated for the purposes of instruction to students and of research on processes. The products made are refined and plantation white sugars, Demarara crystals and table sirup. Research problems are outlined. J. F. B.

**A mathematical evaluation of the dependability of chemical control in sugar mills, especially the determination of the sugar content.** J. VONDRÁK. *Listy Cukrovar.* 47, 357-62(1929).—Errors due to analytical methods, technic and app. have decreased continually, but errors due to variations in compn., poor sampling and lack of homogeneity in a beet or in a batch remain unknown. From a distribution curve of values for deviations from a mean value of sugar content of beets for the years 1924-26 representing 1414 detns., V. concludes that for detg. the probability of error in sugar content analyses, the method of Gauss may be depended upon. The av. variation of an individual reading from a mean is computed according to the relation:  $m = \sqrt{\Sigma[v^2]/n-1}$ , where  $v$  is the deviation, and  $n$  is the no. of detns. or deviations. FRANK MARESH

**Examination of raw sugars, using a single solution.** J. VONDRÁK. *Z. Zuckerind. tšechoslovak. Rep.* 52, 381-8(1928).—Twice the normal sugar wt. is dissolved in water, and made up to 200 cc. at 20° (without the usual clarification). Some of this liquid is used for the moisture detn. by means of the new Zeiss refractometer and prism No. II, the percentage result being obtained from a table specially compiled by the author, making a correction for any deviation from 20°. A further portion of the soln. is used for the ash detn. by means of Šandera's app. (cf. *Z. Zuckerind. tšechoslovak. Rep.* 51, 603-12(1927)). To the remaining portion of the soln., about 100 cc., is added dry basic Pb acetate (about 0.25 g. for first-product raw sugars, and 0.5 g. for after-products), the polarization being read after mixing and filtering. Compared with the present method of analyzing sugars, this rapid method gave sufficiently const. and close results, the rendement in the case of first-products never differing by more than 0.16. B. C. A.

**Ash determination in moist and refined sugars by electric conductivity.** K. ŠANDERA AND B. ZIMMERMANN. *Z. Zuckerind. tšechoslovak. Rep.* 52, 405-12(1928); cf. C. A. 23, 297.—The authors have designed a cond. app. suitable for detg. the low-ash contents of refined sugars. The 2 electrodes consist of a gilt brass tube and a rod fixed axially within it by an insulating plug at the upper end. This electrode system is immersed to a standard depth in the sugar soln. to be tested, which contains 26 g. of sample per 100 cc. As in previous instruments (C. A. 21, 3481; *Z. Zuckerind. tšechoslovak. Rep.* 51, 603-12(1927)), the use of the telephone in balancing the resistances is superseded by an optical method. Results for a no. of Czechoslovakian refined sugars are tabulated. B. C. A.

**Studies on the composition of sugar obtained by complete hydrolysis of pine wood.** I. ERIK HÄGGLUND. Inst. für Holzchem., Åbo, Finland. *Biochem. Z.* 206, 245-7(1929); cf. C. A. 22, 4861.—On hydrolysis of pine wood with HCl, the diffusion method being used, a product is obtained contg. large amts. of a methoxyl substance, which is very sol. and which unlike lignin-HCl loses most of the methoxyl on hydrolysis with hot dil. acids or by yeast fermentation. S. MORGULIS

**The cane improvement at the experimental station for the Java sugar industry at Pasoeroean.** O. PUSTHUMUS. *Arch. Suikerind., Mededeel. Proefsta. Java Suikerind.* 36, III, 991-1022(1928).—A review is given of the breeding of new varieties during 1926, 1927 and 1928. P. R. P.

**The cane position in North Bihar with special reference to the factory industry and the early crushing problem.** WYNNE SAYER. *Agr. J. India* 23, 424-31(1928). K. D. JACOB

**Target blotch of sugar cane.** C. N. PRIODE. *Facts About Sugar* 24, 376(1929).—

An infectious disease, previously unreported, caused by a *Helminthosporium* fungus, which produces blotches of irregular concentric rings, has been discovered in Cuba. Probably it will not cause serious damage to the varieties of cane now being grown commercially there, but further studies are being made.

M. J. PROFFITT

**Preservation of raw cane juice.** EUGENE LOUMÉAN. Trinidad, B. W. I. *Sugar* 30, 491-3(1928).—The efficiency of various preservatives was studied with the object of ascertaining which is most suitable for the keeping of the 12 hr.-composite sample. When thoroughly incorporated with fresh juice in clean containers, Horne's dry Pb acetate, 6 g. per l.,  $\text{HgCl}_2$ , 0.25 g. per l.,  $\text{HCHO}$ , 40%, 10 cc. per l.,  $\text{C}_6\text{H}_5\text{CH}_3$ , 5 cc. per l., render the juice sterile for periods much longer than are required in the routine chem. control of cane-sugar factories. Any small loss occurring is due to enzymes present in the juice. The effect of basic lead acetate as a preservative according to the expts. is greatest, and that of toluene least.

J. F. BREWSTER

**Boiling of white sugars.** F. NOSEK. *Z. Zuckerind. Tschoslovak. Rep.* 52, 441-7 (1928).—Insol. particles in the liquor from which white sugars are boiled (fibers, char dust, mineral matter, etc.), if sufficiently fine, may serve as grain in the subsequent crystn., causing the sugar to be dull. Their presence is therefore to be avoided, though the grayish tinge of granulated sugar may also be due to occluded air bubbles. In forming grain by "seeding," the sugar dust used should be boiled from the best liquors, and care must be taken to disperse it thoroughly throughout the contents of the pan; otherwise conglomerates are formed. Dust obtained by grinding is less suitable than specially boiled very fine grain. Fine "pilé" should not be used. In boiling white sugars the formation of the grain and its growth can be followed to advantage under the microscope, and useful information is thus obtained as to the conditions requisite for the production of uniform crystals.

B. C. A.

**Manufacture of white sugar at cane-sugar factories.** P. HONIG. *Arch. Suikerind.* 37, I, 113-28(1929).—The manuf. of plantation white sugar of the same quality as refined sugar is possible when attention is paid to the raw materials. As far as possible sirup and runoffs should always be of the same quality. The boiling should be done in 4 Strikes; the low-grade sugar, not used for seeding 2nds, should be remelted, clarified and filtered. Special attention should be paid to the washing of the sugars at the centrifugals as the film of molasses affects the color of the sugar to a greater extent than the impurities incorporated in the crystals.

P. R. P.

**Standardized inversion of cane or beet sugar gives best results with  $p_H$  control.** A. A. SCHAAL AND OTTO JOHNSON. Biscuit and Cracker Mfrs. Assoc., Minneapolis. *Food Industries* I, 266-9(1929).—The colorimetric method of detg. H-ion concn. is suitable for invert sugar control. The following forms a good basis for making invert sirup: sugar 100 lb., water 33 lb., tartaric acid 2 oz. for high-grade cane sugar, 3 oz. for low-grade cane or high-grade beet sugar, 4, 5, or 6 oz. for low-grade beet sugar. The water and sugar are heated to boiling, preferably in a glass-lined, steam-jacketed kettle equipped with cold-water circulation in the jacket and with a stirrer to insure const. agitation. When the sirup reaches the b. p., the acid (previously dissolved in a small quantity of  $\text{H}_2\text{O}$ ) is added and the boiling continued for 30 mins. The sirup is then cooled as quickly as possible. Some means of quick cooling, such as circulating cold water in the jacket with which the kettle is surrounded, is essential for the production of light-colored sirups. Beet sugars are more highly buffered than cane sugars, although both can be used with satisfaction provided the  $p_H$  of the batch is controlled. Inversion of the sugar does not change the  $p_H$  of the sirup to any noticeable extent. If a neutral sirup is desired,  $\text{NaHCO}_3$  is added after cooling. A rough pos. correlation may be drawn between the ash content and the buffer action of a sugar in the range of  $p_H$  necessary for inversion. It is not safe to judge sugars for inversion purposes solely by this criterion, however.

C. R. F.

**Method of determination of sugar in fresh slices of beet in relation to the calculation of loss in sugar manufacture.** A. DOLINEK. *Z. Zuckerind. Tschoslovak. Rep.* 52, 329-33(1928).—It is recommended that the official pipet method, employing the single normal wt. of pulp and 308 cc. of dil. basic Pb acetate for the detn. of sucrose in fresh slices, should be abandoned in favor of either of the following two: (1) That in which double the normal wt. of pulp is treated with 354 cc. of dil. basic Pb acetate; or (2) that in which a proportionate amt. of pulp is mixed with 308 cc. of dil. basic Pb acetate from an automatic pipet. Both give satisfactory results compared with the Herles hot-water digestion process, whereas if the above official method be employed in control, the losses indicated may be too high by 0.13% of the sugar in the beet.

B. C. A.

**The determination of sugar in the beet or the cossettes: the volume occupied by**

the marc and the water digestion. EMILE SAILLARD. *Planter and Sugar Mfr.* 82, 123-4(1929).—The most exact method is hot-water digestion (1) in a graduated flask using chopped beets or cossettes and not fine pulp. The Sachs le Docte method (2) is more exact than the Kayser-Lewenberg (3) but not so exact as (1). The difference between the latter 2 methods is in the normal wts., 16.26 g. for the former and 26 g. for the latter. Flasks should be graduated to 401.8 cc. for 52 g. pulp and to 201.2 for double the French normal wt., 32.52 g. Assuming a marc content of 5% in beets and a juice density of 1.085 the vols. of  $H_2O$ , and of Pb subacetate mixt. to be used in methods (2) and (3) are calcd. For method (2) and 26 g. normal wt., 177.24 cc. must be added; for method (2) and the double normal French wt., 32.52 g., 171.53 cc. and for method (3) and the German double normal wt., 52 g., 154.48 cc. The results of polarization are given for dried and undried pulp using method (2). J. F. B.

Storing beets by drying. G. S. BENIN. *Nauchnuie Zapiski* 6, 68-71(1928); cf. C. A. 22, 181.—B. made an expt. on storing dry beet cossettes. Two portions were kept for 1 yr.—one in the lab. with temp. variation from 10° to 20°, the other in an outside refrigerator subjected to atm. changes, but protected from rain and snow. After 6 months the samples were retested. The lab. sample remained almost without change; the other had increased in  $H_2O$  from 5.22 to 8.56%. The humidity of the air was 68-77%. During the second part of the year (Sept.-Feb.) the humidity of the air was 74-83%, and  $H_2O$  in cossettes increased to 13.14%. The temp. variation for the year was from -9.3° to +20.7°. Loss of sugar was only 0.2% on the wt. of the raw beets. Increase of invert sugar was slight. The limit of drying can only be detd. by expt. made on a large amt. of dry cossettes as only ext. layers absorb  $H_2O$ . V. E. B.

Working white sugar massecuites (in the beet-sugar factory). F. NOSEK. Z. *Zuckerind. tšechoslovak. Rep.* 52, 457-61(1928).—Microscopic observation of the centrifuging of granulated massecuites shows that the mother liquor frequently contains such an amt. of extremely fine grain as to impart to it a milky appearance. On turning on cold or particularly hot water for covering, after the adhering sirup has been washed out, the crystal begins to be attacked. Steam has a similar effect, though less severe than hot water, but it also causes the formation of fissures in the wall of sugar in the centrifugal through which the condensed water penetrates, causing further etching of the crystal. B. C. A.

Formation of incrustation on evaporators (of beet-sugar factories). V. STANĚK AND P. PAVLAS. Z. *Zuckerind. tšechoslovak. Rep.* 52, 545-60(1928).—Incrustation formation in beet-sugar factories depends largely on the nature of the heating surface. Thus, on brass polished brightly the percentage of incrustation and of suspension was 97.7 and 2.3, and on rough brass 94.6 and 5.46. Similarly, a copper-plated surface gave 67.3 and 32.7, and one which had been tinned 51.3 and 48.7.  $CaCO_3$  present as aragonite formed centers for the crystallization of the  $CaCO_3$  sepd. from a beet juice, which had been over-carbonated; but  $CaCO_3$  added in the amorphous form merely adhered to the heating surface, increasing the amt. of the scaling. On the other hand, fine carbons (particularly "Norit") acted favorably in diminishing the amt. of the scaling. A weak elec. current between the heating surface and an electrode placed in the liquid exerted an unimportant, though detectable, effect. B. C. A.

Boiling-up of thin juice. V. MAJER. Z. *Zuckerind. tšechoslovak. Rep.* 52, 465-79 (1928); cf. C. A. 21, 1562.—If the carbonation of beet juices is carried beyond the correct alk. (0.01%  $CaO$ ) so that more or less bicarbonate is formed, the pptn. of  $CaCO_3$ , which occurs on subsequent boiling, is much slower and less complete than would be the case with pure solns. of  $CaHCO_3$ . This delayed pptn. is largely due to the influence of sugar and amino acids. Boiling for 20-30 mins. is necessary to remove most of the precipitable lime compds. By working to an alk. corresponding to 0.01%  $CaO$  in the carbonated juice, the total lime content of the juice and the amt. pptd. on boiling for 30 mins. are both reduced to a min. A deviation of 0.01%  $CaO$  from this optimum alk., in either direction, increases considerably the amt. of ppt. (chiefly  $CaCO_3$ ) produced on boiling, and therefore increases the amt. of evaporator incrustation unless the juice is boiled up before entering the evapg. plant. B. C. A.

Final saturation of (sugar) thin-juice. O. SPENGLER AND C. BRENDL. Z. *Ver. deut. Zuckerind.* 76, 637-43(1928).—To obtain juice low in Ca the second carbonation is carried out so as to sat. the natural alk., after which follow successively heating, filtration, sulfitation almost to neutrality at high temp., and a second filtration. At this stage  $Na_2CO_3$  is added in amt. corresponding to the content in Ca present, the juice being lastly boiled and filtered. If at the sirup stage the alk. is too high, it can be reduced by sulfiting. B. C. A.

The composition of juices from the 1928-29 season. J. VONDRÁK AND B. ZIMMER-

MANN. Expt. Inst. Cz. Sugar Ind. (Prague). *Listy Cukrovar.* 47, 325-30(1929).—A statistical report covering the reports sent in from 87 mills in Czechoslovakia representing over 50% of the sugar industry. Detailed tables are given for an 8-year comparison of  $N_2$  in various forms of diffusion and concd. liquors, of the nature of complaints in the various processes and of chem. control of the raw material and product. Averages for the preceding 9 yrs. are given. FRANK MARESH

The evaporation of sugar juices in the presence of activated charcoals. VL. STANĚK AND P. PAVLAS. Exp. Inst. Cz. Sugar Ind. (Prague). *Listy Cukrovar.* 47, 317-22(1929).—Sugar juices after the first satn. were treated with "standard norite," "supra-norite," "superior norite," carboraffin, basswood charcoal, infusorial earth boiled with acids and ignited, aragonite freshly prepd. by pptg.  $CaCl_2$  with  $Na_2CO_3$  at boiling temp. and a mixt. of norite +  $Na_2SO_3$ . The presence of insignificant quantities of charcoals affects the final color of the soln. very favorably and decreases the formation of more coloring matter. The various com. grades of norite vary among themselves but improve the color 67-100%; standard norite was found to be the best; the final color of the soln. is not dependent upon the decolorizing power of any grade of norite. Carboraffin was more effective than the standard norite. Infusorial earth, wood charcoal and aragonite do not increase the coloration of juices during evapn. as compared to untreated samples, but may even decrease the color. The most favorable results were obtained with the combination of activated charcoal and  $Na_2SO_3$  in that the juice was more lightly colored after evapn. than before evapn. was begun. Increasing quantities of charcoal exhibit an unproportional decrease of color in the evapd. soln. An increase of 0.01% is without an effect probably because of satn. of the whole surface by non-sugars. Juices of various origins give varied results during evapn. with activated charcoals; this applies equally to juices which were not treated with decolorizing agents. The combination norite +  $Na_2SO_3$  is to be tried in the next season. FRANK MARESH

Methods of decolorizing sugar solutions by means of active carbons. V. ŠÁZAVSKÝ. *Z. Zuckerind. čechoslovak. Rep.* 52, 413-20(1928).—In the suspension method a certain amt. of the C is mixed with the juice during 15 mins. at about 80° and pumped through filters of suitable type, while in layer filtration the C is previously deposited in a layer about 25 mm. thick and the liquor under decoloration pumped through this. In the latter method a better utilization of the C is realized by working in 2 stages so that the liquors are passed first through almost exhausted C and subsequently through fresh material. Some factories use a combination of the suspension and layer methods. Which method is the more suitable depends mainly on the nature of the C and on the liquors under treatment. In general, the layer method in two stages is the more favored for high-power carbons. B. C. A.

Bone charcoal and active vegetable carbons [in sugar refining]. C. MRASEK. *Z. Zuckerind. čechoslovak. Rep.* 52, 174-6(1927).—Bone charcoal is considered to give more regular and surer working, and, contrary to Wiesner's views, it is more economical than vegetable carbons. B. C. A.

Decolorization of sugar juices by active carbons. F. NOSEK. *Z. Zuckerind. čechoslovak. Rep.* 52, 269-72(1928).—A commentary on recent papers by Wiesner (*C. A.* 22, 2287) and Mrasek (cf. preceding abstract) on the use of active carbons in refinery and factory working. B. C. A.

Clarification of sugar solutions for polarimetry. V. ŠÁZAVSKÝ. *Z. Zuckerind. čechoslovak. Rep.* 52, 669-72(1928).—If 26 g. of beet molasses is defecated with basic Pb acetate soln. and made up to 100 cc., the vol. of the ppt. causes an error of about +0.26 on a polarimetric reading of 50. Such errors are avoided by the use of Horne's dry basic Pb acetate defecant, added after the molasses soln. has been made up to vol. A slight error in the opposite sense arises, however, from an increase in vol. of the liquid due to the space occupied by the excess of defecant in the dissolved state. Excess of defecant must be used to obtain the necessary degree of decolorization, and an excess of 1 g. is found to cause an error of -0.09 on a Ventzke reading of 50°. B. C. A.

Objective measurement of color in sugar manufacture. K. ŠANDERA. *Z. Zuckerind. čechoslovak. Rep.* 52, 261-9(1928).—The author has designed an instrument for measuring intensities of light by means of the photoelectric current produced at a surface of metallic K in a photoelec. cell. It consists of a 100-watt lamp with light filters and stops, from which the light passes through a glass cell contg. the liquid under examn. to a photoelec. bulb or cell contg. a film of K and a grid anode. The current, which passes between the film and the anode on illumination, is amplified by a 3-electrode thermionic valve and measured by means of a millivoltmeter. For light of given quality the photoelec. current is, within wide limits, proportional to the in-



tensity of illumination. Measurements made on sugar juices at various stages of manuf. show agreement of duplicate readings to within 1 in 150. The instrument can be used to measure not only color intensities, but also turbidities. B. C. A.

**Rate of solution of sucrose under various physical and chemical conditions.** V. NEUKA. *Z. Zuckerind. tšchoslovak. Rep.* 52, 289-93(1928).—Using similar app. to that of Šandera (cf. preceding abstract), the author investigated the rate of soln. of pellets of amorphous sugar prep'd. by allowing drops of molten sugar (contg. 2-3% of moisture) to fall into cold Hg. The relative rates of soln. of these pellets in pure water at 20°, 40° and 70° were approx. in the proportions 1:14:13. At a const. temp. of 20° the rate of soln. in pure water was twice that in 18% sucrose soln., and about 10 times as great as the rate in 50% sucrose solns. In lime water, in 1% solns. of  $K_2SO_4$  and oxalic acid, and in 5% soln. of  $Na_2CO_3$ , the pellets dissolved rather less rapidly than in pure water, but the max. observed reduction in rate was only about 5%. In molasses solns. also the rate of soln. was less than in pure water, mainly because of the sugar and only to a slight extent because of the salts present. The rate of soln. of sugar crystals in pure water at 20° showed occasional differences beyond the limits of exptl. error. It is suggested that crystals formed slowly in the cold may dissolve more slowly than those formed under the usual tech. conditions. B. C. A.

**Influence of over-saturation (in the carbonation process) on the precipitation of some acids in presence of magnesia and alkalies.** R. KARGL. *Z. Zuckerind. tšchoslovak. Rep.* 52, 253-9(1928).—Pptn. of the vegetable acids present in beet juices during carbonation, after having added lime contg. MgO, depends on several factors, but especially on the alky. of the carbonated juice. The presence of alkalies has an adverse effect, lowering the efficiency of the clarification and causing oversatn. MgO exerts no influence so long as its amt. does not exceed that of the lime used. B. C. A.

**Cutting sugar costs by modern methods.** N. A. HELMER. *Sugar* 31, 95-7(1929).—A description with illustrations of the Dorr clarifier and the Petree-Dorr process. J. F. B.

**Experiments with Sweetland and Kroog filter presses.** C. SYLMANS. *Arch. Suikerind., Mededeel. Proefsta. Java Suikerind.* 37, III, 11-55(1929).—During the crop 1928 comparative tests were made at Redjoagoeng with Sweetland and Kroog filters. A description of the Sweetland is given. Results are given in tables and graphs. Capacity of the Sweetland was 15% more than that of the Kroog and sweet water required for Sweetland was 50% larger than that for the Kroog. The Sweetland requires less cloth, less labor and less renewing of spare parts. The Vallez filter is discussed. The capacity of this filter is about 3 times greater per sq. unit filtering surface than that of the Kroog. P. R. P.

**Final report of 1928 manufacturing control.** C. SYLMANS. *Arch. Suikerind., Mededeel. Proefsta. Java Suikerind.* 37, III, 57-135(1929).—Av. results of 175 mills are reported, 60 sulfitation, 42 carbonation and 73 defecation. This year besides the gravity purity of final molasses the sucrose purity is also reported. Instead of Geerlig's formula for available sugar Winter's formula is used. The av. sucrose purity of final molasses sucrose in product

of all mills was 34.4. The av.  $\frac{\text{sucrose in juice}}{\text{sucrose in product}} = 90.7\%$ .

**Carbonation process control.** R. T. BALCH AND J. C. KEANE. *Sugar* 30, 534-6(1928).—A description is given of an automatic control of the second carbonation in a beet-sugar factory by change in  $p_H$ . A satd.  $Hg_2Cl_2$  half cell has contact with the juice through a porous cup filled with KCl, constituting the salt bridge. The other electrode is a bare W wire. These were connected with a recording potentiometer with a device for controlling a motor, which operates the gas valve (cf. C. A. 22, 1628). The juice was cooled to 30-35° by passing through a water-jacketed pipe. The "anticipatory control" acts in such a manner that the gas valve is gradually opened when the reaction of the juice is above the desired  $p_H$  and still going higher, and is gradually closed when the  $p_H$  is too low and still going lower. The article is illustrated with photographs showing the installation of electrodes, reversing motor and recorder controller; a chart is reproduced showing records of fluctuations in  $p_H$ . J. F. B.

**Determination of the dew point of flue gases.** J. J. DEN HAAN. *Arch. Suikerind.* 36, II, 1283-91(1928).—All processes where heating is done by vapor-contg. gases are affected by the position of the dew point. H. has computed and constructed a graph indicating the dew point, when the  $CO_2$  of the flue gases and the moisture of the bagasse are known. P. R. P.

**Determination of starch in grain and milling products.** C. VON SCHEELE AND G. SVENSSON. *Tek. Tid., Uppf. C, Kemi* 58, 57-60 and 65-72(1928).—A difficulty

in the detn. of starch in grain and milling products is caused by the hemicellulose compds. that always accompany the starch. In particular the pentosans are far less resistant to the action of chem. reagents than cellulose and are obtained in soln. by the action of enzymes or even by treating with water only. An accurate method of analysis should eliminate or take into account the sources of error arising from the presence of both sucrose and hemicellulose. The following methods have been examd. by the authors: (1) Detn. of starch was by difference, 100% - (fat + protein + ash +  $H_2O$  + pentosans), each analysis having been carried out according to standard methods.  $H_2O$  was detd. by drying for 6 hrs. at  $120^\circ$ . (2) Diastase-treatment was carried out according to M. Märcker, *Handb. der Spiritusfabrikation*, Berlin, 1898. The amt. of maltose formed was detd. iodometrically according to I. M. Kolthoff, *C. A.* 17, 2252. The quantity added of 0.1 N  $I_2$  should be not less than twice the theoretical amt. and the quantity of 0.1 N KOH should be about 20% more than the quantity of 0.1 N  $I_2$ . The procedure described should be followed carefully in all details. (3) Hydrolysis according to Fellenberg (see Kolthoff, *loc. cit.*) was carried out in a N soln. of HCl, the time required have been 45-90 mins. (4) Detn. of pentoses was carried out according to Tollens. The amt. of pentosans in barley was calcd. from the tables of F. Pawlowski, *Die Brautechnischen Untersuchungsmethoden*, p. 37. In all other grain products the tables of Tollens had been used, calcd. as a mixt. of equal parts of araban and xylan. (5) Hydrolysis with HCl in an autoclave under 3.5 atm. pressure and detn. of starch as dextrose with Fehling soln. were carried out according to Reinke, see O. Saare, *Die Fabrikation der Kartoffelstärke*, p. 491, Berlin, 1897. (6) Diastase treatment and dextrose detn. with Fehling soln. (Märcker, *loc. cit.*) were used. (7) The inversion method of Lintner, see J. König, *Untersuchung von Nahrungs-Genussmitteln und Gebrauchsgegenständen*, p. 141, Berlin, 1910, was used. (8) The method of Ewers, *Zeitschr. f. öffentl. Chem.* 14, 8, 150(1908); 15, 8(1909), hydrolysis with HCl, pptn. of proteins with 4% phosphotungstic acid and detn. of sugar by polarization were carried out. (9) The method of Lintner-Schwarz, *Z. ges. Brauwesen* 1913, 101, hydrolysis with alc. and  $H_2SO_4$ , pptn. of proteins with phosphotungstic acid, polarization were used. (10) The method described by A. Ling, D. Nanji and W. Harper (*Wochenschrift f. Brauerei*, p. 206(1924); cf. *C. A.* 19, 1836) and improved by H. Lüers and F. Wieninger, *Zeitschr. f. d. ges. Brauwesen*, June, 1925, was used. A number of tables shows the results obtained in different grain materials by the different methods as well as the corrections to be applied in each case. The improved method (10) of Lüers and Wieninger is considered the most accurate and requires only a correction for water-sol. substances. Although it is very tedious, it should be considered a valuable standard checking method. A sufficiently accurate method is the detn. by polarization after diastase-treatment (11), which is recommended for laboratories where the number of starch detns. is not very great. The results obtained are generally a little lower than those obtained by method (10). For laboratories having a large number of starch detns. the method of Ewers (8) should be preferred as the routine method, the necessary corrections always being taken into account. It is particularly suited for comparison detns. and is the most rapid method of those examd. (2) is usable but has no advantage over the polarimetric method and is slower than the latter. The methods (8), (10) and (11) are described in detail and are suggested as standard laboratory methods.

The acids of gum arabic. L. AMY. *Bull. sci. pharmacol.* 36, 7-17(1929).—See C. A. 23, 478. C. A. ROBAK A. E. MEYER

How does  $CO_2$  behave under pressure? (KRASE, GOODMAN) 2. Composition of gum arabic (BUTLER, CRETCHER) 10.  $CO_2$  assimilation of the sugar beet (LUNDEGÅRDH) 11D. What amounts of nutrient substances present in the effluent of a potato-starch factory are adapted to meadow irrigation? Are these poisonous to fish? (EBELING) 14. The effect of some growth conditions on chemical composition and metabolism in the sugar-cane leaf (FOLLETT-SMITH) 11D. Influence of the distance between rows of sugar beets upon the absorption of nutrition from the soil (Souček) 15. Mixing gases and liquids [treating sugar juices with  $SO_2$ ] (Fr. pat. 648,462) 13. Effecting chemical reactions [hydrolysis of starch] (Ger. pat. 474,075) 13.

Sugar. RAFFINERIE TIRLEMONTAISE SOC. ANON. Fr. 649,993, Feb. 28, 1928. Brit. 286,599 (*C. A.* 23, 540).

Washing crude sugar. LOUIS É. HYVE. Fr. 649,929, Aug. 3, 1927. Crude sugar made into a paste with sirup liquor from a previous operation is passed up an inclined

shaft by means of a spiral screw in the form of a sieve, against a descending current of sirup liquor.

**Continuous sugar-extraction process.** N. NOBEL. Brit. 298,501, July 4, 1927. In extg. sugar from materials such as bagasse the material is forced to flow with and by the greater part of the extg. liquid in a closed circuit in an app., which is described, the liquid continuing to circulate after the solid residue has been removed from the circuit.

**Sugar solutions.** KARL KOMERS and KARL CUKER. Fr. 648,450, Feb. 6, 1928. Instead of protecting sugar solns. from oxidation, they are freely oxidized by passing a current of air through the solns. until they no longer darken in color. They are clarified by the addn. of lime or superphosphate.

**Purifying molasses, etc.** KARL KOMERS and KARL CUKER. Austrian 112,637, Nov. 15, 1928. The purification of molasses and the like with suitably pretreated slices of beet is improved by adding to the beet finely divided inert substances such as active C, charcoal, cellulose, or hydrocellulose. Metals, metal oxides, or salts may also be added or may be pptd. in the soln. to be treated. App. is described.

**Starch.** CORN PRODUCTS REFINING CO. Fr. 649,985, Feb. 28, 1928. See Brit. 277,572 (C. A. 22, 2680).

**Starch.** SÄCHSISCHE KLEBSTOFFWERKE G. M. B. H. Ger. 474,602, Nov. 21, 1924. Cold-water starch preps. are made by mixing 100 parts of air-dried starch with 3 to 4 parts of finely divided chlorinated hydrocarbon and treating the mixt. with alkali lye.

**Starch.** FRANZ RIETHOF. Austrian 112,641 and 112,647, Nov. 15, 1928. Starch that swells in cold water is prepd. by mixing dry starch with about 3% of amyl alc. (112,641) or 3-5% of an aromatic amine (112,647), treating the mixt. with NaOH soln., and neutralizing, preferably with a solid acid, e. g., (COOH)<sub>2</sub>, or an acid salt, e. g., NaHSO<sub>4</sub>.

**Hydrolysis of starch.** VEREIN DER STÄRKE-INTERESSENTEN IN DEUTSCHLAND. Ger. 473,453, Feb. 8, 1924. A product as sweet as ordinary sugar is prepd. by treating starch with very dil. acid under moderate pressure in the presence of *p*-phenetolecarbamide.

## 29—LEATHER AND GLUE

ALLEN ROGERS

**The microscopic examination of vegetable tannins by means of polarized light.** II. B. AVENATI-BASSI AND G. A. BRAVO. *Boll. ufficiale staz. sper. ind. pelli mat. concianti* 7, 64 9(1929).—In continuation of previous studies (C. A. 22, 2854) A. and B. examd. the barks of *Eucalyptus*, poplar, birch, pine and alder by comparing the photomicrographs taken in ordinary light with those obtained in polarized light. G. SCHWOCH

**Tannin extract plant at Crawley, Western Australia.** N. T. M. WILSMORE. *Chem. News* 137, 278-80(1928).—A semi-com. scale ext. plant has been built by the Australian Council for Scientific and Industrial Research in coöperation with the Univ. of Western Australia, for the purpose of detg. the best methods of extg. Australian tanning materials. The equipment consists of Van Gelder crusher and disintegrator, Sirocco dust fan, Cyclone separator, 6 leaching vats, 2-stage evaporator, Kestner drier and special app. for treating barks under pressure or with chemicals.

H. B. MERRILL

**Reactions of tanning materials.** M. DUJARDIN. *Boll. ufficiale staz. sper. ind. pelli mat. concianti*; *La chimica* 5, 33(1929).—Cellulose tanning exts. are often viscous, although of low d. Myrabolan exts. have a characteristic odor; chestnut exts. have less than 1% ash and oak-bark exts. more. After examg. cellulose and synthetic tannins separately, a 0.4% soln. of the ext. is prepd. in the warm, followed by cooling and filtration. A mixt. of 50 cc. of the soln. with 10 cc. 40% formaldehyde and 5 cc. concd. HCl is then boiled, a reflux condenser being used. Catechuic tannins give a flaky ppt., red for mangrove, pink-brown for mimosa, etc. When no ppt. is formed after 1/4 hr., no catechuic tannins are present. After boiling, during 1/2 hr., cool and filter, adding to 100 cc. of the filtrate 5 g. crystd. Na acetate and 1 cc. 1% Fe alum soln. Pyrogalllic tannins give an intense violet. An abundant ppt. with formaldehyde and no color with Fe alum indicate catechuic tannins; absence of a ppt. and a violet-blue color with Fe alum indicate pyrogalllic tannins; and an abundant ppt. with formaldehyde and violet-blue color with Fe alum indicate both pyrogalllic and catechuic tannins.

R. SANSONE

**Chemistry of the liming process.** A. STEIGMANN. *Collegium* 1928, 653-7.—Lime

is as active as 8% NaOH in decomp. cystine, after the reaction starts. Besides sulfide, a complex compd. of  $\text{Ca}(\text{OH})_2$  and cystine, which is not Ca cystinate, is formed. Photographically inactive gelatin can be sensitized with  $\text{Ca}(\text{OH})_2$  and  $\text{Na}_2\text{S}$ . One kg. of cystine combines with 67.5 g. of  $\text{Na}_2\text{S} \cdot 9\text{H}_2\text{O}$  and 1 kg. of gelatin with 0.45 g. If the  $\text{Na}_2\text{S}$  was combining with cystine, 3.5 g. per kg. would be present in the gelatin but a tenth of this quantity would prevent inertness; so other groups must combine with  $\text{Na}_2\text{S}$ . Probably in lime liquors the cystine decomposes to  $\text{Na}_2\text{S}$  and this then combines with hide substance. I. D. C.

Progress in the treatment of tannery wastes (HODGE) 14. Sanio's  $\text{K}_2\text{Cr}_2\text{O}_7$  test for tannins (FEAR) 7. Detection of gallic acid and tannin (CELSI) 7. Varnish for shoes (Swiss pat. 130,137) 26. Wetting agents (Brit. pat. 298,559) 25. Sodium cellulose waste [tanning agent production] (Ger. pat. 472,680) 23.

GERNGROSS, O.: *Fortschritte auf dem Gebiet der Gerberei-Chemie und- Technik*. Berlin: Verlag Chemie, G. m. b. H. 42 pp. M. 2.50.

Process and product for unhairing and dewooling skins without attacking the hide or hair. M. MARTENS. Belg. 353,899, Oct. 31, 1928. The product consists of a mixt. of 1 part NaHS crystals ground to an impalpable powder, 4.5 parts of kaolin ground to an impalpable powder and 4.5 parts of very finely ground sawdust.

Mechanical and chemical process for dehairing and dewooling hides. M. MARTENS. Belg. 353,900, Oct. 31, 1928. The hides are hung so as not to touch one another in a chamber through which an aq. soln. of NaHS is circulated vertically.

Preserving hides and skins prior to tanning. H. DODGE. Brit. 298,435, Feb. 20, 1928. A compn. comprising  $\text{CH}_2\text{O}$ , niter,  $\text{NaHCO}_3$  and  $\text{Na}_2\text{SO}_4$  may be used as a dry mixt. and rubbed into the flesh side of the hides or skins or mixed with salt if the latter is used; it may be used in aq. soln. with agitation or as a spray.

Treating skins. HARRY DODGE. Fr. 649,812, Feb. 25 1928. Skins are treated with a soln. in water of  $\text{CH}_2\text{O}$ ,  $\text{KNO}_3$ ,  $\text{NaHCO}_3$  and  $\text{Na}_2\text{SO}_4$  to improve their quality after tanning. Cf. C. A. 23, 543.

Tanning material. J. R. GRIGY A.-G. Swiss 130,434, Aug. 13, 1927. A synthetic tanning material free from mineral acids is formed by mixing the dried reaction products of hydroxysulfonic acids and  $\text{HCHO}$  with fluosilicates. Thus, the reaction product of cresolsulfonic acid and  $\text{HCHO}$  is neutralized with  $\text{Na}_2\text{CO}_3$  and dried. With this product is mixed dry  $\text{Na}_2\text{SiF}_6$  in the proportions 100 to 50. The resulting mass contains 40-50% tanning material. Another example mentions naphthol- or phenolsulfonic acid as the starting point. Cf. C. A. 22, 2488.

Dye preparation for use on leather, etc. E. COMES. Brit. 298,565, Oct. 11, 1927. A compn. for dyeing leather, etc., comprises a fatty substance, a dye, acetone and other org. solvents; e. g., stearin, turpentine oil and Fat-Ponceau are warmed together, mixed with benzine or "petrol," allowed to stand and finally mixed with acetone.

Leather substitute. LONZAWERKE ELEKTROCHEMISCHE FABRIKEN GES. Brit. 299,023, Oct. 19, 1927. Fibrous material such as long staple cotton (with or without admixt. of animal fibers) is kneaded, preferably at low temp., with a binder such as single or mixed cellulose derivs. or a mixt. of these with albumin; the mixt. is forced through slotted apertures into a coagulating bath or a series of coagulating baths; it may subsequently be treated with finishing or coating compns. and may be subjected to mech. treatments such as calendering, embossing, or goffering.

Glue from chrome-tanned leather. ADAM HOCHÉ (to Litmo Adhesive and Products Co.). U. S. 1,710,687, April 30. Chrome-tanned leather contg. 2-5% Cr oxide is extd. at room temp. in successive baths of  $\text{H}_2\text{SO}_4$  of about 20° Bé., about 10° Bé. and about 5° Bé. (each extn. being for about a half hr.); the extd. leather is then heated in water to form a water-proof glue contg. some Cr oxide.

Glue. KARL KLINGSPO. Fr. 649,309, Dec. 22, 1927. See Brit. 293,232 (C. A. 23, 1524).

Metal-glutin compounds. KARL KÜTTEL. Austrian 112,642, Nov. 15, 1928. Glue or gelatin soln. is treated first with a slight excess of an alkali-hydroxide or carbonate soln. and then with a salt of a bi- or trivalent metal, whereupon an insol. "glutinate" is pptd. The products give an artificial horn when hardened with  $\text{CH}_3\text{O}$ . Cf. C. A. 22, 4739.

# CHEMICAL ABSTRACTS

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No. 13

## 1—APPARATUS AND PLANT EQUIPMENT

W. L. BADGER

Two new laboratory apparatus. HANS J. FUCHS. Wassermann Inst., Berlin. *Biochem. Z.* 207, 405-8 (1929).—A dialyzer and an extn. app. for use at temp. below the boiling temp. of the extracting fluid are described. S. MORGULIS

Notes of the laboratory. III. New tubes for cataphoresis. F. VLÈS. *Arch. phys. biol.* 6, 139-40 (1927).—Tubes for cataphoresis are described, which permit perfect asepsis and the use of larger quantities of liquid than in the usual tubes. A. E. M.

Two new laboratory revolving furnaces. FR. HEINRICH. *Chem. Fabrik* 1929, 173-4; cf. TAFEL, *C. A.* 22, 2495. J. H. MOORE

Batch classification in the laboratory. A. W. FAHRENWALD AND CLARENCE THOM. Bur. Mines, *Repts. of Investigations* No. 2924, 5 pp. (1929).—A batch lab. classifier and elutriator designed for use in conjunction with such app. as ball mills and flotation machines is described and illustrated. An application of the app. to grinding studies is given and preliminary data furnish some insight into the relation of power consumption, and fineness of grinding in closed-circuit operations. Locked lab. closed-circuit tests of this kind are probably more efficient than on a com. scale. In prep. samples for lab. flotation tests, this procedure is to be recommended over the usual method of putting the charge in a mill and regulating the grinding time to give the "mesh through" product. W. H. BOYNTON

Artificial resin as material for the construction of chemical apparatus. EMIL KALMAN. *Chem. Fabrik* 1929, 169-70.—Notes on the properties and uses of Haveg (*C. A.* 19, 3039; 20, 3363). J. H. MOORE

Metallic materials of construction for chemical engineering equipment. EVERETT P. PARTRIDGE. *Ind. Eng. Chem.* 21, 471-6 (1929).—A brief but complete review of the more important types of metals and alloys in use at the present time. The most essential data of each group are listed and the suitability of each group for certain fields of service is indicated. FRANK V. JOHNSON, JR.

Vessel with walls or jackets of wood or similar substances and bottoms of metal. ADOLF HARTZ. *Chem. Fabrik* 1929, 193-4.—Cuts and directions for constructing such vessels are given. The bottom may be heated by direct firing, or by steam, etc., while the walls reduce the amt. of radiation. J. H. MOORE

A design of a low-voltage x-ray tube. ELMER DERSHEM. *J. Optical Soc. Am.* 18, 127-30 (1929).—An x-ray tube for the study of x-rays of long wave length is described. It can be readily dismantled for cleaning or changing of targets or filaments. The property utilized in designing the tube is that, when working with rarefied gases, for given pressures, a much greater potential is required to produce a spark discharge if the distance between the electrodes is somewhat less than the mean free path of the atoms or mols. of the gas than is the case if the electrodes are more widely spaced. For air at pressures from 0.002 to 0.01 mm. Hg, the spacing is  $1\frac{1}{2}$  inch. For 0.01 mm. Hg the breakdown potential is 20 kv., higher potentials being required for lower pressures. A diagram of the tube is shown, and the method of assembly and some points relative to its operation are given. L. L. QUILL

Lenard x-ray tube with glass window. C. M. SLACK. *J. Optical Soc. Am.* 18, 123-6 (1929).—A glass window has been designed to be used on Lenard tubes, which ordinarily have thin Al-foil windows. Windows 2.5 cm. in diam. and 0.0005 cm. thick have been very satisfactory. The windows are constructed by drawing in the end of glass tubing to form a bubble, the glass having been previously thinned at this point. Heat cond., energy losses in the window, the cracking of the windows by electrostatic discharges, etc., are mentioned briefly. An attempt is also being made to apply the glass window to oscillographs. L. L. QUILL

A device for stirring within a sealed container. LEONOLD SCHNEIDER. *J. Chem. Education* 6, 947-8 (1929). R. H.

**Rational crucible tongs for analytical use.** LUDWIG RAMBERG. *Svensk Kem. Tid.* 41, 78-9(1929).—The prongs of the crucible tongs (old style) are replaced by Ni wires, 2 mm. in diam. These finer prongs are so bent that when closed and not grasping an object they pass one another. When a crucible is held one prong touches the crucible at one point and the other at 2, and the spring of the wire is sufficient to hold the object firmly but not so strong as to dent thin Pt ware. Two forms are shown in a photograph. A. R. ROSE

**A new apparatus for the determination of water by means of a difficultly combustible heat carrier.** FRITZ FRIEDRICHS. *Chem.-Ztg.* 53, 287(1929).—The substance is distd. with  $C_2H_5Cl_4$ , the distillate passing through a bulb on the lower end of a buret into which the  $H_2O$  rises and is measured. J. H. MOORE

**Apparatus for visual conductivity titrations and conductivity measurements.** O. PFUNDT. Univ. Göttingen. *Chem. Fabrik* 1929, 184-6.—Descriptions of and operating directions for app. in which the telephone is replaced by a galvanometer, which gives direct readings, with references and 5 cuts. J. H. MOORE

**An apparatus for conductivity measurements in very small volumes of fluid.** IGOR REMEZOV. State Institute for Postgraduate Med., Leningrad. *Biochem. Z.* 207, 66-79(1929).—A microelectrode is described by means of which cond. can be measured accurately in as little as 0.05 cc. of fluid. This is accomplished with the aid of amplifying tubes. S. MORGULIS

**Improved field equipment for the determination of  $p_H$ .** E. HURWITZ and L. S. KRAUS. Sanitary District of Chicago. *Eng. News-Record* 102, 704(1929).—An extremely compact comparator for detg.  $p_H$  in the field, employing Clark's indicators and buffer solns., has been developed. A complete set of color standards for the  $p_H$  range 1.8-9.2, indicators and all equipment necessary are contained in a case  $9 \times 6 \times 8\frac{1}{2}$  in. The standards are sealed in Pyrex glass tubes about 11 cm. long with bore of approx. 4 mm. and capacity of 1 cc., mounted on chalk-white celluloid cards. The detn. is made by pipetting 1 cc. of the unknown soln. into a depression in a spot plate, adding 1 drop of indicator, mixing thoroughly, drawing liquid back into the pipet (which is made of same tubing as the standards) and comparing with the standards. R. E. THOMPSON

**Fractional distillation analyses.** W. J. PODBIELNIAK. *Refiner Natural Gasoline Mfr.* 8, No. 3, 55(1929).—A simplified app. of the type developed by P. and E. H. Leslie at the Univ. of Michigan in 1925-6 for gas analysis by the fractional distn. of the liquefied gas is described. The app. is claimed to be simple, compact and adaptable to routine use in industrial labs. by operators of ordinary training. M. B. HART

**Gas testing.** A. SANDER. *Z. Ver. deut. Ing.* 73, 531-8(1929).—Descriptions of app. for gas-testing, methods of use and calcs. involved are given in full. Included are the Junker gas calorimeter (old and new types), Graefe, Dommer and Strache-Löffler calorimeters, and the recording calorimeter "Union" (likewise designed by Dommer); sp. gr. app. of the Bunsen-Schilling, Zipperer, Simmance and Abady, "Union" types; pressure meters; gas analysis app. such as Brüggemann's, the Gasinstitut Karlsruhe, etc.; Raupp app. for  $H_2S$  detn.; Kattwinkel app. for detn. of  $C_2H_4$  in gas, methods for detn. of total S,  $NH_3$ , etc. Post-war economic conditions have made it imperative that closer control of gas quality be maintained than was the case earlier than 1918. W. C. EBAUGH

**Sensitive instrument for low pressure.** ANON. *Arch. Wärmewirt.* 10, 104(1929).—This device, for showing vacuum in plant app., consists of a barometric manometer bent in the form of a nearly complete circle, and balanced. Changes in the Hg levels cause the manometer to swing, and an attached hand shows the abs. pressure. ERNEST W. THIELE

**The construction and calibration of a sensitive form of Pirani gage for the measurement of high vacua.** L. F. STANLEY. Royal Coll. of Science. *Proc. Phys. Soc. (London)* 41, 194-203(1929).—The app. "consists of manometer and a compensator of identical construction placed in the opposite arms of a Callendar-Griffiths bridge. Each comprises, essentially, a loop of 10 cm. of Pt wire 0.001 in. diam., together with a compensating loop of 2 cm. of the same wire. The symmetry of the circuit makes errors due to thermoelec. effects very small. . . . The gage follows variations of pressure with considerable rapidity, and its range of measurement is from  $2 \times 10^{-3}$  mm. to  $4 \times 10^{-4}$  mm., approx." The paper contains a "Note on the accuracy of the ordinary type of McLeod gage." J. H. MOORE

**The influence of air in apparatus for measuring the pressure and quantity of gases lighter than air, and in the lines leading to them.** KARL LÖNNERCKE. *Feuerungstech.* 16, 268-72(1928).—L. points out that where the measuring app. lies much lower than the line, air in the connecting lines may cause serious errors. ERNEST W. THIELE

**Determination of the pressure on containers filled with liquid ammonia.** R. NITZSCHMANN. *Chem. App.* 16, 81-2(1929).—Mathematical formulas, with 3 tables giving data up to 25.63 atms. over a temp. range from  $-30$  to  $+60^{\circ}$ . J. H. M.

**Electrical instruments used in the measurement of flow.** W. H. PRATT. *J. Am. Inst. Elec. Eng.* 48, 142(1929). H. R. MOORE

**A farewell word on the Venturi meter.** CLEMENS HERSCHEL. *Eng. News-Record* 102, 636-7(1929).—A brief discussion by the inventor of this minimum-loss-of-head meter, which has been unapproached for precision of measurement since developed over 40 years ago. The practice of shortening the meter tube by increasing the cone angle of the discharge tube destroys one of the greatest advantages of the instrument, namely, that of regaining the head in full. The long taper of the discharge tube also delivers the water with less turbulence and produces a more perfect "differential." Venturi tube forms can be built of wood or concrete (with exception of throat piece) inside standard pipe or penstock sections. Such meters have given reliable service for years. R. E. THOMPSON

**The optical chronograph.** HANS RUMPF. *Z. ges. Schiess- u. Sprengstoffw.* 24, 55 7, 99-100(1929).—This app. comprises an oscillograph with unusually high velocity of sensitized paper or film (up to 70 m./sec.). It is applicable to measurement of velocity of detonation of explosives, of velocity of projectiles, of duration and intensity of flame, of the study of coal dust explosions, etc. The instrument and its method of use are described. C. G. STORM

**A modified Wilson-Kern extractor.** H. B. MERRILL. A. F. Gallun & Sons, Milwaukee, Wis. *J. Am. Leather Chem. Assoc.* 24, 244-5(1929).—One of the original 3 glass parts connected by ground joints has been eliminated. The modified app. is more rugged, cheaper and easier to regulate than the original form. H. B. M.

**Determination of the specific gravity of refractory materials.** E. KUEHN. *Feuerfest* 1929, No. 1, 5.—A *volumoscope* is described by means of which more than 30 sp. gr. detns. can be made in 1 hr. The app. is filled with 200 g. of material, vacuum is produced, and by simple operation of the hand true sp. gr. can be read off. The material being tested comes into contact with air only. E. I. S.

**New apparatus for measuring thermal expansion of refractory materials at  $1600^{\circ}$ .** K. ENDELL. *Feuerfest* 1929, 3-4; cf. *C. A.* 22, 3027. E. I. S.

**Summary of recommendations on ordinary commercial cylinders for the storage and transport of the so-called "permanent" gases.** H. C. H. CARPENTER, et al. Dept. Sci. Ind. Research. *Gas Cylinders Research Comm.* 1929, 7 pp.—A reprint of the first report of the Gas Cylinders Research Comm. published in 1921 incorporates revisions representing alterations of wording or changes in the substance of the recommendations. Plain C steel of seamless tubing with the following compn. should be used: C 0.43-0.48%, S < 0.045, P < 0.045, Mn 0.5-0.9%, Si not to exceed 0.3%. Twenty-two recommendations are made covering: materials of the cylinder, manuf., testing of completed cylinders, working pressures, fittings, painting and periodical examn. W. H. BOYNTON

**Characteristics of radio-receiving tubes.** L. SUTHERLIN AND C. B. UPP. *Elec. J.* 26, 146-52(1929).—Twenty-four figs. C. G. F.

**Fire sprinkler systems in the chemical industry.** JOSEF IMMERSCHITT. *Chem. Fabrik* 1929, 157-8. A. WHITE

#### Optical temperature measurement in furnace (AECKERLEIN) 2.

WAGNER, BERNHARD: Tabellen zum Eintauchrefraktometer. Including supplement: Die Refraktometrie der Milch. Edited by SIMON ROTHENFUSSE. Jena: Carl Zeiss. 162 pp. Linen; M. 40.50.

**Thermionic cathodes.** WESTINGHOUSE ELEC. AND MANUF. CO. Fr. 647,021, Jan. 12, 1928. The cathodes are made from an alloy contg., e. g., Ni 80, Co 20, Fe 7.5 and Ti 2.5 parts. The electron-emitting coating contains BaO and SrO.

**Vessel for effecting chemical reactions.** OTTO ROLAND. Ger. 475,127, Aug. 13, 1927. The principal feature is a rotating hollow worm, to the interior of which the reagents are supplied. The reagents pass to the bottom of the worm and thence to the space between the worm and the walls of the vessel; they are then conveyed upward by the worm in close proximity to the walls, which carry heating or cooling pipes. The reagents may be circulated as often as desired, and means are provided for admitting gases to the interior of the worm. The manuf. of AcOH from  $(\text{AcO})_2\text{Ca}$  and  $\text{H}_2\text{SO}_4$  is referred to.

**Tintometer with superposed color screens.** O. ROSENHEIM, E. H. J. SCHUSTER and TINTOMETER, LTD. Brit. 299,194, Oct. 31, 1927. Structural features.

**Filters.** ALBERT SCHREMPF. Fr. 651,642, Mar. 23, 1928. Method of mounting filters of perforated cloth in a cell for the purification of air, gas, vapors, oil, etc.

**Air filter.** GENERAL AIR FILTERS CORP. Fr. 650,821, Mar. 13, 1928. An air filter of the type in which the air is caused to pass in a zig-zag path over plates coated with a viscous fluid is described.

**Continuous rotary drum filter.** JERONIMO D. COMPAIN. U. S. 1,712,258, May 7. Structural features.

**Apparatus for dissolving, filtering, or washing materials.** HERMANN FRISCHER. U. S. 1,711,638, May 7. A rotary sieve or filter drum is mounted within a vat or tank and carries stirring devices on its periphery.

**Apparatus for separating impurities from gas or air by conical baffle plates.** ESTATE OF HANS E. THEISEN. Fr. 650,633, March 9, 1928.

**Apparatus for extracting solids from gases by centrifugal deposition.** JAMES GORDON & Co., LTD. Fr. 647,813, Nov. 21, 1927.

**Bubble cap and tray construction for fractionating or rectifying apparatus.** FAYETTE P. RISDON (to Texas Co.). U. S. 1,711,656, May 7.

**X-ray apparatus.** SIEGMUND LOEWE. Ger. 475,276, Mar. 6, 1919.

**Vacuum tubes.** COMPAGNIE FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON. Fr. 651,345, March 2, 1928, and Fr. 651,362, March 8, 1928. Method of mounting the electrodes.

**Vacuum tubes.** JEAN B. J. M. ABADIE. Fr. 651,204, Aug. 31, 1927. Vacuum tubes contg. rarefied gases, such as Ne, A, He, etc., have electrodes of Pb, Bi, Tl, Sn or Cd instead of Hg.

**Electric vacuum discharge tubes.** W. GERMERSHAUSEN. Brit. 299,431, Oct. 26, 1927. An incandescent cathode may be formed of Ni wire with a surrounding winding of W or Ir wire, plated with Ni and then activated by the formation of a Ba-Ni alloy. Wire already activated may be used for the winding, if desired, and the assembly then plated with an activated metal.

**Electric discharge tube.** FRANZ SKAUPY (to General Electric Co.). U. S. 1,712,407, May 7. A sealed container filled with an attenuated inert gas such as A or Ne contains non-alk. electrodes, which may be formed of Fe or W and which consist of fine wire mesh free from occluded active gases so that a glow discharge may be operated between the electrodes at voltages of about 100 volts; the area of the electrodes is great enough to permit of the indefinite continuance of the glow discharge at such voltages.

**Electron discharge tubes.** COMPAGNIE FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON. Fr. 650,360, Feb. 27, 1928.

**Electron discharge tube.** NAAMLOOZE VENNOOTSCHAP PHILIPS' GLOEILAMPEN-FABRIEKEN. Fr. 650,441, Mar. 5, 1928.

**Electric discharge tubes.** NAAMLOOZE VENNOOTSCHAP PHILIPS' GLOEILAMPEN-FABRIEKEN. Fr. 650,700, Mar. 9, 1928.

**Thermionic valves.** COMPAGNIE FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON. Fr. 651,405, Mar. 14, 1928.

**Mixing machine for powders.** ERNST KUBISCH. Ger. 475,251, Aug. 1, 1926.

**Dispersion mill.** THE ANODE RUBBER CO. (ENGLAND), LTD. Fr. 650,673, Feb. 20, 1928. A mill is described for bringing solids into dispersion in liquids, the liquid contg. the solid to be dispersed and protective colloids being agitated with hard grinding masses, which are of different sizes and rounded but not spherical.

**Grinding mill.** ANDREAS INGENIEUR-BÜRO UND MASCHINENBAU-GES. M. B. H. Ger. 475,149, Mar. 27, 1928.

**Grinding apparatus for mineral substances.** SOC. ANON. DES ANCIENS ÉTABLISSEMENTS RAYMOND FRÈRES. Fr. 650,853, Mar. 14, 1928.

**Disintegrating mill with internal winnowing means.** ERNST C. LOESCHE. Ger. 475,165, Feb. 13, 1925.

**Drying and disintegrating drum for moist materials.** I. G. FARBENIND. A.-G. (Oskar Spengler, Otto Beurlen and Rudolf Weidenhagen, inventors). Ger. 471,298, Feb. 17, 1926.

**Vertical drying chambers.** MINES DOMANIALES DE POTASSE D'ALSACE. Fr. 651,058, Mar. 20, 1928. The greater part of the warm gases are introduced at the top and the rest at the bottom, and are withdrawn at an intermediate point.

**Apparatus for drying pasty materials.** I. G. FARBENIND. A.-G. (Albert Jüngst, inventor). Ger. 475,158, May 6, 1927. The material is taken up on an endless band.



which carries it through a smoother or distributor and then over a heated roller. Cf. C. A. 23, 1314.

**Drying or destructive distillation apparatus.** LUDWIG HONIGMANN. Ger. 466,925, Nov. 6, 1925. The finely granular material to be treated travels along the lower half of a container, the upper half of which is traversed by a current of hot gas. Heat is conveyed to the material by conductive perforated plates mounted on a central rotary shaft.

**Condenser for cracked oil or other vapors.** WILLIAM HILDEBRANDT (to Gasoline Corp.). U. S. 1,712,825, May 14. Structural features.

**Cooler for flowing liquids (applying transverse stream of air).** FRANZ LEITNER. Ger. 475,110, July 26, 1923. Addn. to 402,630.

**Device for cooling liquids with solid carbon dioxide.** LOUIS W. HASSENSALL. U. S. 1,712,701, May 14. The solid refrigerant is placed in a container immersed in the liquid to be cooled and gas evolved from the refrigerant passes through a bent tube and is discharged into the liquid.

**Cooling pan for pitch, asphalt, etc.** GES. FÜR TEERVERWERWERTUNG M. B. H. and ADOLF SPILKER. Ger. 475,028, Feb. 8, 1927.

**Apparatus for concentrating solids by fluid currents.** ALBERT H. STEBBINS. U. S. 1,714,589, May 14. Structural features.

**Furnaces.** JAMES GORDON AND CO. Fr. 650,330, Jan. 11, 1928. Means for regulating the fuel supply for furnaces, such as those using gases from blast furnaces where the supply is very irregular, are described.

**Furnaces.** RUDOLF HAAS and MANFRED SENG. Ger. 474,076, Feb. 19, 1921. Grate furnaces into which a supplementary supply of powd. fuel is blown are constructed or operated so that the powd. fuel is blown in counter current to the fuel on the grate.

**Coal-dust furnace.** JULIUS HAACK. Ger. 475,245, May 9, 1924. Addn. to 467,933 (C. A. 23, 552).

**Shaft furnace.** W. SCHWARZ & Co. Ger. 475,212, Jan. 13, 1928. A shaft furnace for calcining or sintering powd. materials has a no. of coaxial chambers into each of which only fuel or only the material to be treated is fed, the fuel and the material being blown in at the top of the furnace. For instance, 3 chambers may be provided, the material being supplied to the middle one and the other chambers having seals at their lower ends designed to hinder contact of the hot gases with the material leaving the furnace.

**Air heater for furnaces.** WILLIAM M. CONNERY. Ger. 475,493, Aug. 5, 1924.

**Air heater for furnaces.** EUGEN HABER. Ger. 475,494, Feb. 26, 1927.

**Apparatus for automatically supplying oxygen to furnaces in gradually increasing and decreasing quantity.** ARTHUR O. HIGINBOTHAM (one-half to William A. Weigle). U. S. 1,711,943-4, May 7.

**Electric system (depending on steam flow or pressure) for regulating combustion in boiler furnaces.** A. G. S. SANDISON and ELECTROFLOW METERS CO., LTD. Brit. 299,198, Nov. 4, 1927. Numerous structural details are described.

**Water-cooled protective wall for furnace chambers.** SCHMIDT'SCHE HEISSDAMPF-GES. M. B. H. Ger. 475,438, April 24, 1927.

**Gas burner.** H. BANSSEN. Brit. 299,217, Dec. 5, 1927.

**Gas burner.** AUGUST J. HARTFIELD. U. S. 1,712,885, May 14.

**Gas burner.** OTTO B. KIBLE. U. S. 1,711,794, May 7.

**Gas burner.** BERT THORNTON. U. S. 1,712,410, May 7.

**Mechanically regulated gas burner.** FIRMA AUG KLÖNNE. Ger. 475,075, Feb. 15, 1928.

**Gas-burner construction for furnaces.** CARL W. GIBSON. U. S. 1,712,881, May 14.

**Burner construction suitable for liquid fuels.** JOSEPH BROCK. U. S. 1,712,326, May 7.

**Liquid-fuel burners.** SIDNEY E. MAJOR and EMRYS F. BAKER. Australia 12,471, Mar. 24, 1928.

**Burners for liquid fuel.** PAUL LINKE. Fr. 651,335, Feb. 22, 1928.

**Burners for heavy oils.** WALTER OSTHOFF. Fr. 651,248, Mar. 9, 1928. The oil is considerably cooled on its way from the point at which it is vaporized to the mouth of the burner.

**Oil-burner control.** ALLGEMEINE ELEKTRICITÄTS-GES. Ger. 475,492, Oct. 14, 1927. Elec. circuits including a photoelec. cell are described whereby the supply of fuel is automatically varied in accordance with the intensity of the flame, and is discontinued when the flame is extinguished.

**Gasifying means for gasoline or oil burners.** JOSEPH WELTNER. Fr. 650,654, Jan. 17, 1928.

**Apparatus for heat treatment of oils or other liquids.** WILLIAM WINSHIP. U. S. 1,712,372, May 7. Vertical open-ended tubes completely submerged in the liquid under treatment are formed of metal or other suitable material of high elec. resistance; the tubes while contg. and surrounded by the liquid are heated by elec. current. Various other structural details of the app. are described.

**Heat exchanger.** LA MONT CORP. Ger. 475,050, Oct. 20, 1926.

**Heat-exchange apparatus suitable for heating air by use of combustion gases.** GREGORY D. MANTLE (to Mantle Engineering Co.). U. S. 1,712,892, May 14. Structural features.

**Heat-exchange coil suitable for use with heating or cooling apparatus.** JOHN STRINDLUND (to G. D. Jenssen Co.). U. S. 1,713,456, May 14. Structural features.

**Acetylene generator.** PATRICK McDONALD. U. S. 1,712,392, May 7.

**Cartridge for generating acetylene or other gases.** A. P. STRERR. Brit. 299,400, Oct. 25, 1927. Carbide or other gas-generating material is enclosed in an envelope of woven or perforated material, which may be rendered hygroscopic and which may be further protected by an outer covering. Various details of manuf. are specified.

**Apparatus for classifying coal, ores, etc.** ANTOINE FRANCE. Fr. 650,971, Mar. 17, 1928.

**Cooling means for powdered-fuel combustion chambers.** DEUTSCHE BABCOCK & WILCOX DAMPFKESSEL-WERKE A.-G. Ger. 475,228, Aug. 20, 1925.

**Apparatus for pumping fuel oils or other viscous materials.** GUNNAR C. ENGSTRAND (to Salvage Process Corp.). U. S. 1,712,694-5, May 14.

**Floot construction for preventing evaporation from the surface of oil in storage tanks.** IVAN R. AFONIN. U. S. 1,712,321, May 7.

**Evaporator for liquefied gases.** JOHANNES ZÜSR. Swiss 129,292, Dec. 19, 1927. Liquefied gas is contained in a vessel with a heat-insulating jacket outside to prevent too rapid evapn. when placed in a bath. The vessel has a gas-tight cover, and a delivery tube of small cross-section.

**Apparatus for evaporation and concentration of solutions of saline or other substances.** GEORGES H. PASSELECO. U. S. 1,711,614, May 7. An app. is described comprising an evapg. chamber partitioned into sections all communicating with a common vapor outlet and connected in series by conduits to provide a thermo-siphonic circulation system.

**Liquid-degasifying attachment for measuring pumps.** MARTINI & HÜNEKE MASCHINENBAU-A.-G. Ger. 475,444, Mar. 12, 1927.

**Apparatus for indicating and regulating the density of gaseous mixtures.** SMOOT ENGINEERING CORP. Fr. 651,225, Jan. 30, 1928.

**Gas washer suitable for extraction of hydrocarbons from gas and vapor mixtures.** P. M. SALERNI. Brit. 299,481, April 26, 1927. The gas and vapor mixt. together with oil or other absorbent is forced along spiral passages of an app., various structural details of which are described.

**Gas scrubber with rotating sprays.** GUSTAVE FAST. U. S. 1,713,175, May 14. Structural features.

**Cleaning digesters.** GUSTAV ULLMANN. Ger. 475,119, June 6, 1926. Digesters operating under pressure are cleaned by spraying in water or other liquid at the time when the pressure is released.

**Apparatus for producing foam by passing air through a saponin solution, etc.** G. M. THOMSON. Brit. 299,242, Jan. 31, 1928. Various structural details are specified.

**Bubble tray construction for column stills, etc.** J. PRIMROSE and H. R. SWANSON (to Power Specialty Co.). Brit. 299,479, May 5, 1926.

**Abrasion apparatus for determining the wearing qualities of rubber tire treads, shoe soles, linoleum, or other materials.** IRA WILLIAMS (to Grasselli Chemical Co.). U. S. 1,711,866, May 7. An app. is described having a rotating abrading device against which the sample tested is held. The loss of material from the sample per unit of powder used for operating the abrading device is measured.

**Thermoelectric elements.** WALTER KÖNIG. Ger. 475,338, July 18, 1928. In attaching lamelliform thermoelec. elements to a central heating tube of ceramic or other material, the tube is externally enameled and the elements are set in suitable contact in the enamel layer and heated so that a firm union is obtained.

**Temperature switch.** AUDIFFREN SINGRÜN KÄLTE-MASCHINEN A.-G. Swiss 129,704, Dec. 27, 1927. A U-tube has a contact terminal in each limb and an elec. conducting liquid below them. One limb is connected to a closed tube contg. an

expansion liquid, which detts. which of the terminals is in contact with the conducting liquid.

"Two-temperature" thermostat. FRED W. POWERS and MORTON O. SNEDIKER (to Power Regulator Co.). U. S. 1,712,841, May 14. Structural features.

Thermostatic valve-control device. ADOLPH O. NELSON. U. S. 1,711,901, May 7. Structural features.

Thermostatic control for gas valves. JAY H. SMITH. U. S. 1,712,313, May 7. Structural features.

Thermostatic and other control devices for oil-burning steam-generating furnaces. MARC RESEK (to Perfection Stove Co.). U. S. 1,712,737, May 14.

## 2—GENERAL AND PHYSICAL CHEMISTRY

FREDERICK L. BROWNE

Eliot and Storer. Pioneers in the laboratory teaching of chemistry. TENNEY L. DAVIS. *J. Chem. Education* 6, 868-79(1929). E. H.

Julius von Sachs. R. B. HARVEY. Univ. of Minnesota. *Plant Physiol.* 4, 155-7 (1929).—A biographical sketch accompanied by 2 photographs. WALTER THOMAS

Jan Zawidzki (1866-1929). Genetics of his scientific and social work. MIECZYSLAW CENTNERSZWER. *Roczniki Chem.* 9, 149-69(1929).—Several portraits of Z. and of his teachers and co-students in Riga and Leipzig are included. Activity of J. Zawidzki during his last years. WOJCIECH SWIENTOSLAWSKI. *Ibid* 177-86. Dr. J. Zawidzki as the chairman of the department of Science and Ministry of Culture and Public Instruction. ANON. *Ibid* 187-9. Prof. J. Zawidzki. Personal sketch. ALICJA DORABIALSKA. *Ibid* 190-3. J. Zawidzki's kinetic theory. B. SZYSZKOWSKI. *Ibid* 194-205. Bibliography of Zawidzki's works. ANON. *Ibid* 206-10. JAROSLAV KUČERA

Dr. Tadeusz Zwislocki. ANON. *Przemysł Chem.* 13, 113-4(1929).—An obituary with portrait. A. C. ZACHLIN

Chemistry and science in college entrance and graduation requirements. LOUIS W. MATTERN. *J. Chem. Education* 6, 918-30(1929). E. H.

The freshman chemistry course with particular reference to the laboratory work. G. ALBERT HILL. *J. Chem. Education* 6, 914-7(1929). E. H.

Activator, promoter, or strengthener? A. MITTASCH. *Z. Elektrochem.* 35, 96-7 (1929).—A discussion of terminology. J. G. McNALLY

A demonstration experiment with hydrogen chloride. CHARLES H. STONE. *J. Chem. Education* 6, 945-6(1929). E. H.

Compensation method for measuring small currents. R. JAEGER. *Z. Physik* 54, 152(1929).—J. compares his method (C. A. 23, 1794) with an earlier one by Rutherford and Chadwick (C. A. 6, 2357). GEORGE GLOCKLER

A novel method for optical temperature measurement in furnaces. G. AECKERLEIN. Bergakad., Freiberg. *Z. tech. Physik* 10, 129-36(1929).—Optical temp. measurements are correct only if sufficient reflected or transmitted radiation is added to the temp. radiation of the focused object to make its radiation equal to that of a black body. The correction method here expounded consists of measuring the temp. optically (Holborn Kurlbaum pyrometer, 650 $\mu$  glass filter) by focusing on 2 faces of the object which are at an obtuse angle to each other, then analyzing from the 2 measurements the proper and the foreign radiation (sharp and diffuse reflection), thus arriving at the true temp. of the object. The reflecting-power curves of the material are supposed to be known. For the example of "Korunite" (80% Al<sub>2</sub>O<sub>3</sub>, m. 2000°) the method was worked out exptly.; its reflecting power was detd. at various angles of incidence photometrically. For the diffuse reflection (intensity  $I_d$ ) the value of  $(I_d/I_a)(1/\cos \epsilon)$  was  $1.075 \pm 0.082$ ; for the angle of incidence  $\epsilon$  from +20° to -60° and reflection angles up to 70° the coeff.  $d$  was found to be 45.9%. This coeff. appeared not to change on heating. For the direct reflection the coeff.  $r$  was between 9.2 and 10.2% at a 70°, 2.5 to 3.1% at a 40° angle, and depended on temp. Focusing a korunite face in a furnace from 2 angles (40° and 70° with normal) gave measured values of the temp.  $t_1 = 1036.3^\circ$  and  $t_2 = 1039^\circ$ , resp.; from these the intensities  $I_1$  and  $I_2$  are calcd. by  $I = \epsilon_1 \lambda^{-5} e^{-\alpha/\lambda T}$ ; the difference  $\Delta I$  is related to the intensity of the proper radiation of the object by  $I_a = I_1 A_1 - [(d + r_1)/(r_2 - r_1)] A_1 \Delta I$  with  $A_1 = 1 - d - r$ . From  $I_a$  it follows that the actual temp. of the material is  $t_a = 1013^\circ$  as compared with a value of 1019.5° from direct thermoelectric measurement. An energy balance of the various radiation effects is added. B. J. C. VAN DER HOEVEN

**The laws of periodicity. IV.** P. PETRENKO-KRITCHENKO, V. OPOTZKII, M. D'YAKOVA AND A. LOSOVOI. *Ber.* 62B, 581-8(1929); cf. *C. A.* 22, 3574; 23, 2092.—This is a further attempt to show regular relations for the activity of aliphatic halides from the reaction rates with colloidal Ag, KOH, piperidine and AgNO<sub>3</sub>.

A. FLEISCHER

**The structure of the noble metals.** TÖM. BARTH. *Metallwirtschaft* 7, 413-5 (1928).—If the light noble metals be arranged in the order Ru-Rh-Pd-Ag, and the heavy ones in the sequence Os-Ir-Pt-Au, *i. e.*, in the order of their at. nos., it is found that the first member of each series has a hexagonal lattice structure and the other 6 have the cubic form. From the at. wts. of Ag and Au one might think that the latter was larger than the former, but this is not the case; the Au atom is put together more compactly than the Ag atom. The same thing applies to the other 6 metals. Radii of the given atoms are in the ratios 1.30:1.34:1.37:1.44 and 1.31:1.35:1.38:1.44 for the 2 series. Metals in the first series are more easily compressed than those in the second. At a pressure of 14,000 atms. and ordinary temp. the at. vols. of Ag and Au become alike. At high pressure and low temp. Ag is smaller than Au; at smaller pressure and higher temp. the reverse is true.

W. C. EBAUGH

**The influence of elements on the polymorphism of iron.** ALBERT HEINZEL. Kaiser Wilhelm Inst. Eisenforschung, Düsseldorf. *Z. tech. Physik* 10, 136-7(1929).—The boundaries of the field of  $\gamma$  iron of face-centered structure (normally from 906° to 1401°) are influenced by admixts. Elements of the 7th, 8th, 1st and 2nd groups of the periodic system, if sol. in Fe and closely related to Fe physically and chemically, generally widen the range up and downward, *e. g.*, Mn. A narrowing of the range of  $\gamma$  Fe and eventually a disappearance of the  $\gamma$  phase results from addn. of elements of the 3rd to 6th group of the periodic system (*e. g.*, with V there is no  $\gamma$  Fe when V exceeds 1.1%), these being unrelated to Fe even if sol. in it. An exception to the last rule is found in N and C. All elements of large atom radius, alkali and earth alkali metals, Hg, Pb, Tl, Bi and Ag and Cd are insol. in Fe. B. J. C. VAN DER HOEVEN

**The electrical resistance of alloys under pressure.** C. W. UFFORD. Harvard Univ. *Proc. Am. Acad. Arts Sci.* 63, 309-28(1928).—The pressure and temp. coeffs. of elec. resistance were detd. from atmospheric to 12,000 kg./cm.<sup>2</sup> hydrostatic pressures for 3 series of alloys: Li-Sn, Bi-Sn, Ca-Pb; and one alloy of Ca and Mg with 10 atomic % Mg. These 3 series were chosen because the resistance of Li, Bi and Ca increases with pressure, and that of Sn and Pb decreases with pressure. A large variation of pressure coeff. with change in compn. is thus obtained. The relative change of resistance of the 3 series may be correlated with the changes in structure according to equil. diagrams. Putting a foreign metal into a pure one increases the pressure coeff. of resistance of the pure metal algebraically, and increasing the hydrostatic pressure has the same effect. It seems probable that the cond. of a metal depends on the geometrical configuration of the crystal lattice. These expts. do not, as was hoped, give a basis for explaining the positive pressure coeffs. of resistance of Li, Ca and Bi.

M. W. SEYMOUR

**The effect of pressure on the resistance of three series of alloys.** P. W. BRIDGMAN. Harvard Univ. *Proc. Am. Acad. Arts Sci.* 63, 329-45(1928).—The pressure and temp. coeff. of elec. resistance and the sp. resistance at 30° have been detd. for 3 series of alloys: Fe-Co; Fe-Ni; Cu-Ni. The results support Ufford's generalization (cf. preceding abstr.) that the effect of adding a small amt. of a foreign metal to a pure metal is to increase algebraically its pressure coeff. of elec. resistance. His conclusion that the effect of adding a foreign metal is equiv. to an increase of external pressure is shown not to be true for the Fe-Ni series. In this series, the addn. of Ni or Fe to the other pure metal distends the lattice, as a decrease in pressure would do. The same is true for the addn. of Co to Fe, and probably for the addn. of Cu to Ni, though the effect is smaller and uncertain. Greater regularity is found in the curves for sp. resistance and pressure coeff. of resistance, plotted against compn., than in temp. coeff. of resistance. The correlation between high sp. resistance and positive pressure coeff. of resistance is explained by assuming that high sp. resistance is caused by a lack of perfect fit between adjacent atoms in the crystal lattice and that the lack is accentuated by increased pressure.

M. W. SEYMOUR

**The compressibility and pressure coefficient of resistance of zirconium and hafnium.** P. W. BRIDGMAN. Harvard Univ. *Proc. Am. Acad. Arts Sci.* 63, 347-50(1928).—A Zr wire about 0.050 cm. in diam. and 14 cm. long was used for resistance measurements, and a piece of Zr 2.7 cm. long and 3 mm. in diam. was used to det. compressibility. The compressibility at 30°,  $-\Delta V/V_0 = 10.97 \times 10^{-7}p - 7.44 \times 10^{-12}p^2$ . At 75°,  $-\Delta V/V_0 = 11.06 \times 10^{-7}p - 7.80 \times 10^{-12}p^2$ . Pressures are in kg./cm.<sup>2</sup> The

pressure coeff. of resistance at  $30^\circ$ ,  $\Delta R/R(0 \text{ kg.}, 30^\circ) = -4.31 \times 10^{-7}p + 6.5 \times 10^{-12}p^2$ . At  $75^\circ$ ,  $\Delta R/R(0 \text{ kg.}, 75^\circ) = -6.01 \times 10^{-7}p + 5.8 \times 10^{-12}p^2$ . The sp. resistance at  $30^\circ$  is  $49.2 \times 10^{-6}$  and the mean temp. coeff. of resistance between  $0^\circ$  and  $100^\circ$ , 0.00403. A piece of Hf about 2.6 cm. long and 2 mm. in diam. was used for all measurements. At  $30^\circ$ ,  $-\Delta V/V_0 = 9.01 \times 10^{-7}p - 2.37 \times 10^{-12}p^2$ . At  $75^\circ$ ,  $-\Delta V/V_0 = 8.81 \times 10^{-7}p - 2.37 \times 10^{-12}p^2$ . At  $30^\circ$ , the av. deviation from a smooth curve was 1.7% of the max. pressure effect, and at  $75^\circ$ , 2.0%. It is, therefore, not certain that compressibility at  $75^\circ$  is less than at  $30^\circ$ . The pressure coeff. of resistance at  $30^\circ$ ,  $\Delta R/R(0 \text{ kg.}, 30^\circ) = -10.0 \times 10^{-7}p$ . The sp. resistance at  $30^\circ$  is  $35.7 \times 10^{-6}$ , and the mean temp. coeff. between  $0^\circ$  and  $100^\circ$  is 0.00398.

M. W. SEYMOUR

**Theory of concentrated solutions. VI. Application of thermic analysis to the determination of freezing curves of binary mixtures of organic compounds melting at low temperature.** JEAN TIMMERMANS. Univ. Brussels. *Bull. soc. chim. Belg.* 37, 409-23 (1928).—The freezing curves of 20 mixts. of org. compds. were exptly. detd. The compds. were specially purified by the "Bureau des Etalons physico-chimiques" and the results have an unusual degree of accuracy. The systems investigated were:  $C_6H_6 + C_6H_{14}$ ,  $C_6H_6 + CHCl_3$ , cyclohexane + methylcyclohexane, cyclohexane +  $C_6H_{14}$ , cyclohexane + PhMe, cyclohexane +  $CCl_4$ , cyclohexane +  $CHCl_3$ ,  $(CH_2Br)_2 + EtBr$ ,  $(CH_2Br)_2 + PhNH_2$ ,  $PhNO_2 + CS_2$ ,  $PhNO_2 + AcOEt$ ,  $PhNH_2 + CCl_4$ ,  $PhNH_2 + PhMe$ ,  $PhNH_2 + Me_2CO$ ,  $CCl_4 + CHCl_3$ ,  $CCl_4 + CS_2$ ,  $CCl_4 + Me_2CO$ ,  $CHCl_3 + C_6H_{14}$ ,  $CHCl_3 + PhMe$ ,  $CHCl_3 + CS_2$ . The systems cyclohexane + methylcyclohexane, cyclohexane +  $C_6H_{14}$ ,  $(CH_2Br)_2 + EtBr$  and  $CCl_4 + CHCl_3$  are ideal solns. The systems  $C_6H_6 + CHCl_3$ , PhMe +  $CHCl_3$ ,  $PhNH_2 + Me_2CO$  give addn. compds. A new transformation point at  $-91^\circ$  was found in the case of cyclohexane.

ALBERT L. HENNE

**Passivity.** AGNES M. HASEBRINK. Physikalische Inst., Münster i W. *Z. Elektrochem.* 34, 819-29 (1928).—Cr treated with  $HNO_3$  and heated in N remains active during a few hrs., then becomes passive. If HCl is substituted for  $HNO_3$ , Cr retains its activity as long as it is kept in N. Cr activated in H remains active in this gas. At ordinary temp. N, H and  $CO_2$  do not activate Cr; neither do they passivify Cr activated by scratching. The quantity and the nature of the gases occluded in the metal det. the ease with which it will be activated or passivified. Large amounts of O favor passivification, while H retards it. The O of the atm. passivifies Cr rapidly. I may act as an activating agent, never as a passivifying agent. The potential of Cr or Ni rubbed with emery in an indifferent atm. falls at first, then recovers partially; after repeated rubbings, a const. potential is finally reached, which is lower than the initial one. Mol. O passed through the electrolyte during the electrolysis of Cr raises its potential; the replacement of the O current by a current of molecular N or H hardly affects the potential. Electrolytic H or O has an enormous influence on the potential. The above expts. are regarded as evidences in favor of the O theory of passivification. Sheet iron was electrolyzed in a concd.  $KNO_3$  soln. The results depended on the compn. and treatment of the sheet. Liberation of O or H on the surface of the metal seemed to increase the electrolytic solution, but the action of the gas was only mechanical; underrived small metal splinters and tore them off the sheet. A. L. H.

**New ways and means of atom chemistry.** ERNST BRÜCHE. A. E. G., Berlin. *Naturwissenschaften* 17, 252-4 (1929).—A review of recent work (cf. C. A. 21, 2425; 1722) on the detn. of radii of activity of mols. as related to their phys. structure.

$CO$  and  $N_2$  the curves of effective cross section (measured as sq. cm. per cc. at 1 mm. pressure) vs. velocity of the test electrons (Ramsauer method, *Physik. Z.* 29, 823 (1928)) almost identical, indicating great similarity of phys. structure. Effects in the curves related to their chem. difference are apparent only at the lowest velocities; these effects are due to a difference in dipole character of the mols. The mols.  $N_2$  and  $C_2H_2$  also are similar in phys. respects; the H atoms of  $C_2H_2$  penetrate the electron shell of C and are largely shielded while the C kernels (Lewis' conceptions are used) are loosened as a result. A third pair of physically similar mols. is  $CH_4$  and Kr; evidenced by the shape of their elec. field curves. The chem. similarity in inertia of Kr and  $N_2$  is in no way due to similarity in phys. structure (cf. also *Ibid* 29, 830 (1928); A. 23, 2613).

B. J. C. VAN DER HOEVEN

**The electrostatic explanation of complex formation.** A. E. VAN ARKEL AND J. H. BOER. *Chem. Weekblad* 26, 146-9, 182-4, 210-2, 224-8 (1929).—See C. A. 22,

G. CALINGAERT

**Complete and partial surrounding of atoms by other atoms or atom groups, and the raised volatility caused by it.** J. J. VAN LAAR. *Chem. Weekblad* 26, 229-30 (1929).—

A critique of a recently published paper by van Arkel and de Boer (cf. preceding abstr.).

J. C. JÜRRENS

**Magnetic properties in relation to chemical constitution.** L. C. JACKSON. *Nature* 123, 279(1929).—Lowry and Gilbert (C. A. 23, 2334) state that x-ray analysis indicates that Fe pyrites is a ferrous disulfide  $\text{Fe}^{++}\text{S}^{--}$ . J. finds that magnetic measurements also support the idea that  $\text{Fe}^{++}$  in pyrites has a constitution corresponding to that of Fe in say  $\text{K}_4\text{Fe}(\text{CN})_6$  and not as  $\text{Fe}^{++}$  in  $\text{FeSO}_4$ . Minerals of which  $\text{FeS}_2$  is typical must therefore be classified as coordination compds.

GEORGE GLOCKER

**Crystal structure and ferromagnetism.** O. v. AUWERS. *Physik. Z.* 29, 921-7 (1928).—In an attempt to apply the quantum mechanics of Heisenberg to the phenomena of ferromagnetism, a critical survey is made of the available crystallographic and magnetic data. A possible relation between ferromagnetism and lattice structure is sought by considering the behavior of the elements, a series of binary alloys, and a tertiary alloy. Heisenberg's theory is built up upon a very general basis and the question is raised whether this theory is applicable solely to crystals made up of atoms of only one sort or can be extended to crystals made up of different sorts of "building stones." The importance of a temp. function from which the Curie temp. can be calcd. is emphasized and three possible influences of temp. are mentioned. Several geometrical relations of the at. distances corresponding to the various states of Fe are discussed. It is concluded from these considerations that the key to the understanding of ferromagnetic properties should be sought not in any particular crystal system but rather in its alteration with temp.

W. W. STIFLER

**Ferromagnetic ferric oxide.** E. F. HERROUN AND E. WILSON. *Proc. Phys. Soc. (London)* 41, 100-11(1928).—The results obtained during the past 8 yrs. by various investigators are reviewed in detail. The observations of Sosman and Posnjak that lepidocrocite on dehydration yields a strongly ferromagnetic ferric oxide while goëthite does not, are confirmed. Since every specimen of the former contained 3-4% of  $\text{Mn}_2\text{O}_3$  or  $\text{Mn}_3\text{O}_4$ , it is suggested that this may be an essential constituent of this cryst. form. The mode of prepn. has a great influence on the temp. at which the ferromagnetic oxide is permanently transformed into the paramagnetic form. Tests were made on rectangular bars made by compressing the powdered material, and the results for the different kinds of magnetic ferric oxide are compared with those for Cu and Mg ferrites. Cu ferrite has a higher max. permeability than ordinary pptd. magnetic oxide of Fe but this value is much less than that of the purer native magnetites. The high or low values of the susceptibilities of the  $\text{Fe}_2\text{O}_3$  resulting from the oxidation of several of the native magnetites is attributed to the presence or absence of impurities (particularly Mg) as shown by their analyses.

W. W. STIFLER

**Magnetic susceptibility of the alkaline earth halides.** KURT IKENMEYER. *Ann. Physik* [5], 1, 169-91(1929).—The susceptibilities of 20 halides of the alkalis and alk. earths in aq. soln. were measured by a differential method in which the torsional effect in an inhomogeneous field was observed. Measurements were made at from 4 to 9 concns. The results indicate a linear relation between susceptibility and concn. In some cases the mol. susceptibilities are not in agreement with earlier values. The mol. susceptibility is approx. a linear function of the nuclear charge, as shown by the equation  $-X_m = c_1 z_m + c_2$ , in which  $z_m$  is the sum of the nos. specifying the nuclear charges of the ions,  $c_1 = 8.03 \times 10^{-6}$  and  $c_2 = 8.30 \times 10^{-4}$ . From the values given by this equation, the at. susceptibilities are computed for the various ions, by assuming a purely additive law. It is then found that these results can be represented as functions of the nuclear no. of the ion,  $Z$ , by 3 parallel straight lines, according to the equation  $-X_{\text{ion}} = c_1 Z + c'_2$ , where  $c_1$  has the same value as before and  $c'_2 = 6.70 \times 10^{-6}$  for the halogen ions,  $1.6 \times 10^{-6}$  for the alkali ions, and  $-5.10 \times 10^{-6}$  for the alk. earth ions.

W. W. STIFLER

**The diamagnetism of the ions of the noble-gas type.** HELMUTH KULENKAMPFF. *Ann. Physik* [5], 1, 192-4(1929).—According to Langevin's theory, the diamagnetic susceptibility is given by  $-X = e^2 L Z^2 r^{-2} / 6mc^2$  in which  $e$ ,  $m$  and  $c$  have their usual significance,  $L$  is the Loschmidt no.,  $Z$  is the no. of electrons, and  $r^{-2}$  is the av. of the squares of the distances of the electrons from the nucleus. The empirical equation found by Ikenmeyer (cf. preceding abstract) is of this form except for the const. term  $c'_2$ . If this term be neglected for the moment, the value of  $r^{-2}$ , calcd. by equating I.'s value for  $c_1$  to the right-hand side of the Langevin formula, is in excellent numerical agreement with that calcd. from Bohr's theory of the H atom. By considering that  $c'_2$  takes care of the change from the  $Z$  of I.'s empirical equation to the  $Z$  of Langevin's equations are derived which give  $r^{-2}$  for the halogen, alkali and alk. earth ions in terms of the const.  $a_1$  of the Bohr theory.

W. W. STIFLER

**The paramagnetic susceptibility of quinquevalent vanadium ion.** NICOLAS PERRAKIS. *Trans. Am. Electrochem. Soc.* 55 (preprint) 5 pp. (1929).—Two grades of  $V_2O_5$  were tested and also  $NH_4VO_3$  and  $NaVO_3$ . Both the ascension and attraction methods were employed. An av. value of  $44 \times 10^{-6}$  correct within 10% was found for the susceptibility of  $V^{+5}$ . This value is appreciably lower than the value Honda and Owen obtained for metallic V, but since this difference cannot be ascribed to errors in expt., it seems safe to conclude that an element may have several different values for the magnetic susceptibility. The need of further study is emphasized. C. G. F.

**The anomaly of the diamagnetism of gases found by A. Glaser.** HANS BUCHNER. *Ann. Physik* [5], 1, 40–8 (1929).—An error in Glaser's method (*C. A.* 20, 1350) of computing the temp. correction for his test specimen is discussed. It is shown that if there is any heat gradient in the app., the temp. of the specimen depends upon the pressure, and a change in temp. of only  $0.01^\circ$  accounts for the anomalies observed by Glaser. Preliminary results are given on the transfer of heat through  $CO_2$ ,  $H_2$ , and air at various pressures. W. W. STIFLER

**Coercive force and mechanical hardness.** A. KUSSMANN AND B. SCHARNOW. *Z. Physik* 54, 1–15 (1929).—The coercive force (magnetic hardness) was investigated as a function of mech. hardness and composition of alloys. It is shown that in solid solns. in which the lattice const., mech. hardness, elec. resistance, etc., change greatly as compared with the pure metals, the coercive force changes very little. In heterogeneous mixts. the coercive force is greater than in the pure elements, regardless of the change in hardness. The facts are explained by assuming internal strains in the material. GEO. GLOCKLER

**Recent progress in illinium.** L. L. QUILL AND B. S. HOPKINS. *Trans. Illinois Acad. Sci.* 21, 198–202 (1928); cf. *C. A.* 22, 2499.—A review article. L. L. QUILL

**The degree of association in liquid dielectrics.** M. WOLFFKE. Inst. of Technology, Warsaw. *Physik. Z.* 29, 713–6 (1928).—A statistical theory of simple assocn. in liquid dielectrics is given in which the degree of assocn. appears as a function of the concn. and temp. of the mixt. A satisfactory agreement of the theoretical results with exptl. measurements reported by previous investigators has been obtained in the case of  $EtOH$ ,  $PhCl$ , quinoline and  $PhNO_2$ . EMIL KLARMANN

**A superconductor made from two non-superconductors.** W. J. DE HAAS, EDM. V. AUBEL AND J. VOOGD. *Proc. Acad. Sci. Amsterdam* 32, 226–30 (1929).—The eutectic mixt. of Au and Bi was found to be superconductive. Two possible explanations are offered: (a) either Au or Bi is a superconductor under these conditions, although at  $1.25^\circ K.$ , when the mixt. shows the phenomenon, neither component is superconductive; (b) traces of impurity are responsible, although the temp. at which the resistance falls does not correspond to the transition temp. for any known metal. It is proposed to repeat the observations on purer materials. J. B. AUSTIN

**Measurements on the electrical resistance of some metals below the boiling point of oxygen.** W. TUIJN. *Proc. Acad. Sci. Amsterdam* 32, 115–23 (1929); cf. *Comm. Phys. Lab. Univ. Leiden* Nos. 160 (a and b), 167a, 181.—Measurements on the elec. resistance of Cd, Cu (crystals), Au, In, Pb, Pt, Th, Zn and Sn (single crystal) are given for temps. below  $90^\circ K.$  J. B. AUSTIN

**Nomenclature of electric discharge forms in air at atmospheric pressure.** MAX. TOEPLER. *Z. tech. Physik* 10, 113–8 (1929); cf. *C. A.* 23, 2617.—The discharge shape for large gaps and potentials was examd., a 1-cm. iron bar 50 cm. long with  $35^\circ$  point being used as point electrode on one side, a circular Zn disk of 200 cm. diam. on the other side. The ranges of existence of the various discharge types are illustrated in a graph and described for a gap of 60 cm., 500 kv. potential, d. c. with the point either negative or positive. Likewise the discharge between two-point electrodes is treated. For very large electrode distances the discharge is threefold; an intermediary zone can be considered as electrode-less discharge; it has various shapes from striped bands to lightning. Photographs are reproduced of arc discharges at large distances. B. J. C. VAN DER HOEVEN

**Calculation of the internal field due to polarization.** R. DE MALLEMANN. *Compt. rend.* 187, 536–8 (1928).—The use of tensor method allows a treatment of internal fields free from the logical imperfections of the Lorentz or cavity method. With this new method it is possible separately to expand the refractive index, and the optical rotation in the form of a series in the mol. diam. Diams. calcd. in this way agree closely with that calcd. in other ways. In a perfectly regular assemblage, e. g., a cubic crystal there is no polarization field. In liquids this field is due to the irregularities of the mol. motion. F. R. BICHOWSKY

New graphical appliance for the interpretation of rotation diagrams of crystals.

W. BÜSSEM AND K. HERRMANN. *Z. tech. Physik* 9, 148-54(1928); *Science Abstracts* 31A, 604. H. L. D.

Mesomorphic states. G. MAYR. *Nuovo cimento* 5 (*Rivista*), xxv-lv(1928); *Science Abstracts* 31A, 657.—The phenomena of liquid crystals and of anisotropic properties exhibited by liquids under the influence of velocity gradient, electrostatic stress or a magnetic field are considered to be evidence of a distinct state between the solid and the liquid. A long survey with references is made of the exptl. data and papers on these subjects, and the structure of the systems exhibiting these peculiar properties is discussed. H. L. D.

Velocity of water molecules leaving a dehydrating crystal. A. S. PREDVODITELEV. *Z. Physik* 54, 159-60(1929).—Correction and restatement of assumptions related to previous work (C. A. 23, 11). GEORGE GLOCKLER

Flowing of metal crystals produced by torsion. R. KARNOP AND G. SACHS. *Z. Physik* 53, 605-18(1929).—Five % Cu-Al alloy was studied under torsion and the expts. were interpreted from a crystallographic point of view and compared with the stretching expts. of K. and S. (cf. C. A. 22, 4294). GEORGE GLOCKLER

Crystal structure of thin metal foils. S. DEMBINSKA. *Z. Physik* 54, 46-52(1929).—Foil of Pt, Cu, Ni a few  $\mu$  in thickness show crystal structure. The thickness of the foils observed varied from 7 to 18  $\mu$ . They were produced by cathodic sputtering and by thermal evapn. The support upon which the metals are being deposited has an effect upon the crystal arrangement assumed by the layer. GEORGE GLOCKLER

Arrangement of microcrystals in compressed magnesium and aluminum plates. S. TSUBOI. *Mem. Coll. Sci. Kyōtō* 11A, 375-82(1928).—A circular plate of Mg 2.4 mm. thick was compressed to a thickness of 0.4 mm., and the arrangement of the microcrystals investigated by x-ray analysis. Most of the crystals were arranged fibrously with the principal axis of the hexagonal crystal in the direction of compression, but the arrangement was not exact. Al sheets of 1.8 mm. thickness were similarly reduced to 0.13 mm. by compression, both circular and approx. elliptical specimens being used. The microcrystals tended to take up a fibrous structure with the (110) planes parallel to the surface of the plate, and their [112] axes parallel to the direction of flow of the metal. Consequently, with the elliptical specimens the arrangement was different at the extremities of the major and minor axes because of the different directions of flow. B. C. A.

Imperfections of crystals. F. ZWICKY. *Calif. Inst. Tech. Proc. Natl. Acad. Sci.* 15, 253-9(1929).—Z. shows theoretically that even the most perfect crystals contain microscopic cracks. Since the max. lateral contraction on extension of rock salt crystals is 5.4%, the ions in one lattice plane will try to arrange themselves in a lattice characterized by spacings 6% smaller than the spacing in the solid crystal, while the surface planes will exhibit the same tendency to a lesser extent. The equil. configuration of the crystal being one of min. energy, and having thus a varying space lattice decreasing from the interior to the surface, then, since the surface cannot contract as a whole, there will be patches of a definite av. size, between which cracks will open. The new surface formed will be at the expense of the energy gained by the contraction, and V-shaped cracks will appear, not only on the surface, but throughout the entire crystal. In this way elementary blocks of about 10,000 atoms will be formed (Cf. C. A. 20, 1385). The surface of the elementary blocks will increase with an increase in the lattice const., and decrease with increasing tendency to a lateral contraction of the lattice plane forming the surface. The depth of the largest cracks will be detd. by the ratio of the energy of contraction to the surface energy, but in general the cracks will be irregularly distributed over the surface of the crystal. LOUIS WALDBAUER

The lattice constants of calcium oxide and calcium hydroxide. E. RUMPF. *Ann. Physik* 87, 595-6(1928).—The mean value, calcd. from 12 Debye-Scherrer plates, for the CaO lattice const. is 4.799  $\pm$  0.002 A. U. For Ca(OH)<sub>2</sub>, which is hexagonal, the values from three plates are:  $a$  = 3.582  $\pm$  0.001,  $c$  = 4.904  $\pm$  0.008 A. U. R. L. H.

Determination of the lattice constants of the mixed-crystal system KCl-KBr. FRIDA OBERLIES. *Ann. Physik* 87, 238-58(1928).—Mixed crystals of KCl and KBr were made by fusion, followed by slow cooling. These were examd. by the Bragg method, using a Cu anticathode. Due to vaporization from the W filament, W lines were also obtained. For KCl,  $d$  = 3.1362 A. U., for KBr,  $d$  = 3.2952 A. U. Vegard's additivity law holds within the exptl. error. No new interference lines, as would be expected from a regular arrangement of the components, were found. R. L. H.

Crystallography of aliphatic dicarboxylic acids. WILLIAM AUGUSTUS CASPARI. Davy-Faraday Lab. Royal Institution. *J. Chem. Soc.* 1928, 3235-41(1928).—Single crystals of adipic (C<sub>6</sub>), pimelic (C<sub>7</sub>), suberic (C<sub>8</sub>), azelaic (C<sub>9</sub>), sebacic (C<sub>10</sub>), brassylic



( $C_{13}$ ), and hexadecanedicarboxylic ( $C_{16}$ ) acids were examd. by the x-ray rotating or oscillating crystal method. The acids, with their  $a$ ,  $b$ ,  $c$  axial lengths in A. U., their  $\beta$ -angles, and the no. of mols. per unit cell, resp., are: adipic, 10.27, 5.16, 10.02,  $137^\circ 5'$ , 2; pimelic, 9.93, 4.82, 22.12,  $130^\circ 40'$ , 4; suberic, 10.12, 5.06, 12.58,  $135^\circ 0'$ , 2; azelaic, 9.72, 4.83, 27.14,  $129^\circ 30'$ , 4; sebacic, 10.05, 4.96, 15.02,  $133^\circ 50'$ , 2; brassylic, 9.63, 4.82, 37.95,  $128^\circ 20'$ , 4; hexadecanedicarboxylic, 9.76, 4.92, 25.10,  $131^\circ 10'$ , 2. The unit cells have nearly const.  $a$  and  $b$  axes; as regards the  $c$  axes, the acids fall into two groups, one having the mols. of even no. of C atoms, the other the odd. The  $c$  axes of the even-numbered mols. are proportional to the no. of C atoms; for the odd-numbered mols. they are proportional to twice the no. of C atoms. In the latter group, two mols. lie end to end in the cell along the  $c$  axis. The  $\beta$ -angles are always much smaller for the odd-no. acids than for the evens. The space lattice is  $\Gamma_m$ , the space group  $C_{2h}^6$ . If the mols. are asymmetrical, four mols. differently oriented must appear in the cell; if symmetrical two only appear. The first case corresponds to odd-no. acids, the second to even. If the mol. chain is zigzag, odd-no. mols. do not have center of symmetry, even-no. mols. do. The cross section of the cells perpendicular to  $c$  is fairly const. at about  $36 \text{ A. U.}^2$ , a value in good agreement with that found for all other long-chain aliphatic compds. The data indicate a mean difference of 1.53 A. U. between C atoms. The gap between C chains along the  $c$  axis which is occupied by the O and H atoms of two carboxyl groups is about 2.09 A. U. and somewhat larger than that found for the hydrocarbon  $C_{20}H_{42}$ , as might be expected.

R. L. HERSHEY

The crystal structure of strontium and barium. FRITZ EBERT AND HELLMUTH HARTMANN. *Z. anorg. allgem. Chem.* 179, 418-20(1929).—Cryst. structure was detd. at room temp. by the powdered-crystal method of x-ray analysis. Sr has a face-centered cubic structure with  $a = 6.05 \text{ A. U.}$  Ba has a body-centered cubic structure with  $a = 5.01 \text{ A. U.}$

R. J. HAVIGHURST

Stretching of cadmium crystals. W. BOAS AND E. SCHMID. *Z. Physik* 54, 16-45 (1929).

GEORGE GLOCKLER

Influence of admixtures to sodium nitrate solutions on the structure of the crystals obtained. P. P. ORLOV. *Bull. Acad. Sci. Union Rep. Sov. Soc. Class Sci. Phys.-Math.* No. 6-7, 529-48(1928).—The fundamental idea expressed by O. in 1896 on the basis of observed changes of the cryst. structure of NaCl, that the structure of crystals is influenced by adding admixts. which are apt to react both with the solvent and with the solute, is now confirmed by the changes of the cryst. structure of  $\text{NaNO}_3$ . In the latter case the admixts. affecting the structure are: formamide, hydroxyisobutyric acid, lactic acid, etc. A microscopic examn. of  $\text{NaNO}_3$  crystals obtained from hot solns. contg. any of the above reagents reveals sharp-edged rhombohedrons and double crystals; on cooling, they become covered by scales and apparently tend to revert to the usual rhombohedral structure. Very concd. solns. of  $\text{Cr}(\text{NO}_3)_3$ , particularly after standing for a long time, have the effect of dulling (blunting) the edges of  $\text{NaNO}_3$  crystals. A lengthy discussion of the possible nature of the interaction of these admixts. is given.

BERNARD NELSON

Crystal structure of trimethylethylammonium chlorostannate. R. W. D. WYCKOFF AND R. B. COREY. Rockefeller Inst. N. Y. *Am. J. Sci.* 17, [5], 239-44(1929).— $[\text{N}(\text{CH}_3)_3\text{C}_2\text{H}_5]_2\text{SnCl}_6$  has been examd. by the Laue and spectrographic methods. The crystals are cubic, contain 4 mols. per unit cells; the length of the unit cell is 13.17 A. U. The Sn and Cl atoms are at  $4b$  and  $24a$  with  $a$  for Cl =  $0.185 \pm 0.01$ . The chlorostannate groups are of the same size, shape and distribution as in  $(\text{NH}_4)_2\text{SnCl}_6$ . The suggested arrangement of the C and N atoms in the  $[\text{N}(\text{CH}_3)_3\text{C}_2\text{H}_5]$  groups gives the same approx. distances as in analogous compds. The structure is like that of  $\text{CaF}_2$ ; the space group is  $\text{Ti-6}$ .

R. L. HERSHEY

Orientation of single crystals of zinc. K. TANAKA. *Mem. Coll. Sci. Kyōto* 11A, 361 5(1928).—Com. Zn plates 1.5 mm. thick were rolled to 20-70% reduction in thickness, and large crystals grown by annealing at  $400^\circ$  for 1 day. X-ray examn. showed that in most of these crystals the base of the hexagonal crystal was parallel to the plane of the plate. A similar arrangement was found when the plates were extended instead of being rolled before annealing. On drawing com. zinc wires 1.5 mm. diameter through a 0.5-mm. die and then annealing, most of the resulting crystals had their  $[11\bar{2}0]$  axes parallel to the axis of the wire. A rather random distribution was obtained after annealing a wire extended for a small percentage only. When a circular zinc plate is melted, and then cooled gradually from the circumference, large crystals grow towards the center, and most of them grow parallel to the plane of the base of the hexagonal crystal.

B. C. A.

**Lattice dimensions of spinel ( $MgAl_2O_4$ ).** E. POSNJAK. *Am. J. Sci.* 16, 528-30 (1928).—The spinel was prepd. by heating a mixt. of  $Al_2O_3$  and  $MgCO_3$  in the correct proportion to about  $1700^\circ$ . The resulting sintered product was fine-grained and isotropic and had a refractive index of  $1.717 \pm 0.002$ . The radiation used was  $K\alpha$  of Mo and the spacings were standardized with NaCl. A table gives complete powder diffraction data for the spinel. The mean length of the edge of the unit cube is  $8.03 \pm 0.01$ . In the spinel structure 8 mols. are associated with the unit cell. The calcd. d. of the spinel was found to be 3.628, which agrees within 2% with E. Dufau's [*Bull. Soc. Chem.* 25, 669(1901)] value of 3.57.

A. J. MONACK

**The change that a gaseous molecule may undergo between two consecutive collisions.** R. D. KLEEMAN. *Phil. Mag.* [7], 7, 53-63(1929).—K. has shown previously (*C. A.* 22, 3086) that  $pv = \xi MRT$ , where  $\xi$  is a function of  $T$ ,  $v$  and  $M$ . He now shows that  $\xi$  is an inverse function of the vol. From this it follows that the velocity of a mol. in a gas changes between two consecutive collisions. He further discusses the effect of heat radiation on the mol. velocity of translation and suggests exptl. methods of investigating the nature of the function  $\xi$ . K. applies the above ideas to an electron gas and to Carnot's cycle.

L. H. REYERSON

**The pressure of gaseous mixtures. II. Helium and hydrogen and their intermolecular forces.** C. W. GIBBY, C. C. TANNER AND IRVINE MASSON. Univ. of Durham, Eng. *Proc. Roy. Soc. (London)* A122, 283-304(1929); cf. *C. A.* 17, 2804.—The compressibility of He and H and 10 mixts. of the 2 were measured up to 125 atm at  $25^\circ$ . The pure gases and an equimol. mixt. were also studied at  $25^\circ$ ,  $50^\circ$ ,  $75^\circ$ ,  $100^\circ$ ,  $125^\circ$ ,  $150^\circ$  and  $175^\circ$ . The method consisted in a series of comparisons of 2 vol. ratios; one, for the gas under investigation, the other for the manometric gas H, both being mounted in the same app. and subject to the same pressures. The pressure measurements were indirect, in that they were calcd. from the observed H vol. by using the compressibility data of Holborn and Otto for this gas (cf. *C. A.* 19, 926). The deviations from Dalton's law of partial pressures were positive and at a max. in an equimol. mixt., for which, at high compression they attain 4% of the ideally additive pressure. Within a certain range of compn. the mixt. is still more incompressible than H. The data are expressible by equations of the form  $pv = a + bp$  within the exptl. limits of  $\pm 5$  parts in 10,000. The values of  $a$  and  $b$  are tabulated. The observations support the assumption that a spherically symmetrical field of force surrounds a He and a H mol. The influence of temp. upon the values of  $b$ , for the pure gases and mixts., is examined in the light of Lennard-Jones' analysis of intermol. forces (cf. *C. A.* 21, 3290).

R. L. DODGE

**Budde effect in bromine and chlorine.** GEORGE B. KISTIAKOWSKY. *J. Am. Chem. Soc.* 51, 1395(1929).—Using simultaneously a sensitive manometer and a Pt-thermometer, the author shows that neither the warming nor the expansion of halogens on illumination is affected by extreme drying and purification.

G. B. KISTIAKOWSKY

**The electrical conductivity of potassium chloride vapor.** T. PEĆZALSKI AND J. CICHOCKI. *Compt. rend.* 187, 534-6(1928).—The satn. current of KCl vapor at  $550^\circ$  between Cu electrodes at 90 volts is about  $10^{-4}$  amp. This current decreases with the time in consequence of polarization. Chlorine is liberated at the anode. KCl vapor is about 0.002% dissociated into ions at this temp.

F. R. BICHOWSKY

**Determination of gas temperatures by measurement of pressure difference.** HANS SCHMICK. *Z. tech. Physik* 10, 146-7(1929).—The principle of measuring the temp. of a gas by means of the flow of a certain amt. through 2 orifices in series is discussed briefly. If the gas has an unknown abs. temp.  $T_1$  at one orifice and a known temp.  $T_2$  at the next one the measured pressure differentials  $\Delta p_1$  and  $\Delta p_2$  will be proportional to these temps. The exptl. errors were found to be considerable (cf. also Göbel, *Ber. d. Stahlwerksausschuss d. V. d. Eisenhüttenl.* No. 105(1926)), as much as 15% of  $\Delta p$  in some expts. on a gas furnace and on a Bunsen flame.

B. J. C. VAN DER HOEVEN

**Thermal conductivity of gas mixtures.** T. L. IBBS AND A. A. HIRST. *Proc. Roy. Soc. (London)* A123, 134-42(1929).—A method is described of estg. thermal cond. of gas mixts. by the use of Shakespear's katharometer. From known cond. of A-He mixts. and calibration curve of the instrument with these gases, cond. of  $O_2$ , CO,  $CO_2$ ,  $H_2$ ,  $N_2$  and mixts. of these gases were calcd.

G. B. TAYLOR

**The effect of intensive drying on certain physical properties of benzene.** HENRY V. A. BRISCOE, JOHN B. PERL AND PERCY L. ROBINSON. Univ. Durham. *J. Chem. Soc.* 1929, 368-77.—Expts. were made to det. the effect of intensive drying on the density and surface tension of  $C_6H_6$ . At present, the  $C_6H_6$  has stood for 16 months in contact with  $P_2O_5$  in several forms of sealed app. The changes in d., measured by calibrated floats, do not exceed 5-7 parts per 100,000, and confirm Baker's conclusion

that intensive drying does not change the d. of  $C_6H_6$ . This has been found to apply not only to the sample as a whole, but also to fractions obtained by distn. When brought into contact with  $P_2O_5$ ,  $C_6H_6$  changes in d. by 1 part in 8000 during the first few days only, as a result of the soln. of the oxide. The max. observed change in capillary rise on 16 months drying was 0.4 mm., as compared to the 6 mm. expected from previous results of Baker. The surface tension of  $C_6H_6$  in contact with  $P_2O_5$  was not appreciably different from  $C_6H_6$  distd. from  $P_2O_5$ . No evidence of the sepn. of pseudo components as a result of intensive drying could be found. M. W. S.

Relations of coefficient of compressibility of liquids and solids. N. BĂRBULESCU. *Bul. stiinte fizice soc. română stiinte* 29, 29-34 (1926-7). (In French).—The value  $0.5 \times 10^6$  obtained by Richards for compressibility of diamond is not correct, although the sp. heat theory proposed by Born and Kármán leads to almost the same value. To obtain an abs. temp. of fusion exceeding  $3400^\circ$  there must be assumed for compressibility of diamond a max. value of  $0.1 \times 10^{-6}$ . E. M. SYMMES

Viscosity of binary systems of liquids. N. N. EFREMOV. *Ann. inst. anal. phys.-chim.* (Leningrad) 4, 118-59 (1928).—Chloral and bromal form alcoholates of various degrees of stability. In the liquid phase they are usually partially dissoed. into their components. Systems chloral-allyl alc. and nitrobenzene-isobutyl alc. were investigated in detail.  $CCl_3CHO \cdot C_4H_9OH$  is stable even at elevated temps. Density isotherms of the system chloral-allyl alc. are smooth curves and the change in the temp. coeff. of internal friction is analogous to the change in viscosity. Density isotherms of the system nitrobenzene-isobutyl alc. approach straight lines and the change in the temp. coeff. of internal friction is also similar to the change in viscosity. Nitrobenzene has a higher sp. gr. but smaller viscosity than isobutyl alc. up to  $77^\circ$ , when both have the same viscosity because of the high temp. coeff. of isobutyl alc. The temp. coeff. diminishes rapidly with increase in temp. and at  $65$ - $105^\circ$  the curves are almost straight lines. V. KALICHEVSKY

Electric conductivity of binary liquid systems of allyl mustard oil and amines. N. VOSKRESENSKA. *Ann. inst. anal. phys.-chim.* (Leningrad) 4, 160-82 (1928).—Systems of allyl mustard oil, b.  $150.5$ - $151.0^\circ$ , with dimethylaniline, b.  $193$ - $193.5^\circ$ , diethylaniline, b.  $215$ - $215.3^\circ$ , pyridine, b.  $116$ - $117^\circ$ , methylaniline, b.  $193.5$ - $194.0^\circ$ , and ethylaniline, b.  $203.5$ - $204^\circ$ , were investigated. Sp. cond. varied from  $17.81 \times 10^{-6}$  to  $1340 \times 10^{-6}$ . Considerable time was required for cond. to attain a const. value. None of the diagrams (compn. vs. cond.) approached a straight line. Systems of allyl mustard oil with tertiary amines, which do not react, show a max. cond. that is 6-70 times greater than the cond. of individual components. Systems with secondary amines, which react, show two max. with a min. at the points closely approaching equimol. concn. V. KALICHEVSKY

Temperature—conductance curves of solid salts. II. Halides of potassium and thallium. T. E. PHIPPS AND E. G. PARTRIDGE. *J. Am. Chem. Soc.* 51, 1331-45 (1929).—Tables are given to show the relation between  $\log k$  (logarithm of sp. conductance) and  $1/T$  (reciprocal of abs. temp.) for  $TlCl$ ,  $TlBr$  and  $TlI$ . These data are also shown graphically. The heat of liberation (C. A. 20, 2102) for  $TlCl$  was found to be  $11.48 \times 10^{-13}$  ergs per ion; for  $TlBr$  the value was  $11.64 \times 10^{-13}$ . The  $\log k$ - $1/T$  curve for  $TlI$  shows 2 slopes. The heat of liberation for the upper slope was  $10.0 \times 10^{-13}$ , while that for the lower slope was  $6.6 \times 10^{-13}$  ergs per ion. Values of  $\log k$  and  $1/T$  for  $KCl$  crystals and  $KCl$  pellets (formed by compressing  $KCl$  in a die by means of high pressure) are given. The heats of liberation for  $KCl$  crystals are  $32.1 \times 10^{-13}$  for the upper slope and  $15.7 \times 10^{-13}$  for the lower slope; values for  $KCl$  pellets are  $30.3 \times 10^{-13}$  for the upper slope and  $14.7 \times 10^{-13}$  for the lower slope.  $\log k$  and  $1/T$  data are given for  $KBr$  crystals and pellets and  $KI$  pellets. The heats of liberation are as follows:  $KBr$  crystals, upper slope  $31.3$ , lower slope  $15.4 \times 10^{-13}$ ;  $KBr$  pellets, upper slope  $29.2$ , lower slope  $14.4 \times 10^{-13}$ ;  $KI$  pellets, upper slope  $25.7$ , lower slope  $13.5 \times 10^{-13}$  ergs per ion. It was found in most cases that the heat of liberation calcd. from the upper slope is approx. double that from the lower slope. It is concluded that in the polar lattices only the positive ion conducts at lower temps. but that both ions conduct at higher temps. A. J. MONACK

Surface conductance. DAVID R. BRIGGS. *Colloid Symposium Monograph* 6, 41-52 (1928).—In aq. solns. of low sp. cond. present in the interstices of a diaphragm material, e. g., pure paper pulp, the elec. conductance through the interface phase is much greater than that through an equal vol. of liquid in bulk. This fact has been largely neglected in calcs. of the  $\zeta$  potential at interfaces when electrokinetic technic was used. There is described and illustrated a method and app. for detn. of surface conductance of diaphragms, which is important in electrokinetic detns. only when

solns. have low sp. conductivities, or when the micellar material has a high sp. surface area. Salt solns. show definite valence and lyotropic effects on surface conductance.

JEROME ALEXANDER

Electrical relations at surfaces, the spreading of liquids, the thickness of surface films, and the drop-weight and ring methods for the determination of surface tension. WILLIAM D. HARKINS. *Colloid Symposium Monograph* 6, 17-40(1928).—Hexane, emulsified in 0.1 M Na oleate gives droplets mainly 1 to 1.5 $\mu$  (limits about 0.2-10 $\mu$ ). A 1- $\mu$  droplet is surrounded by approx. 10 to 15 million negative oleate ions and oleic acid mols., and thus acts like a multivalent ion of very high charge, surrounded by a diffuse (Gouy) layer of positive ions. If a current passes, the Na ions moving toward the negative electrode tend to follow the contour of the droplets and to drag some negative ions and the solvent with them at a less velocity. While Stokes' law may be expected to hold if the droplets rise under the influence of gravity, motion in a current is affected by this elec. flow of solvent. Stokes' law indicates that the 1- $\mu$  particles have a negative charge of 2430; i. e., only a few of the film-mols. are ionized. By applying the formula for the potential of a charged sphere, the droplet shows a  $\phi$  potential of 84 milliv., which corresponds to the  $\psi$  potential calcd. from the Debye-Hückel theory. Contrary to common assumption, larger drops move faster than smaller ones (Mooney), though electrolytes diminish the difference. II. (With BERNARD GINSBERG.) *Ibid.*—Formulas are developed thermodynamically, for the spreading coeff. If enough benzene is dropped on pure water to make a layer about 1 mm., it spreads to make a uniform surface layer, as is expected from the initial spreading coeff. of 8.9. The 'holes' which appear in this layer as the benzene evaps., are found, by surface-tension measurements, to be covered with a monomol., or thicker, invisible film of benzene. The film surrounding the holes accords with the value of the final spreading coeff. of -1.49 ergs per sq. cm., and indicates a considerable angle of contact. Many exptl. data are given to show that Antonow's rule, generally considered valid in books on surface tension, etc., is not valid. A new drop-wt. app., devised by H. N. Harkins, P. L. K. Gross and W. D. Harkins is described and illustrated. III. (With D. M. GANS.) Monomol. and polymol. films are discussed. Many writers use equations derived from the basic equation of Gibbs by inaccurate assumptions. IV. (With H. F. JORDAN.) Improvements in the ring method for detn. of surface tension are suggested: (1) The liquid under test is placed in a shallow vessel within a spherical flask, and a clean surface is made by overflowing; (2) the pull is detd. by a chainomatic balance sensitive to 0.05 mg.; (3) to avoid surface waves, the balance is raised by a train of gears; (4) the Pt-Ir ring has a double stirrup; (5) the plane of the ring is made exactly parallel to the liquid surface; (6) the large size of the contg. vessel obviates the need of a correction for surface curvature.

JEROME ALEXANDER

Critical-temperature measurements on carbon dioxide in small capillaries. HARVEY T. KENNEDY. *J. Am. Chem. Soc.* 51, 1360-6(1929); cf. C. A. 22, 2966.—The app. by which the CO<sub>2</sub> was purified is illustrated and described. Detns. of crit. temps. were made on samples contd. in 2 small capillaries whose internal diams. midway between the 2 ends were 0.004 and 0.060 mm., resp. Several detns. were also made with a 2-mm. tube. The crit. temp. was found to be independent of the size of the tube; 30.96° was taken as the most probable value. Large differences in crit. point were found for different methods of illumination.

A. J. MONACK

The life history of adsorbed atoms and ions. JOSEPH A. BECKER. *Trans. Am. Electrochem. Soc.* 55 (preprint) 21 pp.(1929).—Adsorbed particles may exist on the surface either as positive adions (adsorbed ions) negative adions or adatoms. Whether a given substance will be adsorbed as an atom, a positive ion or a negative ion, will depend on the fields of force that exist near the metal surface, and near the particle at their distance of nearest approach. The ratio of adions to adatoms can be determined from thermionic expts. The adsorbed ions produce elec. fields, which extend to 10 or more atom diameters, which close to the surface may attain enormous values, and which appreciably alter the electron work function and the evapn. energy for atoms and ions. The ratio of ions to atoms that evaporate from one and the same surface is detd. by the electron work function of the surface and the ionization potential of the adsorbed particles. Within a certain range of temp., the adsorbed particles migrate over the surface like a two-dimensional gas. Adatoms and adions have chem. properties vastly different from those of ordinary atoms. The length of time that an atom remains on the surface before evapn. is detd.

C. G. F.

The activity and adsorption of *p*-toluidine in the surface of its aqueous solution. J. W. MCBAIN, W. F. K. WYNNE-JONES and F. H. POLLARD. *Colloid Symposium Monograph* 6, 57-62(1928).—The partial pressure and activity of aq. *p*-toluidine are

proportional to the concn. This supports the 2-fold conclusion of McBain and Davies: 1st direct exptl. observations show that in all these solns. of sol. substances, even when far from satn., the surface is covered with a monomolecular film of solute, and there is also a large excess in the neighborhood of the surface, probably extending in the form of oriented mols. well into the soln.; 2nd the thermodynamic treatment of Gibbs, generally followed, is insufficient, because it omits consideration of adsorption resulting from the admitted electrification of all such surfaces, as exhibited for instance in expts. on electrokinetics.

**Adsorption of sodium oleate at the air-water interface.** M. E. LAING, J. W. MCBAIN AND E. W. HARRISON. *Colloid Symposium Monograph* 6, 63-72(1928).—Contrary to the predictions of the Gibbs theorem, both in its popular and in its exact form, Na oleate is positively adsorbed in the air-water interface. The amt. adsorbed is nearly twice as great as can be packed into a monomolecular film. This supports the views of McBain and Davies (cf. preceding abs.), based on findings with *p*-toluidine, camphor and amyl alcohol. The adsorbed soap is in hydrolytic equil. with the soln., but its hydrolysis is completely suppressed by a small excess of alkali. JEROME ALEXANDER

**The adsorption of methylene blue by lead sulfate.** WILDER D. BANCROFT AND C. E. BARNETT. *Colloid Symposium Monograph* 6, 73-6(1928).—For any concn. of dye, the amt. of adsorption by a powd. solid is a function of the apparent  $p_H$  of the soln. The max. adsorption of a dye by a crystal is no safe criterion of the total surface of the crystal. Therefore Paneth's method in its present form, is not reliable. Contrary to Marc's statement,  $PbSO_4$  crystals adsorb methylene blue, but the amt. lies within his large exptl. error. JEROME ALEXANDER

**The effect of adsorbed water on the electrical conductivity of powders.** FRANK B. KENRICK AND F. J. GIFFEN. *Colloid Symposium Monograph* 6, 53-6(1928).—The method consists in measuring, by means of an electroscope, the rate of discharge of a condenser through the powder under various conditions of moisture, fixed by passing air of known water content through the powders. Some powders, e. g., glass, conducted well even with small concns. of water vapor; others, like salicylic acid, remained practically non-conducting until the satn. point was reached, when all powders conducted well. In general, substances which initiate bubbles when in contact with aq. solns. of O (satd. at 30-40 atm. pressure) are less conducting in damp air. The initial cond. of glass dropped on standing after moistening, and rose after dry air produced an initial drop in the moistened glass. This suggests an equil. between a surface of adsorbed water and water dissolved in the glass. JEROME ALEXANDER

**Some adsorption phenomena on silver iodide.** II. A. OBRUCHEVA. *Biochem. Z.* 207, 25-7(1929).—The adsorption of caprylic acid, octyl alc., etc., by AgI is studied quant. S. MORGULIS

**Investigation on adsorption of gases and vapors on different kinds of silica gel.** F. BOSSHARD AND E. JAAG. *Helv. Chim. Acta* 12, 105-13(1929).—The adsorptive capacity of  $SiO_2$  gels for  $SO_2$  and  $Br_2$  as affected by the method of prepn. of the gel was studied. All gels prepd. followed the Freundlich equation. A. WHITE

**Lyosorption in organic liquids.** W. HALLER. *Kolloid-Z.* 46, 366-7(1928).—Different powdered substances, talc,  $Al_2O_3$ ,  $SiO_2$ ,  $MgO$ ,  $CaCO_3$ ,  $Fe_2O_3$ , graphite and Norit, were shaken with org. liquids and allowed to settle. The vol. occupied by the powders differed with the liquids, the liquids falling in the same series for each powder. In the order of largest vol. they were:  $CCl_4$ , benzine, benzene,  $CHCl_3$ ,  $Et_2O$ ,  $AcOH$ ,  $EtOH$  and  $Me_2CO$ . The resistance offered to a flow of these liquids through a plug of the powdered materials stands in the same order. The property of the liquid involved is its ability to be adsorbed on the solid surface and the process is called *lyosorption*. The sp. polarization,  $P_e$  of the liquid parallels its lyosorption.  $P_e = [(\epsilon - 1)/(\epsilon + 2)] \cdot (1/d)$ , where  $\epsilon$  = the dielec. const. and  $d$  the density of the liquid. J. G. McNALLY

**Remark on the paper of H. Staudinger: The constitution of high molecular substances.** KURT H. MEYER. *Naturwissenschaften* 17, 255(1929); cf. *C. A.* 23, 2334.—Objections are raised to the mol.-wt. detns. of S. It is pointed out that solvation has not been taken into account. The differences in opinion of S. and of Mark and the author are particularly stressed. B. J. C. VAN DER HORVEN

**The structure of the threads obtained by drying solutions containing ferric chloride.** PAUL BARY. *Compt. rend.* 187, 538-40(1928).—Two classes of filaments are formed by allowing basic  $FeCl_3$  solns. to evap., concentric and needle-like. These filaments consist of (1) a less hydrophilic colloid mostly of  $Fe_2O_3$  and (2) a more hydrophilic gel contg. more  $FeCl_3$ . F. R. BICHOWSKY

**Influence of organic substances on the thixotropy of ferric oxide sol.** H. FREUNDLICH AND K. SÖLLNER. *Kolloid-Z.* 43, 348-55(1928).—The liquefying action of amino

acids on a thixotropic sol cannot be related to the diminution in H-ion concn. (which rather promotes setting), for addn. to amino acids (glycine, alanine) both to concd. thixotropic  $\text{Fe}_2\text{O}_3$  sols and to dil., non-thixotropic sols lowers the H-ion concn. The action is considered to be due to the tendency of amino acids to form complex ferric salts, which are notably hydrophilic. The complexes bound to the colloid particle increase in water content and favor sol formation. Other substances (e. g., sugar) which form complexes with ferric salts also influence the thixotropy in the same sense as do amino acids. Contrary to results formerly obtained with small quantities of glycine, larger amts. have a peptizing effect on  $\text{Fe}_2\text{O}_3$  sols and thus raise the coagulation value. The relation between time of setting,  $\theta$ , and electrolyte concn.,  $c$ , can be expressed for  $\text{Fe}_2\text{O}_3$  sols by the formula  $\theta = e^{-c/k}$ , where  $k$  is a constant. B. C. A.

The coagulation of highly solvated sols by organic liquids and salts. III. BR. JIRGENSONS. *Kolloid-Z.* 47, 236-43(1929); cf. C. A. 23, 1333.—The coagulation of albumin, hemoglobin and casein by  $\text{EtOH}$ ,  $\text{C}_2\text{H}_5\text{OH}$  and  $\text{Me}_2\text{CO}$  from sols. contg. high concns. of inorg. salts was studied. At concns. up to 30-40% by vol., the org. liquid sensitized the soln. Between 30 and 60% a region of stabilization appeared and the sol was again sensitized at concns. above 60%. The dipole action of the org. liquid on the shell of adsorbed ions and water around the micelles tends to disrupt the shell and cause coagulation. Stabilization is caused by the dipole action of the inorg. salt ions adsorbed on the micelles. This dipole action reaches a max. and decreases as the concn. of org. liquid increases. J. G. McNALLY

The effect of temperature on the coagulation of copper colloidal solution. E. F. BURTON AND MRS. BEATRICE RIED DEACON. *Colloid Symposium Monograph* 6, 77-82 (1928).—If samples of Cu colloid were raised to different high temps. for half an hour, there existed one temp. below which the samples were not coagulated and above which they were coagulated as a result of this heating. Copper tubes were used, because impurities dissolved from glass acted as coagulants. Heat speeds the coagulation, though from indications, certain Cu colloids might be expected to remain stable indefinitely at room temp. JEROME ALEXANDER

Coagulation kinetics of colloids of the second order. K. JABLONZYNSKI AND MISS H. JASZCZOLT. *Roczniki Chem.* 9, 111-4(1929).—The velocity of coagulation of colloids, studied spectrophotometrically, is detd. by the equation:  $\log [(\log \text{tg } \alpha_\infty - \log \text{tg } \alpha_0)/(\log \text{tg } \alpha_\infty - \log \text{tg } \alpha)] = K_1 t$  (cf. C. A. 22, 3080; 21, 684), provided the final angle measuring the opacity be approx.  $90^\circ$ ; if that angle is smaller than  $90^\circ$ , the coagulation velocity is expressed by the equation:  $\log \text{tg } \alpha - \log \text{tg } \alpha_0 = K_1 t$ . Both equations were tested for the colloids of the second order  $\text{AgCl}$  and  $\text{AgBr}$  in the presence as well as in the absence of gum arabic. JAROSLAV KUČERA

Jellies and gelatinous precipitates. P. P. VON VEIMARN. *Kolloid-Z.* 46, 356-8 (1928).—Jellies are classified as either membrane or network jellies. The methods of prep. each type, the form of the dispersed particles and the influence of mech. factors on the formation of jellies are discussed. J. G. McNALLY

The influence of the relative volumes of solid and liquid phase on swelling. PAUL P. KESSENBAUM. *Kolloid-Z.* 46, 367-8(1928).—Both the rate and extent of gelatin swelling in water depend on the amt. of gelatin in contact with a unit vol. of water. This relationship is influenced by the nature and amt. of other reagents present in the system and by the purity of the gelatin. The adsorption of these reagents by the gelatin accounts for the influence of the vol. of gelatin on its water adsorption. J. G. McNALLY

Preparation of negatively charged sols by means of tartaric acid. V. Physico-chemical properties of tungstate-tartaric acid colloids. A. V. DUMANSKII AND S. I. D'YACHKOVSKII. *Kolloid-Z.* 48, 49-57(1929).—See C. A. 23, 2341. E. C. M.

The cooling curves of gelatinizing systems. MARTIN H. FISCHER. *Kolloid-Z.* 46, 359-66(1928).—The time-temp. curves of rapidly cooled sols. of-Na soaps show kinks in the curve corresponding to an exothermic change at the point where the soln. becomes opaque. These cooling curves are similar to those of hydrated salts dissolved in their water of crystn. The exothermic change is thought to be caused by the swelling of the soap micelles, which process resembles the recombination of the inorg. salt mol. with its water of crystn. J. G. McNALLY

Soap gels. P. A. THIESSEN. *Kolloid-Z.* 46, 350-5(1929).—The formation of crystn. centers in Na oleate hydrosols was studied and found to follow the same laws as the crystn. of single-phase melts. The clean soap sols. were rapidly cooled at a temp. of about  $0^\circ$ , allowed to remain at this temp. for a time and then warmed to  $12-15^\circ$ . The no. of macroscopic particles that were visible after standing for a given period of time at this higher temp. was taken as an index of the crystn. nuclei formed.

The no. of such nuclei increased rapidly when the temp. of supercooling was decreased beyond a critical temp. ( $+1^\circ$  for a 12.9% sol.), and increased as a linear function of the time of supercooling and the concn. of the soln. Solns. held at a high temp. before supercooling gave fewer crystn. centers than similar solns. that had been kept at lower temps. Photomicrographs of the nuclei in the clear soln. show the same structure as the solid phase previously observed in the opaque gels produced by cooling.

J. G. McNALLY

**Fractionation of gelatin.** M. KUNITZ AND JOHN H. NORTROP. Rockefeller Inst. *J. Gen. Physiol.* 12, 379-90(1929).—A salt-free soln. of gelatin of  $p_H$  4.7 may be sepd. into 2 fractions at  $23^\circ$ , one sol. in water at any temp., the other insol. in water even when heated to  $80^\circ$ . The sol. fraction is proportionally much greater than the insol. fraction. The insol. fraction does not swell in water, but swells in and is finally dissolved by acid and alkali. Blocks of concd. gel composed of various mixts. of the sol. and insol. fractions, made by dissolving the fractions in dil. NaOH, swell differently when placed in large vols. of dil. buffer soln. of  $p_H$  4.7 at  $5^\circ$ . The gel consisting of the insol. fraction shows only a trace of swelling, whereas swelling increases rapidly with the increase in the proportion of the sol. fraction. The insol. fraction made up to a 5% gel in dil. NaOH soln. loses about 70% of its wt. if placed in buffer soln. of  $p_H$  4.7 at  $5^\circ$ , whereas a similar gel made from ordinary gelatin loses only about 20% of its wt. under the same conditions. Isoelec. gelatin cannot be resynthesized from the two fractions. An insol. substance similar to the insol. fraction obtained by repptn. of gelatin is produced on partial hydrolysis of gelatin in dil. HCl soln. at  $90^\circ$ .

C. H. RICHARDSON

**The double refraction of plastic materials.** W. STAUF. *Kolloid-Z.* 46, 345-50 (1928).—The double refraction produced by strain is proposed as a test for such plastic materials as celluloid, casein, glyptol resins, etc. In the case of celluloid made from an 11% N nitrocellulose, the only material on which exptl. data are given, the accidental double refraction is positive at 40% elongation up to 30% camphor, 40% giving negative double refraction. The accidental double refraction increases as the temp. of stretching decreases and is decreased by the addn. of most plasticizers.

J. G. McNALLY

**Influence of solvent on the optical rotation dispersion.** A. L. TH. MOESVELD. *Proc. Acad. Sci. Amsterdam* 32, 344-55(1929).—See C. A. 23, 1553. E. C. M.

**Solubility of antimony in water.** JULIUS GRANT. *Analyst* 54, 227-8(1929).—Finely divided Sb is distinctly sol. in water and air. This was noticed in the study of some Sb deposits. Therefore, when Sb deposits are washed with water, some of the metal is likely to be dissolved. In the absence of air, the soly. is very much less in the case of both electrolytic deposits and powdered Sb.

W. T. H.

**The Debye formula.** N. BARBULESCU. *Bul. stiint. fizice soc. rom. stiint. 29*, 9-14(1926-7).—The Debye formula for sp. heat of solid substances is deduced by integration of the Planck equation, by assuming that the total radiation of an oscillating system is proportional to the internal energy of the system.

E. M. SYMMES

**Distribution of trichloroacetic acid between water and organic solvents.** I. M. ANDREASOV. *Ukrainskii Khim. Zhur.* 3, Sci. part, 463-6(1928).—Timofeev (*Nauka na Ukraine*, No. 4; cf. C. A. 11, 788; 20, 2820), showed that the mol. wt. of  $\text{CCl}_3\text{CO}_2\text{H}$  (I) is different in active solvents (capable of lowering the range of esterification) and in inactive solvents. To obtain new data for mol. conditions of I in the same solvents, A studied the distribution of I between  $\text{H}_2\text{O}$  and a corresponding solvent. According to the Bertholet-Nernst law in case of equal mol. wt. of distributed substance in both of the immiscible solvents the ratio of concns. must be const.:  $C_1/C_2 = K$ , and in case of unequal mol. wt.:  $C_1^n/C_2 = K$ . As in aq. soln. the mols. of I are hydrated, no associated mols. are present. The same applies to the active solvents where mols. of the acid are dissoed. Therefore the distribution of I between  $\text{H}_2\text{O}$  and the active solvent must be according to the 1st equation. In inactive solvents the mols. of I are more or less assocd., and the distribution of the acid between them and  $\text{H}_2\text{O}$  must be according to the 2nd equation, where  $c_1$  is the concn. of the acid in the aq. layer,  $C_2$  in inactive solvent, and  $n$  the degree of assocn. of I in inactive solvent. From the tabulated results it can be seen that the wider the range of reaction in an inactive solvent the greater is the coeff. of distribution. The various solvents can thus be classified according to the range (Timofeev, C. A. 9, 2896):  $\text{CS}_2 > \text{CHCl}_3 > \text{C}_6\text{H}_6 > \text{CCl}_4 > \text{C}_6\text{H}_5\text{NO}_2$ , and according to the coeff. of distribution thus:  $\text{CS}_2 > \text{CHCl}_3 > \text{CCl}_4 > \text{C}_6\text{H}_6 > \text{C}_6\text{H}_5\text{NO}_2$ . From the study of the coeff. of distribution it follows that in  $\text{C}_6\text{H}_6$ ,  $\text{C}_6\text{H}_5\text{NO}_2$ ,  $\text{CHCl}_3$  and  $\text{CS}_2$  the mols. of I are doubled, while in  $\text{CCl}_4$  its mol. wt. is normal, these results differing from those of Timofeev.

CHAS. BLANC

The distribution law. III. Application of the van Laar distribution law to a con-

densified system of molten metals. RICHARD LORENZ AND GEORG SCHULZ. Univ. Frankfurt a.M. *Z. anorg. allgem. Chem.* 179, 339-44(1929); cf. *C. A.* 23, 2633.—The distribution law for condensed systems,  $(x/y)^{\omega} = K$ , has been applied to the data obtained for the distribution of Ag between molten Pb and Al. In this form the ratio is expressed in mol. fractions and  $\omega$  represents a complex function of the van der Waals consts.,  $a$  and  $b$ . The function is composed of 2 parts, 1 of which is detd. empirically and the other of which is calcd. from known values of  $a$  and  $b$ . The results show that the formula is valid over the range from 0.9 to 30 at. percent of Ag in the Al phase. Satn. exists in this phase at 60 at. % Ag. H. F. JOHNSTONE

Voltage effect of electrolytic conductance in very strong fields. MAX WIEN. *Ann. Physik* [5], 1, 400-16(1929); cf. *C. A.* 22, 3088.—Limiting tension effects and concn. effects were detd. for  $K_3Fe(CN)_6$ ,  $Li_3Fe(CN)_6$ ,  $K_4Fe(CN)_6$ ,  $MgCrO_4$ ,  $MgSO_4$ ,  $Ba_2[Fe(CN)_6]_2$ ,  $Ba_2Fe(CN)_6$ . Three solns. of each salt were examd. Their sp. conds. were resp.:  $2.3 \times 10^{-8}$ ;  $4.6 \times 10^{-8}$ ;  $9.2 \times 10^{-8}$ . For these solns. the limiting tension effect agrees with the concn. effect. For ions of low valence, values calcd. on the basis of the Debye-Onsager theory agree with expt. results. The influence of assocn. did not make itself felt in the case of these highly dil. solns. FRANK URBAN

Exact calculation of the Wien difference of potential effect ("Spannungseffekt") in electrolytes. M. BLUMENTRITT. *Ann. Physik* [5], 1, 195-215(1929).—Wien observed a rise in the cond. of electrolytes with the applied voltage (cf. *C. A.* 22, 906). This has been discussed by Joos, by B., and by J. and B. (cf. *C. A.* 22, 4325, 3088, 2861). This "Spannungseffekt" is now computed according to L. Onsager's modification of the Debye-Hückel theory, which includes a consideration of the effects of the Brownian movement (cf. *C. A.* 21, 2412). This takes care of certain discrepancies that appeared in the earlier work. With these modifications the results calcd. by the present theory show excellent agreement with expt. for the "Spannungseffekt" up to fields of 25,000 v./cm. W. W. STIFLER

The electrical conductivity of hydrochloric, hydrobromic and hydriodic acids and the mobility of the hydrogen ion. M. HLASKO AND D. WAZEWSKI. Wilno Univ. *Bull. intern. acad. Polonaise* No. 4-5A, 181-90(1928).—In general acids that are hydrides of various elements increase in strength as one descends a column of the periodic table. This investigation shows that the acids HCl, HBr and HI are no exception to the rule. The authors det.  $\lambda_{\infty}$  for HCl, HBr and HI as 431.5, 433.7 and 432.3, resp. These values together with their value for the mobility of the H ion, viz., 355.1, are notably larger than those usually given. In dil. solns. the relative strengths of the acids are  $HI > HBr > HCl$ , but in very concd. solns. the reverse is the case, HCl having the largest degree of dissociation, a circumstance that is explained by the rule of Nernst and of J. J. Thomson by taking into account the changed dielec. const. of the medium. The densities and viscosities of aq. solns. of these acids are given. The viscosities diminish in the order HCl, HBr, HI. R. E. GIBSON

Conductivity of electrolytes for high-frequency currents. H. RIECKHOFF AND H. ZAHN. *Z. Physik* 53, 619-27(1929).—The theory of Debye and Falkenhagen (*C. A.* 22, 3573) concerning the cond. of electrolytes for high-frequency currents is tested exptly. and found satisfactory for a number of electrolytes over a large range of concn. However with concd. solns. the agreement is only approx. For a completely dissociated electrolyte having two ions,  $\lambda$  the mol. cond. is given by:  $\lambda = \lambda_{\infty} - (\lambda_1 + \lambda_2)\sqrt{\gamma}$ , where  $\lambda_{\infty}$  is the cond. at infinite diln.,  $\lambda_2$  is the decrease in mol. cond. caused by the increased Stokes' friction force due to the ion atm. and  $\lambda_1$  is due to the dissymmetry of the ion atm. relative to the ion when moving under the elec. field;  $\gamma$  = concn. in moles per l. GEORGE GLOCKLER

Relation of the electric conductivity and the vapor pressure of solutions. TH. DAHLBLOM. *Tek. Tid., Uppl. C, Kemi* 58, 76-9(1928).—The following equation was calcd. from the detns. of elec. conductivity and vapor pressure published in the tables of Landolt-Börnstein-Roth:  $K \log(p_0/p) + rC = nF$ , where  $K$  is a const. dependent on the temp. of the soln.,  $p_0$  is the vapor pressure of  $H_2O$ ,  $p$  that of the soln.,  $r$  is a const. specific for the dissolved substance,  $C$  the elec. cond. of the soln.,  $n$  the concn. in mols. per 100 g.  $H_2O$  and  $F$  a const. specific for the dissolved substance and considered by the author as in a certain way expressing the relationship of the substance to the solvent. At  $0^\circ K = 3060^\circ$ . For NaCl in  $H_2O$  at  $0^\circ$  the equation  $3060 \log(4.579/p) + 685 C = n 75.5$  agrees with the exptl. facts from very dil. to satd. soln. From the detns. of Kohlrausch (cond.) and Dieterici (vapor pressure) the following values of  $r$  and  $F$  are calcd.: for KCl, resp., 710 and 87; for NaCl 685 and 75.5; LiCl 1560 and 105;  $CaCl_2$  1920 and 207. From the detns. of vapor pressure at  $100^\circ$  by Tamman and elec. cond. at  $100^\circ$  by the author  $K$  is calcd. as 3926 and the values of



and  $F$  for  $\text{CdSO}_4$  as, resp., 87 and 25.5; for  $\text{MnSO}_4$  186 and 34;  $\text{ZnSO}_4$  428 and 55;  $\text{MgSO}_4$  550 and 63;  $\text{Na}_2\text{CO}_3$  76 and 75;  $\text{KOAc}$  245 and 98;  $\text{K}_2\text{CO}_3$  311 and 149.

C. A. ROBAK

The potential of inert electrodes in solutions of sulfurous acid and its behavior is an oxidizing and reducing agent. ARTHUR A. NOYES and HAROLD H. STEINOUR. Calif. Inst. of Tech. *J. Am. Chem. Soc.* 51, 1409-28(1929).—Measurements were made of the e. m. f. against the molal H electrode of platinized electrodes in solns. of  $\text{H}_2\text{SO}_3$ . From a study of the effect of electrode treatment, agitation,  $\text{SO}_2$  and  $\text{O}_2$  partial pressure, the presence of S and of  $\text{H}_2\text{S}_2\text{O}_8$ , and the H-ion concn., it is concluded that the fairly definite e. m. f. of  $-0.37$  volt is due to an equil. between  $\text{H}_2\text{SO}_3$  and  $\text{H}_2\text{S}_2\text{O}_4$  (which N. and S. propose to call "dithionous" acid). Toward compds. with a more negative potential,  $\text{H}_2\text{SO}_3$  acts as an oxidizing agent; toward those with a potential more positive than  $-0.14$  volt, it acts as a reducing agent; for intermediate values, it may be either, but generally oxidizing (cf. Carter and James, *C. A.* 19, 771).

T. H. CHILTON

The colorimetric measurement of hydrogen-ion concentration in very weakly buffered solutions. ERIK ÖMAN. *Papier-Fabr.* 27, 27-30(1929).—The  $p_H$  value obtained by indicators in a weakly buffered soln., such as distd.  $\text{H}_2\text{O}$ , varies with the amt. of indicator used. Measurements may be made with several known vols. of indicator, making comparison with standard buffers contg. the same amt. of indicator as used in the several samples. Then by plotting the cc. of indicator vs.  $p_H$  a smooth curve is obtained which upon extrapolation gives the true  $p_H$  (with 0 cc. of indicator). The same method may be applied with a common color comparator by using 0.5, 1 and 2 times the standard vol. of indicator and making observations through, resp., 2, 1 and 0.5 times the standard thickness of soln. The accuracy of the result is limited only by the accuracy of the several detns.

R. H. DOUGHTY

The influence of neutral salts on acid-base equilibria. V. First and second dissociation constants of succinic acid, tartaric acid and adipic acid and the influence of neutral salts on the  $p_H$  of a mixture of the acid and its acid salt, and the acid salt and normal salt, respectively. I. M. KOLTHOFF and W. BOSCH. *Rec. trav. chim.* 47, 861-72 (1928); cf. *C. A.* 22, 4316.—The following values have been found from  $p_H$  measurements for the first and second dissocn. const. of the three dibasic acids: succinic,  $6.6 \times 10^{-5}$  and  $2.7 \times 10^{-6}$ ; adipic,  $4.6 \times 10^{-5}$  and  $3.6 \times 10^{-6}$ ; tartaric,  $9.6 \times 10^{-4}$  and  $2.8 \times 10^{-5}$ . The results are extrapolated for infinite diln. Neutral salts increase the activity of the undissocd. acid. The dissocn. const. of the acid is not increased. The Debye-Hückel equation does not completely represent the effect of neutral salts on the ratio of the activity coeffs. of the univalent and bivalent anions of the weak dibasic acid. The sp. ionic interaction must be taken into account. VI. Dissociation constants of acetic, caproic and benzoic acids and the influence of neutral salts on the dissociation constants of weak acids. *Ibid* 872-82.—The dissocn. const. of the 3 monobasic acids at  $18^\circ$  are: acetic,  $1.7 \times 10^{-5}$ ; caproic,  $1.44 \times 10^{-5}$ ; benzoic  $7.0 \times 10^{-6}$ . In this case also there is no evidence that neutral salts increase the dissocn. const. of weak acids.

B. C. A.

The change of potential in acid-alkali titrations and the determination of ionization constants. F. L. HAHN. *Ber.* 62B, 727-36(1929).—The ratio  $\Delta\epsilon_{\text{max}}/\Delta v$  where  $\epsilon$  is the potential and  $\Delta v$  the volume of reagent added, can be used for the detn. of ionization const. The accuracy attainable is about  $\pm 10\%$  for univalent acids and bases,  $\pm 20\%$  for bivalent ones and  $\pm 30\%$  for ampholytes.

FRANK URBAN

Amphoteric hydroxides, their aqueous solutions and crystallized salts. VII. The reaction of stannates in aqueous solution by change of hydrogen-ion concentration with hydrochloric acid. GERHARD JANDER, FRANZ BUSCH and THEODOR ADEN. Univ. Gottingen. *Z. anorg. allgem. Chem.* 177, 345-62(1928); cf. *C. A.* 21, 3522.—Pptn. occurs between  $p_H$  0.9 and 11.6. Just below 11.6 hydrolysis either results in pptn. of all of the Sn or attainment of the upper limit. Addn. of HCl results in soln. of the ppt at the lower limit. Alk. stannates or those that have hydrolyzed to  $p_H$  11.6 show no absorption between 220 and  $700\mu$ . A  $0.1 M \text{Na}_2(\text{Sn}(\text{OH})_6)$  and  $0.02 N$  HCl mixt. gives strong absorption starting about  $300\mu$ . Further addn. of HCl including complete soln. makes no characteristic change in the absorption but the intensity increases. In  $5 N$  HCl soln. absorption above  $300\mu$  increases. In strongly acid solns. at least 3 different compds. of  $\text{Sn}^{++++}$  are present. Addn. of  $\text{Na}_2(\text{Sn}(\text{OH})_6)$  soln. to Cu salts in  $\text{NH}_3$  soln. of  $p_H$  11.5-12.0 gives  $\text{Cu}(\text{Sn}(\text{OH})_6)$ . Ni behaves similarly. No  $\text{Cu}(\text{Sn}_2(\text{OH})_{10})$  was found. Probably in  $5 N$  HCl  $\text{SnCl}_4$  is present. With decreasing  $\text{H}^+$  concn. this forms  $\text{SnOCl}_2$ . Going toward greater alkalinity a compd. of lower Cl and higher OH is probably formed before  $\text{Na}_2(\text{Sn}(\text{OH})_6)$  is reached.

FOSTER DEB SNELL

**Reactions in liquid hydrogen sulfide. VI. Reactions with organic compounds.** R. W. BORGESSON AND J. A. WILKINSON. *Iowa State Coll. J. Am. Chem. Soc.* **51**, 1453-6(1929); cf. *C. A.* **23**, 2092.—Reactions with the following types of org. compds. were studied: satd. hydrocarbons, unsatd. hydrocarbons, alcs., phenols, ethers, amides, ketones, alkyl and aryl halides, acids, acid anhydrides, esters, sugars, nitro compds., Grignard reagent, aldehydes, amines and acyl halides. The substances were cooled to  $-77^\circ$ , liquid  $H_2S$  was added, and the tubes were sealed and allowed to come to room temp. After several weeks the tubes were cooled, opened,  $H_2S$  was evapd. and residues were examd. Several compds. of each type were studied. Qual. solubilities are given. The presence of a double bond is usually shown by mercaptan formation. The last 3 types named are the only ones that show much evidence of reacting with liquid  $H_2S$ . There are 10 references.

GERALD M. PETTY

**Curves of thermodynamic potentials of alloys in the region of formation of chemical compounds.** A. B. MLODZHEVSKII. *Ann. inst. anal. phys.-chim. (Leningrad)* **4**, 247-81 (1928).—It is shown mathematically that the existence of a sharp point (which detd. the presence of a nondissocd. compd.) on the m. p. curves of binary alloys is detd. by the discontinuity of the curves of the thermodynamic potential of the liquid phase. The non-dissocd. compd. must be considered as a new substance which is independent of the original components of the alloy.

V. KALICHEVSKY

**The velocity of decomposition of potassium persulfate in aqueous solution.** ANTON KAILAN AND LUDWIG OLBRIICH. *Monatsh.* **47**, 449-84(1927).—Using the method of Green and Mosson (*C. A.* **5**, 820), the authors studied the velocity of decompn. of  $K_2S_2O_8$  at  $25^\circ$  both alone and in the presence of  $H_2SO_4$ . They also studied the reaction at  $99^\circ$  alone and in the presence of  $K_2SO_4$ ,  $HNO_3$ ,  $H_3PO_4$  and  $H_2SO_4$ . The results indicate a unimol. reaction and agree quant. with previous work. The speed of the reaction is sensitive to ionic influences; in particular  $H^+$  and  $NO_3^-$  ions accelerate the reaction while  $SO_4$  and  $K^+$  ions retard it. Decrease in the partial pressure of  $O_2$  over the soln. does not increase the velocity of the reaction and so the effect of substances like toluene which accelerate the reaction is not due to oxidation. R. E. G.

**The constant of mass action.** R. F. GOLDSTEIN. *Phil. Mag.* [7], **7**, 205-6(1929); cf. *C. A.* **22**, 4040.—Kleeman (*C. A.* **22**, 1888) failed to consider the free energy decrease in the dissocn. of the mol. species which would dissoc. after passing the semipermeable membrane. If this is taken into account the const. of mass action reduces to the simple van't Hoff form.

L. H. REYERSON

**The constant of mass action.** R. D. KLEEMAN. *Phil. Mag.* [7], **7**, 206-8(1929); cf. preceding abstr.—A new deduction of K.'s previous results is given. The usual deduction of the van't Hoff cycle does not take into account assocn. or dissocn. in the mixt. which must follow the removal of a mol. species.

L. H. REYERSON

**Equilibrium in the system: methanol-hydrogen-carbonic oxide.** D. M. NEWITT, B. J. BYRNE AND H. W. STRONG. *Proc. Roy. Soc. (London)* **A123**, 236-52(1929).—Equil. in the system:  $CH_3OH-H_2-CO$ , was approached from both sides by static and dynamic methods. Total pressures of the order of 100 atms. were measured by movement of a disk observed by optical methods. The compn. at equil. was detd. by gas analysis. Partial pressures were calcd. assuming no deviation from Boyle's law. The results from  $260^\circ$  to  $380^\circ$  are not in agreement with prediction for the equil. position made by Kelley or by Audibert and Raineau. The free-energy equation derived from the measurements is  $\Delta F = 70.5T - 30,500$ .

G. B. TAYLOR

**The iron-water system.** G. SCHIKORR. *Z. Elektrochem.* **35**, 62-5(1929).—An equil.  $H_2$  pressure of 190 mm. Hg is calcd. from electrochem. data for the reaction  $Fe + 2HOH \rightarrow Fe(OH)_2 + H_2$ . Exptl. data show that pressures up to 5.8 atm. are developed by the iron-water system and evidence is given that the  $H_2$  is generated by the oxidation of  $Fe(OH)_2$  to  $Fe_2O_3$ .

J. G. McNALLY

**Acid and salt effects in catalyzed reactions. XIX. Catalytic activity of chloroacetic acid in the hydrolysis of ethyl acetate.** HARRY M. DAWSON AND WM. LOWSON. *Univ. Leeds. J. Chem. Soc.* 1929, 393-401; cf. *C. A.* **23**, 2093.—An investigation was made of the catalysis by chloroacetic acid of the hydrolysis of EtOAc in the presence of varying amts. of Na chloroacetate. Since there were previous indications of catalysis of this reaction by both the AcOH mol. and the acetate ion (*C. A.* **22**, 716) and since, in the equation,  $v = k_a[H^+] + k_s[A^-] + k_m[HA]$ ,  $k_m$  increases and  $k_a$  diminishes with increase in the ionization constant,  $K$ , of the catalyzing acid, it was expected that catalysis by the chloroacetic acid mol. could be easily demonstrated. However, the formation of HCl by hydrolysis of the chloroacetate places a limit on the amt. of chloroacetate that can be added to reduce the concn. of  $H^+$  to the point where the velocity of hydrolysis of the EtOAc will not be dominated by its effect. Also, the increase

in  $k_m$ , in replacing AcOH by chloroacetic acid, is much less than the increase in  $K$ . Further,  $k_m/k_h$  for chloroacetic acid is about  $1/35$  the value in the acetone-iodine reaction. Consequently, the detn. of  $k_m$  for the ester hydrolysis is complicated by "inert salt effects." Expts. were made at  $25^\circ$  on solns. contg. 20 cc. (0.206  $M$ ) of EtOAc per l. With 0.1  $N$  chloroacetic acid and 1.0  $N$  chloroacetate, and with 0.05  $N$  chloroacetic acid and 0.50  $N$  chloroacetate, no evidence could be found of catalytic activity by the chloroacetic anion. Hence, the catalytic effect of chloroacetic acid can be expressed by the equation,  $v = k_h[H^+] + k_m[HA]$ , when provision is made for the effects of ionic environment on  $k_h$  and  $K$ . The dependence of  $k_h$  on the reaction medium was detd. from reaction velocity measurements in NaCl solns. with 0.01  $N$  HCl as catalyst. Variations in  $K$  were detd. by combining these last expts. with a corresponding series with 0.1  $N$  AcOH as catalyst. The value of  $k_h$  increases linearly up to 2  $M$  NaCl.  $K$  passes through a max. at about 0.5  $M$  NaCl. When the total ion concn. is kept const., the catalysis by free chloroacetic acid and its mixts. with chloroacetate can be satisfactorily explained on the basis of fixed values for  $K$ ,  $k_h$ , and  $k_m$ .  $k_m = 0.09 \times 10^{-4}$ .  $k_m/k_h =$  about  $1/700$ .  $K$  may be taken as  $1.5 \times 10^{-3}$  in very dil. solns.

MERRILL W. SEYMOUR

An investigation of the combustion of platinum. ERIC K. RIDGAL AND O. H. WANSBROUGH-JONES. *Proc. Roy. Soc. (London)* A123, 202-16(1929).—The kinetics of the reaction between  $O_2$  at pressures 5-200 bars on Pt wires at  $1600$ - $1900^\circ$ .  $K$  is shown to comprise a surface reaction proportional to the pressure and a zero-order gas-phase reaction with Pt vapor. The energy of activation of the surface reaction is found to be 2.75 v. The product of reaction is  $PtO_2$ .

G. B. TAYLOR

The reaction kinetics in a macro-heterogeneous medium. ST. J. V. PRZYBYCKI. *Biochim. Z.* 206, 60-98(1929).—A very extensive theoretical discussion. S. M.

Fusion curves represented in a special system of coördinates. N. V. LIPIN. *Ann. inst. anal. phys.-chim. (Leningrad)* 4, 59-64(1928).—The relationship between the compn. of a binary mixt. and its fusion temp. is derived from the fusion equation of Shreder (*Gornui Zhurnal* 1890, No. 11, 272) and represented in two special systems of coördinates.

V. KALICHEVSKY

Reaction limits, reaction regions, and reaction spaces. W. P. JORISSEN. Univ. of Leiden. *Chem. Reviews* 6, 17-43(1929); cf. *C. A.* 23, 753.—Ternary and quaternary systems of gases and of solids are reviewed with special emphasis on their graphical representation.

ARTHUR FLEISCHER

Heterogeneous equilibrium at  $97^\circ$  in systems which contain water, sodium sulfate, and sulfates of bivalent metals. A. BENRATH AND H. BENRATH. *Z. anorg. allgem. Chem.* 179, 369-78(1929); cf. *C. A.* 22, 903, 4040; 23, 1343.—Study of heterogeneous equilibria by the analytical method at  $97^\circ$  shows the following solid phases in equil. with soln. contg.  $Na_2SO_4$  and a sulfate of a bivalent metal:  $ZnSO_4 \cdot H_2O$ - $ZnSO_4$ ,  $Na_2SO_4 \cdot 4H_2O$ - $ZnSO_4$ ,  $3Na_2SO_4$ - $Na_2SO_4$ ,  $CdSO_4 \cdot H_2O$ - $CdSO_4$ ,  $Na_2SO_4$ - $CdSO_4$ ,  $3Na_2SO_4$ - $Na_2SO_4$ ,  $FeSO_4 \cdot H_2O$ - $FeSO_4$ ,  $Na_2SO_4$ ,  $2H_2O$ - $FeSO_4$ ,  $3Na_2SO_4$ - $Na_2SO_4$ ,  $CoSO_4 \cdot H_2O$ - $CoSO_4$ ,  $Na_2SO_4$ ,  $4H_2O$ - $Na_2SO_4$ ,  $NiSO_4 \cdot 6H_2O$ - $NiSO_4$ ,  $Na_2SO_4$ ,  $4H_2O$ - $Na_2SO_4$ ,  $CuSO_4 \cdot 3H_2O$ - $CuSO_4$ ,  $Na_2SO_4$ ,  $2H_2O$ - $Na_2SO_4$ ,  $MgSO_4 \cdot H_2O$ - $MgSO_4$ ,  $Na_2SO_4$ ,  $2H_2O$ - $MgSO_4$ ,  $3Na_2SO_4$ - $Na_2SO_4$ . The systems contg. Fe and Cu were investigated in dil.  $H_2SO_4$  soln.

R. J. HAVIGHURST

The reaction between iron, iron oxides and water. G. SCHIKORR. *Z. Elektrochem.* 35, (65-70)(1929).—When  $Fe(OH)_3$  is heated with Fe and water, it becomes black and  $H_2$  is generated. Evidence is given that the dark color is caused by the formation of  $Fe_3O_4$  obtained by reducing  $Fe_2O_3$ . The  $H_2$  is formed by the oxidation of  $Fe(OH)_3$  to  $Fe_2O_3$ . The velocity of formation of  $H_2$  is inversely proportional to the cube root of the  $H_2$  pressure on the system, and the rate is doubled by an increase in temp. from  $25^\circ$  to  $35^\circ$ .

J. G. McNALLY

The oxidation of copper at higher temperatures. W. FRITKNECHT. Bern. *Z. Elektrochem.* 35, 142-51(1929).—At higher temps. the rate of oxidation of Cu follows the law  $x^2 = Kt$  after the reaction is well under way; during the early stage of the reaction the rate of oxidation is faster than the equation indicates.  $K$  diminishes faster with fall of temp. than is required by the theoretical equation  $K = Ae^{-E/RT}$ . In oxidations by means of mixts. of  $O_2$  with  $N_2$  and  $CO_2$ , the velocity const. is independent of the partial pressure of  $O_2$  up to the dissozn. pressure of CuO and thereafter diminishes approx. proportionally to the log of  $O_2$  pressure. The oxide layer formed consists of  $Cu_2O$ , with a superficial layer of CuO. This is thickest at medium temps. The  $Cu_2O$  has a metal-like structure. It shows crystal growth which follows the same rules as do metals. The diffusion of  $O_2$  occurs through the crystallites and along the crystallite boundaries. The discrepancy between the exptl. results and the theory is a conse-

quence of the crystal growth of the  $\text{Cu}_2\text{O}$  and the marked decrease in crystallite size with falling temp.

The specific heat of superheated steam at pressures from 30 to 120 atmospheres and from saturation temperatures to  $450^\circ$ . OSCAR KNOBLAUCH AND W. KOCK. *Z. Ver. deut. Ing.* 72, 1733-9(1928); *Mech. Eng.* 51, 147-50(1929); *Naturwissenschaften* 17, 269-70.—By use of an adiabatic flow calorimeter,  $C_p$  for steam has been measured from satn. to  $450^\circ$  and from 30 to 120 atms. At const. pressure the sp. ht. increases rapidly as satn. is reached. Full tables are given.

The properties of the thermodynamic diagram relative to the saturated vapor. G. BRUHAT. *Compt. rend.* 187, 529-31(1928).—The isochores, plotted on an entropy-temp. diagram undergo an abrupt change of direction in crossing from the liquid to the gas phase. The angle thus made is calcd.

Reduction in entropy of a thermodynamic system caused by the interference of intelligent beings. L. SZILARD. *Z. Physik* 53, 840-56(1929).—It was usually stated that the second law of thermodynamics could be violated by a Maxwell demon. S. considers entropy changes of some simple thermodynamic systems which are being interfered with by intelligent beings or their equivalents. Conclusion: Their acts of interference cause in themselves an entropy increase that is exactly equal to the entropy decrease produced in the system by their interference.

The individuality of heats of dilution of strong electrolytes. E. LANGE AND J. MEIXNER. *Naturwissenschaften* 17, 273-4(1929).—Recent measurements on  $\text{LiF}$  and  $\text{KNO}_3$  have shown that the integral heats of diln. ( $C. A.$  23, 1046, 1562)  $V_e$  of strong electrolytes show individual differences even below 0.01  $N$  concn. for uni-univalent salts. The  $V_e$  values ( $\text{LiF} > \text{KF}$ ,  $\text{LiF} > \text{LiBr}$ ,  $\text{KF} > \text{KCl} > \text{KNO}_3$ ,  $\text{KCl} > \text{CsCl}$ ) are larger for smaller ion diams.,  $a$ , ( $\text{Li} < \text{K} < \text{Cs}$ ;  $\text{F} < \text{Cl} < \text{Br} < \text{NO}_3$ ); the  $V_e$  of  $\text{LiF}$  and of  $\text{CaSO}_4$  is larger than required by the Debye-Hückel law (with  $a = 0$ ) for  $dD/dT = -0.337$ . Even with introduction of a finite  $a$  and  $da/dT = 0$  the value of  $V_e$  from  $-0.239 \times 10^{-7} \sum \nu_i z_i^2 (Ne^2/2D) [x/(1 + ax) + (T/D)(dD/dT)]$  can only give individual deviations downward for  $V_e$ . For pos. deviations neg.  $a$  values would be required. A new law analogous to the one of Gronwall, LaMer and Sandved (*C. A.* 22, 3334) including higher members of the activity function was derived for  $\pm 2$

valent electrolytes with  $a_{\text{kat.}} = a_{\text{an}} = a$  in the form  $V_e = RT \left[ \sum_{m=1}^{\infty} (e^2 z^2 / D a k T)^{2m} - 1 \right]$ .  $X_{2m} - 1 - (e^2 z^2 / D a k T) [1 + (T/D)(dD/dT)]$  cal. per mole. The factors  $X$  are those of G. L. and S.,  $da/dT = 0$ ,  $dD/dc = 0$ ,  $D_{25} = 79$  are assumed. Graphically this law means that for very low concns. ( $c < 10^{-4} N$ ) the Debye-Hückel law is followed ( $a = 0$ ) asymptotically. For little higher concns. ( $c > 0.00025 N$ ) experimentally significant, plus or minus deviations are to be expected, depending on the value of  $a$ . For increasing  $a$  the law approaches the Debye-Hückel law with finite  $a$ . Neg.  $V_e$  values cannot be explained by the new expression. Various curves are given for  $a$  from 0.8 to 10 Å. U. in fair agreement with values for different salts. For  $\text{CaSO}_4$  the  $V_e$  curve appears to approach at low concn. the required limit. Neg. tendencies of some  $V_e$  curves ( $\text{KNO}_3$ , specially) might perhaps be due to  $dD/dc \neq 0$ ,  $da/dT \neq 0$  or by the influence of heat of disson.

Heat of fusion (and specific heat) allylphenylthiourea. V. P. SHISHOKIN. *Ann. inst. anal. phys.-chim.* (Leningrad) 4, 183-94(1928).—Sp. heats of liquid and solid  $\text{CS}(\text{NH}_2\text{C}_6\text{H}_5)(\text{NH}_2\text{C}_6\text{H}_5)$  are 0.423 and 0.335, resp., and the heat of fusion is  $6600 \pm 100$  cal. per mol.

The limiting value of the latent heat of vaporization. J. E. VERSCHAFFELT. *Z. physik. Chem.*, Abt. A, 140, 64(1929).—A rejoinder to Kolossowsky's interpretation of V.'s results (*C. A.* 22, 4337).

The heat capacity of hydrogen iodide from  $15^\circ \text{K.}$  to its boiling point and its heat of vaporization. The entropy from spectroscopic date. W. F. GIAUQUE AND R. WIERB. Univ. Calif. *J. Am. Chem. Soc.* 51, 1441-9(1929); cf. *C. A.* 22, 719, 3570.—Entropies for the gaseous state calcd. from spectroscopic data agree within the exptl. error with those calcd. from calorimetric data. Transition points were found at about  $70^\circ$  and  $125^\circ \text{K.}$  The m. p. is  $222.31 \pm 0.05^\circ \text{K.}$  and the b. p. is  $237.75 \pm 0.05^\circ \text{K.}$  The heat of fusion is  $686.3 \pm 0.8$ , and the heat of vaporization is  $4724 \pm 5$ . The entropy of the gas is  $47.8 \pm 0.1 \text{ E. U.}$  at the b. p. There are 17 references.

Velocity of esterification of alcohols in formic acid (KAILAN, BRUNNER) 10. Relation between the increase of the magnetic susceptibility of certain rocks when heated and the modifications occurring in certain of their mineral constituents. (MICHEL-LEVY,

GRENET) 8. An experimental study of the electrochemical polarization of Pt (SEPTAL-SKIL, PICHETA) 4. The electrical conductivity of Carborundum (SEEMANN) 4. Action of optically excited Hg atoms on hydrocarbon molecules (FRANKENBURGER, ZELL) 10. Reaction of atomic H with hydrocarbons (TAYLOR, HILL) 10.

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### 3—SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

S. C. LIND

**Behavior of the radioactive deposit during operations for the determination of the emanation in water.** HENRYK HERSZFINKIEL. *Roczniki Chem.* 8, 519-25 (Polish), 525-6 (German) (1928).—The expts. of Hammer and Vohsen (*C. A.* 7, 2902) and of Engler, Sieveking and Koenig (*C. A.* 8, 2527, 3267) were repeated and it was found that the radioactive deposit in water was not liberated at concns. below 0.01%. Moreover the deposit seps. on to the walls of the vessel on shaking, boiling and by air passage and this also takes place in the state of rest, only more slowly. This behavior agrees with similar observations of Lachs and Wertenstein (*C. A.* 16, 3805). Even by an enormous diln. of radioactive ppt. in H<sub>2</sub>O, the ppt. does not appear in the gaseous state.

**The structure of atoms.** FELIX JOACHIM V. WISNIEWSKI. *Physik. Z.* 29, 716-21 (1928).—The paper represents an attempt to produce a picture of the structure of an atom on the basis of the assumption that every single atom contains an energy level *K*, one of the energy levels *L*, one of 5 energy levels *M*, etc., by substituting for these energy levels those corresponding to individual electrons of the electron orbits. Satisfactory results have been obtained for the energy levels *K*; *L*<sub>I</sub>, *L*<sub>II</sub>, *L*<sub>III</sub>; *M*<sub>II</sub>, *M*<sub>III</sub>, *M*<sub>IV</sub> and *M*<sub>V</sub>.

**The significance of atom models.** A. SOMMERFELD. *Z. Elektrochem.* 34, 426-30 (1928).—Historical review.

**Atomic nuclei and their changes.** E. RUTHERFORD. *Apoth. Ztg.* 44, 577-8 (1929).—An address given before the Ger. Chem. Soc.

**Thermal equilibrium of dissociation of atom nuclei.** SEITARÔ SUZUKI. *Proc. Phys.-Math. Soc. Japan* [3], 10, 166-9 (1928).—The formation of a He nucleus from 4 protons can be treated as an ordinary reversible chem. combination and the Sackur-Tetrode equation applied to it. The result of the computation indicates that dissoen. of He nuclei should take place at  $2.1 \times 10^9$  degrees and pressures between 10 and 0.1 atm. No star has been observed where He is thermally dissociating into protons.

**Significance of the packing fraction.** MARCEL FRANCON. *J. Phys. Chem.* 33, 296-300 (1929).—It is pointed out that the packing fraction (a term introduced by Aston to designate the divergence of the mass no. of an atom from a whole no., divided by the mass no.) is of utmost importance in estg. the energy emitted or absorbed in formation of the elements, and in formulating theories of nuclear structure. Curves given by Aston (*C. A.* 21, 3543) illustrating the variations of packing fractions with mass nos. show that the nucleus has a structure very different from the arrangement of planetary electrons. Cosmological speculations may be drawn from this quantity; thus ele-

ments tend to the formation of other elements for which the packing fraction is as small as possible. H. R. MOORE

**A theoretical expression for the life of the atom in the metastable state.** MEGHNAD SAHA AND D. S. KOTHARI. Univ. Allahabad. *Naturwissenschaften* 17, 271(1929). (In English.)—The life of the excited atom in metastable state has been previously found to be  $T = 3 mc^3/8 \pi^2 e^2 \nu^2$ , of the order  $10^{-8}$  sec. for  $\nu = 10^4 c$ . From the fact that during transitions between metastable states only the magnetic moment of the atom changes and that it can therefore be compared to a closed oscillator, it is derived that the life of an atom in the metastable state is roughly  $T = 3 c^4 m^2 / \pi^2 e^2 h \nu^3$ . This equation gives a value of  $T = 1.5 \times 10^{-1}$  sec. for  $\nu = 10^4 c$ , which is of the correct order of magnitude. B. J. C. VAN DER HOEVEN

**Application of the Pauli-Fermi electron gas theory to the problems of cohesion forces.** YA. FRENKEL. Leningrad. *Z. Physik* 50, 234-48(1928).—This is a mathematical paper in which F. discusses the kinetic energy pressure of an electron gas from the standpoint of relativistic mechanics, and shows that condition for min. energy, which detcs. the state of a mech. system at abs. zero, applied to the Pauli-Fermi metal model, is equiv. to the virial law. The Thomas-Fermi relation for the dependence of electron concn. on potential energy at  $T = 0$  is deduced on the basis of the min. energy principle. The inner structure of at. nuclei is considered. F. shows that an extremely high pressure may possibly cause, even at abs. zero, such a sepn. of electrons from individual nuclei, that the entire mass may be visualized as the mixt. of electrons and nucleus gas, and discusses the structure of stars from this viewpoint. R. L. H.

**Transition probabilities in lithium atoms. II.** B. TRUMPY. Trondhjem. *Z. Physik* 50, 228-33(1928).—T. shows how the method of Schrödinger-Sugiura may be applied to the calcn. of the transition probabilities of the quantum jumps  $2_2 - 2_1$  and  $3_2 - 2_1$  of the Li atom. The values of  $f$  are 0.7230 and 0.0642, resp. By using the exptl. relation, obtained previously (C. A. 21, 3827),  $a_{ki} \sim 1/n^3$ , where  $n$  is the variable quantum number, the  $f$  values for the remaining quantum jumps of the principal series are calcd. and thus  $\Sigma f$  for the continuous part of the absorption is detd.  $\Sigma f$  is 0.171. R. L. H.

**The radiation from atoms.** J. KLEIBER. *Ann. Physik* 87, 461-8(1928).—K. discusses the classical and Bohr theories as regards radiation from atoms and presents a new method of deriving the Balmer formula. R. L. HERSHEY

**A further optical contribution to the investigation of the atomic structure of helium.** J. STARK. *Ann. Physik* 87, 927-34(1928).—A study of the action of an elec. field on He lines bears out S.'s earlier theory (C. A. 22, 3582) that the structure of certain elements possess designated axes. Thus the series components of He, the alkalis and alkaline earths are analogous to H lines in an elec. field. For He, fields of 300,000-555,000 v./cm. give rise to the para series lines  $2P_2 - mP_2$  and the ortho series lines  $2p_2 - mp_2$ . These ortho and para lines lie on opposite sides of the zero line. With regard to the 1S state of He, the magnetic moment of the electron giving rise to the para series is opposed to the magnetic moment of the second electron. H. R. M.

**The nature of cosmic radiation.** W. BOTHE AND W. KOLHÖRSTER. *Naturwissenschaften* 17, 271-3(1929).—Expts. lead to the conclusion that the cosmic radiation is not  $\gamma$ -radiation but is of corpuscular nature. This conclusion necessitates revision of many previous theories. It is only suggested that electrons penetrating the atmosphere at the required speed must have an energy of at least  $10^8$  e v. B. J. C. v. H.

**Absorption in lead, secondary rays and wave lengths of cosmic rays.** I. MISSEVSKII AND I. TUVIM. *Z. Physik* 50, 273-92(1928).—The absorption of cosmic rays by Pb under exptl. conditions similar to those with  $H_2O$  has been detd. The electroscopie was placed within a pile of Pb blocks, the dimensions of the pile being varied. Primary cosmic rays are absorbed in Pb, as in  $H_2O$ , by scattering without noticeable photo effects. In order to study the steep part of the absorption curve, which is in the region of the smaller Pb piles, the electroscopie was placed in a large ice block and the absorbing Pb placed either within or upon the ice block. These expts. showed that the steep drop in the absorption curve in the neighborhood of the boundary of air or ice is due to a scattered radiation, similar to  $\gamma$ -rays, which has considerable photo effect when absorbed in Pb. The results obtained show that the method of calcn. of wave length of cosmic rays by assuming that the absorption coeff. agrees with the scattering coeff. is correct. The wave length reported is  $4.4 \times 10^{-4}$  A. U. R. L. HERSHEY

**Cosmic rays and a cyclic universe.** EDMUND C. STONER. Univ. Leeds. *Proc. Leeds Phil. Lit. Soc., Sci. Sect.* 1, 349-55(1929).—A theoretical discussion on the relative merits of Millikan's (C. A. 22, 1900) and Jeans' (C. A. 23, 1048) interpretation of the nature of cosmic rays and a cyclic system for the universe. S. questions the atom-

upbuilding from electrons and protons and believes the universe is running down through an irreversible transmutation.

Optical method for analyzing  $\alpha$ -ray tracks. L. F. CURTISS. *Nature* 123, 520 (1929).—A double camera (= 2 cameras placed at right angles) take 2 views of an  $\alpha$ -ray track simultaneously on sep. negatives. In order to secure a full-sized image of the  $\alpha$ -ray track it is only necessary to replace the developed negatives in the camera and project them on the focal plane. By adjusting a thin translucent screen a position is found where no part of the composite image appears double. The screen is then in the proper plane. The adjustment is very sensitive and a permanent record can be obtained by replacing the screen by a photographic plate. GEO. GLOCKLER

The detection and estimation of mesothorium in living persons. I. HERMAN SCHLUNDT, HOWARD H. BARKER AND FREDERICK B. FLINN. *Am. J. Roentgenol. and Radium Therapy* 21, 345-54 (1929).—Seven persons who had worked in Ra refineries or luminous-material plants and who might have ingested radioactive material were studied. Electroscope measurements of the  $\gamma$ -ray activity of the subject were made with a Wulf-Hess quartz-fiber instrument. Emanation measurements of the expired air were made with a Lind instrument with a large ionization chamber. Methods for estg. the total radioactive material present, and for discriminating between Ra and MsTh are given. E. H. QUIMBY

Analytical determination of uranium, thorium and lead, as a basis for age-calculations. CLARENCE N. FENNER. *Am. J. Sci.* [v], 16, 369-81 (1928).—Detailed directions are given for the detn. of U, Th and Pb in radioactive minerals such as euxenite, polycrase, samarskite and monazite. B. C. A.

Radioactive minerals from Divino de Ubá, Brazil. C. N. FENNER. *Am. J. Sci.* [v], 16, 382-91 (1928).—A specimen of monazite from Divino de Ubá contained 5.091% Th and 0.0927% Pb, from which its age is calcd. to be  $3.6 \times 10^8$  years. The age of samarskite from the same source is  $3.4 \times 10^8$  years, reckoned from its content of 10.88% U, 1.64% Th and 0.52% Pb. B. C. A.

A basis for dosage determination in interstitial radiation. EDITH H. QUIMBY AND HAYES E. MARTIN. *Am. J. Roentgenol. Radium Therapy* 21, 240-50 (1929).—The distribution of radiation in the tissues around buried radioactive sources, (radon or radium) is detd. for different strengths and arrangements of the sources. Practical dosage problems are considered. E. H. QUIMBY

Pleochroic halos in biotite. D. E. KERR-LAWSON. *Univ. Toronto Studies, Geol. Series* No. 27, 15-27 (1928); cf. C. A. 22, 2106.—An examn. of biotite from Murray Bay, Que., using a microphotometer for detg. the space distribution of the darkening effect in the haloes, indicated that no anomaly with regard to the detd. constants of the uranium series existed. The haloes were exceptionally perfect in definition for their kind, and afford no suggestion that different disintegration const. prevailed during their formation from those now accepted. The persistence of a marked concentric distribution of the darkening effect in the haloes is due to a terminal reversal effect by which in the region of the range of a given set of alpha particles the development of darkening due to other sets of alpha particles is inhibited. J. W. SHIPLEY

The conductivity of metals. LUDWIG KAUL. *Metallbörse* 18, 1435-6 (1928).—A structure is suggested for the Cu atom, composed of H and He atoms so arranged that "electron-channels" exist for the easy passage of electrons. R. J. H.

The perpendicular deflection of slow electrons by gas molecules. RUDOLF KOLATH. *Ann. Physik* 87, 259-84 (1928).—An electron stream, defined by slits, was partly deflected by gas mols. That fraction which was deflected at right angles to the main stream was defined by passing through the spaces between flat ring plates, set perpendicular to and concentric with the main beam. The electrons passing directly through this laminated cylinder and those impinging on the plates were measured by one electrometer, those passing between the plates, which had been deflected perpendicularly, or nearly so, were measured on another. The electron velocities were measured by detg. the opposing field necessary to stop the electron stream. The velocity region 1-6  $\sqrt{v}$ . was studied for He, Ne, A, Kr, H<sub>2</sub>, CO, CO<sub>2</sub>, N<sub>2</sub>O and CH<sub>4</sub>. All these gases showed perpendicular deflection with loss of velocity. Only one max. was found for each gas on the velocity vs. fraction deflected curve. Perpendicular deflection first appears, on reducing voltage, at about 30 v.; the maxima occur in the range 1.5-3.0  $\sqrt{v}$ . The shape and position of the maxima permit division into three groups: A-group, Ne, A, Kr, CH<sub>4</sub>; H<sub>2</sub>-group, H<sub>2</sub>, He; N<sub>2</sub>-CO<sub>2</sub>-group, N<sub>2</sub>, CO<sub>2</sub>, CO, N<sub>2</sub>O. R. L. HERSHEY

Measurement of the heat effects of the condensation of electrons upon metals.



REINHOLD VIOHL. *Ann. Physik* 87, 176-96(1928).—Electrons emitted by a filament were deflected by a magnetic field through slits and on to a Ni block. A Cu-constantan thermocouple was used to measure the heat effects. Corrections were made on the residual kinetic energy from considerations of the magnetic field and the curvature of the electron path. Contact potential may not be neglected. The heat of condensation on Ni is  $97,800 \pm 9800$  cal. per mol.

R. L. HERSHEY

The expulsion of secondary electrons by electrons of 1-30 kilowatts. E. BUCHMANN. *Ann. Physik* 87, 509-35(1928).—The ionization per cm. and at 1 mm. pressure by electrons of velocities above 1 kw. has been measured in air, A, CO<sub>2</sub> and H<sub>2</sub>. The studies for air were carried to 30 kw., for the others to about 7 kw. The electron stream was obtained from a glowing filament, defined by a canal system, passed through an ionization chamber, and received in a Faraday chamber. The ionization current was measured by receiving the pos. ions, rather than the electrons, upon the plate of the ionization chamber. The ionization is proportional to the pressure, and, with the exception of H<sub>2</sub>, equal to a const. times the mol. wt. of the gas. The ionizing power and the probability of ionization decrease with increasing velocity of the primary electrons. No noticeable break in the ionization curve for A was found at the crit. potential of the K shell. The total no. of secondary electrons was detd. at velocities of 4, 7, 8 and 13 kw. The total no. of secondary electrons is directly proportional to the velocity of the primary electrons. The av. energy requirement  $\epsilon$  of secondary electron, in air, is  $31 \pm 3$  v. From the total no. of secondary electrons, the ionization per cm. and  $\epsilon$  the length of path of the primary electrons is calcd. at different velocities. R. L. H.

Electron reflection from cobalt and electron waves. MYRL N. DAVIS. Univ. of Wisconsin. *Nature* 123, 680-1(1929).—The total secondary electron emission from a Co target is measured, and is sep'd. into 2 groups by a retarding potential such that only those electrons having within a few v. of the energy of the primary electrons ( $\epsilon$  e., reflected electrons) can reach the collector. The data show that the important maxima of the total secondary emission may be attributed to the reflected electrons. By applying the Bragg formula, D. calcs. from the most important set of planes for Co in the close-packed hexagonal form the ranges of electron velocities or the bands on the wave-length scale which should be sent back into the receiving cylinder by constructive reflection. By taking their relative intensities as those of the known x-ray reflections, a fair correspondence is obtained between 3 groups of bands and the most prominent maxima of the secondary-electron curve. This necessitated the shifting of the observed curve by about 4 or 5 v., which is about the observed thermionic work function of Co.

G. CALINGAERT

The ratio of ionization and excitation in the motion of electrons through neon. F. M. PENNING AND M. C. TEVES. N. V. Philips Gloeilampenfabrieken, Eindhoven. *Physica* 9, 97-110(1929).—Breakdown of a gas for elec. discharge depends mainly on two factors; the first, how many positive ions are required to liberate one electron from the cathode (C. A. 22, 1904); the second, how many atoms are ionized by an electron in a homogeneous field per unit of distance. The underlying theory is the one of Holst and Oosterhuis (C. A. 18, 786) that at the breakdown point one electron on its way to the anode forms enough positive ions to cause the liberation of one new electron at the cathode. By the method of Townsend with improvements the second problem was exptly. studied on Ne. The problem here studied is different from the one of Compton and Van Voorhis on the probability of ionization; their calcs. include an electron path of only one ionization (cf. also Druyvesteyn, C. A. 23, 760). A curve for  $X/p = \text{const.} = 13.2$  ( $X = v.$  per c. m.;  $p = \text{pressure}$ ) derived from their work has an entirely different shape from those here obtained; it neglects the excitations. Difficulties are met if it is tried to include excitations and thereby calc. the theoretical form of the authors' curves from the data of C. and V.; little is known about the probability of excitation as a function of electron velocity. It is, however, possible to derive from the measurements some values for  $f_i$  the total no. of ionizations performed by an av. electron (one ionization or excitation being taken as max.) on its path and also the ratio of ionizations to excitations  $f_i/(1-f_i)$ . The  $f_i'$  versus  $X/p$  curve for 38.1 v. is a straight line with  $f_i' = 0$  for  $X/p = 4$ ,  $f_i' = 0.22$  for  $X/p = 20$ . The individual detns. derived from the  $f_i$  curves measured show rather considerable deviations; the values for  $f_i$  are taken as preliminary ones. An error of 5 to 10% due to regeneration of electrons by the positive ions is included in the results. For the lower values of  $X/p$  ( $< 15$ ) the curve of  $f_i'$  is considered most reliable. It is also shown that the breakdown potential  $V_d$  rises steeply at the  $X/p$  values where  $f_i$  approaches zero. B. J. C. VAN DER HOEVEN

Selenium and cathode rays. C. E. S. PHILLIPS. *Nature* 123, 681-2(1929).—Careful expts. have shown that the resistance of a Se cell exposed to cathode rays de-

creases rapidly, showing less lag than under exposure to light. X-rays produce a gradual but considerably smaller decrease in resistance.

**Radiometer effect of positive ions.** C. T. KNIPP AND W. S. STEIN. *Phil. Mag.* [7], 7, 70-9(1929).—Expts. are carried out to det. whether pos. ions exert a mech. force on a radiometer or the force is a secondary effect. The evidence, while inconclusive, seems to indicate that a part of the effect is mech.

**Temperatures of positive ions in a uniformly ionized gas.** JANE M. DEWEY. Princeton Univ. *Nature* 123, 681(1929).—An ionized gas may be considered as a mixt. of 3 gases, neutral mols., electrons and pos. ions, each occupying a different energy level, *i. e.*, having a different temp. Assuming (1) that the pos. ions acquire energy solely from the energy of random motion of the electrons, and (2) that they lose energy by collision with the mols. of neutral He at a rate which may be calcd. from the kinetic theory, D. calcs. the temp. of the pos. ions from that of the electrons and the pressure of the gas in a field-free space. The results are compared with those observed by D for He (C. A. 23, 2654). The calcd. values, although consistently high, agree in order of magnitude, and are within the error of calcn. and measurement. According to the calcn. the ion temp. should increase with decreasing electron temp. and increase with increasing electron concn.

**Photoelectric emission from phototropic mercury compounds.** BH. S. V. RAGHAVA RAO AND H. E. WATSON. *J. Indian Inst. Sci.* 12A, 17-29(1929); cf. C. A. 22, 4382.—By making use of a thermionic valve in conjunction with a photoelec. cell, the photoelec. emission from 12 phototropic Hg compds. of the type  $Hg.X_2$ ,  $2Hg.Y$  and  $X.Hg.CNY$  was measured ( $X = Cl, Br, I, HS, CNS, CNSe$ ;  $Y = O, S, Se$ ). A quartz-Hg arc lamp was the source. In all cases the emission from compds. prepd. in the dark was either zero or very small. On exposure to light the compds. darkened and the emission increased to a max. and then remained steady. In a few instances increase in emission took place in 2 stages, indicating the formation of an intermediate compd. The initial photoelec. current depends somewhat on the duration of exposure of the compd. to light; but the final max. did not deviate in value over a period of 80 hrs. On heating or keeping in the dark, the photosensitiveness decreased to that of the freshly prepd. compds. The max. current for any compd. was  $82 \times 10^{-11}$  amps. and the lowest was  $1.5 \times 10^{-11}$  amps. No definite relation could be found between phototropic and photoelec. activity.

**The magnetic moment of the complex ions of the iron group.** PIERRE WEISS. *Trans. Am. Electrochem. Soc.* 55, (preprint) 4 pp.(1929).—The magnetic moments of the simple ions of the Fe group, with minor exceptions, depend only on the no. of electrons in the ion, in accordance with Kossel's displacement law, and as shown by Cabrera's curve. For complex ions an "effective" atomic no.,  $N^1$ , must be used, which is defined by the equation  $N^1 = N - v + 2i - 2p$ , in which  $N$  is the total number of electrons in the central atom,  $v$  the valence,  $i$  the coordination index, and  $p$  the no. of pairs of electrons in the outer shell;  $p$  is generally 4 (rare-gas configuration), but in some cases the influence of the subjacent  $M$  shell may cause  $p$  to become 6, in which cases the coordination index will be 6 also. This leads to a generalization of Kossel's law: "The magnetic moment of a complex ion is equal to that of the normal ion of the same valence or to that of a normal ion whose effective at. no. is greater by 4." B. MILLER

**The longitudinal magnetic action upon bundles of slow electrons (concentrations and periodic expansion).** JEAN THIBAUD. *Compt. rend.* 188, 54-6(1929).—A theory based on classical considerations is developed for the periodic distention of slow-electron beams (under 500 v.) produced by a magnetic field.

**Cathode drop.** M. E. BĂDĂRĂU. *Bul. stiinte fizice soc. română stiinte* 29, 3-8 (1926-7).—Two theories have been advanced to explain the phenomenon of cathode drop. The Starck theory assumes the existence of an ionization potential of metals by positive ions. The Holm theory assumes that metals struck by positive ions emit electrons, whatever may be the energy of these ions. It follows from the latter that the cathode drop is due to the necessity of equil. between the ions which strike the cathode and the ions derived from gaseous mols., ionized by electrons emitted by the cathode. Tests to verify one or the other assumption have shown that the Starck theory must be abandoned, while that of Holm can serve as a starting point. E. M. S.

**Continuous spectrum x-rays from thin targets.** WARREN W. NICHOLAS. *Bur. Standards J. Research* 2, 837-70(1929).—The continuous radiation from thin Al and Au foils as anticathodes in x-ray tubes is analyzed by a crystal. The high-frequency limit of the continuous spectrum from an infinitely thin target consists of a finite discontinuity. The energy distributions on a frequency scale are approx. horizontal for Al and for Au and for  $\psi = 40^\circ, 90^\circ$  and  $140^\circ$ , where  $\psi$  = angle between

measured x-rays and cathode stream; this agrees with Kramer's, but not with Wentzel's theory. The intensities for these values of  $\psi$  are 3:2:1, resp. Observations do not support a supposed quantum process in which a single cathode ray, losing energy  $h\nu$  by interaction with a nucleus, radiates a single frequency,  $\nu$ , in the continuous spectrum, nor the "absorption" process assumed by Lenard. The synthesis of thick-target spectra from thin targets is discussed and empirical laws are formulated describing the dependence on  $\psi$  of thick-target continuous spectrum energy. A structure for the moving electron is proposed.

H. W. WALKER

**The complexity of the  $K\beta'$  line of x-ray spectra.** V. DOLEJŠEK AND H. FILČÁKOVÁ. *Nature* 123, 412-3(1929).—Earlier investigations appeared to show that the  $K\beta'$  line seemed to be distinguished only with certain compds. but D. and F. now show on various Mn compds. that such is not the case. In all cases studied the  $K\beta'$  line is readily distinguished. The line is studied for various elements and found to be a complex line and it is impossible to arrange it in the scheme of Bohr and Coster. The origin of the line is as yet unknown.

GEORGE GLOCKLER

**Determination of total absorption coefficients of different metals and organic compounds in the short wave-length x-ray region.** H. STUMPEN. *Z. Physik* 50, 215-27(1928).—The total absorption coeffs. for Cu, Ag, Al,  $H_2O$ , toluene, xylene, olein and stearic and palmitic acids have been detd. with radiation from Cu, Ag, Mo and W anticathodes. The wave-length range was from 0.1 to 0.7 Å. U. A Bragg spectrometer, with a calcite crystal, was used to obtain a monochromatic beam. Two opposed ionization chambers, only one of which was exposed to the x-radiation, were used. The second compensated the losses due to ionization of the air, which, because of the highly sensitive electrometer used, were not negligible. The results are presented in tables and photographs. The results for metals agree well with those of Allen and Richtmyer.

R. L. HERSHEY

**Diffraction of x-rays in liquids containing heavy atoms.** J. A. PRINS. *Nature* 123, 84(1929).—By means of the spectrograph devised by Coster and P. (C. A. 22, 4292) the diffraction patterns caused by heavy atoms in a soln. have been studied, the solvent being a liquid having such light atoms that diffraction from it may be neglected. Solns. of I ions in  $H_2O$ , and  $CCl_4$  and methylene iodide in  $C_6H_6$  were used. If the dissolved mols. are dispersed like mols. in the gaseous state the scattering at small angles should be greater than that for ordinary liquids. Such an effect was found for d<sup>1</sup> solns. For concd. solns. of I ions (KI and LiI) a reversal is found, scattering again decreasing with increasing concn. This cannot be explained by a geometrical close-packing, but may be due to electrostatic repulsion, as if the ions were much larger, causing an apparent close packing.

R. L. HERSHEY

**Method of determining the orientation of crystal axes by x-rays.** S. TAKEYAMA. Kyoto Imp. Univ. *Mem. Coll. Sci. Kyoto Imp. Univ.* 11A, 469-79(1928).—A V-shaped frame of Pb wires is placed on an ordinary rotating crystal spectrometer between the crystal and the plate and rotated with the crystal. The defining system is a long vertical slit producing vertical lines on the photographic plate. The positions of the shadows cast on these lines by the Pb wires, together with the knowledge of the diffracted wave length, permit the calcn. of the crystallographic axial orientation. The method is useful for thick crystals, for substances on the surface of thick materials and for microcrystals on metallic surfaces. Microcrystals on the polished surface of Cu have their (111) or (100) planes nearly parallel to the polished surface.

R. L. HERSHEY

**The intensities of x-ray diagrams of native cellulose.** K. R. ANDRESS. *Z. physik. Chem.*, Abt. B, 2, 380-94(1929).—An interpretation of the intensities of x-ray diagrams is given.

H. W. WALKER

**The fine structure of the normal scattered molybdenum  $K\alpha$  radiation from graphite.** D. COSTER, I. NITTA AND W. J. THIJSEN. Rijks Univ., Groningen. *Nature* 123, 442(1929).—The work of the authors confirms that of Ehrenberg (C. A. 23, 2360) disproving the contention of Davis and Mitchell (C. A. 23, 765) that the normal scattered radiation from x-rays should have a much more complicated structure than the primary radiation.

G. CALINGAERT

**Remark on the fine structure of the Compton effect.** MAURICE DE BROGLIE. *Compt. rend.* 187, 697(1928).—The results of Davis and Mitchell (C. A. 23, 765) lead to the conclusion that the continuous x-ray spectrum, diffused under the influence of an exciting pencil contg. all wave lengths, must show bands and in the curve of total absorption of an element vs. wave length a part of the absorption max. must be attributed to diffusion.

ALBERT L. HENNE

**Contributions to the method of crystal class determination.** A. HETTICH AND A. SCHLEERDE. *Z. Physik* 50, 249-65(1928).—X-ray examn. of crystals permits the

differentiation into only 11 of the 32 classes, i. e., into those having symmetry centers. This is due to the fact that the x-ray diffraction introduces an apparent symmetry center, whether such exists in the crystal or not. Further differentiation must depend upon some method of polarity study. H. and S. have used the high-frequency piezoelec. method of Giebe and Scheibe (*C. A.* 23, 3207) to investigate a no. of crystals, all systems being represented. The 11 crystal classes having symmetry centers naturally do not produce any effect. Thus it is possible to decide on the presence of a symmetry center. The static method of Meissner (*C. A.* 21, 3825) has been used on  $\text{NaClO}_3$ , cane sugar and tartaric acid. It is possible to explore a no. of crystallographic directions from a single point on the crystal. A diagrammatic representation of the polarity characteristics of each of the 32 classes is included. The expts. agree with this representation. Laue diagrams and a detn. of the polarity characteristics by Meissner's method permit a unique detn. of the crystal class.

R. L. HERSHEY

The angular distribution of Compton recoil electrons. D. SKOBEŁTYN. *Nature* 123, 411-2(1929).—Up to the present the intensity problem of the Compton effect has been left unsolved. There are 2 ways of exptl. test: the investigation of angular distribution of secondary quanta (scattered) radiation and the study of secondary electrons. In both cases decisive information may be obtained only by using  $\gamma$ -rays. The angular distribution of 1000  $\beta$ -ray tracks from a narrow beam of  $\gamma$ -rays filtered through 3.5 mm. of Pb has been detd. and is compared with theory. The angular distribution is definitely not in accord with the theory of Dirac (*C. A.* 21, 2599) and that of Gordon (*C. A.* 3542) but the formula of Klein-Nishina (*Z. Physik* 52, 853-68(1929)) is in good agreement with the present data. The discrepancies, however, exceed even in this case the probable statistical deviations.

GEORGE GLOCKLER

The Raman and infra-red spectra of carbon dioxide. C. R. BAILEY. *Nature* 123, 410(1929).—The results of Rasetti (*Nature* 123, 205(1929)) on the Raman lines in  $\text{CO}_2$  lead B. to consider the emission spectrum of  $\text{CO}_2$  in the infra-red (*C. A.* 22, 2887) as a system of bands which are themselves multiples of a fundamental frequency  $\nu_0 = 107 \text{ cm}^{-1}$ . The wave nos. of the individual bands are obtained by multiplying by  $N$  ( $N$  ranges from 12 to 64). At present it is difficult to see the underlying phys. significance of the results.

GEORGE GLOCKLER

A violation of the selection principle for the principal quantum number. SAKAE IDER. *Phys. Lab. Upsala, Sweden. Nature* 123, 643(1929); cf. Thibaud, *C. A.* 22, 3808.—Careful measurements in the L series and detn. of  $\nu/R$  for the 2 new lines of Ta, W, Pt and Au seem to indicate that the doublets found by Thibaud and Soltan (*C. A.* 22, 1098, 2713) are due to the transitions  $N_{IV}-N_{VI}$  and  $N_V-N_{VI,VII}$ . This would then be the first exptl. evidence of x-rays transitions within the levels of the same principal quantum nos.

G. CALINGAERT

Fine structure absorption edges in metals. B. B. RAY AND P. C. MAHANTI. *Nature* 123, 528-9(1929).—It is well known that when pure metals are examd. by x-ray absorption in general no fine structure edges are observed. If the fine structure edge is supposed to be due to the removal of an electron from the K shell to the various optical levels of the atom, then the non-appearance of the fine structure in metals can be explained by assuming that electrons in metals are free and there exist no definite optical levels in the atoms in the metallic state.

GEORGE GLOCKLER

Origin of the ultra-violet beryllium hydride band spectrum. E. BENGTSSON. *Nature* 123, 529(1929).—The carrier of the ultra-violet BeH band spectrum is shown to be the  $\text{BeH}^+$  mol. (cf. Watson, *C. A.* 23, 768).

GEORGE GLOCKLER

Spectral absorption of certain monoazo dyes. I. The effect of position isomerism on the spectral absorption of methyl derivatives of benzeneazophenol. WALLACE R. BRODE. U. S. Bur. Standards. *Bur. Standards J. Research* 2, 501-40(1929).—Azobenzene, benzeneazophenol, and all the possible mono- and di-Me derivs. of  $\text{PhN}_2\text{C}_6\text{H}_4\text{OH}$ , in which not more than 1 Me substitution occurs in a  $\text{C}_6\text{H}_5$  ring, have been prepd. and their absorption spectra studied, in EtOH, concd. HCl and 3% aq. NaOH as solvents. Similar effects to those observed on these dyes in NaOH as a solvent (*C. A.* 23, 2428) are shown in the alc. and HCl solns. in particular the  $p'$ -substitution increasing the absorption and the  $o'$ -substitution decreasing the absorption. A simple mathematical relation is shown to exist between the frequencies of the absorption bands observed in any one solvent. A more extended discussion of the component bands in NaOH is given.

WALLACE R. BRODE

Relations between the absorption spectrum and chemical constitution of azo dyes. II. Influence of position isomerism on the absorption spectrum of the nitro derivatives of benzeneazophenol, benzeneazo-*o*-cresol and benzeneazo-*m*-cresol. WALLACE R. BRODE. *Ber.* 61B, 1722-31(1928); cf. preceding abstract.—The absorp-

tion spectra of alc. solns. and of solns. in aq. NaOH of the nitro derivs. of benzeneazo-phenol, benzeneazo-*o*-cresol and benzeneazo-*m*-cresol were measured from the red to the ultra-violet (frequency interval from 400f to 1300f). The results, illustrated graphically show that the principal band of the *o*'- and *m*'-nitro derivs. of benzeneazo-phenol is accompanied by a second band of higher frequency; and that the principal band of these compds. in aq. NaOH appears to be double. A comparison of these results with those previously obtained for the Me derivs. (C. A. 23, 2428) shows that a shift of the bands to lower frequencies accompanies an increase in mol. wt. of the dye; that a marked increase in intensity of the principal band and a slight intensity decrease in the second band is effected by substitution of a nitro group in the *p*'-position, that substitution of the nitro group in the *o*'-position brings about a general decrease in intensity of the absorption without altering the positions of the bands. C. C. KIRSS

Near infra-red absorption spectra of some aldehydes, ketones, esters and ethers. JOSEPH W. ELLIS. Univ. of Calif. *J. Am. Chem. Soc.* 51, 1384-94 (1929).—The near infra-red absorption spectra (below  $2.5\mu$ ) have been recorded for a no. of aldehydes, ketones, esters and ethers. The observed absorption band (often doubled) between  $1.9$  and  $2.0\mu$  in all the carbonyl compds. studied is interpreted as the second overtone of the  $5.8\mu$  band which has been previously ascribed to the carbonyl group. There is evidence in some compds. for the third, fourth and fifth overtones of the  $5.8\mu$  band at  $1.45$ ,  $1.61$  and  $0.97\mu$ , resp. WALLACE R. BRODE

The line absorption of chrome alum crystals. H. SAUER. *Ann. Physik* 87, 197-237 (1928).—The line absorption of chrome alums of the type  $\text{RCr}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$  with K, Rb, Cs, Tl,  $(\text{NH}_4)$ ,  $(\text{NH}_4\text{OH})$  and  $(\text{NH}_4\text{CH}_3)$  as the univalent cation and of the type  $\text{RCr}(\text{SeO}_4)_2 \cdot 12\text{H}_2\text{O}$  with K, Rb, Tl and  $(\text{NH}_4)$  as cations has been measured at  $-190^\circ$ ,  $-78^\circ$  and  $+18^\circ$ , as has the continuous absorption of the K Cr alums at room temp. The wave-length range was from about 6200 to 6800 Å. U. The effects of different cations and of the substitution of  $(\text{SeO}_4)^{--}$  for  $(\text{SO}_4)^{--}$  are in general found in position and intensity changes of the absorption lines, with a const. characteristic appearance, so that the individual lines of the various alums may be related. CsCr and  $(\text{NH}_4\text{CH}_3)$  Cr alums are an exception; their lines correspond for themselves but not for the other alums, an effect probably due to lattice change. In the shorter wave-length range a regular equidistant line series is found, which may be explained as due to coincidence of lattice, electron and perhaps mol. vibrations, and which corresponds to a residual ray wave length of  $232\mu$ . Increasing temp. displaces the lines and continuous absorption toward longer wave lengths. The lines broaden proportionally to  $\sqrt{T}$ . A characteristic and intense doublet appears in most alums at about 6700 Å. U. The ratio of absorbing to total centers is  $3 \times 10^{-8}$  for the characteristic doublet; for the continuous absorption in the visible ultra-violet it has a max. of about  $10^{-3}$ . A not electrostatically bound, hompolar Cr- $(\text{H}_2\text{O})$  complex appears as the probable unit in causing the line absorption. R. L. HERSHEY

Line absorption spectra in solids at low temperatures in the visible and ultra-violet regions of the spectrum. S. FREED AND F. H. SPEDDING. *Nature* 123, 525-6 (1929).—Hund calcd. (C. A. 20, 144) the character of the most stable energy level of certain rare gas ions and their corresponding magnetic moments, assuming a certain arrangement of electron levels and the presence of the normal multiples coupling between the orbital and spin moments of the electrons. He assumed that the rare-gas ion was in the gaseous state and found beautiful agreement with magnetic data on the solids and their solns. This remarkable fact suggested to F. and S. that the absorption spectra of the rare earths might resemble the line spectrum of their ions in the gaseous state. They studied  $\text{GdCl}_3 \cdot 6\text{H}_2\text{O}$ ,  $\text{SmCl}_3 \cdot 6\text{H}_2\text{O}$  and  $\text{ErCl}_3 \cdot 6\text{H}_2\text{O}$  at various temp. down to liquid  $\text{H}_2$  temp. and found that the absorption spectra were made up of lines which became finer at lower temps. This work promises quant. information concerning the influences of neg. ions and water of crystn. on the various spectra. G. G.

The influence of adsorbed ions on the light absorption of heavy-metal halides. K. FAJANS AND G. KARAGUNIS. Chem. Lab. Bayer Akad. Wissenschaften, München. *Naturwissenschaften* 17, 274 (1929).—Previously extinction measurements on the light absorption by AgBr showed an influence of adsorbed Ag and Tl ions (cf. Fromherz, C. A. 22, 4381; C. A. 23, 3176). The influence of gelatin was negligible; similar effects were found for  $\text{PbI}_2$  in the presence of Pb ions, i. e., there is always an increase in extinction. These measurements were all made in the long-wave range but expts. were now performed with finely dispersed AgI (little scattering of light) on both sides of a max. of the absorption curve at  $420m\mu$ .  $\text{Ag}^+$  adsorbed on AgI causes an increase in absorption at all points up to 40%, 0.05 N  $\text{AgClO}_4$  being used. It is assumed that the light absorption is closely related to the photoelec. cond. and to the photochem. decompn.

of AgI. The adsorption complex  $(Ag_2I_2)Ag^+$  may be considered as an intermediary step in the soln. process of AgI in Ag salt solns. whereby complex ions,  $Ag_2I^+$ , are formed. The intermediary substance absorbs strongly; the end product,  $Ag_2I^+$ , however, absorbs practically no visible light, having a first absorption max. at  $245.5m\mu$  in the ultra-violet (Fromherz and Menschick, cf. following abstr.). Apparently a loosening up of the AgI lattice takes place first with considerable deformation of the I shell and increased absorptive ability; later a closing of the electron shield of I constitutes the second phase of the soln. and assocn. process.

B. J. C. VAN DER HOEVEN

Optical relations between alkali halide phosphors and complex salt solutions. H. FROMHERZ AND W. MENSCHICK. Chem. Lab. Bayer Akad. Wissenschaften, München. *Naturwissenschaften* 17, 274-5(1929).—Alkali halide phosphors are formed by the incorporation of traces of heavy metal ions (Ag, Cu, Pb, Tl) in the lattice of alkali halide crystals. For the excitation absorption bands in the ultra-violet are necessary which closely resemble those of the pure admixt. but are of a peculiar sharpness (cf. Pohl, C. A. 22, 3356, 4371), for which a special chem. condition is suggested to be responsible. If this condition consists of the coöperation of a strongly deformed cation (heavy metal, not an inert gas-like one) with a deformable anion (halide) an analog of this condition is found in concd. solns. of heavy-metal halides with alkali metal halides. With the solns. the result of the interaction will be the assocn. to complex ions ( $AgCl_2^-$ ,  $CuCl_3^{--}$ , etc.). The absorption spectra of these complex ions were therefore compared with those of the alkali halide phosphors investigated by Smakula (C. A. 22, 193) and by MacMahon (C. A. 23, 766). For the solns. the extinction curve by the pure alkali halide was graphically subtracted from the total one to give that of the complex only. It was found that in shape, position and sharpness the bands of both systems agree; those of the solns. are shifted 6 to  $10m\mu$  towards the red (pure alkali halide solns. show a  $30m\mu$  red shift as compared with their spectrum in cryst. form). From the ratio of intensities of absorption it is derived that only 0.2 to 2% of the heavy metal in the crystal lattice is optically active. The curves given are of NaCl + 0.6% Ag and of KCl + 1.0% Cu in crystal form; the corresponding ones in intensity are of solns. of NaCl + AgCl ( $c = 1.41 \times 10^{-3}$  mol. per l.) and KCl + CuCl ( $c = 1.95 \times 10^{-3}$  mol. per l.).

B. J. C. v. d. H.

Color and optical anisotropy of organic compounds. C. V. RAMAN. *Nature* 123, 494(1929).—From the study of scattering of light done at Calcutta R. deduces the following generalization: The types of mol. structure of Ca compds. which favor the development of color are those which exhibit an exceptionally high degree of optical anisotropy.

GEORGE GLOCKLER

Hyperfine structure in the arc spectrum of cesium and nuclear rotation. D. A. JACKSON. *Proc. Roy. Soc. (London)* A121, 432-47(1928).—The arc spectrum of Cs was investigated to det. if any of its lines possessed hyperfine structure, resulting from a nuclear magnetic moment, due to quantized nuclear spin. The lines belonging to the principal series would, because of the greater degree of penetration of the electron in the  $1s$  or  $6i$  orbit, and the correspondingly greater interaction, show the greatest effect. The lines of the principal series are very easily broadened if the vapor pressure of the metal becomes high, so that great care had to be used in obtaining the spectrum of Cs at a sufficiently low temp. The most satisfactory method of excitation was the application by means of external electrodes of a very high-frequency a. c. to a tube of Heat about 2-mm. Hg pressure contg. a small quantity of Cs. The lines belonging to the principal series were very close doublets with very nearly const. frequency differences. The measurements were made from spectrograms obtained with grating or prismatic spectrographs in conjunction with Fabry and Perot interferometers with 2.5-5-, 10- or 20-mm. etalons. The frequency differences in  $cm^{-1}$  for the 6 lines constituting the first 3 pairs of the principal series are  $0.315 \pm 0.003$  for  $1S - 2^2P_{1/2}$ ,  $0.294 \pm 0.001$  for  $1S - 2^2P_{3/2}$ ,  $0.308 \pm 0.003$  for  $1S - 3^2P_{1/2}$ ,  $0.300 \pm 0.003$  for  $1S - 3^2P_{3/2}$ ,  $0.305 \pm 0.010$  for  $1S - 4^2P_{1/2}$  and  $0.299 \pm 0.005$  for  $1S - 4^2P_{3/2}$ . A theory is worked out which explains the origin of these doublets, assuming a nuclear spin of one-half quantum; by correlating the difference in sepn. of the hyperfine structure doublets in the  $1S - m^2P_{1/2}$  lines and the  $1S - m^2P_{3/2}$  lines, it is shown that a ratio of the magnetic to the mech. moment of the nucleus about twice as great as the corresponding ratio for the electron would account for the observed frequency differences. The results are compared with those found for the hyperfine structure of some of the Bi lines by Back and Goudsmit, and are found to be in satisfactory agreement. A selection principle is found which applies to the Bi and the Cs spectrum.

W. F. MEGGERS

The arc spectrum of samarium. Measurements made at normal pressure between  $\lambda = 2750$  A. U. and  $\lambda = 2200$  A. U. S. PIÑA DE RUBIES. *Compt. rend.* 188, 1101-2(1929).—The list of new lines published for Sm (cf. C. A. 23, 2654) is extended

in the ultra-violet. The wave lengths of about 150 faint new lines range from 2748.73 to 2284.98 A. U. W. F. MEGGERS

The intensities of some  $\text{Fe}^+$  multiplets in the arc and chromosphere spectra. WM. CLARKSON. *Phil. Mag.* [7], 7, 98–105 (1929).—Results of intensity measurements of the multiplets  $2^4\text{F} - 2^4\text{F}'$  and  $2^4\text{F} - 2^4\text{D}$  for ionized Fe, for an Fe arc, and for the chromosphere ("flash" spectrum) show similar wide divergencies from theoretical intensities of individual lines. One line in each multiplet is particularly abnormal. Comparisons of multiplet summations show (1) the multiplet summation rules apply in the case of ionized Fe, as in Ni and Co, only when extended to the total sums of the 2 multiplets; (2) the arc is free from self-absorption and thus gives fundamental line intensities, while the flash sums demonstrate self-absorption. The flash arc relation was found to be linear but the 2 very abnormal lines lie off this curve. L. H. REYERSON

An analysis of the arc and spark spectra of yttrium (Yt I and Yt II). WM. F. MEGGERS AND HENRY N. RUSSELL. *Bur. Standards J. Research* 2, 733–69 (1929).—This paper presents an almost complete classification of the spectra emitted by the neutral and singly ionized atoms of Yt, and a partial classification of lines emitted by the doubly ionized atom. In Yt III the term  $4^2\text{D}$ ,  $5^2\text{S}$ ,  $5^2\text{P}$ ,  $6^2\text{S}$ ,  $5^2\text{D}$  and  $4^2\text{F}$  have been found. The terms of Yt II belong to the singlet and triplet systems,  $1\text{S}_0$  coming from  $s^1$ , being lowest. In Yt I the terms belong to the doublet and quartet systems, with  $1\text{D}$ , coming from the electron configuration  $(5s)^24d$ , lowest. The identifications of many of the terms have been established by Zeeman effects. In all 3 spectra terms which form series have been found, and from these the following ionization potentials have been calcd.: 6.5 v. for the neutral atom; 12.3 v. for  $\text{Yt}^+$ ; and 20.6 v. for  $\text{Yt}^{++}$ . In all, 448 lines of Yt I, 223 of Yt II, and 10 of Yt III have been classified. C. C. K.

The arc spectrum of silicon. A. FOWLER. Imperial Coll. of Science and Technology, London. *Proc. Roy. Soc. (London)* A123, 422–39 (1929).—New wave lengths of Si I have been obtained with a vacuum grating spectrograph down to 1600 A. U. in the Schumann region. These, together with those of longer wave length previously detd., were made the basis of an analysis of the term structure of the arc spectrum. The deepest term is  $3^2\text{P}$  coming from the configuration  $s^2p^2$ . The other terms which have been found are triplets and singlets and are in accord with those required by Hund's theory. Several series of terms have been established from which the value  $65765 \text{ cm.}^{-1}$  is derived for  $3^2\text{P}_0$ . This gives an ionization potential of 8.12 v. for the neutral Si atom. A comparison of the structure of Si I with P II shows a close similarity between the two. Comprehensive tables contain the details of the investigation. C. C. KIESS

The spectrum of doubly ionized nitrogen (N III). L. J. FREEMAN. *Proc. Roy. Soc. (London)* A121, 318–43 (1928).—The spectrum of doubly ionized N has been photographed from 8000 to 850 A. U. by using condensed discharges in vacuum tubes contg. N. The lines of N III have been distinguished from those of other stages of ionization by comparing the relative intensities of the lines under various conditions of discharge. The wave lengths corresponding to 154 lines have been measured; they range from 979.9 A. U. to 6487.55 A. U. Most of these lines have been classified, 100 in the quartet system and 20 in the doublet system. No intercombinations between doublet and quartet terms have been found but approx. values for the deepest term of each were derived from successive terms fitting a Rydberg formula. Thus the abs. values for the ground term  $3^2\text{P}_{1,2}$  are 384088.4 and 383914.0, while the lowest quartet level identified is about 163078.3 which should be increased by about 58,000 to bring it to the same zero as the doublet term. The lowest of the quartet terms has not yet been evaluated; by analogy with the doublet terms, it seems probable that it should lie near 380,000. W. F. MEGGERS

A preliminary report on the measurement of the  $\text{K}_\alpha$  line of carbon. CARL E. HOWE. *Proc. Natl. Acad. Sci.* 15, 251–3 (1929).—The wave length of the  $\text{K}_\alpha$  line of C has been measured by others; the values range from 44.9 A. U. to 45.5 A. U. New measurements are now made from spectrograms made at grazing incidence from a ruled grating in a vacuum spectrograph. The mean of 14 detns. is  $44.60 \pm 0.04$  A. U. W. F. MEGGERS

Separation of various spark spectra of antimony. R. SOULILLOU. *Compt. rend.* 188, 1103–4 (1929).—The electrodeless discharge which with a large no. of elements has been found useful in identifying groups of lines belonging to successive stages of ionization is employed for a similar purpose with Sb. Between 3800 and 1900 A. U. nearly 300 lines have been recorded and these are divided among Sb II, Sb III and Sb IV spectra. The wave lengths for 40 lines (3719.60 to 2054.01 A. U.) of Sb II, 17 lines (3738.58 to 2479.17 A. U.) of Sb III, and 19 lines (3687.01 to 2076.37 A. U.) of Sb III are presented. W. F. MEGGERS

**The continuous spectrum of the hydrogen tube.** D. CHALONGE AND M. LAMBREY. *Compt. rend.* 188, 1104-6(1929).—Investigation of the continuous spectrum from H between 2200 and 4500 A. U. shows that (1) as the pressure increases the intensity of the continuous spectrum passes through a max. between 2 and 3 mm.; (2) for a given pressure the intensity increases with current but the distribution is not sensibly modified by change in current; (3) the spectral distribution of energy emitted by tubes of different designs differs extremely little; (4) the intensity as compared with that of a C arc is about 2.1 at  $\lambda 4400$  and 23.0 at  $\lambda 2200$ . These features suggest the possible use of radiating H tubes as intensity standards in the ultra-violet. W. F. MEGGERS

**The structure of the band spectrum of helium.** V. W. E. CURTIS AND A. HARVEY. *Proc. Roy. Soc. (London)* A121, 381-401(1928); cf. C. A. 22, 1910.—The details and analysis of 5 new  $\text{He}_2$  bands are given. One of these is a weak vibrational band assoc. with the known band near 5730 A. U. ( $3D \rightarrow 2P$  of  $\text{He}_2$ ). Another is the  $\text{He}_2$  counterpart of the  $\text{He}$  band designated  $3X \rightarrow {}^3P$ . The remaining 3 have  ${}^3P$  as the final electronic level and a new type of level (Z) as initial. It is rotationally single like S and X but the rotation terms cannot be represented by the usual type of formula, nor are the relative intensities of the branches at all similar to those in other bands. In consequence of the abnormal character of the initial level the appearance of the Z - P bands is very peculiar; the wave nos. of the R branch, e. g., decrease continuously with increase of rotational quantum no., thus giving it the appearance of a P branch. Two perturbations are recorded in these bands, one a large displacement and the other a splitting into 2 components of about equal intensity. The Zeeman effect has already been found to be very unusual in magnitude and character for the  $4Z \rightarrow 2P$  band. The X and Z levels are clearly addnl. to the ordinary at. system of levels, and evidence is discussed which leads to a tentative identification of them with certain new types predicted by Hund for diatomic mols. but not hitherto definitely established by observation. Although the chief properties of the new bands may readily be accounted for on this view, several unexplained peculiarities remain, such as the absence of Q branches in  $X \rightarrow P$  transitions and the relative intensities of the branches in Z - P transitions. W. F. MEGGERS

**A study of the helium band spectrum.** SUNAO IMANISHI. *Sci. Papers Inst. Phys. Chem. Research (Tokyo)* 10, 193-209(1929).—Improvements in the technic of producing the band spectrum of  $\text{He}_2$  have made it possible to obtain good spectrograms for the region 3000 A. U. to 7000 A. U. in the first 4 orders of a 15-foot concave grating with exposures of 4 to 10 hrs. Some of the results for bands between 3180 A. U. and 3570 A. U. are given. Three new bands at 3356, 3367 and 3564 A. U. are found, and extensions are made to other series. W. F. MEGGERS

**The Fulcher bands of hydrogen.** IAN SANDERMAN. *Proc. Roy. Soc. Edinburgh* 49, 48-64(1929).—The band spectrum of  $\text{H}_2$  presents a problem of peculiar interest since our knowledge of mol. spectra cannot be said to be satisfactory until the spectrum emitted by the mol. of the lightest element has been elucidated. The first advance was made in 1913 when Fulcher discovered the 2 triplet and 4 singlet series commonly called the "Fulcher bands" interpreted as due to changes in rotational energy of the emitting mol. The Fulcher triplets are the first 3 members of series spaced according to a parabolic law, and the hypothesis has been advanced that these series are due to rotational changes in the mol. while the spacing of the triplets themselves was traceable to changes in vibrational energy. This hypothesis recently received striking confirmation in the work of Richardson (C. A. 20, 2949, 21, 705), who has shown the existence of the complete band analog of the Balmer series in the secondary spectrum of H. However, the new and more accurate measurements by Gale, Monk and Lee, while strongly confirming Richardson's allocation of the Q branches, have failed to yield confirmation of the remaining branches which he gives. The present paper gives a no. of combination relations which have been found to hold between the lines of the Fulcher bands. These indicate that there are 3 main branches in each band, designated R', Q, and P' branches, the Q branch being identical with that of Richardson. The R' and P' branches have a common initial level differing from that of the Q branch, while all 3 branches have a common final level. W. F. MEGGERS

**The Fulcher bands of hydrogen.** IAN SANDEMAN. *Nature* 123, 410-11(1929) — S. inquires how the Fulcher bands of  $\text{H}_2$  fit into the new wave mechanics and in particular detcs. the const.  $\sigma$  in the term form  $B(j(j+1) - \sigma^2)$ . An analysis of the bands shows that the terms fit this form provided the quantum no.  $j$  is given integral values. The further consequences of this relation are discussed in terms of modern band analysis. GEO. GLOCKLER

**The band spectrum of fluorine.** H. G. GALE AND G. S. MONK. *Astrophys. J.*



69, 77–102(1929); cf. *C. A.* 22, 4062.—The principal bands of  $F_2$  are photographed with a grating of large dispersion (2.63 Å./mm.); the new measurements show that the bands consist of *P*, *Q* and *R* branches with alternate weak and strong lines in each branch. The *Q* branch is about twice as strong as the *P* and *R* branches. Two of the strongest bands, whose null points lie at  $\nu_0 = 16378.8$  and  $\nu_0 = 17439.5$ , have been completely analyzed, and three fainter bands at  $\nu_0 = 15337.6$ ,  $\nu_0 = 17075.9$  and  $\nu_0 = 18548.4$  partly analyzed. There are strong perturbations in all the bands in both frequency and intensity which have hitherto masked their true character. These perturbations are in the initial state. The analysis of the bands yields the following values of the moments of inertia for the initial and final states of the  $F_2$  mol. and the internuclear distances, resp.,  $I'_0 = 34.2 \times 10^{-40}$ ,  $I_0'' = 26.0 \times 10^{-40}$ ,  $\gamma'_0 = 1.48 \times 10^{-8}$  cm.,  $\gamma_0'' = 1.28 \times 10^{-8}$  cm. The structure and intensity relations indicate that the bands are of the  $^1S - ^1P$  type. A ratio of intensities of strong to weak lines within a branch of 3:1 indicates a nuclear spin of  $1/2(h/2\pi)$ ; the best plots show this intensity ratio to be at least 3:1 and probably greater (cf. *C. A.* 22, 4062). W. F. MCGEES

The spectrum of hydrogen. The bands analogous to the parhelium line spectrum. II. O. W. RICHARDSON AND P. M. DAVIDSON. King's College, London. *Proc. Roy. Soc. (London)* A123, 466–88(1929); cf. *C. A.* 23, 2096.—Details are presented of a third system of  $H_2$  bands which originate in the electronic levels with principal quantum no. 3, the other 2 systems having been previously described (*C. A.* 23, 2883). These new bands are designated as the  $3^1A \rightarrow 2^1S$  system and are characterized by strong *P* branches, weak *R* branches, and the absence of *Q* branches. The lines show no Zeeman effect. Coming from the electronic levels with principal quantum no. 4 are 5 band systems denoted by  $4^1A \rightarrow 2^1S$ ,  $4^1B \rightarrow 2^1S$ ,  $4^1C \rightarrow 2^1S$ ,  $4^1X \rightarrow 2^1S$ , and  $4^1E \rightarrow 2^1S$ . These bands, consisting of *P* and *R* branches, start in the ultraviolet between 3620 and 3700 Å. U. and include nearly all the strong lines in that region of the spectrum. By coordinating the 4-quantum systems with the proper 3-quantum systems it is possible to represent the  $\nu_0$  lines by a Rydberg formula, thereby evaluating the electronic terms and making possible the calcn. of the ionization potential of the  $H$  mol. By the formulas of the old quantum mechanics an ionization potential of 15.381 v. is derived for  $H_2$ , and 15.235 v. by the wave mechanics. These values, however, give practically the same value, 4.465 v., for the heat of dissocn. of  $H_2$ . C. C. KRESS

Titanium oxide bands in the orange, red and infra-red region. F. LOWATER. Coll. of Science, South Kensington. *Nature* 123, 644(1929).—Bands in the region of  $\lambda 5600$  to  $\lambda 8000$  have been analyzed into at least 2 systems, distinct from that of the blue-green region, previously analyzed by Birge and Christy (*C. A.* 22, 4063, 4369). One of these in the orange is a singlet system due to the electronic transition  $^1P - ^1S$ , the other a triplet system in the red and infra-red due to the transition  $^3S - ^3P$ . Of the former only 1 sequence has been found; of the latter, 4 have been detd., namely, the (0,1), (9,0), (1,0) and (2,0), the  $\Delta\nu$  sepns. of the triplet heads of the (0,0) sequence being 66.7 and 74.6  $cm^{-1}$ , resp. The mol. const. detd. from the vibrational analysis of the triplet system show that in the final state the vibrational frequency of the rotationless mol. with infinitesimal amplitude of vibration is the same as that in the blue-green system, and that thus their final energy level,  $^3P$ , is the same. Further, since the sepns. of the triplets of red-infra red system pertains to this final level, it pertains also to the final level of the blue-green system. Analysis of the other bands found in the red is in progress. G. CALINGAERT

A new band system of carbon monoxide ( $3^1S \rightarrow 2^1P$ ), with remarks on the Ångström band system. R. C. JOHNSON AND R. K. ASUNDI. King's College, Univ. of London. *Proc. Roy. Soc. (London)* A123, 560–74(1929).—A new system of four CO bands has been observed with heads at 3680, 3893, 4125 and 4380 Å. U. These bands, consisting of *P*, *Q* and *R* branches, represent the electronic transitions  $3^1S \rightarrow 2^1P$ , and have a structure similar in every respect to the Ångström system which results from the transition  $2^1S \rightarrow 2^1P$ . Detailed analyses of the fine structure are given for the (0,1), (0,2) and (0,3) bands of the new system, and also for the 4511 and 4123 Å. U. bands of the Ångström system. From the analyses the const. of the  $3^1S$ ,  $2^1S$ , and  $2^1P$  levels of the CO mol. have been detd. These data, including the moments of inertia and the nuclear sepns. of the mol. in the different energy states, are presented in a table. C. C. KRESS

The absorption band spectrum of chlorine. A. ELLIOTT. *Proc. Roy. Soc. (London)* A123, 629–44(1929).—New wave-length measurements have been made of the absorption bands of  $Cl_2$  obtained by passing white light through a one-meter column of the gas at 1 atm. The bands consist of *P* and *R* branches and are due to the mol.  $Cl_{35}Cl_{35}$  and  $Cl_{35}Cl_{37}$ . In the mol. with equal nuclear masses the band lines show an alterna-

tion in intensity, which is not present in the bands of the non-sym. mol.  $\text{Cl}_2\text{Cl}_{17}$ . The analysis of these bands according to the usual procedure gives data for the rotational consts., moments of inertia, and internuclear distances of the mols. From these it is seen that absorption of a quantum of energy expands the normal  $\text{Cl}$  mol. considerably; and that although the sym. and non-sym. mols. have different moments of inertia yet their internuclear seps. are the same. C. C. KIESS

The photographic measurement of the relative intensities of the  $L_{\alpha_1}, \alpha_2, \alpha_3$  lines of silver. H. C. WEBSTER. Univ. of Melbourne. *Proc. Phys. Soc. (London)* **41**, 181-91(1929).—The relative intensities of the  $L_{\alpha_1}, \alpha_2, \alpha_3$  lines of Ag were detd. by a method of photographic photometry. Although it is difficult to deduce intensities of x-rays from the blackening produced in the photographic emulsion, yet the photographic method gives a permanent record and makes it possible to get results for weak lines because the photographic effect is cumulative. The intensity of an x-ray line of frequency  $\nu$  is defined as the no. of quanta of characteristic radiation of this frequency which proceed per sec. from the anticathode of the tube. By measuring, with a Moll microphotometer, the densities of the Ag lines produced by a vacuum spectrograph, for different exposure times, the following intensity ratios were found:  $L_{\alpha_1}:L_{\alpha_2} = 100:12.0$ ;  $L_{\alpha_1}:L_{\alpha_3} = 100:4.6$  to  $100:7.3$  according to tube voltage. Not so accurate is the value of the ratio 100:40 found for  $L_{\alpha_1}:L_{\beta_1}$ . C. C. KIESS

Spark satellites of the  $L_{\alpha}$  lines of silver. H. C. WEBSTER. Univ. of Melbourne. *Proc. Phys. Soc. (London)* **41**, 192-3(1929).—Four spark satellites of Ag were observed on the hard side of  $L_{\alpha_1}$  on photographs obtained with a vacuum spectrograph. Their wave lengths in X units detd. with reference to  $L_{\alpha_2}$  are:  $\alpha'_2, 4134.7$ ;  $\alpha'_1, 4130.5$ ;  $\alpha''_2, 4125.6$ ;  $\alpha''_1, 4119.0$ . C. C. KIESS

Excitation of mercury vapor by the resonance line. LORD RAYLEIGH. *Nature* **123**, 488(1929); cf. *C. A.* **22**, 4065.—The light emitted by Hg vapor which has been excited by 2537 is this same light, i. e., simply resonance radiation. In the expts. with a blast of vapor with air at 9 mm. in the tube its source can be observed as sepd. in space from the source of the continuous bands, which are doubtless of mol. origin. However, *in vacuo* the resonance radiation itself can be observed a considerable distance from its origin. This would show that the interval between excitation and emission is under some conditions enormously longer than  $10^{-7}$  secs., as usually assigned. If so, many views held at present will need revision. GEORGE GLOCKLER

Optical determination of the heat of dissociation of salt vapors. G. H. VISSER. *Physica* **9**, 115-8(1929).—The heats of dissocn. of NaBr, LiF and LiBr were detd. by the optical method of Terenin (*C. A.* **20**, 2788; **21**, 3833) in which  $\lambda_m$  of fluorescence light of a salt vapor  $MX$  irradiated with monochromatic ultra-violet light of limiting  $\lambda_p$  is related by  $h\nu_p = D + h\nu_m$  ( $D$  is heat of dissocn.). From the limiting  $\lambda_p$  which gives fluorescence, a high-powered spectroscopic and monochromatic metal spark light being used,  $D_{\text{opt}} = 82.6 \pm 1.5, 78.4 \pm 2.5, 96.7 \pm 1.4$  cal. as compared with thermochem. data of 90.45, 71.25 and 87.06, resp., for the 3 salts. The agreement, especially for the first 2 salts, is considered reasonable. Addnl. work, however, on TII vapor, previously studied by T., showed that contrary to his observations  $\lambda_p$  changes with temp. and pressure of the salt vapor and all 3 Zn lines (2034, 2064 and 2100) gave fluorescence as shown from a spectrophotogram. From one photogram  $D = 48$  cal. for TII would follow; Terenin's value is 61.1 cal.; the thermochem. value is 58.5 cal., which indicates the inadequacy of the method. At the same time the observations clear up the inconsistency of differences in absorption and emission spectrum of TII found by Terenin with regard to their temp. and pressure influence. B. J. C. VAN DER HOEVEN

The formula for the optical dispersion of quartz. T. BRADSHAW and G. H. LIVENES. Univ. College, Cardiff, Eng. *Proc. Roy. Soc. (London)* **A122**, 245-50(1929).—A review of the various formulas for optical dispersion of quartz is given, many of which have no theoretical significance, while those that do, show deviations in parts of the spectrum. Lowry's latest and most accurate formula,  $\omega = [9.5639/(\lambda^2 - \lambda_1^2)] - [2.313/(\lambda^2 - \lambda_2^2)] - 0.1905$ , where  $\lambda_1^2 = 0.0127493$  and  $\lambda_2^2 = 0.000974$ , is compared with that derived by the authors, which is,  $\omega = [845.694/(\lambda^2 - \lambda_1^2)] - [0.40235/(\lambda^2 - \lambda_1^2)^2] - [838.4320/(\lambda^2 - \lambda_2^2)] - [0.13331233/(\lambda^2 - \lambda_2^2)^2] + [43.05794/(\lambda^2 - \lambda_3^2)] + [2119.117/(\lambda^2 - \lambda_3^2)^2]$ , where  $\lambda_1^2 = 0.01274912$ ,  $\lambda_2^2 = 0.01208000$  and  $\lambda_3^2 = 80$ . The latter formula is slightly more satisfactory than any so far proposed in agreeing with observed data and also provides an explanation of the practically const. effect of the infra-red band. Instead of introducing a new band in the extreme ultra-violet it has only been necessary in this formula to split the old single band into a close doublet. It appears possible to improve the formula when better exptl. accuracy makes it advisable. RAYMOND H. LAMBERT

**Zeeman effect in the spectrum of argon (A II).** C. J. BAKKER, T. L. DE BRUIN AND P. ZEEMAN. *Z. Physik* 52, 299-300(1928).—Slight deviations from the g-sum rule of Landé are corrected (cf. C. A. 23, 38). GEO. GLOCKLER

**The Zeeman effect in the spectrum of ionized argon (A II).** C. J. BAKKER, T. L. DE BRUIN AND P. ZEEMAN. Univ. Amsterdam. *Verslag Akad. Wetenschappen Amsterdam* 37, 562-81(1928).—See C. A. 23, 38. B. J. C. VAN DER HOEVEN

**Retardation of the green fluorescence of mercury vapor.** STEFAN PIENKOWSKI. *Bull. intern. acad. polonaise* 1928, 241-56; cf. C. A. 22, 3097; 23, 337.—By means of the app. previously described, it is detd. that the period of lag in the green fluorescence of Hg which has been excited by ultra-violet rays from Al is of the order of  $10^{-6}$  sec. and diminishes with increase in density of the vapor. Microphotometric curves show that the intensity of luminescence increases from the moment optical excitation starts until it reaches a max. in a period which increases inversely with the density of the vapor ( $4.7 \times 10^{-5}$  to  $1.5 \times 10^{-5}$  sec.). The rate of increase of intensity and rate of extinction increase with the vapor density. These facts confirm the theory that in the green luminescence of Hg a modification of the mol. of this metal takes place because of short wave excitation which causes it when leaving the state of purely optical excitation (incapable of fluorescence) to enter a new state which produces green fluorescence under mol. impacts. C. H. PEET

**Remarks on an ultra-violet luminescence of calcium oxide and calcium sulfide caused by x-rays.** E. RUMPF. *Ann. Physik* 87, 590-4(1928).—An ultra-violet luminescence first found in taking x-ray spectrograms of CaO and CaS has been studied. Two bands appear from CaO; the stronger has a max. between 345 and 375  $m\mu$ , and the weaker has a max. between 320 and 330  $m\mu$ . It is probably due to impurities; the voluntary addn. of traces of Cu and Mn produce wider bands. The luminescence from CaS is about 10  $m\mu$  greater in wave length and much weaker than that from CaO. R. L. HERSHEY

**The formation of phosphorescence centers in calcium sulfide.** F. BANDOW. Heidelberg. *Ann. Physik* 87, 469-508(1928).—The effects of various additions to CaS phosphors have been examd. The studies on  $\text{CaSCu}\alpha$ ,  $\text{CaSMn}\alpha$  and  $\text{CaSBi}\alpha$ , showed that for CaS phosphors as ordinarily produced, the addn. of fluoride is necessary to obtain the max. phosphorescence for a given metal content. The necessary fluoride content for max. phosphorescence decreases with decreasing metal content. Phosphors whose basic material is CaS only have been examined. They show, without additions, the max. phosphorescence obtainable from ordinary sulfides with the sufficient fluoride content. The explanation of the fluoride effect must include some effect upon the heavy-metal atoms. The assumption that the no. of separable electrons per metal atom is changed by the fluoride and not the no. of centers seems to agree best with the facts. Since phosphors having only CaS as a base show the full phosphorescence, it is obvious that the  $\text{CaSO}_4$  content of the usual sulfides hinders the electron sepn. R. L. HERSHEY

**Increase of energy with elementary processes.** H. BRUTLER AND B. JOSEPHY. Kaiser Wilhelm Inst., Berlin. *Z. physik. Chem., Abt. A*, 139, Haber Bd., 482-96(1928); cf. C. A. 22, 1096, 4363, 4369, 4376.—By choosing the right conditions the process is observed that on collision of 2 activated atoms one takes up the combined amt. of energy. The reactions  $\text{Na} + \text{HgCl}_2$ ,  $\text{Na} + \text{Cl}_2$  and  $\text{K} + \text{Cl}_2$  give a typical intensity increase in the spectrum of Hg. The max. is twice the energy of the nascent particles. In the last 2 reactions at. Hg has been mixed in. The heat of formation of 4 mols. of NaCl is needed for the "exciting" of 1 atom of Hg. E. SCHOTTE

**The photochemical reaction between mercury vapor and oxygen.** W. ALBERT NOYES, JR. Univ. Chicago. *Z. physik. Chem., Abt. B*, 2, 445-8(1929); cf. C. A. 22, 2717.—The results obtained in the action between O and excited Hg atoms by N, do not differ greatly from those obtained by Leipunskii and Sagulin (C. A. 23, 1054), but the interpretation of the mechanism of the reaction by the latter is shown to be doubtful from energy considerations. The decrease in pressure during the action is probably due to the formation of  $\text{O}_3$  and to the action of  $\text{O}_3$  with the Hg vapor to form  $\text{HgO}$ . On the basis of exptl. facts a series of reactions is formulated which may explain the mechanism of the action, but a final decision is withheld. H. F. JOHNSTONE

**Absorption spectrum and decomposition of hydrogen peroxide by light.** H. C. UREY, L. H. DAWSEY AND F. O. RICE. *J. Am. Chem. Soc.* 51, 1371-83(1929).—With a H discharge light source, a continuous absorption spectrum was observed for  $\text{H}_2\text{O}_2$ , with no indication of any structure. The absorption begins at 300  $m\mu$  and extends toward the ultra-violet to the limit of the app. used. There was no difference in the absorption of the liquid and vapor states. From the absorption data and the emission spectrum, the decompn. of  $\text{H}_2\text{O}_2$  is shown to be;  $\text{H}_2\text{O}_2 + h\nu = 2\text{OH}$ . W. R. B.

The effect of temperature in retarding the photochemical reactions of colored solutions in benzene. N. ZCHODRO. Inst. of Physics and Biophysics. *J. chim. phys.* 26, 178-81(1929).—Increase of temp. diminishes the rate of decoloration of benzene solns. colored by cyanine and gallocyanine. White light was used, and the course of the reaction followed by means of a spectrophotometer at 15°, 32° and 45.5°. A theoretical explanation is given. MALCOLM DOLE

The chemical effects of x-rays. ST. REINER. Duisburg. *Z. angew. Chem.* 42, 77-8(1929).—Expts. on the base exchange in zeolites under x-ray radiation show that metals may be introduced into desmine, under radiation, which ordinarily do not give rise to base exchange in their salt solns. alone. R. L. HERSHEY

The x-ray photolysis of hydrogen peroxide. ORRO RISSE. Tech. Hochschule, Stuttgart. *Z. physik. Chem., Abt. A*, 140, 133-57(1929); cf. *C. A.* 22, 3841.—The effect of concn. on the x-ray photolysis of  $H_2O_2$  soln. by unfiltered W radiation was investigated in the range 0.001 *M* to 0.25 *M* and an empirical curve obtained. At very low concns. the quantity decompd. varies linearly with the product of intensity and time, and the reaction velocity is practically independent of the concn.; while at high concns. the velocity equation for a monomol. reaction holds fairly well. Since the observed data over the whole range do not fit the equations for mono-, bi-, or tri-mol. reactions, it appears that the reaction is a complicated one, probably involving the action of the  $H_2O$ . The cond. of pure  $H_2O$  changes from 1.5 to  $2.28 \times 10^{-6}$  reciprocal ohms, and the  $p_H$  from 6.0 to 7.0 under intensive radiation from x-rays.  $H_2O_2$  is formed quantitatively in amts. corresponding to the  $O_2$  absorbed in the  $H_2O$  and is absent if the air is completely removed from the  $H_2O$  previously by boiling. There is a continuous increase of the acidity up to 0.5-1% and an increase in the sp. cond. to twice its original value even when the atm. gases are removed. The increase of acidity is greater with ultra-violet light, but in that case there is no formation of  $H_2O_2$  in  $H_2O$  satd. with  $O_2$ . It is formed, however, if  $ZnO$  is present. This shows that the activation of the  $O_2$  is a necessary condition for the formation of  $H_2O_2$  by x-rays. In distinction to its spontaneous decompn. by ultra-violet light  $H_2O_2$  gives off when decompd. by x-rays a combustible gas mixt. with the  $O_2$  in amts. of 1.5-2% of the total gas evolved. This may be  $H_2$ , but its identity was not proved. The formation of at. H and O could not be demonstrated. The temp. coeff. of the x-ray reaction at about  $1/60^\circ N$  was equal to one between 2° and 50°. Strong alkalis and acids limit the decompn. Energy considerations show that in very dil.  $H_2O_2$  solns. about 70 kg.-cal. is necessary for the complete decompn. of one mol.; but this value becomes less with increasing concn. A. W. KENNEY

The action of x-rays on ferrous sulfate solutions. HUGO FRIEKE and STERNE MORSE. *Phil. Mag.* [7], 7, 129-41(1929).—The authors studied the effect of various doses of x-rays upon solns. of  $FeSO_4$  in concns. 0.001 *M* to 0.00004 *M*.  $FeSO_4$  was oxidized by exposure to x-rays and the amt. transformed increased in direct relation to the diln. Very high dilns. were therefore used in quantities of 1 or 2 cc. A refined electrometric titration method was developed to det. the small changes which occurred. The exposure to x-rays was made in a small cell placed 20 cm. from the target in the x-ray tube, the width of the x-ray beam being a few mm. wider than the cell itself. The x-ray intensity during irradiation of the cell was controlled by placing a small specially constructed ionization chamber directly beneath the cell. The solns. were satd. with air before irradiation and contained 0.8 *M*  $H_2SO_4$ . The abs. amt. of  $FeSO_4$  transformed was directly proportional to the x-ray doses (expressed in arbitrary units) up to a dose of 29.0. Above a dose of 29.0 the relationship is again linear but when the values are plotted the slope of the curve is only half of that observed below a dosage of 29. The no. of mols. of  $FeSO_4$  transformed by dose 29 was equal to the no. of equivs. of gaseous  $O_2$  dissolved in the solns. It was assumed that the oxidation of ferrous ions was a secondary effect due to activated water mols. which were produced by secondary x-ray electrons. This receives confirmation when it is found on calcn. that twice as many ferrous ions are changed in the presence of dissolved  $O_2$  as compared to its absence, when related to the no. of pairs of gaseous ions produced by the same x-ray energy in air. A similar relation appears when the calcn. is made in comparison to water mols. transformed in pure water. Some evidence is presented for the formation of small quantities of  $H_2O_2$ . In the very dil. soln. an apparent reversal of the reaction takes place when only a trace of ferrous ion remains unconverted. L. H. REYERSON

Active nitrogen. V. The decay of the nitrogen after-glow. ERIC J. B. WILLEY. *J. Chem. Soc.* 1929, 228-31.—An error in the calcn. of W.'s previous paper (*C. A.* 22, 3839) led to an incorrect conclusion as to the process of the decay of the N after-glow. By correcting this error, the reaction in question is shown to be a ternary process

represented by the equation  $2N + N_2 \longrightarrow 2N_3$ . This reaction is complicated by a surface reaction taking place at the same time as that in the bulk of the gas. A. G.

Influence on the light absorption of the adsorption of Ag and Br ions to AgBr hydrosols (FROMHERZ) 5. Changes in nitrocellulose when exposed to light (COFMAN, DEVORE) 23. The influence upon light absorption and photochemical sensitivity of adsorbed ions (FROMHERZ, KARAGUNIS) 5.

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Radioactive liquid. E. SOMMER. *Swiss* 127,544, Aug. 15, 1927. Vessels are made of porous thin-walled material contg. radio active salts to impart radioactive properties to the liquids contained therein.

Luminous composition. J. A. F. BEAVIS. *Brit.* 299,228, Dec. 22, 1927. Phosphorescent or luminous salts such as alk. earth sulfides or complex mixts. of such sulfides or of Al with salts of Bi, Th, Tl, U and alkali metals are ground with a resin or resinous compn. and the product is mixed with suitable solvents, diluents or vehicles which may comprise fatty oils, cellulose derivs. or rubber as addnl. ingredients.

## 4—ELECTROCHEMISTRY

COLIN G. FINK

The beginnings of electrochemical activities. J. LYMAN SHEEHAN. *Pamphlet, Am. Electrochem. Soc.*, May, 1929, 13 pp.—Starting with the observation of frictional electricity by Thales of Miletus (600 B. C.), the history of electricity and electrochemistry is followed through the centuries. Particular emphasis is placed upon the researches of Galvani, Volta, Davy, Faraday and Berzelius. C. G. F.

Electrochemical education in England. E. O. JONES. *Pamphlet, Am. Electrochem. Soc.*, May, 1929, 16 pp.—There are only 2 institutions in England which have definite specialized courses in electrochemistry, the Imperial College, which provides a post graduate course for those who have already graduated with honors in chemistry, and Manchester (College of Technology), which awards a B.Sc. (Tech.) in this subject. Facilities exist, however, at many of the higher institutions for the teaching of this subject. At most English universities theoretical electrochemistry is incorporated in the instruction in phys. chemistry, and no more than brief references to technical applications will occur at appropriate points in the other courses. Although electrochemistry does not, at the present time, occupy an important place in the curricula of the

English universities, need for such instruction has not been overlooked. Judging from the information supplied with regard to the openings available, the facilities offered adequately satisfy the present demands, but it is reasonable to anticipate that the government's policy of electrification will increase this demand, and that in the future increasing attention will be paid to applied electrochemistry, and that important schools in this subject will develop as the need arises. C. G. F.

**Electric furnaces for the heat treatment of steel.** J. SAUER. *A. E. G. Mitt.* 1928, 165-71; *Science Abstracts* 31B, 494.—S. describes and illustrates the 2 chief types of elec. furnaces for the heat treatment of steel, *i. e.*, the resistor furnace with chrome-Ni alloy heating elements suitable for temps. up to 1000°, and the "salt-bath" type for temps. up to 1300°. The salt-bath furnaces are subdivided into those in which the salt is heated by a sep. metal-heating element, and those which, after the salt has been heated to fusing point, maintain their temp. by the passage of current through the mass of the salt. The salts generally used consist of a mixt. of Ba and K chlorides for temps. up to 1000° and of BaCl<sub>2</sub> alone for 1300°, while for tempering operations up to 400° KNO<sub>3</sub> is used. For cementation purposes special mixts. are employed, which enable the surface of the steel to be impregnated to a depth of 1/2 mm. The temp. regulators embodied in the furnaces are able to hold the internal temps within the limits of  $\pm 10^\circ$ . Reference is also made to special furnaces on the Wild-Barfield system. H. L. D.

**The manufacture of ferrosilicon in the electric furnace.** JAMES SILBERSTEIN. *Can. Chem. Met.* 13, 91-3, 94(1929).—A comprehensive account of furnace design, construction and operation for Fe-Si manuf. A furnace of 3000-6000 kw. is considered most suitable. Disadvantages of larger units are: (1) the amount of energy not in use during furnace shutdown, (2) difficulty of furnace repairs, and of electrode replacements due to the higher heat and (3) difficulty of keeping a large furnace from blowing. Three octagonal electrodes are employed; the bottoms are made of some form of C; a life of 1 1/2-3 yrs. for continuous operation, and less for intermittent operation, is usual. The characteristics of graphite, amorphous C and self-baking electrodes are pointed out. The greater % of Fe-S produced is the 50% alloy. Raw materials, charging, furnace operation and product are briefly discussed. The cost of manuf. depends chiefly on price of elec. power. The power consumption in 2000-4000-kw. furnaces ranges from 2.1-2.6 kw. hr. per lb. when coke is the reducing agent; electrode consumption is 3-6 lbs. per 100 lbs. Fe-Si when amorphous C electrodes are used, and 2-4 lbs. when Soderberg self-baking electrodes are used. Intermittent operation does not impair the quality of the product. Fe-Si is chiefly used as a steel deoxidizer. 75-90% ferrosilicon is used for 4% Si steel and for Fe-Si alloys contg. over 15% Si. W. H. BOYNTON

**Sponge iron, a raw material for electric steel.** N. K. G. THOLAND. *Pamphlet, Am. Electrochem. Soc.*, May, 1929, 22 pp.—Sponge Fe is now commercially produced in Sweden. When considered as a base for the manuf. of com. and highest grade steels in place of scrap or pig Fe, the specific properties of the various grades of sponge Fe must be taken into account. Scrap nowadays contains foreign metals, such as Ni and Cu; pig Fe is high in C and in impurities difficult to eliminate completely during steel making. Sponge Fe can be made free from Si and very low in C, S and P. Numerous comparative figures are shown, based on actual heats in the elec. furnace. The phys. properties of steels made with sponge Fe excel those of steels made from scrap or pig Fe. C. G. F.

**A new small-capacity electric furnace.** ANON. *J. four élec.* 38, 117-8(1929).—Illus. A new type furnace combines the advantages of radiation and Heroult furnaces. The electrodes are guided across the arch and enter the furnace at a certain angle, which can be changed during operation. The furnace is started by striking an arc between the electrodes; the heating is then changed to direct arc heating. M. McMAHON

**A new ultra-rapid regulator for electric arc furnaces.** ANON. *J. four élec.* 38, 119-26(1929).—The regulator described consists of a solenoid, an oil auxiliary engine fed by the pump; the piston of this engine acts with a lever-distributor of water of the pump under pressure—feeding the lifting jack, which controls the electrodes. The advantages of this type of regulator are reviewed. M. McMAHON

**The electrometallurgical plant at Chateau Feuillet.** ROBERT SEVIN. *J. four élec.* 38, 45-50(1929).—Illustrated description of elec. equipment of plant designed for the manuf. of carbide and Fe alloys, transformers, furnaces, etc. M. McMAHON

**The electrical conductivity of Carborundum.** H. J. SEEMANN. *Physik. Z.* 30, 143-4(1929).—Resistance measurements were made with 6 selected crystals of Car-

borundum at room temp. and at  $-80^{\circ}$ . The ratio  $R_{-80^{\circ}}/R_{-17^{\circ}}$  lies between 4 and 6. The sp. cond. is about 0.1 mho. Conclusion: Carborundum exhibits partly electrolytic and partly metallic conductance.

E. R. SMITH

The base load central station, and its future relation to the electrochemical industry (electrolytic hydrogen). FARLEY G. CLARK. *Pamphlet, Am. Electrochem. Soc.*, May, 1929, 7 pp.—There are available in the U. S. and Canada large quantities of surplus energy, at costs varying from 0.12 to 0.35 cent per kw.-hr. This surplus energy can be converted into a steady supply of a readily usable commodity, namely,  $O_2$  and  $H_2$  gas, by the electrolysis of  $H_2O$ . The manuf. and sale of these gases should become a normal function of the utility companies. At 0.12 cent per kw.-hr. the 2 gases together will cost 22 cents per 1000 cu. ft. (0.78 cent per cu. m.).

C. G. F.

Current efficiencies and watt efficiencies in water electrolysis. R. NITZSCHMANN. *Metallbörse* 18, 1352(1928).—Graphs and tables only are given.

F. M. SYMMES

Frequency and arcing in the alternating current electrolysis of water. J. W. SHIPLEY. *Trans. Am. Electrochem. Soc.* 55 (preprint), 11 pp.(1929).—The rate of generation of electrolytic gases, using NaOH soln. as electrolyte and with frequencies from 0 up to 300 cycles, was detd. for a. c. electrolysis of  $H_2O$ , with Pt, Cu and Ag electrodes. The electrolytic capacity at const. frequency was const. for Cu, but varied with the quarter-wave area for Pt and Ag. The electrolytic capacity of the electrodes at all frequencies is represented by the equation  $Q_0 = Aq_1^n$ , where  $Q_0$  is the av. storage capacity of the electrodes,  $q_1$  is the quarter-wave area, and  $A$  and  $n$  are electrolytic absorption consts. for the metal. The electrolytic capacity at const. quarter wave area decreased to a min. with increasing frequency. Electrolysis at voltages above 110 gave rise to the thermal decompn. of the water by arcing on the electrodes. This decompn. amounted at high voltages (4,200) to more than 13 times that required by Faraday's law. Arcing, with its accompanying decompn. of  $H_2O$ , can be suppressed by applying external pressure, and thus preventing the formation of steam bubbles on the electrodes. This suggests that elec. boilers should operate under pressure, and that the hot  $H_2O$  be permitted to boil in a second chamber at a lower pressure.

C. G. F.

The electrolytic refining of lead containing bismuth. PAUL SCHACHTERLE AND W. RIECKE. *Bergakademie Clausthal. Metall u. Erz* 25, 637-40(1928).—Pb contg. Bi may be refined by electrolyzing from  $PbS_2O_6$  soln., prepd. (1) by passing  $SO_2$  through  $MnO_2$  (100 g.) and  $H_2O$  (400 cc.) at temps. below  $0^{\circ}$ , and adding  $PbO_2$ , the  $PbS_2O_6$  formed being equiv. to 80% of the  $MnO_2$  going into soln., or (2) by passing  $SO_2$  into an  $Fe(OH)_3$  suspension, coagulating with  $H_2O_2$  and adding  $PbO_2$ . The electrolysis is carried on between an Al (or Pb) cathode and a soft Pb anode, in a soln. contg. 60-90 g. Pb (as  $PbS_2O_6$ ) and 15-30 g.  $H_2S_2O_6$  with an org. addn. agent. Good deposits are obtained with the use of pyrogallol (0.22 g./500 cc. of electrolyte) and gelatin (0.036 g./500 cc.) as addn. agents, while with the addn. of dextrin, starch, glycerol, gum arabic, sugar and gelatin + glycerol, they are unsatisfactory. On electrolyzing, the Bi, Cu and Ag present in the crude Pb remain in the slime, while Sn, Sb and As are also present in the electrolyte. This must be as free as possible from Fe and not too poor in Pb. The purification of the electrolyte may be attained by pptg. the Fe present with  $PbO_2$ .

J. BALOZIAN

Steel anodes for chromium plating. E. M. BAKER AND E. E. PETTIBONE. *Metal Ind.* (New York) 26, 520-1(1928); cf. *C. A.* 22, 3844.—A comparison is made of steel and electrolytic Fe anodes in a chromic acid Cr-plating bath. A graph shows that electrolytic Fe is more resistant to corrosion than mild steel, and still more resistant than moderate and high-C steels. The decrease in anode current efficiency with age is more pronounced with the more impure anodes, which is probably due, in part at least, to a protective oxide or chromate coating formed by the continued passage of current. The effect of anode compn. on ratio of trivalent to hexivalent Cr is indicated at various c. ds. with the different kinds of anodes. C from 0 to 1.9 apparently has no effect on the ratio of trivalent to hexivalent Cr in the bath. The C in the anode increases the rate of anode soln., the effect of a small increase being marked, when the Fe is most nearly free from C.

W. H. BOYNTON

Details of cadmium plating. OTTO H. LOVEN. *Metal Ind.* (New York) 27, 224-7 (1929); cf. *C. A.* 23, 2665.—An outline of methods, equipment and precautions necessary to procure a good Cd plate. The resistance of a Cd plate is quickly detd. by means of the acetic acid peroxide test. A one-l. graduated flask is filled  $\frac{1}{2}$  full of water and 35 cc. glacial AcOH added. After shaking, it is transferred to a beaker or crock, 10 g.  $Na_2O_2$  added gradually with const. stirring till soln. is complete. It is returned to the graduated flask and filled to the mark at  $18^{\circ}$ . A few plated pieces

are covered in a dish with the test soln. A brown discoloration appears and the time required for the development is compared by means of a table to the equiv. no. of hrs. salt spray test.

W. H. BOYNTON

**Measurements of hydrogen-ion concentration in plating baths.** R. E. BREWER AND G. H. MONTILLON. *Trans. Am. Electrochem. Soc.* 55 (preprint) 25 pp. (1929).—The  $p_H$  of representative acid plating baths has been measured successfully by the electrometric method, different kinds of indicator electrodes being used. The theory of the electrodes used— $H_2$ ,  $O_2$ , quinhydrone, Sb and  $PbO_2$ —is discussed. The calibration of the  $O_2$  and Sb electrodes, together with the equations for their calibration curves against the normal calomel electrode, is given. Conditions for the best exptl. procedure have been established, as well as the limitations of the various electrodes, in typical Ni, Co, Fe, Zn and Cr plating baths. A comparative study of the results of electrometric and colorimetric methods of measuring H-ion concn. has been made. Titration curves have been constructed from data obtained by adding known vols. of standard acid or alkali soln. to a measured vol. of the bath, observing by electrometric and colorimetric methods the resulting  $p_H$  after each addn., and plotting the results. Comparison of the curves obtained in this way with similar curves of other investigators and a discussion of the significance of the curves are given. Measurements of  $p_H$  have been made by a simple buffer comparison method. Comparison of these results with measurements made on the same baths, employing the colorimetric "drop-ratio" and the usual electrometric methods using different kinds of electrodes, shows the reliability and utility of this procedure. The method provides for rapid cross-checking of all measurements, and eliminates the need of the usual reference electrodes except for preliminary checking.

C. G. F.

**Nickel-chromium process.** W. PFANHAUSER. *Chem.-Ztg.* 53, 207-8(1929).—A discussion of the application of Cr plating with an intermediate Ni plate. It is essential that the Ni plate be sufficiently low in H, that it can take up the addnl. H deposited with the Cr plate without peeling off. Under these conditions, the Cr can be deposited at such high c. d. that the time in the Cr bath can be reduced to 5-10 mins. The  $p_H$  of the Ni bath should be between 5.2 and 5.8, the thickness of Ni deposited generally running from 0.02 to 0.025 mm. Temps. of 35-40° are recommended. It is exceedingly important that the surfaces to be plated be first thoroughly cleaned.

H. STOERTZ

**Electrodeposition of copper. An historical note.** F. A. J. FITZGERALD. *Pamphlet, Am. Electrochem. Soc.*, May, 1929, 4 pp.—In order to incorporate changes in maps that have been engraved on Cu plates, Wheatstone suggested that instead of hammering up and filing away the section to be changed it should be filled up with an electrically conducting material ready for the new engraving. The Cu deposited, however, turned out to be too brittle to stand the pressure of the printing process. William Dalglish overcame this brittleness by placing a plate of smooth Cu horizontally on the bottom of the electrolyzing dish, and suspending over it at a short distance the plate of Cu to be deposited on. With the aid of a mech. device, he kept the dish rocking, and therefore the electrolyte was always in motion. The deposited Cu was hard, elastic, and much more homogeneous than that deposited when the liquid was at rest. It stripped off the matrix satisfactorily. The speed of the movement of the liquid was the important factor in the deposition of the Cu. These expts. resulted in large-scale equipment, which was used by the government in Ireland for more than 20 years.

C. G. F.

**An experimental study of the electrochemical polarization of platinum.** E. I. SHEPITALSKII AND V. V. PICHETA. *J. Russ. Phys.-Chem. Soc.* 60, 1351-81(1928).—The use of S.'s commutator (cf. C. A. 19, 1356) made it possible to measure the e. m. f. of the cell  $(PtO_2 | 1 N H_2SO_4 || 1 N H_2SO_4 | 1 N H_2SO_4, Hg_2SO_4 | Hg)$  while the current was flowing through it ( $Sp$ ) as well as at certain time intervals after opening the circuit ( $Pot$ ). A H-vessel contd. the electrodes, the anode being a loop of polished Pt wire and the cathode a platinized Pt plate. There was a const. flow of 1 N  $H_2SO_4$  (2 cc. a min.) from + to -. The auxiliary Hg cathode was connected by a capillary bridge to the - leg of the vessel. Resistance bridge, Weston cell and Einthoven's string galvanometer were used in the measurements; the Pt-Hg cell was placed in a thermostat at 0° or 18°. Rapid rotation of the anode did not influence the depolarization curves.  $Sp$  increased with the c. d. while  $Pot$  decreased. Both changed irreversibly when the current was first increased to 60 milliamps. and then reduced to 3 milliamps.;  $Pot$  changed reversibly with subsequent variations in the current strength. A study of Pt wires of varying thickness and previous history as the anodes showed that the values of  $Sp$  and  $Pot$  are each detd. by a distinct process. The introduction



of a chem. depolarizer  $\text{Fe}^{++} \rightleftharpoons \text{Fe}^{+++}$  caused a gradual rise in *Pot* while *Sp* was not changed; when the anode was rotated, *Pot* instantly dropped below the previous value while *Sp* declined only slightly. Conclusion: *Sp* does not represent the physico-chem. phenomena at the anode (soln. of  $\text{O}_2$  and  $\text{O}$  in Pt, formation of indefinite compds. of Pt and  $\text{O}$ ), the latter being closely connected with the changes in *Pot*. B. S.

**Electroplating plant.** J. W. PERRING. *Metal Ind.* (London) 34, 345-6, 375-6 (1929).—A brief description of various types of vats, of methods of heating solns. and of a plating shop layout. The "trussed beam" method of preventing sagging is better than the use of uprights. The employment of a false bottom in plating vats would permit rapid recovery of work. The porosity is a drawback to earthenware vats. Where Fe vats are employed for Cr solns. and the work is liable to approach the sides, it is well to hang sheets of glass around the sides. Rough glass contg. wire netting is satisfactory. W. H. BOYNTON

**Some possible uses of alternating currents in electrodeposition.** H. C. COCKS. *Metal Ind.* (London) 34, 396-8, 414, 424-5 (1929).—A paper dealing principally with the electrolysis by a. c. in which metal deposition does not occur. The amts. of electrochem. effects of a. c. alone are dependent on c. d., those of superimposed a. c. on the ratio of the alternating to the direct component of the current, while the effects of both types of current are greatly influenced by the frequency. Exptl. work shows that the superposition of an a. c. on a d. c. electrode process tends to reduce any irreversibility in that process. Superposed a. c. acts as a depolarizer: it reduces anode and cathode polarization and electrochem. passivity. Chem. depolarizers may leave undesirable decompn. products in the electrolyte, but superposed a. c. will not. Superposition results in marked reduction of  $\text{O}_2$  overvoltage and electrochem. passivity of anodes. Work done on the effects of superposed a. c. in processes involving metal deposition is briefly discussed. The effects are noted for Ni plating, and in combined Zn and Ni plating from a feebly acid soln. of Zn and Ni sulfates. Superposition of a. c. assists the anodic soln. of Cr in acid and alk. solns. The only case of the tech. use of superposed a. c. in electrolysis is that of the Wohlwill modified Au-refining process (Brit. pat. 6,276 (1909)). The introduction of the a. c. in the Wohlwill process converted it from a lab. curiosity to a com. success. The sole effect of the a. c. was on the soln. of the anode and it is very remarkable. Recent proof of the desirability of the presence of chlorides in Ni plating baths and of the employment of temps. of 30-50° tend to discount the outstanding advantages of superimposed a. c. W. H. B.

**Service tests of the mercury arc rectifier.** J. VON ISSENDORFF. *Elektrotech. u. Maschinenbau* 47, 353-7 (1929).—Seven illus. C. G. F.

**Vacuum tubes as oscillation generators.** VIII. D. C. PRINCE AND F. B. VOGDES. *Gen. Elec. Rev.* 32, 288-94 (1929); cf. C. A. 23, 311.—Calcs. for circuit with square current waves agree with its actual performance. M. McMAHON

**Edison's first commercial lamp.** CHAS. L. CLARKE. *Gen. Elec. Rev.* 32, 239-42 (1929).—An historical review of the introduction of Edison's incandescent lamp, its initial installations and early tests. Illustrated. M. McMAHON

**Units of electrical measurement.** G. W. VINAL. *Trans. Am. Electrochem. Soc.* 55 (preprint) 15 pp. (1929).—The elec. units and standards, which were the subject of extended investigation 20 years ago, and thought to be satisfactory for many years to come, are again requiring attention. The relation of the international elec. units to the abs. system of units, which they are intended to represent, is known now to a higher accuracy than when they were established. Differences have been found that will become increasingly serious as science and industry advance. C. G. F.

The production and use of non-ferrous metals in electro-technology (ALTERTHUM) 9. The testing of transformer oils (TYPKE) 22. Rare earths. XXXI. Ionic migration and magnetism in the separation of the rare earths (SELWOOD, HOPKINS). XXXII. Fractional hydrolysis of rare earths by electrolysis (KREMERS, QUILL) 6. Making rubber goods of latex by electrodeposition (KLEIN) 30. The separation of Cb and Ta by electrolytic hydrolysis (YNTEMA) 6. Optical temperature measurement in furnaces (AECKERLEIN) 2. Deposition of rubber (Fr. pats. 650,326, 650,566, 650,977 and 651,672) 30. Nitrocellulose lacquer as a sealing for dry cell batteries (U. S. pat. 1,711,739) 26. Electric sterilization of liquids such as milk (Fr. pat. 651,154) 12. Coating electric lamp bulbs (Brit. pat. 299,477) 19. Apparatus for coating articles with rubber by electrodeposition, etc. (Brit. pat. 298,650) 30.

KRETZSCHMAR, F. EDMUND: *Die Krankheiten des Blei-Akkumulators, ihre Entstehung, Feststellung, Beseitigung Verhütung.* 3rd ed., revised, Munich: R. Oldenbourg. 181 pp. M. 9; bound, M. 10.50.

STEINACH, HUBERT AND BUCHNER, GEORG: *Die galvanischen Metallnieder-schläge und deren Ausführung (Galvanostegie und Galvanoplastik).* 4th ed., revised by Georg Buchner and Alfred Wogrinz. Including: *Neuere Fortschritte d. Galvano-technik* (by Alfred Wogrinz). Berlin: M. Krayn. 85 pp. M. 10.

WAGNER, HEINRICH: *Theoretische Grundlagen der Galvanotechnik in elementarer Darstellung mit Aufgabensammlung.* Leipzig: E. G. Leuze. 55 pp. M. 4.

**Electric batteries.** ANDRÉ HELBRONNER and ERIC DUTT. Fr. 650,923, Aug. 11, 1927. In ordinary or dry batteries using insol. ferricyanides (of Zn, Cu, Ag, etc.) the 2nd electrode is formed of an element high in the electrochem. series such as Zn. The electrode may be  $ZnCl_2$ ,  $ZnSO_4$  or a double cyanide of Zn and Na, etc. Cf. C. A. 23, 2108.

**Electric batteries.** ANDRÉ HELBRONNER and ERIC DUTT. Fr. 651,164, Aug. 24, 1927. An anhyd. or hydrated sesquioxide of Ni, Co, V, etc., or peroxides (U, etc., but not Mn) are used as depolarizing agents in ordinary or dry batteries.

**Electric batteries.** P. PÖRSCKE. Brit. 299,591, July 8, 1927. Porous electrodes are formed by mixing metals and metallic oxides, such as Co oxide and Zn powder, with an acid or base such as NaOH to effect local galvanic action with sepn. of one or more constituents of the mixt. and consequent development of porosity. The mixt. may be heated on a supporting plate. Various mech. details are described.

**Bituminous insulating and sealing composition for electric batteries.** BATTERIEN-UND ELEMENTE-FABRIK SYSTEM ZEILER A.-G. Brit. 299,381, July 22, 1927. A saponifiable material such as wax or resin is mixed with soda lye or the like in insufficient quantity to produce complete saponification; unsaponifiable substances such as paraffin or pitch also are added. Water is removed by heating and fillers such as heavy or light spar may be added.

**Storage battery.** WILLIAM MORRISON (to Vesta Battery Corp.). U. S. 1,712,897, May 14. Structural features.

**Storage batteries.** FRANZ PETRIK. Fr. 651,662, Mar. 24, 1928. Method of fixing the plates and poles.

**Storage batteries.** ANDRÉ A. TOUZOT. Fr. 650,401, Mar. 3, 1928. The sheets of cellulose or cellulosic material used for sepg. the plates of storage batteries are impregnated with sol. mineral substances capable of pptg. an insol. element, such as alkali silicates, which may be followed by a pptn. of  $BaSO_4$  or  $CaSO_4$ . By this means deformation by the electrolyte is avoided.

**Lead-plate storage battery.** GEORGE W. HEBBELER. U. S. 1,712,822, May 14. Structural features. U. S. 1,712,823-4 also relate to connectors for batteries.

**Battery electrodes.** ORTO GERGACHEVICS. Ger. 475,294, Dec. 2, 1926. Battery electrodes of the kind prepd. from a mixt. of CuO and graphite are more easily regenerated if an addn. of retort carbon is made to the initial compn. A suitable compn. comprises CuO 80, graphite 30, powd. retort carbon 110 and water 25 parts.

**Composition for molded battery boxes.** JUNJIRO SATO and TSUNAJI SATO. U. S. 1,711,544, May 7. Powd. elaterite 1, gilsonite 25, blown asphalt 24, silex 23 and asbestos 27%.

**Electrolytic cell for reducing mannose to mannitol or for other reductions of sugars, etc.** HENRY J. CREIGHTON (to Atlas Powder Co.). U. S. 1,712,951, May 14. An aq. soln. contg. 15-25% of mannose and 5% of  $Na_2SO_4$  is placed in the cell, on top of the Hg cathode, and the  $PbO_2$  anode, contained in a porous cylinder, is surrounded with an aq. soln. contg. 5% of  $Na_2SO_4$ , the levels of the solns. being the same. An elec. current having a strength of one and one-half amperes for every sq. dm. of cathode surface is passed through the cell, the Hg cathode being vigorously agitated by the agitator. Nascent H is formed and reduces the mannose to mannitol. Other electrolytes may be used such as  $K_2SO_4$ ,  $Na_2CO_3$ ,  $MgSO_4$  or  $Ca(NO_3)_2$ ; the app. may be employed for effecting various electrolytic reductions.

**Apparatus for reduction of mannose, glucose and other sugars.** HENRY J. CREIGHTON (to Atlas Powder Co.). U. S. 1,712,952, May 14. The app. consists of an electrolytic cell, A, in which alkali metal amalgam is formed, a reduction cell, B, in which the sugar in aq. soln. is reduced by the amalgam, and a reservoir contg. a supply of Hg. When the amalgam attains a desired concn. of alkali metal, it is run into the sugar soln., where it falls to the bottom of the reduction cell. The dilute amalgam and the sugar soln. are then stirred vigorously by means of a stirrer to which are at-

tached 2 blades, which are disposed in the sugar soln. and the Hg, resp. The place of the amalgam used is taken by fresh Hg, which is added from the reservoir, and this pure Hg is converted into another supply of dil. amalgam. After the amalgam added to the sugar soln. has been decomposed by the action of the water, some of the resulting Hg is drawn off into the reservoir, a further quantity of amalgam is run from cell A to cell B, and the proper amt. of Hg is transferred from the reservoir to cell A. This process is continued until the sugar has been reduced. From time to time the electrolyte in cell A is renewed. The Hg may be transmitted from the reservoir to cell A by means of a centrifugal pump.

**Photoelectric cell with gas filling and glow discharge.** TELEFUNKEN GES. FÜR DRAHTLOSE TELEGRAPHIE M. B. H. (August Karolus and Fritz Schroeter, inventors). Ger. 475,113, Jan. 9, 1926.

**Accumulator battery.** MAURICE CHARLES. Ger. 475,432, May 18, 1927. Constructional features.

**Accumulators.** COMPAGNIE GÉNÉRALE D'ÉLECTRICITÉ. Fr. 651,305, Jan. 28, 1928. In accumulators having an alk. electrolyte, pairs of plates composed of tubes or pockets filled with active matter are surrounded with frames made by folding a metal sheet so that the 2 frames for each of the plates of a pair and the junction between the plates are obtained in one piece.

**Accumulators.** SIEMENS-SCHUCKERWERKE A.-G. Fr. 650,240, Mar. 1, 1928. Method of charging and discharging simultaneously.

**Accumulator plates.** I. G. FARBENIND. A.-G. (Georg Kränglein and Richard K. Muller, inventors). Ger. 475,242, May 25, 1927. Plates of a Pb alloy having a framework or skeleton of Pb are electrolyzed in an acid bath until free from the accompanying metals and, if pos. plates are being prepd., are simultaneously oxidized to  $PbO_2$ . Electrolysis at ordinary temp. in a bath of  $H_2SO_4$  of sp. gr. 1.10 and with a c. d. of 1.2 amps. per sq. dm. is suitable.

**Electrodeposition of chromium.** F. LAUTERBACH (to W. G. Poetzsch). Brit. 299,395, Oct. 25, 1927. A small proportion of  $Li_2O$ ,  $Li_2CO_3$ ,  $Li_2SO_4$ , or other suitable Li compd. is added to an electrolyte rich in chromic acid to improve its "throwing power." Li is not deposited. A c. d. of 4-20 amps. per sq. dm. and a temp. of 28-40° may be used for the Cr deposition.

**Electrodeposition of nickel, etc.** SOC. ANON. LE NICKEL. Brit. 299,375, April 13, 1927. Metals such as Ni are deposited on wires or thin rods instead of plates, in order to obtain a dense deposit. The cylindrical billets thus formed are suitable for casting in pots.

**Electroplating apparatus with a perforated rotatable and tiltable receptacle for articles to be plated.** JOSE L. MUJICA. U. S. 1,712,674, May 14. Structural features.

**Electric control system for electroplating apparatus.** LAWRENCE C. TURNOCK. U. S. 1,712,284, May 7.

**Internal chromium plating of rifle barrels or other hollow articles.** J. Q. MACDONALD AND W. M. SCOTT. Brit. 299,298, Oct. 22, 1927. Relative motion between the work and the electrolyte is maintained, at least initially, as by causing flow of electrolyte through the article being internally plated around an accurately spaced and tensioned rod or wire anode.

**Electrometallurgy.** TURE R. HAGLUND. Ger. 475,173, Sept. 3, 1924. Oxides of metals such as Cr, Fe, Mn, Ti, V, W and Mo are reduced in an elec. furnace with briquets prepd. from a carbonaceous reducing agent and a slag-forming oxide such as  $Al_2O_3$ ,  $MgO$ ,  $BaO$ , or  $CaO$ . The slag produced may be briquetted with carbonaceous reducing agent and used again. Reducing agents of low sp. gr. are preferred, e. g., coke or wood charcoal.

**Pure aluminum.** ALUMINIUM-IND. A.-G. Ger. 466,278, Feb. 5, 1928. Pure Al is obtained from crude Al or alloys by employing these as the anode, in the form of a plate whose surface is increased by corrugation.

**Recovery of tin.** SIEMENS & HALSKE A.-G. Fr. 650,579, Mar. 8, 1928. In the electrolytic recovery of Sn from alk. lyes, the lye is treated before electrolysis with addnl. oxidizing agents until all the Sn is in the form of stannate, and a colloid such as gelatin is added. The oxidizing agent is introduced in a hollow perforated vessel.

**Electrical treatment of hydrocarbons.** SIEMENS & HALSKE A.-G. (Hans Becker, inventor). Ger. 474,740, Apr. 16, 1925. Addn. to 466,813. App. for treating hydrocarbons by the method of Ger. 466,813 (C. A. 23, 1577) is described.

**Electrolytic production of lead peroxide.** SIEMENS & HALSKE A.-G. Brit. 299,306, Oct. 22, 1927. A coating of Pb peroxide is deposited on an elec. conductor connected as anode from an alk. soln. of a Pb salt such as a soln. formed from  $PbO$  and  $NaOH$

to which is added an org. compd. of one of the classes: (1) compds. with hydroxy groups such as phenol, resorcinol, hydroquinone, pyrogallol, tannin, phloroglucine, glycerol, sugar, or fluorescein; (2) org. acids such as HOAc or succinic acid; or (3) C-N compds. such as dimethylglyoxime, alizarine-bordeaux, rhodanide and cyanides. A current d. of 1 amp. per sq. dm. is used.

**Measuring the concentration of electrolyte solutions.** I. G. FARBENIND. A.-G. (Hermann Wolff, inventor). Ger. 466,530, Jan. 9, 1926. In an app. for the continuous measurement of the concn. of an electrolyte soln., the soln. flows through a vessel in which are immersed (1) two electrodes connected to a source of a. c., and (2) a vessel contg. an electrolyte soln. of const. concn. and contg. also 2 electrodes in series with those in the larger vessel. The circuit includes also a variable resistance and a voltmeter; the arrangement is such that the tensions between each pair of electrodes can be measured and compared.

**Electrical purification of gases.** METALLGES. A.-G. Ger. 475,109, Sept. 18, 1926. The elec. sepn. of suspended particles from gases contg. O is conducted so as to avoid the formation of  $O_3$ . This may be done by arranging the discharge electrode in an atm. of N in a space sepd. from the pptg. space but with openings for the passage of the ions into the gas stream to be purified. For example, the discharge electrode may be enclosed in a porous or perforated casing through which N is led.

**Electric annealing furnace.** PAUL MENÉ. Fr. 650,197, Feb. 29, 1928. Construction of heating chamber.

**Electrode mounting for electric furnaces.** SOC. ELECTRO-METALLURGIQUE DE MONTRICHER. Brit. 299,414, Oct. 26, 1927. Structural details.

**Electrode mounting for electric furnaces.** SOC. ELECTRO-METALLURGIQUE DE MONTRICHER. Brit. 299,429, Oct. 26, 1927. Structural features.

**Electrically heated steam superheater.** SIEMENS-SCHUCKERTWERKE A.-G. Ger. 475,335, June 4, 1926.

**Temperature regulator for electric apparatus.** ALFRED DÄNIKER. Fr. 650,997, Mar. 19, 1928.

**Thermoelectric current controller suitable for protecting electric apparatus.** OTTO DREYER. U. S. 1,711,634, May 7.

**Electric contact points.** MUIRHEAD & Co., LTD., F. H. MUIRHEAD, F. S. HEURTELEY and J. V. FOLL. Brit. 299,593, Oct. 5, 1927. Points such as those of Pt are embedded in a soft metal such as Pb to prevent chattering.

**Electrical conductor.** HENRI ANDRÉ. Ger. 475,339, Aug. 18, 1927. An elec. conductive material with a high neg. temp. coeff. is prepd. by fusing Ag or a Ag salt with an excess of S or P and casting the product. The conductor may be used in a bath of fused S.

**Composition for coating electrical conductors.** JARED E. SMITH. U. S. 1,711,754, May 7. A compn. suitable for coating metal conductors in order to protect them from acids comprises petroleum residuum 99.5 and creosote 0.5%.

**Dielectric materials.** COMPAGNIE FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON. Fr. 651,397, Mar. 13, 1928. A dielectric material such as  $PhNO_2$  is mixed with another dielec. material such as nitrotoluene, dinitrobenzene, or  $PhCl$  to lower the m. p. of the material and so improve its value for use at low temps. Impurities in  $PhNO_2$  such as water, acids or salts are removed by mixing with  $Al_2O_3$ , heating to  $100^\circ$  and distg. Dielec. materials in the fluid state may be purified by using them as electrolytes in an electrolytic cell.

**Large mercury-vapor rectifier with insulated cathode.** AKTIEN GESELLSCHAFT BROWN, BOVERI & CIE. Ger. 475,034, Feb. 20, 1923.

**Oil-cooling device for a mercury-vapor rectifier.** ALLGEMEINE ELEKTRICITÄTS-GES. (Gustav W. Müller, inventor). Ger. 470,101, July 14, 1923.

**Oil-cooling device for a mercury-vapor rectifier.** ALLGEMEINE ELEKTRICITÄTS-GES. (Gustav W. Müller, inventor). Ger. 471,484, Apr. 18, 1925. Addn. to 470,101.

**Expansion device for transformers or other electrical apparatus containing oil and inert gas.** LELAND H. HILL (to Westinghouse Elec. & Mfg. Co.). U. S. 1,712,765, May 14. Structural features.

**Tungsten filaments.** WILLIAM B. GERO (to Westinghouse Lamp Co.). U. S. 1,712,663, May 14. W filaments are straightened under tension at a white heat in H<sub>2</sub> wound under tension on a form without heating and then severed into individual lengths. An arrangement of app. is described.

**Metals and alloys.** TURE R. HAGLUND. Fr. 650,883, Mar. 15, 1928. In the prepn. of metals or alloys by reduction of oxides or ores in an elec. furnace, the starting materials are so chosen or addns. are made to the starting materials that a strongly

refractory slag contg. MgO and  $Al_2O_3$  and less than 15%  $SiO_2$  is obtained. If an Fe ore is treated which contains a large proportion of  $SiO_2$ , this may be partly reduced to Si, or magnesite and bauxite contg. little  $SiO_2$  may be added. The refractory slag may be used for making furnace hearths, etc.

## 5—PHOTOGRAPHY

C. E. K. MEES

**Toning of silver images by dye mordanting.** R. NAMIAS. *Il prog. fot.* 35, 73-8, 109-19, 145-51(1928).—The process recommended is that using  $Cu(CNS)_2$ . The formula is:  $CuSO_4$ , 20 g.; neutral Na citrate, 60 g.;  $AcOH$ , 40 cc.;  $H_2O$ , 1 l. After complete soln., 20 g. of  $NH_4CNS$  is added. For dyeing, basic dyes are used; those recommended are auramine, rhodamine, malachite green and methylene blue. For reduction and clearing of the whites, a weak soln. of neutral  $KMnO_4$  is recommended without acid, followed by bisulfite.

C. E. K. MEES

**A simple method for reducing the time of exposure of photographs, particularly x-ray photographs.** FRITZ EBERT. *Z. anorg. allgem. Chem.* 179, 279-80(1929).—By heating the plate holder to  $40^\circ$  it was found that the reaction velocity of the photographic process was increased to such an extent that 50-70% less exposure was required. Due to the reduction of exposure time, fogging was diminished.

A. J. K.

**Determination of the silver nuclei produced by the ripening of a photographic emulsion.** H. KIESER. *Z. Elektrochem.* 35, 51-3(1929).—Work on the photochem. equivalence law with respect to the Ag halide of the photographic emulsion is reviewed. Instead of the so-called original Ag proposed by Weigert and Lühr (*C. A.* 23, 1829, 2111) to account for the inefficiency of the above law, K. proposes that this hypothetical original Ag is actually  $Ag_2S$ . He prepd. plates coated with AgBr free from any medium such as gelatin to remove error caused by its presence. With such a prepn. he made tests analogous to those of the above experimenters and found in all cases that  $Ag_2S$  was obtained instead of Ag. AgBr in the presence of excess Ag ion forms  $Ag_2S_2O_8$ , which quickly decomposes, if Ag ion is present in large excess, to form  $Ag_2S$ . This would account for results obtained by Weigert and Lühr with a Valenta emulsion. Persulfate not only attacks the original Ag, but on account of insufficient washing also dissolves the photo-silver. Increase in original Ag by heat is explained by reduction by the medium. Original Ag is probably present but in such small quantities that no present quant. method is known for detg. it.

R. H. LAMBERT

**Primary process in the formation of the latent photographic image.** F. C. TOY AND G. B. HARRISON. *Nature* 123, 679-80(1929).—It is now generally supposed that the formation of the latent image involves the transference of a valency electron from the Br to the Ag by the absorption of light by AgBr, the Br being absorbed by substances present in the emulsion by a complicated chem. process. If pure AgBr is completely enclosed, so that Br cannot escape, an equil. will be set up between the transference and back-transference of the valency electrons, when the AgBr is illuminated. The presence of these temporary free electrons will account for the photo-conductivity effect. In testing for this effect it is necessary to use Ag electrodes and shield them from the light or disturbances will arise. A beam of light was sent through a thin layer of AgBr, fused between quartz plates, on to one half of a film moving behind a fixed slit. The photo-current was amplified about 100,000 times and fed to a string galvanometer, an image of the string being focused on the other half of the moving film. A time scale was registered on the film. Thus it was possible to compare the times of commencement of illumination and photo-current; it was found that the current started within 0.001 sec. of the illumination, and was built up fully in 0.03 sec. Since the galvanometer lag is as much as this, it is justifiable to assume that the effect starts instantaneously and reaches its final value in a time very much less than 0.3 sec. The photocond. effect is observable in the region of normal photographic illumination.

E. W. H. S.

**New field of application for desensitizers.** O. PAPESCH. *Phot. Korr.* 65, 73-4 (1929).—P. recommends the use of a desensitizer, preferably pinakryptol green, in the toning of slow papers, such as Bradux or Kodura, by the method of full exposure and restrained development. The white illumination, which is then admissible, enables the color of the image to be examd. and development arrested accordingly. Any residual stain from the pinakryptol green may be quickly removed by a bath of 1.5% red fuming  $HNO_3$ .

E. R. BULLOCK

**The influence upon light absorption and photochemical sensitivity of adsorbed ions.** H. FROMHERZ AND G. KARAGUNIS. *Z. physik Chem.*, Abt. B, 1, 346-61 (1928).—Absorption measurements were made on a gelatin AgBr emulsion spread on plate glass and soaked with AgClO<sub>4</sub> or KBr soln., thus giving a Ag- or Br- body, resp. Results correspond with those obtained with hydrosols, namely, an increased absorption of the Ag body toward the longer wave lengths as compared with the Br body. Analogous expts. with AgBr to which Th ions are adsorbed showed a similar effect but not so great as with Ag ions. The effects of other ions were also studied and the results were in agreement with those in which gelatin-free AgBr was used. E. P. WIGHTMAN

**Influence on the light absorption of the adsorption of silver and bromine ions to silver bromide hydrosols.** HANS FROMHERZ. *Z. physik Chem.*, Abt. B, 1, 324-45 (1928).—A method is described for the measurement of the relative degree of coagulation of AgBr hydrosols free of binding medium by means of the scattering of light. The method was used to det. the dependence of the degree of coagulation upon the presence of excess Ag or Br ions in the soln. The absorption spectrum of AgBr with adsorbed Br or Ag ions, the particles having the same size in each case, was measured and an increased absorption in the green and yellow was observed with the Ag body as compared with the Br body. This extension towards the longer wave lengths amounted to as much as 15-20  $\mu$ . The results confirm earlier observations according to which photochem. sensitivity of AgBr is increased by the adsorption of Ag ions.

E. P. WIGHTMAN  
**The manufacture of photographic paper.** JOSEPH ROSSMAN. U. S. Patent Office, Washington, D. C. *Paper Trade J.* 88, No. 7, 59-64 (1920).—A brief discussion of the difficulties encountered in the manuf. of photographic papers, with abstracts of U. S. patents. A. PAPINEAU-COUTURE

The chemist in the graphic industry (VNUK) 13.

DAVID, LUDWIG: **Photographisches Praktikum. Lehrbuch d. Photographie.** 6th ed., revised and enlarged. Halle: W. Knapp. 808 pp. M. 16; bound, M. 19.

**Handbuch d. Photographie. Band I. Teil 1.** W. NODDACK: **Photochemie.** ERICH LEHMANN: **Photographische Chemie.** 314 pp. Linen, M. 15. **Teil 2. WILLY NAUCK: Die Fabrikation d. photograph. Materialien.** ERICH LEHMANN: **Die Prüfung d. photograph. Materialien.** 282 pp. Linen, M. 12. Berlin: Union Zweigniederlassg.

GREBE, LEONHARD, HÜHL, ARTHUR AND WALL, EDUARD J.: **Handbuch der wissenschaftl. u. angewandten Photographie. Band VIII. Farbenphotographie.** Vienna. J. Springer. 248 pp. M. 24; bound, M. 26.80.

**Color photography.** LOUIS DUFAY. Fr. 651,196, Aug. 29, 1927. An emulsified reflecting, translucent, or transparent support for the reproduction, printing or multiplication of transparent color proofs obtained by the process of juxtaposed green, violet and orange screens, comprises a screen incapable of direct selection of natural colors, but capable, on the other hand, of pos. synthesis, being made up of juxtaposed elements of simple or primary colors, *i. e.*, yellows, blues and reds. Cf. C. A. 2, 2892.

**Color photography.** JOHANNES HERZOG & Co. Ger. 470,975, Feb. 23, 1928. Addn. to 466,327 (C. A. 23, 1071). In the production of colored prints by the oxidation of leuco dyes described in the prior patent, the treatment with leuco dye is preceded by the oxidation of the Ag or other metal salt forming the print by such oxidizing agents as H<sub>2</sub>O<sub>2</sub>, per-salts, Mn compds. or V salts.

**Color photography.** RUDOLF RUTH. Fr. 650,496, Mar. 6, 1928. Color images which may be examd. directly on an opaque support are obtained by applying to a transparent support a detachable layer of color screens formed, *e. g.*, of a layer of gelatin colored in red, green and blue. On this layer a sensitive emulsion of AgBr is spread. The exposure or reproduction of an image is made through the support on the negative thus prepd. During development a developer is used, which sets free a large proportion of oxidation products hardening the gelatin, such as pyrocatechol. The reduced Ag is dissolved and the Ag salt remaining is developed in full light as for autochrome plates, but in the 2nd development a developer giving oxidation products is not used. A sheet of paper to serve as a provisional support is pressed onto this plate and the layer of colored screens is treated with warm water to eliminate all unhardened parts. The process may be combined with that known as "Ozobrome."

**Color photographs.** WILLIAM V. D. KELLEY (to Max B. DuPont Vitalcolor

Corp.). U. S. 1,712,439, May 7. In forming differently colored sep. images in a colloid carrier, a bleached dye absorbent image and a sep. reduced Ag image are formed in the carrier; the former is dyed and the latter colored a different color. The process is suitable for making colored motion picture films. Cf. *C. A.* 22, 2891.

**Photographic intensifying process.** OTTO MUCK. Ger. 475,459, Dec. 8, 1927. A plurality of points on a feeble image act simultaneously or successively on photoelec. cells, the currents from which are amplified to an equal degree, caused to act on sources of light, and finally reconverted so that each point on the strengthened image corresponds to a point on the original image.

**Photographic films and papers.** VICTOR PLANCHON. Fr. 650,143, Aug. 10, 1927. The sensitive layer is obtained by flowing a single soln. contg. both the gelatin and Fe salts, the compn. in Fe salts being such that alteration of the gelatin is slow. An example is given.

**Photographic films and paper.** SOC. INDUSTRIELLE D'APPLICATIONS PHOTOGRAPHIQUES (Soc. anon.). Fr. 650,123, Aug. 10, 1927. A machine for the continuous development of photographic films and papers by  $\text{NH}_3$  gas is described; in this app. the films, etc., are caused to travel by means of endless bands over the curved perforated top of a chamber contg.  $\text{NH}_3$  gas. Cf. *C. A.* 23, 2670.

**Desensitizing photographic films.** I. G. FARBERNIND. A.-G. Fr. 650,786, Mar. 12, 1928. Photographic films having AgBr emulsions are desensitized by means of an aminophenylphenazonium salt having at least 2 amino groups situated in a C nucleus belonging to an azine complex. In examples, a film or plate is placed in an aq. soln. (about 1:5000) of 1,3-diaminophenylphenazonium chloride (I) for 1–2 mins. and then developed in yellow or candle light. A developer such as "Rodinal" or glycine is mixed with an aq. soln. of I; a plate or film dipped for 1 min. in this soln. may be developed by yellow or candle light. I may be replaced by 1,3-diamino-7-aminophenylphenazonium chloride, 2,3-diaminophenylphenazonium nitrate, 1,3-diamino-*o*-(or *p*)-tolylphenazonium chloride, 1,3-diamino-6-(or 7)-chlorophenylphenazonium chloride, or the corresponding *o*-(or *p*)-hydroxyalkylphenyl derivs. Cf. *C. A.* 23, 2381.

**Developing and other liquid treatments of photographic negatives and prints.** ÉTABLISSEMENTS B. BELIN. Brit. 299,466, Oct. 28, 1927. Liquids such as those used for developing, fixing, washing or drying are applied to negatives or prints by spraying so that this action assists in the penetration of the liquid, and the liquids may be used at a temp. somewhat above normal. Washing is not required between developing and fixing. Rapid drying may be effected by use of an alk. carbonate soln., which is wiped off with scrapers or felt after application.

**Toning blueprints green.** RUDOLF FRITSCH. U. S. 1,712,428, May 7. Blueprint images composed of ferrous ferricyanide are subjected to a soln. of a U salt such as U nitrate until the blue surface of the prints is changed to a green color; the prints are then washed with water.

**Half tones.** HERBERT H. IVES (to Bell Telephone Laboratories). U. S. 1,711,684, May 7. In order to produce a half-tone negative suitable for printing on metal to produce a typographic printing plate of correct tone rendering characteristics, a variable density photographic negative is first made from the object; from this there is made a structured positive by exposure through a screen, and from this positive there is formed a negative by reproducing its structure complementary to the object characteristic.

## 6—INORGANIC CHEMISTRY

A. R. MIDDLETON

**Sulfur nitride.** II. S. A. VOZNESENSKII. *J. Russ. Phys.-Chem. Soc.* 60, 1037–44 (1928); cf. *C. A.* 22, 1113.—The color reactions given by  $\text{N}_4\text{S}_4$  and by thiotriethiazyl chloride,  $\text{N}_3\text{S}_4\text{Cl}$ , in various solvents and in acid and alk. solns. are contrasted. The latter substance reacts with HCl according to the equation:  $2\text{N}_3\text{S}_4\text{Cl} + 12\text{H}_2\text{O} + 4\text{HCl} = 2\text{H}_4\text{S}_6\text{O}_6 + 6\text{NH}_4\text{Cl} + 2\text{S}$ ; with water:  $2\text{N}_3\text{S}_4\text{Cl} + 12\text{H}_2\text{O} \longrightarrow 2(\text{NH}_4)_2\text{S}_6\text{O}_6 + 2\text{NH}_4\text{Cl} + 2\text{S}$ . B. C. A.

**The nomenclature of inorganic compounds.** ANON. *Gazz. chim. ital.* 58, 883–91 (1928).—The latest recommendations of the International Union of Pure and Applied Chemistry are given. C. C. DAVIS

**Some criticisms of the current teaching of inorganic chemistry.** ROBERT DUBOIS. *J. Chem. Education* 6, 906–13 (1929). E. H.

**Univalent iron, cobalt and nickel, and nitrososulfo salts.** Reply to W. Manchot.

I. CAMBI. Istituto Chimico, Reale Univ. Milano. *Gazz. chim. ital.* 59, 56-9(1929).—Comments on an article of Manchot (*C. A.* 23, 1073). AgNO does not arise from reduction of AgNO<sub>3</sub> because it is also obtained when other Ag salts are used; in fact, AgClO<sub>4</sub> gives the highest yield of AgNO. The reaction is therefore of great significance in its refutation of the conclusions of Manchot. The spectrographic measurements of M. and Linck are not precise and the indexes of extinction of Fe nitrososulfide are close to those of other complex ferric salts. The intermediate formation of HNO<sub>2</sub> and the reduction suggested by M. by the reaction:  $\text{Fe}^{++} + \text{NO} + \text{OH}^- \longrightarrow \text{Fe}^+ + \text{HNO}_2$  are absurd, for under the conditions, HNO<sub>2</sub> is an oxidizing agent, and the Roussin salts form in the presence of an excess of FeSO<sub>4</sub> from FeS and alk. nitrite. Moreover, the appearance of HNO<sub>2</sub> and of nitrite in the synthesis of other sulfo salts does not necessitate reduction of the metal, for this would exclude the reaction:  $2\text{NO} + \text{H}_2\text{O} \longrightarrow \text{HNO} + \text{HNO}_2$ , which is probably the intermediate step in the transformation of NO to nitrite and N<sub>2</sub>O by the action of alkalis. The synthesis of nitrososulfo ethers as described by M. and Gall (*cf. C. A.* 22, 2892) can be explained by the reaction:  $2\text{NO} + (\text{RS})^- \longrightarrow (\text{NO})^- + \text{RS}\cdot\text{NO}$ , in which NO acts like a halogen. The formation of the disulfide may be explained by the intermediate formation of the free radical RS $\cdot$ , thus:  $(\text{RS})_2\text{Ni} + \text{NO} \longrightarrow \text{RS}\cdot\text{NiNO} + \text{RS}\cdot$ , the RS $\cdot$  then participating in 2 reactions:  $2\text{RS}\cdot \longrightarrow \text{RS}\cdot\text{SR}$  and  $\text{RS}\cdot + \text{NO} \longrightarrow \text{RS}\cdot\text{NO}$ . These reactions do not affect the valence of the metal. The explanation of M. and G. rests on a fundamentally erroneous premise, in that nitrosyl mercaptides are not analogous to HNO<sub>2</sub> with respect to oxidation, for they decompose to NO and the disulfide and autooxidize to hyponitrites and disulfides, *i. e.*, they are reduction products of HNO<sub>2</sub> and are analogous to NO (*cf. Lecher and Siefkern, C. A.* 20, 2976). It is extremely unlikely that, as maintained by M., there can be assocn. between a metal in a reduced and highly oxidizable state, and NO in a state corresponding to halogens. C. C. DAVIS

Constitution of hydroxides and of hydrates. III. Octahydrated strontium hydroxide. G. NATTA. Reale Politecnico, Milano. *Gazz. chim. ital.* 58, 870-82(1928); *cf. C. A.* 23, 350, 1361.—Though many compds. contg. H<sub>2</sub>O of crystn. have been examd. by x-rays, the position of this H<sub>2</sub>O in the lattice and its dimensions have not been detd. directly heretofore. Sn(OH)<sub>2</sub>·8H<sub>2</sub>O was particularly suitable and interesting for the expts., for it contains both OH groups and H<sub>2</sub>O of crystn., has a high degree of symmetry and a small elementary cell. The position of the H<sub>2</sub>O of crystn. with respect to the positions and dimensions of the other atoms is of interest also in studying the relative stability of hydrates, the dimensions of coördinating ions, the mode of coördination of various atoms in the lattice, and the vols. of the elementary cells. Knowledge of the exact lattice dimensions of hydrated compds. can furnish data for the direct measurement of the mol. vol. of H<sub>2</sub>O of crystn., a vol. which numerous experimenters have tried to det. from the different mol. vols. of the hydrated and anhyd. compds. This method, besides being based on data of doubtful precision (in that the exptl. d. is much lower than the actual d.), does not take into account the fact that by introduction of H<sub>2</sub>O into the lattice, new structures are often formed, the mol. vols. of which may be far different from the sum of the mol. vols. of the anhyd. salt and that of the H<sub>2</sub>O of crystn. Sr(OH)<sub>2</sub>·8H<sub>2</sub>O crystallizes in the tetragonal system, and has an elementary cell with *a* = 6.41 Å. U., *c* = 5.807 Å. U., and a vol. of  $238 \times 10^{-24}$  cc., contg. 1 mol. of Sr(OH)<sub>2</sub>·8H<sub>2</sub>O. The calcd. d. is 1.85. A discussion of the possible distribution of the atoms in the lattice leads to the conclusion that the structure may be defined by the following coördinates: bivalent Sr ion (000); O of the OH group ( $\frac{1}{2}$ , 00); (0 $\frac{1}{2}$ , 0); O of the H<sub>2</sub>O of crystn. (*u u v*) (*-u -u v*) (*-u -u v*) (*-u -u v*) (*u -u v*) (*u -u v*) (*-u -u v*) (*-u -u v*). The values of the parameters, which define the positions of the O of the H<sub>2</sub>O of crystn., are approx. 0.25 for *v* and 0.29-0.30 for *u*. C. C. DAVIS

Observations on the rare earths. XXXI. Ionic migration and magnetism in the separation of the rare earths. PIERCE W. SELWOOD WITH B. S. HOPKINS. *Trans. Am. Electrochem. Soc.* 55, (preprint), 13 pp.(1929).—Expts. were conducted to det. the applicability of the ionic migration method to certain problems in the concn. of the rare earths. It does not compare favorably with the older methods. A review is given of the factors underlying ionic mobility. Details are given in the second part of the paper of attempts made to use the magnetic properties of the rare earths for their sepn. As yet no sepn. has been detected, although the method seems theoretically sound. XXXII. Fractional hydrolysis of rare earths by electrolysis. H. C. KREMERS AND L. L. QUILL. *Ibid* 5 pp.—Neutral solns. of the rare earths give hydroxides at the cathode when electrolyzed. By stirring the cathode portion, a fractional pptn. may be effected. The order of pptn. will follow the order of increasing basicities of the rare earths. The hydroxides produced are granular and easily filtered. The sepn. of Yt from Ho and



Er and the relation of Yt to the Ce group earths were especially studied. From the standpoint of time, convenience and quantity of material to be fractionated, this method is superior to most ordinary fractionation methods depending upon relative basicities. Efficiencies are also practically equal. C. G. F.

The separation of columbium and tantalum by electrolytic hydrolysis. L. F. YNTEMA. *Trans. Am. Electrochem. Soc.* 55 (preprint), No. 8, 3 pp. (1929).—An incomplete sepn. of Cb and Ta is effected by making the soln. of the mixed salts the electrolyte in the anode compartment of an electrolytic cell. The sepn. depends on the pptn. of the insol. columbic and tantalic acids at the diff. H-ion concns. produced during the course of the electrolysis. W. H. BOYNTON

The action of potassium ferrocyanide upon silver and various difficultly soluble silver salts. ERNST BEUTEL and ARTUR KUTZLNIGG. Hochschule f. Welthandel, Wien. *Monatsh.* 51, 369–80 (1929).—The soln. of Ag in boiling solns. of  $K_4Fe(CN)_6$  is due to the decompn. of the latter in the presence of air to give KCN and  $Fe(OH)_3$ . This fact also accounts for the soly. of AgCl, AgBr, AgCN,  $Ag_2Fe(CN)_6$ ,  $Ag_2O$ ,  $Ag_2CO_3$  and  $Ag_2CrO_4$  in alkali ferrocyanide solns. These Ag compds. are also sol. in cold ferrocyanide solns., resulting in the formation of colloidal  $Fe(OH)_3$ . The soly. of  $Ag_2Fe(CN)_6$  in  $H_2O$  lies between that of AgCl and that of AgBr. L. F. AUDRIETH

The action of ozone upon alkali azides. I. Pernitrous acid. KARL GLEU and ERNST ROELL. *Z. anorg. allgem. Chem.* 179, 233–66 (1929).—Purely chemical methods for the oxidation of  $HN_3$  in acid and in neutral soln. are reviewed. The authors have studied the action of ozone upon  $NaN_3$  in neutral and in alk. soln. Ozonized oxygen ( $10\% O_3$ ) passed into  $N NaN_3$  solns. gave a yellow coloration that changed to an orange-red after several hours. Further ozonization caused gradual fading and eventual decoloration. The final colorless soln. was found to be strongly alk., contained nitrites and nitrates, but no azide. The orange-red solns. (A) lost their color upon standing. Addn. of alkali increased the stability of the color, whereas heating or acidification caused its destruction. No yellow compd. could be pptd. from soln. by the addn. of various org. solvents. Ozone had no effect upon  $NaN_3$  dissolved in liquid  $NH_3$ . Heating of A caused evolution of  $O_2$ ,  $N_2$  and  $N_2O$ , the latter two in the vol. ratio, 1:1. Addn. of alkali decreased the relative amts. of  $N_2$  and  $N_2O$  evolved. Solns. ozonized past the stage of max. color intensity gave only  $O_2$  upon heating. Treatment of A with  $N_2H_4$ , HCHO, alk. solns. of stannous salts, hyposulfites,  $Na_3AsO_3$  and  $NaHCO_3$  caused immediate disappearance of the yellow color. The oxidizing power of A as detd. by means of  $Na_3AsO_3$  exceeds by 10% that required by the amt. of  $O_2$  evolved upon heating. Titration of A with standard HCHO solns. gave only  $1/2$  of the  $O_2$  required. The remainder was found to have oxidized an equiv. quantity of  $NaNO_2$  to  $NaNO_3$ . Alk. solns. of  $KMnO_4$  were reduced to green manganate. The  $KMnO_4$  used was found to be equiv. to the amt. of  $Na_3AsO_3$  and  $1/2$  HCHO employed.  $H_2O_2$  was shown to be absent, but the yellow compd. is believed to be an acid deriv. of  $H_2O_2$  in the form of the Na salt, probably pernitrous acid formed by decompn. of an ozonide of  $HN_3$ .  $HN_3 + O_3 = .HN_3(O_3) = HO-O-N=O + N_2$ . The non-formation of pernitrous acid by ozonization of other compds. contg. the imide group is regarded as evidence against the possible contention that the reaction involves decompn. of  $HN_3$  with the formation of the imide residue,  $HN$ , followed by subsequent addn. of  $O_3$ . Analytical methods are discussed in detail. Nitrites were detd. gas-volumetrically with aminosulfonic acid. In the presence of azides a measured amt. of standard  $H_2SO_4$  was added to the soln., the excess of acid titrated, and the amt. of  $HNO_2$  used up by the azide calcd. L. F. A.

Action of silica and alumina on sodium sulfate. GERMAINE MARCHAL. *Compt. rend.* 188, 258–60 (1929); cf. C. A. 18, 509.—The decompn. temp. of  $Na_2SO_4$  is lowered by the addn. of equimol. amts. of silica and alumina. When heated at  $1300^\circ$  the loss of wt. of the  $Na_2SO_4$  in the  $Na_2SO_4-SiO_2$  mixt. was 14.14% in 1 hr., and 24.2% in 3 hrs. In the  $Na_2SO_4-Al_2O_3$  mixt. the loss was 22.03% in 1 hr. and 31.29% in 3 hrs. The pure  $Na_2SO_4$  lost 0.87% in 1 hr. and 4.23% in 4 hrs. AMY LEVESCONTE

Action of silica, alumina and kaolin on barium sulfate. GERMAINE MARCHAL. *Compt. rend.* 188, 399–402 (1929); cf. preceding abstract and C. A. 20, 690.— $BaSO_4$ , when mixed with silica, alumina, or kaolin, is more than half decomposed when heated 4 or 5 hrs. at  $1300^\circ$ . The pure  $BaSO_4$  does not decompose at this temp. The action is rapid at first, slowing down later. The results indicate that  $BaSO_4$  may be substituted for  $BaCO_3$  in the glass and sugar industries. AMY LEVESCONTE

The nitrites. I. Nitrites of nickel and cobalt; pyridinates. L. LE BOUCHER. *Anales soc. españ. fis. quim.* 28, 145–56 (1929).—A new method of obtaining nitrites of bivalent heavy metals combined with pyridine consists in pptg. at  $0^\circ$  an aq. soln. of a metal salt by pyridine and  $NaNO_2$ . This is possible with Ni, Co, Fe, Mn, Cu, etc.

The ppt. contains the metal ion and the  $\text{NO}_2$  ion in the relation  $\text{M}^{++}:(\text{NO}_2)_2$ , combined with variable amts. of  $\text{H}_2\text{O}$  and pyridine. When the compds. are stored in a dry atm. in the presence of pyridine, all  $\text{H}_2\text{O}$  is replaced, giving a compd.  $\text{M}(\text{NO}_2)_n\text{Py}$ ,  $n$  being usually 6. From this compd. others contg. less pyridine can be obtained by storing *in vacuo* over  $\text{H}_2\text{SO}_4$ .  $\text{Ni}(\text{NO}_2)_2\cdot 6\text{Py}$  is a deep blue,  $\text{Ni}(\text{NO}_2)_2\cdot 4\text{Py}$ , a clear blue,  $\text{Co}(\text{NO}_2)_2\cdot 6\text{Py}$ , a red,  $\text{Co}(\text{NO}_2)_2\cdot 3\text{Py}$ , a rose-violet,  $\text{Co}(\text{NO}_2)_2\cdot 2\text{Py}$ , a deep red. Pyridine can be replaced by  $\text{NH}_3$ . The mol. vols. of the new compds. have been detd.

E. M. SYMMES

**The molybdates.** V. GÓMEZ ARANDA. *Anales soc. españ. fis. quim.* 28, 165-8 (1929); cf. *C. A.* 23, 2119.—Molybdates of Sr, Ba and Pb, prepd. by fusion, were analyzed; the  $\text{MoO}_3$  contents were found to be low. The ds. were 4.6624, 4.9747 and 6.9208, resp., not agreeing well with the literature.

E. M. SYMMES

**The systems potassium chloride-ferric chloride-water and aluminum chloride-ferric chloride-water between 0° and 60°.** G. MALQUORI. Istituto Chimico, Reale Univ. Roma. *Gazz. chim. ital.* 58, 891-8(1928).—Because Fe is present in the reaction liquor from the attack of leucite by HCl in the Blanc process (cf. Blanc, *C. A.* 19, 1616), it is of interest to det. whether and to what point this Fe can be held in soln. while the K and Al salts are pptd. In the present paper, the isotherms of the system  $\text{KCl-FeCl}_3\cdot\text{H}_2\text{O}$  at 0°, 25°, 35° and 60°, the isotherm of  $\text{AlCl}_3\text{-FeCl}_3\text{-H}_2\text{O}$  at 0°, and the 2 branches of the isotherms at 40° and 60° in which  $\text{AlCl}_3\cdot 6\text{H}_2\text{O}$  is the solid in excess, are given. These data are necessary in a study of the system:  $\text{HCl-KCl-AlCl}_3\text{-FeCl}_3\text{-H}_2\text{O}$  (cf. *C. A.* 21, 2229). The methods were the same as those used heretofore in similar expts. The results are recorded in tables and triangular diagrams. Hinrichsen and Sachsels have described the system  $\text{FeCl}_3\text{-KCl-H}_2\text{O}$  at 21° (cf. *Z. physik. Chem.* 50, 81(1905)), but contrary to their results, it was found that at 25°, 35° and 60° along the isotherms from satd. solns. of KCl to those of  $\text{KCl} + \text{FeCl}_3\cdot 2\text{KCl}\cdot\text{H}_2\text{O}$ , the solid in excess is always pure KCl; in fact, satd. solns. of  $\text{KCl} + \text{FeCl}_3\cdot 2\text{KCl}\cdot\text{H}_2\text{O}$  sepd. from the solid KCl and placed in contact with KCl do not change in compn. At 0° mixed crystals are possible, but it is not possible to obtain reliable analyses because of the small quantity of Fe and because of the difficulty of sepg. the mother liquors completely. The double salt  $\text{FeCl}_3\cdot 2\text{KCl}\cdot\text{H}_2\text{O}$  is stable at all the temps. studied, and contrary to Walden (cf. *Z. anorg. allgem. Chem.* 7, 331(1894)) it seps. only from solns. with a high  $\text{FeCl}_3$  content. The soly. relations of the system  $\text{AlCl}_3\text{-FeCl}_3\text{-H}_2\text{O}$  are simpler, in that only 2 solids are present at 0°, viz.,  $\text{AlCl}_3\cdot 6\text{H}_2\text{O}$  and  $\text{FeCl}_3\cdot 6\text{H}_2\text{O}$ . At 40° and at 60°, solns. contg. up to 45 and 38.9%, resp., of  $\text{FeCl}_3$  are in equil. with solid  $\text{AlCl}_3\cdot 6\text{H}_2\text{O}$  alone.

C. C. DAVIS

**The complex oxalates of scandium.** JAN ŠTĚRBA-BÖHM AND STANISLAV ŠKRAMOVSÝ. Charles' Univ., Prague. *Časopis Českoslov. Lékárnictva* 8, 211-5(1928); cf. *C. A.* 23, 2698.—Salts were prepd. derived from the following acids:  $\text{HSc}(\text{C}_2\text{O}_4)_2$ ,  $\text{H}_2\text{Sc}(\text{C}_2\text{O}_4)_3$ ,  $\text{H}_3\text{Sc}(\text{C}_2\text{O}_4)_4$ , corresponding to the previously described acids  $\text{HScF}_6$ ,  $\text{H}_2\text{ScF}_6$ ,  $\text{H}_3\text{ScF}_6$ . The following salts were prepd.:  $\text{NH}_4\text{Sc}(\text{C}_2\text{O}_4)_2\cdot 2\text{H}_2\text{O}$ ,  $\text{KSc}(\text{C}_2\text{O}_4)_2\cdot 2\text{H}_2\text{O}$ ,  $\text{NaSc}(\text{C}_2\text{O}_4)_2\cdot 3\text{H}_2\text{O}$ ,  $\text{Na}_2\text{Sc}_2(\text{C}_2\text{O}_4)_3\cdot 9\text{H}_2\text{O}$ ,  $\text{K}_2\text{Sc}(\text{C}_2\text{O}_4)_3\cdot 4\text{H}_2\text{O}$ ,  $\text{Na}_2\text{Sc}(\text{C}_2\text{O}_4)_3\cdot 6\text{H}_2\text{O}$ . The correct formula for the oxalate is  $\text{Sc}_2(\text{C}_2\text{O}_4)_3\cdot 6\text{H}_2\text{O}$  instead of  $\text{Sc}_2(\text{C}_2\text{O}_4)_3\cdot 5\text{H}_2\text{O}$  as was reported by others.

WILLIAM J. HUSA

**Chromatocobaltammines. II. Dichromatotetramminecobaltates and the maximum coordination number of cobalt.** SAMUEL H. C. BRIGGS. *J. Chem. Soc.* 1929, 685-90; cf. *C. A.* 13, 2822.—A series of compds. is described in which the chromate radical forms part of a complex anion. These dichromo-tetrammine-cobaltates are obtained when a soln. of a di-aquo-tetrammine cobaltic salt is added to an excess of a concd. soln. of an alkali chromate, and the resulting soln. kept for several days at ordinary temp. Two cryst. forms have been prepd., green and brown. The presence of dichromate in the soln. appears to favor the production of the brown form. Li, Na, K and Mg salts were prepd. Evidence is adduced to show that in the green Mg form, Co has a coordination no. of 8.

LOUIS WALDBAUER

**Carbon disulfideselenide.** HENRY V. A. BRISCOE, JOHN B. PEEL AND PERCY L. ROBINSON. *J. Chem. Soc.* 1929, 56-60.—In attempting to prep.  $\text{CS}_2$  by passing  $\text{CS}_2$  over heated  $\text{FeSe}$ , a partial replacement occurred, giving  $\text{CSSe}$ , which is a new method for prep. the compd. Its phys. properties and some of its chem. reactions have been studied. It is similarly constituted to  $\text{CS}_2$  but is much less stable. Attempts to prep. the analogs of the thiocarbonates failed, but compds. of  $\text{CSSe}$  with phenylhydrazine and  $\text{C}_6\text{H}_5\text{NH}_2$  have been made.  $\text{CSSe}$  and  $\text{NH}_3$  under certain conditions yield compds., which appear to be highly polymerized and difficult to characterize.

L. L. QUILL

**Sulfoaluminates of calcium.** WILLIAM LERCH, F. W. ASHTON AND R. H. BOGUE. *Bur. Standards J. Research* 2, 715-31(1929).— $3\text{CaO}\cdot\text{Al}_2\text{O}_3\cdot 3\text{CaSO}_4\cdot 31\text{H}_2\text{O}$  is most satisfac-

torily prepd. by interaction of solns. of  $\text{CaSO}_4$  and Ca aluminate, preferably with added  $\text{Ca}(\text{OH})_2$ . The long needle-like hexagonal crystals have refractive indices  $n_D 1.464 \pm 0.002$ ,  $n_D 1.458 \pm 0.002$ ; they are uniaxial negative and show neg. elongation; they have a  $d_{20} 1.48$ . In the presence of dil. solns. of  $\text{CaSO}_4$ , ppts. have been obtained, which indicate an equil. mixt. of  $3\text{CaO} \cdot \text{Al}_2\text{O}_3 \cdot 3\text{CaSO}_4 \cdot \text{aq}$  and  $3\text{CaO} \cdot \text{Al}_2\text{O}_3 \cdot \text{aq}$ . As the concn. of the  $\text{CaSO}_4$  increases, the amt. of the aluminate decreases and eventually disappears. The existence of a new Ca sulfoaluminate  $3\text{CaO} \cdot \text{Al}_2\text{O}_3 \cdot \text{CaSO}_4 \cdot 12\text{H}_2\text{O}$  has been demonstrated. The indices of refraction are  $n_D 1.504 \pm 0.002$ ,  $n_D 1.488 \pm 0.002$ . Its crystal habit is platy instead of acicular and the character of elongation is positive; its  $d_{20}$  is 1.95. The compd. is unstable, and under regular conditions, encountered in concrete, it is converted into the more stable form with the higher  $\text{CaSO}_4$  content. The transformation is retarded by increasing OH-ion concn. In the presence of only a slight excess of sol. carbonates or Mg salts the sulfoaluminates will be destroyed. When both sulfate and chloride solns. are present, the high Ca sulfoaluminate will be formed to the exclusion of Ca chloroaluminate, if there is sufficient  $\text{CaSO}_4$  present.

E. SCHOTTE

**Oxidation of halogen acids by sulfuric acid.** KSENIA PROSKOURIAKOFF. *J. Phys. Chem.* 33, 717-9(1929).—The temps. at which various strengths of  $\text{H}_2\text{SO}_4$  (25-50% and 60-90%, resp.) oxidize HI and HBr are given.

A. P. SACHS

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## 7—ANALYTICAL CHEMISTRY

W. T. HALL

**A system of general reagents for courses in qualitative analysis.** LOUIS J. COURT-MAN. College of the City of New York. *J. Chem. Education* 6, 686-96(1929).—To save trips to reagent shelves and to make each student responsible for his own reagents, students are given small portions of about 70 different substances which they are likely to use in making qual. tests.

W. T. H.

**Applications of ceric sulfate in volumetric analysis. VI. Oxidation of hydrogen peroxide by ceric sulfate. Indirect determination of lead.** N. HOWELL FURMAN AND JOHN H. WALLACE, JR. Princeton Univ. *J. Am. Chem. Soc.* 51, 1449-52(1929); cf. C. A. 23, 2390.—Data are given showing that the direct potentiometric titration of  $\text{H}_2\text{O}_2$  with  $\text{Ce}(\text{SO}_4)_2$  soln. is accurate in solns. which are moderately acid in  $\text{HCl}$ ,  $\text{H}_2\text{SO}_4$ ,  $\text{HNO}_3$ , or  $\text{AcOH}$ . The titration in the reverse direction is also accurate in the presence of  $\text{H}_2\text{SO}_4$  or  $\text{HNO}_3$ . Like  $\text{MnO}_2$ ,  $\text{PbO}_2$  reacts with  $\text{H}_2\text{O}_2$  in the presence of  $\text{HNO}_3$ . By measuring the quantity of  $\text{H}_2\text{O}_2$  used and titrating the excess with  $\text{Ce}(\text{SO}_4)_2$ , the quantity of  $\text{PbO}_2$  can be detd. satisfactorily with 0.18-0.25 g. of material.

W. T. HALL

**Studies in iodometry. III. Copper as a standard in iodometry.** STEPHEN POPOFF, MARGARET JONES, CARL RUCKER AND W. W. BECKER. State Univ. Iowa. *J. Am. Chem. Soc.* 51, 1299-1306(1929); cf. C. A. 19, 2920-1.—Under proper conditions, the reaction between Cu and KI can be used for the accurate standardization of  $\text{Na}_2\text{S}_2\text{O}_3$  solns. The reaction should proceed in a soln. as nearly neutral as possible in the presence of 4% of KI and in the absence of salts. The presence of  $\text{H}_2\text{SO}_4$  sufficient to make the soln. 0.2 N or of  $\text{AcOH}$  enough to make the soln. 0.4 N serves to decrease the  $\text{I}_2$  liberated by 0.2% and 0.08%, resp. In the electrodeposition of Cu, losses will ensue unless care is taken in removing the electrode. **IV. Potassium permanganate as a standard in iodometry.** STEPHEN POPOFF AND ADOLF H. KUNZ. *Ibid* 1307-11.—In the  $\text{Na}_2\text{S}_2\text{O}_3$ - $\text{I}_2$  reaction there is no appreciable oxidation of the  $\text{I}^-$  ion by the air of the lab. if the soln. contains 6% of KI and is 0.2 N in  $\text{H}_2\text{SO}_4$ , provided the titrations are made in the dark.

W. T. HALL

**Avoiding an over-titration.** G. BRUHNS. *Chem.-Ztg.* 53, 248(1929).—The tricks of saving out a part of the soln. and titrating in porcelain dishes while stirring may be old-fashioned but are still useful.

W. T. H.

**Microtitration of iodides, even in the presence of large quantities of nitrite.** J. F. RERRH. *Rec. trav. chim.* 48, 386-90(1929); cf. C. A. 23, 2675.—Nitrites cause low results in the microchem. detn. of iodides by the Winkler principle. This difficulty is best overcome by the use of  $\text{NaN}_3$  (1.7 mg. for 1 mg. of  $\text{NaNO}_2$ ). To 1 cc. of the soln. to be titrated, contained in a 25-cc. Erlenmeyer flask, add an excess of 5%  $\text{NaN}_3$  soln. and make acid to methyl-orange paper with 2 *N*  $\text{H}_2\text{SO}_4$ . Boil vigorously and when the odor of  $\text{NH}_3$  is no longer evident, add a little more to make sure that an excess is used. Make acid again and boil again. Finally add 2 drops of 0.5 *N*  $\text{H}_2\text{SO}_4$  and 3 drops of Br aq., boil off excess Br, add KI and starch and titrate with  $\text{Na}_2\text{S}_2\text{O}_3$ . The detn. depends upon the formation of iodate and its reduction by KI. The use of Br is preferable to Cl because it is easier to make sure that the excess is removed. W. T. H.

**Note on gas analysis.** JAMES T. DONNELLY, C. HAMILTON FOOT AND J. REILLY. Univ. College at Cork. *Sci. Proc. Roy. Dublin Soc.* 19, 165-72(1929).—A photograph and diagrammatic sketch are shown of the Bone and Wheeler app. with certain modifications not previously described. The gas sample is collected in a test tube, introduced into a bell tube under Hg, the gas pressure read and then the gas is brought into contact with various reagents under the bell and the pressure detd. at const. vol. after each absorption. A stopcock with Hg seal is shown and a specially designed CuO furnace for detn. of  $\text{H}_2$ . Particular attention was paid to the elimination of danger from Hg poisoning in the design of the app., of the lab. shelves and even of the lab. flooring. W. T. H.

**Indicators. XII. Azo-indicators.** A. THIEL AND O. PETER. *Z. anorg. allgem. Chem.* 173, 169-98(1928).—Methyl orange exists as a yellow purely azo form and as a red, practically completely quinonoid, form. The electrochem. and color equilibria coincide almost exactly, the indicator thus satisfying the modified Ostwald theory of indicators. The double change is limited to the *p*-aminoazobenzene-*o*-carboxylic acid derivs. Considerable evidence has been obtained for the hypothesis of closed ring formation. A no. of relationships exist between the indicator properties of a substance and its constitution. The half-way stages of all sulfonic and *m*'- and *p*'-carboxylic acids are practically identical and are in accord with those of the free bases having similar amino complexes. The *o*'-carboxylic acids are bivalent indicators, of which the half stage of the first change (basic) lies below that of substances of the first group having the same amino complexes. The color change of the yellow forms of the acidic indicators increases in the order *o*'-, *m*'-, *p*'-, while for the red forms the order is *o*'-, *m*'-, *p*'- for the sulfonic acids and *m*'-, *p*'-, *o*'- for the carboxylic acids, successive increases being produced in all cases by substitution in the amino group in the order: unsubstituted, dimethyl and monophenyl, diethyl for the yellow forms, and unsubstituted, diethyl, dimethyl, monophenyl for the red forms. The depth of color of all the indicators increases by substitution in the amino-group in the order: unsubstituted, monophenyl, dimethyl, diethyl for the yellow forms and unsubstituted, dimethyl or diethyl, monophenyl for the red forms. B. C. A.

**Barium sulfate as an indicator of the effectiveness of sulfuric acid in desiccators.** G. БОРН. *Chem.-Ztg.* 53, 323(1929).—Add 18 g. of  $\text{BaSO}_4$  to 1 l. of concd.  $\text{H}_2\text{SO}_4$ . A ppt. of  $\text{BaSO}_4$  will appear only when sufficient  $\text{H}_2\text{O}$  has been absorbed to render the acid unfit for further use in desiccators. E. M. SYMMES

**Methods of determining bromine in sea water and brine.** A. I. KOGAN. *Ukrainskii Khim. Zhur.* 3, Tech. Pt., 131-7(1928).—Various methods for detg.  $\text{Br}^-$  in the presence of large quantities of  $\text{Cl}^-$  were tested. Treadwell's procedure is tedious and probably inaccurate when the  $\text{Br}^-$  content is very low. The methods of Wesselsky and of Berg are more practical, the latter being preferred. Considerable analytical data are given concerning some obtained with these and several other methods. CHAS. BLANC

**Apparatus and method for the rapid determination of "available chlorine" in weak hypochlorite liquor.** J. M. TAYLOR. *Ind. Chemist* 5, 135-6(1929).—If a soln. of hypochlorite is mixed with excess  $\text{H}_2\text{O}_2$ , 1 mol. of  $\text{O}_2$  is evolved for each mol. of  $\text{OCl}^-$  present. An app. is shown and described, which serves to measure the gas pressure produced by this reaction and which is suitable for use in a bleaching plant. A table shows the "available Cl" corresponding to 0-0.75 lbs. pressure per sq. in. W. T. H.

**Method for the estimation of hydrogen in steel.** T. E. ROONEY AND GUY BARR. *J. Iron & Steel Inst.* (advance copy), 8 pp.(May, 1929); *Engineering* 127, 597-8(1929).—The app. described provides for heating the sample in a known vol. of  $\text{N}_2$  and measuring the vol. of  $\text{H}_2$  evolved by means of the Shakespear katharometer. The method is sensitive and permits the detection of 0.5 ml. of  $\text{H}_2$ . Heating for 1 hr. at 800° serves to remove all  $\text{H}_2$  from steel that has been exposed to this gas. W. T. H.

**The manometric determination of small oxygen partial pressures.** OTTO WARBURG AND FRITZ KUBOWITZ. Kaiser-Wilhelm-Inst. für Biologie, Berlin-Dahlem. *Biochem. Z.* 202, 387-9(1928).—An app. with which the  $O_2$  contamination of pure  $N_2$  or  $H_2$  can be detd. has been improved to measure the partial pressure of only a few 0.0001 atm. of  $O_2$ . This consists of a small flask with an extra glass-stoppered side reservoir, and a small chamber in the center of the bottom, giving thus 3 sep. chambers. The reservoir contains 0.2 cc. 0.5  $M$   $FeSO_4$  dissolved in 0.002  $M$   $H_2SO_4$ . The center chamber contains 0.2 cc. 5%  $KOH$  and the main chamber 2 cc. 0.2  $M$   $Fe$ -free  $Na_2P_2O_7$ . The flask is closed by means of a manometer capillary tube through which the analyzed gas is admitted. The manometer is filled with  $H_2O$ . The app. is shaken in the thermostat until the temp. and pressure are equalized. Since acid  $FeSO_4$  does not absorb  $O_2$ , its pressure does not alter during this procedure. Now the reagent from the side reservoir is poured into the main chamber by tilting the app., whereby  $Fe_3P_2O_7$  is produced; this absorbs  $O_2$  very quickly, and a negative pressure results in the system. If this pressure at equil. is designated as  $P_0$  and the total gas pressure (corrected for vapor tension) before the reaction took place is  $P$ , then  $(P_0/P) 100 = \text{Vol. } \% O_2$ . The method was also checked up by means of known amts. of  $O_2$ . By this method  $N_2$  produced by Lindé contained 0.035 vol.  $\% O_2$ ;  $CO$ , 0.15 vol.  $\%$ , while Lindé's argon was  $O_2$  free.

S. MORGULIS

**A new method for the estimation of ozone in air.** M. S. EGOROV. Acad. of Military Med., Leningrad. *Z. Untersuch. Lebensm.* 56, 355-64(1928).—The method recommended is based on the formation of fluorescein from the leuco compd. by the action of  $O_3$ . Dissolve 1 mg. of fluorescein in a few drops of 10%  $NaOH$ , add 10 cc. of satd.  $NaOH$  soln. and shake with  $Zn$  dust until the disappearance of fluorescence indicates complete reduction. Filter and add 1 drop of this soln. to 10 cc. of 0.5%  $NaOH$  contained in a test tube. Draw air through this soln. at a max. rate of 12-15 l. per hr. The vol. of air used is measured when the fluorescence matches that of a standard soln. contg. 1 part of fluorescein in 100,000,000. The fluorescence is stable in alk. soln. and is unaffected by  $H_2O_2$  or oxides of  $N$ ; the method is sensitive, rapid and specific. One part by wt. of fluorescein is produced by 0.96 parts of ozone.

F. P. G.

**Determination of oxygen in steel by the hot extraction method.** GUSTAV THANHEISER AND CHRISTIAN ALEXANDER MÜLLER. *Mitt. Kaiser-Wilhelm-Inst. Eisenforsch. Düsseldorf* 11, 87-94(1929).—The so-called "hot extraction method" consists in heating the material in a vacuum with  $C$  and forming  $CO$  or  $CO_2$ . Until recently a temp. of 1100-1200° was used, but it is now felt that 1400-1600° is necessary in order to insure complete reduction of the oxides. It is now known that  $Fe$  can be heated far above its m. p. by an elec. current of high frequency; this method of heating has been used by Joran and Eckmann for the  $O$  detn. On the basis of the data given in the present paper, however, it is clear that the hot extraction method is still far from perfect. Of the oxides commonly occurring in steel, only  $FeO$  and  $MnO$  are reduced completely, while  $SiO_2$  and  $Al_2O_3$  are only partially reduced at temps. up to 1500°. Difficulties result from the working in a vacuum furnace at such high temps. It is inadvisable to attempt to work with several samples at the same time. W. T. H.

**Rapid method of analysis of bearing alloys.** I. F. ILCHENKO AND K. M. STAKHORSKI. *Ukrainskii Khim. Zhur.* 3, Tech. part, 237-40(1928).—An outline is given of well-known methods for analysis of white metals, such as Babbitt metal, type metal, solder, etc. Low's method of digesting the alloy with concd.  $H_2SO_4$ , filtering off  $PbSO_4$  and titrating with  $KMnO_4$  in  $HCl$  soln. is recommended for the detn. of  $Sb$ .  $Sn$  is detd. iodometrically after reduction with  $Fe$ ,  $Sb$ , or  $Al$  and filtering off the pptd. metals.  $Pb$  is detd. as  $PbSO_4$  and  $Cu$  is detd. colorimetrically as copper-ammonia compd. C. B.

**Rapid method for determination of iron and uranium.** G. SCAGLIARINI AND P. PRATISI. *Ann. chim. applicata* 19, 85-90(1929).—The method depends on the reaction  $2 Fe^{+++} + Cu = 2 Fe^{++} + Cu^{++}$ . Dil. the neutral soln. contg. 0.05-0.3 g. of  $Fe$  as sulfate to 200 cc. in a flask having a stopper provided with a Bunsen valve and with a glass rod to which can be fastened a copper spiral. Then add 20 cc. concd.  $H_2SO_4$ . Heat the soln. to boiling, lower the  $Cu$  into the liquid and boil for 10 mins. Then raise the  $Cu$  spiral, cool, dil. to 500 cc., and titrate with  $KMnO_4$ . In a similar way  $Cu$  has been found to reduce  $U^{VI}$  to  $U^{IV}$ , but 20-45 mins. boiling with  $Cu$  is advisable. When  $U$  and  $F$  are both present, det. both together in one sample; in another, ppt.  $Fe$  as sulfide and det.  $U$  in the filtrate.

A. W. CONTIERI

**Determination of minute quantities of mercury.** RUDOLF THEILENIUS AND ROBERT WINZER. *Z. angew. Chem.* 42, 284-8(1929).—The difficulties which Stock and his co-workers have experienced in detg. traces of  $Hg$  are explained and it is shown how they can be avoided. Instead of dissolving  $Hg$  in  $Cl_2$  aq., it is better to chlorinate with dry

$\text{Cl}_2$  at a higher temp. Precautions are necessary in order to get correct colorimeter readings. Minute directions are given for carrying out the work. W. T. H.

**Determination of minute quantities of mercury.** ALFRED STOCK AND WILHELM ZIMMERMANN. *Z. angew. Chem.* **42**, 429-30 (1929); cf. *C. A.* **22**, 4082.—A reply to he above criticism. W. T. H.

**A new and rapid method for the determination of mercury.** G. SPACU AND G. SUCIU. *Bul. soc. stiinte Cluj* **4**, 403-8 (1929).—If, at the boiling temp., a neutral or a slightly ammoniacal soln. of  $\text{Hg}^{++}$  salt is treated with KI followed by an excess of  $(\text{Cu en}_2)(\text{NO}_3)_2 \cdot 2\text{H}_2\text{O}$ , the Hg is pptd. completely as  $[\text{Cu en}_2][\text{HgI}_4]$ ; in these formulas "en" signifies ethylenediamine. The ppt. contains 22.49% of Hg. The pptn. is complete in vols. ranging from 80 to 500 cc. even in the presence of considerable  $\text{NH}_4\text{Cl}$  or  $\text{NH}_4\text{NO}_3$ . The reagent can be prepd. by heating a mixt. of 1 mol.  $\text{Cu}(\text{NO}_3)_2$  and 2 mols. ethylenediamine on the water bath until a cryst. crust is obtained. Or, a soln. of  $\text{CuSO}_4$  can be treated with diamine soln. until the characteristic violet color of the complex salt is obtained; an excess of the diamine does no harm. To det. Hg in the presence of Cu, make nearly neutral with  $\text{NH}_4\text{OH}$  and finish the neutralization with ethylenediamine. Heat to boiling, add an excess of KI and an excess of  $(\text{Cu en}_2)\text{SO}_4$ . Dil. with cold water to make the total vol. 25% larger, cool quickly, filter, wash 3-6 times with water contg. the reagents, then 4 times with 2-cc. portions of alc. and finally 3-4 times with ether. W. T. H.

**A new and rapid method for the gravimetric determination of cadmium.** G. SPACU AND G. SUCIU. *Bul. soc. stiinte Cluj* **4**, 409-12 (1929); cf. *C. A.* **22**, 1927.—With Cd a ppt. contg. 13.99% of Cd can be obtained by the action of KI and  $[\text{Cu en}_2](\text{NO}_3)_2 \cdot 2\text{H}_2\text{O}$ . To 100-300 cc. of neutral soln. contg. Cd, add an excess of KI and heat to the b. p. Then add a hot, concd. soln. of  $[\text{Cu en}_2](\text{NO}_3)_2$ . Cool completely, filter and wash first with a soln. contg. 1% of KI and 0.3% of  $[\text{Cu en}_2](\text{NO}_3)_2 \cdot 2\text{H}_2\text{O}$ , then with 4-6 2-cc. portions of alc. and finally 3-4 times with ether. W. T. H.

**Electroanalyses with mercury cathodes.** WILHELM MOLDENHAUER, K. F. A. EWALD AND O. ROTH. *Tech. Hochschule Darmstadt. Z. angew. Chem.* **42**, 331-4 (1929).—After describing the theory and technic of electrolytic work with a Hg cathode in the spoon-shaped electrode devised by M., the following new procedures are described.

**Detn. of Pb from  $\text{HNO}_3$  solns.**—To 50 cc. of soln. contg. about 0.1 g. of Pb, add 2 cc. of concd.  $\text{HNO}_3$  and 0.5 cc. of a concd. soln. of  $\text{NH}_2\text{NH}_2$  in concd.  $\text{HNO}_3$ . Electrolyze with a current of 1 amp. for 1 hr. while rotating the anode. When the electrolysis is finished, stop the stirring and drop the Pt-foil anode into the Hg of the cathode so that the current will not be broken on removing the electrodes from the beaker. When this is accomplished, wash with water, disconnect the current, remove as much of the water as possible and dry for 1.5 hrs. in a vacuum over concd.  $\text{H}_2\text{SO}_4$ .

**Detn. of Ag from ammoniacal soln.**—To 50 cc. of soln. contg. about 0.1 g. of Ag as nitrate, add 10 cc. of concd.  $\text{NH}_4\text{OH}$  and 6 g. of  $\text{NH}_4\text{NO}_3$ . Electrolyze with a current of 0.5 amp. at the start (3.5-4 v.). If the soln. contains any chloride, use fresh Hg for each analysis.

**Detn. of Ni from ammoniacal soln.**—To a  $\text{NiSO}_4$  soln. add 5 g. of  $\text{NH}_4\text{NO}_3$  and an excess of concd.  $\text{NH}_4\text{OH}$ . Electrolyze with a current of 0.5-0.75 amp. (about 5 v.) and add more  $\text{NH}_4\text{OH}$  from time to time.

**Detn. of Zn from ammoniacal soln.**—Add  $\text{NH}_4\text{NO}_3$  and  $\text{NH}_4\text{OH}$  as with Ni. Use a current of 0.4-0.8 amp.

**Detn. of Ag from KCN soln.**—To the  $\text{AgNO}_3$  soln. add KCN until the  $\text{AgCN}$  ppt. dissolves and use about 1 g. of KCN in excess. To avoid formation of  $(\text{CN})_2$  at the anode, add some KOH soln. Electrolyze with a current of 0.3-0.4 amp. at 3 v.

**Sepn. of Ag and Cu.**—To deposit Cu from dil.  $\text{HNO}_3$  soln. keep the e. m. f. at 1.2 v. To prevent anodic deposition of oxide, add a little dil. hydrazine sulfate soln. or some alc.; 0.16 g. of Ag will deposit in 1.75 hr. To deposit Cu use another cathode and increase the current to about 1 amp.

**Sepn. of Ag and Pb.**—To 50 cc. of nitrate soln. contg. about 0.1 g. of each metal, add 3 cc. of concd.  $\text{HNO}_3$ , 1 g. of tartaric acid and 2 cc. of 96% alc. Regulate the current as for the sepn. of Ag and Cu but add additional hydrazine in the Pb detn.

**Sepn. of Ag and Zn.**—Add 3 cc. of concd.  $\text{HNO}_3$  to the neutral soln. of the nitrates and 1 cc. of 96% alc. Keep the potential at 1.2 v. for the deposition of Ag and use 1.5 amp. for the Zn.

**Sepn. of Cu and Ni.**—Use a soln. contg. free  $\text{H}_2\text{SO}_4$ , keep the potential at 2.1 v. for the deposition of Cu and use a current of 1.5 amp. to deposit Ni.

**Sepn. of Zn from Pb or Ag from Zn and Pb.**—As electrolyte use a soln. contg. up to 0.1 g. of each metal in the form of nitrates. Add 10 cc. of 2 N  $\text{H}_2\text{SO}_4$  to ppt. the Pb as  $\text{PbSO}_4$  and deposit the Zn at 50° in a stirred electrolyte, using a current of 2 amp. at 5-6 v. When Ag is present, add a little tartaric acid and alc. to the  $\text{HNO}_3$  soln. and deposit the Ag as described for the Ag-Pb sepn. Then add  $\text{H}_2\text{SO}_4$  and ppt. the Zn as just described. After the Zn detn. siphon off the liquid above the  $\text{PbSO}_4$  ppt. as completely as possible,

and dissolve the ppt. in concd. ammoniacal tartrate soln. Add 3 g. of  $\text{NH}_4\text{NO}_3$  and electrolyze with a current of 0.8 amp. at 3.5–4.5 v. From time to time break the circuit to allow  $\text{PbO}_2$  to dissolve from the anode.

W. T. H.

**Method for the quantitative separation of nickel and calcium.** GEORG W. KÜHL. *Chem.-Ztg.* 53, 279(1929).—When only Ni and Ca are present, make the soln. ammoniacal and ppt. the Ca first as oxalate; in the filtrate det. Ni by the diacetyl dioxime method.

W. T. H.

**Determination and separation of rare metals from other metals.** XV. Quantitative analysis of gallium. 2. LUDWIG MOSER AND ALFRED BRUKL. *Monatsh.* 51, 325–33 (1929); cf. *C. A.* 23, 2387.—Considerable difficulty was encountered in finding a good method for sepg. Ga from certain trivalent and quadrivalent cations. The best reagent for this purpose appears to be cupferron. *Sepn. of Ga from Al.*—To the neutral soln. contg. 0.01–0.3 g. of Ga, add  $\text{H}_2\text{SO}_4$  to make the soln. 2 N and bring the vol. to 200–300 cc. At room temp. add a 6% soln. of cupferron, using 6 times as much as there is Ga present. Filter off the white, flocculent ppt. through a paper filter in a Pt cone and finally apply gentle suction. The first filtrate usually comes through turbid. Add 1–2 cc. more of reagent and filter through the same filter. If the filtrate remains clear for 2 hrs. the complete pptn. of Ga is assured. Wash with small portions of 2 N  $\text{H}_2\text{SO}_4$  and drain each time by gentle suction. When free from chloride, ignite and weigh as  $\text{Ga}_2\text{O}_3$ . Evap. the filtrate to fumes and ppt. the Al as  $\text{Al}(\text{OH})_3$  by dilg. and adding  $\text{NH}_4\text{OH}$ , or, if the quantity of Al is small, ppt. by adding tannin to the  $\text{AcOH}$  soln. If more than 2 g. of Al is present, some Al will be pptd. with the Ga; otherwise a single pptn. is adequate for the sepn. *Sepn. of Ga from Cr.*—Proceed in precisely the same manner. *Sepn. of Ga from In.*—The procedure is the same except that special care must be taken in washing the Ga ppt. It is best to have a little cupferron in the acid wash water. If the In predominates, a double pptn. is necessary. If In is present in the ignited  $\text{Ga}_2\text{O}_3$ , it will show a yellow tint. *Sepn. of Ga from U.*—The same method works here also, provided the U is all present in the sexivalent condition. The absence of reducing agents is necessary since  $\text{U}^{\text{IV}}$  forms a ppt. with cupferron. *Sepn. of Ga from Ce.*—The same method applies. *Sepn. of Ga from Fe.*—Two methods have been found to give results. The first depends upon the pptn. of the Ga by  $\text{Na}_2\text{S}_2\text{O}_3$ , as in the well-known method for sepg. Fe from Al, and the second depends upon the pptn. of Fe as  $\text{FeS}$  in an ammoniacal soln. contg. tartaric or sulfosalicylic acid. If the Fe predominates and little Ga is present, nearly neutralize the soln. with  $\text{Na}_2\text{CO}_3$  and add  $\text{Na}_2\text{S}_2\text{O}_3$  until the violet color of the  $\text{Fe}^{\text{III}}$  complex disappears, showing that complete reduction has been accomplished. Boil for 15 mins. and then, at 5-min intervals, add 10-cc. portions of aniline. Filter while hot and wash till all Na salt is removed. Fuse the ignited  $\text{Ge}_2\text{O}_3$  ppt. with  $\text{K}_2\text{S}_2\text{O}_7$  and repeat the sepn. as given for one of the 2 following cases. (a) If not more than 0.3 g. of oxides are present, treat the soln. with 10% sulfosalicylic acid and then with ammonia until a red color is obtained. Introduce  $\text{H}_2\text{S}$  into the clear, boiling soln. Filter off the  $\text{FeS}$  and wash the ppt. with water contg.  $(\text{NH}_4)_2\text{S}$  and  $(\text{NH}_4)_2\text{SO}_4$ . Make the filtrate acid with  $\text{AcOH}$ , boil off  $\text{H}_2\text{S}$  and ppt. the Ga by  $\text{NH}_4\text{OAc}$  and tannin. (b) If, finally, much Ga and little Fe are present, pour the nearly neutral soln. into an excess of hot, dil.  $\text{NH}_4\text{OH}$  to ppt.  $\text{Fe}(\text{OH})_3$ . Since the ppt. always adsorbs some Ga, dissolve in  $\text{HCl}$  and continue as in (a). In the combined filtrates det. the Ga by pptn. with tannin in dil.  $\text{AcOH}$  soln.

W. T. H.

**Rapid determination of tin in tin plate and tin plate waste.** JACOB HÄGE. *Chem.-Ztg.* 53, 287(1929).—Wind 10 g. of material into a spiral, fasten it to a Pt wire and suspend the metal over hot, 6 N  $\text{HCl}$  until the appearance of the plate indicates that all of the Sn has been removed. Reduce the resulting soln. with Al or Zn using a Bunsen valve or a Gockel valve contg.  $\text{NaHCO}_3$  soln. Dissolve the metal in  $\text{HCl}$  and titrate with  $\text{I}_2$  soln.

W. T. H.

**Detection of small quantities of vanadium.** ANTON FÖLSNER. *Chem.-Ztg.* 53, 259(1929).— $\text{Pb}(\text{OAc})_2$  will give a turbidity in solns. which have given a negative test for V with  $\text{H}_2\text{O}_2$ .

W. T. H.

**Determination of zinc in pyrites.** LORENZ L. HAGEN. *Tids. Kemi Bergvesen* 8, 34–5(1928).—Heat 3 g. of pyrite with 25 cc. of concd.  $\text{HCl}$  in a 500-cc. beaker. Add 5–10 cc. of concd.  $\text{HNO}_3$  and boil some more. Add a little  $\text{Br}_2$ , evap. nearly to dryness, and add 10 cc. of concd.  $\text{NH}_4\text{OH}$ . Stir the residue with a glass rod with rubber, add 25 g.  $\text{NH}_4\text{Cl}$  and 20 cc. of concd.  $\text{NH}_4\text{OH}$  and stir again. Transfer to a 300 cc.-measuring flask, filter and take 100 cc. for the detn. of Zn. Add  $\text{Na}_2\text{S}_2\text{O}_4$  to ppt. Cu. Filter and titrate with  $\text{K}_4\text{Fe}(\text{CN})_6$ .

A. DROGSETH

**Zirconium.** IV. Precipitation of zirconium by phosphates. RUFUS D. REED

AND JAMES R. WITHEROW. Ohio State Univ. *J. Am. Chem. Soc.* **51**, 1311-5(1929); cf. *C. A.* **23**, 2390.—Zr(SO<sub>4</sub>)<sub>2</sub> can be used as a precipitant of K but since this reagent also reacts with Na<sub>2</sub>Co(NO<sub>2</sub>)<sub>6</sub>, it is necessary to remove Zr before the soln. can be treated with Na<sub>2</sub>Co(NO<sub>2</sub>)<sub>6</sub>, to see if the pptn. of K has been complete. A 5-fold excess of (NH<sub>4</sub>)<sub>2</sub>HPO<sub>4</sub> or NaNH<sub>2</sub>HPO<sub>4</sub> in the presence of 0.344-0.688 N H<sub>2</sub>SO<sub>4</sub>, 0.269 N HNO<sub>3</sub>, or 0.204 N HCl will serve to remove Zr completely, but Na<sub>2</sub>HPO<sub>4</sub> is less efficient. In the absence of acid, the pptn. of Zr as phosphate is incomplete. W. T. HALL

Determination of cyanides and oxycyanides of mercury by the mercurimetric method. AL. IONESCO-MATIU AND MLE. A. CARALE. Pharm. Lab. Univ. Jassy. *J. pharm. chim.* **8**, 258-63; *Bul. soc. chim. România* **10**, 127-30(1928); cf. *C. A.* **21**, 2445, 3575.—Gently heat Hg(CN)<sub>2</sub> (A) or Hg(CN)<sub>2</sub>·HgO (B) (about 0.05 g.) with 20 cc. concd. H<sub>2</sub>SO<sub>4</sub> for 10-20 mins.; cool, pour into 120 cc. H<sub>2</sub>O, add KMnO<sub>4</sub> soln. till a pink color is obtained and 15 drops of 10% Na(NO)Fe(CN)<sub>6</sub>. Titrate the turbid liquid with 0.1 N NaCl until it clears. One cc. NaCl = 0.01275 g. A or 0.01187 g. B.

S. WALDBOTT

Notes on molybdates, nitrophosphomolybdates, tungstates and phosphotungstates. TEOFILO GASPARY ARNAL. *Ann. chim. anal. chim. appl.* **11**, 97-103(1929).—The reactions of the following reagents with numerous ions were studied: (A) Na molybdate in 5% aq. soln., (B) NH<sub>4</sub> molybdate in satd. aq. soln., (C) Na nitrophosphomolybdate (Na<sub>2</sub>HPO<sub>4</sub>, Na molybdate and HNO<sub>3</sub>), (D) Na tungstate in 5% soln., (E) Na phosphotungstate in 5% soln. The following results were obtained. *With (A)* no effects were obtained with Li, Na, NH<sub>4</sub>, K, Rb, Cs, Be, Mg, Zn, Hg<sup>++</sup>, Mn, Ni and Co. Cu gives a greenish blue ppt., sol. in NH<sub>4</sub>OH and in HNO<sub>3</sub>; Ag, an abundant white ppt.; Ca, a ppt. that forms slowly but more quickly when alc. is added (the ppt. is sol. in HNO<sub>3</sub>); Sr and Ba give similar ppts. with diminishing soly. in the order named; Al gives a white ppt. forming slowly, sol. in HNO<sub>3</sub> and converted to hydroxide by NH<sub>4</sub>OH; Pb, abundant ppt., sol. in HNO<sub>3</sub>; Th is like Al except that the ppt. forms more readily, Bi is like Th; UO<sub>2</sub> gives a light yellow ppt., sol. in HNO<sub>3</sub> and darkened by adding NH<sub>4</sub>OH; Fe, a ppt., which is dissolved by excess FeCl<sub>3</sub>. *With (B)* no ppt. is obtained with Li, Na, Cu, Ag, Be, Mg, Ca, Zn, Cd, Ba, Hg<sup>++</sup>, Al, UO<sub>2</sub>, Mn, Ni and Co. NH<sub>4</sub> gives nothing in the cold; on heating it gives a yellow ppt. insol. in HNO<sub>3</sub> but dissolved by NH<sub>4</sub>OH; K, Rb and Cs give the same effect as with NH<sub>4</sub> but the soly. of the ppts decreases in the order named; Hg gives an abundant ppt. in the cold, which dissolves on heating but reappears on cooling; Tl and Pb give white ppts. sol. in an excess of the reagent (on heating the ppt. is obtained again and is yellower in color); Th gives a ppt. sol. in excess reagent; on standing a gelatinous mass seps. out, which is transparent at first but eventually becomes opaque; Bi is like Pb; FeCl<sub>3</sub> gives a beautiful blue color. Alk. molybdates, in the presence of FeCl<sub>3</sub>, give analogous ppts., sol. in an excess of FeCl<sub>3</sub>. If, to this soln. a little phosphate is added, a blue coloration is obtained, which is characteristic. *With (C)* no effects are obtained with Li, Na, NH<sub>4</sub>, K, Rb, Cs and Mg ions. Cu gives a light blue ppt. sol. in NH<sub>4</sub>OH; Ag, a yellow ppt. sol. in NH<sub>4</sub>OH; Be, a very abundant ppt. sol. in an excess of Be(NO<sub>3</sub>)<sub>2</sub>, but insol. in NH<sub>4</sub>OH; Ca, slow pptn.; with Sr and Ba the reaction is even slower (the ppts. are insol. in NH<sub>4</sub>OH); Zn and Cd give ppts. of which the Zn salt is more insol. in water but dissolves in NH<sub>4</sub>OH, whereas the Cd salt does not. Hg<sup>+</sup> gives a brown ppt.; Hg<sup>++</sup>, a yellow ppt.; Al, a dense ppt. sol. in NH<sub>4</sub>OH; Tl is like Al; Pb gives a white ppt. insol. in NH<sub>4</sub>OH; Th, a ppt., which changes to Th(OH)<sub>4</sub> with NH<sub>4</sub>OH; Bi, a ppt., which changes color with NH<sub>4</sub>OH; UO<sub>2</sub>, a yellow ppt.; on adding NH<sub>4</sub>OH the color is more pronounced; Mn gives a pink ppt. dissolved by NH<sub>4</sub>OH and then a brown ppt. appears, which contains Mn; Fe, a pale yellow ppt. converted to Fe(OH)<sub>3</sub> by NH<sub>4</sub>OH; Ni, a bluish green ppt., sol. in NH<sub>4</sub>OH; Co, a bluish pink ppt. also sol. in NH<sub>4</sub>OH. *With (D)* no reactions are obtained with Li, Na, Cu, Hg, Be, Zn, Sr, Cd, Ba, Hg, Al, Mn, Fe (except a coloration), Ni and Co, but ppts. are obtained as follows: NH<sub>4</sub> gives a white ppt. sol. in NH<sub>4</sub>OH and insol. in HNO<sub>3</sub>; K, a white ppt. insol. in HNO<sub>3</sub> and sol. in NH<sub>4</sub>OH; Rb and Cs give the same; Tl gives a ppt. insol. in HNO<sub>3</sub> but not very insol. in water; Pb, a ppt. sol. in HNO<sub>3</sub> and insol. in NH<sub>4</sub>OH; Hg<sup>++</sup> is the same except the ppt. darkens with NH<sub>4</sub>OH; Bi gives a ppt. sol. in HNO<sub>3</sub> and altered by NH<sub>4</sub>OH; UO<sub>2</sub>, a ppt., which is formed slowly and which is sol. in HNO<sub>3</sub> and insol. in NH<sub>4</sub>OH. The effect of alc. upon all of these reactions is discussed and some 19 possible applications to analytical chemistry are outlined.

W. T. HALL

Determination and separation of nitrous acid by the esterification method. WALDEMAR M. FISCHER AND ARVID SCHMIDT. Univ. Riga. *Z. anorg. allgem. Chem.* **179**, 332-8(1929).—If a soln. of alkali nitrite is treated with alc. at *pH* = 0.2-4, the esterification of the HNO<sub>2</sub> takes place so rapidly that the presence of substances such as NH<sub>4</sub>



salt, nitrate, chlorate, iodate, perchlorate, chromate, ferricyanide, formate or oxalate does not interfere seriously. If a ferrous salt is present, it reacts with  $\text{HNO}_3$  to form a characteristic brown coloration, but if an excess of  $0.1\text{ }N\text{ K}_2\text{Cr}_2\text{O}_7$  is added, it is oxidized and  $\text{HNO}_3$  is formed again. The app. recommended consists of a 150-cc. dropping funnel to serve as reaction vessel. It has a cylindrical shape and is closed at the top with a 3-holed rubber stopper carrying a small dropping funnel, whose stem reaches nearly to the bottom of the larger funnel and is bent upwards at the bottom, a tube for introducing  $\text{CO}_2$ , which ends at the very bottom of the larger funnel, and a small deplegator tube filled with glass beads. The last-mentioned tube is connected with a specially constructed 10-bubble tube that is provided with a glass stopcock at the bottom for emptying the tube and at the top has a side arm connected to a filter bottle contg. KI soln. and is closed by a stopper with another dropping funnel. To carry out the analysis the aq. soln. of the nitrite and 5–10 cc. of MeOH are placed in the reaction vessel and the 10-bubble Meyer tube is filled with 20% KI soln. Air is expelled by a rapid stream of  $\text{CO}_2$ . Then through the funnel attached to the bubble tube, 10 cc. of  $5\text{ }N\text{ HCl}$  is added to the KI soln. and through the other funnel 5 cc. of  $5\text{ }N\text{ HCl}$  or AcOH is added to the nitrite soln. Gas is led through the app. at the rate of 3–4 bubbles per min. and after 45 mins. the KI soln. is withdrawn and the liberated  $\text{I}_2$  titrated with thiosulfate soln. The method was tested with 10-cc. portions of  $0.1\text{ }N\text{ NaNO}_2$  soln. and good results were obtained except in the presence of  $\text{NH}_2\text{OH}$ ,  $\text{NH}_4\text{NH}_2$ , aniline salts, bromates, sulfites, ferrocyanides and permanganates, all of which react with  $\text{HNO}_3$  so rapidly that the esterification is incomplete.

W. T. HALL

Colorimetric method for the determination of phosphoric acid. II. C. BORDEIANU, *Ann. sci. univ. Jassy* 15, 372–9(1929); cf. C. A. 22, 1297.—The method previously described for the analysis of fertilizers and such products has been applied to the detn. of  $\text{H}_2\text{PO}_4$  in urine, in glycerophosphates and in glucose sirup.

W. T. H.

Colorimetric determination of phosphoric acid by Denigès' method. S. N. ROZANOV, *Trans. Sci. Inst. Fertilizers* (Moscow) 1928, No. 55, 139–58.—Rozanov analyzed 40 samples of rock phosphate for P by the Denigès' method investigating: (1) the influence of the quantity of aqua-regia used in decomp. the rock phosphate on the accuracy of the method; (2) the limits of the  $\text{P}_2\text{O}_5$  concn. which would give reliable results with the Denigès' method; (3) the reliability of the method as compared with the method of double pptn. It was found that the quantity of aqua-regia used in analyses of this type has no influence on the colorimetric detn.; 0.5 to 0.3 mg. of  $\text{P}_2\text{O}_5$  per l. are the optimal limits for this method. The max. deviation when compared with the double pptn. was 1%.

J. S. JOFFE

Analysis of sodium sulfide. JOHANNES PAESSLER, *Ledertech. Rundschau* 21, 61–2 (1929).—Dissolve 10 g. of  $\text{Na}_2\text{S}$  in 1 l. of  $\text{H}_2\text{O}$ , taking care to avoid loss; filter to remove FeS. Pipet 25 cc. of the filtrate into a slight excess of  $0.1\text{ }N\text{ I}$  soln. and titrate with  $0.1\text{ }N\text{ Na}_2\text{S}_2\text{O}_3$  soln.; this determines both  $\text{S}^{--}$  and  $\text{S}_2\text{O}_3^{--}$ . Det.  $\text{S}_2\text{O}_3^{--}$  by adding to the  $\text{Na}_2\text{S}$  soln. an equal vol. of  $\text{ZnSO}_4$  soln., (50 g. of crystals per l.), then filter and titrate with I soln.

I. D. CLARKE

Note on the determination of sulfate in fluorides, especially the cryolites. H. GINSBERG AND G. HOLDER, *Z. angew. Chem.* 42, 314–7(1929).—Extn. of the sulfate by boiling with  $\text{Na}_2\text{CO}_3$  soln. is uncertain because of the difficulty in removing  $\text{Al}(\text{OH})_3$  completely in the presence of  $\text{F}^-$ . Ehrenfeld's method of pptg.  $\text{BaSO}_4$  and  $\text{BaF}_2$  and treating with  $\text{CaCr}_2\text{O}_7$  soln. to dissolve out the F is capable of giving good results, but the work is tedious. The benzidine sulfate method of Raschig is not much better. Ehrenfeld's method of reducing the sulfate to sulfide by means of Zn dust is rapid and gives fairly good results. It is recommended, in this case, to treat 1 g. of fluoride with 10 g. of Zn dust in a glazed porcelain crucible heating 0.5 hr. in a stream of  $\text{H}_2$ . Cool in the  $\text{H}_2$ , transfer to a Corleis flask, add a little  $\text{Al}(\text{OH})_3$  and some colloidal  $\text{SiO}_2$ , treat with  $6\text{ }N\text{ HCl}$  and absorb the  $\text{H}_2\text{S}$  in  $\text{Cd}(\text{OAc})_2$  soln., as in steel analysis. As standard method, however, the following procedure is recommended, which provides for the preliminary removal of all  $\text{F}^-$  by evapg. several times with  $\text{HCl}$  in the presence of pulverulent  $\text{SiO}_2$ . Mix 2 g. of cryolite with 12 g. of soda and fuse at  $1000^\circ$  for 30 mins. in a Pt crucible. Extract the melt with water and filter. Make the filtrate acid with  $\text{HCl}$  and boil off  $\text{CO}_2$ . Add  $\text{NH}_4\text{OH}$  to ppt.  $\text{Al}(\text{OH})_3$ , filter cold, redissolve in  $\text{HCl}$  and repeat the pptn. working in the cold. To the combined filtrates in a porcelain dish, add about 1 g. of  $\text{SiO}_2$  powder and evap. 5 times with 50-cc. portions of concd.  $\text{HCl}$ . Finally treat with  $\text{NH}_4\text{OH}$  to ppt.  $\text{Al}(\text{OH})_3$  that was held in soln. as  $\text{AlF}_3$ ; then ppt.  $\text{BaSO}_4$  in the usual manner. This method is too tedious for every day work.

W. T. H.

Test for tungstates and for molybdates. MME. MARIANNE PAPAFIL AND R.

CHERNATSCO. *Ann. sci. univ. Jassy* 15, 384-6(1929).—Neutral solns. of tungstates and molybdates give ppts. with a soln. of tetramethyldiaminodiphenylmethane (D) in very dil. AcOH. As reagent, prepare a soln. of 1.5 g. of (D) in 300 cc. of water contg. 10 cc. of AcOH; filter and add dil.  $\text{NH}_4\text{OH}$  dropwise until a faint opalescence is produced. Filter again. A blue ppt. is obtained when 2 cc. of  $\text{NH}_4$  molybdate soln. (0.06 g. per l.) is treated with 2-4 cc. of the reagent. An opalescence is obtained with the same vol. of Na tungstate soln. (0.25 g. per l.). The reagent also gives a green ppt. with a sol. vanadate. W. T. H.

Detection of bromide and iodide ions. ERNST MURMANN. *Oesterr. Chem.-Ztg.* 32, 36-7(1929).—The detection of Br by the formation of eosin is very sensitive, but when  $\text{HNO}_2$  or  $\text{HNO}_3$  is present, the test is likely to fail. This difficulty can be overcome by reducing with Zn. It is convenient to use a Drechsel wash bottle through which a stream of air is passing. When 0.1 mg. of KBr is present in 100 cc. of soln. and the gases from the bottle are led through a restricted tube contg. cotton that has been dyed yellow with fluorescein, the red color appears within 10 mins. It is possible to det. I similarly by using cotton that has been moistened with 0.5% KI soln. in 50% glycerol and dried. Make the soln. of iodide distinctly acid with  $\text{H}_2\text{SO}_4$ , add 0.1 g. of  $(\text{NH}_4)_2\text{S}_2\text{O}_8$  and pass air through the flask. The presence of 0.1 mg. of KI in 100 cc. of soln. gives a blue test. If not less than 1 mg. of KI is present, it is possible to test for both Br and I in one expt. In this case use  $\text{KMnO}_4$  to liberate the halogen and lead the gas first to the fluorescein and then to the KI-starch. Data are given to show that the method compares favorably with that of Fellenberg and is of about the same sensitivity. W. T. H.

An improved chloride method for organic material and foods. MAX BIRNER. *Z. ges. expul. Med.* 61, 700-6(1928).—Heat 2-5 g. of the sample in a Ni crucible on the water bath with an excess of NaOH until the sample is broken down to the consistency of an even pulp. Add a little  $\text{KNO}_3$  and heat the crucible to  $120^\circ$  with a final heating of not over  $450^\circ$ . If the mass does not foam on the addition of a small amount of  $\text{KNO}_3$ , the oxidation of organic matter is completed. On cooling the mass should be white. Dissolve it in hot water, filter, make strongly acid with  $\text{HNO}_3$  and add an excess of standard  $\text{AgNO}_3$  soln. To destroy traces of nitrite, boil for at least 15 mins., cool and add, dropwise,  $\text{KMnO}_4$  until there is a persistent color. Decolorize with a few drops of  $\text{Fe}^{+1}$  sulfate soln. Titrate with  $\text{HgNO}_3$  by the Volhard method. F. L. D.

Determination of alcohol in the presence of acetaldehyde. YOSHINORI TOMODA. Tokyo Imp. Univ. *J. Soc. Chem. Ind.* 48, 77-9T(1929).—The detn. of EtOH by the aeration and oxidation method of Dox and Lamb (*C. A.* 11, 242) is not satisfactory in the presence of AcH. T. has studied the behavior of an aq. soln. of AcH-bisulfite upon distn. and aeration. AcH is not volatilized with EtOH in the presence of  $\text{NaHSO}_3$  during aeration if the reaction of the mixt. is acid. On this basis, the following method is recommended. To 5 cc. of EtOH soln. contg. AcH add 4.5 g. of  $\text{NaHSO}_3$ ; after standing 15 mins., aerate the mixt. at the rate of 15 l. per hr. Absorb the vapor in 15 cc. of concd.  $\text{H}_2\text{SO}_4$ . After about 6 hrs. mix the  $\text{H}_2\text{SO}_4$  with 15 g. of  $\text{K}_2\text{Cr}_2\text{O}_7$  in 50 cc. of  $\text{H}_2\text{O}$  in a distg. flask; wash out the absorption tubes with 50 cc. of  $\text{H}_2\text{O}$  and distil off AcOH by heating with steam for 15 mins. Titrate with 0.1 N  $\text{Ba}(\text{OH})_2$  (1 cc. = 0.0046 g. EtOH). The method, which was found accurate to 3%, was not affected by  $\text{HCO}_2\text{H}$ , AcOH, glycerol, sucrose, or AcH. A. S. CARTER.

Dimethylhydroresorcinol as a reagent for aldehydes. L. ROSENTHALER. *Z. angew. Chem.* 42, 317-8(1929).—Replying to a criticism of Vorlander (*C. A.* 23, 1894), R. points out that V., rather than Erdmann, is actually credited with the discovery of this test in R's textbook. W. T. H.

Analysis of dilute solutions of methanol. S. S. KISTLER. College of the Pacific. *Science* 69, 457-8(1929).—Distil the soln. contg. the alc. until it is known that no other oxidizable material is present. All of the MeOH should be in the first half of the distillate. To an aliquot part of the distillate add an excess of standard  $\text{Na}_2\text{Cr}_2\text{O}_7$  and make 12 N with  $\text{H}_2\text{SO}_4$ . Heat on the water bath for 10 mins. Titrate the excess dichromate with  $\text{FeSO}_4$ , detg. the end point electrometrically. W. T. H.

Studies of anthracene. I. The analysis. H. A. J. PIETERS AND TH. H. KOENEN. *Chem. Weekblad* 26, 222-4(1929).—The crude product is extd. with 4 N  $\text{H}_2\text{SO}_4$  to remove the bases. The phenanthrene is then extd. with toluene,  $\text{CS}_2$ , or solvent naphtha. Since anthracene itself is also somewhat sol., the accuracy of the sepn. will be smaller with preps. poor in anthracene. The remaining mixt. of anthracene and carbazole is analyzed for the latter by a  $\text{N}_2$  detn. and for the former by one of the classical methods. G. CALINGAERT.

A simple method for the estimation of antimony in organic antimony compounds.

**SUDHAMOY GHOSH.** Calcutta School of Trop. Med. and Hyg. *Indian J. Med. Research* 16, 457-60(1928).—To 0.05-0.07 g. substance add 2 g.  $K_2SO_4$  crystals and 3 cc. pure, As-free  $H_2SO_4$ . Treat the mixt. gently and with occasional shaking in the beginning, until colorless; dilute with 25 cc.  $H_2O$ , and heat for 3 to 5 mins. to remove any  $SO_2$ , adding a little freshly ignited pumice to prevent bumping. While this is still warm, add 3 to 4 cc. concd.  $HCl$ , cool the whole quickly to room temp. and make up to 100 cc. Make 25 cc. just alk. with 40%  $NaOH$  and then just acid with tartaric acid (1%). Add 10 cc. of 4%  $NaHCO_3$  and 25 to 30 drops of 1% starch soln. Titrate the whole against 0.01  $N$   $I$  soln.

FRANCES KRASNOW \*

**Determination of benzene and toluene in gases.** FERDINAND SCHULZ. *Collection Czechoslov. Chem. Comm.* 1, 228-33(1929).—Gustavson in 1883 devised a simple test for the detection of aromatic hydrocarbons in gasoline by bromination in the presence of anhydrous  $AlCl_3$ . If the resulting hexabromobenzene and the pentabromotoluene are weighed, good results are obtained. By washing the bromination products with  $MeOH$ , the aromatic hydrocarbons can be sepd. from ethylene and from the hydrocarbons of gasoline. In this way it is possible to det. even small quantities of aromatic hydrocarbons in a small sample of gas.

W. T. H.

**Micropotentiometric determination of reducing carbohydrates.** JOSEPH B. NIEDERL AND RALPH H. MÜLLER. N. Y. Univ. *J. Am. Chem. Soc.* 51, 1356-9(1929).—By using 2 vessels filled with Fehling's soln. of the same original concn., connected by an agar- $KCl$  bridge and with electrodes in circuit with a potentiometer, on heating one of the vessels and adding sugar soln. from a microburet, a concn. cell is produced and the progress of the reaction can be followed. The end point is very marked. The more important carbohydrates were studied by this method and their reduction values detd. In this way 3 mg. of sugar can be detd. with an accuracy of about 1%; by carrying out the work with a microbalance and microburet, good results can be obtained with as little as 0.05 mg. of reducing sugar.

W. T. HALL

**Volumetric determination of vanadium by means of potassium iodate.** ERNEST H. SWIFT AND RAYMOND W. HOEPPEL. Calif. Inst. Tech. *J. Am. Chem. Soc.* 51, 1366-71(1929).—The method depends upon the reduction of  $V$  from a valence of 5 to 4 by means of a measured vol. of  $KI$  soln., in a small vol. of soln., which is 6-8  $N$  in  $HCl$  and out of contact with air. Then by keeping the soln. at least 6  $N$  in  $HCl$ , the liberated  $I_2$  and the excess iodide can be titrated with  $KIO_3$  soln. Since  $2I_2$  or  $2HI$  each react with 1 mol. of  $KIO_3$  to form  $ICl$ , it is easy to tell how much of the  $KI$  was oxidized by the vanadate.

W. T. HALL

**Determination of reducing sugars by the ferricyanide method.** AL. IONESCU-MATHIU. *Ann. sci. univ. Jassy* 15, 363-71(1929).—If a hot, alk. soln. of  $K_3Fe(CN)_6$  contg. picric acid as indicator, is treated with a reducing sugar, the ferricyanide is reduced to ferrocyanide; when the ferricyanide has all been reduced, the yellow color changes to red in consequence of the reduction of the picric acid by the excess sugar. For such a titration a 0.5% soln. of glucose, a 1% soln. of picric acid and a soln. contg. 46 g.  $K_3Fe(CN)_6$  and 46 g.  $KOH$  per l. are suitable. With smaller quantities of reducing sugar, it is better to add some ferricyanide to the sugar soln. and to det. the quantity reduced by titration of the resulting ferrocyanide with  $KMnO_4$  in the presence of acid. Five mols. of ferricyanide oxidize 1 mol. of glucose. The application of these tests to biol. fluids such as blood, urine, etc., as well as to glucose, maltose and lactose solns. is described at some length.

W. T. H.

**Volumetric method for the analysis of urotropine.** C. V. BORDEIANU. *Ann. sci. univ. Jassy* 15, 380-3(1929).—In 1926, Mrs. Kollo and B. Angelesco published a method for the analysis of urotropine, which can be completed in 35 mins. and which is based upon the formation of a salt of urotropine with picric acid. The excess of picric acid is detd. by titration with  $NaOH$ . A study of this method shows that it is altogether unreliable.

W. T. H.

The use of 2,6-dichlorophenol indophenol as a reduction indicator in the examination of foodstuffs (TILLMANS, *et al.*) 12. The determination of  $Ag$  by different methods in some colloidal  $Ag$  preparations (BUREŠ, RUBEŠ) 17. Solubility of  $Sb$  in water (GRANT) 2.

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TREADWELL, F. P.: *Quantitative Analysis. Vol. II. 7th ed., enlarged and revised*. New York: John Wiley & Sons, Inc. 792 pp. \$6.

**Detection of mercury vapor.** BIRGER W. NORDLANDER. U. S. 1,711,742, May 7. A flexible strip of material such as paper having a film of a compd. of Se and S is used for detection of Hg vapor, *e. g.*, in air or flue gas. An app. is described.

**Determining the gas content of solids.** W. HESSENBRUCH (to C. Lorenz A.-G.). Brit. 299,303, Oct. 22, 1927. A sample under test is heated *in vacuo* in a furnace, which is evacuated before the introduction of the sample; the sample is introduced in such a manner as to avoid breaking the vacuum. An app. is described in which a lock chamber is used in connection with a quartz-tube furnace heated by a high-frequency coil and contg. a graphite crucible within a magnesia crucible. Various structural features are described.

## 8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY AND J. F. SCHAIERER

**The Tasmanian tectite—Darwin glass.** T. W. E. DAVID, H. S. SUMMERS AND G. A. AMPT. *Proc. Roy. Soc. Victoria* 39, 167–90(1927); *Mineralog. Abstracts* 3, 538. Darwin glass from Mt. Darwin, Tasmania, is described in detail. Two new analyses of this glass are given. Twenty-five published analyses of tectites are plotted on diagrams. J. F. SCHAIERER

**The natural etchings of Japanese pyrite crystals.** SHIMMATSU ICHIKAWA. *Am. J. Sci.* [5], 17, 245–57(1929).—The symmetry of the etch-figures corresponds to the hemihedrism of the crystals. As etching proceeds, pits with hemihedral arrangement develop, and the crystals pass through cubic and tetrahedral phases before complete soln. occurs. R. L. HERSHEY

**Crystal structure of sperrylite.** G. AMINOFF AND A. L. PARSONS. *Univ. of Toronto Studies, Geol. Series* No. 27, 5–10(1928).—Powder x-ray photographs of crystals and crystal fragments of sperrylite from the Vermilion mine, Sudbury, Ont., were compared with similar photographs of pyrite. The unit cube of edge 6.00 Å. U. contains 4 mols. with Pt at 4b and As at 8h, the type of structure being the same as in pyrite. The value 5.40 Å. U. was detd. for the cube edge of pyrite. J. W. SHIPLEY

**The occurrence of orthoclase and microcline in the Finnish granites and pegmatites.** P. ESKOLA. *Bull. comm. géol. Finlande* No. 85, 54–8(1929).—The K feldspar existing in the Archaean granites and pegmatites of Finland is almost always microcline; in the Rapakivi rocks it is usually orthoclase. Microcline can be converted into orthoclase by heating. Orthoclase can, however, be formed at very low temps. A. H. E.

**The structure of leucite and complex kaolinites.** MIŁCZYŚLAW DOMINIŁKIEWICZ. *Roczniki Chem.* 8, 542–52, German résumé 552–3(1928).—Leucite is interpreted as a deriv. of a kaolin anhydride. Its structure approaches that of orthoclase, both natrolite

radicals (cf. C. A. 22, 2341) of the kaolin nucleus being linked to potassium silicate nuclei so that the kaolin nucleus is not completely satd. The structural formula proposed for leucite accounts satisfactorily for all changes of the mineral. From the structural diagrams of andalusite, sillimanite and kyanite the structural isomerism is evident, which is in agreement with the stability of the individual members. These 3 minerals are assumed to be common kaolin aluminates. The possibility of the existence of an ordinary aluminum silicate differing from the mentioned minerals is discussed. The constitution of andalusite is analogous to that of topaz. The difference consists in  $\text{—Al=O}$  groups of the former being displaced by  $\text{—Al=F}$  groups in topaz, which is a kaolin fluo-aluminate. The same constitution must be ascribed to the tourmalines, in which B is linked to the aluminate side of the kaolin nucleus, that is, to the natrolite radicals. A total analogy is found between orthoclase and beryl. Both natrolite radicals of the kaolin nucleus in the 8 Al radicals are satd. with 8 Be-silicate radicals. Eucrase, a deriv. of beryl, is interpreted as a basic Be kaolinite. J. KUCERA

The iron of Sumampa and other pseudometeorites. E. HERRERO DUCLOUX. *Rev. facultad cienc. quim.* (Univ. La Plata) 5, Pt. 1, 77–81(1928).—A supposed meteorite from Sumampa in Santiago del Estero was analyzed. Sp. gr. = 7.005, Fe 91.529–91.629, Mn 0.097–0.104, Sn traces, Ni none, P 0.640–0.655, S 0.098–0.137, C (total) 5.059–4.989, C (graphite) 4.766–4.585, C (combined) 0.293–0.404, Si-bearing residue 1.565–1.624%. The doubt about the meteoric origin was due to 2 earlier findings, that proved not to be meteorites. The first, from Atacama, weighed, 217.5 g. and had sp. gr. 7.909, AgCl 81.960, Ag metallic 17.218,  $\text{Fe}_2\text{O}_3$  0.520, Si-bearing residue 0.822, Se traces. The other specimen, from the Chaco de Santa Fé, weighed 182 g. and had sp. gr. 3.527; in the shell and the interior, resp., were found insol. in HCl 10.82, 8.09, loss at red heat 21.80, 21.80,  $\text{Fe}_2\text{O}_3$  61.90, 66.51,  $\text{Al}_2\text{O}_3$  3.90, 2.88,  $\text{TiO}_2$  0.33, 0.31, MnO 0.76, 0.59,  $\text{P}_2\text{O}_5$  0.12, 0.12,  $\text{SO}_3$ ,  $\text{SnO}_2$ , CaO, MgO traces. A. E. M.

New telluride occurrence in Quebec. ELLIS THOMSON. *Univ. Toronto Studies, Geol. Series No. 27*, 11–4(1928).—Ore from Montbray township, Que., was found to be rich in Te. Two types of ore occur, the first showing the genetic succession: pyrite, chalcopyrite and pyrrhotite, sphalerite, krennerite, tetradymite and altaite, petzite and coloradoite, native gold and chalcocite. In the second, krennerite is the predominating constituent, with considerable pyrite and chalcopyrite and minor amts. of Au, altaite, tetradymite, petzite, sphalerite, pyrrhotite and chalcocite. The 2 types grade into one another. J. W. SHIPLEY

Ores of the noble metals. F. BERNAUER. *Metallwirtschaft* 7, 411–3(1928).—Pt, Ru and perhaps Os occur chiefly in the "iron nucleus" of the earth; Au, Ag, Hg, Pd (with Pt and Ru in smaller amts.) in the sulfide zone; while in the silicate or outer zone are found only the residues of the noble metals left from the process of deposition. Lists of metal-bearing rocks, with localities, showing the mineral assocns. of greatest importance, are reported. Special emphasis is given to recent discoveries of Pt metals in S. Afr. W. C. EBAUGH

Bromine contents of Solikamsk carnallites. N. N. EFREMOV AND A. A. VESELOV-SKII. *Severokhim. J. Chem. Ind.* (Moscow) 5, 1365–9(1928); cf. C. A. 22, 3495.—The analysis of a sample of Solikamsk carnallite by 3 different methods has shown the presence of 0.17–0.30% Br, apparently chiefly in the form of  $\text{KCl.MgBr}_2.6\text{H}_2\text{O}$ . This compares with the av. Br contents of German carnallites, 0.20–0.35%. As the supply of Solikamsk carnallite is estd. at 11 billion tons, their total Br contents are about 22,000,000 tons. Industrially, this Br could be extd. with comparative ease. B. N.

Diatomaceous earth. E. V. ROZHKOVA. *Trans. Inst. Econ. Mineral. Met.* (Moscow) No. 42, 51–61(1929).—The compn. of 2 samples of the diatomaceous earth deposits near Mount Kamyshlov in the Urals is:  $\text{SiO}_2$  78.76, 75.59,  $\text{TiO}_2$  0.27, 0.93,  $\text{Al}_2\text{O}_3$  9.81, 10.57,  $\text{Fe}_2\text{O}_3$  3.15, 3.74, CaO 0.69, 1.05, MgO 1.72, 1.46,  $\text{K}_2\text{O}$  0.78, 0.56,  $\text{Na}_2\text{O}$  0.27, 0.54,  $\text{SO}_3$  0.11, 0.29, loss on ignition 4.70, 4.69%. BERNARD NELSON

Relation between the increase of the magnetic susceptibility of certain rocks when heated and the modifications occurring in certain of their mineral constituents. A. MICHEL-LEVY AND GASTON GRENET. *Compt. rend.* 188, 640–2(1929).—Expts. were made on this section of 8 different holocryst. and semicryst. rocks, which, for the most part, were poor in the ferromagnetic elements. In general the increase in magnetic susceptibility on heating was accompanied by the appearance of opaque regions in the parts containing chlorites. It is concluded that the increase in susceptibility is due to the formation of these dark regions, which are considered to be due to the dehydration of the chlorites or of the crystals of sphene in the inclusions. W. W. STIFLER

The role of pressure in rock crystallization. P. ESKOLA. *Bull. comm. géol. Finlande* No. 85, 77–88(1929).—A polemic. Increase of pressure has the same effect

as decrease of temp. High pressure keeps volatile substances in magmatic solns., lowering the temp. of crystn. and reducing the viscosity. The last stages of magmatic crystn. cause reactions identical with those of metamorphism, *i. e.*, formation of amphiboles at the expense of pyroxenes, epidote at the expense of anorthite, chlorite for biotite or pyroxene, etc.

ALDEN H. EMERY

A beryl-bearing pegmatite from Uuksu in Carelia, Finland. E. H. KRAUCK. *Bull. comm. géol. Finlande* No. 85, 70-7(1929).—The principal components are beryl, biotite, oligoclase and fluorite; K-feldspar, pyrite, epidote and calcite belong to a later stage; sericite and chlorite are alteration products. It is an unusual occurrence because of the lack of quartz.

ALDEN H. EMERY

An experiment regarding the composition of the binding substances of the mineral muds. E. S. BURKSER AND A. F. GORNSHTEIN. *Ukrainskii Khim. Zhur.* 1, Tech. Pt. 491-7(1925).—There are 2 types of mineral muds in Ukraine and the south of Russia: the black drift deposits in closed water basins, the black color of which is due to the presence of FeS, and gray muds of volcanic origin which have a low content of FeS. The muds contain 35-70% H<sub>2</sub>O. In 1889 Verigo established that the plasticity of the muds is due to the presence of the colloidal Fe compds. B. and G. give analyses of 11 muds and show that while the black muds contain about 1.0% by weight of inorganic colloids, the gray ones contain about 32%. A substance similar to the natural muds may be synthesized by mixing in proper proportions clay, sand and colloidal matter. R. M.

The bacteriogenous lime deposits. G. A. NADSON. *Arch. Hydrobiol.* 19, 154-64 (1928).—With reference to the studies of Dew and Molisch, N. points out that the phenomenon of the deposition of CaCO<sub>3</sub> by bacterial activity has been investigated by him in 1899-1903. A brief review is given of the expts. described in his Russian book "The Microorganisms as Geological Factors" I. (St. Petersburg, 1903). G. SCHWOCH

Determination of the quantity of C and constitutional water contained in the soils of the earth (AGAFOFF) 15. The recovery of Pt from dunite rock at Onverwacht, Transvaal (PRENTICE, MURDOCH) 9. Grinding apparatus for mineral substances (Fr. pat. 650,853) 1.

BAUR, MAX: *Edelsteinkunde*. 3rd ed., revised by Karl Schlossmacher. Leipzig: Chr. Herm. Tauchnitz. 64 pp. M. 4.

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## 9—METALLURGY AND METALLOGRAPHY

D. J. DEMOREST, R. H. ABORN

Surface phenomena of small particles of minerals and flotation. KEN TAKAHASHI Hokkaido Imp. Univ. *Hokkaido J. Coal Mining* 169, 6-29(1928).—T.'s study of the charge of various minerals, flotation by means of oleic acid, the action of oleic acid, and the effect of the addn. of K xanthate, and saponin is described, the sample used being sulfides, sulfates and other minerals having the elec. charge of the same sign. *Results*.—The elec. properties of minerals cannot be considered to be the primary factor in the flotation process, although it may be important as a secondary factor. The action of oleic acid was examd. to test the state of adsorption and packing of the small particles, the degree of adsorption being measured by means of a stalagmometer, while the degree of packing was detd. by measuring the velocity of falling of the particles. The result shows that there is a marked difference of adsorption in quartz and other minerals, but the difference in adsorption capacity cannot be considered to be directly responsible for the success or failure of flotation. The effect of oleic acid on the packing of the minerals with different samples varies, the effect being of 3 classes: it was the most marked in the first group, intermediate in the second and very poor in the

third. The result of the flotation test is quite similar, there being 3 different degrees of sepn. By adding xanthate the packing effect of the oleic acid is augmented in galena, pyrite and copper pyrite, and particularly in the second, the effect being roughly proportional to the amt. of xanthate adsorbed. Excess of the reagent decreases the effect. The effect is not remarkable in  $\text{BaSO}_4$ . The effect of saponin is to retard the packing effect of oleic acid, except in  $\text{ZnS}$  and  $\text{BaSO}_4$ , the retardation being proportional to the amt. of the reagent added, although the packing effect is augmented by a large excess. In  $\text{ZnS}$  and  $\text{BaSO}_4$ , saponin has the effect of increasing the speed of settling, but the effect is not very remarkable. Generally speaking, within certain limits  $\text{K}$  xanthate accelerates, and saponin retards the packing caused by oleic acid. This effect is the same as in that of saponin and  $\text{K}$  xanthate upon the degree of flotation of minerals, so that there seems to be a close relation between packing and flotation. K. S.

**Calculations in ore dressing.** W. LUYKEN AND E. BIERBRAUER. *Am. Inst. Mining Met. Eng. Tech. Pub. No. 214*, 25 pp. (1929).—An attempt to show that a sure, complete and successful way to overcome existing difficulties has been found to deal with the calcns. in ore dressing. Enrichment operations are compared on the basis of their abs. or of their economic effect. Characteristics of enrichment are indicated graphically, also curves of equal efficiency. W. H. BOYNTON

**Flotation, a field for chemical work.** RICHARD SCHÖN. *Oesterr. Chem.-Ztg.* **32**, 53 6, 64-7 (1929).—A lecture covering the history, economic importance, methods and "variables" influencing the flotation method for concg. ores. The "variables" include (1) the ore substances (gang and mineral) themselves, (2) oils or org. reagents employed, (3) the nature of the ore-water-oil mixt. itself, (4) the kind of gas used for agitation and (5) the type of app. adopted. The far different economic conditions of Europe account for the fact that flotation lags far behind America, Australia and Africa in tonnages treated by flotation. W. C. EBAUGH

**Flotation separation tests.** BERNARD W. HOLMAN. *Mining Mag.* **39**, 151-61 (1928).—App. and general principles of testing ores by flotation are discussed. A. B.

**Selective flotation in Spain.** L. BARCENA DIAZ. *Eng. Mining J.* **127**, 640-2 (1929). H. C. PARISH

**Development of copper ore leaching in Arizona.** RUDOLF GAHL. *Eng. Mining J.* **127**, 636-9 (1929).—G. concludes that to obtain the best results from a sand leaching plant a decantation plant should be operated in connection with it. If a decantation process is relied upon for treatment of slime it will almost certainly pay, in the treatment of  $\text{Cu}$  ores contg. part of the  $\text{Cu}$  as sulfide, to give the slime a preliminary flotation treatment. H. C. PARISH

**The limitations of the Harris process.** FRIEDRICH VOGEL. *Metallborse* **18**, 1882-3, 2105-6 (1928).—The Harris process consists in refining pig lead by fusion with a mixt. of  $\text{NaOH}$ ,  $\text{NaCl}$  and  $\text{NaNO}_3$ . The reactions are:  $\text{Sn} + \text{Na}_2\text{O} + 2\text{PbO} = \text{Na}_2\text{SnO}_3 + 2\text{Pb}$ ;  $\text{Sb} + \text{Na}_2\text{O} + 2\text{PbO} = \text{Na}_2\text{SbO}_3 + 2\text{Pb}$ ;  $2\text{As} + 3\text{Na}_2\text{O} + 5\text{PbO} = 2\text{Na}_3\text{AsO}_4 + 5\text{Pb}$ . Large amts. of these salts are formed during purification and their disposal is sometimes difficult. E. M. SYMMES

**The Bessemer works of Sweden.** J. A. LEFFLER. *Jernkontorets Ann.* **82**, 545-48 (1927).—A statistical historical survey. A. DROGSETH

**The sintering plant of Spännarhyttan.** J. A. LEFFLER. *Jernkontorets Ann.* **82**, 569-76 (1927).—A description accompanied by drawings is given of the sintering plant of the Swedish iron works of Spännarhyttan. A. DROGSETH

**Sinter plant at Messrs. Guest, Keen and Nettlefolds, Ltd., Cardiff Works.** W. E. SIMONS. *Engineering* **127**, 560-2 (1929); *J. Iron and Steel Inst.* (advance copy) No. 14, May, 1929, 14 pp.—From 16 to 25% of the ore burden consists of sintered  $\text{Fe}$  ore. The sintering consists of mixing fine  $\text{Fe}$  ore, coke and flue dust, placing in a circular steel pan and igniting by means of oil burners, a motor-driven fan drawing air through the pan. The materials are mixed dry and the mixt. is wetted by a fine spray of water till it contains about 15% of water. Lime should be absent. Sprinkling a small quantity of anthracite or coke breeze on the top of the pan prior to ignition insures good ignition and reduces the fines to a min. Burnt pyrite ores require more coke than do hematites and magnetites. The sinter mixt. should not contain more than 30% of flue dust. Flue dust should be stacked in the open for months before use in the blast furnace. Typical operating data are given. W. H. BOYNTON

**Sintering of powdered substances.** J. ARVID HEDVALL AND E. HELIN. *Jernkontorets Ann.* **82**, 265-342 (1927).—High sintering temp., small size of grain and irregular shape of grain give high strength. Expts. with reduction of pure  $\text{Fe}_2\text{O}_3$  preps. by gas contg.  $\text{CO}$ , giving a mixing of  $\text{Fe}_3\text{O}_4$  and  $\text{Fe}_2\text{O}_3$ , gave higher shrinkage and strength. By subsequent oxidation through cooling in air, shrinkage and strength are further

raised. Expts. with oxidation of pure  $\text{Fe}_3\text{O}_4$ , and magnetite showed complicated relations. The intensity of the oxidation  $2\text{Fe}_3\text{O}_4 + \frac{1}{2}\text{O}_2 = 3\text{Fe}_2\text{O}_3$  principally depts. whether strength is increased or decreased. To produce sufficiently strong briquets the intensity must not exceed certain limits. Addn. of (1) 4.3%  $\text{SiO}_2$  to pure  $\text{Fe}_3\text{O}_4$ , (2) 5%  $\text{SiO}_2$  to  $\text{Fe}_3\text{O}_4$ , and (3) 5%  $\text{CaO}$  to  $\text{Fe}_3\text{O}_4$ , raised the strength on sintering. Simultaneous addn. of 5%  $\text{CaO}$  and 5%  $\text{SiO}_2$  to  $\text{Fe}_3\text{O}_4$  was on the contrary not advantageous to the strength.

A. DROGSETH

Utilization and working up of metallic ashes and residues. RICH. GRAUBNER. *Chem.-Ztg.* 53, 307-8(1929).—Metallic ashes are "rich" if they carry 50-80% of metal, and "poor" if the metal content is less than 50%. Such materials are sorted, sifted, mixed in proper proportions to give the pure metal or alloy desired, smelted in a reverberatory furnace with fluxes to yield a slag of low m. p., and then poured and used as an alloy like soft solder or type metal, or refined by the addn. of S,  $\text{Sb}_2\text{S}_3$ , etc., to make mat of the Fe present and yield purer metal. Pb slag is sometimes used in the charge of glass works; Sn slags are smelted with Pb charge and the Sn is recovered in the solder produced.

W. C. EBAUGH

Onverwacht platinum metallurgy. T. K. PRENTICE AND R. MURDOCH. S. African Min. and Eng. J. 39, 565-7(1929).—Treatment of concentrates is by an amalgamation process, with Zn amalgam,  $\text{CuSO}_4$  and  $\text{H}_2\text{SO}_4$  as the activating reagents (cf. Zachert, C. A. 14, 2517). Row sheets of original concn. and treatment plants are given and described and tabular data are included on milling and treatment process results. Cf. following abstr.

E. I. S.

The recovery of platinum from dunite rock at Onverwacht, Transvaal. T. K. PRENTICE AND R. MURDOCH. *J. Chem. Met. Mining Soc. S. Africa* 29, 157-67(1929).—Pt occurs as a primary constituent of hortonolite dunite segregations (sp. gr. 3.7-3.9) within larger bodies of olivine dunite. Its av. compn. is hortonolite 93.2, diopside 5.0, hornblende 1.5, chromite 0.25 and magnetite 0.05%. The rock is regularly jointed, the joints (4 in. wide) being filled with magnesite. The Pt occurs in cubes or irregular nuggets enclosed in the hortonolite or in contact with the chromite (highest assay values). The metal shows the following compns. from the surface and 200 ft. deep, resp.: Pt 84.0, 84.75, Os-Ir 2.3, 0.95, Rh 0.2, tr., Pd 0.3, 0.53, Cu tr., 1.28, Ni —, 0.48, Fe 12.8, 11.98%. Details of the early lab. concn. tests, pilot plant and final large-scale installation and results achieved are given together with numerous flow sheets. Cf. preceding abstr.

A. H. F.

Optical pyrometer for the iron industry. ANON. *Arch. Wärmewirt.* 10, 105-6(1929).—The image of the object is reduced in intensity by a gray wedge until a small comparison field, illuminated by a filament at const. voltage, disappears. E. W. T.

Old iron trade on Gotland. JOHN NIHLÉN. *Jernkontorets Ann.* 82, 679-725(1927).—N. gives the results of historical and archaeological examns. over old iron production on the Swedish island Gotland.

A. DROGSETH

Sponge iron by the Smith process. GEORGE B. WATERHOUSE. *Iron Age* 123, 1143-5(1929).—The process depends on the reduction of Fe ores or Fe oxide materials in vertical ovens, similar to by-product coke ovens in construction, at comparatively low temp. and without fusion, usually in contact with solid reducing materials. The temp. of the reducing zone is 870-1095°. After reduction the material is crushed, magnetically concd. and briquetted. Reduction of Fe oxides is complete. The quantity of C taken up can be controlled up to 1.8%.

C. H. LORIG

Cast iron. ELM GAUFFIN. *Tek. Fören. i Finland Förh.* 49, 68-71(1929).—A general discussion of attempts to increase the tensile strength of cast iron. H. C. D.

A cast iron tank. OSKAR KRON. *Giesserei Ztg.* 26, 223-4(1929).—The construction of a 12-cu. m. capacity cast iron tank is described and illustrated. J. W. W. S.

Metallization of the oxide of iron in ilmenite. R. J. TRAILL AND W. R. McCLELLAND. Pamphlet, *Am. Electrochem. Soc.*, May 1929, 10 pp.—The metallization of the Fe oxide in ilmenite, or titaniferous magnetites, is accomplished by treating the crushed ore mixed with coal and coke in an oil-fired rotary kiln furnace, with the exclusion of excess air. The metallized Fe assocd. with the bulk of the  $\text{TiO}_2$  is sepd. from the unconsumed coal, coke and gang material by magnetic sepn. Over 92% metallization of the Fe is obtained. Leaching of the metallized product with a suitable solvent exts. the Fe, leaving a high-grade  $\text{TiO}_2$  concentrate.

C. G. F.

The manufacture of nickel-steel plate. C. McKNIGHT. *Iron and Steel (A. S. M. E. Trans.)* 50, No. 32, 17-23(1928).

E. I. S.

Twenty months' results of dry-blast operation. EDWIN H. LEWIS. *J. Iron and Steel Inst.* (advance copy) No. 8, May, 1929, 4 pp.—Statistical information is given for a blast furnace when air dried by means of a  $\text{SiO}_2$  gel dehydration plant.

D. S.



**First report on blast-furnace plant and practice.** A. K. REECH, *et al.* *J. Iron and Steel Inst.* (advance copy) No. 2, May, 1929, 27 pp.; *Engineering* 127, 564-6 (1929).—Recent developments in modern blast-furnace practice are outlined under the following headings: selection of raw materials; prepn. of materials; mech. handling of materials; furnace charging and top distribution; furnace lines; hot-blast stoves; gas cleaning; gas burning and surplus gas; blowing plant; power plant; dry blast; pig iron casting; general layout of plant; use of recording instruments in connection with the operation of the blast furnace; and O enrichment of blast. A selected bibliography is appended. **DOWNS SCHAAF**

**The oxidation zone in the blast furnace and its influence on operation.** HANS VON JÜPTNER. *Feuerungstech.* 17, 85-9 (1929).—A miscellaneous discussion, with special reference to the work of Wüst (C. A. 23, 2132). **ERNEST W. THIELE**

**Refractories in open-hearth practice.** O. PHILIPP. *Feuerungstech.* 17, 91-3 (1929).—The types used in the furnace, the regenerators and the ladles are described. **ERNEST W. THIELE**

**Malleable foundry refractories.** U. S. Bureau of Standards. *Elimination of Waste Series. Simplified Practice Recommendations* No. 79, 16 pp.—Effect Feb. 1, 1928. **E. J. C.**

**The mechanical properties of single metal crystals and crystal aggregates.** H. C. H. CARPENTER. *Proc. S. Wales Inst. Engrs.* 44, 541-605 (1929). A lecture. **E. I. S.**

**A new method for the production of sound steel.** CHARLES PARSONS AND H. M. DUNCAN. Newcastle-upon-Tyne, England. *J. Iron and Steel Inst.* (advance copy) No. 10, May, 1929, 12 pp.; *Engineering* 127, 623-4.—A short and thick ingot-mold is described with a large chill-block for its base, thick refractory walls, and gas or oil burners inserted through the cover to retard the freezing of the top of the ingot. A mild-steel ingot 45 in. high, 70 in. in diam., weighing 20.5 tons, was cast in this mold; the macrostructure and elem. analyses showed absence of segregation except near the top edge. The mech. properties and microstructure of some parts of the ingot were poor on account of streaks of inclusions. More rapid pouring, to cover the bottom of the mold more quickly, would probably avoid this trouble, and it was not found in a smaller ingot poured with the same-sized nozzle. S prints and macrographs show less irregularity of compn. than in ordinary ingots. Numerous illustrations of the structure are given. The importance of avoiding segregation is emphasized. **GEO. F. COMSTOCK**

**The coalescence of non-metallic inclusions in steel.** C. H. HERTY, JR. U. S. Bur. Mines Expt. Sta., Pittsburgh, Pa. *Proc. Eng. Soc. West. Penn.* 44, 259-67 (1928).—Non-metallic inclusions in steel may come from dirt in the pig Fe or scrap charged, but are mostly derived from deoxidizers. Various types of inclusions are illustrated. Deoxidation by Mn produced gray slag inclusions; by Si, glassy globules; by Ti and Si, inclusions showing duplex structure; and by Al, fine specks grouped but not coalescing. Coalescence facilitates elimination of inclusions, and a low m. p. promotes coalescence. Al generally raises the m. p. of inclusions, but some combination of elements in a deoxidizer may be found to remove this disadvantage. The connection of inclusions with banded structure was brought out in the discussion. **GEO. F. COMSTOCK**

**Use and development of magnetic analysis in the United States.** A. V. DE FOREST. Am Chain Co., Bridgeport, Conn. *Intern. Congress Testing Materials* 1927, I, 489-500.—“Magnetic analysis” means detg. phys. and mech. properties from magnetic measurements, and thus implies more than mere magnetic testing. Useful relationships between mech. and magnetic properties have often been found with other conditions const., but the relation may be entirely changed by slight differences in compn., strain, or heat treatment. Permeability tests have been used to detect flaws in rods, wires, etc. The progress of the work of an Am. Soc. Testing Materials comm. on magnetic analysis of high-speed steel drills is described; this work makes it possible to recognize the effect of the quenching, or the drawing temp., separately, from magnetic detns. of permeability and watt loss. By means of the cathode ray oscillograph a diagram may be obtained for each specimen from which peculiarities of analysis, working, quenching, and drawing may be separately recognized by comparison with a predetd. standard. This method, using an a. c. bridge to measure loss and induction, has been applied to routine com. testing of case-hardened chain links for brittleness. Changes in reluctance of a d. c. magnetic circuit have been used to det. the uniformity of turbine rotor disks. The Duroscope, tests of wire rope, and checking the quality of specimens to be used for long high-temp. tests are other applications of magnetic analysis. In discussion, D. Lewis of Sheffield described a rapid com. magnetic test for controlling the heat treatment of small steel parts, involving a detn. of coercivity which was closely related to the Brinell hardness. A bibliography of the subject is | **Also in Iron Age** 122, 1573-4. **GEO. F. COMSTOCK**

Some observations on melting of steel. VILHELM LOF. *Jernkontorets Ann.* 82, 257-62(1927).—The paper gives a survey of the decarburizing process. The presence of O and CO in the melted iron was confirmed. L. assumes that killing of iron with Si and Al is caused by disocn. of oxides and CO. Hot brittleness of Fe was examd. and is believed to be caused by oxides dissolved in the Fe.

Autogenous and electrical welding in steel and iron foundries. H. NEESE. *Gieserei Ztg.* 26, 209-16(1929).—Movable and stationary gas welding app. for foundries, gas and arc welding for cast steel and gray cast iron, cold welding, hot welding and the cost of gas and electricity for welding are discussed.

A contribution to the study of the action of gases on metals. I. Kinetic study of the phenomena. G. VALENSI. *J. chim. phys.* 26, 152-77(1929).—Gases evolved by Fe, Cr and Mn on heating were measured and analyzed. Metals prepd. by reduction in an elec. furnace evolve more gas than metals prepd. by the thermite process. The absorption of  $N_2$  at a pressure of 760 mm. by Mn and Cr was also measured at 610°, 800° and 1000°. The results are given in the form of graphs. The amt. of  $N_2$  absorbed by Cr agrees best with the formula  $CrN$  while for Mn the formation of the compd.  $Mn_3N_2$  is the most probable.

The oxidation of iron and steel at high temperatures. L. B. PFEL. *J. Iron and Steel Inst.* (advance copy) No. 11, May, 1929, 47 pp.—When steel is oxidized at red heat in air, scale is formed in 3 layers. The outer 10% is often cracked, with a conchoidal fracture, and is sepd. from the middle 50% by a surface of "bright lightly etched appearance." The middle layer is similar, and shows on its inner surface all details of the original surface of the steel. The inner 40% is very weak, porous and cryst. The outer layer is mainly  $Fe_2O_3$ , and the others are richer in FeO, but none is uniform in compn. Oxidation probably proceeds by diffusion of O inward, and of Fe outward, through the solid solns. constituting the scale. When samples of scale were heated in N or in *vacuo* in the same furnace, if the av. Fe content was over 72%, the O became evenly distributed; but scale contg. 72% Fe did not react with scale lower in Fe. The solid solns. are therefore continuous from FeO to 72% Fe, but a second soln. must exist with less Fe. This is the soln. found in the outer layer, which contains less than 72% Fe. Similar results were obtained on heating Fe with scale, showing that the Fe concn. in scale may increase without direct soln. Scale grows both inward and outward from the original surface. The inner layer is porous because the velocity of outward diffusion of Fe is greater than the rate of oxidation of the Fe core. In scaling alloy steels, the alloying element was concd. in the inner scale layer, except with Mn, and this layer had the same outside dimensions as the original steel. This layer on Ni steel contained metallic globules of Ni, and the steel below the scale showed oxide inclusions. Mn was highest in the middle layer of the scale. MnO is evidently sol. in the Fe-rich oxide soln., while with the other alloys, only the Fe diffuses readily through the scale. The effect of increased time of oxidation was similar to that of a faster rate. Heating of Fe in  $CO_2$ , steam, or with  $Fe_2O_3$ , NiO, CuO or Cu produced cryst. scale. These formations are explained on the theory that Fe diffuses outward through the scale, causing growth of the crystals of the high-Fe (cubic) oxide soln., while the high-O (hexagonal) phase does not occur in the coarse-grained form.

Constitutional diagrams for cast irons and quenched steels. A. L. NORBURY. Cast Iron Research Assn., Birmingham, England. *J. Iron and Steel Inst.* (advance copy) No. 9, May, 1929, 26 pp.—Two distinct types of gray cast Fe are described, similar in chem. compn. and conditions of casting, but having different forms of graphite because of melting conditions. One type contains "supercooled" or fine graphite usually in a ferrite matrix, with a fine sooty fracture; the other type has normal, coarse graphite flakes, in pearlite, with a coarser steel-gray fracture, and inferior chilling tendency. Constitutional diagrams for normal and supercooled cast Fe contg. O, 2 and 4% Si, resp., are shown, similar to those for normal and modified Al-Si alloys, and are discussed in detail. The data used in constructing these diagrams were taken from previous literature. The eutectic temp. is raised by Si, and its C content lowered, and the Fe-C eutectoid is affected in the same way by Si. Less than 2% Si suppresses  $\gamma$  Fe in the absence of C, but with even a small quantity of C, the allotropic transformations are merely brought a little closer together by even 4% Si. When graphite nuclei are destroyed in the melt by superheating, the supercooled structure is obtained, with numerous fine graphite flakes and less combined C. A similar discussion and diagram are given for quenched steel, representing the lowering of the change points as a form of supercooling. Troostite is pearlite refined by supercooling. The solid soly. of C in  $\gamma$  Fe is 0.6% at 350°. Also in *Foundry Trade J.* 40, 375-8, 397-9(1929).

Heat treatment and volume changes of gray cast iron between 15° and 600°.

W. DONALDSON, *Foundry Trade J.* 39, 299-303, 315-8(1928).—Various types were subjected to heat treatments for 200 hrs. at temps. of 450° and 550°, and the influence of such heat treatment on the combined C, tensile strength and hardness was detd. With a total C content from 3.1 to 3.3% there is little change in the heat-resisting properties, but with a further increase in C content there is a tendency to increased decompn., while with a decrease there is a very marked increase in stability. Increasing the Mn content increases the stability uniformly. P exerts a slight stabilizing effect. Si has a noticeable effect on the heat-resisting properties. With 1.10% stability is marked and increases slowly as the Si decreases. Over 1.2% Si stability is greatly reduced and diminishes rapidly as Si increases. The microstructure of the various changes is given in detail and substantiates the results obtained. The vol. changes were detd. by direct or dilatometric measurements. These changes are due to the decompn. of the combined C followed by air penetration along the graphite plates causing oxidation of the Fe. J. W. BOECK

Chain steel requires special qualities. JOSEPH R. MILLER. *Iron Age* 123, 1205 (1929).—Chain steel contains C 0.09%, Mn 0.32-0.45%, P 0.025% and S 0.045%. P and S must not go above these limits for the best welding properties. The steel should be free of oxides and inclusions which favor oxidation of the metal at welding temps. and should contain no Si and As. C. H. LORIG

Influence of forging temperature and heat treatment on strength of forged steel axes. G. L. EKKLUND. *Jernkontorets Ann.* 82, 577-608(1927).—Two steels (0.37% C and 0.56% C) were investigated. Both were forged in 2 temp. ranges (a) 1200-925° and (b) 850-725°. The following heat treatments were tried: (a) normalizing, (b) annealing from normalizing temp., (c) annealing at 670°. The results of the tests show that low finishing temp. gives higher strength. By correctly executed normalization the structure is improved (the difference between periphery and center diminished), and the strength is raised. A. DROGSETH

The microstructure of rapidly cooled steel. J. M. ROBERTSON. Royal School of Mines, London. *J. Iron and Steel Inst.* (advance copy) No. 12, May, 1929, 29 pp.—The microstructures produced in rods of 0.75% C steel, 0.11 in. in diam., by quenching in molten metal at temps. between 600° and 220° are illustrated and described. With very slow cooling in the furnace, each austenite grain changed into pearlite uniformly oriented, but with more rapid furnace-cooling, several orientations of the pearlite appeared in each grain. A fan-shaped arrangement of pearlite laminations was characteristic of still more rapid cooling as in air or in molten metal between 620° and 440°, the fineness of the laminations and of the fans increasing with the speed of cooling. As the temp. of the quenching medium decreased, the laminations became invisible, and the pattern acicular, until at 320° or below martensitic structures were found. The fan structure was sometimes found mixed with any gradation of the other structure. The former arises at the Ar' point, and the latter at the Ar'' point. The discontinuity in crystal form is due to the fact that for a given increase in rate of cooling, the allotropic change in Fe, which is Ar'', is lowered more than the formation of cementite, or Ar', and at a certain rate the latter may be suppressed, but not the former. The manner in which the change is initiated governs the crystal form of the product. The Widmanstätten or true crystal habit of  $\alpha$ -Fe is observed when complete diffusion of C can occur, or when rapid cooling prevents any diffusion. GEO. F. COMSTOCK

The transformation of austenite into martensite in an 0.8 per cent carbon steel. DARTREY LEWIS. Am. Chain Co., Bridgeport, Conn. *J. Iron and Steel Inst.* (advance copy) No. 7, May, 1929, 11 pp.—Cold-drawn wire, 0.192 in. in diam., contg. 0.79% C, 0.45% Mn, 0.22% Si and small quantities of impurities, was heated to 816° and quenched in fused salt, or in salt followed by oil, at various temps. Dilatation and magnetic tests were made on the samples during air-cooling after the quench. Quenching in salt at 232° to 177° produced austenite, which changed to martensite after air-cooling a few min. With the salt at 149°, most of the martensitic change was completed in the salt, and with the temp. below 94°, all of it was completed in quenching. Quenching in salt above 260° produced austenite which was less stable, and 5 mins. in the quenching bath caused a change to a needle-like structure of low hardness. With the salt at 343° or above, no austenite was retained, and the product of the quench was sorbitic. Holding the specimen in salt at 205° for 15 mins. after the quench did not cause the martensitic change to progress any further than holding for 1/3 min. Rockwell hardness of C-59 was obtained by decompn. of austenite below 232°, but when quenched in salt at higher temps. the air-cooled specimens were correspondingly softer. The microstructures are illustrated. A two stage hardening of this kind is readily controlled with accuracy, and may have practical use in avoiding distortion, or to permit forming in the austenitic state. GEO. F. COMSTOCK

**X-ray study of hardened carbon steel.** G. KURDYUMOV AND E. KAMINSKII. *Z. Physik* 53, 696-707(1929); cf. *C. A.* 22, 4430.—The influence of C content upon the axial ratio and upon the parameters of the tetragonal lattice is studied. By removing the surface of the sample in steps it is shown that the tetragonal structure exists not only on the surface of the hardened samples but also in the interior, contrary to the statements of Honda and Sekito (*C. A.* 22, 4430). The change of structure after annealing at 100° has been studied. From the x-ray diagrams it is possible to get some idea how the tetragonal structure is destroyed.

GEORGE GLOCKLER

**The austenite domain in chromium alloyed steels.** BO KALLING. *Jernkontoret's Ann.* 82, 609-67(1927).—The paper gives the results of microscopic and hardness examns. after different heat treatments of Cr steels with 0 to about 30% Cr, and with, in general, low C contents. For steels with Cr < 5% the following etch reagent has been used with good results: 5 g. CuCl<sub>2</sub>, 100 cc. HCl (1.19), 100 cc. alc. and 100 cc. water. The content of CuCl<sub>2</sub> has been varied. The results show that the formation of austenite ceases at a certain Cr content, which has been detd. for different C contents. With 0.25% C the formation of austenite ceases at about 25% Cr, and with 1.0% C at about 30% Cr. Under certain relations only a part of the ferrite is transformed to austenite. These relations have been examd. and the results show that the equil. diagram for Cr > 10% is of a completely different character than the ordinary C-steel diagram. The pearlite eutectoid is replaced by the so-called limit of satn. Carbide is not sol. in the Cr-ferrite under about 1200°; with higher temps. there seems to be a certain soly. which does not exceed about 0.10%. The compn. of the carbide has been examd. The results show that the carbide has a nearly const. compn. in steels from 13 to 30% Cr. The analysis is: C 5.3-5.4%, Cr about 63%. Equil. diagrams are given for 5, 10 and 13% Cr. With higher Cr content a 3-dimensional diagram is necessary.

A. DROGSETH

**The production and uses of non-ferrous metals in electro-technology.** I. Copper and copper alloys. H. ALTERTHUM. *Metallwirtschaft* 7, 680-3(1928). II. Aluminum and aluminum alloys. *Ibid* 708-11. III. Nickel and nickel alloys. *Ibid* 728-31. IV. Lead. *Ibid* 755-7. V. Zinc. *Ibid* 836-8. VI. Silver. *Ibid* 881-3. VII. Platinum. *Ibid* 914-15. VIII. Mercury. *Ibid* 958-61.—Reviews.

R. F. M.

**Copper alloys.** I. Copper-bismuth. II. Copper-arsenic. III. Copper-phosphorus. IV. Copper-oxygen. V. Copper-antimony. VI. Copper-lead. FRIEDRICH FRÉUDE. *Metallbörse* 18, 818, 874-5, 1043-4, 1099, 1379(1928); cf. *C. A.* 21, 1616. P. presents data indicating the effect of small quantities of Bi, As, O, Sb and Pb on the mech. and elec. properties of Cu. 0.02% Bi in Cu causes appreciable hot-shortness. When 0.05% Bi is present Cu becomes cold-short and shows pronounced hot-shortness. Cu contg. not more than 0.1% Bi can be rolled when 0.6% As is introduced in the alloy. With more than 0.005% Bi Cu is unsuitable for wire drawing. With more than 1% As in Cu the metal becomes red-short. Cu contg. both O (0.4%) and As (0.5%) is hard and cold-short. The elec. cond. is reduced to 87.2% for a content of 2.57% As. Addn of 0.6% As to Cu contg. small quantities (0.1% or less) of Bi, Pb, Sb, or S improves the metal noticeably. P dissolves in Cu up to 0.2%. From 0.2 to 8.2% P the alloy consists of primary Cu grains and a eutectic of Cu + Cu<sub>3</sub>P. Both hardness and tensile strength are greatly increased by the addn. of P. O present in Cu as Cu<sub>2</sub>O tends to make the Cu cold-short. It is particularly harmful where the metal is exposed at high temps. to reducing gases. With 1% Sb in Cu the metal is markedly red-short. 0.6% Sb in Cu reduces the elec. cond. to 57.6%. Cu free from O cannot be hot-rolled when it contains 0.02% Pb. When O is present Pb is harmless up to a content of 0.15%. In the latter case hot-shortness becomes pronounced for a Pb content of 0.3%.

H. S. v. KLOOSTER

**The microstructure of the system: magnesium-zinc.** LUDWIG KAUL. *Metallbörse* 18, 1154-5(1928).—A theoretical explanation of the structure of the newly discovered intermetallic compd. MgZn<sub>2</sub> (cf. *C. A.* 22, 1941) based on considerations of the way in which the single atoms arrange themselves. Mg atoms form cyclic aggregates (Mg<sub>6</sub>) whereas Zn atoms form doublets or 2 doublets (Zn<sub>2</sub>) in the form of a rod.

H. S. v. KLOOSTER

**Recent investigations on the thermal aging of light alloys.** P. SCHWERBER. *Metallbörse* 18, 873-4, 985-6, 1098-9(1928); cf. *C. A.* 20, 2141.—A crit. review of the thermal aging of duralumin and related alloys, summarized in the following conclusions: (1) the constituents which cause self-hardening form solid solns. with Al; (2) the solid soly. varies with the temp.; (3) the possibility of hardening depends particularly on the sepn. of a compd. from the solid soln.; and (4) the amt. of the addnl. constituents should be between the limits of solid soln. at high temp. and at room temp. Al alloys free from Mg (such as aeron) age at room temp. just like duralumin when the ever-present Si is re-

moved as insol.  $\text{CaSi}_2$  by the addn. of Ca. Duralumin made with pure Al (contg. only 0.03% Fe and 0.02% Si) age-hardens as well as the usual product which contains Si in the form of  $\text{Mg}_2\text{Si}$ . Systematic investigations by S. since 1926 led to the manuf. of an improved duralumin with a strength 25-30% above that of the usual material.

H. S. v. KLOOSTER  
Aluminum rolling-mill developments. R. J. ANDERSON. *Rolling Mill J.* 3, 83-6, 88(1929). E. I. S.

Making bismuth wire by the extrusion process. D. C. STOCKBARGER. *Wire* 4, 123-139(1929).—Metal that cannot be drawn by ordinary means is satisfactorily formed by special app. E. I. S.

Welding of non-ferrous metals. D. BARDTKE. *Electrotech. Maschinenbau* 46, 523-27; *Science Abstracts* 31B, 421(1928).—The welding of Cu, brass, bronze and Sn, Al and Pb has been successful with certain precautions for the particular metal. Ni is difficult to weld because of liberation of gas. M. MCMAHON

Welding of aluminum castings. O. G. STYRIE. *Metallbörse* 18, 1380(1928).—For corrosion-resisting Al-castings a high-melting solder contg. Al 70-75, Sb 7-10, Cd 3-5, Cu 4-8, Sn 2-5, and Mn 1-1.5%, m. 580-640°, is recommended. The flux used with the solder is made up with powd. borax 5,  $\text{Na}_2\text{CO}_3$  5 and S 1 part. H. S. v. KLOOSTER

Welding copper, brass and bronze. I. T. HOOK. *Welding Eng.* 14, No. 3, 45-8 (1929). E. I. S.

Arc welding nickel-chromium alloys. G. A. MAURATH. *Welding Eng.* 14, No. 3, 49-50(1929). E. I. S.

The production of ductile welds in nickel and monel metal. N. B. PILLING AND T. F. KIHILGREN. *J. Am. Welding Soc.* 8, No. 4, 20-28(1929). E. I. S.

Passivity of metals and its relation to problems of corrosion. ULICK R. EVANS. *Am. Inst. Mining Met. Eng., Tech. Publ.* No. 205, 23 pp. (1929).—Passivity of metals is due to a protective film which is the product of direct reaction of the metal with  $\text{O}_2$ . Passivity can also be brought about by anodic oxidation at high c. ds. The film is insol. in concd.  $\text{HNO}_3$  at ordinary temps. and is therefore believed to be  $\text{Fe}_2\text{O}_3$ . Cl ions, inclusions at phase junctions, and abrasion marks tend to weaken or penetrate the film, thus restoring part of the metal to the active state. Passivity can be brought about in the process of anodic soln. in acids at high c. ds. since at the instant before passivity sets in the liquid film adjacent to the metal (due to the formation of neutral or basic salts) is incapable of dissolving the film. Methods of isolating the film are described. The film is transparent, shows emery marks and is less than 400 A.U. thick. The function of  $\text{O}_2$  in an aq. corrosion process is to divert the attack to regions of lower  $\text{O}_2$  concn. Rust is not the direct reaction product but is a ppt. formed by secondary reactions. Rusting takes place at points in which there is a break in the film which is the direct reaction product. Carbonates and phosphates retard corrosion because of the formation of insol. direct reaction products at the anode while  $\text{Ca}(\text{OH})_2$  and  $\text{Mg}(\text{OH})_2$  prevent it by forming insol. products at the cathode. B. E. ROETHLI

Observations on the corrosion of iron. J. F. G. HICKS. *J. Phys. Chem.* 33, 780-90(1929).—The corrosion of Fe was studied and the effects of  $\text{H}_2\text{O}$ ,  $\text{O}_2$  and  $\text{CO}_2$  were detd. Consideration of the soly. of the various factors involved gave the following results. The primary cause of the corrosion of Fe is attributed to the soln. of Fe in  $\text{H}_2\text{O}$ . A film of  $\text{H}_2\text{O}$  adhering to the metal surface undergoing corrosion is necessary to this dissolving process.  $\text{O}_2$  produces the max. e. m. f. with respect to dissolving Fe and acts as an accelerator; it removes  $\text{Fe}(\text{OH})_2$  and  $\text{H}_2$  by oxidation and is hence a maintenance factor in the corrosion process.  $\text{CO}_2$  is also a maintenance factor because of the removal of  $\text{Fe}(\text{OH})_2$  and it accelerates the reaction by decreasing the  $p_{\text{H}}$ . B. E. ROETHLI

Corrosion phenomena on irons and steels. E. SCHREIBER. *Metallbörse* 18, 2274-75(1928).—A summary of various methods for corrosion prevention such as, oxide film formation, plating, tempering, oiling, lacquering, wrapping in paper or sawdust, etc. The importance of removing acids, bases or salts from the surface of the metal prior to oiling and of having a neutral oil (free from fatty acids) is emphasized. Sawdust should be dry and paper or wood should be free from alk. earth chlorides. B. E. ROETHLI

The corrosion of steel by acid solutions. HIROZÔ ENDÔ. *Science Repts. Tôhoku Imp. Univ.* [1], 17, 1245-63(1928).—See C. A. 23, 1858. DOWNS SCHAFF

Corrosion—a problem in protective coatings. F. N. SPELLER. *Ind. Eng. Chem.* 21, 506-10(1929); cf. C. A. 23, 2410.—A review of the corrosion situation showing the variety of ways in which protective films come into play in corrosion prevention. Conclusion: Corrosion is detd. and controlled by influences, external to the metal which tend to form or destroy surface films; protective films form more readily in air than in  $\text{H}_2\text{O}$ ; in soils or  $\text{H}_2\text{O}$  wrought iron and steel corrode to about the same extent; a Cu

content greater than 0.15% increases the resistivity of films formed in air; when expense and external conditions warrant their use metals forming highly resistant films should be used.

B. E. ROETHLI

**Heat- and corrosion-resistant alloys.** T. HOLLAND NELSON. *Iron Age* 123, 1139-42(1929).—A discussion of heat- and corrosion-resistant alloys of the Fe-Cr series. Cr is alloyed with Fe to render it insol. in  $H_2O$  and many solns. and to prevent selective corrosion or pitting. The phys. properties of these stainless steels vary with the C and Cr content.

C. H. LORIG

**Corrosion phenomena on aluminum sheets.** R. WESENBERG. *Chem. Fabrik* 1929, 208.—Pinhole corrosion of rolled Al sheets may be due to inclusions of a suboxide of Al.

J. H. MOORE

**Electrical resistance method of measuring corrosion of lead by acid vapors.** R. M. BURNS AND W. E. CAMPBELL. *Trans. Am. Electrochem. Soc.* 55 (preprint) 14 pp.(1929) — A method is developed for measuring the rate of corrosion of a metal, in terms of the rate of increase in resistance of a wire as it is reduced in cross section by the progress of corrosion. The reproducibility of the method is tested by running duplicate tests in the same corrosive atm. For these tests extruded Pb wire, 0.213 mm. in diam., is used and the corrosive media are atms. in equil. with concns. of AcOH ranging from 0.00001 *M* to 0.02 *M*. The resistance change-time curves are reproducible to within 15%. The method is applied to the problem of comparing the corrosiveness of different wood sawdusts, and results are obtained which correlate closely with lab. tests on wood acidity and with field experience. Illustrations of the use of the method for following a change in corrosive atm., and for comparing the behavior of different alloys exposed to the same atm., are given.

C. G. F.

**The causes of grate-bar destruction and appropriate preventive measures.** K. HOFER. *Glückauf* 64, 211-5(1928).—Temp., atm. O, contact with ash or slag, and perhaps electrolytic action too, may be taken as the chief causes for the destruction of grate bars. The nature of the metal of the bar itself, especially with respect to the graphite content, causes differences in the resistance, as the C burns out and then oxidation penetrates through the spaces so left. A dense grate bar, especially on the surface, is recommended. Cooling of the grate bars is indicated as a preventive of corrosion. Low S content of coal is also desirable. Cooling may be effected by giving sufficient depth to the bar, by exposing larger surfaces to the cooling air, steam or atomized water, etc., or by having the ash itself cool before it reaches the grate. Addnl. protection is afforded by chrome plating and other O-resistant surface treatments.

W. C. E.

The various cleaning processes for gases, especially for blast-furnace gases (ILLIES) 13. Batch classification in the laboratory (FAHRENWALD, THOM) 1. Sponge Fe, a raw material for electric steel (THOLAND) 4. Cutting and quenching oils (HUDSON) 22. Steel-making refractories (WALKER) 19. Stretching of Cd crystals (BOAS, SCHMID) 2. Flowing of metal crystals produced by torsion (KARNOP, SACHS) 2. Crystal structure of thin metal foils (DEMBINSKA) 2. Apparatus for classifying ores (Fr. pat. 650,971) 1. Apparatus for making AcH from  $C_2H_2$  (Brit. pat 299,234) 10.

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**Washing and separating ores, etc.** FRED E. DAUBAN. Fr. 651,286, Dec. 5, 1927.

**Treating complex ores.** JACQUES MICHAUT. Fr. 650,898, Mar. 16, 1928. An app. is described for enriching complex ores by flotation, in which the mud to be treated is emulsified by water jets which descend on the material in suspension in water.

**Froth flotation process.** MINERALS SEPARATION, LTD. Ger. 475,108, Feb. 20, 1925. See Brit. 223,860 (C. A. 19, 1124).

**Extraction of metals from ores.** ALBERT E. SMAILL. Can. 289,214, April 30, 1929. Sulfide ores contg. Fe, Ni and Cu as well as smaller percentages of precious metals, smelted with an alk. flux under reducing conditions to produce a self-disintegrating mat of metal sulfide contg. alkali. The mat is disintegrated by exposure to a moist atm. An alkali-contg. compd. is added to the disintegrated mat, the mixt. is roasted at 600°, leached (weak acids, brine or solns. of ammonia compds. may be used as solvents if required but hot water is usually sufficient to dissolve the sulfates) to remove sol. constituents, and the leached residue is subjected to gravity sepn. to conc. the precious metal values.

**Metals from ores.** FERDINAND DIETZSCH. Fr. 648,742, Nov. 25, 1927. Oxide, oxidized or roasted ores are treated with a soln. of thiosulfate simultaneously with, or after, treatment with a soln. of  $\text{SO}_2$ , to ext. Cu or Pb and Zn or Ag. Solns. of cuprous sulfite and Pb sulfite or sulfate are formed. The metals are pptd. by adding a sulfide, polysulfide, carbonate, hydroxide or oxide of an alkali or alk. earth metal and the thio-sulfate formed is used again.  $\text{H}_2\text{S}$  may be used to ppt. the metals, in which case the thiosulfate is regenerated by heating with lime and  $\text{H}_2\text{SO}_4$  and  $\text{Na}_2\text{SO}_4$ . Examples are given of the treatment of an oxidized Cu ore and a roasted Pb-Zn-Ag ore.

**Direct reduction of iron from its ores.** SAMUEL L. MADORSKY (to Gathmays Research Corp.). U. S. 1,711,738, May 7. In order to effect a fractional reduction of Fe oxide ores contg. Ti oxide, a reducing gas such as H is passed through the oxide in molten form and the temp. of the mass is maintained above its m. p. and the reducing gas in contact with the molten material is maintained substantially free of C and N. An app. is described.

**Treatment of sulfide ores.** FRIEDRICH JOHANNSEN. Ger. 475,115, May 31, 1924. Sulfide ores and like metallurgical products contg. volatilizable metals are mixed with a reducing agent, e. g., coke, and heated so as to generate metal vapors which are oxidized either in the heating furnace or outside. The reducing agent is added in sufficient amt. to avoid oxidation of the S and to maintain a reducing atm. in the vicinity of the charge in the reaction zone. Alk. earth compds., if not already present, are added also in sufficient amt. to fix the S.

**Treatment of antimony, arsenic and mercury ores.** OESTERREICHISCHE BAMAG-BUTTNER-WERKE A.-G. and RUDOLF JAHN. Ger. 475,387, Feb. 10, 1926. The powd. ore is passed through a heated rotary tube, preferably of cruciform section, in the same direction as a stream of air, and the oxide fumes so obtained are passed into a separator for solid impurities maintained at such a temp. that the fumes are not condensed. The fumes are then blown into a heated chamber in which they are reduced by powd. C or by gases such as CO or H. The reduction may also be effected by mixing the fumes with the gases and blowing the mixt. through an elec. arc.

**Treatment of metals.** CHARLES BOURGEOIS. Swiss 127,588, May 23, 1927. Small metal objects such as parts of clocks are heated in a reducing atm. such as  $\text{CO}_2$ , HCN or  $\text{C}_2\text{H}_2$  to prevent the formation of oxide, and to remove oxide films already present.

**Deoxidizing molten metals.** SIEMENS & HALSKE A.-G. Fr. 650,380, Mar. 3, 1928. See Brit. 288,543 (C. A. 23, 593).

**Recovery of zinc, etc., from iron-bearing materials.** F. KRUPP GRUSONWERK A.-G. Brit. 299,300, Oct. 22, 1927. In effecting recovery of Zn or other volatilizable metals from materials such as waste pyrites (as by the process described in Brit. 225,842; C. A. 19, 1553) the material is mixed with excess (not less than 45%) of fuel and treated in a rotary furnace so as to avoid deposits of iron in the furnace.

**Reducing zinc-bearing materials.** FRANK G. BREYER and EARL H. BUNCE (to New Jersey Zinc Co.). U. S. 1,712,134, May 7. See Fr. 639,972 (C. A. 23, 808).

**Reducing zinc-bearing materials.** FRANK G. BREYER and EARL H. BUNCE (to New Jersey Zinc Co.). U. S. 1,712,132, May 7. Agglomerates of Zn silicate ore or other suitable Zn-bearing material and carbonaceous material are progressively passed through a reducing chamber such as a vertical retort without breaking down the agglomerates and the latter are heated sufficiently to effect reduction of Zn compds. and volatilization of metallic Zn without slagging or fusing of the agglomerated charge; Zn vapor may be withdrawn and directly condensed to Zn metal. An app. is described.

**Condenser for zinc vapor.** FRANK G. BREYER (to New Jersey Zinc Co.). U. S. 1,712,133, May 7. See Fr. 638,619 (C. A. 23, 368).

**Zinc from zinc oxide.** CHRISTIANUS J. G. AARTS. U. S. 1,712,641, May 14. C is added to a fused iron bath and zinciferous material such as ZnO is then treated in the bath at a temp. (suitably about 1500°) at which the vapor pressure of the bath is low and the vapor pressure of the metal to be obtained is high so that reduction and volatilization of the latter is effected.

**Zinc oxide.** CHARLES A. H. DE SAULLES (to American Smelting & Refining Co.). U. S. 1,712,553, May 14. Zn ore is continuously reduced on a slag bath in a furnace having a slightly oxidizing atm. free from impurities, volatilized Zn products are removed to a sep. chamber of lower temp. than the furnace and contg. an excess of oxidizing agent such as air. ZnO is recovered. An arrangement of app. is described. Cf. C. A. 22, 306.

**Tilting and rotating furnace suitable for smelting.** ARTHUR JONES (to U. S. Smelting Furnace Co.). U. S. 1,712,769, May 14. Various structural details are given of a furnace having a burner mounted to be moved into and out of alignment with the furnace.

**Tiltable container for pouring molten metals.** LEE E. ALLEN (to Pennsylvania Engineering Co.). U. S. 1,712,287, May 7. Structural features.

**Apparatus with a tiltable rotating container for dipping articles in a galvanizing or tinning bath.** PATRICK J. KELLEY (to Ohio Brass Co.). U. S. 1,713,232, May 14. U. S. 1,713,233 relates to the use of a similar app. in which the articles to be coated are preliminarily tumbled with a dry flux and then dipped to coat them and freed from surplus coating, all in a continually rotating receptacle.

**Apparatus for casting non-ferrous metal slugs for making articles by extrusion.** WHEELING STAMPING CO. Brit. 299,489, June 28, 1927. Structural features.

**Ingot mold.** VEREINIGTE ALUMINIUM-WERKE A.-G. Ger. 475,077, Sept. 30, 1927.

**Ingot.** EMIL GATHMANN. U. S. 1,712,608, May 14. Ingots are formed of slab-like contour having a depth less than the width or length and with one at least of the larger areas concaved to a depth of one-eighth to one-fourth the thickness of the ingot.

**Hollow metal bars.** A. P. PEHRSON and F. LLOYD. Brit. 299,237, Jan. 20, 1928. A destructible core for use in rolling, drawing or forging of hollow bars from hollow billets comprises a helical sheath which may be formed of a strip of Cu or Cu alloy enclosing a center of pliable material such as sand or a rod of metal such as iron, mild steel, Cu or Cu alloy which will not melt during the working operation nor break during subsequent withdrawal. Cf. C. A. 23, 1104.

**Use of carbonaceous shale for improving ferrous metals.** ERNEST S. FISHER (to Utah Metals Flux Co.). U. S. 1,712,879, May 14. Metals such as cast iron or scrap are brought into contact in the molten state with a material such as the carbonaceous shale found in the northern central portion of Emery County, Utah, south of Price River and Desert Lake, in order to improve the strength and workability of the metal.

**Furnace for heating metal sheets and packs.** ARTHUR R. MCARTHUR and EDWIN E. MOORE (to American Sheet and Tin Plate Co.). U. S. 1,712,576, May 14. Structural features.

**Furnace for heat-treating metal articles.** THOMAS J. LAURENCE (to Chrysler Corp.). U. S. 1,712,831, May 14. Structural features.

**Furnace for heat treatment of long rods, tubes, etc.** HIRSCH KUPFER-UND MES-SINGWERKE A.-G. Brit. 299,453, Oct. 27, 1927. Structural features.

**Salt-bath furnace for hardening steel.** AXEL G. E. HULTGREN. U. S. 1,713,472, May 14. A method of operation is specified in which a fused salt bath is maintained in non-decarburizing condition by introduction of an acid, non-volatile oxide (preferably silica) in contact with the salt.

**Converter with lateral blowing for the production of steel.** JACQUES MORAT. Fr. 648,953, Feb. 14, 1928.

**Charging blast furnaces with furnace dust, etc.** PAUL HESKAMP (to Vereinigte Stahlwerke A.-G.). U. S. 1,713,435-6, May 14. Non-oxidizing gases are used for blowing the furnace dust or other materials into the furnace shaft above the smelting zone. Various structural details are described.

**Hot-blast installation for blast furnaces.** FREDERICK H. WILLCOX (to Freyn Engineering Co.). U. S. 1,713,313, May 14. Structural features.

**Burners and reversing valves for regenerative smelting furnaces.** WILHELM CORSALLI. Ger. 475,167, June 6, 1919.

**Crucible for melting lead, tin, zinc, etc.** WILHELM BUNDS. Ger. 475,076, Sept. 21, 1928. The crucible is made in part of metal and in part of refractory material, the parts being united so as to allow for relative expansion or contraction.



**Recovery of values from metallurgical flue gases.** JOHN D. McLACHLAN. *Fr.* 651,667, Mar. 24, 1928. Materials in smoke obtained in the extn. of Pb and other metals from ores, etc., are oxidized to produce a product similar to sublimed white lead. The materials may be heated in the smoke flue or after recovery, by heating directly or indirectly. If necessary air may be added to ensure complete oxidation, and gas or materials contg. S may be added to increase the sulfate content.

**Iron.** HERMANN VAN ROYEN. *Fr.* 651,612, Dec. 10, 1927. Pure Fe is obtained by bubbling through the bath of refined metal, non-carbonating reducing gas, the vol. of which is not increased by oxidation. Mixts. of CO, CO<sub>2</sub> and N in suitable proportions or of SO<sub>2</sub> and N may be used. The Fe obtained may be carbonated by passing a gas through having a carbonating action consisting of satd. hydrocarbons.

**Cast iron.** THE INTERNATIONAL NICKEL CO., INC., and PAUL D. MERICA, JAMES S. VANICK and THOMAS H. WICKENDEN. *Fr.* 651,242, Feb. 22, 1928. A gray cast iron which does not increase in vol. when heated and cooled repeatedly is obtained by replacing almost all the usual Si content by Ni. Examples given contain C 2.96, Si 0.7, Ni 3.47% and C 3.98, Si 0.19, Ni 3.84%.

**Gray cast iron.** THE INTERNATIONAL NICKEL CO. *Fr.* 650,815, Mar. 13, 1928. A gray cast iron of high tensile strength is obtained by adding to the white or mottled cast iron, after it has been tapped from the furnace, Al, Si, Ni and Mn either singly or together, which induce the formation of graphite. Examples are given.

**Cleaning iron and steel.** LA FILOCHIMICA. *Fr.* 650,705, Mar. 10, 1928. In the siderurgical industry baths contg. heavy tar oil, H<sub>2</sub>SO<sub>4</sub> (66° B<sub>e</sub>.) and oleum are used for cleaning Fe and steel to prepare them for successive treatments.

**Rustless steel.** SOC. ANON. DES ACIÉRIES ET FORGES DE FIRMINY. *Fr.* 651,459, Sept. 7, 1927. A rustless steel contains Mn 0.300–0.700, Si 0.400–1, Cr 5–6, Al 6–9, Ti 0.500–1 and C 0.050–0.600%.

**Alloys.** MEIER & WEICHELT EISEN UND STAHLWERKE. *Fr.* 650,845, Mar. 14, 1928. Fe alloys which are resistant to fire contain Cr 17–18, Ni 18–19, Si about 2, Mn about 1 and C about 0.6%.

**Alloys.** METALLBANK UND METALLURGISCHE GESELLSCHAFT A.-G. *Fr.* 650,419, Mar. 5, 1928. Cu-Si alloys suitable for the needs of the foundry contain Si 1–4, Fe 4–6, and Ni 1–4%. Zn, Sn, Mn and Al may also be present. Examples contain Si 2.5, Fe 5, Ni 5, Zn 10 and Sn 0.5 with or without 0.1% of Al and with or without 0.05% of Mn.

**Alloys for making springs and parts of plants subjected to friction, especially electrical conductors.** SIEMENS & HALSKE A.-G. (Georg Masing and Otto Dahl, inventors). *Ger.* 475,009 and 475,083, May 21, 1927. Alloys contg. Be and a predominating amt. of Ni, Co, or Fe are used. The alloys may be improved by thermal treatment. *Cf.* *Ger.* 469,218, and 469,219 (*C. A.* 23, 1103).

**White metal alloys.** A. L. Pocock. *Brit.* 299,493, July 25, 1927. Zn 85% or more is alloyed with Cu, Al and Ag, suitably in the relative proportions, resp., of 0.5–20.1 3:1 or less. Small addns. of Mg or other metals also may be made.

**Aluminum alloy.** ROLLS-ROYCE, LTD. *Fr.* 650,213, Feb. 29, 1928. An improved Al alloy contains Cr 0.05–4, Ni 0.2–1.5, Mg 0.1–1, Sb up to 0.5, Ti up to 0.5, Si 0.2–1.5, Fe 0.7–1.5 and Cu 2–5%. The amt. of Sb and Ti given is that added before or during fusion, the amt. finally remaining in the alloy being immaterial.

**Aluminum alloys.** COMPAGNIE DE PRODUITS CHIM. ET ÉLECTROMÉTALLURGIQUES ALAIS, FROGES ET CAMARGUE. *Fr.* 650,982, Mar. 17, 1928. Ti is introduced into Al alloys in the presence of, or in the form of, fluorides. The Ti may be alloyed with Al, Cu or Mn and added to the main mass of Al in the presence of fluorides, or the Ti may be introduced in the electrolytic manuf. of Al, which is carried out in the presence of fluorides (cryolite), or a double fluoride of Ti and an alkali metal may be mixed with powd. Al and added to the molten mass. The content of Ti may be 0.05–0.8, but preferably 0.5%. *Cf.* *C. A.* 23, 1103.

**Magnesium alloys.** JAHN A. GANN (to Dow Chemical Co.). U. S. 1,712,988, May 14. Alloys such as those of Mg contg. also about 8% Al and which may also contain other metals are heated in the form of castings to a temp. of about 430–5° for about 1 hr., in order to improve their strength, etc. U. S. 1,712,989 specifies subjecting alloys of Mg contg. also a minor proportion of a metal such as Al or Cu, or both, normally forming both a eutectic and a solid soln. with the Mg, to a heat treatment at a high temp. (suitably about 430°) below the m. p. of the eutectic, to effect complete soln. of the eutectic. U. S. 1,712,990 specifies successive heatings at higher temps. similarly successively to dissolve eutectics of 2 different metals present with the Mg, such as eutectics of 2 different metals present with the Mg, such as eutectics of Mg with Zn and Al, soln.

of which may be effected by heating at 335° and 430°, resp. Other metals such as Cu may also be present. Cf. *C. A.* 23, 88.

**Ferrous alloys containing chromium and tantalum.** PERCY A. E. ARMSTRONG. U. S. 1,711,484, May 7. A rust-, heat- and acid-resisting alloy suitable for cutlery, valves, etc., comprises Fe together with Cr 7-25, Ta about 0.2-3.0% and C about 1.25% or less. Mn and Si also may be added in small proportions.

**Iron alloy.** W. S. SMITH, H. J. GARNETT and J. A. HOLDEN. Brit. 299,502, July 27, 1927. Fe alloys free from C are formed contg. Cu and Si about 3-6% each and a small quantity of a deoxidizer such as Mn also may be added.

**Steel alloy.** EDUARD HOUDREMONT (to Fried. Krupp A.-G.). U. S. 1,711,733, May 7. A steel alloy which has high strength at high temps. comprises Cr 8-18, Mn 2-12, W 3-12% and 1% or less of C.

**Forgeable steel alloy.** JOHN L. COX. U. S. 1,711,519, May 7. An alloy is specified contg. C 0.35-1.5, Cr 4-20, W 6-18 and Al 1-6%, the remainder being mainly Fe. The proportion of W is not less than 1/4 that of the Cr and the proportion of Al is not less than one-sixth that of the W. Alloys of this compn. are suitable for valves operating at high temps.

**Alloy steel resistant to acids.** RALPH P. DEVRIES and HENRY A. DEFRIES (to Ludlum Steel Co.). U. S. 1,712,030, May 7. An alloy steel resistant to H<sub>2</sub>SO<sub>4</sub> and to mixed acids, and suitable for making tanks, valves, etc., exposed to acids contains Ni 14-30, Cr 6-20, Si 1-3, Ta 1-3, C 1% or less, the remainder being Fe.

**Circulatory apparatus for pickling metals.** HEINRICH OSWALD. Ger. 475,422, Jan. 16, 1927.

**Magnetic system for testing the hardness of ball-bearing rings, etc.** L. RENAULT. Brit. 299,388, Oct. 25, 1927.

**Heat treatment and quenching of metal rods and similar articles.** WALTER W. LÖCK (to Scullin Steel Co.). U. S. 1,713,136 7, May 14. An app. and mech. features are described.

**Apparatus for tempering metal-bar stock by electrical heating and quenching.** JOSEPH J. MASCUCH. U. S. 1,712,833, May 14. Structural features.

**Heat treatment of aluminum castings.** RANDOLPH J. ROBERT (to Bohn Aluminum & Brass Corp.). U. S. 1,713,093, May 14. Al alloys such as cast piston blanks contg. Al together with Cu 10, Fe 1, and Mg 0.5% are heated to a temp. as high as possible without distortion, quenched, and then reheated to about 220-250°, in order to refine the grain of the metal.

**Heat treatment of rolled steel.** NARAINA D. CHOPRA and FREDERICK J. BULLEN. U. S. 1,712,251 to 1,712,253, May 7. See Brit. patents 271,606, 271,529 and 271,530 (*C. A.* 22, 1568).

**Prevention of the corrosion of aluminum.** SOC. ANON. DES ÉTABLISSEMENTS LUCIEN AIRE. Fr. 650,587, Mar. 8, 1928. Corrosion of Al in contact with other metals forming herewith a galvanic couple is prevented by interposing a layer of Zn obtained in any suitable manner.

**Protective coating on iron.** EMIL LAY. U. S. 1,711,603, May 7. A diffused protective layer is formed on iron articles by heating with a pulverulent compn. contg. 8-30% of free metallic Al, and which also contains inert substances such as clay or alumina.

**Coating base metal jewelry, etc., with precious metals.** ERNST G. BEK and EUGEN THOMA (Thoma to Bek). U. S. 1,712,244, May 7. Articles of metal such as rings or buttons are coated with a film of a precious metal such as Au having a wt. less than 2.5% that of the article and the article and coating are heated to a temp. somewhat below the m. p. of either of the metals to effect interalloying and to produce a coating of desired color.

**Silvering metals.** LUCIEN J. V. GRANIER. Fr. 651,300, Jan. 25, 1928. See Brit. 296,695 (*C. A.* 23, 2415).

**Metal wire.** JAMES F. HOWE (to Am. Steel and Wire Co. of N. J.). U. S. 1,712,348, May 7. Wire is simultaneously drawn and coated by drawing stock such as ferrous metal through a body of dry metallic powder such as Zn, brass, Cu or Sn immediately prior to entry of the stock into the reducing die so that some of the powder will be drawn into the die with the stock and forced to adhere to the drawn wire.

**Arc-welding electrodes.** QUASI-ARC CO., LTD., and A. P. STROHMENGER. Brit. 299,575, Sept. 15, 1927. The core of a metal arc-welding electrode is covered with a matted fibrous silicate such as blue asbestos, amosite, or a mixt. of these. Loading materials for use in forming a flux or for varying the properties of the weld, such as Fe silicate, ferro-Si, ferro-Mn, V or Ti, may be added to the asbestos during the formation of the electrodes. Various mech. details of manuf. are described.

**Welding electrodes or rods.** B. TURNER and FERRO-ARC WELDING CO., LTD. Brit. 299,604, Oct. 19, 1927. A case of iron or steel is wound with a Ni wire to deposit an alloy of Fe and Ni in the weld and Cr and a small quantity of a deoxidizing agent such as Al also may be used. A filling mixt. may be used comprising powdered Cr 200, Al 2.5, fluorspar 35, limestone 15, and Na silicate 6 parts, with a coating mixt. of fluorspar 70, limestone 30,  $\text{Na}_2\text{CO}_3$  5 and Na silicate 6 parts. Cf. C. A. 23, 2927.

**Folded metal strip (enclosing a core and flux) for use in either electric arc or gas welding.** J. M. WARD (to British Thomson-Houston Co., Ltd.). Brit. 299,476, Oct. 27, 1927. Structural features.

**Solder for aluminum and its alloys.** LAURENCE R. PRESTON. U. S. 1,711,807, May 7. See Brit. 265,733 (C. A. 22, 379).

## 10—ORGANIC CHEMISTRY

CHAS. A. ROUILLER AND CLARENCE J. WEST

**Action of chlorosulfonic acid on substituted amides of cyanoacetic acid.** K. G. NAIK AND M. B. AMIN. *J. Indian Chem. Soc.* 5, 579–83 (1928).—The interaction of a no. of substituted amides (I) of  $\text{NCCH}_2\text{CO}_2\text{H}$  with  $\text{ClSO}_3\text{H}$  (II) was studied. The following compds. were prepd. by treating I with an excess of II in dry  $\text{CHCl}_3$ : *disulfo-cyanoacetanilide*,  $(\text{HO}_3\text{S})_2\text{C}(\text{CN})\text{CONHPh}$ , leaflets; corresponding *p-toluide*, leaflets; *o-toluide*; *m-toluide*, colorless shining scales; *α-naphthylamide*; *β-naphthylamide*, yellow needles; *benzylamide*, colorless plates; *xylide* (1,4,5) colorless shining scales. These compds. are very sol. in  $\text{H}_2\text{O}$ , and almost insol. in alc.,  $\text{CHCl}_3$ ,  $\text{CS}_2$ ,  $\text{CCl}_4$ , acetone, benzene, toluene,  $\text{Et}_2\text{O}$  and petroleum ether. They char when heated to 255–80°. The reactivity of the methylene H with II, that is absent with  $\text{NCCH}_2\text{CONH}_2$ , increases as Ph,  $\text{MeC}_6\text{H}_4$ ,  $\text{C}_{10}\text{H}_7$  are substituted in the amide group, showing that the rapidity with which the reaction proceeds depends on the electronegative character of the group. F. C. H.

**Organic chemistry and vital force.** P. E. VERKADE. Handelshoogschool, Rotterdam *Chem. Weekblad* 26, 238–45 (1929).—A lecture. G. CALINGAERT

**Pyroabietic acids from French rosin.** E. PONROBERT AND E. GRETH. *Chem. Umschau Fette, Oele, Wachse u. Harze* 36, 93–7 (1929).—A French rosin 2A had the following consts.: acid no. 168,  $[\alpha]_D^{20} = +12.7$ . After heating for 168 hrs. to 250° the consts. had changed to: acid no. 122,  $[\alpha]_D^{20} = +41.4$ . This product was then distd. in a high vacuum, yielding 200 g. rosin oil at 145–200° and 500 g. pyroabietic acid at 200–225° (both temp. of vapor), leaving 300 g. non-volatile residue at 245° (temp. of liquid). The pyroabietic acid, crystd. several times from acetone, m. 189° and  $[\alpha]_D^{20} = 8.4$ ; further crystn. from alc. increased the m. p. to 194° and  $[\alpha]_D^{20} = 15.2$ , acid no. 184.3 and mol. wt. 297; analysis showed the formula  $\text{C}_{20}\text{H}_{30}\text{O}_2$ , *l*-pyroabietic acid. The mother liquor yielded a *d*-pyroabietic acid,  $\text{C}_{20}\text{H}_{30}\text{O}_2$ , m. 156–8°,  $[\alpha]_D^{20} = +37.5$ , acid no. 184.4, mol. wt. 298. M. p. tests by mixing the isolated acids with equal parts of *l*- and *d*-abietic acid, m. 178° and 158°, resp., gave little depression of the m. p., indicating a very mild structural difference. By using Biot's law (*Bull. Inst. Pin* 1928, 127) to calc. the compn. of the crude pyroabietic acid, the following results were obtained: 90% *d*- and 10% *l*-pyroabietic acid. P. ESCHER

**α- and β-Diphenylindenes.** I. A. GARCÍA BANÚS AND F. CALVET. *Anales soc. españ. fis. quim.* 27, 49–59 (1929).—Previous articles (C. A. 7, 1019; 16, 3479; 18, 2144; 23, 2178) discuss the exact detn. of the constitution of diphenylisochroman. Condensation of *o*- $\text{OHCC}_6\text{H}_4\text{CH}_2\text{CHO}$  with  $\text{PhMgI}$  should give diphenylisochroman hydrate,  $\text{PhCH}(\text{OH})\text{C}_6\text{H}_4\text{CH}_2\text{CH}(\text{OH})\text{Ph}$ , which is dehydrated by distn. *in vacuo* in the presence of traces of Mg salts to a mixt. of α- and β-diphenylisochroman. *o*- $\text{OHCC}_6\text{H}_4\text{CH}_2\text{CHO}$  was not found in the literature, and attempts to obtain it by ozonizing indene were unsatisfactory. Ozonization breaks the nucleus, giving a compd. *o*- $\text{OHCC}_6\text{H}_4\text{CHPhBz}$  which by further oxidation forms a deriv. of  $\text{CH}_2\text{Ph}_2$  but never *o*- $\text{BzC}_6\text{H}_4\text{COBz}$ . α-Diphenylindene was obtained by the Orzechoff method (C. A. 8, 1115) by dehydration of benzylhydrobenzoin by heating with  $\text{AcCl}$  and isomerizing the β-diphenylindene so obtained by alc.  $\text{Na}_2\text{CO}_3$ . A large excess of  $\text{AcCl}$  is used. If the excess is recovered and re-used there is formed, in place of β-diphenylindene, a compd. resembling benzylhydrobenzoin acetate. This difference can only be due to volatile impurities in the  $\text{AcCl}$ . Very well fractionated  $\text{AcCl}$  does not dehydrate benzylhydrobenzoin and gives only the monoacetate. Addn. of a small amt. of  $\text{SO}_2\text{Cl}_2$

to the  $\text{AcCl}$  gives the dehydrating action. Benzylhydrobenzoin, m.  $154-5^\circ$ , is prepd. in anhyd.  $\text{Et}_2\text{O}$  from benzoin,  $\text{PhCH}_2\text{Cl}$  and  $\text{Mg}$  filings, and is dehydrated with  $\text{AcCl}$  to form  $\beta$ -diphenylindene, m.  $173-5^\circ$ , which rearranges on treatment with alc.  $\text{K}_2\text{CO}_3$  to form  $\alpha$ -diphenylindene, m.  $110^\circ$ . The oxime was obtained by treating diphenylindene in alc. with  $\text{Na}$  in alc., adding recently distd. iso-AmONO. The oxime was reduced with  $\text{Zn}$  powder by heating in  $\text{AcOH}$ , the soln. was cooled, poured into  $\text{H}_2\text{O}$ , an excess of  $\text{NH}_4\text{OH}$  added and extd. with  $\text{Et}_2\text{O}$ , the  $\text{Et}_2\text{O}$  soln. filtered and pptd. by concd.  $\text{HCl}$ , giving aminodiphenylindene- $\text{HCl}$ , which is recrystd. from alc. contg. a few drops of concd.  $\text{HCl}$ , giving aminodiphenylindene. Finely ground  $\alpha$ -diphenylindene dissolved in hot  $\text{HOAc}$  and a 2.8%  $\text{O}_2$  in  $\text{O}_2$  passed through for 90 mins., allowed to stand 1 hr., deposits white needles of (*o*-benzoylphenyl)benzoylcarbinol, m.  $121-3^\circ$ . The mother liquor gives more crystals by partial evapn. *in vacuo*. The carbinol, dissolved in alc. and  $\text{PhNHNH}_2$  (twice theoretical) added with a few drops of  $\text{HOAc}$ , heated under reflux 0.5 hr., cooled, gives the monophenylhydrazone, m.  $143-5^\circ$  if recrystd. from  $\text{Et}_2\text{O}$ . The diketone, dissolved in alc. in a flask having a reflux condenser and a tube to pass in  $\text{H}$  to give a reducing atm. and avoid resinification,  $\text{NH}_2\text{OH}\cdot\text{HCl}$  added and a little  $\text{K}_2\text{CO}_3$  until alk. to phenolphthalein, heated 15 mins. on a water bath, cooled, poured into  $\text{H}_2\text{O}$ , acidified with  $\text{H}_2\text{SO}_4$ , extd. with  $\text{C}_6\text{H}_6$ , avoiding agitation and contact with air, the  $\text{C}_6\text{H}_6$  removed by a vacuum, gives *o*-(benzoylphenyl)-benzoylcarbinol dioxime, m.  $178-80^\circ$ . One g. of carbinol, dissolved in boiling acetone and oxidized by boiling with the calcd. quantity of  $\text{KMnO}_4$ , the pptd.  $\text{Mn}$  compd. filtered off and the liquid concd., gives yellow octahedrons, m.  $92^\circ$ , identical with *o*-Bz- $\text{C}_6\text{H}_4\text{COBz}$  obtained by García Banús by oxidation of  $\alpha$ -diphenylindene by  $\text{KMnO}_4$  in acetone.

E. M. SYMMES

The decomposition of methane. CYRIL W. H. JONES. Univ. London. *J. Chem. Soc.* 1929, 419-22.—The decompn. of  $\text{CH}_4$  was investigated at various temps and pressures and under the influence of the elec. spark. The gas was passed through a heated quartz tube of 1-mm. bore at temps.  $700-1080^\circ$ , pressures 10-70 cm. Hg, and various rates of flow.  $\text{CH}_4$  decompd. partly into  $\text{C}$ ,  $\text{H}$  and smaller quantities of olefins and acetylenes. When sparked,  $\text{CH}_4$  gave the same products, but the quantities of olefins and acetylenes were larger and small quantities of solid and liquid hydrocarbons were also formed.

M. W. SEYMOUR

The action of optically excited mercury atoms on hydrocarbon molecules. WALTER FRANKENBURGER AND ROBERT ZELL. *Z. physik. Chem.*, Abt. B, 2, 395-8 (1929).—The primary reaction between excited  $\text{Hg}$  atoms and pentane vapor mols. consists of a loosening of the  $\text{C-H}$  or  $\text{C-C}$  linkage independent of the air,  $\text{N}$  or  $\text{CO}$  solvent gases. The liberated  $\text{H}$  atoms and hydrocarbon radicals undergo secondary reactions (1) with each other in  $\text{N}$  and at times in  $\text{CO}$  to give  $\text{H}$  and higher and lower hydrocarbons and (2) with air to yield  $\text{H}_2\text{O}_2$ , and  $\text{O}$ -contg. compds. with  $\text{Ac}$  or  $\text{MeC}(\text{OH})$  groups.  $\text{H}$  atoms combine with  $\text{CO}$  to produce  $\text{HCHO}$  and  $(\text{CHO})_2$ . A combination of hydrocarbon radicals with  $\text{CO}$  is uncertain.

H. W. WALKER

The reaction of atomic hydrogen with hydrocarbons. HUGH S. TAYLOR AND DOUGLAS G. HILL. Princeton Univ. *Z. physik. Chem.*, Abt. B, 2, 449-50 (1929).—In the presence of a large excess of  $\text{H}_2$ ,  $\text{C}_2\text{H}_4$  is changed almost completely to  $\text{C}_2\text{H}_6$  by excited  $\text{Hg}$  atoms. However, with relatively higher concns. of  $\text{C}_2\text{H}_4$ , more complex satd. hydrocarbons are formed. With equal proportions of  $\text{C}_2\text{H}_4$  and  $\text{H}_2$ , the satd. hydrocarbon formed has a mean mol. wt. corresponding to  $\text{C}_4$ . Besides the hydrogenation, other reactions take place with the liberation of  $\text{H}_2$  and formation of liquid condensation products of the type  $(\text{CH}_2)_n$ .  $\text{CH}_4$  has also been identified in the product. With a large excess of  $\text{C}_2\text{H}_4$ ,  $\text{C}_2\text{H}_2$  is also formed.

H. F. JOHNSTONE

The estimation of unsaturation with potassium bromide-potassium bromate mixture. FRANK CORTESE. Mass. Inst. of Technology. *Rec. trav. chim.* 48, 564-7 (1929).—Two methods are presented for the detn. of unsatn. with  $\text{KBr-KBrO}_3$  mixt. (A). The theoretical quantity and 1 cc. more of the  $\text{KBr-KBrO}_3$  mixt., prepared according to Francis (*C. A.* 21, 645) are delivered into a 150-cc. glass stoppered Erlenmeyer flask, cooled in ice water. One cc. of the sample of known temp. and d. is added and then 5 cc. 10%  $\text{H}_2\text{SO}_4$ , the flask being shaken until the color is persistent during a few minutes. Ten cc. more of 10%  $\text{H}_2\text{SO}_4$  is added and the flask is shaken 1 more minute. Then 1 cc. of satd.  $\text{KI}$  soln. is added, the liberated  $\text{I}$  being titrated at once with  $\text{Na}_2\text{S}_2\text{O}_3$  (B). This procedure is used when only small quantities of material are available. One cc. of sample is dild. with 10 cc. of pure  $\text{CCl}_4$  and an aliquot portion of 1 cc. is taken for each analysis, with 0.1 *N*  $\text{KBr-KBrO}_3$  and 0.04 *N*  $\text{Na}_2\text{S}_2\text{O}_3$  and an excess of only 0.1-0.2 cc.  $\text{KBr-KBrO}_3$  mixt. The following results were obtained: 2-pentene (A) 0.99, (B) 0.99 (theory: 1.00); trimethylethylene (A) 1.00, (B) 1.02

(1.00); 1-decene (B) 0.83 (1.00); 1-cetene (B) 0.94 (1.00); 1,5-hexadiene (A) 1.94, (B) 1.98 (2.00); 2,4-hexadiene (A) and (B) both 1.94 (2.00); 2,4-pentadiene (A) 1.90 (2.00); dipentene (A) 1.84 (2.00); 2-chloro-5-hexene (B) 0.93 (1.00); allyl bromide (B) 0.97 (1.00); allyl alc. (B) 0.96 (1.00); indene (B) 0.83 (1.00); furan (B) 1.02 (2.00); phenylbutadiene polymer (B) 1.00 (2.00). From these results it follows that the methods are suitable for aliphatic olefins and diolefins, whether conjugated or not, but that it is unreliable for certain ring structures and for substances of unknown constitution. Finally, details on the prepn. of the compds. tested are given.

C. F. VAN DUIN

**The sodium acid salts of palmitic acid.** PER EKWALL AND WILHELM MYLIUS. *Physik. chem. Inst. Akad. Åbo, Finland. Ber.* 62B, 1080-4(1929); cf. C. A. 22, 3864.—Previous studies of the phys. properties of aq. solns. of Na palmitate and palmitic acid have indicated the existence of salts of the compns.:  $2\text{NaPl}:\text{1HPl}$ ;  $\text{1NaPl}:\text{1HPl}$ ; and  $\text{1NaPl}:\text{2HPl}$ . These have been isolated from alc. soln. and their existence was confirmed by analysis, mol. wt. measurements and their const. m. ps.  $2\text{NaPl}:\text{1HPl}$ , m. 115-7°.  $\text{1NaPl}:\text{1HPl}$ , m. 97-8°.  $\text{1NaPl}:\text{2HPl}$ , m. 81-2°.

A. J. K.

**Preparative notes on the preparation of several aliphatic unsaturated acids and esters.** ERNST PHILIPPI. Univ. Innsbruck. *Monatsh.* 51, 277-9(1929).—P. quotes the best methods reported in the literature for elaidic acid and its Et ester, Et  $\beta$ , $\beta$ -dimethylacrylate, allyl alc., allylacetoacetic Et ester, allylacetic Et ester, vinylacetic acid, sorbic acid and hydrosorbic acid.

C. J. WEST

**Action of ammonia and amines upon esters of unsaturated acids.** ERNST PHILIPPI AND EBERHARD GALTER. Univ. Innsbruck. *Monatsh.* 51, 253-66(1929).—A review of previous work, with references, is given. Et oleate and elaidate do not react with liquid  $\text{NH}_3$ ; Et crotonate gives 55% of  $\text{MeCH}(\text{NH}_2)\text{CH}_2\text{CO}_2\text{Et}$ , m. 64-5°; with  $\text{MeNH}_2$  there results a small quantity of  $\text{MeCH}(\text{NHMe})\text{CH}_2\text{CO}_2\text{Et}$ ,  $b_{15}$  75-7°, but the main product,  $\beta$ -methylaminobutyric methylamide,  $b_{15}$  146°; with piperidine, heated 2.5 hrs. at 120°, the only product is Et  $\beta$ -piperidinobutyrate,  $b_{15}$  125° (60% yield). Et  $\alpha$ -ethylacrylate does not react with liquid  $\text{NH}_3$  or with  $\text{MeNH}_2$ . Et  $\beta$ -dimethylacrylate and  $\text{NH}_3$  give about 60% of the addn. product but no amide;  $\text{MeNH}_2$  gives some Et  $\beta$ -methylaminosuccinate,  $b_{14}$  74.5-5.5°, but the main product was the methylamide,  $b_{15}$  138-40°; piperidine does not react. Et allylacetate scarcely reacts with  $\text{NH}_3$ . Et acrylate and piperidine give 87% of Et  $\beta$ -piperidinopropionate,  $b_{12-13}$  104-6°. Me hydrosorbate and liquid  $\text{NH}_3$  give only the amide; Me sorbate and Et phenylisocrotonate behave similarly.

C. J. WEST

**Stability of amyl trichloro acetate in various solvents.** L. M. ANDREASOV. *Ukrainskii Khim. Zhur.* 3, Sci. pt., 467-70(1928); cf. C. A. 23, 322.—A. studied the decompn. of  $\text{Cl}_3\text{CCO}_2\text{Am}$  (I) mixed with  $\text{Cl}_3\text{CCO}_2\text{H}$  in such solvents as  $\text{CHCl}_3$ ,  $\text{CCl}_4$ ,  $\text{C}_6\text{H}_6$ ,  $\text{Me}_2\text{CO}$ ,  $\text{PhNO}_2$ ,  $\text{Et}_2\text{O}$ ,  $\text{BzOEt}$  and  $\text{CS}_2$  at 25° and 50°, finding that it proceeds at the lowest rate in  $\text{C}_6\text{H}_6$  at 25° and in  $\text{PhNO}_2$  at 50° and at the highest rate in  $\text{CS}_2$  at 25° and 50°. The rate of formation of I from  $\text{Cl}_3\text{CCO}_2\text{H}$  and amylene is much faster than the rate of decompn. of I into its components in the same solvents.

CHAS. BLANC

**Velocity of esterification of alcohols in formic acid.** ANTON KAILAN AND GERTRUD BRUNNER. Univ. Wien. *Monatsh.* 51, 334-68(1929).—The velocity of esterification of  $\text{Me}_3\text{COH}$ ,  $\text{Me}_2\text{CHOH}$ ,  $\text{HOCH}_2\text{CH}_2\text{O}_2\text{CH}$  and  $\text{HOCH}(\text{CH}_2\text{O}_2\text{CH})_2$  in  $\text{HCO}_2\text{H}$  contg. 0.1 and 1.2 mols.  $\text{H}_2\text{O}$  at the beginning of the expt. (and with  $\text{HCl}$  as catalyzer in the case of  $\text{Me}_3\text{COH}$ ) was detd. at 25° (also 15° for  $\text{Me}_3\text{COH}$ ) by measuring the f. p. lowering and the coeffs.  $k_1$  +  $k_2$ , calcd. from the equation for monomol. reactions, obtained, through interpolation formulas, as functions of the  $\text{H}_2\text{O}$  content of the  $\text{HCO}_2\text{H}$ . Increasing the  $\text{H}_2\text{O}$  content from 0.3 to 1.37 mol. per l. decreases the value of  $k_1$  +  $k_2$  for  $\text{Me}_3\text{COH}$  by 46%, for the sec. alcs. ( $\text{Me}_2\text{CHOH}$  and  $\text{HOCH}(\text{CH}_2\text{O}_2\text{CH})_2$ ) 15 and 21% and for  $\text{HOCH}_2\text{CH}_2\text{O}_2\text{CH}$  by 30%. Under the exptl. conditions  $\text{Me}_3\text{COH}$  and 1,3- $\text{CHOH}(\text{CH}_2\text{O}_2\text{CH})_2$  were esterified 70-80%,  $\text{HOCH}_2\text{CH}_2\text{O}_2\text{CH}$  80-90% and  $\text{Me}_2\text{CHOH}$  92-100%. The coeffs. of  $\text{Me}_3\text{COH}$  and  $\text{HOCH}_2\text{CH}_2\text{O}_2\text{CH}$  are about equal but only about half that of  $\text{Me}_2\text{CHOH}$ ; the coeff. of the latter is about 10 times that of  $\text{HOCH}(\text{CH}_2\text{O}_2\text{CH})_2$ . With  $N/120$   $\text{HCl}$ , the coeff. for  $\text{HOCH}(\text{CH}_2\text{O}_2\text{CH})_2$  is increased 4 times, that for the other alcs. is doubled. Increasing the temp. from 15° to 25° increases the value for  $\text{Me}_3\text{COH}$  3.2 times, but only 2.4 times when  $\text{HCl}$  is used as catalyzer.

C. J. WEST

**Imide and amide chlorides of non-aromatic acids.** III. JULIUS V. BRAUN AND ALBRECHT HEYMANS. Univ. Frankfurt a. M. *Ber.* 62B, 409-13(1929); cf. C. A. 21, 2875.—It was shown in the earlier papers that the instability of imide chlorides,  $\text{RCCl}:\text{NR}'$ , derived from non-aromatic acids, is conditioned chiefly by a H atom

in R, adjacent to the  $-CCl<$  group, migrating to the N with formation of a compd.  $>CCINHR'$ . If there is no such H atom the imide chlorides are as stable as or even more so than those derived from aromatic acids; thus, while  $PhCCl:NMe$  decomps. at high temps. into  $PhCN$  and  $MeCl$  the imide chloride of fencholic acid is quite stable. The change in stability in passing from the derivs. of aromatic acids to those of non-aromatic acids with the  $CO_2H$  group bound to a tertiary C atom is only a gradual one, however; thus, campholic *N*-methylimide chloride, when refluxed some time and then distd. under atm. pressure, gives campholic nitrile, and the ethyl- and isomylimide chlorides behave in the same way (these chlorides were prepd. with  $PCl_5$  from campholic ethylamide,  $b_{20}$   $160^\circ$ , m.  $88^\circ$ , and isoamylamide,  $b_1$  about  $150^\circ$ , m.  $42-3^\circ$ ). The question naturally suggested itself whether the amide chlorides derived from dialkylated amides would show the same analogy in behavior between the aromatic and non-aromatic compds. Amides of acids of the 3 types  $R_3CCO_2H$ ,  $RCH_2CO_2H$  and  $R_2CHCO_2H$  were studied. (1) *Trichloroacetic diethylamide*,  $b_{12}$   $108-12^\circ$ . Campholic diethylamide,  $b_{12}$   $140-5^\circ$ , m.  $29-30^\circ$ . Neither of these 2 amides reacted with  $PCl_5$  even on long heating on the  $H_2O$  bath. (2) *Chloroacetic diethylamide*,  $b_{10}$   $112-3^\circ$ . Butyric diethylamide,  $b_{12}$   $92^\circ$ . The former with  $PCl_5$  in  $CHCl_3$  evolves a little  $HCl$  and forms an oil which undergoes deep-seated decompn. on attempted distn. With the 2nd amide the decompn. is not so pronounced; about 80% of the product  $b_{10}$   $60-85^\circ$  and the distillate seps. into 2 layers: heavy oil (I) of penetrating odor, and a lighter oil (II),  $b_{13}$   $100-7^\circ$ . I is free of O, regenerates the amide with  $H_2O$  and, from its Cl content (37.54%), consists chiefly of the amide chloride; on standing it darkens and on distn. ( $60-90^\circ$  under 10 mm.) it again loses  $HCl$  and forms more II. The compn. of II (Cl 22.7, N 8.46%) shows that the amide chlorides  $RCH_2CCl_2NR'_2$  of aliphatic acids do not split off  $R'Cl$  like those of the aromatic acids, but  $HCl$  to form compds. of the type  $RCH:CCINR'_2$ . (3) *Methylethylacetic diethylamide*,  $b_{11}$   $84-6^\circ$ , gives with  $PCl_5$  70% of a turbid distillate,  $b_{12}$   $71-102^\circ$ , sepg. into 2 layers: one, the almost pure amide chloride (III), is immediately hydrolyzed to the original amide by  $H_2O$ , while the other,  $EtMeC:CCINEt_2$ ,  $b_{13}$   $76-85^\circ$ , is relatively stable toward  $H_2O$ , only about 0.5 of the Cl being hydrolyzed off by shaking 5 mins. with ice  $H_2O$ . III reacts very energetically with  $PhNH_2$  in  $CHCl_3$ , giving almost quantitatively the amidine,  $EtMeC:CHC:(NPh)NEt_2$ , faintly yellow refractive liquid (chloroplatinate, light yellow, decomp.  $124-7^\circ$ ). While aromatic and aliphatic-aromatic imide chlorides (and bromides), in the form resulting from the shifting of the H, can add Cl and Br, e. g.,  $RCH_2CCl:NR' \rightarrow RCH:CCINHR' + Br_2 \rightarrow RCHBrCCIBrNHR' \rightarrow RCHBrCCl:NR' (+ RCHBrCBr:NR') + HBr (+HCl)$ , they do not add I and  $\alpha$ -I acids can therefore not be prepd. in this way. If the acid radical contains a double bond, formation of the imide chloride, exhaustive chlorination of the  $\alpha$ -C atom and addn. of Cl at the double bond can all be effected in 1 operation with  $PCl_5$ ; thus, *undecylenic ethylamide*, m.  $35^\circ$ , heated 2.5 hrs. on the  $H_2O$  bath with 5.2 mols.  $PCl_5$ , gave 60% of 1,1,9,10-tetrachloroundecylic ethylamide,  $b_{0-2}$  about  $180^\circ$ . C. A. R.

**Manufacture of ethylene chlorohydrin.** M. B. ZAPADINSKII. *J. Chem. Ind. (Moscow)* 5, 1426-9(1928).—Preference is given to the *method of prep.*  $CH_2ClCH_2OH$  by passing  $C_2H_4$  and Cl into  $H_2O$ . Five hundred cc.  $H_2O$  is placed in an externally ice-cooled jar of 1.5-l. capacity, and Cl and  $C_2H_4$  are simultaneously passed through tubes reaching to the bottom of the vessel and terminating with narrow outlets. The temp. is maintained at  $\pm 2^\circ$ , the speed of the stirrer at 800 r. p. m. The pressure in the app. is kept up by 150-200 mm.  $H_2O$ . The quantities of the gases and their speed are carefully noted. It is not possible to maintain a uniform speed, as the inert gases formed dil. the  $C_2H_4$  and cause a slackening of absorption. The vol. of the liquid gradually increases. Z.'s method (C. A. 22, 3864) is used for chlorohydrin detn. at various stages of the process. Expts. made with the addn. of  $(CH_2Cl)_2$  (to increase the soly. of the Cl) or with  $EtOH$  (to increase the soly. of the  $C_2H_4$ ) resulted in considerable decreases of yield, as  $(CH_2Cl)_2$  acts by preventing the hydrolysis of Cl, whereas  $EtOH$  uses up much Cl for oxidation. Brooks' suggestion to operate in presence of gasoline is of doubtful use. To sep. chlorohydrin from the dil. solns. obtained, 3 operations are required, the 1st being the distn. The 1st 10-12% of the distillate contains 80-85% of the chlorohydrin, the next 10-15% contains the rest, only 2-3% remaining behind. The addn. of salts has but an insignificant effect on the distn., unless the operation is carried out *in vacuo*; the addn. of  $C_2H_4$  is needed to decrease the partial pressures. The 2nd distd. fraction is added to the crude product, whereas the 1st is subjected to the 2nd operation, viz., extn. It is advisable to ext. at first twice with  $(CH_2Cl)_2$  obtained as a by-product in this process and contg. chlorohydrin, then twice with pure  $(CH_2Cl)_2$ , taking each time a vol. of the solvent equal to 20% of the soln.

The 3rd operation consists in sepg. the chlorohydrin from  $(\text{CH}_2\text{Cl})_2$  by distn. through a dephlegmator, either at ordinary pressure or *in vacuo*. BERNARD NELSON

**Amino acetals and amino aldehydes with three carbon chains.** R. VOET. *Bull. soc. chim.* 45, 61-9(1929).—The difference in physiol. activity between natural and synthetic muscarines raised a question as to their chem. identity, accordingly the pharmacodynamic activity of secondary and tertiary 3-C amino aldehydes was studied. Synthesis was accomplished by substitution of  $\text{RHN}$  or  $\text{R}_2\text{N}$  for  $\text{Cl}$  in  $\gamma$ -chloropropionyl acetals followed by hydrolysis with cold concd.  $\text{HCl}$ . Contrary to expectation, the various compds. examd. were non-toxic and practically without physiol. action. The reactions were carried out by heating 2 mols. of amine with 1 mol. of chloro acetal to  $100^\circ$  for from a few hrs. to 3-4 days in sealed tubes. The oily amino acetals were washed out of the cryst. amine  $\text{HCl}$  salts with  $\text{Et}_2\text{O}$  and purified by distn. *in vacuo*. Methylaminopropionaldehyde dimethyl acetal (66% yield),  $b_{760}$   $164.5^\circ$ ,  $\text{HCl}$  salt, hygroscopic plates; tetramethyl acetal (by-product), yellowish oil,  $b_{20}$  about  $130^\circ$ ,  $d_{20}$   $0.9759$ ; ethylaminopropionaldehyde dimethyl acetal (70% yield),  $b_{760}$   $177.3^\circ$  (cor.),  $\text{HCl}$  salt, hygroscopic plates; tetramethyl acetal (by-product), faintly colored oil,  $b_{20}$  about  $133^\circ$ ,  $d_{20}$   $0.9608$ ; propylaminopropionaldehyde dimethyl acetal (60% yield),  $b_{760}$   $195.5^\circ$ ,  $d_{20}$   $0.9002$ ,  $\text{HCl}$  salt, white crystals; tetramethyl acetal (by-product), slightly colored oil,  $b_{20}$  about  $140^\circ$ ,  $d_{20}$   $0.9483$ ; diethylaminopropionaldehyde dimethyl acetal (95% yield after 100 hrs. heating), strongly basic,  $b_{760}$   $194.2^\circ$ ,  $d_{20}$   $0.8846$ ,  $\text{HCl}$  salt, fine, white, silky, hygroscopic needles; dipropylaminopropionaldehyde dimethyl acetal (82% yield after 85 hrs.), slightly oily, colorless liquid, almost insol. in  $\text{H}_2\text{O}$ ,  $b_{760}$   $223.4^\circ$ ,  $d_{20}$   $0.8715$ ,  $\text{HCl}$  salt, hygroscopic, sirupy oil crystg. with difficulty. All the amino aldehydes reported form  $\text{HCl}$  salts which refuse to crystallize, are hygroscopic, and dissolve in  $\text{H}_2\text{O}$ , abs.  $\text{EtOH}$  and glacial  $\text{AcOH}$  but not in ether. All are accompanied in the reaction by similar polymers which do not show the above solubilities and which must lack free  $-\text{CHO}$  groups since they do not reduce Fehling solu although the aldehydes themselves do. The ethylaminopropionaldehyde which has been elsewhere studied appears to form a trimol. polymer. The amino aldehydes and their polymers form identical semicarbazones, which proves their relationship. Semicarbazones: methylaminopropionaldehyde, m.  $300^\circ$ ; ethylaminopropionaldehyde, m.  $301.5^\circ$ ; propylaminopropionaldehyde, m.  $303^\circ$ ; diethylaminopropionaldehyde, m.  $309.5^\circ$ . Polymerized diethylaminopropionaldehyde chloraurate, decomps. about  $100^\circ$ . C. H. PEET

**Formylmethionine and formylbromomethionine acids.** H. J. BACKER. Univ. Groningen. *Rec. trav. chim.* 48, 571-6(1929).—Three methods exist for the prepn. of formylmethionine acid (a) addn. of  $\text{H}_2\text{S}_2\text{O}_7$  to  $\text{C}_2\text{H}_2$  (*Ann.* 303, 119(1898)); (b) sulfonation of  $\text{AcH}$  with  $\text{H}_2\text{S}_2\text{O}_7$  (*Bull. soc. chim.* [3], 27, 7(1902)); (c) the interaction of chloral and  $\text{K}_2\text{SO}_3$  (*Ann.* 161, 154(1872)). According to B.'s experience the latter method gives the best results: 45 g.  $\text{K}_2\text{S}_2\text{O}_8$  and 28 g.  $\text{K}_2\text{CO}_3$  are dissolved in 75-cc. water and the soln. is boiled to remove the  $\text{CO}_2$  formed; then it is cooled down to  $80^\circ$  and 15 g. chloral (16.5 g. of the hydrate) is added with continuous shaking, the temp. being kept at  $85^\circ$ . On cooling the  $\text{K}$  salt of the bisulfite compd. of formylmethionine acid,  $\text{KHSO}_3\text{OCH}(\text{CH}(\text{SO}_3\text{K})_2)\text{H}_2\text{O}$  (I), is obtained, which can be purified by recrystn. from water; yield 15 g. With hot dil. alkali I decomps. with the formation of methionine and formic acids, whereas the action of hot dil.  $\text{HCl}$  yields the  $\text{K}$  formylmethionate,  $\text{C}_4\text{H}_7\text{O}_7\text{S}_2\text{K}_2\text{H}_2\text{O}$ , in theoretical yield; 100 g. water dissolves at  $25^\circ$  1.02 g. The following salts were prepd. in the usual way: Ba,  $\text{C}_4\text{H}_7\text{O}_7\text{S}_2\text{Ba} \cdot 4\text{H}_2\text{O}$ ; Ag,  $\text{C}_4\text{H}_7\text{O}_7\text{S}_2\text{Ag} \cdot \text{H}_2\text{O}$ ; Tl,  $\text{C}_4\text{H}_7\text{O}_7\text{S}_2\text{Tl}_2 \cdot \text{H}_2\text{O}$ ; 100 g. of water dissolves at  $25^\circ$  0.3245 g. of the anhyd. Ba salt. On adding gradually to a boiling soln. of 30 g. of the  $\text{K}$  salt and 1 g.  $\text{KBr}$  the theoretical amount of  $\text{Br}$ , or on heating I with 4 atoms of  $\text{Br}$  in a sealed tube at  $100^\circ$  for 2 hrs.,  $\text{K}$  formylbromomethionate,  $\text{C}_4\text{H}_7\text{O}_7\text{BrS}_2\text{K}_2\text{H}_2\text{O}$ , is obtained on cooling with 80% yield; Ba salt,  $\text{C}_4\text{H}_7\text{O}_7\text{BrS}_2\text{Ba} \cdot 2\text{H}_2\text{O}$ . With hot dilute alkali formylbromomethionine acid is decompd. into bromomethionine and formic acids while with  $\text{KHSO}_3$  reduction takes place at room temp. with formation of I. C. F. VAN DUIN

**Carnitine.** WILHELM LINNEWIEH. Univ. Würzburg. *Z. physiol. Chem.* 182, 8-12(1929).—The "apocarnitine" which Engeland (*C. A.* 16, 1079) obtained by dehydration of carnitine with concd.  $\text{H}_2\text{SO}_4$  and thought to be  $\alpha$ -methylene- $\beta$ -butyrobetaine was undoubtedly the crotonobetaine prepd. synthetically by L. (*C. A.* 22, 3135) The identity is now established by prepn. of the so-called apocarnitine and comparison of its properties with those of crotonobetaine. Both decolorize  $\text{KMnO}_4$  and on hydrogenation yield  $\gamma$ -butyrobetaine. Krimberg (*C. A.* 2, 1292) probably had crotonobetaine and mistook it for  $\gamma$ -butyrobetaine when he heated carnitine with  $\text{HI}$  and  $\text{P}$ . This treatment removes  $\text{H}_2\text{O}$  from carnitine but does not hydrogenate the

resulting crotonobetaine. The  $\text{AuCl}_3$  salts of synthetic and natural crotonobetaine are apparently different in cryst. form, although mixts. give no depression in m. p. The difference may be due to some minute impurity or to isomerism. A. W. DOX

Further studies on the problem of the specificity of enzymic cleavage of polypeptides. Experiments with polypeptides containing *dl*-norleucine. EMIL ABDEKHALDEN AND HUGO MAYER. Univ. Halle. *Fermentforschung* 10, 464-73(1929).—New derivs. described include 3 dipeptides and their  $\text{PhNCO}$  derivs. and 3 tripeptides, all contg. *dl*-norleucine. *dl*-Norleucine in *N* NaOH was condensed with *dl*- $\text{BuCHBrCOCl}$  yielding 59.5% of *dl*- $\alpha$ -bromocaproyl-*dl*-norleucine, m. 104°. Amination by 25%  $\text{NH}_4\text{OH}$  converted this into 75.7% *dl*-norleucyl-*dl*-norleucine, m. 259° (*PhNCO* deriv. m. 198°). In the same manner *dl*-norleucine reacted with *dl*- $\text{Me}_2\text{CHCH}_2\text{CHBrCOCl}$  to form 65.5% *dl*- $\alpha$ -bromoisocaproyl-*dl*-norleucine, m. 136°, which on amination yielded 63% *dl*-leucyl-*dl*-norleucine, m. 256° (*PhNCO* deriv. m. 186°). *dl*-Leucine and *dl*- $\text{BuCHBrCOCl}$  yielded 74% *dl*- $\alpha$ -bromocaproyl-*dl*-leucine, m. 158°, from which the dipeptide *dl*-norleucyl-*dl*-leucine, m. 253°, was obtained in 84.5% yield by amination (*PhNCO* deriv. m. 202°). Glycylnorleucine and *dl*- $\text{BuCHBrCOCl}$  yielded 78.65% *dl*- $\alpha$ -bromocaproylglycyl-*dl*-norleucine, m. 118°, from which the tripeptide *dl*-norleucylglycyl-*dl*-norleucine, m. 250°, was obtained in 88% yield. Glycyl-*dl*-leucine and *dl*- $\text{BuCHBrCOCl}$  gave *dl*- $\alpha$ -bromocaproylglycyl-*dl*-leucine, m. 127°, which was converted into 63% *dl*-norleucylglycyl-*dl*-leucine, m. 245°. Norleucylnorleucine and leucylnorleucine were omitted from the hydrolysis tests because of their insol., and the previously described glycyl-*dl*-norleucine and *dl*-leucylglycyl-*dl*-norleucine included. All of these derivs., whether peptides or haloacyl derivs., but not the 3  $\text{PhNCO}$  derivs., were hydrolyzed by *N* NaOH at 37°. Erepsin hydrolyzed the peptides, but the acyl derivs. only in traces. Trypsin hydrolyzed all of these substances, with the exception of the 2 dipeptides tested, viz., the acylamino acids and acyldipeptides, the tripeptides and the  $\text{PhNCO}$  derivs. A. W. DOX

Some crystallized anhydrides of monosubstituted malonic acids. C. MANNICH AND A. BUTZ. Pharmazeut. Inst., Berlin. *Ber.* 62B, 456-60(1929).—The few anhydrides of malonic acids hitherto described are amorphous, apparently polymeric substances. When, however,  $\text{BzCH}_2\text{CHPhCH}(\text{CO}_2\text{H})_2$  is heated at 70° in  $\text{C}_6\text{H}_6$  with  $\text{SOCl}_2$  it yields a beautifully crystd. substance having the properties of an anhydride  $\text{BzCH}_2\text{CHPhCH}(\text{CO} \cdot \text{O} \cdot \text{CO})$  (I); hydrolysis regenerates the original acid, abs. alc.

gives the acid ester,  $\text{NH}_3$  the amidic acid. I is insol. in cold  $\text{Na}_2\text{CO}_3$  and on boiling it dissolves only slowly. Similar cryst. anhydrides were obtained from  $\text{BzCH}_2\text{CH}(\text{C}_6\text{H}_5\text{O}_2\text{CH}_2)\text{CH}(\text{CO}_2\text{H})_2$  and  $\text{AcCH}_2\text{CHPhCH}(\text{CO}_2\text{H})_2$ . According to the investigations of Staudinger, the anhydrides of substituted malonic acids decomp. on heating into  $\text{CO}_2$  and ketenes. The above anhydrides also lose  $\text{CO}_2$  on heating *in vacuo* but the products are not ketenes. That obtained from I is the unsatd. lactone  $\text{PhC} \cdot \text{CH} \cdot \text{CHPh} \cdot \text{CH}_2 \cdot \text{CO} \cdot \text{O}$  (II); I probably enolizes, then undergoes intramol.

acylation and the resulting acid ester yields II by loss of  $\text{CO}_2$ . II had already been prepd. by Vorländer and Knötzsch by boiling  $\text{BzCH}_2\text{CHPhCH}_2\text{CO}_2\text{H}$  (III) with  $\text{Ac}_2\text{O}$ , otherwise it would have been difficult to decide between the ketene,  $\text{BzCH}_2\text{CHPhCH} \cdot \text{CO}$ , and lactone structure for it, since the facts that it gives III with boiling dil.  $\text{Me}_2\text{CO}$ , its Me ester with MeOH and its amide with  $\text{NH}_3$  are reconcilable with both structures. It was thought that hydrogenation would give an aldehyde if the substance were a ketene and the satd. lactone if it is II, but there were obtained acid products, as described in the following abstr. [ $\alpha$ -Phenyl- $\beta$ -benzoyl-ethyl]malonic anhydride (I), m. 153-4°. Mono-Et ester, m. 122°, identical with the product obtained by half-sapon. of the di-Et ester. Amidic acid, m. 151° (vigorous decompn.).  $\delta$ -Hydroxy- $\beta$ , $\delta$ -di-phenyl- $\gamma$ -pentenic lactone (II), from I *in vacuo* at 175-205°, m. 88-9°,  $b_d$  245-50° (yield, 80-85%). Di-Et [ $\alpha$ -methylenedioxyphenyl- $\beta$ -benzoyl-ethyl]malonate (85% from  $\text{CH}_2\text{O}_2\text{C}_6\text{H}_5\text{CH} \cdot \text{CHBz}$ ,  $\text{CH}_2(\text{CO}_2\text{Et})_2$  and  $\text{NaOEt}$  allowed to stand 2 days in  $\text{MeOH} \cdot \text{C}_6\text{H}_6$ ), m. 94°. Free acid (IV), m. 159° (decompn.), easily becomes yellow in the air. Anhydride (yield, 10-5%), m. 192° (decompn.). Amidic acid, m. 145°.  $\delta$ -Hydroxy- $\beta$ -methylenedioxyphenyl- $\delta$ -phenyl- $\gamma$ -pentenic lactone, m. 94°, also obtained in 80% yield by boiling with  $\text{Ac}_2\text{O}$   $\beta$ -methylenedioxyphenyl- $\gamma$ -benzoylbutyric acid (V), m. 154-5°, which is prepd. by heating IV 1 hr. at 170°. Amide of V, from the lactone and alc.  $\text{NH}_3$ , m. 156°. [ $\alpha$ -Phenyl- $\beta$ -acetyl-ethyl]malonic anhydride (yield, 35-40%), m. 129°. Mono-Et ester, m. 106°, volatilizes partially undecompd. at 200° under 12 mm. but under 175 mm. it gives V. and K.'s  $\delta$ -hydroxy- $\beta$ -phenyl- $\gamma$ -hexenic lactone,  $b_d$  167°. C. A. R.



**Hydrogenation of some  $\delta$ -lactones.** A. MANNICH AND A. BUTZ. *Pharmazent. Inst., Berlin. Ber.* 62B, 461-3(1929).—The unsatd. lactones described in the preceding abstr. are readily hydrogenated in  $\text{Me}_2\text{CO}$  with  $\text{H}_2$  and Pd-charcoal. The reduction does not stop with the absorption of 1 mol.  $\text{H}_2$  but continues without any appreciable change in velocity until 2 mols. have been absorbed, yielding monobasic acids ( $\beta$ , $\delta$ -diphenylvaleric (I),  $\beta$ -methylenedioxyphenyl- $\delta$ -phenylvaleric (II)), also obtained in moderate yield from the  $\delta$ -ketonic acids by the Clemmensen method. If the hydrogenation is interrupted when only 1 mol.  $\text{H}_2$  has been absorbed, the products are not homogeneous. Besides the unchanged lactones and I or II, they contain chiefly dihydro intermediate products. These do not dissolve in  $\text{Na}_2\text{CO}_3$  but do so in hot  $\text{NaOH}$ , so that they may be considered as the satd. lactones; acids reppt. them from the alk. soln. and they are readily reduced further to I or II in  $\text{Me}_2\text{CO}$  with  $\text{H}_2$  and Pd-charcoal. The above reaction is not general; the lactone  $\text{MeC}:\text{CH}.\text{CHPh}.\text{CH}_2.\text{CO}.\text{O}$  cannot be hydro na-

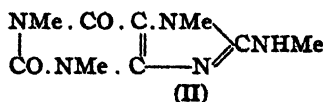
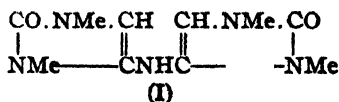
ted with Pd and  $\text{H}_2$ ; the presence of a Ph group in the  $\delta$ -position seems to be a decisive factor. I (yield, 90%), m.  $109-10^\circ$ , easily sol. in  $\text{Na}_2\text{CO}_3$  and repptd. by acids.  $\beta$ , $\delta$ -Diphenyl- $\delta$ -hydroxyvaleric lactone, obtained in 3 g. yield, together with 1 g. I, from 5 g. of the unsatd. lactone hydrogenated until only 500 cc.  $\text{H}_2$  have been absorbed, m.  $117^\circ$ . II, m.  $138-9^\circ$ .  $\delta$ -Hydroxy- $\delta$ -phenyl- $\beta$ -methylenedioxyphenylvaleric lactone (1 g., together with 0.7 g. II, from 2.4 g. of the unsatd. lactone), m.  $132-3^\circ$ .

C. A. R.

**Formation of methyl sodiochloromalonate and its reaction with iodine, with remarks on the stability of haloethanes.** ALFRED ECCLES. *Univ. Leeds. Proc. Leeds Phil. Lit. Soc., Sci. Sect.* 1, 356-9(1929).—Me sodiochloromalonate, prepd. by the interaction of  $\text{CHCl}(\text{CO}_2\text{Me})_2$  and  $\text{NaOMe}$  in  $\text{MeOH}$ , is a stable cryst. compd. contg. both Cl and Na. Treatment of this compd. with I did not yield  $[\text{CCl}(\text{CO}_2\text{Me})_2]_2$ . In this reaction,  $\text{Cl}_2$  splits out and the final product formed is  $[\text{C}(\text{CO}_2\text{Me})_2]_2$  (cf. *In-* gold, C. A. 22, 4501).

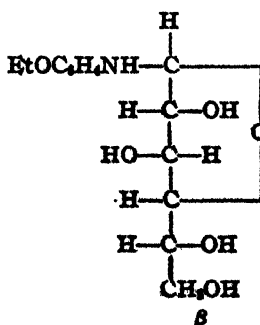
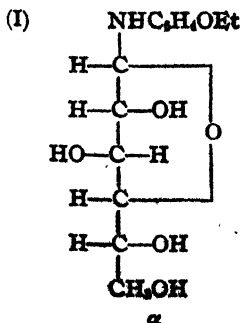
WALLACE R. BRODE

**Derivatives of caffeine.** VII. E. YOSHITOMI. *J. Pharm. Soc. Japan*, 49, 252-4 (1929).—In a previous publication (C. A. 20, 2826) in an attempt to prep. hydroxycaffeine by treating halocaffeine with *N* alkali under pressure, Y. obtained a new compd.  $\text{C}_{10}\text{H}_{13}\text{N}_5\text{O}_2$  (I). By repeating the expt. with halocaffeine and *N* KOH (1 mol.) in an autoclave at  $100-40^\circ$ , Y. obtained hydroxycaffeine and a new compd.  $\text{C}_8\text{H}_{11}\text{N}_5\text{O}_2$  (II), m.  $321^\circ$ . II contains an amino group, gives the murexide reaction, and also parabanic acid on oxidation. Y. claims this new compd. is methylamino-caffeine.

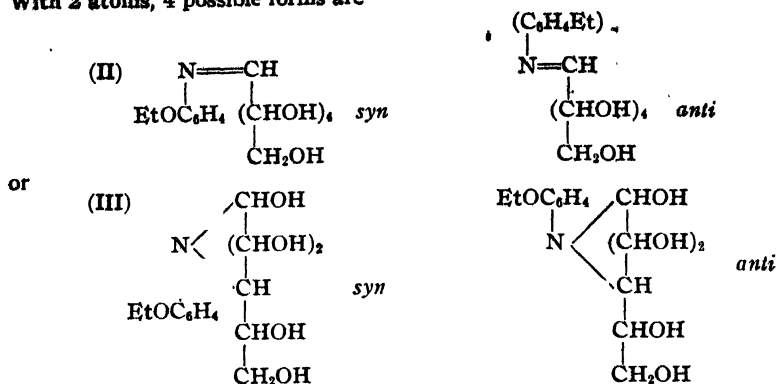


F. I. NAKAMURA

**The product of the condensation of glucose and *p*-phenetidine.** II. M. AMADORI. *Atti accad. Lincei* [6], 9, 68-73(1929).—In a previous paper (C. A. 20, 902) this reaction was studied, and it was shown that according to the method of prepn. employed, 2 products (A and B) were formed. A, m.  $118^\circ$ , was less stable and on prolonged heating was transformed into the more stable B, m.  $115^\circ$ . The constitution of these 2 was next to be detd. Neither has an  $\text{NH}_2$  group, so either 1 or 2 of the H atoms has reacted. In the first case the possible forms are



With 2 atoms, 4 possible forms are



Considering the *A* form, alkali gives variable values for the rotatory power, which, moreover, is different in  $\text{H}_2\text{O}$  or  $\text{EtOH}$ . In acid the final value is always  $30^\circ$ . Even if the soln. is acidified, then made alk., the value remains  $30^\circ$ , therefore, acid causes a permanent decompn. The analysis of *A* shows that in 2 g. there is present 1.2 g. glucose whose rotation is  $50^\circ$ . Therefore, the acid has decompd. *A* into  $\text{EtOC}_6\text{H}_4\text{NH}_2$  and glucose. This is also proved because if *A* is treated with  $\text{HNO}_2$  there is no reaction, but if  $\text{HCl}$  is first added, then the soln. is diazotized. *B*, however, is stable in acid, but decomp. to glucose and phenetidine in alkali. *A* is formed at lower temps., is less stable, is *l*-rotatory with mutarotation, and acids rapidly decomp. it to its constituents. This indicates the structure *A* and may exist in the  $\alpha$ - and  $\beta$ -modifications *B*, which is formed at higher temps., is stable toward acids, is *l*-rotatory with mutarotation and is easily decompd. by alkali. This indicates a constitution like a Schiff base, with stable bonds between the  $\text{NH}_2$  group and the glucose, according to the structures II and III. Here also there is a *cis-trans* equil. A. W. CONTIERI

The ceric acid reaction with particular reference to suberin. R. C. THOMAS. Ohio Agr. Expt. Sta. *Ohio J. Sci.* 28, 246-52 (1928).—Ceric acid obtained by macerating granulated cork in a mixt. of equal parts of concd. aq.  $\text{KClO}_3$  and  $\text{HNO}_3$  (d. 1.42) yields phellonic acid upon sapon. and repeated recrystn. EMIL KLARMANN

Higher hydrocarbons from methane. H. M. STANLEY AND A. W. NASII. Univ. Birmingham. *Nature* 122, 725 (1928).—Fischer's work (*C. A.* 23, 2694) on thermal decompn. of  $\text{CH}_4$  with formation of higher hydrocarbons is confirmed. R. J. H.

Higher hydrocarbons from methane. R. V. WHEELER. Univ. Sheffield. *Nature* 122, 773 (1928).—Production of com. yields of  $\text{C}_6\text{H}_6$  by pyrolysis of  $\text{CH}_4$  was proved at Sheffield two years ago.  $\text{C}_6\text{H}_6$  is probably produced from ethylene and butadiene, the formation of  $\text{C}_2\text{H}_4$  from  $\text{CH}_4$  taking place as follows:  $\text{CH}_3\text{H} \rightarrow \text{:CH}_2 + \text{H H}$  whereupon two  $\text{:CH}_2$  residues combine to form  $\text{C}_2\text{H}_4$ . R. J. HAVIGHURST

Higher hydrocarbons from methane. F. HURN CONSTABLE. *Nature* 122, 882 (1928); cf. *C. A.* 22, 4335; and preceding abstrs.—A graphite surface heated by an elec. current to temps. varying from  $800^\circ$  to  $1200^\circ$  and supported on China clay rods always led to a deposition of gas C on the exterior of the graphite film when acted upon by  $\text{CH}_4$ ,  $\text{C}_2\text{H}_6$ ,  $\text{C}_2\text{H}_2$ ,  $\text{C}_3\text{H}_8$  and  $\text{H}$ . During the expts. with  $\text{CH}_4$  and  $\text{C}_2\text{H}_6$  these gases were suddenly removed and replaced by pressures of 5, 10, 20 and 50 cm of pure  $\text{H}$ . No change in pressure was noted, indicating that under these conditions the C deposited is incapable of combining with  $\text{H}$  at any appreciable speed.

The pyrolysis of methane. R. V. WHEELER AND W. L. WOOD. *Fuel in Science & Practice* 7, 535-9 (1928).—With an app. described by Williams (*C. A.* 20, 280), a study of the thermal decompn. of  $\text{CH}_4$  was made. The results obtained agree, in general, with those of Fischer (*C. A.* 23, 2694).  $\text{C}_6\text{H}_6$  is formed between  $875^\circ$  and  $1100^\circ$ , the optimum temp. (for the app. used) being about  $1050^\circ$  with a yield of 0.2 gal. per 1000 cu. ft. Quartz, porcelain and Cu reaction tubes were all without catalytic effect on the decompn. With an Fe tube only C and H are formed. Dila. of the  $\text{CH}_4$  with N has little effect on the yield of aromatic hydrocarbons obtained at  $1000^\circ$  but dila. with H rapidly decreases the yields. The app. is described and illustrated. D. A. REYNOLDS

**Highly polymerized\* compounds. XVI. Polymerization of  $\alpha$ -methylstyrene.** H. STAUDINGER AND F. BREUSCH. Univ. Freiburg i. Br. *Ber.* 62B, 442-56 (1929); cf. *C. A.* 23, 2950.—Polymerization of styrene in the cold gives a eucolloidal polystyrene with a mol. wt. around 100,000; at 240° and with catalysts ( $\text{SnCl}_4$ ) are formed hemicolloids with an av. mol. wt. of 1000-10,000, consisting of mixts. of polymeric homologous products from which no homogeneous substances can be isolated because the properties of neighboring members of the series are too similar to each other. The polystyrenes are built up by addn. to an activated mol. of other styrene mols. to form long chains; the end valences of which finally sat. themselves by ring formation. The polystyrenes are therefore polymembered rings. With  $\alpha$ -methylstyrene,  $\text{PhMeC:CH}_2$  (I), have been made a no. of observations which confirm these views. I does not polymerize either on long standing or on illumination so that no eucolloidal poly-I can be obtained. On heating and with catalysts polymerization is much more difficult than with styrene. Tiffeneau with concd.  $\text{H}_2\text{SO}_4$  obtained a dimer (II), m. 52°, which is a diphenyldimethylcyclobutane, and Klages with  $\text{H}_3\text{PO}_4$  obtained an unsatd. product, probably  $\text{PhCMe:CHCH}_2\text{CHMePh}$  or  $\text{PhCHMeCH:CHCHMePh}$ . Such unsatd. polymers have been obtained by S. and B. at high temps. and with Florida earth,  $\text{TiCl}_4$  and  $\text{BCl}_3$ . With  $\text{SnCl}_4$  without diln. very vigorous polymerization takes place with formation of satd. polymers, including, besides II, higher products, although in small yield; with solvents practically only II is formed. The polymerization tendency of I is so much smaller than that of styrene that the highest polymer contains only 8 members in its ring and the individual polymers differ enough in their properties to have made it possible to isolate all 8 of the series mono- to octamer in pure or approx. pure form. Below are given their constns. in the order monomer, dimer, etc.:  $b_{0,1}$  45, 118-20, 172-8, 208-12, 240-4, 275-85, 312-22, 345-60°; soly. in MeOH (cc. required to dissolve 1 g.), miscible, 20.4, 21.7, 74.8, 203, 625, 2400, 25,000; viscosity (outflow time of a soln. of 118 g. in 1 l.  $\text{C}_6\text{H}_6$ ;  $t_0 = 40$  sec.), 41, 42.5, 44, 46.2, 49, 52, 56.7, 63.1; d. of amorphous prepn., 0.9044, 1.0038, 1.0455, 1.0594, 1.0624, 1.0657, 1.0671, 1.0684;  $n_D^{20}$ , 1.5330, 1.5633, 1.5842, 1.5934, 1.5960; 1.6050, 1.6010, 1.6120; softening range, —, —32° to —24°, —3° to 9°, 38-48°, 60-8°, 98-108°, 125-33°, 165-72°. The dimer and tetramer have also been obtained in cryst. form; their m. p. and d. are considerably higher than for the amorphous products, viz.: dimer, 52°, 11183; tetramer, 127-9°, 1.1452. It is a striking fact that the dimer should be homogeneous, for there are theoretically possible the 2 structural isomers  $\text{PhMeC:CH}_2\text{:CMePh:CH}_2$  and  $\text{PhMeC:CH}_2\text{:CH}_2\text{:CMePh}$  and a stereoisomer of each

of these; the addn. of the mols. of I to each other therefore proceeds in only 1 direction. Whether the higher polymers are homogeneous or mixts. of stereoisomers cannot be decided as long as they have not been obtained in cryst. form. As shown by the above data, the phys. properties of the polymers of I change with the degree of polymerization. Some of the constns. of mixts. are the mean of those of the components (d., viscosity of solns.), others are lower (liquefaction temp.); in general, the degree or av. degree of polymerization of any prepn. can be deduced from the constns. for the pure substances and mixts. of them. These results confirm the view that the more highly polymerized styrenes, up to the eupolystyrene with an av. polymerization degree of 1000, are not merely assocn. products. It is probable that the eucolloidal polystyrene, like rubber, is made up of extraordinarily large rings, a fact of great significance for their phys. properties, for substances built up of thread mols. (*Fadenmoleküle*), like guttapercha and cellulose, have different properties; by a parallel arrangement of their mols. they cryst. much more readily than polymeric substances with a cyclic structure. In the prepn. of I the dehydration of the  $\text{Me}_3\text{PhCOH}$  is best effected by boiling 1 hr. in an equal wt. of  $\text{Ac}_2\text{O}$ , distg. off the I,  $\text{Ac}_2\text{O}$  and  $\text{AcOH}$  *in vacuo* and repeating the process several times with the unchanged carbinol, about 90% of which can finally be converted into I. For the polymerization, 250 g. I was treated with 20 g.  $\text{SnCl}_4$ ; much heat was evolved and the mixt. boiled; after 24 hrs. it was taken up in 300 cc.  $\text{C}_6\text{H}_6$ , washed with dil. HCl and NaOH, concd. to 0.5 vol., dried with  $\text{CaCl}_2$  and slowly dropped into 1 l. MeOH which gave about 20 g. of curdy flocks. The supernatant liquid on fractionation under 0.1 mm. yielded 180, 20, 11 and 4 g. of the di-, tri-, tetra- and pentamer, resp., and from the MeOH ppt. were obtained another 2 g. of the pentamer and 6, 4 and 6 g. of the hexa-, hepta- and octamers, resp. The unsatd. dimer,  $b_{0,1}$  117-20°, mol. wt. in  $\text{C}_6\text{H}_6$  230, in camphor 219,  $d_{20}$  0.9889,  $n_D^{20}$  1.5677, soly. in MeOH 1:6.8. C. A. R.

Double salts of phenyliodonium iodide with mercuric chloride and the formation of diphenyliodonium salts by decomposition of these double salts. A. N. NESMEYANOV.

Univ. of Moscow. *Z. anorg. allgem. Chem.* 178, 300-8 (1929).—From  $\text{PhN}_2\text{Cl}$  and  $\text{MeOH}$ ,  $\text{K}_2\text{HgI}_4$  pptd.  $\text{PhN}_2\text{HgI}_4$  (I), m.  $63-4^\circ$  (decompn.) I heated with aq. HI gives  $(\text{PhN}_2)_2\text{HgI}_4$  (II), m.  $59.5-60^\circ$ . By covering with  $\text{Me}_2\text{CO}$ , II is decompd. to I,  $\text{N}_2$  and  $\text{PhI}$ . Addn. of  $\text{PhN}_2\text{Cl}$  soln. to  $\text{K}_2\text{HgI}_4$  soln. gave I of lesser purity. Decompn. of I at room temp. gave by  $\text{Et}_2\text{O}$  extn. a product, b.  $188-90^\circ$ , and  $\text{Ph}_2\text{I}$ .  $\text{Me}_2\text{CO}$  extn. gave about 10% of  $\text{Ph}_2\text{IHgI}_2$  (III), m.  $171.5^\circ$ . Hot 50% KI converts III into  $\text{Ph}_2\text{II}$  and  $(\text{Ph}_2\text{I})_2\text{Hg}$  (IV). IV decomp. in 5 days to  $\text{PhI}$  and a small amt. of III.  $\text{Ph}_2\text{II}$  and  $\text{HgI}_2$  combine at  $100^\circ$  to give III. Addn. of KI to a soln. of  $\text{PhN}_2\text{Cl}$  gave no solid  $\text{Ph}_2\text{II}$  and not over 0.27% in soln. The solubilities of  $\text{Ph}_2\text{II}$  in 100 g.  $\text{H}_2\text{O}$  and 100 g.  $\text{PhI}$  are 0.0304 g. and 0.009 g., of  $\text{Ph}_2\text{II}_2$  are 0.015 g. and 0.0486 g. The formation of iodonium compds. without oxidation is analogous to formation of  $\text{R}_4\text{NX}$  from  $\text{R}_3\text{N}$  and  $\text{RX}$ . F. D. S.

**Preparation of homopiperonylamine.** Y. TANAKA AND T. MIDZUNO. *J. Pharm. Soc. Japan* 49, 255-60 (1929).—Condensation of piperonal (30 g.) with  $\text{MeNO}_2$  (13 g.) in  $\text{EtOH}$  (cf. Rosenmund, C. A. 5, 893) gave *methylenedioxy- $\omega$ -nitrostyrene* (I), m.  $159-60^\circ$  (yield 93.2%). Electrolytic reduction of I (cf. Takamoto, C. A. 22, 2354) gave *homopiperonylamine* (II) (yield 76.19%). Salts of II: oxalate, decomp.  $218-9^\circ$ ;  $\text{HCl}$  salt, m.  $208^\circ$ ; picrate, m.  $175^\circ$ ; Pt salt, decomp.  $220^\circ$ . F. I. NAKAMURA

**Compounds of tetryl with hydrocarbons.** N. N. EFREMOV AND A. M. TIKHOMIROVA. *Ann. inst. anal. phys.-chim. (Leningrad)* 4, 92-117 (1928); cf. C. A. 21, 3802.—Tetryl, m.  $126.8^\circ$ , forms equimol. compds. with  $\text{C}_{10}\text{H}_8$  and acenaphthene. Similar compds. with phenanthrene, fluorene, and retene easily decomp. on melting. Picramide, 2,4-dinitroaniline, picryl chloride, trinitroanisole, 2,4,6-trinitro-*m*-xylene and camphor form eutectics of low m. p. but no definite compds. The following eutectics were found: with  $\text{C}_{10}\text{H}_8$ , m.  $80.1^\circ$ , at  $70.8^\circ$  (15 mol. % of tetryl) and at  $82.5^\circ$  (57.5 mol. %),  $\text{C}_{10}\text{H}_8$  -  $\text{C}_7\text{H}_7\text{N}_3\text{O}_8$ , m.  $86.4^\circ$ , at  $75.7^\circ$  (41.5 mol. %),  $\text{C}_{10}\text{H}_8$  -  $\text{C}_7\text{H}_7\text{N}_3\text{O}_8$ , decomp.  $77.5^\circ$  (43.3 mol. %); with retene, m.  $95.2^\circ$ , at  $56.7^\circ$  (25.6 mol. %),  $\text{C}_{10}\text{H}_8$  -  $\text{C}_7\text{H}_7\text{N}_3\text{O}_8$ , decomp.  $61.7^\circ$  (29.5 mol. %); with picramide, m.  $184.2^\circ$ , at  $110.8^\circ$  (86.1 wt. %); with 2,4-dinitroaniline, m.  $176^\circ$ , at  $98.8^\circ$  (80.7 wt. %); with picryl chloride, m.  $81.2^\circ$ , at  $57.8^\circ$  (39.4 wt. %); with trinitroanisole, m.  $63.8^\circ$ , at  $22.8^\circ$  (29.5 wt. %); with 2,4,6-trinitro-*m*-xylene, m.  $180.2^\circ$ , at  $110.8^\circ$  (76.6 wt. %); with camphor at  $102.9^\circ$  (73.3 wt. %). V. K.

**Synthesis of thiocarbanilide.** M. N. UBDINOV, N. S. DROZDOV AND N. A. STEPANOV. *J. Chem. Ind. (Moscow)* 6, 37-9 (1929).—Thiocarbanilide prepn. by the method of Marks and Clark (Eng. patent 244,070 of 1926) runs smoothly and the yield is 86-8%. Expts. undertaken by D. and S. to find the most favorable operating conditions have shown that the relative proportion of  $\text{CS}_2$  and  $\text{PhNH}_2$  taken has a great influence on the yield. The app. consisted of an asbestos-covered tightly stoppered glass cylinder of 750 cc. capacity; a stirrer, a separatory funnel and a thermometer were passed through the stopper. The operating method consisted in introducing aq.  $\text{NaOH}$  into the cylinder at  $25^\circ$ , setting the stirrer into action and adding through the separatory funnel  $\text{PhNH}_2$  soln. in  $\text{CS}_2$  at  $25^\circ$ . The asbestos covering served as a thermoinsulator, making it possible to follow the temp. variations of the reaction mass. The temp. spontaneously went up, reached a max. and dropped to  $40^\circ$ , at which latter point the reaction was considered as ended, the asbestos covering was taken off and the cylinder was cooled to  $15^\circ$  by immersion in cold  $\text{H}_2\text{O}$ . The stirring was continued 30 mins. after the temp. of  $15^\circ$  was reached, then the reaction mass was dild. with an equal volume of  $\text{H}_2\text{O}$  to prevent pptn. of  $\text{Na}_2\text{CS}_3$  together with  $\text{CS}(\text{NHP})_2$ , and the ppt. of the latter was filtered with suction, washed first with  $\text{H}_2\text{O}$ , then with 10-15 cc. 10%  $\text{HCl}$  to transform the aniline into its salt, then again with  $\text{H}_2\text{O}$ , and finally the carbanilide was dried. In all these expts. the total quantity of the reaction mixt. taken was the same, viz., 400 g., the relative quantity of alkali represented 115% of the theoretical calcd. on  $\text{CS}_2$ , but the relative proportions of  $\text{CS}_2$  and  $\text{PhNH}_2$  were varied in each expt. The results of 11 expts. were tabulated and a diagram was drawn which expressed the influence of the proportion of the components on the yield and on the extent of the exothermic effect. The data obtained permit of concluding that,  $\text{CS}_2$  being up to 10-20% in excess, the yield increases to 94%; a  $\text{CS}_2$  excess of between 20 and 40% does not further affect the yield, and an excess of more than 40% decreases the yield as a result of the reaction  $\text{PhNH}_2 + \text{CS}_2 = \text{PhN}:\text{C}:\text{S} + \text{H}_2\text{S}$ . An excess of  $\text{PhNH}_2$  adversely affects the  $\text{CS}(\text{NHP})_2$  yield on account of the tendency to triphenylguanidine formation. The exothermic max., which is about  $77^\circ$ , is registered when the  $\text{CS}_2$  excess is between 10-20%, i. e., when the yield is best.

BERNARD NELSON

**Allylphenylthiourea as a solvent.** V. P. SHISHOKIN. *Ann. inst. anal. phys.-chim. (Leningrad)* 4, 195-224(1928).—CS(NHC<sub>3</sub>H<sub>5</sub>)(NHPh) forms compds. with CHCl<sub>3</sub>, paraldehyde, CCl<sub>3</sub>CO<sub>2</sub>H and Ac<sub>2</sub>O, and probably also with AcOH, C<sub>6</sub>H<sub>5</sub>Br<sub>3</sub>, PhNO<sub>2</sub>, EtOH, MeOH, allyl mustard oil, benzene, toluene and C<sub>10</sub>H<sub>8</sub>. No compds. are formed with aniline, o-nitroaniline, and Ph<sub>2</sub>NH. Exptl. data are given in detail. By applying the laws of Shreder-Le Chatelier (*Gornui Zhurnal* 1890, No. 11, 272; *Compt. rend.* 118, 638(1894)) and Hildebrand-Mortimer (*C. A.* 10, 2426; 11, 3146; 13, 1663; 15, 6; 16, 2803; 17, 2216) the heat of fusion of allylphenylthiourea was calcd. as 6400-6960 cal. per mol. which is close to the exptl. value of 6600 cal. The internal pressure of allylphenylthiourea must be close to that of aniline, and of allyl mustard oil to that of PhNO<sub>2</sub>.

V. KALICHEVSKY

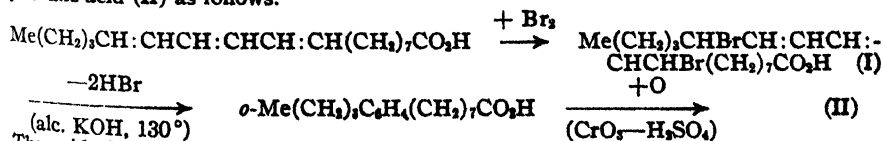
Further communication on my method of thiocyanating organic compounds. H. P. KAUFMANN. Univ. Jena. *Ber.* 62B, 390-1(1929); cf. *C. A.* 22, 2166.—In the original method of thiocyanating org. compds. with the (SCN)<sub>2</sub> liberated from inorg. thiocyanates with Cl or Br, acid solns. were used to impede the hydrolysis of the (SCN)<sub>2</sub>. Many substances do not dissolve well in acids, large quantities of alkali are required to neutralize the acid and, finally, the acid favors secondary transformations of the resulting thiocyanates, but it has now been found, with W. OEHNING and E. WEBER, that the AcOH, HCO<sub>2</sub>H, etc., can be replaced by indifferent solvents (MeOH, Me<sub>2</sub>CO, AcOEt, MeOAc, etc.). MeOH is especially satisfactory in some cases; by satg. it with the corresponding alkali halide, it can be protected against any attack by the Cl or Br. Numerous examples of the application of the modified process in the prepn. of therapeutically valuable S compds. are described in a paper, now in press, in *Arch. Pharm.* Here is reported only the thiocyanation of PhNH<sub>2</sub>: 14 g. PhNH<sub>2</sub> and 37 g. NaSCN in 90 cc. cold MeOH are treated dropwise with 8.5 cc. Br in 30 cc. cold MeOH (satd. with NaBr), poured into H<sub>2</sub>O and neutralized with Na<sub>2</sub>CO<sub>3</sub>, giving 97% of p-NCSC<sub>2</sub>H<sub>4</sub>NH<sub>2</sub>, m. 97° after 1 crystn. from H<sub>2</sub>O.

C. A. R.

The forced reaction between some hydrocarbons and organomagnesium halides. HENRY GILMAN AND JOHN A. LEERMAKERS. Chem. Dept., Ames, Iowa. *Rec. trav. chim.* 48, 577-9(1929).—The Grignard reagent will react with some hydrocarbons, particularly with those having a true acetylenic group; the present paper deals with the reaction between Grignard reagents and hydrocarbons possessing H atoms less acidic than those in the :CH group. The procedure followed was to reflux the Grignard compd., PhCH<sub>2</sub>MgCl or EtMgBr, with di- or triphenylmethane in a mixt. of ether and benzene, toluene or xylene at temps. ranging from 60-128° for from 3-7 hrs. After the usual decompn. of the reaction mixt., after having converted the Grignard compd. with CO<sub>2</sub> into the corresponding acid, a careful search was made for diphenyl- and triphenylacetic acid, which, however, could not be detected in any of the expts. Moreover, the hydrocarbon tested was recovered in every expt. in a very high percentage and in a state of high purity, whereas with Ph<sub>3</sub>CH not a trace of triphenylmethyl peroxide could be detected. These results show that under conditions of protracted refluxing and elevated temps. di- and triphenylmethane do not react with PhCH<sub>2</sub>MgCl and EtMgBr.

C. F. VAN DUIN

**Halogen elimination from halogenated eleostearic acid. Identification of phthalic acid by the fluorescein reaction.** D. HOLDE, W. BLEYBERG AND M. A. AZIZ. *Z. angew. Chem.* 42, 283-4(1929).—Unsatd. acids which have been treated with excess IBr in glacial AcOH (Hanus reagent) and the excess titrated with Na<sub>2</sub>S<sub>2</sub>O<sub>4</sub>, spontaneously liberate the added halogen (cf. Holde, *C. A.* 23, 2049 and Kaufmann and Lutenberg, *C. A.* 23, 3360). Expts. were made to det. if the loss of halogen in the case of dibromo-α-eleostearic acid (I) gives an aromatic acid which can be oxidized with CrO<sub>3</sub> to phthalic acid (II) as follows:

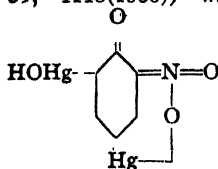


The oxidation product when heated for 3 min. with resorcinol (III) and 1 drop H<sub>2</sub>SO<sub>4</sub> at 160° gave a fluorescent soln. in dil. alkali but this was not due to the presence of II since many other compds., viz., aldehydes, ketones, chlorides, mono- and dibasic acids, and esters give condensation products with III which yield fluorescent alk. solns. (acetfluorescein, succinylfluorescein, etc.). When making a test for II it is essential that no H<sub>2</sub>SO<sub>4</sub> be added and that the condensation with III be brought about at 25-10° for 3 mins. Whether the loss of halogen from I gives oxygenated or polymerized prod-

ucts was not detd. and further investigations are under way to det. the course of this reaction. N. A. LANGE.

The action of arsenic acid and derivatives upon the nitrophenols. OCTORINO RODOLFO PEPE. *Rev. facultad cienc. quim. (Univ. La Plata)* 5, Pt. I, 105-79 (1928).—P. gives first a review of the different methods of combining As with org. radicals, then a description of how to prep. his starting material. His expts. aim at the application of the reaction of Béchamp for the prepn. of *hydroxynitrophenylarsonic acid*,  $o\text{-O}_2\text{NC}_6\text{H}_4\text{OH}$  and  $\text{H}_2\text{AsO}_4$  were brought in contact under varying conditions, then the salts of Na, K and  $\text{NH}_4$  used,  $\text{H}_2\text{As}_2\text{O}_7$  was tried and the expts. repeated in the presence of  $\text{H}_2\text{SO}_4$ ,  $\text{P}_2\text{O}_5$  and  $\text{Ac}_2\text{O}$ . The result of all these expts. was negative. Some tests were made to control the methods of isolation of the expected products and their identification. The 4,3- $\text{HO}(\text{O}_2\text{N})\text{C}_6\text{H}_3\text{AsO}_3\text{H}_2$  is decomposed partially when heated in the presence of  $\text{H}_2\text{AsO}_4$  and  $o\text{-O}_2\text{NC}_6\text{H}_4\text{OH}$ . The different  $\text{HO}(\text{O}_2\text{N})\text{C}_6\text{H}_3\text{AsO}_3\text{H}_2$  give with Br in  $\text{H}_2\text{O}$  the same compds. as the corresponding nitrophenols and in this way cannot be distinguished. A. E. MEYER.

Mercuration of benzene derivatives. B. KALINOWSKI. *Roczniki Chem.* 9, 131-47 (147-8 French) (1929).—1-Bromobenzene-2,4-dimercuric acetate (I),  $\text{C}_{10}\text{H}_5\text{BrO}_4\text{Hg}_2$ , m.  $223^\circ$ , was obtained by heating PhBr with  $\text{Hg}(\text{OAc})_2$  in a closed tube to  $120^\circ$ . I in AcOH gives with NaCl a white ppt. of 1-bromobenzene-2,4-dimercuric chloride,  $\text{C}_6\text{H}_5\text{BrCl}_2\text{Hg}_2$ , m.  $232^\circ$ . From  $p\text{-C}_6\text{H}_4\text{Br}_2$  in a similar way at  $140^\circ$  1,4-dibromobenzenedimercuric acetate,  $\text{C}_{10}\text{H}_3\text{O}_4\text{Br}_2\text{Hg}_2$ , m.  $157\text{--}8^\circ$ , was obtained; the position of the Hg groups, however, could not be detd.  $\text{Hg}(\text{OAc})_2$  in hot AcOH gave with the soln. of *o*-nitrophenol a yellow ppt., *o*-nitrophenol-4,6-dimercuric acetate,  $\text{C}_{10}\text{H}_5\text{O}_7\text{NHg}_2$  (II), triangular crystals which exploded on heating.  $\text{I}_2\text{KI}$  with II in 20% AcOH gave the known 4,6-diiodo-*o*-nitrophenol, m.  $97.5^\circ$ , whereby the position of Hg was detd. On hydrolysis of II, however, the mercuri-*aci-o*-nitrophenol anhydride, (Hantzsch, *Ber.* 39, 1115 (1906)) was not obtained, but 2-nitrophenol-4,6-dimercuric anhydride,



a dark yellow substance, insol. in any solvent. In an analo-

gous way *p*-nitrophenol gave a greenish yellow ppt., 4-nitrophenol-2,6-dimercuric acetate,  $\text{C}_{10}\text{H}_5\text{O}_7\text{NHg}_2$ ; white needles from 20% AcOH, rhombic from 40% AcOH, exploding on heating to  $200^\circ$ . The product of hydrolysis, 4-nitrophenol-2,6-dimercuric anhydride,  $\text{C}_6\text{H}_3\text{O}_4\text{NHg}_2$ , is a white, insol. substance decomp.  $220^\circ$  without melting. *m*-Nitrophenol gives yellow, rhombic crystals of 3-nitrophenol-2-monomercuric acetate (anhydride,  $\text{C}_6\text{H}_3\text{O}_3\text{NHg}$ ),  $\text{C}_6\text{H}_7\text{O}_3\text{NHg}$ , m.  $210^\circ$ , the structure of which was detd. through 2,3- $\text{I}(\text{O}_2\text{N})\text{C}_6\text{H}_3\text{OH}$ , m.  $136^\circ$ . Other mercuric derivs. of  $\text{C}_6\text{H}_5$  were prepd.: 2,4-dinitro-1-phenol-6-monomercuric acetate (anhydride,  $\text{C}_6\text{H}_3\text{O}_4\text{N}_2\text{Hg}$ ),  $\text{C}_6\text{H}_5\text{O}_7\text{N}_2\text{Hg}$ , yellow, insol. crystals; 2,6-dinitrophenol-4-monomercuric acetate,  $\text{C}_6\text{H}_5\text{O}_7\text{N}_2\text{Hg}$ , white crystals exploding on heating; 2-chlorophenol-4,6-dimercuric acetate,  $\text{C}_{10}\text{H}_5\text{O}_6\text{ClHg}_2$  (anhydride,  $\text{C}_6\text{H}_3\text{O}_5\text{ClHg}$ , yellow crystals), white needles, decomp. on heating; 3-chlorophenoldimercuric acetate (anhydride,  $\text{C}_6\text{H}_3\text{O}_5\text{ClHg}_2$ , yellow crystals),  $\text{C}_{10}\text{H}_5\text{O}_6\text{ClHg}_2$ , white needles, decomp. at  $270^\circ$ ; 4-chlorophenol-2,6-dimercuric acetate (anhydride,  $\text{C}_6\text{H}_3\text{O}_5\text{ClHg}$ ),  $\text{C}_{10}\text{H}_5\text{O}_6\text{ClHg}_2$ , white needles, decomp. at  $270^\circ$ . The rule that Hg does not enter into the *m*-position of benzene holds throughout in all these cases. J. K.

Organic sulfur compounds. XII. Formation of mercaptoles by the action of aliphatic diazo compounds on disulfides (preliminary communication). A. SCHÖNBERG O. SCHÜTZ AND J. PETER. *Tech. Hochschule Charlottenburg. Ber.* 62B, 440-1 (1929); cf. *C. A.* 23, 2708.—It is known that the S.S union of certain aromatic disulfides is ruptured by "free" methyl radicals:  $\text{ArSSAr} + 2\text{Ph}_3\text{C} = 2\text{ArSCPh}_3$ . It has now been found that a similar reaction can be effected with "free" methylene radicals. E. g., if diphenyldiazomethane is heated it is generally accepted that it first decomp. into  $\text{N}_2$  and "free"  $\text{Ph}_2\text{C}$  which then stabilizes itself, forming  $\text{Ph}_2\text{C}:\text{CPh}_2$  or  $(\text{N}:\text{CPh}_2)_2$ , depending on the conditions. If, however, the decompn. is effected in boiling  $\text{C}_6\text{H}_6$  in the presence of  $\text{Ph}_2\text{S}_2$  there is formed  $\text{Ph}_2\text{C}(\text{SPh})_2$ . The mercaptole (yield, over 50%) m.  $138^\circ$ , dissolves in concd.  $\text{H}_2\text{SO}_4$  with red-brown color; plunged in a m. p. tube for 15 sec. into a bath at  $230^\circ$  it forms a deep blue-green melt because at this temp. it decomp. into  $\text{Ph}_2\text{CS}$ . C. A. R.

Congo copal oil (preliminary communication). L. WESTENBERG. *Krommenie*

Holland. *Rec. trav. chim.* **48**, 580-2(1929).—The pyrogenetic decompn. of Congo copal at about 300° leads to the formation of Congo copal oil, which has not been investigated up to the present moment. A sepn. into the constituents by fractional distn. could not be carried out, only 2 principal fractions being obtained, b. 240-60° and 170-80°, the first one was the larger one and was very reactive toward several reagents, however it was impossible to obtain a cryst. deriv. in a pure condition. On heating Congo copal oil with 40% S at 250° until H<sub>2</sub>S is no longer evolved, a reaction product is obtained, which, after distn. in a vacuum, yields a hydrocarbon, which easily gives a red *picrate*, m. 139°. This *picrate* is identical with the *picrate*, m. 139°, obtained by Ruzicka and his co-workers, from Manilla copal (*C. A.* **21**, 906), and gives, on treatment with alkali, a hydrocarbon C<sub>13</sub>H<sub>14</sub>, m. 26°, b<sub>760</sub> 295°. The oxidation of this hydrocarbon with CrO<sub>3</sub> in boiling AcOH gives a small amount of an acid C<sub>13</sub>H<sub>12</sub>O<sub>4</sub>, m. 204°, which was not investigated further, and a neutral compd. (C<sub>6</sub>H<sub>4</sub>O)<sub>n</sub>, pale yellow crystals, m. 69°. This substance does not liberate I from KI, nor is it reduced by SnCl<sub>2</sub>, although its compn. agrees with that of ethylbenzoquinone or one of the xyloquinones. The m. p. is fairly in agreement with that of *m*-xyloquinone (72-73°) but a direct comparison could not be carried out.

C. F. VAN DUIN

Preparation of benzaldehyde from toluene using oxides of manganese as oxidizing agents. I. KIYOAKI KAKUTANI AND NAOTOSHI YAMAGUCHI. *Repts. Imp. Ind. Research Inst. Osaka, Japan* **9**, No. 11, 1929.—In order to study the effect of MnO<sub>2</sub>, Mn<sub>2</sub>O<sub>3</sub>, and Mn<sub>3</sub>O<sub>4</sub> as oxidizing agents on the prepn. of BzH from PhMe, K. and Y. prepd. the above oxides by the following methods: (A) by heating Mn(NO<sub>3</sub>)<sub>2</sub>, (I), (B) by treating I with KClO<sub>3</sub>, (C) by treating MnSO<sub>4</sub>, (II) with Cl gas, and (D) by treating II with KMnO<sub>4</sub>. The expt. was carried out in a 3-necked flask provided with a thermometer, reflux condenser and a stirrer. The flask was immersed in a water bath. The product was analyzed by the usual methods. Since MnO<sub>2</sub> prepd. by (1) and the natural pyrolusite have similar properties the following factors were especially studied: effect of reaction time, reaction temp., concn. of H<sub>2</sub>SO<sub>4</sub>, quantity of PhMe used, method of adding the oxide, and quantity of oxide used. In general Mn<sub>2</sub>O<sub>3</sub> is the best oxidizing agent followed by MnO<sub>2</sub> and under the proper conditions its oxidizing power is above 70%. The oxidizing power of an oxide is influenced by its method of prepn. This may be due to its phys. properties. The oxidizing power of MnO<sub>2</sub> prepd. by (A) under any conditions was very poor, while that of MnO<sub>2</sub> prepd. by (B), (C) and (D) under proper conditions was about 40%. The results of further investigation will be published in the future.

F. I. NAKAMURA

Protocatechualdehyde and its simplest ethers. C. JUNGE. *Göttingen. Parfumer* **3**, 35-6(1929).—A recapitulation of their properties and constitution. P. E.

Synthesis of 3-methoxy-4-ethoxy-6-ethylbenzoic acid. T. KONDO AND S. TANAKA. *J. Pharm. Soc. Japan* **49**, 263-7(1929).—In a previous publication (*C. A.* **23**, 2979) by treating *o*-MeOC<sub>6</sub>H<sub>4</sub>OEt with AcCl (1 mol.) K. and T. obtained two Ac derivs., MeO(EtO)C<sub>6</sub>H<sub>3</sub>Ac (I<sub>1</sub>), m. 79°, and (I<sub>2</sub>) with lower m. p. Reduction of the mixt. of I<sub>1</sub> and I<sub>2</sub> with Zn-Hg and HCl gave 2 compds., MeO(EtO)C<sub>6</sub>H<sub>3</sub>Et (II<sub>1</sub>), b<sub>1</sub> 107°, and (II<sub>2</sub>), b<sub>1</sub> 95°. Acetylation of II<sub>1</sub> gave Et(MeO)(EtO)C<sub>6</sub>H<sub>3</sub>Ac (III), m. 81.5-2.5°. III treated with NaOI gave 3-methoxy-4-ethoxy-6-ethylbenzoic acid, m. 133-4°. F. I. NAKAMURA

The saponification of nitriles with orthophosphoric acid. S. C. J. OLIVIER. *Agronomical Univ., Wageningen. Rec. trav. chim.* **48**, 568-70(1929).—Previously Berger and Olivier published a new method for the sapon. of nitriles and amides, *viz.*, by means of H<sub>3</sub>PO<sub>4</sub> (*C. A.* **22**, 239); the present paper deals with the case of 2,4-Br<sub>2</sub>C<sub>6</sub>H<sub>3</sub>CN, which was prepd. from AcNHPH as follows: PhNHAc was brominated to 2,4-Br<sub>2</sub>C<sub>6</sub>H<sub>3</sub>NHAc (cf. Montagne, *C. A.* **7**, 1178); after sapon. with alc. KOH the 2,4-Br<sub>2</sub>C<sub>6</sub>H<sub>3</sub>NH<sub>2</sub> was converted into 2,4-dibromobenzonitrile, m. 93-4°, by means of the Sandmeyer reaction (cf. Montagne, *C. A.* **7**, 1178). Several sapon. expts. were carried out with this nitrile, each time 2 g. being heated with 25 cc. H<sub>3</sub>PO<sub>4</sub> of varying strength at 160-70° for 2 hrs. With 93.5% H<sub>3</sub>PO<sub>4</sub> the nitrile remained unchanged, with 100% acid the transformation was nearly complete and the same result was obtained with H<sub>3</sub>PO<sub>4</sub> contg. free P<sub>2</sub>O<sub>5</sub>. It thus appears that H<sub>3</sub>PO<sub>4</sub> is the more suitable for the sapon. of nitriles the less water it contains; this fact is explained by the greater soly. of the nitrile in the stronger acid and by an easier compd. formation under the latter conditions (cf. O. and B., *l. c.*). The water necessary for the sapon. is given off by the H<sub>3</sub>PO<sub>4</sub>, which begins to lose water at 160°. The possibility that an addn. compd. is formed, which is decompd. with the formation of 2,4-Br<sub>2</sub>C<sub>6</sub>H<sub>3</sub>CO<sub>2</sub>H, on treatment of the reaction product with water, is excluded by the fact that the Br<sub>2</sub>C<sub>6</sub>H<sub>3</sub>CO<sub>2</sub>H sublimes during the heating into the neck of the flask. The 2,4-dibromobenzoic acid, thus obtained, m. 173.5-4.5°; yield 90%.

C. F. VAN DUIN

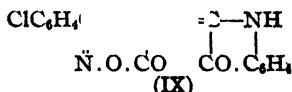
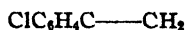
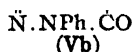
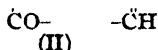
The action of mustard oils and hydrogen chloride upon polyhydric phenols. P. KARRER AND ERNST WEISS. Chem. Inst. Univ. Zurich. *Helv. Chim. Acta* 12, 554-7 (1929).—The condensation of polyhydric phenols with mustard oils in the presence of HCl results in the formation of thio-acid amide derivs. Directions are given for the prepn. of the following new compds.: *ethylamide of thioresorcylic acid*,  $\text{EtNHCS}\cdot\text{C}_6\text{H}_3(\text{OH})_3$ , m.  $96^\circ$  (16 g. from 12 g.  $\text{EtNCS}$  and 15 g. resorcinol); *ethylamide of phloroglucinolthiocarboxylic acid*,  $\text{EtNHCS}\cdot\text{C}_6\text{H}_2(\text{OH})_3$ , m.  $152^\circ$ ; *allylamide of pyrogallolthiocarboxylic acid*, m.  $206^\circ$  (decompn.); *anilide of thioresorcylic acid*, m.  $176^\circ$  (25 g. from 25 g.  $\text{PhNCS}$  and 20 g. resorcinol); *anilide of  $\alpha$ -naphtholthiocarboxylic acid*, m.  $206^\circ$  (9.5 g. from 18 g.  $\text{PhNCS}$  and 20 g.  $\alpha$ -naphthol);  *$\beta$ -naphthylamide of thioresorcylic acid*, m.  $177-9^\circ$ . L. F. AUDRIETH

Question of "quinoid" tautomerism. Chlorination of *p*-nitrobenzyl cyanide. VSEVOLOD NEKRASOV AND A. V. SÓKOLOV. Lab. S. S. Nametkin, Moskau. *Ber.* 62B, 463-6(1929).—Halogens attack  $\text{PhCH}_2\text{CN}$  not only at high temps. and in the light but also in the cold in the presence of catalysts exclusively in the side chain, giving  $\text{PhCHXCN}$ . Only one H atom of the  $\text{CH}_2$  group is substituted;  $\text{PhCCl}_2\text{CN}$  is obtained by other methods. N. and S. have now found that *p*- $\text{O}_2\text{NC}_6\text{H}_4\text{CH}_2\text{CN}$  (I) reacts quite vigorously with Cl at high temps. and in strong light, smoothly yielding *p*-nitrophenyldichloroacetomitrile (II), an oil with no lachrymatory properties. On oxidation in alk. soln. it yields *p*- $\text{O}_2\text{NC}_6\text{H}_4\text{CO}_2\text{H}$ . It is sapond. only very slowly by aq. acids; stronger reagents (HBr,  $\text{H}_2\text{SO}_4$ ) also split off the side chain, giving  $\text{O}_2\text{NC}_6\text{H}_4\text{CO}_2\text{H}$ , but with HCl in  $\text{Et}_2\text{O}$  *p*-nitrophenyldichloroacetic acid (III) was obtained in good yield. In alc. II is turned an intense  $\text{KMnO}_4$ -red by alkalies; the color gradually changes to yellow on standing and disappears on acidification but is restored by an excess of alkali.  $\text{PhCCl}_2\text{CN}$  behaves in the same way. Lifschitz and Jenner proved by spectrochem. studies that the colored salts of I are quinoid,  $\text{NaON}(\text{:O}): \text{C}_6\text{H}_4\text{:CHCN}$ , and Opolski assumed a similar structure for the colored salts of the *o*- and *m*-isomers. This seems hardly probable for the *m*-compds., as no *m*-quinones are known. II contains no H atom replaceable by a metal and can therefore neither be quinoid nor isomerize into an imide form; the question of the structure of the colored salt-like derivs of the nitrobenzyl cyanides cannot therefore as yet be considered as cleared up. II (28 g. from 30 g. I chlorinated at  $120^\circ$  in bright daylight for 11 hrs.), yellowish,  $b_D^{20}$  149.9-5°,  $d_4^{20}$  1.4465,  $n_D^{20}$  1.5710. III (5 g. from 8.5 g. II), m.  $171-2^\circ$  (slight decompn.), easily titrated with phenolphthalein in aq. alc. C. A. R.

Chlorobenzoylactic esters and their derivatives. A. WAHL AND J. ROLLAND. *Ann. chim.* [10], 10, 5-49(1928); cf. C. A. 2, 3057; 22, 1151.—By condensation of *o*-, *m*- and *p*- $\text{ClC}_6\text{H}_4\text{CO}_2\text{Me}$  with  $\text{AcOMe}$  under the influence of metallic Na, are obtained Me *o*-, *m*- and *p*-chlorobenzoylacetates (I). The *o*-I decomps. slowly at  $170-2^\circ$  and 12 mm. pressure,  $d_4^{20}$  1.027. Two mols. condense with elimination of 2 mols. of MeOH to form 6-*o*-chlorophenyl-*o*-chlorobenzoyl- $\alpha,\gamma$ -pyronone (II), m.  $216^\circ$ . *m* I,  $b_{11}$   $165-9^\circ$ ,  $d_4^{20}$  1.185, condenses in the same way, the product m.  $172^\circ$ . *p*-I, m.  $36-7^\circ$ ,  $b_{11}$   $172^\circ$ , yields a similar condensation product m.  $242^\circ$ . The isomeric I are next characterized by cryst. derivs. By the action of  $\text{PhNHNH}_2$  are prepd. *o*-, *m*- and *p*-pyrazolones (III), m., resp.,  $113-4^\circ$ ,  $144^\circ$  and  $140^\circ$ . *p*- $\text{O}_2\text{NC}_6\text{H}_4\text{NHNH}_2$  yields pyrazolones (IV), m.  $203-4^\circ$ ,  $189^\circ$  and  $200-0.5^\circ$ .  $\text{HNO}_2$  yields Me isonitrosochlorobenzoylacetates (V), m., resp.,  $90-1^\circ$ ,  $113-4^\circ$  and  $124-5^\circ$ .  $\text{NH}_2\text{OH}\cdot\text{HCl}$  yields chlorophenylisoxazolones (V), m., resp.,  $138^\circ$ ,  $98^\circ$  and  $152^\circ$ . By the action of  $\text{PhN}_2\text{Cl}$  are prepd. Me benzeneazochlorobenzoylacetates (Va), m.  $95-6^\circ$ ,  $132-3^\circ$  and  $90-1^\circ$ , resp., *p*- $\text{O}_2\text{NC}_6\text{H}_4\text{N}_2\text{Cl}$  gives Me *p*-nitrobenzeneazochlorobenzoylacetates, m.  $104-5^\circ$ ,  $174-5^\circ$  and  $206-7^\circ$ , resp. By condensation of Va with  $\text{PhNHNH}_2$  and of III with  $\text{PhN}_2\text{Cl}$  are obtained identical compds., 1-phenyl-3-chlorophenyl-4-phenylhydrazino-5-pyrazolones (Vb), m., resp.,  $195^\circ$ ,  $166-7^\circ$  and  $204-5^\circ$ . The I are capable of existing as enolic compds. and these tautomeric forms are demonstrated to be present at equil. to the extent of about 25%. By decompn. with dil.  $\text{H}_2\text{SO}_4$  the I are broken down into  $\text{Cl}\cdot\text{C}_6\text{H}_4\text{COMe}$ , of which the *m*-isomer has not been heretofore prepd. Derivs. of the 3 isomers are prepd. In the case of the *m*-chloroacetophenone,  $d_4^{20} = 1.2130$ , the phenylhydrazone is unstable. The chloroacetophenones are heated with  $\text{Na}_2\text{SO}_3$ , the Na sulfonate being formed in the case of the *o*- and *p*-isomers. In the case of the *m*-isomer the Cl is not replaced. Condensation of *o*-V with  $\text{BzH}$  gives benzylidene-*o*-chlorophenylisoxazolone (VI), m.  $152^\circ$ ; with *p*- $\text{Me}_2\text{NC}_6\text{H}_4\text{CHO}$ , *p*-dimethylaminobenzylidene-*o*-chlorophenylisoxazolone (VII), m.  $199^\circ$ ; with  $3,4\text{-(HO)}_2\text{C}_6\text{H}_3\text{CHO}$ , 3,4-dihydroxybenzylidene-*o*-chlorophenylisoxazolone (VIII), m.  $233-5^\circ$ . *m*-Isomers: VI, yellow, m.  $116^\circ$ ; VII, garnet, m.  $192^\circ$ ; the *m*-VIII, orange, m.  $190-2^\circ$ . *p*-Isomers: VI, yellow,



m. 154°; VII, red, m. 200°; *p*-VIII, yellow, m. 201–3°. With 3,4-(HO)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>CHO, the condensation products are capable of acting as mordant dyes. The color intensity of the *m*-Cl deriv. is greater than that of the non-chlorinated deriv.; the intensity is less with the *o*- and *p*-Cl derivs. Further, the 3 V condense with isatin chloride to yield chlorophenylisoxazole-2-indoleindigo (IX); these products are dark violet-brown crystals, m. 250°, 239° and 244° for the *o*-, *m*- and *p*-derivs., resp. W. and R. employ a previously described method (cf. C. A. 6, 2075) which consists in treating a  $\beta$ -ketonic ester in anhyd. Et<sub>2</sub>O with nitrous vapors in the presence of Ac<sub>2</sub>O. The I are thus treated and give the diketones, Me chlorobenzoylglyoxylates, ClC<sub>6</sub>H<sub>4</sub>COCOCO<sub>2</sub>Me (X), the yield being very poor due to decompn. of the X to ClC<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>H. The action of Ph-NHNH<sub>2</sub> on the X varies according to the solvent and temp. By acting in cold dil. AcOH, 3 phenylhydrazones (XI) are prepd., m. 95–6°, 130° and 90–1°, resp. The point of attachment is the  $\alpha$ -ketonic group. At the same time small quantities of the Vb are obtained. These are insol. in 50% AcOH and are easy to sep. from the phenylhydrazones.



R. P. WALTON

New syntheses of coumarin derivatives. II. RICHARD WEISS AND ADALBERT KRATZ. Univ. Wien. *Monatsh.* 51, 386–96(1929); cf. Weiss and Merksammer, C. A. 23, 829. --o-C<sub>6</sub>H<sub>4</sub>(OH)<sub>2</sub>, EtOCH:C(CO<sub>2</sub>Et)<sub>2</sub> and EtONa give Et umbelliferone-3-carboxylate, m. 165–70°. 2,1,3-O<sub>2</sub>NC<sub>6</sub>H<sub>3</sub>(OH)<sub>2</sub> (9 g.), 10.8 g. AcC(:CHOEt)CO<sub>2</sub>Et and EtONa from 1.33 g. Na, warmed 20 mins. on the H<sub>2</sub>O bath, give 3-acetyl-7-hydroxy-8-nitrocoumarin, yellowish brown, m. 230–1° (decompn.). With 8 g. EtOCH:C(CO<sub>2</sub>Et)<sub>2</sub>, 5.72 g. 2,1,3-O<sub>2</sub>NC<sub>6</sub>H<sub>3</sub>(OH)<sub>2</sub> and 0.88 g. Na in EtOH, there results a tetrahydronitrodiphenyl, orange-red, darkens at 270° but does not possess a sharp m p. the alc. filtrate from the above compd. (as Na salt) yields 7-hydroxy-8-nitrocoumarin, light yellow, m. 228°; this crysts. with 0.5 mol. H<sub>2</sub>O and differs from the compd. obtained by Clayton (C. A. 4, 3076) on nitrating umbelliferone. 4,1,3-Cl<sub>2</sub>C<sub>6</sub>H<sub>3</sub>(OH)<sub>2</sub> and AcC(:CHOEt)CO<sub>2</sub>Et give nearly quant. 3-acetyl-6-chloro-7-hydroxycoumarin, brown, m. 241–2°; the aq. soln. has a bluish violet fluorescence; *p*-toluenesulfonyl deriv., m. 160–1°; 4,1,3-EtC<sub>6</sub>H<sub>3</sub>(OH)<sub>2</sub>, AcOH and ZnCl<sub>2</sub>, heated not over 140°, give ethylresacetophenone (I), yellowish, m. 115°, reduced by Zn and HCl to 4,6-diethylresorcinol (II), m. 65–71°. With AcC(:CHOEt)CO<sub>2</sub>Et the latter yields 3-acetyl-5-hydroxy-6,8-diethylcoumarin, brownish yellow, m. 192°; *p*-toluenesulfonyl deriv., grayish white, m. 99°; N<sub>2</sub>H<sub>4</sub>·H<sub>2</sub>O gives 2,6-dihydroxy-3,5-diethylbenzalazine, light yellow, m. 214°. With EtOCH:C(CO<sub>2</sub>Et)<sub>2</sub> II gives Et-5-hydroxy-6,8-diethylcoumarin-3-carboxylate, light yellow, m. 156°; the free acid, light yellow, m. 212°. I and EtOCH:C(CO<sub>2</sub>Et)<sub>2</sub> with EtONa give Et 5-hydroxy-6-acetyl-8-ethylcoumarin-3-carboxylate (or the 8-acetyl-6-ethyl deriv.), light yellow, softens 158°, m. 180–5°; heating with 10% EtOH-KOH for 2 hrs. gives 5-hydroxy-6(8)-acetyl-8(6)-ethylcoumarin, m. 180°. The product described in the literature as 4,6,1,3-Cl<sub>2</sub>C<sub>6</sub>H<sub>3</sub>(OH)<sub>2</sub> is probably the mono-Cl deriv., by the action of SO<sub>2</sub>Cl<sub>2</sub> there results the di-Cl deriv., m. 108–9°; with AcC(:CHOEt)CO<sub>2</sub>Et there results 3-acetyl-5-hydroxy-6,8-dichlorocoumarin, light yellow, m. 235–6° (decompn.); *p*-toluenesulfonyl deriv., m. 150–1°. C. J. WEST

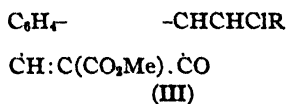
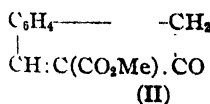
The reactivity of the nitro group in 4,5-dinitroveratrole towards sodium methylate at 35° and 45°. A. H. PARVUS. Univ. Leiden. *Rec. trav. chim.* 48, 560–3(1929).—According to the investigation of Lorang (C. A. 22, 582) the introduction of the OMe group in the 5-position in 2,4-(O<sub>2</sub>N)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>Cl slows down the reactivity toward NaOMe to about 1/3 of its value. The present paper deals with the influence of two OMe groups on the reactivity of a mobile nitro group. The reaction const. for the reaction between 4,5-dinitroveratrole and NaOMe in MeOH was found to be 0.0029 at 35° and 0.0088 at 45°. Taking into consideration that the reaction const. for the reaction between o-C<sub>6</sub>H<sub>4</sub>(NO<sub>2</sub>)<sub>2</sub> and NaOMe in MeOH are 0.0242 at 35° and 0.0695 at 45° (*Rec. trav. chim.* 18, 17(1899)), the const. published here, are to be halved according to Lorang (C. A. 22, 582; Talen, C. A. 22, 1351), it follows that the introduction of 2 OMe groups in o-C<sub>6</sub>H<sub>4</sub>(NO<sub>2</sub>)<sub>2</sub> slows down the reactivity toward NaOMe about

8 times. The following solubilities of 4,5-dinitroveratrole in abs. MeOH were detd.: at 15°, 0.0766 g.; at 25°, 0.1054 g.; at 35°, 0.1821 g. and at 45°, 0.2495 g. in 10 cc MeOH. C. F. VAN DUIN

*peri*-Dibenzyl-naphthalene and two other isomeric hydrocarbons. KAROL DZIEWONSKI AND JAN MOSZEW. *Bull. intern. acad. Polonaise* 1928, 283-91.—Three dibenzyl-naphthalenes were isolated by distn. *in vacuo* of the material left after sepg.  $\alpha$ - and  $\beta$ -C<sub>10</sub>H<sub>7</sub>CH<sub>2</sub>Ph from the condensation of PhCH<sub>2</sub>Cl with C<sub>10</sub>H<sub>8</sub> by AlCl<sub>3</sub>. I, colorless needles, m. 146.5°; II, fine needles, m. 88°; III, gleaming leaflets, m. 132°. I is obtained in best yields by condensing PhCH<sub>2</sub>Cl with  $\alpha$ -C<sub>10</sub>H<sub>7</sub>CH<sub>2</sub>Ph by AlCl<sub>3</sub>. Oxidation to 1,8-C<sub>10</sub>H<sub>6</sub>Bz<sub>2</sub> proves I to have been 1,8-dibenzyl-naphthalene. I gives with difficulty a NO<sub>2</sub> deriv., m. 141°, and can be sulfonated by ClSO<sub>3</sub>H. Both substitutions appear to be in the 4-position. II forms a picrate, orange needles, m. 107°. The constitution of II and III has not been established. C. H. PEET

The Goldschmiedt condensation products of 2,3-hydroxynaphthoic acid with aromatic aldehydes and their relation to the triphenylmethane group. MARIUS REBEK AND VINKO KRAMARŠIČ. Univ. Ljubljana. *Ber.* 62B, 477-87 (1929).—On the assumption that the color of 2,3-C<sub>10</sub>H<sub>6</sub>(OH)CO<sub>2</sub>Me (I) is due to a chromophoric group and that I can exist in equil. with a ketonic form (II), Goldschmiedt and his associates treated it with aromatic aldehydes in the presence of halogen acids and obtained condensation products of the type III (R = Ph, *p*-MeC<sub>6</sub>H<sub>4</sub>, *p*-MeOC<sub>6</sub>H<sub>4</sub>, *p*- and *m*-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub> and *p*-OHCC<sub>6</sub>H<sub>4</sub>). The products crystallize well and HBr is a more effective condensing agent than HCl. Their yellow color and positive FeCl<sub>3</sub> reaction point to a keto-enol equil. similar to that of the I itself. In the compds. with R = Ph, MeC<sub>6</sub>H<sub>4</sub> and MeOC<sub>6</sub>H<sub>4</sub> the halogen is very reactive; mere heating in C<sub>6</sub>H<sub>6</sub> or Me<sub>2</sub>CO with HO compds or NH<sub>3</sub> derivs. gives the corresponding ethers or imides. On adding the reagent the light yellow soln. always deepens in color but this soon disappears. Quite evidently there are here analogies with Ph<sub>3</sub>CH derivs. The reactivity of the halogen atom in the III decreases with the substituent R in the order OMe, Me, H, *m*-NO<sub>2</sub>, *p*-CHO, *p*-NO<sub>2</sub> (the position of the CHO group in this series is uncertain). The object of the present work was to define the position of the NH<sub>2</sub> group in this series, to isolate, if possible, any intermediate products which might be formed in the replacement of the halogen, to bring the Ph<sub>3</sub>CH derivs. into the scope of the investigation and to det. if the deepening of the color during the substitution of the halogen is due to the transient formation of free radicals or colored addn. products. With *p*-Me<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>CHO and I was obtained *Me* 1-[*p*-dimethylamino- $\alpha$ -chlorobenzyl]-2-hydroxy-3-naphthoate-HCl (IV), which is exceedingly sensitive to moisture and seps. from abs. Et<sub>2</sub>O in a HCl atm. in cm.-long needles falling to a fine powder when washed with Et<sub>2</sub>O. It can not be recrystd. and must therefore be prepd. from absolutely pure materials in the purest Et<sub>2</sub>O, repeatedly washed with dry Et<sub>2</sub>O and freed from the condensing agent and solvent by passing dry air over it and letting it stand *in vacuo* over CaO and paraffin. The Cl is unusually reactive and on short standing in the air the IV becomes red and deliquesces. By cautious addn. of the reagents, oxonium and NH<sub>4</sub> salts, characterized by greater or lesser stability, were obtained. Expts. with Ph<sub>3</sub>CH derivs. along this line gave no definite results. The formation of Cl-contg. crystals was observed but analyses immediately after filtering, washing and drying gave Cl values far too low; apparently an oxonium salt is formed but it loses HCl so readily that it cannot be analyzed. Helferich and his associates describe a stable "triphenylcarbinol hydrochloride," first observed in the replacement of a H atom of glucose by the Ph<sub>3</sub>C residue and later obtained from Ph<sub>3</sub>CCl with H<sub>2</sub>O in C<sub>6</sub>H<sub>6</sub>N and from Ph<sub>3</sub>COH and HCl in C<sub>6</sub>H<sub>5</sub>N. R. and K. confirmed their results but think the product is really *triphenylpyridinium chloride*, for it is also formed from Ph<sub>3</sub>CCl and abs. C<sub>6</sub>H<sub>5</sub>N alone and also from Ph<sub>3</sub>CCl and 1 mol. C<sub>6</sub>H<sub>5</sub>N in CHCl<sub>3</sub>. It can be recrystd. unchanged from Ac<sub>2</sub>O, gives C<sub>6</sub>H<sub>5</sub>N with KOH and has the compn. C<sub>24</sub>H<sub>20</sub>NCl (found Cl, 9.69-10.56%). Attempts to isolate intermediate products in the replacement of the halogen in the III by means of org. bases were unsuccessful; only addn. products were formed and since all of these, insofar as they were isolated, were light colored, the deepening in color during the reaction cannot be ascribed to them. The halogen-free dimers (V and VI) corresponding to the III with R = Ph and *p*-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>, which were obtained in cryst. form and in good yield, proved to be sensitive to HO-contg. solvents. In the prepn. of V with "Naturkupper C" hardly any change in color could be noted; in prepg. VI there did occur such a change but the VI itself is more deeply colored than the original III. On the other hand, with pptd., not further purified Cu or ordinary Zn dust, there was considerable deepening in color during the reaction. The cause of the bathochromism is, therefore, not the formation of either colored addn. products or free radicals.

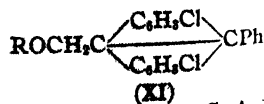
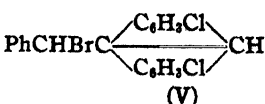
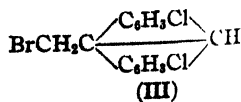
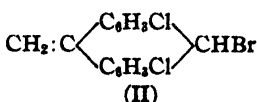
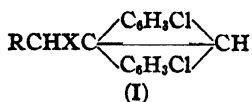
Basic constituents seem to play a role, insofar as they favor the keto form of the compds. IV, light yellow, reddens on heating and decomps. above  $200^{\circ}$ , sol. in  $H_2O$  with ruby-red color disappearing on diln. (with deposition of white flocks), partly sol. in dil. alkalis with dirty blue color, sol. in concd.  $H_2SO_4$  with ruby-red color changed to emerald green by 1 drop of  $HNO_3$ , in  $AcOH-H_2SO_4$  with blood-red color discharged by 3-4 parts alc., insol. in but changed to a dirty red by  $SnCl_4$ , sol. in  $Me_2CO$  with reddish color, in  $CHCl_3$  without color, in  $Ac_2O$  with light ruby-red color deepening on warming and paling out on cooling, in  $PhNO_2$  with pink color changing to violet on heating and to intense green with strong fluorescence on again cooling, in  $C_6H_5N$  with light violet-red color becoming intensely violet-red on heating and pale yellow on cooling; addn. of  $H_2O$  to the fresh  $C_6H_5N$  soln. produces an ultramarine-blue color stable for some hrs.  $PhOH$  dissolves IV with red,  $MeOH$  momentarily with ruby-red color, the soln. rapidly becoming colorless and depositing crystals of the Me ether. Attempts to prep. the dye salt  $CINMe_2:C_6H_4:CHC_{10}H_5(OH)CO_2Me$  were unsuccessful; heating in  $H$  or  $CO_2$  gave non-homogeneous products. Me 1-[p-dimethylamino- $\alpha$ -hydroxybenzyl]-2-hydroxy-3-naphthoate (VII), from IV in  $Me_2CO$  with  $H_2O$  and then  $NaHCO_3$ , greenish yellow, begins to become discolored about  $140^{\circ}$ , m.  $152-4^{\circ}$ , sol. in hot dil.  $HCl$  with pink color, in concd.  $H_2SO_4$  like IV, in hot  $AcOH$  with ruby color paling on cooling, in hot  $HClO_4$  with crimson color and forming an intensely pink ppt. on cooling, in hot  $Et_2O$  without color, likewise in hot and cold  $Me_2CO$  and  $CHCl_3$ , in cold  $Ac_2O$  with light yellow color suddenly turning to crimson on boiling and again suddenly paling on cooling, in cold  $C_6H_5N$  with yellow color changing to reddish violet on boiling and to bluish and then colorless on adding  $H_2O$ , in  $PhOH$  without color change but becoming light blue on warming and pink on boiling and blue again on cooling, in  $MeOH$  without color change and turned transiently reddish by  $HCl$ ; picrate, dark yellow; *HCl salt*, from IV in  $Me_2CO$  with a few drops of  $H_2O$ , yellow, m.  $173-5^{\circ}$ , sol. in hot  $H_2O$  with red, in cold  $C_6H_5N$  with yellow color becoming crimson on heating and paling out on cooling, in  $PhOH$  with violet-red color; Me ether, from IV shaken with  $MeOH$ , then taken up in  $Me_2CO$  and treated with aq.  $NaHCO_3$ , faintly yellow, m. around  $190^{\circ}$ , shows halochromism like IV, sol. in  $PhOH$  with bluish color becoming more intense and then disappearing on warming; continued heating produces a pink color changing to blue on cooling. Methylxonium chloride,  $ClH.NMe_2C_6H_4CH(OMe.HCl)C_{10}H_5(OH)CO_2Me$ , of VII. *HCl*, from IV shaken with  $MeOH-C_6H_6$ , pearly crystals with 1 mol.  $C_6H_6$ , m. around  $82^{\circ}$  (decompn.), obtained solvent-free in yellow leaflets, m.  $155-60^{\circ}$  (decompn.), by treating IV with  $MeOH$  alone and crystg. the product from  $C_6H_6$ ; it slowly loses  $HCl$  in the air. *HCl salt* of the Me ether, from IV shaken with dry  $MeOH$  until crystal begins, then treated with  $Me_2CO$  and slowly with  $H_2O$  until the red color first produced has definitely disappeared, m.  $155-60^{\circ}$  (decompn.). Me 1-benzyl-2-hydroxy-3-naphthoate methylxonium chloride, from III ( $R = Ph$ ) with  $MeOH-CHCl_3$ , yellow, m.  $160^{\circ}$ , loses all its  $HCl$  in 3 weeks. The  $C_6H_5N$  addn. product of III ( $R = Ph$ ) has now been obtained in cryst. form (faintly yellow) from the III in  $CHCl_3$  with dry  $C_6H_5N$  and  $C_6H_6$ .  $PhNH_2$  compd., now obtained directly from III with (dild.)  $PhNH_2$  at a low temp., m.  $179^{\circ}$ . V, obtained in 70% yield when O and moisture are excluded, pale yellow, m.  $223-4^{\circ}$ .  $\alpha,\beta$ -Bis[p-nitrophenyl]bis[Me 2-hydroxy-3-naphthoate]ethane (VI), intensely orange, more labile than V, begins to m.  $185^{\circ}$ , m. completely  $195^{\circ}$ , sol. in concd.  $H_2SO_4$  with blood-red, in  $C_6H_5N$  with orange-red color.



C. A. R.

ms Alkylanthracenes and "transannular tautomerism." V. EDWARD DE B. BARNETT AND NORMAN F. GOODWAY. Sir John Cass Tech. Inst., London. *Ber.* 62B, 423 314 (1929); cf. *C. A.* 22, 1772.—Br forms with 1,5-dichloro-9-alkylanthracenes Br derivs in which the Br atom is extraordinarily reactive; replacement of this Br atom by HO, RO or AcO gives "colorless" compds. which soon change into "yellow" fluorescent isomers which were definitely proved to have the structure I. It was suggested that the Br atom is mobile and that the Br compd. of the 9-Me deriv., e. g., is a tautomeric mixt. of II and III; the "colorless" compds. would then have the alkylidene structure II; this conception was further developed by Cook (*C. A.* 22, 587), but B. and Matthews, believing the exptl. data were not sufficient to justify a migration of groups involved in C.'s views, suggested, with reservations, an endocyclic structure, the Br compd. of the 9-benzyl deriv. being considered a tautomeric mixt. of IV and V,

and the "colorless" compds. having the structure IV. If this were true 1-chloro-9- and -10-benzylantracenes should give the same compd. IV, but an attempt by Cook to settle this point proved indecisive (*C. A.* 23, 1407), although the results favored the alkylidene rather than the endocyclic structure. The problem was then attacked by taking a compd., 1,5-dichloro-9-phenyl-9-bromoanthrone (VI), which does not contain the mobile H atom necessary for the  $IV \rightleftharpoons V$  tautomerism. VI with MeOH and EtOH and  $\text{CaCO}_3$  gave the corresponding 9-MeO- (VII) and 9-EtO derivs. (VIII), which with MeMgI yielded the dihydroanthraquinol derivs.  $\text{HOCMe}(\text{C}_6\text{H}_5\text{Cl})_2\text{CPhOR}$  (IX, R = Me, and X, R = Et). These proved to be unexpectedly stable and the corresponding alkylidene compds.,  $\text{CH}_2:\text{C}(\text{C}_6\text{H}_5\text{Cl})_2\text{CPhOR}$ , could not be isolated, but both IX and X on heating with MeOH and EtOH contg. some HCl gave greenish substances with yellow fluorescence which were beyond doubt the  $\omega$ -alkoxy derivs. XI, showing decisively the possibility of a transannular migration of alkoxy groups. Furthermore, IX heated with EtOH contg. HCl gave the same XI (R = Et) as X. In these compds. the transannular migration occurs much less readily than in the non-phenylated derivs.; with 1,5-dichloro-9-methylantracene it is generally impossible to isolate the "colorless" compd. because of the ease with which it rearranges into the "yellow" isomer, whereas, although both IX and X are converted into the "yellow" XI (R = Et) in boiling HCl-EtOH, in MeOH the change into XI (R = Me) can be effected only in sealed tubes at 100°. IX in boiling HCl-MeOH also doubtless undergoes a change but into a colorless isomer which has not yet been thoroughly studied and is probably a geometrical isomer of the *cis-trans*-type or of the kind described by Schlenk and Bergmann (*C. A.* 22, 4495). Although these results indicate that a transannular migration is possible it would be desirable to obtain decisive proof of the alkylidene structure of the colorless compds. obtained from 1,5-dichloro-9-benzylantracene. Although this has not as yet been entirely possible it has been found that both 1,5-dichloro-9-ethoxy- and -9-benzoyloxyanthrone are dealkylated by  $\text{PhCH}_2\text{MgCl}$  and the resulting oils give in AcOH with concd. aq. HCl at room temp. a *tri-Cl* compd. (XII) which must have the structure  $\text{CHCl}(\text{C}_6\text{H}_5\text{Cl})_2\text{C}(\text{CH}_2\text{Ph})\text{OH}$ , for it forms a *piperidine* compd.  $\text{C}_8\text{H}_{10}\text{NCH}(\text{C}_6\text{H}_5\text{Cl})_2\text{C}(\text{CH}_2\text{Ph})\text{OH}$  (XIII) identical with that obtained from  $\text{PhCH}_2\text{MgCl}$  and  $\text{C}_8\text{H}_{10}\text{NCH}(\text{C}_6\text{H}_5\text{Cl})_2\text{CO}$ . XIII, boiled with dil. aq. HCl, loses 1 mol.  $\text{H}_2\text{O}$  and forms a colorless compd. (XIV) to which must be assigned the alkylidene structure; it is, however, not identical with that obtained from bromo-1,5-dichloro-9-benzylantracene and is probably a geometrical isomer of the latter. As was to be expected, the *ms-Cl* atom in XII is very reactive; boiling MeOH and  $\text{CaCO}_3$  give the 10-MeO deriv. (XV) and  $\text{H}_2\text{O}$  in  $\text{Me}_2\text{CO}$  the HO deriv. (XVI), attempts to prep. the alkylidene compds. from XII, XV and XVI yielded only resinous substances. VII, m. 213°. VIII, m. 150°. 1,5-Dichloro-9-methyl-10-phenyl-9-hydroxy-10-methoxy-9,10-dihydroanthracene (IX), m. 215°, gives with boiling MeOH contg. HCl an isomer, m. 191°, sepp. from MeOH and  $\text{Me}_2\text{CO}$  with 0.5 mol. solvent. 1-EtO homolog (X), m. 205°. 1,5-Dichloro-9-methyl-10-phenyl- $\omega$ -methoxyanthracene (XI, R = Me), greenish yellow, m. 154°.  $\omega$ -EtO homolog (XI, R = Et), m. 124°. 1,5-Dichloro-9-benzoyloxyanthrone, from the 9-Br compd.,  $\text{PhCH}_2\text{OH}$  and  $\text{CaCO}_3$  on the  $\text{H}_2\text{O}$  bath, m. 157°. 1,5-Dichloro-9-methyl- $\omega$ -benzoyloxyanthracene, from the -Br deriv., yellow, m. 118°. 1,5,10-Trichloro-9-benzyl-9-hydroxy-9,10-dihydroanthracene (XII), m. 135° (vigorous decompn.) (once, from the ethoxyanthrone were obtained crystals, m. 144°, and having the compn. of a 1,5-dichloro-9-benzylidene-10-ethoxy-9,10-dihydroanthracene but which were different from the "colorless" compd., m. 190°, obtained from dichlorobromobenzylantracene and EtOH). The benzyloxyanthrone with MeMgI gave only 1,5-dichloroanthrone. XV, m. 144°. 1,5-Dichloro-9-benzyl-9,10-dihydroanthraquinol (XVI), m. 172°. 1,5-Dichloro-9-benzyl-9-hydroxy-10-piperidino-9,10-dihydroanthracene (XIII), m. 169°, seps. from MeOH and  $\text{Me}_2\text{CO}$  with 0.5 mol. solvent. 1,5-Dichloro-9-benzylidene-10-piperidino-9,10-dihydroanthracene (XIV), m. 194°.



C. A. R.

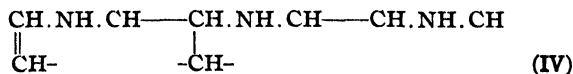
**Action of aromatic aldehydes on phenols.** O. HINSBERG. Freiburg i. B. *Ber.* 62B, 418-21(1929).—Hitherto the reaction of aromatic aldehydes on phenols in the presence of condensing agents has been found almost without exception to give  $\text{Ph}_3\text{CH}$  derivs. by elimination of 1 mol.  $\text{H}_2\text{O}$  from 2 mols. phenol and 1 of aldehyde. By heating equiv. quantities of the phenol and aldehyde in the presence of acids ( $\text{AcOH}\cdot\text{HCl}$ ) under pressure, however, the reaction can be made to follow another course, giving what are probably 9,10-diphenyl-9,10-dihydroanthracenes. Thus, 10 g.  $\text{PhOH}$  and 12 g.  $\text{BzH}$ , heated 6 hrs. in a sealed tube on the  $\text{H}_2\text{O}$  bath in 40 cc. concd.  $\text{HCl}$  and 50 cc.  $\text{AcOH}$ , then boiled with  $\text{Ac}_2\text{O}$  and a little  $\text{Zn}$  dust, yield a product, m.  $202^\circ$ , which is probably a mixt. (I) of 2,7- and 2,6-bisacetyloxy-9,10-diphenyl-9,10-dihydroanthracene, readily sapond. by hot alc.  $\text{KOH}$  to the mixt. of 2,7- and 2,6-di-*HO* compds., darkens and sinters about  $250^\circ$ , also darkens readily on standing in the air or on recrystn. 2,7- and 2,6-Bisacetyloxy-9,10-diphenylanthracene, from I and  $\text{K}_2\text{Cr}_2\text{O}_7\cdot\text{AcOH}$ , yellow, m.  $215-35^\circ$ , converted by alc.  $\text{KOH}$  on the  $\text{H}_2\text{O}$  bath into 2,7- and 2,6-dihydroxy-9,10-diphenylanthracene hydrate,  $\text{C}_{22}\text{H}_{20}\text{O}_8$ , yellow-red cryst. powder with 1  $\text{H}_2\text{O}$ , melts with decompn. at a high temp., forms with concd.  $\text{HCl}$  a red *HCl* salt, dissolves in alkalis with the intense violet color of the benzaurins. In the same way from *p*-cresol and *p*- $\text{O}_2\text{NC}_6\text{H}_4\text{CHO}$  is obtained 1,8 (and 1,5)-dimethyl-4,5 (and 4,8)-dihydroxy-9,10-bis-*p*-nitrophenyl-9,10-dihydroanthracene, faintly yellow, m. above  $270^\circ$ . C. A. R.

**Perylene and its derivatives.** XXII. ALOIS ZINKE AND NORBERT SCHNIDER-SCHITSCH. Univ. Graz. *Monatsh.* 51, 280-4(1929); cf. C. A. 23, 2436.—Catalytic reduction of perylene ( $\text{Pd}$  on  $\text{C}$ ) gives an octahydro deriv., m.  $159-61^\circ$ , and some hexahydro deriv., m.  $189^\circ$ . 3,10-Perylenequinone gives hexahydroperylene-3,10-diol, grayish brown, m.  $298-300^\circ$ ;  $\text{H}_2\text{SO}_4$  gives a violet-red color without soln.; warming changes the color to an emerald-green, then olive and violet to a red; di-*Ac* deriv., m.  $342-3^\circ$ . 1,12-Perylenequinone gives the corresponding 1,12-diol, m. about  $260^\circ$ ;  $\text{H}_2\text{SO}_4$  gives an orange-red soln.; di-*Ac* deriv., m.  $192-4^\circ$ . 3,9-Perylenequinone did not give a homogeneous reduction product. C. J. WEST

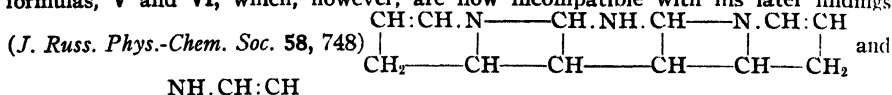
**Polymerization of pyrrole under the influence of glycols.** A. K. PLISOV. *Ukrainskii Khim. Zhurnal* 3, Sci. Pt. 471-5(1928).—This study was undertaken to learn the relation of pyrrole (I) to ethylene hydroxide,  $\text{CH}_2\text{:CHOH}$ , and in general the interaction between I and its derivs. and  $\alpha$ -hydroxides (II) in connection with the amphoteric nature of the H in the NH group of the I. Such an interaction produced no combination between I and II, nor an isomerization of the II to aldehydes and ketones under the action of the acid character of I, as could be expected, the I having been converted to tripyrrole (III). Hitherto the polymerization of I has been successful with  $\text{HCl}$ . The heating of I with II in sealed tubes may result in formation of several reaction products, and, therefore, it was of interest to inquire whether the polymerization of I is caused by the presence of  $\text{H}_2\text{O}$ , high temp., hydroxide or products of its conversion, such as aldehydes, ketones and glycols, and it was demonstrated that on heating of I with II in the presence of  $\text{H}_2\text{O}$  there are formed glycols, which cause the polymerization of I. When 13.5 g. of I and 10 g. of II in 10 g. of  $\text{H}_2\text{O}$  are heated in a sealed tube for 10-12 hrs. in a water bath, there is obtained a reaction mass with an onion-like odor consisting of 2 layers. The upper layer is unchanged I; the lower layer was satd. with  $\text{K}_2\text{CO}_3$  whereby a new layer of dark brown color was formed, which was dried with calcined  $\text{K}_2\text{CO}_3$ . The aq.  $\text{K}_2\text{CO}_3$  soln. on distn. under reduced pressure produced a glycol, while the brown layer on fractionation under 85 mm. results in about 4 g. of I at  $102-156^\circ$ , and 7 g. of a heavy yellow liquid at  $156-185^\circ$  sol. in  $\text{H}_2\text{O}$ , alc. and  $\text{Et}_2\text{O}$ , with a strong onion-like odor, which on standing becomes rose colored and resinsified. The  $\text{HCl}$  salt is slowly formed on satn. of the base with  $\text{HCl}$  gas. In the analysis the figures obtained were between 19.5% and 20.6%, while the theory for  $\text{C}_4\text{H}_5\text{N}$  requires 20.8%. The product has all the properties of III; on heating with an alc. lamp there is liberated  $\text{NH}_3$ , and on heating to  $310-20^\circ$  some  $\text{NH}_3$  and an oily substance are formed, which with steam gives I and crystals of indole, m.  $52^\circ$ . When 5 g. of I and 5 g. of ethylene hydroxide  $\text{CH}_2\text{:CHOH}$  are heated in a sealed tube for 20 hrs. in a water bath, the I remains unchanged, and no aldehyde is formed, consequently the  $\text{CH}_2\text{:CHOH}$  is not capable of isomerization to an aldehyde in the presence of I, while I does not polymerize under the influence of the  $\text{CH}_2\text{:CHOH}$ . The heating of I with  $\text{H}_2\text{O}$  at various temps. up to  $150^\circ$  in sealed tubes caused no change of I. The product obtained by heating 7 g. of I with 5 g. of glycol dried with calcined  $\text{K}_2\text{CO}_3$  and twice distd. in a sealed tube for 6-8 hrs. in a water bath, gave on fractionation the same III as was previously prepd. by heating  $\text{CH}_2\text{:CHOH}$  with I in presence of  $\text{H}_2\text{O}$ . Consequently  $(\text{CH}_2\text{OH})_2$  is capable of polymerizing I to III, and, therefore, on heating aq.  $\text{CH}_2\text{:CHOH}$  with I, the polymerization of I is caused by the glycol formed from the

$\text{CH}_2\text{:CHOH}$ . When 10 g. of  $\text{CMe}_2\text{:CMeOH}$  with 10–11 g. of I and 10 cc. of  $\text{H}_2\text{O}$  are heated in a sealed tube for 10–12 hrs. in a water bath, and the reaction mass is treated as described above, there is formed only a very small amt. of III. The inferior polymerizing influence of  $\text{CMe}_2\text{:CMeOH}$  as compared with that of  $\text{CH}_2\text{:CHOH}$  is possibly due to less mobility of H of the OH group and the resulting minor ability of forming glycols, i. e., the properties of the H of  $(\text{CH}_2\text{OH})_2$  are nearer to those of the acid character, and consequently its polymerizing action will be greater. CHAS. BLANC

**Polymerization of pyrrole.** A. K. PLISOV. *Ukrainskii Khim. Zhur.* 3, Sci. Pt., 477–80 (1928).—It is known that pyrrole (I) is changed by HCl to red pyrrole (II), with the empirical formula  $\text{C}_{12}\text{H}_{14}\text{N}_2\text{O}$ . The poor soly. of II presents difficulties in detg. its structure. The elementary compn. reveals that under the action of acids the process of polymerization of pyrrole nuclei is accompanied by oxidation. The 1st intermediate product of this process is tripyrrole (III). There is some difference in the properties and the structure of III obtained by different workers. Denshtedt's III is an oily, crystallizable liquid, to which he ascribes the formula IV



Chelintzev obtained III as a cryst. substance rapidly changeable in the air, the freshly prepd. product having a low N content and also a mol. wt. of 264 instead of the theoretical of 210, which on standing for 2 days is changed to 311. He proposed the following formulas, V and VI, which, however, are now incompatible with his later findings



$\text{CH:CH.N} \text{---} \text{CH-}$        $\text{-N.CH:CH.}$  Denshtedt obtained III by treating I



with 20% HCl, neutralizing with  $\text{NH}_3$  and extg. with  $\text{Et}_2\text{O}$ . Chelintzev prepd. III either in abs.  $\text{Et}_2\text{O}$  or with better results in abs.  $\text{C}_6\text{H}_6$ . When 13.5 g. of I in 350 cc. of  $\text{C}_6\text{H}_6$  was treated with gaseous HCl and the III was set free with  $\text{NH}_3$ , there were formed 2 forms of III, one cryst. and the other amorphous. P.'s studies of the action of di-, tri- and polybasic alcs. on I revealed that it is capable of polymerisation on heating with liquid alcs. The I when heated 6–8 hrs. on the water bath with a small quantity of  $(\text{CH}_2\text{OH})_2$  undergoes a partial polymerization (preceeding abstr.), a reaction which proceeds more readily with glycerol. When 5 g. of glycerol freed from acid impurities by distn. and 8 g. of I are heated to boiling for 30 mins., there is observed the presence of a condensation product of I. If I is polymerized only by the acid properties of the alcs., then the more rapid action with glycerol than with  $(\text{CH}_2\text{OH})_2$  is explained by the more acid character of the former. The heating of I with solid alcs., such as mannitol and erythritol, produces no changes. AcH evidently combines with I on heating in a sealed tube as the entire mass is converted into a dark brown, gum-like substance sol. only in concd. AcOH with red color. Perhaps this substance is a product of polymerization. No polymerization was obtained by heating I with glucose; however, a probable product of combination of the two, which, after crystn. from pyridine, m.  $190^\circ$ , was isolated. CHAS. BLANC

**The secondary valence forces of indole nitrogen.** O. SCHMITZ-DUMONT and E. MORZKUS. Univ. Bonn. *Ber.* 62B, 466–73 (1929).—In continuation of the study of the additive power of pyrrole N (*C. A.* 23, 2968) the additive power of some derivs. of indole (I) has been investigated, chiefly with  $\text{SnCl}_4$  and  $\text{SnBr}_4$ , and also in some cases with  $\text{TiCl}_4$  and  $\text{AlBr}_3$ . I itself behaves entirely differently from pyrrole with  $\text{SnCl}_4$ , giving the normal compd.  $\text{SnCl}_4 \cdot 2\text{I}$ , from which it can be recovered almost completely. The product has a blue-green color. In the reaction there is first formed a yellow ppt. which, however, soon assumes the blue-green color. The same results were obtained in the most varied solvents and at temps. as low as  $-60^\circ$ . The color, nevertheless, is due to the formation of an intensely blue by-product. The formation of this stable  $\text{SnCl}_4$  product is evidence of the greater additive power of the indole as compared with that of the pyrrole N, but it is not yet sufficient to form stable products with the more weakly additive  $\text{SnBr}_4$ . With  $\text{TiCl}_4$  and  $\text{AlBr}_3$ , however, I forms the normal compds.  $\text{TiCl}_4 \cdot 2\text{I}$  and  $\text{AlBr}_3 \cdot \text{I}$ , from both of which it can be recovered unchanged. While the  $\text{AlBr}_3$  compd. is an almost white cryst. powder, the  $\text{TiCl}_4$  deriv. is deep violet.

It is improbable that the color can be explained in the same way as that of the  $\text{SnCl}_4$  compd., nor can it be due to reduction to tervalent Ti, for aq. alkalis at once form white  $\text{Ti}(\text{OH})_3$ . Polymerization greatly increases the additive power of the indole as well as of the pyrrole N. Triindole (II) forms the compds.  $\text{SnCl}_4 \cdot 2\text{II}$ ,  $\text{SnBr}_4 \cdot 2\text{II}$ ,  $\text{TiCl}_4 \cdot 2\text{II}$  and  $\text{AlBr}_3 \cdot 2\text{II}$ , and, under certain conditions,  $\text{SnCl}_4 \cdot 2\text{II}$ , the Al compd. being colorless, the Sn derivs. faintly yellow and the Ti compd. deep violet-black. Substitution of the imido H atom by Me does not increase the additive power of the N but rather decreases it; under the same conditions as with I, *N*-methylindole (III) forms with  $\text{SnCl}_4$  no normal addn. product from which it can be recovered.  $\text{AlBr}_3$  does, however, form the normal compd.  $\text{AlBr}_3 \cdot \text{III}$ .  $\alpha$ -Methylindole (IV), surprisingly, does not form a normal product with  $\text{SnCl}_4$  but yields the compds.  $\text{C}_9\text{H}_7\text{NSnCl}_3$  and  $\text{SnCl}_3\text{H} \cdot 2\text{IV}$ . The former with aq.  $\text{NH}_3$  at once regenerates pure IV and hence there is no doubt that the imido H atom is substituted by Sn, while the latter gives up all its Sn to  $\text{C}_9\text{H}_7\text{N}$  as  $\text{SnCl}_4 \cdot 2\text{C}_9\text{H}_7\text{N}$ , showing that it is a pure addn. compd. The reaction may be represented as follows:  $\text{IV} + \text{SnCl}_4 = \text{C}_9\text{H}_7\text{NSnCl}_3 + \text{HCl}$ ;  $\text{IV} + \text{HCl} = \text{IV} \cdot \text{HCl}$ ;  $\text{IV} \cdot \text{HCl} + \text{IV} + \text{SnCl}_4 = \text{IV} \cdot \text{SnCl}_3\text{H} \cdot \text{IV}$ . Bis-[ $\alpha$ -methylindyl]methene (V) reacts like dipyrromethene with  $\text{SnCl}_4$ , giving the compd.  $\text{SnCl}_4 \cdot \text{V}$ , although the two N atoms in V are different; no compd. with  $\text{SnBr}_4$  could be obtained. Bis-[ $\alpha$ -methylindyl]dimethylmethane treated in  $\text{CHCl}_3$  with  $\text{SnCl}_4$  and freed *in vacuo* of the  $\text{CHCl}_3$  and excess of  $\text{SnCl}_4$  yielded an orange product contg. the components in the ratio 1:1, but which did not regenerate the original methane; attempts to isolate the addn. product by immediate pptn. with ligroin gave chiefly the unchanged methane.  $\text{SnCl}_4 \cdot 2\text{I}$ , begins to soften  $133^\circ$ , m.  $153^\circ$  (decompn.).  $\text{AlBr}_3 \cdot \text{I}$ , begins to m.  $130^\circ$ , m. completely  $140^\circ$ .  $\text{SnCl}_4 \cdot \text{II}$ , m.  $166-8^\circ$ .  $\text{SnCl}_4 \cdot 2\text{II}$ , softens  $130^\circ$ , m. around  $150^\circ$ .  $\text{SnBr}_4 \cdot 2\text{II}$ , m.  $120-33^\circ$  (decompn.).  $\text{C}_9\text{H}_7\text{NSnCl}_3$ , m.  $149^\circ$ .  $\text{SnCl}_3\text{H} \cdot 2\text{IV}$ , m.  $207^\circ$ .  $\text{SnCl}_4 \cdot \text{V}$ , m.  $201^\circ$ , orange-red. C. A. R.

*N*-Arylisatins and isomeric acridine-meso-carboxylic acids. JOSEPH MARTINET AND ANDRÉ DANSETTE. *Bull. soc. chim.* 45, 101-9 (1929).—The synthesis of 1-phenyl-4,5-benzoisatin (*N*-phenyl- $\beta$ -naphthosatin) (I) by condensation of  $\beta$ - $\text{C}_{10}\text{H}_7\text{NHPH}$  (II), m.  $108^\circ$ , and Et mesoxalate followed by alkaline sapon., decarboxylation and air oxidation showed that this reaction could be carried to I or to benzacridine-meso-carboxylic acid (III) at will. The initial condensation goes readily by heating II with  $\text{CO}(\text{CO}_2\text{Et})_2$  at  $180^\circ$  for 20 mins. or by boiling their soln. in AcOH, forming the Et 1-phenylbenzo-4,5-dioxindole-3-carboxylate (IV), m.  $171^\circ$ ; Ac deriv., m.  $177^\circ$ . 1-Phenylbenzo-4,5-dioxindole (V), microscopic, felted needles, m.  $95-102^\circ$ ; Ac deriv., m.  $150^\circ$ , was obtained by sapon. of IV in absence of air followed by acidification and by reduction of I by  $\text{Na}_2\text{S}_2\text{O}_4$ . Oxidation of V by air in alk. medium or alk. sapon. of IV in presence of air readily gave I, red needles, m.  $227^\circ$ . The Na salt of phenylamino-2-naphthyl-1-glyoxylic acid (VI) first results and this is immediately converted into I on acidification. I forms a characteristic phenylhydrazone, orange, m.  $195^\circ$ . The Ba, Cu and Pb salts of I are unstable. The K salt with 3 mols.  $\text{H}_2\text{O}$  of crystn. is more stable. VI left in alkalis too long (especially hot) is transformed into benzo-1,2-acridine-9-carboxylic acid (VII). VII is prepd. by boiling IV with 10% KOH and it forms many stable metallic salts. VII heated with soda-lime yielded benzoacridine (also called naphthacridine and  $\beta$ -chrysidine), m.  $126-31^\circ$ . C. H. PEET

Separation of carbazole from crude anthracene. B. V. MAKOROV. *J. Chem. Ind. (Moscow)* 6, 41-5 (1929).—Numerous expts. were made to verify the methods of the Ger. patents 393,693 and 386,597. The conclusions are: The HCHO method gives satisfactory results, provided anthracene is preliminarily freed from phenanthrene and other impurities by washing with xylene. The anthracene obtained is not completely N-free, in spite of the numerous treatments with HCHO. A single treatment with a mixt. of 150 parts EtOH, 15 parts 40% HCHO and 3 parts  $\text{Na}_2\text{CO}_3$  per 50 parts crude anthracene contg. 20% carbazole is not sufficient, 2-3 such treatments are required; moreover, larger quantities of HCHO must be used when operating with anthracenes rich in carbazole. When the HCHO mixt. contains an excess of  $\text{Na}_2\text{CO}_3$ , and the heating is prolonged, the results are bad. Anthracenes previously treated by KOH cannot be freed from N compds. by the HCHO method. The treatment of anthracenes by KOH should be carried out without access of air and at as low a temp. and for as short a time as possible. Instead of repeatedly treating anthracene by the HCHO mixt., the former can be extd. by the HCHO mixt. in a Soxhlet apparatus, in which case EtOH may be replaced by its 30-40% aqueous soln., whereas caustic and carbonated alkalis can be replaced by lime. Each expt. is described in detail. BERNARD NELSON

Carbazole derivatives. I. F. KEHRMANN AND FRIEDRICH ZWEIFEL. *Helv.*

*Chim. Acta* 11, 1213-9(1928).—From the nitro derivs. of carbazole by reduction, acylation, and substitution numerous compds. of technical significance have been produced. This report deals with 3-nitrocarbazole (I), where the nitro group is *p*- to the ring N. I was prepd. by methods reported earlier. By alc.  $\text{SnCl}_4$  and  $\text{HCl}$ , I was reduced and treatment with  $\text{Ac}_2\text{O}$  gave, from alc., colorless crystals of 3-acetamidocarbazole (II), m. 217°. II with 5 times its wt. of  $\text{Ac}_2\text{O}$  and  $\text{ZnCl}_2$  yielded, on addn. of  $\text{H}_2\text{O}$ , a yellow-white mixt. of di- (III) triacetyl-3-aminocarbazole (IV). This mixt. was warmed with  $\text{HOAc}$  and nitrated with a mixt. of equal parts of  $\text{HNO}_3$  and  $\text{HOAc}$ . The soln. slowly deposited greenish yellow prismatic crystals of the almost pure  $\alpha$ -nitrodiacetyl-3-aminocarbazole (V), m. 226°. The  $\beta$ -isomer (VI) was not isolatable by fractional crystn., but with elimination of one of the Ac groups, the 2 resulting isomeric forms were separable. By not too long warming with concd. alc.  $\text{NaOH}$  V lost only the Ac group attached to the ring N and  $\alpha$ -nitro-3-acetamidocarbazole (VII) was formed, bright red needles, m. 274°. Warming VII with sufficient 1:1 alc.  $\text{H}_2\text{SO}_4$  to produce soln. gave a cryst., yellow-brown sulfate (VIII), which, with  $\text{NH}_3$ , gave from alc. dark violet needles, m. 233°, of  $\alpha$ -nitro-3-aminocarbazole (IX).  $\alpha$ -o-Diaminocarbazole (X) resulted as the Sn double salt by warming IX with  $\text{HCl}$ ,  $\text{SnCl}_4$ , and Sn until soln. took place, and could be isolated by ether extn. of its alk. soln. as colorless crystals which decompd. on heating and quickly oxidized in air. Without isolating X its Sn-free soln. gave with benzil in alc. on gentle warming at 100° the  $\alpha$ -quinoxaline deriv. (XI), citron-yellow, m. 273°. XI was isolated by making alk. with  $\text{NH}_3$  the concd. alc. soln. of the  $\text{HCl}$  salt and adding  $\text{H}_2\text{O}$  drop by drop. The mixt. of III and IV was rubbed with alc.  $\text{NaOH}$  until the yellow particles were replaced by a red cryst. meal. VII was sepd. by filtration from the soln. of  $\beta$ -nitro-3-acetamidocarbazole (XII) and that of IX. By pptn. with  $\text{H}_2\text{O}$  and crystn. from alc., XII was obtained as red-brown needles, m. 198°. By hydrolysis with alc.  $\text{H}_2\text{SO}_4$  XII gave  $\beta$ -nitro-3-aminocarbazole (XIII), dark red-brown, m. 177°. Exactly as IX gave X so XIII gave  $\beta$ -o-diaminocarbazole (XIV), colorless, insol. in  $\text{H}_2\text{O}$ , and readily oxidized in the air. XIV gave with benzil a bright yellow quinoxaline deriv. (XV), m. 261°. XV differs from XI in yielding a cryst. orange-red perchlorate (XVI) by the direct action of  $\text{HClO}_4$  on the soln. in which condensation has taken place, and in readily giving a green-blue color, changing to violet, with concd.  $\text{H}_2\text{SO}_4$  as a water-sol. sulfonic acid is formed, whereas XI is only slowly altered with  $\text{H}_2\text{SO}_4$ . The location of the second N-contg. group in the substituted phenyl is at 2 or 4, but as yet in which series, the  $\alpha$  or the  $\beta$ , it is at 2, and in which at 4 has not been detd.

G. ALBERT HILL

Three isomeric 1-tolyl-3,5-dimethyl-1,2,4-triazoles and several of their salts. FRANZ HERNLER. Univ. Innsbruck. *Monatsh.* 51, 267-76(1929).—Mol. quantities of *o*- $\text{MeC}_6\text{H}_4\text{NHNH}_2$ ,  $\text{HCl}$ ,  $\text{Ac}_2\text{NH}$  and  $\text{AcONa}$  give 48% of 1-*o*-tolyl-3,5-dimethyl-1,2,4-triazole (I), m. 24.5°, solidifies 28.25°;  $\text{HCl}$  salt, m. 214-6°; picrate, yellow, m. 192-3°; chloroplatinate, yellow, m. 158-62°; mercurichloride, m. 136-7°. The *m*-isomer corresponding to I (58% yield),  $b_{11}$  147-9°;  $\text{HCl}$  salt, m. 206-7°; picrate, yellow, m. 138-9.5°; chloroplatinate, crystg. with 2  $\text{H}_2\text{O}$ , m. 220-3°; mercurichloride, m. 181°; mercurichloride- $\text{HCl}$ , m. 215-20°. The *p*-isomer corresponding to I (30% yield),  $b_{11}$  151-5°, m. 47-9°;  $\text{HCl}$  salt, m. 233-5°; picrate, yellow, m. 128-9°; chloroplatinate, reddish brown, m. 223-5° (decompn.); mercurichloride,  $\text{C}_{11}\text{H}_{13}\text{N}_3$ ,  $\text{HgCl}_2$ , from an acid soln., m. 150-2°; from  $\text{H}_2\text{O}$  there ppts. the compd.  $(\text{C}_{11}\text{H}_{13}\text{N}_3)_4 \cdot 3\text{HgCl}_2$ , m. 144-7°.

C. J. WEST

Plant pigments. P. KARRER. *Bull. soc. chim.* 43, 1041-58(1928); cf. following abstr.—Plant pigments may be classed as those localized in the cell, and called lipochromes, and those in the cell juice, such as flavones, flavonols and anthocyanins. The latter are pyrylium salts, derived from phloroglucinol and a *p*-hydroxybenzene. In some the hydroxyls are methylated, as is shown by alk. decompn., but the 4'-OH group is always free. This is involved in the blue pigments which are quinoid compds. whereas the red ones are oxonium salts. Blue flowers yield a higher ash than the red, since the former are alkali or alk.-earth salts. Some pigments yield on hydrolysis an acid, e. g., *p*- $\text{HOC}_6\text{H}_4\text{CH}:\text{CHCO}_2\text{H}$ ; by the prepn. of methylated pigment derivs. this group is shown to be attached to a phloroglucinol hydroxyl but the particular one is not known. Thus a close relation exists between the depsides and this group of pigments. That the sugar in the anthocyanins is attached as a glucoside on carbon 3, at least in some cases, K. established by a study of hydrolyzed methylation products, with those prepd. synthetically. This conclusion was strengthened by a study of the oxidation products with  $\text{H}_2\text{O}_2$ . Three crocetins may be isolated from saffron, the  $\alpha$ - and  $\beta$ -forms are glucosides, the  $\gamma$ - a di-Me ester of the  $\alpha$ -form. Reduction to a satd. compd. shows the 16-C chain to contain 7 double bonds, which are presumably conjug-



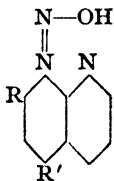
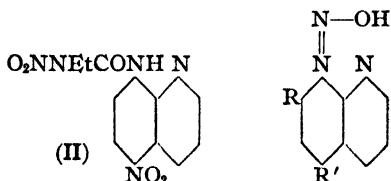
gated, and crocetin is an aliphatic, dibasic acid, with 3 methyls on the chain at carbons 4, 8 and 12. The relationship of this substance to isoprene is apparent. G. A. H.

**Plant pigments. IX (?) Crocetin and lycopin.** P. KARRER, A. HELFENSTEIN AND ROSE WIDNER. *Helv. Chim. Acta* 11, 1201-9(1928); cf. preceding abstr.—The saffron pigment,  $\alpha$ -crocetin (I), is reduced by  $\text{TiCl}_3$  in  $\text{NaOH}$  to  $\alpha$ -dihydrocrocetin,  $\text{C}_{19}\text{H}_{24}\text{O}_4$  (II), light S-yellow, m. 192-3°. By a large excess of  $\text{TiCl}_3$ , up to 40 mols. to 1, a thick honey-colored oil, *hexahydro- $\alpha$ -crocetin*,  $\text{C}_{19}\text{H}_{28}\text{O}_4$  (III) results. I with concd.  $\text{H}_2\text{SO}_4$  gives a violet-blue color, II wine-red, while III becomes brown-red. A table of color effects with different acids and salts on I, II and III is included. II, unlike I, readily adds  $\text{O}_2$  from the air until a wt. increase of 21% has occurred. The nature of the oxidized material, C 56.37%, H 6.46%, has not been established. III is much more stable than II. I is probably 4,8,12-trimethylhexadeca[2,4,5,8,10,12,14-heptane]dioic and II is 4,8,12-trimethylhexadeca[3,5,7,9,11,13-hexaene]dioic acid.  $\gamma$  Crocetin, earlier reported, has now been shown to m. 199-200° when pure. The presence of  $\text{CO}_2\text{H}$  groups favors reduction with  $\text{TiCl}_3$ ; lycopin (IV),  $\text{C}_{40}\text{H}_{58}$ , is not reduced under conditions which reduce I. Perhydrolycopin (V), previously reported, is  $\text{C}_{40}\text{H}_{58}$ , as mol. wt. detns. in  $\text{C}_6\text{H}_6$  and *p*- $\text{BrC}_6\text{H}_4\text{Me}$  indicate,  $d_4^{25}$  0.8211,  $n_D^{25}$  1.45837. The mol. refraction, 187.13, indicates that V is aliphatic. By converting dihydrophytol into its corresponding bromide,  $\text{C}_{30}\text{H}_{41}\text{Br}$ , 1-bromo-3,7,11,15-tetramethylhexadecane, b. 185-188°, is obtained. When this is treated with Na and K, 2 hydrocarbons result. One seems to be phytene,  $\text{C}_{20}\text{H}_{34}$ , b. 127°; the other  $\text{C}_{40}\text{H}_{58}$ , b. 240-2°, is 2,6,10-, 14,19,23,27,31-octamethyldotriacontane, and seems to be identical with V. G. A. H.

**The nitration of  $\alpha$ -2-pyridyl- $\beta$ -ethylurea.** R. P. DIKSHOORN. Univ. Leiden. *Rec. trav. chim.* 48, 545-7(1929).—In view of the difficult nitration of the pyridine nucleus (cf. Friedl, C. A. 6, 1294; *Monatsh.* 34, 760(1913)) it was to be expected that the nitration of  $\alpha$ -2-pyridyl- $\beta$ -ethylurea would give rise to the formation of  $\alpha$ , $\alpha$ -2-pyridylnitro- $\beta$ , $\beta$ -ethylnitrourea or  $\alpha$ -2-pyridyl- $\beta$ , $\beta$ -ethylnitrourea. It is now shown that the latter compd. is formed. On heating 2 g.  $\alpha$ -aminopyridine, 20 cc. dry ether and 15 cc.  $\text{EtNCO}$  in a sealed tube at 100° for 2 hrs.,  $\alpha$ -2-pyridyl- $\beta$ -ethylurea, m. 119°, is obtained on cooling. On nitrating this substance, either with abs.  $\text{HNO}_3$  alone at -10° or with a mixt. of  $\text{HNO}_3$  and  $\text{H}_2\text{SO}_4$  at -20°, a clear soln. is obtained on pouring the reaction mass into water. From this soln.  $\text{EtNHNO}_2$  may be extd. with ether, whereas, after neutralization to congo red, picric acid gives a yellow ppt. of  $\alpha$ -aminopyridine picrate, m. 223-5°; the latter base itself, m. 56°, may be obtained by making the soln. alk., distg. with steam and extg. the distillate with ether. From the fact that  $\alpha$ -aminopyridine itself is nitrated to pyridylnitramine, it follows that the urea deriv. broke down only when the mixt. was poured into water. C. F. VAN DUIN

**Derivatives of 8-aminoquinoline.** R. P. DIKSHOORN. Univ. Leiden. *Rec. trav. chim.* 48, 517-44(1929); cf. C. A. 23, 1903.—The direct nitration of aminoquinolines not being possible (Kaufmann and Zeller, C. A. 12, 1390), the amino group has been protected by coupling 8-aminoquinoline with  $\text{EtNCO}$  and the  $\alpha$ -8-quinolyl- $\beta$ -ethylurea, so obtained, has been nitrated. The reactions of the nitration products with water, ales and  $\text{NH}_3$  were then studied as well as the nitration of 8-quinolylurea and quinoline-8-carbamic acid (cf. Knipphorst, C. A. 20, 589; Lorang, C. A. 22, 230). On heating 14 g. 8-aminoquinoline, 30 cc. ether and 8 cc.  $\text{EtNCO}$  in a sealed tube during 1 hr. at 100°,  $\alpha$ -8-quinolyl- $\beta$ -ethylurea (I) is obtained in 95% yield; it exists in 2 monotropic modifications, m. 176° and 181°, the latter form being obtained by crystn. from benzene and on melting the other form and allowing it to resolidify. When 1 g. of I is nitrated with 8 cc. abs.  $\text{HNO}_3$  at -15°,  $\alpha$ -5-nitro-8-quinolyl- $\beta$ , $\beta$ -ethylnitrourea (II), m. 143-5°, is obtained; it does not give the nitramine reactions of Franchimont and Bamberger and of Liebermann, but, on heating with concd.  $\text{H}_2\text{SO}_4$ , splits off  $\text{HNO}_3$  (Thiele and Lachmann reaction). Contrary to the usual behavior of nitroureas, II is fairly stable toward boiling water, but on subjecting the *not recrystd.*, freshly prepd., nitration product to this treatment, 5-nitro-8-aminoquinoline (III), m. 197°, and 5-nitroquinoline-8-carbamic acid (IV), m. < 300°, were obtained. The structure of III was proved by diazotation in 60%  $\text{H}_2\text{SO}_4$  and boiling the diazonium compd. with alc., 5-nitroquinoline, m. 69-71°, being formed. On boiling II with a large amount of  $\text{MeOH}$  or  $\text{EtOH}$ , *Me 5-nitroquinoline-8-carbamate*, m. 210°, and the *Et ester*, occurring in 2 modifications, m. 111.5° and 121°, are obtained. With either aq. or alc.  $\text{NH}_3$ , II yields 5-nitro-8-quinolylurea, yellow, m. 245°. When I is nitrated by adding to 1 g. in 8 cc. abs.  $\text{HNO}_3$ , 8 cc. concd.  $\text{H}_2\text{SO}_4$  drop by drop and keeping at room temp. for 24 hrs., 5,7-dinitroquinoline-8-carbamic acid (V), m. 230°, was formed; from the mother liquor the Ba salt of  $\text{EtNHNO}_2$  was isolated, the  $\alpha$ -5,7-dinitroquinolyl- $\beta$ , $\beta$ -ethylnitrourea, which is formed in the nitration, having reacted, on pouring out the reaction liquid into water,

with the formation of V and  $\text{EtNHNO}_2$ . On boiling with  $\text{EtOH}$ , V passes into *Et* 5,7-dinitroquinoline-8-carbamate, m.  $195^\circ$ , while, on heating V in 50%  $\text{H}_2\text{SO}_4$  (by vol.) at  $100^\circ$  for an hr., 5,7-dinitro-8-aminoquinoline, m.  $188^\circ$ , is obtained. The interaction of Me and Et chloroformate, 8-aminoquinoline and  $\text{K}_2\text{CO}_3$  in boiling ether leads to the formation of *Me* quinoline-8-carbamate (VI), m.  $45^\circ$ , and the *Et* ester (VII), m.  $66^\circ$ . Nitration of VI and VII with abs.  $\text{HNO}_3$  alone gives the 5-nitro derivs., m.  $210^\circ$  and  $114-5^\circ$ , already described above, further nitration of these mononitro derivs. with  $\text{HNO}_3$  and  $\text{H}_2\text{SO}_4$  yielding the 5,7-dinitro derivs., m.  $190^\circ$  for the Me compd. and  $166-7^\circ$  for the Et compd. (above the m. p.  $195^\circ$  was given by D. for the Et ester; see below). When concd. aq. solns. of 8-aminoquinoline-HCl and KCNO are mixed, a mixt. of 8-quinolyurea (VIII), m.  $223-4^\circ$ , and 8-quinolybiuret, m.  $250-2^\circ$ , is formed, which could be sepd. into its components by means of boiling water, in which VIII dissolves. If, however, the prepn. is carried out in 50%  $\text{AcOH}$  at a low temp., VIII is practically the sole product. The nitration of VIII with abs.  $\text{HNO}_3$  alone, gives rise mostly to the formation of a mixt. or an additive compd. of  $\alpha$ -5-nitro-8-quinolyl- $\beta$ -nitrourea, decomp.  $190^\circ$ , and VIII, while under special circumstances, for which the original paper is to be consulted, the dinitro compd. may be obtained as the chief product, together with a small amount of a substance of unknown structure, m.  $285^\circ$ . With boiling water, MeOH and EtOH,  $\alpha$ -5-nitro-8-quinolyl- $\beta$ -nitrourea is converted into 5-nitro-8-aminoquinoline, m.  $195-6^\circ$ , Me and Et 5-nitroquinoline-8-carbamate, m.  $209-10^\circ$  and  $114-5^\circ$ , resp., already described above. The structure of IV was proved by the action of water, MeOH and EtOH, 5-nitro-8-aminoquinoline, m.  $193-5^\circ$ , the Me and Et esters being formed; the latter being obtained in the modification m.  $121^\circ$ . With boiling MeOH and EtOH, V was converted into the corresponding esters, the Me ester, m.  $205^\circ$ , whereas the nitration of Me 5-nitroquinoline-8-carbamate gave the same ester, m.  $190^\circ$ . The Et ester, prepd. by esterification, m.  $195^\circ$ , and the nitration product of Et 5-nitroquinoline-8-carbamate m.  $167^\circ$ . The structural identity of both these pairs of esters was established by the conversion into 5,7-dinitro-8-aminoquinoline by means of  $\text{NH}_3$  and the higher-melting products could be converted into the lower-melting ones by heating with alc. HCl in a sealed tube at  $100^\circ$ . Attention is drawn to the great stability of these mono- and dinitroquinolinecarbamic acids, which D. ascribes to a betaine-like structure, formed by means of the tertiary N atom. When 8-aminoquinoline and its 5-nitro- and 5,7-dinitro deriv. are diazotized in 60%  $\text{H}_2\text{SO}_4$  and the diazonium solns., thus obtained, are poured into water, ppts. are obtained, which do not show the typical diazonium reactions and which are considered by D. to consist of the so called *anti*-diazohydrates. The relatively great stability of these compds. probably is due to the formation of an internal salt with the tertiary N atom of the pyridine ring. The following compds. are described: quinoline 8-*anti*-diazohydrate (IX), decomp.  $145^\circ$ ; 5-nitroquinoline 8-*anti*-diazohydrate (X), decomp. violently  $185^\circ$  and being easily reconverted into the reactive *syn*-diao form under the influence of acids. Its soln. in 60%  $\text{H}_2\text{SO}_4$  couples with  $\beta$ -naphthol and its soln. in 48% HBr yields 5-nitro-8-bromoquinoline on treatment with  $\text{CuBr}$ ; 5,7-dinitroquinoline 8-*anti*-diazohydrate (XI) decomp. violently with ignition at  $155^\circ$ ; neither this compd. nor its soln. in concd.  $\text{H}_2\text{SO}_4$  gives the normal reactions of diazonium compounds.



- IX: R and R' = H  
 X: R = H; R' =  $\text{NO}_2$   
 XI: R and R' =  $\text{NO}_2$

C. F. VAN DUIN

**Halodinitroquinolines.** R. P. DIKSHOORN. Univ. Leiden. *Rec. trav. chim.* 48, 550-9 (1929).—Attempts to prep. halodinitroquinolines are not to be found in the literature; in the present paper such attempts are described together with the prepn. of halomononitroquinolines. 5-Bromoquinoline was prepd. from 5-aminoquinoline (cf. C. A. 23, 1903) by the Sandmeyer reaction (cf. Freydl, *Monatsh.* 8, 582 (1887)); it appeared necessary to carry out the diazotization in strongly acid soln., otherwise dyestuff and resin formation occurred. The compd. m.  $48^\circ$ , even after purification *via* the oxalate (cf. *J. prakt. Chem.* [2], 40, 385 (1889; 73, 250 (1906))). On nitration with abs.  $\text{HNO}_3$  alone or with a mixt. of  $\text{HNO}_3$  and  $\text{H}_2\text{SO}_4$ , 5-bromoquinoline gives a mixt. of the 6- and 8-nitro compd.; the latter seps. on pouring the reaction product into water while the 6-nitro compd. may be obtained on neutralization of the filtrate with

$\text{NH}_3$ . From 10 g. 5-bromoquinoline, 12 g. 5-bromo-8-nitroquinoline, m.  $146^\circ$ , and 1 g. 5-bromo-6-nitroquinoline, m.  $126^\circ$ , were obtained. The further nitration of 5-bromo-8-nitroquinoline with  $\text{HNO}_3$  and  $\text{H}_2\text{SO}_4$  at  $100^\circ$  during 20–40 hrs. does not yield a dinitro deriv.; the substance is oxidized in this way with the formation of a dibromonitroquinoline and quinolic acid; the di-Br compd. was isolated on pouring the liquid on ice and probably consists of 3,5-dibromo-8-nitroquinoline, m.  $195^\circ$ , quinoline being brominated by preference in the pyridine nucleus. The quinolic acid was obtained as the Cu salt,  $\text{C}_7\text{H}_5\text{O}_4\text{NCu} \cdot 2\text{H}_2\text{O}$ , from the mother liquors. 8-Bromoquinoline, also prep'd. from 8-aminoquinoline by the Sandmeyer reaction,  $b_{760}$   $305\text{--}10^\circ$  (slight decompn.);  $b_{18}$   $165\text{--}6^\circ$ . On nitration the sole product isolated was 5-nitro-8-bromoquinoline, m.  $136\text{--}7^\circ$  (cf. *J. prakt. Chem.* [2], **48**, 153(1893)), the constitution of which was proved by its prep'n. from 5-nitro-8-aminoquinoline by the Sandmeyer reaction. On boiling 1 g. 5-nitro-8-bromoquinoline in 10 cc.  $\text{HNO}_3$  and 10 cc. concd.  $\text{H}_2\text{SO}_4$ , neither nitration nor oxidation takes place, the mononitro compd. being recovered unchanged. A halodinitroquinoline, however, could be prep'd. by means of the Ullmann-Nadai reaction (*Ber.* **41**, 1870(1908)) as follows: 10 g. 8-hydroxyquinoline (Kallbaum) in 25 cc. warm AcOH was added slowly to 100 cc. 60%  $\text{HNO}_3$ , cooled in ice; when the flask was taken out of the cooling bath, a vigorous oxidation soon took place, the temp. rising to  $50^\circ$ . On pouring the nitration mixt. into 2 l. of water, 10 g. 5,7-dinitro-8-hydroxyquinoline, m.  $325^\circ$ , was obtained. On heating 5 g. of the dinitro compd. with 6 g.  $\text{PhNEt}_2$  and 4 g.  $p\text{-McC}_6\text{H}_4\text{SO}_2\text{Cl}$  for 6 hrs. at  $100^\circ$ , 8-chloro-5,7-dinitroquinoline, m.  $154^\circ$ , was formed. C. F. VAN DUIN

Quinolyl-2,4-dinitronaphthylamines. R. P. DIKSHOORN. Univ. Leiden. *Rec. trav. chim.* **48**, 548–9(1929).—Several condensation products of org. bases with chloro-(bromo)-2,4-dinitrobenzene have been prep'd. for the identification of amines (cf. *Rev. trav. chim.* **2**, 31, 103(1883)) by heating alc. solns. of the reacting compds. When, however, the same procedure was adopted for 5- and 8-aminoquinolines (Meigen, *C. A.* **2**, 2558) it was found that 5-aminoquinoline did not react with 2,4-( $\text{O}_2\text{N}$ ) $_2\text{C}_6\text{H}_3\text{Cl}$  under the usual conditions, the reaction taking place only when the 2 substances were fused together. It was now found that although 2,4-dinitrochloronaphthalene is 20 times as reactive as the benzene deriv. (Talen, *C. A.* **22**, 1351), its behavior toward both the aminoquinolines is the same as that of 2,4-( $\text{O}_2\text{N}$ ) $_2\text{C}_6\text{H}_3\text{Cl}$ , the 5-amino compd. reacting only when the 2 constituents were fused together. On heating 1.2 g. 5-aminoquinoline and 1.0 g. chloro-2,4-dinitronaphthalene, mixed intimately, for 2 hrs. at  $100^\circ$ , 5-quinolyl-2,4-dinitronaphthylamine, m.  $195^\circ$ , was obtained. The interaction of 8-aminoquinoline with chloro-2,4-dinitronaphthalene in alc. at  $100^\circ$  for 6 hrs. yields 8-quinolyl-2,4-dinitronaphthylamine, m.  $196^\circ$ . For identification purposes with aminoquinolines,  $\text{C}_{10}\text{H}_8\text{Cl}(\text{NO}_2)_2$  thus offers no advantages over 2,4-( $\text{O}_2\text{N}$ ) $_2\text{C}_6\text{H}_3\text{Cl}$ . C. F. VAN DUIN

Acridine. III. Hydrogenation of acridine with sodium amalgam. KURT LEHMSTEDT and HEINRICH HUNDEKMARK. Tech Hochschule Hannover. *Ber.* **62B**, 414–8 (1929); cf. *C. A.* **23**, 144. —Graebe and Caro found that acridine in alc. with Na-Hg gives dihydroacridine (acridan),  $\text{C}_{13}\text{H}_{11}\text{N}$  (I), and an "insol. hydroacridine" (II). I has been studied by many investigators but not much was known of II. G. and C. in the analysis of a prep'n. still contg. Hg obtained a C:H ratio of 13:11.6 and concluded that it was formed by further reduction of I. L. and H. have now found, however, that II contains O and has the compn.  $\text{C}_{13}\text{H}_{10}\text{ON}_2$ . It is quite unstable and on dry distn. or short heating with concd.  $\text{H}_2\text{SO}_4$  decomp. into 1 mol. each of acridine, I and  $\text{H}_2\text{O}$ ; Graebe's statement that only acridine is formed with  $\text{H}_2\text{SO}_4$  is correct only to a certain extent, for it is only after long heating that the  $\text{H}_2\text{SO}_4$  oxidizes the I to acridine. The ease with which II splits into two O-free acridine mols. indicates that the O is not bound to C but is in an ether-like combination with the N, and the 9,10,9',10'-tetrahydro-10,10'-diacridyl 10,10'-oxide structure seems to accord best with the properties and method of formation of II. II dissolves in boiling  $\text{C}_6\text{H}_6\text{N}$  but from the soln. there sep. prisms (III), m.  $220^\circ$ , having the compn.  $\text{C}_{26}\text{H}_{20}\text{N}_2$ ; they have no basic properties, decomp. on fusion into equal parts of acridine and I but are not split into 2 parts by concd.  $\text{H}_2\text{SO}_4$ ; they give, instead, a new base which has not yet been thoroughly studied. From its whole behavior, III must be *ms*-9,10,9',10'-tetrahydro-10,10'-diacridyl. I has a great tendency to form addn. compds.: I.  $\text{AgNO}_3$ , white ppt., soon darkening with sepn. of Ag; I.  $\text{HgCl}_2$ , yellow ppt. dehydrogenated on heating by the bivalent Hg; 2l.  $\text{NaOEt}$ , m.  $170^\circ$ , deposits pure I when dissolved in boiling alc. and cooled. With 1 mol. acridine-HCl in alc., I forms a deep green soln. (violet by transmitted light, changing to brown on heating and back to violet on cooling); evapn. gives green-black prisms, I.  $\text{C}_{13}\text{H}_9\text{N} \cdot \text{HCl} \cdot 1.5\text{H}_2\text{O}$ . The green soln. is decolorized

by  $\text{H}_2\text{O}$  or  $\text{Et}_2\text{O}$ , which ppt. I and  $\text{C}_{13}\text{H}_9\text{N} \cdot \text{HCl}$ , resp. A dark green soln. is also obtained from I and acridine in glacial  $\text{AcOH}$ . C. A. R.

**Strychnos alkaloids. XLVIII. Cleavage of the oxime of brucinonic acid with alkali.** HERMANN LEUCHS. Univ. Berlin. *Ber.* 62B, 407-9 (1929); cf. C. A. 23, 1387.—Whereas brucinolic acid,  $\text{C}_{22}\text{H}_{26}\text{O}_8\text{N}_2$ , is smoothly decompd. by 1.25 mols. alkali at  $20^\circ$  or by  $\text{NH}_4\text{-MeOH}$  at  $100^\circ$  into isomeric brucinolones and  $\text{HOCH}_2\text{CO}_2\text{H}$ , the corresponding ketonic acid, brucinonic acid,  $\text{C}_{22}\text{H}_{24}\text{O}_8\text{N}_2$  (I), is attacked only with difficulty; more than 60% is recovered unchanged, at least 10% is changed into a hydrate and cleavage is to be detected only by the formation of a little  $\text{HOCH}_2\text{CO}_2\text{H}$  and of an amorphous product. Removal of a  $\text{CO}_2\text{H}$  group and of another C atom from acids of the I series can be effected by the Curtius degradation through the azides but the products contain 1 mol. more of  $\text{H}_2\text{O}$  than the products obtained by alkali cleavage, and as brucinolic acid does not undergo the Curtius degradation it was not possible to compare the products obtained from the 2 acids. It was therefore attempted to effect the cleavage with alkali of some deriv. of I, and it was found that when the oxime (II) of I is allowed to stand 12 days at  $15^\circ$  with 2.5 mols. *N* NaOH, although about 50% is still recovered unchanged, it nevertheless yields about 30% of neutral or slightly acid products, about  $\frac{2}{3}$  of which can be isolated in cryst. form, chiefly yellowish prisms (III), m.  $295\text{--}300^\circ$ , having the expected compn.  $\text{C}_{21}\text{H}_{21}\text{O}_8\text{N}$ , and an isomer, m.  $250\text{--}8^\circ$ . Dehydrobrucinolone (III) is insol. in *N*  $\text{NaHCO}_3$  but sol. in  $\text{NH}_4\text{OH}$  and *N* alkali; its acetate turns brown around  $225^\circ$ , sinters and foams about  $240^\circ$ , slowly dissolves in *N* alkali with sapon. C. A. R.

**3-Methoxy-4-ethoxyphenylaminoethane.** K. SAWAI. *J. Pharm. Soc. Japan* 49, 260-3 (1929).—The study of 2 alkaloids, *corybulbine* and *isocorybulbine* was previously reported by Späth and Dobrowsky (C. A. 19, 2959). S. quite independently undertook the study on the position of the OH radical of the above alkaloids. Vanillin (40 g.) and KOH (12.2 g.) at  $65\text{--}70^\circ$  on addn. of  $\text{EtHSO}_4$  (50 cc.) gave *vanillin Et ether* (I), m.  $65^\circ$ . Condensation of I with  $\text{MeNO}_2$  gave *3-methoxy-4-ethoxy- $\alpha$ -nitrostyrene* (II), m.  $15^\circ$ . Catalytic reduction of II with Pt black gave *3-methoxy-4-ethoxyphenylaminoethane* (III), m.  $194\text{--}5^\circ$ . The HCl salt of III (1 g.) with  $\text{ClC}_2\text{H}_5$  (1 g.) in KOH gave *6-methoxy-7-ethoxy-1-keto-1,2,3,4-tetrahydroisoquinoline* (IV), m.  $195\text{--}6^\circ$ . IV agrees with S. and D.'s oxidation product of *isocorybulbine*. F. I. NAKAMURA

**Glucoside of Rosa multiflora.** I. H. KONDO, K. IWAMOTO AND Y. KUCHIHA. *J. Pharm. Soc. Japan* 49, 232-8 (1929).—The authors extd. from *Rosa Multiflora* a glucoside, multiflorin (I),  $\text{C}_{27}\text{H}_{36}\text{O}_{16}$ , m.  $147\text{--}70^\circ$ . Hydrolysis of I gave an aglucone (II) and sugar. II, multiflorinetin,  $\text{C}_{16}\text{H}_{10}\text{O}_6$ , m.  $283\text{--}96^\circ$ , is optically inactive and shows flavanone reactions. Acetylation of II gave 2 compds.:  $\text{C}_{16}\text{H}_8\text{O}_7\text{Ac}$ , m.  $196^\circ$ , and  $\text{C}_{16}\text{H}_8\text{O}_6\text{Ac}$ , m.  $181\text{--}3^\circ$ . Methylation of II with  $\text{Me}_2\text{SO}$  gave  $\text{C}_{16}\text{H}_8\text{O}_5(\text{OMe})_2$ , m.  $153^\circ$ . KOH fusion of II gave phloroglucinol (m.  $207^\circ$ ) and *p*- $\text{HOC}_6\text{H}_4\text{CO}_2\text{H}$ , m.  $213^\circ$ . The tests for sugar gave positive furfural, Rosenthaler and also osazone reactions. It is certain that I is a glucoside and II is 1,3,4'-trihydroxyflavanol. F. I. N.

**The formula of Digitalinum verum.** A. WINDAUS AND E. HAACK. Univ. Göttingen. *Ber.* 62B, 475-6 (1929).—The formula derived for Digitalinum verum from its cleavage products is  $\text{C}_{36}\text{H}_{56}\text{O}_{14}$  but the glucoside forms no well-defined crystals and has no sharp m. p., so that it is difficult to judge of its purity and analyses of different preps. do not agree well; 59.97-61.07% has been found for the C content while the calcd. value is 60.6%. It seemed desirable, therefore, to study carefully a well-crystd. deriv.; such a compd. is the Ac deriv., which was prepd. by Kiliani's method. It seps. from  $\text{Ac}_2\text{O}$  in flat needles, sinters slightly  $166^\circ$ , m.  $212\text{--}3^\circ$  (if plunged into a bath at  $160^\circ$  and heated rapidly, it m.  $175\text{--}6^\circ$ , resolidifies and again m.  $212\text{--}4^\circ$ ),  $[\alpha]_D^{20} -17.4^\circ$ ,  $-18.1^\circ$  ( $\text{CHCl}_3$ , *c* 4.415, 1.01, resp.),  $[\alpha]_D^{16} -16.9^\circ$  ( $\text{CHCl}_3$ , *c* 2.43), C 59.77, 59.73% H 7.26, 7.14%; calcd. for  $\text{C}_{36}\text{H}_{56}\text{O}_{14}\text{Ac}$ , 59.72, 7.11%, resp. This formula is also confirmed by the Ac content as detd. both by the Freudenberg method and by sapon. C. A. R.

**Humic acid.** G. I. STADNIKOV AND P. KORSHEV. *Kolloid-Z.* 47, 136-41 (1929).—Humic acid obtained from Merck's "acidum huminum" has been estd. by pptn. with  $\text{Ba(OH)}_2$ . Pptn. proceeds slowly to completion. The result does not depend on the concn. of the  $\text{Ba(OH)}_2$ . The reaction is like the adsorption of this hydroxide to stearic acid but unlike the reaction of humic acid with sugar. This would mean it acts strictly as an acid in this case. The resulting equiv. of 147 is not in agreement with that obtained by Oden of 320-340 because adsorption is partly due here to phenol HO groups. The effect of alkali salt concn. on the color of Ba humate was then studied. The salts used were  $\text{KNO}_3$ ,  $\text{KCl}$ ,  $\text{NaNO}_3$ , and  $\text{NaCl}$ . The concn. of sol. humate formed

is proportional to the concn. of alkali salt while that of the Ba salt changes in a complicated manner since its concn. increases much faster than that of the sol. humate. This is expressed by several chem. equations.

RAYMOND H. LAMBERT

The laws of periodicity (PETRENKO-KRITCHENKO, *et al.*) 2. Crystal structure of trimethylethylammonium chlorostannate (WYCKOFF, COREY) 2. Isoprene and rubber. XIV. Degradation of rubber and gutta-percha (STAUDINGER, BONDY) 30. Color and optical anisotropy of organic compounds (RAMAN) 3. Determination of I numbers. II Action of ICl solutions on the fatty acids with conjugated double bonds (GELBER, BOESEKEN) 27. Determination of total absorption coefficients of different metals and organic compounds in the short wave-length x-ray region (STUMPEN) 3. Reactions in liquid  $H_2S$ . VI. Reactions with organic compounds (BORGESON, WILKINSON) 2. Spectral absorption of certain monoazo dyes. I. The effect of position isomerism on the spectral absorption of Me derivatives of benzeneazophenol (BRODE) 3. Crystallography of aliphatic dicarboxylic acids (CASPARI) 2. Products from molasses (Fr. pat. 650,994) 28.

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Organic oxygen compounds. SOC. CHIM. DE LA GRANDE-PAROISSE, AZOTE ET PRODUITS CHIM. Fr. 651,167, Aug. 24, 1927. Alcs., aldehydes, ketones, acids, esters and other org. O compds. are produced by the action of  $CO$ , or gases contg. it, on water in the liquid or gaseous state in the presence of mixed catalysts contg. at least one of the series: K, Na, Mg, V, Cr, Mo, Fe, Co, Ni, Cu, Ag, Zn, Cd, Hg, As, Sb, Bi, assocd. with at least one of the series: Be, Mg, Al, Ce, Si, Ti, Zr, Th, U, Li, Ca, Sr, Ba, W. In examples, mixed carbonates of Mn, Mg and Al are reduced at  $300^\circ$  with  $CO$ , and a mixt. of  $CO$  and  $H_2O$  is passed through at  $450^\circ$ , the excess of water contains 5-6% of various alcs. A soln. of  $ThO_2$  and  $K_2CO_3$  in  $HCOOH$  is dried on pumice stone, a current of  $CO$  at  $250^\circ$  and 500 atm. is passed over it and finally a mixt. of  $CO$  and  $H_2O$ , a soln. of  $HCOOH$  is obtained. Sol. and insol. esters are obtained when  $CuCO_3$ ,  $ThO_2$  and  $Bi_2O_3$  are used, a soln. of alc. when  $MnO_2$ , Al and Mg or  $Pb(NO_3)_2$  and  $Sr(NO_3)_2$  are used, alcs. and other compds. when  $Sb_2O_3$  and  $Th(NO_3)_4$  are used, fatty acids and alcs. when  $Th(NO_3)_4$  and  $Co(NO_3)_2$  are used.

Dehydrating organic substances. ALBERT VERLEY. Fr. 650,539, Mar. 7, 1928. Liquids are dehydrated at low temp. by heating gently with constant stirring and absorbing the vapors as they are formed in conc.  $H_2SO_4$ , the acid being cooled during the operation, and then concd. in an appropriate app. as it becomes hydrated. An app. is described.

Separating hydrocarbon mixtures. I. G. FARBENIND. A.-G. Fr. 650,972, Mar. 17, 1928. Unsatd. hydrocarbons of low b. p. are sepd. from one another or from other substances of low b. p. by fractional distn. under pressure, the vapors being directed from the bottom to the top of a distg. column and being withdrawn as vapor at one or more points in the upper part of the column. Liquids having higher b. ps. may be added to the liquids. If the b. ps. of the constituents are very close, substances which lower the vapor tension of one or more of the constituents may be added. Unsatd.

hydrocarbons may be extd. from mixts. with other hydrocarbons by treatment with org. solvents free from hydrocarbons, and removing the solvent by heat. Several examples are given.

**Purifying alcohols** such as isopropyl alcohol derived from unsaturated hydrocarbons. HYUN E. BUC (to Standard Oil Development Co.). U. S. 1,712,475, May 7. Products such as those comprising mainly iso-Pr alc. and which are derived from unsatd. hydrocarbons are agitated with a colorless petroleum oil having a b. p. above 260°, the oil is sepd. and the process repeated with fresh quantities of oil, and the alc. is subsequently distd.

**Ether-alcohols.** I. G. FARBENIND. A.-G. Fr. 650,973, Mar. 17, 1928. Mixed polyvalent ether-alc. are obtained by reacting alkylene oxides, their derivs. or transformation products with polyatomic alc. contg. more than 2 C atoms, or their derivs. not contg. O groups other than the OH groups. In examples, sorbitol is heated in an autoclave to 140° for 12 hrs. with ethylene oxide, giving a very viscous liquid. Pentaerythritol is similarly treated in the presence of boric anhydride at 125°, giving a sirupy liquid. Gelatin is heated to 30–40° in water and the ether-alc. from sorbitol is added. Glass plates are dipped in the liquid, withdrawn and dried, thin transparent sheets are obtained which may be used for wrapping chocolate, etc. Glycols, glucose and saccharose may also be used.

**Carbohydrate ethers.** LEON LILIENFELD. Ger. 475,214, Aug. 26, 1919. See Brit. 149,320 (C. A. 15, 436).

**Alkali metal alcoholates.** LUCAS P. KYRIDES (to National Aniline & Chemical Co.). U. S. 1,712,830, May 14. A soln. formed of caustic alkali such as NaOH and denatured EtOH or other alc. contg. 2 or more C atoms is subjected to fractional distn. in the presence of a sufficient quantity of a liquid such as C<sub>6</sub>H<sub>6</sub> which forms a min b. p. azeotropic mixt. including all the water, so that the azeotropic mixt. is distd. off and a soln. of the alkali metal alcoholate remains in the still.

**Polymerizing dienes.** THOMAS MIDGLEY, JR., CARROLL A. HOCHWALT and CHARLES A. THOMAS (to General Motors Corp.). U. S. 1,713,236, May 14. Dienes such as isoprene in relatively pure condition are subjected to the action of a metal catalyst comprising an alloy of alkali metals which is liquid under the working conditions under which polymerization is effected; *e. g.*, an alloy of Na and K, m. —12°.

**Highly chlorinated perylenes.** ALOIS ZINKE and KONRAD FUNKE (to Felice Bensa). U. S. 1,713,362, May 14; Fr. 651,658, Mar. 23, 1928. Hepta- to dodecachloroperylenes are formed by mixing an inert liquid solvent such as PhNO<sub>2</sub> with a chloroperylene contg. not more than 6 atoms of Cl and an inorg. chloride such as AlCl<sub>3</sub> adapted to serve as a Cl-transferring agent and then passing a current of dry gaseous Cl through the mixt. Cf. C. A. 22, 3667.

**Hydroxyalkylamines.** I. G. FARBENIND. A.-G. Fr. 650,574, Mar. 8, 1928. Hydroxyalkylamines are produced by slowly adding alkylene oxides to NH<sub>3</sub> or its substitution products. Thus, 2600 parts of ethylene oxide is added slowly to 3870 parts of 25% aq. NH<sub>3</sub> at 25–30°, giving 90–95% triethanolamine. If 352 parts of ethylene oxide is added to 3400 parts of 25% aq. NH<sub>3</sub> at 10°, monoethanolamine is obtained.

**Aminoanthraquinones.** W. SMITH, J. THOMAS AND SCOTTISH DYES, LTD. Brit. 299,333, April 19, 1927. Halogen atoms in the 1-position are removed from halogenated aminoanthraquinones by use of alk. reducing agents and the leuco compd. formed is subsequently oxidized. The reduction may be effected with metals, hydrosulites and glucose, in solns. of hydroxides of alkali or alk. earth metals, and the products may be purified by recrystn. from an org. solvent or by pptn. from their solns. in H<sub>2</sub>SO<sub>4</sub>. Several examples are given.

**Hydrogenating polyhydroxy compounds.** I. G. FARBENIND. A.-G. Brit. 299,373, Oct. 24, 1927. Comps. such as sugars, starch, cellulose, glycerol, glucosans, glyconic acid and cyclic polyhydroxy compds. are hydrogenated by treatment with activated H under high pressure (usually 70–100 atm., but possibly ranging from 10 to 1000 atm.) and at temps. of above 150° (preferably 190–300°). Glycerol and its further reduction product, 1,2-dihydroxypropane, may form the main products. Hydrogenating catalysts are used such as those of the Fe and Pt groups, Cu, Ag, Au or tungstic acid, which may be mixed with each other and used on a carrier.

**Liquid hydrocarbons from acetylene.** J. YLLA-CONTE. Brit. 299,425, Oct. 26, 1927. Structural details are specified of an app. for producing C<sub>6</sub>H<sub>6</sub> and other light liquid hydrocarbons by condensation of C<sub>2</sub>H<sub>2</sub> by heating the latter in an iron or steel vessel to the temp. of reaction and circulating the gas through a refrigerating app. outside the vessel to sep. condensable products and then injecting the uncondensed

gas into the reaction vessel again to prevent undue rise of temp. and to mix the gases. A fan and an annular conduit open at both ends and spaced within the reaction vessel serve to effect circulation of the gases within the vessel.

**Anthraquinone derivatives.** I. G. FARBININD. A.-G. (Paul Nawiasky, Fritz Helwert and Arthur Krause, inventors). Ger. 470,503, Jan. 28, 1927. Addn. to 469,135 (C. A. 23, 1284). Those products obtained in the prior patent which do not contain oxidizable substituents, are purified by after treatment with an oxidizing agent. In the examples, the derivs. obtained in the prior patent are treated with hypochlorite soln. or  $K_2MnO_8$ .

**Thiourea derivatives.** SILESIA VEREIN CHEM. FAB. (Hans Klein and Walter Flemming, inventors). Ger. 475,477, Dec. 5, 1926. Aromatic disubstituted thioureas are prep'd. by the reaction:  $Na_2CS_3 + 2RNO + H_2O = SC(NHR)_2 + Na_2S_2O_3$ , R being an aromatic radical. The prepn. of *p,p'*-dihydroxydiphenylthiourea from nitrosophenol, and of tetramethyldiaminodiphenylthiourea, m. 184–185°, from *p*-nitrosodimethylaniline are described by way of example. Cf. C. A. 22, 4133.

**Chlorine derivatives.** I. G. FARBININD. A.-G. Fr. 650,732, Mar. 10, 1928. Cl derivs. of 1,3-dimethylbenzene-4-sulfonic acid (I) are prep'd. by treating this acid in soln. in a mineral acid with Cl or chlorinating agents, preferably with the addn. of a catalyst. The sulfonic group may be split off by hydrolyzing agents, or may be replaced by Cl if the latter is used in excess. In examples, NaOCl is introduced into a soln. of I in water heated to 40°. The product is the Na salt of 2-chloro-1,3-dimethylbenzene-4-sulfonic acid, the Pb salt of which is difficultly sol. and the Ba salt is almost insol. in water, the amide m. about 223°. The same acid is obtained if Cl is introduced into a soln. of I in conc.  $H_2SO_4$  preferably using I as a catalyst. If the Na salt of this acid is dissolved in dild.  $H_2SO_4$  heated to 160–170°, and superheated steam is passed through, 2-chloro-1,3-dimethylbenzene, m. 185–7°, distills. Examples are (1) dichloro-1,3-dimethylbenzene-4-sulfonic acid (Ber. 23, 2320) using  $FeCl_3$  as catalyst, and by hydrolysis 2,6-dichloro-1,3-dimethylbenzene, which formerly was not obtained free from its isomers, (2) the Na salt of trichloro-1,3-dimethylbenzene-4-sulfonic acid (the amide m. above 325°) and by hydrolysis 2,5,6-trichloro-1,3-dimethylbenzene, m. 95–96°, b. 255–260°, and (3) tetrachloro-1,3-dimethylbenzene, m. 218–220°. Cf. C. A. 22, 2756.

**N-hydroxyethyl derivatives of aminohydroxybenzenes.** GUSTAV REDDELIEN and WERNER MUELLER (to Agfa Ansco Corp.). U. S. 1,712,716, May 14. *N*-Hydroxyethyl derivs. of aminohydroxybenzenes corresponding to the general formula  $HOC_6H_4NXCH_2CH_2OH$ , wherein X represents H or the group  $\cdot CH_2CH_2OH$ , are made by condensing a highly active deriv. of ethane contg. one atom of O and contg. in their mol. the atom figuration  $-CH_2CH_2O-$  comprising halohydrin of glycol and ethylene oxide at ordinary or raised temp. with an aminohydroxybenzene; in some cases an acid-binding agent should be present and there may also be used a diluent, a solvent, or a catalyst. The products form colorless crystals, easily sol. in water, acids, alkalies alc., acetone, and EtOAc and form with  $H_2SO_4$  colorless salts which may be recrystd. from alc. as colorless prisms easily sol. in water. 4-[Bis(hydroxyethyl)amino]-1-hydroxybenzene, m. 140°; 4-(hydroxyethyl)amino-1-hydroxybenzene, m. 96–7°; 2-[bis(hydroxyethyl)amino]-1-hydroxybenzene, when not purified is a brownish oil and when purified forms colorless laminated crystals which decompose above 240°; 2-(hydroxyethyl)amino-1-hydroxybenzene m. 80–1°. Various details of procedure for making these compds are given. Cf. C. A. 22, 4540.

**Esters of amino propanes.** WALTER SCHOELLER and HERBERT SCHOTTE (to Chemische Fabrik auf Actien (vorm. E. Schering)). U. S. 1,711,696, May 7. Pharmaceutical products are prep'd. which correspond to the formula  $XOCH_2CH(OY)CHR'R''$ , in which X is an acyl group, Y an alkyl, R' a H atom or an alkyl or aryl, R'' a H atom or alkyl, R''' a H atom or alkyl, or R' and R''' together a cyclic radical, and in which the 2 remaining affinities of the N can be satisfied by the addition of an alkyl halide. These esters form colorless or nearly colorless salts sol. in water and alc. and are well adapted in the form of their salts for therapeutic use. They may be formed by the esterification of hydroxyaminopropanes which have already been preliminarily etherified in the  $\beta$ -position. Allyl alc. is treated at ordinary temp. in a soln. of MeOH with  $Hg(OAc)_2$ . After 30 mins. the solvent is removed by evapn. and after dilg. with water the residue neutralized with  $NaHCO_3$ . An aq. soln. of KBr is added in excess and an oil seps., which, on being triturated with some EtOAc, crystallizes. After drying in the air, the compd.,  $CH_3(OH)CH(OMe)CH_2HgBr$ , is boiled in aq. suspension or better in a soln. of EtOAc with one mol. I during about 20 mins., until decolorization ensues, whereupon the Hg salt is removed and the residue is subjected

to distn. The  $\alpha$ -hydroxy- $\beta$ -methoxy- $\gamma$ -iodopropane,  $b_{0.4}$  65–6°, is heated with an equal weight of  $\text{Et}_3\text{NH}$  during 2 hrs. to 100°. The liquid which on cooling partly solidifies is taken up with an equal quantity of water. On the addn. of  $\text{K}_2\text{CO}_3$  the  $\alpha$ -hydroxy- $\beta$ -methoxy- $\gamma$ -diethylaminopropane is sepd. in the form of an oil which  $b_{1.3}$  62–3°, has the strong smell and reaction of a base and readily dissolves in ether. *p*-Nitrobenzoate-HCl crystd. from  $\text{C}_6\text{H}_6$  or  $\text{AmOH}$ , m. 143–4°; *p*-aminobenzoate-HCl, m. 159°, sol. in  $\text{H}_2\text{O}$ , and is a vigorous anesthetic. The following compds. may be similarly prepd. (all m. ps. uncor.):  $\text{CH}_2(\text{OH})\text{CH}(\text{OMe})\text{CH}_2\text{NMe}_3\text{I}$ , (I) needles, m. 108–9°, sol. in  $\text{H}_2\text{O}$ ;  $\text{CH}_2(\text{OH})\text{CH}(\text{OEt})\text{CH}_2\text{I}$ , colorless oil,  $b_{1.2}$  78–80°, decompd. by light or air, insol. in  $\text{H}_2\text{O}$ ;  $\text{CH}_2(\text{OH})\text{CH}(\text{OEt})\text{CH}_2\text{NEt}_3$ , colorless liquid,  $b_{12}$  100–1°, basic properties, sol. in  $\text{H}_2\text{O}$  and  $\text{Et}_2\text{O}$  (*p*-nitrobenzoate-HCl, m. 152° sol. in  $\text{H}_2\text{O}$ ; *p*-aminobenzoate-HCl, m. 152°, sol. in  $\text{H}_2\text{O}$  and alc., anesthetic);  $\text{CH}_2(\text{OH})\text{CH}(\text{OMe})\text{CH}_2\text{NH}_2$ , thick oil,  $b_{10}$  104–5°;  $\text{CH}_2(\text{OH})\text{CH}(\text{OMe})\text{CH}_2\text{NHMe}$ , oil,  $b_{12}$  about 75°;  $\text{CH}_2(\text{OH})\text{CH}(\text{OEt})\text{CH}_2\text{NHMe}$ , oil,  $b_{13}$  89–91°; (with piperidine)  $\text{CH}_2(\text{OH})\text{CH}(\text{OMe})\text{CH}_2\text{NC}_4\text{H}_9$ , colorless oil,  $b_{0.3}$  81–2°, sol.  $\text{H}_2\text{O}$ ,  $\text{Et}_2\text{O}$  and alc., basic properties (*p*-nitrobenzoate-HCl, m. 163–4°, sol. in  $\text{H}_2\text{O}$  and alc., difficulty sol. in  $\text{EtOAc}$ ; *p*-aminobenzoate, m. 169–70°, sol. in  $\text{H}_2\text{O}$ , difficulty sol. in  $\text{EtOAc}$  and  $\text{Me}_2\text{CO}$ , anesthetic);  $\text{CH}_2(\text{OH})\text{CH}(\text{OMe})\text{CH}(\text{HgBr})\text{Ph}$ , crystd. from  $\text{CHCl}_3$ , m. 110–1°;  $\text{CH}_2(\text{OH})\text{CH}(\text{OEt})\text{CH}(\text{HgCl})\text{Ph}$ , m. about 86°, sol. in  $\text{MeOH}$ ,  $\text{EtOH}$ ,  $\text{EtOAc}$  and hot  $\text{C}_6\text{H}_6$ , difficulty sol. in petroleum ether;  $\text{CH}_2(\text{OH})\text{CH}(\text{OMe})\text{CH}(\text{NEt}_3)\text{Ph}$ , slightly colored oil, b. 123–5° in high vacuum, difficulty sol. in  $\text{H}_2\text{O}$ . The following esters of I have the property of causing peristaltic movements of the intestines: acetate, crystd. from pyridine and  $\text{AcOH}$ , m. 161–2°, sol.  $\text{H}_2\text{O}$ , alc. and dilute acids; monoester of ethylphosphoric acid, thick slightly brownish sirup,  $\text{Ba}(\text{OH})_2$  gives Ba salt slightly sol. in  $\text{H}_2\text{O}$ ; acid sulfate, thick sirup, sol. in  $\text{H}_2\text{O}$ .

**Amino and nitrodiaryl sulfides; dyes; etc.** BRITISH DYESTUFFS CORP., LTD., and M. MENDOZA. Brit. 299,501, July 27, 1927. Aminodiaryl sulfides of the general type formula  $\text{C}_6\text{H}_5\text{COOH}(1)\text{OH}(2)\text{SAr}(3)$  substituted in the 5-position or carrying a benzo group in positions 5,6 in which Ar represents an aromatic residue contg. at least one  $\text{NH}_2$  group, are obtained by reduction of the products of condensation of the corresponding 1-thiol-2-hydroxy-3-carboxylic acid with an aromatic nitro compd. carrying labile H. As starting materials there may be used 3-thiol-5-methyl(or chloro)-salicylic acid and 1-thiol-2,3-hydroxynaphthoic acid and 1,2- and 1,4-chloronitrobenzenes. The 3-thiol-5-methylsalicylic acid is made by treating 3-chlorosulfonyl-5-methylsalicylic acid or the corresponding sulfonic acid with Zn dust and reducing the resulting 5,5'-dimethyl-3,3'-dithiobisalicylic acid (suitably by alk. hydrosulfite). 3-Thiol-5-chlorosalicylic acid and 1-thiol-2,3-hydroxynaphthoic acid are made in a similar manner from the corresponding chlorosulfonyl compds. or sulfonic acids. The aminodiaryl sulfides prepd. as described are used as components in the *manuf. of azo dyes* which, due to the sepn. of a chelate group from a chromophoric group by the sulfide bridge, remain unchanged in color by after-chroming. The monoamino sulfides may be diazotized and coupled with usual components and the diamino sulfides may be treated with  $\text{HNO}_2$  to produce dyes of the Bismark brown type, or may be used as second components, or may be monoacylated and used as first components, or in some instances may be tetrazotized and coupled with components. Several examples of production of dyes by these methods are given.

**Arsinic acids.** MILLE GERMAINE C. L. A. J. BARNIER. Fr. 651,178, Aug. 25, 1927. Arsine oxides are oxidized to arsinic acids either by air or by  $\text{H}_2\text{O}_2$  in the presence of catalysts. In examples, *p*-dimethylaminophenylarsine oxide is dissolved in water, a soln. of  $\text{Mn}(\text{OAc})_2$  is added and a current of air passed through the soln. for 8 hrs. or  $\text{H}_2\text{O}_2$  is added, giving *p*-dimethylaminophenylarsinic acid.

**Benzoic acid.** HERBERT W. DAUDT (to E. I. Du Pont de Nemours & Co.). U S 1,712,753, May 14. A soln. of a metal acid phthalate is heated at a temp. between 150° and 300° (suitably about 200–220°) in the presence of heavy metal salts such as  $\text{CuSO}_4$  or other Cu or Hg salt capable of forming phthalates and capable of splitting off  $\text{CO}_2$  from phthalic acid.

**Acetic acid.** SOC. ANON. DES DISTILLERIES DES DEUX-SÈVRES. Fr. 651,528, Sept. 10, 1927. See Brit. 296,974 (C. A. 23, 2449).

**Acetic anhydride and other anhydrides.** BRITISH CELANESE, LTD., H. DREYFUS and W. BADER. Brit. 299,342, July 23, 1927. In producing the corresponding anhydride, a liquid aliphatic acid such as  $\text{HOAc}$  or its salt such as  $\text{NaOAc}$  is treated with a phosphoric acid of a lower degree of hydration than  $\text{H}_3\text{PO}_4$  or with an alkali or alk. earth salt of such acid, e. g., Na metaphosphate, with or without use of pressure or of a diluent, at temps. of 100–250°.

**Chloroacetic anhydride, etc.** CHARLES J. STROSACKER and CLARENCE C. SCHWEG-



IER (to Dow Chemical Co.). U. S. 1,713,104, May 14. An acid chloride such as chloroacetyl chloride is heated with monochloroacetic acid or other suitable org. carboxylic acid, in the presence of a suitable metal chloride such as  $\text{AlCl}_3$  in order to form the corresponding chloroacid anhydride.

**1-Aminoanthraquinone-2-sulfonic acid.** IMPERIAL CHEMICAL INDUSTRIES, LTD., A. DAVIDSON, W. W. TATUM and G. E. WATTS. Brit. 299,279, May 30, 1928.  $\alpha$ -Aminoanthraquinone is sulfonated with 1.0–1.5-mol. proportions of  $\text{H}_2\text{SO}_4$  and the acid sulfate so formed is baked (preferably *in vacuo* or in a current of hot gas) at a temp. of 210–245° or slightly higher depending on the state of purity of the starting material. A temp. of 240–5° with purified  $\alpha$ -aminoanthraquinone and 220–30° with "technical"  $\alpha$ -aminoanthraquinone is preferred.

***o*-Carboxamidoarylthioglycolic acids.** NORBERT STEIGER, ERWIN HOFFA and HANS HEYNA (to Grasselli Dyestuff Corp.). U. S. 1,712,365, May 7. Reduction of *o*-cyanoarylsulfonyl chlorides of the general formula  $\text{R}(\text{SO}_2\text{Cl})(\text{CN})$ , wherein R means a substituted aryl residue, can be carried out in such a manner, that the  $\text{SO}_2\text{Cl}$  group is reduced to the SH group, whereas simultaneously the CN group is converted into the carboxamido group  $\text{CONH}_2$ . The *o*-carboxamidoaryl mercaptans thus obtained yield when condensed in the usual manner with monochloroacetic acid in an alk. soln. *o*-carboxamidoarylthioglycolic acids of the general formula  $\text{R}(\text{CONH}_2)(\text{SCH}_2\text{CO}_2\text{H})$ . It is essential that during the whole process of reduction practically no N of the cyano group is split off in form of  $\text{NH}_3$ , as otherwise substances, namely mostly the corresponding *o*-carboxyarylthioglycolic acids, are formed. The cyanoarylsulfonyl chlorides are preferably dissolved in or dild. with a suitable org. solvent of an inert character such as  $\text{C}_6\text{H}_6$  or  $\text{PhCl}$ . As reducing agents Zn dust,  $\text{SnCl}_2$  or finely powdered Fe may be used with addn. of either strong mineral or org. acids. Strong HCl is especially suitable. Among the org. acids especially glacial HOAc, strong  $\text{CH}_3\text{CO}_2\text{H}$  and naphthalene-mono- and -polysulfonic acids are suitable. Probably as intermediates of the reduction process sulfonic acid compds. are formed. The *o*-cyanoarylsulfonyl chlorides which are used as starting materials may be prepd. by converting the corresponding *o*-aminoarylsulfonic acids according to Sandmeyer's reaction into the *o*-cyanoarylsulfonic acids and treating the latter compds. with  $\text{PCl}_5$  or an excess of chlorosulfonic acid. The new *o*-carboxamidoarylthioglycolic acids obtainable in a pure state with a good yield are important intermediates for the production of dye of the thioindigo series especially

when corresponding to the general formula  $\text{CX}:\text{C}(\text{CONH}_2):\text{C}(\text{SCH}_2\text{CO}_2\text{H}):\text{CH}:\text{CY}:\text{CZ}$  wherein X means H or an alkyl group, Y H or halogen or an alkyl group and Z H or halogen. 1-Methyl-2-carboxamido-5-chlorobenzene-3-thioglycolic acid, m. 172–4°; the production of 1-methyl-6-chloro-2-carboxamidobenzene-3-thioglycolic acid and of intermediates is also described in detail. U. S. 1,712,366 relates particularly to the production of 1-alkoxy-4-carboxamidobenzene-3-thioglycolic acids, which are white cryst. powders, sol. in hot water and the usual org. solvents. 1-Ethoxy-4-carboxamidobenzene-3-thioglycolic acid, m. 208–10°. U. S. 1,712,367 relates particularly to the 4-chloro-1-carboxamidobenzene-2-thioglycolic acid, m. 206°.

**Methyl alcohol.** CHARLES HENRY. Fr. 651,194, Feb. 9, 1926. Catalysts for the prepn of MeOH from CO and H are either (1) Sr and PbO ground together, preferably in the proportion of 3Sr:PbO, or (2) Zr and  $\text{Bi}_2\text{O}_3$ , preferably in the proportion of 3Zr: $\text{Bi}_2\text{O}_3$ .

**Apparatus for making acetaldehyde from acetylene.** I. G. FARBENIND. A.-G. Brit. 299,234, Jan. 2, 1928. App. for producing acetaldehyde from  $\text{C}_2\text{H}_2$  with use of a soln. of a Hg salt is formed of or lined with a Cr-Ni steel contg. Mo, *e. g.*, a steel contg. Cr 19–20, Ni 7–8 and Mo 2–3%.

**Chloroacetaldehyde.** I. G. FARBENIND. A.-G. Brit. 299,319, Oct. 22, 1927. Chloroacetaldehyde is produced without use of a catalyst, by introducing Cl gas and vinyl chloride into water and preferably keeping the temp. at 0–40° to avoid formation of by products. It is also preferable to exclude light which tends to cause formation of 1,1,2 trichloroethane. An inert gas such as  $\text{CO}_2$  or N may suitably be used as a carrier and mixing agent.

**Acetone.** CONSORTIUM FÜR ELEKTROCHEMISCHE INDUSTRIE GES. Brit. 299,330, Oct. 22, 1927. In acetone production by passing HOAc vapor over a heated catalyst, the use of iron app. is avoided and there are used instead materials which do not promote secondary reactions, *e. g.*, there may be used: Cu, ferro-Si and steels or other alloys rich in Cr or Ni. With these materials, temps. as high as 400–550° may be used which produce increased yields.

**Acetone.** HOLZVERKOHLEND.-IND. A.-G. (Koloman Róka, inventor). Ger.

475,428, Dec. 11, 1924. Acetone is prep'd. by the interaction of EtOH and H<sub>2</sub>O at 250–600° in the presence of metal-oxygen compds., particularly O compds. of Fe, Mn, and Cu. Preferably, an excess of H<sub>2</sub>O is used and a promoter, *e. g.*, CaCO<sub>3</sub> or MgO, is included in the contact mass. Cf. C. A. 23, 1419.

Ethylene from acetylene and hydrogen. I. G. FARBENIND. A.-G. Fr. 651,037, Mar. 20, 1928. See Brit. 294,787 (C. A. 23, 1910).

Purifying anthracene, naphthalene, etc., by selective catalytic oxidation of the impurities. A. O. JAEGER. Brit. 299,419, Oct. 26, 1927. Material such as anthracene, naphthalene and light oils contg. C<sub>6</sub>H<sub>6</sub> are purified by partial oxidation of the vapor with a limited quantity of O in the presence of oxidizing catalysts which may comprise various complex compds. of which a very large no. of examples are given.

Catalytic hydrogenation of methylaniline or other aromatic bases. WILHELM LOMMEL and THEODOR GOOST (to I. G. Farbenind. A.-G.). U. S. 1,712,709, May 14. In forming hexahydromethylaniline from methylaniline or in similar catalytic hydrogenations of aromatic bases, the reaction is arrested before hydrogenation of the whole mass is complete, hydrogenated products are sep'd. from unchanged base (suitably by distn.) and the unchanged base is then further hydrogenated. This manner of conducting the process serves to lessen the formation of by-products Cf. C. A. 23, 1420.

Hexamethylenetetramine. SCHIEFERWERKE AUSDAUER A.-G. Fr. 650,395, See Brit. 286,730 (C. A. 23, 397).

Mercaptobenzothiazole. HAROLD P. ROBERTS and HARRY A. MERKLE (to Rubber Service Laboratories Co.). U. S. 1,712,968, May 14. Substantially equimol. proportions of thiocarbonyl, S, and CS<sub>2</sub> are heated together in a container maintained under the pressure developed by the gases and vapors evolved in the reaction and at a max. temp. of about 275°.

2,3- and 2,5-Dichloro-4-amino-1-methylbenzene. WILHELM SCHUMACHER and CARL SEIB (to Grasselli Dyestuff Corp.). U. S. 1,712,173, May 7. 2-Chloro-4-acetamido-1-methylbenzene in a mixt. of glacial HOAc 4 and water 1 part is cooled (suitably to a temp. of about 0–5°) and treated with Cl, and the resulting solid ppt. is sep'd. from the soln.

1-Methyl-2,5-dichloro-4-aminobenzene. I. G. FARBENIND. A.-G. Fr. 650,561, March 7, 1928. The above is obtained by nitrating 1-methyl-2-amino-5-chlorobenzene in the presence of H<sub>2</sub>SO<sub>4</sub> replacing the NH<sub>2</sub> by Cl and reducing the NO<sub>2</sub> group. The diazotization may be carried out directly in the nitration liquor without previous sepn. of the nitroaminochloro comp'd. by introducing nitrite and pouring the mixt. into water.

Dimethylolurea. POLLOPAS, LTD., E. C. C. BALY and E. J. BALY. Brit. 299,487, June 24, 1927. Urea is condensed with CH<sub>2</sub>O (preferably using slight excess of CH<sub>2</sub>O) in cold aq. and very slightly alk. soln. An alkalinity of 0.01 N NaOH is suitable, with stirring for 24 hrs. at 15–20°. The product m. above 134° (usually at 138–40°).

Benzanthranyl sulfide, etc. OTTO BRAUNSDORF, EDUARD HOLZAPFEL and PAUL NAWIASKY (to Grasselli Dyestuff Corp.). U. S. 1,712,646, May 14. A benzanthranyl sulfide crystg. from PhNO<sub>2</sub> in dark yellow laminae, m. 347°, (C<sub>17</sub>H<sub>9</sub>O)<sub>2</sub>S, is made by reaction on benzanthrone with S chloride in PhCl in the presence of I at 90–140° and extg. with Na sulfide soln. In general, by causing a S halide, especially SHlg<sub>2</sub>, S<sub>2</sub>Hlg<sub>2</sub> (Hlg stands for halogen), or a mixt. of these compds. to act upon a benzanthrone, new S contg. derivs. of the benzanthrone series are obtainable in a good yield. Preferably, the reaction is carried out in the presence of a suitable solvent and a substance capable of promoting the reaction. It probably proceeds in such a manner that, besides benzanthranyl sulfide, intermediate products are formed which can be easily converted into benzanthranyl mercaptans and benzanthranyl sulfides, resp., by means of a caustic alkali or an alkali metal sulfide. From these products there may then be easily prep'd. in the usual manner corresponding derivs., for instance benzanthranyl disulfide, benzanthranyl thioethers or benzanthranylthioglycolic acids. The new compds. thus obtainable are valuable *intermediate products for the manuf. of dyes*. Several examples are given.

Ammonium formate; formamide. I. G. FARBENIND. A.-G. (Wilhelm Michael, inventor). Ger. 475,366, Aug. 15, 1925. Dry formates are dist'd. with NH<sub>4</sub>NO<sub>3</sub> *in vacuo*, whereby HCOONH<sub>4</sub> is obtained. If the distn. is conducted at atm. pressure, HCONH<sub>2</sub> is obtained. Cf. C. A. 22, 4132.

Purification of synthetic products. I. G. FARBENIND. A.-G. Fr. 650,543, Mar. 7, 1928. Synthetic substances such as MeOH, iso-BuOH, etc., are purified by treatment with oxidizing agents, *e. g.*, KMnO<sub>4</sub>, if necessary with the addn. of alkalis or org. bases and metal halides, with or without treatment with active purifying agents.

## 11—BIOLOGICAL CHEMISTRY

PAUL E. HOWE

A—GENERAL

FRANK P. UNDERHILL

**The effect of emulsification on the peptic synthesis of protein.** H. WASTENEYS AND H. BORSOOK. *Colloid Symposium Monograph* 6, 155-72(1928).—The literature is reviewed. Pepsin digests of egg albumin, which no longer gave a ppt. with  $\text{CCl}_3\text{CO}_2\text{H}$ , were brought to  $p_H$  4 with concd. alkali, filtered, and concd. to 25% (based on the original protein). To 10 cc. of concd. digest were added 1 cc. of 10% aq. pepsin soln. and 1 cc. of emulsifying agent. After incubation (usually 24 hrs.) at  $37^\circ$ , the synthesized protein was washed on a filter and its amt. detd. by the Kjeldahl method. Benzaldehyde, benzoic acid, benzene, toluene and chloroform definitely accelerate synthesis; talc powder,  $\text{BaSO}_4$  and kieselguhr have slight accelerative effect; oleic acid and olive oil do not accelerate. Effective substances induce some protein synthesis even in absence of pepsin. Under optimum conditions, accelerators increase the rate merely, not the amt. of protein synthesis, though in some cases they also increase the amt. The synthesized proteins vary in their rate of hydrolysis by  $\text{HCl}$  and in base-combining capacity.

JEROME ALEXANDER

**Specific nature of invertase.** R. WEIDENHAGEN. *Z. Ver. deut. Zucker-Ind.* 1928, 406-18.—The sucrose-splitting enzymes in *Aspergillus oryzae* (the source of taka diastase), *A. niger*, *Penicillium glaucum*, and pigs' intestine are all capable of decomposing raffinose into melibiose and levulose at rates which are of the same order as those observed in the hydrolysis of sucrose. There are therefore no grounds for assuming that the invertase of taka-diastase or the other materials mentioned represents a different type (gluco-invertase) from that present in yeast (fructo-invertase).

B. C. A.

**Enzymic sucrose cleavage.** RUDOLF WEIDENHAGEN. *Inst. Zuckerindustrie, Berlin. Naturwissenschaften* 16, 654-5(1928); *Z. Ver. deut. Zucker-Ind.* 1928, 539-42.—It has previously been proposed (cf. preceding abstr.) that cleavage of disaccharides is induced by simple glucosidases. For mixed disaccharides two enzymes can attack the substance. It is now found that Willstätter and Bamanns' (*C. A.* 20, 1245) sepn. of "maltase" and "saccharase" actually is a sepn. of  $\beta$ -h-fructosidase and  $\alpha$ -glucosidase: the maltase gave, for optimum  $p_H = 7.0$ , hydrolysis of sucrose of the order of magnitude of maltose cleavage, none at  $p_H = 4.6$ , the optimum for fructosidase action. At  $p_H = 7.0$  no raffinose hydrolysis occurred as expected; however, melezitose cleavage resulted if sufficient active  $\alpha$ -glucosidase ("maltase") was present.

B. J. C. VAN DER HOEVEN

**The specificity and mode of action of sugar-splitting enzymes.** RUDOLF WEIDENHAGEN. *Z. Ver. deut. Zucker-Ind.* 79, 115-54(1929).—A complete review is given of the theories of enzyme action, as well as of the specificity and the mode of action of the sugar-splitting enzymes.

F. CAMPS-CAMPINS

**Enzymes of the seeds of *Strophanthus kombe* and their influence on k-strophanthin.** PIETRO DI MATTEI. *Univ. Roma. Arch. intern. pharmacodynamie* 35, 113-35 (1928).—The seeds of *Strophanthus kombe* contain the following enzymes: lipase, esterase, emulsin, strophanthinase, phenol-oxidase, peroxidase, catalase, reductase. It is not possible to demonstrate alcohol-oxidase in the presence of glutathione.

DAVID DAVIDSON

**The individuality of the trypsin complex. I. Comparative studies on the behavior of various substrates toward various trypsin-kinase preparations at different  $p_H$  values.** EMIL ABDERHALDEN AND OSKAR HERRMANN. *Univ. Halle. Fermentforschung* 10, 474-7(1929).—Trypsin prepn. obtained from powd. pancreas by the Waldschmidt-Leitz procedure, although uniformly active toward casein, show marked differences in the extent to which they hydrolyze halogenacylamino acids or tripeptides. One prepn. gave 18% hydrolysis with chloroacetyl-*dl*-leucine and 72% with chloroacetyl-*l*-phenylalanine, while a 2nd prepn. gave hydrolyses of 15% and 45%, resp., under identical conditions. Different prepn. respond differently toward changes in  $p_H$ . From chloroacetyl-*l*-tyrosine the pptd. tyrosine in one instance was 51 mg. at  $p_H$  7.8 and 35 mg. at  $p_H$  8.4; in another instance 10 mg. at  $p_H$  7.8 and 8 mg. at  $p_H$  8.4. One prepn. which was more active toward the tripeptide *dl*-leucylglycyl-*dl*-leucine was less active toward chloroacetyl-*l*-tyrosine than another prepn. In general, the halogenacylamino acids are attacked more readily at  $p_H$  7.8 and the polypeptides more readily

at  $p_H$  8.4. These observations would indicate that trypsin-kinase is not an individual enzyme complex. II. Attempts to separate enzymes with different actions in the preparation of "trypsin" from pancreas powder. EMIL ABERHALDEN AND ERNST SCHWAB. *Ibid* 478-80.—By changing the  $p_H$  at which the adsorption on  $Al(OH)_3$  is performed in the Waldschmidt-Leitz procedure for purification of trypsin, an attempt was made to sep. the trypsin complex into 2 components, the protease and possibly a polypeptidase. Glycerol ext. of pig pancreas was freed from enterokinase by adsorption on pptd. casein and the centrifuged mother liquor brought to  $p_H$  4.7 with acetate buffer. Three adsorptions on  $Al(OH)_3$  removed the erepsin. The  $p_H$  was then brought to 5.6 and another adsorption performed with  $Al(OH)_3$ , followed by elution with  $NH_4OH$ . This eluate was entirely inert toward *dl*-leucylglycine, *dl*-leucylglycyl-*dl*-leucine and casein, but readily attacked chloroacetyl-*l*-tyrosine, chloroacetyl-*l*-phenylalanine, chloroacetyl-*l*-leucine and the  $PhNCO$  deriv. of glycyl-*dl*-leucine. However, the trypsin component could not be obtained free from all action on acylamino acids, despite repeated adsorptions of the mother liquor with  $Al(OH)_3$ , although its activity toward acylamino acids was greatly diminished without loss of activity toward casein. It is evident that trypsin contains in addn. to its protease one or more enzymes analogous to the "histozyme" which splits hippuric acid into glycine and  $BzOH$ . III. Comparative experiments on the rate of hydrolysis of halogenacylamino acids and polypeptides by the action of different preparations of "trypsin" at different  $p_H$  values. EMIL ABERHALDEN AND WALTER ZEISSET. *Ibid* 481-90.—The chloroacetyl, bromoisovaleryl and bromoisocapronyl derivs. of a no. of amino acids and peptides were tested for cleavage by one and the same trypsin-kinase prepn. at  $p_H$  8.4 and 7.8, resp. Almost without exception the cleavage was greater at  $p_H$  7.8. Certain halogenacyl derivs. which are quite resistant to ordinary preps. of trypsin-kinase, e. g., the chloroacetyl derivs. of valine and its peptides and the bromoisovaleryl derivs. of glycine and the glycyglycines, were tested with the trypsin-free enzyme obtained by adsorption at  $p_H$  5.6. No noteworthy increase in hydrolysis was observed. A. W. DOX

Alcohol fermentation. XIX. Some microorganisms in the maceration juice capable of fermentation. S. KOSTYCHEV AND O. SHULGINA. *Inst. Biochem., Leningrad. Z. physiol. Chem.* 182, 50-6 (1929); cf. *C. A.* 23, 2727. A no. of visible organisms are known to exist also in invisible forms capable of passing through a Chamberland filter. Filtration through porcelain can therefore no longer be regarded as a sure method of sterilization. Proof of the enzymic nature of a fermentation now requires a neg. fermentation test when the fermenting medium is inoculated into a sterile medium; the absence of visible organisms is not conclusive. Filtrates from yeast suspensions are now shown to contain visible organisms which ferment glucose into  $CO_2$  and  $EtOH$ . These have probably passed through the filter in their invisible form. A serious oversight in Buchner's classic expts. with "zymin" is that he undertook to demonstrate sterility before, instead of after, the fermentation. Yeast juice contains organisms which are active even in the presence of  $PhMe$ . They contain also a stimulator liberated from the cells, and this stimulating substance enables insignificant quantities of living cells to function with extraordinary vigor. Enzymic fermentation may possibly occur simultaneously with the fermentation by living cells, but a cell-free fermentation has yet to be demonstrated. A. W. DOX

Chemistry of the blood pigment. IX. The linkage between protein and prosthetic group in hemoglobin. FELIX HAUROWITZ AND HEINRICH WAELSCH. *Z. physiol. Chem.* 182, 82-96 (1929); cf. *C. A.* 22, 1167.—The xpts. of Hill and Holden (*C. A.* 21, 2004), which showed that native globin and hemin unite to form a hemoglobin, were corroborated by gasometric detn. of the reversible O consumption of the product. A genuine hemoglobin is formed through a methemoglobin stage and this has the power of binding mol. O. Under the same conditions denatured globin yields cathemoglobin which lacks this power of taking up O. Since dimethylated hemin and hydrogenated hemin also unite with native globin, it is evident that the carboxyls and the unsatd. side chains do not function in this linkage. The union occurs also in the complete absence of cholesterol. The slight change which the spectrum of porphyrins undergoes on addn. of globin cannot be considered evidence of the formation of a chem. compd., "globin-porphyrin," since this change is not specific and occurs even with serum protein. The view is upheld that the linkage between the 2 components of hemoglobin occurs through the Fe atom by means of coordinative valence. Native globin from the steer is a slightly acid protein. Its isoelec. point is at  $p_H$  6.9-7.0, and its coagulation temp. is  $47^\circ$ . In other respects it shows the typical properties of an albumin. The slight differences between the original and the resynthesized hemoglobin, which coagulate at  $47^\circ$  and  $63^\circ$ , resp., are attributed to a partial

denaturing which the protein component undergoes in the course of isolation.

**Enzymic hydrolysis of melezitose and turanose.** T. ÅGÅRD. *Tids. Kemi Bergvesen* 8, 5-9, 16-20, 35-9(1928).—Results are given of expts. in which 9 specific enzymes act upon melezitose and turanose.  $\beta$ -Glucosidase, rhamnodiastase and invertase do not hydrolyze the reducing disaccharide turanose, which is formed by slight hydrolysis of melezitose, and consists of a mol. fructose and a mol. glucose. Turanose is easily dissoed. by  $\alpha$ -glucosidase. The disaccharide must then be regarded as a  $\alpha$ -glucoside of fructose. Melezitose is not dissoed. by invertase. The trisaccharide is dissoed. by *Aspergillus niger*, but the hydrolysis is incomplete. Melezitose is dissoed. into fructose and glucose by  $\alpha$ -glucosidase. The expts. do not confirm the assumption of Kuhn and van Grundherr (*C. A.* 21, 64) that there is a "glucoinvertase" in *Aspergillus niger* which causes dissoen. of melezitose into turanose and glucose, and that ordinary invertase is a "fructo-sucrase."

**Relationship of the physical properties of chemical substances to their action on microorganisms.** TH. SABALITSCHKA. *Arch. Pharm.* 267, 272-90(1929).—An address before the Ger. Pharm. Assocn.

**The amide nitrogen of blood.** IV. A method of expressing results based upon the protein content of blood. SIDNEY BLISS. McGill Univ., Montreal. *J. Biol. Chem.* 81, 405-6(1929); cf. *C. A.* 23, 1946.—The amide N of blood should be expressed in terms of mg. per 100 g. of blood protein. A method of detg. the amide N of blood is given.

**Electrostatics as a separate realm of investigation in biochemistry.** RUDOLF KELLER. *Kolloidchem. Beihefte* 28, 219-34(1929).—The recent advances are summarized.

**Fundamental principles and limitations to biological  $p_H$  determinations.** F. LEUTHARDT. *Kolloidchem. Beihefte* 28, 262-80(1929).—L. considers the importance of  $p_H$  considerations in biological systems to have been over-emphasized. The cell is a system in which purely thermodynamic considerations are inapplicable and in which statistical variations must be considered.

**Vasilii Leonidovich Omelyanskii (1867-1928).** LJUDEVIT GUTSCHY. *Arch. Hem. Farm* 3, 76-8(1929).—A biography.

**The physico-chemical principles of the irritability of pigment, muscle and glandular cells.** N. K. KOLTZOV. *Rev. gén. sci.* 40, 165-71(1929).—The contraction and expansion of living cells may be controlled when they are washed in solns. which are isotonic with the Tyrode or the Ringer-Locke physiol. solns. by varying the ratio of the concn. of the cations. Expts. were made on melanophore cells of the Teleostei and Batrachia by microscopic study; on smooth muscle tissue of mammals by detg. the rate with which the solns. washed through the organs; and on the salivary glands of the dog by the rate of secretion of saliva. With one exception, an increase in Ca-ion concn. favored contraction, and in all cases an increase in Na-ion concn. favored expansion. The action of K and Mg ions varied, but they were less effective than Na and Ca. Pituitrin caused expansion, and adrenaline caused contraction. A concn. of 1:10,000,000 of adrenaline brought about complete contraction, a reaction which might serve to standardize adrenaline preps.

**The relations between dielectric constant and physiology.** JOS. GICKLHORN. *Kolloidchem. Beihefte* 28, 328-32(1929); cf. *C. A.* 22, 2597.—In the phys. chemistry of colloids the dielec. const. has an important role. Its influence on the application of the law of Coulomb, on formation of potentials, dissoen. dispersion of colloidal particles, satn. of soln., miscibility of liquids, its relation to pressure and sp. gr. and concn. are emphasized. Hence it has influence in physiology on the stability of solns., imbibition, viscosity, dispersion, sp. gr. and refraction. Important is the high dielec. const. of H<sub>2</sub>O as a medium of biochem. reactions and the fact that these reactions occur in an anisotropic space.

**Studies on lipoids.** III. Lipoid content of butter. BRUNO REWALD. *Biochem. Z.* 202, 391-3(1928); cf. *C. A.* 23, 855.—The lipid content of butter is shown to be much higher than generally assumed. In every case investigated, our butter prepn., also German and Danish articles, show a lipid content of over 1% and in one instance even as high as 1.7%. The nutrition of the cows is thought to be responsible for these differences in lecithin. The variation is not due to the fact that lecithin remains behind in the process of butter making, the skimmed milk showing less than 0.01% of lecithin. IV. Effect of heating on the lipoids. *Ibid* 394-8.—Fresh egg yolks were well mixed and 3 portions of 80 g. each used for the analyses: (1) without any preliminary treatment; (2) after heating for 30 mins. on the water bath; (3) after baking for 20

mins. with the lipid-free coconut butter. The material was first extd. 6 times with cold acetone and the acetone ext. was redissolved in ether. The residue after acetone extn. was extd. with 96% alc. 4 times, the last time with the addn. of benzene. All together 2400 cc. acetone and 2000 cc. alc. were used up in the extn. As a const. result it was noted that cold acetone exts. large amts. of lipid material, the more so the greater the amt. of fat present. The analyses further show that warming and even heating causes no immediate increased destruction of lipoids. On the contrary, in expts. with various organs (liver, kidney, meat) the boiling leads to a small loss of lipid material which, however, in proportion to the low lipid content of the organs, is very significant. This is not the result of a decompn. of the lipid, but of a soln. during boiling. V. Preparation of lipoids from chlorophyll-containing organs. *Ibid* 399-402.—Finely cut plant material (800 g.) was extd. 9 times with 1 l. quantities of anhyd. cold acetone. The residue represented 1.31% of the original substance, and, according to its P content, had 11.67% lipid. This again shows that cold acetone exts. much lipid material. This could be sepd. from a highly concd. acetone ext. by cooling to  $-8^{\circ}$ . The alc. extn. of the acetone-extd. residue contained 5.03% phosphatides. From the analyses it is calcd. that fresh salad with a 96% water content contains about 1.1% lipid. S. M.

Absolute absorption spectrum of the respiratory enzyme. OTTO WARBURG AND ERWIN NEGELEIN. *Biochem. Z.* 204, 495-9(1929); cf. *C. A.* 23, 773, 856.—A correction of data reported in an earlier paper (*C. A.* 23, 773). S. MORGULIS

Sulfatase. X. FRITZ WEINMANN. Kaiser Wilhelm-Inst. für Biochem., Berlin-Dahlem. *Biochem. Z.* 205, 214-8(1929).—The  $H_2SO_4$  esters of aromatic hydroxyl compds. of benzene, naphthalene, indole, quinoline, etc., are split by sulfatase, while the  $H_2SO_4$  esters of aliphatic and hydroaromatic alcs. are not affected. Furthermore, K myronate is not attacked by sulfatase from fungi, but is split by the enzyme obtained from animal tissues. The K salt of the  $H_2SO_4$  ester of 3-methylcyclohexylphenol is completely hydrolyzed by sulfatase. S. MORGULIS

The disaggregating activity of pepsin in addition to its more certain hydrolytic function. MAX FRANKEL. Hebraische Univ., Jerusalem. *Biochem. Z.* 207, 53-65(1929).—The question whether an "induction period" precedes the hydrolytic phase of the pepsin activity during which no chemical change occurs but only one of colloidal aggregation, is answered in the negative. S. MORGULIS

The rate of sedimentation of erythrocytes from the standpoint of the Hofmeister ion series. II. D. VON KLOBUSTZKY. Kgl. ungar. Elisabeth-Univ., Pécs. *Biochem. Z.* 207, 80-90(1929).—The anions of the Hofmeister salts influence in hypertonic soln. the elec. charge, viscosity and sp. gr. of plasma as well as the vol. and sp. gr. of the red cells. These effects correspond completely to those observed in the matter of the rate of sedimentation, the dominant factor in which is the alteration in the charge. The effect of the cations is irregular; this is attributed to the fact that these scarcely exert any action on the elec. charge. S. MORGULIS

Oxidation of glucose and glyocoll with alkaline copper solutions. HARRY LUNDIN. Harvard Univ. *Biochem. Z.* 207, 91-106(1929).—Glyocoll in large amt. inhibits the oxidation of glucose by alk. Cu solns. contg. carbonate in the range of  $p_H$  9.1-9.6, as is the case in the Folin reagents. The inhibition of the oxidation by glyocoll is greater the lower the  $p_H$ . If the Cu reduction is carried out with a mixt. of glucose and glyocoll at a  $p_H$  of 9.8 or above, at which the glyocoll no longer hinders the glucose oxidation, the total reduction is approx. equal to the sum of each component. The oxidation of glyocoll by the Folin type of carbonate alk. Cu solns. increases with the  $p_H$  and also with the duration of the boiling, the amt. oxidized depending upon the concn. of the carbonate. The optimum condition for oxidation of glucose is at  $p_H$  9.2-9.8. It is therefore necessary to raise the  $p_H$  of the Folin reagents by the addn. of NaOH in order to obtain reproducible results. S. MORGULIS

Oxidation of glucose and glyocoll with alkaline copper solutions in the presence of boric acid. HARRY LUNDIN. Harvard Univ. *Biochem. Z.* 207, 107-19(1929).—Boric acid inhibits the oxidation of glucose by alk. Cu solns. of the type of Folin's reagents, this effect being greater the lower the  $p_H$  within the range 9.1 to 10.5. If the ratio between boric acid and glucose is very large (400-500) the glucose may not be at all oxidized within that range. Increasing the time of boiling acts in the opposite direction. Cu reagents contg. boric acid oxidize amino acids, creatinine, etc., to the same extent as under similar conditions occurs without the boric acid. The Folin-Wu reagent to which 56 g. boric acid or 85 g. borax is added per l. is not at all reduced by small quantities of glucose but is reduced by glyocoll, creatinine, etc. S. M.

Physical decolorization of bile. HUGO WIT. Univ. Wien. *Biochem. Z.* 207, 141-5(1929).—The decolorization of bile through adsorption was tested by means of

powdered adsorbents (animal charcoal, kaolin, talc or kieselguhr) or gel-like adsorbents ( $\text{Fe}(\text{OH})_3$ ,  $\text{Al}(\text{OH})_3$ , or silicic acid gel). The bile was filtered through these various adsorbents. The filtrate through  $\text{Fe}(\text{OH})_3$  or  $\text{Al}(\text{OH})_3$  was water-clear, whereas through the acid silicic gel the soln. was little decolorized. The adsorption of the bile pigments is thus primarily dependent upon the electrochemical condition of the adsorbent. The amphoteric animal charcoal was the best adsorbent of the first group, the salt-like kaolin, talc or kieselguhr being very much less effective. The reaction of the bile is very important, and the addn. of acid, by giving to the adsorbent a pos. charge, increases its adsorption. The inhibiting action of the bile salts on the decolorization of the bile is attributed to the fact that this is brought about by the adsorption of similarly charged ions. The bearing of these physicochemical findings on problems of the physiology and pathology of the gall bladder is discussed. S. MORGULIS

The effect of protein on the oxidative and catalytic properties of inorganic catalysts. M. I. GALVIALO AND R. DOBROTVORSKA. Military Med. Acad., Leningrad. *Biochem. Z.* 207, 146–50(1929).—Protein is not an indifferent component of a system containing metals, but it increases the oxidative capacity of the metals as well as the catalase action of some of these. This effect is attributed to the protection of the colloidal protein to the suspension of the metal in the soln. S. MORGULIS

Water-soluble phosphatide and the Nadi oxidase reaction. M. GUTSTEIN. Univ. Berlin. *Biochem. Z.* 207, 177–85(1929).—There is obtained from peas and yeast by means of dialysis against water a water-sol. phosphatide, which gives a pos. Nadi oxidase reaction *in vitro* and reduces  $\text{KMnO}_4$ . These reactions (oxidase and reduction) are obtained with extremely small quantities of the phosphatide (0.04 mg.) which is 20 times as active as a similar quantity of yeast. The oxidase action of the phosphatide *in vitro* is thermostable and resistant to HCN which is not the case in the living cells. This oxidase reaction of the phosphatide is specific, benzidine, oxidase, peroxidase and catalase reactions being neg. S. MORGULIS

Isolation of methylglyoxal in lactic acid fermentation. CARL NEUBERG AND MARIA KOBEL. Kaiser Wilhelm-Inst. für Biochem., Berlin-Dahlem. *Biochem. Z.* 207, 212–62(1929).—Exts. made from plasmolyzed or autolyzed mass cultures of *Bacillus delbrücki* produce  $\text{CH}_3\text{COCHO}$  from hexosediphosphoric acid. Similar results are obtained with exts. from acetone or alc.-ether preps. of the bacilli. The  $\text{CH}_3\text{COCHO}$  yield is extraordinarily large, and in 6 balance expts. an av. of 83.2% of the sugar was recovered as  $\text{CH}_3\text{COCHO}$ . This proves that the hexose mol. breaks up into 2 mols. of  $\text{CH}_3\text{COCHO}$ . As substrate the easily sol. and stable Mg salt of hexose-diphosphoric acid was used. For the prepn. of the enzyme usually a quantity of the pure culture of the bacteria corresponding to 14 g. dry substance was suspended in 200 cc.  $\text{H}_2\text{O}$  contg. 10 cc. toluene. After 2 days at  $37^\circ$  a clear supernatant fluid was obtained which was very active. A quicker method of prepn. consisted in plasmolyzing a quantity of fresh bacteria with salt soln., glycerol or acetic ester. But the most potent enzyme prepn. for producing methylglyoxal was made by rubbing in a mortar a quantity of centrifuged bacteria in a mixt. of 450 cc. alc. and 150 cc. ether. This was filtered off and dried in a desiccator. Nine g. of this dry bacterial mass was triturated in a mortar about 5 mins. with 18 cc.  $\text{H}_2\text{O}$  and 3.6 g. powdered  $\text{NaCl}$ , dild. to 360 cc. with water and centrifuged. The methylglyoxal was sepd. from the exptl. mixt. by pptn. with 2,4-dinitrophenylhydrazine-HCl after the mixt. had been deproteinized. The ppt. of the methylglyoxal hydrazone is centrifuged off and washed with dil. HCl,  $\text{H}_2\text{O}$  and alc., and finally recrystallized from pyridine, then from nitrobenzene and weighed after drying at  $120^\circ$ . S. MORGULIS

Lactic acid fermentation of warm-blooded tissue. I. Conditions necessary for the fermentation in liver tissue. OTTO ROSENTHAL. Inst. für Krebsforschung, Charité, Berlin. *Biochem. Z.* 207, 263–97(1929).—Lactic acid fermentation is the result of asphyxia of liver tissue, the carbohydrates of the cells furnishing the substrate. This fermentation never occurs in starved rats; the condition of being well nourished is essential. In some cases the aerobiosis was ineffective because the conditions were already previously present for the fermentation. The fetal liver could not ferment but the age at which the fermentative process appears was not detd. The max. effect of the aerobic period upon the intensity of fermentation after subsequent asphyxia is reached in 15 mins. and extension of aerobiosis for 30 mins. had no further effect. The body temp. of  $37.5^\circ$  is apparently necessary to develop the action of the aerobiosis, since it was absent at  $0$ – $20^\circ$ . Neither does this fermentation occur if during the preliminary aerobiosis period K- and Ca-free Ringer soln. is used as a medium. The substitution of fresh, homologous serum for Ringer soln. has no effect on the aerobiosis so far as the subsequent fermentation under anaerobiosis is concerned. S. MORGULIS

**Iodine as a biogenous element. XVIII.** The mode of combination of iodine in milk. K. SCHARRE AND J. SCHWAIBOLD. Tech. Hochschule, München. *Biochem. Z.* 207, 332-40(1929); cf. *C. A.* 23, 661.—The I always found in milk is only partly in the form of inorg. compds. Mostly it is bound to the org. substances of the serum which is free from protein, fat or lactose; a smaller and variable quantity is in combination with protein, while the fat contains no I or such small traces as to be of no significance. Feeding iodized protein changes these relations very slightly. The administration of large quantities of KI causes a considerable rise in the inorg. I. Feeding iodized fatty acids results in the transfer of the largest part into the milk as iodized fat. S. M.

The activation of insulin by yeast press juice. ERHARD GLASER AND GEORG HALPERN. Pharmakognostisches Inst., Wien. *Biochem. Z.* 207, 377-83(1929).—An insulin activator was prepd. from yeast press juice boiled for 8 hrs. The boiled juice itself has no hypoglucemic effect. By concg. the juice a more potent insulin activator can be obtained. The activation takes place only in a slightly alk. medium ( $p_H = 7.8$ ), if the juice is added to the insulin about 16 hrs. before it is used. When purified by means of a Pb pptn. the active component passes into the eluent. However, the substance does not prolong the time of action of the insulin. It is assumed that part of the insulin in lab. preps. is inactivated and cannot, therefore, produce any effect. S. MORGULIS

**Enzymes and light. XIV.** Studies on the influence of temperature on the light action. LUDWIG PINCUSSEN AND TAKEO OYA. Krankenhaus am Urban, Berlin. *Biochem. Z.* 207, 410-5(1929).—The optimum  $p_H$  of 5.9 at which taka-diastase hydrolyzes starch is maintained at 15° and 45°. The radiated samples show less activity than those kept in the dark, but at  $p_H$  6.68 there was no loss of amylase activity at 45° when the sample was in the dark. Likewise, at  $p_H$  7.15 both the radiated and dark sample showed greater activity at 50° than at 15°. Expts. show that this is not due to a reactivation. S. MORGULIS

**Changes in metabolism under the influence of radiation. IV.** Studies on the fat content of organs. LUDWIG PINCUSSEN AND EUGEN ZUCKERSTEIN. Krankenhaus am Urban, Berlin. *Biochem. Z.* 207, 426-31(1929).—In the serum of radiated animals the total ether ext. is definitely increased but the cholesterol level is unchanged. In the heart the fat content is markedly reduced in the radiated animals and there is no difference between the animals radiated with or without eosin. The cholesterol, on the contrary, markedly increases in eosinized animals when radiated. In the liver the ether ext. is greatly reduced, especially in the eosinized animals. The cholesterol content is somewhat higher, especially in radiated eosinized animals. In the kidney no difference in the total fat content is observed except in eosinized animals. The cholesterol is definitely higher in the radiated animals. In eosinized radiated animals the cholesterol is, like the total fat, appreciably lowered. Similarly in the muscles the quantity of fat is little affected except in those treated with eosin, while the cholesterol content in the radiated and non-radiated animals is the same. In general, the radiated animals show a higher content of the serum in ester-splitting enzymes. S. MORGULIS

**Malt amylase. V.** Determination of dextrin-forming and saccharifying action of amylase and a comparison of the two effects. TH. SABALITSCHKA AND R. WEIDLICH. Univ. Berlin. *Biochem. Z.* 207, 476-93(1929).—A method is devised to det. the velocity of dextrin formation and dextrin hydrolysis during the action of amylase on starch. The method depends upon the use of an artificial color scale for comparison with the color produced by I. By this method, the monomol. equation being used, the activity of various amylases can be compared. The const. of the hydrolysis of dextrin is obtained from detns. of the maltose formed. The ratio of the 2 velocity const. (dextrin formation and saccharification) in the case of different malt amylase quantities was 1.12 ( $\approx 0.14$ ). S. MORGULIS

The influence of hydrogen-ion concentration upon the inactivation of urease by some heavy metals. MATSUNOSUKE KITAGAWA. Kyushu Imperial Univ., Fukuoka. *J. Biochem. (Japan)* 10, 197-205(1929).—An increasing  $p_H$  of the medium intensifies the inactivation of urease by heavy metal ions so that a metal like Zn which is relatively less injurious inhibits the urease reaction on the alkaline side from  $p_H$  6.0, whereas more injurious metals like Cu or Hg are inhibitory both on the acid and alk. side. The effect is parallel to the influence of  $p_H$  on the combination of protein with heavy metals. Free I is very injurious to urease as compared with KI. Inactivation by KI increases on the acid side. S. MORGULIS

**Protamine. I.** RYOZO HIROHATA. State Med. Coll., Formosa. *J. Biochem. (Japan)* 10, 251-8(1929).—A protamine was isolated from the sperm of *Mugil japonicus*. It probably contains no aromatic amino acids nor any basic amino acids except arginine.



which constitutes more than 70% of the total free protein. Relatively large amts. of mono-amino acids sol. in EtOH and MeOH are present. This protamine is designated "Mugiline  $\beta$ " as it seems to differ from the protamine isolated from *Mugil cephalus*.

S. MORGULIS

The effect of proteolytic enzymes on benzoyl and desamino derivatives of polypeptides. TSUTOMU KAWAI. Univ. Kyoto. *J. Biochem.* (Japan) 10, 277-310 (1929); cf. *C. A.* 23, 2196.—Glycyl-*dl*-phenylalanine *dl*-leucylglycine, glycyl-*l*-phenylalanine and glycyl-*l*-leucine are easily split by erepsin but not by trypsin. Benzoyl-glycylglycine is not hydrolyzed by purified or impure erepsin. The benzoyl derivs. of the other dipeptides are very markedly hydrolyzed by the crude erepsin. Trypsin hydrolyzes the benzoyl derivs. of glycyl-*dl*-phenylalanine, *dl*-leucylglycine, glycyl-*l*-phenylalanine and glycyl-*l*-leucine, the hydrolysis of racemic compds. proceeding asymmetrically. Since the products of tryptic hydrolysis of benzoylglycyl-*dl*-phenylalanine are hippuric acid and *l*-phenylalanine it is obvious that the splitting must occur at the peptide linkage. Benzoylglycylglycine is not hydrolyzable either by erepsin or by trypsin. The hydrolyzable dipeptide benzoyl derivs. are affected not only by Grüber's trypsin but especially by trypsin purified by adsorption, at the peptide linkage. In the case of dipeptides like glycyl-*dl*-phenylalanine and *dl*-leucylglycine which are not affected by trypsin, such hydrolysis does occur when the free  $\text{NH}_2$  group is attached to a benzoyl radical. This fact led to expts. with tripeptides in which the amino acid was in combination with dipeptides not hydrolyzed by trypsin. These were again hydrolyzable by trypsin. Benzoyldiglycylglycine is not at all split by trypsin. Desaminated dipeptides like the benzoyl derivs. are not hydrolyzed by erepsin. Desaminated polypeptides were prepd. which generally were very resistant to the action of erepsin, while some were hydrolyzed by trypsin.

S. MORGULIS

Hematoporphyrin hemolysis. HASHIME KAWAI. Biochem. Inst., Imp. Univ., Tokyo. *J. Biochem.* (Japan) 10, 325-50 (1929).—When red blood corpuscles are hemolyzed by exposure to light in the presence of hematoporphyrin no substance is found capable of producing hemolysis. In dil. soln. hematoporphyrin is absorbed by erythrocytes while in concd. soln. it seems to combine with them. Hemolysis caused by hematoporphyrin is often observed in corpuscles with a high content of acid-sol. phosphoric acid and is accompanied by decompn. of org. phosphoric acid. This, however, does not occur in the disintegration of the stroma.

S. MORGULIS

Serum albumin and complex ions. S. G. T. BENDIEN AND L. W. JANSSEN. *Rec. trav. chim.* 47, 1042-57 (1928).—Serum albumin is pptd. by  $\text{NH}_4$  or Na vanadate acidified with AcOH. The theory that the flocculation is due to an albumin sol bearing a positive charge combining with a  $\text{V}_2\text{O}_5$  sol bearing a negative charge was not confirmed by the present investigation. It was found that the flocculation was max. in a definite zone at const. ratio between  $\text{Na}_2\text{VO}_4$  and AcOH. This zone lies near the isoelec. point. On both sides of this zone the high charge of the albumin hinders the flocculation. This zone is wider for globulin than for albumin. Serum albumin can be sepd. into diff. fractions, which in the same mixt. flocculate at diff.  $p_{\text{H}}$  values. The speed of cataphoresis and the viscosity of these serum fractions were detd. when dissolved in different electrolytes and at different  $p_{\text{H}}$  values.

GEO. W. MUHLEMAN

The chemical and biological changes induced by x-rays in body tissues. MONTROSE T. BURROWS, LOUIS H. JORSTAD, EDWIN C. ERNST. *Radiology* 11, 370-7 (1928); cf. *C. A.* 22, 2380.—One action of x-rays in tissues is to remove their lipid content. One of the chief actions of x-rays in destroying cancer may, therefore, be the removal of lipoids from the cancer cells and from the surrounding tissues. These lipoids are necessary for the growth of cancer cells; without their presence the cancers degenerate quickly.

E. H. QUIMBY

The direct and indirect action of radiation on cancer tissues. A. LACASSAGNE. *Radiology* 11, 393-402 (1928).—Three theories have been advanced to explain the destruction of cells under the influence of radiation: a direct action, a local indirect action and a general indirect action. For normal cells the first method is generally admitted to be correct. L.'s expts. tend to show that this is also the case for cancer cells.

E. H. QUIMBY

The biology of the bog lakes as examined on the bog dams of the Iser mountains. FRITZ GESSNER. *Arch. Hydrobiol.* 20, 1-64 (1929).—A study on the phys., chem. and biol. properties of 2 true bog lakes formed by the construction of dams. These lakes have an exceptionally high degree of acidity ( $p_{\text{H}}$  5.1-5.7). The  $p_{\text{H}}$  decreased from the surface toward the bottom. G. concludes that in lakes of this type the acidification occurred from the bottom, the degree of acidity depending on the location of the lake,

the quantity of water flowing through and the age of the lake. As to the latter instance it is assumed that the  $p_H$  increases with increasing age. G. SCHWOCH

The specificity of animal proteases. XIV. The structural assumption for specific hydrolysis by trypsin, trypsin-enterokinase and erepsin. E. WALDSCHMIDT-LEITZ, W. KLEIN AND A. SCHÄFFNER. Tech. Hochschule, Prag. *Ber.* 61B, 2092-6(1928); cf. C. A. 22, 2381.—The enzymes were used on a series of 13 di- and tri-peptides. Benzoylglycylglycine was acted on only by trypsin-enterokinase. The latter acted more strongly than trypsin alone on bromisocapronylglycyltyrosine, chloroacetylphenylalanine, chloroacetyltyrosine, carbethoxyglycyltyrosine, benzoylglycyltyrosine,  $\beta$ -naphthalenesulfonylglycyltyrosine,  $\beta$ -naphthalenesulfonyltyrosylglycine and phenylalanylarginine. The erepsin acted only on phenylalanylarginine and histidylglycine. J. J. WILLAMAN

Enzymic relations of pectin. J. J. WILLAMAN. *Univ. of Minnesota, Studies Biol. Sci.* 6, 333-41(1927).—A review of the history, occurrence and biol. significance of protopectinase, pectase and pectinase. J. J. WILLAMAN

The purification of heparin and its chemical and physiological reactions. W. H. HOWELL. Johns Hopkins Univ. *Bull. Johns Hopkins Hosp.* 42, 199-206(1928).—Heparin was purified by the adsorption of impurities by Lloyd's reagent in acid soln. and the pptn. of the active substance by  $Ba(OH)_2$ . The results of 12 reactions indicate that heparin is a glucuronic acid compd. contg., as isolated, probably Ca and  $H_2SO_4$  in the mol. Its reducing properties are seen only after acid hydrolysis, indicating that it is either a paired glucuronate or a condensation product of glucuronic acid. The low C content favors the latter. R. C. WILLSON

The conduct of amylase in the presence of raw starch. GIULIO RADAELLI. Univ. Genoa. *Pathologica* 20, 269-79(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 47, 154.—Salivary amylase combines with starch from rice, corn and potatoes, although the electrolyte is of decisive importance. Cl is the most active, followed by  $NO_3$  and  $PO_4$  in order. The reaction proceeds better in an acid medium than in an alk. one. R. C. WILLSON

Organic chemistry and vital force (VERKADE) 10. The actual reaction at the beginning of decay of flesh (SCHMIDT) 12. Specificity of enzymic cleavage of polypeptides. Experiments with polypeptides containing *dl*-norleucine (ABDERHALDEN, MAYER) 10.

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## B—METHODS AND APPARATUS

STANLEY R. BENEDICT

Estimation of sugar in urine by means of fermentation tubes. HANNS WILL. *Apoth. Ztg.* 44, 56-9(1929).—An exptl. study involving the use of 6 different types of fermentation tubes. While the app. of both Einhorn and Fiebig were unsatisfactory, the large Hg saccharometer of Lohnstein gave accurate results. The various factors are discussed which affect the results obtainable with the several types of app. W. O. E.

Concentration of serum through ultrafiltration by means of the centrifuge. A. TÓRN. Kaiser Wilhelm-Inst. Arbeitsphysiologie, Berlin. *Biochem. Z.* 197, 353-6

(1928).—Depending upon the speed of centrifuging, 60–70% of the water can be removed from the serum in 1–1½ hrs. S. MORGULIS

The peroxidase reaction. XXIV. A method of simultaneous application of oxidase and peroxidase reaction on blood leucocytes. KOJI TOKUŌ. *Tōhoku J. Exptl. Med.* 12, 295–300(1929).—Apply a satd. aq. soln. of benzidine (contg. 2 drops of 3% H<sub>2</sub>O<sub>2</sub> per 100 cc.) to an air-dried fresh blood smear for 2 mins.; then add a few drops of a 1% aq. eosin soln. for 5–10 secs. Wash with H<sub>2</sub>O; microscopic examn. shows the peroxidase positive granules in the cytoplasm to be brownish red. Then pour on the same smear the Winkler-Schultze oxidase reagent; after 2 mins. wash and reexam.

B. C. BRUNSTETTER

New method of impregnation with gold. R. ALTSCHUL. *Atti accad. Lincei* [6], 9, 74–6(1929).—By the use of HgBr<sub>2</sub> in combination with AuCl<sub>3</sub>, A. has been able to impregnate the cerebral gray matter as well as the central and peripheral nervous tissues. Formalin is used as a fixator. The sections to be impregnated are washed thoroughly in distd. H<sub>2</sub>O, and dipped in a soln. consisting of (A)1% AuCl<sub>3</sub>, and (B) a satd. soln. of HgBr<sub>2</sub>. Various proportions of A and B have been used as 5:20, 5:40, etc. No developer is necessary, and the sections are passed through 5% Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub>, dried, passed through PhOH soln., and then mounted in Canada balsam.

A. W. CONTIERI

Method for determining the oxygen consumption of rats. U. G. BIJLSMA. Centraal Lab. Volkgezondheid, Utrecht. *Arch. intern. pharmacodynamie* 35, 1–12 (1928).—An app. is described and the exptl. errors are discussed. A large no. of detns. is necessary in order to draw conclusions. *Ibid* 13–29.—Urethan, chloralose and "sominfen" narcotics cause a diminished O<sub>2</sub> consumption in rats, which is not dependent on the narcosis or the concomitant lowering of the temp. but upon an inhibition of the respiratory centers, and, as a consequence of insufficient breathing, upon O<sub>2</sub> want in the tissues. The possibility of a decrease in the vol. of the heart was not excluded.

DAVID DAVIDSON

The determination of lactic acid. THEODORE E. FRIEDEMANN AND ARTHUR I. KENDALL. Northwestern Univ. *J. Biol. Chem.* 82, 23–43(1929).—A procedure for the detn. of lactic acid in biol. material is described and the factors influencing its precision are discussed. The effect of certain interfering substances upon the yield of lactic acid is shown. The lactic acid contents of urine, the blood of man, dog and sheep, and of a 1% peptone-0.3% meat ext. culture medium are also given. A. G.

The physical basis for the electropotentials of the organism and the direct methods of their measurement. REINHOLD FÜRTH. *Kolloidchem. Beihefte* 28, 235–45(1929).—A description of the app. used for the measurement of electro-potential differences in biochem. systems and the physical basis for the existence of such potential differences.

ARTHUR GROLLMAN

Measurements of potential differences. K. UMRATH. *Kolloidchem. Beihefte* 28, 245–51(1929).—A description of the binant and quadrant electrometers and their application to measurement of bioelec. potentials.

ARTHUR GROLLMAN

The preparation of micro-electrodes for potential measurements. JOS. GICKLHORN. *Kolloidchem. Beihefte* 28, 252–8(1929).—Directions are given for the prepn. of micro-electrodes suitable for work on biol. systems.

ARTHUR GROLLMAN

The electrical characteristics of solutions, dyes and biocolloids. REINHOLD FÜRTH. *Kolloidchem. Beihefte* 28, 285–92(1929).—An app. is described for the study of the elec. properties of dyes or other colloidal systems.

ARTHUR GROLLMAN

The analysis of dispersoids by means of a new diffusion apparatus. A. NISTLÉR. *Kolloidchem. Beihefte* 28, 296–313(1929).—A description of the app. and methods of Fürth (C. A. 21, 3513).

ARTHUR GROLLMAN

Methods for the determination of the dielectric constants of biological systems. REINHOLD FÜRTH. *Kolloidchem. Beihefte* 28, 314–22(1929).—A review of the methods used and the results of studies of the dielec. consts. of biol. systems. A. G.

Dielectric constants. REINHOLD FÜRTH. *Kolloidchem. Beihefte* 28, 322–8 (1929).—Dielec. consts. play an important role in elucidating vital phenomena.

ARTHUR GROLLMAN

A simple method of preserving feces containing hookworm eggs. P. A. MAPLESTONE. *Indian J. Med. Research* 16, 675–82(1929).—Two % antiformalin is effective in preserving feces for hookworm egg count.

FRANCES KRASNOW

A comparison of the calculated and determined osmolar concentration of normal serum. The base-binding power of proteins and the determination of total base. DAN. C. DARROW AND ALEXIS F. HARTMANN. Washington Univ. *Am. J. Diseases Children* 37, 51–60(1929).—The concn. of electrolyte in normal blood serum can be

calcd. from a consideration of its compn., and of the degree of dissocn. of the several constituents. It agrees within 92% with the value indicated by measurements of the f. p. depression. The base-binding power of the serum proteins may be more accurately calcd. by the use of sep. formulas for serum albumin and globulin than by the use of the formula proposed by Hastings, *et al.* (*C. A.* 21, 2483). E. R. MAIN

The water content of blood serum. A comparison of the determination of the specific gravity by the falling drop method and by several other methods. HARVEY SPENCER. Harvard Med. School. *Am. J. Diseases Children* 37, 546-52(1929).—The falling drop method for the detn. of the sp. gr. of blood serum appears to be more accurate than methods which involve the detn. of mass, total solid content or plasma protein content by refractometric analysis. Abnormally high values for the sp. gr., total solids and plasma protein may be assocd. with dehydration of the blood plasma. E. R. MAIN

A new colorimetric reaction for protein substances. MICHELE MITOLO. *Boll. soc. ital. biol. sper.* 4, 37-9(1929).—The Eschaich reagent ( $\text{Na}_2\text{S}_2\text{O}_8 + \text{AgNO}_3$ ), used for the identification of phenol, was used for the identification of protein substances contg. the benzene ring. It was more sensitive than the xanthoproteic and equally as sensitive as the Millon tests, except that the yellow color appeared almost immediately with the Eschaich reagent but only after 15-16 hrs. with Millon's when a 0.01% soln. of com. ovalbumin was tested. The test was modified so as to get a zonal reaction. Two solns. were prepd.: (A) 100 mg. ovalbumin + 10 cc. distd.  $\text{H}_2\text{O}$  + 5 drops  $\text{NH}_4\text{OH}$  + 0.10 g.  $\text{Na}_2\text{S}_2\text{O}_8$ ; (B) 10 cc.  $\text{C}_2\text{H}_5\text{OH}$  + 10 drops  $\text{N AgNO}_3$ . 1 cc. of B was poured carefully over 1 cc. of A. At the point of contact of the 2 solns. a yellowish orange ring was formed. The sensitivity of the zonal reaction was equal to the Ehrlich reagent. The Eschaich reagent can, therefore, be used for the detection of protein substances containing the benzene ring and is equal in sensitivity to the Millon or Ehrlich reaction. PETER MASUCCI

A biological ionization chamber. FRANCIS C. WOOD. *Radiology* 12, 461-70(1929).—*Drosophila* eggs are a simple, cheap, convenient and reliable biol. medium for use in checking or standardizing x-ray app. Practical details for their use are given. E. H. QUIMBY

A simple and rapid quantitative test for sugar in urine. WM. G. EXTON, A. R. ROSE AND P. V. WELLS. *Proc. 38th Annual Meeting, Assoc. Life Ins. Med. Directors of Am.* 14, 436-41(1928).—For the detn. of sugar in urine transfer 0.2 cc. to a tube graduated at 10 cc. and add the reagent to this mark. Immerse the tube in boiling water for 5 mins., cool and place the tube in a scopometer (*C. A.* 19, 3390) with the green light filter in place and note the wedge reading at the extinction point. The glucose equiv. is read from a chart. To prep. the reagent [cf. Sumner, *C. A.* 19, 1146] add 6 g.  $\text{C}_6\text{H}_5\text{OH}$  to 200 cc. 4%  $\text{NaOH}$  and then 5 g.  $\text{Na}_2\text{SO}_4$ . Add  $\text{H}_2\text{O}$  to about 500 cc. and then 100 g.  $\text{KNaC}_4\text{H}_4\text{O}_6 \cdot 4\text{H}_2\text{O}$ . Mix, add 7 g. 3,5,2-( $\text{NO}_2$ ) $_3\text{C}_6\text{H}_3(\text{OH})\text{CO}_2\text{H}$  dissolved in 300 cc.  $\text{H}_2\text{O}$  and adjust to 1000 cc. A. R. ROSE

Carbohydrate metabolism. I. Comparison of the microanalytical methods for glucose. RYOSUKE MIYAMA. *Bull. Sci. Fakultato Terkultura, Kjusu Imp. Univ.* 3, 122-31(reprint).—The methods of Benedict, Folin-Wu, Folin, Hagedorn, Shaffer-Hartmann and Bang were used to det. the glucose content of blood, pure glucose solns. and artificial mixed solns. With pure glucose soln. all the methods afforded correct results at their standard concn. but showed more or less error when the concn. was deviated. Benedict's method required the largest quantity of sample and Bang's method the smallest. When blood was used, Bang's method gave the smallest amt. of sugar and Benedict's gave the largest. The order was: Benedict > Folin-Wu > Hagedorn > Folin > Shaffer-Hartmann > Bang. All methods were effected by the addn. of cystine. The addn. of  $\text{Na}_2\text{SO}_4$  gave too high results in Folin-Wu's method and too low result in Bang's method. The other methods were little effected. Conclusion: Hagedorn's method was most reliable. H. M. SOULE

An improved method for titrating sugar in blood and urine. P. J. CAMMIDGE AND H. A. H. HOWARD. *Brit. J. Urol.* 1, 17-32(1929).—For the detn. in urine prep. soln. I by adding 4.948 g.  $\text{H}_3\text{AsO}_3$  and 25 g.  $\text{NaHCO}_3$  to 300 cc. distd.  $\text{H}_2\text{O}$ , boil until dissolved, cool and make up to 1000 cc., and soln. II by dissolving 81 g.  $\text{K citrate}$ , 70 g.  $\text{K}_2\text{CO}_3$ , and 92 g.  $\text{K oxalate}$  in 600 cc. hot  $\text{H}_2\text{O}$ , and adding 25 g.  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$  dissolved in 150 cc. warm  $\text{H}_2\text{O}$ , adding 3.2496 g.  $\text{KIO}_4$ ,  $\text{HIO}_3$  to 150 cc.  $\text{H}_2\text{O}$ , boiling until dissolved, making alk. with  $\text{K}_2\text{CO}_3$ , cooling and adding 50 g.  $\text{KI}$ , mixing the solns. and making up to 1000 cc. Add 50 cc.  $\text{H}_2\text{O}$  to 50 cc. soln. II in a 400-cc. flask, boil and add 5 cc. urine. Cool and add 7.5 cc. 30%  $\text{H}_2\text{SO}_4$ . Mix and titrate immediately with soln. I, until the bright blue end point is reached. Subtract the reading from a standard

figure in a preliminary blank detn. and read the glucose equiv. from a table. For blood (A) dissolve 10 g. Na tungstate in 100 cc.  $H_2O$ , (B) dil. 20 cc.  $H_2SO_4$  with 10 cc.  $H_2O$ , (C) to 1 cc. 0.1 N  $H_2AsO_3$  add  $H_2O$  to make 20 cc., (D) dissolve 40 g. crvstd.  $Na_2CO_3$  in 400 cc.  $H_2O$ , add, while stirring, 5 g.  $CuSO_4 \cdot 5H_2O$  and 7.50 g. tartaric acid which had been dissolved in 150 cc. warm  $H_2O$ ; dissolve 0.65 g.  $KIO_3$ ,  $HIO_3$  in 250 cc.  $H_2O$  by heating, neutralize with  $K_2CO_3$  and cool; add 10 g. KI and 18.4 g. K oxalate and then mix in the alk. Cu soln.; cool, make up to 1000 cc. and standardize against soln. C. Prep. protein-free filtrate by adding to 1 cc. blood 7 cc.  $H_2O$  and, when laking is complete, adding 1 vol. each of solns. A and B. Shake, let stand for 5 mins. and filter. Mix 5 cc. of the clear filtrate with 5 cc. soln. D in a narrow test tube. Add a few drops of toluene or benzene and heat the tube in a boiling water bath for 15 mins. Cool immediately in running  $H_2O$  and add 4 cc. soln. B. After 1 min. run in soln. C until the blue end point is reached. Calculation is made as for urine detn. All solns. are stable and can be kept for some time in well-stoppered bottles. R. C. WILLSON

Method of preserving blood for the blood-sugar test. LAX and SZERNAI. *Münch. med Wochschr.* 76, 58-60 (1929).—L. and S. added 1% NaF and 0.1%  $HgCl_2$  to blood and prevented glycolysis and bacterial decompn. for 30 days in the incubator. The process had no influence on the albumin pptn. or sugar reduction. R. C. WILLSON

Determination of reducing sugars by the ferricyanide method (IONESCU-MATIN) 7. Notes of the laboratory. III. New tubes for cataphoresis (VLES) 1.

Handbuch der biologischen Arbeitsmethoden. Edited by EMIL ABDERHALDEN. Abt. I. Chemische Methoden. Teil 2. Allgemeine chemische Methoden. Hälfte 2. Heft 3 (Lieferung 287). JOSEF HALBERKANN and FRITZ FRETWURST: Sulfonieren. EDUARD STRAUSS and KARL KOULEN: Biologische wichtige Reaktionen und Reagenzien. Pp. 1969-2148. M. 10. Abt. II. Physikalische Methoden. Teil 9. Heft 9 (Lieferung 283). M. C. KELLER: Die quantitative Spektralanalyse. WALTER R. HESS: Die Verwendung des Schmalfilms für biologische Zwecke. LUDWIG HEILMEYER: Farbmessungen an gefärbten Körperflüssigkeit mit dem Pulfrichschen Stufenphotometer. Pp. 2263-2366. M. 6. Heft 10 (Lieferung 284). GUNTHER SCHEIBE: Photographische Absorptionsspektrophotometrie. Pp. 2367-2418. M. 3. Abt. III. Physikalisch-chemische Methoden. Teil A. Heft 7 (Lieferung 272). HEINRICH SCHADE and KARL MAYR: Methodik der Gewebeslastometrie und d. H-ionenmessg. am lebenden Organismus. SILVESTER PRAT: Die polarograph. Methode. I. M. KOLTHOFF: Die Pufferlosn. bei d. colorimetr. Bestimmg. d. Wasserstoffionenkonzentration. KARL SCHULTZE: Methodik d. Bestimmg. d. Capillarität. Pp. 1573-1544. Abt. IV. Angewandte chemische und physikalische Methoden. Teil 6, Hälfte 2. Untersuchung d. Funktion d. Verdauungsapparates. Heft 4 (Lieferung 280). M. 6. Teil 13. Quantitative Stoffwechseluntersuchungen. Heft 1 (Lieferung 288) (Conclusion of Teil 10). M. 4. Teil 7 C. Untersuchungs- und Forschungsmethoden der Pharmazie. Heft 1 (Lieferung 281). RICHARD WASICKY: Einleitung. physikalische Untersuchungsmethoden der Pharmazie. LUDWIG KOFLER: Die Untersuchung mit freiem Auge, Lupe, Mikroskop und seinen Nebenapparaten. JAKOB POLLAK: Schmelzpunkt, Siedepunkt, spezifische Gewicht, Löslichkeit. OTTO DAFERT: Optische Methoden. Capillaranalyse, Viscosimetrie, Wasserstoffionenkonzentration. 192 pp. M. 10. Berlin and Vienna: Urban & Schwarzenberg.

## C—BACTERIOLOGY

CHARLES B. MORREY

Methods of studying the surfaces of living cells, with especial reference to the relation between the surface properties and the phagocytosis of bacteria. STUART MUDD, MALDUIN LUCKE, MORTON MCCUTCHEON and MAX STRUMIA. *Colloid Symposium Monograph* 6, 131-8 (1928).—This is the first stage of a study to express the mechanism of the action of opsonins and bacteriotropins in physico-chem. terms. Immune sera were made by injecting rabbits with *B. tuberculosis* and other "acid-fast" microorganisms. The bacteria, treated with serial dilns. of normal and immune sera, have been studied in the following reactions: (1) After standing overnight, the degree of pptn or agglutination is read. (2) The serum-bacterial mixts. are strongly centrifuged and the sediments resuspended by shaking until the untreated control tubes show an even suspension; the treated sediments are resuspended in flocculi, increasing in coarseness with their cohesiveness. (3) The treated bacteria are washed and their wetting or interfacial tension properties std. in the interface reaction—before treatment, the microscope shows that they pass readily into the oil at an oil-water interface, whereas after treat-

ment, they resist passing into the oil in proportion to the degree of their interaction with serum. (4) The electrokinetic potential difference between the washed bacteria and their suspending medium is calcd. from detns. in a microcataphoresis cell. (These 4 reactions give a picture of the surface properties.) (5) Meanwhile rabbit leucocytes being used, the phagocytic index of each of the different sera and bacteria was detd. The results show that sera which increase phagocytosis, concomitantly increase the cohesion, decrease the surface potential difference and alter the wetting properties of the bacteria. Conversely, with certain exceptions, when sera have altered the surface properties of bacteria as indicated, they cause the bacteria to be spread upon and engulfed by leucocytes. The exceptions were aged or heated sera, or sera of another species than the leucocytes, and indicate that the requirements for the spreading are more delicate than the physico-chem. reactions used. The results point to the deposition on the bacterial surface of serum components.

JEROME ALEXANDER

**Disinfectant action.** III. HENRY D. CHEESEWORTH AND E. ASHLEY COOPER. *J. Phys. Chem.* 33, 720-8(1929).—Unsatd. compds. in general tend to possess a higher bactericidal and protozoacidal action than the corresponding satd. compds. This is illustrated by the cases of allyl and propyl alcs., unsatd. and satd. fatty acids and phenols and cyclohexanols. A quant. study of the action of allyl alc. on proteins discloses the fact that chem. interaction through the unsatd. grouping does not occur. It is believed that the superiority of unsatd. substances as germicides is associated with their greater physico-chem. capacities to induce pptn. or denaturation in colloid suspension.

FREDERICK G. GERMUTH

**Influence of osmotically active agents on the bacterial cell.** BASJO RAICHEL. *Arch. Protistenk.* 63, 333-61(1928).—Spirilla show plasmolysis with hypertonic solns, the protoplasm breaking into 2-6 unequal portions. With  $H_2O$  and glycerol plasmolysis occurred. Glycerol and urea sometimes produce deformities in the spirilla

F. KRASNOW

**The cleavage of carbohydrates by bacteria.** MACKENZIE DOUGLAS. ROSS INST., London. *J. Trop. Med.* 32, 57-9(1929).—Detailed results are given. F. K.

**Acid production in media containing carbohydrates by Gram-negative intestinal bacteria.** MACKENZIE DOUGLAS. ROSS INST., London. *J. Trop. Med.* 32, 73-7(1929).—The results are detailed.

F. KRASNOW

**The hydrogen-ion concentration changes in media containing carbohydrates by Gram-negative intestinal bacilli.** MACKENZIE DOUGLAS. ROSS INST., London. *J. Trop. Med.* 32, 89-93(1929).—Results are recorded in detail.

F. KRASNOW

**The chemotaxis of bacteriophage and bacterial products.** PAUL FABRY. Univ. Liège. *Arch. intern. méd. expl.* 4, 409-12(1928).—Lysable bacteria and the sol. products obtained from them appear to exert an attractive force upon their sp. bacteriophages. A filtrate contg. anti-Hiss bacteriophage passes through a Chamberland filter into an emulsion of Hiss bacilli, or into an ext. obtained by grinding the bacilli, but does not pass through the filter into sterile bouillon.

E. R. MAIN

**The behavior of bacteriophage in the presence of nonlysable bacteria.** PAUL FABRY. Univ. Liège. *Arch. intern. méd. expl.* 4, 413-6(1929).—A bacteriophage, in the presence of bacteria which are not lysable by it, but are lysable by other bacteriophages, appears to multiply, although it does not produce visible lysis. A bacteriophage, in the presence of non-lysable bacteria, does not appear to multiply.

E. R. MAIN

**The conditions under which the antibacterial and antitoxic power of bile is manifested.** I. The retardation of lactic fermentation in the presence of bile salts. A. CLEMENTI. *Arch. sci. biol.* (Italy) 13, 211-20(1929).—The object was to det. the effect of bile salts on the intensity of lactic acid fermentation in milk inoculated with lactic acid bacteria. Conclusions: (1) The presence of bile salts causes a retardation of lactose fermentation, and the inhibition of the transformation of caseinogen into casein which takes place during the growth of the organisms in the milk. (2) The increase in H-ion concn., that is a reaction strongly acid to litmus, causes the pptn. of the bile acids and the formation of floccules; this indirectly retards the lactic acid fermentation. II. The growth of *Bacillus coli* in the presence of bile or bile salts. A. CLEMENTI AND A. CASTELLI. *Ibid.* 221-34.—The object was to prove that the inhibiting action of bile or bile salts on the growth of bacteria is due to the formation of insol. bile acids which flocculate and carry down with the ppt. some of the bacteria. The results of the bacterial count showed that in the presence of bile or bile salts there was a marked inhibition in the growth of *B. coli*, if the reaction of the broth became acid owing to the fermentation of dextrose, or is rendered acid artificially by the addn. of lactic acid, but there was no inhibition if the reaction remained alk. The acid reaction of the cultures caused the liberation of bile acids which being insol., pptd., formed floccules, and carried

down the organisms. The inhibition of the growth of bacteria by bile salts is, therefore, not due to any antiseptic action on the part of the bile salts, but is due to the formation of acid in the medium by the fermentation of dextrose or other sugar, and the subsequent flocculation of bile acids. These results also explain the contradictory statements found in literature relative to the action of bile on the growth of bacteria.

PETER MASUCCI

**Experimental studies on the stereoisomeric relations in the dismutation of phenylglyoxal hydrate through various bacteria** (*B. proteus*, *fluorescens*, *pyocyaneum*, *prodigiosum* and *coli*). SHIGERU HAYASHI. Kaiser Wilhelm-Inst. für Biochemie, Berlin-Dahlem. *Biochem. Z.* 206, 223-7(1929).—All contain an enzyme which dismutates phenylglyoxal hydrate quantitatively to mandelic acid which in every instance but one was levorotatory. Reaction  $p_H = 7.0$ . With *B. coli* the dismutation proceeds best at  $p_H = 8.1$ , and a mandelic acid is obtained which contains  $\frac{1}{2}$  to  $\frac{3}{4}$  the dextrorotatory component.

S. MOROGLIS

**Bacteriological study of dysentery in Porto Rico.** OSCAR COSTA MANDRY. Univ. Porto Rico. *Porto Rico Rev. Pub. Health Trop. Med.* 3, 259-66(1928).—Though "diarrhea and enteritis" cause more deaths in Porto Rico than any other group of diseases, organisms of the dysentery group were absent in the stools of 71 cases of acute diarrhea. In 6 cases the Flexner type of dysentery bacillus was found. The presence of other organisms, *e. g.*, *B. paratyphosus* B, *B. enteritidis* and *B. suispestifer* was revealed in diarrheal cases as well as in the controls.

G. SCHWOCH

**The action of mercurochrome and tincture of iodine in skin disinfection.** W. W. SCOTT, J. H. HILL AND M. G. ELLIS. Johns Hopkins Univ. *J. Am. Med. Assocn.* 92, 111-16(1929).—There are extreme exptl. conditions under which neither 7% tinct. I nor the alc.-acetone-H<sub>2</sub>O 2% soln. of mercurochrome will sterilize. Both substances are equally effective in the sterilization of uncleansed human skin, the differences being within the limits of exptl. error.

R. C. WILLSON

The actual reaction at the beginning of decay of flesh (SCHMIDT) 12.

SMEETON, MARY A.: *Bacteriology for Nurses*. 3rd ed., revised. New York: The Macmillan Co. 335 pp.

## D—BOTANY

THOMAS G. PHILLIPS

**Anaerobic respiration of aspergilli.** HIROSHI TAMIYA AND YASUSABURO MIWA. Univ. of Tokyo. *Z. Botan.* 21, 417-32(1929).—The various species of aspergilli may be arranged in a series showing varying degrees of ability to bring about alc. fermentation. *A. clavatus* approaches yeast in its fermentative power. *A. glaucus*, on the other hand, shows little activity in this respect. Fermentative power of peptone cultures of various aspergilli is only  $\frac{1}{4}$  to  $\frac{1}{2}$  that of sugar cultures. Younger mycelia are always richer in ymase than the older. A special app. for measuring CO<sub>2</sub> developed during fermentation is described.

R. C. BURRELL

**The origin of chlorophyll and its relation to the blood pigment.** I. KURT NOACK AND WILHELM KIESSLING. Univ. Erlangen. *Z. physiol. Chem.* 182, 13-49(1929).—The material which furnished the basis for this investigation was the hitherto chemically unknown *protochlorophyll* which may be demonstrated spectroscopically in leaves that have developed in the dark. For preparative purposes it is best obtained from the inner seed coat of the Cucurbitaceae. Protochlorophyll is closely related to chlorophyll. It contains Mg and the typical phytol and Me ester groups. By treatment with acid it is converted into a Mg-free pigment for which the name *protopheophytin* is proposed. By means of the Grignard reaction ( $p\text{-Me}_2\text{NC}_6\text{H}_4\text{MgI}$ ) it can be converted back to the original Mg complex. Protochlorophyll represents a reduction stage of chlorophyll. Comparatively mild treatment of pheophytin *a* and *b* in acid soln. with Fe gives protopheophytin. There is no evidence thus far, however, of the existence of 2 modifications either of the natural protopheophytin or of protochlorophyll corresponding to chlorophyll *a* and *b*. The reduced stage appears to lose the property of allomerization. By reduction with HI pheophytin yields a pigment almost identical with the phylloerythrin from ox gall. Protopheophytin is very closely related to phylloerythrin, which is an anhydride of a carboxylic acid, and which, after introduction of Mg by the Grignard reaction, yields a green substance almost identical spectroscopically with protochlorophyll. Both the synthetic protopheophytin and the phylloerythrin can be split up into the same carboxylic acid which has a strong tendency toward anhydride formation. The natural protopheophytin could thus far be split into the free acid (as Ca salt) only

through the anhydro compd. The tendency here toward anhydride formation by the free acid seems to be still greater. The carboxylic acids obtained from phyloerythrin and synthetic protopheophytin are spectrally identical as are also the 2 Me esters prepd. therefrom. Their spectrum belongs to another type than that of the original substances. However, the free carboxylic acid of phyloerythrin on standing rearranges into a less acidic substance of the spectral type of the mother substance. From natural and synthetic protopheophytin, as also from phyloerythrin, spectrally identical anhydro compds. of the 2nd type were obtained which easily revert to the spectral type of the original substances. The absorption spectrum of the carboxylic acid obtained from protopheophytin and phyloerythrin coincides to a great extent with those of the blood pigment porphyrins. This acid, as also its Me ester, on illumination becomes transformed into a chlorophyll-green substance showing the red band typical of chlorophyll. This process, which occurs with the acid from protopheophytin as well as with that from the animal pigment phyloerythrin, may be regarded as a photooxidation.

A. W. DOX

New observations on the metabolism of *Ustilina vulgaris* L. H. WÜNSCHEN-DORFF AND CH. KILLIAN. *Compt. rend.* 188, 1124-6(1929); cf. *C. A.* 23, 635.—Eight lab. expts. with this fungus where the incubation temp. was controlled at 25° and the evolved gases were analyzed showed that the wt. of  $\text{NH}_3$  formed is directly proportional to the dry wt. of the fungus mycelium. As growth proceeds the acidity of the nutrient soln. decreases. The % of N fixed (in its own mycelium) is practically const at 6.5%. Where non-optimal growth conditions are present, i. e., where the peptone concn. in the medium is below 0.3% or above 3%, the results are very different and the fungus makes only a submerged growth.

C. R. FELLERS

Glutelins. V. The glutelins of rye (*Secale cereale*), and of barley (*Hordeum vulgare*). FRANK A. CSONKA AND D. BREESE JONES. U. S. Dept. Agr. *J. Biol. Chem.* 82, 17-21(1929); cf. *C. A.* 22, 3193.—Rye contains one glutelin which seps. from a 0.2% NaOH soln. by addn. of  $(\text{NH}_4)_2\text{SO}_4$  to 3% satn. Barley contains 2 glutelins which sep. from the alk. medium at 1 to 2%, and at 18%, resp., of satn. with  $(\text{NH}_4)_2\text{SO}_4$ . The elementary compn. of the rye glutelin and that of the  $\alpha$ -glutelin of barley were detd. The cystine, arginine, histidine and lysine contents of the glutelin of rye are 2.56, 7.07, 2.75 and 5.39%, resp., and the  $\alpha$ -glutelin of barley, 3.10, 5.59, 1.09 and 2.88%, resp. The isoelec. point of rye glutelin is  $p_H$  6.2; and of the  $\alpha$ -glutelin of barley, 6.4. A. G.

Vital staining as a general method of botanical investigation. J. PEKAREK. *Kolloidchem. Beihefte* 28, 280-5(1929).—Vital staining is a much more useful aid in botanical investigation than fixation and staining of the dead tissue.

ARTHUR GROLLMAN

Effect of the hydrogen-ion concentration on the reaction of ammonium salts in a nutrient solution. WALTER MEVIUS. *Planta Abt. E Z. wiss. Biol.* 6, 379-455(1928).—Corn seedlings and cuttings of *Tradescantia fluminensis* produced normal plants in solns. contg.  $\text{NH}_4$  salts of strong acids as a source of N, provided the reaction of the soln. was acid. Keeping the soln. neutral or alk. by adding  $\text{CaCO}_3$  caused severe injury to the plants.  $\text{NaNO}_3$ , on the contrary, was injurious at acid but not at neutral or alk.  $p_H$  values. The  $p_H$  value of the soln. was not a limiting factor for  $\text{NaNO}_3$ . Since an acid reaction results from the preferential absorption of  $\text{NH}_4$  ions in the case of corn, it is believed that the injury in an alk. soln. is due to the nature of the  $\text{NH}_4$  radical. The N requirement of the plant is believed to be an important factor in detg. the degree and nature of preferential absorption and hence the reaction of the soln. Changing the soln. frequently was usually found to be detrimental. An extensive review is given of the theories relating to preferential absorption and the mechanism causing injury.

A. E. HITCHCOCK

Contributions to the study of spike disease of sandal (*Santalum album*, Linn.) IV. Composition of healthy and spiked Sandal stems. D. A. RAMA RAO AND M. SREENIVASAYA. *J. Indian Inst. Sci.* 11A, 241-3(1928).—Sandal stems 0.20 to 0.50 cm. in diam. from diseased and healthy trees were analyzed. Diseased stems contain less ash, Ca and K but more N, P and starch. The diseased and healthy stems show similar seasonal variations in compn. V. Transmission of spike by budding. M. SREENIVASAYA AND G. GOPALASWAMI NAIDU. *Ibid* 244-7.—Buds derived from spiked stems were budded successfully on to healthy stocks and after 131 days the stock showed the disease.

H. R. KRAYBILL

The possibility of administering carbon to the leaves of plants. LUIGI MONTE-MARTINI. *Ann. accad. agr. Torino* 70, 3-15(1927).—In an endeavor to ascertain whether extremely finely divided carbon can increase the  $\text{CO}_2$  utilized in chlorophyll assimilation 163 expts. were conducted with "vegetina" (an impalpable powder having carbon as a base) and 92 with pulverized wood charcoal. Plants with pinnate or lobate leaves were



treated, such as kidney bean, potato, mulberry, *Pawlonia*, rose, fig, *Sophora*, tomato, *Ricinus*, horse chestnut, ash, *Glycine*, *Begonia*, *Arabis*, raspberry, etc. Favorable results, in which the increase of dry weight per unit of surface in the treated leaves exceeded that of the untreated leaves, predominated slightly. This predominance was less pronounced with the charcoal. The tests, however, do not permit a definite conclusion and further expts. are necessary.

ALBERT R. MERZ

The structure-forming substances in cabbages. II. HANS PRINGSHEIM AND CHARLES R. FORDYCE. *Ber.* 62B, 831-2(1929).—The structural substance in red cabbage and cauliflower is identical with that in white cabbage, namely a *polyhexosan*. It gives with  $\text{ZnCl}_2$  and I the same reaction as cellulose. The dry substance is hard to be dissolved, but after imbibition of  $\text{H}_2\text{O}$  it is dissolved in a soln. of 15 g.  $\text{Cu}(\text{OH})_2$  in 1000 cc.  $\text{NH}_3$  of 25% and 100 cc.  $\text{NaOH}$  of 8%. The soln. of the triacetate in  $\text{CHCl}_3$  has  $[\alpha] = 0$ , compared with 23 for cellulose. The soln. in an ammoniacal  $\text{Cu}$  soln. with 7.2 mol.  $\text{Cu}$  has a lower  $[\alpha]$  than cellulose. The sugars formed by hydrolysis with  $\text{HCl}$  could not be identified, as decompn. occurs. The x-ray diagram of the leaves is the same as with cellulose.

A. E. MEYER

The vital accumulation of dyestuffs. JOS. GICKLHORN. *Kolloidchem. Beihefte* 28, 367-82(1929).—In vital staining, 3 phases must be distinguished: absorption, accumulation and distribution of the dyestuff. Expts. were made with the epidermis of the fruit of *Symphoricarpos racemosus* L. At low osmotic pressure of the cell fluid globules are present, which absorb the dyestuff. Neutral red and naphthalene blue were used. If the cells are subjected to plasmolysis, the globules are dissolved and the dyestuff is uniformly distributed through the cell fluid. The globules consist of a viscous liquid. Later a colored membrane is formed that includes a colorless liquid. The membrane gives protein reaction. By the access of the dyestuff the equil. in the cell fluid is disturbed and a mixt. of protein and lipoids pptd. The same phenomenon was observed in 120 plants. In the cells of the epidermis of the base of the leaf of *Iris germanica*, *florentina* and *flavescens*, the globules are always visible as glittering drops. All cells especially suitable for the observation contained much  $\text{MgNH}_4\text{PO}_4$ . If cells from scales of bulbs are subjected to plasmolysis against a soln. of  $\text{KNO}_3$  contg.  $\text{Cu}$ , the cell fluid is pressed out of the protoplasm. At the polarization microscope, a concentric arrangement in layers was observed, due to double refraction of crystals of  $\text{Cu}$  salts of fatty acids. Concerning vital staining, there is no fundamental difference between plant and animal cell. The latter contains cell fluid, where the dyestuff is absorbed, while in the former the protoplasm first seps. fine drops of the protein lipid mixt. and so forms the granulation. The quantity of granulation depends on the amt. of that mixt. present in the cell. The accumulation of the dyestuff is not a measure of the permeability of the cell; neither does it give indications as to electrostatic charges in the plasma.

A. E. MEYER

An indigenous manna. E. HERRERO DUCLOUX. *Rev. facultad cienc. quim.* (Univ. La Plata) 5, Pt.1, 73-6(1928).—The manna is produced on eucalyptus trees (*E. viminalis*) by the sting of an insect; it is a white substance, of sweet taste and neutral reaction, partly sol. in  $\text{H}_2\text{O}$ ,  $\text{CHCl}_3$ ,  $\text{MeOH}$  and  $\text{EtOH}$ . It contains:  $\text{H}_2\text{O}$  13.922%, ash 0.600%, waxes 0.200, insol. in  $\text{H}_2\text{O}$  0.725%, gums 1.50%, arabinose 2.90, raffinose 54.00, dextrose 15.50, sucrose 25.30.

A. E. MEYER

Dynamics and energetics of carbon dioxide assimilation. JULIUS STOKLASA, J. PENKAVA AND JAZMILA PETROVA. *Ernähr. Pflanze* 25, 97-105(1929).—There is reviewed here much of the exptl. evidence obtained by S. and his coworkers in support of the idea that the action of *K* in plant growth is due to its radioactivity. L. P. MILLER

Studies of wood-destroying fungi. I. *Polyporus hispidus* (Fries). F. J. NUTMAN. Dept. Sci. Ind. Research, Forest Products Lab., England. *Ann. Appl. Biol.* 16, 40-64(1929).—The following enzymes were found in the mycelium: emulsin, diastase, invertase, ligninase, hemicellulase, oxidase and catalase. The list is probably not exhaustive. A method for the demonstration of ligninase is evolved from a modification of Czapek's "hadromal" reaction. Other biol. data are given. C. H. RICHARDSON

The quantitative determination of chlorophyll. F. M. SCHERTZ. *Plant Physiol.* 3, 323-34(1928).—The more important methods for detg. chlorophyll are reviewed. Colorimetric and spectrometric methods of detg. chlorophyll are described, graphs given and results are compared. The former method is more accurate at chlorophyll concns. of about 0.05 g. per l., the latter at concns. of 0.10-0.15 g. per l. The stability of *K* chlorophyll as a standard is discussed. F. M. SCHERTZ

Studies on solute translocation in plants. Experiments indicating that translocation is dependent on the activity of living cells. OTIS F. CURTIS. Cornell Univ. *Am. J. Botany* 16, 154-68(1929).—When the petioles of bean leaves are chilled to be-

tween about 1° and 4-6°, the removal of carbohydrates from the leaf blades is stopped or greatly retarded. The temps. causing a check in translocation approximate those causing a cessation of protoplasmic streaming and it seems that this streaming protoplasm carries the solutes through the phloem. The available data indicate that the rate of translocation is not much influenced as the temp. is lowered from 25° to around 6-8° even though streaming is retarded as the temp. is lowered. Translocation is, however, markedly checked or stopped at a temp. between 1° and about 4° to 6°. The effect of chilling seems to become evident only at a rather definite temp. Chilling to temps. around 4-6° or below also interferes with the upward movement of inorganic nutrients. The removal of carbohydrates from the leaves of beans seems not to be interfered with appreciably by coating the petioles with melted wax. This is probably due to effective aeration through the petiolar cavity. On the other hand, when the petioles are enclosed in tubes containing N under slight pressure translocation is checked. The evidence indicates that living cells take an active part in both upward and downward solute translocation. It also supports the hypothesis, suggested by ringing and xylem-cutting expts., that upward movement of solute takes place chiefly through the phloem. J. J. SKINNER

The chemical composition of *Andropogon virginicus* and *Danthonia spicata* at successive growth stages. R. B. DUSTMAN AND L. C. SHRIVER. West Virginia Agr. Expt. Sta. *J. Am. Soc. Agron.* 21, 561-7(1929).—The early growth of both grasses is characterized by a relatively high protein and low fiber content compared to the later growth stages. Tables show the % of crude protein, crude fiber, N-free ext., ether ext. and ash. E. F. SNYDER

Chemical relationship between scion and stock in citrus. A. R. C. HAAS AND F. F. HALMA. Citrus Expt. Sta., Riverside, Calif. *Plant Physiology* 4, 113-21(1929); cf. *C. A.* 22, 4149; 23, 409.—Ash, total and water-sol. Ca, total and water-sol. Mg were detd. in Mar. and Aug. in the trunk bark of most of the important varieties of Calif. citrus which represented various commonly occurring combinations of scion and stock. The differences in the Ca content in the leaves of orange and lemon noted previously (*C. A.* 22, 2390) do not exist in the trunk bark, but differences in sol. Mg do exist. Sol. Mg is lowest in the lemon and sour orange and highest in the sweet orange and grapefruit. The values found in the bark of the stock varied according to the scion variety with which it is combined. It is suggested that the growth rate between lemon and sweet orange or grapefruit may play an important role in detg. the influence of scion on stock, for the leaves of the former draw more heavily on the Mg supply than those of the latter. WALTER THOMAS

Seasonal variation of the chloroplast pigments in several plants on the Mall at Washington, D. C. F. M. SCHERTZ. U. S. Dept. Agr. *Plant Physiology* 4, 135-9 (1929).—Detns. of carotin, xanthophyll, total carotinoids and chlorophyll ( $\alpha + \beta$ ) made at intervals during the growing season on both young and old leaves of 3 trees and 2 shrubs showed considerable variation in the amts. of these pigments (*C. A.* 8, 3565). Attempts to correlate the effect of temp., sunshine and rain with the quantity of pigment present were not successful. S. points out the necessity for care in sampling and the danger of general conclusions from the results of only one season's work. W. T.

Plant pigments. IX. Crocetin and lycopin (KARRER, *et al.*) 10. Plant pigments (KARRER) 10.

FAYERS, MATRIN A.: *Air, Water and the Chemistry of Plant Life*. Based on lectures at Wye Agricultural College by J. Russell. London: G. Philip. 86 pp. 1s. 9d., net.

## E—NUTRITION

PHILIP B. HAWK

Studies on the effect of muscular exercise in beriberi. I. The influence of muscular exercise upon the gas and carbohydrate metabolism (resynthesis of lactic acid, acidosis and the entity of fatigue in beriberi). ROKURO INAWASHIRO AND ENAJI HAYASAKA. *Tôhoku J. Exptl. Med.* 12, 1-28(1928).—In 10 cases of beriberi, muscular exercise produced the following effects: (1) the resynthesis of lactic acid is retarded; (2) the decrease of O<sub>2</sub> consumption and respiratory vol. to initial values is much prolonged; (3) the respiratory quotient decreases from a max. nearly equal to the controls to levels far below initial values to which it slowly returns; (4) acidosis is increased; (5) blood sugar is increased. These changes were also found after exercise in a case of exptl. human B-avitaminosis. II. The influence of muscular exercise on the circulatory apparatus, with special reference to its dynamic function as well as

the utilization and supply of oxygen in beriberi (the cause of the hypertrophy and dilatation of the heart in beriberi and the relaxation of the peripheral blood vessels). ENAJI HAYASAKA AND ROKURO INAWASHIRO. *Ibid* 29-61.—Muscular exercise produced in a case of human exptl. B-avitaminosis the same circulatory derangements, though to a less marked degree, that occur in beriberi. The blood flow in beriberi, higher in rest than normal, is increased after exercise; this is attributed to the relaxation of peripheral blood vessels, which in turn seems to be related to paralysis of vasomotor nerve endings, to acidosis and to an increased output of adrenaline or adrenaline-like substances. As a result of this increased blood flow, the heart is excessively worked which, together with the associated paralysis of the respiratory muscles, causes hypertrophy of the right heart. This dilatation of the heart is aggravated by acidosis. Author's conclusion: Since muscular exercise increases blood flow and acidosis markedly in beriberi, it will accelerate the hypertrophy and dilatation of the heart. B. C. B.

Study of wheat bread and of brewer's and baker's yeasts from the point of view of their vitamin B content, and an attempt at the preparation of a bread containing sufficient vitamins. N. V. VESELKIN, O. P. YAROSLAVTZEVA, G. L. SELIBER AND G. A. BOVSHIK. *Bull. Inst. Lesshaft* 12, 87-96(1927); *Biol. Abstracts* 2, 85-6.—Expts. on 4 pigeons, using white bread with varying amts. of baker's yeast and with addns. of brewer's yeast dried at 40°, showed that 0.2 g. of dried brewer's yeast fed daily separately with white bread *ad lib.* provides enough vitamin B to maintain weight and to prevent polyneuritis. Since 0.5 g. brewer's yeast was needed to provide sufficient vitamin B with a vitamin B-free basal diet, it was concluded that white bread contg. 0.5% baker's yeast provided about 1/2 the vitamin B necessary to maintain weight. Attempts to increase this vitamin content of bread by addns. of baker's yeast up to 6% of the total weight were unsuccessful, but addns. of dried brewer's yeast to the dough produced a bread on which the pigeons maintained their wts. const. It is concluded that by addn. of dried brewer's yeast to the dough white bread can be made adequate for human use without change in taste. H. L. D.

What is involved in testing a food for vitamin D? E. J. QUINN. *Columbia Univ. Food Industries* 1, 249-51(1929).—A review of curative and preventive methods for vitamin D assay, using x-ray, histological and chem. criteria. C. R. F.

Nutritional leg-weakness in poultry. R. J. MILLER, R. A. DUTCHER AND H. C. KNADEL. *Poultry Sci.* 8, 113(1929).—Line-tests and bone-ash detns. in large groups of white leghorn chicks on a rachitogenic diet indicated that irradiation for 15 mins. daily with the quartz Hg vapor lamp and with the blue-flame C arc lamp, and by means of sunlight transmitted through Vitaglass and Celo-glass, produced growth response and skeletal development comparable with the results obtained with Newfoundland or Norwegian cod-liver oils. (2 lbs. per 100 lbs. of ration.) C. R. F.

Fish oils as sources of vitamin D for poultry. V. S. ASMUNDSON, W. JOHN ALARDYCE AND JACOB BIELY. *Univ. Brit. Columbia, Vancouver. Sci. Agr.* 9, 594-8(1929).—Standard cod-liver oil contg. 1600 units of vitamin D was compared with pilchard and dog fish-liver oil. Two-day chicks were fed a standard ration, supplemented with oil, until 46-49 days old. The ration consisted of 97 lbs. yellow corn, 2 lbs. CaCO<sub>3</sub>, 1 lb. NaCl and 10-15 lbs. dried skimmed milk. Both "leg weakness" and ash analyses of the tibia were used in judging the vitamin D deficiency. Five series of expts. showed that if the ash content due to 2% cod-liver oil was used as 100, then 2% dog fish-liver oil was valued at 78.5, pilchard oil approx. 86 and control (no oil) 72.3. The temp. at which the dog fish-liver oil was rendered had no effect on its vitamin D potency. Like , 4% of the dog fish liver was no better than 2%. Both pilchard and dog fish-liver oils are variable as to vitamin D potency and in no case are as potent as either com. or medicinal cod-liver oils. C. R. F.

Nutrition and reproduction. III. G. GRIJNS, K. DE HAAN AND J. A. VAN DER LOEFF. *Verslag Akad. Wetenschappen Amsterdam* 37, 540-52(1926); cf. C. A. 20, 3488. Results of a large no. of feeding expts. with different rations are given and tabulated in detail as to the effect on the reproduction of rats. For the production of fertile spermatozoa, as well as the normal reproductivity of the females, there must be present sp. fertility factors in the food, similar to the other vitamins. A special factor is also necessary for a good lactation, probably consisting of an albumin producer. J. C. JURRIJENS

The milk feeding of children. E. BLANCHE STERLING. U. S. Pub. Health Serv. U. S. *Pub. Health Repts.* 44, 957-64(1929).—S. discusses breast milk, cow milk and goat milk. J. A. KENNEDY

The association of bowel disease with vitamin-C deficiency. F. P. MACKIE AND G. D. CHITRE. *Haffkine Inst. Indian J. Med. Research* 16, 77-91(1928).—Monkeys

fed on a diet deficient in or lacking vitamin C become debilitated and anemic, lose weight rapidly and generally suffer from terminal dysentery which ends in death. Administration of orange juice causes a return to health provided the scurvy conditions are not too far advanced. The morbid histology of the intestine suggests degenerative changes due to a toxin.

The interpretation of nutritional experiments. CLIVE NEWCOMB. Pasteur Inst., Coonoor. *Indian J. Med. Research* 16, 537-43(1928).—A statistical discussion of the variations in the wts. of rats and the coefficients of these variations are given.

Calcium and phosphorus metabolism in artificially fed infants. I. Influence of cod-liver oil and irradiated milk. AMY L. DANIELS, GENEVIEVE STEARNS and MARY K. HURTON. State Univ. of Iowa. *Am. J. Diseases Children* 37, 296-310(1929).—The marked differences exhibited by artificially fed infants, in the retention of Ca and P, and in the relative proportions of P excreted in the urine and feces may be a means of detecting early metabolic changes which may result in rickets. Ca and P should be retained in the proportion of 2 parts of Ca to 1 part of P for the normal, optimum development of infants under 1 yr. of age. The retention of these elements appears to be influenced by the antirachitic potency of the foods, as is shown by the following Ca-P retention ratios observed after the feeding of the various mixtures: pasteurized milk, 0.5; boiled milk, 1.2; pasteurized milk and cod-liver oil, 0.8 to 1; boiled milk and cod-liver oil, 1.2 to 1.48; milk with irradiated olive oil, 1.48; and irradiated milk, 2.0.

A brief discussion of vitamins A, B, C and D. D. H. COOK and TRINITA RIVERA. Univ. Porto Rico. *Porto Rico Rev. Pub. Health Trop. Med.* 3, 267-78(1928). G. S.

Numbers of trichomonads in rats on diets of different protein content in relation to the  $pH$  and bacteria in the cecum. HERBERT L. RATCLIFFE. *Am. J. Hyg.* 8, 910-34(1928).—Protein diets influence the number of *Trichomonas muris* to be found in the rat cecum, chiefly through the influence exerted upon the proteolytic anaerobes of the intestine. High protein (casein) diets favor the multiplication of anaerobes and thus tend to restrict the development of trichomonads. While diet modifies the  $pH$ , the latter is of no direct effect on the intestinal flora.

Effect of adrenaline with an excessive amount of fat in the diet: Physiology of the heart and formation of carbohydrate from fat. GUSTAV STÖRRING. Univ. Bonn. *Arch. ges. Physiol.* (Pflüger's) 221, 282-95(1928).—The data presented indicate that adrenaline favors the transformation of fat into carbohydrate.

Phosphatemia in the normal and rachitic organism. JOSEF WARKANY. *Z. Kinderheilk.* 46, 1-12(1928).—When the normal child is given by mouth 0.5 g. of  $Na_2HPO_4$  per kg. of body wt. the increase in inorg. P in the blood is as much as 3.4 mg. %, while the rachitic child reacts with an increase of but 0.4 mg. %. If, however, the rachitic child is given vigantol, the administration of  $Na_2HPO_4$  results in a phosphatemia as great as that shown by the normal child. II. *Ibid* 716-22.—The administration of vitamin D modifies the phosphatemia curve in the rabbit. It is suggested that this fact be used to test the potency of antirachitic preps.

Resorption and retention of egg albumin (nitrogen, phosphorus, sulfur, etc.) by infants. ARMAS RUOTSALINEN. *Z. Kinderheilk.* 46, 370-83.—Infants given egg albumin show a positive balance as regards mineral substances such as P and S, as well as nitrogenous substances and fats.

Disturbances of phosphate metabolism in rickets. II. Excretion of endogenous phosphate. WALTER HEYMANN. *Z. Kinderheilk.* 46, 575-83.—The excretion, by way of the urine, of endogenous phosphate by rachitic children is, per kg. of body wt., about twice that of non-rachitic children, although there is little, if any, difference in excretion through the intestine. III. Phosphatemia in rachitic and non-rachitic children after the parenteral administration of organic and inorganic phosphate. *Ibid* 584-7.—The rachitic and non-rachitic children show the same differences in P in the blood, regardless of whether the P is given by mouth or by injection.

The biochemistry of the carotinoids. BETH v. EULER, HANS v. EULER and P. KARRER. *Helv. Chim. Acta* 12, 278-85(1929).—A study of the growth effect of vitamin A on rats using various carotinoids as sources of the vitamin. Daily doses of 0.01 mg. carotin per rat gave very definite positive growth effects contrary to results of Steenbock, et al. (*C. A.* 16, 1797, 2152, 2166). Dihydroxy- $\alpha$ -crocetin (irradiated peanut oil), 0.015 mg. per day in conjunction with vitamin D, had a surprisingly high growth effect. Lycopin, bixin and capsanthin had no effect. Results were uncertain with norbixin and dihydroxynorbixin. Expts. to correlate the biological results with tests involving measurement of the blue color developed upon addn. of  $SbCl_5$  to a  $CHCl_3$

soln. of the vitamin A food were negative. It was found that all carotinoids and various starches give the  $\text{SbCl}_5$  reaction while vitamin A effect is by no means a general property of naturally occurring carotinoids. Livers from normal rats fed on a mixed diet were found to have a carotinoid content of 25-35 Lovibond units per g. of fresh liver while two carotin-fed rats showed 19 and 29 units, resp. M. H. SOULE

WALKHOFF, OTTO. Die Vitamine in ihrer Bedeutung für die Entwicklung, Struktur und Widerstandsfähigkeit der Zähne gegen Erkrankungen. Berlin: H. Meusser. 100 pp. Linen, M. 13.50.

## F—PHYSIOLOGY

E. K. MARSHALL, JR.

Heat of combustion of living muscle. H. RYCHLEWSKA. *Acta Biol. Exp. Warsaw* 1, No. 2, 1-6(1928).—The heat of combustion of 1 g. of fresh frog gastrocnemius muscle is 1076.5 g.-cal.; after drying, this value rises to 1094.4 g.-cal. The heat of imbibition of muscle is 12.51 g.-cal. per g. of dry substance. The processes taking place during the drying of muscle must be of an endothermic nature. B. C. A.

Physical chemistry of the epidermis. H. SCHADE AND A. MARCHIONINI. *Arch. Dermatol. u. Syphilis* 154, 690-716(1928); cf. *C. A.* 22, 1183.—The  $p_H$  of the epidermis is between 1.78 and 5.17, the av. value being 3.78; the values vary at different points. Perspiration is assoc. with an increase of acidity; wounding or restricted evapn. is attended by an alk. reaction. B. C. A.

Dehydrogenation processes with choroid membranes of albino and pigmented animals. A. CUCCHIA. *Arch. farm. sper.* 45, 67-74(1928).—Contrary to expectation on the oxidation theory of albinism and pigmentation, there is no distinct difference between the rates of reduction of *m*-dinitrobenzene by the choroid membranes of eyes of albino and of pigmented rabbits. B. C. A.

Biochemistry of mixed human saliva. I. Dextrose content. D. ENTIN AND A. A. SCHMIDT. *Deut. Monatsschr. Zahnheilk.* 1927, 710-2.—The Hagedorn-Jensen method is not applicable to saliva. Dextrose and fermenting substances are absent from fasting mixed human saliva. The quantity of substances which reduce thiocyanate (av. 9.7 mg. %) is fairly const. for the individual. B. C. A.

Influence of application of cold or heat to the dog body upon the adrenaline output rate. SHIDZUKA SAITO. *Tohoku J. Exptl. Med.* 11, 544-67(1928).—Cooling non-anesthetized dogs caused no increase in the rate of adrenaline discharge. A slight increase in body temp. did not affect the adrenaline secretion rate, which, however, increased to 7 times the rest period rate when the anal. temp. exceeded  $41^\circ$ . There was a fairly long after-action. B. C. BRUNSTETTER

The presence of adrenaline in the suprarenal bodies in human and bovine fetuses. SHIDZUKA SAITO. *Tohoku J. Exptl. Med.* 12, 254-62(1929).—The suprarenal glands of ox fetuses (4 to 8 months) have as much adrenaline as the adult glands calcd. on a basis of gland wt. Two ox fetuses (13.5 cm. and 15.5 cm., resp.) gave positive results by the rabbit intestine segment method. The left suprarenal of a 5-month human fetus (living briefly after abortion) contained, in mg. per g. of gland, 0.82 by Folin's method, and an av. of 0.02 by 4 closely agreeing biol. methods; a 12 weeks old human fetus gave negative results. The left suprarenal gland of a still-born full-term human fetus contained 2.45 mg. adrenaline by Folin's method (various biological assays were negative); an ext. of the right gland tested negative by Suto's colorimetric method. B. C. BRUNSTETTER

Seasonal variations in the calcium content of the blood serum of the young white rat. A. T. CAMERON AND KATHLEEN R. TURNER. *Univ. Manitoba. Trans. Roy. Soc. Can.* 22, Sect. V, 135-44(1928).—The serum-Ca of the normal adult white rat is reasonably const. (10-11 mg. per 100 cc. serum) throughout the year and the sexes exhibit no difference. The younger the rat the more its serum Ca seems susceptible to influences depressing it below normal (to 6 or 7 mg. per 100 cc.), so that in av. animals about 40 g. in wt. values usually considered normal are only maintained at the height of summer. The chief controlling factor seems to be the solar ultra-violet radiation producing its effect through variations in vitamin D in the food fed the rat. In expts. in which young white rats are employed unless special dietary or other precautions are taken fluctuations in blood Ca are to be expected as normal occurrences. A. T. CAMERON

An attempt to concentrate the active principle of the adrenal cortex. A. T. CAMERON AND F. D. WHITE. *Univ. Manitoba. Trans. Roy. Soc. Can.* 22, Sect. V, 145-9(1928).—Using the enhancement in growth rate of young white rats as test, evidence

is adduced that the active principle of the adrenal cortex passes into the hydrolyzate during hydrolysis with 0.1 N HCl (confirming Kühl, *C. A.* 21, 2813). A. T. C.

The removal of glycogen from living muscle. J. M. HERSHEY AND M. D. ORR. Univ. Toronto. *Trans. Roy. Soc. Can.* 22, Sect. V, 151-7(1928).—Neither starvation and exercise, nor starvation, exercise and shivering removed glycogen completely from the body of the white rat. After strychnine convulsions lasting for varying periods some glycogen still remains in the muscles and liver of the rabbit. A. T. CAMERON

The effect of removal of the liver on the alkaline reserve and the lactic acid content of the blood. L. G. KILBORN, S. SOSKIN AND J. C. THOMAS. Univ. Toronto. *Trans. Roy. Soc. Can.* 22, Sect. V, 159-61(1928).—Expts. with normal, eviscerated, and hepatectomized dogs show a close relationship between the rise in the lactic acid content and the fall in CO<sub>2</sub> capacity of the blood. They cast considerable doubt upon the validity of the respiratory quotient as an index of the type of metabolism proceeding within the organism following such exptl. procedure as evisceration, hepatectomy, or nephrectomy. A. T. CAMERON

The isolation of methyl-hydantoin from an extract of ox testes. J. B. COLLIP AND R. SANDIN. Univ. Alberta. *Trans. Roy. Soc. Can.* 22, Sect. V, 185-6(1928).—In the process of prepg. tissue exts. contg. pressor substances cryst. deposits were frequently obtained in the final stages. That from ox testes on purification and analysis was found to be  $\beta$ -methylhydantoin, the yield by the method used being about 5 g. per 40 kg. of fresh glands. Recrystn. was carried out very satisfactorily with Ac<sub>2</sub>O. A. T. CAMERON

Muscle glycogen in mammals. MARGARET E. MCKAY. Univ. Toronto. *Trans. Roy. Soc. Can.* 22, Sect. V, 329-33(1928).—Expts. on rabbits and cats show that glycogen does not fall rapidly after death, if the tissue is intact. The rate of disappearance is comparatively fast in the sartorius and slowest in the gastrocnemius, which shows no fall after 2 hrs. The glycogen of crushed rabbit muscle practically disappears 15 minutes after the injury. Possibility of restoration of muscle glycogen of which the supply has been depleted by stimulation has been tested in decapitate and decerebrate cats. There is no evidence of any recovery of muscle glycogen after a stimulation period of more than 5 mins. With shorter periods (1 or 2 mins.) there is only some evidence of slight recovery in the gastrocnemius. Causes of this failure in the decerebrate animal are discussed. A. T. CAMERON

Cholesterol metabolism in the incubated egg. KENZO KUSUI. Med. Acad. Nagasaki. *Z. physiol. Chem.* 181, 101-6(1929).—Detns. of cholesterol and cholesterol ester were made on fresh fertile hen eggs and after 3, 7, 14, 18 and 20 days incubation, the digitonin method being used. Free cholesterol showed a steady decrease from 0.2734 g. to 0.1194 g., and cholesterol esters a corresponding increase from 0.0310 g. to 0.1508 g. Up to the 14th day there was a decrease in total cholesterol from 0.3044 g. to 0.2266 g., then an increase to 0.2702 g. on the 20th day. From this it seems highly probable that the embryo is to some extent capable of synthesizing cholesterol. Similar detns. were made with the eggs of a sea turtle, *Thalassochelys corticata*, which require 7 weeks for hatching. The results were similar to those obtained with hen eggs. The free cholesterol decreased while the cholesterol esters increased, and the total cholesterol decreased up to the 30th day but regained half its loss by the 45th day. A. W. D.

Endocrine regulation of blood sugar. L. CERVERA AND F. FORNELIS Y PUIG. *Ciencia* (Barcelona) Oct., 1926; *Rev. sud-am. ericana endocrinol. inmunol. quimioterap.* 11, 210-1(1928); *Physiol. Abstracts* 13, 310.—When HCl comes in contact with the duodenal mucosa, an increase in blood cholesterol takes place if the spleen is intact. If the animal is splenectomized, there is no increased cholesterolemia. H. I. D.

Studies of the inhibitory action of an extract of pancreas upon glycolysis. I. Effect of pancreatic inhibitor on the glycolysis of muscle tissue and muscle extract. ETHEL RONZONI, JEROME GLASER AND DAVID P. BARR. Washington Univ. and the Barnes Hospital, St. Louis. *J. Biol. Chem.* 80, 309-30(1928).—The substance, described first by Winfield and Hopkins (*C. A.* 10, 1213), which inhibits the glycolysis of muscle, was prepd. from the pancreas by a simplified procedure. Glycolysis could be inhibited to the extent of 60%, the inhibition of carbohydrate breakdown being greater than the inhibition in lactic acid formation. The ext. inhibits glycolysis even in the presence of NaF. Evidence is presented to show that the formation of lactic acid by muscle ext. involves the disappearance of both phosphate and carbohydrate with the formation presumably of hexosephosphate. II. Effect of the inhibition upon the glycolysis of malignant tumors. DAVID P. BARR, ETHEL RONZONI AND JEROME GLASER. *Ibid* 331-44.—The inhibitor of glycolysis in muscle exts. has no effect on cancer tissue. The nature of glycolysis in malignant tumors differs from that

in muscle in many respects. Hashing, freezing or extn. prevents glycolysis in tumor tissue; glycogen cannot be used by tumor cells; the phosphate content of these cells is low; and there is no evidence that hexosephosphate is formed in cancer. Since the pancreatic inhibitor acts by preventing esterification, its failure to affect the glycolysis of cancer tissue is, therefore, expected.

ARTHUR GROLLMAN

**Lipide excretion.** V. A study of the partition of the fecal lipides with special reference to bacteria. WARREN M. SPERRY. Univ. of Rochester. *J. Biol. Chem.* 81, 299-319(1929).—The feces excreted by dogs on lipide-free diets were sepd. into portions contg. chiefly (1) bacteria, (2) non-bacterial solids and (3) sol. material. The lipide contents of these fractions were detd. About 40% of the total excretion was contained in the bacterial fraction, most of the rest being in the non-bacterial solids. Essentially the same partition of unsaponifiable material and fatty acids was found for these 2 fractions. The results indicated that fecal lipide excretion is composed of lipides contained in cellular structures (bacteria, epithelial cells, etc.). A. G.

**Glycogen formation in the liver from *d*- and *l*-lactic acid.** CARL F. CORI AND GERTY T. CORI. State Inst. for the Study of Malignant Disease, Buffalo, N. Y. *J. Biol. Chem.* 81, 389-403(1929).—Na *d*-lactate, administered subcutaneously or *per os*, lead to glycogen deposition in the liver. Na *l*-lactate, although absorbed, does not form liver glycogen but is excreted to a large extent in the urine. ARTHUR GROLLMAN

**Studies on cholesterol.** IV. The relation of ovaries and testes to cholesterol metabolism. R. S. RANDLES AND ARTHUR KNUDSON. Albany Med. Coll. *J. Biol. Chem.* 82, 57-9(1929); cf. *C. A.* 22, 978.—The removal of the testes or ovaries from rats had no appreciable effect on the cholesterol content of the blood. A. G.

**Chemical studies of muscle contracture.** II. The distribution of phosphorus in frog muscle during delayed relaxation. H. H. DIXON, H. A. DAVENPORT AND S. W. RANSON. Northwestern Univ. *J. Biol. Chem.* 82, 61-70(1929).—Intraperitoneal injection of hypertonic  $\text{NaH}_2\text{PO}_4$ ,  $\text{NaHCO}_3$ , glycerol, glucose or urea increased the relaxation time of the extirpated gastrocnemii of frogs. The distribution of inorg. P and phosphocreatine in the muscles during fatigue contracture was the same in treated and untreated animals. Dehydration seemed to be the exciting cause of the artificially produced contractures. ARTHUR GROLLMAN

**Secretin.** II. Report. TSUNEYA NISHIKAWA. Tokyo Jikeikwai Med. Coll. *Sei-I-Kwai Med. J.* 47, No. 10, Eng. Abs. 2-3(1928).—HCl exts. of the duodenum of cattle contain activated secretin but  $\text{H}_2\text{O}$  or saline exts. do not. The action of choline and that of histamine on pancreatic secretin are inhibited by atropine. A. G.

**Studies on the glycogen in the central nervous system of some mammals.** II. Changes in the glycogen content of the central nervous system during the postnatal development of some mammals. HYOSAKU TANAKA. Jikeikai Med. Coll. *Sei-I-Kwai Med. J.* 47, No. 10, Eng. Abs. 4(1928); cf. *C. A.* 22, 3690.—On the first day after birth the glycogen content of the nervous system of guinea pigs is high. It then decreases until the first or second week of life after which it again increases. At one month glycogen is found both intra- and extra-cellularly. Between the 3rd and 6th months, it is const. in amt. but somewhat decreased over the preceding period. A. G.

**The interchange of substances between mother and fetus.** E. BRANDSTRUP. Copenhagen Univ. *Klin. Wochschr.* 7, 2340(1928).—NaCl, urea, glucose and amino acids diffuse slowly into the blood of the fetus when they are injected into the mother (rabbit). Sucrose appears not to diffuse from the mother into the fetus.

MILTON HANKE

**Excretion of iodine by the gastric glands.** LUDWIG HEILMEYER STURM. Univ. Jena. *Klin. Wochschr.* 7, 2381-3(1928).—The intravenous injection of NaI leads to the almost immediate excretion of I into the stomach. About 14% of the injected I is so excreted. The concn. of I in the gastric juice is, under these conditions, about 3 times as great as that of the saliva. The injection of iodides increase the secretion of HCl into the stomach. Inhalation of EtI leads to the appearance of I in the gastric juice.

MILTON HANKE

**Carbohydrate metabolism and the catabolism of the glucose molecule.** II. Lactic acid in the blood. ERICH SCHNEIDER AND ERNST WIDMANN. *Klin. Wochschr.* 8, 646-8(1929); cf. *C. A.* 23, 3019.—The liver is the only organ that removes lactic acid from the circulation. Lactic acid that is injected into the portal vein does not appear in the general circulation. Dihydroxyacetone is not converted into lactic acid; and *vice versa*. The lactic acid content of venous and of arterial blood is identical in a resting tissue.

MILTON HANKE

**The mode of action of the thyroid hormone.** RUDOLF WEIL. *Klin. Wochschr.* 8, 652(1929).—Thyroxine, in very minute doses (1:400,000), increases the rate of autoly-

sis of liver cells (*in vitro*) 50% in 24 hrs. W. attempts to explain all of the previously observed phenomena associated with diseases of the thyroid gland on the basis of increased or decreased autolysis.

MILTON HANKE

Oscillations of blood-sugar values within brief periods, and the blood-sugar curve on uniform ingestion of glucose. OTTO J. NIELSEN. Univ. Copenhagen. *Biochem. J.* 22, 1490-8(1928).—Detns. of blood sugar in fasting individuals at complete rest, made at intervals of 1-5 mins. for a period of  $\frac{1}{2}$ -2 hrs., failed to yield previously described oscillations of the blood-sugar curve. In normal individuals N. found an almost horizontal curve; in insulin- and diet-treated diabetics, a rising curve; in diabetics merely treated with diet, a falling curve; in diet-treated diabetics with advanced kidney insufficiency, an almost horizontal curve.

BENJAMIN HARROW

The lactic acid and glycogen contents of kidney cortex. JAMES T. IRVING. Oxford Univ. *Biochem. J.* 22, 1508-13(1928).—The production of lactic acid in excised kidney cortex is, like that in muscle, a reaction of some rapidity. Since under these conditions the glycogen content changes but little, it is deduced that the major part of the lactic acid must be formed from some other source. Glucose may be one of the precursors.

BENJAMIN HARROW

The estrus-producing hormone: its preparation and standardization in a water-soluble form. HAMISH ALLAN, FRANK DICKENS, EDWARD C. DODDS AND FREDERICK O. HOWITT. Middlesex Hospital, London. *Biochem. J.* 22, 1526-43(1928).—The hormone is standardized by injection into rats. One unit of activity is that quantity of material required to produce a full estrus response in 50% of the rats used. Estrus is considered to be present when cornified cells only are shown in the vaginal smear. For the prepn. of the ext. dissected and minced placenta are extd. with boiling  $\text{Ba}(\text{OH})_2$  soln., filtered, concd. by evapn., extd. with  $\text{BuOH}$ , the solvent is distd. off under diminished pressure, the residue dissolved in hot water and filtered, the ppt. washed with ether and the washings are added to the ether exts. of the aq. portion. The combined ether ext. is washed with water, concd. to an oily residue and freed from the remaining  $\text{BuOH}$  by distn. *in vacuo* with a little water. The residue is dissolved in alc., added to water, the suspension shaken with ether, the ext. washed with 0.1 N HCl and then with water until the washings are free from chloride. The ethereal soln. is evapd., the residue dissolved in alc., and then poured into water. The alc. is removed by evapn., 5%  $\text{Ba}(\text{OH})_2$  is added, and the mixt. heated under reflux for 1-2 hrs. The material is filtered, and the ppt. extd. with successive quantities of hot alc. The alc. ext. is evapd. to small vol. and the treatment with  $\text{Ba}(\text{OH})_2$  is repeated. The combined filtrates from the first and second boilings with  $\text{Ba}(\text{OH})_2$  are heated on a water bath and the Ba is removed as  $\text{BaSO}_4$ . The final product is acid in reaction ( $\text{pH}$  5) and can be dialyzed through parchment.

BENJAMIN HARROW

Variations in some of the constituents of the blood throughout the menstrual cycle in normal women. HAROLD G. CLOSE AND ARTHUR A. OSMAN. Guy's Hospital, London. *Biochem. J.* 22, 1544-7(1928).—There is a slight decrease in the serum bicarbonate, and a slight increase in the serum chloride.

BENJAMIN HARROW

The automatism and excitability of the surviving mammalian intestine during oxygen deficiency. ARNOLD SEILER. Univ. Bern. *Z. Biol.* 88, 63-75(1928).—The intestine is automatically active for hrs. Elec. stimulation of the tissue shows similar results both during  $\text{O}_2$  deficiency and  $\text{O}_2$  supply. The reactions are like that of choline. There is a marked difference between this intestine and the heart of cold-blooded animals. The excitability of the latter is greatly diminished in  $\text{O}_2$  deficiency.

F. K.

The influence of liver dialyzates on the surviving heart of cold-blooded animals and on the surviving mammalian intestine. WALTER HOFMANN. Univ. Bern. *Z. Biol.* 88, 119-24(1928).—The liver dialyzates activate the frog heart. The beat counts may remain unchanged or retarded. The effect on the intestine is two phased—a stimulation and an inhibition of activity.

FRANCES KRASNOW

Inhibiting action of sucrose on taurocholate, saponin, and oleate hemolysis. A. C. ROY AND K. C. SEN. *J. Indian Chem. Soc.* 6, 89-92(1929).—Sugar has a great inhibiting action upon the rate of hemolysis of sheep blood by saponin, oleate and taurocholate. Hemolytic behavior of mixtures of hemolytes. KSHITISH CHANDRA SEN AND NARENDRA NATH MITRA. *Ibid* 111-20.—The hemolytic effect of saponin, taurocholate and oleate upon sheep corpuscles is compared with the effect of mixts. of these same substances. The effect of mixts. is approx. the sum of the effects of the components. HCl accelerates the hemolytic action of saponin, while NaOH retards it.

W. D. LANGLEY

Alkali reserve and oxygen capacity of arterial and of venous blood. L. M. HURK-



THAL, A. V. BOCK, J. H. TALBOT AND D. B. DILL. Mass. General Hosp. *J. Biol. Chem.* 81, 681-5(1929).—In a series of normal subjects at rest and at work and in another series of pathol. subjects only small differences were found between arterial and venous blood both in respect to  $\text{CO}_2$  capacity at a partial pressure of 40 mm. of  $\text{CO}_2$  and in respect to  $\text{O}_2$  capacity. In 19 observations on  $\text{O}_2$  capacity there were only 3 in which the  $\text{O}_2$  capacity of arterial blood was greater than that of venous blood and none in which the difference was as great as 1 vol. % in either direction. It is evident that for most purposes the difference between arterial and venous blood is unimportant.

A. P. LOTHROP

The conditions of activity in endocrine glands. XXIV. Asphyxial stimulation of the denervated adrenal gland. R. L. ZWEMER AND H. F. NEWTON. Harvard Med. School. *Am. J. Physiol.* 85, 507-11(1928).—In dogs whose hearts had been denervated by operation, whose sympathetic nerves to the thyroids and liver were severed and whose adrenals had been inactivated by removal of one and denervation of the other, asphyxia of the denervated adrenal induced by compression of the aorta for 10 secs. was followed after release by a great increase in pulse rate. Conclusion: The denervated adrenal medulla responds to asphyxial stimulation by an increased production of adrenaline.

J. F. LYMAN

The effect of daily transplantation of the anterior lobe on the course of pregnancy in the rat and mouse. EARL T. ENGLE AND CAMILLE MERMOD. Stanford Univ. *Am. J. Physiol.* 85, 518-26(1928).—Daily transplantation of fresh anterior lobe of the pituitary into rats or mice from 1 to 4 days after copulation prevented pregnancy; transplants introduced from 11 to 13 days after the beginning of pregnancy caused resorption or expulsion of the fetus. Treatment from the 15th to 17th day of pregnancy did not always interrupt gestation. The gonad-stimulating hormone of the anterior pituitary stimulates the production of a large no. of ovarian follicles, which in turn causes a proliferation of the uterine mucosa that is incompatible with pregnancy.

J. F. LYMAN

The effect of the administration of excessive amounts of water. III. The volume and composition of the bile. ALBERT M. SNELL AND LEONARD G. ROWNTREE. Mayo Clinic and Mayo Foundation, Rochester, Minn. *Am. J. Physiol.* 85, 577-80(1928).—The administration of  $\text{H}_2\text{O}$  in large amts. (50 cc. per kg. body wt.) every half hour produced a temporary decrease in the amt. of bile secreted by animals with permanent biliary fistulas, a decreased total output of bile acids and under certain conditions a decrease in the concn. of bile acids.

J. F. LYMAN

The physiology of the gastric secretion. XIII. The response of the glands to substances applied to the gastric mucosa. J. I. FARRELL. Northwestern Univ. *Am. J. Physiol.* 85, 672-84(1928); cf. *C. A.* 22, 3205.—Expts. on dogs with a pouch of the entire stomach and a duodeno-esophageal anastomosis showed that the gastric glands can be stimulated by the local chem. action of moderate amts. of alc. and by 1% solns. of lactic acid. Water did not stimulate by local chem. action unless warmed to 52.5°.  $\text{NaHCO}_3$  soln. (1%) produced a slight inhibition of the continuous secretion. Bitters had no stimulating effect unless dissolved in alc. Raw meat juice applied to the gastric mucosa stimulated gastric secretion; boiled meat juice did not. Raw egg white, milk, casein and sucrose had no stimulating effect. Coffee was slightly stimulating; fats and fatty acids inhibited gastric secretion. The gastric digestion of meat, casein and egg white liberates secretagogues which excite gastric secretion by local contact with the gastric mucosa. Strong irritants (mustard oil) produced a large amt. of mucoid fluid contg. no acid.

J. F. LYMAN

The distribution of the estrus-producing and estrus-inhibiting hormones in the ovary of the cow. W. B. PAYNE, H. VAN PEENAN AND G. F. CARTLAND. Upjohn Co., Kalamazoo, Mich. *Am. J. Physiol.* 86, 243-7(1928).—The cholesterol-free unsaponifiable fractions of the fat of corpus luteum and ovarian residue (*C. A.* 21, 952) were tested for estrus-producing (causing estrus in sprayed females) and estrus-inhibiting hormones (delay in estrus in sexually mature females). In terms of the dried gland the corpus luteum contained 35 rat units and the ovarian residue 66 rat units of estrus-producing hormone per kg. The estrus-inhibiting hormone of the ovary seems to be localized in the corpus luteum.

J. F. LYMAN

The effect of increased blood flow on the ratio between oxygen consumption and pulmonary ventilation. EDWARD D. CHURCHILL. Mass. Gen. Hosp. *Am. J. Physiol.* 86, 274-84(1928).—The ventilation and  $\text{O}_2$  absorption of each lung of an anesthetized cat were measured separately and simultaneously. By occluding one branch of the pulmonary artery, or one set of pulmonary veins, the total output of the right ventricle was diverted to the contralateral lung. Such procedure caused a marked increase in  $\text{O}_2$

absorption of that lung, probably because of the increased blood flow in the lung, resulting in an increase of the functional diffusing surface. J. F. LYMAN

The resistance of animals to barometric pressure in atmospheres of various oxygen concentrations. RODOLFO MARGARIA. *Arch. sci. biol.* (Italy) 13, 1-18(1929).—These expts. were performed in a pneumatic bell-jar on guinea pigs with the technic previously described (*C. A.* 23, 875). The ventilation of the bell-jar at atms. corresponding to that above 6000 m. altitude was maintained with a mixt. of  $O_2$  and air of known compn. The resistance of the animals to the diminution of the partial pressure of  $O_2$  in the alveoli is less, the greater is the % of  $O_2$  in the atm. inspired. The presence of  $CO_2$  in the inspired air increases the resistance of the guinea pigs to anoxemia; the decreased resistance in an atm. contg. high concns. of  $O_2$  is supposed to be due to a relative diminution of  $CO_2$  pressure in the pulmonary alveoli. PETER MASUCCI

The electrical resistance of nerve tissue as a function of temperature and under the influence of ether and chloroform. NICOLA GAVRILESCU. *Arch. sci. biol.* (Italy) 13, 39-52(1929).—Dogs were decapitated and the spinal cord was removed immediately. This tissue was used to study (1) the effect of temp. and (2) of time on cond. The action of ether and  $CHCl_3$  on cond. was studied on (a) the frog sciatic-gastronomic neuromuscular prepn., (b) the dog phrenic-diaphragmic prepn., (c) the brain *in vivo*, and (d) the juice of the white substance of the brain. Results: (1) The elec. resistance of nerve tissue diminishes with the increase in temp. The decrease is not as regular as that noted in solns. of electrolytes. (2) The resistance of nerve tissue at const. temp. increases with time up to a certain point; then it diminishes rapidly and continuously (probably owing to putrefactive process). (3) The elec. resistance of nerve tissue in a living animal or of living nerve tissue out of an animal increases under the action of anesthetics. This action is in part reversible. (4) In dead nerve tissue and in the juice of the white substance of the brain (myelin) anesthetics also produce an increase of elec. resistance. PETER MASUCCI

Resistance to barometric depression in mixtures of air and carbon dioxide. RODOLFO MARGARIA. *Arch. sci. biol.* (Italy) 13, 19-30(1929).—The method used was similar to that of *C. A.* 23, 875. Guinea pigs were used. The presence of  $CO_2$  in the inspired air even up to a concn. of 20% fails to influence the resistance of the guinea pigs to depression. PETER MASUCCI

Studies on carbohydrate metabolism on a high mountain. G. FERRALORO. *Arch. sci. biol.* 13, 109-26(1929).—The aim was to study the blood-sugar curve at a high altitude (Col d'Olen 2900 meters high) in subjects to whom was administered *per os* a large dose of glucose, and to compare these data with values obtained with the same subjects at lower altitudes (Turin). At high altitudes the blood sugar was constantly higher; in seven subjects it ranged from 0.165 to 0.132% compared to 0.101 to 0.120% at Turin. The high glucemic titer is attributed to several factors: rarification of air, solar rays and hyperadrenalinemia. The limit of tolerance to glucose at high altitudes was confirmed. The glucemic curve was followed in 3 subjects after the ingestion of glucose in amts. close to the limit of individual tolerance. The hyperglucemia obtained at high altitudes was almost the same as that obtained at low altitudes. This indicates that the combustion of sugar at high altitudes is not more active but more regular. The increased limit of tolerance to glucose is ascribed to a diminished renal permeability which is probably caused by the high glucemic titer normally prevailing at high altitudes. PETER MASUCCI

The secretion of the glands in the crop of the pigeon. F. DULZETTO. *Rell. soc. ital. biol. sper.* 3, 949-51(1928); cf. *C. A.* 22, 1997.—The glands in the crop of the pigeon secrete a mucous-like substance and a serous fluid. These approach physiologically the secretion of the salivary glands, except that they are the functional product of the same cellular element, instead of distinct elements as in salivary secretion. PETER MASUCCI

The fall in osmotic pressure and hydrogen-ion concentration of arterial, portal and hepatic vein blood, and a method for its measurement. C. HÄBLER AND K. WEBER. Univ. Würzburg. *Biochem. Z.* 195, 364-75(1928).—The osmotic pressure of the portal blood is not higher than that of the arterial while that of the hepatic vein is only slightly higher. If, however, the  $CO_2$  tension is taken into consideration the osmotic pressure of the portal blood was definitely higher than the arterial but no difference was found between the portal and hepatic vein blood. The portal blood is generally more acid than the arterial while the hepatic blood is more alk. than the portal. S. M.

Tissue respiration. V. The participation of protein in the tissue respiration. K. SINGER AND O. PÖPFELMANN. Med. Poliklinik, Rostock. *Biochem. Z.* 205, 63-70(1929).—The amt. of metabolized protein as detd. directly by the g. N per hr. varies

within very narrow limits, and practically no difference was found in studies made on liver tissue from mice, man or bull. The wide divergence in size or in intensity of metabolism being considered it is concluded that the  $\text{NH}_2$  formation of surviving tissue is largely independent of these factors. The protein metabolism of the living and of the surviving tissue, up to the dog, is the same but in larger mammals the tissue protein metabolism is 17 times as great as in the living organism. S. MORGULIS

Variations in the blood sugar concentration in man in the course of the day. L. M. KRASNYSKII. North Caucasian State Univ., Rostov-Don. *Biochem. Z.* 205, 180-5(1929).—The blood sugar level in the course of the day gives a wave-like curve, the no. and height of whose crests depend upon the food taken. In fasting there is also a succession of ups and downs in the blood sugar curve; only these variations are few and the max. never exceeds 20 mg. Food causes a great and quick rise in the sugar content. This is not dependent upon nerve impulses from the digestive tract, but directly upon the carbohydrate content of the food. S. MORGULIS

Studies on the physiology of the surviving mammalian heart. VI. The sugar consumption of the heart of thyroidectomized as well as of normal and thyroidectomized cats treated with thyroxine. GEORG AMBRUS. Königl. ungar. Univ., Budapest. *Biochem. Z.* 205, 194-213(1929); cf. C. A. 23, 2748.—The sugar consumption of hearts from thyroidectomized cats is much smaller than that of normal animals. The difference in sugar consumption is greater the sooner after thyroidectomy the heart is tested, so that apparently in the course of time some substitute for the thyroid hormone is produced, or else the injured cardiac muscle recuperates. The heart from normal cats treated with thyroxine has a larger sugar consumption than that from untreated cats, while the hearts from thyroidectomized cats treated with thyroxine may consume as much sugar as those from normal animals. S. MORGULIS

The significance of bile acids in fat resorption. II. F. VERZAR AND A. KÜTHY. Univ. Debreczen. *Biochem. Z.* 205, 369-79(1929).—Fatty acids in finely emulsified form yield clear diffusible, apparently molecularly dispersed solns. with the paired salts of Na taurocholate and glycocholate, which are stable even at  $p_H$  6.2. This explains the possibility of intestinal absorption in neutral or even acid medium. The alk soaps which could be in soln. only at  $p_H$  9.0 cannot exist at the reaction of the intestine. The bile acids make it possible for the fatty acids to be in soln. even at an acid reaction. S. MORGULIS

Hemopoietic action of bilirubin and of other hemoglobin derivatives. F. VERZAR AND A. ZIH. Univ. Debreczen. *Biochem. Z.* 205, 388-401(1929).—Bilirubin fed to rabbits in 0.5-25 mg. amts. has a strong hemopoietic effect. Hemibilirubin has a similar effect but biliverdin acts very poorly. Hemoglobin and hematin also have a hemopoietic effect by giving rise to bilirubin in the organism. In large doses bilirubin may occasionally produce an opposite effect (hemolytic), as do other hemopoietic organ extracts prep'd. from spleen or marrow. Lower degradation products like the porphyrins or bilirubinic acid seem to be without action. The bilirubin effect does not depend upon the spleen and can be produced even after splenectomy. Bile, too, has a hemopoietic effect in small doses and in large doses acts hemolytically. It is suggested that the bilirubin or allied substances formed during the normal destruction of red cells serves as the physiol. stimulus to further red cell production. S. MORGULIS

Hemopoietic action of different organs. A. ZIH. Univ. Debreczen. *Biochem. Z.* 205, 402-8(1929).—Feeding normal rabbits on bone marrow as well as spleen may produce either a hemopoietic or a hemolytic effect. Feeding lymph nodes has a similar action. Muscle and lung are practically without any effect, and even feeding liver does not always have a hemopoietic influence, a reduction in the number of red cells being occasionally the result. All organs acting hemopoietically belong to the reticulo-endothelial system and their expts. may contain hemoglobin decompn. products. S. M.

Oxidation of glutamic acid in the animal organism. A. VON BEZNÁK. Univ. Debreczen. *Biochem. Z.* 205, 420-32(1929).—Subcutaneous administration of  $\beta$ -phenylglutamic acid to dogs and rabbits increases the excretion of hippuric acid, the increase in some instances amounting to 13% of the  $\beta$ -phenylglutamic acid. It is concluded that the glutamic acid in the animal organism does not undergo only  $\alpha$ -oxidation but that oxidation in the  $\beta$ -position also takes place. S. MORGULIS

The influence of electrolytes on the sugar metabolism. I. ABELIN. Physiol. Inst. Univ. Bern. *Biochem. Z.* 205, 457-66(1929).—The administration of phosphate,  $\text{NaHCO}_3$  and some other electrolytes causes an alteration in the metabolism of ingested carbohydrates, which manifests itself in a diminished glycogen deposition in the liver and a lowering of the respiratory quotient.  $\text{NaHCO}_3$  has a strong ketogenic effect upon

the rats, probably because of change in liver glycogen since it depresses glycogen formation and carbohydrate utilization.

S. MORGULIS

The reducing substance content of rabbit organs at different blood-sugar levels. G. PREYER. Med. Klinik, Basel. *Biochem. Z.* 206, 1-15(1929).—The reducing substances of organs are detd. following complete hydrolysis. Under normal glucemia the relatively high content of the reducing substance of lung and brain is particularly notable. Under conditions of hyperglucemia or hypoglucemia the adrenals show a particularly high content of reducing substance. In states of excitation (hyperglucemic or synthalin convulsions) the diminution in the reducing substances is most marked in the brain. The muscles are the primary sites so far as the influence of insulin or synthalin on carbohydrate metabolism is concerned. Lethal doses of insulin or synthalin cause practically the complete disappearance of carbohydrate from the muscles. In insulin hypoglucemia the muscles are nearly carbohydrate-free, whereas the liver still contains considerable quantities. Symmetrically located muscles have the same contents of reducing substance, but different muscle groups may vary greatly from each other. The individual muscle components, however, of the group have practically the same percent of reducing substance. The body muscles are quite different from the extremity muscles in this respect.

S. MORGULIS

The ammonia content and the ammonia formation in blood. X. Origin of blood ammonia. W. MOZOLOWSKI. Univ. Lemberg. *Biochem. Z.* 206, 150-7(1929).—The blood  $\text{NH}_3$  comes partly from the adenylic acid but the deamination of this acid cannot account for the entire amt. of  $\text{NH}_3$  produced. The purine base content of the blood of various animals corresponds to their ability to produce  $\text{NH}_3$ . The blood of man, pig, or rabbit with great capacity for producing  $\text{NH}_3$  contains more purine bases than the blood of cows or horses which forms little  $\text{NH}_3$ . In fresh blood the purine bases are almost entirely in the form of nucleotides, principally as adenylic acid. Free adenine is not found in blood. The adenylic acid of the blood changes to inosinic acid by losing the  $\text{NH}_3$ , and the inosinic acid undergoes further hydrolysis with liberation of  $\text{H}_2\text{PO}_4$ .

S. MORGULIS

The physiology of glands. CXIV. Studies on activation of adrenaline by thyroxine. LEON ASHER AND FRITZ ZIMMERMANN. Univ. Bern. *Biochem. Z.* 206, 369-400(1929).—A method is described whereby the glycogen content of 2 muscles of the hind limbs of rats can be detd. without disturbing the physiol. condition of these muscles. By this method the glycogen content was found to be higher than generally given, namely 0.79% on the av. In control expts the av. absolute difference was 2.94%. Adrenaline (1:10,000) caused a diminution of 21.8%; adrenaline (1:1000) 25.28%; and adrenaline (1:10,000) +2% novocaine 28.85%, reduction of the glycogen. The liver glycogen was reduced to 1.79% with adrenaline 1:10,000 or to 0.90% with adrenaline 1:1000. If a thyroxine injection precedes that of the adrenaline by 6 hrs. the loss of glycogen in the muscle increases to 37.06% while that of the liver drops to 0.257%. Thyroxine thus enhances greatly the action of adrenaline on the carbohydrate metabolism. Thyroxine apparently activates adrenaline and the autonomic nervous system generally.

S. MORGULIS

Lactic acid metabolism of the central nervous system. II. HANS JUNGSMANN. Univ. Breslau. *Biochem. Z.* 206, 457-67(1929); cf. *C. A.* 23, 882.—Addn. of glucose to the fluid in which the surviving cord is sustained leads to an increased lactic acid formation both in  $\text{O}_2$  and in  $\text{N}_2$ , but whereas in the presence of  $\text{O}_2$  the increase is found only in the outside fluid, in  $\text{N}_2$  it is found also in the cord itself. Under direct faradic stimulation there is not a diminution of lactic acid, as when no glucose has been added to the fluid, but a slight increase. Insulin causes a reduction in the lactic acid production by the surviving cord both in  $\text{O}_2$  and in  $\text{N}_2$ . When stimulated under similar conditions there is no diminution of the lactic acid in an  $\text{O}_2$  atm. but only in the  $\text{N}_2$ . The combined addn. of glucose and insulin likewise causes a diminution in lactic acid. The presence of a glucolytic enzyme could be demonstrated in the outside fluid.

S. MORGULIS

Blood sugar regulation. III. Influence of increased outside temperature on the blood sugar of the rabbits and dogs. PAUL WEYL. Univ. Köln. *Biochem. Z.* 206, 485-502(1929).—In rabbits exposed to a temp of  $32-37^\circ$  for 5-7 hrs. a hyperglucemia occurs, usually within 5 mins., but the blood sugar diminishes after 2-3 hrs and generally is back to the normal level by the end of the expt. Even by prolonging the expt. for 40 hrs. at  $30-32^\circ$  there was neither hyperglucemia nor hypoglucemia. However, if the animals betrayed strong exhaustion the hyperglucemic condition would persist. If after prolonged exposure to high temp. the animal was transferred to the cold there was a slight hyperglucemia, but if the transfer to the cold was made after a brief sojourn in the warm the hyperglucemia continued to increase. In dogs either long or

short exposures to high temp. (30–38°) caused neither hyperglucemia nor hypoglucemia. The statement that the blood sugar level is lower at high temp. than at low temp. cannot be sustained. S. MORGULIS

The influence of the blockade of the reticulo-endothelial system on the blood sugar level. E. I. STERKIN AND E. L. KERNER-POSHENYAN. State Med. Inst. Charkov. *Zhur. exptl. Biol. Med.* 10, 431–8(1929).—A single intravenous injection of India ink, Vitargol, collargol, trypan blue and Congo red does not produce any noticeable effect on the blood sugar level. S. MORGULIS

The application of Loeb's formula to the "pessimum" phenomenon. A. MAG-NITZKII. Univ. Leningrad. *Zhur. exptl. Biol. Med.* 10, 484–99(1929).—The phenomenon described by Vvedenskii as "pessimum" is a form of parabiosis observable in the terminal app. of a motor nerve. This depends both upon the absolute concn. of ions and their interrelations in the terminal portion of the nerve. An increase in  $K$  in Loeb's ratio of concn.  $Na/concn. Ca = K$  interferes, and a diminution in  $K$  promotes its appearance. Furthermore, the presence of  $Ca$  ions is indispensable while that of  $K$  is not. It is pointed out that the  $Na$  and  $Ca$  antagonism is physiol. and not physicochem. S. MORGULIS

Physicochemical analysis of sympathetic influence on skeletal muscle. I. Potentiometric titration of the perfusion fluid as a method of studying the physicochemical properties of muscle. E. M. KREPS AND V. V. STRELZOV. Military Med. Acad., Leningrad. *Zhur. exptl. Biol. Med.* 10, 558–70(1929).—II. Influence of sympathetic innervation on the curve of potentiometric titration of the muscle perfusion fluid. *Ibid* 570–85.—The study of the buffering effect of active muscle has been carried out under 4 different conditions: on working normal muscle, on working normal muscle under the influence of sympathetic stimulation, on working muscles deprived of sympathetic stimulation and on working muscles poisoned by ergotamine following cauterization of the adrenals. Both methods of eliminating the sympathetic innervation (section or poisoning) lead to a weakening of the clonic working capacity and to an increased contracture. In the exclusion of the sympathetic innervation the connection between the functional properties of the muscle and the constancy of their physicochem. medium is brought out very strongly. This constancy of the physicochem. condition of the muscle is conducive to satisfactory activity with little contracture. The presence of sympathetic innervation hides this relationship between physicochem. conditions and the functional property, and the perfusion fluid of such muscles may be either of a const. or of a very variable compn. The expts. with the sympathetic nerve excluded gave more definite results than those in which the sympathetic was stimulated. III. The effect of sympathetic innervation on the passage of lactic acid from the working muscle into the blood stream. *Ibid* 586–606.—Three potentiometric titration curves (resting condition, immediately after work, and 30 mins. after work) were obtained with each muscle under the 4 different exptl. conditions enumerated before, which permitted the calcn. of the concn. of buffering substances and especially of the lactic acid in the perfusion fluid. The concn. of lactic acid is lowest in the "rest" curve and and highest in the "work" curve. Removal of the sympathetic innervation by any method markedly increases the passage of lactic acid into the blood stream, though the increase is only two-fold where the nerve is sectioned and twenty-fold where the nerve is excluded through ergotamine poisoning. The muscle deprived of its sympathetic innervation thus rapidly loses its carbohydrate store. Most economical disposition of lactic acid is observed in expts. where the working muscle is also undergoing sympathetic stimulation, the rise of acetic acid in the perfusion fluid being at a min. In the absence of the sympathetic innervation there is increased passage of  $H_2PO_4$  into the blood and the reaction shifts towards alkalinity owing to the relative increase in the dibasic phosphate. This increases the buffering property aiding in the accumulation of lactic acid. The return to the "resting" condition after work is more rapid in expts. where the sympathetic was stimulated. S. MORGULIS

Experimental investigations on mineral equilibrium. P. L. VIOLETTE AND P. DUFOURT. *Presse médicale* No. 52, 1011–3(1928); *Bull. soc. hyg. aliment.* 16, 496–7(1928).—The distribution of water in the organism seems to be detd. by a certain no. of equil., of which the following are particularly important: osmotic, acid-base, lipocytic, mineral and protein. In order to det. the conditions of the mineral equil., V. and D. detd the hydrating power of various salt solns. on the gastrocnemius muscle of the frog. By studying the imbibition curves of the muscles and the ionic compn. of the simple or complex solns. used, they found that there are definite relationships between these ions (alkali and alk. earths) and the imbibition phenomena. It would seem that the cation plays a much more important part than the anion:  $Na$ , whether as sulfate

or chloride, has much less pronounced hydrating properties than K and especially than Mg, which has the most pronounced hydrating properties of all the metals. Inversely, Sr salts have dehydrating properties, which are much less pronounced than those of Ca. The most important data are, therefore, the alk.-earth/alkali ratio, or more simply Ca/Na, which approximates very closely to the former. In normal serum the value of this ratio is 0.03. Normal serum has dehydrating properties towards the gastrocnemius muscle of the frog, while Ringer-Locke soln., in which the ratio is 0.011, has hydrating properties towards the same muscle. Under the same exptl. conditions equil. was attained for Ca/Na = 0.023. A. PAPINEAU-COUTURE

Experiments on the action of lipoids. II. Histological and physiological changes of the thyroid, suprarenals and liver in rabbits receiving lecithin injections. ALDO BARCHIESI. *Rass. clin. terap. sci. affini* 27, 366-9(1928); cf. C. A. 23, 2204.—Four groups of rabbits were used. I served as the controls; the 3 others were treated with various amts. of a mixt. of lecithin, lutein and cholesterol esters for 54 days, each group receiving 31 injections. The single doses given to II, III and IV consisted of 0.040 g., 0.200 g. and 0.400 g., resp., of lecithin and of 0.016 g., 0.080 g., and 0.160 g., resp., of lutein and cholesterol esters in 1, 2.5 and 5 g., resp., of physiol. serum. Groups II and III gained wt. more rapidly than did I, while IV first increased in wt. for about 45 days and then lost wt. very rapidly. The histological examn. revealed that the thyroid glands of II and III exhibited a greater no. of large vesicles than did I. Large vesicles were also more frequent in IV than in I. In the cellular elements contained in the vesicles of IV, an active formation of colloid seemed to occur. From these observations B. concluded that the lipid mixt. injected caused a slight increase of the thyroid activity in the animals receiving small doses and a great increase in the animals receiving large doses. With II the cortical and chromaffin cells of the suprarenals were greatly increased in vol.; with III the increase was smaller. With IV the cortical cells gained in vol., while the vol. of the chromaffin cells was slightly below normal. The size of the hepatic cells was markedly reduced in II, III and IV. The glycogen content of the liver was smaller in II, III and IV than in I. G. SCHWOCH

The action of lecithin on the fat metabolism. A. CRUTO. *Rass. clin. terap. sci. affini* 27, 363-5(1928).—The liver and the muscles of the guinea pigs used by Barchiesi (C. A. 23, 2204) with bioplastina were analyzed for their content of lecithin, cholesterol and fatty acids. The 4 groups of guinea pigs included fasting animals (I), fasting animals receiving bioplastina (II), animals of a normal diet (III), and animals on a normal diet and receiving bioplastina (IV). The av. values for the fatty acids of the liver were in I: 6.06%, in II: 2.58%, in III: 0.59%, in IV: 0.58%. For the muscles C. obtained in I: 0.40%, in II: 0.46%, in III: 5.97%, in IV: 5.80%. As to the values obtained for cholesterol and lecithin, no essential differences were noted when comparing group I with II and group III with IV. From his expts. C. draws the following conclusions, which agree with the results obtained by B. The fat catabolism is increased by injections of the lecithin prepn.; at the same time also the fat anabolism rises. In case of IV the increase in anabolism equals that in catabolism; thus the equal values found for the fatty acids in the groups III and IV are accounted for. In case of II, however, only the increase in catabolism is expressed; thus the difference between the liver fatty acids in I and II is explained. G. S.

Role of secretin in the regulation of the alkali reserve of the blood. A. O. WOINAR. Odessa Med. Inst. *Arch. ges. Physiol.* (Pflüger's) 221, 144-9(1928).—See C. A. 23, 2472. G. H. SMITH

Effect of removal of the hemispheres upon the weight, the gas metabolism and the temperature of birds. N. A. POPOV AND B. I. BAYANDUROV. Univ. Tomsk. *Arch. ges. Physiol.* (Pflüger's) 221, 410-18(1929).—See C. A. 23, 2471-2. G. H. SMITH

True reaction of the cerebrospinal fluid. A. BECK AND H. J. LAUBER. Univ. Kiel. *Arch. ges. Physiol.* (Pflüger's) 221, 499-502(1929).—Under normal conditions the  $p_H$  of the spinal fluid is the same as that of the blood (7.3-7.36). G. H. SMITH

Specific dynamic action of intravenously injected amino acids. ELIZABETH MULERT. Univ. Hamburg. *Arch. ges. Physiol.* (Pflüger's) 221, 599-604(1929).—Although sp. dynamic action depends to a considerable extent upon the nutritional state of the animal, glycine given intravenously exerts an effect, alanine does not. G. H. SMITH

Specific dynamic action and the hypophysis. Experiments on rats. R. NOTH-HAMM. Univ. Hamburg. *Arch. ges. Physiol.* (Pflüger's) 221, 763-7(1929).—By feeding rats with the anterior lobe substance of the hypophysis of cattle for a period of from 2 to 3 weeks the sp. dynamic action is increased by about 26%. G. H. SMITH

**Biochemical investigations on the specificity and transformations of the plasma proteins.** H. BERRY. *Compt. rend.* 188, 740-2(1929); cf. C. A. 22, 3927.—Proteinic sugars exist in varying proportions in different plasmas. The ratios, protein C/proteinic sugar and protein N/proteinic sugar, grossly evaluate the blood proteins and can be used to follow variations in these substances. Different species show differences in the plasma proteins. There is a regulatory mechanism which serves to maintain an equil. between the plasma proteins and the proteinic sugar, but these substances can, and do, vary within narrow limits and play an important part in the various changes taking place in the organism.

H. G. SMITH

**The effect of parathyroid hormone on the structure of bone.** C. G. LAMBIE, W. O. KERMACK and W. F. HARVEY. *Nature* 123, 348(1929).—Osteitis fibrosa and osteomalacia are associated with tumors and hyperplasias of the parathyroid glands and such a condition may result in the secretion of excessive amts. of the hormone causing hyperglucemia, negative Ca balance and presumably loss of bone Ca. These authors have studied the effect of prolonged administration of parathyroid hormone to rats, 10 units a day, for 21 days. Histological examn. showed a thinning of the trabeculae of all bones and slight changes in the cortex and epiphyseal cartilages of some. The dried bones were more brittle and fibrous than those of normal controls. There was less ash on ignition but the % of Ca in the whole bones was not altered. Therefore the ash of the bones of the treated rats contained more Ca than the untreated, which finding may indicate a change in the form in which Ca exists in the bones.

H. G. SMITH

**The potassium content of the heart.** H. ZEEHUISEN. *Arch. néerland. physiol.* 12, 295-7(1927).—The K content of the heart falls when the perfusion fluid contains less KCl than 0.02%. If the perfusion is continued the removal of K continues even after the heart has stopped. About 15% of the frog hearts perfused with K-free Ringer soln. will beat again after cessation of activity from perfusion. The auricles of fresh tortoise heart contain 0.058% K and the ventricles 0.14%. The auricle takes up 0.072 mg. per g. and the ventricle 0.016 mg. per g. when perfused with 40 mg.  $\text{UO}_2(\text{NO}_3)_2$  per l.

M. H. SOULE

**The relation of body temperature to the blood sugar content.** CARL SCHWARZ and EDUARD KASPER. *Tierarztl. Hochsch., Vienna. Biol. gen.* 3, 689-98(1927); *Ber. ges. Physiol. expül. Pharmacol.* 45, 651.—When their habitat is changed to one of a cold temp., the body temp. of healthy well-nourished dogs increases several tenths of a degree during the first hrs. At the same time an av. increase of 18% was observed in the blood sugar, while no such increase was observed when their habitat was in a temp. of 22-28° in spite of a rise of several tenths of a degree in body temp. When an increase in body temp. (fever) was produced by the injection of killed colon bacilli, the blood sugar increase was parallel with that of the body temp. Accordingly the increase in blood sugar accompanying a rise in body temp. is not a result of the change in body temp. but is rather an expression of increased metabolic processes, which stand in causal connection with the chem. heat regulation.

R. C. WILLSON

**An investigation of the analysis of human milk.** BERNARD MYERS. *Brit. J. Children Diseases* 24, 249-57(1927); *Ber. ges. Physiol. expül. Pharmacol.* 45, 608.—The compn. of the milk of 86 nursing mothers was detd. Samples were in most cases drawn from only one breast. There were no definite relations between the age of the mother and the amt. of milk secretion. The ages of the mothers ranged from 16 to 30 yrs., the av. being 22 yrs. There was no relation between the per cent content of the chief constituent of the milk and the sex of the child. The av. analysis was: protein 1.58, fat 3.85 and milk sugar 6.0%. The caloric value was 18.95 per oz. (about 28 g milk). The last 1/3 of the expressed milk had the highest fat content, reaching 11.35% in 1 case. The protein content was also somewhat higher in this portion. The milk sugar showed only a slight change and the mineral content no change. There are daily variations in the amt. and compn. of human milk.

R. C. WILLSON

**The influence of the external temperature on the glycogen and fat content of the liver, and the relations of the external temperature to changes in the thyroid gland and suprarenal capsule.** T. NOSAKA. *Folia endocrinol. japon.* 3, 1558-1580(1928); *Ber. ges. Physiol. expül. Pharmacol.* 45, 630.—Rats which were kept at room temp. exhibited no microscopic or macroscopic changes in the liver; the liver contained some glycogen and fat. When kept at 2-7° the wt. and appetite increased, while the glycogen and fat were extensively reduced or completely disappeared. At a temp. of 35° or higher the appetite decreased and the body wt. either remained stationary or decreased. Together with congestion of the liver there was observed an increase in the glycogen and fat. In some cases the liver showed an inclination to destruction of its cellular nuclei

and serious fatty infiltration with an extensive decrease or complete disappearance of the glycogen.

R. C. WILLSON

**The carbohydrate metabolism in parathyroprival tetany.** J. ANDREU URRÁ AND F. QUEROL NAVAS. Fac. de med., Valladolid. *Med. iberica*. 21, 577-80(1927); *Ber. ges. Physiol. explil. Pharmacol.* 45, 524.—After the removal of the parathyroids from 3 dogs an increase in the glucemia was observed, the normal fasting values being 0.68, 0.91 and 0.95 while the later values ranged from 1.30 to 1.60. As soon as the first signs of tetany appear, the values sink to and below normal. After the convulsive attacks a hyperglucemia reappeared temporarily, the authors attributing this to the preventive reaction of the organism against the convulsions. The administration of insulin and glucose temporarily improves the symptoms. The deficiency of sugar in the blood and tissues exerts a large influence in the origin of parathyroid tetany.

R. C. WILLSON

**The influence of vegetable juices on the secretory activity of the stomach.** WITOLD ORLOWSKI. *Polskie arch. med. wewnetrznej*. 5, 66-104(1927); *Ber. ges. Physiol. explil. Pharmacol.* 45, 640.—The action of juices expressed from vegetables was studied on 20 well persons and 61 suffering with gastric maladies; the gastric contents were examined for acidity, free and combined HCl and pepsin. The abnormal subjects consisted of cases of hyperacidity, hypoacidity and achlorhydria. The acidity and N distribution in the juices of cabbage, kohl-rabi, cauliflower and potatoes were considered. The vegetable juices produced greater stimulation to the secretion of gastric juice than the Ewald-Boas test breakfast; in general they effected a higher acidity and more free and combined HCl than the test breakfast. Similar studies were carried out with dogs which had undergone the Heidenhain-Pawlow operation. Controls were fed pulp, water and oxalic acid. From the studies it is concluded that the latent time of the secretion is shorter after administration of cabbage juice and kohl-rabi juice and longer after the juices of turnips, cauliflower and potato juice than after meat. The duration of the secretion is longest after pulp (3.66 g. N), shorter by one-half after cabbage juice (0.25 g. N) and then in a descending series after turnips, potatoes, kohl-rabi and cauliflower of similar N values. The largest quantity of gastric juice was secreted following the ingestion of turnip juice, then in descending series cabbage, potato and kohl-rabi which were always above pulp (3.66 g. N). The amt. of free HCl in the secreted gastric juice after the ingestion of turnip and potato juices is 1.5 times that after pulp which is the same as after cabbage juice and larger than after kohl-rabi and cauliflower. The highest concn. of HCl was observed after potato juice. The digestive power of the gastric juice was greatest after ingestion of pulp (3.6 g. N) then follow, resp., the juice of the potato, turnip, cabbage and kohl-rabi (above-mentioned amts. of N). The action of vegetable juices on the secretion of gastric juice is to be attributed to the N-contg. extractive substance which is contained in the plants.

R. C. WILLSON

**The vagus and the secretion of adrenaline.** B. A. HOUSSAY AND E. A. MOLINELLI. Fac. de ciencias med., Buenos Aires. *Rev. soc. Argentina biol.* 3, 563-72(1927); *Ber. ges. Physiol. explil. Pharmacol.* 45, 396.—Studies were made of the effects of irritation or interruption of the vagus. They used the suprarenal-jugular vein anastomosis, in which the suprarenal vein of the donor dog is communicated with the jugular vein of the recipient dog. Weak faradic irritation of the central end of the severed vagus resulted in a slight decrease in the secretion of adrenaline which in many cases was followed by a slight increase. Stronger elec. or mech. stimulation (section or ligation of the nerve) produced a strong reflectory increase in the secretion of adrenaline. Anesthesia and subsequent section of the nerve had no effect, whereby it is proved that the vagus in a physiol. manner exerts no direct or reflectory tonic action on the secretion of adrenaline.

R. C. WILLSON

**Analysis of the effect of the osmotic pressure and of sodium chloride on the cardiac automatism.** GAETANO VIALE. *Rev. soc. Argentina biol.* 3, 621-36(1927); *Ber. ges. Physiol. explil. Pharmacol.* 45, 516; cf. *C. A.* 22, 983-4.—If the heart is steeped with NaCl soln., it begins to beat again if the concn. of the NaCl is raised quickly. Since under these circumstances an isoosmotic glucose soln. is inactive, while a more concd. one is active, it is logical to assume that the main reason lies in the change in the osmotic pressure. Changing the osmotic pressure suffices to effect the cardiac activity, as is shown by the change following the addn. of NaCl to glucose soln. or glucose to NaCl soln., either addn. causing a fatigued heart to start beating again. This effect is attained if the osmotic pressure is raised or lowered. There is assumed the rapid addn. of the washing fluid into the interior of the heart. The heart is more sensitive to the increase in osmotic pressure through NaCl than it is to the reduction through this same means. When the osmotic pressure is kept steady with glucose, the heart



functions better when the washing fluid contains a smaller amt. of NaCl; however, on account of the antagonism which exists between Na and Ca and Na and K, the heart functions better in the presence of Ca or K when the washing fluid contains a larger amt. of NaCl. In solns. in which K and Ca are equalized, the heart beats better with a little NaCl. The presence of colloids in such solns. does not influence the result.

R. C. WILLSON

**Studies of the relation of the oxidation capacity of the skin to pigmentation.** LUIGI CALIFANO AND AURELIO NASO. Univ. Naples. *Rivista patol. sper.* 2, 480-2(1927); *Ber. ges. Physiol. expil. Pharmacol.* 45, 321.—Black and non-pigmented skin (2 g. each) of the guinea pig was removed from parts of the body corresponding as closely as possible, the subcutaneous cell tissue removed, the samples were cut into small pieces and then treated with 0.02 g. *m*-nitrobenzene in 10 cc. physiol. NaCl. The intensity of the reduction at 37° was followed with the Duboscq colorimeter. The smaller the quantity of the reducing substance, the less was the dehydration capacity and the less the color intensity. The non-pigmented skin always showed a much larger capacity of reducing the nitro group than the pigmented. There was also a difference between the metabolic processes in the pigmented and non-pigmented skin.

R. C. WILLSON

**The amino acids in the blood during pregnancy, childbirth and puerperium.** A. SCOTTRINO. *Riv. ital. ginecol.* 6, 673-95(1927); *Ber. ges. Physiol. expil. Pharmacol.* 45, 539.—Usually the amt. of amino N during the puerperium is higher than during pregnancy according to S. and in opposition to the results of Falk, Hasselbach and Gammltoft. In 12 cases of albuminuria, the amino N of the blood ranged between 6.9 mg. % and 27 mg. %, the av. being 12.7 mg. %. In 6 cases of eclampsia the av. was 13.3 mg. %. The values during toxicosis are much higher than during normal pregnancy (11 mg. %). The highest values were observed in puerperal fever, the av. being 13.7 mg. %. In the pathol. puerperium more amino acids are present in the blood than in the physiol. one. All detns. were made according to Van Slyke's method.

R. C. WILLSON

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## G—PATHOLOGY

H. GIDEON WELLS

**Fractionation of diphtheria antitoxic plasmas.** P. J. MOLONEY AND EDITH M. TAYLOR. *Colloid Symposium Monograph* 6, 109-14(1928).—The antitoxin was pptd. with alc., tannin, and Biebrich scarlet at various  $p_H$  values. Its stability was also detd. with respect to  $p_H$  and alc. Solns. of antitoxin prepd. with alc. gave, with certain serum-sensitive individuals, less reaction after intradermal injection than did solns. prepd. with  $(NH_4)_2SO_4$ .

JEROME ALEXANDER

**Genesis of diabetic hyperglucemia.** E. J. LESSER. *Klin. Wochschr.* 7, 25-26(1928). -- Polemical. The speed of glycogenolysis in the isolated frog's liver does not depend on the sugar content. Glycogenolysis is inhibited by products thereof in sufficiently high concn. An ext. of these products does not alone raise the sugar value in the liver cells, since enzyme and substrate must be brought together.

B. C. A.

**Critic of the interferometric method for the Abderhalden reaction.** A. ZIMMER, E. LENDEL AND W. FEHLow. Univ. Clinic Berlin. *Fermentforschung* 10, 396-427 (1929).—The conclusions reached are based on long experience with the Abderhalden reaction involving some 25,000 individual tests. A slight modification of the 1 mm. chamber is proposed which obviates the possibility of errors due to evapn. while taking the reading and to accidental mixing of the liquids in the 2 compartments. By the examn. of serum alone it is shown that only clear light yellow serum can be used without appreciable error. The substrates may be the cause of more or less error unless the material from which they are prepd. can be obtained anatomically pure. Errors due to adsorption and swelling are practically negligible. Concordant results from expts. with inactivated serum at various temps. up to 37° indicate that the reaction is of enzymic nature, and 24-hr. observations with active and inactive serum and active serum + charcoal in place of substrate establish this beyond a doubt. To assure at all times a uniform course of reaction it is necessary to test thoroughly all newly prepd. substrates. To establish a basis for interpretations of Abbau values of endocrine glands, 125 clinically normal glands were tested; notwithstanding different values each gland

always showed the same correlations. Normal pregnancy does not influence the Abbau picture of the endocrine glands. With brief muscular work there is a slight displacement of the curves. Even the stimulus of repeatedly taking blood samples influences the correlation somewhat. The interferometric method of the Abderhalden reaction is not technically easy of execution. There are a no. of errors arising from technic and material, but with sufficient practice these may be limited and to a large extent avoided. In the examn. of endocrine glands these errors are small, but biol. errors must here be taken into account which fortunately occur only in isolated cases. On the whole the method yields satisfactory and uniform results in the investigation of endocrine glands and warrants the study of broad clinical groups of diseases and a practical evaluation of the results.

A. W. DOX

Further studies on the enzymes occurring in blood plasma and serum with positive Abderhalden reaction, and further observations on their behavior after separation. EMIL ABDERHALDEN AND SEVERIAN BUADZE. Univ. Halle. *Fermentforschung* 10, 455-63(1929).—The Abderhalden reaction may be performed with exts. of dried serum, and thus a greater concn. of enzyme is employed than that present in the fresh serum. A neg. reaction should be verified by repeating the test with a concd. ext. of dried serum. The enzyme is not affected by heating  $\frac{1}{3}$  hr. at 60°, but at 80° it is completely inactivated. Dried serum has been preserved in sealed tubes 93 days without appreciable loss of activity. This treatment does not alter the specificity of the enzyme. In no case could a pos. reaction toward placenta protein be obtained with non-gravid serum. Glycerol and NaCl exts. of dried gravid serum were tested for trypsin content by means of chloroacetyl-L-tyrosine and titration of the CO<sub>2</sub>H in the presence of EtOH, but with neg. results. The presence of erepsin, however, was demonstrated by the increased acidity of *dl*-leucylglycine. An elution prep'd. by treatment of the Al(OH)<sub>3</sub> adsorbate of the serum ext. with (NH<sub>4</sub>)<sub>2</sub>HPO<sub>4</sub> gave a pos. reaction with placenta and a distinct cleavage of *dl*-leucylglycine. The sp. protease which attacks placenta protein is not trypsin-kinase, but it is probable that the products of hydrolysis are further broken down by the erepsin present.

A. W. DOX

The potassium, calcium and choline content of the blood following thyroidectomy in dogs. MARIA MAXIM AND C. VASILIU. *Z. ges. expil. Med.* 61, 707-9(1928).—In 6 thyroidectomized dogs a constant decrease in blood K was observed in the first 4-7 days following operation. The Ca remained unchanged for a few days and then rose. The choline increased and reached very high values during the tetanic convulsions and the respiratory crises observed.

F. L. DUNN

Studies of pathological protein destruction. III. The hexone bases and mono-aminodicarboxylic acids liberated from casein by the action of coli protease. M. SCHIERGE. Sanatorium and Kurhaus Buhlerhohe. *Z. ges. expil. Med.* 62, 141-6(1928), cf. C. A. 22, 4142.—From the residues of the Bu alc. extns. S. obtained 80 mg. of a deep blue easily sol. Cu salt by heating with CuCO<sub>3</sub>, analyses showing 24.96 and 25.36% Cu with 26.36% theoretical for C<sub>8</sub>H<sub>12</sub>N<sub>2</sub>O<sub>4</sub>Cu. From the phosphotungstic acid ppt S. obtained small quantities of histidine, arginine and lysine but not enough for analyses. The colon bacillus produces a primitive protein-splitting enzyme which has an optimum action between *p*<sub>H</sub> 6 and 7.5. Conclusion: The chem. structure of the split products of bacterial action is of great interest in the understanding of the pathology of infections.

F. L. DUNN

A physicochemical property of antitoxic and normal sera. SOPHIE KAZARNOVSKII. *Kolloid-Z.* 47, 351-7(1929).—Based on the *p*<sub>H</sub> detn. K. has shown that immune diphtheria sera become coagulated and peptized at a higher *p*<sub>H</sub> than does the normal sera. Diphtheria sera become gelatinized at a higher *p*<sub>H</sub> than does the normal sera. The expts. were conducted in the acid range.

A. L. ELDER

Bilirubinemia in malaria. M. E. WOLSKI AND E. M. SCHWELEWA. *Arch. Schiffs-Tropen-Hyg.* 33, 210-5(1929).—There is an increase of bilirubin in blood after several fever attacks. This does not occur in latent or chronic malaria.

F. K.

Serum changes in kala-azar. R. B. LLOYD AND S. N. PAUL. *Indian J. Med. Research* 16, 203-19(1928).—The formol-reacting mechanism in kala-azar is of a double nature. One factor is specific, and is assocd. with the euglobulin fraction of the serum. The other factor is non-specific. The formol gel reaction in kala-azar is analogous to a complement-fixation reaction, though the non-specific factor is not identical with complement. There is a considerable increase both in the total serum globulin and in the euglobulin fraction of kala-azar blood. This is accompanied by a decrease in serum albumin, so that the globulin albumin ratio which is normally 0.66 becomes 2.9. Treatment with Heyden 693 brings this ratio to normal in 3 weeks but the globulin pptn. is pos. and HCHO can still produce a semi-opaque gel. Strong urea soln. can prevent

the formol gel reaction and can disperse the white gel when formed. The H ion is higher and the isoelec. pt. lower in kala-azar serum. FRANCES KRASNOW

**Protein graphs in kala-azar.** R. B. LLOYD AND S. N. PAUL. *Indian J. Med. Research* 16, 529-35(1929).—The euglobulin content in kala-azar is 1.5 to 2.5 g. % (40 to 50% of total globulin) as compared with 5% of the normal. At first the total globulin and pseudo-globulin show an enormous and rapid fall while the albumin shows an equally rapid rise. Then the pseudoglobulin rises and the euglobulin falls. F. K.

**Some physicochemical changes in the blood, produced by the malarial paroxysm.** J. A. SINTON, W. B. F. ORR AND BASHIR AHMAD. *Malaria Survey of India. Indian J. Med. Research* 16, 341-5(1928).—There is a fall in surface tension and a rise in refractive index of the serum when the blood is collected at the time of the paroxysm. These changes have a distinct resemblance to those recorded during anaphylactic shock. FRANCES KRASNOW

**Studies in physical properties of different blood sera. II. Surface tension.** R. N. CHOPRA AND S. G. CHAUDHURI. *Calcutta School of Trop. Med. and Hyg. Indian J. Med. Research* 16, 447-56(1928).—Bloods from filariais, leprosy, syphilis, kala-azar and tuberculosis cases were studied. Surface tensions of sera from kala-azar and tuberculosis cases show the lowest value. The formol gel test is not accompanied by a change of  $p_H$ . FRANCES KRASNOW

**Notes on some hematological and serological investigations in leprosy.** JOHN M. HENDERSON, N. K. DE AND S. GHOSH. *Calcutta School Trop. Med. and Hyg. Indian J. Med. Research* 16, 687-94(1929).—The type and stage of leprosy appear to have little influence on surface tension, specific gravity and fragility. F. K.

**The effect of diphtheria toxin on the action of insulin. A study of the effect of infections on carbohydrate metabolism in diabetes mellitus.** R. E. NETZLEY. *Univ. of Mich. Hosp., Ann Arbor. Am. J. Diseases Children* 37, 511-28(1929).—The onset of diphtheritic intoxication in rabbits appears to be accompanied by a condition of refractoriness toward the normally hypoglycemic action of insulin. The condition may be the result of the possession of essentially antagonistic properties by the insulin and diphtheria toxin principles, since the injection of a mixt. of the 2 principles, 15 mins. after their combination, is without effect upon the blood sugar level. The hypoglycemic action of insulin upon normal animals is markedly reduced following prolonged incubation with diphtheria toxin at 37°. E. R. MAIN

**The relationship between fibrin content and sedimentation index in orthopedic cases.** ESTHER M. GREISHEIMER, MARGARET WARWICK AND MARY WALTON. *Am. J. Diseases Children* 37, 953-6(1929).—Neither the sedimentation index nor the fibrin content of the venous blood of children from 7 to 17 yrs. of age appears to be influenced appreciably by sex. Both values are significantly reduced in conditions of under-nutrition. The correlation const. between the fibrin content and the sedimentation index is  $0.757 \pm 0.041$  for the boys and  $0.714 \pm 0.047$  for the girls. A lower degree of correlation is observed in undernourished children. E. R. MAIN

**Uricemia in senility.** CARLO CURRADO. *Boll. soc. ital. biol. sper.* 4, 9-13(1929).—Thirty-seven selected individuals were tested, 36 of which were above 70 yrs. of age. Blood samples were taken in the morning, 15-16 hrs. after the last meal. Uric acid was detd. by Benedict's method. In  $\frac{2}{3}$  of the cases, the amt. of uric acid was less than 3 mg. per 100 cc. whereas in 24 young soldiers the figure was 3.30 to 4.15 mg. PETER MASUCCI

**The relation between alkaline reserve and arterial pressure in experimental post-traumatic states.** LUIGI BIANCALANA. *Boll. soc. ital. biol. sper.* 4, 19-23(1929).—Dogs were used; the traumatic shocks were produced by (1) ripping the sciatic nerves; (2) muscle bruises and fractures; and (3) evisceration and trauma of the intestine. In general, as a result of traumatic shock, there was always a marked lowering of the arterial pressure (40-65 mm. Hg); there was a corresponding drop of 10-17 units in the alk. reserve but only slight changes in the  $p_H$ . There seemed to be some parallelism between lowering of arterial pressure and lowering of alk. reserve but there was no direct relation between the 2; a low alk. reserve did not necessarily det. a lowering of arterial pressure. The injections of various amts. of acid solns. caused a lowering of the alk. reserve (10-15 units) equal to that produced by traumatic shock but the arterial pressure remained unchanged. The injections of stronger acid solns. lowered the alk. reserve further and also the  $p_H$  (7.30 to 7.00). Under these conditions the arterial pressure was lowered 35 mm. Hg; a certain form of intoxication was noted but its picture was obviously different from that of shock. Conclusion: The alk. reserve plays a part in shock but it is not a factor in hypotension. PETER MASUCCI

**The isoelectric condition of toxin-containing bouillon.** A. S. RAJESKI. *Biochem.*

Lab. Pasteur Bacteriol. Institute, Leningrad. *Biochem. Z.* 197, 8-13(1928).—The point of pptn. with max. toxicity is not to be confused with the isoelec. point of the toxin itself. The isoelec. points observed are those either of the bacillary proteins or of a combination of these with the coagulated proteins of the bouillon. S. MORGULIS

Studies on inflammation. III. Carbohydrate metabolism in the inflamed tissue during the initial stage. F. BRIKKER AND F. SUPONITZKII. Lab. pathol. Physiol. Med. Inst., Charkow. *Zhur. expil. Biol. Med.* 9, 285-90(1928).—There is more glucose in the venous blood of the inflamed rabbit ear than of the normal ear. The tissue exudate of the inflamed ear is also richer in glucose than the venous blood of the normal ear. Furthermore, the venous blood of the affected ear has a higher amylolytic index. IV. The nitrogen exchange in the initial stage. F. BRIKKER AND I. LAZARIN. *Ibid* 291-9.—The protein in the inflamed region undergoes increased catabolism, which manifests itself in an increase in the products of incomplete combustion. V. Acetone bodies in the blood of inflamed tissue. F. BRIKKER. *Ibid* 300-2.—The acetone body content of the blood flowing from the inflammatory region is generally higher than that from the normal ear. S. MORGULIS

The involvement of the kidney in diabetic coma. A contribution to the problem of the causation of coma diabeticum. I. ST. LORANT. Deutsche Univ. Prag. *Acta Med. Scand.* 70, 216-41(1929).—The idea is developed from a study of a number of cases of diabetic coma that this is due neither to a failure of the kidneys to excrete the ketone bodies nor to its failure to oxidize  $\beta$ -hydroxybutyric acid. In fact the actual kidney involvement is regarded as secondary in importance, the kidney simply suffering functionally along with all other organs in consequence of the deprivation of the cells of the essential carbohydrate. Occasionally diabetic coma is found which is not accompanied by a ketonuria, in which case there are no ketone bodies present in the blood. The way the kidney suffers is manifested first in its poor cong. capacity, but later the effect is shown more markedly in its inability to secrete water. The absence of ketone body excretion in coma is attributed to the failure of the liver to produce ketone bodies, an effect also caused by the deprivation of this organ of the physiologically all-important carbohydrate. Insulin does improve the kidney's ability to concentrate the urine, but is unable to remedy the loss of water-secreting function. Hence it happens not infrequently that the anuria occurs after the administration of the insulin. S. M.

The concept of glucosuria renalis and innocens. I. Is it at present possible to differentiate with certainty some forms of glucosuria from true diabetes? ERNST B. SALÉN AND T. NYREN. Med. Klin., Stockholm. *Acta Med. Scand.* 70, 303-29(1929).—Renal glucosuria is easily and sharply differentiated from other forms of glucosuria. The diagnosis is corroborated by the presence of a lowered kidney threshold and a normal alimentary reaction. Normal and pathological alimentary reactions are differentiated through the duration of the blood sugar rise, while the degree of rise is of no significance. Renal glucosuria is regarded as a harmless anomaly. Diabetes innocens, or benign glucosuria, is a term productive of nothing more than confusion and should be discarded. II. Definition: "Insulin refractory diabetes"; "insulin refractory group with paradoxical glucosuria"; "neurorenal diabetes." *Ibid* 330-79. The differentiation of various glucosuria forms is studied on the basis of the utilization of the insulin. The condition as "insulin-refractory" is denied any significance, and it is denied also that the fact that the insulin action does not proceed normally indicates a disturbance in the sugar metabolism, nor does the effectiveness of insulin in influencing glucosuria or the lack of its effect justify the differentiation of glucosurias into pancreatogenous and non-pancreatogenous. All forms of renal glucosuria result from a condition that sugar excretion begins at a lower than normal blood sugar concn. This varies from all hyperglucemic glucosuria forms in the presence of a normal blood sugar before breakfast, a normal duration of the loading test and a lowered threshold. However, no plausible explanation is offered to account for the fact that in some diabetics glucosuria disappears under proper insulin treatment whereas in others, no matter how much insulin is used, a certain small glucosuria always persists, except that the individuals belong to categories with high or low glucemic reactions. S. MORGULIS

Studies on iodine metabolism. III. Studies on the blood iodine level in primary thyrotoxicoses. GULBRAND LUNDE, KARL CLOSS AND O. CH. PEDERSEN. Pharmakol. Inst., Univ. Oslo. *Biochem. Z.* 206, 261-74(1929).—A sample of 5-10 cc. venous blood is introduced into 4 vols. of 96% alc. in a measuring cylinder and thoroughly mixed. The coagulum is transferred to a Soxhlet thimble and extd. for 4 hrs. on the water bath with alc. The total inorg. I is now in the alc., leaving behind the alc.-insol. fraction bound to the proteins. The alc.-sol. I can further be fractionated into the lipid-I component (sol. in  $\text{CHCl}_3$ ) and inorg. I, but the former is extremely small. The

iodine detns. are then carried out in each fraction. The normal blood I in Oslo is 11-16 %. In hyperthyreoses (primary thyreotoxicosis) the I content, and especially the org. alc-insol. fraction, is greatly increased. Administration of Lugol's solns. raises the inorg. I fraction considerably, and the org. alc-insol. fraction is at the same time greatly reduced. After a few days it becomes practically normal. The basal metabolism diminishes as the org. I decreases. In Basedows' disease the goiter is colloid and I-poor, and both increase upon treatment with I. It is considered, therefore, very probable that the alc-insol. org. fraction of the blood I is the active, I-contg. principle of the thyroid hormone. In thyreotoxicosis the blood is flooded with this org. or similar I compd. Inorg. I exerts a regulating effect on the abnormal I metabolism in cases of hyperthyreoidism, preventing a flooding of the secretory product from the thyroid gland.

S. MORGULIS

An attempt to analyze pharmacologically the metabolism of cancer. G. HECHT and F. EICHHOLTZ. Pharmacol. Lab. Farbenind., Elberfeld. *Biochem. Z.* 206, 282-9 (1929).—Numerous substances were found which have a specific inhibitory effect on the glycolysis of tumor cells, all having in common the chem. property of forming complex compds. with heavy metals. It is assumed that their inhibiting action on glycolysis is due to a reaction with a heavy metal catalyzer present in the tumor cells. Analysis shows that of all the metals investigated Cu alone is detoxicated by a previous administration of Na pyrocatechol disulfonate, glycine or alanine, if a lethal dose of the metal is given intravenously. Conclusion: Tumor cells contain a Cu catalyzer of glycolysis.

S. MORGULIS

Urine proteins in nephrosis, pregnancy and myelomatosis. LESLIE F. HEWITT. London Hospital. *Lancet* 216, 66-8(1929).—No difference could be detected, on the basis of their optical rotatory powers, between serum albumin and urinary albumin excreted in nephrosis, albuminuria of pregnancy and eclampsia. Passage of large quantities of Bence-Jones proteins through the kidney for long periods does not produce progressive kidney damage and does not cause leakage of serum albumins. Bence-Jones proteins differ in properties. It appears to be present in the serum but not in the cerebrospinal fluid. The albumin and globulin contents of the blood and cerebrospinal fluid are not abnormal in myelomatosis.

F. B. SEIBERT

Estimations of lead in tissues of lead-treated patients and animals. M. JOWETT, W. J. DILLING and W. BLAIR BELL. Univ. Liverpool and Univ. Lond. *Lancet* 216, 126-8(1929).—The method of Fairhall for detg. Pb was used. The animals were given intravenously an injection of electrically prepd. Pb colloid (about 0.5% of Pb). An hr. or two after the injection, various organs and tissues were analyzed for Pb. There is some evidence that Pb is particularly attracted to malignant tissue. The suggestion is made that very little of the Pb injected is permanently stored. The bones do not appear to retain much Pb.

F. B. SEIBERT

The interpretation of blood sugar estimations. XIX. GEORGE GRAHAM. Univ. London. *Lancet* 216, 201-2(1929).—A consideration of urine and blood sugar values in relation to diabetes, diseases of the thyroid gland, etc.

F. B. SEIBERT

Blood cholesterol during the menstrual and epileptic cycles. EDWIN GOODALL. *Lancet* 216, 384-6(1929).—The total cholesterol in whole blood was estd. by Sackett's 1925 modification of Bloor's method. The blood cholesterol was the same in the inter-menstrual as in the intra-menstrual period. In epilepsy the pre-paroxysmal cholesterol was usually slightly lower than the inter-paroxysmal value.

F. B. SEIBERT

Complementing properties of blood plasma. ROSCOE R. HYDE. *Am. J. Hyg.* 8, 859-69(1928).—From the facts that complement was demonstrated in the plasma of a person with hemophilia, that it is inherited as a simple Mendelian recessive unit, and that it is to be found in artificially prepd. (heparine) plasmas, it is concluded that complement is a natural product not derived through injury to the phagocytes.

G. H. S.

Experimental purpura with anti-platelet sera. ROSCOE R. HYDE. *Am. J. Hyg.* 8, 870-4(1928).—Guinea pigs deficient in complement develop purpura when injected with anti-guinea pig rabbit platelet serum just as do normal guinea pigs, thus suggesting that complement is not essential to the reaction. The antibody of anti-platelet serum is not of the heterophile type. Antiplatelet serum causes a destruction of platelets and purpura results, apparently from the action of this material on the capillary endothelium.

G. H. SMITH

Immunological studies of typhoid vaccination by mouth. I. Agglutinins formed in persons treated orally with triple typhoid bacterin. RACHEL E. HOFFSTADT and RANDALL L. THOMPSON. *Am. J. Hyg.* 9, 1-20(1929).—Serum agglutinins develop as readily after the oral administration of triple typhoid vaccine as after subcutaneous injection. II. Complement fixations and precipitin reactions in persons treated orally

with bile and triple typhoid bacterin. *Ibid* 21-36.—Complement-fixing antibody and precipitins are to be found in the serum after oral inoculation of triple typhoid vaccine. III. Agglutinins and complement-fixation reactions in persons treated with typhoid capsules. RACHEL E. HOFFSTADT AND CARL L. MARTIN. *Ibid* 37-46.—The reactions were of the same nature as those induced by oral inoculation of triple typhoid vaccine.

G. H. SMITH

Physical chemistry of the changes in the blood in cholesterol atherosclerosis. IGNOR REMEZOV. Staatl. Inst. in Leningrad. *Arch. ges. Physiol.* (Pflüger's) 221, 534-48(1929).—Like the hypercholesterolemia following the injection of cholesterol, that following administration by feeding is assocd. with a definite inhibition of the serum lipase. This inhibition is apparently due to a sp. reversible binding of the active principle of the blood lipase to the cholesterol. After absorption the complex is not wholly inactive, and activity is restored by the addn. of phosphates. The degree of the enzyme inhibition is detd. by the extent of the hypercholesterolemia, and the lipemia is directly related to the atherosclerosis.

G. H. SMITH

Enzyme chemistry studies in connection with hemolysis. HANS V. EULER AND EDV. BRUNUS. *Arkiv Kemi, Mineral. Geol.* 10B, No. 4, 6 pp. (1928).—A lipase prepn., of demonstrated activity upon olive oil, proved to be hemolytic for sheep cells in the absence of sensitizer and complement. The active principle is thermostable, resisting 70° for 10 mins., and is but slightly weakened by boiling. The addn. of serum to the system inhibits the action of the heat-resistant lipase prepn. but hemolysis by the active enzyme prepn. is not impaired. Sensitization of the cells with specific amboceptor does not materially modify the action of the lipase.

G. H. SMITH

Studies on "phagolysin" (antileucocytic serum). OSAMU OKITA. *Sei-i-kwai Med. J.* 47, No. 7 (Eng. abs.) 1-3(1928).—Goats injected with heterologous leucocytes (rabbit) yield an antiserum of lytic and agglutinating properties, the antibody involved being termed "phagolysin." When rabbits are injected with specific anti-rabbit phagolysin profound changes take place in the cellular elements of the blood; the red cells assume an abnormal morphology assocd. with a prompt and marked reduction in no., the white cells, particularly those of the polymorphonuclear and lymphocytic types, exhibit degenerative processes and there is a marked leucopenia. Serum changes consist in a reduction in complement content, increased mobilization of antibodies such as agglutinins, precipitins, hemolysins, amboceptors, bacteriolysins and opsonins, and an increase in the serum enzymes.

G. H. SMITH

Changes in the acid-base economy in alimentary fever and in salt fever. LUDWIG SCHÖNTHAL. *Z. Kinderheilk.* 46, 491-500.—In a child showing alimentary intoxication, the plasma was concd. with an increased Cl and diminished bicarbonate. When the water economy is disturbed by the administration of large amts. of NaCl the febrile condition is assocd. with changes in the plasma bicarbonate and in the excretion of alkali.

G. H. SMITH

Relation between tetany and water economy. H. BAAR. *Z. Kinderheilk.* 46, 502-30(1928).—The relation between mineral metabolism and hyperirritability cannot be fully explained by any hypothesis. When children with latent tetany are given equiv. amts. of different salts, with the cations or anions varied, there is a very considerable correspondence between the effects and their position in Hofmeister's series K and HPO<sub>4</sub> exert the greatest effects. Insulin and pituitrin are both tetanogenic. Diuretics, theocin in particular, are beneficial in tetany.

G. H. SMITH

Agglutination phenomena in cancer. N. WATERMAN AND L. DE KROMME. *J. Cancer Research* 13, 60-5(1929).—W. and K. confirm Freund and Kaminer's demonstration that normal serum has a lytic action upon washed cancer cells, which is not exhibited by serum from subjects of cancer. W. and K. find that the serum of some species, including adult man but not infants, contains agglutinins for tumor cells acting only when the serum is diluted and the  $p_H$  is less than 6.4. These agglutinins are not species specific and there is no difference between normal and cancerous serum.

H. G. WELLS

Paraffin not productive of cancer. HAROLD B. WOOD. *J. Cancer Research* 13, 97-102(1929).—A study of the occurrence of cancer among paraffin workers supports the exptl. evidence that pure paraffin (C<sub>21</sub>H<sub>44</sub>) is inert and not responsible for the production of cancer, which results from chem. irritants present in crude paraffin oils.

H. G. WELLS

The toxemias of pregnancy. H. J. STANDER. *Medicine* 8, 1-157(1929).—An exhaustive review, discussing the physiol. and biochem. changes of normal pregnancy, as well as pregnancy toxicoses and acute yellow atrophy of the liver. Includes bibliography of 15 pp.

H. G. WELLS

**Blood chemical studies in arterial hypertension.** RALPH H. MAJOR. Univ. Kansas, Kansas City, Kans. *Am. J. Med. Sci.* 177, 188-94(1929).—Only 6 of 154 cases of hypertension—no diabetes in the group—showed blood-sugar values in excess of 120 mg. per 100 cc. A study of 50 persons with normal blood pressures showed the normal blood guanidine value does not exceed 0.2 mg. per 100 cc. and the av. is about 0.1 mg. per 100 cc. All (15) cases of a series of chronic nephritis with hypertension showed a marked increase in blood guanidine. Eighty cases of essential hypertension were studied and 61% showed blood guanidine values higher than normal. The so-called blood guanidine was not definitely detected, but the substance present in the blood of the hypertensives gave the same color reaction as guanidine and has certain chemical properties like those shown by the guanidine bases. R. C. WILLSON

**Peptidase determinations in surgical diseases.** RUDOLF KRAFT. Univ. Graz. *Deut. Z. Chir.* 208, 126-51(1928); *Ber. ges. Physiol. exper. Pharmacol.* 47, 155.—Normal values were found after narcosis, blood transfusion without reaction, surgical tuberculosis, appendicitis without abscess, gastrointestinal ulcer and carcinoma and in severe cachexia. High values were found in suppurative processes, in the parenteral administration of protein or protein-free colloids and in thyreotoxicosis. There was no relation between the peptolytic index and fever. R. C. WILLSON

**The real chemical nature of pulmonary anthracosis.** J. PAVIOT, R. CHEVALIER AND L. REVOL. *J. méd. Lyon* 9, 615-25(1928); *J. Am. Med. Assoc.* 92, 596.—The black pigment in the lungs and sputum in chronic bronchitis and emphysema was found to be Fe pigment. R. C. WILLSON

**The action of sulfur on the general metabolism of dystrophic infants.** G. ROI. *Pratica pediatrica* 6, 373(1928); *J. Am. Med. Assoc.* 92, 938.—R. concludes that there is an abnormal elimination of S in the undernourished and atrophic child, due to altered metabolism. A state of S deficiency develops so that the processes of oxidation are much reduced, the active catalytic effects of S being absent. The oral administration of S supplies the lack of it in the protoplasm and influences favorably the capacity of the organism to assimilate food. R. C. WILLSON

**The sodium chloride content of cerebrospinal fluid in normal and pathological cases.** F. LICKINT. *Z. ges. Neurol. u. Psychiat.* 116, 348-370(1928); *J. Am. Med. Assoc.* 92, 95.—Detns. were made by the Volhard-Neubauer method. The av. normal value was 704-783 mg. per 100 cc. fluid (70 cases). In 35 cases of chronic nephritis there were 6 decreases, 15 normals and 14 increases. In eclampsia the values were nearly always normal; similar results were found in diabetes, latent syphilis (45 cases) and neurosyphilis. In tabes (8 cases) 2 cases showed a decrease. Other neurological diseases gave normal values. Low values (580-700 mg.) were found in meningitis (154 cases). R. C. WILLSON

GASSMANN, TH. *Die Beziehungen des Phosphors zum Nucleinstoffwechsel und zur Entstehung der Krebs- und Gichtkrankheit.* Bern: K. J. Wyss Erben. 23 pp. M 160.

## I—ZOÖLOGY

R. A. GORTNER

**The peroxidase reaction. XIX. Experimental production of the "striatal blood picture" in the carp by the "peroxidase puncture."** KENJI SHOJI. *Tohoku J. Exper. Med.* 11, 613-7(1928).—The "striatal blood picture" (myeloid leucocytes peroxidase-negative, but oxidase-positive) was produced by brain lesions in only 13 of 370 carp operated on. B. C. BRUNSTETTER

**Enzymic hydrolysis of keratin by the crop juice of *Astur palumbarius* (goshawk) and *Vultur monachus* (Arabian vulture).** RADENKO STANKOVIĆ, VOJISLAV ARNOVLJEVIĆ AND PETAR MATAVULJ. Univ. Belgrade. *Z. physiol. Chem.* 181, 291-9(1929).—The undigested refuse regurgitated by a hawk after having consumed a no. of sparrows showed only the quills and not the tufts of the feathers; also the beaks and claws were missing. The inference was that predatory birds are able to digest keratin. A few cc. of gastric secretion was obtained by means of a duodenal sound but not enough for enzyme studies. The gastric ejecta were therefore extd. with physiol. NaCl soln. and the filtrate was incubated with keratin in the presence of phosphate buffer of pH 8. After 24 hrs. digestion at 39° the filtrate gave an immediate reaction with Millon reagent, whereas the control tests with ext. alone and with a suspension of keratin in NaCl soln. were negative. Detns. of increase in amino N showed a partial digestion of keratin preps. from horse hoofs, human hair and sparrow claws. Heating the ext. 0.5 hr. at 95° inactivated the enzyme. Similar results were obtained with a vul-

ture that was being fed pigeons and ravens. On changing from a meat diet to a diet of unplucked birds a gradual increase in keratolytic power of the ejecta ext. was observed. The digestion of keratin is, however, more rapid in the bird's crop than *in vitro*.

A. W. DOX

The application of the metamorphosis reaction of axolotls for the standardization of the thyroid hormone. BORIS ZAVADOVSKII AND L. P. LIPCHINA. Univ. Moskau. *Z. ges. expil. Med.* 62, 27-34(1928).—See *C. A.* 22, 2637.

F. L. DUNN

The composition of the body fluids of the goosefish (*Lophius piscatorius*). HOMER W. SMITH. Bellevue Hosp., N. Y. *J. Biol. Chem.* 82, 71-5(1929).—The inorg. compn. of the spinal, pericardial and perivisceral fluids of *Lophius piscatorius* showed no consistent deviation from the compn. of the blood serum. Analyses of the serum and body fluids of *Gadus callarias*, *Spheroides maculatus*, *Amtatus calva* and *Lepidosteus osseus* are also given.

ARTHUR GROLLMAN

The effect of hydrogen-ion concentration on the sequence of protozoan forms. HUGH H. DARBY. Columbia Univ. *Arch. Protistenk.* 65, 1-37(1929).—Each organism has its own  $p_H$  range. The  $[H^+]$  effects the division rate and unfavorable  $p_H$  brings about a diminution in numbers of protozoa. Part of the rise in  $p_H$  of ponds and hay infusions is due to the urea, excreted by the protozoa and subsequently changed to  $NH_3$ . Good bibliography.

FRANCES KRASNOW

Influence of the nuclear parasites of Infusoria on metabolism. A. FIVEISKA. State Univ., Irkutsk. *Arch. Protistenk.* 65, 275-98(1929).—There is an enlargement and deformation of the nucleus with an accompanying change in its finer structures, disappearance of chromatin. The macronucleus envelops from  $1/3$  to  $3/4$  the *Paramecium* cell. Although the micronucleus contains no parasites, it nevertheless suffers change equal to those of the macronucleus. Then the nutrient vacuole circulation is interfered with and the function of the contractile vacuole is impaired as is also the general metabolism.

FRANCES KRASNOW

The role of free oxygen in development. LOUIS RAPKINE. *Compt. rend.* 188, 650-2(1929).—When fertilized eggs of *Oursin* were put in a closed tube contg. boiled sea water and a small quantity of methylene blue, they developed normally. Others treated the same, except that methylene blue was omitted, did not develop. This indicates that the principal role of O is to regulate the oxidation-reduction potential of the exterior of the cells and consequently of the interior. The establishment of a proper potential induces a special metabolism bringing about cell division.

A. L.

The low cholesterol content of the fatty matter of the chrysalides of Lepidoptera. ANDRÉE COURTOIS. *Compt. rend.* 188, 666-8(1929).—In most invertebrates the unsaponifiable part of the fatty matter is principally cholesterol. In the chrysalides of the Lepidoptera studied (*Attacus pernyi*, *Sphinx ligustri*, *Saturina pyri*) only a small percentage of it is cholesterol, and the ratio of cholesterol to fatty acids is about one-tenth the usual ratio. It is important, then, to det. both the fatty acids and the cholesterol by expt. instead of assuming that all the fatty matter, not cholesterol, is fatty acids. Otherwise, a significant amt. of other non-saponifiable matter may be missed.

AMY LEVESCONTE

The distribution of arginase in fishes. ANDREW HUNTER. Toronto Univ. *J. Biol. Chem.* 81, 505-11(1929).—"The exceptional richness in arginases of the liver, kidney, and heart of the dogfish, as previously observed, has been confirmed; and it has been made probable that this is a character common to the whole selachian subclass. The kidney and heart are as a rule much inferior in activity to the liver, and neither one shows with regularity a higher potency than the other. In contrast with the *Selachii*, the *Holocephali*, as represented by the ratfish, have livers very poor in arginase. The highest concn. of enzyme is here found in the kidney. There is some in the pancreas and possibly a trace in the heart. Among the *Teleostomi* an arginase-contg. heart appears to be a character confined to certain families. It is found, for instance, in the *Clupeidae*, the *Salmonidae*, and the *Embiotocidae*; whereas in the *Scorpenidae*, the *Hexagrammidae*, the *Cottidae*, and the *Pleuronectidae* arginase is restricted apparently to the liver and kidney."

A. P. LOTHROP

The creatine content of the muscles and some other tissues in fishes. ANDREW HUNTER. *J. Biol. Chem.* 81, 513-23(1929).—Each species of fishes shows a fairly characteristic range for the creatine content of the skeletal muscles but considerable differences exist not only between different species but even between individuals of the same species. The differences between species do not correspond in any obvious way with zoological subdivisions. In general the muscles of fish contain more creatine than those of mammals while there is a higher creatine content in the heart and testes of als. In fishes, as in mammals and birds, red muscles contain less creatine



than pale, and fetal muscle less than adult. The heart muscle of elasmobranchs contains decidedly less creatine than that of the *Teleostomi* although there is no difference in muscle creatine.

**The hemoglobin content of the blood of marine fishes.** F. G. HALL and I. E. GRAY. Duke and Tulane Univs. *J. Biol. Chem.* 81, 589-94(1929); cf. C. A. 22, 1628.—The normal hemoglobin content of the blood of 17 species of marine fishes is given. The more active species have the highest hemoglobin concn. and this is, perhaps, an index of their physiol. activity.

**The excretion of ammonia and urea by the gills of fish.** HOMER W. SMITH. N. Y. Univ. and Bellevue Hosp. Med. College. *J. Biol. Chem.* 81, 727-42(1929).—Approx. 6 to 10 times as much N is excreted by the gills of the fresh water carp and goldfish as by the kidneys. The branchial excretion consists largely of the readily diffusible substances,  $\text{NH}_3$ , urea, and amine or amine oxide derivs. while the less diffusible substances, creatine, creatinine, and uric acid, are excreted by the kidneys. The excretion of urea by the gills can unquestionably be explained by diffusion and it appears probable that the excretion of  $\text{NH}_3$  can be accounted for similarly without invoking secretory activity on the part of the gill membranes.

**The arginase law and the ureotelic nitrogen metabolism of the turtle.** A. CLEMENTI. *Boll. soc. ital. biol. sper.* 3, 938-40(1928).—The amt. of urea found in the urine of well-fed turtles in summer was 0.04-0.06%; the amt. of uric acid was too small to be detd. Under similar conditions, the urea in the urine of amphibians was 0.03-0.06%.  $(\text{NH}_4)_2\text{CO}_3$  administered to turtles by the gastrointestinal route was transformed into urea and largely eliminated through the urine. In a turtle whose av. elimination of urea was 0.05-0.06%, the amt. increased to 0.07-0.085% after the administration of  $(\text{NH}_4)_2\text{CO}_3$ . The conclusion is that the N<sub>2</sub> metabolism of the turtle is of the ureotelic type and not of the uricotelic type as in other classes of saurypsids. The presence of arginase in the liver of this type of reptile is not an exception to the arginase law but rather confirms the exactness of the law.

**The local reaction of the eggs of sea-urchin to the microscopic ray puncture of the surface.** SERGIO TCHAKHOTINE. *Boll. soc. ital. biol. sper.* 3, 989-92(1928).—The aim of these expts. was to explain certain physical-chemical phenomena which govern the permeability of the cell and especially the modifications produced after fecundation and formation of the membrane. The eggs used were those of *Paracentrotus lividus*. The eggs were punctured by ultra-violet rays for 3-4 mins. For details of the technic the original must be consulted. The ray puncture was made on unfertilized, fecundated (with membrane), and immature eggs (with nucleus). The 3 types of eggs showed different local reactions to the rays.

**Metabolism of fish retina at different temperatures.** M. NAKASHIMA. *Biochem. Z.* 204, 479-81(1929).—The metabolism of the fish retina increases with rising temp. and as this exceeds 35° aerobic glucolysis occurs to a considerable degree. However, the respiration at 37° is not low, as in the case of frog retina, and should, therefore, be able to suppress the fermentation. It follows that the Pasteur reaction must be inhibited since there is no suppression of fermentation with the rise in temp. So that the retina is an object in which according to the species, the same injury produces aerobic glucolysis either through suppression of the respiration or through suppression of the Pasteur reaction.

**The respiration of non-medullated nerves.** OTTO MEYERHOF and WALTER SCHULZ. Kaiser Wilhelm-Inst. für Biologie, Berlin-Dahlem. *Biochem. Z.* 206, 158-70(1929).—The respiration of non-medullated nerves of *Maja squinado* was compared with that of the medullated frog nerve in a state of rest and stimulation. The resting respiration of the former per g. dry substance is 10 times as great as in the latter at the same exptl. temp., and the anaerobic production of lactic acid increases in about the same ratio. The respiration of the nerves of octopoda which contain connective tissue is only  $1/2$  as great as that of *Maja* nerves. Elec. stimulation causes increased  $\text{O}_2$  consumption which outlasts the period of stimulation. If the tetany stimulation is produced for 15-min. periods with 5-10 mins. intervals, the increased respiration may last 1-2 hrs. The max. increase is frequently observed during the 15 mins. after the stimulation has ceased. From the max. values obtained with a frequency of stimulation of 10 per sec. there is a twentyfold increase in  $\text{O}_2$  consumption per g. dry substance per nerve impulse as compared to the frog ischiadic nerve.

**Lipoid content of fish organs. VI. Lipoids of herrings.** BRUNO REWALD. *Biochem. Z.* 206, 275-81(1929).—Data on the lipoid content of different parts of the herring are given.

**The nature of the calcium carbonate crystals in otoliths of *Gadus morhua*.** GUL-

BRAND LUNDE. *Pharmakol. Inst. Univ., Oslo. Biochem. Z.* 206, 436-9(1929).—The otoliths of *Gadus morrhua* contain 76.39%  $\text{CaCO}_3$ , 11.44%  $\text{CaO}$  and 11.49%  $\text{H}_2\text{O}$ , and org. substance. The  $\text{CaCO}_3$  consists of aragonite. S. MORGULIS

Notes on the chemotropic responses of certain insects. A. C. MORGAN AND S. E. CRUMB. U. S. Bur. of Entomology. *J. Econ. Entomol.* 21, 913-20(1928).—Larvae of the tomato worm (*Protoparce sexta*) fed upon 69 species of plants after they had been dipped in a steam distillate of tobacco plants or jimsonweed leaves. The untreated plants are not eaten by this insect. Sheets of paraffin impregnated with an  $\text{Et}_2\text{O}$  ext. of green tobacco leaves were fed upon freely for several days. Amyl salicylate was decidedly attractive to *P. sexta* moths, and to a no. of other species of sphinx moths. Cutworm moths (Noctuidae) were particularly attracted to fermenting fruits  $\text{EtOH}$ ,  $\text{C}_6\text{H}_5\text{NO}_2$ , artificial musk and civet were slightly attractive. Cutworm larvae were attracted to fermented corn sirup, Et acetate, Et acetoacetate,  $\text{C}_6\text{H}_5\text{NO}_2$  and vinegar; amyl butyrate and citric acid were slightly attractive. Lemon juice and peel, oil of sweet orange peel, citral, amyl nitrate, oil of sweet birch and NaCl were not attractive. A bran bait flavored with  $\text{C}_6\text{H}_5\text{NO}_2$  proved attractive to larvae of the corn root webworm (*Crambus caliginosellus*). The following compds. or mixts. were specially attractive to the insects indicated: mixt. of starch and peptone for the cigar beetle (*Lasioderma serricorne*);  $\text{NH}_3$ , acetaldehyde, isobutyl alcohol and phenylacetic acid for housefly larvae (*Musca domestica*); cinnamaldehyde, salicylaldehyde and anisaldehyde for the flower thrips (*Frankliniella tritici*) and another species of thrips (*Limothrips cerealium*); cinnamic acid, formic acid, benzaldehyde, eugenol, anisaldehyde, citral, benzoyl chloride, cinnamaldehyde and cinnamyl alcohol for bees of several species; anisaldehyde and cinnamic alcohol for the beetle, *Chauliognathus marginatus*; anisaldehyde, cinnamaldehyde and oil of anise for the beetle, *Euphora melancholica*; cinnamaldehyde and cinnamic alcohol for the spotted cucumber beetle, *Diabrotica duodecimpunctata*; cinnamic alcohol for a small fly, *Swammerdamella* sp.; anisaldehyde and cinnamaldehyde for a fly of the genus *Sciara*. Other data are given. Cf. C. A. 16, 971; 18, 3233. C. H. RICHARDSON

Esterolytic processes and duration of life of *Drosophila melanogaster*. B. SEKLA. Charles Univ., Prague. *Brit. J. Exptl. Biol.* 6, 161-6(1928).—The wild type and vestigial mutant of this fly were reared in sep. cultures. The flies were ground and the tissues extd. with  $\text{H}_2\text{O}$ . The esterolytic action of the exts. was measured by the method of P. Rona (*Abderhalden's Handb. der biol. Arbeitsmeth. Abt.* 4, 1, 547), a satd. soln. of tributyrin being used as substrate. The intensity of enzyme action is closely related to the age of the individual and to the innate potentialities of the species for duration of life. The esterolytic activity of an individual animal increases from birth until a given mean age is reached; with the advent of old age, the enzyme action declines, approximating the values for the embryo or very young individual. Enzyme action, in these expts., was markedly greater in the long-lived, wild-type fly than in the short-lived vestigial mutant. The results agree with Ruzicka's (Senescence and Rejuvenation, Prague 1926) conception of senescence: At the onset of old age, the velocity of physiol. functions decreases and there is also a decrease in total rate of metabolism. Varying longevity is due to differences in elementary physiol. processes which are hereditary. The short-lived vestigial mutant appears older than the wild-type fly even at the beginning of life. Preliminary expts. on the proteolytic activity of the exts. from the 2 types of flies showed that the proteolytic function of the vestigial flies is weaker than that of the wild type. C. H. RICHARDSON

Studies on marine wood borers. I. The toxicity of various substances on *Limnoria lignorum*. F. D. WHITE. Univ. Manitoba. *Contributions to Can. Biol. and Fisheries* 4, 1-7(1929).—Vigorous adult gribbles were transferred to crystg. dishes contg. 10 cc. of a soln. of the test compd. in fresh sea water. One individual was placed in each dish. At the end of 18 hrs. the specimens were examd. About 80 substances were tested and these can be divided into 3 groups—those lethal at 1 : 50,000; those non-lethal at the diln.; and a relatively small no. of substances whose insoly. was such that the tests were made with a fine suspension contg. 1 g. in 100,000 cc. of sea water, and which proved to be non-lethal in every case over the 18 hr. period. Org. compds. contg. tervalent As show the greatest general toxicity towards borers. II. The effect of experimental variations in salinity and  $p_{\text{H}}$  upon the wood borers of the Pacific Coast of Canada. *Ibid* 9-18. Sea water was dild. with distd. water or NaCl was added to obtain solutions having varying concns. of salinity. The  $p_{\text{H}}$  values of the solns. were adjusted by the addn. of HCl. To find the av. lethal salinity 5 vigorous adults were transferred to test jars contg. 50 cc. of soln. and examd. every 24 hrs. The  $p_{\text{H}}$  tests were carried out in a similar manner over a range of 2.5 to 9.6. The tests carried out

upon the *Limnoria* of the Pacific Coast, and contrasted with those recorded for the *Limnoria* of the Atlantic Coast, have revealed a much lower figure for 24 hr. lethal salinity (4.25 g. NaCl per l.) and a much higher critical salinity figure (17.75 g. NaCl per l.). The salinity range for full activity (estd. at 18 to 32 g. NaCl per l.) indicates that for the higher temp. of the Pacific a much higher salinity is necessary, and is further evidence that *Limnoria* can exist best under conditions of high salinity and low temp. It is suggested that while these *Limnoria* show greater individual variations, they do not appear to be able to adapt themselves to the varying hydrographic conditions of their environment, and that where low salinity and high temp. are the prevailing conditions, they carry on a precarious existence. Where the salinity factor alone is concerned, graphs have been obtained which suggest that, statistically, the survival of *Limnoria* in varying salinities can be expressed by an S-shaped curve. The variations in the  $p_H$  to which they may be exposed do not appear to be a factor of any importance, since they are unaffected over a  $p_H$  range of 4.5 to 9.6. Tests with exposed *Bankia* apparently confirm the observation that this borer resembles *Limnoria* in its reaction to conditions of low salinity.

M. H. SOULE

The decomposition of clam muscle in acid solution. CHRISTINE E. RICE. Queen's Univ. *Contributions to Can. Biol. and Fisheries* 4, 96-105(1929).—A high acidity developed in macerated clam tissues. The organisms responsible for this reaction were isolated and identified as to genera. They decompd. carbohydrates particularly glycogen with acid production when grown on lab. media.

M. H. SOULE

The iodine content of the thyroid of two species of elasmobranchs and one species of teleost. FRANCES M. BURWASH. Univ. Toronto. *Contributions to Can. Biol. and Fisheries* 4, 115-20(1929).—The skates *Raja laevis* and *R. erinacea* contain, respectively, for males 0.031 and 0.025%  $I_2$  in desiccated thyroid tissue and for females 0.048 and 0.049%. The thyroid of female haddock contains  $I_2$  in about same amts. as that of elasmobranchs.

M. H. SOULE

## 12—FOODS

F. C. BLANCK AND H. A. LEPPER

The use of 2,6-dichlorophenol indophenol as a reduction indicator in the examination of foodstuffs. J. TILLMANS, P. HIRSCH AND E. REINSHAGEN. Univ. Frankfurt a M. *Z. Unters. Lebensm.* 56, 272-92(1928).—The indicator which is obtained by coupling a soln. of 5 g. of 2,6-dichloroquinone chloroimide (the prepn. of this from  $p\text{-NO}_2\text{C}_6\text{H}_4\text{OH}$  is described) with 8 to 12 cc. of an alk. 20% soln. of phenol is very stable if stored in the form of a filtered 0.01 N (0.29%) soln. in a phosphate buffer of  $p_H$  7. The color change is from pale red to blue, between  $p_H$  4 and 5. The indicator appears deep blue in the presence of oxidizing agents and colorless with reducing agents. The reduction potential was detd. and the values at 20° against the normal H electrode were 255 and 233 mv. at  $p_H$  6.85 and 7.01. There is a fall in potential of 1 to 2 mv. for each 1° rise in temp. (C. A. 21, 29). The method was used to det. the effects of  $\text{CH}_2\text{O}$  and heat on the Schardinger reaction of milk but no definite results were obtained. Attempts to apply the method to the detn. of the nature and degree of putrefaction of meat exts. (C. A. 21, 2510) also proved ineffective. Artificial lemon juice was distinguished from the natural juice by the fact that it produced no decolorization of the indicator. The probable nature of the constituents responsible for the changes taking place is discussed.

FRANCIS P. GRIFFITHS

Interpretation of bromatological analyses. A. BRYTHIEN, C. HARTWICH AND M. KLIMMER. *Anales oficina quim. provincia* (La Plata) 1, 231-42(1928); cf. C. A. 22, 1414. Standards for the interpretation of analyses of grains, flours and dough products are given.

A. E. MEYER

The importance of hydrogen-ion concentrations in baking. H. T. S. BRITTON. *Ind. Chemist* 5, 160-3(1929).—The methods of scientific control that may be applied to baking processes on an industrial scale are reviewed. A low  $p_H$  value of the flour and dough increases the enzymic activity and the length of the fermentation period, and improves the vol., color, grain and texture of the loaves. The optimum  $p_H$  to be attained varies with the buffer content, diastatic power and gluten quality of the flour.

AMY LE VESCONTE

Cereals and their products. F. C. BLANCK, E. V. MCCOLLUM AND D. BREEZE JONES. *Am. J. Publ. Health* 19, 410-13(1929); cf. C. A. 23, 212.—Progress rept. with review of the literature.

J. A. KENNEDY

Studies in cereal chemistry. II. Basic materials. T. H. FAIRBROTHER. *Ind.*

*Chemist* 5, 153-5(1929); cf. *C. A.* 23, 2223.—The wheat milled in England comes from all parts of the world, and grading by chem. analysis is especially important. The present method of grading by bushel weight and  $H_2O$  content is being replaced by the protein content detn. Australian wheat varies from 9.17 to 16.18% in protein content. Other factors to be considered are gluten quality, ash content, maltose content and H-ion concn. The  $H_2O$  content detn. may be made in 10 mins. by distn. with xylene.

AMY LÉ VESCONTE

Composition and digestibility of maize and the by-products from its treatment for technical purposes. F. HONCAMP, W. SCHRAMM AND H. WEISSMANN. *Z. Tierzücht. Zuchtungsbiol.* 8, 265-84(1927); *Biol. Abstracts* 2, 227.—Chem. analyses and digestion trials with ethers show that white and yellow corn are essentially alike in content of total and digestible nutrients. Digestibility studies are also reported of the following by-products from corn-starch manuf.: gluten feed, gluten meal and corn-oilcake meal. The following data, calcd. to a 10% moisture basis, show the content of digestible protein and starch value, resp., expressed as kg. per 100 kg. of feed: gluten feed 19.2, 57.1; gluten meal, 43.3, 65.3; corn-oilcake meal, 16.6, 62.5.

H. L. D.

Water content of corn from the time of harvest to spring. ISTVÁN WEISER AND L. SZÉGFY. *Tierphysiol. Versuchsstta.*, Budapest. *Fortschr. Landw.* 4, 43-5(1929).—Moisture detns. were made on the grain and cobs at monthly intervals from Oct. to May for 2 seasons. Water losses are such that in spring a given wt. of ears will contain a larger proportion of grain than at harvest time.

LAWRENCE P. MILLER

A review of the Babcock test in California since 1895. W. M. RUSSELL. *Bur. Dairy Control, Calif. Dept. Agr., Mo. Bull.* 18, 207-14(1929).

C. R. FELLERS

Recent methods for the analysis of milk and their importance for the dairy industry. L. EBERLEIN. *Z. angew. Chem.* 42, 397-402(1929).—A critical discussion of the more recent chem., phys. and biological methods for the analysis of milk as published in the literature.

J. C. JURRJEIS

Microcolorimetry for milk sugar. F. GONZÁLEZ AND A. GIMENO. *Anales soc. españ. fis. quim. (tecnica)* 28, 39-47(1929).—To make the usual quant. milk-sugar detn in milk 25-50 cc. must be available, which usually is not the case. Microchem. methods were investigated; that of Folin and Wu (*C. A.* 14, 2353) for detn. of dextrose was found suitable for use with human and cow milk to an accuracy of about 1%, requiring about  $\frac{1}{4}$  hr.

E. M. SYMMES

Quality and value in cheese. L. J. LORD. *Food Manuf.* 4, 61-2, 69, 133-4, 136 (1929).—L. briefly discusses grading of cheese, the basis of quality in cheese and the practical examn. of cheese—the surface, "trying," taste and odor, texture and body and color.

J. A. KENNEDY

The examination of lard in ultra-violet light. F. WEISS. *Staat. Nahrungsm. Untersuchungsanstalt, Berlin. Z. Untersuch. Lebensm.* 56, 341-55(1928).—The behavior of a large no. of samples of lard in ultra-violet light is recorded, together with data on fluorescence and opalescence, taste, odor and behavior on standing. The effects of activated charcoal, heat, light and air and  $CO_2$  were studied. Fluorescence seemed to depend both upon the type of lard and the treatment to which it was subjected. The conclusion of Feder and Rath (*C. A.* 22, 1863) that the substance causing fluorescence is present in the unsaponifiable matter and is related to the presence of paraffin hydrocarbons is criticized and modified, since the unsaponifiable portion of fluorescent lard does not produce fluorescence when added to a non-fluorescent lard. Change in fluorescence may result from oxidation of cholesterol during heating or by the action of ultra-violet light.

FRANCIS P. GRIFFITHS

Scientific aspects of packaging and quick-freezing perishable flesh products. II. Packaging flesh products for quick-freezing. CLARENCE BIRDSEYE. *Ind. Eng. Chem.* 21, 573-6(1929); cf. *C. A.* 23, 12.—Deterioration of flesh products during freezing and transportation may be caused by desiccation, oxidation, discoloration and absorption of odors, any of which change the flavor of the product. Some of these difficulties are remedied by packaging before freezing so that compactness is obtained, and by the use of air- and moisture-proof packing material and shipping cases.

N. M. NAYLOR

When are meats spoiled? CARL R. FELLERS, ALBERT C. HUNTER AND F. A. KORFF. *Am. J. Pub. Health* 19, 389-92(1929).—Progress rept. with a review of the literature.

J. A. KENNEDY

The actual reaction at the beginning of decay of flesh. FRANZ SCHMIDT. *Arch. Hyg.* 100, 377-91(1928).—The onset of putrefaction in flesh may be detected more accurately from a consideration of electrometric measurements of  $p_H$  than by bacteriol. methods, chem. methods involving the detection of  $NH_3$ , or by cryoscopic methods. The  $p_H$  of horse flesh at death is 6.2. Detns. of the  $p_H$  of aq. exts. of the 1, kept at

various temps., indicate that meat with a  $p_H$  of 6.1 to 6.3 may be considered non-objectionable, but that meat with a  $p_H$  of 6.3, or more, is definitely spoiled. E. R. M.

**Fish meals.** I. Effect of high temperature employed for drying on the nitrogen partition. T. INGVALDSEN. *Can. Chem. Met.* 13, 97-9(1929).—The method used for detg. cystine is given in detail (Folin-Looney modified). Drying at 195° causes an increase in humin and volatile basic N, and a diminution in arginine N and cystine. The other constituents in the hydrolyzates are unaffected. Since arginine and cystine are amino acids essential to a diet, and the content in these therefore helps to det. the biological value of fish meals, heating to such a high temp. as 195° should be avoided in the prepn. of these meals. The results of the analyses are tabulated. II. Comparative analysis of meals made from non-putrid and putrid materials. *Ibid* 129-31, 139.—The results of the analysis of meals made from various species of fish and parts of fish are given in the following headings: (1) fresh material, (2) putrid fish, (3) N partition of fish meal and beef meal, (4) the same from putrid herring and putrid cod, (5) tyrosine, tryptophan and cystine content of meals made from non-putrid fish, (6) the same from putrid fish, (7) distribution of N between press cake and liquor for various fish materials, putrid and non-putrid. The protein (the factor 6.25 being used) figure for meals made from putrid material is higher than that obtained by difference (moisture, ash and ether ext. being subtracted from the total). Reasons are advanced to account for this difference. The tyrosine, tryptophan and cystine contents of the proteins of all meals made from non-putrid materials free from sperms are nearly the same. Putrefaction lowers the content of each of these amino acids; hence putrefaction should be avoided as much as possible in the prepn. of meals for feeding purposes.

E. G. R. ARDAGH

The pectin controversy. WM. CLAYTON. *Food Manuf.* 4, 137(1929). J. A. K.

Fruits, vegetables and their products. H. M. LOOMIS, C. R. FELLERS AND C. A. DARLING. *Am. J. Pub. Health* 19, 393-6(1929).—Progress rept. J. A. KENNEDY  
Grape products work at the University of California. H. B. FARLEY. *Fruit Products J. and Am. Vinegar Ind.* 8, No. 9, 8-9, 21(1929).—F. summarizes the work on some of the problems of the grape industry in the development of new grape products and new uses for existing grape products which will help to increase the consumption of Calif. grapes. J. A. KENNEDY

Beverages. T. J. KING AND MAURICE J. DOOLING. *Am. J. Pub. Health* 19, 511-2(1929).—Progress rept. and recommendations. J. A. KENNEDY

Some observations on the softening of dill pickles. M. A. JOSLYN. *Fruit Products Lab., Univ. Cal. Fruit Products J. and Am. Vinegar Ind.* 8, No. 8, 19-21; No 9, 16-17, 21(1929).—The results of a preliminary survey of the softening of dill pickles are briefly discussed. During the 1926 season an "epidemic" of softening occurred in the East Bay region of Cal.; in the season of 1927 considerable spoilage also occurred but in 1928 much less spoiling was evident. J. A. KENNEDY

Stainless steel and nickel utensils in the manufacture of pickles and sauces. H. G. ASHTON. *Food Manuf.* 4, 129-30(1929). J. A. KENNEDY

Stainless steel, aluminum and lacquered cans. E. J. NORTON. *Food Manuf.* 4, 128-30(1929). J. A. KENNEDY

The choice of metals. Is tinsplate supreme? E. W. LEWIS. *Food Manuf.* 4, 128(1929). J. A. KENNEDY

Storage of truck crops: The girasole, *Helianthus tuberosus*. HAMILTON P. TRAUB, CLIFFORD J. THOR, J. J. WILLAMAN AND R. OLIVER. *Texas Agr. Expt. Sta. and Univ. of Minn. Plant Physiology* 4, 123-34(1929).—The girasole, *Helianthus tuberosus*, is a possible com. source of fructose (*C. A.* 20, 1918). However, the tubers are subject to parasitic diseases under ordinary conditions of storage. Preliminary expts., conducted from Aug. 1927 to Mar. 1928, with the Portland variety, indicate that girasole (artichoke) tubers may be successfully stored at 32-35° F. and a relative humidity of 89-92%. This, however, may not represent the optimum conditions of storage which remain to be detd. Tubers stored at temps. above 40° F. lose moisture rapidly, shrivel and are subject to storage diseases. From maturity to the end of Jan., the ratio of fructose to glucose and of fructose to water-sol. carbohydrates decreases. A seasonal variation in the proportion of water-sol. carbohydrates extractable occurs. At the time of harvest no appreciable amts. of free reducing sugars are present. WALTER THOMAS

Poisoning produced by vetches. A. GUILLAUME. *Bull. sci. pharmacol.* 36, 226-35(1929).—Report concerning the different classes of lathyrus whose grain is used as a human and animal food, of cases of poisoning, lathyrism, and its effect on man and animals. Experiences, prophylaxis and treatment are reported. A. E. MEYER

Chemical or biological analyses of sour feeds? G. RUSCHMANN. *Inst. f. Gärungs-*

gewerbe, Berlin. *Fortschr. Landw.* 4, 233-7(1920).—It is necessary to make bacteriol. exams. as well as chem. analyses properly to evaluate fermented feeding stuffs.

LAWRENCE P. MILLER

The chemical composition of *Endropogon virginicus* and *Danthonia spicata* at successive growth stages (DUSTMAN, SHRIVER) 11D. An improved chloride method for foods (BIRNER) 7. The waste question in dairy plants (UNGNADE) 14.

BERG, RAGNAR: *Die Nahrungs- und Genussmittel, ihre Zusammensetzung und ihr Einfluss auf die Gesundheit, mit bes. Berück. der Aschenbestandteile.* 5th ed., enlarged. Dresden: E. Pahl. 68 pp. Half linen, M. 4.

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MCCARRISON, ROBERT: *Food.* London: Macmillan. 116 pp. 1s., net.

ORR, J. B., AND SCHERBATOFF, HELEN: *Minerals in Pastures and Their Relation to Animal Nutrition.* London: H. K. Lewis. 150 pp. 10s. 6d., net.

PARISI, OTTAVIO: *Contributo allo studio del contenuto in grasso e del residuo magro nel latte di vacca nelle diverse mungiture della giornata.* Lucca: Francescom e Simonetti. 30 pp.

ROSS, HAROLD E.: *A Laboratory Guide in Dairy Industry for Agricultural and Vocational Schools.* Philadelphia: Lea & Febiger. 134 pp.

WILLE, JOACHIM: *Molkereitechnische Lehrhefte.* Heft 8. *Chemie für Molkereifachleute.* Berlin: P. Parey. 66 pp. M. 2.60.

Conditioning wheat or other grain. EDGAR S. MILLER (to Carrier Engineering Corp.). U. S. 1,711,574, May 7. The grain is subjected to intimate contact with air so controlled as to temp. that the temp. of the grain is approx. the same as the wet bulb temp. of the entering air and that the grain is given the desired temp. by suitable conditioning of the air. An app. is described.

Yeast food. OSCAR R. BROWN. U. S. 1,712,025, May 7. A mixt. for use as a yeast food in bread making comprises  $\text{KNO}_3$ , Ca phosphate and  $\text{MgSO}_4$  as essential ingredients, and may also include other ingredients such as NaCl and  $\text{CaSO}_4$ . A dough batch formula is given including 5 oz. of this yeast food per 196 lbs. of flour used.

Preserving soft foods. WILLIAM H. POND and LEVIS W. MINFORD. Ger. 475,019, Mar. 25, 1926. See Brit. 271,205 (C. A. 22, 1636).

Milk products. WIKTOR W. WINTER. Ger. 475,018, July 9, 1925. It is found that the compn. of the products obtainable by freezing milk, wholly or in part, and fractionally thawing the solid is dependent on the shape and surface of the vessel in which the treatment proceeds. This is illustrated by comparison of the products obtained in a frusto-conical vessel with those obtained in an inverted frusto-conical vessel.

Stabilization of milk. HENRI G. J. FOURCADE-CANCELLÉ. Fr. 651,205, Aug. 31, 1927. Milk and foods contg. it are rendered incoagulable in the stomach by the addn. of a sol. phosphate, e. g., 1 g. per l. of a phosphate of Na.

Electric sterilization of liquids such as milk. ADRIAAN H. W. ATEN and WARNER LULOFS. Fr. 651,154, Mar. 23, 1928.

Apparatus for pasteurizing milk in bulk. ERNEST A. KAESTNER and ROBERT E. KAESTNER (to J. G. Kaestner). U. S. 1,712,733, May 14.

Enriching milk and cream with peanut oil or sesame oil. H. BÜNING. Brit. 299,617, Nov. 7, 1927. The oil is "hardened to 32°" and homogenized with the milk or cream under 50-175 atm. pressure.

Butter. JOHANNES SIEDEL. Ger. 475,311, Nov. 4, 1924. Cream with 45% or more of fat is strongly cooled and churned in a vessel having an adjustable internal rotary member shaped so as to spread the cream in a uniform thin layer on the inner

surface of the vessel. The distance between the rotating surface and the wall of the vessel is increased as the operation proceeds. It is stated that sepn. into butter and buttermilk is complete after 10 mins.

**Apparatus for expressing juice from fruit.** GEORGES PELLIER. Fr. 650,498, Mar. 6, 1928.

**Preserving fruits, vegetables, etc., by enclosure in a covering of transparent hydrated cellulose applied in moist condition.** H. I. BEADLE (to Cellacote Co.). Brit. 299,392, Oct. 25, 1927.

**Treatment of raisins, etc.** THOMAS W. W. FORREST (to Sun Maid Raisin Growers of Calif.). U. S. 1,711,729, May 7. Raisins or similar fruits are subjected to intense local heating of their exterior portions while exposing them to the action of a heated vapor such as superheated, steam. An app. is described.

**Coating raisins with liquid petrolatum.** THOMAS W. W. FORREST (to Sun Maid Raisin Growers of Calif.). U. S. 1,711,728, May 7.

**Apparatus for pulping vegetable waste.** INDUSTRIAL WASTE ELIMINATORS, LTD. Fr. 650,254, Mar. 1, 1928.

**Coffee.** GEORGES WISNER. Fr. 650,938, Aug. 19, 1927. The natural aroma of coffee is preserved by a sudden chilling after roasting, or by grinding the roasted coffee while still warm with about 2.5% of melted stearic or palmitic acid, or by grinding the cold coffee with one of these acids, heating momentarily to a temp. near the m. p. of the acid, and cooling rapidly.

**"Mineral feed" for live stock.** VIRGIL R. RUPP. U. S. 1,712,404, May 7. An intimate mixt. of acid sulfate and rock phosphate is heated to form a product comprising acid phosphate with a binder of  $\text{CaSO}_4$ .

### 13—GENERAL INDUSTRIAL CHEMISTRY

HARLAN S. MINER

**Training chemists for the industries.** CHARLES A. KRAUS AND SAMUEL T. ARNOLD. *J. Chem. Education* 6, 852-7(1929). E. H.

**The Swedish chemical industry in 1928.** ANON. *Medd. Sveriges Kem. Ind.* 12, 52-79(1929).—Imports, exports and production and consumption of industrial products are tabulated. A. R. ROSE

**Volatile solvents used in industry.** ALICE HAMILTON, ELIZABETH B. BRICKER AND HENRY F. SMYTH. *Am. J. Pub. Health* 19, 523-6(1929).—The application of coatings to surfaces of all kinds is considered under 2 heads: the character of the coating, and the method of application. J. A. KENNEDY

**Calcination.** W. S. DICKIE. *Ind. Eng. Chem.* 21, 461-4(1929).—Calcining is done in processes where oxidizing is to be done, where materials are to be reduced with or without a reducing agent, where materials are to be made into new compds. by partial fusion, where materials are changed physically by heating, and in the reclamation of valuable materials from waste. The rotary *kiln* and its application to the various calcining industries are described. FRANK V. JOHNSON, JR.

**Evaporation.** PHILIP DEWOLF. *Ind. Eng. Chem.* 21, 451-6(1929).—DeWolf gives a general description of modern types of evaporators and their operation. L. A. PRIDGEON

**The trend of filtration.** ARTHUR WRIGHT. *Ind. Eng. Chem.* 21, 493-5(1929).—A résumé of the progress to date on the art of filtration is given with an indication of future developments. L. A. PRIDGEON

**The efficiency of fractionation apparatus. I. The application of F. D. Brown's rule to distillation with columns.** H. G. GRIMM. *Z. physik. Chem.* 140A, 321-41(1929).—The equation devised by F. D. Brown (*Trans. Am. Chem. Soc.* 1879, 550; 1880, 49, 304; 1881, 517) for the distn. of binary mixts. may also be applied to distn. in app. with fractionating columns, viz.  $\log \xi/L = (1 + k)[(P_1 - P_2)/P_2] \log(\eta/M)$ , wherein  $L$  and  $M$  are the initial quantities of the components  $\xi$  and  $\eta$ , the quantities of the components in the distn. flask at a given time,  $P$  and  $P_2$  are the vapor pressures of the components at the boiling temp. of the mixt., and  $k$  is an app. const. which must be detd. experimentally. EMIL KLARMANN

**Rectification.** FRIEDRICH MERKEL. *Arch. Wärmewirt.* 10, 13-7(1929).—The working of distn. columns is described with the aid of the graphical method of Ponchon (C. A. 15, 1364). ERNEST W. THIELE

**Present trends in dust recovery.** EVERETT P. PARTRIDGE. *Ind. Eng. Chem.* 21,

446-51(1929).—The various types of equipment for dust collection are classified on the basis of what can be done with the dust after removal. Dust recovery equipment has become a unit part in a number of mfg. processes.

FRANK V. JOHNSON, JR.

The chemist in the graphic industry. KAREL VNUK. *Chem. Obzor* 4, 70-6, 108-12 (112 English)(1929).—Chem. control and the role of the chemist in photochem., printing and engraving processes are described.

J. KUCERA

The excretion of lead. ROBERT A. KEHOE AND FREDERICK THAMANN. *Univ. Cincinnati. J. Am. Med. Assoc.* 92, 1418-21(1923).—Pb excreted in the faces of medical students averaged 0.08 mg. per g. ash; that in the urine was 0.08 mg. per l. Workmen with neg. or slight exposure to Pb averaged 0.10 and 0.13, resp. Workmen with moderate or severe exposure to Pb averaged 0.65 and 0.22, resp.

R. C. WILLSON

Lead poisoning in industries. THOMAS OLIVER. *J. State Med.* 37, 187-94(1929).—Miners suffer but little where the lead occurs as the sulfide, galena, which is insol.; where it occurs as the carbonate, cerussite, it has caused much illness and several deaths. The smelting process is dangerous to workmen. The improved conditions under which red and white lead are produced have reduced in  $\frac{1}{4}$  of a century the no. of cases from 377 to 15 per year. Plumbism is less prevalent among pottery workers because of the employment of a much less sol. salt of lead and to the use of a dipping bath contg. a lower content of lead. The disease has recently developed in workmen employed in wrecking old warships; the lead oxide which cements the plates together is volatilized by the oxy-acetylene flame. Painters suffer from plumbism contracted mainly from the dust breathed in while removing old paint; the introduction of a wet method for removing paint has reduced the cases materially. Plumbism is on the increase among workers on elec. accumulators.

G. H. W. LUCAS

The various cleaning processes for gases, especially for blast-furnace gases. H. ILLIES. *Feuerungstech.* 17, 1-7(1929).—A review, reproducing many details of results obtained with various installations.

ERNEST W. THIELE

Obtaining sulfur dioxide from waste gases with the aid of cyclic ketones. G. WEISSENBERGER AND L. PIATTI. *Chem.-Ztg.* 53, 245-7, 266-7(1929).—Under German law waste gases entering the atm. must not contain more than 5 g.  $\text{SO}_2$  per cu. m., whereas gases from a contact  $\text{H}_2\text{SO}_4$  plant may run 10 g. per cu. m. To remove the  $\text{SO}_2$  from the flue gas, washing with cyclohexanone and methylcyclohexanone under definite conditions of temp., concn. and time was tried, and then the soln. formed was studied to det. how it could best be broken up into its components and the recovered solvent reused in the process. The soly. of  $\text{SO}_2$  in the cycloketones depended largely upon its concn. and upon the temp. Whereas 90% of pure  $\text{SO}_2$  could be absorbed, with waste gases contg. 6.4 g.  $\text{SO}_2$  per cu. m. only about 0.5% could be taken up. The catalytic effect of metals, such as Hg, was marked.

W. C. EBAUGH

The progress of industrial heating by oil circulation. ALEXANDER B. MCKECHNIE. Parks-Cramer Co., Boston, Mass. *Ind. Eng. Chem.* 21, 496-8(1929).—The absorber, pump and piping are described. A table describes the application to industry and shows the years of service of several installations.

L. A. PRIDGON

The inflammability of insulating materials and a new apparatus for its determination. W. SCHRAMM AND W. ZEBROWSKI. *Elektrotech. Z.* 49, 601-3(1928); *Science Abstracts* 31B, 427(1928).—The inflammability of various insulating materials was detd. under operating conditions with the help of a newly developed incandescent rod app. The app. consists of an electrically heated silit rod 8 mm. in diam. and with incandescent length of 80 mm. which can be set at the temp. desired with the help of a Kurlbaum optical pyrometer, ampere meter and resistance. The advantages of silit rod as compared with metallic wire are its chem. resistance against oxidation and its high specific resistance. The rod is placed in a specially designed app. with arrangement for holding the test rod of insulating material. Tests were made for (a) inflammability, (b) loss in weight and (c) spread of flame. Values for a, b and c, are tabulated for 15 samples including cellon, bakelite and hard rubber.

M. McMAHON

New cyclic processes for refrigeration machines. HARUHISA INOKUTY. Mitsubishi Lab., Tokyo. *Z. ges. Kälte-Ind.* 36, 21-6(1929).—A theoretical discussion and exptl. data are given, including charts for  $\text{CO}_2$ .

F. D. ROSSINI

Diatomaceous earth [in filtration] (HASTINGS) 18.

ALADIN: Technisch verwendbare Emulsionen mit bes. Berücks. d. bituminösen Emulsionen. Auf Grund d. deutschen u. ausländ. Patentliterature bearb. Berlin: Allgemeiner Industrie-Verlag. 314 pp. M. 20.



BARBAUDY, J.: *Mémorial des sciences physiques*. Fasc. 5. Bases physico-chimiques de la distillation. Paris: Gauthier-Villars et Cie. 66 pp. F. 15.

FIORITO, GIUSEPPE: *La chimica e la batteriologia nella grande guerra: previsioni per il futuro*. Conferenza. Catania: G. Arabito. 28 pp. L. 2.50.

*Fortschritte in der anorganisch-chemischen Industrie*, dargestellt an Hand d. deutschen Reichs-Patente. Band 3, 1924-1927, Abt. 2. Edited by ADOLF BRÄUER and JOHANN D'ANS. Berlin: J. Springer. M. 56. Cf. C. A. 22, 1814.

*Genormte Chemikalien*. (Was ist handelsüblich?) Issued by Chemisch-Metallurgischen Zeitschrift: Die Metallbörse. Oldenburg i. O.: Gerh. Stalling. Berlin: Joachim Stern Verlag. 145 pp. M. 5.

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*Gran enciclopedia de química industrial*. Tomo XI. Barcelona: Francisco Seix: 976 pp. Ptas. 71.25; bound, Ptas. 80.25.

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*Jahrbuch der deutschen Braunkohlen-, Steinkohlen-, Kali- und Erzindustrie, der Salinen, des Erdöls, und Asphaltbergbaus*, 1929. 20th yr. Issued by Deutschen Braunkohlen-Industrie-Verein, F. V. Edited by HEINRICH HIRZ and WILHELM POTHMANN. Halle: W. Knapp. 56 pp. Half linen, M. 16.

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SESTINI, QUIRINO: *La chimica per i meccanici ed i metallurgici*. Generalità e metallurgia. Aria ed acqua nei loro rapporti coll'industria. Combustibili solidi, liquidi e gassosi. Lubrificanti. Materiali refrattari. Introduzione allo studio delle leghe metalliche. Metallurgia del ferro, del rame e degli altri metalli. Brescia: G. Vannini. 509 pp. L. 25.

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*Effecting chemical reactions*. VEREIN FÜR CHEM. IND. A.-G. (Hans Walter, inventor). Ger. 474,283, Apr. 12, 1927. Addn. to 471,267. The method of Ger. 471,267 (C. A. 23, 2229) is modified by supplying both the reagents to one side of the porous wall and supplying to the other side a gas which may be an indifferent gas serving merely to stimulate the diffusion, or may be a reagent or a mixt. of the reagents or a gas intended to react with the initial reaction product. Thus, in prep. MeOH, CO and H may be passed through a porous tube surrounded with petr. ether vapor with which CO and (or) H may be mixed. App. for conducting the process cyclically is described.

*Purifying gases*. I. G. FARBENIND. A.-G. Fr. 650,575, Mar. 8, 1928. Gases to be used in catalytic reactions are freed from traces of water, H<sub>2</sub>S, CO, CO<sub>2</sub>, SO<sub>2</sub>, COS, etc., by treating them with reactive metals dissolved in molten salts, oxides, hydrates or metals. Examples are given.

**Purifying gases.** UNION CHIMIQUE BELGE. Fr. 650,516, Mar. 6, 1928. See Belg. 349,321 (C. A. 23, 2023).

**Drying gas.** W. C. HOLMES & Co., LTD. Fr. 650,192, Feb. 29, 1928. Gas, particularly lighting gas, is dried by passing it under pressure through a hygroscopic liquid, in the case of lighting gas at a pressure higher than the pressure in the mains. Cf. C. A. 23, 3074.

**Separating gas or gas-vapor mixtures.** METALLGES. A.-G. (Vitalis Pantenburg, inventor). Ger. 475,169, Feb. 8, 1925. See U. S. 1,702,311 (C. A. 23, 1533).

**Separating gaseous mixtures.** GESELLSCHAFT FÜR LINDE'S EISMASCHINEN A.-G. Fr. 650,314, Mar. 2, 1928.  $H_2S$  and  $CO_2$  are eliminated from gaseous mixts. by washing with water under pressure with partial recuperation of the energy contained in the water under pressure by expansion in turbines and with regeneration of the water under pressure, by washing the gas in 2 successive steps, the water under pressure being divided so that in the 1st step, the  $H_2S$  is extd. almost completely, while the main amt. of  $CO_2$  is extd. in the 2nd step and by regenerating the  $H_2S$  contg. water separately.

**Separating hydrogen from associated impurities by liquefaction of the associated substances.** I. G. FARBENIND. A.-G. Brit. 299,588, Sept. 29, 1927. Catalyst poisons,  $CH_4$ , etc., are sepd. by fractional liquefaction, the gas is washed with liquid condensate formed, and then passed through a porous material such as active charcoal, silica or alumina gel, chabasite, lignite, etc., and may be washed with alcs. or ketones in connection with the use of the condensates.

**Liquefying and separating gases.** ARTHUR SELIGMANN. Ger. 475,172, April 2, 1926. Addn. to 460,927. Ger. 460,927, which corresponds to U. S. 1,574,119 (C. A. 20, 1478), describes a method for liquefying and sepg. gases in which the total amt. of gas circulating in the app. is first cooled in counter current, then partly expanded in a machine in performing work, then further cooled in counter current, and finally completely expanded by throttling. This method is now adapted to the treatment of a plurality of gas streams of different compons. or at different pressures.

**Exothermic gas reactions.** I. G. FARBENIND. A.-G. Fr. 650,238, Mar. 1, 1928. Heat is recovered by passing the reaction gases up a winding path through the reaction chamber.

**Removing iron carbonyl from gases.** I. G. FARBENIND. A.-G. (Josef Jannek, inventor). Ger. 475,269, June 17, 1924. The gases are mixed with a reagent adapted to decomp. the  $Fe(CO)_4$ , e. g., with O, Cl, HCl or  $COCl_2$ , and the mixt is passed over a porous adsorbent such as active C or silica gel. The  $Fe_2O_3$  or other Fe compd. produced seps. on the adsorbent. Alternatively, the carbonyl-contg. gases and the reactive gas may be passed over the adsorbent in turn, the  $Fe(CO)_4$  being first adsorbed and then decompd.

**Gas masks.** SOC. CHIM. DU CAOUTCHOUC (SOC. ANON.). Fr. 651,522, Sept. 9, 1927. One or more layers of a coating formed of drying oil and cellulose acetate is applied to cloth used for protection against noxious gases.

**Filtering liquids.** SOC. ANON. DES PROCÉDÉS R. AUDUBERT. Brit. 299,448, Oct. 27, 1927. Electrical adsorption phenomena are utilized for effecting filtration under low-pressure differences. Filtration may be effected upwardly through fibrous material impregnated with electrolytic reagents, or, instead of fibers, compressed or agglomerated powdered material may be used. Asbestos, charcoal, silica, plaster or paper may be utilized for the filtration.

**Spraying liquids.** MAX KALTENBACH. Fr. 650,881, Mar. 15, 1928. In chem. reactions where a liquid is sprayed into a vessel, a glass sighthole is mounted on the dome of the vessel; it contains a U-shaped container having 2 series of holes, the lower series giving out a constant spray of liquid, the other in the form of a spiral and visible through the glass giving out a regulated amt. of liquid. The regulation is obtained by a tap lengthened by a tube dipping into the liquid in the container.

**Solidifying liquids or plastic masses.** HANS SCHEIDEMANDEL. Ger. 475,299, June 21, 1928. The manuf. of pellets, beads, strips and the like from suitable liquids or plastic masses is effected by extruding the liquid, etc., into Hg or by allowing it to flow or drop on to a Hg surface. The surface of the Hg may be covered with a hardening liquid. The process is particularly applicable to the manuf. of pellets, etc., from soap or glue.

**Evaporation.** SOC. D'EXPLOITATION D'USINES METALLURGIQUES. Fr. 651,161, Aug. 23, 1927. Liquids are evapd. especially in vacuum, in a thin stream of the order of 1 mm. thick, so as not to give to the vapor formed in contact with the heated wall, a tension appreciably higher than the pressure in the app.

**Refrigeration.** MARGARET E. HALLSTROM. Australia 13,475, May 25, 1928.

**Refrigerators.** DELCO-LIGHT Co. Fr. 651,674, Oct. 27, 1927, and Fr. 651,678, Dec. 13, 1927.

**Refrigerating machine.** SOC. ANON. POUR L'EXPLOITATION DES PROCÉDÉS MAURICE LEBLANC-VICKERS. Ger. 475,053, Feb. 3, 1926. Refrigerating machines of the type in which a refrigerant is evapd. *in vacuo* and part of the condensate returned to the evaporator, and improved means for regulating the flow of the condensate, are described.

**Refrigerating machine.** WILHELM WECKERLE. Ger. 472,400, Nov. 26, 1925, and 474,938, Jan. 13, 1927, addn. to 472,400. In refrigerating machines in which the flow of liquid to the evaporator is controlled by a float valve, the liquid is supplied to the valve chamber from a measuring vessel intermittently tilted. In Ger. 474,938, such intermittent mechanism is caused to actuate also the return flow of liquid from a separator interposed between the evaporator and the condenser.

**Multiple-stage vacuum refrigerating machine.** METALLGES. A.-G. Ger. 475,054, Jan. 22, 1924. Addn. to 453,974.

**Absorption refrigerating machines.** SIEMENS-SCHUCKERTWERKE A.-G. Ger. 475,326, Dec. 23, 1925. In the manuf. of absorption refrigerating machines operating under a pos. pressure, the final sealing of the system is effected while cooling the absorption soln. to such a degree that the excess pressure temporarily disappears.

**Refrigerating machine of the absorption type.** SACHSENWERK LICHT- UND KRAFT-A.-G. (Artur Kröner, inventor). Ger. 475,055, Dec. 8, 1927. In a continuously operating absorption refrigerating machine, the flow of liquid from the heater to the absorber is regulated by a temp.-actuated valve.

**Refrigerating system of the absorption type.** BALTZAR C. VON PLATEN, CARL G. MÜNTERS and SIGURD M. BÄCKSTRÖM (to Electrolux-Servel Corp.). U. S. 1,711,553, May 7.

**Refrigerating systems of the compression type.** RICHARD W. KRITZER (to Peerless Ice Machine Co.). U. S. 1,712,567-8, May 14. Structural features.

**Condenser for refrigerating apparatus.** THOMAS C. WHITEHEAD and FRED J. HEIDEMAN (Heideman to Whitehead). U. S. 1,713,109, May 14. Structural features.

**Insulating material.** SCHIEFERWERKE AUSDAUER A.-G. Fr. 650,442, Mar. 5, 1928. A viscous material which may be molded by pressure in the cold and hardened by heating to produce insulators is obtained by heating to boiling a mixt. of PhOH, *p*-dichlorobenzene and CH<sub>2</sub>O in the presence of NaCl, NH<sub>4</sub>Cl and hexamethylenetetramine, removing the water formed and volatile products and washing.

**Insulating materials.** SCHIEFERWERKE AUSDAUER. A.-G. Fr. 650,512, Mar. 6, 1928. Molded objects such as sheets utilizable as insulators are obtained by high pressure in the cold and heating afterwards to about 80°, of filling material such as slate, with a viscous artificial resin obtained by boiling a mixt. of PhOH, *p*-dichlorobenzene and CH<sub>2</sub>O in the presence of NaCl, NH<sub>4</sub>Cl and hexamethylenetetramine, removing the water formed and volatile compds. and washing with water. The artificial resin is about 1/6 of the wt. of filling material.

**Heat- and sound-insulation composition.** P. H. USSING. Brit. 299,266, Dec. 22, 1927. The process described in Brit. 289,830 (C. A. 23, 921) is modified by use of a soap of Zn, Mg or the like instead of an Al soap.

**Impregnating high-tension electric cable insulation or other materials with vaseline and resin, etc.** CHARLES F. COLEMAN (to F. J. Stokes Machine Co.). U. S. 1,711,774, May 7. An app. is described in which paper-wound cables may be impregnated with molten vaseline and resin mixt. which is maintained under mechanically applied pressure and in which the impregnating material is mechanically circulated in a cycle which includes a cooler external to the impregnating vessel.

## 14—WATER, SEWAGE AND SANITATION

EDWARD BARTOW

**General observations on the establishment of municipal water works.** HARTWIG KLUT. *Arch. Pharm.* 267, 268-72 (1929). W. O. E.

**Growth and operation of waterworks.** H. EIGENBRODT. *Bauing.* 1928, 609-14, 627-31, 643-7, 666-70, 721-5, 734-9; *Wasser u. Abwasser* 25, 133.—Water consumption in Germany has constantly increased since the introduction of modern waterworks. Reduction in water borne diseases has been largely due to waterworks. C. R. F.

**New Missouri River Water Works of Saint Louis.** LEONARD A. DAY. *J. Am. Water Works Assoc.* 21, 485-510 (1929).—The plant is located about 13 miles west of the

city. The present demand is about 55 m. g. d., but its ultimate capacity will be 200 m. g. d. The Mo. River can contain as high as 42 tons of mud per mill. gal., and the principal treatment is for its removal. After leaving a presedimentation basin equipped with a Dorr Clarifier, the water passes through a mixing conduit, where first milk of lime and then iron sulfate are added. After coagulation and sedimentation,  $\text{CO}_2$  is added, and a second coagulation, with aluminum sulfate, completes the treatment. Mechanical and physical details are given.

D. K. FRENCH

"Modern methods for the purification of water." G. GENIN. *Rev. gén. colloïdes* 6, 145-8, 192-7(1928).—Methods of purification are divided into 2 categories: natural and artificial. Natural processes consist in dilution of polluted water, and impounding in shallow basins. Artificial methods are numerous and are applied according to the quantity of water requiring purification and the degree of purification required. The principal methods are: sedimentation, filtration, purification by septic tanks, and the activated-sludge process. The latter method is somewhat expensive to operate but has an appreciably lower cost of installation and requires less space.

L. B. MILLER

Katadyn, a new method of water sterilization. A. THIEME. *Chem.-Ztg.* 53, 285-7(1929); cf. *C. A.* 23, 1452, 1702.—A study of the Krause patents Brit. 293,385, Fr. 643,610, which claim that Ag, Cd, Pd, Cu and other metals possess sterilizing properties for liquids placed in contact with them. The treatment of water, foods and beverages by exposure to these metals, particularly Ag, for sterilization purposes is reviewed. The containers or flasks are divided into many partitions so as to give a large contact area. The treatment may be preceded by a filtration method, the metals being used in the filter itself as an aid in sterilization. Usually several hrs. standing is necessary to destroy all bacteria. No data are presented. The app. is extensively figured.

C. R. FELLERS

Chlorophenol tastes in waters of high organic content. LOUIS B. HARRISON. *J. Am. Water Works Assoc.* 21, 542-9(1929).—Super- and de-chlorination are not satisfactory in preventing or destroying chlorophenol tastes in highly colored waters high in org. matter. In some cases, side tastes even more objectionable were created. While the ammonia-chlorine treatment in many types of water successfully overcomes Cl odors, it does not effectively prevent or destroy chlorophenol tastes. The permanganate-chlorine treatment is considered effective from all points of view. More study must be given the relation between the dose and reaction period.

D. K. FRENCH

Differentiation of boiled and raw water by means of hydrogen-ion concentration. N. KRASOVSKA-KOLOSAVA. *Zentr. ges. Hyg.* 18, 195(1928); *Wasser u. Abwasser* 25, 141.—By colorimetric H-ion detn. methods, K. was able to differentiate in 90% of the cases boiled from raw water. There is a  $p_H$  difference of approx. 0.5. Raw ground water gave 6.75, while boiled gave 7.2. Similarly, raw brook water had a  $p_H$  value of 6.62, boiled, 7.08. The  $p_H$  value of waters depends to a considerable degree upon the carbonate content.

C. R. FELLERS

Method of filtration according to Puech-Chabal. K. MILOS AND G. KARRHELA. *Zentr. ges. Hyg.* 18, 324(1928); *Wasser u. Abwasser* 25, 145.—The system consists of repeated sand filtrations, through 3 layers of sand. The diam. of the sand particles is 1-3 mm. In supplies contg. considerable Fe, the addn. of milk of lime previous to filtration proved desirable. The method proved very efficacious in removing *B. coli*.

C. R. FELLERS

Accelerated volumetric method for determination of hardness of water. I. P. ILCHENKO. *Ukrainskii Khim. Zhur.* 2, Tech. Pt. 124-6(1926).—Permanent hardness of water when detd. by the Bart-Pfeyfer volumetric method gave higher results than when detd. by a gravimetric method, due to pptn. of Fe and Al salts by the alk. mixt. of NaOH and  $\text{Na}_2\text{CO}_3$  used in the volumetric method. The magnitude of the correction is measured as follows: 500 cc. of the water sample is acidified with  $\text{HNO}_3$  and treated at 60-70° in the presence of  $\text{NH}_4\text{Cl}$  with a slight excess of  $\text{NH}_4\text{OH}$ . The ppt. is washed with hot water, dissolved in a known amount of HCl and dild. to 500 cc. A 100-cc. portion is titrated with the NaOH- $\text{Na}_2\text{CO}_3$  mixt. with methyl orange as an indicator. From this titration the value of the correction is calcd.

REA MAIZEL

Mineral water analysis reports. L. FRESSENIUS. *Z. wiss. Bäderkunde* 2, 965-8 (1928); *Wasser u. Abwasser* 25, 132; cf. *C. A.* 22, 1201.—In reporting ions present in mineral waters, F. prefers g./kg. or g./l. to the English and Intern. Soc. Med. Hydrography method of using g./100 cc.

C. R. FELLERS

The mineral waters of Bukovina. Sulfur water from Puciosu. N. D. COSTEANU AND A. COCOSINSCHI. *Bull. sect. sci. acad. roumaine* 12, 48-54(1929).—Free and combined  $\text{H}_2\text{S}$  is present.  $\text{CO}_2$  is present only in small quantities, the  $\text{HCO}_3$  ion being largely replaced by S. The water is collected in cement tanks and is extensively used for bath-

ing purposes. A typical analysis expressed in parts per 10,000 follows: total S 0.22,  $H_2S$  0.04,  $SO_2$  0.55,  $SiO_2$  0.12, total  $CO_2$  5.4,  $Al_2O_3$  0.39,  $Fe_2O_3$  0.13,  $CaO$  25,  $MgO$  0.12,  $Na_2O$  1.78,  $K_2O$  0.02,  $Cl$  0.02 and traces of  $S_2O_3$ ,  $SrO$ ,  $Mn_2O_4$ ,  $PO_4$  and  $NO_3$ . The formation of these peculiar S waters is explained by the subterranean waters highly charged with  $HCO_3$  coming in contact with sulfide ores, particularly Cu pyrite. The alkalis and alk. earth metals deposit as carbonates and the Cu pyrite is transformed into basic carbonate with the liberation of free  $H_2S$ . C. R. FELLERS

The medicaments of the salt springs and mineral baths of Greifswald. K. KEILHACK. *Geol. Centr.* (Ref.) 38, 321; *Wasser u. Abwasser* 25, 226 (1929).—The latest salt analyses show an increase over a 50-yr. period of about 10% in sol. salts.  $SrCO_3$  (0.1%) was found. This salt had not been previously reported from these waters. C. R. F.

Phosphate in boiler-water conditioning. R. E. HALL, et al. *J. Am. Water Works Assoc.* 21, 79-100 (1929).—The disadvantages of soda ash, previously suggested for boiler-water conditioning, are outlined, and phosphate, which possesses none of them, is recommended. A discussion of foaming follows, which stresses the importance of dissolved solids as a producing factor. With calcium present in the boiler water (under-treatment) the alkaline salts of tannic and a few other organic acids act as preventives of foaming; but with the calcium removed as in full treatment, they are ineffective. Many water-insol. materials with foam-repressing characteristics are mentioned and reasons given why consistent results do not follow their use. R. E. HALL

Water from Angoulême, the cause of pollution and effect on typhoid morbidity. A. L. CAPDEVILLE. *Zentr. ges. Hyg.* 18, 778 (1928); *Wasser u. Abwasser* 25, 226.—Very unsanitary conditions of sewage disposal together with an unfavorable geological situation caused a typhoid epidemic. Chlorine or "javel" sterilization of the drinking water is strongly recommended. C. R. FELLERS

Determining free moisture in sand. H. C. MCCALL. *Eng. News-Record* 102, 804 (1929).—A simple, rapid method, the accuracy of which is within the limits necessary. The amt. of sand which will balance a given wt., i. e., 1000 g., when submerged, is dried, weighed and the wt. of absorbed water detd. The sum of these wts. is a const. The amt. of free water present in any other sample is the wt. in air necessary to balance 1000 g. when submerged less the above const. R. E. THOMPSON

Bio-precipitation studies 1921-1927. A. M. BUSWELL, R. A. SHIVE AND S. L. NEAVE. Illinois State Water Survey Bull. No. 25, 93 pp. (1928) I. Aeration. A. M. BUSWELL AND S. L. NEAVE. *Ibid* 22-34.—In bubble aeration the bubbles during their ascent are surrounded by a stationary shell of water, which hinders O diffusion into the adjoining liquid. Opposing the water flow to the bubble ascent, or using suitable baffles, will decrease or rupture this water shell and hasten O absorption. Satn. of thin layers of water requires a measurable time; for satn. to occur in 0.2 sec., the film thickness must be less than 0.01 mm. By simple mech. mixing, a fairly rapid absorption of O takes place. Sewage can be clarified by such mech. devices without the use of compressed air. If mixing and sludge suspension are not dependent upon the air introduced, clarification by activated-sludge process requires less than 0.01 cu. ft. of air per hr. per gal. of sewage. Appendix to Part I. Biochemical oxygen demand experiment with small nidus tanks. *Ibid* 35-6.—II. The role of bio-precipitation in sewage treatment. R. A. SHIVE WITH A. M. BUSWELL. *Ibid* 37-81.—Bacterial growths similar to those in activated sludge removed appreciable amts. of org. matter from sewage in a nidus tank 5 ft. deep without the introduction of air other than by gentle stirring. The introduction of compressed air at a rate calcd. to supply 0.0015 cu. ft. of O per gal. of sewage, in addn. to the oxygen absorbed during gentle stirring, accelerated the growth of activated-sludge organisms. For highest efficiency it was found necessary to shake the growths from the nidus racks at intervals depending upon the detention period in the nidus tank and upon the strength of the sewage. When strong sewage was being treated at very high rates (22,000 gals. a day), it was necessary to shake each rack once in 4 hrs. With 10,000 gals. of strong sewage or less per day, it was necessary to shake the growths from the racks only once in 8 hrs. In the spring of the yr., however, the growth did not have to be removed more than once in 24 hrs., when treating less than 10,000 gals. of weak sewage per day. The foregoing expts. have shown no evidence of denitrification in the nidus tank when the sludge was removed from the racks frequently enough to prevent liquefaction, but there was an apparent loss of N when the sludge was allowed to liquefy on the racks. Straining through  $1/4''$  mesh screens and subsequent treatment in the nidus tank for a period of  $1\frac{1}{2}$  hrs. removed 85% of the suspended solids. This is 15% more than Imhoff tanks remove when treating about the same strength sewage with a detention period of 3 hrs. III. Recent experiments with nidus tank. A. M. BUSWELL. *Ibid* 82-93.—B. discusses nidus rack operating in a sedimentation tank, surface material, mechanisms for operating

wooden racks in settling tanks and cost of veneer racks, blower and rack shaker. A bibliography is appended to this series of papers. J. A. KENNEDY

Biological purification of sewage from the experience of ten years' operation (1918-28) of the treatment plant of Stuttgart. MAIER AND W. SOHLER. *Gesundh.-Ing.* 52, 261-5(1929).—Research showed that the simplest and cheapest treatment of Stuttgart sewage was with biol. filtration and that other processes as chemical pptn., aeration, ozonization, etc., in comparison, were inferior. The effluent from the sprinkling filters was always stable, odorless and clear. These filters have operated satisfactorily under severe weather conditions. WAYNE L. DENMAN

The central sewage-treatment plant of Berlin. E. WEISE. *Gesundh.-Ing.* 52, 252-8(1929).—The sewage is first passed through a sand trap in order that the sand, etc., might settle out. Air is passed through the sewage to prevent deposition of sewage materials. From the sand trap the sewage passes into the treatment plant, which is constructed along the line of two-storied Imhoff tanks. Numerous illustrations and drawings are given. WAYNE L. DENMAN

Pre-determining the extent of a sewage field in sea water. A. M. RAWN AND H. K. PALMER. Los Angeles Sanitary Dist. *Proc. Am. Soc. Civil Eng.* 55, 1167-91 (1929).—The probable area of a sewage field in sea water when the quantity of flow and the direction and depth of discharge below the ocean surface are given was detd. Exptl. tests using Eosine Y as a coloring agency were carried on in Los Angeles Harbor. The spread of dye from the discharge nozzle was detd. by actual measurement. Formulas were developed on the basis of these findings whereby the probable limits of a sewage field at any given degree of dilyn. may be detd. There was no established numerical relationship between the known or pre-detd. factors surrounding an ocean outfall outlet and the probable amt. of dilyn. obtained at the ocean surface over the outlet or of the probable spread of the field. C. R. FELLERS

The depth of sewage filters and the degree of purification. I. Studies on the relation of the depth of a sprinkling filter to the degree of purification. S. I. STRICK HOUSER WITH A. M. BUSWELL. *Illinois State Water Survey Bull.* No. 26, 5-80 (1928).—(1) The gradual evolution of sewage treatment as related to the development of the sprinkling filter is traced. (2) The theory of sewage purification in general and the various theories of the mechanism of purification by filtration are discussed. (3) A new conception of the mechanism of the purification process is proposed, based on an equilibrium between (a) the adsorption, by the film, of colloids, and sol. substances which lower the surface tension of water, and (b) the decompn. and oxidation of these substances by enzymes, bacteria, etc. Consideration of the O requirements of the film emphasized the necessity for intermittency. (4) The theoretical aspects of the relation of the depth of the filter to the degree of purification indicate that the rate of purification should decrease with depth of filter. The literature on this subject is reviewed; exptl. data support the conclusion that there is a definite depth of filter (in this case 6 ft.) beyond which the rate of purification is negligible. (5) Very deep filters cannot be dosed at rates strictly proportional to their depth because of the limiting factors of aeration, ponding and clogging. (6) The advantages of a 6-ft. filter over a 10 ft. filter of the same cubic contents, from the standpoint of most effective utilization of a given amt. of filtering medium, are pointed out. (7) The theoretical advisability of filtering through coarse medium and then through a fine medium is mentioned. There is an appendix to Pt. I contg. the analytical data and plans. A bibliography follows. II. Confirmatory data from experimental trickling filter. A. M. BUSWELL, E. L. PEARSON AND G. E. SYMONS. *Ibid.* 81-90. III. Trickling filter dosing. G. C. HABERMAYER AND H. L. WHITE. *Ibid.* 91-4. IV. Biological data on the sprinkling filter. S. L. NEAVE WITH A. M. BUSWELL. *Ibid.* 95-100. J. A. KENNEDY

Chlorination relieves ponding on sewage filter beds. FREDERICK K. WING AND ROGER C. WILLIAMS. *Eng. News-Record* 102, 621-2(1929).—The Lackawanna, N. Y., sewage treatment plant consists of Imhoff tanks and sprinkling filters. During 1928 ponding of the filters occurred due to growths of slime and accumulation of solids. Application of 32 p. p. m.  $\text{Cl}_2$  to the Imhoff tank effluent for 5 days, insuring presence of 0.5-5.0 p. p. m.  $\text{Cl}_2$  in the applied sewage, remedied the condition and restored the effectiveness of the filters, removing the slime from the stone, header pipes and spray nozzles. The cost per acre was \$110.29 with  $\text{Cl}_2$  at 6¢ per lb. Treatment during the night when the sewage is of low strength would probably be more economical. R. E. THOMPSON

Sewage prechlorination successful at Virginia Beach, Va. WM. W. WATKINS. *Bur. of Water, Norfolk, Va. Eng. News-Record* 102, 783-4(1929).—Continuous chlorination of the crude sewage entering the septic tanks was practised at Virginia Beach

during the summer of 1928. Serious odor nuisance was eliminated and it was found that prechlorination produced a tank effluent contg. no *B. coli* in 1-cc. amts. Prior to adopting prechlorination, analyses showed that  $H_2S$  increased from 2 to 4 to 15 p. p. m. during the passage of the sewage through the tanks. Insufficient  $Cl_2$  to produce residual  $Cl_2$  in the tank effluent was effective in eliminating  $H_2S$ . During the summer months, a  $Cl_2$  dosage of 20 p. p. m. was satisfactory and in cooler weather a lower dosage was effective—about 10 p. p. m. Expts. indicated that there was no advantage to be gained by splitting the  $Cl_2$  dosage between the influent and effluent. Tabulated data are included showing the  $Cl_2$  dosage, residual  $Cl_2$ ,  $H_2S$  content, total no. of bacteria and no. of *B. coli* in the influent and effluent over an extended period.

R. E. THOMPSON

**Changes of sulfur compounds during sewage treatment.** A. L. ELDER WITH A. M. BUSWELL. *Ind. Eng. Chem.* 21, 560-2(1929).—Reduction of the S content of sewage during its purification is small. Absence of obnoxious odors during treatment of sewage in ridus tanks was noted. The rate of reduction of sulfates in sewage was measured at 37°, 22° and 10°. Methods have been adapted for the detn. of various forms of S in sewage.

A. L. ELDER

**Sludge handling and utilization at the Stuttgart treatment plant.** W. SOHLER. *Gesundh.-Ing.* 52, 274-6(1929).—The sludge from the treatment plant carries about 80-85% water. Air drying reduces the water content to 60-70%. The dried sludge was formerly removed from the drying beds by hand, but today this is done mechanically. The saving resulting by mechanical handling is 0.8 marks per cu. m. This material is a good fertilizer.

WAYNE L. DENMAN

**The problem of spontaneous heating of sludge-digestion chambers.** PRÜSS. *Gesundh.-Ing.* 52, 266-8(1929).—Between 100 and 150 German heat units are spontaneously liberated from each cu. m. of sewage per day.

WAYNE L. DENMAN

**The pollution of the air by smoke.** J. S. OWENS. *Mech. World* 85, 348, 364-5 (1929).—A discussion of some aspects of the smoke-pollution problem not so familiar to engineers; the compn. of domestic soot and of London air; daylight and sunlight lost due to smoke haze; methods adopted for measuring degree of pollution of air; effect of wind velocity upon concn. of impurity; and possible remedies.

E. I. S.

**Report on dust investigations in England, the British Dominions and in America.** I. TELIKY. Labor and Health Series of Reports. *Imp. Labor J. Berlin.* No. 7(1928); *Wasser u. Abwasser* 25, 160.—This report summarizes the past 10 yrs.' researches on dust. It is concluded that 70% of the dust particles present in human lungs have a diam. of from 4 to 8  $\mu$ . Particles as large as 14  $\mu$  were rarely found. The most dangerous dust particles are the smallest ones having diams. of 0.5 to 2  $\mu$ . The relation of dust to such diseases as tuberculosis, silicosis, etc., is pointed out.

C. R. FELLERS

**The waste question in dairy plants.** O. UNGNADE. *Zentr. ges. Hyg.* 18, 220 (1928); *Wasser u. Abwasser* 25, 156.—Creamery wastes contain much nitrogenous org. matter, which readily undergoes decompn. In Norway, the whey is concd. by evapn. and used in bread making and in other foods such as cheese. Direct feeding of the fluid waste (whey) to hogs is also a means of economically disposing of the waste.

C. R. F.

**Waste disposal in the textile industry.** C. H. MÖLLERING. *Z. angew. Chem.* 42, 424 7(1929).—A popular exposition. Waste contg. much fat must be de-emulsified by mech. or chem. means before purification can be attempted. Alkalies saponify the fats, which can then be sepd. out mechanically.

C. R. FELLERS

Filtering material (U. S. pat. 1,713,250) 18.

BUNAU-VARILLA, PHILIPPE: *La verdunisation des eaux*. Paris: J.-B. Baillière et Fils. 80 pp. F. 10.

DELÉPINE: *Dernières recherches physico-chimiques sur les eaux de Vichy*. Vichy: Wallon. 15 pp.

LIEUREUX, PAUL: *L'alimentation des villes en eaux potables. Besoins. Origines géologiques. Captages. Purification*. Paris: Albin Michel. 360 pp. F. 35.

MISTRANGELO, CLAUDIO: *Provvista e distribuzione di acqua potabile*. 2nd ed., revised and enlarged. Milan: U. Hoepli. 440 pp. L. 48.

POLLITT, ALAN A.: *The Technology of Water*. London: Ernest Benn, Ltd.

**Purifying and softening water.** HÖGANAS BILLESCHOLMS AKTIEBOLAG and DEL NORDISKE NATROLITH A. S. Fr. 650,270, Mar. 1, 1928. Base-exchange substances for purifying water are prepd. by roasting to a temp. not over 800° a clay contg. important

quantities of alkali in unstable combination, such as keupric clay of Scanie and Bornholm.

**Purification of residual waters.** AKTIESELSKABET DANSK GAERINGS INDUSTRI. Fr. 651,682, Jan. 25, 1928. A rapid and efficacious purification of residual waters is obtained by dividing the bacteriol. action of the microorganisms, according to the nature and properties of the waters to be purified, into several partially successive processes. These processes are adapted first to the principal biochem. groups of the impurities, each partial process being subdivided, if necessary, into operations corresponding to the biol. decompn. phases of the principal biochem. groups; for each of these processes or subdivisions is used a selected aerobic or anaerobic microbe, preferably obtained as a pure culture. According to the nature of the impurities the following cultures may be used, (1) proteolytic bacteria, particularly those which produce  $\text{NH}_3$ , nitrifiers and denitrifiers, (2) fat-decomposing bacteria or fungi (yeast and hyphomycetes), (3) fungi or bacteria dissolving starch or decomposing dextrin and sugar, (4) bacteria which decompose cellulose and pectin.

**Softening water.** HANS REISERT & CO. KOMM.-GES. AUF AKTIEN. Ger. 471,982 Dec. 24, 1922. The feed water for steam boilers is divided into 2 portions before feeding. One portion is treated with a basic softening agent and the other with led-back boiler water.

**Softening water.** ARTHUR ROSENHEIM. Fr. 650,265, Mar. 1, 1928. Water is softened and Fe and Mn are removed by treating it with a gel of an acid or amphoteric substance, such as silicic acid, stannic acid, titanac acid,  $\text{Al}_2\text{O}_3$ ,  $\text{Cr}_2\text{O}_3$ ,  $\text{FeO}$ , or  $\text{Fe}_2\text{O}_3$ , in the presence of basic substances such as alkalies, alkali carbonates, lime,  $\text{BaO}$ ,  $\text{SrO}$ , borates, phosphates, cyanides, silicates, aluminates, stannates, titanates, etc.  $\text{AlCl}_3$  or  $\text{FeCl}_3$  may be added to the sol and a mixed gel may be pptd. by addn. of alkali.

**Water softening.** UNITED WATER SOFTENERS, LTD. Fr. 650,720, Mar. 10, 1928. Means for automatically working the valves controlling the supply of water to be treated by base exchange substances such as zeolite are described.

**Apparatus for softening water by treatment with zeolites.** VERNON L. TANNEHILL (to Fort Wayne Engineering and Mfg. Co.). U. S. 1,713,105, May 14. Structural features of a tank, pipe and valve-control system are specified.

**Water filter.** ALEXANDRE LION and MARC HOFMAN. Fr. 651,511, Mar. 21, 1928.

**Nozzle construction for rotary sewage distributors.** J. HOPWOOD, G. UTLEY and ADAMS HYDRAULICS, LTD. Brit. 299,261, March 29, 1928.

## 15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER

**Training in chemistry to meet the needs of the present agricultural situation.** HENRY G. KNIGHT. *J. Chem. Education* 6, 886-93 (1929). E. H.

**The nitrogen metabolism of the forest soil.** D. FEHER. Königl. ungar. Hochschule für Berg- und Forstingenieur. *Biochem. Z.* 207, 350-60 (1929).—The N metabolism of the forest soil has a marked periodic course. The total N content of the soil reaches a max. in June and July, diminishing rapidly in the fall until the min. is attained in September. The nitrate N generally follows the same course except that the max. comes earlier, in April and May. This again conforms more or less exactly to the curve of the total bacterial content of the soil. Much more striking is the relation between soil and air temp. curve and the N curve. No definite relationship can be traced between the N curves (total N and nitrate N) and the nitrifying and N-binding microorganisms. The relationship to the temp. indicates that the N metabolism of the forest soil is probably primarily a function of the bacterial activity. The  $\text{pH}$  and the humus content of the soil are apparently without significance. S. MORGULIS

**Leaching and decomposition of synthetic urea in natural soils with special consideration to climatic conditions.** R. BUS. Landes-Univ. Giessen. *Fortschr. Landw.* 4, 1-4 (1929).—Varying amts. of synthetic urea were added to a sandy and a loam soil exposed to weathering. Analyses for total N, ammonia N, and nitrate N were made every 14 days. Results agree with those of other investigators (cf. C. A. 19, 1748).

LAWRENCE P. MILLER

**The physical analysis of soils.** E. ROUX, G. JORET and L. COUDERC. *Compt. rend. acad. agr. France* 15, 521-6 (1929).—A new method of mech. analysis is as follows: treat 20 g. of soil, previously freed of org. matter by  $\text{H}_2\text{O}_2$  (in the case only where the soil is rich in humic material), with  $\text{N HCl}$  sufficient to decompose the carbonates, then with



250 cc. of 0.2 N HCl; after contact for 1 hr. with frequent agitation pour on to a filter, wash first with 0.2 N HCl, then many times with distd. H<sub>2</sub>O for removing HCl; after which place the soil in a flask with 500 cc. of H<sub>2</sub>O contg. 1 g. of pure NaOH and agitate for 2 hrs.; then transfer to a large-necked flask, and sep. the following elements: clay, silt, fine sand and coarse sand. This method giving nearly the total clay permits of a better comparison of the soils. The new method permits from the point of view of the clayey colloids a clearer distinction between the different silty soils of the Somme. Its value is again evident when one detcs. the coeff. and curves of satn. (according to the definition and technic of Brioux and Pien); these coeffs. are much more comparable between themselves (for soils evidently poor in humus). The variations of the silty fraction detd. by the new method are almost parallel to those of clay and distinguish clearly the different silty soils of the Somme. For the fine and coarse sand the values obtained by the former method and the new method are very different. E. F. S.

Physical and chemical investigations on Danish heath soils (podsoils), especially as to their colloid and nitrogen content. FR. WEIS. *Kgl. Danske Videnskab. Selskab. Biol. Medd.* 7, No. 9, 148 pp. (1929); (résumé in English, 48 pp.).—The heath soils investigated, the profiles opened and the methods used in the lab. investigations of the soil samples are described. The following detns. were made:  $p_H$  value, hygroscopic H<sub>2</sub>O, humus (C in org. compds.), inorg. colloids (SiO<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub>, Fe<sub>2</sub>O<sub>3</sub>) total N, NH<sub>3</sub> and nitrate N, chemically bound H<sub>2</sub>O, SiO<sub>2</sub>, TiO<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub>, Fe<sub>2</sub>O<sub>3</sub>, CaO, MgO, Mn<sub>2</sub>O<sub>4</sub>, Na<sub>2</sub>O, K<sub>2</sub>O, P<sub>2</sub>O<sub>5</sub>, SO<sub>3</sub> and CO<sub>2</sub>. An attempt was made to characterize the sep. types of soil in order to classify them so that their practical valuation might rest on scientific methods of investigation. The present analyses are considered suitable for illustrating some of the most important phys. and chem. characters of the soils, which, in turn, are detg. factors for their biol. characteristics. The single groups of detns. are first studied separately and later in their mutual relation. E. F. SNYDER

The occurrence of podsol soils in Quebec Province. R. R. McKIBBIN. Macdonald Coll., Quebec, Canada. *Science* 69, 501-2 (1929).—Work with Quebec surface soils and subsoils has shown a prevalence of the podsol type in certain districts. A table is given showing the characteristics of the Quebec podsol soils studied. E. F. S.

Determination of the quantity of carbon and constitutional water contained in the soils of the earth. V. AGAFONOFF. *Compt. rend.* 188, 1000-1 (1929).—From the table given the soil type most developed is the podsol; the lateritic soils are next (by considering the soils of the lowlands and the soils of the mountains as very heterogeneous and poorly studied), the famous chernozem only taking fourth place. The total amt. of C contained in the soils of the earth is only the 10<sup>-8</sup> part of the C of the earth's surface (10<sup>16</sup>). The enormous concn. in constitutional H<sub>2</sub>O of the lateritic soils makes the total quantity of this H<sub>2</sub>O 17 times greater than the quantity of C. It is evident then that complete chemico-phys. analyses of all the zonal soils will lead to geochem. findings of the greatest importance. E. F. SNYDER

The determination of the lime needs of soils. FRANZ WOHACK. Landw. Chem. Bundesversuchsanstalt, Linz. *Fortschr. Landw.* 4, 239-40 (1929).—A modification of the Gehring-Wehrmann method (*C. A.* 22, 294), consisting essentially in a shortening of the procedure by using smaller samples, is suggested. LAWRENCE P. MILLER

Experiences with the determination of the nutrient needs and the inoculability of soils with the *Azotobacter* method of Niklas. LUDWIG VON KREYBIG. *Fortschr. Landw.* 4, 12-7 (1929).—This is a general discussion of the importance of the biology of the soil and of biological methods in nutrient evaluations. The relations between the soil reaction and the *Azotobacter* development and P fertilization and the importance of the *Azotobacter* in the soil are emphasized. LAWRENCE P. MILLER

Comparison of Mitscherlich's and Neubauer's methods for determining nutrient content of soils. H. WIESSMANN AND E. SCHRAMM. *Z. Pflanzenernähr. Düngung* 3B, 105-28 (1929).—In the Mitscherlich method for the potash value the sum of potash in grain and straw should be taken. In potash-deficient soils the grain yield is reduced more than the straw. Of 115 soils of various origins the Mitscherlich method usually gave values only one-half that of the Neubauer method, but the P<sub>2</sub>O<sub>5</sub> was 47-80% higher. Little agreement exists between the two methods. However, soils which are poor or rich, resp., by one method usually show a tendency in the same direction by the other. The results of the authors are in accord with Neubauer's results. Heating of the soils does not cause better agreement between the two methods. Soils low in plant nutrients usually gave lower  $p_H$  values. H. B. SIEMS

Rapid methods for the determination of the phosphorus requirements of soils. F. SCHEFFER. Inst. f. Pflanzenbau, Univ. Halle. *Fortschr. Landw.* 4, 37-40 (1929).—In the *Azotobacter* method of Niklas (*C. A.* 19, 1610) it is often difficult to est. the growth

of the *Azotobacter* because of the presence of foreign organisms. High results sometimes occur since these organisms cause the formation of acids which dissolve some P which would otherwise be unavailable. The substitution of Ca acetate for mannitol in the nutrient soln. gives purer cultures and the results are in good agreement with those given by the Neubauer and Mitscherlich methods. A method introduced by S. (Landw. Jahrb. 67, 779) consists in shaking 30 g. of soil with 1 g. of  $\text{CaCO}_3$  in 75 cc. of  $\text{H}_2\text{O}$  satd. with  $\text{CO}_2$ , on a rotating machine for 1 hr. and detg. the P in the filtrate by the method of Wrangell (C. A. 21, 2857). Results compare favorably with those of other methods.

LAWRENCE P. MILLER

The phosphoric acid requirement of soils and its determination by the *Azotobacter* method of Christensen-Niklas. A. H. ERDENBRECHER. *Centr. Zuckerind.* 35, 885-8 (1927).—Although the *Azotobacter* method must be considered more as a qual. test by means of which soils poor in  $\text{P}_2\text{O}_5$  can be sepd. from those which are not deficient in  $\text{P}_2\text{O}_5$ , nevertheless it is, by reason of the quantity of the material to be handled, superior to the quant. methods. In this case the quantity is the deciding factor. It is to be hoped, therefore, that by the utilization of the knowledge gained by the *Azotobacter* method crop failures attributable to  $\text{P}_2\text{O}_5$  deficiency can be avoided. E. F. SNYDER

Phosphoric acid and lime content of Oldenburg soils. S. GERICKE. *Z. Pflanzenernähr. Düngung* 1B, 1-14(1929).—Most Oldenburg (Germany) soils have high lime and phosphorus requirements. Without lime, neither phosphorus nor potash produces any marked crop response. During 1926-27 38.6% of the soils show  $\text{pH}$  4.0-4.5; 23.6%,  $\text{pH}$  5.0-6.0; 37.8%,  $\text{pH}$  6.5-7.5.

H. B. SIEMS

Determination of plant food content of soils through pot experiments. HANS WIESSMANN. *Z. Pflanzenernähr. Düngung* 2B, 76-89(1929); cf. C. A. 22, 2425.—Plants are able to utilize 20% of easily sol. phosphates in the soil during the growing period; hence the  $\text{P}_2\text{O}_5$  content of soils should be five times as much as is required by each crop. W. used mixtures of sand, soil to be tested and various plant nutrients to det. the state of fertility of soils with respect to phosphorus and potash.

H. B. SIEMS

The utilization of nitrogenous mineral fertilizers by crops. DEMOLON. *Compt. rend. acad. agr. France* 15, 527-32(1929).—The ratio (N recovered:N applied)  $\times$  100 represents the coeff. of utilization. For a given soil, the coeff. of utilization for large amts. of N is always much higher in pot expts. than in field tests. The coeff. calcd. as above may be greater than 100. This is observed only with small quantities of N and principally for the cereals. The coeff. of utilization varies in wide limits, in a parallel manner to the increases in yields obtained per kg. of N. The use of nitrogenous fertilizers allows of a very variable utilization of N by crops, and the possibility of important losses. A table is given showing the coeff. of utilization for wheat, sugar beets, potatoes, oats and barley.

E. F. SNYDER

Investigations of the bacteria content and action of differently treated stable manures with special regard to "processed" manure prepared by the process of H. Krantz. WALTER GOETERS. *Landw. Vers. Sta.* 108, 1-60(1929).—The total bacteria content of the stable manure was reduced as well by very high as by very low temps. (60-80° and 0°, resp.). The greatest increase was observed at 20° and at 40°. The development of the cellulose-decomp. bacteria shows in processed manure a non-uniform course, according as they grow anaerobically or aerobically. The anaerobic cellulose decomposers are slightly resistant against high temps. Only a small portion of these organisms was still capable of living at higher temps. The aerobic cellulose decomposers thrive only at temps. under 38-40°. The increase in yield in pot expts. was about 2 to 4 times greater in pots fertilized with processed manure than in those fertilized with farm manure. The increase in gross returns obtained from farm and processed manure stood in the ratio of 1:2.3 and 1:3.8, resp.

E. F. SNYDER

Chemical and microbiological principles underlying the transformation of organic matter in the preparation of artificial manures. SELMAN A. WAKSMAN, FLORENCE G. TENNEY AND ROBERT A. DIEHM. New Jersey Agr. Expt. Sta. *J. Am. Soc. Agron.* 21, 533-46(1929).—The problems involved in the study of the principles underlying the decompn. of mature straw and other plant residues in composts leading to the formation of so-called artificial manure involve a knowledge of (a) the compn. of the plant material, (b) mechanism of the decompn. processes which are brought about by the microorganisms, and (c) a knowledge of the metabolism of these organisms. Straw and other farm residues that are commonly used for composting consist predominantly (60% or more) of celluloses and hemicelluloses which undergo rapid decompn. in the presence of sufficient N and other minerals; of lignins (15 to 20%) which are more resistant to decompn. and which gradually accumulate; of water-sol. substances (5 to 12%), which decomp.

very rapidly; of proteins which are usually present in very small amts. (1.2 to 3.0%) but which gradually increase in concn. with the advance of decompn.; and of the mineral portion or ash. The processes of decompn. involved in the composting consist largely in the disappearance of the celluloses and hemicelluloses. These polysaccharides cannot be used as direct sources of energy by N-fixing bacteria; their decompn. depends entirely upon the action of various fungi and aerobic bacteria. In the decompn. of the celluloses and hemicelluloses, the microorganisms bring about the syntheses of microbial cell substance. Frequently this may be equiv. to a fifth or more of the actual org. matter decompd. To synthesize these large quantities of org. matter the microorganisms require large quantities of available N and  $P_2O_5$  and a favorable reaction. As the plant residues used in the prepn. of "artificial manure" are poor in N, available inorg. N must be introduced for the purpose of bringing about active decompn. In general, artificial composts can be prepd. from plant residues of any chem. compn. so long as the nature of these residues and of the processes involved in their decompn. are known. By regulating the temp. and moisture content and by introducing the required amts. of N,  $P_2O_5$ ,  $K_2O$  and  $CaCO_3$ , the speed of decompn. and the nature of the product formed can be controlled.

E. F. SNYDER

**The substitution of stable manure by fertilizers, green manures and peat. III.** BURT L. HARTWELL AND F. K. CRANDALL. Rhode Island Agr. Expt. Sta., *Bull.* 216, 1-20(1928).—Twelve-yr. rotation expts. are summarized. Cabbage following late celery gave yields unrelated to the form of org. matter present. Manure materially increased the yields of tomatoes and celery. On the peat plots, even after neutralization of the acidity, only the acid-tolerant plants, cabbage and tomatoes, made satisfactory growths. Under manure, lettuce responded best to very high  $P_2O_5$ , celery to high  $P_2O_5$  and N, while beets, cabbage, tomatoes and spinach required large addns. of N. Chlorosis, because of lack of Mn, developed in some crops. Oats, spinach, beets and lettuce benefited from applications of 8 lbs. per acre of  $MnCl_2$ . Tomatoes, celery and cabbage derived no benefit from the Mn. A nitrate level of 10 p. m. in the soil delayed maturity in some crops but increased the total yield over plots having a lower N level.

C. R. FELLERS

**The action of nitrogen-containing fertilizers.** HASSELHOFF. *Z. Pflanzenernähr. Düngung* 3B, 136-42(1929).—A general discussion of crop response to various synthetic nitrogen fertilizers.

H. B. SIEMS

**Action of various nitrogen-containing fertilizers.** GERLACH. *Z. Pflanzenernähr. Düngung* 2B, 89-91(1929).—Tests made in 1913 with rye show that  $NaNO_3$  and  $Ca(NO_3)_2$  give practically the same crop response. Iodine in Chile saltpeter did not increase the yields as compared with synthetic  $NaNO_3$ . During 1916 and 1917, various synthetic nitrogen fertilizers all gave good results with beets and potatoes.

H. B. SIEMS

**Basis for correct use and good crop response of important nitrogen-containing fertilizers.** O. ENGELS. *Z. Pflanzenernähr. Düngung* 2B, 49-61(1929).—Chile saltpeter, synthetic sodium nitrate and calcium nitrate physiologically react alkaline and are recommended for acid soils such as high peat lands and light mineral soils.  $NaNO_3$  on heavy soils causes formation of a crust, but  $Ca(NO_3)_2$  does not. Fall application of nitrates for winter wheat, etc., is not recommended. Nitrates are best applied early in the spring before growth starts. For winter cereals  $NH_3$ -contg. fertilizers are recommended. Heavy nitrate application may cause lodging and disease attacks. All cereals and sugar beets respond well to nitrate nitrogen. Leafy truck crops such as spinach, etc., prefer the nitrate form. Nitrate nitrogen is not recommended for the best results for potatoes, onions, cucumbers and celery. Tomatoes may become watery and have their flavor impaired by nitrates. Ammonium sulfate is a physiologically acid-reacting fertilizer and should not be used on acid soils without lime, etc. It gives the best results on heavier soils contg. calcium and poorer response on very sandy soils. Conditions should be favorable for nitrification. Colloids in very heavy soils may compete with plants for ammonia and bacteria may convert it into proteins unavailable for plant use. It should not be plowed under with fresh manure. Potatoes, tobacco, etc., prefer ammonia nitrogen. Cyanamide is a chemically and physiologically alkaline-reacting fertilizer. It is not suitable for use on all soil types and should not be used as top dressing. Soils with a high base-exchange capacity give fairly good crop response with cyanamide. Urea reacts physiologically neutral. Tobacco and truck crops have shown particularly good results with urea.

H. B. SIEMS

**A contribution to the saltpeter question.** K. NEHRING. Albertus Univ., Königsberg. *Fortschr. Landw.* 4, 40-2(1929).—Pot investigations with oats using saltpeter from various sources failed to show any appreciable differences. The addn. of small

quantities of KI to pots in which German saltpeter was used did not increase the yields above exptl. error.

LAWRENCE P. MILLER

**Toxicity differences among the common arsenicals.** LEOPOLD FULMEK. *Forstsch. Landw.* 4, 209-12(1929).—Arsenites and arsenates were mixed with talc in such proportions that the arsenites contained 30%  $As_2O_3$  and the arsenates, 30%  $As_2O_5$ . The powders were dusted on leaves and the toxicity against the beetles of *Phyllobius oblongus* L. and the caterpillars of *Orgyia antiqua*, *Gastropacha quercifolia*, and *Pieris brassicae* was detd. The order of toxicity for the arsenites was  $Mg > Cu, Ca, Pb > Fe > Zn$ ; for the arsenates,  $Pb > Cu > Ca > Mg > Zn > Fe$ . The arsenites were more effective than the arsenates except that Pb arsenate was equal to Zn arsenite. A detn. of the water-sol. As in the preps. showed no relation between this and the toxicity. The order of soly. in a buffer mixt. consisting of 280 cc. water, 2 cc. 0.1 N NaOH and 18 cc. glycine,  $pH$  about 9 [the intestinal juice of the caterpillar of *Bombyx mori* has been reported to have a  $pH$  of 9.0-9.8] agreed with few exceptions with the toxicity. LAWRENCE P. MILLER

**The role of Bordeaux mixture as a leafhopper insecticide.** DWIGHT M. DELONG. U. S. Bur. of Entomol., Columbus, Ohio. *J. Econ. Entomol.* 22, 345-53(1929).—Pyrethrum exts. have an immediate toxic action upon the potato leafhopper (*Empoasca fabae*) but do not affect those that hatch a few hrs. after the treatment. Leafhoppers which feed on plants treated with Bordeaux mixt. show no decrease in population during the first 24 hrs., but in 3-4 days none remains alive. Bordeaux mixt. does not kill leafhoppers when they are wetted with it. Expts. showed that the Cu in Bordeaux mixt. is absorbed by the plant and it is inferred that the leafhoppers obtain Cu in some form from the cell sap. C. H. RICHARDSON

**Insecticidal tests with oils and alkaloids of larkspur (Delphinium consolida) and stavesacre (Delphinium staphisagria).** W. M. DAVIDSON. U. S. Food, Drug and Insecticide Administration, Washington, D. C. *J. Econ. Entomol.* 22, 226-34(1929).—Soap emulsions of larkspur and stavesacre oils were effective against red spiders (*Tetranychus telarius*), various species of aphids, Colorado potato beetle larvae (*Leptinotarsa decemlineata*), larvae of the imported cabbage worm (*Pieris rapae*), and cross-striped cabbage worm (*Evergestis rimosalis*) and sow-bugs (*Isopoda*). Young larvae of the greenhouse white-fly (*Trialeurodes vaporariorum*) were killed whereas the other stages proved resistant to a 2% emulsion. The same concn. killed Calif. red scale (*Chrysomphalus aurantii*) in the greenhouse and was of lesser value against San Jose scale (*Aspidiotus perniciosus*) in the field. Two % emulsions injured some plants (beans, sweet cherry, rose, hollihock) but not deciduous trees. The alkaloids, delcosine, delsoline and delphinine (0.042 and 0.085%), in soap solns. were toxic as contact and stomach poisons to a variety of insects. Delphinine-HCl (up to 0.16% alkaloid) was inefficient against the green peach aphid (*Myzus persicae*), mealy bugs, red spiders, *Heliothrips femoralis* and the fall webworm (*Hyphentria cunea*). A 0.085% soln. killed the onion thrips (*Thrips tabaci*) and larvae of *Pieris rapae*. The alkaloids did not generally injure foliage at the concns. used. C. H. RICHARDSON

**Effect on young rice plants of adding aluminum salts to complete culture solutions.** FELIX VILLA. Univ. of Philippines, Los Baños. *Philippine Agr.* 17, 607-25(1929).— $Al_2(SO_4)_3$  and  $Al(NO_3)_3$  were about equally toxic to rice plants in 0.00025, 0.0005 and 0.00075 molar soln. The same proportion of Al in soln. produced more injury in incomplete culture solns. than in complete nutrient media. In concns. of 3, 5 and 8 p. p. m. Al stimulated growth in height but injured rice plants as measured by the dry wt of root and tops. Nine references are given. A. L. MEHRING

**Fumigation with calcium cyanide for the control of the greater and lesser bulb flies.** F. R. COLLE. U. S. Bur. of Entomol., Santa Cruz, Calif. *J. Econ. Entomol.* 22, 236-7(1929).—Finely ground Ca cyanide, 12 oz. per 100 cu. ft., is successfully used to kill larvae of the narcissus bulb fly (greater bulb fly) (*Merodon equestris*) and the lesser bulb fly (*Eumerus strigatus*) in narcissus and daffodil bulbs. The exposure time is 4 hrs. App. is described. C. H. RICHARDSON

**Care of walnut stock before and after vacuum fumigation.** D. B. MACKIE and A. H. CALL. Calif. Dept. Agr., *Mo. Bull.* 18, 218-20(1929).—HCN gas, 18 cc. HCN per 100 cu. ft., is used in vacuum fumigation of nursery stock for red-scale destruction. The contact period is 1 hr. Injury to the vitality of the stock occurred unless the trees were in a dormant condition when fumigated. Few new rootlets should be present, as injury to the roots is most severe. Roots should be protected by burlap or sawdust. After fumigation the stock should be thoroughly sprinkled with water and kept in the shade. C. R. FELLERS

**The purity of commercial o-dichlorobenzene.** J. WM. LIPP. U. S. Bur. of Entomology, Moorestown, N. J. *J. Econ. Entomol.* 22, 268(1929).—A com. product contg.

30% *p*-C<sub>6</sub>H<sub>4</sub>Cl<sub>2</sub>, 40% *o*-C<sub>6</sub>H<sub>4</sub>Cl<sub>2</sub> and 30% trichlorobenzene has been handled by the trade as an insecticide under the name *o*-dichlorobenzene. Pure *o*-C<sub>6</sub>H<sub>4</sub>Cl<sub>2</sub> is at present available only in small quantity at a high price.

C. H. RICHARDSON

**Toxicity of lead salts to insects.** FLOYD J. BRINLEY. Univ. Penn. *J. Econ. Entomol.* 22, 221-5(1929).—When fed by mouth, PbCO<sub>3</sub>, PbSO<sub>4</sub>, PbCrO<sub>4</sub>, and PbO are toxic to fall webworms (*Hyphantria cunea*) in the following order: chromate>sulfate>carbonate>oxide. Toxicity increases with the increase in mol. wt. of the salt. The amt. of Pb in the body of eastern tent caterpillars (*Malacosoma americana*), at the time of death, exclusive of the digestive tract, is const. regardless of the amt. of PbO ingested.

C. H. RICHARDSON

**Some effects of manganese sulfate and manganese chloride on nitrification.** D. H. NELSON. Iowa State College. *J. Am. Soc. Agron.* 21, 547-59(1929).—Mn compds. in small concns. may stimulate the nitrification of dried blood or (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> in soil. There is no regularity of relationship between the concn. of Mn and the stimulation in nitrification. The stimulation in nitrification noted in the presence of Mn salts may be due to the negative ion and not to the Mn. High concns. of Mn salts retard nitrification but do not stop the process. Lime is very effective in reducing the toxic effects of Mn on nitrification in soil.

E. F. SNYDER

**Mercury salts as soil insecticides.** HUGH GLASGOW. *J. Econ. Entomol.* 22, 335-40(1929).—HgCl<sub>2</sub> in aq. soln. and HgCl in aq. suspension or as a dust were effective in checking the cabbage maggot (*Hylemyia brassicae*), the carrot rust fly (*Psila rosae*), and the onion maggot (*Hylemyia antiqua*). HgCl is especially valuable for this work as it does not injure tender plants and is highly efficient. It also has considerable value in checking certain seedbed diseases. Of 5 other insecticides used only naphthalene approached HgCl in effectiveness.

C. H. RICHARDSON

**Potato seed treatment experiments on Long Island with special reference to the organic mercury instant dips.** E. E. CLAYTON. New York Agr. Expt. Sta., *Bull.* No. 564, 32 pp.(1929).—Org. Hg compds. for treatment of seed potatoes were found more effective than HgCl<sub>2</sub>. Org. mercury treatments were effective against seed piece decay and tended to increase the yield.

J. J. SKINNER

**Tolerance of different species and varieties of plants to naphthalene vapor.** ALBERT HARTZELL. Boyce Thompson Inst. *J. Econ. Entomol.* 22, 354-60(1929); *C. A.* 21, 792; 22, 1821, 4197.—150 species and varieties of plants were fumigated with C<sub>10</sub>H<sub>8</sub> (1.5 and 2 oz per 1000 cu. ft. greenhouse space). The dahlia was one of the most tolerant plants to C<sub>10</sub>H<sub>8</sub>. Single fumigations at 2 oz. per 1000 cu. ft. controlled red spider (*Tetranychus telarius*), a thrips (*Heliothrips femoralis*), the onion thrips (*Thrips tabaci*) and a slug (*Limax maximus*). The lower dosage required repeated fumigations at 4-5 day intervals for satisfactory control.

C. H. RICHARDSON

**Eutettix tenellus (Baker) as a factor in the production of nicotine for insecticidal purposes.** WALTER CARTER, Bur. of Entomol. and R. F. CRAWFORD, New Mex. Agr. Expt. Sta. *J. Econ. Entomol.* 22, 158-60(1929).—The beet leaf-hopper (*E. tenellus*) causes a peculiar disease of tobacco planted for the production of nicotine. A native New Mexican variety of tobacco, called locally "poncha," is immune to the disease.

C. H. RICHARDSON

**Bentonite as a dust carrier for nicotine.** L. R. STREETER. New York State Agr. Expt. Sta. *J. Econ. Entomol.* 22, 234-5(1929).—On account of its high adsorptive powers bentonite (a colloidal clay) should not be used as a carrier in nicotine dusts if volatility of nicotine is desired. No decompn. of nicotine in bentonite-nicotine dusts was observed. Nicotine can be recovered from bentonite by steam distn.

C. H. R.

**Further results with fish oil as an adhesive (for lead arsenate sprays).** H. L. DOZIER. Delaware Agr. Expt. Sta. *J. Econ. Entomol.* 22, 140-6(1929).—A continuation of work previously reported (*C. A.* 22, 2025). Excellent results are obtained with early PbHAsO<sub>4</sub> sprays contg. fish oil but the mixt. cannot be used safely for later sprays as it will increase the quantity of spray residue on the fruit.

C. H. RICHARDSON

**A correlation between oil sprays and chlorophyll content of foliage.** JOSEPH M. GINSBURG. N. J. Agr. Expt. Sta. *J. Econ. Entomol.* 22, 360-6(1929).—Two varieties of apple trees were sprayed with an emulsion of highly refined (white) lubricating oil during July and Aug. The viscosity of the oil was 200 Saybolt at 100° F., the oil concn. 2%. No injury to the foliage occurred and the leaves were a darker green and contained appreciably more chlorophyll than those of untreated trees.

C. H. RICHARDSON

**Some observations on Japanese beetle injury. II. Sprayed communities.** G. F. MACLEOD. State Coll., Penn. *J. Econ. Entomol.* 22, 320-2(1929).—PbHAsO<sub>4</sub> coated with Pb oleate was used in an extensive spraying demonstration to control the Japanese

beetle (*Popillia japonica*). Properly sprayed trees or shrubs received 80-90% protection from foliage injury. Sprayed plants well within the area protected by sprays suffered less injury than the same species of plant on the outer boundary of the sprayed area. A small and only temporary protection was afforded unsprayed plants which were surrounded by sprayed plants. When the normal host plants are protected by sprays, some other plants which are ordinarily immune or only occasionally attacked are injured. The Pb-coated  $\text{PbHAsO}_4$  repels rather than kills the insect. C. H. R.

**Variation in resistance of aphids to toxic sprays.** NEELY TURNER. Crop Protection Inst. *J. Econ. Entomol.* 22, 323-6(1929).—The results of expts. with com. nicotine sulfate soln. against 7 species of aphids show a variation in species resistance to this compd. It was applied as an aq. spray without spreader. C. H. RICHARDSON

**Sulfonated oxidation products of petroleum as insecticide activators.** M. T. INMAN, JR. Kay Labs., Inc., West Nyack, N. Y. *Ind. Eng. Chem.* 21, 542-3(1929).—By the addn. of chemically treated oxidation products of Pennsylvania gas oil to a soln. of nicotine sulfate, the efficiency of the poison was considerably increased. The activator principle, entomological technic, process, chem. and phys. properties of the product and future possibilities are discussed. E. F. SNYDER

**The action of sulfur as a fungicide and as an ascaricide.** II. WM. GOODWIN AND H. MARTIN. South-Eastern Agr. Coll. Wye, Kent, England. *Ann. Appl. Biol.* 16, 93-103(1929); cf. *C. A.* 23, 1712.—Previous expts. by chem. methods (*C. A.* 23, 1712) showed that the volatile agent produced when S is applied to a heated surface is gaseous S. This conclusion has been subjected to biol. tests upon the fungi, *Erysiphe graminis* and *Sphaerotheca humuli* and the gall mite, *Eriophyes ribis*. The fungi were not sufficiently sensitive to S to give concordant results; it is probable that actual contact of S particles with them is necessary to produce fungicidal action. The gall mite is affected by traces of S volatilized at ordinary temps. and filtration of the volatile agent through heated or cooled glass wool does not entirely remove it. These results on mites support the previous results from chem. tests. Relatively large concn. of  $\text{SO}_2$  and  $\text{H}_2\text{S}$  are without permanent effect on the gall mite and therefore are not responsible for the ascaricidal action of S. C. H. RICHARDSON

**The sulfur dioxide content of the air and its influence on the plant.** GUSTAV KÖCK, PAUL RECKENDORFER AND FERDINAND BERAN. Bundesanstalt f. Pflanzenschutz. *Fortschr. Landw.* 4, 170-2(1929).—Clover was exposed to concns. of  $\text{SO}_2$  from 1 part per 200,000 to 1 part per 20,000 for periods of 1 to 4 hrs. One such exposure did not affect the digestible protein content and only the higher concns. caused an increase in S content. LAWRENCE P. MILLER

**A laboratory method for determining the attractiveness of bands to codling moth larvae.** C. R. CUTRIGHT AND J. S. HOUSER. Ohio Agr. Expt. Sta. *J. Econ. Entomol.* 22, 62-4(1929).—Wooden posts are erected in pairs in the laboratory or outdoors. The base of each post is surrounded by a barrier to prevent the escape of the codling moth larvae (*Carpocapsa pomonella*). Two bands are compared on each pair of posts. Band A is placed 6 inches from the top of one post and band B, 6 inches below A. On the other post the location of the bands is reversed, band B being placed nearest the top of the post. Larvae are placed on top of each post and allowed to enter the band. The total number of larvae entering the A bands is then balanced against the total number entering the B bands. Results from wet and dry bands and bands treated with  $\beta$ -naphthol and untreated are given. C. H. RICHARDSON

**Observations on the oil-nicotine combination for the control of the codling moth and other apple insects in the Pacific Northwest.** F. B. HERBERT., Balfour, Guthrie and Co., San Francisco, Calif. AND M. D. LEONARD, Tobacco By-Products and Chem. Corp. Louisville, Ky. *J. Econ. Entomol.* 22, 72-8(1929).—Results of 2 yrs.' experimentation show that a spray consisting of a light, highly refined (white) petroleum oil and nicotine sulfate emulsified with casein gave, in most cases, economic control of the codling moth, *Carpocapsa pomonella*, and other more important apple insects. The use of this spray considerably simplified the arsenical spray residue problem on apples. C. H. R.

**Experiments with talc and other dusts used against recently hatched larvae of the oriental and codling moths.** BYRLEY F. DRIGGERS. New Jersey Agr. Expt. Sta., New Brunswick, N. J. *J. Econ. Entomol.* 22, 327-34(1929).—Coarsely and finely ground mica and finely ground talc applied to peach foliage in the lab. killed a high percentage of newly hatched larvae of the oriental fruit moth (*Laspeyresia molesta*) before they entered the twigs. Field tests showed the superiority of talc over mica or  $\text{Ca(OH)}_2$  in adherence to foliage and reduction of larval entry into the twigs. Talc and mica dusts were also effective in killing young codling moth larvae (*Carpocapsa pomonella*). The expts. are preliminary. C. H. RICHARDSON

**Manganese arsenate as a control for the codling moth.** RALPH L. MILLER. State Plant Board, Sanford, Fla. *J. Econ. Entomol.* 22, 340-5(1929).—In lab. expts., Mn arsenate, with or without lime, was not quite as effective as  $\text{PbHAsO}_4$  in preventing entrance of young codling moth larvae (*Carpocapsa pomonella*) into apples. When mixed with lime-sulfur soln. little difference in the toxicity of the two arsenates was noticed, although the toxicity of both was reduced. In field expts. Mn arsenate mixed with lime-sulfur soln. was as good or better than  $\text{PbHAsO}_4$ ; without lime-sulfur soln.  $\text{PbHAsO}_4$  was slightly better. Spray residues of Mn arsenate on fruit are more easily removed than are those of  $\text{PbHAsO}_4$ . C. H. RICHARDSON

**An operation in practical control of codling moth in a heavily infested district.** III. THOMAS J. HEADLEE. N. J. Agr. Expt. Sta. *J. Econ. Entomol.* 22, 89-97(1929); cf. C. A. 23, 467.—A review is given of a 3-year cooperative effort to control the codling moth (*Carpocapsa pomonella*) in heavily infested apple orchards. A progressive increase in quantity of clean fruit results from spraying with  $\text{PbHAsO}_4$ . A film of  $\text{PbHAsO}_4$  on fruit and foliage was more effective than a spotty coating. Eight to ten gals. of liquid spray contg.  $\text{PbHAsO}_4$  in the proportion of 4 lbs. in 100 gals. water is generally sufficient to give an optimum quantity of As deposit on a tree 25 ft. high and 30 ft. in diam. The addn. of casein spreaders and stickers (3 lbs. in 100 gals. water) to the arsenical spray appears to give the optimum coating. Method and time of application of  $\text{PbHAsO}_4$ , spray residues and orchard sanitation are also discussed. The application of proper amts. of miscible pine oil to the portions of the tree covered by rough bark destroyed all overwintering larvae without injuring the tree. C. H. RICHARDSON

**Preliminary report on attractants for peach insects.** OLIVER I. SNAPP AND H. S. SWINGLE. U. S. Bur. of Entomology. *J. Econ. Entomol.* 22, 98-101(1929).—Lab. and field tests showed that the plum curculio (*Conotrachelus nenuphar*) was slightly attracted by gallic acid, Me formate, benzaldehyde, phenylhydrazine, distillate of green peaches, phenylglycine and salicylaldehyde; the peach borer (*Aegeria exitiosa*) by benzyl butyrate, the lesser peach borer (*Aegeria pictipes*) by Et benzoate, mixt. of Ca malate plus acetaldehyde, Na bisulfite, phenol, salicylaldehyde, distillate of green peaches and peach bark distillate; the shot-hole borer (*Scolytus rugulosus*) by peach bark distillate and fermented aq. ext. of peach bark; the spotted cucumber beetle (*Diabrotica duodecimpunctata*) by oil of thyme and benzyl alc.; the soldier beetle (*Chauliognathus marginatus*) by phellandrene, anethole, benzyl alc. and oil of thyme; gnats (*Siphonella* sp.) are strongly attracted by isoamyl valerate and also attracted by thymol, carvacrol and Me heptenone; ants by phenylacetaldehyde and guaiacol; the wasp (*Vespa carolina*) by Et malonate. The results are considered to show little promise from the standpoint of control. Methods are described. C. H. RICHARDSON

**A study of baits, with special reference to the oriental fruit moth.** S. W. FROST. Penn. State College. *J. Econ. Entomol.* 22, 101-8(1929).—Baits contg. glucose, levulose, lactose, sucrose, invert sugar and a no. of com. sirups having various proportions of sucrose and glucose were used to attract the oriental fruit moth (*Laspeyresia molesta*). Some of the baits contained  $\text{Na}_2\text{AsO}_3$ . High-grade com. sirups were superior to com. centrifugal sirups and to the cheaper brands of refiners' sirups. Sucrose, glucose and levulose alone were not very attractive, but mixts. of them which contained certain inorg. compounds present in the molasses were very attractive. Conclusions: Sugar baits have not furnished a satisfactory method of reducing the oriental fruit moth population in an orchard. Molasses baits contg.  $\text{Na}_2\text{AsO}_3$  are superior to baits contg. molasses alone during hot weather because fermentation is restrained and the bait is effective over a long period.  $\text{Na}_2\text{AsO}_4$  was not found to be equal to  $\text{Na}_2\text{AsO}_3$ . A number of other insects including fruit flies and noctuid moths were attracted to the baits but not in numbers sufficient to reduce the population. C. H. RICHARDSON

**A digest of additional experiments in the application of *p*-dichlorobenzene in solution against the peach borer.** F. H. SIRGLER AND LUTHER BROWN. U. S. Bur. of Entomol. *J. Econ. Entomol.* 22, 217-21(1929).—This is a continuation of studies previously reported (C. A. 22, 1647). *p*- $\text{C}_6\text{H}_4\text{Cl}_2$  dissolved in gasoline is as effective as *p*- $\text{C}_6\text{H}_4\text{Cl}_2$  crystals against *Aegeria exitiosa* even if the soil about the peach tree is not prepd. before treatment and banked afterward. The use of 1 oz. *p*- $\text{C}_6\text{H}_4\text{Cl}_2$  in more than 50 cc. gasoline is attended by decreased efficiency. C. H. RICHARDSON

**Some factors that limit artificial control efforts for the oriental peach moth, *Laspeyresia molesta* Busck.** ALVAH PETERSON. Ohio State Univ. *J. Econ. Entomol.* 22, 108-15(1929).—The control of the oriental fruit (peach) moth is still an unsolved problem. No insecticidal control or orchard practice yet proposed is either satisfactory or practical. The more important factors that limit control by artificial means, including ovicides, larvicides, dormant control measures, light traps, attractants (baits) and

repellents, are discussed and opinions on the future possibilities of chemical control are given.

C. H. RICHARDSON

**Preliminary tests with possible repellents of the oriental peach moth.** J. WILLIAM LIPP. U. S. Bur. of Entomology. *J. Econ. Entomol.* 22, 116-26 (1929).—Sprays of crude  $\alpha$ -naphthylamine and Dippel's oil (lab. tests) and furfural, Dippel's oil,  $(\text{NH}_4)_2\text{S}$ , and amyl acetate (orchard tests) were repellent to the oriental fruit (peach) moth, *Laspeyresia molesta*. Methods are described. A useful contact insecticide may be made by dissolving *p*-dichlorobenzene in oleic acid and then treating the mixt. with an alkali to form a soap, which is miscible in water and from which the *p*-dichlorobenzene shows little tendency to crystallize as the temp. is lowered.

C. H. RICHARDSON

K salts (Fr. pat. 650,474) 18. Arsenical soaps [for insecticidal purposes] (U. S. pat. 1,711,503) 27. Treating waste fibers [for fertilizer production] (Fr. pat. 650,110) 1.

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CAREFFE, E. DE.: *Cours de chimie agricole*. Paris: Ecole du génie civil. 588 pp.

DOERELL, ERNST G.: *Das Superphosphat, seine Bedeutung und Anwendung in der Landwirtschaft für bäuerliche Landwirte*. Hannover: C. V. Engelhard & Co 32 pp. M. 0.60.

ENGELHARDT, J. H.: *Bijdrage tot de Kennis van capillaire Verschijselen in Verband met de Heterogeniteit van den Grond*. Groningen and The Hague: J. B. Wolters. 74 pp. Fl. 2.50.

GULLIN, R.: *Enciclopedia agricola. Análisis agrícolas. Tierras. Abonos. Forrajes. Productos de industrias agrícolas*. Barcelona: S. A. Salvat. 428 pp. M. 10, linen, M. 12.

HALL, A. DANIEL: *Fertilizers and Manures*. 3rd ed., revised and enlarged. London: Murray. 414 pp. 8 s. net.

*Jahresbericht für Agrikultur-Chemie*. Edited by F. MACH. Berlin: P. Parey. 575 pp. M. 54.

SACHSSE, RUDOLF, AND HABERNOLL, PAUL: *Des Landwirts Hausbibliothek. Band 4. Kurzegefasster Leitfaden der landwirtschaftlichen Chemie*. Edited by RUDOLF SACHSSE and FRIEDRICH KRETZSCHMAR. Bautzen: E. Hübner. 172 pp. M 3.20.

SCHAEFFER, FRANZ A.: *Leitfaden der Chemie für Landwirt*. 3rd ed., revised by Gustav Stenkhoff. Hannover: M. & H. Schaper. 133 pp. Half linen, M. 3.

**Fertilizer.** EMIL BAUER and EISLER & SZOLD. Ger. 475,429, Feb. 23, 1927. See Austrian 108,903 (C. A. 22, 4709).

**Fertilizers.** PAUL M. MILLAND and ROBERT CAYN. Fr. 647,376, Jan. 14, 1928. A fertilizer is produced by roasting waste galalith below 100° for about 3 hrs. Fr. 647,377 describes a fertilizer obtained from waste from fleshing hides and tanneries while still moist and impregnated with  $\text{Na}_2\text{S}$  or similar products by mixing the flesh with  $\text{Fe}_2(\text{SO}_4)_3$ , drying and heating in a furnace to a max. of 100° and afterwards grinding.

**Fertilizers.** I. G. FARBENIND. A.-G. Fr. 650,287, Mar. 2, 1928. A fertilizer having improved storing and fertilizing properties over Chile salt-peter contains a max. of 60, and preferably 20-50%  $\text{NaNO}_3$  mixed with  $\text{KNO}_3$ .

**Vinasses.** GEORGES BRIOIS. Fr. 650,804, Mar. 13, 1928. Vinasses obtained from the distn. of molasses are concd. to about 38-40° Bé., a small amt. of  $\text{Na}_2\text{SiO}_4$  or  $\text{K}_2\text{SiO}_3$  is added, and the pasty mass obtained is dried at a low temp. and ground for easy transport as a fertilizer.

**Fumigant comprising hydrocyanic acid and chlorocarbonic ethyl ester or similar lachrymatory warning substance.** FERDINAND FLURY (to Deutsche Ges. für Schädlingbekämpfung m. b. H.). U. S. 1,712,917, May 14.

**Disinfecting seeds.** ERNST W. SCHMIDT (to the Firm I. D. Riedel-E. deHaen A.-G.). U. S. 1,711,545, May 7. Ca fluosilicate and Cu carbonate are used together.

**Weed killing.** OLIVER C. ROBERTS. Australia 10,015, Oct. 24, 1927. Prickly pear and other noxious plants are destroyed by projecting a mixt. of Na arsenate and sand or grit into the plant.



## 16—THE FERMENTATION INDUSTRIES

C. N. FREY

**Distillation and fractionation processes used in the alcohol industry.** D. B. KEYES. *Trans. Illinois Acad. Sci.* 21, 236-44(1928).—A review article discussing those processes which have been developed within the last few years and which are responsible for the large-scale production of certain valuable solvents. Flow sheets are shown.

L. L. QUILL.

**Alcohol in solid form.** HEINZ OHLE. *Apoth. Ztg.* 44, 467(1929).—A reply to a recent paper by Weiss (cf. *C. A.* 23, 2781) in which O. shows that while an alc. soln. contg. 2% gelacol yields a rather soft mass, firmer products may be obtained by dissolving more gelacol or using a stronger alc. Since all so-called solid alcs. lose alc. on exposure, they must naturally be packed and shipped in suitable air-tight metal containers.

W. O. E.

**The alcohol yield from rye and wheat.** STAIGER. *Brennerei-Ztg.* 46, 88(1929).—The av. alc. yield of 20 samples of rye was 34.40 cc. per 100 g. rye (31.20-36.0), showing most of the samples to be rich in starch. Most of the 12 samples of wheat were judged to be comparatively low in starch; the av. alc. yield was 34.00 cc. alc. per 100 g. wheat (31.20-37.50).

B. C. BRUNSTETTER

**The preparation of butyl alcohol and acetone by fermentation.** A. ULLRICH. *Metallbörse* 19, 5-6, 61-2, 229-30(1929).—A review.

W. C. EBAUGH

**The kinetics of acetaldehyde formation in alcoholic fermentation by dry yeast.** BRUNO KISCH AND JESAJA LEIBOWITZ. *Univ. Köln. Biochem. Z.* 207, 384-94(1929).—Under optimum conditions of the sulfite-sugar relation and concn. of both substances (2.5%  $\text{Na}_2\text{SO}_3$ , 1-3% sugar) aldehyde formation is practically a linear reaction. This linear course of the reaction is not affected by temp. although, of course, the velocity of the reaction increases with rising temp. until the enzyme begins to be inactivated by heat. The optimum temp. zone is between 31° and 38°. The induction time is also influenced by temp., a fact which must be considered in the study of fermentation.

S. MORGULIS

**The determination of formic acid in vinegar.** W. SCHUT. *Chem. Weekblad* 26, 228 9(1929).—Introduce 1 cc. of the substance in a fermentation tube and add very carefully concd.  $\text{H}_2\text{SO}_4$  until entirely filled; add 1 or 2 small stirrers of about 1 cm. length, made from pieces of iron wire in glass, and bring them to the top with a magnet and move them around rapidly. Put in oven at about 105°, stirring frequently. After 4 hrs. there is usually no more gas produced, and after cooling to room temp. every cc. reading gives 2 mg. formic acid, which can be reduced to 0° and 76 cm. Hg. If more than 3 cc. CO gas is produced, a smaller quantity must be taken for analysis.

J. C. JURRJENS

**Some very old wines.** G. ISSOGLIO. *Ann. accad. agr. Torino* 70, 47-51(1927).—The phys. characteristics and analyses, giving alc., total ext., reducing sugars, glycerol, tartaric, malic, succinic, acetic and tannic acids, ash, alky. of ash, total esters and volatile esters, are given in tables for Barolo (year 1836), black Sardinian (1825), Bordeaux (1836) and Lacrima di Cadice (1849) wines.

ALBERT R. MERZ

ALBERTI, FEDERICO P.: *Elaboración de vinos naturales y artificiales. Formulas prácticas para la imitación de vinos de todas clases. Vinagres naturales y artificiales.* 6th ed. Barcelona: Francisco Puig. 416 pp. Ptas. 10.

BOULLANGER, EUGENIO: *Enciclopedia agricola dirigida por G. Wery. Destileria agricola e industrial. Alcoholes y aguardientes de frutas.* Barcelona: Salvat. S. A. 338 pp. Ptas. 12.

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EIDHERR, ED.: *Chemisch-techn. Bibliothek. Band 2. Der chemisch-technische Brennereileiter.* 6th ed., revised and enlarged. Vienna: A. Hartleben. 430 pp. M 8, linen, M. 9.

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LINTNER, CARL J.: *Grundriss der Bierbrauerei.* 6th ed., revised by Heinrich Lüers. Berlin: P. Parey. 172 pp. Linen, M. 6.50.

LÜERS, HEINRICH: *Pareys Bücherei für chemische Technologie. Band 2. Chemie des Brauwesens.* Berlin: P. Parey. 408 pp. Linen, M. 24.

MATHIEU, L., AND MATHIEU, R.: *Problèmes pratiques sur la vinification.* Gagny-lès-Paris: Institut oenotechnique de France. 72 pp.

PASTEUR: *Coll. Oeuvres de Pasteur. Tome V. Études sur la bière.* Paris. Masson et Cie. 361 pp. F. 120.

**Denaturing alcohol.** I. G. FARBENIND. A.-G. Brit. 298,611, Oct. 12, 1927. Denaturants are used comprising those fractions of coal-tar pyridines boiling above 120° and only slightly sol. in water, or sparingly sol. homologs of pyridines such as are obtained from croton aldehyde or acetylene or paraldehyde and  $\text{NH}_3$  with or without water-sol. pyridines.

**Denaturing alcohol.** I. G. FARBENIND A.-G. Brit. 298,617, Oct. 12, 1927. Denaturants are used comprising neutral substances which render the alc. distinctive in taste and odor even after fractionation over acid or alkali, filtration through charcoal or shaking with paraffin oil. Among the substances which may be used are: methyl thiocyanate, allyl alc., allyl carbinol, diethyl sulfide, dimethyl sulfide, methylethyl sulfide, diacetyl sulfide, acetonitrile, thioacetic ester, thiobutyric ester, ichthyol oil and products contg. these or similar substances in admixts. of which several examples are given.

**Treating alcoholic liquors.** THOMAS D. KELLY. Fr. 648,848, Aug. 22, 1927. EtOH, or material contg. it is mixed with up to 10% glycerol and treated with ultra-violet rays, a small proportion of Ca phosphate being added to check acidification. The product may be solidified by mixing with marine algae or farina, heating to 80° and cooling suddenly. It may be powd. and mixed with medicinal or food products as a stimulant or preservative.

**Glycerol.** ALLAN T. COCKING and CECIL H. LILLY. Ger. 472,870, Jan. 26, 1921. Glycerol, with AcH and alc., is prepd. by the yeast fermentation of sugar in the presence of sol. alkali bisulfite and normal alkali sulfite.

**Organic acids.** RICHARD FALCK. Ger. 473,727, Jan. 19, 1924. Org. acids are produced by the mycelia of fungi which are allowed to develop on a bed composed of a mixt. of nutritive material and materials which give off an acid gas. A suitable mixt. is agar soln. and  $\text{CaCO}_3$ . *Aspergillus* on this mixt. produces citronellic acid.

**Citric acid.** MONTAN- UND INDUSTRIALWERKE VORM. JOH. DAV. STARCK. Fr. 650,072, Feb. 17, 1928. Mold fungi such as *Aspergillus niger* used for the production of citric acid by the fermentation of carbohydrates is cultivated in alternating stages including cultivating in solid media such as gelatin and agar agar, cultivating in liquid media under the condition of industrial fermentation and cultivating on vegetable media such as fruit pulp contg. org. acids and vitamins. The wort used is such as would be used in alc. fermentation, part of the nutritive N being in the form of org. compds, particularly amino acids. Protective substances, which cloak the acidity of the citric acid, such as albumins or their degradation products, or non-fermentable carbohydrates of high mol. wt., may be added. Examples of the fermentation are given.

**Lactic acid.** I. G. FARBENIND. A.-G. (Martin Luther and Hans Beller, inventors) Ger. 472,914, Feb. 13, 1927. Lactic acid is prepd. from the lactate-contg. evapn. residues from the fermentation of carbohydrates, by extg. the lactate with MeOH and decomposing the ext. with acid, or esterifying it with acid and alc. Thus, 1 part of the evapn. residue of potato pulp neutralized with lime is extd. with 5 parts MeOH at 35-40°, until the lactate content of the ext. falls below 3%. The MeOH is removed by distn., the residue contg. about 92% Ca lactate. This can then be treated with acid or esterified.

**Molasses residues.** AKTIESELSKABET DANSK GAERINGS INDUSTRI. Fr. 649,424, Jan. 25, 1928. The residual liquors from the treatment of molasses for the production of yeasts, etc., are treated with microorganisms which will destroy betaine,  $\text{HCOOH}$ , humic substances and albumins. The decompn. of sulfates into  $\text{H}_2\text{SO}_4$  is avoided by the use of pure cultures under absolutely sterile conditions.

**Treating waste fibers.** HIPPOLYTE R. FOUQUE. Fr. 650,110, Aug. 9, 1927. Waste fibers from the agave and other plants are worked up for the *production of alc., fuel and fertilizers* by subjecting the waste to repeated pressing in presses of the continuous type, accompanied by intermediate disintegration and washing to obtain juice and pressed cake. The juice is afterward heated in a sterilizing app. of tinned Cu or Al, said app. being placed in a battery to effect the filling, heating, cooling and discharge in a continuous manner. The juice is fermented out of contact with air by means of

Moreau yeast obtained from the agave plant. The pressed cake is used as fuel and the ash therefrom as a fertilizer. Details of the app. are described.

**Brewing.** HANS KOCK and RUDOLF QUITT. Fr. 650,255, Mar. 1, 1928. A mash tub is described having a central tube surrounding a heating means, the liquid traveling up the tube and being distributed through branch tubes at the top. Cf. C. A. 23, 1466.

**Vinification of grapes.** EDMOND CHERREAU. Fr. 650,712, Mar. 10, 1928. An app. is described for the vinification of grapes. The whole grapes are heated to 80° by circulation of fresh juice suitably heated, whereby the cells of the grape skin are killed, and autolysis of the coloring matter and other substances in the skin is activated giving red wines without fermentation in the vat.

**Sterilization of wine.** SOC. ALFA-LAVAL. Fr. 651,061, Mar. 20, 1928. Wines are sterilized by adding finely divided neutral substances such as fuller's earth,  $\text{SiO}_2$ , etc., to which the microorganisms adhere, and sepg. the particles by centrifugal force.

**Wines, etc.** CHARLES O. BERTIN. Fr. 650,903, Mar. 16, 1928. Fermentation for the production of wines and other products is carried out by a succession of different ferments, each ferment being removed before the next is added. Thus, natural grape juice is fermented partly with an Algerian yeast, partly with a Sauterne yeast and partly with a Champagne yeast, each yeast imparting a particular flavor to the wine.

**Beverages.** PHILIPPE MALVEZIN. Fr. 648,825, June 27, 1927. Wines obtained by the fermentation of grape or other juice are dealcoholized by distn. under reduced pressure at a temp. of about 45–55°.

**Beverages; yeast.** MAURICE J. J. BOUTTEAUX. Fr. 649,741, July 20, 1927. In the manuf. of beer, the liquor expressed from the yeast after removal from the fermentation vats is used for the production of vinegar by the addn. of an acetic ferment; the yeast is purified by the elimination of dead cells and dried.

**Treating yeast.** ERNST PRIBRAM and HUGO WERTHEIM. Austrian 112,464, Oct. 15, 1928. Yeast is improved, particularly as regards durability, by treatment with  $\text{EtOH}$  of a concn. not exceeding 50% by vol., followed by washing with water. The treatment may be begun with  $\text{EtOH}$  of about 10% concn., the concn. gradually rising as the treatment proceeds. The treatment may be applied in a centrifuge or suction filter. Cf. C. A. 23, 1466.

**Yeast.** A. J. C. OLSEN and INTERNATIONAL YEAST CO., LTD. Brit. 299,336, June 21, 1927. In a continuous-addn., continuous-withdrawal process for producing yeast by propagation in 3 or more sep. quantities in successive stages of yeast growth, the yeast environment is controlled in at least the first 2 of the stages including continuous addn. of yeast nutrient materials, in such a manner as to maintain constancy of quality of the yeast produced as a final product. Three or more sep. yeast propagating tanks are connected in series; seed yeast added to them may be of the same or of different generations. Various addnl. details and modifications are described.

**Yeast.** NORDDEUTSCHE HEFEINDUSTRIE A.-G. Fr. 650,891, Mar. 16, 1928. A durable yeast is obtained by keeping yeast of any desired kind in motion during 6–12 hrs. in weak solns. of alc. (e. g., 0.25–1% by vol.), made poor in N and dried in a known manner. As alc. soln. the yeast wort itself or alc.-contg. wort from other fermentation processes may be used.

## 17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

**Essential oil of root of *Cyperus rotundus* L. of Japan.** I. Y. KIMURA AND M. OHTANI. *J. Pharm. Soc. (Japan)* 48, 971–7(1928).—By steam distn. K. and O. obtained about 1% essential oil. This contains some fatty acids. By fractional distn. under reduced pressure K. and O. obtained two chief fractions called, resp., cyperene (yield 32%),  $\text{C}_{15}\text{H}_{24}$  (I),  $b_7$  110–115°,  $d_{13}^{13}$  0.9372,  $[\alpha]_D^{13}$  1.5°, and cyperol (yield 49%),  $\text{C}_{15}\text{H}_{22}\text{O}$  (II)  $b_8$  147–150°,  $d_{20}^{20}$  1.0055,  $[\alpha]_D^{19}$  29.5°. Catalytic reduction of I with Pd and  $\text{BaSO}_4$  gave dihydrocyperene,  $\text{C}_{15}\text{H}_{26}$ ,  $b_{12}$  113–116°,  $d_{19}^{19}$  0.9332,  $[\alpha]_D^{19}$  7.6°. Catalytic reduction of II gave dihydrocyperol,  $\text{C}_{15}\text{H}_{26}\text{O}$ ,  $b_{10}$  145–148°. Chemical properties of I and II are given. F. I. NAKAMURA

**Review of pharmaceutical and pharmacological chemistry.** S. BERLINGOZZI. *Giorn. chim. ind. applicata* 10, 609–612(1928); cf. C. A. 23, 1717.—A review of drugs recently introduced, among them, the alkaloid, bulbocapnine, used in paralysis agitans, abnormal muscular sensibility, etc.; the anesthetic, diocaine,  $\text{EtOC}_6\text{H}_4\text{NHCMc}:\text{NC}_6\text{H}_4\text{OEt}$ , which is better than holocaine, and optocaine B, a mixt. of adrenaline, *p*-amino-

benzoate of diethylaminoethanol, and K and Mg salts; it is less toxic than novocaine; the arsenical derivs., as treparsol, 3,4-(HCONH)(HO)C<sub>6</sub>H<sub>4</sub>AsO(OH)<sub>2</sub>, which is given orally in syphilis. Sb and Bi salts such as CO(NH<sub>2</sub>)<sub>2</sub>·(C<sub>6</sub>H<sub>5</sub>O<sub>2</sub>SbO)<sub>2</sub>·5H<sub>2</sub>O, urea, stibamine and bismuthyliodoxyquinolinic acid have also been used in this disease.

A. W. CONTIERI

**Microchemical reaction for physostigmine.** M. WAGENAAR. *Pharm. Weekblad* 66, 381-2(1929).—The reaction between physostigmine salts and Na salicylate, whereby characteristic crystals are formed, is capable of detecting 10 mg. of the alkaloid at a diln of 1:200. The formation of supersatd. solns. may be avoided by addn. of (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>. The reaction with AuCl<sub>3</sub> giving a brownish red ppt. is sensitive to 5 mg. of alkaloid at a diln. of 1:500. The first reaction has the advantage of being more specific. A. W. D.

**Microchemical reactions for piperine.** M. WAGENAAR. *Pharm. Weekblad* 66, 405-6(1929).—The alkaloid is too feeble a base to form characteristic salts or double salts. It crystallizes readily from 30% AcOH, and if the soln. is dil. it may be salted out by NaOAc. Another useful solvent is MeAc. The alkaloid or evapn. residue is treated with a small quantity of MeAc and the soln. dild. with H<sub>2</sub>O, whereupon characteristic crystals form. Quantities as small as 50 mg. may thus be identified. A. W. D.

**Sirup Fructus.** C. A. ROJAHN and GERTRAUT HAMANN. Univ. Halle-Wittenberg. *Apoth. Ztg.* 44, 467(1929).—A patented Swiss product "for asthmatic horses" proved on examn. to consist essentially of H<sub>2</sub>O, 5% EtOH, about 2% plant ext. (juniper) and 0.4% aq. As soln. W. O. E.

**Evaluation of sodium cacodylate.** D. A. B. 6. G. FRIEDLÄNDER. *Apoth. Ztg.* 44, 528-9(1929).—After a review of the official Ger. method, and also that of Schulek and Villecz, the following procedure is suggested as yielding satisfactory results. In a 100-cc. Kjeldahl flask introduce 0.1 g. (accurately weighed) of the sample and 3 cc. 30% H<sub>2</sub>O<sub>2</sub> soln. After some agitation carefully add 10 cc. concd. H<sub>2</sub>SO<sub>4</sub> and heat with a small flame until the effervescence ceases. Again add, drop by drop, 2 cc. 30% H<sub>2</sub>O<sub>2</sub>, and heat as before and finally with the full flame. After cooling add 50 cc. H<sub>2</sub>O, transfer quantitatively to a titration flask, add KMnO<sub>4</sub> soln. (1:100) to a persistent red and discharge with a crystal of C<sub>2</sub>H<sub>2</sub>O<sub>4</sub>. When fully cooled add 3 g. KI, and a half hr. later titrate the pptd. I with 0.1 N hypo (without indicator) to a colorless soln. Not less than 8.75 nor more than 9.35 cc. hypo should be required for every 0.1 g. of the sample, an amt corresponding to 32.8 to 35.0% As. W. O. E.

**Capillary analysis of homeopathic preparations.** H. NEUGEBAUER. *Pharm. Ztg.* 74, 626-7(1929); cf. C. A. 23, 2532.—An exptl. study of the luminescence effects obtained by ordinary and ultra-violet light on capillary pictures from aconite, tobacco, barberry, cherry laurel, oleander and arnica. W. O. E.

**Rapid method for the examination of ergot fluidextract.** K. HERING. *Apoth. Ztg.* 44, 542(1929).—In a small separatory funnel shake vigorously 1/2 min. a mixt of 1 g. fluidext. of ergot, 5 g. petr. ether and 5 g. distd. H<sub>2</sub>O. Withdraw the aq. layer to a 2nd separatory funnel, add 5 g. Et<sub>2</sub>O and shake vigorously 1/2 min., then with a pipet transfer the upper layer to a narrow test tube contg. 2 cc. H<sub>2</sub>SO<sub>4</sub>, add 1 drop FeCl<sub>3</sub> soln. (1:100). In the course of 10 to 30 mins. a blue-violet to cornflower-colored ring develops in the event of a full strength sample. W. O. E.

**Bromometric and rhodanometric estimation of essential oils. II.** H. P. KAUFMANN. Univ. Jena. *Arch. Pharm.* 267, 249-67(1929); cf. C. A. 23, 1467.—From a large no. of expts. it was found that the approved MeOH soln. of Br, when satd with NaBr, may be advantageously employed in the investigation of essential oils. In the examn. of substances like geraniol, linalool, citral, anethole, terpineol, thymol, cinnamaldehyde, vanillin, carvone, geranyl acetate and linalyl acetate values were obtained which may be regarded as true I nos. The transition points in the bromination process are clearly discernible and persist in most cases for considerable periods. Free rhodan behaves very like a mildly reacting pseudo-halogen. In cases where the theoretical rhodan no. (corresponding to the I no.) is obtained, longer reaction periods are required (anethole, citronellol, terpineol). More interesting are the cases in which a pronounced *partial action* (as compared with the Br behavior) is observable. In a series of cases (linalool, linalyl acetate, geraniol, geranyl acetate, citral, thymol) 1 mol. of rhodan reacts where 2 mols. of Br would be involved; the rhodan value is in such cases equal to 1/2 the I no. In certain instances, as with cinnamaldehyde, the rhodan technic was inoperative. In addn. to expts. with natural mixts. of essential oils, many results are reported on artificial mixts. W. O. E.

**Testing of drugs in recent times.** G. BÜMMING and K. FERREIN. *Arch. Pharm.* 267, 310-20(1929).—A review. W. O. E.

**Estimation of cineole in eucalyptus oil.** PHILIP A. BERRY. *Australasian J.*

**Pharm. 1929, 203-6.**—The results of the work here recorded show that the *o*-cresol method gives satisfactory values with the oil of *E. cneorifolia*, which is one of the comparatively few species of eucalyptus exploited commercially for the production of medicinal eucalyptus oil, whereas the  $H_2PO_4$  method has been shown to yield hopelessly inaccurate results. While the degree of accuracy of the *o*-cresol method itself is not high compared with analytical methods in general, it nevertheless yields concordant results, and is certainly much better than any method yet suggested for the estn. of cineole.

W. O. E.

**Synthetic drugs.** FRANCIS H. CARR. *Chemistry & Industry* 48, 421-3 (1929).—An address given before the Brit. Sci. Guild, London, descriptive of a few prominent synthetic drugs in order to show the way in which our knowledge of chemistry and of the chem. changes of the body is developing, and enabling the manufacturer to supply that which the physician requires.

W. O. E.

**Assay of insulin on rabbits and mice.** A. KROGH AND A. M. HEMMINGSEN. *Kgl. Danske Videnskab. Selskab., Biol. Medd.* 7, No. 6, 13 pp. (1928).—The 2 tests followed are given in considerable detail, the one adopted with some minor modifications from the method of Marks, which depends on the fact that the hypoglucemic action of insulin within certain limits is proportional to the dose when measured as the av. fall of the blood sugar over a period of 5 hrs. following the injections. The essential modification is the use of the av. of the 1st and final values of the blood sugar as the base line, instead of the initial value only, as used by Marks. For the estn. of blood sugar the method of Hagedorn and Norman-Jensen was followed. The mouse convulsion test was studied, and the results obtained are plotted. A series of comparisons was instituted between the 2 methods. A prepn. which had been compared with the international standard by means of the mouse test, and made to correspond to the international standard with a mean error of  $\pm 5\%$ , was compared also in 5 expts. on 2 to 4 rabbits each, and found to be 94, 95, 96, 96 and 99% of the international unit, with an av. of  $96 \pm 3.5\%$ .

W. O. E.

**Essential oil of a new species of anemone leaf Boronia rich in ocimene.** A. R. PENFOLD. *J. Proc. Roy Soc. N. S. Wales* 62, 263-72 (1929).—The oil of the new species *B. dentigeroides* differed from that of *B. anemonifolia* (values in parentheses) in yield of oil 1.3 to 2% (0.6 to 1%), ester no. 15-34 (54-128), pinene under 30% (75%), ocimene 75-80% (trace only). The principal constituents of the new oil are: ocimene, *d*- $\alpha$ -pinene, *d*-limonene (total terpenes 90%), darwinol and corresponding caprate, isovalerate, and acetate, Et formate (?) with small amts. of sesquiterpenes, phenolic substances and paraffin m. 64-6°.

W. O. E.

**Sicilian and Calabrian essences of the season 1928-1929.** G. H. OGSTON & MOORE. *Perfumery and Essent. Oil Record* 20, 111-2 (1929).—With lemon oil the unusually high optical rotation of the past season was continued during the present. The % of citral is appreciably lower, very few samples exceeding 5%; the *d*. is generally low. Numerous typical results obtained have been tabulated. For sweet orange oil the rotation was rather high, very few being lower than 98.5°. The *d*. was between the usual limits 0.8475-0.849, while the non-volatile residue rarely exceeded 1.80%. The bergamot oil of the present season is very like that of the past.

W. O. E.

**Boronia oils—essential oil from a boronia in the pinnate section.** A. R. PENFOLD. *Perfumery and Essent. Oil Record* 20, 113-6 (1929).—A summary of the essential oils from 4 species of *Boronia*, namely *pinnata*, Müllerii, thujona and thujona var. "A," show comparative values in the order named: yield 0.02-0.1, 0.38-0.57, 0.5-0.8, 0.5-0.6%;  $d_{15}^{20}$  0.8784-0.8917, 1.0197-1.0265, 0.9121-0.9152, 1.056;  $n_D^{20}$  1.4762-1.4825, 1.5125-1.5150, 1.4526-1.4543, 1.5255-1.5260; constituents limonene, *d*- $\alpha$ -pinene, sesquiterpene, paraffin; elemicin (70-90%), *d*- $\alpha$ -pinene, geraniol, geranyl acetate;  $\alpha$ - and  $\beta$ -thujone (80-90%), sesquiterpene, paraffin, safrole (75-80%), limonene, sesquiterpene, phenols, paraffin. The oils from all 4 species were strongly fluorescent, probably because of the presence of Me anthranilate.

W. O. E.

**General characterization of perfumes and aromatics.** FRED WINTER. *Pharm. Monatsh.* 10, 36-9, 74-6 (1929).—An address given before the Austrian Pharm Assn. dealing with natural and synthetic perfumes and perfume materials.

W. O. E.

**Preparation and testing of pepsin wine.** W. BRANDRUP. *Apoth. Ztg.* 44, 578-9 (1929); cf. *C. A.* 23, 667.—A study has been made of the  $p_H$  of various pepsin wines, that prepd. with fruit wine having the acidity of 1.4, with sherry 1.8, with malaga 1.8 and with the official D.A.B. 6 prepn. 1.8. The acidity optimum for digestion of 2.2 to 2.5 is accordingly not reached.

W. O. E.

**Drugs and drug adulteration during the year 1927.** C. HAHMANN. *Apoth. Ztg.* 44, 561-3, 589-92(1929); cf. *C. A.* 22, 3259.—A review of adulterations observed in the Inst. für angew. Botanik. W. O. E.

**Determination of optical activity in the D. A. B. 6.** G. WALLRABE. Univ. Königsberg i/Pr. *Pharm. Ztg.* 74, 646-7(1929).—A discussion of the Ger. Pharm. requirements. W. O. E.

**Cacao butter.** BODINUS. *Pharm. Ztg.* 74, 647-8(1929).—A commentary on the standards of the D. A. B. 6. W. O. E.

**Detection of minute quantities of apomorphine in morphine solutions.** FRITZ WISCHO. Univ. Graz. *Pharm. Monatsh.* 10, 66-7(1929).—The behavior of certain *o*-hydroxy compds. toward vanadium-sulfuric acid reagent is described. The limits of sensitiveness to color formation are shown; that for apomorphine is 1:100000. In the presence of morphine the only difference in behavior observed is the transitory nature of the color produced by the reagent. Nearly all com. samples of morphine, notably after being heated in aq. soln., gave a positive test for apomorphine. W. O. E.

**Ultra-violet capillary analysis of pharmaceutical drugs.** PAUL ERNST AND EDEL TRUDIS JENTSCHITSCH. *Pharm. Monatsh.* 10, 67-73(1929).—Results are recorded of the examn. of some 134 different samples of crude drugs (capillary analysis of their aq. exts. in filtered ultra-violet light). W. O. E.

**Scientific pharmacy.** RAPP. *Pharm. Ztg.* 74, 464-8(1929).—The production and general technic of ampuls are discussed. W. O. E.

**Conservation of anesthetic chloroform.** I. G. OBERHARD. *Pharm. Ztg.* 74, 516(1929).—A commentary on recent papers by the author and by K. Bodendorf (cf. *C. A.* 23, 2531) on the same subject. W. O. E.

**Alkaloids of cusparia bark.** J. TRÜGER. *Pharm. Zentralhalle* 70, 213-22, 229-34, 245-52(1929).—A review of our present knowledge of the subject. W. O. E.

**Examination of alkali iodides.** WALTER MEYER. *Pharm. Ztg.* 74, 628(1929).—Alkali iodides which correspond fully to the Pharm. requirements may after some time decompose with deposition of I. Such products contain thiosulfates in such amts as to escape detection by application of the usual official method. A delicate test to det the presence or absence of such contamination consists in adding to a freshly prepd. soln of the sample (1 to 19 parts previously boiled and cooled H<sub>2</sub>O) several drops of starch soln and dil. H<sub>2</sub>SO<sub>4</sub>, whereupon a blue color should not immediately develop; on further addn. of 1 drop of a mixt. of 1 cc. 0.1 *N* I soln. and 9 cc. H<sub>2</sub>O to 10 cc. of the above iodide soln. a pure blue color should immediately appear, which persists on agitation. W. O. E.

**Fluidextract of condurango and its testing.** II. JESCHENBRENNER. *Pharm. Ztg.* 74, 628-9(1929).—An exptl. study more particularly with respect to the requirements of the Ger. Pharm. W. O. E.

**Development of pharmacy from the 16th to the 18th century.** LUDWIG WINKLER. *Pharm. Ztg.* 74, 607-8(1929).—An address. W. O. E.

**Production of isosafrole.** R. PRIESTER. Tech. Hochschule Delft. *Riechstoffind.* 4, 41-2(1929).—After reviewing some recent more or less successful attempts to convert safrole into isosafrole, P. shows how the conversion may be effected almost quantitatively by heating 200 g. charges of safrole with 1 g. KOH at about 9 mm. Hg pressure and in a specially constructed refluxing app. providing side-condensation of the distillate and its withdrawal whenever desired for detg. the  $n_D^{20}$ . The process may be made continuous. W. O. E.

**Composition of the essential oil of Nepeta cataria var. citriodora Beck.** B. N. RUTOVSKII AND I. V. VINOGRADOVA. Chem.-Pharm. Forschungsinst. Moskau. *Riechstoffind.* 4, 43(1929).—Previous work on this oil is reviewed in connection with the examn. of a number of different samples. W. O. E.

**Norwegian juniper oil. II. Terpenes and other constituents of the oil.** AXEL JERMSTAD. Univ. Oslo. *Riechstoffind.* 4, 44-5(1929).—Norwegian juniper contains *l*- $\alpha$ -pinene, camphene, sabinene, terpinene and 4-terpinenol. W. O. E.

**Microchemical distinctions of ethereal oils.** L. ROSENTHALER. *Am. J. Pharm.* 101, 191-6(1929).—See *C. A.* 21, 1870. W. G. GAESSLER

**$\beta$ -Anthraquinonemonosulfonic acid as a microchemical reagent for alkaloids.** L. ROSENTHALER. *Am. J. Pharm.* 101, 196-7(1929).—R. found that this reagent is a general alkaloidal precipitant, although some of the ppts. are not wholly insol. In many cases they are amorphous. Those in which crystals appear are described resulting from the addn. of the cryst. alkaloidal base or salt to a 10% soln. of the reagent. W. G. G.

**Some recent research achievements in pharmacy.** JOHN C. KRANTZ. *Am. J. Pharm.* 101, 269-75(1929).—A review. W. G. GAESSLER

**Comments on the alcohol tests in the German Pharmacopeia.** HENRY LEFFMANN. *Am. J. Pharm.* 101, 275-7(1929).—The test for MeOH depends upon the formation of HCHO by the action of acid permanganate in the cold, but the details of the procedure are such that unless much greater accuracy and delicacy are obtained than with the usual procedure there is no reason for adopting it. The detailed procedure is outlined. There seems to be nothing in the line of convenience, delicacy or certainty to recommend the method over that given in the U. S. P. X. which continued experience shows to be delicate, trustworthy and convenient. The test for acetone is the well-known reaction with NaOH and Na nitroprusside. It is sufficient and fairly characteristic, but indicates also aldehyde if present in notable amt. W. G. GAESSLER

**The Norwegian cod-liver oil industry.** JOSEPH W. ENGLAND. *Am. J. Pharm.* 101, 282-9(1929).—Methods of obtaining the oil are described. Measures taken to produce an oil of high quality and to store it in such a manner as to prevent deterioration are discussed in particular. It is not yet established that irradiated ergosterol is the therapeutic equiv. of cod-liver oil in all respects. W. G. GAESSLER

**Neodorm, a new soporific of the aliphatic series. I. Its chemistry and toxicology.** W. BIEHLER, G. HILDEBRANDT AND E. LEUBE. *Deut. med. Wochschr.* 55, 56-7(1929).—Neodorm, a com. prepn. of  $\alpha$ -bromo- $\alpha$ -isopropyl butyramide, was found to be a valuable and safe hypnotic. II. Its pharmacology. H. FREUND. *Ibid* 57. III. Clinical experiences. PAUL KACZANDER. *Ibid* 57-8. ARTHUR GROLLMAN

**The chemistry, pharmacology and clinical use of acedicon. I. Chemical studies.** CL. SCHÖPF. *Deut. med. Wochschr.* 55, 302-3(1929).—Acedicon is prepd. by reduction of thebaine and the substitution of  $2\text{CH}_3\text{CO}$  groups for  $2\text{CH}_3\text{O}$  groups. It is a cryst. compd., m. 154-6°, insol. in  $\text{H}_2\text{O}$  and easily sol. in org. solvents. It is not decompd. by boiling its aq. soln. for 1 hr., but is hydrolyzed by mineral acids to form AcOH and dihydrocodeine. II. Pharmacological studies. HERMANN WIELAND and BEHREND BEHRENS. *Ibid* 303-5. III. Clinical experience with acedicon. W. NONNENBRUCH and E. RISCHAWY. *Ibid* 305-6. ARTHUR GROLLMAN

**The manufacture and properties of organic antimony compounds.** E. R. KANN. *Metallhorse* 18, 1797-9(1928).—Because of their therapeutic properties, org. Sb compds. are today prepd. in large quantities; these compds. are particularly effective in the treatment of tropical diseases. In many cases the Sb preps. are much more effective than As preps. Methods of manuf. are described for alkyl and aryl stibines and their oxides and salts, mixed As-Sb compds. of the arseno type, stibonic acids and stibonium compds. B. HAMILTON

**Preservation of pharmaceuticals.** FRANT. RYBÁŘ. *Časopis Českoslov. Lékárnictva* 8, 193-6(1928).—R. confirms the value of methyl *p*-hydroxybenzoate as a preservative in pharmaceutical preps. such as sirups, mucilages, etc., as suggested by Sabalitschka (*C. A.* 21, 2157). WILLIAM J. HUSA

**Behavior of colloidal silver preparations in aqueous solution.** OLDŘICH TOMÍČEK. Charles' Univ., Prague. *Časopis Českoslov. Lékárnictva* 8, 196-202(1928).—"Solv-argent" contains 7.8% ionic Ag and "Argol" contains 1.3%; both preps. have a protective colloid contg. S in org. combination. "Thiargol" contains 20% Ag, of which 0.5% is ionic; in aq. soln. (2-0.03%),  $p_{Ag} = 8.0-6.5$ . In solns. of the same concn. "Ichthargan" (30% Ag) shows  $p_{Ag} = 1.8-2.2$ . In aq. solns. (2-0.06%), "Choleval" and "Targesin" give  $p_{Ag} = 4-3.5$ . WILLIAM J. HUSA

**The determination of silver by different methods in some colloidal silver preparations.** E. BUREŠ AND T. RUBEŠ. Charles' Univ., Prague. *Časopis Českoslov. Lékárnictva* 8, 202-7(1928).—The object of the work was to find a rapid and accurate method for detn. of Ag in colloidal Ag preps. The best results were obtained with a method based on oxidation of the org. matter with concd.  $\text{H}_2\text{SO}_4$  and  $\text{HNO}_3$ , followed by titration with  $\text{NH}_4\text{CNS}$ . WILLIAM J. HUSA

**Cyclamine.** E. BUREŠ AND J. BERGAUER. Charles' Univ., Prague. *Časopis Českoslov. Lékárnictva* 8, 208-11(1928).—The tubers of *Cyclamen europeum* were extd. with 88-90% alc., boiling twice in succession. In this way was isolated crude cyclamine, contg. impurities such as coloring matter and resinous material; the yield was 11.4%. After further purification, cyclamine was obtained in cryst. form, m. 253-4°. Cyclamine appears to have very strong hemolytic properties. WILLIAM J. HUSA

**Comparative analyses of American and Philippine cigarettes.** V. G. LAVA AND S. B. FORTMA. Philippine Agr. Expt. Sta. Los Baños. *Philippine Agr.* 17, 565-77(1929).—Philippine-made cigarettes contain less  $\text{C}_2\text{H}_4$ ,  $\text{Et}_2\text{O}$  and  $\text{EtOH}$  exts. and more  $\text{H}_2\text{O}$  ext., ash, total N and protein than most American cigarettes. If the sum of the  $\text{C}_2\text{H}_4$ ,  $\text{Et}_2\text{O}$  and  $\text{EtOH}$  exts. be represented by A and the  $\text{H}_2\text{O}$  ext. by B, the ratio A/B will not

be less than 2.0 with cigarets of good quality. Eight references are appended.

A. L. MEHRING  
The determination of sparteine in broom tops (*Sarothamnus scoparius* Koch). P. BOURGET. *Bull. sci. pharmacol.* 36, 235-7(1929).—Heat 10 g. of cut tops to 100° for 1 hr. with 100 cc. of a 2% soln. of trichloroacetic acid. Filter through cotton and repeat the extrn. until a sample is no longer pptd. by the reagent of Valser. Add to the cold and united exts. 5 cc.  $H_2SO_4$  and a satd. soln. of  $KMnO_4$  until a permanent pink color appears. Destroy the excess of  $KMnO_4$  with some drops of  $NaHSO_3$  and ppt. with a 5% soln. of silicotungstic acid in slight excess. Filter and wash with 2%  $H_2SO_4$ , dry and calcine in conformity with the method given by Javillier (*C. A.* 5, 1906). The ppt has the compn.  $SiO_2 \cdot 12WO_3 \cdot 2H_2O \cdot 2C_{11}H_{25}N_2$  and after calcination a residue,  $SiO_2 \cdot 12WO_3$ , is left.

A. E. MEYER  
The phytotoxins, MICHEL MACHEBOEUF. *Bull. sci. pharmacol.* 36, 237-52 (1929).—A monograph about phytotoxins, their definition and principal properties, prepn., physiologic action on animals, biologic action *in vitro* and immunization. The following substances are discussed: ricin, abrin, crotin, robin and phallin.

A. E. MEYER  
Study of commercial lecithins and specialties with lecithin base. II. JACQUES SONOL. *Rev. facultad cienc. quim.* (Univ. La Plata) 5, 83-104(1929); cf. *C. A.* 23, 2533.—Pharmaceutical prepn. contain 3-10% lecithin emulsified in physiol. salt soln. of 0.7-0.93%  $NaCl$ . The phys. and chem. qualities of commercial products are detd. As decompn. occurs, injectable prepn. are not stable for more than 6 months. The therapeutic value was reported favorable in six cases.

A. E. MEYER  
Some physical studies of iodized preparations used in pharmacy. E. CANALS AND P. SUIFFET. *J. pharm. chim.* 8, 308-13(1928); cf. *C. A.* 22, 1611.—No certain conclusions can be drawn as to the colloidal nature of I in 9 products examd. except perhaps in reference to iodized  $H_2O$ , and a mixt. of tincture of I and  $H_2O$ , which partly contain non-ultrafiltrable I. With iodized tannin, dialysis, ultra-filtration and especially the degree of ionization of the product show that there is no colloidal I in the prepn.; it is present entirely in the cryst. state.

S. WALDBOTT  
Stability of sirup of ferrous iodide. H. E. BECKER AND F. F. BERG. E. R. Squibb & Sons. *J. Am. Pharm. Assoc.* 18, 503-4(1929).—The cause of the darkening of this product in storage is still unknown. A specimen was prepd. by using boiled distd.  $H_2O$ . It was subdivided into flint bottles which were completely filled. Part were evacuated and N was admitted; part were stored in varying temps., including the icebox. In 3 months all specimens at room temp. showed darkening while the icebox specimens were not discolored although sucrose had crystd. In 9 months the cold specimens showed slight discoloration. I had not been set free. Two other sets were prepd., one strictly U. S. P. and another in which citric acid was substituted for the hypophosphorous acid. All were stored in flint bottles in cardboard containers (to restrict light) at ordinary temp. After 4 months the U. S. P. product had changed in color while the others had not.

L. E. WARREN

The formula of *Digitalinum verum* (WINDAUS, HAACK) 10. Glucoside of *Rosa multiflora* (KONDO, *et al.*) 10.

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**Medicine from animal chyle.** TORII & Co., LTD., and H. MORI. Brit. 299,530, Aug. 2, 1927. A remedy for use by injection is obtained by purification of chyle of animals which have been fed on fat. Details of the purification are given.

**Antiseptic compositions.** V. LEONARD. Brit. 299,522, July 29, 1927. A compn. suitable for use as an antiseptic on tissue surfaces, dental or surgical instruments or false teeth, etc., comprises hexylresorcinol dissolved in glycerol and dild. with water to obtain a clear soln. of low surface tension.

**Anesthetic mixture of ethylene and ether.** MERLE B. CHENEY (to Cheney Chemical Co.). U. S. 1,712,250, May 7.  $C_2H_4$  together with a smaller proportion of ether vapor (suitably about 0.5–5.0% the quantity of the  $C_2H_4$ ) is subjected to a pressure of at least 1000 lbs. per sq. in. in order to produce a free-flowing non-freezing product.

**Theobromine.** NAAMLOOZE VENNOOTSCHAP SOCIETEIT VOOR CHEMISCHE INDUSTRIE "KATWIJK." Fr. 651,490, Mar. 19, 1928. See Brit. 287,507 (C. A. 23, 483).

**Arsphenamine.** KAORU MATSUMIYA and HISAKAZU NAKATA. U. S. 1,713,475, May 14. A cathode soln. for the prepn. of arsphenamine by elec. reduction comprises a soln. of HCl of over 4.7 N and 3-nitro-4-hydroxyphenylarsinic acid.

**Iodine compounds.** WM. M. SINCLAIR. Australia 11,512, Feb. 1, 1928. Iodized glucoprotein substances having *therapeutic properties* are prepd. by macerating cacti in boiling water, neutralizing in the presence of S, maintaining the temp. until the evolution of gas ceases, fermenting, adding I and reboiling until the I is taken up.

**Purifying calcium cresolsulfonates.** I. G. FARBERIND. A.-G. (Siegfried Jaeger, inventor). Ger. 475,270, July 9, 1922. Aq. solns. of the Ca salts of acids obtained by the direct sulfonation of cresols are freed from cresol, cresylate and other volatile impurities by steam distn. The products are intended for the treatment of respiratory diseases.

**Mineral waters.** SOC. FRANÇAISE DU "ROYAL VICHY." Fr. 651,117, Mar. 22, 1928. Medicinal mineral waters such as "Vichy" are made agreeable to the taste by emulsifying them in an atm. of  $CO_2$  with sirups, alcoholates, oils of citron, orange, mint, cinnamon, etc.

**Disinfectant.** FLUXO PRODUCTS CO., INC. Ger. 475,305, July 8, 1925.  $NaHSO_4$  is mixed with 2–10% of vegetable ivory. A small amt. of a blue water-sol. dye may be added also.

**Tooth paste.** DONALD H. SEYMOUR and ADOLF FRIEDBERG. Can. 288,933, April 23, 1929. A tooth paste comprises invert sugar 1500 g., distd. water 500 g., oil of peppermint 25 g., oil of cloves 25 g., pptd. chalk 200 g., and suitable coloring matter as carmine, coumarin or various aniline dyes.

**Dentifrice.** E. R. SQUIBB & SONS. Ger. 475,114, Nov. 13, 1924. A dentifrice paste comprises water-free  $Mg(OH)_2$  and glycerol, preferably with other addns. such as  $CaCO_3$ , antiseptics, and thickeners. The paste may be prepd. by adding glycerol to an aq. suspension of  $Mg(OH)_2$  and evapg. under reduced pressure until the water is removed.

## 18—ACIDS, ALKALIES, SALTS AND SUNDRIES

E. M. SYMMES

**New operating method for the manufacture of nitric acid by the ammonia oxidation process.** I. M. LINBSON. *J. Chem. Ind. (Moscow)* 6, 8–12(1929).—The purpose is to improve the  $HNO_3$  yields and to reduce the reaction space, which in existing methods requires too cumbersome a plant app. The principal factor influencing the velocity of transformation of NO to  $HNO_3$  and also the concn. of the acid finally obtained is the concn. of NO in air. However, as the concn. of  $NH_3$  in air must not be above 10%, because of the need of a sufficient amt. of air for oxidation, it has been proposed to enrich the air by O. Even in this case the concn. of  $NH_3$  must not be above 13–14% for fear of formation of explosive mixts. To increase the partial pressure of NO it has also been proposed to operate under pressure. This presents no technical difficulty,

if the  $\text{NH}_3$  is also oxidized under pressure (*C. A.* 23, 242). The objection of Malyarevskii and Papkov (*C. A.* 22, 4727) that pressure affects adversely the reaction  $4\text{NH}_3 + 5\text{O}_2 = 4\text{NO} + 6\text{H}_2\text{O}$  is unfounded. The real objection to the use of pressure is that it acts unfavorably on the reaction  $3\text{HNO}_2 \rightleftharpoons \text{HNO}_3 + 2\text{NO} + \text{H}_2\text{O}$ , so that the  $\text{HNO}_3$  is obtained with a high  $\text{HNO}_2$  content. When the pressure is lowered after the operation, the  $\text{HNO}_2$  decomposes only partly into  $\text{NO}$  and  $\text{HNO}_3$ , and a special app. is required to absorb the  $\text{NO}$  thus emitted. Finally, as pressure decreases the speed of  $\text{NO}$  formation from  $\text{HNO}_2$ , the whole process is slowed down, since most of the time required in this process is used up by the oxidation of regenerated  $\text{NO}$ , and not by that of the original quantity of  $\text{NO}$ . The proposed method is based on the fact that most of the reaction space is needed to obtain the last 25-30%  $\text{HNO}_3$ , when the  $\text{NO}$  concn. in the gases becomes low. To obtain the first 70-75% of  $\text{HNO}_3$ , only 35-40% of the total reaction space is required, on condition that all  $\text{NO}$  is transformed into  $\text{HNO}_3$  at a yield of 93-4%. L. proposes to absorb 70-75% of the original amt. of  $\text{NO}$  in  $\text{HNO}_3$ -sprayed towers in the usual manner, after which the remaining gases are absorbed and transformed into  $\text{N}_2\text{O}_3$  in Gay Lussac towers sprayed with concd.  $\text{H}_2\text{SO}_4$ . Only about 5% of the gases entering the Gay Lussac towers would escape absorption. After ejecting the gases by means of a pump (if they are not to be used as a N source)  $\text{N}_2\text{O}_3$  is introduced into a special small, acid-proof distn. column placed at the inlet.  $\text{N}_2\text{O}_3$  enters it from the top, while a current of hot  $\text{NO}$  from the  $\text{NH}_3$  contact oxidation app. enters from the bottom. The temp. of the latter gases reaches  $550^\circ$ , as they enter the column directly after the contact reaction and are not passed through a steam boiler as usual. Due to the high temp. and the current of inert gases ( $\text{NO}$ , not having had time to oxidize to  $\text{N}_2\text{O}_3$ , acts as an inert gas),  $\text{N}_2\text{O}_3$  decomposes and the  $\text{NO}$  formed is released into circulation. Because of the high temp. (about  $260^\circ$ ) of the gases, the  $\text{H}_2\text{O}$  vapors which they contain are not absorbed by  $\text{H}_2\text{SO}_4$ , which has a temp. of  $130-140^\circ$ , and do not dilute the latter. The gases being thus enriched in the denitration column to a 13.5%  $\text{NO}$  content enter the recuperating column. In the latter, which is sprayed from the top by 50%  $\text{HNO}_3$ , the N gases cool to  $150-60^\circ$ , after which they are passed through a cooling tower sprayed with 20-25%  $\text{HNO}_3$  and finally enter the absorption towers at  $40-45^\circ$ . The usual gas coolers should not be employed, as they require considerable surface. The absorption towers are  $\frac{3}{4}$  filled with small pieces of quartz. A fine spray of  $\text{HNO}_3$  enters the unfilled quarter of the absorption towers, and the  $\text{NO}$  gas current, which enters from the bottom, is thus oxidized. The total yield of  $\text{HNO}_3$  by this process should reach 98%, and the total required reaction space is reduced to 25-30 square meters per ton of  $\text{NH}_3$  burned. Calcs. and reaction equations are given.

BERNARD NELSON

**Sulzer compressors for the production of synthetic ammonia.** A. ELSNER *Z. ges. Kälte-Ind.* 36, 1-8(1929).—The pressures used in the various com. methods for producing synthetic  $\text{NH}_3$  are discussed. Two compressors, a six-stage, 2000 cu. m. per hr., 300 atm., and a four-stage, 7600 cu. m. per hr., 27 atm. are described. F. D. R.

**Oxidation of ammonia from crude by-product liquors.** G. A. PERLEY AND W. P. WHITE. Univ. of New Hampshire. *Ind. Eng. Chem.* 21, 564-7(1929).—The use of a crude  $\text{NH}_3$  liquor high in S as a source of  $\text{NH}_3$ -air mixt. for oxidation temporarily inactivated a Pt gauze catalyst. Removal of the S was accomplished by washing with an aq. suspension of  $\text{NiS}$ , which acts catalytically in the oxidation of  $\text{NH}_4\text{HS}$  to free S.

T. H. CHILTON

**Manufacture of aluminum chloride from clays.** I. E. ADADUROV. Kharkov State Inst. Appl. Chem. *J. Chem. Ind. (Moscow)* 5, 1288-92(1928).—Seven samples of Don basin clays contg. 45.6 to 52.3%  $\text{SiO}_2$ , 33.07 to 39.5%  $\text{Al}_2\text{O}_3$ , a little of other oxides and moisture, were studied with a view of their utilization for direct conversion to  $\text{AlCl}_3$ . The first operation is the removal of  $\text{H}_2\text{O}$ , by burning to  $600^\circ$ . This affects the soly. of  $\text{Al}_2\text{O}_3$  in acids. When kaolin is heated to  $600^\circ$  its soly. in  $\text{HCl}$  increases at the rate at which it loses  $\text{H}_2\text{O}$ ; in the interval between 600 and  $800^\circ$  the soly. remains const.; at  $900^\circ$  it becomes perceptibly lower; and above  $1000^\circ$  the product becomes almost insol. The clays which are most sol. in  $\text{HCl}$  or  $\text{H}_2\text{SO}_4$  are those which have been heated between  $600^\circ$  and  $800^\circ$ . Within the temp. interval  $500-800^\circ$  kaolinite does not decompose into free  $\text{SiO}_2$  and  $\text{Al}_2\text{O}_3$ , but forms a new silicate which is sol. in acids; hence the sol. constituents of calcined clays are not the free  $\text{SiO}_2$  and  $\text{Al}_2\text{O}_3$ , but kaolinite. Hence the importance of detg. the kaolinite contents of clay samples. The method is as follows: A known wt. of non-calcined clay is boiled 1 hr. in a beaker contg. 10 cc. of 20%  $\text{HCl}$  per g. of clay. One-half of the undecompd. residue is again boiled with 20%  $\text{HCl}$  for 1 hr., while the other half is first heated to  $600-800^\circ$  and then boiled 1 hr. with 20%  $\text{HCl}$ ;  $\text{Al}_2\text{O}_3$  is detd. separately in the 2 liquids and  $\text{SiO}_2$  is detd.

by treating the 2 undissolved residues with 50 cc. of a soln. 5%  $\text{Na}_2\text{CO}_3$  and 0.5%  $\text{NaOH}$  and with 25 cc. of a soln. of  $\text{KOH}$  per 1 g. of residue. The difference between the  $\text{Al}_2\text{O}_3$  quantities contained in the 2 filtrates is the  $\text{Al}_2\text{O}_3$  content of the kaolinite; on multiplying it by 2.533 the kaolinite content of the clay is found, the quantities of  $\text{SiO}_2$  found serving as a check. For the transformation of clays into  $\text{AlCl}_3$  it is best to use an agent contg.  $\text{Cl}$  in active form. Budnikov (*C. A.* 18, 2058) has shown that  $\text{COCl}_2$  is more effective than  $\text{Cl}$ , particularly at  $1000^\circ$  in the presence of  $\text{C}$ . A. believes that the superiority of  $\text{COCl}_2$  over  $\text{Cl}$  is due to the circumstance that the former dissociates at  $800^\circ$ , yielding nascent  $\text{Cl}$  which is more effective than ordinary  $\text{Cl}$ . The exptl. fact that the yield of  $\text{AlCl}_3$ , which is 98% at  $1000^\circ$ , drops to 56.3% at  $800^\circ$  when operating with  $\text{COCl}_2$  during the same length of time, is explained by the circumstance that at  $800^\circ$  the dissocn. of  $\text{COCl}_2$  is just beginning and, consequently, there is much less active  $\text{Cl}$  present than at  $1000^\circ$ . Budnikov's equation  $\text{Al}_2\text{O}_3 + 3\text{COCl}_2 = 2\text{AlCl}_3 + 3\text{CO}_2$  should be regarded as a reversible reaction, since at about  $1000^\circ$  some of the  $\text{AlCl}_3$  formed is converted back to  $\text{Al}_2\text{O}_3$  under the influence of the  $\text{CO}_2$  present. This explains the role of  $\text{C}$ , which Budnikov considered as a catalyzer, but which in reality takes part in the reaction by reducing  $\text{CO}_2$  to  $\text{CO}$ . The best effect is obtained when charcoal and clay are not only intimately mixed with each other, but cemented with mazouts or crude oil into porous briquets which absorb  $\text{Cl}$ . A real catalyzer in the reaction is  $\text{KCl}$  in the quantity of 5–10%; in its presence the reaction is accelerated, the yield is improved, and the operating temp. may be lowered to  $720\text{--}750^\circ$ .  $\text{FeCl}_2$  formed in the course of chlorination of clay can easily be sepd. from  $\text{AlCl}_3$ , as it is volatile at  $400\text{--}450^\circ$ . The latter circumstance may be utilized for obtaining  $\text{Al}_2(\text{SO}_4)_3$  free from  $\text{Fe}$  either by starting with chlorinated clays or by chlorinating  $\text{Al}_2(\text{SO}_4)_3$ .

BERNARD NELSON

**Studies on aluminum silicates. II. The dehydration vapor pressure of kaolin.** C. J. VAN NIEUWENBURG and H. A. J. Pieters. *The Tech. Univ. Delft. Rec. trav. chim.* 48, 406–16(1929); cf. *C. A.* 23, 2676.—Within certain limits of  $\text{H}_2\text{O}$  content of kaolin, the equation  $\log p_{\text{H}_2\text{O}} = -\frac{39,300}{4.57} \cdot \frac{1}{T} + 13.5$  is a rough approximation of

the equil. pressure. In reality the behavior of kaolin is not governed by laws of univariant equil. The loss of  $\text{H}_2\text{O}$  from kaolin was studied by a dynamic method at 17 mm., 140 mm., 1 atm. and 3.6 atm., and by the static method. As the pressure is increased the curves are more continuous than at the low pressures where the break in the curve is quite abrupt. The results of the static and dynamic method do not agree except in the form of the curve. A sample of pholerite, with a particle size of  $10\text{--}20\mu$ , was examd. at 1 atm.  $\text{H}_2\text{O}$  pressure and the decompn. temp. found to be  $60^\circ$  higher than with the kaolin sample with particle size of  $1\mu$ . A sample of kaolin dehydrated and rehydrated a no. of times showed a dehydration curve which was continuous, showing that hysteresis is present in the above results. The dissocn. pressure of kaolin is a function of  $\text{H}_2\text{O}$  content over the whole range.

ARTHUR FLEISCHER

**The manufacture of minium of alumina.** VICTOR CHARRIN. *Science & ind.* 13, 166 8(1929).—For some time "minium" designated only  $\text{Pb}_3\text{O}_4$ , but it is now used for a no. of substitutes, which are not only cheaper but also less toxic and less dangerous to use than the  $\text{Pb}$  compd. Bauxite, or rather the residue from treatment of this rock with  $\text{H}_2\text{SO}_4$  for removing  $\text{Al}_2(\text{SO}_4)_3$ , is used as the basis for the prepn. of minium of alumina. Red bauxite, contg. the most  $\text{Fe}$  oxide, is the most suitable source.

FRANK V. JOHNSON, JR.

**Barium carbonate.** ANON. *U. S. Tariff Commission* 1928, 18 pp.—Rept. of Tariff Comm. on differences in costs of production in U. S. and in the principal competing country.

E. J. C.

**Industrial transformation of sodium chromate into dichromate.** F. F. WOLF and I. I. Popov. *J. Chem. Ind. (Moscow)* 6, 12–7(1929).—The best conditions of com. treatment of  $\text{Na}_2\text{CrO}_4$  by  $\text{CO}_2$  and  $\text{NH}_3$  at ordinary pressure to obtain  $\text{Na}_2\text{Cr}_2\text{O}_7$  with recovery of  $\text{NH}_3$  are as follows: (1) Satn. of a  $38^\circ \text{Bé.}$   $\text{Na}_2\text{CrO}_4$  soln. by  $\text{NH}_3$  recovered on evapn. of the solns. of stage 5 till they contain 0.12–0.10 parts  $\text{NH}_3$  per 1 part  $\text{Na}_2\text{Cr}_2\text{O}_7$ ; this treatment of  $\text{Na}_2\text{CrO}_4$  may be done in app. similar to the absorbers used in the  $\text{NH}_3\text{--Na}_2\text{CO}_3$  process. (2) Treatment of the solns. contg.  $\text{NH}_3$  and  $\text{Na}_2\text{CrO}_4$  by gas from  $\text{CaO}$  kilns enriched by  $\text{CO}_2$  obtained in stage 4 by calcining the bicarbonate; this operation may be done in app. of the type of Solvay columns. (3) Sepn. of the  $\text{NaHCO}_3$  ppt. by filtration *in vacuo* from the soln. of  $\text{Na}_2\text{CrO}_4$  and  $(\text{NH}_4)_2\text{CrO}_4$ . (4) Calcination of the  $\text{NaHCO}_3$  in revolving furnaces. (5) Evapn. of the chromate soln. obtained in stage 2.

BERNARD NELSON

**Mechanization of production of salt from lake brines.** B. PANTELEIMONOV.

*Gorniy Journal* (Moscow) 104, No. 1, 36-40(1928).—A review of salt-making technology, including costs. By the author's method use is made of revolving atomizers which greatly accelerate evapn. of the brine. E. I. S.

The theory and practice of cyanamide formation. HEINRICH PINCASS. *Metallbörse* 19, 117-9(1929).—A review. W. C. EBAUGH

The manufacture of bleaching powder without cooling. EUGEN HADAMOVSKY. *Chem.-Ztg.* 53, 321-2(1929); cf. *Angel, C. A.* 23, 935. E. M. SYMMES

Manufacture of bleaching earths from clays. V. V. ZHADIN, E. P. ULYASHCHENKO AND V. I. ASTAFIEV. *J. Chem. Ind.* (Moscow) 5, 864-5(1928).—When natural clays do not possess a high degree of bleaching power they are usually subjected to mech. treatment or to activation by chem. reagents. These treatments are expensive and do not permit utilization of all the valuable constituents of clays. The authors propose a method which meets these objections. Assuming that aq.  $\text{SiO}_2$  is the decolorizing constituent of clays, the latter are heated with dil. 59-60° Bé.  $\text{H}_2\text{SO}_4$  at 120°, washed with hot  $\text{H}_2\text{O}$  till neutral, the residue is dried, pulverized and sieved. With a clay contg.  $\text{H}_2\text{O} + \text{CO}_2$  9.04,  $\text{Al}_2\text{O}_3$  22.65,  $\text{SiO}_2$  63.80,  $\text{Fe}_2\text{O}_3$  2.02,  $\text{CaO}$  0.58,  $\text{MgO}$  0.06,  $\text{K}_2\text{O}$  1.85 they obtained by this process a bleaching earth contg.  $\text{SiO}_2 \cdot n\text{H}_2\text{O}$  92.185,  $\text{Fe}_2\text{O}_3$  0.074,  $\text{Al}_2\text{O}_3$  5.17,  $\text{CaO}$  0.119,  $\text{MgO}$  trace,  $\text{K}_2\text{O}$  trace. The bleaching power of this earth was as high, and sometimes higher, than that of floridin. The wash waters obtained in the manuf. were concd. by evapn. to 23° Bé., freed in a centrifugal from Fe admixts., and the mass pressed out on the centrifugal was redissolved in hot  $\text{H}_2\text{O}$ ; on cooling, K alum was obtained. The mother liquors were evapd. to 45° Bé. and the white  $\text{Al}_2(\text{SO}_4)_3$  soln. obtained was, on cooling, cut into pieces; the latter contained  $\text{Al}_2\text{O}_3$  14,  $\text{Fe}_2\text{O}_3$  0.289, and a trace of free acid and insol. residue. Altogether 1 ton of clay gave 1 ton bleaching earth, 1 ton  $\text{Al}_2(\text{SO}_4)_3$  and 0.1 ton K alum. Any clay will give  $\text{Al}_2(\text{SO}_4)_3$  and bleaching earth by this process, but only clays contg. over 1% K give K alum. BERNARD NELSON

Manufacture of blanc fixe. I. E. ADADUROV. Kharkov State Inst. Appl. Chem. *J. Chem. Ind.* (Moscow) 5, 1420-4(1928).—To det. the conditions of obtaining the best  $\text{BaSO}_4$  ppt. various concns. of  $\text{BaCl}_2$  solns. were added to various concns. of equiv. amts. of  $\text{H}_2\text{SO}_4$ , after which the pptd. crystals were examined microscopically. The best concns. were found to be 20 g.  $\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$  per 100 g.  $\text{H}_2\text{O}$ , and 20%  $\text{H}_2\text{SO}_4$ . The most favorable temp. is 60-70°. Both solns. must be stirred vigorously. The solns. must be in equiv. quantities. The presence of HCl up to 5% decreases the yield of  $\text{BaSO}_4$  2-2.5%, but further increases of HCl have no further influence on the yield. Filtration of the ppt. must be *in vacuo*. The crystals must be filtered off as soon as formed, for although they may be left under water for 48 hrs. without change, the mother liquors which contain an excess of  $\text{H}_2\text{SO}_4$  tend constantly to increase their size. The ppt. should be dried *in vacuo* at a temp. not exceeding 75-80°. BERNARD NELSON

Development of the potash industry in the southern Harz and Unstrut field. DUNCKER. *Kali* 23, 49-53, 65-70, 81-6, 97-101(1929).—Mining and mfg. details are given. E. M. SYMMES

Extraction of bromine from natural bromine waters. V. P. IL'INSKII AND V. M. FILIPPEO. *J. Chem. Ind.* (Moscow) 5, 833-8(1928).—The manuf. of Br in U. S. S. R. is carried out by steaming Saki (Crimea) lake water in a column with a current of Cl which liberates Br. Theoretically 0.44 tons of Cl are required to liberate 1 ton Br, but in practice almost twice as much Cl is used up on account of side reactions. The latter are due to the alky. of the lake water, as a result of which Cl produces chlorides, hypochlorites and chlorates. As the expense in Cl is very considerable, neutralization of the lake water with  $\text{H}_2\text{SO}_4$  before the Cl treatment is recommended. B. N.

Sulfur industry of Sicily in 1927-28. E. SANTORO. *Minera ital.* 13, No. 1, 4-7(1929).—Statistical data on production, management and exports. E. I. S.

Methods of selenium manufacture. A. GARNAK. *J. Chem. Ind.* (Moscow) 5, 1424-6(1928).—All existing methods of Se prepn. from the slimy deposits of  $\text{H}_2\text{SO}_4$  chambers were investigated and 3 new methods added. The sulfite method gives in the cold poor yields (47%) and has the drawback of requiring prolonged washing of the deposit to neutrality. On warming, the yield is improved to 60-70%, but the Se thus obtained is contaminated by up to 5% S. The bisulfite method gives yields below 20%. The oxidation method by  $\text{HNO}_3$  requires a lengthy operation and a considerable expense of the acid and yields but 64% Se. The oxidation method by  $\text{KClO}_3$  gives good results, but is objectionable on account of occurrence of explosions and also on account of the formation of a considerable amt. of  $\text{H}_2\text{SeO}_4$ , which has to be reduced to  $\text{H}_2\text{SeO}_3$  by boiling with HCl. To obviate the danger of explosion and obtain less  $\text{H}_2\text{SeO}_4$  this method was modified as follows: 600 g. of 40%  $\text{H}_2\text{SO}_4$  are added to 1 kg. of the

slimy deposit containing 3.2% Se, the mixt. is carefully stirred at 80–85° while a soln. of 150 g.  $\text{KClO}_3$  in 1 l.  $\text{H}_2\text{O}$ , previously warmed to 60–70°, is introduced in small portions during 4 hrs. The soln. is then filtered by suction through a wool cloth and the ppt. is washed twice by hot  $\text{H}_2\text{O}$ , 100 cc. being used each time, and dried at 50°. The yield is 26.3–26.4 g. Se, viz., better than 82%. Practically all the  $\text{H}_2\text{SeO}_4$  was reduced by  $\text{HCl}$  formed from the chlorate in the presence of bisulfite. The method of consecutive treatment by  $\text{H}_2\text{SO}_4$  and  $\text{HNO}_3$ , which is due to G., gives the highest Se yields. One kg. of the deposit contg. 3.4–3.6% Se is heated to 90° and with careful stirring 600 g. concd.  $\text{H}_2\text{SO}_4$  added in a thin stream, whereupon the temp. rises to 100°. After addn. of all the  $\text{H}_2\text{SO}_4$ , the heating is discontinued, and when the temp. reaches 70–80° 200 g.  $\text{HNO}_3$  (sp. gr. 1.4) are introduced gradually in small portions and with careful stirring. Each new portion of  $\text{HNO}_3$  is added only after the cessation of N oxides emission. After adding the last portion of  $\text{HNO}_3$ , the temp. is raised to 100° and the stirring is continued for 3 hrs.  $\text{H}_2\text{SeO}_3$  is then extd. with hot  $\text{H}_2\text{O}$  3 times, 1 l. being taken each time, and by decantation, after which the soln. is filtered *in vacuo*, all the solns. are united and after cooling treated with 140 g. com. bisulfite (thiosulfate). The mixt. is heated to boiling, the coagulated Se washed twice with  $\text{H}_2\text{O}$ , 100 cc. being taken each time, and dried at 50°. The yield is 92–3%. The method of oxidation by  $\text{Na}_2\text{Cr}_2\text{O}_7$ , also due to G., consists in heating to 95–100° 1 kg. of deposit containing 3.4% Se, adding with careful stirring first 600 g. concd.  $\text{H}_2\text{SO}_4$  and then a satd. soln. of 260 g.  $\text{Na}_2\text{Cr}_2\text{O}_7$ . The whole reaction requires 4 hrs., after which  $\text{H}_2\text{SeO}_3$  is extd. and treated as in the preceding method. The yield is 27.1 g., viz., 80%. G.'s best method from the points of view of yield and cost is oxidation by  $\text{MnO}_2$ . 600 g. concd.  $\text{H}_2\text{SO}_4$  are added with energetic stirring to 1 kg. deposit contg. 3.5% Se and 140 g.  $\text{MnO}_2$  is introduced gradually into this mixt. at 90–95°. The reaction ends within 2.5–3 hrs., after which  $\text{H}_2\text{SeO}_3$  is extd. with 3 l.  $\text{H}_2\text{O}$ . Ten g. tech.  $\text{HCl}$  and 120 g. thiosulfite are added to the united solns. and Se is coagulated by boiling, washed with 200 cc. hot  $\text{H}_2\text{O}$  and dried at 50°. The yield, 31.5 g., is 90% of the theoretical.

BERNARD NELSON

**Diatomaceous earth.** ELLIOTT S. HASTINGS. *Rock Products* 32, No. 6, 50–4 (1929).—A brief survey of applications in filtration, as an insulator and refractory, and as an admixt. in concrete.

RAYMOND WILSON

**Graphite. III. Utilization of graphite.** PAUL M. TYLER. *Bur. Mines, Circ.* No. 6123, 20 pp. (1929). **IV. Status of the American graphite industry.** PAUL M. TYLER. *Ibid.* No. 6124, 14 pp.

E. H.

**Rationalization of shaft lime-kiln design. I, II.** VICTOR J. AZBE. *Rock Products* 32, No. 8, 56–60; No. 11, 51–6 (1929).—Performance data on several kilns are presented. For the best results kilns should be built higher than customary and operated with induced draft.

RAYMOND WILSON

**The testing of adhesives for timber.** W. D. DOUGLAS AND C. B. PETTIFOR. *J. Roy. Aeronautical Soc.* 33, 92–120, 120–28 (1929).

E. I. S.

**Litharge-glycerol cement.** HANS STÄGER. *Z. angew. Chem.* 42, 370–9 (1929).—In judging the suitability or ease of reaction of a litharge, sedimentation tests of particle size are useless. The ease of reaction of the surface of the particles is more important. The quotient of wt./sedimentation vol. is even better. The oil no. gives the particle surface. Cement formation is dependent upon the  $\text{H}_2\text{O}$  content of the glycerol, which should contain about 15%  $\text{H}_2\text{O}$ . Unlike  $\text{ZnO}$  and  $\text{MgO}$  cements, which develop max. hardness at definite ratios of oxides and salt solns., the hardness of litharge-glycerol cement is rather dependent upon factors other than formation of chem. compds. First  $\text{PbO}$  hydrates, then optically active glyceride, which agglomerates to aggregates. A good cement should have a max. hardness in 20 hrs.

E. M. SYMMES

**Extinguishing fire with carbon dioxide snow.** ALFRED KARSTEN-SALMONY. *Chem. Fabrik* 1929, 194–5.—Portable and stationary extinguishers are described.

J. H. MOORE

**Cork scraps as filling and binding material for artificial materials.** WALTER ORST. *Kunststoffe* 19, 25–7 (1929).—The utilization of waste cork is reviewed, with descriptions of several patented processes.

B. HAMILTON

The limitations of the Harris process (VOGEL) 9. Gasifying coal (Fr. pat. 650,475) 21. Water gas [suitable for  $\text{NH}_3$  synthesis] (Brit. pat. 299,485) 21.

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**Hydrocyanic acid.** REINHOLD FICK (to I. G. Farbenind. A.-G.). U. S. 1,712,297, May 7. A compd. of  $\text{NH}_3$  with formic acid, such as formamide is rapidly heated under reduced pressure to 400-900° in the presence of a dehydrating catalyst such as thoria on pumice in such a manner that the vapors and gases are not heated substantially longer than is necessary for obtaining the desired temp. Cf. *C. A.* 22, 3023.

**Nitric acid.** AMMONIAQUE SYNTHÉTIQUE ET DÉRIVÉS (SOC. ANON.). Fr. 651,093, Mar. 21, 1928. Conc'd.  $\text{HNO}_3$  is obtained by oxidizing  $\text{NH}_3$  under pressure, only part of the water of reaction being allowed to react with the oxides of N, the excess being eliminated immediately after the condensation. The oxides of N are absorbed by bubbling the gas through the dil. acid formed during the reaction, and the dil. acid contg. the oxides is transformed into conc'd. acid by oxidation with O under pressure. The residual gases are heated by the gases coming from the oxidation chamber and they are expanded to recover a part of the energy.

**Phosphoric acid.** WLADIMIR KYBER. Ger. 475,128, Feb. 26, 1925. Addn to 449,585. According to Ger. 449,585, crude phosphates, coal and silicates are heated together in a shaft furnace and the gases evolved are treated with air in the amt. required to oxidize their content of P. This method is now modified by using  $\text{CO}_2$  instead of air, the treatment being effected at 1300° in a recuperator or Cowper stove.

**Liquid carbon dioxide.** WALDEMAR HESSLING. Swiss 129,689, Dec. 15, 1927.  $\text{CO}_2$  is liquefied by expansion after prior cooling by an agent which imparts a lower temp than 0°, such as  $\text{NH}_3$ .

**Solid carbon dioxide.** W. HESSLING. Brit. 298,910, Oct. 15, 1927. See Swiss 129,688 (*C. A.* 23, 2790).

**Sulfur trioxide.** ROBERT TERN. Fr. 650,684, Mar. 9, 1928. An app. is described for oxidizing S,  $\text{H}_2\text{SO}_4$  or  $\text{SO}_2$  and air to  $\text{SO}_3$  by the action of a high-tension current, oxides of N being formed at the same time which act as catalysts.

**Sulfur oxides by combustion of sulfur.** JOHN C. BOERTLEIN (to Grasselli Chemical Co.). U. S. 1,713,416, May 14. S and a combustion-supporting gas such as air are introduced into a closed chamber in which combustion is effected under conditions adapted to produce an increased pressure within the chamber which serves to develop power as in a Diesel engine.

**Nitrogen oxides from ammoniacal liquor.** DAVID L. JACOBSON (to The Koppers Co.). U. S. 1,713,045, May 14. Air is blown through ammoniacal liquor to produce a gas contg. N, O and  $\text{NH}_3$ , any  $\text{H}_2\text{S}$  present is oxidized (suitably by use of  $\text{Al}_2\text{O}_3$  as a catalyst) and the gas is then passed over a suitable catalyst such as one contg. Pt to effect reaction of the N and O with each other. An app. is described.

**Synthetic ammonia.** I. G. FARBENIND. A.-G. Fr. 650,721, Mar. 10, 1928. The mixt. of H and N is freed from harmful constituents such as S, P, As or their compds.

or CO by directing it onto metallic complex compds. heated to temps. below the temp. of the catalyst. In an example a double ferrocyanide of K and Al is used heated to 250° under 200 atm. pressure. Cf. C. A. 23, 1726.

**Synthetic ammonia.** NITROGEN ENGINEERING CORP. Fr. 650,728, Mar. 10, 1928. A mixt. of H and N is circulated in a cycle through a single catalytic converter, part of the  $\text{NH}_3$  formed is removed at one point before, and part at a 2nd point beyond, the pump and inlet for the fresh gases, this portion taking with it impurities from these gases and from the lubricating oil in the pump. Cf. C. A. 23, 2537.

**Dispersing insoluble salts.** AUGUST CHWALA. Fr. 650,177, Feb. 28, 1928. Dispersions in water of alk. earth metal and heavy metal salts of phosphoric and arsenic acids are obtained by using as peptizators the alkali metal salts of phosphoric and arsenic acids which have been obtained from ortho acids by loss of water or which may be considered as having been obtained in this manner. In examples Ca arsenate is ground with water and K Na metahexaphosphate or Na pyrothioarsenate, Ca phosphate with Na pyrophosphate, and Pb arsenate with Na pyrothioarsenate; in each case a colloidal suspension is obtained.

**Alkali hydrates.** LEO P. CURTIN. Fr. 651,128, Mar. 22, 1928. Alkali hydrates are prepd. by adding alkali sulfide to an agitated suspension of PbO in water, the addn. being regulated so as to avoid an accumulation of sulfide ions in the soln. The PbS is reconverted to PbO by treatment with  $\text{Na}_2\text{SO}_4$  followed by oxidation of the metallic Pb obtained.

**Alkali metal iodates.** I. G. FARBERIND. A.-G. Brit. 299,445, Oct. 28, 1927. See Ger. 468,213 (C. A. 23, 2254).

**Alumina.** METALLBANK UND METALLURGISCHE GESELLSCHAFT A.-G. Fr. 650,193, Feb. 29, 1928.  $\text{Al}_2\text{O}_3$  is obtained by heating CaO or  $\text{CaCO}_3$  with  $\text{Al}_2\text{S}_3$  and removing the CaS by washing with dil. acids.

**Aluminum oxide from sulfide.** FREIHERR CONWAY VON GIRSEWALD. U. S. 1,713,411, May 14.  $\text{Al}_2\text{S}_3$  is heated with CaO to a temp. (suitably about 800–900°) at least sufficiently high to cause exothermic reaction and the CaS is subsequently removed from the reaction product by leaching.

**Ammonium salts.** AMMONIAQUE SYNTHÉTIQUE ET DÉRIVÉS (SOC. ANON.). Fr. 651,094, Mar. 21, 1928.  $\text{NH}_4$  salts are prepd. by spraying acid into a chamber contg. gaseous  $\text{NH}_3$ . The vapor formed during the reaction is eliminated by condensation in a rectifying column at the side of the reaction chamber. The amt. of acid entering is controlled by a valve regulated by the pressure existing in the reaction chamber.

**Ammonium phosphate.** COMPAGNIE DES MINES DE VICOIGNE, NOEUX ET DROCOURT. Fr. 650,109, Aug. 9, 1927.  $\text{Ca}_3(\text{PO}_4)_2$  is put in suspension in water contg. an  $\text{NH}_4$  salt, and  $\text{CO}_2$  or  $\text{SO}_2$  and  $\text{NH}_3$  in convenient amts. are introduced at a temp. above 30°. A closed container is used for the process.

**Arsenious oxide.** FRANKLIN G. HILLS (to American Smelting and Refining Co.). U. S. 1,713,127, May 14. Material such as crude ore contg. As in oxidized form is mixed with coal, coke or other suitable reducing material which supports combustion, the material is placed in a shallow layer on a support pervious to air and the combustible material is ignited and air is blown through the mixt. to heat it without substantial disturbance of the mixt., to form and volatilize  $\text{As}_2\text{O}_3$  substantially free from dust.

**Bleaching barium sulfide or similar sulfide solutions by addition of sodium cyanide.**

EDWARD A. TAYLOR (to Grasselli Chemical Co.). U. S. 1,713,409, May 14.

**Hydrated oxides of chromium.** I. G. FARBERIND. A.-G. Fr. 650,572, Mar. 8, 1928. Green hydrated oxides of Cr are prepd. by heating chromic acid or its salts with reducing agents, except  $\text{SO}_2$ , at pressures below 150 atm. and in the presence of water. Examples are given in which  $\text{HCOONa}$ , flowers of S and H are used as reducing agents.

**Lead carbonate.** RENÉ DALOZE. Ger. 475,475, July 3, 1926. See U. S. 1,691,841 (C. A. 23, 488).

**Lead carbonate.** ALEXANDER NATHANSOHN, OTAVI MINEN- UND EISENBAHN GES., ARON HIRSCH, METALL- UND FABRIKWERKE A.-G., ZINKHÜTTE HAMBURG AND COMPAGNIE MÉTALLURGIQUE FRANCO-BELGE. Ger. 475,284, Sept. 24, 1924. Pb is recovered as  $\text{PbCO}_3$  from ores, metallurgical products, scrap, etc., by a process comprising essentially (1) extn. of the initial material which a chloride lye, e. g., with 53%  $\text{CaCl}_2$  soln., (2) pptn. of an oxychloride of Pb from the soln. by addn. of alkalies, and (3) sepn. of the oxychloride and treatment thereof with  $\text{CO}_2$ . Detailed examples are given.

**Potassium salts.** JEAN H. BRÉGEAT. Fr. 650,474, Mar. 5, 1928. KCl and  $\text{SiO}_2$ , e. g., sand, are fused together to form  $\text{K}_2\text{SiO}_3$ , which is dissolved in water and satd.

with  $\text{CO}_2$  to obtain  $\text{K}_2\text{CO}_3$  which may be converted into  $\text{K}_2\text{SO}_4$  and mixed with N and P fertilizers.

**Concentrating brines.** WILLIAM E. BURKE and HARALD DE ROPP (to American Potash & Chemical Corp.). U. S. 1,712,787, May 14. Brines such as Seales Lake, Calif. brine contg. carbonates, sulfates and chlorides of Na and K, and which are substantially satd. with NaCl and contain less  $\text{Na}_2\text{CO}_3$  than the quantity necessary to sat. the brine, are evapd. to a concn. less than that at which formation of glaserite begins, and the temp. is increased as the concn. is continued.

**Sodium and potassium fluorides.** ERICH ECKOLDT. Ger. 475,029, Aug. 7, 1926. A known method for the manuf. of KF consists in fusing  $\text{CaF}_2$  with  $\text{SiO}_2$  and KOH or  $\text{K}_2\text{CO}_3$ , whereby, on extn. with water, a soln. contg. KF and  $\text{K}_2\text{SiO}_3$  is obtained. This method is now improved by treating the soln. with HF,  $\text{H}_2\text{SiF}_6$  or  $\text{K}_2\text{SiF}_6$ , in order to convert the  $\text{K}_2\text{SiO}_3$  into KF and  $\text{SiO}_2$ . The soln. may then be treated with  $\text{Na}_2\text{CO}_3$  to obtain NaF, together with  $\text{K}_2\text{CO}_3$  for use again.

**Nickel and cobalt carbonyls.** I. G. FARBERIND. A.-G. Fr. 650,839, Mar. 14, 1928. See Brit. 296,558 (C. A. 23, 2538).

**Zirconium oxide.** Soc. MINIERE ET INDUSTRIELLE FRANCO-BRÉSILIENNE. Fr. 650,937, Aug. 19, 1927. Zircones ( $\text{SiO}_2 \cdot \text{ZrO}_2$ ) are mixed with  $\text{CaO}$ ,  $\text{CaCO}_3$ ,  $\text{CaSO}_4$  or  $\text{Ca}(\text{OC}_2\text{H}_5)_2$  and heated in an elec. furnace. The product is suspended in water and treated with HCl, the  $\text{ZrO}_2 \cdot \text{CaO}$  remaining unattacked. This is treated with concd  $\text{H}_2\text{SO}_4$  which seps.  $\text{CaSO}_4$ , and  $\text{ZrO}_2$  is recovered from the sulfate in the known manner.

**Trisodium phosphate hydrate.** LEON R. WESTBROOK. U. S. 1,711,707, May 7. A crystd. non-caking decahydrate is prepd. by heating an aq. satd.  $\text{Na}_3\text{PO}_4 \cdot 10\text{H}_2\text{O}$  soln. above its crystn. temp., seeding with decahydrate crystals and removing the decahydrate crystals formed.

**Carbon disulfide.** I. G. FARBERIND. A.-G. Fr. 648,889, Dec. 16, 1927.  $\text{CS}_2$  is obtained by treating hydrocarbons, particularly gaseous hydrocarbons such as  $\text{CH}_4$ , with gases such as  $\text{H}_2\text{S}$  capable of liberating S at a high temp. with or without catalysts. Thus,  $\text{CH}_4$  and  $\text{H}_2\text{S}$  in the proportion of 1:2 are passed through porcelain tube heated to  $1000^\circ$  and contg. fragments of baked clay; the issuing gases are intensely cooled to sep.  $\text{CS}_2$ . Cf. C. A. 23, 2791.

**Salt-graining apparatus.** THORVALD C. COLBIORSEN. U. S. 1,712,651, May 14. Structural features.

**Hydrogen.** FRANK C. BLAKE (to Lazote, Inc.). U. S. 1,713,325, May 14.  $\text{CH}_4$  and steam are caused to react in the presence of a catalyst such as a Ni-ceria-alumina catalyst of a temp. of  $400\text{--}700^\circ$  with a vol. ratio of steam to  $\text{CH}_4$  within the range between 3.5:1 and 44:1 and at substantially a "minimum value" for the temp. used (curves for this being given) and for a predetd.  $\text{CH}_4$  conversion and CO content of the resulting gases. Cf. C. A. 23, 3058.

**Hydrogen from carbon monoxide by use of catalysts.** M. CASALE-SACCHI. Brit. 299,492, July 25, 1927. Reaction of water in liquid state with CO or gases contg. CO is effected (suitably at temps. of  $180\text{--}360^\circ$  and under 20–150 atm. pressure) in the presence of catalysts such as reduced Cu, Ni, Fe,  $\text{Ti}$ , Pt or Pd or metallic oxides or metallic salts of weak inorg. acids or their mixts. The reaction may be effected in a tower contg. water in which is the catalyst (the gas being passed through in small bubbles). Exit gases pass through a heat exchange device to heat incoming gases and thence to a  $\text{CO}_2$  eliminator. The reaction may be regulated to obtain a H-CO mixt. for MeOH synthesis or a H-N mixt. for  $\text{NH}_3$  synthesis. Cf. C. A. 22, 3497.

**Phosphorus and cement.** I. G. FARBERIND. A.-G. Fr. 650,412, Mar. 5, 1928. See Brit. 287,036 (C. A. 23, 489).

**Silica.** I. G. FARBERIND. A.-G. Fr. 651,151, Mar. 23, 1928.  $\text{SiO}_2$  as a sol. gel or solid mass is prepd. from silicates along with compds. of Si which are easily hydrolyzed. In an example, cooled sol. glass of sp. gr. 1.070 is stirred, and cooled  $\text{SiCl}_4$  is run in. A limpid sol is formed which, after a little, becomes a homogeneous gel contg. about 100 g. of  $\text{SiO}_2$  per l. It is washed with distd. water and dried. Cf. C. A. 22, 1446.

**Silica in light bulky form.** P. SPENCE & SONS, LTD., T. J. I. CRAIG and A. KIRKHAM. Brit. 299,483, April 28, 1927.  $\text{SiO}_2$  which when dry weighs about 1 g. per 10 cc. is obtained by pptn. from a soln. of alkali silicate in the presence of alkali monocarbonate or bicarbonate soln. (suitably at a temp. of about  $70\text{--}95^\circ$  and with such a quantity of the carbonate that the soln. after the pptn. contains more than 2 mols. of monocarbonate from every 3 mols. of  $\text{SiO}_2$  originally present); the liquid is cooled and filtered and the  $\text{SiO}_2$  washed with water and, if necessary, further washed with acid and then again with water and dried and sieved.

**Silica sols.** I. G. FARBERIND. A.-G. Fr. 650,634, Mar. 9, 1928.  $\text{SiO}_2$  sols of



high percentage are made by treating, after elimination of sol. constituents, silicic gelatins in the known manner with a small quantity of  $\text{NH}_3$  and submitting them without further addn. of water to a raised temp. while avoiding vaporization of water until soln. is produced.

**Silica gel.** I. G. FARBENIND. A.-G. Fr. 650,800, Mar. 13, 1928. Molded  $\text{SiO}_2$  gel is prepd. by molding and drying a sol contg. at least 60, but preferably 90–160, g. of  $\text{SiO}_2$  per l. A gel having narrow pores is obtained from a slightly acid, neutral or feebly alk. sol which has during the contraction a  $p_H$  value less than 6 and preferably between 2 and 4. Gels having large pores are obtained from a sol having a  $p_H$  value above 7, and preferably between 7.2 and 9. Cf. C. A. 22, 144.

**Gels.** THE SILICA GEL CORP. Fr. 650,695, Mar. 9, 1928. Hard, tough gels of  $\text{SiO}_2$ , tungstic acid,  $\text{Al}_2\text{O}_3$ ,  $\text{TiO}_2$  or mixts. thereof having a d. not above 0.5 after heating to  $871^\circ$  are prepd. by heating the hydrogel slowly to  $79$ – $163^\circ$  under conditions which prevent dehydration, and slowly cooling it. The hydrogel may be washed before or after treatment or the dried gel is washed. The treatment may be carried out by passing heated gas satd. with water vapor over the hydrogel immersed in water, or by circulating heated air repeatedly over the hydrogel on perforated trays in a drying chamber, or by soaking the washed hydrogel in strong  $\text{H}_2\text{SO}_4$  which reacts with the water to raise the temp.

**Catalytic gels.** THE SILICA GEL CORP. Fr. 650,257, Mar. 1, 1928. Porous gels, pptd. by an acid such as  $\text{H}_2\text{SO}_4$ , are impregnated with a catalytic metal or compd. thereof by charging the gel with a gaseous compd. having a reducing action and treating it with a soln. of a compd. of the catalytic metal which may be Pt, Ag, Ni, Cu or Fe and the reducing gas may be  $\text{SO}_2$ , CO or  $\text{H}_2\text{S}$ . Cf. 23, 941.

**Adsorbent for filtering and decolorizing.** HAROLD T. MAITLAND (to Sun Oil Co.). U. S. 1,711,504, May 7.  $\text{NH}_4\text{Al}$  sulfate is added to a sol. silicate with agitation and the materials are subjected to boiling until the reaction is substantially complete,  $\text{NH}_3$  is allowed to escape and  $\text{Na}_2\text{SO}_4$  is washed out and the product is dehydrated at a temp. of  $260$ – $540^\circ$ .

**Active charcoal.** JOSÉ M. M. MARQUÉS. Fr. 650,256, Mar. 1, 1928. Active charcoal is prepd. from peanut or almond shells, olive husks, grape seeds, residues from vinification and extn. of oils, etc., with or without a preliminary treatment followed by impregnation with mineral or org. salts and a carbonization in the absence of air or in an activating atm.

**Activating carbon.** JACQUE C. MORRELL. U. S. 1,712,930, May 14. The carbon is treated with an aq. soln. of a halogen-yielding material such as  $\text{HOCl}$  in the presence of a substance such as a carbonate which has a selective neutralizing action on the hydrogen halide which may be formed in the treatment.

**Activating carbon.** JACQUE C. MORRELL. U. S. 1,713,347, May 14. Particles of C of highly porous structure are subjected to the action of an aq. soln. of a halogen such as Cl.

**Preparation of metal catalysts.** I. G. FARBENIND. A.-G. Fr. 650,592, Mar. 8, 1928. As metal catalysts show max. activity at the temp. at which they have been formed, formation at a low temp. is sometimes important and this is secured by reducing the oxides or reducible salts by H in the presence of a catalyst. Examples are given.

**Refining kaolin, asbestos, chalk and like deposits.** PAUL C. H. ROHLAND. Ger. 475,040, Jan. 8, 1927. A continuous refining process is described in which the materials are stirred in water and the suspension is passed in turn through a mill, a separator for heavy impurities and dewatering means.

**Contact masses.** I. G. FARBENIND. A.-G. Fr. 650,237, Mar. 1, 1928. The mech. resistance of contact masses is increased by adding during their prepn. sol. salts of Mg and heating to drive off acid, or solid fragments of Zn, Al, Fe or like metals of the 2nd, 3rd or 8th group of the periodic system, or alloys or carbides of these metals may be used.

**Plastic masses.** MINERAL A.-G. Swiss 127,974, Mar. 15, 1927. Asphalt-like substance is prepd. from a dispersion of a vulcanized, non-bituminous substance with a bituminous material. Thus, 75 parts linseed oil are vulcanized with S at  $130$ – $150^\circ$ , and mixed with 100 parts molten vulcanized bitumen at  $150^\circ$ . After well-mixing, 200–400 parts sand or colored mineral are stirred in. Other examples are given.

**Plastic substances.** THE CELESCOR CO. Fr. 650,874, Mar. 15, 1928. Objects are molded by heating and pressing a powder contg. a finely divided cellulosic deriv. such as celluloid and a finely divided solid solvent such as acetanilide, methylacetanilide or camphor.

**Urea condensation products.** I. G. FARBENIND. A.-G. Fr. 651,035, Mar. 20,

1928. Solns. or suspensions of dimethylolurea, its derivs., substitution products or polymers are condensed with the aid of buffer mixts. by heating, the H-ion concn. being  $p_H = 4-7$ . Thus, a soln. or aq. suspension of dimethylolurea, to which is added a mixt. of mono- and di-Na phosphates, is caused to pass through a system of tubes heated to  $100^\circ$ , the outflow being regulated so that the soln. takes 5-10 mins. to pass through. The product is dried to a powder in a vacuum drying chamber. A suspension of dimethylolurea in iso-BuOH, contg. mono- and di-Na phosphate, is passed through a system of tubes heated to  $100-110^\circ$ , and the formed soln. is neutralized with  $Na_2CO_3$ . Fr. 651,036 describes the prepn. of condensation products of methylolureas with polyatomic alcs. which contain more than one free OH group. Thus, dimethylolurea in suspension in glycerol is heated with K oxalate to  $100-110^\circ$ . On neutralization a stable, very viscous product is obtained. Dimethylolthiourea or a mixt. of dimethylolurea and dimethylolthiourea may be used. Dimethylolurea is incorporated in a soln. of polyglycolic ether and tartaric acid and heated for a short time to  $100^\circ$ , giving a viscous product miscible in all proportions with water, and serving as a source for artificial horn or casein.

**Condensation products of aldehydes and phenols.** I. G. FARBERNIND. A.-G. Fr. 651,646, Mar. 23, 1928. Aldehydes are condensed with *p*-chlorophenol or *p*-bromophenol or with their derivs. contg. indifferent substituents to form products which are used for *moth-proofing wool and the like*. In example (1) 2,4-dichlorophenol is dissolved in glacial AcOH and  $H_2SO_4$ ,  $CH_2O$  is added and the mixt. heated to  $50-70^\circ$  for some hrs. The product is pptd. by pouring into water; (2) *p*-chlorophenol is condensed with *p*-chlorobenzaldehyde, and (3) with *o*-sulfobenzaldehyde.

**Drying casein.** ANTOINE GUILLAUME. Fr. 651,334, Feb. 21, 1928. A series of endless bands are mounted in a chamber one above the other and in staggered relationship so that the casein travels down in a sinuous path.

**Agar.** JOHN BECKER. U. S. 1,712,785, May 14. After preliminary soaking and washing, each lb. of seaweed is mixed with 1 gal. of water and cooked under a constant temp. and pressure and the liquor is drawn off, filtered with "filter mass" and charcoal, agitated, evapd. to remove excess moisture, congealed to a temp. of about  $22^\circ$ , sized and frozen; the ice is then melted, excess water is drawn off by vacuum and the material is dehydrated (suitably by a warm air current).

**Mucilages.** AMAND BRAUN. Fr. 651,552, Sept. 15, 1927. Substances such as marine algae, carob seed or moss used for making mucilages, *e. g.*, for basic dyes, are first heated to  $80-130^\circ$ , with or without steam.

**Filtering material.** HENRY BLUMENBERG, JR. U. S. 1,713,250, May 14. A filtering material suitable for treating hydrocarbon oils, water or sewage or for other uses as a purifying, decolorizing and oxidizing agent comprises Al sulfate,  $Ca(OC_2)_2$  and an inert cellular material such as diatomaceous earth. U. S. 1,713,251 specifies a similar mixt. contg. a sol. sulfate of an alkali-forming metal such as  $Na_2SO_4$  instead of Al sulfate.

**Heat-conveying medium.** GES. FÜR KÄLTECHEMIE G. M. B. H. Ger. 475,080, Nov. 18, 1927. A purified aq. soln. of  $CaCl_2$  and  $AlCl_3$  is used as a heat-conveying medium, particularly in central heating installations.

**Composition for dampening sound and vibration in building construction.** M. HAHN and K. B. EISENBERG. Brit. 299,543, Aug. 9, 1927. Mixts. are formed of materials such as mineral oil or other suitable non-drying oil 25, clay or loam 65 and a dust-like filler, *e. g.*, alumina 10%.

**Cleaning polishing-wheels formed of abrasive material bonded by glue.** JOHN J. CUNNINGHAM (51% to Melrose G. Kopf). U. S. 1,712,751, May 14. In order to clean polishing-wheels of this character, the glue binder is softened (suitably by use of steam) at the periphery of the wheel and the latter is rotated to throw off material from the surface by centrifugal force.

**Tempering shoe parts impregnated with stiffening substance.** EDWARD H. WESTPHAL (to United Shoe Machinery Corp.). U. S. 1,712,600, May 14. Shoe parts, such as toe stiffeners formed of fabric impregnated with a stiffening substance such as celluloid, are treated with a volatile liquid, *e. g.*, an alc.-acetone mixt. in which the stiffening substance is sol. and are placed in layers between felt or other material also treated with the liquid.

**Shoe-stiffening material containing a cellulose ester.** STANLEY P. LOVELL (to Celastic Corp.). U. S. 1,711,956, May 7. In softening a stiffening material such as a sheet of textile fabric contg. a cellulose ester compn. such as celluloid, the material is treated with a mixt. of liquids contg. 2 solvents, one of which is diacetone alc. and the other a substance such as EtOH having a b. p. below that of water, and the mixt. is

allowed to evap. so that the material treated will assume a strong, impervious, elastic form, regardless of moisture in the air.

**Liquid for use in hydraulic brake systems, etc.** A. T. K. TSENG (to Hydraulic Brake Co.). Brit. 299,370, Oct. 24, 1927. An oil such as castor oil is mixed with a higher alc. such as diacetone alc. KOH or Bu alc. KOH may be added. Cf. C. A. 23, 1230.

**Impregnated fabric suitable for brake and clutch facings.** JOHN A. HEANY. U. S. 1,712,002, May 7. Pulpy or fibrous stock such as asbestos, preliminary to the mfg. process for forming yarn or fabric, is mixed with a powdered impregnating material such as gilsonite which is afterward subjected to the action of benzine or other suitable solvent to diffuse the material throughout the fabric.

**Laminated material for gears, etc.** L. J. OLLESHEIMER (to Sprucolite Corp.). Brit. 299, 441, Oct. 28, 1927. In forming a material for pulleys, gears, etc., thin layers of wood with the grain crossing, after drying to a moisture content of not over about 2%, are coated with a binder such as casein glue, pressed lightly until an initial set occurs, and then the pressure is increased. Glue is used contg. insufficient moisture to bring the moisture in the final product up to that of normally kiln-dried wood. The drying may also be effected after the compressed block is made. Brit. 299,442 specifies use of a high initial pressure which is afterward lessened to permit some expansion or "spring back" of the compressed material during final setting.

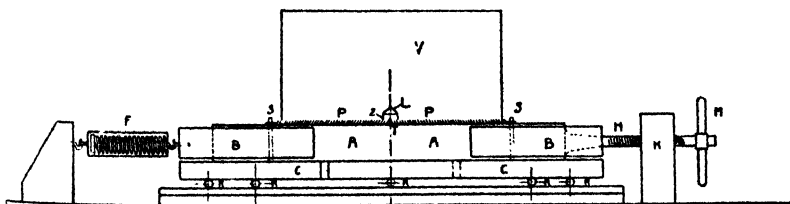
**Filling teeth with gutta percha.** IRVING KULIK. U. S. 1,711,952, May 7. Dry gutta percha is introduced into the cavity to be filled and the gutta percha is then subjected to the action of a solvent such as  $\text{CHCl}_3$  to cause its swelling or expansion. Ammoniacal silver nitrate and  $\text{CH}_2\text{O}$  soln. may be conjointly used.

**Fire extinguishers.** LUCIEN E. P. FOUCAUD. Fr. 650,133, Aug. 12, 1927. Anhydrous  $\text{CuSO}_4$  is added to dry powders used for fire extinguishing as an indicator by its color as to whether the power is dry or has become damp.

## 19—GLASS, CLAY PRODUCTS, REFRACTORIES AND ENAMELED METALS

G. E. BARTON, C. H. KERR

An apparatus designed by A. G. Gagarin for the determination of the plasticity of clay. N. K. LAKHTIN. *Trans. State Exptl. Inst. Silicates* (Moscow) 1927, No. 21, 25-7. The clay sample *AA* is placed between the clamps *BB*, which in construction are similar to those of the Michaelis app. Because of the weakness and flexibility of the clay, the sample *AA* is underlaid by a platform *CC*, which can be moved apart. In order that the clay will not stick to the platform, parchment paper or powder is put on it. The platform rests on a carriage with five rollers *R*, over which both parts of the platform may easily move when the clay sample becomes elongated. To one of the clamps a dynamometer *F* is attached. To the other clamp a screw *H* is attached. To det. the stretching of the sample a special contrivance is made. With the aid of a light



ray it gives automatically the deformation (stretching or elongation) of the clay sample and the increase in the tension, which stretches it. This contrivance consists of 2 spiral weak springs *P*; one is a left- and the other is a right-hand spiral. Both springs have one end attached to the joint-pins *S*, which are placed in the "heads" of the clay sample; the other ends of the springs are fastened together. At the place of their junction *T* a light mirror *Z* (0.5 mm. square) is fastened, which reflects the light ray falling on it from the light of the lamp *L* (prepd. specially for projection purposes). To receive the light ray there is a curved surface *V* on the carriage. On this surface a paper sensitive to light is placed. By increasing the tension of the dynamometer spring without changing the length of the clay sample, the light ray will give a straight line at

the lower edge of the sensitive paper. If the sample becomes deformed with an increase in the strain on the spring of the dynamometer, both spiral springs are stretched equally; because of that the mirror will not move over the axis of the sample, but it will turn because of the stretching of the springs, which causes the springs to unwind equally. Under such conditions the light ray will give a straight line along the left-hand edge of the sensitive paper. By a simultaneous increase of the tension on the dynamometer (increase of the pulling strains in the clay sample) and of the deformation of the sample, the light ray will give a curve indicating the information desired.

J. S. JOFFE

The relation of the composition of glass to its optical constants. III. T. TAKAMATSU. Osaka Ind. Research Inst. *Repts. Imp. Ind. Research Inst., Osaka, Japan* 9, No. 12(1929).—Optical consts. of Na-K glass having the compn. of  $x/2\text{Na}_2\text{O} \cdot x/2\text{K}_2\text{O} \cdot y\text{CaO} \cdot 6\text{SiO}_2$  have been detd. When  $\text{SiO}_2$  and CaO are kept const., the value of  $n_D$  increases regularly with the increase of the sum of the mol. concn. of  $\text{Na}_2\text{O}$  and  $\text{K}_2\text{O}$ , the av. increase being 0.0010 per 0.1 mol. If the sum of the mol. concn. of  $\text{Na}_2\text{O}$  and  $\text{K}_2\text{O}$  is below 2.4 mol. against 6 mol.  $\text{SiO}_2$ , the change of  $n_D$  is in a straight line. The increase of the total dispersion is proportional to the increase of the sum of mol. concn. of  $\text{Na}_2\text{O}$  and  $\text{K}_2\text{O}$ , the av. increase being 0.000059 per 0.1 mol. The change of  $\gamma((n_D - 1)/(n_F - n_C))$  is inversely proportional to the sum of the mol. concn. of  $\text{Na}_2\text{O}$  and  $\text{K}_2\text{O}$ , the av. decrease being 0.30 per 0.1 mol. increase. When  $\text{SiO}_2$ ,  $\text{Na}_2\text{O}$  and  $\text{K}_2\text{O}$  are kept const., the change of  $n_D$  is regular; if the sum of  $\text{Na}_2\text{O}$ ,  $\text{K}_2\text{O}$  and CaO is below 2.4 mol. against 6 mol.  $\text{SiO}_2$ , the change of  $n_D$  is in a straight line, the av. increase being 0.0027 per 0.1 mol. CaO. The av. increase of the total dispersion is 0.000066 per 0.1 mol. increase in CaO. The change of  $\gamma$  is inversely proportional to the increase of CaO, the av. decrease being 0.16 per 0.1 mol. increase in CaO.

F. I. NAKAMURA

Corrosion of crucible in glass manufacturing. MASAJIRO WATATANI. *Repts. Imp. Ind. Research Inst., Osaka, Japan* 9, No. 6, 1-31(1928).—Twenty-one kinds of crucibles were made by combination of domestic and foreign clay and minerals; the degree of corrosion caused by the action of  $\text{Na}_2\text{O}$ -PbO or  $\text{K}_2\text{O}$ -PbO glass was detd. by the macroscopical examn. of the crucible and also by the analyses of the glass, after a definite time interval of heating with molten glass. The corroding action of  $\text{Na}_2\text{O}$ -PbO glass was greater than that of  $\text{K}_2\text{O}$ -PbO glass. The higher the temp. of heating of the crucibles previous to the pouring of the molten glass, the greater was the corrosion. Addn. of feldspar to the ingredients in the prepn. of the crucibles increased the resisting power of crucibles to corrosion. The samples made from German clay had a greater resistance to corrosion than those made from domestic clay.

NAO UYEH

Temperature measurement in the glass-melting furnace. ANON. *Spechsaal* 62, 273-4(1929).—A radiation pyrometer is described, which compensates for the temp. of the instrument by utilizing two symmetrically placed and similar thermal junctions, one of which is exposed to the light radiating from an opening in the furnace. These junctions are connected so that the thermal effect due to the temp. of the instrument is zero.

C. H. LORIG

Natural rocks in the making of bottle glass. I. I. KITAIGORODSKII AND S. V. RODIN. *Trans. State Exptl. Inst. of Silicates (Moscow)* 25, 62 pp.(1928).—Because of the scarcity of soda, nepheline and trachyte rocks were considered as substitutes in glass batches. Besides trachyte the batch consisted of sand and either chalk, dolomite or barite. Devitrification occurred in factory melts when the glass was held at the working temp. A batch of trachyte 85%, sand 5% and the remainder chalk, did not devitrify; it passed specifications for green bottle glass. In some expts 1-2% sulfate was added. The melting time and temp. of these glasses are greater than the customary glass; the working range is shorter.

A. E. BADGER

The behavior of glass towards some aqueous alkali solutions of normal concentration at high temperatures. FRITZ FRIEDRICH. *Spechsaal* 61, 713-5, 730-1, 751-4(1928).—The loss of wt. and the alkali requirement were detd. for 5 types of glasses and  $N$  alkali solns. in the temp. range of 100° to 300°. The glasses were exposed to the liquid phases of the solns. All data are summarized in tables and curves. Under the influence of alkali hydroxides and  $\text{H}_2\text{O}$ ,  $\text{Al}_2\text{O}_3$ -rich glass devitrifies.  $\text{Al}_2\text{O}_3$  in glass promotes its resistance toward alkali hydroxides. Alkali carbonates attack  $\text{Al}_2\text{O}_3$ -rich glass more rapidly than the hydroxide. Glasses of high  $\text{B(OH)}_3$  content dissolve in  $\text{H}_2\text{O}$  to the extent of 48%.

C. H. LORIG

The application of nepheline syenites of the Murman coast in the glass industry. V. V. VARGIN. *Trans. Ceramic Research Inst. (Moscow)* 15, 61 pp.(1929).—The utilization in the glass industry of large beds of nepheline syenite (15-16% alkali), which are found on the coast of Lapland, is suggested as a substitute for soda in glass batches.

Lab. melts of 3 kg. each were tested as regards easy melting and working qualities, tendency to devitrify and ability to withstand tests accorded to bottle glass. Conclusion: Nepheline may be used in glass batches up to an amt. which gives less than 15%  $\text{Al}_2\text{O}_3$  in the glass. The  $\text{SiO}_2$  should be not less than 58% and  $\text{SiO}_2 + \text{Al}_2\text{O}_3$  not less than 70%. The remaining batch constituents besides nepheline are sand and lime. The addn. of 0.3–0.5% sulfate is advisable in order to shorten the plaining period.

A. E. BADGER

**The devitrification of glass.** P. VILLARD. *Compt. rend.* 188, 969–72(1929).—A study was made of the roughening of glass surfaces such as occurs in ordinary lab. glass blowing. The frosted surface sometimes observed on drawing out a piece of glass is due to the Reaumur effect, *i. e.*, the sepn. of the glass into 2 phases. Most of the other devitrification is caused by the corrosive action of the blow torch flame. Expts. are described in which a glass tube was heated in an elec. furnace and the gases present in the flames were passed through the tube. None of them alone caused devitrification, but with  $\text{H}_2$  contg. 1% of  $\text{O}_2$  and with  $\text{H}_2$  activated by an elec. spark, the glass was attacked with the liberation of Na, showing the devitrification to be due to the action of at. H. Glass roughened by flame action can be repolished by holding in the outer region of the flame. Bohemian (K) glass can be worked with a blow torch if a little  $\text{O}_2$  is added to the air.

A. C. HIGGINS

**Various methods of silvering parabolic glass.** LEO LIPKIN. *Sprechsaal* 61, 754 (1928).

C. H. LORIG

**Annealing of glass from the point of view of factory operation.** E. A. COAD-PRYOR. *J. Soc. Glass Tech.* 12, 204–13(1928).—A general discussion of efficiency methods which tend to simplify, cheapen and make fool proof the annealing practice.

H. F. K.

**Expansion and tensile tests on glass house refractories.** J. F. HYSLOP, R. F. PROCTOR AND H. C. BIGGS. *J. Soc. Glass Tech.* 12, 190–204(1928).—Results of the expansion tests above 1000° grouped the  $\text{SiO}_2$ - $\text{Al}_2\text{O}_3$  refractories into 3 classes (a) those of rapid and large contraction, due to lightly or moderately burned material; (b) those of decreased rates of expansion, due to hard burnt material; (c) those of uniform rates of expansion. The tensile test is considered more useful than most other phys. tests because it reveals more clearly the effects of high flux iron oxide content, of high porosity, of low percentage of  $\text{Al}_2\text{O}_3$ , of the gradation of grog and shows the quality of cohesion between crystals and matrix.

H. F. KRIEGE

**The clay studies of the Orsam Laboratories.** EBERHARD ZSCHIMMER. *Sprechsaal* 62, 165–8, 257–60(1929).—The relative viscosity of moistened clay was selected as a criterion of its plasticity and used to det. the amt. of tempering  $\text{H}_2\text{O}$  required. At 1150° soda attacks acid clays much more rapidly than basic clays. Clays are strongly corroded in Glauber salts at temps. above its dissociation temp.; the acid clays are more resistant.

C. H. LORIG

**Lime as used in sand-lime brick.** D. M. GRAY. *Cement Mill and Quarry* 34, No. 4, 18–9(1929).—The two principal processes used in manuf. of hydrated lime are discussed, namely, Clyde and Kritzer systems.

E. I. S.

**Haircracks and exfoliation in faience.** A. J. EDWARDS. *Sprechsaal* 62, 241–3 (1929). Uncombined  $\text{SiO}_2$  in the body tends to increase its coeff. of expansion.  $\text{SiO}_2$  and  $\text{B}_2\text{O}_3$  when dissolved in the glaze lowers its coeff. of expansion, but if used in excess, tends to devitrify the glaze and make it cloudy.

C. H. LORIG

**Advances in ceramics.** JERZY KONARZEWSKI. *Przemysl Chem.* 13, 168–77 (1929). A review of methods of testing, with an abundant bibliography.

A. C. Z.

**Scientific methods in the ceramics industry—application of these methods in the industry of tile and stoneware.** F. CHALAMEL. *Science & ind.* 13, 183–8(1929).

F. V. JOHNSON, JR.

**Heat transfer through ceramic materials.** MAX JAKOB. *Ceram. Age* 11, 121–30 (1928).—The theory of heat transfer is discussed in detail with mathematical derivation of formulas. Methods of detg. heat cond. of ceramic materials and measurement of variable heat flow are given. Various influences which affect the heat cond.,  $K$ , are compn., sp. gr., porosity, moisture, temp. and structure of the material. 10%  $\text{MgO}$  causes 100% increase of  $K$ . 5%  $\text{MgO}$  has no effect. 10%  $\text{CaO}$  causes 50% decrease of  $K$ . A 25% increase in  $\text{Al}_2\text{O}_3$  reduces  $K$  to one third its original value. Further increases up to 50% have no effect. For every 10% increase in  $\text{SiO}_2$ ,  $K$  decreases only 4%. The  $K$  of  $\text{SiO}_2$  brick is more than 50% greater than the  $K$  of fireclay brick of equal d. In general,  $K$  increases as the sp. gr. increases. Abs.  $K$  is low for amorphous materials and high for cryst. materials. For amorphous materials  $K$  increases with temp. For cryst. materials  $K$  decreases with temp. A large number of ceramic materials and refractories are tabulated with their sp. gr. and heat cond.

W. H. RISING

**White stoneware and other white ceramic masses. I, II. FELIX SINGER.** *Chem.-Ztg.* 53, 105-6, 126-9(1929).—Stoneware and porcelains are compared as to compn., methods of manuf., microstructure and general properties and uses.

H. F. KRIEGE

**Preparation of refractory materials. W. OBSR. *Feuerfest* 5, No. 1, 4-5(1929).—A survey of recent patent literature on the prepn. of refractories.**

E. I. S.

**Refractories for the pottery industry. W. EMBRY. *Trans. Ceram. Soc. (Eng.)* 25, 111-26(1926).—A general survey is made of the requirements of refractories used in the construction of intermittent, continuous and frit kilns, and in the manuf. of supports for ware in the kiln.**

B. C. A.

**Steel-making refractories. I, II. E. R. WALKER. *Chem. Eng. Mining Rev.* 21, 93-8, 133-47(1929).—Methods of testing are given for refractoriness, apparent porosity, contraction or expansion, crushing strength, refractoriness under load, spalling and slagging. Graphs are shown giving refractoriness, heat cond. and thermal expansion of fireclay and silica bricks under load. The total impurities in clays should not exceed 4%. The analyses, porosity and apparent sp. gr. of two Australian-made sleeve bricks are:  $\text{SiO}_2$  72.026 and 75.04;  $\text{Al}_2\text{O}_3$  24.64 and 20.74;  $\text{Fe}_2\text{O}_3$  1.59 and 2.76%;  $\text{CaO}$  trace and nil;  $\text{MgO}$  0.41 and 0.41%; ignition loss 0.48 and 0.10; porosity 21.40 and 27.65; apparent sp. gr. 2.02 and 1.91. The analysis and porosity of stoppers most generally used are  $\text{SiO}_2$  47.13 and 47.01;  $\text{Fe}_2\text{O}_3$  3.45 and 5.40;  $\text{Al}_2\text{O}_3$  20.13 and 27.01;  $\text{CaO}$  0.14 and 0.17;  $\text{MgO}$  0.09 - 0.20; C. 29.10 and 19.77; porosity 30.25 and 33.15. Silica and neutral refractories are discussed.**

O. A. NELSON

**Refractory linings for small combustion chambers. C. P. F. WAIDLER. *Fuel Oil* 7, No. 8, pp. 25-26, 118(1929).—Method of building forms and applying monolithic linings to small oil furnaces is described.**

E. I. S.

**Diatomaceous earth (as a refractory) (HASTINGS) 18. Malleable foundry refractories (ANON) 9. Refractories in open-hearth practice (PHILIPP) 9. New apparatus for measuring thermal expansion of refractory materials at 1600° (ENDELL) 1. Determination of the specific gravity of refractory materials (KUEHN) 1. Action of  $\text{SiO}_2$ ,  $\text{Al}_2\text{O}_3$  and kaolin on  $\text{BaSO}_4$  (MARCHAL) 6. Manufacture of  $\text{AlCl}_3$  from clays (ADADUROV) 18.**

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**Glass manufacture. FRITZ ECKERT. Fr. 650,399, Mar. 3, 1928. A homogeneous glass is obtained by passing the glass coming from the fusion chambers at a high temp. through a homogenizing chamber in which it is submitted to mech. agitation.**

**Apparatus for feeding successive mold charges of molten glass.** SAMUEL G. STUCKEY. U. S. 1,711,818, May 7.

**Apparatus for delivering mold charges of molten glass from furnaces.** HOMER BROOKE. U. S. 1,712,327, May 7.

**Apparatus for manufacture of pressed glass articles in molds.** MAX JAEGER (to Anchor Cap & Closure Corp.). U. S. 1,712,499, May 14. Structural features.

**Electric induction furnace suitable for glass manufacture.** H. GEORGE. Brit. 299,393, Oct. 25, 1927. A metal bath is used with which the glass is in contact. Various structural features are specified.

**Rotary vertical leer for annealing glassware.** ROBERT GOOD (to Hazel-Atlas Glass Co.). U. S. 1,712,205, May 7. Structural features.

**Glass press.** GLASFABRIK A.-G. (Alfred Wahl, inventor). Ger. 475,141, July 5, 1925.

**Treating glass objects.** DEUTSCHE SPIEGELGLAS A.-G. Ger. 475,001, April 27, 1927. Glass objects are given a light-diffusing surface without substantial loss of transparency by first roughening the surface in a known manner and then applying heat until the roughened surface has at least begun to soften.

**Composite glass.** SOC. ANON DES MANUF. DES GLACES ET PRODUITS CHIM. DE SAINT-GOBAIN, CHAUNY ET CREY. Fr. 650,155, Aug. 18, 1927. In composite glass wherein 2 sheets are cemented to an intermediate sheet of org. materia of approx. the same index of refraction, the faces of the sheets contacting the org. material are roughened by grinding.

**Reinforced glass.** JACQUES DUCLAUX. Fr. 651,157, Aug. 23, 1927. In making compd. transparent sheets by coating 2 glass sheets successively with gelatin and nitrocellulose, and uniting by pressure, the coating of gelatin is dried by dipping in a bath of EtOH, MeOH, PrOH, BuOH, or acetone or sol. ketone, or of a mineral or org. dehydrating agent. Adhesion may be increased by emulsifying a soln. of nitrocellulose, cellulose ester or ether, or gums, waxes, oils, etc., with the gelatin, or by adding to the gelatin an aq. soln. of a substance capable of dissolving celluloid. Cf. C. A. 23, 2798.

**Glass for electric insulation.** PATENT-TREUHAND-GES. FÜR ELEKTRISCHE GLÜHLAMPEN M. B. H. (Max Thomas, inventor). Ger. 475,135, Aug. 2, 1925. A glass of good insulating properties comprises  $\text{SiO}_2$ , an alkali metal oxide, at least 5% of  $\text{Fe}_2\text{O}_3$ , and at least one other oxide of a bi- or trivalent metal. A suitable compn. is  $\text{SiO}_2$  67,  $\text{K}_2\text{O}$  3,  $\text{CaO}$  10,  $\text{BaO}$  10, and  $\text{Fe}_2\text{O}_3$  10%.

**Coating electric lamp bulbs or other glass articles.** M. PIPKIN (to British Thomson-Houston Co., Ltd.). Brit. 299,477, Oct. 28, 1927. Articles which become heated in use are coated with a mixt. comprising castor oil, a resinous substance (suitably shellac), a pigment and a solvent such as alc. By drying at  $160^\circ$  the coating is suitably matured, presumably by reaction between its ingredients.

**Translucent incandescent lamp bulbs or other hollow glass articles.** MARCELLO PIRANI (to Patent-Treuhand-Ges. für elektrische Glühlampen). U. S. 1,713,394, May 14. Finely pulverized glass is sintered and the end of a glass tube is melted onto a "gob" of the sintered glass; the bulb or like article to be formed is blown through the tube while quickly heating the "gob" to blowing temp. to maintain uniform distribution of the small air or gas pockets within the mass.

**Manufacture of hollow glass bodies.** PATENT-TREUHAND-GES. FÜR ELEKTRISCHE GLÜHLAMPEN M. B. H. Ger. 475,140, July 17, 1927. Mech. and manipulative details.

**Manufacture of double-walled hollow glass bodies.** GLASFABRIK SOPHIENHÜTTE RICHARD BOEK G. M. B. H. Ger. 475,385, July 14, 1925. Manipulative features.

**Waterproofing bricks, etc.** EDMOND LOMBARD. Fr. 650,301, Mar. 2, 1928. A soln. of a K or Na soap is used for waterproofing bricks, etc.

**Cover for the fire space of ceramic and like kilns.** ALEXIS C. RAGOUCY. Ger. 475,495, June 9, 1926.

**Continuous tunnel kiln suitable for burning ceramic ware.** HALVER R. STRAIGHT (to Ethel H. Straight). U. S. 1,711,910, May 7. Structural features.

**Refractory material.** JAMES M. LAMBIE and DONALD W. ROSS. U. S. 1,712,005, May 7. A batch mixt. for forming refractory articles such as crucibles, "plastic fire brick," or glass-melting pots contains sufficient finely divided cyanide to counteract the shrinkage, during firing, of the other ingredients (which may include clay and corundum).

**Refractory substances.** ALBERT WAGEMANN. Fr. 650,536, Mar. 7, 1928. See Brit 286,677 (C. A. 23, 495).

**Manufacture of hollow bodies, open at one side, from quartz and like refractories.** G. FARBERIND. A.-G. (Fritz Doerfinkel and Martin Schliemann, inventors). Ger.

475,142, Sept. 17, 1926. The refractory is fused in the mold around a core constituting an elec. heating resistance.

**Refractory and insulating material.** LA STÉATITE FRANÇAISE. Fr. 650,847, Mar. 14, 1928. Kaolin 1, natural steatite 3 and flux 1 part, with a little clay, are ground in the presence of water, dried, molded and backed at about 1500°.

**Porcelain-like insulating composition.** J. L. A. HILBRENNER. Brit. 299,408, July 26, 1927. A compn. for making insulating parts of spark plugs, heating and lighting devices, etc., is formed with fat clay, kaolin and oxides of Zr and Al; a flux may be added such as ZnO or a frit composed of MgO, ZnO and Al<sub>2</sub>O<sub>3</sub>, may be ground together in a wet state and heated quickly to sintering temp.

**Electric resistance heated furnace suitable for use in enameling, etc.** ALLGEMEINE ELEKTRICITÄTS-GRS. (to International General Electric Co.). Brit. 299,398, Oct. 25, 1927. Structural features.

## 20—CEMENT AND OTHER BUILDING MATERIALS

J. C. WITT

A few thoughts regarding the cement service laboratory. EDGAR S. ERNST. *Rock Products* 32, No. 8, 72-4(1929).—The role of the service lab. in bringing about more intelligent use of cement is pointed out.

**Microscopic analysis of cements.** A. LOPEZ FRANCO. *Rev. obras publicas (Madrid)* 73, 76-8(1929).—Notes on lab. work undertaken at School of Roads. E. I. S.

**The setting of cement. III.** HERMANN GESSNER. *Kolloid-Z.* 47, 160-75(1929), cf. C. A. 23, 1732.—A study has been made of the loss in wt. for H<sub>2</sub>O in cement during hardening. Expts. were carried out over many concns. of H<sub>2</sub>SO<sub>4</sub> starting with a fixed initial ratio of H<sub>2</sub>O to cement. Data were obtained on change of wt. with time extending over periods as much as 200 days. One set of expts. was made with ordinary portland cement and another in which no gypsum was present. The results in the two cases are practically alike. A hydrate especially noticeable with freshly set cement is shown in both cases at about 10.4 mm. Hg which slowly disappears with age. The practical application of vapor-pressure isotherms is discussed. Just how important gypsum content is compared to other factors such as grain size cannot be detd. by these expts. only. Hydration is evaluated from vol. change with aging. Greatest contraction occurred after 2 days' setting. These results accord with those from isotherm detn.

RAYMOND H. LAMBERT

**Temperature rise observed on solidification of mixtures of portland cement and calcium chloride.** SHICHIRO UCHIDA. Sendai Higher Tech. School. *Mem. Sendai Higher Tech. School* 6, 381-7(1928); cf. C. A. 22, 673.—U. measured the time required for the solidification and the accompanying temp. rise of portland cement mixed with 1, 2, 2.5, 3, 5, 7, 10 and 20% CaCl<sub>2</sub>; similar measurements were made with 3:1, 2:1, 1:1 and 1:3 mortar prepd. by mixing 3% by wt. of CaCl<sub>2</sub> with cement. The increase of the CaCl<sub>2</sub> content lessens the time of solidification, the heat evolution increasing irregularly. With mortar, the temp. rise is the greater the greater the cement content.

K. SOMEYA

**Effect of adding various percentages of diatomaceous earth to portland cement mixtures.** ALTON J. BLANK. *Rock Products* 32, No. 6, 81-2(1929).—Increased strengths of 1-3-6 and 1-2½-5½ concrete resulted from the replacement of up to 15% of the cement by diatomaceous earth with cements rather high in free CaO (exact amts. of free CaO not given). Similar tests on a cement low in free CaO showed a reduction in strength with replacement by diatomaceous earth of part of the cement.

RAYMOND WILSON

**Effect of aging on the grinding resistance and cementing value of portland cement clinker.** L. N. BRYANT. *Rock Products* 32, No. 8, 64-5(1929).—The grinding resistance of a given clinker varies in direct proportion to its loss on ignition. A fresh high-lime clinker has a lower grinding resistance than a fresh low-lime clinker. Grinding resistance of the high-lime clinker increases with aging more rapidly than that of a low-lime clinker. The cementing properties of a low-lime clinker are less affected by aging than those of a high-lime clinker. These conclusions are based on tests of several clinkers, reduced when fresh to a size between 8- and 10-mesh and stored outdoors for periods up to 10 months. Grinding resistance was measured by the 200-mesh fineness produced under fixed conditions in a lab. tube mill.

A simple titration method for determining the absorption of fine aggregate. J.



C. PEARSON. Lehigh Portland Cement Co. *Rock Products* 32, No. 10, 64-5(1929).—Water is added from a buret to a 200 g. sample of dry aggregate in a 500 cc. Erlenmeyer flask. The flask is rolled and shaken to insure complete distribution of the water. The point at which the sand persists in adhering to the glass is the end point. Accuracy of the order of 0.05% is attained with clean sands. RAYMOND WILSON

Basic principles of concrete making. F. R. McMILLAN. Portland Cement Assoc., Chicago. I. Cement paste the basis of concrete quality. *Eng. News-Record* 102, 580-3(1929). II. Strength and watertightness—supporting data. *Ibid* 625-32. III. Combining aggregates with paste to make workable concrete. *Ibid* 673-9. IV. Application to specific conditions. *Ibid* 705-9. V. Importance of proper construction methods. *Ibid* 748-52.—An exceptionally complete presentation of the fundamental principles of concrete-making, theory and practice, and of the various factors affecting the quality of the product, with an abundance of supporting exptl. data, for details of which the original must be consulted. The application of these principles to the production of concrete to meet specific requirements of strength, durability, watertightness, etc., is discussed at length. R. E. THOMPSON

Tests of truck-mixer concrete. A. R. HIRST. *Eng. News-Record* 102, 798 (1929).—Three test runs of a truck mixer (Bickel patents) were carried out. Conclusions: (1) The speed of revolution, within the possible limits of the device, does not greatly influence the compressive strength of the concrete. (2) Very dry concrete can be very thoroughly mixed and completely discharged. (3) In general, compressive strength increases with the no. of revolutions. (4) The slump of the concrete decreases with the no. of revolutions. (5) There is no reduction in compressive strength due to long retention in the cylinders up to at least the time of initial set. R. E. T.

Will a fifth ingredient assure durability [of concrete]? ALFRED H. WHITE. *Concrete* 34, No. 3, 15-6(1929).—A brief discussion of "inert" admixtures, water-repellent materials and soluble addns. RAYMOND WILSON

The stability of chert. HERBERT F. KRIEGE. *Rock Products* 32, No. 9, 50-3 (1929).—There is apparently no microscopic property of cherts which serves to identify those of poor resistance to weather when used as concrete aggregates. The factors which seem to contribute to instability of certain cherts are microscopic irregularities of texture and the presence of firmly imbedded foreign crystals with different phys. properties. RAYMOND WILSON

Determining the causes of failure in brick work construction. R.D. DONATH AND H. LEOPOLD. *Chem.-Zig.* 53, 277-9(1929).—The investigation by chem. means of the causes of failure of brickwork construction showed (1) high Cl and NO<sub>3</sub> content of water used in making mortar, thereby causing the reaction  $\text{CaO} + 2\text{NaCl} + \text{CO}_2 = \text{Na}_2\text{CO}_3 + \text{CaCl}_2$  to occur; (2) too high a ratio of Al<sub>2</sub>O<sub>3</sub> and Fe<sub>2</sub>O<sub>3</sub> to SiO<sub>2</sub> in the sand employed, indicating contamination by silicates; and (3) the presence of sintered material enclosing free CaO in the lime used, which caused failure (unsoundness) in time. Especially must care be taken in using water coming from thickly populated districts to avoid sewage with its high Cl and NO<sub>3</sub> content. In the analysis 20 g. of mortar warmed with HCl (1:5) until CO<sub>2</sub> evolution stopped was examd. by ordinary procedure, and the results were interpreted as above. W. C. EBAUGH

Preservation of stone by means of linseed oil. KARL WÜRTH. *Kunststoffe* 19, 27-8(1929).—Pure linseed oil is the best suited preservative for stone material. It forms a hard, waterproof coating, and is useful as an ingredient for mixing with porous binding agents. The linseed oil must be pure and free from slimy substances. This is accomplished by heating the oil to about 160°. The oil thus treated has the advantage of being brighter than raw linseed oil and dries better. B. HAMILTON

Wood pole practice—Western Union's pole preservative. P. J. HOWE. *Elec. Light and Power* 7, No. 4, 88, 90, 92, 96, 122, 124, 126(1929).—Zn meta-arsenite was used. E. I. S.

Diatomaceous earth [as admixture in concrete] (HASTINGS) 18. Marine wood borers (WHITE) 11L. Sulfoaluminates of Ca (LARCH, *et al.*) 6. Wood-destroying fungi. I. *Polyporus hispidus* (NUTMAN) 11D. P and cement (Fr. pat. 650,412) 18.

BÖHM, FRANZ. *Das Betonieren bei Frost*. Berlin: W. Ernst & Sohn. 70 pp. M. 3 60.

Concrete Year Book, 1929: A Handbook, Directory and Catalogue of Concrete. Edited by O. FABER and H. L. CHILDE. 6th yr. London: Concrete Publications. 636 pp. 3s. 6d. net.

GRÜN, RICHARD: *Chemische Widerstandsfähigkeit von Beton*. 2nd ed. Berlin: Zement u. Beton (Tonind.-Ztg.). 59 pp. M. 2.

ISABEY: *Cours de chimie industrielle appliquée au bâtiment*. Paris: Ecole du génie civil. 191 pp.

Le ciment portland artificiel. Fabrication, propriétés. Mortiers et bétons. Brussels: S. A. M. Weissenbruch. 120 pp. F. 10.

LÜRR, HANS: *Beiträge zur Teerstrassenbauauforschung, insonderheit Studien über die Mischung von Teer und Asphalt*. Berlin: Allgemeiner Industrie-Verlag. 64 pp.

Taschenbuch für die Stein- und Zement-Industrie, 1929. 27th yr. Berlin: Gebrüder Borntraeger. 40 pp. M. 4.50.

**Cement composition.** E. BARNHART (to A. Metherell). Brit. 299,427, Oct. 26, 1927. A cement concrete with a glazed surface and a vitreous content distributed throughout the mass is formed by adding  $MgCl_2$ ,  $CaCl_2$ , Al sulfate and  $Na_2SO_4$  to the gaging water. An alum, preferably with further addn. of  $MgSO_4$ , may be used instead of Al sulfate.

**Hydraulic cement.** ROBERT DeLUCE. U. S. 1,713,172, May 14. An aq. mixt. comprising lime, silica and alumina in portland-cement forming proportions is digested at a temp. of at least  $100^\circ$  under superatm. pressure and with violent agitation until an insol. Ca Al silicate is formed and the latter is subsequently heated to the point of incipient fusion.

**Hydraulic cement composition.** LENNART FORSEN. U. S. 1,712,818, May 14. A granular "extender" such as sand or finely divided granite is added to portland cement together with burnt lime and the mixt. is ground for a sufficient time to convert the cement into such finely subdivided condition that it will react quantitatively with water. The product is of good strength.

**Porous concrete.** AEROCRETE (Foreign), LTD. and C. NICOL. Brit. 299,484, April 28, 1927. A small proportion of powdered Al or Zn is mixed with portland or similar cement and a material is also added capable of rendering the mixt. saponaceous in the presence of water and thus increasing the strength of the bubbles and also of retarding deterioration of the mixt. in storage. Stearin or a similar material may be used for this purpose.

**Determining the moisture content of aggregates to be used in concrete.** CHARLES S. JOHNSON. U. S. 1,712,621, May 14. A sample of aggregate is weighed in air, placed in water so that moisture in the aggregate combines with the water, and the dry-aggregate-content of the sample is weighed.

**Bituminous composition suitable for paving, etc.** CHARLES N. FORREST (to Barber Asphalt Co.). U. S. 1,711,727, May 7. Cold mineral aggregate such as broken stone and sand is mixed with cold flux and powdered bitumen in the presence of hydraulic cement and water. The product may be used either for pavement foundation layers or wearing surfaces.

**Bituminous compositions for foundations for heavy loads, etc.** R. STEIN. Brit. 299,208, Aug. 8, 1927. A compn. suitable for supporting railway sleepers, heavy machinery, etc., comprises "Epure" 1, goudron 2, coal-tar pitch 2 and asbestos fiber 1 part, or a similar mixt. which may be reinforced with wire or wire mesh. The "Epure" used is a Trinidad asphalt freed from earthy impurities and the "goudron" is a Trinidad distn. product m.  $95-100^\circ$  and of good toughness.

**Apparatus for impregnating strips of roofing material or other fabric with asphalt or similar materials.** HENRY C. KOCH. U. S. 1,712,770, May 14.

**Laminated structural material comprising rubber and sheet metal.** ALGER G. MARANVILLE (to B. F. Goodrich Co.). U. S. 1,712,965, May 14. A layer of cellular hard rubber is united to a sheet of metal such as steel, Zn, Cu, brass or "duralumin" by a bonding layer of a heat-plastic reaction product of rubber such as may be formed by heating rubber with *p*-phenolsulfonic acid.

**Treating wood.** INTERNATIONAL FIREPROOF PRODUCTS CORP. Fr. 650,737, Mar. 10, 1928. Wood and other material is fireproofed and preserved by successive treatments with solns. of chlorides and boric acid and of metallic sulfates to ppt. insol. sulfates in the wood.

**Surfacing lumber.** WILLIAM C. GARDINER (to Satin Finish Hardwood Flooring Co., Ltd.). U. S. 1,711,884, May 7. Lumber having finished and unfinished surfaces contains a mixt. of denatured alc., turpentine and copal gum extending inwardly on the unfinished side, which serves to exclude moisture and other destructive agents.

**Preserving wood and similar materials.** ADOLF M. KOBIOLKE. U. S. 1,713,388,

May 14. The material is subjected to a vacuum in a kiln, preservative fluid such as creosote is forced into the kiln under air pressure, surplus treating fluid is withdrawn, the material is further subjected to a high vacuum and the vacuum is released to allow a sudden flow of air at atm. pressure to rush into the kiln and assist in evenly distributing the preservative fluid over and in the pores of the material.

## 21—FUELS, GAS, TAR AND COKE

A. C. FIELDNER

**Fuel analysis with a bomb and Orsat gas-analysis apparatus and the behavior of carbon dioxide-oxygen mixtures.** FRAN BOŠNJAKOVIĆ. Tech. Hochschule, Dresden. *Arch. Wärmewirt.* 9, 309–18(1928).—By detg. the temp. and pressure before and after firing in an ordinary calorimetric detn., and analyzing the bomb contents for CO<sub>2</sub> and O<sub>2</sub>, the ultimate analysis of the fuel may be detd. The necessary precautions are worked out. B. detd. the *departure from the perfect gas laws* of CO<sub>2</sub>-O<sub>2</sub> mixts. at 18–30° and 11–39 atm. by forcing the gases successively into a bomb, noting the pressures, and analyzing. ERNEST W. THIELE

**Firing of low-grade fine fuel.** KIICHIRO YAMAZAKI AND IZO TAKASE. Imp. Fuel Research Inst. *J. Fuel Soc. Japan* 8, 406–13(1929).—A preliminary report on an efficient combustion of low-grade fine fuel, such as colliery waste and coke breeze, using modified chain-grate stoker furnace. F. I. NAKAMURA

**Volatility in motor-fuel performance.** G. G. BROWN. *Oil & Gas J.* 27, No. 42, 107–8, 157–8, 161(1929).—The effective volatility of a motor fuel is the quotient obtained by dividing the wt. of fuel in the mixt. delivered to the cylinder by the wt. of fuel in the mist, supplied by the carburetor. Methods of detg. effective volatility are described. Motor fuels should possess an effective volatility of not less than 45–60% under conditions of use if the motor is to answer its throttle with a delay of not more than 4–5 seconds. Since about 30% of fuel is carried into the cylinder in the form of a mist, it is pointed out that the 30% point on the A. S. T. M. distn. curve appears to be the most important point indicating engine performance during the warming-up period or in cold weather. General conclusions reached are: (1) That part of the A. S. T. M. distn. up to 40–50% indicates effective partial volatility; (2) that part from 50 to 90% indicates the effective volatility under steady driving conditions. M. B. HART

**The sampling of coal.** E. S. GRUMELL. *Eng. and Boiler House Rev.* 42, 507–9(1929).—The theory of size-weight ratio has been critically examd. and the theory of errors is discussed. Conclusions which have been based on evidence derived from sampling of cars may be directly applied to taking of gross samples by substituting increments for cars, the two expressions being synonymous in argument. E. I. S.

**Coal testing and plant operation.** M. DOLCH. *Z. Oberschlesisch. Berg- u. Hüttenmannisch. Ver. Katowice* 68, No. 2, 64–72(1929).—Methods and equipment for rapid testing of coal for purpose of thorough fuel control. E. I. S.

**Rectangular graphs as applied to the proximate analyses of Chinese coals.** H. S. WANG. *Bull. Geol. Survey China* 7, 175(1928); *Fuel in Science and Practice* 8, 244–8(1929).—The chem. changes of Chinese coals during coalification are graphically represented upon several diagrams, fixed C, volatile matter and moisture being plotted on the ash-free basis. The classification of these coals according to their fixed C content (ash-free basis) shows close relation to their classification by Ashley's method. D. A. REYNOLDS

**Power consumption of coal mills.** P. ROSIN AND E. RAMMLER. *Arch. Wärmewirt.* 7, 54–7(1926).—Tests on Maxecon mills with air sepn. showed that (1) for a given setting of air blast, the fineness increased linearly as the load increased; (2) for different settings, the power consumption was independent of the fineness; (3) after deducting the power consumed at no load, the remaining power was proportional to the load. ERNEST W. THIELE

**The modern use of pulverized fuel in power-stations.** R. A. CHATTOCK. *Mech. World* 85, 371–3(1929).—Results obtained by Birmingham Elec. Supply Committee at Prince's elec. power station, Nchells, with Lopolco pulverized-fuel equipment fitted to six Vickers-Spearing water-tube boilers, also results obtained with Simon-Carves pulverized-fuel-fired boilers are compared with previous results. E. I. S.

**Progress in the use of pulverized coal as a fuel.** E. G. BAILEY. *Power House (Toronto)* 23, No. 6, 23–5(1929). E. I. S.

**Transportation of powdered coal.** L. KLEIN. *Arch. Wärmewirt.* 10, 177-80 (1929).—The packing of coal dust on transportation, which hinders the flow on discharging, consists in an interlocking of the irregularities of the surfaces of the particles, accompanied by an escape of air. Tests on a shaking machine, as well as in practice, showed a reduction in apparent vol. of 20-30%, most of which occurs in the first 20 km. of travel. A screw in the container helps to loosen the mass. Containers filled under vacuum will hold 25% more coal. ERNEST W. THIELE

**Evaluation of sieve analyses and characteristic curves for powdered coal.** P. ROSIN AND E. RAMMLER. *Arch. Wärmewirt.* 7, 49-53 (1926).—The results of sieve analyses are best expressed by a curve showing the relation between the total amt. passing a given sieve and the linear dimensions of the actual sieve openings. This makes it possible to interpolate and to compare results obtained with various sieve systems. ERNEST W. THIELE

**The behavior of the ash in powdered coal furnaces.** KURT BAUM. *Arch. Wärmewirt.* 10, 143-6 (1929).—Tests on the original ash, ash from the combustion chamber and fly ash showed that the last has the highest softening point. Water extrn. of the ash to remove alkalis raised the softening point. The compn. of the various ashes showed no decided trend. It is better to freeze the droplets of fly ash as soon as possible after they leave the flame, rather than to try to flux them. ERNEST W. THIELE

**Temperature gradient and heat storage in the brickwork of a powdered coal furnace.** K. RUMMEL, E. KUHN AND W. OELLERS. *Arch. Wärmewirt.* 10, 45-7 (1929).—Thermocouples inserted in the brickwork to varying depths showed that the fall in temp. near the inner wall was much greater than that calcd. This is due to the inward flow of air through the wall under the influence of the draft. Hence the heat loss from the wall is only 6% of that calcd. from the cond. of the brick, and the heat stored in the brick is cut in half. ERNEST W. THIELE

**Largest distilled-coal plant in the world opens at New Brunswick, N. J.** R. D. HALL. *Coal Age* 34, 229-30 (1929).—Outline description of a plant with annual capacity of 250,000 tons of coal, using K. S. G. process. Each ton of coal yields 1500 lb. semi-coke, 25 gal. tar, 3500 cu. ft. of rich coal gas with about 900 B. t. u. per cu. ft. and 2 to 3 gal. of light oil. E. I. S.

**Contribution to the study of the mechanism of the carbonization of coal.** E. AUDIBERT. *Fuel in Science and Practice* 8, 225-43 (1929).—The results of a series of lab. investigations are correlated with com. carbonization. On passing from a heating rate of  $1/3^\circ$  per min. to  $3^\circ$  per min. the initial softening temp. of coal is but little changed, whereas the solidification temp. was increased  $50^\circ$ . Softening temps. may be given without specifying the exact heating rate; they are generally about  $350^\circ$ . Solidification temps. range from  $425^\circ$  to  $550^\circ$ . The degree of fluidity which may be attained varies widely with different coals and cannot be predicted from their volatile content. Oxidation causes a decrease in this fluidity. Bubble formation within the fused mass, which causes the porous structure of coke, is independent of the fineness of the particles and is detd. by the fluidity attained during the plastic state. In general, cokes formed without swelling will be stronger the greater the fluidity attained, the more rapid the heating, the finer the original particles and the more nearly the density of the original mass approached the density of the coal. Although swelling increases the fluidity of the fused mass, thus tending to increase the coke strength, the formation of pores will actually reduce this strength. The agglutination of coke is shown by expt. to be independent of the passage of volatile matter during its carbonization; agglutination is therefore dependent only upon the softening of coal. These principles are applied practically to a series of lab. tests by which the com. coking characteristics of a coal may be predicted. D. A. REYNOLDS

**Low-temperature carbonization and the boiler house.** D. BROWNLEE. *Eng. Boiler House Rev.* 42, 522-4 (1929).—The situation today in the field of combined low-temp. carbonization and combustion for boiler-plant practice is discussed. E. I. S.

**Aqueous liquors from low-temperature carbonization of coal.** GILBERT T. MORGAN, DAVID D. PRATT AND ALFRED E. J. PETTER. *J. Soc. Chem. Ind.* 48, 89-93T (1929); cf. C. A. 22, 2828.—Distn. of low-temp. carbonization tar up to a vapor temp. of  $170^\circ$  gave in addn. to oil an aq. distillate to the extent of 7 gals./ton of tar. The latter was made alk. with NaOH and continuously extd. with  $\text{Et}_2\text{O}$  for 2 days; the ext. contained bases (I) and neutral oils (II); the aq. portion was satd. with  $\text{CO}_2$  and phenols (III) were extd. in  $\text{Et}_2\text{O}$ . The remaining aq. portion was concd. by distn., the distillate giving  $\text{NH}_4\text{Cl}$  upon treatment with HCl and evapn. The concd. liquor was acidified, filtered and extd., giving carboxylic acids (IV) in the  $\text{Et}_2\text{O}$  and resinic acids in the  $\text{H}_2\text{O}$ . The compn. of the crude liquor was (in g./l.): I, 0.1; II, 0.2; III, 9.2; IV,

3.7;  $\text{NH}_3$ , 5.5; total S, 2.1. In the distillate the compn. was I, 0.1; II, 1.6; III, 13.3; IV, 1.4;  $\text{NH}_3$ , 16.7; S, 3.4. I contained  $\text{PhNH}_2$ ,  $\text{C}_6\text{H}_5\text{N}$  and  $\alpha$ -picoline; IV contained  $\text{HCO}_2\text{H}$ ,  $\text{AcOH}$ ,  $\text{EtCO}_2\text{H}$ ,  $\text{PrCO}_2\text{H}$ ,  $\text{BuCO}_2\text{H}$ ,  $(\text{CO}_2\text{H})_2$  and resinic acids.

A. S. CARTER

**Progress in manufacture of synthetic anthracite—synthracite.** E. GEVERS-ORBAN. *Rev. univ. mines* 72, 93-8; *Génie civil* 94, 339(1929).—The low-temp. carbonization process for manuf. of anthracite briquets is described. Details of plant at Bonne Fortune, Belgium, are given and the cost of plant and economics of process are discussed.

E. I. S.

**Properties of coal for gas producer.** SEIJIRO UCHIDA. Imp. Fuel Research Inst. *J. Fuel Soc. Japan* 8, 399-404(1929).—In addn. to the common data based on analysis, calorimeter detn., etc., for the selection of the coal for gas producer S. discussed coal grading, caking power, fusing temp. of ash and reactivity of coke made at different temps.

F. I. NAKAMURA

**Prevention of heat losses by flue-ash deposits in steam boilers.** MAX BERGER. *1pparatebau* 41, 61-4(1929).—Descriptions of the stationary and portable "Starke" app. for removing deposits by blowing with steam which injects some of the flue gases.

J. H. MOORE

**Air preheating for grates.** WILHELM GUMZ. *Feuerungstech.* 17, 25-8, 38-43 (1929).—A general discussion of the effects of air preheating on grate firing is given. Reference is made to the caking of the coal, the danger of clinker formation, the effect on the grate bars, and the suitability of different types of grate. Deep fuel beds, non-coking coals, and underfeed stokers are most suitable.

ERNEST W. THIELE

**Savings in preheated combustion air.** A. EUGENE MICHEL. *Oil & Gas J.* 27, No. 42, 236, 257-8(1929).—The Ljungström air preheater reduced the stack loss to 6% as compared with 15.5%; 84.5% of the heat was utilized in producing steam as compared with 75% without the preheater.

M. B. HART

**The installation of heating with two gases and supplementary heating.** KARL LOBBECKE. *Feuerungstech.* 17, 61-4(1929).—A regulator is described which admits the correct amt. of air to a furnace in which two gaseous, liquid, or powd. fuels are being burned in varying proportions, at the same time recording the quantity of each gas and the air.

ERNEST W. THIELE

**Measurement of steam consumption of back-pressure and bleeder turbines.** E. JOSSE. *Arch. Wärmewirt.* 10, 169-73(1929).—Tests were made on several nozzles in which the throat velocity was equal to that of sound. In the formula  $G = ac\sqrt{ps}$ , where  $G$  is the quantity in kg./sec.,  $a$  the area in sq. m.,  $p$  the pressure in atm. and  $s$  the density  $\times 1000$  at the entrance, the value of  $c$  was found to be  $207 \pm 1$  for all cases.

ERNEST W. THIELE

**The briquetting plant of the Pacific Coast Coal Co.** G. N. CALKINS. *Min. Congress J.* 15, 285-6(1929).—This plant has been in continuous operation for 15 years. Seven stages of manuf. are outlined. High efficiency is maintained by annual overhauling during slack seasons.

E. I. S.

**Further results from plants for phenol recovery from ammonia liquors.** H. WIEGMANN. *Glückauf* 64, 605-6(1928).—From the liquor were isolated 52% phenol, 9% *o*-cresol, 16% mixed cresols, 7.5% mixt. of cresols and xlenols. Inadequate washing only removes about 25% of the phenol but about 75% of the cresol. In another plant with better washing, this figure was 50-80%. The steam requirements, at first very great, can be cut down considerably, particularly through heat interchangers. If the washing app. works well, 25% benzene, calcd. on the amount of wash liquor, suffices to give a satisfactory phenol removal. Only large-scale working can decide as to the respective merits of the benzene and alkali extn. methods. The first process has the advantages that it is very simple to work and does not require any additional chemical.

S. L. B. ETHERTON

**Disposal of ammonia liquors.** D. W. PARKES. *J. Soc. Chem. Ind.* 48, 81-6T (1929); cf. *C. A.* 21, 2549, 3449.—The cost of purification of virgin or spent  $\text{NH}_3$  liquors is balanced and a profit may be realized by recovery of phenol and catechol. The monohydroxy phenols (I) are recovered by a process of acidification, absorption in active charcoal and steam distn. The  $\text{NH}_3$  liquor is brought to  $p_H$  6-7 with mineral acid or almost to neutrality with  $\text{CO}_2$ ; after settling of the sludge, the liquor is passed through active C which absorbs I. When several absorbers are used in series, the 1st becomes satd before the others and may be cut out for distn. while a reserve is put in at the end of the series. In general, 3 absorbers contg. 50 lbs. of C each will care for 200 gals./hr. of liquor, one absorber being distd. every 5 hrs. During distn. 3 fractions are obtained: (1) everything until the distillate seps. into 2 layers ( $350^\circ$ ); (2) tar acids

(up to 650°); and (3) 650–800°. During the fraction (2) H<sub>2</sub>O ceases to come over (500°) so steam is admitted; (1) and (3) are returned to the absorbers. Dihydroxy phenols (II) should be removed before I in handling low-temp. and vertical-retort liquors. The liquor is brought to  $p_H$  5–6 by means of mineral acid to ppt. org. matter which would cause waste and to remove sulfides and carbonates. In some cases distn. is sufficient pretreatment; in others it is necessary to add CaOCl<sub>2</sub> and CaO. After decantation, C<sub>6</sub>H<sub>5</sub>O<sub>2</sub>Pb is pptd. at  $p_H$  8 (obtained by addn. of NH<sub>4</sub>OH) by a soln. contg. 46.05% PbCl<sub>2</sub>, 38.37% NaOAc, 14.8% H<sub>2</sub>O and 0.78% HNO<sub>3</sub> (d., 1.4). The Pb ppt. is treated with concd. HCl, filtered, steam distd. and evapd. to give crystals of II. A. S. CARTER

**Shipment and use of powdered Rhenish brown coal.** H. M. KASPER. *Arch. Wärmewirt.* 10, 1–8, 57–61 (1929).—In 1927 112,000 tons of powd. Rhenish brown coal were shipped; 91 cars are used in this service. This report gives details, with many illustrations and figures of results attained, as to cost of distribution, and the use of this coal in power plants, locomotives, reduction of metals, heating tempering and annealing. A bibliography of 46 items is added. ERNEST W. THIELE

**Rapid moisture determination in dry brown coal for briquet manufacture.**—ALFRED FABER. *Z. angew. Chem.* 42, 406–7 (1929).—The Deutsche Braunkohlen-Industrie-Verein and the Braunkohlen-Syndikaten offered prizes amounting to 6000 R. M. for the best methods of H<sub>2</sub>O detn. in brown coals contg. 5–25% H<sub>2</sub>O, using a sample of 20 g. (to avoid errors in sampling), requiring not more than 5 mins. to carry out, and checking the xylene distn. method within  $\pm 0.5\%$ . First prize was awarded the Frankfurter Forschungsinstitut für Getreidechemie G. m. b. H. for a method depending upon the measurement of the dielec. const. of the coal samples, simple elec. instruments being used; time needed, about one min. Second prize (Trauthwein) was won for a method based upon the measurement of H<sub>2</sub>O distd. from the coal placed in a special electrically heated app.; time required, 5–5.5 mins. Third prize (Kubierschky) was given for a method similar to the xylene distn. process, but amyl alc. or a mixt. of amyl alc. and paraffin oil was used; time required, 9–10 mins. Fourth prize (Müller) was given for a method employing 10 g. coal, shaken exactly 2 mins. with 40 cc. glacial AcOH, filtered, and 5 cc. of filtrate titrated, with phenolphthalein as indicator; time, 9 mins. The fifth prize-winning method called for 20 cc. glacial AcOH, a 2-min. shaking period, filtration through glass, distn. into a cond. cell, and measurement of the cond.; time, 8.5 mins. Rossiger and Becker proposed a method for the rise of temp. produced when 5 g. of sample is shaken with 50 cc. concd. H<sub>2</sub>SO<sub>4</sub> in a round-bottom flask, and comparison with curves obtained from coals of known H<sub>2</sub>O content. In all 57 methods were proposed, and of these 9 were investigated in detail. W. C. EBAUGH

**The nation's fuels.** I. Industrial ethyl alcohol and the synthesis of methanol. GEORGES KIMPFILIN. *Rev. gen. sci.* 39, 700–3 (1928). II. Benzene and gas. *Ibid.* 40, 177–82 (1929). III. Gas producers. *Ibid.* 211–5.—The economic situation of France with regard to fuels for internal-combustion engines is reviewed. A. S. C

**The new Basel Gas Works at Kleinhüningen.** K. MEIER. *Schweizerische Bauzeitg.* 93, No. 11, 135–8 (1929).—Features of gas works occupying area of 14 hectares, producing 300,000 cu. m. per day, with gas holders up to 50,000 cu. m. capacity, ammoniac plant, waste-products distillation plant, etc. E. I. S

**Standard pressure base for gas measurement.** F. E. HUFF. *Petroleum World Oil Age* 26, No. 3, 118 (1929).—The advantages of using the standard abs. unit, 14.73 lbs., as the base for all gas-vol. measurements instead of any of the 9 arbitrary base units now in use are pointed out. M. B. HART

**The new coking process at the Jena municipal gas works.** J. GULICH. *Gas. Wasserfach* 71, 1113–9 (1928).—Coal in vertical retorts was covered with a layer of 10–20 mm. coke at least 700 mm. thick, to prevent clogging of the upper coal surface, to increase the gas yield by cracking the tar and also to increase the rate of heat transfer through the charge. Various thicknesses and positions of the coke layer were tested and results reported. Steam was admitted after the seventh hr. instead of the tenth hr. as in usual operations, but only for the first half of each hr. An increased yield of GAN, DAVIS, carbons was secured, especially during the first part of the coking period. cf. C. A. 22, 2828. The gas yield was increased from the usual 17.9 to 13.5%. A coke yield gave in addn. to oil was obtained. The tar yield was decreased, and more coke was required made alk. with NaOH and condensed. The gas yield was increased from the usual 39 cu. m. of 490 B. t. u. bases (I) and neutral oils (II); th B. t. u. per cu. ft. R. W. R.

**Gas analysis.** P. RASSFELD. *Gas u. Wasserfach* 72, 344–7 (1929).—The gas analysis is to use phys. methods whenever possible, giving NH<sub>4</sub>Cl upon treatment with 1 gas analysis is to use phys. methods whenever possible, condensed and extd., giving carboxylic acids. A considerable improvement in methods for 9% was obtained. The compn. of the crude liquor obtained by substituting fractional combustion over

CuO for the explosion method. H and CO are burned quantitatively at 250–300°. CH<sub>4</sub> is not affected at this temp., but is burned quantitatively at 700–800° over CuO. Absorption of the CO<sub>2</sub> is required for complete combustion of either CO or CH<sub>4</sub>. A suitable app. and technic are given. The residue after combustion, commonly called "nitrogen," has been investigated by the interferometer, and found to consist of a mixt. of N and higher homologs of CH<sub>4</sub> (not burned quantitatively over CuO in the absence of O) as well as traces of benzene or other org. vapors.

R. W. RYAN

**A simple analysis of generator gases.** JAROSLAW DOLINSKI. *Przemysl Chem.* 11, 757–63(1927).—This is a graphical method. With the aid of a phase diagram and determinations of only CO<sub>2</sub> and N<sub>2</sub> such values as sp. gr., calorific value, etc., for a given generator gas can be read off directly and with sufficient accuracy. A. C. ZACHLIN

**The gas generator in the gas industry.** G. NEROT. *Science & ind.* 13, 153–60 (1929).—The diverse category of app. which has been successively employed for the firing of furnaces is indicated. A description is given of the most characteristic types of app.

FRANK V. JOHNSON, JR.

**Determination of the calorific value of gas.** HANS LÖFFLER. *Chem. Fabrik* 1929, 232–3; cf. *C. A.* 22, 1460.—Description of the Strache-Löffler "Caloriskop," with which a detn. may be made in about 2 mins. with an accuracy of about 0.3% over a range from 7000 to 13000 Cal.

J. H. MOORE

**Absorbing liquids for technical gas investigations.** OTTO WOLF AND ARTUR KRAUSE. *Tech. Hochschule, Darmstadt Arch. Warmewirt.* 10, 19–21(1929).—The rate of absorption of CO<sub>2</sub> by KOH solns. rises rapidly up to 4% by wt., then more slowly with a max. at 28%. The rate for NaOH is nearly the same as that for KOH up to 4%, beyond which the rate falls slowly. The most rapid rate of O<sub>2</sub> absorption with alk. pyrogallol is at 18% KOH, 15% pyrogallol, and 67% water, but there is a secondary max. at 10% KOH and 5% pyrogallol. No CO could be detected in the residual gases. The soln. recommended for CO is: 20 wt. % Cu<sub>2</sub>Cl<sub>2</sub>, 13.6% NH<sub>4</sub>Cl, 44.4% H<sub>2</sub>O, 22.0% NH<sub>3</sub> soln. of sp. gr. 0.96.

ERNEST W. THIELE

**Water-gas and producer-gas plant at Billingham Synthetic-Ammonia Works.** ANON. *Engineering* 127, 348–51, 362, 450–2, 508–10(1929).—For use in a modified Haber process there have been erected 12 water gas units capable of gasifying over 400 tons of coke in 24 hrs., and 4 mech. gas producers to supply N in amts. 1/3 as great as H from the water-gas sets. Complete descriptions and illustrations are given. The water-gas cycle consists of 5 stages, controlled automatically, viz., "blow" of 1 min., with a "blow purge" of 10 secs., the gases escaping to stack; and an "up-run" of 2.5 mins., a "down-run" of 1 min., and a "run purge" of a few seconds, the last named with air. Coke is fed continuously into the generators. Of special interest are the heat-utilizing and automatic-control devices employed.

W. C. EBAUGH

**Steam, flue gas, and blast-furnace gas as additions to the gas-producer air blast.** W. WISLICIENUS. *Arch. Warmewirt.* 9, 331–4(1928).—W. computes the exit temps., efficiencies, heating values of the gas produced, etc., for a theoretical producer gasifying pure C, using air diluted in the 3 ways, and undiluted.

ERNEST W. THIELE

**Ignition of combustible gas with three-part spark.** TORAHIKO TERADA, KIYOHIKO YUMOTO AND RYŌZŌ YAMAMOTO. *Inst. Phys. Chem. Research, Tokyo. Proc. Imp. Acad. (Tokyo)* 5, 125–6(1929); cf. *C. A.* 23, 2296.—When a jet of coal gas is directed very near the electrode surface (+) or (–), the ignition easily takes place, but the type of spark is mostly changed into the ordinary zigzag type, especially for (+). The frequency of ignition was, therefore, measured by the % of the cases of ignition relative to all the cases in which the sparks were decidedly of the 3-part type. The frequency thus defined, if plotted along the spark track, shows decided minima near the resp. junctions of (+) and (–) parts with the middle part. Along the middle part a max. (80%) is found at a point somewhat displaced toward the negative side from the middle. At the minima, the frequencies fall decidedly below 10%. When the gas jet is at the surface of (–) electrode it seems to approach 100%. At (+) electrode, the 3-part type becomes very rare, so that the frequency as above defined becomes indeterminate. With H<sub>2</sub> qual. similar phenomena were observed, though the effect of the jet upon the form of spark is much different.

C. J. WEST

**Improving the thermal balance of a boiler.** CH. VAN DER PUTTEN. *Sucr. Belge* 262(1929).—The advantages of flue-gas heaters for combustion air over economizers are reviewed.

F. CAMPS-CAMPINS

**Combustion mechanism in the Bunsen flame.** F. HABER. *Metallbörse* 18, 960–1 (1928).—The following processes occur in the hydrogen flame, (1) 2H<sub>2</sub>O = O<sub>2</sub> + 2H<sub>2</sub>; (2) 2H<sub>2</sub>O = 2OH + H<sub>2</sub>; these are linked in (3) 4OH = O<sub>2</sub> + 2H<sub>2</sub>O; (4) H + OH = H<sub>2</sub>O; (5) H + H = H<sub>2</sub>; (6) 2OH = H<sub>2</sub>O<sub>2</sub> + 41 kg. cal. From the heats of forma-

tion and from the disson. of water vapor it is concluded that  $H_2O_2$  is completely decomposed into OH in the flame so that the first product of the  $H_2$  combustion process is OH. The thermal data indicate that the combustion of H ought to be spontaneous. However, it is assumed that either the  $H_2$  or the  $O_2$  undergoes a chem. change necessitating heat absorption before it rapidly reacts with its partner. This "activation" cannot be the decompn. of elementary  $H_2$  into atoms, for this requires too much heat and could not occur rapidly enough near the lower explosion limits of flames. The following reactions occur on combustion of CO, (1)  $O_2 = O'_2$ ; (2)  $O'_2 + CO = CO_2 + O$ ; (3)  $O + CO = CO_2$ ; (4)  $CO + OH = CO_2 + H$ ; (5)  $H + H_2O = OH + H_2$  ( $O'_2$  is oxygen in an activated state due to absorption of 37 kg.-cal.). The hydrocarbon flame shows the spectrum of  $C_2$ , CH and OH. Carbon vapor is preponderantly monatomic from ordinary temp. to the b. p. of C. The reaction  $C_2 + OH = CO + CH$  is exothermal.

S. L. B. ETHERTON

**Determination of temperatures in combustion motors.** C. BONNIER. *Compt. rend.* 188, 957-9(1929).—The temp.  $T_1$  of the gas in a combustion motor on the compression stroke at the instant that the pressure is equal to 1 atm. can be calcd. from the formula  $v_2 = vT_1/273 + v_1(p_1/p_2)^{1/\gamma}$ , where  $v_2$  is the known vol. at  $T_1$ ,  $v$  is the vol. at  $273^\circ$ ,  $v_1$  is the vol. remaining after the exhaust stroke,  $p_1$  is the corresponding pressure and  $p_2$  is the pressure on the detonation stroke corresponding to the piston position at  $v_2$ .

A. S. CARTER

**Poisoning from auto exhaust gases.** H. KUNZ-KRAUSE. *Pharm. Zentralhalle* 70, 261-5(1929).—A discussion of the nature and toxicity of certain components of the exhaust gases of internal-combustion engines, their detoxication taken in comparison with the toxicology of illuminating gas.

W. O. E

**The cracking of coal tars.** G. EGLOFF. *Min. Congress J.* 15, 203-4, 217(1929).—Tar can be commercially converted into motor fuel by the cracking process. Its operation is described.

E. I. S

**The "e-phenols" of primary tar.** G. VAVON AND N. ZAHARIA. *Ann. combustibles liquides* 3, 541-51(1928).—See C. A. 23, 1247.

R. E. SCHAAD

**Skin lesions among tar workers.** HAROLD B. WOOD. *J. Cancer Research* 13, 54-9(1929).—Different types and composition of tars are discussed. Only tar obtained from the distn. of coal at high temps. contains a substance carcinogenic to certain lab animals. Workmen handling coal tar showed tar warts as a result, but no other effect. No irritant action on the human skin was found from low-temp. distillate tar or from petroleum tar.

H. G. WELLS

**Becker coke-oven plant for the Nunnery Colliery Co., Sheffield.** ANON. *Engineering* 127, 453-6(1929).—A modern lay-out of Becker coke ovens and auxiliary app is described. The products from the plant are (weekly) 2800 tons of coke, 50 tons  $(NH_4)_2SO_4$ , 36,000 gal. tar, 13,600 gal. crude  $C_6H_6$ , and about 27 million cu. ft. de-benzolized gas of 550 B. t. u. The ovens (25 in no.) have an av. width of 14 in., work on the regenerative principle, require 12 hrs., 50 mins. for carbonizing, have a capacity per oven of 12.2 tons or 22.4 tons per 24 hrs., and yield 7000 cu. ft. of surplus gas per ton of dry coal. Each oven is 40 ft. long and 12 ft., 6 in. high. Automatic reversal of flow through regenerators is effected every 20 mins.

W. C. EBAUGH

**Distinguishing marks and methods of detecting (allotropic) forms of carbon in coke.** G. AGDE AND FR. SCHIMMEL. *Feuerungstech.* 17, 97-100(1929).—A review with 19 references.

ERNEST W. THIELE

**Coke as fuel.** T. F. HURLEY. *Automobile Eng.* 19, 135-7(1929).—Description of some comparative tests with low-temperature coke and charcoal. Bench tests were made with a Tulloch-Reading producer with mixing valve which allows the engine to run on gasoline or suction gas, or both; a Dorman 4-J.O engine was used. Low-temp. coke may eventually prove a satisfactory fuel for heavy motor vehicles. Producers designed for use with charcoal as fuel require some modifications.

E. I. S.

**Dry quencher operation at Rochester, N. Y.** FREDERICK J. PFLUKE. *Ind. Eng. Chem.* 21, 457-61(1929).—The operating results of a dry coke-quencher installation after a two-year continuous operating period are reviewed. The benefits and objections to dry quenching are briefly summarized.

FRANK V. JOHNSON, JR.

**Determination of  $C_6H_6$  and toluene in gases (SCHULZ) 7. The causes of grate-bar destruction and appropriate preventive measures (HOFER) 9. Gas testing (SANDER) 1. Fractional distillation analyses (PODBIELNIAK) 1. Comparative merits of oil and pulverized coal (COLS) 22. Treating waste fibers (Fr. pat. 650,110) 16. Apparatus for classifying coal (Fr. pat. 650,971) 1. Grinding apparatus for mineral substances**



(Fr. pat. 650, 853) 1. Drying or destructive distillation apparatus (Ger. pat. 466,925) 1. Drying gas (Fr. pat. 650,192) 13. Hydrogenating carbonaceous material (U. S. pat. 1,711,499) 22.

ARGNANI, VITTORIO: Il controllo della combustione. Bologna: L. Cappelli. 473 pp. L. 60.

BAHR, H.: Die Gewinnung von Ammoniaksalzen aus Kokereigasen unter Nutzbarmachung des Gasschwefels. Essen: C. W. Haarfeld. 26 pp.

Fortschritte der Teerfarbenfabrikation und verwandter Industriezweige. Dargestellt an Hand d. systemat. geordn. u. mit krit. Anmn. vers. deutschen Reichspatente. Teil 15. Feb. 1, 1925 to June 30, 1927. Edited by HANS ED. FIERZ-DAVID. Pharmaceutical part edited by MAX DOHRN. Berlin: J. Springer. 1882 pp. M. 258.

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KREULEN, D. J. W.: Brandstoffchemie. De Analyse in het Bijzonder. Amsterdam: D. B. Centen. 135 pp. F. 4.60.

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Von den Kohlen und den Mineralölen. Band I. Ein Jahrbuch für Chemie und Technik d. Brennstoffe und Mineralöle. Edited by FACHGRUPPE FÜR BRENNSTOFF-UND MINERALÖL-CHEMIE D. VEREINS DEUTSCHER CHEMIKER. Berlin: Verlag Chemie. 252 pp. M. 15; bound, M. 17.

Liquid fuels. EUGENE A. PRUDHOMME (to Soc. internationale des procédés Prudhomme). U. S. 1,711,855, May 7. Hydrocarbon vapors such as products of low-temp. coal, lignite or peat distn. are subjected to a succession of catalytic stages which effect hydrogenation, dehydrogenation or splitting up into unsatd. hydrocarbons and satn. and polymerization. U. S. 1,711,856, relates to a generally similar process in which a suitably proportional quantity of a reducing gas such as water gas is added to the vaporized products undergoing treatment before entry into each catalyzer. An arrangement of app. is described in each of these pats.

Smokeless fuel. CHARLES É. BIRR. Fr. 651,181, Aug. 26, 1927. An agglomerated smokeless fuel contains, *e. g.*, coal dust 90, fuel oil 2, mazout 2, starchy matter 4, cellulose 2, CaCO<sub>3</sub> 1 and CaO 1%.

Carbonizing fuel. IMPERIAL CHEMICAL INDUSTRIES, LTD. Fr. 650,735, Mar. 10, 1928. Powd. fuel is preheated in an uncompressed state and on nearing the coking temp. is forced by pressure through a container where coking occurs. The coke takes the shape of the container which may contain a grid to divide up the coke into rods which are cut into blocks by a knife at the end of the container. Superheated steam may be passed in counterflow through the coke.

Apparatus for evolving and recovering volatiles from carbonaceous fuels and for agglomerating the solid residue. W. B. RULON. Brit. 299,611, Oct. 27, 1927. Structural features.

Hydrogenation. I. G. FARBERIND. A.-G. Fr. 650,975, Mar. 17, 1928. In the hydrogenation of coal, tars, etc., the oily constituents are removed from the residues by cautiously heating the residues, partly with the heat from the hydrogenation products. Steam may be introduced which allows working at a higher temp., and the residues are advanced by a screw. The final residues may be used for making active charcoal or as a powd. fuel.

Hydrogenation. I. G. FARBERIND. A.-G. Fr. 650,974, Mar. 17, 1928. In the hydrogenation of coal, mineral oils, etc., the substances entering and (or) leaving the reaction chamber form a heat envelope between the reaction chamber and the wall supporting the pressure.

Apparatus for destructive distillation or drying. KAROLINE DOBBELSTEIN NÉE BUSSMANN, ROLF DOBBELSTEIN, ALINITA DOBBELSTEIN, OTTO DOBBELSTEIN and IRMGARD DOBBELSTEIN. Ger. 475,048, Apr. 17, 1926. Addn. to 455,679. Improved

means are described for forcing the powd. initial material into the disk-like distn. or drying chambers forming a feature of the app. described in Ger. 455,679.

**Low-temperature destructive distillation apparatus.** KOHLENSCHIEDUNGS-GER. M. B. H. Ger. 475,283, Nov. 24, 1926. The app. is particularly designed for the distn. of lignite, and is of the kind comprising a shaft with adjustable partitions down which the lignite is moved.

**Distillation of coal.** COMPAGNIE DES MINES DE VICOIGNE, NOEUX ET DROCOURT. Fr. 651,445, Sep. 5, 1927. In low-temp. distn. of an agglomerated coal, the coal is heated slowly, *i. e.*, 2° per min. for poor coal,  $\frac{1}{10}^{\circ}$  for certain coking coals, during the phase where a change of phys. constitution is taking place. Thus, agglomerated coal contg. 8% tar made with a certain Pas-de-Calais gas coal is heated rapidly to 350°, then 0.2° per min. to 450°, and more quickly above, giving a good marketable product which shows no swelling.

**Distillation of coal.** LOW TEMPERATURE CARBONIZATION, LTD. Fr. 651,650, Mar. 23, 1928. A series of retorts are cast in one piece, and have a rectangular or oblong section, narrowing towards the top. Fr. 651,651 describes a distn. in 2 phases, water being caused to pass into the 2nd retort or into the discharge chamber into which the warm residue is discharged. Fr. 651,652 describes a 2-phase process in which gas is drawn off in the neighborhood of the junction between the upper and lower retort, and this gas is evacuated along with the gas formed and drawn off at the top of the upper retort.

**Distillation of coal or other solid carbonaceous materials.** HEINRICH KOPPERS. U. S. 1,712,082, May 7. Heat-storing bodies such as steel balls are heated separately from the material to be distd. and then brought into contact with the material to heat it and effect distn. of hydrocarbons. An arrangement of app. is described in which the heating bodies and material undergoing distn. may be agitated together in a rotating retort. U. S. 1,712,083 relates to app. for carrying out similar processes.

**Gasifying coal.** OTTO GROSS. Fr. 650,475, Mar. 6, 1928. See Brit. 289,080 (C. A. 23, 691).

**Agglomerating coal.** SOC. ANON. DES ENGRAIS ET NOIR ANIMAL. Fr. 651,462, Sep. 7, 1927. The paste obtained by the action of  $H_2SO_4$  on ligneous and cellulosic substances at a slightly raised temp. is used with or without the addn. of charcoal for agglomerating coal.

**Soluble products from coal.** I. G. FARBERIND. A.-G. Fr. 650,722, Mar. 10, 1928. The yield of products extd. from coal by solvents is increased by first heating the coal to 100–600° under pressures of 2–100 atm. Solvents such as  $C_6H_6$  or its derivs., hydrogenated  $C_{10}H_8$ , alcs., ketones, petroleum, mineral oils or tar oils may be used, and the products may be subjected to cracking or hydrogenation without sepn. from the solvent. Lignite contg. much water is excepted.

**Apparatus for drying and distilling lignite, peat, non-coking coal, etc.** HUBERT DEBAUCHE. U. S. 1,713,032, May 14. A vertical cylindrical retort chamber built from firebrick is surrounded by a heating chamber, and within the retort is positioned a concentric multi-conical ring device of different diams. such that an upper annular space of greater width is provided for drying the carbonaceous material and a lower annular space is provided for carbonizing the fuel. Various other structural details are described.

**Extraction of oils.** I. G. FARBERIND. A.-G. Fr. 651,150, Mar. 23, 1928. Oils of high b. p. are extd. from residues of mineral or tar oils or of the hydrogenation of coal, etc., by the introduction, at temps. above 300° and under reduced pressure, of gases or vapors which form liquids of low b. p. in the liquid state, preferably as a mist. Examples are given of the treatment of mineral oil and lignite hydrogenation residues with damp steam.

**Distillation of oils.** THE BARRETT CO. Fr. 651,127, Mar. 22, 1928. The gases from coke ovens or retorts are cooled and freed from tarry matter by spraying them with oils, which may be those obtained in the condensers of the carbonizing plant, or dirty oils which it is desired to distil and which are recovered by condensation. The process prevents hardening of pitch in the collector mains. Suitable app. is described.

**Distillation of crude benzene.** SOC. DES ÉTABLISSEMENTS BARBET. Fr. 650,138, Aug. 12, 1927. Crude benzene is sepd. into 4 fractions, benzene, toluene, xylene and solvent naphtha, the first 3 by continuous rectification under atm. pressure and the last by a discontinuous rectification under vacuum. An app. is described.

**Purifying gas.** H. KOPPERS A.-G. (to C. J. Hansen). Brit. 299,302, Oct. 22, 1927. Gas contg.  $NH_3$  and  $H_2S$  is scrubbed with a soln. contg. iron and oxy compds. of S and the liquor is regenerated by adding  $SO_2$  or a compd. such as  $NH_4HSO_4$ . The

gas may be further successively scrubbed with a bisulfite soln. and with a sulfite or thio-sulfate soln. and free  $\text{NH}_3$  may be added to the gas at the beginning of the operation if the gas is low in  $\text{NH}_3$ .

**Purifying gases.** THE GAS LIGHT & COKE CO. Fr. 651,605, Oct. 27, 1927. In treating gases contg. CO, such as coal gas, with adsorbent agents such as active charcoal for the removal of hydrocarbons, the adsorption is carried out in Cu-, or Zn-lined vessel to avoid the formation of Fe carbonyl which reduces the efficiency of the charcoal.

**Water gas.** CALEB DAVIES, JR. U. S. 1,712,983, May 14. The fuel bed of a water-gas generator is blasted with air supplied through a highly heated heat-transfer chamber, the blast gas is discharged to heat a second heat-transfer chamber and air is supplied for combustion; steam is then passed through the second heat-transfer chamber and to the fuel bed of the generator so that the ash of the latter is maintained at a temp. which will effect slagging; hot water gas is discharged from the generator through the first-mentioned heat-transfer chamber and the fuel bed is then blasted with air passed through the heat-transfer chamber and hot products are thence passed through fuel for the generator.

**Water gas.** H. NIELSEN and B. LAING. Brit. 299,485, May 28, 1927. Heat is first stored in a chamber contg. brickwork or the like and powdered carbonaceous material and steam are then passed through the chamber. Air may be admitted with the steam and CO present converted catalytically to  $\text{CO}_2$  in the presence of steam, the  $\text{CO}_2$  being then removed to obtain a mixt. of H and N suitable for  $\text{NH}_3$  synthesis.

**Carbureted water gas.** P. DVORKOVITZ. Brit. 299,482, April 27, 1927. See Can. 285,091 (C. A. 23, 960).

**Apparatus for generating water gas from powdered fuel.** J. PINTSCH A.-G. Brit. 299,421, Oct. 26, 1927. Hot water gas from the producer serves, in an assoc. drying and distg. app., to dry and distil the fuel while it is in circulation in the water gas, and steam generated while drying the fuel is used in the generator. Various structural details are described.

**Producing water gas and quenching coke.** J. PINTSCH A.-G. Brit. 299,315, Oct. 21, 1927. Coke is first subjected to a hot air blast and then passes downwardly (in an app. which is described) and is treated with quenching water which produces steam and the latter passes through the superposed body of coke and forms water gas. Cf. C. A. 23, 1741.

**Apparatus for the recovery of heat in water-gas plant.** FRANKFURTER GASGESELLSCHAFT and FRANZ REICHARD. Fr. 651,638, Mar. 19, 1928.

**Mixed coal gas and water gas.** FREDERICK D. MARSHALL. U. S. 1,713,189, May 14. Coal is fed under mech. pressure through a plurality of passages into a vertical carbonizing retort and is carbonized under mech. pressure to produce coal gas and coke. The coke is passed into a water-gas generator and blasted with air to produce blow gas and the latter is passed in heat-interchange with air; the blow gas and heated air are then mixed and are burned externally to heat the carbonizing retort. Alternately, steam is passed downwardly through the heated coke in the water-gas generator to form water gas; the water gas is cooled by heat exchange with water in a steam boiler and steam is thus generated for the water-gas production. The water gas and coal gas produced as described are mixed with each other. Various details of app. are described.

**Lighting gas.** DEMETRIO FUTACCHI. Fr. 650,961, Mar. 17, 1928. H for lighting gas is obtained by passing gases contg. CO and  $\text{H}_2$  such as industrial gas, and steam over Fe turnings or waste at a temp. of 650–750°, and eliminating  $\text{CO}_2$ . Gases obtained by cracking heavy oils may be added.

**Hydrocarbons and alcohol from natural gas.** HYLEMAN A. WEBSTER (one-half to Everet T. Schuler). U. S. 1,711,913, May 7. An app. is specified comprising 2 retorts, to one of which a portion of the gas is supplied while the other retort is heated by the other portion of the gas; connections are provided for supplying steam alternately to the retorts and for supplying air alternately with the steam supply, and a catalyzer chamber is connected to the retorts and supplied with gases from them.

**Gas producer.** FRIEDRICH A. G. D. VAN VLAARDINGER and JACOB VAN VLAARDINGER. Fr. 650,481, Mar. 6, 1928. A producer suitable for distg. inferior quality fuel, particularly waste wood, is described.

**Vertical gas-retort construction.** C. H. LANDER and J. F. SHAW. Brit. 299,201, Nov. 11, 1927. In a metal vertical retort for low-temp. carbonization of coal, the horizontal section has its opposite sides parallel and the retort is of such shape that the rate of increase of its cross-sectional depth (and if desired also its width) is greater toward the discharge end than near its upper end. Brit. 299,202 also relates to the construc-

tion of similar retorts, the lower end of the retort being connected with the duct leading to the coke extractor by a joint permitting relative motion between the retort and duct and the lower part of the retort being of such a cross-section that when expanded by heating it will not have a larger cross-section than that of the adjacent part of the discharge duct. Various other structural details are described.

**Exhaust motor gases.** DEUTSCHE GASGLÜHLICHT-AUßER-GESELLSCHAFT M. B. H. Fr. 650,786, Mar. 12, 1928. The exhaust gases from internal-combustion motors are passed over oxidation catalysts to convert them into  $\text{CO}_2$  and water.

**Distilling tar.** C. WESSERL. Brit. 299,290, July 24, 1928. The process for distg. tar and recovering naphthalene as described in Brit. 273,675 (C. A. 22, 2049) is modified by first heating the tar indirectly to  $180^\circ$  to drive off water and light oils, then discontinuing the original indirect heating while the naphthalene is distd. off with steam injected at a temp. of about  $215^\circ$ . The process may be carried out continuously by passing the tar from one vessel to another in which the 2 sep. stages of distn. are conducted.

**Dehydration and distillation of tar.** THE BARRETT CO. Fr. 650,770, Mar. 12, 1928. Tar is dehydrated by direct contact with the hot gases from coal-distn. retorts. The coal gases may be used at such a temp. that partial distn. of the tar takes place, the gases being passed through condensers to recover the vaporized oils which may be returned to the tar. Cf. C. A. 22, 4779.

**Apparatus for purifying tar used in gasometers.** KONRAD JAGSCHITZ and PAUL M. KUHN. Fr. 651,627, Mar. 9, 1928.

**Coke from lignite.** CHEMISCH-TECHNISCHE-GESELLSCHAFT M. B. H. Fr. 651,013, Mar. 28, 1927. Coke in pieces is obtained by drying lignite, mixing it intimately with emulsions of bituminous substances such as coal-tar pitch or asphalt, with or without sulfite cellulose pitch, placing the mixt. in thick layers and coking. The lignite treated with emulsions may be partly or wholly dried before coking.

**Horizontal coke ovens.** C. OTTO & CO. G. M. B. H. Fr. 651,644, Mar. 23, 1928

**Coke ovens and gas retorts.** ANTON WEINDEL. Fr. 651,114, Mar. 22, 1928  
Construction and arrangement of canals for the distn. products.

**Combined cooling and quenching apparatus for coke.** KOHLENSCHIEDUNGS-GEH. M. B. H. Ger. 475,282, Dec. 17, 1926.

## 22—PETROLEUM, LUBRICANTS, ASPHALT AND WOOD PRODUCTS

W. F. FARAGHER

**Lubricating oils.** J. TAUSS AND M. DREIFUSS. *Petroleum Z.* 24, 1383-1412 (1928).—The lubricating properties of various oils as shown by marginal angles of oils on metal surfaces, by the surface tension of oils and their temp. functions, and by viscosity measurements in small capillaries are studied. The detn. of marginal angles according to the method of Von Dallwitz has no significance in detg. the character of oil or the choice of the bearing metal. The surface-tension-temp. function of oils between  $20^\circ$  and  $100^\circ$  was detd. by the capillary method; in this temp. range it is almost linear. Mol. wt. of oils cannot be detd. from surface-tension measurements according to the equation of Eötvös-Ramsey-Shields but if the mol. wt. is known the value of  $K_s$  can be detd. and hence the crit. temp. and the b. p. of viscous oils. The ratio of surface tension to mol. wt. decreases with the dielec. const. of the oils. Viscosity detns. by means of capillary tubes were unsatisfactory because of friction in narrow capillaries and, therefore, the decrease in an oil layer subjected to a load between two highly polished metal surfaces of the same or different metals has been measured. Dielec. consts. of various oils are reported which, compared with the refractive index  $n_D$ , show that the value of a lubricating oil varies inversely with the value  $\sqrt{K} - n$  at the highest viscosity.

**Fundamental research program.** H. S. TAYLOR. *Oil & Gas J.* 27, No. 42, 120 (1929).—Review of the results so far obtained in the Am. Petroleum Inst. research projects.

**Midcontinent refining problems.** FRED PADGETT. Univ. Oklahoma. *Oil & Gas J.* 27, No. 42, 148, 248, 250(1929).—Some of the technical problems confronting the oil refiner are reviewed briefly.

**Developments in refining petroleum in 1928.** H. W. CAMP. *Refiner Natural Gasoline Mfr.* 8, No. 3, 66(1929); *Oil & Gas J.* 27, No. 40, 30, 106(1929).—Important developments during the year are the increased use of continuous-treating methods;

recovery of treating agents; better boiler-house practice; production of dry and superheated steam and feed-water treatment; installation of high-pressure boilers in connection with bleeder-type turbines which generate electricity at practically no added cost; use of water-cooled furnace walls; and the use of acid sludge as fuel. The general trend in liquid-phase cracking is toward larger units. The pipe still has been adapted to continuous vacuum distn. M. B. HART

Who laid the foundations of the petroleum industry in Poland? J. PFANHAUSER. *Przemysl Chem.* 13, 102-6(1929).—Rzaczynski in 1721 described the properties of petroleum from the foothills of the Carpathians. Other 18th-century references to petroleum in Poland are mentioned. Ignacy Lada Lukasiewicz constructed the first kerosene lamp in 1852 while engaged in his pioneer expts. on distg. petroleum. This date is a year before Silliman's similar independent expts. in the U. S. The paper is largely a bibliography of the work of Lukasiewicz, with portrait. A. C. ZACHLIN

Refining of petroleum distillates. A. E. DUNSTAN. Anglo-Persian Oil Co. *Oil & Gas J.* 27, No. 42, 169, 175(1929).—Soda washing eliminates  $H_2S$  from the oil but mercaptans are not removed completely. Distn. of the spent soda gives some of the mercaptans, but some are oxidized to disulfides by Na polysulfides. M. B. HART

High-pressure fractionation responsible for liquid petroleum gas. GEORGE REID. *Refiner Natural Gasoline Mfr.* 8, No. 2, 63-4(1929).—The Skelly Oil Co.'s high-pressure fractionation system is described briefly.  $C_4H_{10}$ -free gasoline, practically pure  $C_4H_{10}$ , and "Skelgas" (liquefied  $C_4H_{10}$ ) are produced. M. B. HART

Cracking light oils at low pressure. GUSTAV EGLOFF. *Oil & Gas J.* 27, No. 42, 151, 241(1929).—Light cracking stock of  $39.5^\circ$  A. P. I. and I. B. P.  $350^\circ$  F. from Pennsylvania crude oil when cracked at a pressure of 220 lbs./sq. in. produced over 65% of finished gasoline. Complete data on runs and products from a com. plant are given. M. B. HART

Washing heavy cracked naphthas with soap gives good color. D. F. GERSTENBERGER. *Natl. Petroleum News* 21, No. 8, 61, 64, 66(1929).—Pressure distillate is distd without steam to promote aging and to reduce the amt. of acid needed for treating. The treated distillate is rerun with fire and steam. The bad color of some heavy naphtha, caused mainly by the breaking down of certain S compds. during the final distn., can be improved by treating the distillate in the vapor phase with "Seafoam," a soap made by the Palmolive-Peet Co. It is claimed that the soap soln. remains flocculent in the gas oil; it is drained from the tank. M. B. HART

Survey of gravities of domestic crude oils. G. R. HOPKINS AND A. B. COONS. *Bur. of Mines, Circ.* 6114, 26 pp.(1929).—The av. gravity of the crude petroleum produced in the U. S. in 1927 was  $32.2^\circ$  A. P. I., sp. gr. 0.864, as compared with  $32.0^\circ$  A. P. I. for 1921. New Mexico crude oil had an av. gravity of  $48.5^\circ$ . The Casmalia field, Santa Barbara County, Calif., produced an oil of 6.8 gravity or 1.023 sp. gr. The straight-run gasoline in 1927 formed 24% of the total crude run. The weighted av. S content for 78 samples of crude oil analyzed was 1.16% as compared with 1.90% for West Texas. A Cat Canyon crude oil, Santa Barbara Co., Calif., contained 4.13% of S; an oil from Greybull field, Big Horn Co., Wyo., showed only 0.08%. Tables of data for crude oils by fields are given, which include gravities, yields, posted prices, and gasoline and S content. E. E. CRANDAL

Special processing of coking crude oils. G. W. CUPP, JR. *Refiner Natural Gasoline Mfr.* 8, No. 2, 59-63(1929).—General procedure in running crude oil to coke is described. M. B. HART

Comparison of Midcontinent crude oils. SIDNEY BORN. *Transcontinental Oil Co. Oil & Gas J.* 27, No. 44, 34, 139(1929).—A comparison of the cost of producing and refining crude oil from Pecos County, Texas and a typical 30-gravity Midcontinent crude oil indicates that the Texas field has an advantage because of its closeness to Gulf ports. The points of greatest difference in the crude oils are a larger kerosene yield, and a high content of lubricants of low cold test in the Texas crude oil. The gasoline from it has also a higher content of aromatic and naphthene compds. M. B. HART

Distillation of Crane County crude oil. J. W. NEWTON AND W. W. LEACH. *Magnolia Petroleum Co. Oil & Gas J.* 27, No. 42, 100(1929).—During the distn. of a regular charge of the crude (960 bbls.) contg. about 3 tons of S, approx.  $1/2$  comes off as  $H_2S$ . The S content of the heavy ends of the gasoline is high. The S contents of various cuts of gas and oil are tabulated. M. B. HART

Refining value of Hendricks crude oil. C. K. FRANCIS. *Oil & Gas J.* 27, No. 42, 147, 245-6(1929).—A complete workup of Hendricks crude oil with various methods of treatment and analysis of the products. The general properties of the oil are: gravity

30.4° A. P. I.; color, brownish green; odor,  $H_2S$ ; S, 1.518%; sediment, trace; pour, below 0° F.;  $H_2O$ , none. Products obtained on distn. with steam were: 25% of gasoline of 54.8° A. P. I., I. B. P. 116° F., and E. P. 436° F.; 5% of kerosene of 39.0° A. P. I., flash 156° F., fire 176° F., 15% of gas oil, 31.9° A. P. I., flash 120° F., fire 225° F.; 27% of lubricating oil distillate of 26.4° A. P. I., flash 100° F., fire 190° F.; 27% of fuel oil of 12.6° A. P. I., flash 410° F., fire 545° F. Treatment and analysis of products, including cracked gasoline and blended fuels, are given. M. B. HART

**Oil-field emulsions.** I. LESTER C. UREN. Univ. Calif. *Natl. Petroleum News* 21, No. 13, 51-2, 54, 56-7(1929).—The fundamental phys. and chem. nature of oil-water emulsions is discussed. Analyses of typical California oil-field emulsions are given showing gravity, emulsion, free and total water content. M. B. HART

**Treating emulsions without cost.** R. VAN A. MILLS. *Oil & Gas J.* 27, No. 49, 45, 150(1929).—Cut oil in the Tonkawa field is treated with the brine from the well at its natural temp. of about 90° F. The oil enters at the top of a sepg. tank into a flume made from gasoline drums welded together after removing the heads and rises from the bottom of the flume through the warm brine. Clean oil overflows from the tank. Excess brine is removed through a gooseneck overflow. M. B. HART

**Aromatizing shale oils by cracking.** N. WEIDERPASS. *Sitzb. Naturforsch. Ges. Univ. Tartu* 34, 143-53(1927).—An Estonian shale-oil distillate b. 200-300° was cracked in a tinned-iron tube at 600°, 700° and 750°. The cracked oils were fractionated. A pressure of 18 mm. was used for temps. above 150°. The benzene, toluene and xylene fractions were sepd. by distg. through a Hempel column contg. Pt-wire gauze. Benzene was detd. by nitrating the benzene fraction after treating with  $H_2SO_4$  (d. 1.84). The percentage of benzene was also calcd. from the gravities of benzene, the benzene fraction, and the nonaromatics present, by assuming the last to be 0.720. PhOH was detd. by heating the fraction b. 175-185° with  $BzCl$  under a reflux condenser. Naphthalene was sepd. from the 185-220° fraction by freezing; the percentage of anthracene in the 310-360° fraction was obtained in the same way. EMMA F. CRANDAL

**Measurement of the interfacial tension between mineral oils and aqueous solutions—influence of temperature and  $p_H$ .** H. WEISS AND E. VELLINGER. *Compt. rend.* 188, 901-3(1929). H. R. MOORE

**Measurement of the interfacial tension between mineral oils and aqueous solutions—influence of the degree of refining and degree of alterations of the oils.** H. WEISS AND E. VELLINGER. *Compt. rend.* 188, 1099-1101(1929).—Cf. preceding abstr. H. R. MOORE

**Distillation apparatus in use in natural gasoline manufacture.** J. E. KOBERNICK. *Oil & Gas J.* 27, No. 41, 132, 146(1929).—The history of the development of app. for distg. fat absorption oil is reviewed. M. B. HART

**Control in continuous distillation.** C. E. MASON. Foxboro Co. *Oil & Gas J.* 27, No. 42, 153, 154, 157(1929).—Flow controllers and liquid-level controllers are considered to be necessary to ensure uniform quality of vapor from towers. M. B. HART

**Treating pressure distillate.** W. R. HOUNSELL. *Oil & Gas J.* 27, No. 43, 31, 147-8(1929).—Pressure distillate after treatment with 7 lbs. of  $H_2SO_4$  per bbl. and removal of the acid sludge is treated with ammoniacal  $Cu(OH)_2$  soln., settled, and the sludge withdrawn. Gasoline produced by this method is claimed to be of uniform quality. M. B. HART

**Establish specifications for special grades of motor fuel.** C. E. KERN. *Oil & Gas J.* 27, No. 44, 34(1929).—Proposed specifications for U. S. Government motor gasoline and "Motor Fuel V" are given. M. B. HART

**N. Y. state specifications for gasoline.** ANON. *Oil & Gas J.* 27, No. 47, 148(1929).—Specifications effective June 1, 1929 are given. M. B. HART

**Summary analysis of gasoline.** A. MENUCCI. *Bole. informaciones Petroliferas (Buenos Aires)* 6, No. 53, 7-10, 12-14, 16-18, 20-22 and 23-6(1929).—A discussion of the Chavanne and Simon method as adopted by the war ministry of France for examn. of automotive fuels, and of the Egloff and Morrell method, rejected as unsuitable for aviation gasoline. A new analytical method is described. E. I. S.

**Rectification of gasoline fractions.** H. D. WILDE, BRIAN MEAD AND S. P. COLEMAN. *Oil & Gas J.* 27, No. 42, 102, 172(1929).—The air-equil. method of detg. vapor pressure is described and its application in refinery operations discussed. M. B. HART

**Treating gasoline at Columbian plant located at Lefors.** G. G. QUINN. Columbian Gasoline Corp. *Oil & Gas J.* 27, No. 44, 132, 139(1929).—The hypochlorite treating plant operated by the Columbian Gasoline Corp. at Lefors, Texas, is described. M. B. HART

**Continuous treating system.** G. REID. *Refiner Natural Gasoline Mfr.* 8, No. 3,

102(1929).—In the Cushing Refg. & Gasoline Co. plant gasoline and kerosene are sweetened by pumping a mixt. of the oil and a soln. of Ca hypochlorite through a pipe coil which discharges into settling tanks. The treating agent may be recirculated until it becomes spent.

M. B. HART

**Oxidation of paraffin hydrocarbons.** G. EGLOFF AND R. F. SCHAAD. *Oil & Gas J.* 27, No. 43, 156, 173-4(1929).—From the amts. of the various paraffin hydrocarbons in com. fuel gases, it is calcd. that  $2 \times 10^{13}$  cu. ft. of  $\text{CH}_4$ ,  $\text{C}_2\text{H}_6$ ,  $\text{C}_3\text{H}_8$  and  $\text{C}_4\text{H}_{10}$  are available for conversion into oxidation products such as alcs. It is estd. that 21 billion gallons of  $\text{CH}_3\text{OH}$ , 5 billion gallons of  $\text{C}_2\text{H}_5\text{OH}$ , 2.5 billion gallons of  $\text{C}_3\text{H}_7\text{OH}$  and 1.7 billion gallons of  $\text{C}_4\text{H}_9\text{OH}$  could be made from these gases. Research problems in this field are listed.

M. B. HART

**Mixture ratio in rating motor fuels.** JOHN M. CAMPBELL, WHEELER G. LOVELL AND T. A. BOYD. General Motors Corp. *Oil & Gas J.* 27, No. 42, 111, 161(1929); cf. *C. A.* 22, 4782.—In rating fuels as to knocking tendency it is important that the mixt. ratio be controlled as accurately as possible. The carburetor should be adjusted for each fuel to give the mixt. ratio that causes the max. degree of knocking. M. B. H.

**Knock ratings of pure hydrocarbons.** A. W. NASH AND DONALD A. HOWES. Univ. of Birmingham. *Nature* 123, 526-7(1929); cf. *C. A.* 23, 2561. Polemical with Birch and Stansfield (*C. A.* 23, 2813). N. and H. point out that their anti-knock values for trimethylethylene and for diamylene are based on volume percentages whereas B. and S. express theirs as weight percentages. Errors in measurement of anti-knock values arise from lack of attention to air-fuel ratios. Pentene-2 and trimethylethylene resemble cyclohexene in forming peroxides on exposure to air and light.

ARTHUR FLEISCHER

**Many advantages in centrifuge method of making bright stock.** J. T. YOST. *Oil & Gas J.* 27, No. 40, 156, 160, 162(1929).—At the Pure Oil Co. the Sharples process is used for the dewaxing of cylinder stock. A close-cut naphtha having an end-point of 380-400° F. is the diluent used. Advantages of this method over cold settling are a saving of naphtha and increased yield of bright stock of improved quality.

M. B. HART

**Liquid sulfur dioxide in refining.** ROBERT L. BRANDT. *Oil & Gas J.* 27, No. 42, 119, 167, 268, 270(1929).—The Edeleanu process as applied to lubricating oils, kerosene and engine distillate is described. Costs are given.

M. B. HART

**Test decolorizing value of clays.** C. F. BARB. Colorado School of Mines. *Oil & Gas J.* 27, No. 42, 116, 161, 163(1929).—The results of phys. and chem. tests on 21 samples of clays selected from a variety of sources are presented. The chief difference in the compn. of filtering and nonfiltering clays seems to be in the percentage of  $\text{Al}_2\text{O}_3$ , 15% being the max. compatible with efficient filtering. The efficiency for animal fats seems to depend on the CaO content. Acid-treated clays, however, appear to improve with decrease in alk. salts; hence a definite statement cannot be made. High kaolin content indicates a low decolorizing efficiency. Acid treatment may change a clay worthless as mined into a good decolorizer.

M. B. HART

**Determination of detonation ratings.** G. G. BROWN. Univ. of Mich. *Oil & Gas J.* 27, No. 41, 156, 158, 160, 162(1929).—The value of a motor fuel depends on its knock rating and volatility. The former can be detd. satisfactorily only in some kind of engine test, which should be checked by actual road tests. The methods used in testing fuels at the automotive lab. of the Univ. are described and results obtained with various fuels are shown in the form of graphs.

M. B. HART

**Single-flash units reduce costs and increase yields.** FOSTER WHEELER CORP. ENGINEERING DEPARTMENT. *Oil & Gas J.* 27, No. 42, 116, 164, 167(1929).—Typical installations are described briefly. The flexibility of the stills is shown by data from several methods of distg. a crude oil.

M. B. HART

**New inhibitor discovered for protective pipe coatings.** H. K. IHRIG. *Oil & Gas J.* 27, No. 42, 266(1929).—"Inhiburine," a new inhibitive primer recently acquired by Hill, Hubbell & Co., contains an inhibitor which is sol. in bitumens and in the solvent of the bituminous primer but insol. in  $\text{H}_2\text{O}$ . The inhibitor is a stable coal-tar product, basic in reaction.

M. B. HART

**Manufacture of lubricating greases by pressure method.** E. N. KLEMGARD. *Refiner Natural Gasoline Mfr.* 8, No. 3, 68(1929).—There are at least 4 grease plants in the U. S. now using the pressure method in preference to the open-kettle method. One of these plants has made approx. 30,000,000 lbs. of cup grease in the last 5 years by this method with entirely satisfactory results. The advantages of the process are (1) uniform batches; (2) loss of batch practically eliminated; (3) the process may be standardized readily so as to be handled by inexperienced operators; (4) cooking re-

quires at least 2 hrs. less time and there is no guesswork as to when sapon. is complete; and (5) one 5- or 6-bbl. soap kettle can produce sufficient base for 20 or 30 open-type grease mixers. A formula for making medium cup grease is given. M. B. HART

Progress in grease manufacture. RALPH R. MATTHEWS. *Battenfield Grease & Oil Co. Oil & Gas J.* 27, No. 42, 148, 246(1929).—Scientific lubrication calls for compounded greases prepd. for special uses. A new type of pressure-gun grease made from naphthenic acids and Al stearate is recommended. M. B. HART

The lubrication of air compressors. H. M. DAVID. *Mech. World* 85, 324-5 (1929). E. I. S.

Transformer insulating oils. W. E. WARNER. *Power House* 23, No. 5, 35(1929).—Causes and removal of asphaltic sludge are discussed. E. I. S.

Selecting transformer oil. H. HEYDEN. *Elektrizitätswirtschaft* 28, 14-9(1929). E. I. S.

The testing of transformer oils. K. TYPKE. *Elektrotech. u. Maschinenbau* 47, 357-62(1929). C. G. F.

Inspection and testing of transformer oil. O. S. HOCKADAY AND D. B. McDONALD. *Gen. Elec. Rev.* 32, 243-6(1929).—A detailed description of the methods of sampling and testing. Samples of oil in transformers of smaller size than 300 kva. are tested twice yearly; oil in larger transformers is tested quarterly. The oil-testing set is illustrated. W. H. BOYNTON

Reclaiming gasoline-engine oils. CHARLES VAN BRUNT. *Gen. Elec. Rev.* 32, 266-7(1929).—A machine has been marketed which uses concd. silicate of soda and a strong blast of air for evapg. the diluent from the running oil that flows in a thin film over corrugated electrically heated plates. The silicate corrects the acidity and removes all solid matter and other deleterious products of oxidation, forming a dense and heavy sludge, that settles rapidly and completely from the oil into a body of water. The water flows constantly, flushing the sludge, which is oil-free, into the drain. These arrangements make possible an automatic, continuous process. Many oils require an addn. reagent to promote the peculiar effect. Outstanding features of the machine, which is illustrated, are its automatic action and the negligible labor charge. W. H. B.

Fluidity and other properties of aviation engine oils. E. R. LEDEKER AND F. R. STALEY. *Texas Pacific Coal and Oil Co. J. Soc. Automotive Eng.* 24, 149-54(1929).—A general discussion of the fluidity or consistency of aviation-engine oils below their A. S. T. M. pour points and the significance of dewaxing paraffin-bearing oils. Small quantities of wax in lubricating oil change the pour test, the effect becoming more pronounced at low temps. A wax reduction of 0.20%, which changes the pour point by 2° F., lowers the temp. at which the oil changes from a plastic liquid to a plastic solid from +10 to -10° F. Comparative fluidities of various kinds of aero oils and corresponding oils from Coastal, California, Pennsylvania and Ranger crude oils are given. M. B. HART

What the oil man should know about airplane oils. C. M. LARSIN. *Petroleum Age* 23, No. 3, 26-7, 50(1929).—Tests conducted with various airplane lubricating oils indicate that fluidity has no definite relationship to viscosity times pour test. Furol viscosity and Greiner charts fail to indicate what an oil will do in actual service. M. B. HART

Standard engine for fuel tests. SUBCOMMITTEE ON DETONATION OF THE S.A.E. *J. Soc. Automotive Eng.* 24, 212-3(1929).—Exptl. knock-testing engine and regulations for testing are given as developed by the committee. M. B. HART

Cutting and quenching oils. C. H. HUDSON. *Mech. World* 85, 249-51; *J. Junior Inst. Eng.* 39, 215-23(1929).—A general article. E. J. C.

Comparative merits of oil and pulverized coal. EDWIN COLE. *Petroleum Times* 21, 235-6(1929).—A comparison of oil and pulverized coal for marine use shows that oil furnishes more B. t. u.'s per lb. than coal, gives higher boiler efficiencies, requires a smaller boiler-room staff, is fueled more readily, frees more storage space, and has been shown to be reliable. Although pulverized coal may supplant hand-fired coal in cargo steamers, it is not likely that it will replace oil in warships and fast liners. M. B. HART

Methods in refining roofing asphalts. W. W. PETERS. *Beacon Oil Co. Oil & Gas J.* 27, No. 42, 113, 163(1929).—Specifications of typical asphalts and general refining methods are given. M. B. HART

Pseudocumene derivatives from pyroligneous acid. BROR HOLMBERG. *Tek. Högskolan, Stockholm. Svensk Kem. Tid.* 40, 304-15(1928).—On redistg. the liquors from a local (Perstorp) pine-spruce charcoal plant, a cryst. mass formed in the condensers when the MeOH content had decreased 70%. The material was isolated by steam



distn. Colorless prisms, m.  $69^{\circ}$ , were obtained, which proved to be 5-pseudocumylacetone, a new chem. compd. Strong reduction changed this substance to  $\text{MeCH}_2\text{CH}_2\text{C}_6\text{H}_5\text{Me}$ , b.  $-226^{\circ}$ ,  $d_4^{20} = 0.887$ ,  $n_D^{20} = 1.5095$ ; mild reduction gave the corresponding secondary alc., m.  $74^{\circ}$ , as was checked by the Ph urethan, m.  $-115.5^{\circ}$ . A soln. of 5-pseudocumylacetone in glacial AcOH was added in small portions to a soln. of  $\text{Br}_2$  in AcOH cooled by ice water. A large excess of the  $\text{Br}$  soln. was added and the whole evapd. The substance formed was  $\text{MeCOCBr}_2\text{C}_6\text{H}_5\text{Br}_2\text{Me}$ . This  $\text{Br}$  deriv. was recrystd. from warm alc., giving needles almost as fine as hair, m.  $-116^{\circ}$ . Some durylic acid was also formed by oxidation with  $\text{Br}$  in  $\text{NaOH}$  soln. Treatment with alkali in alc. yielded unidentified resins. Grignard reagent gave  $\text{Me}_3\text{COHCH}_2\text{C}_6\text{H}_5\text{Me}$ , m.  $-45^{\circ}$ . This product was checked by synthesis. The yellowish oil from which the Perstorp crystals had been removed was dissolved in 0.5 N  $\text{NaOH}$  and then satd. with  $\text{CO}_2$ . Crystals, m.  $-95^{\circ}$ , which proved to be 6-pseudocumenol, not heretofore identified in wood distillates, were obtained.

A. R. ROSE

The formation and source of acetic acid and other volatile organic components of pyroligneous liquor. C. PADOVANI AND F. B. BURRAI. *Ann. chim. applicata* 19, 22(1929).—After reviewing previous work on the subject, the authors show that digesting wood pulp with weak alkalies gives a yield of AcOH (4–5%) almost equal to that obtained by pyrogenetic decompn. After this max. yield is obtained, no more is obtained except by the action under pressure of very strong alkali; the addnl. yield is obtained, evidently, by action on the cellulose of the plant. The AcOH is, therefore, present originally as a decomposable ester.

A. W. CONTIERI

The recovery of alkali extracts resulting from the industrial delignification of Tripoli woods. C. PADOVANI AND E. SALMOIRAGHI. *Ann. chim. applicata* 19, 23–45 (1928).—The exts. from the lixiviation with  $\text{Cl}_2$  of Tripoli wood when heated in an autoclave at temps. up to  $350^{\circ}$  at pressures above 200 atm. undergo a kind of "cracking," most of the org. matter charring. On decanting, clarified exts. are obtained that contain AcOH. From 100 parts of wood, the yields are:

	(from leaving plants)	coniferous	straw (i. e., bamboo, etc.)
AcOH	5.7	8.11	7
MeOH	1.8–2.4	1.6–2	1.4
$(\text{CH}_3)_2\text{O}$	0.3	0.3	—

A large variety of trees native to Tripoli were examd.

A. W. CONTIERI

The variation of viscosity with temperature. II. C. WALTHER. *Chem. Lab. f. Handel u. Ind.*, Berlin W 35. *Erdöl u. Teer* 4, 526–8(1928).—The formula proposed in Part I (C. A. 23, 316) was applied to several typical Russian and American oils. With the latter, the temp. factor ( $M$ ) was found to be the same (0.58) in every case but one. With the Russian oils, it was found to decrease (from 0.588 to 0.516) with increasing viscosity or sp. gr. Conclusions are drawn with reference to the valuation of the oil and the detn. of its source.

F. S. GRANGER

Fractional distillation analyses (PODBIELNIAK) 1. Skin lesions among tar workers (Wood) 21. Drying or destructive distillation apparatus (Ger. pat. 466,925) 1. Filtering material [for hydrocarbon oils] (U. S. pat. 1,713,250) 18. Condenser for cracked oil (U. S. pat. 1,712,825) 1. Hydrogenation (Fr. pat. 650,974) 21. Electrical treatment of hydrocarbons (Ger. pat. 474,740) 4. Apparatus for pumping fuel oils (U. S. pats. 1,712,694–5) 1. Cooling pan for pitch, asphalt, etc. (Ger. pat. 475,028) 1. Apparatus for heat treatment of oils (U. S. pat. 1,712,372) 1. Distillation of oils (Fr. pat. 651,127) 21. Gas washer suitable for extraction of hydrocarbons from gas and vapor mixtures (Brit. pat. 239,481) 1. Separating hydrocarbon mixtures (Fr. pat. 650,972) 10.

Petroleum spirit. WM. M. KNOWLING (Michael Kostevitch, inventor). Fr. 651,641, Mar. 23, 1928. Petroleum spirit is purified by passing it through glaucol in the cold, the spirit may also be passed through active charcoal and active  $\text{SiO}_2$  gel. All these may be metallized with Cu, Ni, Pt, etc., in a finely divided state. Cf. C. A. 23, 1259.

Refining crude petroleum oils. ARTHUR LACHMAN (to Richfield Oil Co. of Calif.). U. S. 1,712,960, May 14. The oil is treated with  $\text{H}_2\text{SO}_4$  at a temp. slightly above atm. temp. and decanted from the resulting acid sludge, and is then subjected to a treatment at a higher temp. (suitably about  $170^{\circ}$ ) with  $\text{H}_3\text{PO}_4$  and again decanted from acid sludge formed; and the remaining acid in the oil is then neutralized (suitably with  $\text{NaOH}$ ) and the neutralizing agent is removed by washing with water.

**Cracking hydrocarbon oils.** JOSEPH F. DONNELLY. U. S. 1,712,789, May 14. A mass of relatively heavy oil is heated to a cracking temp. under sufficient pressure to prevent vaporization (suitably in a pipe coil) and the heated oil is discharged, before the cracking reaction reaches the condition where free C would be formed, into a zone of lower pressure and the cracking reaction is checked in the lower pressure zone, before it reaches the stage of free C formation, by introduction of cooler hydrocarbon oil. An arrangement of app. is described.

**Cracking hydrocarbon oils.** ROBERT E. WILSON (to Standard Oil Co. of Ind.). U. S. 1,712,187, May 7. Heavy oil such as a heavy distillate oil is subjected to distn. under 4-6 atm. pressure and at a conversion temp. and the distn. is continued until substantial conversion of the oil is effected and the unvaporized oil reaches an asphaltene content not exceeding 0.4%; unvaporized oil is removed while at conversion temp. and forced through a heated confined passage in which it is heated to 425° or higher and is discharged into a conversion chamber in which no substantial reduction in temp. of the oil is permitted; vapors and unvaporized oil are separately withdrawn from the conversion chamber. An app. is described.

**Cracking hydrocarbon oils.** HERMANN WOLF (to Carburul A.-G.). U. S. 1,711,869, May 7. Oil such as a "middle oil" is forced through a tortuous path, *e. g.*, a pipe coil, under pressure, in heat-interchange relation with a body of washing oil and thence through a further tortuous path in which it is heated to a cracking temp.; the pressure on the cracked product is then reduced and its velocity of flow thus accelerated and the expanded and rapidly flowing material is introduced into the body of washing oil, heating the latter and cooling the cracked products below the temp. at which after-reactions would take place; fresh washing oil is aspirated into the body of washing oil by the action of the flow of cracked products; vapors are dephlegmated and recovered, and products of higher b. p. are returned to the process. An app. is described.

**Use of a hypochlorite in cracking hydrocarbon oils.** HENRY BLUMENBERG, JR. U. S. 1,713,252, May 14. A metal hypochlorite such as Al, Zn, Na, K, Mg, Fe or Cu in dry form is added to a mineral oil such as crude or topped oils or distillates and the material is then heated to a cracking temp. to obtain products of lower b. p.

**Refining hydrocarbon oils.** HARRY K. IHRIG (to Associated Oil Co.). U. S. 1,712,619, May 14. Vapors of hydrocarbon material such as a Calif. oil distillate are brought into intimate contact with a heated mixt. of hydrated lime 1 and crude Fe oxide 3 parts, in order to remove corrosive impurities.

**Refining hydrocarbon oils.** JENÖ TAUSS. Ger. 475,277, Dec. 1, 1923. The hot oil or oil vapor is treated with very small amts. of O in order to accelerate the polymerization of the resin-forming constituents, the polymerization products being then removed. Other means of accelerating the polymerization may be additionally applied, *e. g.*, a glow discharge, irradiation or addn. of small amts. of acids or alkalies.

**Apparatus for distilling hydrocarbon oils.** ALFRED SCHWARZ. U. S. 1,713,149, May 14. U-shaped imperforated tubes extend from the top downwardly into a still and are provided with connections for supply of hot gases for heating the body of oil under distn. Various structural features are described.

**Distilling hydrocarbon oils.** DAVID G. BRANDT (to Heat Treating Co.). U. S. 1,713,254, May 14. Oil such as crude petroleum is passed upwardly through a series of zones of increasing temp. (in an app. which is described) and inert gas is passed upwardly through the oil; the oil and gas passing from the uppermost of these zones are further heated and unvaporized liquid from this latter heating stage is passed downwardly through the first-mentioned heating zones, while gas and vapors from such heating stage are passed upwardly through the heating zones; a portion of the vapors is condensed in each of the heating zones and the condensates are separately passed down through the cooler zones. U. S. 1,713,255 and U. S. 1,713,256 relate to similar processes and app. for use in carrying out the process.

**Retort for destructive distillation.** OTTO HELLMANN. Ger. 470,490, May 1, 1927. Addn. to 467,845 (C. A. 23, 1249). Structural improvements are described in destructive distn. retorts of the kind comprising an enclosed annular moving platform which carries the material to be distd.

**Cracking and hydrogenating oils.** PETROLEUM PROCESS CO. Brit. 209,347, June 13, 1927. Oils are passed, after heating, in counter current to a flow of heated gas such as steam, the mixed gases are reheated in a sep. chamber and finally passed upward through a stream of crude oil. Various details of app. and procedure are described.

**Cracking mineral oils.** WILLIAM G. LEAMON. Fr. 651,015, Mar. 19, 1928. Vapors from mineral oils are heated to a temp. somewhat above that desired for cracking, but

travelling at such a speed that little cracking takes place, and are led into a chamber contg. contact substances such as amorphous and colloidal forms of  $\text{SiO}_2$ , pumice stone, etc., in which cracking takes place at a temp. not above  $600^\circ$ . The vapors are freed from undesirable high b. p. constituents before being heated. An app. is described.

**Distillation of mineral oils.** THE PURE OIL CO. Fr. 650,343, Feb. 1, 1928. Oils are drawn through a heated tubular distn. vessel and the vacuum at the point of outlet extends toward the entry, at least to the point where "cracking" would take place under ordinary pressure.

**Separating water and solids from oil.** JOHN C. DEACON (to Standard Oil Co. of Calif.). U. S. 1,713,117, May 14. Oil contaminated with water and solids is continuously discharged upwardly through a body of water on the surface of which a scum is formed so that the oil passes through the scum and into a zone above it. Solids are added to the scum by the contaminated oil under treatment and other solids absorb water and settle to the bottom of the body of water from the scum; water is withdrawn from beneath the scum as it accumulates, and the oil which has filtered upwardly through the scum is continuously withdrawn. An app. is described.

**Filter for lubricating oil of internal-combustion engines.** R. P. F. LIDDELL (to Motor Improvements, Inc.). Brit. 299,434, Oct. 26, 1927. Structural features.

**Hydrogenating carbonaceous material.** MAX HOFSSÄSS. U. S. 1,711,499, May 7. Carbonaceous material such as Mexican crude oil, coal tar or oil sand is heated under pressure with H in the presence of hydride of anthracene and its homologs to a temp. (suitably about  $500^\circ$ ) at which the H in the hydride becomes unstable, in order to produce light liquid motor fuels.

**Separating oils from solid substances.** I. G. FARBENIND. A.-G. Fr. 650,573, Mar. 8, 1928. Oils, particularly those obtained as residues of "cracking" or hydrogenating operations, are sepd. from solid substances contained in them by mixing them, preferably with heat, with a liquid in which the oil is not sol. and the surface tension of which is such that the adhesion between the oils and the solids is decreased, after which the sepn. can be effected in any way. Water, to which wetting or emulsifying agents, such as sulfonic acids or Turkey red oil, and salts such as  $\text{CaCl}_2$  are added, may be used.

**Mineral wax.** A. RIEBECK'SCHE MONTANWERKE A.-G. Fr. 650,421, Mar. 5, 1928. Wax is deresinified and then extd. in the presence of decolorizing powder. Solvents used are mono- and poly-hydric alcs., e. g.,  $\text{AcOEt}$  or glycol monomethyl ether or ketones, e. g., butanone. Examples are given.

**Purifying paraffin.** WERSCHEN-WEISSENFELSER BRAUNKOHLEN-A.G. Ger. 475,313, Aug. 28, 1926. Paraffin is purified and its fastness to light is improved by treating it with decolorizing agents and radiations of short wave length together or in turn. O may be supplied during the irradiation.

**Rectifying and refining benzine.** GALICYJSKIE TOWARZYSTWO NAFTOWE "GALICJA" Sp. Akc. and HUGO BURSTIN. Ger. 475,227, Apr. 3, 1924. The benzine is vaporized and the vapor is led through a series of adsorbers contg., e. g., active charcoal and maintained at successively decreasing temps. Different fractions are adsorbed in the different adsorbers and are recovered therefrom in known manner.

**Chlorinating benzine.** INTERNATIONAL FIREPROOF PRODUCTS CORP. Fr. 650,738, Mar. 10, 1928. Benzine is chlorinated by 1st treating it to remove heavy oils and then bringing it into contact with Cl in the presence of a catalyst such as  $\text{AlCl}_3$  or  $\text{FeCl}_3$ .  $\text{C}_6\text{H}_5\text{Cl}$  is given as representing the gasoline and  $\text{C}_6\text{H}_5\text{Cl}_2$  the chlorinated compd.

**Viscous oils.** I. G. FARBENIND. A.-G. Fr. 650,799, Mar. 13, 1928. Viscous oils suitable as lubricants are obtained by acting on tars or mineral oils or their fractions b. beyond  $150^\circ$  with lower olefins such as  $\text{C}_2\text{H}_4$ ,  $\text{C}_3\text{H}_6$  and  $\text{C}_4\text{H}_8$  with heat and in the presence of condensing agents such as  $\text{AlCl}_3$ ,  $\text{ZnCl}_2$  and  $\text{Fe}_2\text{Cl}_6$ . The action of the condensing agents is increased by the addn. of salts such as a chloride of Hg or U.

**Treatment of bituminous sands.** KARL A. CLARK (to The Governors of the University of Alberta). Can. 289,058, Apr. 23, 1929. A process of sepg. bitumen from sand, silt or clay consists in mixing the compd. with a reagent (as soaps, silicate of soda, alkali and alk. salts), introducing the mixt. to a large body of hot water in small amts at a time with agitation from below the surface of the water, thereby sepg. the bitumen, adding an electrolyte to the wash to prevent coalescence of the sepd. bitumen with the sand, silt or clay and effecting flocculation of the reagent with the sand, silt or clay and recovering the bitumen from the surface of the wash water.

**Separating hydrocarbon polymers from crude alcohol mixtures.** SYLVAN R. MERLEY (to Doherty Research Co.). U. S. 1,713,346, May 14. In order to sep. hydrocarbon polymers from alc.-acid mixts. and alkyl sulfate mixts. such as may be produced from cracked petroleum products, the mixt. is dild. with water and the polymers are

absorbed from the dil. mixt. by a purified water-insol. straight-chain hydrocarbon material and the latter and assoc. polymer are removed before the mixt. is distd.

**Apparatus for recovery of gasoline from natural gas or similar mixtures.** HAROLD B. BERNARD (to Sinclair Oil and Gas Co.). U. S. 1,713,323, May 14. Various structural details of an absorption, distn. and dephlegmation system are described.

## 23—CELLULOSE AND PAPER

CARLETON E. CURRAN

**Future possibilities in the utilization of cellulose.** CHARLES H. HERTY. *J. Chem. Education* 6, 829-45(1929). E. H.

**Lignin and cellulose.** IX. Cellulose. KARL FREUDENBERG. Univ. Heidelberg *Ber.* 62B, 383-6(1929); cf. *C. A.* 23, 276.—Hess, after abandoning the view that cellulose is made up of monoglucosan units held together by forces which cannot be described according to the rules of the old doctrine of valence, now holds to a cellobiosan unit, his strongest argument being that cautious acetolysis of cellulose gives nearly quantitatively a hexaacetylbian. \*F. has repeated his expts. with K. Friedrich and found that the prepn. pptd. with MeOH has a varying Ac content (generally corresponding to that of a hexaacetylbian, to be sure). When, in order to remove the org. solvent, the prepn. is pptd. from Me<sub>2</sub>CO with much H<sub>2</sub>O and carefully dried, it regularly contains about 1% more (45.8%) Ac than the calcd. value for an acetylbian. The substance is therefore not a biosan but a polysaccharide with an av. chain length of 10-16 members. H. has already acknowledged that his "biosan" reduces Fehling soln to about the same extent as 1/8 its wt. of glucose, a fact confirmed by F. and F.; and since cellobiose has, as might be expected, not only 1/2 but more than 2/3 the reducing power of glucose, a polysaccharide of 10-16 glucoses might well have 1/8 the reducing power of glucose. After the glucosan, the biosan too must therefore be abandoned as the unit of cellulose. Lignin, like cellulose, is built up of primary valence chains

C. A. R.

**Hydrophilic properties of cellulose fibers after strengthening.** L. MEUNIER AND R. GUYOT. *Compt. rend.* 188, 506-8(1929).—The optimum conditions for viscose strengthening are 12 hour soaking in an aq. HCHO soln. (concn. greater than 5%), with a  $p_H$  between 1.6 and 1.2, preferably obtained from H<sub>3</sub>PO<sub>4</sub>. By an increasing degree of strengthening, the % swelling in pure H<sub>2</sub>O, the elongation at the rupture point, the absorption of substantive dyes or tannins, and the hydrometric water decrease, while the resistance toward alkalies and the tensile strength increase. The mechanism of strengthening is regarded as follows: (1) The influence of acids causes a partial transformation of cellulose into hydrocellulose, whereby the number of OH groups is increased (2) Evaporation concentrates the acid to a point where it becomes an active catalyst for the formation of methylenic derivs. (3) Two OH groups belonging to different chains react with HCHO. (4) The action of HCHO does not remain confined to the surface but penetrates deeply.

ALBERT L. HENNE

**Changes in nitrocellulose when exposed to light.** V. COFMAN AND H. B. DEVORE. *Nature* 123, 87(1929).—The observation by Rayleigh (*C. A.* 23, 3081) that celluloid contg. malachite green (I) becomes red when exposed to sunlight is explained by the fact that N oxides liberated from the nitrocellulose (II) convert I to a red coloring material. The wave length most effective (per quantum absorbed) in causing acid decompn. of II is about  $\lambda = 3100$  A. U., which does not correspond to the greatest absorption power of II.

FREDERICK C. HAIN

**New English patents relative to the viscose artificial silk industry.** WILHELM A. DYES. *Kunststoffe* 19, 30-4(1929).—A detailed résumé of the English patents issued in 1925 and 1926 which deal with the viscose artificial silk industry. In each instance the no. of the patent with a summary thereof is given.

B. HAMILTON

**The difficulty of mass production of homogeneous hydroacetylcellulose of better viscosity for acetate silk.** WILHELM A. DYES. *Kunststoffe* 18, 272-4(1928).—A résumé of the history of the manuf. and properties of cellite, and an exposition of the economic situation, with especial reference to the competition and the financial results thereof among the various firms engaged in acetate silk manuf.

B. HAMILTON

**Development tendencies in the acetate silk industry.** RICHARD FLINT. *Kunststoffe* 18, 275-9(1928).—An exposition of the economic phases of the acetate silk industry, with the inclusion of the interrelations existing among the firms engaged in the manuf. of acetate silk.

B. HAMILTON

**Carbohydrate changes in the course of sulfite cellulose cooking.** ERIK HÄGG-LUND and TORSTEN JOHNSON. Wood-chem. Inst., Abo. *Svensk Kem. Tid.* 41, 55-9 (1929); cf. *C. A.* 23, 2569.—In German. In a wood digestion run giving a cellulose yield of 49.7% the glucose equiv. of the liquors by direct reduction was 12% of the wood dry wt., which increased 3% by acid hydrolysis. This liquor was treated successively with  $\alpha$ -naphthylamine, norite and charcoal, then digested with chalk, again clarified, concd. and pptd. with alc., giving Ca salts at 8.3 g. per 100 g. wood. The Ca salts repptd. contained 9.6% Ca, 9.3% calcd. for  $\text{Ca}(\text{C}_6\text{H}_{11}\text{O}_7)_2$ . The presence of some pentose is assumed as the cause of the high Ca percentage. The Ca was quantitatively removed as oxalate and the filtrate clarified and concd., set aside 6 weeks for mannonic acid lactone to crystallize. No crystals formed. Phenylhydrazide crystallizes; m. 215°,  $(\alpha)_D^{20} = -10^\circ$ , N 9.52%. Brucine salt, m. 204°,  $(\alpha)_D^{20}$  27.4°. The Bertrand xylonic acid reaction gave characteristic  $\text{CdO}_2\text{R}\cdot\text{CdBr}_2$  crystals. Mannonic and xylonic acids have been identified in sulfite cellulose liquors. A. R. ROSE

**Generation of steam and power in sulfite cellulose factories.** L. MALM. *Ing. Vetenskaps Akad.* (Stockholm), No. 91, 57 pp. (1928). E. I. S.

**Problems of the forest products investigation.** H. WISLICENUS. *Z. angew. Chem.* 41, 1312-6 and 1345-51 (1928).—An address dealing with reforestation and wood-treatment technic. ALBERT L. HENNE

**Coöperation of the university with industry with special reference to pulp and paper.** H. K. BENSON. *J. Chem. Education* 6, 846-51 (1929). E. H.

**Bergmann turbines for paper and pulp industry.** H. FIELITZ. *Bergmann Mitteilungen* 7, No. 1, 10-4 (1929). E. I. S.

**Causes and prevention of deterioration in book materials.** ROBT. P. WALTON. *Bull. New York Public Library* 1929, 39 pp.—A compilation of abstracts. E. J. C.

Cellulose structure and direct dyeing (MEYER) 25.

GREIFFENHAGEN, ERICH: **Kunstseide. Vom Rohstoff bis zum Fertigfabrikat.** Berlin: L. Schottlaender & Co. 115 pp. Linen, M. 4.

HÖSSLE, FRIEDRICH VON, KORN, MOSEL, FRIEDRICH, OFFERMANN, E. and WALTER, LUDWIG, E.: **Technik und Praxis der Papierfabrikation. Band I. Roh-, Halb- u. Ganzstoffe d. Papierfabrikation. Tl. 1. Die Geschichte des Papiers, die Roh- und Halbstoffe der Papierfabrikation mit Ausnahme des Holzzellstoffes.** Berlin: O. Elsner 276 pp. M. 26.

PFÄU, JOHANNES: **Musterbuch der deutschen Papier-Erzeugung, 1928.** Biberach Riss: Güntter-Staib. 536 pp. Linen, M. 18.50.

**Alkali cellulose.** JEAN LAMASSIAUDE. Fr. 643,902, April 15, 1927. The ripening chamber is composed of a series of parallel isothermal tunnels the dimensions of which are reduced to that necessary to allow the wagons contg. the material to pass. Fr. 643,903 describes an app. for making alkali cellulose in which wood pulp in rolls is passed through the necessary baths, the soda being circulated inversely.

**Cellulose.** ERNEST C. H. VALET. Fr. 650,194, Feb. 29, 1928. Cellulose is sepd. from sugar-cane bagasse by treating the bagasse under pressure with a soln. of quick lime, running off the soln. and treating with NaOH soln. contg. KOH and finally adding  $\text{Na}_2\text{SO}_3$ . A final treatment with a weak soap soln. may be given. Cf. *C. A.* 23, 512.

**Preparing cellulose for acetylation.** I. G. FARBERIND. A.-G. Brit. 299,512, July 28, 1927. Cellulose in the form of paper sheets is preliminarily treated with glacial HOAc and may then be rolled up and fed continuously into an acetylating bath.

**Cellulose esters of organic acids.** HARRY LEB. GRAY (to Eastman Kodak Co.). U. S. 1,711,940, May 7. In processes such as that of treating cellulosic material with an acetylating liquid, the mixed materials are subjected to a vacuum to remove entrapped air preliminary to the esterifying reaction. U. S. 1,711,941 specifies a process in which cellulosic material to be esterified is mixed *in vacuo* with an inert volatile org. liquid vehicle such as  $\text{CHCl}_3$  or ether having dissolved in it the acylating agent, e. g.,  $\text{Ac}_2\text{O}$ , for the reaction and also carrying a catalyst such as  $\text{H}_2\text{SO}_4$  and  $\text{H}_3\text{PO}_4$ , evapg. the volatile vehicle *in vacuo* and then breaking the vacuum and effecting esterification.

**Stabilizing cellulose acetates, etc.** I. G. FARBERIND. A.-G. Brit. 299,326, Oct. 22, 1927. Unstable cellulose acetates and other acylcelluloses are rendered stable by treatment with a hydrolytically acting agent such as dil. aq. or alc.  $\text{H}_2\text{SO}_4$  at atm. pressure and at a temp. not exceeding 100°.

**Flexible sheets of cellulose acetate composition.** RUDOLF ROLAND (to Roland Fire-

proof Celluloid Corp). U. S. 1,713,482, May 14. Sheets or films suitable for automobile curtain windows are formed of a compn. comprising acetyl cellulose 25, alc. 25, PhCl 10,  $C_2H_5Cl$  10, benzyl benzoate 10, triacetine 10 and dichlorohydrin 10 parts.

**Cellulose xanthogenate.** I. G. FARBENIND. A.-G. Fr. 651,060, Mar. 20, 1928. Impurities are eliminated from cellulose xanthogenate by  $CH_3OH$  to which water is added in such an amt. that the solvent power for the impurities is increased and swelling of the xanthogenate is avoided. The purification is carried out as rapidly as possible at a low temp., and the solvent is eliminated by pressing, all other drying being avoided.

**Threads, films, filaments, etc., from cellulose derivatives.** ALFRED LANDUCCI (to Du Pont-Pathe Film Mfg. Corp.). U. S. 1,713,289, May 14. A cellulose deriv such as nitrocellulose or cellulose acetate is dissolved in a suitable org. solvent and formed into the desired shape; coagulation is effected in an aq. bath to obtain a more or less opaque product, which is then rendered transparent by a hot air drying. Cf. C. A. 22, 1237.

**Desulfurization of viscose products.** I. G. FARBENIND. A.-G. Fr. 650,882, Mar. 15, 1928. The residual solns. coming from the purification of cellulose xanthogenate are used as solvent for the S pptd. on viscose articles. The solns. may be concd or dried and then taken up with solvents. The solns. may be used with other known desulfurizing agents. Cf. C. A. 23, 1750.

**Artificial silk.** I. G. FARBENIND. A.-G. Fr. 650,513, Mar. 6, 1928. The total output of a spinning machine spinning fine threads is maintained by providing at each spinning point 2 nozzles separately supplied with soln. The bundles of threads are kept sep., being led over double thread guides and wound on sep. spools.

**Artificial silk.** I. G. FARBENIND. A.-G. Fr. 650,862, Mar. 14, 1928. A silk of small total titer (*e. g.* 120 deniers and below) is obtained in "pot" spinning by choosing the diameter of the centrifuge so that the centrifugal force is sufficiently great to use spinning pots of diameter greater than the usual 160 mm., the speed of rotation being appropriate to the desired twisting.

**Artificial silk.** I. G. FARBENIND. A.-G. Fr. 651,006, Mar. 19, 1928. Threads, ribbons, etc., of viscose silk having a finely notched surface, are obtained by adding traces (not more than 0.1%) of a Zn salt, preferably  $ZnSO_4$ , to the pptg. bath.

**Artificial silk.** ERNEST C. H. VALET and OTTO FUNK. Fr. 651,491, Mar. 19, 1928. Cellulose produced from sugar-cane bagasse is used as starting material for the solns. for making artificial silk. The cellulose may be obtained as described in Fr 620,897.

**Apparatus for spinning artificial silk.** THOMAS W. HOLT. Fr. 650,595, Mar. 8, 1928. Construction and mounting of the spinning box or "pot" are described.

**Valve construction for nozzles for spinning artificial silk filaments from solutions.** BRITISH CELANESE, LTD., and J. BOWER. Brit. 299,405, July 26, 1927.

**Adhesive for fabrics, fibers, paper, etc.** ANNELESE RASCH, JOHANNES RASCH and IRENE RASCH. Ger. 475,038, July 25, 1920. Sulfite cellulose lye with its initial content of bases or after addn. of bases is evapd. to a sirup of sp. gr. 1.30-1.35.

**Chemical wood pulp.** DONALD B. BRADNER (to Champion Coated Paper Co) U. S. 1,711,584, May 7. Raw cellulosic material such as wood is digested in a cooking liquor contg.  $Na_2SO_3$ , forming sulfite pulp and waste sulfite liquor; the sulfite pulp is digested in an alk. cooking liquor contg. Na sulfide to form a pulp with a high content of  $\alpha$ -cellulose and waste alk. liquor; raw cellulosic material is digested with the waste alk. liquor to form a sulfate pulp and waste sulfate liquor.

**Wood pulp.** HOWARD F. WEISS (to Bauer Bros. Co.). U. S. 1,711,706, May 7. After satn. with water, the satd. material, in the presence of water, is subjected to the rolling and crushing action of 2 oppositely and concentrically revolving disks under pressure to sep. the fibers.

**Apparatus for pulping and beating paper stock.** WALTER WERNER (to Noble & Wood Machine Co.). U. S. 1,712,598-9, May 14. Structural features.

**Apparatus for making paper.** ROBERT E. ARGY. U. S. 1,712,374-5, May 7.

**Paper-making apparatus.** B. A. MALKIN. Brit. 299,236, Jan. 16, 1928. Structural features.

**Paper-making apparatus.** WILLIAM E. SHEEHAN. U. S. 1,712,587, May 14. A web carrier is used in the form of an endless belt of non-woven pounded felt such as may be produced by fulling an endless belt of carded wool.

**Paper for stencil sheets.** S. HORII. Brit. 299,520, July 29, 1927. Japanese stencil paper is made by subjecting the bast tissue to the wet beating process until the degree of wetness reaches 40 to 60 beating units by the Schoper-Riegler beating

tester. The paper may be coated with a compn. comprising waxes, gelatin or cellulose esters together with tempering agents. Cf. C. A. 23, 1229.

**Pattern effects on waxed paper.** ELSMORE D. LAKE. U. S. 1,711,953, May 7. A paper sheet is treated with a hot wax which normally renders the sheet transparent; certain areas of the sheet are cooled and other areas are subjected to pressure at the moment of cooling. An arrangement of app. is described.

**Glassine paper.** CHARLES E. SWETT (to U. S. Envelope Co.). U. S. 1,712,178, May 7. One surface of glassine paper is treated to reduce glare (suitably by aq.  $\text{CaCl}_2$  soln.) and the other surface is treated to increase transparency, e. g., by use of tannic acid and terpin hydrate.

**Glossing paper.** SIEBENHIRTNER CHEM. INDUSTRIE-WERK G. M. B. H. Fr. 651,273, Mar. 23, 1928. A glossy or satin surface is obtained on paper by adding saponified stearin and salts of heavy metals to the crude paper pulp. In an example, stearin saponifd. with  $\text{NaOH}$  or  $\text{KOH}$ , and  $\text{ZnSO}_4$  with sufficient  $\text{K}_2\text{SiO}_3$  or  $\text{Na}_2\text{SiO}_3$  to give the necessary consistency are used.

## 24—EXPLOSIVES AND EXPLOSIONS

CHARLES E. MUNROE

**Thermodynamic consideration of explosive reactions.** ALBERT SCHMIDT. Z. ges. Schiess- u. Sprengstoffw. 24, 41-6, 90-3(1929).—Methods are given for calcg. for a given explosive its heat of explosion, compn. and vol. of gases of explosion at that temp., and the explosion pressure, when the heat of formation and stoichiometric compn. of the explosive are known. The methods described are particularly applicable to explosives having a deficiency of O. The calcd. heat of explosion is somewhat lower than that detd. in the calorimetric bomb. Nitroglycerin, nitrocellulose and TNT are taken as examples for calcn.

C. G. STORM

**Experiments with explosive gas mixtures.** PAUL H. PRAUSNITZ. Oesterr. Chem.-Ztg 32, 63-4(1929).—Glass filters were used as a means of preventing the propagation of explosions in gaseous mixts. Wire gauze is liable to burn through and permit explosions whereas glass filters are not subject to this hazard. Filters with pore diam. about 0.1 mm. were safe with coal gas-air mixts., less efficient with H-air mixts., and not at all effective with H-O mixt. Tubes and filters of quartz were somewhat better than those of glass, and are recommended for use in expts. upon the combustion of gaseous mixts., as valves to prevent the spread of the burning gases.

W. C. E.

**Typical accident hazards caused by inflammable gas mixtures.** C. C. CUSTER. Nat. Engr. 33, No. 1, (pp.) 13-6(1929).

E. I. S.

**Explosibility of atmospheres behind stoppings.** H. F. COWARD. Colliery Guardian 138, 1139-42(1929).—A stopping is a wall built across old workings in a mine to improve the airway or confine gas which is being evolved. The results of analyses of stopping atms. are given and a table has been prepd. giving the relative explosibility of all mixts. of  $\text{CH}_4$  with O and N. By analysis the components of the stopping atms. may be detected and detd. If  $\text{CH}_4$  is the only inflammable component the menace from the stopping mixt. alone, or in admixt. with air, may be read off from the table. If other inflammable components are present the relative explosibility may be found from calcns. as shown in the article.

CHARLES E. MUNROE

**The mechanism of the stabilization of powders containing nitroglycerin by means of diethyldiphenylurea.** H. LÉCORCHÉ AND P. L. JOVINET. Compt. rend. 187, 1147-8 (1928).—The mechanism of the stabilization is based upon the fact that any nitrous acid present is absorbed by diethyldiphenylurea to form ethylphenylnitrosamine. Presence of the latter compd. may be detected by testing with  $\alpha$ -naphthylamine-HCl.

L. B. MILLER

**Flame speeds and their calculation.** W. PAYMAN AND R. V. WHEELER. Fuel in Science and Practice 8, 4-9, 91-8, 104-14, 153-62, 204-19(1929).—P. and W. have deduced the "law of flame speeds" by which, with fair accuracy, the speed of flame in mixts. of air with several flammable gases may be calcd., provided that the speed of flame, under the same conditions, in mixts. of air with each gas singly is known. The observations upon which this law is based are summarized and existing data concerning the speed of flame are analyzed to show the extent to which the law is obeyed. Thirty-four figures and 50 tables are included.

D. A. REYNOLDS

**The normal flame speed of nitrogen-rich gases (producer gases, blast-furnace gas).** H. PASSAUG. Tech. Hochschule, Wien. Feuerungstech. 17, 7-8, 15-21,

28-31(1929).—In most cases, the speed was detd. by passing air and the gas, at accurately known rates, into a burner of known diam., and noting the area of the inner cone of the Bunsen flame (not sepd. from the outer). Where no stable flame could be formed in this way, it was formed in a vertical glass tube, the upward velocity of the gas-air mixt. being known, and the downward velocity of the flame being noted. The 2 methods agreed well. Explosive limits for upward and downward propagation were detd. in a vertical tube with spark in the middle. The *viscosity* of the mixts. was detd. in a Schilling sp. gr. app., the orifice being replaced by a capillary. Seventeen mixts. contg. 36-71%  $N_2$  were studied throughout the explosive range. Some were made in a small producer, some by mixing the pure gases. The max. speed observed was 91 cm./sec. for a mixt. of 41.0% CO, 20.4%  $H_2$  and 38.6%  $N_2$ . Speeds as low as 5 cm./sec were observed. The effect of the various constituents was not different from that noted with richer gases.

ERNEST W. THIELE

**Flame speed of hydrogen sulfide.** D. S. CHAMBERLIN AND D. R. CLARKE. *Lehigh Univ. Pub.* 3, No. 3, 5pp.(1929).—App. and method for detg. flame speed of  $H_2S$  in air by horizontal flame propagation are described. Flame records were made by a photographic method, gas being inflamed in 2.5-cm. glass tube, open at one end and 1 m. long. Max. flame speed was found to be 49.5 cm. per sec. on burning 10.8%  $H_2S$ .

E. I. S.

**The development of the match industry.** KARL DOPF. *Z. ges. Schiess- u. Sprengstoffw.* 24, 23-4(1929).—Historical and statistical.

C. G. STORM

DE RIGHT, ENRICO: Nitroglicerina, nitroglicol, nitrocellulose e applicazioni. Savona: Tip. Italiana. 29 pp.

RAABYE, C. Artilleri I. Sprængstoffer. Til Brug ved Undervisningen Specialklassens vaabentechniske Kursus og Arterillerikursus. Copenhagen: Haerens Officersskole 188 pp.

RYBA, GUSTAV: Handbuch des Grubenrettungswesens. Band I. Brände und Grubenexplosionen. Die Ursachen, d. Verhüttg. sowie d. Bekämpfung. dieser Ereignisse und ihrer Folgen. 302 pp. M. 20; Linen, M. 24.

SOHLMAN, RAGNAR AND SCHUCK, HENRIK: Nobel. Dynamite and Peace. Translated by Brian and Beatrix Lunn. New York: Cosmopolitan Book Corp. 353 pp \$5. Reviewed in *Ind. Eng. Chem.* 21, 611(1929).

Explosions of lacquer drying ovens (ANON.) 26. Ignition of combustible gas with 3-part spark (TERADA, *et al*) 21. The optical chronograph [for measuring velocity of detonation of explosions] (RUMPF) 1.

**Explosive.** J. THIECKE and H. HERZOG (to Minimax A.-G. and Deutsche Pyrotechnische Fabriken A.-G.). Brit. 299,396, Oct. 25, 1927.  $NH_4NO_3$  and blood charcoal (preferably in the proportions of 85 and 15, resp.) are mixed in a state of fine division to produce a self-combustible compn. suitable for the generation of heat, N gas or compressed gases for various purposes. Wood charcoal may be added.

**Explosives.** A. SEGAY. Brit. 299,462, Oct. 27, 1927. In forming explosives contg.  $NH_4NO_3$ , NaCl or KCl and trinitronaphthalene, a large proportion in trinitronaphthalene is used corresponding to the quantity of O in the mixt. and nitroglycerin or  $KClO_4$ , or both, also may be added; the nitroglycerin may be gelatinized or an absorbent such as sawdust may be added. Trinitrotoluene may be used instead of a portion of the trinitronaphthalene; *e. g.*, an explosive may be prepd. from  $NH_4NO_3$  59, NaCl 18, trinitronaphthalene 8, trinitrotoluene 5 and  $KClO_4$  10%. Cf. *C. A.* 23, 2036.

**Explosives.** EDMUND VON HERZ. Ger. 474,173, Oct. 6, 1927. The trinitrate of methyltrimethylolmethane,  $CH_3C(CH_2OH)_3$ , is used as an explosive or propellant. It is prepd. by condensing  $CH_2O$  with  $EtCHO$  in the presence of  $Ca(OH)_2$  and treating the product with  $HNO_3$  or nitrating acid. It is a viscous oil which remains liquid at  $-15^\circ$ , is more stable than nitroglycerin, and can be worked up into powd. or gelatinous products in the same way as nitroglycerin.

**Nitrocellulose smokeless powder.** ALAN S. HAWKESWORTH. U. S. 1,713,505, May 14. Mononitrotoluene is used for simultaneously drying, dissolving and stabilizing the nitrocellulose.

**Nitroglycerin nitroglycol, etc.** DYNAMIT-A. G. VORM. A. NOBEL & Co. (to A. Schmid and J. Meissner). Brit. 299,384, Oct. 25, 1927. A modification of the procedure for sepg. explosives of this character from residual acids resulting from their manuf. is described, generally similar to the process specified in Brit. 284,701 (*C. A.* 22, 4821).



**Detonating firework composition.** WILLIAM F. GEHRIG (to Essex Specialty Co.). U. S. 1,712,555, May 14. A non-hygroscopic compn. which gives successive detonations when ignited comprises a S-P compd. such as P sesquisulfide together with an oxidizing agent such as  $\text{KClO}_3$  and  $\text{MnO}_2$  and an inorg. binder formed of  $\text{MgO}$  and an alum, e. g., Cr K alum.

## 25—DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

**Advances in the realm of colors.** Z. PULAWSKI. Warsaw Polytech. *Przemysl Chem.* 13, 27–30, 149–53(1929).—Principally statistics on vat dyes, indigo and anthraquinone.

**Interesting sources of natural dyestuffs.** C. D. MELL. *Textile Colorist* 51, 329–32(1929); cf. C. A. 23, 2828.—A possible substitute for brazilwood is the tang tree from Borneo, known botanically as *Koompassia excelsa*. It is a very large tree of the bean family (Leguminosae) and therefore related also the logwood and certain other dye-yielding trees. Elderberry bushes as a source of dyes are discussed. Birch trees are valued more or less highly in many parts of the world as a source of tannin and dye.

**Testing dyestuffs for fastness.** NOEL D. WHITE. *Cotton* 93, 572–7(1929); cf. C. A. 23, 2574.—The testing of hosiery dyestuffs for fastness to crocking, milling and cross-dyeing are discussed from a practical standpoint.

**Testing, mixing and applying dyestuffs.** NOEL D. WHITE. *Cotton* 93, 203–5, 220(1928).—The first of a second series of practical articles on hosiery dyeing. Cf. C. A. 23, 709.

**Para red and its application.** J. STEPHEN HEUTHWAITE. *Textile Colorist* 51, 300–4(1929).—Paranitraniline red is a satisfactory substitute for Turkey red. It is fast to washing with soap and soda in hot water, perspiration and mineral acids, chemicking for bleaching purposes, and light and atm. influence. It is adversely affected by long boiling in alk. dye, boiling with dil. soln. of  $\text{H}_2\text{SO}_4$  or  $\text{NaHSO}_4$ , steaming under pressure, and solns. of Cu salts. Its application is described.

**2,4-Diaminodiphenylamine as an ursol dye.** P. P. KARPUGHIN. *Ukrainskii Khim Zhur.* 3, Tech. pt., 229–31(1928).—K. recommends 2,4-diaminodiphenylamine (I) for dyeing fur and leather. It is prepd. from 2,4-dinitrodiphenylamine (II) obtained by heating at  $75^\circ$  and stirring 1 mol. of  $\text{C}_6\text{H}_3\text{Cl}(\text{NO}_2)_2$  with 2 mols. of  $\text{PhNH}_2$  in presence of  $\text{H}_2\text{O}$ , expelling the excess of  $\text{PhNH}_2$  and filtering off the crystals of II, yield 100%. II is reduced to I with Fe and HCl, neutralized with  $\text{Na}_2\text{CO}_3$ , and after all Fe is settled, I is extd. with boiling  $\text{H}_2\text{O}$ , light brown needles. Russian muskrat skin, most difficult to dye, was degreased, then treated for 90 mins. at  $35^\circ$  with 200 cc. of liquor contg. 0.3 g. of I, 0.3 g. of AcOH and 10 cc. of 2.5% soln. of  $\text{H}_2\text{O}_2$ , for black dyeing. More dil. solus. with less  $\text{H}_2\text{O}_2$  give original yellowish brown dyeings (imitation of monkey fur). The skins mordanted with Cr salts give a black color with brown shading; Cu mordant gives deep black shades. I can also be used with a brush or a spray requiring several applications of treble strength. Chrome leather and unmordanted leather are colored in similar shades.  $\text{NaClO}_3$  can be used instead of perhydrol in equiv. amts. with addn. of traces of  $\text{VCl}_3$ . The skins dyed black without a mordant show a fastness to light of 2, dyed black with Cr mordant, 4; black with Cu mordant, 4.5; brown with Cr mordant, 2.

**The Donnan membrane equilibrium.** ALBERT P. SACHS. *Textile Colorist* 51, 225–9, 304–7(1929).—Such an equil. is shown to underlie the dyeing process.

**Cellulose structure and direct dyeing.** KURT H. MEYER. *The Melliand* 1, 76–9(1929); *Melliand Textilber.* 9, 573–5(1928).—Differences in affinity of the various com. cellulose fibers toward direct dyestuffs are explainable by x-ray data on the internal structure of the fibers, and shape and dimensions of the dye mol.

**The preparation, bleaching and dyeing of jute.** FRED. GROVE-PALMER. *Textile Colorist* 51, 322–6(1929).—General. Methods are described.

**Dyeing celanese drapery cloths with SRA colors.** R. G. DORT. *The Melliand* 1, 102–3(1929).—Dyeing recipes are given. The effects are quite fast.

**Obtaining good results in the one-bath process of hosiery dyeing.** L. J. MCGINTY. Wiscasset Mills, Albemarle, N. C. *Textile World* 75, 3307–9(1929).—Practical.

RUBY K. WORNER

**Salvaging hats by redyeing them.** GEORGE RICH. *Textile Colorist* 51, 307-(1929).—Methods are described. RUBY K. WORNER

**Thickeners for (textile) printing.** R. HALLER. *The Melliand* 1, 80-1(1929).—See C. A. 23, 2038. E. R. CLARK

**Printing with basic colors with emetic in one dye.** WACLAW KACZKOWSKI AND A. SMONBERG. Warsaw Polytech. *Przemysl Chem.* 13, 89-92(1929).—After proper purification glycerotannate gives with emetic a light yellow ppt., which can be dried at room temp., and produces correct colors. Addn. of a small quantity of oxidizing agent, and the use of various wetting agents, improve the brightness of the prints. Their fastness is normal, except that in laundering some are slightly weaker, and in tests on ironing somewhat better. A glycerol ester of antimonous acid, clear sirup of pale cream color,  $b_{30}$  180° was prepd. by treating 0.05 mol.  $Sb_2O_3$  with 0.2 mol. glycerol redistd. at low pressure, and heating the mixt. up to 210° for 2 hrs. A turbulent reaction with evolution of water vapor takes place at 200-5°. The ester is decompd. by water at room temp. with evolution of antimonous acid. A. C. ZACHLIN

**Coloring small glass beads and Christmas tree ornaments with aniline dyes.** WILHELM HANNICH. *Chem.-Ztg.* 53, 265-6(1929).— $H_2O$ -sol. aniline dyes are treated with  $H_2O$  and a colloid, such as gum arabic, gum tragacanth, albumin, gelatin, etc., placed in rotating drums, and thus deposited upon the glass objects to be colored. Freedom from Ca is a necessary condition to success in operating with many dyes. W. C. EBAUGH

**Use of direct illumination in microscopic examination of textiles.** ALOIS HERZOG. *The Melliand* 1, 2-7(1929); *Melliand Textilber.* 9, 832-5(1928); cf. C. A. 22, 4825 — The examn. of textiles by transmitted light is unnatural and wherever possible illumination from above should be preferred. Several low-power microscopes are available which are vastly superior to pick glasses for casual work. A no. of illuminating devices afford means for examg. textiles conveniently up to 150x. The uses of Lieberkuhn's mirror, the vertical illuminator and the Busch condenser are described and the effects obtained are illustrated. The German article contains some practical information about the *microscopy of paper*. The subject is extended by E. WYCHGRAM, *Melliand Textilber.* 10, 197-9(1929). E. R. CLARK

**The fiber plants of the Belgian Congo.** J. H. H. ROSS. *Faserforschung* 7, 180-94 (1929).—Cotton production is increasing and the quality is satisfactory. Kapok occurs natively. The flax produced is of inferior quality. *Raphia* is successfully cultivated. There is considerable local utilization of the fibers of *Boehmeria*; *Urena lobata*, *Triumfetta cordifolia*, *Cephalonema polyandrum*, *Sida rhombifolia* (Queensland hemp, denji fiber), *Hibiscus cannabinus* (African jute), konge-konge fiber, etc. Sisal production is being specially encouraged. E. R. CLARK

**Posidonia fiber.** A. HERZOG. *Faserforschung* 7, 199-201(1929).—*Posidonia* fiber is naturally retted from the sea-plant, *Posidonia australis*, found in the waters off southern Australia. The fiber is rather more lignified than jute and is not suited to fine enough division to make other than quite coarse yarns. The tensile strength is low. E. R. CLARK

**Cultivation of jute.** FR. BONSACK. *Faserforschung* 7, 133-76(1929).—The successful cultivation of jute demands an av. temp. above 24° for a period of 5 months, with av. monthly rainfalls increasing from 2 cm. to 75-100 cm. during the growing season. In north-eastern India, the desired climate is found together with low labor and transport costs, and it is quite unlikely that a profitable jute cultivation industry can be established elsewhere. E. R. CLARK

**Disease-resistant La Plata flax.** ALBERT BOERGER. *Faserforschung* 7, 177-89 (1929).—Increasing restrictions on the possibility of migration of flax culture in the Argentine, and efforts at the development of industries using flax straw, have made the study of wilt-resistant strains attractive. Several such have been developed commercially. E. R. CLARK

**Stains on piece goods.** L. L. LLOYD. *Wool Record* 35, 873-5(1929).—A lecture. The cause and removal of various stains occurring during the mfg. process are discussed. RUBY K. WORNER

**pH Control in the silk industry.** CHAS. E. MULLIN. *The Melliand* 1, 70-5(1929).—Control of pH is useful in almost all wet treatments of silk. E. R. CLARK

**Artificial silk soaking liquids.** S. R. TROTMAN. *Dyer, Calico Printer* 61, 48-9, 80(1929).—The use of "artificial silk soaking liquid" solves most of the difficulties of selecting a lubricant for rayon prior to knitting. Since these liquids contain no  $H_2O$ , there is no reduction of the tensile strength of the fiber. If properly prepd., no difficulties should arise in scouring or dyeing. The liquids consist of an acid soap dissolved

in a suitable org. solvent. The soap may be derived from an ordinary or a sulfonated oil; the solvent is generally a petroleum fraction, b. between 160° and 250°. Methods are described for detg. the nature and approx. compn. of these liquids, the flash point and the wetting power.

RUBY K. WORNER

**A qualitative test for degraded artificial silk.** O. S. RHODES. *J. Textile Inst.* 20, T55-6(1929).—A modification of Nessler's soln. for testing for oxycellulose is prepd. by dissolving 100 g. HgI<sub>2</sub> and 80 g. KI in 500 cc. H<sub>2</sub>O and adding 5 l. of 3 N NaOH soln. The mixt. is filtered through glass wool after standing overnight. Test samples are boiled (after removal of starch and other foreign matter) for 1 min. in the soln., rinsed with warm 1% KI soln., and finally washed with cold H<sub>2</sub>O. The presence of oxycellulose is indicated by a dark stain on a white background. With this treatment cuprammonium silk is not stained; viscose silk becomes light gray; undesulfurized viscose silk turns orange, then orange brown.

J. E. SNYDER

**Wool washing.** H. W. FAWCETT. *Wool Record* 35, 661-3, 667, 733-5, 739, 807 11, 881-3(1929).—Lecture and discussion. The Duhamel system of wool scouring by means of suint is described in detail. Its advantages over the usual soap scouring methods are pointed out.

RUBY K. WORNER

**Extraneous objects in cotton goods.** C. MARTINI. *The Melliand* 1, 40-6(1929).—See *C. A.* 23, 1274.

E. R. CLARK

**Control, computation, faults and tests in warp mercerizing.** JOHN H. SKINKLE. Lowell Textile Inst. *Textile World* 75, 3313, 3339(1929).—Common mercerization faults are too little luster, uneven dyeing, tender yarn, and harshness. Causes and remedies are suggested. Tests are described for detecting mercerization, detg. the strength of the caustic used, testing for oxycellulose or hydrocellulose, and testing for unneutralized acid in the yarn.

RUBY K. WORNER

**Soaps, solvents and detergents.** VERNON D. FREEDLAND. *Wool Record* 35, 1017-9, 1027(1929).—The selection of scouring reagents is discussed for raw wool and for wool yarn and piece goods.

RUBY K. WORNER

**Manufacture of rubberized cloth and attendant cloth dyeing problems (BYAM) 30.** Waste disposal in the textile industry (MÖLLERING) 14. Condensation products of aldehydes and phenols (Fr. pat. 651,646) 18. Adhesive for fabrics, fibers, etc. (Ger. pat. 475,038) 23. Amino and nitrodiaryl sulfides; dyes; etc. (Brit. pat. 299,501) 10. Benzanthranyl sulfide, etc. (U. S. pat. 1,712,646) 10. Textile fibers from shark skins, etc. (U. S. pat. 1,713,036) 29.

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**Dyes.** BRITISH DYESTUFFS CORP., LTD. Fr. 648,158, Feb. 3, 1928. The vat dyestuffs prepd. according to Brit. 29,352 (1910) by treating dibenzoyl-4,4' (or 4,5')-diamino-1,1'-dianthrimides with H<sub>2</sub>SO<sub>4</sub> are treated with oxidizing agents, such as NaOCl and Na perborate, or Na persulfate. The agents may be added to the reaction mixt. or to the isolated dye.

**Dyes.** I. G. FARBERNIND. A.-G. Brit. 299,511, July 28, 1927. Sulfuretted dyes dyeing cotton orange and yellow shades in a Na sulfide bath are made by heating benzidine and S with 2- or 3-nitro- or amino-4-acetylitoluidine.

**Azo dyes.** J. R. GRIGY, A.-G. Ger. 473,526, Aug. 7, 1927. Strongly basic azo dyes are prepd. from mono- or poly-azo dyes contg. one or more primary or secondary amino groups, by treating them successively with chloroacetyl chloride and tertiary or secondary aromatic bases or di- or tri-alkylamines of the aliphatic series. Thus, a diazo soln. of  $\alpha$ -naphthylamine is neutralized with AcONa and added to a soln. of *N*-pyridylacetyl-2,7-aminonaphthol in water, and crystd. AcONa. The dye produced colors cotton a fast blue-red. Other examples are given. A table of dyes prepd. in this way, and their colors in various dye baths, are given. Cf. C. A. 23, 2833.

**Azo dyes.** BRITISH DYE STUFFS CORP., LTD. Fr. 651,585, Mar. 23, 1928. See Brit. 294,284, C. A. 23, 2041.

**Azo dyes.** I. G. FARBENIND. A.-G. Fr. 650,312, Mar. 2, 1928. Azo dyes which are insol. in water are obtained by coupling a 2,3-hydroxynaphthoarylamine with a 4-aminodiphenylamine substituted in one or both rings by one or more alkyl or alkoxy or both groups, or by a halogen combined with one or more alkyl or alkoxy groups. A list of components and the colors obtained is given.

**Azo dyes.** I. G. FARBENIND. A.-G. Fr. 650,688, Mar. 9, 1928. Azo dyes are prepd. by coupling 4,4'-diaminodiphenyl-3,3'-dicarboxylic acid (I) or its derivs. in any order with an aryl-naphthylaminesulfonic acid or one of its derivs., and with an azo component which contains sulfonic, carboxylic or other groups which increase the soly in water, such as hydroxyl, amino or ketomethylene. In an example (I) is diazotized and coupled with 8-hydroxy-1-phenylaminonaphthalene-4-sulfonic acid in alk. medium in the presence of pyridine. The mixt. is heated to about 40°, salted out and dried, giving a black powder which dyes cotton blue; this becomes faster and more green by a final treatment with Cu salts. The dye derived from (I), 5-hydroxy-2-phenyl-naphthylamine-7-sulfonic acid and 1-hydroxynaphthalene-5-sulfonic acid dyes cotton reddish violet, and the dye from (I), 8-hydroxy-1-phenylaminonaphthalene-4-sulfonic acid and sulfoacetacet-*o*-anilide dyes cotton grayish blue.

**Azo dyes.** I. G. FARBENIND. A.-G. Fr. 650,778, Mar. 12, 1928. Diazo compds are coupled with components which have fatty acid radicals contg. arylhydroxy groups attached to the N atoms, or such radicals are introduced into the formed dyes. In examples, PhNH<sub>2</sub> is diazotized and coupled with Na 1-phenoxyacetyl-amino-8-hydroxynaphthalene-3,6-disulfonate in alk. medium. The product dyes wool in fast rose shades. PhNH<sub>2</sub> may be replaced by 2-aminobenzoic acid, 2-acetyl-amino-5-aminoanisole, 1-aminoacetanilide or *p*-xylidine, or these may be coupled with the 2(or 4)-chlorophenoxyacetyl, 2(or 4)-nitrophenoxyacetyl, 2-chloro-4-methylphenoxy- $\beta$ -propionyl or 1-(or 2)-naphthoxyacetyl derivs. of 1-amino-8-hydroxynaphthalene-3,6-disulfonic acid, or of the 1-ethylamino acid. The Na salt of the dye prepd. by coupling in acid medium 1 mol. of 4-nitro-1-aminobenzene-2-sulfonic acid with 1 mol. of 2-( $\omega$ -aminoethyl-amino)naphthalene-7-sulfonic acid is dissolved in water, Na<sub>2</sub>CO<sub>3</sub> is added and 2-chlorophenoxyacetic acid is added drop by drop with stirring and finally heating to 50°. The same dye which gives violet shades on wool may be obtained by prep. 2-[ $\omega$ -(2'-chlorophenoxyacetyl-amino)ethylamino]naphthalene-7-sulfonic acid and coupling it with diazotized 4-nitro-1-aminobenzene-2-sulfonic acid. 1-Aminobenzene-2,5-disulfo-*azo-p*-xylidine is diazotized and coupled with di-Na 1-(4'-chlorophenoxyacetyl-amino)-8-hydroxynaphthalene-4,6-disulfonate.

**Azo dyes.** I. G. FARBENIND. A.-G. Fr. 651,018, Mar. 19, 1928. Azo dyes are prepd. by coupling a diazo compd. of a dihalo-3-amino-1-toluene with a compd. capable of coupling and of dyeing vegetable fiber, *e. g.*, an arylamide of 2,3-hydroxynaphthoic acid. In an example, cotton is boiled in a liquid obtained by dissolving the 4-chloro-2-anilide of 2,3-hydroxynaphthoic acid in hot water with Turkey red oil and NaOH, cooling to about 50° and adding a little CH<sub>3</sub>O. The cotton is centrifuged and dipped for a min. in a soln. of diazotized 1-amino-2,4-dichloro-3-methylbenzene whereby a bright scarlet color is obtained. Several other examples are given.

**Azo dyes.** I. G. FARBENIND. A.-G. (Richard Stüsser, inventor). Ger. 475,341, Mar. 1, 1927. Azo dyes giving fast yellow shades on cotton and viscose silk are prepd. (a) by coupling sulfonic acids of 4,4'-diaminodiphenylurea or its derivs. with sulfonic acids of acetoacetic arylides, or (b) by converting *p*-aminosulfophenylazoacetoacetic arylidesulfonic acids into the corresponding urea, or (c) by coupling 4,4'-diaminodiphenylurea or its derivs. with unsulfonated acetoacetic arylides and sulfonating the product. In the examples, (1) 4,4'-diaminodiphenylurea-3,3'-disulfonic acid is tetrazotized and coupled with acetoacet-*o*-anilidesulfonic acid; (2) the monoazo dye from 4-nitroaniline-2-sulfonic acid and acetoacet-*o*-chloroanilide is sulfonated, reduced and the aminoazo compd. converted to the urea; (3) 5-nitro-2-anilidine-4-sulfonic acid is diazotized and coupled with acetoacet-*o*-anilidesulfonic acid; the product is reduced

with  $\text{Na}_2\text{S}$  and the aminoazo dye so obtained is treated with  $\text{COCl}_2$  to produce the urea. Cf. C. A. 23, 2041.

**Mono azo dyes.** WALTER DUISBERG, WINFRID HENTRICH and LUDWIG ZEH (to Grasselli Dyestuff Corp.). U. S. 1,711,930, May 7. Diazotized 2,4-dinitroaniline-6-sulfonic acid or other diazotized acid substituted dinitroaniline is combined with an acid substituted aromatic amine such as 2-amino-8-naphthol-6-sulfonic acid. Dyes thus formed are, in the form of their alkali metal salts, sol. in water and dye wool in an acid bath violet to blue shades fast to light and fulling.

**Dis- and poly-azo dyes.** I. G. FARBENIND. A.-G. Fr. 650,171, Feb. 28, 1928. Dis- and poly-azo dyes are prepd. by diazotizing or tetrazotizing amino- or diaminoazo dyes derived from arylenediaminecarboxylic acids, and coupling with any azo components, if necessary, in the presence of tertiary bases. The dyes may be diazotized again, either in substance or on the fiber and coupled with azo components, and the dyes obtained may be treated in substance or on the fiber with metal salts. Thus 5-nitro-2-aminobenzoic acid is diazotized and coupled in alk. medium with 2-amino-8-hydroxynaphthalene-6-sulfonic acid. The product is tetrazotized and coupled with *m*-phenylenediamine in alk. soln. The trisazo dye obtained dyes cotton green, and its fastness is increased by treatment with Cu salts.

**Blue tetrakisazo dyes for cotton.** HENRY JORDAN (to E. I. duPont de Nemours & Co.). U. S. 1,712,732, May 14. Blue tetrakisazo dyes for cotton are obtained by forming an intermediate by coupling a diazo compd. of a monoacyl-1,4-arylenediamine with an arylamine not contg. a free hydroxy group, diazotizing the intermediate, coupling the diazotized intermediate with 2-dinaphthylamine-5,5'-dihydroxy-7,7'-disulfonic acid and saponifying the product of the last-named coupling. The first components used in the process are the monoacyl-1,4-arylenediamines and their sulfonic acids. Among the suitable compds. which may be used are, *e. g.*, monoformyl-, monoacetyl- or monooxalyl-1,4-phenylenediamine, 2-acetyl-amino-5-aminoanisole, 2-oxalylamino-4-chloro-5-aminoanisole, 2-oxalylamino-4-methyl-5-aminoanisole and their sulfonic acids, monoacetyl-1,4-naphthalenediamine and its 6- or 7-sulfonic acid. As second components, comprising the amino compds. not contg. a free hydroxy group, there may be used, *e. g.*, *m*-toluidine, *p*-xylydine, cresidine, monoacetyl-*m*-toluylenediamine, 4-acetyl-amino-2-aminoanisole, other amino compounds of the benzene series suitable for another diazotization after having been coupled,  $\alpha$ -naphthylamine,  $\alpha$ -naphthylamine-6- or 7-sulfonic acid and  $\alpha$ -naphthylamine-2-methoxy-6-sulfonic acid. The dyes obtained by this process are, in their dry form, dark powders, dissolving in water with a reddish to greenish blue coloration, dyeing cotton from reddish to greenish blue shades, which on diazotizing and developing on the fiber with  $\beta$ -naphthol change only very little in color, but are remarkably increased in their fastness to washing. Those dyes having naphthalene derivs. as second components are superior, in their fastness to light, to the dyes having benzene derivs. as second components. The dyes are also characterized by their exceptional brightness. Several examples are given with details of procedure for making the dyes.

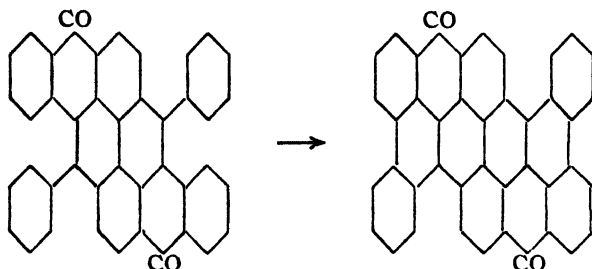
**Monoazo dyes of the pyrazolone series.** LEON W. GELLER (to National Aniline & Chemical Co.). U. S. 1,711,639, May 7. Dyes, giving orange-yellow to brown shades on wool in an acid bath changed to yellow-red to blue-red tints by after-chroming, and which are suitable also for making lakes or pigments, are formed by coupling diazo compds. of an *o*-aminonaphtholsulfonic acid, *e. g.*, 1,2-aminonaphthol-4-sulfonic acid or a similar compd. (which may contain a nitro group substituted in the naphthalene nucleus) with 1-aryl-5-pyrazolones of the benzene series which contain a sulfo group (and may also contain halogen as a substituent in the aryl nucleus), *e. g.*, 1-(4'-sulphophenyl)-3-methyl-5-pyrazolone (or 3-carboxylic acid). Cf. C. A. 23, 286.

**Vat dyes.** COMPAGNIE NATIONALE DE MATIÈRES COLORANTES ET MANUFACTURES DE PRODUITS CHIMIQUES DU NORD, RÉUNIES ÉTABLISSEMENTS KUHLMANN. Ger. 475,298, June 24, 1926. See Brit. 267,121 (C. A. 22, 1242).

**Vat dyes.** I. G. FARBENIND. A.-G. Fr. 651,152, Mar. 23, 1928. Vat dyes are obtained by condensing N-contg. dibenzanthrones, which have at least one active H atom attached to the N, with aromatic compds. contg. neg. substituents, preferably in the presence of high-b. p. solvents or diluents, and with or without catalysts and acid-binding agents. In examples, aminodibenzanthrone (from the  $\text{NO}_2$  compd. obtained by nitration of dibenzanthrone) is boiled with stirring for 15 hrs. in  $\text{PhNO}_2$  with  $\alpha$ -chloroanthraquinone,  $\text{NaOAc}$  and  $\text{CuCO}_3$ . The dye obtained is dissolved in  $\text{H}_2\text{SO}_4$  and pptd. with water. It dyes cotton in very fast shades from gray to black. Similar dyes are prepd. by condensing aminodibenzanthrone with  $\beta$ -chloroanthraquinone, dibromoanthanthrone (by brominating anthanthrone in the presence of halogen

carriers), trichloroanthraquinone-acridone, dibromoisodibenzanthrone, dichloro-*allo-ms*-naphthodianthrone (by chlorinating *allo-ms*-naphthodianthrone which is prepd. by alk. condensation of 2,2'-dimethyl-*ms*-benzodianthrone), tribromopyranthrone, nitrodibenzanthrone, nitronaphthalene, nitrobenzene and tetrabromopyranthrone. Nitrodibenzanthrone may be used along with reducing agents instead of the  $\text{NH}_3$  compd. A dye is also prepd. by condensing with tribromopyranthrone the compd. obtained by the action of  $\text{NH}_4\text{OH}$  on dibenzanthrone (see Ger 393,268).

**Vat dyes.** I. G. FARBENIND. A.-G. Fr. 651,679, Dec. 15, 1927. Valuable new vat dyes of the pyranthrone series are prepd. by treating with oxidizing or condensing agents the *Bz*, *Bz'*-diarylpyranthrone prepd. according to Ger. 278,424 by treating 1,1'-dianthraquinonyl-2'-bisarylketones or their derivs. with condensing agents having a reducing action. If oxidizing agents, *e. g.*,  $\text{MnO}_2$ , are used, the reaction in the simplest case probably takes place according to the following:

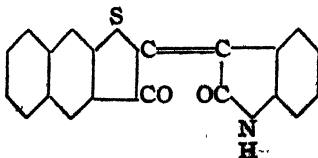


If non-oxidizing agents are used, *e. g.*,  $\text{AlCl}_3$ , the reduction compd. is obtained which is easily transformed to the dye itself. In examples, (1) *Bz*, *Bz'*-diphenylpyranthrone is dissolved in conc.  $\text{H}_2\text{SO}_4$  and a suspension of  $\text{MnO}_2$  in  $\text{H}_2\text{SO}_4$  is added with cooling and stirring. The dye is pptd. on pouring into water, it gives fast orange shades from the vat. (2) *Bz*, *Bz'*-diphenylpyranthrone is added to  $\text{AlCl}_3$  melted with  $\text{NaCl}$  at  $140^\circ$ , on bubbling air through the mixt. the same dye as in (1) is obtained.

**Vat dye.** I. G. FARBENIND. A.-G. (Max A. Kunz and Karl Köberle, inventors). Ger. 468,988, Jan. 15, 1927. A halogenated vat dye, prepd. by introducing halogen, with or without the aid of a catalyst, into *ms*-anthradianthrone (as obtained in Ger. 457,494), is suspended in 200 parts trichlorobenzene. I (0.5 parts) is added and  $\text{Cl}$  led in at  $150^\circ$  until the color of the reaction product is orange. The orange ppt., chloro-*ms*-anthradianthrone, is filtered off after cooling. Other examples are given. Cf. C. A. 23, 3106.

**Vat dyes.** I. G. FARBENIND. A.-G. (Max A. Kunz and Karl Köberle, inventors). Ger. 475,139, Jan. 25, 1927. Halo-*allo-ms*-naphthodianthrone or their derivs. are treated with aminoanthraquinones or their derivs. or with other compds. contg. a N atom to which at least 1 reactive H atom is attached. Solvents, diluents, catalysts and (or) acid-binding substances may be present. The products dye cotton in dark shades, and may or may not contain halogen, this depending on the selection of the initial materials. Examples are given describing the manuf. of dyes from (1) dibromo-*allo-ms*-naphthodianthrone and  $\alpha$ -aminoanthraquinone (dark marine blue shades); (2) dichloro-*allo-ms*-naphthodianthrone and 1-amino-4-methoxyanthraquinone (black shades); (3) dichloro-*allo-ms*-naphthodianthrone and  $\beta$ -aminoanthraquinone (copper-red shades); (4) dichloro-*allo-ms*-naphthodianthrone and *p*-toluenesulfonamide (violet shades); (5) tetrabromo-*allo-ms*-naphthodianthrone and 1-amino-2-methylanthraquinone (dark blue shades); (6) dichloro-*allo-ms*-naphthodianthrone and 1,5-diaminoanthraquinone (violet-black shades). The manuf. of the initial halo-*allo-ms*-naphthodianthrone is described in Ger. 457,493.

**Vat dyes.** KARL THIES, CARL J. MÜLLER, KARL SCHIRMACHER and KARL ZAHN (to Grasselli Dyestuff Corp.). U. S. 1,712,721, May 14. Dyes corresponding to the general formula:



wherein the benzene and naphthalene nuclei may be substituted are obtainable by condensing a 2,3-naphthoxythiophene compd. with an isatin compd. advantageously in the presence of an org. diluent and at elevated temp. and the process can be accelerated by the addn. of a small quantity of a mineral acid. In order to obtain dyes of the above given general formula which contain halogen as substituents, one may start with components contg. halogen or may introduce the halogen afterward into the condensation product. The dyes obtainable according to this invention dye wool and cotton fast red or bluish red shades. Examples are given of the use together of 2,3-naphthoxythiophene and 5,7-dibromoisatin, further bromination of the product of these two components, 2,3-naphthoxythiophene with isatin and subsequent bromination, 2,3-naphthoxythiophene with 5-bromo-7-methylisatin and Br, 2,3-naphthoxythiophene and 5,7-dichloroisatin with  $\text{SO}_2\text{Cl}_2$  and 2,3-naphthoxythiophene with 6-chloro-7-methylisatin and Br.

**Vat dyes formed by acid condensation of 2-benzanthronyl-1-aminoanthraquinones.** HUGO WOLFF (to Grasselli Dyestuff Corp.). U. S. 1,711,710, May 7. Vat dyes dyeing cotton orange-red to brown shades are obtained by heating, with acid condensing agents such as  $\text{H}_2\text{SO}_4$  and  $\text{H}_3\text{BO}_3$  or  $\text{AlCl}_3$  and  $\text{NaCl}$ , compds. such as 2-benzanthronyl-1-aminoanthraquinone, the condensation product formed from 2,6-dichlorobenzanthrone (1 mol.) and 1-aminoanthraquinone (2 mol.), 2-benzanthronyl-1-amino-6-chloroanthraquinone, the condensation product produced from equimol. proportions of 2-chlorobenzanthrone and 1,6-diaminoanthraquinone or the condensation product formed from equimol. proportions of 2,6-dichlorobenzanthrone and 1-amino-4-methoxyanthraquinone. Various examples and details are given.

**Vat dyes.** I. G. FARBENIND. A.-G. (Paul Nawiasky and Julius Müller, inventors). Ger. 475,342, Sept. 23, 1926. The aminobenzanthrone obtained by reducing the nitrobenzanthrone is heated with caustic alkali. The products give green or grey shades on cotton according to the conditions of manuf. Cf. Brit. 289,980 (C. A. 23, 989).

**Dyes derived from diphthalimidoanthraquinones.** ERNEST G. BECKETT and JOHN THOMAS (to Scottish Dyes, Ltd.). U. S. 1,711,873, May 7. Dyes are formed by nitrating a diphthalimidoanthraquinone such as 1,5-diphthalimidoanthraquinone and then treating the product with an alk. sulfide and a hydrolyzing agent such as  $\text{H}_2\text{SO}_4$ . The dyes thus obtained are suitable for producing blue shades on cellulose acetate, wool or other materials.

**Anthanthrone dyes.** I. G. FARBENIND. A.-G. Fr. 650,501, Mar. 6, 1928. Vat dyes of the anthanthrone series are prepd. by condensing halogen anthanthrones with aminoanthraquinones or their derivs. or substitution products in the presence of acid absorbing agents and substances having a catalytic action such as Cu or its compds. In an example, 2,7-dibromoanthanthrone is heated to boiling with  $\text{C}_{10}\text{H}_8$  and  $\alpha$ -aminoanthraquinone in the presence of  $\text{NaOAc}$  and  $\text{Cu}(\text{OAc})_2$  for 4–5 hrs. The reaction mass is extd. with solid naphtha and the residue boiled with dil.  $\text{HCl}$  and dried. The product dyes cotton from the vat in fast greyish blue shades. The dibromoanthanthrone, obtained by brominating anthanthrone in oleum, and  $\beta$ -aminoanthraquinone may also be used. 2,7-Dibromoanthanthrone may be condensed with 1-benzoylamino-4-aminoanthraquinone or the tri- or tetrabromoanthanthrone may be condensed with 3 or 4 mols. of benzoyl-1,5-diaminoanthraquinone.

**Triarylmethane dyes.** I. G. FARBENIND. A.-G. Brit. 299,473, Oct. 28, 1927. Leuco compds. (e. g., the leuco compd. from *v-m*-xylidine and benzaldehyde-2,4-disulfonic acid, the leuco acid from *o*-toluidine or *p*-xylidine and benzaldehyde-2,4-disulfonic acid, *p*-leucaniline or the leuco acid from *o*-cresotinic acid and benzaldehyde-*o*-sulfonic acid) are dissolved in pyridine, quinoline or like compds. or their mixts. and oxidized with mol. O in the presence of a Cu salt such as  $\text{CuCl}_2$ . Glycerol may partly replace the pyridine, etc., and alc. or water may be used as a diluent. Cf. C. A. 23, 716.

Brown dyes suitable for use on wool and leather. ROBERT SCHMIDLIN (to Grasselli

Dyestuff Corp.). U. S. 1,711,860, May 7. Quinone derivs. of  $\text{CO.CX:CR.CO.CX':CR'}$ , wherein R and R' represent radicals of the products obtained by the condensation of chloronitroaryl sulfonic and carboxylic acids with one amino group of an aromatic diamine which may be substituted, and X and X' represent H or a univalent substituent, constitute dyes which dye wool and leather (chrome leather) varied shades of good fastness. The condensation of benzoquinones with the said compds. may occur within wide limits as regards temp. and concn. Several examples are given and among the starting materials which may be used are: 4-nitro-4'-aminodiphenylamine-2-sulfonic acid and chloranil, Na aminonitrodiphenylaminesulfonate and chloranil, 5-methyl-4-amino-4'-nitrodiphenylamine-2'-sulfonic acid and toluquinone, Na (5-

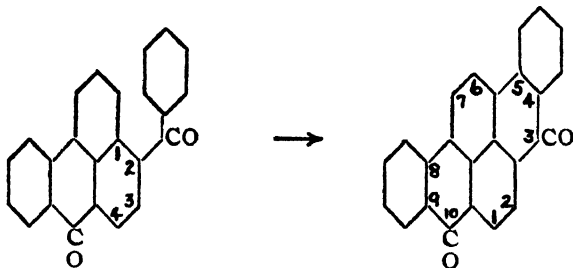
amino-1-naphthyl)-4,6-dinitroaniline-2-sulfonate and toluquinone and Na 4-amino-5-methyl-4'-dinitrodiphenylamine-2'-carboxylate and toluquinone.

**Benzanthrone derivatives.** I. G. FARBENIND. A.-G. (Arthur Lüttringhaus, Hugo Wolff, and Heinrich Neresheimer, inventors). Ger. 475,476, June 16, 1925. Addn to 407,838. 2,2'-Dibenzanthronyl and its derivs. are prepd. by the alk. condensation under mild conditions of a 2-halobenzanthrone with benzanthrone or a deriv. not substituted in the 2-position. Asymmetrically substituted 2,2'-dibenzanthronyls useful as *dye intermediates* can be so prepd. The examples describe the prepn. of 2,2'-dibenzanthronyl, 6-methyl-2,2'-dibenzanthronyl, 6-chloro-2,2'-dibenzanthronyl, m. 312-314°, 7-chloro-2,2'-dibenzanthronyl, m. 305°, 6,6'-dichloro-2,2'-dibenzanthronyl, m. above 370° and 7,7'-dichloro-2,2'-dibenzanthronyl, m. above 370°.

**Cyanoarylthioglycolic acids.** I. G. FARBENIND. A.-G. Fr. 650,955, Mar. 16, 1928. *o*-Cyanoarylthioglycolic acids of the formula I are prepd. from *o*-aminoarylthiocyano compds. of the formula II: (I) (4)YAr[CN(1)][SCH<sub>2</sub>CO<sub>2</sub>H(2)], (II) (4)YAr[CN(1)][SCN(2)] in which Y signifies that the position *p*- to the NH<sub>2</sub> or CN group is substituted or blocked. The NH<sub>2</sub> group is replaced by CN by Sandmeyer's reaction, the SCN group is sapond. to a SH group and treated with monochloroacetic acid, the order of the first 2 steps being immaterial. The products are *intermediates for thioindigo dyes*. In examples, 1-methyl-2-cyano-5-chlorobenzene-3-thioglycolic acid (identical with the compd. mentioned in Fr. 478,107), 1-cyano-4-ethoxybenzene-2-thioglycolic acid, 2-cyanonaphthalene-1-thioglycolic acid and 1-methyl-2-amino-5-chlorobenzene-3-thioglycolic acid, m. 186°, are prepd.

**Dyes and intermediates.** SCOTTISH DYES, LTD. Fr. 650,976, Mar. 17, 1928. 3,3'-Dichloroanthraquinonehydrazine, which dyes cotton a bright reddish blue shade from the vat, is obtained by brominating 2-amino-3-chloroanthraquinone obtained by the process of Brit. 264,916. It may also be obtained by partially dechlorinating tri- and tetrachloroanthraquinonehydrazine (by direct chlorination of anthraquinonehydrazine). 3,3'-Dichloroindanthrone is prepd. by treating 1-bromo-2-amino-3-chloroanthraquinone (by brominating 2-amino-3-chloroanthraquinone) with a Cu salt in the presence of an acid absorbing agent in a solvent at the b. p.

**Dyes and intermediates.** I. G. FARBENIND. A.-G. Fr. 650,439, Mar. 5, 1928. Condensation products of the pyrenequinone series are obtained by treating 2-arylbenzanthrone with a condensing agent in the presence or not of O or air; the reaction taking place as follows:



The 2-arylbenzanthrone used are obtained by transforming 2-benzanthronecarboxylic acid, m. 307°, into its chloride and condensing with a hydrocarbon by the Friedel-Crafts reaction. Thus, when 2-benzoylbenzanthrone is condensed with AlCl<sub>3</sub>, 4,5,8,9-dibenzopyrene-3,10-quinone is obtained which dyes cotton from the vat in deep yellowish red shades. The products may be halogenated to give new dyes. *p*-Bromobenzoyl-2-benzanthrone is condensed with the double chloride of Al and Na, giving monobromo-4,5,8,9-dibenzopyrene-3,10-quinone which dyes cotton orange-red from the vat. 2-Toluybenzanthrone and  $\alpha$ -naphthoyl-2-benzanthrone are condensed in the same way. The chlorination and bromination of 4,5,8,9-dibenzopyrene-3,10-quinone, giving different vat dyes, are also exemplified.

**Dye intermediates.** I. G. FARBENIND. A.-G. Brit. 299,327, Oct. 22, 1927. Halogen arylthioglycolic acids are formed from primary aromatic amines having a free *p*-position, by introducing a CNS group into this position by treating with an inorg. sulfocyanate and a halogen (suitably Br and NaCNS in MeOH) to form a mercapto group, converting the latter by condensation with chloroacetic acid into a thioglycolic acid group and then replacing the NH<sub>2</sub> group by halogen by Sandmeyer's reaction.



**Dyes and lakes.** I. G. FARBENIND. A.-G. Brit. 299,332. Azo dyes are formed in substance, on the fiber or on a substratum by coupling a diazotized 2,3-aminonaphthoic ester or a substitution product with a naphthol or with an arylide of 2,3-hydroxynaphthoic acid or a substitution product. Several examples are given of dyes which in general give bluish red colors. Products may be formed suitable for dyeing fabrics, coloring wall papers or for use in paints. Cf. C. A. 22, 2065.

**Oxidation in dyeing.** EUGÈNE SCHUELLER. Fr. 650,755, Mar. 12, 1928. In dyeing textiles, skins, hair, etc., the treatment by oxidation, by the aid of peroxides, with or without catalysts of the nature of peroxydases, is combined with a treatment by agents to bring about rapid pptn. of the oxidation products, *e. g.*, alkali or alk. earth chlorides which have a phys. action, or metallic salts which combine with the oxidation products.

**Dyeing artificial silk.** WINFRID HENTRICH, RUDOLF KNOCH and MAX HARDT-MANN (to Grasselli Dyestuff Corp.). U. S. 1,711,890, May 7. Org. cellulose esters or ethers are treated with azo dyes obtainable from aromatic diazo compds. contg. an acid group such as diazotized aniline-4-sulfonic acid and  $\alpha,\gamma$ -diketohydrindene or a deriv. Yellow to orange dyeings are obtained. Cf. C. A. 23, 527.

**Dyeing artificial silk.** BRITISH DYESTUFFS CORP., LTD., JAMES BADDILEY, PERCY CHORLEY and CARLTON BUTLER. Ger. 475,125, Mar. 8, 1927. Addn. to 474,430 (C. A. 23, 3110). See Brit. 276,757 (C. A. 22, 2471).

**Dyeing cellulose esters and ethers.** BRITISH CELANESE, LTD., G. H. ELLIS, H. C. OLPIN and E. W. KIRK. Brit. 299,343, July 19, 1927. Dyeing, printing or stenciling is effected with dyes obtained from naphthylenediamines or their nuclear substitution products. Various examples of monoazo and disazo dyes formed from components of the benzene and naphthalene series are given and specific dyes giving red shades are described.

**Dyeing cellulose esters and ethers.** BRITISH CELANESE, LTD., G. H. ELLIS and H. C. OLPIN. Brit. 299,349, July 20, 1927. Dyeing, printing or stenciling is effected with compds. obtainable by introducing at least one  $\beta$ -ketoacyl group into dyes contg. amino groups, which may be of the azo, nitrodiarylamine, nitrodiaryl, nitrodiaryl-methane or anthraquinone series and are usually unsulfonated. Numerous examples are given. When the dyes contain diazotizable amino groups, the dyeings may be diazotized and developed on the fiber.

**Cross-dyeing cellulosic fabrics.** JOHN C. WATSON (to B. B. & R. Knight Corp.). U. S. reissue 17,295, May 14. See original pat. No. 1,629,769 (C. A. 21, 2388).

**Dyeing vegetable fibers.** I. G. FARBENIND. A.-G. (Arthur Zitscher, inventor). Ger. 475,553, May 29, 1925. Addn. to 467,545. The method of Ger. 467,545 (C. A. 23, 993) is modified by using diazo compds. derived from amines substituted in the positions described therein but contg. instead of or in addn. to Cl, a group  $-\text{SO}_2\text{R}$  or  $-\text{COR}$ , where R is an alkyl, aryl or aralkyl residue which may be a simple residue or an amine or amide residue or, if aryl, may be a residue from a ketone, a sulfone or a thio- or carboxy-arylide, and may in any case be further substituted. The use of certain derivs. of *m*-aminobenzoic acid is excluded. The use of the diazo compds. from 2-aminotolyl-4-phenylsulfone and 4-chloro-3-aminobenzanilide is described by way of example, blue and yellow shades, resp., being obtained. A list is given of the shades obtained with a no. of other diazo or tetrazo compds. derived from amines of the kind specified. Cf. C. A. 23, 1759.

**Dyeing or sizing yarns.** ADOLF H. JUNKERS. Ger. 475,118, June 15, 1924. In dyeing or sizing yarns by the method in which the yarn is wound on hollow perforated tubes into which the liquid is forced, the tubes have a comparatively large internal diameter, and the outer surface of the yarn is pressed mechanically or by hand during the treatment.

**Transforming dyed colors.** AUSTRALINE COLOR TRANSFORMERS PROPRIETARY, Ltd. Australia 11,587, Feb. 6, 1928. Dyed colors in fabrics are made lighter by subjecting the material to the action of a mixt. contg. an agent to break down the fixing substance of the dye and substances to bleach the dye slowly. *E. g.*,  $\text{NaOAc}$  1.5 oz., Na thiosulfate 0.5 oz.,  $\text{H}_2\text{O}_2$  0.5 pint, water 1 gallon.

**Dyeing apparatus.** LÉON L. MERCIER and PIERRE J. MERCIER. Fr. 651,408, Mar. 15, 1928. The dyeing vats are made of glass, several of which are mounted over a common liquid-collecting closed channel or box.

**Apparatus for dyeing hanks with vat dyes.** JOAQUIN TARRAGÓ BESCÓS. Ger. 475,281, Mar. 31, 1926.

**Apparatus for dyeing elastic textiles.** WILLY HALSTENBACH. Fr. 651,655, Mar. 23, 1928.

**Machine for dyeing cloth.** ÉTABLISSEMENTS BENNINGER S. A. Fr. 650,173, Feb. 28, 1928. Means for reversing the direction of travel of the cloth through the dye bath are described.

**Treating freshly dyed materials with illuminating gas.** JOHN MACADAM (to Joseph Bancroft & Sons Co.). U. S. 1,712,044, May 7. Freshly dyed materials are passed through an atm. of illuminating gas or other inert or non-oxidizing gas immediately after subjection to a reducing agent and before treatment with an oxidizing agent such as a dichromate or peroxide soln. in order to control the treatments. An app. is described.

**Use of iron carbonyl in printing textile materials.** I. G. FARBENIND. A.-G. Brit. 299,210, Nov. 25, 1927. Iron carbonyl is used in either printing pastes or discharges, examples of which are given. After steaming, the goods may be treated with oxalic acid to remove the iron oxide.

**Sulfurized products.** SOC. ANON. POUR L'IND. CHIM. À SAINT-DENIS. Fr. 650,614, Mar. 9, 1928. A sulfurized product useful for *fixing basic dyes* is obtained by heating together a cresol and a phenol (PhOH, naphthol, resorcinol) in alc. soln. in the presence of S, HF and a catalyst (salt of Al, Sb, or I) and passing a current of air and HCl through the mixt. during the reaction. Excess alc. is afterwards removed, and the residue is heated for several hrs. in an alk. carbonate soln. In an example the starting mixt. contains PhOH 10, cresylic acid 2, MeOH 40, NaS 5, S 2, SbO 0.2, HF 0.1 kg. Fr. 650,615 describes a sulfurized product which may be used as a *wetting or mercerizing agent* obtained by mixing a phenol, cresol, naphthol or resorcinol in alc. soln. with an aldehyde, heating for several hrs. in the presence of a catalyst, making alk., eliminating the alc. and heating the residue for several hrs. with a mixt. of ordinary H<sub>2</sub>SO<sub>4</sub> and oleum. The product is washed with salt water and neutralized. In an example the following are used: MeOH 40, trioxymethylene 15, naphthol 5, AlCl<sub>3</sub> 0.5, phenol 10, H<sub>2</sub>SO<sub>4</sub> (66° Bé) 3, oleum 1 kg.

**Apparatus for lenosating vegetable fibers.** CHARLES LIÉNARD-FIEVET. Fr. 651,630, Mar. 12, 1928.

**Fiber and yarn from flax straw.** M. WADDELL and H. C. WATSON. Brit. 299,519, July 29, 1927. Flax stalks are dried to harden their gummy constituents and render the woody stalks and seed balls dry and brittle, divided into pieces convenient for handling, broken or crushed, scutched, hackled and carded. Fibers thus prepd. are formed into a rope or rove, wound on a reel and retted by bacteria or chemicals and subjected to washing and other desired treatments.

**Apparatus for coating textile threads with powdered metal or solid coloring matter in suspension in liquids.** W. RÖSSING. Brit. 299,219, Dec. 9, 1927. Structural features.

**Coating fabrics with rubber, etc.** A. N. PARRETT (to Imperial Chemical Industries, Ltd.). Brit. 299,321, Oct. 22, 1927. Rubberized fabrics (which may also be varnished) are further coated with a pyroxylin compn. which adheres well to the rubber surface and is sufficiently distensible and pliable to avoid cracking or peeling. Numerous details, formulas and examples of suitable compns. are given.

**Apparatus for conditioning yarn by treatment with steam.** FRANK L. FURBUSH (to C. G. Sargent's Sons Corp.). U. S. 1,713,429, May 14.

**Silk.** I. G. FARBENIND. A.-G. Fr. 650,253, Mar. 1, 1928. Natural and artificial silk are mixed in the desired proportions, carded together and submitted to the usual textile operations.

**Artificial silk.** BENNO BORZYKOWSKI. Fr. 650,747, Mar. 12, 1928. See Brit. 287,073 (C. A. 23, 513).

**Weighting artificial silk.** RENÉ CLAVEL. Ger. 471,370, Nov. 2, 1927. Addn. to 468,018 (C. A. 23, 2306). The acids or acid salts employed in raising the acid concn. of the metal-salt bath for weighting artificial silk according to the method of the prior patent, is incorporated, by impregnation or coating, with the silk. Thus a mixt. of acetate and viscose silk is steeped in a soln. contg. 20 cc. basic H<sub>3</sub>PO<sub>4</sub> and 10 g. EtOH per liter, and squeezed out, before immersion in the weighting bath of ZnCl<sub>2</sub> soln.

**Washing artificial silk.** HERMINGHAUS & Co. G. M. B. H. Ger. 475,035, Feb. 15, 1925. Relates to the washing of artificial silk spun on perforated holders. The holders are stood vertically and closed at the lower ends, and a predetd. amt. of washing liquid is fed to the interior of each holder from a vessel placed above the holders, the liquid passing through the silk merely under the slight pressure due to the head of liquid. The holders are inverted at a suitable stage of the process. Cf. C. A. 23, 3111.

**Apparatus for the treatment of cops of artificial silk fibers.** WULF SCHULZ. Ger. 469,845, Apr. 14, 1926. The cops are mounted on spindles under tubes for acidify-

ing, drying, bleaching, or washing them, according to the nature of the substances introduced into the tubes.

**Apparatus for re-winding artificial silk.** I. G. FARBENIND. A.-G. Brit. 299,399, (Oct. 25, 1927. An app. is described suitable for use in the process described in Brit. 297,744 (C. A. 23, 2823).

**Spinning artificial textile filaments to resemble natural fibers.** W. SEVER and J. B. SPEAKMAN. Brit. 299,291, April 3, 1928. Artificial filaments having a curl or wave similar to natural fibers are formed by extrusion of a suitable spinning soln. into a coagulating medium while causing pulsations of flow of either the coagulating medium or of the soln. being spun. An app. is described.

**Washing artificial threads.** THE NUERA ART-SILK CO. Ger. 475,247, Nov. 16, 1927. The threads leaving the pptg. bath are wound on a bobbin, which rotates alternately within and above a washing bath, the arrangement being such that the pptg. liquid carried on the threads is dild. in the washing bath and the dild. liquid thrown off when the bobbin rotates above the bath.

**Buckram.** SAMUEL HARARY. U. S. 1,712,991, May 14. In prepg. a pattern material for embroidery purposes, the fabric is sized with an acid resist such as starch and then satd. with dil. HCl and dried.

**Bleaching cloth.** ETIENNE ACZEL. Fr. 651,640, Mar. 23, 1928. Fibrous material is bleached by passing it between or around the electrodes of an ozonizer. Suitable forms of app. are described.

**Bleaching cotton.** HERAEUS-VACUUMSCHMELZE A.-G. and WILHELM ROHN. Ger. 475,123, May 26, 1927. In bleaching cotton, particularly with hypochlorites, the cotton is wound on externally enameled bobbins or tubes made of Cr-Ni alloy, if desired, with addns. of Fe, Mo, W or Co, or made of Ni, German silver or Monel metal.

**Heater for bleaching, etc., lyes.** ERNST WERNER. Ger. 475,121, May 2, 1926. Addn. to 457,679. The lyes ascend an annular space in which a heating worm is closely fitted. One or both of the walls of the space are heated by steam jackets.

**Centrifugal separator suitable for treating wool washing water.** AKTIEBOLAGET SEPARATOR. Brit. 299,422, Oct. 26, 1927. Structural features.

**Purifying liquids used for "dry cleaning."** GUTHRIE B. BOON (to R. R. Stolley, (Inc.)). U. S. 1,711,829, May 7. Solvent liquids such as gasoline are treated with a caustic soln. and most of this caustic is then sepd. by passing the solvent through a body of water. Remaining traces of caustic are removed by use of  $\text{CaCl}_2$ . An app. is described.

**Cleaning soiled "dry cleaning" liquids, etc.** EUSTACE A. ALLIOTT, CHESHAM BORS and ARTHUR E. HATFIELD. U. S. 1,713,317, May 14. Soiled liquid from washing app. such as that used for "dry cleaning," laundry washing, wool scouring, etc., is mixed with a "filter aid," and the quantity of the latter mixed with the liquid, during part of the cleaning operation at least, is diminished as the mixt. passes to a filter. An app. is described.

## 26—PAINTS, VARNISHES AND RESINS

A. H. SABIN

**Paint technology.** LOUIS A. JORDAN. *J. Soc. Chem. Ind.* 48, 13-21T(1929).—J. briefly reviews some of the recent developments and theories of paint technology. X-ray examn. of pigments indicates the importance of the presence of small amounts of impurities. Determination of particle size of pigments is fundamental in connection with the proper use of pigments. Recent work suggests that fine grinding of pigments may be overdone. Surface activity and adsorption are important in relation to the wetting of pigment by oil and to stability of the dispersed pigment. Producing the proper adsorption film on pigment particles before suspending in oil may alter the entire character of the resulting paint. Recent work on the drying of oil and the proper use of oil driers is discussed. The maturing of varnishes, effect of ultra-violet light on oils, and the cause of "bloom" on varnish films also are considered. L. B. MILLER

**Testing of paint films.** E. RITTER. *Korrosion u. Metallschutz* 5, 64-7(1929).— $\text{Ag}_2\text{CrO}_4$  in gelatin was used to coat one side of a glass plate and then the paint to be tested was put on the gelatin. A waterproof covering was put around the edges of the plate and the whole immersed in chloride solns. at const. temp. At the points penetrated by  $\text{Cl}^-$  ions spots of  $\text{AgCl}$  formed, indicating the extent of penetration of the paint film. The gelatin film was unaffected by light. The effect of the gelatin upon the paint was not detd. With variations in temp. some of the films which showed no spots at

const. temp. were attacked. An app. is described in which the plates could be exposed to varying temps., humidity and ultra-violet light. B. E. ROETHELI

**Comparative analyses of water paints and paint emulsions.** FRIEDRICH WAGNER. *Farbe u. Lack* 1929, 187-8, 204-5. Tables are given showing the percentage compn. of various com. water paints and emulsion paints with special reference to the proportions of water, oil, adhesive and pigment. G. G. SWARD

**Aluminum pigments as heat-resisting paints.** OTTO MERZ. *Arch. Wärmewirt.* 10, 156-7(1929).—Two tables are given showing the wearing qualities of Al and Al bronze pigments in various vehicles at various temps. up to 500°. E. W. T.

**Yellow pigments for facades.** ANON. *Farbe u. Lack* 1929, 167.—The main requirements are stability toward light and lime. The first requirement excludes all coal-tar colors while the second excludes most of the artificial mineral colors, such as chrome yellows, yellow ultramarine, etc. The others are the only reliable pigments for this purpose. G. G. SWARD

**Lead soaps.** MANFRED RAGG. *Farben-Ztg.* 34, 1605-9, 1661-4(1929).—All basic Pb pigments react with fatty acids to form true soaps of pronounced anisotropic character showing spherulites and needles in polarized light. The soaps are slightly sol. in cold oils and org. solvents. At moderate heat PbO is sol. in linseed oil, forming complex compds. contg. glycerol which differ from true Pb soaps in their compn. and morphological properties. When red lead is dissolved in hot linseed oil, the intermediate formation of PbO<sub>2</sub> can be shown. The PbO<sub>2</sub> is reduced to PbO. In aged paint films contg. red lead, white lead and "Tego," the presence of mixts. of true Pb soaps and complex glycerides can be proven analytically and microscopically. The bulk of the org. Pb compds. in paint films consists of an amorphous isotropic sol. The supposition that these Pb compds. have a strengthening effect on the film is therefore erroneous. G. G. SWARD

**Determination of oil requirement of pigments.** C. P. VAN HOEK. *Farben-Ztg.* 34, 1784-5(1929).—The lab. method of adding the oil to the pigment is the reverse of the general factory practice of adding the pigment to the oil. The former method yields high results. By the Gardner-Coleman method as modified by Fasig and by Wolff (mortar and pestle), 100 g. ZnO formed a paste with 18.6 g. linseed oil when the pigment was added to the oil. When, however, the oil was added to the pigment, 26 g. oil was required. To the latter paste, however, 30 g. of pigment could be added without its losing the properties of a paste, thus restoring the ratio, pigment : oil = 100 : 18.6. The paste thus formed was "shorter" than the one prepd. by adding pigment to oil. Similarly, putty prepd. by adding oil to chalk is always shorter and stickier and more difficult to work than putty prepd. by adding chalk to the oil. G. G. SWARD

**The iodine number of fatty drying oils.** VON REIBNITZ. *Farben-Ztg.* 34, 1782-4(1929).—The Hanus, Hübl-Waller and Wijs iodine numbers of raw and bodied linseed and tung oils were found to increase with increase of temp. and length of the reaction period. The Wijs method is recommended for speed, reliability and reproducibility. G. G. SWARD

**Wood oil and wood oil substitute.** JOHANNES SCHEIBER. *Farbe u. Lack* 1929, 153-4.—The instability of pure wood oil films is due to the eleostearic acid and its triply conjugated bonds, which imparts pronounced polymerization characteristics. These polymerization characteristics eventually lead to the destruction of the film. If the elements of water be removed from ricinoleic acid by appropriate means an acid with doubly conjugated bonds results. This acid may be readily esterified with glycerol to form a drying oil with many of the desirable and with but few of the undesirable properties of wood oil. G. G. SWARD

**Australian standard specification for China wood oil.** ANON. *Australian Commonwealth Eng. Standards Assoc.* (Sydney) No. K-11, 18 pp.(1929).—Specifications cover color, sp. gr.,  $n$ , I value, sapon. value, acid value and standard methods of sampling and testing. E. I. S.

**Tung oil. III.** D. HOLDE, W. BLEYBERG AND M. A. AZIZ. *Farben-Ztg.* 34, 1725-6(1929); cf. C. A. 23, 1761, 2049.—To ascertain if the hydroaromatic derivs. were present, as previously suggested, the dehalogenated products were oxidized with KMnO<sub>4</sub> or chromic acid and tested for the presence of phthalic acid. The resorcinol-H<sub>2</sub>SO<sub>4</sub> fluorescence test was modified by heating the sample with addn. of H<sub>2</sub>SO<sub>4</sub> to 205-10°. No evidence of phthalic acid was found. G. G. SWARD

**The use of mineral oils in "running" copals.** B. SCHNEFEL. *Farben-Ztg.* 34, 1786(1929).—Pyhäliä (cf. C. A. 23, 3113) is adversely criticized on the grounds that complete "running" of the copal and complete removal of the mineral oil were not shown. G. G. SWARD

**Determination of viscosity of oils and varnishes by the air-bubble method.** RUCHTI. *Farben-Ztg.* 34, 1899-1901(1929).—R. describes a frame for holding the viscometer tubes vertical. A comparison is given of Engler degrees and the bubble values for tubes 0.80 cm. internal diam. G. G. SWARD

**Australian standard specifications for varnishes.** *Australian Commonwealth Eng. Standards Assoc.* (Sydney) Nos. K-14 to 16, 25 pp.(1929).—Specifications cover classification, color, rates of drying, viscosity, volatile matter, etc., for interior oil varnish, exterior oil varnish and flattening or rubbing varnish. Standard methods of sampling and testing are included. **Genuine red lead, dry.** *Ibid* No. K-19, 16 pp.(1929).—Specifications cover compn., color, org. coloring matter, coarse particles, volatile matter and standard methods for sampling and testing. **Lithopone.** *Ibid* No. K-20, 16 pp.(1929).—Specifications cover compn., coarse particles, color, reducing power, volatile matter and standard method of sampling and testing. **Linseed oil putty.** *Ibid* No. K-27, 15 pp.(1929).—Specifications cover compn., condition, and standard methods of sampling and testing. E. I. S.

**Thickening of varnish paints.** HANS WOLFF AND R. SINGER. *Farben-Ztg.* 34, 1840-1(1929).—The addn. of fatty acids or their metallic soaps and other org. acids inhibits or reduces the thickening of lacquers contg. red lead (ordinary or dispersed) or clay, but had no effect on those containing ZnO. Alcs. and ketones sometimes produced a like effect which may have been due to the presence of acids. The phenomenon is probably phys. and may be due to an absorption of the reagent by the pigment or to a change in the charge on the pigment or liquid. The behavior of oil systems should be analogous to that of lacquers. G. G. SWARD

**Explosions of lacquer drying ovens.** ANON. *Feuerungstech.* 17, 21-2(1929).—Expts. on a small-scale oven showed that even at 180-190°, which is far below the ignition temp. of the vapors, spontaneous ignition may occur if drops of solvent are allowed to evaporate from an iron surface. With Al no ignition occurred at 300°. E. W. T.

**Baking of japans and shivel finishes on phonograph parts.** I. STANLEY WISHOSKI. *Fuels and Furnaces* 6, 1695-1704(1928). L. B. MILLER

**Acid values of resins.** ERICH STOCK. *Farben-Ztg.* 34, 1727(1929).—The acid values of 19 different resins, both synthetic and natural, were detd. in alc.-benzene and according to the "Albert indirect method." The agreement was good. G. G. S.

**Oilcloth and its manufacture.** P. MARTELL. *Kunststoffe* 19, 28-30(1929).—The history of oilcloth and its manuf. are described. B. HAMILTON

**Pyroabietic acids from French rosin (FONROBERT, GRETH) 10.** Abrasion apparatus for determining the wearing qualities of linoleum (U. S. pat. 1,711,866) 1.

**BITMEAD, RICHARD: French Polishing and Enameling.** 9th ed. London: Crosby Lockwood. 120 pp. 2s. 6d. net.

**JAEGER, PAUL: Das Problem der Leinöltechnik und seine natürliche Lösung.** Feuerbach-Württ: Forschungs- u. Lehrinstitut für Anstreichtechnik. 53 pp.

**MARGIVAL, FRANCOIS: Encres nouvelles.** Preparation des encres noires et de couleurs. Encres fixes et à copier. Traçage. Effaçage. Revivification des traits pâles. Paris: Desforges, Girardot et Cie. 178 pp.

**SCOTT, WINFIELD G.: Formulas and Processes for Manufacturing Paints, Oils and Varnishes; A Laboratory Manual.** Chicago: Trade Review Co. 223 pp. \$4.50.

**WOLFF, HANS, SCHLICK, W. AND WAGNER, HANS: Taschenbuch für die Farben- und Lackindustrie sowie für den einschlägigen Handel.** Revised and enlarged ed. Stuttgart. Wissenschaftliche Verlag. m. b. H. 382 pp. Linen, M. 11.

**Linseed oil varnishes.** I. G. FARBENIND. A.-G. Brit. 299,361, Oct. 24, 1927. Deposition of driers in linseed oil varnishes is prevented by converting the free fatty acid in the oil into salts such as those of Ca, Mg, Zn or Cd.

**Lacquer.** INTERNATIONAL FIREPROOF PRODUCTS CORP. Fr. 650,736, Mar. 10, 1928. See Brit. 286,724 (C. A. 23, 532).

**Lacquers.** I. G. FARBENIND. A.-G. Fr. 650,814, Mar. 13, 1928. Lacquers are prepd by mixing solns. of oxygen with solns. of nitrocellulose with or without softening agents, resins or the like. Thus, a soln. of celluloid wool in AcOAm or AcOBu is mixed with an alc. soln. of linoxyn. Tricresyl phosphate may be added, and if too thick the lacquer may be thinned with alc., AcOAm, acetone, etc.

**Nitrocellulose lacquer as a sealing for dry cell batteries.** PAUL A. MARSAL (to National Carbon Co.). U. S. 1,711,739, May 7. See Can. 282,684 (C. A. 22, 4070).

**Printing ink.** JACQUES G. AULAGNE and JULES J. SOUCHON. Fr. 651,217, Dec 30, 1927. A printing ink consists of a metallic powder such as Au, Ag or bronze in a colorless varnish.

**Dammar resins.** LOUIS BLUMER. Fr. 651,631, Mar. 13, 1928. Dammar resins are improved for use in the manuf. of varnishes having a basis of cellulose esters by elimination of the  $\beta$ -dammar resin. The resins are treated with solvents such as alcs., ethers, acetone,  $C_6H_6$  and mixts. of  $C_6H_6$  or toluene and EtOH, which dissolve the dammaric acid and the  $\alpha$ -resin, but not the  $\beta$ -resin.

**Colophony.** LOUIS G. L. DÉSALBRES. Fr. 651,648, Mar. 23, 1928. Black rosin tars are distd. in vacuum for the production of colophony; 0.2–0.3% of hydroquinone may be added to the tar.

**Resin solutions.** SOC. D'EXPLOITATION DE BREVETS ET PROCÉDÉS P. N. Brit. 299,293, Oct. 22, 1927. The process of forming aq. resin-bearing fluids described in Brit. 263,393 (C. A. 22, 165) by treating resin, without heating, with caustic alkali soln. is modified by replacing the cold solns. of caustic alkali by cold solns. of other sol. mineral or org. bases or their salts of less concn. than that which would cause pptn or salting-out of the resinate of the base and using only such salts as are formed from acids with a weaker disson. constant than that of the resin acids present.

**Synthetic resins.** I. G. FARBERIND. A.-G. (Gerhard Balle and Karl Daimler, inventors). Ger. 475,478, Feb. 2, 1922. Resinous compns. which can be hardened by heat are prepd. by mixing the resinous or pitchy condensation products from  $SOCl_2$  and tar oils, tars, pitches and like aromatic hydrocarbons with reactive resins of the  $PhOH \cdot CH_2O$  type. Cf. C. A. 23, 3115.

**Synthetic resins.** R. H. KIENLE (to British Thomson-Houston Co., Ltd.). Brit. 299,424, Oct. 26, 1927. A "polybasic" acid such as phthalic acid is condensed with a monohydric and a polyhydric alc. such as glycerol and amyl, butyl, allyl or diacetone alc. or phenol or borneol; the polybasic acid may in part be replaced by a monobasic acid such as oleic acid. The use of succinic, maleic, fumaric, citric, sebacic, tartaric and oxalic acids and of glycol and EtOH is also suitable. Fusible and sol. products are first obtained by heating in stages at  $160^\circ$  and  $200\text{--}20^\circ$  and these products may be rendered infusible and insol. by further heating for several hrs. at  $150\text{--}200^\circ$ . Cf. C. A. 22, 4844.

## 27—FATS, FATTY OILS, WAXES AND SOAPS

E. SCHERUBEL

**Pachira aquatica Aubl.** J. PIERAERTS. *Mat. grasses* 20, 8279–80, 8335–7(1928); cf. C. A. 22, 4000.—The characteristics of the oil obtained from this plant are practically identical with those of palm oil. The economical value is stressed and its cultivation advocated in Africa. In the last article its properties and characteristics are compared with those of oils of various origins.

**Animal and vegetable fats and oils.** U. S. Census Bur. 1928, 18 pp.—Production, consumption, imports, exports and stocks are given by quarters for 1926 and 1927.

E. J. C.

**Systematic classification of fats. II. Proposed classification of vegetable fats according to scientific and practical viewpoints.** W. HALDEN. *Graz. Med. Chem. Inst. Chem. Umschau Fette, Oele, Wachse u. Harze* 36, 109–15(1929); cf. C. A. 22, 2072.—A new classification is proposed for vegetable fats and oils, based on the botanical grouping by Engler and Gilg ("Syllabus der Pflanzenfamilien"). There are 37 botanical families, the members producing mainly drying oils; 64 families producing non-drying oils and fats; 14 families with members among both, the drying and non-drying oils, and 1 family (castor plant) which necessitated a 3rd division. The botanical character of the plants takes preference over the chem. properties of their oils. Members of one family produce mostly one type of oil and certain relationships exist between the oils of adjacent groups.

P. ESCHER

**The field of fats. XIII. Partial halogen addition to multiply unsaturated fatty acids.**  $\beta$ -Eleostearic acid glyceride and wood oil. H. P. KAUFMANN WITH CH. LUTENBERG. *Univ. Jena. Ber.* 62B, 392–401(1929). Eleostearic acid (I) and its glyceride, (II), which are readily available and can be prepd. in pure form, afforded welcome exptl. material in K.'s search for a method of partial halogen addn., which could be detd. quantitatively by titration. It had already been shown that in the action of Br in MeOH (satd. with NaBr) on II there is a distinct halt in the addn., corresponding to the consumption of 2 mols. Br; on continuing the action for several days, 1 nos. approaching

that corresponding to 3 double bonds are obtained; the latter is reached quickly with Br in  $\text{CCl}_4$  in the light of a uvial lamp. Hitherto, however, it had not been possible to obtain titrimetrically with halogen a definite halting point corresponding to 1 double bond, such as can be secured with  $(\text{SCN})_2$ . The object of the present work was to obtain a sharper endpoint in the addn. of Br to 2 double bonds and to establish, if possible, the conditions for adding halogen, in a titrimetrically controllable manner, to 1 double bond. By using Br in  $\text{CCl}_4$  in the dark on pure II and Chinese wood oils, the values obtained for 2 double bonds are so const., as compared with the results of other methods hitherto known, that the process is recommended for the detn. of the I no. of the wood oils. Addn. of  $\text{KIO}_3$ , at the end of the detn., and titration of the I liberated by the acid present, shows that only a very slight amount of acid is formed in the process and that therefore no appreciable substitution has occurred. If, however, the I no. detn. is made with Br in MeOH satd. with NaBr instead of in  $\text{CCl}_4$ , and  $\text{KIO}_3$  is added at the end of the expt., almost all of the halogen is recovered. Substitution of alc. NaI for the aq. KI had no detectable influence on the results. To effect with halogens what had already been accomplished with  $(\text{SCN})_2$ , i. e., addn. to only 1 double bond, it was necessary to diminish greatly the reactivity of the halogen. Numerous attempts were made to secure this result by using substances holding Br in loose combination, such as org. perbromides (azobenzene perbromide), but none of these solns. fulfilled the condition of titrimetric constancy. The desired object was finally attained by combining the Br in MeOH not only with NaBr but also with I; numerous trials showed that the best results were obtained by using equiv. amounts of Br and I in NaBr-MeOH and by dissolving the fat in equal vols. of  $\text{CHCl}_3$  and  $\text{CCl}_4$ . C. A. R.

**Distinguishing between expressed and extracted cacao butter.** AUFRECHT. *Chem.-Ztg.* 53, 318(1929).—Dissolve 2 g. cacao butter in 5 cc.  $\text{CHCl}_3$  in a test tube. Mix the clear soln. with 5 cc. HCl (d. 1.192). A light green color in the lower layer, followed by a dark green in 1 min. indicates extd. cacao butter. By adding 2 drops of  $\text{HNO}_3$  (d. 1.42), and heating to  $50^\circ$  a reddish brown color is produced in 2 mins. Ext'd. residues give a brownish yellow color, which in 5 mins. changes to a brown-violet. Expressed cacao butter remains unchanged when treated as above. E. SCHERUBEL

**Formation of toxic gases in the manufacture of washing compounds containing trichloroethylene.** WELWART. *Seifensieder-Ztg.* 56, 26(1929).—Toxic gases were formed when a fresh lot of  $\text{C}_2\text{HCl}_3$  washing compd. was made by charging the kettle with the required amt. of solid KOH, which on coming into contact with a few l. of liquor left in the kettle from the last operation formed a concd. hot KOH soln. This decomposed the  $\text{C}_2\text{HCl}_3$  into formate, CO,  $\text{C}_2\text{H}_4$  and traces of dichloroacetylene, which latter caused spontaneous ignition of the mass after a sufficient amt. had accumulated.

P. ESCHER

**The "Wecker" method.** C. H. KRUTGEN. Marburg. *Seifensieder-Ztg.* 56, 145 6(1929).—An answer to "Kronos" (C. A. 23, 2587).—The "Wecker" method has been slowly developed through many years and factory results are now cited for both the fatty acid distn. and the removal of free fatty acids from oils. In the latter case the removal is carried down to  $1\frac{1}{2}\%$  free fatty acids, and the remaining  $1\frac{1}{2}\%$  removed by NaOH, thus utilizing the bleaching effect of NaOH and producing a min. amt. of foots.

P. ESCHER

**Heat consumption in the fatty acid industry.** K. E. SKÄRBLOM. *Arch. Wärme-wirt.* 10, 174-6(1929); cf. C. A. 23, 3116.—The results of a steam survey of a fatty acid plant using the Twitchell process and concg. glycerol are given. The latent heats, in cal./g., calcd. from the vapor pressure curves of others, are: for stearic acid, 166.3-0.38%, for palmitic acid, 152.8-0.35%; for oleic acid, 150.9-0.31%. ERNEST W. THIELE

**Bromine derivatives of linolenic acid.** WASABURO KIMURA. Kyoto Inst. for Chem. Res. *Chem. Umschau Fette, Oele, Wachse u. Harze.* 36, 125-8(1929).—The bromides were prepd. by adding an excess of Br to free linolenic acid at low temp., 145 g. bromides having been obtained from 300 g. On recrystn. from  $\text{C}_6\text{H}_6$  a white powder of tallowy feel resulted, m.  $183^\circ$ , neutralization no. 67.33, Br. 63.73%. The free linolenic acid being liberated from the hexabromostearic acid by means of Zn dust and MeOH plus HCl and the acid rebrominated with the calcd. amt. of Br yielded a cryst. hexabromostearic acid; an oily hexabromide resulted. No tetrabromide was observed, so that the presence of  $\beta$ -linolenic acid, which does not absorb Br quantitatively, could not be confirmed. When the bromination and debromination of the hexabromide were repeated, the yield of solid hexabromostearic acid as well as the Br content of the oily bromide and its I no. gradually diminished while the mol. wt. increased. These changes are evidently due to some oxidation of the linolenic acid and partly to polymerization. P. ESCHER

**Determination of iodine numbers. II. Action of iodine chloride solutions on the fatty acids with conjugated double bonds.** E. TH. GELBER AND J. BÖESEKEN. *Rec. trav. chim.* 48, 377-85(1929).—When Wijs' soln. is allowed to act upon linoleic acid dissolved in  $\text{CCl}_4$ , a low I no. is obtained unless a large excess of reagent is used (about 400% of the theoretical quantity) and about 48 hrs. allowed for the reaction to take place. By dissolving linoleic acid in  $\text{AcOH}$ , by adding Wijs' soln. and pipetting off portions at different intervals, it was found that the reaction takes place in 2 stages; the first stage takes place instantaneously and gives an I no. of about 91, corresponding to the effect of 1 double bond; the second stage corresponds to the action of I on the second double bond and takes place so slowly that low results are obtained if the analysis is conducted normally. The explanation seems to be that linoleic acid in contact with  $\text{ICl}$  takes up more Cl than I so that there is to a certain extent an accumulation of I in the reagent. In the case of eleostearic acid the formula proposed by Böesecken and Ravenswaay would call for an I no. of 270 whereas previous detns. have given 180; but in the light of the above facts, it is now possible to get as high a value as 272, so that the opinion is confirmed that eleostearic acid is a linoleic acid. Two double bonds react quickly but the third reacts very slowly with I. Apparently the first reaction with  $\text{ICl}$  results in the formation of a tetrachloride, which then very slowly adds on an additional mol. of  $\text{ICl}$ . W. T. H.

**Hardening oxidized oils.** W. NORMANN. *Chem. Umschau Fette, Oele, Wachse u. Harze* 36, 81-2(1929).—In technical hardening the OH group of castor oil is little or not at all attacked while its double C bond is fully satd., the hydroxyl no. usually dropping from 148 to 130-135. There are few or no OH groups in oxyns, the product of oxidized oils, but they react in part with  $\text{Ac}_2\text{O}$ . But the oxyns of fish oils are partly attacked in hardening with Ni at 180-190° before the double C bonds are satd.; higher temps. than 190° greatly influence the reaction and may explain the results of Wassiljero, who used high temps. and obtained different results. P. ESCHER

**Report of joint committee with A. S. T. M. on cold test of fatty oils.** R. R. MATTHEWS, et al. *J. Am. Leather Chem. Assoc.* 24, 242-4(1929). Pour point was detd on 2 samples of neatsfoot oil by the A. S. T. M. method (D97-28), employing (1) intervals of 5° F., as prescribed in the method, and (2) intervals of 2° F. between tests. By the latter procedure, the mean results for pour point found for the 2 oils were 2.2° F. and 0.9° F. lower than by the former, but the av. deviation of different analysts from the mean was no smaller when the test was made at smaller temp. intervals. For a low-test oil, the av. deviation from the mean was 2.1° F. and for a high-test oil, 1.6° F. Conclusion: The 2° F. interval in making the pour test has no particular advantage. H. B. M.

**Report of Smalley Foundation Committee. Coöperative meal samples for the season 1928-1929.** H. C. MOORE. *Oil & Fat Ind.* 6, No. 5, 24-7(1929).—Five tables are given showing the results of coöperative analytical work of the Smalley Foundation for oil and  $\text{NH}_3$ . E. SCHERUBEL

**Australian standard specifications for perilla oil and soy-bean oil.** *Australian Commonwealth Eng. Assoc.* (Sydney), Nos. K-12 and 13, 16 pp.(1929).—Standard methods of sampling and testing are included. E. I. S.

**Constituents of the soy bean with special reference to its oil sediment.** E. HOLTZ. *Seifensieder-Ztg.* 56, 103-4, 112-3, 121-2, 130-2, 140-1(1929).—An av. of 4 analyses of soy beans showed:  $\text{H}_2\text{O}$  13.88, fat 17.85, protein 37.87, crude fiber 6.30, ash 4.26, N-free ext. 1.30 and lecithin, 18.54; the last was calcd. from the percent of P, giving lecithin a mean mol. wt. of 800. The bean after the extn. of oil contains: protein 44.99, lecithin 18.00, oil 1.00,  $\text{H}_2\text{O}$  11.96, crude fiber 7.76, ash 6.62 and N-free ext. 9.65. After the extd. oil has been freed from its solvent, it deposits a sediment of phosphatides contg.  $\text{H}_2\text{O}$  20.20, free fatty acids 5.78, lecithin 48.67, dirt 4.07, unsapon. 1.08, protein 0.69 and neutral oil (difference) 17.51. From this sediment a fairly pure lecithin was prepd. by dissolving 100 g. in ether and pptg. with acetone; 45 g. of a light yellow, rapidly darkening, crumbly substance was obtained, which had all the properties of Merck's pure lecithin except that it flocculated in hot alc. and liberated some  $\text{H}_2\text{S}$ , while Merck's product was perfectly sol. P 3.89, N 1.22 and S 0.54% were found by analysis as against the calcd. 3.94, 1.75 and 0.0 for lecithin. Coagulation of the phosphatides by the elec. current failed, but addn. of electrolytes was successful, especially with  $\text{MgCl}_2$  and  $\text{MgSO}_4$  in 20-30% soln. Upon addn. of 0.5% of the soln. at 60° with intensive stirring, the phosphatides sepd. clean after 24-48 hrs. settling; the sediment showed 24.80-30%  $\text{H}_2\text{O}$ , 3.84-5.80 free acid, 0.98-1.99 unsapon., 43.64-53.48 phosphatides, 9.86-15.40 neutral oil and 3.00-6.22% dirt. To remove the Mg salts, the phosphatides were taken up in benzene, but the removal of the solvent caused the lecithin



to decomp. at 80°; it was necessary to add 25% oil during this distn. to protect the lecithin. The sepn. of the phosphatides from the oil by heat resembles the coagulation of albumin, a transformation of a colloidal soln. into a suspension. The solvent can be removed by adding some 40% coconut oil and distg. in a CO<sub>2</sub> atm. without decomp. the phosphatides. When the oil is extd. from the bean by benzene, phytosterol is also extd. and accumulates in the soap stock up to 2–3%. It may be sepd. by treating the soap stock with acid, neutralizing the sepd. acids, extg. the resulting soap with benzene, evapg. the solvent, and crystg. residual phytosterol from alc. P. ESCHER

**Domestic soy-bean oil.** OTTO EISENSCHIML. *Oil & Fat Ind.* 6, No. 4, 15–20 (1929).—This is a survey of the history and prospects of development of soy-bean oil in the U. S. E. SCHERUBEL

**American safflower-seed oil.** GEORGE S. JAMIESON AND SAMUEL I. GERTLER. *Oil & Fat Ind.* 6, No. 4, 11–3 (1929).—The consts. of a sample of hot-pressed oil from seed grown in Montana were  $d_{25}^{20}$  0.9243,  $n_{25}^{20}$  1.4744, I no. 149.3, sapon. no. 190.5, acetyl no. 12.5, R. M. no. 0.2, Polenske no. 0.1, % hexabromide 0.4, unsapon. 0.59%, satd. acids 5.93, unsatd. acids 87.72%, I no. of unsatd. acids 156. The compn. of the oil in % of acids was: oleic 25.7, linolic 65.8, linolenic 0.15, myristic 0.04, palmitic 4.1, stearic 1.6, arachidic 0.4, lignoceric 0.06. E. SCHERUBEL

**Official cottonseed analysis.** LEHMAN JOHNSON. *Oil & Fat Ind.* 6, No. 4, 35–6 (1929).—Crack the seed, without grinding or sepg., in a mortar. Weigh out 10 g. and dry 4 hrs. at 102–3° for detn. of H<sub>2</sub>O. Immediately grind in an iron mortar after adding 2.5 g. of ground glass. Place the whole in filter papers, using a Butt tube and a 50-cc. extn. flask having a file mark on the neck showing 60 cc. when filled to this mark. Add 30 cc. of standard petroleum ether and ext. 4 hrs. without regrinding. Without evapg. the ether, fill with more ether and mix thoroughly. Remove and set aside 30 cc. for the free fatty acid test. Evap. the ether from the half portion and weigh for oil. Remove the entire residue from the filter into an 800-cc. Kjeldahl flask marked on the neck to show when filled to 900 cc. Add 1 g. HgO, 15 g. K<sub>2</sub>SO<sub>4</sub> and 50 cc. H<sub>2</sub>SO<sub>4</sub> and digest in the usual way. Fill with H<sub>2</sub>O to the 900-cc. mark and pour off 600 cc. for duplicate detns. Add the usual reagents and distill the NH<sub>3</sub>. To the 30 cc. petroleum-ether soln. of oil add 15 cc. neutral alc. and 0.5 cc. 1% phenolphthalein soln.; titrate with 0.1 N alkali. The wt. of the oil is known from the other half evapg. off for oil. Calc. the free fatty acid. E. SCHERUBEL

**Thiocyanate value of parsley-seed oil.** A. STEGER AND J. VAN LOON. Tech. Hochschule, Delft. *Z. Untersuch. Lebensm.* 56, 365–7 (1928).—Kaufmann's method (C. A. 20, 2256) is used for detg. the thiocyanate value of linolic and satd. acids in parsley-seed oil. The compn. is unsapond. matter 30, total fatty acid 65.2 (consisting of satd. acid 3.0, petroselinic acid 45, 9,10-oleic acid 8.0, linolic acid 9.1), glycerol residue 2.8, volatile matter 2.0%. Twitchell's (C. A. 15, 3617) Pb salt and alc. method cannot be used for sepg. the fatty acids of this oil, because the Pb salt of petroselinic acid is fairly fusol in EtOH. Bertram's oxidation method proved inapplicable. F. P. G.

**The composition of rape oil of German origin.** K. TAUFEL AND C. L. BAUSCHINGER. Deut. Forschungsanstalt Lebensmittelchemie Munich. *Z. Untersuch. Lebensm.* 56, 253–64 (1928); cf. C. A. 23, 294. Rapeseed extd. under pressure yielded 21% oil. This was filtered at 40° and refined by treatment with H<sub>2</sub>SO<sub>4</sub>. Two years storage did not alter the properties of the oil. A table of properties is given. The satd. fatty acids were pptd. from the oil by addn. of excess Pb(OAc)<sub>2</sub> soln. according to the method of Twitchell (C. A. 15, 3617) and the ppt. was filtered off after 12 hrs. at 15°, washed with EtOH and recrystd. from Et<sub>2</sub>O. The fatty acids obtained were dissolved in EtOH and fractionally pptd. 6 times with 1% LiOAc in 95% EtOH. The pptd. contained 18.85% satd. fatty acid and 81.15% erucic acid. The filtrate from the Twitchell sepn. was treated with EtOH soln. of Mg(OAc)<sub>2</sub> and erucic acid liberated from the Mg salt and recrystd. from EtOH. The mother liquor was brominated at –14° for 3 hrs. and the bromide filtered off, washed with Et<sub>2</sub>O and weighed. The  $\alpha$ -hexabromostearic acid (m. 179°) obtained corresponded to 2.45% linolenic acid. The residue left by evapg. the brominated mother liquor was warmed at 35° with petroleum ether for 20 mins. and  $\alpha$ -tetrabromostearic acid (m. 114°) equal to 5.42%  $\alpha$ -linolic acid was obtained. The oleic acid was detd. by pptg. an EtOH soln. of the fatty acids with Zn(OAc)<sub>2</sub>. The % compn. of the oil was: erucic acid 43.5, oleic acid 37.8, linolic acid 10.6, linolenic acid 3.5, glycerol residue (C<sub>3</sub>H<sub>5</sub>) 3.8, unsaponifiable matter 1.0% and satd. fatty acid 0.8%. FRANCIS P. GRIFFITHS

**Glycerides of rape oil.** K. TAUFEL AND C. L. BAUSCHINGER. *Z. Untersuch. Lebensm.* 56, 265–72 (1928).—The presence of oleo-linolenic-erucin, oleo-dierucin, and trierucin in rape oil has been established (C. A. 15, 606). The amts. of oleo-dierucin and tri-

erucin are uncertain and cannot be detd. from the erucic acid content, on account of the presence of other mixed glycerides contg. this acid. Mol. wt. and Br. detn. on products resulting from fractional crystn. of brominated glycerides indicated 1.7% of oleolinoleno-erucin, corresponding with 0.5% linolenic acid. The remainder is combined in a different form. Fractional crystn. from a mixt. of rape oil and  $\text{CH}_3\text{COCH}_3$  at 20° and 0° by the method of Tomow, *viz.*, the action of  $\text{N}_2\text{O}$  on the mixt., gave *elaidodibrassinidin*  $[\text{C}_{21}\text{H}_{41}(\text{C}_{22}\text{H}_{43}\text{O}_2)_2 (\text{C}_{19}\text{H}_{39}\text{O}_2)]$  and *tribrassinidin*  $\text{C}_{21}\text{H}_{41}(\text{C}_{22}\text{H}_{43}\text{O}_2)_3$ . F. P. G.

Oil of *Cydonia vulgaris*. E. BUREŠ AND J. ŠÁTEK. Charles' Univ., Prague. *Časopis Českoslov. Lékárnictva* 8, 187-8(1928).—The oil extd. with ether from the ground seeds of *Cydonia vulgaris* in 20.50% yield had constants as follows: d. 0.919, acid no. 7.82, sapon. no. 186.0, I no. 107.60, Reichert-Meissl no. 2.046, Polenske no. 0.467, Ac no. 23.58. WILLIAM J. HUSA

Oil of *Nigella sativa*. E. BUREŠ AND H. MLÁDKOVÁ. Charles' Univ., Prague. *Časopis Českoslov. Lékárnictva* 8, 186-7(1928).—The oil extd. with ether from the seeds of *Nigella sativa* in 30% yield had consts. as follows: d. 0.8930, acid no. 14.68, sapon no. 210.60, I no. 110.9, Reichert-Meissl no. 3.378, Polenske no. 0.532, Hehner no. 89.22, Ac no. 23.92. WILLIAM J. HUSA

Oil of peony. E. BUREŠ AND B. ŠUSTEROVÁ. Charles' Univ., Prague. *Časopis Českoslov. Lékárnictva* 8, 185-6(1928).—The oil extd. with  $\text{CCl}_4$  from the ground seeds of the peony (*Paeonia peregrina*) in 22.15% yield had consts. as follows: d. 0.9600, acid no. 14.01, sapon. no. 211.26, I no. 187.10, Reichert-Meissl no. 1.537, Polenske no. 0.5568, Hehner no. 91.87, Ac no. 12.96. WILLIAM J. HUSA

Oil of *Hyoscyamus niger*. E. BUREŠ AND A. KRACÍK. Charles' Univ., Prague. *Časopis Českoslov. Lékárnictva* 8, 183-5(1928).—The oil extd. with petr. ether from the ground seeds of *Hyoscyamus niger* in 30.25% yield had consts. as follows: d. 0.921, acid no. 23.60, sapon. no. 187.70, I no. 135.70, Reichert-Meissl no. 1.055, Polenske no. 0.452, Hehner no. 93.34, Ac no. (Normann) 21-21.6, Ac no. (Lewkowsitch) 20.54. W. J. H

Chemical study of the liver oil of a young male basking-shark, *Cetorhinus maximus* Günner. Biological relations between cholesterol and squalene. ÉMILE ANDRÉ AND HENRI CANAL. Hospice de la Salpêtrière, Paris. *Ann. combustibles liquides* 3, 833-50 (1928); cf. C. A. 21, 1891.—A study which compares the liver oil of a young shark with that of the adult animal shows that the transformations: fatty acid→cholesterol→squalene take place during the growth of the animal. The liver oil of the young shark contains 58.5% by wt. of fatty acids (of the approx. compn. by wt.: myristic,  $\text{C}_{14}\text{H}_{28}\text{O}_2$ , 20%; therapeutic,  $\text{C}_{18}\text{H}_{36}\text{O}_2$ , 10%; arachidonic,  $\text{C}_{20}\text{H}_{40}\text{O}_2$ , 15%; and cetoleic,  $\text{C}_{22}\text{H}_{42}\text{O}_2$ , 55%), 32% of which was in the form of glycerides and the remainder as esters of cholesterol. The unsapond. material consisted of squalene,  $\text{C}_{30}\text{H}_{50}$  (mixed with small quantities of pristane,  $\text{C}_{19}\text{H}_{38}$ ); and cholesterol,  $\text{C}_{27}\text{H}_{46}\text{O}$ , in amts. representing, resp., 18 and 22.5% by wt. of the original liver oil. R. E. SCHAAD

Calibration of sixty-five 35-yellow Lovibond glasses. I. G. PRIEST, D. B. JUDD, K. S. GIBSON AND G. K. WALKER. *Bur. Standards J. Research* 2, 793-819 (1929); cf. C. A. 22, 4265.—Sixty-five 35-yellow Lovibond glasses were calibrated and considered fit to be regarded as equiv. to standard 35-yellow under the present customary conditions of grading oils. The discrepancies of color grading cannot be charged to lack of uniformity among the 35-yellow glasses. The sources of these troubles are: (a) unstandardized, non-uniform and insensitive methods of comparing the oil samples with the glasses, (b) grading of oil by observers having abnormal color sense or low power of hue discrimination, (c) errors in the red glasses. E. SCHOTTE

Report of soap section committee. Progress achieved in formulation of standards for acids used in glycerol analysis. A. K. CHURCH. *Oil & Fat Ind.* 6, No. 5, 28-33 (1929).—The report of 11 lbs. is given on the precise method of standardizing the acid used. The use of one indicator does not give the same results as the use of another indicator. Six labs. use  $\text{Na}_2\text{CO}_3$ , 4 use  $\text{AgCl}$ , and 1 uses benzoic acid. E. SCHERUBEL

Common antiseptics used in soaps. PAUL I. SMITH. *Am. Perfumer* 24, No. 2, Soap Ind. Sec., 147-8(1929).—The antiseptics which find favor for use in soap are coal tar, phenolic and cresolic preps., mercuric chloride and iodide, essential oils such as resins, terpine, almond oil and thymol. Before a chemical can affect a micro-organism it must first penetrate the lipid covering and the thickness of this varies with different organisms, and therefore the rate of absorption of the antiseptic is in simple ratio to this factor. The remedial value of phenolic soaps is questionable, but the Hg soaps are very useful in skin diseases. Hg salts have no injurious effects on the soap. Many of the heavy metallic salts are of doubtful value in soaps because of this pptg. action on proteins. Essential oils possess antiseptic properties and highly scented

soaps are of greater value than the pungent medicinal soaps so widely advertised.

**The metal soap content of fats and the examination of metallic soaps.** H. DUBOVITZ. *Chem. Umschau Fette, Oele, Wachse u. Harze* 36, 160-2(1929).—A description of the methods used in detg. Ca soaps in bone grease and the detn. of free fatty acids in Zn oleate. P. ESCHER

**Check on the salt-rubin method.** J. HERRTES. *Z. phys. chem. Seifenforsch.* 2, 22 5(1929); cf. Zakarias, *C. A.* 23, 2056.—For comparative results in detg. the salt-rubin no. of soaps it is necessary to standardize the Congo rubin indicator so that 10 cc. of a 0.01% soln. turns violet only after addn. of 0.5 cc. of a 10% NaCl soln. Some test results with different soaps and indicators are tabulated. "Grübler" Congo rubin is preferred. P. ESCHER

**Remarks about the methods of analysis for soaps and soap powders.** J. GROSSER. *Seifensieder-Ztg.* 56, 127-9(1929).—G. suggests for the detn. of total fatty acids, as proposed by the Commission for Standard Methods of Analysis, to decomp. the warm soap soln. directly in a separatory funnel instead of in a beaker with subsequent transfer to the separatory funnel. While the Commission omits the washing with H<sub>2</sub>O of the ether soln. of fatty acids, G. recommends it, especially when H<sub>2</sub>SO<sub>4</sub> has been used, but thinks the drying with anhyd. Na<sub>2</sub>SO<sub>4</sub> unnecessary when the layers form clear solns. Any H<sub>2</sub>O that enters the ether by washing is carried off with the ether at 50° if brisk evapn. is maintained. Unsapon. neutral fat and unsapon. matter: The proposed washing of the united petr. ether ext. with 50% alc. contg. some NaOH is wrong in principle, since a 50% alc. soap soln. can saponify small quantities of neutral fat in the presence of free alkali; it is better to add a little soda to the alc. The drying of the unsapon. at 100° until all odor of petroleum ether has disappeared may cause some loss if hydrocarbons are present; drying at 80° to 90° is recommended. Geissler's app. for CO<sub>2</sub> detn. yields unreliable results, and the regular absorption train is recommended. In detg. Na silicate the concn. of soap soln. and HCl should be definitely stated to avoid incomplete pptn. of SiO<sub>2</sub>. The mean mol. wt. of fatty acids in the detn. of Na<sub>2</sub>CO<sub>3</sub> in soap powders should be lowered from the proposed 300. In the detn. of the turbidity point the hot filtrate should be readjusted to its original wt. by addn. of H<sub>2</sub>O. P. ESCHER

**Washing extracts and their preparation.** R. KRINGS. *Seifensieder-Ztg.* 56, 137 9(1929).—"Washing exts." are K soaps contg. some solvent like hexalin, etc., and are used mostly in the textile industry for special purposes. P. ESCHER

**Experiments to prepare highly active washing extracts.** R. KRINGS. *Seifensieder-Ztg.* 56, 158-9(1929).—K. describes the prepn. of liquid K soaps of extraordinary cleansing power and of a cream-like appearance by adding 2 1/2% of oil of turpentine in one case and 2 1/2% NH<sub>4</sub>Cl in another case. P. ESCHER

Determination of viscosity of oils and varnishes by the air-bubble method (RUCHTI) 26. Composition and digestibility of maize and the by-products from its treatment for technical purposes (HONCAMP, *et al.*) 12. Soaps, solvents and detergents (FREEDLAND) 25. The sodium acid salts of palmitic acid (EKWALL, MYLIUS) 10. Apparatus for heat treatment of oils (U. S. pat. 1,712,372) 1. Separating oils from solid substances (Fr. pat. 650,573) 22.

HAASE, WILHELM: *Bibliothek d. ges. Technik* 376. Ölmüllerei. Leipzig: M. Jänecke. 91 pp. M. 4.50.

KRAIS, PAUL AND SINNER, HERBERT: *Die Einwirkung von Härtebildnern auf Natron- und Kaliseifen*. Dresden: Deutsches Forschungsinstitut für Textilindustrie. 44 pp. Half linen, M. 6.

**Apparatus for steam distillation of fatty acids, glycerol, etc.** WILHELM GENSECKE. U. S. 1,713,431, May 14. An app. for steam distn. under high vacuum comprises a distg. vessel, a surface condenser connected with the still, a water-cooled steam condenser and a steam-operated injection compressor having its suction side connected with the surface condenser and its pressure side connected with the steam condenser.

**Apparatus for extracting olive oil.** JOSÉ C. TORRES. Fr. 650,635, Jan. 11, 1927.

**Extraction plant for olive oil, etc.** PAUL ZAHRA. Fr. 650,147, Aug. 16, 1927.

**Purifying waxes.** RISSBCK'SCHE MONTANWERKE A.-G. Brit. 209,357, Oct. 24, 1927. Refining of waxes such as carnauba, candelilla or other vegetable waxes is effected in soln., *e. g.*, a soln. of carnauba wax in EtOAc heated to the b. p. is stirred.

with "Carboraffin," centrifuged to sep. the C and the solvent is distd. off. Various other solvents and modifications of the procedure are mentioned.

**Apparatus for atomizing molten paraffin or wax.** LEIPZIGER TANGIER-WERK A.-G. Fr. 650,762, Mar. 12, 1928.

**Removable filtering and washer plate for press pots of cacao presses.** MAX MICHEL. U. S. 1,713,478, May 14. Structural features.

**Soap.** YVES M. C. DE WISMES and PIERRE MARMION. Fr. 650,953, Aug. 22, 1927. Mineral hydrocarbons in the form of petroleum or petrolatum residues, liquid petrolatum or mineral oil are added to the soap ingredients before sapon., to make a powerful cleansing soap.

**Arsenical soaps.** ARNOLD N. MACNICOL. U. S. 1,711,503, May 7. In forming arsenical soaps suitable for *insecticidal purposes*, wool fat is mixed with caustic alkali and an alkali arsenite and the resulting mixt. is emulsified (suitably by heating to about 90–105°).

## 28—SUGAR, STARCH AND GUMS

J. K. DALE

**Determination of chlorine in sugar-factory products.** C. E. BUDLOVSKÝ. *Z. Zuckerind. Tschoslovak. Rep.* 52, 421–30(1928).—In the case of products sol. in water or dil.  $\text{HNO}_3$ , the acidified soln. is treated with a slight excess of  $\text{AgNO}_3$ , clarified with  $\text{FePO}_4$ , and the ppt. centrifuged and dried without washing. It is then distd. with concd.  $\text{H}_2\text{SO}_4$  in the presence of Cu in a special app., the HCl condensed in water being titrated by Votoček's method. Insol. products are distd. with concd.  $\text{H}_2\text{SO}_4$  in the same app., following the lines of the Vaubel-Scheuer method (*Chem.-Ztg.* 30, 167 8 (1906), and the HCl is detd. as before. Results obtained by these 2 methods were consistently higher than those found by detg. the Cl in the ash of the product examd.  
B. C. A

**Chlorine as a sugar decolorant.** L. R. BLISS. *Sugar* 31, 3–5, 57–9, 99–101(1929).—Chlorine gas, washed and dried, was led into the solns. to be decolorized. Its effect upon the polarization of sucrose, dextrose, invert sugar and mixts. of these was practically nil. Diluted molasses defecated with Horne's dry lead followed by treatment with Cl gave solns. easily polarized. Addn. of K alum or  $\text{AlCl}_3$  to cloudy solns. resulting from chlorination of leaded filtrates causes flocculation and easy filtration. The use of a defecant is necessary with cane juice and molasses. Directions for the use of Cl in the Clerget detn. are essentially as follows: Transfer 2.5 normal sugar wts. of molasses or other product with a little  $\text{H}_2\text{O}$  to a 250-cc. flask. Add basic Pb acetate and alumina cream and complete the vol. Shake, filter and delead with a little powd.  $\text{K}_2\text{C}_2\text{O}_4$ , add kieselguhr and filter. Treat 50 cc. of the filtrate in a 100-cc. flask with 30 cc. satd. Cl water and allow to stand in a cool place to bleach. Dil. to vol. and read. To a second 50 cc. add 30 cc. of a soln. of HCl in satd. Cl water adjusted to 1.1 sp. gr. and let stand 2–3 hrs. Adjust to vol. and polarize. Correct the direct and invert readings for concn. and for the sucrose. Calc. Clerget by the usual formula using the Steuerwald factors. The possibilities of dangers by inversion in the direct polarization, of the oxidation of levulose, and of the influence of HCl upon the specific rotation of levulose are discussed. Tables are given in which comparison is made between results obtained with and without the use of Cl in both direct polarization and Clerget methods. A tentative method is given for the "approx." detn. of purity by destruction of reducing sugars with alkali followed by Cl bleaching and polarization. The Brix is detd. preferably by refractometer.

**Vladimir Staněk.** ANON. *Chem. Obzor* 4, 97–101(1929).—50th birthday and 30th jubilee of his scientific work with portrait and bibliography.  
J. F. BREWSTER  
J. KUČERA

**Sodium hyposulfite in the sugar factory.** MARCEL LEMIRE. *Bull. assoc. chim. suc. dist.* 46, 33–5, 68–70(1929).—The merits and defects of the various preps of sulfur compds. used in sugar factories are discussed. Full details as to technical use are given. Methods of analyzing the sulfur compds. are described.  
E. A. FIEGU

**Determination of end point in the final saturation.** O. SPENGLER and C. BRENNEL. *Z. Ver. deut. Zuckerind.* 79, 39–43(1929).—The present methods of detg. the end point of the carbonation process are reviewed. The difficulties inherent in these methods are mentioned. A new method is given: Approx. 25 cc. of juice without filtration is poured into a small stand glass. Five drops of phenolphthalein soln. is added to the hot sample, followed by 5 drops of  $\text{CaCl}_2$  soln. (15 g. to 100 cc.). About half a min. after shaking the container, the color of the soln. is noted. If it is a faint, dirty rose,

then satn. is complete; if colorless, the  $\text{CO}_2$  supply must be cut off; if it is a distinct rose or red color, carbonation must be continued. This method is more readily carried out than the customary titration.

E. A. FIEGU

**The most advantageous method of thin juice sulfitation.** ERNST THIELEPAPE AND PAUL MEIER. *Z. Ver. deut. Zuckerind.* 79, 176-93(1929).—The authors point out the defects of the Weisberg process. Two methods of sulfitation are given: (1) introducing  $\text{SO}_2$  into the filtered juice from the second carbonation, till slightly acid, and then adding  $\text{Na}_2\text{CO}_3$  to an alkalinity of about 0.02; (2) an alkaline process in which about 0.14% (on beets)  $\text{Na}_2\text{CO}_3$  is added to the filtered juice prior to the second carbonation, and carbonation continued to about 0.05 alky., followed by sulfitation till the alky. reaches about 0.02. These two processes, in comparison with the old process, give juices which are very low in lime salts, and which have a light color. Again, the  $\text{SO}_2$  stays in the juice as alkali sulfite, and is fully utilized. Full details of all exptl. work are given, and comparative tables are supplied. Sirups from poor beets high in lime salts when sulfitated and then treated with  $\text{Na}_2\text{CO}_3$ , can be largely freed from Ca.

F. CAMPS-CAMPINS

**The sugar content of carbonation press cake.** A further contribution to the explanation of undetermined losses. O. SPENGLER AND C. BRENDL. *Z. Ver. deut. Zuckerind.* 79, 61-76(1929).—The customary methods of detg. sugar in press cake do not give true values. Microscopic examn. of press cake showed particles of slime from which sugar is removed with difficulty. Detns. of the true sugar content of samples gave values which were 2 to 2.5 times that given by the regular method of analysis. Fresh press cake was analyzed by the usual method; also a quantity of press cake was digested at 95-99° for about  $\frac{3}{4}$  hour with stirring, filtered and the sugar content of the filtrate and of the sludge detd., giving the true sugar content of the press cake. The work was checked by concn. of the filtrate. The digestion permitted the extn. of the sugar from the slime particles. A sweetened-off press cake will, on standing, give a higher sugar content than if analyzed when fresh. This is due to the sugar diffusing from the interior of the slime particles in the course of time.

E. A. FIEGU

**Automatic apparatus for determination alkalinity of continuous carbonation.** P. R. CHECHEL AND M. G. LISHCHINSKII. *Nauch Zapiski Sakharnoi Prom.* 7, 24-6(1928). The app. is described.

V. E. BAIKOV

**The "De Vecchis" process.** Comparison of French and Italian beets. P. MARCINELLI. *Bull. assoc. chim. suc. dist.* 46, 133-9(1929).—Because of differences in compn. of French and Italian beets, results of the Vecchi process in Italy should be compared only to Italian factory figures for the ordinary process and not to such figures from other countries. Results show that the process is satisfactory.

F. C.-C.

**New experiments on beet saponins.** K. REHORST. *Z. Ver. deut. Zuckerind.* 79, 155-75(1929).—Previous work is reviewed. From a thorough study of its cleavage products, the author assigns the formula  $\text{C}_{37}\text{H}_{56}\text{O}_9$  to sugar beet saponin: this is checked by elementary analysis. The results of titration point to 2 free carboxyl groups. The hydrolysis of saponin is then expressed by the equation:  $\text{C}_{37}\text{H}_{56}\text{O}_9 + \text{H}_2\text{O} = \text{C}_{31}\text{H}_{48}\text{O}_3 + \text{C}_6\text{H}_{10}\text{O}_7$ . (Sugar beet saponin plus  $\text{H}_2\text{O}$  gives beet sapogenin and *d*-glucuronic acid.) Within the limits of exptl. error, these cleavage products can be shown to occur in the amts. required by the equation. The methods of prepn., and the properties of these substances are studied experimentally so as to throw light on their structure. Full description of all expts. is included.

F. CAMPS-CAMPINS

**The precipitation of colloids from beet-sugar molasses.** I. ERICH GUNDERMANN. *Chem.-Ztg.* 53, 305-7(1929).—Solns. of beet sugar molasses contg. 10-50% dry substance were treated with increasing amts. of acid. The time required for flocculation to become visible was observed in each case. At a  $p_H$  of about 3.2 flocculation occurs most rapidly, while at a higher as well as a lower value the velocity decreases. At 80° sedimentation was much faster with formation of rapidly settling clusters. For detn. a lower temp. must be used, as otherwise decompn. products are formed. In dil. soln. more colloids are coagulated than in concd. soln. II. *Ibid* 322-3.—Clarification, ease of filtration and decolorization of solutions, accompanying flocculation, is optimum at  $p_H$  3.2. The best results in clarification and purification of juices and sirups in sugar houses with  $\text{SO}_2$ , are obtained at  $p_H$  close to that producing inversion. J. C. J.

**Composition and digestibility of maize and the by-products from its treatment for technical purposes [corn starch] (HONCAMP, et al.) 12.** Action of  $\text{SiO}_2$ ,  $\text{Al}_2\text{O}_3$ , and kaolin on  $\text{BaSO}_4$  (MARCHAL) 6. Apparatus for reduction of mannose, glucose and other sugars (U. S. pat. 1,712,952) 4. Electrolytic cell for reducing mannose to mannitol

or for other reductions of sugars, etc. (U. S. pat. 1,712,951) 4. Cellulose [from bagasse] (Fr. pat. 650,194) 23. Vinasses (Fr. pat. 650,804) 15.

EARLE, FRANKLIN S.: *Sugar Cane and Its Culture*. New York: John Wiley & Sons, Inc. 355 pp. \$4.50.

TALWAR, OM P.: *Remedy of Unknown Losses in the Sugar Industry*. Chakwal, Jhelum, Punjab, India: Talwar Chemi Cottage. 27 pp. Rs. 1. Reviewed in *Intern Sugar J.* 31, 217 (1929).

**Sugar.** JACOB POHLMANN and JACOBUS R. F. RASSERS. Fr. 650,844, Mar. 14, 1928. Albumins are eliminated from sugar juices coming from the presses by the addn. of tannic acid or its derivs., MeOH, picric acid, phosphotungstic acid or phosphomolybdic acid. Crystn. of the sugar is thereby greatly facilitated.

**Treating sugar solutions to increase their sucrose content.** WALTER H. DICKERSON (to Industrial Waste Products Corp.). U. S. 1,713,118, May 14. A sugar soln. which contains both sucrose and invert sugar is treated to obtain a product in powder form and of greater proportionate sucrose content than the original sucrose content of the soln., by spraying the soln. into a hot drying gas and effecting a reduction in the temp. of the sprayed material by the time drying is substantially completed so that the product is not injured.

**Sugar juice.** AKTIEBOLAGET SEPARATOR. Fr. 650,752, Mar. 12, 1928. After the addn. of lime to ppt. the impurities, sugar juice is decanted by gravity so that only a small amt. of solid substances remains in it, which are extd. by a centrifuge provided with a bowl having non-perforated walls on which the solid substances deposit and from which they are periodically removed.

**Sugar juice.** AKTIEBOLAGET SEPARATOR. Fr. 651,113, Mar. 22, 1928. Sugar juice is purified by adding lime and centrifuging before pptg. excess of lime, *e. g.*, by the addn. of CO<sub>2</sub>. Substances of less sp. gr. than the juice are eliminated before the addn. of lime.

**Products from molasses.** YOSITARO TAKAYAMA. Fr. 650,994, Mar. 19, 1928. Betaine-HCl and KCl are extd. from waste molasses by passing in HCl to the concd. liquor whereby KCl is pptd. The liquor is filtered and concd. whereby betaine HCl contg. some KCl is pptd. The ppt. is dissolved in water, neutralized with CaCO<sub>3</sub>, filtered and concd. whereby crystals of KCl are obtained. HCl is added to the filtrate from these, and concn. gives betaine-HCl. After filtering the filtrate may be used as a starting point for the prepn. of glutamic acid.

## 29—LEATHER AND GLUE

ALLEN ROGERS

**Temperature factor in vegetable tannin fixation.** ARTHUR W. THOMAS AND MARGARET W. KELLY. Columbia Univ. *J. Am. Leather Chem. Assoc.* 24, 282-9 (1929).—Two-g. portions of fat-free hide powder were tanned with solns. contg. 40 g. solids per 1000 cc. of 1 of the following exts.: wattle, oak bark, gambier or quebracho. Temps. employed were 4°, 7°, 25° and 37.5°. After varying periods, up to 117 days, each sample was washed free from sol. matter in a Wilson-Kern extractor, dried and weighed, increase in wt. being taken as tannin fixed. Rate of tannage increased rapidly with temp., and increase in rate is much greater for the 12.5° interval from 25° to 37.5° than for the 18° interval from 7° to 25°. Tanning takes place at the lowest temp. tried.

H. B. MERRILL.  
**Determination of moisture in tanning extracts.** Committee report, 1928-29. HENRY B. MERRILL, *et al.* *J. Am. Leather Chem. Assoc.* 24, 314-20 (1929).—Direct drying of a weighed sample of solid quebracho ext. was compared with evapn. and drying of an aliquot of the analytical soln. Some members of the committee obtained identical results by the 2 methods, both of which are now official, other members obtained more H<sub>2</sub>O by direct drying, probably because of gain in wt. of residues from evapn. of soln., due to oxidation. **Recommendation.**—The direct drying method should be employed only when the ext. does not give uniformly turbid soln. H. B. MERRILL.

**Determination of insoluble matter in tannin extracts.** D. McCANDLISH AND W. R. ATKIN. Leeds Univ. *J. Am. Leather Chem. Assoc.* 24, 231-5 (1929).—The analytical soln. is filtered through paper, with the aid of kaolin, as in the official method, but a Büchner funnel and suction are employed. The app. consists of a Büchner funnel,

preferably with stopcock in stem, connected to a straight-sided separatory funnel with side tube and stopcock, which connects to a filter flask. Vacuum is applied both to the flask and to the funnel. The paper is tanned 1 hr. as usual, the filtrate being collected in the funnel, and transferred to the flask periodically until it comes through optically clear. After tanning the paper, fresh soln. is poured on the filter, the soln. in the receiving funnel is drawn into the flask, and then the vol. of filtrate required for evapn. is collected in the funnel. Insol. matter in 6 different exts. was detd. by the above and by the filter candle method. No difference beyond the limit of exptl. error was found with liquid and solid chesnut, quebracho, mimosa and a blended ext. With liquid myrobalams (2 samples), the paper method gave 0.7 and 0.9% more insol. matter than the candle; with the latter, an optically clear filtrate could not be obtained. Advantages claimed for the proposed method over the official procedure are (1) more uniform thickness of kaolin layer on the paper, and (2) smaller error due to tannin adsorption by the paper because of the smaller paper employed. As compared to the candle method, the filtration is slower but time spent in cleaning candles is saved.

H. B. MERRILL

**Determination of insoluble matter in tannin extracts.** C. RISS. Tech. Hochschule, Darmstadt. *J. Am. Leather Chem. Assoc.* 24, 229-31(1929); cf. preceding abstract.—The method proposed by McCandlish and Atkin is simplified by filtering under the suction produced by a column of filtrate in a capillary tube 1.2 m. long. No special app. is required.

H. B. MERRILL

**The one-bath chrome tanning process in the light of Werner's coordination theory.** C. H. SPIERS. *Leather Trades Rev.* 51, 891, 964(1928); 52, 14, 96(1929); *J. Am. Leather Chem. Assoc.* 24, 246-70(1929).—The work of Gustavson, Stiasny and others is reviewed. Conclusion: The quality of a Cr leather appears to depend upon the nature of the acido-chromi-complex that it contains, its acidity, and the nature of the acid radical.

H. B. MERRILL

**Action of water on vegetable-tanned leather. I. Rate of removal of uncombined water-soluble matter.** HENRY B. MERRILL. A. F. Gallun and Sons Co., Milwaukee, Wis. *J. Am. Leather Chem. Assoc.* 24, 235-42(1929).—Vegetable-tanned leather contains substances that are firmly combined, loosely combined and not combined at all with collagen. It is shown that such uncombined substances as glucose, NaCl and Na gallate are completely removed by washing in a percolator for 2 hrs. or less. A sample of vegetable-tanned leather contg. no added load lost about 5% org. H<sub>2</sub>O-sol. matter in the same time, and the "% H<sub>2</sub>O-sol. matter: time-of-washing" curve for this leather had no break up to 4 days. This shows that it is not possible to distinguish between added, sol. loading materials and org. H<sub>2</sub>O-sol. matter naturally present, on the basis of ease of extrn. from the leather with H<sub>2</sub>O.

H. B. MERRILL

**Tentative Australian standard specifications for vegetable-tanned leather belting.** *Australian Commonwealth Eng. Standards Assoc.* (Sydney) No. B4, 15 pp.(1929).—Specifications cover quality of leather, currying, manuf., length of lap, thickness of grades and tests.

E. I. S.

**How temperature and humidity affect leather belts.** D. A. HAMPSON. *Power Transmission* 34, no. 3, 21-2(1929).

E. I. S.

**Critical study of the biochemistry of soaking and liming. III. Influence of the gaseous environment upon the soaking of heavy hides.** E. R. THEIS AND JEROME M. MILLER. Lehigh Univ. *J. Am. Leather Chem. Assoc.* 24, 290-314(1929).—Samples of 50 g. of either domestic or South American hides cut into pieces about 1 cu. mm. were suspended in 250 cc. of water at 25° for 14 days. A continuous current of 1 of the following gases was passed through the app.: O<sub>2</sub>, N<sub>2</sub>, H<sub>2</sub>, CO<sub>2</sub>, air, C<sub>2</sub>H<sub>2</sub>, SO<sub>2</sub> or producer gas. At the end of the expt. the solns. were examd. for acidity, total amide N, total dissolved N, total protein N, formol titration, dissolved S and dissolved volatile acids. With domestic hides, the least putrefaction occurred in the presence of C<sub>2</sub>H<sub>2</sub>, SO<sub>2</sub> and CO<sub>2</sub>; most decompn. occurred in the presence of H<sub>2</sub> and N<sub>2</sub>. With South American hides, air and H<sub>2</sub> caused the most, and N<sub>2</sub> the least, decompn. In the presence of CO<sub>2</sub>, notable amts. of S compds. from epidermis and hair were rendered sol. Butyric acid was formed in all liquors—least in the presence of air or O<sub>2</sub>, most in the presence of H<sub>2</sub> and N<sub>2</sub>. Hydration of skin was studied as a function of gaseous environment by the method of Theis and Neville (*C. A.* 23, 2319). Hydration was greatest in the presence of CO<sub>2</sub> and O<sub>2</sub>, and least in the presence of N<sub>2</sub>.

H. B. MERRILL

**Hydrolysis of hide powder in saturated sodium chloride solutions at various *p*<sub>H</sub> values.** ARTHUR W. THOMAS AND MARGARET W. KELLY. Columbia Univ. *J. Am. Leather Chem. Assoc.* 24, 280-2(1929).—Samples of hide powder were suspended in solns. of initial *p*<sub>H</sub> values from 0.76 to 9.97, all satd. with NaCl. Aliquots were removed

and filtered, and dissolved N was detd. after various periods up to 224 days. Percent of the total collagen present that was dissolved in 224 days increased with the  $p_H$  value of the soln., being approx. 3 times as great as  $p_H$  9.97 (8.36 final) as at  $p_H$  0.76 (4.49 final). Use of  $Na_2CO_3$  in salt used for curing is therefore inadvisable. H. B. MERRILL

**Analysis of some English book-binding leathers.** R. W. FREY, L. R. LEINBACH AND E. O. REED. Bur. Chem., Dept. Agr. *J. Am. Leather Chem. Assoc.* **24**, 190-6 (1929).—Analyses and tensile-strength measurements were made on 13 goat, 6 calf, 1 cow and 1 pig leather, all submitted as especially suitable for book-binding. Thirteen of these leathers were claimed, and found to be practically free from  $H_2SO_4$  (Proctor Searle Method). The others contained from 0.0 to 2.2%  $H_2SO_4$ . In general, the leathers contg. the most acid had the lowest tensile strength.  $p_H$  values of aq. exts. of all leathers were detd. In all cases where %  $H_2SO_4$  < 0.5, the  $p_H$  value of the ext. < 3.0; in 4 out of 5 leathers in which  $H_2SO_4$  > 0.5%, the  $p_H$  value of the ext. < 3.0. The authors consider most of these leathers to be over-tanned and deficient in grease. Pyrogallol tannage was found in 16 cases, and mixed tannage in 6 cases. The life of bindings made from these leathers is being detd. H. B. MERRILL

Causes and prevention of deterioration in book materials (WALTON) **23**. A modified Wilson-Kern extractor (MERRILL) **1**. Analysis of  $Na_2S$  (PAESSLER) **7**. 2,4-Diaminodiphenylamine as an ursol dye (KARPUKHIN) **25**. Fertilizers [from tannery waste] (Fr. pat. 647,376) **15**. Abrasion apparatus for determining the wearing qualities of shoe soles (U. S. pat. 1,711,866) **1**. Brown dyes suitable for use on leather (U. S. pat. 1,711,860) **25**.

GRASSER, GEORG.: *Einführung in die Gerbereiwissenschaft*. Leitf. f. Studierende u. Praktiker. Leipzig: Paul Schulze. 173 pp. M. 12.

**Depilating hides and skins.** MAX BERGMANN, EUGEN IMMENDÖRFER and HERMANN LOEWE (Fritz Stather, inventor). Ger. 475,301, July 3, 1924. Addn. to 434,569. According to Ger. 434,569, hides and skins are depilated by suitable alkali depilating agents in the presence of sol. silicates. This method is now modified by using  $(NH_4)_2S$  and (or) other  $NH_4$  salts in place of the alkali depilating agents.

**Textile fibers from shark skins, etc.** ALFRED EHRENREICH. U. S. 1,713,036, May 14. See Fr. 647,030 (C. A. **23**, 2598).

**Leather.** JEAN MULSANT. Fr. 650,357, Feb. 20, 1928. Cracks and faults in leather are removed by a mixt. contg.  $Sb_2S_3$  5, black stearate 10, lamp black 20, nitrocellulose 39, amyl acetate 35%.

**Artificial leather.** FRANÇOIS M. LOUP. Fr. 650,593, Mar. 8, 1928. Waste and old leather is washed with a warm soln. of  $NaHCO_3$  and  $CS_2$ , steeped in an aq.  $NH_4$  bath and washed. It is then pulverized, made into a pulp as in paper-making, and pressed into sheets.

**'Goldbeaters' skin and parchment.** A. EHRENREICH. Brit. 299,599, Oct. 11, 1927. The large intestine and wall of the stomach of sharks and similar fishes are washed, the veins are caused to disappear by compression or extraction, the material is limed for 2-4 days with addn. of a carbolate and immersed in a tanning liquid and then in a 1%  $HCl$  bath contg. also at least 4%  $NaCl$ . Tanning is then completed in a basic chrome alum bath or with a vegetable tanning material such as quebracho or sumach, or  $CH_2O$ , with or without alum, may be used. In production of drum skins, the large intestines are filled for 24 hrs. with shark oil or the like and sea salt and hung in the open air.

**Water-resistant animal glue.** CLARENCE E. HRUBESKY and FREDERICK L. BROWNE. U. S. 1,712,077, May 7. A glue compn. is prepd. from animal glue 100, water 225, paraformaldehyde 10 and a suitable acid such as oxalic acid 5-7 parts

### 30—RUBBER AND ALLIED SUBSTANCES

C. C. DAVIS

**New developments in the rubber industry. The Peachey process.** F. JACOBS *Caoutchouc & gutta-percha* **26**, 14,506-9 (1929).—A detailed description of the process and its latest developments. C. C. DAVIS

**Making rubber goods of latex by electrodeposition.** PAUL KLEIN. *Rubber Chem. & Technol.* **2**, 278-84 (1929).—See C. A. **23**, 2067. C. C. DAVIS



**The chemical constitution and the mechanical properties of rubber.** LOTHAR HOCK AND GUIDO FROMANDI. *Phys.-Chem. Inst., Univ. Giessen and Gummiwarenfabrik, Poppe & Co. Kautschuk* 5, 81-2(1929).—When synthetic isoprene-rubbers are treated electrically so that their viscosity, softening temp., mol. wt. and I no. increase to values similar to those of plantation rubber (cf. F., C. A. 23, 1009, 2323) their phys. characteristics also approach closely those of natural rubber. Moreover, a decrease in these consts. through elec. treatment of a high-grade natural rubber is accompanied by a loss of the most desirable properties of the rubber. This suggested that the poorer phys. characteristics of certain lower-grade com. rubbers might be assocd. with a lower I no., i. e., a lower degree of chem. unsatn. Purified rubber (by the Pummerer method) gave almost the theoretical I no. (372.8). Smoked sheet with 3.2% acetone ext. and 0.4% ash had an I no. of 348. Kongo rubber with 5.9% acetone extn. and 1.7% ash had an I no. of 329. In the latter case the acetone-sol. part had an I no. of 24, so that with 5.9% ext., 1.4 units were to be subtracted from the I no. of the rubber, giving 327.6 for the I no. of the rubber hydrocarbon. Dissolved in  $C_6H_6$ , filtered, pptd. twice with acetone and once with EtOH, and dried *in vacuo*, the I no. increased to 351.4. The same results were obtained with a Peruvian rubber. This treatment did not remove all impurities, and since the I no. approached so much nearer the theoretical value, it is doubtful whether there is any relation between the poorer phys. properties of the Congo rubber and its degree of unsatn., particularly since the elastic properties of rubber depend upon its colloidal state as well as upon its chem. constitution. This is also still more probable when the rubber is mixed with fillers, because the quality then depends upon the surface energy between the rubber and filler, which is governed by the phys. and chem. state of the rubber and the presence of non-rubber components.

C. C. DAVIS

**Titanium dioxide in the rubber industry.** RUDOLF DITMAR. *Kautschuk* 5, 79-81(1929).—The characteristics and behavior of  $TiO_2$  as a rubber compounding ingredient are described. Among the properties which may be of importance are its ability to soften rubber notably during milling and the limitations in the choice of accelerator to obtain a strictly white vulcanizate when it is used as the only white pigment.

C. C. DAVIS

**The effect of mixtures of crude ozocerite and "Agerite" on the aging of rubber mixtures.** F. KIRCHHOF. *Caoutchouc & gutta-percha* 26, 14,501-3(1929).—Ozocerite and "Agerite" fused together to a homogeneous mixt. give a product which combines the antioxidant and plasticizing properties of each component. Excellent results were obtained with a mixt. contg. 3-5% "Agerite" in ozocerite. Tests of vulcanized rubber which deteriorated rapidly with no antioxidant showed that its aging, judged by the deterioration of its phys. properties in air at 52° and at 75°, could be greatly improved by the addn. of the mixt. described, even when only enough of the mixt. was added to furnish 0.1% "Agerite" (by wt. of the rubber mixt.). This antioxidant effect was disproportionately great, for the 0.1% "Agerite" added in this form gave the same protection as 0.5% added alone, i. e., with ozocerite mixts. the same effect can be obtained as with 5 times as much Agerite added in the ordinary way. Photographic observations with ultra-violet light of the deteriorated samples showed that O penetrated less into the interior of the samples contg. ozocerite-Agerite than into those contg. none and the deterioration in phys. properties was proportional to this penetration.

C. C. D.

**The thermochemistry of rubber.** SIEGFRIED BOSTRÖM. *Univ. Giessen. Rubber Chem. & Technol.* 2, 259-74(1929).—English version of C. A. 22, 4271. C. C. DAVIS

**A thermodynamic theory of rubber fillers.** LOTHAR HOCK. *Univ. Giessen. Rubber Chem. & Technol.* 2, 275-7(1929).—An English version of Z. *Elektrochem.* 34, 662(1928) (C. A. 23, 2321).

C. C. DAVIS

**Pigment reinforcement.** R. W. LUNN. *Trans. Inst. Rubber Ind.* 4, 396-412(1929).—In the present investigation energy is chosen as the criterion of reinforcement. In the past, pigments have been compared by the resilient energy values of rubber mixts. contg. equal vols. of the pigments, but in the present paper the total energy is analyzed into that pertaining to the rubber and that to the pigment. Expressed mathematically, if  $E_A$  is the total energy of a mixt. contg. a pigment A,  $e_R$  the energy of the rubber component, and  $e_A$  the energy from  $x$  vols. of A, then  $E_A = e_R + e_A$ , and  $e_A/x$  is the energy from 1 unit vol. of pigment, this  $e_A/x$  value being a characteristic of the pigment. The object of the expts. was to det.  $e_A/x$  at various concns. of pigment and at various elongations up to rupture. If  $x$  vols. of pigment are added to a cube contg. 100 vols. of rubber, the new cube is  $(1 + x/100)$  times as large. Furthermore, if it is assumed that the pigment concentrates at 1 end of the enlarged cube, when this cube

is elongated the rubber and pigment elongate to the same degree, *e. g.*, when the cube is elongated 100%, both rubber and pigment elongate 100%. There are objections to this analysis, but the energy value of the pigment independent of the energy value of the rubber component may be readily detd. up to the breaking point. Pptd.  $\text{BaSO}_4$ ,  $\text{ZnO}$ , Thermatomic black and gas black were studied on this basis. An org. accelerator was not used in the base mixt., chiefly because of the influence of the pigments on it. The base mixt. was: rubber 100, S 3 and  $\text{PbO}$  10.3. The rubber was plasticized to an extreme degree to minimize the variations in milling necessary with the different pigments. To the base mixt. were added various proportions of the different pigments, and the resulting mixts. were vulcanized for a time and at a temp. which corresponded to that cure which gave the max. resilient energy for the base mixt. The results are recorded in graphical form, including the change in plasticity of rubber on mastication, the tensile strength, elongation, stiffness and energy of the base mixt. cured to different degrees, variations in the energy with concn. of the pigments, total energy-elongation relations, concn. of pigment-elongation relations, pigment energy per unit vol. of pigment, and the change of pigment energy per unit vol. with the concn. These results admit of certain general conclusions. Up to a high concn. C black increased the total energy,  $\text{ZnO}$  and Thermatomic black increased it much less and the maxima were at far lower concns., and pptd.  $\text{BaSO}_4$  increased it still less so, with its max. at a still lower concn. A comparison of the total energies at elongations below the breaking point shows that up to 50 vols. concn.,  $\text{BaSO}_4$  behaved like Thermatomic black and  $\text{ZnO}$ , while the C black showed much higher total energy values. With data on the base mixt. and on the loaded mixts., it was possible to cal. the energy due to the pigment, a vol. correction factor being used so that each mixt. was based on a unit vol. of rubber. The resulting curves of the pigments were similar to those showing total energy as a function of elongation. Finally the pigment energies per unit vol. of pigment are expressed graphically. In no case was there a sharp change in the mechanism of reinforcement as the proportion of pigment increased, the ultimate reinforcement per unit vol. declining progressively with increase in concn., with no evidence of agglomeration or of diln. With gas black and Thermatomic black, the reinforcement per unit vol. at definite elongations increased with increase in the concn., the effect being more marked with gas black. The reinforcement per unit vol. by  $\text{ZnO}$  increased less markedly above 10 vols. concn., while with  $\text{BaSO}_4$  above 20 vols. concn. it reached an approx. const. value at each elongation. Natural barytes would probably have behaved differently. The results show the sp. reinforcing power of the pigments at various concns. and elongations. The sp. reinforcing power of gas black and of Thermatomic black increased with the concn. and the elongation; with  $\text{ZnO}$  it increased in the same way but to a lesser degree, while the sp. reinforcing power of  $\text{BaSO}_4$  reached a const. value for each concn. and elongation. This suggests that there may be pigments which, beyond a crit. point, should exhibit a progressively diminishing reinforcing power. Curves of the ultimate energy values as the energy per unit vol. concn. of pigment show a trend toward 0 energy with increase of concn., suggesting that the pigment energy may become 0, *i. e.*, act as a diluent, but that neg. reinforcement does not occur, where the energy of the rubber component is diminished. The curves approach closely from 50 vol. concn. upwards, indicating that at high concns. no pigment has any notable advantage over any other pigment from the point of view of the energy imparted to a rubber mixt.

C. C. DAVIS

The coloring of rubber. W. J. S. NAUNTON. *J. Soc. Dyers and Colourists* 45, 31-5 (1929).—See C. A. 22, 4875; 23, 2068.

T. G. HAWLEY, JR

The behavior of Prussian blue and some other ferrocyanides in rubber. J. R. SCORR. *Trans. Inst. Rubber Ind.* 4, 374-95 (1929).—An elaboration of C. A. 22, 2683. Preliminary expts. on *plasticity*, the results of which are to be reported later in greater detail, indicate that uncured rubber mixts. exhibit plastic flow so as to conform at least in an approx. way to the law:  $F = a(vc/s + f)$ , where  $F$  is the shearing force,  $a$  the area between parallel surfaces,  $v$  the relative velocity of the surfaces,  $c$  the consistency,  $s$  the distance between surfaces and  $f$  the friction or yield value.

C. C. D.

Industrial applications of a terpene product. EMILE ROUXVILLÉ. *Rev. gén. caoutchouc* 6, No. 50 9-12 (1929).—The terpene product which has already been described as a valuable reclaiming agent (cf. C. A. 23, 1775) has a wide industrial application, *e. g.*, in agglomerating ground cork, as an adjunct in the prepn. of rubber-leather mixts., impregnating cotton fabrics to improve the quality of ebonite, etc.

C. C. D.

Isoprene and rubber. XIV. Degradation of rubber and gutta-percha. H. STAUDINGER AND H. F. BONDY. Univ. Freiburg. *Ann.* 468, 1-57 (1929); cf. C. A. 23, 2847.—An investigation is made of the degradation of rubber and gutta-percha

by heat. The materials used were a raw rubber contg. about 5% protein, rubber purified by Pummerer's method and gutta-percha obtained from a leaf gutta-percha, the  $\text{CCl}_4$  soln. being centrifuged from impurities, filtered and pptd. with  $\text{MeOH}$ . The viscosity of a  $\text{C}_6\text{H}_6$  or  $\text{PhMe}$  soln. of gutta-percha was not affected by boiling but  $\text{C}_6\text{H}_4\text{Me}_2$  or  $\text{C}_{10}\text{H}_{12}$  solns. of this substance, as well as all 4 solns. of raw and purified rubber, underwent an appreciable change of viscosity, the change being the greater, the higher the b. p. of the soln. It follows that the rubber undergoes degradation at fairly low temps., whereas gutta-percha withstands higher temps. Degradation of rubber in boiling  $\text{C}_6\text{H}_4\text{Me}_2$  produces gummy products, mol. wt. about 4200, while gutta-percha gives powdery substances, mol. wt. about 2500. Both products are regarded as being lower members of the 2 different series of which rubber and gutta-percha, resp., are complex members. In boiling  $\text{C}_{10}\text{H}_{12}$ , further degradation does not take place, although cyclization of the open-chain residues takes place to some extent. It is only at temps. above  $300^\circ$  that both decomp. to give identical products. The degradation of raw rubber appears to be inhibited somewhat by the presence of the protein at temps. up to  $142^\circ$ , but at higher temps. it follows a course similar to that observed with pure rubber. (With T. GERIGER.) The pyrogenic decompn. of gutta-percha begins at  $285\text{--}90^\circ$  and 11 mm., becomes vigorous at  $300\text{--}15^\circ$  and then ceases. Sixty g. of pure gutta-percha, heated 7 hrs. at  $300\text{--}10^\circ$  and 11 mm., gives 57% distillate and 40% residue; the latter is a *polycyclogutta-percha*,  $(\text{C}_8\text{H}_8)_x$ , mol. wt. in freezing  $\text{C}_6\text{H}_6$ , 1950, which contains 1 double bond (Br titration). Catalytic reduction with H and Ni gives a *hydro deriv.*,  $(\text{C}_{22}\text{H}_{42})_x$ , mol. wt., 1930,  $n_D^{20}$  1.5238. Raw rubber in boiling  $\text{C}_{10}\text{H}_{12}$  with HCl gives a *cyclorubber*, mol. wt. 2500, liquefying at about  $123^\circ$ , while gutta-percha gives a *cyclogutta-percha* indistinguishable from the rubber product. At lower temps., however, the 2 give different cyclization products. The *cyclorubbers* obtained in boiling  $\text{C}_6\text{H}_4\text{Me}_2$  and  $\text{PhMe}$  have mol. wts. 4000–12,900 and 14,000, resp. The *cyclogutta-perchas* obtained in boiling  $\text{C}_6\text{H}_4\text{Me}_2$ ,  $\text{PhMe}$  and  $\text{C}_6\text{H}_6$  have mol. wts. 2600–8100, 10,000 and about 8500, resp. Cyclization in  $\text{PhMe}$  at  $20^\circ$  gives different products with very high mol. wts. The heat-degradation products of rubber and gutta-percha are hemicolloids, mixts. of polyprenes with an av. mol. wt. of 10,000, which are relatively stable. This explains the considerable soly. of the products, the fact that the mol. wt. does not vary with concn. and the fact that the viscosities of solns. of the products are roughly proportional to the concn. Rubber, on the other hand, is a eucoioid, consisting of a mixt. of polyprenes having an av. mol. wt. of 100,000. Even a slight temp. elevation causes degradation. The macro-mol. is the colloid particle. The structures of the 2 compds. are discussed. Rubber contains about 1000 isoprene residues covalently united, and may be a *trans*-compd. The mol. of gutta-percha is smaller (about 300–500 isoprene residues), is more sym. and is possibly a *cis*-compd.

C. J. WEST

British standard specification for friction surface rubber transmission belting. ANON. *Brit. Eng. Standards Assoc.* (London) No. 351, 13 pp. (1929).—Specifications for construction, fabric, joints, freedom from defects, tolerances on width. Methods of testing for elongation, strength of fabric, adhesion and seam strip are given. E. I. S.

Manufacture of rubberized cloth and attendant cloth dyeing problems. S. G. BYAM. *Am. Dyestuff Repr.* 18, 15–23 (1929).—Dry heat curing is considered most satisfactory for rubberized fabrics. Testing of rubberized fabrics is discussed. Tentative fabric specifications for rubberized cloth are given. T. G. HAWLEY, JR.

The nature of vulcanization. W. H. STEVENS. *J. Soc. Chem. Ind.* 48, 60–2T (1929); cf. C. A. 22, 1703.—A crit. review and discussion of exptl. facts known about vulcanization leads to the conclusion that vulcanization is the phys. manifestation of the chem. combination of rubber with S (or other elements), the mechanism of which is a reinforcement by the resultant S reaction product, with or without coexistent sorption. Thirty-five references are included. C. C. DAVIS

Vulcanization and the structure of rubber. HEINRICH LOEWEN. *Kautschuk* 5, 77–9 (1929).—A criticism of various features of an article by Lindmayer (cf. C. A. 23, 2323). C. C. DAVIS

The tackiness of unvulcanized rubber. T. L. GARNER. *Trans. Inst. Rubber Ind.* 4, 413–23 (1929).—The expts. are concerned chiefly with the action of light on raw rubber and on rubber to which has been added a small proportion by as little milling as possible, and are in part an amplification of previous work by other investigators. The tackiness of the samples was judged by their viscosities, a viscometer of the Ostwald type being used. In ordinary cases of exposure of raw rubber to air and light, tackiness and oxidation proceed concurrently, but it was possible to reduce the viscosity of a rubber soln. in the absence of O by exposure to ultra-violet light. Such a soln. gave on evapn. a depolymerized rubber which readily absorbed O. Introduction of a small

quantity of O into a tube contg. rubber in an atm. of N gave on exposure a rubber apparently as tacky as if exposed to air. The only difference was that part of the rubber was rendered insol. The action of light was in part polymerization and in part depolymerization, the extent of each depending upon the conditions. The presence of O was necessary for the formation of a tacky film, thus confirming expts. by Fry and Porritt (cf. *C. A.* 22, 4870). Little change in the soln. viscosity of rubber or its soln. took place when heated to 40° in the absence of light. Under the conditions of the expts., no insol. rubber was obtained by exposing solns. of uncompounded rubber in air, but in inert gases the formation of insol. rubber of the polymerized O-free type of Asano (cf. *C. A.* 19, 3616) was observed to increase with the time of exposure. The insol. rubber, formed when rubber protected by the addn. of an antioxidant was exposed to light, did not appear to be of this type, but rather the transparent oxidized rubber obtained by Asano. At the same time, the rate of oxidation, judged by the increase in acetone ext., did not progress to the same extent as with unprotected raw rubber. The protection against tackiness afforded by antioxidants is apparently unrelated to their value in preventing changes resulting from oxidation. Of importance in the technical use of antioxidants is the fact that they protect rubber in such a way that they prevent to some extent depolymerization and changes due to oxidation, thereby promoting the formation of an insol. polymerized rubber. This was not manifest in ordinary exposure. Thus an insol. layer of rubber was formed on the surface of the exposed rubber and the tackiness was destroyed. Consequently the use of much antioxidant in a rubber mixt. which must remain tacky where exposed in light in a factory for some time is inadvisable. On exposure to light, rubber mixts. contg. 1% antioxidant lost their surface tackiness much more rapidly than the corresponding mixts. contg. no antioxidant, the surfaces of the mixts. contg. antioxidant becoming dry and hard. The results suggest a *theory of tackiness*. When raw rubber is masticated, part of the globules burst and simultaneously the rubber hydrocarbon depolymerizes, which reduces the soln. viscosity. The tackiness of unmasticated rubber is due to the action of O upon the depolymerized hydrocarbon, and this tackiness cannot appear until depolymerization has occurred. Thus, on exposure of unmasticated rubber, the surface layer must first be depolymerized and then oxidized. In protecting rubber from depolymerization and subsequent oxidation, antioxidants permit the polymerizing action of light to become the predominant effect. Accordingly in a tacky rubber, repolymerization of the depolymerized-oxidized layer occurs to some extent, and the loss of tackiness is proportional to the extent of polymerization. In ordinary masticated rubber, the depolymerized-oxidized rubber is distributed throughout the mass, but in certain cases only the surface is affected. Tackiness is destroyed by substances which migrate to the surface and form greasy films, *e. g.*, stearic acid, or by substances which in any way promote the polymerizing action of light. Therefore, where tackiness is desired, conditions such as those described which favor this tendency must be eliminated.

C. C. DAVIS

**Exploitation of Euphorbia in South Africa: examination of the rosin and rubber.** W. SPOON AND M. VAN ROYEN. *Ber. Afdeel. Handelsmuseum Ver. Koloniaal Inst.* 34, 3-14(1928).—The rubber made from the latex of *E. dregeana* and other *Euphorbia* species has very little similarity to real rubber. From a sample of coagulum from the *E. dregeana* Bush rosin and rubber were prepd. The former was very impure, being of a soft and a hard texture and of apparently no value, while the latter was a thin soft mass. The *Hevea* culture need not fear any competition from this source.

J. C. JURRIJENS

**Abrasion apparatus for determining the wearing qualities of rubber tire treads** (U. S. par. 1,711,866) 1. **Laminated structural material comprising rubber and sheet metal** (U. S. pat. 1,712,965) 20. **Coating fabrics with rubber, etc.** (Brit. pat. 299,321) 25.

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*Gummi-Kalender*, 1929. Edited by ERNST A. HAUSMA and KURT MAIER. Berlin: Union, Zweigniederlassg. 54 pp. Linen, M. 5.80.

HEIM DE BALSAC, F., AUDUBERT, R. and LEJEUNE, G.: *Études physicochimiques sur les latex caoutchoucifères*. Paris: Ministère des colonies. 67 pp.

**MORGAN, SIDNEY:** *The Preparation of Plantation Rubber.* Preface and chapter on "Vulcanization" by H. P. Stevens. 2nd ed. London: Constable. 374 pp. 21s. net.  
**SÖRLIN, ANTON:** *Kautschuken, dess odling, anvanding o kommersiella betydelise.* Stockholm: Geber. 160 pp.

**Rubber.** **RICHARD LATOUR.** Fr. 651,530, Sept. 12, 1927. Waste rubber which has been vulcanized in the cold with  $\text{CS}_2$  is recovered by shredding it to very thin sheets, removing the fatty substances, resins and S by sapon. with NaOH or KOH under steam pressure. Waste rubber which has been vulcanized by heating with free S is reduced to a powder, oils, fats or other solvents such as crude rubber, acetone, ether,  $\text{NH}_3$ , chloroform, etc., are added and the mass is devulcanized with steam, shredded and treated as in the first case.

**Rubber.** **THE ANODE RUBBER CO. (England) LTD.** Fr. 650,565, Mar. 7, 1928. Articles of rubber are made by bringing into contact with one another in a moist state and with or without pressure 2 or more pieces of material obtained directly by deposition, dipping, spreading, spraying or impregnating, from natural or artificial dispersions of rubber, etc., and drying or coagulating. Cf. C. A. 23, 2850.

**Rubber.** **THE B. F. GOODRICH CO.** Fr. 648,759, Dec. 27, 1927. Conversion products of rubber are obtained by heating it for a long time with a solvent for rubber such as benzine, a phenol and one of the following: HCl, HBr, org. sulfonyl chlorides, org. sulfonic acids, dil.  $\text{H}_2\text{SO}_4$  and trichloroacetic acid. The phenols include phenol, cresol, catechol, resorcinol, naphthols and *p*-chlorophenol. The products are plastic when heated and may be combined with fillers, pigments, etc.

**Rubber.** **VEREINGTE ALUMINIUM-WERKE. A.-G.** Ger. 472,662, Mar. 30, 1923. Glossy surfaces are produced on rubber goods by placing them on Al foil and rolling.

**Treating rubber latex.** **J. MCGAVACK** (to Naugatuck Chemical Co.). Brit. 298,628, Oct. 14, 1927. A reversible uncoagulated gel is formed by treating latex with an acid or, preferably, an alk. hydrosol of silicic acid in small quantity, either by direct addn. or by formation of the hydrosol in the latex. A gel which may be used for spreading, coating or other purposes forms in a few mins. Examples and details are given.

**Improving the aging properties of rubber.** **RUBBER GROWERS' ASSOCIATION, INC., G. MARTIN AND W. DAVEY.** Brit. 299,585, Sept. 26, 1927. Latex serum and an alkali, such as NaOH, KOH or  $\text{Na}_2\text{CO}_3$ , are added to a rubber mixt. before vulcanization (suitably in a proportion of about 5% and 1%, resp., based on the quantity of the rubber in the mixt.).

**Articles made from crude rubber.** **JAMES H. BURTON.** Fr. 649,565, Feb. 22, 1928. Crude rubber (latex prima, crepes, etc.) is heated with stirring in an autoclave with an alk. soln., and the granulations obtained are similarly heated with water, dried and pressed in heated molds.

**Rubber articles.** **THE NAUGATUCK CHEMICAL CO.** Fr. 651,615, Dec. 30, 1927. Rubber articles are produced directly from latex by dilg. the latex, adding substances which enable the aq. portion to filter more easily through the deposit as it forms, agitating and heating. Raw latex may be used to which stabilizers such as glue, Na oleate, casein or undecylenic acid emulsion may be added, the solid contents of the latex being 8-24, preferably 14%. To render filtering easy a Zn oxide or salt and a sulfide of Na, K, Li or  $\text{NH}_4$  are added, other substances which may be used are gel-forming colloids of buller solns. controlling the H-ion concn., substances liberating metallic ions and vulcanization accelerators.

**Compounding rubber with other materials.** **RAY P. DINSMORE** (to Goodyear Tire & Rubber Co.). U. S. 1,712,333, May 7. An emulsion of rubber is mixed with a suspension of a filler material such as pptd.  $\text{BaSO}_4$  and the rubber is coagulated on the filler, the product is washed free from water-sol. material and a rubber softener such as pine oil is added while the mass is still highly pasty and the product is then incorporated into a rubber mix upon the mill.

**Deposition of rubber.** **THE ANODE RUBBER CO. (England) LTD.** Fr. 650,566, Mar. 7, 1928. In the elec. deposition of rubber from aq. dispersions, the uniformity of thickness of the deposit is influenced by screens of insulating or poorly conducting material such as hard rubber, or celluloid or of conductive material to form equi-potential surfaces. The screens may be perforated or cut away, and if sep. chambers are used the screens are preferably disposed in the cathode chamber. Cf. C. A. 23, 2603.

**Deposition of rubber.** **THE ANODE RUBBER CO. (England) LTD.** Fr. 650,977, Mar. 17, 1928. In the direct deposition of a substance of the nature of rubber on porous supports imbibed, e. g., with a soln. of  $\text{CaCl}_2$ , or by electrophoresis, a coagulating agent is caused to act from the outside on the deposit before it is dried. This treat-

ment may be given once or several times before the full thickness of the deposit is reached.

**Deposition of rubber.** THE ANODE RUBBER CO., LTD. Fr. 651,672, Aug. 3, 1927. In the deposition of rubber on an anode support from aq. dispersions thereof, particularly from natural latex, by an elec. current, protective colloids are added to the dispersion. Thus, 6-12 g. of soft soap is added to 1 l. of latex contg. 30% of rubber.

**Deposition of rubber.** WM. A. WILLIAMS. Fr. 650,326, Dec. 27, 1927. See Brit. 293,095 (C. A. 23, 1527).

**Apparatus for coating articles with rubber by electrodeposition, etc.** G. F. WILSON (to Anode Rubber Co., Ltd.). Brit. 298,650, Oct. 13, 1927. Structural features.

**Drying rubber deposits.** A. SZEGVARI (to Anode Rubber Co., Ltd.). Brit. 298,483, Oct. 6, 1927. Articles formed by deposition of rubber from aq. dispersions are dried by applying to them a pervious material such as a fabric strip wrapping which exerts a compacting pressure. An app. is described.

**Preserving rubber.** B. D. PORRITT, T. R. DAWSON and RESEARCH ASSOCN OF BRITISH RUBBER & TYRE MANUFACTURERS. Brit. 299,169, Sept. 29, 1927. Rubber goods are coated with a mixt. contg. substances resistant to light and air, e. g., a mixt. formed of soft "mineral rubber" 60, aldol  $\alpha$ -naphthylamine 10, "Oil Red S" 2 and toluene 100 parts.

**Recovery of rubber.** MAURICE dit RENÉ GATTEFOSSE and SOC. FRANÇAISE DE PRODUITS AROMATIQUES, ANCIENS ÉTABLISSEMENTS GATTEFOSSE. Fr. 649,726, July 19, 1927. Vulcanized rubber is recovered by dissolving or treating it with an ester such as ethyl decylate, the alc. of which is not a solvent for rubber, and eliminating the ester by sapon. Cf. C. A. 23, 732.

**Artificial rubber.** KATHERINE B. G. EDMONDSTONE and DONALD CHAUVEL. Australia 10,433, Nov. 16, 1927. Artificial rubber consists of cactus or other wax-like plants, with or without the leaves of vinca or periwinkle plant, white vinegar or AcOH and S.

**Rubber substitute.** HOWARD W. MATHESON (to The Can. Electro Products Co., Ltd.). Can. 288,640, Apr. 9, 1929. The compn. specified includes clay, rubber, S, ZnO, coloring matter, and a product made by treating vinyl ester with an aldehyde

"Synthetic rubber." J. BAER. Brit. 298,889, Oct. 15, 1927. An aldehyde such as  $\text{CH}_3\text{O}$  is treated with alkali metal or alk. earth metal polysulfides in soln. with or without conjoint use of a halogen deriv. of a satd. hydrocarbon such as ethylene or methylene dichloride or dibromide. A rubber-like product is formed.

**Making tires from synthetic rubber produced by polymerization of butadiene.** I. G. FARBERIND. A.-G. Brit. 299,037, Oct. 20, 1927.

**Puncture-sealing composition.** W. C. P. TANNER. Brit. 299,542, Aug. 9, 1927. Gum tragacanth which has been heated to at least  $85^\circ$ , water,  $\text{CH}_3\text{O}$  and a fibrous filler such as asbestos are used together. Carrageen and agar agar may be substituted for part of the tragacanth.

**Aldehyde-amine condensation products for use as rubber vulcanization accelerators.** S. M. CADWELL (to Naugatuck Chemical Co.). Brit. 298,537, Nov. 1, 1926. Derivs. such as those contg. Cl, Br or I are formed from the condensation product of heptaldehyde and aniline or other similar condensation products of an aliphatic aldehyde having 2-7 C atoms and a primary amine. Various examples are given of the prepn. of different accelerators from these condensation products by use of halogenating and other reagents such as Cl, Br, I, acids, alc. and Na, HCl, Zn and Sn, etc. Cf. C. A. 22, 3068.

**Apparatus for vulcanizing tire flaps or other endless bands of rubber.** D. S. HARRINGTON (to Goodyear Tire and Rubber Co.). Brit. 299,005, Oct. 19, 1927.

**Rubber vulcanization.** J. TEPPERMA (to Goodyear Tire and Rubber Co.). Brit. 298,942, Oct. 17, 1927. Accelerators are used comprising mercaptotrazoles or their derivs. such as reaction products with amines such as diphenylguanidine, diethylamine, butylamine and benzylamine (which may be prepd. by mixing solns. of the azole and the amine in hot alc.). Mercaptonaphthotrazole is prepd. by treating  $\beta$ -naphthol with  $\text{HNO}_3$  to form a nitroso deriv., which is then treated with Na hydrosulfide and  $\text{CS}_2$ .

**Vulcanizing rubber.** J. TEPPERMA (to Goodyear Tire & Rubber Co.). Brit. 298,622, Oct. 13, 1927. An accelerator is used which comprises the reaction product of a hydroxy aromatic aldehyde and an amine, e. g.,  $\beta$ -hydroxynaphthaldehyde and aniline may be heated under a reflux condenser to produce a yellow cryst. compd. which on heating gives off an oil and leaves a resinous residue which acts as an accelerator; or the aldehyde and amine may be heated for 1-2 hrs. in a closed vessel at  $300^\circ$  to form the accelerator.

# CHEMICAL ABSTRACTS

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## 1—APPARATUS AND PLANT EQUIPMENT

W. L. BADGER

**An apparatus for exhibiting determinations of melting and boiling points.** WALTER SCHMIDT. *Chem. Fabrik* 1929, 279.—A modified Thiele m.-p. app. for use with a projector. J. H. MOORE

**A dispensing buret for strong alkali.** E. F. ALMY. *J. Chem. Education* 6, 734-5 (1929).—An inverted 1.25 X 8" lipless test tube has a 3-hole stopper, 1 for the supply tube from the elevated stock bottle, 1 for the delivery tube and 1 for a vent tube, the inner arm of which extends to the top of the test tube and the outer arm to the level of the top of the stock bottle. The test tube is marked with labels for different vols. of soln. J. H. MOORE

**Apparatus for filling pipets and burets with corrosive substances.** ROBERT F. McCrackan. *J. Chem. Education* 6, 733(1929).—A 2-hole stopper in the stock bottle carries a rubber bulb pump, with hole in the neck to relieve pressure, and a funnel tube reaching nearly to the bottom of the bottle. A ground-glass stopper in the mouth of the tube carries a No. 00 rubber stopper through which the tip of the pipet or buret passes into the soln. when blown up the funnel tube. Cf. *C. A.* 22, 1499; 23, 1779. J. H. MOORE

**An automatic pipet.** MAURICE HYMAN. *J. Soc. Chem. Ind.* 47, 368T(1928).—The measuring pipet is cut off at the graduation mark and the neck fitted into a wide overflow stoppered tube having a mouth piece connected with rubber tubing. C. H. B.

**New desiccator and inset.** H. LIESEGANG. *Chem. Fabrik* 1929, 256-7.—The app. is rectangular, giving a better utilization of the inner space. J. H. MOORE

**A simple interferometer for measuring small layer thicknesses.** HANS FROMHERZ AND WILHELM MENSCHICK. *Z. physik. Chem., Abt. B*, 2, 399-404(1929).—The app. and method of operation are described. The layer thicknesses of 2 flat bulbs of about 10 $\mu$  and 50 $\mu$  thickness were measured to 0.2%. F. D. ROSSINI

**A safeguard for stock solutions.** E. F. ALMY. *J. Chem. Education* 6, 735(1929).—Description, with 1 cut, of a device for operating a pinchcock placed near the top of the siphon supply line from the stock bottle to the bottom of burets with a 2-way cock, to prevent loss of soln. due to a break in the line. J. H. MOORE

**A new viscometer; system Michell.** ANON. *Mat. grasses* 21, 8459-65(1929).—The viscometer consists of a steel or cast-iron head with a concave surface; it is provided with a handle in which fits a thermometer reaching to the steel head. Three small protrusions in the head prevent a ball made of steel from coming in contact with the head and at the same time regulate the thickness of the film of liquid under test. The viscosity is measured by the time necessary for the ball to detach itself from the head, when suspended downward. A great rapidity of test, precision, simplicity and direct measure of viscosity, irrespective of the density of the liquid, are claimed. P. T.

**The Plonait colorimeter.** I. MEYER. *Farben-Ztg.* 34, 1955-6(1929).—The soln. (2 g./50 cc.) of the sample contained in a cell 20 mm. thick and the soln. of the standards contained in hollow glass wedges are, by means of totally reflecting prisms, simultaneously viewed through a slit. The wedges are moved until a color match is obtained. Two standards are provided, one a soln. of a very pale rosin, two a soln. of a very dark grade. Either or both of the wedges may be used in obtaining the color match. The app. may also be used to det.  $p_H$  values by filling the wedges with basic and acidic solns. contg. an indicator. From the relative positions of the wedges when the sample contg. the same percentage of indicator is matched, the  $p_H$  value may be calcd. G. G. S.

**Differential manometer functioning by air under pressure; determination of the velocity and of the flow of fluids.** F. BORDAS AND F. TOUPLAIN. *Bull. soc. encour. ind. natl.* 1929, 257-65.—The following are discussed in considerable detail: 1. Detn. of flow by the use of manometers: (1) general considerations; (2) differential manometers of 1 or 2 liquids furnished with Pitot outlet tubes and functioning by means of

air under pressure. II. Principles and characteristics of the manometric system: (1) simple manometer; (2) differential liquid manometer; (A) remarks and observations: (a) influence of the aperture of the air exit tubes; (b) density of manometric liquids; (3) manometer of 2 liquids; (A) the law regulating its functioning; (4) static and dynamic outlet tubes. III. Installations of the app.: (1) manometer app. and its accessories; (2) one-liquid manometer; (3) two-liquid manometer; (A) manometer scales; (B) mode of operation; (C) calibration of the app.; (D) characteristics and advantages of the process. IV. Recording manometer. A. J. MONACK

The Pulfrich stage photometer as a turbidity-measuring instrument. STEFAN GÄRTNER. *Kolloid-Z.* 48, 10-5(1929).—Directions are given for the use of the Pulfrich stage photometer with slight changes in the glass receptacles for the measurement of turbidity. If the extinction coeff. of the turbid soln. is directly proportional to the concn., then the concn. may be exactly evaluated from the extinction coeff. by this method; otherwise, it cannot. L. F. MAREK

Filtering equipment and the systematic and continuous extraction of sludges, precipitates and ores. G. FOURTON. *Chimie & industrie* Special No., 175-80(Feb. 1929).—A discussion of the advantages of the horizontal, continuous, rotary vacuum filter and its application in the production of phosphoric acid from phosphate rock, in the extn. of Zn from low-grade ores, in the washing of sugar-house scums and in the extn. of drainings from centrifuges in the manuf. of sugar. A. PAPINEAU-COUTURE

Jena glass filtering crucibles. R. H. SIMON. *J. Assoc. Official Agr. Chem.* 12, 209-11(1929).—A brief discussion of the advantages of glass filtering crucibles, particularly for the detn. of  $P_2O_5$  by the volumetric method and for the detn. of K. A. PAPINEAU-COUTURE

The use of vitrified silica apparatus for the determination of metals as sulfates. A. A. GUNTZ AND J. BARBIER. *Chimie & industrie* 21, 711-2(1929).—In the detn. of Na as  $Na_2SO_4$ , ignition can be carried out in semi-transparent  $SiO_2$ -ware at  $1000^\circ$  without attacking the  $SiO_2$ , but there is appreciable loss by volatilization above  $950^\circ$ ; a min. temp. of  $700^\circ$  is required to decomp. the bisulfate or pyrosulfate formed. In the detn. of Mg, ignition should be carried out between  $600^\circ$  and  $850^\circ$ . In the detn. of Li, ignition should be carried out at  $500$ - $950^\circ$ , considerable attack of the  $SiO_2$  taking place above  $1000^\circ$ . Cd can be detd. as sulfate in  $SiO_2$ -ware at  $450$ - $800^\circ$ , above which the sulfate is decompd. into oxide, which is volatile and which attacks the  $SiO_2$ . Pb is readily detd. by ignition at  $450$ - $800^\circ$ . Mn can be detd. as sulfate by ignition at  $400$ - $750^\circ$ ; but ignition at higher temp. to obtain  $Mn_2O_3$  is not recommended. Zn can be detd. very accurately as  $ZnSO_4$  by ignition at  $400$ - $600^\circ$ ; ignition to  $ZnO$  above  $900^\circ$  results in loss by volatilization, if an open crucible is used, but is accurate with a covered crucible. Detn. of Ni and Co as sulfates is not recommended because the permissible temp. range for ignition is too small. A. PAPINEAU-COUTURE

Heat exchange in recuperators. E. TERRES AND W. BESECKE. *Gas u. Wasser-fach* 72, 417-21, 447-9, 466-9 and 476-7(1929).—Measurements and computations as to the heat exchange in recuperators are given. R. W. RYAN

Design of superheaters for high pressures and high temperatures. R. M. GATHS AND C. W. GORDON. *Power* 69, 869-72(1929).—Low-C steel can be used in superheaters up to a steam temp. of  $800^\circ F.$ , medium-C steel, up to  $850^\circ$ , *calorized steel*, up to  $1000^\circ$  and *Cr-Ni steel*, up to  $1100^\circ$ . A chart shows the relation between unit stresses and wall temps. up to  $1200^\circ$  for these materials. D. B. DILL

Small gas muffle furnace. F. W. HORST. *Chem. Fabrik* 1929, 280-1.—An improved Hempel muffle made by F. Hegershoff, Leipzig. J. H. MOORE

Boiler house Orsat set. R. N. C. PUCKERING. *Eng. Boiler House Rev.* 42, 608-12(1929). E. I. S.

Welded aluminum in the chemical and process industries. W. M. DUNLAP. *Am. Mach.* 70, 747-8(1929). E. I. S.

High-vacuum technic (KNIPP) 2. The determination of gas density with the vacuum balance. III. The electromagnetic balance for laboratory use (Strock) 2.

Air filter. LEWIS L. DOLLINGER. U. S. 1,714,854, May 28. Structural features.

Bag filter, etc., for separating dust from air. CLARENCE E. BILLINGS (to New Haven Sand Blast Co.). U. S. 1,715,273, May 28.

Centrifugal separator for dust, etc., from air or gas. CLAUDE H. CRAIG and ALBERT E. HAMILTON. Fr. 652,411, April 10, 1928.

Device for separating oil, water and air. EMIL H. STEPHAN (to William H. Gast). U. S. 1,714,825, May 28.



**Filter and gravity separator for oil and water, etc.** A. C. HANDLEY. Brit. 299,648, Jan. 20, 1928. An app. is described comprising a sepg. chamber with baffles and assoc. filtering material such as coir fiber or artificial silk.

**Filter press.** WALTER A. TYLER and RAYMOND STARK (to L. A. Dreyfus Co.). U. S. 1,714,331, May 21.

**Filter for liquids under pressure.** GRÉGORI JAVITCH and SIMON JAVITCH. Fr. 652,232, April 5, 1928. Constructional details.

**Devices for regulating temperatures according to a definite time-temperature curve.** LIVERPOOL RUBBER CO., LTD., F. AMENDE and E. D. GRIFFITHS. Brit. 300,-226, Aug. 9, 1927.

**System for calibrating thermometers and pyrometers.** N. M. HOPKINS. Brit. 300,112, Nov. 5, 1927.

**Radiation pyrometer.** CHARLES E. FOSTER. U. S. 1,714,664, May 28. Structural features.

**Vacuum tubes.** COMPAGNIE FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON. Fr. 652,667, April 6, 1928. Method of maintaining the electrodes in position.

**X-ray tube.** CLAYTON T. ULREY and HARRY DEF. MADDEN (to Westinghouse Lamp Co.). U. S. 1,715,150, May 28. Structural features.

**X-ray tubes.** CLAYTON T. ULREY and LOUIS F. EHREKE (to Westinghouse Lamp Co.) U. S. 1,715,151-2, May 28. Structural features.

**X-ray anode.** WILLIAM D. COOLIDGE (to General Electric Co.). U. S. 1,714,975, May 28. Structural features.

**Thermionic tubes.** ERNEST A. TUBBS. Fr. 652,568, April 6, 1928.

**Thermionic lamps.** ARCHIBALD F. POLLOCK and DAVID A. POLLOCK. Fr. 652,600, April 12, 1928.

**Thermionic valves.** J. W. MARDEN (to Westinghouse Lamp Co.). Brit. 299,715, Oct. 27, 1927. Various structural details are specified. A pellet of an alkali metal compd. and a reducing agent may be supported by a loop in a metal strip secured to the grid support. Before mounting, the anode and grid are baked in H for 5-10 mins. at 1000° to remove O, oxides and grease and the filament is straightened by flashing at 1000° in an inert gas such as "forming gas" contg. H admixed with 80% its volume of N. The completed mount is heated for 30-60 mins. at 300° in air to remove grease and dirt by volatilization or oxidation. A soln. of petroleum jelly in CHCl<sub>3</sub> or shellac, or the like, may be used to assist in sealing. In order to form a layer of electronegative gas on the filament, O or air is admitted and the filament flashed at 2000° for about 30 mins. to remove grease and hydrocarbons and to insure retention of the oxide layer formed on the filament; or, instead of directly admitting O, a pellet of CsMnO<sub>4</sub> and Si may be used and heated to a low temp. to evolve O and then further heated to 900° to drive off Cs.

**Electron discharge devices.** ALLGEMEINE ELEKTRICITÄTS-GES. (to International General Elec. Co.). Brit. 299,857, Nov. 2, 1927. Introduction of alk. earth metals into an electron discharge device is effected by heating within the envelope a mixt. of a reducing agent, which does not appreciably volatilize at the temp. of the reaction, such as Al, Be or one of the rare earth metals, and a stable alk. earth compd., which does not emit deleterious gases during the reaction, such as alk. earth oxides, aluminates or silicates. Metals such as Cu or Al, which form alloys with the alk. earth metals, may also be added. Various details of operation are given.

**Electron discharge tubes.** NAAMLOOZE VENNOOTSCHAP PHILIPS' GLOEILAMPEN-FABRIEKEN. Fr. 652,324, April 6, 1928.

**Electric discharge devices.** H. PLAUSON. Brit. 299,735, May 30, 1927. A cathode-ray app., which may be used for sterilization, for synthesis of chem. compds., for polymerization, as for conversion of isoprene into rubber, for oxidation, for chlorination and for hydrogenation of inorg. oils, is described. Part of the cathode rays may be converted into Röntgen rays by inserting a piece of quartz, mica or glass inside or outside the envelope. The window may be of flat or cellular foil of Ni, Al or Be, or alloys of Be, Mg and Al. The envelope is highly evacuated and residual gas such as N is removed by Li. Various structural details are described.

**Gas-filled discharge tube for radiation of ultra-violet light.** NAAMLOOZE VENNOOTSCHAP PHILIPS' GLOEILAMPEN-FABRIEKEN. Brit. 299,931, Aug. 12, 1927. An incandescent oxide or oxide-contg. cathode is used with one or more solid anodes (which may be C cylinders) and a gaseous filling comprising Hg vapor and a rare gas such as A; at least part of the wall is formed of quartz or of glass with an extremely low coeff. of expansion. Various structural details are described.

**Furnaces.** AMERICAN ENGINEERING Co. Fr. 652,084, April 2, 1928. Construction of walls.

**Furnaces.** FRANK B. BIGELOW. Fr. 652,508, Feb. 16, 1928. Construction of walls.

**Furnaces.** STOCKHOLMS AKTIEBOLAGET PRIVAT. Fr. 651,936, Mar. 29, 1928. Gases are withdrawn from the back of the furnace, mixed with air and introduced at the front, the rest of the furnace receiving combustion air, which has been heated only a little or not at all. If a very damp fuel is used, the gases charged with steam formed at the front of the furnace are evacuated separately.

**Gas furnace.** H. VOGT-GUT A.-G. Fr. 651,713, Mar. 24, 1928. The gas leads are arranged in a horizontal circle, the gas being directed on to a conical surface of ceramic material, so that the flames reach the center of the hearth.

**Tunnel furnaces.** RENIER JONKERGOUW. Fr. 652,616, April 12, 1928. Method of equalizing the temp. at the top and bottom of the furnace.

**Furnace for annealing ring-shaped articles such as magnetic cores for loading coils.** WILLIAM A. TIMM (to Western Elec. Co.). U. S. 1,713,790, May 21. Structural features.

**Continuous push furnace for heating billets, etc.** WILLIAM B. CHAPMAN (to Chapman-Stein Furnace Co.). U. S. 1,713,995, May 21. Structural features.

**Apparatus for indicating and regulating the air supply to furnaces utilizing different gaseous fuels.** C. LÖBBECKE. Brit. 300,204, Nov. 8, 1927. An app. is described suitable for use in regulating the use of different fuels such as coke-oven gas and blast-furnace gas.

**Automatic temperature regulators, particularly for furnaces.** FELIX JOMBART. Fr. 652,160, Nov. 7, 1927.

**Oil furnace.** M. M. SILATYEBV. Russ. 5578, June 30, 1928. Constructional features are specified.

**Oil burner.** SIDNEY E. MAJOR and EMRYS F. BAKER. Australia 12,471, Mar. 24, 1928.

**Oil burner.** V. P. KAZAKOV. Russ. 5544, June 30, 1928.

**Oil burner.** V. S. KOLOBOV. Russ. 5736, June 30, 1928.

**Oil burner.** A. I. KOTLYARENKO, F. I. KOTLYARENKO and V. I. KOTLYARENKO. Russ. 5104, April 30, 1928.

**Oil burner.** A. I. KOTLYARENKO, F. I. KOTLYARENKO and V. I. KOTLYARENKO. Russ. 5654, June 30, 1928.

**Oil burner.** M. V. PAPA-FEDOROV. Russ. 5659, June 30, 1928.

**Oil burner.** P. I. SLEPCHENKO. Russ. 5118, April 30, 1928.

**Oil burner.** V. K. VASILYEV. Russ. 5731, June 30, 1928.

**Thermostatic oil burner.** LEE S. CHADWICK (to Perfection Stove Co.). U. S. 1,715,334, May 28.

**Air-delivery apparatus for an oil burner.** GOVERNMENT SHIP BUILDING TRUST IN PETROGRAD. Russ. 5641, June 30, 1928.

**Gas burner.** ARTHUR STOCKSTROM and ISAAC V. BRUMBAUGH (to American Stove Co.). U. S. 1,714,409, May 21. Structural features.

**Gas burner.** JOHN S. ZINK. U. S. 1,715,051, May 28.

**Tunnel-type gas burner.** WILLIAM M. HEPBURN (to Surface Combustion Co.). U. S. 1,714,473, May 21. Structural features.

**Apparatus for heating fluids with steam under any desired pressure.** ARTURO CASTELLAZZI. Fr. 652,321, April 6, 1928.

**Acetylene generator.** LÉON HENRY and GUSTAVE DÉJARDIN. Fr. 652,288, April 6, 1928.

**Acetylene generator.** ERNEST MOREL and AUGUSTE ROQUET. Fr. 651,994, Mar. 30, 1928.

**Acetylene generator.** P. I. NIKULIN. Russ. 5636, June 30, 1928.

**Acetylene-gas generator under high pressure.** HANS GEBHARDT. Fr. 652,136, April 4, 1928.

**Carbide indicator for acetylene generators.** EMIL MENZ. Fr. 652,041, Mar. 31, 1928.

**Apparatus for scrubbing gas or for effecting other operations involving direct contact of gases with liquids.** FREDERICK W. SPERR, JR. (to Koppers Co.). U. S. 1,715,252-3, May 28. Structural features.

**Gas-purifying trap with a heating device for restoring absorbent qualities of material in the trap.** FRANK SCHAEFER (one-half to American Signs Corp.). U. S. 1,714,245, May 21.

- Apparatus (with rotary pumps) for mixing or blending gases.** RALPH B. STITZER and KENNETH M. WADDELL. U. S. 1,714,284, May 21.
- Apparatus for the recovery of gases or vapors by solid absorbents.** SOC. DE RECHERCHES ET D'EXPLOITATIONS PÉTROLIFÈRES. Fr. 33,710, Mar. 21, 1927. Addn. to 612,386.
- Apparatus for reëvaporating liquefied gases.** GESELLSCHAFT FÜR INDUSTRIE-GASVERWERTUNG. Fr. 651,750, Mar. 24, 1928.
- Apparatus for impregnating liquids with gases such as carbon dioxide.** HUGH S. STINSON and LESLIE STINSON (to Stinson Carbonator Co.). U. S. 1,713,787, May 21.
- Apparatus for concentrating and distilling liquids.** ANTOINE MONTUPET. Fr. 33,717, Mar. 30, 1927. Addn. to 629,395. Constructional improvements.
- Apparatus and method for mixing liquids by impinging a mist or stream of one liquid on a film or thin stream of the other.** F. E. SMITH, A. P. H. DESBOROUGH, W. T. THOMSON, H. F. REYNOLDS and E. W. BLAIR. Brit. 299,942, Aug. 26, 1927.
- Closed-circuit crystallization system.** METALLBANK UND METALLURGISCHE GESELLSCHAFT A.-G. Fr. 652,055, April 2, 1928.
- Apparatus for the production of carbon dioxide snow.** L'ACIDE CARBONIQUE PUR (SOC. ANON.). Fr. 652,094, April 3, 1928.
- Acid-proof self-lubricating cock.** MATHEW LOTZ. U. S. 1,714,606, May 28. Structural features.
- Surface condenser for steam.** JOHN F. KIRGAN (to Ingersoll-Rand Co.). U. S. 1,713,534, May 21. Structural features.
- Scrubber for preventing loss of vapors of gasoline or other volatile liquids from storage tanks.** HAROLD V. ATWELL (to Standard Oil Co. of Ind.). U. S. 1,715,112 May 28. Oil may be passed through the scrubber and into the tank.
- Rotary-drum apparatus for drying, charring, or similar treatment of loose materials.** OTTO DOBBELSTEIN. U. S. 1,714,853, May 28. Structural features.
- Digester cover.** SOC. ANON. RECORD. Brit. 299,706, Oct. 29, 1927.
- Apparatus (with screw conveyors) for continuous cooking of seeds, garbage, etc.** STANLEY HILLER. U. S. 1,715,065, May 28.
- Apparatus for distributing fire-quenching foam on floating decks of oil tanks.** CHARLES R. GALLAGHER (to Consolidated Steel Corp.). U. S. 1,714,015, May 21.
- Apparatus for applying fibrous pulp to a core such as wire.** HELGO W. JESPERSEN (to Western Electric Co.). U. S. 1,713,904, May 21. Structural features.
- Mercury air pump.** A. I. ZVEREV. Russ. 5718, June 30, 1928. Constructional features are described.
- Thermostatic valve for controlling gas supply to burners.** F. W. ROBERTSHAW and G. A. ROBERTSHAW. Brit. 300,145, June 30, 1927.
- Thermostatic control for electric circuits.** ALBERT E. WHITTIER. U. S. 1,713,578, May 21.
- Device for thermostatic and time-interval regulation of electric furnaces or other apparatus.** L. D. WEILL. Brit. 299,714, Oct. 28, 1927. Structural and electrical features are described.

## 2—GENERAL AND PHYSICAL CHEMISTRY

FREDERICK L. BROWNE

- George Kassner.** F. SIERP. *Chem.-Ztg.* 53, 409–10(1929).—Obituary with portrait E. H.
- William Küster 1863–1929.** K. H. BAUER. *Chem.-Ztg.* 53, 353(1929).—Obituary. E. H.
- Edgar Fahs Smith, chemist.** MARSTON T. BOGERT. *Science* 69, 557–65(1929). E. H.
- Ernst Wagner.** S. VALENTINER. *Physik. Z.* 30, 281–90(1929).—Obituary with portrait and bibliography. E. H.
- Chemistry, agriculture and industry in Germany.** W. A. DYER. *Chemistry & Industry* 48, 507–10, 528–31, 551–4(1929). E. H.
- The synthetic kingdom.** EDWIN E. SLOSSON. *Proc. 2nd Intern. Conference Bituminous Coal* 1, 80–99(1928). E. H.
- Nomography.** OTTO LIESCHE. *Chem. Fabrik* 1929, 170–1; cf. C. A. 23, 1536.—Parallel scales are given with a guide line between them upon which are indicated points through which lines may be drawn to find such equivalents as lbs.—kg., oz.—dekagram, tons—metric tons. W. C. EBAUGH

**Nomography.** Nomogram for use in the chemical factory. OTTO LÄESCHE. *Chem. Fabrik* 1929, 279-80.—A nomogram for  $p_H$  detns. within  $\pm 0.05$  unit. Cf. C. A. 22, 3858, 4017; 23, 1536. J. H. MOORE

**Origin of the term saponin.** FRITZ FERCHL. *Arch. Pharm.* 267, 290-309(1929).—A historical study appears to indicate Gmelin and Grothus as the first to employ the term saponin (in all probability developed from their earlier expressions: Saponarien-gummi, Kalksaponyl, Saponyl). W. O. E.

**Application of the logistic function to experimental data.** LOWELL J. REED AND JOSEPH BERKSON. *J. Phys. Chem.* 33, 760-79(1929).—A mathematical paper investigating the basic properties and some methods of analysis of the equation  $y-d = K/(1 + Ce^{rt})$ , which in logarithmic form is  $\ln\{[K-(y-d)]/(y-d)\} = \ln C + rt$  and in differential form is  $dy/dt = (r/K)[y-d][K-(y-d)]$ .  $y$  is the dependent variable,  $t$  the independent variable and the difference,  $y-d$  (in which  $d$  may equal 0) varies logarithmically with  $t$ . Mathematically the method of least squares is most proper to det. the parameters but practically this is a difficult or a useless refinement. The methods used are essentially graphic approximations which R. and B. illustrate in the evaluation of equations for positive and negative autocatalysis, bimolecular reactions with and without equal initial concns. of reactions, and oxidation and reduction potentials. A. P. SACHS

**The work of H. G. Grimm on the chemistry of atoms.** GULBRAND LUNDE. *Tids Kemi Bergvesen* 8, 27-30, 46-48, 59-62(1928). A. DROGSETH

**Fundamental atomic weights. VII. The atomic weight of potassium.** (HÖNIGSCHMID AND J. GOUBREAU. *Z. anorg. allgem. Chem.* 177, 102-8(1929).—By analysis of KBr, the value for the at. wt. of K found previously by analysis of KCl was confirmed. K oxalate was recrystd. five times, the mother liquors and small head fractions being discarded. The bromide was prepd. from purified Br, and then recrystd. The salt was dried in pure  $N_2$  at gradually increasing temp., and finally fused. Comparison with Ag was made as AgBr. The value is 39.104. L. L. QUILL

**Revision of the atomic weight of cerium.** Analysis of cerium trichloride. O. HÖNIGSCHMID AND H. HOLCH. *Z. anorg. allgem. Chem.* 177, 91-101(1929).— $CeCl_3$  was analyzed, the Ce being obtained free from La and Nd as the double Mg nitrate. The recrystd.  $CeCl_3$  was dehydrated, first in a current of  $N_2$  and HCl, then in pure HCl and finally fused. Comparison with Ag was made in the usual way, weights being corrected to vacuum. The value found is 140.125; Brauner found 140.25. L. L. Q.

**Determination of particle sizes.** DONOVAN WERNER AND STIG GIERTZ-HEDSTRÖM. *Tek. Tid. Uppf. C (Kemi)* 58, 17-23(1928); cf. C. A. 22, 4752.—A description of the app. and method for the detn. of the distribution of particle sizes in cement, emery, soils and similar materials by sedimentation analysis, previously described by D. Werner, C. A. 20, 469. Illustrated. C. A. ROBAK

**Experiments on para- and orthohydrogen.** K. F. BONHOEFFER AND P. HARTECK. *Sitzb. preuss. Akad. Wiss.* 1929, 103-8.—Quantum theory has led to the claim that mol. H is a mixt. of para- and orthohydrogen. The heat cond. of liquid H was studied at low pressure and liquid-air temp. No change was noted after 3 weeks. Gaseous H, however, contained in a brass cylinder under a pressure of 350 atm. at room temp., and then transferred to a liquid-air bath, showed a change in the ratio para- to orthohydrogen from 25/75 to 45/55. Liquid H at the same pressure showed a change in the ratio from 25/75 to 29/71 after 5 hrs., and 40/60 after 30 hrs. The heat of transition of ortho- into parahydrogen is 329 cal. at zero abs. Pure parahydrogen was obtained by adsorption on charcoal from gaseous H at the temp. of liquid H. Its heat conductance is  $1/4$  higher than that of the 1:3 mixt. At room temp. and 1 atm. parahydrogen is stable for several days. At 100 atm. conversion into orthohydrogen occurs. The temp. coeff. is small. Platinized asbestos brings about conversion in a short time. An elec. discharge has the same effect. FRANK URBAN

**Action of helium on platinum.** HORACIO DAMIANOVICH. *Compt. rend.* 188, 790-2 (1929); cf. C. A. 23, 1537.—The probable existence of He compds. in processes involving cleanup of He or He products at low temp. after activation by elec. discharge has an important bearing on valence theories. D. has made quant. expts. illustrating the absorption or chem. combination of He with Pt. One set-up consisted of a discharge tube 20 cm. long with 2 very pure Pt electrodes. Receiver tubes were inserted near the electrodes to catch the Pt-He compd. of brownish tinge. The other tube was built of quartz and had demountable electrodes. With Tube I pressure decreases of 0.23 and 0.63 mm. were noted, and with Tube II, a 2-mm. decrease. The initial pressures varied from 0.75 to 5 mm. The ratio  $(He_{abs}/Pt \text{ used})$  could be taken as an index of

the extent of compd. formation. The vol. of He consumed per g. of Pt was 14–34 cc.

**The action of helium on platinum.** H. DAMIANOVICH AND J. J. TRILLAT. *Compt. rend.* 188, 991–2 (1929); cf. *C. A.* 23, 1537.—X-ray powder diagrams were made of Pt prep'd. by elec. discharge in He and in air and of Pt so prep'd. after heating. The Debye-Scherrer rings showed a particle size varying with the method of prep'n. In Pt prep'd. in He, a very fine extra ring indicated a small proportion of a new form of Pt or of some kind of Pt-He combination.

**Thermal expansion of tantalum.** PETER HEDNERT. *Bur. Standards J. Research* 2, 887–96 (1929).—Measurements were made on the linear expansion of three samples of worked and annealed Ta over various temp. ranges between  $-190^{\circ}$  and  $500^{\circ}$  with app. previously described (*C. A.* 22, 750, 1313). Worked Ta expanded practically the same as annealed Ta. The most probable second-degree equation for the expansion of Ta between  $20^{\circ}$  and  $500^{\circ}$  is  $L_t = L_0[1 + (6.59t + 0.00008t^2)10^{-6}]$ . The coeff. of expansion increases slightly with temp. Between  $20^{\circ}$  and  $100^{\circ}$  the av. coeff. of expansion is  $6.6 \times 10^{-6}$  per degree C.

**Solid helium at high temperatures.** F. SIMON. Univ. Berlin. *Naturwissenschaften* 17, 256 (1929).—Recently it has been shown (*C. A.* 23, 2640) that the curve of m. p. vs. pressure for He does not approach lower temps. or reach a limit but rises continuously according to the relation  $\log(a + p) = c \log T + b$ . Exptly. it was to be found whether this curve is bounded by a crit. point of cryst. and liquid phases. Work of S. (*C. A.* 23, 2860) comprises the data from  $12^{\circ}$  to  $20^{\circ}$  abs., represented well by the equation. In order to go to higher pressures, the plugging of a capillary was used as the criterion of solidification; 14 points of the m.-p. curve between  $20.4^{\circ}$  and  $32.4^{\circ}$  abs. were det'd. The accuracy was 1.5%. The pressures corresponding to m. ps. of  $1^{\circ}$ ,  $4^{\circ}$ ,  $8^{\circ}$ ,  $12^{\circ}$ ,  $16^{\circ}$ ,  $20^{\circ}$ ,  $24^{\circ}$ ,  $28^{\circ}$  and  $32^{\circ}$  abs. are, resp. (Keesom values), 26, 131, 425, 813, 1270, 1800, 2380, 3010 and 3690 kg. per sq. cm. The pressure range is being further extended; if no crit. point appears, the pressure at  $80^{\circ}$  abs. should be 15,000, at room temp. 100,000 kg. per sq. cm. It is significant that for He solidification is possible at a temp. sixfold the ordinary crit. temp. The greatest excess previously known is 20% for  $\text{CO}_2$ . The importance of this for the knowledge of the condition of elements in the interior of stars is evident.

**Quantum mechanics and chemical linkage.** F. HUND. *Z. Elektrochem.* 34, 437–42 (1928).—A summarizing review.

**The different types of chemical union.** H. G. GRIMM. *Z. Elektrochem.* 34, 430–7 (1928).—A summarizing review.

**The determination of the forces of attraction from chemical equilibria.** RICHARD LORENZ. *Z. physik. Chem., Abt. A., Haber Bd.*, 139, 1–11 (1928).—In his book "The law of chem. mass action" (cf. *C. A.* 22, 1530) L. has developed a new equation for condensed systems, calcd. with the thermodynamic potential and the equation of van der Waals. The new equation is applied to a series of chem. equil. and a better insight into the forces of attraction between mols. and atoms is obtained.

**The different magnetic states of an ion.** G. FOEX. *Trans. Am. Electrochem. Soc.* 55 (preprint) 5 pp. (1929).—The  $\text{Fe}^{++}$  ion occurs in 3 distinct magnetic states; it is difficult to account for the differences between the 3 magneton values. Measurements made with different samples of  $\text{NiSO}_4 \cdot 7\text{H}_2\text{O}$  have always given the value = 16 magnetons. The Co ion value is 25 magnetons. The dehydrated  $\text{CoSO}_4$  put into soln. gave a value of 26, but after long standing the value decreased to 25. However, when a Co salt ( $\text{CoCl}_2$ ) is put into soln. in alc., the value for the Co ion is only 23 magnetons. In conc'd.  $\text{H}_2\text{SO}_4$  the value is 25.66. Upon crystallizing  $\text{CoCl}_2$  out of soln. in alc., the value shifts from 23 (soln.) to 26 (crystal). It follows that the ion in soln. is not the same as the ion in crystal. It seems probable that the different magnetic states correspond to a different structure in the outer layer of electrons in the atom. It is to be expected that other properties of the ion, which depend on that outer layer, will change with the changes which occur in this layer.

**Molecular form and dipolar moment.** WALTER HÜCKEL. *Z. physik. Chem., Abt. B*, 2, 451–7 (1929).—The existence of dipolar moments in compds. of the type  $\text{Ca}_4$  is not contradictory to the ideas of classical stereochemistry and cannot be used as an argument for the pyramidal form of such mols. The arguments are based on the equivalence and freedom of rotation of the groups attached to the C atom.

**The electric moment of primary alcohols.** P. N. GHOSH. *Nature* 123, 413–14 (1929).—The primary alcs. have very nearly the same dipole moment  $\mu = 1.63 \times 10^{-18}$ . The secondary alcs. have a different elec. moment of roughly  $1.78 \times 10^{-18}$ .

**Solution velocity of substances being reduced to fragments.** WAWRZYNIEC

JACEK. *Roczniki Chem.* 9, 19-38(38-40 French)(1929); cf. *C. A.* 22, 2096.—The soln. consists of two simultaneous processes: (a) the penetration of the constituent fragments of substances (atoms, ions, molecules, etc.) in the solvent and (b) their simultaneous deposition from the soln. on the surface of the solid substances. The velocity of the first process is in the simplest case const.; that of (b) is proportional to the concn. of the soln. at a given moment. If  $\nu'$  is the no. of constituent fragments detaching at a given moment from the surface unit and penetrating the soln. in the time unit, and  $n$  the no. of fragments already dissolved at the time  $t$ , then the no. of the fragments  $dn$  actually dissolving in the interval of time  $dt$  from the surface unit is expressed by (I)  $dn = [\nu' - K'(n/v)]dt$ , where  $v$  is the velocity of soln. and  $K'$  the proportionality factor. At the satn. point  $dn/dt = 0$ ,  $\nu' = K'(N/v)$  (II),  $N/v$  denoting the concn. of the satd. soln. If  $P$  is the surface of the dissolving fragments, then according to I and II  $dn/dt = (P/\text{surface unit})(K'/v)(N - n)$  and (III)  $dn/dt = (P/\text{surface unit})(\nu'/N)(N - n)$ . If the surface  $P$  is variable during the processes, the last equation can be transformed, replacing the fragments of  $N$  by spheres; thus  $N = (4/3)\pi a_1^3(\delta/m)$  where  $a_1$  is the radius of the sphere,  $\delta$  its density,  $m$  the mass of the fragments. Similarly,  $n = (4/3)\pi(a^3 - r^3)(\delta/m)$ , where  $a$  is the radius of the spheres of fragments going into soln. at  $t = 0$  and  $r$  is the radius of the sphere at the time  $t$ . Finally  $\nu' = \rho' \times \text{surface unit} \times (\delta/m)$  is deduced,  $\rho'$  being the thickness of the layer of dissolving fragments in the unit of time if the solvent is in excess, for in this case only can the process (a) take place. On substitution in place of III (IV)— $dr/dt = (P/4\pi r^2)(\rho'/a_1^3)(C - r^3)$  or more simply  $c = (a_1^3 - a^3)$  (cf. *C. A.* 22, 2095).  $P$  is the variable surface value of the fragments being dissolved. The equation IV is applicable even if  $P$  expresses the sum of surfaces of small fragments which are dissolved. These fragments were cubes in the case of NaCl. Here they are of equal size and, therefore,  $P/4r^2\pi = \text{const.}$   $\rho'$  is the actual velocity const. of soln. (of dimensions  $L/T$ ). For the crystals  $\rho'$  is a variable quantity on account of their anisotropy and it is necessary to take an average value in this case. J. K.

**Prism refractometry and certain goniometrical requirements for precision.** L. W. TILTON. *Bur. Standards J. Research* 2, 909-30(1929).—From a crit. review of sixth-decimal prism refractometry and refraction methods it is concluded that the method of min. deviation is the most sensitive for solid or liquid media. The use of four or more equidistant microscopes for scale observations, in which accidental and periodical errors are eliminated and an accuracy of  $\pm 1$  unit in the sixth decimal place is obtained even on uncalibrated circles, is prescribed. Micrometer errors and variable residual mech. strains in the goniometer are discussed. H. W. WALKER

**The crystal structure of some binary compounds of the platinum metals.** L. THOMASSEN. *Z. physik. Chem., Abt. B*, 2, 349-79(1929); cf. *C. A.* 22, 4289.—X-ray powder-method photographs reveal a pyrites structure for  $\text{OsTe}_2$  with  $a = 6.369$  A. U.,  $\text{OsSe}_2$  with  $a = 5.933$  A. U.,  $\text{RuTe}_2$  with  $a = 6.360$  A. U.,  $\text{RuSe}_2$  with  $a = 5.921$  A. U. and  $\text{PtSb}_2$  with  $a = 6.428$ . It is concluded that  $\text{PdTe}_2$  with  $a = 4.028$  and  $c = 5.118$  A. U.,  $\text{PtTe}_2$  with  $a = 4.010$  and  $c = 5.201$  A. U.,  $\text{PtSe}_2$  with  $a = 3.724$  and  $c = 5.062$  A. U., and  $\text{PtSb}_2$  with  $a = 3.537$  and  $c = 5.019$  A. U., possess the  $\text{CdI}_2$  type of structure.  $\text{PdTe}$  has the Ni arsenide structure with  $a = 4.127$  and  $c = 5.663$  A. U. Attempts to prep.  $\text{OsTe}$ ,  $\text{OsSe}$ ,  $\text{RuTe}$  and  $\text{RuSe}$  were unsuccessful. Systems of these compns. were mixts of the corresponding binary compd. and free metal. These binary compds. together with the corresponding Ir and Rh derivatives were found to be slightly para- or diamagnetic but not ferromagnetic. H. W. WALKER

**The numerical determination of the speed of crystallization.** HANS SCHWERDT-FEGER. *Chem. App.* 16, 45-7, 82-5(1929).—A mathematical paper designed solely for lab. use, and in no sense a contribution to the theory of crystal structure. J. H. MOORE

**Chemical valency considered as an electrostatic phenomenon.** A. E. VAN ARKEL AND J. H. DEBOER. *Chem. Weekblad* 26, 282-6(1929); cf. *C. A.* 23, 3135. G. C. Berthelot's principle of maximum work from the molecular kinetic point of view.

N. V. TANTZOV. *J. Russ. Phys.-Chem. Soc.* 60, 361-8(1928). J. KUČERA

**A new equation of state for fluids.** JAMES A. BEATTIE AND OSCAR C. BRIDGMAN. *Proc. Am. Acad. Arts Sci.* 63, 229-308(1928); cf. *C. A.* 23, 1032.—On the basis of the kinetic theory, the following equation of state is derived:  $p = [RT(1 - \epsilon)/V^2](V - B) - (A/V^2)$ , in which  $A = A_0[1 - (a/V)]$ ,  $B = B_0[1 - (b/V)]$  and  $\epsilon = c/VT^2$ . In the derivation, it is assumed that the kinetic and cohesive pressures can be considered separately, and, with respect to the law of force between mols., it is assumed only that the force diminishes rapidly with distance. Among the advantages of the proposed equation are: (1) the ease and uniqueness of the detns. of the values of the consts. from measurements of pressure, vol., and temp.; (2) simplicity in mathematical form; (3)

applicability over wide ranges of temp. and density; (4) provision for extension of the vol. and temp. functions  $A$ ,  $B$  and  $c$  without change in the general form of the equation. A critical study of the equation is made from the point of view of the exptl. facts regarding the isotherms and isometrics of a gas. The method of detg. the consts. from exptl. data is illustrated,  $O_2$  being used as an example. A critical bibliography is given of the compressibility data for He, Ne, Ar,  $H_2$ ,  $N_2$ ,  $O_2$ ,  $CO_2$ ,  $CH_4$  and  $(C_2H_5)_2O$ . Detailed comparisons are made of observed pressures with pressure calcd. from the equation. The av. deviation at 1777 points of comparison for the ten gases studied is 0.18%. The use of the equation in thermodynamic calcs. is discussed. MERRILL W. SEYMOUR

**The fundamental equation in the kinetic theory of liquids and gases.** D. ENSKOG. *Arkiv. Mat. Astron. Fysik.* 21A, No. 13, 28 pp. (1928).—By using van der Waals' assumption concerning the mol., complicated mathematical reasoning can be avoided, although many difficulties still remain. The term contg. the vol. is estd. from an av. of a great no. of identical systems. A further difficulty met with is the no. of impacts. A new derivation for the transport equation is given which includes the no. of impacts. The new definition agrees with earlier work of the author. The equation applies satisfactorily to liquids. Boltzmann's fundamental equation for dil. gases has also been remodeled. The article is largely mathematical. RAYMOND H. LAMBERT

**The determination of gas density with the vacuum balance. III. The electromagnetic balance for laboratory use.** ALFRED STOCK. *Z. physik. Chem., Abt. A*, Haber Bd., 139, 47–52 (1928); cf. *C. A.* 21, 679.—Details of construction and method of operation are given. The balance permits a quick detn. with an accuracy of from one to several tenths of one percent. It may also be used for the identification of gases, for the analysis of gas mixts. (also flue gas), etc. EMIL KLARMANN

**High-vacuum technic.** C. T. KNIPP. *Trans. Illinois Acad. Sci.* 21, 212–8 (1928).—Diagrams of various types of Hg vapor pumps are given. The quant. study of the speed of exhaustion of these pumps, and curves showing this behavior are discussed. L. L. QUILL

**Specific heat of gases in combustion technic.** HOLGER A. LUNDBERG. *Jernkontorets Ann.* 82, 217–46 (1927); *Ingeniors-Vetenskapsakad. Hand* 58, 1–32.—A survey of data concerning sp. heat of  $CO_2$ ,  $N_2$ ,  $O_2$ , CO,  $CH_4$  and steam. Schacks' formulas (Mitteilungen der Wärimestelle Düsseldorf, No. 87, 1926) are used for calcn. of theoretical combustion temp.

**Thermal diffusion of rare constituents in gas mixtures.** SIDNEY CHAPMAN. *Phil. Mag* [7], 7, 1–16 (1929).—Thermal diffusion in gases is capable of producing concn. gradients of the same order of magnitude as are found in the Soret effect in many liquid solns. The prospect of arriving at even an approx. correct theory, where pure thermal diffusion is the main cause, is at present rather remote. The law of force between He mol. and Rn is detd. L. H. REYERSON

**The thermal properties of carbon dioxide in the gaseous, liquid, and solid states.** R. PLANK and J. KUPRIANOFF. *Z. ges. Kälte-Ind.* 36, 41–8 (1929).—See *C. A.* 23, 2644. F. D. ROSSINI

**Flow of gases from orifices.** O. WALGER. *Arch. Wärmewirt.* 9, 368–9 (1928).—The thermodynamic correction factor which takes account of compressibility in the flow of gases from orifices is very nearly a linear function of the pressure-drop ratio for any given value of the sp. heat ratio. This makes possible a convenient approximation formula which is accurate to 0.5%. ERNEST W. THIELE

**Viscosity of mixtures of rare gases.** I. A. G. NASINI and C. ROSSI. *Gazz. chim. ital.* 58, 898–912 (1928); cf. *C. A.* 23, 1033.—The kinetic theory of viscosity deals with monatomic gases, and so the rare gases are of special interest in this connection, not only because they are monatomic but also because the ratio of their mass to viscosity varies in a way which lends itself particularly well to theoretical deductions. New viscosity measurements were therefore made, mixts. of He and Kr and of He and Ne being chosen. The viscometer and technic were essentially the same as already described in previous work. The viscosity-concn. curve of the He-Kr mixts. showed a max. of the already known character, whereas there was no max. for Kr-Ne mixts. The data obtained for these mixts. agree well with those calcd. by the formula of Pulu. The formula of Kuenen (cf. *Die Eigenschaften der Gasen*, Leipzig, 1919) and its relation to the const. of mol. attraction is discussed. C. C. DAVIS

**Viscosity of gaseous mixtures.** I. A. G. NASINI and C. ROSSI. *Gazz. chim. ital.* 58, 912–21 (1929); cf. preceding abstr.—Mathematical. Analysis of the formula of Pulu. allows the calcn. of the temp. limits between which it is possible for maxima to exist in the curves showing the viscosities of gaseous mixts. as a function of the proportions of the components. Deductions show that the max. can at times be proved only be-

tween 2 well-defined limits of temp., whereas in other cases the max. may exist and yet not be established. The results which are obtained agree well with exptl. data

C. C. DAVIS

The state called "Sama-Zustand." ERIC A. HOLM. *Compt. rend.* 187, 531-7 (1928).—The Sama-Zustand is defined as a state in which there is temp. difference and yet complete equil. (no thermal flow). With gases at low pressure such a state is reached in a gravitational field, the force downward counterbalancing a higher temp. in the lower part of the gas. The temp. gradient is of the order of  $13 \times 10^{-6}$  degree/cm. at pressures of  $10^{-4}$  mm. This effect has been detected by the use of a microbalance.

F. R. BICHOWSKY

Electric conduction of salt vapors. HJ. V. BROTHÉRUS. *Ann. acad. sci. Fennicae* 28A, No. 6, 1-20 (1928).—Elec. conduction of vapors of LiI and CdI<sub>2</sub> was studied. A const. and homogeneous stream of vapor was obtained by inserting a capillary tube and a glass screen between the vaporization chamber and the electrodes. Upon applying the potential the current strength decreases rapidly and after a few mins. becomes const. Data and curves are given showing the effect of varying pressure, temp. and voltage on the time before const. current is obtained. The time is greater at the higher pressures, higher voltages and lower temps. The current decrease is thought to be due to an initial thermal ionic equil., which is displaced to a new value upon closing the circuit. Data and curves are given for CdI<sub>2</sub> vapor showing the current increase with temp. from 400° to 550°. The no. of mol. impacts per sec. was calcd. and found to be too few to attribute the ionization phenomena to simple inelastic impacts of neutral unexcited mols. The Saha equation,  $2 \log (i_1/i_2) = -5048 V[(1/T_1) - (1/T_2)] + 1.5 \log (T_1/T_2)$ , gives 5.4 as the ionization potential,  $V$ , for CdI<sub>2</sub> vapor;  $i_1$  and  $i_2$  are the c. ds. at the resp. temps.  $T_1$  and  $T_2$ .

J. E. SNYDER

The conductivity of insulating liquids and the electromotive force of galvanic chains with those liquids determined by an electrostatic method. H. G. BOS. *Physica* 9, 128-41 (1929).—For the detn. of the cond. of insulating fluids a measuring vessel was used (tinned beaker  $50 \times 72$  mm.) with brass rod ( $7 \times 50$  mm.) as center electrode. The elec. app. was ventilated with warm, dust-free air or gas to eliminate moisture leakage effects. The beaker electrode was held at a const. potential. The rise in potential of the rod electrode, initially zero, was detd. by electrometer; it indicates the cond. The sign of the potential used was repeatedly reversed. At any moment the electrometer potential  $V$  is detd. by  $dV/dt = [q_1 - k(V + E_0 - B) - (KV + L)] / (cD + C_0 + C_b)$  in which  $q_1$  is the "primary effect," i. e., elec. charges from gas or liquid flow friction, space charges, etc.,  $k$  the cond. of the liquid,  $V$  and  $B$ , resp., are potentials of rod and beaker,  $E_0$  is the e. m. f. of the rod-liquid-beaker galvanic element,  $KV + L$  the sum of all elec. fluxes outside the measuring vessel,  $D$  the dielec. const. of the liquid,  $c$  the capacity of the vessel in vacuo, and  $C_0$  and  $C_b$  are capacities of app. and addnl. measured capacity. A no. of equations are derived for the detns. with blank expts. of various consts., part of which can safely be neglected. The limiting value of  $V_1$  is found to be  $\Delta = [q_1 - k(E_0 - B) - L] / (k + K)$  and of  $k + K = (cD + C_0 + C_b) / t_1 \ln (1/a)$  if  $t_1$  is the time necessary to make  $\Delta - V_1$  equal to  $a(\Delta - V_0)$ . A commercial gasoline was used for control of the theory. The potential of the electrometer was read every 5 secs. For the cond.  $k$  was found  $3.0 \times 10^{-12}$  mho, sp. cond.  $\lambda = 1.9 \times 10^{-14}$  mho, the value of  $E_0$  was  $-0.20$ . No polarization of the electrodes was observed, Ohm's law being followed by the element.

B. J. C. VAN DER HOEVEN

A capillary-tube method for the simultaneous determination of surface tension and of density. ALLAN FERGUSON and J. A. HAKES. *Proc. Phys. Soc. London* 41, 214-23 (1929).—A capillary tube of radius  $r$  is immersed vertically to a depth  $h_1$  in the liquid of d.  $\rho_1$  under test. The pressure  $gph$  required to force the meniscus down to the lower end of the capillary and hold it there is measured. If  $h_1$ , and consequently  $h$ , be varied, a plot of  $ph$  against  $h_1 - (r/3)$  gives a straight line from whose slope and intercept the surface tension and the d. of the liquid may be inferred. Two cuts of the app., 2 graphs and 3 tables of results are given and the theory of the method is treated mathematically, with references.

J. H. MOORE

The process of adsorption. II. W. KÄLBERRER and C. SCHUSTER. *Z. physik. Chem., Abt. A*, 141, 270-96 (1929); cf. *C. A.* 23, 1036.—The magnitude and properties of the interface of silicic acid gel were studied by measurements of the isotherms and heats of adsorption of gases. The heat of adsorption of A detd. experimentally agrees with that calcd. from the isotherms. It is 2500 to 3200 cal. at 0°, the higher values being for the more completely outgassed gels. The isotherms for CO<sub>2</sub> are sometimes linear in the lower range of pressures (indicating adsorption on plane surfaces), sometimes have a steep initial portion (indicating active areas in the gel), and sometimes



have convex curvature (indicating capillary condensation). These effects may be superimposed upon each other. The heat of adsorption of  $\text{CO}_2$  on plane surfaces is 7200 cal. at  $0^\circ$ . The heat of adsorption of  $\text{N}_2$  at  $0^\circ$  is 3000 cal., but varies with the method of prepg. the gel. For  $\text{C}_2\text{H}_4$  the heat of adsorption is 7300–7700 cal. The adsorption vol. is a function of the heat of adsorption, being smaller the higher the heat of adsorption. The interface of silicic acid gel is  $100 \times 10^4$  sq. cm. per g.

F. L. BROWNE

Calculated conceptions from viscosity in the realm of plastic flow. WOLFGANG OSTWALD. *Kolloid-Z.* 47, 176–87(1929).—The theoretical equation for viscosity and pressure by Blair (*C. A.* 23, 1798) is not generally applicable because it fails to agree with published data. Since a well-defined yield value is often present, the curve for low rates of flow is necessarily not linear so that Blair's linear relationship would apply only to some middle portion of the curve. Such colloids as clays may obey the formula. Data obtained from various sources and with quite different instruments are compared and found to be identical with calcd. values obtained from the author's formula.

RAYMOND H. LAMBERT

Adsorption at the surface of binary liquid mixtures. R. S. BRADLEY. *Phil. Mag.* [7], 7, 142–5(1929).—Too much attention has been paid to the adsorption of one constituent in binary liquid mixts. without considering the changes in the surface concn. of the other. Rideal and Schofield (cf. *C. A.* 19, 3397) were not dealing with surface concn. of alc. in alc. mixts. but with  $\Gamma_1 - \Gamma_2(N_1/N_2)$  where  $\Gamma_1, \Gamma_2$  are the Gibbs surface excesses and  $N_1, N_2$  the mol. fraction of alc. and water, resp. From the measurements of Frumkin (cf. *C. A.* 19, 1799) an expression is deduced which permits calcn. of the surface excesses for the alc.-water mixts. When surface concn. is plotted against mol. fractions a max. is found in the curve for each constituent. The calcn. is checked by plotting the surface concn. of alc. against that of water. A straight line results.

L. H. REYERSON

The influence of adsorbed films on rates of evaporation. RONALD P. BELL. *J. Phys. Chem.* 33, 99–117(1929).—Measurements were made of the rate of evapn. of Cl from its soln. in  $\text{CCl}_4$  under different conditions of Cl concn. and velocity of flow. The influence on the evapn. rate of  $\text{CCl}_3\text{COOH}$  dissolved in  $\text{CCl}_4$  was measured and the decreased rate of evapn. attributed to surface adsorption. From the results it is deduced that a satd. surface film, presumably monomol., is formed at all concns. greater than about 1.4 g. of acid per 100 g. of soln. This value is in agreement with that obtained by the application of Gibbs' adsorption equation to surface tension measurements of  $\text{CCl}_3\text{COOH}$  solns. The author suggests that the measurement of rates of evapn. may prove of general utility in the investigation of adsorption from soln.

P. T. NEWSOME

Capillarity. X. Further formulation of capillary structure. KARL SCHULTZE. *Kolloid-Z.* 47, 310–3(1929).—A theoretical discussion of the influence of the capillary cross section on the flow of fluids by the aid of a novel system of formulation. L. F. M.

The influence of capillary size on the flow of colloidal solutions in the capillary viscometer. W. HALLER AND V. TRAKAS. *Kolloid-Z.* 47, 304–10(1929).—A critical no. characteristic of the structure viscosity, was detd. for the flow of colloidal solns. similar to the Reynolds no. for turbulence. The exptl. results confirmed the theory. On the basis of certain assumptions, similar relations for the whole structure viscosity range may be detd. Certain anomalous viscosities of colloidal solns. may be explained by means of the relation between viscosity and turbulence. The equation of A. de Waele Wo. Ostwald was altered so that the const. are independent of dimensions of app. and are functions of the material only.

L. F. MAREK

Rigidity in weak clay suspensions. R. K. SCHOFIELD AND B. A. KEEN. *Nature* 123, 492 3(1929).—In the course of work necessitating the purification of quantities of the smallest soil particles (the so-called clay fraction) a striking phenomenon was observed during the flocculation and sedimentation of the material in dil. HCl. When the concn. of the suspension exceeds a crit. value a no. of sharp ramifying fissures develop contg. clear liquid. The density of this being less than that of the surrounding clay-laden liquid a circulation is set up, clear liquid rising through the fissures while the remainder sinks. Near the bottom of the vessel the fissures tend to close, and to enlarge progressively towards the top of the column into conical chimneys. There is no doubt that the suspension has acquired rigidity. The surface of the settling suspension has the appearance of a region covered with many craters. GEO. GLOCKLER

The colloids and industry. H. PERPEROT. *Science & ind.* 13, 177–80(1929).—A study of colloidal substances, their chem. constitution, their prepn. and some of their

properties. Flocculation and coagulation, osmosis, dialysis, flotation and ultrafiltration are discussed.

**Dispersion and size of particles.** REINHOLD FÜRTH. *Kolloidchem. Beihefte* 28, 293-5(1929).—A review of the conceptions of the size of particles in relation to their properties.

**Chemical combination and dispersion of crystalline particles.** WO. OSTWALD AND A. VON BUZÁGH. *Kolloid-Z.* 47, 314-23(1929).—The stereochem. combination of the elementary micelle of crystals as shown by x-rays is recognizably different from the stoichiometric combination of macrocrystals. The first combination must result from the growth of the particles themselves. The transition for the growth of particle size was detd. and plotted for a series of lattice types. It is shown that the convergence of the stereochem. and stoichiometric combinations occurs in crystals of the rock salt type at  $1-2 \times 10^3$  elementary cells arranged in a hexahedron; in fluorite at  $4-5 \times 10^4$ ; in the others at about  $10^5$  elementary cells. The edge of these first crystallites from practically stoichiometrical combination varies between  $10^{-6}$  and  $10^{-5}$  cm. This is the typical colloidal dimension. Also the not stoichiometrically related surface tension or adsorption phenomena of crystals may be assumed of the same order of magnitude. From this it follows that, theoretically, the combination of colloidal particles in sols or highly dispersed ppts. can vary with the particle size. As examples, a cryst.  $\text{CaF}_2$  sol formed by condensation at high dispersions is Ca-richer than at lower; an old  $\text{CaF}_2$  ppt. is altered by recrystn.; changes in H-ion concn. occur on standing, etc. By use of the Smekal theory it is shown that the lattice structures postulated by this author are essentially identical with crystallites which have reached stoichiometric relations. The Smekal elements are of colloidal dimensions. The change from stereochem. to stoichiometric combination is apparently related to a peculiar stabilization of the crystallites concerned.

**Lyophilic colloids. I. Osmotic pressure and viscosity measurements of rubber solutions.** H. KROEFELIN. *Kolloid-Z.* 47, 294-304(1929).—The expt. was carried out on the cold ether ext. of acetone-extd. crepe rubber. Through measurement of the osmotic pressure at  $11^\circ$  and  $40^\circ$  the vapor pressure of rubber solns. and then temp. coeff. were detd. From the values the heat of diln. was calcd. From the simplified van der Waal's equation the micelle wt. was detd. as 200,000. The present exptl. work may be presented by use of Freundlich's swelling equation, as Wo. Ostwald has shown for the "sol-swelling" of other systems. For the evaluation of viscosity measurements, the mean value of the velocity of flow of a stream through a capillary was used. From the results it is shown that the apparent viscosity is a function of the mean velocity of flow. Measurements in different capillaries gave the same value for the apparent viscosity, when the mean value of the velocity is selected as the independent variable. The apparent viscosity is a linear function of the log of the velocity with all rubber solns. used. No simple relation was found to exist between viscosity and osmotic pressure.

**The stability of colloids. I. Lyophobic colloids.** H. R. KRUYT. *Rev. gén. colloides* 6, 118-33(1928).—This is a general review of the history and properties of lyophobic colloids, as developed by students of the subject from the time of Thomas Graham to the present time. **II. Lyophilic colloids.** *Ibid* 149-60.—This is a general review.

**A method for investigating the appearance of coagulation and peptization.** A. V. BUZÁGH. *Kolloid-Z.* 47, 370-2(1929).—By counting the pieces of pulverized glass which settle from a suspension in  $\text{H}_2\text{O}$ , it was shown that the addn. of increasing quantities of sodium oleate and NaOH has a peptizing effect on the pulverized glass, while  $\text{KCl}$ ,  $\text{BaCl}_2$  and  $\text{ThCl}_4$  have coagulating effects. A max. coagulating effect is reached with  $\text{ThCl}_4$  at the isoelec. point.

**The behavior of hydrotropic mixtures.** A. NOLL. *Chem. tech. Fabr.* 26, 43-6, 47-50(1929).—The soly. and emulsifying property are given for many mixts. in which the following substances were used in varying proportions:  $\text{H}_2\text{O}$ , hexalin, methylhexalin, majamin, soaps, terpineol, castor oil, savonette oil, fusel oil, rosin, Nekal A, Nekal BX, Idrapid and naphthalene salt.

**Emulsions and the effect of hydrogen-ion concentration on their stability.** JOHN C. KRANTZ, JR., AND NEIL GORDON. *Colloid Symposium Monograph* 6, 173-206(1928).—Oil-in-water emulsions are given by Na oleate, arabic acid; arabates of Na, Mg and Fe; valerates of  $\text{NH}_4$  and Na; Na gluconate, galactonate, dihydroxystearate, salicylate and gallate. Water-in-oil emulsions are given by oleates of Mg, Ca, Co(ous), Mg and Al; Mg and Zn valerates; dihydroxystearate. Pb arabate would not serve, and the following were amphoteric: Ca gluconate, Cd galactonate, Ca salicylate

and gallate. In emulsions of vegetable or mineral oil with acacia, greatest stability exists when the  $p_H$  of the external phase is between 2 and 10. With tragacanth, the  $p_H$  range is 1.9 to 2.3. Greatest stability for acacia,  $p_H$  4.11 to 4.28; for tragacanth, about 2.5. Particle size, surface tension, interfacial tension and viscosity were detd. at various  $p_H$ , which affects particle size and viscosity in tragacanth emulsions, but not in acacia emulsions, except that particle size increased in the latter with  $p_H$  over 7. "There are indications of Fischer's hydrate theory being substantiated in emulsions prepd. with tragacanth." Olive oil gives a more stable emulsion with Mg oleate than does mineral oil, the most stable emulsion range being  $p_H$  11–12.5, with an extremely unstable range at  $p_H$  2.5. Surface tension of water-in-oil emulsions is unaffected by  $p_H$  changes of the internal phase; unstable emulsions had lower viscosity than stable ones; particle-size variations, up to  $30\mu$  average, did not alter stability. J. A.

**Colloidal platinum. V. The coagulation by electrolytes in acid solution.** STUART W. PENNYCUICK. *J. Chem. Soc.* 1929, 618–23; cf. C. A. 22, 4306.—The addn. of a salt causes cationic interchange at the surface with the liberation of the free acid of the salt. In agreement with Pauli and Schmidt, P. shows that this interchange leads to coagulation of the colloid. The change is followed by conductance measurements. In acid solns. cationic interchange is partial. The coagulum contains some of the surface acid. Highly hydrolyzed salts of strong acids show the symptoms of acid coagulation. As the  $p_H$  is lowered, the coagulating value of the salt increases. VI. The behavior of platinum sols in basic solution. *Ibid* 623–33.—By titrating Pt sols with the hydroxides of Na and Ba, P. concludes that 25% of the surface of a colloidal Pt sol consists of hexahydroxyplatinic acid. The rest of the surface is composed of lower, less active acid oxides which are too weak to form acids with water but form salts with bases. These conclusions enable P. to explain the different actions of NaOH and Ba(OH)<sub>2</sub>. P. also shows that Pt sols are reversible if the correct conditions are obtained. The pptd. particles obtained by freezing a sol are not peptized by washing or warming with NaOH soln. F. W. LAIRD

**Bright-colored silver sols by use of hydrogen peroxide. I. ERNST WIRGEL.** *Kolloid-Z.* 47, 323–5(1929).—A method is described for the prepn. of Ag sols from AgNO<sub>3</sub> solns. by the use of alk. dextrin solns. The Ag sols may then be colored from an orange-yellow, to shades of red, to shades of violet and blue, to colorless by the addn. of varying amts. of a 9% soln. of H<sub>2</sub>O<sub>2</sub>. Results are tabulated with a description of the ultra-microscopic appearance of the sols. L. F. MAREK

**Equilibrium in the system: colloidal iron hydroxide-hydrochloric acid-water.** ERICH HEYMANN. *Kolloid-Z.* 47, 325–30(1929); cf. C. A. 23, 1797.—The reaction: colloidal Fe(OH)<sub>3</sub> + 3HCl → FeCl<sub>3</sub> + 3H<sub>2</sub>O was studied. For const. concn. of HCl a higher concn. of Fe(OH)<sub>3</sub> gave a higher concn. of FeCl<sub>3</sub>. The ratio [HCl]<sup>3</sup>/[FeCl<sub>3</sub>] is only fairly const. In accordance with Herzfeld's findings it is assumed that the reaction occurs throughout the particle rather than on the surface only. The equil. is influenced by the degree of dispersion of the hydrolysis products, in that coarsely dispersed Fe(OH)<sub>3</sub> is in equil. with a lower concn. of FeCl<sub>3</sub> than is finely dispersed Fe(OH)<sub>3</sub>. The degree of dispersion varies with the age of the sol. Micelles of varying chem. compn. were obtained by varying the age of the sol or by varying the procedure at equil. conditions. An explanation is offered based on the work of Wintgen and Biltz. L. F. MAREK

**Colloidal solutions of alumina and of chromium oxide and their desiccation.** PAUL BARY AND JOSÉ V. RUBIO. *Compt. rend.* 188, 625–6(1929).—Colloidal solns. prepd. by the dialysis of Al(OAc)<sub>3</sub> and of CrCl<sub>3</sub> were allowed to evapor. Concentric rings alternately colorless and colored were formed due to the lamellar arrangement of the dried film. L. B. MILLER

**Method of ebullioscopic and tonometric researches.** WOJCIECH ŚWIĘTOSŁAWSKI. *Roczniki Chem.* 9, 266–307(307–8 French)(1929).—Several simple and differential ebullioscopes and the methods of using them are described. They were used in the following physicochem. researches: graduation and comparison of thermometers, verification of the thermometric scales, tonometrical measurements, detns. of coeff.  $dp/dT$  and heat of vaporization, of b. ps. of liquids or their mixts., of the coeff. of variation of the soly. with temp., of esterification const. in the gaseous and liquid phase  $K_p$  and  $K_l$ , of the velocity const.  $K$ , and in the investigation of azeotropic mixts. and displacement of the max. or min. point with pressure. An app. for ebullioscopic researches allowing pressures up to 20–30 atm. is described. J. KUČERA

**Ebullioscopic studies of mixtures of salt solutions.** GRZEGORZ PRONIEWSKI. *Roczniki Chem.* 9, 115–28(129–30, French)(1929).—Bourion and Rouyer's data concerning the deviations of b. ps. of mixts. of salt solns. were verified and their method (C. A.

21, 3009) was applied to saline solns. in which the cations were alkali metals and most metals of the second group and the anion was  $\text{Cl}^-$ . The mixts. of alkali and alk. earth chlorides with the chlorides of Zn, Cd and Hg show particular lowering of b. ps. The max. of the deviation curves for the mixts. with  $\text{CdCl}_2$  and  $\text{ZnCl}_2$  are at the point corresponding to 60% of alkali or alk. earth chloride in the mixt.; the position of max. practically does not vary when the solns. cease to be equimol. and their concns. become two, three or four times as great. By using the same method for the mixts. of alkali chlorides with water (and also alk. earth chlorides), a curve is obtained with a max. close to 50% of water content. On addn. of water to the solns. of  $\text{CdCl}_2$ ,  $\text{ZnCl}_2$  and  $\text{HgCl}_2$ , deviation curves are obtained different from the preceding ones, deviations being positive or negative depending upon the kind of chloride or concn. By comparing the curves it can be seen that the deviation of b. p. depends principally on the process taking place during the mixing of the solns. of alkali chlorides (and alk. earth chlorides) with water. This is the cause of the deviation and the influence of  $\text{CdCl}_2$ ,  $\text{ZnCl}_2$  and  $\text{HgCl}_2$  consists in a considerable increase of deviations, due to the mixing of solns. of  $\text{MCl}$  with water, and in insignificant displacement of max. Therefore, conclusions are drawn that the deviation of b. ps. and the position of max. observed by mixing  $\text{CdCl}_2$ ,  $\text{ZnCl}_2$  and  $\text{HgCl}_2$  solns. with  $\text{KCl}$  or  $\text{CaCl}_2$  solns. cannot serve as an indication for detg. the compn. of double salts as Bourion and Rouyer believe. J. KUČERA

The boiling temperatures of the homologous series. BORIS NEKRASOV. *Z. physik. Chem., Abt. A*, 140, 342-54 (1929).—If it is assumed that the boiling temp. is a function of two variables, mol. mass and mol. vol., then  $T_b \sqrt{R} / \sqrt{M(1-R)} = \text{const.}$ , wherein  $M$  is the mol. wt. and  $R$  the sp. refraction corresponding to the mol. vol. In simple compds. such as the satd. hydrocarbons the sp. refraction can be calcd. from optical data. In polar compds. another empirical factor must be introduced. The equation retains its validity for the boiling temps. of satd. hydrocarbons at reduced pressures. Another equation can be derived from it by substitution which holds even at crit. temps.; it indicates the differences of vapor pressure of the individual constituents of a homologous series with satisfactory accuracy. EMIL KLARMANN

The "ebullioscopic paradox." A. BERTHOUD, E. BRINER AND A. SCHIDLOF. *J. chim. phys.* 26, 149-51 (1929); cf. *C. A.* 22, 11, 535.—The priority of Mazzucchelli (*C. A.* 22, 1712) in a similar treatment of this subject is acknowledged, but a polemical reply is made to the criticisms of Verschaffelt (*Wis. en nat. Tijds.* 4, 1 (1929)). T. H. CHILTON

A study of some complexes by the polarigraphic method. MME. N. DEMASSIEUX AND J. HEYROVSKY. *Bull. soc. chim.* 45, 30-5 (1929).—Study of complex formation by means of a modified dropping Hg cathode was extended to salts of Pt, Hg and Cu.  $\text{K}_2\text{PtCl}_6$ ,  $\text{K}_2\text{PtCl}_4$ ,  $\text{K}_2\text{PtBr}_6$  and  $\text{K}_2\text{PtBr}_4$  are completely dissocd. in soln.  $\text{K}_2\text{Pt}(\text{CN})_4$  is not dissocd. The metal cannot be deposited from the complex cyanides of Fe, Zn and Cu, but from Ag, Au and Cd complexes the metal can be deposited easily and reversibly at the cathode.  $\text{Hg}(\text{CN})_2$  behaves peculiarly in the presence of excess KCN. A sharp increase is observed on the polarization curve which is attributed to the adsorption of ions on the Hg drops. The cyano, oxalato, tartrato, and hyposulfito complexes of Cu were studied. The cyano complex is not dissocd. in a freshly prepd. soln. but is partly so in solns. which have stood for a time or which have been dild. L. L. Q

The connection between the osmotic coefficient and the chemical constitution of the ions of tetraalkylammonium salts. L. EBERT AND J. LANGE. *Z. physik. Chem., Abt. A, Haber Bd.*, 139, 584-96 (1928).—Debye and Hückel (cf. *C. A.* 17, 2665) have developed the following function for the osmotic coeff.  $1 - \phi = 0.37 v$  ( $v$  = mol. concn.). Several inorg. salts show discrepancies and the current theories to explain this are discussed. A series of salts of the  $\text{NR}_4$  base type are cryoscopically investigated in dilns. from 0.05 to 1 mol. per 1000 g.  $\text{H}_2\text{O}$ . They show a pronounced individuality. With the inorg. salts the halides were close together but with the org. salts the curves show great differences, which become more pronounced with the higher radicals. The salts  $\text{N}(\text{C}_2\text{H}_5)_4\text{I}$  and  $\text{N}(\text{C}_2\text{H}_5)_4\text{I}$  show the smallest lowering of the f. p. for salts with univalent cation and anion. They may give the best data to compare the different theories of the strong electrolytes. E. SCHOTTE

Equilibrium law of electrolytes. Association. K. JABLČEVŇSKI. *Roczniki Chem.* 9, 97-109 (109-10, French) (1929).—On the basis of the equil. law (*C. A.* 16, 3021) the cryoscopic data for the nitrates of alkali metals were recalcd. From the decrease of the coeff. with increasing concn. of nitrates it is concluded that the nitrates associate,  $\text{NO}_3^-$  combining with undissocd. mols., e. g.,  $\text{KNO}_3$  forming the complex anions  $(\text{KN}_3\text{O}_6)^-$ . Consequently the following equations were proposed:  $K_1 = (n_1 P)^{1/2} / (N - 2n_1)$  and

$K_2 = (n_1 P)^{1/2} / P^{1/2} (N - 2n_1)$ ,  $K_1$  being the equil. coeff. of concns.:  $n_1$  of alkali cation and  $n_2 (= P)$  of the anion  $\text{NO}_3^-$  and  $n_0$  of undissocd. mols.;  $K_2$  is the equil. coeff. of concns.:  $n_2$  of  $\text{NO}_3^-$  and  $n_0$  of undissocd. mols. and  $n_3$  of the complex anion  $(\text{MN}_3\text{O}_6)^-$ . The total no. of mols. is  $N$ . Calcn. gave the following results for  $\text{HNO}_3$ ,  $\text{LiNO}_3$ ,  $\text{NaNO}_3$ ,  $\text{KNO}_3$ ,  $\text{RbNO}_3$  and  $\text{CsNO}_3$ , resp.:  $K_1 = 3.36, 2.16, 2.16, 1.99, 2.11, 1.94$ ;  $K_2 = 0, 0, 1.1, 4.0, 4.0, 5.0$ ; hydration  $9\text{H}_2\text{O}, 11\text{H}_2\text{O}, 3\text{H}_2\text{O}, 0, 0, 0$ . The nitrates of Li, Na, K, Rb, Cs have almost identical equil. coeffs.; the coeff. for  $\text{HNO}_3$  is greater, as  $\text{HNO}_3$  behaves as an electrolyte far stronger than the salts. The same is true for  $\text{HCl}$  and its salts. There is no assocn. of mols. in the case of  $\text{HNO}_3$  and  $\text{LiNO}_3$ ; assocn. increases however, with increasing mol. wt. The tendency to assocn. depends upon the kind of cation. The degrees of hydration of cations of nitrates are identical with those of the chlorides.

JAROSLAV KUČERA

**The transport number of aqueous acetic acid.** JAMES W. MCBAIN AND CHARLES E. HARVEY. *Trans. Am. Electrochem. Soc.* 55 (preprint) 11 pp. (1929).—The migration number of a weak electrolyte has been ascertained and compared with the conflicting predictions from the data for corresponding strong electrolytes. The transport number of  $\text{HOAc}$  over the whole range of concns. and temps. studied is 0.108. It is shown that the anions of  $\text{HOAc}$  itself are simple and it is suggested that the anomalies in the data deduced for the strong electrolytes may be traceable to the presence of complex ions, even when they are in fairly dil. solns.

C. G. F.

**Transport numbers of lithium chloride, lithium bromide and sodium iodide in solutions of acetone and alcohol.** W. BIRKENSTOCK. *Z. physik. Chem., Abt. A*, 138, 432–46 (1928).—Transport nos. for Cl, Br and I ions in acetone solns. of  $\text{LiCl}$ ,  $\text{LiBr}$  and  $\text{NaI}$  are 1.21, 0.833 and 0.614, resp. Addn. of  $\text{MeOH}$  to the acetone soln. causes a sharp decrease in the transport no. of the anion of  $\text{LiCl}$  and  $\text{LiBr}$ , but there is no effect on the transport no. of I in  $\text{NaI}$ . The conclusion is that  $\text{LiCl}$  and  $\text{LiBr}$  form complexes in acetone that are destroyed by alc., while  $\text{NaI}$  forms no complexes in acetone.

R. J. HAVIGHURST

**The mobility of the hydrogen ion and the electrical conductivity of the halogen acids.** M. DE HLASKO. *J. chim. phys.* 26, 125–48 (1929).—New conductance measurements on the halogen acids gave values of  $\lambda_\infty$  at  $25^\circ$  for  $\text{HCl}$ ,  $\text{HBr}$ , and  $\text{HI}$ , 431.5, 433.7, 432.3, resp. From the mobilities of the anions, the value of 355.1 is obtained for that of  $\text{H}^+$ . From calcs. of the percentage ionized at various dilns., it is concluded that in very dil. solns.  $\text{HI}$  is stronger than  $\text{HBr}$ , and  $\text{HBr}$  than  $\text{HCl}$ . In concd. solns., the order is reversed. This is attributed to the effect of the acids on the dielec. const. of the soln. Measurements of the conductance of the poly-halogen acids and salts, taking account of the hydrolysis of the free halogen, indicate that  $\text{HI}$  is stronger than  $\text{HBr}$ , both being strong acids.

T. H. CHILTON

**Investigations on the Faraday effect in aqueous solutions of some uni-univalent electrolytes.** F. BUCH ANDERSEN AND R. W. ASMUSSEN. *Kgl. Danske Videnskab. Selskab Math.-fys. Medd.* 8, No. 9, 19 pp. (1928).—The magnetic rotations of several salt solns. were measured at  $0^\circ$  in a polarimeter of the Laurent type for the wave lengths  $578\mu$ ,  $546\mu$  and  $436\mu$ . The polarimeter tube (40 cm. in length with a capacity of 35 cc.) was surrounded by a solenoid of 7 ohms resistance through which a current of 20–23 amps. was flowing. All measurements were reduced to an arbitrary current of 19 amps. From the calibration of the app. with water it was calcd. that the magnetic potential was 80,000 gauss per cm. The total error is estd. to be not over 0.5%. Measurements were made on 24 different salts all of the uni-univalent type. The mol. rotation  $M$  was shown to vary slightly with the concn., and is not always the same for the three wave lengths. For yellow light  $M$  appears to increase with diln. for chlorides of small at. no. elements, but decreases for chlorides of large at. no. The rotation is very nearly additive in the halides of H, Li, Na, K, Rb and Cs, but the variation for a cation with different anions is large, while the variation for an anion with different cations is small. By assigning to  $\text{H}^+$  a value of  $M = 0$ , which is true if the H ion is identical with its positive nucleus, it is possible to calc. the values of  $M$  for the other ions. When these relative values are plotted against the at. no., the resulting curve approximates the ionic vol. and mol. refraction curves. The value of  $M$  decreases markedly in going from  $\text{MCl}$  to  $\text{MClO}_4$ , and from  $\text{MClO}_4$  to  $\text{Cl}$  in an org. mol. Similarly, it is increased by the substitution of Br for I. It is further observed that water has a rotation equal to about one-half of the sum of  $\text{H}^+$  and  $\text{OH}^-$  while ammonia has a rotation equal to the sum of  $\text{NH}_4^+$  and  $\text{OH}^-$ .

HANS C. DUUS

**The theory of electrolytic dissociation.** W. NERNST. *Z. physik. Chem.* 135, 287–50 (1928); cf. *C. A.* 22, 342, 1886.—The paper is a direct continuation of work by Nernst and Orthmann (cf. *C. A.* 23, 2645) and Meiring Naudé (*C. A.* 23, 2645).

Aq. solns. of electrolytes contain a considerable proportion of chemically bound mols. besides the free ions in agreement with the classical ideas of Arrhenius. The deviations from the law of mass action depend upon the electrostatic action of the ions, as has been assumed by previous investigators; the theoretical foundations have been provided through the work of Debye and collaborators. However, the theory of Debye does not lend itself readily to practical use because it contains factors about which little is known, e. g., the active ion radius and the dependence of the dielec. const. upon the distance of the ions. N. and collaborators restricted their work to univalent ions of equal mobility because in such case the Debye effect is small and the active ion radii are nearly equal. The following results were obtained and are particularly significant: It was possible to calc. the rather complex course of the heat of diln. with satisfactory accuracy from the heat of diln. of LiCl and from the temp. coeffs. of the heat of diln. of the other salts. The heats of assocn. and dissocn. were detd. The decrease of the numerical values of cryoscopic measurements caused by the Debye effect and by assocn. was detd. The degree of assocn. was detd. also from cond. measurements of salts with ions of equal mobility.

EMIL KLARMANN

**Electrochemical studies on ethereal solutions. II. The system: arsenic trichloride-ethyl ether.** M. USANOVICH. *Z. physik. Chem.*, Abt A, **140**, 429-34 (1929) cf. *C. A.* **21**, 1913.—The elec. cond. of the system:  $\text{AsCl}_3\text{-Et}_2\text{O}$  has been detd. in concns. ranging from 0 to 100%  $\text{AsCl}_3$ . A distinct conductance can be noticed at a concn. of 40%  $\text{AsCl}_3$ ; it rises with the rising concn. and the max. is reached at a concn. of 94%  $\text{AsCl}_3$ . At higher concns. the cond. falls rapidly. The temp. coeff. of the elec. cond. is negative at all concns. The decompn. potential of a soln. contg. 68.81% of  $\text{AsCl}_3$  was found to be 1.22 volts at 18°. The quantity of As deposited at the cathode in the course of electrolysis agrees with the requirements of Faraday's law. The curves of the sp. and the mol. conductivities correspond to those of the system  $\text{AsBr}_3\text{-Et}_2\text{O}$ .

EMIL KLARMANN

**The conductivity of solutions of some aliphatic organic acids in water and ethyl alcohol.** HERSCHEL HUNT AND H. T. BRISCOE. *J. Phys. Chem.* **33**, 190-9 (1929).—The conductivities of various fatty acids (acetic, propionic, butyric, isobutyric, valeric, isovaleric, caproic and isocaproic) and various halogen,  $\text{NH}_2$  and CN substitution products were measured for the dilns. 2, 8, 32, 128, 512, 1024. The aim of the investigation was to correlate the relative ease of H removal from the remainder of the acid mol. in both the  $\text{H}_2\text{O}$  and  $\text{EtOH}$  solns. Such factors as differences in dielec. const., viscosity, and assocn. will not explain the fact that conductivities of aq. solns. were 40-1000 times as great as those of alc. solns. Decided shifts in the abilities of the acids to conduct in the 2 solvents were noted. In general, homologous fatty acids stand in a series with decreasing mol. cond. as the no. of C atoms increase. The Lewis conception of the binding forces in the  $\text{COOH}$  group may be correct in so far as cond. data are a measure of the stability of the electronic bond between H and O.

H. R. MOORE

**Electrochemistry of the system: benzamide-bromine-nitrobenzene.** V. S. FINKELSTEIN AND O. K. KUDRA. *J. Russ. Phys.-Chem. Soc.* **60**, No. 5, 783-92 (1928).—Having previously (*C. A.* **20**, 3377) come to the conclusion that the  $\text{C}_6\text{H}_5\text{CONH}_2\text{Br}_2$  mol. is heteropolar, F. and K. proceeded to study the properties of the solns. of this electrolyte in  $\text{C}_6\text{H}_5\text{NO}_2$ . The electrolyte was prepd. by adding equiv. quantities of benzamide to solns. of Br in  $\text{C}_6\text{H}_5\text{NO}_2$ . The elec. conductivities were detd. by the method of Kohlrausch-Ostwald. The sp. conductivities at 25° and 35° are graphically presented in form of parallel curves; they continue to increase with the increase of  $\text{C}_6\text{H}_5\text{CONH}_2\text{Br}_2$  concns. up to 52%. A detailed study of the influence of temp. on elec. cond. could not be made, because on cooling the soly. drops sharply, whereas on heating the vapor tension of Br over the soln. is increased. At 25-35° benzamide has an insignificant soly. in  $\text{C}_6\text{H}_5\text{NO}_2$  and practically does not change its elec. cond. The curves of mol. elec. cond. have a typically anomalous character. The influence of an excess of Br is to increase the cond.: this result is explained according to Plotnikov's electrochem. resonance hypothesis (*C. A.* **21**, 1051) by the considerable ionizing power of Br toward the  $\text{C}_6\text{H}_5\text{CONH}_2\text{Br}_2$  mol. The compn. of the electrolyte was detd. by a method analogous to that of Chugaev and Koblyanskii (*C. A.* **7**, 3935) and it was established that  $\text{C}_6\text{H}_5\text{CONH}_2\text{Br}_2$  is the electrolyte of the system studied. By electrolysis Br was collected on the anode in accordance with Faraday's law, whereas crystals of benzamide were deposited on the cathode. The dependence of the current on the tension is proportional, which is explained by the polarizing action of the products of thermal dissocn. of electrolyte mols. The decompn. potential is absent, but this circumstance is not incompatible with this scheme of electrolytic dissocn.:  $\text{C}_6\text{H}_5\text{CONH}_2\text{Br}_2 \rightleftharpoons \text{C}_6\text{H}_5\text{CONH}_2^{++} + 2\text{Br}^{--}$ .

BERNARD NELSON

**Theory of changes in unpolarized electrodes.** M. VOLMER. *Z. physik. Chem.*, Abt. A, 139, Haber Bd., 597-604(1928). H. R. MOORE

**Recent investigations of the passivity of metals.** WOLF J. MÜLLER. *Z. Elektrochem.* 34, 571-86(1928).—A general account of the previously published work of M. and his co-workers. A consequence of M.'s theory is that the "passivating" power of an electrolyte may be expressed numerically. It is proposed to call "coating passivity" that kind of passivity which is characterized by the metal passing into soln. at stronger polarization with the valency of the active metal. B. C. A.

**Periodic passivity of chromium and chromium alloys, and the influence of temperature on passivity potentials.** B. STRAUSS AND J. HINNÜBER. *Z. Elektrochem.* 34, 407-15(1928).—An app. is described for the continuous registration of the potential at an electrode, and by means of it the potentials in dil.  $H_2SO_4$ , dil.  $HCl$ , and mixts. of both, of Cr-Fe alloys and Cr-Ni-Fe alloys of varying compn. which could be rendered passive, have been measured over several days. It is found that periodic phenomena occur, not only with Cr, but also with the alloys (cf. Adler, C. A. 7, 14). A necessary condition for the active-passive change is the presence of two phases which act as local elements. In one case the second element is Fe carbide, sepd. out from the austenite present, and in the other case it is Fe oxide. Theories of passivity are discussed, and it is pointed out that the assumption of an O film as the cause of passivity explains the fact that the change from active to passive metal and *vice versa* takes place continuously and without transition potential; if, on the other hand, the oxide skin theory is accepted, a definite transition potential should occur. A mechanism is suggested for the periodic phenomenon, based on the action of local elements and on the occurrence of a concn. polarization. Investigation of the influence of change of temp. on passivity potentials shows that, under certain conditions, the normal effect of fall of potential with rising temp. may be masked, and the potential may even rise. This phenomenon is explained from the point of view of the O-film theory. B. C. A.

**Electrode potential of nickel. II. Effect of occluded hydrogen on the electrode potential of nickel.** KWANJI MURATA. *Bull. Chem. Soc. Japan* 3, 253-61(1928); *Tech. Repts. Tôhoku Imp. Univ.* 8, 197-208(1929); cf. C. A. 22, 2102.—Cathodic polarization of the Ni electrode in dil. acid caused a slight decrease in the initial value of the e. m. f. Occluded  $H_2$  has no effect on the true electrode potential except in the presence of  $O_2$ ; hence it is concluded that for the measurement of the potential of the Ni electrode, complete exclusion of  $O_2$  is essential. MALCOLM DOLE

**Single potential of the copper electrode.** EDGAR NEWBERY. *J. Am. Chem. Soc.* 51, 1315-22(1929).—The variations in existing data on the single potential of a Cu electrode are traced to the formation of insol. films of basic  $Cu^{++}$  or  $Cu^+$  salts on the surface of the electrode due to a reaction between the electrolyte and Cu. The reaction is more rapid when air is present. By working quickly so that no film was formed the e. m. f. of the cell  $Cu|0.5 M CuSO_4|Hg_2SO_4|Hg$  was found:  $0.3630 \pm 0.0005$  v. at  $20^\circ$ , which is identical with the single potential of the two-phase Cu amalgam of Nielsen and Brown (C. A. 21, 3808). The abs. potential of the normal Cu electrode is 0.635 v. if that of the normal H electrode is 0.285 v. H. S. v. KLOOSTER

**Preliminary notes on an antimony electrode. I. The fundamental qualities.** F. VILS AND E. VELLINGER. *Arch. phys. biol.* 6, 38-54(1927).—The Sb electrode in contact with soln. of different  $p_H$  has been studied. In a liquid of definite  $p_H$  with one  $HgCl$  electrode, the Sb with an absolutely metallic surface has in the first moment a potential different from its definitive e. m. f. The curves of the e. m. f. represent two different types. They are steeper with a higher  $p_H$ . The final e. m. f. depends on the  $p_H$  and between  $p_H=1$  and  $p_H=12$  it is governed by a linear law,  $p_H = 0.0175 E + a$ . Differences exist between the different samples of electrodes, depending on the individual conditions and the temp. II. A practical differential adjustment. F. VILS. *Ibid* 92-6.—An arrangement of two electrolytic cells for  $p_H$  detn. is described, in which the difference of the e. m. f. is measured and the const. of the Sb electrodes eliminated. This method permits the rapid prepn. of buffers with gradually increased  $p_H$ . A. E. MEYER

**The velocity of saponification of esters and lactones by sodium hydroxide in mixtures of two and three solvents.** J. F. M. CAUDRI. *Univ. Leiden. Rec. trav. chim.* 48, 422-60(1929).—The object of this research was to investigate the influence of org. solvents on the velocity of the ring-opening of phthalide, investigated already in  $H_2O$  by Tasman (C. A. 22, 240, 584). Since this reaction resembles closely the sapon. of esters by alkali, the latter reaction was also investigated under the same circumstances. In general, the connection between velocity of reaction and compn. of the solvent is very irregular and not readily connected with any other phys. const. Very small quantities

of 1 solvent, added to another solvent, sometimes produce an enormous change in the velocity of reaction without any other phys. const. changing materially. In mixts. of alc. and water it is possible that a part of the NaOH is converted into NaOEt. According to Lobry de Bruyn and Steger (*Rec. trav. chim.* 18, 41, 311(1899)), most of the Na is present as alcoholate, even with alcs. very considerably dild. with water. If so, on the basis of Wegscheider's theory (*C. A.* 13, 2474) a good const. for a bimol. reaction may be expected, but the magnitude of that const. may depend on the initial concn. of the base used. This deduction is in accordance with published exptl data. A good bimol. const. cannot be expected in those cases in which the concn. of the water can no longer be considered const. during the reaction. It is shown, however, that the hypothesis of Lobry de Bruyn and Steger is not correct. When phthalide is hydrolyzed by NaOH in a mixt. of 5% alc. and 95% ether by wt., the Na salt of *o*-HOCH<sub>2</sub>C<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>H is pptd.; only an insignificant amt. of the Na salt of *o*-EtOCH<sub>2</sub>C<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>H can be formed. The velocity of the sapon. of phthalide was measured by the method of Tasman except that, after it had been shown that the re-formation of phthalide from HOCH<sub>2</sub>C<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>H is a very slow reaction compared with the alkaline sapon., a measured quantity of the reaction liquid was brought into a small excess of dil. HCl. The const. for the sapon. of phthalide in H<sub>2</sub>O is  $K_{25}^{\circ} = 14.07$ ; for the reversed reaction it is 0.0156 in H<sub>2</sub>O, 0.0124 in 15% alc. and much less in 50% alc. For the sapon. of phthalide at 25° in mixts. contg. H<sub>2</sub>O and 10, 30, 50, 70, 90, 100 vol. % EtOH  $K$  is, resp., 12.53, 7.89, 4.27, 2.90, 1.55, 0; in mixts. contg. H<sub>2</sub>O and 15, 30, 50, 70, 90% MeOH,  $K$  is, resp., 8.97, 4.74, 1.78, 0.63, 0.095; in mixts. contg. H<sub>2</sub>O and 15, 30, 50, 70, 90% Me<sub>2</sub>CO  $K$  is, resp., 10.65, 7.96, 5.24, 4.83, 6.28. For the sapon. of EtOAc in mixts. of H<sub>2</sub>O and 0, 10, 30, 50, 70, 90, 100% EtOH  $K$  is, resp., 6.54, 6.23, 4.37, 2.17, 1.12, 0.34, 0; in mixts. contg. H<sub>2</sub>O and 15, 30, 50, 70, 90% Me<sub>2</sub>CO  $K$  is, resp., 5.83, 5.20, 3.86, 2.84, 3.29. For the sapon. of MeOAc in H<sub>2</sub>O and 0, 15, 30, 50, 70, 90% MeOH  $K$  is, resp., 10.56, 7.25, 4.28, 1.69, 0.51, 0.074. For the sapon. of phthalide and EtOAc in the system H<sub>2</sub>O-EtOH-Et<sub>2</sub>O:

Compn. of mixt. in Wt. %		Et <sub>2</sub> O	$K_{25}^{\circ}$	
H <sub>2</sub> O	EtOH		Phthalide	for EtOAc
62.2	24.8	13.0	4.30	2.48
40.2	29.8	30.0	3.43	1.70
32.4	54.6	13.0	3.07	1.14
26.1	43.9	30.0	3.29	1.13
20.5	34.5	45.0	4.13	1.28
9.8	60.2	30.0	2.12	0.43

The const. for the sapon. of EtOAc in H<sub>2</sub>O, when measured for the first time after prep. the soln., is 8.09 instead of 6.55 (*C. A.* 22, 240; cf. Cashmore, McCombie and Scarborough *C. A.* 16, 1527; Blakey, McCombie and Scarborough, *C. A.* 21, 1214). A 2nd proof that the Na salt rather than the ether of *o*-HOCH<sub>2</sub>C<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>H is formed during sapon. of phthalide in strong alc. soln. is afforded by the fact that the velocity of re-formation of phthalide from its sapon. products is the same in H<sub>2</sub>O as in 80% alc. soln. The following conclusions were drawn: (a) The velocity of sapon. of phthalide is reduced by the addn. to the aq. solns. of EtOH, MeOH, Me<sub>2</sub>CO or Et<sub>2</sub>O and finally becomes zero in the abs. alcs. (b) The retarding action of MeOH exceeds that of EtOH. (c) With increasing amts. of Me<sub>2</sub>CO or Et<sub>2</sub>O the reaction const. do not decrease continuously, but increase again at fairly high concns. (d) If a mixt. of alc. and water contains little alc., the addn. of ether reduces the reaction const., whereas it is increased by the addn. of ether to a mixt., contg. more than 70% of alc. by vol. (e) Similar phenomena occur in the alk. sapon. of MeOAc and EtOAc under the same circumstances. An explanation of these phenomena is given in accordance with the hypothesis of Lapworth (*C. A.* 3, 738) and Rice (*C. A.* 22, 1270) that the activity of the ions becomes greater the smaller the hydration.

C. F. VAN DUIN

Application of reduced equations in chemical kinetics. WOJCIECH ŚWIENTOS-LAWSKI AND JAN G. ZAWIDZKI. *Roczniki Chem.* 9, 246-65 (265 French)(1929).—Zawidzki's conception of "reduced times" in kinetic equations are further developed and the equation  $\tau = f(x')/f(1/n) = {}^1f(x)$ , derived by introducing partial concns. (1 -  $x'$  and  $x'$ ) instead of mol. concns. ( $a - x$  and  $x$ ) and by replacing the time by the reduced time:  $\tau = t/h/n$ ,  $t/n$  being the time of transformation of the  $n$ th part of the initial substance and  $c$  a const. equal to  $1/f(1/n)$ . The values  $a$  and  $k$  (velocity const. of the reaction) disappeared in these equations. Consequently all reactions to which the formula  $dx/dt = K(a - x)^{-n}$  is applied can be represented on reduced coordinates by one curve for each value of  $n$  and  $p$ . A no. of equations were solved by calc.



the values  $x'$  and  $\tau$  relative to three different transformations of time, especially for  $1/n = 1/4, 1/2$ , and  $3/4$ . The curves were drawn expressing the course of different reactions by reduced coordinates ( $x'$  and  $\tau$ ).

J. KUČERA

**Kinetics of oxidations of organic compounds with bromine. II. Action of bromine on formic acid.** EDWARD JÓZSEFOWICZ. *Roczniki Chem.* 9, 309-24 (325 English) (1929); cf. *C. A.* 22, 4319.—The reaction between  $\text{Br}_2$  and  $\text{HCOOH}$  in dil. aq. solns. follows approx. the equation:  $dx/dt = K_1(a-x)^2/2x$ ,  $K_1$  decreasing during the reaction. The addn. of  $\text{HBr}$  diminishes the reaction velocity, the equation, in the presence of an excess of  $\text{HBr}$ , being:  $dx/dt = K_1(a-x)^2/(c+2x)$ . The addn. of strong acids, such as  $\text{HCl}$  and  $\text{HNO}_3$ , has a similar effect; the equation in this case is:  $dx/dt = K_1(a-x)^2/(0.75c+2x)$ . Addn. of bromides decreases only a little the reaction velocity, addn. of chlorides and nitrates slightly, whereas the addn. of  $\text{Na}_2\text{SO}_4$  is followed by a considerable increase in the reaction velocity. No perceptible influence of light on the course of reaction was found. The temp. coeff. between  $20^\circ$  and  $30^\circ$  is 2.26. The mechanism of the reaction is explained by assuming a direct action between formic ions and bromine mols.  $\text{HBr}$  formed diminishes the reaction velocity: (a)  $\text{H}$  ions diminish the dissocn. of formic acid, and (b)  $\text{Br}$  ions form with  $\text{Br}$  mols. tribromide ions, which do not act on formic acid.

J. KUČERA

**The cryoscopic determination of the molecular equilibrium of resorcinol in aqueous solutions of potassium chloride.** F. BOURION AND CH. TUTTLE. *Compt. rend.* 188, 1110-1 (1929); cf. *C. A.* 22, 3337.—The mol. equil. of resorcinol in 0.5 and 1.225  $M$  solns. of  $\text{KCl}$  has been detd. cryoscopically. In the two series the equil. between simple and double mols. extends up to concns. 0.5  $M$  in resorcinol. Between simple and triple mols. it extends from 1.00 to 1.750 and 1.875  $M$ . The cryoscopic consts. were 18.4 for water, 22.3 for 0.5  $M$  and 25.0 for 1.225  $M$   $\text{KCl}$ . This difference in consts. is explained by an adsorption of the water by the ions and mols. of the salt. A. C. H.

**Equilibrium in the liquid state between potassium and sodium and their bromides.** E. RINCK. *Compt. rend.* 188, 1108-9 (1929).—R. has previously studied the equil. of the hydroxides and of the chlorides (Hackspill and R., *C. A.* 21, 3527). The equil. of the bromides in the molten state was studied by heating in iron tubes at  $800^\circ$ , cooling suddenly and analyzing the two phases present. The equil. const.  $C = [\text{Na}][\text{KBr}]/[\text{K}][\text{NaBr}] = 28.8$  with a max. deviation of 20%.

A. C. HIGGINS

**The displacement velocity of silver in silver telluride, antimonide and stannide.** G. V. HEVESY AND W. SEITH. *Z. anorg. allgem. Chem.* 180, 150-8 (1929).—The displacement velocity of silver in  $\text{Ag}_2\text{Te}$ ,  $\text{Ag}_3\text{Sb}$  and  $\text{Ag}_3\text{Sn}$  was studied by following the diffusion velocities of these substances in the corresponding  $\text{Cu}$  compds. The diffusion velocity of  $\text{Ag}_2\text{Te}$  in  $\text{Cu}_2\text{Te}$  may be expressed by the formula  $D = Ac - B/T$ , where  $A = 2.027 \times 10^4$  and  $B = 10,430$ . The displacement velocities of these three substances, calcd. for the same fraction of the abs. m. p. ( $0.76 T_m$ ), decreases by approx.  $10^{-2}$  in the following order:  $\text{Ag}_2\text{Te} > \text{Ag}_3\text{Sb} > \text{Ag}_3\text{Sn}$ . High displacement velocities are noted for those compds. intermediate between the salt-like type and the intermetallic ones. In the case of the strongly heteropolar salt-like compds. and the metal itself the displacement velocity in the lattice is extremely small.

L. F. AUDRIETH

**The topochemistry of contact catalysis.** G. M. SCHWAB AND E. PIETSCH. *Z. Elektrochem.* 35, 135-41 (1929).—See *C. A.* 23, 2093.

B. HAMILTON

**Topochemistry of contact catalysis. II. An experimental case of adlineation.** G. M. SCHWAB AND E. PIETSCH. *Z. physik. Chem., Abt. B*, 2, 262-3 (1929).—By the radioactive indicator method of Paneth, it is shown that the exchange adsorption of heavy metals on crystal gratings in many cases, particularly in many naturally grown crystals as crocoite, does not occur upon the whole crystal surface, but takes place principally along the edges of the crystal. Photographs obtained by imposition of crocoite crystal surfaces with adsorbed radioactive lead upon a photographic plate show the very strong adlineation of the adsorbate along the crystal edges. It must be imagined that the less rigid bond of the edge particles leads just as it does to exchange adlineation also to an adlineation of molecules foreign to the gratings.

B. HAMILTON

**Catalytic action of organic compounds containing iron.** HANS V. EULER, HARALD NILSSON AND DAGMAR RUNEHJELM. *Svensk Kem. Tid.* 41, 85-92 (1929). (In German).—The catalytic activities of hemin (I), mesohemin (II), deuterohemin (III) and pyratin (IV) are compared. An activity unit is defined as reaction const./millimol.  $\text{Fe}$ . The reaction mixt. contains 0.0082 mol.  $\text{H}_2\text{O}_2$  buffered with borate to  $p_H$  8.5. The temp. is  $0^\circ$  and aliquots are titrated with  $\text{KMnO}_4$  at 10-min. intervals. The following equiv. units were obtained: I 0.6, II 1.7, III 1.0 and IV 0.8. It was also run with phosphate buffer  $p_H$  6.7 giving 1.1. A series of expts. was carried out in which the oxidation of phenolphthalein reduced with  $\text{Zn}$  dust was used as catalase index, and the

end colors were compared in a colorimeter. If the value for I is 100, the others become: II 125, III 200 and IV 1000. A. R. ROSE

**Kinetics of the solution of aluminum and of cadmium in hydrochloric acid.** K. JABLŲCZYŃSKI, E. HERMANOWICZ AND W. WAJCHSŁEWSKI. *Z. anorg. allgem. Chem.* 180, 184-92(1929).—The process of soln. of Al and of Cd in HCl was studied by measuring the amt. of  $H_2$  evolved and calcg. the speed of reaction. The results indicate that the soln. of Al in HCl is a purely chemical reaction, unaffected by diffusion. The high temp. coeff. ( $K = 2.36$ ) indicates increase in activity of the metal with rise in temp. The speed of soln. was found directly proportional to the concn. of HCl (where the concn. varied from 0.2 N to 0.8 N). Passivated Al dissolved very slowly. The rate of soln. did not increase with time; this led to the conclusion that the passive oxide layer is deep-seated. Passive Al has a high temp. coeff. ( $K = 2.47$ ), indicating that the passive condition disappears with rise in temp. The data indicate that the soln. reaction is monomol. in nature. Activation of Al with  $HgCl_2$  caused the diffusion reaction to become paramount. The rate of soln. of Cd in HCl decreased rapidly with time. Activation caused more pronounced action, which increased with time. Stirring did not affect the rate of soln., which leads to the conclusion that the soln. of Cd in HCl is also purely chem. L. F. AUDRIETH

**The ternary system: water-sodium nitrate-potassium nitrate.** EUGÈNE CORNEC AND HENRI KROMBACH. *Caliche* 10, 5-15(1928); *Compt. rend.* 188, 788-90(1929).—Previous measurements of this ternary system have been confined to ordinary temp. The soly. of  $NaNO_3$  increases by addn. of  $KNO_3$  and that of  $KNO_3$  diminishes slightly and then increases greatly by addn. of  $NaNO_3$ ; at  $100^\circ$  these changes become more pronounced. The % compn is given as  $H_2O$  15.2,  $NaNO_3$  36.7,  $KNO_3$  4.81. The mutual increase in soly. of  $KNO_3$  and  $NaNO_3$  is due to the formation of a double salt in soln. The isotherm at  $111.7^\circ$  was detd.; it has 2 branches relating to 2 pure nitrates. H. R. MOORE

**The ternary system: water-sodium sulfate-sodium nitrate.** ANDRÉ CHRÉTIEN. *Compt. rend.* 188, 1047-50(1929).—The five solid phases present between  $0^\circ$  and  $100^\circ$  are ice,  $NaNO_3$ ,  $Na_2SO_4 \cdot 10H_2O$ ,  $Na_2SO_4$  and  $Na_2SO_4 \cdot NaNO_3 \cdot H_2O$ , darapskite. This last has a narrow incongruent field over the temp. range  $13^\circ$  to  $74^\circ$ . Isotherms were obtained, but are not given in the paper. F. R. BICHOWSKY

**The system: sodium iodate-sodium chloride-water.** H. W. FOOTE AND JOHN E. VANCE. *Am. J. Sci.* [5], 17, 425-30(1929).—The ternary system was studied from the lowest eutectic to  $35^\circ$ . Soly. isotherms were detd. at  $0^\circ$ ,  $15^\circ$ ,  $25^\circ$  and  $35^\circ$  by the method of wet residues and the relations plotted in a solid model. The results indicate that 6 different solid phases can exist in contact with various solns., one of them being a double salt never before described, of compn.  $2NaIO_3 \cdot 3NaCl \cdot 10H_2O$ , stable between  $-21.2^\circ$  and  $+24.6^\circ$ . Two ternary eutectics (1)  $0.36\% NaIO_3$ ,  $23.28\% NaCl$  at  $-21.18^\circ$ , (2)  $0.34\% NaIO_3$ ,  $19.93\% NaCl$  at  $-16.9^\circ$ , were established in addn. to 3 invariant transition points. At (1) ice, double salt,  $NaCl \cdot 2H_2O$ , soln. and vapor are in equil. while at (2) ice, double salt,  $NaIO_3 \cdot 5H_2O$ , soln. and vapor occur. The other solid phases in the system are  $NaCl$  above  $0.04^\circ$  and  $NaIO_3 \cdot H_2O$  above  $6.8^\circ$ . R. H. F.

**Contributions to the ceramics of highly refractory materials. II. The system: zirconia-lime.** OTTO RUFF, FRITZ EBERT AND EDWARD STEPHAN. *Tech. Hochschule, Breslau. Z. anorg. allgem. Chem.* 180, 215-24(1929).—Study of the m.-p. diagram of the system:  $ZrO_2$ -CaO reveals two eutectics, contg. resp., 30 and 60 mol. %  $ZrO_2$ , and the compd.  $CaZrO_3$ . X-ray Debye-Scherrer photographs verify the existence of this compd. and also show that CaO and  $ZrO_2$  form mixed crystals with a CaO content varying from 0 to 40 mol. %. Evaluation of the Debye diagrams gives to the compd. a monoclinic structure, closely bordering on the cubical,  $\beta \sim 89^\circ$ . The density calcd. from these data is  $d_c = 4.74 \pm 0.05$ , which agrees very well with the value obtained pycnometrically,  $d_p = 4.78 \pm 0.05$ . Chem. analyses not only verify the existence of  $CaZrO_3$ , but prove that no vaporization of CaO takes place on fusion. The differences between the systems:  $ZrO_2$ -CaO and  $ZrO_2$ -MgO are readily explained by consideration of the size relationships which obtain among the ionic radii of the three cations involved ( $Ca^{++} = 1.06$ ,  $Zr^{IV} = 0.93$ ,  $Mg^{++} = 0.78$  A. U.). L. F. AUDRIETH

**The thermal decomposition of ozone at low pressures.** LOUIS S. KASSEL. *Z. physik. Chem., Abt. B*, 2, 264-5(1929).—The decompn. of complicated mols. proceeds under high pressures according to the second order, under low pressures according to the first order, and under still lower pressures again according to the second order with increasingly large velocity consts. This second transition is known for several reactions (decompn. of azomethane, propionaldehyde, etc.), and it has been indicated that the decompn. of acetaldehyde probably is an example of the first transition. Ozone

shows this behavior. There is no other triatomic gas known which decomposes monomolecularly; and no other monomolecular reaction shows such a low velocity as is found for ozone. If the primary process in the monomolecular reaction is  $O_3 = O_2 + O$ , with a reaction heat of 20,000 calories, and if the heat of formation of ozone is 35,000 calories, then from this it follows that the heat of dissoen. of the oxygen is about 110,000 calories. The value according to the work detd. from the spectrum is about 150,000 calories.

B. HAMILTON

**van der Waals' equation and thermodynamics.** J. E. VERSCHAFFELT. *Compt. rend.* **188**, 312-3(1929); cf. *C. A.* **22**, 1716.—Exception is taken to the statement of Vasilescu-Karpen (*C. A.* **23**, 1792) that van der Waals' equation can be derived thermodynamically without recourse to Carnot's principle. The internal energy must be included; necessarily involves the second law, since change in entropy is considered as an exact differential.

RAYMOND H. LAMBERT

**The principle stated by Carnot; the theorem. Formulas of the second law of thermodynamics independent of any source.** C. RAVEAU. *Compt. rend.* **188**, 313-6 (1929).—The equation for the 2nd law of thermodynamics is incapable of interpretation from the principle stated by Carnot, since the cycle employed is actually the result of two simple cycles impossible to separate. This idea therefore needs profound revision. By use of the idea of fixed irreversibility consequences can be deduced in which no definition need be employed. The mathematics is given for completing such a cycle whereby a triangular area is utilized in place of the customary parallelogram. The method for obtaining the sign for the various terms in the 2nd law is discussed.

RAYMOND H. LAMBERT

An investigation into the piezoelectric effect of diamond (WOOSTER) 8. A new case of photochemical catalysis. The reaction between NO and cyanogen and its mechanism (NORRISH, SMITH) 3. Characteristics of the non-explosive oxidation of propane and the butanes (PEASE) 10. Determination of parachors of substances in solution (HAMMICK, ANDREW) 10.

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### 3—SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

S. C. LIND

**Determination of parameters in crystal structure by means of Fourier series.** W. LAWRENCE BRAGG. *Proc. Roy. Soc. (London)* A123, 537-59 (1929).—The representation of the scattering matter in a crystal by Fourier series first used by W. H. Bragg and later developed by Duane, Havighurst, and Compton is applied here to the detn. of the parameters in a complex crystal. A series is used which gives the projection of the scattering matter in the unit cell on each of its faces in turn. Conclusion: The method may be used in conjunction with an analysis of the usual type of crystal by assigning parameters to atoms and may considerably shorten the labor. The series is particularly of value in discovering the positions of the lighter atoms and in leading directly to precise values of the parameters. The use of the method is shown in connection with measurements recently published by West and B. and it is shown that it is in satisfactory agreement.

**Structure of the methane molecule.** G. W. BRINDLEY. *Nature* 123, 760-1 (1929).—If the C-H bond consists of a shared L electron from C and the H electron, there would be a difference in type for the 2<sub>1</sub> and the 2<sub>2</sub> electrons. This is confirmed by mass spectrograph evidence of Hogness and Kvalnes (cf. *C. A.* 23, 2650).

**The constitution of oxygen.** HAROLD D. BABCOCK. *Nature* 123, 761 (1929).—New spectrograms at low solar altitudes confirm the existence of the isotope O<sup>18</sup> and the relative band intensity indicates a ratio of 1/1300.

**Properties of the terms of the helium molecule.** G. H. DIEKE. *Nature* 123, 716-7 (1929).—From a study of band spectra it is found that the influence of the inter-nuclear axis on the valence electron predominates over that of the nuclear rotation in most moles.

**Reflection of hydrogen atoms from crystals.** Intensity measurements of the specularly reflected beam. THOS. H. JOHNSON. *J. Franklin Inst.* 207, 629-37 (1929); cf. *C. A.* 22, 4362.—Quant. measurements were made of the intensity of the specularly reflected beam of H atoms from a crystal of rock salt, as a function of the angle of incidence and of the temp. of the crystal. The ratio of the intensity at an angle near grazing

becomes greater as the temp. of the crystal is reduced, and the intensity of the specular beam at any particular angle is greater at low temps. than at high temps. I. J. P.

**Reflection of hydrogen atoms from crystals. Velocity selection in the specular beam.** THOS. H. JOHNSON. *J. Franklin Inst.* 207, 639-43(1929); cf. *C. A.* 22, 4362, and preceding abstr.—In order to discover whether velocity selection takes place in a specularly reflected beam of H atoms, the beam was reflected from a second rock salt crystal. If the first specularly reflected beam contains only atoms with certain selected velocities, it should be reflected from the second crystal with greater intensity than a beam contg. the same no. of atoms distributed according to the Maxwellian law. There is little, if any, velocity selection. I. J. PATTON

**Quantum mechanical theory of the anomalously large effective cross sections of atom systems during energy transfer.** H. KALLMANN AND F. LONDON. *Naturwissenschaften* 17, 226-7(1929).—The excitation energy is often transmitted from one atom to another at distances far exceeding those derived from the kinetic gas theory, *e. g.*, in resonance fluorescence. In particular this effect becomes noticeable when a min. amt. of translation energy is involved in the transfer. The theory of quantum mechanics gives a satisfactory explanation of this anomaly (cf. following abstr.). For the cross section of a special energy transfer 2 factors are important: (1) the sharpness of resonance  $\sigma$  measured as  $\sigma = h(\nu_M - \nu_M'')$  with  $\nu$  the values of the transition frequencies of the 2 atoms, (2) the energy of interaction  $W_{12}$ , *i. e.*, a Coulomb type of interaction of the charge distribution of the active parts of the atoms for the transitions in question. Factor  $W_{12}$  can be expressed for "permitted" transitions as a function of the dipole

moments of the virtual oscillators involved:  $W_{12} = \frac{\mu_1 \mu_2}{R^3}$ . From the theory follows an ap-

parent cross section of the atom for the energy transfer of  $q = \pi \int_0^\infty \frac{R dR}{1 + \left(\frac{\sigma}{2W_{12}}\right)^2}$  and in

the permitted transitions  $q = \left(\frac{2\mu_1 \mu_2}{\sigma}\right)^{2/3} \cdot \frac{\pi^2}{3\sqrt{3}}$ . In a graph is shown for  $\mu_1 = \mu_2 =$

$1.2 \times 10^{18}$  how  $q$  depends on  $\sigma$ . Corrections applied to the equation are that for  $\sigma > /a$  temp. effect enters based on the max. kinetic energy available at the temp., also that for sharp resonance ( $\sigma$  close to zero) the energy transfer at the very large distances of the 2 atoms becomes slow and so limits the practical sphere of action. Allowance

being made for the last effect, it is found that  $\lim_{\sigma \rightarrow 0} q = \pi^2 \frac{\mu_1 \mu_2}{h\nu}$  with  $\bar{\nu}$  the mean rela-

tive velocity of the 2 atom species; this correction is also dependent on temp.; for higher velocities the transfer becomes less efficient at sharp resonance. For the NaD line virtual oscillators with  $\mu = 1 \times 10^{-17} \bar{\nu} = 3 \times 10^4$ , the  $q$  value is about 100,000 times the normal one from kinetic theory. For non-permitted transitions  $q$  values of tenfold normal in second-order collisions may occur;  $W_{12}$  is then a function of the higher multipoles.

B. J. C. VAN DER HOEVEN

**Quantum mechanical energy transfers between atomic systems.** H. KALLMANN AND F. LONDON. *Z. physik. Chem., Abt. B*, 2, 207-43(1929); cf. preceding abstr.—A quantum mech. analysis of energy exchange between atoms in different quantum states. The probability is calcd. for the interchange of energy between an excited and an unexcited system in terms of the potential energy of interaction and the defect from resonance between the 2 systems. This probability, in the general case, is periodic in the time. Curves are drawn for the probability of exchange for various adiabatic and non-adiabatic approaches and sepn. of the systems. An adiabatic approach and sepn. lead to no interchange; but it is shown that gas kinetic motions at ordinary temp. cannot be regarded as adiabatic. In a statistical assembly, the equation for the no. of approaches leading to transfer is shown to be of the same form as that for the no. of gas kinetic collisions, in which the gas kinetic effective cross section is replaced by an apparent cross section  $\sigma$ , which is a function of the resonance defect and the energy of interaction. The apparent cross section grows very rapidly as  $\sigma$  diminishes, being, for instance, for a resonance defect of 20 millivolts about 50 times the gas kinetic value and increasing to larger values for closer resonance. The probability of transfer is influenced by the temp. in 2 ways: the mol. motions must not be too slow, or approaches and sepn. will be adiabatic and hence there will be no excitation; they must not be too vigorous, since the transfer itself requires a finite time. The abnormally large values of effective cross section will therefore hold only for a limited temp. range. These general conclusions are applied in detail to the special cases of collisions of the

2nd kind between A and H<sub>2</sub>, Hg and Na, to the  $2^1P_1 \rightarrow 2^1P_0$  transition in Hg, to the depolarization of fluorescent light, to energy exchanges in chem. reactions, and to the broadening of spectral lines by the addn. of foreign gases. W. WEST

**Quantum mechanics of many-electron systems.** P. A. M. DIRAC. *Proc. Roy. Soc. (London)* A123, 714-83(1929).—The Bohr atom model, according to which the stationary states correspond to electron orbits, is now replaced by a structure in accordance with quantum mechanics in which the orbits are replaced by quantum-mech. states represented by a wave function in 3 dimensions. According to the old theory the spins were either parallel or anti-parallel, necessitating large forces coupling the spin vectors, an assumption not justified by theory. The new theory shows that there is a definite magnitude of the spin vector connected with each stationary state, but in general it is not possible to give a meaning to the direction of spin. An explanation of multiplet structure requires some means of accounting for the large coupling energy between spin vectors. The soln. is provided by the exchange interaction of the electrons, which arises because of the electrons being indistinguishable from one another. A proof is given for the existence of exclusive sets of states and a formula is derived for the energy levels of these states. C. J. HUMPHREYS

**Study of phenomena of groupings of the atoms of radioelements.** C. CHAMIE. *J. phys. radium* [6], 10, 44-8(1929); cf. C. A. 22, 910.—Examn. of solns. of radioactive elements indicates that the atoms of these elements are distributed through the mixt. as clusters or groups forming a sort of colloidal soln. The method of study is to bring the radioactive mixt. into intimate contact with a photographic plate. After development the presence of the groups is indicated by spots on the plate having the appearance of stars. The plate is subsequently examd. by aid of a microscope. The usual procedure is to mix the active substance with Hg, but other liquids yield similar results. For the examn. of Rn the gas is blown against the plate. While each radioactive substance yields a characteristic pattern, this phenomenon of grouping seems to be common to all families of radioactive elements. C. J. HUMPHREYS

**The cosmic radiations and their relation to physical and cosmic processes.** LISE MEITNER. *Z. angew. Chem.* 42, 345-51(1929).—M. presents a summary of the investigations on the so-called cosmic radiation, giving the results and theories of Hess, Hoffmann, Kohlhorster, Millikan, Steinke and others. She discusses their penetration, intensity, measurement (describing in detail Hoffmann's app. with a diagram), relation to radioactive radiations, wave length, daily variations in intensity, and theories of their origin, such as Nernst's idea of radioactive decompn. of trans-uranium elements, or atomic synthesis in interstellar space. WILLIAM E. VAUGHAN

**Cosmic radiation and radioactivity.** LOUIS R. MAXWELL. *J. Franklin Inst.* 207, 619-28(1929).—M. investigated the effect of cosmic rays on the disintegration of Po, by measuring the activity at the bottom of an 1150-ft. mine. He found no observable change. From theoretical considerations he concludes that there should be no appreciable effect even at the earth's surface. I. J. PATTON

**Cosmic radiation and radioactive disintegration.** N. DOBRONRAVOV, P. LUKIRSKII AND V. PAVLOV. *Nature* 123, 760(1929).—Filtering out of cosmic rays by 20 ft. of sea water caused no change in the radioactivity of Rn above the exptl. error, 1%. This radiation might, however, be sufficient to start disintegration of U, since the disintegration const. is small. GREGG M. EVANS

**Microcalorimetric determination of the absorption of  $\gamma$ -radiation from radium C.** FELICITAS WEISS-TESSBACH. *Sitzb. Akad. Wiss. Wien., Abt. IIa*, 137, 551-62(1928).—W.-T. gives a brief summary of the dissertation of J. Tischler (unpublished) on the heat of absorption by Pb of various thicknesses (0.28-1.7 mm.) of the  $\alpha$ , and some of the  $\beta$  and  $\delta$  radiations from Ra and Po preps. W.-T. used screens of Pb, Cu and Al 5-13 mm. thick. The results are considerably lower than those obtained by Yovanovitch (C. A. 18, 3001; 20, 2784). The ratio of the heating effects of the 3  $\delta$  components is 1:6.8:10.8. I. J. PATTON

**Structure of atomic nuclei.** ERNEST RUTHERFORD. *Proc. Roy. Soc. (London)* A123, 373-90(1929).—The accomplishments since the introduction of the nuclear atom model are briefly reviewed, including the work of Aston establishing the isotopic constitution of ordinary elements, the proof of the artificial disintegration of certain elements by  $\alpha$ -particles accompanied by the liberation of protons, and the detn. of the frequencies of  $\gamma$ -rays by Ellis. Conclusions from  $\alpha$ -ray scattering expts. are presented. It is pointed out that for nuclei of at. nos. 29 to 92  $\alpha$ -particles are scattered according to the inverse-square law, but that scattering is abnormal for lighter elements, indicating attraction for close approach. The general conclusion is that the nucleus must have a certain vol. or structure. It is evident that the nucleus is surrounded by a very high

potential barrier. The escape of  $\alpha$ -particles through this barrier is explained by new mechanics. The effect of packing in the nucleus as related to the atom as a store of energy is discussed by aid of Aston's curves. The formation of atoms up to at. wt. 120 is accompanied by emission of energy. For heavier atoms the  $\alpha$ -particles or protons which make up the external nuclear structure are less closely bound, resulting in a larger energy content as we proceed to higher at. nos.

C. J. HUMPHREYS

**Question of yield in atomic disintegration experiments.** GERHARD KIRSCH AND HANS PETTERSSON. *Sitzb. Akad. Wiss. Wien., Abt. IIa*, 137, 563-82(1928); cf. *C. A.* 23, 561.—The results of K. and P. and of Bothe and Fränz (*C. A.* 21, 2601, 3152; 22, 1902) are discussed, with the conclusion that Bothe and Fränz's method is untrustworthy.

I. J. PATTON

**Design and use of a double camera for photographing artificial disintegrations.** P. M. S. BLACKETT. *Proc. Roy Soc. (London)* A123, 613-29(1929).—The necessity of photographing a very large no. of  $\alpha$ -ray tracks in order to observe artificial disintegrations, because of the exceedingly small probability of collision between an  $\alpha$ -particle and a nucleus, demands that the photographic app. be constructed so as to provide for the photographing of as large a no. of tracks as possible at one time. In the arrangement described, the camera plates are set at right angles but the lenses are tilted so that the plane of the chamber is conjugate with the planes of both lenses. The necessary trigonometric calcns. for the detn. of the angles in space between colliding particles are given. The interrelation of the depth of focus, the intensity of images, and the magnification is discussed. It is desirable to reduce the last as far as the resolving power of the emulsion will permit. A reduction of pressure or the dila. of the gas with  $H_2$  or He increases the yield of resolved collisions as well as the range of the disintegration product, so that the details of the collision process may be observed more easily.

C. J. HUMPHREYS

**The wave theory of electrons.** G. P. THOMSON. *Chemistry & Industry* 48, 311-5 (1929); cf. *C. A.* 22, 4353.—A qual. discussion of the expts. of T. showing diffraction with 20,000-60,000-v. electrons and of Davisson and Germer with electrons of a few hundred v. velocity. It is shown that the application of the wave theory to chem. facts is more successful than the orbit theory.

H. R. MOORE

**Elastic collisions of electrons with helium.** N. F. MORR. *Nature* 123, 717(1929).—The scattering of 210-v. electrons by He has been calcd. by wave mechanics. It is plotted and compared with the curve from the classical theory. They differ widely for small angles, and only the quantum curve agrees to any extent with the exptl. results of Dymond and Watson (cf. *C. A.* 22, 1273).

GREGG M. EVANS

**Electronic analysis. Diffraction of electrons by the oxides of magnesium, zinc and cadmium—the law of Louis de Broglie.** M. PONTE. *Compt. rend.* 188, 909-10 (1929).—Diffraction methods, hitherto developed, are applied to ZnO, MgO and CdO, with electrons of 16,670 or 10,870 v. velocity. Lattice dimensions are estd. to a 1% accuracy.

H. R. MOORE

**A study of the mobility of ions in gas mixtures whose components are electro-negative.** HERBERT MAYER. *Bul. stiinte fizice soc. romând stiinte* 29, 35-94(1926-7).—The mobilities of positive and negative ions were detd. for an atm. of pure, dry  $O_2$  and for a mixt. of  $O_2$  and  $Cl_2$ , the concn. of  $Cl_2$  being varied from 50 to 4.5%. An approx. calcn. was made of the relation of mobilities found for positive and negative ions in pure  $Cl_2$  at 80 mm. pressure. The method used was that of the Rutherford alternating field as modified by Franck and Pohl. Instead of a sinusoidal, a static alternating field was used, produced by a high-tension battery and revolving commutator. For  $O_2$  the mobilities found were  $k_{pos-760} = 1.38$  cm./sec. per volt/cm.,  $k_{neg-600} = 2.05$  cm./sec. per volt/cm. Introduction of  $Cl_2$  in such small amts. as 0.5% reduces considerably the mobility of negative ions, but does not affect that of positive ions appreciably. After reaching the concn. at which mobility of positive ions equals that of the negative ions, the mobility of the positive ions is also affected perceptibly, but remains constantly greater than that of the negative ions. The relation of the 2 mobilities in pure  $Cl_2$  at 80 mm. pressure (Hg) is  $k_{pos.}/k_{neg.} = 1.222$ . Comparison of results obtained with previous theories of mobility of ions shows that these results cannot be explained by the theory of complex ions. It also shows that there are elec. forces which play an important part in formation of mol. groupings which do not permit characterization by the dielec. const. To explain the difference in mobilities of positive and negative ions it is necessary to make use of forces depending upon electronegative or electro-positive nature of the gas, which Franck has called electronic affinity. E. M. S.

**The influence of chlorine on mobility of ions in hydrogen.** HERBERT MAYER. *Bul. stiinte fizice soc. romând stiinte* 29, 108-15(1926-7); cf. *C. A.* 22, 19.—The mobility

of positive and negative ions in pure, dry  $H_2$  was detd. by the alternating field of the Rutherford-Franck-Pohl method, finding  $k_{pos.760} = 6.00$  cm./sec. per volt/cm. and  $k_{neg.760} = 10.07$  cm./sec. per volt/cm. Then increasing amts. of  $Cl_2$  were introduced, beginning with 0.3%, and the mobilities of the 2 kinds of ions detd. for each concn. The mobility of the positive ion is altered considerably by the presence of  $Cl_2$ , while that of the negative ion diminishes, even for traces of  $Cl_2$ , below that of the positive ion. These results confirm the Cluster theory of ionic complexes and indicate also the existence of elec. forces between ions and neutral mols. These forces are not due only to dielec. polarization of the latter because of the ions, but more to the elec. structure of atoms of different gases.

E. M. SYMMES

The theory of electron scattering in gases. ALLAN C. G. MITCHELL. *J. Franklin Inst.* 207, 753-64; *Proc. Nat. Acad. Sci.* 15, 520-5(1929).—Mathematical. E. H.

The recombination of gaseous ions. LEONARD B. LOEB. *Trans. Am. Electrochem. Soc.* 55 (preprint) 15 pp.(1929).—Because of insufficient modern exptl. data available, it has been impossible to formulate the theory of the recombination of gaseous ions accurately. The recent results of Marshall, who used a direct method of study of great flexibility, has made it possible to answer the questions outstanding. It is shown experimentally by Marshall, as well as theoretically by Sommerfeld and L., that the recombination process for gaseous ions is primarily a process of random drifting together of ions, the attractive forces playing a role only in the last free path or two between the ions. On account of the non-random distribution of the ions in ionization (ions generated in pairs close together) the value of  $a$  undergoes an apparently rapid decrease in the first 0.1 sec., and the value of  $\alpha$  in short time intervals depends on the duration of the flash, the period of recombination and the initial concn. of ions. The true value of the coeff. for air probably lies in the neighborhood of  $0.9 \times 10^{-8}$ , instead of  $1.6 \times 10^{-8}$ , as usually assumed. Free electrons play no direct role in the recombination of ions, as studied in gases near atm. pressure. The electrons can recombine with positive ions only by first attaching to mols. to form negative ions. The independence of  $a$  of the mobilities of ions is a direct consequence of the Thomson theory of a recombination due to thermal agitation, and depending largely on temp. and the unknown masses of the ions in most gases.

C. G. F.

A comparative study of certain properties of electrons and the ions of the alkali metals. C. H. KUNSMAN. *J. Chem. Education* 6, 623-33(1929).—A non-technical article. K. describes an app. contg. a new source of  $K^+$  ions as compared to the equiv. electron source and presents a summary of phys. and chem. expts. in which similar results are sought with electrons and positive ions under the same conditions, such as (1) the activation of  $N_2$  and  $H_2$  in the synthesis of  $NH_3$ , (2) detn. of the work function  $\phi$  for positive ions, (3) bombardment of metal surfaces and (4) excitation and ionization.

WILLIAM E. VAUGHAN

Diffraction of electrons by metal films. E. RUPP. *Ann. Physik* [5], 1, 773-800 (1929); cf. *C. A.* 22, 3094; 23, 563.—When electrons pass through thin films of metals of cubic lattice structure, diffractions are observed. These were electrically measured by (a) a ring collector in which the beam velocity is so adjusted that the known diffraction ring just fits the opening of the collector ring, and (b) by a movable Faraday cylinder by which the angle between the cylinder and the incident beam can be varied. The position of the diffraction ring is found to coincide with that previously calcd.. From the index of refraction,  $\mu$ , the lattice potential  $E$ , for  $Ag \sim 12$  v. and that for  $Ni \sim 17$  v. Diffraction electrons are defined (from expts.) as those which are diffracted on passage through a metal film within a small angle without appreciable loss in velocity; others are merely scattered electrons. G. P. Thomson's theory (*C. A.* 23, 1049) of the refraction does not hold for the films, as these are random conglomerates of small crystals.

LOUIS WALDBAUER

The mechanism of spark discharge in air at atmospheric pressure. LEONARD B. LOEB. *Science* 69, 509-12(1929).—If, in consequence of fortuitous arrangement of electrons, the negative cloud of one should approach the positive cloud of the one ahead of it, a large local increase of potential gradient might be produced. The distances of less than one mm. necessary to accomplish this would account for the unexpectedly small time lag found in recent expts. by others.

GREGG M. EVANS

Electron reflection and diffraction at single crystal surfaces. E. RUPP. *Ann. Physik* [5], 1, 801-13(1929); cf. *C. A.* 23, 2649.—By a modified Davission and Germer (*C. A.* 22, 4354; 23, 29) exptl. arrangement, the reflections of electrons from metallic single crystal surfaces were detd. for  $Ni$ ,  $Cu$ ,  $Ag$ ,  $Au$ ,  $Al$  and  $Pb$ . The diffraction maxima were found to correspond with those calcd. by the de Broglie equation (*C. A.* 22, 3094) if the index of refraction,  $\mu$ , is introduced to explain the systematic deviations.



These indices are due to the inner lattice potentials,  $E_0$ , of the metals.  $E_0$  is related to the work function  $A$ , by means of the Sommerfeld theory of metallic conduction.

LOUIS WALDBAUM

**Diffraction of cathode rays by powdered crystals.** TOSHINOSUKE MUTO AND TASABURO YAMAGUTI. *Proc. Imp. Acad. (Tokyo)* 5, 122-4 (1929).—The values of spacings obtained by means of cathode rays with powder. MgO and graphite are in good accord with those from x-rays. A fair agreement is also found in the relative intensities of the rings.

C. J. WEST

**Measurement of excitation and ionization potentials by the diffusion method.** W. GLIWITZKY. *Ann. Physik* [5], 1, 701-20(1929); cf. Bartels, *C. A.* 22, 1538.—The crit. potentials of A were measured by the Hertz differential method and by the diffusion method proposed by Bartels. The latter method was also employed with mixts. of He and Ne. Excitation potentials of A were found at 11.51, 12.89, 14.02 and 14.79 v., with a well-defined ionization potential at 15.81 v. All the crit. potentials are complex, and correspond to the excitation of a term group; e. g., the first one corresponds to a 4-term excitation at 11.49, 11.57, 11.67 and 11.78 v. The detd. max. depends on the probabilities within the term group, and possibly on the relationships within the app. (electron velocity distribution, etc.). The He-Ne measurements were only carried out at 0.3 mm., and Ne gave excitation potentials at 16.6 and 18.5 v., agreeing with Hertz's and spectroscopic data. Helium gave a measured ionization potential at 24.5 v. The new method does away with the need for a calibrating gas, and, as opposed to Hertz's method, gives a well-defined max. for the ionization potential.

L. W.

**The ionization of potassium vapor.** R. W. DITCHBURN AND F. L. ARNOT. *Proc. Roy. Soc. (London)* A123, 516-36(1929).—App. is described similar to that used by Smyth. Ions are produced by: (1) photo-ionization, (2) electron impact, (3) emission of  $K^+$  ions by a Kunsman filament with subsequent attachment to neutral atoms to form  $K_2^+$ . By the first method the only ions formed are  $K^+$ . The evidence indicates that the  $K^+$  ions are formed by the ionization and dissocn. of  $K_2$  mols. The electron impact method yields  $K^+$  and  $K^-$  ions and evidence of the existence of unstable  $K_2^+$ ,  $K_1^+$  and  $K_3^{++}$ . It is shown that the lives of the unstable compds. are of the order of  $10^{-6}$  secs. The number of  $K_2^+$  ions formed according to the third method, including those which dissoc., is about 10% of the no. of incident  $K^+$  ions. Because of the conservation of linear momentum, half the energy of the impacting particle, in the formation of the  $K_2^+$  ion, must be radiated or transformed. It probably appears as continuous radiation. In general, high temp. and low voltage are favorable to the dissocn. of  $K_2^+$  ions. It is believed that  $K_2^+$  ions exist in two states, one of which can be dissocd. and the other, which is an excited state, cannot until after a return to the first; this presumably is caused by an increase in temp., giving rise to collisions of the second kind. It is assumed that all the transitions of the  $K_2$  mols. and  $K_2^+$  mol. ions are such that the moment of inertia increases and the heat of dissocn. decreases on excitation.

C. J. HUMPHREYS

**The passage of electric current through a Cooper-Hewitt mercury lamp.** SARVENDRA RAY. *Z. Elektrochem.* 35, 89-93(1929).—The author offers an explanation for the rectifying action of Cooper-Hewitt Hg lamp, which only lights up when Hg is cathode and anode is vapor. The light is a result of a process set up when the arc starts. The theory of "inner elec. discharge of atom" is expanded to cover the Hg lamp. The substance called "Z" is loosened by inner discharge of Hg atoms and is absorbed either on each mol. or on groups, of Hg mols. Passage of d. c. through gas in the Cooper-Hewitt lamp is a case of electrolysis of the hypothetical substance "HgZ." The cycle of reactions of Hg and "Z" is outlined on the basis of this theory.

M. McMAHON

**The adsorption of hydrogen on the surface of an electrodeless discharge tube.** M. C. JOHNSON. *Proc. Roy. Soc. (London)* A123, 603-13(1929).— $H_2$  was dissocd. by introducing from outside a ring discharge (cf. *C. A.* 22, 725, 2709). Micromanometer readings were taken every 15 secs. Curves of adsorption fatigue are given for two bulbs. The adsorbed layer of at. H is never more than one mol. thick. The heat of adsorption of at. H was found to be 11,000 cal. A micromanometer is described, sensitive to  $10^{-6}$  cm., with a range of 0.05 cm.

GERALD M. PETTY

**The photoelectric effect of ultra-violet rays on gases.** R. DANTINNE AND P. LENAERTS. *Arch. sci. phys. nat.* [5], 11, 5-14(1929).—A special app. is described, consisting essentially of a condenser type of ionization chamber. A p. d. of 1000 v. is put on one of the plates and a quadrant electrometer is connected to the other. The photo-ionization of  $O_2$ ,  $CO_2$  and  $SO_2$  is studied at atm. pressure. It is shown that a relation exists between the relative intensities of the effect on different gases and the

relative intensities of the effect of the same radiation on a metallic surface held in the same gas. The Hertz effect, or photoelec. effect on metals, is considered from this work to have its origin in the ionization of adsorbed gas. H. R. MOORE

**Photo-ionization of cesium vapor.** F. L. MOHLER, C. BOECKNER, R. STAIR AND W. W. COBLENTZ. *Science* 69, 479(1929).—The photo-ionization of Cs vapor was redetd. by means of an ionization chamber designed to reduce the surface photo-elec. effect to a min. The Hg 3130 line gives 78% of the photo-ionization, and there is no effect on the red side of this line, showing the absence of surface effect. The mean atomic absorption coeff.,  $k_{3130} = 1.85 \times 10^{-19}$  for the Cs pressure range of 0.005—0.06 mm. (corresponding to a temp. range 146–201°).  $k_{3134} = (2.3 \pm 0.2) \times 10^{-19}$ . The error lies in the uncertainty in the temp. measurement of the Cs, and does not take into account the uncertainties in the v.-p. data of Cs. Little's value of  $k_{3130} = 2.2 \times 10^{-21}$  is unexplained, as his exptl. values were of the same order of magnitude (C. A. 21, 3155). LOUIS WALDBAUER

**A new integrating photometer for x-ray crystal reflections, etc.** W. T. ASTBURY. *Proc. Roy. Soc. (London)* A123, 575–602(1929).—The theory and construction details are given of an integrating microphotometer in which the photographic negative is replaced by a carbon print and light by  $\alpha$ -rays. The integrating action is obtained because the total ionization is made a measure of the total x-ray intensity, whatever the distribution over the photographic image. It is possible to attain direct proportionality between the x-ray intensities and the  $\alpha$ -ray ionizations observed in the electroscop. The essential features of the app. are an effectively uniform deposit of Po placed near a thin strip of mica, in which a slit is cut to allow the  $\alpha$ -rays to pass through to the carbon tissue and thence to the electroscop. The extension of the use of the photometer to  $\alpha$ -,  $\beta$ - and  $\gamma$ -rays, and also to visible light is discussed. It can be applied to the measurement of the integrated intensity of any radiation, the photographic density of which is exponential or approx. so. C. J. HUMPHREYS

**Study, by x-rays, of the superficial or interfacial orientations by the tangent-drop method.** JEAN J. TRILLAT. *J. phys. radium* [6], 10, 32–43(1929).—A new method is described for the study of mol. orientations at a surface of sepn. liquid-liquid, liquid-solid, solid-gas, or liquid-gas, by aid of diffraction patterns produced by x-rays. Essentially the method is to direct a beam of x-rays by aid of a collimating tube so that it just grazes a drop of the substance to be examd. This drop is either liquid or solidified from the molten state. The diffracted rays impinge on a photographic plate. The method is applied to a study of the action of the fatty acids on Hg and yields the result that the lattice spacing of the Hg salt is proportional to the no. of C atoms on the compd. It is also applied to a study of the superficial structure of long-chain C compds. in the form of solid drops, and to the mol. structure of oleate of Pb at various temps. C. J. HUMPHREYS

**The emission of soft x-rays by different elements at higher voltages.** O. W. RICHARDSON AND F. S. ROBERTSON. *Proc. Roy. Soc. (London)* A124, 188–96(1929); cf. C. A. 21, 3551.—Since previous work using voltages up to 500 has shown that efficiency of emission of soft x-rays increases to a max. at the middle of the periodic system and then falls off, the authors have applied voltages up to 6000 in order to see if the emission becomes more like that of ordinary x-rays, whose efficiency is proportional to the at. no. over the whole range of the periodic table. Their preliminary results indicate no striking change between voltages of 500 and 6000. MALCOLM DOLE

**Intensity of total scattering of x-rays.** I. WALLER AND D. R. HARTREE. *Proc. Roy. Soc. (London)* A124, 119–42(1929).—An approx. formula is deduced for the total scattering of x-rays by atoms of a monatomic gas. This formula is applied to the special case of scattering by He atoms, taking the wave functions which correspond to the case of vanishing interaction. The formation of approx. wave functions of required symmetry properties for an atom contg. several electrons is discussed, and these wave functions are applied to obtain the scattering formula in a more explicit form. The relation between scattering by a many-electron atom and by a one-electron atom is considered. W. and H.'s formula for total scattering is evaluated for A and compared with the exptl. data. The theoretical values agree with the expt. if the exptl. values are multiplied by the factor 1.25 to convert them to abs. values. MALCOLM DOLE

**The ultra-violet optical properties of  $\alpha$ - and  $\beta$ -naphthalenesulfonic acids.** DENISE LITTOLEFF. *Arch. phys. bol.* 6, 97–128(1927).—The Ca salts of both acids show 5 bands at  $\lambda$ 321, 307, 275, 252 and 230. The two spectra are very similar to each other and to that of naphthalene. The absorption is slightly higher in the  $\alpha$  deriv. than in the  $\beta$ . In both it is higher at  $p_H$  2.75 than at  $p_H$  9.1. The fluorescence is stronger in the  $\beta$  than in the  $\alpha$  salt. The mol refraction of the Ca and Na salts in the

visible and ultra-violet light shows a very slight inflection (negative) for the  $\alpha$  and very slightly more for the  $\beta$  compd.

A. E. MEYER

**The spectra of As III and Sb III.** P. PATTABHIRAMIAH AND A. S. RAO. *Indian J. Physics* 3, 437-44(1929).—Classifications of the lines emitted by doubly ionized As and Sb are presented. The terms which have been found to account for the lines belong to the doublet system and arise when the outer  $p$  electron is shifted to the various outer orbits. If an  $s$  electron is shifted both doublet and quartet terms arise, but in the present analysis no quartet terms have been established.

C. C. KRESS

**The spectrum of doubly ionized chlorine.** K. MAJUMDAR AND S. C. DEB. *Indian J. Physics* 3, 445-50(1929).—This paper presents an extension of the analysis of Cl III made by Bowen (*C. A.* 22, 1100). The new terms, which have been found are  $^4P$ ,  $^4D$ , and  $^4F$ , and their combinations with known terms account for the identification of 30 addnl. lines. The details of the investigation are given in the tables.

C. C. KRESS

**The spectrum of hydrogen.** The bands analogous to the parhelium line spectrum. III. IV. O. W. RICHARDSON AND P. M. DAVIDSON. *Proc. Roy. Soc. (London)* A124, 50-68, 69-88(1929); cf. *C. A.* 23, 3163.—The details of the analysis of the  $H_2$  band systems are presented which represent transitions from the initial electronic levels  $^1K$ ,  $^1L$ ,  $^1M$ ,  $^1N$ ,  $^1O$ , and  $^1Q$  to the final electronic level  $2^1S$ . These bands are all built up of  $P$  and  $R$  branches of approx. equal strength, in marked contrast with those described previously. In each progression the lines alternate in intensity. In addn., a description is given of 2 progressions, starting at 4142.8 A. U. and 4097.4 A. U., which consist apparently of only  $Q$  branches; and of 4 progressions lying in the deep red and near infra-red consisting of  $P$  and  $R$  branches.

C. C. KRESS

**Intensity relations in the spectra of titanium.** II. Relative intensities of the stronger multiplets of Ti I. GEO. R. HARRISON AND HARRY ENGWICHT. *J. Optical Soc. Am.* 18, 287-301(1929).—The method of photographic photometry described in an earlier paper (*C. A.* 23, 1570) was applied to the measurement of the intensities of lines in 16 multiplets of Ti I emitted in the vacuum arc. The multiplets selected for measurement form triads and result from transitions between the middle energy states and the low metastable and ground states of the atom. The results confirm Kronig's formulas for multiplet intensities in triads especially if the temp. of excitation of the arc is taken at 10,000° abs. In a triad resulting from a 2-electron jump the intensities agree qualitatively with Kronig's formulas for the nearest equiv. 1-electron jump. The strongest line in the spectrum under normal excitation conditions is 3653.49 A. U., which confirms its character as *raie ultime*, established by spectrochem. methods.

C. C. KRESS

**Zeeman effect in the spectrum of ionized neon (Ne II).** C. J. BAKKER. *Proc. Acad. Sci. Amsterdam* 32, 515-22(1929).—See *C. A.* 23, 1567.

E. C. M.

**Study of the absorption of a screen of blue rock salt.** PIERRE LEROUX. *Compt. rend.* 188, 904-7(1929).—Light-absorption measurements have been made of the blue Stassfurt salt as a function of wave length and temp. Absorption coeffs. are recorded for the Hg lines  $\lambda 3655-5460$  at 18° and 220°. At the higher temps. a rapid decrease in absorption is noted; i. e., the min. of absorption is displaced to longer wave lengths. A slab 0.107 cm. in thickness loses coloration on heating to 250°.

H. R. MOORE

**Broadening and displacement of spectral rays by molecular diffusion.** JEAN CABANNES AND PIERRE SALVAIRE. *Compt. rend.* 188, 907-8(1929).—With the aid of a Perot and Fabry echelon, it was found that the 4358 A. U. radiation of Hg is broadened asymmetrically by mol. diffusion in butane at atm. pressure. A total increase of 0.04 A. U. was noted, of which 0.01 A. U. was toward the red. The effect is due to fluctuations in the orientation of anisotropic mols., but radiation giving fluctuations in d. (resulting in the displacement toward the red) is also noted. The displacements are found to be 0.065 A. U. for MeOH, 0.05 for EtOH, 0.070 for PrOH, 0.055 for  $CH_3COOH$ , and 0.035 A. U. for benzene.

H. R. MOORE

**Hartmann equation for the calibration of spectral apparatus.** FR. HOFFMANN. *Physik. Z.* 30, 238-9(1929).—H. shows by calcn. that the formula given by Russell and Shenstone (*J. Optical Soc. Am.* 16, 298(1928)) for the calibration of prism spectroscopes in terms of the frequency instead of the wave length is in greater error than Hartmann's original formula.

LOUIS WALDBAUER

**An amplifier for comparison spectra.** PIÑA DE RUBIES. *Anales soc. españ. fis. quim. (tecnica)* 28, 48-56(1929).—A device allowing direct comparison of different spectrograms obtained on different plates, is described. Simultaneously with direct observation this device allows detg. the spectrogram of a mineral and of the main elements contained in it. In addn. to the speed with which any spectrogram can be

interpreted there is also a proof on which the degree of accuracy of analysis can be carried to the desired degree.

**Spectra of boron.** W. D. LANSING AND W. F. TYLER. *Trans. Illinois Acad. Sci.* 21, 210-11(1928).—Crude B prep'd. by Moissan's method is placed in a combustion tube, dried at red heat in a current of  $H_2$ , and then treated with  $Cl_2$ . The  $BCl_3$  is condensed and then purified by distn. The pure  $BCl_3$  is mixed with pure  $H_2$  and passed over a hot W wire; B is formed on the wire. The pure B thus prep'd. consists of beautiful, hard, gray crystals. The method of photographing the arc and spark spectra is given. The regions 2050 A. U. to 5200 A. U. and 4500 to 6680 A. U. are being studied.

**The absorption spectrum of lithium hydride and its molecular constants.** G. NAKAMURA. *Z. physik. Chem., Abt. B*, 3, 80-2(1929).—A partial analysis of the many-line spectrum of LiH has been made from absorption data. The band system is composed of a number of partial bands degraded toward the red, each of which consists of a simple P and R branch. The moment of inertia in the normal state has been calcd. to be  $2.90 \times 10^{-40}$  g. cm.<sup>2</sup> and the equil. distance between nuclei is  $1.42 \times 10^{-8}$  cm.

**Densitometric measurements of the  $K\alpha$  line of carbon.** C. B. BAZZONI, FAUST, AND WEATHERBY. *Nature* 123, 717(1929).—Densitometric measurements of the  $K\alpha$  line of C in 3 orders obtained with a grating having 1200 lines per cm. show distinct sepn. of components in the second and third orders. There are 4 principal components in the main line at 44.2, 42.0, 45.4 and 46.15 A. U. The relative intensities apparently depend on excitation potential, thus explaining the divergence of wave length obtained by other observers in the third order.

**Polarization of radiations for the resonance of zinc.** PAUL SOLEILLET. *Compt. rend.* 187, 723-5(1928).—By reason of resonance of metallic vapors, radiations of excited rays are emitted that are polarized and are extremely sensitive to a weak magnetic field. Previous results for Hg and Cd have been followed up for Zn. From values of the magnetic field in the direction of excited rays and in the direction of observed rays the av. life of an excited atom is calcd. to be  $10^{-8}$ . This is much greater than for the other two metals. Stability depends both on the simplicity of the electronic structure and on the no. of atoms present. This radiation for Zn at  $\lambda = 3076$  is compared with that at  $\lambda = 2139$ . The latter, however, is difficult to measure because of the weak sensitivity of plates in this region.

**The optical activity of quartz perpendicular to the optical axis.** G. SZIVESSY AND C. SCHWEERS. *Ann. Physik* [5], 1, 891-947(1929).—The authors' expts. have shown that results of W. von Voigt (*Göttinger Nachr.* 1903, 171) and F. Wever (*Jahrbuch der phil. Fakultät d. Univers. Göttingen* 1920 [2], p. 206) on the optical activity of  $\alpha$ -quartz perpendicular to the optical axis are incorrect and that previous experimenters were deceived by defective parallelity of light. Measurements carried out by authors' methods show that "the component of gyration tensors perpendicular to optical axis in  $\alpha$ -quartz is disappearingly small; the gyration surface is therefore a very flat tened rotation ellipsoid with disappearingly small equator diameter."

**Raman effect in crystals.** HISAMITU NISI. *Proc. Imp. Acad. (Tokyo)* 5, 127-9(1929).—Raman spectra are given for quartz, topaz and calcite. No trace of Raman lines was found in fluorspar.

**Raman effect in atomic hydrogen.** BORIS PODOLSKY. *Nature* 123, 761(1929).—The Raman effect can be calcd. from P.'s former solution of the Schrödinger equation (cf. C. A. 22, 2312, 4048).

**The modifications of the spectra of organic compounds dependent on the pH and the mathematical formulation of the functions relating the conditions of absorption to the pH.** F. VLÉS AND M. GEX. *Arch. phys. biol.* 6, 69-91(1927).—A general equation, formulated previously, is applied to some org. substances and the calcd. const. are compared with those empirically found.

**Polarized fluorescence.** ELSBETH HAKENBECK. *Ann. Physik* [5], 1, 457-96(1929).—A detailed study is made of the fluorescence properties of uranin (sodium fluorescein) in glycerol. The following facts are established: (1) The degree of polarization is a function of the direction of vibration of the incident light; (2) observations of the degree of polarization as a function of the soln. medium give the mol. radius with the aid of Perrin's formula; (3) measurements of the refractive indices give the order of magnitude of the const. of quasi-elastic binding.

**The influence of boric acid on the phosphorescence of zinc sulfides prepared by the explosion method.** F. PREYER. *Compt. rend.* 188, 903-4(1929).—The advantage of the "explosive" mode of prep. ZnS from the elements consists of incorporating in

the mixt., before explosion, the substances whose effect on the phosphorescence it is desired to evaluate. A series of ZnS mixts. with increasing amts. of  $\text{H}_2\text{BO}_3$  gave an increase in the intensity of luminosity within the range 5–20%  $\text{H}_2\text{BO}_3$ . An optimum amt. of  $\text{H}_2\text{BO}_3$  was assocd. with greatest luminescence.

H. R. MOORE

**Optical relations between alkali halide phosphors and complex salt solutions.** HANS FROMHERZ AND WILHELM MENSCHICK. *Z. physik. Chem.*, Abt. B, 3, 1–40(1929); cf. C. A. 23, 3180.—F. and M. have attempted to show that the optical activity produced in cryst. alkali halide phosphors by a trace of heavy-metal salts is identical with the activity produced in solns. of such halides by the addn. of heavy-metal salts and that it is due to complex formation. With this in view they have obtained the extinction curves for solns. of NaCl, NaBr, KCl, KBr, KI,  $\text{NaClO}_4$ ,  $\text{AgClO}_4$ ,  $\text{Cu}(\text{ClO}_4)_2$ ,  $\text{CuCl}_2$ ,  $\text{CuBr}$ ,  $\text{NaCl} + \text{AgCl}$ ,  $\text{KCl} + \text{AgCl}$ ,  $\text{NaBr} + \text{AgBr}$ ,  $\text{KBr} + \text{AgBr}$ ,  $\text{KI} + \text{AgI}$ ,  $\text{AgClO}_4 + \text{AgI}$ ,  $\text{KCl} + \text{CuCl}_2$ ,  $\text{KBr} + \text{CuBr}_2$ ,  $\text{KCl} + \text{CuCl}$ ,  $\text{KBr} + \text{CuBr}$ , and have compared them with existing data on the absorption bands of cryst. phosphors. The absorption bands of pure alkali halide solns. are displaced about  $30\text{m}\mu$  toward the red as compared with the crystal bands. The absorption bands of complex alkali halide solns. with Ag and Cu salts agree in relative position, form and sharpness with the corresponding crystal bands but are displaced 6 to  $10\text{m}\mu$  toward the red. From a comparison of the intensities of the bands it is estd. that from 0.2 to 2% of the heavy-metal salt in the crystal lattice is sufficient to produce optical activity.

J. B. AUSTIN

**The statistics of the photon.** IOAN I. PLACINTEANU. *Ann. sci. univ. Jassy* 15, 359–62(1929).—According to the statistical methods of Gibbs the probability ( $p$ ) of a photon forming an excited mol. of the order  $r$  is  $p = e^{[(\psi/\theta) - r\{\alpha + (\epsilon/\theta)\}]}$  where  $\epsilon$  is the energy,  $\theta = KT$  (Boltzmann const. times abs. temp.) and  $\psi$  and  $\alpha$  are consts. If  $r = 0$ , that is, if there is no excitation, the equation reduces to the classical form; if  $r = 0.1$  the equation reduces to the Fermi-Dirac form; if  $r = 0, 1, 2r$ , it reduces to the Bose-Einstein form.

F. R. B.

**A test of the radiation hypothesis of chemical reaction.** WM. URE AND RICHARD C. TOLMAN. *J. Am. Chem. Soc.* 51, 974–83(1929).—The rate of racemization of liquid piene exposed to infra-red radiation at about  $156^\circ$  was measured optically. The rate was not accelerated by a large increase in the density of radiation over the range of wave lengths out to  $3\mu$ . No conclusion as to the effectiveness of wave lengths longer than  $3\mu$  was warranted.

R. L. DODGE

**Active nitrogen.** P. K. KICHLU AND S. BASU. *Nature* 123, 715–6(1929).—Increase of life of active N from the electrodeless discharge with decrease in pressure is taken as evidence that this form of active N consists of metastable mols. Spectral results from uncondensed discharges show that no appreciable density of atoms exists.

**Active nitrogen.** LORD RAYLEIGH. *Nature* 123, 716(1929); cf. preceding abstract.—R. calls attention to an earlier article (cf. *Proc. Roy. Soc. (London)* A86, 264) describing the giving-off of light by active N under compression; and expresses doubt of the correctness of the conclusions of K. and B.

GREGG M. EVANS

**A new case of photochemical catalysis. The reaction between nitric oxide and cyanogen and its mechanism.** R. G. W. NORRISH AND F. P. P. SMITH. *Trans. Faraday Soc.* 24, 620–9(1928).—If the system cyanogen-NO is exposed to light of wave length shorter than  $360\text{m}\mu$  when under a partial pressure of  $1/2$  to  $1/3$  atm. for each reactant the reaction  $4\text{NO} = \text{N}_2 + 2\text{NO}_2$  occurs; cyanogen is thus a photochem. catalyst. The increase in “Draper” effect and of the fall in pressure with time was followed for a no. of partial pressures of reactants. The photochem. reaction is similar to that of  $\text{H}_2$  and  $\text{Cl}_2$ . Fall in pressure occurred also in the dark.  $\text{O}_2$  as an impurity appears necessary for the reaction. The curves assume the same shape if produced back to  $\text{O}_2$  content. Wave length of active light lies in the region  $360$ – $220\text{m}\mu$ .  $\text{N}_2\text{O}$ ,  $\text{N}_2$  and  $\text{CO}_2$  accumulate as the reaction proceeds. Equations are presented for the mechanism of the reaction in which NOCN is an intermediate product. This in turn is attacked by  $\text{NO}_2$  in presence of light forming  $\text{NO}$ ,  $\text{N}_2$  and  $\text{CO}_2$ . Fall in pressure is due to polymerization of  $\text{NO}_2$ . An analogous mechanism has been observed in the system NO–CNCl, an account of which is to be given later.

RAYMOND H. LAMBERT

**Studies in photochemistry. II. The Shear test applied to maize oil.** A. J. PACINI AND R. W. CROSLBY. *Clin. Med.* 36, 34–8(1929); cf. C. A. 22, 3546.—Maize oil gave a positive Shear test after exposure to the action of infra-red radiation and also after ultra-violet radiation.

M. H. SOULE

**The influence of pressure on the photochemical formation of hydrogen bromide.** I. W. JOST AND G. JUNG. *Z. physik. Chem.*, Abt. B, 3, 83–94(1929).—Previous work is discussed at length and several references are given. Theoretical considerations show

that the reaction velocity is proportional to  $\sqrt{1/p}$  and that the recombination of an excited with a normal Br atom takes place in only a very small fraction of all collisions. The effect of pressure was investigated with a specially constructed app. and the above conclusion verified within the limits of accuracy of the procedure. II. W. JOSR. *Ibid.* 95-127.—The effect of pressure on the photochem. formation of HBr, the influence of the container walls and the effect of light from the band spectra and from the continuous spectrum of the Br<sub>2</sub> was investigated with an improved app. for studying the effect of pressure on velocity of "light" reactions. The reaction velocities in the band region and in the continuum are practically equal. The Br atoms recombine in triple collisions and may also be destroyed on the walls, so that the walls have a characteristic effect on the reaction velocity. The activated Br atoms formed in the primary action affect the reaction velocity like the unactivated because they are deactivated before they can react. The velocity consts. of the single reactions occurring in the formation of HBr have been recalcd. and found in agreement with the theory. C. W. W.

**Phosphorescence and photochemical action of some organic and inorganic compounds after exposure to ultra-violet light.** F. KIRCHHOFF. *Physik. Z.* 30, 240-1 (1929).—After exposure to ultra-violet light from a quartz-Hg lamp, the following showed phosphorescence: fluorene, phenyl- $\beta$ -naphthol, benzoin, the ash of a photochemically active paper, boric acid and Ca(H<sub>2</sub>PO<sub>3</sub>)<sub>2</sub>. The Zn salt of an org. sulfonic acid and BaPt(CN)<sub>4</sub> were not phosphorescent. Of the compds. treated with ultra-violet light, fluorene and the Zn salt of the sulfonic acid showed an appreciable effect on a photographic plate and BaPt(CN)<sub>4</sub> a very great effect, while the others showed none or scarcely any. Two phenomena seem to occur, viz., phosphorescence followed by a brief photochem. effect (in fluorene), and an invisible radiation (perhaps ultra-violet) of relatively long photochem. duration (in BaPt(CN)<sub>4</sub>). LOUIS WALDBAUER

**Effect of x-radiation on crystalline and dissolved sucrose.** M. C. REINHARD AND K. L. TUCKER. *Radiology* 12, 151-3(1929); cf. C. A. 23, 2996.—X-rays color crystals of sucrose reddish brown. These crystals, when dissolved, show measurable amts. of invert sugar. In solns. some invert sugar is formed, the amt. being proportional not to the concn., but to the time of exposure, for a given quality of radiation

E. H. QUIMBY

**Effect of cathode rays on hydrocarbon oils and on paper. The mechanism of cable deterioration.** C. S. SCHOEPFLE AND L. H. CONNELL. *Ind. Eng. Chem.* 21, 529-36(1929).—The wax found in cable is formed by condensation of the impregnating compd. due to the action of the silent discharge and is accompanied by the liberation of H<sub>2</sub>. Paper under the influence of the silent elec. discharge produces appreciable amts. of H<sub>2</sub>O as well as gases, H<sub>2</sub>, CO<sub>2</sub>, etc. The gases and H<sub>2</sub>O formed within the cable during use are very important factors causing deterioration. Numerous tables and curves are given, showing the results of a large number of expts. Improvement in the cable can probably be expected if the silent discharge can be eliminated by changes in design, or if an impregnation compd. and a paper or suitable substitute can be found which will not produce gases and H<sub>2</sub>O when subjected to the silent discharge.

O. A. NELSON

**A vacuum arc lamp of new design for spectroscopic work (PROSAD) 4.** Ultra-violet light-transmitting glasses (STARKIE, TURNER) 19. Influence of Fe<sub>2</sub>O<sub>3</sub> content on the light transmission of soda-lime-SiO<sub>2</sub> glass, with special reference to the ultra-violet (STARKIE, TURNER) 19. Absorption spectra of some phthaleins of the trihydroxyphenols (GIBBS, SHAPIRO) 10. Absorption spectra of some halogenated fluorosceins (GIBBS, SHAPIRO) 10. Tautomerism of hydroxytriarylcarbinols (ANDERSON) 10. Structure and activation of aliphatic aldehyde molecules. II. Formaldehyde, acetaldehyde, propionaldehyde and chloral. III. Absorption spectra of solutions (SCHOU) 10.

HOLST, HELGE AND KRAMERS, H. A.: *Bohns Atomteori. Ahmenfatteligt fremstillet*. 2nd ed., revised and enlarged. Copenhagen: Gyldendal. 176 pp.

**Photochemical reactions.** I. G. FARBENIND. A.-G. Fr. 649,295, Nov. 14, 1927. The yields in photochemical gaseous reactions are increased by passing the gas or gaseous mixt. charged with metallic vapor in permanent circulation near the source of resonance radiations so that the products are formed in relatively feeble concn., preferably below 2%, and are continually removed from circulation by solvents, etc. Examples are given of the prepn. of CH<sub>2</sub>O and glyoxal from CO and H, H<sub>2</sub>O<sub>2</sub> from O and H, aldehydes from water gas, and aldehydes and H<sub>2</sub>O<sub>2</sub> from CH<sub>4</sub> and air. Cf. C. A. 23, 2369.

**Photochemical reactions.** I. G. FARBENIND. A.-G. Fr. 652,382, Apr. 7, 1928. Substances to be treated are submitted to the action of a source of radiations from a metallic vapor arc lamp of lengthened form placed centrally in the reaction chamber so that it is surrounded throughout its length directly by the substance to be treated except for the cooling means. Examples are given.

**Light-sensitive cells utilizing selenium, thallium sulfide, etc.** J. L. BAIRD and BAIRD TELEVISION DEVELOPMENT CO., LTD. Brit. 300,183, May 7, 1927. Structural features.

**Material for excluding Röntgen rays.** I. G. FARBENIND. A.-G. Brit. 299,723, Oct. 28, 1927. Pulp from which cardboard is made may be mixed with a Pb compd. or paper, cardboard, textile fabric, metal or wood may be coated with one or more layers of a Pb compd. such as basic Pb carbonate distributed in a colloid vehicle such as gelatin; or paper may be attached to cardboard by an adhesive contg. a Pb compd. as by a mixt. of PbO and glycerol.

#### 4—ELECTROCHEMISTRY

COLIN G. FINK

**High-frequency induction furnaces.** G. RIBAUD. *Tech. moderne* 21, 225-31, 265-71 (1929).—Recent progress in the manuf. and uses of these furnaces is described.

P. THOMASSET

**Electrically heated rotary carburizer.** H. M. CHATTO. *Iron Age* 123, 1153-4 (1929).—An elec. rotary carburizing furnace is described, the installation consisting of a rotating alloy cylinder inside an electrically-heated, box-shaped furnace chamber. The feature is 2 point control, which gives uniform temp. in the cylinder, a rapid uniform penetration of C and which economizes labor and material. One thermocouple is placed in the furnace chamber with the sensitive end near the winding and the other is placed inside the revolving cylinder. With a 72 kw. rating, the time of heating to carburizing temp. is from 1.5 to 3.25 hrs. under normal conditions, and the total overall time is always several hrs. less than that required to heat up cold boxes and their contents. Small forgings can be given a  $1/32$ -in. case at 1680° F. in 6.5 hrs. at the rate of 31 lbs. net per kw. hr. The radiation loss at this temp. is approx. 17 kw. hr. H. STOERTZ

**Electrical heating by the container resistance method.** Articles of process equipment become their own heating systems. R. A. CARLETON. *Ind. Eng. Chem.* 21, 525-9 (1929); cf. *C. A.* 22, 1547.—Data are given on heating tubular heaters, kettles, tanks, pipe-lines, forced circulation evaporators and drums or cylindrical heaters; their present application in industry and their cost are compared with other systems.

J. H. MOORE

**Progress in the art of electrical precipitation.** WALTER A. SCHMIDT. *Trans. Am. Inst. Chem. Eng.* 21, 11-33 (1928).

E. H.

**Fluosilicic acid or dithionic acid as an electrolyte for lead refining.** FRIED. VOGEL. *Metallbörse* 19, 313-4, 369-70 (1929).—Although Betts recognized  $H_2SiF_6$ ,  $BHF_4$ ,  $H_2S_2O_6$  and org. acids of S as suitable for Pb refining by the electrolytic process, only the first mentioned has found wide application in practice. This is true in spite of the low cost of the  $H_2S_2O_6$ , which may be obtained practically as a waste product at most smelters. It is urged that research may still show the way to reduce refining costs greatly by utilizing  $H_2S_2O_6$ .

W. C. EBAUGH

**Starting Andes Copper's electrolytic and refining plant.** CARR B. NEEL. *Eng. Mining J.* 127, 714-9 (1929).—A description of the electrolytic and refining plant of the Andes Copper Mining Co. at Potrerillos, Chile, operation of which began in July, 1928. N. discusses the equipment, arrangement and early practice in the electrolytic department, where the leach solns. are electrolyzed, with brief mention of the breaking in of the refining furnace.

H. STOERTZ

**The action of limestone and dolomite on zinc sulfate solutions.** L. CAMPI, G. BOZZA AND D. MASPERI. *Giorn. chim. ind. applicata* 11, 3-8 (1929).—In the electrolytic prepn of Zn from  $ZnSO_4$  a neutralizing material such as limestone or dolomite is added to maintain a neutral soln., as well as to ppt. Fe, and to coagulate siliceous material. However, if present in excess, these will ppt. Zn as basic carbonate. The rate of this reaction has been studied at 40° and 100° for both limestone and dolomite, and the consts. of the reactions have been detd. as follows: limestone at 40° —  $K = 0.000282$ ; at 100° —  $K = 0.00124$ ; dolomite at 40° —  $K = 0.0000884$ ; at 100° —  $K = 0.000636$ . It is evident that dolomite reacts with only  $1/3$  the speed and is, therefore, preferable in minimizing losses through pptn. of basic Zn salts.

A. W. CONTIERI

The electrodeposition of cadmium for rust prevention. S. WERNICK. *Chem. Age* (London), Monthly Met. Section, 20, No. 505, 17-18, No. 510, 27-28(1929).—See C. A. 23, 2369. E. C. M.

Testing of electrodeposits on aluminum. G. B. BROOK AND GEORGE H. STOTT. *Engineering* 127, 531-4(1929); *Metal Ind.* (London) 34, 419-21, 439-41(1929).—See C. A. 23, 2370. E. C. M.

An electrical test for tin coating on copper wire. H. M. LARSEN AND C. M. UNDERWOOD. *Wire* 4, 118-19, 140(1929).—A rapid, inexpensive and accurate method is described, which is claimed to have many advantages over the chem. test for detg. the amt. of deposit. E. I. S.

The single potential of the nickel electrode. EDGAR NEWBURY. *J. Am. Chem. Soc.* 51, 1429-36(1929).—The e. m. f. of a Ni electrode in a soln. of  $\text{NiSO}_4$  depends very little on the purity of the salt or of the metal (except for occluded H), but largely on the method of prepn. of the electrode and whether it is kept in motion. Reproducible values were obtained only when the electrode was rotated and was subjected intermittently to anodic action. The results are explained on the assumption of 2 allotropic forms of Ni and of hydration of Ni ions in soln. T. H. CHILTON.

Rapid copper-plating of steel over a thin deposit of nickel. M. BALLAY. *Rap. métal.* 26, 221-3(1929).—Lab.-scale and semi-com. expts. have shown that Cu-plating of steel in a cyanide bath for 45 mins. could be replaced by Ni-plating for 1 min. followed by Cu-plating for 3 mins. in a hot acid sulfate bath. A bath contg. 400 g. Ni sulfate, 22 g. crystd. Ni chloride, 22 g. boric acid and a trace of Ni nitrate or  $\text{HNO}_3$  per l. and stirred with compressed air, can be used at temps. of 35-55° and at a  $p_H$  value of 5.5-4.4, according to the c. d., which can be as high as 15 amp. per sq. dm. in certain cases; generally, a  $p_H$  of 5.0-5.5 and a temp. of 50° permit of working at 10 amp. per sq. dm. and for parts of very complicated form, the c. d. can be lowered but need very seldom fall below 5 amp. per sq. dm. A treatment of 45-60 secs. is sufficient. A bath contg. 300 g.  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$  and 25-30 cc. of 66° Bé.  $\text{H}_2\text{SO}_4$  per l. of water and stirred with compressed air, permits of working at 45° with a c. d. of 10 amp. per sq. dm.; densities up to 30 amp. were used with satisfactory results. The adherence of the double coating is perfect; sheet steel coated in this way can be bent right back on itself or heated to over 900° without causing sepn. A. PAPINEAU-COUTURE

Selection, care and operation of plating. W. S. BARROWS. *Can. Machy.* 40, No 7, 39-40(1929).—Gray-iron gears wear best. E. I. S.

Studies of the electromotive behavior of aluminum and its amalgams. ROBERT MÜLLER. *Z. Elektrochem.* 35, 240-9(1929).—M. finds that the electrode potential of Al is the same as its amalgams up to a concn. of 99.8 at. % Hg, both from measurements of cells contg. amalgams of different concns. measured against a reference electrode and from measurements of the potential necessary to cause the deposition of Al on either Pt or Hg. The mechanism of the reaction of Al with water and acids is discussed, and M. concludes that, although it is impossible to decide how Al reacts with water, it is evident with HCl that Al reacts with the undissocd. mols. of HCl. M. D.

The influence of the solvent on the electromotive force of silver halide cells. I. Water-alcohol mixtures. A. S. AFANASIEV. *Z. Elektrochem.* 35, 220-2(1929).—The equation of Brodskii (C. A. 20, 3377) is further confirmed by data on cells contg. Ag AgCl electrodes instead of calomel electrodes, which Brodskii used. MALCOLM DOLE

Electrolysis of ammonium acetate and ammonium capronate. FR. FICHTER AND WERNER LINDENMAIER. *Helv. Chim. Acta* 12, 559-72(1929).—The electrolysis of  $\text{NH}_4\text{OAc}$  in AcOH solns. with Pt electrodes gives  $\text{C}_2\text{H}_4$  by the regular Kolbe reaction, and also some  $\text{AcNH}_2$ , especially if the anode is well cooled. The formation of  $\text{AcNH}_2$  is attributable to a side reaction between  $(\text{AcO})_2$  and the  $\text{NH}_3$  from either  $\text{NH}_4\text{OAc}$  or  $(\text{NH}_4)_2\text{CO}_3$ . Similarly,  $\text{NH}_4$  capronate yields  $\text{C}_6\text{H}_{11}\text{CONH}_2$ . In  $\text{NH}_3$  soln. and with a graphite anode,  $\text{NH}_4\text{OAc}$  yields  $\text{CO}_2$ , MeOH and a small quantity of  $\text{MeNH}_2$ , the latter in quantity similar to that obtained by the explosion of  $\text{AcOOH}$  in an atm. of  $\text{NH}_3$ . Thermal decompn. of  $\text{AcOOH}$  alone yields MeOH,  $\text{CO}_2$  and  $\text{C}_2\text{H}_4$ , thus explaining the formation of  $\text{C}_2\text{H}_4$  in the electrolysis of  $\text{NaOAc}$ . In  $\text{NH}_3$  soln. and with Pt anode,  $\text{NH}_4\text{OAc}$  yields MeOH and HCHO, the latter reacting further with  $\text{NH}_3$  to give  $\text{MeNH}_2$ , and other bases and amorphous products of high mol. weight. In all cases  $\text{CO}(\text{NH}_2)_2$  is formed, probably by anodic reaction of the  $(\text{NH}_4)_2\text{CO}_3$ . G. C.

Experiments with an electrolytic generator. V. M. SHULGIN. *Physik. Z.* 30, 235-7(1929); cf. *Ibid* 29, 724(1928).—Continuing previous expts. of using a reversed Wehnelt interruptor (Pb anode and Pt cathode) as a source of electromagnetic oscillations, S. was able to show that the pressure of  $\text{H}_2$  at the Pt cathode gave rise to the oscillations. He devised a simple method for keeping the cathode surrounded with



an atm. of  $H_2$ , maintaining the pressure so that the tip of the cathode just dips in the acid. In this way, with a 240 v. input, he was able to get a current of 0.143 amp. in the room antenna, and one of 3.05 milliamp. in the receiving app. On eliminating the self-inductances in the generating circuit, an even greater antenna current was obtained. The same phenomena are observed as with a Tesla coil, so this new method is recommended as a simple and certain method of obtaining high-frequency currents.

LOUIS WALDBAUER

**The nature of gas-metal electrodes.** SIDNEY J. FRENCH AND LOUIS KAHLBERG. *Trans. Am. Electrochem. Soc.* 54, 163-99(1928); *Metal Ind.* (London) 33, 443-6, 543-5, 569-70.—When an Al electrode, freshly sanded, is placed in a soln. of a neutral electrolyte such as KCl, the e. m. f. falls off rapidly during the first 15 or 20 mins., and a const. potential is finally reached 500 or 600 millivolts less than the initial e. m. f. If  $H_2$  or  $N_2$  be now bubbled through the electrolyte around the electrode, the potential, after an initial lag, gradually becomes more basic till a new const. e. m. f. is obtained, 300-400 millivolts more basic than that in air. However, it is not possible to raise the potential of the Al electrode up to the initial e. m. f. of 1.4 v., indicating that the gas and metal form a combination *gas-metal electrode* with a specific potential of its own. The effect of  $O_2$ ,  $N_2$  and  $H_2$  upon 25 different metals was studied, all of them forming gas-metal electrodes. The metals used were Al, Sb, As, Bi, Cd, Cr, Co, Cu, Au, C (graphite), Fe, Pb, Mg, Mo, Hg, Ni, Pd, Pt, Te, Si, Ag, Th, Sn, W and Zn. A few expts. were made with CO,  $CH_4$  and He. The results show in general that gas-metal electrodes are specific for the particular metal and gas, and are related to the absorbing power of the metal for the gas or for each gas in case of a mixt. The total combination potential is due both to absorbed gas and to a condensed film of gas on the surface of the metal.  $O_2$  tends to make the metal potentials less basic, while  $N_2$  and  $H_2$  have the opposite effect. Elements having amphoteric properties and variable valences and which are known to function as catalysts show greater change with  $N_2$  and  $H_2$  than do the more simple and pronouncedly metallic elements. Helium has little effect on potentials, but on Pt and Cd it has a small but definite effect. Coating the electrodes and stirring the electrolyte have the same effect of preventing the condensation of a gas film on the surface of the electrode. The most const. electrodes are those which show the smallest difference between their  $O_2$  and  $N_2$  potentials. The gas-metal electrode potential depends on the gas dissolved in the electrolyte and not on that in the gas phase. H. S.

**A vacuum-arc lamp of new design for spectroscopic work.** KAMTA PRASAD. *J. Sci. Instruments* 6, 126-30(1929).—In this new arc lamp the arc can be struck in vacuum from outside as often as desired and can be run without attention for about an hr. or so at a time. The vacuum seal is so simple that, even if the arc is to be uncovered, the time required in resealing the cover air-tight is very short. Ordinarily the arc works very steadily at about 1 cm. of Hg, but, if desired, the pressure can be further reduced. E. H.

The transport number of aqueous AcOH (MCBAIN, HARVEY) 2. The manufacture of caustic soda (MORIN) 18. Melting Al (BALLY) 9. The manufacture of glass for electric incandescent lamps (TISCHER) 19. Cr-plating steel before heat treating (TOUR) 9. Mg and its alloys (CAZAUD) 9. Cr-plated Cu used as fuse wires or strips (Brit. pat. 300,160) 9. Preparing Si steel sheets for electrical purposes (U. S. pat. 1,714,038) 9. Tar distillation [purifying by elec. discharges] (Fr. pat. 652,109) 21. Deposition of rubber (Fr. pat. 651,730) 30. Device for thermostatic and time-interval regulation of electric furnaces or other apparatus (Brit. pat. 299,714) 1. Removing water from rubber-coated fabrics or other rubber products by electric endosmose (Brit. pat. 299,713) 30. Molded carbonaceous articles such as electrodes (U. S. pat. 1,714,165) 18.

BERTHIER, AUGUSTE: *L'énergie électrique de demain*. Le problème de la transformation directe de l'énergie chimique potentielle en énergie électrique. La pile au charbon. La pile à gaz et la pile aux hydrocarbures. Théorie et réalisation. Paris: Desloges, Girardot et Cie. 236 pp. F. 40.

**Electric battery.** K. SCHENKEL (to Siemens & Halske A.-G.). Brit. 299,784, Oct. 31, 1927. Plates are formed with a layer of C and a layer of depolarizer, such as  $MnO_2$ , joined together by pressure with a stiffening material, such as linen or paper, extending over at least one surface of the depolarizer and which may serve also to absorb the electrolyte. Rosin melted with the graphite may also be used to stiffen the depolarizer; plaster of Paris and glue also may be used.

**Electric battery assembly.** H. HITCHEN. Brit. 300,003, Oct. 28, 1927. Structural features.

**Storage battery.** V. G. CHERNUKH. Russ. 5756, June 30, 1928. Constructional features are specified.

**Storage battery.** ADRIAN M. CLARK (to Cooper Corp.). U. S. 1,714,077, May 21, 1928. Structural features.

**Storage battery.** WILLIAM E. DUNN (to Electric Storage Battery Co.). U. S. 1,714,467, May 21, 1928. Structural features.

**Storage batteries.** COMPAGNIE GÉNÉRALE D'ÉLECTRICITÉ. Fr. 652,511, Feb. 21, 1928. Construction of connecting elements.

**Storage battery plates.** FRANK GARACA (to Luthy Research Laboratory). U. S. 1,713,825, May 21, 1928. A paste is formed by mixing sulfated active material with a dil. NaOAc soln.; the paste is applied to grids, and the sulfates and acetate are removed from the paste before the forming operation (suitably by electrolysis).

**Drying chamber for battery plates.** JOHN H. STEELE. Australia 15,014, Aug. 11, 1928.

**Salvaging storage-battery electrode material.** CLARENCE B. WHITE. U. S. 1,715,262, May 28, 1928. In order to recover separately the antimonial lead forming the grid frame and the filler material comprising lead oxide and sulfate, the plates are heated to a temp. sufficient to liquefy only the metal portions; the molten metal which flows off is collected; the hot filler material and entrapped molten metal are projected upon a cooler material having a roughened surface to effect liberation of the entrapped metal and disintegration of the filler material, which is separately collected. An app. is described.

**Hydrometer (containing "specific gravity balls") suitable for testing storage battery electrolyte.** J. H. COLLIE. Brit. 299,816, July 18, 1927. Structural features.

**Electrothermal operations.** GRÄFLICH SCHAFFGOTSCH'SCHE WERKE G. M. B. H. Fr. 651,941, Mar. 29, 1928. In electrothermal operations, such as in the production of carbides, silicides and metals from their ores, semi-coke obtained at a temp. lower than coke from cokeries is used as a reducing agent.

**Electrodeposition of metals.** ÉMILE HOORICKX. Fr. 652,619, April 12, 1928. In depositing metals on fragile surfaces such as glass the current conductors are in the form of pads placed on the surface; they are raised or lowered by rotation of a wheel.

**Apparatus for the electrodeposition of a protecting metal on wire.** MARCEL VINCENT. Fr. 652,650, April 13, 1928.

**Electrodeposition of metals such as zinc.** METALLGES. A.-G. (formerly Metallbank und Metallurgische Ges.). Brit. 299,725, Oct. 27, 1927. Smooth and dense deposits are obtained by the addn. to the bath of a hydrophilic inorg. colloid, insol. in the electrolyte, in a suitable state of dispersion and free from assoc. detrimental substances. Small proportions of colloidal silicic acid are suitable for use with a soln. obtained by leaching ZnO not contg. silica with acid ZnSO<sub>4</sub> soln. In refining Cu, colloidal hydrated tungstic acid obtained from Cu tungstate by adding H<sub>2</sub>SO<sub>4</sub> may be used. Metatitanic acid or zirconic acid may be used with acid electrolytes, and Fe(OH)<sub>3</sub> or Mg(OH)<sub>2</sub> with alk. electrolytes.

**Electrodeposition of metals on wood, etc.** I. AINSTEIN (known as W. I. Einstein). Brit. 300,060, Feb. 22, 1928. Wood or other org. material is dipped in sol. glass and its surface is sanded and then dried. A pulverized coating such as an alloy of easily fusible metals comprising Pb, Sb, Bi, Sn and Zn is then applied by a "gun"; a second coating of Cu, bronze, or brass may be applied similarly, followed by electroplatings first in a cold and then in a hot bath.

**Electrodeposition of chromium.** RUDOLF APPEL. U. S. 1,713,514, May 21, 1928. The metallic object to be coated is subjected to electrolysis in a chromic acid bath contg. not more than 0.5 g. per l. of NaIO<sub>3</sub>, which serves to improve adhesion of the Cr to the underlying metal. Cf. C. A. 22, 2116.

**Electrodeposition of chromium.** E. V. HAYES-GRATZE. Brit. 300,043, Jan. 5, 1928. Anodes are used which are formed of pure electrodeposited Cr and which are approx. to the reversed shape of the mold or article to be plated. Various details and modifications are described.

**Electroplating apparatus.** K. BARANOWSKI. Brit. 300,038, Dec. 21, 1927. Brushes preferably made of glass filaments and carrying vanes serve to sweep the electrodes as they rotate on a shaft. Various structural details are described.

**Zinc plating.** GIUSEPPE BIANCO. Fr. 652,112, April 3, 1928. Porous Zn is used in electrolytic Zn-plating baths, e. g., a bath contains porous Zn 100-200, Hg 1-15, H<sub>2</sub>

SO<sub>4</sub> 125-275, double sulfate of Fe and Al 15-40, H<sub>3</sub>PO<sub>4</sub> 5-15, NaOH and KOH 5-15, distd. water 1000 parts by wt.

**Galvanoplastic baths.** H. WINDLER A.-G. Fr. 652,185, April 4, 1928. Means are described for raising and lowering at the same time the anode and cathode.

**Electrolytic baths.** ALEXANDER WACKER GESELLSCHAFT FÜR ELEKTROCHEM. IND. G. M. B. H. Fr. 651,998, Mar. 30, 1928. Diaphragms, filters, or porous substances for electrolytic baths; are formed by agglomerating finely powd. BaSO<sub>4</sub>, quartz, glass, corundum, cinders, or asbestos with solns. or suspensions of gum, gutta-percha, balata, cellulose and cellulose compds., or natural or artificial resins. Metallic cloth may be used as support for the diaphragm.

**Electrolytic refining of aluminum.** ALUMINIUM-INDUSTRIE A.-G. Brit. 299,689, Oct. 25, 1927. An electrolyte is used comprising a halide salt of Al and a halide salt of an alkali or alk. earth metal or both, which are molten at the working temp. at which the anode and cathode remain solid; small quantities (0.1-5%) of Mn, Pb, Cd, or Ni or their compds. are added to the bath directly or by way of inclusion with the anode material. Cf. C. A. 23, 2667.

**Magnesium.** W. KOEHLER. Brit. 300,149, July 29, 1927. Mg ore is heated in an elec. furnace with a gaseous reducing agent such as H or a gas contg. H, which is introduced at such a point that it is ionized; Mg is obtained as vapor. Coal or coke may be added to the ore and when dolomite is used, CaC<sub>2</sub> is also formed and collected. Various details of the app. and process are given. Cf. C. A. 22, 546.

**Phosphorus nitride.** CLAUDE G. MINER. U. S. 1,715,041, May 28. P and N are brought together in proper proportions at a temp. above the b. p. of P but below redness, and the mixt. is subjected to an energetic elec. discharge in a reaction chamber. An app. is described.

**Electric resistance furnace suitable for heat treatment of metal or ceramic ware, etc., in reactive gases.** FRANCIS A. J. FITZGERALD (to Harper Elec. Furnace Corp.). U. S. 1,714,081, May 21. The resistor chamber contains an inert gas and is sepd. from the heat-treating chamber by a septum of material such as Si carbide, which will not deteriorate when heated to a high temp. and which will resist the active gas in the treating chamber. Various structural details are described.

**Electric annealing furnaces.** AKT. GES. BROWN, BOVERI & CIE. Fr. 652,242, April 5, 1928. Method of making the annealing chamber gas-tight. Cf. C. A. 23, 1066

**Furnace for continuous annealing of wire in hydrogen, etc.** ALLGEMEINE ELEKTRICITÄTS-GESELLSCHAFT (to International General Electric Co.). Brit. 300,242, Nov. 9, 1927. Structural features of an elec. resistance-heated furnace.

**Rotary electric furnace with steel electrodes, suitable for activating decolorizing carbon.** L. WICKENDEN and S. A. W. OKELL. Brit. 300,146, July 5, 1927.

**Electrodes for electric furnaces.** SOC. ÉLECTRO-MÉTALLURGIQUE DE MONTRICHER (Soc. anon.). Fr. 652,014, Mar. 31, 1928.

**Medical electrode.** NELSON H. LOWRY and LLOYD F. MEGAW. U. S. 1,713,970, May 21. A conductor such as Pt or a Pt alloy is surrounded by an insulating material such as porcelain having a high m. p. and having about the same coeff. of linear expansion as the conductor. U. S. 1,713,971 relates to the use of Pt Ir alloy electrodes for sterilizing and drying cavities of teeth by discharge from a source of high frequency elec. oscillation as long as such discharge will take place.

**Incandescent cathodes.** SIEMENS & HALSKE A.-G. Fr. 652,017, Mar. 31, 1928. The emission material of incandescent cathodes with high electron emission is composed of an alk. earth, e. g., Ba, or a mixt. or alloy of several such metals. A layer of BaO may be fixed between the support and the metal.

**Incandescent cathode discharge tubes.** NAAMLOOZE VENNOOTSCHAP PHILIPS' GLORILAMPENFABRIEKEN. Brit. 299,704, Oct. 29, 1927. In a discharge tube for low tensions with an arc discharge, a gas filling such as Ar or Ne mixts. is used with a small quantity of Hg vapor; the wall of the lamp is of material transmitting ultra-violet rays. The cathode may be of the Wehnelt type or coated with BaO or otherwise given a high emission at relatively low temp.; it may be heated by the discharge. A device is described adapted for operation at temps. below 100°. Various structural details are described.

**Dielectric material for condensers.** TELEPHON-APPARAT-FABRIK E. ZWIETUSCH & Co., GRS. Brit. 299,697, Oct. 29, 1927. An impregnating or filling material for condensers may be formed of colophony 10 and ozocerite 90%; when the condenser is to be used in contact with steam or subjected to material variation in temp., half of the colophony may be replaced by carnauba wax.

**Electrical condenser.** SAMUEL RUBEN. U. S. 1,714,319, May 21. Cu plate electrodes are used in surface contact with a film-forming electrolyte, which may contain KF in paraffined cotton gauze and which is mixed with Cu particles. Cf. C. A. 23, 2667.

**Electrolytic condenser.** SAMUEL RUBEN. U. S. 1,714,191, May 21. An electrolyte mixt. comprising glycerol,  $\text{NaHCO}_3$  and  $\text{H}_2\text{BO}_3$  is used with spaced film-forming electrodes such as Al sheets coated with an oxide film.

**Apparatus for vacuum impregnation of electrical condensers with wax, oil, etc.** REGINALD H. HOYT (to Wireless Specialty Apparatus Co.). U. S. 1,715,035, May 28.

**Gas-filled electrical discharge device.** CHARLES G. SMITH (to Raytheon, Inc.). U. S. 1,714,402, May 21. Cathodes and anodes are placed in a receptacle filled with a gas and spaced apart by distances which are too short normally to permit of gaseous ionization and conduction; one of the electrodes is provided with openings to permit of long electron paths through it, and a device adjacent to the openings serves to alter the lengthened paths to control the gaseous discharge. U. S. 1,714,403 relates to structural features of elec. gaseous discharge devices. U. S. 1,714,404 specifies a method of controlling the conducting properties of a gaseous medium between 2 electrodes spaced sufficiently close together normally to prevent gaseous ionization, by lengthening the paths of electrons between the electrodes to cause conduction to take place, and by distorting the ionization over a small portion of the electrode surfaces. U. S. 1,714,405 relates to a device with 2 electrodes immersed in gas and spaced apart by a distance comparable to the mean free path of electrons in the gas, together with means for lengthening the electron paths in a direction parallel to the electrode surfaces, and means for altering the effect of the path lengthening means over a restricted portion of the gaseous region between the electrodes. U. S. 1,714,406 specifies an elec. device suitable for use in amplification, etc., comprising a pair of electrodes in a nearly perfect vacuum and various assocd. elec. and structural features. U. S. 1,714,407 relates to a device with an electrode of material such as Na K alloy, which is liquid at ordinary temp., an opposing electrode, and a gas space sufficiently short between the electrodes to prevent substantial ionization by electrons traversing the shortest paths between the electrodes; means are provided to cause electrons to flow longer paths in one direction of applied potential between the electrodes.

**Electrical gas purification plant.** DINGLER'SCHE MASCHINENFABRIK A.-G. Pat. 651,993, Mar. 30, 1928.

**Electric conductivity-testing apparatus for determining the purity of boiler-feed water and other liquids.** H. L. RANGER. Brit. 300,229, Aug. 9, 1927.

**Oscillation generator.** JAMES A. MILLER (one-fourth to John Flam and three-eighths to Harold F. Elliott). U. S. 1,714,689, May 28. A pair of electrodes is cooled to prevent a cond. or arc discharge; a diffused gaseous discharge of a compd. of C and H (or of Si, Se, or Th and H) is produced between the electrodes. Various structural details are described.

**Recording sound by alternating currents.** H. KÖNEMANN. Brit. 299,702, Oct. 29, 1927. In app. for recording sound by a. c. as described in Brit. 291,029, metal oxides are used on metal electrodes of the arc lamp to produce de-ionization by keeping the temp. low. The electrodes may either be coated with the oxide or may themselves be oxidized.

**Electric incandescent lamp.** FRITZ ECKHARDT and MAX HOHNEKAMP. U. S. 1,713,752, May 21. A shunt permanently connected to the ends of the filament comprises a sulfide such as galena, which is non-conductive when the normal voltage is applied to the lamp but conductive if a higher voltage is applied; it serves as a safety device for lamps connected in series. Cf. C. A. 22, 2518.

**Lamps containing ionizable gases.** GEORGES MABBOUX. Fr. 651,879, Mar. 27, 1928. Means for varying the distribution of electrostatic charges on the electrodes.

## 5—PHOTOGRAPHY

C. E. K. MEES

**Chemistry of reduced silver.** I. R. NAMIAS. *Il prog. fot.* 36, 115-8(1929).--The general chemistry of the developed image is described. The nature of light-sensitivity of photographic materials, optical sensitizers and desensitizers, and some notes on the nature of developing agents are given.

**Application of the noble metals in photographic chemistry.** W. NODDACK. *Metallwirtschaft* 7, 477-9(1928).--A general discussion of the chem. and catalytic changes

in the salts of Ag, Hg, Pt, Au and other metals produced by light, with particular reference to the employment of these in photography and the photographic industries. There is a brief discussion of the basic theories. Minor attention is given to the reactions of other metals such as Os, Ru and Ir.

C. L. MANTELL

**Sensitivity of photographic emulsions.** III. S. O. RAWLING. *Phot. J.* 69, 83-93 (1929); cf. *C. A.* 21, 863.—The effect of altering the acidity of an emulsion during digestion on the final sensitivity is examd. The depression caused by decreasing the  $p_H$  in emulsions contg. sensitizing nuclei is similar to those made with desulfurized gelatin. Two factors evidently control sensitivity: the degree of nucleation and the H-ion concn. The effect of  $p_H$  alteration is independent of the mode of making of the emulsion whether  $NH_4OH$  or heat ripening is employed, or whether AgI is present, but is a characteristic of the gelatin used. When an emulsion is divided into 2 parts and ripened at different  $p_H$  values, the alteration of speed with digestion follows 2 widely sep'd. paths. Emulsions ripened at  $p_H$  8 are initially faster and increase in speed, while those maintained at  $p_H$  5 are slow and may become slower. An emulsion prepd. at a low  $p_H$  and raised to a high does not attain the full speed of the high  $p_H$  emulsion. Similarly, an emulsion prepd. at a high  $p_H$  is not depressed fully by conversion to a low  $p_H$ . The ratio of fall from high  $p_H$  is approx. equal to rise from low. Within the limits  $p_H$  5 —  $p_H$  8.5 the fog remains unchanged.

K. C. D. HICKMAN

SCHMIDT, FRITZ: *Kompndium der praktischen Photographie*. 15th ed., revised. Leipzig: E. A. Seemann. 516 pp. Linen, M. 15.

URBAN, WILHELM: *Theoretisch-praktischer Leitfaden durch das Gebiet der Phototechnik*. Stuttgart: Verlag Ferdinand Enke. 348 pp. M. 8; linen, M. 9.50.

**Color cinematography.** O. PILNY (to A. Pilny). *Brit.* 300,210, Nov. 8, 1927. Optical features.

**Stereoscopic photography.** L. F. SAVAGE. *Brit.* 299,733, April 30, 1927. Optical features.

**Photographic developers.** B. MEREJKOVSKY. *Brit.* 299,751, June 29, 1927. To a developer contg. a polyphenol with 2 or more OH groups and no  $NH_2$  group (such as hydroquinone or pyrogallol) together with hydroxylamine sulfonic acids or nitrilosulfonic acid or their salts, there is added, as an accelerator, a very small quantity of a primary diamine or a secondary amine such as piperidine, methylaniline, methylparaamidophenol, amidol or like compds.

**Combined photographic developer and desensitizer.** HERBERT MEYER (to Agfa Ansco Corp.). U. S. 1,713,613, May 21. A developer is prepd. comprising Hg cyanide, methyl-*p*-amino-phenol sulfate and hydroquinone; it serves to avoid fogging during development in proper lighting.

**Sensitized paper.** ZAIDAN HOJIN RIKAGAKU KENKYUJO. *Fr.* 652,008, Mar. 30, 1928. A positive sensitized paper is obtained by coating paper with an aq. soln. of a tetrazodiaminodiphenylamine compd., or a diazoamidodiphenylamine compd. or derivs. of these, this soln. being mixed with an org. or inorg. acid, and with or without the addn. of an azo dye, and drying the paper. Examples are given.

**Cinematographic films.** PALMIRE H. NICOLIC and MAURICE J. E. CLAUDE. *Fr.* 33,724, Apr. 6, 1927. Addn. to 635,828. The conducting coating of the prior patent is incorporated with an adhesive coating or varnish before its application to the film, or is deposited on such a coating applied to the film. Cf. *C. A.* 23, 1831.

**Printing title indicia, etc., on films or negatives.** SAMUEL E. KELLOGG. U. S. 1,713,360, May 21. The negative is placed with the emulsion side next to an impression of the indicia; a protecting material such as paper is placed against the negative and pressure is applied to the protecting material by means of the indicia type and with the type in register with the indicia.

## 6—INORGANIC CHEMISTRY

A. R. MIDDLETON

**Advances in inorganic chemistry since 1925.** WILHELM KLEMM. *Z. angew. Chem.* 42, 467-79, 494-501 (1929).

**The preparation of beryllium chloride from beryl.** R. W. WINTERS and L. F. YNTEMA. *Trans. Am. Electrochem. Soc.* 55 (preprint) 3 pp. (1929).—An intimate mixt.

of powdered beryl and carbon was heated in a retort to  $800^{\circ}$  in a stream of  $\text{CCl}_4$  and  $\text{Cl}_2$ .  $\text{BeCl}_2$  was condensed at a temp. above the boiling points of  $\text{AlCl}_3$  and  $\text{SiCl}_4$ . C. G. F.

**The decomposition of sodium sulfate.** GERMAINE MARCHAL. *Bull. soc. chim.* 45, 225-8 (1929).— $\text{Na}_2\text{SO}_4$  is very slowly decompd. by heat alone even at  $1300^{\circ}$ . Addn. of  $\text{SiO}_2$  or of relatively smaller proportions of  $\text{Al}_2\text{O}_3$  promotes the decompn.; the latter reaction may serve as a method of *producing alumina*. T. H. CHILTON

**Strontium thiosulfate.** R. PORTILLO. *Anales soc. españ. fís. quim.* 27, 243-50 (1929).— $\text{SrS}_2\text{O}_3$  was obtained by double decompn. of  $\text{SrCl}_2$  and  $\text{Na}_2\text{S}_2\text{O}_3$ . Recrystn. from alc. gives very pure  $\text{SrS}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$ . In the air it loses 4  $\text{H}_2\text{O}$  mols. The last  $\text{H}_2\text{O}$  mol. is not lost even on heating to  $180^{\circ}$ . It has  $d_{25} = 2.202$ .  $\text{SrS}_2\text{O}_3 \cdot \text{H}_2\text{O}$  has a  $d_4^{25} = 2.916$ , showing  $V_m$  of  $\text{H}_2\text{O} = 14.22$ . The soly. of  $\text{SrS}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$  at 0, 12.8, 27.5,  $40^{\circ}$  is 8.78, 13.82, 21.10, 26.80%, resp.; mol. heat of soln.,  $Q = -7.34$ ; for  $\text{SrS}_2\text{O}_3 \cdot \text{H}_2\text{O}$   $Q = +2.38$ . The heat of hydration of  $\text{SrS}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$ , starting from  $\text{SrS}_2\text{O}_3 \cdot \text{H}_2\text{O}$ , is  $+9.7$  cal. E. M. SYMMES

**Notes on the molybdates.** V. GÓMEZ ARANDA. *Anales soc. españ. fís. quim.* 27, 251 (1929); cf. C. A. 23, 3180.—Gray, reheated Pb molybdate had a  $d_4^{25} = 6.693$ ; E. M. SYMMES

**The tetrathionates.** I. Barium tetrathionate. R. PORTILLO. *Anales soc. españ. fís. quim.* 27, 236-42 (1929).—Very pure  $\text{BaS}_4\text{O}_{12} \cdot 2\text{H}_2\text{O}$  was obtained by the Fordos and Gelis method (*Compt. rend.* 15, 920 (1842)) by allowing I to react on  $\text{BaS}_2\text{O}_3$ .  $\text{BaS}_4\text{O}_{12} \cdot 2\text{H}_2\text{O}$  is rather stable in the air, does not lose  $\text{H}_2\text{O}$  of crystn. even if heated to  $40$ - $50^{\circ}$ , above this temp. it decomposes. Aq. solns. of  $\text{BaS}_4\text{O}_{12} \cdot 2\text{H}_2\text{O}$  are very unstable even at ordinary temp., but aq.-alc. solns. are very stable.  $\text{BaS}_4\text{O}_{12} \cdot 2\text{H}_2\text{O}$  has  $d_{25} = 2.777$ , soly.  $0^{\circ} = 26.5$ ;  $12.8^{\circ} = 29.8$ ;  $27.5^{\circ} = 36\%$ , mol. heat of soln. at  $17^{\circ}$ , 800 mol.  $\text{H}_2\text{O} = -7.00Q$ . E. M. SYMMES

**The reaction of sulfur dioxide with nitrogen dioxide.** W. MANCHOT AND H. SCHMID. *Ber.* 62B, 1261-3 (1929); cf. C. A. 21, 477.—The authors confirm the work of Briner, *et al.* (C. A. 23, 1584), that the compd.  $2\text{SO}_2 \cdot \text{N}_2\text{O}_3$  (I) is formed by the reaction of  $\text{SO}_2$  on either  $\text{NO}_2$  or  $\text{N}_2\text{O}_3$  as well as by the action of  $\text{SO}_3$  on  $\text{NO}$ . These last 2 gases first undergo an oxidation-reduction reaction. It was attempted to prove that  $\text{NOOSO}_2\text{ONO}$  first formed, 2 mols. of which then lose  $\text{N}_2\text{O}_3$  to give I. I on the heating loses  $\text{N}_2\text{O}_3$  to give  $(\text{ONOSO}_2\text{OSO}_2)_2\text{O}$ . The loss of water by 2 mols. of nitrosylsulfuric acid indicates that the chamber process is not as complicated as is believed. V. F. H.

**The preparation of hypophosphoric acid by the action of sodium hypochlorite on red phosphorus.** JOHANNES PROBST. *Z. anorg. allgem. Chem.* 179, 155-60 (1929); cf. C. A. 22, 198.—The method is a modification of Speter's method of prepg.  $\text{NaHPO}_3 \cdot 3\text{H}_2\text{O}$ . Red P is added at  $5^{\circ}$  to a soln. of  $\text{NaOCl}$  with mech. stirring. The yield is 25%. A new method of detn. of hypophosphoric acid is given depending upon the pptn. of its Ag salt and on the subsequent conversion of the latter into  $\text{AgCl}$ . EMIL KLARMANN

**The behavior of amorphous carbon and sulfur compared with the behavior of diamond and of graphite and the carbon disulfide of Ciusa.** J. P. WIBAUT AND E. J. VAN DER KAM. *Proc. Acad. Sci. Amsterdam* 32, 501-11 (1929).—See C. A. 22, 2892. E. C. M.

**The existence of an oxide of bromine.** BERNARD LEWIS AND H. J. SCHUMACHER. *Z. physik. Chem., Abt. A*, 138, 462 (1928).—When  $\text{Br}_2$  and  $\text{O}_2$  are allowed to mix in a flask, a white deposit appears on the walls of the flask, and soon thereafter an explosion destroys the app. The white deposit is thought to be an oxide of  $\text{Br}_2$ . R. J. H.

**The index of coordination in 5 hydrates.** F. SIERRA. *Anales soc. españ. fís. quim.* 27, 220-7 (1929).— $\text{ZnSO}_4 \cdot 6\text{H}_2\text{O}$  was obtained by evapn. of a cold, satd. soln. of  $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$  on a bath at  $45$ - $50^{\circ}$ . The mass of small crystals should be sepd rapidly from the mother liquor by filtering on a Schott funnel. Analysis agrees with theory. Dried by a current of very dry air,  $\text{ZnSO}_4 \cdot 6\text{H}_2\text{O}$  loses 5 mols. of  $\text{H}_2\text{O}$  even at  $50^{\circ}$ . The last mol. of  $\text{H}_2\text{O}$  is lost only above  $150^{\circ}$ .  $\text{ZnSO}_4 \cdot 6\text{H}_2\text{O}$  has a  $d_4^{25} = 2.0537$  and a mol. vol.  $V_m = 131.1$ ; therefore  $V_m = 15$  for the first 5  $\text{H}_2\text{O}$  mols. and  $V_m = 9.7$  for the other. This agrees with Moles that it is a question of a pentahydrate cation salt, the other  $\text{H}_2\text{O}$  mol. being attributed to the anion, or  $\text{Zn}(\text{H}_2\text{O})_5(\text{SO}_4 \cdot \text{OH}_2)$ . Prepn of  $\text{ZnSO}_4 \cdot 6\text{H}_2\text{O}$  by desiccation of  $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$  at  $40$ - $50^{\circ}$  is useless because  $\text{ZnSO}_4 \cdot 6\text{H}_2\text{O}$  loses 5 mols. of  $\text{H}_2\text{O}$  even at this temp. E. M. SYMMES

**The dissociation of hydrated metallic nitrates.** J. GARCÍA VIANA AND E. MOLES. *Anales soc. españ. fís. quim.* 28, 157-64 (1929).—Beyond certain limits  $\text{H}_2\text{O}$  cannot be removed from hydrated metallic nitrates without loss of  $\text{N}_2\text{O}_5$ . How far this behavior is in accord with the existence of an orthonitric acid,  $\text{H}_2\text{NO}_4$ , has been investigated in a systematic dehydration of  $\text{Co}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$  and  $\text{Ni}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$ . A  $\text{N}_2\text{O}_5$  loss is

not encountered as long as 2 mols. of  $H_2O$  are present, *i. e.*, if the compn. corresponds approx. to the ortho-acid.

**The Ditte reaction.** L. RODRÍGUEZ PIRE. *Anales soc. españ. fís. quim.* 27, 192-219 (1929).—The reaction  $5 CO + I_2O_5 = 5 CO_2 + I_2$ , used frequently to detect and oxidize traces of CO, was first proposed by Ditte (*Ann. Chim. Phys.* 13, 318 (1870)). It is proposed to call it the Ditte reaction. In spite of numerous modern articles on this reaction, there is now no quant. study of it. Also, rather contradictory data are found in the literature regarding temp. and other conditions. The reaction of very pure components was studied. The CO was made by dehydrating  $HCOOH$  by  $H_2SO_4$  in the cold *in vacuo*.  $I_2O_5$  was made by dehydrating  $HIO_3$  obtained by oxidizing I by fuming  $HNO_3$ , the only method which gives a product sufficiently stable and free from  $SO_3$  in the form of  $3I_2O_5 \cdot SO_3$ . Contrary to data in the literature, the Ditte reaction can occur even at  $0^\circ$  and is practically quant. if passage of the gas is slow enough. In desiccation of  $HIO_3$  2 periods were found at  $110^\circ$  and  $200^\circ$ , which confirms the Baxter and Tilley data (*C. A.* 3, 1124). Also, dry  $I_2O_5$ , subjected to a current of dry air, loses not exceeding 0.00006 g. per hr. Quant. oxidation of CO depends mainly upon velocity of the CO current,  $k$  being  $0.7 \times 10^{-4}$  at  $100^\circ$  and  $8.5 \times 10^{-4}$  at  $25^\circ$  and less than 3% at  $0^\circ$ . Increase in unoxidized product at low temp. can be attributed to the action of free I liberated but not entrained by the gas current, forming an insulating layer on the  $I_2O_5$ . The reaction is isothermic. Direct decompn. of  $I_2O_5$  does not take place below  $270^\circ$ . Preliminary tests to det. the  $5CO:I_2:5CO_2$  ratio give encouraging results, showing that the method can be improved.

R. M. SYMMES

**Complex salts of dimethylglyoxime.** J. V. DUBSKÝ AND FR. BRYCHTA. *Pub. Faculty Sci., Masaryk Univ., Brno* No. 103(1928); *Czechoslov. Chem. Comm.* 1, 137-54(1929).—The following new derivs. of dimethylglyoxime have been prepd. ( $DH_2$  being used as an abbreviation for  $(CH_3)_2C_2(NO_2)_2$ ):  $DH_2 \cdot NiCl_2 \cdot 2H_2O$ ,  $DH_2 \cdot NiBr_2$ ,  $(DH_2)_2 \cdot NiBr_2$ ,  $(DH_2)_2 \cdot NiI_2 \cdot I_2$ ,  $(DH_2)_2 \cdot CoCl_2 \cdot 2H_2O$  and  $(DH_2 \cdot CoDH)Cl$ . Attempts to prep. the analogous nitrates and sulfates failed, because of the decompn. of dimethylglyoxime by  $HNO_3$  and  $H_2SO_4$ . Attempts to obtain  $COCl_2 \cdot DH_2$  derivs. with  $C_2H_5 \cdot (NH_2)_2$  also failed on account of their great soly.  $DH_2 \cdot CuCl_2 \cdot xH_2O$  and  $(DH_2)_2 \cdot CuCl_2$  probably do not exist.  $CaCl_2$  and  $ZnCl_2$  do not form addn. products with  $DH_2$ . The structures of the various addn. products were explained in terms of the Werner theory.

J. H. REEDY

FOSTER, WM.: **Inorganic Chemistry for Colleges.** A Textbook for Second-Year Students. New York: D. Van Nostrand Co., Inc. 838 pp. \$3.90. Reviewed in *Chemicals* 31, No. 23, 6(1929).

## 7—ANALYTICAL CHEMISTRY

W. T. HALL

**Hydrogen assay for tin ore.** WM. H. R. ALLEN. *Mining Mag.* 40, 25(1929).—The sample is mixed with  $CaO$  and reduced with H at red heat. After cooling in H, the crucible is treated with a few drops of  $H_2O$  and 30 cc. of concd.  $HCl$  to dissolve the Sn. The Sn is then cemented on Al ribbon and the resulting sponge of Sn and Al redissolved in  $HCl$ . The flask is filled with  $CO_2$  and titrated with a standard I soln. W, Sb, Bi, Cu and As must be removed before titration, if present.

A. BUTTS

**The determination of minute quantities of iodine.** E. GLIMM AND J. ISENBRUCH. *Biochem. Z.* 207, 368-76(1929).—A special app. has been designed for the detn. The substance to be analyzed is placed in a glass-stoppered flask into which a separatory funnel is fused, discharging its contents at the bottom of the flask. Through a side arm it communicates with a special absorption bottle contg. 2%  $KOH$ . A current of air is passed through the entire app., which is at first taken through 2 wash bottles filled with glass wool soaked in  $KOH$ . The flask is suspended in a paraffin bath. The temp. is brought up to  $40-60^\circ$  when 20-25 cc. concd.  $H_2SO_4$  per g. of substance is allowed to run in from the separatory funnel, then 30%  $H_2O_2$ . This generates a very vigorous reaction and the temp. rises to  $90^\circ$ . The addn. of  $H_2O_2$  must be carefully controlled so as to insure a uniform evolution of gas. The air is now drawn slowly through the app. and the temp. of the bath is raised to  $220-230^\circ$ . The distn. is continued for about an hr. The alk. contents of the absorption bottle are evapd. to dryness in a Pt dish. In the method proposed, so little volatile fatty acid is formed and absorbed by the  $KOH$  that the removal of their soaps is easily attained by gentle heating of the dry residue. Or a more complete removal is effected by dissolving the residue after the incineration in

a few drops of  $H_2O$ , evapg. to dryness and heating once more to a dull redness. The residue upon cooling is now extd. with a few cc. of alc. The alc. is evapd. in a small porcelain dish on a water bath. The small residue of salt is transferred with a few cc. of  $H_2O$  to a 30-cc. crucible, acidified with  $HCl$  and treated with a few drops of  $Br_2$  water. It is heated, then, to insure that every trace of free  $Br_2$  is driven off, whereby the vol. is reduced to 1-2 cc. Upon the addn. of a tiny grain of  $KI$  the soln. is titrated with a freshly prepd. 0.002 or 0.001  $N Na_2S_2O_3$ . S. MORGULIS

Two new methods for the volumetric estimation of combined iodine. FRANZ VIEBÖCK. *Pharm. Monatsh.* 10, 59-63(1929).—The methods now commonly used in the volumetric estn. of iodides are discussed in considerable detail, as also 2 procedures involving, in principle, titration of the properly dild. and measured iodide in  $H_2O$  with  $Br$  aq. in the presence of  $CCl_4$ , whereby all the iodide is finally converted into iodate, then titration of the pptd.  $I$  with 0.1  $N$  thiosulfate after addn. of  $KI$  and  $AcOH$ . W. O. E

Shortening the time of nitrogen determinations by the use of the grid burner. H. D. SPEARS AND W. G. TERRELL. *J. Assoc. Official Agr. Chem.* 12, 250-1(1929); cf. Shedd, C. A. 22, 202.—With  $Cu$  as catalyst and natural gas as source of heat, Kjeldahl digestion of materials such as feeding stuffs required only 1.5 hrs. with a grid burner (Fischer), instead of 3 hrs. required with a Bunsen burner. A. PAPINEAU-COUTURE

Progress in analytical chemistry of metals during 1926. HENRYK WDOWISZEWSKI *Przemysl. Chem.* 13, 53-60(1929).—A review with bibliography of new methods for  $Sb$ ,  $As$ ,  $Be$ ,  $Cr$ ,  $Sn$ ,  $Zn$ ,  $Al$ ,  $Cd$ ,  $Mn$ ,  $Cu$ ,  $Mo$ ,  $Ni$ ,  $Pb$ ,  $Hg$ ,  $U$ ,  $V$ ,  $W$  and  $Fe$ . A. C. Z.

Determination of small quantities of the free and organically combined carbon in an inorganic substance. DRAGUTIN STROHAL. *Archiv. chem. farm.* 3, 63-71 (71-2, in German) (1929).—For the detn. of  $C$  in soil it is recommended to heat 5-10 g. of  $H_3PO_4$ -treated and air-dried substance in a combustion tube contg.  $KClO_3$  and  $MnO_2$  mixt. (1:2), (to furnish  $O_2$ ), an asbestos plug, coarse  $CuO$  and another plug. Directions for properly regulating the  $O_2$  supply and for carrying out the method are given in detail. J. K

The separation of ruthenium and osmium and the use of benzene in the iodometric titration of osmium. SHŌICHIRO SAITŌ. *Bull. Inst. Phys.-Chem. Research* (Tokyo) 8, 164-79(1929); *Abstracts* 2, 23-5. (In English).—Expts. on the sepn. of  $Os$  and  $Ru$  either alone or with other metallic elements have shown that:  $Os$  distills off completely on boiling a sample with  $HNO_3$  stronger than 6  $N$  if the element is present in a form sol in  $HNO_3$ . By the same treatment  $Ru$  behaves variously on distn. according to how the element is present: (a) no  $Ru$  distils from the soln. of the sulfide in aqua regia; (b) a little  $Ru$  distills from a distillate of  $RuO_4$  obtained by distg. with  $Cl_2$ , receiving in  $HCl$  and  $EtOH$ , and evapg.; (c)  $Ru$  can be distd. more completely from the melt obtained by fusing with  $Na_2O_2$  and leaching with  $H_2O$ .  $Os$  distills completely, but  $Ru$  does not at all, on boiling a  $HCl$ -soln. of about 1  $N$  in  $HCl$ , which has been made by acidifying (a) an alk. soln. contg. the distillate from the  $HNO_3$  distn. described above, or (b) an aq. soln. of the mass resulting from the fusion with  $Na_2O_2$ . The latter soln. must, however, be allowed to stand for at least a few mins. before boiling, after it has been acidified with  $HCl$ ; otherwise, a very small quantity of  $Ru$  may distil from the soln. For the detection and estn. of a small quantity of  $Os$ , the color of the  $NaOH$  soln. in the receiver in the distn. with  $HCl$ , or the ppt. produced by  $H_2S$  from hot soln. in a pressure bottle, is far more reliable and accurate than those ppts. produced in the same  $NaOH$  soln. mentioned above by means of  $HCl$  and  $H_2S$ , or  $HCl$  and  $Na_2S_2O_3$ . For the same purpose with regard to  $Ru$ , the ppt. produced by  $H_2S$  from hot soln. in a pressure bottle, or the color produced by  $RuO_4$  either in aq.  $NaOH$  soln. or in a mixt. of  $HCl$  and  $EtOH$ , is more reliable and accurate than the color produced in the soln. of  $Ru$  salt by means of  $KCNS$ , or  $NH_4OH$  and  $Na_2S_2O_3$ , or  $KNO_3$ ,  $EtOH$  and  $(NH_4)_2S$ . In the iodometric titration of  $Os$  described by Klobbie, the end point of the reaction between  $I_2$  and  $Na_2S_2O_3$  is very hard to observe exactly by using starch soln. as outside indicator. Benzene alone has been found to be suitable as inside indicator, by means of which the end point can be accurately observed. G. CALINGAERT

Methods for determining silicon in steel, pig iron and the ferrosilicons. R. P. HUDSON. *Heat Treating and Forging* 15, 446-7(1929); cf. C. A. 22, 1746.—A review. E. H.

Tin assay. H. R. BERINGER AND A. F. H. STEPHENS. *Mining Mag.* 39, 360-1 (1928).—Improvements in the Beringer method of reduction of  $Sn$  from its oxide by  $Zn$  vapor are described. A. BUTTS

A simple and reliable test for tinstone. H. V. ELLSWORTH. *Can. Mining J.* 50, 354(1929).—The test described is based on the fact that  $Sn$  oxide in contact with  $Zn$ , which is being acted on by acid, is reduced to metallic  $Sn$ . Common sheet  $Zn$  can be



used, and the acid may be  $\text{HCl}$  or  $\text{H}_2\text{SO}_4$ , preferably the former, because it attacks  $\text{Zn}$  readily in the cold. Common solid acids such as tartaric, citric and oxalic acids attack  $\text{Zn}$  slowly. The test is not quant. E. I. S.

**The determination of iodoform.** ADOLF JÁNSKÝ. *Časopis Českoslov. Lékařnictva* 8, 215-21(1928).—For the detn. of  $\text{CHI}_3$ , J. recommends the volumetric method of Gane and Webster (*C. A.* 3, 1669) based on the sapon. of  $\text{CHI}_3$  with  $\text{NaOH}$  and on the titration of the iodide formed by Volhard's method, taking precautions against the presence of  $\text{Cl}^-$  in the  $\text{NaOH}$ . Another method, which is also suitable for the analysis of gauze contg.  $\text{CHI}_3$ , depends on the reduction of  $\text{CHI}_3$  by  $\text{Zn}$  in a satd. alc. soln. of  $\text{NaOH}$  at an elevated temp. and on the potentiometric titration of the iodide formed. Although the method just described is more precise, J. has recommended for the pharmacopeia a simpler method based on the direct reaction between  $\text{CHI}_3$  and  $\text{AgNO}_3$  in alc. soln. in the presence of  $\text{HNO}_3$ . WILLIAM J. HUSA

**The volumetric determination of phosphoric acid.** WM. H. ROSS. *J. Assoc. Official Agr. Chem.* 12, 170-6(1929); cf. *C. A.* 22, 2433.—Collaborative investigation of the effects of sulfates on the detn. of  $\text{P}_2\text{O}_5$  (pure  $\text{KH}_2\text{PO}_4$  and standard Tennessee phosphate rock were used) by the volumetric method confirmed the view that the presence of  $\text{SO}_3$  seriously interferes when pptn. is made at  $45-50^\circ$ , giving results that are too high, but that the interference is slight when pptn. is made at room temp. with stirring. As the rate of pptn. and compn. of the phosphomolybdate ppt. vary with the temp. of the soln. to which the molybdate is added, a temp. of  $30^\circ$  should preferably be adopted. A. PAPINEAU-COUTURE

**Separation of silver chloride, bromide and iodide.** Application to the determination of bromides, mixtures of chlorides and bromides and of mixtures of chlorides, bromides and iodides. H. LESTRA. *Bull. sci. pharmacol.* 36, 209-21(1929).—In 100 cc. of a soln. contg. 0.80 g.  $\text{NH}_3$  it is possible to ppt. the bromides as  $\text{AgBr}$  while the chlorides remain in soln. In a soln. contg. 60 cc. of official  $\text{NH}_3$  in 100 cc.,  $\text{AgI}$  is pptd., without including  $\text{AgBr}$ . For the titration of the halogens the method of Denigès with a soln. of  $\text{AgNO}_3$  in  $\text{KCN}$  is used. For bromides alone, dissolve 1 g. and fill to 100 cc.; take 10 cc., add 4 cc. of  $\text{NH}_3$ , and  $\text{H}_2\text{O}$  to make about 80 cc. Add 10 cc. 0.1  $N$   $\text{AgNO}_3$ . Fill to 100 cc. Shake and filter; take 50 cc., add 5 cc. 0.1  $N$   $\text{KCN}$ , some drops of  $\text{KI}$  soln. and titrate with 0.1  $N$   $\text{AgNO}_3$  until a persistent turbidity appears. In a mixt. with chloride det. first the  $\text{Cl}$  and  $\text{Br}$  by Mohr's method. Then proceed as for  $\text{Br}$  alone. In a mixt. of chlorides, bromides and iodides use Mohr's method first. Use the method as for bromide alone, maintaining the  $\text{NH}_3$  content at 0.80%. This gives  $\text{Br}$  and  $\text{I}$ . The same process with a soln. contg. 60% of official  $\text{NH}_3$  gives  $\text{I}$ . A. E. M.

**Report on (the analysis of) caustic poisons.** C. M. SMITH. *J. Assoc. Official Agr. Chem.* 12, 141-4(1929).—The Chapin method (*C. A.* 14, 2772) was found satisfactory for the detn. of phenol in such products as sapond. cresol solns., coal tar dips, disinfectants, fly sprays, etc. The results, however, are about 10% lower than the theoretical. A. PAPINEAU-COUTURE

**Accidental poisoning by hydrocyanic acid.** E. KOHN-ABREST. *Ann. méd. légale criminol. police sci.* 9, 132-5(1929).—In cases of death by  $\text{HCN}$ , the latter very rapidly disappears. It is frequently, but by no means always, partially converted during putrefaction into stable thiocyanates, from which the  $\text{HCN}$  can be regenerated and identified and detd. The results of several post-mortem examns. carried out 4-15 days after death gave 0-0.75 mg. "free"  $\text{HCN}$  and 0-4.15 mg. combined  $\text{HCN}$  in the viscera. As  $\text{HCN}$  is destroyed in the course of its action on the organism, it cannot be detected unless the amt. absorbed is greater than the lethal dose. A. P.-C.

**The use of organic reagents for the identification of cations.** ARMANDO NOVELLI. *Rev. Jurm.* (Buenos Aires) [2], 2, 108-20(1929).—A complete survey is given of the reaction of metals with org. substances suitable for qual. or quant. analytical use. A. E. MEYER

**Notes on some tests for acetone and aldehyde.** HENRY LEFFMANN. *Am. J. Pharm.* 101, 337-40(1929).—A review and discussion of proposed tests for acetone and aldehyde (cf. *C. A.* 12, 2180; 15, 1324; 18, 879; 19, 1877; 21, 721). Many of the descriptions of tests for acetone and aldehyde make no mention of interferences, especially no statement whether aldehyde masks or simulates acetone, and similarly with the tests for aldehyde. A study was made of some recently proposed procedures to det. whether simulation also occurs, since several of the familiar tests for one of these give similar results with the other. As a result of these trials, it seems that the newer reagents have no great advantages either for delicacy or certainty. The alkali-vanillin test is quite sufficient for routine clinical work, and salicylaldehyde is even more delicate. W. G. GAESSLER

**Studies on methods. IX. Combined determination of halogens in organic substances.** LUDWIG PINCUSSEN and WADIM ROMAN. *Biochem. Z.* 207, 416-25(1929); cf. *C. A.* 21, 3920.—The dry substance is fused in a Ni crucible with five times the quantity of KOH, whereby the org. matter is all destroyed and all halogen is converted to K salts. The fused mass is leached with  $H_2O$  and the KI is extd. with alc. after evapn to dryness. After removing the alc., the residue is acidified with  $HNO_3$  and with  $KMnO_4$ , the traces of org. matter are oxidized and the iodide is changed to iodate. The  $HNO_3$  is boiled off, the residue dissolved in  $H_2O$  and decolorized with charcoal. The clear filtrate is treated with HCl, KI and starch, the liberated  $I_2$  being titrated with 0.001-0.002  $N Na_2S_2O_3$ . The residue after the alc. extn. is dissolved in  $H_2O$  and transferred to a 50-cc. flask. The  $Br_2$  is detd. by setting it free with  $H_2O_2$ , acidifying with  $HNO_3$  and extg. it with  $CHCl_3$  by shaking. The  $CHCl_3$  ext., washed with ice-cold NaCl soln. to remove every trace of oxidizing substance, is treated with KI, and the amt of  $I_2$  set free by Br is detd. by thiosulfate titration. The Br and Cl contents of the soln. are detd. by the regular Volhard titration, the Cl being calcd. by subtracting the Br value from the Br + Cl combined value. The method yields quick and accurate results. S. MORGULIS

**Report on chemical methods for reducing sugars.** R. T. JACKSON. *J. Assoc. Official Agr. Chem.* 12, 166-9(1929); cf. *C. A.* 22, 2529.—The time consumed and troubles caused by neutralizing the soln. with  $NH_3$  in the detn. of Cu by the  $Na_2S_2O_3$  method are very readily overcome by neutralizing with NaOH to a faint turbidity of  $Cu(OH)_2$  and then clearing by adding 1-2 drops AcOH. In the Lane and Eynon volumetric method, with methylene blue as internal indicator, it was found that variations of as much as 2 mins. from the normal boiling period produced almost negligible variations in the titration results; in the titration, instead of adding the sugar soln. in 10-cc. portions, as specified in the A. O. A. C. method, which tends to cause the analyst to overrun the end point, equally accurate results can be obtained by adding the sugar soln. rapidly in indefinite vols. in the usual manner of titration until the faintest perceptible blue remains, then adding the indicator and completing the titration. It was found that Nyns' method for the detn. of levulose (*C. A.* 19, 1236) is not perfectly selective, 13 mg. of dextrose pptg. the same wt. of Cu as 1 mg. of levulose; the detn. of the dextrose correction for an unknown mixt. involves a complicated and laborious calcn. for neither dextrose nor levulose can be detd. until both are known simultaneously, but it has been found possible to construct a "nomogram" from which the ratio of levulose to total sugar can be read directly, and which will soon be published in the *Bur. of Standards J. of Research*. A. PAPINEAU-COUTURE

The Ditte reaction (PIRE) 6. The recovery of pyridine and phenol from raw C.H. (PIETERS, MANNENS) 21. The use of vitrified silica apparatus for the determination of metals as sulfates (GUNTZ, BARBIER) 1.

JANDER, G. AND PFUNDT, O.: Die chemische Analyse. XXVI. Die visuelle Leitfähigkeitstiteration und ihre praktischen Anwendungen. Stuttgart: Ferdinand Enke. 64 pp. 9s. Reviewed in *Analyst* 54, 310(1929).

## 8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY AND J. F. SCHAIRER

**An investigation into the piezoelectric effect of diamond.** W. A. WOOSTER. *Mineralog. Mag.* 22, 65-9(1929).—This investigation employed 2 diamonds flattened parallel to an octahedron face and a force of 300 g. derived from magnetic attraction. The results show that the effect, if any, is within the limit of error of the expt. and less than  $1/200$  part of that of quartz cut perpendicular to an elec. axis. W. F. HUNT

**The so-called "thermokalite" and the existence of sodium bicarbonate as a mineral.** F. A. BANNISTER. *Mineralog. Mag.* 22, 53-64(1929).—Saline incrustations collected 40 years ago about 9 miles west of Naples and provisionally labelled "thermokalite" have been shown by recent investigations to consist of a mixt. of trona, thermohalite, thenardite and free  $NaHCO_3$ . No K salts are present. The  $NaHCO_3$  constitutes over 20% of the mass and the name *nahcolite* ( $NaHCO_3$ -lite) is suggested for it. W. F. HUNT

**The structure of boracite.** JOHN W. GRUNER. *Am. J. Sci.* 17, 453-60(1929); cf. *C. A.* 23, 795.—Data from oscilation spectrograms show that the unit cell of boracite

is base-centered orthorhombic with  $a_0 = b_0 = 16.97$  A. U. and  $c_0 = 12.00$  A. U. for colorless crystals. The unit cell contains 8 mols. of  $Mg_2Cl_2B_{14}O_{28}$ . The space group is probably  $C_{2v}^{11}$ , although  $C_{2v}^{12}$  could not be eliminated with certainty. R. J. H.

**Ben Nevis, Munro, Kamiskotia and other base-metal areas, Districts of Cochrane and Timiskaming.** T. L. GLEDHILL. *Rept. Ontario Dept. Mines* 37, Pt. 3, 1-52 (1928).—Sulfide replacement ores carrying Cu, Au, Ag and Zn were noted, similar to those in Quebec. Rocks and geological structures were also found to be alike. An ore-body of fairly good size has already been proved on Hollinger claims in Kamiskotia; additional finds of Cu, Pb and Zn are to be expected. E. I. S.

**Primary platinum deposits.** A. ZAVARITSKII. *Mining Ind. Mag. S. Africa* 7, 503-4, 547-50 (1929).—General geological conditions of platiniferous zone of Urals are outlined and the origin of the dunite complex is discussed. The dunite core is regarded as a product of solidification of liquid dunite magma, in the lower part of which Pt was localized. The distribution of Pt in the Nijni-Tagilsk dunite massive is discussed. The Pt is always associated with chromite; the types of Pt metals in the deposit are noted and a comparison of Russian and Transvaal deposits is made. E. I. S.

**Certain lead-zinc deposits in the district of Algama.** M. E. HURST. *Rept. Ontario Dept. Mines* 37, Pt. 3, 68-78 (1928).—A description of Vacheresse, Kirby-Legge, Victoria, Cascade and Kozak properties; while ore has not been developed on a com. scale, showings warrant further investigation. E. I. S.

**Lead-zinc ore deposits in the Save basin faults of Litiya type.** A. TORNUST. *Berg u. Huttenmann. Jahrb.* 77, No. 1, 1-27 (1929).—Detailed description of geology and mineralogy of Pb-Zn deposits in northwestern Yugoslavia. Genesis of the deposits and comparison with similar deposits in Eastern Alps are discussed. E. I. S.

**The Manitoba tin discoveries.** R. C. ROWE. *Can. Mining J.* 50, 284-5 (1929).—Brief account of tin ore occurrence at Shatford Lake and later discovery at Bernice Lake. Cassiterite is distributed irregularly in feldspathic pegmatite dikes; commercial ore-body is not proven. E. I. S.

**The bauxite deposits of the Rhone Delta.** V. CHARRIN. *Génie civil* 94, 258-60 (1929).—Maps and description of geological features. E. I. S.

**Government potash exploration in Texas and New Mexico.** G. R. MANSFIELD AND W. B. LANG. *Am. Inst. Mining Met. Eng., Tech. Pub.* No. 212, 17 pp. (1929).—A preliminary account of work done by the U. S. Geological Survey and Bur. of Mines. The Permian salt basin, salt accumulation therein, conditions affecting selection of drilling sites, N. Mex. and Tex. core tests and private exploration stimulated by government and state activity are discussed. The principal economic data relating to the 10 test wells are tabulated and indicate that at least 2 have beds of polyhalite sufficiently rich and thick to suggest com. exploitation, and 2 others offer com. possibilities. W. H. BOYNTON

**The salt deposits of the northeast bench of the Mansfelder basin found on opening the Wils, Johannashall and Salzünde potash mines.** ERICH MÜLLER. *Kali* 23, 57-9, 74-6, 89-92, 102-9 (1929).—Salts corresponding to the order of deposit of the Stassfurt profile are not found here in their primary, petrographic formation, but are almost wholly recrystd. as they were covered in the Mesozoic era, heated and altered chemically. They could not have sepd. from normal sea water. The original solns. must have had high concns., since the present geological profile of the K deposits does not correspond to the van't Hoff and Jänecke law of mass action. The Ca salts have sepd. mainly as anhydrite and not as gypsum. The Everding, Naumann, Rózsza and Seidl theories of rock salt formation must be abandoned from petrographic findings of a geological and physico-chem. standpoint. E. M. SYMMES

**The relation of chemical composition to texture of groundmass in siliceous lavas.** HOWARD A. POWERS. *J. Geol.* 37, 268-71 (1929).—Siliceous lavas show 2 types of groundmass textures, either rhyolitic with spherulitic, granophyric, or microgranulitic assemblages of quartz and feldspar, or felted masses of tabular crystals characteristic of trachytes. A study of 50 siliceous lavas showed that rocks with more than 26% of quartz in the norm showed rhyolitic, those with less, trachytic texture. W. F. H.

**A composite stock at Snowbank Lake in northeastern Minnesota.** C. W. SANDERS, JR. *J. Geol.* 37, 135-49 (1929).—The composite stock is made up of 3 syenite masses differing slightly in age, intruded by granite. The differentiation is not due to assimilation or to desilication of digested limestone but to gravitative differentiation in the magmatic reservoir. The basic border phases approach the compn. of the early magma. W. F. HUNT

**The mode of origin of a reaction porphyry dike at Cornucopia, Oregon.** G. E. GOODSPED. *J. Geol.* 37, 158-76 (1929).—A stock of quartz diorite intruded a felds-

pathic schist forming a breccia. The foreign fragments reacted with the magma producing plagioclase of labradorite compn. with a sodic rim. Other changes in the siliceous magma involve biotite replaced by hornblende. The syntectic magma produced through chem. reactions was drawn off into a fissure-like mass forming a "reaction porphyry." W. F. HUNT

The stock of alkaline rocks near Libby, Montana. ESPER S. LARSEN AND J. T. PARDEE. *J. Geol.* 37, 97-112(1929).—The stock is composed largely of pyroxenite rich in apatite, which was the earliest of the intrusive bodies. Magnetite, garnet and biotite are also present. Locally, the rock is nearly pure biotite, now altered to vermiculite. The pyroxenite was followed by syenite and nephelite syenite. These in turn were followed by small dikes of granite. Hydrothermal action has altered the pyroxenite to fibrous hornblende, the nephelite to muscovite, zeolites, or albite, and has introduced considerable aegirite and titanite. Analyses are recorded for pyroxenite, biotite and nephelite syenite. W. F. HUNT

The tholeiite dikes of the north of England. A. HOLMES AND H. F. HARWOOD. *Mineralog. Mag.* 22, 1-52(1929); cf. *C. A.* 23, 66.—A study of certain intrusive rocks composed of basic plagioclase, pyroxenes, titaniferous magnetite and olivine with interstitial glass. Five major types are described with anorthite-bearing varieties of each. Chem. and mineral analyses are given and it is concluded that the different types of tholeiites cannot be explained on the basis of differentiation by crystn. and sepn. of the residual liquid. W. F. HUNT

Altered tuffs in the Ordovician in Minnesota. VICTOR T. ALLEN. *J. Geol.* 37, 239-48(1929).—A soft gray shale 3 in. thick interbedded with limestone near the base of the Decorah represents an altered tuff. It consists of montmorillonite retaining the structure of pumice. Other minerals include sanidine, quartz, biotite, apatite and zircon. It resembles the Ordovician bentonite of Kentucky and Tenn. with which it has been correlated. W. F. HUNT

Two [mineralogical] notes from Bohuslän. IVAR D. WALLERUS. *Geol. Fören. Förh.* 51, 100-4(1929).—(1) Blocks of limestone found at Tärnskar are different from all other limestones found in Scandinavia but similar to those found around the Mediterranean. It is supposed that they were used as ballast in some early Roman ship which was shipwrecked here. (2) A reddish boulder found at Styrsö turns out to be meteoric. W. SEGERBLÖM

A comparative study of different types of thermal stratification in lakes and their influence on the formation of marl. F. M. KINDLE. *J. Geol.* 37, 150-7(1929).—The relatively low temp. of the upper zone in the Great Lakes and in high mountain lakes (above 5000 ft. in southern Canada) prevents the development of the thin zone of warm water nearly satd. with  $\text{CaCO}_3$ , which is essential to marl deposition. W. F. HUNT

The first rains and their geological significance. ASSAR HADDING. *Geol. Fören. Förh.* 51, 19-29(1929).—A survey of the problems connected with the first condensation of water on the earth shows that these are astronomical, geophysical, geochemical, geological and biological. The influence of water on erosion, on the chem. sorting of material, on cementation and on the formation of sedimentary rocks shows that the first condensation of atm. water marks the boundary between 2 important periods of the earth's history,—the pre-aquatic time and the historic time. Conclusion: The leptite formation contains the oldest sediments of the earth, formed in connection with the first condensation of water. W. SEGERBLÖM

DUNN, E. J.: *Geology of Gold*. London: Chas. Griffin & Co. 469 pp. \$10. Reviewed in *Eng. Mining J.* 127, 928(1929).

KOBER, L.: *Der Bau der Erde*. 2nd ed., revised. Berlin: Verlag Gebrüder Borntraeger. 500 pp. M. 30.

WONG, WM. A.: *Mineral Wealth of China*. Shanghai: The Commercial Press, Ltd. 129 pp.

## 9—METALLURGY AND METALLOGRAPHY

D. J. DEMOREST AND R. H. ABORN

Progress and investigations in the preparation and working of metals in 1928. E. FISCHER. *Metallbörse* 19, 426-7(1929).—A review. W. C. EBAUGH

X-ray spectrography in metallurgy. J. LAISSUS. *Tech. moderne* 21, 161-5, 197-203 (1929).—A review. P. THOMASSET

**Principle, organization and results obtained in the working of a plant for the separation and concentration of ores by flotation.** CH. BERTHELOT. *Chimie & industrie Special No.*, 190-204 (Feb., 1929).—A general discussion. A. PAPINEAU-COUTURE

**Selective flotation plant of Potosi Industrial Co.** J. HORCASITAS. *Bol. minero* (Mexico) 27, 27-33 (1929).—The ore treated is chiefly from Potosi mine with 300 g. Ag per ton and 9.2% each of Pb and Zn. The plant and treatment are described and analyses of concentrates produced are given. E. I. S.

**Working low-grade copper ores by leaching or flotation.** FRIEDR. VOGEL. *Metall-horse* 19, 537-8, 705-6 (1929).—A survey of the present state of the art of Cu extn. from low-grade ores, with data from 11 well-known mining districts. W. C. EBAUGH

**Gravity concentration of Alabama öolitic iron ores.** F. D. DE VANEY, B. W. GANDRUD AND W. H. COGHILL. *Bur. Mines, Repts. of Investigations No. 2937*, 7 pp. (1929).—Employing gravity concn. to the öolitic ores results in the removal of siliceous gang, leaving the hematite as rich high-grade "slime" and as clean granular grains. The "slime concentrate" is recovered by desliming processes, and the öolitic grains and granular hematite are recovered by tables. A rubber-covered rod is used in an ordinary rod mill and acts as a sheller, which liberates the Fe and leaves the öolitic quartz grains unbroken. The öolitic grains are polished by the rubber-covered rods and are rejected by tabling. Tabling recovers the clean hematite, which is too coarse to overflow the desliming devices. A flowsheet is shown for the closed-circuit performance. Lab. results indicate that operating costs for 2000 tons per day should not exceed 40¢ per ton (909 kg.) milled. This figure includes dry crushing, dewatering, filtering the concentrate and disposing of the tailing; it is cheaper than magnetic log washing. The grade of concentrate is nearly as good but the recovery is not as high as in the magnetic process. A typical unit or section consisting of a rod mill, a drag deslimer, a 10-spigot classifier and 10 tables, would take 12 tons (10,909 kg.) per hr. of mill feed, yielding 8.7 tons of concentrate contg. 47.6% Fe, 14.2% SiO<sub>2</sub> and 5.5% CaO. The results were successful on four of five ores examd., the failure being on a slate-bearing ore.

W. H. BOYNTON

**Factors governing the entry of solutions into ores during leaching.** JOHN D. SULLIVAN, WALTER E. KECK AND GEORGE L. OLDRIGHT. *Bur. Mines, Tech. Paper 441*, 38 pp. (1929).—Expts. indicate that surface tension is not the governing factor. Although the surface tension has been lowered to  $\frac{1}{3}$  the value for water with Na oleate, the rate of penetration was practically unchanged. Poiseuille's law is also not the governing factor. The soly. of the gas within the rocks in the penetration liquid is the factor that detcs. the rate of ingress of solns. When air was displaced by SO<sub>2</sub>, 95% of the total penetration took place in 4 to 9 hrs., whereas it took distd. water approx. 60 hrs. to attain the same % penetration when voids of the same size and kind were filled with O. It took 120 hrs. for 5% CuSO<sub>4</sub> soln. to penetrate voids filled with air. The time needed increases with the size of the particle. This suggests the possible advisability of finer crushing of the ore before it is put on the heaps or of blasting directly to the desired size. The interest on the money from the extra Cu extd. in the shortened time would amply pay crushing or blasting costs. If waste gases are allowed to enter heaps and to displace the air before water is added, the solns. should penetrate more rapidly. Such gases would also help dissolve the Cu minerals present. H. C. P.

**Beneficiation of oxidized manganese ores by magnetic separation of roasted jig concentrates.** F. D. DE VANEY AND W. H. COGHILL. *Bur. Mines, Repts. of Investigations No. 2936*, 4 pp. (1929).—Tests on a variety of Mn-Fe ores show that some of them are amenable to magnetic sepn. after a short roast. The P and insol. are locked more with the Fe than with the Mn. The results of roasting and magnetic sepn. of a Tennessee concentrate, a Georgia concentrate and a Virginia concentrate are tabulated. When the impurities of some of the oxides of Mn are carried as a phys. mixt. with Fe-oxide grains, a reducing roast will magnetize the Fe oxide, permitting removal by a low-intensity magnet and leaving a clean concentrate of Mn ore. Thus, some ore contg. too much Fe to make ferromanganese may be brought to the ferrograde. W. H. BOYNTON

**Utilization of burnt pyrites as an iron ore.** C. FICALI. *Giorn. chim. ind. applicata* 10, 511-21 (1928); cf. C. A. 23, 359.—A description is given of the plant and method used by the Montecatini Co. at Porto Maghera, where burnt pyrites is used for the prepn. of about 400 tons per day of agglomerated ore, mostly utilized by the Fe industry. The agglomeration of finely divided Fe ore, in particular of burnt pyrites, by the briquetting process consists in heating the material, previously compressed into blocks, to about 1350°. The various hypotheses advanced in explanation of the changes taking place, viz. (1) formation of silicates in the fused and solid states, (2) semi-fusion (sintering) of the Fe oxides and (3) recrystn. of these oxides, are examd. Hypothesis

(1) is excluded as a result of microscopical examn. and in virtue of the possibility of agglomerating pure  $\text{Fe}_2\text{O}_3$ , and (2) by reason of the difference between the m. p. of the oxides (about  $1550^\circ$ ) and the actual temp. of agglomeration, which in certain circumstances can be effected even at about  $1200^\circ$ . The exptl. results favor hypothesis (3), and it appears that the red, earthy hematite contained in the burnt pyrites is transformed by the heating into a black, cryst.  $\text{Fe}_3\text{O}_4$ , magnetite being formed as an intermediate product possessing catalytic properties. B. C. A.

**Precipitation of lead and copper from solution on sponge iron.** G. L. OLDRIGHT, H. E. KEYES, VIRGIL MILLER AND W. A. SLOAN. *Bur. Mines, Bull.* 281, 128 pp. (1929).—Vigorously stirred solns. should be heated to  $60^\circ$  to ppt. the Pb in less than 1 hr. If stirred too vigorously particles of sponge Fe more thickly coated with Pb were observed to "ball." Freedom from "balling" was insured by slowly rabbling sponge Fe downward over a series of superimposed trays in a cylindrical tank and by allowing the pregnant soln. to flow upward countercurrently against the passage of the Fe. Products contg. over 80% Pb were made; the liquors running from the machine were barren of lth. To ppt. Cu an excess of 7.5% metallic Fe over the chem. equiv. was usually sufficient. Whether sponge Fe was added in stages or all at the start made little difference. The temp. increased very rapidly as the Cu was pptd. and was difficult to control. Often over 80% of the metal was replaced in 2 to 4 mins. An increase in acidity decreased the rate of Cu pptn. in the richer Cu solns. but increased it in the poorer solns. with 7.5% excess Fe. Where the resoln. of the Cu on account of the admission of air was not serious, the metal could be pptd. almost completely in 15 to 25 mins. with 7.5% excess sponge Fe. H. C. PARISH

**Solution of various oxidized copper minerals.** JOHN D. SULLIVAN. *Bur. Mines, Repts. of Investigations* No. 2934, 9 pp. (1929).—Approx. 100% of Cu in Cu-Azurite, Malachite, Chrysocolla and Tenorite is sol. in  $\text{H}_2\text{SO}_4$  or in acidified  $\text{Fe}_2(\text{SO}_4)_3$  solns. In 1 or 2% neutral  $\text{Fe}_2(\text{SO}_4)_3$  the soln. is slower, but in nearly every instance the minerals are completely decompd. in 24 hrs. or less. Soly. in 5% neutral  $\text{Fe}_2(\text{SO}_4)_3$  is about the same as that in  $\text{H}_2\text{SO}_4$  or in acidified  $\text{Fe}_2(\text{SO}_4)_3$ . Chrysocolla is often said to be insol in  $\text{H}_2\text{SO}_4$  or in ferric Fe solns. Such insol. silicates of Cu are probably Diopbase. H. C. PARISH

**Develops rapid method for determining clay in foundry sands.** H. L. CAMPBELL. *Foundry* 57, 412-3 (1929).—The material designated as clay consists of those particles which remain in suspension in water and which may be washed from the sand. The tentative method of the Am. Foundrymen's Assoc. for grading sands according to their clay content is long and tedious. The proposed rapid method: 100 g. of dry sand and 50 cc. of 1% NaOH soln. are placed in a 2000 cc. washing flask and the flask is clamped in the app., which is mounted on a wooden stand. The steel frame mounted on this base may be tilted and clamped in any position and to it are attached a small motor and a speed reducer. A cast-Al bolt is bolted fast to the slow-motion shaft of the speed reducer. The alkali deflocculates the clay from the grains and throws it into colloidal suspension, thus facilitating the washing. Details of the app. are shown in plan and elevation, and the complete mounted app. is illustrated. The sand grains are ground by the rotation of the washing flask for 5 mins. Washing is continued until the wash water in the sand trap is clear. W. H. BOYNTON

**Technology of the platinum metals.** OTTO FREUSSNER. *Metallwirtschaft* 7, 469-70 (1928).—The Pt group, including Pd, Rh, Ru, Ir, Os, is discussed as to chem. properties, m. ps., phys. properties and mech. characteristics. The sepn. of each element from the others is discussed, as well as a no. of the alloys of Pt. C. L. MANTELL

**Cadmium in 1927.** PAUL M. TYLER. *Bur. Mines, Mineral Resources of the U. S.* 1927, Part I, 323-39 (preprint No. 14 published March, 1929). E. H.

**Melting aluminum.** J. BALLY. *Rev. Aluminium* 4, 442-7 (1927); *J. Inst. Metals* 39, 661.—It is shown that about 70 kw. hr. of energy should, under good conditions, be required to melt 100 kg. of Al. Figures for the fuel consumption and melting costs are given for 4 types of furnaces: the reverberatory, heavy oil-fired reverberatory, coke-fired pot furnace, and producer-gas-fired pot furnace. A note is added on the use of elec. furnaces. H. L. D.

**Sorting red metal turnings and waste.** EDMUND R. THEWS. *Metallbörse* 19, 593-4 (1929).—The kinds of metal scrap to be expected from various industries and their behavior upon melting and refining are discussed. W. C. EBAUGH

**Chloridizing and cyanidation plant of Penyoles Mining Company, Achotla Unit, at Temixco, Guerrero.** C. BRUCHOLD. *Bol. Minero (Mexico)* 27, 34-9 (1929).—Ore from Suriana mines, with Au and Ag values, high in Fe, and with minor amts. of Pb, Cu and Zn is used. E. I. S.

**The theory and application of regenerative principles in the steel industry.** T. J. McLOUGHLIN. *Am. Iron and Steel Inst.*, Adv. Paper, 1929, 30 pp.—A discussion of fuel, thickness of brick and area of openings, effect of increased checker depth and efficiency of regenerators, distribution of waste gases and air, dust deposits, regeneration in blast-furnace stoves and application to soaking pits and reheating furnaces. Also in *Blast Furnace & Steel Plant* 17, 852-6(1929). E. I. S.

**The efficiency of hot-blast stoves.** J. B. FORTUNE. *Proc. Inst. Mech. Eng.* (London) 1928, 1021-32.—Tests were made on a 350-ton blast furnace equipped with 5 Cowper hot-blast stoves 90 ft. high and 21 ft. in diam., a total heating surface of 77,750 sq. ft. The gas supplied to stoves was cleaned by a Halberg-Beth dry-cleaning plant. The correct proportioning of gas and air was detd. by elec. CO<sub>2</sub> app. installed to det. CO<sub>2</sub> in the chimney of each stove. The efficiency of the stove was 79.12%. The total gas made by the blast furnace was 2,257,500 cu. ft. per hr. The total gas used at the stoves was 563,000 cu. ft. per hr. The proportion of gas used in heating blast was 25%. A. W. HOLMES

**The design and operation of the cupola.** A. S. BEECH. *Foundry Trade J.* 40, 355-6, 379-80(1929). E. H.

**Blast-furnace stock column.** S. P. KINNEY. *Bur. Mines, Tech. Paper No. 442*, 148 pp.(1929).—A study of the operation of a 700-ton blast furnace, attempting to follow the steps in reduction of the charge during the descent in the furnace shaft. Methods have been developed for the measurement of velocities of gas, temps., pressures and compn. of gas across a series of planes at any elevation between the inwall and center of the furnace. There are many illustrations, tables, curves, etc. An appendix covers: calibration of Pitot tube, the flow of air through beds of broken solids, and detn. of free area available for flow of air, and accuracy of calibration and conclusions thereon. W. H. BOYNTON

**An open-flame stationary hearth-type furnace for melting aluminum and its alloys.** R. J. ANDERSON, G. E. HUGHES AND M. B. ANDERSON. *Foundry Trade J.* 40, 357-8(1929).—See C. A. 23, 2141. E. H.

**Recording the results of metallographic investigations.** H. REININGER. *Metallography* 19, 145-7(1929).—All metallographic records are entered in a journal in chronological order and given current numbers: exptl. data are appended. Card index records are then made, the photographs filed on them, and classified into 10 types of alloys. W. C. EBAUGH

**The affinity of sulfur for metals.** C. FRICK. *Chem.-Ztg.* 53, 317-8(1929).—A comparison of the "affinity series" of metals for S, as detd. by Fournet (1834), Markus, Schweder, Thomsen-Durre, Ostwald, Guertier and Frick (1927). Very general agreement in results is observed in spite of the differences in methods of measurement used. W. C. EBAUGH

**Regularities in the structure of alloys.** A. WESTGREN AND G. PHRAGMÉN. *Metallwirtschaft* 7, 700-3(1928).—A crit. review of previously published data. R. F. M.

**Special properties of eutectics and eutectoid alloys in binary metallic systems.** P. SALDAU. *J. Inst. Metals*, Adv. Copy, No. 487, 21 pp.(1929).—The straight-line relationship (phys. properties plotted against compn.) characteristic of a mixt. of 2 different phases does not hold true with the eutectic or eutectoid alloys, even after annealing. The eutectic alloys in the systems Sn-Pb, Pb-Sb, Sn-Zn, Au-Zn and Au-Cd as well as Fe-C eutectoid alloys were investigated. It is also pointed out that for coalescence to occur in eutectic alloys an excess of one phase is necessary. J. W. B.

**Study of the internal cooling of homogeneous isotropic bodies.** J. MERCIER AND P. MICHOULTIER. *Rev. métal.* 26, 171-92(1929).—A study of the rate of cooling of heavy parts. Its importance, particularly as regards quenching, is brought out. The article is very largely mathematical, and from the results numerous curves and 3-dimension surfaces are plotted. The value of the results obtained is discussed from the standpoint of their application in exptl. work and industrial practice showing, e. g., how the internal structure of heavy parts after quenching can be predetd. by means of the graphs which are given. A. PAPINEAU-COUTURE

**Magnetic susceptibility of some amalgams and binary alloys.** W. G. DAVIES AND E. S. KEEPING. *Phil. Mag.* [7], 7, 145-53(1929).—The relative magnetic susceptibilities of dil. amalgams of Au, Sn, In and Ga with respect to that of Hg were detd. by means of a Curie-Chineveau magnetic balance. The (diamagnetic) susceptibility decreases in abs. value but not linearly as the concn. of the dissolved metal increases. Indium produces a greater effect on the susceptibility of Hg than the other elements tried. The susceptibilities of Cu-Mg and Cu-Sb alloys over a wide range of compn. were detd. The susceptibility-compn. curves for Cu-Mg show maxima corresponding to eutectics

on the ordinary equil. diagram and minima corresponding to the compds.  $\text{CuMg}_2$  and  $\text{Cu}_2\text{Mg}$ . Annealing increased the susceptibility. L. H. REYERSON

The influence of the dimensions of the test pieces on the determination of the yield point of metallurgical products. J. COURNOT. *Compt. rend.* 188, 995-7 (1929).—Al and duralumin wires 1 to 2.8 mm. in diam. were tested at 15° to 350°. Increase in diam. had a like effect on the yield point. A. C. HIGGINS

The relation between stress and strain in the impact test. RYŌNOSUKÉ YAMADA. *Science Repts. Tohoku Imp. Univ.*, 1st Series, 17, 1179-1211 (1928).—Stress-strain curves were obtained for 0.1, 0.3 and 0.5% C steels, and a Ni-Cr steel contg. 3.5% Ni and 0.8% Cr, with a Charpy impact tester by the method of Körber and Storp. The low-temp. brittleness of steel was investigated and in general it was found that the temp. at which steels become brittle is higher in impact than in static tests. DOWNS SCHAAP

Work-softening and a theory of intercrystalline cohesion. F. HARGREAVES AND R. J. HILLS. *J. Inst. Metals*, Adv. Copy, No. 488, 27 pp. (1929); cf. C. A. 22, 3870.—Further work on work-softening established the following conditions necessary for its occurrence: (1) the presence of more than one phase, not necessarily a eutectic; (2) both constituents must have the property of undergoing spontaneous annealing after working at air temp. A theory of intercryst. cohesion is outlined, which states the existence of a transition zone between 2 orientations. This is not to be regarded as amorphous metal, for, given the same 2 orientations and the same relative position of the boundary, the same pattern of at. arrangement is always found in the unstressed metal. The cause of the very pronounced softening by heavy working is attributed to interphase boundary action and to the retention of the individual phases in a quasi-viscous condition. Fatigue of metals, cause of creep and season cracking are briefly discussed Also in *Engineering* 127, 767-71 (1929). J. W. BOECK

The erosion of guns. R. H. GREAVES, H. H. ABRAM AND S. H. REES. *J. Iron & Steel Inst.*, Adv. Copy, No. 4, May, 1929, 55 pp.—From the results of erosion vent expts. showing the relative corrodibilities of different steels and non-ferrous metals, and the examn. of many worn guns, it is concluded that the erosion occurring in large guns is almost wholly due to the melting and sweeping away of metal from the bore surface by the rapid stream of highly heated propellant gases. The only practicable means of reducing erosion is by use of cooler propellants and a careful design of the chamber. DOWNS SCHAAP

Instructions for the examination and selection of bare electrode (welding) wire. J. FUCHS. *Electrotech. Maschinenbau* 46, 527-34; *Science Abstracts* 31B, 421 (1928).—A bare electrode wire to give best service should analyze approx.: C less than 0.1%, Si trace, Mn 0.5%, S less than 0.03%, P less than 0.04%. M. McMAHON

The annealing of cast iron. H. H. BEENY. *Foundry Trade J.* 40, 229-31, 251-3 (1929).—Ordinary foundry Fe contg. 2.19% Si can lose 0.2% combined C when heated 200 hrs. at 300°. This loss increases with increasing total C and Si. 1% Si-Fe retains most of the combined C even after prolonged annealing at 550°. In irons contg. 1.00 to 1.30% a slight reduction in combined C occurs at 650° but the loss increases rapidly up to 750° where it reaches its max. Strength falls off with loss in combined C. Striking increases in strength with annealed chill-cast bars were obtained when the compn. was such that deep chill formation was avoided. This makes for soundness and the interior metal possesses a much finer form of graphite than that obtained by annealing completely white metal. H. C. PARISH

Nickel-chrome alloy iron. W. R. SHIMER. *Foundry Trade J.* 40, 254 (1929).—The introduction of an alloy-bearing pig Fe to the cupola is more effective than the addn. of alloys synthetically. The benefits attending the use of Ni-Cr pig Fe may possibly not be obtained from Ni and Cr alone, but also from other deoxidizers in the Fe such as high C, Ti and a slight quantity of V. The addn. of even 4% of Ni-Cr pig Fe raises the hardness from 180 Brinell to 200-220 and increases machinability. Ni strengthens cast Fe and aids in sepg. graphite. Cr holds C in combined form. As Cr predominates in Mayari pig Fe its use means an increase in combined C and a stronger Fe. For heavy heat-resisting castings with Si from 1 to 2%, 25% of Ni-Cr pig Fe is added to cupola mix. It reduces shrinkage, makes a sounder, cleaner and close-grained casting. H. C. PARISH

Effect of nitrogen in iron and steel. V. N. SVECHNIKOV. *Heat Treating and Forging* 15, 436-41 (1929).—The effects of N content on the phys. properties of iron and steel and the sources of N are reviewed. E. H.

Third report on heterogeneity of steel ingots. A COMMITTEE OF THE IRON AND STEEL INST. *J. Iron & Steel Inst.*, Adv. Copy, No. 1, May, 1929, 71 pp.—The report describes the progress made in 4 investigations devoted to researches into fundamental



matters. Andrew and Binnie describe their exptl. methods of detg. the liquidus and solidus ranges of some com. steels and the application of the data obtained to the problem of ingot manuf. They also report the results of their work on detg. the soly. of Fe and Mn sulfides in steel by the thermal method. Desch and Smith describe their app. and methods, and give the data so far obtained in their expts. to det. the changes in density occurring in steel in the neighborhood of the f. p. A mathematical analysis of the effect of latent heat on the solidification of steel ingots is made by N. M. H. Lightfoot.

DOWNES SCHAAF

Standard specifications for carbon-steel car and tender axles. Serial designation A 21-7. Bur. of Foreign and Domestic Commerce, *Industrial Standards No. 14*, 14 pp. English-Spanish ed. Text as adopted by the Am. Soc. for Testing Materials. Revised, 1927.

E. J. C.

Standard specifications for carbon-steel forgings for locomotives. Serial designation A 20-8. Bur. of Foreign and Domestic Commerce, *Industrial Standards No. 13*, 16 pp. Text as adopted by Am. Soc. for Testing Materials. Revised, 1928. E. J. C.

Relation between various degrees of hardness of unhardened carbon steel. A. WALLICH AND H. SCHALLBROCH. *Maschinenbau* 8, 69-74(1929).—Steel contg. from 0.1 to 1.0% of C was exposed to various hardening tests, as a result of which a curve is plotted showing ratio of Brinell hardness to new hardness coeff.; corresponding equations are derived. Bibliography.

E. I. S.

Aging and recrystallization tests on boiler plate. A. POMP. *Z. Bayer. Revisions-Ver.* 33, 7-9, 26-7, 93-6(1929).—Aging is accelerated by annealing of cold-worked steel. The aging tendencies of different steels vary greatly. Results are given of strength and notched-bar tests to det. the conditions governing both natural and artificial aging and to obtain information on the relation of temp. to notch resistance of aged material. Fourteen different steels, 10 without alloy, and 4 with Ni addns. were tested.

E. I. S.

The mechanical and metallurgical properties of spring steels as revealed by laboratory tests. G. A. HANKINS AND MISS G. W. FORD. *J. Iron & Steel Inst.*, Adv. Copy, No. 5, May, 1929, 28 pp.—Brinell, tensile, fatigue, Izod and torsion tests were made on hardened and tempered low-Cr steel, high-Cr steel, Ni-Cr steel, and 2 water-quenched C steels contg. 0.60 and 0.46% C, resp.

DOWNES SCHAAF

Brittleness in mild steel. G. R. BOLSOVER. *J. Iron & Steel Inst.*, Adv. Copy, No. 3, May, 1929, 15 pp.—Detailed results are reported of an investigation into the cause of the brittleness in mild steel when deformed beyond certain limits and reheated to approx 250°. B. suggests that an internal strained condition is set up in mild steel with resulting brittleness because a sub-microscopic recrystn. takes place along the planes of max. movement when the cold-worked material is heated to 250° without recrystn. of the mass of metal.

DOWNES SCHAAF

The differential method for measuring the thickness of hard cases without sectioning them. EDWARD G. HERBERT AND PAUL WHITAKER. *J. Iron & Steel Inst.*, Adv. Copy, No. 6, May, 1929, 10 pp.; *Engineering* 127, 593-4(1929).—A method for measuring the thickness of the case on case-hardened steels consists in making 2 different hardness tests, a primary test (Herbert pendulum), which measures only 1 variable, the hardness of the case, and a secondary test (Brinell), which measures the combined effects of 2 variables, hardness and thickness of the case, the difference between the 2 hardness values being a function of the thickness of the case. The general procedure for the inspection of case-hardened work by means of the cloudburst method is given in detail.

DOWNES SCHAAF

Utilization of mineral oils for the thermal treatments of steels. L. ROY. *Aciers spéciaux* 4, 75-7(1929).—The properties of different petroleum oils are presented.

A. J. MONACK

Influence of addition elements on the properties of steels. (Carbon.) L. PERSOZ. *Aciers spéciaux* 4, 69-74(1929); cf. C. A. 23, 2139.—The Fe-C equil. diagram is explained and discussed. Photomicrographs show the various compds. and eutectics formed in different steels. A graph shows the resistance to rupture and the resilience for C steels as functions of the temp. of reheating after tempering. The effects of C on other properties are discussed.

A. J. MONACK

Chromargan, a non-oxidizing steel. W. SACK. *Z. ges. Giessereipraxis* 50, No. 8, 29-30(1929).—This alloy steel (made by Krupp) is used for turbine blades, shafts, valves, cutlery and table ware, medical instruments, etc. It is classified in 2 groups, VM and VA; the former has av. Cr content of 13 to 15% and small Ni content; the latter has 18 to 25% Cr content. VM is magnetic and VA non-magnetic.

E. I. S.

Chromiumplating steel before heat treating. S. TOUR. *Rochester Eng.* 7, 198-201

(1929).—Cr plating gives promise of suitable protective layers that can be put on steel directly to protect it from oxidation, carburization, or decarburization during heat-treatment process.

E. I. S.

**Electrical properties of nickel-iron alloys.** G. J. SIZOO AND C. ZWICKER. *Z. Metallkunde* 21, 125-6(1929).—By sucking molten alloys of Fe (99.9%) and Ni (99.6%) into a quartz tube of 1 mm. diam., S. and Z. succeeded in obtaining rods of about 20 cm. consisting of single crystals, which could be readily drawn into wires of 0.25 mm. diam. These wires were annealed *in vacuo* at 900° and their elec. resistance was detd. at 0° and 100°. The curve for the sp. elec. resistance shows a min. at 34% Ni and a flat max. around 68% Ni. The min. and max. are more pronounced in the curve for the temp. coeff. of the elec. resistance. The latter shows also a pronounced max. at 26% Ni and a min. at 88% Ni.

H. S. VAN KLOOSTER

**Properties of materials at high temperatures. V. The "Creep" strength of a "high-nickel high-chromium steel," between 600° and 800°.** H. J. TAPSELL AND J. REMFRY. Dept. Sci. Ind. Research. *Eng. Research, Special Rept.* No. 15(1928), cf. C. A. 22, 4433; 23, 77.—Material of the following compn. was used for expts. C 0.46, Si 1.20, Mn 1.09, Ni 26.5, Cr 14.0, W 3.59, S 0.028 and P 0.026%. Short-time tensile tests show an ultimate stress varying from 45.9 tons per sq. in. at 15° to 17.2 at 800°. The estd. value of limiting "Creep" stress at 600° is 11 tons per sq. in., at 700° 6 and at 800° 2 tons per sq. in.

H. C. PARISH

**Ferro-silicon.** K. TH. KÜRTEN. *Metallwirtschaft* 7, 911-4(1928).—A review of the history, production and properties of ferro-silicon, with especial emphasis on the chemistry of the reduction process.

ROBERT F. MEHL

**Sherardizing.** A. P. PETRIE. *Metal Ind.* (London) 34, 483-4(1929).—Review.

E. H.

**Development and application of Widia.** R. D. PROSSER. *Am. Mach.* 70, 587-9(1929).—A brief history of development of W carbide material and some practical considerations regarding its proper use in a shop.

E. I. S.

**The cast structure of copper.** P. SIEBE. *Metallwirtschaft* 8, 391-5(1929).—The type and temp. of the mold, the temp. of the metal when cast, and the degree of deoxidation of the metal in the refining process det. the cast structure of Cu.

C. H. LÖRIG

**The change in structure of copper during the refining process.** L. TRONSTAD. *Metallwirtschaft* 8, 396-7(1929).—The structure of solidified Cu is detd. chiefly by its Cu<sub>2</sub>O content.

C. H. LÖRIG

**Brittleness in arsenical copper. II.** CLEMENT BLAZEY. *J. Inst. Metals, Adv. Copy*, No. 486, 6 pp.(1929); *Metal Ind.* (London) 34, 291-3.—A type of brittleness in arsenical Cu described in a previous paper, characterized by low tensile strength and elongation and inability to withstand repeated bending after annealing below 600-650°, was found to be produced under certain conditions by small quantities of Bi. It occurs on low-temp. anneals only and is recurrent. After annealing at a high temp the brittleness disappears but reappears after cold working and again annealing at a low temp. P added after Bi, or remelting, destroys this susceptibility to brittleness. The effects of Sb, P, S and As were also investigated.

J. W. BOECK

**The effect of sulfur dioxide on bronze and copper.** P. RÖNTGEN AND G. SCHWIETZKE. *Z. Metallkunde* 21, 117-20(1929).—Whereas SO<sub>2</sub> causes porosity in Cu due to a reversal of the reaction: SO<sub>2</sub> + 6Cu = Cu<sub>2</sub>S + 2Cu<sub>2</sub>O on cooling, there is no gas porosity when SO<sub>2</sub> is added to a molten bath of bronze (10% Sn), since the reaction: SO<sub>2</sub> + 2Cu + Sn = Cu<sub>2</sub>S + SnO<sub>2</sub> is not reversible. R. and S. assume that Al-bronze, brass and Ni alloys contg. Zn behave like bronze. Porosity caused by SO<sub>2</sub> can be avoided by suitable deoxidation.

H. S. v. KLOOSTER

**X-ray investigation of aluminum at high temperatures.** A. I. ALICHANOV. *Z. Metallkunde* 21, 127(1929).—A. made an x-ray study of Al at temps. up to the m. p. in order to find out whether Al possesses a transition point between 575° and 600° as claimed by various authors. The specimen used was a wire of 0.5 mm. diam. and a length of 4 cm. through which a constant current was sent. The spectrograms gave the same system of lines at all temps. indicating a face-centered cubic arrangement with an av. lattice constant of 4.107 Å. U. = 0.005.

H. S. v. KLOOSTER

**Influence of sulfur on copper-lead alloys.** HIDEO NISHIMURA AND SHIRO ANDO. *Suiyokashiki* 5, 696-706(1928).—The authors found that the addn. of a small quantity of S can prevent the usual marked segregation in a 50:50 Cu-Pb alloy. Specimens contg. no S or 0.1 and 1.3% S show marked irregularity in the distribution of hardness, microscopic examn. also confirming the existence of marked segregation. The specimens contg. 0.4 and 0.8% S show little segregation. Impact test shows that the addn. of S makes the material brittle. From the results of thermal and other analyses they

conclude that when S is added, it is adsorbed on the primary crystals of Cu, preventing the growth of dendritic crystals of Cu, and preventing segregation. K. SOMEYA

**Phosphor-bronze for foundry work.** EIICHIRO ITAMI. *Suiyokashii* 5, 717-49 (1928).—Tensile strength, hardness, impact, compression, cold working, annealing and corrosion tests were made on phosphor-bronze ingots contg. Cu 95, Sn 4 and P 0.3%. Microscopic examn. of the annealed specimen showed that when the annealing is made at a low temp. a eutectic contg. the phosphide of Cu is present besides the  $\alpha$  solid soln., while in the sample annealed at a high temp. no eutectic makes its appearance. K. S.

**Silver, its alloys and their preparation.** I. A. A. LEROUX. *Metallwirtschaft* 7, 467-8(1928).—The properties, both phys. and chem., of pure Ag and its alloys are discussed. The Cu-Ag phase-rule diagrams are given, as well as the mech. properties and photomicrographs of various constituents of the phase-rule diagram. Methods of prepn. of the pure alloys are described. C. L. MANTELL

**White gold.** L. NOWACK. *Metallwirtschaft* 7, 465-6(1928).—The theoretical background of these alloys is discussed, including the phase-rule diagrams for the Au-Pt and the Au-Ni systems. The mech. properties, constitution, working and fabrication of the alloys are discussed in some detail. C. L. MANTELL

**Transcrystallization of aluminum.** E. SCHEIL. Forsch. Inst. der Verein. Stahlwerke, Dortmund. *Z. Metallkunde* 21, 121-4(1929).—S. studied the effect of casting temp., mold temp. and thickness of container wall on the development of columnar crystn. in Al castings. Casting at high temp. in a cold mold causes trans-crystn. to the very center. At lower casting temps. (700°) a more granular structure is developed. Heating to 1100° followed by cooling to 700° and casting at that temp. produces mostly a radial structure with some equiaxed grains in the center of the ingot. H. S. v. K.

**Technology of aluminum and its alloys.** H. RÖHRIG. *Metallwirtschaft* 7, 502-7 (1928).—A review of progress and a discussion of the properties of pure Al and some of its alloys, particularly those with Fe and Si. C. L. MANTELL

**Some investigation on the improvement of aluminum silicon alloys.** MARIE L. V. GAYLER. *Metallwirtschaft* 7, 861-4(1928).—Supercooling of Al-Si alloys has practically the same improving effect as the introduction of small quantities of Na to the alloy. The cooling curves for the Al-Si alloy when supercooled essentially coincide with the ordinary curves for Na-treated alloys. It is impossible to obtain different curves for Na-treated alloy melts when rapidly cooled. Conclusion: the addn. of Na causes crystn. in alloys at the temps. of supercooling for normal alloys and the no. of grains would probably be increased. B. E. ROETHLI

**Magnesium and its alloys.** R. CAZAUD. *Aciers spéciaux* 4, 83-8, 131-9(1929).—C. discusses the electrolytic metallurgy of Mg, phys. properties, Mg and corrosion, chem. properties, founding of Mg. A short bibliography is appended. The following are discussed by means of equil. diagrams and photomicrographs: Mg-Al, Mg-Cu, Mg-Zn, Mg-Cd, Mg-Pb, Mg-Ce, Mg-Ca and Mg-Si alloys. A. J. MONACK

**The importance of design and setting of large kettles used for refining low melting-point alloys.** HARRY C. LANCASTER. *J. Inst. Metals*, Adv. Copy, No. 485, 6 pp., 1929.—L. demonstrates that on increasing the size of the cast-Fe kettles from 20 to 50 tons capacity 2 factors which help to increase the life of the kettle are the shape of the kettle and the method of setting. J. W. BOECK

**The influence of pickling operations on the properties of steel.** H. SUTTON. *J. Iron & Steel Inst.*, Adv. Copy, No. 15, May, 1929, 24 pp.—Expts. were made to ascertain the influence of pickling mild steel, medium C steel and alloy steel in acid solns. The work affords addnl. evidence of the deleterious effect of H generated at the surface of steels during pickling operations. DOWNS SCHAAP

**The significance of organic sulfonic acids for chemical scale removal.** ORTO MERZ. *Arch. Wärmewirt.* 9, 394-5(1928).—The  $CH_3O$  condensation product of naphthalenesulfonic acid is recommended as an agent that requires no subsequent alkali wash and that attacks Fe much less than ordinary pickling agents. ERNEST W. THIELE

**Lanolin rust preventers.** C. JAKEMAN. Dept. Sci. Ind. Research, *Eng. Research, Special Rept.* No. 12, 22 pp. (1929).—Steel pieces coated with lanolin by immersion in or painting with solns. of lanolin (in benzene, xylene, white spirit solvent, naphtha, turpentine, tetralin,  $C_2H_2Cl_4$  and  $C_2HCl_3$ ) and exposed to weather were protected from 40 to 137 days (the benzene soln. being the best and tetralin the poorest). Introduction of paraffin or ceresin yielded a harder and more durable coating. Crude lanolins of low acidity were found best. Lanolin coatings were found superior to petroleum grease both in protective power and adhesion. B. E. ROETHLI

**The corrosion problem with particular reference to the prevention of corrosion by corrosion-resistant alloys.** WILHELM WIEDERHOLT. *Metallwirtschaft* 7, 856-61

(1928).—A review of the general methods of corrosion prevention with special reference to the use of alloys in which mixed-crystal formation takes place. The difference between "passive limit" and "resistant limit" is defined. "Passive limit" refers to the concn. of metal alloyed with another necessary to yield a material which is capable of forming a very dense resistant film when in the corroding medium. "Resistant limit" refers to the min. concn. of the nobler metal in the alloy which will cause the formation of a material which is more stable in the corroding medium due to energy considerations. Alloys of Au-Ag, Si-Al, Cu-Zn are discussed from this point of view.

B. E. ROETHLI

**Organic type inhibitors in the acid corrosion of iron.** J. C. WARNER. *Trans. Am. Electrochem. Soc.* 55 (preprint) 9 pp. (1929).—Further evidence is presented which substantiates the theory that inhibitors of the org. type function by increasing the over-voltage required for the deposition of H. The effect of various concns. of gelatin upon the energy required for the deposition of H on iron has been studied, and these results have been compared with the inhibitor action of gelatin in the acid corrosion of Fe. The effect of small-quantities of quinoline, aniline, bases from petroleum fractions, and bases from coal-tar oils, upon the energy required for the deposition of H has been studied, and the effectiveness of these substances as inhibitors in the acid corrosion of Fe has been detd. Expts. indicate that any substance, which will form a large positively-charged oily ion, or a positively-charged, oily, colloiddally-dispersed particle, in acid soln., should inhibit the acid corrosion of Fe if the substance cannot be electrolytically reduced.

C. G. F.

**Protection against corrosion.** OTTO TIEDEMANN. *Metallwirtschaft* 7, 285-9, 314-6 (1928).—A review.

B. E. ROETHLI

**Excessive corrosion of galvanized mild steel cisterns.** H. F. RICHARDS. *Iron and Steel Ind. and Brit. Foundryman* 1, 183-4 (1928).—Excessive corrosion of galvanized mild steel cisterns is attributed to the high CO<sub>2</sub> and NaCl content and increased temp., which liberates more CO<sub>2</sub>. Cf. C. A. 23, 1859.

B. E. ROETHLI

**Corrosion of iron and steel.** W. B. LEWIS AND G. S. IRVING. *Iron and Steel Ind. and Brit. Foundryman* 1, 185-6 (1928).—A discussion of the existing corrosion theories

B. E. ROETHLI

**Regarding several cases of corrosion in aluminum transmission cables.** H. BOHNER. *Z. Metallkunde* 20, 309-15 (1928).—An illustrated discussion of the effects of chem. compn., roll strains, strains and abrasions occurring in erecting lines, and changes in compn. and structure due to short circuits or lightning on corrosion

B. E. ROETHLI

**Corrosion of centrifugal pumps.** R. W. MÜLLER. *Korrosion u. Metallschutz* 5, 59-61 (1929).—Corrosion of rotors and casings of centrifugal pumps occurs mostly in the portions of pumps operating below atm. pressure. The corrosion is attributed to the liberation of O<sub>2</sub> at the metal surfaces. In series pumping systems practically all the corrosion occurs in the low-pressure stage. A bronze brine pump with cast-iron bolts failed by graphitic corrosion of the bolts due to electrolytic corrosion in which the bolts were anodic and the rotor and casing cathodic.

B. E. ROETHLI

**Tests on corrosion of aluminum and aluminum alloys.** W. SCHWINNING AND H. JAHN. *Korrosion u. Metallschutz* 5, 49-58 (1929).—Tests of Al and Al alloys by the thermic HCl test, oxidizing NaCl test and fatigue tests gave results which were not comparable among themselves and could therefore hardly be considered as means for estg. the length of life of the materials in question under actual service conditions.

B. E. ROETHLI

**The attack of metallic pipes by direct and by alternating currents.** W. BECK. *Z. angew. Chem.* 41, 1361-7 (1928).—A discussion showing the theoretical and practical aspects of corrosion by stray currents in a. c. and d. c. circuits. A. c. circuits are more dangerous to buried pipe than d. c. because of the 3 possible ways in which currents are caused to flow in pipe within reach of the stray currents: contact, induction and influence.

B. E. ROETHLI

**Regarding the ferroxy indicator.** WILHELM VAN WÜLLEN-SCHOLTEN. *Korrosion u. Metallschutz* 5, 62-4 (1929).—The ferroxy indicator in studying bare metal gives erroneous results when made up in agar-agar because of the fact that it does not show differential aeration effects. It is also stated that the concns. of K<sub>3</sub>Fe(CN)<sub>6</sub> and phenolphthalein are too high and that the metal is immersed in an unnatural electrolyte. S. finds that concns. of 0.004% phenolphthalein and 0.008% K<sub>3</sub>Fe(CN)<sub>6</sub> in a molal soln. of NaCl do not appreciably change the properties of the electrolyte and give results which are not in error.

B. E. ROETHLI

**The effect of cold-working on the corrosion of iron and steel.** HIKOZO ENDO. *Science Repts. Tohoku Imp. Univ.*, 1st Series, 17, 1265-78(1928); cf. C. A. 23, 806.—The wt. loss of steels contg. 0.1, 0.3, 0.5, 0.7, 1.1 and 1.3% C was detd. after they had been subjected to different kinds of mech. stress by immersing them in a 1%  $H_2SO_4$  soln. kept at 25° for 72 hrs.

**Causes and prevention of corrosion of aluminum and its alloys.** SCHULZ. *Metallwirtschaft* 7, 507-8(1928).—A review of the factors causing corrosion, with some emphasis on electrolytic corrosion.

**Much work on corrosion problems in progress in laboratories.** F. R. STALEY. *Oil & Gas J.* 27, No. 40, 66(1929).—Work on the resistance of alloys to corrosion is reviewed.

**The corrosion of aluminum.** JEAN CALVET. *Compt. rend.* 188, 1111-4(1929).—Al made by the Hoopes process, a high grade of Al made in France and an ordinary Al were tested for corrosion in various org. and inorg. acids and in sea salt. In every case the Hoopes-process Al showed the greatest resistance to corrosion and the ordinary Al, the least. This conforms with the electrochem. theory of corrosion.

**The mechanism of the calcium hydrate process (for protecting pipe).** MAX GROECK. *Gas u. Wasserfach* 72, 319-24(1929); Polemical (cf. Bücher and Schulte, C. A. 21, 1960).—An attack on the published theories as to the mechanism of the Bücher process for protecting pipe lines from corrosion by aggressive  $CO_2$ . Answer to Groeck by the CHEMICAL STAFF OF THE PREUSS. LANDESANSTALT FÜR WASSER-, BODEN- UND LUFTHYGIENE. *Ibid* 324-8.—Comments by CHR. BÜCHER. *Ibid* 328. R. W. R.

**Practical methods of oxy-acetylene welding.** L. A. COWLES. *Power Plant Eng.* 33, 482-3, 530-1(1929).—A general article. Some special suggestions are made for steel and wrought Fe, Cu and Al.

Periodic passivity of Cr and Cr alloys, and the influence of temperature on passivity potentials (STRAUSS, HINNÜBER) 2. Filtering equipment and the systematic and continuous extraction of sludges, precipitates and ores (FOURTON) 1. Design of superheaters for high pressures and high temperatures (GATES, GORDON) 1. Thermal expansion of Ta (HIDNERT) 2. Passivity of metals (MÜLLER) 2. Explosions while granulating Cu (STAHL) 24. Metals in dairy equipment; corrosion caused by washing powders, chemical sterilizers and refrigerating brines (HUNZIKER, *et al*) 12. Metallurgical limestone—problem in production and utilization (BOWLES) 18. Refractory material suitable for lining metal molds (U. S. pat. 1,713,580) 19. Preventing corrosion of condensers of oil cracking apparatus (U. S. pat. 1,715,095) 22.

**Foundryman's Handbook.** Cleveland, Ohio: Penton Pub. Co. 574 pp. \$6. Reviewed in *Abrasive Ind.* 10, No. 6, 37(1929).

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**Roasting ores.** ELECTRO-METALLURGICAL ORE REDUCTION, LTD. Fr. 652,076, Apr. 2, 1928. Ores and metallurgical products to be roasted are mixed in a finely divided state with an aluminous binding agent such as clay, and a soln. of  $FeSO_4$ . The plastic mixt. is formed into rings or other shape to prevent close packing. Pyrites or other S compds. may be added if this is scient.

**Roasting and reducing ores, etc.** FREDERICK L. DUFFIELD. Fr. 652,627, April 12, 1928. In roasting and reducing metallic ores in a 2-stage treatment, 2 rotary furnaces are used alternatively for each stage of the treatment.

**Treating ores, etc.** STANLEY C. SMITH. Fr. 652,213, April 4, 1928. See Brit. 295,224 (C. A. 23, 2143).

**Separating ores from gang, etc.** I. G. FARBENIND. A.-G. Fr. 652,244, April 5, 1928. Solid substances of different d., particularly ores and gang, are sepd. by imparting to the ground-up solids a wave agitation by blowing gases through the whole layer.

**Apparatus for separating ore and gang by use of air currents.** I. G. FARBENIND. A.-G. Brit. 299,936, Aug. 20, 1927.

**Apparatus (with an inclined trough) for separating crushed ore constituents by aid**

of liquid currents and air. WILLIAM E. ENDREZZE. U. S. 1,714,007, May 21. Structural features.

**Iron ores.** GRANULAR IRON CO. Fr. 652,050, Mar. 31, 1928. Fe ores are reduced by mixing with a carbonaceous material contg. S and with lime, heating in a slightly inclined rotating furnace in a reducing atm. and at a temp. below the f. p. of Fe. Cf. C. A. 23, 590.

**Recovery of tin from solutions also containing arsenic.** HENRY HARRIS. U. S. 1,714,667, May 28. Calcareous material such as  $\text{Ca}(\text{OH})_2$  is added, as the pptg. agent for the Sn, to a soln. already contg. a  $\text{CO}_2$  compd. such as  $\text{Na}_2\text{CO}_3$  to prevent simultaneous pptn. of As. Cf. C. A. 22, 3023.

**Washing or leaching tin-bearing sands, etc.** F. L. WILDER, E. MORRIS, E. SCHIFF and E. S. KING. Brit. 299,750, July 30, 1927. Complex minerals such as Sn-bearing sands are washed or leached with a soln. contg. persulfates and chlorides of an alkali metal, and ferric salts. The very fine particles are thus dissolved out and the residue may be further concd. as by a gravity process. Free Cl may be present in the leaching soln., and when the ore treated contains Fe, at least a part of the ferric salts may be formed *in situ*. In an example, the soln. used contains  $\text{H}_2\text{SO}_4$ , NaCl,  $\text{NaHSO}_4$ , Na persulfate, persulfuric acid,  $\text{FeCl}_3$ ,  $\text{Fe}_2(\text{SO}_4)_3$  and free Cl. Various auxiliary treatments to sep. metals such as Cu and Sn, etc., are described.

**Apparatus for washing titaniferous sand.** MARIUS MILLOT. Fr. 651,838, Mar. 28, 1928.

**Titanium compounds.** TITANIUM PIGMENT CO., INC. (Willis F. Washburn, applicant in U. S.). Fr. 652,357, April 7, 1928. See Brit. 288,569 (C. A. 23, 590).

**Recovery of zinc.** THE RIO TINTO CO., LTD. Fr. 652,367, April 7, 1928. Wash-liquors contg.  $\text{ZnSO}_4$  from pyrites or other ores contg. Zn, or from the ashes from the roasting of these ores, are treated with MgO or  $\text{MgCO}_3$  to ppt. the Zn. The liquor may be passed through layers of calcined MgO or  $\text{MgCO}_3$ .

**Reducing metallic oxides.** ARTHUR J. F. J. COUSIN (to Soc. Anon. John Cockerill) U. S. 1,714,767, May 28. Oxides of relatively heavy non-volatile metals such as Fe and Cu are comminuted and thoroughly mixed with a separately finely comminuted reducing agent such as coal or coke and, after air in this mixt. has been displaced by the addn. of water, the mixt. is compressed to expel remaining traces of air; the compressed mixt. is subjected to the action of a neutral flame at a temp. sufficient to produce a reducing action but below the temp. of fusion of the metal in a neutral atm. having no oxidizing effect on the solid metal at the temp. of treatment.

**Reducing metallic oxides.** SIGURD WESTBERG. U. S. 1,715,155, May 28. Oxides such as those for making Fe and Cr alloys together with solid carbonaceous matter such as ferro-Cr high in C and a H-contg. gas are heated in a reaction zone to effect reaction and conversion of most of the carbonaceous material into CO; the carbonaceous material is kept sep. from the molten metal produced; proportions are controlled to produce a max. yield of metal of the desired C content. An app. is described. Cf. C. A. 23, 366.

**Extraction of metals.** I. G. FARBERNIND. A.-G. Fr. 652,384, April 7, 1928. Substances contg. Ag, Zn, or Cu are more easily extd. by aq.  $\text{NH}_3$  or  $\text{NH}_4$  salts contg. free  $\text{NH}_3$  if they have been given a preliminary chlorinating treatment at a high temp., e. g., by heating with  $\text{MgCl}_2$  or  $\text{NH}_4\text{Cl}$ .

**Purifying metals such as magnesium and aluminum.** BRITISH MAXIMUM, LTD. Brit. 300,164, Nov. 7, 1927. Light metals such as Mg or Al are filtered through metal gauze coated with an alloy or amalgam having a m. p. below  $190^\circ$ , e. g., an amalgam of Sn 2, Pb 1 and Hg 1 part, or an alloy of Sn, Pb, Bi and Cd.

**Ferrous metals containing molybdenum.** A. KISSOCK (to Climax Molybdenum Co.). Brit. 299,800, Nov. 1, 1927. A Mo compd. such as Mo oxide or sulfide or Ca molybdate is added to a blast-furnace charge to produce a pig iron contg. the desired proportion of Mo. Such pig iron may then be used with other metal for producing Mo-contg. gray, white, malleable, or semi-steel castings, etc. Cf. C. A. 23, 1611.

**"Anti-friction metal."** DONALD C. LEE. U. S. 1,714,679, May 28. Brass 4 and Babbitt metal 1 part are alloyed together.

**Metal fusion.** SOC. ANON. DES HAUTS FOURNEAUX ET FONDERIES DE PONT-A-MOUSSON. Fr. 652,670, Apr. 13, 1928. Metals are fused in a cupola by introducing and burning at the base of the furnace a mixt. of a gaseous or powd. fuel and air in the correct proportions. The coke equally employed may be greatly reduced in amt. or suppressed.

**Molds.** JULES L. F. HARDY. Fr. 652,424, April 10, 1928. Molds for molten

metals, etc., are made from a mixt. of artificial corundum and wood charcoal, with  $\text{Na}_2\text{SiO}_3$  as binding agent.

**Ingot molds.** G. W. NAYLOR, J. F. NAYLOR, W. NAYLOR and C. E. NAYLOR. Brit. 300,033, Dec. 15, 1927. Structural features.

**Centrifugal apparatus for casting ingots, etc.** MANNESMANNRÖHRENWERKE. Brit. 299,869, Nov. 4, 1927. Structural features.

**Casting bronze tubes, etc.** G. BÜHLER. Brit. 299,878, Nov. 4, 1927. A resilient core is formed of a mixt. of sand and sawdust and the sawdust is subsequently burnt out. Brit. 299,879 specifies forming tubes of bronze contg. Cu 90-92 and Sn 10-8% by drawing thick-walled tubes cast in chill molds with resilient cores. Various mech. features are described.

**Casting precious and other non-ferrous metals.** A. M. ERICHSEN. Brit. 299,850, Nov. 2, 1927. Molds are used composed wholly or in part of a metal or alloy, which is a poor heat conductor such as a Ni alloy preferably contg. 35% Ni. Various structural features are specified.

**Furnaces for fusing metallic substances.** AMERICAN RADIATOR CO. Fr. 652,368, April 7, 1928. Combustion chambers are arranged radically and slightly inclined round a central chamber contg. the substance to be heated by the gaseous combustion products.

**Furnace for roasting zinc blend and other sulfur ores.** ERZRÖSTUNG G. M. B. H. Fr. 651,692, Feb. 27, 1928.

**Furnace for melting brass, copper, iron, or other metals.** ADOLPH W. MACHLET. U. S. 1,713,543, May 21. A magazine for loose stock comprises a barrel and a crucible into which the barrel discharges; a furnace surrounds the crucible; the furnace is provided with a constricted vent so that heat is confined in the furnace to produce a metal-melting temp. and this vent discharges into a heating chamber which surrounds the stock supply and preheating barrel. Other structural details are also described.

**Converter with an arrangement for preheating and fusing metal.** D. D. VOEIKOV and P. P. KRSTOVNIKOV. Russ. 5622, June 30, 1928. Constructional features are described.

**Blast furnace.** J. P. DOVEL. Brit. 299,941, Aug. 25, 1927.

**Cast iron.** JOSEF DECHESNE. Fr. 33,763, May 10, 1927. Addn. to 616,240. Molten cast Fe or other metal is degasified by being submitted to agitation as it flows from the furnace by a mech. shaking of the recipient.

**Wrought iron.** ARTHUR J. BRIGGS (to Onondaga Steel Co.). U. S. 1,713,887, May 21. Discrete particles of iron are mixed with slag-forming materials in proper quantities to produce the desired fibrous structure of the iron, and the mixt. is heated to a welding temp. in a rotary elec. furnace from which air is excluded.

**Iron sponge.** SVEN E. SEURIN. U. S. 1,714,280, May 21. See Brit. 296,235 (C. A. 23, 2414).

**Tempering steel.** WERNER STAUFFER. Fr. 651,807, Mar. 27, 1928. See Swiss 126,252 (C. A. 23, 592).

**Preparing silicon steel sheets for electrical purposes.** ALPHONSUS F. MURPHY and WILLIAM JONES (to American Rolling Mill Co.). U. S. 1,714,038, May 21. The sheets are pickled, acid is washed and cleaned away, the sheets are then annealed, cold-rolled and finally re-annealed.

**Heating or burning iron, steel, porcelain, or other materials susceptible to oxidation.** HEINRICH KOPPERS (to Koppers Development Corp.). U. S. 1,713,834, May 21. A reducing atm. is maintained in direct environment of the bodies being heated by coating or otherwise maintaining them in intimate contact with carbonaceous material which is not readily combustible, such as graphite, so as to prevent oxidation without effecting carbonization; this facilitates firing with highest practical efficiency without requiring a fuel-gas surplus and lack of sufficient air for substantially complete combustion of the gas.

**Apparatus, with a rotating holder, for heat treatment of steel balls or other articles.** ALBERT VUILLEUMIER (to New Departure Mfg. Co.). U. S. 1,715,317, May 28. Structural features.

**Composition for cleaning and arsenic-coating ferrous metals.** JAMES H. GRAVELL (to American Chemical Paint Co.). U. S. 1,713,653, May 21.  $\text{H}_3\text{PO}_4$  and an oil-remover such as EtOH and BuOH are used with an As compd. such as Na arsenite from which, on contact, a film of As will plate out on a ferrous metal surface.

**Treating waste iron pickle.** A. J. EVANS. Brit. 299,919, Aug. 8, 1927. Treatment of waste iron pickle with alk. earth carbonate and atm. O is improved by the addn.

of a protective colloid such as liquid glue or size or other colloid not affected by salts of Fe, which promotes sepn. of hydrated ferric oxide by formation of a froth.

**Alloys.** WILLIAM H. GORDON. Australia 15,516, Sept. 7, 1928. A ductile non-magnetic Cu alloy, which is resistant to sea-water and many acids, contains Cu 56.6, Ni 18.882, Mn 1.886, Al 7.544, Zn 13.202 and Sn 1.886%. The Cu is first melted and the other metals are added in the above order, the mass being heated to such temp. as to melt the various components. Australia 15,517 describes an Al alloy which retains a high polish and may be cast and machined and which is unaffected by liquids usually met with in domestic use; it contains Ni 29.813, Mn 0.621, Al 49.667 and Zn 19.875%. The Al is first melted and the other metals are added in the above order.

**Alloys.** THE GENERAL ELECTRIC CO. Fr. 652,201, April 4, 1928. Alloys contg. Ni and Cr are made from the pure metals, preferably in powder, and are obtained by hydrolysis, by heating them in the presence of H, which may be purified by passing it over Cr heated to 700–850°.

**Alloys.** THE INTERNATIONAL NICKEL CO. and NORMAN B. PILLING. Fr. 652,168, Feb. 22, 1928. A small quantity of Ca (0.005–0.5%) is added to Ni or other alloys, preferably just before casting. To prevent a film of oxidized Ca on the surface of the mass a thin layer of siliceous slag is formed on the surface before adding Ca.

**Powdered alloys.** SOC. ANON. DES TRÉFILIERIES ET LAMINOIRS DU HAVRE (ANCIENS ÉTABLISSEMENTS LAZARE WEILLER, SOC. COOP. DE RUGLES and LA CANALISATION ÉLECTRIQUE RÉUNIS). Fr. 652,040, Mar. 30, 1928. Powd. alloys particularly brass or bronze are obtained by heating the powd. metals composing the alloy to a temp. below the f. p. of the alloy desired. The heating is carried out in the presence of protecting or reducing gases.

**Alloys for use as bearing metals.** FIRM OF J. NEURATH (to E. Abel). Brit. 299,773, Oct. 31, 1927. Bearing metals consisting mainly of Pb, Sb and Sn, and contg. also Ni and Cu, with or without other metals such as Fe, Cd, Bi and As, contain at least 1.5 times as much Cu as Ni. The Ni content is preferably 0.7–0.8% and does not exceed 1%. Cf. C. A. 22, 4102.

**Aluminum alloys.** H. C. HALL and T. F. BRADBURY. Brit. 300,078, April 3, 1928. Al alloys are formed contg. Ni 0.2–1.5, Mg 0.2–5.0, Cu 0.5–2.0, Si 0.2–0.5, Fe 0.7–1.5% and up to a total of 0.25% of Mn and Ti, which are added as cleansing agents.

**Alloy of beryllium, iron and chromium.** GEORGE G. MARSHALL and HAROLD S. BOOTH. U. S. 1,713,766, May 21. An alloy which is suitable for making carburizing boxes, etc., used at high temps. comprises Be 2–12, Fe 46–90 and Cr 4–42%.

**Copper-aluminum-cerium alloy.** FREDERICK J. READ (one-half each to Calaveras Iron and Steel Co. and Sydney H. Demarest). U. S. 1,714,729, May 28. An alloy which is suitable for journals and bearings comprises Cu together with Ce 0.1–10 and Al 5–10%.

**Iron alloy.** OESTERREICHISCHE SCHMIDTSTAHLWERKE A.-G. Fr. 652,621, April 12, 1928. A fusible alloy of Fe which is resistant to acids contains Ni more than 30, Cr more than 20 and C 0.5–1%, preferably with the addn. of metals such as Mo, which make the working of the metal easier. A reducing agent such as V may also be added.

**Decarbonizing iron alloys.** ELECTRO METALLURGICAL CO. Fr. 652,266, April 5, 1928. Alloys of Fe such as ferrochromium are decarbonized by a blast richer in O than air, e. g., contg. 50% O, which is directed on to the molten surface of the alloy. The alloy may afterwards be blown with H, which is directed under the surface.

**Alloys of nickel and iron, etc.** A. B. DAVIS (to Barber Asphalt Co.). Brit. 300,248, Nov. 10, 1927. Alloys are formed composed mainly of Ni and Fe, contg. also Cr and small proportions of Si and Mn with or without W, Co and Cu. Brit. 300,249–50 also relate to similar alloys with the constituents in different proportions.

**Ferrous alloy containing tin and aluminum.** LEWIS W. MALLASEE (to William H. Mallasee). U. S. 1,714,177, May 21. Sn 2.5 and Al 2.5 or more are added to molten ferrous metal such as steel 1600 parts while the metal is at a pouring temp., in order to form an alloy which is tough, strong, resonant and capable of taking a high temper.

**Alloys of lead with alkali and alkaline earth metals.** I. G. FARBENIND. A.-G. Brit. 300,129, Nov. 5, 1927. Alloys of this class are homogenized by extrusion through a perforated plate. An alloy of Pb with 20% Na, with or without 0.4% Ba, may be extruded at 260–330° in rod or tube form.

**Bronze.** SAARBRÜCKER METALLGUSSEWERK G. M. B. H. Fr. 652,400, April 10, 1928. Bronzes for bearings, etc., contg. 2–12% Pb have added thereto Ni 0.5–8, Cr 0.5–1.5, Mn up to 9, Al up to 5 and Mg 0.15–2% in the presence of metalloids such as As, Si, S, P and Cu, which may be present either singly or together in amt. up to 5%.

**Protecting metals.** GILBERT MICHEL. Fr. 33,706, Mar. 12, 1927. Addn. to



607,663. Metals such as Mg, Al or Ca are protected by a varnish such as a synthetic resin varnish contg. free phenol. Cf. C. A. 23, 369.

**Protecting metals.** GEORGES NOBILLEAU and JOCELYN GUIPET. Fr. 651,850, Mar. 28, 1928. Fe and Cu metals are protected against atm. corrosion by cementation under pressure with powd. Zn contg.  $\text{BaCO}_3$  and (or)  $\text{K}_4\text{Fe}(\text{CN})_6$  and flint.

**Coating objects.** E. I. DU PONT DE NEMOURS & Co. Fr. 652,006, Mar. 30, 1928. In coating surfaces, particularly metals, the primary coating contains a mixed ester of a polyhydric alc. and a polybasic acid and drying oil acids, with or without a natural resin and natural resin acid. Coats of different compn. from the primary are then applied. Examples are given.

**Corrosion preventing.** I. G. FARBENIND. A.-G. Fr. 652,598, April 12, 1928. Corrosion of Fe or its alloys by  $\text{H}_2\text{SO}_4$  of any concn. is lessened by adding to the acid small amts. of thiosemicarbazide or its derivs. A table is given showing the effect of the addn. of thiosemicarbazide, phenylthiosemicarbazide and hydrazinethiodicarboxamide.

**Restricting corrosion of magnesium and its alloys.** ARTHUR C. ZIMMERMAN (to Dow Chemical Co.). U. S. reissue 17,309, May 28. Reissue of original pat. No. 1,677,667 (C. A. 22, 3128).

**Testing the resistance of ferrous metals to rusting.** CARL MAULER. U. S. 1,714,035, May 21. The affinity of O to iron, steel and iron alloys is detd. by immersing the specimens to be tested in a hot oxidizing soln. such as a soln. formed from NaOH,  $\text{NaNO}_3$  and lime and measuring from time to time the temp. of the soln. in order to det. the temp. at the moment at which the surface of the immersed specimen combines with the O of the soln. Cf. C. A. 23, 1382.

**Chromium-plated copper used as fuse wires or strips.** C. W. COX and C. E. C. SHAWFIELD. Brit. 300,160, July 27, 1927.

**Apparatus for cleaning metal sheets or strips by liquid baths.** CLIFFORD B. HIGGINS, HARRY A. HIGGINS and JOHN TYLER. U. S. 1,714,668, May 28. Structural features.

**Split rings for roller bearings.** JOSEPH G. AYERS, JR. (to General Motors Corp.) U. S. 1,715,268, May 28. In making a split ring with a hard raceway surface suitable for roller bearings, cold rolled steel in its flat condition is heat-treated and quenched to produce a hard surface with minimum distortion; the hardened strip is further heat-treated to produce a homogeneous and uniform grain structure, the strip is rolled to remove distortion and is bent into the required form.

**Annealing ferrous metal strips.** HARRY M. NAUGLE and ARTHUR J. TOWNSEND (to Columbia Steel Co.). U. S. 1,714,040, May 21. The metal is heated in a non-oxidizing gas to an annealing temp. and then cooled to below  $100^\circ$  while still in the non-oxidizing gas, all during a continuous endwise movement of the strip. An app. is described.

**Composition for use in soldering or welding aluminum.** WILHELM REUSS. U. S. 1,711,445, May 21. See Ger. 468,540 (C. A. 23, 1100).

**Soldering.** KARL SCHUMPELT (to Ernst G. Bek). U. S. 1,713,677, May 21. The surfaces to be soldered are brought together, and there is deposited on them, without the use of external electric current, such an amount of solder as can be absorbed by the metal of the article, during the subsequent heating operation without substantially changing the color of the article; finally, the solder is heated to cause it to melt and to be absorbed by the metal of the article.

## 10—ORGANIC CHEMISTRY

CHAS. A. ROUILLER AND CLARENCE J. WEST

**Determination of parachors of substances in solution.** DALZIEL L. HAMMICK and LESLIE W. ANDREW. *J. Chem. Soc.* 1929, 754-9.—Parachors ( $P_m$ ) of solns. have been detd. with the aid of the formula  $P_m = M_m \gamma^{1/2} / (D - d)$  where  $\gamma$ ,  $D$  and  $M_m$  are the surface tension, d., and mean mol. wt. of the soln.;  $d$ , the vapor d. being negligible (at  $25^\circ$ ).  $P_x$ , the parachor of the solute, may be calcd. from  $P$ , the known parachor of the solvent, and  $P_m$  by the formula  $P_m = P(1 - x) + P_x x$  assuming  $P$  obeys the straight-line mixt. law, where  $x$  is the mol. fraction of solute. Surface tensions were detd. using Sugden's app. (C. A. 18, 1771), and  $P_x$  calcd. for the following solns.:  $\text{CCl}_4$ ,  $m\text{-C}_6\text{H}_4\text{Me}_2$ , cyclohexane,  $\text{CHCl}_3$ ,  $\text{EtOH}$ ,  $\text{AcOH}$ ,  $\text{Me}_2\text{CO}$ ,  $\text{PhNO}_2$ ,  $\text{MeNO}_2$ ,  $\text{PhAc}$  and  $\text{Et}_2\text{O}$  in  $\text{PhH}$ ;  $\text{PhNO}_2$  and  $\text{AcOEt}$  in  $\text{CCl}_4$ ;  $\text{AcOEt}$  and  $\text{Me}_2\text{CO}$  in  $\text{HOAc}$

and in EtOH. Excellent agreement was found between exptl. and calcd. values for  $P_x$  and they are generally independent of diln. However, in all mixts. tried contg. nitro compds. and with Et<sub>2</sub>O in PhH,  $P_x$  was a direct linear function of diln. passing through the true parachor (within 1%) at  $x = 1$ . It is thus possible to det.  $P$  for substances which are not stable above their m. p.

A. S. CARTER

**Mechanism of the vapor phase oxidation of isomeric octanes. I. Normal octane.** J. C. POPE, F. J. DYKSTRA AND GRAHAM EDGAR. *J. Am. Chem. Soc.* 51, 1875-89 (1929).—The vapor-phase oxidation (dynamic method) of C<sub>8</sub>H<sub>18</sub>, C<sub>8</sub>H<sub>18</sub>CHO and PrCHO has been studied in detail. The results may be simply interpreted on the theory that the initial oxidation product of C<sub>8</sub>H<sub>18</sub> is C<sub>7</sub>H<sub>16</sub>CHO, which in turn is further oxidized to aldehydes of successively smaller no. of C atoms, CO and some CO<sub>2</sub> being simultaneously formed. The existence of luminescent "chain" reactions is indicated, apparently corresponding to the oxidation of the aldehydes to lower aldehydes, CO and H<sub>2</sub>O. The results are given in curves, for which the original should be consulted.

C. J. WEST

**Characteristics of the non-explosive oxidation of propane and the butanes.** ROBERT N. PRASE. *J. Am. Chem. Soc.* 51, 1839-56(1929).—A study has been made by the flow method of the reactions of mixts. of O with C<sub>3</sub>H<sub>8</sub> and the C<sub>4</sub>H<sub>10</sub>. No attempt has been made to analyze the liquid products and all conclusions are based on the results of gas analyses. The reactions are classified into 3 types which (with examples) are as follows: (I) unsaturates by dissocn. (C<sub>3</sub>H<sub>8</sub> → C<sub>3</sub>H<sub>6</sub> + H<sub>2</sub>); (II) unsaturates by oxidation (C<sub>3</sub>H<sub>8</sub> + 0.5 O<sub>2</sub> → C<sub>3</sub>H<sub>6</sub> + H<sub>2</sub>O); (III) aldehyde reaction (C<sub>3</sub>H<sub>8</sub> + 2 O<sub>2</sub> → CO + 2 H<sub>2</sub>O + AcH). Types I and II give evidence of being more or less normal homogeneous gas reactions which appear at 500-600°, but are subject to induction by Type III at lower temps. in amt. increasing with the temp. Type III may begin at temps. of 300-50° and gives every indication of being a chain reaction. Its development is highly spontaneous and at the same time it is sensitive to relatively minor variations in the conditions of reaction. In particular, it is subject to suppression by a broken-glass packing (especially when this is coated with KCl) and by use of a reaction tube of small diameter. Lowering the pressure to a few mm. has a like effect. Diln. with O, CH<sub>4</sub>, N, CO<sub>2</sub> or H depresses the reaction in amt. increasing in the order named; this effect is the greater at higher temps. Under these conditions the reaction thus has a negative temp. coeff., though eventually becoming explosive. Excess of hydrocarbon promotes the reaction. Under suppression, there may be no reaction up to 500-600°, Types I and II then appear, accompanied by Type III in varying amt. Considerations bearing on the isolation of particular reactions are set forth.

C. J. W.

**Low-temperature oxidation of hydrocarbons. I. The pressure-temperature curves of amylene-oxygen mixtures.** J. STANLEY LEWIS. *J. Chem. Soc.* 1929, 759-67, cf. C. A. 21, 3180.—C<sub>5</sub>H<sub>10</sub> (I) was washed with acidified KI, dried over CaCl<sub>2</sub> and distd., the fraction b. 34-5° being collected. Varying quantities of I were introduced into O<sub>2</sub>-filled bulbs which were connected to manometers. These were slowly heated and the vol. was held const. by varying the Hg head on the manometer, the pressure being recorded against the temp. The curves so formed show 3 sections: (a) a region approximating the normal vapor pressure curve but deviating slightly; (b) a gradual drop in pressure to a min. point indicating slow reaction with decrease in the no. of mols; (c) a sharp rise due to decompn. of products formed in (b), followed by a nearly normal gas pressure. Analyses during (a) gave pos. evidence of reaction with the formation of CO, CO<sub>2</sub> and aldehydes; the amt. increasing with the % of I up to equimol quantities of I and O<sub>2</sub>, above which it again decreased. The min. of (b) varies from 240° with 17.8% of I to 237° with 62.2% of I and the pressure drop is greatest in the equimol. mixt. I. suggests that peroxides (II) formed dissoc. and decomp. to aldehydes during (a); increase of temp. increases their formation and also the decompn. which results in polymerized aldehydes; hence the drop in pressure during (b). At the min. point sufficient unstable material is present to set up chain reactions giving rapid oxidation. Addn. of 0.5% PbEt<sub>4</sub> gave a linear relation between pressure and temp., the contraction disappearing; at the end, CO and CO<sub>2</sub> proved that slow reaction had taken place. H<sub>2</sub>O increased the pressure above the normal probably because of decompn. of II. The same effect was produced to a greater extent by pumice and charcoal, a light depression being observed, followed by detonation at 240° and 222° with pumice and charcoal, resp. The evidence supports the idea that the combustion of a hydrocarbon is the oxidation of a primarily formed unsatd. compd. to II which decomp. to give products which are further oxidized to CO, CO<sub>2</sub> and H<sub>2</sub>O, by virtue of energy from the decompn. of II.

A. S. CARTER

**Aliphatic diolefins. I. Behavior of Δ<sup>1,4</sup>-hexadiene towards sulfuric acid** FRANK

CORTESE. *Ber.* 62B, 504-9(1929).—The chief products of the action of  $\text{H}_2\text{SO}_4$  on  $\Delta^{1,5}$ -hexadiene (I) are a *cryst., neutral, cyclic monoester* (II),  $\text{MeCH}_2\text{CH}_2\text{CH}_2\text{CHMe} \cdot \text{O} \cdot \text{SO}_3\text{H}$ , and a *di-ester* (III),  $(\text{CH}_2\text{CHMeOSO}_2\text{H})_2$ , of

hexane-2,5-diol (IV). Both are unstable and yield IV on hydrolysis. IV is likewise unstable in the presence of acids and is dehydrated with formation of  $\alpha, \alpha'$ -dimethyl-tetrahydrofuran (V) and diallyl oxide (VI). VI in turn is readily attacked and forms condensation products (hydrocarbons) of high mol. wt. The yields of esters, ether and condensation products depend on the concn. of the acid and the temp. I (15 cc.) is added in the course of 25–100 mins. to 13.3 cc. 100%  $\text{H}_2\text{SO}_4$  at  $-15^\circ$  to  $4^\circ$ , treated with ice after 10 mins. to 2 hrs. and the tar filtered off on a glass filter. The filtrate (VII) soon becomes pink. The tar, stirred under ice water, changes into a white powder (II) and the  $\text{H}_2\text{O}$  soln. (VIII) assumes a deep, dark lavender color. The well-washed powder, dried in the air, has a refreshing odor reminiscent of caramel and pepper, m.  $90^\circ$  (cor.) after 15 crystals from  $\text{Me}_2\text{CO}$  with charcoal, is a little hygroscopic and somewhat volatile, mol. wt. in freezing  $\text{C}_6\text{H}_6$  185, is insol. in dil.  $\text{NaOH}$ , is not acid to phenolphthalein, does not at once decolorize a very faintly yellow soln. of Br in  $\text{CCl}_4$ ; crystallographic data (by GUILLERMO ZULOAGA), biaxial negative,  $\alpha_D -50^\circ$ , refractive index  $\beta = 1.505$ , double refraction  $\approx 0.009$ , monoclinic system, extinction  $43^\circ$ . The lavender soln. VIII becomes red-violet in a few days, then blood-red, and deposits a tar; alkalies change the color to a light green-yellow and acids back to the original color, spontaneous evapn. or pptn. with excess of acid gives a purple tar insol. in alc. and sol. in  $\text{Et}_2\text{O}$  and  $\text{Me}_2\text{CO}$ , while in alk. soln.  $(\text{NH}_4)_2\text{SO}_4$  ppts. a green tar with opposite solubilities. All of the tar in colloidal suspension can be brought down with  $\text{BaSO}_4$  by adding  $\text{Ba}(\text{OH})_2$ . The tar consists of condensation products of VI; the "acid" can be converted into the "alk." tar, and *vice versa*. The pink filtrate VII contains 4–8 cc. VI and III; it is neutralized with  $\text{Ba}(\text{OH})_2$  at  $10^\circ$ , freed from the excess of Ba with  $\text{CO}_2$  and concd. at  $45\text{--}55^\circ$  under 10–5 mm., giving 7–8 g. of the *Ba salt*,  $\text{C}_6\text{H}_{12}\text{O}_8\text{S}_2\text{Ba}$ , of III, at once decomps. in a drying oven into tar, VI,  $\text{SO}_2$ , and  $\text{BaSO}_4$ ; even in a glass-stoppered bottle *in vacuo* over lime in the dark it decomps. completely in a few days; on boiling in  $\text{H}_2\text{O}$  it yields  $\text{BaSO}_4$ , the amt. of which corresponds exactly to the increase in acidity. These results indicate that the salt obtained by Béhal from the product of the reaction of I with  $\text{H}_2\text{SO}_4$  was not a sulfonate  $\text{HOCH}_2\text{CH}(\text{SO}_3\text{ba})\text{CH}_2\text{CH}_2\text{CH}:\text{CH}_2$  but  $\text{MeCH}(\text{OSO}_3\text{ba})\text{CH}_2\text{CH}_2\text{CH}(\text{OH})\text{Me}$ , mixed with the above salt of III. When the reaction between I and  $\text{H}_2\text{SO}_4$  is carried out at  $-10^\circ$  the formation of tar is reduced to a min. and III seps. as an almost white ppt.; at  $20\text{--}40^\circ$ , on the other hand, neither VI nor esters are formed, the product being a dark red viscous oil which behaves like the above "acid" tar. The min. concn. of  $\text{H}_2\text{SO}_4$  which will attack I at room temp. is 65%; after shaking 18 hrs. 50 cc. of I yields 25 cc. VI and 10 cc. of red condensation products; the esters are completely decompd. The red polymerization products on distn. under 5 mm. yield 2 cc. of an oil,  $\text{C}_{12}\text{H}_{22}\text{O}$ ,  $b_D^{25} 65\text{--}85^\circ$ , colorless, of pleasant terpene-like odor, absorbs 2 atoms Br,  $d_{25}^{25} 0.865$ ,  $n_D^{25} 1.4536$ , mol. wt. about 180. VI (12 cc.) shaken 18 hrs. with 67%  $\text{H}_2\text{SO}_4$  yields 4 cc. of a deep violet oil giving 1.0 and 0.5 cc. of colorless unsatd. products  $b_D^{25} 55\text{--}7^\circ$  and  $110\text{--}27^\circ$  and having the compn.  $\text{C}_6\text{H}_{10}$ . As the furan ring is easily formed and again easily ruptured, the 1st step in the reaction undoubtedly consists in a rupture of the C–O union and the 2nd possibly in a reorientation of the mols. to  $\text{MeCOBu}$  which is condensed by the acids to unsatd., O-contg. compds. and unsatd. hydrocarbons.  $\text{Me}_2\text{CO}$ ,  $\text{MeCOEt}$ ,  $\text{Et}_2\text{CO}$ ,  $\text{Pr}_2\text{CO}$  and  $\text{MeCOBu}$ , treated like VI above, give deep red, green and purple oils of pleasant odors. C. A. R.

Polymerization of acetylene by electric discharge. Synthesis of dipropargyl and some isomers. GEORGES MIGNONAC and RENÉ VANIER DE SAINT-AUNAY. *Compt. rend.* 188, 959–61(1929).—By means of high-frequency discharge with the electrodes at low temp. ( $-60^\circ$ ),  $\text{C}_2\text{H}_2$  polymerized to give 70% of *trimer*,  $b_{25} -10^\circ$ ,  $d_4^{25} 0.752$ ,  $n_D^{19.5} 1.4446$ , which further polymerized slowly, oxidized at room temp. in air and degraded upon heating. It could be preserved in soln. in  $\text{PhH}$ ,  $\text{Et}_2\text{O}$  or  $\text{CHCl}_3$ . By oxidation with  $\text{KMnO}_4$  or  $\text{O}_3$ , this trimer gave  $\text{HCO}_2\text{H}$ ,  $(\text{CO}_2\text{H})_2$ ,  $\text{EtCO}_2\text{H}$  and  $(\text{CH}_3\text{CO}_2\text{H})_2$ ; hydrolysis of the ozonide gave  $\text{HCHO}$ ; reduction with Pt gave  $\text{C}_6\text{H}_{14}$  and treatment with alc.  $\text{AgNO}_3$  or  $\text{Cu}_2\text{Cl}_2$  indicated a mixt. of 3 constituents, *dipropargyl* (I), *methylpentadiene* (II),  $\text{HC}:\text{C}:\text{CHMeC}:\text{CH}$ , and *1,5,3-hexadiene* (III),  $\text{H}_2\text{C}:\text{C}:\text{CHC}:\text{CH}:\text{CH}_2$ . With  $\text{Cu}_2\text{Cl}_2$ , I gave a ppt. of yellow  $\text{C}_6\text{H}_4\text{Cu}_3 \cdot 2\text{H}_2\text{O}$  and II gave a red ppt. of the same formula; with  $\text{AgNO}_3$ , I and II were pptd. as  $\text{C}_6\text{H}_4\text{Ag}_3 \cdot 2\text{AgNO}_3$ ; in both cases, III remained.

A. S. CARTER

Preparation of butylmagnesium bromide. P. BORGSTROM, F. C. WAGNER AND

H. C. GRIFFIN. *J. Am. Chem. Soc.* 51, 1861-5(1929).—The effect of rate of addn. of BuBr, reverse process of addn., excess of BuBr and excess of Mg on the yield of Grignard reagent has been studied; the yields obtained on the large scale are in close agreement with those obtained by Gilman and co-workers in quant. work on the small scale.

C. J. WEST

Structure and activation of aliphatic aldehyde molecules. II. Formaldehyde, acetaldehyde, propionaldehyde and chloral. SVEND AAGE SCHOU. *J. chim. phys.* 26, 1-43(1929); cf. *C. A.* 23, 2151.—Inertial moments have been calcd. from absorption spectra and used as the basis to calc. the dimensions of the  $H_2CO$  mol. On the assumption that the Y-shaped mol. has an angle of  $60^\circ$  between the legs carrying the H the dimensions are: H to H,  $1.3 \times 10^{-8}$  cm.; C to H,  $1.3 \times 10^{-8}$  cm.; C to O,  $1.09 \times 10^{-8}$  cm. Two fundamental frequencies correspond to the C and O and to the H—H vibrations. In activated mols. the frequencies are decreased and the atoms are farther apart; with increase of temp. the no. of rotational states (no. of lines) is increased. The characteristics of the C:O relation have been likened to the spectrum of Mg, the normal state of which is  $^1S$  and the excited states  $^3P$  (*C. A.* 22, 2325); the electronic states indicate a quadrivalence of the  $H_2CO$  mol., which may be best likened to Si, the normal state being  $3p^2P_{0,1,2,3}$  and the activated  $4s^2P_{0,1,2}$ . AcH vapor shows a 60 band absorption between 3480 A. U. and 3000 A. U.; and below 3000 as far as 2823 A. U., structure is not observed but absorption is evident. Moments were calcd. for AcH and found to be 1.8 times that of  $H_2CO$ , leading to the belief that the rotational axis of the 4 H atoms is about the C—C=O chain which is in a straight line; thus the rotational mass of AcH (4 H atoms) is approx. twice that of  $H_2CO$ . EtCHO shows discontinuous absorption (3406 to 3249 A. U.) in bands which are very close together and difficult to distinguish.  $CCl_3CHO$  shows 2 continuous regions between 3008 and 2693 A. U. The aldehydes observed, with the exception of  $CCl_3CHO$ , showed discontinuous absorption, the structure of the spectra, however, decreasing with increase in the no. of C atoms in the mol. III. Absorption spectra of solutions. *Ibid* 69-90—A soln. of monomol.  $H_2CO$  (I) in  $C_6H_{14}$  was observed at  $-70^\circ$  and found to contain at least 17 bands between 3542 and 2750 A. U., corresponding to 2 states of vibration of the vapor. The max. for the soln. (2940 A. U.) showed a shift of 5 A. U. toward the red (max. for vapor = 2935 A. U.). Aq. solns. of I and  $(H_2CO)_2$  were identical, both showing an increasing absorption toward the ultra-violet with no band characteristic of :C:O, indicating high % hydration to :C(OH) $_2$ , which was calcd. to be less than 1 mol. of I per 1200 mols. of hydrate or polymer. AcH (II) in  $H_2O$  and  $C_6H_{14}$  gave max. at 2778 and 2934 A. U., resp. (vapor, max. = 2800 A. U.), and from the extinction coeffs. at this point, it is estd. that 26% of II is hydrated in  $H_2O$ . EtCHO gave a max. in  $H_2O$  at 2765 A. U. and in  $C_6H_{14}$  at 2895 A. U.; 50% hydration was indicated. In all cases the  $C_6H_{14}$  solns. gave characteristic max. absorptions in the region of 2900 A. U.; chloral gave exactly 2900 A. U., but in  $H_2O$  this :C:O band was not present, indicating a high degree of hydration. The enol form of the aldehydes (:C. CH(OH)) causes absorption in the region of 2210 A. U.; from the extinction coeff. for an aq. soln. of II at this point, it was estd. that 1 mol. in 30,000 was enolized (*vinyl alc*). A 0.1 M soln. of II in 0.01 N NaOH absorbed very much more in this region and had an enol ratio of 1:335. Aq. solns. of II and of *paraldehyde* were made just acid with drop of HCl and found to contain enol to the extent of 1:1040 and 1:835, resp. The formation of *crotonaldehyde* is not responsible for these absorptions, for its max. falls at 2000 A. U.

A. S. CARTER

Esters of dimethylethylacetic acid. B. B. CORSON, J. S. THOMAS AND D. D. WAUGH. *J. Am. Chem. Soc.* 51, 1950-1(1929).—Details are given of the prepn. of *tert*-AmCl in 65% yields; the Mg compd. with  $CO_2$  gives 60% of  $Me_2EtCCO_2H$ . The following esters were prepd. with  $H_2SO_4$  as catalyst ( $b_{744}$  (cor.),  $n_D^{25}$  and  $d_4^{25}$  are given): *Me*, 125-5.5°, 1.3991, 0.8943; *Et*, 141.8-2.2°, 1.3989, 0.8601; *Pr*, 164-4.4°, 1.4040, 0.8575; *Bu*, 184-4.7°, 1.4098, 0.8566; *Am*, 202.5-3.5°, 1.4140, 0.8544; *iso-Am*, 192.5-6.5°, 1.4128, 0.8533.

C. J. WEST

The preparation of ethylene glycol, its homologs and derivatives as disclosed in the patent literature. A. ULLRICH. *Metallbörse* 19, 901-3, 957-8, 1013-14(1929).—A review.

W. C. FBAUGH

Dithioformic acid. II. T. G. LEVI. *Atti accad. Lincei* [6], 9, 170-5(1929); cf. *C. A.* 18, 1114.—The K salt was prepd. by the reaction  $CHCl_3 + 2K_2S = HCS_2K + 3KCl$  (in EtOH); the salt purified by recrystg. from abs. EtOH in dry air, forms golden yellow crystals, m.  $193^\circ$  (decompn.) to a red liquid. The free acid is obtained by adding dil. HCl to the EtOH soln. cooled with ice, as a white solid, insol. in common solvents. There is a slight evolution of  $H_2S$  during the reaction. The acid is collected

on a filter and washed with EtOH, then Et<sub>2</sub>O; it m. 55–60° (decompn.). The NH<sub>4</sub> salt is formed by titrating the acid with NH<sub>4</sub>OH; this decompn. on standing (2HCS<sub>2</sub>·NH<sub>4</sub> = 2NH<sub>3</sub> + H<sub>2</sub>S + (HCS<sub>2</sub>)<sub>2</sub>S). (NH<sub>4</sub>)<sub>2</sub>S does not react directly with CHCl<sub>3</sub>. When the free acid is heated the decompn. products are H<sub>2</sub>S, CS<sub>2</sub>, C and S. (HCS<sub>2</sub>Me)<sub>2</sub> is formed in 70% EtOH by the reaction of MeI on HCS<sub>2</sub>K, as a white solid, which, when decolorized with animal charcoal and recrystd., m. 105.5°. F. p. detns in C<sub>6</sub>H<sub>6</sub> give a mol. wt. 267–276, i. e., the trimeric formula as above. The Et ester is a liquid at ordinary temps. The Pr ester, m. 38–9°; here again we have (HCS<sub>2</sub>Pr)<sub>2</sub>. (HCS<sub>2</sub>Bz)<sub>2</sub> exists in 2 forms, one m. 77°, the other m. 154.5°. The two are sepd. by dissolving in C<sub>6</sub>H<sub>6</sub> and adding EtOH, which ppts. the isomer, m. 154.5°. Both of these also have the mol. wt. 504 of a trimer. (HCS<sub>2</sub>)<sub>2</sub>S is formed by the reaction 2HCS<sub>2</sub>K + BrCN = KCNS + (HCS<sub>2</sub>)<sub>2</sub>S. This, as well as the disulfide, is insol. in common solvents.

A. W. CONTIERI

**New syntheses of organic selenium compounds.** QUINTINO MINGOIA. *Gazz. chim. ital.* 58, 667–73 (1928).—The discovery that HSeMgBr is a valuable agent for the synthesis of a wide variety of org. Se compds. (C. A. 21, 1104) led to further expts. with AcCl, ClCO<sub>2</sub>Et, EtI, AcH and BzH. Freshly distd. AcCl (7.8 g.) in anhyd. Et<sub>2</sub>O added to HSeMgBr (from 2.4 g. Mg and 11 g. EtBr), heated 4 hrs. on a water bath, cooled, decompd. with ice, the 2 layers sepd., and the Et<sub>2</sub>O layer let stand, deposits Se, probably originating from decompn. of AcSeH by atm. O. If the Et<sub>2</sub>O layer is immediately extd. with NH<sub>4</sub>OH, and the ext. (pomegranate-red soln.) evapd. *in vacuo* over H<sub>2</sub>SO<sub>4</sub>, the residue contains Se, AcOH and NH<sub>4</sub> salts, because of oxidation, thus: AcSeNH<sub>4</sub> + O → AcONH<sub>4</sub> + Se. Attempts to prep. salts of heavy metals gave ppts. which formed slowly when cold and rapidly when hot, but which decompd. to the corresponding selenides. There were thus obtained from Pb(OAc)<sub>2</sub> a white ppt. when cold, a black ppt. when hot; from AgNO<sub>3</sub> a white ppt. when cold and a black ppt. when hot; from Bi(NO<sub>3</sub>)<sub>3</sub> a canary-yellow ppt. when cold and a black ppt. when hot; from FeCl<sub>3</sub> a brown-red ppt. when cold and a black ppt. when hot; from CuSO<sub>4</sub> no ppt. when cold and a black ppt. when hot. With Co, Ni, Sn and Zn salts no ppts. were obtained. This decompn. to black selenides when hot is analogous to the corresponding decompn. of thioacetates to sulfides (cf. *Gazz. chim. ital.* 25, i, 314 (1895); 27, i, 316 (1897)). Freshly distd. ClCO<sub>2</sub>Et (10.8 g.) in anhyd. Et<sub>2</sub>O heated 4 hrs. on a water bath with HSeMgBr (from 2.4 g. Mg and 11 g. EtBr), cooled, decompd. with ice, the aq. layer acidified with dil. H<sub>2</sub>SO<sub>4</sub>, the layers sepd., the aq. layer extd. with Et<sub>2</sub>O, the combined Et<sub>2</sub>O exts. treated with concd. NH<sub>4</sub>OH, gave 2 solns. (1) *The ammoniacal soln.* evapd. *in vacuo* over H<sub>2</sub>SO<sub>4</sub>, the residue dissolved in water, acidified with dil. H<sub>2</sub>SO<sub>4</sub>, extd. immediately with Et<sub>2</sub>O, the ext. evapd. *in vacuo* over H<sub>2</sub>SO<sub>4</sub>, yields a small quantity of a compd. contg. Se, m. 122–3°. (2) *The Et<sub>2</sub>O soln.* treated with NH<sub>3</sub>, concd. on a water bath, the residual oil fractionated twice, yields a major part as an oil, b. 125–7°, of characteristic odor and neutral reaction, the analysis corresponding to *monoethylselenocarbonic acid anhydride* (EtOCO)<sub>2</sub>Se. Therefore, if EtOCOSeH is formed, the greater part decompn. as follows: EtOCOSeH → CO + Se + EtOH. This decompn. was confirmed by identification of CO, Se and EtOH in the reaction products. Dry HSeMgBr heated with EtI for 6 hrs. on a water bath, cooled, decompd. with ice, neutralized with dil. H<sub>2</sub>SO<sub>4</sub>, extd. with Et<sub>2</sub>O, the ext. concd. and the residual oil fractionated, yields for the most part EtSeH, the reaction being EtI + HSeMgBr → MgBrI + EtSeH. Freshly distd. AcH (4.4 g.), heated with HSeMgBr (as before) for 4 hrs. on a water bath, cooled, decompd. with ice, neutralized with dil. H<sub>2</sub>SO<sub>4</sub>, the 2 layers sepd., the aq. layer extd. with Et<sub>2</sub>O and the Et<sub>2</sub>O-exts. concd., yields a reddish yellow oil with a disagreeable penetrating odor, which on heating or *in vacuo* decompn. with sepn. of red Se. Let stand several days *in vacuo* over H<sub>2</sub>SO<sub>4</sub>, an uncrystallizable mass was obtained, analysis of which indicated C<sub>2</sub>H<sub>4</sub>Se, so that the reaction is probably in 2 stages, thus: AcH + HSeMgBr → MeHC(SeH)OMgBr + H<sub>2</sub>O, and MeHC(SeH)OH·H<sub>2</sub>O → MeHCSe. To transform the MeHCSe obtained into the solid modification obtained by Vanino and Schinner (cf. C. A. 9, 1609), it was dissolved in abs. EtOH, the soln. was satd. with HCl gas, evapd. *in vacuo* over H<sub>2</sub>SO<sub>4</sub> and CaO, which yielded a cryst. compd., m. 136° (cf. 139° of V. and S.). Freshly distd. BzH (10.6 g.) in anhyd. Et<sub>2</sub>O, heated with HSeMgBr for 10 hrs. on a water bath, and treated as before, yields a small residue insol. in water or Et<sub>2</sub>O. On evapn. the Et<sub>2</sub>O ext. yields chiefly unaltered BzH. On crystn. from boiling C<sub>6</sub>H<sub>6</sub>, the residue insol. in water or Et<sub>2</sub>O yields PhCHSe, m. 203–5°.

C. C. DAVIS

Dioxan. W. HERZ AND ERWIN LORENTZ. *Z. physik. Chem., Abt. A*, 140, 406–22 (1929); cf. C. A. 21, 1095.—The com. product is dried with Na and by fractionation dioxan is obtained, b<sub>760</sub> 100.8°. From the d. at different temps. d<sub>4</sub><sup>20</sup> 1.0548, d<sub>4</sub><sup>100.3</sup> 0.9457,

and the crit. temp.  $310^{\circ}$  are calcd. On mixing with  $H_2O$  contraction, whereas with MeOH and EtOH dilatation, takes place. The abs. viscosity at  $20^{\circ}$ , 0.01255, changes to 0.00539 at  $80^{\circ}$ . The influence on the viscosity by  $H_2O$ , MeOH and EtOH is very specific for each system. The surface tension from  $20^{\circ}$  to  $90^{\circ}$  is detd. and changes from 35.42 to 25.97 dyne/cm. Mixts. with  $H_2O$  have decreasing surface tension with decreasing  $H_2O$  concn. With the alcs. the opposite is found. The sp. heat  $c_p$  detd. at  $23^{\circ}$  is 0.420. The heat of evapn. is 86.2 cal. per g. The b. p. const. is 3270 and not 2200. The lowering of the f. p. by  $C_{10}H_8$  gives 5010 for the const. In  $C_8H_8$  dioxan is monomol. The heat of combustion is 6602 cal. per g. The solubilities of different inorg. and org. salts in dioxan- $H_2O$  mixts. are given, also some cond. measurements.

E. SCHOTTE

**Mechanism of organic reactions. II.** The "non-existence" of a migratory methyl group in the conversion of glycerol dichlorohydrin into glycerol monomethyl ether. HAROLD HIBBERT and MYRON S. WHELEN. *J. Am. Chem. Soc.* 51, 1943-7 (1929); cf. C. A. 23, 2939.— $CH(OH)(CH_2Cl)_2$ , MeI and AgO give glyceryl  $\alpha,\alpha'$ -dichlorohydrin  $\beta$ -Me ether (I), b.  $157-9^{\circ}$ ,  $n_D^{17}$  1.4550; hydrolysis by heating with AcO and 75% EtOH for 16 hrs. at  $115-30^{\circ}$  and then heating the filtrate 1 hr. with 75% EtOH contg. 3% HCl gives only MeOCH( $CH_2OH$ ) $_2$ . Allyl Me ether and Cl at  $0^{\circ}$  give glyceryl  $\alpha,\beta$ -dichlorohydrin  $\alpha'$ -Me ether, b.  $153-7^{\circ}$ ,  $n_D^{17}$  1.4489; conversion into the acetate and sapon. yields only the  $\alpha$ -Me ether. Previous work in this field, pointing to the probability of the migration of a Me radical in the conversion of I into the acetate and subsequent hydrolysis of the latter, is based on the mistaken identity of the resulting product as the  $\alpha$ -Me ether. The bearing of these results on the methylation of  $C_3H_5(OH)_3$  and carbohydrate derivs. is pointed out and the importance of the pure  $\alpha$ - and  $\beta$ -glyceryl Me ethers as "type substances" further confirmed. C. J. W.

**Further syntheses of  $\alpha$ -keto acids of the carbohydrate series.**  $\alpha$ -Ketogalactonic or  $d$ -tagaturonic and  $\alpha$ -ketomaltobionic or  $d$ -glucosido- $d$ -fructuronic acids. TORAO KITASATO. *Biochem. Z.* 207, 217-29 (1929).— $d$ -Galactosone is oxidized with  $Br_2$  to  $\alpha$ -keto- $d$ -galactonic acid which is isolated as the Ca salt from MeOH, which in turn can be converted into the Ba salt and pptd. from EtOH. Both salts are  $H_2O$ -sol. The Ba salt is converted to a brucine salt also easily sol. in  $H_2O$ , but not in abs. alc. or  $Me_2CO$ . Recrystd. several times from acetone, this salt has  $[\alpha]_D^{21} -24.55^{\circ}$  in  $H_2O$  and  $-24.39^{\circ}$  in 50% alc. Its isomer,  $d$ -tagaturonic acid, in an equiv. amt. of HCl, has  $[\alpha]_D^{21} -7.6^{\circ}$  to  $-7.8^{\circ}$ . The  $\alpha$ -ketomaltobionic acid is prepd. from maltosone by oxidation with  $Br_2$ . The sol. Ba salt is obtained by pptn. with MeOH and is converted to the brucine salt. The latter m.  $150-60^{\circ}$  (decompn.),  $[\alpha]_D^{21} 11.2^{\circ}$  in water and  $16.1^{\circ}$  in 50% alc.  $d$ -Glucosido- $d$ -fructuronic acid is isomeric and its Ba salt in water has  $[\alpha]_D^{20} 54.8^{\circ}$ , and reduces Fehling soln. powerfully. Hydrolysis with acids and enzymes was studied. S. MORGULIS

**Preparation of osone solutions for purposes of synthesizing keturonic acids.** T. KITASATO AND C. NEUBERG. Kaiser Wilhelm-Inst. für Biochem., Berlin-Dahlem. *Biochem. Z.* 207, 230-1 (1929).—The osazones are hydrolyzed with fuming HCl in an ice mixt. and the pptd.  $PhNHNH_2 \cdot HCl$  removed by filtration. From the dark filtrate the HCl is removed by neutralizing with alkali-free  $PbCO_3$ . The  $PbCl_2$  is allowed to crystallize out in the cold, and the soln. is decolorized with charcoal. It is concd. *in vacuo* to give about 2% concn. of osone. On oxidation this yields keturonic acids. S. MORGULIS

**Synthesis of cyclic compounds. V.** The catalytic and the thermal decomposition of some normal dibasic acids. A contribution to the problem of the ease of formation of simple carbon rings. ARTHUR I. VOGEL. *J. Chem. Soc.* 1929, 721-33; cf. C. A. 22, 4481.—V. gives a critical discussion (with many references) of the exptl. and theoretical work on ring formation, particularly Ingold's (C. A. 15, 1696, 3078; 20, 2830) and Wojnicz-Sianozeki's (C. A. 16, 3073). For a study of the ease of formation of simple C rings, V. chose as a suitable reaction the slow thermal distn. of the normal dibasic acids  $(CH_2)_n(CH_2CO_2H)_2$ , which could decomp. to form a ketone,  $CH_2 \cdot (CH_2)_n \cdot CH_2 \cdot CO$ , or a satd. monobasic acid,  $Me(CH_2)_nCH_2CO_2H$ . His results

indicated that the cyclopentane ring is formed more readily than the cyclohexane ring, disagreeing with I.'s theoretical computations, but agreeing with W.-S.'s. The distns. were all carried out by heating slowly in a bath filled with Cu turnings. Glutaric acid (I) (280 g.) and succinic acid (90 g.) were prepd. in 2 expts. from 1 part cyclopentanone (400 g.) and 10 parts  $HNO_3$  (2:3). I on distn. gave butyric acid, b<sub>100</sub>  $160-2^{\circ}$ , d<sub>15</sub>

0.9595,  $n_D^{19.9}$  1.3978. Fifty g. I on catalytic decompn. (meaning always a distn. with Fe filings and Ba(OH)<sub>2</sub> in the proportion of 100 and 5 g., resp., to 100 g. of acid) formed 1.5 g. of a liquid,  $b_{768}$  145–50°. The yields of cyclopentanone from adipic acid under the following conditions were: distd. alone, 80%; distd. with an equiv. amt. of Fe, 61%; with 5% by wt. of Ba(OH)<sub>2</sub>, 78%; on catalytic decompn., 51% (and in addn. probably some cyclopentylidenecyclopentanone). Pimelic acid (II), m. 105–6°, was prepd. most conveniently almost quantitatively by refluxing the dinitrile (from  $\alpha,\epsilon$ -C<sub>6</sub>H<sub>10</sub>Br<sub>2</sub> and alc. KCN) 9 hrs. with 12–15 times its wt. of 50% H<sub>2</sub>SO<sub>4</sub>. On distn. 50 g. II yielded 52% cyclohexanone,  $b_{768}$  155°,  $d_{15.2}$  0.9489,  $n_D^{16.2}$  1.4521 (semicarbazone, m. 166°) and hexoic acid (4.3 g. of the Ag salt). Catalytic decompn. of II gave chiefly cyclohexanone (56%). The yields of suberone and heptoic acid on distn. of 50 g. suberic acid, under the following conditions were, resp.: alone, 0.9 g., 15.5 g. ( $b_{18}$  120°,  $d_{18.8}$  0.9212,  $n_D^{18.8}$  1.4255); with 5% by wt. of Ba(OH)<sub>2</sub>, about 2%, 12.9 g. ( $b_{18}$  121°,  $d_{17.1}$  0.9231,  $n_D^{17.1}$  1.4265); with 5% by wt. of Fe, 2.5 g. (impure), 8.5 g. ( $b_{18}$  121°); with 0.5 the quantity Fe required to form the Fe<sup>++</sup> salt, 7.7 g., 1.8 g.; with an equiv. quantity Fe, 8 g., 0.1 g. with an equal wt. of Fe, 10 g. suberone. These expts. indicate that increasing the proportion of Fe increases the purity of the suberone, as shown by the b. p., d.,  $n$  (the values are given) and the formation of semicarbazone. An intermediate Fe<sup>++</sup> salt is thought to be formed at a relatively low temp. and to decompose into suberone at a higher temp. Azelaic acid (III), m. 106–7°, (from the oxidation of ricinoleic acid by KMnO<sub>4</sub>; Maquenne, *Bull. soc. chim.* 21, 1061) on distn. gave mainly 1.4 g. of a liquid, b. 180–230° (apparently impure cyclooctanone), and 5 g. octoic acid,  $b_{16}$  129–30°. III on catalytic decompn. for 27 hrs. (the temp. being very slowly raised) formed about 10% cyclooctanone, identified as the semicarbazone, m. 166–7°. Catalytic decompn. of III isolated from the mixed acids (cf. C. A. 22, 4481) gave suberone as the main product. Fifty g. sebacic acid (IV) on distn. gave 0.9 g. of a ketone and 7 g. nonoic acid,  $b_{16}$  142–3°,  $d_{18}$  0.9096,  $n_D^{18}$  1.4343. Catalytic decompn. of IV gave a small yield of Me octyl ketone, identified as the semicarbazone, m. 122–3°.

JANET D. SCOTT

**Configuration determinations of mirror image isomers.** BROR HOLMBERG. *Svensk. Kem. Tid.* 41, 60–73 (1929).—A critical discussion on recent work on *d*- and *l*-isomers of lactic, malic, succinic, etc., derivs., citing Holmberg, Wohl, Freudenberg, Hudson, Levene, *et al.* So far no general method has become available for ascertaining the configurations of mirror image isomers. Those offered are objectively unsatisfactory and allow subjective evaluation of evidence leading to conflicting conclusions. *E. g.*, there is general agreement that *d*-rotatory asparaginic acid is of like configuration to *l*-rotatory malic acid—but the *l*-rotatory halosuccinic acids are classed *d* by Holmberg and Levene and *l* by Freudenberg, etc. Stelling's (C. A. 22, 4056) x-ray spectrographs may possibly give clues to the true configurations.

A. R. ROSE

**Question of the existence of an "activated" form of oxalic acid.** F. KRAUSS AND E. BRUCHHAUS. *Ber.* 62B, 487–9 (1929).—Oberhauser and Hensinger (C. A. 22, 2142) found that, if HgCl<sub>2</sub> is added to dil. solns. of (CO<sub>2</sub>H)<sub>2</sub> or (CO<sub>2</sub>Na)<sub>2</sub> and KMnO<sub>4</sub>, immediately after they have reacted, it is reduced to HgCl if (CO<sub>2</sub>H)<sub>2</sub> is present in excess, a phenomenon which they explain by assuming the formation, after the reaction with KMnO<sub>4</sub>, of an activated form of (CO<sub>2</sub>H)<sub>2</sub> whose activity slowly decreases. K. and B. have been able to confirm these observations without difficulty but they believe the reduction of the HgCl<sub>2</sub> is effected by a decompn. product of the (CO<sub>2</sub>H)<sub>2</sub>, *viz.*, HCO<sub>2</sub>H. HCO<sub>2</sub>H is best detected by adding to the soln. being examd. 5 cc. of 2% HgCl<sub>2</sub> and warming; if HCO<sub>2</sub>H is present a ppt. of HgCl seps. before boiling; if only very little HCO<sub>2</sub>H is present merely a turbidity is formed. If there is no reaction it is well to add another 5 cc. of HgCl<sub>2</sub> as an excess of HgCl<sub>2</sub> is necessary. When mixts. of 200 cc. of 5% (CO<sub>2</sub>H)<sub>2</sub> and 20–30 cc. of 5% KMnO<sub>4</sub> are heated, immediately after decolorization, with 5–10 cc. of 2% HgCl<sub>2</sub>, HgCl is pptd.; moreover, the resorcinol-H<sub>2</sub>SO<sub>4</sub> test gives not only the blue ring of (CO<sub>2</sub>H)<sub>2</sub>, but also, above it, the orange band of HCO<sub>2</sub>H, with gas evolution. Again, if the decolorized mixt. is partly distd. into H<sub>2</sub>O, the distillate gives a turbidity on heating with HgCl<sub>2</sub> and with resorcinol-H<sub>2</sub>SO<sub>4</sub>, shows the orange band of HCO<sub>2</sub>H but no longer the blue ring of (CO<sub>2</sub>H)<sub>2</sub>; 25 cc. distillate from a mixt. of 200 cc. (CO<sub>2</sub>H)<sub>2</sub> and 30 cc. KMnO<sub>4</sub> was neutralized with 0.46–0.50 cc. of 0.1 N NaOH, and the neutralized distillates yielded on evapn. HCO<sub>2</sub>Na, identified by its m. p., mixed m. p. and analysis. (CO<sub>2</sub>H)<sub>2</sub> alone distd. under the same conditions yielded no volatile acid.

C. A. R.

**Preparation of maleic acid by the catalytic oxidation of benzene.** TEIJIRO YABUTA

AND RINTA SIMOSE. *Bull. Inst. Phys.-Chem. Research (Tokyo)* **8**, 197-205 (1929); *Abstracts* **2**, 26 (in English).—In the oxidation of  $C_6H_6$  to maleic acid with air and a  $V_2O_5$  catalyst, Y. and S. study the influence of (a) diluent gases, (b) methods of prep. the catalyst and (c) the influence of acidic metal oxides in the catalyst. G. C.

Dicyanic acid. TENNEY L. DAVIS AND KENNETH C. BLANCHARD. *J. Am. Chem. Soc.* **51**, 1806-9 (1929).—Cyanic acid in  $H_2O$  ionizes as a weak acid, trimerizes to cyanuric acid, which may ppt. out or may appear as a residue when the liquid is evapd., undergoes hydrolysis to produce  $NH_3$  and  $CO_2$  (the  $NH_3$  combines with unchanged  $HOCN$  to form  $CO(NH_2)_2$  and  $NH_4CNO$  in the ratio corresponding to the equil. between these substances), and it dimerizes to form dicyanic acid. Dicyanic acid either depolymerizes during the evapn. of the soln. or undergoes hydrolysis—for an aq. soln. yields only  $CO(NH_2)_2$  and a little cyanuric acid when it is evapd. to dryness. Allophanic esters and biuret are formed directly from the alcs. and from  $NH_3$ , resp., not by the addn of  $HOCN$  to intermediate carbamic esters and  $CO(NH_2)_2$ . Aq. solns. of  $HOCN$  contain some substance, not biuret, which gives a biuret test, which reacts with  $PhNH_2$  to form phenylbiuret and with alcs. to form allophanic esters. C. J. WEST

Dearrangement of nitrobiuret and its application in synthesis. TENNEY L. DAVIS AND KENNETH C. BLANCHARD. *J. Am. Chem. Soc.* **51**, 1801-6 (1929).— $NH_2CONHCONHNO_2$  (I) appears to dearrange in 2 modes, to form  $NH_2NO_2$  and dicyanic acid, and  $O_2NNCO$  and  $CO(NH_2)_2$ . When an aq. soln. is warmed, the  $NH_2NO_2$  evidently breaks down into  $N_2O$  and  $H_2O$ , the  $O_2NNCO$  into  $N_2O$  and  $CO_2$  and the liquid acts toward various reagents as if it contained dicyanic acid. With moist  $EtOH-KOH$  I yields K allophanate, while with moist alcs. it gives allophanic esters which react with the alcs. on refluxing to produce carbamic esters. With  $NH_4OH$  I yields biuret, with biuret, tetruret; with primary and sec. amines,  $\omega$ -substituted biurets. The following  $\omega$ -alkyl- and  $\omega,\omega$ -dialkylbiurets were thus prepd. (m. p. and yield given): Me, 166.5-7°, 12.5%; Et, 154-4.5°, 23.9%; Pr, 147.2-7.6°, 45.0%; Bu, 129.1-9.5°, 70%; benzyl, 174.5-5°, 43%; Ph, 165°, 80%; p-tolyl, 199°, 62%;  $\alpha$ -naphthyl, 217-3-7.6°, 52%; di-Me, 141-1.5°, 33.6%; di-Et, 139-9.2°, 80%; di-Pr, 129-9.4°, 62%; di-Bu, 144.8-5°, 50%; ethylphenyl, 155.2-5.8°, 71%; propylphenyl, 151-1.5°, 45.3%. A soln. of I in concd.  $H_2SO_4$  gives up its  $NO_2$  group quant. in the nitrometer and is a suitable reagent for nitration. C. J. WEST

Dearrangement of nitrourea and its application in synthesis. TENNEY L. DAVIS AND KENNETH C. BLANCHARD. *J. Am. Chem. Soc.* **51**, 1790-801 (1929).— $NH_2CONHNO_2$  (I) dearranges into  $HNCO$  and  $NH_2NO_2$ ; it has been prepd. from these substances and they have been prepd. from it. The products of the decompn. of I by heat are those which would be expected from the 2 possible modes of its dearrangement ( $NH_2NO_2$  and  $HNCO$  and  $NH_3$  and  $O_2NNCO$ ).  $N_2O$  and  $HNCO$  are produced quant. when I is heated with  $H_2O$ . A soln. of I in concd.  $H_2SO_4$  contains  $NH_2NO_2$  and may be used as a reagent for nitrations. Alkalies promote the decompn. of I; acids hinder it. A very slight alk. in the presence of a trace of  $H_2O$  is sufficient to cause its spontaneous decompn. An aq. soln. of I, being a source of  $HNCO$ , reacts with  $NH_3$  and with primary and sec. amines to form  $CO(NH_2)_2$  and substituted derivs. The yields are excellent, the manipulation is simple and the other products of the reaction are gaseous. The method is especially advantageous for the prepn. of those substituted ureas which cannot be heated with  $H_2O$  without decompn. The following compds. were thus prepd.: Methylurea, m. 102° (85% yield); Et deriv., m. 92.1-2.4° (80%); Bu deriv., m. 96° (91%); benzeneazophenylurea, m. 222-3° (3%); ethylenediurea, m. 193-4° (78%); m-uraminobenzoic acid, m. 269.5-70.2° (90%); p-isomer, does not m. 275°; hydantoic acid, m. 160-1° (60%); (Et ester, m. 134-5° (62%)); phenylurea, m. 147° (98%). The following  $\alpha,\alpha$ -dialkylureas were prepd. in essentially the same way: di-Me, m. 182° (88% yield); di-Et, m. 75-5.3° (65%); di-Pr, m. 75.8-6.1° (57%); di-Bu, m. 118-9° (86%) (picrate, m. 82-3°); di-iso-Am, oil (92%) (oxalate, m. 101.5-2.5°; picrate, m. 72.8-3.9°); 2,3,4-trihydroquinolylurea, m. 146.2-6.6° (85%). The following  $\alpha$ -alkyl- $\alpha$ -phenylureas were prepd.: Me, m. 81.8-2.0 (72%); Et, m. 62.3-2.5° (76%); Pr, m. 89.4-9.8° (80%) (picrate, m. 118-8.5°; oxalate, m. 71-2°); Bu, m. 50.1-1.1° (50%). Heating the Pr deriv. at 210-5° gives 94.3% of  $PhNHPr$ .  $\omega,\omega$ -Dipropyl- and  $\omega$ -propyl- $\omega$ -phenylbiuret are obtained as by-products in the prepn. of urea derivs. from I and the corresponding amines. Moist alcs. react with I to produce carbamic and allophanic esters. C. J. WEST

Procedure for a convenient method to prepare salts of methylguanidine which are stable in air. WILHELM TRAUBE AND KURT GORNIAK. *Z. angew. Chem.* **42**, 379-81 (1929).—A 60-70% yield of crude methylguanidine sulfate (I) is obtained when a finely powd. mixt. of 42 g. dicyanodiamide and 87.5 g.  $MeNH_2Cl$  are heated just to the m. p.



(80–110°), then heated for 3 hrs. at 175° (never above 180°), cooled, dissolved in 250 cc. hot abs. alc., allowed to stand 12 hrs., filtered from the 2 g. of melamine-HCl which seps., an aliquot portion taken for detn. of Cl by gravimetric or Volhard method, a quantity of Na equiv. to the Cl in the original soln. dissolved in abs. alc. and added to the original soln. to ppt. NaCl (Soln. I), H<sub>2</sub>SO<sub>4</sub>, then added with cooling until the soln. is neutral which ppts. sulfates, the soln. and ppt. warmed 0.5 hr., filtered, the ppt. dissolved in a little H<sub>2</sub>O, a large vol. of alc. added which causes a ppt. to form as well as 2 immiscible liquid layers, filtered and the ppt. recrystd. from H<sub>2</sub>O; after a recrystn. from H<sub>2</sub>O, it m. 238°; when treated with the calcd. quantity of Ba(NO<sub>3</sub>)<sub>2</sub> in H<sub>2</sub>O, evapd. to dryness and recrystd. from abs. alc., it yields the *nitrate*, m. 148–9°. If Soln. I is neutralized with HCO<sub>2</sub>H, evapd. to a small vol., the sepd. crystals filtered, pressed on a porous plate, dried in a desiccator and recrystd. from alc., it yields the *formate*, m. 122°; the *nitrite* prepd. by treatment of I with Ba(NO<sub>2</sub>)<sub>2</sub>, m. 150°; the *free base* is obtained by treatment of the nitrate in alc. with an equiv. of EtONa and evapg. A 60% yield of *acetylmethylguanidine* (II), m. 171–2°, is obtained by warming the free base with EtOAc and recrystg. from EtOH; *HCl salt*, m. 172°; when II is heated above 171° it yields *dimethylacetoguanamine*, MeC:N.C(NHMe):N.C(NHMe):N. *Benzoylmethyl-*

*guanidine*, prepd. like II from the free base and EtOBz, m. 156°; the HCl salt, m. 220–1°. *Oxalymethylguanidine*, NH.C(:NH).NMe.CO.CO, prepd. by adding (CO<sub>2</sub>Et)<sub>2</sub>

to the free base in EtOH, filtering and recrystg. by adding AcOH to a MeOH soln., m. 205–7°. A 50% yield of *iminomalonylmethylguanidine* was obtained by adding 11.3 g. CNCH<sub>2</sub>CO<sub>2</sub>Et and 2.3 g. Na in abs. alc. to 7.3 g. free base in alc., refluxing 0.5 hr., filtering, neutralizing the filtrate with AcOH, filtering, evapg. the filtrate to dryness, dissolving the residue and previous ppts. in H<sub>2</sub>O, adding an excess of NH<sub>4</sub>OH and recrystg. the ppt. from H<sub>2</sub>O; it crysts. with 1 mol. H<sub>2</sub>O and m. 162° (decompn.); it forms cryst. salts with mineral acids and with HNO<sub>2</sub> yields a red *isonitroso compd.*

N. A. LANGE

**Hydantoins. XLVIII. Synthesis of polypeptide-hydantoins from hydantoin-1-acetic acid.** ALICE G. RENFREW AND TREAT B. JOHNSON. *J. Am. Chem. Soc.* 51, 1784–9(1929); cf. C. A. 23, 820.—Refluxing a mixt. of 7 g. Et hydantoin-1-acetate (I), 6.3 g. *p*-MeOC<sub>6</sub>H<sub>4</sub>CHO, 8 g. AcONa, 12 cc. AcOH and 3 cc. Ac<sub>2</sub>O for 6 hrs. gives 31% of *5-p-anisalhydantoin-1-acetic acid*, crystg. with 1 EtOH, m. 215–6°; heating with HI and red P gives the *5-p-IIO deriv.*, m. 201°. The structures of these compds. were established by methylation and reduction, which give 3-methyl-5-hydroxybenzylhydantoin-1-acetic acid, m. 167°, proving that the CH<sub>2</sub> group in the hydantoin cycle is the reactive complex when brought into reaction with aldehydes. I and MeONa in MeOH give, after digesting with an excess of MeI, *Et 3-methylhydantoin-1-acetate*, m. 91–2°; the free acid and *p*-MeOC<sub>6</sub>H<sub>4</sub>CHO with AcONa in AcOH give 3-methyl-5-*p*-anisalhydantoin-1-acetic acid, m. 203–5°, and also the labile modification, m. 168–9°, the yield of either isomer was small. Neither with hydantoin-1- nor -3-acetic acid was any evidence of the formation of geometric isomers obtained. The biol. importance of hydantoinacetic acids is emphasized and also their possible structural relationship to proteins.

C. J. WEST

**Pyrimidines. CVII. Examination of yeast nucleic acid for 5-methylcytosine.** TREAT B. JOHNSON AND HENRY H. HARKINS. *J. Am. Chem. Soc.* 51, 1779–84(1929); cf. C. A. 23, 2445.—A method for prepg. a protein-free nucleic acid from yeast is described; this is based on the original method of Altmann modified as recommended by Studel. The acetol test for thymine and 5-methylcytosine has been applied to the pyrimidine fraction of yeast nucleic acid and has been found to be negative. It may be concluded, therefore, that neither of these pyrimidines is present in yeast nucleic acid. By application of the acetol test for 5-methylcytosine to the aminopyrimidine fraction of any nucleic acid, it is now possible to detect this substance when present in very minute quantities.

C. J. WEST

The condensation product of glucose and *p*-anisidine. M. AMADORI. *Atti accad. Lincei* [6], 9, 226–30(1929); cf. C. A. 23, 3211.—Equimol. portions of glucose and *p*-anisidine placed in MeOH or EtOH slowly dissolve (8–10 days in MeOH, 15–20 in EtOH) completely, and, on allowing the soln. to evap. spontaneously, give a product, m. 86°. If the same compds. are boiled in the alc. and the product is recrystd., it m. 140°. These 2 forms evidently correspond to the 2 forms obtained when glucose and *p*-phenetidine condense. The compd., m. 86°, in H<sub>2</sub>O [ $\alpha$ ]<sub>D</sub><sup>20</sup> —38°, is quite stable to alkalis, but is decompd. by acids as with phenetidine. The compd., m. 140°, in

$\text{H}_2\text{O}$   $[\alpha]_D^{20} -28^\circ$ , is stable toward acids, and is decompd. to its constituents by alkalis. Therefore, the  $86^\circ$  compd. has the constitution of a glucoside, the  $140^\circ$ , that of a Schiff base.

A. W. CONTIERI

**Optical rotation and atomic dimension. VIII. Haloheptaacetyl derivatives of melibiose and maltose.** The structure of bioses and cellulose. D. H. BRAUNS, *J. Am. Chem. Soc.* 51, 1820-31(1929); cf. *C. A.* 22, 391.—The pure cryst. F, Cl and Br derivs. of acetylated melibiose and maltose have been prepd. The sp. rotational values of these  $\alpha$ -biase derivs. show an agreement with the at. dimension relationship of the monose sugars, whereas the values for the halogen derivs. of the  $\beta$ -biase, investigated before, agree with the relationship only by excluding the values for the F derivs. An explanation of this behavior is obtained by model studies, which show that the direction of the  $\beta$ -valence allows the constituting monoses to face each other, with a resulting selective influence, whereas the direction of the  $\alpha$ -valence does not allow this position. The new (more detailed) structure formula for cellobiose suggests a structure formula for cellulose. As compared with formulas heretofore suggested, this new formula gives a better interpretation of the chem. and phys. properties of cellulose. *Fluoroheptaacetylmellibiose*, prepd. according to B. (*C. A.* 17, 2107), m.  $135^\circ$ ,  $[\alpha]_D^{20} 149.70^\circ$ ; *Cl deriv.*, m.  $127^\circ$ ,  $[\alpha]_D^{20} 192.50^\circ$ ; *Br deriv.*, m.  $116^\circ$ ,  $[\alpha]_D^{20} 209.90^\circ$ . *Fluoroheptaacetylmaltose*, m.  $174-5^\circ$ ,  $[\alpha]_D^{20} 111.1^\circ$ ; *Cl deriv.*, m.  $125^\circ$ ,  $[\alpha]_D^{20} 159.50^\circ$ ; *Br deriv.*,  $[\alpha]_D^{20} 180.10^\circ$ .

C. J. WEST

**Dehydration of cyclohexene oxide and the conversion of the  $\text{C}_6$ -cycle into the  $\text{C}_5$ -cycle.** PIERRE BEDOS AND ADRIEN RUYER. *Compt. rend.* 188, 962-4(1929).—Passing 1,2-epoxycyclohexane (I) over thoria at  $330^\circ$  at the rate of 10-15 drops per min gave 1,2-dihydrobenzene (II), cyclopentane aldehyde (III) and unidentified compds. Dropping I into  $\text{C}_6\text{H}_4(\text{CO})_2\text{O}$  heated nearly to its b. p., gave 15 to 50% of II and 40 to 10% of III, the ratios of II and III varying, resp., with conditions of temp. and rate. This method gave pure II,  $b_{755} 81^\circ$  after distn. Small amts. of III were also formed through the use of  $(\text{CO}_2\text{H})_2$ ,  $\text{KHSO}_4$ ,  $\text{H}_2\text{SO}_4$  or  $\text{P}_2\text{O}_5$  as dehydrating agent. A. S. CARTER

**Action of allyl mustard oil on benzidine.** B. CECCHETTI AND U. SARTI. *Gazz. chim. ital.* 58, 760-3(1928).—The various reactions of thioureas studied by Lellmann and Würthner (cf. *Ann.* 227-8, 206, 209(1885)) and the nature of the products suggested that it was possible to obtain benzidine mustard oil (I) directly from allyl mustard oil (II) and benzidine (III). II (50 g.) refluxed a short time with III (10 g.), cooled, filtered, the residue washed repeatedly with EtOH and then with  $\text{Et}_2\text{O}$  and dried *in vacuo*, yields a compd. (IV) which m.  $243^\circ$ . This shows that I was not formed, in fact, analysis indicated that the product is the bi-addn. product of II and III prepd. by Schiff by another method (cf. *Ber.* 11, 830(1878)). Oxidized with concd.  $\text{HNO}_3$ , IV gives an unidentified bright red compd., m.  $176^\circ$ . II (100 g.) refluxed with III (10 g.) for 4 hrs., and the product treated as before, yields the compd.  $\text{C}_{14}\text{H}_{18}\text{N}_2\text{S}_2$ , m.  $203^\circ$ , which conforms to the properties of the product obtained by Jaffé from  $\text{CSCl}_2$  and III, i. e.  $[\text{SCNC}_6\text{H}_4-]_2$ . No  $\text{H}_2\text{S}$  was evolved in this last reaction, and it is probable that the reaction takes place in 2 steps: (1)  $\text{III} + 2\text{II} \longrightarrow [\text{C}_6\text{H}_5\text{NHCSNHC}_6\text{H}_4-]_2 \longrightarrow [\text{SCNC}_6\text{H}_4-]_2 + 2\text{PhNH}_2$ .

C. C. DAVIS

**Action of carbon disulfide on benzidine in the presence of metallic oxides.** B. CECCHETTI AND U. SARTI. *Gazz. chim. ital.* 58, 758-60(1928).—In a study of methods of removing  $\text{H}_2\text{S}$  from the sphere of action in the formation of thioureas from  $\text{CS}_2$  and amines and thus rendering the reaction quant., Krulla (cf. *C. A.* 8, 100) found that with  $\text{Sn}(\text{OH})_2$  an intermediate product of the dithiocarbamate type, e. g.  $(\text{PhNHCSS-})_2\text{Sn}$ , was formed. On the other hand, with other metallic compds. no intermediate compds. were formed. It was therefore of interest to det. whether with the method of K., compds. of the type  $(\text{RNHCS})_2$ , could be obtained, perhaps with formation of intermediate products. Alc. benzidine agitated for several hrs. with  $\text{CS}_2$  and fresh dry  $\text{SnO}$ , filtered, washed with EtOH and  $\text{Et}_2\text{O}$ , the residue treated repeatedly with concd.  $\text{HCl}$ , filtered, washed with water, EtOH and  $\text{Et}_2\text{O}$  and the residue dried *in vacuo* over  $\text{H}_2\text{SO}_4$ , yields the compd.  $\text{C}_{26}\text{H}_{22}\text{N}_4\text{S}$ , decomp. without fusion, probably has the constitution:  $[\text{H}_2\text{NC}_6\text{H}_4\text{C}_6\text{H}_4\text{NHCS-}]_2$ . It contains 2 free  $\text{NH}_2$  groups, for, diazotized and coupled with alk.  $\beta$ -naphthol, it gave the compd.  $\text{C}_{46}\text{H}_{40}\text{O}_2\text{N}_4\text{S}$ , dark red, decomp. above  $210^\circ$  without fusion, gives a violet-red soln. in concd.  $\text{H}_2\text{SO}_4$ ; its structure is probably  $[\beta\text{-HOC}_6\text{H}_4\text{N-NC}_6\text{H}_4\text{C}_6\text{H}_4\text{NHCS-}]_2$ . The expts. are being continued.

C. C. DAVIS

**Thioureas in the series of azo derivatives.** G. B. CRIPPA (WITH G. FAINI). *Gazz. chim. ital.* 58, 726-31(1928).—Though there is an extensive literature on the phenyl- and naphthylthioureas derived from aromatic amines, there are only 2 references to

thioureas from azo compds. (cf. Berju, *Ber.* 17, 1404(1884); Bolser and Hartshorn, *C. A.* 17, 3863). This lack of data induced C. to prep. several thioureas of azo compds. by the action of CS<sub>2</sub> on aminoazo compds. Cold CS<sub>2</sub> (60 cc.) added to *p*-H<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>N<sub>2</sub>Ph (6 g.) in EtOH (90 cc.), boiled for 15 hrs., filtered, washed with EtOH and Et<sub>2</sub>O and the residue recrystd. from PhNO<sub>2</sub>, yields (*p*-PhN<sub>2</sub>C<sub>6</sub>H<sub>4</sub>NH)<sub>2</sub>CS (I), m. 202° (cf. Berju, *loc. cit.*), decomps. above its m. p. with evolution of yellow fumes with a characteristic odor. The ease of formation of I is an indirect confirmation of the conclusions of Bolser and Hartshorn (*loc. cit.*) regarding the condensation products of *p*-C<sub>6</sub>H<sub>4</sub>(NH<sub>2</sub>)<sub>2</sub> and CS<sub>2</sub>. Let stand at room temp. with a mixt. of AcOH and perhydrol, filtered, the residue extd. with xylene and the ext. evapd., I yields (*p*-PhN<sub>2</sub>C<sub>6</sub>H<sub>4</sub>NH)<sub>2</sub>CO. The latter is also formed when I is oxidized by yellow HgO in boiling EtOH. When the oxidation with perhydrol is carried out above room temp., a brown substance is formed which contains no S and which is probably a carbamidoazoxy deriv. I (15 g.) suspended in hot AcOH, reduced with Zn dust (40 g.), boiled 1 hr., neutralized with satd. Na<sub>2</sub>CO<sub>3</sub>, filtered, the residue dried, ext. with EtOH, the ext. concd., dild. with water and the ppt. recrystd. from dil. EtOH, gives a very small yield of (*p*-H<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>NH)<sub>2</sub>CS. The latter in EtOH boiled with CS<sub>2</sub> for 12 hrs., the condensation product treated with cold dil. HCl, then with boiling EtOH, filtered and washed with boiling water, yields diphenylenedithiourea. Since the latter is also formed by condensation from *p*-C<sub>6</sub>H<sub>4</sub>(NH<sub>2</sub>)<sub>2</sub> and CS<sub>2</sub>, it has a dimeric *p*-cyclic structure and not the monomeric type of phenylenedithiourea. Following the same procedure as for I, there was prepd. 4,4'-thiocarbamido-1,1'-phenylazonaphthalene, yellow, m. 165°. Boiled for a long time with AcOH it forms phenylazo- $\beta$ -naphthylamine and an unidentified green compd. contg. S. Likewise from *o*-, *m*- and *p*-tolylazo-4-naphthalene were prepd.: 4,4'-thiocarbamido-1,1'-*o*-tolylazonaphthalene, m. 160°; 4,4'-thiocarbamido-1,1'-*m*-tolylazonaphthalene, m. 172°, and 4,4'-thiocarbamido-1,1'-*p*-tolylazonaphthalene, m. 185°. The last, treated for a long time with AcOH at 60–70°, yields a small quantity of a dark yellow substance, contg. no S, m. 215°. CS<sub>2</sub> reacts extremely slowly with *o*-H<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>N<sub>2</sub>Ph, and an appreciable quantity of the condensation product can be obtained only after boiling about 100 hrs. This product is brown, m. 100°, and by analogy should be 2,2'-thiocarbamidoazobenzene. Likewise CS<sub>2</sub>, boiled for a long time with alc. phenylazo- $\beta$ -naphthylamine, forms a brown substance which by analogy should be 2,2'-thiocarbamido-1,1'-phenylazonaphthalene. These compds. are to be studied further.

C. C. DAVIS

Phenyl isothiocyanate and *o*-tolyl isothiocyanate as reagents for primary aromatic bases. THEO. OTTERBACHER and FRANK C. WHITMORE. *J. Am. Chem. Soc.* 51, 1909–11 (1929).—PhNCS and *o*-MeC<sub>6</sub>H<sub>4</sub>NCS are satisfactory reagents for many primary aromatic amines, forming well crystg. and sharply melting thiocarbamides in good yields. The reagents do not react with H<sub>2</sub>O or EtOH and a detn. may be made in their presence. There are no by-products of the reaction. The following m. ps. are for the *o*-MeC<sub>6</sub>H<sub>4</sub>NCS and PhNCS derivs., resp.: *p*-MeC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub>, 132°, 141°; *o*-MeC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub>, 158°, 136°; *m*-MeC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub>, 140°, 94°; *p*-BrC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub>, 143°, 148°; *o*-BrC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub>, 128°, 146°; *m*-BrC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub>, 101°, 97°; *p*-ClC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub>, 134.5°, 152°; *o*-ClC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub>, 140°, 156°; *m*-ClC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub>, 124°, 116°; *p*-IC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub>, 150°, 153°; PhNHNH<sub>2</sub>, —, 172°; (PhNH)<sub>2</sub>, —, 168°; 3,4-Br(H<sub>2</sub>N)C<sub>6</sub>H<sub>3</sub>Me, 132°, 154.5°; 2,4-Me<sub>2</sub>C<sub>6</sub>H<sub>3</sub>NH<sub>2</sub>, 143.5°, 133.5°; 2,5-H<sub>2</sub>N(HO)C<sub>6</sub>H<sub>3</sub>Me, 182.5°, 167.5°; *p*-H<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>OH, 158°, 150°; NH<sub>3</sub>, 160°, 154°; *p*-MeOC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub>, 138°, —; *o*-MeOC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub>, 126°, —.

C. J. WEST

Nitration of phenylbenzylamine derivatives. JOSEPH REILLY, PETER J. DRUMM and TIMOTHY V. CREEDON. *J. Chem. Soc.* 1929, 641–4.—In a previous paper (cf. *C. A.* 22, 1963) the authors showed that on nitration of PhNHCH<sub>2</sub>Ph and PhN(CH<sub>2</sub>Ph)<sub>2</sub> under similar conditions the former yielded only the nitrate of the base. Nitration of the secondary base in H<sub>2</sub>SO<sub>4</sub> led to the formation of 3-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>CH<sub>2</sub>NHPh together with a smaller amt. of the corresponding 4-nitro deriv. The work is now extended to include the nitration of PhNHCH<sub>2</sub>Ph derivs. in which the NH-H is replaced by acidic and other groups. Unlike the parent substance, PhN(NO)CH<sub>2</sub>Ph is nitrated directly or in AcOH soln. with remarkable ease giving 4-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>N(NO)CH<sub>2</sub>Ph as the main product and a small amt. of the 2-nitro compd. In the nitration of PhN(CH<sub>2</sub>Ph)<sub>2</sub> in H<sub>2</sub>SO<sub>4</sub> the authors have isolated a new dinitro deriv. which is shown by direct synthesis to be phenyldi-*m*-nitrodibenzylamine, canary-yellow, m. 129–30°. The exptl. evidence supports the view that nitration of PhNHCH<sub>2</sub>Ph derivs. directly (*i. e.*, as bases) leads to the formation of nitro derivs. substituted in the aniline ring, whereas nitration through the salt promotes substitution in the benzyl nucleus. W. O. EMERY

Attempts to synthesize *o*-thiolphenylhydrazine. PRAPHULLA CHANDRA GUHA

AND TEJENDRA NATH GHOSH. *J. Indian Inst. Sci.* 12A, 31-5(1929).—*o*-HSC<sub>6</sub>H<sub>4</sub>NHNH<sub>2</sub> (I) cannot be prepd. from *o*-HSC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub> by diazotization and subsequent reduction. Hence (*o*-H<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>S)<sub>2</sub> (II) was (in 35% yield) prepd. by Hofmann's method (*Ber.* 20, 2259) (except that the final oxidation was carried out with I<sub>2</sub> soln.), and was diazotized. Its diazonium salt, however, could not be reduced with SnCl<sub>2</sub> and HCl or with Na<sub>2</sub>SO<sub>3</sub> to I, and it could not be coupled with aniline or EtOCS<sub>2</sub>K, but decompd. always to give a brownish tar, which on steam distn. yielded a pale yellow oil, (III), C<sub>13</sub>H<sub>8</sub>OS<sub>2</sub>, b. 231° (decompn.). III is evidently *oxydiphenylene disulfide*,

*o*-C<sub>6</sub>H<sub>4</sub>.SS.C<sub>6</sub>H<sub>4</sub>.O, formed by loss of water from the unstable (*o*-HOC<sub>6</sub>H<sub>4</sub>S)<sub>2</sub>. 37 g. III was obtained from II (10 g.) by diazotization and decompn. on standing in water. This is the first synthesis of a 7-membered ring contg. 1 O and 2 S. Reduction of III with Sn and HCl gave a colorless oil, probably a mercaptan. (*o*-AcNH(C<sub>6</sub>H<sub>4</sub>S)<sub>2</sub> (IV) (3 g.), m. 154°, was prepd. by refluxing II (3 g.) with Ac<sub>2</sub>O (10 cc.) and fused AcONa (1.5 g.) 2-3 mins. G. and G. hoped to make the NO deriv., [*o*-AcN(NO).C<sub>6</sub>H<sub>4</sub>S]<sub>2</sub> (V) and then I by reduction. V could not be obtained by addn. of NaNO<sub>2</sub> (1 g.) to IV (2 g.) in moderately strong HCl; or by passing the gas from strong HNO<sub>3</sub> and As<sub>2</sub>O<sub>3</sub> into IV in HCl or in glacial AcOH (the hot soln. in AcOH was rapidly cooled in ice to a crystn. paste). Just as benzenyl-*o*-aminothiophenol (VI) gives *o*-HSC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub> when heated with fused potash (*Ann.* 208, 291; *Ber.* 13, 1223; 20, 2259), G. and G.

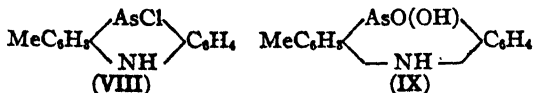
hoped that 2,3-benzo-6-phenyl-1,4,5-thiodiazine, C<sub>6</sub>H<sub>4</sub>.S.CPh.N.NH (VII), might give I. VIII, yellowish plates, m. 109° (5.6 g.), was prepd. from PhNHNHBr (80 g.) and S (30 g.) at 190-200° for 24 hrs. (cf. Hofmann, *Ber.* 13, 1223, for the prepn. of VI, which G. and G. prepd. in 50% yield). VII (20 g.) fused with powd. KOH (100 g.) gave BzOH and H<sub>2</sub>S, but no compd. with the SH or NHNH<sub>2</sub> group. J. D. S.

Cyclic *N*-hydroxy and *N*-oxide compounds. GUSTAV HELLER. *J. prakt. Chem.* [2], 121, 269-72(1929).—In the reduction of certain *o*-nitro substituted derivs. of PhH, *N*-HO compds. are formed; in other cases, *N*-oxide derivs. result. H. reviews the literature and concludes that in some cases there is a question as to whether the product belongs to the *N*-HO or *N*-oxide series. He suggests various tests by which this may be detd. M. A. DAILEY.

10-Chloro-5,10-dihydrophenarsazine and its derivatives. VII. Synthesis of the 1-methyl and 3-methyl homologs. CHARLES S. GIBSON AND JOHN D. A. JOHNSON. *J. Chem. Soc.* 1929, 767-87; cf. *C. A.* 22, 4528.—3-Amino-*p*-tolylarsonic acid (I) (10 g.) was dissolved in 18.7 cc. of HCl and 16.5 cc. of H<sub>2</sub>O and diazotized with 3.33 g. of NaNO<sub>2</sub> in 6.6 cc. of H<sub>2</sub>O (below 0°). This was added to 3.8 g. of CuCl<sub>2</sub> in 12.7 cc. of HCl during 3 mins., followed by 25 cc. of H<sub>2</sub>O. After stirring for 30 mins., filtering, washing with cold H<sub>2</sub>O and recrystg. from hot H<sub>2</sub>O, 65% of 3-chloro-*p*-tolylarsonic acid (II), m. 189-91°, was obtained. II (4.3 g.) was dissolved in 14 cc. of HCl contg. a trace of I and treated with SO<sub>2</sub> for 5 mins. After cooling, the oil was extd. in PhH, dried over CaCl<sub>2</sub>, evapd. and finally distd. *in vacuo*, giving 3-chloro-*p*-tolylidichloroarsene (III), b<sub>17</sub> 166-7°, m. 27-9°. One g. of III was warmed with 5 cc. of H<sub>2</sub>O and 5 cc. of NH<sub>4</sub>OH soln. (d. 0.88) for 20 mins., filtered, washed with H<sub>2</sub>O and repptd. from NaOH by means of CO<sub>2</sub>, giving 3-chloro-*p*-tolylarsenious oxide, m. 277°. Treatment of the diazo soln. of I with HBr and Cu<sub>2</sub>Br<sub>2</sub> (from CuSO<sub>4</sub> + KBr satd. with SO<sub>2</sub>), gave, instead of II, the 3-Br deriv. 4,2-MeBrC<sub>6</sub>H<sub>3</sub>AsO<sub>2</sub>H<sub>2</sub> (IV), m. 208-10° (decompn.) (72% yield). In the same manner as III, 60% of the 3-Br analog (V), b<sub>14</sub> 176-7°, m. 47-9°, was obtained and subsequently 3-bromo-*p*-tolylarsenious oxide, m. 266-8°. A warm soln. of 5 g. of II in 20 cc. of H<sub>2</sub>O contg. 5.7 g. of Na<sub>2</sub>CO<sub>3</sub>.10H<sub>2</sub>O was added to 12.6 g. of KMnO<sub>4</sub> in 312 cc. of H<sub>2</sub>O and boiled for 8 hrs. while continuously subjected to a stream of CO<sub>2</sub> bubbles. After cooled, acidified

acid (VI), m. over 310°. In the same manner, 65% of the 2-Br analog of IV was obtained. A mixt. of 11.8 g. of IV, 3.75 g. of PhNH<sub>2</sub>, 8.8 g. of anhyd. K<sub>2</sub>CO<sub>3</sub>, 35 cc. of AmOH and a trace of Cu powder was boiled for 5 hrs., steam distd., decolorized, filtered and acidified with dil. HCl, giving 63% of crude 3-methyldiphenylamine-6-arsonic acid, 4,2-Me(PhNH)C<sub>6</sub>H<sub>3</sub>AsO<sub>2</sub>H<sub>2</sub> (VII). Pure VII, m. 158-9° (sol. in HOAc, MeOH, EtOH and Me<sub>2</sub>CO), was obtained by mixing the crude with cold NH<sub>4</sub>OH, warming to soln., then adding concd. NH<sub>4</sub>OH; the NH<sub>4</sub> salt which crystd. was dissolved in H<sub>2</sub>O, acidified with HCl and the ppt. decolorized in HOAc to which enough water had been added while boiling to cause turbidity; cooling after filtration pptd. VII. VII (3.45 g.) was dissolved in 15 cc. of hot HCl and 15 cc. of EtOH contg. a trace of I, reduced with SO<sub>2</sub>, cooled and the 2.2 g. of ppt. was dried and recrystd. from PhH, giving yellow

10-chloro-3-methyl-5,10-dihydrophenarsazine (VIII), m. 216–6.5°. Two g. of VIII, dissolved in 70 cc. Me<sub>2</sub>CO, was treated with 4.5 g. chloramine-T in 63 cc. of H<sub>2</sub>O; after 30 mins. 81% of 3-methylphenarsazinic acid (IX) was filtered off and recrystd. from HOAc which gave IX + HOAc which was not removed by drying over KOH. Two g. of VIII was also oxidized in boiling HOAc (20 cc.) with 4.0 cc. of H<sub>2</sub>O<sub>2</sub>; 80 cc. of H<sub>2</sub>O was added, the solid filtered off, dissolved in hot NaOH and decolorized with charcoal. Excess NaOH was added and, upon cooling, 79% of IX pptd. as the Na salt which was dissolved in warm water and acidified, pptg. IX. Upon cooling a soln. of 1.6 g. of IX in 47 cc. of hot EtOH and 14 cc. of HCl, the HCl salt, m. 232–3° (decompn.), was pptd.; this is also obtained by boiling IX with concd. HCl, cooling, filtering and recrystg. from EtOH and HCl. Through the use of HBr instead of HCl in the prepn. of VIII, the 10-Br deriv. (X), m. 206–8°, was obtained. Yellow 3-nitro-*p*-tolyl-dichloroarsine, m. 113°, was prepd. from the arsonic acid in the same manner as III. 3-Nitro-*o*-tolyl-arsonic acid (XI), m. 228–30°, was prepd. according to Jacobs, Heidelberger and Rolf (C. A. 12, 2550); it was found that excess HOAc added to the "coupled" soln. before the addn. of HCl gave the Na H salt of XI, m. 97°; soln. of this in NaOH and pptn. with mineral acid gave XI. XI was converted into 3-nitro-*o*-tolyl-dichloroarsine (XII), m. 93°, by the method used to prep. III. Boiling 12.2 g. of XI with 100 cc. of HBr (d 1.49) contg. a trace of I gave 92% of yellow dibromoarsine deriv., m. 116.5–7.5°. 3-Amino-*o*-tolylarsonic acid was prepd. according to the method of J. H. and R., evapg. the aq. soln. of the Na salt under reduced pressure to avoid excessive dearsenication; 12 g. of this was dissolved in 22.4 cc. HCl and 20 cc. of H<sub>2</sub>O and converted to 76% of the 3-Cl-*o*-deriv., m. 236–9° (decompn.), in the manner used to prep. II, which was converted to 78% of the dichloroarsine (XIII), b<sub>11</sub> 156°, m. 37.5°, by the method used for III. Heating XIII with NH<sub>4</sub>OH gave the arsenious oxide, m. to a milky liquid at 234–7°. The 3-bromo-*o*-tolyl derivs. were prepd. in the same general manner as IV, V, etc., giving 75% of the arsonic acid, 2,6-MeBrC<sub>6</sub>H<sub>3</sub>AsO<sub>3</sub>H<sub>2</sub> (XIV), m. over 306°; the dichloroarsine, b<sub>13</sub> 170–1°, m. 25–7°; and the arsenious oxide, m. 214–9°. XIV was converted to 67% of 3-methyldiphenylamine-2-arsonic acid (XV), m. 170–1° (decompn.), and subsequently to 10-chloro-1-methyl-5,10-dihydrophenarsazine (XVI), m. 216–6.5°, and 1-methylphenarsazinic acid (XVII), m. 316° (decompn.), by the method for the 3-Me isomers VII, VIII and IX. Boiling 1.1 g. of XV with concd. HCl (8 cc.), adding 8 cc. of EtOH and cooling gave the HCl deriv., m. 231–2° (decompn.); this was also prepd. from XVII by boiling with a mixt. of EtOH and HCl. Boiling 21 g. of *o*-bromophenylarsonic acid (XVIII), 8 g. of *m*-MeC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub>, 65 cc. of AmOH and 16.3 g. of anhyd. K<sub>2</sub>CO<sub>3</sub> with a trace of Cu powder for 5 hrs. gave 61% of 3-methyldiphenylamine-6'-arsonic acid (XIX), m. 141–2°, which was worked up in the same manner as VII and reduced to 1- and/or 3-methyl-10-chloro-5,10-dihydrophenarsazine (XX), m. 216–7°. This substance was oxidized by both methods given for VIII and the product (XXI) was indistinguishable from the rationally synthesized 1-methyl- and 3-methylphenarsazinic acids. Treating XIX as in the case of VII and XV, the HCl deriv., m. 232–3°, was indistinguishable from IX or XVII. There exists a possibility that IX, XVII and the HCl deriv. of XXI are the same, but it would require a ring-splitting and rearrangement of XVI during its conversion to XVII.



A. S. CARTER

Reaction of mercuric acetate with *p*-bromodiethylaniline. FRANK C. WHITMORE, A. R. CADE AND G. J. LEUCK. *J. Am. Chem. Soc.* 51, 1952(1929).—While *p*-BrC<sub>6</sub>H<sub>4</sub>NMe<sub>2</sub> gives a good yield of *o*-Hg product, *p*-BrC<sub>6</sub>H<sub>4</sub>NEt<sub>2</sub> does not react with Hg(OAc)<sub>2</sub> under any of the exptl. conditions tried, except to give unmanageable oxidation products.

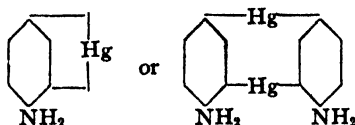
C. J. WEST

Tin tetraphenyl as a phenylating reagent. R. W. BOST AND P. BORGSTROM. *J. Am. Chem. Soc.* 51, 1922–5(1929).—SnPh<sub>4</sub> reacts with halogens to form aryl monohalides, with acyl halides to form Ph ketones, with S to form Ph<sub>2</sub>S, Ph<sub>2</sub>S<sub>2</sub> and thianthrene. The reactions with alkyl halides and SO<sub>2</sub>Cl<sub>2</sub> were not conclusive. With HNO<sub>3</sub>, PhNO<sub>2</sub> was isolated.

C. J. WEST

The formation of a closed heterocyclic ring by mercury atoms. L. VECCHIOTTI. *Gazz. chim. ital.* 58, 712–5(1928).—A preliminary note. Expts. by Dreher and Otto (Ann. 154, 93), by Pesci (*Gazz. chim. ital.* 28, ii, 101) and by V. in his numerous researches (C. A. 21, 395; 22, 231, 2555, 4506, 4507) have shown that aromatic groups may be linked together by a bridge of a single Hg atom. It was of interest to det.

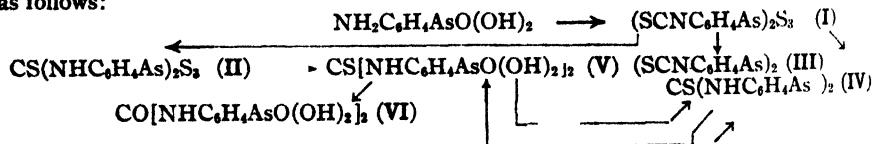
whether by carrying out similar reactions with compds. contg. 2 AcOHg groups it would be possible to synthesize compds. of the general formula  $R \begin{array}{c} \text{Hg} \\ \diagup \quad \diagdown \\ \text{Hg} \end{array} R$ . The initial expts. were carried out with  $\alpha$ - and with  $\beta$ -biacetatomercuri-*o*-chloroaniline and seemed to indicate the formation of compds. contg. 2 Hg bridges, as already described (cf. V. and Michetti, *C. A.* 20, 589). Continuing the expts., diacetatomercurianiline (cf. V., *C. A.* 9, 448) and 50%  $\text{Na}_2\text{S}_2\text{O}_4$  heated several hrs. yielded a white, semi-gelatinous substance, which showed evidence of decompn. at  $162^\circ$  and m.  $184^\circ$ , and which was insol. in all solvents. Its constitution was probably one of the 2 following structures:



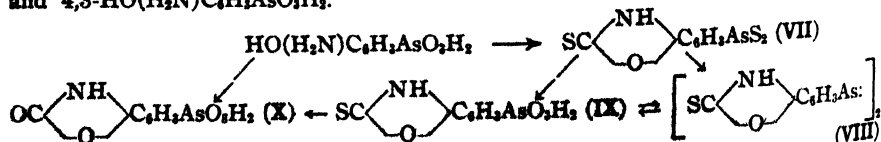
Expts. are in progress dealing with the action of Na-Hg on compds. formed from halogenated  $\text{C}_6\text{H}_4$  nucleus and contg. a lateral chain halogenated at its extremity.

C. C. DAVIS

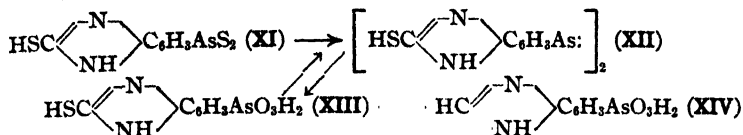
**Trypanocidal activity and chemical constitution. I. New sulfur derivatives of aromatic organic arsenicals.** JOHN G. EVERETT. *J. Chem. Soc.* 1929, 670-9.—Aromatic org. arsenicals contg. the C:S group attached to N have been prepd. and tested in exptl. infections of *Trypanosoma equiperdum* in mice. Results show that the permanency of cure and the toxicity are not influenced appreciably by the substitution of S for O, except in those compds. contg. As in the 5-position in a 2-thiolbenzimidazole ring, which are very efficacious. Aminophenylarsonic acids have been condensed with  $\text{CS}_2$  in the presence of alc. and NaOH by boiling. From *p*-arsanilic acid 70% of *p,p'*-dithiocarbiminophenylarsonic sesquisulfide (I) instead of the expected *diphenylthiourea-p,p'*-arsenic sesquisulfide (II) was obtained as a yellow amorphous solid. The constitution of I was shown as follows: Hydrolysis with NaOH gave II. Reduction with  $\text{Na}_2\text{S}_2\text{O}_4$  gave 74% *p,p'*-dithiocarbiminoarsenobenzene (III). Hydrolysis of III by NaOH gave 81% of *p,p'*-arseno[*diphenylthiourea*] (IV), obtained also as an orange amorphous solid by reduction and hydrolysis of I with  $\text{Na}_2\text{S}_2\text{O}_4$  and 25% NaOH at  $90^\circ$  (yield 40%), by reduction of II with  $\text{Na}_2\text{S}_2\text{O}_4$  (yield 62%), and by the reduction of *diphenylthiourea-p,p'*-diarsonic acid (V) with  $\text{Na}_2\text{S}_2\text{O}_4$  (yield 71%). From  $\text{CSCl}_2$  and *p*-arsanilic acid in NaOH, V can be obtained in 69% yield and also by treating IV and II, resp., with 0.1 N I, in yields of 42% and 31%. In the presence of excess  $\text{NaHCO}_3$  followed by treatment with 0.5 N I, V gave 43% *diphenylurea-p,p'*-diarsonic acid (VI), identical with the compd. from  $\text{COCl}_2$  and *p*-arsanilic acid. These reactions are summarized as follows:



From 4,3-HO(H<sub>2</sub>N)C<sub>6</sub>H<sub>3</sub>AsO<sub>2</sub>H<sub>2</sub> condensed similarly to *p*-arsanilic acid, 64% of 1-thio-benzoxazolone-4-arsenic disulfide (VII), sol. in dil. NaCN, was obtained. Reduction of VII and IX, resp., with  $\text{Na}_2\text{S}_2\text{O}_4$  gave 4,4'-arseno[1-thiobenzoxazolone] (VIII), a yellow amorphous solid sol. in dil. NaCN, in yields of 73% and 70%. On treatment with I, both VII and VIII gave 30% and 45%, resp., of 1-thiobenzoxazolone-4-arsenic acid (IX), yellow needles, identical with that obtained from 4,3-HO(H<sub>2</sub>N)C<sub>6</sub>H<sub>3</sub>AsO<sub>2</sub>H<sub>2</sub> and  $\text{CSCl}_2$ , in 78% yield. In the presence of excess  $\text{NaHCO}_3$  and treatment with I, IX gave 77% of benzoxazolone-4-arsenic acid (X) identical with the compd. from  $\text{COCl}_2$  and 4,3-HO(H<sub>2</sub>N)C<sub>6</sub>H<sub>3</sub>AsO<sub>2</sub>H<sub>2</sub>.



From 3,4-(H<sub>3</sub>N)<sub>2</sub>C<sub>6</sub>H<sub>4</sub>AsO<sub>2</sub>H<sub>2</sub>, 64% of 2-thiolbenzimidazole-5-arsenic disulfide (XI) was obtained, which when reduced by Na<sub>2</sub>S<sub>2</sub>O<sub>4</sub> gave 72% 5,5'-arseno[2-thiolbenzimidazole] (XII). On oxidizing with I, 2-thiolbenzimidazole-5-arsonic acid (XIII), obtained from XI by treatment with I (yield 37%), gave benzimidazole-5-arsonic acid (XIV) in 83% yield. (H<sub>3</sub>N)<sub>2</sub>C<sub>6</sub>H<sub>4</sub>AsO<sub>2</sub>H<sub>2</sub> →



S attached to As only may be sharply differentiated from mercaptan S, by means of either I or Na<sub>2</sub>S<sub>2</sub>O<sub>4</sub>, the latter form not being oxidized by I unless some alkali is present. The arsenic acids V, IX and XIII gave no color with alk. Na<sub>2</sub>Fe(CN)<sub>5</sub>NO soln. whereas all sulfides mentioned gave a deep violet color. In order to compare O with S, in analogous compds., VI and X and their arseno compds. were prepd. In many cases due to the amorphous nature of the compds. the at. ratios of As:N:S were found for the purpose of identification.

**The thermal behavior of phenols.** A. HAGEMANN. *Z. angew. Chem.* 42, 355-61 (1929).—When PhOH vapor is passed through a tube filled with pumice stone and heated to 650-750°, it decomps. as follows: PhOH = CO + H + "balance of mol."; the removal of the CO group destroys the aromatic character and structure, thus necessitating a rearrangement of the "balance of the mol." into a more stable form resulting in the formation of (a) C + H; (b) partial hydrogenation by the liberated H to form CH<sub>4</sub>, C<sub>2</sub>H<sub>4</sub>, (CH<sub>2</sub>:CH)<sub>2</sub>; (c) traces of C<sub>2</sub>H<sub>2</sub>; (d) condensation of the CH≡ fragments to form aromatic hydrocarbons such as PhH, C<sub>10</sub>H<sub>8</sub>, C<sub>14</sub>H<sub>10</sub>, phenanthrene and chrysene. Under similar conditions at a temp. of 850° PhOH decomps. as follows: PhOH = H<sub>2</sub>O + "balance of mol."; again the unstable "balance of mol." is immediately converted into the more stable forms as above. The decompn. of PhOH in all cases causes a rupture of the ring. The formation of PhH is due to a subsequent polymerization of the CH≡ fragments. Decompn. of PhOH at 300-450° in contact with Ni catalyst on silica gel is as follows: PhOH = CO + 3H<sub>2</sub> + 5C; the CO thus formed is partly decomd. into CO<sub>2</sub> + C, while a part of the H reduces the intermediate CH≡ fragments to CH<sub>4</sub>. Similarly, in contact with activated charcoal the principal reaction is: PhOH = H<sub>2</sub>O + 2H<sub>2</sub> + 6C with a small portion reacting as follows: PhOH = CO + 3H<sub>2</sub> + 5C; at the same time reduction takes place as follows: PhOH = H<sub>2</sub> + C<sub>6</sub>H<sub>6</sub> + H<sub>2</sub>O; the amt. of aromatic condensation products is very small. When *m*-cresol and N<sub>2</sub> are passed through an unfilled hot tube at 630-50°, decompn. occurs as follows: MeC<sub>6</sub>H<sub>4</sub>OH = CO + H + "balance of mol."; under the influence of H, the "balance of mol." loses the Me with formation of CH<sub>4</sub>, H<sub>2</sub> and polymerization of CH≡ fragments to aromatic hydrocarbons as PhH, C<sub>10</sub>H<sub>8</sub>, etc.; a part of the "balance of mol." retains the Me and polymerizes to methylated hydrocarbons, MePh, MeC<sub>10</sub>H<sub>7</sub>, etc.; simultaneously part of the H gives rise to the following reactions: MeC<sub>6</sub>H<sub>4</sub>OH + 2H = MeH + PhOH. The % yields of compds. obtained at 750° are given in detail. The expts. with dihydroxybenzenes were conducted by passing the vapors through a quartz tube filled with glass rings. *o*-C<sub>6</sub>H<sub>4</sub>(OH)<sub>2</sub> decompd. as follows: C<sub>6</sub>H<sub>4</sub>(OH)<sub>2</sub> = (2CO + 2H + "balance of mol.") = (CH<sub>2</sub>:CH)<sub>2</sub> + 2CO; the yield of butadiene was 21%; the decompn. of hydroquinone was similar. The decompn. of resorcinol is as follows: C<sub>6</sub>H<sub>4</sub>(OH)<sub>2</sub> = (2CO + 2H + "balance of mol.") = (CH<sub>2</sub>:CH)<sub>2</sub>, C<sub>2</sub>H<sub>4</sub>, CH<sub>4</sub>, C, H and aromatic hydrocarbons; the yield of (CH<sub>2</sub>:CH)<sub>2</sub> was low. When phloroglucinol is heated in a flask (with O<sub>2</sub> excluded), it first decomps. as follows: 2C<sub>6</sub>H<sub>3</sub>(OH)<sub>3</sub> = H<sub>2</sub>O + (HO)<sub>2</sub>C<sub>6</sub>H<sub>2</sub>OC<sub>6</sub>H<sub>2</sub>(OH)<sub>2</sub>; when the temp. is raised to 320-50°, a gas is rapidly evolved consisting of 98.8% CO<sub>2</sub> and the balance CO, H, CH<sub>4</sub> and other hydrocarbons; the residue is about 80% sol. in Me<sub>2</sub>CO and seems to resemble a humic acid. When α-naphthol is heated to 600° in a glass tube, it decomps. into CO, H and "balance of mol." the latter subsequently decompd. into C and H which then reduce the unchanged α-naphthol to C<sub>10</sub>H<sub>8</sub>, CH<sub>4</sub>, a hydrocarbon C<sub>22</sub>H<sub>10</sub> of unknown constitution and possibly some α-dinaphthylene oxide. The decompn. of β-naphthol is similar except that the "balance of mol." decomps. into PhH, PhMe, C<sub>7</sub>H<sub>8</sub> gases, C<sub>10</sub>H<sub>8</sub>, β-dinaphthostilbene and methylenedinaphthyl oxide, C<sub>10</sub>H<sub>4</sub>.CH<sub>2</sub>.C<sub>10</sub>H<sub>4</sub>.O.

N. A. LANGE

**Action of bromine on certain mixed ethers.** L. CHAS. RAIFORD AND D. M. BIROSEL. *J. Am. Chem. Soc.* 51, 1776-8(1929).—Ph allyl ether and Br in CHCl<sub>3</sub> give 2,4,6-Br-

$C_6H_5OH$  and 2,4-dibromophenyl  $\beta,\gamma$ -dibromopropyl ether,  $b_{10}$  220–3°. 2,4- $Br_2C_6H_3OH$ , by Claisen's method, gives 54% of 2,4-dibromophenyl allyl ether,  $b_{12-23}$  165–70°. 5-Tribromophenyl allyl ether and Br in  $CHCl_3$  give 2,4,6-tribromophenyl  $\beta,\gamma$ -dibromopropyl ether, m. 42.5–3.5°. 2-Nitro-4-chlorophenyl deriv., m. 55°; 2,4,6-trinitrophenyl deriv., m. 102°. 2,4- $Br_2C_6H_3OH$  and iso-PrOH give 2,4-dibromophenyl isopropyl ether,  $b_{11}$  156°; 2,4,6-tribromophenyl deriv., m. 40°. The HBr evolved in the bromination of the ethers tested may split them unless  $AcONa$  is present. The splitting is most pronounced when the alkyl is connected through a sec. or tert. C atom. C. J. W.

Oxidation-reduction. XIII. Preparation of indophenols which may be used as oxidation-reduction indicators. H. D. GIBBS, W. L. HALL and W. M. CLARK. *U. S. Pub. Health Repts. Suppl.* No. 69, 35 pp. (1929).—For the group  $H_2:C_6H_4:O$  the name of "benzenone" is retained when the two H atoms are substituted by :N-, while for this bridging N the stem "ind." is used. The nomenclature of the compds. is discussed. The prepn. by oxidation of a mixt. of a phenol and a  $p$ -aminophenol by  $NaOCl$  gives poor results as a lab. method. The reported substances are prepd. by the action of  $NaOCl$  on an aminophenol and coupling the formed quinonechloroimide with the phenol by adding  $NaOH$ ; the Na salt is salted out. Leucoindophenols are obtained by reducing the Na salts with  $K_2S$  and pptg. with  $AcOH$ . Benzenoneindophenol ( $p$ -indophenol) was obtained from the Na salt by pptg. with  $CO_2$ . It has no definite m. p. At 129° an exothermic reaction takes place. Leuco- $p$ -indophenol, m. 175.5°. 2-Methylbenzenoneindophenol (*o*-cresolindophenol),  $O:C_6H_3(CH_3):NC_6H_4OH$ . Two samples prepd. by both methods gave at  $p_H$  8.633  $E'_{0.0846}$  and 0.0844; calcd. 0.0851. At  $p_H$  9.609  $E'_{0.0108}$  and 0.0167; calcd. 0.0113. M. p. 162°. The leuco-2-methylindophenol (4,4'-dihydroxy-3-methyldiphenylamine) shrinks at 151°, m. 152.5°. 3-Methylbenzenoneindophenol (*m*-cresolindophenol), m. 110–1° (decompn.). The leuco compd. could not be isolated. 2,6-Dimethylbenzenoneindophenol,  $O:C_6H_3(CH_3)_2:NC_6H_4OH$  from buinonechloroimide and 2,6- $Me_2C_6H_3OH$ . The Na salt forms green crystals. 3-Methyl-6-isopropylbenzenoneindophenol (thymolindophenol), m. 134.1°, at 151° decompn. sets in. 2-Methyl-5-isopropylbenzenoneindophenol (carvacrolindophenol), m. 121.2° and is stable up to 171°. 2-Methoxybenzenoneindophenol (guaiacolindophenol), m. 171°. 3-Methoxybenzenoneindophenol (methylresorcinolindophenol) is sol. in  $Et_2O$  to 0.5% and can be pptd. from this soln. with benzine. 2-Chlorobenzenoneindophenol (*o*-chlorophenolindophenol) was not obtained in a pure form. 2-Bromobenzenoneindophenol (*o*-bromophenolindophenol) The Na salt, when heated, carbonized below 100°, the free indophenol was not obtained, the leuco compd. not in cryst. form. 3-Bromobenzenoneindophenol (*m*-bromophenolindophenol) was obtained as the Na salt in a very impure form. 2,6-Dichlorobenzenoneindophenol (2,6-dichlorophenolindophenol). The Na salt is nearly insol. in  $H_2O$ . The leuco compd. m. 175°. 2,6-Dichlorobenzenoneindo-3'-methylphenol (2,6-dichlorophenolindo-*o*-cresol),  $O:C_6H_3Cl_2:NC_6H_4MeOH$  from 2,6-dichloroquinonechloroimide and *o*-cresol. The leuco compd., when recrystd. from 20%  $EtOH$  in  $H_2O$ , m. 108°. On drying at 90° 1 mol.  $H_2O$  is lost. The m. p. is then 114°. 2,6-Dichlorobenzenoneindo-2'-methylphenol (2,6-dichlorophenolindo-*m*-cresol); the leuco compd., m. 209°, when crystd. from  $MeOH$ . 2,6-Dichlorobenzenoneindo-3'-chlorophenol (2,6-dichloroindo-*o*-chlorophenol); the Na salt is green, purple by transmitted light. No leuco compd. was prepd. 2,6-Dichlorobenzenoneindo-2'-chlorophenol (2,6-dichlorophenolindo-*m*-chlorophenol) was obtained as the Na salt only of 85.2% purity. 2,6-Dibromobenzenoneindophenol (2,6-dibromophenolindophenol); the leuco compd. was recrystd. from 20%  $MeOH$  and m. 179–81°. 2,6-Dibromobenzenoneindo-3'-methylphenol (2,6-dibromophenolindo-*o*-cresol); the Na salt was dissolved in  $EtOH$  and pptd. with  $Et_2O$ . 2,6-Dibromobenzenoneindo-2'-methylphenol (2,6-dibromophenolindo-*m*-cresol). 2,6-Dibromobenzenoneindo-2'-methyl-5'-isopropylphenol (2,6-dibromophenolindothymol), from 2,6-dibromoquinonechloroimide and thymol. 2,6-Dibromobenzenone-3'-methoxyphenol (2,6-dibromophenolindo-*o*-guaiacol). 2,6-Dibromobenzenoneindo-3'-bromophenol (2,6-dibromoindo-*o*-bromophenol). 2,6-Dibromobenzenoneindo-2'-bromophenol (2,6-dibromoindo-*m*-bromophenol). 2,6-Dibromobenzenoneindo-3'-chlorophenol (2,6-dibromophenolindo-*o*-chlorophenol). 2,6-Dibromobenzenoneindo-3'-Na sulfonatephenol (2,6-dibromophenolindo-*o*-phenol - *o*-sulfonate), prepd. with  $o-HOC_6H_4SO_3Na$ . 2,6-Dibromobenzenoneindo-2'-Na sulfonatephenol (2,6-dibromophenolindo-*m*-phenol - *m*-sulfonate). Benzenoneindo-*o*-phenol (phenolindo-*o*-phenol),  $O:C_6H_4:NC_6H_4OH$ , from *o*-quinonechloroimide and phenol. The leuco product was crystd. from  $H_2O$ ; it is colorless, m. 168.5–9.8°. 3-Methylbenzenoneindo-*o*-phenol (*m*-cresolindo-*o*-phenol); the yield was very poor, the leuco compd. could not be obtained in cryst. form. 2-Bromobenzenoneindo-*o*-phenol (2-bromophenolindo-*o*-phenol) 1-in cryst. form. 2-Bromobenzenoneindo-*o*-phenol (2-bromophenolindo-*o*-phenol).  $O:C_6H_4:NC_6H_4OH$ , from 1,2- $C_6H_4(OH)SO_3Na$  and quinonechloroimide. The mono-



Na salt was pptd. with  $\text{CO}_2$  and recrystd. from abs. EtOH. 1-Naphthenone-2-sulfonic acid-*indo-3'-methylphenol* (1-naphthol-2-sulfonic acid-*indo-o-cresol*). The di-Na-salt forms crystals of green-bronze color; for mono-Na salt, see previous compd. 1-Naphthenone-2-sulfonic acid-*indo-3',5'-dichlorophenol* (1-naphthol-2-sulfonic acid-*indo-3',5'-dichlorophenol*); the di-Na salt forms bronze-colored crystals, blue in transmitted light. 1-Naphthenone-2-sulfonic acid-*indo-3',5'-dibromophenol* (1-naphthol-2-sulfonic acid-*indo-3',5'-dibromophenol*). The leuco compd. m.  $190^\circ$ . Benzenone-*indo-3'-methylaniiline* (*o-toluidine-indophenol*),  $\text{O}:\text{C}_6\text{H}_4:\text{NC}_6\text{H}_4\text{MeNH}_2$ , could not be purified; the leuco compd., prepd. by reduction with  $\text{H}_2\text{S}$ , m.  $148^\circ$ . XIV. Equilibrium potentials of sodium 2,6-dibromobenzenoneindophenol-2'-sulfonate, sodium 2,6-dibromobenzenoneindophenol-3'-sulfonate, 2,6-dichlorobenzenone-*indo-2'-chlorophenol*, and 2,6-dimethylbenzenoneindophenol. WALLACE L. HALL, PAUL W. PREISLER AND BARNETT COHEN. *Ibid* No. 71, 26 pp.—The e. m. f.,  $E'_0$ , corresponding to an equimol. mixt. of oxidant and reductant was detd. at different  $p_{\text{H}}$  values and  $30^\circ$ . The "N" potential  $E_0$  corresponding to  $p_{\text{H}} = 0$  was calcd. In the succession corresponding to the substances in the heading, the values of  $E_0$  were: 0.6834, 0.6906, 0.6919, 0.5688. Dissocns. ( $\text{pK}$  log  $1/K$ ) were detd.: the const. of the oxidant  $\text{pK}_0 = 6.07, 7.40, 6.16, 8.9$ ; of the reductant  $\text{pK}_{\text{H}} = 7.01, 7.12, 6.89, 10.0$ .  $\text{pK}_{\text{r}} = 10.22, 8.93, 9.21, 10.9$ . The reversal in magnitudes of  $\text{pK}_0$  and  $\text{pK}_{\text{H}}$  in the 2nd compd. produces a unique alteration in the character of the usual  $E'_0:p_{\text{H}}$  curve of indophenol systems. The 1st 3 compds. occupy a position on the extreme electropositive side of the indophenol series. A list of oxidation-reduction indicators is presented with their  $E'_0$  between  $p_{\text{H}} = 5.0$  and  $9.0$  at intervals of  $0.2 p_{\text{H}}$ . A means of distinguishing between dissociations in the oxidant and those in the reductant is described. The influence of substitution by  $\text{SO}_3\text{H}$ , Cl, Me is discussed.

A. R. MEYER

The natural rotation of polarized light by optically active bases. II. The rotation of *d*- $\alpha$ -phenylethylamine and its hydrochloride in solution with remarks concerning the rotation of active tetrahydroquinoline. WOLFGANG LEITHE. *Monatsh.* 51, 381-5 (1929); cf. *C. A.* 22, 3663.— $[\alpha]_D^{15}$  for solns. of *d*-PhCHMeNH $_2$  (b.  $185^\circ$ ,  $d_{15} = 0.9561$ ,  $[\alpha]_D^{15} = +40.67^\circ$ ) and its HCl salt (m.  $171^\circ$ ), in various solvents at varying concns., has been measured. The values for the *sp. soln. vol.*,  $V_L$ , as calcd. from the formula  $V_L = 1/p(100/d_{\text{soln.}} - 100 - p/d_{\text{solvent}})$ , where  $p = \text{g. substance per 100 g. of soln.}$ , are found to parallel the values for  $[\alpha]_D^{15}$ .

L. F. AUDRIETH

Methylurethans of the isomeric  $\alpha$ -hydroxyphenylethyldimethylamines and their mitotic activity. EDGAR STEDMAN AND ELLEN STEDMAN. *J. Chem. Soc.* 1929, 609-17.—The substances heretofore examd. include 2 series of isomeric methylurethans, *viz.*, the dimethylaminophenyl esters of methylcarbamic acid,  $\text{HNMeCO}_2\text{C}_6\text{H}_4\text{NMe}_2$ , and the methylurethans of the hydroxybenzylidimethylamines,  $\text{NHMeCO}_2\text{C}_6\text{H}_4\text{CH}_2\text{NMe}_2$ . None of the compds. of these series contains an asym. C, and in view of the known difference in activity of the enantiomorphs of certain physiol. active substances, expts. have been carried out with the object of introducing such asymmetry into the latter of the above series of isomerides. For this purpose, the methylurethans of the isomeric  $\alpha$ -hydroxyphenylethyldimethylamines have been prepd., this particular series being chosen because the introduction of an asym. C is effected with the min. structural alterations necessary for this purpose. Unfortunately, these urethans have not yet been obtained in optically active forms. In the meantime, the results obtained with the *dl*-bases are here recorded. The 3 isomeric urethans were prepd. by conversion of the methoxybenzaldehydes into the methoxyphenylmethylcarbinols *via* Grignard, followed by treatment with HBr; the corresponding bromides thereupon react with  $\text{Me}_2\text{NH}$  to give the  $\alpha$ -methoxyphenylethyldimethylamines, which on demethylation by HBr yielded the phenols and finally the methylurethans,  $\text{NHMeCO}_2\text{C}_6\text{H}_4\text{CHMeNMe}_2$ , by interaction with MeNCO under appropriate conditions. The following compds. are described: *m*-methoxyphenylmethylcarbinol,  $b_{14.5} 133^\circ$ ;  $\alpha$ -*m*-methoxyphenylethyldimethylamine,  $b_{17} 118-9^\circ$  (HCl salt, m.  $105^\circ$ ; methiodide,  $\text{C}_{12}\text{H}_{13}\text{ONi}$ , pale cream, m.  $142^\circ$ );  $\alpha$ -*m*-hydroxyphenylethyldimethylamine, m.  $87-8^\circ$  (HCl salt,  $\text{C}_{10}\text{H}_{15}\text{ON} \cdot \text{HCl}$ , m.  $197-8^\circ$ ; methiodide, micro-cryst., m.  $160^\circ$ );  $\alpha$ -*o*-methoxyphenylethyldimethylamine,  $b_{12} 105-7^\circ$ ,  $b_{13.5} 108.5^\circ$  (HCl salt, an oil; methiodide,  $\text{C}_{12}\text{H}_{13}\text{ONi}$ , m.  $136-7^\circ$ );  $\alpha$ -*o*-hydroxyphenylethyldimethylamine,  $b_{14} 112-4^\circ$  (HCl salt,  $\text{C}_{10}\text{H}_{15}\text{ON} \cdot \text{HCl}$ , m.  $136-7^\circ$ );  $\alpha$ -*p*-methoxyphenylethyldimethylamine,  $b_{14} 118^\circ$  (HCl salt,  $\text{C}_{11}\text{H}_{17}\text{ON} \cdot \text{HCl}$ , m.  $213^\circ$ ; methiodide, m.  $128-30^\circ$ ); di[ $\alpha$ -*p*-methoxyphenylethyl]dimethylammonium bromide,  $\text{C}_{20}\text{H}_{25}\text{O}_2\text{NBr} \cdot \text{H}_2\text{O}$ , thick plates, m.  $109^\circ$ ;  $\alpha$ -*p*-hydroxyphenylethyldimethylamine, m. about  $115^\circ$  (HBr salt, m.  $178^\circ$ ; HCl salt,  $\text{C}_{10}\text{H}_{15}\text{ON} \cdot \text{HCl}$ , m.  $183^\circ$ ). Methylurethan of  $\alpha$ -*m*-hydroxyphenylethyldimethylamine,  $\text{C}_{13}\text{H}_{15}\text{O}_2\text{N}_2$ , m.  $86^\circ$  (HCl salt, m.  $169^\circ$  (effe-

vescence); *methiodide*,  $C_{11}H_{21}O_2N_2I$ , m.  $130^\circ$  (effervescence)). *Methylurethan of  $\alpha$ -o-hydroxyphenylethylidimethylamine*, m.  $90^\circ$  (HCl salt (I) extremely hygroscopic; *methiodide*,  $C_{11}H_{21}O_2N_2I$ , m.  $148^\circ$  (effervescence)). *Methylurethan of  $\alpha$ -p-hydroxyphenylethylidimethylamine*, unknown in free state (HCl salt,  $C_{11}H_{18}O_2N_2 \cdot HCl$ , m.  $203^\circ$ ; *methiodide* (II), m.  $173^\circ$  (effervescence)). The 3 urethans have been tested for miotic activity in the form both of their HCl salts and methiodides by instillation into cats' eyes, 1.5% solns. of these substances in physiol. salt solns. being employed. In case of (I) the free urethan was dissolved in the calcd. amt. of 0.153 N HCl and dil'd. to 1.5% with physiol. salt soln. With the exception of (II), which had no action at this diln., a contraction of the pupil resulted in each case, the extent of the miosis differing with the various substances employed. The estimated order of activity is: *m*-HCl > *o*-MeI > *p*-HCl, *o*-HCl, *m*-MeI > *p*-MeI. This order can of course only be regarded as provisional until the activities on other organs have been compared. It should, however, be noted that the observed activities of *p*-HCl, *o*-HCl, *m*-MeI were quite small in the dilns. used, the *m*-HCl and *o*-MeI being very much greater. The miotic activity of *m*-HCl was intense and persistent, probably approaching that of physostigmine.

W. O. EMERY

Some ureas and thioureas derived from vanillylamine. Relations between constitution and taste of pungent principles. N. A. LANGE, H. L. EBERT AND L. K. YORSE. *J. Am. Chem. Soc.* **51**, 1911-4 (1929).—Vanillylamine-HCl and KCNO in  $H_2O$  give 90% of vanillylurea, m.  $178.5^\circ$  (all m. p. cor.); the thiourea, m.  $167.5^\circ$  (60% yield). PhCNO gives 63% of phenylvanillylurea, m.  $190.5^\circ$ ; thiourea, m.  $138-8.5^\circ$ . *p*-Tolyl-vanillylthiourea, m.  $138.5-9^\circ$ ; *o*-tolyl deriv., m.  $138-8.5^\circ$ . The last three thioureas have the property of pungency but to a lesser degree than capsaicin. None of the compds. has a sweet taste, the effect of the Ph and  $MeC_6H_4$  groups, which are known to repress the sweetness of compds., predominating over the favorable effect of the MeO group; the slightly bitter taste which is characteristic of many thioureas was also observed in several of these compds.

C. J. WEST

Preparation of *o*-nitroacetophenone. WM. O. KERMAK AND JAMES F. SMITH. *J. Chem. Soc.* **1929**, 814-5.—In prepg. *o*- $O_2NC_6H_4Ac$  (I) by Gevekoht's method [*Ann.* **221**, 323 (1883)] from *Et o*-nitrobenzoylacetate (II) with  $H_2SO_4$ , *o*-nitrobenzoylacetone (III) was obtained in large quantities as a by-product, probably because of hydrolysis of the  $-CO_2Et$  and loss of  $CO_2$  from II. The wt. of acid was varied to 50, 36 and 28%, giving the following yields of I and III; 27 and 52%, 22 and 68%, and 16 and 70%, resp. To avoid this hydrolysis, the boiling was carried out for 7 hrs. in EtOH contg. 10%  $H_2SO_4$ ;  $H_2O$  was then added and the soln. dist'd. to remove EtOH and EtOAc; after refluxing for 1 hr., cooling and extg. with  $Et_2O$ , distn. of the ext gave 75% of I and no III.

A. S. CARTER

The synthesis of acetosyringone. F. MAUTHNER. *J. prakt. Chem.* [2], **121**, 255-8 (1929).—Acetylpyrogallol 2,6-di-*Me* ether (I) treated with  $AlCl_3$  in  $PhNO_2$  yields 3,5-dimethoxy-4-hydroxyacetophenone ("acetosyringone") (II), white crystals from ligroin, m.  $122-3^\circ$ ; *p*-nitrophenylhydrazone, m.  $189-90^\circ$ . II methylated with MeI and KOH yields trimethylgalloacetophenone, previously described. An earlier paper (cf. *C. A.* **22**, 1966), reported the rearrangement of II by  $ZnCl_2$  to yield 3,4-dihydroxy-4-methoxyacetophenone, a *m*-rearrangement; whereas this latter work with  $AlCl_3$  checks the results of Rosenmund and Schnurr (cf. *C. A.* **22**, 1579), who obtained only *o*,*p*-rearrangements of Ac derivs. of phenols.

M. A. DAHLEN

Diastereoisomerism. I. Configuration of ephedrine. HERMANN EMDER. *Helv. Chim. Acta* **12**, 365-76 (1929).—Ephedrine (I),  $PhCH(OH)CH(NHMe)Me$ , contains 2 different asym. C atoms, of optical rotations *a* and *b*. It must therefore have 6 optical isomers: (*a* + *b*), (*a* − *b*), (−*a* + *b*), (−*a* − *b*), and the 2 *dl*-compds. (−)-I hydrate. The  $H_2O$  soln. of the HCl salt is treated with an excess  $K_2CO_3$  and ext'd with  $Et_2O$ , yielding a viscous oil, crystg. in the presence of  $H_2O$  as the hydrate, m.  $39-40^\circ$ . The  $H_2O$ -free base gives in  $H_2O$   $[M]_D^{20}$   $18.5^\circ$ . Heating for 24 hrs. at  $100^\circ$  does not change the compd., showing that the results of Gadamer (*Arch. Pharm.* **246**, 574, 1908) for the EtOH soln. of the compd. ( $[\alpha]_D^{20} -6.3^\circ$ ) corresponded to the hydrate. (−)-I.HCl, m.  $216^\circ$ ,  $[M]_D^{20} -72^\circ$ . The  $H_2O$  soln. reacts faintly acid to litmus, the solns. in org. solvents are neutral. Solubilities at room temp. and at the b. ps., resp., (parts of solvent for 1 part of solute):  $H_2O$ , 5, 1; abs. EtOH, 28, 9;  $CHCl_3$ , 3000, 2000;  $Et_2O$ , insol., nearly insol. (+)-Pseudoephedrine (II). Free base, 6 g. of II.HCl are dissolved in 30 cc.  $H_2O$ , and 30 cc. of N NaOH is added. II seps. in milky needles (4.9 g., m.  $117.5^\circ$ ), can be titrated with HCl and methyl red. The EtOH soln. gives  $[M]_D^{20}$   $87.5^\circ$ . It is hardly sol. in  $H_2O$ , sol. in  $Et_2O$  and  $Me_2CO$ , easily recrystd. from

the latter. (+)-II.HCl, m. 179°,  $[M]_{D}^{20}$  123.2°, much more sol. in H<sub>2</sub>O, EtOH, CHCl<sub>3</sub> and Me<sub>2</sub>CO than (—)-I.HCl. The 2 compds. are best sep'd. by crystn. from EtOH. (+)-Desoxyephedrine: [(+)-1-phenyl-2-methylaminopropane, (+)-β-phenylisopropylmethylamine]. A soln. of 3 g. NaOAc in 40 cc. H<sub>2</sub>O is made neutral to litmus with a few drops of AcOH; 2 g. of Pd-BaSO<sub>4</sub> catalyst is added, with 9.8 g. of (+)-bromopseudoephedrine-HBr, (or 7.2 g. of (+)-chloropseudoephedrine-HCl), and agitated under H<sub>2</sub> at room temp. About 90% of the theoretical H<sub>2</sub> is absorbed in 2–3 hrs., the catalyst is filtered off and the product is steam distd. from the filtrate after addn. of NaOH. There remains a small residue of (+)-didesoxyephedrine. The 1st distillate is neutralized with HCl (methyl red) and crystd. from abs. EtOH (soly., 1:4). Yield, 80–90%. (+)-Desoxyephedrine-HCl. The residue from the above is extd. with Et<sub>2</sub>O, dried and distd. under a high vacuum. The HCl salt, m. 172°, is sol. in H<sub>2</sub>O,  $[M]_{D}^{25}$  33°. (+)-Didesoxyephedrine. A viscous oily residue from the above prepn., distd. below 1 mm., m. 70°, b<sub>0.6</sub> 165°. The chloroplatinate, recrystd. from H<sub>2</sub>O, C<sub>20</sub>H<sub>30</sub>N<sub>2</sub>Cl<sub>6</sub>Pt, m. 224–5° (decompn.). The base showed peptizing action,  $[M]_{D}^{18}$  78.8°, showing no mutarotation. A comparison of the  $[M]$  values show that  $a > b$ , that the natural (—)-I corresponds to the (a — b) configuration and the natural (+)-II to the (a + b). The crystd. (—)-I is a hydrate (m. 39°) while the crystd. (+)-II is anhyd. II. Steric inversion of ephedrine with hydrochloric acid. *Ibid* 377–84.—2.5 g. of (—)-I or (+)-II are heated in a sealed tube at 100° with 25 cc. of 25% HCl. After cooling,  $[\alpha]_{D}^{20}$  is measured. After 50 hrs. the inversion into the equil. concn. of I and II is completed. With 25% HBr instead of HCl, the process requires 280 hrs. Only traces of the HCl salts are found, but a little more of the HBr salts. With 38% HCl, the yield of I and II HCl salts is practically quant. III. Chloro- and bromoephedrine. *Ibid* 384–99.—(+)(—)-Chloropseudoephedrine-HCl, PhCHClCHMeNHMe HCl (III). (a) From (—)-I.HCl, and PCl<sub>5</sub>: 60 cc. CHCl<sub>3</sub> and 60 g. PCl<sub>5</sub> are put in a wide-mouth glass-stoppered bottle, and after cooling with ice 40 g. of powd. (—)-I HCl is added in 0.5 g. portions in about 10 mins., shaking vigorously after each addn. The bottle is then shaken mechanically for 2 hours. The reaction mass is then decanted into a 750 cc. beaker, leaving the excess PCl<sub>5</sub> in the bottle. After rinsing with 20 cc. CHCl<sub>3</sub>, 500 cc. Et<sub>2</sub>O is added and the product allowed to stand. The product crystallizes out, is filtered under suction, washed with Me<sub>2</sub>CO and dried in a vacuum desiccator. Yield, 99.4%. A few recrystns. from EtOH yields III optically pure. (b) From (—)-I.HCl and SOCl<sub>2</sub>. Similarly, using 20 cc. SOCl<sub>2</sub>, 20 cc. CHCl<sub>3</sub> and 10 g. of the salt. The reaction is slower, and after 0.5 hr. 100 cc. Et<sub>2</sub>O is added and the crystd. III is treated as above. Yield 93%,  $[\alpha]_{D}^{20}$  85°. (c) From (+)-II.HCl and SOCl<sub>2</sub>. Similarly, from 2 g. of salt, 5 cc. CHCl<sub>3</sub> and 4 cc. SOCl<sub>2</sub>. The addn. of 100 cc. Et<sub>2</sub>O ppts. 2.15 g. of yellowish product,  $[\alpha]_{D}^{18}$  73°. III is slightly acid to litmus and neutral to Congo, m. 201°, hydrolyzed completely in 20 hrs. at 100°, more rapidly in the presence of MgO, NaOAc, (CO<sub>2</sub>Na)<sub>2</sub>, Na<sub>3</sub>PO<sub>4</sub>. One-half of the Cl may be titrated with AgNO<sub>3</sub> in the cold, the other half after 24 hrs. heating to 100°. The total Cl may be titrated after vigorous stirring for 2 hrs. with MgO.  $[M]_{D}^{20}$  25.6°, and is the same in H<sub>2</sub>O and in 25% HCl. The rotary dispersion is normal. Free (+)-chloropseudoephedrine, PhCHClCHMeNHMe (IV), yellow oil, with a strong odor similar to that of II, too unstable to be purified for analysis. Chloroplatinate: 1 g. of III in 10 cc. of N HCl is treated with 3 cc. of a 34% PtCl<sub>4</sub>. The compd., C<sub>20</sub>H<sub>30</sub>N<sub>2</sub>Cl<sub>6</sub>Pt ppts., first amorphous, then as orange-red crystals, and is recrystd. from boiling H<sub>2</sub>O, m. 188° (decompn.). Chloraurate: From 1 g. III in 25 cc. of N HCl, with 5 cc. of 20% AuCl<sub>3</sub>, light yellow needles, m. 128°, decompd. by light or by boiling H<sub>2</sub>O, recrystd. from EtOH. Investigation of the steric inversion of III. One part of III heated for 9 hrs. with 10 parts of PCl<sub>5</sub> in a sealed tube loses 1/7 of its rotary power, and is thereby not fractionated, whether by decompn. or by inversion. Heating for 31 days at 60° with 10 parts of CHCl<sub>3</sub> has no effect. Hydrolysis of III. III, heated to 100° in a sealed tube with H<sub>2</sub>O, is completely hydrolyzed in 20 hrs. to a mixture of (—)-I and (+)-II, in which the latter predominates. An expt. at 60° showed the reaction to be approx. monomol., the final product corresponding to 38% of (—)-I and 62% of (+)-II after 84 hrs. At room temp. III shows a very slow mutarotation,  $[\alpha]_{D}^{20}$  decreasing from 116.6° to 85.70° after 87 days. (+)-Bromopseudoephedrine-HBr (V), from 12.9 g. of (—)-I.HBr, 50 g. PBr<sub>3</sub> and 60 cc. CHCl<sub>3</sub>. After 3 hrs. of shaking, the product is decanted off and treated with 500 cc. of Et<sub>2</sub>O and filtered off. Yield, 98% of pure product, m. 174–5°.  $[M]_{D}^{18}$  385°. The H<sub>2</sub>O soln. is faintly acid to litmus and neutral to Congo. It turns acid to Congo on standing or heating. It is completely hydrolyzed

by heating for 1 hr. at 100° with H<sub>2</sub>O. The H<sub>2</sub>O soln. shows a more rapid mutarotation than that of the Cl compd., being 0.5 completed in 290 hrs. and corresponding, like that of (–)-I-HBr and III, to a monomol. reaction. The reaction velocity const. varies, however, somewhat on account of the hydrolysis which is taking place simultaneously. Both hydrolysis and mutarotation take place much faster at 60°. (–)-Bromoephedrine-(I). By inversion from the (+)-compd., as follows: 5 g. of V and 10 cc. CHCl<sub>3</sub> are kept around 60° for 20 days in a sealed tube, or the mixt. is refluxed until it becomes cryst. (about 24 hrs.). This yields 4.1 g. of pure product [ $\alpha$ ]<sub>D</sub><sup>20</sup> –90.2°. Pptn. with Et<sub>2</sub>O yields an additional crop of [ $\alpha$ ]<sub>D</sub><sup>20</sup> 24°, which is a mixt. of the 2 optical isomers. Inversion of (+)-II-HBr into (–)-bromoephedrine-HBr. From 9 g. of (+)-II-HBr, 30 cc. CHCl<sub>3</sub> and 35 g. PBr<sub>5</sub>. Recrystd. from EtOH, it m. 174.5°, [ $M$ ]<sub>D</sub><sup>20</sup> –287°. This (–)-compd. is much less soluble in H<sub>2</sub>O than the (+)-isomer, and shows similarly the mutarotation and hydrolysis, but more markedly. IV. Steric inversion of ephedrine with sulfuric acid. *Ibid* 399–405.—(+)-II *O*-sulfuric ester, from (–)-I. Twenty g. of natural (–)-I-HCl are added in 40 fractions in 10 min. to 100 g. of ice-cooled concd. H<sub>2</sub>SO<sub>4</sub>. After shaking and standing, the product is poured onto 200 g. of cracked ice and 300 cc. of EtOH is added. (+)-II *O*-sulfuric ester (VI) seps. as white needles, m. 248–50° (decompn.), show no mutarotation. [ $M$ ]<sub>D</sub><sup>20</sup> 272°.

The rotation dispersion is normal. The mother liquor yields a little more VI with some (+)-II and (–)-I sulfate. *Apoephedrine*, and *didesoxyephedrine*, [PhC(CHMeNHMe)]<sub>2</sub> (VII). Twenty g. of I HCl in 100 g. of ice-cooled H<sub>2</sub>SO<sub>4</sub> is allowed to stand for 5 days. It is then steam distd. after treating with 250 g. of 40% NaOH. The distillate contains MeNH<sub>2</sub>, (+)-II, (–)-I and an unidentified non-basic oil with an odor of roses. The main product does not distil, and is extd. with Et<sub>2</sub>O and distd. under 0.7 mm. The main product b. 172° and contains 4.4% O<sub>2</sub>. VII is therefore different from didesoxyephedrine. *No didesoxyephedrine without catalyst*.—To test whether the formula PhC(CHMeNHMe)NMeCHMeCH<sub>2</sub>Ph is that of didesoxyephedrine a soln. of 3.89 g. of III and 3.27 g. of (+)-desoxyephedrine-HCl in 50 cc. H<sub>2</sub>O is prepd. Part of it is treated with NaOAc and [ $\alpha$ ] of both portions is compared from time to time. The portion without NaOAc only shows the mutarotation of III, but the other shows a much greater mutarotation, indicating that NaOAc accelerates the hydrolysis of III. The working up of the NaOAc soln. gave no didesoxyephedrine, showing that VIII is not the correct formula.

G. CALINGAERT

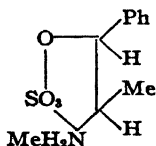
**Synthesis of ephedrine and structurally similar compounds.** II. Synthesis of some ephedrine homologs and the resolution of ephedrine. RICHARD H. F. MANSKE AND TREAT B. JOHNSON. *J. Am. Chem. Soc.* 51, 1906–9(1929); cf. C. A. 23, 1104.—In extending the reaction leading to the synthesis of ephedrine (I), the following compds. were prepd.: PhCH(OH)CHRNHMe, where R is Me and Et, the HCl salts of which m. 198° and 226° (all m. ps. cor.), resp.; PhCH(OH)CHMeNHR, where R is CH<sub>2</sub>CH<sub>2</sub>OH, PhCH<sub>2</sub> and PhCH<sub>2</sub>CH<sub>2</sub>, m. p. of the HCl salts, 166°, 184–5° and 207–8°, resp.; RCH(OH)CHMeNHMe, where R is *p*-EtC<sub>6</sub>H<sub>4</sub> and 2,5-Me<sub>2</sub>C<sub>6</sub>H<sub>3</sub>, and *p*-MeC<sub>6</sub>H<sub>4</sub>CH(OH)CH<sub>2</sub>NHMe, whose HCl salts m. 208°, 221° and 208°, resp. Synthetic I may be resolved into its *d*- and *l*-isomers, by means of mandelic acid; the *l*-isomer is identical with the base from the Chinese drug, Ma Huang. Natural *l*-I lends itself admirably to the prepn. of pure *l*-mandelic acid.

C. J. WEST

**Identification of *o*-, *m*- and *p*-hydroxybenzoic acids.** F. F. BLICKE AND F. D. SMITH. *J. Am. Chem. Soc.* 51, 1947–9(1929).—Lyman and Reid (C. A. 11, 1830) recommend the *p*-nitrobenzyl esters as suitable for the identification of HOC<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>H; their method, however, gives the dinitrobenzyl derivs in part, which, because of ease of crystn. and high mol. wt., are more suitable for this purpose. The dinitrobenzyl derivs. of *o*-, *m*- and *p*-HOC<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>H, m. 137–9°, 142–4° and 196–7°, resp., were prepd. by heating 1.25 g. *p*-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>CH<sub>2</sub>Br in 10 cc. Me<sub>2</sub>CO and 0.35 g. acid, 0.3 g. NaOH and 4 cc. H<sub>2</sub>O for 2 hrs; the *p*-deriv. is quite insol. in Me<sub>2</sub>CO, the *o*-deriv. is fairly sol., while the *m*-deriv. is intermediate in soly. The *p*-nitrobenzyl esters, m. 97–8°, 106–8° and 180–2°, resp., were prepd. by adding 2.15 g. *p*-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>CH<sub>2</sub>Br during 0.5 hr. to a boiling soln. of 1.4 g. acid and 0.55 g. NaOH in 5 cc. H<sub>2</sub>O to which 15 cc. Me<sub>2</sub>CO had been added, then heating 1 hr., cooling, dilg. with H<sub>2</sub>O and pptg. with HCl. Sapon. of the dinitrobenzyl derivs. (0.5 g.) with 3 g. K<sub>2</sub>CO<sub>3</sub> in 30 cc. 60% EtOH gives the nitrobenzyl ethers, m. 166–8°, 193–6° and 259–61°, resp.

C. J. WEST

**Studies on  $\gamma$ -resorcylic acid.** F. MAUTHNER. *J. prakt. Chem.* (2) 121, 259–65 (1929).—Directions are given for the prepn. of 2,6-dimethoxybenzoic acid, crystals from



pH, m. 186–7°; amide, m. 207–8°; nitrile, m. 118°; Me ester, m. 88°.

M. A. DAHLEN

The reactions of tropic acid and of the tropeines. MARC CHAMBER. *Bull. sci. pharmacol.* 36, 222–6(1929).—The different reactions obtained with tropic acid and its compds., hyoscyamine, atropine, hyoscyne and scopolamine are discussed. A. E. M.

Higher terpene compounds. XXXV. Constitution of bisabolene. L. RUZICKA AND A. G. VAN VEEN. *Ann.* 468, 133–43(1929); cf. C. A. 22, 1347.—Dehydrogenation of bisabolene (I) with S or Se does not give  $C_{15}H_{24}$  hydrocarbons, their formation apparently being hindered by the middle semicyclic double bond; the bond appears to wander during the operation for the dehydrogenation product gives terephthalic acid on oxidation with  $CrO_3 \cdot H_2SO_4$ ; this does not result on the oxidation of I. Natural I or that regenerated from the HCl deriv. and  $O_3$  give  $Me_2CO$  and levulinic acid as well as  $(CH_2CO_2H)_2$ . Catalytic reduction gives a tetrahydro deriv.,  $b_{18}$  125°,  $d_4^{15}$  0.857, which yields a hexahydro deriv. on further reduction;  $C(NO_2)_4$  in EtOH gives a yellow color. With  $O_3$  this yields methylheptanone and 4-methylcyclohexanone, identified by oxidation to the acids. These results indicate that I consists principally of the  $\gamma$ -form (cf. R. and Capato (C. A. 19, 2333)). XXXVI. Constitution of zingiberene. Ibid 143–62.—Crude zingiberene (I) in  $Et_2O$  at 0°, satd. with dry HCl, gives some bisabolene tri-HCl, m. 82°.  $AcOH \cdot H_2SO_4$  gives isozingiberene,  $b_{14}$  130–5°,  $d_4^{15}$  0.910,  $n_D^{20}$  1.506, which yields a di-HCl salt, m. 168°. The action of  $O_3$  upon I gives  $Me_2CO$ ,  $(CH_2CO_2H)_2$  and levulinic acid; part of the  $Me_2CO$  probably comes from I, the rest from the bisabolene (II) contained therein. The catalytic dehydrogenation of a mixt. of the hexahydro derivs. of I and II gave as the only product 2-methyl-6-p-tolylheptane,  $b_{12}$  135° (C too high), which was synthesized from  $p-MeC_6H_4MgBr$  and methylheptanone, dehydrated with  $K_2SO_4$  and reduced with Pt,  $b_{18}$  135–6°,  $d_4^{15}$  0.8524,  $n_D^{16}$  1.4832. A tetrahydro deriv. of the crude I,  $b_{18}$  130–5°,  $d_4^{15}$  0.842,  $n_D^{20}$  1.463, and  $O_3$  give a methylheptanone, whose semicarbazone m. 154°. I and  $N_2CHCO_2Et$ , heated 100 hrs. in  $CO_2$  on the  $H_2O$  bath, give an acid,  $C_{17}H_{28}O_2$ ,  $b_{6.3}$  170–80°. Dihydrozingiberene (mixed with II),  $b_{15}$  135–6°,  $d_4^{15}$  0.865,  $n_D^{20}$  1.4881; HCl gives only an amorphous product; it does not condense with  $N_2CHCO_2Et$ ; dehydrogenation gives cadalene;  $O_3$  gives  $(CH_2CO_2H)_2$ ,  $Me_2CO$  and levulinic acid and aldehyde. Oxidation with  $KMnO_4$  of the ozonide of the dihydro deriv. gives an ester,  $C_{14}H_{24}O_6$ ,  $b_{0.3}$  140–55°, further oxidized by  $NaOBr$  to the ester,  $C_{14}H_{24}O_6$ ,  $b_{0.3}$  140–50°.

C. J. WEST

Kessyl alcohol. V. New constituents of "Kesso" oil. Y. ASAHINA AND S. NAKANISHI. *J. Pharm. Soc. Japan* 49, 135–40(1929).—The cryst. substance sometimes found in "Kesso" oil (I) was found to be kessyl acetate (II) contg. 1 mol.  $H_2O$  of crystn. Previous work by Bertram and Gildemeister (*Arch. Pharm.* 228, 483) and also by Asahina and Hongo (C. A. 18, 2510) showed that II could not be crystd. even when cooled to –20°. Introduction of some of the crystals, however, into the 70% alc. soln. of II resulted in an immediate crystn. The crystals, m. 60–1°,  $b_{774}$  280–3°,  $b_{4.5}$  148–50°,  $[\alpha]_D^{18}$  –62.74° (–65.1° for the anhyd. compd.). Boiling of "blue oil" (the high boiling fraction of I from which kessyl alc. (III) has been removed) with  $H_2O$  gave kessoglycerol (IV)  $C_{15}H_{28}O_3$ ,  $[\alpha]_D^{18}$  –15.13°. Oxidation of IV with  $AcOH$  and  $Na_2Cr_2O_7$  gave kessotriketone, m. 208°. Semicarbazone, m. 208°. When roots of *Valeriana officinalis* L. v. *latifolia* Miq. grown by Toyana Pharm. Coll. were steam distd., an oil (V) ( $d_4^{20}$  0.98;  $[\alpha]_D$  –32.44°) somewhat different from I was obtained. It does not contain III. Fractional distn. of V gave a satd. compd. (IV),  $C_{19}H_{30}O_5$ , m. 119°,  $b_{760}$  259°. Sapon. of V with  $EtOH \cdot KOH$  gave kessoglycol, m. 58–9° due to the liberation of 2 Ac groups.

NAO UYEI

The oxidation of pinenes in presence of catalysts. GEORGES DUPONT AND JEAN CROUZET. *Bull. inst. pin* 1929, 101–8.—An investigation into the rate of oxidation at const. pressure and at const. vol. of pinene and nopinene obtained by very careful rectification of spirits of turpentine followed by redistn. over Na to remove the last traces of oxidation products. The oxidation curve of pure dry pinene is typical of autoxidation in which the oxidation products act as catalysts and the rate is increased by diffuse daylight, and still more by direct sunlight; the rate of oxidation at high temps. is also greatly increased by agitation. The rate of oxidation of nopinene is lower than that of pinene under the same conditions, but the curve is of the same general character as that of pinene. Co resinates increases very greatly the initial rate of oxidation of both pinene and nopinene, which first increases, reaches a max., and then rapidly decreases; this decrease is at least partly due to decompn. of the metallic salt, probably by the  $HCO_2H$  and  $AcOH$  formed by oxidation. In presence

of Co resinate the rate of oxidation is not appreciably affected by light, but is increased considerably by heat. Fe, Pb, Ni and Cr resinates,  $\text{FeCl}_3$ , I and KI behave similarly to Co resinate, but are less active. Hydroquinone, pyrogallie acid, gallic acid, activated charcoal, Ce oxide, Th oxide,  $\text{Hg}(\text{AcO})_2$ ,  $\text{SnCl}_2$ , titanie acid, spongy Pt reduced Cu, freshly prepd. Cu resinate and S have anti-O properties, which disappear after various periods of time, the anti-O properties of the 1st 4 being still quite marked after 1000 hrs. Certain substances act as reversible catalyzers, the one with the clearest action being Mn resinate; reversal of the properties takes place quite suddenly after a crit. period, which depends on the conditions of the expts. The interpretation of the results is briefly discussed in the light of Moureu's theory of anti-O and pro-O action.

#### A. PAPINEAU-COUTURE

**Study on the addition problem in a case from the camphene series.** P. LIPP AND MARIA HOLL. *Ber.* 62B, 499-504(1929).—The chief factors playing a role in addns. at an ethylene union are the chem. polarity of the ethylene C atoms and that of the adding substance or its degree of dissocn., the addn. velocity, which need not be the same at both unsatd. C atoms, and finally the spatial relations resulting at the points of addn. from different substituents on the ethylene C atoms. Acids contg. O may in part add in 2 forms, ionic and radical; thus,  $\text{H}_2\text{SO}_4$  can add to  $\text{C}_2\text{H}_4$  as "monohydrate" with formation of  $\text{EtOSO}_3\text{H}$  or as "oleum" with primary formation of  $\text{HOCH}_2\text{CH}_2\text{SO}_3\text{H}$ , and  $\text{AcOH}$ , under the influence of small quantities of  $\text{H}_2\text{SO}_4$ , can add to amylenes to form  $\text{EtCM}_2\text{OAc}$ , whereas in  $\text{Ac}_2\text{O}$  contg. "sulfoacetic acid" (in which there is always free  $\text{AcOH}$ ) it can form *p*-Ac derivs. of phenol ethers, probably by primary addn. of HO and Ac at the 1,4-positions of the  $\text{C}_6\text{H}_4$ . L. and H. attempted to effect the latter form of addn. at the semicyclic double bond of camphene which, as is well known, adds  $\text{AcOH}$  to form isobornyl acetate (I) under the conditions of the Bertram-Walbaum reaction. With  $\text{SO}_3$  in  $\text{AcOH}$  it does not, however, give an acetoborneol as expected



but, together with much I, a compd.  $\text{C}_{10}\text{H}_{16}\text{O}_3\text{S}$  (II),  $\text{CH}_2-\overset{\text{CH}_2}{\underset{\text{CH}_2-\text{SO}_2}{\text{C}}}-\text{CH}-\text{O}$  shown to be a

sultone by its decompn. with  $\text{NaOH}$  or  $\text{Ba}(\text{OH})_2$  into the salts of the corresponding hydroxysulfonic acid (III). Attempts to prove the structure II by oxidation of III to Reichler's camphorsulfonic acid (IV) met with difficulties and the inverse process was accordingly used; IV was reduced in alk. soln., giving 2 stereoisomeric 2-hydroxy-camphane-*o*-sulfonic acids, an *endo*-form (V) with a little *exo*-form (VI). V can be converted into VI and the VI spontaneously loses 1 mol.  $\text{H}_2\text{O}$  and yields II. 2-Hydroxy-camphane-*o*-sulfonic lactone (II) (38 g. crude or 3.8 g. pure product from 60 g. camphene heated 10 hrs. at  $100^\circ$  with 15 g.  $\text{SO}_3$  in 75 g.  $\text{AcOH}$ ),  $b_{0.8}$  147.5- $8^\circ$  (temps. cor.),  $m$  133.5°, mol. wt. in freezing  $\text{C}_6\text{H}_6$  211.0-7.4. Salts of III: Na; Ba;  $\text{NH}_4$ , decomp. 186°. Salts of V:  $\text{NH}_4$ , decomp. 232°; *p*-toluidine,  $m$ . 152-3° (gas evolution) (*p*-toluidine salt of IV,  $m$ . 161-2° (cor.)). C. A. R.

**Synthetic camphor.** A. ULLRICH. *Metallbörse* 18, 1013-14, 1069-70(1928).—A review of the patent literature dealing with the manuf. of camphor and isoborneol

B. HAMILTON

**Swann Corporation develops diphenyl on commercial scale.** D. N. HAUSEMANN *Mfrs. Record* 95, No. 20, 58-9(1929).—Methods and results of preliminary tests and mfg. operations are described.

F. I. S.

**Corrections in the chemistry of diphenyl derivatives of the "Kaufler" type, and the formation of dibenzocdiazines.** RAYMOND J. W. LE FÈVRE. Univ. College, London *J. Chem. Soc.* 1929, 733-8.—The compds. cited by Kaufler (*C. A.* 1, 1396, 2691) and related compds. have been studied by Le Fèvre and Turner (*C. A.* 21, 80), and Kuhn, Jacob and Furter (*C. A.* 21, 2891). Remfry's "malonylbenzidine" (*C. A.* 5, 2855)

is probably 4,4'- $\text{CO}.\text{CH}_2.\text{CO}.\text{NC}_6\text{H}_4\text{C}_6\text{H}_4\text{NH}_2$ , since it gives a colorless amorphous sulfate, and with excess salicylaldehyde-phenol mixt. forms a salicylidene deriv.,  $\text{C}_{27}\text{H}_{16}\text{N}_2\text{O}_8$ , light yellow,  $m$ . 298-300°. Starke's "thiocarbonyl- and carbonyl-dianisidines" (*J. prakt. Chem.* [N. S.], 59, 216) similarly form salicylidene derivs., yellow powders. The "oxalyl-*o*-tolidine" of Taussig (*Monatsh.* 25, 375) forms with salicylaldehyde a colorless powder,  $\text{C}_{27}\text{H}_{24}\text{N}_2\text{O}_8$ ,  $m$ . above  $300^\circ$ . Taussig's "oxalylbenzidine" is the 4,4'-diethyloxamido-3,3'-dimethyldiphenyl to be expected from  $(\text{COOEt})_2$  and *o*-tolidine (cf. Le Fèvre and Turner, *C. A.* 22, 1349). (*o*- $\text{H}_2\text{NC}_6\text{H}_4$ )<sub>2</sub> (I) was prepd. in 50-60%

yield by Ulmann and Bielecki's method (*Ber.* 34, 2177), except for the addn. of sand, from  $o\text{-ClC}_6\text{H}_4\text{NO}_2$  and Cu bronze with reduction with Fe and HCl. 2,2'-Disalicylideneaminodiphenyl,  $\text{C}_{26}\text{H}_{20}\text{N}_2\text{O}_2$ , yellow, m. 153-4°. I and  $\text{CS}_2$  refluxed one day in alc. gave  $N,N'$ -thiocarbonyl-2,2'-diaminodiphenyl,  $\text{C}_{13}\text{H}_{10}\text{N}_2\text{S}$ , m. 243°. I (7.4 g.) and phenanthraquinone (8.3 g.) in AcOH at 100° for 2 hrs. yielded 13,14-[ $o,o'$ -diphenylene]-dibenzot-12,15-diazine,  $\text{C}_{26}\text{H}_{16}\text{N}_2$ , (11 g.), yellow, m. 268-9°. Cases of the easy formation of 8-membered rings between the 2- and 2'-positions of  $\text{Ph}_2$  are rare (cf. Kenner and Stubbings, *C. A.* 15, 2434, and Barber and Smiles, *C. A.* 22, 3153). Such rings are probably strainless because of rotation of the  $\text{Ph}_2$  nuclei around their common axis. Täuber's method (*Ber.* 25, 129) for the prepn. of "di- $m$ -nitrodi- $o$ -aminobiphenyl" always gave probably a mixt. of chiefly the 5,5', 4,4'- and 4,5', with some 3,3'- and 3,5'-dinitro derivs., which did not yield dinitro-octadiazines. I could not be condensed with  $(m\text{-HO}_2\text{SC}_6\text{H}_4\text{CO})_2$  (Kafka, *Ber.* 24, 794).  $(o\text{-C}_6\text{H}_4\text{NHAc})_2$  (prepd. by Brady and McHugh's method, *C. A.* 17, 3496), heated with Br in AcOH, yielded about 90% of the 5,5'-di-Br deriv., m. 266-7°. 5,5'-Dibromo-2,2'-diaminodiphenyl (II), m. 140-1°. Disalicylidene deriv., yellow microcryst. powder, m. 263-5°. II and phenanthraquinone in AcOH at 100° formed 3,8-dibromo-13,14-[ $o,o'$ -diphenylene]-dibenzot-12,15-diazine,  $\text{C}_{26}\text{H}_{14}\text{Br}_2\text{N}_2$ , yellow, m. above 280°. 4,4'-Dibromo-2,2'-diaminodiphenyl, m. 192-4°, was prepd. by reduction with Fe filings of the corresponding dinitro compd. (from 2,5- $\text{Br}_2\text{C}_6\text{H}_3\text{NO}_2$  according to Ulmann and Bielecki). Disalicylidene deriv.,  $\text{C}_{26}\text{H}_{18}\text{Br}_2\text{N}_2\text{O}_2$ , m. 210-1°. The ability of the nuclei in I to rotate is indicated by the ease of  $N,N'$ -disubstitution (cf. Täuber, *Ber.* 24, 198). I and 2,4-( $\text{O}_2\text{N}$ ) $_2\text{C}_6\text{H}_3\text{Cl}$  give chiefly 2,2'-di[2'',4''-dinitrophenylamino]diphenyl,  $\text{C}_{24}\text{H}_{16}\text{N}_6\text{O}_8$ , yellow, m. 177-8°, with some  $N$ -2',4'-dinitrophenylcarbazole, red, m. 216-7°. Diphenic anhydride (III) and benzyl alc. at 160° yield benzyl H diphenate, m. 112-3°. IV (6.7 g.) and  $\alpha$ -naphthol (4.3 g.) give naphthyl H diphenate (8 g.), m. 202-3°. The  $\beta$ -mono ester m. 178-9°.

JANET D. SCOTT

**Structure of metal ketyls. I. The Schmidlin formula.** CHARLES B. WOOSTER. *J. Am. Chem. Soc.* 51, 1856-60 (1929).—The reaction of EtBr with  $\text{Ph}_2\text{CONa}$  in liquid  $\text{NH}_3$  is not identical with that between Na and a soln. of EtBr and  $\text{Ph}_2\text{CO}$  in the same solvent. In the latter reaction the  $\text{Ph}_2\text{CO}$  remains unchanged, while the EtBr gives NaBr,  $\text{NaNH}_2$  and  $\text{C}_2\text{H}_6$ . The action of  $\text{Ph}_2\text{CO}$  on  $\text{Ph}_2\text{C}(\text{ONa})\text{Na}$  gives  $\text{Ph}_2\text{CONa}$ . This shows that the Schmidlin formula for the metal ketyls is incorrect. The interpretation of the reactions of these compds. proposed by Schlenk and his co-workers is not necessarily the only alternative to be considered.

C. J. WEST

**Rubcene.** ALFRED ECKERT. *J. prakt. Chem.* [2], 121, 278-80 (1929).—Rubcene (I) is a hydrocarbon which is obtained in very small quantities as a by-product in the prepn. of fluorenone by distn. of diphenic acid with lime (cf. *C. A.* 6, 1006). Crude I is obtained when fluorene (II) is subjected to the heat of a Pt wire for 30 hrs. in the app. described by Meyer (cf. *C. A.* 11, 780), then distd. and the last fraction, which is a red resin, recrystd. from xylene; a 2nd crystn. from xylene gave 0.2-0.3 g. pure I from 30 g II; the mother liquors contain an unknown substance, m. 218°; I is stable to the action of light. When dibiphenylene-ethene in glacial AcOH is exposed to direct sunlight until all of the red crystals have disappeared, it forms fluorenone (cf. Hantzsch and Glover, *Ber.* 39, 4156 (1906)), and dibiphenylene-ethane, m. 246°, which was isolated by removal of AcOH with distn. and cooling.

N. A. LANGE

**Tautomerism of hydroxytriarylcannabinols. II.** L. C. ANDERSON. *J. Am. Chem. Soc.* 51, 1889-95 (1929); cf. *C. A.* 22, 415.—Curves and tables show the quant. absorption of ultra-violet light by  $\text{Et}_2\text{O}$  solns. of the methane, the benzenoid and the quinonoid carbinol and the fuchson of each of the following compds.: 5-chloro- $o$ -cresyldiphenylcarbinol, 5-Br deriv. and guaiacyldiphenylcarbinol. Supplementary data are given for the absorption of light by  $\text{Et}_2\text{O}$  solns. of  $\text{Ph}_3\text{CH}$ ,  $\text{Ph}_3\text{COH}$  and the methane, benzenoid and quinonoid carbinol and the fuchson of 4- $\text{HOC}_6\text{H}_4\text{CPh}_2\text{OH}$  and  $o\text{-MeC}_6\text{H}_4\text{CPh}_2\text{OH}$ . Further evidence based on spectroscopic data is presented to prove the existence of a quinonoid modification of  $\text{HOC}_6\text{H}_4\text{CPh}_2\text{OH}$ .

C. J. WEST

**Phenolphthaleins.** F. F. BLICKE AND F. D. SMITH. *J. Am. Chem. Soc.* 51, 1865-75 (1929).—Di-Et 4-fluorophthalate,  $b_{25}$  165-70°, results in 50% yield from the 4- $\text{NH}_2$  deriv. through the diazonium borofluoride; the 4-Cl deriv.,  $b_{25}$  185-90°; the 4-Br deriv.,  $b_{80}$  225° (70% yield); the 4-I deriv. is a red oil. 4-Fluorophthalic acid, m. 147-8°; 4-Cl deriv., m. 150°; 4-Br deriv., m. 170°; 4-I deriv., m. 185-6°. 4-Fluorophthalic anhydride,  $b_{740}$  260°, m. 76-8°; 4-Cl deriv.,  $b_{780}$  284°, m. 98°; 4-Br deriv.,  $b_{750}$  290-3°, m. 108-9°; 4-I deriv., m. 125-6°; 3-I deriv., m. 159-61°. From these anhydrides mixts. of isomeric phthaleins were obtained except in the case of the 3-I deriv., which *phthalein* m. 252-4°. The compn. of the mixts. was established by

alkali fusion and identification of the  $\text{HOC}_6\text{H}_4\text{CO}_2\text{H}$  formed. Crystallographic data are recorded for the 4-substituted anhydrides.

**Absorption spectra of some phthaleins of the trihydroxyphenols.** R. C. GIBBS AND C. V. SHAPIRO. *J. Am. Chem. Soc.* 51, 1755-66(1929).—Data and curves are presented on the absorption spectra of the benzein, phthalein and sulfonephthalein of 1,2,3- $\text{C}_6\text{H}_3(\text{OH})_3$ , the phthalein and sulfonephthalein of 1,2,4- $\text{C}_6\text{H}_3(\text{OH})_3$  and the sulfonephthalein of 1,3,5- $\text{C}_6\text{H}_3(\text{OH})_3$ . Correlations are drawn with data previously obtained for phthaleins of  $\text{PhOH}$  and  $\text{C}_6\text{H}_4(\text{OH})_2$ . The effect on the chem. properties and absorption spectra of the phthaleins, due to the introduction of HO groups, is discussed. Gallein, which is colored in both the solid state and in neutral soln., is shown to be primarily lactoid in structure, but probably in equil. with a small amt. of the quinoid modification. The unusual behavior of 1,2,4- $\text{C}_6\text{H}_3(\text{OH})_3$  in weakly alk. solns., both as regards its absorption and fluorescence, is described and a possible explanation is advanced.

**Compounds of phthaleins with metals.** E. BUREŠ, J. BERGAUER AND A. KRÁČÍK. *Časopis Českoslov. Lékárnictva* 8, 180-3(1928).—The condensation of fluorescein with  $\text{Hg}^{++}$  salts yielded a product contg. 18.37% of Hg; as this is slightly below the theoretical value, it is probable that some complex compds. were formed. A similar condensation product of dibromofluorescein contained 16.41% of Hg, or nearly the theoretical proportion. With phenolphthalein the Hg entered the mol. Na, K, Li and Ba salts of the mercurialized phthaleins were prep'd. Condensations were also made of phthaleins with Ag, Bi and several other metals.

**Absorption spectra of some halogenated fluoresceins.** R. C. GIBBS AND C. V. SHAPIRO. *J. Am. Chem. Soc.* 51, 1769-73(1929).—Absorption curves and data are presented for the di-Br, tetra-Br and tetra-Cl derivs. of fluorescein. Halogenation of the phenolic groups appears to bring into action 2 opposing forces: (1) a tendency to decrease the intensity which can be ascribed to the intrinsic nature of the halogen, (2) a tendency to increase the intensity, which may be ascribed to the mass action of the halogen.

**Ethyl- and hexylfluorescein. Their dibromo and monomercure derivatives.** REUBEN B. SANDIN AND JOHN W. SUTHERLAND. *J. Am. Chem. Soc.* 51, 1773-5(1929). Ethylresorcinol and  $\text{C}_6\text{H}_4(\text{CO})_2\text{O}$  give *ethylfluorescein*, dark brown by pptn. with HCl from hot NaOH soln., or boiling with HCl, brown by slow evapn. of the EtOH soln. and yellow by adding AcOH to the cold NaOH soln.; *di-Br deriv.*, reddish brown, *Hg deriv.*, red. *Hexylfluorescein*, brown by adding HCl to boiling NaOH soln., yellow by adding AcOH to cold NaOH soln.; *di-Br deriv.*, reddish brown; *Hg deriv.*, reddish brown. The yellow form of each is given the lactoid, the brown form, the *p*-quinoid structure.

**Derivatives of binaphthylene dioxide.** I. A. CORBELLINI AND F. VIETTI. *Gazz. chim. ital.* 58, 766-74(1928).—A study of the method of prep'n. of binaphthylene dioxide (I) of Pummerer, Prell and Rieche (cf. C. A. 21, 405) showed that the 2nd method can be simplified and the yield increased by eliminating the  $\text{PhNO}_2$ , increasing the CuO and the temp. Further expts. show that I reacts very easily with various reagents such as Cl, Br and  $\text{HNO}_3$ , and condenses easily with  $\text{BzCl}$  and  $\text{C}_6\text{H}_4(\text{CO})_2\text{O}$ . In the present paper some disubstituted and tetrasubstituted derivs. are described.  $\beta$ -Binaphthol (286 g.) and CuO (336 g.) heated 4-5 hrs. at  $300-10^\circ$  with const. agitation (the end of the reaction being when the product mixed with dil. NaOH and filtered does not give a ppt. with acids), pulverized, extd. with PhCl (100 g. per 15 g. of product), the ext. decolorized with bone black, concd., cooled and the ppt. recrystd. from  $\text{C}_6\text{H}_6$ , yields 84% of I, m.  $240^\circ$ . Mixts. of concd. HCl (30 cc.) and AcOH (180 cc.) and of 34%  $\text{H}_2\text{O}_2$  (7 g.) and AcOH (90 cc.) added simultaneously during 1.5 hr. to I (10 g.) in  $\text{PhNO}_2$  (400 cc.) on a water bath, let stand overnight, filtered, washed with EtOH and the residue recrystd. from  $\text{PhNO}_2$ , yields a *di-Cl deriv.* (II),  $\text{C}_{20}\text{H}_8\text{O}_2\text{Cl}_2$ , of I, yellow, m.  $259^\circ$ , gives a violet soln. in concd.  $\text{H}_2\text{SO}_4$ , from which I is reprecip. by diln. with water. This method of chlorination (cf. Zinke and Pongratz, C. A. 19, 1568) must be controlled so that the proportion of Cl to I is exact, otherwise a slight excess forms compds. with more Cl. Like chlorination, bromination must be carried out with the exact proportion of Br. Br (11.33 g.) in  $\text{CS}_2$  (50 cc.) added slowly to I (10 g.) in  $\text{CS}_2$  (200 cc.), agitated for some time, filtered and the residue recrystd. from PhCl, yields a *di-Br deriv.*,  $\text{C}_{20}\text{H}_8\text{O}_2\text{Br}_2$  of I, light yellow, m.  $277^\circ$ , which with concd.  $\text{H}_2\text{SO}_4$  behaves like II. Brominated with an excess of Br, I yields a *tetra-Br deriv.*,  $\text{C}_{20}\text{H}_4\text{O}_2\text{Br}_4$ , of I, light yellow, m.  $349-51^\circ$ , gives a violet-blue soln. in concd.  $\text{H}_2\text{SO}_4$ . A tetranitro and a hexanitro deriv. of I are already known (cf. Fr. Pat. 600,390(1925)). I (5 g.) in  $\text{CCl}_4$  (80 cc.) agitated with  $\text{HNO}_3$  (d. 1.2) (100 cc.), let stand several hrs., dild. with water, the  $\text{CCl}_4$  distd., filtered



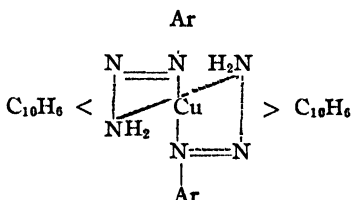
and the residue recrystd. from  $\text{PhNO}_2$ , yields a *dinitro deriv.* (III),  $\text{C}_{20}\text{H}_8\text{O}_2(\text{NO}_2)_2$ , of I, dark red. III dissolved in cold concd.  $\text{H}_2\text{SO}_4$  (violet soln.), pptd. by addn. of water, the ppt. dissolved in dil.  $\text{NaOH}$ ,  $\text{Na}_2\text{S}_2\text{O}_4$  (or  $\text{SnCl}_2$  and  $\text{HCl}$ ) added, yields a yellow compd., which is unstable in air and which was not identified.  $\text{BzCl}$  (5 g.) and then  $\text{AlCl}_3$  (5 g.) added slowly to I (5 g.) in  $\text{CS}_2$  (100 cc.), let stand overnight, heated several hrs. on a water bath, the  $\text{CS}_2$  distd., the residue decompd. with  $\text{HCl}$ , boiled, filtered and the residue recrystd. from  $\text{PhCl}$ , yields a *dibenzoyl deriv.* (IV),  $\text{C}_{20}\text{H}_8\text{O}_2\text{Bz}_2$ , of I, yellow, m.  $318.5^\circ$ , gives in cold concd.  $\text{H}_2\text{SO}_4$  a violet-blue soln. which turns brown when heated, and from which IV is repptd. on diln. with water. IV sublimes with partial decompn. Condensation of I in  $\text{C}_6\text{H}_6$  was carried out by a method similar to that used by Heller for hydrocarbons (cf. *C. A.* 3, 318). I (5 g.) fused with  $\text{C}_6\text{H}_5(\text{CO})_2\text{O}$  (2.6 g.) (avoiding sublimation), pulverized, suspended in anhyd.  $\text{C}_6\text{H}_6$  (200 cc.),  $\text{AlCl}_3$  (5 g.) added slowly, heated several hrs. on a water bath (until  $\text{HCl}$  is no longer evolved), the  $\text{C}_6\text{H}_6$  distd., water added (which forms  $(\text{C}_{20}\text{H}_8\text{O}_2\text{COC}_6\text{H}_4\text{CO}_2)_3\text{Al}$ ), treated with  $\text{NaOH}$ , filtered,  $\text{HCl}$  added to the filtrate and the ppt. recrystd. from  $\text{PhCl}$ , yields a *monophthaloyl deriv.*,  $\text{C}_{22}\text{H}_{14}\text{O}_6$ , of I, orange, decomp. at  $350^\circ$ , gives a green soln. in concd.  $\text{H}_2\text{SO}_4$ . Proceeding as before, only with twice as much  $\text{C}_6\text{H}_5(\text{CO})_2\text{O}$  and  $\text{AlCl}_3$ , and recrystg. the product from nitrotoluene, there is obtained a *diphthaloyl deriv.*,  $\text{C}_{20}\text{H}_8\text{O}_2(\text{COC}_6\text{H}_4\text{CO}_2\text{H})_2$ , of I, yellow, decomp. at  $350^\circ$ , gives a green soln. in concd.  $\text{H}_2\text{SO}_4$ . The orientation of the substituents in the derivs. of I is being studied.

C. C. DAVIS

**Action of phthalic anhydride on aminoazo derivatives.** G. B. CRIPPA AND P. GALIMBERTI (WITH A. BORRONI). *Gazz. chim. ital.* 58, 731–8 (1928).—An investigation under way necessitated protecting the  $\text{NH}_2$  group of phenylazo- $\beta$ -naphthylamine (I), and so the tendency of  $\text{C}_6\text{H}_5(\text{CO})_2\text{O}$  (II) to pass to the corresponding phthalimide was studied. Though this reaction was considered certain, the condensation product of I and II showed none of the phys. and chem. properties of compds. contg. a N group, and therefore the reaction proceeded differently from that leading to naphthylphthalimides (cf. *Gazz. chim. ital.* 15, 479 (1885); Lesser, *C. A.* 8, 661). The action of II on the 2 isomers of arylazonaphthylamines, where the  $\text{NH}_2$  group is in positions 2 and 4, resp., was, therefore, studied. The results show that the 1-arylazo-4-aminonaphthalenes form the corresponding 1-arylazo-4-phthalimidonaphthalenes (III),  $\text{C}_{10}\text{H}_6(\text{N}:\text{NAr})-\text{N}(\text{CO})_2\text{C}_6\text{H}_4$ , which in turn form the arylazonaphthylphthalamic acids (IV),  $\text{C}_{10}\text{H}_6(\text{N}:\text{NAr})\text{NHCOC}_6\text{H}_4\text{CO}_2\text{H}$ , whereas the 1-aryl-2-aminonaphthalenes lose by reduction the entire aryl-N group, forming  $\beta$ -naphthylphthalimides. The mechanism of this latter reaction is uncertain. II (2 g.) and 1,4- $\text{C}_{10}\text{H}_6(\text{N}:\text{NPh})\text{NH}_2$  (2.5 g.) heated 1 hr. at  $170^\circ$  and the product recrystd. repeatedly from  $\text{AcOH}$  and xylene, yields 1-phenylazo-4-phthalimidonaphthalene (V), orange-yellow, m.  $219^\circ$ . Aq. 30%  $\text{KOH}$  (70 cc.) boiled with V (1 g.) for 2 hrs., and the product recrystd. from water or  $\text{C}_6\text{H}_6$ , yields K 1-phenylazonaphthyl-4-phthalimide (VI), red. Ba salt. VI dissolved in hot  $\text{AcOH}$  and cooled ppts. 1-phenylazonaphthyl-4-phthalimidic acid (VII), green with golden reflection; its soln. in  $\text{AcOH}$  is an intense violet-red. When heated, VII loses  $\text{H}_2\text{O}$ , forming V. In dil.  $\text{AcOH}$ , VII dyes animal fibers orange-red. Likewise was obtained from 1-[o-tolylazo]-4-aminonaphthalene, after crystn. from  $\text{AcOH}$ , 1-[o-tolylazo]-4-phthalimidonaphthalene, orange-red, m.  $194^\circ$ , and from the *m*-compd., with crystn. from  $\text{AcOH}$ , the 1-*m*-tolylazo deriv., intense red, m.  $198^\circ$ . II and 1-[*p*-bromophenylazo]-4-aminonaphthalene heated at  $180^\circ$ , and the product crystd. from  $\text{AcOH}$  and xylene, yields 1-[*p*-bromophenylazo]-4-phthalimidonaphthalene, orange, m.  $243^\circ$ . Similarly, with crystn. from xylene and  $\text{AcOH}$ , 1-[*p*-acetylphenylazo]-4-aminonaphthalene (VIII) forms 1-[*p*-acetylphenylazo]-4-phthalimidonaphthalene, dark lustrous red, m.  $249^\circ$ . VIII, not described heretofore, was prepd. by diazotizing *p*- $\text{H}_2\text{NC}_6\text{H}_4\text{COME}$  in  $\text{HCl}$ , coupling with  $\alpha\text{-C}_{10}\text{H}_7\text{NH}_2$ , neutralizing with  $\text{NH}_4\text{OH}$  and crystg. from  $\text{EtOH}$ . It is brown-red and m.  $197^\circ$ . II (3 g.) heated at  $195^\circ$  with K phenylazo-4-naphthylamine-*p*-sulfonate (2 g.) and the product recrystd. from  $\text{AcOH}$  and then water, yields K 4-phthalimidonaphthyl-1-azophenyl-*p*-sulfonate, yellow, decomp. without fusion.  $\alpha$ -Naphthylazo-4-amino- $\alpha$ -naphthalene and II from (crystn. form  $\text{AcOH}$  and xylene) 1-naphthylazo-4-phthalimidonaphthalene, lustrous orange-yellow, m.  $211^\circ$ . Similarly is obtained  $\alpha$ -naphthylazo-4-phthalimido- $\beta$ -naphthalene, orange, m.  $257^\circ$ . I (2.5 g.) and II (2 g.) heated for 1 hr. at  $150\text{--}5^\circ$ , the product recrystd. repeatedly from xylene and  $\text{AcOH}$ , and finally sublimed, yields  $\beta\text{-C}_{10}\text{H}_7\text{N}(\text{CO})_2\text{C}_6\text{H}_4$ . A small quantity of  $\beta$ -naphthylazo- $\beta$ -naphthylamine was isolated as a by-product. The same reaction with other  $\alpha$ -aminoazo compds., e. g., *p*-acetylphenylazo- $\beta$ -naphthylamine and  $\alpha$ -naphthylazo- $\beta$ -naphthylamine, always led to the formation of  $\beta\text{-C}_{10}\text{H}_7\text{N}(\text{CO})_2\text{C}_6\text{H}_4$ , showing that this reaction is general for  $\alpha$ -aminoazo compds.

C. C. DAVIS

**Metallic complexes in the series of *o*-amino and *o*-hydroxyazo derivatives.** G. B. CRIPPA (WITH F. VICINI, G. LEVI AND A. MANGANO). *Gazz. chim. ital.* **58**, 716-26 (1928).—Expts. on compds. of the type  $[C_{10}H_6(N:NAr)X]_2M$ , where Ar is an aryl radical, X is  $NH_2$  or OH and M is Cu, Ni or Co (cf. *C. A.* **22**, 415) were continued, efforts being made to det. whether various substituents, particularly negative ones, in the aryl nucleus have an influence on the formation of these complexes, and whether combination with the metal is still possible when H is replaced by oxyazo compds. In the present paper the ammoniacal metal sulfate was made to react with the arylazo-naphthylamine or arylazonaphthol contg. the OH,  $NO_2$ , Ac and  $SO_3H$  groups. Phenolic OH has an unfavorable influence on the reaction, the complexes derived from *p*-hydroxyphenylazo- $\beta$ -naphthol forming with difficulty, and the analogous compds. from *p*-hydroxyphenylazo- $\beta$ -naphthylamine not being obtained. On the other hand, the Ac and  $NO_2$  groups do not impede the formation, the reaction proceeding easily except with Co.  $SO_3H$  behaves at times in a way which does not admit of any general conclusion. Thus among the sulfonated aminoazo derivs. the properties of the cupric complex differed from the analogous complexes of simple aminoazo derivs., the Cu being united as in the other cases with 2 mols. of the aminoazo deriv. but the structure being complicated by the adherence of *n*  $NH_2$  groups in an unstable condition. Thus the K salt of phenylazo- $\beta$ -naphthylamine is  $[1,2-C_{10}H_6(N:N(1')C_6H_4(4')SO_3)NH_2]_2Cu \cdot nNH_3 \cdot K_n$ , while phenylazo- $\beta$ -naphthol-*p*-sulfonic acid leads to a complex with no coordinated  $NH_2$  groups and which is an  $NH_4$  salt:  $[1,2-C_{10}H_6(N:N(1')C_6H_4(4')SO_3)OH]_2Cu(NH_4)_2$ . Attempts to prep. the corresponding Ni complex led to compds. of various colors which are unstable in light and air and which could not be obtained with const. compns. The 2nd part of the investigation was concerned with the mol. configuration of the new compds. Their general properties and the similarity between the derivs. of the azonaphthylamine and azonaphthol series, in the former of which the complexes are formed by direct action of the metallic powder in an inert medium, indicates that the org. mol. participates in its entirety in the coordination of the complexes. A discussion of the possible structures leads to the conclusion that the formula  $[C_{10}H_6(N:NAr)X]_2M$  (*loc. cit.*) is the most likely one if the metal atom is considered to be in the center and united to 2 org. mols. by partial valences alone. Such a configuration is similar to that suggested by Kunz and Stuhlinger (*C. A.* **20**, 414) and K and Kress (*C. A.* **21**, 1658) for a Cu-indigo complex. In this latter connection the property of aminocupric complexes of being easily transformed into the corresponding triazoles can be explained by the following structure:



At the instant of disintegration of the complex and of dehydrogenation of the aminoazo deriv., the N double bond is weakened, and a new bond, which is of the ordinary type rather than covalent, is formed between the 2 N atoms. For the prepn. of the complexes, the azo deriv. was treated with the ammoniacal metal sulfate (method A) or with the finely powd. metal (method B). The following data show the compds. prepd. (A) or (B) designating which of the methods above was used. *Nickelo-di-p-hydroxyphenylazo- $\beta$ -naphthol* (A), dark brown, could not be crystd., does not m. up to  $300^\circ$ , decompd. by AcOH, stable in alkalis. *Cupri-di-p-hydroxyphenylazo- $\beta$ -naphthol* (A), dark maroon-red, could not be crystd., m.  $245^\circ$ . No corresponding Co salt could be obtained. From *p*-hydroxyphenylazo- $\beta$ -naphthylamine, no metal complexes could be obtained, either by (A) or (B). *Nickelo-di-p-acetylphenylazo- $\beta$ -naphthol* (A), 75% yield, brown-green, does not m. up to  $300^\circ$ . *Cupri-di-p-acetylphenylazo- $\beta$ -naphthol* (A), 35% yield, dark brick-red, does not m. up to  $300^\circ$ . *Cobalto-di-p-acetylphenylazo- $\beta$ -naphthol* (A) in presence of  $NH_4Cl$ , black powder, m.  $275^\circ$ . *Cupri-di-p-acetylphenylazo- $\beta$ -naphthylamine* (A), black, m.  $210^\circ$ . The corresponding Ni and Co derivs., prepd. by (B), have already been described (cf. Crippa, *C. A.* **21**, 1810). *Nickelo-di-o-nitrophenylazo- $\beta$ -naphthol* (A), 50% yield, greenish black, m.  $294^\circ$ . *Cupri-di-o-nitrophenylazo- $\beta$ -naphthol* (A), 50% yield, brown-green, m.  $263^\circ$ . The corresponding Co salt could not be obtained. *Ni-di-m-nitrophenylazo- $\beta$ -naphthol* (A), 60% yield, dark

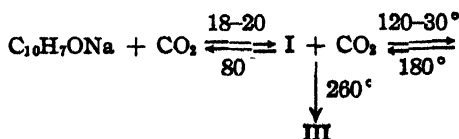
green, does not m. up to 300°. *Cupri-di-m-nitrophenylazo-β-naphthol* (A), 80% yield, maroon-red, m. 295°. No corresponding Co salt was obtained. *Nickelo-di-p-nitrophenylazo-β-naphthol* (A), 80% yield, dark gray, does not m. up to 300°. *Cupri-di-p-nitrophenylazo-β-naphthol* (A), 80% yield, coffee-color, does not m. up to 300°. No corresponding Co salt was obtained. *Nickelo-di-o-nitrophenylazo-β-naphthylamine* (A), 35% yield, greenish black, m. 250°. The formation of the corresponding Cu salt was uncertain, though a dark green compd., m. 260°, was obtained. By (B) no Co complex could be isolated in a pure form. *Nickelo-di-m-nitrophenylazo-β-naphthylamine* (A), 60% yield, greenish black, m. 258°. *Cupri-di-m-nitrophenylazo-β-naphthylamine* (A), 45% yield, brown, m. 209°. *Cobalto-di-m-nitrophenylazo-β-naphthylamine* (B), very dark green, microcryst., does not m. up to 300°. *Nickelo-di-p-nitrophenylazo-β-naphthylamine* (A), 40% yield, dark green, microcryst., m. 290°. *Cupri-di-p-nitrophenylazo-β-naphthylamine* (A), 60% yield, maroon with golden reflection, m. 236°. *Cobalto-di-p-nitrophenylazo-β-naphthylamine* (A), very low yield, green, does not m. up to 300°. By method (A), *p*-nitrophenylazo-β-naphthylaminesulfonic acid did not form compds. which could be isolated in definite form, but 2 g. suspended in boiling EtOH (40 cc.), boiled 1 hr. with NiSO<sub>4</sub> (6 g.) in dil. NH<sub>4</sub>OH (10 cc. of NH<sub>4</sub>OH + 6 cc. H<sub>2</sub>O), filtered hot, and the filtrate let stand, yields the compd. [1,2-C<sub>10</sub>H<sub>6</sub>(N:N(1')-C<sub>6</sub>H<sub>4</sub>(4')SO<sub>3</sub>)OH]<sub>2</sub>Ni, greenish black. By method (A) there was also obtained the compd. ([C<sub>10</sub>H<sub>6</sub>(N:NC<sub>6</sub>H<sub>4</sub>SO<sub>3</sub>)OH]<sub>2</sub>Cu)(NH<sub>4</sub>)<sub>2</sub> brown, evolves NH<sub>3</sub> at 120–50° or in aq. KOH. With Co the results were uncertain. With 1,2-H<sub>2</sub>NC<sub>10</sub>H<sub>6</sub>N:NC<sub>6</sub>H<sub>4</sub>SO<sub>3</sub>K-*p*, no Ni or Co complex was obtained, but by method (A) the compd. ([C<sub>10</sub>H<sub>6</sub>(N:NC<sub>6</sub>H<sub>4</sub>SO<sub>3</sub>)(NH<sub>2</sub>)<sub>2</sub>Cu.4NH<sub>3</sub>)K<sub>2</sub> evolves NH<sub>3</sub> when gently warmed; when boiled in water for a long time it forms K *N*-phenyl-1,2-naphthotriazolesulfonate (cf. *Ber.* 27, 2375 (1894); *Ger. Pat.* 107,498). In a similar way was obtained the compd. ([C<sub>10</sub>H<sub>6</sub>(N:NC<sub>6</sub>H<sub>4</sub>SO<sub>3</sub>)(NH<sub>2</sub>)<sub>2</sub>Cu.4NH<sub>3</sub>)Na<sub>2</sub>. On the other hand, 1,2-H<sub>2</sub>NC<sub>10</sub>H<sub>6</sub>N:NC<sub>6</sub>H<sub>4</sub>SO<sub>3</sub>H-*p*, CuSO<sub>4</sub> and excess NH<sub>4</sub>OH did not form the corresponding complex, but the triazolesulfonic acid. The ammoniacal sulfates of the metals which formed the foregoing types of complexes were added to Me ether of phenylazo-β-naphthol and to the Me and Et ethers of *p*-acetylphenylazo-β-naphthol, but in no case was it possible to isolate a complex. *p*-Acetylphenylazo-β-naphthol, which has not been described heretofore, was prepd. by coupling a *p*-aminoacetophenonediazonium salt with phenylazo-β-naphthol in aq. NaOH. It is red with golden reflection, and m. 180°; *oxime*, bright red, m. 234–5°; *phenylhydrazone*, maroon, m. 165°; *semicarbazone*, maroon with green reflection, does not m. up to 300°. *Me ether of p*-acetylphenylazo-β-naphthol, by the action of Me<sub>2</sub>SO<sub>4</sub>, dark red, m. 134–5°; *oxime*, red, m. 250°; *phenylhydrazone*, red, m. 87–8°; *semicarbazone*, red, m. 210°. *Et ether of p*-acetylphenylazo-β-naphthol, by the action of Et<sub>2</sub>SO<sub>4</sub>, ruby-red, m. 102°; *oxime*, red, 161–2°; *phenylhydrazone*, dark red, m. 64°; *semicarbazone*, brick-red, m. 190°.

C. C. DAVIS

Constitutional influences on the conversion of azonaphthols into their azosulfites and their bearing on the structure of  $\alpha$ - and  $\beta$ -naphthol. ALBERT T. KING. *J. Chem. Soc.* 1929, 601–9.—The conversion of azonaphthols into their azosulfites is of special significance in dyes derived from them, since this reaction underlies their degree of fastness to SO<sub>2</sub> on alk. fabric as distinguished from the ordinary stoving test with excess of SO<sub>2</sub>. The difference in activity, notably with respect to the "active range" of alkyl on wool fabric, is further considered in the present paper, more particularly with regard to the positional effect of SO<sub>3</sub>H groups. With the naphthol nucleus unsubstituted, the azo- $\alpha$ -naphthol bisulfite compds. form fairly readily, although less so than the corresponding  $\beta$ -naphthol derivs., e. g., *p*-sulfobenzeneazo- $\alpha$ -naphthol reacts rather less readily than *p*-sulfobenzeneazo- $\beta$ -naphthol, and 4-sulfo- $\alpha$ -naphthaleneazo- $\alpha$ -naphthol (acid brown R) distinctly less readily than the corresponding  $\beta$ -naphthol compd. (fast red A). No close comparison of constitutional influences can be drawn here, since the coupling of  $\beta$ -naphthol derivs. occurs at the *o*-position to the HO group, while with the above  $\alpha$ -naphthol compds. the coupling is at the *p*-position to the HO group. When the naphthol component is sulfonated, however, so that the coupling is in the *o*-position for both  $\alpha$ - and  $\beta$ -naphthol, a wide divergence in reactivity appears. The azo- $\beta$ -naphtholsulfonic acids show no falling off in reactivity; rather, owing to the increasing soly. accompanying introduction of SO<sub>3</sub>H groups, conversion into the azosulfite becomes, if anything, more readily effected. The well-characterized sulfites of a no. of azo- $\beta$ -naphtholsulfonic acids are recorded in the exptl. part. No example has so far been found where an azo compd. with a  $\beta$ -naphthol residue has failed to form a bisulfite deriv. On the other hand, azo derivs. of  $\alpha$ -naphthol show a striking loss of reactivity with introduction of SO<sub>3</sub>H groups, the only case of sulfite formation observed being with a SO<sub>3</sub>H group in the 5-position and then only when the azo deriv.

is formed from an unsulfonated diazo compd., e. g.,  $\alpha$ -naphthaleneazo- $\alpha$ -naphthol-5-sulfonic acid (Double Ponceau) yields the azosulfite, but the corresponding 4-sulfo- $\alpha$ -naphthaleneazo- $\alpha$ -naphthol-5-sulfonic acid (Fast Red V.R.) merely undergoes slow fission, without any azosulfite formation occurring. The non-reactivity of the following dyes illustrates the general inhibition with a sulfonated  $\alpha$ -naphthol component:  $\alpha$ -naphthaleneazo- $\alpha$ -naphthol-4,8-disulfonic acid (Azo Bordeaux, Bayer),  $\alpha$ -naphthaleneazo- $\alpha$ -naphthol-3,6-disulfonic acid (Benzyl Bordeaux B, Clayton Aniline Co.), 4-sulfo- $\alpha$ -naphthaleneazo- $\alpha$ -naphthol-4-sulfonic acid (Carmoisine, Sandoz), 4-sulfo- $\alpha$ -naphthaleneazo- $\alpha$ -naphthol-5-sulfonic acid (Fast Red V.R., Bayer), 6-sulfo- $\beta$ -naphthaleneazo- $\alpha$ -naphthol-4-sulfonic acid (Brilliant Ponceau 4R, Bayer). With regard to the actual compn. of the bisulfite compds., the fission of the azo linkage which usually occurs under prolonged treatment of azo dyes of the  $\alpha$ -naphthol type with bisulfite is of significance. The analyses recorded in the exptl. part are all lower than are required by the dehydrated form, but show generally a slightly higher content of  $\text{SO}_2$  than is required for the hydrazone form. The difficulty both of purifying and of accurately analyzing these compds. makes such evidence untrustworthy as to whether the water mol. is split off or not. The marked difference in color, however, between the dye and its bisulfite compd. suggests a modified N linking, and this view is supported by the fact that the N link in the bisulfite product is stable to further action of bisulfite, whereas the azo link is reduced. Consequently, the bisulfite compds. are to be regarded as retaining the additive structure, without reversion to the azo linking by loss of water. Among the compds. prepd. and characterized were: *Na benzeneazo-6-sulfo- $\beta$ -naphthyl sulfite*,  $\text{C}_{16}\text{H}_{10}\text{O}_4\text{N}_2\text{S}_2\text{Na}_2$  (bisulfite compd. of Croceine Orange, Bayer), canary-yellow powder on rubbing; *Na  $\alpha$ -naphthaleneazo-6-sulfo- $\beta$ -naphthyl sulfite*,  $\text{C}_{20}\text{H}_{12}\text{O}_6\text{N}_2\text{S}_2\text{Na}_2 \cdot \text{H}_2\text{O}$  (bisulfite compd. of Fast Red B, Bayer), bronze-brown cryst. product on drying; *Na 4-sulfo- $\alpha$ -naphthaleneazo-6-sulfo- $\beta$ -naphthyl sulfite*,  $\text{C}_{20}\text{H}_{11}\text{O}_8\text{N}_2\text{S}_4\text{Na}_3 \cdot \text{H}_2\text{O}$  (bisulfite compd. of Fast Red E.A.S., Brit. Dyestuffs Corp.), bright orange cryst. powder; *Na benzeneazo-3,6-disulfo- $\beta$ -naphthyl sulfite*,  $\text{C}_{16}\text{H}_9\text{O}_6\text{N}_2\text{S}_4\text{Na}_3 \cdot \text{H}_2\text{O}$  (bisulfite compd. of Acid Orange R, Brit. Dyestuffs Corp.), dull yellow cryst. powder; *Na m-xyleneazo-3,6-disulfo- $\beta$ -naphthyl sulfite*,  $\text{C}_{18}\text{H}_{13}\text{O}_6\text{N}_2\text{S}_4\text{Na}_3 \cdot \text{H}_2\text{O}$  (bisulfite compd. of Ponceau 2RE, Geigy) buff-yellow cryst. powder; *Na o-carboxybenzeneazo-3,6-disulfo- $\beta$ -naphthyl sulfite*,  $\text{C}_{17}\text{H}_9\text{O}_{11}\text{N}_2\text{S}_4\text{Na}_4 \cdot \text{H}_2\text{O}$  (Solochrome Red B, Brit. Dyestuffs Corp.), dull orange cryst. powder; *Na  $\alpha$ -naphthaleneazo-3,6-disulfo- $\beta$ -naphthyl sulfite*,  $\text{C}_{20}\text{H}_{11}\text{O}_8\text{N}_2\text{S}_4\text{Na}_3 \cdot \text{H}_2\text{O}$  (bisulfite compd. of Bordeaux B, Sandoz), brick-red cryst. powder; *Na 4-sulfo- $\alpha$ -naphthaleneazo-3,6-disulfo- $\alpha$ -naphthyl sulfite*,  $\text{C}_{20}\text{H}_{10}\text{O}_{12}\text{N}_2\text{S}_4\text{Na}_4 \cdot \text{H}_2\text{O}$  (bisulfite compd. of Azo Rubine S, Sandoz), orange-brown cryst. powder; *Na 4-sulfo- $\alpha$ -naphthaleneazo-6,8-disulfo- $\beta$ -naphthyl sulfite*,  $\text{C}_{20}\text{H}_{10}\text{O}_{12}\text{N}_2\text{S}_4\text{Na}_4 \cdot \text{H}_2\text{O}$  (bisulfite compd. of Scarlet 5/0, Brit. Dyestuffs Corp.), dull yellow cryst. powder; *Na 4-sulfo- $\alpha$ -naphthaleneazo-3,6,8-trisulfo- $\beta$ -naphthyl sulfite*,  $\text{C}_{20}\text{H}_9\text{O}_{15}\text{N}_2\text{S}_6\text{Na}_5 \cdot \text{H}_2\text{O}$  (bisulfite compd. of Ponceau 6R, Bayer), deep orange cryst. powder deliquescent in air; *Na  $\alpha$ -naphthaleneazo-6-sulfo- $\alpha$ -naphthyl sulfite*,  $\text{C}_{20}\text{H}_{12}\text{O}_6\text{N}_2\text{S}_2\text{Na}_2 \cdot \text{H}_2\text{O}$  (bisulfite compd. of Double Ponceau 2R, Bayer), orange cryst. powder.

Chemistry of the Kolbe-Schmitt syntheses. The action of carbon dioxide on sodium 2-naphtholate. ERW. SCHWENK WITH M. KNOB AND H. STEIN. *Chem.-Ztg* 53, 297-9, 333-6 (1929).—When dry  $\beta$ - $\text{C}_{10}\text{H}_7\text{ONa}$  (prepd. by dissolving Na in  $\beta$ - $\text{C}_{10}\text{H}_7\text{OH}$  in boiling anhyd. solvent naphtha, b. p.  $160^\circ$ , cooled with ice, filtered, washed with ligroin, dried *in vacuo* over  $\text{H}_2\text{SO}_4$  and paraffin) in a glass tube is treated at  $18$ – $20^\circ$  with  $\text{CO}_2$  (dried with  $\text{H}_2\text{SO}_4$ ,  $\text{CaCl}_2$  and then  $\text{P}_2\text{O}_5$ ) at 10 mm.  $\text{H}_2\text{O}$  pressure, nearly 1 mol. (95%) is absorbed forming  $\text{C}_{10}\text{H}_7\text{OCO}_2\text{Na}$  (I); when I is heated to  $120$ – $30^\circ$  for 6 hrs. in a sealed tube it forms  $\text{CO}_2$ ,  $\beta$ - $\text{C}_{10}\text{H}_7\text{OH}$  and *Na  $\beta$ -hydroxy- $\alpha$ -naphthoate*,  $\text{C}_{10}\text{H}_6(\text{OH})\text{CO}_2\text{Na}$  (II); when I is heated to  $80^\circ$  it forms  $\beta$ - $\text{C}_{10}\text{H}_7\text{ONa}$  and  $\text{CO}_2$ ; when II is heated *in vacuo* (8 mm.) for 3 hrs. at  $180^\circ$  it forms  $\text{CO}_2$  and  $\beta$ - $\text{C}_{10}\text{H}_7\text{ONa}$ ; when II is heated *in vacuo* for 6 hrs. at  $280^\circ$  it forms  $\beta$ - $\text{C}_{10}\text{H}_7\text{OH}$  and *Na 2-hydroxy-3-naphthoate* (III); III is not decompd. by heating to  $280^\circ$ . From this it is concluded that the mechanism of the reaction is as follows:



thus explaining the remarkable rearrangement of the  $\text{CO}_2\text{H}$  group from position 1 to position 3.  $\beta$ , $\alpha$ - $\text{C}_{10}\text{H}_6(\text{OH})\text{CO}_2\text{K}$  is stable at temps. up to  $200^\circ$  and (unlike the

corresponding Na salt) is not converted to the salt of 2,3- $C_{10}H_6(OH)CO_2H$  unless heated to at least 230° when only traces are formed. Contrary to the statements in D. R. P. 436,524, no *K* 2-hydroxy-6-naphthoate was obtained at 260, 280, or 300°. These negative results may be due to the small amts. of starting material (5 g.) not furnishing a sufficient amt. for identification. These results confirm the theories of the mechanism of similar reaction as expressed by Tijmstra and Eggink (cf. *Ber.* 39, 14(1906)) and Davies (cf. *C. A.* 23, 2507).

N. A. LANGE

**Preparation of aminonaphthols.** WILSON F. BROWN, JOHN C. HEBDEN AND JAMES R. WITHROW, *J. Am. Chem. Soc.* 51, 1766-9(1929).—1,7- $C_{10}H_6(NH_2)OH$  was prepd. in good yield and of good quality from 1,7- $C_{10}H_6(NH_2)SO_3H$  by NaOH fusion, at much higher temps. than were given by Cassella (Ger. Pat. 69,458) and was isolated both as the base and as the HCl salt. The mixt. was heated at 265-75° for 1 hr., at 305° for 5 mins. and then cooled to 200°. 1,6- $C_{10}H_6(NH_2)OH$  was prepd. similarly from 1,6- $C_{10}H_6(NH_2)SO_3H$  and was purified by extg. with 7.5% HCl and pptg. with  $NH_4OH$  or by repeatedly crystg. from hot  $H_2O$ ; it m. 190.6° (cor.); the picrate m. 170° (cor.); acetylation was unsuccessful.

C. J. WEST

**Mercuration of naphthalic acids.** G. J. LEUCK, R. P. PERKINS AND FRANK C. WHITMORE, *J. Am. Chem. Soc.* 51, 1831-6(1929).—Naphthalic acid (50.5 g.) in 1.2 l.  $H_2O$  and 31 g. NaOH, treated with 55 g.  $HgO$  in 150 cc.  $H_2O$  and 40 cc. glacial AcOH and refluxed 98 hrs., gives 97.6% of anhydro-8-hydroxymercuri-1-naphthoic acid; evapg. an alk. soln. gives Na 8-hydroxymercuri-1-naphthoate; heating 46.5 g. of the Na salt in 500 cc.  $H_2O$  with 200 cc. concd. HCl gives 87% of the 1-naphthoic acid, m. 162°. 3-Nitronaphthalic anhydride (304 g.) gives 505 g. (97%) of a mixt. of anhydro-3-nitro-8-hydroxymercuri-1-naphthoic acid and the corresponding 6- $NO_2$  compd.(I), which could not be purified. Evapg. the alk. soln. of I gives Na 3-nitro-8-hydroxymercuri-1-naphthoate, yellow. Refluxing with an excess of EtOH-NaI gives Na 8-mercuribis-3-nitro-1-naphthoate. Heating I with HCl for 2 hrs. gives 63% of 3-nitro-1-naphthoic acid (II), m. 270.5-1.5°, and 13% of the 6- $NO_2$  deriv.(III), m. 227-7.5°. II forms an Et ester, yellow, m. 87.5-8.5°; this does not react with  $NH_3$  in  $H_2O$ , EtOH or when fused. II, with  $SOCl_2$  and  $NH_3$ , gives the amide, m. 280-80.8°. Reduction of II gives the 3- $NH_2$  deriv., m. 181-2°; Ac deriv., cream-colored, m. 254-5°. III forms an Et ester, m. 111.5-2°; amide, cream-colored, m. 216.5°. Mercuration of 4-nitro-1-naphthoic anhydride gives mainly anhydro-4-nitro-8-hydroxymercuri-1-naphthoic acid and a little of the 5- $NO_2$  compd.; heating this mixt. with concd. HCl gives 70% of 4,1- $C_{10}H_6(NO_2)CO_2H$ , whose Et ester m. 57-8° and Me ester m. 107.5-8.5°. The mother liquor gives 4% of the 5- $NO_2$  deriv.

C. J. WEST

**Some observations with triquinoyl.** F. BERGEL, *Ber.* 62B, 490-1(1929).—All attempts hitherto to prep. polymers of CO have been more or less failures. It may be assumed that triquinoyl,  $C_6O_8 \cdot 8H_2O$  (I), contains a preformed hexamer but the 8 mols. of  $H_2O$  somewhat alter the simple structure. In connection with the prepn. of I it was noted that the snow-white I *in vacuo* over  $P_2O_5$  slowly assumes a yellow color which again disappears in the air. When heated in a high vacuum over  $P_2O_5$  at the temp. of boiling alc. until its loss in wt. corresponds to almost exactly 8 mols.  $H_2O$  it assumes, without any apparent change in cryst. form, a deep brown-yellow color and, unlike prepn. which have lost only 1-2 mols.  $H_2O$ , it now deliquesces very rapidly in the air; it readily dissolves in  $H_2O$ , MeOH, EtOH,  $Me_2CO$  and  $Et_2O$  with reddish color and decomp. 136-7°. As combustion analyses indicated the presence of some  $H_2O$  and the substance cannot be converted back into I by  $H_2O$  or by cautious addn. of  $H_2O$  to an alc. or  $Me_2CO$  soln. it is probable that the dehydration of I is accompanied by an at least partial decompn. into rhodizonic or croconic acid; with  $BaCl_2$  the brown dehydration product gives, like I,  $CO_2$  and a red Ba salt,  $C_6O_8Ba \cdot BaCl_2 \cdot 4H_2O$ , and it must therefore still have the same skeleton as I. Dialysis gave no indications of the formation of higher polymerization products. Attempts to decomp. the substance at 135° apparently led to disproportionation;  $CO_2$ , C and a small quantity of a  $H_2O$ - and alc.-sol. substance were formed.

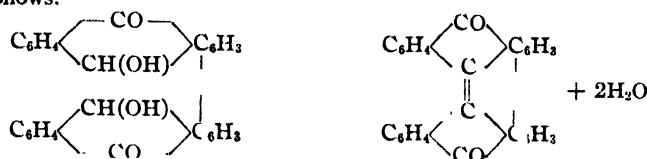
C. A. R.

**Polyiodoanthraquinones.** ALFRED ECKERT AND MAX KLINGER, *J. prakt. Chem.* [2], 121, 281-8(1929).—Tetraiodobenzoic acid (I) is best recrystd. from  $PhCl$ ; when 1 g. I is heated rapidly with 10 parts concd.  $H_2SO_4$  to 190-200° and kept at this temp. for 1 hr. until I is no longer evolved, cooled, dild. with  $H_2O$ , filtered, washed with hot  $H_2O$  until all of the red material has been extd., the insol. residue extd. with warm dil. NaOH until all of the violet color has been extd., the residue, recrystd. from  $PhCH_2OBz$ , gave 0.2 g. of a tetraiodoanthraquinone, yellow, m. 476° (decompn.); the high temp. of the reaction casts doubt as to its being the 1,2,3,4-tetra-I deriv. When a finely powd. mixt. of 1 g. I and 5 g.  $AlCl_3$  is heated to 150°

and then to 175°, I and HCl are evolved; the reaction product after extn. with HCl and then Na<sub>2</sub>CO<sub>3</sub> gave 0.03 g. of a *diiodoanthraquinone*, yellow, m. 290–2°. When 5 g. dry C<sub>14</sub>H<sub>2</sub>O<sub>2</sub> in 50 cc. oleum (70% SO<sub>3</sub>) is treated with 20 g. I in small portions and then heated under reflux for 8 hrs. at 180°, cooled, poured on ice, the product extd. with hot glacial AcOH, the AcOH removed from the ext. by distn., the product pptd. with H<sub>2</sub>O, washed with Na<sub>2</sub>CO<sub>3</sub>, then with NaOH and recrystd. from PhCl, yellow needles, m. 277° of a *triiodoanthraquinone* of unknown configuration are obtained. The residue from the AcOH extn. above was partly dissolved in PhNO<sub>2</sub>, filtered and on cooling gave brown needles of a *pentaiodoanthraquinone*, m. 368°. The residue from the AcOH and PhNO<sub>2</sub> extns. was recrystd. from PhNO<sub>2</sub> or PhCH<sub>2</sub>OH and gave yellow needles, m. above 500°, which is probably the *1,4,5,8-tetraiodoanthraquinone*. Attempts to replace the halogen with other groups (PhNH, MeO, etc.) were not successful. Other polyiodoanthraquinones are formed in the reaction but the quantities present were not sufficient for identification.

N. A. LANGE

**Reduction products of 1,1'-dianthraquinonyl.** ALFRED ECKERT. *J. prakt. Chem.* [2], 121, 273–7(1929).—Attempts to reduce 1,1'-dianthraquinonyl (I) to the corresponding dianthraquinonyl hydrocarbon were not successful (cf. C. A. 4, 2797) but gave *meso*-benzbianthrone (II) or reduction products which could not be identified. Yellow leaflets of *tetraacetyldianthrahydroquinone*, [C<sub>14</sub>H<sub>7</sub>(OAc)<sub>2</sub>]<sub>2</sub>, are obtained (cf. C. A. 4, 2799) when 2 g. I (recrystd. from PhNO<sub>2</sub>) is suspended in 30 cc. Ac<sub>2</sub>O, heated to boiling, treated with 6 g. Zn dust (in 1 g. portions during 2 hrs.) (cf. Liebermann, *Ber.* 21, 435(1888)), refluxed 2 hrs. longer, dild. with glacial AcOH, filtered hot, the ppt. of Zn extd. with hot AcOH until the filtrate is colorless, the combined filtrates evapd. to a small vol. until crystals sep., Zn(OAc)<sub>2</sub> removed from the crystals with dil. HCl and the product recrystd. from glacial AcOH with charcoal or from xylene, the green soln. in H<sub>2</sub>SO<sub>4</sub> on diln. with H<sub>2</sub>O gives helianthrone; a soln. in glacial AcOH after exposure to direct sunlight for a week gradually deposits II. The dehydration of dianthrahydroquinone to form II is explained by the desmotropic form (cf. C. A. 5, 1408) as follows:



N. A. LANGE

**Synthesis of trihydroxymethylantraquinones.** I. S. KEIMATSU AND I. HIRANO. *J. Pharm. Soc. Japan* 49, 147–56(1929).—The total no. of natural and synthetic trihydroxymethylantraquinones is 17, but the constitution of only 9 of these is known. In order to establish the constitution of some of the remaining compds., a few trihydroxymethylantraquinones were prepd. and their properties were compared with those given in the literature. For this purpose, 3 different dichlorophthalic anhydrides were condensed with *o*-ClC<sub>6</sub>H<sub>4</sub>Me (I) by Friedel-Craft's reaction and the resulting compds. were converted into the corresponding anthraquinones. Condensation of 3,6-Cl<sub>2</sub>C<sub>6</sub>H<sub>3</sub>(CO)<sub>2</sub>O and I gave 4',3,6-trichloro-3'-methyl-2-benzoylbenzoic acid, m. 157–8°, and that of 4,5-Cl<sub>2</sub>C<sub>6</sub>H<sub>3</sub>(CO)<sub>2</sub>O and I gave 4',4,5-trichloro-3'-methyl-2-benzoylbenzoic acid, m. 174–5°, while 3,4-Cl<sub>2</sub>C<sub>6</sub>H<sub>3</sub>(CO)<sub>2</sub>O and I gave 4',3,4-trichloro-3'-methyl-2-benzoylbenzoic acid or its isomeric 4',5,6-tri-Cl deriv., m. 265–6°. Heating of these benzoylbenzoic acids with fuming H<sub>2</sub>SO<sub>4</sub> gave 3,5,8-trichloro-2-methyl-9,10-anthraquinone, m. 250–1°, the 3,6,7-tri-Cl isomer, m. 314–5°, and the 3,5,6 (or 3,7,8)-tri-Cl compd., m. 264–5°, resp. (yield 67.7–90.2%). These anthraquinones and MeONa gave 87% of the corresponding tri-MeO derivs., m. 218–9°, 205–6° and 193–4°. These anthraquinones with HBr in glacial AcOH gave the corresponding tri-OH derivs., m. 211–2° (III) (tri-Ac deriv., m. 173–4°), m. 322–3° (IV), and m. 165–6° (V or VI), (tri-Ac deriv., m. 168–9°). III and HI gave 3,5,8-trihydroxy-2-methylanthrone, decomps. 238–9°. V or VI and HI gave 3,5,6(or 3,7,8)-trihydroxy-2-methylanthrone, decomps. 223–4°. A comparison of the chem. and phys. properties of these compds. with those given in the literature showed that IV is a new compd. and V or VI corresponds to Hesse's chrysarone (C. A. 2, 2282) while III corresponds to H.'s rhabarberone (*Ann.* 309, 42) or Tschirch and Eijke's isoemodin (*Schweiz. Wochschr. Pharm.* 1904, Nos. 40 and 41).

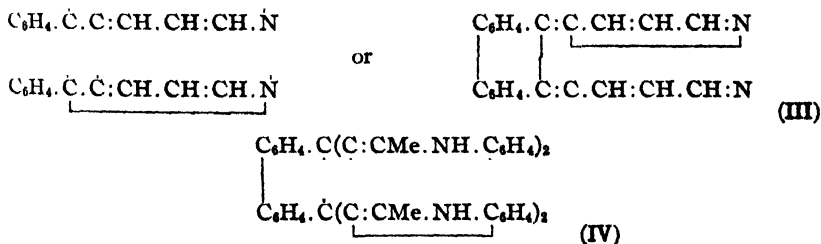
NAO UYEH

**Reaction of alizarin and mercuric acetate.** FRANK C. WHITMORE AND G. J. LEUCK. *J. Am. Chem. Soc.* 51, 1951–2(1929).—Alizarin and excess of Hg(OAc)<sub>2</sub> give large

amts. of  $\text{HgOAc}$  and a product which appeared to be *acetoxymercuridihydroxyalizarin*,  $\text{C}_{16}\text{H}_{10}\text{O}_8\text{Hg}$ .  $\text{HCl}$  gives a yellow-red dye with properties similar to those of alizarin.  $\text{NaOH}$  corresponding to 4 HO groups gives a bluish red soln., changed on warming to red; this may be 1,2,5,8-tetrahydroxy-4-acetoxymercurianthraquinone. C. J. W.

**9-Benzohydrylanthrone and isodianthranyl.** EDWARD DE BARRY BARNETT AND NORMAN F. GOODWAY. *J. Chem. Soc.* 1929, 813-4.—Anthrone (8 g.) and 20 cc. of  $\text{Ph}_2\text{CHCl}$  in 100 cc. of 25%  $\text{KOH}$  were boiled for 20 mins. to a pale soln. The 9-benzohydrylanthrone (I), m. 188-9°, was cooled, washed with  $\text{H}_2\text{O}$ , triturated with  $\text{Et}_2\text{O}$  and crystd. from  $\text{HOAc}$  and  $\text{PhH}$ -ligroin. With  $\text{C}_6\text{H}_5\text{N}$  and  $\text{Ac}_2\text{O}$ , it gave the *acetate*, m. 234-5°, which fails to check the m. 228-9° reported by Padova (*C. A.* 3, 2678). Ten g. of I and 20 g. of Zn dust were boiled in 100 cc. of  $\text{HOAc}$  while 20 cc. of concd.  $\text{HCl}$  was added (45 mins.); after boiling for 1 hr. more, the soln. was filtered hot and upon cooling, *isodianthranyl*, m. 312° (after recrystn. from  $\text{HOAc}$  contg.  $\text{HCl}$  and twice from  $\text{PhH}$ ), crystd. The  $\text{HOAc}$  soln. contained  $\text{Ph}_2\text{CH}_2$ . A. S. CARTER

**Reactions between phenanthrenequinone and magnesylypyrroles.** QUINTINO MINGOIA. *Gazz. chim. ital.* 58, 673-9(1928).—Continuing earlier work (cf. *C. A.* 22, 242) on the behavior of quinones with magnesylypyrrole (I) and magnesylyndoles, further expts. show that phenanthrenequinone (II) reacts in a similar way to anthraquinone. I (prepd. by the method of Oddo, *C. A.* 4, 2460, from 1.2 g.  $\text{Mg}$ , 5.5 g.  $\text{EtBr}$  and 3.4 g. pyrrole, with elimination of all  $\text{C}_2\text{H}_5$ ) in  $\text{Et}_2\text{O}$  refluxed with II (5.2 g.) for 20 hrs., cooled, ice added, neutralized with dil.  $\text{H}_2\text{SO}_4$ , the 2 layers sepd., the aq. layer extd. with  $\text{Et}_2\text{O}$ , the combined  $\text{Et}_2\text{O}$  exts. evapd., the residue steam-distd., to remove pyrrole, the new residue dissolved in  $\text{AcOEt}$ , pptd. by petr. ether, dissolved in  $\text{C}_6\text{H}_6$  and pptd. again by petr. ether, yields 9,10-dipyrroledihydrophenanthrene,  $\text{C}_{22}\text{H}_{14}\text{N}_2$  (III), dark green, m. 190°, the constitution of which was verified by several tests. In the reaction between I and II, it is best to place II in a receptacle above the I in  $\text{Et}_2\text{O}$  so that the cloud of  $\text{Et}_2\text{O}$  will slowly dissolve the II and carry it to the I soln. below. Following the same technic, II (2.6 g.) heated with magnesylymethylketole (from 1.2 g.  $\text{Mg}$ , 5.5 g.  $\text{EtBr}$  and 6.5 g.  $\alpha$ -methylindole) for 24 hrs. on a water bath, cooled, decompd. with ice, the aq. layer neutralized with dil.  $\text{H}_2\text{SO}_4$ , the aq. layer then extd. with  $\text{Et}_2\text{O}$ , the combined  $\text{Et}_2\text{O}$  exts. evapd., the residue steam distd., the new residue dissolved in  $\text{AcOH}$ , pptd. with petr. ether, dissolved in benzine and pptd. with  $\text{C}_6\text{H}_6$ , yields 9,10-tetra- $\alpha$ -methylindylidihydrophenanthrene  $\text{C}_{30}\text{H}_{20}\text{N}_4$  (IV), dark violet, m. 154°, insol. in hot or cold aq. alk. carbonates and hydroxides, and in dil. mineral acids, gives a violet soln. in concd.  $\text{H}_2\text{SO}_4$ , in dil.  $\text{EtOH}$  ppts. with  $\text{AgNO}_3 + \text{NH}_4\text{OH}$  a gray *Ag deriv.*, sol. in excess  $\text{NH}_4\text{OH}$ . The formation of IV is thus analogous to the formation of rosindoles (cf. M., *C. A.* 21, 1117). IV, boiled 4 hrs. with excess  $\text{Ac}_2\text{O}$  with fused  $\text{AcONa}$ , the excess  $\text{Ac}_2\text{O}$  decompd. with water and the resinous product crystd. from dil  $\text{EtOH}$ , yields a *tetra-Ac deriv.*  $\text{C}_{30}\text{H}_{18}\text{N}_4\text{O}_4$ , m. 170°.



C. C. DAVIS

**1,2-Phenanthrenequinone.** LOUIS F. FIESER. *J. Am. Chem. Soc.* 51, 1896-1906 (1929).—Coupling of 2-phenanthrol with  $p\text{-HO}_2\text{SC}_6\text{H}_4\text{N}_2\text{X}$  and reduction of the dye gives nearly quant. 1-amino-2-phenanthrol (I), pale gray, darkens 210° but with no definite point of decompn.; *HCl salt*, decomp. about 250° and gives a cherry-red soln. with warm concd.  $\text{H}_2\text{SO}_4$ . I (1 g.) and 10 cc.  $\text{Ac}_2\text{O}$ , boiled until the mono-Ac deriv. has just dissolved, give the *diacetate*, m. 227° (cor.); boiling the crude acetylation product with  $\text{EtOH-HCl}$  gives 1-acetyl-amino-2-phenanthrol, m. 295°; longer boiling of the acetylation mixt. with  $\text{Ac}_2\text{O}$  and  $\text{AcONa}$  gives the *triacetate*, m. 125°; heating either the di- or triacetate until no more  $\text{AcOH}$  or  $\text{Ac}_2\text{O}$  is evolved gives the *oxazole*

deriv. nearly quant. 1,2-phenanthrenequinone (II), brilliant red, m. 244° (cor., ompn.); concd.  $\text{H}_2\text{SO}_4$  gives a brilliant blue color, quickly changing to an intense

sap-green. Reduction of II gives 1,2-dihydroxyphenanthrene, m. 178°; *di*-MeO deriv., m. 102°. II,  $\text{Ac}_2\text{O}$  and concd.  $\text{H}_2\text{SO}_4$ , with cooling, give 36% of 1,2,4-triacetoxypheanthrene, m. 189° (cor.); alk. hydrolysis in a N atm. gives 88% of 2-hydroxy-1,4-phenanthrenequinone (III), orange-yellow, m. 190° (cor., decompn.); the soln. in concd.  $\text{H}_2\text{SO}_4$  is green, in alkali, red. 2-MeO deriv., m. 172.5°. The Ag salt of III and allyl bromide in  $\text{C}_6\text{H}_6$  give a mixt. of 4-allyoxy-1,2-phenanthrenequinone, dark red, m. 128°, and the 3-allyl deriv. of III, orange, m. 157°; the alk. soln. of the latter is grape-purple but the color disappears completely on boiling. Cleavage of III by alkali gives 1-aceto-2-naphthylglyoxylic acid, m. 181° (decompn.); Me ether, m. 112°. II and  $\text{NaHSO}_3$  in dil. NaOH give 65% of Na 1,2-dihydroxyphenanthrene-4-sulfonate, gray powder; K salt, crystg. with 2  $\text{H}_2\text{O}$ ; *p*-toluidine salt, pale yellow, m. 248° (cor., decompn.); oxidation of the above Na salt with  $\text{CrO}_3$  and  $\text{H}_2\text{SO}_4$  gives Na 1,2-phenanthrenequinone-4-sulfonate, bright red, crystg. with 1  $\text{H}_2\text{O}$ ; *p*-toluidine salt, bright red, decomp. on heating. The remarkable stability of the  $\text{SO}_3\text{H}$  group of this quinone is probably due to the spatial arrangement of the mol.

C. J. WEST

Phenanthrenequinones related to alizarin and purpurin. LOUIS FREDERICK FISHER. *J. Am. Chem. Soc.* 51, 1935-42 (1929).—Reduction of 1,2-phenanthrenequinone with Zn and  $\text{AcONa}$  in  $\text{Ac}_2\text{O}$  gives 80% of 1,2-diacetoxypheanthrene, m. 146-7°; oxidation with  $\text{CrO}_3$  in  $\text{AcOH}$  gives 60% of 1,2-diacetoxypheanthrenequinone, orange, m. 257° (cor.) (decompn.), which is hydrolyzed to the 1,2-(*HO*)<sub>2</sub> deriv., very dark red, decomp. on heating; the alkali soln. and salt are green; the concd.  $\text{H}_2\text{SO}_4$  soln. is red and the  $\text{C}_6\text{H}_5\text{N}$  soln. crimson; it dyes unmordanted wood a pale bluish gray and wool or silk with Al or Cr mordant, dark green. 1,2,4-Triacetoxypheanthrenequinone, orange, m. 227-8° (decompn.); hydrolysis in a N atm. gives the 1,2,4-(*HO*)<sub>3</sub> deriv., which could not be recrystd. and decomp. on heating; the compd. from EtOH contains 1 mol. EtOH; the green alk. soln. is changed to a pale red by the air; the concd.  $\text{H}_2\text{SO}_4$  soln. is green, the  $\text{C}_6\text{H}_5\text{N}$  soln. cornflower-blue; it has scarcely any dyeing properties. Reductive acetylation of 3-hydroxy-1,4-phenanthrenequinone gives 1,3,4-triacetoxypheanthrene, m. 138°; oxidation with  $\text{CrO}_3$  in  $\text{AcOH}$  gives 47% of 1,3,4-triacetoxypheanthrenequinone, yellow, softens 220°, decomp. 240°; hydrolysis in a N atm. gives the 1,3,4-(*HO*)<sub>3</sub> deriv., very dark red; the green alk. soln. on exposure to the air becomes a pale pink; the concd.  $\text{H}_2\text{SO}_4$  soln. is deep red, the  $\text{C}_6\text{H}_5\text{N}$  soln. deep red, becoming green on diln. with  $\text{H}_2\text{O}$ ; it has poor dyeing properties. 4-Amino-3-phenanthrol diacetate, m. 211° (cor.); heating splits off  $\text{AcOH}$ , giving the oxazole of 4-amino-3-phenanthrol, pale yellow, m. 155° (86% yield). Oxidation with  $\text{CrO}_3$  in  $\text{AcOH}$  gives 47% of the oxazole of 4-amino-3-hydroxyphenanthrenequinone, orange, m. 282° (cor.), which could not be hydrolyzed by EtOH-NaOH. 4-Amino-3-hydroxyphenanthrenequinone triacetate, yellow, m. 207° (cor.); hydrolysis gives a *di*-Ac deriv., brown-yellow, decomp. 255-60°, slowly oxidized in the air; acid hydrolysis gives the oxazole.

C. J. WEST

Constitution of hydroxymethylanthraquinone. S. KEIMATSU AND I. HIRANO. *J. Pharm. Soc. Japan* 49, 140-7 (1929).—In spite of the work of Heller and Schulke (C. A. 3, 318) and of Ullmann and his co-workers (C. A. 8, 1584; 10, 2721), the positions of the Cl and Me groups in the chloromethylbenzoylbenzoic acid (I) and chloromethylanthraquinone (II) obtained by the condensation of *o*- $\text{C}_6\text{H}_4(\text{CO})_2\text{O}$  (III) and *o*- $\text{ClC}_6\text{H}_4\text{Me}$  (IV) and subsequent dehydration have not yet been satisfactorily detd. In order to solve this point, the following expts. were carried out. Twenty-five g. of III and 100 g. of IV were condensed by Friedel-Craft's reaction in presence of 50 g.  $\text{AlCl}_3$  to give 43 g. of I. Recrystn. of 13 g. of I from  $\text{C}_6\text{H}_6$  and  $\text{C}_6\text{H}_5\text{Me}$  several times gave 2 fractions, one difficultly sol. fraction (V) m. 182-3° (yield 9 g.), and the other, easily sol. fraction (VI), m. 176-7° (yield 3 g.). Fuming  $\text{H}_2\text{SO}_4$  with V gave Ullmann's 2-methyl-3-chloroanthraquinone (VII), m. 219°, whereas VI and fuming  $\text{H}_2\text{SO}_4$  gave 1-chloro-2-methylanthraquinone (VIII), m. 171°, showing that V should have the structure of 3'-methyl-4'-chloro-2-benzoylbenzoic acid, and VI, that of 2'-chloro-3'-methylbenzoylbenzoic acid. In other words, the Cl atom in V is located *para* to the CO group, while in VI it is *ortho* to the same group. In order to replace Cl with the OH group, Strouder and Adam's method (C. A. 21, 3053) was used. VII and MeONa gave 2-methyl-3-methoxyanthraquinone (VIII), m. 179-80°. Heating of VIII and HBr in glacial  $\text{AcOH}$  gave 2-methyl-3-hydroxyanthraquinone, m. 298-9°. Ac deriv., m. 284-5°. VIII and MeONa gave 1-methoxy-2-methylanthraquinone (IX), m. 156-7°. IX and HBr in glacial  $\text{AcOH}$  gave 1-hydroxy-2-methylanthraquinone, m. 184-5°. Ac deriv., m. 177-8°. The above facts show that in the condensation of III and IV, 2 chloromethylbenzoylbenzoic acids are produced, one having the Cl *para*, and the other *ortho* to the CO group, and on dehydration they give rise to 2 kinds of anthraquinones.

NAO UYER



**Retene and some of its derivatives.** LI MAN CHEUNG. *Bull. inst. pin* 1929, 108-10.—The origin and properties of retene are briefly reviewed. Below 160° rosin combines with S to give a reddish resin with sulfurous odor, the amt. of S entering into combination depending on the temp., time of heating and proportion of S used; above 160° the rosin-S combination is decompd. with evolution of H<sub>2</sub>S and MeSH; at 240-50° the CO<sub>2</sub>H of the rosin is split off, and the action of S can be represented by the equation  $C_{10}H_{14}O_2 + 5S = C_{14}H_{18} + 4H_2S + MeSH + CO_2$ . On the assumption that rosin oil consists of octahydrotetene, the action of S can be represented by the equation  $C_{18}H_{26} + 4S = C_{18}H_{18} + 4H_2S$ . By the following method 41% of the theoretical yield of retene was obtained from rosin oil: to 800 g. of light-colored rosin oil at 200° gradually add in small successive portions 370 g. S with stirring; toward the end of the reaction (about 5 hrs.) raise the temp. to 250°; when evolution of gas has ceased, add 160 g. of Fe filings and distil under partial vacuum (60-80 mm.), most of the yellowish distillate (which consists of a mixt. of rosin oil and crystd. retene) passing at 275-95°; ext. the distillate with hot 95% EtOH; the residue from the extn. (280 g. of viscous oil) is treated with 10% of its wt. of S, distd. and extd. with EtOH as above. The optimum proportion of S is 3-4 atoms per mol. of abietic acid in the case of rosin or of octahydrotetene (in the case of rosin oil), S derivs. of retene and their decompn. products being obtained when the amt. of S taken corresponds to that calcd. from the equations given above. Stable S derivs. of retene are formed at the distn. temp., and the best results were given by Fe filings for decompg. them, the yield of retene obtained with S alone or with CaO as desulfurizing agent being much lower than with Fe filings. Attempts to ext. the retene from the reaction products without vacuum distn. were unsuccessful. The purified retene, m. 98-9°, was identified with the natural product because it does not lower the m. p. of the latter, the picrate m. 126-7° and on treating with CrO<sub>3</sub> in AcOH it gives a quinone, m. 196-7°. Nitration of retenequinone in AcOH and Ac<sub>2</sub>O gave golden yellow crystals of dinitroretenequinone, m. 229-30°. Condensation of retenequinone with *p*-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>NHNH<sub>2</sub> gave maddered prismatic crystals of retenequinone *p*-nitrophenylhydrazone, m. 219°, very sparingly sol in AcOH and EtOH. Nitration of retene gave ill-defined, resinous nitro derivs.

A. PAPNEAU-COUTURE

**Thianthrene.** III. K. FRIES, H. KOCH AND H. STUKENBROCK. *Ann.* 468, 162-201 (1929); cf. *C. A.* 9, 785.—Reduction of 18 g. 4-nitroveratrole by 68 g. SnCl<sub>2</sub> in concd. HCl gives 80% of the 4-NH<sub>2</sub> deriv., m. 85°; *Ac deriv.* (I), m. 135°. I (19.5 g.) in 200 cc hot PhMe, treated with 11 g. P<sub>2</sub>S<sub>5</sub> and 11 g. K<sub>2</sub>S and boiled 1 hr., gives 55% of 4,5-dimethoxythioacetanilide, yellow, m. 114°, which gives with K<sub>3</sub>Fe(CN)<sub>6</sub> in 2 N NaOH 40% of 2-methyl-5,6-dimethoxy[4',5'-benzothiazole], m. 75°, b<sub>14</sub> 184°; heating with KOH and abs. EtOH 30 hrs. at 100° (sealed tube) gives the salt of 4,5-dimethoxy-2 aminophenyl mercaptan, which was not purified but treated with NaNO<sub>2</sub>, giving 35-40% of 5,6-dimethoxy[phenylenediazosulfide], m. 138°; this decomp. at 160-90°, splitting off N and giving 2,3,6,7-tetramethoxythianthrene (II), m. 176° (the yield is always small). Reduction of veratrolesulfonylchloride with Zn and HCl gives 70-80% of 4,5-dimethoxyphenyl mercaptan (III), b<sub>14</sub> 138°. H<sub>2</sub>O<sub>2</sub> and III in EtOH give di[4,5-dimethoxyphenyl] disulfide, yellow, m. 89°. Oxidation of III with concd. H<sub>2</sub>SO<sub>4</sub> gives 30% II. HNO<sub>3</sub> (d. 1.2) and II in AcOH give the monosulfonide (IV), m. 196°; concd. H<sub>2</sub>SO<sub>4</sub> gives a blue color, changing to green on heating. HNO<sub>3</sub> (d. 1.4) and II in AcOH give the disulfonide (V), m. 259°, sol. in concd. H<sub>2</sub>SO<sub>4</sub> with a blue color and reduced by HBr-AcOH in the presence of NaHSO<sub>3</sub> to II. The hot soln. of II in AcOH, dild. with H<sub>2</sub>O so that all the II remains in soln. and treated with Cl for 2 mins., gives the sulfone sulfonide (VI), m. 275°; concd. H<sub>2</sub>SO<sub>4</sub> gives a deep blue soln., soon changing to red; H<sub>2</sub>O ppts. a bright red ppt., from which CCl<sub>4</sub> exts. the monosulfone, m. 253°; reduction with NaHSO<sub>3</sub> in AcOH gives the tri-Me ether of the tetrahydroxythianthrene sulfone sulfonide, m. 270°. VI also results upon oxidation of II with H<sub>2</sub>O<sub>2</sub>, and by the oxidation of the monosulfone with concd. HNO<sub>3</sub>. Boiling II in AcOH with H<sub>2</sub>O<sub>2</sub> 1 hr. gives the disulfone (VII), m. 296°; this is not reduced by HBr in AcOH. Heating 4 g. VII with 20 g. KOH and 20 cc. abs. EtOH 3 hrs. gives 4,5-dimethoxy-2-ethoxyphenylsulfonic acid, sinters 75°, m. 118-20° (decompn.), which is reduced by HBr-AcOH to 3,4,3',4'-tetramethoxy-5,5'-diethoxy-1,1'-diphenyl disulfide, m. 84°. The following merquinoid dithionium salts of II were prepd.: Sulfate, blue needles, m. 230-2° (decompn.), from 1 part II and 50 vol.-parts concd. H<sub>2</sub>SO<sub>4</sub> on standing 3 weeks; the blue H<sub>2</sub>SO<sub>4</sub> or green HCCl<sub>2</sub>H soln. is stable on heating; reduction with SnCl<sub>4</sub> or HI gives II; hydrolysis by H<sub>2</sub>O is not complete in 2 days; hydrolysis by 50% AcOH gives a mixt. of II and sulfonide. Perchlorate, green, decomp. 245°; chloride, greenish blue, m. 164-6° (decompn.); perbromide, green, m. 220-2° (decompn.); this also results from IV or

V and HBr-AcOH. Heating II with HI and AcOH gives about 50% of 2,3,6,7-tetrahydroxythianthrene (VIII), m. 273°; the concd.  $\text{H}_2\text{SO}_4$  soln. is green, changing to blue; in the air VIII slowly turns blue; Ac deriv., m. 224°.  $\text{H}_2\text{O}_2$  and VIII in AcOH give the compd.  $\text{C}_{12}\text{H}_8\text{O}_8\text{S}_2$  (isomerized sulfoxide), deep blue, decomps. 200°; the soln. in concd.  $\text{H}_2\text{SO}_4$  is greenish blue, in alkalis a dirty gray; reduction with  $\text{SnCl}_2$  in AcOH gives VIII. Acetylation of this compd., or oxidation of the Ac deriv. of VIII with dil.  $\text{HNO}_3$  gives tetraacetoxythianthrene sulfoxide, m. 213°, sapond. to the deep blue compd. The monosulfone of VIII results from the tetra-Me deriv. and HI, carbonizes above 300°; tetra-Ac deriv., m. 203°. VII and HI give the disulfone, m. above 310°; tetra-Ac deriv., m. 245°. Br in AcOH gives the 1,4,5-tri-Br deriv., m. above 340°, while excess of Br gives the 1,4,5,8-tetra-Br deriv., pale rose, m. above 350°;  $\text{FeCl}_3$  gives a blue color; the tetra-Ac deriv. decomps. at 300°. The following meriquinoid dithionium salts of VIII were prepd.: Sulfate, blue, unchanged at 330°; concd. HCl and  $\text{HCO}_2\text{H}$  give deep blue solns., concd.  $\text{H}_2\text{SO}_4$  a greenish blue color;  $\text{HNO}_3$  in AcOH gives a deep red soln. which remains on diln. with  $\text{H}_2\text{O}$ ; hydrolysis with  $\text{H}_2\text{O}$  is incomplete after 2 weeks. Perchlorate, green, which explodes on heating; bromide, blue, m. 250° (decompn.), chloride, blue, decomps. 220°. II, moistened with AcOH, treated with  $\text{HNO}_3$  (d. 1.52) and heated until the soln. is dark red, gives 2,3,6,7-tetramethoxy-(?)-din'trodiphenylsulfone, pale green, m. 238°; this also results from VI or the monosulfone and  $\text{HNO}_3$  on standing 5 mins. 4-Bromo-5-nitroveratrole and  $\text{Na}_2\text{S}$  in boiling EtOH give 4,5,4',5'-tetramethoxy-2,2'-dinitrodiphenyl 1,1'-sulfide, yellow, m. 209° (60% yield); reduction with  $\text{SnCl}_2$  and HCl gives the 2,2'-di- $\text{NH}_2$  deriv., m. 110°. 4-Nitro-4'-methylidiphenyl sulfide-2-sulfonic acid (IX), light yellow, m. 123°; heating IX with HBr-AcOH a short time gives the compd.  $[\text{p-MeC}_6\text{H}_4\text{SC}_6\text{H}_4(\text{NO}_2)_2\text{S}]_n$ , yellow, m. 154° (60% yield); with concd.  $\text{H}_2\text{SO}_4$  IX gives 3-nitro-6-methylthianthrene, golden yellow, m. 157°; concd.  $\text{H}_2\text{SO}_4$  gives a deep red-violet soln. Reduction gives the 3- $\text{NH}_2$  deriv., m. 130°, sol. in concd.  $\text{H}_2\text{SO}_4$  with a red-violet color (Ac deriv., m. 180°, sol. in concd.  $\text{H}_2\text{SO}_4$  with a dark violet color; allowed to stand in concd.  $\text{H}_2\text{SO}_4$  48 hrs., there results the 2-sulfonic acid, carbonizes above 270° (Ba salt)). The Ac deriv. and concd.  $\text{H}_2\text{SO}_4$  give the half quinoid sulfate, blue. 3-Nitro-6-aminothianthrene, dark red, m. 198°; Ac deriv., yellow, m. 205°; 3,6-Diaminothianthrene, m. 192°;  $\text{FeCl}_3$  gives the blue compd.,  $\text{C}_{12}\text{H}_{10}\text{N}_2\text{S}_2\text{Cl}$ .  $\text{FeCl}_3$ . 4-Nitro-3',4'-dimethoxydiphenyl sulfide-6-sulfonic acid, yellow, m. 131°. HBr-AcOH gives the compd.  $\text{C}_{20}\text{H}_{24}\text{O}_8\text{N}_2\text{S}_4$ , red, m. 196°. Concd.  $\text{H}_2\text{SO}_4$  gives 3-nitro-6,7-dimethoxythianthrene, yellow-red, m. 194°; 3- $\text{NH}_2$  deriv., m. 149° (Ac deriv., m. 180°). 2,2'-Diamino-4,4'-dinitrodiphenyl sulfide, red, m. 211°; di-Ac deriv., light yellow, m. 245°. 4-Nitro-2-aminophenyl mercaptan, orange-yellow, m. 108°; 2,2'-diamino-4,4'-dinitrodiphenyl disulfide, citron-yellow, m. 178°; di-Ac deriv., m. 263°; di-Bz deriv., citron-yellow, m. 225°. 2-Phenyl-5-nitrobenzothiazole, pale yellow, m. 193°.

C. J. WEST

**Thionaphthene.** K. FRIES AND E. HEMMECKE. *Ann.* 470, 1-19 (1929).—Nitration of 20 g. thionaphthene in 25 cc. AcOH at 50° with 10 cc.  $\text{HNO}_3$  (d. 1.52), heating at 110° for about 20 mins. gives 13 g. of the 3- $\text{NO}_2$  deriv. (I), yellow, m. 81°, volatile with steam and distd. undecompd. Reduction of I with  $\text{SnCl}_2$ -HCl gives the 3- $\text{NH}_2$  deriv. (Ac deriv., m. 168°); heating the  $\text{SnCl}_4$  salt in  $\text{H}_2\text{O}$  or heating the amine with dil. HCl gives the 3-HO deriv.; distn. of the amine *in vacuo* gives the sec. amine,  $\text{NH}_2$  being split off. The  $\text{SnCl}_4$  salt (10 g.), stirred with 50 cc. 40% NaOH, gives *di*[3-thionaphthene]amine, m. 117°; strong acids give intensely yellow salts, easily hydrolyzed. Reduction of I with  $\text{Na}_2\text{S}_2$  in 2 N NaOH gives the *di*-Na salt (II) of *aci*-IV, needles with 6  $\text{H}_2\text{O}$ ; heating II with concd. HCl gives a deep blue compd., which could not be purified; II did not react normally with  $\text{AcCl}$ ,  $\text{BzCl}$  and  $\text{Me}_2\text{SO}_4$ ; oxidation of II gives I (Br or  $\text{K}_3\text{Fe}(\text{CN})_6$ ); with  $\text{SnCl}_2$ -AcOH there results 3,3'-diamino-2,2'-dithionaphthene, yellow, m. 238° (decompn.); concd.  $\text{H}_2\text{SO}_4$  gives a violet color, slowly changing to blue; boiling AcOH gives a red color; Ac deriv. (III), m. 346° (decompn.), oxidation with  $\text{K}_3\text{Fe}(\text{CN})_6$  gives thioindigo-3,3'-diimine, orange-red, m. 228° (decompn.), which gives a green color in concd.  $\text{H}_2\text{SO}_4$ ; HCl salt, violet; the product could not be acetylated but the Ac deriv., bright red, m. 285°, results by the oxidation of III. The aq. soln. of II and dil. AcOH give 3,3'-dinitro[2,2'-dithionaphthene] 2,3,2',3'-tetrahydride (IV), m. 126°. AcOH gives a mixt. of *d*[2,2'-thionaphthe deriv., corresponding to IV, m. 150° (HCl salt, decomps. 300°), and 3-amino[*di*2,2'-thionaphthene] 2,3-dihydride gives V with  $\text{NaNO}_2$  and  $\text{H}_2\text{SO}_4$ ; and 3-amino[*di*2,2'-thionaphthene] 2,3-dihydride m. 83.5° (HCl salt, needles; Ac deriv., m. 231°), gives V with  $\text{NaNO}_2$ . These are sep'd. by extg. the bases with AcOH and crystg. from hot  $\text{C}_6\text{H}_6$ . Nitration of thionaphthene at 0-8° with concd.  $\text{HNO}_3$  or dil.  $\text{HNO}_3$  (1:1) gives 3-nitro-2,3-dihydro-

[*di-2,3'-thionaphthenyl*] (VI), m. 161° (decompn.); the AcOH mother liquor, heated to 110°, gives I. Reduction of VI gives a mixt. of the 3-NH<sub>2</sub> deriv., m. 271° (decompn.); (HCl salt, decomps. 298°; Ac deriv., m. 225°), and *di-2,3'-thionaphthenyl*, m. 76°. also formed from the amine and HNO<sub>3</sub>. C. J. West

**New syntheses of nitrogenated heterocyclic nuclei. II. 1,3,5-Triarylpyrazole-4-carboxylic and 1,3,5-triarylpyrazolic acids from aldehydrazones and benzoylacetate esters.** GAETANO MINUNNI AND SALVATORE D'URSO (WITH GIUSEPPE TROIA, ANTONINA CARNEVALE, GIOVANNI AREZZI AND CARMELO VIZZINI). *Gazz. chim. ital.* **58**, 691-712(1928).—In continuation of previous expts. (cf. M., Lazzarini and d'Urso, C. A. **20**, 599), 4 aromatic aldehyde phenylhydrazones were made to react with BzCH<sub>2</sub>-CO<sub>2</sub>Et (I) to extend the field of application of the new synthesis. The results show that, as with AcCH<sub>2</sub>-CO<sub>2</sub>Et, I leads to Et esters of trisubstituted pyrazolecarboxylic acids. As before, the position of the substituents in the pyrazole nucleus was established with certainty. I (7 g.), PhCH:NNHPh (5 g.) and ZnCl<sub>2</sub> (0.1 g.) heated 3 hrs. at 130-5° (stirring periodically with a Cu wire), an equal vol. of EtOH added, let stand several days in darkness (covering the crystd. mass with EtOH), filtered, washed with EtOH and purified with boiling EtOH and animal charcoal, yields 50% of Et 1,3,5-triphenylpyrazole-4-carboxylate (II), m. 145-6.5°. II (5 g.) heated with concd. H<sub>2</sub>SO<sub>4</sub> (25 g.) on a water bath until a drop in water no longer gives a ppt. sol. in KOH, cooled, poured slowly in a large excess of water, let stand several hrs., filtered, washed with water, dissolved in 10% KOH, filtered, dil. HCl added to the filtrate, filtered, washed, the residue purified with boiling EtOH and animal charcoal, yields the free acid (III) of II (cf. *J. prakt. Chem.* **58**, 152(1898)). II (5 g.) refluxed 0.5 hr. with KOH (5 g.) in EtOH (50 cc.), cooled rapidly, poured into a large vol. of water, filtered, dil. HCl (1:5) added to the filtrate, let stand several hrs., filtered, washed with water and then EtOH, boiled with a little EtOH, filtered (which removes a small quantity of a secondary product, m. 180-97°), purified with animal charcoal and recrystd. from boiling EtOH, yields III. If II is boiled for 3 hrs. with alc. KOH, there is obtained, besides III, a secondary product, m. around 165°. III heated on a sand bath until CO<sub>2</sub> is no longer evolved from the fused compd., cooled, dissolved in boiling EtOH, cooled, the ppt. dissolved in much hot EtOH, refluxed for 2 hrs. with animal charcoal, filtered, concd., the treatment repeated and the product recrystd. from boiling EtOH, yields 1,3,5-triphenylpyrazole, m. 140-40.5° (cf. *Ber.* **21**, 1206(1888); *Compt. rend.* **136**, 1264(1903)), contains no EtOH of crystn. as reported by Knorr and Laubmann (*loc. cit.*). These reactions establish the constitution of II. I (7 g.), *o*-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>-CH:NNHPh (5 g.) and ZnCl<sub>2</sub> (0.06 g.), treated as in the prepn. of II, yield 80% of Et 1,5-diphenyl-3-*o*-nitrophenylpyrazole-4-carboxylate (IV), m. 115.5-17.5°. Treated in a similar way as II with concd. H<sub>2</sub>SO<sub>4</sub> or with alc. KOH, IV yields the free acid (V) C<sub>20</sub>H<sub>15</sub>O<sub>4</sub>N<sub>3</sub>. EtOH, m. 232.5-3.5°, loses its EtOH at 150°. The better yield is obtained with alc. KOH. Its purification is very laborious. V (2 g.) refluxed 5 mins. at 300°, dissolved in boiling EtOH, filtered, allowed to evap., the ppt. treated with dil. Na<sub>2</sub>CO<sub>3</sub>, filtered, washed with water, the residue treated with dil. Na<sub>2</sub>CO<sub>3</sub> twice more, the residue washed with water, dried, dissolved in hot EtOH, boiled 3 hrs. with a decolorizing powder, filtered, concd., allowed to evap. further and the cryst. mass. purified from hot EtOH, yields 1,5-diphenyl-3-*o*-nitrophenylpyrazole, m. 116-7°. The reaction is particularly violent with I, *m*-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>-CH:NNHPh (VI) and ZnCl<sub>2</sub>, with low yields and much resinification, the best conditions being to heat I (7 g.), VI (5 g.) and ZnCl<sub>2</sub> (0.06-0.7 g.) 3 hrs. at 135° and purifying with EtOH as before, which yields 45% of Et 1,5-diphenyl-3-*m*-nitrophenylpyrazole-4-carboxylate (VII), lustrous yellow, m. 126.5-27.5°. VII refluxed 0.5 hr. with 10% alc. KOH (10 parts), poured into water, filtered, the filtrate acidified with dil. HCl and the ppt. purified with animal charcoal and boiling EtOH, forms the free acid (VIII), m. 230° (decompn.). It can be prepd. in a purer state and in higher yield (50%) by heating VII (5 g.) and concd. H<sub>2</sub>SO<sub>4</sub> (25 g.) for 2 hrs. on a water bath, cooling, pouring on ice, letting stand several hrs., filtering, washing with water and then EtOH, dissolving in boiling EtOH (150 cc.), filtering, and animal charcoal, filtering and repeating the purification. It is then a straw color, contains 1 mol. of EtOH of crystn. and m. 232° (decompn.). VIII heated to 290°, cooled, dissolved in boiling EtOH (40 cc.), filtered, concd., allowed to evap. further, the residue treated repeatedly with hot 10% Na<sub>2</sub>CO<sub>3</sub> until the latter soln. no longer becomes turbid with HCl, the residue refluxed 3 hrs. with EtOH and animal charcoal, and finally purified again from EtOH, yields 60% of 1,5-diphenyl-3-*m*-nitrophenylpyrazole, yellowish, m. 137.5-9°. VII (5 g.) refluxed with 10% alc. KOH for 3 hrs., evapd. to dryness, the residue boiled with a little water, filtered, the residue digested

in dil. HCl (1:5), filtered, the residue refluxed with EtOH, then with  $C_6H_6$ , evapd., dissolved in a min. of boiling  $PhNO_2$ , filtered hot, let stand, the ppt. washed with boiling  $C_6H_6$  and dried *in vacuo*, yields 1.5 g. of the *azoxy deriv.* of VIII,  $C_{14}H_{10}O_3N_2$ , turns brown toward  $235^\circ$ , m.  $240-7^\circ$  (decompn.) to a brown liquid. Dil. alc.  $PhHNNH_2$  (50 g.) added slowly to dil. alc.  $p-O_2NC_6H_4CHO$  (68 g.), cooling if necessary to prevent undue violence and the product recrystd. from boiling EtOH, yields *p-nitrobenzaldehyde phenylhydrazone* (IX), dark red with metallic luster, m.  $153-4^\circ$ . As in the formation of VII, the reaction of I, IX and  $ZnCl_2$  is vigorous. The best yield is obtained by heating IX (2 g.), I (2 g.) and  $ZnCl_2$  (0.20 g.) for 30 mins. at  $125-30^\circ$ , purifying the product with EtOH as before and finally purifying by pptn. from EtOH with  $C_6H_6$ , which gives 50% of *Et 1,5-diphenyl-3-p-nitrophenylpyrazole-4-carboxylate* (X), m.  $166-7^\circ$ . From the EtOH- $C_6H_6$  mother liquor was isolated a very small quantity of a brown-red secondary compd., m.  $142-5^\circ$ , and the EtOH from the treatment of the crude X yields on concn. a small quantity of a brown-red compd., m.  $136-40^\circ$ . X (2 g.) heated with concd.  $H_2SO_4$  (10 g.) for 1.5 hrs. on a water bath, poured on ice, filtered, the residue boiled with EtOH and animal charcoal and finally recrystd. from EtOH, yields the *free acid* (XI), contains no EtOH of crystn., pale gray or mother-of-pearl color, m.  $248-90^\circ$  (decompn.). It is also formed when X is refluxed with 5% alc. KOH, in which case it m.  $248-9^\circ$ . XI heated at  $260^\circ$  until  $CO_2$  is no longer evolved, the product pulverized, dissolved in EtOH, filtered, the residue extd. with boiling EtOH, the ext. refluxed several hrs. with animal charcoal, filtered, concd., cooled and the ppt. recrystd. from EtOH, yields *1,5-diphenyl-3-p-nitrophenylpyrazole*, m.  $153-5^\circ$ . X boiled for 3 hrs with alc. KOH, evapd. to dryness, the residue extd. with hot water, filtered, washed with water, the residue recrystd. from hot water, digested in dil. HCl, filtered, washed with boiling water, dried, extd. with boiling EtOH, the residue dissolved in boiling  $PhNO_2$ , filtered, allowed to crystallize, filtered, washed with EtOH, again crystd. from  $PhNO_2$  and washed, yields the *azoxy deriv.* of XI, lustrous yellowish, m.  $285^\circ$ . The results of the new researches on the dehydro-condensation of aldehydrazones with  $\beta$ -ketonic acid esters confirm the belief already expressed in earlier work that the reactions represent a general method of synthesis not only of pyrazolecarboxylic acids, but also of alkyl and aryl derivs. of pyrazole.

C. C. DAVIS

**Synthesis of 4-(3,4-dihydroxyphenyl)thiazoles.** TREAT B. JOHNSON and ELIZABETH GATEWOOD. *J. Am. Chem. Soc.* 51, 1815-9(1929).— $AcNHCH_2CN$  (20 g) in 75 cc. abs. EtOH and 25 cc. concd.  $NH_4OH$ , cooled to  $10^\circ$  was satd. with  $H_2S$ , giving 19 g. *acetamidoacetothioamide*, m.  $123-4^\circ$ ; with 3,4-(HO) $_2C_6H_2COCH_2Cl$  (I) this gives *2-acetamidomethyl-4-[3,4-dihydroxyphenyl]thiazole-HCl*, crystg. with 1 EtOH, m.  $188-90^\circ$ ; digestion with concd. HCl gives *2-aminomethyl-4-[3,4-dihydroxyphenyl]thiazole di-HCl*, m.  $225-30^\circ$ . *Acetylmethylaminoacetothioamide*, m.  $156-7^\circ$ , in 16 g. yield by acetylating 20 g. of  $MeNHCH_2CN$ , dissolving in concd.  $NH_4OH$  and satg. with  $H_2S$ . The thioamide from  $Me_2(NH_2)CCN$ , m.  $185-6^\circ$ , with I gives *2- $\alpha$ -acetamidoisopropyl-4-[3,4-dihydroxyphenyl]thiazole*, crystg. with 2  $H_2O$ , m.  $198-200^\circ$ ; *HCl salt*, m.  $188-9^\circ$ . the *2-amino deriv.-HCl*, crystg. with 1  $H_2O$ , m.  $210-5^\circ$  (decompn.). The following 4-[3,4-dihydroxyphenyl]thiazoles were also prepd.: *2-acetylmethylaminomethyl-HCl*, m.  $186-8^\circ$ ; *2-methylaminomethyl*, crystg. with 1 EtOH, m.  $128-30^\circ$ ; *HCl salt*, m.  $220-5^\circ$ ; *2-mercapto*, crystg. with 1  $H_2O$ , m.  $250^\circ$ ; *2-phenyl*, m.  $164-5^\circ$ ; *2-amino-HCl*, crystg. with 1  $H_2O$ , m.  $230-5^\circ$ ; *2-methylamino-HCl*, m.  $275-80^\circ$ . These thiazoles are characterized by their stability in the air; all compds. thus far examd. are physiol active.

C. J. WEST

**Some derivatives of 4,5-naphtho-1,2-thiazole (naphth-1,2-thiazole).** R. STOLLÉ and W. BADSTÜBNER. *J. prakt. Chem.* [2], 121, 266-8(1929).—The ring system  $C_{10}H_8.CH:N.S$  is called 4,5-benzo-1,2-thiazole, and the corresponding  $C_{10}H_8$  derivs

are called 4,5-naphtho-1,2-thiazoles. The following compds. are described: *5,6-benzo-2,3-diketo-2,3-dihydrothionaphthene*, red, m.  $171^\circ$ ; [4,5-(2',3'-naphtho)-1,2-thiazole] *3-carboxamide*, (I), m.  $208^\circ$ ; *acid*, from I, yellow, m.  $197^\circ$  (decompn.); [4,5-(1',2'-naphtho)-1,2-thiazole] *3-carboxamide*, brown, m.  $225^\circ$ .

M. A. DAHLEN

**Stability of diazonium salts of the triazole series.** JOSEPH REILLY and DENIS MADDEN. *J. Chem. Soc.* 1929, 815-6.— $NH_2C(NH)NHNH_2$ ,  $HNO_3$  (I) (25 g.) was heated with 20 g. of  $EtCO_2H$  and a few cc. of  $H_2O$  for 24 hrs., followed by neutralization with  $K_2CO_3$  and evapn. to dryness. The residue was extd. with  $AcOEt$  and the soln. treated with concd.  $HNO_3$ , giving 17 g. of *5-amino-3-ethyl-1,2,4-triazole nitrate* (II), m.  $167^\circ$  (after recrystn. from hot  $EtOAc-EtOH$  mixt.); the *free triazole*, (II), gave the following compds. upon diazotization and coupling: *5-azo- $\beta$ -naphthylamine*, red, m.  $259^\circ$ ; *5-azo- $\beta$ -naphthol*, orange-red, m.  $180-1^\circ$ ; *5-azoacetylacetone*, yellow,

m. 236°; and 5-diazo-chloroaurate. The 3-isobutyltriazole (16 g.), m. 171°, corresponding to II, was prepd. in the same manner from 20 g. of isovaleric acid and 20 g. of I. The stability of triazolediazonium salts is increased by alkyl substitution, the effect increasing with the mol. wt. of the alkyl group. A. S. CARTER

**Constitution of carthamin.** II. CHIKA KURODA. *Proc. Imp. Acad.* (Tokyo) 5, 82-5 (1929); cf. C. A. 23, 1906.—Carthamin, heated with dil.  $H_3PO_4$ , gives a mixt. of carthamidin (I),  $C_{15}H_{12}O_8$ , pale yellow, crystg. with 1  $H_2O$ , m. 218°, unstable, and isocarthamidin (II), isomeric with I, yellow, crystg. with 1  $H_2O$ , m. 238°. Various color reactions are given for I and II. I and  $Ac_2O$  with  $H_2SO_4$  give the  $\alpha$ -Ac deriv. (III), m. 158°; Ac deriv. (IV) of II, m. 180°. I or III with  $AcONa$  and  $Ac_2O$  at 125° gives the  $\beta$ -Ac deriv. of I, m. 143°. II or IV with  $AcONa$  and  $Ac_2O$  at 140-50° gives the  $\gamma$ -Ac deriv. of I, m. 179°. II is probably 5,6,7,8-tetrahydroxyflavanone. III,  $\beta$ -Carthamidin methyl ether and its synthesis. *Ibid* 86.— $\beta$ -Acetylcarthamidin,  $Me_2SO_4$  and KOH in an atm. of H give the  $\beta$ -Me ether, m. 112°, identical with 2,3,4,6,4'-pentamethoxychalcone. C. J. WEST

**Dissociation into free radicals of substituted dixanthyls.** V. The rate of dissociation. JAMES B. CONANT and MILDRED W. EVANS. *J. Am. Chem. Soc.* 51, 1925-35 (1929); cf. C. A. 21, 3055.—The rate of O absorption of dibutyl dixanthyl in PhBr at 25° has been measured by means of a differential pressure app. The reaction is of the 1st order until about 0.5 mole of O per mole of dixanthyl deriv. has been absorbed. The rate is independent of the concn. of the O in the soln. It thus appears that the rate-controlling step is the dissocn. of the dixanthyl deriv. into a free radical. The rates of dissocn. of the following dixanthyl derivs. in PhBr have been measured at different temps. by following the rate of O absorption: di-Me, di-Et, di-Pr, di-Bu, di-Am, di-iso-Am. The energy of activation has been calcd. from the temp. coeff. of the reaction velocity. A parallelism has been found between the rates of dissocn. and the temp. at which appreciable dissocn. first occurs as evidenced by the appearance of color in a dil. soln. The results are given in tables and curves. C. J. WEST

**5,8-Dihydroxy- $\alpha$ -anthrapyridinequinones.** HARRY RAUDNITZ (WITH GRETE LAUBE). *Ber.* 62B, 509-13 (1929).—As might have been expected from the close relationship between phthalic and quinolinic acids, quinolinic anhydride (I) with  $C_6H_6$  and  $AlCl_3$  gives  $\beta$ -benzoylpicolinic acid which yields the N analog,  $\alpha$ -anthrapyridinequinone, of anthraquinone. This quinone, heated with NaOH and Zn dust, forms a deep blue soln decolorized by shaking with air, the presence of the pyridine ring in the anthraquinone complex apparently deepening the color as compared with anthraquinone. It seemed of interest, therefore, to prep. 5,8-dihydroxy- $\alpha$ -anthrapyridinequinone ( $\alpha$ -pyrquinizarin) (II) and 5,8-dihydro-6,7-benzo- $\alpha$ -anthrapyridinequinone (6,7-benzo- $\alpha$ -pyrquinizarin) (III), analogous to quinizarin (IV) and 1,4-dihydroxy-2,3-benzanthraquinone (V), resp., to det. the spectroscopic effect of the pyridine ring. This effect proved to be a distinct shifting of the max. of the absorption bands toward the red, as shown by the following values for these max. in KOH,  $H_2SO_4$ , and  $H_2SO_4$ - $H_3BO_3$ , resp.: IV, violet, 596.1, 553.7, 317.7; red, 548.3, 509.6, 476.4; red, 547.5, 508.8, 473.5. II, violet, 600.7, 561.5; crimson, 574, 532.2; pink, 547.5, 506.5, 473.5. V, violet, 584, 539, 505, orange, 540, 500, 469; yellow, 534, 496.5, 463. III, red-violet, 586.5, 544; yellow-red, 1-sided absorption beginning in the yellow; orange, 541.5, 503, 467. Whereas I with aromatic compds. and  $AlCl_3$  gives only ketopicolinic acids, with a  $Na-AlCl_4$  melt (1:5), it yields  $\alpha$ -anthrapyridinequinones directly with aromatic compds. contg. HO groups in the 1,4-positions, but, unlike  $C_6H_4(CO)_2O$ , it does not condense with  $o$ - $C_6H_3(OH)_2$ . IV, m. 198°, and V, dark red, m. 349°, were also obtained in very pure form from  $C_6H_4(CO)_2O$  and  $p$ - $C_6H_4(OH)_2$  and 1,4- $C_{10}H_6(OH)_2$ , resp., with  $Na-AlCl_4$ . II, dark red, sublimes *in vacuo*, m. 237°, isolated as the Na salt, dark blue-violet powder (yield, 44%). III, brown-red, sublimes *in vacuo* with partial decompn., m. 363°; Na salt, dark violet powder. C. A. REICHERT

**Substituted aromatic aldehydes in Hantzsch's pyridine condensation.** I. Methoxy-, chloro- and hydroxybenzaldehydes. LEONARD E. HINKEL and WM. R. MADEL. *J. Chem. Soc.* 1929, 750-4.—One mol. of  $p$ - $MeOC_6H_4CHO$ , 2 mols. of  $AcCH_2CO_2Et$  and 20 cc. of EtOH were satd. with  $NH_3$  and after standing 1 hr. were heated on a water bath for several hrs.; 65% of 2,6-dimethyl-3,5-dicarboethoxy-4- $p$ -methoxyphenyl-1,4-dihydropyridine (I), m. 159°, crystd. upon cooling. I was made into a paste with EtOH and  $N_2O_5$  passed in until a clear soln. resulted. The EtOH was removed by evapn., the residue was neutralized with  $Na_2CO_3$  soln. and extd. with  $Et_2O$ . 2,6-Dimethyl-3,5-dicarboethoxy-4- $p$ -methoxyphenylpyridine (II) crystd. upon evapn. of the  $Et_2O$  and after recrystn. from ligroin, m. 50°. In the same manner as in the case of I, the following similarly substituted dihydropyridines were prepd.: 4- $o$ -methoxyphenyl

(48%), m. 151°; 4-*m*-methoxyphenyl (33%), m. 120°; 4-*p*-chlorophenyl (69%), m. 149°; 4-*o*-chlorophenyl (38%), m. 132° (from aq. MeOH); 4-*m*-chlorophenyl (78%), m. 142° (from aq. MeOH); 4-*p*-hydroxyphenyl (49%), m. 227° (from EtOH); and 4-*m*-hydroxyphenyl (36%), m. 202°. No product could be obtained in the case of the *o*-HO deriv. Following a course analogous to the prepn. of II, the corresponding analogs of II were made: *o*-MeO, m. 65°; *m*-MeO, m. 82°; *p*-Cl, m. 68°; *o*-Cl, m. 62°; *m*-Cl, m. 53°; the HO derivs. formed nitroso compds. and could not be oxidized. From the theory of alternate polarities of Lapworth and Shoesmith (*C. A.* 16, 3078) the negative substituents in the *o*- and *p*-positions should increase the activity of BzH and a similar group in the *m*-position should diminish it. This is not the case; comparing the yields, it is seen that they do not agree among themselves, for with the HO derivs. the *m*- is greater than the *o*-, and with the Cl-derivs., the *m*- is greater than either *o*- or *p*-. In all cases the activity of BzH (which gives 90% yields) is decreased by the substituents.

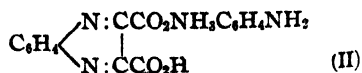
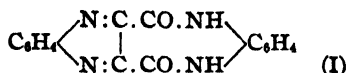
A. S. CARTER

Action of diazonium salts on 2,5-dimethyl-6-hydroxypyrazine. III. G. GASTALDI AND E. PRINCIVALLE. *Gazz. chim. ital.* 58, 679-82 (1928).—The expts. described show that 2,5-dimethyl-6-hydroxypyrazine (I) (*C. A.* 16, 101) reacts in a normal way with phenyl-, *p*- and *o*-tolyl diazonium salts, in the sense that the corresponding azo compds. have the constitution:  $\text{N}:\text{C}(\text{OH})\cdot\text{CMe}:\text{N}:\text{C}(\text{N}:\text{NR})\cdot\text{CMe}$ . They are stable, are

more acidic than the corresponding hydroxypyrazines and give stable cryst. salts. The ease with which I couples with the diazonium salts indicates that it reacts in the lactic form, and possibly with alkyl halides it first forms *O*-ethers which are then transformed into *N*-derivs. (*C. A.* 23, 602). Preliminary expts. indicate that the product of the coupling of I and *p*-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>N<sub>2</sub>Cl is not an azo compd. Coupling of I and PhN<sub>2</sub>Cl was carried out in an alk. medium, the alk. salt being then filtered, dissolved in water, decompd. with HCl, dried in air and recrystd. from EtOH, which gives a good yield of 3-phenylazo-2,5-dimethyl-6-hydroxypyrazine (II), orange-red, m. 208° (decompn.). Na salt, C<sub>13</sub>H<sub>13</sub>ON<sub>4</sub>Na, orange-red, by heating II with excess aq. NaOH and allowing to cool slowly. Prepd. in the same way, I and *p*-MeC<sub>6</sub>H<sub>4</sub>N<sub>2</sub>Cl give almost quant. 3-*p*-tolylazo-2,5-dimethyl-6-hydroxypyrazine, orange-yellow, m. 242° (decompn.). Na salt, C<sub>13</sub>H<sub>13</sub>ON<sub>4</sub>Na, orange-yellow. Likewise I and *o*-MeC<sub>6</sub>H<sub>4</sub>N<sub>2</sub>Cl yield 3-*o*-tolylazo-2,5-dimethyl-6-hydroxypyrazine, orange-yellow, m. 221° (decompn.). Na salt, C<sub>13</sub>H<sub>13</sub>ON<sub>4</sub>Na, orange-yellow.

C. C. DAVIS

Action of *o*-phenylenediamines upon dihydroxytartaric acid. FREDERICK D. CHATTAWAY AND WILLIAM G. HUMPHREY. *J. Chem. Soc.* 1929, 645-51.—When Na dihydroxytartrate is heated with aq. *o*-C<sub>6</sub>H<sub>4</sub>(NH<sub>2</sub>)<sub>2</sub>, 2 mols. of the diamine react with 1 mol. only of the salt, forming quinoxaline-2,3-dicarboxy-*o*-phenylenediamide (I); Na dihydroxytartrate is only very sparingly sol. in H<sub>2</sub>O, and any excess above 1 mol. remains in suspension unchanged. When the filtered alk. soln. is partly neutralized with HCl, I seps. as a colorless cryst. powder, stable in neutral soln. and dissolving readily in cold dil. aq. alkali, from which it is reprecip. on addn. of a deficiency of acid. It dissolves in hot dil. HCl (1:50), but on cooling, the *o*-phenylenediamine salt (II) of quinoxaline-2,3-dicarboxylic acid (III) seps.; whereas, if it is dissolved in hot moderately concd. HCl (1:1), III seps. on cooling, *o*-phenylenediamine-HCl remaining in soln. The II and III may consequently be obtained directly from the original yellow condensation soln., the former by making the soln. weakly acid with HCl, and the latter by satg. it with gaseous HCl.



Attempts to acetylate or benzoylate I by the usual methods also cause decompn., with formation of the di-Ac or the di-Bz deriv. of *o*-C<sub>6</sub>H<sub>4</sub>(NH<sub>2</sub>)<sub>2</sub>. Heated with Ac<sub>2</sub>O, III yields the anhydride, while dry NH<sub>3</sub> on this anhydride in C<sub>6</sub>H<sub>6</sub> suspension gives the NH<sub>4</sub> salt of 3-carbamylquinoxaline-2-carboxylic acid (IV), from which the acid itself may be obtained on acidification. This amic acid is converted into the corresponding imide (V) on being heated above its m. p., and into the Ac deriv. of the imide on boiling with Ac<sub>2</sub>O. On being heated above its m. p., III decompn., evolving CO<sub>2</sub> and yielding a small quantity (10%) of quinoxaline; better yields (30%) of this base are obtained by heating the NH<sub>4</sub> salt of the acid. In common with other N bases, quinoxaline forms a stable, well-crystd. monotetrachloroiodide. Similarly, Na chloro-quinoxaline-2,3-dicarboxy-*p*-chloro-*o*-phenylenediamide, from which the *p*-chloro-*o*-phenylenediamine salt of 6-chloroquinoxaline-2,3-dicarboxylic acid, and the free acid

(VI) are obtained by heating with dil. and with concd. HCl, resp. *p*-Bromo-*o*-phenylenediamine gives the corresponding Br deriv. These halogen-substituted derivs. are considerably less sol. than the unsubstituted compds., and are therefore more readily prepd. and purified; otherwise their reactions are analogous. The following compds. were prepd. and characterized: I, m. 184° (decompn.). II, lemon-yellow, m. 186° (decompn.). III, prisms contg. 2 mols. H<sub>2</sub>O of crystn., m. 190° (decompn. after loss of H<sub>2</sub>O at 110°); *Et* ester, C<sub>14</sub>H<sub>14</sub>O<sub>2</sub>N<sub>2</sub>, prisms, m. 83°; *NH*<sub>4</sub> salt, m. 220–30°; *anhydride*, pale yellow prisms decomp. and charring 250–60°. IV, m. 190–5° (decompn.). V, pale yellow, m. about 260° (decompn.); *Ac* deriv., leaflets, m. about 220° (decompn.). Quinoxaline mono-tetrachloroiodide, C<sub>8</sub>H<sub>2</sub>N<sub>2</sub>·HICl<sub>4</sub>, m. 125–30° (decompn.). 6-Chloroquinoxaline-2,3-dicarboxy-*p*-chloro-*o*-phenylenediamide, C<sub>18</sub>H<sub>6</sub>O<sub>2</sub>N<sub>4</sub>Cl<sub>2</sub>, m. 207° (decompn.). (*p*-chloro-*o*-phenylenediamine salt, C<sub>18</sub>H<sub>12</sub>O<sub>2</sub>N<sub>4</sub>Cl<sub>2</sub>, m. 205° (decompn.)); 6-bromoquinoxaline-2,3-dicarboxy-*p*-bromo-*o*-phenylenediamide, m. 198° (decompn.). (*p*-bromo-*o*-phenylenamine salt, m. 199° (decompn.)). VI, m. 175° (decompn.) (*anhydride*, m. 235–40° (decompn.)), *Et* *H* ester, m. 159°; *di-Et* ester, m. 60°; *NH*<sub>4</sub> salt, m. 215–25° (decompn.)). 6-Chloroquinoxaline, m. 60°. 6-Bromoquinoxaline-2,3-dicarboxylic acid, m. 172° (decompn.) (*anhydride*, m. 235–45° (decompn.)), *Et* *H* ester, m. 161°. *di-Et* ester, m. 69°. *NH*<sub>4</sub> salt, m. 235–40° (decompn.)). 6-Bromoquinoxaline, m. 56°. Pyrazine-tetracarboxylic acid (by oxidation of the anhydride of III), m. 205° (decompn.), *di-K* *di-II* salt is cryst., *tetra-Et* ester, m. 104°. W. O. E.

**Calycanthine. I.** The isolation of calycanthine from *Meratia praecox*. RICHARD H. F. MANSKE. *J. Am. Chem. Soc.* 51, 1836–9 (1929).—Calycanthine has been isolated from *Meratia praecox*, Rehd. and Wils., a shrub native to Asia, 4 kg. of seeds giving 70 g. alkaloid, identical with that from *Calycanthus floridus*, L. Two other alkaloids, m. 197–8°, and an oil, were isolated in small quantities, but have not been investigated. The existence of glucose, or a sugar which gives glucosazone, in the seeds has been shown. Xylose was isolated from the epicarp of the seeds by hydrolysis with dil. H<sub>2</sub>SO<sub>4</sub>. C. J. WAST

**Synthetical experiments on the aporphine alkaloids. V. Laurotetanine.** Syntheses of 2,3,6,7- and 3,4,6,7-tetramethoxyaporphines. ROBERT K. CALLOW, JOHN M. GULLAND AND ROBERT D. HAWORTH. *J. Chem. Soc.* 1929, 658–70.—Recent investigations have shown that isoglaucine (II), obtained by Gorter (*C. A.* 16, 2470) from laurotetanine (I) (R=OH, R'=MeO, the positions of which may be the reverse of that shown), is impure glaucine (III) and does not contain the vicinal homocatechol group in ring III. It occurred to the authors of this paper that this vicinal arrangement does not occur in the aporphine series and that a synthesis of 2,3,6,7-tetramethoxyaporphine (II) and 3,4,6,7-tetramethoxyaporphine (IV) would be of value in detg. the true nature of I. Synthesis of these compds. shows as expected that neither resembles isoglaucine. After some difficulty 6'-nitro-3',4'-dimethoxyphenylaceto-β-2,3-dimethoxyphenylethylamide (V), m. 144.5–5.5° (9.5 g.), was obtained by adding 6,3,4-O<sub>2</sub>N(MeO)<sub>2</sub>·C<sub>6</sub>H<sub>2</sub>CH<sub>2</sub>COCl, obtained from the corresponding acid (13.1 g.) and PCl<sub>5</sub> in CHCl<sub>3</sub>, to a mixt. of 2,3-(MeO)<sub>2</sub>C<sub>6</sub>H<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>NH<sub>2</sub> (12 g.) in CHCl<sub>3</sub> and dil. aq. NaOH. With PCl<sub>5</sub> in cold CHCl<sub>3</sub>, 19.5 g. of V was converted into 6 g. of 6'-nitro-3',4',5,6-tetramethoxy-1-benzyl-3,4-dihydroisoquinoline, m. 187.5–9.5°. The methiodide of this base, m. 146–8° (3.5 g.), was reduced by means of Zn dust and HCl to 2.2 g. of 6'-amino-3',4',5,6-tetramethoxy-1-benzyl-2-methyl-1,2,3,4-tetrahydroisoquinoline (VI), m. 233.5–5° (decompn.). A diazotized soln. of this compd. gave with an alk. β-naphthol a red ppt. of an azo dye. Diazotization of VI in MeOH-alc.-H<sub>2</sub>SO<sub>4</sub> gave *di*-2,3,6,7-tetramethoxyaporphine (II), pale yellow needles, m. 115.5–6.5° (0.55 g. from 1.94 g. of the di-HCl salt). A hydriodide, m. 227.5–30.5°, and a methiodide, m. 204–8°, were also obtained from II. Attempts to resolve II by means of *d*- and *l*-tartaric acids were unsuccessful. Colors with H<sub>2</sub>SO<sub>4</sub>, HNO<sub>3</sub>, Mandelin's, Fröhde's, and Erdman's reagents did not resemble those described by Gorter for isoglaucine. The yield of 6,3,4-O<sub>2</sub>N(MeO)<sub>2</sub>·C<sub>6</sub>H<sub>2</sub>CH<sub>2</sub>CO<sub>2</sub>H prepd. by the method of Oxford and Raper (*C. A.* 21, 1649) was increased from 60 to 77% by increasing the proportion of KOEt and (CO<sub>2</sub>Et)<sub>2</sub> to 6-nitrohomoveratrole. By the interaction of 2,3,4-O<sub>2</sub>N(MeO)<sub>2</sub>·C<sub>6</sub>H<sub>2</sub>CH<sub>2</sub>COCl from 19 g. of the corresponding acid (cf. Gulland and Haworth, *C. A.* 22, 2949) with 14 g. of β-2,3-dimethoxy-1-oxyphenylethylamine, 26 g. of 2'-nitro-3',4'-dimethoxyphenylaceto-β-2,3-dimethoxyphenylethylamide (VII), m. 95–6° was obtained. With PCl<sub>5</sub> in CHCl<sub>3</sub>, 4.5 g. VII gave 2.5 g. 2'-nitro-3',4',5,6-tetramethoxy-1-benzyl-3,4-dihydroisoquinoline (VIII), peach-colored prisms, m. 152–6°. The methiodide, m. 183–4° (decompn.); 6 g., reduced by Zn and HCl, gave 3.7 g. of 2'-amino-3',4',5,6-tetramethoxy-1-benzyl-2-methyltetrahydroisoquinoline (IX), m. 117.5–9.5°. A diazotized soln. of this amine in HCl gave with alk. β-naphthol scarlet azo dye. By diazotization of 3.72 g. IX in MeOH-alc.-H<sub>2</sub>SO<sub>4</sub>, 0.87 g. of

in dil. HCl (1:5), filtered, the residue refluxed with EtOH, then with  $C_6H_6$ , evapd., dissolved in a min. of boiling  $PhNO_2$ , filtered hot, let stand, the ppt. washed with boiling  $C_6H_6$  and dried *in vacuo*, yields 1.5 g. of the azoxy deriv. of VIII,  $C_{14}H_{10}O_2N_2$ , turns brown toward  $235^\circ$ , m.  $240-7^\circ$  (decompn.) to a brown liquid. Dil. alc.  $PhHNNH_2$  (50 g.) added slowly to dil. alc.  $p-O_2NC_6H_4CHO$  (68 g.), cooling if necessary to prevent undue violence and the product recrystd. from boiling EtOH, yields *p*-nitrobenzaldehyde phenylhydrazone (IX), dark red with metallic luster, m.  $153-4^\circ$ . As in the formation of VII, the reaction of I, IX and  $ZnCl_2$  is vigorous. The best yield is obtained by heating IX (2 g.), I (2 g.) and  $ZnCl_2$  (0.20 g.) for 30 mins. at  $125-30^\circ$ , purifying the product with EtOH as before and finally purifying by pptn. from EtOH with  $C_6H_6$ , which gives 50% of Et 1,5-diphenyl-3-*p*-nitrophenylpyrazole-4-carboxylate (X), m.  $166-7^\circ$ . From the EtOH- $C_6H_6$  mother liquor was isolated a very small quantity of a brown-red secondary compd., m.  $142-5^\circ$ , and the EtOH from the treatment of the crude X yields on concn. a small quantity of a brown-red compd., m.  $136-40^\circ$ . X (2 g.) heated with concd.  $H_2SO_4$  (10 g.) for 1.5 hrs. on a water bath, poured on ice, filtered, the residue boiled with EtOH and animal charcoal and finally recrystd. from EtOH, yields the free acid (XI), contains no EtOH of crystn., pale gray or mother-of-pearl color, m.  $248-50^\circ$  (decompn.). It is also formed when X is refluxed with 5% alc. KOH, in which case it m.  $248-9^\circ$ . XI heated at  $260^\circ$  until  $CO_2$  is no longer evolved, the product pulverized, dissolved in EtOH, filtered, the residue extd. with boiling EtOH, the ext. refluxed several hrs. with animal charcoal, filtered, concd., cooled and the ppt. recrystd. from EtOH, yields 1,5-diphenyl-3-*p*-nitrophenylpyrazole, m.  $153-5^\circ$ . X boiled for 3 hrs with alc. KOH, evapd. to dryness, the residue extd. with hot water, filtered, washed with water, the residue recrystd. from hot water, digested in dil. HCl, filtered, washed with boiling water, dried, extd. with boiling EtOH, the residue dissolved in boiling  $PhNO_2$ , filtered, allowed to crystallize, filtered, washed with EtOH, again crystd. from  $PhNO_2$  and washed, yields the azoxy deriv. of XI, lustrous yellowish, m.  $285^\circ$ . The results of the new researches on the dehydro-condensation of aldehydrazones with  $\beta$ -ketonic acid esters confirm the belief already expressed in earlier work that the reactions represent a general method of synthesis not only of pyrazolecarboxylic acids, but also of alkyl and aryl derivs. of pyrazole.

C. C. DAVIS

**Synthesis of 4-(3,4-dihydroxyphenyl)thiazoles.** TREAT B. JOHNSON and ELIZABETH GATEWOOD. *J. Am. Chem. Soc.* 51, 1815-9(1929).— $AcNHCH_2CN$  (20 g.) in 75 cc. abs. EtOH and 25 cc. concd.  $NH_4OH$ , cooled to  $10^\circ$ , was satd. with  $H_2S$ , giving 19 g. acetamidoacetothioamide, m.  $123-4^\circ$ ; with 3,4-(HO) $_2C_6H_3COCH_2Cl$  (I) this gives 2-acetamidomethyl-4-[3,4-dihydroxyphenyl]thiazole-HCl, crystg. with 1 EtOH, m.  $188-90^\circ$ ; digestion with concd. HCl gives 2-aminomethyl-4-[3,4-dihydroxyphenyl]thiazole-di-HCl, m.  $225-30^\circ$ . Acetylmethylaminoacetothioamide, m.  $156-7^\circ$ , in 16 g. yield by acetylating 20 g. of  $MeNHCH_2CN$ , dissolving in concd.  $NH_4OH$  and satg. with  $H_2S$ . The thioamide from  $Me_2(NH_2)CCN$ , m.  $185-6^\circ$ , with I gives 2- $\alpha$ -acetamidoisopropyl-4-[3,4-dihydroxyphenyl]thiazole, crystg. with 2  $H_2O$ , m.  $198-200^\circ$ ; HCl salt, m.  $188-9^\circ$ , the 2-amino deriv.-HCl, crystg. with 1  $H_2O$ , m.  $210-5^\circ$  (decompn.). The following 4-[3,4-dihydroxyphenyl]thiazoles were also prepd.: 2-acetylmethylaminomethyl-HCl, m.  $186-8^\circ$ ; 2-methylaminomethyl, crystg. with 1 EtOH, m.  $128-30^\circ$ ; HCl salt, m.  $220-5^\circ$ ; 2-mercapto, crystg. with 1  $H_2O$ , m.  $250^\circ$ ; 2-phenyl, m.  $164-5^\circ$ ; 2-amino-HCl, crystg. with 1  $H_2O$ , m.  $230-5^\circ$ ; 2-methylamino-HCl, m.  $275-80^\circ$ . These thiazoles are characterized by their stability in the air; all compds. thus far examd. are physiol active.

C. J. WEST

**Some derivatives of 4,5-naphtho-1,2-thiazole (naphth-1,2-thiazole).** R. STOLLÉ and W. BADSTÜBNER. *J. prakt. Chem.* [2], 121, 266-8(1929).—The ring system  $C_{10}H_8.CH:N:S$  is called 4,5-benzo-1,2-thiazole, and the corresponding  $C_{10}H_8$  derivs

are called 4,5-naphtho-1,2-thiazoles. The following compds. are described: 5,6-benzo-2,3-diketo-2,3-dihydrothionaphthene, red, m.  $171^\circ$ ; [4,5-(2',3'-naphtho)-1,2-thiazole] 3-carboxamide, (I), m.  $208^\circ$ ; acid, from I, yellow, m.  $197^\circ$  (decompn.); [4,5-(1',2'-naphtho)-1,2-thiazole]-3-carboxamide, brown, m.  $225^\circ$ .

M. A. DAHLEN

**Stability of diazonium salts of the triazole series.** JOSEPH REILLY and DENIS MADDEN. *J. Chem. Soc.* 1929, 815-6.— $NH_2C(NH)NHNH_2.HNO_3$  (I) (25 g.) was heated with 20 g. of  $EtCO_2H$  and a few cc. of  $H_2O$  for 24 hrs., followed by neutralization with  $K_2CO_3$  and evapn. to dryness. The residue was extd. with  $AcOEt$  and the soln. treated with concd.  $HNO_3$ , giving 17 g. of 5-amino-3-ethyl-1,2,4-triazole nitrate (II), m.  $167^\circ$  (after recrystn. from hot  $EtOAc-EtOH$  mixt.); the free triazole, m.  $152^\circ$ . II gave the following compds. upon diazotization and coupling: 5-azo- $\beta$ -naphthylamine, red, m.  $280^\circ$ . 5-azo- $\beta$ -naphthol, orange-red, m.  $180-1^\circ$ . 5-azoacetylacetone, yellow,



m. 236°; and 5-diazo-chloroaurate. The 3-isobutyltriazole (16 g.), m. 171°, corresponding to II, was prepd. in the same manner from 20 g. of isovaleric acid and 20 g. of I. The stability of triazolediazonium salts is increased by alkyl substitution, the effect increasing with the mol. wt. of the alkyl group.

A. S. CARTER

**Constitution of carthamin.** II. CHIKA KURODA. *Proc. Imp. Acad.* (Tokyo) 5, 82-5 (1929); cf. *C. A.* 23, 1906.—Carthamin, heated with dil.  $H_3PO_4$ , gives a mixt. of carthamidin (I),  $C_{15}H_{12}O_8$ , pale yellow, crystg. with 1  $H_2O$ , m. 218°, unstable, and isocarthamidin (II), isomeric with I, yellow, crystg. with 1  $H_2O$ , m. 238°. Various color reactions are given for I and II. I and  $Ac_2O$  with  $H_2SO_4$  give the  $\alpha$ -Ac deriv. (III), m. 158°; Ac deriv. (IV) of II, m. 180°. I or III with  $AcONa$  and  $Ac_2O$  at 125° gives the  $\beta$ -Ac deriv. of I, m. 143°. II or IV with  $AcONa$  and  $Ac_2O$  at 140-50° gives the  $\gamma$ -Ac deriv. of I, m. 179°. II is probably 5,6,7,8-tetrahydroxyflavanone. III,  $\beta$ -Carthamidin methyl ether and its synthesis. *Ibid.* 86.— $\beta$ -Acetylcarthamidin,  $Me_2SO_4$  and KOH in an atm. of H give the  $\beta$ -Me ether, m. 112°, identical with 2,3,4,6,4'-pentamethoxychalcone.

C. J. WEST

**Dissociation into free radicals of substituted dixanthyls.** V. The rate of dissociation. JAMES B. CONANT and MILDRED W. EVANS. *J. Am. Chem. Soc.* 51, 1925-35 (1929); cf. *C. A.* 21, 3055.—The rate of O absorption of dibutyl dixanthyl in PhBr at 25° has been measured by means of a differential pressure app. The reaction is of the 1st order until about 0.5 mole of O per mole of dixanthyl deriv. has been absorbed. The rate is independent of the concn. of the O in the soln. It thus appears that the rate-controlling step is the dissocn. of the dixanthyl deriv. into a free radical. The rates of dissocn. of the following dixanthyl derivs. in PhBr have been measured at different temps. by following the rate of O absorption: di-Me, di-Et, di-Pr, di-Bu, di-Am, di-iso-Am. The energy of activation has been calcd. from the temp. coeff. of the reaction velocity. A parallelism has been found between the rates of dissocn. and the temp. at which appreciable dissocn. first occurs as evidenced by the appearance of color in a dil. soln. The results are given in tables and curves.

C. J. WEST

**5,8-Dihydroxy- $\alpha$ -anthrapyridinequinones.** HARRY RAUDNITZ (WITH GRETE LAUBE). *Ber.* 62B, 509-13 (1929).—As might have been expected from the close relationship between phthalic and quinolinic acids, quinolinic anhydride (I) with  $C_6H_6$  and  $AlCl_3$  gives  $\beta$ -benzoylpicolinic acid which yields the N analog,  $\alpha$ -anthrapyridinequinone, of anthraquinone. This quinone, heated with NaOH and Zn dust, forms a deep blue soln decolorized by shaking with air, the presence of the pyridine ring in the anthraquinone complex apparently deepening the color as compared with anthraquinone. It seemed of interest, therefore, to prep. 5,8-dihydroxy- $\alpha$ -anthrapyridinequinone ( $\alpha$ -pyrquinizarin) (II) and 5,8-dihydro-6,7-benzo- $\alpha$ -anthrapyridinequinone (6,7-benzo- $\alpha$ -pyrquinizarin) (III), analogous to quinizarin (IV) and 1,4-dihydroxy-2,3-benzanthraquinone (V), resp., to det. the spectroscopic effect of the pyridine ring. This effect proved to be a distinct shifting of the max. of the absorption bands toward the red, as shown by the following values for these max. in KOH,  $H_2SO_4$ , and  $H_2SO_4$ - $H_3BO_3$ , resp.: IV, violet, 596.1, 553.7, 317.7; red, 548.3, 509.6, 476.4; red, 547.5, 508.8, 473.5. II, violet, 600.7, 561.5; crimson, 574, 532.2; pink, 547.5, 506.5, 473.5. V, violet, 584, 539, 505, orange, 540, 500, 469; yellow, 534, 496.5, 463. III, red-violet, 586.5, 544; yellow-red, 1-sided absorption beginning in the yellow; orange, 541.5, 503, 467. Whereas I with aromatic compds. and  $AlCl_3$  gives only ketopicolinic acids, with a  $Na-AlCl_4$  melt (1:5), it yields  $\alpha$ -anthrapyridinequinones directly with aromatic compds. contg. HO groups in the 1,4-positions, but, unlike  $C_6H_4(CO)_2O$ , it does not condense with  $o$ - $C_6H_4(OH)_2$ . IV, m. 198°, and V, dark red, m. 349°, were also obtained in very pure form from  $C_6H_4(CO)_2O$  and  $p$ - $C_6H_4(OH)_2$  and 1,4- $C_6H_4(OH)_2$ , resp., with  $Na-AlCl_4$ . II, dark red, sublimes *in vacuo*, m. 237°, isolated as the Na salt, dark blue-violet powder (yield, 44%). III, brown-red, sublimes *in vacuo* with partial decompn., m. 363°; Na salt, dark violet powder.

C. A. R.

**Substituted aromatic aldehydes in Hantzsch's pyridine condensation.** I. Methoxy-, chloro- and hydroxybenzaldehydes. LEONARD E. HINKEL and WM. R. MADEL. *J. Chem. Soc.* 1929, 750-4.—One mol. of  $p$ - $MeOC_6H_4CHO$ , 2 mols. of  $AcCH_3$ ,  $CO_2Et$  and 20 cc. of EtOH were satd. with  $NH_3$  and after standing 1 hr. were heated on a water bath for several hrs.; 65% of 2,6-dimethyl-3,5-dicarbethoxy-4- $p$ -methoxyphenyl-1,4-dihydropyridine (I), m. 159°, crystd. upon cooling. I was made into a paste with EtOH and  $N_2O_5$  passed in until a clear soln. resulted. The EtOH was removed by evapn., the residue was neutralized with  $Na_2CO_3$  soln. and extd. with  $Et_2O$ . 2,6-Dimethyl-3,5-dicarbethoxy-4- $p$ -methoxyphenylpyridine (II) crystd. upon evapn. of the  $Et_2O$  and after recrystn. from ligroin, m. 50°. In the same manner as in the case of I, the following similarly substituted dihydropyridines were prepd.: 4- $o$ -methoxyphenyl

(48%), m. 151°; 4-*m*-methoxyphenyl (33%), m. 120°; 4-*p*-chlorophenyl (69%), m. 149°; 4-*o*-chlorophenyl (38%), m. 132° (from aq. MeOH); 4-*m*-chlorophenyl (78%), m. 142° (from aq. MeOH); 4-*p*-hydroxyphenyl (49%), m. 227° (from EtOH); and 4-*m*-hydroxyphenyl (36%), m. 202°. No product could be obtained in the case of the *o*-HO deriv. Following a course analogous to the prepn. of II, the corresponding analogs of II were made: *o*-MeO, m. 65°; *m*-MeO, m. 82°; *p*-Cl, m. 68°; *o*-Cl, m. 62°; *m*-Cl, m. 53°; the HO derivs. formed nitroso compds. and could not be oxidized. From the theory of alternate polarities of Lapworth and Shoemith (C. A. 16, 3078) the negative substituents in the *o*- and *p*-positions should increase the activity of BzH and a similar group in the *m*-position should diminish it. This is not the case; comparing the yields, it is seen that they do not agree among themselves, for with the HO derivs. the *m*- is greater than the *o*-, and with the Cl-derivs., the *m*- is greater than either *o*- or *p*-. In all cases the activity of BzH (which gives 90% yields) is decreased by the substituents.

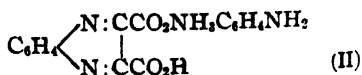
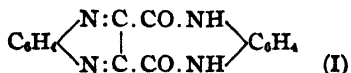
A. S. CARTER

Action of diazonium salts on 2,5-dimethyl-6-hydroxypyrazine. III. G. GASTALDI AND E. PRINCIVALLE. *Gazz. chim. ital.* 58, 679-82 (1928).—The expts. described show that 2,5-dimethyl-6-hydroxypyrazine (I) (C. A. 16, 101) reacts in a normal way with phenyl-, *p*- and *o*-tolyl diazonium salts, in the sense that the corresponding azo compds. have the constitution:  $\text{N}:\text{C}(\text{OH})\cdot\text{CMe}:\text{N}:\text{C}(\text{N}:\text{NR})\cdot\text{CMe}$ . They are stable, are

more acidic than the corresponding hydroxypyrazines and give stable cryst. salts. The ease with which I couples with the diazonium salts indicates that it reacts in the lactimic form, and possibly with alkyl halides it first forms *O*-ethers which are then transformed into *N*-derivs. (C. A. 23, 602). Preliminary expts. indicate that the product of the coupling of I and *p*-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>N<sub>2</sub>Cl is not an azo compd. Coupling of I and PhN<sub>2</sub>Cl was carried out in an alk. medium, the alk. salt being then filtered, dissolved in water, decompd. with HCl, dried in air and recrystd. from EtOH, which gives a good yield of 3-phenylazo-2,5-dimethyl-6-hydroxypyrazine (II), orange-red, m. 208° (decompn.). Na salt, C<sub>11</sub>H<sub>11</sub>ON<sub>2</sub>Na, orange-red, by heating II with excess aq. NaOH and allowing to cool slowly. Prepd. in the same way, I and *p*-MeC<sub>6</sub>H<sub>4</sub>N<sub>2</sub>Cl give almost quant. 3-*p*-tolylazo-2,5-dimethyl-6-hydroxypyrazine, orange-yellow, m. 242° (decompn.). Na salt, C<sub>11</sub>H<sub>13</sub>ON<sub>2</sub>Na, orange-yellow. Likewise I and *o*-MeC<sub>6</sub>H<sub>4</sub>N<sub>2</sub>Cl yield 3-*o*-tolylazo-2,5-dimethyl-6-hydroxypyrazine, orange-yellow, m. 221° (decompn.). Na salt, C<sub>11</sub>H<sub>13</sub>ON<sub>2</sub>Na, orange-yellow.

C. C. DAVIS

Action of *o*-phenylenediamines upon dihydroxytartaric acid. FREDERICK D. CHATTAWAY AND WILLIAM G. HUMPHREY. *J. Chem. Soc.* 1929, 645-51.—When Na dihydroxytartrate is heated with aq. *o*-C<sub>6</sub>H<sub>4</sub>(NH<sub>2</sub>)<sub>2</sub>, 2 mols. of the diamine react with 1 mol. only of the salt, forming quinoxaline-2,3-dicarboxy-*o*-phenylenediamide (I); Na dihydroxytartrate is only very sparingly sol. in H<sub>2</sub>O, and any excess above 1 mol. remains in suspension unchanged. When the filtered alk. soln. is partly neutralized with HCl, I seps. as a colorless cryst. powder, stable in neutral soln. and dissolving readily in cold dil. aq. alkali, from which it is reprecip. on addn. of a deficiency of acid. It dissolves in hot dil. HCl (1:50), but on cooling, the *o*-phenylenediamine salt (II) of quinoxaline-2,3-dicarboxylic acid (III) seps.; whereas, if it is dissolved in hot moderately concd. HCl (1:1), III seps. on cooling, *o*-phenylenediamine-HCl remaining in soln. The II and III may consequently be obtained directly from the original yellow condensation soln., the former by making the soln. weakly acid with HCl, and the latter by satg. it with gaseous HCl.



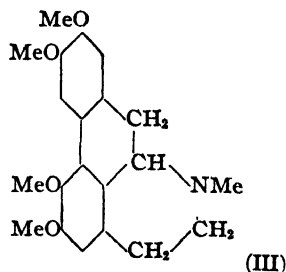
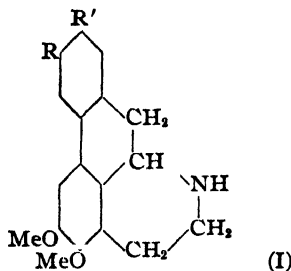
Attempts to acetylate or benzoylate I by the usual methods also cause decompn., with formation of the di-Ac or the di-Bz deriv. of *o*-C<sub>6</sub>H<sub>4</sub>(NH<sub>2</sub>)<sub>2</sub>. Heated with Ac<sub>2</sub>O, III yields the anhydride, while dry NH<sub>3</sub> on this anhydride in C<sub>6</sub>H<sub>6</sub> suspension gives the NH<sub>4</sub> salt of 3-carbamylquinoxaline-2-carboxylic acid (IV), from which the acid itself may be obtained on acidification. This amic acid is converted into the corresponding imide (V) on being heated above its m. p., and into the Ac deriv. of the imide on boiling with Ac<sub>2</sub>O. On being heated above its m. p., III decomp., evolving CO<sub>2</sub> and yielding a small quantity (10%) of quinoxaline; better yields (30%) of this base are obtained by heating the NH<sub>4</sub> salt of the acid. In common with other N bases, quinoxaline forms a stable, well-crystd. monotetrachloroiodide. Similarly, Na chloroquinoxaline-2,3-dicarboxy-*p*-chloro-*o*-phenylenediamide, from which the *p*-chloro-*o*-phenylenediamine salt of 6-chloroquinoxaline-2,3-dicarboxylic acid, and the free acid

(VI) are obtained by heating with dil. and with concd. HCl, resp. *p*-Bromo-*o*-phenylenediamine gives the corresponding Br deriv. These halogen-substituted derivs. are considerably less sol. than the unsubstituted compds., and are therefore more readily prepd. and purified; otherwise their reactions are analogous. The following compds. were prepd. and characterized: I, m. 184° (decompn.). II, lemon-yellow, m. 186° (decompn.). III, prisms contg. 2 mols. H<sub>2</sub>O of crystn., m. 190° (decompn. after loss of H<sub>2</sub>O at 110°); *Et* ester, C<sub>14</sub>H<sub>14</sub>O<sub>4</sub>N<sub>2</sub>, prisms, m. 83°; *NH*<sub>4</sub> salt, m. 220–30°; *anhydride*, pale yellow prisms decomp. and charring 250–60°. IV, m. 190–5° (decompn.). V, pale yellow, m. about 260° (decompn.); *Ac* deriv., leaflets, m. about 220° (decompn.). Quinoxaline mono-tetrachloroiodide, C<sub>8</sub>H<sub>6</sub>N<sub>2</sub>·HICl<sub>4</sub>, m. 125–30° (decompn.). 6-Chloroquinoxaline-2,3-dicarboxy-*p*-chloro-*o*-phenylenediamide, C<sub>16</sub>H<sub>8</sub>O<sub>2</sub>N<sub>4</sub>Cl<sub>2</sub>, m. 207° (decompn.). (*p*-chloro-*o*-phenylenediamine salt, C<sub>16</sub>H<sub>12</sub>O<sub>4</sub>N<sub>4</sub>Cl<sub>2</sub>, m. 205° (decompn.)); 6-bromoquinoxaline-2,3-dicarboxy-*p*-bromo-*o*-phenylenediamide, m. 198° (decompn.). (*p*-bromo-*o*-phenylenediamine salt, m. 199° (decompn.)). VI, m. 175° (decompn.) (*anhydride*, m. 235–40° (decompn.)), *Et* H ester, m. 159°; *di-Et* ester, m. 60°; *NH*<sub>4</sub> salt, m. 215–25° (decompn.)). 6-Chloroquinoxaline, m. 60°. 6-Bromoquinoxaline-2,3-dicarboxylic acid, m. 172° (decompn.) (*anhydride*, m. 235–45° (decompn.)), *Et* H ester, m. 161°, *di-Et* ester, m. 69°, *NH*<sub>4</sub> salt, m. 235–40° (decompn.)). 6-Bromoquinoxaline, m. 56°. Pyrazine-tetracarboxylic acid (by oxidation of the anhydride of III), m. 205° (decompn.), *di-K* *di-H* salt is cryst., *tetra-Et* ester, m. 104°. W. O. E.

**Calycanthine. I.** The isolation of calycanthine from *Meratia praecox*. RICHARD H. F. MANSKE. *J. Am. Chem. Soc.* 51, 1836–9 (1929).—Calycanthine has been isolated from *Meratia praecox*, Rehd. and Wils., a shrub native to Asia, 4 kg. of seeds giving 70 g. alkaloid, identical with that from *Calycanthus floridus*, L. Two other alkaloids, m. 197–8°, and an oil, were isolated in small quantities, but have not been investigated. The existence of glucose, or a sugar which gives glucosazone, in the seeds has been shown. Xylose was isolated from the epicarp of the seeds by hydrolysis with dil. H<sub>2</sub>SO<sub>4</sub>. C. J. WESS

**Synthetical experiments on the aporphine alkaloids. V. Laurotetanine.** Syntheses of 2,3,6,7- and 3,4,6,7-tetramethoxyaporphines. ROBERT K. CALLOW, JOHN M. GULLAND AND ROBERT D. HAWORTH. *J. Chem. Soc.* 1929, 658–70.—Recent investigations have shown that isoglaucine (II), obtained by Gorter (*C. A.* 16, 2470) from laurotetanine (I) (R=OH, R'=MeO, the positions of which may be the reverse of that shown), is impure glaucine (III) and does not contain the vicinal homocatechol group in ring III. It occurred to the authors of this paper that this vicinal arrangement does not occur in the aporphine series and that a synthesis of 2,3,6,7-tetramethoxyaporphine (II) and 3,4,6,7-tetramethoxyaporphine (IV) would be of value in detg. the true nature of I. Synthesis of these compds. shows as expected that neither resembles isoglaucine. After some difficulty 6'-nitro-3',4'-dimethoxyphenylaceto-β-2,3-dimethoxyphenylethylamide (V), m. 144.5–5.5° (9.5 g.), was obtained by adding 6,3,4-O<sub>3</sub>N(MeO)<sub>3</sub>-C<sub>6</sub>H<sub>2</sub>CH<sub>2</sub>COCl, obtained from the corresponding acid (13.1 g.) and PCl<sub>5</sub> in CHCl<sub>3</sub>, to a mixt of 2,3-(MeO)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>CH<sub>2</sub>CH<sub>2</sub>NH<sub>2</sub> (12 g.) in CHCl<sub>3</sub> and dil. aq. NaOH. With PCl<sub>5</sub> in cold CHCl<sub>3</sub>, 19.5 g. of V was converted into 6 g. of 6'-nitro-3',4',5,6-tetramethoxy-1-benzyl-3,4-dihydroisoquinoline, m. 187.5–9.5°. The methiodide of this base, m. 146–8° (3.5 g.), was reduced by means of Zn dust and HCl to 2.2 g. of 6'-amino-3',4',5,6-tetramethoxy-1-benzyl-2-methyl-1,2,3,4-tetrahydroisoquinoline (VI), m. 233.5–5° (decompn.). A diazotized soln. of this compd. gave with an alk. β-naphthol a red ppt. of an azo dye. Diazotization of VI in MeOH-alc.-H<sub>2</sub>SO<sub>4</sub> gave *di*-2,3,6,7-tetramethoxyaporphine (II), pale yellow needles, m. 115.5–6.5° (0.55 g. from 1.94 g. of the *di*-HCl salt). A *hydriodide*, m. 227.5–30.5°, and a *methiodide*, m. 204–8°, were also obtained from II. Attempts to resolve II by means of *d*- and *l*-tartaric acids were unsuccessful. Colors with H<sub>2</sub>SO<sub>4</sub>, HNO<sub>3</sub>, Mandelin's, Fröhde's, and Erdman's reagents did not resemble those described by Gorter for isoglaucine. The yield of 6,3,4-O<sub>3</sub>N(MeO)<sub>3</sub>-C<sub>6</sub>H<sub>2</sub>CH<sub>2</sub>CO<sub>2</sub>H prepd. by the method of Oxford and Raper (*C. A.* 21, 1649) was increased from 60 to 77% by increasing the proportion of KOEt and (CO<sub>2</sub>Et)<sub>2</sub> to 6-nitrohomoveratrole. By the interaction of 2,3,4-O<sub>3</sub>N(MeO)<sub>3</sub>-C<sub>6</sub>H<sub>2</sub>CH<sub>2</sub>COCl from 19 g. of the corresponding acid (cf. Gulland and Haworth, *C. A.* 22, 2949) with 14 g. of β-2,3-dimethoxy-1-oxyphenylethylamine, 26 g. of 2'-nitro-3',4'-dimethoxyphenylaceto-β-2,3-dimethoxyphenylethylamide (VII), m. 95–6° was obtained. With PCl<sub>5</sub> in CHCl<sub>3</sub>, 4.5 g. VII gave 2.5 g. 2'-nitro-3',4',5,6-tetramethoxy-1-benzyl-3,4-dihydroisoquinoline (VIII), peach-colored prisms, m. 152–6°. The *methiodide*, m. 183–4° (decompn.); 6 g., reduced by Zn and HCl, gave 3.7 g. of 2'-amino-3',4',5,6-tetramethoxy-1-benzyl-2-methyltetrahydroisoquinoline (IX), m. 117.5–9.5°. A diazotized soln. of this amine in HCl gave with alk. β-naphthol scarlet azo dye. By diazotization of 3.72 g. IX in MeOH-alc.-H<sub>2</sub>SO<sub>4</sub>, 0.87 g. of

*dl*-3,4,6,7-tetramethoxyaporphine (IV) was obtained. The *dl*-base was purified by conversion to the *HI* salt, m. 257–62°. After regeneration from this salt it was crystd. from ligroin. The resolution of the *dl*-base by *d*- and *l*-tartaric acids gave *d*-3,4,6,7-tetramethoxyaporphine *H d*-tartrate, m. 174–85°, and *l*-3,4,6,7-tetramethoxyaporphine *H l*-tartrate, m. 170–80°. From these salts were isolated *d*-3,4,6,7-tetramethoxyaporphine, pale yellow, m. 125–5.5° [ $\alpha$ ]<sub>D</sub><sup>20</sup> 168° in CHCl<sub>3</sub> (*c* = 0.459), and *l*-3,4,6,7-tetramethoxyaporphine, m. 125.5–5.6° [ $\alpha$ ]<sub>D</sub><sup>20</sup> –167° in CHCl<sub>3</sub> (*c* = 0.978). The methiodide obtained from the *l*-base by heating with MeI, m. 208–10°. Color reactions of the aporphines are also summarized.



I. A. KOTEN

Acids resulting from the oxidation of brucine with chromic acid. HEINRICH WIELAND AND WILHELM MÜNSTER. *Ann.* 469, 216–24(1929).—Hanssen (*Ber* 17, 2849; 18, 777) reported an acid C<sub>16</sub>H<sub>18</sub>N<sub>2</sub>O<sub>4</sub> from the energetic oxidation of brucine and strychnine with CrO<sub>3</sub>, although later investigators could not obtain this product. It is now shown that, following exptl. conditions given in detail, 2 acids may be obtained, sepd. by crystn. from H<sub>2</sub>O. The acid C<sub>17</sub>H<sub>22</sub>N<sub>2</sub>O<sub>6</sub> crysts. with 5H<sub>2</sub>O, does not m. 345°, is readily sol. in hot H<sub>2</sub>O but slightly in H<sub>2</sub>O at 20° (1:140), [ $\alpha$ ]<sub>D</sub><sup>24</sup> 49.2° (0.591% soln. in H<sub>2</sub>O); titration indicates 1CO<sub>2</sub>H; *HCl* salt, crysts. with 2H<sub>2</sub>O, does not m. 320°; the *HBr* salt also crysts. with 2H<sub>2</sub>O; *chloroplatinate*, golden yellow, crystg. with 3H<sub>2</sub>O. The acid C<sub>16</sub>H<sub>20</sub>N<sub>2</sub>O<sub>4</sub> crysts. in 2 forms, with 2 and 4 mols. H<sub>2</sub>O, m. 311° (decompn.), soly. in H<sub>2</sub>O at 20° 1:6, [ $\alpha$ ]<sub>D</sub><sup>24</sup> –116.3° (1.062% soln. in H<sub>2</sub>O); titration indicates 1CO<sub>2</sub>H; *HBr* salt, crysts. with 1EtOH, decomp. 286°; *chloroplatinate*, golden yellow, crysts. with 5H<sub>2</sub>O. This may be the acid of Hanssen. C. J. WIST

New strychnine alkaloid. I. HEINRICH WIELAND AND GERHARD OERTEL. *Ann.* 469, 193–215(1929).—Vomicine (I), C<sub>22</sub>H<sub>24</sub>N<sub>2</sub>O<sub>4</sub>, the method of sepn. of which is not given, crysts. from 80% EtOH or Me<sub>2</sub>CO, [ $\alpha$ ]<sub>D</sub><sup>22</sup> 80.4° (0.398% soln. in EtOH), 1 g. dissolves in 70 cc. 80% EtOH at the b. p. and in about 55 cc. Me<sub>2</sub>CO; *HCl* salt, m. 245° (decompn.). CrO<sub>3</sub> in H<sub>2</sub>SO<sub>4</sub> gives a deep red soln. which is permanent for some time; HNO<sub>3</sub> (1:1) slowly gives a brown to orange-yellow color; heated with 10–20% MeOH-KOH till soln. results, there results an intense green color; acidified and FeCl<sub>3</sub> added, there results a splendid red-violet color. Heating 4 g. I in 10 cc. 20% MeOH-KOH in a N atm. for 0.5 hr. gives 3.9 g. vomicinic acid (II), sinters at 164° with loss of H<sub>2</sub>O and then m. 282°; heating with N HCl for 1 min. gives I; while II in alk. soln. is quickly oxidized by the air to a green dye, the acid soln. is stable toward O. I and BzCl give the *Bz* deriv., isolated only as the *HCl* salt, m. 182°. I. HCl and satd Br-H<sub>2</sub>O give a *Br* deriv., C<sub>22</sub>H<sub>22</sub>N<sub>2</sub>O<sub>4</sub>Br, m. 306°; heating 1 hr. with 20% MeOH-KOH gives bromovomicinic acid, m. 306°; this does not show the characteristic color reactions of II. I does not react with MeI even at 150°; Me<sub>2</sub>SO<sub>4</sub> gives an addn. product which, recrystd. from hot H<sub>2</sub>O, gives I *Me* sulfate, which loses H<sub>2</sub>O of crystn. at 100° and then m. 264° (decompn.). I, transformed into II as above and then treated with MeI, gives *N*-methylvomicinic acid, m. 254° (*HCl* salt, m. above 320°) and vomicinic acid betaine, C<sub>24</sub>H<sub>26</sub>N<sub>2</sub>O<sub>6</sub>, m. 210°, decomp. 230°. Catalytic reduction of I (Pt oxide) gives the dihydro deriv. (III), m. 290°; this does not react with MeI at 100°; dihydrobromovomicine, m. 280°. I, HI, red P and AcOH, heated 4 hrs., give desoxyvomicine, C<sub>22</sub>H<sub>24</sub>N<sub>2</sub>O<sub>3</sub>, catalytically reduced to a mixt. of 2 bases, C<sub>22</sub>H<sub>24</sub>N<sub>2</sub>O<sub>3</sub> (IV), m. 213°, and C<sub>22</sub>H<sub>24</sub>N<sub>2</sub>O<sub>3</sub> (V), m. 179°, sepd. by the greater soly. of V in MeOH. IV yields a methiodide, crystg. with 1H<sub>2</sub>O, m. 236° (decompn.). V gives a *Br* deriv., m. 159°. III, HI, red P and AcOH give iododihydrodesoxyvomicine, m. 242°, reduced by Zn and AcOH to dihydrodesoxyvomicine, m. 210°; the I is also split off by EtOH-KOH. Oxidation of 10 g. I in 240 cc. 4 N H<sub>2</sub>SO<sub>4</sub> with 21 g. CrO<sub>3</sub> in 105 cc. H<sub>2</sub>O at 70° gives the acid C<sub>16</sub>H<sub>18</sub>O<sub>4</sub>

$O_2N_2$ , m.  $304^\circ$  (decompn.), sublimes unchanged. Using 6 g. I and 21 g.  $CrO_3$  and starting the reaction at  $0^\circ$ , finally raising the temp. to  $90^\circ$ , there result 2 acids,  $C_{17}H_{22}N_2O_7$ , m.  $262^\circ$  (decompn.), crystg. with  $5H_2O$  and  $C_{17}H_{22}N_2O_8$ , m.  $312-4^\circ$  (decompn.), crystg. with  $3EtOH$ . C. J. WEST

The constitution of *l*- and *d*-pimaric and abietic acids. L. RUZICKA. *Bull. inst. pin* 1929, 112-22.—An address reviewing the present status of our knowledge of the constitution of these acids with bibliography of 45 references. A. P.-C.

Euphorbone from euphorbium resin. JULIUS A. MÜLLER. *J. prakt. Chem.* 121, 97-112(1929).—Details are given for the isolation of euphorbone, m.  $121.5-2.5^\circ$ ,  $[\alpha]_D^{16}$   $16.58^\circ$ .  $Ac_2O$  and  $AcONa$  give a mixt. of 2 acetates, sepd. by crystn. from  $Me_2CO$ ; euphorbol acetate(I), sinters  $85^\circ$ , m.  $90-1^\circ$ , clears  $98^\circ$ ,  $[\alpha]_D^{16}$   $11.34^\circ$ , is the principal product and is more sol. in  $Me_2CO$ ; novorbol acetate, m.  $123-4^\circ$ ,  $[\alpha]_D^{18}$   $-12.52^\circ$  (results in only a low % yield). Vitorbol, sinters  $120.5^\circ$ , m.  $122.5-123.5$  to  $125^\circ$ ,  $[\alpha]_D^{17}$   $12.85^\circ$ ; this may be simply a purified euphorbone; analysis indicates  $C_{27}H_{44}OH$  as its formula; novorbol,  $C_{26}H_{44}O$  or  $C_{26}H_{46}O$ , m. about  $150^\circ$ ,  $[\alpha]_D^{17}$   $29.61^\circ$ . Alk. sapon. gives a novorbol, m.  $123.5-4.5^\circ$ , which is optically inactive. I gives a *di-Br deriv.*, m.  $163-4^\circ$  (decompn.),  $[\alpha]_D^{17}$   $5.615^\circ$ . Vitorbol *p*-bromobenzoate, m.  $132-3^\circ$ ,  $[\alpha]_D^{19}$   $20.45^\circ$ ; novorbol deriv., m.  $183.5-4.5^\circ$ ,  $[\alpha]_D^{19}$   $18.88^\circ$ . C. J. WEST

Present status of the chemistry of the resin acids of conifers. LÉVY. *Bull. inst. pin* 1929, 122-4.—A brief review. A. PAPINEAU-COUTURE

Our knowledge of resin acids. G. ROUIN. *Bull. inst. pin* 1929, 124-37; cf. C. A. 23, 602.—A review. A. PAPINEAU-COUTURE

Flavanone glucosides. IV. Naringin and hesperidin. Y. ASAHINA AND M. INUBESE. *J. Pharm. Soc. Japan* 49, 128-34(1929).—Naringin (I) when dried at  $110^\circ$ , m.  $171^\circ$  and has the compn.  $C_{27}H_{32}O_{14} \cdot 2H_2O$ . When recrystd. from  $H_2O$ , it has an addnl  $6H_2O$  of crystn. and m.  $83^\circ$ . The following equation is based on the detn. of the hydrolytic products of I:  $C_{27}H_{32}O_{14} + 2H_2O = C_{15}H_{18}O_5$  (naringenin) + glucose + rhamnose. When I in  $Ba(OH)_2$  soln. is heated 12 hrs. in  $H_2$  atms., it gives *p*- $HOC_6H_4CHO$  and phloroacetophenonerhamnoglucoiside (II),  $C_{26}H_{28}O_{13} \cdot H_2O$ , m.  $149-50^\circ$ ,  $[\alpha]_D^{21}$   $-86.51^\circ$ . Recrystn. from  $H_2O$  gives an addnl.  $4H_2O$  of crystn. Hydrolysis of II with dil.  $H_2SO_4$  gives phloroacetophenone, glucose and rhamnose. I and  $CH_3N_2$  give a syrupy substance which on hydrolysis gives isosakuranetin (5,7-dihydroxy-4'-methoxyflavanone). Since sakuranetin (5,4'-dihydroxy-7-methoxyflavanone) and  $CH_3N_2$  give 4',7-dimethoxy-5-hydroxyflavanone and the HO group at 5 is not methylated (cf. Asahina, *et al.* C. A. 22, 1592) as in the case of I, it is assumed that the sugar group in I is bound at the position 7. The hydrolysis of hesperidin (III) proceeds as follows:  $C_{28}H_{34}O_{15} + 2H_2O = C_{16}H_{14}O_6$  (hesperetin) + glucose + rhamnose. III and  $Ac_2O$  give the *di-Ac deriv.*, m.  $142-3^\circ$ ,  $[\alpha]_D^{21}$   $-32.9$ . Heating of III with  $Ba(OH)_2$  gives isoferrulic acid and a rhamnoglucoiside which on hydrolysis gives glucose, rhamnose and a substance giving the color reactions of 1,3,6-(HO) $_3C_6H_3$ . NAO UYEI

Alginate acid from *Macrocystis pyrifera*. WM. L. NELSON AND LEONARD H. CRETCHER. *J. Am. Chem. Soc.* 51, 1914-22(1929).—Extn. of *Macrocystis pyrifera* with  $EtOH$  gives 4-5% of mannitol. Details are given of the prepn. of alginate acid, which, by repeated dialysis, was obtained with 0.1% ash, mostly Fe. It is very slightly sol. in  $H_2O$ , liberates  $CO_2$  from carbonates and may be titrated with alkali to a definite end point. It does not reduce Fehling soln., but rapidly forms reducing substances if dried at  $100^\circ$  or if boiled with  $H_2O$  or dil. acid, considerable amts. of  $CO_2$  being liberated. The Na salt has  $[\alpha]_D^{20}$   $-133^\circ$ . On heating with 18%  $HCl$  it loses 24.65% as  $CO_2$ . Hydrolysis with distd.  $H_2O$ , dil.  $H_2SO_4$ , 80%  $H_2SO_4$  and  $HNO_3$  shows the acid to be a polymer of the anhydride of an aldehyde sugar acid in which all CHO groups are conjugated and all  $CO_2H$  groups free. The uronic acid could not be obtained cryst. With cinchonine it yields a salt, m.  $152^\circ$  (cor.); the salt of *d*-galacturonic acid m.  $158^\circ$ ;  $[\alpha]_D^{25}$  for the 2 products are  $113.6^\circ$  and  $134^\circ$ . Uronic acid may be oxidized to a dibasic  $C_6$  sugar acid. The diamide and diphenylhydrazide of this acid correspond in properties to the analogous compds. prepd. from *d*-mannosaccharic dilactone. C. J. WEST

Saponin of the sugar beet. K. REHORST. *Ber.* 62B, 519-34(1929).—See C. A. 23, 3357. C. A. R.

Constituents of corn cockle seed. II. Githagenin and githagic acid. E. WEDEKIND AND W. SCHICKLE. *Z. physiol. Chem.* 182, 72-81(1929); cf. C. A. 21, 384.—Further examn. of githagenin, the sapogenin of corn cockle seed, has led to the formula  $C_{27}H_{44}O_4$ .

instead of  $C_{25}H_{44}O_4$  previously reported, and for the oxidation product githagic acid  $C_{25}H_{42}O_5$  instead of  $C_{25}H_{42}O_6$ . Oxidation by  $CrO_3$  converts githagenin into githagic acid which is now shown to be a diketolactonemonocarboxylic acid. It forms a dioxime, and titrates monobasic in cold, dibasic in hot soln. Githagenin contains a lactone, a secondary alc. and a keto group, and is therefore a hydroxyketolactone. The OH or CO group is probably adjacent to a tertiary C common to 2 rings. Oxidation would then break the ring at the place of O or OH attachment and form the  $CO_2H$ , while the tertiary C would form CO. The Me ester of githagic acid may be distd. undecompd in a high vacuum; hence it is probable that the CO is not in  $\gamma$ - or  $\delta$ -position to the  $CO_2H$ . The instability of the acid toward boiling alc. KOH or a mixt. of HCl and AcOH suggests the occurrence in githagenin of OH and CO on the same ring and in  $\alpha$ - or  $\beta$ -position. The similarity of githagenin to the sapogenin  $C_{29}H_{44}O_6$  of *Chamellia japonica* (Aoyama, C. A. 23, 2445) and that of quillaic acid suggests a difference of 1OH and a common derivation of all 3 from the satd. hydrocarbon  $C_{29}H_{50}$  which would contain 5 hydrogenated rings.

A. W. DOX

The oxidation of carotinoids by permanganate. P. KARRER. *Helv. Chim. Acta* 12, 558(1929).—The results obtained by Kuhn, Winterstein and Karlovitz (C. A. 23, 2698) in their study of the  $KMnO_4$  oxidation of bixin and crocetin afford verification of work done previously by Karrer and Salomon (cf. C. A. 22, 2949) in the detn. of the structure of crocetin.

L. F. AUDRIETH

The ultra-violet optical properties of  $\alpha$ - and  $\beta$ -naphthalenesulfonic acids (LITTOFF) 3. Electrochemistry of the system benzamide-Br-nitrobenzene (FINKELSTEIN, KUDRA) 2. The boiling temperatures of the homologous series (NEKRASOV) 2. The velocity of saponification of esters and lactones by NaOH in mixtures of 2 and 3 solvents (CAUDRI) 2. The modifications of the spectra of organic compounds dependent on the  $p_H$  and the mathematic formulation of the functions relating the conditions of absorption to the  $p_H$  (VLÄS, GEX) 3. A new theory of the mechanism of alcoholic fermentation (KLUIJVER) 16. Concentrating acids (Fr. pat. 651,944) 18. Ether-alcohol esters of polycarboxylic acids such as phthalic acid (U. S. pat. 1,714,173) 26.

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Synthesis of low-boiling point hydrocarbons. W. GESSMANN and E. W. SHALDERS. *Brit.* 299,820, June 30, 1927. See Can. 282,392 (C. A. 22, 4128).

Hydrocyclic compounds. O. DIELS and K. ALDER (to I. G. Farbenind. A.-G.). *British* 300,130, Nov. 5, 1927. Hydrocyclic compds. are made by condensing a compd. having conjugated double bonds with a quinone or an unsatd. compd. such as an unsatd. aldehyde or acid. The double bond is opened up in the 1,4-position. Double-bond compds. mentioned include butadiene, cyclopentadiene, cyclohexadiene, myrcene, phellandrene, pyrrole and substituted pyrroles and furans; unsatd. compds. such as may also be used for the reaction include maleic acid or anhydride, itaconic anhydride, citraconic anhydride, acrylic acid, acrolein and ethylideneacetone. The products comprise terpenes, sesquiterpenes, alkaloids and camphors. Examples are given of the production of 3,6-endomethylene-*cis*- $\Delta^4$ -tetrahydrophthalic anhydride, *cis*- $\Delta^4$ -tetrahydro-*o*-phthalic anhydride, 3,6-endomethylene- $\Delta^4$ -tetrahydrobenzaldehyde, 3,6-endomethylene- $\Delta^4$ -tetrahydrobenzoic acid and the product of condensation of dihydrobenzene with maleic anhydride. 3,6-Endomethylenehexahydro-*o*-phthalic acid is made by hydrogenating the corresponding tetrahydro compd. in the presence of colloidal Pd; similarly *cis*- $\Delta^4$ -tetrahydro-*o*-phthalic acid yields hexahydro-*o*-phthalic acid.

Acylation of multivalent ether-alcohols. I. G. FARBENIND. A.-G. Fr. 652,383, April 7, 1928. Acyl groups are introduced into mixed multivalent ether-als. or their derivs., giving products which are solvents and swelling agents, particularly for nitrocellulose, or as substitutes for camphor in the manuf. of films. Examples are given.

Urethans of secondary alcohols. I. G. FARBENIND. A.-G. *Brit.* 300,177, Nov. 7, 1927. Urethans such as those of phenylethylmethylcarbinol, phenylethylethylcarbinol and ( $\alpha$ -allyl- $\beta$ -phenylethyl)methylcarbinol, possessing antipyretic properties, are prepd.

from the alc. in the usual manner as by treatment with carbamic acid chloride or by conversion into the chlorocarbonate by use of phosgene and subsequent treatment with  $\text{NH}_3$ . Phenylethylmethylcarbinol is made by the action of phenylethylmagnesium bromide on propionaldehyde, and ( $\alpha$ -allyl- $\beta$ -phenylethyl)methylcarbinol from allyl-benzylacetoacetic ester by ketonic decompn. followed by reduction.

**Ketols.** ANGELO KNORR and ALBERT WEISSENBORN (to Winthrop Chemical Co.). U. S. 1,714,378, May 21. Condensation of an aldehyde with a ketone is effected in the absence of water with use as condensing agent of an alkali metal compd. of a 1,3-ketol such as may be produced by treating the ketone which is to be condensed with anhyd. alkali metal hydroxide without heating. The aldehyde is gradually added while cooling. Examples are given of the production of diacetone alc. and hydracetyl-acetone, hexanol-4-one-2, octanol-5-one-3, crotylideneacetone, cinnamylideneacetone, ethylideneacetophenone, and *o*-ethylidenecyclohexanone.

**Phenols.** I. G. FARBERNIND. A.-G. Fr. 652,193, Apr. 4, 1928. Phenols are obtained by passing halogen derivs. of the aromatic series with steam over heated active  $\text{SiO}_2$ -gel, with or without metals or their compds. Examples are given. Cf. C. A. 23, 611.

**Arylaminoanthraquinones.** I. G. FARBERNIND. A.-G. Fr. 652,614, Apr. 12, 1928. Mixts of  $\alpha$ - and  $\beta$ -arylaminoanthraquinones or their derivs. are sepd. by treating them in an appropriate solvent with alkali metal hydroxides at a moderate temp. The  $\beta$ -compds. dissolve whereas the  $\alpha$ -compds. do not. Thus, impure 1-benzoylamino-8-chloroanthraquinone is heated to 45–50° in alc. soln. with KOH. The soln. obtained is found to contain  $\beta$ -benzoylaminochloroanthraquinone.

**Hydroxythionaphthenes.** I. G. FARBERNIND. A.-G. Fr. 652,049, Mar. 31, 1928. Hydroxythionaphthenes are prepd. by heating with aq. alkali *o*-thioglycolic acids of arylcarboxamides which are obtained by acid sapon. agents on cyanoaryl-*o*-thioglycolic acids. In examples 2-cyano-3-methyl-5-chlorobenzene-1-thioglycolic acid is heated with  $\text{H}_2\text{SO}_4$  to 95–100° for 5 hrs. giving 2-carbamyl-3-methyl-5-chlorobenzene-1-thioglycolic acid (I), m. 172–174°. Similarly, 5-methoxy-2-cyano-1-thioglycolic acid is converted to 5-methoxy-2-carbamyl-1-thioglycolic acid, m. 208–210°. I is heated with NaOH and  $\text{Na}_2\text{CO}_3$  to 80° for 7 hrs., and the hydroxythionaphthencarboxylic acid which is pptd. is oxidized to 4,4'-dimethyl-6,6'-dichloroindigo. Similarly, 5-ethoxybenzene-2-carbamyl-1-thioglycolic acid is converted to 6-ethoxy-3-hydroxythionaphthene and 6,6'-diethoxyindigo.

**Alkyl phosphates.** I. G. FARBERNIND. A.-G. Brit. 300,044, Jan. 12, 1928. Reaction is effected between alcs. and P oxychloride while continuously removing HCl from the reaction mixt. by heating or reduction of pressure. Diluents such as  $\text{CHCl}_3$ ,  $\text{C}_6\text{H}_6$ , or an excess of the alc. may be used as may also catalysts such as Cu or metal chlorides. An example is given of the treatment of Bu alc. to form tri-Bu phosphate and the use of EtOH, iso-Bu alc. or primary AmOH also is mentioned.

**Formates.** I. G. FARBERNIND. A.-G. Fr. 652,597, Apr. 12, 1928. See U. S. 1,698,573 (C. A. 23, 1138).

**Benzanthrone and derivatives.** BERTHOLD STEIN, WILLY TRAUTNER and ROBERT BERLINER (to Grasselli Dyestuff Corp.). U. S. 1,713,565, May 21. Benzanthrone is formed by heating to about 100° cinnamylideneanthrone in a melt of anhyd.  $\text{AlCl}_3$  and NaCl. A product which is probably a chlorobenzanthrone is similarly obtained from cinnamylidene- $\alpha$ -chloroanthrone, and a  $\beta$ -chlorobenzanthrone is obtained from cinnamylidene- $\beta$ -chloroanthrone.

**Piperidine derivatives.** SAMUEL M. McELVAIN. U. S. 1,714,180, May 21. Compds. such as a 1-alkyl-3-carbalkoxy-4-piperidyl benzoate or other compds. of the

general formula  $\text{RN}.\text{CH}_2.\text{CH}(\text{CO}_2\text{R}').\text{CH}(\text{OCOR}^2).\text{CH}_2.\text{CH}_2$  in which R and R' represent alkyl groups and R<sup>2</sup> an aromatic group, are formed by causing a reaction between a primary alkylamine and alkyl  $\beta$ -halopropionate, sepg. the  $\beta,\beta'$ -dicarbalkoxy-diethylalkylamine thus produced and condensing it by heating with a condensing agent adapted to eliminate a mol. of alc., thus forming 1-alkyl-3-carbalkoxy-4-piperidone, treating the latter with a reducing agent to convert the ketone group into an alc. group, acylating with an agent contg. a nitro-substituted phenyl group, reducing the nitro group and alkylating the resulting primary amino group. 1-Isoamyl-3-carbethoxy-4-piperidyl benzoate-HCl, m. 181°; 1-amyl-3-carbethoxy-4-piperidyl benzoate-HCl, m. 166; 1-amyl-3-carbethoxy-4-piperidone-HCl, m. 143°; 1-butyl-3-carbethoxy-4-piperidyl benzoate-HCl, m. 177°, and the corresponding piperidone-HCl, m. 129°; 1-isobutyl-3-carbethoxy-4-piperidyl benzoate-HCl, m. 199°, and the corresponding piperidone-HCl, m. 126°; 1-isoamyl-3-carbethoxy-4-piperidyl *p*-aminobenzoate-di-HCl,

m. 215°; 1-isobutyl-3-carbethoxy-4-piperidyl *p*-aminobenzoate-di-HCl, m. 232°, and the hydrochloride of the *p*-nitrobenzoate, m. 206°; 1-butyl-3-carbethoxy-4-piperidyl *p*-aminobenzoate-di-HCl, m. 230°, and the hydrochloride of the *p*-nitrobenzoate, m. 194°. Some of the compds. are suitable for use as *local anesthetics*. Numerous details of their prepn. are given.

**Organic hydroxy acids from nitriles.** I. G. FARBENIND. A.-G. Brit. 300,040, Dec. 28, 1927. Production of  $\alpha$ -hydroxycarboxylic acids by the acid saponification of the corresponding nitrile is effected with a sufficient quantity of water in the presence of an inert org solvent such as dioxane, ethyl ether,  $C_2H_5Cl$ , or  $CHCl_3$  capable of dissolving the reagents and reaction products except the resulting  $NH_4$  salt. The nitriles used may be prepd. in the same solvent used for the saponification. Examples are given of the production of lactic, mandelic and  $\alpha$ -hydroxybutyric acids.

**Carbamylaryl-*o*-thioglycolic acid.** I. G. FARBENIND. A.-G. Fr. 651,843, Mar. 28, 1928. *o*-Cyanoarylsulfonyl chlorides are reduced so as to transform the sulfonyl chloride group into a mercaptan, and at the same time the CN group into a carbamyl group and condensed with monochloroacetic acid. Thus, 1-methyl-2-amino-5-chlorobenzene-3-sulfonic acid is transformed into 1-methyl-2-cyano-5-chlorobenzene-3-sulfonic acid by Sandmeyer's reaction, the latter is dissolved in  $C_2H_5$ , and Zn dust is added slowly. The mass is stirred at 60° for 1 hr., cooled and HCl and Zn dust are added, after some hrs. the transformation to 1-methyl-2-carbamyl-5-chlorobenzene-3-mercaptan is complete. This is dissolved in NaOH soln. and condensed with monochloroacetic acid, giving 1-methyl-2-carbamyl-5-chlorobenzene-3-thioglycolic acid, m. 172-4°. When boiled with dil. NaOH soln. the amino group is split off and 1-methyl-2-carboxy-5-chlorobenzene-3-thioglycolic acid, m. 166°, is obtained. The prepn of 1-ethoxybenzene-4-carbamyl-3-thioglycolic acid, m. 208-10°, 1-ethoxy-4-carboxybenzene-3-thioglycolic acid, m. 218°, 4-chlorobenzene-1-carbamyl-2-thioglycolic acid, m. 206°, and 4-chloro-1-carboxybenzene-2-thioglycolic acid is also described.

***o*-Acylbenzoic acid compounds.** JOHN M. TINKER and IVAN GUBELMANN (to Newport Co.). U. S. 1,713,569, May 21. In producing *p*'-chloro-*o*-benzoylbenzoic acid from the reaction mass resulting from the condensation of phthalic anhydride with PhCl in the presence of  $AlCl_3$  and contg. an org. Al compd. and an excess of PhCl, or in the similar production of other aromatic acylbenzoic acid compds., the reaction mass is charged into cold water, maintained at a temp. of about 25° and allowed to form a 3-layer system including an upper aq. layer contg. most of the  $AlCl_3$ ; this aq. layer is sepd., and the remaining 2-layer system is made alk. and subjected to steam distn. Numerous details of procedure are described.

**Benzoic acid from phthalic anhydride and similar reactions.** ALPHONS O. JAEGER (to Selden Co.). U. S. 1,714,956, May 28. Phthalic anhydrides or their derivs. such as esters or other dicarboxylic acids or their derivs. are passed over catalysts which favor the splitting of carboxy groups in the presence of H, H-contg. or other reducing gases, such as illuminating gas, natural gas, etc., or vapors, such as MeOH, Me formate, etc. Good yields of the corresponding monocarboxylic acids or their derivs. are obtained and there is practically no loss, for the H or reducing gases can be recirculated and any unreacted polycarboxylic acid substance can be easily sepd. from the monocarboxylic acid substance formed and reused. The products obtained will vary with the ratio of H or other reducing gases, the reaction temp., time of contact and with the catalyst. Thus it is possible to obtain from phthalic anhydride a high percentage of benzoic acid under suitable conditions and in some cases the only by-products are small amts. of benzaldehyde and occasionally benzyl alc., which can be readily sepd. Under suitable reaction conditions, and with catalysts which favor reduction, larger proportions of aldehydes and other reduction products are obtained. Numerous examples and details are given.

**Acetic acid.** SOC. ANON. DES DISTILLERIES DES DEUX-SEVRES. Brit. 300,246, Nov. 10, 1927. In extn. of HOAc from its aq. solns. by a solvent such as AmOAc having a b. p. higher than HOAc but below 150° followed by the dehydration of the ext. by distg. with an entraining liquid such as EtOAc, as described in Brit. 296,974 (C. A. 23, 2449), the heating of the liquids in the column in which the entraining liquid and water are distd. off is effected by heat of the vapor of HOAc from the still in which it is sepd. from the solvent. Various details of app. are described.

**Concentrating acetic acid by multiple stage distillation.** HERMANN SUIDA. U. S. 1,715,313, May 28. Aq. HOAc soln. is distd. in successive stages at successively decreasing pressures, and the resulting mixed HOAc and  $H_2O$  vapors from each stage are subjected to extn. with an extn. agent such as described in U. S. 1,621,441 (C. A. 21, 1464) or U. S. 1,624,810 (C. A. 21, 1819) of higher b. p. than HOAc; the ext. is



drawn off and the water vapors substantially freed from HOAc, from each stage, are used for heating the dil. HOAc soln. in the next succeeding stage. An arrangement of app. is described. Cf. C. A. 23, 2449.

**Purifying sulfonic and naphthenic acids.** NAAMLOOZE VENNOOTSCHAP DE BATAAFSCHE PETROLEUM MAATSCHAPPIJ. Brit. 300,264, Nov. 11, 1927. Purification is effected by pptn. from their aq. solns. either in the form of the acids themselves or of their salts by adding a volatile electrolyte such as HCl, HNO<sub>3</sub>, HOAc or NH<sub>3</sub>; impurities remain in soln. Various details and examples are given.

**Acid anhydrides.** CONSORTIUM FÜR ELEKTROCHEMISCHE INDUSTRIE GES. Fr. 652,078, April 2, 1928. Carboxylic acid anhydrides are prepd. from a vinyl ester and a carboxylic acid by heating them in the presence of H<sub>2</sub>SO<sub>4</sub>, H<sub>3</sub>PO<sub>4</sub>, benzenesulfonic, sulfoacetic or other acid, and an acid salt or neutral salt such as Hg<sub>2</sub>SO<sub>4</sub>. AcH formed may be sepd. by distn. The reaction may be made continuous. Mixed anhydrides such as acetopropionic anhydride from vinyl acetate and propionic acid and butyroatetic anhydride from vinyl butyrate and AcOH may be prepd.

**Catalysts for methanol synthesis.** BRITISH CELANESE, LTD., W. BADER AND S. J. GREEN. Brit. 300,142, May 2, 1927. Catalysts for MeOH synthesis are prep. by pptg. ZnCO<sub>3</sub> in gelatinous form, washing and drying the ppt. so that it retains its colloidal state, and heating the gel at a temp. not exceeding that employed in the MeOH synthesis. Protective colloids also may be used and various details and examples are given.

**Glycerol.** J. W. LAWRIE (to E. I. duPont de Nemours & Co.). Brit. 300,254, Nov. 11, 1927. In effecting distn. by atomizing glycerol slop in the presence of a hot gaseous medium, the surface of the still in contact with the glycerol is formed of material not having a more active catalytic action on the glycerol than that of the solids normally present in the slop. Cu, Al, "monel metal" or enameled surfaces may be used.

**Acetaldehyde.** WILLY O. HERRMANN and HANS DEUTSCH (to Consortium für Elektrochemische Industrie). U. S. 1,714,783, May 28; Fr. 651,728, Mar. 24, 1928. See Brit. 288,213 (C. A. 23, 609).

**Chloroacetaldehyde.** I. G. FARBENIND. A.-G. Brit. 299,722, Oct. 28, 1927. Chloroacetaldehyde, produced as described in Brit. 299,319 (C. A. 23, 3235) may be sepd. from the aq. HCl produced by a single distn. after bringing up the HCl in the soln. to 20% by adding or forming HCl in the soln. A 70–80% concn. of chloroacetaldehyde may be obtained in a suitable column still and by passing the vapors leaving the column over CaCl<sub>2</sub> at 100° the chloroacetaldehyde may be obtained pure and in 85–90% yield. The residue is distd. without a column and introduced into the next operation.

**Formaldehyde sulfoxylate.** CURT SCHUMANN, EDUARD MÜNCH, OTTO SCHLICHTING and BRUNO CHRIST (to Grasselli Dyestuff Corp.). U. S. 1,714,636, May 28. Formaldehyde bisulfites are subjected "under energetic conditions" and in the presence of a hydrogenating catalyst such as Ni on kieselguhr to the action of a reducing gas, e. g., H under 120 atm. pressure at 50° for 40 hrs. U. S. 1,714,637 specifies production of aldehyde sulfoxylates contg. at least 2 C atoms in a similar manner from the corresponding aldehyde bisulfites.

**Acetone.** CONSORTIUM FÜR ELEKTROCHEMISCHE INDUSTRIE GES. Brit. 299,720, Oct. 29, 1927. HOAc vapor is passed over a catalyst such as one comprising a Ce compd., at such a speed that only part of the HOAc can be converted into acetone; unchanged HOAc may be sepd. from the acetone and returned to the process. Inert gases such as steam, CO<sub>2</sub> or N also may be added and the increased heat consumption may be compensated for by preheating the HOAc vapor to about 300°. Cf. C. A. 23, 3235.

**Flavanthrone.** WILLIAM SMITH and JOHN THOMAS (to Scottish Dyes, Ltd.). U. S. 1,714,249, May 21. A 1-halo-2-anthraquinonyl urethan compd. such as a 1-chloro-compd. is converted into flavanthrone by heating with finely divided Cu.

**1-Phenylbenzanthrone, etc.** WILLY TRAUTNER, ROBERT BERLINER and BERTHOLD STEIN (to Grasselli Dyestuff Corp.). U. S. 1,713,571, May 21. 1-Phenylbenzanthrone is formed by heating cinnamylideneanthrone (suitably in the presence of an inert liquid of high b. p. such as a molten mixt. of KOAc and NaOAc) to a temp. of about 250°. The 1-phenylbenzanthrone crystallizes from glacial HOAc or from PhCl as yellow needles, m. 181°. Substituted cinnamylideneanthrones such as  $\alpha$ - or  $\beta$ -chloro, methyl or hydroxy derivs. react likewise by heating to 250–260° in presence or absence of a solvent or suspension agent to form the corresponding 1-phenylbenzanthrone compds.

**10-Phenylbenzanthrone, etc.** ROBERT BERLINER, BERTHOLD STEIN and WILLY TRAUTNER (to Grasselli Dyestuff Corp.). U. S. 1,713,591, May 21. By treating

1-phenylbenzanthrones (which may be produced as described in U. S. 1,713,571; cf. preceding abstr.) with an acid condensing agent (such as with anhyd.  $\text{AlCl}_3$  and  $\text{NaCl}$  at 100–150°), isomeric compds. are obtained. The 10-phenylbenzanthrone forms yellow needles, m. 199–200°.

**Amyl chloromalonamide.** ARTHUR W. DOX (to Parke, Davis & Co.). U. S. 1,713,822, May 21. This compd. is a white cryst. substance, m. 134–5°, has powerful sweetening properties, and may be made by a three-stage process with intermediate production of ethyl amyl malonate and amyl malonamides.

**Condensation products of the benzanthrone series.** GEORG. KRÄNZLEIN and MARTIN CORELL (to Grasselli Dyestuff Corp.). U. S. 1,714,677, May 28. By heating benzoates of 2-hydroxy- or 2,6-dihydroxynaphthalenes to a temp. between about 100° and about 200° in the presence of  $\text{AlCl}_3$  while introducing O, new condensation products are obtainable. With the benzoate of  $\beta$ -naphthol there is obtained  $\alpha$ -hydroxybenzanthrone; with the dibenzoate of 2,6-dihydroxynaphthalene the hitherto unknown 1,6-dihydroxy-3,4,8,9-dibenzopyrenequinone is obtained.

## 11—BIOLOGICAL CHEMISTRY

PAUL E. HOWE

### A—GENERAL

FRANK P. UNDERHILL

**Ricinus lipase.** I. (a) Hydrolysis of esters and of beeswax. (b) Hydrolysis of carbohydrates. A. PIUTTI AND E. DE CONNO. *Ann. chim. applicata* 18, 468–78 (1928).—An industrial prepn. hydrolyzes, not only glycerides, but also, almost quantitatively, other esters and to some extent, sucrose and starch. Cf. following abstr. B. C. A.

**Ricinus lipase.** II. Hydrolysis of lecithin. A. PIUTTI AND E. DE CONNO. *Ann. chim. applicata* 18, 512–20 (1928).—Using *Ricinus* lipase as furnished by the "Sirio" soap and perfume manufacturers, the authors were unable to hydrolyze lecithin to more than about 25%, although the seeds of *Ricinus* plants will complete the hydrolysis. Evidently, the manufd. product lacks something which the natural product has. This may be the glycerophosphatase of Plimmer. III. Hydrolysis of phytin. *Ibid.* 520–7.—Phytin was hydrolyzed with the manufd. *Ricinus* lipase and the amt. hydrolyzed detd. by means of P detns. The hydrolysis only proceeded to about 2%. On repeating with freshly prepd. lipase, the hydrolysis was only about 1%. On repeating again with the *Ricinus* seeds the hydrolysis was 5.7%, indicating the presence of phytase. Cf. preceding abstr. A. W. C.

**Relations between chemical constitution and physiological properties.** S. BERLINGOZZI. *Giorn. chim. ind. applicata* 10, 555–7 (1928).—A review of recent work on this subject as well as a brief summary of methods of analysis of pharmaceutical products.

A. W. CONTIERI

**Biological properties of the protein constituents of serum.** II. Hemolytic properties of albumin and globulin from hemolytic serum. V. SCAFFIDI. *Riv. patol. sper.* 3, 265–70 (1928); *Physiol. Abstracts* 13, 569.—The hemolytic properties are retained in the albumin fraction, not in the globulin of the serum. H. L. D.

**Preparation of the crystalline potassium salts of hydroxyhemin.** A. HAMSÍK. *Z. physiol. Chem.* 182, 117–24 (1929).—Crystals of the tri-K salt of  $\alpha$ -hydroxyhemin are readily obtained by suspending  $\alpha$ -hydroxy- or  $\alpha$ -chlorohemin in MeOH, then adding sufficient KOH in MeOH to effect soln. and finally an equal vol. of 20% KOH in MeOH. After 6 hrs. the crystals are filtered and washed with MeOH- $\text{Et}_2\text{O}$ . Only the  $\alpha$ -modification of chloro- or hydroxyhemin gives a good yield of the K salt; the  $\beta$ - and pseudo-forms give smaller yields and the crystals are indistinct. In the transition from  $\alpha$ - to  $\beta$ - or pseudo-form it is probable that the 3rd active H and especially the further less active H atoms are lost. The more feebly active H atoms are probably necessary also for anhydride formation and for Cl linkage, since only the  $\alpha$ -modification can form anhydride or bind Cl firmly. They probably function also in protoporphyrin formation, since the pseudo modification yields no protoporphyrin. The  $\beta$ -modifications in many instances appear to be mixts. of  $\alpha$ - and pseudo-forms. A. W. DOX.

**Fractionation of the partial hydrolyzates of proteins.** K. FELIX AND A. LANG. *Z. physiol. Chem.* 182, 125–40 (1929).—An exchange of bases is readily effected between the salts of diamino acids and the Na of permittite. These substances behave as mono-acid bases and the extent of exchange is detd. by the abs. amt. of base present and not

by the concn. of the soln. With arginine, an equil. was reached in 5 hrs. at 32°, where more than  $\frac{1}{2}$  of the org. base had been exchanged, 80% of this reaction having occurred in the first 10 mins. In the equation,  $[(b-x)/x] [(a-x)/x]^\beta = K$ ,  $a$  = initial quantity of arginine,  $b$  = Na present in permutite,  $x$  = ions of each exchanged. Expressed in logarithms, the equation becomes

$$\log \frac{b-x}{x} = \beta \left( \log \frac{x}{a-x} \right) + \log K.$$

By plotting the values of  $\log \left( \frac{b-x}{x} \right)$  as ordinates and those of  $\log \left( \frac{x}{a-x} \right)$  as abscissas, the curve obtained is a straight line, the tangent of whose angle of inclination toward the abscissa gives the value for  $\beta$ . The const.,  $K$ , represents the point of intersection of the curve with the ordinate. The curves for different substances vary according to the angle  $\beta$  and the const.  $K$ . Values detd. for  $\beta$  are:  $\text{NH}_4$  0.717, arginine 0.6055, histidine 0.3075, ornithine 0.2652; and for  $K$ : histidine 54.2, arginine 45.8, ornithine 42.02,  $\text{NH}_4$  0.61. The smaller the value of  $K$  the more easily is the exchange effected. Thus,  $\text{NH}_4\text{Cl}$  easily expels any of the histone bases from the permutite. From a mixt. of arginine and ornithine, the latter is taken up more readily by the permutite and a fair sepn can thus be effected. The amt. of absorption is measured by Kjeldahl N detn. of the soln. before and after shaking with permutite. An attempt was made to fractionate a peptic hydrolyzate of gelatin by successive filtrations at  $p_H$  6.7 through 50 g. portions of permutite. After the 8th filtration no further absorption occurred. Each fraction was then extd. from the permutite by satd.  $\text{KCl}$  and analyzed. Although no fraction represented an individual substance, the compn. of the various fractions differed considerably, especially as regards the relative amts. of arginine, histidine and lysine contained therein.

A. W. DOX

**Hemin compounds.** RAPHAEL ED. LIESEGANG. *Pharm. Zentralhalle* 69, 497-9 (1928).—The functions of hemin in respiration are discussed in connection with Warburg's and other investigators' views on the subject of hemoglobin and globin. Attention is directed also to the combination of hemin with nicotine as being an example of a true catalyzer, whereas hemoglobin (hemin + globin) really functions as a transport agent rather than as a catalyzer.

W. O. E.

**Biophysical chemistry. I.** VICTOR COFMAN. *J. Chem. Education* 6, 858-67 (1929)

W. D. LANGLEY

The effect of local changes in temperature on gas tensions in the tissues. H. C. BAZETT AND L. SRIBYATTA. *Am. J. Physiol.* 86, 565-77 (1928).—Gas mixts. (20 cc.) were injected under the skin of the forearm, the arm was immersed to the elbow in water at varying temps. and samples of gas were removed from time to time for analysis. The effect of temp. on equil. conditions of  $\text{CO}_2$  and  $\text{O}_2$  was considerable.

J. F. L.

The effect of local changes in temperature on blood from the hand veins. L. SRIBYATTA AND H. C. BAZETT. *Am. J. Physiol.* 86, 578-86 (1928).—Blood drawn from the veins of the hand, after immersion of the arm in water at varying temps., was analyzed for  $\text{O}_2$ ,  $\text{CO}_2$  and  $p_H$ . The gas tensions, calcd. from the blood data, agreed roughly with those in the tissues as detd. by the gas-equil. method (preceding abstr.). The cooling of a limb caused the blood to have a much lower  $\text{O}_2$  tension, a lower  $\text{CO}_2$  tension, and a slight shift in acidity toward the neutral point.

J. F. LYMAN

Changes in the blood resulting from mechanical obstruction of the hepatic veins. J. P. SIMONDS AND W. W. BRANDES. *Am. J. Physiol.* 86, 623-7 (1928).—When the outflow of blood from the liver was blocked by mechanically constricting the hepatic veins, blood pressure fell 40-60 mm.; blood concn. decreased about 11%, with a gradual increase back to normal at the end of 15 mins.; coagulation time decreased followed by an increase upon release of the constriction; blood sugar fell about 42% during constriction for 15 mins. with a rapid rise on release.

J. F. LYMAN

The effects of bicarbonate buffers and of carbon dioxide on the motor functions of the excised small intestines of rabbits. TORALD SOLLMANN, W. F. VON OERTINGEN AND Y. ISHIKAWA. Western Reserve Univ. *Am. J. Physiol.* 86, 661-74 (1928); cf. *C. A.* 22, 3424.—The addn. of  $\text{NaHCO}_3$  in Locke's soln. up to 0.08% stimulated the muscles of rabbit's intestine placed therein. Bicarbonate stimulation was due to  $\text{HCO}_3$  ions and independent of  $p_H$ .  $\text{CO}_2$  addns., within the  $p_H$  range of 8.2 to about 6.8, had but little effect on intestinal movements. Serious depression began at about  $p_H$  6.4 and arrested movements occurred generally between 6.2 and 6.0.

J. F. LYMAN

Water retention under low barometric pressure. C. S. SMITH. *Am. J. Physiol.* 87, 200-7 (1928).—A fall in barometric pressure of 2.6 to 9.8 cm. Hg during a period of

12 to 48 hrs. was accompanied by a retention of  $H_2O$  in the bodies of dogs and rats subjected thereto.

**J. F. LYMAN**  
The difference in osmotic concentrations between egg yolk and white of egg. **JAN STRAUB.** *Rec. trav. chim.* 48, 49-82(1929).—The f. p. of egg yolk is  $-0.60^\circ$  and of egg white  $-0.45^\circ$ . The concns. of Na, K, Cl, lactate and other univalent ions, glucose and unknown undissocd. mols. were detd. in egg yolk and white and found to be different and to bear no const. ratio to each other in the different parts of the egg. The calcn. and measured f. p. depressions agree. If the white and yolk of the egg were in equil., an osmotic pressure of 1.8 atm. must exist across the membrane dividing the 2 parts. This is a greater mech. pressure than the membrane can stand without rupture so the 2 cannot be in equil. The osmotic concn. of the egg did not alter, however, on keeping 42 days. A stationary state is suggested to exist which is maintained by the continual performance of work by the oxidation of glucose. The energy required is 0.01 calories per day. When the egg is killed by freezing or poisoning, the osmotic pressures inside and outside the egg yolk tend to become equal. The mechanism by which glucose oxidation furnishes the energy for electroendosmose to maintain the stationary state is discussed.

**J. G. McNALLY**  
Further studies on the solubility of urinary uric acid. **RUGGERO ASCOLI.** *Riv. chim. terap. sper.* 16, 33-46(1929); cf. *C. A.* 23, 163, 168.—The comparative soly. of synthetic and urinary uric acid in normal urine was studied. The  $p_H$  of fresh urine was detd. and then divided into 2 equal pts. One was continuously agitated for  $\frac{1}{2}$  hr. with an excess of uric acid (1 g. of uric acid per 100-200 cc. of urine); the other served as a control. Both portions were filtered through paper, preserved with  $CHCl_3$ , and allowed to stand 24 hrs. The formation of any ppt. was noted and the uric acid was detd. by the Folin-Shaffer method. Results: (1) Alk. and neutral urines dissolved appreciable amts. of synthetic uric acid. (2) Slightly acid urines,  $p_H$  6.5-7.0, do not dissolve any uric acid. (3) Strongly acid urines,  $p_H$  5.5-6.5, when agitated with synthetic uric acid produce a ppt. which consists of urinary uric acid, an amt. equal to about 10% of the total uric acid in the urine. (4) The amt. of synthetic uric acid which dissolves in alk. urines is not directly dependent on the  $p_H$  but is inversely proportional to the urinary uric acid content. (5) The addn. of crystals of uric acid to acid urines with a high uric acid content produces a ppt. of uric acid equal to only 7% of the total. If the uric acid in the urine existed in the form of a supersaturated soln., the addn. of the uric acid crystals should have pptd. all the uric acid dissolved in excess. Failure to do so shows that only about 7% of urinary uric acid is in a state of supersatn. (6) When the alk. urines are agitated with synthetic uric acid and treated with the U acetate reagent, a typical characteristic flocculent ppt. is formed which is distinctly different from that which is formed with normal urines. Conclusion: The difference in behavior of urinary and synthetic uric acid indicates that the 2 are chemically different; the former probably exists in some form of mol. complex with special properties. The soly. of uric acid is, therefore, governed by factors that are essentially chem.

**P. M.**  
Studies on chronaxia. II. The action of magnesium on the chronaxia of the neuro-muscle preparation. **P. S. ISRAEL.** *Boll. soc. ital. biol. sper.* 4, 84-7(1929)

**PETER MASUCCI**  
Hydrogen ions and the spinal medulla. **MICHELE MIROLO.** *Boll. soc. ital. biol. sper.* 4, 88-90(1929).—The influence of the H-ion concn. was studied on the isolated spinal medulla of *Bufo vulgaris*, Baglion's central prepn. being used. Pieces of cotton batting (1-2 mm. diam.) soaked in HCl solns. of varying concns. were applied for 30 mins. on the dorsal or ventral intumescence of the spinal medulla. The results indicate that the H ions when acting on the sensor-coördinator elements induce a const. increase of reflex excitability, and with fuming HCl this is manifested in the form of spontaneous tetany of the posterior ends of the prepn. This is followed later, if the concn. of the acid is 1-10%, by central depression and paralysis. When the H ions act on the central motor elements, even in dil. solns., they provoke a torpor of reflexes and a diminution of excitability which leads to a rapid central paralysis.

**PETER MASUCCI**  
The enzymic hydrolysis of acetyl, formyl and benzoyl derivatives of amino acids. **HIDRO KIMURA.** *J. Biochem. (Japan)* 10, 207-23, 225-50(1929).—Histozyne hydrolyzes not only hippuric acid but also benzoyl derivs. of other amino acids. The hydrolysis of various amino acid derivs. was studied by means of glycerol exts. from different organs of rabbits, pig and dog. The kidney and liver of rabbits hydrolyze hippuric acid only slightly or not at all, but do attack most vigorously the acetyl or formyl deriva. of amino acids, which are likewise hydrolyzed by exts. from various other organs. All organs of the pig hydrolyze acetyl and formyl derivs., while liver and kidney also hydrolyze hippuric acid. The pancreas scarcely hydrolyzes hippuric acid, but does

hydrolyze acetyl- or formyl-*dl*-phenylalanine much better than kidney or liver. Acetyl and formyl derivs. are well hydrolyzed by most organs of the dog, while hippuric acid is hydrolyzed only by the kidney. The optimum  $p_H$  is 7.2-6.4; there is little variation for the various acylamino acids. The enzymes that hydrolyze acetyl- and benzoyl-glycine are fairly resistant to acid or alkali, since they are destroyed after 20 hrs. in the ice box only at  $p_H$  1.2 or 12. Heating for 1 hr. at 65-70° considerably reduces their activity while at 75° it is completely lost. The addn of Na acetate or formate does not inhibit the hydrolysis of the acetyl or formyl derivs. while the addn. of amino acids, especially of *dl*- or *l*-leucine, causes inhibition. The leucine, however, has no effect on the hydrolysis of derivs. of leucine, but does affect that of glycine or phenylalanine. The acetylamino acid-splitting enzymes are best adsorbed at  $p_H$  3.4 by  $Al(OH)_3$ , but not by kaolin, and can be leached out with  $(NH_4)_2HPO_4$ . S. MORGULIS

The nature of the co-enzyme. A. P. STRUYK. *Bull. trimestr. assoc. école sup. brasseurie univ. Louvain* 29, 16-22(1929).—See C. A. 21, 2908. A. PAPINEAU-COUTURE

Odor and chemical structure. F. PIRRONI. *Rivista ital. essenze profumi* 11, 2-5(1929).—There are two osmophore groups in odorous compds., the stronger creating the type of the odor, the other the variety. The rest of the mol. has its influence, analogy of the chem. constitution often bringing with it similarity of odor; e. g., fural resembles BzH in odor; furalacrolein resembles cinnamon; and nitrothiophene resembles nitrobenzene. However, there are compds. of similar odor with completely different chem. constitutions; e. g., tertiary trichlorobutyl alc. is similar in odor to bornyl acetate; many compds. have a camphor odor; and the odor of anis, lemon, cinnamon, mint, etc., is found in many very different org. compds. Natural musk and muscone are completely different from the nitroso compds., although the odors are very similar. The entrance of a methyl group in the aromatic series does not modify the fundamental odor. Lengthening of a lateral chain changes the odor; e. g., there is no similarity in the odors of BzH and of  $PhCH_2CHO$  or those of  $PhCH_2OH$  and  $PhCH_2CH_2OH$ . In esters, increasing mol. wt. of the alc. radical causes decreasing odor. Unsatt. bonds in a mol. have a strong influence on the odor; their position is also important. R. SANSONE

The protective action of some substances on protoplasm. V. V. LEPESHKIN. *Am. J. Botany* 16, 207-18(1929).—The protective action of narcotics on the protoplasm of yeast which was affected by poisonous substances was investigated. The narcotics used were ether, chloroform, nitrobenzene and furfurol, and the poisons I,  $CHCl_3$ , and alc. All narcotics used show a protective action on protoplasm if employed in suitable concn. If the concn. is too high the harmful effect of narcotics diminishes their protective action or annihilates it completely so that the favorable action is transformed into a harmful one. The protective effect of the narcotics which possess a high dielec. const. is stronger than that of the narcotics with a low dielec. const. The substances, which penetrate protoplasm comparatively easily but are not accumulated in it, act protectively in 2 ways. They may remove water from protoplasm like other substances producing plasmolysis, and they may dissolve in protoplasm and sep. the mols. of the principal compds. of living matter from each other as do the narcotics. Consequently some protect protoplasm more than do the narcotics. Among the poisonous substances used I dissolves first in living protoplasm, and then it acts on the proteins and lipoids of protoplasm chemically. This chem. action produces a decompn. of the principal compds. of the latter which leads to death. The soln. of I in the living protoplasm of yeast has a brownish color, as compared with the yellow color of a soln. of I in  $H_2O$ . J. J. S.

Studies of heredity by means of enzyme chemistry. I. HANS V. EULER AND HAROLD NILSSON. *Arkiv. Kemi, Mineral. Geol.* 10B, No. 6, 1-6(1929).—The validity of Mendel's law is demonstrated by detns. of the catalase content of the cotyledons of germinated barley. A white variety of barley deficient in chlorophyll was crossed with barley contg. chlorophyll. A segregation resulted in which the proportion of white to green germs was about 1:3. The catalase content of these showed a consistent difference, the greater amt. of catalase being present in the cotyledons contg. chlorophyll. CORNELIA T. SNELL

The course of oxidation reactions. H. WIELAND. *Anales soc. españ. fís. quim.* 27, 181-91(1929).—The principles of biological oxidation are reviewed. The theory of dehydration is developed and its applicability to the understanding of vital reactions is represented by various examples. The biological significance of hydrogen peroxide, and the participation of Fe in intracellular oxidation and the Warburg theory are discussed. E. M. SYMMES

Susceptibility of proline peptides to enzyme hydrolysis. W. GRASSMANN, H. DYCKERHOFF AND O. V. SCHOENNEBECK. *Ber.* 62B, 1307-10(1929); cf. C. A. 22, 1984, 2381.—In continuation of the study of the specific relation between peptidases and

their substrates, prolylglycine and prolylglycylglycine were used. Both were hydrolyzed strongly by a glycerol ext. of intestinal mucosa, fairly strongly by yeast autolyzate and by glycerol ext. of pancreas. They were not acted on by dry preps. of yeast or of intestinal mucosa, by trypsin-kinase or by papain + HCN. J. J. WILLAMAN

## B—METHODS AND APPARATUS

STANLEY R. BENEDICT

**Determination of iodine in blood.** GULBRAND LUNDE, KARL CLOSS AND JOHAN HOLSR. *Norsk mag. Laegevidenskab.* 89, 500-6(1928).—Obtain 5-10 cc. blood with an instrument previously washed with citrate. Immediately syringe the blood into a measuring cylinder contg. 4 times as much 96% alc., and shake well. Then ext. with alc. in a Soxhlet app. during 4 hours. The total inorg. I is now dissolved in alc. Det. I separately in the soln. and in the residue. Both inorg. and org. I were found in all samples except for a few cases where the org. I component, which is insol. in alc., was diminished after I medication by hyperthyreosis. For detn. of total org. I the following method is necessary: Evap. the alc. ext. to dryness on a water bath. To the residue add water and shake with  $\text{CHCl}_3$ . The I is obtained in the form of "lipoid I." To the aq. soln. add  $\text{CHCl}_3$ , and a little dil. nitrite- $\text{H}_2\text{SO}_4$  mixt. or  $\text{H}_2\text{O}_2$ , by which the inorg. I is freed and can be shaken out with  $\text{CHCl}_3$ . But the nitrite- $\text{H}_2\text{SO}_4$  mixt. also removes free I from some org. combinations. In the aq. residue there still exists some org. I, in combinations which are sol. in alc., insol. in  $\text{CHCl}_3$  and undecomposed by nitrite- $\text{H}_2\text{SO}_4$ . Earlier investigators have not observed this last fraction, and have therefore reported for org. I values that were too low. A. DROGSETTI

**Blood fibrinogen determination with the interferometer.** F. KAUFMANN. *Z. ges. expl. Med.* 62, 165-83(1928).—With as little delay as possible remove the blood from a vein by means of a paraffined or a platinum-iridium needle. Place a part of it in a paraffined tube and another part in a tube contg. a small quantity of paraffin. Cover the blood with water-free liquid paraffin. The refractive indices for hirudinized plasma and native plasma are practically identical, so that either may be used. Centrifuge the tubes and use the clear plasma. Remove the fibrin by the use of a glass rod. The difference between the refractive index for hirudinized or native plasma and for the defibrinated plasma is the fibrin, and the value for each may be detd. against water or the hirudinized plasma may be placed in one path of the interferometer and the plasma serum in the other. A table must be constructed for each interferometer. The method can be made easier by using citrated plasma and pptg. the fibrin by heating at 56-57° for 5 mins. K. used isotonic Na citrate, 5 parts plasma to 1 part citrate soln. Recalcification of plasma for pptn. of fibrin gives inconst. results. The addn. of gum solns having the same viscosity as the citrated plasma acts on the Ca citrate complex and results in quant. removal of the fibrin. A bibliography is included. F. L. DUNN

**Estimation of blood sugar.** HORKHEIMER. *Pharm. Ztg.* 74, 546(1929).—After a review of the methods of Kaufmann, Glassmann and Hagedorn-Jensen, the conclusion is reached, based upon comparative expts., that the rapid method of Kaufmann yields only approx. values and should not, therefore, be resorted to in the lab.; and that the microchem. method of Hagedorn-Jensen should be given the preference. W. O. E.

**The estimation of pepsin.** W. SCOTT POLLARD AND ARTHUR L. BLOOMFIELD. *J. Clin. Investigations* 7, 45-55(1929).—A series of test tubes contg. increasing dilns. of pepsin enzyme (pepsin) are treated with a standard 2% soln. of edestin adjusted to  $p_H$  2.0. After incubation at 37° for 1/2 hr., the undigested protein is pptd., centrifuged and its quantity compared with the control tubes similarly treated. A. G.

**A note on "optimal" hydrogen-ion concentrations in colloidal gold in the Lange test.** HUGH NICOL. *J. Soc. Chem. Ind.* 48, 100T(1929); cf. *C. A.* 23, 750.—"In the present state of our knowledge too great precision would be unscientific. The results of the author's work are in agreement with what appears to be the consensus of recent opinion, that colloidal gold intended for use in the Lange test should be neutral, or, preferably, slightly alk. From the point of view of prepn. of the sol it is desirable to have it alk. If it is desired to reduce the alky., that may be effected by addn. of  $(\text{COOH})_2$  without altering the physical condition of the sol." J. A. KENNEDY

**An improved apparatus for measuring quantities of gases and vapors in experiments involving inhalation.** H. BRÜCKNER. *Arch. Hyg.* 101, 16-26(1929). E. R. MAIN

**Determination of the different nitrogenous constituents of urine by fractional precipitation with mercuric chloride.** B. LUSTIG AND B. SPEISER. *Biochem. Z.* 206, 340-59(1929).—The reaction of the urine to be analyzed is adjusted to a  $p_H$  = 5.2 by means of Kolthoff's indicator made up by mixing equal vols. of an alc. 0.2% soln. of

methyl red and 0.1% soln. of methylene blue. The urine is pptd. with  $\text{HgCl}_2$ , and the ppt. and filtrate are worked up separately. The ppt. is extd. successively with warm 0.3%  $\text{AcOH}$ , 0.5%  $\text{HCl}$  and with 1%  $\text{HCl}$  in alc. The filtrate is again fractionated by means of 50%  $\text{Na}$  acetate, and the ppt. thus formed is also extd. with warm 1%  $\text{HCl}$  and with 1%  $\text{HCl}$  in alc. In the filtrate  $\text{NH}_3$ , peptone and allantoin are detd. By analyzing the various fractions for  $\text{N}$ , the concns. of amino acids,  $\text{NH}_3$ , creatinine, pigment, etc., are detd. The method is rather involved, but it is claimed that 98–99% of the total  $\text{N}$  is thus accounted for by this procedure of fractional pptn. and extn. S. MORGULIS

The pigment analysis of urine. VII. Spectrometric determination of urobilin. M. WEISS. *Biochem. Z.* 207, 151–8(1929); cf. *C. A.* 23, 626.—With the aid of a new spectrometer and a comparison tube with a known amt. of ceribilin, the urobilin content of urine, feces and bile is easily detd. S. MORGULIS

The determination of organic acids of urine and of the equivalent bound base in small quantities of urine. FRITZ MAINZER AND ANNA JOFFE. *Biochem. Z.* 207, 167–76(1929); cf. *C. A.* 23, 1672.—The principle of this method is that of Van Slyke and Palmer's but the procedure is different. A sample of 25 cc. of urine is mixed with 0.5 g.  $\text{Ca}(\text{OH})_2$ , well shaken and allowed to stand 30 mins. before filtering. This removes phosphates and carbonates, which would interfere with the titration. The filtrate is dild. with an equal vol. of  $\text{CO}_2$ -free  $\text{H}_2\text{O}$ , and 5 cc. is measured into each of 4 similar test tubes. To each of 2 test tubes is added 0.1 cc. 1% phenolphthalein soln. and both are titrated with 0.25  $N$   $\text{HCl}$  from a microburet to the first disappearance of the red color ( $p_{\text{H}} = 8.0$ ). To each is added 3 drops of 0.1% aq. soln. of the  $\text{K}$  salt of benzenesulfonic acid-azobenzyl-aniline, and the titration with 0.25  $N$   $\text{HCl}$  is continued to  $p_{\text{H}} = 2.7$ . This point is detd. by titrating one sample to  $p_{\text{H}} = 2.6$  and the other to  $p_{\text{H}} = 2.8$ , comparing the colors with 2 samples of corresponding  $p_{\text{H}}$  made up according to MacIllvaine's system of phosphate-citric acid buffers. Two 5-cc. samples are used with the same amt. of indicator. The mean of the 2 titrations gives the amt. of 0.25  $N$   $\text{HCl}$  required for  $p_{\text{H}} = 2.7$ , and a correction of 0.05 cc. is made for the blank. The uncorrected amt. of org. acid in milliequivs. is calcd. as follows: milliequiv. = (titration cc. — 0.05)  $\times$  cc. urine/10, where the titration cc. represent the amt. of 0.25  $N$   $\text{HCl}$  required to titrate from  $p_{\text{H}} = 8.0$  to  $p_{\text{H}} = 2.7$ . To det. the base bound to the org. acid, the total amt. of 0.25  $N$   $\text{HCl}$  used previously is added to the remaining samples of the urine filtrate, and this is titrated with 0.25  $N$   $\text{NaOH}$  back to the original  $p_{\text{H}}$  of the urine. The  $p_{\text{H}}$  of the urine is detd. with the aid of MacIllvaine's  $\text{Na}_2\text{HPO}_4$ -citric acid buffers covering a range of  $p_{\text{H}}$  2.6 to 8.0. Various indicators are prescribed for the different  $p_{\text{H}}$  ranges. Albumin in the urine seriously interferes with the detn. S. MORGULIS

Studies of Van Slyke's method. L. ROSENTHALER. *Biochem. Z.* 207, 298–301 (1929).—Various org. compounds were investigated from the point of view of their reaction with  $\text{HNO}_2$  in the Van Slyke amino acid app. The results are expressed in terms of  $N$ /mol. S. MORGULIS

Determination of levulose in urine. C. I. KRUISHEER. *Biochem. Z.* 207, 441–6 (1929).—The principle of the method is destruction of aldoses by an excess of  $\text{I}_2$  in alk. soln while the levulose remains untouched (99%). After removal of the excess  $\text{I}_2$ , the levulose is then detd. titrimetrically. Ten cc. of urine with no more than 3% total sugar are measured into a 100-cc. volumetric flask, dild. with 30 cc.  $\text{H}_2\text{O}$  and 5 cc. 4  $N$   $\text{NaOH}$  and treated with 16 cc. of an  $\text{I}_2$  soln. (13 g.  $\text{I}_2$  and 15 g.  $\text{KI}$  in 100 cc.), or more, as the case may be, until the mixt. is colored brown by the excessive  $\text{I}_2$ . A few mins. later (5–7 mins.) 3 cc. 4  $N$   $\text{H}_2\text{SO}_4$  is added, and the excess  $\text{I}_2$  removed with 20%  $\text{Na}_2\text{SO}_3 \cdot 7\text{H}_2\text{O}$ , until the soln. is just barely colored. The last traces of  $\text{I}_2$  are removed carefully and exactly with 2%  $\text{Na}_2\text{S}_2\text{O}_3$ , starch being used as indicator. The soln. is now neutralized with 4  $N$   $\text{NaOH}$  to methyl orange, dild. to vol. and the levulose detd. by the usual Fehling procedure. An accuracy of 0.05% is claimed for the method, by means of which dextrose and levulose can be detd. in the same material. It has also been found that heating with  $\text{HCl}$  destroys levulose up to a certain degree, a definite concn. remaining. S. M.

A biological method for the determination of thyroid activity in animals. B. ZAVADOVSKII AND M. NOVIKOVA. *Endokrinologie* 1, 167–73(1928).—The method consists in the implantation of the thyroid from different species into axolotls. A min. dose of 30 mg. and an optimum dose of 50 mg. of thyroid were necessary to induce metamorphosis of a 4–10-g. axolotl into an amblystoma. The relative activities of various thyroids are thus tested. S. MORGULIS

The influence of temperature on the staining of blood smears. GEORG W. OCHS. *Folia Haematol.* 37, 241–57(1929).—Staining depends more on colloidal conditions than on chem. union of dye and cell protoplasm. In general, an increase in temp. increases adsorption, hence intensity of staining. This does not hold with methylene blue

or eosin, probably because the degree of dispersion decreases.  $p_H$  affects the degree of dispersion; at  $p_H$  6.0 the particles are smaller than at  $p_H$  6.8. The bibliography contains 29 titles.

JOHN T. MYERS

**Method of determining a small quantity of morphine in urine and gastric juice.** CHOSAKU WADA. *Keio J. Med.* 8, 1017-34(1928).—The morphine is extd. with  $CHCl_3$ , a definite quantity of 0.01 *N* I soln. is added, the pptd. morphine periodide filtered off and the excess I titrated with 0.005 *N*  $Na_2S_2O_3$ . This titration is compared with a blank titration on the original liquid.

K. SOMEYA

## D—BOTANY

THOMAS G. PHILLIPS

**Chlorophyll from tropical plants and its determination by means of the spectrograph.** R. H. DASTUR AND N. A. BUHARIWALLA. *Ann. Botany* 42, 949-64(1928).—Willstätter's methods of extn. were applied to various local plants of both sun and shade types, for which yields of pure chlorophyll are given. A spectrographic method is described for the detn. of the amt. of chlorophyll from a single leaf. From a study of leaves of different ages, it is concluded that chlorophyll content and water content increase in rather definite ratio to maturity; after maturity the water content decreases more rapidly than does chlorophyll content.

JOSEPH S. CALDWELL

**Chemical studies in the physiology of apples. X. A quantitative study of chemical changes in stored apples.** D. HAYNES AND H. K. ARCHBOLD. *Ann. Botany* 42, 965-1017(1928).—A rather full discussion of the difficulties incurred in the analysis of stored fruits and of the methods employed in the present work precedes the presentation of data. Two lots of Bramley's Seedling apples, one of low and one of high N content, were employed, identical portions being stored at 12° for 174 days and at 1° for 370 days; portions were removed for analysis at intervals of about 3 weeks. At 12°, the apples of low-N content lost larger percentages of water, sucrose, total sugar and alc-insol residue, and a smaller percentage of acid, than the high-N fruits. At 1° the behavior of the 2 lots was similar, but the high-N fruit succumbed to physiol. disease after 252 days. Its storage life was thus only  $\frac{2}{3}$  that of the low-N fruit. Low N and high sucrose are factors favoring long keeping. The N content of the apple is a principal factor in detg. its respiratory rate, and the ratio of loss of total respirable material to N content is closely const. in the 2 lots of fruit for proportional periods of their storage life. Exponential curves of closest fit for dry weight, total sugar, sucrose, acid, cell wall material and total respirable material are plotted for the 2 lots of apples; comparisons show close parallelism of the curves for dry weight and total respirable material in the 2 lots of fruit. In the high-N series, internal breakdown was characterized by reduction of the stored acid to a point too low to maintain the acidity of the protoplasm.

J. S. C.

**Studies on the transport of nitrogenous substances in the cotton plant. I. Preliminary observations on the downward transport of nitrogen in the stem.** E. J. MASEKELL AND T. G. MASON. *Ann. Botany* 43, 206-31(1929).—The material employed was that already employed in studies of carbohydrate transport (cf. *C. A.* 22, 1379, 3903) and included samples taken at 2-hr. intervals over 24 hrs. In the leaf N falls in amt. during the night, rising during the day. In the bark of plants bearing no bolls it increases during the night and early morning, declines at midday and rises again in the afternoon, thus following the changes in the leaf with a lag. In plants bearing bolls it varies very little from day to night. In plants from which a ring of bark had been removed, the diurnal changes of N in leaves and in bark below the ring were like those in normal plants, indicating that nitrates are transported through the wood. In plants which had flaps of bark sepd. from the wood except at the upper end, the N content was that of bark of intact plants, but was significantly lower when the flaps were severed at their upper ends. In plants which had the bark partially removed, the amts. of N in bark and wood below the constriction were reduced but not in proportion to the area removed, i. e., the rate of transport increased with reduction of the cross-section of the transporting tissues. The variation in N content of the wood in response to variations in supply and demand is about twice that in the bark.

JOSEPH S. CALDWELL

**The biological decomposition of pectin.** ARTHUR G. NORMAN. *Ann. Botany* 43, 233-43(1929).—*Bacillus carotovorus*, *B. atrosepticus*, *B. solaniasprus* and *B. subtilis* were grown upon artificial media contg. 1-2% pectin from lemons. The rate of attack was followed by making detns. of furfural and Ca pectate. All 4 organisms secrete a pectin-decomp. enzyme, destroying pectin more rapidly than the degradation products are used up. The rate of action by *B. subtilis* is much below that of the other organisms.

JOSEPH S. CALDWELL



**The transmission of inhibition through dead stretches of stem.** R. SNOW. *Ann. Botany* 43, 261-7(1929).—Seedlings of *Vicia faba* were decapitated at the epicotyl, allowed to develop 2 axillaries of the cotyledons, and one of these was decapitated, the other allowed to grow. The growing shoot inhibited development of lateral buds on the decapitated one, which was removed if the growing shoots were in turn decapitated. Inhibition continued after killing of a zone at the base of the decapitated shoot by heat. Apparently the inhibiting substance was transported downward in the growing shoot, thence upward with the transpiration stream through the dead zone to the buds of the decapitated shoot.

JOSEPH S. CALDWELL

**An investigation of the changes which take place in the chemical composition of pears stored at different temperatures, with special reference to the pectic changes.** A. M. EMMETT. *Ann. Botany* 43, 289-308(1929).—Pears of the variety Conference were stored at 12°, 5°, 4° and 1° in the years 1924-1926. The methods of analysis were those developed by Haynes and co-workers in concurrent studies on apples, pectins being detd. by the method of Carre, and the results are compared throughout with those of these authors with apples. At 12° the fruit ripened in 10-12 days; at 1° there were few indications of ripening after 180 days. The rate of decompn. of pectic substances was very closely paralleled by the rate of ripening. Formation of sol. pectin is the chief factor concerned in softening of fruit, and accounts wholly for the decrease in alc.-insol. material during ripening. Differences in keeping quality appear to be due mainly to differences in the rate of breaking down of pectic compds. Breaking down of pectins occurs more rapidly at 12°, more slowly at 1°, than in any apples thus far examd. This suggests that in low-acid fruits the process is enzymic, while hydrolysis by acids may occur in fruit of higher acidity. The general course of change in chem. compn. in storage in pears is similar to that in apples, the chief difference being that some nonpectic materials are involved in the decompn. of the cell walls in apples but not in pears.

JOSEPH S. CALDWELL

**The interaction of factors in the growth of Lemna. II. Technic for the estimation of dry weight.** M. THET SU AND ERIC ASHBY. *Ann. Botany* 43, 329-32(1929).—An elec. resistance coil is so placed within a vacuum desiccator filled with concd. H<sub>2</sub>SO<sub>4</sub>, and connected with a vacuum pump that material may be dried at 50° at a pressure of 5 mm. of Hg. By employing Pt boats enclosed in light glass phials, and weighing with a Bunge micro-balance, samples as small as 0.5 mg. dry weight may be successfully handled. **III. The interrelationship of duration and intensity of light.** ERIC ASHBY. *Ibid* 333-54. The app. described previously (*C. A.* 22, 3904) was employed in growing 4 cultures of *Lemna minor* under const. conditions of temp., nutrient supply and light intensity. One of the cultures was continuously lighted, a second for 12 hrs., a third for alternating 2-hr. periods and a fourth for 6 hrs. out of 24. Four series were run with lights varying from 350 to 1400 foot candles intensity, all at 25°. With 350 foot candles growth was greatest under continuous light; 12 hr. and 2 hr. alternate treatments showed no significant differences, and indicated unrestricted growth, but there was restriction with the 6-hr. period. With 700 foot candles, growth was much more rapid and again greatest with continuous lighting, the 12 hr. and 2 hr. alternate groups showing close similarity. At 1400 foot candles, growth was restricted and it was evident that optimum light intensity had been exceeded. The plants became yellowish green, with thickened fronds. Possible sources of error involved in the method are discussed.

JOSEPH S. CALDWELL

**Studies on the growth of root hairs in solutions. VIII. Structural and intracellular features of collards in calcium nitrate.** CLIFFORD H. FARR. *Bull. Torrey Botan. Club* 55, 529-53(1928).—An earlier paper reported upon structural responses of collard roots and root hairs to CaCl<sub>2</sub> (cf. *C. A.* 22, 1793, 3904). This reports the responses observed in Ca(NO<sub>3</sub>)<sub>2</sub>. In neutral or acid solns. of high salt concn. the aquatic root hairs are equidistant in spacing; in alk. solns. or in low salt concns. they occur in clusters. They show a much smaller range of types than do the amphibious hairs. In both aquatic and amphibious hairs the particular type developed is correlated with the concn. and the p<sub>H</sub> of the Ca(NO<sub>3</sub>)<sub>2</sub> soln. Observations of nuclear behavior in growing hairs indicate that the nucleus tends to move toward the region of most rapid growth but that its presence in such regions ultimately retards growth by interfering with lines of flow of the cytoplasm.

JOSEPH S. CALDWELL

**The absorption of carbon dioxide by the roots and its utilization in the photosynthesis of chlorophyll.** M. BERGAMASCHI. *Atti accad. Lincei* [6], 9, 238-42(1929).—Plants were transplanted after removing all leaves, and planted in soil, the upper part of the plant being in a CO<sub>2</sub>-free atm., while water rich in CO<sub>2</sub> was fed to the roots. The plants grew other leaves, and CO<sub>2</sub> detns. indicated that CO<sub>2</sub> was absorbed through the

roots. Some authors have considered that the leaves alone were concerned in the "breathing" of  $\text{CO}_2$ , but this paper indicates that the roots are effective in absorbing sufficient  $\text{CO}_2$ . A. W. CONTIERI

The behavior of "anthocyanins" at varying hydrogen-ion concentrations. B. H. BUXTON AND F. V. DARBISHIRE. *J. Genetics* 21, 71-80 (1929).—According to the reaction of colored flowers in media of varying H-ion concns., their anthocyanins can be differentiated into 2 main groups, the blue and red. The anthocyanin of the former group is an ultramarine blue at  $pH$  7; that of the latter is a vermillion red at  $pH$  3. The effect of yellow flavones upon the tints produced is considered. Tables and a colored plate are appended. FREDERICK G. GERMUTH

The initiation and acceleration of protoplasmic streaming by means of optically active amino acids. HANS FITTING. *Jahrb. wiss. Botan.* 70, 1-24 (1929).—Protoplasmic streaming was induced or accelerated in the cells of *Vallisneria* plants when the latter were placed in solns. of optically active amino acids. Similar responses, although to a lesser degree, were obtained with certain non-optically active forms of the same acids. The slightly pos. action of the non-optically active acids was regarded as being due to the presence of small quantities of the optically active forms as impurities in the synthetic acid salts. A. E. HITCHCOCK

The influence of moist habitats on the sugar content of plants. V. S. IL'IN. *Planta, Abt. E., Z. wiss. Biol.* 7, 59-71 (1929).—The same species of plants growing in wet and dry habitats had different amts. of sugar, a high sugar content being correlated with a dry habitat. Leaves of *Ficus carica*, *Hedera helix* and *Quercus ilex* showed the max. differences in sugar content (4.8 to 7.7%) under external conditions of max. and min. moisture. Percentage values were based on 100 cc. of expressed juice. A. E. HITCHCOCK

Nitrogen exchange in green plants. HORST ENGEL. *Planta, Abt. E., Z. wiss. Biol.* 7, 133-63 (1929).—When the N supply was cut off from *Callisia*, *Tradescantia* and corn plants, analyses showed a decrease in protein and amide N, and an increase in amino N. The N needs of young leaves were supplied in the form of amino N from protein reserves in old leaves. As a result of this protein decompn., the old leaves yellowed and died prematurely. Similarly, the growing regions of roots received the necessary sol. N from older portions of the root. The suggested course of decompn. is as follows: protein N  $\rightarrow$  amino acids  $\rightarrow$  asparagine  $\rightarrow$   $\text{NH}_3$   $\rightarrow$  inorg. N. A. E. HITCHCOCK

Nitrogen metabolism in underground storage organs. R. GRÜNTUCH. *Planta, Abt. E., Z. wiss. Biol.* 7, 388-420 (1929).—N metabolism was followed in the underground storage organs of *Solanum tuberosum*, *Helianthus tuberosus*, *Dahlia variabilis*, *Asparagus officinalis* and several other plants under different conditions of growth. Total N in these organs varied not only in different plants, but also in the same plant at different stages of development. In spite of this variation the ratio (protein N:sol. N) remained nearly const. On the basis of these results, the physiol. function of vegetative storage organs still remains obscure. A. E. HITCHCOCK

The fixation of atmospheric nitrogen by *Phoma radialis callunae*, including a new method for investigating nitrogen fixation in microorganisms. W. NEILSON JONES AND M. LLEWELLYN SMITH. *Brit. J. Exptl. Biol.* 6, 167-89 (1928).—Chem. analyses of seeds of *Calluna vulgaris* and of seedlings grown on a N-free medium show this plant can use sufficient N from the air to prevent nitrogen starvation. A new app. for the study of N fixation by microorganisms is described. The mycorrhizal fungus of *C. vulgaris* has been grown in pure culture on a N-free medium with and without a supply of mol. N. The amounts of glucose used and N present at the end of an expt. were greater when mol. N was available. C. M. McCAY

The imbibing power of various varieties of rye and wheat. FRANZ HUEBER. *Fortschr. Landw.* 4, 97-100 (1929).—The osmotic pressure of the seedlings of the varieties of wheat tested varied from 23.45 to 34.5 atm.; rye seedlings varied from 27.5 to 34.5 atm. Varieties adapted to heavy soils and those adapted to dry conditions had high osmotic values. LAWRENCE P. MILLER

Investigations on the potash and phosphorus intake of grains in the seedling stage. TH. SCHRADER. *Fortschr. Landw.* 4, 230-3 (1929).—Studies with varieties of rye, wheat, barley and oats, by the method of Neubauer (*C. A.* 18, 877), led to the following conclusions: In nutrient content and intake the varieties show characteristic differences. These differences are brought out in vegetative development as well as by chem. analyses. Varieties that grow rapidly take up the available nutrients in a shorter time than more slowly growing varieties. Potash is taken up more quickly than P. L. P. M.

Transformation of acetic acid into pyruvic and fumaric acids by *Mucor stolonifer* and a method for the separation and determination of these acids. VL. S. BUTKEVICH

AND M. V. FEDOROV. *Biochem. Z.* 207, 302-18(1929).—In expts. where pyruvic, malic, lactic or tartaric acids were acted upon by *Mucor stolonifer* in the presence of  $\text{CaCO}_3$  there was no evidence of a formation of fumaric acid. On the contrary, in expts. where glycerol was used much fumaric acid appeared. Ehrlich's failure to find fumaric acid in cultures contg. glycerol is shown to be due to the fact that he did not use any  $\text{CaCO}_3$ . When the mold was acting on AcOH in the presence of  $\text{CaCO}_3$ , both pyruvic and fumaric acids appeared in large quantities, amounting to 15-30% of the acetic acid consumed. The results are different from those obtained with sugar in that the pyruvic acid is greatly in excess, making up 80-90% of the total amt. of ether-sol. acid produced, whereas in expts. with sugar the pyruvic acid rarely exceeds 10%. These exptl. results support Thunberg's and Wieland's dehydrogenation theory. The appearance of pyruvic acid in various fermentation processes is thought to be possibly due to the formation of AcOH. If sugar is added to the AcOH acted upon by the mold, the process of acid formation is accelerated and the proportion of the 2 acids is shifted in favor of the fumaric acid. This suggests the possibility that the transformation of sugar to fumaric acid goes through a pyruvic and acetic acid stage, but this idea needs further exptl. corroboration. Pyruvic acid can be sepd. from a mixt. with fumaric acid by means of  $\text{KMnO}_4$ , the titration with  $\text{KMnO}_4$  also serving for the detn. of fumaric acid. The same is true, of course, for mixts. of fumaric acid with other substances which do not react with  $\text{KMnO}_4$ .

S. MORGULIS

The ammonia nutrition of higher plants. D. N. PRYANISHNIKOV. *Biochem. Z.* 207, 341-9(1929).—In a neutral medium  $\text{NH}_3$  gives better results while in an acid reaction nitrate is the better source of N for plants. Not only by a change in H-ion concn., but also of other cations in the nutritive medium, the nutrition of the plant can be so altered that its optimum development will result either from  $\text{NH}_3$  or from  $\text{NO}_3$  nourishment. The carbohydrate content plays the most important role as the inner condition, and the greater this is the larger is the amt. of  $\text{NH}_3$  tolerated by the plant which quickly changes this to amide in the production of asparagine or glutamine. Not only excessive nitrogenous nourishment, but everything interfering with the synthesis of org. matter (too much acid in medium, anesthetics) can produce ammonia poisoning in plants.

S. MORGULIS

Report on (the determination of) plant (constituents). O. B. WINTER. *J. Assoc. Official Agr. Chem.* 12, 193-4(1929).—A microchem. method has been developed by which Fe and Al can be pptd. as phosphates, the Fe and Al sepd., and each detd. colorimetrically. In the hands of 3 analysts the method gave results which fell within a range of approx. 5% error. The details of the method will be published later. A. P.-C.

Report on (the determination of) total chlorine in plants. DORIS H. TILDEN. *J. Assoc. Official Agr. Chem.* 12, 195-200(1929); cf. *C. A.* 22, 2768.—The results of collaborative detns. of Cl in plant material based on methods involving incineration with  $\text{Na}_2\text{CO}_3$  as a fixative for Cl indicated that the modified gravimetric (pptg. in the cold with a slight excess of  $\text{AgNO}_3$ , shaking till the ppt. becomes granular, letting settle and washing by decantation before transferring to the Gooch crucible, keeping the pptn. flask covered with a black cloth as far as possible during the manipulations), Gay-Lussac and Volhard methods are equally reliable and accurate. Results showed wide variations with the same sample soln., possibly because of the presence of too large an amt of org. solids. Methods for the detn. of Cl in plant material involving wet ashing or the "open Carius method" have so far proved unsatisfactory on account of the difficulty of removing all the org. matter prior to making the back titration with KCNS.

A. PAPINEAU-COUTURE

The influx of nutritive salts from the outflow and inflow water relative to the sprout and root mass and the leaf structure. I. II. JOSEF KISSER. *Anz. Akad., wiss. Wien* 64, 29-30(1927).—The plant *Triticum vulgare* was placed in distd.  $\text{H}_2\text{O}$  in solns. of the c. p. nutrient salts. The anions were const. Thus the attained results occurred only under the influence of the cations, and the influence of osmosis was eliminated by the use of dil. solns. With 100 g. masses the transpiration decreased with Mg, K and Na nutrient. Considering the  $\text{H}_2\text{O}$  adsorption, the K adsorption was greatest and less for Ca, Mg and Na. By an increase in the concn. of salt the rate of adsorption was decreased. The  $\text{H}_2\text{O}$  economy for Ca nutrient appeared especially unfavorable; the K nutrient under other conditions gave different results (when there was little root system and no root hairs). With an increased concn. of K nutrient a rapid rise was noted in sprout and root mass but with Ca nutrient there was a decrease. Each nutrient salt produced a change in the anatomy of the leaves. The Ca nutrient produced fewer hairs and stomata than distd.  $\text{H}_2\text{O}$ , the Mg nutrient more. In the K nutrient the production of hair and stomata was decreased but not in the proportion as noted with Ca

nutrient. Variations in the structure of the mesophyll and in the thickness of the bottom epidermis were noted for each salt. M. H. SOULE

**Effects of storage on alcoholic extracts of plant tissues. Amino acid changes.** JAMES E. WEBSTER. *Plant Physiol.* 4, 141-4(1929).—The effect of storage on the content in  $\alpha$ -amino acids of alc. exts. of spinach was detd. after the addn. of excess of  $\text{CaCO}_3$ . Five conditions were examd., viz., (A) spinach ext., stored in Jan., in warmth and light; (B) spinach ext. + nitrate ( $\text{KNO}_3$ ), stored as (A); (C) spinach ext., stored in Aug., in darkness; (D) spinach ext. + asparagine, stored as (C); and (E) young alfalfa ext., stored in Sept., in warmth and light. A marked decrease in amino N occurred under all 5 conditions. The mechanism of deamination is discussed. W. T.

**X-ray photography of mineral accumulations in plants.** C. L. CRUTCHFIELD. *Plant Physiol.* 4, 145-54(1929).—X-ray photography exceeds in sensitivity the microchem. methods of detecting accumulations of Al and Fe in the nodes of corn stalks (C 17, 2301). The possibilities of this method in the investigation of problems connected with translocation of salts in plants are pointed out. Six x-ray photographs showing the behavior of Ca, Fe, K and Na are reproduced. Addnl. work is in progress. W. T.

**Schloesing's experiments on the relation of transpiration to the translocation of minerals.** W. E. LOOMIS. *Plant Physiol.* 4, 158-60(1929).—The classic expt of Schloesing has been given an unjustified importance in establishing the dependence of mineral movement in the plant upon transpiration. The data are better interpreted, as showing the effects of increased  $\text{CO}_2$  rather than of decreased transpiration. W. T.

The chlorate method for the determination of nitrate N, total N and other elements in plant tissues (EMMERT) 15. Studies of certain phases of the interrelationship between soil and plant. I. Availability of mineral plant nutrients in relation to the degree of dispersion (THOMAS) 15.

## E—NUTRITION

PHILIP B. HAWK

**Growth-promoting vitamin A. I. Vitamin-A-choleic acid.** T. SHIMIZU AND T. HATAKEYAMA. *Z. physiol. Chem.* 182, 57-71(1929).—The vitamin-A prepn. was obtained from the yolks of boiled eggs by  $\text{Et}_2\text{O}$  extn., sapon. of the ext. with alc. KOH, pptn. of fatty acids by alc.  $\text{CaCl}_2$ , removal of excess Ca by  $\text{CO}_2$ , evapn. of the  $\text{EtOH}$  extn. of the residue with  $\text{Et}_2\text{O}$ , shaking the ext. successively with HCl,  $\text{Na}_2\text{CO}_3$  and  $\text{H}_2\text{O}$ , drying with  $\text{Na}_2\text{SO}_4$  and evapg. After addn. of a min. quantity of MeOH and cooling with ice, the cholesterol sepd. and was filtered off. Evapn. of the filtrate then left a dark orange-red residue. Most of these operations were carried out in an atm. of N or  $\text{CO}_2$ . For the isolation of vitamin A, Wieland's choleic acid principle was applied. The vitamin residue obtained as above was dissolved in 100 parts of abs.  $\text{EtOH}$ , a few drops of  $\text{H}_2\text{O}$  added and 4.5 parts of desoxycholic acid. The mixt. was evapd to dryness, dissolved in warm abs.  $\text{EtOH}$  and  $\text{H}_2\text{O}$  added to incipient fluorescence. On standing overnight yellow crystals of the *vitamincholeic acid* sepd., m.  $179^\circ$ ,  $[\alpha]_D^{25} 45^\circ$ . The yellow color disappears when the substance is dissolved in alkali and reappears when the substance is again pptd. out by HCl. The name *gallosterol* is proposed for the complex. The difficult soly. of the substance in abs.  $\text{Et}_2\text{O}$  or abs.  $\text{CHCl}_3$  makes it easy to sep. from free vitamin A and cholesterol. Its Na, K and Ca salts are sol. in  $\text{H}_2\text{O}$ . It contains 16.8% vitamin A and corresponds to the formula  $(\text{C}_{27}\text{H}_{46}\text{O}_4)_x \cdot \text{C}_{27}\text{H}_{44}\text{O}_2 \cdot \text{H}_2\text{O}$ . In contrast to the free vitamin it is quite stable to light and air. When *gallosterol* is boiled 40 mins. with xylene in a  $\text{CO}_2$  atm., the desoxycholic acid unites with xylene and ppts. out as the difficultly sol. xylenecholeic acid, while the vitamin A is liberated and remains in soln. Another method of sepn. is by distn. in high vacuum; with a bath temp. of  $200-50^\circ$  the vitamin distils over and by treatment of the distillate with abs. MeOH it may be obtained in crystals m.  $187^\circ$ . This substance, for which the name *vitosterol* is proposed, gives the Liebermann reaction, at first orange-red, then violet-red and finally blood-red; a distinction from cholesterol and sitosterol is that the  $\text{CHCl}_3$  soln. remains colorless. Analysis corresponds to the formula  $\text{C}_{27}\text{H}_{44}\text{O}_2$ . Addn. of I and catalytic hydrogenation both indicate the presence of 2 double linkages. The hydrogenation product was a yellow oil. Feeding expts. were performed with young mice. Addn. of *gallosterol* to a vitamin A-free diet gave normal growth. Desoxycholic acid had no toxic action when given with a complete ration, but became toxic when the ration was deficient in vitamin A. A daily dose of 0.23 mg. *gallosterol* to avitaminous mice was not sufficient to check the loss in wt. or the symptoms of avitaminosis, but 0.3-0.42 mg. per day brought about an increase in wt. and the disappearance of avitaminosis. A. W. DOX

**Recent advances in our knowledge of vitamins.** R. F. HUNWICKE. *Quart. J. Pharm.* 1, 581-9(1928); cf. *C. A.* 22, 2592.—A review. W. O. E.

**Tissue calcification under the influence of vitamin D.** C. R. H. RABL. *Deut. med. Wochschr.* 55, 63-4(1929).—The injection of  $\text{CaCO}_3$  into white mice, accompanied by an overfeeding of vitamin D, resulted in pathological calcification of the viscera, particularly the kidneys. ARTHUR GROLLMAN

**Vitamins as factors in health and in food values. II.** HENRY C. SHERMAN, D. B. JONES, T. P. B. JONES, E. L. FISK AND C.-E. A. WINSLOW. *Am. J. Pub. Health* 19, 482-7(1929); cf. *C. A.* 22, 2399.—Progress rept. with review of the literature. J. A. KENNEDY

**Relationship between vitamin (biosterol and oryzanin) and immune body.** TOKUJI SAITO. *Sei-i-Kwai Med. J.* 47, No. 12, 81-8(1929). (In English, 4.)—No relationship was found. W. D. LANGLEY

**Hemoglobin maintenance upon synthetic diets.** DAVID L. DRABKIN AND C. STANLEY WAGGONER. *Science* 69, 480(1929).—Dogs fed on the Karr-Cowgill diet maintained hemoglobin at a const. normal level. The casein and Vitavose in this diet furnished only  $\frac{1}{4}$  as much Cu per kg. of body wt. as Hart fed to rats on whole milk diets. Addn. of  $\text{CuSO}_4$  to the diet had no effect on the hemoglobin maintenance of the dogs or on their speed of recovery after bleeding. A Cu-free synthetic diet was devised, egg albumin being used instead of casein and yeast instead of Vitavose. The growth, general appearance and hemoglobin maintenance were normal in rats on this Cu-free diet, as well as in rats fed this diet with Cu salts added. Rats that had been rendered anemic by a whole milk diet were cured by the synthetic Cu-free diet.

AMY LE VESCONTE  
**The influence of feeding on certain acids in the feces of infants. I.** A comparison of the effects of breast milk and modified cow milk on the excretion of volatile acids. JESSE R. GERSTLEY, CHI CHE WANG, RUTH E. BOYDEN AND AGNES A. WOOD. *Am. J. Diseases Children* 35, 580-9(1928).—The total titratable acidity and volatile acid content of the feces remain const. during maintenance upon breast milk. Wide variations become apparent upon shifting the diet to mixts. of cow milk. It is suggested that an unstable condition in the intestinal tract may be assoc. with the digestion of the latter food. E. R. MAIN

**The respiratory metabolism in infancy and in childhood. VIII.** The respiratory exchange in marasmus: basal metabolism. SAMUEL Z. LEVINE, JAMES R. WILSON AND GERTRUDE GOTTSCHALL. *Am. J. Diseases Children* 35, 615-29(1928); cf. *C. A.* 22, 4158.—The basal metabolic rate of undernourished infants is approx. 80 cal. per kg. per 24 hrs.; that of well-nourished infants is about 30% lower. The high rate observed for the undernourished infants does not appear to indicate the existence of an abnormal respiratory metabolism, but may, rather, be the result of a marked decrease in the reserves of metabolically inert tissue, which constitute about 30% of the body weight in well-nourished infants. E. R. MAIN

**Vitamin requirements of the nursing young. II.** The production of beriberi in the nursing young (*Mus norvegicus albinus*) associated with hemorrhages. BARNETT SURE AND S. J. SCHILLING. *Am. J. Diseases Children* 35, 811-22(1928).—Diets, which contain sufficient quantities of vitamin B to protect adult white mice, may not prevent the occurrence of beriberi or polyneuritis in their nursing young. It is suggested that deficiencies in the vitamin B content of the diets of infants may be more prevalent in this country than hitherto recognized. E. R. MAIN

**The influence of overheating on the alimentary value of cereals.** AGOSTINO CASTELLI. *Biochim. terap. sper.* 15, 425-40(1928).—In order to get accurate and comparable results, it is absolutely necessary that the heat be uniform and penetrate through the entire mass. The overheated grains, either by satd. steam at ordinary pressure for 3 hrs. or by satd. steam at  $1\frac{1}{2}$ - $3\frac{1}{2}$  atm. pressure for  $1-2\frac{1}{2}$  hrs., undergo changes which modify their nutritive value and produce in pigeons all the symptoms of exptl. beriberi. The onset of the disease is more rapid and grave when the pigeons are fed with grain autoclaved at  $1\frac{1}{2}$  atm. for  $2\frac{1}{2}$  hrs. The syndrome is similar to that shown by pigeons fed with polished rice. If at the onset of the beriberi symptoms, autoclaved grain is substituted for the polished rice, the birds show signs of a better appetite and a slight improvement manifested at times by a transitory arrest of the polyneuritic symptoms and an increase in body wt. Later, the animals succumb to the characteristic syndrome. If polished rice is substituted for autoclaved grain, the disease becomes aggravated, the animals lose wt. and their period of survival is shortened. These tests indicate that the nutritive deficiency of grain heated at  $127-128^\circ$  for  $2\frac{1}{2}$  hrs. is no greater than that observed by feeding polished rice. The syndromes caused

by both are identical. Therefore, the term "devitaminized food" applies to both decorticated grain and grain overheated within the limits necessary to cook and sterilize it.

PETER MASUCCI

**Nitrogen metabolism. III. The relation between "traceable" nitrogen and "non-traceable" nitrogen during alimentation with various proteins.** UGO LOMBROSO AND SALVATORE DI FRISCO. *Boll. soc. ital. biol. sper.* 3, 795-8(1928); cf. C. A. 22, 3911.—By "traceable" N is meant that N which administered to an animal can be accounted for by the N in the urine and feces and by the N utilized by the organism for building up its tissues; "non-traceable" N is that quantity of N not accounted for either in the excretions or in the tissues. A large part of the N unaccounted for occurs during the fasting of animals. This suggested the inquiry whether this loss is related to the chem. structure of the protein destroyed in the tissues during the fast or depends upon general conditions peculiar to the organism. On administering to albino rats a diet with casein as a base, there is at first an elimination of N in the urine and feces which corresponds to that of the diet. When there is a deficit there is also simultaneously an increase in wt. to account for this deficit. If casein is administered for longer periods, the amt. of N in the urine and feces may be about 35% lower than the N in the diet administered, with no corresponding increase of N in the organism. Somewhat similar results were obtained by feeding the rats bread (gluten plus cooked starch), ovalbumin and meat. The results indicate that the phenomenon cannot be attributed to any particular chem. structure of the protein mol., but is due to factors still unknown.

PETER MASUCCI

**Growth-producing amino acids and the milk feeding of the baby.** CESARE COCCHI. *Boll. soc. ital. biol. sper.* 4, 55-8(1929).—Cow milk was modified by removing  $\frac{1}{2}$  the casein from it and adding to it 6-8 g. per l. of lactalbumin. Babies were nourished with this for several months. The results indicated that milk poor in casein but rich in lactalbumin produces regular growth; there is a profound change in the intestinal flora which is similar in character to that observed in the breast-fed baby; more protein N is utilized than with cow milk; the fecal N is always higher in the baby fed with cow milk. It is not sufficient, therefore, to satisfy merely the min. protein needs but it is also necessary to take into account the min. lactalbumin requirements. P. M.

**Further observations on albino rats fed with egg albumin.** ANTONIO GALAMINI. *Boll. soc. ital. biol. sper.* 4, 91-5(1929).—A male rat fed exclusively on egg albumin survived 151 days. At death its wt. had decreased 42.2% from its original wt. In general, rats fed exclusively on a high protein diet showed functional and anatomical changes of the kidneys. The addn. of starch or butter to egg albumin decreased the amt. of N excreted and caused the green pigment from the urine to disappear. P. M.

**Further investigations on the influence of the feeding of iodine to pregnant sows on the weight of the litter and the development of the young pigs.** ISTVÁN WEISER AND A. ZAITSCHEK. *Fortschr. Landw.* 4, 229-30(1929).—Although conditions were such that the controls made very good growth, the addn. of small amts. of I to the diet resulted in significant increases.

LAWRENCE P. MILLER

**The demonstration of vitamin A.** H. STREUDEL. *Biochem. Z.* 207, 437-40(1929).—Exptl. evidence is given to show that substances which fail to produce the  $\text{SbCl}_3$  blue reaction nevertheless prove themselves in feeding as contg. vitamin A. This fact does not deprive the color reaction of Price and Carr of its value, but neg. results should not be taken to prove an absence of vitamin A unless this is confirmed by feeding expts.

S. MORGULIS

**The vitamin content of various grasses.** ARTHUR SCHEUNERT. *Biochem. Z.* 207, 447-57(1929).—Various pasture grasses were investigated from the point of view of their contents of vitamins A and B. The results substantiate the view that the grasses have a high vitamin A content, 0.5 g. sufficing to insure optimum growth in rats. The vitamin B content is decidedly lower and as much as 4 g. was required to secure only av. growth. The differences in vitamin content of the various grasses were slight.

S. MORGULIS

**The effect of feeding polished rice on the heat reaction of rats.** MAX REISS AND STEFAN PERÉNY. *Endokrinologie* 1, 411-8(1928).—Feeding decorticated rice has an influence on the heat phenomena manifested in the uterus and vagina of the rat, B-avitaminosis producing continuous rut in the normal rat. This does not depend upon the ovary as it occurs also in ovariectomized animals.

S. MORGULIS

**Non-consumption of vitamin B by growing chicken sarcoma.** WARO NAKAHARA AND EIICHI SOMEKAWA. *Sci. Papers Inst. Phys.-Chem. Research (Tokyo)* 10, 211-20(1929).—Livers were obtained from a sarcoma-bearing group of chickens and from an uninoculated group, all fed on a diet lacking vitamin B. The dried liver was fed to

rats losing wt. on a vitamin-B-deficient diet in amts. varying from 0.25 to 1 g. per rat per day. The same gain in wt. for those rats receiving liver from tumor-bearing chickens as in those rats receiving liver from non-tumor-bearing chickens indicates that the liver from each group of chickens is equally active in vitamin B content. Vitamin B may not be necessary for the growth of chicken tumor. N. M. NAYLOR

**Toxicity of aluminum compounds in the diet.** E. V. MCCOLLUM, O. S. RASK AND J. ERNESTINE BECKER. *Bull. soc. hyg. aliment.* 17, 65-73(1929); cf. Schaeffer, *et al.*, C. A. 22, 3686.—A criticism of the work of Schaeffer, *et al.*, not intended as a defense of alum baking powders but showing that the work of Schaeffer is not in agreement with the most recent work of American investigators. The latter have shown that under conditions approximating those of normal diet Al is not appreciably absorbed by the digestive tract, and that the presence in food of the quantities of Al salts resulting from the normal use of alum baking powders is without any great physiol. significance. Cf. following abstract. A. PAPINEAU-COUTURE

**The physiological action of alum baking powders.** G. SCHAEFFER, G. FONTÈS, E. LE BRETON, CH. OBERLING AND L. THIVOLLE. *Bull. soc. hyg. aliment.* 17, 74-87 (1929); cf. preceding abstr.—A reply to McCollum, *et al.* A. PAPINEAU-COUTURE

**Study of the antirachitic action of irradiated substances: irradiated ergosterol.** JEAN HUGUENIN. *M. D. Thesis, Paris*, 1928, 90 pp. A. PAPINEAU-COUTURE

**The effect of ultra-violet rays in rickets with studies on the lime-depositing capacity of the light.** CARL SONNE. *Arch. Phys. Therapy, X-Ray, Radium* 10, 139-49(1929).—Rats kept on rachitogenic food were prevented by ultra-violet radiation from developing rickets. Certain lines of the ultra-violet spectrum were found to be much more effective than others. Animals which had been irradiated had a higher percentage of lime in their bones than those which had not. E. H. QUIMBY

**Preliminary study of a common Porto Rican diet.** DONALD H. COOK, TRINITA RIVERA AND LUIS TORRES DÍAZ. *Porto Rico Rev. Pub. Health and Trop. Med.* 4, 253-5 (1928); cf. C. A. 22, 2397.—Rice and red kidney beans form a large part of the Porto Rican diet. A mixt. of these 2 foodstuffs proved to be inadequate for the normal growth of young rats, which after 8 weeks had gained 46 g., while the wt. of young rats kept on a complete standard diet had increased by 101 g. G. SCHWOCH

**Carotin and vitamin A.** THOMAS MOORE. *Lancet* 1929, I, 499-500.—The physical properties or selective absorption of carotin and "biosterin," a cod-liver concentrate, are entirely different and therefore preclude their identity, in spite of the fact that the minimal physiological (rat) dose of each is the same. The significance and explanations of these facts are discussed. F. B. SEIBERT

**Irradiated ergosterol.** E. H. VOLWILER. *Clin. Med.* 36, 28-31(1929).—A review. M. H. SOULE

**Germinating power, nutritive value and vitamin B content of rice kernels kept in contact with carbon dioxide and with air for 4 years.** MANTARŌ KONDŌ, SHŪZŌ MATSU-SHIMA AND TAMOTSU OKAMURA. *Proc. Imp. Acad.* (Tokyo) 5, 159-60(1929).—No changes were observed after 4 years. C. J. WEST

**Vitamins and calcium in hemodystrophies.** A. BARSOTELLI. *Arch. med. cirug. yespec.* 29, 624 (1928); *J. Am. Med. Assoc.* 92, 186.—In hemophilia and hemorrhagic purpura blood Ca increases while K decreases, but the changes are not in proportion. In the osmotic balance of the plasma quant. changes occur in the Mg and Na. R. C. W.

**The action of different pharmaceuticals on the blood pressure of the pigeon during avitaminosis.** TSUNEMICHI HAYAMA. *Imp. Univ., Kyoto. Folia pharmacol. japon.* 7, 15-6(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 47, 347.—During avitaminosis produced by feeding polished rice, the blood pressure is below normal. In this condition adrenaline acts more slowly and digitalein practically the same as in the normal animal. Acetylcholine and oryzanin produce only a slight increase or none at all. The same results follow the use of these 4 drugs during fasting. R. C. WILLSON

**Vitamin-A deficiency in Newfoundland.** W. R. AYRKROYD. *Irish J. Med. Sci.* 1928, 161-5.—The diet of the av. Newfoundlander is deficient in vitamins. The functional hemeralopia seen among them—it is not directly associated with beriberi or scurvy—is rapidly cured by foods rich in vitamin A. R. C. WILLSON

**The effect of liver on the blood-sugar level.** HARRY BLOTNER AND WILLIAM P. MURPHY. *J. Am. Med. Assoc.* 92, 1332-6(1929).—The liver fractions which are effective in the treatment of pernicious anemia have no effect on the blood sugar, while others which are ineffective in pernicious anemia have effects similar to that of liver. Diabetic patients on liver therapy for 1-12 months showed constantly lower blood-sugar levels than before liver therapy. R. C. WILLSON

LUSK, G.: *The Elements of the Science of Nutrition*. 4th ed., revised and enlarged. 844 pp. Philadelphia and London: W. B. Saunders Co.

## F—PHYSIOLOGY

F. K. MARSHALL, JR.

**The role of hemoglobin in the blood.** A. BAIRD HASTINGS. *Colloid Symposium Monograph* 6, 139-54(1928).—The physiologically important properties of hemoglobin are: (1) it reacts with O in such wise that, in the environment provided by the organism, it takes up O from the lungs and delivers it to the tissues with max. efficiency; (2) it provides the blood with 90% of its capacity to buffer acids by virtue of its constituent weak acid groups and its unique capacity to increase its acidity upon oxygenation; (3) it controls, in large measure, the distribution of diffusible ions between the serum and cells.

JEROME ALEXANDER

**The autolysis of skin.** MARIO MONACELLI. *Arch. Dermatol. u. Syphilis* 157, 31-44(1929).—Histochem. technic demonstrated the appearance of granules in human epidermis during the course of autolysis. By reason of their staining reactions they are believed to be composed of phospholipins derived from a decompn. of preëxisting lipoproteins.

B. C. BRUNSTETTER

**The amount of hormone in the pancreas of several species of animals.** SÔSHIKO TAKEUCHI. *Tohoku J. Exptl. Med.* 12, 62-74(1928).—Exts. of 25 g. portions of fresh pancreas were prepd. by (1) a  $H_2SO_4$ -alc. method or (2) a picric acid-acetone method. These exts. were assayed by the Toronto method except that rabbits of 1-2 kg. body wt. were used, and the dosages were reduced to a 1 kg. body wt. basis. The av. results expressed in rabbit units per 1 kg. pancreas and obtained by method (2) were: dog 2619, horse 1432, hog 1263, ox 916, man 843 and cat 683.

B. C. BRUNSTETTER

**The peroxidase reaction. XXIII. Development of the leucocyte peroxidase in fetal life and the early stages of infancy.** KOJI TOKUË. *Tohoku J. Exptl. Med.* 12, 281-94(1929).—In human embryos and very young rabbits the peroxidase reaction (which runs parallel to the oxidase reaction) becomes progressively stronger.

B. C. BRUNSTETTER

**The mechanism of lymph formation.** G. QUAGLIARIELLO. *Atti accad. Lincei* [6], 9, 243-9(1929).—Of the 2 theories of lymph formation, the physicochem. and the secretory, Q. favors the former. There are 2 arguments against this theory: that the Cl content of the lymph is higher than that in the plasma, and that the cond. of lymph is higher than in the plasma. Q. states that the lymph being formed by diffusion through semi-permeable membranes would naturally show greater concn. of electrolytes which diffuse more readily. As to the argument that the elements are not in chem. equil., it is pointed out that the lymph contains not only products derived from the plasma, but also those derived from the tissues, and in addn. the tissues absorb various compds. selectively, so that one should not expect a strict chem. equil. The membranes as well as the diffusing substances are in a continual state of change. A. W. CONTIERI

**The heavy metals of the human liver and their spectrographic detection.** HILDE TURNWALD AND FELIX HAUROWITZ. *Z. physiol. Chem.* 181, 176-81(1929).—The ash of normal human liver was dissolved in 10% HCl, placed between C electrodes and the arc spectrum photographed in the ultra-violet. In addn. to numerous Fe lines there were distinct lines of Cu, Zn and Mn. The lines of P, Mg and Ca were also visible. Although these elements do not interfere with the identification of heavy metals, it is best to remove them in order to obtain more concd. solns. This is done by pptg. the heavy metals as sulfides and dissolving the ppt. in 10% HCl. Since the heavy metals are suspected of performing a biological function as catalysts, the liver ext. was sepd. into 4 fractions, each of which was examd. for esterase and catalase and ashed separately for the spectrographic analyses. The bulk of the metals was present in the enzyme-free fractions. It is possible, however, that individual metals may occur in chem. compds. and are catalytically active only in some particular type of linkage. The spectrographic method does not furnish data on the existence of such compds. or their distribution between fractions rich and poor in enzymes. A. W. DOX

**The fate of diphenylene oxide in the intermediary metabolism of the rabbit.** ANAST. A. CHRISTOMANOS. *Z. physiol. Chem.* 181, 182-4(1929).—After subcutaneous injection of 7 and 8 g. of diphenylene oxide dissolved in olive oil, the rabbits excreted in the urine a considerable amt. of hippuric acid and a slightly increased amt. of BzOH as compared to the control period. Neither *o*-HOC<sub>6</sub>CO<sub>2</sub>H nor *o*-hydroxyhippuric acid was found. Evidently the (C<sub>6</sub>H<sub>5</sub>)<sub>2</sub>O breaks apart at the O-bridge, and the nucleus



carrying the O then undergoes destruction, leaving the other nucleus intact as BzOH which conjugates with glycine in the usual way. A. W. DOX

The relation of the vegetative nervous system to the action of pituitrin on fat metabolism. W. RAAB. *Z. ges. expul. Med.* 62, 366-72(1928); cf. *C. A.* 21, 3084.—The action of pituitrin on the blood fats is a reduction in the neutral fat content. The effect is weakly increased by ergotamine and not affected by atropine. The action of pituitrin on fat metabolism is through the tuber cinerium-cervical cord-sympathetic and liver. F. L. DUNN

Iodine content and the action of the thyroid secretion. EDMUND NOBEL. *Z. ges. expul. Med.* 62, 540-1(1928).—N. objects to Kreitmair's modification (*C. A.* 23, 623) of his method in detg. the amt. of thyroid material necessary to reduce the weight of 200-300 g. guinea pigs 10% in that it introduces the complications of feeding whereas N.'s method detg. the amt. necessary to produce death, and does not shorten the time of the test materially. F. L. DUNN

Enervation of the liver and the cholesterol in bile. B. E. GAISSINSKIL. *Z. ges. expul. Med.* 62, 678-87(1928).—About 23-28 mg. cholesterol per day is the normal output for dogs through a biliary fistula, and the fluctuations are not over 2-5 mg. Section of the sympathetic nerve supply increases the daily variations markedly, while section of the vagus has little effect or decreases the normal variations slightly. The output of cholesterol through the fistula does not parallel the blood cholesterol. G. emphasizes that variations in the sympathetic innervation of the liver can produce changes in cholesterol balance which are not reflected in the blood. F. L. DUNN

The chemistry of hormones. OESTERLIN. *Metallbörse* 19, 565-7(1929).—A review. W. C. EBAUGH

Results of hormone investigations. FREITAG. *Pharm. Ztg.* 74, 693-5(1929).—A brief review of results obtained during the past 40 yrs. W. O. E.

The effect of an excess of carbon dioxide in the inspired air before and after section of the vagi. Studies on the regulation of the respiration. I. SHOSETSU SASAKI. *J. Biophysics (Japan)* 2, 197(1927); *Collected Papers Physiol. and Biological Physicochem.* 4, 197-213(1928).—The respiratory changes induced by the inhalation of CO<sub>2</sub>-contg. air were tested on unanesthetized rabbits for 30-120 mins. before and after section of the vagi. With intact vagi the depth of respiration increases with more than 3% of CO<sub>2</sub>, while the frequency shows an increase with more than 5% of CO<sub>2</sub>. The CO<sub>2</sub> elimination is hindered by the CO<sub>2</sub> content in the inspired air. The O<sub>2</sub> absorption decreases also with CO<sub>2</sub> content, but its effect is less intensive than that on the CO<sub>2</sub> elimination. With both vagi divided, the frequency is not influenced by the CO<sub>2</sub> content of the inspired air, while the depth increases to its max. with more than 3% of the CO<sub>2</sub>. The CO<sub>2</sub> elimination and the O<sub>2</sub> absorption are diminished when the CO<sub>2</sub> is more than 4%. Thus Scott's conclusion (*J. Physiol.* 37, 308), that the depth of respiration is controlled by the CO<sub>2</sub> tension in the blood, while the frequency is controlled by the vagus reflex, was confirmed under conditions different from those of his expts. namely, without anesthesia and with the inspiration of CO<sub>2</sub>-contg. air for a long period. Respiration of man at rest and the effect of abnormal air breathed upon the respiration. II. *Ibid* 215-42.—Respiration expts. on a human individual showed that: The depth of respiration is augmented when the inspired air contains more than 2.5% of CO<sub>2</sub>, while the frequency is accelerated with more than 3.5%. The CO<sub>2</sub> elimination and O<sub>2</sub> absorption are depressed by an excess of CO<sub>2</sub> in the inspired air. The alveolar CO<sub>2</sub> tension has a tendency to decrease with the increased depth of respiration or else ventilation takes place spontaneously in the scope of physiol. variation. This suggests that, during the normal respiration, some factor other than the alveolar CO<sub>2</sub> tension controls the depth or ventilation, which in turn has an influence on the alveolar gaseous tensions. The alveolar CO<sub>2</sub> tension increases, when the inspired air contains more than 2% of CO<sub>2</sub>, accompanied by augmented ventilation. An insufficient O<sub>2</sub> supply excited the respiratory center to cause an augmentation of the depth of respiration, and this, in turn, results in a lowering of the alveolar CO<sub>2</sub> tension. The respiratory dead space increases when the depth of respiration increases spontaneously in the scope of its physiol. variation, or it is augmented by an abnormal content of CO<sub>2</sub> or an O<sub>2</sub> lack in the inspired air. C. R. F.

Hydrogen-ion equilibrium in the blood. III. Temperature effect on the amphoteric property of oxyhemoglobin. SATORU KATO. *J. Biophysics (Japan)* 2, 243-9(1928); *Collected Papers in Physiology and Biol. Physicochem.* 4.—If oxyhemoglobin acts as an amphoteric electrolyte, there should exist a CO<sub>2</sub> tension at which both the blood and its serum show the same H-ion concn., this being the isoelec. pt. of oxyhemoglobin. With defibrinated horse blood it was found that the  $p_H - p_{CO_2}$  curve

of the blood interests with that of the serum at the isoelec. point of oxyhemoglobin. In the range more alk. than this point, the blood is more acidic than the serum, when both are equilibrated with a common  $\text{CO}_2$  tension. In the more acidic range the relation is just the reverse. The isoelec. point of oxyhemoglobin coincides well with that found by cataphoresis. The mean  $p_H$  of this point is 6.95 at  $18^\circ$ , 6.82 at  $25^\circ$ , 6.75 at  $30^\circ$  and 6.57 at  $37^\circ$ . Thus the  $p_H$  at the isoelec. point is slightly acidic, and its deviation from neutrality increases with the rise in temp. C. R. FELLERS

**A new method of measuring the volume of the blood corpuscles.** II. KOZO HIROTA, *J. Biophysics* (Japan) 2, 283-91(1927); *Collected Papers in Physiology and Biol. Physico-chem.* 4.—In H.'s preliminary report (*C. A.* 21, 1284), corpuscular vol.,  $(V_\infty) = 1/b$ , where  $b = 0.03734$  at 2500 r. p. m. of the centrifuge, horse blood being used. Refinements in the centrifuge and calcn. of results by the method of least squares led to the establishment of the revised formula  $1/VT = a + b(t - t_1)$ , where  $t$  is the duration of centrifuging,  $VT$ , the observed corpuscular vol.,  $a$  and  $b$  are consts., and  $t_1$  is the initial time of observation. At 1500 r.p.m.,  $a = 0.3052$  and  $b = 0.03356$ ; at 2500 r. p. m.,  $a = 0.3525$  and  $b = 0.3734$ ; at 2700 r. p. m.,  $a = 0.3244$  and  $b = 0.03459$ . An error of only 0.1-0.2% was observed. The formula is not influenced by the inertia of the centrifuge. The method is applicable as well to the corpuscular suspension in a salt soln. as to the blood. Among several indirect methods which were compared, Stewart's cond. method as used by Suzue (*C. A.* 21, 1275) gave the best results although an unavoidable 5% error (too low) is always present. C. R. FELLERS

**Mode of combination of carbon dioxide in the blood.** K. HAYASI, Y. NISIMARU AND M. OKUYAMA. *J. Biophysics* (Japan) 2, 293-303(1927); *Collected Papers in Physiology and Biol. Physico-chem.* 4.—In order to det. whether or not the red blood corpuscles share in the transportation of  $\text{CO}_2$  from the blood to the lung tissues, a comparison was made of the  $\text{CO}_2$ -dissocn. curves of oxalated goat blood and plasma from the same sample of blood. The blood was brought into a Barcroft tonometer, filled with an air of a desired  $\text{CO}_2$  tension. The tonometer was slowly rotated in a thermostat at  $37^\circ$  for 10 mins. to equilibrate the blood with the gas. Then the sample was divided into 3 portions, one for  $\text{CO}_2$  content by Van Slyke's app., a second portion was passed into a Barcroft differential manometer for  $\text{CO}_2$  detn. on the whole blood, while a third portion was titrated electrometrically. The  $\text{CO}_2$  tension of the gaseous content of the tonometer was measured by means of the Haldane app. Every precaution was observed to prevent contact with atmospheric air, and to maintain body temp. The  $\text{CO}_2$ -carrying ability of the blood corpuscles is superior to that of the plasma, so that a considerable portion of the  $\text{CO}_2$  discharged from the blood in the lung is transported by the corpuscles. The supposition, that the  $\text{CO}_2$  is contained in the blood entirely in the forms of free  $\text{CO}_2$  and bicarbonate, is a mistake. A part of the  $\text{CO}_2$  is combined in an unknown form other than those mentioned above, as the exptl. data are at variance with the law of mass action applied to the  $\text{CO}_2$ -bicarbonate equil. established under the above supposition. C. R. FELLERS

**Problems of carbohydrate metabolism with special reference to the role of the liver.** F. FISCHLER. *Deut. med. Wochschr.* 55, 605-7(1929).—The chemical changes occurring during carbohydrate metabolism are discussed. ARTHUR GROLLMAN

**Amino acid catabolism.** III. The fate of the  $\omega$ -hydroxy derivatives of propionic, butyric, valeric and caproic acids in the phlorhizinized dog. RALPH C. CORLEY AND CARL S. MARVEL. *J. Biol. Chem.* 82, 77-82(1929); cf. *C. A.* 23, 2744.— $\gamma$ -Hydroxybutyric acid is a sugar former in the completely phlorhizinized dog, while hydracrylic,  $\delta$ -hydroxyvaleric, and  $\epsilon$ -hydroxycaproic acids are not. The view is supported that successive stages in the breakdown of the diamino acids may result in the acids with 1 less C, with an  $\text{NH}_2$  group in the  $\omega$  position, the corresponding  $\omega$ -hydroxy acids, and the corresponding dicarboxylic acids. ARTHUR GROLLMAN

**The role of the phospholipides of the intestinal mucosa in fat absorption.** With additional data on the phospholipides of the liver, and smooth and skeletal muscle. ROBERT G. SINCLAIR. *J. Biol. Chem.* 82, 117-36(1929).—During the absorption of fat there is a pronounced change in the compn. but not in the amt. of the phospholipide fatty acids of the intestinal mucosa and liver. There is no change in the amt. or compn. of these acids in the intestinal or skeletal muscles. It is suggested that absorbed fatty acids are transformed into phospholipide within the intestinal mucosa as an essential step in the resynthesis of neutral fat. ARTHUR GROLLMAN

**Studies of calcium and phosphorus metabolism.** II. The calcium excretion of normal individuals on a low calcium diet, also data on a case of pregnancy. WALTER BAUER, FULLER ALBRIGHT AND JOSEPH C. AUB. *J. Clin. Investigation* 7, 75-96(1929); cf. *C. A.* 23, 1171.—The neg. Ca balances were detd. on 13 normal individuals on a very

low Ca intake. It is shown that this neg. balance is an aspect of Ca metabolism which can be studied quantitatively under varying conditions. Observations in a case of pregnancy showed that the Ca excretion during gestation is essentially normal. III. The effects of the thyroid hormone and thyroid disease. JOSEPH C. AUB, WALTER BAUER, CLARK HEATH and MARION ROPES. *Ibid* 97, 137.—Patients with hyperthyroidism showed an increase of 23% in the excretion of Ca as compared to normal individuals. In myxedema, the Ca excretion was decreased. An increased Ca and P excretion also followed the administration of thyroid ext. to normal individuals. IV. The effect of the parathyroid hormone. FULLER ALBRIGHT, WALTER BAUER, MARION ROPES and JOSEPH C. AUB. *Ibid* 137-81.—In patients maintained on a const. diet contg. an inadequate amt. of Ca, parathyroid administration gradually increased the urinary Ca excretion without affecting the fecal excretion. The P level of the blood was primarily lowered by parathormone and there was an increased P excretion in the urine. N excretion was not affected nor were 2 ossifying hematomas affected by parathormone.

ARTHUR GROLLMAN

Cell and tissue potentials. K. UMRATH. *Kolloidchem. Beihefte* 28, 259-62 (1929).—A review of recent work with references.

ARTHUR GROLLMAN

The monocyte question. WILLIAM BLOOM. *Klin. Wochschr.* 8, 481-3 (1929).—A bibliographical review.

MILTON HANKE

Ovarian hormone and basal metabolism. GERTRUD KOEHLER. *Klin. Wochschr.* 8, 502-3 (1929).—Administration of ovarian hormone to patients with visible evidence of a disturbed ovarian function does not, in any case (8 cases), produce a change in the basal metabolism. The fact that it is impossible to raise the basal metabolic rate or to reduce the weight in cases of obesity that follow castration should of itself be sufficient evidence to prove that the ovarian hormone has little, or nothing, to do with these conditions. The hypophysis and the thyroid gland are probably the active agents. The obesity that follows castration is, therefore, probably not due to any direct action of the ovarian hormone but more likely due to the indirect action of the lack of this hormone upon the thyroid and hypophysis.

MILTON HANKE

Theories of hydrochloric acid formation in the stomach. FRANKLIN HOLLANDER. *J. Am. Inst. Homeopathy* 22, 311-21 (1929).—An accessory stomach (Pavlov pouch) was made in 5 dogs. By means of a catheter, the accumulated gastric juice was removed from this pouch in a period of 15 to 30 sec. This juice usually had a  $p_H$  of  $0.90 \pm 0.01$ , corresponding to 0.157 N or 0.55% HCl. Titration gave identical values for free HCl and total acidity, and a value of 0 for combined acidity. Apparently neutral chlorides were absent, and the juice was isotonic with the blood. When 2 portions of an isotonic NaCl soln. were sepd. by the skin of a recently killed frog, distinct evidence was obtained that hydrolysis occurred according to the equation  $\text{NaCl} + \text{H}_2\text{O} = \text{NaOH} + \text{HCl}$ . The HCl was transported to one side of the membrane, while the NaOH remained on the other side and was buffered by NaCl. The hypothesis is presented that HCl is secreted into the vacuole of the parietal cell by a similar process, and is then concd. to a certain extent, by reabsorption of  $\text{H}_2\text{O}$  from the vacuole until the secretion is isotonic with the blood. A comprehensive review and bibliography are included.

JOSEPH S. HEPBURN

Passage of arsenic through placental circulation. ERNST ZIEMKE. *Deut. Z. ges. gericht. Med.* 13, 217-25 (1929).—As passes through the placental circulation to the fetus, but only in very small quantity. The placenta when functioning normally protects the fetus from excessive amts.

FRANCES KRASNOW

Observations on the hydrogen-ion concentration of the alimentary canal of the albino rat. G. R. McROBERT. *Indian J. Med. Research* 16, 545-52 (1928).—The gastrointestinal contents of normal albino rats are acid except in the lower part of the ileum where they are alk. Addn. of small quantities of tomato, lettuce or milk to food is sufficient to prevent the development of alky. The absence of vitamin B does not alter the  $p_H$  in the bowel.

F. K.

The amount of the alcohol extract according to sex from the brain of the albino rat. CHIA CHU WANG. *J. Comp. Neurol.* 47, 67-73 (1929).—The ext. is largely myelin, which is present in the brains of both sexes in the same proportion.

F. K.

Experiments with acids. W. BURRIDGE. *Quart. J. Exptl. Physiol.* 18, 1-9 (1928).—The H ion exerts 2 independent actions on the excitability of the frog heart; "a depression mediated through disorganization of Ca function and an augmentation mediated through changes of colloid aggregation." Changes of  $p_H$  between  $p_H$  8 and  $p_H$  7.0 gave only depression, the augmenting action of an acid being developed beyond  $p_H$  7.0. The actions of lactic and butyric acids were not wholly accounted for in terms of their H ion, especially when used as very dil. solns.

FRANCES KRASNOW

**Mineral composition of blood platelets and white blood cells.** G. ENDRES AND L. HERGET. *Z. Biol.* 88, 451-64(1929).—There is a close chemical relationship between the blood platelets and the white blood cells. The  $H_2O$  content as well as the quant. and qual. salt content differs only slightly. Both show mineral compn. different from the plasma and erythrocytes. Like the red cells, they contain less Na and Ca but more K than plasma. The P (inorg.) is higher and the bicarbonate low. F. K.

**Dehydration of lactic acid.** AMANDUS HAHN, E. FISCHBACH AND W. HAARMANN. *Z. Biol.* 88, 516-22(1929); cf. C. A. 23, 1654.—By means of a specific dehydrase, different from succinic acid and malic acid dehydrase, lactic acid is changed to pyroracemic acid in the presence of methylene blue. FRANCES KRASNOW

**Experimental investigation on glycogen of the internal ear of the guinea pig.** VI. The changes of glycogen in the internal ear due to the injection of insulin. HYOSAKU TANAKA. *Sei-i-Kwai Med. J.* 47, No. 12, 1-11 (In English, 1-2) (1929).—By use of histological methods, it is shown that insulin has the same effect upon the glycogen content in the internal ear of guinea pigs as upon the glycogen of the liver or other organs. VII. The post-mortal changes of the glycogen content in the internal ear. *Ibid* 12-26 (in English, 2-3).—After death of an animal, the glycogen of the internal ear disappears nearly completely within 30 mins. W. D. LANGLÄV

**The rotatory power of serum as a function of the temperature.** P. LÉCOMTE DU NOTY. *Compt. rend.* 188, 660-2; *Science* 69, 552-3(1929).—The destruction of the complement in serum heated to  $56^\circ$  is accompanied by a definite min. viscosity, suggesting a chem. change in the protein mols. The specific rotation for normal horse serum between  $0^\circ$  and  $50^\circ$  has a const. value of  $-58^\circ$  for green light. Above this temp. the rotatory power increases slowly, but above  $59^\circ$  this change is rapid. At the same time there is an obscuring of the light after a few minutes that prevents readings on a polariscope. It is suggested that the structure of the mols. changes at a rate that increases progressively with the temp. and this change corresponds with the suppression of the complement of the serum. The change in viscosity and the darkening of the polariscope reading may result from a change in dispersion and hydration of the proteins following the chem. change indicated by the increase in rotatory power. AMY LEVESCONTE

**The utilization of pentoses in the animal organism.** P. THOMAS, A. GRADINESCU, AND MILE. R. IMAS. *Compt. rend.* 188, 664-6(1929).—A detn. was made of the increase in glycogen of fasting frogs when they received varying quantities of xylose or arabinose. If each mol. of pentose furnishes 1 mol. of lactic acid which is then changed to glycogen, the max. of glycogen produced should be 54% of the pentose. Arabinose furnished 54.9% and xylose 51.24% of glycogen which is within exptl. error. More xylose than arabinose is eliminated by the kidney. AMY LEVESCONTE

**The fluctuations of the capillary blood sugar in normal young men during a twenty-four hour period (including a discussion of the effect of sleep and of mild exercise).** HARRY C. TRIMBLE AND STEPHEN J. MADDOCK. *J. Biol. Chem.* 81, 595-610(1929).—"The concn. of sugar in the capillary blood of 9 normal young men living upon their usual diet has been detd. at hourly intervals over a 24-hr. period. The following av. hourly values from 8 A. M. to 11 P. M. were found: 97, 121, 99, 101, 103, 132, 118, 113, 103, 96, 93, 130, 134, 126, 103, 99 mg. per 100 cc. In each individual the concn. was maintained at a very const. level while at rest in bed during the night. This level varied slightly with the individuals but in no case did it differ widely from the group av. of 94-5 mg. %. This was approx. the value found also as the mean concn. of sugar in the capillary blood of a much larger group of young men in the post-absorptive condition. Therefore, it is concluded that sleep does not cause a significant change in the blood sugar concn. There was some indication also that after mixed meals the capillary blood sugar returns to fasting levels somewhat more slowly than others have found after the ingestion of pure carbohydrate. Various forms of mild exercise did not produce any significant change in blood sugar. Only as the intensity of the exercise was increased markedly was any indication of an increase of sugar concn. obtained." A. P. LOTHROP

**Calcium metabolism and parathyroid hormone in different kinds of animals.** M. TRÖLLDTE. *Krankheitsforsch.* 6, 397-492(1928).—There appear to be specifically different means of regulation of the Ca metabolism in different species of animals. Parathyroid hormone, injected subcutaneously into dogs, cats and rabbits, causes a marked increase in the Ca content of the blood serum. However, the course of the increase in the Ca concn., as indicated by plotted rate curves, is uniquely characteristic for each of the animal species. A similar, but temporary, effect follows the injection of a soln. of  $CaCl_2$ . Repeated injection of the hormone into cats and rabbits did not show a

summation of effect as has been reported by Collip to occur in dogs. A decrease in galvanic sensitiveness, especially in the cathodic opening contraction, is assocd. with the increase in the Ca concn. which follows the injection of the hormone. This occurs almost simultaneously with the increase in the Ca concn. in rabbits, but is somewhat retarded in dogs.

E. R. MAIN

The contractile activity of embryonic heart transplants under normal conditions and under the influence of certain hormones. VINCENZO BISCEGLIE. *Arch. sci. biol.* 13, 53-72(1929).—The contractile activity of chick embryonic heart transplants of different age, and the change in activity caused by insulin, thyroid ext., and follicular liquid, were studied. Insulin produced a depression and aq. exts. of thyroid, an increase in activity. Follicular liquid caused a more or less rapid diminution of the frequency followed by a decrease in the intensity of the contractions.

PETER MASUCCI

The action of calcium on the endocrine glands. GIORGIO SCHREIBER. *Arch. sci. biol.* 13, 127-57; *Boll. soc. ital. biol. sper.* 4, 61-3 (1929).—Enriques and collaborators have demonstrated a correlation between endocrine activity and bone fracture and have advanced the theory that the Ca salts thrown into the circulation by osteolysis excite the endocrine system. The aim of this investigation was to explain the action of Ca on the endocrine system by injecting 1%  $\text{CaCl}_2$  soln. into guinea pigs for 8-12 days and noting its effect on the wt. and on the histological picture of the thymus, thyroid and suprarenal glands. The action of Ca on the wt. of these glands was manifested by the following facts: (1) The thymus increased in wt. in the old animals when compared with the controls. (2) The suprarenals diminished in the young but increased considerably in the adult. (3) The thyroid increased in all ages, although to a lesser degree than the other two glands. Histologically, the changes noted in the thymus indicated an increased functional activity similar to that observed in fractures; this was noted only in young animals which showed an increase in wt. In the suprarenals, the increase in wt. was directly related to the marked increase in vol. of the reticular zone, whereas the other zones remained unaltered. The increase in vol. of the reticular zone was followed by the appearance of hyperpigmentation phenomena in that same zone. Conclusion: The thymus gland, in view of the perfect analogy of its behavior in fractures and in its response to Ca injections, is stimulated by Ca; the suprarenal gland however, presents an entirely different correlative picture in fractures than it does to Ca injections.

PETER MASUCCI

Modifications of the blood while sojourning in high mountains in relation to the function of the spleen. A. CHIATELLINO AND S. GOLDBERGER. *Boll. soc. ital. biol. sper.* 4, 7-9(1929).—At high altitudes in animals deprived of the spleen the increase in red blood corpuscles is markedly greater than in the normals; the same is true with regard to hemoglobin except that the increases are not so marked. Therefore, the spleen plays a part in the functioning of bone marrow.

PETER MASUCCI

Respiratory exchange in the experimental pneumothorax and oleothorax. GIULIO CERUTI. *Boll. soc. ital. biol. sper.* 4, 17-9(1929).—The variations which the respiratory exchange undergoes as a result of the suppression of the gaseous exchange in one of the lungs obtained with the pneumothorax ( $\text{N}_2$ ), or by introducing vaseline in the pleural cavity, was detd. Dogs were used; the detn. of  $\text{CO}_2$  and  $\text{O}_2$  was made with Haldane's app. In the animals with pneumothorax, respiration increased in proportion to the pleural pressure and returned to normal as the pressure decreased. Dogs with oleothorax did not behave similarly; dyspnea persisted always. Data are also given for pulmonary ventilation and  $\text{O}_2$  consumed under various exptl. conditions.

P. M.

The action of amino acids on the blood vessels of homeotherms. GIUSEPPE RUSSO. *Boll. soc. ital. biol. sper.* 4, 44-6(1929).—The action of amino acids on the blood vessels of mammals was studied by perfusing isolated lung, kidney and heart of the dog in Locke soln. by itself and in Locke soln. plus 0.1% glycolol or asparagine. Both sets of solns. contained an equal amt. of phosphate buffer at  $p_H$  7.2. Amino acids added to perfusion fluids in concns. not much stronger than those normally found in the blood do not have any marked sp. action on the vessels.

PETER MASUCCI

The optic qualities of the vitreous humor (absorption of ultra-violet). TETSUO ABE. *Arch. phys. biol.* 6, 1-21(1927).—The natural body of  $p_H = 8.2$  presents absorption near  $\lambda$  260-270, not identical with that of the crystalline humor, 276, and of the white of egg, 276. If the vitreous humor is left to itself, the  $p_H$  increases and the absorption decreases; this is probably due to the transformation of a mucinogenous substance into mucin. At const.  $p_H$  the spectral evolution can be observed as a function of time.

A. E. MEYER

Experimental study of certain relations between the real acidity and the leucocytic reaction. TERESA SARIANO. *Rev. farm. (Buenos Aires)* [2], 2, 16-27(1929).—Leuco-

cytes were observed by injecting suspensions of carmine in liquids of detd. acidity into frogs. The liquid was withdrawn later and the leucocytes were observed by the comparative method with indicators under the microscope. The  $p_H$  of protoplasm was 8.2–8.4, of granules 7.7–7.9, of vacuoles 7–7.5. No relation exists between the acidity of the leucocytes and that of the injected liquid. The  $p_H$  of the exudate is influenced by the acidity of the injected liquid only for 48 hrs.; after that it is 8. Liquids injected at  $p_H$  9–10 contain the largest amt. of leucocytes; the best phagocytosis is obtained at  $p_H$  8–10; the best mobility is obtained at  $p_H$  10. Mobility and phagocytosis are not related.

**Hyperglobulism in voluntary apnea.** ARTURO A. BRUNO. *Rev. sud-americana endocrinol., inmunol., quimioterap.* 11, 679–81(1928).—In need of O, red corpuscles are expressed from the spleen, increasing the content in Fe and cells in the blood and its sp. gr.

**Female sexual hormones. A biological and experimental study.** FRANCISCO GARCIA TREVIÑO. *Rev. sud-americana endocrinol., inmunol., quimioterap.* 11, 763–76(1928).—Serum from pregnant women produces estrus in immature rats and a considerable enlargement of the uterus. The active substance is resistant against heat, sol. in EtOH, and apparently diffusible. One cc. of serum contains 10 biol. (inquire) units. The substance is produced not only in the ovary, but in the placenta and possibly in the uterus.

**Preexistence of a vagotropic substance in the blood, the lymph and the cerebrospinal fluid and its probable identity with the vagal substance of Loewi.** G. VIALE. *Rev. sud-americana endocrinol., inmunol., quimioterap.* 11, 840–5(1928).—The vagotropic substance is not identical with choline or acetylcholine. A vagotropic substance was found in blood, etc., that is not pptd. by phosphotungstic acid. From expts with dogs it is concluded that the substance is a normal constituent of the blood and produced in larger quantity under the action of the vagus.

**The leucocytic reaction and chloremia during digestion.** ARTURO A. BRUNO. *Rev. sud-americana endocrinol., inmunol., quimioterap.* 12, 173–85(1929).—During digestion, the Cl in the blood is increased, but in the serum it is lower. The transportation from the tissues to the stomach is performed by the corpuscles. The blood in the portal vein contains more Cl and fewer corpuscles after meals. The leucocytosis is not strictly related to the chloremia. As emotion produces leucopenia in dogs, in all expts. connected with the application of substances by force the emotional factor must be considered. HCl, lactic acid, AcOH and KCl may produce leucocytosis.

**The lactic acid excretion in the urine and sweat during football games.** I. SNAPPER AND A. GRÜNBAUM. *Biochem. Z.* 206, 319–33(1929).—Before the game only a trace of lactic acid was found in the urine of 57 players. After the game at most only traces of albumin appeared in the urine of 74 players and only 2 instances of glucosuria were noted. In 6 out of 55 urines when the game was played on a warm day, more than 60 mg. lactic acid was found, whereas on cold days 16 out of 32 urines contained more than 60 mg. lactic acid. This difference in appearance of lactic acid in the urine depending upon the temp. of the air is due to the excretion of the lactic acid in the sweat. During a football game lasting 1.5 hrs. on a hot day 1.1–2.2 g. lactic acid was eliminated in the sweat; also in about half the players 2–4 g. Cl was eliminated. The first sweat contains more lactic acid than the sweat at the end of the game. The lactic acid concn. of sweat can be ten times as great as that of the blood.

**Insulin and depot nourishment.** A. LÖW AND A. KRČMA. *Biochem. Z.* 206, 360–9(1929).—Studies on the carbohydrate content of the liver, muscles and omentum fat of mice lead to the conclusion that the fat tissue plays an important role in the glucose metabolism and that not only is carbohydrate converted to fat but fat is also changed to carbohydrate.

**The upper limit of hydrogen-ion concentration and bicarbonate concentration of urine.** FRITZ MAINZER. *Biochem. Z.* 207, 159–66(1929).—Under consideration of the  $CO_2$  tension the  $p_H$  of the urine on the alk. side cannot exceed the  $p_H = 8.3$ . The bicarbonate elimination at const.  $CO_2$  pressure is a simple function of the  $p_H$ , and the max. bicarbonate concn. should be about 1200 vol. % (= 536 millimols). This has been proved by means of expts. where alkali was administered orally to 5 human subjects and where alkali intoxication was produced in dogs with intravenous bicarbonate injections. In these expts. the urine  $p_H$  actually reached a max. value of 8.30, but the bicarbonate concn. did not exceed 416 vol. % (= 186 millimols). Evidently other factors control the limiting bicarbonate concn.

**The lipid-soluble and lipid-insoluble forms of the ovarian hormone (feminin).**

E. GLIMM AND F. WADEHN. *Biochem. Z.* 207, 361-7(1929).—The estrus-producing substance is present in the urine as an ether-sol. and as an ether-insol. form, the former being definitely in a preponderating quantity. Prolonged boiling of the urine in alk. medium as well as of highly purified artificial solns. converts the ether-sol. component into an ether-insol. form. The nature of the ether-insol. substance seems to be influenced by the duration of heating. It is not clear yet, however, if the ether-insol. compd. present in urine and the substance produced artificially are identical. The insol. substance resulting from brief boiling in alk. medium can be changed to the ether-sol. form again by treating with acid.

S. MORGULIS

The ionic composition of mother and fetus. SHIGERU HAYASHI. *Biochem. Z.* 207, 432-6(1929).—Under proper nourishment the organism of pregnant female rats retains its K, Ca, Mg and P contents in liver, heart and bones. The K:Ca ratio in the liver rises perhaps 10% as a max., whereas in the heart it diminishes in consequence of an increased Ca. The bones retain their Ca and Mg contents unimpaired. The Ca:Mg ratio in the pregnant rat is somewhat less than in the normal animal. The compn. of fetuses from 17 mm. in length (approx. 12 days old) as regards the K and Mg content is practically unchanged, only in the earliest periods the results being somewhat high. The Ca content naturally increases with the growth of the skeleton and reaches a max. at time of birth. The amt. of P likewise increases during development, but the max. content is attained before that of the Ca.

S. MORGULIS

Ovulation during pregnancy induced by hypophyseal anterior lobe hormone. BERNHARD ZONDEK AND S. ASCHHEIM. *Endokrinologie* 1, 10-22(1928).—Under the influence of hypophyseal hormone of the anterior lobe, the ovary of the pregnant mouse is stimulated to new functional activity: follicles ripen, burst and the eggs pass into the tubes. Some of the eggs in the tube possess a good nucleus; in some the nucleus is resolved into chromatin shreds, but in most of them it is fragmented and degenerated. In the ovary besides the corpora lutea graviditatis there are also young corpora lutea coming from newly ruptured follicles. In the uterus there are live fetuses. It follows thus that the anterior lobe of the hypophysis hormone is effective in awakening ovulation in the state of pregnancy.

S. MORGULIS

Ovarian hormone and blood calcium. MAX REISS AND KARL MARX. *Endokrinologie* 1, 181-4(1928).—Application of the ovarian hormone causes a drop in the serum calcium level. There seems also a possibility that the extent of the drop depends upon the dose. The Ca level rises again when the hormone treatment is discontinued.

S. MORGULIS

The water and iodine content of the thyroid gland of domestic animals (ox, cow, calf, goat, sheep) of Aostatales and Umbrien. OSW. POLIMANTI. *Endokrinologie* 1, 401-11(1928).—The fresh thyroid gland of animals from Umbrien is 3.47 g. heavier than that of animals from the Aostatal region, but the wt. of the dry substance is only 1.489 g. greater. It is suggested from this fact that the Umbrien domestic animals have a more highly functional gland. The iodine content in the thyroid of full-grown cattle is considerably larger than that in the young (cow 0.79 mg., ox 0.82 mg., calf 0.50 mg. I per g of dry gland) and is greater in the Umbrien than in the Aostatal region (0.70 mg. and 0.52 mg., resp.).

S. MORGULIS

Ovarian hormone and blood cholesterol. SHIGEKI MORI AND MAX REISS. *Endokrinologie* 1, 418-21(1928).—The ovarian hormone causes a rise in the blood cholesterol.

S. MORGULIS

The calcium content of the blood and blood plasma on partially parathyroidectomized dogs and determinations of the blood calcium content in some patients with tetany symptoms. G. F. J. M. BÄR. *Endokrinologie* 1, 421-30(1928).—A dog whose 3 parathyroids were removed showed even 4 yrs. later definite parathyroid insufficiency symptoms although it was on a Ca-rich food. It is suggested (though the analytical data do not seem to confirm this) that the parathyroid hormone regulates the blood-plasma Ca by transferring Ca to the red cells. Following a hypoglycemic dose of insulin, the Ca content of the corpuscles increased from 0 to 5.6 mg. %. In 2 normal persons the blood plasma Ca was found to be 9 mg. % and that of the red cells 2-25 mg. %. The results in disease are variable.

S. MORGULIS

Climacteric hypertony. EUGEN V. RUTICH. *Endokrinologie* 3, 255-62(1929).—The cessation of ovarian function is not the primary cause of climacteric hypertony but is a stimulus or possibly a releasing factor, which in the constitutionally disposed organism increases the liability of the vegetative nervous system. It promotes changes in the colloidal relations which ultimately result in definite hypertony. Menformone glanduovin and glandofolin do not permanently affect the climacteric hypertony.

S. MORGULIS

**The metabolism of nitrogen in the embryos of birds.** M. H. TARGONSKI *Bull. intern. acad. polonaise* 1927 B, 1277-1300.—The amniotic and the allantoic fluids from hen eggs were analyzed for P, S, uric acid, urea,  $\text{NH}_3$ , creatine and oxyproteic acid. Uric acid is present after the 6th day. The ratio between P and N decreases in proportion to the development of the embryo: 10th day  $\text{P/N} = 0.43$ ; 18th day  $\text{P/N} = 0.12$ ; S/N the 14th day = 0.067; 18th day  $\text{S/N} = 0.11$ . In the vitellin  $\text{P/N} = 0.057$ . Catabolism of P compds. is more rapid during the early than the later stages. Between the 8th and 12th days  $\text{NH}_3$  can be detected. The min. amount has not been detd. The av. amt. of N at the end of the 10th day in the amniotic liquid is 0.34 mg., increasing to 1.06-1.27 mg. on the 14th day, and to 110 mg. on the 16th day. The non-protein N at the 16th day is 3.1-3.9 mg. The liquid accumulated is food for the fetus toward the end of fetal life. The ratio between amniotic N and allantois N up to the 14th day is 0.2; on the 16th day, 7; on the 18th day, 4.5. The allantoic liquid was treated with phosphotungstic acid. On the 12th, 14th, 16th and 18th days, resp., the % of the total N pptd. by phosphotungstic acid was 40.2, 51, 65.1 and 43.2. The percentage of N that was present as uric acid during the four periods was 43.5, 50, 68.1, 38.6. The urea N in urea in this same period showed little variation. The amino acid N was 8% of the total N. Traces of  $\text{NH}_3$  were found but no oxyproteic acid. There is agreement with the finding of Needham of  $\text{CO}(\text{NH}_2)_2$ , but not in the findings of uric acid. The ratio between anabolism and catabolism of purines is the same as that found by Mlle Aznerowna between the 10th and 18th days. GEO. W. MUHLEMAN

**The permeability of muscles to electrolytes during work and in a state of repose.** A. WOJTCZAK. *Bull. intern. acad. polonaise* 1927B, 1253-76.—The inorg. constituents in the muscles of frogs are K (0.3%), P(0.12%), Na(0.05%), Ca and Mg(0.02%) and Cl (0.04%). This compn. is maintained by absorption from the exterior due to the exterior protoplasmic compn. of the muscle. Contraction makes the exterior coating more permeable to the inorg. constituents of the muscle. K and Ca in the soln. activate the absorption of glucose. Muscle in the nutrient soln. contg. no glucose lost K during work; it lost P during repose and contraction but more during contraction; Ca was absorbed during repose and work. If glucose is present in the nutrient soln., much less K and P are lost. Fructose has the same effect. G. W. M.

**Excretion of dyes by the normal liver and the kidneys. I. Their relation to the diffusibility of dyes.** YOSHINORI TADA. *Acta Schol. Med. Univ. Imp. Kioto* 11, 193-229(1928).—According to T. the generally accepted theory that the excretion of dyes by the kidneys and by the liver depends solely on the phys. properties of the dyes leaves 2 problems unexplained, which T. attempts to solve in these investigations and in those to follow. The 1st one is whether the chem. constitution of the dyes has an influence on the excretion, while the 2nd problem is concerned with the fate of those dyes whose colloidal mols. are large and therefore cannot be excreted by the liver or the kidneys. Dogs served as test animals. A biliary and a urinary fistula was established and 1 cc. per kg. body wt. of a 1% dye soln. or, in case of small soly., of a satd dye soln. was injected into the ear vein of the animal narcotized by novocaine. Bile and urine were collected and the amt. of dye present was detd. colorimetrically. Most of the 44 acid and 7 basic dyes used were of known chem. constitution. In some cases their basic or acid character was established according to the method of Michaels and Shoji. The diffusibilities of many dyes were detd. according to the method of Schulemann; a 5% soln. of agar was used, however, instead of a 2% soln. of gelatin. It was observed that, in general, acid dyes of great diffusibility appear early in the excreta; that the velocity of their elimination was relatively great; and that their concn. in the bile and urine was high. These relations, however, could not be noted with basic dyes. Although in general the dyes of poor diffusibility were sparingly excreted by the kidneys, some dyes of great diffusibility were found that were not eliminated in the urine. The majority of the dyes, especially those of slight diffusibility, were excreted by the liver. As a rule, the dyes appeared in the urine earlier than in the bile. Dyes of great diffusibility appeared earlier in the urine than did dyes of small diffusibility. A certain relation existed between the amt. of dye excreted by the liver and that excreted by the kidneys; in case that the dye was only slightly eliminated in the urine, it was largely excreted in the bile and *vice versa*. The fate of the few dyes not excreted by either liver or kidneys could not be ascertained. Besides the diffusibility, the acid or basic character of the dye exerts a great influence on the quantities excreted, the elimination of basic dyes being generally very incomplete. The chem. constitution plays an important role. With the acid dyes, the trisazo dyes were eliminated in small quantities only, while most of the disazo dyes and dyes of the Sansen series were excreted solely by the liver. II. The compensative function of the kidneys of animals



for eliminating dyes after ligation of the common duct. *Ibid* 231-41.—A urinary fistula was established in dogs weighing 7 kg. and the common duct ligated. After recovery from the operation 7 cc. of a 1% dye soln. was injected into the ear vein of these animals (I) and of normal control dogs (II). Dyes were selected which under normal conditions were eliminated mainly or entirely by the liver. The urine was collected and analyzed. It was observed that when the excretion of the dye was 0 in II, it was also 0 in I. When the dye was excreted in II, it was also excreted in I, but in much increased amts. The max. dye concn. in the urine and the amts. of dye eliminated per time unit did not exceed, to a large degree, those encountered in II. The time of excretion, however, was distinctly prolonged. There is a certain limit to the dye-eliminating capacity of the kidneys, which cannot be surpassed as long as there is no change in the concn. of the dye in the blood. The time required for the complete elimination in I was inversely proportional to the increase of the max. concn. in the urine. III. The compensative function of the liver in the elimination of dyes in animals (in which the renal arteries and veins are ligated). *Ibid* 243-52.—Four dyes were selected which under normal conditions were mainly or entirely excreted in the urine. Dogs with a biliary fistula weighing about 10 kg. were divided in 2 groups. Seven cc. of a dye soln. was injected into the 1st group (I). The 2nd group (II) received first an injection of 0.7 cc. of a soln. of 2.0 g. of pantopon and 0.03 g. scopolamine in 50 cc. of water. After the dogs had fallen asleep, 7 cc. of dye soln. was injected. Several days later these animals were narcotized with the pantopon-scopolamine mixt. and Et<sub>2</sub>O and the renal arteries and veins and the urethras ligated at both sides. Then 7 cc. of dye soln. was injected. The usual measurements were made in all instances. It was noticed that narcosis caused a decrease in the quantity of bile excreted. In most cases, however, the concn. of the dye in the bile increased at the same time; thus the amts. of dye excreted remained about the same as those excreted by I. The amts. of bile produced by II after narcosis did not differ greatly from those produced after narcosis and operation. When the results obtained in the dogs of group II in the 2 stages mentioned were compared, it became evident that dyes not excreted by the liver under normal conditions were also not excreted in the bile after ligation of the urethras and the renal arteries and veins. The concn. of the dye in the bile and the amt. excreted per time unit did not show any marked increase after the operation; however, the time of elimination was much prolonged. Thus the total amt. excreted by the liver was much greater than normally. The eliminating capacity of the liver is limited and influenced by the concn. of the dye in the blood. The time required for the complete compensative elimination was inversely proportional to the increase of the max. concn. of the dye in the bile. IV. The relation between the concentration of dyes in the blood stream and the concentration of excreted dyes. *Ibid* 253-66.—The expts. were carried out with 6 dyes on dogs with urinary and biliary fistulas. The animals were kept under such conditions as to render the output per time unit of bile and urine as const. as possible. A certain quantity of the dye soln. was injected into a dog. One or 2 days later a quantity of dye soln. larger than the 1st one was injected. The expt. was repeated 2 more times with increasing quantities of dye soln.; the amts. of dye excreted each time were detd. as usual. The dye concn. in the bile and urine rises with increasing dye concn. in the blood, but even after ligating one of the organs in question, the excretion through the other organ cannot surpass a certain max. The amts. excreted are different for different dyes, but with the same dye the amts. excreted are const. as long as there is no change in the concn. of the dye in the blood. The ratio between the total amt. of dye eliminated in the bile and that eliminated in the urine is const. This ratio is not affected by changes in the concn. of the dye in the blood or the amts. of dye injected into the blood stream as long as there enters no factor that produces an abnormal change in the amt. of dye circulating through the liver and kidneys.

G. SCHWOCH

The excretory function of the stomach. II. The elimination of urotropine through the mucous membrane of the stomach. GIOVANNI DE TONI. *Biochim. terap. sper.* 7, 257-63 (1928); cf. *C. A.* 22, 2599.—Rabbits fasting for 24 hrs. were used for the 1st series of the expts. Different quantities of a 40% urotropine soln. varying from 1 to 6 cc. were injected into the marginal ear vein of the animals. Immediately afterward, 0.20 cc. of a 0.1% histamine soln. was administered subcutaneously in order to increase the flow of the gastric juice. Thirty mins. after the injection of the urotropine the juice was removed and filtered. When the quantity injected was larger than 2 millimols per kg. body wt., the presence of urotropine in the stomach could be demonstrated with Br water or with HgCl<sub>2</sub> or with Burnam's test as modified by Breunig. In a 2nd series of expts. the urotropine was administered to young, healthy children by intramuscular injection or by rectum. The drug was found present in the stomach

after 1 hr., when the amts. injected intramuscularly were larger than 0.5 millimol per kg. body wt. When the urotropine was given by rectum, the min. doses required to cause a pos. test after 1½ hrs. varied between 1 and 1.5 millimols per kg. Urotropine introduced parenterally into the body is converted into HCHO already in the stomach. This may account for the gastric troubles frequently encountered in clinical cases after injections of urotropine. G. SCHWOCH

**Regulation of metabolism. XI. Peculiar position of the egg cell as regards oxygen utilization.** ERNST WERTHEIMER. Univ. Halle a. S. *Arch. ges. Physiol.* (Pflüger's) 221, 119-38(1928); cf. C. A. 22, 4156.—After strychnine poisoning the loss in carbohydrate by the liver, muscle, heart and brain is very great, while the carbohydrate of the egg cell is not diminished. In a similar way adrenaline and insulin reduce the glycogen of the tissues but not that of the egg. The compn. of the egg cell is also less influenced by temp and anoxybiotic condition than is the case with other cells. G. H. SMITH

**Is the amount of glycogen changed in the tonic contraction of striated muscles?** ERNST WERTHEIMER. *Arch. ges. Physiol.* (Pflüger's) 221, 139-43(1928).—In 15 of the 33 preps. studied no loss in glycogen occurred; in the other 18 cases it was reduced by an av. of 28%. G. H. SMITH

**Permeability of animal membranes for dyestuffs.** ERNST GELLHORN. *Arch. ges. Physiol.* (Pflüger's) 221, 230-46(1928).—Diffusible acid dyestuffs penetrate membranes without regard to their lipid soly. There is no strict relation between rate of penetration and the size of the particles of the dyestuff. The muscle membrane is penetrated by acid dyestuffs more quickly than is the skin, while basic dyestuffs enter the skin more readily. G. H. SMITH

**Fetal development of blood in cattle. I. Average volume and average dry substance and hemoglobin content of the red cells in cattle.** D. VON DESER. *Arch. ges. Physiol.* (Pflüger's) 221, 321-6(1928).—The dry substance of the red cell is 1.97%, and of the dry material 85.9% is hemoglobin. The av. vol. is 52.2μ³. **II. Average volume and average dry substance and hemoglobin content of the red cells of the fetus.** *Ibid* 327-33(1928).—The properties of the red cells change throughout the period of fetal life. G. H. SMITH

**Lactic acid metabolism of the surviving extremity.** A. BORNSTEIN AND ERICH SCHMUTZLER. *Arch. ges. Physiol.* (Pflüger's) 221, 395-9(1929).—The perfused, resting dog leg does not give up lactic acid to the perfusion fluid, even if insulin or alc. is added, but if oxidation is inhibited by NaCN, there is a marked increase. When lactic acid is added in gradually increasing amts. to the perfusion, the resting leg (per kg.) can utilize between 0.075 and 0.1 g. of lactic acid per hr. G. H. SMITH

**Blood supply and metabolism of the working mammalian muscle: The surviving extremity and the heart-lung preparation.** A. BORNSTEIN AND H. F. ROESSE. *Arch. ges. Physiol.* (Pflüger's) 221, 400-9(1929).—Like the heart-lung prepn., the active perfused dog leg does not yield lactic acid or NH₃ to the perfusion fluid, but if the O supply is inadequate, both preps. give up both substances. Vasoconstricting substances of the serum are slowly destroyed in the resting perfused leg. G. H. SMITH

**The heart hormone. The active principle of Haberlandt's frog heart hormone.** R. RIGLER. *Arch. ges. Physiol.* (Pflüger's) 221, 509-25(1929); cf. C. A. 23, 1169.—The frog heart hormone of Haberlandt is composed of 2 active principles, K with chronotropic action, and something with inotropic effect corresponding to Clark's substance. G. H. SMITH

**Regulation of carbohydrate metabolism. Excretion of insulin through the kidney.** ALEXANDER PARTOS. *Arch. ges. Physiol.* (Pflüger's) 221, 562-70(1929); cf. C. A. 23, 869.—Insulin is a normal component of human and rabbit urines. In the fasting rabbit no insulin is excreted, thus explaining the behavior of injected sugar in the fasting animal. During the hyperglucemic stage the urine contains no insulin, but as soon as the blood pressure falls excretion begins. Absorbed carbohydrate is an adequate stimulus for insulin production, and the amt. of glucose to be found in the liver after a meal contg. abundant carbohydrate depends upon the amt. of insulin present. In human as well as in exptl. pancreatic diabetes there is no insulin in the urine. G. H. SMITH

**Hormone of heart action. XI. Action of the heart hormone preparation on the frog heart.** L. HABERLANDT. *Arch. ges. Physiol.* (Pflüger's) 221, 576-90(1929); cf. C. A. 23, 1169.—The heart hormone prepn. was still active after being rendered completely free of histamine. G. H. SMITH

**Comparison of the membrane structure and the permeability of the red blood cells of different mammals.** RUDOLF MOND AND HEINZ GERTZ. *Arch. ges. Physiol.* (Pflü-

ger's) 221, 623-32(1929).—With respect to permeability velocities the types of red cell tested may be expressed man > pig > horse > sheep, goat, cow. G. H. SMITH

**Formation of urine in the frog kidney.** XVII. Dyestuff secretion by the second section. FERDINAND SCHEMINZKY. *Arch. ges. Physiol.* (Pflüger's) 221, 641-91(1929).—Tubule cells loaded with dyestuff after vital staining of the whole animal show no impairment of function. When the isolated kidney is perfused with neutral red, it requires a much higher concn. of dyestuff in the arterial system than in the venous to obtain the same effect, and different sections are stained. From the vein neutral red passes readily to the urine; cyanole passes readily from the artery. As regards the vascular supply, the fourth section of the tubule and the glomerulus represent one system; the second section constitutes a second one; and the two systems do not behave in the same way in dyestuff secretion. G. H. SMITH

**Work and acid production in muscle. I. Effect of loading on fatigue.** OTTO RIESSER AND WALTER SCHNEIDER. *Arch. ges. Physiol.* (Pflüger's) 221, 713-9(1929).—To a high degree, fatigue is independent of the load and the mech. work. Fatigue is more strictly related to the rate of acid production than to the total amt. produced. II. **Formation of lactic and phosphoric acids in the isolated frog muscle with different degrees of isotonic activity.** T. NAGAYA. *Ibid* 720-32.—In the course of fatigue due to a rhythmic stimulus under anaerobic conditions the formation of acids is related to the period of stimulation or the number of stimuli, but is not a function of the work done. III. **Lactic acid formation in the free contracting frog heart.** T. NAGAYA. *Ibid* 733-41(1929).—Lactic acid formation cannot be detd. by the work done, but is rather a function of the changes in length of the muscle fibers of the heart. G. H. S.

**Physiology of the blood vessel.** A. A. TITAIKV. *Arch. ges. Physiol.* (Pflüger's) 221, 787-99(1929).—Temp. exerts a very considerable effect upon the contraction, rhythm and tonus of arteries. Curare in small doses exerts its effects on the arteries apparently through the central nervous system, causing vasoconstriction and increased number and extent of the contractions. Large doses exert the opposite effects. With frogs KCl and CaCl<sub>2</sub> solns. cause a reflex vasodilatation, but if the lumbo sacralis is sectioned or if large doses of curare are given, KCl leads to vasoconstriction. In this respect CaCl<sub>2</sub> is antagonistic to KCl. The effect of K ions depends upon the nature of the anions. G. H. SMITH

**Permeability of the surface layer of muscle fibers for potassium, and the effect of sucrose.** JOSEF MONAUNI. *Arch. ges. Physiol.* (Pflüger's) 221, 800-6(1929).—Apparently K does not penetrate through the cells but through the interstices. Sucrose does not exert any immediate effect, but after a period of 40 mins. the penetration of K is increased. G. H. SMITH

**A report of experiments indicating some new factors in respiration.** E. FIDLAR. *Univ. Toronto Studies, Physiol. series*, No. 98, 77 pp. (1928).—There is described a *respi-ratory app.* for frogs in which an attempt is made to control temperature, total pressure, oxygen partial pressure and humidity. Certain rhythms in respiratory quotient were noted, there being a lower quotient for the night periods than for day periods. This diurnal rhythm did not remain const. for more than 4 days at any one time. Averaged over several weeks, the respiratory quotients for night periods were found to be 0.02 less than for day periods, being of the same magnitude as has been shown for man. It is suggested that this phenomenon is of a fundamental nature in animal life, although it may not occur in a normal environment, but only under those unnatural conditions which have been necessary in measuring gaseous exchange. Evidence was obtained of the presence of an unknown gas or gases, assumed "nitrogen," not only as an excretion, but also as an absorption of the animal. The significance of the findings is discussed. H. G. SMITH

**Relation of the liver to fat metabolism. I. Effect of liver lack on fat combustion and the respiratory quotient.** D. R. DRURY AND PHILIP D. MCMASTER. *J. Exptl. Med.* 49, 765-78(1929).—Fat combustion is carried on adequately in rabbits deprived of the liver or brought into a condition of extreme liver insufficiency. Even 24 hrs. after hepatectomy fat combustion goes on as well as in the normal animal. Evidently the liver plays no essential part in the breaking down of fat. C. J. WEST

**Biometry of calcium, inorganic phosphorus, cholesterol and lipid phosphorus in the blood of rabbits. III. Influence of various types of light environment.** ALVIN R. HARNES. *J. Exptl. Med.* 49, 859-82(1929); cf. C. A. 23, 2473.—The Ca, inorg. P, cholesterol and lecithin in the blood of normal rabbits are influenced by 4 types of light environment. Animals exposed to the ultra-violet light for a brief period each day give results which are diametrical to those obtained for animals living in total darkness. The results obtained for animals exposed to the Cooper-Hewitt light and for those

living in the open lab. are somewhat similar but occupy a position between those of the dark and ultra-violet groups. Animals do not develop immediately the characteristic effects of a particular environmental condition but pass through a period of accommodation which varies somewhat with different environmental conditions. C. J. W.

**Relation of chromatin to hemoglobin and bilirubin.** HERMAN H. RIECKER. *J. Exptl. Med.* 49, 937-43(1929).—Attention is directed to the diversity of opinion among investigators regarding the site and manner of hemoglobin formation in the body and its relation to bile-pigment metabolism. It is probable that in forming new hypotheses on this subject the earlier work of A. B. Macallum on the relation of chromatin to hemoglobin formation has not received sufficient consideration. By means of microchem Fe stains of the bone marrow cells, it is shown that the Fe content of the hematoblast is increased during rapid hemoglobin production in simple anemia. This fact is compatible with the work of M., who believed that hemoglobin is derived from the chromatin of the hematoblast. It does not support the theory that hemoglobin is formed as a part of a circulating pigment. It is suggested that bilirubin is derived from the chromatin of body cells through the intermediary stages of the respiratory pigments, hemoglobin and cytochrome, from erythrocytes and other cells, resp. C. J. W.

**The ratio of urea nitrogen to total non-protein nitrogen in the blood in normal pregnancy.** W. DENIS, E. L. KING AND FRANCES BRIGGS. *Am. J. Obstet. and Gynecol.* 17, 386-91(1929).—In the normal pregnant woman there is usually a slight decrease in the blood non-protein N and a relatively large decrease in the urea N. There is a slight but gradual decrease in the ratio of urea N to non-protein N during the course of pregnancy, while postpartum there is an equally definite rise in the ratio. R. C. WILLSON

**Cholesterolemia in infants.** J. BAYLAC AND M. SENDRAIL. *Arch. méd. enfants* 31, 662-9(1928); *J. Am. Med. Assoc.* 92, 270.—The free cholesterol in the blood serum was detd. in 100 children from 1 month to 15 yrs. in age by the colorimetric Grigaut method, the av. being 1.49. The cholesterol content changes with the age, as low as 0.95 in the first months, rising gradually to 1.69 at 10-15 yrs. R. C. WILLSON

**The influence of the endocrine glands on the elimination of acetone bodies in the urine of dogs on normal diet and while fasting.** H. MIZOKAMI. *Folia endocrinol. japon.* 4, 296-330(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 47, 438.—Normal dogs eliminate a measurable amt. of acetone daily. On the first day of fasting the acetonuria is increased in contrast to the feeding period, reaches its max. on the second and third days and then recedes. During the feeding period administration of thyroid substance increases the acetone elimination, while thyroid extirpation decreases it. Repeated adrenaline injections increase the acetonuria; repeated insulin injections diminish it. The increase and decrease in the elimination of acetone bodies under the influence of the endocrine gland were greater in the fasting period than in the feeding period. R. C. WILLSON

**Globulin and albumin in serum and urine.** T. GEILL. *Bibliotek f. Laeger* 120, 612(1928); *J. Am. Med. Assoc.* 92, 96.—This preliminary report gives the results of investigations on the pptn. of serum proteins and urinary proteins by means of  $(\text{NH}_4)_2\text{SO}_4$  and the dependence of the process on NaCl concn., pH, protein concn. and temp., as well as the urinary constituents, particularly NaCl and urea. R. C. WILLSON

**A comparison of the amylase concentration in the saliva of infants and adults.** WALTER B. MAYER. *Bull. Johns Hopkins Hosp.* 44, 246-7(1929).—Infants, both normal and premature, can digest starch from birth. The amylase concn. increases with the age of the individual, but varies widely in adults (200-2850 units per g. saliva) R. C. WILLSON

**The influence of endocrine preparations on the basal metabolism in hyperthyreosis.**  
I. **The influence of suprarenal preparations.** T. HARA. Univ. Kyoto. *Folia endocrinol. japon.* 4, 401-32(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 47, 466.—When 0.6-0.8 g. of suprarenal prepn. (Parke, Davis) was given daily to hyperthyreotics, the basal metabolism decreased in 7 cases, decreased slightly in 3 cases and was unchanged in 5 cases. The influence of the endocrine prepn. is evident after 20 days, but reaches its max. after 40-60 days. R. C. WILLSON

**Physiological investigation of fetus. III. Supplementary research of enzymes in digestive organs: lipase in the stomach.** T. TACHIBANA. *Japan. J. Obstet. and Gynecol.* 11, 20-6(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 47, 94.—The stomach of the human fetus and newborn forms lipase which splits tributyrin. The enzyme can be detected in the fourth fetal month and increases with subsequent development. It is formed in the mucous membrane. R. C. WILLSON

**The menstrual cycle and calcium.** A. BOCK. *Monatsschr. Geburtsh. u. Gynakol.* 79, 9-16(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 47, 313.—During the time of men-

situation the blood Ca varies between 9.2 and 10 mg. %, the normal value being 9.65 mg. %. The slight change is atypical. There is a premenstrual increase in blood Ca.

R. C. WILLSON

**The influence of biliary acids on the creatine metabolism.** SHIGERU IKOMA. *Okayama-Igakkai-Zasshi* 40, 890-8(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 47, 87.—Addn. of cholic acid or desoxycholic acid to autolyzed muscle broth inhibits the formation of urea and creatine and increases the amt. of arginine.

R. C. WILLSON

## G—PATHOLOGY

H. GIDEON WELLS

**The sedimentation test in pulmonary tuberculosis.** H. A. CLEGG. *Tubercle* 10, 205-12(1929).—The normal sedimentation rate by the Zeckwir and Goodel method (2 cc. 3% Na citrate and 8 cc. of blood in a 15 cc. centrifuge tube being used) was 9.6 cc. of red cells at 1 hr. In normal cases the physiol. variation was slight. The rate in pulmonary tuberculosis is an accurate measure of the activity of the lesion. The test is more useful in prognosis than diagnosis. Normal sedimentation rates were found in some cases of active pulmonary tuberculosis.

H. J. CORPER

**Seasonal variations in body weight in pulmonary tuberculosis.** M. KESAVA PAI. *Tubercle* 10, 212-15(1929).—There is a general agreement of wt. curves in all parts of the world, apparent differences being due to the differences in climate of localities where observations are made. Extremes of heat and cold and dryness of the air cause a fall of wt., while the pleasant temp. like summer in colder countries and the cold season in the tropics produces a rise in wt. curve. Rains have no effect.

H. J. CORPER

**Co-relation of calcium metabolism, parathyroid function and chronic pulmonary tuberculosis.** II. PHILIP ELLMAN. *Tubercle* 10, 257-66(1929); cf. *C. A.* 22, 805.—The Ca content of the blood serum in pulmonary tuberculosis varies only within normal limits (9 to 12 mg. per 100 cc.). In cases responding favorably to treatment the Ca content can be increased, but only within normal max. limits. The administration of Ca or parathyroid must be continued over prolonged periods if Ca retention is to be promoted. A combination of parathyroid ext. with Ca lactate has proved as effective as any. Microscopical examn. of the parathyroid glands in cases of pulmonary tuberculosis shows signs of increased functional activity of the glands. Conclusion: There is a definite relationship between pulmonary tuberculosis on the one hand, and Ca metabolism and parathyroid function on the other.

H. J. CORPER

**Observations on the occurrence of non-specific agglutinins in tuberculosis.** ROBERT A. KILDUFF AND WM. W. HERSOHN. *Am. Rev. Tuberculosis* 19, 223-7(1929).—Nonspecific, heterologous agglutinins may be produced in tuberculosis for microorganisms of the typhoid group and, infrequently, for *B. proteus* X 19. There was no apparent relation between the presence or amt. of agglutinins and the character or clinical course of the tuberculous infection. The occurrence of agglutinins for microorganisms of the typhoid group is not per se conclusive evidence that they are nonspecific, or heterologous in origin, as, in a definite no. of such cases, the patient will be found to have had typhoid fever or to have received antityphoid vaccine. Heterologous agglutinin-production in pulmonary tuberculosis is of relatively infrequent occurrence and without apparent relation to the clinical course of the disease.

H. J. CORPER

**A note on the occurrence of positive Wassermann and precipitin reactions in pulmonary tuberculosis.** ROBERT A. KILDUFF AND WM. W. HERSOHN. *Am. Rev. Tuberculosis* 19, 228-9(1929).—During the course of a study of the incidence of nonspecific agglutinins in pulmonary tuberculosis, both precipitin and complement fixation tests for syphilis were applied to the sera in 200 cases of all stages of pulmonary tuberculosis. Neg. results were obtained in 191 of these, and in the majority of these reacting pos. this was proven to be due to the specificity of the reaction.

H. J. CORPER

**A clinical study of tuberculin fractions prepared from non-protein culture media.** FREDERICK EBERSON AND ERNEST WOLFF. *Am. Rev. Tuberculosis* 19, 327-49(1929).—In extension of earlier work (*C. A.* 19, 2979; 20, 2536) in which the inadequacy of old tuberculin was stressed and tuberculin fractions were prepd. from non-protein culture media, the authors present detailed analyses of different tuberculous and non-tuberculous groups and conclude that a tuberculin prepn. described as T. E. (alc.- and ether-insol.) gives better results than ordinary old tuberculin and is more selective as a clinical test material. Six weeks growth on a non-protein culture medium described by Gessard and Vaudremer (*Compt. rend. soc. biol.* 87, 1012(1922)) is evapd. to  $\frac{1}{10}$  vol. and 19 vols. of pure MeOH are added. To the filtrate contg. washings of MeOH derived from the alc-insol. fraction were added 4 vols. of pure Et<sub>2</sub>O and a second fraction sepd. by filtra-

tion. The ppt. was washed thoroughly with ether and the combined filtrates were evapd. virtually to dryness to yield a third fraction. The alc-insol. fraction represented 3.44% by wt. of the original tuberculin, the ether-insol. fraction 1.6% and the ether-sol. 0.86%. For clinical tests the fractions were dild. so that 1 cc. contained 1 mg. of tuberculin material.

H. J. CORPER

**Blood-serum calcium in the negro.** C. LYDON HARRELL. *Am. Rev. Tuberculosis* 19, 350-2(1929).—Forty-four negroes with no chest pathology gave an av. serum Ca of 10.93 g. per 100 cc. of blood, this being 0.43 g. higher than the normal blood Ca as given for the white individual which is 10.5 and H. attributes this to the greater amt. of exposure of the negro to the sun rays as well as the use of 3 forms of food rich in Ca, namely, cheese, cabbage and turnips. In the second group there were 41 cases suspicious of having definite tuberculosis. The blood Ca averaged 9.8 g. which is 1.13 g. lower than normal, indicating a hypocalcemia.

H. J. CORPER

**The relationship between blood sedimentation index and fibrin content in tuberculous individuals.** ESTHER M. GREISHEIMER, CHARLOTTE C. VAN WINKLE AND OLGA H. JOHNSON. *Am. Rev. Tuberculosis* 19, 559-66(1929).—A significant relationship was found between the fibrin content and sedimentation index in the groups studied as well as in the sexes. In both sexes a significant correlation existed between the fibrin content and the amt. of sedimentation detd. at 15 min. intervals up to a 1 hr. period.

H. J. CORPER

**The nitrogen content of the blood in sensitized animals.** Z. DINNERSTEIN AND S. GENES. *Z. ges. expil. Med.* 62, 248-58(1928).—D. and G. corroborate the work of Freund and Rupp (*C. A.* 18, 112) and Hashimoto and Pick (*C. A.* 8, 3466) that there are no changes in the total or rest N in sensitization in the blood of guinea pigs.

F. L. DUNN

**The changes in  $p_H$  of the blood and urine after eating in normal and peptic ulcer patients.** VITZ ZSIGMOND VON PINTER-KOVATS. *Z. ges. expil. Med.* 62, 634-8(1928).—The  $p_H$  of the blood was detd. by the method of Hollo-Weiss, and the urine, by the method of Michaelis, following a breakfast. The differences in  $p_H$  were greater in the normal group than in the ulcer group.

F. L. DUNN

**The metabolic disturbances by trypanosomiasis of white rats.** I. G. SCHEFF. *Magyar Orvosi Arch.* 30, 110-9(1929); cf. *C. A.* 23, 641.—The injury and death of the host are not caused by toxins but result as a consequence of disturbances of metabolic processes. The trypanosomes deprive the organism primarily of sugar. As long as the supply is satisfactory, the metabolism remains undisturbed. As soon, however, as the liver is injured, its reserves are exhausted and the transformation of fats and proteins into sugar is hampered, hypoglycemia develops.

G. H. VON FUCHS

**The oxygenation and acid-basic equilibrium of blood by the trypanosomiasis in white rats.** I. G. SCHEFF. *Magyar Orvosi Arch.* 30, 120-4(1929).—Both sugar and O consumption play a very important role in the metabolic disturbances of the host. Acidosis has rather a secondary significance, diminishing the resistance of the infected animal. As in other cases of symbiosis, one finds the host and the parasites struggling for foodstuffs indispensable to life.

G. H. VON FUCHS

**Clinical discussions of metabolic diseases. II. Uric acid and gout.** P. F. RICHTER. *Deut. med. Wochschr.* 55, 749(1929).—A review and discussion of the relation between uric acid and gout.

ARTHUR GROLLMAN

**Liver function test in chirurgic diseases. Evaluation of the levulose test.** HANS ACHELIS. *Klin. Wochschr.* 8, 641-4(1929).—The ingestion of 60 g. of levulose by hepatopathics leads regularly (90%) to a levulosemia and levulosuria. Levulosemia and levulosuria seldom (10%) occur in healthy individuals under the above conditions. This can, therefore, serve as a liver function test. The less characteristic results obtained previously (*Deut. Z. Chirurgie* 205, No. 3-6; 207, No. 1-4) were due to the fact that too much levulose was administered. One hundred or even 75 g. of levulose may produce levulosuria in a large no. of normal persons. This test is never of any value in nephritics.

MILTON HANKE

**The cholesterol content of the skin.** A. H. ROFFO. *Neoplasmes* 7, 344-52(1928).—The percentage of cholesterol in the dry material is greater in the skin of the face than in the skin of the abdomen although the subcutaneous fat tissue in both regions contains about the same percentage of cholesterol. The skin of the man contains a greater percentage of cholesterol than the skin of the woman. More neoplasms occur in the skin of the face than in the skin of other regions and more neoplasms of the face occur in men than in women. In 1557 cases of neoplasms of the skin of the face examd., 70.9% were in men and 29.1% in women. Neoplasms contain a greater percentage of cholesterol

than normal tissues and it is probable that cholesterol is of importance in the establishment of a precancerous condition.

HARRIET F. HOLMES

**The effect of oxygen and carbon dioxide inhalation of short duration on the red blood picture of man under normal and pathologic conditions.** F. KERTI AND F. STENGEL. *Wien. Arch. inn. Med.* 16, 381-98(1929).—In 45 cases, both normal and pathological, the blood was examd. before and after the inhalation of  $O_2$ . In 21 of the 45 cases there was a distinct change in the erythrocyte count, a decrease in 16 and an increase in 5 cases. Most cases showing a decrease had a relatively high initial erythrocyte count. Hemoglobin only seldom showed change and the size of the erythrocytes was altered only in a few cases. The most marked changes in no. and size were in cases of polycythemia. After  $CO_2$  inhalation there was almost always a fall in blood pressure and a deepening of respiration while both the pulse rate and the respiration rate varied. There was a definite change in erythrocyte count, an increase in normal cases and in pernicious anemia and a decrease in polycythemia. The size of the erythrocytes was little affected, except in a case of polycythemia in which there was a decrease, and in a case of pernicious anemia in which there was a marked increase. HARRIET F. HOLMES

**Fractionation and antigenetic properties of diphtheria toxin.** P. SEDALLIAN, A. LEULIER AND MME. CLAVEL. *Compt. rend.* 187, 1297-9(1928).—Diphtheria toxin adjusted to a pH of 4.7 seps. into 2 fractions. The sol. portion consists of protein material and pigments and is non-toxic as shown by injections made on guinea pigs. The pptd. fraction dissolved in saline soln. is toxic but not so toxic as the original toxin. The addn. of a peptone increases the toxic power of the pptd. fraction until the lethal dose is about the same as that for the unaltered toxin. The existence of non-specific colloids in toxins that increase the absorbent power of the specific toxin and thereby its toxicity is discussed.

J. G. McNALLY

**The sulfur content in the blood serum of syphilitics.** SILVIO COLOMBINO. *Biochim. terap. sper.* 16, 5-8(1929).—The blood serum of 32 cases of syphilis showed a noticeable increase in total S, protein S and non-protein org. S. This increase was noted in all stages of the disease, even in the pre-humoral period. The ratio non-protein org. S:inorg. S was considerably higher than the normal.

PETER MASUCCI

**The serum-chromogen reaction in syphilis.** ENRICO DE-SILVESTRI. *Biochim. terap. sper.* 16, 59-61(1929).—Certain specific substances X are present in the serum of syphilitics which react with certain reagents ( $H_2SO_4$ , citric acid, monochloroacetic acid and vanillin) to give characteristic color tests. The substances X are probably antigen-antibody combinations. The reaction is very sensitive and is very useful in the diagnosis of syphilis. For the prepn. of the reagents and the details of the technic of the test, consult the original.

PETER MASUCCI

**The physical-chemical constants of the blood in eclampsia.** I. OSCAR M. BERNARDI. *Boll. soc. ital. biol. sper.* 4, 77-9(1929).—The av. lowering of the f. p. ( $\Delta$ ) of 16 detns. on 8 normal non-pregnant women was  $-0.553$ . The av.  $\Delta$  of 24 detns. on 12 normal but pregnant (9 months) women was  $-0.541$ . The av.  $\Delta$  of 31 detns. in 8 eclampsia cases was  $-0.5727$ . The elec. conductivities of defibrinated blood and blood serum were detd. Conclusion: The defibrinated blood and blood serum of eclampsia cases show a diminution of elec. cond. with respect to the blood of pregnant women.

II. Viscosity. *Ibid* 80-2.—The av. viscosity of 24 detns. on the defibrinated blood of 8 normal non-pregnant women was  $\eta = 4.3$ . The viscosity of the defibrinated blood of normal pregnant women was  $\eta = 4.1$  (av. of 24 detns. on 8 women). The viscosity of the defibrinated blood of 13 eclampsia cases varied from  $\eta = 5.31$  to  $\eta = 10.70$ . The higher figures were obtained on the bloods drawn immediately after a convulsive attack.

PETER MASUCCI

**Study of the physico-chemical properties of tissues in relation to the normal and pathological conditions of the organism. IV. Experimental modifications of the receptivity of mice for cancer grafts.** F. VLÈS AND A. DE COULON. *Arch. phys. biol.* 6, 22-37(1927); cf. C. A. 21, 3671.—Many substances, as emery, kaolin, silica, powd. metals, org. substances, lower the receptivity of mice for cancer graft. The index of receptivity as a function of the time elapsed between interference and graft has been studied. The index is expressed by  $i = (S-T)/T$ , S being the proportion of graft, taking in animals treated, to the proportion of controls. The chem. property of the substances has no influence.

A. E. MEYER

**Displacement of the isoelectric points of serum in acute infections.** PAUL H. ROSSER. *Arch. phys. biol.* 6, 129-38(1927); *Physiol. Abstracts* 13, 329.—In acute infectious diseases, a shift of the isoelec. point of the serum is observed. Beginning with incubation, the isoelec. points are displaced toward higher pH, attaining a max. after

the decline of the fever. The return to normal shows a curve with oscillations and a neg. phase, where the isoelec. point descends to  $pH$  5.5. A. E. MEYER

The role of the thyroid and parathyroid gland in adrenaline hyperthermy and in salt fever. G. VIALE AND J. KURI. *Rev. sud-americana endocrinol.-immunol., quimioterap.* 11, 831-9(1928).—Adrenaline hyperthermy and salt fever depend on the cooperation of the thyroids; the parathyroids have the more important role. The absence of hyperthermy in animals after parathyroidectomy is related to the lower Ca content of the blood. A. E. MEYER

Effect of cations on the fermentative ability of the tumor cell. I. A. LASNITZKI AND O. ROSENTHAL. *Biochem. Z.* 207, 120-40(1929).—In Ringer soln. lacking either the K or Ca ions the fermentation produced by tumor cells is diminished. In the Flexner-Jobling rat carcinoma the av. reduction is over 40% and in Jensen's rat sarcoma, about 25%. S. MORGULIS

Chemical studies on the "Haff disease." A contribution to the arsenic hypothesis. GEORG LOCKEMANN. *Biochem. Z.* 207, 194-216(1929).—Neither in the air above the water surface nor in the gases developed from As-contg. slime or algae of the "Frische Haff" could even traces of arsine be discovered, which is also true of the water itself. These observations were made at the time when the "Haff disease" epidemic was still raging. Evidence of As present in these materials reported by other investigators is attributed to impurities of reagents. The putrefactive gases evolved in the "Haff" have been found to be entirely innocuous for animals. Likewise various water animals obtained in the "Haff" region show only traces of As, which holds true for the aquatic plants except the algae. These investigations definitely disprove any relation of As to the epidemic outbreak of the "Haff disease." S. MORGULIS

Liver and thyroid: hyperfunction of the liver in Basedow's disease. N. PENDE. *Endokrinologie* 1, 161-7(1928). S. MORGULIS

New studies on the diagnosis, pathology and therapy of Basedow's disease and hyperthyreoses. KARL CSÉPAI. *Endokrinologie* 1, 250-63(1928).—In patients with Basedow's disease an increased sensitivity to various hormones was noted. The hormones studied were adrenaline, pituitrin, insulin, parathormone and thyroxine. Thyroxine also increases the responsiveness to the other hormones. The combined iodine and x-ray therapy gave very good results, further progress in this direction depends upon the success in finding the best way of detg. the dosage. S. MORGULIS

The antigenic properties of the d'Herelle bacteriophage. A. K. HORST. *Centr. Bakt. Parasitenk.*, I Abt., 111, 1-8(1929).—Antibacteriophage serum contains something which exerts a definite inhibition of the homologous bacteriophage. JOHN T. MYERS

The biological differences between heated and unheated water-soluble antigens of the cholera vibrio. I. The differences in the production of agglutinins and precipitins. K. FUJIMORI. *Centr. Bakt. Parasitenk.*, I Abt., 111, 68-83(1929).—Antibody production by heat-killed cholera cells = that by killed cells + unheated broth filtrate, <unheated cells + bouillon < unheated cells + filtrate heated for 20 mins. in a boiling water bath. Heating the filtrate in this manner increases its antigenic power. It is suggested that filtrate contains a thermolabile substance which interferes with the action of antigenic substances, the latter being thermostable. JOHN T. MYERS

The isolation of an active protein from anthrax-precipitating serum. H. P. ROSENHOLZ. *Centr. Bakt. Parasitenk.*, I Abt., 111, 92-5(1929).—A globulin was obtained from anthrax-pptg. serum equal in titer to the whole serum. The serum was dild. with 5 or 6 vols. of distd. water, the resulting ppt. removed by double paper filtration or centrifugation, and dried at 37°. The yield was 0.6 to 1.0 g. per 100 cc. of serum. This product is insol. in distd. water but sol. in the presence of electrolytes or weak alkalies. When dissolved in a minimal amt. of 3% NaCl soln. and filtered through paper, a clear, somewhat opalescent fluid resulted. The dried pptd. globulin is stable and easily transportable and should be of practicable value. JOHN T. MYERS

The work of Regendanz and Tropp on trypanosomiasis. KURT SCHERN. *Centr. Bakt. Parasitenk.*, I Abt., 111, 139-43(1929).—The pathogenesis of trypanosomiasis and spirachetosis depends largely on disturbances in carbohydrate metabolism. J. T. M.

Studies on the existence of neurocidins as described by Aldershoff and Pondman. E. GILDEMEISTER AND GEORG HEUER. *Centr. Bakt. Parasitenk.*, I Abt., 111, 151-6(1929).—Injections of brain emulsions did not produce neurocidins in the sense of Aldershoff and Pondman. Lysis was apparently due to particles of glass since none occurred if the containers were lined with paraffin. JOHN T. MYERS

The leucocyte phenomenon in lobar pneumonia in a physicochemical light. K. RUDSIT. *Folia Haematol.* 37, 377-87(1929).—When 2 cc. of a 20% soln. of  $CaCl_2$  is injected intravenously, there is a rise in the leucocyte count within 2 to 5 mins. in nor



mal individuals. In cases of lobar pneumonia there is a drop instead of a rise. The usual rise follows such an injection 3 days after the temp. crisis. More work is promised.

JOHN T. MYERS

Review of the physical and chemical hematological contributions in the field of pediatrics for the year 1926. OPITZ. *Folia Haematol.* 37, 404-18(1929).—The article is a review and an extensive bibliography.

JOHN T. MYERS

Tumor immunity. Natural cytotoxins (heterotoxins); protection of cells against homologous antibodies. THOMAS LUMSDEN AND ALICE C. KOHNSPEYER. *J. Path. Bact.* 32, 185-93(1929).—The fresh serum of normal animals contains a non-sp. cytotoxin against tumor cells and the normal tissue cells of foreign animals. They are of the nature of very labile immune bodies and are ineffective in the absence of complement. Tumor cells possess some mechanism which protects them specifically against damage by homologous cytotoxin, either sp. or non-sp.

JOHN T. MYERS

The content of complement compounds in dialyzed guinea-pig serum. H. TOKUNAGA. *Acta Schol. Med. Univ. Imp. Kioto* 11, 273-86(1928); cf. *C. A.* 22, 3217.—When serum is dialyzed for 5 to 9 hrs., the globulin fraction in physiol. NaCl soln. possesses complementary activity. The complementary effect of the globulin fraction first increases with increasing duration of dialysis and then decreases; after a dialysis of 24 hrs., the complementary effect is no longer present. In isotonic AcOK soln., however, the globulin fraction is able to hemolyze completely strongly sensitized goat erythrocytes. In this case the hemolytic action increases with the duration of dialysis. An almost complete hemolysis may be produced by the globulin fraction after dialysis for 24 to 48 hrs. A decrease in the activity of the albumin fraction occurs progressively with the duration of dialysis; finally it is completely inactivated (after 48 hrs.). Thus with increasing duration of dialysis the complement activity passes into the globulin fraction. An inhibitory influence on the effect of complement was observed during the dialysis, the inhibition being more distinct in physiol. NaCl soln. than in AcOK soln. Hence it may be assumed that complement is not split into 2 compds. In the course of dialysis the principle reactivating serum that has been inactivated with  $(\text{NH}_4)_2\text{SO}_4$  accumulates in the globulin fraction. However, the albumin fraction, in which no complementary effect can be detected, is still able to reactivate completely the serum treated with  $(\text{NH}_4)_2\text{SO}_4$ .

G. SCHWOCH

The content of complement compounds in the fractions obtained by precipitation with ammonium sulfate. H. TOKUNAGA. *Acta Schol. Med. Univ. Imp. Kioto* 11, 287-96(1928); cf. preceding abstr.—The complement of guinea-pig serum is fractionated by addn. of  $(\text{NH}_4)_2\text{SO}_4$ , the quant. distribution depending on the amt. of  $(\text{NH}_4)_2\text{SO}_4$  employed. The complement passes into the globulin fraction. The effect is more pronounced if the globulin fraction is taken up in AcOK soln., because in physiol. NaCl soln. a certain inhibition of the complementary activity occurs. On half-satn. with  $(\text{NH}_4)_2\text{SO}_4$ , the globulin fraction shows the complementary effect almost quant. Accordingly a decrease in the effect of the 2nd fraction occurs. After half-satn. the 2nd fraction is no longer able to act as complement. The complement in the fractions reacts more slowly than that of the original active serum. By satn. with  $(\text{NH}_4)_2\text{SO}_4$  the entire complement goes into the ppt., the latter showing a nearly complete complementary activity. A mixt. of the 2 fractions exerts an action just as great as that of the original active serum. The results of Browning and Mackie and those of T. described in earlier papers, according to which it seemed possible to split complement with  $(\text{NH}_4)_2\text{SO}_4$ , are erroneous and probably due to faulty exptl. technic.

G. SCHWOCH

The content of complement compounds in guinea-pig serum fractionated by passing carbon dioxide through it. H. TOKUNAGA. *Acta Schol. Med. Univ. Imp. Kioto* 11, 297-312(1928); cf. preceding abstr.—Both the globulin and the albumin fractions obtained by passing  $\text{CO}_2$  through guinea-pig serum at low temp. are able to act as complement when taken up in isotonic AcOK soln. The complementary activity of the globulin fraction increases only to a slight degree on passing  $\text{CO}_2$  through the serum for a long period of time. The albumin fraction obtained at low temp. possesses a strong complementary activity, which, however, is decidedly inhibited by an excess of the albumin fraction. This inhibition is more pronounced at elevated temp. The complementary activity disappears in both the albumin and the globulin fractions when the  $\text{CO}_2$  is passed through the serum at elevated temp. However, in conjunction with each other, the 2 resulting fractions produce a distinct hemolysis. The power of reactivating the serum previously inactivated with  $(\text{NH}_4)_2\text{SO}_4$  disappears almost entirely in the globulin fraction, when the  $\text{CO}_2$  is introduced at elevated temp. The reactivating properties of the albumin fraction do not suffer any loss. The complementary activity in the globulin and albumin fractions lost by passing  $\text{CO}_2$  at elevated temp. through the serum

may be restored by addn. of a small quantity of active guinea-pig serum or by addn. of serum heated at 56° and deprived of its euglobulin by proper treatment with CO<sub>2</sub>. The complete splitting of complement into 2 compds., which only occurs at elevated temp. and at an optimum diln., is only apparent, because the part of the complement necessary for the reactivation of the (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> serum is greatly damaged in the globulin fraction while it remains almost undamaged in the albumin fraction.

G. SCHWOCH

**The action of alcohol on the complement of guinea-pig serum.** H. TOKUNAGA *Acta Schol. Med. Univ. Imp. Kioto* 11, 313-7(1928); cf. preceding abstr.—The ppt obtained by action of EtOH on guinea-pig serum and taken up in physiol. NaCl soln. cannot produce complementary activity. In isotonic AcOK soln., however, it acts as a complement, though to a slight extent only; its activity decreases with the duration of the treatment with EtOH. The EtOH ppt. exerts little or no reactivating action on guinea-pig serum inactivated with (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>.

G. SCHWOCH

**Specific antivenins to combat scorpionism and arachnidism.** AFRANIO DO AMARAL *Bull. Antivenin Inst. America* 2, 69-71(1928).—By application of the principles of immunization used in the production of antitoxic sera, therapeutically effective antisera can be produced for the poisons of scorpions and spiders. Since scorpion venoms are sp. appropriate antisera must be used in treatment. In South America, since an antiserum has been available for the poison of the common variety, *Tityus bahiensis*, no deaths from scorpionism have been reported. The 2 species of spider responsible for most cases of arachnidism are *Lycosa raptoria* and *Ctenus nigriventer*, and their poisons are highly sp. *Lycosa* poison causes a local necrosis, but no systemic action; *Ctenus* venom causes intense pain, a slowed pulse, reduced temp., muscular contraction, convulsions and anuria. The bivalent antivenin is therapeutically effective.

G. H. SMITH

**The cold-hemagglutinin.** N. YU. *Acta Med. Keijo* 11, 23-34(1928).—The hemagglutinin which reacts strongly at 0° and which is non-active at 37° has been called by Shiga cold-agglutinin. Normal rabbit serum contains the auto-cold-hemoagglutinin. Normal horse serum contains but little auto-cold hemagglutinin. The cold-agglutinin as well as the auto- and hetero-agglutinin is not harmed by heating for 30 min. at 60°. At 65° they are slightly injured and at 70° they are entirely destroyed. The receptors for the cold-agglutinin and the immuno-agglutinin are specific and differ from one another. The receptors of the auto- and hetero-cold agglutinin are strongly specific.

ARTHUR J. VORWALD

**Experimental dehydration: Chemical changes in the blood of the dog contrasted with those following obstruction of the cardiac end of the stomach.** RUSSELL L. HADEN AND THOMAS G. ORR. *J. Exptl. Med.* 49, 945-53(1929).—A comparative chem. study of the blood and the urine of the dog with exptl. dehydration and with obstruction of the cardiac end of the stomach is reported. The av. duration of life is slightly longer with dehydration than with obstruction. The urine output per kg. of body wt. is almost twice as great in dehydration as with obstruction. The increase in non-protein N and urea N is much the same in the 2 groups although somewhat more marked with obstruction. The chlorides of the blood are markedly increased with dehydration and slightly decreased with obstruction. The increase in fibrinogen and total protein is twice as great with obstruction as with dehydration. These findings indicate that there must be some factor or factors in addn. to dehydration producing the toxemia of cardiac obstruction.

C. J. WEST

**Chemical findings in the blood of the dog after closed-loop obstruction of the jejunum.** RUSSELL L. HADEN AND THOMAS G. ORR. *J. Exptl. Med.* 49, 955-8(1929).—The chem. findings in the blood of 6 dogs with closed-loop obstruction of the upper jejunum are reported. The duration of life with closed loops is less than with simple obstruction. All animals showed a marked rise in non-protein N and urea N and fall in chlorides. Usually the CO<sub>2</sub>-combining power of the plasma is increased. The findings in closed-loop obstruction are essentially the same as those in simple intestinal obstruction.

C. J. WEST

**The inactivation of the chicken-tumor virus by means of calcium compounds.** MARGARET REED LEWIS AND HOWARD B. ANDERVONT. *Bull. Johns Hopkins Hosp.* 42, 191-7(1928).—The addn. of CaO, Ca mono-basic phosphate and Ca hexosephosphate in as small quantities as 0.5, 0.75 and 1%, resp., to the chicken-tumor ext. (1:10) inactivated the virus and prevented the growth of a tumor. Larger amts. (25%) of CaCO<sub>3</sub> adsorbed and fixed the virus. The addn. of 2% plaster of Paris inactivated the virus, but 1% was ineffective.

R. C. WILLSON

**Endemic goiter in Tennessee (OLESEN) 14.**

## H—PHARMACOLOGY

A. N. RICHARDS

**Studies on the mechanism of the fluoride effect.** F. LIPMANN. Kaiser-Wilhelm Inst. Biologie, Berlin-Dahlem. *Biochem. Z.* 196, 3-21(1928).—The effect of F on the hydrolysis of  $H_2PO_4$  from esters and on the respiration and lactic acid production of muscle has been investigated. The hydrolysis of glycerophosphoric acid, hexosediphosphoric acid and hexosemonophosphoric acid by muscle pulp, by coenzyme-free acetone yeast, or by muscle ext. is only slightly less inhibited by F than is the lactic acid production. Conclusion: The inhibition of lactic acid production is due to the depression of  $H_2PO_4$  hydrolysis. The respiration of cut muscle is influenced less than the lactic acid production by the F, its repression being detd. *indirectly* by the inhibition through the diminution of lactic acid concn. which can be remedied by the addn. of lactate; and *directly* by the inhibition of respiration. The opposite effect of respiration and lactic acid production becomes particularly marked under the addn. of lactate, when 0.01 N NaF inhibits the latter 100% while it has no effect at all on the former. These expts. also demonstrate the important fact that the extent of respiration in NaF depends upon the lactic acid concn. The oxidation quotient of lactic acid is much reduced by F, and is only 1 when lactic acid production is inhibited, *i. e.*, there is no resynthesis of lactic acid. The oxidation of glycerophosphoric acid is practically not influenced by F, whereas the hydrolysis of  $H_2PO_4$  is already suppressed, which is the reverse of the condition under the influence of HCN.

S. MORGULIS

**Caffeine diuresis.** FRANZ FALUDI. *Z. ges. exptl. Med.* 62, 242-8(1928).—See C. A. 23, 906.

F. L. DUNN

**Clinical tests of the practical value of the new sexual hormone preparations.** RUD. TH. V. JASCHKE. *Deut. med. Wochschr.* 55, 301-2(1929).—The sexual hormones are useful in cases of secondary amenorrhea, hypoplasia of the uterus, premature climacterium and after ovariectomy.

ARTHUR GROLMAN

**The mechanism of pilocarpine hyperglucemia.** GAETANO VIALE AND LUIGI NAPOLEONI. *Biochim. terap. sper.* 15, 421-4(1928).—The suprarenals were removed from 5 dogs and the animals were injected intravenously with one cg. of pilocarpine. In dogs without suprarenals, pilocarpine either fails to effect the glucemia, or else produces a profound hypoglucemia, comparable in intensity to that of insulin. Therefore, the suprarenals are involved in pilocarpine hyperglucemia in the sense that under the action of this alkaloid, adrenaline is set free. Probably, in itself, pilocarpine has a hypoglucemic action similar to that of choline. This hypothesis explains Bucciardi's results who found that in guinea pigs, pilocarpine in small doses did not modify the glucemia, in medium doses produced hyperglucemia, and in large doses produced no effect. The last results indicate that the hypoglucemic action of pilocarpine neutralized the hyperglucemic action of adrenaline. Similarly, this mechanism also explains why ergotamine impedes the hyperglucemic action of pilocarpine, and why pilocarpine produces hypoglucemia if injected after ergotamine.

PETER MASUCCI

**Concerning the study of Giulio Bucciardi "The effect of colloidal sulfur (sulfosolo) on the blood sugar level of normal men and animals."** GIUSEPPE PENNETTI. *Arch. farmacol. sper.* 27, 222-4(1929); cf. C. A. 23, 1176.—Polemical. Reply. GIULIO BUCCIARDI. *Ibid* 239-40.

G. SCHWOCH

**Trypanocidal activity and chemical constitution.** I. New S derivatives of aromatic organic arsenicals (EVERETT) 10.

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LYNN, ELDIN V.: **Pharmaceutical Therapeutics with Pharmacology, Posology and Toxicology.** New York: McGraw-Hill Book Co., Inc. \$4. Reviewed in *Am. J. Pharm.* 101, 377(1929).

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UNDERHILL, FRANK P.: **Toxicology or the Effects of Poisons.** 2nd ed., revised. Philadelphia: P. Blakiston's Son & Co. 322 pp.

## I—ZOOLOGY

R. A. GORTNER

**Action of bromine on the fat bodies of insects.** JEAN TIMON-DAVID. *Compt. rend.* 188, 1122-4(1929); cf. C. A. 22, 4178.—Continuing his work on insect fats T.-D.

detd. the I no. (Wijs) of the fats of numerous insects: *Vanessa urticae* L. 159.7, *Pieris brassicae* L. 149.9, *Saturnia pernyi* Guer. 140.4, *Archia caja* L. 133.3, *Malacosoma francica* Esp. 138, *Colaspidea atra* L. (larva) 113.4, *Leptinotarsa decemlineata* Say (imago) 108.6, and *Galerucella luteola* Mull 118.2. The hexabromide no. (Hehner) was also made on several insect oils: *Saturnia pernyi* Guer. 14.7, *Pieris brassicae* L. 14.3, *Thaumetopoea pityocampa* Sch. 2.1, *Leptinotarsa decemlineata* Say 3.1, *Colaspidea atra* Oliv. 6.3, and *Ergates faber* L. 0.0. *Linolenic acid* was identified in the oil derived from *Colaspidea atra* Oliv. The food of insects plays an important role in the compn. of their body fat. C. R. FELLERS

Further studies on the silver line system of ciliata. BRUNO M. KLEIN. *Arch. Protistenk.* 65, 183-257(1929); cf. *C. A.* 22, 4563.—The occurrence of specific line systems (formed after Ag staining) is described for the conjugation period of *Colpodium campylum*, *C. copoda*, *Euplotes* and *Aspidisca*. Good bibliography. F. K.

The different seat of action of the calcium ion and of the potassium ion on the spinal medulla of *Bufo vulgaris*. MICHELE MIROLO. *Boll. soc. ital. biol. sper.* 4, 39-41 (1929).—The central seat of action of the Ca and K ions was investigated. Baglioni's prepn. was used; the KCl and CaCl<sub>2</sub> solns. were applied on the posterior intumescence of the isolated spinal medulla of *Bufo vulgaris* and the variations in the excitability of reflex were noted. Solns. of 0.1-0.88% KCl produced no effect when applied on the dorsal surface of the posterior intumescence, but did provoke a diminution of the reflex activity of the prepn. if applied on the ventral side. On the contrary, CaCl<sub>2</sub> solns. in concns. up to 4% when applied on the ventral side did not provoke any appreciable alterations of the excitability, but if applied on the dorsal side of the same intumescence, solns. as weak as 1.17% produced diminution of the reflex activity, which became more accentuated with 2.4-4.0% solns. until the excitability disappeared. Conclusion: The K and Ca ions are both depressor poisons of the central nervous system. They have, however, a different seat of action: while the K ion causes depression by acting on the motor centers mechanism of the anterior horn, the Ca ion depresses the central activity by acting on the sensori-coördinators of the posterior horn of the spinal medulla.

PETER MASUCCI

Potentiometric study of the oxidation-reduction potential of the eggs of the sea urchin. EDMOND VELLINGER. *Arch. phys. biol.* 6, 141-51(1927); cf. *C. A.* 22, 463.—The detn. of the  $p_H$  was performed after grinding the eggs at  $-60^\circ$  at a temp. near the cryoscopic point. The interior  $p_H$  is for *Arbacia aequituberculata* 5.2, for *Paracentrotus lividus* 5.8. The  $p_H$  obtained by the direct method is slightly higher than that obtained by the use of indicators. A. E. MEYER

Function of the interrenal tissue in the torpedo. BRUNO KISCH. *Endokrinologie* 1, 31-9(1928).—Total extirpation of the interrenal tissue in torpedoes leads, after a latent period of one to several days' duration, to a no. of typical symptoms. The pigment of the skin chromatophores is clumped together tightly, a condition which persists until death and gives the animals a dirty gray color. The respiration is generally strongly inhibited and body movement causes further slowing up and deepening of the respiration. The animals show progressive weakening of the muscles, quick fatigue and an inertia which may actually lead to failure to respond to stimulation. Furthermore, rigidity and contracture of the muscle occur, lasting till death and causing extreme conditions of opisthotonus. Following interrenal tissue extirpation the animals become extraordinarily sensitive to lack of O<sub>2</sub>. Survival of the extirpation depends upon the special and individual constitution (age, pregnancy, etc.), temp., O<sub>2</sub> supply, while intense body movement may induce sudden death. Death is due to respiratory arrest, while the heart still beats regularly. It is believed that the interrenal tissue yields to the blood some compd. which is directly or indirectly responsible for the oxidation of certain metabolic products. S. MORGULIS

Studies on the chemical embryology of reptiles. I. MASAJI TOMITA. *J. Biochem.* (Japan) 10, 351-6(1929).—The eggs of the sea turtle, *Chelonia cauwana*, have an av. wt. of 34.4 g., of which the shell weighs 2 g.; the white, 13.5 g. and the yolk, 18.9 g. 13.5 g. of the egg white is composed of 13.30 g. water and 0.2 g. dry residue; it contains 0.04 g. N and 0.08 g. ash. The 18.9 g. yolk consists of 13.75 g. water and 5.15 g. dry residue, with 0.55 g. N and 0.22 g. ash. The 2 together contain 1.65 g. fat and 2.81 N-free extractives. The egg white contains very little free amino acids, no tryptophan and no purine bases. In the egg yolk the amino acid content is much greater and the same as in chick egg yolk. Tryptophan is also present. In the course of development the urea of the egg content increases gradually from 0.0056% in the fresh egg to 0.0294% after 30 days and to 0.0612% after 45 days of incubation. The uric acid content which in the fresh egg is nil rises to 0.17 mg. after 15 days' incubation but does not increase

beyond that even after 45 days. **II. The behavior of the non-protein nitrogen of the reptilian egg during incubation.** MASAJI TOMITA AND YASUO NAKAMURA. *Ibid* 357-60.—The entire egg of the sea turtle contains 1.77% total N which is much less than that in the hen egg, and this total diminishes during incubation, falling to 1.54% at the end of 45 days. The non-protein N, however, increases during incubation. The fraction precipitable by phosphotungstic acid is very small as compared to the hen egg. **III. The production of *d*-lactic acid in the incubation of the sea turtle egg.** MASAJI TOMITA AND YUZO SENDJU. *Ibid* 361-3.—The amt. of *d*-lactic acid in the fresh sea turtle egg is 0.008% and increases to 0.041% after 15 days of incubation, which is very much less than in the developing hen egg. The lactic acid content then remains about the same throughout the later stages of incubation (0.015%). **IV. The behavior of the essential amino acids in the incubation of the sea turtle egg.** *Ibid* 365-7.—The various essential amino acids are found in quantities  $\frac{1}{2}$  to  $\frac{1}{4}$  that present in the hen egg. During incubation the content of tryptophan, tyrosine, cystine and arginine gradually increases. The quantity of lysine remains practically unchanged. There is a gradual rise in the histidine content which is not the case in the developing hen egg. The purine bases, both free and combined, increase with the progress of the development of the embryo. **V. Relation of inorganic components to the incubation of sea turtle eggs.** MASAJI TOMITA AND JUNJI KARASHIMA. *Ibid* 369-74.—The only striking alterations in the mineral compn. are the great increase in Ca, Mg and P found in the advanced stage of incubation and in the newly hatched embryo, which indicate that the shell is used up in the developmental process. The P increase is at the expense of org. P which begins to disappear in the last third of the incubation period. **VI. The behavior of fat in the incubation of the sea turtle egg.** *Ibid* 375-7.—The total fat content of the whole egg diminishes considerably in the last developmental stages. After the 15th day of incubation there is a marked rise in the free fatty acids. These free acids cannot be due to the oxidation of non-fat components of the egg since the total amt. is not changed thereby. **VII. The enzymes in the sea turtle egg.** MASAJI TOMITA AND JUN-ICHIRO SAGARA. *Ibid* 379-82.—Diastase, lapase and nuclease increase during incubation, especially in the late stages and in the newly hatched embryo. The trypsin activity remains unchanged in the egg but shows an increase in the newly hatched embryo.

S. MORGULIS

**The experimental method as applied to entomological investigations.** W. B. HERMS. *J. Econ. Entomol.* 22, 45-61(1929).—This is an address covering the following topics: insect nutrition, H-ion concn. of insect environments, insect vectors of human and plant diseases, effect of toxic chemicals on insects, reactions to light, insect physiology, exptl. equipment, qualifications for investigators in exptl. entomology. Bibliography.

C. H. RICHARDSON

**Nutrition as a factor in the responses of the European corn borer.** J. S. HOUSER AND L. L. HUBER. *J. Econ. Entomol.* 22, 171-4(1929).

C. H. RICHARDSON

**The function of the blood of the *Limulus longispina*.** K. MORIBE. *Fukuoka Ikudangaku Zasshi* 21, 84(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 47, 402.—The max O content of the blood of the Japanese *Limulus longispina* ranged between 1.83 and 2.91%, av. 2.17%. The N content was 0.59-1.13%, av. 0.81%. The  $H_2CO_3$  content of the serum was 5.22-9.11%, av. 6.97%. The hemocyanin of the blood is functionally important for the respiration as is the hemoglobin of the warm-blooded animals.

R. C. W.

**The influence of the seasons on the formation of glycogen in frogs.** ANNA GOLDFEDEROVA. Univ. Brno. *Spisy Lekárske Fakulty Masarykovy Univ.* 5, 89-104(1927); *Ber. ges. Physiol. exptl. Pharmacol.* 47, 433; cf. *C. A.* 22, 283.—In summer, frogs fed with worms showed an increase of 0.5-6.0% in the liver glycogen. Parenteral administration of glucose, starch, Ca lactate and glycerol to esculenta caused an increase of 8-18% in the liver glycogen in the summer and fall. Animals in nature showed the same seasonal variations as those in captivity.

R. C. WILLSON

**The actual reaction of the heath-moor "Seefelder" near Reinerz and the significance of the H-ion concentration for the individuality of the moor fauna (HARNISCH).** 14. Comparative determination of the actual reaction of moor waters (SMORODINTSEV, ADOVA) 14.

## 12—FOODS

F. C. BLANCK AND H. A. LEPPER

**Definitions and standards for food products.** Food, Drug and Insecticide Administration, U. S. Dept. Agr. *Service & Regulatory Announcement* F. D. No. 2 (Rev. 1), 20 pp.(Dec., 1928).—The principles on which definitions and standards are based are set forth and those adopted for guidance of officials in the enforcement of the food and drugs act: meats and the principal meat products, milk and milk products, grain products, fruits and vegetables, sugars and related substances, condiments (other than wines, vinegars and salt), tea, coffee and cacao products, beverages, wines, vinegar, salt and baking powder.

H. A. LEPPER

**Regulations for the enforcement of the Federal Food & Drugs Act.** Food, Drug and Insecticide Administration, U. S. Dept. Agr. *Service & Regulatory Announcement* F. D. No. 1, 19 pp.(Oct., 1927).—The text of "An act for preventing the manufacture, sale, or transportation of adulterated or misbranded or poisonous or deleterious foods, drugs, medicines and liquors and for regulatory traffic therein, and for other purposes" as amended is given with the regulations adopted.

H. A. LEPPER

**The relation of research to control.** C. A. BROWNE. *J. Assoc. Official Agr. Chem.* 12, 211-23(1929).—An address dealing principally with the development of the application of research to food and drug control in the U. S.

A. P. C.

**Certification of coal-tar colors.** Food, Drug and Insecticide Administration, U. S. Dept. Agr. *Service & Regulatory Announcement* F. D. No. 3, 10 pp.(Oct., 1927).—The procedure for the certification of coal-tar food colors is outlined and the requirements which such dyes must meet are given. The permitted dyes, 14 in no., are listed in Supp. No. 1 issued April, 1929.

H. A. LEPPER

**Solbrol [methyl *p*-hydroxybenzoate].** U. G. BILSMA. *Arch. intern. Pharmacodynamie* 34, 173-9(1928); *Physiol. Abstracts* 13, 476.—The preventive action of solbrol on the growth of bacteria and molds is of the same order as that of salicylic acid, and similar effects are produced by equal quantities. Solbrol is only slightly toxic, and its use in the preservation of food is without danger. No ill effects on health have been observed, but it is not advisable to use large quantities. The continuous use of either drug causes a lowering of resistance of young rats in unfavorable outward conditions, but when these are not bad it is well borne in doses of 4 g. per kg. per day. The effect of solbrol on N exchange of dogs is appreciably less than that of salicylic acid. On decompn. in the body 250 mg. of solbrol yields 54 mg. of MeOH, which causes no trouble.

H. I. D.

**The effect of boiling on the nutritive value of food.** NATALIE YARUSOVA. *Biochem. Z.* 207, 395-404(1929).—Prolonged boiling has no appreciable influence on the nutritive value of food.

S. MORGULIS

**Interim report on protein content as a factor in grading wheat.** H. M. TORY, et al. Natl. Research Council (Canada) *Bull.* 13, 7-60(1929).—Interviews were made in various parts of the U. S. on the advisability of making protein content a factor in grading wheat. Modern bakeries require a flour with a protein content of 10.75 to 11% and are willing to pay a premium for high protein flour. The cost in 5 labs in the U. S. for making a single protein test was not over \$0.50. If protein tests were required on all wheat, sampling would need to be done more carefully, and extra bin space would be required at the elevators. It would probably not affect greatly the speed of movement of the crop. In the U. S. protein content is not a grade factor but the premiums paid for high protein content make it the prime factor in detg the price of high-protein wheat. If it were a factor in grading wheat in Canada and the premium received for high protein could be reflected to the growers, more high protein wheat would be grown. Certain European buyers test samples of wheat for strength before buying, and Canadian wheat often receives a premium because of its high av. protein content. In countries where there is no standard system of baking, however, high-protein wheat is not valued, and it is a question if the demand for high-protein and the premiums received will pay for the extra cost of the tests and of keeping the wheat sep. in exporting. A study of drying moist wheat showed that 82° is the max. safe temp. for the drying air, and that the initial H<sub>2</sub>O content did not affect the quality of the dried grain. The establishment of an exptl. mill at Winnipeg is suggested as a means of checking lab. results on a semi-com. scale.

AMY LÉVESCONTE

**New method of determination of Indian corn flour admixed to wheat flour.** A. V. MILSKIL. *Ukrainskii Khim. Zhur.* 3, *Tech. pt.*, 183-208(1928).—Air-dry the flour which is to be analyzed, place 37.5 g. in a 250-cc. volumetric flask, add 150 cc. 95%

EtOH, shake the contents to mix well, adapt a reflux condenser and reflux the mixt. exactly 1 hr. on a water bath. The strength of the EtOH used must be exactly 95% as detd. by a Tralles alcoholometer, as the quantity of proteins extd. greatly depends on the strength of the alc.; the presence of a small quantity of MeOH as denaturant does not interfere. After refluxing, fill the flask with its hot contents approx. to the mark with 95% EtOH, shake, fill exactly to the mark after cooling, shake again and let stand to settle overnight, or at least 2 hrs. Filter the supernatant liquid quickly through asbestos placed in a tube so as to obtain 150–160 cc. of filtrate in the first 15–20 mins. Take by means of a pipet 15–25 cc. of the transparent filtrate, evap. in a Kjeldahl flask, add 5–7 cc.  $H_2SO_4$ , sp. gr. 1.84, and det. N by the Kjeldahl method. Calc. the % of the maize admixt. by the formula  $X = (A - 26)/5.84$ , where  $X$  is the % of maize flour,  $A$  is N expressed in mg. and calcd. on an ext. from 100 g. air-dry flour. (In this calcn. it is conventionally assumed that flour occupies in the extn. flask a vol., in cc., equal to its weight in g.) If the flour contained in addn. some rye, the exactness of the maize detn. would be but little affected: a 25% admixt. of rye would appear as a 1% admixt. of maize. If barley meal is also present, the result will practically not be affected. This method is exact and simple. When applying this method to the analysis of baked bread, it is, of course, also found that the quantity of N found in the alc. ext. of maize-contg. bread is considerably higher than that of the pure wheat bread, but the proper conditions of extn. when dealing with breads have not yet been detd.

BERNARD NELSON

**Ammonium persulfate and the baking capacity of meal.** H. LÜERS AND A. SAUMWEBER. *Z. ges. Getreidew.* 16, 8–14(1929).—Bread made of meal treated with  $(NH_4)_2S_2O_8$  possesses an increased batch vol. and a finer pore formation. The persulfate has a sp. stimulating action on the yeast. The gluten is more solid and resistant while the enzymes are little changed.  $(NH_4)_2S_2O_8$  acts on some meals while others remain unaffected.

C. SCOTT

**Studies in cereal chemistry. III. The basic materials.** T. H. FAIRBROTHER. *Ind. Chemist* 5, 199–201(1929); cf. *C. A.* 23, 3277.—When barley is to be used for feed, bushel wt. and  $H_2O$  content are the important factors in grading. If it is to be used for production of malt, beer, etc., other factors to be considered are: percentage germination, thickness of husk, yield of malt, quantity of sol. ext., diastatic activity and protein content. Since oats are used primarily for food, the factors considered in grading are amt. of husk or fiber and the protein, fat, carbohydrate and ash content of the endosperm. In grading maize, bushel wt. and  $H_2O$  content are detd. An acidity test will indicate incipient deterioration. The detn. of the amt. of rye flour in a mixt. of wheat and rye flour is sometimes necessary. Cereal flours may be distinguished by a microscopic examn. of the starch granules.

AMY LEVESCONTE

**A yellow color in dough without the use of a dye.** TH. VON FELLEBERG AND J. RUFFY. *Mitt. Lebensm. Hyg.* 20, 34–7(1929).—A secret process offered for sale by a Dutch firm to Swiss millers for treating cereal groats without the use of a dye, so as to produce a yellow dough, was investigated. It was found that at least 3 cc.  $N/1$  NaOH per 100 g. groats was necessary to produce a yellow dough, which fluoresced greenish yellow in ultra-violet light. This fluorescence was due to certain constituents of the hulls. Dough untreated with NaOH gives a bluish fluorescence. Groats treated with NaOH can also be detected by the alky. of the ash.

B. C. BRUNSTETTER

**Report on (the determination of alumina in) baking powders and baking chemicals.** L. H. BAILEY. *J. Assoc. Official Agr. Chem.* 12, 206–8(1929).—Wohlk's volumetric method (*C. A.* 22, 3112) was found unsatisfactory. Hess and Campbell's phenylhydrazine bisulfite method (*J. Am. Chem. Soc.* 21, 776(1899)), with some slight modifications, gave satisfactory collaborative results, and will be studied further.

A. PAPINEAU-COUTURE

**Regulations for the enforcement of the Federal import milk act.** Food, Drug and Insecticide Administration, U. S. Dept. Agr. *Service & Regulatory Announcement* I. M. No. 1, 6 pp.(July 21, 1927).—The text of "An act to regulate the importation of milk and cream into the U. S. for the purpose of promoting the dairy industry of the U. S. and protecting the public health" is given with the regulations adopted.

H. A. LEPPER

**The value of milk pasteurization at 63° to 65° for the prevention of tuberculosis.** H. RAUTMANN. *Z. Fleisch. Milchkhyg.* 37, 185–9(1927); *U. S. Pub. Health Eng. Abstracts* E-789b, 16.—Low-temp. pasteurization (63° to 65°) properly applied can be relied upon to destroy the tubercle bacilli.

C. R. FELLERS

**Antigenic properties of evaporated milk.** ORAN T. CUTLER. *J. Am. Med. Assoc.* 92, 964(1929).—The heating of cow milk in prepn. of evapd. milk does not change

the antigenic capacity of the casein as detd. by anaphylactic reactions. There is an alteration of whey protein during such heating as is shown in the change in specificity whereby heated whey proteins are less reactive in animals sensitized with raw or pasteurized milk, or with antibodies against pasteurized milk. R. C. WILLSON

**Malted milk: a study of the action of the enzymes of malt upon milk solids during manufacture.** B. G. HARTMANN AND F. HILLIG. *J. Assoc. Official Agr. Chem.* 12, 223-38(1929).—An investigation into whether biol. activities occur in the evapn of the mixt. of malt infusion and milk in the manuf. of malted milk. A study of the effect of temp. on the conversion of starch in the mashing process showed that: the mashing temp. does not materially affect the H-ion concn.; the highest sugar degree (% sugar in solids) is obtained at 45°; for complete conversion of starch a temp. of 65° is necessary; and a malt infusion prep'd. at 65° has a  $p_H$  of about 5.7 and an acidity of approx. 0.14% as lactic acid. Under the conditions of the expts. no lipolytic action took place when malt infusions prep'd. at 30-65° were permitted to act on butter fat or powd. whole milk; since the temps. and  $p_H$  ranges used cover the conditions that may occur in factory practice, it is very doubtful that digestion of fat occurs during the mfg. process. This conclusion is open to the criticism that the expts. did not take into consideration the concn. of the enzyme through the progressive removal of  $H_2O$ , under which circumstances increased activity is possible. The expts. showed that proteolytic activity undoubtedly occurs when a properly prep'd. malt infusion is permitted to react with milk proteins, but that no proteolytic digestion occurs during the first 3 hrs. of evapn. as conducted in the factory; but whether there is an action of proteolysis during the final evapn. to dryness, through the concn. of the enzyme, is not demonstrable in the lab. Expts. with a no. of the better known brands of malted milk, wherein sol. starch was used as the substrate, showed only slight digestion when tested with I; this may be due to the high  $p_H$  of these products (about 7.2), as the expts. have shown that max. starch conversion takes place at 45° at a  $p_H$  of about 5.9. Even after long storage (2 yrs.) at room temp., malted milk has distinct digestive properties. Organoleptic observations made on malted milk prep'd. in the usual manner and on products obtained by drying inactivated malt-infusion-milk mixts showed both kept equally well by storing 2 yrs. at room temp., contrary to the generally made claim that the action of enzymes in the process of manuf. improves the keeping qualities of malted milk. A. PAPINEAU-COUTURE

**Report on (the determination of lactose in) malted milk.** B. G. HARTMANN. *J. Assoc. Official Agr. Chem.* 12, 201-2(1929).—By use of the modified fermentation method proposed by Allen (*Proc. World's Dairy Congress* 2, 1316(1923)), which consists essentially in fermenting the material under aeration and detg. the residual lactose by Cu reduction, acceptable results were obtained when lactose was detd. in pure soln. and in admixt. with sucrose or pure dextrose (cerealose); but malt ext., com. glucose and com. invert sugar leave a considerable residue after fermentation, which reduces Cu. A very decided reduction of the interfering residue was obtained by fermenting with yeast that had been activated by incubating overnight at room temp. in a cerealose soln. A. PAPINEAU-COUTURE

**The microscopical identification of malted milk and its flavored products.** F. HILLIG AND B. G. HARTMANN. *J. Assoc. Official Agr. Chem.* 12, 238-40(1929).—Photomicrographs are given and explained of genuine malted milk, spray-dried whole and skim milk, spray-dried and drum-dried malt ext., cocoa and sugar, and mixts of certain of these ingredients. In true malted milk prep'd. in accordance with the definition of the U. S. Food, Drug and Insecticide Administration, the malt ext. solids and the milk solids are incorporated into homogeneous irregular fragments having a stippled surface; the appearance is so characteristic that it is considered that it cannot be mistaken for any product of similar compn. A. PAPINEAU-COUTURE

**Butter with an abnormally high Polenske number.** OTTO HÖGL AND HANS SCHELENBURG. *Mitt. Lebensm. Hyg.* 20, 37-41(1929).—Samples of butter boiled over the free flame to a dark brown color showed an av. increase of 1.5 in the Polenske no. This effect occurred only after a direct boiling of the whole butter. There was no change in the Polenske no. after heating the filtered fat from the butter. Other analytical characteristics were unaffected. B. C. BRUNSTETTER

**Metals in dairy equipment; corrosion caused by washing powders, chemical sterilizers and refrigerating brines.** O. F. HUNZIKER, W. A. CORDS AND B. H. NISSEN. *J. Dairy Sci.* 12, 252-84(1929).—The same metals were used as in a previous expt. (cf. C. A. 23, 2506). The washing solns. used were 0.5% soln. of NaOH, special alkali,  $Na_2CO_3$ , Wyandotte Cleaner and Cleanser,  $Na_3PO_4$  alone and with 0.025%  $Na_2CrO_4$ . The Al products suffered by far the most intense corrosion, then followed tinned Cu



and tinned Fe, although their resistance was much greater than that of the Al products. Of the remaining metals the Cr-Ni steel, Allegheny Metal, and the ordinary Cr steels, Ascolay and Enduro proved most resistant. Ni and Monel metal were practically immune, while Ni-Ag tarnished considerably. The corrosion of Cu, Fe, galvanized Fe and Zn was greater but not as severe as that of the tin-plated products. The chem. sterilizers used were solns. of NaClO, Diversol and Chloramine-T. Diversol was very destructive to Al, but the least corrosive. Chloramine-T showed less intense action than NaClO, but its corrosive effect was somewhat greater than Diversol. Allegheny Metal and Enduro showed no visible corrosion, and the attack on Ascolay, Ni, Monel metal, and Ni-Ag was but slight. Both neutral NaCl brine and neutral CaCl<sub>2</sub> brine were used. Portions were made alk. with NaOH, and other portions treated with NaCrO<sub>4</sub> and Na silicate, resp. Ni and Allegheny Metal resisted practically completely corrosion, then followed Enduro, Ascolay, Monel metal, Ni-Ag and Sn. Cu and tinned Fe products showed considerable corrosion. Al withstood corrosion except in alk. brines. Fe, galvanized Fe and Zn suffered heavy weight losses in all brines and very poor resistance to corrosion. The action of the Na brines was more severe than that of the Ca brines.

J. C. JURRIJENS

**Desiccation of vegetable material.** B. J. OWEN. *Domestic Eng.* 49, No. 5, 83-91 (1929).—The chief considerations in problems of drying vegetables and other agricultural products are temp. and the relation between compression, density and resistance to passage of air. Processes are described which are considered suitable for drying grasses, cereals, sugar beets, grain, apples, hops and potatoes.

E. I. S.

**Composition of raisins from Cyrenaica.** A. FERRARA. *Agr. coloniale* (Florence) 21, 5-11 (1927); *Intern. Rev. Sci. & Practice Agr.* [N. S.] 18, 467T.

E. H.

**The preservation of tropical fruits with latex.** W. SPOON. *Ber. Afdeel. Handelsmuseum Ver. Koloniaal Inst.* No. 43; *India Rubber J.* 77, 586 (1929).—Expts. on the preservation of E. Indian fruits with fresh latex, vulcanized latex and "Uterex" (Utermark centrifuged latex) are described. The fruits were dipped 2-3 times, dried, packed and shipped to Amsterdam, along with similar fruit not so treated. The expts. warrant certain general conclusions. Concd. latex gives a thicker, stronger film than ordinary latex, and both prevent the development of mold for a considerable time. Vulcanized latex films are unsuitable because they encourage mold development. With concd. latex it is difficult to obtain films of the same thickness on different fruits. Rubber films affect adversely the taste of papaws, mangoes and certain citrus fruits. In no case does the application of a rubber film have any decided advantage, for though it retards ripening, the fruits usually deteriorate without ripening after the films are removed. The tendency of vulcanized latex to encourage the growth of mold was confirmed by tests of artificial cultures of *Penicillium* (the mold found on the fruit), whereas ordinary latex and particularly concd. latex retarded mold growth. Similar expts. on mangoes and mangosteens have been described by Chevalier (*Rev. botan. appl. agr. colon.* 3, 839 (1923)) and by Cramer (*De Indische Merkuur* 48, 207 (1925); *Algem. Landbouw-Weekblad v. Ned.-Indië* 9, 1215 (1925)).

C. C. DAVIS

**Paper wrappers and their effect upon physical and chemical properties of horticultural products.** H. D. BROWN. Michigan Agr. Expt. Sta., *Tech. Bull.* 87, 29 pp. (1928).—The chem. effects of using wrapping paper on fruit and vegetable products in shipping were neg. Kraft tissue, waxed vegetable parchment, etc., were tried in the tests. The amts. of sugar in sweet corn and peas were quickly reduced upon exposure to high temp. Sugar in peas apparently first changed to acid-hydrolyzable material and then to starch. In corn the change was apparently directly to starch. Storage in low temp. retarded these changes.

J. J. SKINNER

**The method of honey-production by bees and time involved.** A. SCHÖNFELD. *Vestník Českoslov. Akad. Zemedelske* 3, No. 3, 228-31 (1927) (résumé in French); *Intern. Rev. Science & Practice of Agr.* [N. S.], 18, 486-7T.—Differences in compn. of honey produced by the same species of bee in diff. geographical locations are attributed to differences in compn. of the nectar from which the honey is made. Swarms fed on 3 different sugar solns.: (a) sugar dissolved cold in an equal wt. of water; (b) sugar dissolved hot in half its own wt. of water; (c) as in (b), but with the addn. of citric acid that presumably would help the inversion of the sucrose, gave honey of the following compns.: water 19.5, 17.4, 19.1; saccharose 26.97, 40.20, 49.18; invert sugar 51.10, 47.94, 30.32; glucose 22.33, 17.12, 14.06; fructose 28.77, 20.82, 10.26; albuminoids 9.206, 0.144, 0.125. The bees inverted, resp., 48.14, 37.46 and 17% of the sucrose contained in the nutrient solns. a, b, c, hence the greater the concn. of the nectar in sucrose, the less the quantity that the bees can invert. This also applies to the activity of invertase.

H. L. D.

**Determination of glucose sirup and glucose in presence of sucrose and invert sugar.** C. I. KRUISHEER. *Chem. Weekblad* 26, 254-63(1929).—The new sugar titration method of Schoorl has been applied by K. The method has been so worked out that it is possible to obtain an exact idea of the compn. of such a mixt. for which a no. of formulas have been deduced. The method has been applied to the examn. of jams; in this case the error is not greater than 2%, independent of the corn-sugar content, and is smaller than with the methods usually applied at the present time. The method is also applicable to a mixt. contg. solid glucose instead of corn sirup, which makes it of importance in the examn. of confectionery and chocolates. J. C. JURRIENS

**Report on (the detection of artificial invert sugar prepared by enzyme conversion in) honey.** H. A. SCHUERTE. *J. Assoc. Official Agr. Chem.* 12, 151-6(1929); cf. *C. A.* 22, 2416.—From a discussion of results obtained in a collaborative investigation of the Auerbach-Bodländer method of detg. the levulose:dextrose ratio of honey, and also of both published and unpublished data, S. considers that no useful advantage would be gained at the present time in attempting to establish a levulose-dextrose ratio as an index of the presence of added invert sugar sirup. A. P. C.

**Sweetening component of some astringent "Kaki" (varieties *Dispyros kaki* L.).** MOTOE IWATA. *Bull. Inst. Phys.-Chem. Research* (Tokyo) 8, 220-2(1929); *Abstracts* 2, 27-9. (In English.)—In 1922, I. (in collaboration with Tazaki) found that *Kakishibu* (tannin-like component of "kaki" fruit) contained a white cryst. compd. of sweet taste. This is now identified as *D*-mannitol by analysis, m. p., rotary power and chem. reactions. Mannitol is therefore a notable factor in the sweetening elements of Kaki, and should always be detd. as well as the sugars. G. CALINGAERT

**Regulations for the enforcement of the Tea Act.** Food, Drug and Insecticide Administration, U. S. Dept. Agr. *Service & Regulatory Announcement* T. No. 1, 10 pp., (April, 1928).—The text of "An act to prevent the importation of impure and unwholesome tea" approved March 2, 1897, with amendments, is given with the regulations adopted. H. A. LEPPER

**Lead in oil sardines.** HEINRICH ZELLNER. *Deut. Nahrungsm. Rundschau* 4, 23-4(1929).—A case of Pb poisoning from eating canned sardines led to the analysis of a large no. of samples of different origin. From 0.2 to 3.2 mg. of Pb was found in 50% of the samples per 100 g. Sn was found in practically all samples, amounting to 3.2-13.4 mg. per 100 g. The cans contained from traces to 9.4 parts of Pb per 100 parts and the solder 49.2-65.0%, while only traces of Sb were found. The method of analysis is given in detail. J. C. JURRIENS

**Report on (the detection of) stock feed adulteration.** H. E. GENSLE. *J. Assoc. Official Agr. Chem.* 12, 148-50(1929); cf. *C. A.* 22, 2418.—The previously described method was modified by staining by the Gram method in order to accentuate the *B. lactis*, which are Gram positive, and also by triturating the feed in a mortar with water to isolate the bacteria from the milk particles. In most instances the bacteria were found in abundance by all collaborators in samples contg. buttermilk; but when the specimens represented a "cultured" product, few *B. lactis* were present. Examn. of ingredients used in stock feeds showed that many of them contained bacteria which might be confused or mistaken for *B. lactis*. Tests for the detection of buttermilk gave uncertain results when less than 2% was present. It is not advisable to sep. the bacteria, because when the actual particles of buttermilk are present they can be identified by the *B. lactis* enclosed within their areas and the danger of confusing various types of bacteria is thus avoided. A. PAPINEAU-COUTURE

**The white "zacate" of Honduras, *Ixophorus unisetus* Sch.** T. A. CALVO. *Bol. fomento* (San José, Costa Rica) 6, No. 3, 88(1927); *Intern. Rev. Agr.* [N. S.] 19, 466-- This graminaceous species is called both *Setaria unisecta* Tourn. and *Panicum unisetum* Trin. In Honduras it is used for grazing cattle. When green, air-dried and dried at 100°, resp., the plant contained water 83.87, 12.00, —; protein 1.27, 6.93, 7.87; fat 0.08, 0.46, 0.52; carbohydrates 8.28, 45.11, 51.27; fiber 4.89, 26.70, 30.31; ash 1.61, 8.80, 10.00%. The nutritive ratio was 1:10.49. H. L. D.

**Toxicity of Al compounds in the diet (McCOLLUM, *et al.*) 11E.** The physiological action of alum baking powders (SCHAEFFER, *et al.*) 11E. A simple method for the extraction of fresh water from sea water, etc. [evaporation of fruits] (RICHARD) 14. Freezing bio-colloids (Fr. pat. 652,234) 17. Clarification of fruit juices (Fr. pat. 652,144) 16. Dehydrating vegetable materials (U. S. pat. 1,713,619) 13.

**BEAU, M., AND BOURGAIN, C.: L'industrie fromagère. II.** Paris: J.-B. Baillière & Sons. 216 pp. Reviewed in *Expt. Sta. Record* 60, 664(1929).

BOIS, D.: *Les plantes alimentaires*. Paris: Paul Lechevalier. 593 pp. Reviewed in *Expt. Sta. Record* 60, 124 (1929).

ELLIS, D., AND CAMPBELL, D.: *The Science and Practice of Confectionery*. London: Longmans, Green & Co. 235 pp. 5s. Reviewed in *Chemistry & Industry* 48, 460 (1929).

FARRINGTON, E. H., AND WOLL, F. W.: *Testing Milk and Its Products*. Revised and enlarged ed. Madison, Wis.: Mendota Book Co. 280 pp. Reviewed in *Expt. Sta. Record* 60, 206 (1929).

PLIMMER, R. H. A., AND PLIMMER, VIOLET G.: *Food, Health, Vitamins*. New York: Longmans, Green and Co. \$1.20. Reviewed in *Practical Home Econ.* 7, 150 (1929).

ROOKER, WILLIAM A.: *Fruit Pectin*. New York: Avi Pub. Co. 170 pp. Reviewed in *Expt. Sta. Record* 60, 111; *J. Assoc. Official Agr. Chem.* 12, 252 (1929).

**Bakery furnace.** SOC. GOBERT ET CHARPENTIER. Fr. 652,060, April 2, 1928.

**Preserving foods by refrigeration.** J. E. W. REEH. Brit. 300,209, Nov. 8, 1927. See Fr. 643,666 (*C. A.* 23, 1446).

**Puffing cereal or other food products after cooking and pressing.** E. H. MCKAY (to Kellogg Co.). Brit. 300,261, Nov. 10, 1927.

**Puffed cereal products.** A. P. ANDERSON (to Anderson Puffed Rice Co.). Brit. 300,194, Nov. 8, 1927. An app. is described in which a puffed product is made by applying heat and pressure to moisture-contg. material reduced to a state such that it will flow under pressure; the treated material is passed through an annular or other orifice to permit the moisture to vaporize and produce a puffed product.

**Sterilizing liquid foods, etc.** CARL A. HARTUNG. U. S. 1,714,366, May 21. The liquid under treatment is heated in a circulating system, in an app. which is described, by indirect heat-transfer, countercurrentwise, from a liquid-heating medium, the temp. of which is so regulated as to be substantially constant and but a few degrees above the temp. of the treated liquid at any particular time and portion of the app. This avoids giving a scorched taste to foods treated.

**Sterilizing milk or other liquid foods with multiple steam jets.** GEORGE GRINDROD. U. S. 1,714,597, May 28. An app. is described suitable for sterilization of milk without giving it a "cooked taste."

**Centrifugal apparatus for use in tests such as those of milk and cream.** ROLAND J. WIGHTMAN (to Cherry-Burrell Corp.). U. S. 1,713,579, May 21. Structural features of bottle supports are described.

**Cheese.** E. S. MARTIN (to Phenix Cheese Corp.). Brit. 300,113, Nov. 5, 1927. Cheese or a mixt. of comminuted cheese with milk, cream or butter is stirred and heated to about 75° to effect pasteurization; it is homogenized by passing through small orifices under high pressure and is packed in sealed containers while hot. An emulsifier such as Na citrate may be added to the mixt.

**Apparatus for mixing, cooking and "compounding" cheese.** ALBERT S. KUX. U. S. 1,713,537, May 21. Structural features.

**Butyric acid bacteria.** MARTIN FLUBACHER. Swiss 129,468, Oct. 23, 1926. Addn. to Swiss 124,090. The development of butyric acid bacteria in stored fodder is prevented by spraying with solns. contg. such salts as NaCl, CaCl<sub>2</sub>, Na<sub>2</sub>PO<sub>4</sub> and iron lactate.

### 13—GENERAL INDUSTRIAL CHEMISTRY

HARLAN S. MINER

**Eighth (French) congress of industrial chemistry.** MAURICE DESCHIENS. *Chimie & industrie Special No.*, 7-114 (Feb., 1929).—A detailed account of the proceedings, Strasbourg, July 22-30, 1928.

**Chemical engineering in modern industry.** CHARLES M. A. STINE. *Trans. Am. Inst. Chem. Eng.* 21, 45-54 (1928). E. H. A. PAPINEAU-COUTURE

**The role of chemical engineering in city industrial expansion programs.** CHARLES W. CUNO. *Trans. Am. Inst. Chem. Eng.* 21, 1-10 (1928). E. H.

**Chemical engineering education in the United States.** ALFRED H. WHITE. *Trans. Am. Inst. Chem. Eng.* 21, 55-85 (1928). E. H.

**Massachusetts Institute of Technology (M. I. T.) Department of Chemical Engineering, including the School of Practical Chemistry and the Research Laboratory for Applied Chemistry.** S. KAMAI. *Chem. Fabrik* 1929, 257-9. J. H. MOORE

**The recovery of solvents from dry air of spreading machines.** OTTO KREBS. *Gummi-Ztg.* 43, 1294-5(1929).—Descriptive. C. C. DAVIS

**The drying speed in high-temperature drying.** M. TAMURA. *J. Soc. Mech. Eng. Japan* 32, No. 142, 69-76(1929).—Relations between factors which effect drying speed in so-called high-temp. drying in one dimension are discussed, particularly for the case where effects of speeds of evapn. and osmosis are negligible. E. I. S.

**Drying in combination with power generation.** H. BALCKE. *Wärme* 52, 359-61 (1929).—Driers are in many cases an excellent medium for exhaust-steam utilization in heating and power plants. Details are given of modern high-temp. driers. E. I. S.

**Emulsions, their scope and application.** W. E. BILLINGHAM. *J. Soc. Dyers Colourists* 45, 63-7(1929).—The dispersing medium is the crux of the problem of the production of emulsions for practical use in industry, since this depends upon the continuous phase possessing the essential quality of conferring stability and permanence to the emulsion by the necessary modifications of surface and interfacial tension. A stable emulsion must contain in the dispersing medium the right stabilizer, one which is elastic and has a long breaking length. The surest way of overcoming gravity, viscosity and surface and interfacial tension is to create an emulsion system in a closed form of the material to be emulsified, using this concd. system as the emulsifying agent or dispersing medium. *Amoa Amoil* is offered as possessing universal emulsifying and stabilizing properties. S. K. FORD

**Errors of sampling and measurements rationalized by control.** A. R. R. WESTMAN. *Chem. Met. Eng.* 36, 292-3(1929).—An article presenting charts which can be used in solving systematically the problems involving errors of sampling and measurements which arise in connection with engineering tests. A. WHITE

**Amination by ammonolysis—A unit chemical engineering process.** P. H. GROGINS. *Chem. Met. Eng.* 36, 273-5(1929); cf. *C. A.* 22, 3938.—A discussion of the effect of the following factors on ammonolysis:  $\text{NH}_3$  ratio,  $\text{NH}_3$  concn., temp, agitation, catalysts and solvents. A. WHITE

**British standard specification for synthetic-resin varnish-paper boards and tubes for general electrical purposes excluding tubes molded after being rolled.** *Brit. Eng. Standards Assoc.* No. 316, 29 pp.(1929). E. I. S.

**Regulations for the enforcement of the Caustic Poison Act.** Food, Drug and Insecticide Administration, U. S. Dept. Agr. *Service & Regulatory Announcement* C. P. No. 1 (Rev. 1), 12 pp. (Jan., 1929).—The text of "An act to safeguard the distribution and sale of certain dangerous caustic or corrosive acids, alkalies and other substances in interstate and foreign commerce" (Federal Caustic Poison Act) is given with the regulations adopted. H. A. LEPPER

**Acceptable antidotes for dangerous caustic or corrosive substances covered by the Federal Caustic Poison Act.** Food, Drug and Insecticide Administration, U. S. Dept. Agr. *Service & Regulatory Announcement* C. P. No. 2, 3 pp.(April 9, 1929).—Antidotes are given for  $\text{HCl}$ ,  $\text{H}_2\text{SO}_4$ ,  $\text{HNO}_3$ ,  $\text{PhOH}$ ,  $(\text{COOH})_2$ , salt of  $(\text{COOH})_2$ ,  $\text{AcOH}$ ,  $\text{HClO}$ ,  $\text{NaOH}$ ,  $\text{KOH}$ ,  $\text{NH}_4\text{OH}$  and  $\text{AgNO}_3$ . H. A. LEPPER

**A method of calculation for rotary compressors and its application to the refrigeration machine.** C. COLUMBI. *Z. ges. Kälte-Ind.* 36, 48-51, 68-72, 87-92(1929).—Theoretical. F. D. ROSSINI

**Notes on the question of mounting and insulating cable junctions.** P. FLORENSKII AND B. MAKOROV. *Vestnik Exptl. i Teoret. Elektrotekh.* 1, 17-26(1929).—Different mounting systems are described and a survey is made of methods and materials used for insulating purposes. VICTOR SHESHUNOFF

**Chemistry, agriculture and industry in Germany (DYMS) 2.** Effect of cathode rays on hydrocarbon oils and on paper. The mechanism of cable deterioration (SCHÖPFEL, CONNELL) 3. Determination of particle sizes (WERNER, GIERTZ-HEGSTRÖM) 2. Nomography. Nomogram for use in the chemical factory (LIESCHG) 2. Acylation of multi-valent ether-alcohols (Fr. pat. 652,383) 10.

**Grafes Handbuch der organischen Warenkunde.** Edited by Victor Grafe. Band V. Halbbd. 2. Borsten, Schwämme. Plastischen Massen. Federn, Synthetische Produkte. Heilmittel. Künstliche Gerbmittel. 416 pp. M. 21; linen, M. 24. Stuttgart: C. E. Poeschel.

**Official Directory of the British Chemical Plant Manufacturers' Association.** London: British Chem. Plant Mfrs.' Assoc. 119 pp. Reviewed in *Chemistry & Industry* 48, 463(1929).

RASSOW, B. AND LOESCHER, A.: *Jahresbericht über die Leistungen der chemischen Technologie für das Jahr 1928. Abt. 2. Organischer Teil.* Leipzig: J. A. Barth. 612 pp. M. 36; bound, M. 39.

WASSER, BRUNO: *Der Betriebs-Chemiker.* 4th ed., revised and enlarged. Berlin J Springer. 340 pp. Bound, M. 19.50.

**Catalytic reactions.** I. G. FARBENIND. A.-G. Fr. 652,595, Apr. 12, 1928. In exothermic catalytic reactions the tubes contg. the catalysts are assembled in groups so close together that the incoming gas has a greater linear speed than that in the tubes. Cf. C. A. 23, 1227.

**Catalytic reactions.** SOC. CHIM. DE LA GRANDE-PAROISSE, AZOTE ET PRODUITS CHIM. Fr. 652,574, Apr. 11, 1928. In exothermic catalytic reactions carried out under pressure, the fresh gas is caused to arrive between the wall supporting the pressure and an inner tube contg. the catalytic material, to protect the wall against the temp. The gas is mixed with the residual gas from the reaction chamber from which the product of the reaction has been removed, and the mixt. enters a heat exchanger before passing to the reaction chamber. Cf. C. A. 23, 1701.

**Liquefying gases.** GESELLSCHAFT FÜR LINDE'S EISMASCHINEN A.-G. Fr. 651,748, Mar. 24, 1928.  $C_2H_2$  is removed from gases to be liquefied by passing the gases over catalysts such as partially dehydrated bauxite or hydrates of Fe, which will cause disson, hydrogenation, or polymerization of the  $C_2H_2$ .

**Liquefaction of gases.** SOCIÉTÉ L'AIR LIQUIDE (SOC. ANON. POUR L'ÉTUDE ET L'EXPLOITATION DES PROCÉDÉS GEORGES CLAUDE). Fr. 33,712, Mar. 25, 1927. Addn. to 638,382 (C. A. 23, 223). Oxides of N and  $C_2H_2$  are removed from gases to be liquefied by hydrogenation in the presence of a catalyst such as Cu. Oxides of N may also be removed by hot  $(NH_4)_2SO_4$  solns.

**Removing sulfur compounds from gases.** I. G. FARBENIND. A.-G. Fr. 652,243, Apr. 5, 1928. The amt. of O necessary to oxidize the S compds. and the amt. of  $NH_3$  to form  $NH_4$  salts is added to the gas, which is directed at a high temp. onto active adsorption agents such as activated charcoal or onto alloys or compds. of metals with metalloids of the 4th, 5th, or 6th group of the periodic system, with the exception of O. The gas may be mixed with insufficient O and a small quantity of  $NH_3$  and directed at ordinary temp. on to the charcoal; this is afterward treated with O or air at a high temp., either with the addn. of  $NH_3$  or absorption in aq.  $NH_3$ .

**Separating dust, water, oil, etc., from gases.** HUNDT & WEBER G. M. B. H. Fr. 651,857, Mar. 28, 1928. The gas is caused to enter tangentially a primary scpg. chamber which contains a 2nd much smaller chamber into which the gas enters by helical tubes, and which has an axial exit tube.

**Recovery of volatile compounds.** VEREIN FÜR CHEMISCHE INDUSTRIE A.-G. Fr. 651,716, Mar. 24, 1928. Products such as hydrocarbons, ethers, ketones, Cl derivs. of  $C_2H_4$ , etc., which have been recovered from air by active C or  $SiO_2$ -gel, are displaced from the adsorbent by heated  $CO_2$ , the satd.  $CO_2$  being then passed through a KOH soln.

**Recovery of solvents.** I. G. FARBENIND. A.-G. Fr. 652,406, Apr. 10, 1928. Volatile org. solvents such as  $C_6H_6$  are recovered from gaseous mixts. by washing the mixts. with the fractions b. below  $200^\circ$  of the products of the catalytic hydrogenation of oxides of C.

**Recovery of plastic materials from their solutions.** THE NAUGATUCK CHEMICAL CO. Fr. 651,939, Mar. 29, 1928. An app. is described for passing a gas such as superheated steam through plastic, gummy, or amorphous material for removal of traces of solvent therefrom.

**Dehydrating vegetable materials.** BRYNAR J. OWEN (to Sugar Beet and Crop Driers, Ltd.). U. S. 1,713,619, May 21. Material such as disintegrated sugar beets liable to be injured by excessive heat in disintegrated form is massed to a thickness of 5-12 in., an artificial drying agent such as air is passed through the material for 45-60 mins. at graduated temps. and at substantially const. vol., so that the temp. of the drying agent is highest in contact with the fresh material and is progressively reduced as drying proceeds; the vol. of the drying agent is dependent on the exit temp. at which it is discharged in a state of satn. Cf. C. A. 23, 1699.

**Degreasing articles of metal, horn, celluloid, glass, etc.** A. WACKER GES. FÜR ELEKTROCHEMISCHE INDUSTRIE GES. and G. WOLFF. Brit. 299,650, Jan. 26, 1928. The articles are treated in warm, open baths of solvents such as  $CCl_4$ ,  $C_2HCl_3$ , gasolene, or  $C_6H_6$  above which cooling surfaces are placed to prevent escape of vapors from the degreasing liquid. Various details of an app. used are described.

**Artificial ice.** MAX EULE (to Adolf Hartmann). U. S. 1,713,596, May 21. In order to prepare water for freezing to obtain substantially clear ice, difficultly sol. constituents such as gases and Ca carbonates are removed from the water; the water is then treated with a small proportion of  $\text{Na}_2\text{CO}_3$  or  $\text{NaOH}$ .

**Freezing liquids by evaporation of hydrocarbons.** SAMUEL C. CARNEY. U. S. 1,713,888, May 21. A liquid hydrocarbon material such as a blend of  $\text{C}_2\text{H}_6$  and  $\text{C}_3\text{H}_8$  is supplied to an excess of liquid, such as water, which is to be frozen, in a chamber in which a partial vacuum is maintained; part of the hydrocarbon liquid is evapd. and the excess unevapd. hydrocarbon is withdrawn from the chamber, and frozen material is withdrawn from the excess of unfrozen liquid. An app. is described.

**Refrigerators.** NATHANIEL B. WALES. Fr. 652,471, Apr. 11, 1928.

**Refrigerating systems.** A. EINSTEIN (to L. Szilard). Brit. 299,783, Oct. 31, 1927. In either compression or absorption systems, the heat of condensation is absorbed by a solid or semi-solid material such as  $\text{PhOH}$ , which melts or changes its state during a relatively short period of compression or generation and which gradually gives up its heat during the idle or evaporating periods. Absorbents such as C or substances to effect m.-p. reduction may be used with the  $\text{PhOH}$  or like substance.

**Refrigerating system of the absorption type.** BURCHARD THOENS (one-half to Burchard M. Thoens). U. S. 1,713,934, May 21. Structural features.

**Refrigerating apparatus of the compression type.** EUGENE L. BARNES (to Barber Asphalt Co.). U. S. 1,713,639, May 21.

**Refrigerating apparatus of the compression type.** H. R. VAN DEVENTER and J. A. GRIER. Brit. 299,728, Oct. 27, 1927. Structural features.

**Refrigerating apparatus of the compression type.** M. AUDIFFREN and SINGRÜN. Brit. 299,724, Oct. 28, 1927. Structural features.

**Thermostatic control device for refrigerating systems.** HOWARD W. PARTLOW. U. S. 1,713,856, May 21.

**Electric insulation.** BRITISH THOMSON-HOUSTON CO., LTD., H. W. H. WARREN, R. I. MARTIN and A. E. SMITH. Brit. 299,906, Aug. 3, 1927. Textile fabric, paper or asbestos layers are held together by a synthetic resin of the phenolic condensation type and have an outer layer coated with shellac.

**Electrical insulation.** HOMER H. LOWRY (to Bell Telephone Laboratories, Inc) U. S. 1,714,683, May 28. Material such as particles of magnetic cores for loading coils is provided with a coating, which will withstand mech. stresses and high temps without deterioration, by applying finely divided hydrated silica to the material and heating to form an adherent silica coating.

**Insulating electric conductors.** HOWARD D. SAYLOR (to Driver-Harris Co) U. S. 1,713,716, May 21. A flexible conductor such as stranded Cu wires is successively coated with loose fibrous asbestos and a non-vulcanizable rubber coating surrounding and adhering to the superficial fibers only of the asbestos layer and not exceeding about 0.03 in. in thickness.

**Heat-insulating material.** P. H. USSING. Fr. 652,391, Apr. 7, 1928. See Brit 299,266(C. A. 23, 3285).

## 14—WATER, SEWAGE AND SANITATION

EDWARD BARTOW

**Bogota water-supply project.** B. RUIZ AND A. PINZON. *Anales ing.* (Bogota) 36, 461-75(1928). E. I. S.

**\$700,000 Waterworks system for Monroe, Louisiana.** M. P. HATCHER. *Mfrs. Rec.* 15, No. 12, 63-4(1929).—Improvement programs provide for filtration plant of 6,000,000 gals. daily capacity, centrifugal pumps of combined daily capacity of 28,500,000 gals. and storage tank of 500,000 gals. E. I. S.

**Report of Committee No. 1 on Standard Methods of Water Analysis.** JACK J. HINMAN, JR., et al. *J. Am. Water Works Assoc.* 21, 668-84(1929).—The work in process includes studies on: brilliant green lactose bile medium, brilliant green lactose peptone bile, non-confirming spore formers, eosin methylene blue agar, turbidity, phenol detn., mineral analysis, detn. of free Cl and detection of I and of biochem. O demand. Some work is also being done regarding microscopical exam. for plankton, etc. These as well as a few other matters are recommended to be continued.

D. K. FRENCH

Sixth report on the working of the Water Analysis Laboratory, Corporation of

**Madras, India, for the year 1927.** S. V. GANAPATI. 36 pp.(1928).—Extensive tabulated analytical data on the Madras water supply are given and discussed. Prechlorination was practiced throughout the year, the bleaching powder soln. having been applied at the entrance to the raw water conduit during a portion of the year to remove algae growths. The  $\text{Cl}_2$  dosage varied from 1 to 2.5 and averaged 1.4 p. p. m. The chlorinated raw water was of uniformly good quality, showing lactose fermenters in less than 20 cc. only on very few occasions, but as in previous years the slow sand filter effluent at several times was of very much poorer bacteriological quality than the applied water. Prechlorination reduced cleaning of the filters 21% over the previous year and slightly increased the effective life of the filters. The no. of samples from the distribution system, which would be classed as good, showed an increase from 8.5 in 1926 to 17.8 in 1927, the remainder of the samples failing to conform to accepted standards of purity. The atypical vibrios described previously (cf. C. A. 22, 654) were isolated from time to time from both the raw and treated waters. Cholera broke out in epidemic form during the period July to October. Because of failure of the West Monsoon the use of water had to be severely restricted and a no. of private wells were brought into use,  $\text{Ca}(\text{OCl})_2$  being supplied for treating the same. A government comm. has been appointed to study the supply. R. E. T.

**The determination of the degree of turbidity of water.** H. ILZHÖFER. *Arch. Hyg.* 101, 1-4(1929).—A photometric method is described for the detn. of the degree of turbidity of water. The method gives results which agree with those obtained by the use of the app. of Olszewski and Rosenmüller. E. R. MAIN

**The hydrogen-ion concentration of Bloomington water, Normal water, and of Bloomington-Normal sewage during the present school year.** H. W. ADAMS AND DON TARVIN. *Trans. Illinois Acad. Sci.* 21, 219-21(1928).—Both the raw sewage and the waters at their sources show an alk. value, the greatest variations being in the sewage. There seems to be some correlation between  $p_H$  values of these waters and the season of the year. L. L. QUILL

**Investigations on oxygen in Japanese lakes.** AUGUST THIENEMANN. *Arch. Hydrobiol.* 19, 295-8(1928).—Survey of the studies of S. Yoshimura in *Geograph. Rev. of Japan* 3, 1117-51, in which a classification of the Japanese lakes in relation to their  $\text{O}_2$  content is given. G. SCHWOCH

**Water purification and handling.** E. LINK. *Z. Ver. deut. Ing.* 73, 553-6(1929).—The water utilization per day per capita in most German cities is approx. 100 l. Self-purification in settling basins occurs by the mech. settling out of suspended matter, by the gradual decimation of bacteria and by the chem. transformation of proteinaceous org. matter to nitrates. Rapid-type filters are endorsed. Pptn. of colloidal matter by means of Al salts is best accomplished at the isoelec. pt. The  $p_H$  value for optimal pptn. should be below 7. For general chlorination of surface waters, the addn. with thorough mixing of 0.1-0.3 g. of Cl per cu. m. is recommended. Both Fe and Mn in potable water should be reduced to below 0.1 mg. per l. C. R. FELLERS

**Purification of water, containing humus, by slow sand filtration.** C. P. MOM AND K. HOLWERDA. *Mededeel. Dienst Volksgezondheid Nederland.-Indië* 17, 561-8 (1928).—The  $\text{H}_2\text{O}$  examined, contg. Fe and humic acids, could not be purified in a practical way by a slow sand filter, contg. ferruginous river sand as filter material. A clear filtrate was obtained but the filter was obstructed in from 2 to 4 days. The cause of this obstruction was principally in the filter film, which appeared to consist mainly of a ppt. of Fe-humic acid compds. dissolved in the raw  $\text{H}_2\text{O}$ . No indication could be obtained that organisms were present in the filter film, which caused the deposit of this ppt. J. A. KENNEDY

**Electroosmotic water purifying plant.** J. BECKER. *Eng. Progress* (Berlin) 10, 92-4(1929).—The process provides for the removal of salts dissolved in water by means of electrolysis, metal ions sepg. out at the cathode and acid residues at the anode. Deposits are free to react with electrolyte at both electrodes. App. for electroosmotic purifications of water consists of ten 3-cell systems of the type described arranged together like a filter-press. E. I. S.

**Control of washing at rapid water filtration plants.** EDWARD S. HOPKINS. *Eng. News-Record* 102, 841(1929).—Graphical data on filter washing at Baltimore, Md., show that, using a const. filtration rate (125 million gals. daily per acre) with the applied water properly coagulated and having a turbidity of 4-7 p. p. m., the length of filter runs increases as the turbidity of the final wash water decreases, becoming const. for a final wash-water turbidity of 75 p. p. m. The velocity of washing has considerable influence, a final turbidity of 800 p. p. m. with velocity of 2.9 ft. vertical rise per min. giving a longer filter run than 400 p. p. m. with a velocity of 2.3 ft. At Balti-

more the time required to obtain a final wash-water turbidity of 75 p. p. m. varies from 6 mins. at a velocity of 2.3 ft. vertical rise per min. to 4 mins. at velocities of 2.7 and 2.9 ft. per min. A 4-min. wash at 2.7 ft. is therefore the most economical. Observations on filters washed by 7 experienced operators on the basis of casual inspection of the wash water showed the final turbidity varied from 25 to 150 p. p. m.

R. E. THOMPSON

**The effect of potassium permanganate in eliminating iron from drinking water.** C. P. MOM AND O. H. VAN DER HOUT. *Mededeel. Dienst Volksgezondheid Nederland-Indië* 17, 550-60 (1928).— $\text{Fe}(\text{HCO}_3)_2$  occurring in subsoil water is not completely oxidized by aëration. The use of a contact substance such as  $\text{Fe}(\text{OH})_3$  or  $\text{MnO}_2$  is necessary to remove the Fe under these circumstances. During this process, adsorption of  $\text{Fe}(\text{OH})_3$  and O takes place.  $\text{KMnO}_4$  in a quantity equiv. to the Fe<sup>++</sup> to be oxidized can completely oxidize the latter and coagulate the  $\text{Fe}(\text{OH})_3$  produced. Cl and  $\text{H}_2\text{O}_2$  do not exert this effect.

J. A. KENNEDY

**Zeolite water softening plant at Mangum, Okla., uses open basins instead of pressure tanks.** H. B. CRANE. *Eng. News-Record* 102, 900-3 (1929).—The hardness of the water supply of Mangum, derived from 5 dug wells about 40 ft. deep, increased with the amt. of water drawn from the wells; a softening plant was recently installed. Investigation indicated that zeolite softening would be more economical than lime-soda or lime-zeolite treatment. The plant is of 1,000,000 gals. capacity and consists of raw and treated water reservoirs and softening beds. The water passes upward through 12 in. of graded gravel and through 66 in. of zeolite contained in open concrete basins, unsoftened water being automatically added to the effluent to give a water of 3 grains hardness per gal. Operating cycle consists of 5½ hrs. softening and ½ hr. regeneration, 4% salt soln. being used for the latter, distributed through the same headers and laterals as the raw water. The cost of the softening plant was approx. \$45,500. The hardness of the well water is 30 grains per gal.

R. E. THOMPSON

**The cost of softening water by the base exchange process.** H. G. CATHCART. *Domestic Eng.* 49, No. 4, 70-4 (1929).

E. I. S.

**Crenothrix in ground water supplies.** KENNETH W. BROWN. *J. Am. Water Works Assoc.* 21, 750-7 (1929).—See *C. A.* 23, 1194.

E. C. M.

**A simple method for the extraction of fresh water from sea water, salines, polluted water, any watery substances, or from the atmosphere, by means of solar heat.** JULIUS RICHARD. *Bull. Inst. océanographique* (Monaco) No. 535, 27 pp. (1929).—A pane of glass is tightly set over a frame tank or shallow basin which is filled with salt water. The glass is set at an angle of approx. 20° with the horizontal and facing the sun. A draining device carries the condensed  $\text{H}_2\text{O}$  from the lower part of the pane to a receiving bottle. Beginning on Mar., 1928, the av. daily amts. of fresh  $\text{H}_2\text{O}$  (cc.) obtained per sq. m. of exposed surface were: Mar. 1171, Apr. 2173, May 3032, June 3450, July 3440, Aug. 2970, Sept. 1697, Oct. 1277, Nov. 735, Dec. 525, Jan. (1929) 663 and Feb. 782. By the use of mirrors to obtain greater heat, the yield was materially increased. The app. proved suitable for the reclamation and purification of EtOH. Fruits were also evapd. by the use of the equipment without the usual loss in flavor.

C. R. F.

**Comparative determination of the actual reaction of moor waters. II. Employment of the quinhydrone method.** I. A. SMORODINTZEV AND A. N. ADOVA. *Arch. Hydrobiol.* 19, 323-30 (1928).—The values obtained in detg. the  $p_{\text{H}}$  of moor water according to the quinhydrone method and the indicator method without buffer were compared with those obtained by means of the H electrode. In the acid moor waters both the quinhydrone and the bufferless indicator methods gave good results, while in the alk. waters of the moors of the Segge type the deviations from the values obtained with the H electrode were often considerable. As to the indicators used, *p*-nitrophenol, 1,2- and 1,4-dinitrophenol gave satisfactory results, while *m*-nitrophenol did not. The waters of the *Sphagnum* moors had a  $p_{\text{H}}$  of 3.82-5.60; they were poor in animal and plant life. No larvae of *Anopheles* were found in waters with a  $p_{\text{H}}$  of below 5. The waters of the Segge moors had a  $p_{\text{H}}$  of 7.40-8.47. During the time of observation (June to September) there occurred only slight changes in the  $p_{\text{H}}$  of the individual moor water. The  $p_{\text{H}}$  falls slightly with increasing age.

G. SCHWOCH

**The actual reaction of the heath-moor "Seefeldler" near Reinerz and the significance of the hydrogen-ion concentration for the individuality of the moor fauna.** O. HARNISCH. *Arch. Hydrobiol.* 19, 299-300 (1928).—On account of his own careful investigations, which show that water of the moor "Seefeldler" had a  $p_{\text{H}}$  of 3.8-4.0, H. withdraws his attack against S. N. Skadowsky's theory that the high acidity of the moor water is responsible for the scarceness of animal life in heath moors.

G. S.



**Water treatment to prevent embrittlement.** FREDERICK G. STRAUB. *J. Am. Water Works Assoc.* 21, 511-23(1929).—See *C. A.* 23, 2231. E. H.

**Rational selection of a feed-water treatment.** C. E. JOOS. *Paper Trade J.* 88, No. 15, 36-44(1929).—A discussion of the following factors in connection with the use of softened water in boilers, particularly when high pressures are used: degree of remanent hardness, corrosiveness of the water, reduction in total dissolved solids and suspended matter, protection against embrittlement of the boiler metal, cost of treatment including blowing down. The importance of the use of phosphate treatment to keep down the caustic alk. at high pressures is explained. A. P.-C.

**Condensate as boiler feed.** C. N. RIDLEY. *Eng. and Boiler House Rev.* 42, 406, 408(1929). E. I. S.

**Corrosion in steam heating systems.** F. N. SPELLER. *Plumbers Trade J.* 86, 701 4, 752(1929).—Study of causes of deterioration in piping and how to treat boiler water to guard against corrosion. E. I. S.

**Priming and foaming—causes and controlling factors.** A. L. S. RUDDER. *Power House* 23, No. 5, 34, 50(1929).—Causes and prevention of discharges of water with steam are discussed. E. I. S.

**Endemic goiter in Tennessee.** ROBERT OLESEN. *Pub. Health Repts.* 44, 865-97(1929).—There appears to be no relationship between the amt. of endemic goiter and the sources, treatment and ultimate safety of public water supplies in Tenn. There is a slightly larger incidence of endemic goiter among the users of chlorinated drinking water than among the consumers of unchlorinated water. In Oregon the incidence of endemic goiter is slightly greater among the users of unchlorinated water. There appears to be no relationship between geologic formations in Tenn. and the varying incidence of endemic goiter. The author discusses prophylaxis and makes a number of specific recommendations. J. A. KENNEDY

**Water supply, sewage treatment and refuse disposal in 1928.** H. BURDETT. *Public Works* 60, 34-6(1929).—A brief review of the progress and of the completed and projected improvements is given. C. C. RUCHHOFF

**Odor control at Haddonfield sewage plant.** LEROY FOREMAN. *Public Works* 59, 425-7(1928).—All units of the plant were responsible for the odors. The odors were apparently the result of the reduction of sulfates in the liquor to  $H_2S$ . The odors could be controlled by the use of  $Cl$  or  $FeSO_4$ . About 20 p. p. m. of  $Cl$  or 25 p. p. m. of  $FeSO_4$  was required. C. C. RUCHHOFF

**Excluding inflammable oils from Baltimore sewers.** C. E. KEEFER. *Public Works* 59, 484-5(1928).—An ordinance was passed prohibiting the disposal of all waste oils into the sewers and requiring its storage and collection under the supervision of the city officials. A contract has been made with a private company for the collection and disposal of this material. The collector uses 3 trucks and collects from 1000 to 1500 gals. daily. This is disposed of by refining. C. C. RUCHHOFF

**The sewage treatment plant of the Bloomington and Normal sanitary district.** CHARLES C. BROWN. *Munic. News and Water Works* 76, 32-5(1929).—A general description of the sewage disposal problem and the new plant is given. The plant is of the Imhoff tank and sprinkling filter type and is designed for a population of 54,000. C. C. RUCHHOFF

**Rye Beach sewage-disposal plant.** D. J. SHAW. *Public Works* 59, 420-2(1928).—The old plant which was abandoned was located in an amusement park. The sewage was pumped from the old plant over a ridge to a new plant. At the new plant the sewage passes through a grit chamber, bar screens and Reinch Wurl type fine screens. It is then chlorinated and pumped to a new outfall. C. C. RUCHHOFF

**Digestion of sewage screenings at Milwaukee.** DARWIN W. TOWNSEND. *Public Works* 59, 459-64(1928); cf. *C. A.* 23, 3040.—The exptl. sewage-screenings digestion plant with a capacity of about 464 cu. ft. of screenings per day is described. The plant includes 4 tanks, each capable of taking  $\frac{1}{12}$  of the total daily screenings production or 116 cu. ft. and is designed to collect and utilize the gases of decompn. for maintaining the optimum temp. conditions in the plant. The digested screenings are to be disposed of by mixing with the waste activated sludge or by returning to the raw sewage or by drying on sand beds. Fifteen sand beds have also been constructed for studying this method of disposal. C. C. RUCHHOFF

**Digesting sewage screenings at Milwaukee.** WILLEM RUDOLFS, H. M. HEISIG AND D. E. BLOODGOOD. *Public Works* 60, 24-7(1929); cf. *C. A.* 23, 3039.—A mixt. of 200 gals. of fine screenings and 60 gals. of ripe sludge contg. 3.45% total solids of which 18.1% was ash was digested in a covered tank at 80° F. The  $pH$  was maintained at 7.4 with lime and daily B. O. D. detns. were made during the 290 days of the exptl.

During the last 188 days daily charges of 5 gals. of fine screenings (av. 1.7 lbs. per day dry solids) were added. The av. solids content of the screenings added was 5.33% and of the digested sludge drawn 3.5%. The total solids reduction during the period was 61.6%. This was possible because the material contained 92.1% volatile matter. The av. ash increase was 265% and the av. fat reduction was 56%. The sludge drawn was black, appeared well digested and drained readily. Conclusion: 0.115 cu. ft. per capita capacity was necessary for digesting fine screening. C. C. RUCHHOFF

**Biological effects of sewage effluents in streams.** R. W. BUTCHER. *Public Works* 60, 22-3(1929).—The effect of small and weak sewage effluents which produce no visible pollutional effect in streams is discussed. Such effluents do produce deleterious effects due to their O requirements, org. matter and high silt content. Very weak sewage favors the growth of diatoms, stronger sewage unicellular algae and flagellates and still stronger the pollutional forms *Carchesium septomitus lacteus* and *Sphaerotilus natans*. The bottom animals have been divided into 3 groups depending upon the character of the bottom. The first group which lives only upon a clean bottom and is driven away by sewage deposits includes water shrimps, may fly and caddis larvae and numerous other forms. This group forms the usual and best food for fish and since the weakest effluents reduce the nos. of this group it is presumed that a harmful effect upon fish results. Also in *Eng. Sanit. Record* 82, 589(1928). C. C. RUCHHOFF

**Some biochemical factors in sewage and sludge treatment.** WILHELM RUBOLFS. *Public Works* 59, 483-4(1928).—The decompn. of the unstable org. compds. in sewage sludge is dependent upon phys., chem. and biological factors which are interdependent. Ripe sludge, which when mixed with fresh solids shortens the digestion time, does not retain its inoculation value indefinitely and should not be over 2 to 3 months old. A partially decompd. material is poor for seeding purposes while sludge at the peak of gasification is excellent. A favorable reaction is important for biological activities and the proper reaction may be more easily maintained by suitable buffer solns. The enzymes which were found in sludge include diastase, lipase, pepsin, trypsin, catalase, invertase and rennet. These vary in abundance during digestion. Some of them increase and then decrease before others reach their max. The colloidal material in an undisturbed digesting sludge increases and then decreases and at the same time the chem. compn. of the colloidal material changes. C. C. RUCHHOFF

**Notes on practical sludge digestion.** JOHN R. DOWNES. *Public Works* 59, 423-5(1928).—Very important points for good sludge digestion in Imhoff tanks or scp digestion tanks are: the effectiveness of the settling tanks from which the solids are collected, provisions for the prompt removal of solids to the digestion chamber, the adequacy of the provision of ultimate disposal of the sludge. The effects of temp. and barometric changes are discussed. Gas collection and utilization are advocated for odor control and for the production of favorable digestion conditions, besides for the value of the gas as a fuel. C. C. RUCHHOFF

**Methods of sludge disposal for small sewage plants.** FRANK BACHMANN. *Munic. News and Water Works* 76, 13-4(1929).—The methods which are discussed include disposal by lagooning, by filling in low lands, by direct application to land and by plowing in and on prepd. sand beds. Dried sludge may be disposed of as a fill or as fertilizer. C. C. R

**Small activated-sludge plant in Texas has special features.** E. W. STEEL. *Eng. News-Record* 102, 761-3(1929).—The 0.5-million gal. daily activated-sludge plant of Mercedes, Tex., has 2 unique features which effect a considerable saving in power: pre-aëration without activated sludge and air diffusion through 4-in. horizontally placed porous cylindrical tubes suspended so that their centers are 4 ft. 2 in. below the flow line. The plant consists of presedimentation, pre-aëration, activated sludge and final settling compartments, the excess activated sludge being digested with the presedimentation sludge. Pre-aëration has little effect upon nitrification but affects a considerable reduction in O<sub>2</sub> demand; tests indicate that it materially reduces the time necessary for aëration with activated sludge. Aëration for 3½ hrs. with sludge at a rate of 0.6 cu. ft. of air per gal. brings about stability and practically complete nitrification. The net amt. of air, excluding waste, is somewhat less than 0.5 cu. ft. per gal. At the present flow of 0.15 million gal. daily the power consumption is 34 h. p. per million gals. equiv. to a cost of \$18 per million gals. It is estd. that when the plant is operated at full capacity the power consumption will be 8.5 h. p. per million gals. and the cost \$4.50 to \$6 per million gals. The cost of the plant was \$35,000. R. E. THOMPSON

**Land disposal of activated sludge at San Marcos, Tex.** E. G. EGERT AND CHESTER COHEN. *Eng. News-Record* 102, 830-1(1929).—Excess activated sludge from the 0.35-

million gal. daily San Marcos plant is disposed of without nuisance by discharging into furrows in 6 acres of land. After drying, the surface crust is broken by a single plowing down the center of the furrow and the land is again ready for use. The effluent from the plant is treated with  $\text{Cl}_2$  to protect a bathing resort downstream from the plant.

**Activated-sludge disposal plant at Charlotte, N. C.** E. G. McCONNELL. *Public Works* 59, 438-44(1928); cf. *C. A.* 22, 4690.—The new 5 m. g. d.-capacity activated-sludge plant is described. The sewage is passed through preliminary settling tanks before aeration. The preliminary settled solids and the activated sludge are digested in tanks equipped to recover the gas produced. One of the air compressors in the plant is being driven by a gas engine using the gas produced at the plant; it has reduced the power costs. Some difficulty due to bulking of the activated sludge has been experienced, but has not interfered with its digestion.

**Sludge disposal in England.** J. H. GARNER. *Public Works* 60, 65-7(1929).—Sludge is disposed of by pumping on land either by plowing under or by trenching. For this method the Royal Commission on Sewage Disposal recommends about  $1\frac{1}{4}$  sq. yds. per capita for domestic sewage sludge of 90-95% water. The most widely used method of drying sludge is upon specially constructed sand filter beds the same as in our country. Chem. treatment with lime and "aluminoferric" is used to hasten dewatering.

**Report of Bureau of Sanitary Engineering, Maryland State Dept. of Health, 1928.** ABEL WOLMAN. 19 pp. (mimeographed, 1929).—The activities of the Bureau during 1928 are reviewed and discussed. Substantial progress was made during the year in improving stream conditions, routine sampling of the water courses at various points having proven an effective means of pollution control. The treatment of the following industrial wastes was studied: paper mill, laundry, garbage reduction, steel rolling mill and cannery. Details are given of new water and sewage works constructed and of improvements and addns. to existing plants carried out during the year. Special investigations relative to water supply, oyster pollution, sewage disposal and aerial pollution conducted by the Bureau are outlined. The typhoid mortality rate was by far the lowest in the history of Maryland, being 5.2 per 100,000 for the State, 4.2 for City of Baltimore and 6.5 for the counties.

**Purification of swimming-pool water.** G. C. DUNHAM. *Military Surgeon* 64, 361-73(1929).—During the summer of 1928, a study was made of the comparative effectiveness of continuous and intermittent chlorination in the operation of a swimming pool at Carlisle Barracks. The  $\text{Cl}$  enters the pool through a pipe in the wall at the deep end at mid-depth and is diffused by the bathers. The presence of *B. coli* was detd. by a modified presumptive test—10 cc. of  $\text{H}_2\text{O}$  were inoculated into 30 cc. of lactose broth; the presence of more than 10% of gas after 24 hrs. incubation was indicative of *B. coli*. With intermittent chlorination it was shown that as the no. of bathers (cumulative) increased the excess  $\text{Cl}$  content decreased to zero and presumptive tests for *B. coli* changed from neg. to pos. With continuous chlorination—excess  $\text{Cl}$  always being present—presumptive tests for *B. coli* were always neg.

**Refuse disposal in Borough of Brooklyn, New York City.** E. L. COLLINS. *Eng. News-Record* 102, 862-3(1929).—A description of refuse disposal in Brooklyn, which is carried out by contract. The refuse is sorted on conveyor belts at 15 stations and unsalable material is destroyed by incineration, the residue being employed for land fill. Brief details are given of three 500-ton incinerators which are under construction.

**Routine records of collection service for refuse material.** SAMUEL A. GREELEY. *Munc. News and Water Works* 76, 21-3(1929).—The importance of collecting complete collection service and cost records is discussed.

**German exposition of gas and water technology (ALBACH) 21.** Apparatus for continuous cooking of garbage (U. S. pat. 1,715,065) 1. Electric conductivity-testing apparatus for determining the purity of boiler-feed water (Brit. pat. 300,229) 4.

**Automatic regeneration of base exchange water-purifying substances.** ÉTABLISSEMENTS PHILLIPS ET PAIN (SOC. ANON.). (Emmanuel Breuil, inventor.) Fr. 652,665, Apr. 13, 1928.

**Treating acidified mine water.** JOHN T. TRAVERS (to Travers-Lewis Process Corp.). U. S. 1,714,828, May 28. Acidified mine water such as that contg. Fe salt and  $\text{H}_2\text{SO}_4$  is caused to come into impact with and to flow through successive bodies of travertine in order to avoid stream pollution.

**Scale solvent and sealing composition.** JOHN M. COUGHLIN (to Scale Solvent & Products Co.). U. S. 1,715,337, May 28. A compn. suitable for use in boilers and water-supply systems is formed of "soluble glass" soln., coffee ext. and a diluent such as water.

**Apparatus for separating suspended solids from sewage, etc.** MARCUS B. TARK (to Link-Belt Co.). U. S. 1,714,739, May 28. Structural features.

**Apparatus for incinerating garbage or other refuse.** WILLIAM F. DREW. U. S. 1,714,005, May 21. Structural features.

## 15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER

**John Kerfoot Haywood (1874-1928).** W. W. SKINNER. *J. Assoc. Official Agr. Chem.* 12, No. 2, ii-v (May 15, 1929).—An obituary with portrait. A P C

**The chemist's aid to agriculture.** CHAS. M. A. STINE. *Chemicals* 30, No. 25, 7-9; No. 26, 7-8 (1928).—An address. E. J C

**Report on (the determination of) less common metals in soils.** J. S. McHARGUE. *J. Assoc. Official Agr. Chem.* 12, 146-7 (1929).—A detailed description is given of the technic recommended for the bisulfate fusion method for the detn. of Mn in soils. A. PAPINEAU-COUTURE

**Report on (the determination of) reaction value of acid soils.** E. T. WHERRY. *J. Assoc. Official Agr. Chem.* 12, 145-6 (1929); cf. *C. A.* 22, 2427.—In stating reaction values of soils, the  $p_H$  no. should be supplemented by the corresponding values of H- or OH-ion concn. The most convenient way to express these is to make use of units of  $10^{-7}$  g. per l. of H ion and  $17 \times 10^{-7}$  g. per l. of OH ion. These units represent the ionic concns. in pure  $H_2O$  at about  $18^\circ$ , a temp. selected to make the exponent a whole no. To calc. H-ion concns. in these units, the following formulas may be used.  $H^+ = 10(7-p_H) - 0.1(7-p_H)$ ;  $OH^- = 10(p_H-7) - 0.1(p_H-7)$ . In both cases, when the 1st of the 2 terms  $> 10$ , the 2nd term may be neglected. A P C

**Contribution to the study of solonetz in the chernozem belt of western Siberia.** K. P. GORSHENIN. *Pochvovedenie (Pédologie)* [N. S.], 22, No. 3, 42-59 (1927), *Egypt Sta. Record* 59, 611.—A series of chemical analyses of samples from alkali soil profiles, differing by the depth of the A horizons, is presented, together with the morphological structure of the various types of solonetz. H I D

**A new, simple, and rapid method for determining the moisture equivalent of soils, and the role of soil colloids on the moisture equivalent.** GEORGE J. BOUYOUCOS. *Soil Sci.* 27, 233-42 (1929).—A new, simple method is described for detg. the moisture equiv. of soils for use as a single value factor. This is also correlated with the results from the hydrometer method for mech. analyses of soils. The moisture-equiv. method consists of connecting a Büchner funnel with a suction flask, placing a sample of soil into the funnel with a filter paper at the bottom, thoroughly soaking the soil with  $H_2O$ , and allowing the suction force from running water to operate for a definite length of time. There is a close relationship between colloid content and moisture equiv. The ratio of percentage of  $H_2O$  divided by percentage of colloids present is fairly const., the av. for 22 soils being 0.6224 with extremes of 0.510 and 0.713. There is no relationship between coarse silt and sand and the moisture equiv. M. S. ANDERSON

**Studies of certain phases of the interrelationship between soil and plant. I. Availability of mineral plant nutrients in relation to the degree of dispersion.** WALTER THOMAS. *Soil Sci.* 27, 247-70 (1929).—A critical digest is given of the literature dealing with the permeability to and adsorption of colloidal materials by living plant cells. An extensive bibliography is appended. M. S. ANDERSON

**The chlorate method for the determination of nitrate nitrogen, total nitrogen and other elements in soils and plant tissues.** E. M. EMMERT. *J. Assoc. Official Agr. Chem.* 12, 240-7 (1929).—A method has been devised for detg. nitrate and total N giving results that compare very favorably with those of the Kjeldahl method in a much shorter time, and leaving a residue in such a state that the other inorg. elements (except Na and S) also may be detd. easily. The principle of the method, the technic of which is described in detail, is essentially as follows: To a sample contg. 0.5-1.0 mg. nitrate N in a 500-cc. Kjeldahl flask add 20 cc. of 50% by vol.  $H_2SO_4$ , connect the flask to a condenser, the free end of which leads through a 2-holed rubber stopper into a 200-cc. cylindrical absorption tower contg. 150 cc. of freshly prepd.  $ClO_2$  soln., the 2nd hole being fitted with a Hopkins form Kjeldahl trap adjusted to such a depth that a portion of the tower contents is forced into it; heat the Kjeldahl flask to expel

the gases rapidly (but not violently) until white fumes begin to be evolved, save the residue for detn. of reduced N; to an aliquot of the  $\text{ClO}_2$  soln. contg. at least 0.25 mg. nitrate N add (while hot) 0.05–0.1 g.  $\text{Ag}_2\text{SO}_4$ , let stand 5 mins. with occasional shaking, add 0.5–1.0 g.  $\text{CaO}$ , let stand a few mins. with intermittent shaking, filter repeatedly till clear, evap. to dryness an aliquot contg. at least 0.2 mg. nitrate N, and det. the latter colorimetrically by means of phenoldisulfonic acid. Cool the residue from the distn., add 10 cc.  $\text{H}_2\text{O}$ , cool to room temp., add 1 g.  $\text{NaClO}_2$  for each 0.1 g. of dry tissue or for each 0.5 g. of green tissue or soil; before connecting heat rapidly until the green fumes of Cl peroxide first evolved are decompd. with a slight explosion and only white fumes are present. Connect immediately to the distn. app.; after violent reaction ceases distil rapidly into  $\text{H}_2\text{O}$  contained in the absorption tower, disconnect the Kjeldahl flask as soon as the soln. remains colorless; white fumes form and  $\text{H}_2\text{SO}_4$  condenses on the sides; det. N in the distillate as previously described. To det. total N, put into a dry 500-cc. Kjeldahl flask a smaller sample than that used in detg. nitrate N, add  $\text{NaClO}_2$  at the same rate as for reduced N, wash down the sides with 25 cc. of 50% by vol.  $\text{H}_2\text{SO}_4$ , and proceed as in the detn. of reduced N. For the detn. of non-volatile elements, tilt the Kjeldahl flask slightly downward (but not so much that the contents run out), support the end of the neck on a beaker, distil the residue rapidly till only a melt of  $\text{Na}_2\text{SO}_4$ ,  $\text{NaHSO}_4$  and the inorg. plant constituents remain, let cool, dissolve in hot water and make to a convenient known vol. for aliquoting; if a detn. of Na is desired, use  $\text{KClO}_3$  instead of  $\text{NaClO}_2$ . While detg. total N with  $\text{NaClO}_2$  a large quantity of gas is evolved and C entirely disappears; though a good proportion of this gas is  $\text{CO}_2$ , it comes off so rapidly that KOH bulbs will not absorb it all. In order to collect the gas a 2-l. Florence flask was filled with acidulated water and connected to the absorption tower used for collecting N; another tube led from this flask to a 3-l. flask, so that when the gases were evolved through the absorption tower they displaced the water from the 2-l. to the 3-l. flask. After complete distn. the system was disconnected from the condenser and connected to the following absorption train: (1) absorption tower contg. a satd. KI soln., acidified with  $\text{H}_2\text{SO}_4$ , to catch Cl; (2) small bubble tube contg.  $\text{AgNO}_3$  in  $\text{HNO}_3$  to note whether traces of Cl were coming over; (3) U-tube contg.  $\text{P}_2\text{O}_5$  and glass wool to absorb  $\text{H}_2\text{O}$ -vapor; (4) weighed Fleming soda-lime and  $\text{P}_2\text{O}_5$  bulb; (5)  $\text{H}_2\text{SO}_4$  scrubber; (6) bottle of  $\text{Ba(OH)}_2$ , to indicate loss of  $\text{CO}_2$ . The app. was connected to a suction pump and means provided for measuring the vol. of gas drawn out, so that several aliquots of gas from the same sample could be used. Results checked to within 0.2%, which is considered good for the large quantity of C present.

A. PAPINEAU-COUTURE

**Reclamation of Fresno type of black alkali soil.** W. P. KELLY and E. E. THOMAS. Calif. Agr. Expt. Sta., *Bull.* 455, 37 pp. (1928).—Field expts. have shown that the crop-producing power of the Fresno black alkali soil can be greatly improved by the use of gypsum, S,  $\text{FeSO}_4$ , or alum, provided these materials are applied in sufficient quantities. Yields of alfalfa ranging from 6 to 11 tons per acre per annum have been produced on land, which at the beginning of the expts. was entirely unproductive. The unproductivity of this soil is due to (a) an excess of sol. salts, especially  $\text{NaHCO}_3$ , and (b) the abnormal chem. composition of the clay-like constituents of the soil. The reclamation of the soil must involve the removal of the excess of sol. salts and the conversion of at least a part of the clay constituents into Ca compds. The former may be leached out, but ordinary leaching fails to bring about the needed chem. changes in the latter. Gypsum, S,  $\text{FeSO}_4$ , and alum produce beneficial effects on black alkali soils but at different rates. These materials act on the sol. carbonate and the clay constituents simultaneously. Gypsum brings about these changes because of its sol. Ca, while the effect of S,  $\text{FeSO}_4$ , and alum is due to their acidic nature, in consequence of which sol. carbonate is decompd. and Ca minerals of the soil, especially  $\text{CaCO}_3$ , are dissolved. The Ca thus brought into soln. reacts with the clay constituents.  $\text{FeSO}_4$  and alum react with the soil most quickly because of their high soly. and acidic nature. S acts most slowly as this material must undergo oxidation before it can produce any important effect on the soil. S has proven to be much more economical than the other materials. Large yields of alfalfa have been produced on soil that was badly affected with alkali and entirely unproductive at the outset by applying one ton of S per acre; when used in conjunction with stable manure, 1000 lbs. of S per acre has given good results. Leaching expts. without the application of any material except water have failed to bring about a satisfactory reclamation. Although the beneficial effect of S is dependent on oxidation, and the oxidation is brought about by certain species of bacteria, these expts. have not shown any special advantage for artificially inoculated S over that obtained from uninoculated S.

J. J. SKINNER

**A critical study of the influence of soil type on the calcium and magnesium content and on the physiological characters of the alfalfa plant.** JOHN F. FONDRE. *Soil Sci.* 27, 205-32(1929).—Alfalfa stems and leaves and the expressed juice of stems and leaves grown on 7 soil types were analyzed for Ca and Mg at different stages of growth. The  $H_2O$  content and the sp. gr. of the expressed juice were also detd. There were marked differences in the Ca and Mg contents of alfalfa stems and leaves and expressed juice in plants grown on different soil types. Also, the sp. gr. of the juice varied with the soil type. Generally the Ca content was higher in the dry tissue and in the expressed juice of stems and leaves of plants grown on the heavy soils. Soil type had less influence on the second crop than on the first. In fact, the effect of soil texture was negligible in the second crop. There was no consistent relationship between soil texture and Mg content of the alfalfa plant. About equal amts. of Mg were in the tissue of the leaves and stems and also in the juice. The Ca content was always higher than that of Mg. Also, the Ca content increased as plants matured. The  $H_2O$  content of both stems and leaves decreased with maturity. More  $H_2O$  was present in stems than in leaves when plants were young but this difference tended to disappear with maturity. The sp. gr. of the expressed juice of the leaves was greater than that from the stems. The most satisfactory time to obtain alfalfa samples in order to eliminate variations due to time of day lies between noon and 4 p. m. and the least satisfactory time between 8 a. m. and noon.

M. S. ANDERSON

**The effect of boron deficiency on the growth of tobacco plants in aerated and un-aerated solutions.** J. E. McMURTREY, JR. *J. Agr. Research* 38, 371-80(1929); cf. *C. A.* 23, 2525.—It is impossible to grow tobacco plants to normal maturity in nutrient solns. contg. only the commonly accepted essential elements dissolved in distd  $H_2O$ . When 0.5 p. p. m. B was added, normal plants were grown. B deficiency is characterized by injury to the terminal bud and occurs at the bases of the young leaves, while Ca deficiency produces injury at the tips and margins of the young leaves. Eight references are given.

A. L. MEHRING

**Conditions of utilization and action of phosphates on black soils (chernozem).** V-VII. M. A. EGOROV. *Ukrainskii Khim. Zhur.* 3, Tech. Pt., 241-62(1928); cf. *C. A.* 22, 3947.—When black soils are extd. with normal solns. of  $NaH_2PO_4$  or  $Na_2HPO_4$ , the ext. is light yellow, whereas, when  $Na_3PO_4$  is used, the ext. is dark. This difference is due not only to the fact that  $Na_3PO_4$  soln. has an alk. reaction, but also to the character of the Ca phosphates formed. In general, when soils are extd. with salt solns., the more alk. the solns., the more org. matter is extd. The time of digestion of the soils with the salt soln. is an important factor: the longer the interaction, the more org. matter is extd.; however, the rate of the increase is different for different soils. The influence of the temp. at which the digestion takes place is not the same for different soils: while with 1 sample of soil a little more of org. matter was extd. at  $35^\circ$  than at room temp.; another soil sample gave the opposite result. The influence of the humidity of soil is considerable. For 1 sample of soil the quantity of sol. org. matter increased with the increase of moisture content up to 75%, then dropped; for another soil the max of extd. org. matter coincided with a 50% moisture content. The question as to the manner of introducing  $Na_2HPO_4$  depends on the character of the soil: with 1 soil the max. of extd. org. matter was obtained by introducing solid  $Na_2HPO_4$  into the crude soil, then adding  $H_2O$ , whereas with another soil a better result was obtained by operating with a  $Na_2HPO_4$  soln. The reason for this difference is that the nature of the org. matter is not the same in all soils. For the same reason the most favorable concn. of  $Na_3PO_4$  to be used cannot be established for all soils. With  $Na_2HPO_4$ , however, it is found that the more concd. the soln. the more org. matter is extd. When soils are treated with solns. of  $NaH_2PO_4$ ,  $Na_2HPO_4$  and  $Na_3PO_4$ , the formation of  $Ca(H_2PO_4)_2$ ,  $CaHPO_4$  and  $Ca_3(PO_4)_2$  takes place. Ca mono- and di-phosphates formed in the soil tend to become transformed into the hardly sol.  $Ca_3(PO_4)_2$ , and the further this transformation progresses, the more org. matter of the soil dissolves. Thus, by the quantity of dissolved org. matter one may est. the activity of reversion factors in a given soil. Expts. show that various soils differ from one another to the extent of the reversion process which they effect. *Chernozem soils*, on being first treated with a  $Na_3PO_4$  soln. and then washed with  $H_2O$ , lose more org. matter, which dissolves, than other soils. Comparatively low contents of crenic and apocrenic acids in the  $Na_3PO_4$ -sol. org. matter is characteristic of chernozem soils; the predominating fraction of these soils consists of humic acid. In other soils crenic and apocrenic acids may constitute about  $1/2$  of the sol. org. matter.

BERNARD NELSON

**Peat as a source of nitrogen.** Z. V. LOGVINOVA. *Trans. Sci. Inst. Fertilizers* (Moscow) No. 56, 1-66(1929).—The absorption of  $NH_3$  and other bases by various

types of peat is described. The moss peat contains more absorbed  $\text{NH}_3$  than the meadow peats. The upper layers of either type of peat contain more absorbed  $\text{NH}_3$  than the lower layers. The Ca in peat is present in the absorbed state and is easily replaced by Na. The moss peats give appreciable amts. of P when treated with NaCl soln.; the meadow peats give only traces. The former peats are satd. with H, the latter with Ca. Compost expts. with lime and wood ash addns. to the various peats show that the  $\text{NH}_4$  becomes nitrified; in some peats more org. N is set free and mineralized. An extensive German summary is given. J. S. JOFFE

**Liming as a factor of mobilizing phosphoric acid in the podzol soil.** D. L. ASKINAZI and S. S. YARUSOV. *Trans. Sci. Inst. Fertilizers* (Moscow) No. 57, 59 pp. (1928).—Summarizing the results of several years' expts., A. and Ya. point out that: (1) The introduction of lime into a podzolized soil increases the energy of decompn. processes and mineralization of org. matter and results in an accumulation of the mineral forms of N and phosphoric acid in the soil soln. (2) As the processes of decompn. and mineralization of the org. material slow down, the influence of the lime on the N supply to the plants becomes less and less apparent; vegetation expts. seem to indicate that the influence becomes zero at the 9th year after liming. (3) The residual effects of lime consist in improving the  $\text{P}_2\text{O}_5$  supply in the soil. A soil which had the  $\text{P}_2\text{O}_5$  as its min. factor was not in need of P fertilization after 9 years of liming. (4) The vegetation expts. were corroborated by field expts. (5) Weak acid exts. on limed and unlimed podzol soils showed an increased soly. of  $\text{P}_2\text{O}_5$  in the limed soils. (6) Liming seems to increase the soly. of the insol. phosphates of Fe and Al; no exptl. proof was obtained to prove the aforesaid. (7) Liming of podzol soils neutralizes the acidity, increases the absorption properties of the soil, its biological activities, restoring in the same time the fertility of the soil lost during the podzol-soil-forming process. (8) Liming as a means of increasing the N and  $\text{P}_2\text{O}_5$  supply in podzols should be practised. J. S. JOFFE

**Nitrogen and the fertilizer industry.** CHARLES J. BRAND. *J. Franklin Inst.* 207, 665-90 (1929).—An address delivered before The Franklin Inst., in which the nature and importance of N and the development of the art of fertilization are discussed. The processes of manuf. of synthetic N are discussed. In 1913 the world's production of N was 840,055 tons and in 1927 the production capacity of the world was 1,620,000 tons, an increase of almost 100% in 14 years. The production by countries is given. The manuf. of concd. fertilizers and the plan favored by the fertilizer industry for the utilization of the Muscle Shoals plant are discussed. J. J. SKINNER

**Report on nitrogen activity methods in fertilizers. Determination of active water-insoluble nitrogen by the alkaline permanganate method.** JOHN B. SMITH. *J. Assoc. Official Agr. Chem.* 12, 182-91 (1929); cf. *C. A.* 22, 2433.—The effects of the modifications suggested a yr. previously were investigated collaboratively. The results indicated a considerable degree of probability that the results from a single lab. would not differ from the mean for several labs. by more than 3% of that mean. This is not considered the ultimate limit of accuracy for the method, but it should be regarded as encouragement to continue the study of details that allow deviations in technic. A. PAPINEAU-COUTURE

**Report on (the determination of) nitrogen (in fertilizers).** A. L. PRINCE. *J. Assoc. Official Agr. Chem.* 12, 176-81 (1929); cf. *C. A.* 22, 2433.—B. F. Robertson (Clemson Agr. College) has proposed the following unpublished method for the detn. of inorg. N in com. fertilizers in the presence of Ca cyanamide and urea: (1) Det. total N by the usual method. (2) Wash 2 g. of the sample with  $\text{H}_2\text{O}$  to a vol. of 200 cc. and det. N in the residue by any of the modifications of the Kjeldahl method. (3) Distil 50 cc. of the filtrate obtained in (2) with MgO for detn. of ammonia N. (4) Place 50 cc. of the filtrate obtained in (2) in a 500-cc. Kjeldahl flask with 2 g.  $\text{FeSO}_4$  and 20 cc. concd.  $\text{H}_2\text{SO}_4$ , digest for at least 10 mins. after white fumes appear and complete the N detn. as usual. (1) - (2) =  $\text{H}_2\text{O}$ -sol. N.  $\text{H}_2\text{O}$ -sol. N - (4) = nitrate N. (3) + nitrate N = total inorg. N. (1) - inorg. N = org. N. A comparison of this method with the Jones method (*C. A.* 21, 1324) showed the former to be slightly more accurate and simpler. A. PAPINEAU-COUTURE

**Comparative biological and chemical studies in different varieties of stable manure.** G. RUSCHMANN. *Cenir. Bakt. Parasitenk.*, II Abt., 77, 216-39 (1929); cf. *C. A.* 23, 1205.—Manure of various ages and degrees of fermentation was mixed with soil, usually about 10 g. of manure per kg. of soil, and the production of  $\text{CO}_2$  studied. Young, cold fermented samples produced more  $\text{CO}_2$  than did young, warm fermented samples. Old samples in the heated stage held a middle place. JOHN T. MYERS

**Graining and shaping fertilizers.** B. WAESER. *Metallbörse* 19, 285-6 (1929).—To avoid the tendencies to lump and harden upon standing, losses through dusting,

etc., but still to be finely divided enough for proper distribution and absorption in the ground, it is necessary to pay more attention to graining and shaping fertilizers. Sol. fertilizers are thus "grained" or changed to granules of desired sizes, *i. e.*, 1 to 2 mm. diam., by rotary evaporators of the countercurrent type. Satd. solns. may be used to chill superheated brines dropped through sieves into such solns. Hot solns. sprayed into air currents have also proved of value.  $\text{CaCN}_2$  is supplied either in powder or granular form, and Thomas slag always as a powder.

W. C. EBAUGH

**Report on potash.** Direct titration (Weems) method for chlorine in mixed fertilizers. L. D. HAIGH. *J. Assoc. Official Agr. Chem.* 12, 191-3(1929).—Collaborative results on the detn. of Cl by direct titration with  $\text{AgNO}_3$  in the presence of  $\text{K}_2\text{CrO}_4$  of the aq. ext. of mixed fertilizers, some contg. and some without  $\text{NH}_4$  salts, both with and without addn. of  $\text{CaCO}_3$  to neutralize the acidity of the soln., were consistently lower than the theoretical results, but no consistent difference was found that could be attributed either to the acidity of the aq. soln. or to the presence of  $\text{NH}_4$  salts. The consistently low results obtained are possibly due to the fact that part of the chlorides are retained and cannot be recovered by washing with  $\text{H}_2\text{O}$ , as is known to be the case with  $\text{K}_2\text{O}$ .

A. PAPINEAU-COUTURE

**Regulations for the enforcement of the insecticide act of 1910.** Food, Drug and Insecticide Administration, U. S. Dept. Agr. *Service & Regulatory Announcement* I F No. 1, 12 pp.(Oct., 1928).—The text of "An act for preventing the manuf., sale and transportation of adulterated or misbranded Paris greens, Pb arsenate and other insecticides and fungicides and for regulating traffic therein and for other purposes" is given with the regulations adopted.

H. A. LEPPER

**Report on (the electrolytic determination of copper in) insecticides and fungicides.** J. J. T. GRAHAM. *J. Assoc. Official Agr. Chem.* 12, 139-40(1929).—It was found that the tentative A. O. A. C. method for the electrolytic detn. of Cu in such products as Bordeaux-Paris green and Bordeaux-Ca arsenate mixts. without removal of the As and in the presence of  $\text{H}_2\text{O}_2$  gave results checking closely with those of the  $\text{Na}_2\text{S}_2\text{O}_3$  method. If too much  $\text{H}_2\text{O}_2$  is added, the deposition of Cu is slow until the concn of  $\text{H}_2\text{O}_2$  has been reduced by electrolysis.

A. PAPINEAU-COUTURE

**Study with reference to apple canker and to Sphaeropsis malorum.** GIACOMO PRETI. *Ann. scuola agr. Portici* [3], 1, 25-41(1926).—Hanging drop cultures of the conidia of *Sphaeropsis malorum* and of *Macrophoma*, solns. of  $\text{CuSO}_4$ ,  $\text{Al}_2(\text{SO}_4)_3$ ,  $\text{FeSO}_4$ ,  $\text{K}_2\text{S}_2\text{O}_8$  and oxalic acid being used, showed that these arrested germination in the strengths 0.0001, 0.05, 0.06, 0.05 and 0.05%, resp.

ALBERT R. MERZ

**Studies of the relative resistance to arsenical poisoning of different strains of codling-moth larvae.** WALTER S. HOUGH. *J. Agr. Research* 38, 245-56(1929); cf. C. I. 22, 2634.—Colorado larvae consistently demonstrated a marked superiority over Virginia larvae in withstanding poisoning by arsenical sprays.

A. L. MEHRING

**Preliminary report on control of hibernating codling-moth larvae.** L. C. McALISTER, JR. *J. Econ. Entomol.* 22, 424-5(1929).—In preliminary expts. undiluted kerosene and  $\text{C}_2\text{H}_5\text{Cl}$  killed the hibernating larvae of the codling moth (*Carpocapsa pomonella*). Lubricating oil emulsion, nicotine, *m*-nitroaniline, *o*-toluidine, aniline, 2,4-dinitroaniline and nitrobenzene were less efficient.

C. H. RICHARDSON

**Determining hydrocyanic acid gas concentration in fumigation experiments.** C. O. EDDY AND E. N. GEDDINGS. *J. Econ. Entomol.* 22, 366-78(1929).—The following method was used to det. the HCN concn. in a large room fumigated with com. Ca cyanide: Samples of air from the room are passed through a 3.5% NaOH soln., which is then analyzed for HCN by a turbidimetric method modified from the Liebig method for HCN. A standard AgI soln. is freshly prepd. for each series of titrations by diluting 10 cc. 0.1 N  $\text{AgNO}_3$  soln. to 400 cc. with distd.  $\text{H}_2\text{O}$ , adding this soln. with stirring to 400 cc. distd.  $\text{H}_2\text{O}$  contg. approx. 5 g. KI and diluting to 1 l. The soln. of NaOH contg. NaCN is titrated with the standard AgI soln. to the first appearance of turbidity. No consistent difference was noted in the concn. of HCN at different elevations in the room. Temp. and relative humidity did not modify the concn. The rate of decrease of HCN concn. in the room was greater for the higher doses, and was directly proportional to the initial concns. The most rapid change in concn. occurred during the first 5 hrs., but was noticeable throughout the expt. The decrease extended over a somewhat longer period with the higher concns. Smaller doses of Ca cyanide give higher initial concns. of HCN per unit than larger doses.

C. H. RICHARDSON

**Recent progress in the chemistry of derris.** R. C. ROARK. *J. Econ. Entomol.* 22, 378-81(1929).—A review of the chemistry of the active insecticidal principle "rot-enone," from the plant, *Derris elliptica*.

C. H. RICHARDSON

**Maximum weights of various fumigants which can exist in vapor form in a 1000**



**cubic foot fumigating chamber.** R. C. ROARK AND O. A. NELSON. *J. Econ. Entomol.* 22, 381-7(1929).—Formula developed from the equation,  $PV = nRT$ , are presented by which one may derive the no. of lbs. of fumigating gas, liquid, or solid, which can exist in the vapor phase in 1000 cu. ft. space at temps. from 0° to 50°, and 1 atm. pressure. Absorption of the fumigant by the walls of the container or by other materials is not considered. Tables are given for the following compds.:  $NH_3$ ,  $AsH_3$ ,  $CO$ ,  $CO_2$ ,  $SO_2$ ,  $CNCl$ ,  $CH_2:CH_2$ ,  $HCHO$ ,  $CS_2$ ,  $CHCl_3$ ,  $CNO_2Cl_3$ ,  $CCl_4$ ,  $HCN$ ,  $<(CH_2)_2:O$ ,  $CH_2Cl-CHCl_2$ ,  $CHCl_2-CHCl_2$ ,  $CHCl_3$ ,  $CHCl_2-CCl_3$ ,  $HCOO.Me$ ,  $HCOO.Et$ ,  $HCOO.CH(CH_3)_2$ ,  $CH_3-COO.Et$ ,  $CH_2ClCOO.Me$ ,  $pC_6H_4Cl_2$ ,  $C_{10}H_8$ , camphor and nicotine. C. H. R.

**The growth of the foliage and fruit of the apple in relation to the maintenance of a spray coating.** CLYDE C. HAMILTON. *J. Econ. Entomol.* 22, 387-96(1929).—The increase in leaf area and the quantity of  $As_2O_3$  per unit area of leaf surface of apple trees sprayed with  $PbHASO_4$  were detd. at weekly intervals throughout the growing season. The quantity of  $As_2O_3$  upon the fruit was also detd. Methods are described. During the active growing season, much of the reduction in  $As_2O_3$  per unit area is due to the increase in leaf growth; later the loss is largely due to weathering. The reduction in  $As_2O_3$  per unit area or per lb. of fruit largely resulted from increase of growth of the fruit. The loss of  $As_2O_3$  on fruit which was attributed to weathering was much smaller than that which occurred on the foliage. Data are given on the increase in surface area and vol. of apples during growth. C. H. RICHARDSON

**A contribution to the study of control measures for cucumber beetles, *Diabrotica duodecimpunctata* Oliv. and *vittata* Fabr.** H. C. HUCKERT. *J. Econ. Entomol.* 22, 405-11(1929).—The effectiveness of nicotine- $Ca(OH)_2$  dust for the spotted cucumber beetle (*D. duodecimpunctata*) and the striped cucumber beetle (*D. vittata*) depends upon a relatively dry environment, on direct contact of the dust with the beetle and on a heavy application of the dust. Under the same conditions many arsenical and non-arsenical dusts contg.  $Ca(OH)_2$  and  $Ca(OH)_2$  alone were noticeably effective as insecticides. The following compds. were used in the dust mixts.:  $PbHASO_4$ ,  $Ca$  arsenate,  $Zn$  arsenite, Paris green,  $Na_2SiF_6$ ,  $CuSO_4 \cdot H_2O$ , nicotine sulfate and  $Ca(OH)_2$ . C. H. RICHARDSON

**The carrot rust fly problem in New York.** HUGH GLASGOW AND J. G. GAINES. *J. Econ. Entomol.* 22, 412-7(1929).—The carrot rust fly (*Psila rosae*) may be controlled in small plantings by the use of  $HgCl_2$  applied either as a spray or dust.  $HgCl_2$  applied as a spray and  $C_{10}H_8$  applied as a dust were less satisfactory. Mech. barriers are also useful. For large plantings the use of insecticides is not practical. C. H. R.

**New investigations on weed eradication by dusting.** JAQUENAUD. *Compt. rend. acad. agr. France* 15, 611-17(1929).—In most of the cases the weed-eradicating, dusts are preferred to the liquid weed eradicators. It seems equally reasonable to replace the weed eradicators by an eradicating mixt., which at the same time constitutes a complete fertilizer and increases the resistance of the cereals to lodging. Powd. cyanamide, ground sylvite and  $(NH_4)_2SO_4$  play the deciding role in these mixts., and according to the case, one should employ one or the other of the mixts. mentioned for increasing or diminishing the proportion of N according to the requirements. E. F. SNYDER

**Sodium chlorate spray controls quack grass.** C. R. MEGEE AND R. S. HUDSON. Mich. Agr. Expt. Sta. *Quart. Bull.* 11, 129-32(1928).— $NaClO_3$  (1 lb. per gal. of  $H_2O$ ), applied by spraying at the rate of 100-150 gals. per acre early in the season followed by a second application after a few weeks, effectively controlled quack grass. Preliminary results indicate that  $NaClO_3$  has a temporary detrimental effect upon the soil and crop yields for not over 1 season. The use of this chemical is particularly recommended for treating weedy fence rows. Sheep were grazed upon newly sprayed meadow without ill results. C. R. FELLERS

**Agriculture in Germany (DYBS) 2. Rigidity in weak clay suspensions (SCHOFIELD, KEEN) 2. Analysis of caustic poisons (SMITH) 7. Determination of small quantities of the free and organically combined C [in soil] (STROHAL) 7. Nutrition as a factor in the responses of the European corn borer (HOUSER, HUBER) 11L.**

HEUSER, O.: *Grundzüge der praktischen Bodenbearbeitung auf bodenkundlicher Grundlage*. Berlin: Paul Parey. 228 pp. Reviewed in *Expt. Sta. Record* 60, 207 (1929).

MARTIN, H.: *The Scientific Principles of Plant Protection*. London: E. Arnold & Co., Ltd. 316 pp. 21s. Reviewed in *Chemistry & Industry* 48, 461(1929).

MICHEL, C. A.: *Systematic Laboratory Studies of Field Crops and Weeds*. Philadelphia: Lea & Febiger. 298 pp. Reviewed in *Expt. Sta. Record* 60, 327(1929).

NOSTRITZ, A. V., AND WEIGERT, J.: **Die künstlichen Düngemittel.** Die Handelsdünger unter Berücksichtigung der Wirtschaftsdünger. Stuttgart: Verlag Ferdinand Enke. 419 pp. M. 26; bound, M. 28.

SCHNEIDENWIND, W.: **Die Ernährung der landwirtschaftl. Kulturpflanzen.** 6th ed., revised. Berlin: Paul Parey. 543 pp.

**Apparatus for sterilizing soil by heating.** E. A. FOWLER. Brit. 299,653, Feb. 8, 1928. Structural features.

**Fertilizer.** HENRY H. BASS. Australia 12,453, Mar. 23, 1928. Hot concd. distillery slop is mixed with phosphate material, such as Nauru phosphate rock and  $H_2SO_4$ .  $(NH_4)_2SO_4$  or K salts may be added during the mixing, and the mixt. is dried.

**Fertilizers.** LOUIS NOMBLOT and COMPAGNIE MINIÈRE DU M'ZAITA. Fr. 652,427, April 10, 1928. Natural phosphate is finely ground and treated with the amt. of com. HCl necessary and sufficient to produce total solubilization of the  $H_3PO_4$  and filtered; the filtrate is satd. with free bases or carbonates.

**Fertilizers.** F. UHDE. Brit. 299,896, Nov. 3, 1927. In fixing  $NH_3$  to produce fertilizers, a portion of the  $NH_3$  is oxidized to produce  $HNO_3$  and the latter is used to treat crude Ca phosphate in such proportion that only  $CaCO_3$  contained in it is acted on to form  $Ca(NO_3)_2$ . Residual Ca phosphate is treated with  $H_2SO_4$ ; the  $H_3PO_4$  soln. thus formed is neutralized with  $NH_3$  to form  $NH_4$  phosphate and  $CaSO_4$ ; the latter is acted on by  $NH_3$  and  $CO_2$  to form  $(NH_4)_2SO_4$  and  $CaCO_3$ . Other fertilizer ingredients may be added.

**Mixed potassium and ammonium salts for use as fertilizers.** I. G. FARBERNIND A.-G. Brit. 299,984, Oct. 13, 1927. The solid deposit is sepd. from an aq. soln satd with the chlorides or nitrates or both of K and  $NH_4$ , together with Na salts if desired, and which is in equil. with at least 3 solid phases of the salts; to the sepd. soln there is added solid  $KNO_3$  or  $NH_4NO_3$  or KCl or  $NH_4Cl$  or their mixts., with or without salts of Na or of other metals. Sol. phosphates also may be added to similar solns. to obtain mixed crystals contg. them. Various details and modifications for the production of different mixed crystal products are described.

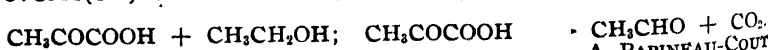
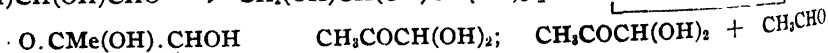
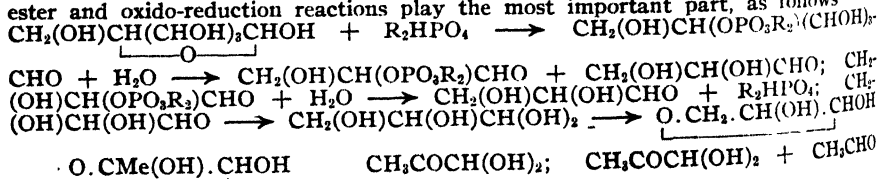
**Iron compounds.** O. S. NEILL. Brit. 300,233, Aug. 9, 1927. A ferruginous liquor such as a waste pickle or  $FeSO_4$  soln. is dispersed into particles or globules, which are given a rapid rotary motion and exposed to hot drying gases to obtain hollow particles suitable for use in insecticides, for killing weeds, for dehydrating purposes, etc.

## 16—THE FERMENTATION INDUSTRIES

C. N. FREY

**Remarks on the mechanism of alcoholic fermentation.** M. A. J. KLUIJVER. *Bull. soc. chim.* 45, 311-12(1929).—A discussion regarding priority. C. N. FREY

**A new theory of the mechanism of alcoholic fermentation.** A. J. KLUIJVER. *Bull. trimestr. assoc. élèves école sup. brasserie univ. Louvain* 29, 1-16(1929).—An address outlining the work of K. and co-workers (*C. A.* 19, 2353, 2967, 3510; 20, 930; 21, 108, 2908; 22, 245, 1168, 1785; 23, 619), which led them to a conception of the mechanism of alcoholic fermentation in which the formation of hexose-monophosphoric ester and oxido-reduction reactions play the most important part, as follows:



**Obtaining glycerol by fermentation.** A. ULLRICH. *Metallbörse* 19, 509-10, 621-2(1929).—A review. A. PAPINEAU-COUTURE  
W. C. ÉBAUGH

**The acetone-butyl fermentation and its application to molasses.** G. MEZZADROLI AND G. MAGNO. *Giorn. chim. ind. applicata* 10, 551-4(1928).—With the use of *Bacillus butylicus*, sugars derived from the starches (cereals, potatoes, etc.) or molasses, may be fermented,  $(CH_3)_2CO$  and  $C_4H_9OH$  being produced simultaneously. *Concns. of*

5 6% sugar, and in molasses  $p_H = 6$  to 5.4, are optimum conditions. Whether molasses or grains are used will depend on the relative costs. A. W. CONTIERI

The higher-boiling constituents of a Yugoslavian fusel oil. I. The basic constituents. A. CHASTON CHAPMAN AND F. A. HATCH. *J. Soc. Chem. Ind.* 48, 97T-100T (1929).—A study has been made of the basic constituents of a high-boiling fraction obtained from a com. fusel oil made from molasses. The bases consist chiefly of trimethylpyrazine and tetramethylpyrazine. Two bases isomeric with tetramethylpyrazine, possibly ethylpyrazine, were found. Higher homologs were present. One had the formula  $C_8H_{13}N_2$ , a substance apparently not described previously. A compd. considered to have the compn.  $C_{10}H_{15}N_2$  was studied. Pyridine was not found nor collidine nor 2,5-dimethyl-3-ethylpyrazine. C. N. FREY

Experiments on the separation and washing of spent grain from wort by decantation. J. KAUX. *Brasserie et malterie* 19, 21-8(1929).—The expts. showed that sepn. by decantation is impractical because of the large amt. of ext. remaining with the spent grain and the time required for settling. A. PAPINEAU-COUTURE

Agitation in fermentation. P. PETIT. *Brasserie et malterie* 19, 33-7(1929).—A brief discussion of the effects of "rousing" and other methods of agitation on the danger of infection, on the degree of fermentation and on the "body" of the finished beer. A. PAPINEAU-COUTURE

Rapid determination of moisture in the malting industry. P. PETIT. *Brasserie et malterie* 19, 43-6(1929).—The Chopin app. consists essentially of a small thermostatically controlled elec. oven, in which a 20-g. sample is heated in a metal tube connected to a small condenser and delivering into a suitably graduated receiver, the %  $H_2O$  being read directly after 20 mins. heating. The results obtained agree within 1 5% with those obtained by heating in a paraffin bath or by drying to const. wt. at 105°. A. PAPINEAU-COUTURE

Determination of alcohol in wines and liquors by means of potassium dichromate and sulfuric acid. L. SEMICHON AND M. FLANZY. *Ann. fuls.* 22, 139-52(1929).—After a discussion of the various chem. methods of detg. EtOH, detailed results are given of an investigation of the  $H_2SO_4$ - $K_2Cr_2O_7$  method, which showed that it is as accurate as (if not more accurate than) the official French method by means of an alcoholometer. The following technic is recommended: to 20 cc. of unneutralized wine in a 100-cc. flask add about 30 cc. distd.  $H_2O$ , distil about half the liquid into a 100-cc. volumetric flask, make to 100 cc. at 15°, in an Erlenmeyer flask, mix. 20 cc. of standard  $K_2Cr_2O_7$  (33.832 g. per l., 1 cc. = 0.7943 mg. EtOH = 1% EtOH by vol.) and 10 cc. of 66° Bé.  $H_2SO_4$ , cool, add all at once 5 cc. of the distillate, stopper, after 5-10 mins. titrate the excess of  $K_2Cr_2O_7$  with ferrous  $NH_4$  sulfate (135.310 g. and 20 cc.  $H_2SO_4$  per l.) using 1%  $K_3Fe(CN)_6$  as outside indicator. Under the above conditions oxidation of EtOH to AcOH is complete and there is no loss of AcH by volatilization. A. PAPINEAU-COUTURE

Wine clarification. M. RÜDIGER AND E. MAYR. *Kolloid-Z.* 47, 141-55(1929); cf. C. A. 22, 4713.—In a study of the clarification of wine by use of gelatin, no relation was found between the constituents of the wine and the clarity obtained. This is particularly true with respect to tannic acid content. No conclusion can be made regarding the type of gelatin to be used, for clarification is affected by the time of swelling of the gelatin up to 18 hrs., the temp. and the concn. employed. A 0.25% soln. which has been aged 2-3 days before adding gave optimum results. The inefficiency of greater concns. is believed due to formation of secondary particles. Temps. between 30° and 40° are optimum. A zone of clarity is found with respect to gelatin content and  $p_H$  of the wine. Too much gelatin increases the N content of wine. The viscosity decreases and surface tension increases with increasing gelatin content. The possibility of treating overclarified wine with agar is considered. A new method of treating viscous wines with agar is given. The pptn. of the tannin-gelatin material is only a secondary reaction. RAYMOND H. LAMBERT

Nature of the substance causing bitterness in wines. E. VOISENET. *Compt. rend.* 188, 941-3(1929); cf. C. A. 4, 2709, 3117; 5, 3606.—Previous work by the author has demonstrated the formation of acrolein during those disorders which cause bitterness of wines. This aldehyde presumably undergoes resinification to form the bitter principle. In an effort to concentrate this substance, 40 l. of wine was submitted to a series of fractional distillations and ether extrns. About 3 cc. of a liquid boiling at 198° was obtained. This sirupy liquid has a faint odor of acrolein, is extremely bitter and yields acrolein on careful oxidation. R. P. WALTON

The disease of stringiness in wines. G. MEZZADROLI AND E. VARETON. *Giorn. chim. ind. applicata* 11, 14-7(1929).—Wines which are turbid and oily may be cured

by bubbling through  $\text{SO}_2$  till the acidity is increased by 2 cc. 0.1 N NaOH per 10 cc. of wine. This clarifies the wine but the oiliness remains. Now activated carbon (Norite) is added (1% by vol.) and the wine stirred vigorously, and filtered, and the norite treatment repeated. This restores the wine as well as removes all but a trace of the  $\text{SO}_2$ . A. W. CONTIERI

**Interpretation of the results of analysis of damaged wines.** L. ROOS. *Ann. fals.* 22, 166-9(1929).—The analytical results obtained with wine which has been attacked by *Mycoderma aceti* might lead to the conclusion that the wine has been watered if the history of the product is not known. A. PAPINEAU-COUTURE

**Cognac brandy, its production and handling.** BENGT THORBJÖRNSSON. *Tek. Tid., Uppl. C (Kemi)* 58, 81-7(1928).—Cognac is defined as the natural product obtained by distn. without rectification of wine which is cultured, treated and distd within the borders of the Cognac district in France, the borders having been fixed by French law (1909). The article contains an illustrated description of the production, storing and handling of this product. C. A. ROBAX

**Study of the limit of fermentation (of beer).** PH. LECOCQ. *Bull. assoc. élèves inst. sup. fermentations Gand* 30, 125-35(1929).—The paralyzing action of the medium (EtOH content and acidity) on the elimination of the last traces of fermentable sugars has been confirmed, the action varying with different strains of yeast. Differences in the degree of fermentation with different yeasts, even with 3 successive fermentations, are possibly due to the time factor, which was not investigated. A. P.-C.

**Determination of carbon dioxide in beer by titration.** J. DE CLERCK. *Bull. trimestr. assoc. élèves école sup. brasserie Univ. Louvain* 29, 30-7(1929).—The method worked out is a modification of that of J. Cannizaro (*Am. Brewer* 41, 33(1924)) in which the beer is added to an excess of 0.2 N  $\text{Na}_2\text{CO}_3$  and the excess titrated with 0.2 N HCl, correction being applied for the non-volatile acids. The modifications comprise reading the end point by means of Liérs' method (*C. A.* 15, 2149) and using NaOH instead of  $\text{Na}_2\text{CO}_3$ . As this requires titration to a  $p_H$  value of 8.4 in order that the  $\text{CO}_2$  will be converted to  $\text{NaHCO}_3$ , a buffer soln. of this  $p_H$  is prepd. by adding 8.5 cc. 0.2 N NaOH to 50 cc. of a 0.2 N  $\text{H}_3\text{BO}_3$  and KCl soln. (12.404 g.  $\text{H}_3\text{BO}_3$  and 14.912 g. KCl per l.) The technic is described in detail. A. PAPINEAU-COUTURE

**Top fermentation by means of pure yeast cultures.** R. MORLION. *Bull. assoc. élèves inst. sup. fermentations Gand* 30, 55-75(1929).—Exptl. fermentations made with pure cultures prepd. from commercial brewers' yeast gave good results, the beer being easy to clarify and resistant. The use of raw grain resulted in degeneration of the yeast, particularly when used to the extent of 50%. A. PAPINEAU-COUTURE

### Cereal chemistry. III. The basic materials (FAIRBROTHER) 12.

**Fermentation.** I. G. FARBENIND. A.-G. Fr. 652,407, Apr. 10, 1928. In fermentation processes, particularly for the production of BuOH, the products are distd off in vacuum before completion of the fermentation, fresh wort is added and the fermentation continued.

**Fermentation.** DEUTSCHE HYDRIERWERKE A.-G. Fr. 652,556, Apr. 3, 1928. Natural mixed cultures of yeast or bacteria, with or without submission to one or more selection processes, are used in fermentation processes. The selection process may consist in cultivating the yeast, etc., in the presence of the product to be produced. Thus, yeast for the production of alc. is cultivated in the presence of alc.

**Tartaric compounds.** ALPHONSE L. NEMOZ. Fr. 651,690, Feb. 14, 1928. Lees in the form of boiling vinasses are centrifuged to ext. the tartaric compds. The molten liquors always kept at the same temp., so that they always contain the same amt of bitartrate in soln., are treated with HCl and then satd. with  $\text{CaCO}_3$ , the tartrate being dried.

**Clarification of wine, fruit juices, etc.** HERMANN LIST. Fr. 652,144, Apr. 4, 1928. The liquid is clarified in a rotating cylinder, the heavy particles adhering to the walls, and then filtered in a centrifuge.

## 17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

The importance of grinding seeds in the manufacture of coriander and anise ethereal oils. A. CHERNUKHIN. *Masloboino Zhirnooe Delo (Oil and Fat Ind.)* (Russia) 1928, No. 5, 11-13.—An increase in the yield of 17 and 5% in coriander and anise

oils, resp., was obtained by steam-distg. the ground seed, while 10 to 15% less steam and 25% less time were required for these operations. A. A. BOEHTLINGK

**Comparative tests of chlorine disinfectants.** R. FETSCHER. *Z. Desinfekt. u. Gesundh.* 20, 78(1928); Dept. Sci. Ind. Research. Water Pollution Research Board *Summary of Current Lit.* 2, No. 6, A146(1929).—F. made tests with *B. coli* of the following disinfectants: Chloramine, "Pantosept" I, II, III, "Pantosept" Tablets I and II, "Pantosept" Soda Tablets, "Pantosept" Soap, "Caporit," "Maquocid," chloride of lime and cresol soap, to det. the relationship between the Cl content and the disinfecting power. The Cl contents of the different preps. were widely different. The efficiency was not proportional to the Cl content. Alterations in the Cl content of any one prep. lead to corresponding changes in bactericidal properties. Chloramine-Heyden, containing about 24% of active Cl, has the same disinfectant properties as Caporit, contg. about 60%. Magnocid is the next most efficient, with 40% of active Cl, and the "Pantosept" preps. show great variations in their Cl content and disinfecting properties. "Pantosept" Soda Tablets and "Pantosept" soap cannot be used as disinfectants. E. J. C.

**Nitrobenzaldehyde as a reagent for organic drugs.** H. W. VAN URK. *Pharm. Weekblad* 66, 429-35(1929).—A large no. of org. compds. give color reactions with *o*-, *m*- and *p*-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>CHO. The reagent consists of a 1% soln. of the aldehyde in EtOH contg. 2% H<sub>2</sub>SO<sub>4</sub>. A few drops of this is added to a trace of the substance to be tested, the mixt. is evapd. on the water bath and the residue dissolved in H<sub>2</sub>O. The colors thus obtained range from yellow to violet. In general, the reaction is pos. with phenols, phenetidines, pyrroles, some CO derivs. and alkaloids contg. OH; neg. with anilides, purines and pyridines. Salicylic acid, *p*-cresol, holocaine,  $\beta$ -naphthol, acoune, scopalamine, narcotine and tyrosine react with *o*- but not with *m*- or *p*-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>CHO. Morphine and codeine may be distinguished by the green to brown color obtained with the former and the yellow color with the latter. A list of 112 substances is given and the colors obtained with *o*-, *m*- and *p*-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>CHO are tabulated separately. Reactions, which might be useful for purposes of identification, are designated by italics. A. W. DOX

**An impurity in commercial narceine which gives the color reaction with sodium nitroprusside.** J. J. L. ZWIKKER. *Pharm. Weekblad* 66, 445-9(1929).—Some samples of com. narceine give a red color with Na nitroprusside, while others give only a yellow color. The red reaction is due to the presence of a small quantity of methylnarceine, and may be obtained with pure narceine after treatment with Me<sub>2</sub>SO<sub>4</sub>. It appears that com. narceine is frequently prepd. by methylation of narcotine, and in this process a small portion of the product becomes further methylated to methylnarceine. The nitroprusside reaction will detect 2% of methylnarceine in 50 mg. of narceine-HCl. Narceine samples may contain more or less Me deriv. and still conform to the present Pharm. standards. A. W. DOX

**[Standardization of] preparations containing ergotamine.** H. J. STROBAND. *Arch. intern. Pharmacodynamie* 34, 224-6(1928); *Physiol. Abstracts* 13, 476.—Expts. for the detn. of ergotamine by measuring its antagonism for adrenaline have been made to find a more suitable organ than the uterus of the guinea-pig, from which the alkaloid is not easily washed out. The uterus of the ox, hedgehog and pig, as well as the vagina and vas deferens of the pig, have been examd. and are not any better, if as good, for the purpose. H. L. D.

**Application of "critical solution temperature" to pharmaceutical investigations.** F. WRATSCHKO. *Pharm. Presse* 34, 143-5(1929).—In connection with a discussion of the possible use of the "critical solution temperature" in the examn. of pharmaceutical preps., the following values were detd. for the pairs: Et<sub>3</sub>N—H<sub>2</sub>O 18.6, butyric acid—H<sub>2</sub>O 24.3, CS<sub>2</sub>—MeOH 40.5, C<sub>6</sub>H<sub>14</sub>—MeOH 42.8, C<sub>2</sub>H<sub>4</sub>(CN)<sub>2</sub>—H<sub>2</sub>O 55.4, PhOH—H<sub>2</sub>O 68.8, AcC<sub>2</sub>H<sub>5</sub>Ac—H<sub>2</sub>O 87.7, salicylic acid—H<sub>2</sub>O 90.5, iso-BuOH—H<sub>2</sub>O 107, *m*-nitrobenzoic acid—H<sub>2</sub>O 107, resorcinol—C<sub>6</sub>H<sub>6</sub> 108.9, EtCN—H<sub>2</sub>O 113.5, BzOH—H<sub>2</sub>O 115.5, PhCl—S 117, furfural—H<sub>2</sub>O 122.8, PhCNS—S 125.7, iso-BuOH—H<sub>2</sub>O 131.5, PhNH<sub>2</sub>—S 139.5, AcEt—H<sub>2</sub>O 150, C<sub>6</sub>H<sub>6</sub>—S 162.8, PhNH<sub>2</sub>—H<sub>2</sub>O 167, PhMe—S 179.5°. W. O. E.

**Alkaloidal constituent of *Artabotrys suaveolens* Blume.** JOAQUIN M. MARAÑON. *Philippine J. Sci.* 38, 259-68(1929).—The bark of the stem and root of *A. suaveolens* Blume from the Philippines contains an alkaloid, *artabotrine*, C<sub>23</sub>H<sub>35</sub>NO<sub>6</sub>, m. 187°. It has a slightly bitter taste, is physiologically active, freely sol. in CHCl<sub>3</sub>, fairly sol. in Et<sub>2</sub>O, EtOH and AcMe; it is sparingly sol. in other org. solvents. It is pptd. by the usual alk. reagents, gives color tests with concd. HNO<sub>3</sub>, Fröhde's reagent and some

oxidizing agents. The *HCl* and *HBr* salts occur in definite crystal forms (illustrated).  
W. O. E.

**Histological and microchemical studies on the bark and leaf of *Artabotrys suaveolens* Blume from the Philippines.** JOSÉ K. SANTOS. *Philippine J. Sci.* **38**, 269-82 (1929).—The structure of *A. suaveolens* is described in detail. Microchem. tests proved that the alkaloid of *A. suaveolens* is located in the stem and root barks and is lacking in the wood and the leaf. It is found in the cortical parenchyma, the medullary cells and the phloem parenchyma. It is relatively more abundant in the cortical parenchyma than in the other types of tissues, and there is a greater amt. of alkaloid in the root bark than in the stem bark.  
W. O. E.

**Chaulmoogryl-substituted phenols and ethyl chaulmoogryloxybenzoate.** IRENE DE SANTOS AND AUGUSTUS P. WEST. *Philippine J. Sci.* **38**, 293-8 (1929).—Four new esters of chaulmoogric acid were prepd.: *2,4-dichlorophenyl*,  $C_{24}H_{33}O_5Cl_2$ , crystals, m. 53.1-55.1°; *2,4-dibromophenyl*, crystals, m. 57.2-60.2°; *hydroquinone ester*,  $C_{24}H_{33}O_5$ , crystals, m. 54.1-57.2°; *m-carbethoxyphenyl*,  $C_{27}H_{40}O_5$ , m. 56.1-59.1°. All 4 esters are sol. in the common org. solvents.  
W. O. E.

**Oxytocin and vasopressin.** A further examination of the separated principles of pituitary (posterior lobe) extract. J. H. BURN. *Quart. J. Pharm.* **1**, 509-12 (1928).—The anti-diuretic activity of a sample of vasopressin was found to be the same per unit of pressor activity as that of a sample of pituitrin. No trace of anti-diuretic activity was found in a sample of oxytocin. The power which pituitary extract possesses of inhibiting the hypoglucemic effect of insulin is possessed also by vasopressin but not by oxytocin.  
W. O. E.

**Variation in activity of different samples of strophanthin.** FRANK WOKES. *Quart. J. Pharm.* **1**, 513-6 (1928).—From time to time complaints are made concerning the activity of samples of strophanthin. Nine different com. samples were accordingly examd. in comparison with the official ouabain of the U. S. P. X. by the cat method. The strongest had 2.4 times the potency of the weakest. The av. potency of 8 of the samples was 47.3% of that of ouabain, and 7 of the 8 were within 25% of this av. It is suggested that a sample of strophanthin should not be regarded as satisfactory for medicinal purposes if it differs from this av. by more than 25%. The 9th sample of strophanthin possessed only  $\frac{1}{2}$  the av. potency of the other samples.  
W. O. E.

**Use of rabbits in insulin assay.** KATHLEEN CULHANE. *Quart. J. Pharm.* **1**, 517-33 (1928).—The error of a cross-test in which 10 or more selected rabbits are used is less than 5%. For the best results the wts. of the 2 groups of rabbits should be equal. Certain rabbits are unsuitable for quant. work on insulin. Variability of response is affected by wt. and by season, heavy animals giving a higher % reduction than light ones, and all being more sensitive in the summer than in the winter. An alternative method is suggested for the calcn. of cross-test results in which a "day variation factor" is formulated. The "day variation" for groups of rabbits is discussed, and a new method of assay suggested, which is less accurate but quicker than a cross-test. The effect on the result of terminating a cross-test at the 2nd and 3rd hr. has been shown to be small.  
W. O. E.

**Structure of synthetic drugs in relation to their therapeutic action.** W. H. LINNELL. *Quart. J. Pharm.* **1**, 558-73 (1928).—A review.  
W. O. E.

**Recent research in pharmacognosy.** T. E. WALLIS. *Quart. J. Pharm.* **1**, 571-80 (1928).—A review.  
W. O. E.

**Standardization of tincture of digitalis.** FRANK WOKES. *Quart. J. Pharm. and Pharmacol.* **2**, 48-62 (1929).—The requirements laid down for tincture of digitalis in the present edition of the Brit. Pharm. are unsatisfactory. They assume that digitalis leaves always have approx. the same activity. But when 8 samples of English digitalis leaves were assayed by the cat method, they showed an av. activity similar to that possessed by the international standard, but a variation in activity between different samples of nearly 140%. This variation in activity of digitalis leaves leads to a similar variation in the activity of tincture of digitalis. Among 80 com. samples of the tincture a variation in activity of nearly 400% was noted, 25 of the samples differing by more than 25% from the activity possessed by a tincture prepd. from the international standard powder. This variation in activity of the com. tinctures can at present be avoided only by employing biological assays. Twenty samples of tincture of digitalis were biologically assayed both by the cat and by the frog method. The av. exptl. errors were 8.7 and 5.9, resp. The results by the 2 methods differed from each other by more than the exptl. error in 7 cases. On the whole, the frog method gave lower results than the cat method. When the age of these tinctures was taken into account, the cat and frog results became consistent. It was found

that the frog potency diminishes rapidly and steadily during the 1st few months of storage, until it reaches a level of  $1/2$  to  $1/3$  of its original value, at which point it becomes fairly const. for some yrs. The cat potency, on the other hand, decreases much more slowly. Tinctures not more than a month old will give the same results when assayed either by the cat or by the frog method. With older tinctures, the results will be different, and further clinical evidence is required to show which is the more accurate est. of the therapeutic value. If the frog method is to be employed, comparison must in every case be made with a standard tincture which has not been made longer than a month.

W. O. E.

Science and technic in service of the practical druggist. K. H. BAUER. *Pharm. Zentralhalle* 70, 309-17(1929).—An address.

W. O. E.

Alkaloidal content of ipecacuanha infusion. G. BRUCK. *Apoth. Ztg.* 44, 612 (1929).—Infusions of 2-g. samples (total alkaloids 0.047%) in 800, 400, 200, 100 and 40 g. H<sub>2</sub>O yielded 0.029, 0.019, 0.0186, 0.0169, 0.0168% alkaloid, resp., while addn. of HCl to the  $2/40$  infusion raised the alkaloid content to 0.0338%.

W. O. E.

Synthetic aromatic chemicals. J. N. TAYLOR. *Am. J. Pharm.* 101, 345-61 (1929).—The products of this branch of the org. chem. industry are not now arbitrarily restricted to cyclic compds., but include those of aliphatic origin as well. Synthetic aromatic chemicals are employed primarily because of their pleasant odor or agreeable flavor and may be classified chemically as alcs., ketones, aldehydes, acids and esters of both coal-tar and non-coal-tar origin. In addn. to the utility of these synthetic org. compds. as perfume bases and flavor materials they are also employed in many other ways. A classified list describing some of the more important synthetic aromatic chemicals finding employment in various ways is given. Tables are given showing U. S. production of coal-tar flavor and perfume materials for each year from 1918 to 1927, inclusive, imports into the U. S. of principal aromatics entered for consumption for each year from 1924 to 1928, inclusive, and also a table including production of synthetic aromatics compared with imports during 1926 and also 1927.

W. G. GAESSLER

The evaluation of solutions of adrenaline. TOM. VACEK. *Časopis Českoslov. Lékařnictva* 9, 1-3(1929).—In a study of the influence of acidity of aq. solns. of adrenaline it was found that the more acid solns. were not always more stable and that the stability does not increase in proportion to the degree of dissocn. of the acid used.

WILLIAM J. HUSA

Determination of the oxidizability of adrenaline. TOM. VACEK. *Časopis Českoslov. Lékařnictva* 9, 3-4(1929); cf. *C. A.* 22, 1652.—The stability of aq. solns. of adrenaline can be estd. by detg. the oxidizability, using H<sub>2</sub>O<sub>2</sub> and following the change colorimetrically.

WILLIAM J. HUSA

Belladonnine, bellatropine and chlorotropane. MAX and MICHEL POLONOWSKI. *Bull. soc. chim.* [4], 45, 304-11(1929).—The literature on bellatropine (I) is reviewed. Many errors have occurred in the literature concerning this substance; in order to clarify them, the following work was undertaken. It was found that bellatropine, supposedly an isomer of tropine (II), is really chlorotropane. Crude I was prepd. from atropine (III) hydrobromide and Ba(OH)<sub>2</sub>, converted into the *chloroplatinate*, m. 252°, or the *chloroaurate*, m. about 160° (sinters above 150°), and pure I obtained from these derivs. by means of H<sub>2</sub>S. Upon hydrolysis it yields II and a polymer of atropic acid. Treatment with HCl produces 3-chlorotropane (IV) hydrochloride, m. 232-3°. IV is a colorless oil, b. 163-5° with decompn. partially to the hydrochloride of tropidine (V). From IV there was prepd. the *chloroplatinate*, m. 227-8°, the *chloroaurate*, m. 215°, *picrate*, m. 216-7°, *MeI deriv.* (VI), m. 305-6° and the *oxide*, the hydrochloride of which m. 210° and the *picrate* m. 174-5°. Reduction of VI yields the *MeI deriv. of tropane*. The action of HCl on atropine, III and hyoscyamine and II produces IV-HCl in every case. Similarly, treatment of I and III with HBr yields 3-bromotropane, the *picrate* of which m. 205°. The *picrates* of II, pseudotropane and V m. 228°, 258° and 285°, resp.

J. M. LEVINE

Methyl red as an indicator for determination of several alkaloids. E. M. EDERMAN. *Farm. Zhur.* 1928, 602-6.—A volumetric detn. of hydrastine and quinine was made and the results agreed closely with those of the gravimetric method. Methyl red as an indicator gives a very clear end-point and should be preferred to methyl orange or hematoxylin.

YETTA POROSOWSKY

"Calcas," a casein preparation to replace laroson. E. I. VALIASHKO AND N. A. VALIASHKO. *Farm. Zhur.* 1928, 699-702.—Calcas (Ca caseinate) was prepd. and compared with laroson of the firm Hoffmann-La Roche. The data indicate that the 2 compds. are practically identical. Calcas has the advantage of being more easily

sol. Its physiol. action is satisfactory and the prepn. from milk does not require a special app.

**A simplified method of preparing a solution of iron albuminate.** I. A. OBERHARD *Farm. Zhur.* 1928, 702-5.—A soln. of Fe albuminate was prepd. by mixing dil. solns. of  $\text{FeCl}_3$  and albumin at a temp. of  $50^\circ$  and neutralizing the mixt. with a 15% soln. of NaOH at the same temp. After the ppt. was washed free of Cl and dissolved by making slightly alk. the other components which the pharmacopoeia prescribes (glycerol, alc., etc.) were added. The prepn. is stable and satisfies the requirements of the pharmacopoeia.

**The aloe in Sardinia.** G. B. ZANDA. Univ. Cagliari. *Boll. chim. farm.* 68, 255-60 (1929).—Notes on the occurrence of different *Aloe* species in Sardinia. The characteristics of the juices obtained from some species are discussed.

**Cod-liver oil with ferrous iodide.** G. SIBONI. *Boll. chim. farm.* 68, 260-1 (1929). Formulas are given for the manuf. of cod-liver oil contg.  $\text{FeI}_2$ .

**Comparative study of methods of determination of citral in lemon essence and characteristics of Spanish essence.** O. FERNÁNDEZ AND A. MOSCARDÓ. *Anales de la Real Soc. españ. fís. quim.* 27, 265-78 (1929).—The best method is that of the U. S. Pharm. The citral content of Valencian essence is shown.

**Tegin, a new base for cosmetics.** A. KARSTEN-SALMONY. *Mat. grasses* 21, 8484 (1929).—Tegin is an ester giving emulsions readily with  $\text{H}_2\text{O}$  at  $70-80^\circ$ . The consistency of the emulsions can be regulated by altering of the amt. Tegin. S. suggests possible uses for this product. Also in *Chem.-tech. Rundschau* 44, 47 (1929).

**Scarlet R, aminoazotoluene and acetoazotoluide as cicatrizing agents.** ED. JUSTIN-MUELLER. *J. pharm. chim.* [8], 8, 441-9 (1928).—An indication of the efficacy of the dye-stuffs named as cicatrizing agents for wounds may be obtained by the behavior *in vitro* of mineral-oil solns. of these dyes (0.1 g.: 10 cc.) when shaken with aq. solns. of ovalbumin (1 egg-white: 1 l.) or blood albumin (0.5 g.: 1 l.). Stable emulsions are formed whether the dyes are present or absent. When the emulsion is filtered and the paper is dried, it is covered with a perceptible, smooth film only if the dyes were used; in a blank test film formation (parallel to cicatrization), is insignificant. The film is more accentuated and better formed with acetoazotoluide (azodermine Agfa) (A), than with Scarlet R, a fact in accord with previous clinical observations. The emulsions formed with or without addn. of the dyes remove 50% of ovalbumin from the aq. soln. used, nil from the blood albumin soln. except that in the case of A, 25% of blood albumin is also removed. In the formation of the film, the dyes seem to act as peptizing agents on the proteins (cf. C. A. 15, 2372; 16, 368). Of the dyes tried, A is not only innocuous, as compared with aminoazotoluene, it also produces only a faint, or practically no annoying, coloration.

**Purification of vaccine virus by adsorption on kaolin.** HIDETAKE YAOI AND HISAO KASAI. *Proc. Imp. Acad. (Japan)* 5, 179-81 (1929).—The virus of vaccinia is adsorbed on kaolin in neutral or, more completely, in weakly acid reaction. Washing causes no, or very slight, diminution of the virus and the disoccn. of the virus from kaolin takes place very readily in strong alk. solns. The vaccinal prepn. is usually a transparent soln. and contains no cell or cell elements. The prepn. show weak biuret reaction when concd. to 0.1 of the original vol., but the Molisch reaction is neg.

New strychnine alkaloid (WIELAND, OERTEL) 10. The relation of research to [drug] control (BROWNE) 12. Relations between chemical constitution and physiological properties [analysis of pharmaceutical products] (BERLINGOZZI) 11A. Regulations for the enforcement of the Federal Food & Drugs Act. (ANON.) 12. The effect of heat on tragacanth and its mucilage (GABEL) 28. The reactions of tropic acid and of the tropeines (CHAMBON) 10. Methylurethans of the isomeric  $\alpha$ -hydroxyphenylethyl-dimethylamines and their mitotic activity (STEDMAN, STEDMAN) 10. Medical electrodes (U. S. pats. 1,713,970-1) 4. Urethans of secondary alcohols (Brit. pat. 300,177) 10. Piperidine derivatives (U. S. pat. 1,714,180) 10.

GLYN-JONES, H.: **Forensic Pharmacy.** London: Pharmaceutical Pr. 138 pp 3s. 6d. net.

MITCHELL, C. AINSWORTH, et al.: **Allen's Commercial Organic Analysis.** Vol. VII. **The Vegetable Alkaloids.** 5th ed., revised. Philadelphia: P. Blakiston's Son & Co \$7.50. Reviewed in *Chemicals* 31, No. 23, 6 (1929).

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tical Perfumery. 3rd ed., revised and enlarged. London: Chapman & Hall, Ltd. 535 pp. 25s. net. Cf. C. A. 23, 3051.

**Medicine for treating diseases of the biliary tract.** EMANUEL W. LIPSCHUTZ. (to Brooklyn Scientific Products Co.). U. S. 1,714,430, May 21. Oleic acid and bile salts are used together.

**Cancer toxin, antitoxin, etc.** T. J. GLOVER. Brit. 300,144, May 6, 1927. Cancer organisms (the properties of which are described) are prepd. from cancerous tissue in a medium consisting of decoctions of sunflower seed, Iceland moss, and Irish moss, peptone, hormone gelatin broth and glucose, with or without agar, of a  $p_H$  about 6.5. Toxins and antitoxins are prepd. from the cultures. The "hormone gelatin broth" is made from eggs, beef heart, peptone, NaCl, digested beef heart, gelatin and dextrose.

**Depolymerizing carbohydrates such as starch and cellulose by treatment with ethylene glycol and monochlorohydrin.** FRITZ LANGE (to I. G. Farbenind. A.-G.). U. S. 1,714,565, May 28. Cf. Brit. 290,377 (C. A. 23, 981). The products are suitable for pharmaceutical purposes.

**Freezing bio-colloids.** BORIS ZITOVITSCH. Fr. 652,234, Apr. 5, 1928. Bio-colloids such as therapeutic serums, toxins, fruit juices, pharmaceutical extracts, beer, milk, cream, etc., are frozen by introducing them in a fine mist or in small drops into a chamber the temp. of which is below the m. p. of the liquid. The colloids may be restored to the original state without detriment when desired.

**Dialkoxyacridines.** LOUIS BENDA and WERNER SCHMIDT (to Winthrop Chemical Co.) U. S. 1,715,332, May 28. Dialkoxyacridines are formed by heating 3,6-dihydroxyacridines in the presence of acid-binding substances, with alkylating agents. 3,6-Diethoxyacridine m. 142-3°; 3,6-dimethoxyacridine m. 138-9°; and 3,6-bishydroxythoxyacridine m. 200°. These compds., of which the dimethoxy compd. is particularly mentioned, have been found suitable for combating diphtheria bacilli and streptococci even when highly dil.

**Cyclopentyl compounds having bactericidal properties.** ROGER ADAMS (to Abbott Laboratories). U. S. 1,715,052, May 28. Compds. which in general are strongly bactericidal against acid-fast bacteria such as *B. leprae* or *B. tuberculosis* and which have the general formula  $C_5H_9(CH_2)_yCHRCOOZ$ , in which "y" represents zero or more, R represents an aliphatic hydrocarbon group, and Z represents H, a metal, or a hydrocarbon group such as an alkyl or an alkylene, are made by a process which includes introducing an alkyl group and a group contg. a cyclopentyl radical into a malonic ester, followed by saponification and elimination of one mol. of  $CO_2$ . The compd. of the general formula  $C_5H_9CHRCOOH$  in which  $R = C_8H_{17}$   $b_1$  165°;  $R = C_9H_{19}$   $b_1$  177°, m. 40-2°;  $R = C_{10}H_{21}$   $b_1$  176°, m. 37°;  $R = C_{11}H_{23}$   $b_1$  175°, m. 48°. The compd. of the general formula  $C_5H_9CH_2CH_2CHRCOOH$  in which  $R = C_8H_{17}$   $b_2$  130-2°;  $R = C_9H_{19}$   $b_1$  135-7°;  $R = C_7H_{15}$   $b_2$  152-4°;  $R = C_8H_{17}$   $b_1$  173-5°.

**Dry yeast.** MATRO GES. Brit. 300,039, Dec. 24, 1927. In prep. dry yeast for curative and nutritive purposes, from fresh moist yeast, the yeast is subjected to extn. with ale at a temp. of 55-65°, followed by pressing, washing, drying and heating at 150-160°.

**Disinfectant.** THEODOR SABALITSCHKA and HEINRICH JACOBSON. U. S. 1,715,251, May 28. An ester of a non-adjacent hydroxybenzoic acid is used for disinfecting the mouth, etc.

**Chewing gum.** HOWARD W. MATHESON (to Can. Electro Products Co., Ltd.). Can. 289,982, May 28, 1929. A compn. of matter for use as chewing gum includes chiclet and sweetening and flavoring material and a product made by the treatment of vinyl acetate with a satd. aliphatic aldehyde. Cf. C. A. 22, 3026.

## 18—ACIDS, ALKALIES, SALTS AND SUNDRIES

E. M. SYMMES

**The manufacture of synthetic nitric acid.** M. KALTENBACH. *Chimie & industrie* 21, 701-7 (1929).—Transportation of liquid  $NH_3$  by common carriers is expensive because of the precautions required to meet the regulations. A system is described, suitable for transportation over short distances or over private lines when the  $NH_3$  and  $HNO_3$  plants are close to each other, in which the  $NH_3$  is cooled to -30° and transported in ordinary tank cars covered with suitable insulation. The loading and unloading plants are also described. The Parsons catalyzer, consisting of 3 thicknesses of Pt gauze

in the form of a hollow cylinder, has been improved by adding a fourth layer of gauze on the outside, which increases very greatly its mech. strength, the outer layer taking practically no part in the catalysts and consequently deteriorating very slowly. It also permits passing the  $\text{NH}_3$  through the catalyzer at a higher rate, thus increasing the output of the catalyzer. By using a portion of the catalyzed gases to heat the  $\text{NH}_3$  gas, the amt. of catalyzed gases thus used being regulated by a by-pass, the temp. in the catalyzer is readily kept at the optimum pt. (about  $1000^\circ$ ). Various features of the construction of the absorption towers, designed to improve the efficiency of the absorption of the catalyzed gases, are described briefly. A. PAPINEAU-COUTURE

**Progress in the manufacture of sulfuric acid in recent years.** II. ST. ZEROMSKI. *Przemysl Chem.* 13, 106-11 (1929); cf. C. A. 23, 934.—A review and bibliography of the catalytic oxidation of  $\text{SO}_2$  in the presence of oxides of N. A. C. ZACHLIN

**Carbamate-carbonate theory of the ammonia-soda process.** E. I. ORLOV. *Ukrainskii Khem. Zhur.* 3, Tech. Pt. 139-40 (1928).—O.'s article (the physico chem side of the ammonia-soda process and in particular of the working of the carbonization tower, *Ukrainskii Khem. Zhur.* 1, (1928)) was a result of an application of Fenton's method to the investigation of ammonia-salt solns. subjected to satn. with  $\text{CO}_2$ . Lab. expts. had shown that the ammonia-soda process in the course of carbonization is more involved than hitherto supposed, namely, in the initial stages of carbonization of  $\text{NH}_3$  or  $\text{NH}_3\text{-NaCl}$  soln. there is always formed the carbamino-acid ammonium salt, which on standing or on further satn. with  $\text{CO}_2$  reacts with  $\text{H}_2\text{O}$  and changes to carbonate, whether neutral or acid is not detd., and then in the form of  $\text{NH}_4\text{HCO}_3$  undergoes double decompn. with  $\text{NaCl}$ . Thus an equil. is always attained between the carbamate and the carbonate depending upon temp. This equil. between the carbamate, which does not go into a double decompn. with  $\text{NaCl}$  and the carbonate, which does undergo a double decompn. in presence of  $\text{CO}_2$ , explains why the process of sepn. of  $\text{NaHCO}_3$  during carbonization is never carried out to the end. These lab. investigations were extended at the "Chimugol" Donezkii Soda Works at Kharkoff, to the process of carbonization in towers of large-scale production with detn. of carbamates, carbonates and free ammonia throughout the entire length of the tower, and the results obtained fully confirm O.'s supposition. CHAS. BLANC

**The manufacture of caustic soda.** H. MORIN. *Russa* 4, 525-31 (1929).—A brief description of the manuf. of  $\text{NaOH}$  by chem. and electrolytic processes (electrolysis of  $\text{NaCl}$  solns., and of fused  $\text{NaCl}$ ), and of the concn. of  $\text{NaOH}$  solns. A. P.-C.

**Development of heat economy in the potash industry.** MAENICKE. *Arch. Warmewirt.* 10, 133-7 (1929).—Among the measures adopted for reducing the heat consumption in potash works are: the working of rich salts only; the substitution of mech. for steam agitation; the use of heat exchange by distg.  $\text{H}_2\text{O}$  under vacuum from the hot concd. liquors to the cold mother liquors; the preheating of the mother liquors with exhaust steam; the modernization of power plants. ERNEST W. THIELE

**Purification of brine by the sulfate method.** A. MITTENBERG. *Ukrainskii Khem. Zhur.* 2, Tech. Pt. 105-23 (1926).—A 3-stage method for elimination of  $\text{Ca}$  and  $\text{Mg}$  salts from the raw liquor used in prepn. of table salt is described. In stage 1 the raw liquor is mixed with mother liquor from previous cooks, soln. of  $\text{Na}_2\text{SO}_4$ , and milk of lime in such proportions that 100 cc. of clear filtrate requires for neutralization at least 10.5 cc. of 0.25  $N$   $\text{HCl}$ . In this stage  $\text{Mg}$  comes down as a hydrate, and the bicarbonates are changed to  $\text{CaCO}_3$ . The greater part of the  $\text{CaSO}_4$  also comes down, because of the high concn. of  $\text{Na}_2\text{SO}_4$ . The decanted liquid is then treated with scrubbed flue gases until 100 cc. of soln. titrates 0.5 cc. of acid and is allowed to stand until the ppt. comes down. Then  $\text{Na}_2\text{CO}_3$  is added until a test sample does not give any ppt. on addn. of  $\text{Na}_2\text{CO}_3$ . After 20 hrs. the clear liquor is used for evapn. The  $\text{Na}_2\text{SO}_4$  content is kept above 15 g. per l. for high concn. of alkali in stage 2, imperative for successful operation of the process. Calcs. and tables for computation of chemicals and the total cost under various conditions are given. With this method of purification not a trace of  $\text{CaSO}_4$  deposits on the evaporator tubes. REA MAIZEL

**The Trona enterprise.** G. ROSS ROBERTSON. *Ind. Eng. Chem.* 21, 520-4 (1929).—A review of the methods in use and the conditions surrounding the production of  $\text{K}_2\text{O}$  and borax at Searles Lake, Calif. W. H. ROSS

**The manufacture of carbon disulfide.** H. MORIN. *Russa* 4, 349-53 (1929).—A brief outline of the processes of manuf. of  $\text{CS}_2$  and of its properties. A. P.-C.

**Recovering sulfur from a Nevada surface deposit.** H. L. HAZEN. *Eng. Mining J.* 127, 830-1 (1929).—The coalescing method is employed with success. The ore is crushed to 10-mesh or finer, pulped with water, 1:1, sealed into a pipe 6 in. or less in diam. which is rotated and heated to  $138^\circ$ , and then cooled while rotating. With the

pipe diam. limited to 6 in. S collects and solidifies into a few lumps much larger than the screen openings, which permit all the gang to pass through. The large lumps contain 97% S, and the tailings about 3.5%. With ore testing 23% S, a recovery of 87% is indicated. The successive steps are: (1) the refiner is filled with filtered flotation concentrate contg. about 18% moisture; (2) the blow-off valve near the top of the refiner is closed and the Kelly head lowered into place and tightened; (3) steam is turned on at the bottom; (4) liquid S is drawn off through a specially constructed valve; (5) the blow-off valve at the top is opened and the pressure released; (6) Kelly head is released and the retort dumped and washed out. 2700 tons (2,454,300 kg.) have been produced by this method. Each cycle produces about 5 tons of pure S and about 7 cycles can be made in a 24-hr. day. Difficulties in refining the flotation concentrate are: failure of S to coalesce into a pool, and accumulation of gang around the S draw-off pipe. Tailings dumped from the refiner average about 35% S and are returned to the flotation circuit. "Aerofloat No. 15," in the proportion of 0.25 g. per kg. of ore, gave the best results. Recovery averaged 85%. The concentrate averaged 77% S and the mill heads (half mine and half dump ore) about 15% S. W. H. BOYNTON

Volumetric relations of the reaction  $N_2 + O_2 \rightleftharpoons 2NO$  — 43,200 gram calories. R. NITZSCHMANN. *Metallbörse* 18, 1799-1800(1928).—A mathematical discussion and tabulation of the results. E. M. SYMMES

Silicic acid gel and silica gel. KUNO WOLF AND MAX PRAETORIUS. *Metallbörse* 19, 341 2(1929); cf. *C. A.* 23, 2787.—A review. W. C. EBAUGH

Metallurgical limestone—problems in production and utilization. OLIVER BOWLES. *Bur. Mines, Bull.* No. 299, 40 pp.(1929); cf. *C. A.* 22, 1124.—A rept. purporting to cover present knowledge of the utilization of metallurgical stone and the problems connected with its quarrying or mining and prepn. There is a marked tendency toward underground mining of limestone which tends to produce a stone of higher purity. Utilization problems are approached from the standpoints of: blast-furnace flux, basic open-hearth flux, and limestone flux in non-ferrous metallurgy. Production problems of fluxing limestone are discussed from the standpoints: the relation of metallurgical stone production to other limestone industries; prospecting; plan of development; impurities, quarrying to maintain uniformity in rock compn.; by-product industries; and production cost of fluxing stone. W. H. BOYNTON

Factors affecting the solution rates of limestone in acid media. HERBERT F. KRIEGER. *Rock Products* 32, No. 10, 73-80(1929).—The soln. rate of limestone in dil. buffer d acid solns. is inversely proportional to particle size. The rate for any limestone is specific for that stone. Phys. properties are not an indication of soln. rate. Compn. affects the rate to a marked degree,  $MgCO_3$  dissolving more slowly than  $CaCO_3$ . RAYMOND WILSON

Efficiency and fuel consumption of gas-fired lime kilns. A. SCHACK. *Arch. Warmwirts.* 7, 65-9(1926); cf. *C. A.* 21, 990.—An analysis of the heat balance and equal conditions on a lime kiln, with reasonable assumptions as to radiation loss, shows that the heat liberated by the gas is equal to the heat required to raise the flue gases, exclusive of  $CO_2$  from the limestone, to a temp.  $t$ , less the heat given off in cooling the lime below the temp.  $t$ , plus 840 cal. per g. of  $CaO$  produced. The temp.  $t$  is that at which  $CaCO_3$  has a  $CO_2$  pressure equal to the  $CO_2$  partial pressure in the stack gases. The efficiency of a kiln increases as the flame temp. of the fuel rises; 70% is a max. unless the heat in the stack gases is recovered. ERNEST W. THIELE

Development of modern kiln design. E. L. JOHNSON. *Cement, Mill and Quarry* 34, No. 5, 45-7(1929).—Lime kilns are discussed. E. I. S.

Graphite. I. General information. PAUL M. TYLER. *Bur. Mines, Circ.* No. 6118, 45 pp (1929); cf. following abstr.—A very complete rept. on the history, uses, properties, mining, concn. and refining methods for graphite. The manuf. of artificial graphite, the world and domestic production of graphite, grades, prices, etc., are discussed, and an excellent bibliography is appended. W. H. BOYNTON

Graphite. II. Domestic and foreign deposits. PAUL M. TYLER. *Bur. Mines, Circ.* No. 6122, 25 pp.(1929). III. Utilization of graphite. *Ibid* 6123, 20 pp. IV. Status of the American graphite industry. *Ibid* 6124, 14 pp. Cf. preceding abstr. E. H.

Proposed method for testing casein. ELBERT G. MILHAM. *Paper Trade J.* 88, 55-6(1929).—A description of the proposed official method of the Technical Assocn. of the Pulp and Paper Industry. A. PAPINEAU-COUTURE

Analytical differences between acid casein and rennet casein. CH. PORCHER AND MISS J. BRIGANDO. *Ann. fals.* 22, 153-63(1929); cf. *C. A.* 22, 3672; Fouassier, *C. A.* 22, 4733 —There is no essential difference between "acid" casein and "lactic" casein.

By observing proper precautions in manuf., either process can give a product practically as pure as that obtained in the lab.; the analytical differences in the various com products are due to carelessness or improper processing. The constitution and compn of rennet-casein are different, as shown in the previous paper. Certain of Fouassier's statements are challenged.

A. PAPINEAU-COUTURE

Filtering equipment and the systematic and continuous extraction of sludges, precipitates and ores (FOURTON) 1. Some properties of fuller's earth and acid-treated earths as oil-refining adsorbents (DAVIS, MESSER) 22. Government potash exploration in Texas and New Mexico (MANSFIELD, LANG) 8.

**Phosphoric acid.** EDOUARD D. MATHEY and AUDLEY O. WILLIAMS. (to American Cyanamid Co.). U. S. 1,714,685, May 28. An inorg. material capable of liberating P, such as a mixt. of phosphate rock,  $\text{SiO}_2$  and coke, is heated with sticks of carbonized wood in an elec. furnace.

**Sulfuric acid.** VEREIN FÜR CHEMISCHE UND METALLURGISCHE PRODUKTION Fr. 652,440, Apr. 10, 1928. See Brit. 289,879 (C. A. 23, 936).

**Concentrating acids.** HOLZVERKOHLLUNGS-INDUSTRIE A.-G. Fr. 651,944, Mar. 29, 1928. Aliphatic acids, particularly  $\text{AcOH}$ , are concd. by distg. in the presence of  $\text{NaHSO}_4$ ,  $\text{H}_2\text{SO}_4$ , or mixts. thereof and by bringing the vapors into contact with fused  $\text{NaHSO}_4$ .

**Ammonia.** KALI-INDUSTRIE A.-G. and THEODOR C. THORSSELL. Fr. 652,174, Mar. 20, 1928. See Brit. 288,154 (C. A. 23, 486).

**Ammonia.** NITROGEN ENGINEERING CORP. Fr. 651,899, Mar. 28, 1928. In the synthetic production of  $\text{NH}_3$  a small quantity of  $\text{CO}_2$  is introduced into the circulating H and N to form  $(\text{NH}_4)_2\text{CO}_3$  with the water vapor present and  $\text{NH}_3$ . Other impurities such as dust and oil are removed with the  $(\text{NH}_4)_2\text{CO}_3$ . Cf. C. A. 23, 3313.

**Alkali metal silicates.** I. G. FARBENIND. A.-G. Brit. 299,763, Oct. 31, 1927. Raw siliceous materials such as finely ground sand are heated under pressure with liquor. contg. alkali metal chloride and hydroxide obtained by electrolysis of  $\text{NaCl}$  or  $\text{KCl}$  solns.

**Inositolhexaphosphates.** FRITZ GOEDECKE. U. S. 1,715,031, May 28. Comminuted parts of plants contg. inositol hexaphosphoric acid are extd. with water, the acid and acid salts in the aq. soln. are converted into neutral alk. earth metal salts as by addn. of  $\text{CaCO}_3$  and these salts, which are practically insol. in water, are sepd. by filtration and are treated with oxalic acid to liberate the acid and acid salts from the pptd. compds.

**Fluorine compounds.** VEREIN FÜR CHEMISCHE UND METALLURGISCHE PRODUKTION Fr. 652,258, Apr. 5, 1928. The gases obtained by the action of  $\text{H}_2\text{SO}_4$  on F compds. such as fluorspar are dehydrated with oleum, and the  $\text{HF}$  is condensed. The residual gases rich in volatile compds. of Si are absorbed in water and used for making  $\text{AlF}_3$  or double fluorides of Al and alkali metal. The diluted oleum is used for reacting with more fluorspar.

**Molding zirconium and other oxides.** DEUTSCHE GASGLÜHLICHT-AUER-G. M B H Fr. 652,256, Apr. 5, 1928.  $\text{ZrO}_2$ ,  $\text{ThO}_2$  and  $\text{BeO}_2$  are made plastic or capable of being cast for making objects therefrom, by mixing with water and less than 5% of  $\text{MgO}$  or  $\text{Al}_2\text{O}_3$  or mixts. thereof and a small quantity of a salt soln. of the oxide to be made plastic or of the oxide to be added.

**Alumina, etc.** I. G. FARBENIND. A.-G. Brit. 300,184, Aug. 4, 1927. Materials such as clay, phonolite or leucite are treated with  $\text{H}_2\text{SO}_4$  or a mixt. of  $\text{H}_2\text{SO}_4$  and  $\text{HCl}$ , the soln. is sepd. from the residue and is evapd. with a quantity of  $\text{NaCl}$  equiv. to the  $\text{H}_2\text{SO}_4$  and the residue is heated to  $700^\circ$ ;  $\text{HCl}$  is evolved and the sintered product is further heated to  $1000^\circ$  with C to produce Na sulfide, Na aluminate and soda; the product is lixiviated, some Na sulfide may be sepd. by crystn. and alumina is pptd. by use of  $\text{H}_2\text{S}$  or  $\text{CO}_2$  or a mixt. of these gases. Addnl. Na sulfide may be then crystd. and the mother liquor may be treated with  $\text{CO}_2$  to sep.  $\text{NaHCO}_3$ . Various other details and modifications of the process are described.

**Aluminum chloride.** HENRY I. LEA and CLIFFORD W. HUMPHREY. U. S. 1,713,968, May 21. Hot Al oxide is treated in a retort with hydrocarbon vapors in sufficient quantity to impregnate the oxide with hydrocarbons carrying an excess of C over that required for chlorination; the material thus treated is then treated with  $\text{Cl}_2$ . An app. is described.

**Ammonium phosphate.** I. G. FARBENIND. A.-G. Brit. 299,796, June 29, 1927. Mono- and di-Ca phosphates are treated in the presence of water with  $\text{NH}_3$  or  $(\text{NH}_4)_2\text{CO}_3$  to produce a soln. of  $\text{NH}_4$  phosphate and a residue of difficultly sol. tri-Ca phos-

plate which is treated with acid to form further quantities of mono- and di-Ca phosphate. Pressure and heating may be employed.

**Ammonium sulfate.** S. ROBSON. Brit. 299,934, Aug. 16, 1927. Crude ammoniacal liquor such as that from gas works is distd. to free it from non-volatile N compds., the distillate is concd., if required, to an  $\text{NH}_3$  content of over 6%, and is then volatilized at such a temp. that the proportions of  $\text{NH}_3$  gas and  $\text{H}_2\text{O}$  vapor in the resulting gaseous mixt. are correct for combination with  $\text{SO}_3$  to produce dry neutral  $(\text{NH}_4)_2\text{SO}_4$ . The latter may be recovered by bag filters or by electrostatic sepn. Cf. C. A. 23, 938.

**Barium sulfate.** SERGE WITTOUCK. Fr. 652,675, Apr. 13, 1928.  $\text{BaSO}_4$  is formed by the decompn. of an alkali sulfate with  $\text{Ba}(\text{OH})_2$ .

**Calcium hypochlorite.** JESSE A. GUYER (to Mathieson Alkali Works). U. S. 1,713,654, May 21. Ca hypochlorite products contg.  $\text{CaCl}_2$  are freed from the latter by the action of caustic alkali in the presence of water.

**Calcium hypochlorite.** ANTHONY GEORGE and ROBERT B. MACMULLIN (to Mathieson Alkali Works). U. S. 1,713,650, May 21. See Ger. 473,924 (C. A. 23, 3058).

**Calcium hypochlorite.** ROBERT B. MACMULLIN and ANTHONY GEORGE (to Mathieson Alkali Works). U. S. 1,713,668, May 21. See Ger. 474,080 (C. A. 23, 3058). U. S. 1,713,669 specifies chlorinating milk of lime, adding caustic alkali to the chlorinated milk of lime slurry, continuing the chlorination, and sepg. the Ca hypochlorite produced.

**Potassium nitrate.** KALI-INDUSTRIE A.-G., THEODOR THORSSSELL and AUGUST KRISTENSSON. Fr. 651,685, Feb. 2, 1928. See Brit. 287,133 (C. A. 23, 488).

**Drying sodium silicate.** AKTIEBOLAGET MALMO GLASBRUK (to Aktiebolaget Termolit). Brit. 300,141, Nov. 5, 1927. In order to obtain "waterglass" in the form of hollow globes or balls for use as an *insulating material*, it is preliminarily dried to a solid mass and reduced to grains as by milling; the grains are subjected to heating on a surface such as that of a metal plate heated to dull redness over which they are moved. Alternatively, the fluid waterglass may be passed through a sieve, the drops dried by a current of hot air and the grains thus formed then further heated on a hot surface.

**Purifying caustic soda.** D. A. PRITCHARD and UNITED ALKALI CO., LTD. Brit. 299,995, Oct. 21, 1927. Dil. caustic liquor such as the effluent from electrolytic cells may be purified from  $\text{NaCl}$  by evapn. and subsequent addn. of  $\text{Na}_2\text{SO}_4$  (or other suitable salt of  $\text{H}_2\text{SO}_4$ ) or of  $\text{H}_2\text{SO}_4$  itself. Various details are given.

**Metal carbonyls.** I. G. FARBENIND. A.-G. Fr. 652,594, Apr. 12, 1928. Metal carbonyls are prepd. by oxidizing the metal and reducing one or more times and then treating with  $\text{CO}$ . Examples are given of the prepn. of the carbonyls of Ni and Fe. Cf. C. A. 23, 938.

**Sulfur-burning apparatus.** OTTO BUSE (to Grasselli Chemical Co.). U. S. 1,714,657, May 28. Melted S is delivered onto an inclined corrugated plate in a gas conduit. Cf. C. A. 23, 2539.

**Apparatus for a continuous discharge of burned lime from the kiln.** A. L. PYATAKOV. Russ. 5621, June 30, 1928. Mechanical features are specified.

**Gels.** THE SILICA GEL CORP. Fr. 652,269, Apr. 5, 1928. See Brit. 289,890 (C. A. 23, 941). Fr. 652,270 describes the prepn. of gels of  $\text{SiO}_2$ , oxides of Al, Ti, W, etc., in which the hydrogel is washed with water at 21–80°, preferably 65°, whereby after drying a gel is obtained, the apparent d. of which is less affected when strongly heated. Cf. C. A. 23, 3315.

**Silica gel.** THE SILICA GEL CORP. Fr. 652,022, Mar. 31, 1928. Solns. of a sol. silicate and an acid in such concn. and amt. that the mixt. solidifies are stirred together and the hydrogel formed on allowing to stand is washed with hot water, treated with an acid, preferably  $\text{H}_2\text{SO}_4$ , increasing in concn. from 45° Bé. to 60° Bé. and decreasing again to 45°, and washed again with hot water. The gel has an apparent d. not over 0.70 after activation at 870°.

**Decolorizing substances.** LA CARBONISATION (SOC. GÉNÉRALE D'EXPLOITATION DE CARBONES). Fr. 652,156, Sept. 16, 1927. Charcoal from wood, peat, lignite, etc., is reduced to a fine powder, freed from tars by treatment with  $\text{NaOH}$  or  $\text{KOH}$  solns., then with dil. acids and washing, and mixed with Ca phosphate (80%) and with or without  $\text{Al}_2\text{O}_3$  (5%). The mixt. is heated to 600–900°, giving a valuable decolorizing compd.

**Separating asbestos fiber from rock, etc.** THOMAS ROSE (to Selective Treatment Co., Ltd. and Powhatan Mining Corp.). U. S. 1,714,438, May 21. The mineral is submerged in water and passed repeatedly through a rubbing and crushing app. by continuous recirculation of the water, and sepn. is effected by flotation and sedimentation. An app. is described. Cf. C. A. 22, 4209.

**Molded carbonaceous articles such as electrodes.** HARVEY N. GILBERT (to Roess-

ler & Hasslach Chemical Co.). U. S. 1,714,165, May 21. A shaped article of an apparent sp. gr. over 1.7 is made by filling a mold with a mixt. of comminuted graphitized C and a carbonaceous plastic binder such as pitch, compressing the mixt. and carbonizing the binder while resisting by mech. means expansion of the formed body, and then further heating (suitably at a temp. of about 1000°) to give addnl. d.

**Composition for sound records or other molded articles.** WILLIAM McC CAMERON (to Celanese Corp. of America). U. S. 1,713,740, May 21. Acetanilide 5-50 and rosin 95-50 parts are used together in a compn. which may also contain fillers, coloring substances, etc.

**Sound records.** BRITISH THOMSON-HOUSTON CO., LTD., H. N. SPORBORG, A. P. YOUNG and A. T. WARD. Brit. 299,752, July 27, 1927. A thin metal disk (which may be perforated) or metal gauze is coated on one or both sides with a synthetic resin (preferably one formed from phthalic anhydride and glycerol) and an addnl. thin coating of shellac is applied for receiving the sound-groove impressions. The resin may be mixed with a filler such as wood flour or chalk and coloring substances.

**Curing and dyeing foliage.** DAVID S. ANDERSON. U. S. 1,714,838, May 28. Foliage such as ferns for decorative work is impregnated with a curing and color-changing soln. contg.  $\text{CaCl}_2$ , HOAc, glycerol and alc., and is afterward immersed in a soln. contg. these same ingredients together with an aniline dye and camphor and gum arabic, and is finally immersed in a soln. contg. water, gum arabic and aniline dye and some of the curing and color-changing soln.

**Emulsions for use as detergents, in dyeing, etc.** F. W. ATTACK. Brit. 299,817, April 19, 1927. A liquid emulsion readily miscible with water is prepd. by emulsifying a grease solvent such as trichloroethylene or other chlorinated hydrocarbon, in water by use of Turkey red oil and stabilizing the emulsion with bentonite or similar natural colloidal hydrosilicate. Small proportions of fatty acids and  $\text{NH}_3$  may be added. Emulsions thus formed may be used as detergents for cleaning or washing clothes, in scouring, dyeing, finishing wool, cotton, artificial silk or mercerized cotton, degumming silk, as wetting agents in dyeing, removing ink from paper stock and for application to the Foudrinier wires or to the sulfite digester or wood grinder in the paper making industry.

**Wax-like products from halogenated saturated hydrocarbons.** J. BAER. Brit. 300,200, Nov. 8, 1927. Halogen compds. such as methylene and ethylene dichlorides or dibromides are treated with a "thinned"  $\text{NH}_4$  sulfide soln. which is stated to produce a wax-like material harder than beeswax or carnauba wax.

**Metallizing various surfaces.** A. I. GATES-WARREN, E. L. GATES-WARREN and PRECIOUS METAL INDUSTRIES, LTD. Brit. 299,903, Aug. 2, 1927. Non-cond. materials such as casein products, cellulose acetate, vegetable and synthetic gums, tortoise-shell, urea and phenol condensation products, etc., which have or may be given a porous surface by abrasion, if necessary, are treated with a suspension or paste of a metal salt and metal and exposed to light or to the action of a reducing agent such as  $\text{CH}_2\text{O}$  or furfural. The article may be subsequently electroplated if a heavier metal coating is desired.

**Composition for sealing intermeshed joints of metal barrels or drums, etc.** RICHARD L. PARISH (to American Flange & Mfg. Co.). U. S. 1,713,675, May 21. A sealing mixt. suitable for use when dild. with an equal quantity of benzene is formed of Ceylon crepe rubber 46.6, pptd.  $\text{CaCO}_3$  46.6,  $\text{ZnO}$  4.7, S 1.8 and tetramethylthiuram disulfide 0.3%.

**Treating rubber gaskets with hot paraffin.** HARRY C. LOUDENBECK (to Westinghouse Air Brake Co.). U. S. 1,714,033, May 21. Rubber gaskets such as those which are to be used between metal surfaces are dipped in a bath of paraffin which is heated to a temp. of about 90-120°.

**Reclaiming dry mats for preparing matrices for newspaper or like printing.** GORDON W. NELSON. U. S. 1,713,913, May 21. A previously used and pre-moistened matrix is rolled into a flat sheet and its reverse side is prepd. for and given another impression.

**Waterproof sheet material suitable for automobile tops, etc.** CHARLES H. RAYNER. U. S. 1,714,240, May 21. Loose hair is spread on a reinforced paper sheet backing or binding sheet, the material is punched through with barbed points carrying loops and ends of hair strands through it, the loops and ends projecting through the sheet are singed, the singed hair and back are covered with asphalt and an artificial leather compn. is applied over the asphalt.

**Composition for waterproofing paper conduits or tubing, etc.** WALLACE B. VAN ARSDEN (to Brown Co.). U. S. 1,714,702, May 28. See Can. 284,377 (C. A. 23, 681).

**Removal of water from "carbolite."** G. S. PETROV. Russ. 5588, June 30, 1928. To remove the water the goods are heated in a medium of org. solvents with the addn. to the latter of paraffin, wax, ethers, cellulose or tars.

**Paint and varnish remover.** ADDIE TREMAIN and HARRY D. TREMAIN. U. S. 1,714,530, May 28. NaOH 25 lbs., "hydrated calcium" 40 lbs., fuller's earth 5 lbs., Na<sub>2</sub>PO<sub>4</sub> 5 lbs., red Mn oxide 10 lbs., powdered starch 5 lbs. and methyl salicylate 1 dram.

**Removing non-vitreous enamel from metals.** HARRY O. LANG. U. S. 1,714,879, May 28. The enameled article is immersed in a molten bath comprising mainly an alkali metal nitrate or nitrite or both.

**Plastic caps for milk bottles, etc.** LAKEWEST CORP. Brit. 300,001, Oct. 26, 1927. Several laminations of fibrous material such as crinkled paper are partially impregnated and fully consolidated with earthy and resinous substances such as a mixt. of terra alba and deodorized rosin. It is stated that the rosin may be deodorized by melting and treating with a small proportion of "sodium bisulfide."

**Testing the strength of acid and alkali solutions of fire extinguishers.** GEORGE B. TOURTELLOTTÉ. U. S. 1,714,197, May 21. A measured sample of each soln. is placed in a container having normally sepd. compartments which are open at their upper ends; the app. is provided with a closure and pressure gage and is inverted to mix the solns. so that the pressure developed by gas generation from their reaction may be noted. The app. is described.

## 19—GLASS, CLAY PRODUCTS, REFRACTORIES AND ENAMELED METALS

G. E. BARTON, C. H. KERR

**The Carl Zeiss Works and the Zeiss Foundation.** ANON. *Engineering* 127, 665-8 (1929). E. H.

**The theoretical basis of chemical attack on glass from the consideration of its action against water.** P. TIETZE. *Sprechsaal* 61, 809-10(1928).—The chem. attack on glass is treated as a heterogeneous solid-liquid system. The soln. velocity depends on the surface of contact and on the concn. of the dissolved material in the solvent.

C. H. LORIG

**The relation of heat conductivity of glass to the chemical composition.** ALFRED RUSS. *Sprechsaal* 61, 887-91(1928).—The temp. coeff. and heat cond. of a variety of glasses were detd. for the temp. interval 0-100°. Glass plates 3 × 3 sq. cm. and 0.1 to 0.2 cm. thick were securely held between Cu plates and the heating element of the app. Temp. drops between plates were detd. with thermocouples embedded in the Cu. The glass-forming oxides, SiO<sub>2</sub>, B<sub>2</sub>O<sub>3</sub>, MgO, Al<sub>2</sub>O<sub>3</sub>, Fe<sub>2</sub>O<sub>3</sub>, ZnO, Na<sub>2</sub>O, PbO, BaO and K<sub>2</sub>O, influence the heat concn., the first-mentioned oxides exerting the greatest influence. Heat concn. values calcd. from the glass components are in agreement with measured values. The av. error is ± 1.66%. Heat concn. is an additive or an approx. additive property of glass.

C. H. LORIG

**Thermal movements in glass.** E. BERGER. *Sprechsaal* 61, 827-31(1928).—Movements in a glass batch occur when various parts are at different temps. The hottest columns of glass flow in a direction opposing the force of gravity.

C. H. LORIG

**Determination of solution alkalinity of granulated glass.** ERNST FISHER AND WALTER TEPOHL. *Sprechsaal* 61, 847-8(1928).—The solubilities of 5 glasses in distd. water held for 3 hrs. at 80° were detd.

C. H. LORIG

**Calculation of glass constants on the basis of recent investigations.** E. ZSCHIMMER. *J. Soc. Glass Tech.* 12, 82-118T(1928).—The recent literature is reviewed in the effort to combine sufficient data of the phys. properties of glasses to permit the calcn. of const. for a glass of given compn. The phases considered are the method of permutants, covering the specific effects of the oxides, the devitrification const. of soda-lime-silica glasses, their working viscosities at high temps. and the effect of CaO, MgO, Al<sub>2</sub>O<sub>3</sub>, B<sub>2</sub>O<sub>3</sub>, etc., on the viscosities. *Ibid* 333-66T.—The recent investigations on the density-thermal expansion,  $n$ , elec. cond. and the annealing properties of glass show that our present information is too incomplete to calc. glass const. from known compn.

H. F. KRIEGE

**The significance of Brenker phonolite in the glass industry.** HUGO KÜHL. *Schnurpfel's Rev. for Glass Works* 13, 3321-5(1929).—A study of German minerals for use in the glass industry showed Brenker phonolite to be one of the best natural stones. Its value lies in its high alkali content, which reaches 18%. A typical analysis shows

alumina 24, iron oxide 2.3, silica 50.3 and alkali 17.6%. It has been found very suitable for colored glasses, but because of the Fe content its use is limited in the production of colorless glass. Batches from various sources are given using as high as equal parts of sand and phonolite for brown bottles. One part of phonolite to 10 parts of sand may be used for light green medicine bottles.

M. A. EDDY

**Characteristics of refractory clays for the glass industry.** G. GEHLHOFF, H. KAL-SING, K. LITZOW AND M. THOMAS. *J. Soc. Glass Tech.* 12, 213-79, 280T(1928).—Twenty clays used in the German and Bohemian glass industries were examd. chemically, physically and microscopically to relate their properties with their behavior as refractories. It was found that the chem. resistance and the stability of clays at high temps. increase generally with their  $Al_2O_3$  content, their firing temp. and the density to which they are burned. Porosity is the chief factor detg. the resistance of refractories to corrosion by raw batch materials and molten glass. The high sintering temps. of clays rich in  $Al_2O_3$  gives them porosity under ordinary burning conditions, which overcomes their resistant qualities due to chem. compn. When grains of grog are under 2 mm. diam., their size has no influence on the softening temp. under load. The grain size does affect the resistance to chem. action, particularly with clays low in  $Al_2O_3$ . The density of the refractories is more important than their chem. compn. when corrosion by glass in motion is considered. The presence of accessory minerals, such as  $Fe_2O_3$  and feldspar, affects the refractoriness of clays regardless of their chem. compn. otherwise. Small quantities of feldspar may serve advantageously in lowering the sintering temp. and thus decreasing the porosity of a glass refractory.

H. F. K.

**The manufacture of sheet and window glass.** H. SCHNURPFEL. *Schnurpfel's Rev. for Glass Works* 13, 3243-5(1929).—There are two standard window glass batches, one contg. soda ash as a flux and the other contg.  $Na_2SO_4$ . The addn. of  $KNO_3$ , arsenic and manganese to the soda ash batch makes the glass suitable for photographic dry plates. For drawn window glass a softer glass contg. barytes is desirable. The soda ash batch may be used as a basis for colored sheet glass and batches are given using the following coloring agents: violet glass using manganese and saltpeter, brown-violet using manganese and iron oxide; carbon yellow using powdered charcoal and  $Na_2SO_4$ ; yellow using ferruginous manganese; black using manganese and cobalt oxide; green using copper oxide, iron oxide and  $K_2Cr_2O_7$ ; milk-white using red lead, cryolite, feldspar, flourspar, bone ash and arsenic; aquamarine using copper oxide, blue using cobalt oxide. All these batches have been used successfully.

M. A. EDDY

**Lead glass and its use.** C. A. BECKER. *Metallwirtschaft* 7, 230-1(1928).—Summarizing review on the compn. and the technology of Pb glasses. Among the more important applications are table glassware, the optical glasses, imitations of precious and semi-precious stones and protective material for x-ray work (some Pb glasses show the same absorption of x-rays in a 20 mm. layer as solid Pb of 5 mm. thickness).

EMIL KLARMANN

**Ultra-violet light-transmitting glasses.** DAVID STARKIE AND W. E. S. TURNER. *J. Soc. Glass Tech.* 12, 306-21(1928); cf. *C. A.* 22, 2821.—Com. glasses transmitting rays between 2950 A. U. and 3150 A. U. were considered. A photometer of the "platinum wedge" type was employed to measure the transmitting properties of the several glasses. Corex glass contg. the least Fe (0.012%  $Fe_2O_3$ ) showed the highest transmission, namely, 89% as compared with 1% of ordinary window glass. The transparency to ultra-violet rays decreased in some glasses with prolonged exposure to sunlight. With exposure to a C arc light all the glasses lost in transmitting power. The change appeared due to the oxidation of the  $Fe^{++}$  present.

H. F. KRIEGER

**Influence of ferric oxide content on the light transmission of soda-lime-silica glass, with special reference to the ultra-violet.** D. STARKIE AND W. E. S. TURNER. *J. Soc. Glass Tech.* 12, 324-32(1928).—To glasses contg.  $SiO_2$  75,  $CaO$  19 and  $Na_2O$  15%,  $Fe_2O_3$  was added in amounts between 0.005 and 1.0%. The melts were made in Pt after they had been sintered for 6 hrs. in  $SiO_2$  crucibles to decrease the soln. of the Pt. When the  $Fe_2O_3$  content of the glasses was plotted against the wave-length limit in the ultra-violet region, a smooth curve was obtained. An  $Fe_2O_3$ -free glass of this compn. should have a transmission limit of 2300 A. U. Four glasses contg. up to 1.01%  $Fe_2O_3$  on exposure to light from a C arc showed no change in transmission power since practically no FeO was present.

H. F. KRIEGER

**The action of glass towards sodium hydroxide at high temperatures.** FRITZ FRIEDRICHS. *Sprechsaal* 61, 967-9, 980-6(1928).—The loss of wt. and alkali loss or gain in 1N NaOH soln. was detd. for 14 glasses of different compns. in the temp. range of 100° to 300°. The alkali loss in 1N NaOH decreases with increased  $B_2O_3$  content. Porcelain shows no alkali loss; instead, even at low temps., it takes alkali from the soln.



On investigating the influence of time on the action of 1N NaOH toward 3 characteristic glasses, it was found that at temps. above 170° the loss of wt. becomes independent of the time of action. An equil. results between the glass and soln. This equil. is not obtained at temps. below 170°. The effect of NaOH concn. from 5N to infinite diln. was obtained for 3 glasses. For strongly acid glasses the loss of wt. for a definite time as well as for a definite concn. of NaOH becomes const. C. H. LORIG

The manufacture of glass for electric incandescent lamps. JOSEPH TISCHER. *Sprechsaal* 61, 788-90(1928). C. H. LORIG

The glass-melting furnace as a heat machine. D. AUFHÄUSER. *J. Soc. Glass Tech.* 12, 297-306(1928). H. F. KRIEGER

Theory and practice of cooling glassware. E. ZSCHIMMER. *Sprechsaal* 61, 869-72 (1928).—The distribution and magnitude of compression and tension forces in the interior of glass are most easily detd. through observations in a polarization app. The cooling process consists of 2 operations, the tempering of the glass and the uniform cooling of the tempered glass. It is essential to know the tempering temp. and the time-temp. relation for cooling glassware. C. H. LORIG

Temperature distribution in the Fourcault machine during the cooling process. K. L. SCHARASCHKIN AND W. E. BROMLEY. *Sprechsaal* 61, 790-1(1928). C. H. L.

Strength of brick. ALFRED B. SEARLE. *Brick and Clay Record* 74, 402-3(1929).—Some fire brick are stronger when being fired than when cold. Silica brick are weaker at 200° than at any other temp. below 800°. The strength increases to that of cold silica brick between 300° and 575° but then falls rapidly as the temp. increases; the cause is unknown. H. G. SCHURECHT

Investigation of twenty-one Saskatchewan ball clays. W. G. WORCESTER. *J. Am. Ceram. Soc.* 12, 360-76(1929).—The clays have com. value. Raw strength is unusually high. C. H. KERR

A new method of treating clays to overcome drying defects. J. G. PHILLIPS. *Can. Mining Met. Bull.* No. 203, 470-81(1929).—The use of 2 clays, abundant in the Prairie Provinces of Canada, has been handicapped by cracking in drying. These drying defects can be overcome by: (1) preheating to from 450° to 550°, or (2) using grog plus chem. coagulants; FeCl<sub>3</sub> and a mixt. of FeCl<sub>3</sub> and NaCl were efficient. The best mixt. for method (2) was 85% clay (2 parts soft clay to 1 shale), 15% grog (ground brick bats), plus 1% FeCl<sub>3</sub> and 0.5% NaCl, added in the pug water. This reduced the drying loss from 40% to almost nothing, reduced the time from 7 or 8 to 3 days and improved the color and general properties. A. BUTTS

Plasticity and water absorption of clays. H. B. OAKLEY. *Nature* 123, 714-5 (1929).—Expts. on absorption of 0.1 N NaCl soln. show that the plasticity range with respect to water content increases with ability to absorb NaCl soln. The absorption increases with diln. of the soln. Tables show the influence of the base used. G. M. E.

Properties of the clay-water system. OTTO BARTSCH. *Ber. deut. keram. Ges.* 10, 146-83(1929).—A method of detg. the resistance of clay slips to deformation is described. The results are similar to those obtained with viscosity measurements. H. G. SCHURECHT

Accomplishments of Structural Clay Tile Association. EDWARD C. KERTH. *Brick and Clay Record* 74, 394-6(1929). H. G. SCHURECHT

The prediction of service value (of ceramic materials) from laboratory test data. A. E. R. WESTMAN. *J. Am. Ceram. Soc.* 12, 319-29(1929). C. H. KERR

Flotation as a means of purifying kaolin. H. KLAR. *Keramos* 8, 7-11(1929).—The flotation process for purifying ores has been used with success. A special flotation process known as the "Schaum-Schwimmverfahren" is suggested as a means of purifying primary kaolins. H. G. SCHURECHT

Kaolin deposits suitable for pottery manufacture. A. K. DENMEAD. *Queensland Govt. Mining J.* 30, 99-101(1929).—Of the known clay deposits only a small number can be classed as pottery clays. Seventeen localities are enumerated and a brief description is given of the deposits, with analysis in some cases. E. I. S.

Rate of drying of a plastic porcelain mass due to reduced pressure and heat. LOUIS NAVIAS. *J. Am. Ceram. Soc.* 12, 305-18(1929).—Reduced pressures of 0.7, 5, 15 and 35 cm., with temps. of 23, 50 and 65° were tried. Straight line relationships for rate of drying were found when the log of loss of wt. was plotted against log of time. With the lowest pressure a single slope was found, but with the higher pressures there were 2 slopes to each curve. C. H. KERR

A sandblast abrasion test for glazes. EDWARD SCHRAMM. *J. Am. Ceram. Soc.* 12, 356-9(1929).—The app. is described. C. H. KERR

A new type of tunnel kiln for firing pottery. J. WILLIAMSON. *Trans. Ceram. Soc. (England)* 27, 290-6(1928); cf. *C. A.* 22, 2251. H. F. KRIEGER

The new tunnel kiln of the Steatit-Magnesia Joint-Stock Co. M. THURNAUER. *Keramos* 8, 4-9(1929).—It is 63 m. long, holds 36 cars and the firing time is 54 hrs. H. G. SCHURECHT

Studies on firing ceramic round furnaces. O. TIPPMMANN. *Sprechsaal* 61, 707-9, 725-7(1928).—Curves are given to show the effect of CO<sub>2</sub> on the temp. of the hot gases and the time required to heat the muffle to a known temp. C. H. LORIG

A faience oven of the Winterthur master, Hans Heinrich Graf 1688, in the museum of Ulm. MAX SCHEFOLD. *Sprechsaal* 61, 1022-4(1928). C. H. LORIG

Use of pulverized coal as a fuel for periodic kilns. D. J. WATSON. *J. Am. Ceram. Soc.* 12, 336-41(1929). C. H. KERR

A new refractory material (Wetamaterial). A. KARSTEN-SALMONY. *Korrosion* 4, 17(1929).—"Weta" is suitable as a porcelain and quartz glass substitute for lab. app. It is made of powd. SiC mixed with silicates and certain metals. It resists acids, alkalis, temp. shock and is not easily broken. J. H. MOORE

Refractories and boiler furnace linings. REGINALD TRAUTSCHOID. *Paper Trade J.* 88, No. 17, 56-60(1929). A. PAPINEAU-COUTURE

Comparative tests on monolithic refractory cements. H. N. CLARK. *J. Am. Ceram. Soc.* 12, 330-5(1929). C. H. KERR

Study on enameling agent. T. UCHIDA. *Repts. Imp. Ind. Research Inst., Osaka, Japan* 9, No. 4, 1-381(1928).—By combining various proportions of Na<sub>2</sub>CO<sub>3</sub>, K<sub>2</sub>CO<sub>3</sub>, orthoclase, H<sub>3</sub>BO<sub>3</sub>, Zn white, CaCO<sub>3</sub>, fluorspar, MgO, Al<sub>2</sub>O<sub>3</sub>, quartz, clay, feldspar, Na<sub>2</sub>SiF<sub>6</sub>, Co<sub>2</sub>O<sub>3</sub> and saltpeter, about 2000 specimens of frit were prepd. and studied when applied on Cu, cast Fe, or steel plates. Examn. was made of luster, emulsification, shrinkage, amt. of bubbles and cracks and the degree of adhesion. The influence of compn. on quality is discussed. The relation is complicated and no hard and fast rule can be given. The standard compn. of an enameling agent can be expressed by 1.5 R<sub>2</sub>O, 1 RO, 0.5 B<sub>2</sub>O<sub>3</sub>, 3 SiO<sub>2</sub> (where R = a metallic element). About 250 pp. of tables and numerous photomicrographs are presented. NAO UYEI

Enameling agent containing antimony. T. UCHIDA AND K. ARIKI. *Repts. Imp. Ind. Research Inst., Osaka Japan* 9, No. 1, 1-33(1928).—Various combinations of enameling agent, contg. various amts. of (a) Sb<sub>2</sub>O<sub>3</sub> + KNO<sub>3</sub> (2:3), (b) fluorspar, (c) cryolite, (d) SiO<sub>2</sub>, (e) feldspar, (f) Na<sub>2</sub>O and (g) borax were studied for luster, degree of emulsification, shrinkage, bubbles and cracks produced in the product after baking at about 800°. The chem. compn. of these combinations was calcd. from the amts. of ingredients used in the mixt. and is given in a table. Results: *Luster*.—samples contg. (a) and (c) were inferior to those contg. (b). The ones contg. much basic constituents, i. e. (f) and (e) gave poor luster. *Emulsification*.—The influence of compn. on the degree of emulsification was very slight. Samples contg. much (a) gave products of low quality, while ones contg. (a), (b) and (c) together gave the best results. Samples contg. excess of (f) and (g) gave very poor results, and the ones contg. basic constituents gave poor emulsification, which is contrary to the usual conception. *Shrinkage*.—When (a), (b) and (c) were present together, good products were obtained. With increase in acid constituents products of lower grade were obtained. *Bubbles*.—With increase in basic constituents inferior products resulted. *Cracks*.—An increase in (c) gave more cracks, while an increase in basic constituents seemed to improve the products. NAO UYEI

Ceramics of highly refractory materials. II. The system: ZrO<sub>2</sub>-CaO (RUFF, *et al.*) 2. Heating or burning porcelain (U. S. pat. 1,713,834) 9.

Glass. IMPROVED GLASS PROCESS, INC. Fr. 651,985, Mar. 30, 1928. BaSO<sub>4</sub> is added to the constituents of glass to give a brilliant and easily worked glass. The addn. is sufficiently small to avoid the formation of foam or of a molten layer of sulfate on the glass. Decolorization may be effected by a substance contg. Se, Mn, etc.

Glass. IMPROVED GLASS PROCESS, INC. Fr. 652,036, Mar. 31, 1928. The BaSO<sub>4</sub> of Fr. 651,985 (cf. preceding abstr.) is replaced by BaS, which may be obtained by reduction of BaSO<sub>4</sub>, residues of BaSO<sub>4</sub> diminishing the formation of foam during the fusion.

Distributor for molten glass from the furnace. ALFRED BOUCHER. Fr. 33,709, Mar. 19, 1927. Addn. to 640,854 (*C. A.* 23, 945).

Glass-making crucibles. SOC. MAGNIER FRÈRES (S. A. R. L.). Fr. 652,414, Apr. 10, 1928.

Decorating glass. J. T. FELL and J. FELL. Brit. 300,070, March 15, 1928. The

glass to be decorated is placed in contact with sprinkled "floating cellulose colors" (cellulose varnish and pigments) to pattern the under side of the glass (parts of which may be preliminarily covered with paper, etc., to form a design) and any uncovered portions of the surface may be coated with other decorative materials. A backing of rubber soln. or other material may be applied.

**Forming blown "bubble" or "blister" glassware.** REUBEN HALEY. U. S. 1,715,130, May 28. Mech. features.

**Glass articles with lines of strain to facilitate division of the articles.** FELIX MEYER. U. S. 1,713,854, May 21. An internal strain is developed along a division line of an article such as a sheet or bottle in order to facilitate subsequent intentional breakage along the line without splintering.

**Annealing leer for glassware.** PERCY Q. WILLIAMS (to Owens Bottle Co.). U. S. 1,714,707, May 28.

**Apparatus for annealing glass objects.** THE AMSLER-MORTON CO. Fr. 652,117, Apr. 3, 1928.

**Coloring glass electric lamp bulbs.** M. PIPKIN (to British Thomson-Houston Co., Ltd.). Brit. 300,179, Nov. 7, 1927. In a method such as described in Brit. 277,695 (C. A. 22, 2518) pigments are used on the frosted surface comprising  $\text{WO}_3$  or comprising a mixt. of a finer and a coarser powder, which may include oxides, sulfides and silicates of Fe, Cd, Cr, Co, Se, Ti, W and Zr. Red P may be added as a "getter." Cf. C. A. 23, 3321.

**Composite sheets of glass and celluloid or cellulose acetate.** P. H. HEAD. Brit. 299,900, July 30, 1927. Diacetone alc. is used alone or in soln. to cause adhesion between glass sheets of celluloid or cellulose acetate. Denatured alc. may be added as may also  $\text{C}_2\text{H}_2\text{Cl}_4$ , acetone,  $\text{C}_2\text{HCl}_3$ , methyl cyclohexanone, or cyclohexanone. The glass is preferably preliminarily cleaned with diacetone alc., and a sugar soln. contg. a small addn. of  $\text{HNO}_3$  also may be used to assist cleaning and adhesion.

**Gas-forming materials for producing porous bricks, insulation, etc.** M. PLATSCH. Brit. 299,854, Nov. 2, 1927. Gas-liberating substances such as  $\text{CaC}_2$ , Ca hydride and ferro-Si (such as are suitable for use in the manuf. of light bricks, insulating and abrasive materials) are coated with glue, gelatin, water glass, or the like to retard their action.

**Burning ceramic ware.** TAINÉ G. MCDUGAL (to A. C. Spark Plug Co.). U. S. 1,713,851, May 21. The ware is heated in a kiln while exposed on substantially all sides to direct radiation from the walls of the kiln to which heat is applied. A kiln construction is described. U. S. 1,713,852 also relates to a tunnel kiln construction.

**Chrome refractory brick.** RUSSELL P. HEUER (to General Refractories Co.). U. S. 1,714,506, May 28. In making a chrome refractory brick from clay and chrome ore contg. combined magnesia, a body of chrome ore is treated with a small quantity of clay and magnesia in sufficient quantity to prevent softening reaction between the clay and chrome ore at high temps.; a soln. of a salt such as  $\text{MgCl}_2$  or  $\text{MgSO}_4$  which will yield Mg ions in the mixt. is also added.

**Refractory material suitable for lining metal molds for casting metals.** HARRY M. WILLIAMS (to General Motors Research Corp.). U. S. 1,713,580, May 21. At least a substantial portion of a non-oxidizable refractory material such as  $\text{MgO}$ , zirconia,  $\text{SiO}_2$ ,  $\text{Al}_2\text{O}_3$ , or thoria is reduced to an impalpable powder in the presence of an alkali, tannic acid, or other suitable deflocculating agent; the powdered material is formed into the desired shape and is heated to effect coherence.

**Composition for use as a furnace cement, etc.** RALPH M. HARDGROVE (to Fuller Lehigh Co.). U. S. 1,714,598, May 28. Pulverulent heat-cond. material such as  $\text{SiC}$  is mixed with water glass, glycerol and castor oil or other suitable oil to form a product which is substantially non-porous when dry.

**Abrasive wheels.** BIRMINGHAM SMALL ARMS CO., LTD., A. R. PAGE and P. S. DEVEREUX. Brit. 299,633, Dec. 16, 1927. Abrasive segments clamped around a central rotary member have the interstices between them filled with a plastic material, which sets so as to have a character similar to that of the material of the segments. A mixt. of  $\text{MgO}$ , abrasive grit and  $\text{MgCl}_2$  soln. may be used for this purpose.

## 20—CEMENT AND OTHER BUILDING MATERIALS

J. C. WITT

**Standard specification for concrete and reinforced concrete.** *Can. Eng. Standards Assoc.* No. A23, 149 pp. (1929). E. I. S.

**A new process of burning portland cement.** K. BEHL. *Cement, Mill and Quarry*

34, No. 5, 40-2(1929).—New design of shaft kiln avoids sticking and hanging of charge. Photomicrographic characteristics of clinkers for rotary, ordinary shaft and newly designed shaft kilns are given. E. I. S.

Blending Fresno pumicite with cement. J. B. LIPPINCOTT. *West. Construction News* 4, 243-6(1929).—Fresno pumicite is unique on account of its extreme fineness and uniformity, which should give to it greater cementaceous properties than coarser materials of the same chem. properties. Chem. and sieve analyses and setting time and strength heats are given. E. I. S.

New wet-process cement plant. C. G. THORNBURGH. *Cement, Mill and Quarry* 34, No. 5, 13-7(1929).—The Davison Coke and Iron Co., Pittsburgh, Pa., is building a combination by-product coke plant, blast-furnace and wet-process cement plant. The surplus gas from coke plant will be utilized in the kilns. The blast-furnace plant will supply granulated slag which with limestone, clay or shale will constitute the raw material for cement manuf. E. I. S.

Experiments with concrete mixing machines. A. BONWETSCH. *Tonind.-Ztg.* 53, 746-8(1929). F. O. ANDEREGG

Compressive and flexural strengths of concretes having varying water-cement ratios, fineness moduli and maximum aggregate size. M. GENEL. *Beton u. Eisen* 28, 184-8(1929). F. O. ANDEREGG

Setting temperatures in concrete bridge piers. A. A. JAKKULA. *Eng. News-Record* 102, 913-4(1929).—Temp. of atm., of area surrounding the concrete, which was enclosed with tarpaulins and heated by salamanders, and of the concrete itself during setting of piers of Cedar Ave. bridge, Minneapolis, Minn., constructed in winter, are shown graphically. A rise of 30-50° F. can be expected in large masses of concrete if suitably protected. Canvas and salamander protection is satisfactory. R. E. T.

Better curing raises core strength of concrete pavement base. M. D. WILSON. *Eng. News-Record* 102, 827(1929).—Control of the mix and improvements in the methods employed for curing the concrete pavement base in Akron have resulted in an increase in strength in excess of 400% since 1923 without increase in cost. During 1928 the curing procedure consisted of covering with wet burlap for the first 24 hrs. and with wet straw for the following 6 days. The mix employed is 1:7½. Allowance for bulk-ing will be made in 1929. R. E. THOMPSON

Standard cement concrete pavement opened in 48 hours. EARLE W. MECKLEY. *Eng. News-Record* 102, 871(1929).—A description of the methods employed in laying a concrete pavement in Allentown, Pa., which was opened for traffic 2 days after placing. The mix employed was 1:2:3, with a 1¼ min. mixing period and just sufficient water to permit satisfactory working. CaCl₂ was added to the mix at the rate of 2 lbs. per bag of cement. The concrete was cured by covering with wet burlap. The compressive strengths at the ages of 1 to 7 days are shown graphically. The av. 48-hr. strength was 2260 lbs. per sq. in. R. C. THOMPSON

Deterioration of concrete and its protection by means of surface coatings. RICHARD GRÜN. *Tonind.-Ztg.* 53, 382-4, 699-701, 716-8(1929); cf. C. A. 22, 3030; 23, 2800. —The properties of importance in protective coatings include: sp. gr., spreadability and yield, viscosity, drying capacity, covering strength and appearance, elasticity and denseness, also behavior against phys. actions, including cold, ultra-violet light, wet and dry heat. Coatings should stand up against the chem. action of O₃, H₂SO₃ (both hot and cold), H₂SO₄, HCl, HOAc and NaOH. F. O. ANDEREGG

The formation of two different calcium sulfoaluminates from the gypsum in cement. P. MECKE. *Tonind.-Ztg.* 53, 681-4(1929).—As a result of the reaction of Ca(OH)₂ and aluminate on the sulfoaluminate, 3CaO.Al₂O₃.3CaSO₄, another salt, 3CaO.Al₂O₃.2CaSO₄, is formed which has different crystal structure and optical properties and is of different resistance to NaOH and Ca(OH)₂ solns. The first salt does not remove the SO₃ completely from soln., some 40% being left, while the latter apparently does. The second form is regarded as more stable. (Cf. Lerch, Ashton and Bogue, C. A. 23, 3180, whose more careful work does not agree with that of M.) F. O. A.

The effect of steam treatment of portland cement mortars on their resistance to sulfate action. T. THORVALDSON AND V. A. VIGFUSSON. *Eng. J. (Can.)* 11, No. 3, 174-9(1928); *Expt. Sta. Record* 59, 377; cf. C. A. 22, 4753. —Expansion measurements of portland cement mortar bars were used to study the effect of steam treatment of mortars on their resistance to the action of the sulfates of Mg, Na and Ca. Treatment of mortars with satd. water vapor at 50° reduced their resistance to sulfate action. Satd. water vapor at temps. of 75° or above increased the resistance. The higher the temp. the more effective was the treatment and the shorter the time of treatment required. Steam treatment of mortars at the boiling point of water made them practi-

call completely resistant to the action of  $\text{Na}_2\text{SO}_4$  solns. and very materially increased their resistance to the action of  $\text{MgSO}_4$  solns. Immersion of mortars in hot water was nearly as effective in increasing the sulfate resistance as was treatment with steam at the same temp. The addn. of tricalcium aluminate to portland cement speeded up the rate of expansion of its mortar in solns. of the sulfates of Na, Mg and Ca. Steam treatment of these mortars was not as effective in preventing expansions in solns. of Na and Ca sulfates as was steam treatment of mortars from the same cement without the addn. of tricalcium aluminate. It is suggested that the greatly increased resistance to sulfate action brought about by steam treatment of portland cement mortars is primarily due to the action of the steam on the aluminate in the cement. The speeding up of the hydration of the silicates by the steam treatment, while increasing the strength, is considered to be probably of secondary importance in relation to sulfate resistance.

H. L. D.

**Is the filling of architectural terra cotta with concrete necessary or desirable?** M. BARRETT. *Trans. Ceram. Soc. (Eng.)* 28, 79-82 (1929).—Concrete filling is considered unnecessary for terra cotta since so little gain in strength results and disruption of the unit may occur because of unequal expansion and contraction of the 2 materials.

H. F. KRIEGER

**Investigations on breeze and clinker aggregates.** F. M. LEE. Dept. Sci. Ind. Research (Brit.), *Building Research Tech. Paper No. 7*, 86 pp. (1929); cf. *C. A.* 22, 1452.—The properties of breeze or clinker when used as concrete aggregate are detd. by the amt. and character of the combustible matter present. Failure of breeze and clinker concretes is usually due to the presence of certain types of coal which are dangerous to concrete by reason of the expansional movements they produce during the setting period and early life of the concrete. Coals may be divided into 3 classes: (A) those which are not dangerous; (B) those with intermediate properties; (C) those which cause cracking of concrete when present in relatively small quantities. Class (B) and (C) coals have a higher O content than class (A) coals and display higher sorptive power for moisture. Class (C) coal has a high sorptive power for methylene blue. Class (B) and (C) coals absorb O more rapidly than class (A) coal. Decompn. of coals by heating at temps. of  $500^\circ$  or above decreases the dangerous properties of any coal. Oxidation of a coal at lower temps. increases its dangerous properties. Failure of breeze or clinker concretes due to the presence of S compd. appears to be rare. The limiting S content which may safely be present is dependent on its phys. state. The following amts. may safely be permitted: S as sulfide—not above 0.45%; S as sulfate—not above 0.4% S; total S excluding that present as sulfate—not above 0.75%. Considerably higher contents may be permitted when the S compds. are sintered or fused. A breeze contg. more than about 40% combustible matter will give only a very low-grade concrete, whatever the nature of the combustible matter. RAYMOND WILSON

**Relation between the temperature curve and the expansion curve in the setting of plaster of Paris.** F. J. WILLIAMS AND F. C. WESTENDICK. *J. Am. Ceram. Soc.* 12, 377-81 (1929).—The first vol. change is a contraction, probably due to a soln. of  $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$ . The expansion which follows is due to crystn. of  $\text{CaSO}_4 \cdot \text{H}_2\text{O}$ . Curves are given for both temp. and expansion.

C. H. KERR

**The factors of the fireproofing of wood.** A. GILLET. *Chimie & industrie Special No.*, 221-7 (Feb., 1929).—After discussing the influence of the various factors involved in the ignition and combustion of wood, G. gives the results he obtained in tests carried out with  $(\text{NH}_4)_2\text{HPO}_4$ ,  $\text{Na}_2\text{SiO}_3$ ,  $\text{NH}_4\text{Cl}$ ,  $(\text{NH}_4)_2\text{SO}_4$ ,  $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$ ,  $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$ ,  $\text{NH}_4\text{BO}_2$ ,  $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ ,  $\text{CuCl}_2$  (5% and 20%),  $\text{Al}_2(\text{SO}_4)_3 \cdot 18\text{H}_2\text{O}$ ,  $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$ ,  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ ,  $\text{NH}_4\text{Cl} + \text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$ ,  $\text{NaNH}_2\text{HPO}_4$ ,  $(\text{NH}_4)_2\text{SO}_4 + (\text{NH}_4)_2\text{HPO}_4$ ,  $(\text{NH}_4)_2\text{SO}_4 + \text{NH}_4\text{BO}_2$ ,  $(\text{NH}_4)_2\text{SO}_4 + \text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ ,  $\text{Fe}(\text{SO}_4)_3 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$ ,  $\text{MgCl}_2$ ,  $\text{NH}_4\text{Cl} \cdot 6\text{H}_2\text{O}$ ,  $\text{NH}_4\text{Cl} + \text{Zn}(\text{BO}_2)_2$ ,  $\text{Na}_2\text{SiO}_3 + \text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$ . The tests were carried out by immersing air-dried blocks  $4 \times 4 \times 45$  mm. for 3 days in a 20% soln. of the salt and detg. the wt. of impregnating substance absorbed, the calorific value of the impregnated wood, the vol. of vapors given off at  $650^\circ$  by a given wt. of wood, studying the carbonization and the flame of the gases evolved, examg. the combustibility of the charcoal and testing local inflammability. The results of the tests are briefly discussed; but no general conclusions are drawn, as the tests are only preliminary. A. P.-C.

Rubber floor and wall coverings, etc. (Brit. pat. 300,008) 30.

**Cement from slurry.** JOHN E. VELZY and WALTER T. GRONER (to Southwestern Portland Cement Co.). U. S. 1,714,060, May 21. After delivery and mixing of lime

slurry, water is added in the mixer, the slurry is mixed centrifugally with waste dust, the dust and lime slurry are subjected to whirling, and the mixt. is conveyed and further mixed as it is delivered to a cement mill. An arrangement of app. is described.

**Aging calcined gypsum.** SAMUEL G. MCANALLY. U. S. 1,713,879, May 21. Moisture is directly applied in the proportion of about 70 lbs. water per ton of calcined gypsum, while agitating the material.

**Treating by-product calcium sulfate from phosphoric acid manufacture.** ROBERT S. EDWARDS (to Rumford Chemical Works). U. S. 1,713,868, May 21. The mass is subjected to grinding in water in a continuous process, in the presence of a neutralizing compd. until a completely hydrous and blended neutralized product is produced, which is suitable for use as a plaster.

**Artificial stone.** SOC. ANON M. A. P. Fr. 652,195, April 4, 1928. Artificial stone is made from cryst.  $\text{CaCO}_3$ , a binding agent such as  $\text{CaSO}_4$ , and colloidal  $\text{SiO}_2$ .

**Bituminous material for roads.** W. H. SCHMITZ. Brit. 300,196, Nov. 8, 1927. Aggregate is first wetted with an alkali soln. and then treated with a bituminous emulsion. Cf. C. A. 23, 2547.

**Building material.** VICTOR C. J. NIGHTINGALL. Australia 13,096, May 2, 1928. A cellular building material with soundproof and insulating properties is made by mixing plaster of Paris,  $\text{CaCO}_3$  and an acid such as oxalic acid. It may be reinforced with fiber or other material.

**Building material.** ENRIQUE D. ROLANDO. Fr. 652,339, April 6, 1928. A material which may replace wood or Fe is composed of a mixt. of pumice stone and a binding agent (lime, cement, silicate, etc.) with or without  $\text{MgO}$  and may be made in the cold or with heat and pressure.

**Asphalt, etc.** I. G. FARBERIND. A.-G. Fr. 652,114, April 3, 1928. Bituminous emulsions for use on roads, etc., are made with water and materials contg. insol. humic acid or substances having the character of this acid.

**Coating roofing felt or paper.** JOHN C. BLACK and WIRT D. RIAL (to Pan American Petroleum Co.). U. S. 1,714,206, May 21. A body of melted asphalt is protected from any substantial oxidation by displacing any air in it by introduction of a non-oxidizing gas such as a stored combustion gas mixt. and the asphalt is kept at a temp. of about  $200^\circ$  by heating and circulating it through a pipe system and regulated quantities of the asphalt are introduced into a coater tank to maintain a constant level in the tank through which the material to be coated is passed.

**Waterproof and flame-resistant building paper.** Otto A. Frederickson (to Wire-Mold Co.). U. S. 1,715,080, May 28. A relatively thick sheet of paper has one face with a waterproof and flame-retarding coating of stearin pitch adapted to blister when exposed to fire, with an overlying thin coating of paraffin to give a smooth non-sticky surface.

**Wall board.** UPSON CO. Brit. 300,041, Dec. 30, 1927. Wall boards which may be faced with paper are formed by admixture of an intumescent binder such as a sol. alkali silicate, hide glue or corn starch with a filler such as powdered dolomite and sawdust and heating the mixt. to form a porous rigid mass. Various details and an arrangement of app. are described.

**Apparatus for forcing impregnating liquid into wood.** R. STEINFELD. Brit. 299,842, Nov. 2, 1927. Structural features.

## 21—FUELS, GAS, TAR AND COKE

A. C. FIELDNER

**New fuel research laboratories at Ottawa.** B. F. HAANEL. *Engineer* 147, 160-1 (1929).—The permanent equipment will include by-product recovery coke plant, a powd.-fuel steam-generating plant, a briquetting plant, all on the com. scale, a large-scale coal-working plant and an exptl. domestic heating plant. D. B. DILL

**Average qualities of Russian fuels.** A. K. BESYADOVSKII. *Izvestiya Teplolekhn. Inst. (Trans. Thermo-Tech. Inst. (Moscow))* 1928, No. 10, 77-85.—Very complete data are given on coals from Donetz, Moscow, Ural, Kuznetskii, Minusinskii, Chermkovskii, Eastern Siberia and Suchanskii. A. A. BOERTLINGK

**Investigations on liquid fuels.** V. IPAT'EV. *Chimie & industrie Special No.*, 115-22 (Feb., 1929).—An address reviewing the progress accomplished during the last 15 yrs. in the production of liquid fuels from raw materials other than petroleum. A. P.-C.

**Soft coal as a source of liquid fuels.** RENÉ CHAUX. *Rev. sci.* 67, 5-16 (1929).—A

review of the work done in this field: high- and low-temp. carbonization, hydrogenation, tar treatment and gasification. P. THOMASSET

**Terminology in coal research.** REINHARDT THIESSEN AND WILFRID FRANCIS. *Bur. Mines, Tech. Paper 446*, 27 pp. (1929). E. H.

**A chemical engineering view of coal processing.** H. C. PARMELEE. *Proc. 2nd Intern. Conference Bituminous Coal 1*, 133-8 (1928). E. H.

**Coal cleaning problems of today.** K. GLINZ. *Proc. 2nd Intern. Conference Bituminous Coal 2*, 22-36 (1928). E. H.

**The chemical utilization of coal.** FRITZ ROSENDAHL. *Metallbörse 19*, 397-8, 455-6, 510-12, 622-4, 678-80, 733-5 (1929).—An attempt to cover in one article (1) the constitution of coal, (2) low- and high-temp. distn. of coal, (3) application of the gases for the synthesis of hydrocarbons and fertilizers, (4) liquid fuels: benzene, alc., hydro-naphthalene, (5) production of oils without coking. Conclusion: The direct utilization of coal for the production of valuable products is still an unsolved problem, but the new processes for combining CO, CO<sub>2</sub> and H obtained from coal, low-temp. distn., high-temp. distn., and the indirect treatment of coal and its products by catalysts, have already proved their worth. W. C. EBAUGH

**Some recent developments on the constitution of coal.** REINHARDT THIESSEN. *Proc. 2nd Intern. Conference Bituminous Coal 1*, 695-767 (1928). E. H.

**Inorganic constituents of coal.** SZ. HANKISS. *Szénkísérleti Közlemények 2*, 134-9 (1928); *Chimie & industrie 21*, 721.—Various finely ground coals were extd. successively with H<sub>2</sub>O and 2 and 10% HCl. Mäza coal yielded only a small quantity of ext. (about 4% of the wt. of ash), from which it is concluded that the inorg. matter of this coal consists chiefly of insol. silicates. Pécs coal gave about 3% of ext. (equiv. to about 15% of the ash); the ash of the original coal was red, and that of the extd. coal white, showing that the whole of the Fe was dissolved; quant. analysis showed most of the Fe was present in the form of pyrites, the H<sub>2</sub>O ext. contg. a little FeSO<sub>4</sub> due to oxidation. The S extd. amounted to 40% of that present in the coal and to 1% of the coal; the aq. ext. contained only small quantities of alk. silicates; the Mg and Ca compds. are of but little importance. A. PAPINEAU-COUTURE

**The coal industry and the analysis of coals.** M. DOLCH. *Z. Oberschles. Berg- u. Hüttenmann. Ver. Katowice 68*, 64-72 (1929); *Chimie & industrie 21*, 722-3.—H<sub>2</sub>O can be detd. in about 10 min. by treating the coal with abs. alc., distg., adding an equal vol. of petroleum to a suitable aliquot and detg. the turbidity pt. H<sub>2</sub>O, tar, gas and coke can be detd. on the same sample as follows: place the sample in a Fischer steel retort in an elec. furnace, dry in a current of CO<sub>2</sub> or N, collecting the H<sub>2</sub>O; heat to 530°, collecting the gas and primary tar; finally heat to 1000° to obtain the coke. The ordinary method of reporting results is not suitable for technical purposes, and it would be preferable to report the distribution of the latent heat in the 3 phases of the fuel, as it would allow of predicting with greater certainty the phenomena which would take place on gasifying; when the gaseous phases of such dissimilar fuels as bituminous coal and lignites are considered, in this manner it is surprising to find that they give figures of the same order. D. also shows the advantage of detg. the max. CO<sub>2</sub> content of total combustion gases, from which the importance of the ultimate decompn. in the presence of steam can easily be obtained, as well as the amt. of gas due to the cracking of the tar; the amt. of H produced by the H alone can also be found. A. PAPINEAU-COUTURE

**Locomotive coal tests.** J. G. B. SIMS. *Engineer 147*, 244 (1929).—Details are given of tests using *Welsh, Pocahontas and New River coal*. The av. coal consumption per ton mile was, resp., 0.242, 0.271 and 0.264 lb. D. B. DILL

**The past, present and future of Illinois coal.** S. W. PARR. *Am. Iron and Steel Inst.* (advance paper) 1929, 23 pp.—Historical notes with review of modern practice and conditions. The future of Illinois coals holds decided promise for manuf. of both coke and gas. E. I. S.

**The composition of a Permi-Carboniferous coal in North China.** K. ASADA. *Bull. Geol. Soc. China 7*, 185-9 (1928). (In English.) E. I. S.

**Coal from the Yakutsk mining district.** N. M. KARAVAYEV AND I. B. RAPOPORT. *Izvestiya Teploekkh. Inst. (Trans. Thermo-Tech. Inst. (Moscow)) 1928*, No. 10, 32-43.—Coal from Sangarui contains 4.25-9.5% H<sub>2</sub>O, 10% ash (on dry coal), S very low, volatile matter 40-54%; its heating value is 7359-8100 cal./kg. The elementary compn. is C 75.4-81, H 5.5-6.4 and N up to 1%. This coal is suitable for low-temp. carbonization; it belongs to class II according to Gruner's classification. Coal from the Zhiganui area has up to 20% H<sub>2</sub>O, 13-15% ash (on dry coal), 0.3-0.35% S, 45.5-48.5% volatile matter, 6900 cal./kg. heating value, 69-71.3% C, 4.77-5.5% H. It is unsuitable for

low-temp. carbonization. The Buluk area has hard and brown coal (analysis not given).

A. A. BOEHLINGK

**Oxidation of Moscow coal in a stream of air oxygen at various temperatures.** N. M. KARAVAYEV AND A. K. IVANOV. *Izvestiya Teplolekhn. Inst. (Trans. Thermo-Tech. Inst. (Moscow))* 1928, No. 10, 44-50.—Twenty-five g. each of Shchekinskii coal and Bobrinskii coal were heated to 60°, 80°, 110°, 140° and 180° in a container immersed in an oil bath in a stream of air (a total of 30 l.). The oxidation reaction is of two types, i. e., the addn. of O and the splitting off of some products of decompn. or oxidation. Bobrinskii coal absorbed O very slowly at the lower temps.; the absorption increased considerably in the neighborhood of 180°. Shchekinskii coal absorbed O at an approx. steady rate. The decrease in C and H with increasing temp. is higher for Bobrinskii coal. At 110° an appreciable chemical change has begun; so this temp. is too high for H<sub>2</sub>O detns. Both coals lose 10-14% of their heating value when preheated to 180°. Marcasite, which by some authors is considered as the cause of self ignition, was not detected in these coals. The carbonyl O (2.65 and 2.15% at ordinary temp.) increased to 3.46 and 3.09% at 180°. Bobrinskii coal, then, takes up O at a temp. below 80°, while Shchekinskii coal takes up O below 140°. The amount of CO found in the products of oxidation increases with the increase in temp. H. decreases more rapidly than C. The carbonyl O increases with increase in temp.

A. A. BOEHLINGK

**The binding power of coal extract.** SZ. HANKISS. *Szénkísérleti Közlemények* 2, 161-5(1928); *Chimie & industrie* 21, 722.—Extn. of 2000 g. of Tata coal for 30 hrs. with 6 l. of a mixt. of EtOH and C<sub>6</sub>H<sub>6</sub> gave 9.8% of ext. which was fairly plastic under high pressure, the extd. coal contg. 0.75% of residual bitumen. Briquets prepd. by mixing the extd. coal with 0.75-18.4% of the ext. at 70° and briquetting in a hydraulic press at 1500 atm. proved unsatisfactory. Pécs coal was extd. under pressure; the unextd. coal gave better briquets than the extd. coal; addn. of ext. improved the quality of the briquets. H. considers that the quality of the briquets depends primarily on the phys. condition of the coal (state of subdivision, H<sub>2</sub>O, temp. and pressure) and on the humic compds., bituminous compds. playing a secondary role.

A. P.-C.

**Commercial aspects of low-temperature coal distillation by the International Bitumenol Corporation process.** J. N. VANDEGRIFT. *Proc. 2nd Intern. Conference Bituminous Coal* 1, 546-59(1929).

E. H.

**Low-temperature carbonization of coal under pressure.** B. MORY. *Szénkísérleti Közlemények* 2, 96-8(1928); *Chimie & industrie* 21, 724.—If there is no suitable market for the pitch sepd. in the distn. of primary tar, the pitch can be practically eliminated by carbonizing the coal under pressure so as to crack the primary tar into lighter compds. Carbonization at 510° and 10 atm. of Gyöngyös lignite (H<sub>2</sub>O 35.76, ash 12.32%) gave only 2.5% of distillate, instead of 5% at atm. pressure; but the pressure distillate contained more C<sub>6</sub>H<sub>6</sub>.

A. PAPINEAU-COUTURE

**The low-temperature carbonization plant at the Imperial Fuel Research Institute.** YOSHISADA BAN. *Proc. 2nd Intern. Conference Bituminous Coal* 1, 303-11(1928).

E. H.

**Low-temperature carbonization of blended New Zealand coals.** W. G. HUGHSON. *New Zealand J. Sci. Tech.* 10, 263-74(1929).—The Gray-King assay as described in the Great Britain Fuel Research Survey of Natural Coal Resources, No. 7 (C. A. 21, 2780) has been used to det. the behavior of New Zealand coals when subjected to low-temp. carbonization. Tabulated results on 55 brown, bituminous and blended coals are given.

A. S. CARTER

**Low-temperature distillation of Moscow soft coals and the analysis of tar and gas.** G. L. STADNIKOV. *Izvestiya Teplolekhn. Inst. (Trans. Thermo-Tech. Inst. (Moscow))* 1928, No. 10, 96-8.—Bobedinskii coal was heated to 500° (1) in an aluminum retort, (2) in Graefe's retort and (3) in Fischer's rotating aluminum retort. The products (in %) of (1) and (2), resp., were total water 36.1, 36.2; water of decompn. 4.0, —; semi-coke 50.7, 48.4; tar 6.6, 4.8; gas, 6.6, 9.9; gas with H<sub>2</sub>S —, 4.7; total H<sub>2</sub>S —, 1.3. The gas from (2) contained CO<sub>2</sub> 28.2, C<sub>2</sub>H<sub>4</sub> 2, CO 10.6, CH<sub>4</sub> 17.2, H<sub>2</sub> 39.0 and N<sub>2</sub> 3.0%; heating value was 3,261 cal./kg. In (3) 20 kg. coal produced 17.4% ash, 32.1% moisture, 0.8% light oil, 1.5% heavy oil, benzene-extd. oils from dust 0.93%, H<sub>2</sub>O-free tar 3.3%, semi-coke 52.4%, coal dust 10.0%. The tar fractions were 0.7% below 100°, 6.24% at 100-150°, 6.39% at 150-200°, 9.49% at 200-250°, 18.85% at 300-350° and residue above 350° 20%. It contained phenols 18.7%, crude paraffin wax 5.55% and asphaltenes 11.8%. The tar contained coal dust and water which was extremely difficult to separate. This coal is not suitable for low-temp. carbonization.

A. A. BOEHLINGK

**The coking test of coal.** T. SHIMMURA. *J. Fuel Soc. Japan* 8, 379-85(1929).—In



order to study the coking properties of coal S. tested nearly 50 kinds of Japanese and Chinese coals, using Lessing's coking app. The strongly coking coal gave a swollen coke of mushroom appearance and black in color, while the coke from weakly coking coal has a gray color with no metallic luster; the vol. of the coke is less than that of the coal. In order to study the relation of the swelling property and the mushroom appearance of the coke to the coking constituents of the coal, S. extd. from coal  $\alpha$ ,  $\beta$  and  $\gamma$  compds., and carbonized these compds. in L.'s coking app. The  $\alpha$  compd. gave a black, powder coke. The  $\beta$  compd. of certain coals swelled but gave no mushroom appearance, and in other coals a black powder coke similar to the  $\alpha$  compd. resulted. The  $\gamma$  compd. of all kinds of coals fused easily and produced a black flake of mushroom appearance. The analysis of gas produced in L.'s coking app. shows that the weakly coking coal is rich in  $\text{CO}_2$  and CO and poor in satd. and unsatd. hydrocarbons. F. I. NAKAMURA

**The briquetting of Pécs coal.** SZ. HANKISS AND ST. PETER. *Szénkísérleti Közlemények* 2, 156-60(1928); *Chimie & industrie* 21, 722.—Because of its high adhesive power and swelling properties Pécs coal can give good briquets directly. It begins to decomp. at about  $280^\circ$ , is very adhesive at about  $300^\circ$  and completely softened and plastic at  $350$ – $450^\circ$ . The swelling and distn. of the tar also take place at about  $400^\circ$ . Above  $400^\circ$  the decompn. becomes more quiet and at  $500^\circ$  the coal becomes hard again. The content of agglutinating matter is very low (about 0.5%), the moisture content 10% and ash 23%. By using a high pressure (about 1500 atm.) briquetting can be carried out at a much lower temp. (about  $100$ – $50^\circ$ ). The briquets thus prepd. are quite strong and resistant to the action of water; their adhesion is decreased about 15–20% after exposing to sunlight for about 6 weeks. The briquets are very compact, ignite readily, and burn with a min. of smoke and soot and clinkering. A. PAPINEAU-COUTURE

**Fixation of sulfur in coal briquets.** R. KADA AND K. OGATA. *J. Fuel Soc. Japan* 8, 414-28(1929).—Fixation of sulfur to prevent disagreeable fumes in the use of coal briquets for domestic fuel was studied.  $\text{CaO}$ ,  $\text{CaCO}_3$ ,  $\text{MgO}$ ,  $\text{Na}_2\text{CO}_3$ , Eschka mixt. and  $\text{BaCO}_3$  were used for the fixation of S. Lime is the best agent; it fixes about 60–80% of total S at  $700$ – $900^\circ$ . Catalysts such as  $\text{Fe}_2\text{O}_3$ ,  $\text{MnO}_2$  and  $\text{ZnO}$  were employed.  $\text{Fe}_2\text{O}_3$  shows the best result; the reaction takes place at  $450$ – $650^\circ$ . Addn. of 1–2% of  $\text{Fe}_2\text{O}_3$  with slaked lime gave almost 100% fixation of S. F. I. NAKAMURA

**Manufacture of coal and lignite agglomerates.** CH. BERTHELOT. *Tech. moderne* 21, 173-9, 204-6(1929).—Modern methods of the manuf. of these products are described. P. THOMASSET

**Modern developments in lignite carbonization.** F. P. KERSCHBAUM. *Proc. 2nd Intern. Conference Bituminous Coal* 1, 283-302(1928). E. H.

**Drying lignites under pressure.** B. MORV. *Szénkísérleti Közlemények* 2, 140-4(1928); *Chimie & industrie* 21, 721; cf. C. A. 23, 2012.—Lignites from Gyöngyös ( $\text{H}_2\text{O}$  40%), Mucsony ( $\text{H}_2\text{O}$  25%) and Sajóvölgy ( $\text{H}_2\text{O}$  30%) were heated in an autoclave at 8–12 atm. for 1.5–2.5 hrs. and the surface moisture was then allowed to evap. The amt. and m. p. of the ash were reduced, and the C content, H content and calorific value of the dry lignite were increased. The yield of tar was unchanged and the coke obtained from the dried lignites was less friable. A. PAPINEAU-COUTURE

**The effect of a liquid dispersion medium on the treatment of semi-coke and lignite with hydrogen at high temperature and pressure.** H. I. WATERMAN AND J. S. DOTING. *Chimie & industrie Special No.*, 218-20(Feb., 1929).—At a temp. of  $423^\circ$  and under a pressure of about 7 atm. (measured cold), semi-coke from lignite absorbs only a very small quantity of H; paraffin (from Rangoon petroleum) absorbs quite an appreciable quantity of H; semi-coke from lignite in presence of paraffin absorbs a considerably larger proportion of H than in the absence of paraffin. By substituting activated charcoal (norite E and carboraffin) for the semi-coke in presence of paraffin, the H absorption was practically the same as that with the paraffin alone, showing that the semi-coke actually absorbs H and does not merely act as a catalyzer toward the hydrogenation of the paraffin. A. PAPINEAU-COUTURE

**New considerations on the use of carbon as an economic substitute fuel (for automotive engines).** A. CHARLES ROUX. *Chimie & industrie Special No.*, 213-7(Feb., 1929); cf. C. A. 22, 3757, 4231.—From a discussion of the problem from both technical and economic standpoints, R. considers that the solution of the problem is in using a mixt. of wood charcoal and semi-coke from the low-temp. carbonization of coal, agglomerated by means of a peat product (the exact nature of which is not stated), which could be produced at approx. the same cost as wood charcoal. A. P.-C.

**Study of the possibility of using wood carbonized at low temperature as a fuel in gas producers (for motor vehicles).** G. DUPONT, J. L. LUSSAUD AND J. ALLARD. *Ann. combustibles liquides* 3, 553-5(1928). I. Study of the distillation of various woods at

different temperatures. *Ibid* 555-75. II. Tentative theory of the gasification of wood charcoal to determine the most suitable carbonization temperature. G. DUPONT. *Ibid* 576-90.—See C. A. 23, 2551. R. E. SCHAAD

Heat efficiency of a domestic heating stove. M. KUROKAWA. *J. Fuel Soc. Japan* 8, 386-97(1929).—The temp. and compn. of exit gas, humidity and temp. of inlet air were observed every 20 mins. and the heat balance was calcd. from the mean values. Charcoal gave the highest efficiency followed by gas coke, Tsuzura semi-coke and anthracites. The thermal loss due to excess air, the moisture in flue gas, incomplete combustion and the unburned matter in the ash are also discussed. F. I. NAKAMURA

Present day methods of extraction of pyridine bases. CH. AB-DER-HALDEN. *Chimie & industrie* 21, 708-10(1929).—A brief review of the  $C_5H_5$ , steam distn., and  $Na_2CO_3$  methods for the extn. of  $C_5H_5N$  from pyridine sulfate obtained from coal tar. A. PAPINEAU-COUTURE

The recovery of pyridine and phenol from raw benzene. H. A. J. PIETERS and M. J. MANNENS. *Chem. Weekblad* 26, 286-90(1929).—The titration of pyridine in dil. solns. and with methyl orange as indicator gives very inaccurate results. (The error is less than 0.5% if dimethyl yellow and methylene blue are used as indicators (Kolthoff, *Massanalyse* II 66, 1928) and if the final concn. is not less than 0.1 g. per 100 cc. Phenol and pyridine can be recovered from raw benzene by washing prior to distn. The efficiency of the process depends on the initial concn. In one run, 16 tons of raw benzene yielded 34 kg. pyridine dissolved in dil.  $H_2SO_4$  at 150 g. per l. and 50 kg. phenol at 140 g. per l. The acid consumption decreased 30%, while the NaOH increased 50%, and the washing losses were decreased 35%. G. CALINGAERT

Manufacture of water gas from powdered coal. H. L. RAMSEY. *Ind. Chemist* 5, 156-9(1929).—Recent advances in the production and use of water gas and in the use of powd. coal are pointed out. The Howard "reverse air-blast-process" and the "pier" for the use of bituminous coal in the production of water gas are described briefly. The work and proposals of K. M. Balley, Clauss, R. H. Burditt, La Combustion Rationnelle Co., Max Klötzer, Trenkler, Ledebör and Jamotte, Haslam, Gwosdz, Interessen Gemeinschaft, H. W. Benner and Trent are discussed. E. G. R. ARDAGH

German exposition of gas and water technology. FR. ALBACH. *Gas u. Wasserfach* 72, 393-403(1929).—A descriptive article. R. W. RYAN

Technical processes for removing sulfur compounds from gases. HORST BRÜCKNER. *Gas u. Wasserfach* 72, 442-5(1929).—A critical review of the most important methods for removing S compds. from gas, with extensive references to patents and literature. R. W. RYAN

Locomotive firebox conditions: gas compositions and temperatures close to copper plates. T. M. HERBERT. *Proc. Inst. Mech. Eng. (London)* 1928, 985-1006.—Locomotive firebox gases were sampled through hollow stays in side sheets of the firebox. The heads of the stays were arranged so that the sample was taken next to the plate. Av. analyses of gases for various positions on the side plate and with heavy and light working of a freight locomotive were  $CO_2$  11.0-13.7%,  $O_2$  2.7-5.2% and CO 1.6-5.8%. Tests on a passenger locomotive running at 35-60 miles per hr. gave similar firebox gas analyses. The gases are not as a rule highly oxidizing, nor are they reducing except for short periods. The temps. attained at stayheads were detd. by drilling small holes in the head and inserting plugs of a series of fusible alloys having melting points at 220-380° by 10° steps. Tests were made on several types of locomotives working with good and bad boiler water as used in England and Scotland. The av. temps. were between 251 and 295° with a max. of 345°. The surface temps. rise during life and soiling of the firebox, while superimposed on this is periodic rise and fall of temps. due to washing of boilers. The temps. are affected by the amount of work the engine does. Narrow fireboxes show greater extremes of heat. A. W. HOLMES

The processes of Georges Claude for the separation of gas by liquefaction and the synthesis of ammonia. JEAN DELORME. *Proc. 2nd Intern. Conference Bituminous Coal* 2, 223-30(1928). E. H.

The gas and tar industries in France. JEAN BING. *Proc. 2nd Intern. Conference Bituminous Coal* 2, 766-88(1928). E. H.

Increasing the value of low-temperature carbonization tars. M. STÉMART. *Chimie & industrie Special No.*, 305-11(Feb., 1929).—Low-temp. carbonization tests on a lab. scale (25 kg.) with a Polish, non-agglutinating coal contg. 30.5% volatile gave a max. yield of primary tar (90-5 l. per ton) at a temp. of 375° in the tar vapors just above the coal (corresponding to 425-50° in the coal), with corresponding yields of 60-5 cu. m. of gas contg. 9-10 l. of "gasoline" boiling at ordinary temp. and 840-60 kg. of semi-coke. A Scotch coal contg. 34.6% volatile gave max. tar yield at the same temp., at

which there was obtained: tar 114 kg., gas 40.5 cu. m., semi-coke 778.5 kg. Comparative tests with very wet coal and the same having a normal  $H_2O$  content showed that partially dried coal gave a higher gas yield. A moderate general preheating of the coal does not affect the tar and gas yields, but permits of reducing the time of heating about 50%. Fractional distn. of tars obtained in lab. and semi-com. tests gave 25–30% of gasoline with initial b. p. of  $90^\circ$  of which 80–90% distills up to  $380^\circ$ . When the carbonization is not properly controlled, the yield of gasoline is reduced to about 15% and the amt. distg. below  $360^\circ$  to about 50%. At the present time, cracking of the tar (after distn. to remove the gasoline it contains) is considered the best treatment, as the degasolined tar can give up to 50% of gasoline on cracking, and the higher phenols are converted into lower phenols, for which a market is more readily found. The most satisfactory method of refining was hydrogenation by the Kling-Florentin process (treating at  $400\text{--}500^\circ$  with H at a pressure of up to 500 kg. per sq. cm. in the presence of catalyzers, followed by bleaching with  $SiO_2$  gel, the process being preferably applied directly to the degasolined tar). The Centrales Électriques des Flandres et du Brabant has installed a plant for the commercial application of these results, with a view to recovering by-products from the coal burned in the central power station; the cracking plant uses the Dubbs process and is designed to be able to treat heavy petroleum oils as well as the tar.

A. PAPINEAU-COUTURE

**The "E-phenols" of primary tar.** G. VAVON AND N. ZAHARIA. *Chimie & industrie Special No.*, 257–60 (Feb., 1929); cf. C. A. 23, 1247.—It is shown that all phenols are extractible by  $Et_2O$  from alk. soln., the "extn. coeff." varying within wide limits with the constitution of the phenol: it is increased by introduction of aliphatic radicals in the mol., the increase being greater the larger and more numerous the substituted radicals, and it is greater when substitution takes place in *o*-position than in *p*-position. The latter observation furnishes a method of distinguishing between isomeric *o*- and *p*-phenols. From a discussion of the results, Weindell's distinction between "*e*-phenols" and "*ne*-phenols" (C. A. 18, 1741) is considered to be without foundation. A. P.-C.

**Cracking in the distillation of coal tar.** F. J. POPHAM. *Ind. Chemist* 5, 179–80 (1929).—Distn. results obtained by quick and slow lab. distn. and works distn. with steam of a coke-oven tar indicate that the cracking was not particularly rapid, and is due to maintaining the tar at a high temp. for a prolonged period. The tar could be heated to  $400^\circ$  in the lab. with increasing yields of creosote without undue cracking and without the production of much free carbon provided the distn. was sufficiently rapid. In ordinary distn. 40% or more of the creosote is obtained by cracking. By making an alc. extn. and a  $CS_2$  extn. it was found that the largest % of creosote comes from the alc.-sol. portion and this is accompanied by the lowest free-C formation, indicating that cracking takes place in the heavier fractions. The time factor is more important than the temp. factor.

E. G. R. ARDAGH

**Hydrogenation of pitch.** G. HUGEL. *Chimie & industrie Special No.*, 128–33 (Feb., 1929); cf. C. A. 23, 2018.—A coke-oven coal-tar pitch, giving 43.8% of liquid products distg. at  $50\text{--}350^\circ$ , was berginized 10 hrs. at  $480^\circ$  under an initial pressure (cold) of 100 kg. per sq. cm. It absorbed 5.7% H and on distn. yielded:  $50\text{--}250^\circ$  16.5,  $250\text{--}300^\circ$  12.0,  $300\text{--}50^\circ$  16.0,  $350\text{--}400^\circ$  13.0, pitch 15.0, coke 27.0, loss 0.5%. The use of alkali hydrides as hydrogenation catalyzers is briefly discussed. According to Nellensteyn (C. A. 21, 3738) there are 3 components to asphalt: an oily phase, a lyophilic portion consisting of protective compds., and a lyophobic portion consisting of the C: when a small quantity of a reagent ( $NaH$ ,  $H_2SO_4$  and  $C_6H_6$  were used) is added to such a medium, the reagent is absorbed; but if a large amt. is added there is an irreversible flocculation due to the destruction of the micella. By adding a small quantity of  $C_6H_6$ , flocculation of the pitch was avoided and yields of up to 80% (85% when it is considered that the pitch used contained about 5% of C insol. in all solvents) of liquid products were obtained. Hydrogenation at very low temp. (e. g.,  $250^\circ$ ) of coke-oven pitch gave no oil, but a soft pitch, which could even have the consistency of a viscous liquid. The successive changes of pitch as a function of the H absorbed being followed under suitable conditions, it was found that most of the latter was absorbed without any apparent change in the colloidal structure of the pitch, which gradually becomes softer until it is converted into a thick, viscous liquid, insol. in benzine, and which may be termed "hydro-pitch." The conversion of "hydro-pitch" into oils with destruction of its colloidal structure requires a relatively small absorption of H. Hydrogenation of indene gives a very stable colloidal hydrocarbon of the same nature as the cycloparaffins; if this hexahydropolylindene is subjected to moderate cracking, it splits into smaller units, the free valences being satd. with H. The 1st change (conversion into hexahydropolylindene) is considered to be similar to the conversion of pitch to "hydro-pitch" and

is accompanied by a large absorption of H, while the cracking of the hexahydropolymers requires but a small absorption of H and is similar to the production of oils from "hydro-pitch." The pitch oils contain practically no  $C_6H_6$ . The 1st portions start coming off at about 200°, indicating the presence of tetralin, and hence of the naphthalene nucleus. Most of the pitch oil constituents must contain very highly condensed nuclei as they distil at ordinary pressure without decompn. at temps. above 500° and even 600°. The base of these substances is certainly formed of polyaromatic hydrocarbons, such as chrysene, picene, etc., because they give well-crystd. hydrocarbons on dehydrogenation. In the pitch these highly condensed nuclei are connected by unsatd. side chains (as in polystyrene) or by unsatd. hydroaromatic or cycloparaffin nuclei. This hypothesis does not take into account the O, N and S; but as these are eliminated quite rapidly in the early stages of hydrogenation in the presence of NaH without any change in the colloidal structure of the pitch, it is not considered that combinations with these elements play the most important part in the structure of pitch.

A. PAPINEAU-COUTURE

**An economic test of low-temperature coking.** R. S. McBRIDE. *Chem. Met. Eng.* 36, 288-91(1929); cf. *C. A.* 22, 3760.—A low-temp. carbonization plant and its operation are described.

A. WHITE

**Coke-oven operation.** K. S. ZAREMBO. *J. Chem. Ind. (Moscow)* 6, 254-8(1929).—In the coke ovens of old construction, which are in operation in the Don basin, the hydraulics which take the place of modern gas collectors are sprayed with tar, and the resultant fuel gas is contaminated with very large quantities of naphthalene originating in the decompn. of the tar; as a result, gas conduits, scrubbers, condensers, etc., become plugged and considerable other trouble is experienced. Expts. show that spraying should best be effected continuously and at a max. of intensity and that it is best to spray the hydraulics with weak  $NH_3$  soln. instead of with tar; tar may be introduced only once in 24 hrs. while cleaning the hydraulics from foots which it helps to dissolve and remove. At any rate, the gas obtained is defective, since it contains too much N and Cl and attacks the metal of the installation.

BERNARD NELSON

**Recovery of coke-oven by-products.** J. O. *La Nature* 2808, 406-13(1929).—A description of  $NH_3$  recovery, tar treatment and utilization of gases.

P. THOMASSET

**Heat required for the coking process.** ERNST TERRES. *Proc. 2nd Intern. Conference Bituminous Coal* 2, 657-84(1928); *Gas u. Wasserfach* 72, 361-9(1929).—Methods for detg. the heat of coking, the heat of decompn. of coal and also the (heat) cond. of coal and coke are given and discussed. They are also applied to the detn. of the length of the coking period and used to explain the differences in the coking properties of various German coals.

R. W. RYAN

**Investigations of the reactivity of chamber coke towards a mixture of nitric and sulfuric acids.** R. KATTWINKEL. *Glückauf* 65, 634-8(1929).—The reducing action of various types of coke (used in the Gay-Lussac tower of the  $H_2SO_4$ -Pb-chamber process) on a mixt. of  $HNO_3$  and  $H_2SO_4$  was detd. by heating 10 g. of coke with a mixt. of 100 g. 36° B $\acute{e}$   $HNO_3$  and 1000 cc. 60° B $\acute{e}$   $H_2SO_4$  for 2 hrs. at const. temp., 70°. The mixt. was filtered over coke and the filtrate titrated with 0.5 N  $KMnO_4$ . Eight successive detns. were made with the same coke and fresh acid mixts. The results varied with different cokes even when they originated from the same coal. The reactivity depends on the chem. constitution of the coke. Blast-furnace coke is more reactive than foundry coke because (1) the C of the former is amorphous and active while the graphitic-cryst. C of the latter prevents the liberation and gasification of the more reactive C; (2) the greater porosity and lesser hardness of the former create a larger surface of effective C mols. Increased loss of ash during the test is accompanied by greater reactivity due to the increased available C surface.

J. B. SHOHAN

**Specific heat of gases in combustion technic (LUNDBERG) 2. Use of pulverized coal as a fuel for periodic kilns (WATSON) 19. Removing S compounds from gases (Fr. pat. 652,243) 13. Gasoline from solid bituminous material (U. S. pat. 1,714,963) 22. Separating oil from gases (Fr. pat. 651,857) 13. Separating hydrocarbons, etc., by fractional solution (Brit. pat. 300,266) 22. Apparatus for mixing or blending gases (U. S. pat. 1,714,284) 1. Apparatus for scrubbing gas (U. S. pat. 1,715,252-3) 1.**

**Fuel briquets.** CHEMISCHE-TECHNISCHE GES. Brit. 300,195, Nov. 8, 1927. In forming briquets from fuels of different coking properties, the coking fuel is heated to or below the softening temp. (suitably about 300°) and the non-coking fuel to a higher temp. (suitably about 600°) and the fuels are then mixed and briquetted. The mixing and briquetting may be effected in a continuous operation.

**Governing combustion of powdered fuel in suspension.** ALFRED COTTON. U. S. 1,713,817, May 21. The fuel is carried in suspension in a mixt. of air and combustion gases, the relative proportions of which are regulated so as to control the rate of combustion.

**Regulating combustion in boiler furnaces by varying the supply of oxygen.** SIEMENS-SCHUCKERTWERKE A.-G. Brit. 299,885, Nov. 4, 1927. O is added to the air and its supply is increased with increase in the load. Air may be supplied in unchanged quantity or its quantity may be varied inversely with that of the O.

**Light oils from solid or liquid hydrocarbons.** P. GIRARD, F. PETIT and A. CHARBONNEAU. Brit. 299,861, Nov. 3, 1927. In a process such as that described in Brit. 290,606 (C. A. 23, 959), in which solid fuel is distd. in the presence of an oxidizing agent to obtain light hydrocarbons, a substance which gives off nascent O on heating such as  $\text{KMnO}_4$ ,  $\text{MnO}_2$  or  $\text{K}_2\text{Cr}_2\text{O}_7$  is used. The process may be applied to materials such as resins, pitch, bitumens, waxes, tars, asphalts and products obtained by the treatment of solid fuels with solvents such as petroleum or coal oils. Gas is evolved and about 10% of coke is formed. The reaction may be assisted by ionizing the vapors by high-frequency discharges.

**Setting for vertical retorts, recuperator chambers, etc.** LOW TEMPERATURE CARBONIZATION, LTD., and C. H. PARKER. Brit. 299,795, April 27, 1927. Structural features.

**Carbonization retorts.** CHARLES TURNER. Fr. 651,729, Mar. 24, 1928.

**Carbonization of fuel.** I. G. FARBENIND. A.-G. Fr. 652,405, April 10, 1928. In the carbonization of fuel at low temp. hot inert gas or vapors are blown through a layer of the fuel in amt. sufficient to keep the fuel in agitation.

**Carbonizing coal.** IRVING F. LAUCKS (to Old Ben Coal Corp.). U. S. 1,713,840, May 21. Coal which becomes plastic on sufficient heating is passed through a cylindrical retort by the action of a screw and is simultaneously heated in such a regulated manner that at the zone where the plastic coal commences to set, the screw is hotter than the retort, so as to conclude the setting process at the rotor while the plastic coal adheres to the retort. An app. is described.

**Carbonizing and gasifying powdered coal.** W. H. TRENT (to Trent Process Corp.). Brit. 299,792, Oct. 25, 1926. Waste combustion gases from a furnace are passed into contact with a continuously moving body of the coal, and the coke powder thus produced is transferred while hot to a gas producer so as to generate producer gas for use in the furnace. The plant includes a boiler furnace.

**Heating pulverized coal while in a pneumatic conveyor leading to a furnace.** W. H. TRENT (to Trent Process Corp.). Brit. 299,718, Oct. 25, 1926. The conduit and storage receptacle for the coal are heated so that the coal itself may be brought to a temp. of  $200^\circ$  at which gas is continuously evolved and serves to accelerate the flow of the coal.

**Distillation of coal.** LOW TEMPERATURE CARBONIZATION, LTD. Fr. 652,540, Mar. 23, 1928. In low-temp. distn. the substance to be distd. is introduced in containers which are caused to pass through a retort by rolling on an inclined path from the charging point to the outlet. Means are provided for closing the retort at both ends. Cf C. A. 23, 3332.

**Hydrogenation of coal, tar, mineral oils, etc.** I. G. FARBENIND. A.-G. Fr. 651,891, Mar. 28, 1928. Valuable hydrocarbons of low b. p. are obtained by the action of H on coal, tar, mineral oils and their distn. products at temps. above  $300^\circ$ , and preferably under pressure, in the presence of oxides of elements of the 3rd to the 7th group of the periodic system, pptd. in small proportions on metals or alloys. Examples are given of the production of benzines, the main portion of which boils below  $200^\circ$ , from mineral oil and lignite-tar oil using Al coated with U nitrate or boric acid or  $\text{NH}_4$  vanadate, or Zn wool evapd. with a suspension of the blue oxide of Mo, at about  $450^\circ$  and 200 atm.

**Briquets from coal, etc.** P. J. SPENGLER and J. P. SPENGLER. Brit. 299,859, Nov. 4, 1927. Briquets are formed from coal or a mixt. of coal and coke with a binder such as tar by repeated pressing operations at gradually increasing pressures.

**Apparatus for removing water from peat.** L. L. GINTER. Russ. 5603, Sept. 15, 1924. Mechanical features are specified.

**Montan wax.** I. G. FARBENIND. A.-G. Fr. 651,869, Mar. 29, 1928. Montan wax is treated with oxidizing agents in acid soln. under such conditions that a yellow to white product is obtained similar to carnauba wax, but much more easily sapond. and emulsified than the latter. Examples are given.

**Gas.** WALTER SCHWEDER. Fr. 652,277, April 5, 1928. See Brit. 288,336 (C. A. 23, 693).

**Purifying gas.** H. KOPPERS A.-G. (to C. J. Hansen). Brit. 299,765, Oct. 31,

1927. In effecting removal of  $\text{NH}_3$  and  $\text{H}_2\text{S}$  from gas by washing with liquor contg. Fe and oxy compds. of S, as described in Brit. 299,302 (C. A. 23, 3332), a liquor is used which contains a metallic salt which reacts with  $\text{H}_2\text{S}$ . A soln. of Fe thiosulfate may be used and the spent liquor may be regenerated with  $\text{SO}_2$ ; salts of Zn and Mn also may be used. Various other details are described.

**Gas producer.** BERNITZ FURNACE APPLIANCE CO. Brit. 299,627, Dec. 2, 1927. The fuel bed is enclosed in a casing formed by hollow bricks and cooled by circulation of gases which subsequently pass mainly into the lower portion of the charge. Various structural details of the producer are described.

**Gas producer for mixed gases.** ULRIC DE TOYTOT. Fr. 652,152, July 27, 1927.

**Plant for water-gas manufacture.** MAX W. ERDMANN. U. S. 1,715,064, May 28. Flat flaring nozzles placed helically about a carburetor inject oil vapors into the carburetor in fan-like streams from different directions.

**Production of water gas from natural gas.** EDWARD H. BOOMER (to Governors of the University of Alberta). Can. 289,830, May 21, 1929. A mixt. of 1 g. atom of O to each g. atom of C in the natural gas is passed at a pressure of 1 to 2 atm. and at a temp. exceeding  $975^\circ$  over suitable catalysts; a max. yield, from a commercial standpoint, of water gas is obtained.

**Coke-oven gas.** GESELLSCHAFT FÜR LINDE'S EISMASCHINEN A.-G. Fr. 652,326, Apr. 6, 1928. In the decompn. of coke-oven gas by partial liquefaction triple-bond compds. are eliminated before liquefaction by washing with suitable solvents or by treatment with HCl or Cl in the presence of catalysts to oxidize or hydrogenate them. Parts of the app. made of Cu or its alloys coming in contact with the gas are covered with Sn or Pb to avoid formation of compds. of Cu with  $\text{C}_2\text{H}_2$ . Other gases which tend to cause explosions such as  $\text{NH}_3$ , oxides of N and water vapor are also eliminated. Cf. C. A. 23, 1740.

**Preventing corrosion in wet gas meters.** J. A. FLETCHER and C. R. NORMAN. Brit. 300,096, May 16, 1928. An oil emulsion such as may be formed from cottonseed oil, mineral oil, fish oil and KOH soln. is used as the liquid in which the drums or bells work. Cf. C. A. 22, 3037.

**Storing acetylene.** M. ROHRSCHEIDER. Brit. 299,681, April 24, 1928. An absorbent filling for use in receptacles for storing  $\text{C}_2\text{H}_2$  comprises finely divided leather, freed from acids, water and acetone-sol. constituents, and which may be mixed with pulverulent or granular heat-resistant materials such as pumice or kieselguhr. If grease-free leather such as chrome leather waste is used, extn. with acetone (otherwise usually employed) may be omitted.

**Tar distillation.** THE BARRETT CO. Fr. 652,109, April 3, 1928. Tar is distd. by spraying it into hot coal gases as they pass from the retorts to a collector main, and the resulting gases and vapors while hot are purified from suspended particles by subjection to elec. discharges and finally cooling to condense the oils. Cf. C. A. 23, 3075.

**Distilling tar acids.** J. A. SHAW (to Koppers Co.). Brit. 299,837, Nov. 2, 1927. Tar acids such as phenol or cresol are removed from liquids such as gas liquor obtained in the carbonization of coal, etc., by maintaining the liquid at a temp. just below its b. p. and blowing an inert gas such as air through it. Tar acids are removed from the gas (suitably by NaOH) and the gas is recirculated. An arrangement of app. is described.

**Plant for utilizing heat from quenching coke for generating steam under pressure.** OSWALD HELLER. U. S. 1,714,168, May 21.

**Coke oven.** JOSEPH VAN ACKEREN (to Koppers Co.). U. S. 1,714,933-4, May 28.

**Coking pitch.** HEINRICH KOPPERS (to Koppers Development Corp.). U. S. 1,715,240, May 28. A body of pitch is gradually accumulated and simultaneously coked as the depth of the coking mass is gradually increased by addn. of liquid pitch to the top surface of the mass. An app. is described.

## 22—PETROLEUM, LUBRICANTS, ASPHALT AND WOOD PRODUCTS

W. F. FARAGHER

**Petroleum refinery statistics 1927.** G. R. HOPKINS. Bur. Mines, *Bull.* 297, 93 pp.(1929). E. H.

**The petroleum industry in 1928.** R. KISSLING. *Chem.-Ztg.* 53, No. 43, *Fort-schrittsber.*, 61-8(1929). E. H.

**Sulfur compounds in pressure-cracked naphtha and cracked naphtha sludge.** D. S. MCKIRTRICK. *Ind. Eng. Chem.* 21, 585-92 (1929).—From a naphtha derived from the cracking of a fuel oil from Midway crude oil (California), thiophene and its 2-Me, 3-Me, 2,3-dimethyl, 3,4-dimethyl, 2-Et and 3-Et derivs. were isolated in the form of their mercurichloro compds. These compds. were obtained from that portion of the naphtha which boiled below 160° (cf. C. A. 22, 2459). The acid sludge obtained from the sulfuric-acid treatment of the naphtha yielded two compds. of unknown structure. They were apparently absent in the untreated oil. They contain 8 and 11 carbon atoms, b. 162-8° and 229-30°, and have  $n$  1.468 and 1.486, resp. The d. of the first compd. is 0.900. Their chem. and phys. properties indicate that they are cyclic sulfides. The lower-boiling substance forms two compds. with  $\text{HgCl}_2$ ,  $(\text{C}_8\text{H}_{13}\text{S})_2 \cdot 7\text{HgCl}_2$ , m. 147.5-8.0°, and  $\text{C}_8\text{H}_{13}\text{S} \cdot 3\text{HgCl}_2$ , m. 130-0.5°. (The high mol. wts. do not permit the differentiation between straight-chain and cyclic compds.). Under the same conditions of prepn.,  $\text{Bu}_3\text{S}$  and iso- $\text{Bu}_3\text{S}$  form  $\text{Bu}_3\text{S} \cdot 2\text{HgCl}_2$ , m. 110-0.5°, and (iso- $\text{Bu}_3\text{S}) \cdot 5\text{HgCl}_2$ , m. 131.5-2.0°. The following compds. were also prepd.:  $\text{Et}_3\text{S} \cdot 3\text{HgCl}_2$ , m. 131.5-2.0°;  $\text{Pr}_2\text{S} \cdot 2\text{HgCl}_2$ , m. 126.5-7.5°; and allyl sulfide tetrabromide (di-2,3-dibromopropyl sulfide), m. 94-5.5°.

I. M. LEVINE

**Study of the double bonds in petrolatums.** R. POGGI. *Giorn. chim. ind. applicata* 10, 601-5 (1928).—The method of Rosenmund, which depends on the action of  $\text{C}_6\text{H}_5\text{N} \cdot \text{H}_2\text{SO}_4 \cdot \text{Br}_2$  as the brominating agent, was found to be much more reliable for the detn. of unsatn. than the Hanus method. The unsatn. of various commercial petrolatums was studied because this is important in detg. the value as a stabilizer in storing smokeless powder. The colorimetric method of Angeli (C. A. 4, 2457) for unsatn. was compared with the above methods. In this method the vaseline sample, about 1.5 g., is dissolved in 9 cc.  $\text{CHCl}_3$ , and 50-80 mg.  $\text{C}_6\text{H}_5\text{NO}$  added through a stoppered buret into a closed air-tight vessel, and placed in the dark. As the reaction proceeds the color changes from a blue-green eventually to yellow, depending on the extent of the reaction. Only slightly colored vaselines can be tested. A vaseline showing only 0.7 mg.  $\text{Br}_2$  addition (Rosenmund) remained blue-green 17 days; one showing 8.1 mg.  $\text{Br}_2$  addn. changed to yellow-green in 4 days; one showing 95.0 mg.  $\text{Br}_2$  addn. changed to yellow in 1 day. A. W. C.

**Some properties of fuller's earth and acid-treated earths as oil-refining adsorbents.** C. W. DAVIS AND L. R. MESSER. *Am. Inst. Mining Met. Eng. Tech. Pub. No. 207*, 18 pp. (1929).—"Acid-treated" earths include those products from the partial decompn. of mineral matter by acid which are equal to or more efficient than an untreated fuller's earth for bleaching mineral oil by the "contact" process. This process consists in heating and agitating the oil with finely divided adsorbent that is subsequently removed by filtration. The results of exptl. work with 17 earths are given. Most fuller's-earth deposits are sedimentary; some deposits in Arkansas and in Massachusetts are exceptions. Slides show California earths, which, when acid-treated, produce com. adsorbents that may be divided into 2 classes: those which show the texture of volcanic ash and those too fine-grained to exhibit a characteristic texture. The chem. compns. of fuller's earths and of earths from which oil-bleaching adsorbents may be prepd. are widely divergent, but a high silica-alumina ratio is characteristic of them. Identification tests on fuller's earth are applicable only to materials from certain districts. Swelling in  $\text{H}_2\text{O}$  is apparently peculiar to earths that become good adsorbents by acid treatment, but earths that swell do not always become good oil bleachers. The concn. of  $\text{H}_2\text{SO}_4$  in the water-acid soln. that produced the best adsorbents ranged from 15 to 20% by wt. Higher concns. are detrimental. Analyses of several adsorbents and clays are tabulated and several graphs shown.

W. H. BOYNTON

**Progress in the field of mineral oils.** MAX NAPHTALI. *Z. angew. Chem.* 42, 508-18 (1929).

E. H.

**Artificial aging of mineral oils. II.** F. EVERS AND R. SCHMIDT. *Wiss. Veröffentlich. Siemens-Konzern* 7, 343-71 (1928).—Lab. aging tests of insulating oils are made by heating the oil at 120° in a closed tube filled with  $\text{O}_2$ , after previously mixing the oil with silica gel impregnated with a catalyst. Sixty g. of gel is stirred with 44.48 g. of  $\text{FeSO}_4$  crystals dissolved in  $\text{H}_2\text{O}$  and, after oxidation has taken place, the mass is soaked in 100 cc. of  $\text{H}_2\text{O}$  contg. 14.13 g. of  $\text{NH}_4$  heptamolybdate, dried and heated at 410° until  $\text{NH}_3$  and  $\text{H}_2\text{SO}_4$  are expelled. This amt. is sufficient for 15 g. of oil. American and Russian oils give curves of the form  $y = c \log x + k$ , when the  $\text{O}_2$  absorption is plotted against the time;  $c$  and  $k$  vary with temp., compn., phys. character and proportion of catalyst used. Oxidation is apparently confined to the constituents with a double linking, and the presence of unsatd. fatty acids appears to have no influence on the rate of oxidation.

B. C. A.

**The Estonian combustible shales.** J. GELLER. *Arch. Warmewirt.* 9, 345-9

(1928).—The location, seams, winning, compn. and uses of these shales are described. Of 300,000 tons produced yearly, railroads consume nearly half, and cement works, carbonization plants and other industries most of the rest.

ERNEST W. THIELE

**Goudron number of oils.** LESZEK HOZER. *Przemysł Chem.* 13, 12-16(1929).—A soln. of 60 cc. of the oil in 100 cc. of light benzine is shaken for 3 mins. with 10 cc. of concd.  $H_2SO_4$  in a graduated cylinder. After standing for 1 hr. the increase in vol. of the acid is read. This increase expressed as a percentage of the oil used is its goudron no. (tar no.). A few drops of water may be added to facilitate the reading of vol. if the mixt. is too dark (cf. Maim, *Chem. Revue* 7, (1905)). This value, which is taken to represent very roughly the amt. of unsatd. bonds, is widely adopted in Russia and to some extent also in Poland in the most general classification of petroleum products. It is very misleading, however, for the characterization of oils because it cannot give consistent results, and is not suitable as an analytical const. for evaluating and comparing oils. Only the curve representing the effect of concn. of  $H_2SO_4$  on the goudron no. can serve for characterizing oils.

A. C. ZACHLIN

**Steam-turbine oils.** H. STÄGER AND J. P. BOHNENBLUST. *Arch. Wärmewirt.* 8, 349-56(1927); 9, 59-63(1928).—Steam-turbine oils were kept at  $112^\circ$  in open containers for 1000 hrs., and a portion was treated with fuller's earth. The original oils, the oxidized oils and the filtered oxidized oils were studied, as well as some oils which had been used in turbines. The film-forming properties were detd. by measuring the angle of contact with steel, cast iron, bronzes and white metals by the method of Dallwitz-Wegener (*C. A.* 20, 3076). The first 2 show the highest (poorest) contact angle. The oxidized oils are better than the original, but when filtered, the angle of contact is little better than in the original state. The viscosity and compn. of the oils have no connection with the contact angle. The surface tension against water and solns. was measured by the drop-wt. method. Oxidation reduces this value greatly, especially with caustic and soda solns.; NaCl and  $H_2SO_4$  solns. behave nearly like water. Emulsibility was detd. by admitting steam to an oil-water mixt. and studying the sepn. The fresh oils all sepd. well; in general, the oxidized oils emulsified badly, either with water or caustic or with both. In all tests, used oils behaved like the oxidized oils; sometimes they were more oxidized than the exptl. oils.

ERNEST W. THIELE

**The testing of steam-turbine oils.** H. STÄGER. *Arch. Wärmewirt.* 9, 383-4(1928).—A review of Swiss work, concluding with the specifications of the Brown Boveri Co. for these oils. Details of the aging test are given.

ERNEST W. THIELE

**Investigations on steam-turbine oils.** H. STÄGER. *Congrès intern. essai des matériaux* 1927, II, 457-69(publ. in 1928).—Tests are usually made on oils as delivered but their quality as lubricants may alter greatly with use; hence tests are necessary to det. the character of the changes. Stäger assumes that the smaller the angle of contact of oil with metal, the greater the "wettability" and the greater the adhesion; but there are considerable differences which depend upon the compn. of the metals in use, which are of three principal kinds: (1) steel and cast iron; (2) brass and bronze; and (3) white metal. For a bearing metal, a well-marked heterogeneity is necessary, and in the process of "running in," a fine relief surface is produced, which assists the spreading of the lubricant. S. studied fourteen oils after several thousand hrs. of use and also after 1000 hrs. of heating in air at  $112^\circ$ . The two sets are quite similar. There is a marked change in the adhesion, which is due to the production of polar groups in the mol. and not to increase in viscosity. The adhesion is weakest for steel, better for bronze, and best for white metal; it is not impaired when Sn is replaced by Pb. By treating the aged oils with fuller's earth, which removed the polar compds., the wettability was decreased very greatly. Some substances of high wettability are not acidic. Foam and emulsion formation is not detd. by viscosity and surface tension, but rather by substances on the interfaces, which are foam-formers. The max. foam production occurs when the mols. of the dispersion medium and of the foam former are in equal numbers. Neutral salts are not likely to injure oils but alkalies are.

EUGENE C. BINGHAM

**Adaptation of the stability test to plant and field control (asphalt).** P. HUBBARD AND F. C. FIELD. *Asphalt Assoc. Circ.* No. 49, 51-5(1929).

E. I. S.

**"Braunkohlenbenzin" or "Braunkohlenbenzol?"** MALLISON. *Z. angew. Chem.* 42, 427-9(1929).—Benzine has no precise meaning, while benzene (or benzol) has. The volatile liquid obtained partly from the gases from lignite distn., partly from the light oil from lignite tar, and sold as a motor fuel, has been called by both names in the title as well as by fanciful terms. In spite of its antiknock properties, it should be called "-benzin" and not "-benzol" because it certainly contains far less than 50% of aromatic hydrocarbons.

AUSTIN M. PATTERSON

**A study of auto-ignition temperatures. III. (a) Mixtures of pure substances;**



(b) **gasolines.** HENRY J. MASSON AND WILLIAM F. HAMILTON. *Ind. Eng. Chem.* 21, 544-9(1929); cf. *C. A.* 22, 3567.—Measurements were made of the auto-ignition temps. of a no. of mixts. having a wide range of characteristics. Curves are given showing the relationship between compn. and auto-ignition temp. PbEt<sub>4</sub> raises or lowers the auto-ignition temp. toward the optimum. A working hypothesis is advanced for correlating auto-ignition temps. and knock.

FRANK V. JOHNSON, JR.

**Study of the phenomena of the combustion of gas mixtures by recording the pressures.** M. AUBERT AND A. PIGNOT. *Chimie & industrie Special No.*, 231-3(Feb., 1929); cf. *A., P.*, and Villey, *C. A.* 22, 863.—The app. used, consisting essentially of a combustion cylinder, a manometer and a recording device, is described. The results of expts. carried out on cyclohexene agree with those of the previously reported expts. and show that: (1) when the mixt. is enriched in hydrocarbon, the curve representing the variations of max. pressure as a function of the compn. of the mixt. has a very much flattened max.; (2) for each hydrocarbon in admixt. with air, there are limiting compns. of the mixt. between which combustion is particularly active: the time clapsing between the beginning of the increase in pressure and the max. elongation of the manograph is very short; on the other hand, the retardation of inflammation increases fairly regularly with the proportion of combustible gas.

A. PAFINEAU-COUTURE

**Contribution to the study of the pressures of combustion.** M. AUBERT AND A. PIGNOT. *Ann. combustibles liquides* 3, 591-611(1928).—As the volumetric compression ratio is increased from 3.87 to 8.28, the max. adiabatic auto-ignition pressure of cyclohexane:air mixts. (1:12 by wt.) rises, the duration of inflammation increases (0.0025 to 0.0036 sec.), the ratio of the max. ignition pressure to initial pressure decreases (5.3 to 2.83 kg./sq. cm.), and the lag of inflammation decreases (0.054 to 0.0021 sec.). At the volumetric compression ratio 8.28, the lag and duration of inflammation increase (0.0021 to 0.023 sec. and 0.0036 to 0.0053 sec., resp.) as the temp. is decreased from 100° to 63°. With C<sub>6</sub>H<sub>14</sub>, cyclohexane and C<sub>6</sub>H<sub>6</sub> the auto-ignition pressures reach maxima of about 69, 63 and 56 kg./sq. cm., resp., for the respective air-fuel ratios 9.24:1, 6.33:1 and 6.28:1. With the air:fuel ratios 16.1:1 for C<sub>6</sub>H<sub>14</sub>, 15.6:1 for cyclohexane and 14:1 for C<sub>6</sub>H<sub>6</sub> the corresponding durations of inflammation are 0.0033, 0.0032 and 0.0058 sec., resp. Perhaps these differences in inflammation duration may account for the antiknock properties of C<sub>6</sub>H<sub>6</sub>. The effects of antiknock compds. on the duration of the combustion process are given (cf. *C. A.* 22, 2832).

R. E. SCHAAD

**The ultramicroscopy of asphalt and related products.** F. J. NELLENSTEIJN AND J. P. KUIPERS. *Kolloid-Z.* 47, 155 60(1929); cf. *C. A.* 22, 2266.—Further study has been made on asphalts and related products, which confirm previous work. Artificial asphalt from distn. residues of Mexican gasoline, an oxidized portion from these residues, and coal tar were studied. Solvents were C<sub>6</sub>H<sub>6</sub>, CS<sub>2</sub>, PhNO<sub>2</sub>, toluene, nitrotoluene, xylene, nitranisole, furfural and quinoline. In nearly all cases ultramicroscopic particles were easily observed. Best results for artificial asphalt were obtained with CS<sub>2</sub>, but if the surface tension is greater than 24 dynes/cm. at 25° and if asphalt and medium are miscible, the particles are plainly visible. At great diln. natural asphalt gives better ultramicroscopic results than artificial, although addn. of fine inorg. powders to artificial asphalt makes the samples comparable to coal tar. Lampblack with asphalt in soln. (in nitrobenzene, aniline, etc.) gives a good microscopic picture as well as ultramicroscopic.

RAYMOND H. LAMBERT

**Some aspects of hardwood distillation and its products.** M. SCHOFIELD. *Ind. Chemist* 5, 141-6(1929).—Much interesting information on the conditions surrounding the industry and on the various operations involved. Possible new processes and outlets for the products are discussed. A brief review of some of the research work that has been carried out on hardwood distn. and on the activation of the charcoal produced is given. Twelve photographs are included.

E. G. R. ARDAGH

**Pyrogenous decomposition of wood tar in the presence of hydrogen and under pressure.** V. N. IPAT'EV AND A. D. PETROV. *Akad. Wiss. Leningrad. Ber.* 62B, 401-7(1929).—Earlier investigation of the pyrogenetic decompn. in the presence of catalysts (Al<sub>2</sub>O<sub>3</sub>, Fe<sub>2</sub>O<sub>3</sub>) of a series of individual compds., which are constituents of wood tar, justified the assumption that the tar, heated with H<sub>2</sub> under pressure even at the relatively low temp. of 440-80°, would give considerable amounts of benzene and aromatic hydrocarbons as the result partly of cracking and partly of the reduction of unsatd. and O-contg. compds. The object of the present work was to study the influence of the conditions on these reactions and to compare the advantages, as regards the formation of the more valuable low-boiling products, of heating with H<sub>2</sub> or of distg. with H<sub>3</sub>PO<sub>4</sub> according to Melamid and Grützinger. Wood tar contains chiefly (1) alcs. (iso-Am, iso-Bu), (2) ketones of the Me<sub>2</sub>CO series and cyclic (satd. and unsatd.) ketones, (3)

various phenols and their mono- and polyethers, and (4) acids (palmitic, abietic, etc.). Alcs. have been shown to be dehydrated to  $C_2H_4$  hydrocarbons, which then condense to satd. (hexane, heptane), unsatd. (amylene, hexylene), and polymethylene hydrocarbons. In the presence of  $H_2$  there must also be at least a partial conversion into hydrocarbons of the paraffin series. Ketones with open chains are reduced to the corresponding hydrocarbons, and cyclic ketones in the presence of  $H_2$  react in the same way, as shown with cyclohexanone which, when heated for 24 hrs. at  $420-40^\circ$  with  $Al_2O_3 + Fe_2O_3$  and  $H_2$  under pressure, gives cyclohexane in good yield. Unsatd. cyclic ketones in the presence of  $H_2$  also give phenols besides hydrocarbons; on short heating, the only difference, as compared with heating without  $H_2$ , is that the total yield of liquid products is increased, whereas longer heating results in a decreased yield of phenols because of reduction (homoisophorone heated 2 hrs. at  $460-80^\circ$  with  $H_2$  gave 40% of phenols). This reduction of the phenols (uni- and bivalent) and their ethers (*o*- $C_6H_4(OEt)_2$ ) heated for 4 hrs. at  $430^\circ$  under  $H_2$  that gave 50% of liquid products (chiefly  $PhOH$  and  $C_6H_6$ ) is a distinct advantage over the  $H_3PO_4$  distn. method, in which the univalent phenols remain unchanged and the bivalent phenols are completely decomposed. The acids with  $Al_2O_3$  at  $440-60^\circ$  under  $H_2$  are easily decomposed, yielding chiefly very low-boiling hydrocarbons almost completely insol. in  $H_2SO_4$ . The high-boiling fractions of the wood oil, especially the pitch, may contain, as shown by Benson, decompn. products of abietic acid (retene, chrysene, picene); these homologs of phenanthrene undoubtedly decompose in the same way as phenanthrene itself; in fact,  $C_{10}H_8$  and alkynaphthalenes were identified in the products of the pyrolysis of wood tar (in the absence of  $H_2$  at atm pressure,  $C_{10}H_8$  is formed only at temps. of bright redness). The products of pyrolysis lack the peculiar unpleasant odor of wood tar; the high-boiling fractions dissolve in part in  $H_2SO_4$  but do not darken on standing and can be used as lubricants and for other purposes. Both Kahlebaum's wood tar and a product richer in pitch from the "Veskolies" Trust were investigated. The results showed that on heating with  $H_2$  under pressure the total yield of liquid products is larger than on distg. with  $H_3PO_4$ ; the % of hydrocarbons and low-boiling fractions is higher; and the % of unsatd. compds. is materially smaller than in cracking without  $H_2$ . The conditions for obtaining the largest possible yield of liquid products are a temp. of  $440-60^\circ$  and an excess of  $H_2$  in the presence of catalysts. C. A. R.

**Motor fuels and other products from the cracking of wood tars.** JACQUE C. MORRELL AND GUSTAV EGLOFF. *Ind. Eng. Chem.* 21, 537-42 (1929).—The possibilities of the utilization of waste-wood products, particularly tars, from the destructive distn. of wood, by conversion into motor fuels and other products by the cracking process are shown by means of data obtained by cracking three types of wood tar. These data indicate that, in general, the products obtained from pine tar are most suitable for solvents and paint thinners. Hardwood tar may be utilized for the manuf. of low-boiling tar acids and phenols; Douglas-fir tar produces a highly antiknock motor fuel.

O. A. NELSON

**Present status of our knowledge of the composition of spirits of turpentine.** (MLLE.) MARCELLE BARRAUD. *Bull. inst. pin* 1929, 93-7.—A brief review of the compn. of spirits of turpentine obtained from different species of trees, with bibliography of 23 references.

A. PAPINEAU-COUTURE

**A technical study of the distillation of turpentine from Spanish pine.** MARIANO T. LACRUE. *Bull. inst. pin* 1929, 2-10.—The effects of varying quantities and temps. in the steam distn. of turpentine to obtain rosin and oil of turpentine are studied by means of graphs and tables. The conditions that diminish the yield of oil, given in the order of decreasing importance are: (1) the use of quantities of water smaller than those of the oil to be obtained; (2) the use of low temps., especially low final temps.; and (3) the working of large quantities of crude turpentine. MERRILL W. SEYMOUR

**Effect of cathode rays on hydrocarbon oils (SCHOEFFLE, CONNELL) 3.** Increasing the value of low-temperature carbonization tars (STÉMART) 21. Hydrogenation of pitch (Hugel) 21. Filter and gravity separator for oil and water, etc. (Brit. pat. 299,648) 1. Device for separating oil, water and air (U. S. pat. 1,714,825) 1. Scrubber for preventing loss of gasoline from storage tanks (U. S. pat. 1,715,112) 1. Light oils from solid or liquid hydrocarbons (Brit. pat. 299,861) 21. Hydrogenation of coal, tar, mineral oils, etc. (Fr. pat. 651,891) 21.

**Composition for purifying and clarifying crude petroleum oils.** DONALD E. WOODS and EARL J. NEELE (to Oil-O-Treat Co.). U.S. 1,715,217, May 28. A mixt. suitable

for treating Texas crude oil is formed of a heavy petroleum fraction such as gas oil about 68,  $H_2SO_4$  about 10, a fatty oil such as "redoil" about 14 and crude phenol about 8%.

**Distilling heavy petroleum distillates and residues to produce gasoline.** ALBERT E. MILLER (to Sinclair Refining Co.). U. S. 1,714,097, May 21. An app. is described in which the heavy oil used is heated in a body at about 300–350° in contact with a body of fuller's earth; vapors are taken off and refluxed, gasoline components are led off from the refluxing operation, reflux condensate is stripped of light components, and the stripped condensate residue is returned to the first-mentioned body of oil.

**Distilling hydrocarbon oils and treating them with gases containing hydrogen.** WILLIAM J. KNOX (to Petroleum Conversion Corp.). U. S. 1,715,239, May 28. A liquid hydrocarbon material such as a heavy petroleum distillate is heated in a treating chamber by contact with heated H-contg. gases after a preliminary partial fractionation by heat exchange with gases and vapors from the chamber; the vapors and gases from the fractional distn. are passed directly into the treating chamber. Various structural details are described.

**Dewaxing hydrocarbon oils.** ERNEST B. PHILLIPS and JAMES G. STAFFORD (to Sinclair Refining Co.). U. S. 1,714,133, May 21. An app. is described having an insulated tank with cooling coil and agitator and to which the oil to be dewaxed is supplied together with a finely divided solid material such as fuller's earth. A filter press receives material from this tank and serves to sep. oil from wax and added solid material; the wax is sepd. from the added solid by settling of the latter; the solid material is passed to a drier and dried for reuse.

**Conversion of hydrocarbon oils into lighter products.** MYRON W. COLONY (to Petroleum Conversion Corp.). U. S. 1,715,341, May 28. A mass of inert refractory heat-absorbing material is heated to a temp. above that required for the oil conversion; a carrier gas such as steam and hydrocarbon gas is passed over the material and into a reaction chamber contg. hydrocarbon material such as oil vapor undergoing treatment to effect conversion under substantially uniform temp. conditions; motor fuel is obtained from the mixed gases and vapors leaving the reaction chamber. An arrangement of app. is described.

**Cracking hydrocarbon oils.** EUGENE C. HERTHEL and HARRY L. PELZER (to Sinclair Refining Co.). U. S. 1,714,090, May 21. A body of oil is maintained at a cracking temp. and vapors are taken off under pressure; oil from the body is circulated through heating tubes externally exposed to heating gases and then back to the body; a bed of finely divided filtering material such as fuller's earth is maintained in the path of the circulating oil; a gaseous heating medium such as uncondensed hydrocarbon gases heated to a cracking temp. is introduced into the body of oil beneath the bed of finely divided filtering material. Various features of the app. are described. U. S. 1,714,091 specifies circulating a charge of oil in a pressure still from a bulk supply drum through heating tubes back to the bulk supply drum and maintaining a body of finely divided absorbent material such as fuller's earth on a support through which the oil passes in its circulation; the oil is heated to a cracking temp. in the heating tubes, vapors including the desired product are taken off under pressure, and the body of absorbent material in the bulk supply drum is subjected to agitation. Various details of app. are described. Cf. C. A. 23, 3078.

**Cracking hydrocarbon oils in the liquid phase.** STANDARD DEVELOPMENT CO. Brit. 299,683, Sept. 22, 1927. In effecting cracking in app. of the "tube and drum" type in which pairs of digestion drums are employed so that one may be cleaned while the other is in use, the drum which has just been cleaned is filled with heated oil before diverting the stream of oil passing to the drum still in use. Various structural details of the app. are described.

**Cracking hydrocarbon oil vapors in contact with mercury vapor as the sole heating agent.** C. P. TOLMAN. Brit. 299,957, Sept. 17, 1927. An arrangement of app. is described.

**Cracking oil.** ALFRED SCHWARZ (to Coal and Oil Products Corp.). U. S. 1,714,453, May 21. A mass of carbonaceous material such as coal or coke is heated to an oil-cracking temp. and waste gases produced in such heating are used to heat a body of oil to a distg. temp.; vapors are sepd. from the body of oil and unvaporized oil from the body is introduced into the mass of carbonaceous material to effect vaporization; the resulting vapors are passed downwardly through zones of increasing temp. to crack them, resulting vapors and gases are fractionated, and heavier condensed fractions are conducted to the oil body for retreatment. U. S. 1,714,454 specifies an oil-cracking app. suitable for carrying out processes such as described in U. S. 1,714,453, and in which a

gas producer to which steam is supplied serves to furnish the heated carbonaceous material for use in the oil cracking.

**Apparatus for cracking hydrocarbon oils.** WILLIAM R. HOWARD (to Universal Oil Products Co.). U. S. 1,715,066, May 28. A stream of oil is heated to a cracking temp. as it flows through a pipe coil and then passes to a compartment of an enlarged reaction zone, which is connected with a dephlegmator; reflux condensate is collected in another compartment of the enlarged reaction zone and heat is applied to the second-mentioned compartment only of the reaction zone. Pressure is maintained in the app. and various other structural details are specified. Cf. C. A. 23, 2028.

**Apparatus for cracking hydrocarbon oils.** GEORGE W. WALLACE. U. S. 1,714,198, May 21. A closed chamber filled with refractory material such as fire brick or C has a free space at its top into which a complete combustion burner leads; an oil inlet pipe passes through the burner and terminates with a spray nozzle within the space mentioned; volatile products are led off from the bottom of the chamber and may be passed to a dephlegmator.

**Heating system for heating oil-cracking stills by combustion gases.** JOSEPH F. DONNELLY. U. S. 1,714,855, May 28. Various structural details are specified.

**Preventing corrosion of condensers of oil-cracking apparatus.** JACQUE C. MORRELL and HARRY P. BENNER (to Universal Oil Products Co.). U. S. 1,715,095, May 28.  $\text{NH}_3$  soln. is added to the vapors before they enter the condenser to neutralize HCl present in the vapors leaving the cracking app. An arrangement of app. is described.

**Treating hydrocarbon residues, etc.** STANDARD DEVELOPMENT CO. Brit. 299,925, Aug. 9, 1927. Heavy products such as cracking coal tar or pressure-still tar, which ordinarily form a carbonaceous sediment on standing, are treated with "acid oil" (prepd. by dilg. with water the acid sludge formed in treating petroleum oils with acid) to ppt. the sediment. An inert material such as coke in granular form may be added to facilitate filtering and the oil is sepd. and may be used for fuel. The C residue may be extd. with a solvent such as  $\text{CS}_2$  to remove oil and asphalt and the C remaining may be used for making electrodes or as a filler with rubber compns.

**Separating hydrocarbons, etc., by fractional solution.** W. MERCK, K. MERCK, L. MERCK, W. MERCK and F. MERCK (trading as the firm of E. Merck). Brit. 300,266, Nov. 11, 1927. Constituents of lubricating oils, lignite tar oils, etc., are sepd. by adding a solvent liquid such as EtOH, PrOH, or other alc., or  $\text{CCl}_4$  of such character and at such a temp. that a homogeneous mixt. is formed, and then cooling in stages so that the different constituents are pptd. fractionally.

**Hydrocarbons and oils.** RAOUL M. BERLINE. Fr. 652,505, Feb. 11, 1928. Hydrocarbons and oils which have been purified by treatment with  $\text{H}_2\text{SO}_4$  are neutralized with gaseous  $\text{NH}_3$  instead of the usual NaOH to avoid formation of emulsions.

**Separating oils from emulsions.** STANDARD OIL DEVELOPMENT CO. Fr. 652,206, Apr. 4, 1928. Oils are sepd. from their emulsions with water by adding not more than 5% by wt. of a sulfonic acid sol. in water formed by the action of concd.  $\text{H}_2\text{SO}_4$  or oleum on a petroleum lubricating oil.

**Distilling mineral oil.** ARTHUR E. PEW, JR., and HENRY THOMAS (to Sun Oil Co.). U. S. 1,714,811, May 28. A distn. system is described in which Hg vapor is utilized for heating the oil under treatment. U. S. 1,714,812 relates to app. for the same purpose.

**Retort treatment of oil-bearing shales.** MILON J. TRUMBLE. U. S. 1,713,794, May 21. In operating a battery of retorts for treating oil-bearing shale with superheated steam, the battery is divided into sub-groups each including a plurality of retorts; each group is provided with a steam superheater. Each fresh quantity of steam is successively passed through the retorts of one sub-group, through an oil-catcher, through a superheater, and forward through the retorts of another sub-group, and finally into a vapor main. Various other details are described.

**Furnace for pyrogenous decomposition of crude oil.** V. E. GRUM-GRZHUMILO. Russ. 5739, June 20, 1928. In a metallic cylindrical vertical fire box the bell-shaped top is heated by a direct contact of a flame, which, being reflected, leaves the furnace through openings provided in the lower part. At a certain distance from the outer side of the bell is a bell-shaped cover, the rims of which are immersed in water. The oil enters through an opening in the center of the second bell, drops on the hot first bell, whereby it is decomposed into hydrogen and coke. H is withdrawn through an opening in the second bell; the coke is removed from the first bell by a mechanical scraper and drops into the water in the gas trap, from where it is removed by usual methods.

**Lubricating oils.** SWAN, HUNTER & WIGHAM RICHARDSON, LTD., and HORACE J. YOUNG. Fr. 651,968, Mar. 30, 1928. Waste lubricating oils are recovered by heating

them in contact with Zn, Al, Mg, or alloys thereof, or alloys of Ca and (or) Na with the above.

**Liquid fuel for internal combustion engines.** ASIATIC PETROLEUM CO., LTD., A. C. EGERTON and C. H. BARTON. Brit. 300,156, Aug. 6, 1927. "Knocking" of hydrocarbon fuels is checked by adding about 0.5–1.5% of compds. such as oleate, naphthenate, or "sulfonate" of Na, K, Li, Rb or Cs. The "sulfonate" may be derived by treating acid-treated petroleum fractions with KOH or  $K_2CO_3$ .

**Mixed liquid fuel suitable for internal combustion engines.** GRANT HAMMOND (to Fuel Development Corp.). U. S. 1,713,530, May 21. A light satd. liquid hydrocarbon fuel such as gasoline is mixed with 1–10% of a mixt. formed from com. EtOH 70, butanol 20 and glycerol 5 parts, in order to prevent "knocking." Cf. C. A. 23, 1248.

**Motor fuel.** EUPHIME V. BERESLAVSKY (to Ethyl Gasoline Corp.). U. S. 1,713,589, May 21. Diaminomesitylene or a similar compd. is added to fuels such as gasoline or kerosene in order to prevent "knocking."

**Gasoline from solid bituminous material.** MILON J. TRUMBLE. U. S. 1,714,963, May 28. A condensate from the distn. of solid bituminous material such as coal, lignite or shale is subjected to cracking in a cracking still; hot C from the cracking is recovered in a receptacle sep. from the still, and superheated steam and hot vapors from the cracking process and C receptacle are passed through a body of solid bituminous material for distg. volatiles from it; vapors thus formed are dephlegmated and the condensate from the dephlegmation is delivered to the cracking process, and uncondensed vapors from the dephlegmation are passed to a condenser. An arrangement of app. is described.

**Air-cooled floating roof for oil storage tanks.** CHARLES F. H. BOHNHARDT. U. S. 1,714,207, May 21. Structural features.

**Dehydrating attachment for oil flash testers.** SAMUEL E. CALVIN. U. S. 1,714,765, May 28. A closed-cup flash tester is provided with an inner receptacle for retaining a dehydrating agent such as  $CaCl_2$ , which is arranged to be in contact with vapors of the oil being tested.

**Automatic fire extinguisher for oils.** A. V. TIKHONENKO. Russ. 5711, June 30, 1928. In a tank a foam fire extinguisher is placed on a float. A plug of a low-melting alloy releases a hammer by which the acid container is broken and the foam is uniformly distributed over the surface of the oil.

**Oxidized asphaltic material.** LESTER KIRSCHBRAUN (one-half to Frank L. Belknap). U. S. 1,715,069, May 28. In prepg. a product which is of ductile rubber-like properties, petroleum residuum is mixed with air and the mixt. is passed through a long passage such as a pipe coil in which its temp. is gradually raised (suitably to about 200–350°); it is thence passed into an agitated bulk supply of the oxidation end product whence liquid oxidized asphalt is withdrawn. An app. is described.

**Asphalt emulsions.** ARTHUR L. HALVORSEN and PIERCE M. TRAVIS (to Emulsion Process Corp.). U. S. 1,714,982, May 28.  $Na_3PO_4$  not exceeding 0.75% is used for effecting emulsification of asphalt and water.

**Emulsions of bitumen.** ARNALDO CAROSELLI and HEINRICH HEINZ. Fr. 651,794, Mar. 26, 1928. Asphalts, tars, petroleum residues, etc., are emulsified with Na, K, or  $NH_4$  salts of fatty or resin acids to which org. substances, such as lower alcs. or ketones of the fatty series,  $BzOH$ , or  $PhOH$ , capable of lowering the surface tension between the bitumen and water, has been added.

**Apparatus for reclaiming journal box waste.** EDWIN S. PEARCE (to American Laundry Machinery Co.). U. S. 1,713,711, May 21. Structural features.

## 23—CELLULOSE AND PAPER

CARLETON E. CURRAN

**Cellulose.** CHAS. J. J. FOX. *Artificial Silk World* 2, 269–70(1929).—The importance of micelle size of cellulose in the manuf. and properties of artificial silk.

S. K. FORD

**The adsorption of simple aliphatic compounds by cellulose.** KURT BRASS AND JOSEF K. FREI. *Kolloid-Z.* 45, 244–55(1928).—Formic acid is adsorbed in similar manner by purified cotton, by pure cotton cellulose and by viscose. Formic and acetic acids dissolved in  $H_2O$  and in acetone give similar adsorption curves.  $CH_3ClCO_2H$ ,  $CHCl_2CO_2H$  and  $CCl_3CO_2H$  are adsorbed by viscose in a similar manner. Adsorption by viscose of  $AcOH$ ,  $EtCO_2H$ ,  $PrCO_2H$ , palmitic and stearic acids in  $H_2O$ , acetone and alc. and glycolic, phenylacetic, fumaric, maleic and phenoxyacetic acids in  $H_2O$  was

studied. Palmitic and stearic acids are not adsorbed by cellulose. Adsorption is reversible for the other fatty acids.  $\text{CH}_3\text{O}$  is not adsorbed by cellulose in acetone,  $\text{EtOH}$ , glycol, glycerol or water solns. No relation exists between mol. wt. and adsorption value. Adsorption increases as the dissocn. const. increases. Of aromatic compds., only those which show electrolytic dissocn. are adsorbed. R. H. L.

The selective action of the three hydroxyl groups of cellulose. TADASHI NAKASHIMA AND ICHIRO SAKURADA. *Bull. Inst. Phys. Chem. Research* (Tokyo) 8, 272-6; *Abstracts* 2, 33-5(1929). (In German.)—The reactions in which the OH groups of cellulose take part may be divided into 3 classes, according to whether 1, 2 or 3 OH groups enter the reaction for every  $\text{C}_4$  unit. Of the 3 OH groups of the glucose unit in cellulose, 2 are secondary (2 and 3 positions) and one is primary (position 6). N. and S. attempt to det. whether the mono-*p*-toluenesulfonic ester of cellulose is primary or secondary. Heating for 15 hrs. at  $100^\circ$  with  $\text{N}_2\text{H}_4$  hydrolyzes the ester. The formation of unsatd. compds. and of hydrazine derivs. indicates that the ester is secondary (according to theory of Freudenberg). The dibenzyl ether of cellulose can be converted into tribenzyl ether by dissolving it in  $\text{C}_6\text{H}_5\text{CH}_2\text{Cl}$  and heating with  $\text{Ag}_2\text{O}$ . G. C.

Manufacture of cellulose acetate. HELLE-STAU. *Russa* 4, 513, 515(1929).—A brief outline of the process of manuf. of cellulose acetate. A. PAPINEAU-COUTURE

Effect of aniline on cellulose triacetate. H. LEB. GRAY, T. F. MURRAY, JR. AND C. J. STAUD. *J. Am. Chem. Soc.* 51, 1810-4(1929).—Cellulose acetate (I) is saponified by heating with  $\text{PhNH}_2$  at the b. p. of the  $\text{PhNH}_2$ -I solns.; the decrease in Ac content is apparent after as short a time as 2 hrs. After 25 hrs. heating, the product is insol. in  $\text{CHCl}_3$ - $\text{EtOH}$  or  $\text{Me}_2\text{CO}$ ; after 100 hrs., the Ac content has decreased from 43.9 to 2.3%. The cellulose equiv. agrees approx. with the theoretical value. The decrease in Ac content at  $148$ – $51^\circ$  gives a curve of the same form as that obtained at the higher temp. The sp. rotation, so far as present interpretation permits, does not seem to indicate the possibility of a stereoisomeric change comparable with the mutarotation of the sugars, as suggested by Knoevenagel. The product obtained at  $183^\circ$ , upon reacylation, reverts to a product having the analytical constns. of I. The deesterifying action of  $\text{PhNH}_2$  on I at room temp. is exceedingly slow. C. J. WEST

Solvents and swelling agents for acetylcellulose. AUGUST NOLL. *Seide* 33, 404-10 (1928); cf. *C. A.* 22, 867, 4792.—A detailed survey of 35 compds. used as solvents for acetylcellulose. Phys. properties, flash points, examples for use, trade names and structural formulas are given. H. W. STIEGLER

Allylcellulose. ICHIRO SAKURADA. *Z. angew. Chem.* 42, No. 21, 549-50(1929); *Bull. Inst. Phys. Chem. Research* (Tokyo) 8, 114-7; *Abstract ed.* 2, 18.—See *C. A.* 23, 3081. E. C. M.

Cellulosamine and cellulosaniline. ICHIRO SAKURADA. *Bull. Inst. Phys. Chem. Research* (Tokyo) 8, 265-71, *Abstracts* 2, 31-3(1929). (In German.)—Cellulose mono-*p*-toluenesulfonate (I) (Kita, Nakashima and Sakurada, *C. A.* 22, 684) heated in a sealed tube for 24 hrs. with concd. aq.  $\text{NH}_3$  gives a product corresponding to 1 cellulosamine + 1 cellulose +  $\frac{1}{2}$  I. Prolonged heating does not increase the yield of the amino compd. Heating for 20 hrs. in the same way of I with an  $\text{NH}_3$  soln in abs.  $\text{EtOH}$  satd. at  $0^\circ$  gives after 20 hrs. 2 cellulosamine + 1 cellulose + 2 I. Heating I on a water bath with  $\text{C}_6\text{H}_5\text{NH}_2$  in  $\text{H}_2\text{O}$ -free glycerol gives after 20 hrs. 2 cellulosaniline + 1 cellulose + 2 I, and after 100 hrs. 2 cellulosaniline +  $\frac{1}{2}$  cellulose + 1 I. Washing of the products with  $\text{Cu-NH}_3$  soln. leaves pure cellulosamine,  $\text{C}_{12}\text{H}_{15}\text{O}_2\text{NH}_2$  and cellulosaniline,  $\text{C}_{12}\text{H}_{15}\text{O}_2\text{NHPH}$ . G. CALINGAERT

Benzyl ether of cellulose. TADASHI NAKASHIMA. *Bull. Inst. Phys. Chem. Research* (Tokyo) 8, 261-4(1929); *Abstracts* 2, 31 (1929). (In German.)—Cotton paper is dissolved in 40-50%  $\text{NaOH}$ , and then treated with 2 mols. of  $\text{C}_6\text{H}_5\text{CH}_2\text{Cl}$ , dissolved in  $\text{C}_6\text{H}_6$  or  $\text{C}_6\text{H}_5\text{Me}$ . A quant. yield of cellulose dibenzyl ether is obtained. The prepn. of higher ethers is more difficult. Alkali cellulose from a 10-20%  $\text{NaOH}$  soln. gives a product contg. only  $\frac{1}{2}$  benzyl group per  $\text{C}_4$ . By extg. the unchanged cellulose with  $\text{Cu-NH}_3$  soln. a residue of monobenzyl ether is obtained. Both ethers are sol. in  $\text{CHCl}_3$ ,  $\text{C}_6\text{H}_6$  and  $\text{CCl}_4$ , and insol. in  $\text{Et}_2\text{O}$ ,  $\text{EtOH}$  and  $\text{H}_2\text{O}$ . G. CALINGAERT

Homogeneous standard viscose with high content of pure cellulose. WILHELM A. DYER. *Seide* 34, 129-32(1929).—The needs and methods are discussed. H. W. S.

The penetration of wood by liquids. H. WYATT JOHNSTON. *Pulp Paper Mag. Can. International No.*, 342-4(Feb., 1929).—A brief summary of work carried out, chiefly on jack pine, on the penetration of liquids under various conditions. Though the results in themselves are probably of little strictly chem. interest, they may find considerable practical application in the sulfite pulping process. A. P.-C.

Adsorption of gases and vapors by wood. LLOYD M. PROCTOR. *Pulp Paper Mag.*

**Can. International No., 344 (Feb., 1929).**—The large mass of the gas contained in the wood was found to have the same compn. as air, and to be simply filling the cavities; the portion of gas obtained after the gas filling the cavities has been removed is actually adsorbed on the walls of the wood structure and has not the same compn. as air, *i. e.*, it is selectively adsorbed. The adsorption of vapors was studied by means of a quartz spring balance which permitted of measuring differences in wt. on a 0.15-g. sample to an accuracy of 0.3%. The equil. values throughout a wide range of temps. for vapor pressures ranging from 0.1 mm. to the satn. value were measured. At high temps. the equil. value is completely reversible, while at low temp. an apparent hysteresis is noticed; this is most pronounced when the sample has been subjected to excessive drying, but even then a truly reversible value may be obtained. A. P.-C.

**Method of testing clay, talc and agalite.** D. D. UONG. *Paper Trade J.* 88, No. 11, 55-6(1929).—A description of the proposed official methods of the Technical Assoc. of the Pulp and Paper Industry. A. PAPINEAU-COUTURE

**Moisture content of English coating clays.** R. M. COBB and DONALD V. LOWE. *Paper Trade J.* 88, No. 11, 56-7(1929).—Clay received in America with a moisture content above 9% cannot have picked up H<sub>2</sub>O in crossing the Atlantic, because clays dry out in an atm. of 100% relative humidity to a moisture content of 9% or less. No injury to coating clays results if they are heated to 105° to drive off all H<sub>2</sub>O. The difference between the H<sub>2</sub>O of wet and previously dried clays at the same relative humidity results from drying out of the capillaries and increasing the radius of curvature of the liquids in the capillaries. A. PAPINEAU-COUTURE

Effect of cathode rays on paper (SCHOEFFLE, CONNELL) 3. Proposed method for testing casein (MILHAM) 18. Acylation of multivalent ether-alcohols (Fr. pat. 652,383) 10. Printing ink suitable for use on rubber, celluloid, etc. (U. S. pat. 1,715,209) 26. Emulsions for use as detergents [in paper industry] (Brit. pat. 299,817) 18.

**Saccharifying cellulose.** INTERNATIONAL SUGAR & ALCOHOL CO., LTD. Brit. 299,844, Nov. 2, 1927. In a diffusion treatment of cellulosic material with HCl, the material is pre-mashed in a mixer with part of the total acid used and then transferred to the diffuser. Proportioning of the acid is so regulated that a temp. of 25-30° is developed in the diffuser. An acid soln. of partially hydrolyzed cellulose from a previous operation may be used for the pre-mashing. Cf. C. A. 22, 2680.

**Cellulose derivatives and products resembling cork.** I. G. FARBERIND. A.-G. Brit. 300,207, Nov. 8, 1927. Products resembling cork are obtained by treating cellulose or a cellulose compd. still contg. at least one reactive OH group with one or more chlorides of an "estolidic acid" and one or more chlorides of higher aliphatic acids or derivs., *e. g.*, cellulose, lauryl chloride, PhCl, polyricinyl chloride and pyridine are heated together at 125-30° for 90 mins. The product may be molded under pressure while heated. Dyes, fillers, etc., may be added.

**Solvent for nitrocellulose.** LOUIS E. CLEMENT (to DuPont-Pathe Film Mfg. Corp.). U. S. 1,713,512, May 21. A soln. suitable for making films, artificial silk, etc., is formed of nitrocellulose with a solvent comprising anhydrous EtOH 80 and pure acetone 20 parts by volume.

**Softeners for cellulose-ester compositions.** E. I. DUPONT DE NEMOURS & Co. and NOBEL INDUSTRIES, LTD. Brit. 300,157, May 5, 1927. Coconut oil is treated to form a product contg. mixed glycerides of the oil acids and acetic, formic or propionic acid. In treating cellulose acetate, the softener is used with another solvent softener such as triacetin.

**Solvent for acetylcellulose.** LOUIS E. CLEMENT (to DuPont-Pathe Film Mfg. Corp.). U. S. 1,713,997, May 21. A solvent comprising equal parts by vol. of pure acetone and anhyd. EtOH is used for making films, artificial silk or other products.

**Recovery of camphor.** RICHARD VAN REES. Fr. 652,009, Mar. 30, 1928. Camphor is recovered particularly from waste celluloid by decomposing the latter with alkali hydroxide and distg. the liberated camphor with steam, the 2 operations being combined by passing steam up through the celluloid while a soln. of hydroxide, *e. g.*, 20% NaOH, is passed down.

**Artificial silk.** FR. KÜTTNER A.-G. Fr. 650,848, Mar. 14, 1928. The cakes of artificial silk obtained by "pot" spinning are flattened out before rinsing. The original shape of the cake may be restored before further treatment. Cf. C. A. 23, 3099.

**Artificial silk.** F. KÜTTNER A.-G. Brit. 300,131, Nov. 5, 1927. Flattened cakes of artificial silk made by the centrifuge spinning process as described in Brit. 287,097 (C. A. 23, 530) are dried before the threads are unwound and reeled or spooled.

**Artificial silk.** LA SOIE DE CHATILLON (Soc. anon. Italiana). Fr. 652,035, Mar. 2, 1928. The winding of the finished or half finished thread during or after spinning is carried out so that the bundles of thread are crossed, leaving intervals between the spirals whereby passage of fluids through the threads is facilitated.

**Perforated bobbins for treatment of artificial silk.** I. G. FARBERIND. A.-G. 652,068, Apr. 2, 1928. The perforated bobbins on which artificial silk is treated with various liquids have a cushion of fibrous material and (or) a covering of rubber or other elastic material.

**Apparatus for "dry spinning" of filaments from solutions of cellulose esters and ethers.** M. KLEIN (to Ruth-Aldo Co.). Brit. 300,166, Nov. 7, 1927. An app. of the general type described in Brit. 292,608 (C. A. 23, 1505) is modified so that each zone of the spinning cell is provided with orifices for the admission and discharge of air, each zone having an independent air circulation. Various structural details are described.

**Hollow rayon fibers.** WALTER O. SNELLING. U. S. 1,713,679, May 21. After forming a preliminary fiber, the latter is brought into contact with a thin film of a coating agent such as a cellulose deriv. soln., carried on a rotating roller or other suitable support, the liquid coating is solidified (suitably by a coagulating bath) and the preliminary fiber is then dissolved. An arrangement of app. is described.

**Producing a curl or wave in artificial filaments.** W. SEVER and J. B. SPEAKMAN. Brit. 300,221, July 9, 1927. Fibers with a wave or curl resembling that of natural wool or cotton are obtained by extruding a fiber-forming soln. through a spinneret into a coagulating medium to which a swirling or eddying motion is imparted.

**Vegetable fiber.** ALFRED TINGLE. U. S. 1,714,831, May 28. Fibrous vegetable material such as spruce chips is digested in an aq. soln. of lime and S and then treated with a lime-eliminating material such as  $H_2SO_4$ .

**Softening wood, straw, grass or other vegetable fibers.** SIDNEY D. WELLS (to Paper Mill Laboratories, Inc.). U. S. 1,714,459, May 21. Softening is effected by spent liquors from pulp-cooking processes using NaOH "free from more powerful chemicals" and contg.  $Na_2CO_3$  and the material may be used without further refining and in the presence of S.

**Fiber board.** WILLIAM M. SHOEMAKER, JR. (to National Vulcanized Fiber Co.). U. S. 1,714,640, May 28. A soln. such as a 70° B $\acute{e}$ .  $ZnCl_2$  soln. is projected simultaneously against opposite sides of each of a plurality of cellulose paper sheets at from room temp. to about 35° and the sheets are joined under pressure. U. S. 1,714,641 relates to app. for use in such processes. Cf. C. A. 22, 3301.

**Paper pulp.** H. KUMAGAWA and K. SHIMOMURA. Brit. 299,740, June 30, 1927. Material contg. pithy fiber such as cane-sugar bagasses or kaoliang straw is beaten in a hollander with a constant flow of water to remove the sugar and other water-sol. substances and to sep. the thin and short pithy fibers. The long fibers are suspended in the water and the short pithy fibers float on the surface; the long fibers, alone or with a regulated admixture of short fibers, are collected for use as pulp.

**Paper pulp.** G. A. MOURLAQUE. Brit. 299,965, Sept. 24, 1927. See Fr. 639,900 (C. A. 23, 982).

**Paper pulp.** ROGER G. SMITH. U. S. 1,715,310, May 28. After digestion and before beating, paper pulp is treated with an aq. soln. of a sulfate and an acid such as  $Na_2SO_4$  and  $H_2SO_4$  in order to remove undesirable org. substances.

**Apparatus for draining, drying and molding paper pulp.** CHARLES J. KEENAN, EUGENE P. KENNEDY and GEORGE H. KIRSCH (to Alaska Pulp and Paper Co.). U. S. reissue 17,303, May 28. Reissue of original pat. No. 1,621,671 (C. A. 21, 1548).

**Rotary "refiner" for paper pulp, etc.** EDMUND P. ARPIN, JR. U. S. 1,714,752, May 28.

**Heating and ventilation of paper-pulp-grinding buildings.** EMIL A. BRINER. U. S. 1,713,510, May 21. Air adjacent to machinery for grinding wood with water, and adjacent to the pulp, is confined in a passageway through which the air from the structure is exhausted; fresh air admitted to the room is heated by the exhaust air.

**Paper making.** LEVIS M. BOOTH. U. S. 1,713,642, May 21.  $Al_2(SO_4)_3$  and  $Na_2CO_3$  or other suitable substances which react to form a metallic hydroxide are added to paper-making stock after addn. of size and size-pptg. agents to the stock and at or before delivery to the paper making app., in order to improve and facilitate the sizing.

**Paper making apparatus.** CHARLES E. POPE (to Great Northern Paper Co.). U. S. 1,714,238, May 21. Structural features.

**Paper-making apparatus.** CHARLES W. VALENTINE and ALFRED F. HELIN (to Bagley and Sewall Co.). U. S. 1,713,988, May 21. Structural features.



**Sizing paper, etc.** HUGH M. SPENCER. U. S. 1,714,052, May 21. Coagulation of a rosin emulsion is effected by admixture of a peptized colloidal soln. of  $\text{Al}(\text{OH})_3$ .

**Impregnating paper for bag manufacture, etc.** ALFRED HOLTER. U. S. 1,714,222, May 21. Paper is prepd. for subsequent folding and forming by impregnating one surface of a paper web with an aq. soln. of a material such as soap and glue which can react with sol. Al compds. to form insol. reaction products, and impregnating a second web with a soln. contg. alum or other sol. Al compd., and then bringing the 2 surfaces into contact with each other immediately prior to folding or otherwise fabricating into webs (without drying prior to folding).

## 24—EXPLOSIVES AND EXPLOSIONS

CHARLES E. MUNROE

**The ignition temperature of several aromatic nitro explosives.** S. MICEWICZ AND K. MAJKOWSKI. *Z. ges. Schiess- u. Sprengstoffw.* 23, 422-7(1928). See C. A. 22, 4249.

C. G. STORM

**The use of lead and its compounds in the chemistry of explosives.** L. METZ. *Metallwirtschaft* 7, 228-30(1928).—Pb is used as testing material for explosives.  $\text{Pb}(\text{N}_3)_2$  is frequently used as priming but it has certain disadvantages as compared with mercuric fulminate. The thiosulfate, thiocyanate and trinitroresorcinolate of Pb are also in use.

EMIL KLARMANN

**Safety measures in chemical works.** ANON. *Chem. Age* (London) 20, 441 (1929).—The Assoc. of Brit. Chem. Mfrs. propose to issue a set of model safety rules in two pts., Pt. I covering Principles and Pt. II, Detailed Instructions. C. E. M.

**What do we know about the explosibility of coal dust in mines?** H. P. GREENWALD. *Bur. Mines, Circ.* No. 6112, 7 pp.(1929).—A statement is given of factors involved with a discussion of each but no summary of conclusions. C. E. M.

**The limit of inflammability of gaseous mixtures.** J. CHAPPUIS AND A. PIGNOT. *Chimie & industrie Special No.*, 228-30(Feb., 1929).—The limit of inflammability of  $\text{CH}_4$ -air mixts. increases appreciably with increase in pressure up to 15-20 kg. per sq. cm., and only slowly above this point. The app. used was similar to that used by Caillietet for the liquefaction of gases, but modified so as to obtain a larger working vol.

A. PAFINEAU-COUTURE

**Extinguishing gas (line) fires without water.** NEUMANN. *Gas u. Wasserfach* 72, 305(1929).—Fire extinguishers of the liquid  $\text{CO}_2$  (snow) type have been used to extinguish gas fires occurring along mains. Three extinguishers, each contg. about 10 lbs. of liquid  $\text{CO}_2$ , were used successfully to extinguish a flame from a saw-cut half through a 4-in. pipe, with a gas pressure of about 40 in. of water. The extinguisher nozzle should be held very near the fire and several app. used simultaneously, if possible.

R. W. RYAN

**Explosion in nitroglycerin paste mixing house.** H. F. WATTS. *Special Rept.* No. 243, H. M. Insp. of Explosions Mimeograph, 11 pp., Apr., 1929.—The explosion occurred Oct. 15, 1928 at the factory of the Explosives and Chem. Products, Ltd., Great Oakley, Essex, England, causing the death of 5 persons. In the building were 3 mixing and 2 extruding machines, one of each variety being in use at the time of the accident. It was thought most probable the explosion originated in the heated mixing machine and was due to the breaking of the blades of the mixer, or the shearing off of a cotter-bolt, or to volatilized ethylene glycol dinitrate from the paste condensing on some part of the moving machinery. The account of expts. made and of the recommendations offered are of interest. In rebuilding the 2 operations are to be conducted in sep. buildings.

CHARLES E. MUNROE

**New type of laboratory dust-explosion apparatus.** C. M. BOUTON, C. H. GILMOUR AND GARNET PHILLIPS. *Bur. Mines, Repts. of Investigations* No. 2927, 10 pp.(1929).—An illustrated description of the device, with directions for operating it and treatment of the data, accompanied by a discussion of the general subject. C. E. M.

**Explosions while granulating copper.** W. STAHL. *Metallbörse* 19, 205(1929).—If the Cu be not too hot, the steam not too rapid and the mass kept stirred, explosions are reduced to a minimum.

W. C. EBAUGH

**Study of the double bonds in petrolatums [in relation to value as stabilizer in storing smokeless powder] (POGGI) 22.**

**Explosives for blasting coal, etc.** B. I. STROORS (to Hercules Powder Co.). Brit. 299,862, Nov. 4, 1927. A carbonaceous material of low d. such as sawdust of balsa wood or Congo wood is impregnated with a salt such as a nitrate or perchlorate which is preferably first mixed with a salt contg. water of crystn. such as  $Mg(NO_3)_2$ ,  $Ca(NO_3)_2$ ,  $Fe(NO_3)_3$ , or Al nitrate, heated to release the water of crystn. and then used as a melt for the impregnation. Sensitizers such as nitroglycerin or nitropolyglycerin may be added. Cf. C. A. 22, 2665.

**Use of moss as an absorbent for dynamite manufacture.** CHARLES O. BLACK and WILLIAM A. MOORE (to E. I. du Pont de Nemours & Co.). U. S. 1,713,816, May 21. Moss such as sphagnum is used.

## 25—DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

**Advances in dye chemistry in 1928.** F. MAYER. *Chem.-Ztg.* 53, No. 43, *Fortschrittsber.* 41-61(1929). E. H.

**Interesting sources of natural dyestuffs.** C. D. MELL. *Textile Colorist* 51, 401-4 (1929); cf. C. A. 23, 3347.—Natural dyestuffs are obtained from the root bark of the arnatto plant (*Bixa orellana*), the bark of pito (*Erythrina corallodendron*), the bark of the caobillo tree and from the root bark of mountain mahogany (*Cercocarpus parvifolius*). RUBY K. WORNER

**Application of the method of analyzing colors to the examination of pigments and lakes.** A. G. GREEN. *Rev. gén. mat. color.* 32, 93-9(1928). R. HOUGHTON

**Application of collodion membranes to the separation and analysis of coloring matters.** GEORGE GENIN. *Rev. gén. mat. color.* 32, 2-3, 20-2(1928).—Cellulose esters in porous form remove certain coloring matters from soln. very completely and quickly. Basic colors are adsorbed. Acid colors are usually not adsorbed, but the colloidal condition of the dye in soln. influences the behavior. The affinity of the esters for basic dyes is variously ascribed to presence of oxycellulose or to acid radicals (sulfate, acetate, etc.). Theories are discussed with a view to applying cellulose and its esters to identification of dyestuffs in com. mixts. Three forms of ultra-filter of lab. type available in France are described. Descriptions of cases of actual application of this technic to sepn. of specific dyestuffs from mixts. are omitted. E. M. SHELTON

**The effect of sulfurous acid on azoic colors and a new method for testing fastness to sulfuring.** A. T. KING. *Rev. gén. mat. color.* 32, 106-8, 142-6(1928).—The degree of conversion of azoic colors dyed on wool into azo-sulfites (having slightly different shades) by exposure to  $SO_2$  is entirely dependent on the amt. of alkali in the cloth. Samples must be brought to a definite degree of alky. (Bromothymol Blue being used) before tests for fastness to sulfuring are reliable. H. F. LEUPOLD

**Application of the insoluble azo colors in printing.** WM. H. COTTON. *Proc. Am. Assoc. Textile Chem. and Colorists; Am. Dyestuff Repr.* 18, 288-92(1929).—A review is given of the development of this class of colors and of methods of printing on cotton for the production of various colored effects. E. W. CLARK

**Naphthols and rapid fast colors in printing.** H. E. HAGER. *Proc. Am. Assoc. Textile Chem. and Colorists; Am. Dyestuff Repr.* 18, 255-9(1929).—Printing with the Naphthol AS colors is divided into 3 groups, the discharge and resist style, the rapid fast colors and the naphthol print-on style. Vat colors are suitable for colored discharges and equal the fastness of the naphthol grounds. Most naphthol grounds are stable to  $NaClO_2$  and can be used in the chlorate discharge style. Uses of Blue Salt B, Variamine Blue Salt and resist combinations are described. Naphthol resists under aniline blacks give very bright effects. The goods are padded with aniline soln., dried and printed with  $ZnO$ - $NaOH$  resist contg. the naphthol, then aged in dry steam and padded in a fast color salt soln. The rapid fast colors are mixts of certain naphthols with the nitrosamines of certain bases in an alk. medium. They are suitable for all cotton fabrics, for most rayons, Bemberg and Tubize, but do not print well on silk and not at all on Celanese. The Rapidogenes and H brands give stable printing pastes. The fastness of this group is very good. The indigosols may be used to complete the range of shades. When used in combination with the indigosols, oxalic or formic acid is used for developing. Combinations of the rapid fast colors with basic, chrome and vat colors are described and formulas given. E. W. C.

**Dyeing without the use of coloring matters.** P. BRUNAN. *Ann. fals.* 22, 132-9 (1929).—A discussion of the Escaich-Worms process of dyeing (C. A. 19, 1351, 2750,

3165, 3279, 3599; 20, 1528; 22, 1481), and more particularly of its advantages.

**The production of greens in dyeing.** RENÉ TOUSSAINT. *Têta* 7, 373-89(1929).—A discussion of the difficulties encountered in correcting shades, due to the fact that there are practically no dyes giving pure colors, with a plea for dye manufacturers to develop such dyes.

**Dyeing of knitted goods containing mixed fibers.** W. A. EDWARDS AND G. A. HARDCASTLE. *Rev. gén. mat. color.* 32, 121-3(1928).—General. R. HOUGHTON  
**Indigosol resists on chrome and alizarin colors.** J. BERT. *Dyer, Calico Printer* 61, 161(1929).—Formulas are given.

**Whites and light shades tainted by strong acid gases.** GEORGE RICE. *Dyer, Calico Printer* 61, 160-1(1929).—A blow-off attachment to care for gaseous discharges from the agers and a ventilating hood are described.

**The effects of after-treatments on the degree of aggregation, location, shade and fastness-properties of insoluble azo colors on the fiber.** PERCY BEAN AND F. M. ROWE. *J. Soc. Dyers Colourists* 45, 67-76(1929).—Max. increase in fastness to light is a function of the more or less extensive hot after-treatment of the dyed material. Hot alk. after-treatment is more rapid in increasing the fastness to light and rubbing. Change in shade is due to increased size of pigment particles by moist heat with increased light fastness or decreased size of pigment particles by dry heat with lowered light fastness. After-treatment of dyed artificial silks has the effect of blinding the luster. There is an insert of 24 photomicrographic plates showing aggregation of pigment particles following different after-treatments.

**Modern piece and skein dyeing machines.** KURT GÖTZE. *Seide* 34, 88-96(1929).—A survey, giving illustrations of many types of silk-dyeing app. H. W. S.

**The dyeing of silk (organzine and tram) "Fast to sun and rain."** RAYMOND CURTIS. *Am. Dyestuff Rept.* 18, 171-3, 198(1929).—Tannin weighting methods and selection of dyes to produce colors fast to sun and rain under standard tests are discussed.

**Instructive ideas in silk dyeing.** THOMAS F. HUGHES. *Textile Colorist* 51, 380-3(1929).—Practical.

**The dyeing of pure silk hose.** H. D. MUDFORD. *J. Soc. Dyers Colourists* 45, 107-10(1929).—A paper presenting the methods of prepn. and dyeing of pure silk hose with acid and direct colors, some of which are fast to washing.

**Remarks on troubles encountered in the hosiery dyehouse.** DANIEL MCGOWAN. *Proc. Am. Assoc. Textile Chem. and Colorists; Am. Dyestuff Repr.* 18, 206-8(1929).

**Recent progress in artificial-silk dyeing.** L. G. LAWRIE. *Artificial Silk World* 2, 187-9(1929).—The causes for the uneven absorption of dyestuffs by regenerated cellulose fibers, the selection of suitable colors to overcome these defects and a patented method for correcting uneven dyeings consisting of treating the dyed material 30 mins. in a bath contg. 1% of  $\beta$ -naphthol and 1% of NaCl at 195° F. are discussed. The absorption of the mordant "Katanol O" by rayons appears to be at a max. when 5% "Katanol O" and 1%  $\text{Na}_2\text{CO}_3$  are used. It is necessary to sour the mordanted material with dil. AcOH to prevent it from washing out. For dyeing cellulose acetate rayons, insol. dyes which are in a dispersed state are used. "Duranol," "Dispersol" and "Cel-liton" dyes are of this type. Two new patented methods of mordanting acetate rayon are described. B. P. 273,692 relates to the use of  $\text{FeCl}_3$ , while B. P. 273,695 describes the use of swelling agents as formic or acetic acid, furfuraldehyde, phenol or pyridine.

**Dyeing black on artificial silk and cotton materials.** A. J. HALL. *Dyer, Calico Printer* 61, 162-3(1929).—Sulfur and direct colors, Naphthol AS and vat dyes, and S. R. A., Celatene, Dispersol and aniline blacks are considered from a practical viewpoint.

**Conditions for the even stripping of rayons (except acetate silk) dyed with substantive dyes. IV. The dyeing of rayons.** W. WELTZER AND K. GÖTZE. *Seide* 34, 136-43(1929).—For even dyeing, the degree of dispersion is of little importance. With several substantive dyes, the influence of temp. on the amt. absorbed is detd. and a definite relationship between max. absorption at medium temps. and evenness is established. In testing for evenness, the same dye should be compared on several fibers. The relations between capillarity, dye absorption and levelness are simplified and for the first time, simple rules are given for the dependence of simultaneous stripping on dyeing conditions. Some deductions for the dyeing of mixed fibers are discussed. Increasing evenness by means of after-treatment is discussed.

**The coloring of cellulose acetate solutions.** C. F. J. NEWBY. *J. Soc. Dyers Colourists* 45, 104-7(1929).—Types of colors used are pigments, dyes, metallic and colored bronzes. Mixing of pigments with the vehicle, solvents used and maturing of the medium before and after coloring are described. ROBERT HOUGHTON

**The microscopical examination of fibers.** W. GARNER. *Ind. Chemist* 5, 147-52, 155(1929).—Detailed methods of mounting various fibers are given. Much information on methods of examn. of silks, rayons, worsted, mohair, cashmere, alpaca, camel hair, cow hair, jute, hemp, esparto, flax, ramie, cotton and mercerized cotton are given. A method of cutting cross sections of fibers for microchem. examn. is described. Fifteen photomicrographs of fibers are included. E. G. R. ARDAGH

**The application of naphthols on textile fibers.** I. Dyeing. R. W. MARSSON. *Am. Dyestuff Repr.* 18, 249-55(1929).—The application of some new naphthols and developers and the dyeing of naphthols in combination with vat and sulfur colors. ROBERT HOUGHTON

**Starches used in the textile industry.** ALBERT H. GRIMSHAW. *Proc. Am. Assoc. Textile Chem. and Colorists; Am. Dyestuff Repr.* 18, 180-6(1929).—G. describes the prepn., uses and tests employed to identify type and quality of common starches in the textile trade. A. K. JOHNSON

**Stiffness in fabrics produced by different starches and starch mixtures, and a quantitative method for evaluating stiffness.** ESTHER C. PETERSON and TOBIAS DANTZIG. *U. S. Dept. Agr., Tech. Bull.* No. 108, 29 pp.(April, 1929).—An attempt is being made in the Bur. of Home Economics to differentiate and define the individual properties of a sized fabric which collectively constitute its "feel." A phys. method and app. have been developed for measuring quantitatively the stiffness of materials, which is the property considered in this communication. The mathematical basis for this method and comparative stiffening values on a cotton fabric of starches from wheat, rice, corn and potato are reported. Of these starches, a com. wheat produced the stiffest fabric, potato the least stiff and the lab.-prepd. wheat, corn and rice practically the same effect. The stiffening properties of the same species of starch are dependent upon the origin, 3 different values being obtained for 4 corn starch samples differing in this respect. No appreciable effect was observed when the time of heating the starch paste was varied from 5 to 60 mins. Preliminary studies of the effect on starch paste of concn. and addn. of foreign substances indicated that, with potato starch, no decrease was observed until the concn. had been reduced to approx. 17% of the original. This difference may be explained by the very viscous character of the potato starch paste. Addn. to the corn starch paste of borax increased its stiffening power up to a max. of 20% of the wt. of the starch, when a decrease occurred, while addn. to it of salt, paraffin, beeswax and hydrogenated vegetable oil up to 27% of the wt. of the starch had no appreciable effect. Projected strips of starched fabrics bend under their own weight according to elastic laws and assume a curve, the shape of a quartic parabola, expressed by the formula,  $\bar{y} = -(\omega/4l^3)\bar{x}^4$ , where  $\bar{x}$  and  $\bar{y}$  are the coordinates when the vertex of the parabola is at the free end of the projected strip and the  $x$  and  $y$  axes are the tangent and normal, resp., at the free end. From this, it is shown that the stiffness of the projected strip is proportional to the cube root of the elastic modulus given by the equation  $c^3 = (Eh^3/12w)$  and to the length of the radius vector as expressed by the equation  $c^3 = (\cos(4/3)\theta/80)r^3$ . A detailed description of the methods used for desizing the fabrics and prepg. the starches and starch pastes is included. RUBY K. WORNER

**A contribution to the theory of mercerization: The action of sodium hydroxide on partially methylated cellulose; the preferential absorption and heat evolution.** FREDERICK C. WOOD and AGNES C. ALEXANDER. *J. Soc. Chem. Ind.* 47, 357-61T(1928).—The following expression due to Coward and Spencer (*C. A.* 17, 1553) should be applied in detg. the amt. of preferential absorption of caustic alkali by finding the change in wt. concn. of the soln.:  $100(w/g) [(p - p')/(100 - p')]$ , where  $w$  = wt. of original soln. taken,  $g$  = wt. of dry cellulosic material used,  $p$  = g. of NaOH per 100 g. of soln. initially present and  $p'$  = g. of NaOH per 100 g. of soln. finally present. By means of a curve  $W$  and  $A$ . present the results of expts. on the properties of methylated cellulose and give values for (1) hygroscopic moisture taken up at 66% relative humidity, (2) methoxyl content, (3) hydration capacity and (4) direct dyestuff held. The exptl. methods used are described in considerable detail. Data and curves show the preferential absorption of NaOH. The following conclusions were drawn: (1) Great swelling occurs at 16° in solns. of about 9% NaOH by wt. (2) The preferential absorption of NaOH is greatly diminished with methylated cellulose. (3) There is apparently a horizontal portion of the curve between 15 and 22%

NaOH by wt., but more points would be required to substantiate this. Data are given for the following (expressed on 100 g. of dry cellulosic material): wt. of liquor held, NaOH held, H<sub>2</sub>O held, vol. of liquor held, preferential absorption of NaOH. The app. of Barratt and Lewis (*C. A.* 16, 3545) was used for measuring the heat of reaction between partly methylated cellulose and caustic soda solns. The following data are presented: (1) evolution of heat with anhyd. scoured Egyptian cotton sliver, and (2) evolution of heat with anhyd. methylated cotton (12-14% OMe). A table of values is given for absorption and desorption of water vapor at 16° by partly methylated cellulose previously dried at 105°. It appears probable that degradation (or depolymerization) of cellulose may be accompanied by an increased preferential absorption of caustic soda from aq. soln. The preferential absorption of the alkali by cellulosic material seems to be a function of the hydroxyl groups present. A. J. MONACK

**Schreiner calendering: successfully conducting the major and minor operations.** HAROLD D. CHASE. *Textile World* 75, 3831, 3891-3(1929). RUBY K. WORTNER

**The application of logwood to silk.** DAVID WALLACE. *Am. Dyestuff Repr.* 18, 212-8(1929).—A paper describing the application of logwood to unweighted and weighted silk. The weighting of silk by the use of logwood and tannin exts. with formulas for the production of blacks and the weighting of silk are given. R. H.

**Problems of the loading of natural silk.** J. BRUYAS. *Russa* 4, 557(1929).—Rough "feel" of loaded silk is attributed to insufficient washing before and after passing through the phosphate baths. A. PAPINEAU-COUTURE

**Problems of the loading of natural silk.** LOUIS SAUZAY. *Russa* 4, 39-49, 205-17, 375-89(1929).—A discussion of modern silk-loading processes, of quant. and qual. methods of testing loaded silk, and of the strengthening and recovery of loading baths. A. PAPINEAU-COUTURE

**The effect of storage on weighted silks.** P. HEERMANN. *Seide* 34, 23-7(1929).—Various weighted and dyed silks were packed to exclude light and dust and were stored at normal room temp. and moisture for a period of 3 years. Strength tests made each year showed little loss of strength in the more lightly weighted fabrics. Heavily weighted black dyed samples showed appreciable loss in strength. Loss in stretch was decided and was in proportion to the amt. of weighting. Light shades lost about 20% in 3 years. Heavy shades lost 35 to 50%. Light monopole black lost 20%; 150% weighted lost 55 and 200% weighted lost 80%. Conclusion: Loss in strength during storage is not as serious as is generally believed. Loss in stretch, however, is marked. Curves and tables are given. H. W. STIEGLER

**Artificial silks.** MARTIN BATTEGAY. *Bull. soc. ind. Mulhouse* 95, 171-301 (1929).—A review. A. PAPINEAU-COUTURE

**Differentiation of rayons.** P. PICAVET. *Russa* 5, 539(1929).—P. concludes from the examn. by ultra-violet light of different types of com. rayons, which were not subjected to any treatment before examn., that the differences in fluorescence are not sufficiently sharp to enable rayons to be identified with certainty. A. P.-C.

**The sizing and desizing of artificial silks.** KURT GÖTZE. *Seide* 34, 56-8(1929).—A survey, giving formulas, machine methods and methods of analysis for sizing. H. W. STIEGLER

**The desizing of cotton and rayon piece goods.** THOMAS F. HUGHES. *Am. Dyestuff Repr.* 18, 307-8(1929).—The use of dry concd. enzymes, which are supposed to act rapidly, is suggested for desizing. A. K. JOHNSON

**Comparison of some chemical and physical properties of cotton and viscose silk.** A. J. HALL. *J. Soc. Dyers Colourists* 45, 98-104(1929).—When treated with caustic soda (in comparison to cotton), viscose silk swells more, contracts more in length, suffers less change in affinity for dyestuffs (except certain ones) and less alteration in hygroscopic moisture nature (remaining about 11%) and has greater soly. The harmful action of caustic soda on the handle, luster and tensile strength of viscose decreases with increase of temp. Cotton yarn dyed under tension is invariably lighter in shade than when dyed with less tension; viscose shows variation with certain dyes only. Classifications of direct dyes according to differences in affinity toward viscose whether untreated or alkali-treated, or dyed with or without tension are practically in complete agreement with existing classification of "even and uneven-dyeing" dyes for commercially unequal grades of viscose silk. The suitability of a direct dye for use with unequal grades of viscose may be rapidly and accurately detd. by dyeing untreated and alkali-treated viscose; if both are dyed equally well in shade, the dye is suitable. A. K. JOHNSON

**The tensile strength and fluidity of chemically modified cotton.** DOUGLAS A. CLIBBENS AND BERT P. RIDGE. *J. Textile Inst.* 19, T389-404(1928).—Tables and

curves are given showing the relation between increase of fluidity in 0.5% cuprammonium soln. at 20° and % loss of strength of chemically modified cotton yarn. The results of about 25,000 single thread breaking strengths of yarns made from 40's ring spun warp of combed Sakel (Egyptian) cotton are summarized. The yarn was sampled by the "cut skein" method in which alternate threads served as controls. The actions of the following chem. agents were examd.: HCl and H<sub>2</sub>SO<sub>4</sub> under widely different conditions, 0.04 *N* NaClO with 0.2 *N* Na<sub>2</sub>CO<sub>3</sub> ( $p_H$  11.2), 0.04 *N* NaClO with neutral phosphate buffer ( $p_H$  7), 0.01 *N* alk. hypobromite with 0.1 *N* NaOH, and 0.04 *N* dichromate in the presence of 0.2 *N* H<sub>2</sub>SO<sub>4</sub> or 0.2 *N* oxalic acid, at 25° for different periods upon yarns with or without boiling with different alkalies before and after chem. modification. Increasingly severe treatment caused increasing fluidities accompanied by increasing loss of strength. Concd. HCl or H<sub>2</sub>SO<sub>4</sub> at ordinary temp. or dil. acids at the boil caused approx. the same loss of strength. Similarly the tendering is the same whether caused by alk. hypobromite or hypochlorite in neutral or alk. soln. The same fluidity corresponds, however, with slightly greater tendering by acids than by hypochlorite. Nearly straight lines are obtained on plotting fluidity against loss of strength caused either by acid or hypochlorite attack. The loss of strength for a given rise of fluidity is much less for yarns attacked by dichromate together with H<sub>2</sub>SO<sub>4</sub> or oxalic acid. The acids thus used were of such concn. as to cause no detectable loss of strength without the dichromate. Yarns tendered by acids or alk. hypochlorite suffer only slight addnl. tendering when subsequently keir-boiled (6 hrs., 1% NaOH, 20 lbs. excess pressure), but yarns tendered by neutral hypochlorite suffer great addnl. tendering and the loss of strength is still greater when modification has been caused by dichromate together with H<sub>2</sub>SO<sub>4</sub> or oxalic acid. Yarns oxidized with dichromate with oxalic acid show increasing loss of strength with subsequent increasing alk. of the liquid but even very mild conditions produce greatly enhanced tendering. The normal mercerization process produces effects similar to alk. boils. Boiling unmodified yarns in alkalies produces a slight loss of strength but hardly greater than the exptl. errors of mech. testing. Strength, Cu no. (Schwalbe Braid) and wt. of oxidized yarn are reduced to a greater strength the more alk. the boil, but even boiling in water for 6 hrs. reduces the strength of modified cotton without much effect upon its Cu no. and without causing much loss of material. Cu nos. are therefore valueless as a chem. measure of modified cotton. All mech. testing was done at about 70° F. and 70% relative humidity.

C. H. BADGER

Kier-bleaching cotton with peroxides. T. E. BELL. *Proc. Am. Assoc. Textile Chem. and Colorists; Am. Dyestuff Repr.* 18, 293-5(1929).—Application and control of proper chemicals to the particular fabric as well as mech. details are essential to efficient kier-bleaching of cotton with peroxides.

H. LEUPOLD

Staining, tendering and other faults in cotton-cloth bleaching. THOMAS F. HUGHES. *Textile World* 75, 3821-9(1929).—Suggestions are given concerning causes and remedies of defects in bleaching.

RUBY K. WORNER

Properties of wool. L. MEUNIER AND G. REV. *Halle aux cuirs* 1929, 137-48; cf. C. A. 22, 1047, 1479, 4829.—Swelling of wool as a function of  $p_H$  value. Effect of salts on swelling.—Hanks of degreased wool were immersed for 48 hrs. at 18-20°, in normal solns. of salts, then centrifuged and weighed. The gain in wt. was taken as the measure of swelling. Results for Na salts were: NaI 59, NaSCN 56.5, NaBrO<sub>3</sub> 52, NaNO<sub>3</sub> 52, NaClO<sub>3</sub> 51, NaCl 48, NaC<sub>2</sub>H<sub>3</sub>O<sub>2</sub> 47, Na<sub>2</sub>SO<sub>4</sub> 46, Na citrate 46, H<sub>2</sub>O 45%.  $p_H$  values of these solns. all lay between 5.2 and 7.2, and there was no relation between,  $p_H$  value and degree of swelling. High concns. of NaSCN at high temps. peptize wool giving strongly fluorescent solns. The acid-alkali swelling curve of wool was obtained with solns. of NaOH and HCl, free from salts. The curve shows a sharp min. at  $p_H$  0, a sharp max. at  $p_H$  1.25, a broad min. at  $p_H$  3.75-5.25, apparent inflection point at  $p_H$  8. Deaminized wool, and wool treated with quinine, swell less than ordinary wool in  $p_H$  range 0.5-3, and the isoelec. point is displaced toward  $p_H$  3. Irradiated wool swells more at all  $p_H$  values than ordinary wool; the isoelec. point is unchanged. In solns. of H<sub>2</sub>S, wool swells less than in pure H<sub>2</sub>O, but wool pretreated with H<sub>2</sub>S swells more in alk. soln. than does wool not pretreated. This supports the hypothesis that SH<sup>-</sup> renders keratin more reactive toward OH<sup>-</sup>. Determination of NH<sub>2</sub> groups in wool.—The app. consists of (1) source of CO<sub>2</sub> and purification train, (2) reaction vessel, consisting of glass-stoppered flask provided with gas inlet and outlet, and stop-cock thistle tube for introducing acid, (3) absorption bottle contg. a soln. of 20% NaOH and 6% KMnO<sub>4</sub>, and (4) gas-measuring tube (1 g. wool is placed in the reaction flask). The app. is freed from air by CO<sub>2</sub> current. A mixt. of 20 cc. of 10% nitrite soln. and 15 cc. glacial AcOH is introduced through a stopcock funnel. Reaction begins immediately.

$\text{NO}_2$  and  $\text{N}_2$  are evolved and entrained by  $\text{CO}_2$  current.  $\text{CO}_2$  and  $\text{NO}_2$  are absorbed by alk.  $\text{KMnO}_4$ .  $\text{N}_2$  is collected and measured. A sample of raw, degreased wool gave 0.57%  $\text{N}_2$ . Chem. treatment that tends to hydrolyze wool increases the yield of amino N. Silk fibroin gave only 0.40%  $\text{N}_2$ , which indicates fewer amino groups than in wool; this is in line with the greater swelling of the latter. H. B. MERRILL.

Some scientific aspects of wool as they affect the wearer. S. G. BARKER. *J. Soc. Dyers Colourists* 45, 77-82(1929).—Detns. of fiber shape, density, moisture absorption, tensile strength, elasticity, plasticity, and ultra-violet transmission of wool are reviewed and their value to the finished fabric is discussed. Tables and references are given.

T. G. HAWLEY, JR.  
Some points in scouring woollens and worsteds. ALEX. J. BENNETT. *Textile Colorist* 51, 394-6(1929).  
RUBY K. WORNER

Emulsions, their scope and application (BILLINGHAM) 13. Constitutional influences on the conversion of azonaphthols into their azosulfites and their bearing on the structure of  $\alpha$ - and  $\beta$ -naphthol (KING) 10. Emulsions for use as detergents in dyeing, etc. (Brit. pat. 299,817) 18.

*Handbuch des Zeugdrucks*. Lfg. 3. Edited by Georg Georgievics, Robert Haller and L. Lichtenstein. Leipzig: Akad. Verlag. pp. 513-801. M. 32. Cf. C. A. 22, 3534.

Dyes. L. B. HOLLIDAY AND CO., LTD., JOE KITSON and CECIL SHAW. Fr. 651,731, Mar. 24, 1928. See Brit. 293, 110 (C. A. 23, 1511).

Dyes. I. G. FARBENIND. A.-G. Brit. 299,909 Aug. 4, 1927. Sulfuretted dyes are obtained by polysulfide fusion, in the presence of  $\text{CuSO}_4$ , of indophenols produced by joint oxidation of *p*-aminophenol and alkyl ethers of *p*-hydroxyaryl-1-naphthyl-aminomonosulfonic acids or of the corresponding leuco indophenols. The dyes formed dye cotton clear, fast, greenish yellow tints from a Na sulfide bath. Several examples are given.

Dyes. I. G. FARBENIND. A.-G. Brit. 300,114, Nov. 5, 1927. A deriv. of 3-hydroxy-1-thionaphthene substituted in the nucleus is condensed with 7-methylisatin  $\alpha$ -chloride substituted by halogen or methyl in the 5-position or by halogen or methyl (or both) in the 4- and 5-positions. Several examples are given.

Dyes. I. G. FARBENIND. A.-G. Brit. 300,219, July 7, 1927. Anthraquinone vat dyes are formed by heating anthrones having a further ring attached in the *ms*- and 1-positions (at least in the latter by means of a N atom) and halogenated in the 2-position, with metals, with or without use of a solvent. Various details and examples are given.

Dyes. I. G. FARBENIND. A.-G. Fr. 652,080, April 2, 1928. Dyes which dye silk and cotton mordanted with tannic acid are prepd. by reacting diazo compds. of safranin with  $\beta$ -diketones. Thus, tolusafranin is diazotized and coupled with acetylacetone, acetoacetic ester, malonic ethyl ester, acetoacetic-*o*-toluidide, or acetoacetic xylidide forming dyes which give Bordeaux-red shades. Diethylsafranin is diazotized and coupled with acetoacetic anilide, acetoacetic ester, methylacetoacetic ester, malonic ethyl ester, acetylacetone, benzoylacetone, etc., giving dark blue and green shades.

Dyes. SOC. ANON. POUR L'IND. CHIM. À BÂLE. Brit. 299,791, Oct. 31, 1927. Direct dyes for cotton are made by coupling a diazo compd. of the benzene or naphthalene series with a further diazotizable component of the benzene or naphthalene series, rediazotizing, and coupling with 1,5,7-aminonaphtholsulfonic acid in an acid, neutral or alk. medium. The products give uniform gray to blue-gray and green-gray dyeing from neutral or slightly alk. baths. Several examples are given with a statement of the properties of the dyes produced.

Azo dyes. I. G. FARBENIND. A.-G. Fr. 651,945, Mar. 29, 1928. Azo dyes are produced in substance or on the fiber by coupling with an arylamide of 2,3-hydroxynaphthoic acid the diazo compd. of a dihalogen deriv. of *p*-toluidine having a halogen atom *o*- and *m*- to the  $\text{CH}_3$  group. Several examples are given and also a list of components and colors obtained.

Azo dyes. SOC. ANON. POUR L'IND. CHIM. À BÂLE. Brit. 299,331, Oct. 22, 1927. Azo dyes and intermediate products contg. at least one cyanuric ring and at least one thiazole ring are obtained either (1) by condensing a cyanuric halide with suitable compds. at least one of which contains a thiazole ring and, if necessary, converting the product into an azo dye by diazotization and coupling or by coupling with a diazo compd., or (2) by coupling a diazo component with a coupling component and for

this purpose selecting components one of which contains a cyanuric ring and the other of which contains a thiazole ring. The dyes thus formed may be subjected, either in substance or on the fiber, to addnl. treatments such as reduction, condensation, acidylation (such as treatment with phosgene), alkylation, aralkylation, arylation, further coupling with a diazo compd., diazotization and further coupling with a component, or treatment with a metal compd. A very large number of examples are given.

**Azo dye formed by combining diazotized aromatic amino-pseudoazimino compounds with arylides of 2,3-hydroxynaphthoic acid.** AUGUST L. LASKA and ARTHUR ZIRTSCHER (to I. G. Farbenind. A.-G.). U. S. reissue 17,306, May 28. Reissue of original pat. No. 1,667,667 (C. A. 22, 2065).

**Vat dyes.** ALBERT KUNZ and KARL KÖBERLE (to Grasselli Dyestuff Corp.). U. S. 1,714,427, May 21. A *ms*-benzodianthrone is halogenated at atm. pressure, e. g., with Br in  $\text{PhNO}_2$  with or without I, which forms a dye giving yellow shades on cotton.

**Vat dyes.** I. G. FARBENIND. A.-G. Fr. 652,002, Mar. 30, 1928. Vat dyes are prepd. by transforming a 3-methyl-4-halophenyl-1-thioglycolic acid, substituted in the 2-position by a carboxy, carbamyl or nitrile group, into the corresponding hydroxythionaphthenes and converting the latter by oxidation into sym. thioindigo dyes, or by condensing the said hydroxythionaphthenes or their 2-derivs. with a compd. capable of coupling therewith. In examples, the nitrile of 3-methyl-4-chlorophenyl-1-thioglycolic-2-carboxylic acid is heated with NaOH and  $\text{Na}_2\text{S}$  in water, the Na salt of 4-methyl-5-chloro-3-amino-1-thionaphthene-2-carboxylic acid being pptd. on addn. of NaCl. The ppt. is dissolved in water contg. a small quantity of NaOH and bisulfite acidified with  $\text{H}_2\text{SO}_4$  and heated until the hydroxythionaphthene is formed, and transformed to a dye by known methods. The 4,4'-dimethyl-5,5'-dichlorobisthionaphthene-indigo gives fast violet-red shades on cotton. 3-Methyl-4-chlorophenyl-1-thioglycolic-2-carboxylic acid is heated to boiling with  $\text{Ac}_2\text{O}$  and  $\text{AcONa}$ , and the 4-methyl-5-chloro-3-acetylhydroxythionaphthene is sapond. and oxidized to form the dye. Chloroisatin is heated in  $\text{C}_6\text{H}_6$  with  $\text{PCl}_5$  and 5-bromo-4-methyl-3-hydroxythionaphthene is added; the dye obtained dyes cotton in a bluish violet shade.

**Vat dyes.** I. G. FARBENIND. A.-G. Fr. 652,359, April 7, 1928. Vat dyes of the anthanthrone series are prepd. by heating with condensing agents such as  $\text{H}_2\text{SO}_4$ ,  $\text{ClHSO}_3$ ,  $\text{AlCl}_3$ , KOH, etc., the dyes obtained by condensing halogenated anthantrones with aminoanthraquinones and oxidizing if necessary. Examples are given.

**Vat dyes.** I. G. FARBENIND. A.-G. Fr. 652,388, April 7, 1928. Vat dyes are prepd. by transforming 3,5,6-trimethylbenzene-1-thioglycolic acid, or one of its substitution products contg. a carboxyl, carbamyl or nitrile group in the 2-position, into the corresponding hydroxythionaphthene and converting the latter by oxidation into the 4,6,7,4',6',7'-hexamethylbisthionaphtheneindigo, or condensing the hydroxythionaphthene with a compd. capable of coupling with it. An example is given of the conversion of the nitrile of 3,5,6-trimethylbenzene-1-thioglycolic-2-carboxylic acid, by heating it with aq. NaOH, into 4,6,7-trimethyl-3-amino-1-thionaphthene-2-carboxylic acid which is converted to the dye in known manner. The nitrile used may be prepd. by replacing the  $\text{NH}_2$  of 1-amino-2-nitro-3,4,6-trimethylbenzene by CN, reducing the  $\text{NO}_2$  group to  $\text{NH}_2$  and replacing this by  $\text{SCH}_2\text{COOH}$  in known manner.

**Reducing vat dyes, etc.** I. G. FARBENIND. A.-G. Brit. 299,899, May 4, 1927. Reduction products of vat dyes or of other org. substances contg. reducible carbonyl or quinone groups are obtained by treating the substances with mixts. of  $\text{SO}_2$  and formic acid, in the free state or partly in the form of salts, in the presence of an org. base such as pyridine and in the absence of any considerable quantity of water. Examples are given of the reduction of indigo and several of its derivs. and of the reduction of isatin to .dioxindole.

**Anthraquinone vat dyes.** I. G. FARBENIND. A.-G. Brit. 299,972, Sept. 30, 1927. Vat dyes are obtained by alk. condensation of the  $\alpha,\beta$ -di-9-anthronyleneethylenes obtainable by condensation of an anthrone 2 and glyoxal 1 mol. as described in Brit. 296,817 (C. A. 23, 2578). Examples are given for producing claret-red dyes.

**Green vat dye.** BERTHOLD STEIN, WILLY TRAUTNER and ROBERT BERLINER (to Grasselli Dyestuff Corp.). U. S. 1,713,680, May 21. 10,10'-Diphenylviolanthrone is formed by alkali fusion and oxidation, from 10-phenylbenzanthrone. It forms a blue vat from which cotton is dyed bluish green shades of good fastness.

**Acid wool dyes.** I. G. FARBENIND. A.-G. Brit. 299,721, Oct. 29, 1927. Acid wool dyes are formed by causing a sulfonic, nitrosulfonic, aminosulfonic or sulfamic acid of naphthalic anhydride to react with  $\text{NH}_3$  or an aliphatic or aromatic amine. Similar or identical dyes are also obtainable by converting the products of the reaction



of naphthalic anhydride or its derivs. with  $\text{NH}_3$  or an aliphatic or aromatic amine into the sulfonic or sulfamic acid, or by treating naphthalic anhydride or its derivs. with sulfonated amines. Several examples are given of dyes producing yellow or orange colored dyeings on animal fiber.

**Safranine dyes.** I. G. FARBENIND. A.-G. Brit. 300,178, Nov. 7, 1927. Dyes giving blue to violet shades on wool from an acid bath are prepd. by oxidation of a 4-acidylamino-3'-amino- or 4-nitro-3'-aminodiphenylaminesulfonic acid or a homolog or deriv. with a *p*-phenylenediamine or a deriv. The acidylamino group in the product may be saponified and the nitro groups may be reduced, *e. g.*, by use of Zn and HOAc or by alk. hyposulfite, and the resulting leuco compd. then oxidized. Several examples are given.

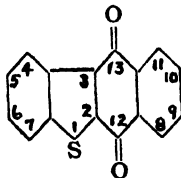
**Dyes of the pyrone series.** MAX WEILER (to Grasselli Dyestuff Corp.). U. S. 1,715,261, May 28. In order to remove by-products (which cause dulling and discoloration of dyeings) from dyes formed as described in U. S. 1,532,790 (C. A. 20, 509), the by-products (usually of browner color than the desired products) and desired dye acids in mixt. are converted into salts such as Na salts and the difficultly sol. salts of the pure pyrone dyes are sepd. from the more readily sol. salts of the by-products. Examples are given.

**Dye comprising a mixture of isoviolanthrone and dichloroisoviolanthrone.** BERTRAM MAYER and HUGO SIEBENBÜRGER (to Soc. anon. pour l'ind. chim. à Bâle). U. S. 1,715,242, May 28. A dye of this compn. produces vivid violet dyeings.

**Cinnamylideneanthrones.** ROBERT BERLINER, BERTHOLD STEIN and WILLY TRAUTNER (to Grasselli Dyestuff Corp.). U. S. 1,713,590, May 21. Cinnamylideneanthrone (probably a 10-deriv.), a yellow cryst. substance m. after crystn. from acetone at  $110^\circ$ , sol. in concd.  $\text{H}_2\text{SO}_4$  with a cornflower-blue color, which turns bluish red and after some standing shows a green fluorescence, is formed by the condensation, in a neutral or acid medium, of cinnamaldehyde and anthrone. Substituted anthrones such as  $\alpha$ - and  $\beta$ -hydroxyanthrones,  $\alpha$ - and  $\beta$ -chloroanthrones, anthrone- $\beta$ -carboxylic acid, alkyl and arylanthrones, etc., and substituted cinnamaldehydes and their derivs. react similarly. The products may be used as *dye intermediates*.

**1,4-Diarylamino-5,8-dihydroxyanthraquinones.** KLAUS WEINAND (to Grasselli Dyestuff Corp.). U. S. 1,713,576, May 21. Leuco-1,4,5,8-tetrahydroxyanthraquinone is heated under practically anhyd. conditions with an arylamine (suitably *p*-toluidine for the production of 1,4-di-*p*-toluino-5,8-dihydroxyanthraquinone) in the presence of arsenic acid and a condensing agent such as boric acid. The products may be used as *dye intermediates*.

**Phthaloyl-2,3-thionaphthenes.** FRITZ MAYER (to Grasselli Dyestuff Corp.). U. S. 1,713,670, May 21. Phthaloyl-2,3-thionaphthene and its substitution products can be obtained by causing phthalic anhydride or a substitution product to act upon thionaphthene or a deriv. and condensing the thionaphthenylbenzoic acids thus formed. The products may be used as *dye intermediates*. Phthaloyl-2,3-thionaphthene, corresponding most probably to the formula:



is a yellow powder which is insol. in water, alkalies and acids and yields with alk. hyposulfite a feebly colored vat which dyes wool yellow tints.

**Lakes.** I. G. FARBENIND. A.-G. Brit. 299,521, July 28, 1927. In a process generally similar to that described in Brit. 275,943 (C. A. 22, 2471), there are employed as starting materials mixts. of the specified amines with basic dyes, which may or may not contain acid groups. Examples are given of the treatment, with Na phosphotungstate, of (a) 4,4'-tetramethyldiaminobenzohydrol and Victoria pure blue BO; (b) 4,4'-tetramethyldiaminobenzohydrol and light green SF; and (c) *p*-aminobenzaldehyde and Victoria pure blue BO; which form, resp., deep blue, greenish blue and olive-green products. Cf. C. A. 23, 1283.

**Dyeing fatty acids.** I. G. FARBENIND. A.-G. Brit. 299,790, Oct. 31, 1927. Materials such as stearic acids or other "higher fatty acids" or their mixts. with ceresin,

paraffin, etc., are treated with an org. deriv. of  $\text{NH}_3$  before, during or after dyeing or coloring with org. or inorg. substances. Alkyl-, aryl-, and aralkylamines, and especially hydroxyalkylamines, are suitable, and various coloring substances may be used. Numerous examples are given.

**Dyeing textiles.** SOC. ANON. POUR L'IND. CHIM. À BALE. Fr. 651,810, Mar. 27, 1928. In dyeing dense textiles the textiles are first treated at a high temp. with protective colloids such as glue and waste sulfite cellulose lye, and then dyed without rinsing in the presence of glue or waste sulfite cellulose lye.

**Dyeing material on dipping frames.** I. G. FARBERIND. A.-G. Brit. 299,743, July 26, 1927. Dyeing with ester compds. of leuco indigo and other leuco vat dyes is effected with a bath to which starch, glue, dextrin or the like is added to reduce the mobility of the ester compd. on the material and thus ensure a more even drying of the stretched material. Details of procedure are given.

**Dyeing mixed fabrics containing "acetate silk."** I. G. FARBERIND. A.-G. Brit. 299,787, Oct. 31, 1927. Compns. suitable for dyeing materials contg. both "acetate silk" and other fibers such as wool, cotton, or natural silk comprise a diazotizable base suitable for dyeing the "acetate silk," a cotton or wool dye and a wetting agent. Examples are given.

**Dyeing fur.** VASILY E. BOLDIREV and PETER N. KORUKIN (one-half to Peter F. Naletko and Feodor M. Chalov). U. S. 1,714,941, May 28. The fur is tumbled with a mixt. of dry coloring matter and sawdust until it has acquired the desired color.

**Printing cloth.** I. G. FARBERIND. A.-G. Fr. 652,596, April 12, 1928. In printing cloth with dyes which require alkali for their fixation on the fiber, the dyes contg. vegetable mucilages coagulable by alkalies or other basic agents are printed on the cloth, which is then passed through an alk. bath contg. a reducing agent. Cf. C. A. 23, 1759.

**Printing or stenciling cellulose derivatives.** HENRY DREYFUS. Fr. 651,934, Mar. 29, 1928. Cellulose derivs., particularly the acetate, are printed or stenciled by the application of pastes or aq. dispersions of dyes or insol. or relatively insol. compds. in a non-dispersed form. The material may be treated with Al acetate before printing.

**Printing or stenciling cellulose esters or ethers.** H. PLATT (to British Celanese, Ltd.). Brit. 299,849, Nov. 2, 1927. To facilitate obtainment of sharply defined outlines, the materials are treated, before application of dyes, with a basic metallic acetate such as that of Al to which is also preferably added an org. acid such as  $\text{HOAc}$  or formic acid. Examples with details of the treatment are given.

**Dyeing apparatus.** THE DELTEX CO. Fr. 651,717, Mar. 24, 1928.

**Vat and circulating system for dyeing or washing textile materials.** CECIL F. HAMMOND and WILLIAM SHACKLETON. U. S. 1,714,777, May 28. Structural features.

**Spinnable fiber from coconut husks.** BAREND G. H. VAN DER JAGT (one-third each to Dr. Zadok van der Bergh and Frederick A. J. van Kuyk). U. S. 1,713,681, May 21. Husks are sepd. from the shell, crushed to facilitate access of liquid into the matted mass of fiber and the material is satd. with a liquid such as a boiling weak alkali soln. which facilitates slipping of the fibers one over another, surplus soln. is pressed out and the satd. husk is repeatedly treated to effect disintegration and alternately pressed between rollers; the fiber and pith are subjected to differential drying to enable removal of the pith, thus leaving a sepd., clean spinnable fiber suitable for making woven fabrics.

**Drying and carbonizing webs of fabric.** JOSEPH H. WALSH (to Johns-Manville, Inc.). U. S. 1,714,062, May 21. The fabric is subjected to successive treatment with radiant heat and highly heated still air while passing through an app., which is described, in a series of vertical runs over guide rollers.

**Mercerizing cotton.** OTTO DUBAC. Fr. 33,797, June 25, 1927. Addn. to 618,170. Linen and silk effects are obtained by treating cotton alternately in hot and cold baths contg.  $\text{NaOH}$  for a short time, the cotton being washed out with boiling water after each treatment.

**Dissolving natural silk.** TOMENOSUKE MUTO and SABURO HIDA (to Kanega-Fuchi Boseki Kabushiki Kwaisha). U. S. 1,714,039, May 21. See Fr. 649,979 (C. A. 23, 3111).

**Artificial silk of the hollow-filament type.** ALSA SOC. ANON. Brit. 299,710, Oct. 29, 1927. Hollow filaments are further distended during the process of coagulation or subsequently, by immersion in a liquid contg. a gas in soln. or a gas-generating material and then subjecting the material to treatment such as heating or reduction of pressure or chem. treatment to cause generation of gas; e. g., a hollow filament of "viscose silk" is immersed in cold water satd. with air and the temp. then raised; or a hollow filament

may be soaked in  $\text{Na}_2\text{CO}_3$  soln. and then treated with dil.  $\text{HOAc}$  preferably satd. with air or  $\text{CO}_2$ . The product is preferably dried in closed chambers at  $80\text{--}100^\circ$ .

**Treating artificial silk.** I. G. FARBERIND. A.-G. Fr. 651,770, Mar. 26, 1928. The bobbins on which the artificial silk is wound are magnetic, and are put in and out of the various washing and treating baths by electromagnetic means.

**Gas-proof cloth.** L'ÉTAT FRANÇAIS (REPRÉSENTE PAR LE MINISTRE DE LA GUERRE). Fr. 652,150, Nov. 24, 1926. Cloth which is supple and impermeable to gas has a coating of cellulose covered by a coating of varnish having a basis of cellulose ester.

**Treating surfaces of hat bodies.** VICTOR BÖHM. U. S. 1,713,641, May 21. A neutral reagent contg. a carbonyl group such as  $\text{CH}_2\text{O}$  or other aldehyde or ketone is applied to the surface of hair or wool hat bodies, in order to improve their gloss or smoothness. An oxidizing agent is also preferably used.

**Apparatus for preparing bleaching solutions for laundry use, etc.** GEORGE M. HOGAN. U. S. 1,713,657, May 21.

## 26—PAINTS, VARNISHES AND RESINS

A. H. SABIN

**Reflection factors of white paint.** F. H. RHODES AND J. V. STARR. *Ind. Eng. Chem.* 21, 596-9 (1929).—The effects of the addn. of known amts. of C black, Prussian blue, and Al powder upon the brightness and the hiding power of white paints are measured in a reflectometer. Small quantities of C black or of Prussian blue decrease the brightness only slightly and increase the hiding power markedly. With larger amts. of the colored pigments the decrease in the brightness becomes relatively more pronounced. With very small quantities of Prussian blue the ratio of the increase in hiding power to the decrease in brightness is greater than with C black. The addn. of Al powder greatly increases the hiding power, but lowers the brightness and causes the dry film to have a flecked appearance. The use of Al powder in undercoats for white finishing coats is of advantage.

R. J. MOORE

**The influence of light on paints containing lead.** I. G. ZEIDLER AND W. TOELDT. *Farben-Ztg.* 33, 2607-11 (1928).—Eleven paints contg. various Pb pigments in whole or in part were spread on Fe panels and exposed to the radiations from the sun, an arc light, a mercury arc and a Nitra lamp for intervals from 6 to 28 hrs. The degree of darkening or lightening and loss of gloss was compared with a set kept in the dark. The results are shown in graphs which should be consulted for the details. II. *Ibid* 34, 1547-9 (1929).—Films of the paints described in I were exposed to dil.  $\text{H}_2\text{S}$  fumes for 15 min. and then to the various light sources for periods of 1 to 3 hrs. In general, the mercury arc effected the greatest degree of fading of the discoloration produced by the  $\text{H}_2\text{S}$ , but the relative effects of the different radiations on the various paints were not uniform.

G. G. SWARD

**Paints from silicate of soda and ultramarine.** A. DUBOSC. *Peintures, pigments, vernis* 5, 668-9 (1928).—A review.

B. HAMILTON

**British standard specification for zinc chromes for paints.** *Brit. Eng. Standards Assoc.* No. 389, 6 pp. (1929).

E. I. S.

**British specification for white titanium dioxide pigment for paints.** *Brit. Eng. Standard Assoc.* No. 392, 7 pp. (1929).

E. I. S.

**British standard specification for oil pastes (colored) for paints.** *Brit. Eng. Standards Assoc.* No. 390, 7 pp. (1929).

E. I. S.

**British standard specification for tinted oil pastes for paints.** *Brit. Eng. Standards Assoc.* No. 393, 9 pp. (1929).

E. I. S.

**Spray painting.** LEONARD GREENBURG. *New Haven Health Dept.* 55, No. 10, 3-4 (1928); *U. S. Pub. Health Eng. Abstracts* E-789c, 4.—The spraying of lacquers with paint spray guns was investigated. When paints contg. Pb or benzene are applied with a spray gun, the painter should be protected by means of masks or respirators and suitable exhaust ventilation. Efforts are being made by the Natl. Safety Council to produce non-injurious painting materials.

C. R. FELLERS

**Casein paints.** F. MARGIVAL. *Peintures, pigments, vernis* 5, 673-5 (1928).—Various compns. of casein-contg. paints are given.

B. HAMILTON

**The red lead question.** A. JUNK. *Farben-Ztg.* 34, 1664-7 (1929); cf. C. A. 23, 1291.—Reply to criticisms by Wolff, Toeldte and Zeidler (C. A. 23, 2839) and by Luty.

G. G. SWARD

**Oil absorption of pigments.** RUCHTI. *Farben-Ztg.* 34, 1954 (1929).—The oil absorption of a pigment depends upon the compn. as well as the degree of subdivision.

*E. g.*, 3 others characterized by oil absorption values (according to the method of Wolff, Zeidler and Toeldte, *Farben-Ztg.* 33, 2730(1928)) of 39, 33 and 33 possessed relative finenesses of 2, 11 and 3, resp. No. 1 contained much clay and no. 2 much lime. Any method which is capable of reasonable precision is satisfactory even though the values are not minimum ones.

G. G. SWARD

**The resistance to light of typed manuscripts, their carbon copies and writing made with copying ink pencils.** H. I. WATERMAN, J. GROOT AND M. J. TUSSENBOECK. *Chem. Weekblad* 26, 276-7(1929).—Writing obtained with violet typewriter ribbon (methyl violet and carbon black as coloring matter) and with black carbon paper faded slightly after 3 weeks' exposure to daylight. Copies made with violet carbon paper contg. only methyl violet faded strongly or entirely. Conclusion: The use of typewriter ribbons and carbon papers contg. carbon black furnishes manuscripts suitable for archive purposes. Violet carbon paper and copying ink pencil contg. only methyl violet as coloring matter are unsuitable for copies which are to be kept for long periods.

F. DE LEEUW

**Physico-chemical studies on the mechanism of the drying of linseed oil. I. Changes in density of films.** G. L. CLARK AND H. L. TSCHENTKE. *Ind. Eng. Chem.* 21, 621-7(1929).—Accurate density measurements were made by the flotation method on a large no. of thin, baked films of linseed oil. These films and the characteristic density changes (usually increasing) illustrate the effects of drier, sunning and weathering, ultra-violet exposure, ozonization, natural aging in darkness, influenced of thickness, effect of 2 films superposed, metallic soaps and inhibitors. A mechanism of failure of linseed oil films independent of complex chem. changes is indicated by the density data: stresses and strains are set up throughout the film as a result of unequal contraction of surface and inner layers. Also crystn. of metallic soaps causes non-homogeneity and failure.

R. J. MOORE

**Effect of various driers on linseed oil films during aging.** P. E. MARLING. *Ind. Eng. Chem.* 21, 594-6(1929).—This is a continuation of previously reported expts. (*C. A.* 21, 658, 1889). It shows the relationship during aging of acid no., I no., and soly. of linseed oil films contg. different concns. of Pb, Mn and Co.

R. J. M.

**British standard specification for tung oil.** *Brit. Eng. Standards Assoc.* No. 391, 9 pp.(1929).

E. I. S.

**Non-scaling (aqueous) vehicles.** A. CHRIST. *Farbe u. Lack* 1929, 218.—Scaling of distempers occurs whenever the surfaces to which they are applied possess less tensile strength than the dried films. Succeeding coats should therefore be formulated with progressively less glue than the preceding ones. Weak plaster walls also tend to allow scaling of distempers.

G. G. SWARD

**Place of synthetic amyl products among lacquer solvents.** M. M. WILSON AND F. J. WORSTER. *Ind. Eng. Chem.* 21, 592-4(1929). Recent addns. to the present group of lacquer solvents are synthetic Am alc. and synthetic Am acetate. This alc is made from pentane as a raw material. The synthetic Am alc. is practically a duplicate of the so-called high-test fusel oil offered in the past. The synthetic Am acetate is prepd. from the alc. and AcOH. In lacquer formulation this acetate ranks in the general class of high boilers, including Bu propionate, fusel oil acetate, Cellosolve acetate, etc. Lab. data are given showing various relations between these and other solvents. These comparisons are based on the usual methods of testing the suitability of solvents, and consist of data on distn., tolerance of nitrocellulose solns. for hydrocarbons, viscosities of nitrocellulose solns., evapn. rates and soly. of resins.

R. J. M.

**New materials for the lacquer industry.** AUGUST NOLL. *Farben-Ztg.* 34, 1486-90, 1549-52(1929).—A review of the phys. properties of recently developed lacquer solvents, plasticizers and diluents which are in use in Germany. Many of them are described under their trade names.

G. G. SWARD

**Zinc compounds in nitrocellulose lacquers.** WALTER BAER. *Chem.-tech. Rundschau* 44, 51(1929).—Nitrocellulose contg. 11.8-12.3% N is used in the production of nitrocellulose lacquers. These are colored chiefly with mineral pigments, brightened sometimes with 2-6% of an org. dyestuff. Zn compds. such as zinc white, zinc sulfide and lithopone are particularly suitable as pigments. The first of these stabilizes the film. Lacquers contg. lithopone do not withstand weathering. A mixt. of lithopone and Zn sulfide is stable and has very good covering power. In these lacquers easily hydrolyzable compds. such as ethyl acetate should be avoided. In zinc enamels dibutyl phthalate is a suitable plasticizer, but tricresyl phosphate is not since it yellows the Zn pigments.

E. PICKERING

**Brief notes on crystallizing lacquers and toluene resins.** H. A. GARDNER. *Am. Paint and Varnish Mfrs. Assoc. Sci. Sect. Circ.* No. 348, 321-31(1929).—References

are quoted describing various types of crystal, crackle and wrinkle finishes. Notes are given on producing some of these finishes. One of the cryst. lacquers is produced by pptn. of a toluene-formaldehyde condensation resin in a lacquer film. Properties of this resin are described. Photomicrographs are shown of crystg. lacquers.

R. J. MOORE

**Recent results from the investigations of resins.** W. NAGEL. *Metallbörse* 19, 173-4 (1929).—Because resins afford substances closely related to one another, easily undergoing transformations into similar compds., their study is difficult. While colophonium is derived from a methylpropylphenanthrene nucleus, shellac is  $\text{CH}_2\text{OH}-(\text{CH}_2)_3-(\text{CHOH})_2-(\text{CH}_2)_7-\text{COOH}$ . Less definite information is available concerning other natural resins. The synthetic resins are becoming of so much greater importance than the natural resins that studies of the compn. of the latter substances have little practical value.

W. C. EBAUGH

**Hardening and esterification of rosin.** A. I. GELIKH. *J. Chem. Ind. (Moscow)* 6, 253 (1929); cf. C. A. 22, 3055.—Pyhäälä's calcns. are based on the supposition that rosin consists of abietic acid only; in reality it may consist of abietic anhydride and it may contain other resinous substances. If rosin consisted of abietic acid only, 200 parts of it would have to be melted with 60.6 parts  $\text{C}_3\text{H}_5(\text{OH})\cdot\text{CaO}$ , and not with 27 parts, as Pyhäälä prescribes. As a whole, the mechanism of this reaction, as well as those of the other reactions given by Pyhäälä, is not clear. In reality the monoglycerinate,  $\text{MnO}(\text{OH})_2\cdot\text{C}_3\text{H}_5$ , is not obtained in any of the known reactions, but the diglycerinate can be obtained from  $\text{C}_3\text{H}_5(\text{OH})_3$ ,  $\text{NaOH}$  and  $\text{MnO}_2$ . The other reactions given by Pyhäälä are also incorrect.

BERNARD NELSON

**Advances in the production of artificial resins.** W. BAER. *Chem.-tech. Rundschau* 44, 208 (1929).—A brief and incomplete review.

E. PICKERING

**Euphorbone from euphorbium resin (MÜLLER) 10.** Present status of the chemistry of the resinic acids of conifers (LÉVY) 10. Our knowledge of resinic acids (ROUIN) 10. Retene and some of its derivatives (LI MAN CHEUNG) 10.

**Paint.** HERMANN FRENKEL. Fr. 651,771, Mar. 26, 1928. A paint, several coats of which may be applied without drying, has a binder of fatty oil with which  $\text{SCl}_2$  is caused to react partially while diluents and more fatty oil are added. The paint used for the first coats may have added high b. p. hydrocarbons or esters, essential oils or amines to prevent rapid drying on the surface.

**Paint.** DEUTSCHE GASGLÜHLICHT AUER-G. M. B. H. Fr. 652,322, April 6, 1928. The resistance of paints, particularly oil paints, to the weather is increased by the addn. of insol. germicides, such as compds. of Cu, Zn, Cd, Hg or poisonous org. compds.

**Titanium pigments.** F. G. C. STEPHENS, L. J. ANDERSON and W. A. CASH. Brit. 299,835, Aug. 2, 1927. A Ti sulfate soln. is added gradually to a prepd. bulk of a soln. of a sol. alk. earth metal salt such as  $\text{BaCl}_2$ , and a temp. of 30-35° is suitable during the pptn. of the alk. earth metal sulfate, with a subsequent heating at about 100° to ppt. substantially all the Ti from the soln. Various details are given. Cf. C. A. 22, 1862.

**Pigments containing titanium.** FRANCIS G. C. STEPHENS, LENNOX J. ANDERSON and WILLIAM A. CASH (to National Metal and Chemical Bank, Ltd., of London, England). U. S. 1,714,408, May 21. See Brit. 273,017 (C. A. 22, 1862).

**Zinc and cadmium sulfide pigments.** L. A. LEVY and D. W. WEST. Brit. 299,797, July 1, 1927. Phosphorescent and fluorescent Zn or Zn-Cd sulfides for use as pigments are treated after firing with a soln. of alkali metal phosphate (preferably  $\text{Na}_3\text{PO}_4$ ) or carbonate or borax and the solvent is evapd. White metal oxides such as those of Mg, Th, Al or Ce or other rare earth or alk. earths are also preferably added.

**Ultramarine.** B. K. KLIMOV. Russ. 5542, June 30, 1928. Instead of tar and the siliceous materials that are the usual ingredients of the ultramarine mixture, oil shale is used. The mixt. is heated and the product then treated in the usual way.

**Printing ink suitable for use on rubber.** HERBERT N. MORRIS. U. S. 1,715,209, May 28. An ink suitable for use on rubber, celluloid, etc., contains acetone, tetrahydronaphthalene, methylethyleneglycol and spirit-sol. induline.

**Lithographing ink.** OTTO E. HARDER. U. S. 1,714,166, May 21. A compn. for use with printer's ink comprises "petrolatum oil" 73%, paraffin 21%,  $\text{MgCO}_3$  3% and oleic acid 3%.

**Staining wood.** HAROLD P. VANNAH and JOHN G. GOSSELINK (to Brown Co.). U. S. 1,714,701, May 28. Wood is first impregnated by suction with an acid soln. of

2,4-diaminophenol-HCl or other org. dye intermediate capable of pptg. pigments when neutral or alk., by oxidation, and is then treated with aq.  $\text{NH}_3$  to permit such oxidation in the wood. Cf. C. A. 22, 3756.

**Varnish.** GASTON ROELANDTS. Fr. 652,410, April 10, 1928. A varnish is made by adding Venice turpentine 25, tricresyl phosphate 10, BuOH 10, linseed oil 3, to 100 parts of collodion made from nitrocellulose 30, AcOBu 45, toluene 18 and EtOH 7 parts. This varnish is quickly polished by a mixt. of equal parts of AcOBu, BuOH, vaseline oil and tinct. of benzoin with or without gum lac varnish.

**Plastic substances, varnishes, etc.** I. G. FARBERIND. A.-G. Fr. 651,870, Mar. 29, 1928. Plastic substances, varnishes, etc., having a basis of nitrocellulose are prep'd. by using as gelatinizing agents esters of phthalic acid in which a carboxylic group is esterified by the radical of an aromatic or hydroaromatic alc., and finally adding resins, fillers, dyes, solvents, etc. Examples are given.

**Nitrocellulose varnishes.** I. G. FARBERIND. A.-G. Fr. 652,658, April 13, 1928. See Brit. 289,387 (C. A. 23, 703).

**Coating compositions.** W. H. MOSS (to British Celanese, Ltd.). Brit. 299,781, Oct. 31, 1927. Cellulose derivs. such as the acetate, formate, propionate or butyrate or methyl or ethyl cellulose are used with a ketone-phenol-aldehyde resin and a volatile solvent, with or without natural resins, solvents of high b. p., plasticizers, dyes or pigments. Such compns. may be used as lacquers over a priming coat which may contain linseed oil or over nitrocellulose lacquers, and may be covered with a cellulose acetate lacquer contg. no synthetic resin. Brit. 299,782 relates to solvents for use in such compns. and which comprise a mixt. of  $\text{C}_6\text{H}_6$ , ethylene dichloride and EtOH or a similar mixt. of an aromatic hydrocarbon, a halide of an unsat'd. hydrocarbon and an alc. Various optional ingredients are specified.

**Lacquer.** YVES M. CORTIN. Fr. 649,939, Aug. 4, 1927. An unbreakable lacquer for Fe, wood, etc., contains metallic filings such as Cu dissolved in an acid, with or without ZnO. The linseed oil used is preferably heated first to a high temp., and the proportion of gum is higher than in the usual lacquer.

**Colored lacquers.** HANS WOLFF and RUDOLF SINGER. Fr. 652,441, April 10, 1928. To prevent thickening or gelatinizing of cellulose lacquers contg. Pb pigments, org. compds. having 3 or more C atoms in the mol. and having either a carboxylic or aldehydic group are added thereto, or the salts (Pb, Na, Mg or Mn) thereof which are sol. in the org. solvents for the lacquers. Appropriate compds. are mentioned.

**Cellulose esters for lacquers, etc.** G. SCHNEIDER (to British Celanese, Ltd.). Brit. 300,140, Nov. 5, 1927. Org. esters of cellulose of low viscosity are prep'd. by an esterification process conducted at a temp. not exceeding that at which a substantial degradation of the cellulose takes place, e. g., at a temp. not exceeding about  $55^\circ$  in prep'g. cellulose acetate with the use of  $\text{H}_2\text{SO}_4$  as a catalyst. Numerous details and other examples are given.

**Ether-alcohol esters of polycarboxylic acids such as phthalic acid.** JOHN M. KESSLER and OREGON B. HELFRICH (to Kessler Chemical Co.). U. S. 1,714,173, May 21. Plasticizing agents suitable for use with *pyroxylin lacquers* are produced by bringing an aliphatic ether-alc. as diethylene glycol, triethylene glycol, diethylene glycol Et ether, diethylene glycol Bu ether, dipropylene glycol, ethylene propylene diglycol, etc., or an ether deriv. thereof by substituting a hydrocarbon radical for an H of an OH group, as Et, Pr, Bu, Am, etc., into interaction with a polycarboxylic acid as succinic acid, glutaric acid, maleic acid, phthalic acid, the naphthalenepolycarboxylic acids under conditions such that water is split out and an ester of the carboxylic acid formed. The esterification may be effected by heating the aliphatic ether-alc. and the polycarboxylic acid, preferably in the form of its anhydride. The diethylene glycol Et ether ester of phthalic acid is a neutral viscous liquid having a sp. gr. of 1.1765 at  $20^\circ$  and a flashpoint of  $265-270^\circ$ .

**Artificial horn.** FRANZ PABST. Fr. 652,615, April 12, 1928. A mixt. of phenol, aldol and resin is added to albuminoid material such as casein to be made into artificial horn.

**Treating crude resin.** A. PIETZSCH. Fr. 652,141, April 4, 1928. A small quantity of turpentine oil is added to the crude resin which makes it sufficiently fluid to be filtered in the cold, and it is afterward distd.

**Refining rosin.** IRVIN W. HUMPHREY (to Hercules Powder Co.). U. S. 1,715,083, May 28. See Can. 284,986 (C. A. 23, 1001). U. S. 1,715,086. See Can. 284,988 (C. A. 23, 1001).

**Refining rosin.** HARRY E. KAISER and ROY S. HANCOCK (to Hercules Powder Co.). U. S. 1,715,084, May 28. See Can. 284,985 (C. A. 23, 1001). U. S. 1,715,085

relates to a rosin purified by treatment with furfural. Cf. C. A. 23, 1001. U. S. 1,715,088. See Can. 284,983 (C. A. 23, 1001).

**Refining rosin.** GEORGE M. NORMAN (to Hercules Powder Co.). U. S. 1,715,087, May 28. See Can. 284,984 (C. A. 23, 1001).

**Synthetic resins.** KUNSTHARZFABRIK FRITZ POLLACK G. M. B. H. Fr. 651,723, Mar. 24, 1928. In making artificial resins by condensing phenols and aldehydes, protective colloids such as gum arabic, saponin, casein or gelatin are added to the condensation soln. before or at the moment of the reaction. Preferably neutral salts are added to the soln. before pptn. Cf. C. A. 23, 1294.

**Synthetic resins.** E. I. DU PONT DE NEMOURS & Co. Fr. 652,119, April 3, 1928. Synthetic resins are prepd. by heating a polyhydric alc., e. g., glycerol and a polybasic acid, e. g., phthalic acid, to 180–265° with a drying oil and a natural resin such as Congo resin. The reaction is carried out in a non-reactive atm. such as CO<sub>2</sub> and is continued until the evolution of steam ceases. The resin may be mixed with cellulose esters or drying oils for the production of varnish.

**Synthetic resins.** COMPAGNIE FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON. Fr. 33,789, June 24, 1927. Addn. to 604,198. Resins which are hardened by heat are solubilized by heating them with a liquid which dissolves the constituent part of the resin, e. g., a glycerol phthalate resin is heated with a solvent for glycerol and phthalic anhydride. A condensation product in the gel state is made sol. by heating it in contact with a liquid in which the product is sol. before being transformed into the gel state.

**Condensation products.** SOC. ANON. POUR L'IND. CHIM. À BÂLE. Swiss 129,592, June 16, 1927. A new condensation product is produced by treating PhNH<sub>2</sub> with C<sub>2</sub>H<sub>2</sub> in presence of a catalyst. The product is a resin which can be used in the varnish and rubber industries. Thus, 280 parts PhNH<sub>2</sub> are stirred with 27 parts HgCl<sub>2</sub> in an atm. of C<sub>2</sub>H<sub>2</sub> at 30–50° until no more C<sub>2</sub>H<sub>2</sub> is absorbed. The product is dissolved in mineral acid and the Hg deposit filtered off. The unchanged PhNH<sub>2</sub> is removed by steam, leaving a reddish resin, m. 70–140°. Other examples are given.

## 27—FATS, FATTY OILS, WAXES AND SOAPS

E. SCHERUBEL

**Report on (the analysis of) fats and oils.** G. S. JAMIESON. *J. Assoc. Official Agr. Chem.* 12, 203–5 (1929); cf. C. A. 22, 4000.—Further collaborative work on the Pb salt-Et<sub>2</sub>O method for the detn. of satd. and unsatd. acids confirmed the belief that extensive experience is required on the part of the analyst before the difficult technic can be mastered, but that when the directions are actually followed in every detail as given satisfactory results are obtained.

A. PAPINEAU-COUTURE

**Determination of the saponification number—a more stable alcoholic potash reagent.** D. T. ENGLIS AND V. C. MILLS. *J. Assoc. Official Agr. Chem.* 12, 248–50 (1929).—Addn. of a small quantity of Na<sub>2</sub>S<sub>2</sub>O<sub>4</sub> (5 g. per l.) to alc. KOH reagent was found effective in preventing coloration of the soln. When the clear supernatant liquid is used for the detn. of sapon. values the results obtained with this reagent agree with those obtained with the official reagent. An attempt to find a general inhibitor for color development during the sapon. process was not successful.

A. P.-C.

**Standardization of methods of determination of the iodine number.** J. GIRAL. *Anales soc. españ. fís. quim.* 27, Sección técn., 259–64 (1929).—Unlike other countries, Spain has no official method for detn. of I no. The method used should always be specified in the data.

E. M. SYMMES

**The detection of olive oil in some refined vegetable oils.** W. H. DICKHART. *Olive Oil* 2, 11 (1929); *Squibb Abstract Bull.* 2, A-531.—When 5 cc. of pure olive oil was treated with 5 cc. of a soln. contg. 1 vol. of concd. H<sub>2</sub>SO<sub>4</sub> and 4 vol. of abs. alc. (A), and after the formation of an emulsion 10 drops of a 2% alc. soln. of furfurole (B) added, the lower soln. became dark cherry-red and after standing much darker; refined cottonseed oil failed to give this color even after long heating. Palm-kernel, peanut, coconut, tea-seed and castor oils gave a slight red coloration with this test but on the addn. of 10 cc. of water the color disappeared, leaving a milky soln. Sesame oil gave a pink coloration in the cold but a dark lavender to almost black ppt. in the hot; in the former instance the pink disappeared with the addn. of water. Mustard oil gave a greenish blue and became milky with water. Thus if a pink coloration appears upon the addn. of 5 cc. of A and 10 drops of B to 5 cc. of a sample of oil, sesame oil is indicated;

if after heating on the water bath (94–95°) and adding 10 cc. of cold water a red color appears after 5–10 mins., olive oil is indicated. A very pronounced red coloration with this test on samples of refined cottonseed, soy-bean, peanut, tea-seed, corn oils, etc., contg. 2, 3 and 5% olive oil, is a definite proof of contamination. The test will differentiate between tea-seed oil and olive oil. If sesame oil is present in an oil, olive oil cannot be detected by the above method. H. L. D.

**Fachini's reaction for the identification of oil extracted from the residue from the pressing of olives.** R. MARCILLE. *Ann. fals.* 22, 163–6(1929); cf. Fachini, *C. A.* 21, 3474.—When the reaction is applied to virgin oil contg. a relatively small proportion of extd. oil, it is not very sharp, being masked by the color imparted by the oil to the  $\text{Ac}_2\text{O}$ . This interference can be removed by a preliminary treatment of the oil to be tested with decolorizing black; but a large no. of oils of known purity were found to give a positive reaction after this treatment, such oils generally (but not always) having a high acidity. The reaction is considered as not specific of extd. oils, but is also given by pressed oils obtained from olives which have undergone fermentation. A. P.-C.

**Use of vegetable oils in the soap industry.** S. KAZARNOVSKII AND V. SIZONENKO. *Masloboino Zhirovoe Delo (Oil and Fat Ind. (Russia))* 1928, No. 5, 7–10.—In consequence of a shortage in animal fats and such oils as coconut and palm oil the Russian soap industry is compelled to use liquid vegetable oils which are partly hydrogenated to meet the specifications. The following mixtures are used at the present time. The figures represent for each mixt., resp., the I no. and the percent contents of solid satd. acids, of oleic acid, of linolic acid and of linoleic acid. 70% hydrogenated sunflower oil plus 30% linseed oil 96, 39.9, 37.3, 9.6, 13.2; 70% hydrogenated sunflower oil plus 30% sunflower oil 80, 39.7, 43.5, 16.8, —; 70% hydrogenated sunflower oil plus 30% cottonseed oil 74, 44.6, 47.1, 8.3, —; 70% hydrogenated cottonseed oil plus 30% linseed oil 90, 37.8, 39.4, 9.6, 13.2; 70% hydrogenated cottonseed oil plus 30% sunflower oil 73, 37.6, 45.5, 16.8, —; 70% hydrogenated cottonseed oil plus 30% cottonseed oil 67, 42.5, 49.1, 8.3, —. A. A. BOEHTLINGK

**Modern developments in soap manufacture.** H. M. LANGTON. *Ind. Chemist* 5, 65–70, 105(1929). E. H.

**Making soap in closed kettles.** G. MARGOLIN. *Masloboino Zhirovoe Delo (Oil and Fat Ind. (Russia))* 1928, No. 5, 10–1.—Twenty-five % less steam is used for boiling soap when the boiling is done in closed kettles; the same quality of soap is obtained as in open kettles. A. A. BOEHTLINGK

**Dyeing fatty acids** (Brit. pat. 299,790) 25. Device for separating oil, water and air (U. S. pat. 1,714,825) 1. Filter and gravity separator for oil and water, etc. (Brit. pat. 299,648) 1.

HOLDE, D.: *Huiles et graisses minérales, végétales et animales, etc.* Translated from the 6th German ed. by Ad. Jouve. Paris: Ch. Béranger. 961 pp.

**Fatty substances.** RAYMOND VIDAL. *Fr.* 33,740, April 19, 1927. Addn. to 637,274 (*C. A.* 23, 536). Prepn. which are more fluid than those of *Fr.* 637,274 are obtained by substituting ricinoleic acid for oleic acid. Addns. of alkali hypochlorites or hypobromites may be made. Cf. *C. A.* 23, 1519.

**Wool fat.** I. G. FARBENIND. A.-G. *Fr.* 652,070, April 2, 1928. The fraction of wool fat having a low f. p. or liquid and more easily sol. in solvents is sapond. to obtain separately in known manner from the sapon. product, acids and nonsaponifiable fractions. The acids may be converted to soap by the addn. of NaOH soln.

**Purifying wool grease.** I. G. FARBENIND. A.-G. *Fr.* 652,613, April 12, 1928. Bleached anhyd. wool grease is obtained by heating under pressure to a high temp., e. g., 160°, the emulsions of the grease with reducing bleaching agents, such as  $\text{NaHSO}_3$ , lye or  $\text{SO}_2$  soln.

**Purifying fatty vegetable oils.** ANTHONY S. MORRIS (to Cresson-Morris Co.). U. S. 1,714,231, May 21. A body of oil and admixed alkali soln. is heated and a portion of the oil is continuously withdrawn from the lower portion of the body and returned beneath the level of the body and within the latter in cyclic circulation so as to cause the returned portion to circulate through and to intermix with the body before being again withdrawn. An app. is described.

**Apparatus for the preparation of olive oil.** RAOUL M. BERLINE. *Fr.* 652,818, Feb. 7, 1928.

**Candelilla wax.** JOSE T. GARCIA. U. S. 1,715,194, May 28. The plant material from which the wax is to be estd. is subjected to crushing, tearing and beating so that



wax and non-waxy matter in finely divided form are sepd. from the plant fibers and then subjected to screening, in an app. which is described.

**Hand-cleansing composition.** ADREN B. STRAWTHER. U. S. 1,714,054, May 21. A compn. suitable for removing paint, etc., from the skin comprises finely divided wood 300,  $\text{Na}_2\text{CO}_3$  280, soap 280, Na borate 25 and powd.  $\text{NH}_4\text{Cl}$  about 5 parts.

**Hand-washing powder.** KURT RÖHLER. U. S. 1,713,920, May 21. A mixt. is formed from dry finely ground wood pulp 15, sal soda 12, neutral fat 3, green soap 7, finely pulverized pumice 1.5 and turpentine varnish 1 part, and is suitable for use on the skin or on fabrics.

**Apparatus for casting soap into bars.** L. H. NELLES. Brit. 299,960, Sept. 21, 1927. Structural features.

**Rotating boiler for soap making.** LAFAYETTE H. NELLES. Fr. 652,369, April 7, 1928.

## 28—SUGAR, STARCH AND GUMS

J. K. DALE

**Report on polariscope methods (of sugar determination).** F. W. ZERBAN. *J. Assoc. Official Agr. Chem.* 12, 158-66(1929); cf. *C. A.* 22, 2479.—Results are given of collaborative expts. on the 4 generally used inversion methods as applied to mixts. of pure sugars with pure amides and amino acids (aspartic acid and asparagine). The following conclusions are drawn. In the analysis of complex mixts. resembling cane products and contg. sucrose, invert sugar, reversion products and asparagine or aspartic acid, the invertase method must be used to det. the actual sucrose content. Sucrose as detd. by Jackson and Gillis' method No. II is increased by reversion products formed under the conditions of the expts., but is not affected by the presence of asparagine or aspartic acid. Sucrose by Jackson and Gillis' method No. IV is high because of reversion products, but is low in the presence of asparagine or aspartic acid. The difference between the sucrose result by Jackson and Gillis' method No. II and by the invertase method gives an approx. measure of the reversion products produced by HCl under the conditions of the analysis. The difference between the sucrose result by Jackson and Gillis' method No. II and that by No. IV gives an approx. measure of the asparagine or aspartic acid present. The plain acid method may give any kind of a result, depending on the relative proportion of the different constituents in the mixt. analyzed.

A. PAPINEAU-COUTURE

**Influence of the temperature of refinery massecuite on hardness and destruction of sugar.** M. I. NAKHMANOVICH AND I. F. ZELIKMAN. *Nauch. Zapiski Sakharnoi Prom.* 6, 394-412(1928).—Generally very slight increase in hardness is produced by dropping a massecuite at a temp. of 105° instead of 96°. The color of the sugar boiled at the higher temp. is greater than that boiled at 96°. Apparently increase in the color more than offsets the gain in hardness.

V. F. BAIKOV

**The viscous fermentation of frozen beets.** H. COLIN AND MARC SIMONET. *Compt. rend.* 188, 943-5(1929); *J. fabr. sucre* 1929, No. 14.—The viscous product is no doubt due to a coccus, round or slightly oval, occurring singly or in short chains of 6 or 8 elements. The viscous material elaborated by the organism at the expense of the sugar is analogous to, if not identical with, the product described by earlier observers under the term "fermentation gum" or "dextran."

R. P. WALTON

**Report on drying, densimetric and refractometric methods (for the determination of moisture in sugar products).** J. F. BREWSTER. *J. Assoc. Official Agr. Chem.* 12, 156-7(1929).—A brief discussion of the lack of satisfactory methods of detg.  $\text{H}_2\text{O}$  for any but very high-grade sugar products.

A. PAPINEAU-COUTURE

**Economics of the farm manufacture of maple sirup and sugar.** JOHN A. HITCHCOCK. Vermont Agr. Expt. Sta., *Bull.* 285, 1-96; *Bull.* 286, 1-24(1928).—A very complete study of cost data as related to maple products in the U. S.

C. R. F.

**The spontaneous decomposition of sugar-cane molasses.** C. A. BROWNE. *Ind. Eng. Chem.* 21, 600-6(1929).—Periodical analyses of 2 samples of sugar-cane molasses that had undergone deterioration extending over a period of 14 yrs. showed: (1) a progressive lowering in polarization, (2) a constantly increasing loss of sucrose, (3) a slow, irregular increase in the % of invert sugar, (4) a constantly increasing loss in the total sugars after inversion, and (5) a const. increase in the % of org. non-sugars. These changes resulted from chem. activities within the molasses and not from fermentation by microorganisms. This spontaneous decompn. is apparently a retarded type of "froth" or "hot room" fermentation. Two explanations are offered: (1) the forma-

tion of unstable compds. as glucic acid by the action of lime, introduced during clarification, upon the reducing sugars, and (2) the formation of unstable compds. by the acid of the amino acids of the molasses upon the reducing sugars. The part each probably plays in the deterioration is considered.

**Solid molasses.** STAIGER and GLAUBIT. *Brennerei-Ztg.* 46, 78(1929).—Sun-dried samples of sugar cane molasses received from N. Africa were heavily infested with a variety of microorganisms. 100 g. solid molasses gave on fermentation 31.75–34.25 cc. alc., total N = 0.32% (only 0.01% N utilizable by yeast); % H<sub>2</sub>O = 8.22; 20 g. solid molasses neutralized 0.6 cc. N alkali.

**The effect of heat on tragacanth and its mucilage.** L. F. GABEL. *J. Am. Pharm. Assoc.* 17, 1206–10(1928).—In the prepn. of tragacanth mucilage one- and two-min. boiling periods produce an initial max. viscosity, which increases greatly upon aging. Three-minute boiling produces a mucilage of high viscosity, which aging does not materially change. Prolonged boiling decreases the viscosity of the mucilage to a great degree. Heat has a deleterious effect on powd. tragacanth. Loss of moisture seriously impairs the powd. gum.

Filtering equipment and the systematic and continuous extraction of precipitates (FOURTON) 1. Determination of glucose sirup and glucose in presence of sucrose and invert sugar (KRUISHEER) 12. The saponin of the sugar beet (REHORST) 10. Dehydrating (of sugar beets) (U. S. pat. 1,713,619) 13. Paper pulp (from bagasse) (Brit. pat. 299, 740) 23.

KLINGE, G.: *Notas sobre la industria azucarera del Hawaii*. Lima, Peru: Sociedad nacional agraria. 220 pp. Reviewed in *Expt. Sta. Record* 60, 436 (1929).

**Fine soft granulated sugar.** BERNARD H. VARNAU and TRUMAN B. WAYNE U. S. 1,715,049, May 28. A comparatively concd. sucrose soln. is maintained substantially free from crystals at a temp. of 60–100° and is rapidly cooled to effect a substantially complete and regular grain setting, further maintained at a crystg. temp. and the crystals are sepd. from mother liquor. An app. is described. Cf. C. A. 23, 1522.

**Treating sugar solutions with lime.** RALPH W. SHAFOR. U. S. 1,713,925, May 21. A continuous reaction in a series of steps is first effected between lime and sucrose soln. to the point of concn. of the lime at which the alk. approaches a max. point as the reaction is completed, and reaction in a series of steps is then effected between the product of the first reaction with lime to produce a ppt. of lime and sucrose; the material in the second reaction is kept from mixing with the material undergoing the first reaction. An arrangement of app. is described.

**Apparatus for extracting sugar from beets.** A. A. SHUMILOV, YU. D. LYUBCHENKO and R. R. KRAUSS. Russ. 5755, June 30, 1928. Mechanical features are specified. Starch. CORN PRODUCTS Co., LTD. Fr. 652,360, Apr. 7, 1928. See Brit. 288,516 (C. A. 23, 728).

## 29—LEATHER AND GLUE

ALLEN ROGERS

Collected references on colloid technic. Colloid chemistry in the tannery. G. SANDOR. *Kolloid-Z.* 48, 96–103(1929).—A survey is made of the literature on the colloid chemistry of tanning based on: the chemistry of the proteins, the swelling of hides, vegetable tanning materials, chrome tanning, other mineral tanning materials, fat liquoring and finishing.

**Tanniferous barks of Madagascar. II. Bark of Terminalia catappa** L. A. DEFORGE, J. MAHEU and F. HEIM DE BALSAC. *Halle aux cuirs* 1929, 118–23; cf. C. A. 23, 2845.—The fruit of *Terminalia* (myrobalams) is its chief contribution to the leather industry, but the bark of some varieties is also rich in tannin. H. B. M.

**The modified shake method for tannin analysis and the Darmstadter apparatus.** G. BALDRACCO. Nat. Inst. for the Leather Ind., Turin. *Boll. ufficiale staz. sper. ind. pelli nat. concianti* 7, 82–94(1929).—B. stresses the exactness and simplicity of his 2 modifications (C. A. 15, 2366; 19, 3070) of the official method for the detn. of non-tannins in tanning liquids. The advantages of performing the analysis according to his method in the Darmstadter app. are pointed out. Parallel detns. always gave con-

cordant results; the values obtained agreed closely with those obtained with the official method. The detannizing was complete. The following procedure is recommended: Dry hide powder (8.5 g.) chromed in advance with chrome alum is introduced into the Darmstadter app. Seventy-five cc. of the tanning liquid is added. The app. is closed and agitated for 15–20 mins. Then the washing liquid is removed by suction and 75 cc. of the tannin soln. is added. After shaking for 15 mins. the soln. is removed by suction and filtered. The detn. of the nontannins in 50 cc. of the clear filtrate is carried out according to the usual method. A minor change in the construction of the Darmstadter app. is proposed.

G. SCHWOCH

**Synthetic tanning materials. I. Hydroxybenzene series.** G. GRASSER. *J. Faculty Agr. Hokkaido Imp. Univ.* 24, 73–92(1929).—The manuf. of syntans always involves a condensation reaction. Different types of condensations are reviewed. For syntans, the most important condensation is that in which  $H_2O$  is eliminated, and the most important agents are  $HCl$  and  $H_2SO_4$ . The technically important syntans are formed by the union of 1 mol. of aldehyde or ketone with 2 mols. of aromatic hydrocarbons or substitution products thereof, including phenols and their ethers. Very numerous qual. expts. were made in which various aldehydes were condensed with  $C_6H_5OH$ ,  $C_6H_5ONa$ , or  $HOC_6H_4SO_3H$ , in various solvents, with and without  $H_2SO_4$  present. When a  $H_2O$ -sol. product was obtained, its pptg. power toward gelatin was tested.  $HOC_6H_4SO_3H$  is much more readily condensed than  $C_6H_5OH$  or  $C_6H_5ONa$ . With the former, in  $H_2O$ , most  $H_2O$ -sol. aldehydes and ketones, including glucose and lactose, but not "cellulose ext.," are readily condensed. In  $EtOH$  soln.,  $HCHO$  and  $CH_3CHO$  react readily; salicylaldehyde and protocatechualdehyde react only in presence of  $H_2SO_4$ , forming insol. resins, which, however, are sol. in  $NaOH$ , forming solns. that are not pptd. by acid and have tanning properties; glucose and lactose cannot be condensed with  $HOC_6H_4SO_3H$  in  $EtOH$  soln., even in presence of  $H_2SO_4$ ; "cellulose ext.," on the other hand, reacts readily, forming a compd. possessing tanning properties.  $HCHO$  is readily condensed with  $HOC_6H_4SO_3H$  in soln. in  $(CH_3)_2CO$ ,  $(CH_3CO)_2CO$ ,  $CH_3COOEt$ ,  $HAc$  and  $C_2H_5(OH)_2$ , giving  $H_2O$ -sol. compds. that ppt. gelatin.

H. B. MERRILL

**A few south-Japanese tanning materials.** G. GRASSER. *J. Faculty Agr. Hokkaido Imp. Univ.* 24, 61–72(1929).—Japan is almost wholly dependent upon importation for tanning materials. In Formosa, however, many tanniferous species are available. Nine species were examd. to det. the kind and amt. of tannin and suitability for tanning. Results:

Species	Structure	% tan- nin (dry)	Tannin like	Remarks
<i>Q. castanopsisifolia</i>	Acorn cups	28.3	Valonia	Recommended
<i>Q. amygdalifolia</i>	Acorns	6.1	—	—
<i>Q. glandulifera</i>	Galls	20.4	European galls	Recommended
<i>Areca catechu</i> L. (Betel nut)	Nuts	12.3	Mangrove	Difficult to ext.
<i>Castanopsis taiwaniana</i> Hayata	Wood	2.0	—	Bark recommended
	Bark	9.2	—	—
<i>Castanopsis kawakamii</i> Hayata	Wood	3.3	Pine bark	Bark recommended
	Bark	9.3	Pine bark	—
<i>Acacia confusa</i> Merr	Bark	12.0	Quebracho	Recommended
<i>Dioscorea rhipogonoides</i> Oliv.	Root nodes	30.0	—	Recommended
<i>Diospyros kaki</i> (Persimmon)	Fruit	—	—	Tannin too unstable for use.

H. B. MERRILL

**Ultra-violet absorption spectra of tanning extracts.** A. DEFORGE. *Halle aux cuirs* 1929, 131–6.—A review.

H. B. MERRILL

**Examination of raw hide.** G. GRASSER. *J. Faculty Agr. Hokkaido Imp. Univ.* 24, 97–9(1929).—Raw skin is sometimes analyzed to det. the method of curing and preservation employed. Qual. and quant. examn. of mineral constituents usually suffices. Analyses of mineral matter from arsenicated, salted and dried skins from the orient are given.

H. B. MERRILL

**Influence of hydrogen-ion concentration on the color of vegetable-tanned leather.** R. O. PAGE AND A. W. PAGE. *Ind. Eng. Chem.* 21, 584–5(1929).—It is shown that when strips of skin are pretreated with solns. of  $pH$  values from 1 to 9 and tanned with wattle or chestnut liquors of the corresponding  $pH$  values, the depth of color of the leather rises and falls with  $pH$  value in a manner very similar to the swelling curve of skin. Strips all pretreated at  $pH$  5 and tanned in liquors of  $pH$  1 to 9 showed progressive darkening with increasing  $pH$ , corresponding to change of color of liquor with

$p_H$  value. Strips pretreated at  $p_H$  2 and 13, then brought to  $p_H$  5 and tanned at  $p_H$  5, were both darker than strips pretreated at  $p_H$  5. These effects are attributed to changes in structure of collagen due to pretreatment.

The dyeing of gloving leathers. J. W. LAMB. *Dyer, Calico Printer* 61, 168-9 (1929); cf. *C. A.* 22, 3550.—General. Formulas are given. H. B. MERRILL  
RUBY K. WORNER

Qualitative investigation of chrome-leather spews. G. GRASSER. *J. Faculty Agr. Hokkaido Imp. Univ.* 24, 93-6 (1929).—Spews may be composed of fats, fatty acids, S, salts, or mold growths. Microscopic examn. followed by microchem. tests is advised. H. B. MERRILL

Leather. SIEGFRIED STRANSKY. *Fr.* 651,853, Mar. 28, 1928. Two pieces of skin of fish such as large ray are passed through lime, placed one on another so that the inner sides touch, joined at the edges and submitted to tanning for the production of fancy leather.

Finishing leather. A. O. T. BEARDMORE. *Brit.* 300,077, April 3, 1928. In finishing and removing blemishes from leather, the dried tanned hide is caused to absorb 20-25% of water, stacked to effect even penetration of the water, sprayed with a mixt. of mineral and vegetable oils at about 140°, rough-rolled and finally subjected to hot embossing under heavy pressure.

"Leather substitute." ROBERT A. MARR. U. S. 1,713,846, May 21. Material contg. digested wood is subjected to brush beating at a speed not substantially below 1000 ft. per min., a sizing is added, a portion of the disintegrated binding matter is removed and the product is formed into sheets.

Imitation leather. CHARLES H. DENNISON (to American Rubber Co.). U. S. 1,713,746, May 21. A strain-resisting flexible backing such as woven textile fabric is coated with a rubber compn., a layer of fibrous rubber compn. is applied over the first rubber layer, the material is subjected to vulcanization and then to abrasion to expose the ends of the fibers.

### 30—RUBBER AND ALLIED SUBSTANCES

C. C. DAVIS

Belt dressing for eliminating static. P. W. EDWARDS AND J. O. REED. *India Rubber World* 80, 60 (1929).—Static electricity can be eliminated from rubber or leather belts by the use of special belt dressings. A good non-static rubber belt dressing contains spar varnish 82, lampblack 18, it is allowed to dry before running the belt. For leather belts the following mixt. is especially good: liquid fish glue 100, glycerol 80, sulfonated castor oil 100, water 170, 2%  $NH_4OH$  20 cc. and lamp black 82 g., in some cases more fish glue and glycerol being advisable. Conditions favoring the production of static electricity and methods of preventing it are described. C. C. DAVIS

The generation of rubber. R. L. DUPONT. *Rev. gén. mat. plastiques* 4, 621-3, 745-51 (1928); 5, 237, 239 (1929).—A review. A. PAPINEAU-COUTURE

Rubber, with special reference to the use of lead compounds. J. R. SHEPPARD. *Trans. Am. Inst. Chem. Eng.* 20, 187-212 (1928).—A review and discussion, with illustrations and tabulated data, dealing with the phys. properties of vulcanized rubber, vulcanizing agents, accelerators and compounding ingredients, with particular reference to Pb compds. C. C. DAVIS

Active fillers for rubber. MARJA SAGAJLO. *Przemysl Chem.* 13, 154-7 (1929).—A review with bibliography. A. C. ZACHLIN

Coagulation phenomena in Hevea latex. VIII. Influence of some heavy metal salts on coagulation and coalescence. OTTO DE VRIES AND N. BEUMÉE-NIEUWLAND. *Arch. Rubbercultuur* 13, 125-204 (1929); (in English 205-18); cf. *C. A.* 23, 1771.—In studying the effect of  $MnSO_4$ ,  $CuSO_4$ ,  $NiSO_4$  and  $HgCl_2$  on coalescence and coagulation, the aq. salts were added to undild. latex, to latex dild. to various degrees and to heated dild. latex, with and without the simultaneous addn. of  $AcOH$ , the addns to heated latex being for the purpose of detg. the influence of the salts on the coalescing power of fresh latex and of exts. contg. coalase. The results of the expts. are summarized in the following data, the arithmetical values representing in all cases the concn. of the salt in mg.-mols. per l. in the liquid in question: Coalescing power (in B mixt.)— $MnSO_4$ , weak, coalescence in 24 hrs. by 35 and in 2 days by 10;  $NiSO_4$ , no effect;  $CuSO_4$ , weak, coalescence in 24 hrs. by 64 and a trace of coalescence in several days by 32;  $HgCl_2$ , distinct, coalescence in 2.5 hrs. by 40-50, in 24 hrs. by 20 and a trace in several days by 2.5. Coagulating power.— $MnSO_4$ , distinct, coagulation in

undild. latex in 1-2 hrs. by 13, flocculation in dild. latex (1:9) by 7 and coagulation in undild. latex (1:9) in a short time by 33;  $\text{NiSO}_4$  distinct, coagulation in undild. latex in 0.25 hr. by 16, and in dild. latex (1:9) a clot in 0.25 hr. by 8;  $\text{CuSO}_4$  distinct, in undild. latex a thickening or pasty condition by 10-20, coagulation in 24 hrs. by 30-60, and in dild. latex (1:9) flocculation by 2 and coagulation in a few hrs. by 30;  $\text{HgCl}_2$  distinct, undild. latex became viscous with 5-10 and coagulated in 24 hrs. with 40, and dild. latex (1:9) flocculated with 1 and coagulated in 24 hrs. with 20. *Effect on heated latex (1:9 B mixt.) without acid.*— $\text{MnSO}_4$  flocculation by 3.3, coalescence after 3 days by 33, and after 2 days by 80;  $\text{NiSO}_4$  flocculation (with a white serum) by 2.4, flocculation (with a clear serum) by 40, with no coalescence;  $\text{CuSO}_4$  flocculation in 24 hrs. by 8, rapid flocculation, by 64, coalescence after a few days by 46;  $\text{HgCl}_2$  flocculation in a few hrs. by 0.5, coalescence in 1 day by 10, coalescence in a few hrs. by 40. *Influence on coagulation by AcOH.*— $\text{MnSO}_4$  acceleration caused by 3.3 or more in undild. latex, and by 5-6 or more in dild. latex (1:9);  $\text{NiSO}_4$  acceleration caused by 8-16 in dild. latex and by 2-6 in dild. latex (1:9);  $\text{CuSO}_4$  flocculation promoted with formation of a paste or porridge-like mass, but coalescence retarded by 0.8-4, and accelerated by 12-40, while in dild. latex (1:9) syneresis proceeded very slowly;  $\text{HgCl}_2$  flocculation promoted as with  $\text{CuSO}_4$ , coalescence retarded more strongly than with  $\text{CuSO}_4$  with 0.5-10, while 75 or more accelerated coagulation. *Destruction of coalescing power of exts.*— $\text{MnSO}_4$ , no effect,  $\text{NiSO}_4$  distinct, 40-80 diminishing the power greatly and 130-200 nearly destroying it altogether;  $\text{CuSO}_4$  strong, the power being destroyed by 0.8 or more;  $\text{HgCl}_2$  strong, 0.5 or more destroying the power. *Spontaneous coagulation by bacterial acid formation.*— $\text{MnSO}_4$  no effect;  $\text{NiSO}_4$  no effect;  $\text{CuSO}_4$  coagulation of undild. latex inhibited by 4, and of dild. latex (1:1) inhibited by 2;  $\text{HgCl}_2$  coagulation of undild. latex inhibited by 5 and of dild. latex (1:1) inhibited by 0.75.  $\text{CoSO}_4$  was not available, but tests of  $\text{Co}(\text{NO}_3)_2$  indicated that it would have much the same properties as  $\text{NiSO}_4$ . The results show that the phenomena are varied and complicated.  $\text{MnSO}_4$ ,  $\text{NiSO}_4$  and  $\text{Co}(\text{NO}_3)_2$  showed in general the normal behavior of bivalent salts except that  $\text{NiSO}_4$  in high concns. diminishes the coalescing power and has no coalescing power itself (whereas  $\text{MnSO}_4$  has a weak coalescing power).  $\text{CuSO}_4$  however, acts abnormally, particularly in that coagulation by  $\text{AcOH}$  is greatly retarded at certain concns. of  $\text{CuSO}_4$ , and in that the coalescing power of fresh latex and exts. is diminished or destroyed.  $\text{HgCl}_2$  is also noteworthy in its power of destroying the coalescing power of fresh latex and exts. contg. coalse.  $\text{AgNO}_3$  (0.6 and 1.2 mg.-mols. per l.) did not coagulate dild. latex (1:1); in fact spontaneous coagulation was retarded. Coagulation by  $\text{AcOH}$  is uninfluenced by 0.6 mg.-mols. and is retarded by 1.2 mg.-mols. It has a weak coalescing effect. C. C. DAVIS

**Volume compounding.** F. HARRIS COTTON. *India Rubber J.* 77, 583-4(1929).—

A discussion of the principles.

C. C. DAVIS

**China clay as a reinforcing agent in rubber compounding.** T. J. DRAKELEY AND W. F. O. POLLETT. *Trans. Inst. Rubber Industry* 4, 424-60(1929).—Since clays are cheaper than C blacks and can also be used in light-colored rubber products, an extensive investigation was made of the suitability of china clays as reinforcing agents and the quality obtained in comparison with C blacks under the same conditions. The base mixt. contained: pale crepe 100,  $\text{ZnO}$  5, S 4, diphenylguanidine 1, to which were added various proportions of the pigments. The phys. tests of the cured mixts. included the relation between tensile products and times of cure, the influence of temp. on the stress-strain curves, stress-strain curves and their comparative curvatures, resilient energy, the effects of softeners and the relative stiffness of the various samples. The data are given in detail in tables and graphs, and the results may be most readily summarized from the following conclusions: None of the clays retarded the rate of vulcanization, and some had a mild accelerating action. On the other hand, the C blacks had a retarding action. The accelerating action of some clays was probably closely related to their alkali content, for equiv. quantities of  $\text{Na}_2\text{CO}_3$  had the same effect. Small proportions of stearic acid did not influence the accelerating action of the clays, but did eliminate the retarding action of the C blacks. The extent of these accelerating or retarding effects was proportional to the quantity of pigment. The lower the temp. at which the mixts. were tested, the lower the elongation and the greater the tensile strength. Increasing proportions of clays displaced the stress-strain curve toward the stress axis in a way typical of reinforcing pigments. Up to 18% by vol. (based on the rubber) the clays increased the tensile strength, and the best clays increased the tensile strength more than did equal vols. of the C blacks. Up to 25% by vol., the clays increased the resilient energy, the max. being reached at about 12%. These max. resilient energy values were greater than the corresponding

ones with C black, but the clays failed to reinforce at such high loadings as the best C blacks. Small proportions of stearic acid did not influence the % vol. of clay or of C black at which the max. energy values occurred. With clays, stearic acid reduced the tensile strength and resilient energy values, whereas with C blacks it increased it. The slope of the stress-strain curve of the base mixt. was increased at first by clay or C black, but in some cases a max. was reached, beyond which the slope diminished with more pigment. The stress required to obtain a given elongation does not represent the stiffness of a cured mixt., particularly when the effect of increasing proportions of pigments is taken into account. Stiffness is more satisfactorily expressed by the elongation which a given stress produces. The C blacks increased the stiffness more than did the corresponding vols. of clays, and though stearic acid was without effect with small proportions of pigment, at higher proportions it further increased the stiffness. This stiffening action of the clays and C blacks had little relation to their effects on the tensile strengths. Clays did not increase the concavity factor (cf. Wiegand, C. A. 19, 2423, 3386) of the base mixt. so much as did the same vols. of the C blacks. With increase in the % pigment, the effect on the concavity factor gradually diminished, while this factor was not affected by small proportions of stearic acid. C. C. DAVIS

The influence of selenium red on the physical properties of accelerated rubber mixtures. RUDOLF DITMAR. *Chem.-Ztg.* 53, 239(1929).—A study of the action of Se red (cf. C. A. 23, 1526) on the phys. properties of rubber-S-ZnO-CaCO<sub>3</sub>-Se red-accelerator mixts. vulcanized with 19 different accelerators showed that it behaves like the com. grade of Se called "Vandex," the reinforcing effect depending upon the accelerator and being inappreciable with some accelerators. C. C. DAVIS

The behavior of the selenium preparation "Vandex" in rubber mixtures. RUDOLF DITMAR and MANFRED RACHNER. *Gummi-Ztg.* 43, 1583-4(1929).—Tests of the phys. properties of different cured rubber mixts. contg. Se (in the form of Vandex) show that (1) in a mixt. contg. rubber 100, S 5, CaCO<sub>3</sub> 20, Vandex 2, the Vandex stiffened the cured mixt., whereas with much higher proportions this stiffening action was diminished; (2) in a mixt. contg. rubber 100, S 5, ZnO or PbO or MgO 10, CaCO<sub>3</sub> 20, Vandex 2, the Vandex had a stiffening effect with ZnO, but had no effect with PbO or MgO; (3) in a mixt. contg. rubber 100, S 3, PbO 10, CaCO<sub>3</sub> 30, accelerator 2, Vandex 2, the Vandex had a stiffening effect with some accelerators, whereas with others it had no effect; and (4) in a mixt. contg. rubber 100, S 3, ZnO 10, CaCO<sub>3</sub> 30, accelerator 2, Vandex 2, the Vandex had a high stiffening effect with some accelerators, whereas with other accelerators its effect was negligible. The accelerators with which Vandex showed a stiffening effect in conjunction with PbO were different in some cases from those accelerators with which it showed a stiffening action with ZnO. Therefore the stiffening action of Vandex depends upon the accelerator and other factors, and it must be detd. for the individual case. C. C. DAVIS

The nature of vulcanization. IV. H. P. STEVENS and W. H. STEVENS. *J. Soc. Chem. Ind.* 48, 55-9T(1929); cf. C. A. 22, 1703.—A survey of the literature shows that there is still uncertainty concerning the max. proportion of S, which under the most favorable conditions will combine with rubber on vulcanization. Expts. were therefore carried out, under conditions different from those of previous investigators, to det. the max. limit of combined S. Prolonged vulcanization was carried out at 100° by the aid of Zn diethyldithiocarbamate (cf. *British Patent* 269,693, C. A. 22, 1498), which minimized the decompn. of the rubber. If the Zn diethyldithiocarbamate remained unaltered during vulcanization, it would be removed on acetone extn., whereas if it were decompd., ZnS would be formed. The technic took care of each possibility, the acetone-extd. rubber having been analyzed directly for combined S, and the vulcanizates also having been extd. with HCl in Et<sub>2</sub>O to remove any ZnS. The results were such that, even if all the Zn were converted to ZnS and allowance were made for this in the calcs., the combined S of the hard rubber was considerably in excess of that corresponding to C<sub>6</sub>H<sub>8</sub>S. Extn. of the hard rubber with HCl-Et<sub>2</sub>O mixt. removed part of the combined S; the greater the proportion of the latter the more was removed, but in all cases the proportion remaining was considerably greater than that corresponding to C<sub>6</sub>H<sub>8</sub>S. This was true whether the rubber was ordinary crepe, sprayed rubber or partially purified rubber, whether vulcanization was carried out in the ordinary way or by the solvent method of Whitby and Jane (cf. C. A. 20, 2763), and regardless of the excess S. With prolonged vulcanization, the proportion of combined S depended chiefly upon the excess of S. The H<sub>2</sub>S and other volatile S compds. evolved in appreciable quantities during vulcanization being considered, the results show that part of the combined S is accounted for by substitution of H by S. This substitution product is decompd. by the treatment with HCl-Et<sub>2</sub>O mixt., though it is probably impossible to decomp. all of this S-

substitution product. Consequently, any combined S in excess of that corresponding to  $C_4H_8S$  may be the result of substitution. Degradation products contg. combined S were not formed, the brown substance remaining in the acetone ext. after removal of free S from the latter contg. no S compds. but probably being composed of decompn. products derived from non-rubber components. Even with continued acetone extrn. for several months, small quantities of free S were still being removed. C. C. D.

**New microscopic methods in connection with the problems of vulcanization.** E. A. HAUSER, H. MIEDEL AND M. HÜNEMÖRDER. *Colloid Symposium Monograph* 6, 207-17 (1928).—By means of a tiny vulcanization chamber, which is illustrated, vulcanization of the following mixts. was followed microscopically: (1) 100 rubber, 3 S; (2) same as (1) plus 5 ZnO; (3) same as (2) plus 1 accelerator. With (1), when undecured, S reappears as colloidal globules which grow and form dendrites. ZnO retards this process, dendrites being marked. Accelerators seem to prevent sepn. of the S, except at the surface (blooming), and may thus be recognized. Thiuram disulfide slowly forms needle-shaped deposits, which aggregate into half-moon shaped crystals of unknown compn. While (1) and (2) show marked flow at the beginning of vulcanization, (3) shows only slight flow, which stops abruptly. Ether-sol.  $\alpha$ -rubber vulcanizes more slowly and requires a higher temp. than whole rubber, or  $\beta$ -rubber. The view is advanced that vulcanization "depends on minute traces of a substance present in crude rubber, a substance which firmly adheres to the  $\alpha$ -fraction, so that it can be removed only after this fraction has been isolated from its original combination in the rubber." JEROME ALEXANDER

**The consumption of accelerator during vulcanization.** L. v. WISTINGHAUSEN. *Kautschuk* 5, 57-61, 75-7 (1929).—The extent to which accelerators of different types disappear during vulcanization was studied by curing accelerated base rubber mixts. with different proportions of S, with and without ZnO, and by detg. the proportions of accelerator remaining after increasing times of cure. The 2 accelerators chosen were diphenylguanidine (I) and mercaptobenzothiazole (II). Throughout the expts. they were used in the same proportion by wt. The stress-strain curves of the vulcanizates were also obtained to det. whether there is any relation between the stability or fugitiveness of an accelerator and its activity. In all cases the consumption of I and II increased progressively with the duration of cure, approaching a max. in each case. All the results are given in graphical form, and it is this max. which shows most clearly the influence of the type of rubber, the type of accelerator, the % S, the presence or absence of ZnO and the time of vulcanization on the extent of the disappearance of the accelerator. Without ZnO, I disappeared much more rapidly than II, and this was reflected in a greater accelerating power by I, the stress-strain curves showing stiffer, stronger vulcanizates for given cures. With other conditions equal (with or without ZnO, etc.), more I and II disappeared with 1st latex crepe than with sprayed rubber or Peru rubber. This had no relation to the phys. properties of the vulcanizates, for the stress-strain curves bore no relation to the accelerator consumption. The disappearance of I and II was smallest without ZnO; with increasing proportions of ZnO (up to 12 parts per 100 parts of rubber) progressively higher proportions of I disappeared. The stress-strain curves showed that ZnO had an activating effect. Without ZnO, the higher the % S the greater the proportion of I but the less the proportion of II which disappeared. With ZnO, the higher the % S the greater the proportions of both I and II which disappeared. In all cases the rate of vulcanization (judged by the stress-strain curves) increased with the % S. The results indicate that the accelerating power depends in some way upon its reactivity and disappearance in the reaction, rather than upon a catalytic effect. Where no appreciable part of the accelerator disappeared, there was no accelerating effect. The formation of complexes of accelerators and Co salts of unsatd. org. acids makes it probable that complexes of I and II with ZnO are formed during vulcanization. Such complexes would increase the soly. of the accelerator in the rubber, and would also increase the electro-positive state of the Zn and thus activate the S (cf. Scholz, *C. A.* 21, 2399). The increase in consumption of accelerator with increase in the % S indicates, furthermore, that S takes part in this complex formation. It is also possible that a rubber-accelerator compd. is formed. The expts. were not carried far enough to find a relation between the consumption of accelerator and the increase of combined S (cf. Hardman and White, *Gummi-Ztg.* 1927, 305; cf. *C. A.* 21, 4098). Twiss has already found (*Gummi-Ztg.* 1928, 2307; cf. *C. A.* 22, 2491; 23, 2070) that a combined S-cure curve gives no indication of the optimum cure, and similarly the present expts. show that there is no apparent relation between the progressively increasing consumption of accelerator and the changes in phys. properties. The consumption of accelerator was measured

indirectly by detg. the residual accelerator extractable with hot acetone. *Detn. of I.*—Ext. 20 g. of finely divided rubber for 12 hrs. in a Soxhlet app. with acetone, evap. the ext., dissolve in Et<sub>2</sub>O, add 10 cc. of aq. 0.1 N HCl, evap. the ether, cool, filter, dissolve the residue in Et<sub>2</sub>O, treat as before with HCl; repeat this 3 times; wash the final residue with water; to the combined filtrates (not over 50 cc.) add 50 cc. of 1% aq. picric acid, let stand overnight, filter through a weighed Gooch crucible, wash with 5 cc. of water, and dry at 100°. With overcured vulcanizates the final picrate may have a dark brown color, and probably contains decompn. products. *Detn. of II.*—Ext. 100 g. of finely divided rubber for 12 hrs. in a Soxhlet app. with acetone, evap. the ext., dissolve the residue in 20 cc. of warm C<sub>6</sub>H<sub>6</sub>, filter, wash with C<sub>6</sub>H<sub>6</sub>; to the filtrate add an excess of 3% filtered C<sub>6</sub>H<sub>6</sub> soln. of Cu oleate until the soln. remains green and let stand overnight, centrifuge, wash the ppt. with C<sub>6</sub>H<sub>6</sub> and then with petr. ether, dry at 140° and weigh. The reaction is:  $2\text{II} + \text{Cu}(\text{C}_{18}\text{H}_{33}\text{O}_2)_2 \longrightarrow 2\text{C}_{18}\text{H}_{33}\text{O}_2 + \text{CuC}_7\text{H}_4\text{NS}_2 + \text{C}_7\text{H}_4\text{NS}$ , the C<sub>6</sub>H<sub>6</sub>-sol. Cu salt which is formed being transformed into a C<sub>6</sub>H<sub>6</sub>-insol. Cu salt and dibenzothiazolodisulfide (like the decompn. of Cu(CN)<sub>2</sub> to CuCN and (CN)<sub>2</sub>). In the Cu ppt. is 0.5 of the II, so that this must be multiplied by the factor 1.4556; to obtain the quantity of II extd. by the acetone.

C. C. DAVIS

**The oxidation of vulcanized rubber.** A. VAN ROSSEM AND P. DEKKER. *Rubber Age* (N. Y.) 25, 85-8, 143-5(1929).—An English version of *C. A.* 23, 2598. C. C. D.

**Onazote.** J. C. G. KUNHARDT. *Bull. Rubber Growers' Assoc.* 11, 222-8(1929).—"Onazote" is a type of vulcanized rubber which has been made to absorb a neutral gas under pressure during vulcanization and is thus expanded into a highly cellular condition. The gas is retained under pressure, and the product may be molded into any desired form, and can be made soft and resilient, or hard. Unlike sponge rubber it is non-absorbent and has certain notable characteristics, *e. g.*, (1) it is the best non-conductor of heat; (2) it is the lightest solid known (3-7 lbs. per cu. ft.); (3) the soft variety is by far the most compressible solid in existence and has a recovery almost the same as that of air; (4) it is an extremely efficient absorber of shock and vibration; (5) it is probably the best non-conductor of sound; and (6) its great expansion during vulcanization allows better molding than ordinary rubber mixts. The unique properties of Onazote make it of great value for a very wide variety of uses, many of those already tried or suggested being mentioned.

C. C. DAVIS

**Temperature coefficient of vulcanization of a litharge compound.** J. R. SHEPPARD. *India Rubber World* 80, 56-60(1929); *cf. C. A.* 22, 4272.—Exptl. data on the stresses at intermediate elongations, tensile strength, ultimate elongation, tensile product, energy and free S of a mixt. contg.: rubber 100, S 8, PbO 15, stearic acid 1 and ZnO 44, vulcanized to different degrees, were utilized to construct graphs showing the time of cure as a function of the temp. for const. values of the 6 properties mentioned above. There were no significant differences in the temp. coeffs. for the several properties. The coeffs. of the various properties varied from 12.6 for strength at 300 and 600%, elongations to 13.7 for tensile product, with an av. of 13.1, *i. e.*, to halve or to double the time of cure required a change of 13.1° F. This method may be applied to the study of vulcanization in general and to accelerator action in particular, *e. g.*, the more exact evaluation of the suitability of an accelerator for low or high temp. cures, the comparative effects of various methods of curing (air, steam, mold, etc.), the instability of accelerators to avoid scorching, comparisons of different activators with different accelerators, the adsorption of accelerators by reinforcing agents, etc. C. C. D.

**Lyophilic colloids.** I. Osmotic pressure and viscosity measurements of rubber solutions (KROEPFLIN) 2. The preservation of tropical fruits with latex (SPOON) 12. Printing ink suitable for use on rubber (U. S. pat. 1,715,209) 26. Imitation leather (U. S. pat. 1,713,746) 29.

**Rubber.** THE DUNLOP RUBBER CO., LTD. Fr. 652,439, Apr. 10, 1928. Viscous liquid or semi-solid accelerators, anti-aging agents, or softeners are mixed or combined with colophony before compounding them with rubber. Examples are given. Hardened rosin and substances such as ZnO or clay may be added to vary the consistency.

**Recovery of latex from storage-tank settlings by centrifugal treatment.** AKTIEBOLAGET SEPARATOR. Brit. 299,808, Nov. 1, 1927.

**Deposition of rubber.** THE ANODE RUBBER CO. (England), LTD. Fr. 651,730, Mar. 24, 1928. The constitution of the electrophoretic deposition of rubber is acted upon by varying the content of electrolytes practically free from OH ions in the dispersion. Thus, the content of such electrolytes may be decreased by dialysis, or in-



creased by addn. of more of such electrolytes. Electrolytes, the anions of which form sol. or insol. compds. with the metal of the cathode, may be used. Cf. *C. A.* 23, 3375.

**Apparatus for mixing rubber compositions, etc.** WILLET B. RANNEY (to Wm. Wrigley, Jr., Co.). U. S. 1,713,554, May 21. Structural features.

**Rubber-mixing apparatus.** RICHARD C. LEWIS (to Farrel-Birmingham Co.). U. S. 1,713,969, May 21. Structural features.

**Apparatus for testing strength and stretch of rubber, etc.** DAVID C. SCOTT (to Henry L. Scott Co.). U. S. 1,714,638, May 28.

**Rubber articles.** SOCIETÀ ITALIANA PIRELLI and UGO PESTALOZZA. Fr. 651,684, Jan. 27, 1928. Small quantities of solns. or suspensions of salts of bi- or trivalent metals are added to latex, which is subsequently heated to produce coagulation or thickening of the latex. Molded articles may be produced directly by dipping heated formers into the treated latex, or by heating the latex in a mold.

**Thin-walled stretchable rubber articles.** ISTVAN DOROGI and LAJOS DOROGI (one-half to Dorogi Es Tarsa Gummigyar R. T.). U. S. 1,713,751, May 21. See Brit. 288,541 (*C. A.* 23, 731).

**Rubber bulbs or other hollow articles.** DUNLOP RUBBER CO., LTD., D. F. TWISS and E. A. MURPHY. Brit. 299,974, Oct. 5, 1927. A rod, tube, or like device carrying a bulbous enlargement of rubber having a roughened surface and of approx. the desired shape is dipped into a concd. dispersion of rubber or similar vegetable resins, followed by drying, and if desired by vulcanizing, and removal of the rod, etc. Successive dippings may be effected for increasing the thickness of the deposit, and a settling medium such as a heated soln. of  $\text{CaCl}_2$  or  $\text{NH}_4\text{OAc}$  may be used. Brit. 299,975 specifies use of a distended collapsible former for use in a similar process. Cf. *C. A.* 23, 1309.

**Molded articles by dipping formers into rubber dispersions, etc.** P. KLEIN and F. GABOR (to Dunlop Rubber Co., Ltd.). Brit. 299,737, June 28, 1927. In molding by dipping formers into dispersions such as those of rubber, gutta, balata, or mixts. of these, which may also contain proteins, cellulose esters, natural or synthetic resins, etc., the entire molds or their surfaces are formed of solid or solidified non-porous substances of such compn. that contact with the dispersion liberates agglomerating agents for the dispersion. The mold may be of a solid salt, such as an alum, which reacts with an alk. dispersion such as latex preserved with  $\text{NH}_3$ , or it may be of a metal, such as Zn or Al. Crystd. citric acid is mentioned, as are also liquid acids such as  $\text{HOAc}$  which may be solidified with collodion, and sol. salts which may be mixed with substances which are liquefiable by heat. The mold may have an inert skeleton. Emission of gas may be prevented by addns. to the dispersion or to the mold, e. g., the mold surface may be formed from a paste contg. a metal such as Al bronze powder and an oxidizing agent such as  $\text{MnO}_2$  or  $\text{PbO}_2$ . Metal molds may be coated with a film of gelatin to keep gas bubbles away from the deposit. The temp. may be raised to promote agglomeration. Cf. *C. A.* 23, 1012.

**Removing water from rubber-coated fabrics or other rubber products by electric endosmose.** C. L. DARBY (to Anode Rubber Co., Ltd). Brit. 299,713, Oct. 28, 1927. Layers or articles of rubber or the like formed from an aq. dispersion are treated by elec. endosmose for removal of water. In one method described, a metal plate coated with rubber is connected as anode while immersed in Hg or an electrolyte; exposed parts of the plate not coated with rubber are coated with wax or other insulating substance. In another method, the coated plate, connected as anode, is placed between 2 metal plates connected as cathodes. An app. and various details of procedure are described. The process is adapted for treated wire or metal strip coated with rubber.

**Rubber dressing or finish.** JAMES S. MOTTER. U. S. 1,714,919, May 28. A mixt. is formed from xylene, "petroleum spirits," Al palmitate, black aniline oil dye, gilsonite, carnauba wax and barberry wax.

**System of distributing fiber in rubber stock to form shoe soles, etc.** WILLIAM B. WESCOTT (to Rubber Latex Research Corp.). U. S. 1,714,995, May 28. Relatively long fiber is distributed so as to reinforce the rubber in all directions in a sheeted material; the latter is plated so as to possess more extensibility in one direction than in another. Cf. *C. A.* 23, 1528.

**Rubber floor and wall coverings, etc.** H. BECKMANN. Brit. 300,008, Nov. 8, 1927. Rubber floor or wall coverings and the like are coated with a thin film of porous or spongy rubber to facilitate their sticking to other materials by use of glue, pitch, resin, etc. The rubber article before vulcanization may be coated with viscous latex contg. S and vulcanization may be effected under conditions to prevent evapn. of water as described in Brit. 193,207 or the latex may contain substances which generate gas during vulcanization.

**"Self healing" composition for automobile tire tubes.** JOHN SCHWAB, JR. U. S. 1,715,213, May 28. Vulcanizing cement 30 and melted vulcanized rubber 30 parts are mixed with each other and then with honey 40 parts; the mixt. is heated to about 125°.

**Synthetic rubber.** ERNEST KLEIBER and PIERO GILARDI. Fr. 651,824, Mar. 27, 1928. Petroleum or its residues is oxidized with  $\text{Na}_2\text{O}_2$  or for several days with  $\text{HNO}_3$  after which it seps. into 2 layers, one composed of octanaphthenes, which on treatment with S are transformed to *m*-xylenes, and a turbid aq. layer, which is transformed by oxidation with fuming  $\text{HNO}_3$  to cyclohexanes and passes to adipic acid. The *m*-xylenes are mixed with the adipic acid and they also are converted to adipic acid; terpenes are then added and after heating to about 150°, isoprene and butadiene are formed, from which artificial rubber is obtained.

**Synthetic rubber.** I. G. FARBENIND. A.-G. Brit. 300,167, Nov. 7, 1927. Examples are given of processes such as described in Brit. 286,272 (C. A. 23, 310) in which polymerization of hydrocarbons is effected in the presence of a colloid and an electrolyte, *e. g.* in the presence of glue and  $\text{Na}_2\text{SO}_4$  in an atm. of O.

**Apparatus for vulcanizing rubber tires.** F. KRUPP GRUSONWERK A.-G. Brit. 299,647, Jan. 19, 1928. Structural features.

**Reclaiming vulcanized rubber.** TATSUCHI TOKOYAMA. U. S. 1,714,835, May 28. The material is treated with a hydrogenated naphthalene rubber solvent contg. dissolved therein a substance such as  $\text{NaOEt}$ , which has a strong affinity for S.

**Vulcanizing rubber.** I. G. FARBENIND. A.-G. Brit. 300,208, Nov. 8, 1927. An alicyclic base or deriv. or compd. is used as a vulcanization accelerator. The basic group may be in the ring as in decahydroquinoline, decahydroquinaldine, or perhydro-methylindol, or in non-cyclic combination as in hexahydromethyl toluidine. Various examples are given.

**Vulcanization of rubber.** THE RUBBER SERVICE LABORATORIES CO. Fr. 652,254, Apr. 5, 1928. See Brit. 297,726 (C. A. 23, 2851).

**Rubber vulcanization.** THE RUBBER SERVICE LABORATORIES CO. Fr. 652,817, Feb. 6, 1928. Compds. produced by the action of one or more mol. proportions of an aldehyde, preferably of the aromatic series, on a compd. resulting from the reaction of one mol. proportion of an aliphatic aldehyde on 2 mol. proportions of a primary aromatic amine are used as vulcanization accelerators. Examples are given.

# CHEMICAL ABSTRACTS

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## 1—APPARATUS AND PLANT EQUIPMENT

W. L. BADGER

**A comparison of Seitz and Mandler filters.** N. W. LARKUM. *Am. J. Pub. Health* 19, 670-3(1929).—A careful study of the comparative efficiency of Seitz and Mandler filters has shown a distinct superiority for the former. The rate of filtration and the amt. of yield have shown some advantages for the Seitz. The adsorptive capacity of the 2 filters is essentially identical. For many purposes the Seitz is unquestionably cheaper and more satisfactory than the Mandler.

J. A. KENNEDY

**Monochromatic light filters. II. Application of the Goldberg spectrodensograph.** E. ELVEGORD, HERBERT STAUDE AND FRITZ WEIGERT. *Z. physik. Chem., Abt. B*, 2, 149-60(1929); cf. *C. A.* 22, 729.

W. F. MEGGERS

**Development of the ultracentrifuge and its field of research.** J. B. NICHOLS. *Colloid Symposium Monograph* 6, 287-308(1928).—A review including: thermodynamical and kinetic applications; solvation and incipient gel formation; proteins. J. A.

**An x-ray tube with detachable ends and electrodes for x-ray spectroscopy.** W. BAND AND A. J. MADDOCK. *J. Sci. Instruments* 6, 160-3(1929).—Directions for constructing a tube with the advantages of the Owen and Preston tube, but which requires the use of a small lathe only. Cf. *C. A.* 21, 343.

J. H. MOORE

**A pyrometer for the measurements of temperatures by means of color changes.** G. NAESER. *Stahl u. Eisen* 49, 464-6(1929).—The compound filter used in the pyrometer can be thought to consist of 3 single filters. The first filter absorbs all except 2 complementary colors, e. g., red and green. The second filter is wedge-shaped and absorbs with increasing thickness more and more red but none of the green; the third wedge-shaped filter absorbs more and more of the green color with increasing thickness, but none of the red. The observer sees a mixt. of the 2 colors, and depending on the thickness of the wedge-shaped filters through which the light rays pass, red or green will predominate. The mixed color, in this case white, will be observed at a place where the intensities of the 2 colors are equal. The change in temp. of the light source changes the place of the mixed color. The filters are of gelatin contg. various org. dyes. The pyrometer is calibrated by means of a radiating black body of known temp. It can be used from 900° to 2000°; the limit of error is  $\pm 13^\circ$ . J. A. S.

**A modified colorimeter for the determination of hydrogen-ion concentration.** J. J. BEAVER. *J. Optical Soc. Am.* 18, 41-9(1929).—A modified Duboseq type colorimeter is described, similar to a standard colorimeter with the addn. of an added cup and plunger, so that there are 2 cups, one above the other, for buffer solns. and a third cup for the unknown. An opal glass plate is placed in the light path to equalize the 2 rays. From the scale reading, when the 2 fields match and the indicator is const., the  $p_H$  is easily calcd. The method is accurate and rapid and can be used with colored or turbid solns.

E. G. VANDEN BOSCHE

**The junior scopometer.** WM. G. EXTON. *J. Am. Med. Assoc.* 92, 708-12(1929).—Description of a simplified app. for measuring, by means of an optical wedge, turbidity and color by the extinction or vanishing point of a target. Cf. *C. A.* 23, 1314, 2331.

J. H. MOORE

**A simple viscometer.** R. A. VAN LINGE. *Chem. Weekblad* 26, 301(1929).—A 50-cc. pipet is provided at the upper end with a two-way stopcock. In one position of the cock the liquid is sucked up into the pipet. A quarter turn closes it. Another quarter turn opens it to the air, allowing the liquid to flow out. The time of delivery is measured by a stop-watch. The temp. is detd. by allowing the liquid, as it is delivered from the pipet, to flow over the bulb of a thermometer.

E. SCHOTT

**An improved simple viscometer for colored fluids.** A. E. ROBINSON. *Ind. Chemist* 5, 205-6(1929).—The improvement is designed to permit the use of the "falling ball" method with colored solns., more particularly with nitrocellulose lacquers. The tube contg. the colored lacquer is fitted at the top with a cap with a hole in the center through which

the ball is dropped. The lower end is closed by a cork or hard rubber stopper to which two or more copper or brass strips are attached and bent so as to catch the falling ball, which then makes contact so that a lamp in the circuit immediately lights. Specifications in detail and a sketch are given.

E. G. R. ARDAGH

**A gravimeter for recording rapid changes of specific gravity in gases.** A. BLACKIE AND B. H. WILLIAMS. *J. Sci. Instruments* **6**, 157-60(1929).—A report is made on favorable attempts to adapt the Ranarex CO<sub>2</sub> recorder to this purpose. Precautions to be observed are given.

J. H. MOORE

**An automatic mercury still.** F. L. ROBESON. *J. Optical Soc. Am.* **18**, 72-4(1929).—A still of Pyrex glass is described. It starts and stops automatically and needs little attention. With 90 w. 100 g. of Hg are obtained per hr.

E. G. VANDEN BOSCHE

**A sublimation mercury still.** K. C. D. HICKMAN. *J. Optical Soc. Am.* **18**, 62-8; *Chemistry and Industry* **48**, 366-9(1929).—An automatic vacuum Hg still, giving about 400 cc. in 24 hrs., is described. Three Pyrex bulbs, blown in the form of an alembic, in series; are utilized for condensation of the Hg. Electrically heated, the Hg is sublimed into a vacuum space allowing no boiling to disturb the liquid surface.

E. G. V. B.

**A still for liquids of high boiling point.** K. C. D. HICKMAN. *J. Optical Soc. Am.* **18**, 69-71; *Chemistry & Industry* **48**, 365-6(1929).—Unstable org. liquids easily oxidized in the presence of air, can be distd. under highly reduced pressure with the app. It consists of an electrically heated still, made in the form of an alembic, so constructed that the surface of the liquid is within a cm. or so of the cooling space.

E. G. V. B.

**Still heads and laboratory rectification columns.** V. LONGINOV AND A. PRYANISHNIKOV. *Trans. Inst. Pure Chem. Reagents (Moscow)* **1929**, No. 7, 54 pp. (Summary in French).—By using an equimol. mixt. of C<sub>6</sub>H<sub>6</sub> and CHCl<sub>3</sub> the efficiency of the Hempel column was studied from the following points of view: (a) height, (b) diam., (c) isolation, (d) rate of distn., (e) reflux ratio, and (f) the nature of the material with which the column is filled. The most important factor is (e). It increases the efficiency 25-63% when the other factors are kept const. Its greatest effect is manifested when the column is isolated, filled with active objects and when the distillation is fast. The factor of next importance is (a). The greatest effect is shown when there is no reflux and when the column is isolated and filled with active objects. (d) and (f) are factors of nearly equal but of secondary importance. The effect of slow distn. is greatest when there is no reflux and when active objects are used. The influence of (f) is greatest when there is a large reflux and when distn. is slow. The influence of (b) is even less and is noticeable only without reflux and with fast distn. The factor of least influence is (c). It is noticeable under the same conditions as (b).

H. F. JOHNSTONE

**A reaction tube.** CHARLES DIHÉRE. *Bull. soc. chim.* **45**, 183-4(1929).—The classical reaction tube described by Hoppe-Seyler is modified in that the cup is maintained in position by three small expansions of the outside tube, instead of by a glass rod reaching to the bottom of the tube.

ALBERT L. HENNE

**Extraction and perforated apparatus for the extraction of liquids.** PAUL H. PRAUSNITZ. *Oesterr. Chem.-Ztg.* **32**, 71-3(1929).—Historical, with references and 8 cuts. Cf. *C. A.* **22**, 4011.

J. H. MOORE

**A portable pH apparatus with microanalytical electrode and saturated calomel electrode.** ARAO ITANO. *Ber. Österr. Inst. landw. Forsch. (Japan)* **4**, 19-26(1929).—The results which are closely comparable with those obtained with the type K potentiometer are obtained with the app. described. The app. is inexpensive and easily carried around, and the cost of maintenance is very low. Each part in the app. is independent so that it can be used separately, if so desired. An electrode for the detn. of the pH value in a min. quantity of sample, 0.02 cc. or less, is described. The results of a comparative study of a 0.1 N electrode and a satd. electrode of special prepn. show very close agreement. The calcd. potential of a satd. calomel electrode was 0.2514 v. at 18°. A photograph of the app. is shown.

E. F. SNYDER

**Labor-saving devices for the commercial protein testing laboratory.** W. O. WHITCOMB. *Cereal Chem.* **6**, 215-17(1929).—Description is given of carriages for holding Kjeldahl flasks, caustic soda buret, acid buret, buret for distd. water and tube for indicator.

L. H. BAILEY

**D. V. L. pressure cylinder and its use.** E. RACKWITZ AND ERICH K. O. SCHMIDT. *Chem. Tech. Rundschau* **44**, 343(1929).—The Deutschen Versuchsanstalt für Luftfahrt has introduced a glass or porcelain cylinder for use in testing corrosion of metals and protective coatings by liquids and gases. The cylinder has a lateral rectangular opening of about 50 × 200 mm. in which the material to be tested is inserted, the cylinder then being filled with the liquid under investigation.

E. PICKERING

**Use of amplifiers for the measurement of small quantities of energy.** J. BRENTANO.

*Z. Physik* **54**, 571–81 (1929); cf. *C. A.* **22**, 4058.—A bridge arrangement of amplifier tubes is described by which direct currents of  $5 \times 10^{-14}$  amp. and potential differences of  $10^6$  v. can be measured.

GEORGE GLOCKLER

**Conveying chemicals with portable loaders.** MARTIN H. KIDDER. *Chem. Markets* **24**, 619–23 (1929).

F. J. C.

**Chemical plants are turning to welded construction.** ALAN G. WIKOFF. *Chem. Met. Eng.* **36**, 352–4 (1929).

E. J. C.

**An improved electrically heated thermostat.** P. VAN CAMPEN. *Z. Elektrochem.* **35**, 265–6 (1929).—A Hg temp. regulator with a vacuum tube relay is described, the regulator being connected in the grid circuit of the tube. Since the operating current through the regulator is only  $10^{-4}$  amp., difficulties with arcing are avoided. A magnetic relay for controlling heater current is also described. The device makes contact by means of an iron U-shaped bar bridging Hg cups; all contacts are placed in an evacuated glass container, troubles from arcing being thus eliminated. Control of a water thermostat to  $0.002^\circ$  is attained.

C. Z. ROSECRANS

**Filter or diaphragm.** SIEMENS & HALSKE A.-G. Fr. 653,033, April 19, 1928. A porous filtering layer or an electrolytic diaphragm is made from oxide of Cr by mixing the oxide with one or more compds. of Cr, e. g., chromic acid,  $\text{Cr}(\text{NO}_3)_3$ , pressing the mixt. into molds and heating until the other Cr compds. are transformed to the oxide. Substances such as NaCl or substances such as sawdust, which are eliminated by heating, may be added before heating.

**Air filter.** ALBERT KRAUTZBERGER. Ger. 476,050, Jan 21, 1928.

**Dust filter for gases.** AUGUSTE J. GAUNE (Fils). Fr. 654,821, May 25, 1928.

**Rotary star filter for separating dust from gases.** MASCHINENFABRIK BUCKAU R. WOLF. A.-G. Ger. 476,762, Feb. 25, 1927.

**Device for determining the quantity of dust in gas currents.** ASKANIA-WERKE A.-G. VORM., CENTRALWERKSTATT DESSAU and CARL BAMBERG. Ger. 475,604, Jan. 15, 1926. The device is particularly applicable to gases contg. coal dust. The passage of the dust-laden gas through an electrically heated tube causes variations in the temp.

**Filter for liquids.** JAKOB GLAUSER-JOST. Swiss 130,409, Feb. 3, 1928.

**Filter for water, etc.** ROBERT D. TACKABERRY. U. S. 1,715,435, June 4. Structural features.

**Filter for water of engine-cooling systems, etc.** MORRIS BASSION. U. S. 1,715,492, June 4. Structural features.

**Oil filter.** AC SPARK PLUG CO. Fr. 654,561, May 22, 1928.

**Vacuum filter for oil, etc.** GASTON J. LIPSCOMB. U. S. 1,716,786, June 11. Structural features.

**Continuous-filter thickening apparatus.** ALBERT L. GENTER (to Genter Thickener Co.). U. S. 1,716,040, June 4. Structural features.

**Apparatus for withdrawing the bottom layers of liquid mixtures.** FRITZ REHMANN. Swiss 130,657, Dec. 13, 1927.

**Steam-heated apparatus for gravity separation of oil and water.** HUBERT J. SMITH. U. S. 1,716,934, June 11.

**Tank with v-shaped bottom for settling solids from liquids.** JAMES Q. HORNE. U. S. 1,716,228, June 4. Structural features.

**Closed rotary drum for clarifying and purifying liquids.** RAMESOHL & SCHMIDT A.-G., JOHANN F. MEYER and HANS LÜCKER. Ger. 476,731, May 27, 1925.

**Dipping refractometer suitable for opaque liquids.** EMIL BUSCH A.-G. Ger. 476,360, June 24, 1927.

**Atomizer.** OSKAR BRANDEIS. Ger. 476,741, Aug. 29, 1926. Water is electrically heated before being forced through the atomizing nozzles.

**Thermometers.** THERMEX SOC. ANON. Ger. 476,684, April 23, 1927. A method of regulating a bimetal spiral thermometer is described.

**Optical pyrometer.** ANSON HAYES. U. S. 1,716,775, June 11.

**Funnel with automatic closing device in the neck.** GOTTFRIED OPPLIGER. Swiss 130,669, Feb. 23, 1928.

**Cathode funnel for mercury-vapor rectifier.** AKTIEN-GESELLSCHAFT BROWN, BOVERI & CIE. Swiss 131,216, Feb. 2, 1928.

**X-ray tube.** ALBERT BOUWERS (to Naamlouze Vennootschap Philips' Gloeilampen-fabrieken). U. S. 1,717,309, June 11. An incandescent filament cathode is used with an anticathode consisting partly of W and hollowed at the focal spot. Various structural details are described.

**Safety device for Röntgen-ray apparatus.** REINIGER, GEBBERT & SCHALL A.-G. Ger. 476,785, Feb. 10, 1924. Details are given.

**Electron tubes.** RADIOWERK E. SCHRACK. Fr. 654,804, May 14, 1928. Arrangements of electrodes are described.

**Electron-discharge tubes.** BENJAMIN F. MIESSNER. Fr. 653,825, May 3, 1928.

**Electron-discharge device.** EMIL G. WIDELL (to Westinghouse Lamp Co.). U. S. 1,716,159, June 4. A device contg. alkali metal has a portion of its envelope adjacent; the leading-in wires are coated with a non-conducting org. material such as shellac or rosin capable of preventing leakage between the leading-in wires. Various other structural details are described. Cf. C. A. 23, 312.

**Anode for electron-discharge devices.** WESLEY F. MASSEY (to General Electric Co.). U. S. 1,717,239, June 11. Structural features.

**Vacuum tube for ultra-violet rays.** NAAMLÖÖZE VENNOOTSCHAP PHILIPS' GLOEI-LAMPENFABRIEKEN. Fr. 653,622, April 30, 1928.

**High-vacuum apparatus comprising condensation vacuum pumps operating in series.** OSKAR SEITZ (to Akt.-Ges. Brown, Boverie & Cie.). U. S. 1,716,507, June 11. Structural features.

**Thermionic electrode.** GEORGE M. J. MACKAY (to General Electric Co.). U. S. 1,716,545, June 11. See Brit. 267,142 (C. A. 22, 1065).

**Thermionic valves.** WILLIAM R. BULLIMORE. Fr. 655,051, May 31, 1928.

**Furnaces.** EUGEN HABER. Ger. 475,693, Feb. 7, 1924. The heat-exchanging structures of a gas heater are built as conducting canals round the main gas canal.

**Furnaces.** ALBERT REPPMAN. Fr. 655,050, May 31, 1928. Construction of an adjustable roof is described.

**Furnaces.** KOHLENVEREDLUNG A.-G. Fr. 653,942, May 7, 1928. Furnaces, particularly for the coking of bituminous products, are heated by hot gases traversing a layer of the product in a direction perpendicular to the direction of movement of the layer.

**Furnaces.** L. and C. STEINMÜLLER. Ger. 475,694, Feb. 11, 1927. Water tubes are arranged in the fire-chamber walls.

**Furnaces.** C. H. WECK KOMM.-GES. Ger. 475,692, Oct. 30, 1925. The furnace has several compressed air chambers and a traveling grate mounted on rollers.

**Automatic furnaces.** RILEY STOKER CORP. Fr. 653,710, May 2, 1928. Method of regulating the air to the surfaces supporting the fuel.

**Annealing furnace.** HEINRICH BANGERT. Fr. 654,698, Jan. 17, 1928.

**Annealing furnaces.** OTTO BASSON. Ger. 476,069, Aug. 19, 1927. Relates to continuously-operating annealing furnaces of the kind in which the goods are lifted from the hearth at intervals and moved forward by eccentrically operated carriers, and describes improvements in the means for operating the carriers.

**Annealing furnace.** SIEMENS-SCHUCKERTWERKE A.-G. Fr. 653,930, May 7, 1928. Cooling means are mounted inside the air-tight envelope of the furnace.

**Tunnel furnace.** HEIMSOOTH & VOLLMER, G. M. B. H. Fr. 654,909, May 26, 1928

**Furnace with trough-shaped fire-chamber bottom.** FRÄNKEL & VIEBAHN. Ger. 476,743, Mar. 19, 1926. Addn. to 438,842.

**Trough-like fire chamber for ovens, drying apparatus and the like.** EMIL GRUND-MANN ERSTE SACHSISCHE PATENT-BACKOFEN- UND PATENT-ARMATURENFABRIK. Ger. 475,691, July 15, 1926. Details are given.

**Coal-dust furnace.** HERMANN BLEIBTREU. Ger. 472,696, Oct. 6, 1926. Addn. to Ger. 446,637. The combustion chamber widens in stages and the burning nozzles are axial and parallel.

**Burners for powdered fuel.** RILEY STOKER CORP. Fr. 654,303, May 14, 1928.

**Burner for powdered fuel.** EWALD HERMSDORF. Ger. 476,224, Mar. 10, 1927. The air-fuel mixt. on its way to the combustion chamber is given a whirling movement by a rotary mixer actuated by a turbine wheel arranged in the path of the mixt.

**Burners for liquid fuel.** PAUL LINKE. Fr. 653,729, Mar. 10, 1928.

**Oil-fuel burner.** FREDERICK HAAGER and GEORGE H. CLARK. Australia 11,061, Dec. 30, 1927.

**Oil burner with fuel feed above and below the burner.** STEAM PRODUCTION CORP. Ger. 475,690, April 26, 1927.

**Burner for vaporized hydrocarbons.** PHILIP H. STEINER. Fr. 653,542, April 27, 1928.

**Safety devices for gas furnaces.** COMP. DES FORGES DE CHÂTILLON-COMMENTRY ET NEUVES-MAISONS. Ger. 476,612 and 476,613, Oct. 7, 1927.

**Mixture regulator for gas furnaces.** LUDWIG STIEGLER. Ger. 476,646, Dec. 10, 1925. Details are given.

**Temperature regulator for gas furnaces.** LE RÊVE S. A. Fr. 653,498, April 27, 1928.

**Gas-furnace burners.** DEUTSCHE WÄRME-AUSNÜTZUNG, G. M. B. H. "DEWAG." Fr. 653,197, Sept. 16, 1927.

**Gas burner.** JOHAN W. BAKHUIZEN. Fr. 654,864, May 25, 1928.

**Gas burner.** JOHN G. CALVERT. U. S. 1,715,989, June 4.

**Gas burners.** LOUIS M. J. GUERPILLON. Fr. 653,451, April 26, 1928. Air-admission regulation is described.

**Gas burners.** COMPAGNIE DES LAMPES. Fr. 33,847, July 6, 1927. Addn. to 584,551.

**Gas burner.** FIRME DEUTSCHE WÄRME-AUSNÜTZUNG, G. M. B. H. "DEWAG." Fr. 654,600, April 26, 1928.

**Gas burners.** IMPERIAL CHEMICAL INDUSTRIES, LTD. Fr. 653,679, May 2, 1928.

**Gas burner.** GEORGE F. REZNOR. U. S. 1,716,601, June 11.

**Compressed air and gas burner.** DEUTSCHE WÄRME-AUSNÜTZUNG, G. M. B. H. Ger. 476,614, Feb. 23, 1928.

**Regulating device for furnaces for liquid or dust-like fuels.** RUDOLF MEYER. Ger. 475,576, Oct. 7, 1927.

**Means for tapping shaft furnaces.** DEMAG A.-G. Ger. 476,024, Nov. 4, 1928. Addn. to 437,206.

**Furnace wall.** LIPTAK FIRE-BRICK ARCH CO. Ger. 476,175, April 26, 1927.

**Operating device for the traveling grate of a furnace.** BÜTTNER-WERKE A.-G. (Herbert Zikesch, inventor.) Ger. 475,998, Oct. 17, 1925.

**Traveling grate.** WILHELM BERG. Ger. 476,081, Dec. 13, 1927.

**Coal-feed control for trough grates.** ENZINGER-UNION GES. FÜR WÄRMETECHNIK M. B. H. Ger. 476,026, April 6, 1928.

**Hurdles or grates for gas purifiers.** ARTHUR BEUTHNER. Ger. 476,352, Sept. 16, 1928. Addn. to 456,371.

**Movable fuel container for tunnel retort.** JULIUS PINTSCH. A.-G. Ger. 476,661, Sept. 14, 1924. Details are described.

**Oven with rotating annular hearth for heating powdered or finely granular materials in a thin layer.** TROCKNUNGS-, VERSCHWELUNGS-, UND VERGASUNGS-G. M. B. H. Ger. 476,395, Dec. 10, 1927.

**Heating device for laboratory water bath.** HANS VON CHRISTIAN. Swiss 131,048, Feb. 20, 1928.

**Heat regenerators.** VERGASUNGS-INDUSTRIE A.-G. Austrian 112,826, April 15, 1928. The patent describes heat regenerators in which the blow gases of a gas generator are burnt and which are adapted to act as water evaporators. The evapp. chamber is arranged below the combustion chamber.

**Heat-exchange apparatus.** RUDOLPH VUILLEUMIER (to Safety Car Heating & Lighting Co.). U. S. 1,716,333, June 4. Structural features.

**Heat exchanger for heating air.** EUGEN HABER. Ger. 476,262, Sept. 19, 1925.

**Heat exchanger, especially for heating air.** SCHMIDT'SCHE HEISSDAMPF-GES. M. B. H. (Georg H. Davin, inventor). Ger. 476,083, Sept. 28, 1926.

**Apparatus for heating liquids.** ALBERTO E. BIANCHI. Fr. 653,750, April 5, 1928. In an app. for distg. hydrogenating or dehydrogenating liquids such as naphtha, tar, or mazout, the shafts carrying rotating agitators in the vessels heated externally are hollow and connected at their ends to form a worm by which the liquid to be treated is introduced in a continuous manner.

**Drying apparatus.** ERNEST WINDSOR. Ger. 476,783, Oct. 21, 1927. Details are given.

**Drying machine for fibrous materials.** ERICH LAU. Ger. 476,532, Dec. 10, 1927.

**Matrix drying apparatus.** EMIL HAAS and WALTER STUDER. Swiss 131,116, Mar. 8, 1928.

**Distilling column.** MANRY FRÈRES. Fr. 653,576, April 28, 1928. A column is described which may be used either for concg. alcs. to a high degree or for distg. them.

**Fractionating distilling column.** ROBERT E. WILSON, ROGER D. HUNNEMAN, WILLIAM H. BAELKE and FRANCIS M. ROGERS (to Standard Oil Co. of Ind.). U. S. 1,716,939, June 11. Structural features.

**Apparatus for introducing materials into high-pressure vessels, particularly coal into hydrogenation vessels.** CHEMISCHE-TECHNISCHE-GES. M. B. H. (Albert Besta, inventor.) Ger. 476,396, Nov. 18, 1924.

**Rotary vacuum liquid cooler.** FRANZ GOEKE. Ger. 475,940, May 25, 1928. Details of construction are given.

**Apparatus for vacuum concentrating liquids.** PAUL C. LEMALE. Fr. 654,272, Oct. 13, 1927.

**Gas-tight joints for metallic high-vacuum vessels, with a mercury luting.** AKTIEN-GESELLSCHAFT BROWN, BOVERI & CIE. Swiss 130,780, Jan. 14, 1928.

**Gas-tight joints between glass and metal tubes.** CHRIST KIRWER (to Westinghouse Elec. & Mfg. Co.). U. S. 1,716,140, June 4. Structural features.

**Closing device for high-pressure piping.** CHARLES SCHAEER. Swiss 131,175, Feb. 12, 1927.

**Mixing apparatus.** ARCA-REGLER A.-G. Ger. 476,338, July 10, 1928. Mech. regulated app. is described whereby substances of different consistencies are continuously and automatically mixed in a predetd. proportion. Reference is made to the *manuf. of paper pulp* with a predetd. content of water.

**Mixing and agitating apparatus.** CHEM. FABRIK GRÜNAU LANDSHOFF & MEYER A.-G. Ger. 476,181, Oct. 21, 1927.

**Driving means for vibrating classifiers.** WILHELM SELTNER. Ger. 476,208, Mar. 19, 1924.

**Diffusion apparatus for indicating the presence of combustible, explosive or poisonous gases.** BRUNO TREBITSCH. Austrian 112,720, Nov. 15, 1928.

**Apparatus for automatic recording of the analysis of gas containing carbon dioxide.** SOC. ANON. DES ANCIENS ÉTABLISSEMENTS VANHOUTTE ET JUILLOT. Fr. 653,844, May 4, 1928.

**Time and temperature control device for valves supplying heating fluids.** ROY W. BROWN (to Firestone Tire and Rubber Co.). U. S. 1,715,987, June 4.

**Apparatus (utilizing a wheatstone bridge) for comparative heat conductivity tests of gases.** RICHARD H. KRUEGER (to Charles Engelhard, Inc.). U. S. 1,715,374, June 4.

**Apparatus for comparing and registering the intensity of radiant energy.** ARTHUR C. HARDY and FREDERICK W. CUNNINGHAM. Fr. 655,039, May 31, 1928.

**Apparatus for recovering the heat and vapors generated in gas reactions.** GEORGES L. E. PATART. Ger. 476,840, Jan. 22, 1925. Details of arrangement are given.

**Arrangement of tubes to increase the effective area of a surface condenser.** MASCHINENFABRIK OERLIKON. Swiss 130,762, Nov. 29, 1927.

**Fat-removing and cleaning apparatus, especially for hollow bodies.** ANNA W. F. SCHAMMER (NÉE STOLLE) and ANITA H. SCHAMMER-UHLENDORF. Ger. 476,036, Aug. 2, 1927. The bodies to be cleaned are treated with volatile solvents in a rotating or swinging basket surrounded by a system of cooling tubes which may move with the basket or be stationary.

**Fat-removing and cleaning apparatus, especially for hollow bodies.** ANNA W. F. SCHAMMER (NÉE STOLLE) and ANITA H. SCHAMMER-UHLENDORF. Ger. 476,366, Dec. 17, 1926. Addn. to 456,811. The app. is generally similar to that of Ger. 476,036 (cf. preceding abstract) but differs in mech. details.

**Hydrogenation apparatus.** SOC. INTERNATIONALE DES COMBUSTIBLES LIQUIDES (Deutsche Bergin A.-G. für Köhle und Erdölchemie, applicants in Germany.) Fr. 653,135, Apr. 20, 1928. Welding prepn. which resist the attack of hot H under pressure are composed of alloys of Fe with Be, Al, V, Cr, Mo, Mn, Ni or Co or of the metals themselves, or the joints of the app. using hot H under pressure are covered with a layer of one of these metals or an alloy thereof. Fr. 653,136 describes the coating of vessels and pipes of hydrogenation app. with a layer of Cr, Be or Al, which are preferably diffused into the top layer of steel by a heat treatment.

**Rotary acetylene generator with counter-pressure chamber.** RICHARD MÜTSCHLE. Ger. 476,647, May 26, 1926. Details of construction are given.

**Containers for storing gases.** SVENSKA AKTIEBOLAGET GASACCUMULATOR (Gustav Dalén, inventor). Ger. 476,263, Mar. 17, 1925. Containers for storing  $C_2H_2$  and other gases are filled with balls or lumps prepd. from a fibrous, granular or powd. porous material and an adhesive, e. g., from kieselguhr, pumice, asbestos, cellulose, etc., and  $ZnCl_2$ . The balls or lumps may have a core of different porous material, e. g., charcoal. The spaces between the balls or lumps are filled with loose fibrous, granular or powd. material, e. g., kieselguhr.

**Storage tank with a "breather roof" for holding volatile liquids.** HARRY C. BOARDMAN (to Chicago Bridge & Iron Co.). U. S. 1,716,947, June 11. Structural features.

**Automatic vent for "breather roofs" for volatile-oil storage tanks.** CLAYTON L. DAY (to Chicago Bridge & Iron Co.). U. S. 1,716,950, June 11. Structural features.



**Apparatus for dissolving and feeding calcium hydroxide into iron pipes to check corrosion by water, etc.** CHRISTIAN BÜCHER. U. S. 1,716,205, June 4.

**Thermostatic valve for gas burners.** VICTOR MAUCK. U. S. 1,717,052, June 11. Structural features.

**Thermostatic control for valves of gas burners.** GEORGE A. ROBERTSHAW. U. S. 1,715,950, June 4. Structural features.

**Thermostatic control for regulating supply of fuel to burners.** EDWARD L. FONSECA (to Wilcolator Co.). U. S. 1,715,650, June 4. Structural features.

**Thermostatic control device for electric heating apparatus.** LEE P. HYNES (to Consolidated Car-Heating Co.). U. S. 1,717,155, June 11.

**Thermostatic control for apparatus for heating fluids.** VICTOR G. VAUGHAN (to Westinghouse Elec. & Mfg. Co.). U. S. 1,715,687, June 4. Structural features of a thermostatic switch, etc.

**Thermostatically controlled water-heating system.** RICHMOND ROCHESTER, JR. (to Automatic Electric Boiler Co.). U. S. 1,715,512, June 4.

**Thermostatic mixing valve suitable for controlling the mixing of hot and cold water.** WILLIAM B. LASKEY. U. S. 1,715,662, June 4. Structural features.

**Thermostatic control for electric circuits.** HERBERT E. RIDER (34% to Emil Blair, and 18% each to Clinton T. Revere and George C. Shubert). U. S. 1,715,676, June 4. Structural features.

**Thermostatic control for electric appliances.** WILLIAM W. McLAREN. U. S. 1,715,464, June 4. Structural features.

## 2—GENERAL AND PHYSICAL CHEMISTRY

FREDERICK L. BROWNE

**Maximilian Toch.** ELLWOOD HENDRICK. *Ind. Eng. Chem.* **21**, 704(1929).—Biography with portrait. E. C. M.

**Charles Mayer Wetherill, 1825-1871.** I. EDGAR F. SMITH. *J. Chem. Education* **6**, 1076-89(1929). E. J. C.

**Award of American Institute of Chemists (to Mr. and Mrs. Francis Patrick Garvan).** *J. Chem. Education* **6**, 1035-75(1929). **Advance of the nation through the science of chemistry.** CHAS. H. HERTY. Pp. 1037-44. **Chemistry in relation to medicine.** JOHN J. ABEL. Pp. 1045-64. **Pioneers in public service.** JOHN W. DAVIS. Pp. 1065-8. **Presentation address.** JOHN H. FINLEY. Pp. 1069-71. **Acceptance address.** FRANCIS P. GARVAN. Pp. 1072-5. E. J. C.

**Ancient symbols for metals.** JOHN WHITE. *Science Progress* **23**, 687-8(1929).—A relationship is suggested between the alchemical symbols for the metals and the Arabic numerals. JOSEPH S. HEPBURN

**The number of students of chemistry.** F. QUINCKE. *Z. angew. Chem.* **42**, 522-3(1929).—This is an interpretation of statistics from various sources as to the number of students taking chemistry in German institutions, with an attempt to reconcile the discrepancies in such reports. The numbers of students enrolled during the summer semesters of 1911, 1925 and 1928 are as follows: (a) Universities—1524, 3693, 2679; (b) Technical schools (Technische Hochschulen)—1671, 3759, 2497; (c) Pharmacy (in universities)—954, 1505, 742; (d) ditto (in technical schools)—84, 200, 122. (e) Totals of above—4233, 9157, 6040. The increase in the no. of women students is noted specially. W. C. EBAUGH

**The conduct of courses in the teaching of high-school chemistry.** J. O. FRANK. *Science Education* **13**, 211-6(1929). E. H.

**High-school projects in chemistry.** S. D. LAW. *J. Chem. Education* **6**, 1139-43(1929). E. J. C.

**Educational aims in teaching elementary chemistry.** FRANCIS C. COULSON. *J. Chem. Education* **6**, 1120-5(1929). E. J. C.

**Reform in the chemistry curriculum.** R. J. HAVIGHURST. *J. Chem. Education* **6**, 1126-9(1929). E. J. C.

**Improvement of scientific ability through the use of the individual laboratory exercise in chemistry.** RALPH E. HORTON. *J. Chem. Education* **6**, 1130-5(1929). E. J. C.

**International chemistry.** AUSTIN M. PATTERSON. Antioch Coll. *Science* **69**, 531-6(1929).—A sketch of international coöperation in the last 40 years, with special reference to the work of the *Intern. Union of Pure and Applied Chemistry*. The previous

*Intern. Asscn. of Chem. Societies* is briefly described and "dreams of the future" along the lines of international coordination and distribution of chem. literature are discussed.

E. J. C.

**Limitations upon the unification of chemical nomenclature.** ATHERTON SEIDELL. *J. Chem. Education* 6, 720-9(1929).—A report on 84 replies to an inquiry sent to chemists of various countries. About two-thirds think that internat. efforts to reform nomenclature will not arouse chauvinistic or other antagonisms, and favor commissions for the purpose. However, as to unification of names of long-known elements (Fe, Cu, Ag, Au, etc.), only 29 were clearly in favor, while 37 were unreservedly opposed. Individual comments are given. "The results of this inquiry point out clearly that efforts to improve the nomenclature of chemistry must be confined to new names and to the harmonizing of variations in usage which do not conflict with fundamental language differences."

AUSTIN M. PATTERSON

**Some regularities in the periodic system.** D. STRÖMHOLM. *Z. anorg. allgem. Chem.* 177, 303-12(1928).—Even though the principle upon which Mendeleev designed his table, namely, that of arranging the elements periodically as a function of their at. wts., is no longer wholly tenable, such an arrangement is very usable. S., considering later theories, shows that the percentage electron content of the atomic nucleus increases rapidly with increase of at. wt., and that the relation may be expressed as the quotient of the fraction,  $(at. wt./2) : [(at. wt./2) - Z]$ , where  $Z$  is the at. no. of the element in question. This increase in percentage electron content increases in stages, each stage beginning with a decidedly rare element. The second begins with Sc, the third at either Ga or Ge, the fourth at In and the fifth probably with Hf. S. discusses the significance of these stages particularly as to the formation and disintegration of elements, assuming that elements are formed by reactions analogous to those found in a radioactive series.

L. L. QUILL

**The magnetization of single crystals of cobalt.** SEIJI KAYA. *Science Repts. Tôhoku Imp. Univ.*, 1st Series, 17, 1157-77(1928).—Two circular disks, about 4.5 mm in diam. with their planes coinciding, resp., with the 2 principal planes (0001) and (1010) were prepd. from large crystals of Co. In the plane (1010) there are 2 particular directions [0001] and [1010] perpendicular to each other; 1 being the direction of easy magnetization and the other that of difficult magnetization. The parallel and perpendicular components of magnetization in this plane vary with a period of  $180^\circ$ . The satn. value of the intensity of magnetization was found to be 1422 at  $26^\circ$ . D. S.

**A new determination of the melting point of palladium.** C. O. FAIRCHILD, W. H. HOOVER AND M. F. PETERS. *Bur. Standards J. Research* 2, 931-62(1929).—The m. p. of Pd was detd. by measuring with an optical pyrometer the ratio of brightness of the red light ( $\lambda = 0.6528 \mu$ ) emitted by black bodies at the m. ps. of Pd and Au, resp. Of the 2 procedures used, the crucible method in which the pyrometer is sighted into a black body immersed in freezing or melting metal in a crucible was found to be more reliable than the wire method, in which a Lummer-Kurlbaum black-body furnace was employed, the brightness of the black body being measured at the instant a small bit of Au or Pd wire placed inside of the black body and connecting the hot junction ends of a thermocouple melted and halted the e. m. f. of the thermocouple. The temp. of melting Pd was calcd. in terms of that of melting Au by means of Wien's law which is equiv. to Planck's law for light of such wave-length and for such a range of temp. In the computation,  $c_2$  of Wien's law was taken as 1.432 cm. degree and the m. p. of Au as  $1063^\circ$ . The m. p. of Pd was  $1556.6^\circ \pm 1^\circ$ . The av. of this result with those of 6 former detns. is  $1553^\circ \pm 0.7^\circ$ . It is estd. that the uncertainty in this value on the centigrade thermodynamic scale is approx.  $2^\circ$ .

R. J. HAVIGHURST

**A mechanical model of an asymmetric carbon atom.** H. G. TANNER. *J. Phys. Chem.* 33, 755-9(1929).—A description of the construction and functioning of a mech. model of an asymmetric C atom, based on the single postulate that electrodynamic asymmetry of the valence "bonds" is responsible for optical activity.

R. J. H.

**The atomic volume relations in certain isomorphous series.** III. A. F. HALLIMOND. *Mineralog. Mag.* 22, 70-6(1929); cf. C. A. 22, 4411.—Compressibilities of 11 alkali halides can be calcd. from the at. vols. by means of the formula  $\beta = V/K$ ,  $\beta' = V'/K'$ , where  $\beta$  and  $V$  are the compressibilities and at. vols. of the combined metals, resp.,  $\beta'$  and  $V'$  those of the halogens. For the all metals  $K = -4 \times 10^{-4}$ , for the halogens  $K' = -2.5 \times 10^{-4}$ .

W. F. HUNT

**High-temperature experiments. I. Preliminary conditions and materials.** WILLI M. COHN. *Metallwirtschaft* 8, 367-71(1929).—At high temps. stable compds. are rare, the tendency being to split into simpler substances, elements or even at. nuclei with few electrons. Star spectra indicate temps. for their atms. of 3000-30,000°, while

the interiors may be as high as  $40 \times 10^6$ . In high-temp. studies one must have control of the speed of heating, maintenance of a given temp. for a known length of time, production of an oxidizing, reducing or neutral atm., a sufficiently large vol. of heating space, etc. As materials for furnace construction ceramic products, earths, alk. earths, free elements of high m. p., oxides, nitrides and carbides are listed and their phys. properties recorded. From these may be selected materials suitable for working up to temps. of  $3000^\circ$ . By isolating the high-temp. zone from the rest of the app. (as by air layers, vacuum, etc.) higher temps. may be attained.

W. C. EBAUGH

Measurements with the aid of liquid helium. III. Resistance of metals. Superconductivity of tantalum. Contribution to the explanation of superconductivity. Specific heat of gaseous helium. W. MEISSNER. *Z. ges. Kälte-Ind.* 36, 62-8(1929); cf. *C. A.* 20, 3269.—The elec. resistance of various specimens was measured at  $273.2^\circ\text{K}$ . and from  $90^\circ\text{K}$ . to  $1.28^\circ\text{K}$ . In terms of the resistance equal to 1 at  $273.2^\circ\text{K}$ ., the following results were obtained at the lowest temps.,  $1.28^\circ$  to  $1.35^\circ\text{K}$ .: Cu,  $2.9 \times 10^{-4}$ ,  $3.5 \times 10^{-4}$ ; Al, 0.0067; Fe, 0.0103, 0.0141, 0.0163; Be, 0.3077; Co, 0.3632, Mo, 0.1335; Rh, 0.3380; Pd, 0.0245; Ta,  $< 5 \times 10^{-6}$ ; W, 0.0307; Ir, 0.0478; Sb, 0.0239; C, 1.193; nickel silver, 0.8983, 0.9149. Ta was the only specimen showing superconductivity. After measuring the resistance of two like specimens of superconducting Sn, one intimately encased in a nickel silver tube and the other not, it is concluded that the phenomenon of superconductivity is not a surface effect. By a suitable expt. with a four-stage amplifier, no irregularity in the flow of direct current through a sample of superconducting Pb was found. By means of a new precision calorimeter, which is described, the heat capacity of gaseous He at  $5.5^\circ\text{K}$ . and  $0.75^\circ\text{K}$ . is found to be 1.94 cal. per mol.

F. D. ROSSINI

The mechanism of the valve effect at poor contacts. R. AUDUBERT AND M. QUINTIN. *Compt. rend.* 188, 52-4(1929); cf. *C. A.* 22, 533, 1894.—From a theory based on electronic emission and Poisson's equation, an equation representing the valve effect is derived. It agrees with the previous theoretical data. The theory probably explains also the mechanism of AgS and PbS detectors.

ARTHUR FLEISCHER

Calculation of the molecular polarization of dissolved substances at infinite dilution. GUNNAR HEDESTRAND. *Z. physik. Chem.*, Abt. B, 2, 428-44(1929).—The mol. polarization and dipole moment are calcd. for substances dissolved in benzene and hexane, and for glycolcol in water.

F. D. ROSSINI

The measurement of color. F. A. O. KRÜGER. *Z. Ver. deut. Ing.* 73, 465-8(1929).—A modification of the Pulfrich photometer is described whereby it is possible to compare colors and give to them numerical values capable of reproduction. In it the Ostwald factors of basic color, white and black are employed to express the compn. of the sample examd., and illustrations are shown for (a) the numerical values of certain colors, (b) the changes of colors upon weathering and (c) the plotting of results upon logarithmic and 3-component coordinate systems.

W. C. EBAUGH

The solid and liquid phases of helium. W. H. KEESOM. *Natuurw. Tijdschr.* 11, 65-79(1929).—A recent lecture.

J. C. JURRIJENS

Molecular motions in rarefied gases. ERNEST RUTHERFORD. *Engineering* 127, 347-8(1929).—Marked changes occur in the behavior of gases, in passing from ordinary to extremely low pressures. An explanation of this behavior is afforded by the kinetic theory, the essential point being that while at normal pressure, and temp., the mean free path of a mol. is of the order of  $1/100,000$  cm., at pressures corresponding to  $1/100$  to  $1/10,000$  mm. of Hg it becomes comparable with the dimensions of the vessel in which the gas is enclosed. *Ibid* 381.—Expts. indicated that radiometer effects are produced neither at high nor at very low pressures, but only when the mean free path of the mol. is short compared with the dimensions of the radiometer bulb. The phenomena involved are very complicated and have been the object of much study, both theoretical and exptl. *Ibid* 449-50.—The condensation of mols. on a surface produces a complicated problem. A mol. when it strikes a surface does not, in general, rebound at once, but sticks for a little time and then when it does come off, it does so in a direction which is perfectly random and in no way correlated with original direction of incidence. The av. time during which the mol. remains on the surface depends on the abs. temp. The view is now held that mols. which condense on a surface act as a two-dimensional gas. The mols. wander over the surface at random, forming aggregations in the course of time. The d. of the stream of atoms condensing on a surface must attain a certain critical value if a visible deposit is to be formed. Such a visible deposit must be at least three mols. thick.

FRANK V. JOHNSON JR.

The specific heats of some condensed gases between  $10^\circ$  absolute and their triple points. KLAUS CLAUSS. *Z. physik. Chem.*, Abt. B, 3, 41-79(1929).—A vacuum

*calorimeter* for measuring sp. heats of condensed gases down to  $10^\circ$  abs. is described and measurements of  $C_p$  for  $N_2$ ,  $O_2$ ,  $CO$ ,  $CH_4$  and  $HCl$  are given.  $CH_4$  shows a hitherto unsuspected transformation at  $20.4^\circ$  abs. Below  $13^\circ$  the course of the sp.-heat curves is well represented by a *Debye function*. A discussion of the *Pb thermometer* is also given, with tables for the resistance below  $20^\circ$ .

J. B. AUSTIN

**Specific heats of gases at high temperatures.** E. D. EASTMAN. *Bur. Mines, Tech. Paper No. 445*, 27 pp. (1929).—An outline of the methods and results of a study of the most reliable values possible from available data, with an estimate of their accuracy. Earlier investigations are reviewed critically and reasons are given for rejection of some researches purporting to be of high accuracy. Some results are recalcd. from the original data by methods largely eliminating errors characteristic of the methods of measurement. The recalcs. and graphical presentations make apparent the exact contribution of each research and permit independent appraisal of the results. On the side of technic the necessity in sound-velocity work of adequate temp. control and of careful study of tube correction is emphasized.

W. H. BOYNTON

**A new, semiempirical vapor-pressure formula.** VALENTIN KIREV. *Z. Elektrochem.* **35**, 217–20 (1929).—By combining the Clausius-Clapeyron and Nernst equation of state with K.'s empirical formulas for the relation of reduced temps. and pressures, K. derives the equation  $\pi - \ln \pi = m + a (\tau - 1.10 \ln \tau + n)$  where  $\tau$  and  $\pi$  are the reduced temp. and pressure, and  $m$ ,  $n$  and  $a$  are consts.  $a = K_s (1.10 - \tau_s)$  and  $K_s = L_s/RT_s$ ;  $s$  refers to the b. p. and  $L$  to the heat of vaporization. Tables for the values of the functions  $y = x - \ln x$  and for  $y = x - 1.10 \ln x$  are given. The equation holds from pressures above 0.3 atm. to a reduced crit. temp. of 0.85. The calcs. are made for  $C_2H_5OH$  and  $C_6H_6$ .

ARTHUR FLEISCHER

**A vapor-pressure chart for hydrocarbons.** HAL B. COATS and GEORGE G. BROWN. *Univ. Mich. Dept. Eng. Research, Cir. Series No. 2*, 17 pp. (1928).—A new form of vapor pressure chart for hydrocarbons, accurate to  $\pm 0.5^\circ$  over wide ranges of temp., is described. The chart uses straight lines for the vapor pressure of each compd. It was developed by a method based on the fundamental principal that the variations of all properties in the normal paraffin series follow smooth regular curves. A crit. study of existing vapor pressure data was made, and the most reliable were used as a nucleus for the construction of the chart. Curves are given for propane, isobutane, butane, 2-methylbutane, pentane, diisopropyl, 2-methylpentane, hexane, hexamethylene, benzene, 2-methylhexane and heptane.

R. L. DODGE

**The vapor pressure of ethylene chloride between  $-30^\circ$  and  $100^\circ$ .** J. N. PEARCE and PAUL E. PETERS. *J. Phys. Chem.* **33**, 873–8 (1929).—The vapor pressures of ethylene chloride over the temp. range from  $-30^\circ$  to  $100^\circ$  were detd. by a static method. The normal b. p. at 760 mm. was found to be  $84.1^\circ$ , the crit. temp. calcd. to be  $321.9^\circ$ , the molal heat of vaporization at the b. p. 7745 cal. and the molal entropy of vaporization 21.68 cal. Between  $243^\circ K.$  and  $363^\circ K.$  the vapor pressure can be calcd. within 1 mm. by the equation  $\log p = -(4481.12/T) - 52.3092 \log T + 0.071537 - 0.0000418477^2 + 128.756$ .

J. C. McNALLY

**Determination of molecular weights in the vapor state from vapor pressure and evaporation data.** EDWARD W. WASHBURN. *Bur. Standards J. Research* **2**, 703–13 (1929).—Discussion of a method, (cf. *C. A.* **22**, 2693 and 2694) which is based upon detg. at the same temp. the vapor pressure of a substance and the amt. of it required to saturate by aspiration a known vol. of an indifferent gas. The method is applicable to the detn. of the mol. wt. at temps. at which the vapor pressure is small. By employing a reference substance of known mol. wt. the method is practically independent of temp. fluctuations and the measuring of the vol. of gas aspirated can be eliminated.

E. SCHOTTE

**Quantity relations in moist gases.** ROBERT NITZSCHMANN. *Metallbörse* **19**, 958–60 (1929).—Equations and tables designed to shorten calcs. involving moist gases.

W. C. EBAUGH

**Gas-equilibria (homogeneous).** ROBERT NITZSCHMANN. *Metallbörse* **19**, 677–8, 735–6, 790–1, 846–7, 903 (1929).—A series of 282 equations designed to simplify calcs. involving gaseous equilibria.

W. C. EBAUGH

**Volumetric relations of the reaction  $4 HCl + O_2 = 2 H_2O + 2 Cl_2 + 29,400$  cal.** R. NITZSCHMANN. *Metallbörse* **19**, 398–9, 567–8 (1929).—A series of equations, tables and graphs showing values derived from the equation given, under varying conditions.

W. C. EBAUGH

**The volumetric relations of the reaction  $Cl_2 + H_2 = 2 HCl + 44,000$  cal.** R. NITZSCHMANN. *Metallbörse* **19**, 64–5, 176–7 (1929).—A series of 58 equations shows

the results of reactions involving (a) equiv. amts. of  $H_2$  and  $Cl_2$ , (b)  $Cl_2$  in excess, (c)  $H_2$  in excess, but without formation of  $H_2O$ , and (d) ditto but with formation of  $H_2O$ ; and 8 tables give numerical values computed for 6 volume % of  $Cl_2$  in such mixts.

W. C. EBAUGH

**Volumetric and equilibrium relations of the reaction  $CH_4 + H_2O \rightleftharpoons CO + 3 H_2$ .** R. NITZSCHMANN AND H. LIPKA. *Metallhörse* 19, 1014-5(1929). —Equations, tables and illustrative problems.

W. C. EBAUGH

**The decomposition of nitrous oxide in the silent electric discharge. IV. Influence of the addition of foreign gases.** SHRIDHAR S. JOSHI. *Trans. Faraday Soc.* 25, 137-43 (1929).—Measurements were made of the initial velocity of decompn. in mixts. of a const. amt. of  $N_2O$  with varying quantities of  $N_2$ ,  $O_2$  and  $NO_2$  to confirm previous conclusions (C. A. 23, 2887) that the velocity of reaction, the current flowing through and the energy consumed in the ozonizer are related to the amt. of  $NO_2$  present. Added gases cause an increase in  $V_m$  (min. p. d. necessary to initiate decompn.) with increasing electron affinity;  $P$  (mean watts consumed in ozonizer during discharge) diminished.

M. MCMAHON

**The measurement of flame temperatures.** EZER GRIFFITHS AND J. H. AWBERRY. *Proc. Roy. Soc. (London)*, A123, 401-21(1929); cf. C. A. 22, 4340.—Max. explosion temps. were measured in a cylindrical bomb with plate glass ends. Light from an incandescent solid passed through the bomb. Its temp. was adjusted until the  $D$  lines just appeared or did not appear, immediately after the explosion. The temp. could be set within  $10^\circ$  at  $2100^\circ$ . Temp. curves are given for different air-CO mixts. and different gas velocities. The electrodes of an at. H blow pipe were found to be at  $3200^\circ$ , and the gas between them at  $2515^\circ$ .

GERALD M. PETTY

**Combustion of rigidly dried carbonic oxide-oxygen mixtures.** WM. A. BONE. *Nature* 123, 644(1929), cf. Bone, *Ibid* p. 584.—The electrodes were freed from  $H_2$  by glowing *in vacuo* and also in  $O_2$ . A highly purified 2 CO +  $O_2$  mixt., which, under all necessary precautions, has been rigidly dried to the utmost limit possible with redistd. and highly purified  $P_2O_5$ , will still explode and propagate flame provided that a sufficiently powerful igniting spark is used. With Pt-balled electrodes the min. condenser discharge spark required is about 0.75 microlarad at 1000 v. (energy = about 0.75 joule).

G. CALINGAERT

**The temperature relationship of density and refractive index.** W. HERZ. *Z. anorg. allgem. Chem.* 180, 159-60(1929); cf. C. A. 23, 1542.—From  $\alpha = [1/(t_1 - t)] [(d - d_1)/d_1]$  for the temp. coeff. of  $d$ , and  $\beta = [1/(t_1 - t)] [(n - n_1)/n_1]$  for the temp. coeff. of refractive index, the ratio of  $\alpha$  to  $\beta$  for some 23 liquids was investigated; in the calcs. were used temps. of  $8/12 T_k$  and  $7/12 T_k$  and their corresponding values of refractive index and  $d$ . There is no marked similarity in  $\alpha/\beta$ , although for the majority of the substances considered, chiefly org., the range is from 2 to 4.  $S$  and  $H_2O$  are higher, 6.10 and 9.62, resp.

WILLIAM E. VAUGHAN

**Measurements of the refractive index of water between 23 and 73 cm. wave length.** ERNST FRANKENBERGER. *Ann. Physik* [5], 1, 918-62(1929); cf. C. A. 21, 2102.—The app. used is described and illustrated. The refractive index of pure  $H_2O$  remains practically const. in the region of wave length between 23 and 73 cm. Very dil. solns. of  $Na_2Si_2O_5 + 2H_2O$  and  $Na_2SiO_3 + 6H_2O$  from dil. NaOH and colloidal  $H_2SiO_3$  solns. show just as little dispersion as pure  $H_2O$  between 50 and 60 cm. wave lengths. Previous measurements according to the second Drude method have a consistent error due to the surface condition of the wire used.

M. MCMAHON

**Influence of temperature on the expansion coefficient of normal liquids.** K. M. STAKHORSKII. *Ukrainskii Khim. Zhur.* 3, *Sci. Pt.*, 457-62(1928).—From theoretical considerations the following law has been deduced, which expresses the relation between the coeff. of expansion ( $\alpha$ ) and the temp. ( $T$ ):  $\alpha = 0.17 T_{cr}/(T_{cr} - T)$ , where  $T_{cr}$  is the crit. temp. of the liquid. Expts. show that this equation can be used for the temp. interval between the f. ps and the b. ps of the liquids; however, in the vicinity of the b. ps. the const. of the equation is rather 0.18 than 0.17. The equations given by Herz (C. A. 11, 2746) and Kolosovskii (C. A. 21, 1745) present only particular cases of the above equation, which is general. With regard to the applicability of this equation to assoc. liquids, A. Bachinskii has shown (cf. C. A. 5, 1218) that a certain temp. called *metacritical* corresponds to every mol. state of assoc. liquids. The *metacritical* temp. ( $T_{mc}$ ) can be calcd. from S.'s equation by presenting it in this form:  $T_{mc} = T/[1 - (0.17/\alpha T)]$ . The *metacritical* temp. increases with the assocn. factor of the liquid, and both decrease with the rise of temp. The *metacritical* temp. is higher than the usual crit. temp. However, the *metacritical* temp. corresponding to the mol. state of AcOH at the b. p. almost coincides with the usual crit. temp.; this indicates that on

raising the temp. from the b. p. to the crit. point the association factor of  $AcOH$  apparently remains almost unchanged.

BERNARD NELSON

**The molecular theory of non-elastic deformation.** BECKER. *Metallbörse* 18, 709, 765(1928).—A hardened metal, consisting of very small cryst. particles with haphazard orientations, may be considered a sep. phase which differs in free energy from the single-crystal phase by the heat of recrystn. Also its vapor pressure will be higher than that of the single crystal. Recrystn. consists in the formation of large single crystals through the diffusion of atoms from neighboring crystal particles with fortuitous orientation to a "seed" crystal which happens to have a regular structure and a favorable position, and this phenomenon takes place only at temps. so high that diffusion is appreciable.

R. J. HAVIGHURST

**Diffusion in crystallized compounds.** C. TUBANDT, HERM. REINHOLD and WILH. JOST. *Z. anorg. allgem. Chem.* 177, 253-85(1928).—When a direct current is passed through a number of tablets or plates of a salt, the surfaces of which are firmly pressed against each other, no change in the appearance or weight of the individual parts takes place. When different salts touch which contain a common ion, e. g.,  $AgCl$  and  $Ag_2S$  or  $AgCl$  and  $NaCl$  or  $BaCl_2$  and  $BaBr_2$ , an exchange of ions takes place regardless of whether the new salt (formed by substitution) is miscible with the original or not. The extent of this substitution may be detd. very simply by weighing. The method may also be used for purification of the salts without affecting their structure. Similarly the mutual diffusion of 2 salts into each other may be investigated. The velocity of diffusion of the cations was studied in  $Ag_2S$ ,  $AgI$ ,  $AgBr$ ,  $AgCl$ ,  $Cu_2S$ ,  $CuI$  and  $CuBr$ . The diffusion const. of  $Ag_2S$ ,  $Cu_2S$  and  $AgI$  follows the relation  $D = A \cdot e^{-(B/T)}$ . In the case of  $AgI$  and  $CuI$  the diffusion const. may be calcd. from the elec. cond. according to  $D = C \cdot T^{\frac{1}{2}}$ . It is also possible to det. the "autodiffusion" from measurements of cond. and transference in pure salts and mixed crystals.

EMIL KLARMANN

**Electric conductance method for determining liquefaction temperatures of solids.** EDWARD W. WASHBURN and EDGAR R. SMITH. *Bur. Standards J. Research* 2, 787-91(1929).—When a solid or mixt. of solids behaves as an elec. insulator below its liquefaction temp., but becomes a conductor as soon as the liquid phase appears, the temp. at which the system acquires this elec. conductance will be the liquefaction temp. of the system. The app. for detg. this temp. is described. The method is especially convenient when only small quantities of material are available and is unaffected by impurities which do not lower the initial liquefaction temp. It will give reliable results in many cases in which the customary methods fail. Some exptl. data on eutectic temps. of water-salt systems and on transition temps. of salt hydrates are given. E. S.

**Electromotive and elektrokinetic potentials of graphite.** NATHANIEL THON. *Compt. rend.* 188, 253-4(1929); cf. *C. A.* 22, 4330.—Graphite electrodes do not behave like the  $Au$  electrode. The potential increases with increase in concn. of the electrolyte. Graphite functions as a cation electrode. Crystal violet reverses the sign of the electrokinetic potential on graphite.

ARTHUR FLEISCHER

**Adsorption.** RENÉ DUBRISAY. *Rev. sci.* 67, 1-4(1929).—A review. P. T.

**Remarks upon the formulas representing adsorption isotherms.** A. BOUTARIK. *Compt. rend.* 188, 450-2(1929).—By using  $\mu$  the reciprocal of  $\gamma$ , the amt. adsorbed per g. of adsorbent and  $\phi$ , the reciprocal of  $c$  the equil. concn., Perrin's formula simplifies to  $\mu = a\phi + b$ , where  $a$  and  $b$  are consts. By differentiation of Perrin's equation B derives a general equation  $dy/yn = K dc/cn$ : in Perrin's equation  $n = 2$  while in Freundlich's  $n = 1$ . Conclusion: Freundlich's is the simpler equation. A. F.

**The dependence of the adsorption of a dissolved substance on the properties of the solution and solvent.** W. HERZ and L. LORENZ. *Kolloid Z.* 47, 331-4(1929).—A study is made of the adsorption by charcoal of  $I_2$  from its soln. in  $EtOH$ ,  $HOAc$  and various mixts. of  $C_6H_6$  and  $CCl_4$ , and  $C_7H_{16}$  and  $Pr_2O$ . A const. relationship is found between the adsorbability of a substance from org. solvents and their mixts., the soly. of the substance, and the d. and viscosity of its satd. soln. This relationship depends upon the nature of the solvent. R. I. RUSH

**Adsorption from aqueous solutions by silica.** F. E. BARTELL and YING FU. *J. Phys. Chem.* 33, 676-87(1929).—Hydrolytic adsorption occurs when aq. salt solns. are treated with pure dehydrated  $SiO_2$  prepd. from  $SiCl_4$ . The basic constituent is preferentially adsorbed from such solns. In general, bases are adsorbed, org. acids are slightly adsorbed, and inorg. acids are not adsorbed at all. Inorg. bases are preferentially adsorbed in the order  $LiOH > NaOH > KOH > NH_4OH$ . This order is the same as that for the degree of hydration of the cations. The order of adsorption is probably due to the strongly hydrophilic nature of the  $SiO_2$ . Org. acids are adsorbed in decreasing amts. in an ascending homologous series, i. e., formic > acetic > propionic > butyric.

This order is more pronounced in adsorption from org. solvents. From solns. of Na salts of the org. acids hydrolytic adsorption (preferential adsorption of base) occurs in increasing amts. in the ascending homologous series, *i. e.*, Na formate < Na acetate < Na propionate < Na butyrate. Inasmuch as an equil. condition exists between the base adsorbed and the acid in soln., the extent of base adsorption is regulated by the acid given to the soln. by the hydrolytic adsorption, *i. e.*, by the strength of the acid or H-ion concn. of the soln. This probably accounts for the higher degree of hydrolytic adsorption with salts of org. acids than with salts of inorg. acids. The adsorption of inorg. salts such as KCl by  $\text{SiO}_2$  is completely hydrolytic; that is, no KCl as such is adsorbed, neither is Cl ion nor HCl adsorbed. The degree of adsorption is detd. not only by the sp. properties of adsorbent and adsorbate, but is dependent on the soly. of solute in the solvent and upon the solid-liquid interfacial tension relationships. If the soly. of a given adsorbate is the same in a series of different solvents, greater adsorption will occur from solns., the solvent of which has the lower adhesion tension with the adsorbent.

A. WHITE

**Adsorbing power and vapor pressure of adsorbed water by acidic, neutral and alkaline earths.** H. ISOBE. *Bull. Inst. Phys. Chem. Research* (Tokyo) 7, 1133-59; *Abstract sect. 1*, 106-9(1928).—The adsorption of moisture by the earths, "Sansei-Hakudo" from Osawa in Odo, was measured by a relative method. Neutral earth is a better adsorber than alk. or acid earth. Some vapor-pressure curves are given.

G. B. TAYLOR

**The adsorption of water, ethyl alcohol, ethyl acetate and acetic acid by tungstic and zirconium oxides; its bearing on heterogeneous catalysis.** J. N. PEARCE AND M. J. RICE. *J. Phys. Chem.* 33, 692-704(1929).—The adsorption of  $\text{H}_2\text{O}$ ,  $\text{EtOH}$ ,  $\text{AcOH}$  and  $\text{AcOEt}$  vapors by W and Zr oxides was studied at  $99.4^\circ$ . The results are compared with those of a similar study of the adsorption of the same vapors by  $\text{ThO}_2$  and  $\text{Al}_2\text{O}_3$ . For unit vol. of adsorbent the adsorption capacities for  $\text{H}_2\text{O}$  vapor decrease in the order Th, Al, W and Zr oxides. This is also the order of the dehydrating power of these oxides toward alc. The order of adsorption for  $\text{AcOEt}$  is exactly the reverse of that for  $\text{H}_2\text{O}$  vapor. The results confirm the view that in the catalytic process both the alc. and  $\text{AcOH}$  vapor must be adsorbed simultaneously. Further, that the catalytic effect increases as the power of the oxide to adsorb  $\text{H}_2\text{O}$  decreases.

A. WHITE

**The adsorption of iodine, bromine and various halogen salts by carbon in some organic liquids.** JOSEPH TRIVIDIC. *Rev. gén. colloïdes* 7, 14-22(1929); *cf. C. A.* 22, 2092, 2700.—The adsorption of I by C in org. solvents obeys Freundlich's formula rather than that proposed by Davis and Schmidt. The adsorption curves for a series of liquids pass through a common point characteristic of the C and of the series under consideration. Binary mixts. of org. solvents obey the Freundlich equation. A relation exists for these mixts. between the fixed I and that retained in the pure liquids. This also holds for Br. It appears impossible to obtain decisive data on the adsorption of alkali halides by C because of the feeble adsorption possessed by C. I. **Effect of time on the adsorption of iodine by carbon in some organic solvents.** *Ibid* 22-4.—Two preps. of C activated with  $\text{ZnCl}_2$  were used throughout the work. Adsorption work was studied in the following liquids: Me, Et, Pr, isopropyl, Bu, isobutyl, and isoamyl alcs.,  $\text{C}_6\text{H}_6$ , toluene, xylene,  $\text{CCl}_4$  and  $\text{CHCl}_3$ . Contrary to the results of Davis (*C. A.* 2, 221) the adsorption of I is complete after 30 mins. II. **Adsorption of iodine in some organic liquids. Verification of the rule of Freundlich.** *Ibid* 67-73.—In addn. to the above liquids the following were studied: ethylene chloride, ethylidene chloride,  $\text{C}_2\text{H}_5\text{Cl}$ ,  $\text{C}_2\text{HCl}_3$ , mixts. of  $\text{C}_6\text{H}_6$  and  $\text{C}_7\text{H}_8$ , and of  $\text{CHCl}_3$  and  $\text{CCl}_4$ . Freundlich's rule was verified.

RAYMOND H. LAMBERT

**Rapid method for determining maximum adsorption of activated charcoal.** H. BURSTIN AND J. WINKLER. *Przemysl Chem.* 13, 114-9(1929).—On the basis of earlier work, which is here reviewed, a relationship is derived between max. adsorption ( $A_{\text{max}}$ ) and heat of wetting  $Q$  for the system: activated charcoal-benzene, *vis.*  $A_{\text{max}} = KO$ . This relationship is confirmed experimentally by a newly developed practical method for measuring heat of wetting which gave  $K = 1.9\%$  cal. A specimen vacuum flask with a ground-in calibrated thermometer served as the calorimeter. It is a fundamental requirement of this method that the calorimeter, C, and benzene should all be at the same temp., about  $20^\circ$ , at the beginning of the expt. Ten cc. benzene is delivered from a calibrated pipet into the calorimeter flask and the app. is allowed to come to a const. temp. by shaking it  $1\frac{1}{2}$  min. Two g. of activated C, previously dried at  $105^\circ$  is then introduced, the vessel shaken vigorously  $1\frac{1}{2}$  min., and then the temp. rise is read off. Heat of wetting  $Q$  is calcd. from this temp. rise and heat capacities of the materials and app. previously measured.  $A_{\text{max}}$  is measured by passing dry air satd.

with benzene over a weighed quantity of the C to const. wt. and is expressed in  $\frac{g}{g}$ . This method is expected to give good results also for other systems, e. g., activated C, heptane, silica gel-water, etc.

A. C. ZACHLIN

**The relation between the ability of activated charcoal to adsorb electrolytes and the kind of gas with which it is charged.** I. B. BRUNS AND A. FRUMKIN. *Z. physik. Chem.*, Abt. A, **141**, 141-57 (1929).—Ash free sugar charcoal, made by charring recrystallized sucrose in quartz or Pt dishes and then heating the resulting C in a rotating porcelain tube to 1000°, behaves as a gas electrode when placed in solns. of electrolytes; the adsorption of acid or base by such charcoal results from the formation of an elec. double layer at the C-liquid interface. The sign of the charge at the C surface is detd. by the nature of its gas content. Thus, active C after exposure to air adsorbs acid strongly from 0.01 N HCl soln., but adsorbs no KOH from 0.01 N KOH. C cooled in H<sub>2</sub> adsorbs markedly less acid than an air-satd. sample; it likewise adsorbs no KOH. Small percentages of Pt in the activated C enhance the effect produced by charging with H<sub>2</sub>. A C contg. 0.16% Pt adsorbs no acid if satd. with H<sub>2</sub>, whereas it adsorbs acid strongly if satd. with air. Similarly an air-satd. Pt contg. C adsorbs no KOH from 0.01 N KOH, whereas a H<sub>2</sub>-satd. C adsorbs KOH strongly. By its catalytic activity, the Pt present in the C is believed to assure the complete removal of the O<sub>2</sub> content of the C by H<sub>2</sub>. The approx. amt. of adsorption from a given concn. of acid soln. was the same for HCl, H<sub>2</sub>SO<sub>4</sub> and H<sub>3</sub>PO<sub>4</sub>. The amt. of adsorption from acid solns. increased with increasing initial concn. of the acid. The adsorption of benzoic acid from a 0.01 N soln. was independent of both the Pt content of the C and the nature of the gas contained therein. Approx. calcn. of the surface area of a sample of C gives a value of the order of 500 sq. m., of which 0.37 sq. m. only is estd. as covered by a 16% Pt content. The very marked influence of so small a quantity of Pt is regarded as analogous to *promoter action in catalytic reactions*. A discussion of the probable electrode potential of such gas-charged C electrodes is given. II. R. BURSTEIN AND A. FRUMKIN. *Ibid* 158 66.—Ash free C was heated to 1000° in H<sub>2</sub> and its adsorptive activity toward various electrolytes measured without again exposing it to air or O<sub>2</sub>. Samples thus prepd. and tested adsorbed 0.066 milliequiv. of KOH per g. of C from 0.01 N KOH; no HCl was adsorbed from 0.01 N HCl. On the other hand, a g. of the same C when contaminated with air manifested just the reverse ability, adsorbing 0.14 milliequiv. of HCl from 0.01 N HCl but no KOH from 0.01 N KOH. Adsorption of fumes of SO<sub>2</sub> from gas burners in the laboratory was found to decrease the adsorptive efficiency of the C toward the electrolytes. The rate of desorption of adsorbed HCl from C is much faster in a stream of circulating H<sub>2</sub> than in a stream of either N<sub>2</sub> or N<sub>2</sub> and O<sub>2</sub>. App. and technic for prepg. a C sample and testing its adsorptive capacity out of contact with air are described.

P. H. F.

**The behavior of outgassed activated carbon toward electrolytes.** R. BURSTEIN AND A. FRUMKIN. *Z. physik. Chem.*, Abt. A, **141**, 219-20 (1929); cf. preceding abstr.—Ash free sugar C, after being evacuated to  $10^{-5}$  mm. at 1000° for several hours, was found to adsorb neither HCl nor NaOH from dil. solns. of the 2 compds. The same material after exposure to air adsorbed 0.140 milliequivs. of HCl from a 0.01 N HCl soln.

P. H. F.

**Statistical description of the size properties of non-uniform particulate substances.** T. HATCH AND S. P. CHOATE. *Harvard Eng. School, Publ.* No **35**, 369-87 (1928-29). An attempt is made to define particle size by means of well-known statistical methods and to indicate mathematical laws of relationship between particle size, thus defined, and certain size properties of non-uniform particulate substances, namely, number of particles per g. of material and sp. surface of substance. Bibliography. E. I. S.

**Preparation of colloidal solutions.** A. BOUTARIC. *Rev. sci.* **67**, 33-8 (1929).—A review.

P. THOMASSET

**The structure of colloids in the solid state.** J. DUCLAUX. *Rev. gén. colloïdes* **7**, 9-14 (1929).—Colloids may assume different structures in the solid state depending on the mode of prepn. As an example the structure of nitrocellulose is cited. An entirely new form may be prepd. in the presence of cinnamic acid which may be called cellular and which is found to dry very slowly in air. This characteristic resembles certain living tissues.

RAYMOND H. LAMBERT

**Properties of dielectrics and the structure of hydrophilic colloids.** NEDA MARIN-ESCO. *Compt. rend.* **187**, 718-20 (1928).—The inductance capacity of a hydrophilic colloid may change in consequence of adsorption in the same way as that of H<sub>2</sub>O when an electrolyte is added. Dielec. satn. should occur when a micelle is entirely surrounded by H<sub>2</sub>O. Calcd. values of levulose dissolved in H<sub>2</sub>O for dielec. const. as a function of concn. agree well with observed values. Application has been made to methemoglobin, sol. starch



and gum arabic. The dispersing medium plays an important role in the structure of the hydrophilic micelle. The thickness of a  $\text{H}_2\text{O}$  envelope about methemoglobin micelle of radius equal to  $27 \times 10^{-8}$  cm. is calcd. to be  $70 \times 10^{-8}$  cm. R. H. LAMBERT

**The morphology of chemical reactions in colloidal medium.** M. S. DUNIN AND F. M. SHEMAKIN. *Kolloid-Z.* **47**, 335-41(1929).—Satd. solns. of various electrolytes were dropped on 5% gelatin contg. an electrolyte at different concns. The electrolytes used were  $\text{AgNO}_3$ ,  $\text{K}_4\text{Fe}(\text{CN})_6$ , and  $\text{CuSO}_4$ . When  $\text{AgNO}_3$  is the outer electrolyte and  $\text{K}_4\text{Fe}(\text{CN})_6$  the inner, radiating rosetts are formed in the diffusion field. The concn. of the cyanide most favorable is 0.05-0.01  $N$ . No rosetts are obtained if  $\text{AgNO}_3$  is the inner electrolyte. When the concn. of the inner electrolyte is 0.5-0.25  $N$ , concentric layers are formed only under the drops. Radiating rosetts are also formed in the diffusion field when  $\text{CuSO}_4$  is the outer electrolyte and  $\text{K}_4\text{Fe}(\text{CN})_6$  the inner at concns. of 0.05-0.01  $N$ . When the concn. of the inner electrolyte is 0.25-0.05  $N$  well-formed deposits of microscopic layers are formed under the drops. The morphological individuality of the reactions depends to a large extent on the gelatin used. R. I. RUSH

**The reactions between colloidal silica and lime.** PIERRE JOLIBOIS AND LOUIS CHASSEVENT. *Compt. rend.* **188**, 452-4(1929). When solns. of silica and lime are mixed and allowed to stand, the ppt. formed is due to a coagulation of the silica by the lime. This ppt. then slowly combines with the Ca forming a hydrated Ca silicate. The Ca remaining in soln. if highly concd. may continue to be adsorbed by the ppt. for several months. AMY LEVESCONTE

**The influence of agitation on the rate of coagulation of colloids.** K. JABLČZYŃSKI AND G. SZAMES. *Bull. soc. chim.* **45**, 206 10(1929).—When dialyzed  $\text{Fe}_2\text{O}_3$  hydrosol is coagulated with KCl, agitation at first increases the speed of coagulation and then decreases it. With undialyzed  $\text{Fe}_2\text{O}_3$  sol agitation decreases the speed of coagulation. Also in *Roczniki Chem.* **9**, 335-9(339, French) 1929. A. L. ELDER

**Emulsions and suspensions.** ALAN A. CLAFLIN. *Am. Dyestuff Reprtr.* **18**, 277-81 (1929). A general discussion giving elementary definitions and homely examples. The possibilities and applications of the colloid mill are considered. S. K. FORD

**Information on emulsions. I. The influence of soap concentration in both phases on the action of an emulsion.** J. WEICHHERZ. *Kolloid-Z.* **47**, 133-6(1929).—Oil-water and water-oil emulsions stabilized by soap are discussed. Emulsions form on increasing the concn. of soap in water added to oil. On diln. of such oil emulsions with water a critical phase vol. ratio is reached at which the phases reverse and oil in a water emulsion is obtained which depends on soap concn. Expts. are reported with tetralin- $\text{H}_2\text{O}$ , paraffin oil- $\text{H}_2\text{O}$  and xylene- $\text{H}_2\text{O}$  emulsions. The amt. of soap required varied from 0.1 to 8.0% of the oil. Whether oil or  $\text{H}_2\text{O}$  dissolves the soap or soap micelles are absorbed has not been decisively detd. RAYMOND H. LAMBERT

**Ultra-filtration and its industrial application.** G. GÉNIN. *Chimie & industrie Special No.*, 168-74(Feb., 1929).—A review of the properties and prepn. of ultra-filtrating membranes and of their lab. and com. applications. A. PAPINEAU-COUTURE

**The preparation of collodion membranes.** J. BOESEKEN AND O. MEYER. *Rec. trav. chim.* **48**, 504 7(1929).—Collodion membranes were impregnated with  $\text{Cu}_2\text{Fe}(\text{CN})_6$ , and were found to retain dextrans almost completely while permitting some reducing sugars to dialyze. Mol. wts. of 5340-5780 were obtained for the dextrin. T. H. C.

**Solvents and gel formation.** FELIX HEBLER. *Farben-Ztg.* **34**, 1841-3(1929).—Gels may be formed by the swelling of "xerogels" or by the loss of solvent from sols. The properties of gels formed by these two methods are usually different. Suspensions of wax in different liquids, while possessing different working properties, could not definitely be differentiated by their Engler viscosities. G. G. SWARD

**Some properties and theories of gels.** EMIL HATSCHKE. *Chemistry & Industry* **48**, 389-99(1929); cf. *C. A.* **22**, 2093. —Gels are "transparent or translucent bodies contg. a considerable fraction of liquid, but maintaining their shape and exhibiting rigidity." Gels are of 4 types; (1) heat reversible gels like gelatin, (2) irreversible gels like  $\text{SiO}_2$ , which are ineptly called "inelastic" because on drying they become porous instead of shrinking, (3) gels which are an unstable, transient stage in crystn. like azomethine and  $\text{MnHAsO}_4$ , (4) gels, like collodion, formed by displacement of the dispersion medium by a miscible, but non-solvent liquid. The elastic properties of (1) and the appearance of double refraction when stressed are reviewed. Little study has been made of the elastic properties of (2) except that their rigidity, resulting in audible vibration, has been observed and when stressed they are found not to be doubly refracting. The behavior of gels of type (2) on drying has been studied and the size of the pores in the xerogels measured. The properties of types (3) and (4) have received very little study. Gas bubbles forming in gels are lenticular in shape; in the sol imme-

diately before gelation they are spherical. "A single theory of gel structure is not likely to explain the great diversity of behavior exhibited by a few typical gels, though on the other hand every theory of a single example will have to explain some features common to all." H. holds that gels are 2-phase systems, that at least in many gels one phase is solid, and that a fibrillar structure is indicated. F. L. BROWNE

**Solubility of silver in water.** H. KŘEPELKA AND F. TOUL. *Collection Czechoslov. Chem. Comm.* 1, 155-64(1929).—The soly. of metallic Ag in water (cf. Hönigschmid and Birckenbach, *C. A.* 16, 860) is detd. by nephelometric and e. m. f. methods. In the latter method, the set-up consisted of the cell,  $\text{Ag-H}_2\text{O-satd. KCl-Hg}_2\text{Cl}_2$  in  $N$  KCl-Hg, a ballistic galvanometer being used as the null instrument (cf. Beans and Oakes, *C. A.* 15, 8). The soly. at  $20^\circ$  reaches a max. of about 0.036 mg. per l. in about 21 days. Since no Ag dissolves in water from which air and  $\text{CO}_2$  have been carefully excluded, soln. is due to direct oxidation to  $\text{Ag}_2\text{O}$ . The soly. is slightly higher in glass vessels than in Ag, probably because of the alkalies dissolved from the glass. J. H. REEDY

**The aqueous solution of cupric and ferrous sulfates.** F. K. CAMERON AND H. D. CROCKFORD. *J. Phys. Chem.* 33, 709-16(1929).—Detns. at  $30^\circ$  showed that the solubilities of  $\text{CuSO}_4$  and  $\text{FeSO}_4$  in  $\text{H}_2\text{O}$  are each depressed by addn. of  $\text{H}_2\text{SO}_4$ . Soly. of either  $\text{CuSO}_4$  or  $\text{FeSO}_4$  in  $\text{H}_2\text{O}$  is depressed by the presence of the other and increasingly so if  $\text{H}_2\text{SO}_4$  is present. The behavior is explained by assuming the solid phases  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$  and solid soln. of  $\text{FeSO}_4$ ,  $\text{H}_2\text{SO}_4$  and  $\text{H}_2\text{O}$ . M. MCMAHON

**The systems butyl alcohol-water and butyl alcohol-acetone-water.** DAVID C. JONES. *J. Chem. Soc.* 1929, 799-813.— $\text{BuOH}$ ,  $d_{44}^{20}$  0.81417 and  $n_D^{20}$  1.39711, was used to det. the binary soly. curve with  $\text{H}_2\text{O}$  to approx.  $-20^\circ$ . The crit. soln. concn. is 32.4%  $\text{BuOH}$  and the crit. soln. temp. is at  $124.75^\circ$ . The ternary system  $\text{BuOH-Me}_2\text{CO-H}_2\text{O}$  was studied to det. the effect of a 3rd component. The  $\text{Me}_2\text{CO}$   $b_{760}$  56.3°. The soly. curve was detd. by the synthetic method for the mixts. made up by wt. As the concn. of  $\text{Me}_2\text{CO}$  increases the crit. line falls slowly from the binary crit. soln. temp. and then increasingly steeply to  $-15^\circ$ . Mutual solvents as alc. and  $\text{AcOH}$  examined gave the same results as  $\text{Me}_2\text{CO}$ . In all cases the ternary crit. soln. temps. are more sensitive to impurities than the binary. I. A. KOTEN

**The densities of butyric acid-water mixtures.** JOHN GRINDLEY AND CHARLES R. BURY. *J. Chem. Soc.* 1929, 679-84.—The results confirm the suggestion of Jones and Bury (*C. A.* 22, 341), that micelle formation occurs in butyric acid solns. It is argued that micelle formation must lead to abrupt changes in the slope of phys. property-compn. curves. The densities of butyric acid-water mixts. were detd. at  $0^\circ$ ,  $12^\circ$ ,  $18^\circ$ ,  $25^\circ$  and  $34.94^\circ$ . The partial sp. vols. of the 2 components were evaluated by the graphical method of Hildebrand. Ds. were detd. according to Hartley and Barrett (*C. A.* 5, 2996) with a modification of their formula and the use of a flask of the type used by Baxter and Wallace (*C. A.* 10, 303). The d. of pure butyric acid over the range studied is given by  $d_4^{20} = 0.97844 - 0.001004t + 2.5 \times 10^{-7}t^2$ . As expected, there is an abrupt change in the slope of the curve at a concn. of about 15% acid. I. A. K

**Osmosis of ternary liquids.** G. A. H. SCHREINEMAKERS. *Chem. Weekblad* 26, 306-14(1929).—See *C. A.* 23, 1536. J. C. JURRIENS

**Osmotic pressures of acetone solutions.** M. J. MURRAY. *J. Phys. Chem.* 33, 896-920(1929).—Attempts were made to measure osmotic pressures with acetone as a solvent and rubber sheets as semipermeable membranes. The permeability of the rubber for the solutes used— $\text{H}_2\text{O}$ ,  $\text{NaI}$ ,  $\text{KI}$ , succinic, malic, tartaric and citric acids—made the results of the expts. uncertain but it is concluded that the osmotic pressures of acetone solns. would agree with those predicted by the gas laws if the exptl. errors were lower. J. G. McNALLY

**Isotonic liquids.** F. A. H. SCHREINEMAKERS. *Rec. trav. chim.* 48, 393-401(1929).—When two aq. solns. are sep'd. by a membrane permeable to  $\text{H}_2\text{O}$  only, a quantity  $\gamma$  of  $\text{H}_2\text{O}$  diffuses through the membrane toward the soln. with the higher osmotic water attraction,  $\xi$ , and the decrease in the thermodynamic potential of the total osmotic system is  $(\xi - \xi')\gamma - C\gamma^2$ . The 2 solns. are isotonic with respect to  $\text{H}_2\text{O}$  when  $\xi = \xi'$  and no  $\text{H}_2\text{O}$  passes through the membrane. For a binary soln. of  $X$  in  $W$  there is only one concn. at which the soln. is isotonic with some given soln., but for a ternary soln. of  $X$  and  $Y$  in  $W$  there are an infinite no. of concns. that are isotonic. For any soln.,  $\xi$  depends not only on the concn. but also upon the temp. and pressure. The pressure coeff. of  $\xi$  is  $d\xi = [-V + x(\delta V/\delta x) + y(\delta V/\delta y)]dP = -\Delta V \cdot dP$ . The temp. coeff. of  $\xi$  is  $d\xi = [H - x(\delta H/\delta x) - y(\delta H/\delta y)]dT = \Delta n \cdot dT$ .  $x$  and  $y$  are the mol. fractions of solutes  $X$  and  $Y$ ,  $V$  is the vol.,  $H$  the entropy of 1 mol. of soln.,  $P$  pressure and  $T$  temp. When  $P$  and  $T$  both change  $d\xi = -\Delta V \cdot dP + \Delta n \cdot dT$ . Two solns. may be isotonic at one temp.

only and the direction of movement of  $H_2O$  through the membrane differs above and below that temp. Two solns. with the same f. p. are isotonic only at that temp. Analogous rules may be stated for pressure instead of temp., reading vapor pressure for f. p. Two solns. with the same osmotic pressure,  $\pi$ , are isotonic only at the pressure  $1 + \pi$  atm.; solns. isotonic at 1 atm. pressure have different osmotic pressures. Two isotonic solns. remain isotonic if temp. and pressure change thus:  $(\Delta V - \Delta V')dP = (\Delta\eta - \Delta\eta')dT$  where  $\Delta V$  is the change in total vol. and  $\Delta\eta$  the change in entropy when soln. is mixed with 1 mol. of  $H_2O$ . For very dil. solns. (1) if the solns. are isotonic at any given  $T$  and  $P$ , they are also at other temps. and pressures, (2) the concn. alone det. whether the solns. are isotonic, (3) isotonic solns. have the same f. p., vapor pressure and osmotic pressure, and (4) solns. with the same f. p., vapor pressure and osmotic pressure are isotonic. Two solns. are isotonic with respect to a solute  $X$  when they have the same osmotic  $X$  attraction.

A. J. MONACK

**A new application of the differential ebullioscope.** W. SWIETOSLAWSKI. *Compt. rend.* 188, 256-8(1929).—The app. previously described may be used to study liquids which form azeotropic mixts. The differences in temp. of the liquid and vapor are noted at various pressures.

ARTHUR FLEISCHER

**Conductivity of a solution of lead and ammonium nitrate.** G. MALQUORI. *Atti accad. Lincei* [6], 9, 231-3(1929).—In a previous paper (*C. A.* 22, 3852) the authors by a study of the solubilities of the compds. in each other's presence, indicated the possibility of the formation of a *complex salt*. This hypothesis is strengthened by a study of the cond. of the solns. The conductivities of the individual salts when plotted, show a straight-line increase, but with both present there is a break in the curve, which further indicates a complex formation. It is probable that a complex ion of the type  $Pb(NO_3)_4^{--}$  is present.

A. W. CONTIERI

**Investigations of carbohydrates. I. Conductivity of binary salts in ethyl chloride.** P. WALDEN AND G. BUSCH. *Z. physik. Chem., Abt. A*, 140, 89-123(1929).—With  $EtCl$  as solvent, precise cond. measurements were made up to a diln. of 400,000 at  $0^\circ$ ,  $25^\circ$ , and  $50^\circ$  of  $Et_4N$  picrate,  $Et_4NCl$ ,  $Et_4NClO_4$ ,  $Et_4NI$ ,  $Me_4N$  picrate,  $Me_4NClO_4$ ,  $Me_4NI$ , etc. Phys. measurements of dielec. const., both of salt and solvent, as well as viscosity measurements were made. The Kohlrausch-Debye-Huckel square-root law for the trend of cond. with concn. was found valid for high dilns.; with decreasing dielec. const. this is transformed to the Walden equation  $\epsilon \sqrt{c} = \text{const.}$  for high dilns. The salt-like character of the substances studied has an important bearing on the cond. at a given diln. The degree of disocn. of the cation is found to be in the order  $N(CH_3)_4^+ < N(C_2H_5)_4^+ < N(C_3H_7)_4^+ < N(C_4H_9)_4^+$  Kohlrausch's law for the additivity of the conductivities is shown to be applicable with  $EtCl$  as solvent. The general Walden rule  $\lambda \cdot \infty \eta = \text{const.}$  is also found to hold.

H. R. MOORE

**Electrolytic polarization. VII. Complex cyanides: (a) silver.** SAMUEL GLASSSTONE. *J. Chem. Soc.* 1929, 690-702; cf. *C. A.* 19, 1228.—The cathode potentials and current efficiencies for Ag deposition were measured in a no. of argentocyanide solns. and the results discussed. The influence of stirring, temp. and diln. were investigated. It is shown that the argentocyanide probably dissociates very rapidly. Existing theories of the deposition of Ag from cyanides are shown to be unsatisfactory and a new theory involving a complex cation is proposed. The effects of Na, K and  $CO_3$  ions on the form of the Ag deposit are discussed. **Complex cyanides: (b) copper.** *Ibid* 702-13.—Electrometric titration of  $CuCN$  and soly. measurements in alkali cyanide solns. show that the complex ions  $Cu(CN)_2^-$  and  $Cu(CN)_3^{--}$  can both exist. The cathode potentials and current efficiencies for Cu deposition were measured. The effects of raising the temp. and of stirring were investigated and shown to be in harmony with the view that cuprocyanide ion dissociates rapidly. The difference in behavior of Cu and Ag in complex cyanide solns. is shown to be connected with the fact that a small increase in the ratio cyanide : metal ions with Cu raised the electrode potential to a point at which the evolution of  $H_2$  is possible.

LOUIS WALDBAUER

**Calcium-amalgam electrode in dilute aqueous solutions.** RUSSEL J. FOSBINDER. *J. Am. Chem. Soc.* 51, 1345-56(1929).—F. redetd. the activity coeffs. of  $CaCl_2$  from 0.01 to 3.3  $M$  and obtained values which agreed up to 1.0  $M$  with those of Lucasse (*C. A.* 19, 1365). A suitable app. was devised for the detn. of the activity coeffs. of Ca ions, by means of which their values were detd. in aq. solns. of  $CaSO_4$ , Ca lactate,  $Ca(OH)_2$ ,  $CaCl_2$  and Ca acetate for concns. between 0.01 and 0.001  $M$ . It was impossible to use the Ca electrode for the detn. of Ca activities in physiol. solns. The potential is lowered in the presence of cations either above or below Ca in the electromotive series and likewise by the presence of protein.

H. S. v. KLOOSTER

**The problem of dilution in colorimetric hydrogen ion measurements. I. Isohydric indicator methods for accurate determination of  $p_H$  in very dilute solutions.** EDNA H. FAWCETT AND S. F. ACREE. *J. Bact.* **17**, 163-204(1929).—A study of the diln. curves for the different buffers and media investigated reveals 3 types of variation from the electrometric  $p_H$ ; (1) buffer diln. effects, (2) changes caused by varying  $CO_2$  and by alk. impurities in the water used, and (3) differences in  $p_H$  valued of the indicator solns. The effect of  $CO_2$  is not marked until a diln. of 1 to 50 is reached; it then increases markedly with diln.; in the case of buffer  $p_H$  5 water often carried the curves beyond the range of the indicators used.  $CO_2$  acts not only as an acid but also as a buffer. The adjustment of the buffer soln. itself does not begin to make noticeable changes in readings until a diln. of 1.100 is reached in org. media, or molalities of 0.00001 to 0.000083 in synthetic media. The isohydric indicator method makes possible colorimetric salt error corrections and  $p_H$  measurements to about 0.1  $p_H$  by the use of indicators adjusted at their mid point  $p_H$  for buffers at the usual concns. and up to 50-fold diln. If adjusted at their lowest, mid point, and highest useful  $p_H$  values the method can be used from 50- to 100-fold diln. of buffer solns. If adjusted at intervals of 0.1 or 0.2  $p_H$  the method can be used for extreme dilns. where q. m. f. detns. are inaccurate or useless. A bibliography is included. JOHN T. MYERS

**Copper oxide in the borax bead.** WILDER D. BANCROFT AND R. L. NUGENT. *J. Phys. Chem.* **33**, 729-44(1929); cf. *C. A.* **23**, 2868. —The change of blue to green in the Cu borax bead is due to reduction of  $Cu^{++}$  to  $Cu^+$ . The green of Cu glasses is due to a mixt. of  $Cu^{++}$  and  $Cu^+$ . The blue given to glass by CuO deepens with increasing amt. of alkali and at low temps.; increasing Cu content in the borax bead with high temps. changes the color from light blue to deep green. The behavior of CuO in glazes is considered. A critical bibliography is included. M. McMAHON

**Elliptical polarization produced by reflection at the surface of fatty acid solutions in water.** CH. BOUDET. *Compt. rend.* **188**, 59-61(1929); cf. *C. A.* **21**, 3312. —Measurements of the elliptical polarization of the fatty acids from acetic to myristic were made covering the entire range of concn. where satd. solns. were not formed. As the no. of C atoms increases the tendency for a min. in the curve increases. The ellipticity is a function of the concn. The orientation of mols. in the pure org. acid is not the same as that in the soln. of min. ellipticity. ARTHUR FLEISCHER

**Study of ionic equilibria. III. Equilibrium of cadmium sulfide and dilute hydrochloric acid.** MAURICE AUMERAS. *J. chim. phys.* **25**, 727-42(1928); cf. *C. A.* **21**, 3009; **22**, 529. —The equil. was studied by pptg. 0.1 N  $CdCl_2$  with 0.1 N  $H_2S$  and detg. the amt. of N HCl just able to dissolve the  $CdS$ . The consts. for the various equilibria were calcd. by the law of mass action. For the reaction  $CdS + 2HCl = H_2S + CdCl_2$ ,  $K = 1.06 \times 10^{-6} = [CdCl_2][H_2S]/[HCl]^2$ . This value is an arithmetic mean of those found by Bruner and by Zawadzki by other methods. Depending on whether Walker and McCormack's or Auerbach's value for the soly. product of  $CdS$  at  $18^\circ$  is used, the secondary dissoen. const. of  $H_2S$  is 0.59 or  $0.37 \times 10^{-15}$ . KNOX found  $1.2 \times 10^{-15}$ . ARTHUR FLEISCHER

**The effects of salts on weak electrolytes. III. Interaction of certain weak electrolytes.** HENRY S. SIMMS. *J. Phys. Chem.* **33**, 745-54(1929). —Previous expts. (*C. A.* **22**, 3815; **23**, 21) are extended to the interaction of weak electrolytes. Glycine causes a drop in  $P_{K'}$  of  $H_2PO_4$  which increases with addn. of the salt; the presence of  $Na_2HPO_4$  increases  $P_{K'}$  of glycine.  $Na_2SO_4$  produces a similar effect on glycine as does  $Na_2C_2O_4$ , Na succinate and Na citrate in concns. up to 0.2  $\mu$ . In more dil. soln. (0.01  $\mu$ ) these 3 latter salts decrease  $P_{K'}$  of glycine. Similar effects were observed for  $P_{K'}$  of succinimide. M. McMAHON

**Action between copper salts and glycerol.** B. K. VAIDYA. *Nature* **123**, 414(1929). —A vigorous action occurs when a soln. of any Cu salt (hydrated or dehydrated) in glycerol is heated to about  $150-200^\circ$ . The salts with the exception of  $CuCl_2$  are decomposed into metallic Cu and free acid, which may undergo further decompn. Glycerol yields  $C_2H_5OH$ , acrolein,  $CO_2$ ,  $CH_4$ , CO and  $H_2$ .  $CuCl_2$  yields  $Cu_2Cl_2$ . Other polyhydric alcs. (glycol, erythritol and mannitol) give nearly the same result. Some of the decompn. products may be due to the catalytic decompn. by finely divided Cu. The action may be represented by  $C_6H_{10}O_6Cu_3 \rightarrow 3Cu + 3CO_2 + CH_4 + C_2H_6$ . The Cu so produced is good for catalytic purposes. GEO. GLOCKLER

**The oxidation of benzoyl-*o*-toluidine at a benzene-water interface with special reference to the temperature coefficient of the reaction rate.** LOUIS S. KASSEL AND NORWOOD K. SCHAFFER. *J. Am. Chem. Soc.* **51**, 965-74(1929). —The oxidation of benzoyl-*o*-toluidine by  $KMnO_4$  at a  $C_6H_6-H_2O$  interface was measured and found to depend upon the rate of stirring and upon the presence of some unknown catalyst. The temp.

coeff. of this rate does not appear to be 13, as reported by Bell (cf. *C. A.* **22**, 3085), but is about 2. It increases somewhat with the temp., indicating that more than one reaction is occurring. The mechanism suggested by Bell, impact of  $\text{MnO}_4^-$  ions on an adsorbed film of benzoyl-*o*-toluidine, does not agree with the data. Other possible mechanisms are suggested.

R. L. DODGE

**Reactions with very large apparent temperature coefficients.** LOUIS S. KASSEL. *J. Am. Chem. Soc.* **51**, 1136-45(1929).—The exptl results of Topley and Hume (cf. *C. A.* **22**, 4036) on the temp. coeff. of the rate of dehydration of  $\text{CaCO}_3 \cdot 6\text{H}_2\text{O}$  crystals can be accounted for by assuming stepwise reactions, all but the last one being reversible. It is unlikely that the dehydration is a single reaction with a temp. coeff. of 12. The anomalous temp. coeffs. of reaction rates in the decompn. of bornyl and menthyl sulfonate solns. (cf. *C. A.* **23**, 128) can be accounted for on the basis of autocatalysis by the resulting acids.

R. L. DODGE

**The theory of molecular dislocation applied to homogeneous catalysis.** J. BÖESCH-KEN. *Trans. Faraday Soc.* **24**, 611-20(1928); cf. *C. A.* **22**, 2307. — Since the Friedel and Crafts reaction is too complicated for a study of the several catalytic actions involved, that of the change of white P into red due to the presence of I was chosen for study. A distinction is made between physical and chemical catalysis. The change of activity of the mol. is named *dislocation* and is considered as elec. in nature. The polymerization of acetaldehyde is an example of dislocation. This action of catalysts is believed to be an induction of the open polar character of the bond between mols. Inhibition occurs if the catalyst is bound too closely so as to form a new non-polar system. In bi-mol. reactions the catalyst causes dislocation in both mols; this is an important factor in the choice of a catalyst. A thermodynamic treatment is given of the dislocation with respect to photooxidation of primary into secondary alcs. under the influence of certain ketones. The supposition is made that in phys. catalysts the  $A$  term of the Arrhenius equation relating temp. and reaction const. remains unchanged the  $B$  term being enlarged, while for chem. catalysis the  $A$  term always increases.

RAYMOND H. LAMBERT

**Homogeneous catalysis. II. Intermediate addition compounds and chain reactions.** J. A. CHRISTIANSEN. *Trans. Faraday Soc.* **24**, 714-15(1929).—In the general discussion on homogeneous reactions C. agrees that a definite chem. mechanism of oxidation and inhibition occurs up to a certain point but some assumption of a chain mechanism must be incorporated to explain exptl. facts.

RAYMOND H. LAMBERT

**Report on the theory of chain reactions.** J. A. CHRISTIANSEN. *Trans. Faraday Soc.* **24**, 596-601(1928).—Factors in certain equations expressing bimol. reactions are discussed. The effect of traces of foreign substances apart from a catalytic action may be neglected. Negative catalysis is not necessarily due to breaking of the chain by foreign material, since hydration produces a like effect. The method of calcn. is equiv. to the method of stationary velocity used in kinetics and is advantageous in the case of negative catalysis where very small concns. of active intermediate products are strongly influenced by the inhibitor.

RAYMOND H. LAMBERT

**The inhibition of chain reactions by bromine.** M. POLÁNYI. *Trans. Faraday Soc.* **24**, 606-11(1928).—Admixt. of  $\text{Br}_2$  for arbitrarily shortening the chain in chain reactions has been studied since  $\text{Br}_2$  inhibits by reacting with free H atoms or  $\text{CH}_3$  radicals. An inherent inhibition influences chain length markedly for small concns. of  $\text{Br}_2$ . For greater  $\text{Br}_2$  concns. alkali bromide is formed, being thereby lost to the induced reaction. Inhibition slightly decreases with increase in temp. in the reaction  $\text{H}_2 + \text{Cl}_2$ ; this is due possibly to  $\text{Br}_2$  catalysis. Alkali metals can be replaced by other metals or even metalloids for the inductive effect as evidenced by a series of bivalent metals. The primary process for Zn takes place according to the reaction  $\text{Zn} + \text{Cl}_2 = \text{ZnCl} + \text{Cl}$  while for Cd the inductive part is less than 1 so that the reaction  $\text{Na} + \text{Cl}_2 = \text{NaCl} + \text{Cl}$  proceeds much faster than  $\text{Cd} + \text{Cl}_2 = \text{CdCl} + \text{Cl}$ . The inductive effect depends on  $\text{H}_2$  pressure and  $\text{N}_2$  admixt. both increasing the effect. The heat of activation is, in these cases, found to equal the heat of reaction for monochlorides of the type  $\text{M}^+ + \text{Cl}$ . Cd and Zn do not in general combine with  $\text{Cl}_2$  to form the normal dichloride but form a monochloride and free Cl atom since  $5 \times 10^3$  collisions can take place between Zn and  $\text{Cl}_2$  before formation of dichloride while  $10^5$  must occur in the case of Cd.  $\text{Br}_2$  does not inhibit formation of HCl but exerts a slight acceleration, while the induced reaction does occur for  $\text{CH}_4$  and  $\text{Cl}_2$ .

RAYMOND H. LAMBERT

**The mechanism of inhibition in autoxidation reactions.** HANS L. J. BÄCKSTRÖM. *Trans. Faraday Soc.* **24**, 601-5(1928).—A study was made of the relation between inhibition and induced reactions which appears to throw some light on the mechanism by which reaction chains may be broken by an inhibitor. The oxidation of sulfite

solns. in the presence of alcs. was chosen for the reaction. Isopropyl, *sec*-butyl and benzyl alcs. were tried as inhibitors. The activity of the alc. in breaking the chains was proportional to its concn. and its relative inhibitory power. For a mixt. of two alcs. oxidation was proportional to the alc. concn. and the relative inhibitory powers. Results were identical whether started thermally or photochemically. Induced or "photosensitized" oxidation of alc. obeys Einstein's photochemical equivalence law. Cu catalysis accelerates the total reaction without changing the ratio of sulfite oxidized to alc. oxidized, *i. e.*, without altering the chain length. RAYMOND H. LAMBERT

The influence of nitrogen peroxide on the combination of hydrogen and oxygen. H. W. THOMPSON AND C. N. HINSHELWOOD. *Proc. Roy. Soc. (London)*, **A124**, 219-27 (1929); cf. *C. A.* **22**, 3816.—The effects of the pressure, temp. and nature of reaction vessel on the combination of  $H_2$  and  $O_2$  in the presence of  $NO_2$  were studied and a theory of chain reactions involving the formation of  $H_2O_2$  is given and discussed.

MALCOLM DOLE

Activity of various catalysts in promoting the oxidation of methane by means of oxygen. JOHN R. CAMPBELL. *J. Soc. Chem. Ind.* **48**, 93-7T (1929).—Hydrolysis of  $MeMgI$  gave  $CH_4$ ; this was mixed with 0.5 vol. of  $O_2$  and stored over satd.  $MgCl_2$  soln. The mixt. was circulated over 20 cm. of hot catalyst at a rate of 50 cc. per min. for 5 hrs. by means of a Sprengel pump. Products were partially removed from the gas by washing with 5 cc. of ice- $H_2O$ ; at the end of the oxidation, the gas pressure was noted and the compn. calcd. by the method of Bone and Wheeler (*J. Chem. Soc.* **83**, 1074). The wash-water was tested for  $H_2CO$ ,  $HCO_2H$  and  $MeOH$ . The following catalysts were used: Ag (I) from ignition of  $AgNO_3$  and reduction at  $500^\circ$ ; Cu (II) from  $Cu(NO_3)_2$  at  $400^\circ$ ; V oxides (III) from  $NH_4VO_3$ ; Pt-asbestos (IV) from  $(NH_4)_2PtCl_6$ ; and Pt- (V) and Pd-black (VI) reduced on asbestos by means of  $H_2CO$ . I, II and III were made up with 1 g. of catalyst on 12 g. of 8-32 mesh pumice; IV, V and VI contained 0.027 g. of metal on 3 g. of asbestos. Tables and curves show the  $CH_4$  oxidized between  $0^\circ$  and  $700^\circ$ . I and II became active at about  $320^\circ$ , and I gave a complete reaction at a lower temp. ( $610^\circ$ ) than II or IV. III became active at  $480^\circ$  and gave a complete consumption of  $O_2$  at  $580^\circ$ , which was lower than I, II or IV, the latter becoming active, however, at  $430^\circ$ . V and VI induced reaction at room temp.; V causing total consumption of available  $O_2$  at a temp. about  $100^\circ$  above VI. The following gives the decreasing order of efficiency of the catalysts: VI, V, III, I, IV and II.  $H_2$  was produced with I and III, probably from the decompn. of  $H_2CO$ , otherwise  $H_2CO$  was the only intermediate product detected in the wash- $H_2O$  aside from a small quantity of  $HCO_2H$  in the case of III. The presence of a catalyst did not seem to change the course of the oxidation as proposed by Bone, but varied the stages so that intermediates were not easily isolated.

A. S. CARTER

Catalytic decomposition of carbon monoxide. I. Iron as catalyst. HIROSHI TUTIVA. *Sci. Papers Inst. Phys. Chem. Research (Tokyo)* **10**, 69-82 (1929). (In Esperanto.)—The decompn. rate of CO was measured in presence of C, of 2 kinds of Fe wire, of reduced Fe and of a mixt. of  $Fe_3C$  and C, and the carbons produced were studied with x-rays. Conclusions: (1) Fe itself functions not as a catalyst but as a catalyst donor, *i. e.*, as a supporter of autocatalytic decompn. of CO. (2) When CO decomposes in presence of Fe,  $Fe_3C$  forms first and the two reactions,  $3Fe + 2CO = Fe_3C + CO_2$  and  $2CO = C + CO_2$  progress concurrently. (3)  $Fe_3C$  has a remarkable catalyzing ability and plays a chief role in the decompn. of CO. (4) C isolated from the catalytic decompn. not only has no catalyzing power but even hinders the catalytic effect of  $Fe_3C$ . (5)  $Fe_3C$  becomes very densely packed with the C which is itself isolated by decompn., till it ceases completely to catalyze. On this account  $Fe_3C$  in the C is very difficultly removable. This suggests a quality of C which is obtained catalytically by decompn. in presence of metal. (6) "X-carbide" of U. Hofmann is Fe oxide.

AUSTIN M. PATTERSON

Study of the action of iron catalyzers on mixtures of carbon monoxide and hydrogen. E. AUDIBERT AND A. RAINEAU. *Ann. combustibles liquides* **3**, 367-428 (1928).—See *C. A.* **23**, 2094.

R. E. SCHAAD

The autocatalytic decomposition of thiosulfuric acid. II. K. JABLONCZYŃSKI AND S. FRENKENBERG. *Bull. soc. chim.* **45**, 210-7; *Roczniki Chem.* **9**, 327-34 (334 in French) (1929); cf. *C. A.* **21**, 1215.—The rapidity of the decompn. of  $H_2S_2O_3$ , as measured by the relative opacity of the soln., was greatly increased by preliminary addn. of a suspension of colloidal S from previous runs, approx. in proportion to the amt. added. Addns. of com. powd. S or of mastic also increased the rate but not so markedly.

T. H. CHILTON

Catalytic effects in concentrated salt media. M. BOBETSKY AND D. KAPLAN.

*Z. anorg. allgem. Chem.* **177**, 119–23 (1928).—The analytical method suggested in *C. A.* **22**, 3816 is developed further. For the investigation, there is required only a half cc. of the soln.; this is mixed with 30 cc.  $\text{H}_2\text{C}_2\text{O}_4/\text{H}_2\text{SO}_4$  soln. The app. employed is the same as in the earlier work. To 15 cc. of a soln. 0.2 *N* in oxalic acid and *N* in sulfuric acid add 15 cc. of 2.5 *N* salt soln. and finally 0.5 cc. of inductor soln. Adjust the temp. of the mixt. to 5° (plus or minus 0.1° tolerance) and add from a second vessel at the same temp., 0.5 cc. of 0.01 *N*  $\text{KMnO}_4$  and stir. Det. the time of decolorization by a stop watch. The results are interpreted through the assistance of tables, and conditions of acceleration and retardation of the velocity of decolorization are set forth through mathematical formulas taken in connection with the tables. B. HAMILTON

**Catalytic oxidation of naphthalene.** TOKISHIGE KUSAMA. *Bull. Inst. Phys. (Chem. Research (Tokyo))*, **7**, 1087–1132, Abstract sect. 1, 105–6 (1928).—Acidic oxides are the best promoters for  $\text{V}_2\text{O}_5$  as catalyst in the oxidation of naphthalene to phthalic acid. A theory is presented that basic oxides including lower *V* oxides combine with the acid produced.  $\text{H}_2\text{O}$  vapor tends to yield benzoic acid. G. B. TAYLOR

**Investigations on the one-component system silica. III. Stability regions of quartz, tridymite and cristobalite.** C. J. VAN NIEUWENBURG. *Rec. trav. chim.* **48**, 402–5 (1929); cf. *C. A.* **22**, 2863.—The samples of cristobalite and tridymite were prepd. by mixing quartz with the proper amt. of  $\text{LiCO}_3$  soln. and evapg. to dryness so 1% of the catalyst was present. After heat treatment the samples were washed with dil.  $\text{HCl}$  and distd.  $\text{H}_2\text{O}$  and dried at 60–70°. The thermal dilatation diagram was worked out from these samples. The stability regions of quartz, tridymite and cristobalite as described by Fenner (*C. A.* **7**, 3945) were confirmed. It was proved that cristobalite cannot be formed from the vapor phase and that amorphous  $\text{SiO}_2$  results. Below about 1300° quartz is always a transitory decompn. product of cristobalite. In the course of 6 to 20 hrs., depending on the temp., the quartz is changed, evidently into tridymite. There is a very clear irregularity in the expansion of tridymite at temps. varying from 430° to 480°, but neither a very sensitive thermal analysis nor a study under the polarizing microscope showed the slightest discontinuity at 450°. The question of whether or not a fourth enantiotropic modification of tridymite really exists is left open.

**Binary system alumina-silica.** VEADIMIR ŠKOLA. *Chem. Obzor* **4**, 112–7 (1929) (117 English).—The heterogeneous binary system  $\text{Al}_2\text{O}_3\text{--SiO}_2$  is very complicated because both  $\text{Al}_2\text{O}_3$  and  $\text{SiO}_2$  exist in various heteromorphous forms. The different relationships are illustrated by the diagrams of Fenner, Parkin-Shepherd-Wright and Bowen-Greig. The *manuf. of artificial corundum and sillimanite* according to Malinowsky, Lecesne-Gowen and Goldschmidt is described and the high content of  $\text{Al}_2\text{O}_3$  for the good qualities of ceramic materials is emphasized. J. KUČERA

**Compound formation in ester-water systems.** JAMES KENDALL AND LILIAN E. HARRISON. *Trans. Faraday Soc.* **24**, 588–96 (1928).—An examn. was made of data obtained on the f.-p. depression and soly. for aq. solns. of the following esters: Me propionate, Pr formate, Et formate, Me acetate, and dimethyl oxalate with data also on Et acetate. Low soly. is closely related to small internal pressure. Internal pressure differences cause abnormally small f.-p. depression while compd. formation produces abnormally large depression. Dimethyl oxalate shows the greatest neg. deviation in f.-p. depression. Little differences are observed where the alc. radical is the only variable factor. Compd. formation is connected with acidic strength of acid radical. Speed of ester hydrolysis is also dependent on this latter property. A further study is to be made of this phenomenon. RAYMOND H. LAMBERT

**Critical solution-temperature phenomena in the ternary system phenol-thymol-water.** KATHLEEN W. WILCOX AND C. R. BAILEY. *J. Phys. Chem.* **33**, 705–8 (1929).—The liquid-liquid equil. is examd. by the synthetic method. Data and curves are given for the binary system thymol-water and for the ternary system phenol-thymol-water. R. J. HEMPHILL

**Ammonium sulfite and bisulfite. I. Solubility and transition point of ammonium sulfite.** F. ISHIKAWA AND H. MUROOKA. *Bull. Inst. Phys. Chem. Research (Tokyo)* **7**, 1160–76, Abstract sect. 1, 110–1 (1928); cf. *C. A.* **23**, 2642.—Equil. in the system  $(\text{NH}_4)_2\text{SO}_3\text{--H}_2\text{O}$  was measured at –13 to +100°. Transition from  $(\text{NH}_4)_2\text{SO}_3\text{·H}_2\text{O}$  to  $(\text{NH}_4)_2\text{SO}_3$  occurs at 81°. G. B. TAYLOR

**The reduction of cuprous oxide by carbon monoxide.** CHAS. G. MAIER. *Bur. Mines, Repts. of Investigations*, Ser. 2926, 7 pp. (1929).—The presence of less than 0.1 mm.  $\text{CO}$  pressure in an atm. of otherwise pure  $\text{CO}_2$  will act reducingly towards  $\text{Cu}_2\text{O}$  below 1064°. The equil. changes with temp. in such a way that below 900° decreasing quantities of  $\text{CO}$  suffice to reduce  $\text{Cu}_2\text{O}$ . At temps. near and above the m. p. of  $\text{Cu}$

a partial pressure of 7.6 mm. CO in otherwise pure CO<sub>2</sub> should reduce the dissolved CuO to 0.008%.

**The dependence of the surface tension  $\gamma$  and the heat of vaporization  $\lambda$  on density and temperature, up to the critical temperature.** J. J. VAN LAAR. *Z. anorg. allgem. Chem.* **180**, 193-214(1929).—A theoretical treatment yields the equation  $\gamma = 0.4362 f \alpha d_1 (d_1 - d_2)^2 p_k \sqrt{v_k/N}$ , where  $f$  and  $\alpha$  are consts.,  $d_1$  and  $d_2$ , resp., densities of liquid and vapor;  $p_k$  is crit. pressure;  $v_k$ , crit. vol.; and  $N$ , Avagadro's no. A test with benzene and ether gives  $\alpha = 0.2537$  and  $0.2502$ , resp. The agreement is fair considering the large temp. range (10° to 280° for benzene), but not startling. The law of Dutoit and Friderich is derived theoretically. Heat of vaporization and mol. surface energy and their relationship with  $d$  and temp. are also treated mathematically.

WILLIAM E. VAUGHAN

**Calculation of latent heats of vaporization of hydrocarbons and alcohols.** J. W. SCHULTZ. *Ind. Eng. Chem.* **21**, 557-9(1929).—If, for a liquid, the Dühring line and the entropy of vaporization at 2 or 3 temps. is known, the latent heat of vaporization can be calcd. for other temps. The method has been applied to 4 hydrocarbons and 2 alcs for temps. nearly up to the crit.

F. D. ROSSINI

**Statistics of Bose-Einstein and Fermi-Dirac and the upper limit of energy-density.** SEITARÔ SUZUKI. *Proc. Imp. Acad. (Tokyo)* **5**, 68-71(1928).—Mathematical treatment.

C. J. WEST

**Development of the ultracentrifuge and its field of research (NICHOLAS) 1.** Ultra violet light, insulin and acid catalysis (ORT) **11A**. Comparison of the thickness of oxide layers determined from tempering colors and by weighing (TAMMANN, BOCHOW) **9**.

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### 3—SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

S. C. LIND

**Fine structure of absorption edges of x-rays.** B. B. RAY AND P. C. MAHANTI. *Z. Physik* **54**, 534-6(1929).—See *C. A.* **23**, 3158.

GEORGE GLOCKLER

**Synthesis of the elements.** G. I. POKROVSKII. *Z. Physik* **54**, 724-30(1929). cf. *C. A.* **23**, 2879.—The energy of nuclear synthesis in interstellar space is assumed to come from the combination of a proton and an electron with emission of a quantum. The resulting velocity of the proton may carry it into the nucleus. The mass defects of the elements are calcd. and the curve obtained agrees with Aston's (cf. *C. A.* **21**, 3543).

GEORGE GLOCKLER

**Synthesis of the elements in the stars.** R. D'E. ATKINSON AND F. G. HOUTERMANS. *Z. Physik* **54**, 656-65(1929).—The notion of Gamov (*C. A.* **23**, 2352) that a probability exists for the disruption of a nucleus by the emission of an  $\alpha$ -particle gives



the idea according to von Laue (C. A. 23, 1565) that the inverse process also can take place. A. and H. find that in the interior of stars protons can enter the nucleus of lighter elements;  $\alpha$ -particles cannot. The heavier elements are also considered.

GEORGE GLOCKLER

**Optical concentration measurement of atoms and ions.** W. DE GROOT. *Z. Physik* 55, 52-5(1929).—The influence of the broadening of the emission line caused by self absorption on the concn. measurements by optical means is discussed (cf. C. A. 22, 910).

GEORGE GLOCKLER

**Matter and light as two different phases of the same material.** W. ANDERSON. *Z. Physik* 54, 433-44(1929).—Matter (protons and electrons) and light (quanta) become identical at high pressure.

GEORGE GLOCKLER

**An isotope of oxygen, mass 18.** W. F. GIAUQUE AND H. L. JOHNSTON. *J. Am. Chem. Soc.* 51, 1436-41; *Nature* 123, 318(1929).—The weak doublets of the atm. absorption bands of  $O_2$  originate from a mol. consisting of an O atom 16 and one of 18 or  $O_{16}O_{18}$ . Some results of band analysis are given and it is claimed that no other isotope of O combined with an atom of O of weight 16 will satisfy the data. The data show that the normal state of the  $O_2$  mol. has one-half units of vibration in agreement with the wave-mechanic theory.

GEORGE GLOCKLER

**Density and shape of submicroscopic particles.** G. PLACZEK. *Z. Physik* 55, 81-118(1929).—From the behavior of an uncharged metallic particle in an inhomogeneous field it is possible to get some idea of its spherical shape and the compactness of its structure. Expts. are carried out on oil drops, Ag and Hg. The problem relates to questions concerning Millikan's oil-drop method of detg. the charge of an electron.

GEORGE GLOCKLER

**Determination by electrical means of  $\alpha$ -particles.** G. ORTNER AND G. STETTER. *Z. Physik* 54, 449-76(1929).—The various methods used in the detection and the detn. of  $\alpha$ -particles and other corpuscular rays are discussed. The use of amplifiers which magnify the ionization currents due to the  $\alpha$ -rays is especially studied on Ra C.

GEORGE GLOCKLER

**Some experiments on the multiple scattering of  $\alpha$ -particles.** D. C. ROSE. *Proc. Cambridge Phil. Soc.* 24, 557-66(1928).—Expts. have been made on the scattering of  $\alpha$ -particles by surfaces on which radioactive material had been deposited and on surfaces in the neighborhood of the source in an attempt to raise the effective strength of the source by including particles which were scattered out of the surface at glancing angles. The effect was found to be too small to be of importance. A repetition of the Lawson and Hess expts. (cf. C. A. 14, 146) on the scattering of  $\alpha$ -particles by the walls of a long glass tube down which a beam of particles was projected indicated that the particles may lose any fraction of their energy in the scattering. It was also indicated that the probable angle of scattering in such expts. is large, and that the av. particle spends at least half and probably a greater fraction of its range in the scattering material.

J. B. AUSTIN

**New species of fast  $\beta$ -rays.** D. SKOBELEZIN. *Z. Physik* 54, 686-702(1929).—In a Wilson cloud chamber there appeared  $\beta$ -ray tracks due to electrons produced by cosmic rays.

GEORGE GLOCKLER

**Determination of radium content using the  $\gamma$ -rays.** V. A. SOKOLOV. *Z. Physik* 54, 385-98(1929).—The  $\gamma$ -ray method for the detn. of Ra is as accurate and more convenient than the  $\alpha$ -ray or emanation methods. A  $\gamma$ -ray electroscope with a sensitivity of  $2 \times 10^{-10}$  g. Ra per g. of substance is described (cf. C. A. 16, 4130).

GEORGE GLOCKLER

**Spontaneous emission of protons during radioactive processes.** A. V. GROSSE. *Z. Physik* 54, 764-6(1929).—On the basis of Einstein's equation  $E = mc^2$  and Aston's curve of packing fractions (C. A. 21, 3543), G. shows that the emission of a proton from a radioactive element could only take place with the absorption of a great deal of energy and that therefore such a process would not take place of itself. G. G.

**The radioactivity hypothesis in the "Serono effect" of the irradiated phosphatides.** NICOLA GENTILE. *Rass. clin. terap. sci. affini* 27, 451-7(1928); cf. Serono and Cruto, C. A. 22, 4361.—Considering all the exptl. facts that have been gathered so far in the study of the "Serono effect," G. favors the hypothesis that this effect is an expression of a radioactivity produced in org. substances contg. elements of low at. wt. The photoactive rays emitted from the irradiated phosphatides are secondary, characteristic rays belonging to the same class as x- and  $\gamma$ -rays. The theory is supported by the following facts: the effect is distinctly related to the phenomenon of fluorescence. It may be produced by various electromagnetic wave lengths as are present in x-rays and the rays emitted from the sun or the Hg lamp. It manifests itself at a distance

from the irradiated substance. It persists for a long time after cessation of the primary irradiation. The theory of the Hertz-Hallwachs effect places the ultra-violet rays in the same class as x- and  $\gamma$ -rays concerning the ability of attacking the at. structure. Large wave lengths of the exciting rays are sufficient to induce photoactivity; the radiation emitted cannot be abundant in the org. substances composed of elements with a low enough at. wt. G. SCHWOCH

**The uranium-thorium ratio in monazites.** SATOYASU IMORI. *Sci. Papers Inst. Phys. Chem. Research* (Tokyo) 10, 229-36(1929).—U and Th were detd. in 5 monazites from different localities in Japan, Korea and Ceylon. Th was detd. chemically (Benz method) but as U is present in such small quantities in monazite it was calcd. from the Ra content (ratio of Ra to U =  $3.4 \times 10^{-7}$ ). Ra was detd. by boiling off the emanation from the samples dissolved in concd.  $H_2SO_4$ . A careful gravimetric estn. gave lower results than the calcd. No relation between the ratio of U to Th and the amt. of U or Th was found in the monazites. The estd. age of the monazites was calcd. from its He content (cf. *C. A.* 21, 1610). Thorouranium, parent of Th, with a half-value period of  $10^{-7}$  years must nearly have disappeared from the earth's crust. C. H. BADGER

**Deflection of molecular rays.** I. I. RABI. *Z. Physik* 54, 190-7(1929).—A beam of neutral atoms or mols. enters an elec. or magnetic field obliquely and particles having an elec. or magnetic moment suffer a deflection in the field much as light is refracted when entering an optically different medium. The method avoids the measurements of inhomogeneous fields. The magnetic moment of K is found to be one Bohr magneton. GEORGE GLOCKLER

**The polarization of canal rays. III. Canal rays for the mercury line 2537.** E. RUPP. *Ann. Physik* [5], 1, 289-300(1929); cf. *C. A.* 23, 2099. —The polarization relation  $J_p/J_s$  for the Hg line 2537 canal rays was measured. Polarization for this line occurs only if a disturbance of light emission occurs at the slit. Removal of this disturbance by baking out the slit causes polarization to disappear. The polarization relation depends on the nature of the gas and its pressure and on the magnetic field. The elec. vector for polarized canal rays is in the direction of the beam axis. On producing a diffuse beam polarization disappears. RAYMOND H. LAMBERT

**Polarization of neon lines due to an electron beam and due to neon canal rays.** W. HANLE AND B. QUARDER. *Z. Physik* 54, 819-25(1929). GEORGE GLOCKLER

**Polarization of the tungsten L radiations.** PAUL KIRKPATRICK AND IWAO MIYAKE. *Proc. Natl. Acad. Sci.* 15, 418-21(1929).—The states of polarization of the three lines  $L\alpha_1$ ,  $L\beta_1$  and  $L\gamma_1$  of W were examd. separately. The results are in accord with the consensus of earlier researches, no polarization being found for any line, though the method employed should have revealed any polarization as great as 1%. W. F. MEGGERS

**Polarization of fluorescence in mercury vapor.** W. HANLE AND E. F. RICHTER. *Z. Physik* 54, 811-18(1929). GEORGE GLOCKLER

**Decay of fluorescence in the case of molecules.** H. H. HUFFELD. *Z. Physik* 54, 484-97(1929).—The duration of luminosity in  $Na_2$ ,  $K_2$ ,  $I_2$  and Na resonance is of the order of  $10^{-8}$  sec. (cf. *C. A.* 21, 3023). GEORGE GLOCKLER

**Fluorescence in flames.** R. M. BADGER. *Z. Physik* 55, 56-64(1929).—Metal vapors show fluorescence in the flame. The alkali metals are an exception. Sensitized fluorescence could not be produced in a flame. Expts. on the extinction of Hg fluorescence in  $H_2-N_2$  mixts. at high pressure and low temp. showed that the action of mixts. can be calcd. roughly from the action of the individual gases. GEORGE GLOCKLER

**Preparation of luminescent substances.** N. F. ZHIROV. *Ukrainskii Khim. Zhur.* 3, Tech. Pt. 209-27(1928).—As carriers the very pure sulfides of Ca, Sr, Ba and Mg are used; they are prepd. by calcining the corresponding carbonates in a very high degree of purity with S. The following method of prepg.  $CaCO_3$  was found to be best for this purpose. Pure white marble is dissolved in tech. HCl; the marble taken in excess is allowed to settle during several days under its HCl soln., after which the latter is filtered, acidified by HCl, boiled, satd. with  $H_2S$ , boiled to remove  $H_2S$  and filtered hot. On cooling, 3%  $H_2O_2$  is added to the liquid in the quantity of about  $1/20$  of its vol., the mixt. is boiled till cessation of gas emission, filtered and pptd. by  $(NH_4)_2S$ . A weight of milk of lime equal to about  $1/10$  of that of the marble taken is added. After boiling several hrs. the lime becomes gray and the liquid is filtered. After cooling, a current of  $CO_2$  is passed into the liquid to complete resolu. of the ppt. at first formed, after which  $CO_2$  is completely removed by boiling and the ppt., which is formed again, is filtered. The color of the ppt. serves as indicator of purity: the grayer it is, the less pure the soln. If necessary, the purifying operation by means of  $Ca(OH)_2$  is re-

peated. The soln. obtained is evapd. to crystallize  $\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$ , the crystals are redissolved in distd.  $\text{H}_2\text{O}$  and subjected to an electrolysis between 2 Pt plates with a current of 2 v. and 0.1 amp. not less than 24 hrs. The soln. is filtered, pptd. by a satd. soln. of  $(\text{NH}_4)_2\text{CO}_3$  and left standing together with the ppt. not less than 24 hrs. After that, the liquid is removed by decantation and the ppt. of  $\text{CaCO}_3$  is repeatedly washed, first with hot  $\text{H}_2\text{O}$ , then with cold  $\text{H}_2\text{O}$ , then with  $\text{EtOH}$  and  $\text{Et}_2\text{O}$ , air-dried and calcined slightly for  $1\frac{1}{2}$  hr. The reagents used in these operations must be very pure. The  $\text{H}_2\text{S}$  used should not be prepd. from pyrites; it is best to prep. it by the action of vaseline oil on S.  $\text{CO}_2$ , after being prepd. from marble and  $\text{HCl}$ , is washed by being passed successively through a soln. of  $\text{CuSO}_4$ , a soln. of  $\text{K}_2\text{MnO}_4$ , pure  $\text{H}_2\text{O}$  and is finally passed through cotton. Ashless filter paper should be used in all filtrations. Pure  $\text{SrCO}_3$  and  $\text{BaCO}_3$  are prepd. by the same lengthy process as pure  $\text{CaCO}_3$ . With  $\text{SrCO}_3$  one may start with either the com.  $\text{Sr}(\text{NO}_3)_2$  or  $\text{SrCl}_2$ , but in order to obtain  $\text{BaCO}_3$  it is necessary to start with  $\text{Ba}(\text{NO}_3)_2$ ;  $\text{BaCl}_2$  will not do. The corresponding sulfides are obtained by calcination with S; a certain quantity of sulfates is obtained thereby; the latter may be reduced either by pure starch, or by sugar. An admixt. of sulfates is not in itself harmful, since a 75% admixt. of this salt reduced the luminosity by only 8%. S used for this calcination must be extremely pure; it is best crystd. from aniline. As fluxes, salts contg. water of crystn. are used. The crucibles used are lined with lime and asbestos. The characteristics of luminophores are as follows. Bad luminophores are obtained by using  $\text{BaS}$  with  $\text{Rb}$  and  $\text{CaS}$ , or  $\text{SrS}$  with  $\text{Mn}$ . The best red luminophores are obtained by using  $\text{BaS}$  with  $\text{Cu}$  and  $\text{Rb}$ . The best yellow luminophores are obtained by using  $\text{SrBaS}$  with  $\text{Pb}$ ,  $\text{Cu}$ ,  $\text{Sb}$ ,  $\text{Tl}$ . In  $\text{CaS}$  gives a greenish light-blue luminophore,  $\text{In}$  in  $\text{SrS}$ —blue-green,  $\text{Th}$  in  $\text{CaS}$ —light bluish violet;  $\text{U}$  in  $\text{BaS}$  gives a bad luminophore. The best of the new activators are  $\text{In}$  in  $\text{SrS}$ ,  $\text{Zr}$  in  $\text{SrS}$ ,  $\text{V}$  in  $\text{CaS}$ . Of the complex luminophores the following are good:  $\text{SrS-Cu}$ ,  $\text{SrS-U}$ ,  $\text{Bi}$ ,  $\text{SrBaS-Th}$ ,  $\text{Pb}$ ,  $\text{Cu}$ ,  $\text{CuS-Tl}$ ,  $\text{U}$ ,  $\text{Bi}$  and  $\text{Rb}$ . B. N.

**Photoluminescence of liquids.** S. I. VAVILOV AND L. A. TUMMERMANN. *Z. Physik* 54, 270-6(1929).—Many liquids show a blue fluorescence when irradiated by the light of a Hg lamp. The spectra of this fluorescence are very similar for the different liquids. It appears that the phenomenon is caused by an impurity such as  $\text{O}_2$  or  $\text{CO}_2$  of the air, since so many different liquids as  $\text{H}_2\text{O}$ ,  $\text{H}_2\text{SO}_4$ ,  $\text{C}_2\text{H}_5\text{O} \cdot \text{C}_2\text{H}_5$ ,  $\text{CH}_3\text{CO} \cdot \text{CH}_3$ ,  $\text{C}_6\text{H}_6$ ,  $\text{C}_6\text{H}_5\text{CH}_3$ ,  $\text{C}_2\text{H}_5\text{OH}$ , etc., show it. By repeated distn. of  $\text{H}_2\text{O}$  the fluorescence disappears.

GEORGE GLOCKLER

**Luminescence caused by x-rays in mercury vapor.** S. MROZOWSKI. *Z. Physik* 54, 422-6(1929); cf. *C. A.* 23, 39.—The visible and the ultra-violet light produced by x-rays in Hg vapor are due to the photoelectron produced by the x-rays. G. G.

**Theory of x-ray diffraction of liquids.** H. MARK. *Z. Physik* 54, 505-10(1929).—The intensity max. in the case of spherical mols. can be obtained theoretically by considering a liquid as a powder, the crystals of which have lattices of hexagonal or cubic closest packing with large temp. motion (cf. *C. A.* 23, 764). G. G.

**Diffraction of x-rays in liquids.** H. F. HERTLEIN. *Z. Physik* 54, 341-6(1929).—The diffraction of x-rays in liquids and liquid mixts. is thought to be an intermolecular rather than an intramolecular phenomenon (cf. *C. A.* 23, 764). GEORGE GLOCKLER

**X-ray diffraction haloes in the aqueous solutions of electrolytes.** HIKORCHI SHIBA AND TOKUNOSUKE WATANABE. *Sci. Papers Inst. Phys. Chem. Research (Tokyo)* 10, 187-92(1929).—By the measurement of photographs of x-ray diffraction haloes it is found that from aq. solns. of  $\text{H}_2\text{SO}_4$  the halo contracts continuously with increase in concn.; haloes from solns. of  $\text{KCl}$ ,  $\text{NaCl}$ ,  $\text{NH}_4\text{Cl}$  and  $\text{NH}_4\text{OH}$  in any concn. have the same size as that for  $\text{H}_2\text{O}$ ; haloes from solns. of  $\text{LiOH}$ ,  $\text{NaOH}$ ,  $\text{KOH}$  and  $\text{LiCl}$  expand as the concn. is increased; and haloes of  $\text{BeCl}_2$ ,  $\text{MgCl}_2$ ,  $\text{CaCl}_2$ ,  $\text{AlCl}_3$ ,  $\text{Al}(\text{NO}_3)_3$  and  $\text{Be}(\text{NO}_3)_2$  solns. show slight expansion and then a contraction with increase in concn. Halo contraction is assocd. with hydration of the cation. The diffraction at small angles is remarkable in dil. solns. as compared with pure  $\text{H}_2\text{O}$  and becomes weak in concd. solns. Tables of data and plates of patterns are included.

H. W. WALKER

**Homogeneity of x-rays by filtration.** N. MIROLUBOV AND I. POROKOV. *Z. Physik* 54, 399-407(1929).—The idea of homogeneity is defined as the no. of octaves within the ray. The relation between filter and voltage, given similar homogeneous rays, is deduced. GEORGE GLOCKLER

**Liberation of photoelectrons by x-rays at total reflection.** W. EHRENBERG AND F. JENTZSCH. *Z. Physik* 54, 227-35(1929).—The photoelec. current from a metal mirror reaches a max. near the angle of total reflection for x-rays and decreases rapidly to very small values for smaller values of the angle. GEORGE GLOCKLER

Photoelectric thresholds and photoelectric fatigue for iron, cobalt and nickel. GEORGE B. WELCH. *Phys. Rev.* 31, 709(1928); cf. *C. A.* 23, 763. E. J. C.

The surface photoelectric effect of the silver halide and silver sulfide. F. KRÜGER AND A. BALL. *Z. Physik* 55, 28-43(1929).—The surface photoelec. effect is studied on AgCl, AgBr, AgI and Ag<sub>2</sub>S as a function of wave length and compared with the volume photoelec. effect and the photochem. effects. GEORGE GLOCKLER

Inversion of the photovoltaic effect by hydroxyl and hydrogen ions. G. ATHANASIU. *Compt. rend.* 188, 786-8(1929).—The sign and magnitude of the photovoltaic effect for Ag-AgI, Hg-Hg<sub>2</sub>I<sub>2</sub>, and Ag-Ag<sub>2</sub>S cells can be changed by modifying the OH<sup>-</sup> and H<sup>+</sup> concns. of the electrolytic media. Thus for the cell Ag-AgI | KCl neutral | Ag-AgI the electrode becomes pos. on illumination but by making the electrolyte basic a neg. charge is obtained. The addn. of OH<sup>-</sup> also is found to shift the sensitivity max. from  $\lambda$ 4240 to  $\lambda$ 4300 Å. U. Similar inversion effects are noted for Hg-Hg<sub>2</sub>I<sub>2</sub>, Cu-Cu<sub>2</sub>I<sub>2</sub>, and Cu-Cu<sub>2</sub>I<sub>2</sub> cells. The addn. of OH<sup>-</sup> to the Ag-Ag<sub>2</sub>S cell, on the contrary, augments the neg. photovoltaic e. m. f. With some electrodes regions of sensitivity are found common to the 2 effects. This effect, usually observed, of an increased e. m. f. due to addn. of H<sup>+</sup> and OH<sup>-</sup> ions to the electrolyte is attributed to the acceptance by the electrolyte of one of the products of photochem. decompn. H. R. MOORE

Multiple absorption and secondary K-absorption limits. B. B. RAY. *Z. Physik* 55, 119-26(1929).—It is assumed that a single x-ray quantum can be absorbed by more than one electron in various energy levels. The calcd. absorption limits are very near to the exptl. observed ones (cf. *C. A.* 22, 2322). GEORGE GLOCKLER

Absorption of electrons. W. BOTHE. *Z. Physik* 54, 161-78(1929).—The absorption of  $\beta$ -rays is studied theoretically by assuming that the reduction in nos. in the absorbed beam is due to many small-angle scatterings. The distribution in direction in normal incidence is in agreement with expt. The calcd. absorption coeff. for Al for varying velocity agrees with the exptl. value. The change of mass absorption coeff. with the material used is not given correctly because of simplifying assumptions made in the theory. GEORGE GLOCKLER

Gas adsorption determined by experiments on electron diffraction. L. H. GERMER. *Z. Physik* 54, 408-21(1929).—With the proper exptl. conditions it is possible to obtain 4 different diffraction patterns when electrons are reflected from a single crystal of Ni. The 4 patterns are due to: the space lattice of the crystal; the first outermost layer of Ni atoms; a monatomic adsorbed gas layer and an outer deeper layer of adsorbed gas (cf. *C. A.* 22, 4354). GEORGE GLOCKLER

Selective absorption by excited mercury vapor. E. P. METCALFE AND B. VENKATESACHAR. *Nature* 123, 761(1929). GREGG M. EVANS

Efficiency of resonance of  $\lambda$ 2537 of mercury. W. HANLE. *Z. Physik* 54, 848-51(1929).—The efficiency of resonance for electrons of 4.9-10.0 v. speeds is measured. The efficiency curve shows a max. at  $1\frac{1}{2}$  v. above the resonance point. G. G.

Critical potentials in mercury. V. PAVLOV AND N. SUEVA. *Z. Physik* 54, 236-45(1929).—Several crit. potentials are found for Hg below 4.9 v. which do not fit into the optical energy diagram. GEORGE GLOCKLER

Increase of the sparking potential of a gas mixture by irradiation. F. M. PENNING. *Proc. Acad. Sci. Amsterdam* 32, 341-3(1929); cf. *C. A.* 22, 1904, 3352.—A review of the expts. done earlier, with further explanation of the theory. E. SCHOTTE

Second-order Stark effect in the Balmer series of hydrogen. H. RAUSCH VON TRAUBENBERG AND R. GEBAUER. *Z. Physik* 54, 307-20(1929).—The middle component agrees with Schroedinger's theory; the higher components do not. G. G.

A note on the hydrogen chromosphere. W. H. MCCREA. *Proc. Cambridge Phil. Soc.* 24, 506-15(1928).—A mathematical treatment of the equil. between H and its ions in the chromosphere. J. B. AUSTIN

Calculation of the energy of helium. EGIL A. HYLLERAAS. *Z. Physik* 54, 347-66(1929).—The energy of par-He is calcd. by methods of approximation from the wave-equation expressed in distances only. The calcd. value is  $E = -1.45162 R_{\text{He}}/h$  to be compared with the exptl. value  $E = -1.45182 R_{\text{He}}/h$ .  $R_{\text{He}}$  = Rydberg const. for He,  $h$  = Plank's const. With ortho-He the approximations are not carried out so completely but agreement between calcd. and exptl. values is deduced (cf. *C. A.* 22, 2873). GEORGE GLOCKLER

Frequencies of the carbonate group. C. SCHAEFER. *Z. Physik* 54, 676-8(1929).—This is a criticism of remarks by K. F. Herzfeld in Handbuch d. expt. Physik VII, 273, regarding interpretation of the infra-red frequencies of the CO<sub>3</sub> group. G. G.

Electrodeless discharge with undamped excitation. H. STEINHÄUSSER. *Z.*

*Physik* **54**, 788-97(1929).—Striking potentials and conductivity as dependent on gas pressure in air, O<sub>2</sub>, N<sub>2</sub>, CO<sub>2</sub>, H<sub>2</sub>, He, Ne and A are studied. GEORGE GLOCKLER

**Transparency in the infra-red of thin metal foils and their electrical conductivity.** H. MURMANN. *Z. Physik* **54**, 741-60(1929).—It is shown experimentally that the transparency of Ag, Bi and Sb foils in the range  $\lambda = 25\mu$  to  $\lambda = 110\mu$  is independent of the wave length, and depends only on the product of thickness and elec. cond., in agreement with theory. GEORGE GLOCKLER

**Chemical and optical properties of reactive organic groups.** A. DADIEU. *Z. Elektrochem.* **35**, 283-91(1929).—A substituent may change the location of the max. and width and intensity of absorption bands, or it may alter the type of absorption spectrum. The latter type is not considered. Displacement of the max. is compared in  $\mu\mu$ , width at half the max. in  $\mu\mu$  and change of intensity by the difference in molar extinction. Data on perylene (cf. *C. A.* **23**, 1351), PhH and C<sub>10</sub>H<sub>8</sub> indicate that the displacement of the max. depends on the kind of nucleus and position of substitution. Broadening of the band does not parallel displacement. A similarity is found between decrease of intensity and broadening of the band but they are apparently not entirely due to the same factor. The more strongly neg. a group the more it displaces the absorption band, with NH<sub>2</sub> an exception because of NH<sub>2</sub> type complex formation. The parallelism between negativity and bathochromic properties is important in prediction of the optical effect of a substituent. Apparently in the cases considered an electron is raised to a higher energy level but this effect is not sufficient to change the type of energy distribution, the max. only being shifted. Broadening of the band depends on changes in the outer electron structure due to the substituent. The degree of steric hindrance, a non-rigid atom being assumed, is a factor in the neg. nature of a group. Other methods of measurement of reactivity are reviewed. FOSTER DEE SNELL

**Evolution of the new quantum mechanics.** N. M. BLYTH. *Science Progress* **23**, 619-32(1929).—A review. JOSEPH S. HEPBURN

**New quantum theory.** RASCHKO ZAYCOFF. *Z. Physik* **54**, 588-9(1929).—Mathematical. GEORGE GLOCKLER

**Quantum theory of radioactivity.** J. KUDAR. *Z. Physik* **54**, 297-9(1929); cf. *C. A.* **23**, 2352.—Mathematical. GEORGE GLOCKLER

**Quantum theory of the nucleus.** TH. SEXL. *Z. Physik* **54**, 445-8(1929).—Mathematical treatment of the appropriate wave equation of radioactive decay as given previously by Gurney and Condon (cf. *C. A.* **23**, 329) and Gamow (*C. A.* **23**, 2352). GEORGE GLOCKLER

**Wave theory of the electron.** J. M. WHITTAKER. *Proc. Cambridge Phil. Soc.* **24**, 501-5(1928).—In Darwin's method of accounting for the "duplexity" of the atom without using the spinning-electron hypothesis, the work can be given invariance of form only by replacing the 4 wave functions by 16. This complication is avoided by specifying the electron wave as a 6-vector analogous to the electromagnetic force vector, the first 3 components being the components of a space vector analogous to the elec. force, and the last 3 the components of a space vector analogous to the magnetic force. The differential equations satisfied by these functions are obtained by assuming that in a null magnetic field they admit a soln. representing a plane wave advancing with uniform velocity. The theory leads to the correct energy levels for the fine structure of the H atom, and gives correct results for the free motion of the electron. B. C. A.

**Wave-mechanical treatment of the temperature coefficient of electrical resistance.** G. BORELIUS. *Z. Physik* **54**, 806-10(1929).—The theoretical formulas derived so far fail to give agreement with expt. (cf. *C. A.* **22**, 4347). GEORGE GLOCKLER

**Diffraction of short electromagnetic waves by a crystal.** W. L. BRAGG. *Scientia* **45**, 153-62(1929).—A popular account of the fundamentals of diffraction of x-rays by crystals. G. L. CLARK

**Spectral-analytical method for the determination of low melting and volatile substances by the use of the cathode-ray tube.** O. EISENHUT AND E. KAUPP. *Z. Physik* **54**, 427-32(1929).—The x-ray emission spectrum of a substance is obtained by placing the material near the window of a cathode-ray tube. The emerging electrons excite the characteristic x-rays of the material, and these rays are analyzed in the usual way. GEORGE GLOCKLER

**A spectroscopic method for the detection of unstable intermediate products in active gases and its application to active oxygen, nitrogen and hydrogen.** Z. BAY AND W. STERNER. *Z. physik. Chem.*, Abt. B, **3**, 149-61(1929).—By means of a weak, const. vibratory discharge there is produced within the discharge generated in active

gases an emission spectrum, the examn. of which leads to the identification of intermediate products. With quant. expts. it is possible to follow spatially and temporally the alteration velocity of intermediate products in the reacting gas. The efficiency of the method is demonstrated by active H, N and O. In active N the arc line of N was detected for the first time, which makes it very reasonable that N atoms play an essential role. H. W. WALKER

**Recent advances in science: Physics.** L. F. BATES. *Science Progress* 23, 577-84 (1929).—A review of recent work on cosmic rays, and the Raman effect. J. S. H

**The Raman effect.** A. PETRIKALN and J. HOCHBERG. *Z. physik. Chem.*, Abt. B, 3, 217-28 (1929).—The Raman spectra of the following compds. have been observed: bromobenzene, pyridine, naphthalene, (both in liquid condition and in benzene soln.) nitromethane, acetonitrile, hexane, cyclohexane, diphenylmethane (in alc. soln.), triphenyl methane (ether soln.), carbon disulfide, sodium azide (in aq. soln.). Diphenylmethane and triphenyl/methane gave continuous spectra showing no lines; Na azide gave one line on a continuous background; the rest showed a no. of Raman lines. The spectra of pyridine and bromobenzene are quite similar and show a marked resemblance to the Raman spectra of benzene and chlorobenzene reported in the literature; the naphthalene spectrum is entirely different. Hexane and cyclohexane give almost identical spectra. J. B. AUSTIN

**The Raman effect in gases.** E. L. HILL and F. C. KEMBLE. *Proc. Nat. Acad. Sci.* 15, 387-92 (1929).—Recent results on the Raman effect in HCl and H<sub>2</sub> can be interpreted by assuming a new selection rule for the rotational quantum no.,  $j$ . In the ordinary infra-red vibration-rotation spectrum, where the  $Q$  branch is absent, the selection rule is  $\Delta j = \pm 1$ . However, in order to account for the appearance of Raman lines corresponding to the "missing line" in the vibration-rotation band and to account for the absence of alternate lines in the pure rotation spectrum, the rule must be changed here to  $\Delta j = 0, \pm 2$ . It is shown that this rule under suitable restrictions can be derived from the new quantum mechanics. W. F. MEGGERS

**A study of the Raman effect in acetone.** JOHN W. WILLIAMS and ALEXANDER HOLLAENDER. *Proc. Nat. Acad. Sci.* 15, 421-3 (1929).—Acetone was irradiated with Hg light and the scattered light was photographed with glass prism and with quartz spectrographs. The time of exposure was 10 to 14 hrs. for the glass instrument and 30 to 50 hrs. for the quartz. Thirteen lines were recorded; their wave lengths range from 4090 to 4729 Å. U. Twelve of these lines correspond, within the limits of exptl. error, to absorption bands which have been observed in investigations of infra-red spectra. The remaining calcd. absorption line, 18.77 $\mu$ , is beyond the region ordinarily studied in infra-red work. W. F. MEGGERS

**About the production of the continuous x-ray spectrum.** A. SOMMERFELD. *Proc. Nat. Acad. Sci.* 15, 393-400 (1929).—The continuous spectrum of x-rays produced in a thin target is treated from the standpoint of wave mechanics. W. F. M

**M-x-ray absorption spectra; tungsten to uranium.** ERNST LINDBERG. *Z. Physik* 54, 632-42 (1929).—The absorption edges  $M_V$ ,  $M_{IV}$  and  $M_{III}$  are detd. for the elements: W, Pt, Au, Hg, Tl, Pb, Bi, Th and U (cf. *C. A.* 23, 32). G. G

**Perturbations in band spectra.** I. JENNY F. ROSENTHAL and F. A. JENKINS. *Proc. Nat. Acad. Sci.* 15, 381-7 (1929).—The series of lines which make up a band in the spectrum of a diatomic mol. show, in certain cases, irregularities which are known as perturbations. When these occur, some of the energy terms involved must deviate from a regular term-formula of the ordinary type. Until recently no theoretical interpretation of these phenomena had been attempted, and the empirical data were few and scattered. However, accurate descriptions are now available of the quant. relations in perturbations in several spectra (CN, SiN, CO, N<sub>2</sub><sup>+</sup>, BeO, HgH<sup>+</sup>). The obvious method of studying such cases is to derive a formula to fit the frequencies of the regular lines of the series, and then to plot the deviations of all observed lines from this formula. Such curves are found to have a form similar to a curve of anomalous dispersion in the region of the resonance frequency. Kronig has recently (*C. A.* 23, 32) discussed the origin of perturbations from the standpoint of the wave mechanics. The theory is supported by verification of several predictions but there appear also to be exceptions. W. F. MEGGERS

**New relations in the band spectrum of helium.** G. H. DIEKE, S. IMANISHI and T. TAKAMINE. *Z. Physik* 54, 826-43 (1929). GEORGE GLOCKLER

**Analysis of band spectrum of helium.** W. WEIZEL. *Z. Physik* 54, 321-40 (1929).—Former designation of electron terms in the He<sub>2</sub> band spectrum is supported by wave-mechanical analysis. A powerful source of the He<sub>2</sub> band spectrum is described. The

upper limit for the heat of dissocn. of  $\text{He}_2$  is 55,000 cal./mol. Several new bands are given (cf. *C. A.* 23, 769).

**Intensity measurements in the band spectrum of mercury hydride.** W. KAPUŚCINSKI AND J. G. EYMERS. *Z. Physik* 54, 246–56(1929).

**The band systems in the molecular spectrum of hydrogen. I. The singlet system.** W. FINKELNBURG AND R. MECKE. *Z. Physik* 54, 193–214(1929).—383 lines of the Balmer band system are assigned (cf. *C. A.* 23, 564). **II. The triplet system.** *Ibid* 597–631.—Band spectra are analyzed, and bands of molecular  $\text{H}_2$  are systematically arranged.

**The continuous spectrum of the hydrogen atom.** PAUL S. EPSTEIN AND MORRIS MUSKAT. *Proc. Natl. Acad. Sci.* 15, 405–11(1929).—The purpose of this paper is to obtain expressions for the intensities in the continuous spectrum of H suitable for numerical calcs. This purpose is accomplished by means of a new integral representation for the wave function in this special case. As examples of application the absorption spectra of H beyond the limits of the Balmer and of the Lyman series as well as certain limiting values of the absorption are calcd.

**Series in the arc spectrum of krypton.** W. GREMMER. *Z. Physik* 54, 215–26(1929); cf. *C. A.* 23, 33.—The arc spectrum of Kr is similar to the spectra of Ne and A.

**Mercury-argon and mercury-krypton bands.** O. OLDENBERG. *Z. Physik* 55, 1–15(1929); cf. *C. A.* 23, 1729. —Bands observed in Hg-A and Hg-Kr mixts. are studied and analyzed.

**The fluorescence spectrum of oxygen.** F. RASETTI. *Proc. Natl. Acad. Sci.* 15, 411–14(1929).—The spectrum of the light from a Hg arc scattered by  $\text{O}_2$  at atm. pressure and photographed with a quartz spectrograph, shows, besides Raman lines, a series of doublets extending from the ultra-violet limit of the spectrum on the plate down to the visible region. This appears as a fluorescence spectrum excited by the resonance line 1849 Å. U. of Hg which is strongly absorbed in  $\text{O}_2$ . These fluorescent doublets have a sepn. of about 60  $\text{cm}^{-1}$ , their relationship with the known  $\text{O}_2$  bands is discussed.

**The structure of the fundamental line and several other lines of the cadmium spectrum.** ANNELEISE SCHRAMMEN. *Ann. Physik* 87, 638–52(1928).—The work previously reported (cf. *C. A.* 22, 22) is continued with a new quartz Lummer-Gehrcke plate of superior quality. The structure of the resonance line  $1S_0 - 2^1P_1$  (2288.74 Å. U.) appeared in the earlier investigation to be dependent on discharge conditions in the Cd lamp. This line was also studied by Wood, who found 2 components with the same intensity with sepn. of 0.021 Å. U. These results are now explained by self-reversal. The line is studied again both in emission and absorption and it appears that this line has an unresolved satellite with a difference  $d\lambda - 0.00035$  Å. U. or  $d\nu + 0.067$   $\text{cm}^{-1}$  from the principal component. The structures of several lines (2660.45, 3081.03, 3261.17, 2403.74 and 3500.09 Å. U.), which could not be detd. before without ambiguity, are remeasured.

**The spectra of Zn II, Cd II, In III and Sn IV.** R. J. LANG. *Proc. Natl. Acad. Sci.* 15, 414–8(1929).—In the Zn II spectrum 6 new combinations between known terms are located. In Cd II the 7 S term is found and 2 intercombinations are recorded. In In III one new multiplet, based on known term values, is given and possible values for the 6 F terms are obtained. In Sn IV 4 multiplets are located, all based upon previously known term values. The new lines lie in the very short wave-length region of the spectrum investigated by means of a vacuum spectrograph and a vacuum spark between metallic electrodes.

**Infra-red spectrum of halogen compounds.** G. B. BONINO. *Z. Physik* 54, 803–5(1929).—The lack of agreement between the Raman lines and the infra-red lines in the case of  $\text{C}_2\text{H}_2\text{Cl}_4$  and  $\text{C}_2\text{H}_2\text{Cl}_2$  as found by Pringsheim and Rosen (*C. A.* 23, 39) does not exist.

**The ultra-violet bands of alkaline earth sulfide phosphors.** OTMAR SCHILLENBERG. *Ann. Physik* 87, 677–715(1928).—The conditions for prep. alk. earth sulfide phosphors with ultra-violet bands are studied. The metals were Fe, Cu, Zn, Ag, Sb, Pb and Bi in  $\text{CaS}$ , Fe, Zn, Ag, Pb and Bi in  $\text{SrS}$ , Cu, Pb and Bi in  $\text{BaS}$ ; it was found that for good ultra-violet emission only minute quantities of metal could be used. Analogous to the displacement of visible phosphorescence bands toward longer waves with transition from Ca to Sr to Ba, the same behavior is found for ultra-violet bands. The temp. properties of the new bands are detd. and described in detail.

**The spectrum emitted by a carbon plate under bombardment.** A. A. NEWBOLD. *Phil. Mag.* [7], 7, 706–19(1929).—A special quartz tube was constructed and an electro-

static method developed for the investigation of soft x-ray spectra. The method was applied to the spectrum emitted by a carbon plate under electron bombardment up to 600 volts. Over the frequency range 5700 to 26,000 the spectrum found was either identical with, or at least resembled very closely that mapped by Millikan and Bowen for gaseous carbon.

L. H. REYERSON

A new method of studying the electrochemical behavior of substances in very dilute solution (JOLIOT) 4. Ultra-violet absorption spectra of certain aromatic amino acids and of the serum proteins (SMITH) 11A. Radioactive substances in a body 5 years after death (St. GEORGE, *et al*) 11A. Monochromatic light filters. II. Application of the Goldberg spectrodensograph (ELVEGORD, *et al*) 1. Properties of carburized W (BARNES) 9. Electronic conception in organic chemistry. II. An interpretation of the  $\alpha$ -glycols (MIGITA) 10. The electron theory as applied to organic compounds, particularly  $C_6H_6$  (ULMANN) 10.

Radioactive preparations. DEUTSCHE-GASGLÜHLICHT-AUER-GES. M. B. H. Ger. 476,173, Aug. 18, 1926. The discovery that  $\gamma$ -rays give rise to secondary  $\beta$ -rays when absorbed in elements of high at. wt., *e. g.*, Th or U, is applied to the storage or use of radioactive prepns. Thus, the prepns. may be kept in containers of Th or U, or one of these metals may be interposed between the prepn. and the object to be subjected to radiation.

Radium emanation. CHARLES MILANDRE and ÉTIENNE GIE. Fr. 654,561, May 22, 1928. Ra emanation is obtained by immersing for a long time a poor ore contg. Ra or residues from the manuf. of Ra in a liquid, *e. g.*, water, which is then heated, or through which air is bubbled to liberate the emanation in the atm.

Phosphorescent or luminous composition. HENRY M. MINES (to Frederick Curd) U. S. 1,716,972, June 11.  $SrCO_3$  and  $CaCO_3$  are dissolved in an acid such as  $HNO_3$  or  $HCl$ , a phosphorogen such as a compd. of Tl, Th, U, Bi, Ag or Ni is added and the mixt. is pptd. as carbonate (suitably by adding  $(NH_4)_2CO_3$ ); the ppt. is dried and is mixed with  $MgCO_3$ , Al carbonate,  $Li_2CO_3$ ,  $Rb_2CO_3$ , "luminophores," S and carbonaceous matter and heated in a closed crucible.

Apparatus for generating infra-red rays. THOMAS J. BARRETT. U. S. 1,715,634, June 4.

Tubes for x-ray spectrography. C. H. F. MÜLLER A.-G. Ger. 476,172, July 22, 1925. Tubes for x-ray spectrographic examn. of materials, especially metals, have a hot cathode surrounded by a metal giving x-ray spectral lines which are either covered completely by the spectral lines of the anode metal or else lie well outside the spectral line range of the anode metal.

Material opaque to x-rays. I. G. FARBENIND. A.-G. (Max Schmidt, inventor). Ger. 476,114, Oct. 29, 1927. See Brit. 299,723 (C. A. 23, 3409).

#### 4—ELECTROCHEMISTRY

COLIN G. FINK

Present trend in the construction and application of the electric furnace in the foundry. ALBERT LEVASSEUR. *J. four élec.* 38, 185-7(1929). C. G. F.

Continuous electric furnace manufacture of cyanamide. GEORGE BASSEREAU. *J. four élec.* 38, 153-6(1929).—A detailed review of the manuf. of granulated cyanamide and its advantages over other varieties of cyanamide. The equipment used in the manuf. of the granulated product consists of a continuous elec.-resistance tunnel furnace 40 m. long and 1.70 m. wide, which is divided into 3 zones. The  $CaC_2$  is rapidly taken to  $900^\circ$  in the first zone; reaction is completed in the second zone where temp. is  $1100^\circ$  due to exothermic nitration reaction; in the third zone suitable ventilation cools the cyanamide. The yield is greater than 86%. The product is granulated by subjecting the crude product to hydration, adding sufficient  $H_2O$  to change free lime and to destroy residual carbide; after thorough mixing the material is transferred to a series of pans and held in layers for 2 hrs. to permit completion of reaction. It is then stirred well, cooled and taken to app. for granulation. More  $H_2O$  is added and the granulation is carried out in a specially designed grinder. The equipment used is illustrated.

M. McMAHON

Electric (heated) galvanizing (tanks). ROBERT A. CLARK, JR. *Elec. World* 93, 1321-3(1929).—The introduction of elec. heating resulted in close temp. control and



consequent improved quality of product. The heat distribution of the bath is more uniform than with other heating methods.

**Electrical cleaning of blast-furnace gas.** ROBERT DURRER. *Blast Furnace & Steel Plant* 17, 862-3 (1929).—Elec. pptn. is discussed. C. G. F. E. J. C.

**Electrolytic crystal growth of copper in copper sulfate solutions.** IRMGARD CHIOU. *Dissertation, Greifswald* 1927, 45 pp.; *J. Inst. Metals* 39, 595.—Expts. have been made on the growth of electrolytic Cu deposits from sulfate electrolytes, with varying conditions of c. d., temp., acidity and concn. of electrolyte. In the first series a single crystal Cu sphere 0.6-0.8 cm. in diam. was used as cathode inside a cylindrical Cu anode 5 cm. in diam. In  $N$  CuSO<sub>4</sub> soln. at 20° the cathode grew as a single crystal with c. ds. between 0.5 and 1.7 amp. per sq./dm.; above and below these limits the deposits were polycryst. Addn. of 6.9 gm./l. of concd. H<sub>2</sub>SO<sub>4</sub> altered the above interval to 0.06-0.4 amp. per sq./dm.; in both cases, however, the final single crystal obtained tended to approx. an octahedron in shape. By raising the temp. of the neutral soln. or by increasing the concn. of Cu salt, the single-crystal deposition tends to take place at higher c. ds. In the second series of tests an annealed Ag sheet was used as cathode; with c. ds. within the above-mentioned limits and under the same conditions of temp., acidity and concn., the crystal structure of the deposited Cu represents an isomorphous growth on the Ag crystals of the cathode. A third series, using a hard-rolled Ag sheet anode, produced a fibrous Cu deposit under the above conditions. In both the latter cases c. ds. outside the stated limits produced an irregularly oriented deposit. H. L. D.

**Some recent work on silver plating.** F. B. SANIGAR. *Electroplaters' and Depositors' Tech. Soc.*, Advance copy, 1928, 61-4; *J. Inst. Metals* 39, 597-8.—The effect of the carbonate and free-cyanide content in the Ag-plating soln. upon the hardness of the deposit is described. A suitable method to det. the hardness was found to be the measurement of the breadth of a scratch produced on the deposit by a diamond under a load of 200 g.; the thickness of the deposit was in each case 0.00063 in. The effect of increasing Na<sub>2</sub>CO<sub>3</sub> content was a regular decrease in the hardness of the deposit. Softer deposits also resulted on adding free cyanide up to about 180%, the effect being less marked at the higher figures. A peculiar bright deposit gradually developed as the free cyanide was progressively increased to 600%, this being harder than the softest deposit obtained. Fifty to 100% free cyanide is considered the most satisfactory range. H. L. D.

**Silver plating.** A. E. NICOL. *Electroplaters' and Depositors' Tech. Soc.*, Advance copy, 1928, 49-60; *J. Inst. Metals* 39, 597.—The factors encountered in the com. electrodeposition of Ag are examd. The present-day silver-plating process is claimed to be efficient and satisfactory. Good deposits are obtainable from solns. varying very widely in compn. For light deposits, a content of 2 oz./gal. of Ag and for heavy deposits 3.25-4 oz./gal. is recommended. The permissible free cyanide content varies with the age of the soln. The presence of carbonates increases the cond. and the "throwing power" of the soln. and is not deleterious, producing a finer crystal structure. Chlorides are deleterious. Comparatively small increases in temp. are accompanied by undesirable results, while 3 amp. per sq. ft. is considered a satisfactory c. d. Methods of analysis of the Ag, carbonate and cyanide content are given. H. L. D.

**A comparison between sodium cyanide and potassium cyanide silver-plating solutions.** EDWARD B. SANIGAR. *Metal Ind.* (London) 34, 539-40 (1929); cf. *C. A.* 23, 43.—Twenty-four spoons were exactly similarly prepd. for plating and placed in vats with regular batches of work. The plated spoons were examd. by experts who found it impossible to distinguish between the ones plated in NaCN and those plated in KCN baths. On the basis of finishing losses, the spoons plated in NaCN solns. were slightly superior (4.5%) to those from KCN solns., which, at least, shows that NaCN is equal to KCN for the purpose. W. H. BOYNTON

**Bent cathode test for determining the optimum ratio of chromic acid to sulfate in chromium-plating baths.** WALTER L. PINNER AND EDWIN M. BAKER. *Metal Ind.* (London) 34, No. 24, 585-6, 611-2 (1929).—See *C. A.* 23, 2664. E. C. M.

**Eliminating health hazards in chromium plating.** J. J. BLOOMFIELD AND WILLIAM BLUM. *Chem. Met. Eng.* 36, 351 (1929); cf. *C. A.* 22, 4385. E. J. C.

**Plating and polishing.** W. JAMES. *Electroplaters' and Depositors' Tech. Soc.*, Advance copy, 1928, 41-8; *J. Inst. Metals* 39, 599.—Practical hints and observations are given on the processes of electroplating and polishing. The method of obtaining the fine old "church" finish is described, and notes on lacquering, dips for non-ferrous metals and nickel-plating solns. are given. The composite deposit, Ni-Cu (from sulfate

soln.)-Ni is recommended. Some observations on the position of Cr plating are included. H. L. D.

A new method of studying the electrochemical behavior of substances in very dilute solution. F. JOLIOR. *Compt. rend.* 188, 1106-8(1929).—J. has previously (*C. A.* 21, 3152) described a method of measuring very small electrolytic deposits of radioactive substances by measuring their radioactivity. The new method can be used for any substance. The electrode consists of a sheet of glass bearing a transparent layer of Au or Pt deposited by cathodic projection. The light transmitted by the electrode is measured by a photo-elec. cell. As the substance is deposited the light transmitted becomes less. From this the rate of deposit can be calcd. Using this electrode for the deposition of Bi from dil. solns. of the nitrate, about 0.05 v., referred to the calomel electrode, was obtained for the normal potential. Again with a  $10^{-4}$  N soln. of tellurous acid in a 0.2 N  $\text{HNO}_3$  soln. J. obtained a potential of -0.11 v. with respect to the calomel electrode. On adding a satd. soln. of  $\text{SO}_2$  to the electrolyte, the rate of deposit slowed down to zero. This corresponds to the pptn. of Te from more concd. tellurous acid solns. by  $\text{SO}_2$ . A. C. HIGGINS

Reversible electromotive force of electrolysis. J. VUILLERMOZ. *Compt. rend.* 188, 1098-9(1929).—The difference in potential between a negatively polarized Pt electrode and 2N  $\text{H}_2\text{SO}_4$  was observed at the instant the current was shut off and for the first half sec. thereafter. Simple breaking of the circuit did not cause an instantaneous variation in potential. When the break was accompanied by a static discharge across the electrode-electrolyte surface there was an instantaneous variation. The reversible e. m. f. was -0.49 v. The results are explained by considering the electrode-electrolyte contact as a parallel circuit composed of a resistance and a condenser of which the capacity  $c = q_1/u_1 = q_2/u_2 = \dots$ , where  $q_n$  is the electrostatic discharge and  $u_n$  is the instantaneous variation.  $c$  was 10 to 40 microfarads per sq. cm. A. C. HIGGINS

Electrolytic formation of sodium arsenate. O. A. ESIN. *Z. Elektrochem.* 35, 234-40(1929).—A soln. of 80.5 g.  $\text{As}_2\text{O}_3$  and 100.6 g. NaOH in 1 l.  $\text{H}_2\text{O}$  was electrolyzed with Fe electrodes, without diaphragm and with a c. d.  $D_K = D_A = 0.03$  amp./cm<sup>2</sup>. Considerable reduction of the electrolyte on the cathode takes place. The method is improved by the use of a diaphragm and weaker solns. (70 g.  $\text{As}_2\text{O}_3$  and 87.5 g. NaOH per l.). Different  $D_A$  values result in different grades of oxidation. A. E. BEITLICH

Electrolytic reduction of benzoic acid. F. SOMLÓ. *Z. Elektrochem.* 35, 261-5 (1929).—Phthalic acid was electrolyzed and a product found which was similar in chem. behavior to an oil which Baur and Mueller (*C. A.* 22, 1894) had found by the electrolysis of benzoic acid, and which they regarded as cyclohexenone. The substance is in both cases an Et ester of  $\Delta$ -1,3-dihydrobenzoic acid. The presence of  $\text{CO}_2$  and CO in the cathode gas is due to electrolysis of the solvent and not to the benzoic acid. A. E. BEITLICH

The electrolyses of isomeric caproic acids. SHERLOCK SWANN, JR. *Trans. Am. Electrochem. Soc.* 56, preprint, 9 pp.(1929).—The electrolyses of diethylacetic acid and methylpropylacetic acid have been carried out. The Kolbe synthesis of hydrocarbons does not take place with either of the acids studied. The investigation is being continued. C. G. F.

Electrosynthesis of hydrocarbons. LUIS MERMEJO AND LUIS BLAS. *Anales soc. españ. fis. quim.* 27, 228-35(1929).—In prepn. of  $\text{C}_2\text{H}_6$  by electrosynthesis a quant. yield is obtained by using a satd. soln. of ZnAc at a temp. below 20° and current density of 100 amp. per sq. dm. In electrolysis of  $(\text{AcO})_2\text{Pb}$  it was found that an anhyd. electrolyte is required to obtain Pb tetraacetate; that aq. acid and neutral acetate solns. subjected to electrolysis always produce  $\text{PbO}_2$  on the anode by decompn. of the tetraacetate formed; that in alk. solns. of basic acetates no tetraacetate is formed, but only a simple oxidation of basic acetate forms  $\text{Pb}_2\text{O}_3$ ; that  $\text{C}_2\text{H}_6$  is produced in all these electrosyntheses. E. M. SYMMES

A photoelectric smoke recorder. E. H. VEDDER. *Elec. J.* 26, 199-201(1929).—A beam of light is projected through a stack into a lens which concentrates the light on a photoelec. cell. The amplified response then actuates a recording instrument. A double-box construction makes the units weatherproof. Air is drawn in at the vent at the rear of the unit and around the internal box, which is kept covered, and into the holes in the pipe connecting the internal and external boxes. This air flows through the pipe on which the units are mounted on the front of the internal box. Photographs are shown of the amplifier and control unit, and of the light source unit, and graphs show the schematic arrangement of the smoke detector, characteristics of the

photo-cell and of the amplifier tube, the wiring of the smoke recorder, sections of a smoke recorder chart, and the graphic instrument which keeps a continuous record of smoke d.

**The incandescent electric lamp.** KENNETH R. SWAN. *Electrician* 102, 724 (1929).—Historical sketch emphasizing the world's indebtedness to Sir Joseph Swan.

C. G. F.

**Electric dust precipitation.** F. MUELLER AND A. SCHODER. *Commonwealth Eng.* 16, 162-8(1929).—A review.

C. G. F.

**Properties and tests of carbon brushes for motors and generators.** G. M. LITTLE. *Elec. J.* 26, 194-8(1929).—Some results are given of an extensive research in connection with C brush testing in an attempt to correlate some of the properties of the brushes with their performance in different kinds of field service, and to improve the quality of the brushes. All prominent makes of brushes and about 400 exptl. samples were examd., in part at least, according to a definite schedule. Tests indicating the phys. properties of the brushes include: the heat flow, which is a quick detn. of thermal cond., an air flow porosity test, magnetic susceptibility, sp. resistance, strength, tone test and porosity. Tests indicating the chem. properties are: % ash and volatile matter. Operating characteristics include: contact drop, coeff. of friction, and life and commutation. Special machines have been developed such as: (1) an app. for investigating the action of the circulating current that flows from bar to brush to bar under the brush face, (2) a machine for studying the behavior of different grades of C brushes when subjected to extremely short arcs, (3) a special traction-brush testing machine showing differences in commutation and life, (4) a machine detg. the tendency of a brush to chip, (5) a machine for measuring the ability of a brush to resist side wear, and (6) a slip-ring test device.

W. H. BOYNTON

**A sensitive roughneck (direct current regulator).** W. SCHARLCHLIN. *Elec. J.* 26, 216-24(1929); 22 illus.—A rugged electro-dynamic regulating device for controlling voltage, current, load, speed or torque of d. c. machines.

C. G. F.

**Electrolytic polarization. VII. Complex cyanides:** (a) Ag, (b) Cu (GLASSTONE) 2. Ni-Cr alloys in electrical resistance heating (BARCLAY, STONE) 9. The application of Cd as rust-protecting medium by the Udylyte method (FELDMAN) 9. Causes of corrosion of magnetite electrodes (VOGEL) 9. Electrodeposition of rubber or similar substances (Brit. pat. 299,738) 30. Deposition of rubber (Fr. pat. 654,809) 30. Rubber articles (Fr. pat. 653,215) 30. Magnetic material (U. S. pat. 1,715,541) 9. Pressure-casting machine with an electrically heated crucible (Ger. pat. 475,595) 9. Filter or diaphragm (Fr. pat. 653,033) 1. Metallized ceramic products (Fr. pat. 652,748) 19. Viscous oils (Fr. pat. 654,650) 22. Treating magnetic materials (U. S. pat. 1,715,713) 9.

**Electric battery.** FERNAND C. F. PORTAIL (to Soc. anon. le Carbone). U. S. 1,716,461, June 11. See Brit. 291,420 (C. A. 23, 1063).

**Elastic sealing composition for dry-cell batteries.** ARLIE W. SCHORGER (to Burgess Battery Co.). U. S. 1,717,172, June 11. A sealing compn. is formed from asphalt (m. 117°) 80-82.5, Montan wax 10-15.5 and linseed oil 2-10 parts.

**Gas accumulator battery.** RENE OPPENHEIM. U. S. 1,717,244, June 11. An intimate mixt. of a finely divided porous conducting material such as charcoal, a pectizable colloidal soln. such as a starch compn. and a concd. soln. of an electrolyte such as  $\text{NH}_4\text{Cl}$  are used together; the colloidal soln. serves both to render the porous conducting material impermeable to liquids without destroying its permeability to gases and to immobilize the electrolyte. Current-conducting material such as retort-carbon rods penetrates the center of the mixt.

**Storage battery.** EDWARD A. LUNDGREN (to Revere Rubber Co.). U. S. 1,715,935, June 4. Structural features.

**Storage battery.** JOE B. PARSONS (to Prest-O-Lite Storage Battery Corp.). U. S. 1,716,598, June 11. Structural features.

**Storage battery.** STANLEY SWENSON. U. S. 1,716,197, June 4. Structural features.

**Storage battery.** HARLAND D. WILSON and ALBERT L. HOPKINS (to Prest-O-Lite Storage Battery Corp.). U. S. 1,716,610, June 11. Structural features.

**Storage battery.** RENÉ É. BRENNER. Fr. 652,758, Sept. 22, 1927. Construction of plates is given.

**Storage batteries.** LOUIS F. J. ROUSSEAU. Fr. 652,716, Sept. 15, 1927. The plates are sepd. by insulating frames forming tight compartments filled with electrolyte.

**Storage batteries.** I. G. FARBERIND. A.-G. Fr. 654,998, May 30, 1928. Method of making Pb electrodes is given.

**Storage battery plates.** LAWRENCE J. PEARSON (to Philadelphia Storage Battery Co.). U. S. 1,716,320, June 4. A regulated volume of air is circulated over negative storage battery plates contg. Pb and  $H_2SO_4$ ; the air is dried and is then heated before again being brought into contact with the plates. This treatment serves to prepare the plates for shipment and storage. An app. is described.

**Noncorrodible battery terminals.** CHARLES T. HIXSON (one-fourth each to Willard W. Campbell and Henry E. Pischel). U. S. 1,715,599, June 4. In making terminals which are resistant to electrolyte and fumes, Pb and Sb are heated to redness, powdered glass is added to the molten mass at such temp., with stirring, and the mixt. is molded.

**Galvanic cells.** NEUFELDT & KUHNKE, G. M. B. H. Ger. 475,764, Apr. 7, 1927. C electrodes are impregnated with depolarizing material by soaking them successively with 2 sep. solns., the second soln. having a reducing action on the first. Thus, the first soln. may contain a high-valent Mn compd. and the second soln. a low-valent Mn compd. such as  $MnCl_2$ .

**Galvanic cell.** PÖRSCHKE ELEKTRIZITÄTS-GES. M. B. H. 476,222, Dec. 30, 1925. In a galvanic cell having a pos. electrode of  $CuO$ , the neg. electrode is supported by one or more bodies of porous ceramic material arranged so as to interpose between the electrodes. The purpose of this arrangement is to accelerate the regeneration of the pos. electrode, which is effected by pouring away the electrolyte, removing the neg. electrode and heating. The electrolyte absorbed in the porous material then evaps. rapidly and accelerates the regeneration.

**Tanks for galvanic baths.** ALBERT BUTZIGER. Fr. 654,735, Mar. 27, 1928.

**Selenium cells.** JOHN NEALE. Fr. 655,034, May 31, 1928.

**Lead-zinc accumulators.** ADOLFO POUCHAIN. Ger. 475,569, May 20, 1927; Fr. 653,958, May 7, 1928. In a method of working an elec. Pb-Zn accumulator, the electrolyte contains 80 g. free acid per l. at the end of each complete discharge and 280 g. at the end of each complete charge. A suitable cell contains 1000 cc. water, 80-150 g.  $H_2SO_4$ , 450-650 g.  $ZnSO_4$  and 15-30 g.  $Al_2(SO_4)_3$ .

**Device for the correct filling of accumulators.** JEAN L. M. FRÉJACQUES. Ger. 476,795, Oct. 21, 1927.

**Accumulator plates.** I. G. FARBERIND. A.-G. (George Kränzlein and Richard K. Müller, inventors). Ger. 476,344, June 1, 1927. Addn. to 475,242. The method of Ger. 475,242 (C. A. 23, 3173) is modified by conducting the electrolysis in an alk bath. Plates of Pb-Na alloy on a framework of Pb can be so treated. A higher c. d. is applied than in Ger. 475,242, e. g., 15-25 amps./sq. dm.

**Accumulator plates and gratings.** WILHELM PETRI. Ger. 476,798, Aug. 11, 1927. Details of construction are given.

**Drying negative accumulator plates.** ERICH SIEG and LEOPOLD GRÄFENBERG. Ger. 476,281, Dec. 29, 1927. The plates are stored in water or other liquid in the drying chamber until it is required to dry them, whereupon the liquid is expelled by evacuating the chamber or by supplying an inert gas.

**Alloy for accumulator plates.** METALLGES. A.-G. Ger. 476,259, Mar. 19, 1927. The frame supporting the active mass is made from a Pb-Li alloy contg. up to 2% Li with or without an addn. up to 1% of Na, K or Rb, which improves the hardness, and (or) an addn. up to 1% of Ca, Ba, Sr or Mg, which enhances the toughness. A suitable alloy contains Pb 99.33, Li 0.02, Na 0.3 and Ca 0.35%.

**Electrodeposition of chromium.** FIRMA WILHELM STEINHORST. Ger. 476,264, Oct. 21, 1927. In the electrodeposition of Cr, the injurious effects on the product of the  $H$  simultaneously evolved are avoided by treating the object on which the metal is to be deposited, before, during or after the deposition, with  $O_3$ . The treatment may be accelerated by simultaneous irradiation with ultra-violet light.

**Chromium plating.** ALBERT BUTZIGER. Fr. 654,734, Mar. 27, 1928. Cast Fe contg. 1% or more of C, or 0.5% or more of P is plated with Cr by suspending the Fe for some mins., in the absence of any current, in a bath contg. the Cr soln. The same effect is obtained by submitting the Fe to the action of a current for a few mins. before plating.

**Cadmium plating.** THE GRASSELLI CHEMICAL CO. Fr. 654,850, May 25, 1928. A small quantity of a Ni salt is added to a Cd electrolytic bath to give brilliant hard deposits of Cd. An example of a suitable bath contains NaCN 120, Cd hydrate 48,  $Na_2SO_4$  60, crystd.  $NiSO_4$  1.5, turkey red oil or sulfonated castor oil 12 g. Cf. C. A. 22, 3847.

**Electroplating plant.** INTERNATIONAL COPPERCLAD CO. Ger. 476,106, May 29,

1927. A frame, movable along the cell, carries a no. of anodes and cathodes connected to a pair of contact shoes, which move, resp., along the pos. and neg. bus bars.

**Electroplating apparatus.** WESLEY F. HALL (to Hanson-Van Winkle-Munning Co.). U. S. 1,715,357, June 4. Structural features.

**Electroplating apparatus.** NICHOLAS P. DICESARE (to Kohler Co.). U. S. 1,715,411, June 4. Structural features.

**Electrolyte for electrolytic rectifier.** AMBROS GALETZKA. Ger. 476,610, Jan. 21, 1926. The electrolyte consists of a mixt. of  $\text{NH}_4\text{HCO}_3$  and  $(\text{NH}_4)_2\text{PO}_4$  solns. with addn. of a small quantity of alkali lye.

**Electrolytic cell.** FRANZ GERLACH. Swiss 130,897, Apr. 4, 1927. A cell for the decompn. of alkali chlorides has a Hg or amalgam cathode.

**Electrolytic vat.** PAOLO PESTALOZZA. Fr. 653,300, Apr. 21, 1928. A vat for the electrolysis of salts such as alkali chlorides is divided into 2 compartments having a bottom inclined both in the transversal and longitudinal sense; it has a single opening at the lowest point of the sepg. wall connecting both, and an overflow pipe at the lowest point of the vat for the discharge of the densest cathode liquid. Arrangement of the envelopes surrounding the cathode elements is also described.

**Amalgam tank for the electrolysis of chlorides.** I. G. FARBERIND. A.-G. Fr. 654,417, May 18, 1928.

**Electrolytic gas generators.** ATELIERS DE CONSTRUCTION OERLIKON. Fr. 654,922, May 29, 1928. Construction of gas collectors is given.

**Electrolytic apparatus for the production of hydrogen and oxygen.** "MONTECATINI" SOC. GENERALA PER L'IND. MINERARIA ED AGRICOLA. Fr. 654,289, May 14, 1928.

**Hydrogen peroxide.** I. G. FARBERIND. A.-G. Fr. 654,592, May 23, 1928. In the production of  $\text{H}_2\text{O}_2$  by the cathodic reducing of O, the current of O or gas contg. O required for the electrolysis vat is employed at the same time for the concn. or distn. of the soln. of  $\text{H}_2\text{O}_2$  produced in the vat.

**Acetylene.** I. G. FARBERIND. A.-G. Fr. 653,505, Apr. 27, 1928.  $\text{C}_2\text{H}_2$  is formed from coke-oven gas by passing it over a Ni catalyst to convert the CO to  $\text{CH}_4$  and by treating the resulting mixt. in an elec. arc. The heat of the gas from the elec. arc is used to heat the gas going to the catalyst.

**Refining antimony.** NORDDEUTSCHE AFFINERIE (Heinrich Roscher, inventor). Ger. 476,619, July 19, 1927. See Brit. 294,143 (C. A. 23, 1827).

**Pure alumina.** ELEKTRIZITÄTSWERK LONZA. Swiss 130,694, Aug. 4, 1927. Al ores are reduced thermoelectrically and an oxidizing atm. is applied continuously to the smelt to produce pure  $\text{Al}_2\text{O}_3$ .

**Electrometallurgy.** TURE R. HAGLUND. Ger. 475,735, Oct. 24, 1926. In extg. metals or alloys by heating briquets formed of oxide or oxide ore and carboniferous reducing material with slag in an elec. furnace, one part of the total reducing material (about 25%) is contained in the briquets while the other part is freely mixed among them in granular form. Cf. C. A. 23, 3173.

**Removing burrs from the cutting edges of tools.** GEBR. FUNKE A.-G. Ger. 476,757, Mar. 7, 1928. Addn. to 456,720. The burrs are removed electrochemically after the manner of the prior patent. The tools are plunged into a conducting bath of molten salts such as  $\text{BaCl}_2$  or  $\text{KCl}$  and serve as the anode while the bath container or an immersed conducting body serves as the cathode.

**Cathodes for making compounds containing active oxygen.** I. G. FARBERIND. A.-G. Fr. 654,881, May 26, 1928. The cathodes used for the production of compds. contg. active O are protected from corrosion by soaking with Hg either continuously or from time to time. The soaking may be accomplished by electrolytic pptn. of Hg on the cathode.

**Electrical gas-purifying plant.** LOUIS TOCCO and HENRY G. RYS. Fr. 652,855, Apr. 2, 1928.

**Electrical device for removing small solid particles from gases.** METALLGESELLSCHAFT A.-G. Ger. 476,794, Jan. 19, 1927. Addn. to 446,008.

**Apparatus for activating gases with electric waves of high or low frequency.** PAUL E. H. MARDULYN. Fr. 654,732, Mar. 27, 1928.

**Calcium arsenate.** PAUL E. H. MARDULYN. Fr. 654,733, Mar. 27, 1928. Ca arsenate is prepd. by treating arsenical pyrites or mispickel in elec. rotating, concentric furnaces to obtain arsenious anhydride, which, mixed with  $\text{CaO}$ , gives Ca arsenite; the latter is transformed into Ca arsenate by O activated in the app. of Fr. 654,732 (cf. preceding abstr.).

**Dewatering slimes by electroosmosis.** STETTINER PORTLAND-CEMENT-FABRIK. Ger. 476,144, May 18, 1921. The slime is fed under pressure into a vertical tube of

uniform cross section, on opposite sides of which the anode and the permeable cathode are arranged. The lower end of the tube is closed by a movable disk having an outlet aperture which is brought into register with the tube at suitable intervals.

**Furnaces.** PIERRE F. VIANDON. Fr. 654,676, May 24, 1928. An elec. furnace for the reduction of ores in a single fusion is described.

**Electric furnace.** DET NORSK AKTIESELSKAB FOR ELEKTROKEMISK INDUSTRI NORSK INDUSTRI-HYPOTEKBANK. Ger. 475,732, Oct. 13, 1921. The vertically arranged electrodes are hollow and are filled with a calcined conducting material which bridges the gap and forms the heating resistance. The furnace is arranged so that the material to be heated is loaded around the electrodes and the column of material in the gap.

**Electric furnaces.** WILHELM HAMMER. Fr. 654,053, May 10, 1928. The heating current is induced in a fusion bath surrounding the chamber or article to be heated Cf. C. A. 23, 1066.

**Electric furnace for the treatment of metals.** PITTSBURGH RESEARCH CORP. Fr. 654,432, May 18, 1928.

**Annular rotating electric furnace for ores, etc.** PAUL E. H. MARDULYN. Fr. 654,731, Mar. 27, 1928.

**Electrically heated furnace for melting metals such as aluminum.** STEPHAN SCHNEIDER (to Westinghouse Elec. & Mfg. Co.). U. S. 1,715,678, June 4. Various details are specified of a furnace comprising a melting pot to which an inert or reducing gas may be supplied.

**Induction furnace for melting copper, etc.** EMIL F. RUSS. Fr. 653,909, May 8, 1928.

**Electric induction furnace.** ELECTRIC FURNACE CO., LTD. Fr. 654,949, May 29, 1928.

**Electric induction furnace.** MARCEL FOURMENT. Ger. 476,098, Feb. 12, 1926 See Brit. 265,548 (C. A. 22, 196).

**Mounting and packing for electrodes of electric furnaces.** JAMES E. McLAUGHLIN (to Brown Co.). U. S. 1,715,376, June 4. Structural features.

**Replenishing furnace electrodes.** CARL BECKER. Austrian 112,969, Dec. 15, 1928. Manipulative and structural features are described.

**Device for raising the electrode in an electric smelting furnace.** DEMAG A. G. Ger. 475,733, July 17, 1925.

**Electric resistance heater.** HENRY A. ZIOLA (to Swartzbaugh Mfg. Co.). U. S. 1,715,690, June 4. Structural features.

**Electric resistance heating unit.** WILLIAM E. DUERSTEN (to Globar Corp.) U. S. 1,715,824, June 4. Structural features.

**Electric resistance element.** CHRISTIAN DANTSIZEN (to General Electric Co.). U. S. 1,717,193, June 11. A resistance element suitable for use as in "grid leaks" comprises a fibrous support such as paper with a uniform continuous graphite coating retained on the support without a binder in its superficial interstices.

**Electrical resistances.** NAAMLOOZE VENNOOSTCHAP PHILIPS' GLOEIILAMPEN-FABRIEKEN. Fr. 653,880, May 4, 1928. A conducting material such as C is mixed with a phenol-aldehyde condensation product or cellulose acetate to form elec. resistances.

**Electric resistors.** HEINRICH TRAUN & SÖHNE, VORMALS HARBURGER-GUMMI KAMM-COMPAGNIE. Ger. 476,982, Nov. 5, 1926. Finely powd. PbO is mixed with such plastic masses as rubber.

**High resistance electrical unit.** GEORGE A. WELLS. U. S. 1,715,879, June 4. A base of unglazed porcelain material substantially impervious to moisture and ordinary acids carries an attenuated coating of dry elec. conducting carbonaceous material, and has a resistance value of great constancy for extended periods of continuous operation.

**Electrical condenser.** SAMUEL RUBEN. U. S. 1,715,789, June 4. Al electrodes coated with Al sulfide are used in close contact with CuS. Cf. C. A. 23, 3414.

**Condenser for zinc vapors from electric furnaces.** FILIP THARALDSEN. U. S. 1,715,960, June 4. A condenser is described comprising a block of deep relatively narrow parallel channels spaced apart and inclined downwardly from the furnace chamber to a common container for collecting the products of combustion.

**Electric control or recording apparatus for carbon dioxide meters, draft gages, etc.** FREDERICK D. PORTER and NELSON HISS (to Combustion Control Co.). U. S. 1,715,511, June 4.

**Mercury-vapor rectifier.** AKTIEN GESELLSCHAFT BROWN, BOVERI & CIE. Swiss 130,560, Feb. 3, 1928. The anode has a protecting cover.

**Electrical calorimeter.** CHRISTIAN HÜLSMEYER. Ger. 476,361, Aug. 24, 1926.

**Plastic conductive composition.** ARLIE W. SCHORGER (to Burgess Battery Co.). U. S. 1,717,171, June 11. A compn. suitable for forming cathodes of flat elec. dry batteries comprises graphite 60, rosin 30, Montan wax 5 and linseed oil 5%.

**Luminous neon tubes.** BATTISTA DEROSI and AGOSTINO D. DEROSI. Fr. 654,544, May 22, 1928. The electrodes are formed of elements having a low at. wt. such as alkali, alk. earth or earth metals.

**Wire filaments.** COMPAGNIE FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS. THOMSON-HOUSTON. Fr. 653,805, May 3, 1928. A non-metallic element such as C is combined with a metal filament such as W by exposing the filament at incandescent heat in a chamber into which a gas contg. C is introduced. The duration of the exposure is controlled according to the increase of resistance of the filament.

## 5—PHOTOGRAPHY

C. E. K. MEES

New uses for Cd [as bromide in light-sensitive gelatin films] (FRANK) 18.

**Photographic processes.** ERNST BURI. Ger. 475,619, Nov. 15, 1927. A gelatin surface which has been exposed and soaked is dusted simultaneously or in sequence with coloring materials which have differing actions thereon. The materials are so chosen that some act more strongly on the highly soaked part of the surface and others more strongly on the less soaked parts.

**Photographic process.** SCHERING-KAHLBAUM A.-G. (Wolfgang Schultz, inventor). Ger. 475,816, Dec. 31, 1927. Two-layer photographic plates for taking direct positives have the layers sep'd. by a lamina of material, e. g., resin or casein, which is dissolved in or decomposed by the usual baths following the exposure.

**Photographic processes.** SOCIÉTÉ DU FILM EN COULEURS KELLER-DORIAN. Ger. 475,655, Dec. 3, 1926. Elements are attached to the surface of cylinders so that their impress remains on light-sensitive films passed thereover after the film is developed.

**Photographic processes.** SOCIÉTÉ CIVILE POUR L'ÉTUDE DE LA PHOTOGRAPHIE ET DE LA CINÉMATOGRAPHIE EN COULEURS. Ger. 475,656, April 8, 1927. A method of producing lenticular film bands is described.

**Sensitive material for color photography.** SOC. CIVILE POUR L'ÉTUDE DE LA PHOTOGRAPHIE ET DE LA CINÉMATOGRAPHIE EN COULEURS. Ger. 476,499, June 4, 1927. See Brit. 289,864 (C. A. 23, 782).

**Photographic prints.** LUXOR-FILM, G. m. b. H. Fr. 653,670, May 1, 1928. Detailed prints are obtained on bichromate colloid layers with a short exposure ( $\frac{1}{4}$  to  $\frac{1}{4}$  sec.) by treating the layer after printing with cold supersatd. water vapor, which may contain weak volatile acids, such as AcOH or CO<sub>2</sub>. The prints are developed directly in cold water, and colored if desired, or they may be subjected first to an addnl. exposure, which may be through the support during or after the vapor treatment. Layers are described which are sensitized by a 3-10% soln. of bichromate, followed by treatment while still wet, with pure water or a weak soln. of bichromate.

**Composition photographs.** ROY J. POMEROY (one-half to Paramount Famous Lasky Corp.). U. S. 1,715,510, June 4. Optical features.

**Photographic plates.** I. G. FARBENIND. A.-G. Fr. 654,989, May 30, 1928. See Ger. 472,890 (C. A. 23, 2895). Photographic plates are rendered free from halo by the application on the reverse side of the plates of an alk. soln. of casein to which has been added a dye such as acid black 2B, nigrosine D or lampblack and CH<sub>2</sub>O.

**Photographic films.** PAUL J. M. LÉBOUCHER. Fr. 652,735, Sept. 20, 1927. To prevent accumulation of electrostatic charges on photographic and cinematographic films, an adherent coating of animal or vegetable albumen, particularly egg albumen, is formed thereon.

**Films for color cinematography.** ALEX PILNY and H. SCHÄRRER. Swiss 131,124, Oct. 29, 1927.

**Apparatus for treating cinematographic film surfaces.** LÉON GILLON and GRATIOUT-LET MAURICE. Fr. 653,955, May 7, 1928.

**Working up old cinematograph films.** HANS PICK. Austrian 112,989, Dec. 15, 1928. The gelatin emulsion is removed with a warm, very dil., soln. of NaOH and the

films are then steeped in a cold *N* soln. of NaOH in order to dissolve the albumen layer used to affix the emulsion to the celluloid. The Ag is recovered from the gelatin soln. obtained in the first step by coagulating, etc.

## 6—INORGANIC CHEMISTRY

A. R. MIDDLETON

The preparation of barium. A. GUNTZ. *Chimie & industrie* Special No., 458-62 (Feb., 1929); cf. G. and Benoit, *C. A.* 18, 2654.—By slowly heating Ba amalgam *in vacuo* to 1150°, a metal was obtained contg. Ba 98.35, Hg 0.83, Fe 0.40, Fe<sub>2</sub>O<sub>3</sub> and SiO<sub>2</sub> 0.05%. Hg and Fe could not be completely eliminated. BaH<sub>2</sub> was obtained by heating Ba amalgam in a current of H; to obtain the BaH<sub>2</sub> pure, the amalgam must be heated progressively and very slowly in H, avoiding fusion, or most of the Hg must be driven off before passing H. On heating the BaH<sub>2</sub> to fusion, Ba is obtained, contaminated with a little Fe from the tube; it is readily purified by sublimation. BaO and Mg heated *in vacuo* in a mild-steel crucible with the end of a water-cooled steel tube placed near the mouth of the crucible give in the crucible a black mass contg. Ba<sub>2</sub>O, and on the end of the water-cooled tube a mixt. of Ba and Mg. Mg reacts with BaO to form chiefly Ba<sub>2</sub>O, which is unstable and which dissociates at high temp. to give Ba; the latter in turn reacts with the MgO formed; an equil. is established so that the proportion of the two metals deposited varies with exptl. conditions. It was concluded from these results that Ba can be prepd. very simply by heating BaO to a high temp. with a compd. having a high heat of oxidation; numerous expts. showed that the best metal is Al, which has a very low vapor tension at 1350°, the temp. required to obtain about 50 g. Ba per operation. Pure Ba has a white metallic luster (when it contains N it is yellow), m. about 850°, has d. 3.78, is volatile *in vacuo* and can thus be sublimed, and readily burns to BaO when heated. When added to one of its fused salts it is rapidly dissolved with formation of sub-salts; BaCl, BaBr, BaI and BaF were thus obtained. The following *heats of formation* were detd.: BaO 134.0, Ba<sub>2</sub>O 149.5, BaCl, 204.3, BaCl 110.4, Ba(NH<sub>2</sub>)<sub>2</sub> 80.2, BaH<sub>2</sub> 40.9, Ba<sub>3</sub>N<sub>2</sub> 31.3 cal. It is unaffected by dry CO<sub>2</sub>; when hot it readily absorbs H or N to form BaH<sub>2</sub> or Ba<sub>3</sub>N<sub>2</sub>, resp.; below 28° it combines with NH<sub>3</sub> gas to form Ba(NH<sub>2</sub>)<sub>2</sub>, which very slowly decomps. in the cold with evolution of H and formation Ba(NH<sub>2</sub>)<sub>2</sub>; when heated in NH<sub>3</sub> gas it forms Ba(NH<sub>2</sub>)<sub>2</sub>, which can give the imide, the reaction being reversible. A bibliography of 46 references is included.

A. PAPINEAU-COUTURE

The Buff compounds and Bunsen salt. FRANZ HÖLZL. *Monatsh.* 51, 157-68 (1929).—Buff in 1854 observed that by satn. of an alc. soln. of H<sub>4</sub>Fe(CN)<sub>6</sub> with HCl substances of the formulas (C<sub>2</sub>H<sub>5</sub>)<sub>4</sub>Fe(CN)<sub>6</sub>·2C<sub>2</sub>H<sub>5</sub>Cl·6H<sub>2</sub>O, (C<sub>2</sub>H<sub>5</sub>)<sub>4</sub>Fe(CN)<sub>6</sub>·6H<sub>2</sub>O and (C<sub>2</sub>H<sub>5</sub>)<sub>4</sub>Fe(CN)<sub>6</sub> were formed. It is now proved that these compds. suffer no sapon. in aq. soln. and are not esters or ethers. The dissoen. is exactly analogous to that of the Bunsen salt (NH<sub>4</sub>)<sub>4</sub>Fe(CN)<sub>6</sub>·2NH<sub>4</sub>Cl or Fe(CN)<sub>6</sub>·H<sub>4</sub>(NH<sub>2</sub>)<sub>4</sub>·2NH<sub>3</sub>·HCl thus: Fe(CN)<sub>6</sub>·H<sub>4</sub>(C<sub>2</sub>H<sub>5</sub>OH)<sub>4</sub> + 2C<sub>2</sub>H<sub>5</sub>OH·HCl. Hence the salt nature is indicated. Vapor pressure measurements prove that H<sub>4</sub>Fe(CN)<sub>6</sub> forms 4 compds. with EtOH, 1 mol. of the acid with 4, 3, 2 and 1 mols. of alc. The compds. are primary, secondary, tertiary and quaternary salts of the tetrabasic acid with the base alcohol, or they are the ethoxonium salts of the related acids.

G. L. CLARK

A new method for the preparation of the fluorine oxide. P. LEBEAU AND A. DAMIENS. *Compt. rend.* 188, 1253-5 (1929).—The authors have previously shown that in the electrolysis of a bath of KHF<sub>2</sub> in the presence of a little H<sub>2</sub>O, a gas contg. F<sub>2</sub>O contaminated with O<sub>2</sub> was liberated (*C. A.* 22, 200). Efforts to prep. the pure gas led to the discovery that most of the O<sub>2</sub> is retained by the soln. when F<sub>2</sub> is passed at the rate of 1 l. an hr. through a 2% soln. of NaOH. The O compd. is unstable and is strongly oxidizing. The final result is expressed by: 2 F<sub>2</sub> + 2 NaOH = 2 NaF + F<sub>2</sub>O + H<sub>2</sub>O. The gas was collected over H<sub>2</sub>O and then liquefied by liquid air. By fractionation a product of purity greater than 97% was obtained. It b. about -167° and freezes below -190°.

H. F. JOHNSTONE

The reaction between cuprous sulfide and metallic lead, tin and especially zinc at the melting point. CARL FRICK. *Metall u. Erz* 24, 465-72 (1927); *Chem. Zentr.* 1928, I, 114.—Upon melting Cu<sub>2</sub>S with Zn, Sn or Pb, a part of the Cu was freed and the S combined with the other metals to give metallic sulfides upon cooling the melt. PbS and SnS form eutectics, ZnS and Cu<sub>2</sub>S only mech. mixts. with Cu<sub>2</sub>S. Cu and Zn or Sn form an alloy within the Cu<sub>2</sub>S regulus. Cu and Pb do not alloy.

F. P. G.



**Amphoteric hydroxides, their aqueous solutions and crystalline compounds.** VIII. GERHART JANDER, DIETRICH MOJERT AND THEODOR ADEN. *Z. anorg. allgem. Chem.* 180, 129-49(1929); cf. C. A. 23, 3147.—A summary of work on simple, isopoly and heteropoly tungstates. Several tungstates were prepd., analyzed and investigated by diffusion and optical absorption expts. Particular attention is given the *parawolframate*,  $\text{Na}_2\text{W}_2\text{O}_7$ , a new compd. The *arsenic polywolframate*,  $\text{H}_2[\text{As}(\text{W}_2\text{O}_7)_2]$  aq., was studied also.

WILLIAM E. VAUGHAN

**Studies in the preparation of pure metallic tungsten.** IV. The degree of hydration of tungstic acid. YOSHIO NAKAZAWA AND TATSUZO OKADA. *Elec. Rev.* 17, 89-94 (1928).—To obtain tungstic acid suitable for the prepn. of pure metallic W, and to study the relation of the method of the formation of tungstic acid to its properties the following methods of prepn. were used. (1) Conc'd. HCl soln. of the acid was evapd.; this gave yellow  $\text{WO}_3 \cdot \text{H}_2\text{O}$  in crystals  $3\mu$  in diam. (2) The conc'd. HCl soln. was dild. by passing  $\text{H}_2\text{O}$  vapor into it; finer yellow crystals of  $\text{WO}_3 \cdot \text{H}_2\text{O}$  were pptd., many of them measuring  $0.3\mu$  in diam. (3) The conc'd. HCl soln. was dild. to 7 *N* HCl with  $\text{H}_2\text{O}$  at ordinary temp.; a light yellow ppt. was formed in which the mean diam. of the particles was  $0.3\mu$ . The compn. varied, but water of hydration was greater than  $\text{WO}_3 \cdot 7\text{H}_2\text{O}$ . The acid resembles the white tungstic acid of Hüttig and Kerr. The first two acids can easily be filtered and washed and lose their  $\text{H}_2\text{O}$  only above  $180^\circ$ . They are suitable for prepn. of pure W. The acid prepd. by the 3rd method cannot be readily filtered and washed and is unsuitable for the prepn. of the metal.

K. SOMEYA

**A study of the composition of sodium bismuth tartrate.** JOHN H. YOE AND JOHN H. MORE. *J. Am. Pharm. Assoc.* 18, 450-9(1929).—The specimens of Na Bi tartrate used had been prepd. by treating  $\text{Bi}(\text{OH})_3$  with NaOH and tartaric acid and pptg. with 95% EtOH. With small amt. of  $\text{H}_2\text{O}$  it forms a gel, which dissolves in more  $\text{H}_2\text{O}$ . The salt so treated remains in soln., however much dild. If treated at once with a large excess of  $\text{H}_2\text{O}$  it forms a cloudy soln. The soln. is alk. to phenolphthalein. Bi was detd. as  $\text{Bi}_2\text{S}_3$  and as Bi by the hyposulfite method. The mean values obtained were, resp., 73.26 and 73.24%. Tartaric acid was detd. by a modification of the method used by Warren (C. A. 19, 1756). The mean values for 3 lots were 14.40, 14.38 and 13.45%  $\text{C}_4\text{H}_6\text{O}_6$ . Mean of all was 14.07 but 14.92 when corrected for soly.  $\text{CO}_2$  detns. gave 0.47, 0.29 and 0.52%, indicating small quantities of  $\text{Na}_2\text{CO}_3$  or  $\text{NaHCO}_3$ . The compn. is evidently Na tetra-Bi tartrate.

L. E. WARREN

The reactions between colloidal  $\text{SiO}_2$  and lime (JOLIBOIS, CHASSEVENT) 2. Hydrogenation and decomposition of silico-organic compounds at high temperature and pressure (IPAT'EV, DOLGOV) 10.

OPPENHEIMER, CARL: *Grundriss der anorganischen Chemie mit besonderer Berücksichtigung der allgemeinen Chemie*. 13th ed., revised. Leipzig: G. Thieme. 332 pp.

## 7—ANALYTICAL CHEMISTRY

W. T. HALL

**Acidimetry and alkalimetry in presence of a few fluorescent indicators, especially umbelliferone.** Y. VOLMAR AND E. WIDDER. *Chimie & industrie Special No.*, 160-3 (Feb., 1929).—The method consisted in titrating the soln. in a quartz (or thin Pyrex glass sufficiently transparent to ultra-violet light) Erlenmeyer flask illuminated by light from a Hg arc filtered through a Wood screen, the titration being carried out in a dark room. Temp. has a slight retarding effect. The intensity of the fluorescence is generally higher in aq. than in alc. solns.; with umbelliferone the max. intensity was observed at about 50% alc. by vol. As little indicator as possible should be used to make the end point sharp. Umbelliferone is the most sensitive indicator, 1 drop of 0.001% soln. giving a clear end point; acridine requires 10 times as much, quinine 100 times and fluorescein 500 times. For titrating strong acids and alkalis at concns. of *N* to 0.1 *N*, fluorescent indicators offer no advantage over the ordinary indicators; but at very high dilns. (0.001 *N*) titrating can be carried out as accurately with umbelliferone as they can be with *N* solns. and ordinary indicators. For org. acids with very dil. solns. umbelliferone gives as accurate results as for strong acids, but the other fluorescent indicators offer no advantages. Boric acid can be titrated more accurately

with umbelliferone (especially in presence of glycerol).  $\text{NaH}_2\text{PO}_4$  is clearly acid to umbelliferone, and less acid to quinine, acridine and fluorescein;  $\text{Na}_2\text{HPO}_4$  is neutral to umbelliferone and quinine, and alk. to acridine and fluorescein;  $\text{Na}_3\text{PO}_4$  is alk. to all the fluorescent indicators. With medium concns. (0.1–0.01 *N*)  $\text{NH}_3$  is best titrated with acridine, with an accuracy equal to that of the titration of strong alkalis; at high dilns. (0.001 *N*) umbelliferone is the best indicator. Acridine and umbelliferone give as accurate results in the titration of alk. carbonate as for strong alkalis. Alkali borates and cyanides can be titrated like strong bases, with either umbelliferone or acridine, but not as accurately. Alkali salts of volatile acids can be titrated with  $\text{H}_2\text{SO}_4$ , either directly by boiling and then by cooling to observe the fluorescence, or by removing the liberated  $\text{AcOH}$  by entrainment with steam. A. PAPINEAU-COUTURE

Zinc uranyl acetate as reagent for sodium. I. M. KOLTHOFF. *Chem. Weekblad* 26, 294–8(1929); cf. *C. A.* 21, 1773; 22, 2898.—A summary of the earlier expts.

E. SCHOTTE

Gravimetric determination of tungsten in the presence of vanadium. A. JILEK AND J. LUKÁŠ. *Chimie & industrie Special No.*, 166–7(Feb., 1929); *Collection Czechoslov. Chem. Comm.* 1, 263–74.—If the soln. contg. W and V is alk., neutralize with  $\text{HCl}$ , add 1 cc. concd.  $\text{HCl}$  and 0.5 g.  $\text{NH}_4\text{OH} \cdot \text{HCl}$ , dil. to 100 cc., boil till the soln. turns blue, add 1 cc. concd.  $\text{HCl}$ , dil. to 200 cc., add 10 cc. of a 2% soln. of  $\text{As}_2\text{O}_3$ , heat to boiling, add quickly a 2% soln. of quinine- $\text{HCl}$  with stirring, let stand 12 hrs. with occasional stirring, filter, wash with 200 cc.  $\text{H}_2\text{O}$  contg. 2 cc. concd.  $\text{HCl}$ , 2 cc. of 2%  $\text{As}_2\text{O}_3$  soln. and 4 cc. of 4% quinine- $\text{HCl}$ , wash with 200 cc. of  $\text{H}_2\text{O}$  contg. 2 cc. concd.  $\text{HCl}$  and 4 cc. of 4% quinine- $\text{HCl}$ , dry, ignite and weigh as  $\text{WO}_3$ . The method is suitable for not more than 0.2 g. of  $\text{WO}_3$  and 0.2 g. of  $\text{V}_2\text{O}_5$ . If more than 0.1 g. of either is present, it is advisable to make a double pptn. if V is to be detd. in the filtrate. In the absence of V, the reduction with  $\text{NH}_4\text{OH} \cdot \text{HCl}$  can be omitted. V can be detd. in the filtrate as follows: evap. to dryness, add 10 cc. of concd.  $\text{H}_2\text{SO}_4$  and a little  $\text{CuO}$  or  $\text{CuSO}_4$ , evap. to white fumes, dil., reduce by boiling with  $\text{H}_2\text{SO}_4$ , boil off the excess, ppt. Cu and As with  $\text{H}_2\text{S}$ , filter, wash, acidify the filtrate with  $\text{H}_2\text{SO}_4$ , boil off  $\text{H}_2\text{S}$ , make slightly alk. with  $\text{NaOH}$ , oxidize to vanadate with a 30%  $\text{H}_2\text{O}_2$  soln. boiling till the excess is destroyed, ppt. with  $\text{Hg}_2(\text{NO}_3)_2$ , filter, ignite and weigh as  $\text{V}_2\text{O}_5$ .

A. PAPINEAU-COUTURE

Detection of vanadium and cerium by hydrogen peroxide. J. LUKÁŠ AND A. JILEK *Chimie & industrie Special No.*, 165(Feb., 1929).—Sec. *C. A.* 23, 2904.

A. PAPINEAU-COUTURE

New general method for the quantitative analysis of an alloy. O. MACCHIA. *Fonderie moderne* 1927, 507–10; *J. Inst. Metals* 39, 547.—A method for the analysis of an alloy contg. Sn, Sb, Ni, Co, Cd, Cu, Zn, Mg, Pb, Al, Fe, Bi and Mn from one original soln. and dispensing with complex reagents is described.

H. L. D.

Determination of phosphorus in steels containing vanadium. ED. ROUSSEAU. *Chimie & industrie Special No.*, 147–50(Feb., 1929).—The following procedures are recommended: *High-speed tool steels*.—Dissolve 1 g. in 15 cc. of 1:1  $\text{HCl-HNO}_3$ , add 20 cc. of boiling  $\text{H}_2\text{O}$ , filter, wash slightly with hot 5%  $\text{HCl}$ , evap. to 8–10 cc., add 10 cc. of 12 *N*  $\text{HNO}_3$ , boil a few mins., add 2–3 cc. of 10%  $\text{NaNO}_2$  and immediately after 30–5 cc. of molybdate reagent, stir, let stand a few mins. and centrifuge. *High Cr steels contg. V*.—Treat 1 g. with 20 cc.  $\text{HCl}$  and 3–4 g.  $\text{KClO}_3$ , first cold, then hot, evap. to about 10 cc., add  $\text{KMnO}_4$  to abundant pptn. of  $\text{MnO}_2$ , boil a few mins., dissolve  $\text{MnO}_2$  with a little  $\text{NaNO}_2$ , wash slightly, conc. to 10 cc., add 10 cc. of 12 *N*  $\text{HNO}_3$  and proceed as above. *V steels sol. in 6 N HNO<sub>3</sub>*.—Dissolve 1 g. in 15 cc. of 6 *N*  $\text{HNO}_3$ , boil a few mins., add 2–3 cc.  $\text{NaNO}_2$  and immediately add the molybdate reagent, and centrifuge. By following these instructions the V at the time of pptn. is in the vanadyl state and the temp. is not above 65°, below which vanadyl salts do not seem to oxidize to vanadic acid.

A. PAPINEAU-COUTURE

Mercurimetric studies. I. Titrimetric determination of the cyanide ion. B. VOTOČEK AND J. KOTRBA. *Collection Czechoslov. Chem. Comm.* 1, 165–72(1929); *Chimie & Industrie Special No.*, 164, (Feb., 1929).—A continuation of V.'s work on the use of  $\text{Hg}(\text{NO}_3)_2$  in titration (cf. *C. A.* 12, 2177; 17, 1769). Na nitroprusside is used as an indicator, forming with the excess  $\text{Hg}^{++}$  an opalescent turbidity due to a ppt. of  $\text{HgFe}(\text{CN})_5\text{NO}$ . A correction must be made to allow for the excess  $\text{Hg}^{++}$  necessary to form the turbidity. Alk. cyanides are detd. by adding an excess of 0.1 *N*  $\text{Hg}(\text{NO}_3)_2$  to convert the  $\text{CN}^-$  into un-ionized  $\text{Hg}(\text{CN})_2$ , then a known vol. of 0.1 *N*  $\text{NaCl}$  to convert the excess  $\text{Hg}^{++}$  into  $\text{HgCl}_2$ , and titrating back the excess  $\text{Cl}^-$  with more 0.1 *N*  $\text{Hg}(\text{NO}_3)_2$ . The results are excellent.  $\text{CN}^-$  and  $\text{Cl}^-$  are detd. in the presence of each other by titrating, in one sample, both  $\text{CN}^-$  and  $\text{Cl}^-$ ; in a second

sample, HCHO is added to remove the  $\text{CN}^-$  as glycolic nitrile,  $\text{CH}_2\text{OHCN}$ , and  $\text{Cl}^-$  alone is titrated. Nitroprussides are detd. by pptn. as  $\text{HgFe}(\text{CN})_5\text{NO}$ , followed by soln. in a known vol. of 0.1 *N* NaCl and by titration of the excess  $\text{Cl}^-$  by 0.1 *N*  $\text{Hg}(\text{NO}_3)_2$ .

J. H. REEDY

**Diphenylamine and diphenylamine blue.** A. THIEL. *Z. Elektrochem.* **35**, 274-8 (1929).—For the colorimetric detn. of  $\text{Ph}_2\text{NH}$  the best oxidizing agent is  $\text{Fe}_2(\text{SO}_4)_3$  in 18 *N*  $\text{H}_2\text{SO}_4$ . The color develops slowly in the cold or at  $100^\circ$  on a water bath in 5 mins. Longer heating has no effect. The color is const. for weeks at room temp. At least 100 moles of  $\text{Fe}_2(\text{SO}_4)_3$  is necessary. One cc. of 40 p. p. m. of  $\text{Ph}_2\text{NH}$  in 50%  $\text{H}_2\text{SO}_4$  oxidized by 9 cc. of satd.  $\text{Fe}_2(\text{SO}_4)_3$  in 50%  $\text{H}_2\text{SO}_4$  gives a measurable color in a 30 mm. layer; 1% of this can be detected. By this reaction the solubilities in water,  $\text{H}_2\text{SO}_4$  and salt solns. are detd.  $\text{Ph}_2\text{NH}$  is a weak base. The absorption spectrum of diphenylamine blue was detd. With moderate excess of oxidizing agent this is a time reaction. It is suggested that the  $\text{C}_6\text{H}_5\text{N}:\text{C}_6\text{H}_4\cdot$  radical by oxidation joins another such radical to give the product.

FOSTER DEE SNELL

**Determination of reducing sugars, especially dextrose, by alkaline copper solutions in the presence of hydrocyanic acid.** H. HÉRISSEY AND A. CHALMETA. *J. pharm. chim.* [8], **8**, 393-406 (1928).—Detn. of dextrose by Bertrand's method (1906) gives low results in the presence of HCN, for several reasons. Methods of obtaining accurate results are: (A) Rapid titration of the alk.-Cu soln. with the sugar soln. until decolorized. (B) Elimination of HCN (a) by complete evapn. on the water-bath; exact results are obtained with simple solns. of dextrose and HCN in pure  $\text{H}_2\text{O}$ . With complex mixts., e. g., crystd. amygdalin in contact for 5 days with  $\text{H}_2\text{O}$  and emulsin of almonds, evap. an aliquot vol. to one half, then restore the vol. with  $\text{H}_2\text{O}$ . Det. the sugar in this soln. by Bertrand's method after defecation with basic Pb acetate and after removing excess of Pb with  $\text{Na}_2\text{SO}_4$ ; (b) by passing a current of air through the simple soln. or through the complex mixt. for 5 hrs.; (c) by chem. means; ppt. HCN with excess of  $\text{AgNO}_3$ , filter, remove Ag with NaCl, filter and det. the sugar by Bertrand's method.

S. WALDBOTT

BOLL, M. AND LEROIDE, J.: *Précis d'analyse chimique. T. III. Anions.* Paris: Dunod. 468 pp. P. 67.

LUNDEGÅRDH, HENRIK: *Die quantitative Spektralanalyse der Elemente und ihre Anwendung auf biologische, agrikulturchemische und mineralogische Aufgaben.* Jena: G. Fischer. 155 pp. M. 18; linen, M. 20.

**Estimation of hydrogen.** SOC. INTERNATIONALE DES COMBUSTIBLES LIQUIDES (Deutsche Bergin A.-G. für kohle und erdolchemie, applicants in Germany). *Fr.* 653,137, April 20, 1928. H in gaseous mixts. is estimated by the measure of the pressure of H diffused through a diaphragm of Pd, Pt or Ir in the form of a small tube closed at one end, and the capacity of which is reduced as much as possible by an inert filling material, which may be formed by a lengthening of the metallic tubular connection to the manometer serving to measure the pressure. The measuring operation is carried out at a temp. of  $300-500^\circ$ .

## 8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY AND J. F. SCHAIRER

**Dispersion of minerals.** A. N. WINCHELL. *Am. Mineral.* **14**, 125-49 (1929).—All of the reasonably accurate data on dispersion ( $\text{F-C}$  or  $\text{H}_\beta\text{-H}_\alpha$ ) are assembled in tabular form. The minerals are classified first in groups of increasing dispersion and then arranged in each group in the order of increasing refringence. A. M. BRANT

**An Illinois record copper erratic.** A. R. CROOK. *Am. Mineral.* **14**, 119-24 (1929).—Includes a list of the specimens of drift Cu found in Illinois with complete data.

A. M. BRANT

**An x-ray study of the domeykite group.** L. S. RAMSDALL. *Am. Mineral.* **14**, 188-96 (1929).—A series of artificial preps. made chiefly by fusion of Cu and As was in entire agreement with the Cu-As system diagram, which is known from pure Cu to Cu 70-As 30%, as shown by microscopic examn. and x-ray photographs. No constituents but  $\text{Cu}_3\text{As}$  and Cu-As solid solns. were found. *Whitneyite*,  $\text{Cu}_3\text{As}$ , was found to be a mixt. of algodonite and Cu-As solid soln. *Algodonite*,  $\text{Cu}_3\text{As}$ , is a definite compd., but is unstable at its m. p., breaking down into  $\text{Cu}_3\text{As}$  and Cu-As solid soln.

**Domeykite**,  $\text{Cu}_3\text{As}$ , is a definite compd., which is unstable at or near its melting point, undergoing a monotropic inversion to a dimorphous form which corresponds to the artificial  $\text{Cu}_3\text{As}$  compd. A. M. BRANT

**Note on hydrophilite**. CHESTER B. SLAWSON. *Am. Mineral.* 14, 160-1 (1929).—Artificial hydrophilite is probably orthorhombic with pseudo-tetragonal development; it has  $\alpha = 1.600$ ,  $\beta = 1.605$ ,  $\gamma = 1.613$ , all  $\approx 0.003$ . Polysynthetic twinning is characteristic. Positive biaxial interference figures were obtained on the wider lamellae. The inversion of  $\text{CaCl}_2$  to an isotropic form, described by Larsen, is thought to be due to the formation of a compd. with the immersion liquids. A. M. BRANT

**Loseyite**, a new Franklin mineral. L. H. BAUER AND HARRY BERMAN. *Am. Mineral.* 14, 150-3 (1929).—The compn. deduced from analysis is  $2\text{RCO}_3 \cdot 5\text{R}(\text{OH})_2$ , where  $\text{R} = \text{Mn}:\text{Zn}:\text{Mg} = 5:4:1$ . The mineral occurs as small lath-shaped bluish white crystals, loosely grouped in radiating bundles in cavities of a narrow vein of altered pyrochroite and susexite along with calcite and chlorophoenicite. It is monoclinic, elongated parallel to b, and biaxial +, with  $2V = 64^\circ$ ,  $Y = b$ ,  $\rho > v$ ,  $\alpha = 1.637$ ,  $\beta = 1.648$ ,  $\gamma = 1.676$ . The sp. gr. = 3.27, hardness = 3; cleavage was not detected. A. M. BRANT

**Mooreite**, a new mineral, and fluoroborite from Sterling Hill, New Jersey. L. H. BAUER AND HARRY BERMAN. *Am. Mineral.* 14, 165-72 (1929).—Clear glassy white crystals of mooreite and bluish white  $\delta$ -mooreite were associated with altered pyrochroite, rhodochrosite and zincite in a vein in the normal ore. The formulas assigned are: mooreite  $7\text{R}(\text{OH})_2 \cdot \text{RSO}_4 \cdot 4\text{H}_2\text{O}$ , where  $\text{R} = \text{Mg}:\text{Mn}:\text{Zn} = 4:1:2$ , and  $\delta$ -mooreite  $6\text{R}(\text{OH})_2 \cdot \text{RSO}_4 \cdot 4\text{H}_2\text{O}$ , where  $\text{R} = 5:3:4$ , resp. Mooreite is monoclinic, with perfect cleavage parallel to (010), hardness = 3, sp. gr. = 2.470. It is biaxial —, with  $2V = 50^\circ$ ,  $X = b$ ,  $Z \wedge c = 44^\circ$ ,  $\rho > v$ ,  $\alpha = 1.533$ ,  $\beta = 1.545$ ,  $\gamma = 1.547$ .  $\delta$ -Mooreite is granular, with imperfect cleavage, hardness = 3, sp. gr. = 2.665. It is biaxial —, with  $2V = 40^\circ$ ,  $\alpha = 1.570$ ,  $\beta = 1.584$ ,  $\gamma = 1.585$ . Fluoroborite in hair-like crystals coated the mooreite. The analyses given indicated the formula  $6\text{MgO} \cdot \text{B}_2\text{O}_3 \cdot 3(\text{F}_2 \cdot \text{H}_2\text{O})$ , the ratio of the  $\text{H}_2\text{O}$  to F being 2:3. It is uniaxial —, with  $\omega = 1.548$ ,  $\epsilon = 1.518$  and sp. gr. = 2.88, or when assocd. with zincite 1.547, 1.522 and 2.92, resp. X-ray spectrographs indicate that fluoroborite is hexagonal. A. M. BRANT

A unique formation of satin spar. V. G. HILLS. *Am. Mineral.* 14, 200-1 (1929).—In a mine at Skouriotissa, Cyprus, which had been closed for 1500 years, were found long, clear, hair-like crystals of selenite up to 13 ins. long. A. M. BRANT

The gold deposits of Colombia: the gold veins of Recreo. W. RINTISCH. *Abhandl. prakt. Geol. u. Bergwirtschaftslehre* No. 16, 37 pp. (1928).—Comprises the general geology of region and description of Au veins in department of Tolima, on Anaimé River. The origin of the deposits and methods of ore treatment are discussed. E. I. S.

**Important gold-cobalt occurrence**. W. F. H. DUDGEON. *S. African Mining Eng. J.* 40, 113 (1929).—A brief description of the Co-Au deposit on Krui River farm in the Middleburg district. The ore carries 3% Co and 10 dwts. Au. E. I. S.

**Copper belt at Mount Perry**. J. T. AMOS. *Queensland Govt. Mining J.* 30, 110-11 (1929).—Unlimited ore is available. E. I. S.

**Amamoor manganese deposits**. C. C. MORTON. *Queensland Govt. Mining J.* 30, 96-8 (1929).—Production is about 1600 tons from two open cuts. The ore is dense psilomelane with 50-54% Mn, and meets requirements of the steel industry as to silica and P contents. E. I. S.

**Microscopic study of complex ores from Colquijirca, Peru, containing copper and silver**. J. ORCEL AND GIL RIVERA PLAZA. *Compt. rend.* 188, 181-3 (1929).—The following types are distinguished: (1) Cu-Ag ores characterized by the constant presence of native Ag or of an argentiferous mineral such as stromeyerite or pyrrargyrite; (2) Cu and Pb-Cu ores including chalcopryrite, bornite, tetrahedrite, sometimes with galena; these are also argentiferous, but much less so than (1); (3) Pb-Zn ores accessory to (2) and with variable % of Ag. The minerals present in each type are enumerated. The gang of all these minerals is formed principally of barite, white colloidal Ag and siderite. The microscopic examn. showed that there exist 2 types of minerals of different origin: (1) deep-seated, including chalcopryrite, sphalerite, galena, pyrite, enargite, tetrahedrite, bornite; (2) minerals of the zone of cementation formed by means of metasomatic replacement of part of the above and characterized by the presence of native Ag and stromeyerite. A. J. MONACK

**Geology of the ball clays of South Devon**. A. SCORR. *Trans. Ceram. Soc. (England)* 28, 53-61 (1929). H. F. KRIEGE

**Rock crystal and diamond pipes in Brazil**. R. R. WALLS. *Geol. Mag.* 46, 111-6

(1929).—Near Diamantina, Minas Geraes, the occurrence of rock crystal in metamorphosed quartzite, where the action of heated vapors was indicated, led to the discovery of potentially diamondiferous pipes. The diamond mines of Sopa and Boa Vista, in the weathered portion of 2 of these pipes, had been worked as ordinary alluvial deposits. A. M. BRANT

The quartz-basalt of Taradake, Japan. T. OGURA. *Geol. Mag.* 46, 68-71(1929).—The formation of this rock may be explained by magmatic differentiation. The phenocrysts of quartz and oligoclase in the upper acid magma (dacite) partly sank down into the lower basic zone and became ingredients of the basalt. The quartz phenocrysts are partly altered to tridymite. A. M. BRANT

An unusual college monument. C. A. BONINE. *Am. Mineral.* 14, 200(1929).—A monument known as the Polyolith containing every known building stone in Pa. stands on the campus of the State College. It indicates how the various stones have withstood weathering during 33 years. A. M. BRANT

The radioactive constituents of hokutolites and other minerals from Japan. JUN YOSHIMURA. *Bull. Inst. Phys. Chem. Research (Tokyo)* 8, 223-7(1929); *Abstract Sect. 2*, 29-30.—The Ra and Th contents of hokutolites, allanite and xenotime from Japan were detd. For Ra Soddy's emanation electroscope was used, and for Th the const. current method. The results are:

Mineral	Locality	Ra (%)	U (U <sub>3</sub> O <sub>8</sub> ) (%)	Th (ThO <sub>2</sub> ) (%)
Hokutolite	Hot spring of Hokuto, Taiwan	$1.73 \times 10^{-7}$	...	0.02
Hokutolite	Hot spring of Shibukuro, Akita P.	$1.22 \times 10^{-7}$		0.01
Allanite	Shirakawa near Kyoto	$4.87 \times 10^{-9}$	0.017	1.05
Xenotime	Ishikawa, Fukushima P.	$6.98 \times 10^{-7}$	2.42	

In the above table, the U content was calcd. from the amt. of Ra, the recognized equil. ratio being applied. The Ra and Th contents of both hokutolites are of the same order of magnitude. The radioactivity of this substance is mainly ascribed to Ra and its disintegration products, the effect due to the Th series being slight, since the quantity of Th present is relatively very small. With the xenotime, the sample used contained assocd. zircon; hence the decompn. was effected by boiling with concd. H<sub>2</sub>SO<sub>4</sub>, and the activity of the evolved emanation was measured; the amt. of Ra shown in the table may, however, include a little from the zircon. Also in *Sci. Papers Inst. Phys. Chem. Research, Suppl.* 10, No. 10, 47-52(1929). G. CALINGAERT

The moon and radioactivity. V. S. FORBES. *Geol. Mag.* 46, 57-65(1929).—On the assumption that the moon was originally derived from the outer layers of the earth, the surface features of the moon can be ascribed to a period of cataclysmic vulcanicity, marked by violent eruptions, releasing the pent-up heat derived from the radioactive constituents. A. M. BRANT

- The U-Th ratio in monazites (IIMORI) 3. Helium in New Zealand (FARR, ROGERS)  
18. The atomic volume relations in certain isomorphous series (HALLIMOND) 2.

IANCOULESCO, AUREL P.: Les richesses minières de la nouvelle Roumanie. Paris: J. Gamber. Reviewed in *J. Inst. Petroleum Tech.* 15, 246(1929).

## 9—METALLURGY AND METALLOGRAPHY

\* D. J. DEMOREST AND R. H. ABORN

The dressing of argillaceous ores. WILHELM WITTE. *Arch. Eisenhüttenw.* 2, 607-12(1929).—The dressing of the limonite ores in Vogelsberg with the Excelsior machine is described; this device works with a sand bath and thick slimes. J. B.

Consumption of reagents used in flotation, 1927. A. M. GAUDIN. *Bur. of Mines, Repts. of Investigations* No. 2931, 17 pp.; *Eng. Mining J.* 127, 999-1003(1929).—An investigation covering trends in the choice of reagents and the extent to which new reagents are displacing less suitable older ones. The general trend has led to the

more extensive use of chem. collector, the more widespread and judicious use of alk. circuits and greatly increased consumption of depressing reagents. W. H. BOYNTON.

**Mechanical preparation of minerals.** VICTOR CHARRIN. *Science & ind.* 1929, 238-40; cf. C. A. 23, 2512.—C. discusses *enrichment by flotation*. Various types of app. are shown and schematic diagrams are used to explain industrial installations.

A. J. MONACK

**Differential grinding applied to tailing retreatment.** LEON M. BANKS AND GEORGE A. JOHNSON. *Am. Inst. Mining Met. Eng., Tech. Pub.* No. 217, Preprint, 11 pp. (1929).—A difference was noted in the type of tailings from upper-level and lower-level ore, the latter contg. hard lime chats bearing blende and the former soft, porous, cellular lime chats contg. varying amts. of blende. The tailings were a mixt. of lime and flint with some shale, most of the blende being attached to the dolomite. Comparison of ball mill and roll-crusher grinding favors the latter, due in the first instance to a marked enrichment of the fines and an impoverishment in the larger sizes, that is not obtained in the roll-crushing. A preliminary concn. can be effected by a quick ball-mill grind, followed by a screening of the discharge. This permits a discard of about 50% by wt. Lab. results were duplicated under operating conditions. W. H. B.

**Influence of varying proportions of ore and slag on the yield of the Siemens-Martin furnaces.** G. BULLÉ. *Met. ital.* 20, 517-32 (1928); cf. C. A. 22, 2131.—A large no. of mixes were made with varying proportions of ore and slag, as well as with ores of different compns., and the yield and compn. of the resulting steels noted. No general conclusions are drawn. A. W. CONTIERI

**The influence of the addition of lime on metal slag systems. A contribution of the question of slag reactions.** E. DIEPSCHLAG AND H. FLIEGENSCHMIDT. *Zentr. Hutten- u. Walzwerke* 31, 551-6, 567-72, 587-90 (1927); *Chem. Zentr.* 1928, I, 112-13. Heating pure  $\text{CaCO}_3$  above the dissocn. point for  $\text{CO}_2$  results in a shrinkage in vol. and the formation of a lattice of crystals. Impurities cause liquefaction and the cementing of the mass. The most shrinkage occurs between  $1200^\circ$  and  $1400^\circ$ .  $\text{CaF}_2$  in quantities to 3% causes a marked lowering of the softening point. The study of the reaction between  $\text{CaO}$  and  $\text{SiO}_2$  confirmed the results of other investigators. Heating  $\text{FeO} \cdot \text{SiO}_2$  with  $\text{CaO}$  for 1 hr. at  $1200^\circ$  displaces  $\text{FeO}$ . The reaction takes place quickly at  $900^\circ$  if  $\text{CaF}_2$  is added because of the increase in liquid phase. FRANCIS P. GRIFFITHS

**Blast roasting at Cerro de Pasco.** GLENN A. KEEP. *Am. Inst. Mining Met. Eng., Tech. Pub.* No. 209, 12 pp. (1929).—Properly crushed ore is mixed with salt, water and sufficient coal or sulfide ore to produce a roasting temp. of  $650^\circ$  to  $700^\circ$ . Addition of correct amt. of moisture is important in yielding a porous mix which will allow passage of air through the charge. When the charge is roasted through on top, air is shut off, the roaster grates are started and the charge is dropped to 22-24 ins. After the red hot calcine is spread evenly over the grate area, a full charge of mix is drawn into the roaster from the overhead bin. The new charge is leveled on top and air pressure turned back on the roaster. The new charge is ignited from the hot bottom layer and proceeds to roast through to the top, completing the cycle. Nine to 10 cycles a day are made. Successful roaster operation depends on good mixing

H. C. PARISH

**Function of steel-plant metallurgy.** R. E. SHERLOCK. *Iron Age* 123, 1639-41 (1929).

**Foundry sands and their applications.** G. C. CASTLE. *Iron & Steel Ind. & Brit. Foundryman* 2, 265-7, 286 (1929).

**Refractory materials for the foundry.** ALFRED B. SEARLE. *Iron & Steel Ind. & Brit. Foundryman* 2, 269-73 (1929).

**The mixing end selection of foundry irons.** J. E. HURST. *Iron & Steel Ind. & Brit. Foundryman* 2, 261-3 (1929).—The phys. properties and chem. compn. of pig Fe are considered in the proper selection of foundry Fe.

**Using scrap in steel, gray iron and malleable mixtures.** E. K. SMITH AND F. B. RIGGAN. *Foundry* 57, 514-8 (1929).—See C. A. 23, 2131.

**The casting of steel ingots.** FRANZ PACHER. *Stahl u. Eisen* 49, 627-45 (1929). The most favorable casting and solidifying conditions are reviewed. The effects of the temp., chem. compn., size, form and cooling of the ingots are discussed. The defects caused by faulty thermal, mechanical and metallurgical treatments are outlined. A new pressure method, similar to the method of Harmet, is given. According to this method, which prevents segregation and piping, a piston subdivided like a telescope is pressed upward against the liquid part of the ingot. J. A. SZILARD

**The fragility of homogeneous iron.** G. SIROVICH. *Met. ital.* 21, 1-17 (1929).—A large no. of photomicrographs were made of various fractures in samples of "homo-

geneous" iron, *i. e.*, low-C steel. S. feels that Italy is not justified in using this type of steel so extensively, as it has lower strength than the higher-C steels, and more of it is required, which is uneconomical to a country so poor in natural resources. The higher-C steels, although somewhat higher priced, more than compensate for this by the reduced amt. required.

**Experiments on the working of galena-wulfenite concentrates.** W. HERTEL. *Metall u. Erz* 26, 115-8 (1929).—Wet and dry methods given in the literature for working the pure Mo ore prove unsatisfactory when used on the galena-wulfenite concentrate. By passing gaseous HCl over the finely divided ore, the Pb and Mo therein may successfully be sepd. Expt. shows that at 390°, heating for 1.75-2.0 hrs., all the Mo above 0.4% is sublimed off. Under these conditions practically all of the Pb is converted into PbCl<sub>2</sub>.

**Cyanide regeneration or recovery as practiced by the Compania Beneficiadora de Pachuca, Mexico.** C. W. LAWR. *Am. Inst. Mining Met. Eng., Tech. Pub. No.* 208, 37 pp. (1929).

**Construction of a (gas) metal-melting furnace.** E. SCHUMACHER. *Gas u. Wasserschiff* 72, 369-75 (1929).—Details of construction of a gas-fired furnace capable of melting up to 50 kg. of brass or bronze in 1½ to 2½ hours, the former value being obtained when the air for combustion is preheated by the products of combustion. R. W. R.

**History of the blast furnace in Steiermark (Austria).** RUDOLF SCHAUR. *Stahl u. Eisen* 49, 489-98 (1929).

**The charging equipment of blast furnaces and its effect on their operation.** HUBERT HOFF. *Stahl u. Eisen* 49, 613-27 (1929).—Construction details are given, with examples from well-known plants.

**Use of blast-furnace and coke-oven gas in open-hearth furnaces.** FRANK R. LEAHY. *Iron Age* 123, 1486-8 (1929); *Blast Furnace and Steel Plant* 17, 857-61 (1929).—The advisability of using a mixed gas composed of blast-furnace and coke-oven gas in open-hearth furnaces under certain economical conditions is pointed out. The construction of the open-hearth furnace, especially the checkers, should be altered for the efficient use of the mixed gas. Figures are given for flame temp. which show the benefit of preheating the blast-furnace gas.

**Large open-hearth furnaces.** F. A. KING. *Blast Furnace & Steel Plant* 17, 850-1 (1929); cf. *C. A.* 23, 2399.—Their advantages are outlined.

**The development of copper mat concentration in the shaft furnace, the reverberatory furnace and the converter.** OTTO BARTH. *Metall u. Erz* 26, 66-9 (1929).—The development of these furnaces in Mansfeld is traced.

**High-purity magnesium produced by sublimation.** H. F. BAKKEN. *Chem. Met. Eng.* 36, 345-7 (1929).—Crude, 90-95% Mg can be refined to a 99.99% Mg by distn. under low pressure. (U. S. Pat. 1,594,345; *C. A.* 20, 3215). A still permits continuous charge and discharge by means of a vacuum lock and a vacuum chamber discharge. The product is obtained as ingots without oxidation.

**South African platinum.** J. SCHLENZIG. *Metallbörse* 19, 1153-4 (1929).—Pt was discovered in the Waterberg district in 1923. Deposits have been found elsewhere; in norite (a metamorphosed volcanic rock) they run about 6 dwt./ton, in sulfide-bearing norite ores contg. 3.5-11.0 dwt./ton, and in the Merensky Reef with a content of 3 dwt. and less/ton. Sulfide-norite ores are concd. by flotation, with eucalyptus oil, paraffin and xanthate, with a recovery of 85-90% of the Pt. With oxidized ores the concentrates are roasted and leached by the so-called German process. For pure sulfide concentrates a chlorination process has proved successful. For horton-olite-dunite ore, with its large particles of metallic Pt, a concentrate is obtained and then amalgamated with Hg, CuSO<sub>4</sub>, H<sub>2</sub>SO<sub>4</sub> and Zn-amalgam.

**Rare metals.** Cobalt, molybdenum, nickel, tantalum, titanium, tungsten, radium, uranium and vanadium in 1927. FRANK L. HESS. *Bur. Mines, Mineral Resources of the U. S.* 1927, Pt. I, 393-453 (Preprint No. 17, published May 1, 1929).

**Secondary metals in 1927.** J. P. DUNLOP. *Bur. Mines, Mineral Resources of the U. S.* 1927, Pt. I, 373-92 (Preprint No. 16, published April 4, 1929).

**Gold, silver, copper, lead and zinc in New Mexico.** CHAS. W. HENDERSON. *Bur. Mines, Mineral Resources of the U. S.* 1927, Pt. I, 455-79 (Preprint No. 18, published May 17, 1929).

**The appearance, prevention and repair of different kinds of flaws in welded and hard-soldered objects.** H. REININGER. *Metallbörse* 19, 482-4, 538-40 (1929).—Flaws or imperfections in joints are divided into 4 classes: (1) those due to shrinkage during cooling, (2) flaws that appear after cooling, due to internal stresses, (3) those due to inclusions of oxides, etc., and (4) flaws due to imperfect union of metal to metal, prob-

ably because of temp. improperly regulated at time joint was made. Mech. processes for preventing and curing such troubles are given. Fluxes ought to melt about 30° lower than the metal used as a solder. W. C. EBAUGH

Causes of corrosion of magnetite electrodes. FRIEDR. VOGEL. *Metallbörse* 19, 761(1929).—Insol. magnetite anodes are made usually from the residues from pyrite burners; the  $\text{Fe}_2\text{O}_3$  so formed is melted in an elec. furnace, poured into molds and tempered. Chem. and microscopic investigations showed that (1)  $\text{SiO}_2$  in  $\text{Fe}_2\text{O}_3$  used should not exceed 3%, and (2) the melted  $\text{Fe}_2\text{O}_3$  should be poured into hot molds and tempered slowly. In faulty anodes it was found that Fe silicates (slags) had segregated, thus forming places of attack. W. C. EBAUGH

Impurities in acetylene. Effects of phosphine on welding. G. LE GRIS. *Welding J.* 24, 345-7(1927); *J. Inst. Metals* 39, 644.—In an air-acetylene flame the phosphine is not completely burnt and some escapes in the free state. Such flames readily give up P to both Cu and Fe, forming phosphide eutectics. In an oxy-acetylene flame, on the other hand, all the phosphine is burnt, and a Cu wire, placed well away from the high-temp. portion of the flame, does not absorb much P. In actual welding practice, however, where the hot part of the flame is used, the phosphine may not be entirely burnt, and P absorption occurs. Expts. with Cu and Fe are described, and the need for purification of the acetylene is emphasized. H. L. D.

Special metals required for extreme temperatures and pressures. A. E. WHITE and C. L. CLARK. *Power* 69, 898-9(1929).—Charts show the phys. properties of various steels up to 1300° F. D. B. DILL

Hardening of metal alloys. W. GUERTLER. *Metallwirtschaft* 8, 510-5(1929).—G. discusses the mechanism of the constitutional changes produced in alloys by heat treatment and mech. working, with particular reference to the analysis of phase diagrams. H. STOERTZ

The technology of the metallographic examination of very hard alloys. KARI. SCHRÖTER. *Z. Metallkunde* 20, 31-3(1928); *J. Inst. Metals* 39, 534-5.—Prepn. for microscopic examn. of samples of so-called hard metals which chiefly contain W carbide in addn. to Ti, Fe, Ce and Cr, is described in detail. Aq. alk. solns. of  $\text{K}_3\text{Fe}(\text{CN})_6$  and mixts. of concd.  $\text{HNO}_3$  and concd. HF were found to be suitable etching reagents. Photomicrographs are given of various cutting metals known as Tizit, Volumit, Lohmanit, Thoran, Miramant, Arboga and Widia. H. L. D.

Torsional modulus of carbon steel, phosphor bronze, brass and Monel metal. W. P. WOOD. *Trans. Am. Soc. Steel Treating* 15, 971-81(1929).—The deflection method being used, modulus detns. were made upon 3 types of steel, P bronze, brass and Monel metal as used in spring construction. In steel, quality and manuf. affect the torsional modulus more than chem. compn. and heat treatment. A decrease in Zn causes an increase with brass. Variations in any of the factors appearing in the ordinary deflection formula for helical springs affects the torsional modulus only slightly. W. A. MUDGE

Influence of the elements upon the polymorphism of iron. FRANZ WEVER. *Arch. Eisenhüttenw.* 2, 739-48(1929).—After a discussion of the classic theories of the structure of mixed crystals and metallic compds., the polymorphism of Fe and the influence of other elements upon it are studied. A relation is demonstrated between the influence of an element upon the crystal structure of Fe and the at. radius of that element or its position in the periodic system. The same relation probably also applies to the structural properties of homogeneous mixed crystal series. H. STOERTZ

Single crystals of iron. H. GRIES and H. ESSER. *Arch. Eisenhüttenw.* 2, 749-61(1929).—A study of methods for the production of Fe single crystals. The influence of initial grain size upon the degree of deformation required to produce recrystn. is considerable. Thus with 250 grains per sq. mm., the degree of deformation required is only 2.85%, while with 22 grains per sq. mm., it is 9.0%. The uniformity of the deformation, crystallite orientation with respect to the force producing deformation, and O content all affect the beginning of recrystn. Pressure figures and reflection phenomena are used in detg. crystallite orientation. Hardness varies on the different crystal faces, being lowest on the cubic face and highest upon the rhombic dodecahedral face. Increased O content produces increased hardness. With 0.03% O, the Brinell no. was 70.2; with 0.141% O, the Brinell no. was 79.6. H. STOERTZ

The change of specific gravity of cold-worked iron and steel by tempering. KANZI TAMARU. *Bull. Inst. Phys. Chem. Research (Tokyo)* 8, 187-96(1929); *Abstract sect. 2*, 25-6.—The temp. of strain-release for Fe and steel was detd. from change of density and was found to be 400° for all specimens treated. Armco Fe showed a max. at 150° and a min. at 400°. The values of the max. and the min. decreased with the C content



of the steel, disappearing finally at 0.2% C. When the strained specimen is tempered at a low temp., a min. increase in grain size takes place, and hence, the sp. gr. increases to yield a max. If the tempering temp. is raised still higher, the interior of the grain seps. into a series of thin layers and increases the total surface of the grain, thus yielding a min. d.

G. CALINGAERT

Effects of nickel and chromium on cast iron. I. D. HANSON. *Metallurgist* (Suppl. to *Engineer* 147, Mar. 29) 38-40(1929).—As the % of Ni is increased to 20, Brinell hardness passes through a max. at 2% Ni and a min. at 3% Ni. Then there is a slight rise followed by a continuous decline. Micro-structures are illustrated and explain the shape of the curve. The first effect of Si is similar but there is no second max. Increasing concn. of Si gives graphite and a soft weak matrix. II. *Ibid* (Suppl. to *Engineer* 147, Apr. 26) 56-60.—The effects of Ni and Si together can be explained on the assumption that each element exerts its characteristic influence and that the final result is essentially the sum of the 2 effects. With good quality gray iron, Si decomposes free carbide, eliminates chilling, softens the matrix; Ni decomposes free carbide but hardens the matrix; Cr stabilizes free carbide, increases chilling and hardens the matrix.

D. B. DILL

The influence of nickel on combined carbon in gray iron. J. R. HOUSTON. *Trans. Am. Soc. Steel Treating* 15, 145-53(1929).—Ni is a "pearlite builder" in gray Fe and permits a control of the amt. and structural form of combined C to give density to heavy sections and machinability to light sections.

W. A. MUDGE

Graphitization in the presence of nickel. H. A. SCHWARTZ. *Trans. Am. Soc. Steel Treating* 15, 957-66(1929); cf. *C. A.* 23, 2136.—Si is inoperative as an accelerator in the presence of Ni. No explanation is offered for the different behavior of Si and Ni as accelerators.

W. A. MUDGE

The thermal conductivities of gray cast irons. J. W. DONALDSON. *Proc. Inst. Mech. Eng.* (London) 1928, 953-83.—App used for detg. the thermal conductivities was based on the guard-ring method. Heat is applied at one end of the test bar and its enclosing guard ring or tube while sep. calorimeters remove the heat from the other end of the test bar and guard ring. Three thermocouples 4 ins. apart give temp. differences along the test bar. Series of tests were made on 4 plain irons and several alloy irons. Increasing Si reduced cond. Within the present P variation (0.17-0.81%) its effect on thermal cond. is small. Cr and W increase cond. while Ni and V decrease it. Heat treatment at 550° at first increases the thermal cond. because pearlite decomposes to form ferrite and graphite, after which the oxidation of iron in the vicinity of the graphite flakes causes a slight decrease. Free ferrite appears to be a much better conductor of heat than eutectoid pearlite.

A. W. HOLMES

Deoxidation of steel with silicon. C. H. HERTY, JR., AND G. R. FITTERER. *Trans. Am. Soc. Steel Treating* 15, 569-84(1929); cf. *C. A.* 23, 801.—Complete deoxidation of steel is impossible unless the oxide formed is infusible and insol. at steel-making temps. Silicates high in Fe or Mn are more readily eliminated from the bath than high silica particles because of their lower m. p.

W. A. MUDGE

The manufacture of acid open-hearth steel for forging ingots. H. P. RASSBACH. *Trans. Am. Soc. Steel Treating* 15, 289-302(1929).—A description of modern open-hearth furnacing with particular reference to the casting of a 210 ton ingot.

W. A. M.

Oxygen in iron and steel. II. Influence of oxygen upon the structure and a few properties of various structural steels. P. OBERHOFFER, H. HOCHSTEIN AND W. HESSENBRUCH. *Arch. Eisenhüttenw.* 2, 725-38(1929).—A comparison of O-rich and O-poor Ni, Ni-Cr, Cr-W, W, Cr, Mo and V steels, with respect to behavior in casting and in forging, and effect upon red shortness, crystal structure, hardness, etc. O content ranged from 0.005% to 0.062%. Steels high in O show a coarser structure than O-poor steels, and thereby exhibit a greater tendency to an internal cryst. structure and a complicated arrangement of ferrite and perlite. In the investigation of red shortness, Jansen's formula (O-Mn 16/25) is found to hold for these steels. In the process of cementation, O-rich steels show a small depth of cementation zones and a small irregular grain in the hypereutectoid zone. V steels show abnormal structure throughout. The range of hardness of O-poor steels is greater than for O-rich steels. The latter tends strongly to overheating. In O-poor steels, the decrease in hardness takes place in a small temp. range, while O-poor steels tend to scale fracture. Conclusive results were not obtained as to the effect of O upon the production of brittleness.

H. STOERTZ

Hair-line cracks upon the surface of (steel) plates. ERICH A. MATEJKA. *Arch. Eisenhüttenw.* 2, 681-705(1929).—The chief cause seems to lie in the great difference in temp. between the inside and surface of the material to be rolled. It is above all

essential that the rough block as well as the block for preliminary rolling be uniformly preheated, any appreciable temp. difference between the surface and center of the piece being avoided. Finally, it is important that the proper relation between rolling pressure and temp. be chosen to avoid overloading the surface particles of the metal.

Steels are now available for high pressures and temperatures. H. STOERTZ AND J. J. KANTER. *Power* 69, 904-5(1929).—High-temp. strengths of alloy and cast steels are shown graphically up to 1200° F.

Depth and character of case induced by mixtures of ferro alloys with carburizing compounds. E. G. MAHIN AND R. C. SPENCER. *Trans. Am. Soc. Steel Treating* 15, 117-41(1929).—A deep case without a zone of free cementite has been produced by mixing 20% Fe-Si with an ordinary carburizer and using higher temps. The time of the operation is shortened.

Solubility of carbon in normal and abnormal steels. OSCAR H. HARDER AND WILLARD S. JOHNSON. *Trans. Am. Soc. Steel Treating* 15, 49-62(1929).—Pptn. takes place at higher temps. in abnormal steels with similar C contents. The amt. of C taken up by normal and abnormal steels becomes essentially the same as the carburizing temp. increases. Photomicrographs show typical structures.

Magnetic investigations of carbon steels. CLIFFORD C. QUELL. *Trans. Am. Soc. Steel Treating* 15, 630-51(1929).—A drop in magnetism occurs from 150 to 200° in steels contg. Fe<sub>3</sub>C. In steels contg. only martensite decreased magnetism occurs at 300°.

Steel failures in aircraft. F. T. SISCO. *Trans. Am. Soc. Steel Treating* 15, 589-624(1929).—A discussion of failures in steel aircraft parts which have been investigated at Wright Field.

Surface cooling of steels in quenching. H. J. FRENCH, G. S. COOK AND T. E. HAMILL. *Trans. Am. Soc. Steel Treating* 15, 217-84(1929).—The characteristics of the cooling curves of 1/4-1 1/4 in. diam. steel spheres in H<sub>2</sub>O, NaOH solns., oils and air and the effects of some of the variables encountered in com. heat treatment. Center and surface cooling curves obtained for pressure spray quenching with H<sub>2</sub>O are correlated with tensile and impact properties.

Service annealing of sling and crane chains. WM. J. MERTEN. *Trans. Am. Soc. Steel Treating* 15, 193-209(1929).—Heat treatments are given for original and service annealing. An initial, high temp. treatment above AC<sub>3</sub> for grain refinement is imperative.

The effect of furnace atmospheres on steel. R. G. GUTHRIE. *Trans. Am. Soc. Steel Treating* 15, 96-105(1929).—Scaling or oxidation with O<sub>2</sub> does not cause decarburization at 1500° F. CO<sub>2</sub> alone both decarburizes and oxidizes.

Austenitic decomposition and length changes in steel. EDGAR C. BAIN AND WILLIS S. N. WARING. *Trans. Am. Soc. Steel Treating* 15, 69-90(1929); cf. *C A* 23, 585.—A preliminary study with an oil-hardening die steel and a stainless steel to show that the efficiency of quenching mediums and knowledge of the nature of the steel may be obtained by measuring length changes during quenching.

Studies on martensite. J. ORLAND. *Anal. usoc. ing.* (Madrid) 8, 28-39, 141-53(1929).—Martensite is not a solid soln. of  $\gamma$ -iron and C. It is always present in needle-like form and in 2 distinct phases distinguishable by etching with nitric or picric acid. insol. white needles being allied with austenite grains.

The martensite system. K. GEBHARD, H. HANEMANN AND A. SCHRADER. *Arch. Eisenhüttew.* 2, 763-71(1929).—A thermal and photomicrographic investigation of martensite, using electrolytic Fe and steels with C content ranging from 0.06 to 1.75%. The heterogeneity of martensite is established, as well as the existence of a second metastable system of Fe-C alloys. Photomicrographs and a phase diagram of the martensite system are included. In the metastable martensite equil. only  $\epsilon$ -Fe occurs up to about 0.1% C. From 0.1 to 0.37% C, martensite consists of  $\epsilon$ -Fe and *heynite* ( $\delta$ -phase), while between 0.37 and 0.9% C, *heynite* and *hardenite* ( $\eta$ -phase) are the constituents of martensite. With more than 0.9% C, a quenched steel contains *hardenite* and *austenite*, the austenite increasing as C increases. If the steel contains more than 1.1% C, the  $\eta$ -phase crystallizes from the  $\gamma$ -Fe immediately. If the equil. is not completely established, hardened steel contains austenite even with less than 0.9% C, and *heynite* even with more than 0.9% C.

Further observations on the microstructure of martensite. FRANCIS F. LUCAS. *Trans. Am. Soc. Steel Treating* 15, 339-64(1929).—A further contribution to the microstructure of martensite. Excellent photomicrographs at high magnification show representative structures in quenched and tempered conditions. A martensitic needle

is a decompn. along the octahedral crystallographic planes of austenite, has a mottled granular appearance and is confined to an area of uniformly oriented austenite. It is an aggregate and not a solid soln. and indicates a decompn. of the austenite, probably to  $\alpha$  Fe and  $\text{Fe}_3\text{C}$  highly dispersed.

Comparative tests of tool steels. L. PERSOZ. *Aciers spéciaux* 4, 121-3 (1929).—W. A. MUDGE  
P. presents a fairly complete review of the subject. A. J. MONACK

A study of the constitution of high-manganese steels. V. N. KRIVOBOK. *Trans. Am. Soc. Steel Treating* 15, 893-928 (1929).—A study of the constituents of austenitic Mn steel (Hadfield) under different conditions of treatment. Austenite is decompd. by cold working followed by heating to suitable temps. W. A. MUDGE

High-chromium steels. OWEN K. PARMITER. *Trans. Am. Soc. Steel Treating* 15, 796-816 (1929).—A general discussion of compn., heat treatment, phys. properties and resistance to corrosion of low-C stainless steel types and several high-C-Cr die types. W. A. MUDGE

An investigation of the physical properties of certain chromium-aluminum steels. FRANK B. LOUNSBERRY AND WALTER R. BREELER. *Trans. Am. Soc. Steel Treating* 15, 733-62 (1929).—Alloys contg. 2-6% Al, 7-13% Cr and 1% Si plus C were investigated. Al effectively stabilizes the  $\alpha$ -Fe phase and, when in combination with Cr, greatly increases the resistance of the metal to oxidation at elevated temps. W. A. MUDGE

Surface hardening of special steels with ammonia gas. RAYMOND H. HOBROCK. *Trans. Am. Soc. Steel Treating* 15, 543-57 (1929). See C. A. 23, 1607. W. A. M.

Cutting qualities of an alloy steel as influenced by its heat treatment. O. W. BOSTON AND M. N. LANDIS. *Trans. Am. Soc. Steel Treating* 15, 451-67 (1929).—The S. A. E. 6140 steel cuts best when spheroidizing is greatest. The drill torque increases as machining qualities are improved. There is no relation of drill thrust to machining qualities. W. A. MUDGE

A new method for heat treating high-speed steel. HORACE C. KNEER. *Trans. Am. Soc. Steel Treating* 15, 429-45 (1929).—Features of the method describe induction heating of salt baths, prolonged container life and a salt bath, which does not give off fumes or attack the tools. W. A. MUDGE

High-carbon, high-chromium steels. J. P. GILL. *Trans. Am. Soc. Steel Treating* 15, 387-420 (1929).—A comparison of the heat treatment, phys. properties and microstructures of 6 high-C, high-Cr die steels. W. A. MUDGE

Stainless iron and its application to the manufacture and transportation of nitric acid. WALTER M. MITCHELL. *Trans. Am. Soc. Steel Treating* 15, 303-26 (1929); cf. C. A. 23, 2919.—A discussion of the Cr and Cr-Ni stainless steels with special reference to resistance to corrosion in the  $\text{NH}_3$  oxidation process for  $\text{HNO}_3$ . W. A. M.

Chromium-copper steels as possible corrosion-resisting ferrous alloys. B. D. SAKLATWALLA AND ALBERT W. DEMMLER. *Trans. Am. Soc. Steel Treating* 15, 36-48 (1929).—Phys. properties and resistance to corrosion are given for Cr-Cu steels contg. com. and practical ranges of the 2 elements to show possibilities of high strength with fair corrosion resistance at a reasonable cost. W. A. M.

The stress-strain diagrams of a heat-treated nickel-chrome steel. I. Compression tests. ANDREW ROBERTSON AND A. J. NEWPORT. *Metallurgist* (Suppl. to *Engineer* 147, Feb. 22) 23-6 (1929).—Tests were made on tubes  $1\frac{1}{4}$  in. in diam., 18 gage, contg. C 0.25, Ni 4.1 and Cr 1.25%. If tempered at 700-750° and cooled in air, the elastic limit is low. If hardened at 800-900° and tempered at 400°, it has an elastic limit of 60 tons per sq. in. and is toolable. There is evidence of definite "mass" effect as slow cooling and air cooling have unlike results. II. *Ibid* (Suppl. to *Engineer* 147, Mar. 29) 35-6.—Tension tests were carried out on steel bars of the same material. Stress-strain diagrams are similar to those obtained by compression tests. D. B. D

Methods of approximating certain physical characteristics of nitrified steel cases. G. M. HATON. *Trans. Am. Soc. Steel Treating* 15, 1-24 (1929).—The Vickers diamond indenter hardness tester offers a practical method for inspecting nitrified steel products. W. A. MUDGE

Properties of carburized tungsten. B. T. BARNES. *J. Phys. Chem.* 33, 688-91 (1929).—A study is made of the spectral and total emissivity and m. p. of  $\text{W}_2\text{C}$ . The spectral emissivity measurements were made on tubular, pressed W filaments, carburized and uncarburized, a pyrometer being used. The emissivity measurements of surface carburized to  $\text{W}_2\text{C}$  showed an increase of 0.03 at any given temp. Total emissivity measurements were made on 10-mil. W filaments before and after carburizing; these results are shown graphically. As with spectral emissivity there is an increase in total radiation with increased carburization. The carbide layer was usually of uni-

form thickness, independent of crystal boundaries; decarburization is less regular. A method for detg. the m. p. is summarized.

Present status of tungsten carbide as cutting material. F. C. SPENCER. *Am. Mach.* 70, 865-7; *Abrasive Ind.* 10, No. 7, 23-4 (1929).—A.S.M.E. committee rept.

Latest results from tungsten carbide tools. W. P. EDDY, JR. AND H. J. LONG. *Machy.* (N. Y.), 3, 783-4; *Iron Age* 123, 1414-6 (1929).

Nickel-chromium alloys in electrical resistance heating. W. R. BARCLAY AND G. E. M. STONE. *Elec. Times* 73, 82-4 (1928); *J. Inst. Metals* 39, 624-5.—Of the alloys so far developed the Ni 80, Cr 20% binary alloy for use at temp. up to 1100° (wire temp.), and the ternary alloy contg. Ni 60/65, Cr 12/15%, and remainder Fe for temps. up to 850° (wire temp.), are among the most valuable. The alloys are worked hot in the early stages, but the later stages of the manuf. of tapes and wire are carried out cold.

Solubility of cupric sulfide in cuprous sulfide at high temperatures. I. G. VUKOV. *Metall u. Erz* 26, 137-41 (1929).—Electrolytic Cu and pure S are heated together in various proportions in a vacuum elec. furnace at 1140-1180°. Increasing S content lowers the f. p. of the mixt. Free S is not found until the S content exceeds 22.4%, corresponding to 16% CuS. Microscopic examn. of the melts shows that up to 16% CuS, the sulfides form solid solns. with one another.

Contribution to the metallurgical study of antique bronzes. BUTESCU. *Ann. Mines* 13, 177-92 (1928); *J. Inst. Metals* 39, 681.—Particulars of the analytical and metallographical examn. of some antique bronze swords, axes, daggers, etc., found in Rumania. The majority of these contained from 11 to 13% Sn, but 1 or 2 contained considerably less. Zn was absent, and the Pb content was usually very small, and never more than 1%. They showed the dendritic structure characteristic of cast metals, but it is not stated whether evidence of working or deformation after casting was found. The objects probably belong to the period 1400-1100 B. C.

Study of nickel-copper alloys. ALEXANDRE KRUPKOWSKI. *Rev. métal.* 26, 131-53, 193-208 (1929); cf. *C. A.* 23, 1544.—The Ni-Cu alloys used were carefully homogenized by annealing for several days at 800-900°. The measurements were made with very accurate instruments and by the most sensitive methods. The conclusions follow: (1) The line of magnetic transformation is a straight line which cuts the horizontal corresponding to *abs.* 0° extrapolated from measurements down to -250° at a compn. of 41.5% Ni by wt. (2) The crit. pts. corresponding to the transformation  $Cu_{\alpha} \rightarrow Cu_{\beta}$  for alloys ranging from 2.1 to 38.8% Ni were detd. by low-temp. elec. resistance methods. (3) From the shape of the  $\alpha$  (elec. resistance temp. coeff.) curves, it was detd. that immediately after the transformation  $Cu_{\alpha} \rightarrow Cu_{\beta}$ ,  $Ni_{\alpha} \rightarrow Ni_{\beta}$  the value of  $\alpha$  decreases and passes through a min. This favors the formation of alloys having a const.  $\alpha$  coeff. over a certain temp. range, *e. g.*, *constantan*. (4) From the shape of the curves of the transformation  $Cu_{\alpha} \rightarrow Cu_{\beta}$  and  $Ni_{\alpha} \rightarrow Ni_{\beta}$ , Ni-Cu alloys have been divided into 2 classes in accordance with Tamman's theory; in the 1st class of alloys, contg. 0-41.5% Ni, Cu acts as solvent, and in the 2nd class, contg. 41.5-100% Ni, Ni acts as solvent. The 1st class of alloys are not ferro-magnetic at any temp.; the 2nd class can be either ferro- or para-magnetic according to the temp. (5) Micrographic examn. showed the existence of solid solns. in all Cu-Ni alloys, there being no modification in structure either in passing from the para- to the ferro-magnetic state or in passing from alloys in which Cu is the solvent to those in which Ni is the solvent. (6) Careful examn. of the curves of elec. resistance, of temp. coeff. of elec. resistance, of thermo-elec. force and its variation with temp., of expansion coeff., of hardness coeff., of coeff. of soln. *e. m. f.* taken in connection with the results of metallographic examn. contradicts the existence of a compd. CuNi.

Influence of aluminum, lead, iron and tin in brass. I. ANON. *Z. Metallkunde* 21, 152-9 (1929).—The effect of Al, Fe, Pb and Sn upon brass is studied. 0.5 to 0.9% Al is used, Zn being replaced in the ratio 1Al = 4Zn; 0.2 to 2.0% Fe is merely added without change in Cu and Zn; this is likewise true of Pb (0.2 to 4.0%), while the content of 1 to 6% Sn investigated replaces Zn in the ratio of 1Sn = 3Zn. The results are as follows: Pb addn. strongly suppresses the values of reduction in area and strength in bending and torsion tests for brass contg. 57, 60 and 65% Cu. In the proportions used very little effect was obtained from Fe, other than a slight increase in mech. strength and decrease in elongation. With both 62 and 68% brass, replacement of Zn with Al produces an increase in tensile strength and a considerable decrease in elongation, reduction in area, and drawing ability. The replacement of Zn by structurally equiv. quantities of Sn produces improvement in mech. properties. The greatest influence is

upon elongation, the value of which is increased about 100% with a Sn content of 5%.

H. STOERTZ

**The properties of industrial gold alloys.** ERNEST A. SMITH. *Metal Ind.* (London) 34, 342-4, 352, 373-4 (1929).—An increase beyond 7% Zn in 9 carat Au tends to produce brittleness. Usually the hardest, strongest and best working alloy for any given carat is obtained by equal parts of Ag and Cu. Other proportions must sometimes be used for a desired color. Au with 60% Ag is quite white. An alloy of 90% Ag-10% Au is sold as white Au for gem setting. It holds its color longer than pure Ag. Green Au is made with 25% Ag. If 18 carat Au alloyed with 25% Cu cools slowly, a mol. change occurs rendering the alloy hard and brittle. Quenching the alloy above 400° gives a malleable and ductile metal. Other Au-Cu alloys show the same phenomenon to a lesser extent. The hardest of all triple alloys, Au 50, Ag 25 and Cu 25%, has a Brinell hardness of 150. When subjected to the same amt. of rolling, Au-Cu alloys harden more quickly than Au-Ag alloys. Usually all Au alloys are satisfactorily annealed by heating for a few minutes at 650° to 700°.

H. C. PARISH

**The melting of aluminum and its alloys in melting pots.** EDMUND R. THIEWS. *Metallbörse*, 19, 425-6, 481-2 (1929).—In melting Al and its alloys care must be taken to guard against the reaction of the metal with O, N, hydrocarbons and the material of which the pot is made. The presence of Fe and Si in the alloy formed is often very harmful. As fluxes, Na and K compds. with Cl or F are widely used. Iron and steel vessels of higher C and Si content are better than those of purer Fe, e. g., total C 3.5, combined C 0.40, Mn 0.80, S (max.) 0.15, P 0.50 and Si 2.25%. The addn. of 2% Cr increases resistance to action of furnace gases. Ordinary steel or semi-steel should never be used. Painting the pot with Al varnish is recommended. Fireclay and MgO mixts. have been used to coat the inside of the pots. Better results come from Ca(OH)<sub>2</sub> or CaO-graphite pastes rubbed into the walls with steel brushes.

W. C. EBAUGH

**Radiography of light metal alloys.** S. H. ANDERSON AND L. MARICK. Univ. of Wash. Eng. Expt. Sta., *Bull.* No. 49, 18 pp. (1928).—Work was undertaken to det. under what conditions of voltage, tube current and exposure best contrast is obtained for particular castings and shapes radiographed. The effect of various factors involved in technic of radiography are brought out.

E. I. S.

**Dilatometric investigation of the thermal effects on annealing duralumin and its structural components.** M. HAAS AND H. HECKER. *Z. Metallkunde* 21, 166-73 (1929).—Measurements are made with the Universal Dilatometer of Oberhoffer-Esser, and include duralumin, Al-Cu, Al-Mg<sub>2</sub>Si, Al-Cu-Mg<sub>2</sub>Si and the German duralumins 681, 681B and 681B <sup>1</sup>/<sub>2</sub>. Varying Mn content appears to be of small influence upon the dilatometer curves. The bend in the curves between 250° and 300° can be due only to the sepn. of Mg<sub>2</sub>Si from the supersatd. soln. The results show that an upper limit of 520° in the heat treatment is sufficiently high to take into soln. all of the hardening constituents (Mg<sub>2</sub>Si and CuAl<sub>2</sub>), and also indicate that working temps. for parts made of duralumin should not be above 200°.

H. STOERTZ

**Immersion or dip gilding on brass jewelry and novelties in a red or 14-carat gold shade.** JOSEPH TRISKA. *Monthly Rev. Am. Electroplaters' Soc.* 15, No. 8, 13-4 (1928); *J. Inst. Metals* 40, 638 (1928).

E. H.

**Comparison of the thickness of oxide layers determined from tempering colors and by weighing.** G. TAMMANN AND K. BOCHOW. *Z. anorg. allgem. Chem.* 169, 42-50 (1928).—From the thickness of an air layer sufficient to produce a color equiv. to the tempering color in question the thickness of the tempering color can be detd. by the equation  $d_f = l/n$ , where  $l$  = thickness of air layer in  $\mu\mu$ ,  $n$  = the refractive index of the tempering layer and  $d_f$  = the thickness of the tempering layer. By weighing a plate before and after tempering to a certain color, the thickness of the tempering film can be detd. according to the equation  $d_o = \frac{(\Delta g \times a \times 100)}{(S \times q)}$ , where  $\Delta g$  = increase in weight of plate,  $a$  = ratio of equiv. wt. of oxide formed to equiv. wt. of O,  $S$  = sp. gr. of oxide and  $q$  = area in sq. mm. If the metal surface in consideration were in such a condition, when the plate is weighed, as to be free from a layer which might affect the optically detd. thickness, then  $d_o$  would have to equal  $d_f$ . However, if this is not the case,  $d_f = d_o + d_a$ , where  $d_a$  is the thickness of a layer present upon the metal before tempering and upon the oxide layer after tempering. Expts. show that  $d_a$  is equiv. to an oxide layer of 80 to 120  $\mu\mu$  in thickness and that this layer is present before and after tempering. Ni plates 0.1-0.2 mm. thick were carefully polished and treated in an extn. flask with alc. and alc. vapor until the weight remained const. upon a microbalance. The plates were placed in heat-treating furnaces at the desired

temps. When the plates had been in long enough to attain the desired colors they were removed and weighed. Plates uniformly tempered were used since nonuniformity would give erroneous results. Errors of  $30\mu$  were not visible to the human eye and such errors did occur between different crystals of the metal sheet. Another set of expts was made by preheating the metal in an atm. of H to  $500^\circ$  or  $600^\circ$  and cooling in H, weighing to const. wt. and tempering to the desired color. Repetition of the reduction after tempering gave results in which the loss in wt. upon reduction was much less than in the first case. The mean difference  $d_f - d_g$  is about  $99\mu$  and is attributed to the existence of NiO, hydrated NiO, absorbed air and steam. Hence it is seen that there is present a layer of substance which apparently changes the thickness of the actual layer about  $100\mu$  when detd. by the temper color method. The difference for Cu was about  $91\mu$ , for Fe  $85\mu$ . Since the sp. gr. and  $n$  of FeO were not known, those of NiO were used in computation.

B. F. ROETHLI

**Rolled and welded-on coatings and oxidation of light metals.** F. RACKWITZ. *Z. ges. Gewerkspraxis* 50, No. 18 (*Das Metall*), 69-70(1929).—Metal coatings of different kinds can be advantageously applied to Fe-Al alloys and other metals by certain rolling processes. Plating of Fe with Al is carried out by the Jordan process, Al being applied under high pressure and then rolled down to plate thickness; or by the Trier process in which Al is cold-rolled on Fe. Al can also be applied in like manner to other metals. The protection of light metals by oxidation is discussed.

E. I. S.

**Recent progress in the study of corrosion.** G. D. BENGOUGH. *Chimie & Industrie Special No.*, 134-40(Feb., 1929).—An address reviewing Whitney's theory of corrosion and its modifications resulting from subsequent investigations, particularly by British and American investigators, and dealing only with corrosion by water and by salt solns.

A. PAPINEAU-COUTURE

**Anodic oxidation as a means for protecting aluminum valves from corrosion.** W. ELSNER v. GRONOW. *Gas. u. Wasserfach* 72, 429-36(1929).—Al valves and similar articles may be protected from corrosion by a surface film formed by electrolysis in  $3\%$  chromic acid or similar solns., with a potential up to 50 v. and with a c. d. of 0.3 to 0.4 amps. per sq. dm. for pure Al, although many alloys require a greater current. The temp. should be held at  $40 \pm 2^\circ$  or defective coatings will result. Alloys contg. over 5% Cu cannot be protected by this method.

R. W. RYAN

**Corrosion experiments with iron.** WILHELM VAN WÜLLEN SCHOLTEN. *Gas u. Wasserfach* 72, 456-8(1929); cf. *C. A.* 23, 83.—A review of exptl. technic and theory of iron corrosion, with 33 literature references.

R. W. RYAN

**The corrosion of metals and light metals by [liquid] fuels.** ERICH K. O. SCHMIDT. *Auto-Tech.* 16 (15) 7-9(1927); *Metallbörse* 17, 623-4, 681-2; *J. Inst. Metals* 39, 522. Expts. on the corrosion of steel, Cu, brass, Al, duralumin and other metals by benzene, benzene, alc. and various mixts. are described and discussed.

H. L. D.

**Results of investigations to establish the cause of the corrosion of sheet metal by motor fuels.** WAWRZYNOK. *Auto-Tech.* 16 (21), 23-25; (22), 19-28(1927); *J. Inst. Metals* 39, 522.—Although tin resists the corrosive action of motor fuels, it does not necessarily protect other metals from this action when it is used as a coating metal Pb and Zn protective coatings are practically completely removed by prolonged contact with gasoline and gasoline-alc. mixts. Certain brands of Al sheet and the non-rusting V2A steel behave satisfactorily, but the effect of lapping, welding and riveting these metals has not yet been studied.

H. L. D.

**The resistance of some metals to the action of nitric acid.** W. SCHMIDT. *Metallbörse* 17, 2415-6(1927).—W. describes various expts. on the corrosion of Al, Al alloys, Cr-Fe, Cr-steel, Cr-Ni-steel and various alloys by  $\text{HNO}_3$  of different concns., and discusses the results.

H. L. D.

**The application of cadmium as rust-protecting medium by the Udylyte method.** EDWARD D. FELDMAN. *Metallwaren-Ind. u. Galvano-Tech.* 26, 8-9(1928); *J. Inst. Metals* 39, 589.—The properties of Cd are discussed. The advantages of Cd deposits over the Ni and Zn deposits for the protection of various metals against rust are dealt with. In expts. on comparative rust resistance, rust was produced on Ni-plated articles after 2 hrs., on hot zincd articles after 650 hrs., and on Udylyte-plated articles after 1860 hrs. Cd is specially good as a between-deposit of metal in various compd. electroplating methods. Cd-Cr plating has many advantages. The Udylyte method is described, the compn. of the electrolyte is considered, and the production of glossy and matt deposits is dealt with.

H. L. D.

**Electrical cleaning of blast-furnace gas (DURRER) 4. Using blast-furnace gas for heating (EBNER) 21. Prevention of boiler corrosion by the addition of alkalis (SPITT-**

GERBER) 14. Fuel problems of the iron and steel industry (EVANS) 21. The use of MeOH and EtOH as fuels in internal-combustion engines (LOUIS) 21. D. V. L. pressure cylinder and its use (RACKWITZ, SCHMIDT) 1. A new determination of the melting point of Pd (FAIRCHILD, *et al.*) 2. Research findings on corrosion and vitamin destruction (KOHMAN) 11E. New uses for Cd [as anti-corrosive material] (FRANK) 18. Xanthates [for use in flotation] (U. S. pat. 1,716,273) 10. Briquetting ores (Ger. pat. 476,319) 21. Hydrogenation apparatus (Fr. 653,135) 1.

**Arc Welding.** Lincoln Prize Papers submitted to the Am. Soc. of Mech. Engineers. Edited by EDWARD P. HULSE. New York: McGraw-Hill Book Co. 421 pp. \$5.

BRAY, JOHN L.: **Principles of Metallurgy.** Boston: Ginn & Co. 568 pp. \$5.80.

HENTZE, E.: **Sintern, Schmelzen und Verblasen sulfidischer Erze und Hüttenprodukte.** Berlin: V. D. I. Buchhandlung. Bound, M. 46.50.

**Ore treatment.** FRIED KRUPP GRUSONWERK A.-G. Ger. 475,749, Sept. 11, 1925. Ore briquets are formed by running the ore paste on to a rotary molding drum.

**Apparatus for classifying ore constituents by water currents of increasing strength.** BYRON M. BIRD. U. S. 1,715,693, June 4.

**Separating ores from gang by an upward current of air.** GEORGE RAW. Fr. 654,677, May 24, 1928.

**Mineral concentration by flotation.** ELMER K. BOLTON (to E. I. duPont de Nemours & Co.). U. S. 1,716,104, June 4. Sulfides such as those of Pb and Zn are subjected to froth flotation in the presence of a metal salt of 1-mercaptobenzothiazole, *e. g.*, the Na or Zn salt.

**Reduction of ores.** THOMAS ROWLANDS. Fr. 653,808, May 3, 1928. See Brit. 295,338 (C. A. 23, 2143).

**Reducing complex ores.** FRANK O. KICHLINE (to Bethlehem Steel Co.). U. S. 1,717,160, June 11. Complex ores (such as Mayari Fe ore of Cuba) contg. reducible components not widely different in their reduction temps. are heated with sufficient reducing agents such as C or H substantially to reduce such of the more readily reducible components, *e. g.*, Ni and Fe, as it may be desired primarily to sep. from the ore; the temp. for this purpose is lower than the fusion temp. of the desired component. The mass is then heated to a higher temp. at which a substantial agglomeration of the metallic particles may be effected, and is then cooled and crushed, the metallic agglomerate is sep'd. from the unreduced material and the latter is subjected to a secondary reduction by further heating with a reducing agent such as coal, *e. g.*, to reduce Cr.

**Iron ores.** STAALSYNDICAAT LEDEBOER. Fr. 653,261, Mar. 22, 1928. See Brit. 287,925 (C. A. 23, 366).

**Treatment of chrome iron ore.** KURT HELMHOLZ. Ger. 476,397, Nov. 26, 1927. Chrome iron ore is opened up by heating with  $\text{HPO}_3$  or  $\text{H}_3\text{P}_2\text{O}_7$  to about  $300^\circ$ . If the heating is interrupted as soon as a sample of the melt gives a deep green color on cooling, a transparent product is obtained which may be freed from  $\text{SiO}_2$  by soln. in water, filtered, and then worked up. If, however, the heating is continued, a sparingly sol. opaque product is obtained useful as a pigment or enamel. Suitable initial proportions are ore 1 and  $\text{H}_4\text{P}_2\text{O}_7$  8 parts.

**Zinc ores.** REAL COMPAÑIA ASTURIANA DE MINAS. Fr. 654,463, May 19, 1928. Zn ores are roasted in ordinary furnaces to a content of 2-3% of S, and to the mass is added (1) crude ground calamine, contg. as much Fe and Si as possible, to render the charge fusible and porous, (2) about 7% of ground coke from reduction furnaces, or about 5% of fine coal. The charge thus agglomerated is then heated in superroasting furnaces.

**Metal founding.** ROBERT B. DALE. Ger. 475,770, Sept. 12, 1926. A device for regulating the cooling of a centrifugal mold pre-heated by Hg vapor is described.

**Metal founding.** EISEN UND STAHLWERK HOESCH. A. G. Ger. 475,593, May 5, 1927. A comp'd. casting is made by introducing a block of hard steel into the center of a mass of molten steel.

**Metal founding.** LUDW. LOEWE & Co. A.-G. Ger. 475,591, Mar. 21, 1925. Automatically cooled molds are described.

**Metal founding.** METALLGESELLSCHAFT A.-G. (Emil Lay, inventor). Ger. 475,841, Feb. 19, 1927. A method and app. for producing rollable double-metal castings by heating the foundation metal in the mold and pouring it on the covering metal are described.

**Two-part stop-frames for metal founding.** HEINRICH HEPPERLE. Ger. 475,590, Dec. 29, 1927. Structural details are given.

**Fusion crucibles for metals or alloys.** DEUTSCHE GOLD- UND SILBER-SCHNEID-ANSTALT VORM. ROESSLER. Fr. 653,995, May 8, 1928. A method of gas heating is described.

**Machine for casting metals.** JOSEF POLÁK and HEINRICH TALLA. Ger. 476,093, Sept. 3, 1927.

**Machine for casting difficultly fusible metals.** MIGUEL C. VALLS and JOSÉ S. ESTELLER. Ger. 476,094, Feb. 10, 1927.

**Pressure-casting machine with an electrically heated crucible.** KUNO WELSCHER. Ger. 475,595, June 4, 1925. Details of arrangement are given.

**Casting gears.** CARL H. RICH (to Riley Stoker Corp.). U. S. 1,716,833, June 11. In casting a rim of bronze around an iron center placed in a mold, molten metal is poured into contact with the center evenly to heat it and to cause it evenly to expand and contract during the operation. An app. is described.

**Apparatus for casting ingots.** EDWIN C. WASHBURN. Fr. 654,379, May 16, 1928.

**Ingots.** EISEN- UND STAHLWERK HOESCH A.-G. Fr. 653,700, May 2, 1928. Ingots which are chemically and physically pure are obtained by bringing the cast ingots after the first cooling with liquid nucleus into a shaft with high-frequency elec. heating which quickly regulates the temp. To obtain a smooth surface the shaft is first heated so that the outer crust melts. The ingots are kept liquid from the interior out, the exterior crust being kept solid by a current of air between the ingot and the internal walls of the shaft. By the manner of treatment the liquid nucleus receives a rotating movement so that gas is eliminated and a uniform mixing takes place. The final cooling is regulated to give a uniform solidification which is detd. according to the compn. of the steel.

**Vertical ingot mold and stool.** JOHN E. PERRY (to Valley Mould & Iron Corp.). U. S. 1,715,620, June 4. Structural features.

**Pin and socket guide for a metal mold.** JAMES F. HINES. Ger. 475,589, May 7, 1926.

**Mechanical furnaces for roasting ores.** JOHN HARRIS. Fr. 654,513, May 21, 1928.

**Metallurgical furnace suitable for steel manufacture.** BENJAMIN TALBOT. U. S. 1,716,391, June 11.

**Coal-dust-consuming furnace for the heat treatment of iron and steel.** PETER LAUSEN. Ger. 476,146, Nov. 12, 1926.

**Blast furnace.** WALLACE A. STUART (to Inland-Stuart Linings, Inc.). U. S. reissue 17,325, June 11. See original pat. No. 1,632,633 (C. A. 21, 2455).

**Device for indicating the height of the charge in a blast furnace.** SIEMENS-SCHUCK-ERTWERKE A.-G. (Franz J. Mosch, inventor). Ger. 476,841, Dec. 15, 1925.

**Checkerwork construction for hot-blast stoves, etc.** EARL G. WHELPLEY (to Shea-Whepley Construction Co.). U. S. 1,715,969, June 4.

**Siemens-Martin and fusion furnaces.** OTTO G. KARRENBERG and HERMANN RÖMER. Fr. 653,977, May 8, 1928. Construction of a roof is described.

**Open-hearth furnace.** THOMAS J. JAMISON. U. S. 1,717,107, June 11.

**Cupola furnace.** FRIEDRICH W. CORSALLI. Ger. 475,948, Dec. 8, 1925. A device for catching the molten iron flowing from the shaft is provided in the forehearth.

**Cupola furnace.** KARL SCHMIDT. Fr. 652,697, Apr. 14, 1928.

**Cupola-furnace operation.** KARL GROCHOLL. Ger. 476,414, May 17, 1928. A part of the melt descending the furnace is intercepted between the melting zone and the tuyère zone and is conducted to the hearth or forehearth without traversing the tuyère zone. A suitably constructed furnace is described.

**Reversing device for a regenerative furnace consisting of inverted U-shaped gas conducting tubes.** FRANCISQUE PAUL ROUSSEL. Ger. 475,577, July 7, 1925.

**Annealing furnace for metals.** ARTHUR T. KATHNER. Fr. 653,379, Apr. 24, 1928.

**Continuous furnace for annealing wire.** WILLIAM M. HEPBURN and ERNEST W. WEAVER (to Surface Combustion Co.). U. S. 1,716,956, June 11. Structural features.

**Packing for a metal-annealing muffle furnace.** ERICH G. KÖHLER. Ger. 476,858, June 16, 1926.

**Galvanizing furnace.** FIRMA N. FRITZNER. Ger. 476,107, Sept. 8, 1928. A furnace for melting Zn is constructed so that the heating gases are directed against the sides of the crucible while the Zn is protected against overheating by a blast of air directed against the bottom of the crucible.

**Treatment of metals.** SIGURD WESTBERG. Ger. 476,513, Apr. 30, 1928. Metals and alloys, especially Fe and steel plates, bands and wires, are hot-worked in an atm. of H in the presence of a substance such as oxides of Al, Ca, Ba or Sr which decompose or absorb compds. (as of S or P) formed on the metal surface during the working.



**Separating metals.** JULES BICHON and LOUIS BERGOGNON. Fr. 653,981, May 8, 1928. Bronzes or alloys contg. Sn or Sb are melted and oxidized at a high temp in the presence of sand which combines with the oxides formed, or  $\text{Na}_2\text{CO}_3$  which dissolves them. The Cu remaining is refined in known manner. The slag contg. the oxides is melted in a reducing medium to obtain an alloy of the other metals, which is submitted to fusion with alk. sulfide to transform the metals to sulfides, and these are sepd. by chem. treatment of their soln. in water.

**Separating tin, lead, antimony, copper and zinc from alloys, etc.** FRANZ BISCHITZKY. Austrian 112,963, Dec. 15, 1928. The known method of sepg. Sn, Pb, Sb, Cu and Zn from alloys, mixts., ores, scrap, etc., contg. them in which the alloy, etc., is dissolved as far as possible in hot HCl is improved by addn. of non-oxidizing salts, *c. g.* chlorides, phosphates or borates, to the acid. These addns. act catalytically. Cf. C. A. 23, 370.

**Precipitating metals on surfaces.** NAAMLOOZE VENNOOTSCHAP PHILIPS' GLOELAMPENFABRIEKEN. Fr. 654,563, May 22, 1928. The metals Rh, Ir, Os and Ru are pptd. on surfaces of W, Mo, C, Ni, etc., by heating the surface in an atm. contg. volatile compds. of the metals, particularly halogen or carbonyl compds.

**Removal of sulfur from nickel and copper-nickel.** THE INTERNATIONAL NICKEL CO. Ger. 476,814, July 21, 1926. S is removed from coarse Ni and Ni-Cu by a blast of gas which is weakly oxidizing, weakly reducing or indifferent in action. The app. is described.

**Pure metals.** I. G. FARBENIND. A.-G. Fr. 33,809, June 30, 1927. Addn. to 609,204. Pure Fe is obtained by allowing the liquid carbonyl to fall on to a liquid such as liquid paraffin heated to  $270^\circ$ . According to Fr. 33,811 the process of Fr. 609,204 is applied to the prepn. of other metals such as Co, Ni or Mo.

**Titanium compounds.** I. G. FARBENIND. A.-G. Fr. 653,893, May 5, 1928. See Can. 285,355 (C. A. 23, 673).

**Recovery of tin.** HÜTTENWERKE TROTHA A.-G. and WILHELM WITTER. Fr. 653,669, May 1, 1928. Sn is recovered from material contg. oxides of Sn and Pb by heating with caustic alkalies to a temp. of  $300\text{--}450^\circ$  to insure the formation of alkali stannates. A little C may be added to the starting materials. The mass is afterwards treated with water only sufficient to dissolve out the excess alkali.

**Zinc.** ALEXANDER ROITZHEIM and WILHELM REMY. Ger. 476,153, Apr. 29, 1926. See Brit. 294,127 (C. A. 23, 1861).

**Cast iron.** EUGEN PIWOWARSKY (to Vereinigte Stahlwerke A.-G.). U. S. 1,715,509, June 4. In producing high-grade cast iron from pig iron of grades such as have ordinarily been cast in sand and exhibit a gray fracture, a predominantly white solidification is obtained by casting in chill molds having a cross-sectional area of less than 100 sq. cm. and causing such amts. of graphite as may remain after solidification to be dissolved by remelting at a high temp. Cf. C. A. 22, 1754.

**Cast iron.** WERNER STAUFFER. Swiss 130,201, Feb. 3, 1928. Cast iron of a high tensile strength and contg. 2.6–3.2% C is prepd. in a cupola from a mixt. comprising not less than 30% of special pig iron contg. about 2.5% C, 10–30% steel (these two constituents together not exceeding 70%) and not less than 30% of the usual pig or scrap iron. The air blast is kept constant. Cf. C. A. 22, 4452.

**Low-carbon chromium steel.** HENRY C. BIGGE and CHARLES R. ELLICOTT (to Bethlehem Steel Co.). U. S. 1,715,979, June 4. In prepg. a low-C ferrous alloy contg. a metal of the Cr group normally tending to be "wild," a reducing agent such as ferro-S is added to the slag to produce a strongly exothermic reaction and the alloy is poured while the thermal effects of the reaction still persist in the slag.

**Ferro-vanadium.** BYRAMJI D. SAKLATWALLA (to Vanadium Corp. of America). U. S. 1,715,867, June 4. A ferro-V contg. 85–95% of V is prepd. for use in making V alloy steels, etc.

**Desulfurizing steel.** CHARLES T. HENNIG. U. S. 1,717,153, June 11. Soda is mixed into molten iron forming part of the charge for making steel prior to its introduction into an open-hearth furnace which causes the metal to be violently agitated and boiled by gases given off by the soda and forms a soda-contg. slag on the metal which is of relatively higher fluidity than the ordinary basic slag; the iron thus treated, together with the slag on it, is then run into a bath of partially refined metal in the open hearth furnace and the boiling of the metal is continued in the open-hearth furnace until the oxides and sulfides have been eliminated from the metal to the required extent.

**Galvanizing steel.** EVAN A. ATKINS. Fr. 654,849, May 25, 1928. Steel is galvanized by passing it into a bath of molten Pb at a temp. such that the steel is made

red hot, and then plunged into molten Zn or a Zn alloy without coming in contact with the atm.

**Galvanizing apparatus.** VEREINIGTE ELEKTROCHEM. FAB. OSKAR HAHN. Ger. 475,975, Mar. 2, 1928. A device for plunging a number of articles together into the bath is described.

**Copper sulfate.** MAX SPEICHERT (to Hüttenwerke Tempelhof A. Meyer). U. S. 1,715,871, June 4. An alloy composed of Cu, Sn, Pb and Sb (such as a scrap metal) is melted with S to produce a mixt. of sulfides of the metals, the sulfide mixt. is roasted, the roasted product is leached with  $H_2SO_4$  and the soln. contg.  $CuSO_4$  is sepd. from the insol. residue.

**Alloys.** THE BARBER ASPHALT CO. Fr. 653,899, May 5, 1928. An alloy capable of resisting almost completely the action of  $HNO_3$  contains Ni 20-40, Fe 30-50, Cr 15-25 and 10% of a modifier which may be Si, Mn, W, Cu or Co. An example gives Ni 30, Fe 40.8, Cr 21, W 6.2, Si 0.45, Mn 1.55%. Fr. 653,900 describes a similar alloy, an example of which contains Ni 20, Fe 56, Cr 14.5, Co 5, Cu 4.5%. Fr. 653,901 describes a similar alloy, an example of which contains Ni 53, Fe 23, Cr 15, W 4, Mn 1.25, Si 3.75%. Cf. C. A. 23, 3434.

**Alloys.** THOMAS H. KELLY. Fr. 654,336, May 15, 1928. See Brit. 281,950 (C. 1 22, 3624).

**Alloys.** LÉO KLÜGER. Fr. 653,290, Apr. 21, 1928. An alloy which is not affected by repeated heating to 1200° contains C more than 1, Ni 40-50%, Cr  $\frac{2}{3}$  of the amt of Ni present, Fe the rest.

**Alloys.** SIEMENS & HALSKE A.-G. Fr. 653,460, Apr. 26, 1928. A magnetic alloy contains Ni (or Co) 30-80, Si 1-20, Fe 20-70%. An example gives Ni 78.5, Si 4, Fe 17.5%. A high permeability is obtained by reheating the alloy to about 900° for a long time, slowly cooling to about 625°, maintaining it at this temp. for a long time and then rapidly cooling to ordinary temp.

**Fire-resistant alloy of high electrical resistance.** HANS G. A. VON KANTZOW. U. S. 1,717,284, June 11. An alloy which is suitable for elec. resistance heaters comprises as its main constituents Fe together with Al 0.5-14, Cr 30 or less and Co 0.5-6%.

**Aluminum-beryllium alloy.** ROBERT S. ARCHER and Wm. L. FINK (to Aluminum Co of America). U. S. 1,716,943, June 11. An Al base alloy contg. Be is heated to a temp. slightly below the m. p. of the Al-Be eutectic to cause substantial soln. of the undissolved Be constituent of the alloy, and is then quenched from substantially such a temp.

**Aluminum-silicon alloys.** METALLGES. A.-G. Ger. 476,384, Nov. 27, 1921. Al Si alloys contg. more than 2% Si are rendered suitable for casting by addn. of 2-6% Cu and (or) more than 5% Zn, care being taken that the incidental content of Fe does not exceed 1%. Suitable alloys contain Si 6 and Cu 4%, or Si 8 and Zn 10%, or Si 8, Zn 10 and Cu 2.5%.

**Brass alloy.** METALLGESELLSCHAFT A.-G. Ger. 476,962, Aug. 20, 1924. A brass alloy suitable for foundry work contains Cu 50-56%, Si 0.1-0.8% and Sn 0.1-0.4%.

**Copper-aluminum alloys.** OSNABRÜCKER KUPFER- UND DRAHTWERK. Ger. 476,481, Jan. 1, 1927. Cu-Al alloys for the autogenous welding of Al bronze contain Al up to 15 and an alkali metal up to 2%. A suitable alloy contains Cu 96, Al 4 and Na 0.3 parts.

**Alloys of iron.** BYRAMJI D. SAKLATWALLA. Fr. 653,860, May 4, 1928. See Brit. 288,861 (C. A. 23, 594).

**Iron alloys.** VERE B. BROWNE. Fr. 652,949, Apr. 17, 1928. Fe alloys contg. Cr and Al, specially those contg. Cr 5-30, Al 3-10% and little C, are worked from the ingot by forging or rolling in a series of stages with gradually reducing temp. from a starting temp. of 1100°. The final working may be carried out in the cold, and the alloy may be annealed by heating to a temp. below 870°. The process yields an alloy which is ductile and resists oxidation at high temps.

**Iron alloys.** CENTRAL ALLOY STEEL CORP. Fr. 653,686, May 2, 1928. The physical properties of an Fe alloy contg. Cu and Mo are improved by adding to the molten alloy a proportion of Mn such that 0.2-1% of Mn remains in the alloy, which contains C less than 0.2, Cu 0.2-2 and Mo up to 0.2%. Si (up to 0.5%) is introduced, and Al in amt. such that only a trace remains in the final alloy. The amt. of S and P should be less than 0.04% of each.

**Alloy pig iron.** HARRY P. PARROCK. U. S. 1,716,181, June 4. A method of producing pig iron suitable for making alloyed pig iron without disturbing the normal operation of the blast furnace comprises smelting ore in a blast furnace, transferring a portion of the molten iron to an open-hearth furnace where it is heated to a high temp., separately melting a relatively small quantity of alloying metal such as ferro-Ni, and,

without further treatment of the produced molten iron, adding the alloying material to the metal in the open-hearth furnace; the alloyed pig iron is cast, and, meanwhile, the undiverted portion of the molten iron from the blast furnace is also cast. An arrangement of app. is described.

**Alloys containing zinc, nickel and copper.** WILLIAM M. GROSVENOR and VICTOR P. GERSHON (Gershon to Grosvenor). U. S. 1,716,050, June 4. Alloys which are suitable for use in making "white gold" comprise Zn about 20, Ni 70 or more, and Cu 9% or less.

**Device for the hot rolling of metals and alloys.** WILHELM HAMMER. Ger. 475,931, May 15, 1927. Details are given.

**Method of annealing.** AKTIEN GESELLSCHAFT BROWN, BOVERI & CIE. Swiss 130,736, Dec. 8, 1927. Metal objects are subjected to a continuous glowing heat in a gas atm. with exclusion of air. The furnace comprises radially arranged chambers into which the objects are placed, and the heat in the annealing chamber is used to pre-heat the cold objects in an adjacent chamber.

**Hardening one surface of metal blanks (such as those for making brake drums) preparatory to bending.** NATHAN H. SCHERMER and CHARLES G. HEILMAN. U. S. 1,716,191, June 4. Blanks are arranged in spaced pairs with adjacent surfaces of the members of each pair in contact and are carbonized on one side only with the non-contacting surfaces exposed to the action of a hardening medium.

**Treatment of aluminum surfaces.** BOHUMIL JIROTKA. Ger. 475,789, Mar. 2, 1927. Al and its alloys are given an oxidized surface by treatment in the cold with a bath contg. HF and a chromate. The appearance of the surface is improved by inclusion of a heavy metal salt. A suggested bath contains HF 2,  $\text{Na}_2\text{Cr}_2\text{O}_7$  5 and  $\text{CuSO}_4$  0.5% per l.

**Mechanically worked zinc product.** WILLIS M. PEIRCE and EDMUND A. ANDERSON. (to New Jersey Zinc Co.). U. S. 1,716,599, June 11. Sheet metal or other mech. worked products are formed from a Zn base alloy substantially free from Al and contg. not less than Zn 92, Mg 0.005–0.5 and Cu 0.05–5%.

**Magnetic material.** GUSTAF W. ELMEN (to Bell Telephone Laboratories). U. S. 1,715,541, June 4. A magnetic material suitable for use in elec. signaling systems comprises Fe, Ni and Co (suitably in the relative proportions of 22–25, 40–50 and 20–30, resp.) and possesses a high degree of constancy of permeability over a range of magnetizing forces including that employed in continuous loading of elec. signaling conductors; at least one of the following elements is also added to increase the resistivity: Mo, Cr, W, Mn, V, Ta, Zr, Cu and Si. U. S. 1,715,542 relates to elec. coils with cores characterized by incremental permeability at low magnetizing forces, greater after being subjected to a large direct magnetizing force than before. Such cores may be formed of Ni 45, Co 25 and Fe 30%. U. S. 1,715,543 specifies cores formed mainly of Fe, Ni and Co (suitably in the relative proportions of 10–45, 20–70 and 10–50%, resp.) and which may also contain Mo, Cr, W, V, Ta, Zr, Cu, Si, Al, Mn, etc. Cf. C. A. 23, 2692.

**Magnetic material.** GUSTAF W. ELMEN (to Western Electric Co.). U. S. 1,715,646, June 4. A magnetic material suitable for use in signaling circuits comprises essentially Ni, Co and Fe, with a Ni content 65–80% of the total Ni-Co-Fe content. U. S. 1,715,647 specifies a magnetic material including at least 2 magnetic elements such as Ni, Co and Fe which may be in about the relative proportions of 60, 15 and 25%, resp., having negligible variation in permeability over a range of flux densities at least 50 c. g. s. units in width and lying between zero as a lower limit and 5000 c. g. s. units as an upper limit. U. S. 1,715,648 (assigned to Bell Telephone Laboratories) specifies a compn. formed mainly of Fe, Ni and Co, including 9% or more Fe, 4% or more Ni and Co, with or without addn. of a fourth substance such as Mo or Ti to increase the resistivity or modify other properties; the Co content is over 45% of the Fe-Ni-Co content but not in excess of 80% of the entire compn. Cf. C. A. 23, 1105.

**Treating magnetic materials.** VICTOR E. LEGG (to Bell Telephone Laboratories). U. S. 1,715,713, June 4. Magnetic materials such as alloys of Fe, Ni and Co for use in signaling systems are subjected to the simultaneous influence of a d. c. field and an a. c. field, and the direction of the d. c. field is periodically reversed, to restore their properties when abnormally magnetized.

**Apparatus for pickling metal articles.** LEIF LEE. U. S. 1,716,068, June 4. Structural features.

**Separating stacked metal sheets.** VICTOR G. ROSS (to Continental Can Co.). U. S. 1,716,602, June 11. Sheets of metal such as tin plate are subjected to a magnetic field to render them mutually repellent and facilitate their sepn.

**Linings for internal-combustion engines.** EDWARD SOKAL. Ger. 475,974, July 19, 1925. An antiknocking coating for the cylinders of internal-combustion engines is composed of readily fusible metals such as Pb, Sb or Te with a binding material of such substance as silicate.

**Production of hollow metal ware by centrifugal apparatus.** FERNANDO ARENS. Swiss 131,151, Dec. 16, 1927.

**Continuously operating plant for coating tubes or bars with metal or other coatings.** GOTTFRIED BUCHERT. Ger. 473,020, July 9, 1926.

**Apparatus for coating wires, bands, etc.** WERNER & MERTZ A.-G. Ger. 476,037, Apr. 6, 1927. The wire, etc., is passed first through a bath of coating compn., then through a hole in a Fe plate, then again through the bath, then through another hole in the plate, and so on, the holes being of different sizes so that coatings of different depths can be obtained. A series of baths may also be used. Cf. C. A. 23, 369.

**Coating small articles such as those of radio apparatus with metals such as tin or zinc.** CHARLES E. JONES (to General Electric Co.). U. S. 1,717,220, June 11. See Brit. 279,092 (C. A. 22, 2736).

**Corrosion preventing.** I. G. FARBERIND. A.-G. Fr. 652,899, Apr. 16, 1928. Surfaces of Fe are protected by treating them with a powd. alloy of Al and Cr (Al 15, Cr 85%) at about 1000° in a reducing atm. Cf. C. A. 23, 3435.

**Rust preventing.** LOUIS HUBER and HUGUES WOLFF. Fr. 653,635, May 1, 1928. Fe is cleaned and heated to a convenient temp. and coated with a layer of lignite tar.

**Removing rust and scale from ferrous metals.** WILLIAM H. COLE. U. S. 1,715,695, June 4.  $\text{H}_3\text{PO}_4$  soln. of such diln. is applied that no coating is left on the articles when they are treated, in a closed vessel, at boiling temp. and under pressure.

**Brazing flux.** JOHN J. PHELAN (to General Electric Co.). U. S. 1,717,250, June 11. A brazing flux suitable for brazing Cr alloys comprises at least 25% K acid fluoride and at least 40% K tetraborate, and may also contain other alkali fluorides and borates.

**Welding rods containing copper, zinc and silicon.** ARTHUR R. LYTLE (to Union Carbide & Carbon Research Laboratories). U. S. 1,716,590, June 11. Welding rods for use with brass and bronze alloys, etc., comprise Cu and Zn together at least 82.5% (the Cu content being 55-65%) and Si 4% or less.

**Electric welding.** SVEN R. BERGMAN (to General Electric Co.). U. S. 1,716,614, June 11. An arc is maintained to heat the parts to be welded, a gaseous medium such as H is preheated to increase its volume and this gaseous medium is applied to the arc and molten metal.

## 10—ORGANIC CHEMISTRY

CHAS. A. ROUILLER AND CLARENCE J. WEST

**Recent advances in science: Organic chemistry.** J. N. E. DAY. *Science Progress* 23, 585-8(1929); cf. C. A. 23, 1384.—A review of recent work in org. chemistry, chiefly with reference to dyes of the cyanine group, pseudoaconitine, and selenophene.

JOSEPH S. HEPBURN

**Modern viewpoint in regard to theories of aromatic substitution.** W. A. WATERS. *Science Progress* 23, 649-54(1929).—A review.

JOSEPH S. HEPBURN

**Chemistry of the cracking process.** A. N. SACHANEN (SAKCHANOV) AND M. D. TILICH'EV. Ber. 62B, 658-77(1929); cf. C. A. 23, 963.—To get light on the chemistry of the cracking of naphtha and naphtha oils, which consist almost exclusively of  $\text{C}_{14}$  and aromatic hydrocarbons and naphthenes, the cracking of individual representatives of these groups of compds. has been studied. The expts. were carried out in an Fe autoclave provided, between the autoclave and the condenser, with a reducing valve by means of which the pressure could be regulated by letting out some of the decompn. products. Paraffin, m. 53°, was cracked at 425-50° for 60-180 min. At 425° under 10 atm. the gaseous products contain practically no  $\text{H}_2$  (0.5-1%), with 68-72%  $\text{CH}_4$  hydrocarbons; at 450° under 15-25 atm., 22-23%  $\text{H}_2$ , 0.25-2% CO and 59-61%  $\text{CH}_4$  hydrocarbons; the yield of products lighter than the original paraffin is excellent (95% or more). As no  $\text{H}_2$  and C are formed the decompn. can take place only according to the scheme  $\text{RCH}_2\text{CH}_2\text{CH}_2\text{R}' \rightarrow \text{RCH}:\text{CH}_2 + \text{MeR}'$  and not according to either  $\text{RCH}:\text{CH}_2\text{CH}_2\text{R}' \rightarrow \text{RMe} + \text{MeR}' + \text{C}$  or  $\text{RCH}_2\text{CH}_2\text{CH}_2\text{R}' \rightarrow \text{RCH}:\text{CH}_2 + \text{CH}_2:\text{CHR}' + \text{H}_2$ . There is practically no condensation; that observable in the expts at higher pressures is to be ascribed to the formation of unsatd. hydrocarbons. The cracking distillate contains about 50% unsatd. hydrocarbons, this proportion remaining

nearly const. in the 50° fractions from 30° to 300°; after removal of the unsatd. hydrocarbons with  $\text{H}_2\text{SO}_4$  the residue consists almost exclusively of normal paraffins. In the cracking of the paraffin the 220–40° fraction is the largest, indicating that the cleavage occurs chiefly in the middle of the mol. The more quickly the cracking products are removed from the field of reaction the smaller will be the amt. of polymers and naphthenes formed by condensation of the unsatd. hydrocarbons. Increase in pressure will therefore result in a decrease of unsatd. hydrocarbons; in expts. under 10 and 40 atm. the I no. of the resulting benzene was 107.8 and 58.8, resp. (Iso-Am)<sub>2</sub> heated 63 mins. at 425° (original pressure, 83 atm., increasing to 121 atm.) gave gases contg. 12% unsatd. hydrocarbons, 6.5% CO, 20.0%  $\text{H}_2$  and 61.5%  $\text{CH}_4$  hydrocarbons (by difference). The liquid products yield 4.9% of a fraction, b. 25–45° (isoamylene and isopentane), 6.1% b. 45–75° (hexanes, 22.9% unsatd.), 5.7% b. 75–125° (heptanes and octanes, 48.8% unsatd.) and 1.0% b. 125–45°. The small amt. of unsatd. hydrocarbons in the 45–75° fraction is probably due to partial polymerization of the olefins; an appreciable quantity of higher boiling fractions is also formed. Cracking of aromatic hydrocarbons without side chains results only in condensation; if they have side chains, the cracking can proceed in 2 directions.  $\text{C}_6\text{H}_6$  could not be studied in the liquid phase because of its low b. p.; in the vapor phase Berthelot obtained  $\text{Ph}_2$ .  $\text{C}_{10}\text{H}_8$  was practically unchanged when heated 3 hrs. at 425°; the pressure remained const. at 30 atm. At 475° the pressure rose only very slowly from 25–50 atm. in 4 hrs. 20 mins.; no C was liberated but crystn. of the 415–36° fraction (1.6%) yielded (2- $\text{C}_{10}\text{H}_7$ )<sub>2</sub>, m. 181–2.5°. Anthracene heated 2 hrs. 37 mins. at 475° (pressure up to 70 atm.) yielded gaseous products and changed into a compact, hard, coke-like mass, 59% of which (54.7% of the original) was insol. in hot  $\text{C}_6\text{H}_6$ . This very great difference in the thermal stability of  $\text{C}_{10}\text{H}_8$  and anthracene explains in great part the differences in the tendency to coke formation in the cracking of naphthas obtained from different fractions. With cymene heated 3 hrs. at 425° the pressure rose only from 85 atm. to 90, the d. hardly changed, and the yield of volatile products (including gases and loss in distn.) was not more than 10%; the gases (10 l. from 500 g. cymene) contained 1.1% unsatd. hydrocarbons, 2.3% CO, 68.5%  $\text{H}_2$  and 28.1%  $\text{CH}_4$  hydrocarbons (by difference). No  $\text{C}_6\text{H}_6$  was formed; about 1% PhMe and 3% xylene were obtained. The residue b. above 180° (6.2%) had a d. considerably higher (0.913) than the corresponding residue (d. 0.888) of the original cymene, indicating that condensation processes took place during the cracking. From 400 g. tetralin at 425° (pressure, 35–40 atm.) for 3 hrs. was obtained 2 l. gas contg. 89.2%  $\text{H}_2$  and 10.8%  $\text{CH}_4$  hydrocarbons. Heated 19 hrs. 40 mins. at 450° (pressure, 50–100 atm.), it gave 18.2% gases (and losses), 25.1% hydrocarbons of lower b. p., 14.1% of unchanged tetralin, 23.3% of  $\text{C}_{10}\text{H}_8$ , 10.4% of tetralin condensation products, 8.9% loss in fractionation. The decompn. therefore proceeded in 3 directions: Splitting off of the side chain with formation of  $\text{C}_6\text{H}_6$  homologs, 55%; dehydrogenation of the side chain and formation of  $\text{C}_{10}\text{H}_8$ , 30%; formation of condensation products, 15%. A naphthene mixt. b. 245–94°, obtained from an almost paraffin-free fraction of vaselin oil treated with  $\text{H}_2\text{SO}_4$ , when heated 62 mins. at 425° under 78 atm. yielded 4% gases (and loss), 19.5% b. up to 200° and 16.2% b. 200–300°, 10.3% b. 145–203°, 17.2% b. 203–55°, 20% b. 255–303°, 9.4% b. 303–352°. The fractions b. 145–303° had a higher d. than the corresponding fractions of the original oil. Finally, a mixt. of naphthenes and aromatic hydrocarbons, a Baku machine oil b. 250–90°, heated 12 mins. at 463° under 10 atm. gave 15.6% gases (and losses), 26.3% benzene, b. up to 200°, 25.0% petroleum (200–300°) and 5.1, 11.3, 5.6, 1.3, 1.3% b. 150–80°, 180–200°, 260–80°, 280–300° and 300–15°, resp. Not only the fractions with the same b. p. as the original fractions but even those of lower b. p. have a considerably higher d., indicating that in the cracking there is not only a formation of higher boiling condensation products but also a change in chem. compn., chiefly an increase of aromatic hydrocarbons. The thermodynamics of the cracking process is briefly discussed.

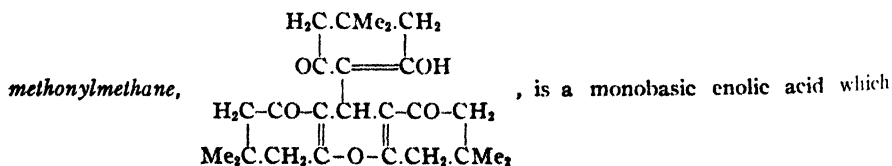
C. A. R.

Reactions of certain olefins of high molecular weight with sulfuric acid, hydrochloric acid and the air. WM. E. MESSER. *Chem. News* 138, 292–3 (1929).—1-*Hexadecene* (I),  $b_{11}$  163°,  $b_2$  123°, m. 4°,  $d_{20}$  0.779, was prepd. by distg. spermaceti under 300–400 mm. pressure. Distn. of Na oleate and NaOEt gave crude 8-*heptadecene* (II) which, purified by fractionation,  $b_{11}$  136°,  $b_{10}$  173°,  $d_{20}$  0.795. *Tertiary alcs.* were prepd. from EtMgBr with the Me ester of com. stearic acid and dehydrated, giving a mixt. b. 152–9°,  $b_{11}$  193–213°, contg. 35%  $\text{C}_{22}\text{H}_{44}$  and 65% of  $\text{C}_{20}\text{H}_{40}$ . Me stearate gave by the above reaction *dimethylheptadecylcarbinol* (III), which was dehydrated with anhyd.  $(\text{CO}_2\text{H})_2$ , giving 2-*methyl-1-nonadecene* (IV),  $b_{11}$  146°,  $b_{10}$  189°, m. 11–2°,  $d_{20}$  0.795,  $n_D^{20}$  1.4504. I and II did not react when shaken with concd. HCl; III gave 95% of 2-*chloro-2-methylnonadecane* (V), m. 19.6–20°, and 5% of IV. With alc. alkali, crude

95% V gave 65% of IV and 35% of III. Olefins were shaken with  $\text{H}_2\text{SO}_4$  and sepd. into 2 layers; no org. matter was found in the  $\text{H}_2\text{SO}_4$  layer; the oil was analyzed for  $\text{SO}_2$ , unsatn., and  $\text{H}_2\text{SO}_4$  upon hydrolysis. Straight-chain compds. (VI) were attacked by 80%  $\text{H}_2\text{SO}_4$  and branched-chain compds. (VII) by 70%; stronger acid had the same effect. After shaking and standing 1 hr., the oil contd. 35–50%  $\text{H}_2\text{SO}_4$ ; VI gave  $\text{SO}_2$  with 95%  $\text{H}_2\text{SO}_4$ ; VII gave much less. The  $\text{SO}_2$  increased upon standing and heating; increasing the quantity of  $\text{H}_2\text{SO}_4$  used for the test increased the  $\text{ROSO}_3\text{H}$  but had no effect upon the  $\text{SO}_2$  value; fuming or 100%  $\text{H}_2\text{SO}_4$  produced  $\text{SO}_2$  and tar even at  $-15^\circ$ ; VI gave more  $\text{ROSO}_3\text{H}$  than did VII. Ba alkylsulfates of I and II were isolated and converted to free acids which readily hydrolyzed to give 2-hexadecanol, m.  $41.5^\circ$ , 8-heptadecanol and 9-heptadecanol, the last 2 as a mixt., m.  $34^\circ$ . IV gave a mixt., m.  $45^\circ$ . IV was most readily oxidized, 0.23 atoms of  $\text{O}_2$  being absorbed at room temp. by a 1-cm. layer in 1450 hrs.; absorption was a linear function of time. All of the olefins were oxidized at  $100^\circ$  and  $156^\circ$ , acids being formed; tars resulted at the higher temp. A. S. CARTER

**Action of alkalis on chloroform.** D. VORLÄNDER AND FRIEDRICH W. GUTHKE *Ber.* 62B, 549–54 (1929).—To explain the remarkably strong reducing power of  $\text{CHCl}_3$  and alkalis on Fehling sol., it has been assumed that, not to mention chlorinated intermediate products ( $\text{CCl}_2$ ,  $\text{CHCl}$ ), activated CO and  $\text{HC(OH)}_2$ , an aldehyde (either as nascent  $\text{HCO}_2\text{H}$  or  $\text{HCHO}$ ) might be a primary decompn. product of the  $\text{CHCl}_3$ . V. and G. have attempted to shed light on this by the use of methone (5,5-dimethylhydroresorcinol) (I), which is a sp. aldehyde reagent. As the result of their expts.  $\text{HCHO}$  is excluded as an intermediate product in the  $\text{CHCl}_3$ -alkali reaction. They obtained, not the  $\text{HCHO}$ , but a *formic acid compd.* (II) of I. Preformed alkali formate in neutral or alk. soln. or the formate ion, however, do not react with I. Similar to the action of  $\text{CHCl}_3$  on Fehling soln. is that of  $\text{CHBr}_3$  (only somewhat more sluggish),  $\text{CHI}_3$  (in boiling alc. alk. soln.),  $\text{CCl}_3\text{CHO}$  and  $\text{CCl}_3\text{CO}_2\text{H}$ . CO or  $\text{CHCl}_3$  and alkali give at room temp. with Fehling soln. the brick-red Cu oxide which according to Moser is formed only in hot Fehling soln. Cold  $\text{NH}_3$ - $\text{AgNO}_3$  is also reduced.  $(\text{CH}_2\text{Cl})_2$ ,  $(\text{CH}_2\text{Br})_2$ ,  $\text{MeCHCl}_2$ ,  $(\text{CHCl}_2)_2$  and  $(\text{CCl}_3)_2$  have no perceptible reducing action.  $\text{CCl}_4$  and alkali give no  $\text{Cu}_2\text{O}$  with Fehling soln.  $\text{HCO}_2\text{H}$  with I gives the same II as was obtained with  $\text{CHCl}_3$ -alkali, although formic esters and alkali do not react with I. Esters of  $\text{HC(OH)}_2$  and alkali react with neither I nor Fehling soln. CO likewise does not react with I or with I and alkali and attempts to activate the CO by ultra-violet illumination, silent elec discharge (in an ozonizer) or heat were unsuccessful. Since I in  $\text{H}_2\text{O}$  or alc. reacts only with aldehydes and not with CO, ketones or  $\text{CO}_2\text{H}$  acids, there might be conceived as an intermediate product, along with  $\text{ClCHO}$ , a hydroxyformaldehyde, an energy isomer of  $\text{HCO}_2\text{H}$ , formed directly from the  $\text{CHCl}_3$  or through chlorinated intermediate products. In such a  $\text{HOCHO}$  the hydroxyl H might not be as strongly dissociated as in  $\text{HCO}_2\text{H}$  and the  $\text{HOCHO}$  might, contrary to  $\text{HCO}_2\text{H}$ , be unusually chem. reactive and capable of existence for a short time in the  $\text{CHCl}_3$ -alkali mixt. In free  $\text{HCO}_2\text{H}$  itself there would

be an equil. between the 2 forms,  $\text{HO}(\dot{\text{C}}:\ddot{\text{O}}):\text{H} \rightleftharpoons \text{H}:\ddot{\text{O}}:(\text{C}:\ddot{\text{O}}):\text{H}$ . Free  $\text{HCO}_2\text{H}$  as a result would have a reducing action in hot aq. soln. but chiefly by virtue of the minute amt. of  $\text{HOCHO}$  in equil. with the real  $\text{HCO}_2\text{H}$ , whereas in solns. of alkali formates the  $\text{HOCHO}$  cannot exist under the influence of the metal and the salts and esters of  $\text{HCO}_2\text{H}$  therefore have no reducing action and do not react with I. II, apparently formed according to the equation  $\text{HOCHO} + 3\text{C}_6\text{H}_{13}\text{O}_2 = 3\text{H}_2\text{O} = \text{C}_{18}\text{H}_{32}\text{O}_6$ , may be considered as a hydrogenated triphenylmethane,  $\text{CH}(\text{C}_6\text{H}_{11}\text{O}_2)_3$ , in which a mol. of  $\text{H}_2\text{O}$  has been eliminated between 2 of the  $\text{C}_6\text{H}_{11}\text{O}_2$  residues; the resulting II, designated *anhydrotri*



can be titrated with Na alcoholate and characterized through monoacyl derivs. and is not easily converted back into its components with boiling alkali. It m. about  $234^\circ$  (cor.) with decompn., is sol. in  $\text{Na}_2\text{CO}_3$ , dil.  $\text{NaOH}$  and  $\text{NH}_4\text{OH}$  and in concd.  $\text{HCl}$  and  $\text{H}_2\text{SO}_4$  with yellow color, insol. in dil.  $\text{HCl}$ , gives a dark green-brown color with  $\text{FeCl}_3$  in alc.; *Na salt*, yellow, decomp.  $255-60^\circ$ ; *acetate*, m.  $153^\circ$ , solidifies cryst.-solid with supercooling, insol. in alkalis, gives no color with  $\text{FeCl}_3$ ; *benzoate*, m.  $258^\circ$  (decompn.). In the prepn. of II from  $\text{CHCl}_3$ -alkali, the  $\text{CHCl}_3$  layer contains an alkali-insol. by-prod-

uct, m. 175–7°, having approx. the compn.  $C_{17}H_{22}O_4$ , easily decompd. into I by hot acids and alkalis. C. A. R.

**Synthesis of higher alcohols from carbon monoxide and hydrogen.** HANS DERSIN. *Chem.-tech. Rundschau* **44**, 310 (1929).—By passing CO and  $H_2$  over the same catalyzers, but at a slower rate than for MeOH, there may be obtained *alcs.* of higher mol. wt. These are contaminated with MeOH, aldehydes, amines and small quantities of liquid hydrocarbons. By suitable variation in the operating conditions formation of higher alcs. is favored. The pat. literature is reviewed. F. PICKERING

**Synthetic production of methanol from carbon monoxide and hydrogen.** HANS DERSIN. *Chem.-tech. Rundschau* **44**, 146–8, 176 8 (1929).—A review of periodical and pat. literature on production and purification of initial materials, app., *catalyzers* and purification of the crude *methanol*. F. PICKERING

**Diethyl ether. I. The products of its autoxidation.** HAROLD KING. *J. Chem. Soc.* **1929**, 738–50.—Ether on storage may change into AcH and peroxides. Clover (C. A. **16**, 1930) concluded that  $EtOCH(OOH)Me$  was formed; Wieland and Winger (C. A. **17**, 2558) suggested that the peroxide was di- $\alpha$ -hydroxyethyl peroxide,  $MeCH(OH)OOCH(OH)Me$ , (I). K. from new detns. (a table is given) finds that the ratio of AcH to peroxides in old ethers is approx. 1:1, in agreement with either theory. That old ethers can fix more AcH, in the ratio 2:1, disproves Clover's constitution for the peroxide, but is consistent with W. and W.'s view that the peroxide is a combination of AcH and  $H_2O_2$ . K., however, from detns. of the partition coeffs. of the peroxides in question between water and ether, concludes that the main peroxide in old ether is  $MeCH(OH)OOH$ . A 2nd more stable peroxide is indicated in old ether by an increase of  $H_2O_2$  in the residue after distn. with acid. This peroxide might be *s*-dihydroxydimethyl peroxide,  $HOCH_2OOCH_2OH$  (II), but no  $HCIO$  could be found in the distillate. K.'s method for detg. peroxides in ether is more rapid than the usual liberation of  $I_2$  from  $KI$ , is accurate, and is applicable in all cases except with II: to 5–10 cc. ether and a few crystals  $MnSO_4$  in 50 cc. approx.  $N H_2SO_4$ , 0.1  $N KMnO_4$  is added until the pink color produced by 2 drops of  $KMnO_4$  has not entirely faded in 10 secs. The peroxides remain behind quant. when old ether is distd. with a column. One part  $H_2O_2$  in 400,000 parts ether (in the absence of org. peroxides and AcH) may be detected by acid  $K_2Cr_2O_7$  (faint blue color) or by Jorissen's vanadic acid reagent (Baskerville and Hamor, C. A. **5**, 2303) (brownish orange color). The AcH in ether is estd. by Ripper's method (*Monatsh.* **21**, 1079), by acidifying and distg. into  $NaHSO_4$ . AcOH (Richardson and Fortey, *Proc. Chem. Soc.* **1896**, 165) and  $HCO_2H$  are also present in old ether. I is prepd. as a clear sirup by extg. Merck's  $H_2O_2$  with dry ether, adding 2 mols. AcH for each mol.  $H_2O_2$  and evapg. rapidly in a vacuum. Cryst. II is prepd. from formalin and  $H_2O_2$  in water. I and II do not give blue colors with alc. benzidine or guaiacum until peroxidase is added. Like  $HCHO$  and  $H_2O_2$  together (Woker, C. A. **8**, 3663; Wieland and Winger, *l. c.*), a fresh aq. soln. of 2 AcH and 1  $H_2O_2$  gives the benzidine test, but not after 2–3 days. The color is thought to be due to the formation of an intermediate peroxide, as  $MeCH(OH)OOH$ . The peroxide from old ether also gives the benzidine test. JANET D. SCOTT

**Hydrogenation and decomposition of silico-organic compounds at high temperature and pressure.** V. IPAT'EV AND B. N. DOLGOV. *Ber.* **62B**, 1220–6 (1929).—This is the first of a series on the stability of the group Si-C and Si-O-Si. Tetraethylsilane (I) at 350° under a  $H_2$  pressure splits off ethane, giving hexaethyldisilane (II) and other products. Triethylphenylsilane gives benzene and II. It also rearranges to give I and diethyldiphenylsilane. Tetraphenylsilane is stable up to 490°, where it yields a product probably of a highly condensed nature. V. F. HARRINGTON

**Action of potassium cyanide on chloroaldehydes.** FREDERICK D. CHATTAWAY AND HARRY IRVING. *J. Chem. Soc.* **1929**, 1038–48.—The action of KCN upon  $Cl_2CCHO$  in MeOH, EtOH, PrOH and allyl alc. gives, resp.,  $Cl_2CHCO_2Me$  (84%),  $Cl_2CHCO_2Et$  (88%), *Pr* *dichloroacetate*, b. 176° (70%) and the *allyl ester*, b. 175.5° (64%).  $Cl_2CHCHO$ , EtOH and KCN in EtOH give 58%  $Cl_2CHCO_2Et$ ,  $Cl_2CHCHO$  and KCN in EtOH or  $H_2O$  give 10% of AcOEt.  $MeCHClCCl_2CH(OH)_2$  and KCN in EtOH give, if the reaction is not moderated,  $MeCH:CClCO_2Et$ ; if the temp. is not allowed to rise above 15°, there also results  $MeCHClCHClCO_2Et$  and some *butylchloral cyanohydrin* (I), m. 101–2°.  $MeCHClCHClCO_2Et$  loses HCl readily, giving  $MeCH:CClCO_2Et$ ,  $MeCHCl$

EtOH give 85% of  $MeCH:CClCO_2Et$ . In  $H_2O$  the reaction products of KCN and  $MeCHClCCl_2CH(OH)_2$  are I and  $MeCH:CClCO_2H$ .  $CCl_2CH(OH)NH_2$  and KCN

give 92% of  $\text{Cl}_3\text{CHCONH}_2$ .  $\text{MeCHClCCl}_2\text{CH(OH)NH}_2$  and KCN give 93% of  $\text{MeCH}_2\text{CClCONH}_2$ . KCN has little or no action on dichloroacetal.  $\text{Cl}_3\text{CCH(OAc)}$ , in EtOH give 80% of  $\text{Cl}_3\text{CHCO}_2\text{Et}$ ; in MeOH 76% of  $\text{Cl}_3\text{CHCO}_2\text{Me}$ .  $\text{MeCHClCCl}_2\text{CH(OH)}_2$  and KCN in  $\text{C}_6\text{H}_6$  probably give 6-keto-2,4,7-tris[ $\alpha,\alpha,\beta$ -trichloropropyl]cyclo-2,4,6,7-tetramethylene-1,3,5-dioxamine, m. 99.5–100.5°. 6-Nitro-2,4-bis[trichloromethyl]-1,3-benzodioxin and KCN in EtOH give 6-nitro-2 (or 4)-trichloromethyl-4 (or 2)-dichloromethylene-1,3-benzodioxin, m. 136.5°. The mechanism of these reactions is discussed.

C. J. WEST

Products of the action of chlorosulfonic acid on propionyl chloride at room temperature. M. KRAJČINOVIČ. *Ber.* 62B, 579–81(1929); cf. *C. A.* 21, 224.—From 50 g.  $\text{EtCOCl}$  treated in the course of 3–4 hrs. with 50 g.  $\text{ClSO}_3\text{H}$ , allowed to stand 5–10 days at room temp. (the evolution of HCl becomes distinctly perceptible only on the 2nd day) and then poured into cold  $\text{H}_2\text{O}$  is obtained a pitch-like mass from which  $\text{Et}_2\text{O}$  exts.  $\alpha'$ -ethyl- $\beta,\beta'$ -dimethylpyrone,  $\text{EtC:CMc.CO.CHMe.CO.O}$  (I), m. 151°, and

the residue remaining from the  $\text{Et}_2\text{O}$  extn. yields  $\text{MeCH(SO}_3\text{H)CO}_2\text{H}$ . The formation of I is explained as follows: The  $\text{ClSO}_3\text{H}$  combines with the  $\text{EtCOCl}$  to form  $\text{EtCO}_2\text{SO}_2\text{CHMeCO}_2\text{SO}_2\text{CHMeCOCl}$ ; the  $\text{SO}_3$  groups are then split off and the resulting  $\text{EtCOCHMeCOCHMeCOCl}$  partially enolizes at the  $\delta$ -C atom and the ring in I is closed by elimination of HCl.

C. A. R.

Volatility and structure of the azides and aliphatic diazo compounds. NEVIL V. SMDGWICK. *J. Chem. Soc.* 1929, 1108–10.—Published data on the b. ps. of azides and aliphatic diazo compds. are recorded. The b. ps. of the azides lie near those of the bromides or between these and the iodides; the b. ps. of the diazo compds. lie very near those of the chlorides; those of the  $\text{NO}_2$  compds. are always much higher. These results seem to indicate that the ring formulas should be retained for both of these classes of compds.

C. J. WEST

Electronic conception in organic chemistry. II. An interpretation of the  $\alpha$  glycols. MASAO MIGITA. *Bull. Chem. Soc. Japan* 4, 57–65(1929); cf. *Ibid* 3, 308–16 (1928).—Dehydration of these glycols may proceed in 3 ways: (1) the semihydrobenzoin rearrangement,  $\text{HORR'CCHR''OH} \rightarrow \text{RR'CCHR''O} \rightarrow \text{RR'R''CCHO}$ ; (2) the vinyl dehydration,  $\text{HORR'CCHR''OH} \rightarrow \text{RR'C:CR''OH} \rightarrow \text{RR'HCCOR''}$ ; or (3) the semipinacolin rearrangement,  $\text{HORR'CCHR''OH} \rightarrow \text{RR'C(O)CHR''} \rightarrow \text{RCOCHR'R''}$ . With dil.  $\text{H}_2\text{SO}_4$ : Owing to the highly positive nature of the H, nearly all these glycols have negatively polarized tertiary hydroxyls, therefore, if the dehydration is catalytic, as previously discussed, it must be this group that is removed with either of the hydrogens on the secondary C; which H is removed is dependent on the substituting groups of that C, and hence the reaction goes according to (1) or (2). If the radicals on the tertiary C are strongly pos. and those on the secondary strongly neg., the secondary HO is induced negatively and hence removed. The reaction goes according to (3). With concd. acid the reaction is one of substitution, hence these influences are interfered with by the fact that the secondary HO is substituted more easily than the tertiary, hence (2) occurs when the tertiary HO is polarized negatively. With a negative secondary HO or in glycols without marked polarity (3) occurs. In the last case it is to be noticed that the secondary C is made highly pos. by the presence of the  $\text{SO}_3\text{H}$ ; hence, if the substituents on the other C are different, the more neg. one will migrate. The work in 26 articles has been examd. and found to agree with this conception.

V. F. HARRINGTON

Catalytic reduction of the dioximes—preparation of 2,3-diaminobutane. J. FREJKA AND MILLE. L. ZAHLOVA. *Collection Czechoslov. Chem. Comm.* 1, 173–87(1929).—Pure 2,3-diaminobutane is readily prepd. by the catalytic reduction of dimethylglyoxime in AcOH in the presence of Pt black. The free AcOH in the resultant soln. is removed by vacuum distn. Upon adding KOH, the residue seps. into 2 layers, the upper layer contg. the amine. Upon fractional distn., pure 2,3-diaminobutane is obtained, mainly in the form of its hydrate,  $\text{C}_4\text{H}_9(\text{NH}_2)_2 \cdot \text{H}_2\text{O}$ . Yields of 50% are reported. Upon fractional distn., the monohydrate and possibly the hemihydrate are obtained. The consts. of the former are:  $b_m$  56–60°,  $d_4^{20}$  0.90024,  $n_D^{20}$  1.44496. Upon dehydration by metallic Na, the anhyd. amine was obtained as a clear liquid, fuming in moist air and absorbing moisture and  $\text{CO}_2$  with avidity. It is sol. in  $\text{H}_2\text{O}$  and org. solvents, and has a disagreeable odor suggesting  $\text{NH}_3$ . The consts. are:  $b_m$  60–4°,  $d_4^{20}$  0.86011,  $n_D^{20}$  1.44416. The following deriva. were prepd.: *HCl salt*,  $\text{C}_4\text{H}_9(\text{NH}_2)_2 \cdot 2\text{HCl}$ , needle-like crystals, sol. in  $\text{H}_2\text{O}$ , slightly sol. in EtOH, insol. in  $\text{Et}_2\text{O}$ ; *HBr salt*,  $\text{C}_4\text{H}_9(\text{NH}_2)_2 \cdot 2\text{HBr}$ , needles, slightly sol. in EtOH, sol. in  $\text{H}_2\text{O}$ , insol. in  $\text{Et}_2\text{O}$ ; *sulfate*,  $\text{C}_4\text{H}_9(\text{NH}_2)_2 \cdot \text{H}_2\text{SO}_4$ , needles; *chromate*,



$C_4H_8(NH_2)_2$ ,  $H_2CrO_4$ , yellow powder; *chloraurate*,  $C_4H_8(NH_2)_2 \cdot 2HAuCl_4$ ; *chloroplatinate*,  $C_4H_8(NH_2)_2 \cdot H_2PtCl_6$ , orange-yellow, sol. in  $H_2O$ , slightly sol. in  $EtOH$ ; *oxalates*,  $C_4H_8(NH_2)_2 \cdot H_2C_2O_4 \cdot H_2O$ , white needles, and  $C_4H_8(NH_2)_2 \cdot H_2C_2O_4$ ; *succinate*,  $C_4H_8(NH_2)_2 \cdot H_2C_4H_4O_6$ , small white needles; *picrate*,  $C_4H_8(NH_2)_2 \cdot 2C_6H_3(NO_2)_3OH$ ; *picrolonate*,  $C_4H_8(NH_2)_2 \cdot 2C_{10}H_8N_4O_8$ ; *acetate*,  $C_8H_{10}N_2O_2$ , silky white needles; *phenyl isocyanate*,  $C_8H_8N_2N_2O_2$ , voluminous white powder; *Et acetate deriv.*,  $C_{16}H_{28}N_2O_4$ , white powder, m.  $59^\circ$ .

J. H. REEDY

**Polymethylene acid alcohols ( $\omega$ -hydroxyaliphatic acids) containing 8 to 21 carbon atoms.** P. CHUIT and J. HAUSSE. *Helv. Chim. Acta* 12, 463-92 (1929).—Several sym. acid alcs. or their derivs. have been isolated from waxes derived from conifers. In order to augment the present knowledge of this class of acids all the hydroxy fatty acids contg. 8-21 C atoms have been synthesized and their properties studied. Of these acids the  $C_9$ ,  $C_{10}$ ,  $C_{11}$ ,  $C_{13}$ ,  $C_{16}$  and  $C_{17}$  compds. have been prepd. and most of these characterized. The  $C_8$  acid was prepd. by reduction of the ester,  $HO_2C(CH_2)_6CO_2Me$  (I),  $b_1$  146-50°,  $d_{20}$  1.047, crystn. p. about 10°. This ester was transformed into the K salt, reduced with Na and alc., acetylated and dissolved in benzene to sep. it from suberic acid. From 100 g. of I, 15 g. of the Ac compd.,  $HO_2C(CH_2)_6CH_2OAc$  (II),  $b_1$  155-8°, m. 9-10°,  $d_{20}$  1.042, was obtained. Sapon. of II gives the HO acid,  $HO_2C(CH_2)_6CH_2OH$  (III), m. 58°. *Me ester* (9 g. from 12 g. of acid),  $b_1$  137-8°,  $d_{20}$  0.992. The Br deriv.,  $HO_2C(CH_2)_6CH_2Br$ ,  $b_1$  147-50°, m. 38.5-9.0°, was prepd. from III by treatment with 50% HBr. Several methods were used in the prepn. of the  $C_9$  acid. (a). The K salt of the ester  $HO_2C(CH_2)_7CO_2Me$  (IV) was reduced in a manner similar to that used for the prepn. of III. From 250 g. of the ester 85 g. of the Ac compd.,  $HO_2C(CH_2)_7CH_2OAc$  (V),  $b_1$  192-3°, crystn. p. 1°,  $d_{20}$  1.025, was obtained. The HO acid,  $HO_2C(CH_2)_7CH_2OH$  (VI), m. 51-1.5°, was formed upon sapon. of V. The yield of VI was 31.5% calcd. on IV. (b). The di-Me azelate,  $(CH_2)_7(CO_2Me)_2$  (VII), was reduced as in (a). From 200 g. there was obtained 20 g. of V and 8% of VI, besides 73% of the corresponding glycol (VIII), m. 45°. (c). The bromohydrin of VIII,  $CH_2Br(CH_2)_7CH_2OH$  (IX),  $b_1$  125-6° (without decompn.), m. 33.5°, (20 g.) was oxidized with  $K_2Cr_2O_7$  and  $H_2SO_4$ . One portion (11 g.) of the oxidation products dissolves in  $Na_2CO_3$  soln. and consists of the Br acid,  $CH_2Br(CH_2)_7CO_2H$  (X),  $b_1$  160-1°, m. 36-6.5°; the other portion (9 g.) contains the ester,  $CH_2Br(CH_2)_7CH_2O_2C(CH_2)_7CH_2Br$  (XI),  $b_1$  228-32°, m. 5°,  $d_{15}$  1.237, formed by the condensation of IX and X. The yields of X and XI were 47% and 34%, resp. Heating XI with KOAc at 200° yields the corresponding diacetate (XII),  $b_1$  222-3°,  $d_{20}$  0.988. Upon sapon. of XI, VI was obtained in theoretical yield. The heat treatment of X (25 g.) with KOAc led to the formation of 12 g. of impure V and 8 g. of the acetylated etholide,  $AcOCH_2(CH_2)_7CO_2CH_2(CH_2)_7CO_2H$  (XIII),  $b_1$  250-60°, m. 40°. This compd. is a condensation product of V and X. It may also be obtained by the heating of V. The sapon. of XIII or the heating of VI yields a simple etholide of VI,  $CH_2(OH)(CH_2)_7CO_2CH_2(CH_2)_7CO_2H$  (XIV), m. 60-1°, which, when heated at 200° for 1 hr., also combines with itself to form a double etholide,  $HO_2C(CH_2)_7CH_2O_2C(CH_2)_7CH_2O_2C(CH_2)_7CH_2O_2C(CH_2)_7CH_2OH$  (XV), m. 71-2°. (d). Azelaic acid monoacetate (XVI),  $b_1$  159-61°,  $d_{20}$  0.955, (60 g. from the acetylation of 100 g. of VIII with  $Ac_2O$  and NaOAc), when oxidized, yields impure V. This was transformed into the *Me ester* of VI,  $b_1$  147-50°,  $d_{20}$  0.978 and then sapon. to give VI. Among the oxidation products XII was also present. The compd.  $BrCH_2(CH_2)_8CO_2H$  (XVII),  $b_1$  163-5°, m. 42-2.5°, was prepd. from the corresponding HO acid (XVIII) which had been previously characterized by its treatment with 50% HBr in HOAc. The *Me ester* of XVIII,  $b_1$  160-5° (27 g.), when heated to 220-30°, yields 6 g. of the etholide,  $CH_2(OH)(CH_2)_8CO_2CH_2(CH_2)_8CO_2H$  (XIX), m. 56-6.5°. From 55 g. of the acetylated acid,  $HO_2C(CH_2)_8CH_2OAc$  (XX), 110 g. of MeOH and 10 g. of  $H_2SO_4$ , 27 g. of the Me ester and 15 g. of the *Me etholide* were obtained. Heating of XIX led to the formation of many products, one of which was isolated and had the formula  $C_{30}H_{50}O_{13}$ , m. 72.5-3.0°. The analysis indicated the condensation of 6 mols. of XVIII, although titration signified that 7 mols. were condensed. The acid,  $CH_2(OH)(CH_2)_9CO_2H$  (XXI), already known, was prepd. in 2 ways. (a). The nitrile,  $CH_2(OH)(CH_2)_9CN$ ,  $b_1$  186-7°, m. 12-3°,  $d_{20}$  0.910, was prepd. from XVII (23 g. from 30 g. of XVII and 9 g. of KCN) and when sapon. gave XXI. (b). The Na deriv. from 45 g. of  $CH_2(CO_2Me)_2$  was allowed to react with 70 g. of IX. The resulting ester was sapon., acidified, acetylated and decompd. by heating at 150°. A yield of 50 g. of the acetylated acid,  $CH_2(OAc)(CH_2)_9CO_2H$  (XXII),  $b_1$  184-5°, m. 34°, was thus obtained. Sapon. of XXII resulted in 40 g. of XXI. *Me ester*,  $b_1$  168-9°, m. 27-7.5° (7 g.) from 10 g. of XXI. The Br-acid,  $CH_2Br(CH_2)_9CO_2H$ ,  $b_1$  173-4°, m. 51° (6 g.), was obtained from 5 g. of XXI by treatment with HBr in HOAc as usual. Sabinic acid,  $HO_2C(CH_2)_{10}CH_2OH$  (XXIII), was prepd. in 2 ways. (a).

$\text{CHNa}(\text{CO}_2\text{Me})_2$  was condensed with XVII as in (b) for the prepn. of XXI. (b). The ester,  $\Delta^{12}$ -tridecenyl acetate (55 g.), was oxidized with  $\text{O}_3$  with the formation of 19 g. of *acetylsabinic acid*,  $b_{0.5}$  174–6°, m. 45°. When this was sapond, XXIII was obtained. Besides the acid the oxidation products contained the aldehyde,  $\text{AcOCH}_2(\text{CH}_2)_{10}\text{CHO}$ ,  $b_{0.5}$  143–5°, m. 8–9°,  $d_{15}$  0.9436; *semicarbazone*, m. 85–6°. Reduction of 16 g. of XXIII gave 5.2 g. of the corresponding glycol (XXIV),  $b_s$  184–6°, m. 79–9.5°. The *Me ester* of XXIII m. 34–4.5°. The *acetyl Me ester*, prepd. from the *Me ester* with  $\text{AcCl}$  and  $\text{C}_6\text{H}_5\text{N}$ ,  $b_{0.5}$  150–3°, m. 15°. The *Br acid*, m. 52–2.2°. Reduction of the ester  $(\text{CH}_2)_{11}(\text{CO}_2\text{Me})_2$  (60 g.) as in (b) for the prepn. of VI yielded the acetylated acid,  $\text{CH}_2(\text{OAc})(\text{CH}_2)_{11}\text{CO}_2\text{H}$  (XXV),  $b_1$  202–3°, m. 49–9.2°. Sapon. led to the formation of the acid,  $\text{CH}_2(\text{OH})(\text{CH}_2)_{11}\text{CO}_2\text{H}$  (XXVI), m. 79–9.5°. *Me ester*,  $b_{10}$  192–3°, m. 44.5°. The *Br acid* was prepd. in 2 ways. (a). Treatment of 80 g. of XXVI with  $\text{HBr}$  in  $\text{HOAc}$  gave 95 g. of the *Br acid* (XXVII),  $b_{1.5}$  190–2°, m. 59–9.2°. (b). The bromohydrin,  $\text{CH}_2\text{Br}(\text{CH}_2)_{11}\text{CH}_2\text{OH}$  (XXVII), m. 59°, was formed by the bromination of the corresponding glycol. Oxidation of XXVII yields XXVIII besides the product of condensation of XXVII and XXVIII. The di-*Br ester*,  $\text{Br}(\text{CH}_2)_{12}\text{CO}_2(\text{CH}_2)_{12}\text{Br}$ , m. 38–9°. The acid,  $\text{CH}_2(\text{OH})(\text{CH}_2)_{12}\text{CO}_2\text{H}$  (XXIX) was prepd. in 3 ways. (a). In the reduction of the di-*Me ester* of the acid  $(\text{CH}_2)_{12}(\text{CO}_2\text{H})_2$  (XXX) a wax was obtained which consisted of a condensation product of XXIX and XXX, m. 75°. This wax was sapond. and then treated as in the prepn. of III. The *Ac compd.*,  $\text{CH}_2(\text{OAc})(\text{CH}_2)_{12}\text{CO}_2\text{H}$  (XXXI),  $b_1$  215°, m. 54–4.5°, was so obtained. Sapon. gave XXIX. (b).  $\text{CHNa}(\text{CO}_2\text{Me})_2$  was condensed with the bromohydrin,  $\text{CH}_2\text{Br}(\text{CH}_2)_{12}\text{CH}_2\text{OH}$  (XXXII), and the acid was purified by sapon. of the *Me ester*,  $b_{10}$  196–8°, m. 47°. (c). The compd. XXVIII is transformed into the nitrile,  $\text{OH}(\text{CH}_2)_{12}\text{CN}$ ,  $b_1$  205°, m. 53–3.4° (7 g. from 10 g. of XXVIII). By sapon. and acidification XXIX was obtained. The *Br acid*, m. 61.8–2.0°. A yield of 12% of the acid,  $\text{CH}_2(\text{OH})(\text{CH}_2)_{13}\text{CO}_2\text{H}$  (XXXIII), was obtained by reduction of  $(\text{CH}_2)_{13}(\text{CO}_2\text{Me})_2$ . Condensation of XXVIII with malonic ester also yielded XXXIII after the sapon. of the *Ac deriv.*,  $b_2$  219–21°, m. 59.4–9.6°. *Me ester*,  $b_2$  180–2°, m. 52–2.5°. The *Br acid*, m. 65–2–5.5°. Juniperic acid,  $\text{CH}_2(\text{OH})(\text{CH}_2)_{14}\text{CO}_2\text{H}$  (XXXIV), was prepd. in 2 ways. (a). The ester,  $(\text{CH}_2)_{14}(\text{CO}_2\text{Me})_2$  was reduced and 11.5% of the *Ac compd.*,  $\text{CH}_2(\text{OAc})(\text{CH}_2)_{14}\text{CO}_2\text{H}$  (XXXV), was obtained. Sapon. gave XXXIV. (b). The glycol,  $(\text{CH}_2)_{14}(\text{CH}_2\text{OH})_2$  (390 g.), was heated with 193 g. of  $\text{Ac}_2\text{O}$  and 20 g. of  $\text{NaOAc}$  and yielded 255 g. of the *diacetate*, m. 47°,  $b_{1.5}$  193–4°, and 145 g. of the *mono acetate* (XXXVI),  $b_s$  217–8°,  $b_1$  193–5°, m. 54–4.5°, besides 40 g. of unchanged material. Oxidation of 100 g. of XXXVI with  $\text{CrO}_3$  yielded 75 g. of XXXV, m. 62°, and 25 g. of the condensation product of XXXV and XXXVI. Sapon. of 120 g. of XXXV yielded 95 g. of XXXIV. The *Me ester* (6 g. from 8 g. of XXXIV)  $b_2$  194–6°, m. 55–5.5°. The *Br acid* (75 g. from 75 g. of XXXIV)  $b_1$  214–7°, m. 70–0.5°. The synthesized XXXIV was found to be identical with the natural product derived from the wax obtained from pine needles of the fir in a yield of 0.17% based on the dry needles. The etholide,  $\text{C}_{44}\text{H}_{122}\text{O}_6$ , m. 87–5–8.0°, was obtained by heating XXXIV at 125°. The formula was confirmed by titration. When dissolved in benzene it crystallizes with benzene of crystn. The acid,  $(\text{CH}_2)_{15}(\text{OH})\text{CO}_2\text{H}$ , m. 87.5–8.0°, was obtained by sapon. of its *Ac deriv.*,  $b_1$  223–5°, m. 67.6–8.0°, a yield of 11% of which was formed by the reduction of  $(\text{CH}_2)_{15}(\text{CO}_2\text{Me})_2$ . *Me ester*,  $b_3$  210°, m. 58.6–9.0°. The *Br acid*  $b_1$  219–20°, m. 70.5–1.0°. In a similar manner, the  $\text{C}_{18}$ ,  $\text{C}_{19}$ ,  $\text{C}_{20}$  and  $\text{C}_{21}$  acids were prepd. from the corresponding dibasic acid esters. The  $\text{C}_{18}$  acid, m. 96.6–7.2°; *Ac deriv.* (yield 15 g. from 115 g. of ester),  $b_1$  228–31°, m. 70–0.5°; *Me ester*, m. 61.5–2.0°; *Br acid*,  $b_4$  240–1°, m. 75.2–5.8°. The  $\text{C}_{19}$  acid (yield 10%), m. 91–1.5°; *Ac deriv.*,  $b_{2.5}$  225–9°, m. 70–0.2°; *Me ester*, m. 65.6–6.0°; *Br acid*  $b_{2.5}$  225–8°, m. 73–4°. The  $\text{C}_{20}$  acid (yield 8%), m. 97.4–7.8°; *Ac deriv.*,  $b_3$  235–40°, m. 77°; *Me ester*, m. 68–8.5°; *Br acid*,  $b_3$  245–7°, m. 77–8°. The  $\text{C}_{21}$  acid (yield 16%), m. 92.5–3.0°; *Ac deriv.*,  $b_3$  239–42°, m. 73.8–4.2°; *Me ester*, m. 70–1°. *Br acid*, m. 75–6°. When the m. ps. of the HO acids were plotted against the no. of C atoms in the mol., 2 curves were obtained, according to whether the mols. had an even or odd no. of C atoms. The same was true of the *Ac derivs.*, *Me esters* and *Br acids*.

I. M. LEVINE

**Amino acid anhydrides.** III. Curtius and Goebel's glycine anhydride silver compound. TEI-ICHI ASAHINA. *Bull. Chem. Soc. Japan* 4, 75–7 (1929); cf. C. A. 23, 819.— $\text{Ag}_2\text{O}$  with glycine anhydride and a little  $\text{NH}_3$  turns white. The product is sol in  $\text{HNO}_3$  and  $\text{NH}_4\text{OH}$  and explodes on heating. It is probably identical with C. and G.'s compd.

V. F. HARRINGTON

**Reactions of nitrosulfonyl chlorides.** I. Reaction of hydrazine hydrate with *o*-nitrosulfonyl chlorides. ARTHUR T. DANN and WM. DAVIES. *J. Chem. Soc.* 1929, 1050–5.—2,4,5- $\text{ClMe}(\text{O}_2\text{N})\text{C}_6\text{H}_3\text{SO}_2\text{Cl}$  and  $\text{N}_2\text{H}_4\cdot\text{H}_2\text{O}$  in  $\text{C}_6\text{H}_5\text{-EtOH}$ , on warming to

40°, evolve N and give over 90% of 2-chloro-5-nitro-*p*-toluenesulfonic acid (I), very pale yellow, m. 131.5°; heating with  $C_6H_5N$  for 50 hrs. gives 77% of 2,5-Cl(O<sub>2</sub>N) $C_6H_4$ Me; MeOH-MeI give 50% of 2-chloro-5-nitro-*p*-tolyl Me sulfone, m. 145-6°. If the above reaction is carried out in a freezing mixt., there results 98% of 2-chloro-5-nitro-*p*-toluenesulfonehydrazide (II), m. 110-3° (decompn.); this decomp. in the presence of hot aq.  $N_2H_4$  or dil. HCl to form I and the theoretical quantity of N; in hot EtOH II reacts with *o*-HOC<sub>6</sub>H<sub>4</sub>CHO or PhCH:CHCHO to form the azines, although there is evidence of the formation of sulfonehydrazones. In warm PhOMe, PhCH:CHCHO and II give cinnamaldehyde 2-chloro-5-nitro-*p*-toluenehydrazone, dark red, m. 95°. The formation of this hydrazone, the fact that II cannot be obtained pure from MeOH rich in Me<sub>2</sub>CO and the reduction of Fehling's soln. in the cold all indicate that the constitution of II is normal. *o*-Nitrobenzenesulfonehydrazide, m. 101° (decompn.), results in 82% yield but is relatively unstable. 6-Chloro-4-nitro-*o*-toluene- and 2-chloro-6-nitro-*p*-toluenesulfonehydrazides, m. 127° and 125°, resp. *o*-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>COCl and  $N_2H_4 \cdot H_2O$  give the hydrazide, and also *N,N'*-di-*o*-nitrobenzoylhydrazine, m. 298°. Benzaldehyde *p*-nitrobenzoylhydrazone, pale yellow, m. 259°; its formation in EtOH is a delicate test for BzII. *N,N'*-Di-*p*-nitrobenzoylhydrazine, pale yellow, m. 291°; it forms a very sparingly sol. scarlet salt. C. J. WEST

**Preparation of *d*-gluconic acid.** H. KILIANI. *Ber.* 62B, 588-92(1929).—Two features of K.'s method for prep. *d*-gluconic acid (I) (oxidation with Br at room temp.) have been found undesirable by a no. of workers: the use of too large an excess of Br and of the "expensive" Ag<sub>2</sub>O to remove the halogen. The large Br excess is used because liquid Br acts much more powerfully and rapidly than Br dissolved in HBr. As to the use of Ag<sub>2</sub>O, while the necessary initial outlay for AgNO<sub>3</sub> is considerable, it can be regenerated at a minimal cost from the Ag halide ppts. PbCO<sub>3</sub> was recommended at one time instead of Ag<sub>2</sub>O but the pptn. of the halogen is always incomplete and it is not at all easy to procure PbCO<sub>3</sub> entirely free of alkali. The method has been improved in some respects; if the glucose soln. which has been treated with Br is shaken very often and at times continuously, the liquid Br disappears in 2.5-3 hrs. (instead of 30-36 hrs.), and instead of using H<sub>2</sub>S, the dissolved Ag is much better removed by cautious addn. of dil. HCl with vigorous shaking; the incomplete crystn. of PbBr<sub>2</sub> from the concd. soln. after complete satn. with PbCO<sub>3</sub> is not due to the formation of a "difficultly sol. double salt" with the gluconate, but to a mutual soly. influence. Being in need of a large amt. of I, K. has worked out a new method of prepn. Boiling with CaCO<sub>3</sub> after the Br treatment and adding alc. to ppt. the Ca gluconate while the CaBr<sub>2</sub> remains in soln. works only with small quantities, for from concd. solns. alc. ppts. the Ca salt only in the form of a thick magma of amorphous pellets which, when filtered, eagerly absorb moisture and deliquesce, and with more dil. solns. an immoderately large amt. of 95% alc. is necessary for adequate pptn. BaBr<sub>2</sub> of itself is difficultly sol. even in 50% alc. but under certain definite conditions (which are described in detail) there can be obtained with BaCO<sub>3</sub> around 65% of quite pure Ba gluconate (contg. only traces of bromide and at most only faintly colored). The Ba gluconate and bromide afford an excellent example of the mutual soly. influence mentioned above; either salt alone crysts. with great ease and cannot be called easily sol. in H<sub>2</sub>O, but in mixts. of the 2 both of these properties disappear. *Addendum.*—In the paper on the use of (CO<sub>2</sub>H)<sub>2</sub> for detg. Ba in salts of org. acids (C. A. 22, 3139) K. stated that the tendency to the formation of an acid salt is practically nil, but he has since found that 50% alc. slowly removes free (CO<sub>2</sub>H)<sub>2</sub> from the crystd. Ba salt. The proposed method, however, loses none of its practical value if the ppt., nearly purified by washing with 50% alc., is converted into the carbonate by gentle ignition. C. A. R.

**Dioximes.** LI. G. PONZIO AND M. MILONE. *Gazz. chim. ital.* 58, 844-53(1928); cf. P., C. A. 22, 4120; 23, 375.—It is known that the formation of solid solns., with resulting abnormalities in the detn. of the mol. wt. of many compds. by cryoscopic methods, is due to the similarity of the mol. structure of the solute and solvent. This fact suggested that it might be possible to verify the structures of the 2 peroxides formed by the dehydrogenation of MeC(:NOH)C(:NOH)Ar compds. and which were assigned the formulas:  $\text{MeC:N}(\text{:O})\text{O:N:CAr}$  (I) and  $\text{MeC:N.O.O.N:CAr}$ , resp. Only I

should form solid solns. with  $\text{MeC:N.O.N:CAr}$  (III) compds. because of the presence of the group  $\text{—C:N.O.N:C—}$  common to both. Expts. confirmed this prediction, I representing the peroxide which melts at the higher temp. This also precludes the

possibility of the structure  $\text{O.N.CMe:CAr.N.O}$ , which is that proposed by Green and Rowe for *o*-quinone dioxime peroxides (cf. *C. A.* 7, 3119; 8, 1412). Compds. of the II type do not form solid solns. with those of the III type so that the structure;  $\text{MeC:N.O.N(:O):CAr}$  is excluded.  $\text{MeC:N(:O).O.N:CPh}$  (IV),  $\text{MeC:N(:O).O.N:CC}_6\text{H}_4\text{OMe-}p$  (V),  $\text{MeC:N.O.O.N:CPh}$  (VI) and  $\text{MeC:N.O.O.N:CC}_6\text{H}_4\text{OMe-}p$  (VII) show normal mol. wts. in AcOH,  $\text{C}_6\text{H}_6$  and PhOH, whereas IV, V and  $\text{MeC:N(:O).O.N:CC}_6\text{H}_4\text{Br-}p$  show in  $\text{MeC:N.O.N:CC}_6\text{H}_4\text{OMe-}p$  (VIII) mol. wts. higher than the theoretical ones. VI and  $\text{MeC:N.O.O.N:CC}_6\text{H}_4\text{Br-}p$  show in VIII mol. wts. above their theoretical ones. In VI and in VII, VIII shows a normal mol. wt. In IV and in V, VIII shows a mol. wt. above the theoretical. The cryoscopic of  $\text{MeC:N.O.N:CPh}$  could not be detd. because of its low f. p. The consts. of Br and  $\text{NO}_2$  derivs. of V and VII in  $\text{MeC:N.O.N:CC}_6\text{H}_3(\text{OMe})\text{Br}$  (IX) and in  $\text{MeC:N.O.N:CC}_6\text{H}_3(\text{OMe})\text{NO}_2$  (X) were then detd. In VIII,  $\text{MeC:N(:O).O.N:CC}_6\text{H}_3(\text{OMe})\text{Br}$  (XI) and  $\text{MeC:N(:O).O.N:CC}_6\text{H}_3(\text{OMe})\text{NO}_2$  (XII) show mol. wts. above the theoretical ones.

In VIII,  $\text{MeC:N.O.O.N:CC}_6\text{H}_3(\text{OMe})\text{Br}$  (XIII) and  $\text{MeC:N.O.O.N:CC}_6\text{H}_3(\text{OMe})\text{NO}_2$  (XIV) show normal mol. wts. XI in IX and XII in X show normal mol. wts. In IX, XIII does not show any lowering of the f. p., and the same is true of XIV in X. These facts establish the constitutions of XI, XII, XIII and XIV, because only XI and XII form solid solns. with VIII and therefore only XI and XII have similar structures to that of VIII. An Eyckmann depressimeter which permitted cstns. to  $0.005^\circ$  was used. Particular care was taken in the purification of VIII, and instead of prepg. it by the method of Boeris (*Gazz. chim. ital.* 23, ii, 186(1893)), furoxan (10 g.) was heated for 24 hrs. on a boiling water bath with glacial AcOH (50 cc.),  $\text{SnCl}_2$  (20 g.) and concd. HCl (50 cc.), dild. with water, treated with  $\text{NaOEt}$  and steam-distd., which gave a product m.  $65.6^\circ$ .

C. C. DAVIS

***d*-Glucuronic acid.** II. FELIX EHRLICH AND KURT REHORST. *Ber.* 62B, 628-34 (1929); cf. *C. A.* 20, 740.—It was shown in the first paper that free *d*-glucuronic acid (I) can be obtained readily and in good yield in cryst. form by cautiously decomp. mentholglucuronic acid (II) with  $\text{H}_2\text{SO}_4$  on the  $\text{H}_2\text{O}$  bath and purifying it through the Ba salt. Lactone formation is avoided if, after the cleavage with  $\text{H}_2\text{SO}_4$ , enough Ba is added not only to ppt. the  $\text{H}_2\text{SO}_4$ , but also to form the salt of I and the I is liberated from this salt at a low temp. with the calcd. amt. of  $\text{H}_2\text{SO}_4$ . In the method of prepn. as originally given, difficulties in the purification sometimes result from the fact that  $(\text{NH}_4)_2\text{SO}_4$  dissolves readily in the acid alc. soln. of the II; furthermore, long continued action of  $\text{BaCO}_3$  may lead to discolorations and decompns. The method has accordingly been somewhat modified; the  $\text{NH}_4$  salt of II is treated in  $\text{H}_2\text{O}$  suspension with  $\text{H}_2\text{SO}_4$  and extd. with  $\text{Et}_2\text{O}$  and the ext. washed twice with  $\text{H}_2\text{O}$ , which removes the  $(\text{NH}_4)_2\text{SO}_4$ . The  $\text{Et}_2\text{O}$  is evapd., the II heated 12 hrs. on the  $\text{H}_2\text{O}$  bath with dil.  $\text{H}_2\text{SO}_4$ , cooled, filtered from the menthol, concd. *in vacuo*, extd. 12 hrs. with  $\text{Et}_2\text{O}$  to remove unchanged II and colored impurities, treated with  $\text{Ba}(\text{OH})_2$ , filtered from the  $\text{BaSO}_4$ , completely neutralized with  $\text{BaCO}_3$  with gentle heating, filtered, decolorized with charcoal, concd. *in vacuo*, treated at room temp. with  $N \text{ H}_2\text{SO}_4$  and alc. and concd. *in vacuo* at  $30^\circ$ , then over  $\text{CaCl}_2$  and finally over  $\text{H}_2\text{SO}_4$ ; yield of pure I, 59.5%. From this pure I were prepd. a no. of salts: Na, from I and 0.1 *N* NaOH in 80% alc., colloidal ppt. changing to needles with 1  $\text{H}_2\text{O}$  after drying *in vacuo* over  $\text{H}_2\text{SO}_4$ ,  $[\alpha]_D^{20}$  in  $\text{H}_2\text{O}$  (*c* 5.243)  $-0.56^\circ$  (initial),  $22.51^\circ$  (final, after about 1.5 hrs.); 1 g. anhyd. salt completely reduces 173 cc. of normal Fehling's soln. after 2 mins. boiling. *K*, cryst. powder with 1.5  $\text{H}_2\text{O}$ ,  $[\alpha]_D^{21}$  ( $\text{H}_2\text{O}$ , *c* 2.647)  $4.53^\circ$  (initial),  $20.02^\circ$  (final, after about 1.5 hrs.); anhyd. salt,  $[\alpha]_D^{25.15}$  ( $\text{H}_2\text{O}$ , *c* 1.240)  $-2.78^\circ$  (initial),  $22.47^\circ$  (final, after 2 hrs.).  $\text{NH}_4$ ,  $[\alpha]_D^{20}$  ( $\text{H}_2\text{O}$ , *c* 3.453)  $-4.05^\circ$  (initial)  $23.17^\circ$  (final, after 1.5 hrs.). *Ba*, amorphous,  $[\alpha]_D^{20.6}$   $17.45^\circ$  ( $\text{H}_2\text{O}$ , *c* 3.725), does not show mutarotation. *Brucine*, crystals with 1  $\text{H}_2\text{O}$  which they do not lose *in vacuo*

over  $P_2O_5$  at  $100^\circ$ , m.  $156-7^\circ$ ,  $[\alpha]_D^{20} -15.08^\circ$  ( $H_2O$ ,  $c$  3.117). Whereas the salts immediately after soln. are distinctly *l*-rotatory, the free I itself uniformly gave  $[\alpha]_D 11^\circ$ . Hudson, on the basis of his rule, calcd. that the initial rotation of the  $\alpha$ -form of I should be  $82^\circ$ , that of the  $\beta$ -form  $-5^\circ$ , and at his suggestion E. and R. tried, by varying the solvents and the method of prepn., the concn. and the temp. of the solns., to obtain lower rotations, but without success, even when the soln. was prepd. with ice  $H_2O$ . With a I liberated from its Na salt with the calcd. amt. of  $H_2SO_4$  at  $0^\circ$ , however, an initial  $[\alpha]_D$  of  $3.5^\circ$  was obtained. Possibly in their method of prepn. of the free I at some stage of the process the  $\beta$ -form partly changes into the  $\alpha$ -form, or perhaps the H. rule does not hold for the free acid, the H ions greatly influencing the equil. between the 2 forms; unlike the reducing sugars, both I and *d*-galacturonic acid reach their final rotation at room temp. very quickly (about 2 hrs.). The final rotation of I at  $0-20^\circ$  for  $c$  0.5-3.3 was around  $36^\circ$ .

C. A. R.

**Active molecule of oxalic acid.** F. OBERHAUSER AND J. SCHORMÜLLER. *Ann.* **470**, 111-28(1929); cf. *C. A.* **22**, 2142; Chichibabin, *C. A.* **23**, 1114.—Previous work being continued, it is found that by means of the activated  $(CO_2H)_2$  0.01 mg. Mn per l. may be detected. The action of  $H_2O_2$  on  $Fe^{++}$  in the presence of  $(CO_2H)_2$  gives in the cold a good yield of the activated form;  $Fe^{+++}$  does not react in this manner but rather retards the reaction.  $Fe^{++}$  (0.056 mg. as  $FeSO_4$ ) causes the sepn. of 0.1150 g. Hg as  $HgCl$  from  $HgCl_2$ ; there appears to be a min.  $(CO_2H)_2$  concn. for a given max.  $HgCl$  pptn.; there seems to be no definite relation between the  $HgCl_2$  or  $H_2O_2$  concns. and the pptn. of  $HgCl$ . The order of addn. is important, since no pptn. occurs if the  $FeSO_4$  is added to  $(CO_2H)_2$ ,  $HgCl_2$  and  $H_2O_2$ .  $K_2S_2O_8$  also acts as an activating agent, 1-g. atom causing the sepn. of 100 times that amt. of  $HgCl$ . Nitrates do not activate  $(CO_2H)_2$ , while nitrites do.  $(CO_2H)_2$  may also be activated electrolytically. Heating  $(CO_2H)_2$  with  $(CO_2NH_4)_2$  does not cause activation but the Hg quartz lamp causes pptn. of  $HgCl$ . Activated  $(CO_2H)_2$  loses its activity by heating to the b. p. The constitution of the activated mol. is discussed.

C. J. WEST

**Experiments in the glutaric series.** C. RAVENNA AND R. NUCCORINI. *Gazz. chim. ital.* **58**, 853-64(1928).—The expts. had as their object the synthesis of polypeptides from glutamine (I), following a procedure similar to that used by R. and Bosinelli (cf. *Gazz. chim. ital.* **49**, ii, 303(1919); **51**, ii, 281(1921); *C. A.* **15**, 68) for the synthesis of  $\beta$ -diptptides from asparagine (II). Moreover, since the anhydride of the dipeptide of aspartic acid was also obtained in a quite different way from  $NH_4$  malate (cf. *Beilstein*, 3rd Ed. **1**, 1389), it was attempted to prep. by analogy from  $H_4NO_2CCHOHCH_2CH_2CO_2NH_4$  (III) the dipeptide of  $HO_2CCHNH_2CH_2CH_2CO_2H$  (IV). The results show that the reactions are not analogous, no dipeptide being obtained from I under the conditions used with II, but rather  $HO_2CCHCH_2CH_2CO.NH$  (V) from the loss of  $NH_3$  from 1 mol.

of I. But though only 1 mol. of I is involved, the reaction is similar to that with II in that  $NH_3$  is eliminated at the expense of an amido and an amino group. Whereas, however, the amido group of II is essential to the imine condensation (the reaction not occurring with aspartic acid) a pyrrolidonecarboxylic acid is also obtained from (IV) (cf. Foreman, *C. A.* **9**, 632; Skola, *C. A.* **15**, 524). Like III it does not behave in an analogous manner to  $NH_4$  malate,  $NH_3$  instead of  $H_2O$  being eliminated from III. The I used in the expts. was prepd. from beets by extg. 5 kg. units of the latter with water, defecating with basic Pb acetate, filtering, adding excess aq.  $Hg(NO_3)_2$  (contg.  $HNO_3$ ), suspending the ppt. in water, decompg. with  $H_2S$ , filtering, distg. off the  $H_2S$  in *vacuo*, neutralizing the residue with  $NH_4OH$ , concg. in *vacuo*, adding EtOH, adding a little water and recrystg. by soln. in water and addn. of EtOH, which yields about 20 g. of I. No m. p. of I was found in the literature. The product obtained was variable, the m. p. being  $178-86^\circ$ . To prep.  $HO_2CCHOHCH_2CH_2CO_2H$  (VI), gluten was converted to the HCl deriv. of IV by the method of Fischer (*Ber.* **39**, 582(1906)), from which IV was obtained by the method of Hugounenq and Florence (*C. A.* **15**, 370), and from which in turn VI was prepd. by the method of Fischer and Moreschi (*C. A.* **7**, 86), purifying by the Zn salt, 50 g. of IV yielding 20 g. of VI. III was prepd. by passing  $NH_3$  into VI in anhyd. EtO. It could not be isolated without decompn. and was therefore used in soln. I (8 g.) refluxed in water (160 cc.) for 230 hrs., cooled,  $1/2$  N  $Ba(OH)_2$  (400 cc.) added, let stand in *vacuo* for 72 hrs., the  $Ba(OH)_2$  removed by titration with  $1/2$  N  $H_2SO_4$ , filtered and the filtrate concd. in *vacuo* to a very small vol., pptd. a cryst. mixt. which on sepn. with EtOH, yielded IV and V. The cryst. mixt. was composed of homogeneous crystals and may have been a labile compd. of IV and V. Similar preps. from IV and from mono- $NH_4$  glutamate yielded homogeneous mixts., probably also labile compds. of IV and V, as suspected by Menozzi and Appiani (*Gazz. chim. ital.* **24**, i, 374(1894))

and by Skola (C. A. 15, 524). Such compds. would be analogous to the addn. products of various amino acids and of amino acids and diketopiperazine (cf. Abderhalden and Sickel, C. A. 18, 2685; Pfeiffer and Angern, C. A. 19, 2033; 21, 897). To det. the behavior of III when heated, VI (3.70 g.) in anhyd.  $\text{Et}_2\text{O}$  was satd. with  $\text{NH}_3$ , the product was heated for 2 hrs. at  $150^\circ$ , extd. with hot  $\text{EtOH}$ , the ext. boiled with bone-black, filtered, concd., cooled and the cryst. ppt. purified from  $\text{EtOH}$ , which yielded 0.5 g. of  $\alpha$ -hydroxyglutaric acid diamide,  $\text{C}_6\text{H}_{10}\text{N}_2\text{O}_3$  (VII), m.  $181-2^\circ$  (decompn.); its aq. soln. gives with  $\text{KOH}$  and  $\text{CuSO}_4$  a violet color. Higher yields were obtained by heating III under pressure. Thus VI (12 g.) in anhyd.  $\text{Et}_2\text{O}$ , satd. with  $\text{NH}_3$ , the  $\text{Et}_2\text{O}$  eliminated, heated in a sealed tube for 2 hrs. at  $145-55^\circ$ , yields 4 g. of VII. VII (2.5 g.), heated 2 hrs. at  $185-90^\circ$ , cooled,  $\text{EtOH}$  added, extd. with anhyd.  $\text{Et}_2\text{O}$ , the  $\text{Et}_2\text{O}$  distd. until turbid, more  $\text{Et}_2\text{O}$  added until clear, petr. ether added until again turbid, let stand at  $0^\circ$ , filtered and the residue (0.50 g.) purified by soln. in  $\text{Et}_2\text{O}$  and pptn. with petr. ether, yields the compd.  $\text{C}_6\text{H}_7\text{O}_3\text{N}$ , which is probably the lactone of  $\alpha$ -hydroxyglutaric acid monoamide,  $\text{H}_2\text{NCOCH}(\text{CH}_2\text{CH}_2\text{CO}_2\text{O})$ , m.  $87-9^\circ$ , gives in water a violet color with

$\text{KOH}$  and  $\text{CuSO}_4$ . It may, however, have the dimeric constitution  $\text{H}_2\text{NCOCH}(\text{CH}_2\text{CH}_2\text{O.CO.CH}(\text{CH}_2\text{CH}_2\text{CONH}_2)\text{O.CO})$ . A mol. wt. detn. showed that the former

formula is the correct one.

C. C. DAVIS

**Constitution of Guareschi's cyanobutadiene acids. An attempt to synthesize  $\beta$ -isopropylglutaconic acid.** CHARLES S. GIBSON AND JOHN L. SIMONSEN. *J. Chem. Soc.* 1929, 1074-80.—Condensation of  $\text{AcH}$  and  $\text{NCCH}_2\text{CO}_2\text{Et}$  according to Guareschi (*Atti accad. sci. Torino* 36, 454(1900)) gives the *NH*, salt of 2,6-dihydroxy-3,5-dicyano-1-methylpyridine, thin prisms; hydrolysis with 60%  $\text{H}_2\text{SO}_4$  gives 2,6-dihydroxy-4-methylpyridine (Rogerson and Thorpe, *J. Chem. Soc.* 87, 1685(1905)).  $\text{Me}_2\text{CHCHO}$  and  $\text{NCCH}_2\text{CO}_2\text{Et}$  (cf. G., *Atti accad. sci. Torino* 38, 290(1902)) give the *NH*, salt of 2,6-dihydroxy-3,5-dicyano-4-isopropylpyridine, prisms, does not m.  $295^\circ$ ; hydrolysis gives a mixt. of 2,6-dihydroxy-3-cyano-4-isopropylpyridine, crystals with 1 mol.  $\text{H}_2\text{O}$ , m. about  $248^\circ$ , or anhyd., m.  $273^\circ$ , and 2,6-dihydroxy-3-isopropylpyridine, m.  $213-4^\circ$ ;  $\text{HCl}$  salt, plates; *p*-nitrobenzoyl deriv., m.  $200-1^\circ$ ; oxime, pale yellow, m.  $123-4^\circ$ . *Et*  $\alpha$ -bromo  $\beta$ -isopropylglutarate, from the acid chloride and  $\text{Br}$ , followed by esterification,  $b_p$   $178^\circ$ .  $\text{PhNEt}_2$  gives, as the main product, the *Et* ester of *dl*- $\alpha$ -hydroxy- $\beta$ -isopropylglutaric lactone,  $b_p$   $178^\circ$ ,  $n_D^{20}$  1.4466; the lactone acid is a viscous oil.

C. J. WEST

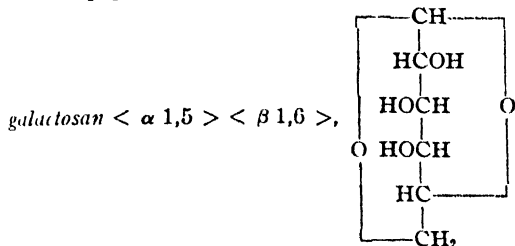
**Butane- $\alpha,\beta,\delta$ -tricarboxylic acid.** H. KILIANI. *Ber.* 62B, 640 1(1929).—In the  $\text{HI}$  reduction of the synthetic product from *K* *l*-mannosaccharate and  $\text{KCN}$ , K. had expected to obtain  $\text{HO}_2\text{CCH}_2\text{CH}(\text{CO}_2\text{H})\text{CH}_2\text{CH}_2\text{CO}_2\text{H}$  (I) but was never able to do so. The I is very imperfectly described in the literature and K. accordingly obtained a supply of  $\text{NCCH}_2\text{CH}(\text{CN})\text{CH}_2\text{CH}_2\text{CO}_2\text{Et}$  from Leuchs, 24.75 g. of which he heated 2.5 hrs. on the  $\text{H}_2\text{O}$  bath, with occasional stirring, with 72 g.  $\text{Ba}(\text{OH})_2 \cdot 8\text{H}_2\text{O}$  and 372 cc.  $\text{H}_2\text{O}$ ; he then evapd. the mixt. nearly to dryness, stirred the residue with  $\text{H}_2\text{O}$ , decompd. it quantitatively with  $\text{H}_2\text{SO}_4$  and evapd. the filtrate to a thin sirup which on standing in the air deposited the I in columns or prisms which he purified by Leuchs and Möbis' method, with, however, 4 parts  $\text{C}_6\text{H}_6$  instead of 3 to 3 of  $\text{Me}_2\text{CO}$ . The I m.  $123^\circ$  and is optically inactive. None of the metal salts shows a definite tendency to crystallize; the  $\text{Ba}$  and  $\text{Ca}$  salts are more difficultly sol. in hot than in cold  $\text{H}_2\text{O}$ . The neutral K salt with  $\text{Cd}(\text{NO}_3)_2$  gives an amorphous ppt. which redissolves as long as any unchanged K salt remains. According to Steimetz the cryst. druses of I (from  $\text{H}_2\text{O}$ ) which, macroscopically, are beautiful, contain but few individual crystals with unetched faces and sharp angles; these are triclinic and apparently triclinic pinacoidal, a drawing of the predominant form is given.

C. A. R

**The constitution of isoborneol.** E. PUXEDDU. *Gazz. chim. ital.* 59, 59-69(1929). A survey of the literature on the problem of the isomerism of borneol (I) and isoborneol (II) leads to the conclusion that a study of their constitutions by means of  $\text{Cl}$  derivs. leads to insurmountable difficulties, and that there is much more hope in studying the oxidation of II to camphor (III) and reduction of III to II. With ordinary methods of oxidation, both I and II are transformed into camphor, but it was found that with a method of oxidation not hitherto applied to this problem, it is possible to oxidize I but not II to III. This method is a photochem. oxidation already described (cf. C. A. 14, 3368; 16, 2640). A mixt. of I (10 g.) in anhyd.  $\text{Et}_2\text{O}$  (400 cc.) and a filtered soln. of sublimed  $\text{FeCl}_3$  (10 g.) in anhyd.  $\text{Et}_2\text{O}$  (100 cc.) exposed to direct sunlight for 3 days, filtered, the black-brown residue washed with  $\text{Et}_2\text{O}$  and laid aside for future analysis, the filtrate exposed as before for 3 days, the new dirty white ppt. filtered and washed with  $\text{Et}_2\text{O}$  and laid aside, the new filtrate exposed as before for 2 days

until completely decolorized, filtered,  $\text{FeCl}_3$  (5 g.) in  $\text{Et}_2\text{O}$  (100 cc.) added to the filtrate, again repeatedly exposed to sunlight and filtered until colorless, and the whole process repeated until a total of 30 g. of  $\text{FeCl}_3$  is used, the  $\text{Et}_2\text{O}$  liquor finally concd. to a relatively small vol., the soln. extd. with water until a test for Fe is no longer obtained, and the non-aq. residue steam-distd., yields **III** and a brown-yellow resin which was not analyzed. The max. yield of **III** was 8 g. Using the same proportions of **II** and  $\text{FeCl}_3$  and following the same procedure, no **III** was obtained, but an unidentified colorless oil which was impure. Changing the proportions of **II** and  $\text{FeCl}_3$  and the time of exposure to light did not lead to the formation of **III**. Therefore the chief argument used in the past in support of the secondary alc. structure of **II**, viz., that it is always easily oxidized to **III**, is no longer significant. Furthermore there are instances known of the oxidation of tertiary alcs. to ketonic compds., and above all, methylcamphenylol, whose close relationship to **II** is evident, and which is certainly a tertiary alc., is also easily oxidized to **III** (cf. *Ann.* 340, 58; *Ber.* 38, 2461 (1905)). Possibility of tautomerism among the terpene alcs. exists. The discussion leads to the conclusion that **I** has a secondary camphoric structure and **II** a tertiary camphene structure. C. C. DAVIS

**Sugar anhydrides.** **I. Galactosen**  $< \alpha 1,5 > < \beta 1,6 >$ . FRITZ MICHEL. *Ber.* 62B, 687-93 (1929); cf. *C. A.* 22, 226.—Of the hitherto known sugar anhydrides, levoglucosan and  $\alpha$ -glucosan have been obtained in cryst. form and shown to be glucosan  $< \alpha 1,5 > < \beta 1,6 >$  and glucosan  $< 1,2 > < 1,5 >$ , resp. The others (for the most part non-cryst.) are generally assumed to be analogs of glucosan with a labile 1,2-ring. In this paper is described a cryst. galactose anhydride (**I**) which is very probably a



It was synthesized by a method by

which levoglucosan can also be obtained;  $\alpha$ -acetobromogalactose combines with  $\text{NMe}_3$  to form *tetraacetylgalactosidotrimethylammonium bromide* (**II**), which, from its rotation, probably belongs to the  $\beta$ -series, and the **II** with hot alkalis is hydrolyzed to **I**. Starting with a galactose deriv. contg. an  $< \alpha 1,5 >$ -ring, the  $\beta$ -ring in the anhydride may, theoretically, take in the 1,3-, 1,4- or 1,6-C atoms. If it is assumed that the 1,5-ring is without strain (which is the case if the angle between the O valences is assigned the probable value of  $110^\circ$ ), the above 3 rings would have strains of about  $110^\circ$ ,  $70^\circ$  and  $40^\circ$ , resp., i. e., the last should be the most stable. In spite of wide variation in the conditions of anhydridization, no isomer of **I** was ever obtained. **I** is stable towards Br and  $\text{KMnO}_4$ , reduces Fehling soln. only in traces even on long boiling, is not hydrolyzed by cold dil. acids but is completely on long boiling, and gives a mixt. of  $\alpha$ - and  $\beta$ -Me galactosides with HCl in MeOH. Small amts of **I** are also obtained by distg.  $\beta$ -galactose in a high vacuum and seeding the distillate. This great stability of **I** speaks decisively against a 1,3-ring structure. Furthermore, **I** is converted by  $\text{Me}_2\text{CO}$  with  $\text{CuSO}_4$  almost quant. into a well crystd. *acetone compd.* (**III**). These conditions are so mild that a ring shifting is improbable, and of the 3 possible anhydrides only **I** contains 2 adjacent HO groups in the *cis*-position to each other. With 1% HCl (which does not alter **I** itself), **III** regenerates **I**.  $\beta$ -Me galactoside (**IV**) similarly yields an *acetone compd.* (**V**), regenerating **IV** with 1% HCl. **III** has only 1 free HO group and condenses by the usual method with acetobromoglucose to an *acetonedisaccharide tetraacetate* which, however, was obtained only in amorphous form. **II** (13 g. from 20 g. acetobromogalactose, 7.5 g. abs. alc., 7.5 g.  $\text{C}_6\text{H}_6$  and 7.5 g.  $\text{NMe}_3$ ), m.  $173^\circ$  (decompn.),  $[\alpha]_D^{20}$   $31.1^\circ$  ( $\text{CHCl}_3$ ). **I** (5.9 g. from 33 g. **II** with  $\text{Ba}(\text{OH})_2$ ), m.  $220-1^\circ$ ,  $[\alpha]_D^{21}$   $-21.9^\circ$  ( $\text{H}_2\text{O}$ ), mol. wt.  $174^\circ$  ( $\text{H}_2\text{O}$ ); the mother liquors ( $\text{AcOEt}$ ) with  $\text{C}_6\text{H}_5\text{N}-\text{Ac}_2\text{O}$  yield 2.6 g. of the *triacetate*, m.  $73-4^\circ$ ,  $[\alpha]_D^{22}$   $-5.7^\circ$  ( $\text{CHCl}_3$ ). *Galactosido*  $< 1,5 >$ , *trimethylammonium bromide* (5.4 g. from 10 g. **II** and dil. HBr on the  $\text{H}_2\text{O}$  bath), m.  $162-4^\circ$ ,  $[\alpha]_D^{20}$   $37.6^\circ$  ( $\text{H}_2\text{O}$ ). *3,4-Isopropylidenegalactosan*  $< \alpha 1,5 > < \beta 1,6 >$  (**III**), m.  $151-2^\circ$ ,  $[\alpha]_D^{22}$   $-61.7^\circ$  ( $\text{H}_2\text{O}$ ),  $-73.3^\circ$  ( $\text{CHCl}_3$ ). *3,4-Isopropylidene- $\beta$ -methylgalactoside*  $< 1,5 >$  (**V**), m.  $134-5^\circ$ ,  $[\alpha]_D^{17}$   $20.96^\circ$  ( $\text{H}_2\text{O}$ ). C. A. R.

**Compounds of hydroxides of the alkaline earths with sugars.** JOHN E. MACKENZIE and JAMES P. QUINN. Univ. of Edinburgh. *J. Chem. Soc.* 1929, 951-64.—A review is given of the literature of the subject. CaO (0.9 mol.) added to 1 mol. sucrose in 5% aq. soln. and pptd. with 500 cc. 60% EtOH (200 cc. sugar-alkali soln.) gives 60% of  $C_{12}H_{22}O_{11} \cdot CaO \cdot 2H_2O$  (termed monolime-monosucrose), from which the  $H_2O$  is removed by triturating with 60% EtOH; evapn. of the aq. soln. over  $P_2O_5$  gives  $C_{12}H_{22}O_{11} \cdot CaO \cdot 5$  (or 6)  $H_2O$ , from which the  $H_2O$  may also be removed by 60% EtOH; this compd. is unstable at room temp. Addn. of 500 cc. of 60% EtOH to 250 cc. CaO-satd. sucrose soln. ppts. dilime-monosucrose, amorphous, sepg. with 6  $H_2O$ , soly. 1 in 37.7 parts  $H_2O$ . Heating the CaO-satd. sucrose soln. to 80° gives trilime-monosucrose, sepg. with 6  $H_2O$ ; soly. 15.33 g. anhyd. compd. per 1.  $H_2O$ .  $Me_2SO_4$  and the 3CaO salt give mixts. of methylated sucroses. Higher lime-sucrose compds., such as  $C_{12}H_{22}O_{11} \cdot 4CaO \cdot H_2O$  and  $C_{12}H_{22}O_{11} \cdot 9CaO \cdot H_2O$ , were obtained by heating solns. which were not satd. with CaO. One mol. each of sucrose and KCl in the min. quantity of boiling  $H_2O$  deposit the cryst. compd.  $C_{12}H_{22}O_{11} \cdot KCl \cdot 2H_2O$ . A sucrose soln. (200 cc. of 20%) in which 1 mol. SrO has been dissolved at 75°, on cooling deposits the compd.  $C_{12}H_{22}O_{11} \cdot SrO \cdot 6H_2O$ ; soly. per 1., 43.95 g. of anhyd. salt at 16° with  $[\alpha]_D^{15}$  42.00°. When slightly more than 3 mols. SrO are added to a boiling 15% sucrose soln. and the boiling continued 2 mins., the compd.  $C_{12}H_{22}O_{11} \cdot 2SrO$  ppts.; soly. 11.89 g. per 1. at 100°; the soln. at 15° had  $[\alpha]_D^{15}$  37.79°. Higher SrO compds. could not be obtained pure. The only compd. with BaO is  $C_{12}H_{22}O_{11} \cdot BaO$ ; soly. 22.10 g. per 1. at 20°,  $[\alpha]_D^{20}$  43.89°. Glucose and CaO at 0° give the complex  $C_6H_{12}O_6 \cdot CaO \cdot 2H_2O$ , amorphous, which is stable for months if dry, but if wetted, it decomps. overnight. Attempts to isolate other hydrates gave inconclusive results. Negative results were obtained in attempts to prep. compds. of CaO, SrO and BaO with  $\alpha$ - and  $\beta$ -Me glucosides. Fructose forms the compd.  $C_6H_{12}O_6 \cdot CaO \cdot 6H_2O$ , which loses 4 mols.  $H_2O$  *in vacuo* at 9° over concd.  $H_2SO_4$ ; soly. at 15°, 0.847 as the monohydrate,  $[\alpha]_D^{15}$  —39.05°. Higher lime-fructoses could not be obtained pure. No evidence was found of compd. formation with  $\alpha$ - or  $\beta$ -Me fructosides. *Monolime-monomaltose* crystallizes with 1  $H_2O$ ,  $C_{12}H_{22}O_{11} \cdot CaO \cdot H_2O$ ; soly. 18.9 g. per 1.,  $[\alpha]_D^{15}$  120.4°. Me maltoside does not give compds. with the alk. earth oxides. Monolime-monolactose is stable when dry; soly. 18.6 g. per 1.,  $[\alpha]_D^{15}$  46.06° (approx.), since decompn. sets in immediately on soln.  $\beta$ -Me lactoside does not yield compds. with the oxides.

C. J. WEST

**Unsaturated reduction products of sugars and their derivatives.** XI. 2-Desoxycellobiose (celldesose) and derivatives of 2,3-bisdesoxycellobiose. MAX BERGMANN and WILHELM BREUERS. Kaiser Wilhelm-Inst. für Lederforschung. *Ann.* 470, 38-51 (1929); cf. *C. A.* 19, 2478.—Cellobial (12 g.) in 60 cc. 2 N  $H_2SO_4$  at 0°, upon shaking, dissolves in 6-7 hrs.; after another hr. the acid is removed with Ba, the filtrate warmed to 60°, filtered through charcoal and concd. *in vacuo*; heating with 95% EtOH causes crystn.; the resulting *celldesose* (2-desoxycellobiose) (I), m. 184° and decomps. 200° (cor.),  $[\alpha]_D^{21}$  23.2° ( $H_2O$ ); in  $C_6H_5N$  (0.1595 g. in 8.1964 g.  $C_6H_5N$ ),  $[\alpha]_D$  after 5 mins. is 9.82°, changing (during 48 hrs.) to 37.8°. One g. I corresponds to 51 cc. Fehling soln.; I also reduces  $NH_4OH$ - $AgNO_3$  and alk. I soln. Alkali decomps. it with production of a yellow color; mineral acids decomp. it with darkening of the soln. A pine splinter in the presence of HCl is colored green; with Fe contg.  $H_2SO_4$  and AcOH there results a blue color. The yield of I is 56%. I (4 g.) in 200 cc. anhyd. MeOH contg. 1% HCl, allowed to stand 1 hr., gives 38-48% of the *methylactolide*, which is sepd. into 2 isomers by fractional crystn.; *methylcelldesoside A*, m. 169-71° (cor.),  $[\alpha]_D^{22}$  40° (70% aq. soln.); the *B isomer*, m. 220° (decompn.),  $[\alpha]_D^{20}$  —19.9° (3.5% aq. soln.); these do not reduce Fehling soln. and are decompd. by mineral acids; 0.01 N HCl at 100° gives 97% of CHO group; from the soln. 85% of I may be recovered. With 0.001 N HCl, 50% sapon. occurs after 1 hr. at 100°; with 0.1 N HCl, the sapon. is complete in less than 5 mins. Pentaacetyl- $\psi$ -cellobial (10 g.) in 10 parts anhyd. MeOH contg. 0.25% HCl gives, after 15 min. at room temp., *pentaacetyl- $\psi$ -cellobial  $\alpha$ -methylactolide*, m. 131.5-2.5°,  $[\alpha]_D^{21}$  65.3° (in  $C_2Cl_4$ ); Br is added in  $CHCl_3$ ; hot Fehling soln. is not reduced.  $Ba(OH)_2$  in dil.  $Me_2CO$  sapons. this deriv., giving the  $\psi$ -cellobial  $\alpha$ -methylactolide, m. 112-3° (cor.),  $[\alpha]_D^{21}$  97.3° (in  $H_2O$ ), 97.3° (AcOH); the dry compd. absorbs 1.5 mols.  $H_2O$ ; in  $H_2O$  Br is rapidly taken up; the compd. is very sensitive to acids. Catalytic reduction gives the *2,3-bisdesoxycellobiose  $\alpha$ -methylactolide*, m. 147-8° (cor.),  $[\alpha]_D^{21}$  90.2° ( $H_2O$ ); it is hygroscopic and takes up 1 mol.  $H_2O$  from the air. XII. New reduction products of sugars. *Ibid* 54-61.—Catalytic



reduction of triacetyl- $\psi$ -glucal in AcOH with Pd gives 80% of diacetylhexane-1,4,5,6-tetrol  $< 1.5 >$  anhydride (I),  $b_{0.1} 102-3^\circ$  (bath temp.  $125-30^\circ$ ),  $n_D^{19} 1.4511$ ; a by-product is apparently triacetyl-dihydro- $\psi$ -glucal,  $b_{1.2-1.5} 150-7^\circ$  (bath temp.  $180-90^\circ$ ),  $n_D^{17} 1.4545$ . Catalytic reduction (Pt and AcOH) of diacetyl- $\psi$ -glucal gives I and probably a mixt. of diacetyl-dihydro- $\psi$ -glucal,  $b_{0.2-0.4} 140-50^\circ$ . Sapon. with  $Ba(OH)_2$  gives hexane-1,4,5,6-tetrol  $< 1.5 >$  anhydride,  $b_{1.5} 122^\circ$ , does not react with CO reagents, does not reduce Fehling soln.  $H_2SO_4$  deriv., m.  $99^\circ$ ,  $[\alpha]_D^{26} 8.62^\circ$  ( $C_2Cl_4$ ); BzH and  $ZnCl_2$  at  $100^\circ$  gives the BzH deriv., m.  $137-7.5^\circ$ ;  $PCl_5$  gives a dichlorohexanediol anhydride,  $b_{0.8} 55^\circ$ . Reduction of hexacetyl- $\psi$ -cellobial gives pentaacetylglucosidohexanetetrol anhydride, m.  $133-4^\circ$  (cor.),  $[\alpha]_D^{21} 18.1^\circ$  ( $C_2Cl_4$ ); this also results upon reducing the penta-Ac deriv.; a 2nd product of this latter reduction is pentaacetyl-bisdesoxycellobiose, m.  $153-5^\circ$ ,  $[\alpha]_D^{19} 32.1^\circ$  ( $C_2Cl_4$ ). Reduction of the penta-Ac deriv. with Pd according to Willstätter-Waldschmidt-Leitz gives 75% of pentaacetylglucosidohexanetetrol anhydride, m.  $109-10^\circ$ ,  $[\alpha]_D^{20} 20^\circ$  ( $C_2Cl_4$ ); this may be further reduced to the hexane deriv. Diacetyl-arabinal (17 g.) heated with 400 cc.  $H_2O$  20 min., the  $H_2O$  removed *in vacuo* and the product treated with  $Ac_2O$  and  $C_6H_5N$  in the cold, gives 62% of diacetyl- $\psi$ -arabinal,  $b_{0.8} 120-4^\circ$ ,  $n_D^{24} 1.4625$ .

C. J. WEST

**Constitution of pine wood lignin. VIII. The nutritive sap of the pine.** PETER KLASON. *Ber.* 62B, 635-9(1929); cf. *C. A.* 22, 2147.—The sap was prepd. by Tiemann's method, being scraped with glass plates from the freshly felled trunks. It is faintly acid, contains about 10% dry matter, has a pleasant odor of freshly baked rye bread, contains little coagulable protein but considerable peptones and amino acids. The N content of the dry matter varies from 0.3 to 0.8%. The sap therefore rapidly spoils on standing. The scrapings are dild. with an equal vol. of boiling  $H_2O$ , let stand overnight, squeezed through cloth, filtered and concd. to a sirup. When the coniferin content is considerable the sirup gradually sets to a half-solid, stable mass. The solid matter consists mostly of sugar. In one case the sap contained, according to the power of reducing Fehling soln., 36% sugar, and, after inversion, 60% of the dry wt. Apparently there are present not inconsiderable amts. of sucrose for alc. fermentation of the non-inverted sap gives more alc. than corresponds to the reducing value. The pentose is chiefly xylose; there is little or no arabinose. To det. whether any lignin was present the sap was evapd. to dryness on the  $H_2O$  bath, shaken with 66%  $H_2SO_4$  until everything had apparently dissolved (12 hrs.), dild. with  $H_2O$ , filtered through an alundum crucible, heated 12 hrs. in the crucible under  $N$  HCl in a covered weighing bottle in a steam bath, completely freed of the  $H_2SO_4$  and dried at about  $70^\circ$ . As the lignin is very hygroscopic the crucible was cooled and weighed in a stoppered weighing glass. In 1 case the lignin, called *protolignin*, was 14% of the dry wt. As the sap contains coniferin and the coniferyl alc. in it is highly sensitive to even very dil. mineral acids, part of the lignin isolated must have been produced from the coniferin; it is probably a product intermediate between coniferyl alc. and the pentoses. The coniferin was hydrolyzed with emulsin according to Tiemann. Neither it nor the coniferyl alc. give the lignin reactions but the free alc. is quite auto-oxidizable and its solns. after a short time distinctly show the lignin reactions. If the hydrolyzed soln. is allowed to stand at room temp. for several days with asbestos contg. Pt sponge the oxidation proceeds so far that it can be followed analytically by micro methods.  $\beta$ - $C_{10}H_7NH_2$  HCl gave a yellow ppt. with 2.60%, *i. e.*, a mixt. of dimeric and trimeric forms. The oxidized soln., satd. with  $SO_2$ , heated 12 hrs. in a steam bath, concd. and freed from  $H_2SO_4$ , gave with  $C_{10}H_7NH_2$  HCl a ppt. with exactly the same properties as that obtained from the sulfite waste liquors. Coniferin itself in the solid state is not auto-oxidizable but if the sap scrapings are dried at room temp. and extd. with hot  $H_2O$ , the ext. gives strong lignin reactions. The ppt. thrown down from the sap by  $C_{10}H_7NH_2$  HCl is not homogeneous but consists largely of free  $C_{10}H_7NH_2$ ; the filtrate gradually deposits a yellow, extremely finely granular substance of the compn.  $2C_{10}H_9O_3 + C_{10}H_9N + 2H_2O$ , apparently an anil of a protolignin. The sap, satd. with  $SO_2$  and heated 12 hrs. in a steam bath, gives with  $C_{10}H_7NH_2$  HCl a yellow ppt. similar in all respects to that obtained from the sulfite waste liquors. These results show that coniferyl alc., as obtained from coniferin with emulsin, can change even at room temp. into a trimeric coniferyl aldehyde identical with the lignin of wood. In the nutritive sap of the pine there is a protolignin which combines with  $SO_2$  and condenses with  $C_{10}H_7NH_2$  and by loss of  $H_2O$  changes into polymers of coniferyl aldehyde. It can also lose  $H_2O$  directly to form coniferyl alc. *Addendum.*—Pauly and Feuerstein (*C. A.* 23, 2982) claim that the  $C_{10}H_7NH_2$  salt of coniferylhydrosulfonic acid

synthesized by K. from vanillin is really the hydrosulfonate of a condensed AcH, as they were able to obtain it from AcH alone. But a condensation product of AcH alone can contain no MeO. K.'s prepn. contained 6.3% MeO (calcd., 7.7%) and further purification with cold MeOH-Et<sub>2</sub>O gave a product with 7.1% MeO. There are 2 coniferyl aldehydes: one (K.'s) is labile and combines with SO<sub>2</sub>; the other (Pauly's) is stable and does not react with SO<sub>2</sub>. Only the labile form is found in living organisms and the error into which, according to P., K. fell in prepg. his aldehyde was necessary in order to obtain the labile form.

C. A. R  
**Constitution of cellulose xanthates. II.** TH. LIESER. *Ann.* **470**, 104-10 (1929); *C. A.* **22**, 4792.—Cellulose xanthate and CH<sub>2</sub>N<sub>2</sub> in MeOH give a *monomethyldicellulose* (I), colorless, with the appearance of cotton cellulose; CH<sub>2</sub>N<sub>2</sub> does not react with cellulose. Hydrolysis with 75% H<sub>2</sub>SO<sub>4</sub> at room temp. for 20 hrs., followed by fermentation of the glucose, gives *2-methylglucose*, yellow, amorphous, whose hydrazone m. 176°. This was synthesized from  $\beta$ -pentaacetylglucose through 1-chloro 2 tri-chloroacetyl-3,4,6-triacetoglucofucose, 1-chloro-3,4,6-triacetoglucofucose and *3,4,6-triaceto-2-methyl methylglucoside*, m. 121°, which, on sapon, on sapon, and treatment with PhNHNH<sub>2</sub>, gives the same hydrazone, m. 176°. Since the I does not show the viscose reaction, it may be concluded that the sec. HO group in the 2-position of cellulose enters into the viscose reaction.

C. J. WEST  
**Keto-lactol tautomerism. II.** Influence of the cyclohexane ring on the tautomeric character of cyclohexane-1-acetone-1-malonic acid, a comparison with cyclopentane-1-acetone-1-malonic acid, and synthesis of the corresponding  $\delta$ -keto-monobasic acids. MUHAMMAD QUDRAT-I-KHUDA. *J. Chem. Soc.* **1929**, 713-21; cf. *C. A.* **23**, 2152.—*Cyclohexane-1-acetone-1-malonic acid*, C<sub>8</sub>H<sub>10</sub>>C(CH<sub>2</sub>COMe)CH(CO<sub>2</sub>H). (I), and the corresponding *cyclopentane acid* (II), in the liquid state exists as an equal mixt. of the keto and lactol forms,  $\text{RR}'\text{C} \cdot \text{CH}_2 \cdot \text{C}(\text{OH})\text{Me} \cdot \text{O} \cdot \text{CO} \cdot \text{CHCO}_2\text{H}$ . The

lactols could not be isolated, but the amt. of each form present in the equil. mixts. was deduced from the amt. of ketomonobasic acid,  $\text{RR}'\text{C}(\text{CH}_2\text{COMe})\text{CH}_2\text{CO}_2\text{H}$ ,  
 $\text{O} \text{---} \text{CMe}$

formed by decompn. of the keto form, and of dilactone (III)



from the lactol form. As expected from a consideration of the alteration of the C tetrahedral angle by the inclusion of the C as a spiran atom in cyclohexane and cyclopentane rings, I shows more marked tautomeric behavior than II (I gives 68-70% dilactone; II, 47-52%). 27.6 g. cyclohexenylacetone, b<sub>16</sub> 90°, d<sub>4</sub><sup>20</sup> 0.9404, n<sub>D</sub><sup>16</sup> 1.47751 (prepd. by Wallach's method, *C. A.* **7**, 1002), heated 6 hrs. in abs. alc. with 16.8 g. NCCH<sub>2</sub>CONH<sub>2</sub> and 4.6 g. Na, yields 35 g. *cyclohexanespiro-cyclo-1,3-glyoxy 6-cyano-3-methyl-5-piperidone*, C<sub>8</sub>H<sub>10</sub>>C·CH<sub>2</sub>·C(OH)Me·NH·CO·CHCN, m. 258° (charring).

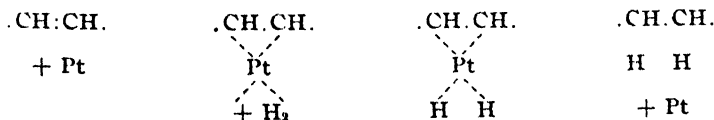
sol. in caustic alkali and dil. acid. 25 g. of the spiro compd., heated 28 hrs with 25 g. KOH in 100 cc. water, gives 25 g. I, m. 116°, decomps. about 118°; *semicarbazone*, m. 183° (decompn.); normal *Et ester* (from the dry Ag salt and EtI), b<sub>14</sub> 192°, d<sub>4</sub><sup>20</sup> 1.0681, n<sub>D</sub><sup>18.5</sup> 1.46984, [R<sub>L</sub>]<sub>D</sub> 77.3 (calcd. 77.2) (*semicarbazone*, m. 104°). I (5 g.), heated at 130-40° 5-6 hrs., forms 68% *dilactone* (III, RR' = C<sub>6</sub>H<sub>10</sub>>), m. 141°, and *cyclohexane-1-acetone-1-acetic acid* (IV), C<sub>8</sub>H<sub>10</sub>>C(CH<sub>2</sub>COMe)CH<sub>2</sub>CO<sub>2</sub>H (1.3 g.), m. 73°. The dilactone is the only product when I is heated in C<sub>6</sub>H<sub>6</sub>, or treated with concd. HCl or a dehydrating agent. Hydrolysis of the dilactone with hot dil. caustic alkali gives I. Cyclohexane-1,1-diacetic anhydride (91 g.) (prepd. by heating with Ac<sub>2</sub>O the diacid (V), Thorpe, *C. A.* **14**, 1522; **5**, 2848)) heated 4 hrs. with MeOH (40 cc.) forms the acid ester; *Ag salt*; *Me ester* (VI) of IV (from the acid ester with SOCl<sub>2</sub> and then ZnMeI), b<sub>18</sub> 152°, d<sub>4</sub><sup>20.4</sup> 1.0363, n<sub>D</sub><sup>20.4</sup> 1.46748, [R<sub>L</sub>]<sub>D</sub> 56.81 (calcd. 57.08) (*semicarbazone*, m. 137°). IV, m. 73° (with a little V), is prepd. from VI and KOH in MeOH; *semicarbazone*, m. 185°. VI with the calcd. amt. of EtONa gives quant. cyclohexane *spiro-cyclohexane-3,5-dione*, m. 169-70°, also obtained (with some VI) from IV and alc. HCl, instead of the expected ethoxy-lactone, which would have been evidence of the lactol form of IV. IV reacts in the lactol form with excess AcCl, yielding the unsatd. *lactone*, C<sub>8</sub>H<sub>10</sub>>C·CH·CMe·O·CO·CH<sub>2</sub>, b<sub>17</sub> 144°, d<sub>4</sub><sup>19.9</sup> 1.0533, n<sub>D</sub><sup>19.9</sup> 1.4952, [R<sub>L</sub>]<sub>D</sub>

49 85 (calcd. 49.79), hydrolyzed by alc. KOH to IV. *Cyclopentane-spiro-cyclo-3-hydroxy-6-cyano-3-methyl-5-piperidone* (VII) (18 g.), m. 282°, is prepd. from cyclopentenylacetone (26 cc.),  $\text{NCCCH}_2\text{CONH}_2$  (16.8 g.), and Na (4.6 g.), and is hydrolyzed to II, half-pyramid crystals, m. 106°, decomp. near 130°; semicarbazone, m. 177°; normal *Et ester* (from II and alc. HCl),  $b_{13}$  179°,  $d_4^{18}$  1.0767,  $n_D^{18}$  1.4632,  $[\text{R}_L]_D$  72.68 (calcd. 72.78) (semicarbazone, m. 109°). II (5 g.) at 140–50° 5 hrs. forms about 47% dilactone (III,  $\text{RR}' = \text{C}_4\text{H}_8 >$ ), m. 139°, and 2.05 g. *cyclopentane-1-acetone-1-acetic acid* (VIII), m. 53°. The dilactone also arises from II and concd. HCl or any dehydrating agent, or from VII and concd. HCl. Cyclopentane-1,1-diacetic anhydride, boiled 3 hrs with MeOH, yields the oily acid Me ester; *Ag salt*; *Me ester* (IX) of VIII (44 g. from 60 g. acid ester,  $\text{SOCl}_2$  and  $\text{ZnMeI}$ ),  $b_{12}$  130°,  $d_4^{17.7}$  1.0386,  $n_D^{17.7}$  1.46021,  $[\text{R}_L]_D$  52.24 (calcd. 52.46) (semicarbazone, m. 119°). IX, heated with Na and alc., gives quant. cyclopentane-spiro-cyclohexane-3,5-dione, m. 136°, best prepd. in this way. IX is hydrolyzed by KOH in aq. alc. to VIII, m. 53° (semicarbazone, m. 191°) and a little cyclopentane-1,1-diacetic acid. VIII with MeOH and HCl yields IX. VIII, heated 1 hr. with  $\text{AcCl}$ , forms the unsatd. lactone,  $b_{14}$  124°,  $d_4^{18}$  1.0573,  $n_D^{18}$  1.49043,  $[\text{R}_L]_D$  45.42 (calcd. 45.17), hydrolyzed by alc. KOH to VIII.

JANET D. SCOTT

**The catalytic hydrogenation of phenol and naphthol ethers with hydrogen and platinum.** E. WASER, H. SOMMER, C. LANDWEER AND C. GAZA. *Helv. Chim. Acta* 12, 118–43 (1929).—A review of the literature is given covering the hydrogenation of various aliphatic-aromatic and pure aromatic ethers and their substituted compds. Not only does hydrogenation take place but splitting reactions and complete removal of the alkoxy groups also occur. In this work the hydrogenation of the alkyl Ph ethers of the type  $\text{PhOR}$ , where R is an alkyl group contg. 1 to 6 C atoms, was studied, as was that of 1- and 2- $\text{C}_{10}\text{H}_7\text{OEt}$  and guaiaacol. The reaction was allowed to take place in the presence of Pt black at ordinary temp. and at a max pressure of 1 m of water above atm. These conditions are much milder than those used heretofore. In all cases the products were similar and consisted of the compds,  $\text{C}_6\text{H}_{11}\text{OR}$ ,  $\text{C}_6\text{H}_{11}\text{OH}$ , cyclohexane, ROH and RH. These products are possible if 3 different reactions occur, which may be represented by the equations: (a)  $\text{PhOR} + 3\text{H}_2 \longrightarrow \text{C}_6\text{H}_{11}\text{OR}$ , (b)  $\text{PhOR} + 4\text{H}_2 \longrightarrow \text{C}_6\text{H}_{11}\text{OH} + \text{RH}$ , (c)  $\text{PhOR} + 4\text{H}_2 \longrightarrow \text{C}_6\text{H}_{12} + \text{ROH}$ . Thus for simple hydrogenation 3 mols. of  $\text{H}_2$  are required whereas 4 mols are utilized in the other reactions. An av. of 3.66 mols. was actually absorbed before reaction ceased. This signifies that the product of simple hydrogenation forms about  $\frac{1}{3}$  of the total. As a mechanism for reactions (b) and (c) it was suggested that a split between the C and O atoms first takes place, resulting in the formation of benzene or phenol according to whether the bond is broken between the O atom and the alkyl or the Ph group. Benzene is then hydrogenated while phenol first undergoes keto-enol tautomerism with the formation of the compd.,  $\text{CH}:\text{CH}:\text{CH}:\text{CH}:\text{CH}_2:\text{CO}$ , from which  $\text{C}_6\text{H}_{11}\text{OH}$  is

obtained by hydrogenation. That the ketone is formed as an intermediary product is shown by the fact that when  $\text{NH}_2\text{CONHNH}_2 \cdot \text{HCl}$  was present during the hydrogenation, the semicarbazone of cyclohexanone was always obtained regardless of the size of the alkyl group. A mechanism for the hydrogenation of the benzene ring, involving the catalyst, is also given. It was observed in every case that while the  $\text{H}_2$  is being absorbed, the catalyst is suspended through the liquid medium, but when the reaction is approaching completion it ppts. When fresh ether is added the catalyst is again found suspended until the absorption of  $\text{H}$  ceases. Furthermore, some particles of the catalyst procure a metallic luster. This behavior may be explained by the following series of reactions:



The catalyst was prepd. in the manner described in C. A. 23, 388. As already mentioned cyclohexane, cyclohexanol and in the presence of  $\text{H}_2\text{NCONHNH}_2 \cdot \text{HCl}$ , the semicarbazone of cyclohexanone was isolated in every case. The other products consisted of the paraffin, alc. and hexahydro ether peculiar to each ether hydrogenated. The hexahydro derivs. of anisole and phenetole are known; the following lists the *hexahydrophenyl ethers* used with their b. p.,  $d_4^{20}$ ,  $n_D^{20}$ , and M.R., found and calcd. *Pr*,  $b_{128}$  170.5–1.5°, 0.8665, 1.43936, 43.18, 43.20. *iso-Pr*,  $b_{716}$  168–9°, 0.9235, 1.48332,

43.74, 43.20. *Bu*,  $b_{711}$  193.5–4.5°, 0.8664, 1.43853, 47.36, 47.82. *iso-Bu*,  $b_{711}$  175–7°, 0.8618, 1.44137, 47.89, 47.82. *iso-Am*,  $b_{711}$  206–7°, 0.8523, 1.44136, 52.76, 52.44. *Hexyl*,  $b_{728}$  222.5–4.5°, 0.8515, 1.44375, 57.32, 57.06.  $\alpha$ -C<sub>10</sub>H<sub>17</sub>OEt absorbs 5.59 mols. of H<sub>2</sub> whereas simple hydrogenation requires 5 mols. The products of hydrogenation were analogous to those obtained in the Ph series. They were decalin,  $\alpha$ -decahydronaphthol, EtOH and  $\alpha$ -decahydronaphthyl Et ether,  $b_{718}$  236–8°.  $\beta$ -C<sub>10</sub>H<sub>17</sub>OEt absorbs 5.66 mols. of H<sub>2</sub>. The products were *cis*- $\beta$ -decahydronaphthol, EtOH, *cis*-decalin and  $\beta$ -decahydronaphthyl Et ether,  $b_{718}$  238–40°, 0.9419, 1.47718, 54.67, 54.86. Guaiacol absorbs 4.06–4.38 mols. of H<sub>2</sub>. The products consisted of a very complex mixt. but the following were isolated: cyclohexane, cyclohexanol, MeOH, hexahydroguaiacol,  $b_{730}$  175–80°,  $d_{20}^{20}$  0.9775,  $n_D^{20}$  1.45687, M.R. found 36.24, calcd. 35.48, and possibly hexahydroanisole. I. M. LEVINE

**Properties of conjugated compounds. VII. Additive formation of cyclohexenes.** ERNEST H. FARMER AND FRANK I. WARREN. *J. Chem. Soc.* 1929, 897–909; cf. *C. A.* 23, 2156.—4,5-Dimethyl-*cis*- $\Delta^4$ -tetrahydrophthalic anhydride (I), m. 78°, results quant by keeping CH<sub>2</sub>:CMeCMe:CH<sub>2</sub> and maleic anhydride 24 hrs. at room temp.; heating a few mins. with 10 times its wt. of H<sub>2</sub>O gives the acid, m. 180–92° reverting partly to the anhydride at its m. p. Decompn. of the ozonide gives an acid, m. 186°, probably 3-acetyl-4-methylcyclopentan-4-ol-1,2-dicarboxylic acid (II). An acid, which appears to be a lactonized form of II, is formed from I and HNO<sub>3</sub> (1.1), m. 219°. Addn. of maleic anhydride to BrCH<sub>2</sub>CH:CHCH:CHCH<sub>2</sub>Br in C<sub>6</sub>H<sub>6</sub> by heating at 100° for 5.5 hrs., gives 67% of 3,6-dibromomethyl-*cis*- $\Delta^4$ -tetrahydrophthalic anhydride, m. 98°, this could not be oxidized with KMnO<sub>4</sub> with the production of cryst. products; the anhydride is not hydrolyzed by boiling H<sub>2</sub>O; boiling with aq. Na<sub>2</sub>CO<sub>3</sub> gives 63% of the dilactone (III) of 3,6-dihydroxymethyl-*cis*- $\Delta^4$ -tetrahydrophthalic acid, m. 159–63°; attempts to oxidize the Na salt proved futile; KMnO<sub>4</sub> caused degradation to (CO<sub>2</sub>H)<sub>2</sub>. Catalytic reduction of III gives the lactone of 3,6-dihydroxymethylhexahydrophthalic acid, m. 119–20°. Maleic anhydride and Et *trans-trans*-muconate, heated 18 hrs. at 100°, give 50% of 3,6-dicarboxy- $\Delta^3$ -tetrahydrophthalic anhydride, m. 185–8°; *tetra-Et ester*, m. 75°. Catalytic reduction of the acid gives 3,6-dicarboxyhexahydrophthalic acid (hexahydroprehnitic acid), crystg. with 1 H<sub>2</sub>O, m. 168° (IV); *tetra-Et ester*,  $b_{13}$  238°; dianhydride, m. 223–5°. Sorbic acid and maleic anhydride at 100° for 36 hrs. give 80% of 6-carboxy-3-methyl-*cis*- $\Delta^3$ -tetrahydrophthalic anhydride, m. 174°; boiling with H<sub>2</sub>O for 1 hr. gives the acid, m. 194°; no definite products could be isolated from the oxidation with O<sub>3</sub> or KMnO<sub>4</sub>; catalytic hydrogenation gives 6-carboxy-3-methyl-*cis*-hexahydrophthalic acid, crystg. with 1 H<sub>2</sub>O, m. 194–6°. The addn. of maleic anhydride to cyclohexadiene gives dicyclooctenedicarboxylic acid, oxidized by alk. KMnO<sub>4</sub> to a tetrabasic acid, m. 168°, identical with IV. The cyclopentadiene addn. compd., on oxidation, gives a tetrabasic acid, m. 181–2° (anhydride formation); *tetra-Et ester*,  $b_{14}$  226°; it was impossible to det. whether this is cyclopentane-1,2,3,4-tetracarboxylic acid or cyclobutane-1,2,3-tricarboxy-4-acetic acid. The *trans*-hexatriene maleic anhydride addn. compd. is 3-ethylidene-*cis*- $\Delta^4$ -tetrahydrophthalic anhydride,  $b_8$  148°, m. 51.5°; boiling with H<sub>2</sub>O for 10 mins. gives the acid, m. 164–6°; PhNH<sub>2</sub> gives the *anilic acid*, m. 174°. The same compd. was derived from *cis*-hexatriene. C. J. WEST

1,3-Diphenyl-3-cyclohexen-5-one. A. D. PERKOV. *Ber.* 62B, 642–5 (1929).—See *C. A.* 23, 2156. C. A. R.

The electron theory as applied to organic compounds, particularly benzene. MAX ULMANN. *Z. Elektrochem.* 35, 268–74 (1929); cf. *C. A.* 23, 377; Loewen, *C. A.* 23, 1626.—U. amplifies his theory, using PhOH as an illustration. FOSTER D. SNELL

1,4-Dimethyl-3,5,6-trichloro-2-aminobenzene and some of its derivatives. J. BUREŠ AND T. RUBŠ. *Časopis Českoslov. Lékárnictva* 8, 225–31, 258–64 (1928).—By the action of Cl<sub>2</sub> on 2,5-Me<sub>2</sub>C<sub>6</sub>H<sub>3</sub>NHAc in glacial AcOH at ordinary temp. and pressure, without catalyst, B. and R. obtained 1,4-dimethyl-3,5,6-trichloro-2-acetamidobenzene, m. 222°, which on hydrolysis gave the 2-amino compd., m. 206° (I). From I were prepd. the Bz deriv., m. 223°, the picrate, m. above 100° (decompn.), and the 2-methyl-amino compd., m. 62°. There were also prepd. 1,4-dimethyl-3,5,6-trichloro-2-hydroxybenzene, m. 175° (Me ether, m. 91°; Et ether, m. 79°; benzoate, m. 101°; acetate, m. 103°); 1,4-dimethyl-3,5,6-trichlorobenzene, m. 96°; 1,4-dimethyl-2,3,5,6-tetrachlorobenzene, m. 223°; 1,4-dimethyl-3,5,6-trichloro-2-benzonitrile, m. 213°.

WILLIAM J. HUSA

The bromination of *p*-anisidine and 1-methoxy-4-acetamidobenzene and the nitration of 3,5-dibromo-1-methoxy-4-acetamidobenzene and some of their derivatives. E. BUREŠ AND M. NEDĚLKOVÁ. *Časopis Českoslov. Lékárnictva* 9, 23–8, 41–51, 78–83

(1929).—3,5-Dibromo-1-methoxy-4-aminobenzene, m. 83°, was prepd. by the action of  $\text{Br}_2$  on *p*-anisidine in alc., without catalyst, at ordinary temp. and pressure. The action of  $\text{Br}_2$  on 4-AcNHC<sub>6</sub>H<sub>4</sub>OMe in glacial AcOH yielded 3,5-dibromo-1-methoxy-4-acetamidobenzene, m. 205°. The following derivs. were prepd.: 4-diacetyl-amino, m. 136°; 4-benzoylamino, m. 198°; 4-methylamino, b. 186°; 4-ethylamino, b. 234°; HCl salt, picrate (m. 97°) and sulfate of 3,5-dibromo-1-methoxy-4-aminobenzene; 3,5-dibromo-1-methoxy-4-benzonitrile, m. 177°; 3,5-dibromo-1-methoxybenzene, m. 38°; 3,5-dibromo-1-methoxy-4-chlorobenzene, m. 76°; 3,4,5-tribromo-1-methoxybenzene, m. 79°; 3,5-dibromo-1-methoxy-4-iodobenzene, m. 98°; 3,5-dibromo-1-methoxy-2-nitro-4-aminobenzene, m. 172°; 3,5-dibromo-1-methoxy-2-nitro-4-acetamidobenzene, m. 206.5°; 3,5-dibromo-1-methoxy-2-nitrobenzene, m. 85°; 3,5-dibromo-1-methoxy-2-nitro-4-chlorobenzene (sublimes without melting); 3,5-dibromo-1-methoxy-2-nitro-4-iodobenzene, m. 207°.

WILLIAM J. HUSA

**3,4-Dibromo-*o*-anisidine and some of its derivatives.** E. BUREŠ AND M. SOUČEK. *Časopis Českoslov. Lékařnictva* 8, 295-9, 317-25 (1928).—By the action of  $\text{Br}_2$  on 2-AcNHC<sub>6</sub>H<sub>4</sub>OMe in glacial AcOH was obtained 3,4-dibromo-1-methoxy-2-acetamidobenzene, m. 146°, which on hydrolysis yielded the 2-amino deriv. (I), m. 103°. The following derivs. were prepd.: sulfate and HCl salt of I; 3,4-dibromo-1-methoxy-2-methylaminobenzene, b. 162°; 2-benzoylamino compd., m. 137-8°; 2-HO compd., m. 94° (II) (benzoate, m. 114°; acetate, m. 90°); 3,4-dibromo-1-methoxybenzene, b. 127°; 3,4-dibromo-2-chloro-1-methoxybenzene, m. 98°; 2,3,4-tribromo-1-methoxybenzene, m. 101°; 3,4-dibromo-2-iodo-1-methoxybenzene, m. 94°.

W. J. H.

**Transformation of phenylnitroamines into nitroanilines.** I. ALAN E. BRADFELD AND KENNEDY J. P. ORTON. *J. Chem. Soc.* 1929, 915-21, cf. C. A. 2, 1700, 2232.—3-Bromo-*p*-tolylnitroamine (I), from the anine and  $\text{HNO}_3$  in  $\text{AcOH} \cdot \text{Ac}_2\text{O}$ , m. 65°; 2,4-dibromophenylnitroamine, m. 77°; both are highly sensitive to light. In the transformation a by-product is formed which is capable of coupling with a phenol to give an azo compd. Under the conditions employed, with at least 10 mol proportions of the catalyzing acid, nitroamine and by-product formation proceed as side reactions of the 1st order. No stoichiometrical relation exists between the relative amt. of nitroaniline and by-product; the ratio varies with the concn. of the catalyzing acid, the diln. of the  $\text{AcOH}$  medium and the nitroamine employed, but, in general, has the same value for different acids at equiv. concns. With  $\text{H}_2\text{SO}_4$  as catalyst, in 98%  $\text{AcOH}$ , transformation of I proceeds at about 0.5 the rate of transformation with HCl of the same normality; diln. of the medium to 50%  $\text{AcOH}$  causes a marked decrease in the velocity of the reaction. The behavior of  $\text{HNO}_3$  is abnormal. The anion of the acid catalyst is not fundamentally concerned in the reaction, which is in harmony with the view that in the transformation of the nitroamines into nitroanilines an intramol. process plays the important part.

C. J. WEST

**Action of diazonium salts on the lateral chains of unsaturated compounds. II.** A. QUILICO AND E. FLEISCHNER. *Gazz. chim. ital.* 59, 39-49 (1928); cf. Q. and Freri, C. A. 23, 597.—In the present work, the reaction between unsatd. phenolic ethers and diazonium salts is extended to isoeugenol (I). Because of a free OH group and an *o*-position available for coupling, I reacts in the lateral chain, the latter being partially eliminated. The reaction can be carried out either in  $\text{AcOH}$  or in  $\text{EtOH}$ , but a tendency with  $\text{AcOH}$  to resinify makes  $\text{EtOH}$  preferable for a high yield and pure product.  $p\text{-O}_2\text{NC}_6\text{H}_4\text{NH}_2$  (3.5 g.) in glacial  $\text{AcOH}$  (20 cc.) and concd.  $\text{H}_2\text{SO}_4$  (2.5 cc.) diazotized with  $\text{AmNO}_2$  (5 cc.), the product purified by pptg. 3 times with  $\text{Et}_2\text{O}$  and resoln. in glacial  $\text{AcOH}$ , dissolved in a min. of  $\text{AcOH}$ , 95%  $\text{EtOH}$  (60-70 cc.) added, made ice-cold, freshly distd. I (4 g.) in  $\text{EtOH}$  (20 cc.) added slowly with vigorous agitation, let stand 10-12 hrs., filtered, the residue washed with a little  $\text{EtOH}$ , and recrystd. from  $\text{EtOH}$ , yields about 6 g. of a compd. whose properties conformed to 3,4-MeO(HO)-C<sub>6</sub>H<sub>3</sub>CH:NNHC<sub>6</sub>H<sub>4</sub>NO<sub>2</sub>-*p* (II), m. 225° (cf. 227° of Biltz and Sieden, *Ann.* 324, 232 (1902)). This shows that I behaves like anethole, and it also shows the great difference in character of the reaction of I and diazo compds. when the medium is acid or alc. instead of alkali (cf. *Ber.* 37, 4135 (1904); *Gazz. chim. ital.* 35, i, 55 (1905); 36, ii, 1 (1906)). Prepn. of the di-Ac deriv. (III) of II further confirmed its identity. Vanillin and IV (equal wts.) in glacial  $\text{AcOH}$  heated 0.25 hr. on a water bath and the ppt. recrystd. from  $\text{EtOH}$  also yield II. Acetylvanillin (cf. *Ber.* 7, 614 (1874)) (1.94 g.), glacial  $\text{AcOH}$  (25 cc.) and  $p\text{-O}_2\text{NC}_6\text{H}_4\text{NHNH}_2$  (IV) (1.53 g.) heated on a water bath and the ppt. recrystd. from boiling  $\text{EtOH}$ , yields acetylvanillin *p*-nitrophenylhydrazone, golden yellow, m. 179°, gives a characteristic violet color when sapond. by boiling aq. alkalis, and when boiled with  $\text{Ac}_2\text{O}$  and  $\text{AcONa}$  it forms III.  $p\text{-O}_2\text{NC}_6\text{H}_4\text{NH}_2$  (3.5 g.) diazotized with  $\text{NaNO}_2$  (1.8 g.) and concd. HCl (7.5 cc.), filtered, the filtrate poured

very slowly into ice-cold I (4 g.) in 5% KOH (60 cc.), let stand, filtered, washed with water, the residue dissolved in dil. KOH, and reprecipitated with AcOH, yields 100% of the hydroxyazoisoeugenol obtained by Puxeddu (cf. *Rend. accad. Lincei* [5], 15, 131 (1906)). 2,4-(O<sub>2</sub>N)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>NH<sub>2</sub> (V) (1 g.) in glacial AcOH (10 cc.) and concd. H<sub>2</sub>SO<sub>4</sub> (0.6 cc.) diazotized by the method of Hantzsch, the product purified with Et<sub>2</sub>O, suspended in EtOH (40 cc.), made ice-cold, alc. I added, let stand 24 hrs., filtered, washed with EtOH, and the residue recrystd. from boiling glacial AcOH, yields the compd. C<sub>14</sub>H<sub>11</sub>O<sub>6</sub>N<sub>4</sub> (VI), m. 250° (decompn.), gives a violet-red color in aq. alkalis. VI is also formed by heating vanillin (1.5 g.) and V (2 g.) in glacial AcOH for 0.25 hr. on a water bath, and purifying with boiling AcOH. Concd. Na<sub>2</sub>S<sub>2</sub>O<sub>4</sub> added very slowly to V in boiling aq. 1% NaOH, until the purple color disappears and a copious yellow ppt. is formed, filtered, the residue washed with EtOH, yields the compd. C<sub>14</sub>H<sub>15</sub>O<sub>4</sub>N<sub>3</sub>, yellowish, m. 192° (decompn.), is unstable in air and is probably MeO(HO)C<sub>6</sub>H<sub>3</sub>CH<sub>2</sub>NHNHC<sub>6</sub>H<sub>3</sub>N<sub>3</sub>O<sub>2</sub> (VII). The attempt was made to reduce the Ac deriv. of VII in EtOH with Sn and HCl, but only *p*-C<sub>6</sub>H<sub>4</sub>(NH<sub>2</sub>.HCl)<sub>2</sub>, a white resin and a trace of guaiaacol were found. This behavior can be explained by the great instability of the vanillylamine (cf. Nelson, C. A. 13, 2198). The allyl isomers behave quite differently. No product could be isolated from safrole and diazotized *p*-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub>, either in AcOH or in EtOH. With safrole and diazotized (O<sub>2</sub>N)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>NH<sub>2</sub>, a small quantity of a red compd., m. 139-40°, insol. in aq. acids and alkalis, was isolated. Its low m. p. indicated that it was of a different type from the products obtained from propenyl ethers. Neither could a cryst. product be obtained from styrene (cf. Meyer, Irschick and Schlosser, C. A. 8, 2878). To explain mechanism of the reaction, other unsatd. compds. were studied, e. g., PhCH:CHCO<sub>2</sub>H (VIII), PhCH:CHCO<sub>2</sub>Et (IX) and PhCH:CHCH(OH) (X), but these compds. remained unaltered after several days' contact with the diazo compd. This is not surprising, since in many other cases negative substituents inhibit the additive property of olefinic double bonds (cf. Ber. 37, 3317 (1904); J. prakt. Chem. 72, ii, 201 (1905); Bauer and Moser, C. A. 1, 1407). The similar behavior of anethole I and other propenyl ethers in distinction to the behavior of the corresponding allyl isomers can be foreseen by reference to the work of Angeli (*Mem. accad. Lincei* [5], 14, 627 (1924); cf. C. A. 18, 1118, 2502) on the similarity of behavior of C<sub>6</sub>H<sub>5</sub> derivs. of the AC<sub>6</sub>H<sub>4</sub>B type, where A and B are in *o*- or *p*-positions, with the corresponding aliphatic A-B derivs. Researches by Meyer (C. A. 5, 2624; 6, 88; 7, 993, 2539; 8, 2878) on enolic-ketonic tautomerism show that the activity of olefinic double bonds is gradually increased by the presence of an OH or alkyloxy group united directly to 1 of the double bonded C atoms, i. e., compds. of the RC(OH)·CHR' and RC(OAk)·CHR' type have much higher additive power than compds. of the RCH:CHR' type. Phenolic ethers have a structure of the 1st type, whereas allyl ethers, e. g., eugenol and safrole, are comparable to the compds. HOCH<sub>2</sub>CH:CH<sub>2</sub> and MeOCH<sub>2</sub>CH:CH<sub>2</sub> and therefore react with much greater difficulty, as do VII, IX and X, as expts. confirm. The great activity of propenyl ethers which occurs in many reactions (cf. Q, C. A. 23, 1628) is to be attributed to the presence, in the *p*-position to the lateral chain, of a OH or alkyloxy group, which renders active the double bond of the lateral chain. These ethers should therefore be regarded as true enols. The expts. offer a new method of distinguishing between propenyl and allyl chains to be added to the classic methods of Angeli with HNO<sub>2</sub>, of Balbiano with AcOHg and of Bruni with NO<sub>2</sub> deriv. addn. compds.

C. C. DAVIS

**New syntheses among the amino acids. II.  $\alpha$ -Anisylideneamino- $\beta$ -lactones.** GAETANO MINUNNI and SALVATORE D'URSO (WITH V. BELLECCI and I. OTTAVIANO) *Gazz. chim. ital.* 59, 32-9 (1929); cf. C. A. 23, 1120.—The work on the reaction between aromatic  $\alpha$ -aldoximes and esters of  $\beta$ -ketonic acids was continued in 2 directions by studies of (1) the action of AcCH<sub>2</sub>CO<sub>2</sub>Et (I) and of BzCH<sub>2</sub>CO<sub>2</sub>Et (II) on other aromatic aldoximes, the results with  $\alpha$ -anisaldoxime (III) being described in the present paper, and (2) some interesting transformations of arylideneaminolactones, which will be described in a forthcoming paper. In the prepn. of III by the method of Bamberger and Scheutz (*Ber.* 34, 2024 (1901)), a higher yield can be obtained and the process be made more convenient by chilling with ice the alk. soln. during passage of the CO<sub>2</sub>. This gives crystals m. 62-4°. III reacts more energetically than benzaldoxime with I, and the reaction must be carried out at a lower temp. I, III and crystd. H<sub>3</sub>PO<sub>4</sub> (equal parts) heated on a water bath for 0.5 hr. after the mass has solidified, the product ground into a paste with water, mixed with 10% Na<sub>2</sub>CO<sub>3</sub>, filtered, washed with water, the residue mixed with EtOH, yield 14 g. of crude product, which, boiled with EtOH, cooled, filtered, washed with EtOH, suspended in EtOH (200 cc.) heated to boiling, C<sub>6</sub>H<sub>5</sub> added until soln. is complete, filtered hot and cooled, yields  $\alpha$ -anisylideneamino- $\beta$ -

crotonolactone,  $\text{MeOC}_6\text{H}_4\text{CH}:\text{NC}:\text{CMe}.\text{O}.\text{CO}$  (IV), m. 179–80°. Prolonged boiling with

alc.  $\text{PhHNHNH}_2$  converts IV to anisalphenylhydrazone, while heating IV with 1% KOH forms anisaldehyde (V). II (10 g.), III (5 g.) and  $\text{H}_3\text{PO}_4$  (5 g.) heated about 2 hrs. on a water bath, cooled, ground with a little EtOH, filtered, washed with EtOH, the combined filtrate and wash liquor allowed to evap., the mother liquor concd. and steam-distd., the residue ground with EtOH (and heated if necessary) leaves a residue which, combined with the previous residues, and the mixt. boiled in EtOH (100 cc. per 30 g.) for 1 hr., chilled with cold water, filtered, washed with EtOH, and the residue finally recrystd. from boiling EtOH, yields 70% of  $\alpha$ -anisylideneamino- $\beta$ -cinnamolactone (VI), yellow, m. 166–6.5°. V heated on a water bath with 1% KOH, cooled and extd. with  $\text{Et}_2\text{O}$ , yields V, while the  $\text{Et}_2\text{O}$ -insol. liquor treated with dil. HCl ppts. an unidentified hydrolytic yellow cryst. compd. which gives an acidic soln. in hot water.

C. C. DAVIS

**3,4-Methylenedioxyphenylarsonic acid.** ISIDORE E. BALABAN. *J. Chem. Soc.* 1929, 1088–93.—These derivs. were prepd. in the hope of obtaining 3,4-(HO) $_2$ C $_6$ H $_2$ -AsO $_3$ H $_2$  by a convenient manner. 3,4-CH $_2$ (O) $_2$ C $_6$ H $_2$ NH $_2$ , through the diazo reaction, gives 41.7% of 3,4-methylenedioxyphenylarsonic acid (I), crystg. with 0.75 mol. H $_2$ O, decomp. 270°; Ca and Ba salts, cryst.; Mg salt, amorphous. Attempts to open the CH $_2$ O $_2$  ring by SOCl $_2$ , H $_2$ SO $_4$  and a phenol or AlCl $_3$  in PhCl failed. Reduction of I gives 65% of arsenopyrocatechol methylene ether, pale yellow, amorphous powder. Nitration of I at 0° gives 59.5% of the 6-NO $_2$  deriv. (II), bright yellow, m. 231° (decompn.), (also obtained from 5,3,4-O $_2$ N(CH $_2$ O) $_2$ C $_6$ H $_2$ NH $_2$  in 36.9% yield); heating with NaOH gives a blood-red color; reduction of II gives the 6-NH $_2$  deriv. (III), needles, sol. in 80% HCO $_2$ H, diazotizes normally and on reduction gives 6,6'-diaminoarsenopyrocatechol methylene ether, bright yellow, amorphous. Ac deriv. of III, prisms. 4-Nitro-1,2-diacetoxylbenzene, m. 98°; 4-NH $_2$  deriv., m. 114° (41.8% yield); while this diazotizes normally, no arsonic acid could be isolated, 4-Nitropyrocatechol dibenzyl ether, m. 97° (48.7% yield); 4-NH $_2$  deriv., m. 92° (50% yield); Ac deriv., m. 150°; again no arsonic acid could be isolated through the diazo reaction. Toxicity data are given.

C. J. WEST

**Chemotherapy of some bromine derivatives of phenylarsonic acids and arsenobenzenes.** ALAN HAYTHORNTHWAITTE. *J. Chem. Soc.* 1929, 1101–4.—2,4-H $_2$ N(AcNH)-C $_6$ H $_2$ AsO $_3$ H $_2$  through the diazo reaction gives 2-bromo-4-acetamidophenylarsonic acid, plates (Ba and Ca salts, needles; Mg salt, amorphous); the 4-NH $_2$  deriv. forms plates whose Ca and Mg salts are amorphous. 3-Bromo-4-hydroxyphenylarsonic acid, plates (Ca salt, cryst.; Mg salt, amorphous). The following arsenobenzenes, all yellow, were prepd. in the usual manner: 4,4'-di-Br, 3,3'-dibromo-4,4'-diamino, 2,2'-dibromo-4,4'-diamino, 4,4'-diacetamido, and its 2,2'-di-Br deriv., all of which are insol. in NaOH; the following are sol.: 3,3'-dibromo-4,4'-dihydroxy, 5,5'-dibromo-3,3'-diamino-4,4'-dihydroxy, and its di-Ac deriv. The min. curative dose and toxicity data are given for these Br-contg. compds. and the corresponding compds. without the Br; in no case did the compd. produced show an improved chemotherapeutic index when compared with the corresponding compd. contg. no Br.

C. J. WEST

**Some derivatives of arylthioarsinous acids.** HARRY J. BARBER. *J. Chem. Soc.* 1929, 1020–4.—4-H $_2$ NC $_6$ H $_4$ AsO $_3$ H $_2$  and HSCH $_2$ CO $_2$ H in *N* NaOH give a neutral soln. from which acids ppt. di[carboxymethyl] 4-aminophenylthioarsinite, m. 142–3°; with HSCH $_2$ CO $_2$ Et there results in 2 *N* HCl the HCl salt, m. 100–5°, of the di[carbethoxymethyl] deriv., oily. With NH $_3$  the ester gives the di[carbamylmethyl] deriv., m. 145°, best obtained by using HSCH $_2$ CONH $_2$ . Di[carboxymethyl] 3-amino-4-hydroxyphenylthioarsinite, m. 157–8°; the amide, m. 132–3°; with cysteine-HCl there results the di[ $\beta$ -carboxy- $\beta$ -aminoethyl] deriv., needles. Di[carboxymethyl] 5-acetamido-2-hydroxyphenylthioarsinite, m. 172–4°; 4-carbamylmethylaminophenylthioarsinite, m. 90°; 8-acetamido-3-hydroxy-1,4-benzisoxazine (I), m. 212° (decompn.); the amide, m. 233–5°; di[ $\beta$ -carboxy- $\beta$ -aminoethyl] deriv. of I, needles; di[ $\beta$ -hydroxyethyl] deriv., needles. In these compds. acid does not liberate HSCH $_2$ CO $_2$ H nor does hydrolytic fission occur with alkali; the salts are neutral and generally extremely sol. in H $_2$ O and have pronounced therapeutic activity. In alk. soln. they show an intense nitroprusside reaction. They can be titrated with I in acid or NaHCO $_3$  soln. They are oxidized in alk. soln. by atm. O to the parent arsonic acid.

C. J. WEST

**Thiolacetamide as a reagent for identifying arsonic acids.** HARRY J. BARBER. *J. Chem. Soc.* 1929, 1024–6.—Arsonic acids react with HSCH $_2$ CONH $_2$  to form thioarsinites, ArAs(SCH $_2$ CONH $_2$ ) $_2$ , with definite m. ps., which may prove a means of identifying and characterizing these acids. With easily sol. arsonic acids they are

added to 4 mols.  $\text{HSCH}_2\text{CONH}_2$  in hot  $\text{H}_2\text{O}$ ; with sparingly sol. acids it is more convenient to use the Na salt of the acid; with  $\text{NO}_2$  compds. the reaction should be carried out in the cold. The following thioarsiniles were prepd.: *Ph*, m. 129–30°; 2-amino-phenyl, m. 140°; 4-aminophenyl, m. 145°; 2-hydroxyphenyl, m. 161–3°; 4-hydroxyphenyl, m. 160–2°; 3-amino-4-hydroxyphenyl, m. 132–3° (3-Ac deriv., m. 176°); 5-acetamido-2-hydroxyphenyl, m. 188°; 3-amino-4-methylaminophenyl, m. 141–3°; 4-chlorophenyl, m. 134–6°; 4-chloro-3-nitrophenyl, m. 142–3°; 3,5-diamino-4-hydroxyphenyl, m. 159–61°; 2,6-diacetamidophenoxyacetic-4-arsonic acid, m. 157°; 8-acetamido-3-hydroxy-1,4-benzisoxazine-6-arsonic acid, m. 233–5°.

C. J. WEST

**Interaction of tellurium tetrachloride and dimethylaniline.** GILBERT T. MORGAN AND HENRY BURGESS. *J. Chem. Soc.* 1929, 1103–6.— $\text{TeCl}_4$  (15.2 g.) in 160 cc.  $\text{Et}_2\text{O}$ , added to 21 cc.  $\text{PhNMe}_2$  in 200 cc.  $\text{Et}_2\text{O}$ , gives practically quant. *bisdimethylaniline-tellurium tetrachloride* (I), yellow, turns green at 137° and m. to a blue liquid 144–5° with elimination of  $\text{Te}$ ; it slowly decomps. in moist air. Boiling 28.5 g. of I with 200 cc.  $\text{H}_2\text{O}$  for 15 min. gives 8 g. of 4,4'-tetramethyldiaminodiphenyl telluridichloride (II), bright yellow, turns blue 181° and m. 188–9°; it dissolves in concd.  $\text{H}_2\text{SO}_4$  with effervescence, forms a  $\text{HCl}$  salt, m. 136–7°, and with  $\text{NaNO}_2$  in dil.  $\text{HCl}$  gives  $\text{TeO}_2$  and  $p\text{-ONC}_6\text{H}_4\text{NMe}_2$ ;  $\text{NaI}$  in  $\text{Me}_2\text{CO}$  gives the diiodide, dark red, m. 158–9° (decompn.). Reduction with  $\text{K}$  metabisulfite gives 4,4'-*tr*-methyldiaminodiphenyl telluride, pale olive green, m. 128–30°, which slowly oxidizes to a colorless insol. solid. The aq. mother liquors from II, on concn., give *trisdimethylaniline hydrochloride-tellurium tetrachloride*,  $(\text{PhNMe}_2\text{HCl})_3\text{TeCl}_4\cdot\text{EtOH}$ , greenish yellow, m. 119–21°, hygroscopic, decompd. by alkalis.  $\text{TeCl}_4$  and  $\text{Ph}_2\text{NMe}$  in  $\text{Et}_2\text{O}$  give 80% of an indigo-blue solid, which was not convertible by  $\text{H}_2\text{O}$  into a dichloride; concn. of the  $\text{Et}_2\text{O}$  gives a small amt. (about 5%) of 4,4'-diphenyldimethylaminodiphenyl telluridichloride, primrose-yellow, m. 170–2°; warming with concd.  $\text{H}_2\text{SO}_4$  gives an intense violet to blue color, while  $\text{HNO}_3$  gives a deep wine-red tint.

C. J. WEST

**Action of ammonia on halogen-substituted arsines.** V. IPAT'EV, G. RASUVAIEV AND V. STROMSKI. *Ber.* 62B, 598–604 (1929); *J. Russ. Phys.-Chem. Soc.* 61, 3–12 (1929).— $\text{Ph}_2\text{AsCl}$ ,  $\text{MeAsCl}_2$  and  $\text{PhAsCl}_2$  were chosen to study the action of  $\text{NH}_3$  on substitution derivs. of  $\text{AsCl}_3$ , a subject on which very little work had been done before. Dry  $\text{NH}_3$  was passed through sols. of these compds. in  $\text{C}_6\text{H}_6$  carefully protected from atm. moisture; the weakly exothermic reaction proceeded smoothly to the end and in every case the  $\text{Cl}$  was quant. split off as  $\text{NH}_4\text{Cl}$  with formation of the corresponding  $\text{R}_2\text{AsNH}_2$  or  $\text{RAs:NH}$ , the latter polymerizing to  $(\text{RAs:NH})_n$  where  $n$  is 4–6. The structure of the products is shown by their hydrolytic cleavage into  $\text{NH}_3$  and oxidation by  $\text{H}_2\text{O}_2$  to  $\text{R}_2\text{AsO}_2\text{H}$  or  $\text{RAsO}_2\text{H}_2$ . *Diphenylarsenamide*, crystals of faint aromatic odor, m. 53°, mol. wt. in freezing  $\text{C}_6\text{H}_6$  284–93, irritates the skin in powd. form or in the vapors of a volatile solvent. *Methylarsenimide*, crystals of faint but unpleasant odor, irritating to the mucous membranes, m. 205°, mol. wt. in freezing  $\text{C}_6\text{H}_6$  647–48.5. *Phenylarsenimide*, m. about 265°, mol. wt. in freezing  $\text{C}_6\text{H}_6$  642, is very irritating to the skin in powd. form, in the vapor of a volatile solvent and in soln. The  $\text{NH}_2$  or  $\text{NH}$  groups in these compds. are very loosely held; even atm. moisture splits them off as  $\text{NH}_3$ , the primary compd.  $\text{Ph}_2\text{AsNH}_2$  being the most sensitive; of the secondary amines, the aliphatic are more sensitive than the aromatic derivs. The ease with which they are hydrolyzed results in a rapid change in their m. ps., especially when they are in soln., and makes it necessary in their prepn. to use most carefully dried materials and solvents and to exclude atm. moisture in all the operations, otherwise the product will be mixed with the oxide or consist of the pure oxide. They are oxidized so energetically by concd.  $\text{HNO}_3$  that they are completely decompd., often with deflagration, likewise when heated with  $\text{Na}$ . With  $\text{HCl}$  in  $\text{Et}_2\text{O}$  they do not form an  $\text{HCl}$  addn. product but decomp. into  $\text{NH}_4\text{Cl}$  and, apparently, the original chloroarsine. C. A. R.

**Manufacture of synthetic phenol from halogen derivatives of benzene.** W. J. HALE AND EDGAR C. BRITTON. *Rev. gén. mat. color* 32, 100–2 (1928); cf. C. A. 21, 249; 22, 950.—A description for the process of manuf. of phenol from  $\text{Cl}$  derivs. of benzene using  $\text{Ph}_2\text{O}$  for heat transfer. References.

E. M. SHELTON

**"Oxidizing" action of alkalis (preliminary communication).** RUDOLF LEMBERG. *Ber.* 62B, 592 (1929).—Lock recently (C. A. 23, 827) reached the conclusion that in alkali fusions there often occur, not oxidations but dehydrogenations, with replacement of a  $\text{H}$  atom by the group  $\text{KO}$ , and announced his intention of extending his investigations to the direct hydroxylation of aromatic compds. Lemberg therefore feels impelled to report briefly some expts. he carried out some time ago but which he has been unable to take up again. Barth found that  $\text{PhOH}$  fused with  $\text{NaOH}$  yields di- and trihydroxyphenols, dihydroxydiphenyls and considerable amts. of dark phenol-



like products of high mol. wt., and, although he noted the evolution of H, he assumed the reaction was an oxidation by atm. O. If, however, PhONa and alkali contg. H<sub>2</sub>O are fused with stirring in a closed Ni app. in a current of N the same products are obtained; at a definite temp. there quite suddenly occurs a vigorous evolution of H. The Ni of the app. appreciably lowers the dehydrogenation reaction without diminishing the yield of dark, H<sub>2</sub>O-insol. but for the most part alkali-sol. products. The m-H dehydrogenation with NaOH competes with that between 2 phenol mols. C. A. R.

**Introduction of the triphenylmethyl group into phenols. II.** DOUGLAS V. N. HARDY. *J. Chem. Soc.* 1929, 1000–11; cf. C. A. 22, 1970. —According to their behavior toward an AcOH-H<sub>2</sub>SO<sub>4</sub> soln. of Ph<sub>3</sub>COH, phenols and phenolic ethers fall into 3 groups: I (those which undergo condensation), PhOH, PhOMe, PhOEt, *o*-MeC<sub>6</sub>H<sub>4</sub>OMe, *o*-MeC<sub>6</sub>H<sub>4</sub>OEt, *m*-MeC<sub>6</sub>H<sub>4</sub>OH, *o*-C<sub>6</sub>H<sub>4</sub>(OH)<sub>2</sub>, *o*-HOC<sub>6</sub>H<sub>4</sub>OMe, *o*-C<sub>6</sub>H<sub>3</sub>(OMe)<sub>2</sub>, *m*-C<sub>6</sub>H<sub>3</sub>(OMe)<sub>2</sub>, *p*-C<sub>6</sub>H<sub>4</sub>(OH)<sub>2</sub>, 1,2,3-C<sub>6</sub>H<sub>3</sub>(OH)<sub>3</sub>, 1,2,3-C<sub>6</sub>H<sub>3</sub>(OMe)<sub>3</sub>, thymol,  $\alpha$ - and  $\beta$ -C<sub>10</sub>H<sub>7</sub>OH, *o*-Cl- and *o*-BrC<sub>6</sub>H<sub>4</sub>OH; II (those under whose influence the Ph<sub>3</sub>COH is reduced to Ph<sub>2</sub>CH), *p*-MeC<sub>6</sub>H<sub>4</sub>OH, *p*-MeC<sub>6</sub>H<sub>4</sub>OMe, *p*-MeC<sub>6</sub>H<sub>4</sub>OEt, *o*- and *p*-ClC<sub>6</sub>H<sub>4</sub>OH, *o*-BrC<sub>6</sub>H<sub>4</sub>OH, *p*-C<sub>6</sub>H<sub>4</sub>(OMe)<sub>2</sub>; III (those which are unreactive), *o*- and *p*-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>OH, picric acid, *o*- and *p*-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>OMe, *o*-HOC<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>H, *o*-MeOC<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>H, Cl<sub>3</sub>C<sub>6</sub>H<sub>2</sub>OH, Br<sub>3</sub>C<sub>6</sub>H<sub>2</sub>OH and Cl<sub>3</sub>C<sub>6</sub>H<sub>2</sub>OMe. The reactions were carried out by dissolving 6 g. Ph<sub>3</sub>COH and 6 g. of phenol in 60 cc. AcOH by warming and then adding 10 g. H<sub>2</sub>SO<sub>4</sub>. PhOEt gives 6.38 g. 4-ethoxytetraphenylmethane, m. 191°. *m*-C<sub>6</sub>H<sub>4</sub>(OMe)<sub>2</sub> gives a mixt. of Ph<sub>2</sub>CC<sub>6</sub>H<sub>3</sub>(OH)<sub>2</sub> and 1,3-dimethoxy-1,6-bis(triphenylmethyl)benzene, m. 271°. 1,2,3-C<sub>6</sub>H<sub>3</sub>(OH)<sub>3</sub> gives 3,4,5-trihydroxytetraphenylmethane, crystalline, with 2 mols. Me<sub>2</sub>CO, m. 255° (decompn.); the *tri*-Me ether, m. 178°.  $\alpha$ -C<sub>10</sub>H<sub>7</sub>OH gives 7.25 g. of 4-triphenylmethyl-1-naphthol, m. 204–45°, and about 0.8 g. of 2,4-bis-triphenylmethyl-1-naphthol, m. 235–6°.  $\beta$ -C<sub>10</sub>H<sub>7</sub>OH gives 6.4 g. of 1-triphenylmethyl-2-naphthol, m. 228°. Thymol gives 4-hydroxy-2-methyl-5-isopropyltetraphenylmethane, which exists in 2 cryst. forms, m. 106–7° and 157°. *o*-ClC<sub>6</sub>H<sub>4</sub>OH gives 2.1 g. 3-chloro-4-hydroxytetraphenylmethane, m. 193–5°, and 1.66 g. Ph<sub>2</sub>CH. *o*-BrC<sub>6</sub>H<sub>4</sub>OH gives 1.68 g. 3-bromo-4-hydroxytetraphenylmethane, m. 186–7°, and 1.56 g. Ph<sub>2</sub>CH. The other phenols which react give known products. Ph<sub>3</sub>COH, *o*-MeC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub>, concd. HCl and AcOH give 4-amino-3-methyltetraphenylmethane, m. 216–7°, which yields a diazonium sulfate, m. 106–7° (decompn.); with EtOH this gives 4-ethoxy-3-methyltetraphenylmethane, m. 143°, also obtained from Ph<sub>3</sub>COH and *o*-MeC<sub>6</sub>H<sub>4</sub>OEt. 4-Chloro-3-methyltetraphenylmethane, pale brown, m. 160°. Ph<sub>2</sub>(PhC<sub>6</sub>H<sub>4</sub>)COH, PhOH, AcOH and H<sub>2</sub>SO<sub>4</sub> give diphenyl-4-hydroxytriphenylmethane, m. 183°. The behavior of a no. of tetraarylmethane derivs. towards H<sub>2</sub>SO<sub>4</sub> and HI-AcOH is reported. The behavior of H<sub>2</sub>SO<sub>4</sub> furnishes addnl. data that the Baeyer-Villiger reaction is reversible.

C. J. WEST

**Action of sulfites upon aromatic amino and hydroxyl compounds. XIII. Extension of the sulfite reaction to resorcinol (synthesis of *m*-hydroxyazo dyes), *p*-phenylene diamine and their derivatives.** HANS TH. BUCHERER and ERICH HOFFMANN. *J. prakt. Chem.* 121, 113–52 (1929); cf. C. A. 20, 1074. —The properties of the mono-SO<sub>3</sub>H acid from *m*-C<sub>6</sub>H<sub>4</sub>(OH)<sub>2</sub> and NaHSO<sub>3</sub>, through the bisulfite, indicate the constitution 2,4-(HO)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>SO<sub>3</sub>H, with NH<sub>4</sub>OH this yields *m*-H<sub>2</sub>NC<sub>6</sub>H<sub>3</sub>(OH)SO<sub>3</sub>H; Ph-NHNH<sub>2</sub> gives *m*-hydroxyazobenzenesulfonic acid, dark red, sol. in H<sub>2</sub>O with a yellow-red color; *p*-AcNHC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub>, *p*-H<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>OH and *p*-H<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>(OH)CO<sub>2</sub>H do not react with the acid; *p*-C<sub>6</sub>H<sub>4</sub>(NH<sub>2</sub>)<sub>2</sub> gives *p*-amino-*m*'-hydroxydiphenylaminesulfonic acid, yellow, easily oxidized in the air, stable at 180°, carbonizes at 270°; the diazo soln. is moss-green and gives with R-salt in Na<sub>2</sub>CO<sub>3</sub> a yellow-red dye. NaHSO<sub>3</sub> and *m*-MeC<sub>6</sub>H<sub>3</sub>(NH<sub>2</sub>)<sub>2</sub> form, with splitting off of NH<sub>3</sub>, a sulfite ester, but there is no substitution in the C<sub>6</sub>H<sub>4</sub> nucleus. PhOH does not react with NaHSO<sub>3</sub>, even in the presence of *p*-C<sub>6</sub>H<sub>4</sub>(NH<sub>2</sub>)<sub>2</sub>. 1,4-C<sub>10</sub>H<sub>6</sub>(NH<sub>2</sub>)SO<sub>3</sub>H, *p*-C<sub>6</sub>H<sub>4</sub>(NH<sub>2</sub>)<sub>2</sub> and NaHSO<sub>3</sub> give *p*-aminophenyl-naphthylaminesulfonic acid, green; the diazo soln. couples with R-salt to give a violet dye. 1,5-C<sub>10</sub>H<sub>6</sub>(NH<sub>2</sub>)SO<sub>3</sub>H gives Na *p*-aminophenyl-1-naphthylamine-3-sulfonic acid; the diazo soln. gives a violet dye with R-salt. 1,6-C<sub>10</sub>H<sub>6</sub>(NH<sub>2</sub>)SO<sub>3</sub>H gives *p*-aminophenyl-naphthylamine-6-sulfonic acid, bluish green; *p*-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>N<sub>2</sub>X gives a bluish violet dye. 1,2,4-H<sub>3</sub>NC<sub>6</sub>H<sub>3</sub>(OH)SO<sub>3</sub>H and *p*-C<sub>6</sub>H<sub>4</sub>(NH<sub>2</sub>)<sub>2</sub> with NaHSO<sub>3</sub> give *p*-aminophenyl-1-amino-2-naphthol-4-sulfonic acid, green, turning black through oxidation by the air, with the probable formation of an oxazine. C. J. WEST

**Oximes and the Beckmann rearrangement. X. Constitution of oximes.** JAKOB MEISENHEIMER and WALTER THEILACKER. *Ann.* 469, 128–46 (1929); cf. C. A. 23, 2708. —A reply, in support of the Hantzsch-Werner view of the isomerism of oximes, to Ponzio (C. A. 22, 4120). C. J. WEST

**Action of bromine on some hydrazones. II.** R. CIUSA AND P. MEGA. *Gazz. chim. ital.* **58**, 831-40(1928); cf. C. and Vecchiotti, *C. A.* **10**, 2893.—In the previous expts. on the bromination of hydrazones, the formation of  $O_2NC_6H_4CBr:NNHC_6H_4Br_2$  and of  $BrC_6H_4CH:NNHC_6H_4Br_2$  from  $O_2NC_6H_4CH:NNHPh$  and  $PhCH:NNHPh$  resp. was so surprising that further expts. on the confirmation of the differing positions of the 3 Br atoms seemed warranted. Accordingly, the yield of  $p-BrC_6H_4CO_2H$  (I) from the oxidation of  $p-BrC_6H_4CH:NNHC_6H_4Br_2$  (II) was studied. II was obtained under various conditions, but the yields were extremely variable, and large quantities of  $BzOH$  were also formed under all conditions. This suggested that the formula of II was perhaps  $PhCBr:NNHC_6H_4Br_2$  (III) and that I arose from the bromination of  $BzOH$  during oxidation of III. The 2nd formula was confirmed by the fact that by boiling with  $AcONa$  in  $AcOH$ , 1 Br is eliminated quantitatively, and that with  $PhNH_2$ , the product was  $PhC(NHPh):NNHC_6H_4Br_2$  (see below). The action of Br on anisal phenylhydrazine (IV) and on  $p$ -nitrophenylhydrazones was then studied. *Expt.* The oxidation of III was tried under various conditions of temp. and concn., the acid being isolated by filtration, acidification with aq.  $SO_2$ , extn. with  $Et_2O$ , evapn. *in vacuo* and sublimation of the  $BzOH$ . Analysis of the residue showed:  $p-BrC_6H_4CO_2H$ . Alc. III refluxed with  $PhNH_2$  (2 mols.) for 3 hrs., steam-distd., the residual oil washed with boiling water, and crystd. from  $C_6H_6$ , yields  $\omega$ -phenylaminobenzal-2,4-dibromophenylhydrazine, rose-colored, m.  $106^\circ$ . When the alc. mother liquor from the prepn of 2,4- $Br_2C_6H_3NHN:CHPh$  in the previous work was concd. to a small vol., a combd. m.  $171^\circ$ , crystd. It was not identified. Br (21 g.) in cold glacial  $AcOH$  added cautiously to IV (10 g.) in cold glacial  $AcOH$ , filtered, washed with  $EtOH$ , and the residue recrystd. from  $EtOH$  or ligroin, yields  $\omega$ -bromoanisal-2,4-dibromophenylhydrazine, m.  $135^\circ$ . Br (50 g.) in  $AcOH$  (100 cc.) added very slowly to  $PhCH:NNHC_6H_4NO_2$  (25 g.) suspended in  $AcOH$  (200 cc.), with cooling, let stand 24 hrs., filtered, washed with  $AcOH$  and then water and the residue recrystd. from  $AcMe$ , yields the combd. 2,4- $Br_2(O_2N)C_6H_3NHN:CBrPh$  (V), yellow, m.  $171^\circ$ , gives a violet color with alc.  $KOH$ . V (13 g.) refluxed 2 hrs. with  $NaOAc$  (13 g.) and glacial  $AcOH$  (200 cc.), poured into water, filtered and washed with water, yields 9 g. of the *alc. deriv.*, 2,4- $Br_2(O_2N)C_6H_3NHN:CPhAc$  (VI), yellow, could not be purified sufficiently to obtain a definite cryst. form. VI (9 g.) refluxed 2 hrs. in  $EtOH$  (90 cc.) and concd.  $HCl$  (90 cc.), cooled, filtered, the residue dissolved in water,  $NaOAc$  added, filtered, washed and recrystd. from dil.  $EtOH$ , yields 2,4-bromonitrophenylhydrazine (VII), m.  $143^\circ$ , reduces Fehling soln. and  $AgNO_3-NH_4OH$ . VII in alc.  $AcOH$  with  $BzH$  forms, after crystn. from  $EtOH$ , 2,4-bromonitrophenylhydrazone (VIII), dark yellow, m.  $166^\circ$ . Br (6 cc.) in  $AcOH$  added slowly to  $m-O_2NC_6H_4CH:NNHC_6H_4NO_2$  (10 g.) suspended in glacial  $AcOH$  (500 cc.), with cooling, let stand 24 hrs., filtered, and the residue recrystd. from  $AcOH$ , yields the compd.,  $m-O_2NC_6H_4CBr:NNHC_6H_4BrNO_2$  2,4, canary-yellow, m.  $212-3^\circ$ , gives a violet color with alc.  $KOH$ . To prove whether Br is in the *o*-position in VIII, VII was prepd. starting with  $p-O_2NC_6H_4NH_2$  and brominating the  $Bz$  deriv., eliminating the  $Bz$  group with  $KOH$ , diazotizing and reducing with  $SnCl_2$ , for it is known that under these conditions Br enters the *o*-position (cf. *Ber.* **10**, 1709). The nitrophenylhydrazine obtained m.  $143^\circ$  and forms a hydrazone, m.  $166^\circ$ , so that these last 2 compds. are VII and VIII resp. The expts. show that when aromatic hydrazones are brominated, a Br atom always enters the  $\omega$ -position, while the other Br atoms enter the hydrazinic  $C_6H_5$  nucleus. The expts. are closely related to recent expts. of Humphries, Bloom and Evans (*C. A.* **17**, 3170; Chattaway and Walker, *C. A.* **19**, 2332, 2938-9; Vanghelovitch, *Bull. soc. chim. Roumanie* **7**(1926) and *C. A.* **22**, 3640). C. C. DAVIS

**Industrial methods of benzaldehyde manufacture.** P. SHORIGIN, I. KIZBERG, N. TROITZKII AND E. SMOLYANINOVA. *J. Chem. Ind. (Moscow)* **6**, 258-60(1929).—The method of toluene oxidation by  $MnO_2$  was investigated by varying the temp., the  $H_2SO_4$  concn., the proportions of the mixt. and by trying the action of accelerators. After about 100 expts. it was found that the most favorable conditions are: temp.  $18-19^\circ$ ,  $H_2SO_4$  concn. 65%, ratio of toluene to that of  $MnO_2$  4:1. Under those conditions the  $BzH$  yield reaches 55-6% of theory (calc. on the active  $MnO_2$ ). Among catalysts, a small quantity of  $HNO_3$  was found to have a slight accelerating action, whereas  $CuSO_4$  and  $KI$  were found to be without effect. To avoid the use of the expensive  $MnO_2$ , the product of heating powd. pyrolusite with 10-25%  $NaOH$  in an autoclave at  $156-8^\circ$  under 6-6.5 atm. was tried; the  $BzH$  yield in this case reached only 14%. Neg. results were also obtained by operating, instead of with  $MnO_2$ , with *pyrolusite* passed through a colloidal mill. *Walker's method of BzH prepn. by oxidiz. of toluene vapors by atm. O in presence of  $V_2O_5$  as catalyzer* was also investigated. The catalyzer

consisted of pumice contg. on its surface 33%  $V_2O_5$ . Ten expts. were made, each time 100 g. toluene being passed during 4–6 hrs. with an excess of air, the rate of passing the latter being 120 l. per hr. The most favorable temp. is 390–410°. The BzH yield is but 4–5% of the wt. of toluene, while BzOH (2–3%) and anthraquinone (4–5%) are also obtained simultaneously, and 56% toluene is obtained unchanged and 30–35% of it is completely burned to  $CO_2$  and  $H_2O$ . As both these processes are unsatisfactory, expts. on BzH prepn. from toluene through benzyl chloride were undertaken. By chlorinating toluene vapors in presence of a 4–5000 c. p. elec. lamp crude  $PhCH_2Cl$  is obtained which contains 30% unchanged toluene. This crude product was treated for 6 hrs. with 10% NaOH in a closed app provided with a stirrer and a reflux condenser. After this sapon. operation the alky. of the soln. corresponded to 2% NaOH. On cooling, the reaction mixt. sepd. in 2 layers which, as they both contained  $PhCH_2OH$ , were treated together for oxidation by being introduced in a mixt. heated to 40° of bleaching lunc suspended in  $H_2O$  and a 30% excess of  $Na_2CO_3$  soln. The temp. rose spontaneously to 60° and a mixt. of BzH and BzOH was obtained. 40–60° are the most favorable temp. conditions; the yield of the BzH-BzOH mixt. is 35% of the wt. of the crude  $PhCH_2Cl$  taken, the accompanying PhMe being unaffected during the treatment. This seems to be a good industrial process; it gives BzH of very good quality. BzH may also be manufd. by catalytic oxidation of either  $PhCH_2OH$  or  $PhCH_2Cl$ . 100 g.  $PhCH_2OH$  gave 60 g. pure BzH (51% yield) and 1.5 g. BzOH when its vapor mixed with an excess of air was passed for 4.25 hrs. at 400–480° over pumice contg. 33%  $V_2O_5$ . 30 g.  $PhCH_2Cl$  mixed with 50–80 g.  $H_2O$  vapor and 160 l. air and passed for 1 hr. at 360–380° through a tube 25 mm. in diam. and 97 cm. long contg. the pumice- $V_2O_5$  catalyst gave a BzH yield of 74% and a BzOH yield of 10%. (When the operation is effected at 310–320° the BzH yield is only 15%, and at 450–460° it is 32%.)  $PhCH_2Cl \rightarrow PhCH_2OH + HCl$ ;  $PhCH_2OH \rightarrow BzH \rightarrow BzOH$ . Anthraquinone formation is not observed, but a few g. of black tar is deposited on the catalyst. The catalyst may be regenerated by calcination in an Fe dish followed by heating in a porcelain dish with a small quantity of  $HNO_3$ , evapn. on a water bath and ignition in a test tube at first in a current of air, then in a current of  $O_2$ . The prepn. of the catalyst from the black tech. product contg. 73%  $V_2O_5$  consisted in pulverizing it, melting with  $KNO_3$  and  $Na_2CO_3$ , extg. with  $H_2O$ , filtering and pptg. with HCl; the ppt. was washed, made into a paste with  $H_2O$  and treated with pea-size pieces of pumice which were previously calcined. The treated pumice was then dried on a water bath and calcined in a test tube at 450° in a current of air and  $O_2$ . The catalyst obtained contained 30–40%  $V_2O_5$ .

BERNARD NELSON

**Isomerism of the oximes. XXXIV.** The dissociation constants of isomeric oximes and their influence on the production of the isomerides in alkaline solution. OSCAR L. BRADY and NAVNITLAL MOHANLAL CHOKSHI. *J. Chem. Soc.* **1929**, 946–51; cf. C. A. **22**, 1968.—The cond. method cannot be used for those oximes which are very weak acids and sparingly sol. in  $H_2O$  owing to the sepn. of the solid oxime when the Na salt dissociates hydrolytically. The method of Farmer (*J. Chem. Soc.* **79**, 863 (1901)), depending upon the measurement of the degree of hydrolysis of the Na salt as detd. by the distribution coeff. of the oxime between aq. NaOH and an org. solvent, was employed. The following values are reported ( $K_a \times 10^{11}$ , for some 2 values are given):  $\alpha$ -*o*-methoxybenzaloxime, 1.45, 1.60;  $\alpha$ -*m*- $NO_2$  deriv., 7.10, 6.69;  $\alpha$ -*p*- $NO_2$  deriv., 10.93;  $\alpha$ -*p*-dimethylamino deriv., 0.55, 0.57;  $\alpha$ -furfuraldoxime, 1.46, 1.33;  $\beta$  deriv., 1.57, 1.43;  $\alpha$ -*o*-methoxycinnamaloxime, 1.61, 1.53;  $\beta$ -deriv., 0.45, 0.44;  $\alpha$ -*p*-nitrobenzophenone oxime, 1.21, 1.59;  $\beta$ -deriv., 3.37; benzophenone oxime, 0.48, 0.53; acetophenone oxime, 0.33. These results with exptl. work on the production of oximes show that if the dissoen. const. are widely different, only the oxime with the higher const. is obtained, whereas if they are nearly the same, both isomeric oximes are formed.

C. J. WEST

**Arylidene-2,4-diphenylsemicarbazones from aldophenylhydrazones and phenyl isocyanate.** GAETANO MINUNNI and SALVATORE D'URSO with SILVIA GUGLIELMINO, PIETRO SALANITRO, DOMENICO TORRISI and MARIO VASTA. *Gazz. chim. ital.* **58**, 808 20(1928).—In syntheses of nitrogenated heterocyclic compds., it was necessary to use, as a starting point, substances of the general type  $RCH:NNR'CONHR''$ . Accordingly the prepn. of the latter by the reaction:  $RCH:NNHR' + CONR'' \rightarrow RCH:NNR'CONHR''$ , was studied, a reaction which was investigated by Busch and Walter (cf. *Ber.* **36**, 1357(1903)), who did not succeed in obtaining the desired products. In spite of this, the present paper shows that phenylhydrazones of BzH and other aromatic aldehydes react even at room temp. with  $PhNCO$  (I) to give good yields of the corresponding arylidene-2,4-diphenylsemicarbazones. I (3.5 g.) refluxed 3 hrs.

with  $\text{PhCH:NNHPh}$  (II) (5 g.) in anhyd.  $\text{C}_6\text{H}_6$  (25 cc.), the  $\text{C}_6\text{H}_6$  removed by distn., the residue ground with EtOH, filtered, washed with EtOH, and the residue crystd. from boiling EtOH, yields 4 g. of  $\text{PhCH:NNPhCONHPh}$  (III), m.  $174-5^\circ$  (cf.  $173^\circ$  of Busch and Walter, *Ber.* 36, 1357(1903)). From the EtOH used in grinding the crude reaction product (*loc. cit.*) was obtained a very small quantity of  $(\text{PhHN})_2\text{CO}$ , I (3.5 g.) let stand at room temp. with II (5 g.) in anhyd.  $\text{C}_6\text{H}_6$  (25 cc.) for 15 days with frequent agitation, and treated as before, yields 4.3 g. of III, m.  $172-3^\circ$ . From the alc. mother liquors were obtained very small quantities of 2 secondary products, a yellow compd., m.  $194-6^\circ$ , and a canary-yellow compd., m.  $175-88^\circ$ , which could not be freed of impurities. III is easily reduced, e. g., with Zn and glacial HOAc it forms  $(\text{PhNH})_2\text{CO}$ . The dild. mother liquor from the latter reaction, made alk. with  $\text{NH}_4\text{OH}$ , concd., extd. with  $\text{Et}_2\text{O}$  and the ext. evapd., yields on recrystn. from hot water an unidentified compd., m.  $116-8^\circ$ . The transformation of arylidene-2,4-diarylsenicarbazones to 2,4-diarylsenicarbazides was then investigated, because the latter should be of value in the synthesis of nitrogenated heterocyclic compds. Recent expts. with  $\text{PhHNNH}_2$  (IV) compds. contg. arylidene groups indicated that III could be transformed by  $\text{PhHNNH}_2$  according to the reaction:  $\text{III} + \text{IV} \rightarrow \text{H}_2\text{NNPhCONHPh}$  (V) +  $\text{PhCH:NNHPh}$  (VI). Expts. showed that the benzylidene group was split with great ease, but V could not be isolated in a pure state. Thus, heated at  $150^\circ$ , III and IV yield an amorphous paste which, digested in hot dil. HCl, the solidified product dissolved in boiling EtOH, cooled and recrystd. in the same way, gives a product m.  $125-45^\circ$ . III (5 g.) and IV (2 g.) refluxed in glacial AcOH (10 cc.) for several hrs., cooled, yields VI, but no V could be isolated.  $o\text{-O}_2\text{NC}_6\text{H}_4\text{CH:NNHPh}$  (VII) (2 g.) and I (1.2 g.) refluxed in anhyd.  $\text{C}_6\text{H}_6$  (50 cc.) for 3 hrs., the mother liquid coned and allowed to evap., yields a small quantity of a substance, m.  $178-81^\circ$ , and a mixt., m.  $135-70^\circ$ . I and VII heated at  $120^\circ$  do not react well, while at  $150^\circ$  the mixt. resinifies almost completely. But I and VII (equal wts.) heated 3 hrs. at  $130^\circ$ , digested in hot EtOH, filtered, and the residue purified by further treatment with EtOH, yields *o*-nitrobenzylidene-2,4-diphenylsemicarbazone,  $o\text{-O}_2\text{NC}_6\text{H}_4\text{CH:NNHPhCONHPh}$  (VIII), lustrous yellow, m.  $190-2^\circ$  (decompn.). I and VII (equal wts.) let stand in a little  $\text{C}_6\text{H}_6$  for 20 days, filtered, the residue washed with EtOH, recrystd. from boiling EtOH, gives about the same yield of VIII as by the hot method (*loc. cit.*). VIII heated several hrs. on a water bath with glacial AcOH and Zn dust, filtered hot, the filtrate treated with water, and the ppt. recrystd. from boiling EtOH, yields  $(\text{PhNH})_2\text{CO}$ .  $m\text{-O}_2\text{NC}_6\text{H}_4\text{CH:NNHPh}$  and I (equal wts.) heated 6 hrs. in  $\text{C}_6\text{H}_6$  yield *m*-nitrobenzylidene-2,4-diphenylsemicarbazone (IX), m.  $206-8^\circ$  (decompn.). The reaction is more rapid without solvent, e. g., heated at  $130-5^\circ$  for 2.5 hrs., and the product purified with EtOH. As with VIII, reduction of IX with Zn and glacial AcOH forms  $(\text{PhNH})_2\text{CO}$ . With  $p\text{-O}_2\text{NC}_6\text{H}_4\text{CH:NNHPh}$  (X), the reaction is relatively slow. I (1.3 g.) and X (1 g.) refluxed in  $\text{C}_6\text{H}_6$  (15 cc.) for 9 hrs. yield 0.6 g. of *p*-nitrobenzylidene-2,4-diphenylsemicarbazone, m.  $198-200^\circ$ . More satisfactory results are obtained without  $\text{C}_6\text{H}_6$ . X (5 g.) and I (4 g.) heated for 5 hrs. at  $150^\circ$ , digested in EtOH, filtered, the residue refluxed with EtOH, filtered, the residue suspended in boiling EtOH,  $\text{C}_6\text{H}_6$  added until soln. is complete, cooled, and the ppt. recrystd., yields 4.5 g. of *p*-nitrobenzylidene-2,4-diphenylsemicarbazone, rose-yellow, m.  $199-201^\circ$ . I (2.6 g.) and piperonalphenylhydrazone (XI) (5 g.) in anhyd.  $\text{C}_6\text{H}_6$  (25 cc.) let stand 3 weeks at room temp. with daily agitation, filtered, and purified with EtOH, yields 92% of *p*-nitrobenzylidene-2,4-diphenylsemicarbazone (XII), lustrous, yellowish, m.  $169-9.5^\circ$  (decompn.). I (2.6 g.) and XI (5 g.) in anhyd.  $\text{C}_6\text{H}_6$  (50 cc.) refluxed 3 hrs., yields after purification from EtOH, 5.3 g. of XII.

C. C. DAVIS

New syntheses of nitrogenated heterocyclic nuclei. III. Triaryl derivatives of 1,2,4-triazoles from arylidene-2,4-diphenylsemicarbazones. GAETANO MINUNNI AND SALVATORE D'URSO (WITH SILVIA GUGLIELMINO, PIETRO SALANITRO, DOMENICO TORRISI AND MARIO VASTA). *Gazz. chim. ital.* 58, 820-31(1928).—The development of a general method for the prepn. of arylidene-2,4-diarylsenicarbazones (cf. preceding abstr.) gave an opportunity to study the possibility of prepg. various isocyclic and heterocyclic compds. The synthesis of 1,2,4-triazoles, thus:  $\text{RCH:NNR'CONHR''}$

$\xrightarrow{-\text{H}_2}$   $\text{RC:N.NR'.CO.NR''}$ , was first studied, a reaction already used under in-

convenient conditions by Busch and Walter (cf. *Ber.* 36, 1360(1903)). The chief difficulty was to find a suitable oxidant, but since the H atoms to be eliminated from compds.  $\text{RCH:NNR'CONHR''}$  are analogous to those in aldo-phenylhydrazones where the H atoms have been successively oxidized out by  $\text{AmNO}_2$  (*C. A.* 22, 238),

it was considered that  $\text{AmNO}_2$  was the best choice. The expts. described in the present paper show that this is a very satisfactory reagent, all the semicarbazones tested being transformed into 1,3,4-triaryl-1,2,4-triazolones.  $\text{PhCH:N.NPhCONHPh}$  (I) reacts easily in  $\text{C}_6\text{H}_6$  at room temp., whereas  $o\text{-O}_2\text{NC}_6\text{H}_4\text{CH:N.NPhCONHPh}$  (II),  $m\text{-O}_2\text{NC}_6\text{H}_4\text{CH:N.NPhCONHPh}$  (III),  $p\text{-O}_2\text{NC}_6\text{H}_4\text{CH:N.NPhCONHPh}$  (IV) and  $\text{O.C}_6\text{H}_4\text{O.C}_6\text{H}_4\text{CH:N.NPhCONHPh}$  (V) react in soln. extremely slowly, but when

boiled in  $\text{AmNO}_2$  for several hrs. without any other solvent they give fair yields of the triazolones. The latter can be easily crystd. and thus purified. I does not react with  $\text{HgO}$ , either in  $\text{Et}_2\text{O}$  or in  $\text{CHCl}_3$ , nor with  $\text{AmOH}$  in  $\text{Et}_2\text{O}$  even after heating several hrs.; but with  $\text{PhMe}$  or better with  $\text{C}_6\text{H}_6$  the reaction proceeds readily. I (5 g.), anhyd.  $\text{C}_6\text{H}_6$  (30 cc.) and  $\text{AmNO}_2$  (10 g.) refluxed at least 6 hrs., let stand several hrs., filtered, washed with  $\text{EtOH}$ , and the residue recrystd. from boiling  $\text{EtOH}$ , yield 40% of  $\text{PhC:N.NPh.CO.NPh}$  (VI), m.  $221.5\text{--}2.0^\circ$  (cf.  $215\text{--}6^\circ$  of Busch and Walter, *loc.*

*cit.*). A fair yield is obtained after many days' standing at room temp., using an excess of  $\text{AmNO}_2$ . I (2 g.) boiled in  $\text{AmNO}_2$  (5 g.) for 4 hrs. and the product purified with  $\text{EtOH}$ , yields 0.8 g. of VI, which is therefore a good method of prepn. With II a large excess of  $\text{AmNO}_2$  is necessary, or the yield is low. II (2 g.) refluxed 7 hrs. with fresh  $\text{AmNO}_2$  (15 g.), cooled, filtered, washed with  $\text{Et}_2\text{O}$ , the filtrate evapd. *in vacuo*, a little  $\text{Et}_2\text{O}$  mixed with the residue, allowed to evap. until a cryst. ppt. forms, filtered, the residue combined with the previous one, boiled 3 hrs. in  $\text{EtOH}$  with animal charcoal, filtered, the filtrate concd., and the ppt. recrystd. from  $\text{EtOH}$ , yields 1,4-diphenyl-3-*o*-nitrophenyl-1,2,4-triazolone (VII), m.  $135\text{--}7^\circ$  (decompn.). VII (2 g.) heated with Zn dust (5 g.) and glacial  $\text{AcOH}$  (50 cc.) on a water-bath for 2 hrs., filtered, the filtrate poured into a large vol. of water, filtered, washed with water, boiled in  $\text{EtOH}$  with animal charcoal, filtered, concd., and recrystd. several times from boiling  $\text{EtOH}$ , yields 1,4-diphenyl-3-*o*-aminophenyl-1,2,4-triazolone, m.  $192.5\text{--}3.5^\circ$  (decomp.). A trace of a secondary product, m.  $244\text{--}7^\circ$ , was obtained. Very little reaction took place when III (2 g.) was heated with  $\text{AmNO}_2$  (5 g.) in  $\text{PhMe}$  for 4 hrs. However, III (2 g.) refluxed in  $\text{AmNO}_2$  (30 g.) for 8 hrs., let stand several hrs., filtered, the residue mixed with  $\text{EtOH}$ , filtered, washed with  $\text{EtOH}$  and recrystd. repeatedly from boiling  $\text{EtOH}$ , yields 50% of 1,4-diphenyl-3-*m*-nitrophenyl-1,2,4-triazolone, lustrous yellow, m.  $198\text{--}200^\circ$ . IV (2 g.) refluxed in  $\text{AmNO}_2$  (20 g.) for 8 hrs., cooled, filtered, washed with  $\text{EtOH}$  and the residue recrystd. from boiling  $\text{EtOH}$ , or better from a mixt. of  $\text{EtOH}$  and  $\text{C}_6\text{H}_6$ , yields 50% 1,4-diphenyl-3-*p*-nitrophenyl-1,2,4-triazolone (VIII), lustrous yellow, m.  $193\text{--}4^\circ$ . VIII (2 g.) heated with Zn dust (10 g.) and glacial  $\text{AcOH}$  (100 cc.) for 4 hrs., filtered hot, the filtrate cooled, refiltered, the filtrate concd. *in vacuo*, poured into a large vol. of water, let stand several hrs., filtered, washed with water, and the residue purified by suspension in hot water, addn. of  $\text{EtOH}$  to complete soln. and cooling, yields 85% of the compd.  $\text{C}_{20}\text{H}_{17}\text{N}_3$ , which may be the triphenyltriazole  $\text{PhC:N.NPh.CH}_2\text{.NPh}$ . V (2 g.) heated with  $\text{AmNO}_2$  (15 g.) for 10 hrs. on a water

bath, the reaction mixt. distd. *in vacuo* on a water bath, the residue recrystd. repeatedly from  $\text{EtOH}$ , yields 1,4-diphenyl-3-piperonyl-1,2,4-triazolone, which m.  $169\text{--}70^\circ$  and has a greasy feeling.

C. C. DAVIS

**Isomerism relationships in the chalcone series.** VI. Relations between polymorphism and ethylene stereoisomerism. C. WEYGAND (WITH E. BAUER AND H. HENNIG). *Ber.* 62B, 562-73 (1929); cf. *C. A.* 22, 953.—It seems now to be practically unanimously agreed by chemists working in the field of polymorphism of org. compds. that the boundary between "phys." and "chem." isomerism, insofar as it can be detd. at all with exactness, does not coincide with the boundaries of the classical doctrines of isomerism. Recently W. attempted to group the long known, well defined forms of dibenzoylmethane enol (I) and its *o*-Et (II) and *o*-Me ethers (III) in such a way as to indicate that in this "family" of polymorphic modifications the relationship between certain members of the 3 "series" should be closer than that with other members. The original scheme has had to be modified in certain minor respects and now stands as follows:

$\beta$ -Methoxychalcone	m.	$65^\circ$	$78^\circ$	$81^\circ$	$?$	(Series III)
$\beta$ -Ethoxychalcone		$63^\circ$	$74^\circ$	$78^\circ$	$81^\circ$	(Series II)
$\beta$ -Hydroxychalcone		$?$	$73^\circ$	$78^\circ$	$81^\circ$	(Series I)
Member No.		1	2	3	4	

All the forms capable of existence of a no. of closely related substances are designated

a "family," and all the (hylotropic isomeric) forms of an individual, structurally homogeneous substance as a "series"; in the above scheme the members of 2 or more series standing immediately under each other are corresponding members, and such members should correspond very closely to each other in their fine mol. structure, or at least should be much more closely related in this respect than non-corresponding members. As to the individual members of the above family, some new observations have been made. W. had formerly believed that his 73°-form (m. 72-3°) of I was identical with the 70-1°-form, which had also been discovered independently by Dufrasse and Gillet who obtained it by aseptic crystn. of the ordinary 78°-form from hot MeOH. W. has since found that it can be obtained from solns. of both ordinary I and of BzC : CPh in concd. H<sub>2</sub>SO<sub>4</sub> allowed to absorb H<sub>2</sub>O from the air. The 73°-form, which is formed on spontaneous solidification of the undercooled melt of I, can, contrary to the 71°-form, be kept practically as long as desired, is not oversensitive to germs of the stable form and is therefore distinctly different from it. The scheme has been constructed on the basis of observations of various kinds. The 1st criterion is furnished by the m. ps. In this respect the present scheme is more satisfactory than the earlier one; there are no longer any gaps in the middle and the differences between the m. ps. of corresponding members are remarkably uniform. No place has yet been found for the very unstable 71°-form. Stability relationships might be thought to be a 2nd criterion, but such is not the case; the scheme is intended to indicate only that corresponding members have the same or similar fine mol. structures. The rule that *trans*-forms are often more stable than the *cis*-forms has a real meaning only when 2 of the H atoms in a C<sub>2</sub>H<sub>4</sub> mol. are substituted; when, as in the above family, 3 of the H atoms are substituted, it is already quite arbitrary which of the structures BzCH and BzCH

is considered as the *cis*-form. Nevertheless, the stability relationships in this family are such as to justify rather than discredit the scheme. In Series I and II the 3rd members are stable, the 4th metastable. The first 2 of Series II and the 2nd of I are metastable. In Series III the relations between the 1st and 3rd members are such that it cannot reliably be stated which is the unconditionally stable form. The 2nd member is metastable and corresponds to the 2nd member of Series I and II. The 3rd criterion is purely chem and requires the greatest caution in its application. The postulate that members of Series II and III when hydrolyzed with acids should yield corresponding members of Series I would require, when applied to C<sub>2</sub>H<sub>4</sub> stereoisomers, that in mild reactions *cis*- or *trans*-forms always give derivs of the same configuration. Although this is generally true, recent observations point to the need of caution in this direction. In the above family, the 81°-form of II gives the 81°-form of I and the 81°-III and 78°-II give the corresponding 78°-I. The 65°-III, in the absence of every outside influence, does not give the corresponding (as yet unknown and perhaps non-existent) I but the next adjacent member (metastable 73°-form). The 63°-II gives the non-corresponding stable 78°-I. The above postulate may be reversed: mild methylation or ethylation of a member of Series I should give a corresponding deriv. of Series III or II. This has been verified with the 78°-I treated with CH<sub>3</sub>N<sub>2</sub> or M CHN<sub>2</sub>. A 4th postulate is that corresponding forms should be crystallographically similar to each other. The 65°- and 81°-III form different melts and solns.; neither has a seeding influence on the melt of the other; they are readily transformable into each other (by crystn. from MeOH, action of sunlight or heating with traces of acid in alc., heating in the dry state); the same equil. point is reached from either direction; the m. p. of mixts. is considerably depressed. While the two III thus behave like true chem. individuals of the kind of numerous C<sub>2</sub>H<sub>4</sub> stereoisomers, the corresponding 63°- and 78°-II stand distinctly on the boundary between isomerism and polymorphism. The more sol., metastable form can be extd. from the conglomerate with petroleum ether; they show mixed m. ps. but no depression; an undercooled melt of one can be made to solidify in the other form by seeding and the solid 63°-changes into the 78°-form spontaneously or in contact with the latter. Crystallographic comparisons were not made by measuring individual crystals but by observing the mechanism of solidification of melts and by qual. comparison of the polarization tones. The 78°-II and 81°-III grow out from an undercooled drop of their melts in fungus-like forms, while the 63°-II and 65°-III yield radiating flat formations differing but slightly from the drop in shape. The same similarity to each other of the members of each pair and difference from the members of the other pair is found in the characteristic polarization tones and in the behavior of the advancing zone of solidification toward air bubbles imprisoned in the melt. It had been concluded, from the

behavior toward picric acid, that *p*'-ethyl- and *p*'-propylchalcone (known in only 1 form) did not belong to the stable  $\alpha$ -form but to a metastable form; on observing their undercooled melts under the microscope, the authors now find that the 2 substances behave quite alike on cooling and entirely differently from *p*'-methoxychalcone, which solidifies only in the  $\alpha$ -form. The solidified melts of the 63°-III and 63°-II are not so similar to each other as those of the higher melting pair; possibly the process of solidification of the II melts, seeded with the 63°-form, is especially complicated because they contain different forms. In the transformation of the higher into the lower melting forms by heating, the seeding effect of the solid phases on the undercooled melts can be observed immediately after fusion with the II but only after about 1 hr. with the III, *i. e.*, equil. between several forms is probably established very rapidly with the II while the III preserves its identity unchanged for a time. The same may be true in solid, which would explain why the 65°-III gives a metastable I on hydrolysis while the 63°-II does not. C. A. R.

**Isomerism relations in the chalcone series.** VII. A natural system of the polymorphous forms of *p*'-methylchalcone. C. WEYGAND AND H. BAUMGÄRTEL. *Ann.* **469**, 225-56 (1929); cf. preceding abstr.—Seven forms of *p*'-methylchalcone, m. 74.5°, 56.5°, 55.5°, 54.5°, 45.5°, 48°, and 44.5°, have been observed on a cover glass. The original should be consulted for details of the exptl. methods and the theoretical discussion of the relations of these forms. C. J. WEST

**Problem of the constitution of 1,3-diketones.** II. Tendency to enolize and direction of the enolization. C. WEYGAND AND H. BAUMGÄRTEL. *Ber.* **62B**, 574-9 (1929), cf. *C. A.* **22**, 1580.—It was shown in the 1st paper that the keto-enols  $\text{RC}_6\text{H}_4\text{C}(\text{OH})\text{CHCOPh}$  and  $\text{RC}_6\text{H}_4\text{COCH}_2\text{C}(\text{OH})\text{Ph}$  corresponding, formally, to the unsym. 1,3-diketones  $\text{RC}_6\text{H}_4\text{COCH}_2\text{COPh}$  are not formed by hydrolysis of their *o*-Me ethers and it is therefore a question to which, if any, of the enolization products of 1,3-diketones a definite structure can be assigned. Scheiber and Herolds' method of detg. the structure of enols did not shed any light on the problem in this case; not only did the solns. of 4 preps., which in the solid state were to all appearances homogeneous keto-enols, always yield the cleavage products of the 2 theoretically possible enol forms but the substituted dibenzoylmethanes behaved towards  $\text{O}_3$  as if they were chiefly dienols,  $\text{RC}(\text{OH})\text{:C:C}(\text{OH})\text{R}'$ , whereas their polymorphism phenomena show quite definitely that they are  $\beta$ -hydroxychalcones (see preceding abstrs.). While the enolization relationships in purely aromatic substituted 1,3-diketones are thus extraordinarily obscure, they are strikingly simple, in a certain respect, in the homologs of  $\text{CH}_2\text{Ac}_2$  (I) where the relation between the tendency to enolize and the direction of enolization surmised by Meyer and proved in all its essential points by Scheiber and Herold is shown in all clearness by a homologous series contg. many members. The direction of the enolization, however, is surprising. Since it had hitherto been generally assumed that there is an intimate relationship between the enolization tendency of an acyl group and the strength of its corresponding  $\text{CO}_2\text{H}$  acid it might have been expected that in decyloacetone (II) the Ac group would be chiefly enolized and further that it would be less enolized than in I with its two Ac groups. As a matter of fact, the % of enol in the equil. mixts. of the *acylacetones* increases in the order: I, 76.4; propionyl (III), 80.2; butyryl (IV), 83.6; heptyl (V), 93.9; II, 100.2. The  $\text{O}_3$  cleavage which, because of the favorable soly. relations, was carried out in the extraordinarily indifferent  $\text{EtCl}$ , yielded products corresponding entirely to this unexpected behavior. While I gave the characteristic  $\text{AcCHO}$  (VI), isolated as the osazone, III yielded only smeary ppts. (presumably mixts. of the osazones of VI and  $\text{EtCOCHO}$ ); IV gave chiefly an only product, together with some VI and much  $\text{PrCO}_2\text{H}$  (*i. e.*, the cleavage products of  $\text{PrC}(\text{OH})\text{:CHAc}$ ); V yielded much VI with some enanthic acid, and II gave impure VI and a large amt. of capric acid. When the C chain is branched the enolization relationships change at once;  $\text{Me}_2\text{CHCOCH}_2\text{Ac}$  (VII) at equil. contains only about 60% enol. These simple results, however, did not seem to agree with observations made in connection with the synthesis of the diketones (through their Cu salts). On distn. *in vacuo* (not under atm. pressure) of the III, IV and V liberated from the crude Cu salts, they yielded 2 distinct fractions which gave Cu salts of different m. ps.; W. and B. are inclined to believe that this is a case of finer "phys." isomerism of the type observed by Harries with mesityl oxide. III gave fractions  $b_{12}$  43° and 45°, IV fractions  $b_{11}$  57-61° and  $b_{12}$  64-8° yielding Cu salts, m. 164-5° and 161-2°, and V fractions  $b_{12}$  108° and  $b_{12}$  114-8°, whose Cu salts m. 125-6° and 122-3°. II,  $b_{12}$  150-2° (Morgan and Holmes give 180° under 11 mm.), m. 124-7°; Cu salt, m. 110° (M. and H., 114°). VII,  $b_{12}$  67-71°. C. A. R.

The green forms of the *p*-dihydroxydibenzal ketones. D. VORLÄNDER AND OTTO KOCH. *Ber.* 62B, 534-40 (1929).—Green forms of (*p*-HOC<sub>6</sub>H<sub>4</sub>CH : CH)<sub>2</sub>CO (I) and of *p*-dihydroxydibenzal cyclopentanone and -hexanone have been obtained by Zincke and Mülhausen and by Vörländer by decomp. the dark violet or blue-black HCl or HBr salts of the ordinary forms with cold H<sub>2</sub>O and washing until the washings no longer give a turbidity with AgNO<sub>3</sub> and the green residues are halogen-free (Beilstein test). These green forms can be recrystd. from cold EtOH-H<sub>2</sub>O but change in time into the yellow (orange- or brown-yellow) forms. A particle of the green I forms in 100-300 parts of cold Ac<sub>2</sub>O a dark violet-blue soln. whereas the ordinary form gives only a light yellow soln. so there can be no doubt that the green forms are capable of independent existence in soln. as well as in the solid state. Further expts. with I and with divanillalacetone (II) have led to results in a direction differing materially from that to which the earlier work was believed to point. The green "halogen-free" form of I must as a matter of fact always contain a small amt. of a strong acid to appear green; the Beilstein test is much less sensitive than is generally assumed. A green I which on decompn. with fused purest, halogen-free NaOH shows 0.11% HCl hardly gives the test when carried out in the usual way and only when the ketone is concd. from a satd. Me<sub>2</sub>CO soln. on the porous CuO does the flame test become distinctly visible; even this modified form of the test gave a negative result with the same green prepn. purified by crystn. from EtOH-ice H<sub>2</sub>O until the HCl content was only 0.04%. By this purification the color of the I was changed to yellow-green and when the greenish tone completely disappears as the result of further crystn. the prepn. no longer contains any HCl. If the dark olive-green alc. soln. of the freshly prepd. green I is treated with cold alc. AgNO<sub>3</sub> its green color disappears much more quickly than that of a soln. in alc. without AgNO<sub>3</sub> (0.5 as compared with 5 hrs.). In the change of the green into the yellow form there is not only a splitting off of the minute traces of HCl but a change from the colloidal state of the green into the coarse cryst. state of the yellow form which often is no longer turned green by traces of HCl. Thus the C<sub>6</sub>H<sub>6</sub> soln. of the yellow I is not turned green by traces of HCl and that in much Ac<sub>2</sub>O does not become violet-blue, but a H<sub>2</sub>O suspension is turned greenish by dil. HCl. The Me<sub>2</sub>CO soln. of the green form changes from blue through brown to yellow and under the ultramicroscope shows scarlet disks paling to orange; the abs. alc. soln. is green with light, faintly reddish disks and after 2 hrs. is yellow-greenish with light green disks; on the other hand, solns. of the yellow form in C<sub>6</sub>H<sub>6</sub> or C<sub>4</sub>H<sub>8</sub> with a trace of HCl are faintly yellow and almost optically void. The difference in dispersion between the green and yellow forms accounts for a host of observations already reported but without being able to explain them (decrease in soly. of the green form on standing, its more rapid acetylation, its apparently greater soly. in Ac<sub>2</sub>O, the dark violet-blue color of its soln. in Ac<sub>2</sub>O, etc.). These phenomena are very complicated and are by no means to be ascribed entirely to differences in the degree of dispersion but it may at least be stated that the green forms consist of solid colloidal solns. of small amts. of colored acid addn. products in yellow crystals. A surprising time reaction can be observed when the dark black HCl salt is dissolved in cold dil. alkali and then treated with excess of dil. AcOH. If the acid is added immediately a green ppt. is formed but if the alk. soln. is allowed to stand a few min. before adding the acid a yellow ppt. is obtained. The free green or yellow I, on the other hand, are pptd. from alk. soln. only in yellow form, regardless of the length of time the alk. soln. has stood. These yellow ppts. are at once colored greenish by dil. HNO<sub>3</sub> and such greenish ppts. are always obtained from alk. solns. with excess of dil. HCl. In other words, in an alk. soln. of the ketone-HCl there occurs a time reaction in which the alkali reacts with the HCl of the ketone-HCl. Cl ions have nothing to do with this time reaction; addn. of much KCl or NaCl to the alk. soln. and subsequent acidification with AcOH produces no green ppt. or time phenomenon, whereas these results are obtained by turning the ketone green with concd. HCl, then dissolving it in alkali and reprecip. it with AcOH. The key to these phenomena is probably the strongly colloidal condition of the alk. aq. solns., all of which, whether prepd. from the yellow or the green forms, show bright, intensely red light disks under the ultramicroscope. In the freshly prepd. alk. solns. of the ketone-HCl, a part of the HCl adsorbed on the colloidal ketone remains unneutralized for a varying length of time in the presence of the excess of OH ions and produces a green ppt. with AcOH, but as soon as it has been completely neutralized AcOH can no longer form a green ppt. V. and K. can find no other explanation for their results. The blue-black HCl salt of II, freshly pptd. from alc. with HCl, contains up to 3 mols. HCl, after 12 hrs. *in vacuo* 2 mols., after 3 days hardly more than 1 mol., when it is dark green, it no longer fumes and is quite stable. The green form of II, which always con-



tains traces of acid, is obtained by shaking the freshly prepd. blue-black HCl salt with cold  $\text{H}_2\text{O}$ , the yellow form by pptn. of the blood-red, aq. alk. soln. of the green form with AcOH. The yellow II, recrystd. from  $\text{EtOH-H}_2\text{O}$ , contains 1 mol.  $\text{H}_2\text{O}$  and m.  $118^\circ$ ; after drying *in vacuo* over  $\text{P}_2\text{O}_5$  or recrystg. from  $\text{C}_6\text{H}_6\text{-PhMc}$ , it m.  $143^\circ$ . The 2 forms do not differ appreciably in soly. The  $\text{C}_6\text{H}_6$  soln. of the anhyd. yellow form is changed permanently green by traces of moist HCl, whereas in the absence of moisture a brown-red color is formed. The solid anhyd. yellow form can stand 45 mins. in dry HCl before a green color becomes distinctly visible, whereas the hydrated II under the same conditions becomes superficially green in 1 min. and in aq. suspension is at once turned green by 5–10% HCl. The green color produced depends on the concn. of the aq. HCl; besides HBr and HCl, other strong acids (but not AcOH) in  $\text{H}_2\text{O}$  give green compds. In ice-cold aq. alk. soln. both the yellow and the green ketone give the same dibenzoate, yellow, m.  $191^\circ$ . Under the ultramicroscope solns. of the green form are strongly colloidal, those of the yellow form almost optically void, but with excess of alkali both yield the same colloidal red solns. The time reaction when the HCl salt is dissolved in alkali can be followed much better than with I; it depends on the temp. (is more rapid in hot than in cold soln.) and on the concn. of the alkali; its velocity did not seem, at least at first, to increase with the concn. of the alkali. Divanillacyclohexanone, from vanillin, cyclohexanone and HCl in abs. alc. at  $0^\circ$ , seps. as a dark blue-violet HCl salt which becomes dark green when washed with  $\text{Et}_2\text{O}$  and, if rapidly dried over  $\text{P}_2\text{O}_5$  and  $\text{H}_2\text{SO}_4$ , contains less than 1 mol. HCl. The blue-violet salt with  $\text{H}_2\text{O}$  gives a light green cryst. prepn. which does not turn yellow even on boiling but is converted into the yellow form by dissolving in dil. KOH and pptg. with AcOH (NaOH gives a brown-yellow salt). The yellow ppts., soon after their formation, are turned green by dil. HCl, but after 5–10 mins. (i. e., after they have become cryst.) the same HCl has practically no action on them; from alc. they sep. in yellow needles, m.  $179^\circ$ . The time reaction in the alk. solns. of the blue-violet or green HCl salts is much slower than that of the salts of II. Errata in earlier papers.—C. A. 19, 1414: for blue-black A-HCl deriv. of *p*-hydroxybenzal-*p*-hydroxyacetophenone, read red A-HCl deriv. C. A. 19, 1415: strike out the cor. m. ps.  $166^\circ$ ,  $178^\circ$  for dianisalcyclohexanone; the temps.  $162^\circ$ ,  $173^\circ$  are the cor. values. C. A. 16, 188 (p. 2264 of original): a compd., m.  $176^\circ$ , has been repeatedly obtained from suberone and anisaldehyde, and in addn. higher melting condensation products of doubtful compn.; Wallach's dianisalsuberone, m.  $128.9^\circ$ , is believed to be monotropic cryst.-liquid, the m. p. sometimes being lower ( $124^\circ$ ), the suberone obtained by different methods from suberic acid seemed to consist of a mixt. of several ketones. C. A. 5, 506: in Table VI, l. 14, read  $\text{CMe}_3\text{CO}_2\text{K}$  for  $\text{CMe}_3\text{CO}_2\text{Na}$ . The m. ps. of Na palmitate and stearate given in l. 9–11 from below were detd. "in tubes" and are therefore different from the values detd. "microscopically" (l. 12–14 from below); the latter are the less reliable, as the Rinne app. then used proved not to be trustworthy.

5-Phenyl-1-pentadienal and 7-phenyl-1-heptatrienal. II. D. VORLÄNDER AND ERICH DAEHN. *Ber.* 62B, 541–5 (1929).—Shortly after the appearance of the first paper by V., Fischer and Kunze (C. A. 19, 2940), V.'s attention was called to the fact that the 5-phenyl-1-pentadienal (I) and 7-phenyl-1-heptatrienal (II) had already been described by Engelberg (*Diss. Berlin, 1914*), working under Erlenmeyer with the co-operation of Schimmel & Co. E. and E. therefore had much larger amts. of the crude aldehyde at their disposal than did V., F. and K., but when the high-boiling fractions are to be sepd. from the mixt., it is perhaps better to work with smaller amts. to avoid decompn. during the long vacuum distns. In spite of some differences in the m. p. data, there can be no doubt of the identity of V., F. and K.'s I with E. and E.'s product. The investigation has been continued with a com. product (tailings in the fractionation of synthetic  $\text{PhCH:CHCHO}$  supplied by Schimmel and Co.). This contains 10–5%  $\text{PhCH:CHCO}_2\text{H}$  which was removed with  $\text{Na}_2\text{CO}_3$ . The residual oil (0.5 kg. after drying with  $\text{Na}_2\text{SO}_4$ ) yielded under 10–5 mm.  $18\%$  b.  $145^\circ$  (chiefly  $\text{PhCH:CHCHO}$ ),  $7\%$  b.  $145\text{--}57^\circ$ ,  $9\%$  b.  $157\text{--}65^\circ$ ,  $17\%$  b.  $165\text{--}79^\circ$  (also chiefly I),  $9\%$  b.  $180\text{--}95^\circ$ ,  $14\%$  b. above  $195^\circ$  and  $26\%$  residue. Fractions 3 and 4, refractionated twice more under 10–25 mm., gave a fraction, b.  $160\text{--}8^\circ$ , of I sufficiently pure for further synthetical expts. The condensation of  $\text{PhCH:CHCHO}$  in the lab. is effected much more rapidly by E. and E.'s than by V., F. and K.'s method, but MeOH was used instead of EtOH; 100 g.  $\text{PhCH:CHCHO}$ , 200 g. MeOH, 100 cc.  $\text{H}_2\text{O}$  and 100 g. 50% aq. AcH slowly treated at  $0\text{--}5^\circ$  with 100 g. 5% NaOH and allowed to stand 5 hrs. in ice gave 15–20 g. I, b.  $160\text{--}80^\circ$ , together with 30–40 g. unchanged  $\text{PhCH:CHCHO}$ . I and amines, from mol. quantities in alc. or without a solvent heated 2–4 hrs. at  $50\text{--}70^\circ$  or allowed to stand 1–3 days at room temp.: Aniline,  $\text{C}_7\text{H}_7\text{N}$ ,

refractive yellow leaflets, m. 112° (m. ps. cor.), non-cryst.-liquid (c.-l.), gives a color with concd.  $\text{H}_2\text{SO}_4$ ; *p*-toluidine, yellow, m. 105°, non-c.-l., gives an orange color with  $\text{H}_2\text{SO}_4$ ; *p*-anisidine, dark yellow, m. 147° (V., F. and K., 143°), monotropic c.-l. schlieren, 2 cryst.-solid phases; *p*-phenetidine, golden yellow, m. 137° (V., F. and K., 133-4°), monotropic c.-l. schlieren; *p*-aminoazobenzene, red-yellow, enantiotropic c.-l. schlieren, 1st m. p. 168°, 2nd m. p. 163° (V., F. and K., 172°-168°), gives a blue-violet color with  $\text{H}_2\text{SO}_4$ ;  $\beta$ -naphthylamine, yellow, m. 140°, non-c.-l., gives a red color with  $\text{H}_2\text{SO}_4$ ; *p*-aminoacetophenone, yellow, apparently 2 monotropic c.-l. phases, schlieren along 1 axis, gives a crimson color with concd.  $\text{H}_2\text{SO}_4$ ; phenylhydrazine, yellow, m. 178° (V., F. and K., 170-2°; E. and E., 177°), non-c.-l., gives a dirty green color with  $\text{H}_2\text{SO}_4$ ; hydrazine, yellow leaflets from alc., m. 210°, or golden yellow leaflets from  $\text{C}_6\text{H}_6$ , m. 217° (V., F. and K. from alc., 207-9°; E. and E. from AcOH, 207°), dimorphous cryst.-solid, mixed m. p. of the 2 forms 206-10°, non-c.-l., gives a red-violet color with  $\text{H}_2\text{SO}_4$ . I with ketones: acetone, m. 189°, monotropic c.-l. after the 1st fusion; acetophenone, yellow, m. 79°, non-c.-l., amorphous liquid when supercooled after fusing, gives a red-violet color with  $\text{H}_2\text{SO}_4$ ; cyclopentanone, red, m. 203-4°, changes on heating into 2 cryst.-solid forms, non-c.-l., gives a blue color with  $\text{H}_2\text{SO}_4$ ; cyclohexanone, m. 202°, monotropic c.-l. The earlier work had shown that II can be obtained from the higher boiling aldehyde fractions in the form of well characterized derivs. but a repetition of this work on the larger amts. of com. aldehyde rendered the prospects of obtaining II less promising. The 180-95° fraction, which should have contained II, gave on repeated distn. an oil, b<sub>14</sub> 185-95°, from which were obtained the following condensation products: with  $\text{PhNHNH}_2$ , a very small amt. of a cryst. powder or needles, non-c.-l., m. 189°, gives an orange color with  $\text{H}_2\text{SO}_4$ ; with *p*-phenetidine, yellow, enantiotropic c.-l. schlieren, solidifies cryst.-solid without supercooling, m. 188° and 164°, gives an orange color with  $\text{H}_2\text{SO}_4$  (V., F. and K. give 200° and 171° as the 2 m. ps.); with *p*-anisidine, yellow, m. 183°, strongly monotropic c.-l. schlieren, gives a yellow color with  $\text{H}_2\text{SO}_4$  (V., F. and K. describe their product as enantiotropic c.-l., m. 205-7° and 165°); with *p*-PhN:NC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub>, golden yellow, enantiotropic c.-l. schlieren, m. 250-2° and 208-10°, gives a crimson color with  $\text{H}_2\text{SO}_4$  (V., F. and K. give the m. ps. as 300° and 251°). As the m. ps. given by V., F. and K. are in general higher, they possibly did not have derivs. of II but of a higher ene-homolog. The statement of E. and E. that II cannot be sepd. by vacuum distn. from the higher boiling residues in the prepn. of I (condensation in alc.) has been confirmed; this applies, however, only to the condensation products of I and AcH as they are obtained in the presence of large amts. of alc. in the short time of 5 hrs., not when the procedure of V., F. and K. (condensation in the presence of much H<sub>2</sub>O and little alc. for several days) is followed. The II (?) obtained by E. and E.'s method was enantiotropic c.-l., m. 110° and 104° (in another expt., 103° and 101°; E. and E., 98°), and reduced NH<sub>2</sub>-AgNO<sub>3</sub>; the c.-l. properties of some of its condensation products with amines were strikingly weak and differed in m. p. from those obtained by V., F. and K.; the substance seems to be a mixt. of higher aldehydes.

C A R

**7-Phenylheptatrienic acid.** D. VORLÄNDER AND ERICH DAEHN. *Ber.* 62B, 545-9 (1929); cf. preceding abstr.—The study of 7-phenylheptatrienic acid (I) was of interest from the point of view of the behavior of the 3 double bonds in addn. reactions and of the question whether cryst.-liquid (c.-l.) properties are strengthened by lengthening the chain even without *p*-substitution. Unlike the aldehyde, I can be obtained pure and was shown to be enantiotropic c.-l. There is thus now available the series B $\cdot$ OH, PhCH:CHCO<sub>2</sub>H, PhCH:CHCH:CHCO<sub>2</sub>H and I in which the c.-l. properties increase with the lengthening of the chain and introduction of each further CH:CH group, although it does not establish whether the C:C groups act only spatially by lengthening the chain, or also energetically, or, which is most probable, cumulatively through several very different functions. The yield of phenylpentadienalmalonic acid was increased from 40 to 60% by using alc. NH<sub>3</sub> instead of AcOH in the condensation; it seps. from alc. in orange needles, m. about 191° (m. ps. cor.) with evolution of CO<sub>2</sub> (Erlenmeyer and Engelberg, 190°; V., Fischer and Kunze, 210-2°). With 2 parts Ac<sub>2</sub>O at 120-30° it gives about 30% I, almost colorless or yellowish white, gives a yellow-brown color with  $\text{H}_2\text{SO}_4$ , m. 199° and 189-90° (E. and E., 187°). K, Na and NH<sub>4</sub> salts, microcryst. ppts. I and its Na salt in H<sub>2</sub>O suspension are strikingly stable toward light, even ultra-violet, only a small part decomp. In CHCl<sub>3</sub> I adds 3 mols. Br<sub>2</sub> without appreciable evolution of HBr. Me ester, prepd. with MeOH and H<sub>2</sub>SO<sub>4</sub>, very faintly yellowish, m. 114°, non-c.-l., gives a brown color with  $\text{H}_2\text{SO}_4$ ; Et ester, almost colorless, m. 91°, non-c.-l. (a mixt. of the Me and Et esters is likewise non-c.-l.).

can be supercooled and then solidifies rhythmically with marked contraction; this cryst.-solid phase changes on standing into 2 cryst.-solid phases. *Chloride*, prepd. with  $\text{SOCl}_2$ , brownish mass. *Anilide*, dull yellow, m.  $213^\circ$ , forms 2 cryst.-solid phases, non-c.-l., gives a red-brown color with  $\text{H}_2\text{SO}_4$ . *p-Toluide*, pale yellow, m.  $209^\circ$ , faint monotropic c.-l. *schlieren*, gives a red-brown color with  $\text{H}_2\text{SO}_4$ . *p-Aniside*, yellow-green, dimorphous enantiotropic c.-l., m.  $203-4^\circ$  (presumably transition solid  $\rightarrow$  c.-l.), gives a red-brown color with  $\text{H}_2\text{SO}_4$ . *p-Phenide*, yellow-greenish, m.  $210-1^\circ$ , enantiotropic c.-l., then amorphous-liquid; like the aniside, on cooling there appear a 1st and a 2nd cryst.-liquid phase. With Na-Hg and  $\text{CO}_2$  in  $\text{H}_2\text{O}$  on the  $\text{H}_2\text{O}$  bath, I gives a *di-* or *tetrahydro deriv.*, waxy leaflets, m.  $64^\circ$ , gives a brown color with  $\text{H}_2\text{SO}_4$ , reduces  $\text{KMnO}_4$ , is non-c.-l., becomes yellowish and sticky after 2-3 days in the air and light. The C content lies between the values calcd. for  $\text{C}_{13}\text{H}_{11}\text{O}_2$  and  $\text{C}_{13}\text{H}_{12}\text{O}_2$  and the H content is too low for the latter formula but titration with Br in  $\text{CHCl}_3$  points to a tetrahydro acid with only one C:C bond. There are no definite relations between the light and color phenomena under a quartz ultra-violet lamp and the degree of unsatn. of the compds. *p-MeOC}\_6\text{H}\_4\text{CHBrCHBrCHBrCHBrCO}\_2\text{H} shines with an unusually bright pink color, anisic acid glows at least as strongly as *p-MeOC}\_6\text{H}\_4\text{CH:CHCO}\_2\text{H} or the Me ester of I, but BzOH more weakly than  $\text{PhCH:CHCO}_2\text{H}$ . The phenomenon changes with shifting of the double bond from *p-MeOC}\_6\text{H}\_4\text{CH}\_2\text{CH:CHCH}\_2\text{CO}\_2\text{H} (faintly luminous) to the  $\alpha,\beta$ -unsatd. isomer (strongly luminous) or on rearrangement of  $\text{MeOC}_6\text{H}_4\text{CH:CHCH:CHCO}_2\text{H}$  (strongly luminous) into the *allo* acid (weakly luminous). Complete hydrogenation usually, but apparently not always, decreases the luminescence. All the arylideneamines hitherto tested appear black in the light of the quartz Hg lamp, as does Et *p*-azoxycinnamate, whereas phenylhydrazones glow brightly and the anilides, anisides, etc., of the acids are more or less bright. C. A. R.***

**Synthesis of isomeric ephedrine and their homologs.** WILHELM N. NAGAI AND SEIZO KANAO. *Ann.* **470**, 157-82(1929); cf. *C. A.* **23**, 1472.—BzH (10.6 g.) and 7.5 g.  $\text{EtNO}_2$ , shaken 5 days with 8 cc. 25%  $\text{K}_2\text{CO}_3$ , give 80% of 1-phenyl-1-hydroxy-2-nitropropane, b<sub>4</sub>  $123-4^\circ$ ; reduction with Zn and 25% AcOH in EtOH gives the 2-hydroxy-amino deriv., m.  $78-9^\circ$ ; shaking with 35% HCHO in  $\text{H}_2\text{O}$  the methylenemirone deriv., m.  $100^\circ$ ; reduction with Zn and AcOH in the presence of  $\text{CuSO}_4$  gives *dl*-ephedrine (1-phenyl-1-hydroxy-2-methylaminopropane) (I), m.  $75^\circ$ ; *HCl* salt, m.  $187-8^\circ$ ; chloroplatinate, yellow, m.  $199^\circ$ ; chloroaurate, yellow, m.  $112-3^\circ$ ; *p*-nitrobenzoyl deriv., pale yellow, m.  $162^\circ$ ; dimethylammonium iodide, m.  $228-9^\circ$ . Resolution of I with *d*-tartaric acid gives *l*-I, identical with the natural product; the *d*-I, m.  $40-40.5^\circ$ ,  $[\alpha]_D^{20}$   $+4.42^\circ$ , *p*-nitrobenzoyl deriv., pale yellow, m.  $187-8^\circ$ ,  $[\alpha]_D^{20}$   $+51.12^\circ$  ( $\text{CHCl}_3$ ). The 2nd product of the above reduction, which crystals first from  $\text{H}_2\text{O}$ , is *dl*-isoeephedrine (II), m.  $118^\circ$ , *HCl* salt, m.  $164^\circ$ ; oxalate, m.  $218^\circ$  (decompn.); chloroaurate, yellow, m.  $117^\circ$ , and pale yellow, m.  $194^\circ$ ;  $\text{CuSO}_4$  gives the compd.  $2\text{C}_{10}\text{H}_{12}\text{NO} \cdot \text{CuO} \cdot 2\text{H}_2\text{O}$ , violet, m.  $129^\circ$  (decompn.); *N*-*p*-nitrobenzoyl deriv., m.  $165-6^\circ$ ; dimethylammonium iodide, m.  $183^\circ$ . Resolution of II with *d*-tartaric acid gives *l*-II, m.  $118-8.5^\circ$ ,  $[\alpha]_D^{20}$   $-51.93^\circ$  (EtOH); *HCl* salt, m.  $182-2.5^\circ$ ,  $[\alpha]_D^{20}$   $-61.88^\circ$  ( $\text{H}_2\text{O}$ ); *N*-*p*-nitrobenzoyl deriv., m.  $177^\circ$ ,  $[\alpha]_D^{20}$   $-140.47^\circ$  ( $\text{CHCl}_3$ ). The mother liquor gives *d*-II, identical with the natural product. Reduction of  $\text{PhCH(OH)CH(NO}_2\text{)Me}$  with Fe and  $\text{H}_2\text{SO}_4$  in EtOH at  $45^\circ$  gives a mixt. of *dl*-norephedrine (III) and *dl*-norisoeephedrine (IV), sepd. by crystn. of the *HCl* salts from abs. EtOH. III, m.  $104-5^\circ$ ; *HCl* salt, m.  $194^\circ$ ; sulfate, m.  $285-6^\circ$ ; oxalate, m.  $245^\circ$  (decompn.); dioxalate, m.  $182-3^\circ$  (decompd.); chloroplatinate, pale yellow, m.  $221.5^\circ$  (decompn.); chloroaurate, yellow; compd.  $2\text{C}_{10}\text{H}_{12}\text{NO} \cdot \text{CuO} \cdot 2\text{H}_2\text{O}$ , purple, m.  $169^\circ$  (decompn.); *N*-Ac deriv., m.  $135^\circ$  (*N* *HCl* gives III; concd. *HCl* gives IV); *N*-*p*-nitrobenzoyl deriv., m.  $189^\circ$ . Resolution of III with *d*-tartaric acid gives *d*-III, m.  $52^\circ$ ,  $[\alpha]_D^{27}$   $+14.76^\circ$  (EtOH); *d*-bitartrate, crystg. with 1 EtOH, m.  $160^\circ$ ,  $[\alpha]_D^{27}$   $+34.69^\circ$ ; *HCl* salt, m.  $171-2^\circ$ ,  $[\alpha]_D^{27}$   $+33.40^\circ$ ; sulfate, crystg. with 2  $\text{H}_2\text{O}$ , m.  $285-6^\circ$  (decompn.),  $[\alpha]_D^{27}$   $+31.51^\circ$ ; oxalate, m.  $245^\circ$  (decompn.); chloroplatinate, pale yellow, m.  $221.5^\circ$  (decompn.); chloroaurate, yellow, m.  $188^\circ$ ; *N*-*p*-nitrobenzoyl deriv., pale yellow, m.  $175-6^\circ$ ,  $[\alpha]_D^{20}$   $+49.95^\circ$  ( $\text{CHCl}_3$ ). The mother liquor contains the *l*-III, m.  $50^\circ$ , of which the same derivs. were prepd.; the *p*-nitrobenzoyl deriv., pale yellow, m.  $175-6^\circ$ , on heating with concd. *HCl*, gives the corresponding deriv. of IV, m.  $71^\circ$ , is much more sol. in  $\text{Et}_2\text{O}$  than III; *HCl* salt, m.  $169^\circ$ ; sulfate, m.  $290.1^\circ$  (decompn.); oxalate, m.  $235^\circ$  (decompn.); dioxalate, m.  $171^\circ$  (decompn.); chloroplatinate, yellow, m.  $199.5^\circ$  (decompn.); chloroaurate, yellow, m.  $132-3^\circ$ , compd.,  $2\text{C}_{10}\text{H}_{12}\text{NO} \cdot \text{CuO} \cdot 2\text{H}_2\text{O}$ , purple, m.  $154^\circ$  (decompn.); *N*-Ac deriv., m.  $85-6^\circ$ ; *N*-*p*-

*nitrobenzoyl deriv.*, pale yellow, m. 170°. Resolution with *d*-tartaric acid gives *l*-IV, m. 77.5–8°,  $[\alpha]_D^{20}$  –32.64° (EtOH); *d*-bitartrate, m. 202°,  $[\alpha]_D^{20}$  –13.39°; *HCl salt*, m. 180–1°,  $[\alpha]_D^{20}$  –42.68°; *sulfate*, m. 290–1° (decompn.);  $[\alpha]_D^{20}$  –39.99°; *N*-*p*-*nitrobenzoyl deriv.*, pale yellow, m. 199°,  $[\alpha]_D^{20}$  –105.13° (CHCl<sub>3</sub>); *oxalate*, m. 235° (decompn.); *chloroplatinate*, pale yellow, m. 199°; *chloroaurate*, yellow, m. 137–8°. The mother liquor contains the *d*-IV, identical with the natural product. *dl*-*N*-Benzoylnorisoephedrine, m. 143°, with concd. H<sub>2</sub>SO<sub>4</sub> gives  $\alpha,\mu$ -diphenyl- $\beta$ -methyloxazoline, PhCH<sub>2</sub>CHMe.N:CPh.O (75% yield) (*picrate*, m. 140–1°, which, heated with dil.

HCl, gives *dl*-norisoephedrine benzoate, m. 220° (*picrate*, yellow, m. 186° (decompn.); *sulfate*, m. 182° (decompn.)). *dl*-*N*-Benzoylnorisoephedrine, m. 128°. A mixt. of PhCH(OH)CH(NO<sub>2</sub>)Me and HCHO, reduced with Zn and AcOH, gives a mixt. of *dl*-methylephedrine (V) and *dl*-methylisoephedrine (VI), sepd. by crystn. of the HCl salts from Me<sub>2</sub>CO. V, m. 63.5–4.5°; *HCl salt*, m. 207–8°; *oxalate*, m. 170–1° (decompn.); *picrate*, light yellow, m. 124–5°; *chloroaurate*, yellow, m. 137°. Resolution with *d*-tartaric acid gives the *l*-V, identical with the natural product; the mother liquor gives the *d*-V. VI,  $b_{16}$  135.5°,  $b_{23}$  144.5° (cor.),  $d_D^{20}$  0.9917,  $n_D^{20}$  1.5148; *picrate*, light yellow, m. 148–8.5°. Resolution with *d*-tartaric acid gives the *d*-VI,  $b_{21}$  145–5.5°, m. 28–8.5°,  $d_D^{24}$  0.98566,  $n_D^{24}$  1.5109,  $[\alpha]_D^{20}$  48.00° (MeOH), identical with the natural product the mother liquor gives the *l*-VI.

C. J. WESSE

The reaction of sunlight on the cinnamic acids and on the salts of *trans*-cinnamic acid. The trimorphism of *cis*-cinnamic acid. A. W. K. DE JONG. *Chem. Weekblad* 26, 270–5(1929).—de J. gives a compilation of the reactions of *cis*- and *trans*-cinnamic acid under influence of sunlight and discusses the modifications of the *cis*-acids. A large no. of references is given.

F. DE LEEUW

Reactions of nitroso derivatives on unsaturated compounds. VII. New isomers of *o*-nitrophenylpropionic and isotogenic es.ers. L. ALESSANDRI. *Gazz. chim. ital.* 58, 738–42(1928); cf. *C. A.* 23, 1635.—In the previous expts. on the transformation of 1,2-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>C:CCO<sub>2</sub>Et (I) to OC.C<sub>6</sub>H<sub>4</sub>.N(:O):CCO<sub>2</sub>Et (II) by the catalytic action

of aryl NO compds., a small quantity (2–17%) of a compd. (III), m. 121°, of the same % compn. as I was formed. A similar phenomenon has been described only once before (cf. Pfeiffer, *C. A.* 10, 1334), and so the nature of the compd. was investigated. With PhNO as catalyst and with a suitable solvent and other conditions favorable, 50–70% of III was obtained, with only 7% of II. Analysis and a mol. wt. detn. of III showed a compn. of C<sub>11</sub>H<sub>9</sub>O<sub>4</sub>N, i. e., identical with I, so that it is an isomer of I or II. Heating for a brief time above its m. p. transforms it to a yellow compd. (IV), m. 150–1°, which is very stable. This transformation occurs rapidly at 125° and very slowly at its m. p., and it is exothermic and irreversible. The compn. of IV shows it to be an isomer of III. Similarly the trace of compd. (V), m. 140°, obtained in the transformation of 1,2-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>C:CCO<sub>2</sub>Me (VI) to OC.C<sub>6</sub>H<sub>4</sub>.N(:O):CCO<sub>2</sub>Me (VII)

with PhNO as catalyst, was increased to 27% with 21% of VII by using *p*-ONC<sub>6</sub>H<sub>4</sub>OH under suitable conditions. V exists in 2 cryst. forms according to the conditions of sepn., the 1st form m. 139° and the 2nd form m. 141°. Analysis of the 1st form showed it to be of the same compn. as VI. Heated above its m. p., V is transformed into a yellow compd. (VIII), which exists in 2 cryst. forms, the 1st form m. 149–50° and the 2nd form m. 161–2°, the compn. of which is the same as V. These compds. therefore are isomers. The chem. constitution of these isomers of III and of V has not yet been established. Ruggli has obtained isomers of isotogenic derivs., to which the isomers of A. may bear a close relation.

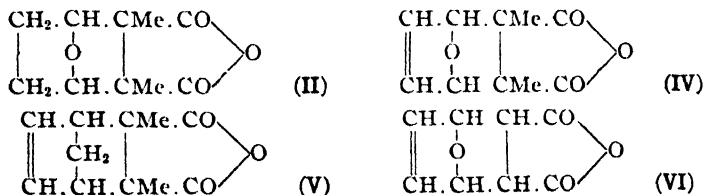
C. C. DAVIS

Synthesis of an isomer of thyroxine and of related compounds. CHARLES R. HARRINGTON AND WM. MCCARTNEY. *J. Chem. Soc.* 1929, 892–7.—(4-MeOC<sub>6</sub>H<sub>4</sub>)<sub>2</sub>CHCl and Et K phthalimidomalonate, heated in C<sub>6</sub>H<sub>6</sub>Me<sub>2</sub> 4 hrs. at 145°, give Et di-[4-methoxyphenyl]methylphthalimidomalonate, m. 106° (75% yield); heated with 50% KOH for 1 hr. there results 75% of  $\alpha$ -*o*-carboxybenzamido- $\beta,\beta$ -di[4-methoxyphenyl]propionic anhydride, m. 209–10°; boiling this with HI and Ac<sub>2</sub>O gives  $\alpha$ -amino- $\beta,\beta$ -di[4-hydroxyphenyl]propionic acid (I), m. 241° (decompn.). The ice-cold soln. of I in NH<sub>4</sub>OH with I in KI (2.54 N) gives 60% of the 3,5-di-I deriv., m. 218° (decompn.). Heating I at 290–315° and 2 mm. gives 55% of  $\beta,\beta$ -di[4-hydroxyphenyl]ethylamine (II), m. 207–8°; *HCl salt*, m. 275°; *tri-Bz deriv.*, m. 200°; 3,5-di-I deriv., m. 232–3°. Et di-phenylmethylphthalimidomalonate, m. 117° (57% yield); hydrolysis with KOH gives  $\alpha$ -*o*-carboxybenzamido- $\beta,\beta$ -diphenylpropionic anhydride, m. 214–5°; HI and Ac<sub>2</sub>O

give 77% of  $\alpha$ -amino- $\beta,\beta$ -diphenylpropionic acid, m. 236° (decompn.). 3',5'-Dibromo-3,5-diiodothyronine, m. 244.5° (decompn.) (45% yield). Neither the di-I derivs of I or II showed any trace of the type of physiol. activity characteristic of thyroxine.

C. J. WEST

**Synthesis in the hydroaromatic series. II. Cantharidin.** OTTO DIELS AND KURT ALDER (WITH ERICH NAUJOJKS). *Ber.* 62B, 554-62 (1929); cf. *C. A.* 22, 1144.—The opinion expressed in the first paper that the new method of synthesis of hydroaromatic compds. there described would prove of wide applicability has been fully verified; the method has been successfully used in the most varied fields and in the present paper are reported observations made in connection with cantharidin (I). If I has the structure II (Gadamer), it would seem that it could be synthesized, by the new method, by addn. of pyrocinchonic anhydride (III) to furan and hydrogenation of the resulting product (IV). Preliminary work has made the prospects of accomplishing this synthesis very bright, for it has been possible to add III to cyclopentadiene to form the compd. (V), and maleic anhydride to furan to give the compd. (VI) which can readily be hydrogenated to "norcantharidin" (VII). VI on heating decomps. into its components and it might therefore be concluded that it is a "mol. compd." but such a view does not agree with the stability of VI and its easy hydrogenation to VII, the structure of which has been proved. Compds. of this type, contg. a bridge (which may consist of C or N or CH<sub>2</sub> or the like), seem to have a very great tendency to regenerate the system with conjugated double bonds, and decomps. of this kind have been noted so often in compds. with "endo"-unions and of undoubted structure that Staudinger's criticism (*C. A.* 23, 1622) of D. and A.'s formulation of Albrecht's cyclopentadiene-quinone is without valid foundation. v. Bruchhausen and Bersch (against whose invasion of this field D. and A. protest vigorously) have recently announced (*C. A.* 23, 1647) the prepn. of VI and VII but give no proof of their structure, which D. and A. have established as follows: VII with HCl or HBr gives the corresponding 3,6-dichloro(or bromo)hexahydrophthalic acid (VIII) (or IX), which are reduced to Baeyer's *trans*-C<sub>6</sub>H<sub>10</sub>(CO<sub>2</sub>H)<sub>2</sub>; furthermore, IX, when boiled with H<sub>2</sub>O or, better, with alkali, loses HBr and CO<sub>2</sub> and gives  $\Delta^{1,2}$ -cyclohexadiene which adds maleic anhydride to form 3,6-endo-ethylenetetrahydrophthalic anhydride (X).  $\alpha,\alpha'$ -Dimethylfuran adds maleic anhydride as readily as does furan, and the resulting product (XI) is readily hydrogenated to "isocantharidin" (XII) which, unlike VII, does not give a dihalogen deriv. with halogen acids but changes into 3,6-dimethyl- $\Delta^{2,6}$  or  $\Delta^{2,5}$ -dihydrophthalic acid; cautious oxidation of the latter gives 3,6,1,2-C<sub>6</sub>H<sub>2</sub>Me<sub>2</sub>(CO<sub>2</sub>H)<sub>2</sub>. These results show that the new method of synthesis is not limited in its application to acyclic and isocyclic "dienes" and that there is apparently no material difference in the passage to



heterocyclic systems like furan. VI, obtained quant. from maleic anhydride in Et<sub>2</sub>O suspension and 1 mol. furan, m. 125° (decompn. into its components), immediately reduces dil. alk. KMnO<sub>4</sub> but does not decolorize Br in cold CHCl<sub>3</sub>. V, from 3 g. III, 8 g. of the diene and 2 cc. C<sub>6</sub>H<sub>6</sub> heated 4 hrs. at 100° in a sealed tube, m. 155°. *Mono-Et* 3,6-endoxohexahydrophthalate, from VI hydrogenated 5 mins. in alc. with colloidal Pd, m. 107-8°, has a sharp bitter taste; in the calcd. amt. of Na<sub>2</sub>CO<sub>3</sub> it is hydrogenated with colloidal Pd in about 10 mins. to the anhydride (VII), m. 116-7°, stable toward KMnO<sub>4</sub> in Na<sub>2</sub>CO<sub>3</sub>, which, heated with H<sub>2</sub>O some hrs. at 100°, yields the acid, crystals with 1 H<sub>2</sub>O, m. 112-3° (foaming), has a strong acid taste; *mono-Me ester*, from VII refluxed 2 hrs. in MeOH, m. 146° (foaming). VIII, from VII heated 12 hrs. at 100° in a sealed tube with concd. HCl, m. 111°, has a weak acid taste. IX,  $\alpha$ -form (5 g. from 4 g. VII heated 12 hrs. at 100° with 40 cc. AcOH-HBr), m. 218-9° (foaming);  $\beta$ -form, from 3 g. VII heated 12 hrs. at 100° with aq. HBr (satd. at 0°), m. 177° (decompn.). 3,6-Endoxo-3,6-dimethyl- $\Delta^4$ -tetrahydrophthalic anhydride (XI), m. 78°, immediately reduces KMnO<sub>4</sub> in Na<sub>2</sub>CO<sub>3</sub>, is more stable than its lower homologs when heated above its m. p. Hexahydro compd. (XII), m. 121.5°, does not decolorize KMnO<sub>4</sub> in Na<sub>2</sub>CO<sub>3</sub> even on long standing, has no taste or odor but leaves a burning sensation

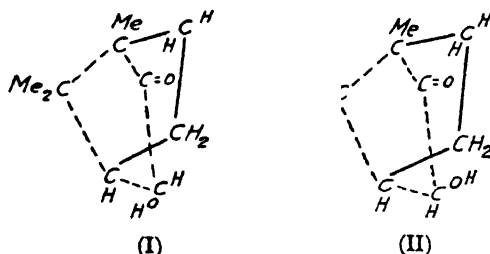
in the mouth and produces blisters on the tongue. *3,6-Dimethyl- $\Delta^3$ - $\delta^2$ -dihydrophthalic anhydride*, m. 159°, is strongly unsatd. towards  $\text{KMnO}_4$ . C. A. R.

Syntheses in the hydroaromatic series. III. Syntheses of terpenes, camphors, hydroaromatic and heterocyclic systems. OTTO DIELS AND KURT ALDER with WOLFGANG LÜBBERT, ERICH NAUJOKA, FRANZ QUERBERITZ, KARL RÖHL and HARRO SEIGBERG. *Ann.* 470, 62-103(1929); cf. *C. A.* 22, 1144 and preceding abstr.—The semicarbazone of *endo*-methylene-2,5-hexahydrobenzaldehyde(I), previously reported as m. 142°, on recrystn., m. 160.5°. I on standing in the ice box changes into a trimer, m. 178-9°. I, heated with  $\text{Ac}_2\text{O}$  and  $\text{AcONa}$  for 2 hrs., gives *enol-norcamphenilinaldehyde acetate*(II),  $b_{15}$  109-11°, decompd. by  $\text{O}_3$  in moist  $\text{C}_6\text{H}_6$  to norcamphor, m. 91-2° (semicarbazone, m. 196-7°). Catalytic reduction of I in  $\text{AcOH}$  with  $\text{PtCl}_4$  and H gives the *acetate*,  $b_{15}$  103-4° (also form II with Pd and H), of *endo*-methylene-2,5-hexahydrobenzyl alc.(III),  $b_{10}$  101-2°; phenylurethan, m. 118-9°; *iodide*,  $b_{14}$  107-9°; with  $\text{Me}_3\text{N}$  the latter yields *endo*-methylene-2,5-hexahydrobenzyltrimethylammonium iodide, m. 266-7°; treating with excess  $\text{Ag}_2\text{O}$  and dry distn. give *endo*-methylene-2,5-hexahydrobenzylidimethylamine, b. 182°; *picrate*, m. 172°. III yields a *xanthogenate*,  $b_{15}$  182°, which, distd. at normal pressure, decomp. at 200-20°, giving *norcamphene*,  $b_{15}$  123°,  $d_4^{25}$  0.8789; *nitroschloride*, m. 125°. I and  $\text{PhMgBr}$  give *phenyl-endo-methylene-2,5-cyclohexylcarbinol*,  $b_{20}$  162-5°; dehydration with  $\text{K}_2\text{SO}_4$  at 190° gives *phenyl-endo-methylene-2,5-cyclohexylidenemethane*,  $b_{15}$  145-7°. Careful heating of maleic anhydride and myrcene gives the *anhydride*(IV),  $b_{12}$  202-3°, m. 34-5°, of *4-isohexenyl-cis- $\Delta^4$ -tetrahydrophthalic acid*(V), m. 122-3°. Heating this acid with 35%  $\text{HBr}$  at 100° for 12 hrs. gives *1,1-dimethyloctahydronaphthalene-6,7-dicarboxylic acid*, m. 206-7°, slowly oxidized by alk.  $\text{KMnO}_4$  but not by  $\text{O}_3$ ;  $\text{AcCl}$  gives the *anhydride*, m. 215-7°. Catalytic reduction of IV gives the *anhydride*,  $b_{11}$  207°, m. 42°, of *4-isohexyl-cis- $\Delta^4$ -tetrahydrophthalic acid*. Heating the *cis*-acid with 30%  $\text{HBr}$  12 hrs. at 100° gives *4-isohexyl-trans- $\Delta^4$ -tetrahydrophthalic acid*, m. 169-70°. The  $\text{O}_3$  decompn. of V gives  *$\Delta^4$ -tetrahydrobenzene-1,2-dicarboxylic-4-propionic acid*, oily, analyzed as the *Ph salt*  $\text{MeCH:CHCHO}$  and  $\text{CH}_2\text{:CHCH:CH}_2$ , heated 4-5 hrs. at 150°, give *6-methyl- $\Delta^3$ -tetrahydrobenzaldehyde*(VI),  $b_{22}$  75°,  $b_{38}$  83° (semicarbazone, m. 168°). Similarly, isoprene gives the *3,6-di-Me deriv.*,  $b_{25}$  92-3° (semicarbazone, m. 179-80°); 1,3-dimethylbutadiene gives the *2,4,6-tri-Me deriv.*,  $b_{12}$  81-2° (semicarbazone, m. 183°); 2,3-dimethylbutadiene gives *3,4,6-tri-Me deriv.*,  $b_{12}$  89° (semicarbazone, m. 181°); 1,1,3-trimethylbutadiene gives the *compd.*  $\text{C}_{11}\text{H}_{16}\text{O}$ ,  $b_{18}$  93-5°.  $\text{CH}_2\text{:CHCHO}$  and isoprene, heated at 100°, give *3(4?)*-methyl- $\Delta^3$ -tetrahydrobenzaldehyde,  $b_{10}$  63-4° (semicarbazone, m. 146°), *3,4-di-Me deriv.*,  $b_{10}$  79° (semicarbazone, m. 172°); *2,4(3,5?)*-dimethyl- $\Delta^3$ ( $\Delta^4$ )-tetrahydrobenzaldehyde,  $b_{10}$  71-3° (semicarbazone, m. 174°).  $\text{MeCH:CHCHO}$  and myrcene, heated several hrs. at 150°, give *6-methyl-3-isohexenyl- $\Delta^3$ -tetrahydrobenzaldehyde*,  $b_{12}$  143-4°;  $\text{CH}_2\text{:CHCHO}$  and myrcene give the *compd.*  $\text{C}_{13}\text{H}_{20}\text{O}$ ,  $b_{17}$  134-6°, while  $\alpha$ -phellandrene gives the *compd.*  $\text{C}_{13}\text{H}_{20}\text{O}$ ,  $b_{12}$  128-30°, and with  $\text{MeCH:CHCHO}$  gives the *compd.*  $\text{C}_{14}\text{H}_{22}\text{O}$ ,  $b_{18}$  143-4°.  $\text{PhCH:CHCHO}$  and 1,3-dimethylbutadiene give the *compd.*  $\text{C}_{15}\text{H}_{18}\text{O}$ ,  $b_{16}$  156-8°. Reduction of VI (Pd and H) gives *hexahydro- $\alpha$ -toluylaldehyde*,  $b_{11}$  61-2° (semicarbazone, m. 155°). Air oxidation gives *trans-hexahydro- $\alpha$ -toluylaldehyde*(VII), m. 52°. Butadiene and  $\text{MeCH:CHCO}_2\text{H}$  give the *acid*,  $\text{C}_{11}\text{H}_{16}\text{O}_2$ , b. 144-5°, m. 68°, reduced to VII. 1,1,3-Trimethylbutadiene gives the *acid*  $\text{C}_{11}\text{H}_{16}\text{O}_2$ ,  $b_{14}$  166-8°, m. 88.5-9°; 1,3-dimethylbutadiene gives the *acid*  $\text{C}_{10}\text{H}_{16}\text{O}_2$ ,  $b_{11}$  131°, m. 98°. Sorbic acid and maleic anhydride give the *compd.*  $\text{C}_{10}\text{H}_{12}\text{O}_6$ , m. 198° (decompn.), while the Et ester gives a *compd.*, m. 117-8°. Heating  $\text{MeCH:CHCHO}$  and cyclopentadiene 4 hrs. at 100° gives a mixt. of *cis*- and *trans*-2,5-endo-methylene-6-methyl- $\Delta^3$ -tetrahydrobenzaldehyde(VIII). At 100° principally the *cis*- and at 150° practically only the *trans*-VIII is formed; crystn. from  $\text{MeCN}$  gives 2 semicarbazones, m. 158° and 181°, resp.; decompn. of the latter gives an VIII,  $b_{46}$  80°. Catalytic reduction of the semicarbazones gives 2 *compds.*, m. 166.5° and 174°, resp. The latter gives *trans*-2,5-endo-methylene-6-methylhexahydrobenzaldehyde,  $b_{12}$  90°; the *cis*-deriv.,  $b_{12}$  85°. Air oxidation gives *trans*- and *cis*-2,5-endo-methylenehexahydro- $\alpha$ -toluylaldehydes, m. 66° and  $b_{12}$  136-7°, resp. *3(4?)*-Methyl- $\Delta^3$ -tetrahydrobenzaldehyde and  $\text{Me}_2\text{CO}$ , shaken with  $\text{Ba(OH)}_2$  3-4 days, give the *compd.*  $\text{C}_{11}\text{H}_{16}\text{O}$ ,  $b_{18}$  121-2°. *2,4,6*-Trimethyl- $\Delta^4$ -tetrahydrobenzaldehyde and  $\text{Me}_2\text{CO}$  with  $\text{EtONa}$  give a *pseudotirone*,  $\text{C}_{11}\text{H}_{20}\text{O}$ , pale yellow,  $b_{20}$  138-9°; *p*-bromophenylhydrazine, m. 175°; *thiosemicarbazone*, m. 191-2°. The *2,4,6*-tetramethyl deriv. and  $\text{Me}_2\text{CO}$  give *methylirone*, whose *p*-bromophenylhydrazine, m. 155-6°. 1,3-Dimethylbutadiene and maleic anhydride give *3,5-dimethyl- $\Delta^4$ -tetrahydrophthalic anhydride*, m. 56-7°. Reduction of 1,3-dimethylbutadiene gives 2-methyl-2-pentene. The hydrocarbon  $\text{C}_8\text{H}_{16}$  obtained by Harries on dry distn. of the phosphate of 2-methyl-2,4-diaminopentane is shown to be 1,3-

dimethylbutadiene, as is that obtained by Saytzev from  $\text{CH}_3\text{:CHCH}_2\text{Br}$  and  $\text{Me}_2\text{CO}$  and that from  $\text{MeCH:CHAc}$  and  $\text{MeMgI}$ . Other hydrocarbons may be characterized by condensation with maleic anhydride; isoprene gives a compd. m. 63–4°; 1-methylbutadiene, m. 62°; 2,3-dimethylbutadiene, m. 78–9°; 1,4-dimethylbutadiene, m. 95–6°; trimethylbutadiene, m. 49°. *N*-Methylpyrrole gives the compd.,  $\text{C}_5\text{H}_9\text{O}_2\text{N}$ , m. 98–9°. C. J. WEST

**Synthesis of camphor.** The concentration of isobornyl acetate and its influence on the synthesis of camphor. MARIANO T. LACRUE. *Bull. inst. pin* 1929, 15–30.—To diminish the oily residue from the sapon. of the acetates of borneol and isoborneol in the synthesis of camphor, and to facilitate the purification of the borneol, it is recommended that, before sapon., the acetate be obtained about 98% pure by distns. under reduced pressure. The optimum cuts are worked out on the basis of exptl. data, and tables give the relations between the concn. of the acetate and the d. and n of the oil as a basis for controlling the cuts. The industrial significance of the procedure is discussed. MERRILL W. SEYMOUR

**Constitution of Manasse's  $\alpha$ - and  $\beta$ -hydroxycamphor (o-exo- and o-endo-hydroxycamphor).** II. J. BREDT. *J. prakt. Chem.* 121, 153–72(1929); cf. C. A. 20, 2157.—The mixt. of o-exo- and -endo-camphors (I and II) may be sepd. by forming the Me ether of II, which is volatile with steam (2 l.  $\text{H}_2\text{O}$  are necessary to remove 10 g.). The semicarbazone of II varies in m. p. depending upon the rate of heating; quick heating, 215–6°; slow heating, 210–1°. Active I gives a semicarbazone, m. 183–4°; the *dl*-deriv., m. 182–3°. Active bis-o-endo-hydroxycamphor Me ether, m. 149–50°, heated with abs. MeOH and dry HCl for 2–3 hrs, gives the monomeric Me ether of II,  $b_d$  81°,  $b_{12}$  105–6°, m. 37–8°,  $d_4^{25}$  0.9996,  $n_D^{25}$  1.4636 (semicarbazone, m. 124°). I and MeOH with dry HCl give the monomeric Me ether,  $b_{15}$  105–7°,  $d_4^{11}$  1.0202,  $n_D^{11}$  1.47426 (semicarbazone, m. 204°). Active II, m. 211–2°, and MeMgI give nearly quant. allomethylbornyleneglycol, m. 163–4°; the crude product from the inactive II, m. 97–100°, but could not be recrystd. The product from active I, m. 209–10°. Active I gives an acetate, m. 61–2°; benzoate,  $b_{0.33}$  168°; benzoate of II, m. 84–5°. The benzenesulfonate of active II, m. 110°; of I, m. 79–80°. The following formulas are proposed for I and II:



C. J. WEST

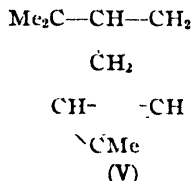
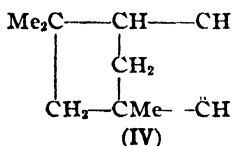
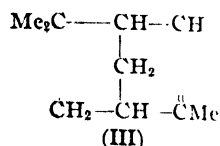
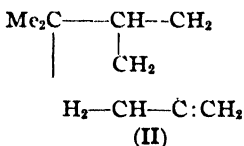
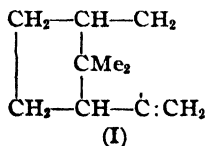
**Oxidation of  $d$ - $\Delta^4$ -carene with Beckmann's chromic acid mixture.** CHARLES S. GIBSON AND JOHN L. SIMONSEN. *J. Chem. Soc.* 1929, 909–10.—Oxidation of  $d$ - $\Delta^4$ -carene with Beckmann's  $\text{CrO}_3$  mixt. gives *l*-trans-caronic acid, identical with that obtained from  $d$ - $\Delta^3$ -carene; in addn. a small amt. of a neutral oil, yielding a semicarbazone, m. 205–7°, was obtained. C. J. WEST

**Fenchene series. I. Ozonization and constitution of the fenchenes.** GUST. KOMPPA AND R. H. ROSCHIER. *Ann.* 470, 129–56(1929).— $\alpha$ -Fenchene(I), b. 155–60°,  $d_4^{17.5}$  0.8670,  $n_D^{17.5}$  1.46729, and  $\text{O}_3$  in petroleum ether yield an ozonide which, decompd. in AcOH, yields *d*- $\alpha$ -fenchocamphorone, 1- $\alpha$ -fenchenylic acid (7,7-dimethyl-(1,2,2)-bicycloheptane-2-carboxylic acid), m. 71.5–2°, stable toward  $\text{KMnO}_4$  and  $\text{NaBrO}$  and does not react with CO reagents; anilide, m. 149.5–50°; various metallic salts are described. The corresponding aldehyde is also formed but could not be isolated in a pure state; oxidation gives the above acid. The ozonide of *dl*- $\beta$ -fenchene (II) (b. 151–3°,  $d_4^{17}$  0.8598,  $n_D^{17}$  1.46620), formed and decompd. in AcOH, gives *dl*- $\beta$ -fenchocamphorone, b. 185–95°; semicarbazone, m. 193–5°; this also results by the oxidation of the fenchene with  $\text{KMnO}_4$ . Oxidation of the ketone gives *dl*-apofenchocamphoric acid, m. 144–5°.  $\gamma$ -Fenchene (III), b. 145–7°,  $d_4^{17}$  0.8547,  $n_D^{17}$  1.46072 (which contains some  $\beta$ -fenchene), gives an ozonide, from which there is obtained the

*ketoaldehyde*,  $\text{Me}_2\text{C} \cdot \text{CH}(\text{CHO}) \cdot \text{CH}_2 \cdot \text{CHAc} \cdot \text{CH}_3$ ,  $b_{10}$  118–20°  $d_4^{20}$  1.0215,  $n_D^{20}$  1.4700,

$n_a$  1.4677,  $n_p$  1.4815; *disemicarbazone*, m. 219° (decompn.); a 2nd product is the corresponding *keto-acid*,  $\text{C}_{10}\text{H}_{16}\text{O}_3$ ,  $d_4^{20}$  1.0924,  $n_D^{20}$  1.4774; *semicarbazone*, m. 220 1°; *Ag salt*; *Cu salt*, light green.  $\text{NaBrO}$  oxidizes the *keto-acid* to a *dicarboxylic acid*,  $\text{Me}_2\text{C} \cdot \text{CH}(\text{CO}_2\text{H}) \cdot \text{CH}_2 \cdot \text{CH}(\text{CO}_2\text{H}) \cdot \text{CH}_3$ , m. 147–8°; 100 cc.  $\text{H}_2\text{O}$  at 25° dissolves

1.472 g. acid.  $\delta$ - or isofenchene(IV), b. 141–3°,  $d_4^{17}$  0.8476,  $n_D^{17}$  1.45424, through the ozonide, yields a *ketone*,  $\text{C}_9\text{H}_{14}\text{O}$ , whose *semicarbazone*, m. 209°; this is oxidized to a *dicarboxylic acid*,  $\text{C}_9\text{H}_{14}\text{O}_4$ , m. 117–8°. The acid is *dl-cis-fenchocamphoric acid*, m. 173–4°. In the ozonization of the last 2 products, there remains unattacked a part termed *cyclofenchene*(V),  $b_{782}$  142–3°,  $d_4^{16.5}$  0.8624,  $n_D^{16.5}$  1.45364, identical with  $\beta$  pinolene of Aschan (C. A. 6, 1144); through the acetate there results isofencheny! alc. *Cyclofenchene-HBr*,  $b_{12}$  92–3°, m. 4°,  $d_4^{20}$  1.2389,  $n_D^{20}$  1.50570. The formulas ascribed to these 5 fenchenes are:

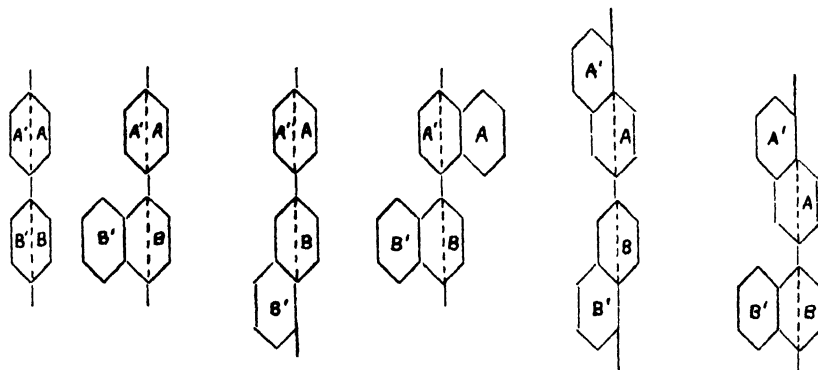


C. J. WEST

**Biphenyls and their derivatives. III. Stereoisomerism of derivatives of monophenylnaphthalenes and binaphthyls.** LUIGI MASCARELLI. Reale Univ. Torino *Gazz. chim. ital.* 58, 791–800(1928); cf. C. A. 22, 68; 23, 2962. —A survey of the previous expts. on optical isomerism, in which a comparison was made of  $\text{Ph}_2$  derivs. which could and which could not be split into optical antipodes, leads to certain general conclusions. No derivs. (with the proper substituents) with the 2,6,2',6'-positions substituted possess free rotation. For the mol. to become asym., it is necessary that the 2,6-positions of 1 nucleus contain differing substituents, while the 3rd substituent in the other nucleus can be but need not be the same as 1 of the substituents in the disubstituted nucleus. If all 4 of the 2,6,2',6'-positions are occupied by identical groups, there will be oscillation instead of free rotation, and only when at least 2 of the 4 substituents are different and are distributed in the 2 nuclei will the mol. be asym. In certain special cases, substituents in the 3,5,3',5'-positions contribute to the mol. asymmetry. On the other hand, substituents in the 4,4'-positions can have no influence. Free rotation exists when: (1) no H atom in the 2,2',6,6'-positions is substituted, (2) a single H atom in these positions is substituted, and (3) 2 H atoms in these positions and in the same  $\text{C}_6\text{H}_4$  nucleus are substituted. The rotation is impeded, *i. e.*, a nucleus oscillates, so that it describes an almost complete circle around the other nucleus, when only 2 H atoms belonging to the 2 nuclei (2,2'- or 6,6'-positions) are substituted. There is semicircular oscillation, *i. e.*, the oscillatory motion of 1 nucleus with respect to the other nucleus is limited almost to a semicircle, when at least 3 H atoms in the 2,2',6,6'-positions are substituted. Very numerous are the substances which show similar phenomena of stereoisomerism without contg. asym. atoms, including all those which can be considered as derivs. of  $\text{Ph}_2$ , *e. g.*, certain phenylnaphthalenes, binaphthyls, bianthracyls, bianthraquinonyls, biphenanthryls, bipyrnyls, bipyrindyls, biquinolyls, biindyls, bicarbazolyls and biacridyls. In the present paper the conditions governing mol. asymmetry in derivs. of the 2 monophenylnaphthalenes and the 3 binaphthyls are discussed. With the aid of known facts which govern optical isomerism in the  $\text{Ph}_2$  series, it is easy to det. the conditions under which the various derivs. show mol. asymmetry. The latter is manifest after more or less complex substitutions according to the position of the bond uniting the 2 nuclei. Several more compds. are studied, their structures being discussed in detail. Omitting the details of this theoretical



analysis of the various compds., the following conclusions are reached.  $\alpha$ -Phenyl-naphthalenes follow the same general principles as  $\text{Ph}_2$  derivs. Only the 2,2',6'- and the 3',5'-positions play a part in bringing about mol. asymmetry, since  $\alpha\text{-C}_{10}\text{H}_7\text{Ph}$  has (because of its inherent structure) its 5,6-positions occupied.  $\beta\text{-C}_{10}\text{H}_7\text{Ph}$  derivs. are similar to those of the  $\text{Ph}_2$  series, since here, too, asymmetry begins with the tri-substituted derivs. and the 2,6,2',6'-positions and the 3,3',5'-positions have a determinant influence on the asymmetry. The only difference between  $\beta\text{-C}_{10}\text{H}_7\text{Ph}$  derivs. and  $\text{Ph}_2$  derivs. is the fact that the 5-position does not play a part, since it is already occupied in the former derivs. Among the 1,1'-dinaphthyl derivs. ( $\alpha, \alpha$ -,  $\beta, \beta$ - and to have mol. asymmetry. Two substituents (identical or different) in the 2,2'-positions render the mol. asym. Substitution in any other position than 2 or 2' has no influence on the asymmetry, though in certain cases the 8,8'-positions form an exception to this. In 2,2'-binaphthyl derivs., substitution in the 2,6,2',6'-positions alone can produce mol. asymmetry. This asymmetry is produced as soon as any 3 of the positions mentioned are occupied by like or unlike substituents. In 1,2'-binaphthyl derivs., substitution in the 2,6,6'-positions alone can produce mol. asymmetry, the latter manifesting itself as soon as any 2 of the positions mentioned are occupied by like or by unlike substituents. Asymmetry persists if there are 3 substituents (like or unlike) in the 2,6,6'-positions. These generalities are fully confirmed by cases already to be found in the literature. IV. The great number of optical antipodes, containing no



biphenyl     $\alpha$ -phenyl-     $\beta$ -phenyl-    1,1'-binaphthyl    2,2'-binaphthyl    1,2'-binaphthyl  
naphthalene    naphthalene

asymmetric atoms, which can be derived from them. *Ibid* 865-9.- A survey of the results published so far leads to the following summary, the data giving the type of compd., whether or not there is free rotation, the no. of substituents sufficient for impeded rotation, the no. of substituents sufficient for semicircular oscillation, the no. of substituents sufficient for mol. asymmetry, the other positions influencing asymmetry, and the no. of substituents with which asymmetry begins, resp.: Biphenyls, yes; 2 (equal or not) distributed between 2,2' or 6,6'; 3 (equal or not) between 2,6,2',6'; 3 (of which at least 2 are different and are distributed on 1 nucleus among 2,6,2',6'); 3,5 and 3',5'; 3.  $\alpha$ -Phenyl-naphthalene, yes; 1 in 2' or 6'; 2 (equal or not) between 2,2', 6'; 2 between 2,2',6' (if equally distributed on 2 nuclei with 2 always occupied, if different anywhere); 3',5' (special position 8); 2.  $\beta$ -Phenyl-naphthalene, yes; 2 (equal or not) between 2,2'; 3 (equal or not) among 2,6,2',6'; 3 among 2,6,2',6' (of which 1 is different and distributed so that 2',6' are different or so that only 1 of the 2',6' is occupied); 3,3',5'; 3. 1,1'-Binaphthyls, no; 0; 1 between 2,2'; 1 between 2,2'; 0 (special positions 8,8'), 1. 2,2'-Binaphthyls, yes; 2 (equal or not) between 2,2' or 6,6'; 3 (equal or not) among 2,6,2',6'; 3 (equal or not) among 2,6,2',6'; 0; 3. 1,2'-Binaphthyls, yes; 1 between 2,6; 2 (equal or not) between 2,2',6'; 2 (equal or not) between 2,2',6'; 0 (special position 8'); 2. The more complex the mols. become on account of the addn. of substituents (which often leads to an increase in the no. of elements of asymmetry), the smaller the no. of conditions necessary for producing mol. asymmetry. In all 6 types of compd. the bond uniting the 2 nuclei of the mol. functions as an axis of rotation, and mol. asymmetry exists only when the 2 nuclei cannot rotate freely but are restricted

to semicircular oscillation. This restriction exists when at least 3 of the 4 positions nearest to those of the bond (which may be termed *o* to the bond) are occupied by the proper substituents. In the diagrams, the imaginary vertical line cutting the 2 nuclei and dividing each compd. into a right and left part makes it possible to ascertain directly whether or not the mol. is asym. Mol. asymmetry exists when the parts on the right (A and B) are mirror images of the corresponding parts on the left (A' and B'). All polysubstituted derivs. of 1,1'-binaphthyl (besides that which contains a substituent in 1 of the 2,2'-positions) are asym., provided that at least 1 of the 2,2'-positions is occupied. Substitution in the 4,4'-positions can have no influence. All polysubstituted derivs. of 2,2'-binaphthyl which contain at least 3 substituents distributed among the 2,6,2',6'-positions are asym. All polysubstituted derivs. of 1,2'-binaphthyl which contain at least 2 substituents distributed among the 2,6,2',6'-positions are asym. Substitution in the 4 position can have no influence. The structure of the 3 binaphthyls is such that, as soon as the nuclei are restrained (by the presence of certain substituents in certain positions) to semicircular oscillation with respect to 1 another, the mol. structure acquires an asym. configuration which no new substituent can overcome. On the other hand the Ph<sub>3</sub> mol. is so constructed that even when the mol. becomes asym. by the proper substituents, it may become again sym. by further substitution. Because of the presence of a C<sub>6</sub>H<sub>5</sub> and a C<sub>10</sub>H<sub>7</sub> nucleus, C<sub>10</sub>H<sub>7</sub>:Ph derivs. show a behavior intermediate between that of Ph<sub>3</sub> and binaphthyl.

C. C. DAVIS

**Intermolecular condensation of styryl ketones. III. Further examples of the ready formation of bis(styryl ketones).** ISIDOR M. HEILBRON and FRANCIS IRVING, *J. Chem. Soc.* 1929, 931-6; cf. C. A. 23, 116.—*Bis(styryl Pr ketone)*, m. 194-5°, results from BzH and MeCOPr; concd. H<sub>2</sub>SO<sub>4</sub> gives a yellow soln.; Vorländer (*Ber.* 30, 2267 (1897)) considered this a complex triketone. MeCOBu and BzH give *bis(styryl Bu ketone)*, m. 175-6°. BzH and MeCOCH<sub>2</sub>CHMe<sub>2</sub> give *bis(styryl iso-Bu ketone)*, m. 202°; this also results from styryl iso-Bu ketone and 25% NaOH in EtOH at room temp. Cuminal and MeCOCH<sub>2</sub>CHMe<sub>2</sub> with alkali give *bis[4-isopropylstyryl iso-Bu ketone]*, m. 192-4°, unsuccessful attempts were made to obtain dimerides by the condensation of MeCO:CH<sub>2</sub>CHMe<sub>2</sub> with piperonal, veratraldehyde and *p*-ClC<sub>6</sub>H<sub>4</sub>CHO. BzH and MeCOC<sub>6</sub>H<sub>13</sub> give *bis(styryl hexyl ketone)*, m. 152°, while *p*-MeOC<sub>6</sub>H<sub>4</sub>CHO gives the 4-MeO deriv., m. 145-6°. 4-Methoxystyryl hexyl ketone, m. 55°. *Bis(styryl isohexyl ketone)*, m. 177°; the heptyl homolog, m. 144°; the octyl homolog, m. 131.5°; *styryl octyl ketone*, pale yellow, m. 38-9°. In general, the higher members of the series of the bis-compds are more easily produced; a substituted aldehyde gives rise to a dimeride less readily than BzH itself. Dimerides are only formed from branched-chain ketones when at least 1 CH<sub>2</sub> group seps. the branch radical from the CO group. The solvent appears to be 1 of the main factors detg. the formation of the mono- or bis-form during the condensation; in aq. EtOH (60-70%) the styryl ketone itself is formed but in abs EtOH the dimeride is produced even under the same conditions of alkali concn.

C. J. WEST

**New derivatives of triphenylmethane.** HEINRICH WEILAND and HELLMUT KLOSS *Ann.* 470, 201-23 (1929).—The Grignard reagent from 1.2 g. Mg and 5.5 g. EtBr and C<sub>6</sub>H<sub>5</sub>I is shaken with 9 g. Ph<sub>3</sub>CCl (deep violet color) and decompd. in the usual manner, there results 1-1.5 g. of hexaphenylbutane, m. 260°, stable towards Br, KMnO<sub>4</sub>, CrO<sub>3</sub> in AcOH, O<sub>2</sub>, and catalytic reduction; fuming HNO<sub>3</sub> gives the hexa-NO<sub>2</sub> deriv., yellow-green, m. above 300°. PhC:CH and Ph<sub>3</sub>CCl give tetraphenylpropine, PhC(CPh<sub>3</sub>)<sub>2</sub>, m. 139°; it is as unreactive towards oxidizing agents and Br as the hexa-Ph deriv., tetra-NO<sub>2</sub> deriv., light yellow, m. 182° (decompn.); catalytic reduction gives 1,1,1,3-tetraphenylpropane, m. 126°. *p*-Tritolylphenylpropine, m. 141° (80% yield); reduction gives 1,1,1-tri-*p*-tolyl-3-cyclohexylpropane, m. 126°. Ph<sub>3</sub>CHC:CCPh<sub>2</sub>, m. 114°, is obtained similarly in 40-50% yields. 1,1,3-Triphenylpropine, m. 79° (80% yield), catalytic reduction (Pd black) gives 1,1,3-triphenylpropane, m. 46°, also obtained by reducing the corresponding alc. with HI and P; reduction with Pt oxide gives 60% of 1-cyclohexyl-3,5-diphenylpropane(?), b<sub>1</sub> 160-70°. Oxidation of PhC:CCPh<sub>2</sub> with KMnO<sub>4</sub> gives (PhC(CPh<sub>2</sub>))<sub>2</sub>, m. 179°; this was also obtained from PhC(C(OH)Ph<sub>2</sub>) with TiCl<sub>4</sub>; in a boiling soln. of C<sub>6</sub>H<sub>5</sub>Me<sub>3</sub> or C<sub>10</sub>H<sub>7</sub> a deep orange-red color develops, indicating dissocn.; this disappears on cooling; solns. at temps. below 100° are colorless. (Ph<sub>3</sub>C(OH)C:); and PCl<sub>5</sub> in Et<sub>2</sub>O for 12 hrs. gives 1-diphenylmethylene-2-chloro-3-phenylindene, deep red, m. 158°; reduction with HI and P in boiling AcOH gives diphenylmethylenephenylindene, m. 205-6°, after 15 mins. or the tetrahydro deriv., m. 133°, after 1 hr.; after 0.5 hr. there results the intermediate dihydro deriv., m. 115°. Ph<sub>3</sub>CN<sub>3</sub> and Ph<sub>3</sub>CCOCl in abs. Et<sub>2</sub>O (N atm.), shaken for 6 hrs., and the product decompd. with ice H<sub>2</sub>O in the presence of Et<sub>2</sub>O, give *p*-triphenylacetyltriphenylmethane, m. 183-

4°; decompn. with alkali gives  $\text{Ph}_3\text{CH}$  and  $p\text{-Ph}_2\text{CHC}_6\text{H}_4\text{CO}_2\text{H}$ ; reduction gives the hydrocarbon,  $p\text{-Ph}_2\text{CHC}_6\text{H}_4\text{CH}_2\text{CPh}_3$ , m. 177°.  $\text{Ph}_3\text{CNa}$  and  $\text{Ph}_2\text{CHCOCl}$  give 30–40% of  $\text{Ph}_2\text{CCOCHPh}_3$ , m. 180°.

C. J. WEST

**Pyrogenic decomposition of aromatic compounds with hydrogen under pressure in the presence of a mixed catalyst.** II. V. IPAT'EV AND N. ORLOV. *Ber.* 62B, 593–7 (1929); cf. *C. A.* 22, 396; 23, 3567.—It was shown in the 1st paper that a whole series of aromatic compds. heated with H and a catalyst ( $\text{Al}_2\text{O}_3$ ) yield products of lower b. p. and richer in H and that certain com. products (solvent naphtha and coal-tar oil) can be converted, with good yields, into  $\text{C}_6\text{H}_6$  hydrocarbons. In such a pyrogenesis of a heavy,  $\text{C}_{10}\text{H}_8$ -free oil was obtained a considerable amt. of  $\text{C}_{10}\text{H}_8$  which, it was assumed, was produced from substituted naphthalenes in the oil. The object of the present work was to obtain exptl. confirmation of this assumption. It was also of interest to explain the appearance of a small amt. of benzene; the simplest assumption was that it was produced at the expense of the paraffins always present in coal tar. The formation of  $\text{NH}_3$  in the pyrogenesis and the fact that  $\text{PhNH}_2$  is readily decompd. into  $\text{C}_6\text{H}_6$  and  $\text{NH}_3$  naturally suggested a study of the behavior of org. bases under the same conditions. The earlier work established with sufficient clearness that the formation of lighter hydrocarbons from solvent naphtha is the result of dealkylation of  $\text{C}_6\text{H}_6$  homologs; it has now been found that another constituent of the naphtha, viz., indene, under a sufficiently high H pressure, is very easily converted into hydriodene and is then further decompd. into substituted benzenes, under a smaller pressure it is almost completely changed into a thick resin which does not distil without decompn. Tetralin heated under the pressure of its own vapor (without H) forms  $\text{C}_6\text{H}_6$  hydrocarbons (as with H) and at the same time undergoes dehydrogenation with formation of a considerable amt. of high-boiling condensation products. Unlike  $\text{CH}_2\text{-Ph}_2$ ,  $(\text{CH}_2\text{Ph})_2$  is decompd. with extraordinary ease, giving  $\text{PhMe}$ . In the presence of an  $\text{Fe}_2\text{O}_3\text{-Al}_2\text{O}_3$  catalyst the crude com. products are completely freed of S compds. All the expts. were carried out in an 800 cc. Ipat'ev high-pressure app. with 7–10% of a mixt. of equal parts  $\text{Fe}_2\text{O}_3$  and  $\text{Al}_2\text{O}_3$  as catalyst; initial H pressure, about 70 atm.; temp., 440–65°.  $\alpha\text{-C}_{10}\text{H}_7\text{Me}$  (50 g.) gave  $\text{CH}_4$  (7% of the gaseous products), 27 g.  $\text{C}_{10}\text{H}_8$ , and  $\text{C}_6\text{H}_6$  hydrocarbons, hydro- and methylhydronaphthalenes; 50 g.  $\beta\text{-C}_{10}\text{H}_7\text{Me}$  gave 11 g.  $\text{C}_{10}\text{H}_8$ , 8 g.  $\text{C}_6\text{H}_6$  hydrocarbons and 14 g. hydrogenated naphthalenes; from 87 g. of the products of pyrogenesis of 1,6- $\text{C}_{10}\text{H}_6\text{Me}_2$  were obtained 16 g.  $\text{C}_6\text{H}_6$  hydrocarbons, 28 g.  $\text{C}_{10}\text{H}_8$  and an oil yielding  $\beta\text{-C}_{10}\text{H}_7\text{Me}$  on dehydrogenation; 2,6- $\text{C}_{10}\text{H}_6\text{Me}_2$  behaved in the same way. From 35 g. paraffin after 12 hrs. was obtained 22 cc. benzene, b. 50–170°,  $d_4^{20}$  0.7211,  $n_D^{20}$  1.412, completely indifferent toward  $\text{H}_2\text{SO}_4$  and nitrating acid. Carbazole after 18 hrs. showed only a quite insignificant alteration while 35 g. quinoline after 10 hrs. gave  $\text{NH}_3$  and 7 g. hydrocarbon, b. 80–150°,  $d_4^{25}$  0.8763, vigorously attacked by  $\text{H}_2\text{SO}_4$  and nitrating acid. Unlike  $(\text{CH}_2\text{Ph})_2$  and  $\text{Ph}_2\text{O}$ , dibiphenylene oxide remained completely unchanged after 10 hrs.

C. A. R.

**Products of nitration of 2-naphthol-6-sulfonic acid.** N. N. VOROZHTZOV AND N. M. KASATKIN. *Bull. inst. polytech. Ivanovo-Vosniesensk* 11, 75–85 (1928).—V. and K. undertook the investigation of reactions of nitration of  $\beta$ -naphtholsulfonic acids, beginning with Schaeffer's salt (I), which, when treated with  $\text{HNO}_3$  in presence of monohydrate  $\text{H}_2\text{SO}_4$  to form mononitro derivs., produces 13% of the yellow mononitro compd. and 32% of the red dinitro compd., and when treated to form dinitro deriv. gives 78% of the red dinitro compd. only. The mononitro compd. proved to be structurally identical with the 1,2,6- $\text{C}_{10}\text{H}_6(\text{NO}_2)(\text{OH})\text{SO}_3\text{H}$  obtained by oxidation of the corresponding nitroso compd., while the formula of the dinitro deriv. is uncertain. The Ba salts of the nitrated I are insol. in  $\text{H}_2\text{O}$ , the Pb salts are poorly sol. in  $\text{H}_2\text{O}$ . The comparative study of solubilities shows that the 2 red dinitro compds. obtained by nitration to mononitro and to dinitro derivs. are identical.

CHAS. BLANC

**Methods of preparation and conversion of 1,5-nitronaphthylamine.** N. N. VOROZHTZOV AND A. A. KULEV. *Bull. inst. polytech. Ivanovo-Vosniesensk* 9, 87–93 (1928).—V. and K. give improved methods of prepn. of 1,5- $\text{C}_{10}\text{H}_6(\text{NO}_2)\text{NH}_2$  (I) from  $\text{C}_{10}\text{H}_6(\text{NO}_2)_2$  (II), and the conversion of I to 1,5- $\text{C}_{10}\text{H}_6(\text{NO}_2)\text{OH}$  (III) and 1,5- $\text{C}_{10}\text{H}_6(\text{NH}_2)\text{OH}$  (IV). II was isolated from the com. product when 100 g. of the latter was dissolved in 1000 g. of  $\text{H}_2\text{SO}_4$ , d. 1.83, at 100°, the soln. cooled to 20°, the pptd. 1,5-isomer filtered off at 20°, washed free from the acid; yield 20.5 g., m. 200°; when recrystd from  $\text{PhNO}_2$ , yield 14.5 g., m. 217°. By another method II was obtained when 100 g. of com. product was dissolved in 600 cc. of  $\text{PhNH}_2$  on the water bath, cooled to 0°, the pptd. II filtered off, washed with dild. HCl and then with  $\text{H}_2\text{O}$ , yield 29 g., m. 212°. II was then converted to I when 9 g. of  $\text{Na}_2\text{S}$  in 20 cc. of  $\text{H}_2\text{O}$  was added at 85° to a mixt. of 10 g.

of **II** with 14.5 g. of  $(\text{NH}_4)_2\text{SO}_4$  in 50 cc. of  $\text{H}_2\text{O}$ , the ppt. was collected on a filter, treated with  $\text{HCl}$ , the  $\text{HCl}$  ext. was made alk. with  $\text{NH}_3$ , and the pptd. **I** was collected and dried; yield 40%, m.  $117^\circ$ . An improvement on the method of Morgan and Jones (*J. Soc. Chem. Ind.* 341T(1923)) for prepn. of **I** was obtained when 300 g. of  $\text{C}_{10}\text{H}_7\text{NH}_2$  was dissolved in 3000 g. of  $\text{H}_2\text{SO}_4$  (d. 1.84) at  $10^\circ$ , to which was added a mixt. of 120 cc. of  $\text{HNO}_3$  (d. 1.437), and 210 cc. of  $\text{H}_2\text{SO}_4$  at  $1-3^\circ$ , the soln. was allowed to stand in the cold for 16 hrs., filtered and poured on ice, the ppt. of the sulfates of  $\text{C}_{10}\text{H}_6(\text{NO}_2)_2\text{NH}_2$  was filtered off and washed first with 1 l. of 3  $N$   $\text{H}_2\text{SO}_4$  and then with 1 l. of  $N$   $\text{H}_2\text{SO}_4$  to dissolve out the 1,8-isomer, then the remaining ppt. was twice recrystd. from hot  $\text{H}_2\text{O}$ , filtered, and the sulfate was converted to free base of **I** with dild.  $\text{NH}_3$ ; yield 102 g., m.  $105^\circ$ ; when dissolved in  $\text{HCl}$ , treated with  $\text{NH}_3$  and recrystd. from  $\text{C}_6\text{H}_6$ , m.  $117^\circ$ . **III** was obtained by diazotizing the sulfate of **I** and then substituting  $\text{OH}$  for the diazo group, the best yield (41.7%) having been secured by diazotizing in the course of 6 hrs., while in the substitution of  $\text{OH}$  for the diazo group the best yield was obtained with increased concn. of  $\text{H}_2\text{SO}_4$  in the bath. The addn. of  $\text{Cu}$  salts proved detrimental. It forms yellow needles, m.  $171^\circ$ . **IV** was obtained when 0.7 g. of **III** together with 1 g. of c. p.  $\text{Sn}$  and 50 cc. of  $\text{HCl}$  (d. 1.16), was heated on the water bath, cooled, sepd. from an excess of  $\text{Sn}$ , extd. with  $\text{CS}_2$ , treated with a soln. of  $\text{Na}_2\text{CO}_3$ , resulting in a white flocculent ppt. of **IV** (yield 88.12%); recrystd. from hot  $\text{H}_2\text{O}$  it forms long, pink needles, m.  $192^\circ$ .

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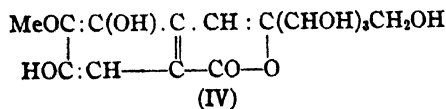
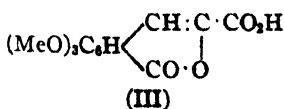
**Stereochemistry of aromatic compounds. VIII. Optically active heterocyclic compounds and optically active azo dyes of the binaphthyl series.** RICHARD KUHN AND PAUL GOLDFINGER. *Ann.* 470, 183-200(1929); cf. *C. A.* 23, 1129. —(2- $\text{H}_2\text{NC}_{10}\text{H}_{6.5}$  (**I**) cannot be resolved by tartaric acid or by helicin but is resolved by *d*-camphorsulfonic acid. *d*-2,2'-Diamino-1,1'-binaphthyl (**II**), m.  $242.5-3^\circ$  (cor.);  $[\alpha]_D^{19} -46^\circ$  (2  $N$   $\text{HCl}$ ),  $-35^\circ$  ( $N$   $\text{HCl}$ ),  $183.8^\circ$  ( $\text{C}_6\text{H}_6$ ),  $[\alpha]_D^{20} -30^\circ$  ( $N$   $\text{HCl}$ ),  $149.5^\circ$  ( $\text{C}_6\text{H}_5\text{N}$ ),  $[\alpha]_D^{21} 21^\circ$  ( $\text{AcOH}$ ),  $144.5^\circ$  ( $\text{C}_6\text{H}_5\text{N}$ ); *d*-camphorsulfonate, m.  $243^\circ$  (cor.),  $[\alpha]_D^{19} 93.6^\circ$  ( $\text{C}_6\text{H}_5\text{N}$ ),  $[\text{M}]_D^{19} 483.0^\circ$ . The mother liquor gives the *l*-isomer (**III**), m.  $243^\circ$ ,  $[\alpha]_D^{18} 46.8^\circ$  (2  $N$   $\text{HCl}$ ). The active compd. is not racemized by heating with  $N$   $\text{HCl}$  for 6 hrs. at  $100^\circ$ . [2,6- $\text{Me}(\text{H}_3\text{N})\text{C}_6\text{H}_3$  and  $\text{Bz}_2$ , heated 15-20 min. at  $180-200^\circ$  give the *S*-yellow condensation product,  $\text{C}_{28}\text{H}_{22}\text{N}_2$ , m.  $213^\circ$ ; it ppts. unchanged from concd.  $\text{H}_2\text{SO}_4$ . **I** and  $\text{Bz}_2$  give a deep orange condensation product,  $\text{C}_{34}\text{H}_{26}\text{N}_2$ , m.  $275.5^\circ$  (cor.) and clears  $291.5^\circ$ , the **III** gives a compd., m.  $281^\circ$ ,  $[\alpha]_D^{19} 823.4^\circ$  ( $\text{C}_6\text{H}_5\text{N}$ ); another sample showed  $559.0^\circ$ . **II** gives a compd., m.  $295^\circ$ , with  $^{121} -1890^\circ$  ( $\text{C}_6\text{H}_5\text{N}$ ),  $-1800^\circ$  ( $\text{CHCl}_3$ ),  $-1410^\circ$  ( $\text{AcOH}$ ),  $-3270^\circ$  ( $\text{H}_2\text{SO}_4$ ); hydrolysis with 20%  $\text{HCl}$  gives the **II** again, m.  $206-16^\circ$ ,  $[\alpha]_D^{21} 59^\circ$  ( $\text{C}_6\text{H}_6$ ).  $(\text{O}_2\text{NC}_6\text{H}_4\text{CO})_2$  gives a deep bluish red melt, m.  $335^\circ$ ,  $[\alpha]_D^{21} -1611^\circ$  ( $\text{C}_6\text{H}_5\text{N}$ ). **II** gives a dibenzal compd., straw-colored, m.  $146^\circ$  (cor.),  $[\alpha]_D^{20} 129^\circ$  ( $\text{C}_6\text{H}_5\text{N}$ ),  $-130^\circ$  ( $\text{H}_2\text{SO}_4$ ). The *di*-*Ac* deriv. m.  $237^\circ$ ,  $[\alpha]_D^{21} 151.6^\circ$  ( $\text{AcOH}$ ); during catalytic reduction the optical activity is lost; this is also true of the condensation product with  $\text{Bz}_2$ . The diazo compd. from the **II** couples with *m*- $\text{C}_6\text{H}_4(\text{OH})_2$  to give a deep red azo dye,  $\text{C}_{32}\text{H}_{20}\text{O}_4\text{N}_4$ , decomps. above  $300^\circ$ ,  $[\alpha]_{5563}^{20} -1730^\circ$ ,  $[\alpha]_{5893}^{20} -3230^\circ$  ( $\text{C}_6\text{H}_5\text{N}$ ).  $[\alpha]^{20}$  for 6563, 5893, 5463 and 4861 are given for several of these compds.

C. J. WEST

***o*-Quinamines of the naphthalene series and their transformation into homologs of naphthyl-2-acetic acid.** K. FRIES AND A. KÜSTER. *Ann.* 470, 20-37(1929). cf. *C. A.* 22, 3146. —The crude *Br* deriv. from 1,2- $\text{C}_{10}\text{H}_6\text{Me}(\text{OH})$ , prepd. according to F. and Engel (*C. A.* 19, 59), gives with  $\text{PhNH}_2$  1-anilino-1-methyl-2-ketonaphthalene 1,2-dihydride (**I**), yellow, m.  $141^\circ$ ; concd.  $\text{H}_2\text{SO}_4$  gives an olive-green color; it is stable in alkalis and acids, reduced by  $\text{Zn}$  and  $\text{AcOH}$  to 1,2- $\text{C}_{10}\text{H}_6\text{Me}(\text{OH})$ . **I** and  $\text{Br}$  in  $\text{EtOH}$  give the 2',4'-dibromoanilino deriv., yellow, m.  $174^\circ$ ; reduction gives 2,4- $\text{Br}_2\text{C}_6\text{H}_3\text{NH}_2$  and 1,2- $\text{C}_{10}\text{H}_6\text{Me}(\text{OH})$ . Using *p*- $\text{BrC}_6\text{H}_4\text{NH}_2$  there results the 4'-bromoanilino deriv. of **I**, yellow, m.  $148^\circ$ . 1,6-Dibromo-1-methyl-2-ketonaphthalene 1,2-dihydride and  $\text{PhNH}_2$  give the 1-anilino deriv., golden yellow, m.  $149^\circ$ ; 1-[4'-bromoanilino] deriv., yellow, m.  $168^\circ$ ; 1-[2',4'-dibromoanilino] deriv., *S*-yellow, m.  $185^\circ$ . The above derivs. are not rearranged by acids. 1-Methyl-1-anilino-2-ket-4,6-dibromonaphthalene 1,2-dihydride (**II**), orange, m.  $200^\circ$ , is reduced by  $\text{Zn}$  to  $\text{PhNH}_2$  and 1,4,6,2- $\text{MeBr}_2\text{C}_{10}\text{H}_4\text{OH}$ ; in concd.  $\text{H}_2\text{SO}_4$  the green color soon changes to brown, giving 1-methyl-3,6-dibromo-2-naphthyl 4'-aminophenyl ether, yellow, m.  $137^\circ$ . **II** and 1 mol.  $\text{Br}$  in  $\text{EtOH}$  give the *N*-bromoanilino deriv., light yellow, m.  $187^\circ$ ; this also results from the 1,4,6- $\text{Br}_2$  deriv. and  $\text{PhNH}_2$  in  $\text{EtOH}$ ; the compd. is stable in boiling  $\text{EtOH}$  and  $\text{AcOH}$  but with  $\text{HCl}$ ,  $\text{HBr}$  or  $\text{H}_2\text{SO}_4$  rearranges to the 4-bromoanilino deriv., yellow, m.  $201^\circ$ .

also formed from the 1,4,6-Br<sub>3</sub> deriv. and *p*-BrC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub>. The quinamine and Ac<sub>2</sub>O with a little H<sub>2</sub>SO<sub>4</sub> give 1-methyl-1-acetylanilino-2-ketonaphthalene 1,2-dihydride, m. 174° (90% yield); EtONa in EtOH, boiled 0.25 hr., gives 8-methyl-1-phenyl-2-oxo-[6,7-benzoindeole 2,8-dihydride] (III), m. 178° (80–5% yield); an intermediate product is 8-methyl-1-phenyl-2-ket-9-hydroxy-[6,7-benzoindeole 2,3,8,9-tetrahydride] (IV), m. 174°; soln. in concd. H<sub>2</sub>SO<sub>4</sub> and pptn. with H<sub>2</sub>O gives III; oxidation with CrO<sub>3</sub> in AcOH gives 50% of a compd. C<sub>19</sub>H<sub>15</sub>O<sub>5</sub>N. The Me ether of IV, m. 184°. Catalytic reduction of IV in AcOH gives the 2,3,4,5,8,9-hexahydride, m. 159°, stable toward dil. alkali; Ac. deriv., m. 152°. III and Br in CHCl<sub>3</sub> give 8-methyl-1-phenyl-2-ket-3,4,5,9-tetra-bromo-[6,7-benzoindeole 2,3,4,5,8,9-hexahydride], m. 200° (decompn.). Reduction of III with SnCl<sub>2</sub> and AcOH gives 8-methyl-1-phenyl-2-ket-[6,7-benzoindeole 2,3,5,8-tetrahydride], m. 189°, pptd. unchanged from concd. HCl or H<sub>2</sub>SO<sub>4</sub>; reduction of IV gives the same compd. Catalytic reduction of III gives the 2,3,4,5,8,9-hexahydride, m. 145°. Reduction of III with amalgamated Zn in AcOH gives 95% of 1-methyl-2-naphthylacetic acid, m. 166°; amide, m. 228°. Heating the Na salt with Cu and soda lime at 380–400° at 12 mm., there results from 16 g. of the acid 6.4 g. 1,2-C<sub>10</sub>H<sub>8</sub>Me<sub>2</sub>. I and (EtCO)<sub>2</sub>O with a little H<sub>2</sub>SO<sub>4</sub> give the 1-propionylanilino deriv., m. 142°; with EtONa this gives 3,8-dimethyl-1-phenyl-2-ket-[6,7-benzoindeole 2,8-dihydride], m. 165°; reduced according to Clemmensen to methyl-[1-methyl-2-naphthyl]acetic acid, m. 128°. 1-Acetylanilino deriv. of I, m. 226°; 8-methyl-1-phenyl-2-ket-9-hydroxy-6,7-[4'-bromo-2,1'-benzo]indole 2,3,8,9-tetrahydride, m. 201° (80% yield); 8-methyl-1-phenyl-2-ket-6,7-[4'-bromo-2',1'-benzo]indole 2,8-dihydride, m. 174° (75% yield); 6-bromo-1-methyl-2-naphthylacetic acid, m. 210° (90.5% yield). C. J. WüST

**Non-tannin substances in the extract of the root of badan (*Saxifraga crassifolia*).** I. BERGENIN, A. E. CHICHIBABIN, A. V. KIRSANOV, A. I. KORELEV and N. N. VOROZHTZOV, JR. *Ann.* **469**, 93–127 (1929); cf. Garreau and Machelart, *Compt. rend.* **91**, 942 (1880).—Bergenin (I), C<sub>14</sub>H<sub>16</sub>O<sub>6</sub>, crystg. with 1 H<sub>2</sub>O, lost at 100°, [α]<sub>D</sub> –37.25° (0.99% EtOH soln.) (mono- and di-Na and K salts), isolated from the Me<sub>2</sub>CO exts. of badan roots after removal of tannins, contains 6 HO groups and 1 MeO group but no CO<sub>2</sub>H or free CO groups. Excess of Ac<sub>2</sub>O and I give the penta-Ac deriv., m. 199–203°, which still contains 1 free HO group; with a smaller excess of Ac<sub>2</sub>O, a product, m. 192–3°, was obtained which was not examd. I and CH<sub>2</sub>N<sub>2</sub> in Et<sub>2</sub>O give a di-Me deriv., crystg. with 2 H<sub>2</sub>O, m. 89°, anhyd., m. 194–6°; oxidation with KMnO<sub>4</sub> gives a mixt. of 4,5,6-trimethoxysisocoumarin (II), m. 84°; 3,4,5-trimethoxysisocoumarin-2-carboxylic acid (III), m. 254° (decompn.) (Ag salt), which yields II by distn. in vacuo (Me ester, m. 155–6°); and 3,4,5-trimethoxyphthalic acid, b<sub>17</sub> 226°, m. 139–40°, with conversion into its anhydride but in a bath at 170° it m. 176–7° (decompn.). Heating 1.18 g. II with 50 cc. 0.1 N NaOH gives a compd., m. 122–8° (decompn.); after heating at 200° the compd. C<sub>12</sub>H<sub>14</sub>O<sub>6</sub>, m. 72–6° and crystals with 0.5 C<sub>6</sub>H<sub>6</sub>; using 20 cc. 0.5 N NaOH there results a compd. C<sub>24</sub>H<sub>26</sub>O<sub>11</sub>, m. 185–6°. Oxidation of II with alk. KMnO<sub>4</sub> converts it into 3,4,5-trimethoxyhomophthalic acid, m. 145–6°; distn. at 14 mm. gives the anhydride, m. 124–5°; this acid was synthesized from 4-hydroxy-3,5-dimethoxyphthalide-2-carboxylic acid by reduction with HI and red P and rapid methylation in a H atm. of the resulting trihydroxyhomophthalic acid with Me<sub>2</sub>SO. Fusion of I with KOH at 200° converts it into 3,5,4-(HO)<sub>2</sub>MeOC<sub>6</sub>H<sub>2</sub>CO<sub>2</sub>H. On the basis of these results the structural conclusions of Sadikov and Guthner (*C. A.* **22**, 1767) are criticized and structure IV is assigned to I; in agreement with this, I titrates as a lactone.



The following reactions are less readily explained. I couples normally in alk. soln. with 1 mol. of PhN<sub>2</sub>Cl to yield benzeneazobergenin (V), orange-red, decomp. 200°, which, however, can couple with a 2nd mol. of PhN<sub>2</sub>Cl to yield the compd. C<sub>14</sub>H<sub>14</sub>O<sub>8</sub> (NPh)<sub>2</sub>, brown; both dyes color wool in an acid bath brownish yellow to brown. V is reduced by SnCl<sub>2</sub> and HCl to (3)-aminobergenin, crystg. with 3 H<sub>2</sub>O, light yellow, m. (anhyd.) 244° (decompn.); with HNO<sub>2</sub> there results a diazo oxide, light yellow, crystg. with 2 H<sub>2</sub>O. Like the parent isocoumarin, II and III are converted by NH<sub>3</sub>

**New meso-derivatives of anthracene and dianthryl.** B. P. FEDOROV. *Bull. inst. polytech. Ivanovo-Vosnesensk* 9, 103-9(1928).—By direct sulfonation of anthracene (I) the  $\text{SO}_3\text{H}$  groups are introduced into the side rings. F. has discovered that by the action of  $\text{Na}_2\text{SO}_3$  on *ms*-nitroanthracene (II) the  $\text{SO}_3\text{Na}$  group is substituted for  $\text{NO}_2$  forming *Na ms*-anthracenesulfonate (III). The  $\text{SO}_3\text{Na}$  attached to the *ms*-C atom is highly reactive and easily replaced by H on boiling with dil. mineral acids, giving I, and by OH on heating with alkalis, giving anthranol, while on heating with  $\text{NH}_3$  under pressure it forms *ms*-anthramine. In the action of  $\text{Na}_2\text{SO}_3$  on II there is also formed a by-product, *Na dianthryl-ms-sulfonate* (IV), the  $\text{SO}_3\text{H}$  group of which is readily replaced by H, OH,  $\text{NH}_2$ , etc., forming *ms-hydroxydianthryl* (V) and *ms-aminodianthryl* (VI), all of which were hitherto unknown. *Exptl. part.*—Eighteen g. of II with 45 cc. of 19.3%  $\text{NaHSO}_3$ , 3.35 g. of 100% NaOH in 10 cc. of  $\text{H}_2\text{O}$  and 50 cc. of  $\text{H}_2\text{O}$  is simmered 4 hrs. in an air bath, the contents are poured into 100 cc. of iced  $\text{H}_2\text{O}$ , cooled to  $5^\circ$ , and after 3 hrs. filtered from the ppt. of unchanged II and IV. The latter is twice boiled with dil. alc., filtered boiling hot, evapd. to 300 cc., salted out hot, cooled, filtered and recrystd. from dil. alc.; yield of IV 1.7 g., which crystallizes with 1 mol. of  $\text{H}_2\text{O}$ , insol. in cold  $\text{H}_2\text{O}$ , sparingly sol. in hot  $\text{H}_2\text{O}$ , easily sol. in hot alc. IV can also be produced with poor yield from III by boiling with very dil. NaOH. IV on boiling with dil. mineral acids is quant. decompd. into  $\text{SO}_2$  and dianthryl. The decompn. to dianthryl and anthraquinone proves that S in IV is attached to the *ms*-C atom. When IV is fused with NaOH and the melt treated with HCl there is formed a small amt. of V, which was not further investigated. VI is obtained when 1.5 g. of IV is heated with 25 cc. of 20%  $\text{NH}_4\text{OH}$  in a sealed tube at  $190-200^\circ$  for 10 hrs. and filtered; yield 0.92 g., faintly yellow rods from  $\text{C}_6\text{H}_6$  or  $\text{PhCH}_3$ , m.  $305^\circ$  (decompn.). *ms*-Anthramine when diazotized acts abnormally, forming anthraquinone and diamino-dianthryl (*Ber.* 40, 518(1907)), while VI is normally diazotized in alc. and will slowly couple with  $\beta$ -naphthol to a cherry-red azo soln., which on standing deposits a brown dyestuff; with other hydroxynaphthalenes and their  $\text{SO}_3\text{H}$  acids VI gives yellow, red and brown azo dyes. The filtrate obtained after sepn. of II and IV, contr. III and  $\text{NaNO}_2$ , is cooled and treated with  $\text{SO}_2$ , the excess of  $\text{SO}_2$  is neutralized with  $\text{Na}_2\text{CO}_3$ , evapd. to dryness, taken up in warm alc., filtered, evapd. and dried over  $\text{H}_2\text{SO}_4$ ; yield of III 17 g., colorless prisms, easily sol. in  $\text{H}_2\text{O}$ , poorly sol. in alc. On boiling with dil. mineral acids III is decompd. into  $\text{SO}_2$  and I, probably with formation of anthranol as an intermediary product. This and the oxidation with  $\text{KMnO}_4$  to anthraquinone prove that S is attached to the *ms*-C atom. Anthranol, obtained when 1 g. of III is heated with 3 g. of NaOH at  $200-10^\circ$ , made acid with HCl, filtered, crystd. from alc., m.  $163-4^\circ$  (poor yield). *ms*-Anthramine is produced when 1 g. of III is heated in a sealed tube with 15 cc. of 20%  $\text{NH}_4\text{OH}$  at  $200^\circ$  for 4 hrs., the contents quickly filtered, dissolved in alc., satd. with HCl, the HCl salt is filtered and dried; yield 20-25%. The alc. soln. gives with diazobenzenesulfonic acid the Goldmann color reaction (*Ber.* 23, 2522(1890)). The free base forms yellow plates, m.  $115-6^\circ$ , and not  $145-50^\circ$  as is given in *Ann.* 330, 166(1904). CHAS. BLANC

**Differently colored states of anthrahydroquinonecarboxylic acids, and anthrahydroquinone- $\alpha$ -carboxylic lactones.** ROLAND SCHOLL, OSKAR BÖTTGER AND SIGFRIED HASS. *Ber.* 62B, 616-28(1929).—The incentive to this work was certain observations on the  $\text{Na}_2\text{S}_2\text{O}_4$  reduction products of anthraquinonecarboxylic acids which in their formation and color strikingly resembled the so-called aryloxanthronyls, dark blue free org. radicals, described some yrs. ago. When the red  $\text{Na}_2\text{S}_2\text{O}_4$  vat, prepd. in the cold, of  $1\text{-C}_6\text{H}_4(\text{CO})_2\text{C}_6\text{H}_3\text{CO}_2\text{H}$  (I) is treated with HCl the vat acid seps. as a red jelly which, however, soon becomes brown-violet, even under N. Similarly the red vat acid from  $2,6\text{-HO}_2\text{CC}_6\text{H}_3(\text{CO})_2\text{C}_6\text{H}_3\text{CO}_2\text{H}$  (II) becomes violet after a time while the red aq. alk. vat of the 1,5-acid (III) at once gives a violet ppt. with HCl. The almost colorless, neutral, aq. soln. of the Na salt of III gives with  $\text{Na}_2\text{S}_2\text{O}_4$  at room temp. an orange-red vat which, when shaken with air in the presence of an excess of  $\text{Na}_2\text{S}_2\text{O}_4$ , yields a violet ppt. If the almost colorless, free, amorphous III or II or the 1,3,5,7-tetracarboxylic acid (V) in aq. suspension is treated with an excess of  $\text{Na}_2\text{S}_2\text{O}_4$  there are formed yellow-red to yellow-brown solns. giving violet ppts. when shaken with air; in the absence of an excess of  $\text{Na}_2\text{S}_2\text{O}_4$  or in the presence of mineral acids the suspended acids can be converted directly into violet ppts. While these facts are strikingly reminiscent of the corresponding phenomena with the oxanthronyls, the violet ppts. are not free radicals. The vat acid from the red alk. vat of I was prepd. in the complete absence of air and under conditions under which anthrahydroquinone and its derivs. are not sepd. into oxidized and reduced parts. There were thus obtained in good yield brownish violet  $\text{KMnO}_4$ -like crystals, almost brick-red by transmitted light,



pptd. from their sol. salts by means of alkali. To this mixt., suspended in 100 parts water, is added 14.2 parts (by vol.) 0.1 *N* KOH, the mixt. taken up by 200-250 parts (by vol.) of pea-sized pumice particles and the whole dried at 400-500°. The other method consists of fractional crystn. of crude anthracene from furfural, the anthracene content being raised by 2 such treatments from 31 to 90%. A previous purification with *o*-C<sub>6</sub>H<sub>4</sub>Cl<sub>2</sub> will remove phenanthrene and neutral oils.

E. PICKERING

**Unsaponifiable matter from the oils of elasmobranch fish. V. Constitution of squalene as deduced from its degradation products.** ISIDOR M. HEILBRON, WM. M. OWENS AND IAN A. SIMPSON. *J. Chem. Soc.* 1929, 873-83; cf. *C. A.* 22, 2363.—This work was undertaken with the idea of proving that under all methods of attack squalene (I) yields decompn. products typical of those to be anticipated from a triterpene hydrocarbon. The results have enabled definite structural formulas to be ascribed to the isomeric hydrocarbons of which it is composed. Distn. of I at 300-350 mm. in a *N* atm. gives, excluding the hemiterpene fraction, consisting mainly of Me<sub>2</sub>C:CHMe, 70% of a golden yellow mobile liquid; distn. at 20 mm. gives 30% of a fraction b<sub>40</sub> 100°; further distn. gives a fraction b<sub>15</sub> 60-3°, d<sub>4</sub><sup>17.6</sup> 0.8225, n<sub>D</sub><sup>20</sup> 1.4619, which, however, on redistn. b<sub>740</sub> 162-77°; distn. over Na gives several fractions, of which 2, b<sub>740</sub> 167-70°, 174-6°, were studied; while the Br values agree with C<sub>10</sub>H<sub>18</sub>, the I nos. are high, these are considered to be const.-boiling mixts. rather than individual substances. The hot-wire method of decompn. (Chapman, *C. A.* 17, 2262) fails to confirm the existence of a single substance, such as heparene reported by C. Indications of the presence of an unsatd. open-chain terpene (myrcene?) have been furnished by an expt. in which the monoterpene fraction, b<sub>20</sub> 60-100°, was heated 24 hrs. with 99% HCO<sub>2</sub>H. The last fraction of the reaction product resembled a diterpene. The expts. of Majima and Kubota (*C. A.* 16, 3628) on the action of O<sub>3</sub> upon I have been confirmed; the supposed acids C<sub>8</sub>H<sub>10</sub>O<sub>6</sub> and C<sub>8</sub>H<sub>14</sub>O<sub>6</sub> are now shown to be levulinic aldehyde peroxide, C<sub>8</sub>H<sub>10</sub>O<sub>6</sub>, m. 195°, and probably methylheptenone peroxide, C<sub>8</sub>H<sub>14</sub>O<sub>6</sub>, m. 136°. C.'s results on the oxidation of I with KMnO<sub>4</sub> have been confirmed in general; however, addn. of solid KMnO<sub>4</sub> to I in Me<sub>2</sub>CO gives small amts. of dihydro-ψ-ionone (geranylacetone) and probably methylheptenone; even an excess of KMnO<sub>4</sub> and heating leaves about 40% of the I unchanged; this residual I yields a HCl salt from which the high-melting isomer is easily obtained, which is further evidence that I is a mixt. of 2 isomers and suggests that 1 isomer is more readily broken down than the other. Oxidation of I with CrO<sub>3</sub>Cl<sub>2</sub> in CS<sub>2</sub> gives small amts. of HCHO, AcH, (CH<sub>2</sub>CO<sub>2</sub>H)<sub>2</sub> and much resinous material. Bromination of I from several sources in Et<sub>2</sub>O at -25° gives a product, sepd. by crystn. from AcOEt into a high-melting fraction, m. 198°, C<sub>30</sub>H<sub>50</sub>O<sub>2</sub>, and a low-melting fraction, m. 178°, which decompn. in moist air and could not be recrystd.

**VI. Constitution of squalene as deduced from a study of the decahydrosqualenes.** I. M. HEILBRON AND ALBERT THOMPSON. *Ibid* 883 92.—Hydrogenation of squalene until 5 mols. of H had been absorbed gave a product (II), b<sub>3</sub> 227-30°; this was treated with O<sub>3</sub> for 36 hrs. (until Br was no longer absorbed) and the ozonide decompd. by boiling with H<sub>2</sub>O for 2 hrs. in an atm. of N; 450 g. II gave 502 g. ozonide from which 16 g. steam-volatile ketone, 287 g. of neutral, non-steam-volatile matter, including 35% of squalene, and 178 g. of mixed acids were obtained. The steam-volatile fraction is *Me isohexyl ketone*, b<sub>785</sub> 164-6°, whose semicarbazone m. 149-50°. The non-volatile neutral fraction was divided into 3 fractions, b<sub>12</sub> 124-45°, b<sub>3</sub> 155-75° and b<sub>2</sub> 200-10°; the 1st fraction contains hexahydro-ψ-ionone, b<sub>11</sub> 119-21°, whose semicarbazone m. 97-8°. The 2nd fraction contains 3,7,11-trimethyl-15-hexadecanone, C<sub>19</sub>H<sub>38</sub>O, whose semicarbazone m. 71.5-3.5°. The 3rd fraction contains 3,7,11,15-tetramethyl-19-eicosanone(?), b<sub>1</sub> 195-205°. Since it might be supposed that the 2nd fraction contained 2,6,10-trimethyl-14-pentadecanone (III), this ketone was synthesized from hexahydrofarnesol, b<sub>3</sub> 125-8°, n<sub>D</sub><sup>18</sup> 1.4469, d<sub>4</sub><sup>18</sup> 0.8361; the bromide, b<sub>4</sub> 122°, n<sub>D</sub><sup>18</sup> 1.4605, d<sub>4</sub><sup>18</sup> 1.001; *Et* hexahydrofarnesylacetoacetate, b<sub>33</sub> 175-8°, n<sub>D</sub><sup>18</sup> 1.4184, d<sub>4</sub><sup>18</sup> 0.9014; decompn. with EtOH-KOH gives III, b<sub>3</sub> 142-3°, n<sub>D</sub><sup>18</sup> 1.4 35, d<sub>4</sub><sup>19</sup> 0.8403; semicarbazone, m. 70-70.5°. The acid fraction was sepd. by distn. of the Me est.rs; the 1st fraction, whose ester b<sub>785</sub> 139-41°, is γ-methylvaleric acid. The 2nd fraction is 4,8-dimethylnonic acid, whose ester b<sub>3</sub> 105-8° and amide m. 80-1°; this acid was synthesized by oxidizing hexahydro-ψ-ionone with CrO<sub>3</sub>. The 3rd fraction contains 3,7,11-trimethyltetradecanoic acid(?), whose ester b<sub>3</sub> 145-8°. In certain expts. a compd., possibly 4,8-dimethylnonaldehyde, whose semicarbazone m. 115-6°, is obtained. These results indicate that there may be at least 3 isomers of I, Me<sub>2</sub>C:CHCH<sub>2</sub>(CH<sub>2</sub>CMc:CHCH<sub>2</sub>)<sub>2</sub>CH<sub>2</sub>CMc:CHMe, Me<sub>2</sub>C:CHCH<sub>2</sub>(CH<sub>2</sub>C(CH<sub>3</sub>)CH<sub>2</sub>CH<sub>2</sub>)<sub>2</sub>CH<sub>2</sub>CMc:CHMe, and Me<sub>2</sub>C:CHCH<sub>2</sub>



CH : CMe(CH<sub>2</sub>)<sub>2</sub>CH : CMe(CH<sub>2</sub>)<sub>2</sub>CH : CMe(CH<sub>2</sub>)<sub>2</sub>CH : CMe(CH<sub>2</sub>)<sub>2</sub>CMe : CHMe. Evidence for these formulas is presented. C. J. WEST

**Hydrogenation of phenanthrene.** II. G. SCHROETER, HANS MÜLLER AND JOSEPH Y. S. HUANG. *Ber.* 62B, 645–58 (1929); cf. *C. A.* 19, 1274.—It was shown in the 1st paper that the hydrogenation of anthracene leads rapidly in only 3 phases through *ms*-dihydroanthracene and tetracene to the stable oethracene while with phenanthrene (I) it was possible to isolate tetanthrene (II) and octanthrene (III) but not *ms*-dihydrophenanthrene (IV). To be sure, there is described in the literature under this name a compd. (V), m. 95°, capable of forming a picrate, m. 137°, but this has been found to be not a chem. individual but I contaminated with some II. The true IV can be obtained, along with II or with II and III, by partial hydrogenation of I. II can readily be removed from this mixt. because it is the only component which forms a picrate, and the III and IV, which boil at almost the same temp., can be sepd. through their SO<sub>3</sub>H derivs.; III forms a mono-SO<sub>3</sub>H acid quite difficultly sol. in H<sub>2</sub>SO<sub>4</sub> while IV yields an easily sol. di-SO<sub>3</sub>H acid, hydrolysis of which gives pure IV. Although this ready formation of a di-SO<sub>3</sub>H acid and the non-formation of a picrate were already strong evidence that IV is the true *ms*-dihydro compd., its identity was further established by synthesizing the IV from (*o*-BrCH<sub>2</sub>C<sub>6</sub>H<sub>4</sub>)<sub>2</sub> and Na. In the 1st paper II was assigned, without absolute proof, the 5,6,7,8-tetrahydro structure because of its strong tendency to picrate formation and because it is also formed by partial dehydrogenation of III. This, too, has now been confirmed by synthesis. Oxidation of II does not give a quinone, as does tetracene, but, with CrO<sub>3</sub>, 5-tetanthrenone (VI) with some I, and, with KMnO<sub>4</sub>, in Me<sub>2</sub>CO, both VI and the 8-isomer (VII). VII and VI are also obtained by gently warming 2- and 1-C<sub>10</sub>H<sub>7</sub>CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>COCl (VIII and IX), resp. The corresponding  $\gamma$ -1- and 2-naphthylbutyric acids (X and XI) were prepd. as follows: C<sub>10</sub>H<sub>7</sub> and ClCH<sub>2</sub>COCl heated with a little P<sub>2</sub>O<sub>5</sub> give 84%  $\alpha$ - and 16%  $\beta$ -C<sub>10</sub>H<sub>7</sub>COCH<sub>2</sub>Cl (XII and XIII) (sepd. through their picrates or by conversion with NaOCl into a mixt. of  $\alpha$ - and  $\beta$ -C<sub>10</sub>H<sub>7</sub>CO<sub>2</sub>H and sepn. of the latter through their Ca salts). With NaCH(CO<sub>2</sub>Me)<sub>2</sub> the chlorides yield the corresponding *di*-Me  $\alpha$ - and  $\beta$ -naphthacylmalonates (XIV and XV), which on hydrolysis to the free acids (XVI and XVII) and elimination of CO<sub>2</sub> give  $\beta$ -1- and 2-naphthylpropionic acids (XVIII and XIX) and these with Zn and HCl form X and XI, thus establishing the structure of VI and VII and, consequently, of II. The peculiar transformation of IV into II, involving a migration of 2 H atoms from the middle to 1 of the outer rings, can also be effected with Na and AmOH, for IV was also obtained along with II in the partial hydrogenation of I by this means; the V obtained at the same time can be sepd. by fractional crystn. from alc. into I and II. For the catalytic hydrogenation the com. I must be freed from fluorene (which is still present to the extent of about 10% in the purified com. product) by fractionation *in vacuo* and then treated with Na until it gives no test for S; 89 g. of a I so treated and hydrogenated in a tetralin-catalyst mixt. under 20 atm. H<sub>2</sub> pressure at 150–80° until it has absorbed 1.4 mols. H<sub>2</sub> (about 25 mins.) gives 86 g. oil, b<sub>11</sub> 170–80°, which yields 119 g. II picrate and 31 g. of a mixt., b<sub>11</sub> 167–70°, of III and IV; from 18 g. of this mixt. with concd. H<sub>2</sub>SO<sub>4</sub> at 80° are obtained 5 g. octanthrenesulfonic acid, 15.2 g. *di*-Na *ms*-dihydrophenanthrenedisulfonate and 9.6 g. of more easily sol. stereoisomeric Na salts; the less sol. salts with PCl<sub>5</sub> give 14 g. of a disulfonyl chloride, m. 263° (decompn.), the more easily sol. salts a chloride, m. 184.5°. The chlorides, hydrolyzed back to the Na salt and heated at 200° with fuming HCl, give IV, b<sub>15</sub> 168–9°, m. 34.5–5°, can easily be supercooled, d<sub>4</sub><sup>14</sup> 1.0953, d<sub>4</sub><sup>20</sup> 1.0757, M 59.360, 59.979, 61.369, 62.941 for  $\alpha$ , D,  $\beta$  and  $\gamma$  at 14.7°, E<sub>Z</sub> 1.308, 1.405, 53%, 53% for  $\alpha$ , D,  $\beta$ - $\alpha$ , and  $\gamma$ - $\alpha$ . Picrate of II, red-yellow, m. 111°. II, m. 33–4°, b<sub>11</sub> 173° (v. Auwers and Kraul's prepn., m. 14°, was evidently impure), d<sub>4</sub><sup>10</sup> 1.0061, M 59.116, 59.752, 61.317, 62.805 for  $\alpha$ , D,  $\beta$  and  $\gamma$  at 40°, E<sub>Z</sub> 0.885, 0.991, 62%, 68% for  $\alpha$ , D,  $\beta$ - $\alpha$  and  $\gamma$ - $\alpha$ . VI, m. 69°; *semicarbazone*, m. 225° (decompn.); *oxime*, m. 172–3°; *picrate*, m. 101–2°. VII (1.2 g., together with 2.7 g. VI and 10 g. unchanged II, from 18.2 g. II), m. 96–7°; *semicarbazone*, m. 247° (decompn.); *oxime*, m. 165–6°; *picrate*, m. 106–7°. With boiling aq. KMnO<sub>4</sub>, II gives phthalic and mellophanic acids.  $\alpha$ -Naphthacyl chloride (XII), m. 40–1.5°, b<sub>12</sub> 203°; *picrate*, m. 94°.  $\beta$ -Isomer (XIII), m. 67–8°; *picrate*, m. 90–1°. XIV, sirup (14 g. from 10 g. XII); XVI (9.5 g.) gives at 130–40° 7 g. XVIII, m. 131–2°, which yields 4.2 g. X, m. 106–7°, b<sub>15</sub> 217°, and this through the chloride gives 2.5 g. VII. XV (6 g. from 6.1 g. XIII), m. 115.5°; 5 g. yields 4 g. XVII, m. 162°, titrates in H<sub>2</sub>O with Me orange as a monobasic acid, in alc. with phenolphthalein normally as a dibasic acid, yields 3.7 g. XIX, m. 174°, 3.3 g. of which gives 2.5 g. XI, m. 94–5°, and 2.4 g. of the XI yields 1.5 g. VI. C. A. R.

**Heterocyclic systems containing selenium. I. Cycloselenobutane (tetrahydro-selenophene).** GILBERT T. MORGAN AND FRANCIS H. BURSTALL. Teddington, Middlesex. *J. Chem. Soc.* 1929, 1096-1103.— $\text{Br}(\text{CH}_2)_4\text{Br}$  and  $\text{Na}_2\text{Se}$  in excess, heated at  $80^\circ$  in a current of  $\text{H}$  (aq. soln.) for 4 hrs., give 75% of cycloselenobutane (I),  $b_{770}$   $90-1^\circ$ ,  $b_{770}$   $135-6^\circ$ ,  $d_4^{25}$  1.484,  $d_4^{25}$  1.5060 — 0.001354t,  $n_D^{25}$  1.5510,  $\gamma^{18}$  40.40; it has a very pungent and somewhat unpleasant odor, is volatile with steam or in the vapors of  $\text{EtOH}$  and  $\text{Et}_2\text{O}$ ; it is oxidized by fuming  $\text{HNO}_3$  and aq.  $\text{KMnO}_4$ ; mercurichloride, m.  $146^\circ$ . Passing  $\text{Cl}$  into I in  $\text{CCl}_4$  gives cycloselenobutane 1,1-dichloride (II), m.  $88-9^\circ$ ; dibromide (III), yellow, m.  $92^\circ$ ; perbromide,  $\text{C}_4\text{H}_8\text{SeBr}_2$ , Br<sub>2</sub>, crimson, decomp. in the air or when heated, giving III; diiodide, purplish black, m.  $99-100^\circ$ . III and excess  $\text{Ag}_2\text{O}$  in  $\text{H}_2\text{O}$  give the 1,1-dihydroxide (IV), hygroscopic; the aq. soln. is neutral to litmus,  $\text{HBr}$  regenerates III. With 0.5 the theory of  $\text{Ag}_2\text{O}$  or by mixing equimol. proportions of III and IV, there results the 1-hydroxy-1-bromide, decomp. slowly on keeping, or on heating at  $99-100^\circ$ ; the aq. soln. is strongly acidic. 1-Hydroxy-1-chloride, decomp.  $116^\circ$ . Cold dil. aq. solns. of II and  $\text{H}_2\text{PtCl}_6$  give the 1-chloroplatinate, yellow, decomp.  $230^\circ$ ; excess of II gives bis-1-chlorocycloselenobutane 1-chloroplatinate, orange, m.  $179^\circ$  (decompn.). Equal parts of I and  $\text{MeI}$  give the 1-methiodide, sublimes slowly at  $150^\circ$ , m. (sealed tube)  $174^\circ$ .  $\text{Br}(\text{CH}_2)_4\text{Br}$  and I give 1- $\delta$ -bromobutylcycloselenobutane 1-bromide, m.  $65-6^\circ$ . A mixt. of I,  $\text{Br}(\text{CH}_2)_3\text{Br}$  and  $\text{H}_2\text{O}$ , heated at  $90^\circ$  in a sealed tube, gives tetramethylene- $\alpha,\delta$ -biscycloselenobutane 1,1'-dibromide, m.  $95-6^\circ$ .  $\text{KSeCN}$  and  $\text{Br}(\text{CH}_2)_4\text{Br}$  in  $\text{Me}_2\text{CO}$ , heated several hrs., give nearly quant. tetramethylene  $\alpha,\delta$ -diselenocyanate, m.  $40^\circ$ , decomp. slowly on keeping; with  $\text{EtONa}$  this gives cyclo-tetramethylene diselenide, yellow, m.  $41-2^\circ$ ; strongly heated, it gives I;  $\text{Br}$  in  $\text{CHCl}_3$  gives III; warm  $\text{HNO}_3$  (1:1) gives  $\alpha,\delta$ -tetramethylenediseleninic acid dinitrate, decomp.  $136^\circ$ .

C. J. WISE

$\Delta^1$ - and  $\Delta^2$ -pyrazolines. K. v. AUWERS AND E. CAUER. *Ann.* 470, 284-312 (1929); cf. Buchner, *Ann.* 273, 214 (1893); v. Pechmann, *Ber.* 33, 3590, 3594, 3597 (1900).— $\text{CH}_2:\text{CHCO}_2\text{Et}$  and  $\text{CH}_2\text{N}_2$  in abs.  $\text{Et}_2\text{O}$ , allowed to stand 2 hrs., give Et pyrazoline-3-carboxylate, m.  $73-4^\circ$ ,  $d_4^{20}$  1.0766,  $n$  1.47731, 1.48288, 1.49799 for  $\alpha$ ,  $\text{He}$  and  $\beta$  at  $100.2^\circ$ ; oxidation with  $\text{Br}$  in  $\text{Et}_2\text{O}$  gives Et pyrazole-3(5)-carboxylate, m.  $157-8^\circ$ .  $\text{CH}_2:\text{CHCO}_2\text{Me}$  and  $\text{MeCHN}_2$  give Me 5-methylpyrazoline-3-carboxylate,  $b_{12}$   $138^\circ$ , m.  $42.5-4^\circ$ ,  $d_4^{27.3}$  1.1044,  $n$  1.49094, 1.49757, 1.51207 at  $57.3^\circ$ ; 1-Ac deriv., pale yellow-green,  $b_{12}$   $140^\circ$ ; 1-carbethoxy deriv., m.  $84-5.5^\circ$ ; 1-Me deriv.,  $b_{12}$  about  $105^\circ$ .  $\text{AcCH}:\text{CHCO}_2\text{Me}$  and  $\text{N}_2\text{H}_4$ ,  $\text{HCl}$  in dil.  $\text{EtOH}$  give, after 24 hrs., Me 3-methylpyrazoline-5-carboxylate,  $b_{12}$   $117^\circ$ ,  $d_4^{19.4}$  1.1400,  $n$  1.47340, 1.47660, 1.48411 at  $19.4^\circ$ , 1-phenylurethan, m.  $117.5-8.5^\circ$ ; 1-Ac deriv., m.  $52.5-3^\circ$ ; 1-carbethoxy deriv., m.  $53-4.5^\circ$ .  $\text{AcCH}:\text{CHCO}_2\text{Me}$  yields a carbethoxyhydrazone, m.  $127-7.5^\circ$ , which gives the above carbethoxy deriv. on closing the ring. In the attempted prepn. of Me 1,3-dimethylpyrazoline-5-carboxylate a small amt. of an oil,  $b_{11}$   $104^\circ$ , was obtained, which turned deep brown in the air.  $\text{MeCH}:\text{CHCO}_2\text{Me}$  and  $\text{CH}_2\text{N}_2$  give Me 4-methylpyrazoline-3-carboxylate, m.  $33-5^\circ$ ,  $d_4^{58.6}$  1.1156,  $n$  1.49518, 1.50105, 1.51762 at  $56.6^\circ$ , Bz deriv., yellow, m.  $89-90^\circ$ .  $\text{MeCHN}_2$  gives Me 4,5-dimethylpyrazoline-3-carboxylate,  $b_{14}$   $139-40^\circ$ ,  $d_4^{21.4}$  1.0994,  $n$  1.50046, 1.50575, 1.52053 at  $21.4^\circ$ ; 1-phenylurethan, m.  $111-3^\circ$ .  $\text{PhCHN}_2$  gives a product which decomp. on distn.; oxidation of the crude product with  $\text{Br}$  gives, after sapon., 4-methyl-3(5)-phenylpyrazole, crystg. with 1  $\text{H}_2\text{O}$ , m.  $234-6^\circ$  (decompn.).  $\text{PhCH}:\text{CHCO}_2\text{Et}$  and  $\text{CH}_2\text{N}_2$  give Et 4-phenylpyrazoline-3-carboxylate, m.  $100-100.5^\circ$ ; Et 4-phenylpyrazole-3(5)-carboxylate, m.  $162-2.5^\circ$ .  $\text{PhCH}:\text{CHCO}_2\text{Am}$  and  $\text{CH}_2\text{N}_2$  give Am 4-phenylpyrazoline-3-carboxylate, m.  $109-11^\circ$ . 3-Phenylpyrazoline-5-carboxylic acid gives a 1-Ac deriv., m.  $216-7.5^\circ$ , a 1-NO deriv., light brown, m.  $133.5^\circ$  (decompn.), and a Me ester, yellow,  $b_{12}$   $178^\circ$ ,  $d_4^{17.6}$  1.1817,  $n$  1.57188, 1.57937, 1.59858 at  $17.5^\circ$  (phenylurethan, m.  $136.5-7.5^\circ$ ); oxidation with  $\text{Br}$  gives 4-bromo-3-phenylpyrazole-5-carboxylic acid, light brown, m.  $256-7^\circ$ . Di-Me maleate and  $\text{MeCHN}_2$  give di-Me 5-methylpyrazoline-3,4-dicarboxylate,  $b_2$   $145-53^\circ$ ,  $d_4^{60.4}$  1.1628,  $n$  1.47944, 1.48415, 1.49657 at  $68.4^\circ$ ; oxidation and sapon. give 5-methylpyrazole-3,4-dicarboxylic acid, m.  $229-30^\circ$ . Di-Me citraconate and  $\text{CH}_2\text{N}_2$  give a mixt. of 3 compds.; the fraction  $b_{14}$   $104^\circ$  is di-Me 1-methyltrimethylene-1,3-dicarboxylate,  $d_4^{20}$  1.112,  $n$  1.44425, 1.44680, 1.45315, 1.45863 at  $19.5^\circ$  for  $\alpha$ ,  $\text{He}$ ,  $\beta$  and  $\gamma$ , the free acid, m.  $141-2.5^\circ$ ; excess of  $\text{AcCl}$  gives the anhydride,  $b_{11}$   $126-7^\circ$ ,  $d_4^{20}$  1.234,  $n$  1.46466, 1.46756, 1.47461 at  $21.2^\circ$  for  $\alpha$ ,  $\text{He}$  and  $\beta$ . The fraction  $b_{12}$   $148^\circ$  is di-Me 3-methyl- $\Delta^1$ -pyrazoline-3,4-dicarboxylate,  $d_4^{21.7}$  1.1973,  $n$  1.46167, 1.46508, 1.47164, 1.47778 for  $\alpha$ ,  $\text{He}$ ,  $\beta$  and  $\gamma$  at  $21.7^\circ$ ; this does not react with  $\text{PhNCO}$ ; oxidation with  $\text{Br}$  gives

3(5)-methylpyrazole-4-carboxylic acid, m. 228°; with HCl in abs. Et<sub>2</sub>O there results the HCl salt, m. about 120°, of *di*-Me 5-methylpyrazoline-4,5-dicarboxylate, *b*<sub>20</sub> 172°, *d*<sub>40</sub> 1.2299, *n* 1.47594, 1.47933, 1.48615, 1.49263 at 20°. The fraction *b*<sub>12</sub> 178° is *di*-Me 4-methylpyrazoline-3,4-dicarboxylate, m. 58–60°, *d*<sub>4</sub><sup>66</sup> 1.1980, *n* 1.48415, 1.48910, 1.50129 for  $\alpha$ ,  $\beta$  and  $\beta$  at 65.8°; phenylurethan, m. 148–9°. *Di*-Me pyrocinchonate and CH<sub>3</sub>N<sub>2</sub> give *di*-Me 3,4-dimethyl- $\Delta^1$ -pyrazoline-3,4-dicarboxylate, *b*<sub>11</sub> 149°, m. 49–51°, *d*<sub>4</sub><sup>17</sup> 1.1750, *n* 1.46393, 1.46735, 1.47349 at 17°. HCl in Et<sub>2</sub>O gives the HCl salt, m. about 160°, of *di*-Me 4,5-dimethylpyrazoline-4,5-dicarboxylate, m. 71–3°, *d*<sub>4</sub><sup>99.7</sup> 1.1242, *n* 1.44618, 1.44966, 1.45509 at 99.7°; phenylurethan, m. 136–7°. PhCH:CMcCO<sub>2</sub>Me and CH<sub>3</sub>N<sub>2</sub> give a PhMeC:CMcCO<sub>2</sub>Me, probably a mixt. of *cis*- and *trans*-forms.

C. J. WEST

**Aminobenzothiazoles. XII.** The mobility of 1-amino-3,5-dimethylbenzothiazole. A case of complete reactivity in the aminothiazole form. ROBERT F. HUNTER AND WM. E. PRIDE. *J. Chem. Soc.* 1929, 943–6; cf. *C. A.* 23, 835. —*m*-Xylylthiocarbamide (I) and Br in CHCl<sub>3</sub> give the intermediate *Br* compd., C<sub>9</sub>H<sub>10</sub>N<sub>2</sub>Br<sub>2</sub>S, orange, m. 273° (decompn.), reduced by SO<sub>2</sub> in H<sub>2</sub>SO<sub>4</sub> to 1-amino-3,5-dimethylbenzothiazole (II), m. 139–40°. I and Ac<sub>2</sub>O at 75° give the labile *Ac* deriv. (III), m. 121–2°, which changes with ease to the stable form (IV), m. 181–2°. III gives 1-imino-2-acetyl-3,5-dimethyl-1,2-dihydrobenzothiazole, m. 118°; this is unchanged after refluxing with 60% H<sub>2</sub>SO<sub>4</sub> for 3 hrs. but with 30% HCl for 3 hrs. it yields II. IV and Br in CHCl<sub>3</sub> give 1-acetamidobenzothiazole, m. 167° (decompn.), reduced by SO<sub>2</sub> to the acetamidobenzothiazole, m. 259–60°, identical with the *Ac* deriv. of II. Methylation of II with MeI gives the *HI* salt, silvery green luster, m. 274° (decompn.), of 1-amino-2,3,5-trimethyl-1,2-dihydrobenzothiazole, m. 105–6°, whose *Ac* deriv., m. 186°. The quantity of II methylated in C<sub>6</sub>H<sub>6</sub> is inappreciable in the 1st few hrs.; after 16 hrs. unchanged II and an *i*-free compd., m. 156–7°, are the only products. *sym*-m-Xylylthiocarbamide, m. 152°; Br in CHCl<sub>3</sub> gives the intermediate *Br* compd., m. 129°, which is reduced to 1-methylamino-3,5-dimethylbenzothiazole, m. 124–5°; *Ac* deriv., m. 156–7°; *HI* salt, m. 225–7° (decompn.). II and Me<sub>2</sub>SO<sub>4</sub> in C<sub>6</sub>H<sub>6</sub> give a methosulfate, m. 216–7°; decompn. with 20% KOH gives II.

C. J. WEST

**Styrylpyrylium salts. XI.** Determination of the reactive group in ketones of the type CH<sub>3</sub>COCH<sub>2</sub>R by means of the benzo- $\beta$ -naphthaspiropyran color change. ISIDOR M. HEILBRON and FRANCIS IRVING. Imp. College Sci. Tech., London. *J. Chem. Soc.* 1929, 936–43; cf. *C. A.* 22, 4526. —Benzo- $\beta$ -naphthaspiropyran substituted in the 3-position ionize on being heated in inert solvents, giving colored solns., while the isomeric 3'-substituted compds. fail to show this phenomenon; this reaction can therefore be utilized in deciding between the structures *o*-HOC<sub>6</sub>H<sub>4</sub>CH:CHCOCH<sub>2</sub>R and *o*-HOC<sub>6</sub>H<sub>4</sub>CH:CH CRAc. The use of this reaction is shown in the case of the ketone of Dickinson (*C. A.* 21, 80) from *o*-HOC<sub>6</sub>H<sub>4</sub>CHO and PhCH<sub>2</sub>COMe. 2-Hydroxy- $\alpha$ -phenylstyryl Me ketone and 2,1-C<sub>10</sub>H<sub>6</sub>(OH)CHO in abs. EtOH, satd. with dry HCl, or a cold soln. of *o*-HOC<sub>6</sub>H<sub>4</sub>CHO and PhCH<sub>2</sub>COMe in abs. EtOH, satd. with dry HCl and then treated with 2,1-C<sub>10</sub>H<sub>6</sub>(OH)CHO give 3-phenylbenzo- $\beta$ -naphthaspiropyran, m. 208–9° to a purple liquid which loses its color on cooling; the colorless soln. in C<sub>6</sub>H<sub>6</sub>Me<sub>2</sub> becomes faintly colored on heating; in PhNO<sub>2</sub> a strong reddish blue color is produced. D's compd., m. 145°, from *o*-MeOC<sub>6</sub>H<sub>4</sub>CHO and PhCH<sub>2</sub>COMe, is probably not *o*-MeOC<sub>6</sub>H<sub>4</sub>CH:CHCOCH(Ph):CHC<sub>6</sub>H<sub>4</sub>OMe (*o*), since an isomeric compd., pale yellow, C<sub>20</sub>H<sub>12</sub>O<sub>2</sub>, m. 180°, results from the condensation of these components with dry HCl at –5°; 1 of these, probably the former, may have a cyclopentenone structure. *Bz*II and AcCH(CHMe<sub>2</sub>)CO<sub>2</sub>Et with NaOH give  $\gamma$ -benzylidene- $\alpha$ -isopropylacetoacetic acid, m. 134° (decompn.); heating with Cu at 130–40° for 1.5 hrs. gives styryl iso-Bu ketone. *o*-HOC<sub>6</sub>H<sub>4</sub>CHO and iso-BuCOMe with EtOH-NaOH give 2-hydroxystyryl iso-Bu ketone, yellow, m. 104°; with 2,1-C<sub>10</sub>H<sub>6</sub>(OH)CHO this gives 3'-isopropylbenzo- $\beta$ -naphthaspiropyran, pale yellow, m. 118°, which gives colorless solns. in veratrole and Ph<sub>2</sub>O. 3-Isopropylidene- $\beta$ -naphthaspiropyran, m. 204°, gives purple solns. in boiling C<sub>6</sub>H<sub>6</sub>Me<sub>2</sub> or veratrole. 2-Hydroxystyryl nonyl ketone gives 3'-octylbenzo- $\beta$ -naphthaspiropyran, m. 101–2°, which gives colorless solns. in Ph<sub>2</sub>O and C<sub>6</sub>H<sub>6</sub>Me<sub>2</sub>. Me nonyl ketone gives 3-octylidene- $\beta$ -naphthaspiropyran, m. 157°, which gives a purple soln. in boiling C<sub>6</sub>H<sub>6</sub>Me<sub>2</sub>. **XII. Spiropyrans** derived from 9-methyl- and 9-ethylxanthylum salts. FRANCIS IRVING. *Ibid* 1093–5. —9-Methylxanthanol (I), 2,1-C<sub>10</sub>H<sub>6</sub>(OH)CHO and dry HCl give xantha- $\beta$ -naphthaspiropyran, m. 201° to a deep red liquid; in boiling Ph<sub>2</sub>O a deep strawberry color develops. *o*-HOC<sub>6</sub>H<sub>4</sub>CHO and I with HCl give benzo-xantha- $\beta$ -piropyran (II), m. 154°. 9-Ethylxanthanol and 2,1-C<sub>10</sub>H<sub>6</sub>(OH)CHO give

3'-methylxantha- $\beta$ -naphthaspiropyran (III), m. 271°. Solns. of II and III in Ph<sub>2</sub>O remain colorless when heated. C. J. WEST

**Methoxy derivatives of thioxanthone.** KENNETH C. ROBERTS AND SAMUEL SMILES. *J. Chem. Soc.* 1929, 863-72.—2-HSC<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>H, 4-IC<sub>6</sub>H<sub>4</sub>OMe, K<sub>2</sub>CO<sub>3</sub> and Cu(OAc)<sub>2</sub> in AmOH, boiled 16 hrs., give 90% of 2'-carboxy-4-methoxydiphenyl sulfide (I), m. 232°. In the reduction of 2,4-O<sub>2</sub>N(MeO)C<sub>6</sub>H<sub>3</sub>Me with Sn and HCl there results a small amt. of a chloro-4-methoxy-*o*-toluidine, m. 112°. 2-Iodo-4-methoxytoluene, pale yellow, b. 252-3°; with 2-HSC<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>H as above, this gives 75% of 2'-carboxy-5-methoxy-2-methyldiphenyl sulfide (II), m. 176-7°. 4-IC<sub>6</sub>H<sub>4</sub>(OMe)<sub>2</sub> gives 2'-carboxy-3,4-dimethoxydiphenyl sulfide (III), m. 212-3°. I and H<sub>2</sub>SO<sub>4</sub> at 15° for 1 hr. give 2-methoxythioxanthone, m. 129; perchlorate, orange; the compd. absorbs dry HCl but the product is unstable. A mixt. of 2-HSC<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>H, 16 g. 4-ClC<sub>6</sub>H<sub>4</sub>OMe and 150 cc. H<sub>2</sub>SO<sub>4</sub>, stirred 1.5 hrs., gives 8 g. 1-chloro-4-methoxythioxanthone, pale yellow, m. 196°; this does not give a perchlorate or HCl salt; with *p*-H<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>Me and a little AcOK and Cu(OAc)<sub>2</sub> there results the 1-*p*-toluidino deriv., red, m. 133° (HCl salt, yellow). 4-MeOC<sub>6</sub>H<sub>4</sub>Me and 2-HSC<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>H give 4-methoxy-1-methylthipxanthone, pale yellow, m. 162°, which does not yield a perchlorate. II and concd. H<sub>2</sub>SO<sub>4</sub>, stirred for 1 hr., give 1-methoxy-4-methylthioxanthone, bright yellow, m. 128°; it absorbs 3 mols. HCl, giving a red salt; the crimson perchlorate is relatively stable. 1,4-Dimethoxythioxanthone gives a crimson *di*-HCl salt, a deep red chloroplatinate, a red ferrichloride and a crimson perchlorate. 2-Bromoveratric acid, PhSH, K<sub>2</sub>CO<sub>3</sub> and Cu(OAc)<sub>2</sub> in boiling AmOH for 3.5 hrs. give, after treatment with H<sub>2</sub>SO<sub>4</sub>, 3,4-dimethoxythioxanthone, pale yellow, m. 185°; the perchlorate is orange but the HCl salt was too unstable for examn. *o*-C<sub>6</sub>H<sub>4</sub>(OH)<sub>2</sub> and 2-HSC<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>H with concd. H<sub>2</sub>SO<sub>4</sub> give 2,3-dihydroxythioxanthone (IV), analyzed as the *di*-Ac deriv., pale yellow, m. 191°; it does not form a boracetate. 1,4-Dihydroxythioxanthone yields a crimson boracetate, decompd. by boiling H<sub>2</sub>O to 1-hydroxy-4-acetoxythioxanthone, yellow, m. 171°; the *di*-Ac deriv., yellow, m. 168°. Methylation of IV or dehydration of III gives 2,3-dimethoxythioxanthone (V), pale yellow, m. 172°; *di*-HCl salt, orange; ferrichloride, orange or chocolate-brown (2V.HfFeCl<sub>4</sub> or V.HfFeCl<sub>4</sub>). 1,2-Dimethoxythioxanthone, yellow, m. 143-4°. 2,3,4-Trimethoxythioxanthone, m. 153-4°; *di*-HCl salt, orange; perchlorate, orange. C. J. WEST

**Polarity of the halogens in solutions of pyridinium and allied dichloriodides.** THOMAS H. READE. *J. Chem. Soc.* 1929, 853-63.—C<sub>5</sub>H<sub>5</sub>NCl<sub>2</sub>I and PhMe<sub>3</sub>NCl<sub>2</sub>I are highly dissociated in H<sub>2</sub>O, the solns. being rich in H ions, Cl ions, HIO and its decompn. products; mol. Cl and I ions are absent. The retarding effect of electrolytes contg. Cl and H ions on the dissocn. of these compds. has been measured. The probability that these are double salts contg. a highly reactive, positively charged I atom is discussed. HIO behaves similarly toward phenolic substances and aromatic amines. The original should be consulted for the detailed discussion. C. J. WEST

**Action of mercuric acetate on phenylcinchoninic acid.** B. CECCHETTI AND E. GODI. Reale Univ. Bologna. *Gazz. chim. ital.* 58, 764-5(1928).—Hg(OAc)<sub>2</sub> (I) in very dil. AcOH added to  $\alpha$ -phenylcinchoninic acid (II) (2 mols.), filtered, washed with EtOH and Et<sub>2</sub>O and dried *in vacuo* over H<sub>2</sub>SO<sub>4</sub>, yields the compd. C<sub>22</sub>H<sub>20</sub>O<sub>2</sub>N<sub>2</sub>Hg, light yellow, decomps. at a high temp. without fusion. It is probably the neutral Hg salt of II, [C<sub>6</sub>H<sub>4</sub>.N:CPh.CH:CCOO]<sub>2</sub>Hg. On the other hand when equimol. parts of I and II

are heated, there is obtained the compd. C<sub>16</sub>H<sub>9</sub>O<sub>2</sub>NHg, decomps. without fusion. It is prob-

ably hydroxymercurio- $\alpha$ -phenylcinchoninic anhydride,  $\text{C}_6\text{H}_4\text{.N:CPh.CH:CCOO.O Hg}$ .

The results are interesting in their analogy to the reaction of Na salicylate and I (cf. *Gazz. chim. ital.* 32, 2(1902)). C. C. DAVIS

**Preparation of quinaldinic acid.** THOMAS W. J. TAYLOR. Dyson Perrins Lab., Oxford. *J. Chem. Soc.* 1929, 1110-1.—In the prepn. of quinaldinic acid by Reissert's method (*Ber.* 38, 1610(1905)) the tedious operation of removing the Cu with H<sub>2</sub>S may be avoided by taking advantage of the low soly. of the Na salt in cold NaOH. The Cu salt is boiled with about 2 N NaOH until all the Cu is present as oxide and the hot soln. filtered; the Na salt, crystg. with 1.5 H<sub>2</sub>O, seps. in 85% yield on cooling. At room temp. the Na salt is about 40 times less sol. in 1.5 N NaOH than it is in H<sub>2</sub>O. The acid is obtained by adding the theoretical amt. of HCl to the aq. soln. of the Na salt. C. J. WEST

**The Doebner reaction. VII. Syntheses with  $\beta$ -aminoanthracene.** R. CILSA AND L. MUSAJO. *Gazz. chim. ital.* 59, 70-4(1929); cf. C. and Cremonini, *C. A.* 22, 2565.—BzH (5.5 g.) and  $\beta$ -aminoanthracene (10 g.) suspended in EtOH (200 cc.), refluxed



to carbonaceous products. With  $\text{PhHNNH}_2$  and with  $\text{Na}_2\text{S}_2\text{O}_4$ , alk. solns. of VI become an intense blue, but this disappears on oxidation, *e. g.*, by exposure to the air. Suspended in concd.  $\text{HCl}$ , VI and  $\text{SnCl}_4$  give an intense blue color, but no definite products could be purified. The impure products gave an intense blue color in concd.  $\text{H}_2\text{SO}_4$ .

C. C. DAVIS

**Merquinoid derivatives of 9,10-dihydrophenarsazine.** I. G. RASUVAYEV. *Ber. 62B*, 605-16(1929); *J. Russ. Phys.-Chem. Soc.* 61, 13-28(1929).—(The notation with  $\text{N} = 9$  and  $\text{As} = 10$  is used.) Wieland called attention to a reaction characteristic of derivs. of dihydrophenarsazine (I), *viz.*, an intense red color of their solns. in  $\text{H}_2\text{SO}_4$  which he explained on the basis of halochromism. There is nothing in the literature to show whether other acids also produce this color. R. has now found that the oxide of I dissolves in  $\text{HClO}_4$  with red, in fused  $\text{ClCH}_2\text{CO}_2\text{H}$  with green color (changing to blue on standing) and in  $\text{Cl}_3\text{CCO}_2\text{H}$  with green color. 10-Chloro(or bromo)-9,10-dihydrophenarsazine, the oxide, the  $\text{MeO}$  deriv., trisdihydrophenarsazinamine, as well as the acetate and sulfate all dissolve (relatively little) in cold  $\text{HCO}_2\text{H}$  with faint yellow color changing on warming to an extraordinarily intense red which on cooling, especially with shaking, rapidly disappears and on warming appears again. Here halochromism as an explanation of the color is excluded, as is also dissocn. into the free phenarsazine (Wieland), since the color is produced at relatively low temps. (heating in  $\text{HCO}_2\text{H}$  contg.  $\text{Me}_2\text{CO}$ ) and the colored soln. is not sensitive to water but is very sensitive to atm. O and is decolorized with absorption of O. A careful study has shown that when the oxide, the  $\text{Me}$  ether or the acetate is dissolved in cold  $\text{HCO}_2\text{H}$ , there is

formed the corresponding formate,  $\text{C}_6\text{H}_4 \begin{array}{c} \text{AsR} \\ \diagup \quad \diagdown \\ \text{NH} \end{array} \text{C}_6\text{H}_4$  (II,  $\text{R} = \text{O}_2\text{CH}$ ), which, boiled

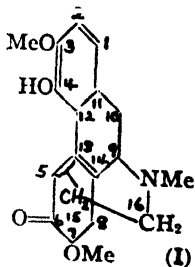
in  $\text{Me}_2\text{CO}$  or alc. alone, gives no color but on addn. of  $\text{HCO}_2\text{H}$  develops an intense red color. This intense color is readily produced by heating a  $\text{HCO}_2\text{H}$  soln. of the sulfate and chloride ( $\text{R} = \text{Cl}$ ), with considerably greater difficulty from the bromide, the iodide gives no color at all. Decolorization of these solns. with air regenerates the original salt. When the color begins,  $\text{CO}_2$  is evolved, indicating that the  $\text{HCO}_2\text{H}$  decomps. into  $\text{CO}_2 + \text{H}_2$ , the latter being used up in reducing the II and forming the intensely colored deriv. This reduction can be catalyzed by adding Pt sponge in the cold; even more effective is H itself. The color is also produced by other reducing agents ( $\text{SnCl}_2$  or Zn and  $\text{AcOH}$ ). From the amt. of  $\text{CO}_2$  liberated when the  $\text{HCO}_2\text{H}$  soln. is heated, it can be calcd. that 1 atom H is used up per mol. of II, which would correspond to a quinhydrone structure for the colored product, but such a structure fails to explain a no. of the properties of the colored soln.: its distinctly unsatd character (it adds O, Cl, Br, I, NO and  $\text{NO}_2$ ) and its quite high elec. cond. All of these properties point to the presence of radicals; of the possible formulas, R. gives the preference

to the merquinoid, half-free radical  $\left[ \text{C}_6\text{H}_4 \begin{array}{c} \vdots \\ \text{AsH} \\ \diagup \quad \diagdown \\ \text{NH} \end{array} \text{C}_6\text{H}_4 \right] \text{X}$  (III), as the absorption

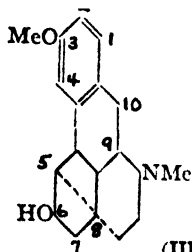
spectrum shows a broad band beginning in the green part of the spectrum and the colored solns. show a salt-like character; if such solns. (in  $\text{HCO}_2\text{H}$ ,  $\text{AcOH}$ , alc.,  $\text{Me}_2\text{CO}$ ,  $\text{PhOH}$ ) are shaken with  $\text{C}_6\text{H}_6$  or other hydrocarbons, the hydrocarbon layer remains perfectly colorless; on heating the  $\text{HCO}_2\text{H}$  soln. of the II ( $\text{R} = \text{Cl}$ ) the elec. cond. was greatly increased (to about 25% of the cond. of a  $\text{NaCl}$  soln. of the same concn.). One atom of halogen is required to decolorize the III but the product of direct addn. could not be isolated; there was always obtained quant. the II ( $\text{R} = \text{halogen}$ ), irrespective of the nature of X (Cl, Br,  $\text{O}_2\text{CH}$ ,  $\text{HSO}_3$ ) in the III. The H on the As in the III is very loosely held, the original II being regenerated by shaking with O in the cold or by heating with S; 0.5 atom O per mol. III is consumed. 9,10-Dihydrophenarsazine formate, from the oxide in  $\text{Me}_2\text{CO}$  suspension slowly treated with  $\text{HCO}_2\text{H}$  until it dissolves completely, needles unstable in the air, darkens about  $100^\circ$ , then becomes entirely black and finally yellow around  $150^\circ$ . The reduced solns. of the II in  $\text{HCO}_2\text{H}$  add I instantly, yielding the iodide (II,  $\text{R} = \text{I}$ ), intensely red, m.  $222-4^\circ$ . Bromide, intensely yellow, m.  $210^\circ$ . Chloride, m.  $191-3^\circ$ . NO is absorbed only very slowly in  $\text{HCO}_2\text{H}$  alone but rapidly in a mixt. of equal parts of  $\text{EtOH}$  and  $\text{HCO}_2\text{H}$ ; an appreciable amt. is absorbed after the soln. has become decolorized (faintly yellow) and the total amt. absorbed varies greatly in different expts. under the same conditions. The addn. product could not be isolated; the decolorized soln. decomps. very rapidly in the air with formation of a ppt. and appearance of a deep brown color. C. A. R.

23, 3446.—In attempting to explain why  $\text{AsCl}_3$  and  $(2,4\text{-Cl}_2\text{C}_6\text{H}_3)_2\text{NH}$  do not condense to give 2,4,6,8,10-pentachloro-5,10-dihydrophenarsazine, it has been suggested that the compd. might be too unstable to exist. In order to test this, some typical compds. have been subjected to the action of Br; this action, in every case studied, led to the removal of As and the formation of  $\text{Ph}_2\text{NH}$  derivs. 10-Chloro-5,10-dihydrophenarsazine from  $\text{Ph}_2\text{NH}$  and Br in AcOH; this may be the 2,2',4,4'-Br<sub>2</sub> deriv. The bromination was carried out under varying conditions but the product was always the same 10-methyl-5,10-dihydrophenarsazine gave the same tetra-Br deriv. 10-Chloro-2,8-dimethyl-5,10-dihydrophenarsazine gives a tetrabromodi-*p*-tolylamine, m. 161–2°, identical with the compd. from  $(p\text{-MeC}_6\text{H}_4)_2\text{NH}$  and Br. 7-Chloro-7,12-dihydrobenzophenarsazine and Br give a tetrabromophenyl- $\alpha$ -naphthylamine, m. 150°; 12-chloro-7,12-dihydrobenzophenarsazine gives the  $\beta$ -naphthyl deriv., m. 205° (*Ber.* 20, 1170(1887)).  $\text{C}_6\text{H}_4\text{Me}$ , m. 167–70°; 12-chloro-10-methyl-7,12-dihydrobenzophenarsazine gives a Br<sub>2</sub> deriv. of  $\alpha\text{-C}_6\text{H}_4\text{NH}_2$  deriv., m. 165°, of  $\beta\text{-C}_{10}\text{H}_7\text{NHC}_6\text{H}_4\text{Me}(p)$ . Bromination of phenarsazinic acid in boiling AcOH gives 2,4,6,8,10-pentabromo-5,10-dihydrophenarsazine, yellow, m. 275° and a small amt. of the 2,4,6,8-tetra-Br deriv., also obtained by the action of  $\text{H}_2\text{O}_2$  in AcOH upon the penta-Br deriv., m. 294° (decompn.).

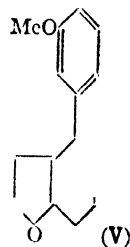
**Constitution of sinomenine.** HEIZABURO KONDO AND EIJI OCHIAI. *C. J. WEST* 224 54(1929); cf. *J. Pharm. Soc. Japan* No. 497, 503, 538; *C. A.* 22, 964–5, 4531—et Wils., found in South Japan. I, liberated from the HCl salt with  $\text{Na}_2\text{CO}_3$  and form is also obtained by adding  $\text{NH}_4\text{OH}$  to the aq. soln. of the HCl salt, on standing it reverts to the lower melting form; analysis and mol. wt. indicate the formula  $\text{C}_{19}\text{H}_{23}\text{NO}$ ;  $[\alpha]_D^{26} -70.76^\circ$  (0.2120 g. in 10 cc. EtOH); *HCl* salt, decomp. 231°,  $[\alpha]_D^{17} -6.89^\circ$  (4.1812 g. in 100 cc.  $\text{H}_2\text{O}$ ), crystals with 2  $\text{H}_2\text{O}$ ; *chloroaurate*, amorphous; *methiodide*, m. 251°; *Bz* deriv., by heating I and  $\text{Bz}_2\text{O}$  4 hrs. at 100°, m. 225°,  $[\alpha]_D^{26} -3.37^\circ$  (0.3075 g. in 10 cc. EtOH) (*chloroaurate*); *Me* deriv., from I and  $\text{CH}_3\text{N}_2$ , m. 175° (*HCl* salt, m. 252°; *semicarbazone*, decomp. 250–2°); *oxime*, m. 254° (decompn.); *semicar-*



(I)



(III)



(V)

*bazone*, decomp. 264°. Catalytic reduction of I according to Skita gives the *dihydro* deriv. (II), m. 199°,  $[\alpha]_D^{16} 170.5^\circ$  (0.1756 g. in 15 cc. EtOH); *semicarbazone*, decomp. 207°. *I* and Br in AcOH give 2 *Br* derivs., m. 138° and 205°.  $\text{ClCO}_2\text{Et}$  and KOH give the compd.  $\text{C}_{20}\text{H}_{25}\text{NO}_4\text{Cl}$ , m. 166–83° (decompn.),  $[\alpha]_D^{17} -108.4^\circ$  (0.2265 g. in 12 cc.  $\text{CHCl}_3$ ). Heating I and  $\text{Bz}_2\text{O}$  6 hrs. at 150–60° gives the compd.  $\text{C}_{20}\text{H}_{25}\text{O}_6$ , m. 206°, gives a purple-red color with concd.  $\text{H}_2\text{SO}_4$  and a red-brown color with hot NaOH. Zn distn. of I gives phenanthrene and  $\text{Me}_3\text{N}$ . Reduction of I with amalgamated Zn and HCl gives *desoxytetrahydrosinomenine* (III), m. 150–1°, crystg. with 0.5  $\text{H}_2\text{O}$ ,  $[\alpha]_D^{21} 48.20^\circ$  (0.1774 g. in 15 cc. EtOH); *III* salt, m. 250–1°; *methiodide*, m. 265°; does not react with Co reagents; III is the optical antipode of dihydrothebaccodine (Speyer and Siebert, *C. A.* 15, 3975); a mixt. of the 2, crystd. from  $\text{Me}_2\text{CO}$ , is optically inactive. *III*, *MeI* and KOH, heated until a brown oil seps., gives *des-N-methyl-desoxytetrahydrosinomenine* (IV), m. 140°,  $[\alpha]_D^{21} -41.59^\circ$  (0.1635 g. in 20 cc. MeOH); *methiodide*, hygroscopic; transformed into the chloride and heated with KOH, there results

the *compd.* V, pale yellow, m. 93°,  $[\alpha]_D^{17}$  —181.6° (0.1564 g. in 20 cc. EtOH) and  $\text{Me}_3\text{N}$  V is stable toward cold  $\text{KMnO}_4$  but on boiling a *compd.*, m. 115°, is obtained; V is not changed by boiling with  $\text{Ac}_2\text{O}$  for 15 mins. Reduction of II with Na-Hg gives the *compd.*  $\text{C}_{18}\text{H}_{25}\text{NO}_3$ , m. 92–105° (decompn.),  $[\alpha]_D^{20}$  32.02° (0.1374 g. in 20 cc. EtOH); *methiodide*, m. 268–72°,  $[\alpha]_D^{29}$  23.9° (0.1548 g. in 20 cc. MeOH). This is *des-methoxy-dihydrosinomeninol* and is the optical antipode of the reduction product of dihydrothebainone (*dihydrothebainol*, m. 144°,  $[\alpha]_D^{28}$  —46.2°; *methiodide*, m. 278° (decompn.),  $[\alpha]_D^{29}$  —24.25°), since a mixt. of the 2 is optically inactive. Reduction of I with Na-Hg gives the amorphous *base*,  $\text{C}_{18}\text{H}_{25}\text{NO}_3$ , m. 180°,  $[\alpha]_D^{27}$  —11.24° (0.1424 g. in 20 cc. EtOH). Heating 9 g. Na homoveratrumate and 9 g. *o*-nitroveratrumic aldehyde in 50 cc.  $\text{Ac}_2\text{O}$  50 hrs. at 110–20° gives  $\alpha$ -3,4-dimethoxyphenyl-2-nitro-3',4'-dimethoxycinnamic acid, yellow, m. 191–2°; reduction with  $\text{FeSO}_4$  and  $\text{NH}_4\text{OH}$  gives the 2-amino deriv., yellow, m. 146°; the diazo *compd.* gives a mixt. of 3,4,5,6-tetramethoxyphenanthrene-9-carboxylic acid (VI), m. 234°, and the 3,4,6,7-tetra-MeO deriv., m. 210°. The latter, heated with AcOH 20 hrs. at 250–60°, gives 3,4,6,7-tetramethoxyphenanthrene, m. 124–5°, identical with dimethylsinomenol (cf. Goto, *J. Agr. Chem. Soc. Japan* 2, No. 17).  $\alpha$ -3',4'-Dimethoxy-6'-bromo-2-nitro-3,4-dimethoxycinnamic acid, yellow, m. 216°; 2- $\text{NH}_2$  deriv., yellow, m. 187°; 8-bromo-3,4,5,6-tetramethoxyphenanthrene-9-carboxylic acid, m. 187–8° (decompn.); reduction gives VI. Catalytic reduction of thebainone with Pd gives  $\beta$ -dihydrothebainone, m. 76°,  $[\alpha]_D^{27}$  —83.94° (0.2323 g. in 20 cc. EtOH); picrate, yellow, m. 245°; semicarbazone, m. 199–201° (decompn.). Reduction of dihydrohydroxycodone according to Clemmensen gives dihydrohydroxythebaine, m. 138–9°,  $[\alpha]_D^{25}$  —58.15° (0.1135 g. in 20 cc.  $\text{Me}_2\text{CO}$ ) I (5 g.) and 6.2 g.  $\text{AgNO}_3$  in  $\text{H}_2\text{O}$  give, after 36 hrs., the *nitrate*, decomps. above 280° of dehydrosinomenine, m. 218–20°,  $[\alpha]_D^{12}$  97.38° (0.1222 g. in 30 cc. MeOH). Catalytic reduction (Pd) gives isodihydrosinomenine,  $\text{C}_{19}\text{H}_{25}\text{NO}_4$ , decomps. 271°,  $[\alpha]_D^{24}$  171.16° (0.1579 g. in 20 cc. EtOH); *methiodide*; *oxime*, m. 245–50° (decompn.). This *compd.* also results by the action of  $\text{AgNO}_3$  on II; a 2nd product, insol. in  $\text{Me}_2\text{CO}$ , is apparently  $2\text{C}_{19}\text{H}_{25}\text{NO}_4$ , m. 270°,  $[\alpha]_D^{13}$  113.8° (0.0914 g. in 20 cc. MeOH). Thebaine and  $\text{AgNO}_3$  give  $\psi$ -thebaine,  $\text{C}_{19}\text{H}_{21}\text{NO}_3$ , decomps. 227°,  $[\alpha]_D^{16}$  —339.5° (0.1352 g. in 20 cc.  $\text{Me}_2\text{CO}$ ); semicarbazone, decomps. above 290°; dihydro deriv., m. 270° (decompn.),  $[\alpha]_D^{25}$  —71.77° (0.1045 g. in 20 cc.  $\text{Me}_2\text{CO}$ ).

C. J. WEST

**Strychnine and brucine. VIII. Action of hydriodic acid on strychnidine.** Dihydrostrychnidine (B) and substances derived therefrom. Wm. H. PERKIN, JR., AND ROBERT ROBINSON. *J. Chem. Soc.* 1929, 964–1000.—Strychnidine (25 g.), 100 cc. HI (d. 1.94) and 8 g. P, boiled 24 hrs., give dihydrostrychnidine (B) (I),  $\text{C}_{21}\text{H}_{29}\text{ON}_2$ , softens 145°, m. 151°; it is very sol. in org. solvents and thus difficult to obtain pure; it does not react with  $\text{NH}_4\text{OH}$ , is not reduced by Na and EtOH or electrolytically; it does not yield an Ac deriv. and does not condense with aldehydes. The HCl salt crystallizes with 3 $\text{H}_2\text{O}$ , of which 2 are lost at 100° and then m. 123°; the anhyd salt, m. 144–7°. A soln. of I in dil.  $\text{H}_2\text{SO}_4$  contg. a little  $\text{H}_2\text{SO}_3$  and excess NaI gives di-III salt, which loses HI when boiled with MeOH, giving the mono-III salt, m. 235–40° (decompn.); boiling with  $\text{H}_2\text{O}$  and AgCl gives the HCl salt. I and  $\text{Me}_2\text{SO}_4$  in  $\text{C}_6\text{H}_6$  at 10° give the methosulfate (a); with NaI in warm  $\text{H}_2\text{O}$  there results the methiodide (a) (II), m. 340–5° (decompn.);  $\text{CHCl}_3$  forms an addn. *compd.*, which gradually decomps. in the air and more rapidly over  $\text{H}_2\text{SO}_4$  in *vacuo*; AgCl and  $\text{H}_2\text{O}$  gives the methochloride (a), m. 335–40° (decompn.) with the formation of I. I and  $\text{Me}_2\text{SO}_4$  in warm  $\text{C}_6\text{H}_6$  give the dimethosulfate (A); NaI gives the dimethiodide (A) (III), m. 238–42° (decompn.) and appears to give an addn. *compd.* with  $\text{CHCl}_3$ . The dimethochloride (A) forms a resin which, on heating at 120°, gives methoxymethyltetrahydrostrychnidine (B) (IV), m. 178–80°. The dimethobromide (B) decomps. at about 345°. I and MeI in cold MeOH give II; heating the MeOH soln. 2 hrs. gives a mixt. of II, III and the (B) isomer of III, m. 260–5° (decompn.), purified by repeated crystn. from MeOH. II is easily obtained by digesting the crude dimethiodides with MeOH-KOH. II methiodide (b) is obtained by digesting the dimethiodide (B) with MeOH-KOH, it shrinks at 250° and gradually melts as the temp. rises; it does not combine with  $\text{CHCl}_3$ . The methochloride (b) crystallizes with 2 $\text{H}_2\text{O}$ , lost at 100°; heating with MeOH-KOH at 120–30° gives IV. The methobromide (b) decomps. at 340–5°. I and  $\text{PhCH}_2\text{Cl}$  in boiling PhMe give the benzyl chloride, m. 325° (decompn.), giving a yellow gum, consisting in part of I. Oxidation of I in  $\text{Me}_2\text{CO}$  with  $\text{KMnO}_4$  gives dihydrostrychnine



(B),  $C_{21}H_{24}O_2N_2$  (V), m. about  $196^\circ$ , which yields a sparingly sol. HCl salt, and a HI salt, m.  $350-5^\circ$ ; the *methiodide*, pale yellow, m. about  $365^\circ$  (decompn.); *methochloride*, m.  $370-5^\circ$  (decompn.); *methobromide*, m. about  $375^\circ$  (decompn.); *benzylidene deriv.*, pale lemon-yellow, m.  $270-5^\circ$  (HCl salt). II does not appear to yield an oxime. The  $MnO_2$  ppt., extd. with  $H_2O$ , gives a small amt. of an acid,  $C_{21}H_{21}O_7N_2$ , decomp. about  $205^\circ$ . Hydrolysis of V with EtONa gives *dihydrostrychnic acid* (B), m.  $285^\circ$  (decompn.); HCl salt; at the m. p.  $H_2O$  is eliminated and V formed. V and  $H_2O_2$  give *dihydroxydihydrostrychnic acid*,  $C_{21}H_{28}O_6N_2$ , decomp.  $300-5^\circ$ . Oxidation of dihydrostrychnidine (A) with  $KMnO_4$  in  $Me_2CO$  gives *hydroxydihydrostrychnidine* (A),  $C_{21}H_{24}O_2N_2$ , m. about  $345^\circ$ , isomeric with V. Decompn. of II.MeCl or II.2MeCl with MeOH-KOH, gives a mixt. of *methoxymethyltetrahydrostrychnidine* (B) (VI), m.  $179-80^\circ$ , *methyl- $\psi$ -strychnidine* (B), (VII), m.  $222-5^\circ$ , and *dihydrostrychnidine* (C) (VIII), m.  $132-4^\circ$ . VI is not changed by boiling with  $10\%$   $H_2SO_4$  for 2 hrs. and is not reduced electrolytically. The III salt decomp.  $175-80^\circ$  and then m. again  $235^\circ$  and then again  $325^\circ$ ; at  $250-60^\circ$  MeOH is eliminated, giving II; VI may also be changed into II by boiling with HI and P for 2 hrs. VI yields a *methiodide* (IX), which decomp.  $235-8^\circ$ ; at  $250^\circ$  MeI is lost and VI reformed. The *methochloride* decomp.  $170^\circ$  and gives VI. The *dimethosulfate* is deliquescent; NaI transforms it into the *dimethiodide*, m.  $210^\circ$ , which gives IX with  $25\%$  MeOH-KOH. The  $PhCH_2Cl$  compd. of II and MeOH-KOH at  $150^\circ$  give *methoxybenzyltetrahydrostrychnidine* (B), m.  $126.7^\circ$ . Oxidation of VI with  $KMnO_4$  in  $Me_2CO$  gives *formylmethoxytetrahydrostrychnidine* (B), m.  $154^\circ$ ; this is not hydrolyzed by EtONa, does not react with MeI or BzI but with dil.  $H_2SO_4$  gives *methoxytetrahydrostrychnidine* (B) (X),  $C_{21}H_{26}O_2N_2$ , m.  $150-2^\circ$  (NO deriv., light yellow; MeI gives the HI salt of VI); distn. of the formyl deriv. gives what appears to be a 2nd modification of X, m.  $137^\circ$ , transformed into X by boiling with dil.  $H_2SO_4$ , and therefore probably contaminated with some unchanged formyl deriv. VII yields a *dimethiodide*, m.  $275^\circ$ , decomp.  $280-5^\circ$ ; the *dimethochloride* could not be prepd. VIII is monoclinic,  $a:b:c = 1.037:1.2:\beta = 113^\circ 48'$ , the *dimethiodide*, m.  $265-70^\circ$  (decompn.); the *dimethochloride* is a brittle mass, from which MeCl is eliminated with MeOH-KOH, giving VIII. *Benzylidenestrychnine*, m.  $235-7^\circ$ , from the yellow HCl soln. a sparingly sol. HCl salt seps. *Benzylidenebrucine* crystallizes with difficulty, but the HCl salt crystallizes with  $0.5 H_2O$  as yellow needles. *Strychnidine methochloride* crystallizes with  $2H_2O$  and m.  $370^\circ$  (decompn.). *Strychnidine dimethosulfate* crystallizes in long needles; the *dimethochloride* is a gum. *Strychnidine benzyl chloride*, m.  $330-5^\circ$  (decompn.); with MeOH-KOH this gives *methoxybenzyl-dihydrostrychnidine*, m.  $92-5^\circ$ . Many color reactions are described for these various compds.

C. J. WEST

**Strychnine and brucine.** VIII. R. CIUSA. *Gazz. chim. ital.* **58**, 774-5(1928); cf. C. and Scagliarini, *C. A.* **18**, 3192.—Comments on the relation between expts. of Oxford, Perkin and Robinson (*C. A.* **22**, 430) and their relation to the earlier researches of C. (cf. *Rend. accad. Lincei* **21**, ii, 84; **23**, ii, 480; **28**, ii, 185; *C. A.* **18**, 3192). The existence of an OH group and of a double bond in isostrychnine is now firmly established.

C. C. DAVIS

**Higher terpene compounds.** XXXVII. Agathidicarboxylic acid, the crystalline resin acid,  $C_{20}H_{30}O_4$ , of kauri, hard and soft Manila copals. L. RUZICKA AND J. R. HOSKING. *Ann.* **469**, 147-92(1929); cf. *C. A.* **23**, 3455.—The isolation of the  $Et_2O$ -sol. cryst. resin acids from the above copals by the method of Horrmann and Kroll (*Arch. Pharm.* **265**, 214(1927)) and careful fractionation of the product with  $(NH_4)_2CO_3$ ,  $Na_2CO_3$  and NaOH are described. From each copal is isolated the same cryst. dibasic acid,  $C_{20}H_{30}O_4$ , m.  $203-4^\circ$ ,  $[\alpha]_D^{25} 52-56^\circ$  in EtOH, for which the name *agathidicarboxylic acid* (I) is suggested. The various dibasic acids isolated from different copals are probably more or less impure forms of this acid. By a large no. of analyses and direct comparison of the acids and the derivs. described below, the identity of the parent acids from various sources is definitely established and the above compn. assigned in preference to the alternative  $C_{20}H_{30}O_4$ . Mol. refractivity data support this conclusion. The systematic nomenclature used is suggested by R. and H. to replace the various names occurring in the earlier literature. By the Ag salt method I yields a *di-Me ester*,  $b_{0.1} 196-8^\circ$ ,  $[\alpha]_D^{25} 61.2^\circ$  to  $54.6^\circ$  in EtOH,  $d_4^{25} 1.076$ ,  $n_D^{25} 1.5178$ . Catalytic reduction of I yields the *tetrahydro deriv.*, purified through its *di-Me ester*,  $b_{0.1} 189-90^\circ$ ,  $b_{0.1} 165-6^\circ$ ,  $[\alpha]_D^{25} 47.9^\circ$  to  $42.4^\circ$  in EtOH,  $d_4^{25} 1.040$ ,  $n_D^{25} 1.4910$ . Heating I above its m. p. gives *noragathic acid*,  $C_{19}H_{28}O_4$ ,  $b_{0.1} 195-7^\circ$ ,  $b_{0.1} 180-3^\circ$ , m.  $146.7^\circ$ ,  $[\alpha]_D^{25} 59.3^\circ$  (1.81% soln. in EtOH); *Me ester*,  $b_{0.1} 151-2^\circ$ ,  $d_4^{25} 1.002$ ,  $n_D^{25} 1.5087$ ,  $[\alpha]_D^{25} 57.02^\circ$  (4.5% soln. in EtOH). Catalytic reduction gives *tetrahydronoragathic acid*, m.  $133^\circ$   $[\alpha]_D^{25}$

50.3° (2.2% soln. in EtOH); *Me ester*,  $b_{0.5}$  141-2°, m. 52-3°,  $d_4^{25}$  0.9411,  $n_D^{25}$  1.4693. I thus contains 2 double bonds, which, unlike those in abietic acid, exhibit no difference in reactivity and the mol. refractivity data are in good agreement with the dicyclic structure thus required. Catalytic dehydrogenation of the amorphous, Et<sub>2</sub>O-sol. resin acids from kauri copal with Se yields the C<sub>10</sub>H<sub>8</sub>MeEt obtained similarly from soft Manila copal, a hydrocarbon, C<sub>17</sub>H<sub>20</sub> (*picrate*, m. 138°), and some retene, but no pimarthere. Dehydrogenation of pure I yields the same hydrocarbon, C<sub>17</sub>H<sub>20</sub>, and pimarthere but no retene.

C. J. WEST

**Conjugated double bonds. IX.** The coloring matter in *physalis alkekengi* and *physalis franchetti*. RICHARD KUHN AND WILLY WIEGAND. *Helv. Chim. Acta* 12, 499-506(1929).—The pigment *physaliene* was isolated from both *Physalis alkekengi* and *Physalis franchetti*. It is present in the sepals to the extent of 0.9 to 1.8% and also in the skin of the berries to the extent of 0.05% based on the dry fruit. Its chem. and phys. properties make it akin to the carotene class of hydrocarbons although its formula, C<sub>60</sub>H<sub>80</sub>O<sub>4</sub>, contains O. Upon hydrogenation in the presence of PtO the pigment absorbs 11 to 11.6 mols. of H<sub>2</sub> to yield the colorless, optically inactive, cryst. compd., *perhydrophysaliene*. Oxidation leads to the formation of 5 mols. of HOAc. These facts indicate that the mol. of physaliene contains 11 double bonds and 5 Me groups. The parent hydrocarbon can thus be considered as a polymer of isoprene contg. 12 C<sub>4</sub>H<sub>6</sub> particles. Physaliene m. 97° to an orange-red liquid which at 200° fades in color and a colorless oil distills over. The distillate soon solidifies. Xylene is not a product of the thermal decompn. In air the pigment undergoes autooxidation and absorbs 3.9% of its wt. of dry O<sub>2</sub> at atm. pressure in 36 hrs. It reacts with I to give the dark green compd., *physaliene diiodide*, C<sub>60</sub>H<sub>80</sub>I<sub>2</sub>O<sub>4</sub> (0.16 g. from 0.22 g. of physaliene and 0.064 g. of I). The spectrum exhibits 3 bands whose position varies with the solvent. In CS<sub>2</sub> the optical centers are at the points 5145, 4814 and 4498 Å. U.; in petroleum ether they are displaced to the points 4830, 4515, 4230 Å. U. The first 2 bands are much more intense than the 3rd, the ratio of the intensities being 8:10:1. I. M. L.

**Action of chloro derivatives (metallic and non-metallic chlorides) on cholesterol.** VII. E. MONTIGNIE. *Bull. soc. chim.* 45, 302-4(1929); cf. C. A. 23, 2446.—Cholesterol was treated with ICl<sub>3</sub>, S<sub>2</sub>Cl<sub>2</sub>, PCl<sub>5</sub>, As<sub>2</sub>O<sub>3</sub> in HCl, SbCl<sub>3</sub>, CaCl<sub>2</sub> and SnCl<sub>4</sub>. PCl<sub>5</sub> produces the chloride, C<sub>27</sub>H<sub>46</sub>Cl; CaCl<sub>2</sub> reacts as it does with other alcs.; As<sub>2</sub>O<sub>3</sub> in HCl and SbCl<sub>3</sub> produce a red and violet color, resp.; from the others indefinite solids were obtained.

I. M. LEVINE

**Sterol group. III. Acetylation and catalytic hydrogenation of ergosterol.** ISIDOR M. HEILBRON AND WILFRED A. SEXTON. *J. Chem. Soc.* 1929, 921-6; cf. C. A. 22, 1980.—Catalytic reduction of ergosterol (I) in Et<sub>2</sub>O or EtOH gives  $\alpha$ -ergosterol (II), m. 130-1°. Catalytic reduction of 5 g. I (350 cc. H) gives dihydroergosterol, identical with that obtained by Windaus and Brücken by reduction of I with Na and EtOH, and some II. Reduction of I in glacial AcOH at 70° (8 hrs.) gives *allo*- $\alpha$ -ergosterol acetate, identical with that obtained by Reindel and Walter by hydrogenation of  $\beta$ -ergosterol acetate. I, AcOK and AcOH, heated at 100° for 5-6 hrs. in a stream of CO<sub>2</sub>, give *ergosterol  $\alpha$ -acetate* (III), m. 132-3°, which is considered the normal Ac deriv., heating with Ac<sub>2</sub>O 1 hr. converts it into the  $\beta$ -acetate, m. 172-4°, as does heating the molten compd. at 170-80° for 0.5 hr. Catalytic reduction of III gives  $\alpha$ -ergosterol acetate, m. 109-10°; hydrolysis of III gives I. IV. **Existence of isomeric ergosterols.** I. M. HEILBRON, W. A. SEXTON AND FRANK S. SPRING. *Ibid* 926-31.—The above work was carried out with a I from Böhringer und Söhne of Hamburg; in continuing a I from Messrs. Boot (IV) was used, which under identical conditions of reduction gave only a dihydro deriv. instead of the tetrahydro deriv. from I. The pure IV had  $[\alpha]_{D}^{25}$  -171° and the pure I -159.3°; both showed the same m. p. The extinction coeffs. were slightly different, the ratio being of the order 1.2 (I):1.0 (IV). The acetates of I and IV, although having the same m. p. and optical activity, still showed the same difference on hydrogenation. Hydrolysis of the IV acetate gives a sterol identical with I. A 2nd sample from Boot behaved like I. The m. p. of ergosterol  $\beta$ -acetate depends upon the duration of the treatment with Ac<sub>2</sub>O; the longer the treatment, the lower is the m. p. and the higher the optical activity.

C. J. WEST

Blau gas (DAL PRATO) 21. Electrosynthesis of hydrocarbons (MERMEJO, BLAS) 4. Ionone (HERNÁNDEZ, *et al.*) 17. Adrenaline as an oxidation catalyzer. Oxidative deamination of amino acids by means of adrenaline or some simple hydroxybenzenes (BLIX) 11A. A vapor-pressure chart for hydrocarbons (COATS, BROWN) 2. The theory of molecular dislocation applied to homogeneous catalysis (BÖSSKEN) 2. Activity of

various catalysts in promoting the oxidation of  $\text{CH}_4$  by means of O (CAMPBELL). 2. Scrubbing effluent gases (as in production and purification of phthalic anhydride) (U. S. pat. 1,718,028) 13. Extracting volatile substances from aqueous solutions (Austrian pat. 112,980) 13.

**KLARMANN, E.: Handbuch der biologischen Arbeitsmethoden.** Edited by Emil Aberhalden. Abt. I. Chemische Methoden. Teil 2, Hälfte 2. Heft 4 (Lieferung 204). *Darstellung metallorganischer Verbindungen.* Berlin and Vienna: Urban & Schwarzenberg. pp. 2149-2307. M. 8. Reviewed in *Chem. News* 138, 381(1929).

**Unsaturated carbon compounds.** LÁSZLÓ AUER. Swiss 130,435, Sept. 29, 1926. The phys. properties of colloids contg. unsatd. C compds are changed non-chemically by adding a small quantity of dry electrolyte and dispersing it therein by warming. The electrolyte may be an org. or inorg. salt.

**Furnace for the production of unsaturated hydrocarbons.** I. G. FARBENIND. A.-G. Fr. 653,646, May 1, 1928. In the production of olefins, etc., by heat decompn of paraffins, the hot parts of the decompn. furnace are made from alloys of metals of the Fe group among themselves or with common metals at the large min. of the curve of atomic vols. of the elements, or with alloys of the latter with other metals, or the hot parts of the furnace are made of materials which provoke abundant deposition of C and these are coated with preserving substances. Examples are given of the use of V2A steel, of Fe faced with a Cu-Mn bronze and lined with CaO and fragments of Cr, or coated with a thin layer of a paste made with KOH,  $\text{K}_2\text{SiO}_3$ , kieselguhr and water, or with NaOH, kieselguhr and sol. glass.

**Chlorinating organic compounds.** MICHAEL POLÁNYI and STEPHAN VON BOGDANDY. Fr. 653,163, Apr. 20, 1928. Org. compds., particularly hydrocarbons, are chlorinated by adding to a gaseous mixt. of the org. compd and Cl a small amt of a "primer" in vapor form which will not react with the org. compd. but will react readily with the Cl. Thus, Na, Cd or Zn vapor is added to a mixt. of  $\text{CH}_4$  and Cl to form  $\text{CH}_3\text{Cl}$ , it being assumed that the reaction is due to liberation of atomic Cl.

**Chlorination of hydrocarbons.** EUGENE E. AYRES, JR. (to B. A. S. Co.). U. S. 1,717,136, June 11. In the chlorination of pentanes or other hydrocarbons that exist in vapor phase at temps at which their rate of reaction with Cl is low, Cl is introduced into the hydrocarbon vapor while maintaining the latter in motion at a velocity in excess of one-half that required for distinct turbulent flow of the mixt.

**Organic arseno compounds.** SCHERING-KAHLRAUM A.-G. (Arthur Binz and Curt Rath, inventors). Ger. 475,937, July 23, 1925.  $\text{AsH}_3$  derivs. of the general formula  $\text{RAS}_2\text{H}_2$  are allowed to react with oxy or halogen derivs. of the general formula  $\text{RASO}$  or  $\text{RAS}(\text{halogen})_2$  in the presence of a small amt. of reducing agent such as hypophosphite, R denoting an aliphatic, aromatic, or heterocyclic residue. Thus, *p*-aminophenylarsenic acid is reduced with Zn and HCl to form the arsine deriv., which is filtered off and stirred into 2-hydroxypyridine-5-dichloroarsine.  $\text{NaH}_2\text{PO}_2$  is added and after stirring for about an hour and filtering, 2-hydroxy-4'-amino-5,1'-arsenopyridinebenzene is obtained. Other examples are given.

**Liquid hydrocarbons from acetylene.** FERDINAND GROS. Ger. 475,883, Jan. 22, 1924. Liquid hydrocarbons are obtained from  $\text{C}_2\text{H}_2$  by pyrogenetic conversion in a tube or vessel heated electrically. In the example, a mixt. of 50%  $\text{C}_2\text{H}_2$  and 50% H is heated to  $580^\circ$  and the product cooled giving a mixt. of liquid hydrocarbons which are fractionated to give benzene 38.1, toluene 2.6 and naphthalene 7.5%.

**Dehydration of organic salts.** SAMUEL KAN. Fr. 653,388, April 25, 1928. Org. salts contg. water of crystn. are dehydrated in an autoclave with steam at a temp. above  $120^\circ$ .

**Protection of organic compounds against lower organisms.** I. G. FARBENIND. A.-G. (Karl Dobmaier, inventor). Ger. 475,703, Oct. 24, 1926. The org. compds. prepd. according to 442,125, 442,840 and 456,979 (acids, alcs., aldehydes and ketones), particularly the high-boiling constituents, are protected from vegetable and animal organisms by admixture of Turkey red oil, with or without soap.

**Esters.** CONSORTIUM FÜR ELEKTROCHEMISCHE INDUSTRIE, G. M. B. H. Fr. 653,705, May 2, 1928. Esters are prepd. by treating vinyl esters with uni- or multi-valent alcs. or with phenols with or without a catalyst. Examples are given. Mixed esters may also be produced.

**Esters.** I. G. FARBENIND. A.-G. Fr. 654,535, May 22, 1928. Esters are prepd. from org. acids and alcs. in the presence of small quantities of metallic soaps or oxides.

In examples (1) the fatty acid of peanut oil and glycerol are heated with the addn. of 0.1% of the stannous salt of the fatty acid, (2) the fatty acid of olive oil is heated with glycerol in the presence of 0.2% of Mg oleate. Both esters may be employed as foods.

**Ketonic esters.** ALEXANDER WACKER GESELLSCHAFT FÜR ELEKTROCHEMISCHE IND., G. M. B. H. Fr. 654,413, May 18, 1928. Esters of ketonic acids are prepd. by treating carboxylic esters of BuOH or higher alcs. with metal alcoholates. Examples are given.

**Polysulfide ester of aromatic acids.** ROBERT EDER. Swiss 131,284, to 131,290, May 27, 1927. Addns. to 129,730. Mercapto-benzoic or -salicylic acid, an ethylating agent and a S halide are allowed to interact. Thus, 2-mercaptobenzoic acid is dissolved in methylene chloride with  $\text{SCl}_2$  and warmed. The filtered residue is shaken with acetone, boiled with alc. and dried to give dibenzoic acid-2,2'-trisulfide as a yellow powder m. 302-304°. The sulfides are used in therapy. Cf. C. A. 23, 1137.

**Esters and alcohols.** E. I. DU PONT DE NEMOURS AND CO. Fr. 652,845, Mar. 17, 1928. Vapors of alcs. contg. more than one C atom are passed over a heated dehydrogenating catalyst under pressure whereby the yield of the corresponding ester is increased, and an alc. with twice the no. of C atoms is formed, whereas the production of aldehyde and acid is diminished. An example is given of the passage over a catalyst of EtOH at 350° under 270 atm. giving AcOEt, *n*-BuOH and a small quantity of AcH. Catalysts used are metals such as Cu, Ni, Co and Fe to which oxides of other metals such as Mn, Cr, Mg, Ca or Zn may be added.

**Separating alcohols from mixtures.** IRLING H. HAABESTAD (to B. A. S. Co.) U. S. 1,716,957, June 11. Monohydric alcs. which are somewhat sol. in water and contain 4 to 6 C atoms are sepd. from mixts. also contg. a volatile substance such as  $\text{AmCl}$ ,  $\text{BuCl}$  or hydrocarbon material which is substantially insol. in water, by treating the mixt. with water to form a soln. of the desired alc., heating the soln. to distil water and the alc. together, condensing the vapors, sepg. the alc. from the condensate, and returning the residues of the heating and sepg. operations to the previous treatment stage. An arrangement of app. is described.

**Metal alcoholates.** ALEXANDER WACKER GESELLSCHAFT FÜR ELEKTROCHEMISCHE INDUSTRIE G. M. B. H. Fr. 653,818, May 3, 1928. Metallic compds. of alcs. having more than 3 C atoms are obtained by distg. the alcs. with the metal hydroxides until the formation of alcoholate is complete. Examples are given.

**Aromatic hydroxy compounds.** I. G. FARBENIND. A.-G. (Hermann Schütte, inventor). Ger. 475,827, Sept. 7, 1926. Sulfurized condensation products of aromatic hydroxy compds. sol. in water are prepd. by treating PhOH or its derivs. or homologues, with HCHO, sulfites and S, in presence of alkali. Examples mention PhOH, *m*-cresol and *p*-chlorophenol as the starting substances.

**Hydroxyaldehydes.** I. G. FARBENIND. A.-G. Fr. 653,975, May 8, 1928. Aromatic hydroxyaldehydes, e. g. salicylaldehyde, vanillin and 5-formyl-1,2,3-*o*-cresotic acid are prepd. by treating hydroxyalkylamines with isatin or its derivs. in the presence or absence of an oxidizing gas.

**Unsaturated aldehydes.** ANGELO KNORR and ALBERT WEISENBORN (to Wintthrop Chemical Co.). U. S. 1,716,822, June 11. An aldehyde which has no  $\text{CH}_2$  group in the 2-position to the formyl group is condensed with an aldehyde which contains a  $\text{CH}_2$  group in the 2-position to the formyl group, in the presence of an alk. agent such as KOH and an org. solvent such as EtOH contg. less than half its wt. of water. The diminution of the proportion of water present in such reactions counteracts the formation of aldols. Examples are given of the formation of:  $\text{PhCH}(\text{CMe}_2)\text{CHO}$ ;  $\text{PhCH}:\text{C}(\text{CHMe}_2)\text{CHO}$ ,  $b_{13}$  132-4°;  $\text{PhCH}:\text{C}(\text{CHMe}_2)\text{CHO}$ ,  $b_{13}$  133-5°; *p*-MeO- $\text{C}_6\text{H}_4\text{CH}:\text{C}(\text{Et})\text{CHO}$ ,  $b_{13}$  169-72°; *p*-MeOC<sub>6</sub>H<sub>4</sub>CH: $\text{C}(\text{Am})\text{CHO}$ ,  $b_{13}$  195-200°; Me-(CH<sub>2</sub>)<sub>3</sub>CH $\text{EtCH}:\text{C}(\text{Am})\text{CHO}$ ,  $b_{10}$  150-5°; MeCH<sub>2</sub>CH<sub>2</sub>CH: $\text{C}(\text{EtCH}:\text{C}(\text{Am})\text{CHO})$ ,  $b_{10}$  150-5°;  $\text{PhCH}:\text{CHCH}:\text{C}(\text{Et})\text{CHO}$ ,  $b_{12}$  172-80°;  $\text{PhCH}:\text{CHCH}:\text{C}(\text{MeCHO})$ ,  $b_{18}$  170-80°; m. 58°, pale yellow crystals;  $\text{PhCH}:\text{CHCH}:\text{C}(\text{AmCHO})$ ,  $b_{18}$  203-10°, yellow liquid;  $\text{PhCH}:\text{C}(\text{MeCH}:\text{C}(\text{MeCHO}))$ , m. 43°,  $b_{14}$  175-80°, pale yellow crystals;  $\text{PhCH}:\text{C}(\text{MeCH}:\text{C}(\text{EtCHO}))$ ,  $b_{18}$  185-90°.

**Aroylating agents.** BRITISH DYE STUFFS CORP., LTD. Fr. 653,030, April 19, 1928. See Brit. 293,924, C. A. 23, 1650.

**Methylsulfinic acid salts of secondary aromatic-aliphatic amines.** I. G. FARBENIND. A.-G. (Max Bockmühl and Kurt Windisch, inventors). Ger. 467,627, Mar. 5, 1921. The amines are condensed with formaldehydesulfoxylate. In the examples, (1) the Na salt of 1-phenyl-2,3-dimethyl-5-pyrazolone-4-methylaminomethylsulfinic acid is obtained from 4-monomethylaminoantipyrine; (2) the Na salt of *N*-ethyl-*p*-phenetidinomethylsulfinic acid is obtained from *N*-ethyl-*p*-phenetidine; (3) the Na

salt of *N*-methyl-*p*-phenetidinemethylsulfinic acid is obtained from *N*-methyl-*p*-phenetidine.

***N*-Methyl sulfités and *N*-methanesulfinic acid salts of secondary aromatic aliphatic amines.** I. G. FARBENIND. A.-G. (Max Bockmühl and Kurt Windisch, inventors). Ger. 476,643, Mar. 5, 1921. Addn. to 421,505. The *N*-methyl sulfité or *N*-methanesulfinic acid salt obtained by the condensation of primary aromatic amines with  $\text{CH}_2\text{O}$  and  $\text{NaHSO}_3$  or with formaldehydesulfoxyate, after the manner of the prior patent (cf. C. A. 16, 3732, U. S. 1,426,348), is treated with alkylating agent. Thus, Na 1-phenyl-2,3-dimethyl-5-pyrazolone-4-ethylaminomethyl sulfite is prepd. by shaking the aminomethyl sulfite soln. with  $\text{Na}_2\text{CO}_3$  and  $(\text{Et})_2\text{SO}_4$ . The substance m.  $80-90^\circ$ . Other examples are given.

**Benzanthrone derivatives.** I. G. FARBENIND. A.-G. Fr. 652,920, April 16, 1928. Benzanthrone derivs. are prepd. by treating with a metallic chloride alone, or a metallic chloride and an oxidizing agent, either 4-benzoyl-1,8-naphthalic anhydride or its derivs. or substitution products, or the reaction products of 4-royl-1,8-naphthalic anhydride or its derivs. and  $\text{NH}_3$  or an aromatic monoamine or *o*-diamine, in both cases in the presence or absence of a flux or diluent. Examples, benzanthrone-*peri*-dicarboxylic anhydride, m. above  $300^\circ$ ; 7-chlorobenzanthrone-*peri*-dicarboxylic anhydride, m. above  $300^\circ$ ; the *N*-phenylimide of benzanthrone-*peri*-dicarboxylic acid, m. above  $300^\circ$ ; a dye which dyes cotton orange-red from the vat from 4-benzoyl-1,8-naphthoylenebenzimidazole (by condensation of 4-benzoyl-1,8-naphthalic anhydride with *o*-phenylenediamine); a dye giving brown shades on cotton from the vat from 4-benzoyl-1,8-naphthoylene(1,2-naphthylene)imidazole (by condensation of 4-benzoyl-1,8-naphthalic anhydride with 1,2-naphthylenediamine).

**Diarylguanidines.** ALFRED E. PARMELEE (to E. I. Du Pont de Nemours & Co.). U. S. 1,716,081, June 4. In sepg. and purifying di-*o*-tolylguanidine or other diarylguanidine produced by desulfurizing a diarylthiourea, any excess of  $\text{NH}_3$  and alc. present in the reaction mass is removed, the remaining mixt. is acidified with an acid such as  $\text{HCl}$  which will dissolve impurities present, and there is added to the resulting soln. a sufficient quantity of an alk. reacting substance such as  $\text{Na}_2\text{CO}_3$  to ppt. the impurities while leaving the diarylguanidine in soln.

**Butadienes.** I. G. FARBENIND. A.-G. Fr. 653,600, April 30, 1928. Butadienes are produced by heating a mixt. of 1 vol. of steam and 2 vols. of a formenic, ethylenic, cycloane or cycloene hydrocarbon (not a monocyclic terpene) to a high temp. in the presence of a catalyst or not, and at ordinary or reduced pressure. In an example a mixt. of hexamethylene (2 vols.) and steam (1 vol.) is passed over large grains of  $\text{CaO}$  at  $680^\circ$ , giving butadiene, butylene, propylene, etc. The catalysts described in Fr. 635,889 as well as silicates,  $\text{SiO}_2$ , precious metals, Cr, V, Mn, Co or their alloys or alloys of Fe contg. Cr, Ni, V, Mn, Co, Mo or W may be used. Cf. C. A. 23, 1143.

**Xanthates.** JOSEPH H. JAMES (to Clarence P. Byrnes, trustee). U. S. 1,716,273, June 4. Xanthate mixts. suitable for use in flotation processes or in prepg. insecticides or fungicides are obtained by the reaction of  $\text{CS}_2$  and alkali hydroxide on mixts. produced by the catalytic oxidation of kerosene, gas oil or similar products.

**Diazo preparations.** I. G. FARBENIND. A.-G. Fr. 33,946, July 29, 1927. Addn. to 610,261. Prepns. of stable diazo salts are made by adding as stabilizer a free aryl-sulfonic acid, alone or mixed with an easily sol. salt.

**Carbazole derivatives.** I. G. FARBENIND. A.-G. Fr. 654,129, May 12, 1928. Carbazole derivs. are prepd. by introducing groups into carbazoles substituted with easily removable groups which are then removed. In examples, 1-aminocarbazole-3,6,8-trisulfonic acid is prepd. by nitrating carbazole-3,6,8-trisulfonic acid and reducing, the  $\text{SO}_3\text{H}$  groups are then eliminated by heating under pressure with dil.  $\text{H}_2\text{SO}_4$ . Similarly 1,8-dihydroxycarbazole is prepd. from 1,8-dihydroxycarbazole-3,6-disulfonic acid.

**1-Aminocarbazole and derivatives.** I. G. FARBENIND. A.-G. Fr. 654,074, May 10, 1928. The above are prepd. by exchanging the OH group of 1-hydroxycarbazole or its derivs. by an  $\text{NH}_2$  group in known manner such as by heating under pressure with  $(\text{NH}_4)\text{HSO}_4$ .

***N*-Dihydro-1,2,1',2'-anthraquinoneazaine and derivatives.** I. G. FARBENIND. A.-G. Fr. 654,686, Oct. 6, 1927. The above are prepd. by fusing 2-aminoanthraquinone or its derivs. with caustic alkali with addn. of salts of lower fatty acids as well as salts of higher fatty acids or alcoholates or phenolates. *N*-Dihydro-1,2,1',2'-anthraquinoneazaine is chlorinated by passing in  $\text{Cl}$  in the presence of  $\text{H}_2\text{SO}_4$  of 85-95% strength and at a temp. of  $40-70^\circ$ . The dichloro compd., is particularly valuable as a dye, it may be reduced to the hydrazine compd. by reducing agents.

**Mercaptans of the furfuryl series.** HERMANN STAUDINGER and THADEUS REICH-

STEIN (to Internationale Nahrungs-und Genussmittel A.-G.). U. S. 1,715,795, June 4. See Can. 283,765 (C. A. 22, 4537).

**Quaternary ammonium compound.** SOC. ANON. POUR L'IND. CHIM. A BALE. Swiss 130,881, July 26, 1927. See Brit. 294,582 (C. A. 23, 1909).

**Concentrating volatile aliphatic acids.** HOLZVERKOHLEUNGS-INDUSTRIE A.-G. Fr. 652,965, April 17, 1928. See Can. 285,930 (C. A. 23, 1141).

**Concentrating volatile aliphatic acids.** HOLZVERKOHLEUNGS-INDUSTRIE A.-G. Fr. 652,966, April 17, 1928. See Can. 285,929 (C. A. 23, 1141).

**Concentrating volatile aliphatic acids.** HOLZVERKOHLEUNGS-INDUSTRIE A.-G. Fr. 652,967, April 17, 1928. See Can. 285,928 (C. A. 23, 1141).

**Sulfonic acids.** I. G. FARBENIND. A.-G. Fr. 654,080, May 11, 1928. True sulfonic acids are prepd. from unsatd. aliphatic or hydroaromatic hydrocarbons or their derivs. by treating these compds. with sulfonating agents in the presence of substances capable of forming with sulfonating agents onium (oxonium, ammonium, thionium, etc.) compds. or by esters of  $\text{ClHSO}_3$  or substances capable of forming them. Examples are given.

**Sulfonic acids.** ORANIENBURGER CHEMISCHE FABRIK A.-G. Fr. 653,790. May 2, 1928. See Brit. 289,841 (C. A. 23, 848).

**Aromatic sulfonic acids.** I. G. FARBENIND. A.-G. (Karl Dachlauer and Emil Thiel, inventors). Ger. 476,906, June 3, 1925. Aromatic sulfonic acids are prepd. by treating a mixt. of aromatic hydrocarbon and  $\text{EtOH}$  or  $\text{MeOH}$  with  $\text{ClHSO}_3$  or fuming- $\text{H}_2\text{SO}_4$  at high temps. (110–130°). Cf. C. A. 23, 848.

**Sulfonic acids of *N*-acetylacetic arylamides.** I. G. FARBENIND. A.-G. Fr. 653,210, Dec. 3, 1927. The above are prepd. by sulfonating *N*-acetylacetic arylamines in the absence of water and with sulfonating agents not contg. water such as oleum contg. 10–20%  $\text{SO}_3$  and at a low temp. The products can be coupled with diazotized  $\text{PhNH}_2$  for the production of dyes.

**Sulfonic acids of 6-chloro-2-amino-1-toluene.** I. G. FARBENIND. A.-G. Fr. 653,878, May 4, 1928. See Brit. 290,229 (C. A. 23, 849).

**1-Aminoanthraquinone-2-sulfonic acid.** I. G. FARBENIND. A.-G. Fr. 653,159, April 20, 1928. See Brit. 289,097 (C. A. 23, 609).

**$\beta$ -Naphthol-1-sulfonic acid.** ALFRED E. PARMELEE (to E. I. duPont de Nemours & Co.). U. S. 1,716,082, June 4.  $\beta$ -Naphthol, suspended in *o*-nitrotoluene, is sulfonated with chlorosulfonic acid at a temp. below 10°. Cf. C. A. 22, 1365.

**Maleic acid.** THE BARRETT COMPANY. Ger. 475,808, April 27, 1921. Maleic acid is formed by exposing vaporized aromatic hydrocarbons contg. one or more benzene rings and a side chain to  $\text{V}_2\text{O}_5$  with air or  $\text{O}$  at 400–550°. Thus, toluene and air exposed to  $\text{V}_2\text{O}_5$  for 16 hrs. at 410° yield benzoic acid, maleic acid and benzaldehyde.

**Acetic anhydride.** CONSORTIUM FÜR ELEKTROCHEMISCHE IND., G. M. B. H. (Rudolf Meingast and Martin Mugdan, inventors). Ger. 475,885, Oct. 19, 1926. See Fr. 643,114 (C. A. 23, 1419). Acetic anhydride is prepd. by heating  $\text{AcOH}$  vapor to high temps. with a small quantity of gaseous catalyzer, preferably a weak inorg. acid. In the examples,  $\text{H}_3\text{PO}_4$ ,  $\text{H}_3\text{BO}_3$ ,  $\text{NaPO}_3$  and  $\text{Et}_3\text{PO}$  are mentioned as the catalyzers.

**Acetic anhydride.** I. G. FARBENIND. A.-G. Fr. 652,820, Feb. 10, 1928.  $\text{Ac}_2\text{O}$  produced by heat decompn. of  $\text{AcOH}$  is freed from water by passing the mixt. of vapors still superheated into a fractionating column down which streams an indifferent solvent such as  $\text{C}_6\text{H}_6$ , toluene,  $\text{CHCl}_3$ ,  $\text{C}_2\text{H}_4\text{Cl}_2$ ,  $\text{C}_2\text{HCl}_3$ , etc., or a mixt. such as  $\text{C}_6\text{H}_6$  and  $\text{C}_2\text{H}_5\text{Cl}$  or  $\text{C}_6\text{H}_6$  and quinoline. The water may also be removed by surmounting a dephlegmator on the fractionating column, and injecting a mixt. such as  $\text{C}_6\text{H}_6$  and  $\text{C}_2\text{HCl}_3$  at the base, without forming a stream in the column.

**Methanol.** I. G. FARBENIND. A.-G. Fr. 652,898, April 16, 1928.  $\text{MeOH}$  is produced from  $\text{CO}$  and  $\text{H}$  at 100–250° using catalysts having a basis of particularly active  $\text{Cu}$ . The  $\text{Cu}$  may contain oxides of metals from the 2nd to the 7th group of the periodic system, pptd. from aq. solns. of salts of the metals. In an example a mixt. of  $\text{CuO}$  and  $\text{MgO}$  obtained by pptn. at 20° of 2 mols. of  $\text{Cu}(\text{NO}_3)_2$  and 1 mol. of  $\text{Mg}(\text{NO}_3)_2$  by dil. aq.  $\text{NaOH}$ , with washing and drying up to 250°, is reduced for 30 hrs. by a mixt. of  $\text{N}$  and  $\text{H}$  contg. 5% of  $\text{H}$  at 100–250°. If a mixt. of  $\text{CO}$  and  $\text{H}$  contg. 33%  $\text{H}$  is directed on to this catalyst at 150° a good yield of  $\text{MeOH}$  is obtained contg. only traces of compds. reacting with  $\text{Br}$ .

**Methanol synthesis.** HENRY DREYFUS. Fr. 653,554, April 28, 1928. Catalysts for the synthesis of  $\text{MeOH}$  are prepd. by pptg.  $\text{ZnCO}_3$  in a gelatinous form, washing by decantation and drying the product under reduced pressure so as to retain the colloidal state, and heating the gel to a temp. not above that to be used in the synthesis, e. g., 400°. The  $\text{ZnCO}_3$  gel may be produced by pptn. in a very dil. soln., or by incorporating

during or after pptn. with a protective colloid such as starch, pectin, saponin or hydrated  $\text{SiO}_2$ . The catalyst may be used in conjunction with a promoter such as 5-10% of  $\text{Cr}_2\text{O}_3$  or other catalyst.

**Aldol.** I. G. FARBERIND. A.-G. Fr. 654,315, May 15, 1928. See Brit. 298,349 (C. A. 23, 2725).

**Borneol.** GÁZA AUSTERWEIL. Fr. 654,550, May 22, 1928. Borneol is prepd. by heating nopinene with org. acid anhydrides, *e. g.*, phthalic anhydride, with the addn. of alc. drop by drop, so that a reaction takes place between nopinene and an acid in the nascent state, giving a bornyl ether, which is afterwards sapond., the alc. and anhydride being reformed in known manner.

**$\alpha$ -Naphthol.** ALEX B. DAVIS (to Pennsylvania Coal Products Co.). U. S. 1,717,009, June 11. In order to obtain pure  $\alpha$ -naphthol from naphthol contg. both  $\alpha$ - and  $\beta$ -naphthol, the naphthol is subjected to the action of an alk. earth substance such as  $\text{Ca}(\text{OH})_2$  which forms with the  $\alpha$ -component a relatively sol. and with the  $\beta$ -component a relatively insol. product and these products are sepd. by their different solys.

**Hexylresorcinol.** HERMANN HIRZEL (to Sharp & Dohme). U. S. 1,717,105, June 11. Resorcinol is caused to react with a hexyl halide, *e. g.*, with hexyl chloride in the presence of Zn or Cu.

**Heptylresorcinols.** ALFRED R. L. DOHME (to Sharp & Dohme). U. S. 1,717,098, June 11. Heptylresorcinols in a purified state are subjected to reduction with Zn amalgam and HCl.

**Formaldehyde.** I. G. FARBERIND. A.-G. Fr. 33,810, June 30, 1927. Addn. to 617,032. In the production of  $\text{CH}_2\text{O}$  by the catalytic oxidation of MeOH, the gases from the reaction contg.  $\text{CH}_2\text{O}$  and water vapor are cooled and washed with very concd. solns. of  $\text{CH}_2\text{O}$ . Cf. C. A. 23, 1650.

***m*- and *o*-Hydroxybenzaldehydes.** FREDERICK H. KRANZ (to National Aniline & Chemical Co.). U. S. 1,715,417, June 4. A crude nitrated benzaldehyde is reduced, the amino compds. thus obtained are diazotized, the diazo product is distd. in the presence of water, and the *m*-hydroxybenzaldehyde is recovered from the residue in the distg. app. and the *o*-hydroxybenzaldehyde from the distillate.

**Diiodotrimethylamine.** LÉON GROUCHKINE. Fr. 652,809, Dec. 16, 1927. See Australia 11,019.

**Tetrahydro-*N*-ethyl- $\beta$ -naphthylamine.** SOC. ANON POUR L'IND. CHIM. À BAËLE. SWISS 130,836, April 8, 1927. Addn. to 130,423 (C. A. 23, 2987). This substance is prepd. by the catalytic hydrogenation of *N*-ethyl- $\beta$ -naphthylamine. Ni is mentioned as the catalyzer.

**2-Aminopyridine.** DEUTSCHE GOLD- UND SILBER-SCHNEIDANSTALT VORM. ROESLER. (Karl Vieweg, inventor). Ger. 476,458, Dec. 17, 1925. 2-Aminopyridine is prepd. by heating equimol. amts. of pyridine and an alkali amide in an indifferent medium such as toluene to a temp. below the b. p. of pyridine, preferably below 100°.

**Dibenzanthrone.** I. G. FARBERIND. A.-G. Fr. 653,027, April 19, 1928. Dibenzanthrone is produced by the alk. fusion of benzanthrone in the presence of aldehydes or their derivs. or compds. which behave like aldehydes. Examples are given of the use of paraformaldehyde, Na formaldehyde bisulfite, Na formaldehydesulfoxylate, the amt. being about 15-20% of the wt. of benzanthrone. Na glyoxal bisulfite, Na benzaldehyde bisulfite or the corresponding Zn compds. may be used.

**Pentaerythritol.** CHARLES E. BURKE (to E. I. du Pont de Nemours & Co.). U. S. 1,716,110, June 4.  $\text{CH}_2\text{O}$  and acetaldehyde are condensed in aq. soln. in the presence of  $\text{Ca}(\text{OH})_2$ , the Ca is pptd. (suitably by  $\text{K}_2\text{CO}_3$  or  $\text{Na}_2\text{CO}_3$ ) and the pentaerythritol is crystd. from alk. soln.

**$\beta$ -Aminoethylurea.** J. D. RIEDEL-E. DE HÄEN A.-G. Ger. 476,533, Aug. 16, 1925. Ethylenediamine is treated with 1 mol. of an acid and 1 mol. of an alkali cyanate to produce  $\beta$ -aminoethylurea. HCl and CNOK are given in the example; the m. p. of the hydrochloride is 139-140°.

**Vanillin.** I. G. FARBERIND. A.-G. (Oskar Spengler and Hugo Pfannenstiel, inventors). Ger. 475,918, July 29, 1923. Vanillin is prepd. by subjecting trichloromethylguaiacylcarbinol to a sapon. and oxidation by a soln. of a heavy metal compd. Thus, the carbinol may be heated in a reflux condenser for 12 hrs.,  $(\text{AcO})_2\text{Cu}$  added and the mixt. heated for a further 12 hrs. The soln. is then evapd. to about half its vol. and the vanillin extd. with ether. Other examples are given.

**Styrene.** THE NAUGATUCK CHEM. CO. Ger. 476,270, Aug. 29, 1924. In the manuf. of styrene and its homologs by passing alkylated aromatic hydrocarbons, with at least 8 atoms of C and 10 of H, through a tube heated to 450-700°, the conditions are adjusted so that the amt. (R) of hydrocarbon vapor passing through the tube,

(expressed in g. per min.), the temp. (T) in the middle of the tube, and the volume (V) of the heated part of the tube (expressed in cc.), are related in accordance with the formula  $0.064V/R + T = 633K$ , where K is 0.8-1.2.

Crotyl bromide. I. G. FARBENIND. A.-G. Fr. 653,338, April 23, 1928. See Brit. 289,777 (C. A. 23, 851).

Ethylene chloride. ALBERT MAIER. Fr. 653,434, April 25, 1928.  $C_2H_4Cl_2$  is made by bringing together  $C_2H_4$  and  $Cl_2$ , both previously cooled to a low temp., c. g.,  $-30^\circ$ .

Glass atomizers for ethyl chloride. FRITZ ECKERT. Ger. 476,993, Mar. 19, 1926. Constructional details are given.

Aluminum ethylate. I. G. FARBENIND. A.-G. (Hans Meerwein, inventor). Ger. 475,557, Jan. 4, 1925. Alc.-free  $(EtO)_3Al$  is prepd. from Al and abs. alc. in the presence of a catalyzer by adding the alc. gradually by dropping into an excess of Al. The Al may be suspended in molten  $(EtO)_3Al$  or an indifferent solvent. The catalyzer may be contained in the alc.

Condensation products of the benzanthrone series. I. G. FARBENIND. A.-G. (Georg Kalischer, Heinz Scheyer, Paul Nawiasky and Emil Krauch, inventors). Ger. 475,574, Dec. 3, 1926. Addn. to 465,506. Condensation products of *Bz*-1 nitro-2-methylbenzanthrone are obtained by subjecting it to the action of other acid materials than the fuming  $H_2SO_4$  mentioned in the prior patent. An example mentions a mixt. of 100 parts fuming  $H_2SO_4$  and 50 parts chlorosulfonic acid.

Naphthalene condensation products. I. G. FARBENIND. A.-G. Fr. 33,807, June 28, 1927. Addn. to 628,440. Condensation products are prepd. by treating  $C_{10}H_8$  or its derivs. with crude or purified gases contg. olefins under pressure and in the presence of catalysts such as  $AlCl_3$ .

## 11—BIOLOGICAL CHEMISTRY

PAUL E. HOWE

### A—GENERAL

FRANK P. UNDERHILL

The substance in oysters (*Ostrae gigas* Thunberg) causing hypoglucemia. TAIZO KUMAGAI AND YOSHIO SHIKINAMI. *Tôhoku J. Exptl. Med.* 12, 425-32(1929). The hypoglucemic effect of oyster ext. is strong in summer but very weak in winter. Hepatopancreatic exts. were more active than exts. of the whole oyster; exts. from egg-cells had max. activity. Hepatopancreatic and egg exts. were similar in their hypoglucemic activity to guanidine prepsns.

B. C. BRUNSTETTER

Ultra-violet light, insulin and amino acid catalysis. JOHN M. ORT. *J. Phys. Chem.* 33, 825-41(1929); cf. C. A. 21, 1446; 22, 970.—Reduction potentials were measured in solns. of dextrose and of levulose, at  $pH = 10$ , in the presence of various amino acids, of insulin, and when exposed to ultra-violet light. Irradiation speeded up the drift in potentials before the addn. of  $H_2O_2$ , and greatly increased the speed of recovery of reducing potentials afterwards. This effect of irradiation is much greater than the catalytic effect of the amino acids previously reported; and under irradiation, the catalytic effects of the different acids are completely changed. The effect of insulin in delaying the recovery of reducing potentials was also less noticeable under irradiation.

T. H. CHILTON

Biophysical chemistry. II. V. COFMAN. *J. Chem. Education* 6, 1090-9(1929); cf. C. A. 23, 3481.

B. J. C.

Intestinal erepsin. K. LINDERSTRØM-LANG. *Z. physiol. Chem.* 182, 151-74(1929).—Ordinary erepsin prepd. from the intestinal mucosa of the hog is believed to contain 2 dipeptidases. One of these effects a max. cleavage at  $pH$  7.3 and hydrolyzes leucylglycine and glycylglycine at practically the same velocity. The other shows a  $pH$  optimum at 8.1 and hydrolyzes leucylglycine about 20 times as rapidly as glycylglycine. A detn. is rendered uncertain by the overlapping of the activity  $pH$  curves and the values should therefore be regarded as merely preliminary. The partial sepn. of the peptidases is effected by fractional extn. or adsorption on  $Al(OH)_3$ . The 1st enzyme is very unstable in aq. soln., and even in 53% glycerol it rapidly loses activity. The 2nd is much more stable and keeps well in aq. soln. at ice box temp. Whether these represent 2 separable enzymes, or 1 enzyme and 2 activators or possibly a coenzyme, is not fully established. Again, according to the modern conception of enzymes as active groups bound to colloidal carriers, 2 active groups might be bound to the same



carrier or to different carriers. The important observation is that 2 different specific actions are here manifested. Many of the proteolytic enzymes now regarded as individuals may actually be mixts., and calcs. of dissocn. consts. and enzyme affinities are at present of little significance.

**The decomposition of hemoglobin.** New chemical and bacteriological mechanistic studies. K. BRINGOLD. *Klin. Wochschr.* 8, 866-73 (1929); cf. *C. A.* 23, 178.—The blood catalase protects hemoglobin against oxidation by  $H_2O_2$ . Catalase can be destroyed *in vitro* by the action of physical (heat), chemical (acid and alkali) and bacteriological agents. The Fe in the hemoglobin mol. is also an oxidation catalyst. It is able to intensify the oxidation potential of  $H_2O_2$ . This leads to a destruction of the hemoglobin mol. by  $H_2O_2$  when the protective catalase is absent.

**Some experiments in cytology with special reference to the law of similars.** FRANK C. BENSON, JR. *Hahnemannian Monthly* 64, 321-30 (1929).—A discussion of the action of the radiations of Ra and Po in therapeutic doses and in physiol. doses. J. S. H.

**Ultra-violet absorption spectra of certain aromatic amino acids and of the serum proteins.** FRANK C. SMITH. *Proc. Roy. Soc. (London)* B104, 198-205 (1929); cf. *C. A.* 23, 1654.—In the absorption spectrum of tyrosine, new bands were found at 1940 and 2240 Å. U. The serum proteins (albumin and pseudoglobulin) of man and of the horse yielded absorption spectra that were in very close agreement. The ratio of the extinction coeff. at the head of the curve to that at the foot of the curve was an index of the purity of the protein; this ratio was: horse albumin 2.24, human albumin 2.14, pseudoglobulin (human and horse) 3.00. The ratio of albumin (A) to globulin (G) may be calcd. as follows: If the total protein be known, then  $A/G = (E_h - 1.2x) \div (5.8x - E_h)$ . If the total protein be unknown, then  $A/G = (1.5 E_g - 0.5 E_h) \div (0.325 E_h - 0.725 E_g)$ . In these formulas,  $x$  is the total concn. of protein in %,  $E_h$  extinction coeff. at the head of the absorption curve and  $E_g$  extinction coeff. at the foot of the curve. No error was introduced by scattering of the radiation by the colloidal particles of protein.

**Cytochrome and respiratory enzymes.** D. KEILIN. *Proc. Roy. Soc. (London)* B104, 206-52 (1929).—The respiratory pigment, cytochrome, is widely distributed in the cells of aerobic organisms. It is composed of 3 hematin compds. (designated  $a'$ ,  $b'$  and  $c'$ ) and an unbound hematin compd. which is similar to protohematin of hemoglobin. The components  $a'$  and  $c'$  are not autoxidizable; the component  $b'$  (in washed muscle and dried yeast cells) is autoxidizable; and the unbound hematin is autoxidizable and also (in the reduced state) combines with CO. The hemochromogen of cytochrome is autoxidizable but does not combine with CO. The hematin compds. are responsible for the thermostable peroxidase reaction with guaiac, benzidine and *p*-phenylenediamine in the presence of  $H_2O_2$ . The cells of yeast, muscle and other tissues also contain a true thermolabile insol. *indophenol oxidase*, which is greatly damaged by drying the cells in air or by treatment with acetone or alc., and is completely inactivated by a temp. of 70°. Its activity is inhibited by very small concns. of KCN and  $H_2S$ , and by CO at high partial pressure and in the dark; the inactive CO-oxidase compd. is dissoed. on exposure of the cells to light with liberation of the active enzyme. The factors which influence the oxidase also influence the  $O_2$  consumption by the cells in the same manner; hence this enzyme plays an important part in cellular respirations. The oxidation of cytochrome is inhibited or abolished by the same factors which inhibit or abolish the activity of the oxidase; hence this enzyme is responsible for the oxidation of cytochrome, especially of its components  $a'$  and  $c'$ . In the living cells, cytochrome is reduced by various org. compds. which become donors of H on activation by dehydrases; this reduction is delayed by all factors which inhibit the activity of the dehydrase system, *e. g.*, warming to 52°, very low temps. and narcotics. Cytochrome functions as a carrier between 2 types of activating mechanisms in the cell, the dehydrases which activate the H of org. mols., and the indophenol oxidase which activates  $O$ ; it acts as a H-acceptor which is specifically oxidized by the oxidase. The 3 autoxidizable hematin compds. (component  $b'$ , unbound hematin and hemochromogen of cytochrome) may also act as carriers between H-donators and mol.  $O_2$ , as well as direct catalysts in the oxidation of compds. which are not activated by sp. dehydrases. The *polyphenol* or *catechol oxidase* of potato may be obtained in a clear soln., is destroyed by a temp. of 70°, inhibited by KCN,  $H_2S$  and CO, and not injured by alc. or drying; light does not influence its inhibition by CO. A bibliography of 60 references is appended.

JOSEPH S. HEPBURN  
BRONTE

a temporary breaking down of certain lipoids supposedly located in the cortex of the Golgi app. and required for mitosis. The radiation may cause the smooth Golgi app. to become granular and flocculent. Just before prophase, recovery from the effects of broken-down lipoids is impossible, so abnormal mitosis and death of the cell occur. The centrosome is not affected by radiation.

JOSEPH S. HEPBURN

Ionic mobility as a factor in influencing the distribution of potassium in living matter. A. B. MACALLUM. *Proc. Roy. Soc. (London)* B104, 440-58(1929).—When silica sand of natural origin was used as the adsorbent, it adsorbed only K from (a) a soln. contg. KCl and NaCl in equimol. concn., and (b) a soln. contg. LiCl and KCl in approx. equimol. concn. The amt. of K adsorbed depended on the time, and on the quantity of sand through which the soln. percolated. However, when the soln. contained 0.7614% NaCl and 0.0381% KCl (the concns. in which these salts occur in human blood plasma), both K and Na were adsorbed; but the ratio of the adsorbed K to the total K of the soln. was greater than (at times more than twice) the ratio of the adsorbed Na to the total Na of the soln. These results are explained by the ionic mobility of K, which is greater than that of Na or of Li. Apparently chloride ions were not adsorbed by silica, and the soln. after percolation contained HCl, for its  $p_H$  ranged between 5.5 and 5.6 before percolation and between 3.2 and 3.8 after percolation.

J. S. H.

Protein metabolism and organic evolution. JOSEPH NEEDHAM. *Science Progress* 23, 633-48(1929).—The main nitrogenous excretory product of an animal depends upon the conditions under which its embryos live;  $NH_3$  and urea are associated with aquatic pre-natal life, and uric acid is associated with terrestrial pre-natal life. From the chemico-embryological viewpoint, mammals count as aquatic animals, since the excretion of nitrogenous waste products through the placenta is analogous to their excretion into water. The production of uric acid by the terrestrial embryo and the excretion of this insol., nondiffusible compd. into the allantoic liquid is a well-adapted mechanism which deals with incombustible waste and also permits reabsorption of water through the allantoic wall. Marine invertebrates usually excrete most of their N as  $NH_3$ . Since the alkyl. of  $NH_3$  is incompatible with even an undeveloped kidney,  $NH_3$  excretion disappears with increasing complexity of body. Neutralization by acid necessitates waste of the latter, so  $NH_3$  is replaced by urea. The chick embryo between the 2d and 5th days exhibits morphologically piscine characteristics and excretes  $NH_3$  and urea with no uric acid; evidence is thus given of its aquatic ancestry. A bibliography of 65 references is appended.

JOSEPH S. HEPBURN

Role of lipoids in the vegetative system. I. Antagonistic influence of the physico-chemical condition of lipid sols. KURT DRESEL and RICHARD STERNHEIMER. *Z. klin. Med.* 107, 739-58(1928).—Colloidal sols. contg. both cholesterol and lecithin have a different behavior than the colloidal soln. of either lipid. An antagonistic action is exerted on such mixts. of colloids by K, Cl, H and (OH). This is analogous to the physiol. antagonism of ions. Coagulation and peptization are reversible within wide limits. II. Action of colloidal lecithin and cholesterol upon the Laewen-Trendelenburg frog preparation. *Ibid* 759-84.—Colloidal lecithin acts as a vasodilator, colloidal cholesterol as a vasoconstrictor. Lecithin acts as an antagonist, cholesterol as a synergist to adrenaline. III. Action of lipid sols upon the Straub frog heart. *Ibid* 785-95.—Neither lecithin nor cholesterol produces any change in diastole or systole. Lecithin decreases and cholesterol increases the systolic action of adrenaline. Lecithin strengthens and cholesterol weakens the diastolic action of choline. IV. Influence of lipoids on the blood picture. K. DRESEL, R. STERNHEIMER and R. HIRSCH. *Ibid* 796-802.—Intravenous injection of aq. solns. of lecithin usually, though not invariably, increases the total leucocyte count and the % of lymphocytes. Administration of lecithin emulsion by duodenal tube also increases the % of lymphocytes. Administration of cholesterol intravenously or intraglutely produces no characteristic change in the blood picture. Administration of cholesterol emulsion by the duodenal tube gives rise to a relative leucocytosis. V.—Effect of adrenaline on the lecithin and cholesterol of the blood serum. K. DRESEL, R. STERNHEIMER and FRED HIMMELWEIT. *Ibid* 803-9.—Injection of adrenaline produces an increase in the cholesterol and a decrease in the lecithin of the blood serum for a short time. In paradoxical patients the injection produces first the reverse of these changes, for 10 to 20 mins., then the normal change for 30 to 50 mins., and finally a return to the normal values.

JOSEPH S. HEPBURN

Radioactive substances in a body five years after death. A. V. ST. GEORGE, A. O. GETTLER and R. H. MULLER. *Arch. Path.* 7, 397-405(1929).—The body was exhumed 5 years after interment for the purpose of obtaining evidence in connection with the death of the girl and the illness of several others who had been employed

at painting watch dials with luminous paint, the latter contg. radioactive substances. The bones and the liver, brain, lungs and spleen were tested for signs of radioactivity. Every portion of tissue and of bone tested gave photographic and electroscopic evidence of radioactivity. All 3 rays ( $\alpha$ ,  $\beta$  and  $\gamma$ ) were detected. The nature of the emanation was found to be that of Ra. Detn. (by the emanation method) showed the presence of 48,282 micrograms of Ra in the entire skeleton. The Ra content was also estd. for the lungs, liver, spleen and brain. The total estd. Ra content for entire bones, liver and lungs was 48,4179 micrograms.

HARRIET F. HOLMES

The permeability of the placenta of the rat to glycine, alanine and urea. J. M. LUCK AND E. T. ENGLE. *Am. J. Physiol.* 88, 230-6(1929).—Amino acids and urea diffused readily through the placenta of the rat into the fetus. J. F. LYMAN

Various hemoglobins and their renal thresholds in the dog. E. J. MANWELL AND G. H. WHIPPLE. Univ. of Rochester. *Am. J. Physiol.* 88, 420-31(1929).—When hemoglobin solns. were injected intravenously into normal dogs the amts tolerated before hemoglobinuria occurred was as follows: for dog blood hemoglobin 215 mg per kg. body wt., for sheep and goose hemoglobin 115 mg and for dog muscle hemoglobin 11 to 15 mg., resp. Severe prolonged anemia did not modify these threshold values. J. F. LYMAN

Glutathione. Its importance in biological oxidations and its behavior under normal and pathological conditions. V. BISCEGLIE. *Biochim. terap. sper.* 16, 134-43 (1929).—A general review with a complete bibliography. PETER MASUCCI

The variations in organic phosphorus of the blood by the action of ultra-violet rays and irradiated air. G. DE TONI AND A. STANCATI. *Boll. soc. ital. biol. sper.* 4, 165-70 (1929).—The object was to see if it was possible to obtain the transformation of labile acid-sol P into inorg. P. The normal process of hydrolysis by which the labile P in blood filtrates is transformed into inorg. P can be accelerated by direct irradiation with ultra violet rays, by bubbling atm. air through the filtrate, or by bubbling irradiated air. The latter is the most effective. PETER MASUCCI

The optimum hydrogen-ion concentration for the enzymic activity of animal asparaginase. A. CLEMENTI. *Boll. soc. ital. biol. sper.* 4, 200-2(1929).—The optimum activity of asparaginase from chicken liver is at pH 7.4-7.6. PETER MASUCCI

A contribution to the knowledge of the activity of liver amylase. I. S. VISCO AND W. DUCK. *Boll. soc. ital. biol. sper.* 4, 267-72(1929).—The glycogenolytic enzyme of dog liver does not have a true temp. optimum, but instead its action increases from 0° to 38°; then there is little fluctuation in activity until the temp. reaches 50°. Above 50°, the activity diminishes very definitely. The amylase activity of rabbit liver begins to decrease at 40°, and at 50° the quantity of glucose formed is noticeably less. Tables are given showing the amylase activity of dog and rabbit liver covering a temp. range from 0° to 100°. PETER MASUCCI

The action of scorpion poison. O. MAGALHAES. *Mem. Inst. Oswaldo Cruz* 21 [1] (1928); *Rev. sud-americana endocrinol. imunol. quimioterap.* 12, 358-9(1929).—77% of the vesicular weight is poison. It contains hemolysin, hemorrhagin, leucocytolysin, neurotoxin and agglutinin and has a proteolytic and anticoagulant action. A serum was prepd., which neutralized 50 times the lethal dose. A. E. MEYER

The chemistry of micellae and its application to biochemical and biological problems. KURT H. MEYER. *Biochem. Z.* 208, 1-31(1929).—A highly interesting discussion of the micellar structure of a variety of substances. S. MORGULIS

Physicochemical studies on irradiated proteins. VI. Further investigations on the spectroscopic and biological demonstration of the alteration of proteins by light. M. SPIEGEL-ADOLF AND Z. OSHIMA. *Biochem. Z.* 208, 32-44(1929); cf. C. A. 23, 164.—Ovalbumin in the presence of alkali to prevent any visible pptn. shows an increase in the absorption capacity in the short wave region of the spectrum, when acted upon for several hrs. by light of a Hg-vapor lamp just as was found with serum proteins. With serum albumin and pseudoglobulin the increase in absorption capacity depends upon the concn. of the added acid or alkali in that further addns. produce an equiv. rise in the absorption capacity. This, however, is only true when the acid is added before the radiation, whereas increasing the acid concn. after irradiation only increases the transmission of the ultra-violet rays. VII. Comparison of the absorption capacity in the ultra-violet by serum albumin and ovalbumin denatured through the action of heat, ultra-violet, radium and x-rays. M. SPIEGEL-ADOLF AND O. KRUMPEL. *Ibid* 45-59.—Serum and ovalbumin solns. to which acid or alkali was added to prevent coagulation and which were subjected to the action of a temp. of boiling water show an increased absorption only in the region of short wave lengths beginning with  $\lambda = 274.9 \mu\mu$ . Protraction of the time of boiling to 1 hr. does not affect the absorption

capacity of the serum albumin, but the transmission of the alk. serum albumin solns. does increase. Qualitatively the heat-denatured albumin solns. behave like solns. treated by ultra-violet radiation, but quantitatively the effect is definitely less. The influence of Ra radiation manifests itself (in alk. medium) in a much greater absorption capacity ( $\lambda = 292.6\mu\mu$ ) than is attained by heat inactivation. S. MORGULIS

The influence of protein substances on colloidal ferric hydroxide. H. FREUNDLICH AND G. LINDAU. *Biochem. Z.* 208, 91-111(1929); cf. *C. A.* 23, 856.—The coagulation of ovalbumin, hemoglobin, paraglobin, gelatin, globin and trypsin was studied with  $\text{Fe}(\text{OH})_3$  sol and NaCl. Gelatin and trypsin flocculate without the addn. of salt, whereas ovalbumin or serum paraglobulin in small concns. diminishes the coagulation value of the  $\text{Fe}(\text{OH})_3$  and hemoglobin and globin have only a protective action. The complex combination between the 2 colloidal particles has a characteristic coagulation value which is independent of that of the  $\text{Fe}(\text{OH})_3$  sol. When this is lower than that of the pure sol there is always sensitization. The idea of a combination between the 2 colloids finds further corroboration in the fact that  $\text{FeCl}_3$  and protein are likewise flocculated by NaCl, though the pure solns. themselves are not. The coagula, whether obtained with colloidal  $\text{Fe}(\text{OH})_3$  or with  $\text{FeCl}_3$ , can be peptized by diln. with  $\text{H}_2\text{O}$  shortly after the pptn., provided the protein concn. is low and a very small salt concn. is required for the pptn. Mixts. of  $\text{Fe}(\text{OH})_3$  sol and protein undergo marked changes in coagulation value, increasing to a max. in the small protein concns. because of the increase in protective action of the protein. The detns. which were made on the H-ion concns. in these mixts. show that this plays a subordinate role in the resulting changes. S. MORGULIS

The influence of different preparations of the quinine group on the enzymic functions of the organism. XI. Comparison of the effects of potassium, sodium and quinine chloride on the pepsin digestion of protein. I. A. SMORODINTZEV AND E. A. SVESHNIKOVA. *Biochem. Z.* 208, 151-63(1929); cf. *C. A.* 23, 2493.—KCl, NaCl and quinine-HCl in *M*/40 concn. inhibit the peptic digestion of hen egg-albumin. KCl and NaCl in all concns. have the same effect on the process, but the *M*/40 quinine-HCl is more strongly inhibiting than an equimol. concn. of the salts. In concns. 0.1 to 0.001 of the above quinine-HCl exerts neither an accelerating nor a retarding action on the peptic digestion. The inhibition of the hen egg-albumin digestion requires only about half as much KCl or NaCl as was found necessary in expts. with edestin. In concns. 10-1000 times smaller than the above neither KCl nor NaCl has any effect on the peptic digestion of the egg albumin. Quinine-HCl which causes inhibition in a concn. of 0.6-1.0% also causes a shift in the  $p_{\text{H}}$  of the medium away from the opt. for the peptic activity, and the inhibitory action can be removed by increasing the acidity of the soln. The therapeutic doses of quinine-HCl will not disturb the progress of peptic digestion in the stomach in the presence of a normal acidity. S. MORGULIS

The parenteral resorption of colloids. II. S. HAYASHI. *Biochem. Z.* 208, 361-7(1929).—Intravenous injection of urease caused a very great increase in the concn. of the enzyme in the serum. This remains unchanged for several hrs., the traces of enzyme disappearing only gradually. Urease injected intraperitoneally likewise accumulates in the serum, but this requires several hrs. and is only obtained with large quantities of injected enzyme. Subcutaneous enzyme injections lead only very slowly to the appearance of traces of urease in the blood. The intraperitoneal absorption of urease seems to depend upon the solvent, concn. and kind of ions as well as H-ion concn. S. MORGULIS

Stereochemical specificity of sulfatase. XI. CLAUDE FROMAGEOT. *Biochem. Z.* 208, 482-9(1929).—By use of the K salt of the sulfuric ester of *p*-sec.-butylphenol it was found that sulfatase either from *Aspergillus* or from pig liver has the same stereochem. effect, always setting free dextro *p*-sec.-butylphenol. The unsplit residue hydrolyzed by boiling with HCl yielded only the levo form. S. MORGULIS

Adrenaline as an oxidation catalyzer. Oxidative deamination of amino acids by means of adrenaline or some simple hydroxybenzenes. GUNNAR BLIX. *Skand. Arch. Physiol.* 56, 131-72(1929).—Glycocoll is oxidized by mol.  $\text{O}_2$  at  $40^\circ$  in the presence of adrenaline, pyrocatechol, hydroquinone, resorcinol, pyrogallol and phloroglucinol, the amino acid becoming deaminated at the same time. As oxidation products,  $\text{NH}_3$ ,  $\text{CO}_2$  and  $\text{HCOOH}$  were found. The above-mentioned substances act as catalysts and apparently in such a way that they first undergo oxidation by mol.  $\text{O}_2$ , and the oxidation product is then reduced by the amino acid. The catalytic reaction requires a definite H-ion concn. opt. of about  $p_{\text{H}} = 10$ . Adrenaline seems to act better than the other catalysts on the acid side of the opt. H-ion concn., and even within the physiol.  $p_{\text{H}}$  range the oxidation of amino acids through the catalysis by adrenaline still proceeds.

at a good rate. Adrenaline and pyrocatechol can also induce the oxidation of alanine, and among the oxidation products, besides  $\text{NH}_3$ ,  $\text{CH}_3\text{COOH}$  also appears. Furthermore, oxidation of valine and leucine was observed in the presence of adrenaline. The exptl. results lead to the conclusion that the effect of adrenaline on the oxidative processes in organs and tissues as well as in the whole organism is to be attributed to a primary oxidation catalysis. The autoxidation of these catalysts (adrenaline, pyrocatechol, hydroquinone) has been studied at different  $p_{\text{H}}$  values and certain numerical relationships have been established. In the autoxidation of adrenaline and pyrocatechol in alk. soln. 3–4 atoms of O are used up per mol. and  $\text{CO}_2$  and  $\text{HCOOH}$  are formed.

S. MORGULIS

**Hydrolysis of gelatin by acids and alkalis.** I. S. YAICHNIKOV. *J. Russ. Phys.-Chem. Soc.* 61, 109–18(1929).—Aside from the polypeptide complex the proteins also contain other org. groups, e. g., that of arginine. Acids do not affect the latter, whereas alkalis decomp. the polypeptide as well as the other org. groups. Consequently proteins are more profoundly hydrolyzed by alkalis than by acids if other conditions (concn., temp. time) are identical. The extent of the hydrolysis has in previous expts. (*C. A.* 21, 3389; 22, 1371) been measured by formolic titration which detd. the quantity of amino acids formed; but it is now realized that one cannot judge of the quantity of protein decompd. by the quantity of amino acids formed, since in the first stage of the hydrolysis albumin is split with production of albumoses and peptones, whereas amino acids are still deficient. It is therefore necessary to det. directly the quantity of protein escaping hydrolysis. The protein is pptd. by the Fassenbender reagent and N is detd. in the ppt. Aside from undecompd. protein, the quantities of peptones and of  $\text{NH}_3$  were also detd. The peptones were detd. by being pptd. together with protein by tannin, detg. in the ppt. the combined N of the peptones and of the proteins and by subtracting the N of the latter. The appended columns of exptl. data show that acids as well as alkalis act on proteins more vigorously at higher temps. and concns. than at lower; this result could be expected. They also show that the action of alkalis is considerably more powerful than that of the acids. The latter result may be explained by either the existence in the protein of groups of the type  $-\text{CH.NH.CH}-$  (in arginine) which are inaccessible to the action of acids and are only affected by boiling alkalis, or by the presence of anhydrides which are more easily acted upon by alkalis than by acids. A lengthy discussion is appended, together with illustrations, of the various methods of graphic representation of the results obtained. It is shown that through the guidance of proper principles in drawing the curves expressing the compn. of the hydrolyzate material may be obtained for the characterization of various proteins. Correction. *Ibid* 467.

BERNARD NELSON

**Structure and characterization of genuine protein substance.** S. P. L. SØRENSEN. *III Nord. Kemistmötet* (Finland) 1926, 72–91(1928).—Investigations during 1924–5 bearing on the structure of proteins are reviewed in Danish. The protein mol. is essentially composed of heterocyclic rings but S. still considers the chief linkage of amino acids as Fischer's peptide. The persistence of P in protein prepn. has been weakened by alc.- $\text{Et}_2\text{O}$  treatment at  $-4^\circ$ . Serum albumin is now known to be P free but the egg albumin must contain P as a component of its mol. Egg albumin soln. kept in ice for 11 years and submitted to alc.- $\text{Et}_2\text{O}$  treatment at  $-4^\circ$  gave a prepn. retaining all characteristic phys. properties but gave 4.7 mg. P per g. N instead of the usual value of 7.3. For protein of mol. wt. 34,000, 1 P to 380 N there should be 5.0 mg. P per g. N. Definitive phys. characteristics for protein identity are discussed. A. R. ROSE

**The influence of the hydrogen-ion concentration upon the enzyme.** IV. The cause of the erepsin-decomposing action of acids. KANICHI HISHIKAWA. *Exptl. J. Digestive Diseases* 3, 167–77(1928).—In acid concns. of 0.25 N to N erepsin is completely decompd. in 1 hr., independently of the degree of the dissoen. of the acid. With more dil. acid, the decompn. velocity is parallel to the degree of dissoen. The amount of decompn. is mostly proportional to the H-ion concn. when the concn. is less than  $2.5 \times 10^{-4}$ . At H-ion concns. greater than  $2.5 \times 10^{-4}$ , the same rate of decompn. is observed for all kinds of acids, because the undissociated acids have also a decompn. action. The resistance of erepsin towards acids is the strongest at  $p_{\text{H}}$  5.5–6.8.

K. SOMEYA

**Donnan's membrane equilibrium.** The change of protein solutions by heating, and its effect upon the membrane equilibrium and the relation between it and the viscosity. KASUHI SHIGI. *Ayoro J. Med.* 25, 706–10(1928); cf. *C. A.* 23, 2630.— $\text{S}^0$  added to egg white the same quantity of N HCl or N NaOH, heated the mixt. at  $490^\circ$  for various lengths of time and examd. the change of the membrane potential. When HCl is added, there is almost no change in less than 60 mins. On heating longer than

80 mins. the potential gradually falls, until it finally becomes zero after 150 mins., showing that the colloid capable of yielding  $RH^+$  or  $ROH^-$  ion is destroyed. When NaOH is used, heating for 10 mins. shows a change in viscosity. K. SOMEYA

The fat-decomposing enzyme. IX. Resolution of lipase into two essential constituents. KENSUKÉ GYOTOKU AND SHOICHI TERAJIMA. *Tokyo J. Med.* 42, 1692-706 (1928).—When a suitable quantity of quinine is added to the lipase soln. obtained by extg. the dry mucous membrane of the stomach of an animal, *e. g.*, when 1% quinine-HCl is added to 5 cc. of the lipase soln. obtained from pig stomach, there is obtained a ppt. of protein which has very little lipolytic action. The supernatant clear soln. is only weakly lipolytic. But when the ppt. and the supernatant clear soln. are mixed an intense lipase action is observed. Thus the stomach lipase is resolved into two constituents, each of which acts only very sluggishly when used independently. Both of these constituents have slight resistance towards acids, but they keep for a longer time than the original lipase soln. The action is most intense in 40 days after resolution. The constituent remaining in the supernatant clear soln. is that which shows the properties peculiar to various lipases, such as the fat-decompg. action and the resistance towards such enzyme poisons as quinine, atoxyl, etc. The component which goes into the ppt. augments the fat-decompg. action, but possesses none of the peculiar properties mentioned above; it appears to be the same for all kinds of lipases. The product obtained by mixing the sol. component from one animal with the insol. component from a different kind of animal has always the properties of the stomach lipase of the animal from which was obtained the sol. component. The splenic lipase also can be resolved into two components, the resolution being rendered especially easy if the protein content is increased by adding beforehand the euglobulin obtained by passing  $CO_2$  into the liver lipase. If the lipases of the stomach and of the spleen are each resolved into their two components and the two different components from each are mixed, there is obtained a strong lipase, the properties of which are detd. by the component present in the supernatant soln.; *i. e.*, the product shows properties of the splenic or the gastric lipase, but never shows properties which are intermediate between the two. The component contained in the ppt. is probably a kind of activator. The proportion of the two components in the mixture has an intimate relation with the strength of the "regenerated" lipase, the action being the most intense with a certain definite proportion. X. The interactivating action of the lipases obtained from the stomach, intestine and duodenum. KENSUKÉ GYOTOKU AND SEIKO MATSUBARA. *Exptl. J. the Digestive Disease* 3, 756(1928).—The lipase action of a mixt. of the intestinal and gastric juice is greater than the sum of the lipase actions of the two; the interactivating action is possessed by both of the liquids, and can be observed when only a very small quantity of one is added to the other. The gastric juice obtained from a patient whose secretion of the juice is hindered has no activating action, so that it is concluded that the activating substance is secreted from the gastric membrane. The substance resists heat. XI. Intestinal lipase. KENSUKÉ GYOTOKU AND SEIKO MATSUBARA. *Tokyo J. Med.* 42, 1892-905(1928).—The lipase value of the intestinal juice of dog is unity per 0.3-0.5 cc., the action being most marked at  $pH$  8.2. Its action is inhibited by quinine a little less than that of the splenic or gastric lipase of dog but it is inhibited strongly by NaF. Even a small quantity of cocaine promotes the reaction. The intestinal lipase of rabbit behaves similarly, but atoxyl does not inhibit the action of the dog lipase, while it does inhibit the action of rabbit lipase. When splenic lipase is mixed with intestinal lipase, the lipase action gradually increases, reaching a max. in 3-5 hrs., and afterwards decreases gradually. The activating action depends upon the quantity of the intestinal liquid added; it manifests itself more quickly at a higher temp. and is not appreciably affected even by heating for 30 mins. at 70-80°. When a small quantity of serum is added to the splenic juice, the progress of activation is slower than with the addn. of the intestinal juice, but the max. is greater than without the serum. Bile further promotes the fat-decomposing action of the splenic lipase, even when it has already been activated to a certain extent by the addn. of the intestinal juice. K. SOMEYA

Biochemical studies on the so-called unsaponifiable substance. II. Unsaponifiable substance, cholesterol and fatty acid in an incubated egg. EIKICHI IGARASHI. *Sei-i-kwai Med. J.* 48, No. 1, 19-32, Abstract sect. 1-2(1929); cf. *C. A.* 23, 1654.—The amts. of unsaponifiable substance and cholesterol in unfertilized eggs laid by a certain hen are nearly the same. Fertilized eggs contain large amts. of unsaponifiable substance and less cholesterol than unfertilized ones. There seems to be no difference in the amino acid content of the 2 varieties. M. H. SOULE

The phase of action of tyrosinase in the reaction with cresol purple. ROBERT

CHODAT. *Compt. rend. soc. physique Geneve* 45, 100-3(1928); *Ber. ges. Physiol. expil. Pharmacol.* 48, 442.—The action of tyrosinase on *p*-amio cresol proceeds in 2 stages: in the first with the coöperation of tyrosinase and in the second without the influence of the enzyme. R. C. WILLSON

Pseudo-peroxidase, a new indirectly oxidizing enzyme, active because of hydrogen peroxide. ROBERT CHODAT. *Compt. rend. soc. physique Geneve* 45, 103-7(1928); *Ber. ges. Physiol. expil. Pharmacol.* 48, 442.—An emulsion of the rhizome of *Cyperus esculentus* L. reacts with *p*-cresol with the formation of a carmine-red water-sol. dye. C isolated this enzyme, which he called pseudo-peroxidase, and found it thermostable. It has no action on tyrosine. R. C. WILLSON

BECHHOLD, H.: *Die Kolloide in Biologie und Medizin*. 5th ed., revised. Dresden and Leipzig: Verlag von Theodor Steinkopff. 586 pp. M. 32; bound, M. 35.

PREIFFER, HANS: *Wissenschaftlichen Forschungsberichte. Band XXI. Elektrizität und Eiweisse, insbesondere des Zellplasmas*. Dresden and Leipzig: Verlag von Theodor Steinkopff. 149 pp. M. 10; bound, M. 11.50.

## B—METHODS AND APPARATUS

STANLEY R. BENEDICT

Simple methods for the estimation of sugar in urine. K. BODENDORF AND A. KOWNATZKI. *Apoth. Ztg.* 44, 636-7(1929).—To 20 cc. of the sample add 2 g.  $\text{Hg}(\text{OAc})_2$  and 2 drops  $\text{AcOH}$ , shake, and after 10 mins. pass through a dry filter. To eliminate the Hg add 1 drop concd.  $\text{HCl}$ , 3 g. Zn dust and a trace of  $\text{CuSO}_4$ , let stand 20-30 mins., filter, and test the clear filtrate with  $\text{SnCl}_2$  for the presence of Hg (in the case of high glucose content, dil. the filtrate with 2 to 3 parts of  $\text{H}_2\text{O}$ ). To 20 cc. freshly prepd. Fehling soln. in an Erlenmeyer flask, add 5 cc. of the dild. urine and a trace of kieselguhr, heat to boiling, continue to boil very gently for 2 mins. Add 30 cc. of  $\text{H}_2\text{O}$ , allow the ppt. to subside, filter rapidly through a moistened folded filter into a 100-cc. graduated cylinder, wash with a few drops of  $\text{H}_2\text{O}$  and fill to the mark. In a 2nd cylinder of exactly like character contg. 80-90 cc. of  $\text{H}_2\text{O}$ , add Fehling soln. drop by drop until the degree of color (against a white background) in both cylinders is the same. The amt. of Fehling soln. consumed (b) added to the 2nd cylinder subtracted from 20 cc. gives the amt. of Fehling soln. expended in reduction. W. O. EMERY

A simple method for the estimation of blood urea applicable at the bedside. HARENDA NATH MUKHERJEE. *Indian Med. Gaz.* 64, 252-5(1929); cf. *C. A.* 23, 2454.—Urea is estd. by pptn. with xanthidrol in alc. soln., as dixanthidryl urea. The turbidity produced by this ppt. in  $\text{CH}_3\text{COOH}$ , in which the excess of reagent is sol., forms a basis of comparison with prepd. standards. FREDERICK G. GERMUTH

The influence of hydrocyanic acid fumes on the color of death spots. W. LAVES. *Deut. Z. ges. gericht. Med.* 13, 261-9(1929).—It is difficult to distinguish the red color in death spots produced by cyanogen poisoning from that produced by HCN. When there is no access of  $\text{O}_2$ , the marks are gray violet. FRANCES KRASNOW

Theory and technic concerning the demonstration of oxygen in lung and intestinal gases of the cadaver. F. DYRENFURTH. *Deut. Z. ges. gericht. Med.* 13, 287-90(1929), cf. *C. A.* 23, 1921.—Discussion. FRANCES KRASNOW

A modified Haldane gas-analyzer for use with small volumes of gas. H. C. BAZETT. *Am. J. Physiol.* 86, 556-64(1928).—A modified Haldane analyzer is described, utilizing some of Krogh's modifications, and designed to analyze mixts. of  $\text{O}_2$  and  $\text{CO}_2$  with a neutral gas, when the vol. available is 2.0 cc. or less and the % of any of the gases varies from 0 to 100. J. F. LYMAN

Improvements of the Welcker method for the determination of the total blood volume—the relation of the blood volume to body weight and surface of the pigeon. O. W. BARLOW AND M. S. BISKIND. *Am. J. Physiol.* 86, 587-93(1928).—The red cell count and sp. gr. of the blood are detd. The animal is decapitated and the hemorrhage blood collected and measured. The circulatory system is then washed by perfusion with 0.85%  $\text{NaCl}$  and the blood content of the perfusate detd. from its vol. and a comparison of its red cell count with that of the original blood. Blood wt. of normal pigeons is 6.5% of the gross body wt.; but total blood vol. is more closely assocd. with body surface rather than with body wt. J. F. LYMAN

Regulation of respiration. XX. A quinhydrone electrode vessel and adapter and

suitable for samples of 0.05 to 0.2 cc. is described, together with a bakelite adapter and 1 cc. syringe for transferring samples without loss of  $\text{CO}_2$ . J. F. LYMAN

An apparatus for the continuous recording of the oxygen consumption of small animals. A. N. RICHARDS AND L. W. COLLISON. *J. Physiol.* 66, 299-306 (1928).—The exptl. animal (small rabbit, guinea pig or rat) is placed in a small closed chamber and the  $\text{CO}_2$  and  $\text{H}_2\text{O}$  which it produces are absorbed by soda lime.  $\text{O}_2$  bubbles in through paraffin oil to keep the pressure const. in the chamber, and the entrance of each bubble is recorded on a drum. The  $\text{O}_2$  consumption is detd. from the rate of formation of the bubbles. J. F. LYMAN

The determination of cholesterol in biliary calculi. MARIO AIAZZI MANCINI *Biochim. terap. sper.* 16, 9-14 (1929).—The author proposes 2 methods: (1) Gravimetric. The pulverized calculi are extd. in a Soxhlet app. with  $\text{Et}_2\text{O}$ . The solvent is distd off and the residue dried at  $80^\circ$  to const. wt. The residue is dissolved in benzene to which is added an amt. of metallic Na equal to the wt. of the residue. Enough anhyd.  $\text{EtOH}$  is added to bring the metallic Na in soln. and form Na ethylate. The soln. is then placed on the water bath and refluxed for 2 hrs. to saponify the fats. The material is cooled, filtered and the ppt. washed carefully with small quantities of benzene. The benzene filtrate and washings are placed in a separatory funnel and shaken with several portions of distd.  $\text{H}_2\text{O}$  until the aq. layer is no longer alk. The benzene which contains only the cholesterol is transferred to a tared flask, the benzene is distd. off and the residue dried in the oven. The criterion of purity is the m. p. Duplicate detns. are made. (2) Volumetric. If the material available is insufficient for duplicate tests, or if the m. p. of the cholesterol residue is not correct, the volumetric method is preferable. The benzene residue is weighed and treated with  $1\frac{1}{2}$  times its wt. of  $\text{Ac}_2\text{O}$  in the presence of  $\text{NaOAc}$  which acts as a catalyzer. The material is refluxed for 4 hrs. to form  $\text{Ac}$  derivs. On cooling, it is filtered by suction, the ppt. is washed with warm  $\text{H}_2\text{O}$  made slightly alk. with  $\text{NaHCO}_3$ , and then with distd.  $\text{H}_2\text{O}$  until the washings are absolutely neutral. The residue is transferred to a flask, and an accurately measured quantity of 0.5  $N$  alc.  $\text{KOH}$  is added. It is then refluxed for 5 hrs. The acetylcholesterol is sapond. and free cholesterol is formed. On cooling, the material is filtered, washed carefully with  $\text{EtOH}$  and the excess  $\text{KOH}$  titrated with 0.5  $N$   $\text{HCl}$ , phenolphthalein being used as an indicator. Each cc. of 0.5  $N$   $\text{KOH}$  consumed corresponds to 0.193 g of cholesterol. PETER MASUCCI

Extraction and analysis of gases from blood. Applications. E. KOHN-ARREST *Chimie & industrie* Special No., 142-6 (Feb., 1929); cf. *C. A.* 19, 664, 837. Further improvements have been made in the app., simplifying its setting up, enabling the vacuum to be maintained and eliminating joints. The app. and the technic of its manipulation are described, and the results obtained are briefly discussed. A. P.-C.

Labor-saving devices for the commercial protein-testing laboratory (WHITCOMB 1.

Device for ascertaining the acid content of gastric juices. MAX DWORZAN. *Ger* 475,767, Feb. 14, 1928.

## C—BACTERIOLOGY

CHARLES B. MORREY

Bactericidal action of acetic acid. WALTER OBST. *Deut. Essigind.* 33, 129-31 (1929).—A review of previous work on the disinfectant action of  $\text{AcOH}$ . Attention is directed to the need of more exact expts. in this direction. W. O. E.

The cultivation of *Endameba gingivalis* (Gros) from the human mouth. CHARLES A. KOFOID AND HERBERT G. JOHNSTONE. *Am. J. Pub. Health* 19, 549-52 (1929).—The authors use Locke's egg albumin (L. E. A.) medium which consists of coagulated egg slants (contg. a small quantity of Locke's soln.) with the addn. of 6-10 cc. of Locke's albumin soln. J. A. KENNEDY

The nature of salt hydrolysis of starch considered in the light of the influence of salt on the development of bacteria. MORIO YASUDA. *J. Biochem. (Japan)* 10, 259-76 (1929).—In expts. with starch and either neutral salt or peptone the hydrolysis is due exclusively to the development of microorganisms. The organisms were isolated in pure culture. Salt strongly affects their amylolytic power, and their development was directly dependent upon the salt concn. Multivalent cations even in quantities scarcely demonstrable chemically have a strong influence on their development. Furthermore, these multivalent cations have a very favorable effect on the  $\text{O}_2$  transfer to the microorganisms, as could be shown by expts. on the oxidation of  $\text{FeSO}_4$ . S. M.

Slime formation by *Streptococcus hemolyticus*. MARC. OPPENHEIM. *Centr.*



*Bakt. Parasitenk.*, I Abt., 111, 83-92(1929).—The formation of a mucosus type of growth prevents hemolysis. It is not known whether the slime prevents hemolysin formation, adsorbs it, or directly neutralizes it. Ten strains of *Streptococcus mucosus* changed into *Streptococcus hemolyticus* after repeated transfers on plates made with serum-free erythrocytes.

JOHN T. MYERS

The anaerobic cultivation of *B. influenzae* (Pfeiffer). ADOLPH EHRUND. *Centr. Bakt. Parasitenk.*, I Abt., 111, 195-206(1929).—The influenzae bacillus will grow anaerobically in the presence of the V factor found in plant exts. The presence of the X factor favors indole formation but V alone hinders it.

JOHN T. MYERS

A contribution to anaerobic culture methods. KURT TRAUTWEIN. *Centr. Bakt. Parasitenk.*, II Abt., 77, 551-7(1929).

JOHN T. MYERS

Proteolysis and the selective destruction of amino acids by *Clostridium sporogenes* and *Clostridium histolyticum*. M. W. MEAD, JR. AND C. G. KING. *J. Bact.* 17, 151-61 (1929).—*Cl. sporogenes* and *Cl. histolyticum* growing in protein media tend to utilize or destroy tyrosine to a greater degree than histidine. *Cl. sporogenes* is more active with both amino acids than is *Cl. histolyticum*. The action of the organisms is selective toward these 2 amino acids in fibrin and edestin media. The proteolytic power of *Cl. histolyticum* is greater than that of *Cl. sporogenes* as measured by the production of  $\text{NH}_3$ . Tyramine appears in the cultures but not to the extent that tyrosine disappears; hence the latter is evidently decarboxylated and then further consumed in putrefaction. Histamine was not found in any cultures. The 2 organisms give rise to a  $\text{pH}$  of 7.5 to 8.2 in protein-rich media. In *Cl. histolyticum* cultures, the  $\text{H-ion}$  concn. is such as to facilitate tyrosine crystn. when it is set free in the medium.

JOHN T. MYERS

A review of the development and application of physical and chemical principles in the cultivation of obligately anaerobic bacteria. IVAN C. HALL. *J. Bact.* 17, 255-301 (1929).—A very complete review and bibliography.

JOHN T. MYERS

Further observations on the oxidation by bacteria of compounds of the *p*-phenylenediamine series. S. ELLINGWORTH, J. M. McLEOD AND J. GORDON. *J. Path. Bact.* 32, 173-83(1929).—The oxidations of the various substitution products of *p*-phenylenediamine-HCl produced by chem. oxidizing agents resemble closely those produced by certain bacteria. The facility of oxidation of such diamines increases with the no. of Me groups in the mol. In the absence of free O, the various diamines have a roughly similar toxicity for bacteria. When O has free access to bacterial colonies previously exposed for a few secs. to a soln. of a diamine, the monomethyl compd. is the least, and the tetraethyl the most, toxic. Toxicity varied with the speed with which the colonies develop a black tint. A 0.5% soln. of the tetramethyl compd. is best for diagnostic bacteriology. The species capable of oxidizing the tetra compd. also reduce it; hence the blue-violet color fades at varying speeds with different species. Those diamines which produce a black color do not fade as they kill the bacteria; hence there can be no subsequent reduction. This compd. indicates the oxidizing activity of a no. of bacteria not picked out by the other diamines, notably *B. pertussis* and *B. influenzae*, of which the former is the more active. All attempts to prep. media contg. diamines on which oxidizing bacteria would develop colored colonies as they grow have failed.

JOHN T. MYERS

Changes of the phagocytic capacity in vitro through the influence of dextrose on bacteria, serum and leucocytes. ALESSANDRO VASATURO. *Folia med.* 14, 539-73 (1928); *Ber. ges. Physiol. expil. Pharmacol.* 47, 167.—Dextrose acting on leucocytes or serum promotes phagocytosis but is inhibiting to bacteria.

R. C. WILLSON

Demonstration of the formation of vitamin B by *Bacillus vulgatus* Migula by means of a new and reliable method. MARTIN SCHIEBLICH. *Biochem. Z.* 207, 458-61(1929).—Exptl. evidence is offered to prove that *B. vulgatus* Migula grown on an artificial medium free from vitamin N produces this vitamin as can be demonstrated by feeding to young rats cultures of these organisms.

S. MORGULIS

The classification of the micrococci. G. J. HUCKER. *Centr. Bakt. Parasitenk.*, I Abt., 111, 9-22(1929).—The article contains a detailed description of the biochem. actions of a no. of common micrococci.

JOHN T. MYERS

A new dye medium for differentiation between paratyphoid bacilli A and B. KENRO ISHIYAMA. *Centr. Bakt. Parasitenk.*, I Abt., 111, 24-6(1929).—The medium was: agar, 100 cc.; 1.2% crocein in distd. water, 1.5 to 2.0 cc. Paratyphosus B destroys the color in 12 hrs., while paratyphosus A requires at least 3 days.

JOHN T. MYERS

*Bacterium typhosus hemolyticus*. Experimental production of a new type through the action of bacteriophage. CURT SONNENSCHNEIN. *Centr. Bakt. Parasitenk.*, I Abt., 111, 177-80(1929).—When acted on by bacteriophage, *B. typhosus* acquires the power to produce a hemolysin for sheep erythrocytes.

JOHN T. MYERS

Alkaline media and their effect upon *Bacillus acidophilus* and its products in the mouth (BADANES) 17.

MORREY, CHAS. B.: *The Fundamentals of Bacteriology*. 4th ed., revised. Philadelphia: Lea & Febiger. 347 pp.

## D—BOTANY

THOMAS G. PHILLIPS

Carbon nutrition of some algae isolated from soil. B. M. B. ROACH. *Ann. Botany* 41, 509-17(1927); cf. *C. A.* 20, 2180.—A study of 5 species of soil algae, grown in pure culture on media contg. mineral salts with 1% of various sugars, shows that all the species were capable of growth in complete darkness, provided that a suitable org. compd. was present. The requirements of the individual species and their responses to different conditions were, however, widely different, and it is not justifiable to regard the soil algae as a homogeneous physiol. unit. B. C. A.

A kinetical explanation of photosynthesis based on Harder's results with *Fontinalis*. J. C. GHOSH. *Jahrb. wiss. Botan.* 69, 572-86(1928).—On the basis of Willstätter and Stoll's hypothesis for the mechanism of photosynthesis G. shows that a kinetical explanation is possible which agrees with Harder's theory (*C. A.* 16, 3929) for the assimilation of carbohydrates. When either the concn. of  $\text{CO}_2$   $1/C$  or the light intensity  $1/I$  was plotted against the velocity of the reaction  $1/V$ , a straight-line curve was obtained. These results do not agree with Blackman's explanation that the velocity of reaction is proportional to the concn. of  $\text{CO}_2$  up to a certain point and thereafter is not. The equation for the effect of varying temps. has not as yet been worked out. A. E. H.

Influence of temperature and nutrients on the reaction velocity of diastase in cultures of *Aspergillus niger*. ELISABETH LUIPPOLD. *Jahrb. wiss. Botan.* 70, 26-54 (1929).—The reaction velocity for the digestion of starch by diastase was detd. at 15° and 35°. The temp. quotient for this reaction was not altered, providing the nutrients and the  $p_H$  of the medium were the same at both temps. When, however, either the  $p_H$  or the nutrients was altered, the value of the temp. quotient was changed. Since the  $p_H$  of the medium was altered by a change in temp., it follows that temp. exerts an indirect but not a direct influence on the temp. quotient. The max. value for the quotient (5.1) was obtained at  $p_H$  5.2-5.4 in solns. contg. carbohydrates as a source of C. A. E. HITCHCOCK

Physiological investigations of *Plasmopara viticola* during infection processes. KARL ARENS. *Jahrb. wiss. Botan.* 70, 93-154(1929).—Zoospores of *Plasmopara viticola* reacted positive toward  $\text{PO}_4$  and  $\text{OH}$  ions, and negative toward  $\text{H}$  ions. The presence of phosphatides on the surface of grape leaves and the outflow of gaseous materials through the stomates are believed to offer surface tension effects that are favorable for the chemotaxis of the zoospores. Since a similar reaction (the accumulation of zoospores around stomates) occurs on the leaves of many kinds of plants and since similar surface tension effects are produced in dil. soln. of several different compds., the substance responsible for the chemotaxis is believed to be non-specific. A. E. HITCHCOCK

The influence of colloidal substances on the growth of roots. B. NIELEWSKI AND A. KRAUSE. *Jahrb. wiss. Botan.* 70, 158-62(1929).—In colloidal solns. of agar, starch, and *m*-ferrioxhydrocol roots of beet seedlings grew more rapidly than in distd.  $\text{H}_2\text{O}$ . These results indicate that soil colloids may be of more importance in plant growth, aside from any nutritive value, than has previously been supposed. A. E. H.

The occurrence and significance of tannin in plants. HANNA HUBER. *Jahrb. wiss. Botan.* 70, 278-325(1929).—The quant. extn. of tannin from different plants required different procedures. A 40% soln. of acetone extd. 100% of the tannin from acorns of *Quercus pedunculata*. Germinating seeds of *Q. ilex* var. *ballota* contained a greater amt. of tannin than dormant acorns. Although 30% of the tannin was found in the cotyledons, it is not known whether or not tannin functions as a reserve material. The non-toxic effect of tannin in the cell is probably due to its occurrence as an insol. adsorption product. A. E. HITCHCOCK

The relation between protein content and size of chloroplasts in leaf cells of *Pelargonium zonale*. WALTER SCHUMACHER. *Jahrb. wiss. Botan.* 70, 389-433(1929).—No correlation was found between the protein N content and size of chloroplasts in leaf cells of *Pelargonium zonale* after the leaves had been in darkness 1-3 days. These results do not substantiate the theory proposed by Meyer, Molisch and Ullrich that such a correlation existed and could therefore account for the localized synthesis of proteins in the chloroplasts. A. E. HITCHCOCK

Conditions of coremia formation by certain fungi. A. YA. MANTSEFEL AND V. N.

SHAPOSHNIKOV. *Trans. Sci. Chem.-Pharm. Inst. (Moscow)* 1927, No. 18, 31-47.—*Penicillium arenarium* Shaposhnikov and Manteifel, *P. luteum* Link, *P. expansum* Thom (Link) and *Botrytis bassiana* Bals. responded differently to media for the formation of coremia. *P. arenarium* forms coremia when the N content of the substrate is increased. The other two penicillia do not respond to N increase and the production of coremia by them could be traced to the split products in the media produced by the metabolism of the first crop of fungi. The power of *Botrytis* to form coremia depends on the moisture conditions. The cultures are described in detail and photographic illustrations given.

Some effects of the waxy gene in maize on fat metabolism. F. A. ABEGG. *J. Agr. Research* 38, 183-93(1929).—Nonwaxy and waxy maize grain contain 6.5 and 7.3% crude oil, resp. The corresponding endosperm and embryo tissues of the resp. grains contain 1.05 and 34.0 and 1.5 and 34.3% crude oil. The av. acid value of the Et<sub>2</sub>O-sol. crude oil from nonwaxy grain was 13 and from waxy 34. The av. acid values and saponos. of the fats from nonwaxy endosperm tissues were consistently lower than those from waxy. The above differences appear to be restricted to the endosperm tissues. Since the effects of the waxy gene on carbohydrate metabolism in the plant are evident in both endosperm and pollen these effects are considered primary while those on fat metabolism are secondary. It is thought that the waxy gene is connected with the synthetic and hydrolytic powers of maize endosperm lipase. It appears that the waxy type lipase does not effect a condensation of fatty acids with glycerol to the same extent as does the nonwaxy.

Inheritance of yield and protein content in crosses of marquis and kota spring wheats grown in Montana. J. ALLEN CLARK AND KARL S. QUISENBERRY. *J. Agr. Research* 38, 205-17(1929).—Awnleted selections of crosses averaged higher in yield but lower in protein content than awned selections. The crude protein content of F<sub>2</sub> and F<sub>3</sub> plants was positively correlated to a highly significant degree.

The influence of growth-promoting substances of the nature of vitamin D on yeast cells. HANS LECROIX. *Centr. Bakt. Parasitenk.* 11 Abt. 76, 417-28(1929).—It was not possible to grow yeasts in pure mineral solns. Growth of yeast is enhanced by exts. of fruits and vegetables, and especially sprouting grains.

The relation between maximum rate of photosynthesis and concentration of chlorophyll. ROBERT EMERSON. *J. Gen. Physiol.* 12, 609-22(1929); *Proc. Natl. Acad. Sci.* 15, 281-4.—The max. rate of photosynthesis in the alga, *Chlorella vulgaris*, is a smooth function of the chlorophyll content. A method is given for varying the chlorophyll content per unit vol. of alga cells with other factors const.

Photosynthesis as a function of light intensity and of temperature with different concentrations of chlorophyll. ROBERT EMERSON. *J. Gen. Physiol.* 12, 623-39(1929).—Photosynthesis reaches its max. rate at approx. the same light intensity for all chlorophyll concns. studied, and shows the same relation to temp. over this range of concn. The temp. characteristic ( $\mu$  of the Arrhenius formula) decreases gradually as the temp. rises. The lower the concn. of chlorophyll the greater is the depression of rate of photosynthesis by HCN. Photosynthesis probably involves an autocatalytic reaction and chlorophyll must play a part in the process other than that of absorption of light.

Catalase activity and sex in plants. W. H. CAMP. *Am. J. Botany* 16, 221-4(1929).—The catalase activities of various tissues from 12 species of plants having bisporangiate, monosporangiate or dioecious types of inflorescences were compared with the sexual expression. In all species examined it was found that tissues related to the staminate or male structures, either purely vegetative or floral, showed a distinctly greater catalase activity than tissues related to the carpellate or female structures of the same species. It was also found that, in general, floral structures showed a greater difference than vegetative parts.

Lateral transfer of lithium nitrate in *Salix*. E. T. BODENBERG. *Am. J. Botany* 16, 229-39(1929).—LiNO<sub>3</sub>, when introduced into stems by a normal mode of entrance through roots growing on one side of these stems, apparently was unable to pass laterally through the stems. Spectroscopic tests for the detection of the salt were made in the leaves of transpiring branches attached to the stems and at opposite sides from the absorbing roots. The time allotted was as much as 295 hrs. The expts. were not continued longer because of the possibility of new tissue being proliferated to bridge the gap in the conducting system between roots and branches. The same results were obtained when H<sub>2</sub>O was supplied to the stems by means of a wick attached to a cut on the upper side as when the stems were kept constantly moist by wet sphagnum. The indication is that mineral salts are not normally transferred across the stems of woody

plants, though the evidence may not be entirely conclusive. On the other hand it appears that a lateral movement of water may take place. J. J. SKINNER

Heat-resistant races of yeast. JULIUS RENNING. *Ber.* 62B, 1267-70(1929).—Methods are detailed for the comparison of yeasts, both spores and vegetating cells, for their fermentation power at higher temps. J. J. WILLAMAN

Role of the cytoplasm in starch formation. A. MAIGE. *Compt. rend.* 188, 1058-60 (1929).—The cytoplasm can, by physico-chem. variations, affect starch formation in 2 ways: unfavorably, by acting toxically on the starch plastid; and favorably, by conditioning in the plastid stroma a physico-chem. change which induces a conversion of sugar to starch. J. J. WILLAMAN

Foliar diagnosis and its degree of surety. H. LAGATU AND L. MAUME. *Compt. rend.* 188, 1062-4(1929).—A diagnosis of the nutrient condition of a plant is made by analyzing the leaves for N, K<sub>2</sub>O and P<sub>2</sub>O<sub>5</sub>, and comparing the values with those of normal plants. The trustworthiness of the results are dependent on the degree of soil (or culture) homogeneity. J. J. WILLAMAN

Glutathione in plants. W. H. CAMP. *Science* 69, 458(1929).—Fink's micro-method for glutathione, using Na nitroprusside, was adapted for its detection in plants. It was found in the stem apex of young sunflowers (*Helianthus annuus*); it was especially characteristic of staminate tissue in arum (*Alocasia odora*), and in corn (*Zea mays*). "The nitroprusside reaction, indicating glutathione, is thus helpful as an indicator of certain chemical reactions in the cells, and may be used to advantage in measuring the metabolic level of various tissues during the ontogeny of the plant." J. J. W.

Hexamethylenetetramine and formaldehyde are nutrients for beans. I. MARRASSÉ. *Compt. rend.* 188, 1006-7(1929).—Bean embryos, sepd. from the cotyledons and freed from starch by sprouting in the dark, were placed in solns. of hexamethylene tetramine (0.1 to 0.3 g. per l.) and of HCHO (0.16 to 0.6 g. per l.). Judged both by the formation of starch and by the growth of the nuclei, both substances proved to have nutritive value. The optimum concn. of the first was 0.2 g. and for the second, 0.16 g. per l. J. J. WILLAMAN

Constitution of pine wood lignin. VIII. The nutritive sap of the pine (KLASON) 10. Non-tannin substances in the extract of the root of badan. I. Bergein (CHICHIBABIN, et al) 10. Conjugated double bond. IX. The coloring matter in *Physalis alkekengi* and *Physalis franchetti* (KUHN, WIEGAND) 10.

OWENS, CHARLES E.: Principles of Plant Pathology. New York: John Wiley & Sons. 629 pp. 23s. 6d. net. Reviewed in *J. Ministry Agr.* 36, 300(1929).

## E—NUTRITION

PHILIP B. HAWK

The sterols isolated from several vegetables. MIZUHO SUMI. *Bull. Inst. Phys. Chem. Research* (Tokyo) 8, 228-33(1929); *Abstracts sect. 2*, 30.—S. investigated the sterols isolated from (1) *Enteromorpha compressa*, (2) *Cytophyllus fusiforme* Harv., (3) *Digenea simplex* C., (4) *Osmunda regalis* L., (5) spore of *Lycopodium clavatum*, (6) pollen of *Typha japonica* Miq., (7) seed of *Ginkgo biloba* L. and (8) oil of rice bran. The sterols were all sitosterol. The ergosterol content mixed in these sterols was detd. by the ultra-spectroscopic method. The non-crystd. portions of the unsaponifiable parts of (1), (2), and (3), which were purified by cooling with liquid air, and with digitonin, were tested for the antirachitic property. 0.1 mg. per day of these fractions had the power to prevent rickets in young white rats. G. CALINGAERT

The antirachitic potency of biosterol. SADAYUKI HAMANO. *Bull. Inst. Phys. Chem. Research* (Tokyo) 8, 293-6(1929); *Abstract sect. 2*, 38(1929).—Albino rats were made to suffer from rickets, after having been fed with Steenbock diet No. 2965 during 4-5 weeks. The regular daily dose, 0.1, 0.05, 0.01, 0.001 mg., resp., of biosterol dissolved in linseed oil, was given per rat *per os* for 3 weeks, and then the animals were examd. by radiography. The 6 series of observations on 88 rats in total showed that a daily dose of 0.01-0.05 mg. of biosterol per head was necessary to bring out the healing or preventive effect on the exptl. rickets. Similar expts. were carried out also with the market sample of "Ricken Vitamin A," of which the daily dose of 2 mg. was found sufficient to attain a similar effect. G. CALINGAERT

The oryzatoxin theory. MASATARO MIURA. *Bull. Inst. Phys. Chem. Research* (Tokyo) 8, 311-8(1929); *Abstract sect. 2*, 39-41(1929).—A large no. of feeding expts. on pigeons, *Uroloncha domestica* Flower, and albino rats were carried out. (1) The typical polyneuritis may be brought about by the EtOH-extd. polished rice or by the

similarly treated potato-starch diet, and it can be cured or prevented by administration of vitamin B. (2) With Simonnet's diet pigeons suffer from spasms in a very high percentage of cases and in some the onset is remarkably delayed. (3) With fats and EtOH-sol. matters removed from the same diet, the pigeons all died of marasmus. (4) The compn. and the relative proportions in the diet seem to affect the length of the incubation period of polyneuritis in pigeons. (5) The addn. of EtOH ext. of polished rice or its petroleum ether fraction does not quicken the onset of the disease in pigeons. (6) For the growth and well-being of albino rats, a supply of vitamin B is necessary, even when EtOH-extd. rice or EtOH-extd. potato starch is used as the carbohydrate moiety of a synthetic diet. (7) Though the onset of polyneuritis on a vitamin B-free diet was not affected, in any way, by the addn. of a very minute amt. of vitamin B, a small amt. either of vitamin A or of irradiated or non-irradiated ergosterol, the possibility of the presence in the EtOH ext. of polished rice of some sp. non-toxic substance or substances which increase the requirement for vitamin B in test animals cannot definitely be denied. (8) EtOH ext. of polished rice shows slight protein reactions, and contains a small amt. of ash and vitamin B in addn. to a large amt. of fats. Potato starch also contains vitamin B, but much less. (9) Vitamin-B-free diet does not necessarily produce the typical picture of polyneuritis. These results indicate that the expts. carried out by Teruuchi do not conclusively prove the existence of a toxin (oryzatoxin) in the EtOH ext. of polished rice. (10) M explains briefly why he made use of nervous symptoms, especially the spasms and accompanying characteristic rapid fall of body temp., as the criterion of the onset of the disease, and also, as a further check, the effects on these symptoms of subsequent administration of vitamin B.

Lumière's claim to have produced the classical symptoms of polyneuritis in pigeons on a diet rich in vitamin B but quantitatively insufficient is not confirmed. G. C.

**A peculiar disturbance of carbohydrate metabolism.** RUDOLF SCHÖNHHEIMER. *Z. physiol. Chem.* 182, 148-50(1929).—The autopsy of a 7 $\frac{3}{4}$  year old girl who had died of grippe showed enormous enlargement of liver and kidneys. These organs contained enormous deposits of glycogen. On the dry basis the glycogen content of the kidney was 36.82% and of the liver 33.72%. This value for the liver is almost the max. ever obtained by forced feeding of animals with carbohydrate, but so high a value for the kidney is wholly without precedent. The glycogen accumulation was probably due to some disturbance which prevented enzymic breakdown of the glycogen. Six days autolysis of the liver failed to diminish its glycogen content, but glycogen prep. from this liver was readily hydrolyzed by livers obtained from other cadavers. A. W. DOX

**Research findings on corrosion and vitamin destruction.** E. F. KOHMAN. *Canning Age* 9, 227-31(1928); *Expt. Sta. Record* 59, 94.—A brief summary of investigations on the vitamin C content of canned apples (*C. A.* 19, 543), peaches (*C. A.* 20, 1432), and strawberries (*C. A.* 22, 1995), with special emphasis on the relation of O to destruction of vitamin C and the means required with different fruits to exhaust the O present in the fruit before canning if losses of vitamin C are to be prevented. A similar relationship exists between the O content of fruit and the corrosion of cans; recent studies on factors involved in corrosion are summarized. In colored fruits canned in stainless steel the color is preserved better than in enameled cans. A preliminary report is included on the vitamin content of tomato concentrate. No appreciable loss in vitamins A and B was found to take place during the concn., but there was some loss in vitamin C. This loss is not, however, in proportion to the concn. Tomato pulp is thus considered to be somewhat richer in vitamin C than raw tomatoes, wt. for wt., and several times richer in vitamins A and B. H. L. D.

**Growth, reproduction and longevity of experimental animals as research criteria in the chemistry of nutrition.** H. L. CAMPBELL. *Diss., Columbia Univ., N. Y.*, 1928, 39 pp.; *Expt. Sta. Record* 59, 789-90.—The purpose was to demonstrate the possibility of forming a quant. estimate of the value of different approx. adequate diets by long-time feeding expts. on rats for comparisons of the relative growth of the young animals, the vigor of the adults, and the relative longevity. It is concluded that properly standardized animals under carefully controlled conditions may be used as criteria in nutritional research, growth, reproduction and longevity. "This promises to be of special value when the field of investigation is that which approaches more or less closely to the adequate in nutrition, in which short time expts. are of little value." H. L. D.

**The vitamin A and vitamin D content of cod-liver meal.** E. M. CRUICKSHANK.

with skim milk *ad libitum*, being used. In the vitamin D expts. the corn was yellow and in the A expts. white. One % of cod-liver meal was sufficient to protect the chicks against rickets and from 7 to 10% to meet the requirements for vitamin A. Ophthalmia was not observed in the vitamin A deficiency, but respiratory and lung trouble, with nodular lesions of mouth and pharynx, and characteristic changes in the kidneys, in which the ureters and renal tubules were filled with an accumulation of urates, were observed. H. L. D.

The vitamin A and vitamin D content of cod-liver meal. E. M. CRUICKSHANK, E. B. HART AND J. G. HALPIN. *Poultry Sci.* 7, 9-16(1927); *Expt. Sta. Record* 59, 465; cf. preceding abstr.—Cod-liver meal contg. 45% of oil and 43% of protein was tested for its vitamins A and D potency. In testing the vitamin D content 9 groups of chicks were fed for six weeks on a basal ration of 97 parts of yellow corn, 2 parts of  $\text{CaCO}_3$ , 1 part of salt, and skimmed milk *ad libitum*. To the basal ration were added in the various groups ultra-violet light, cod-liver oil, and cod-liver meal in amts. varying from 1 to 10%. In testing the vitamin A content 10 groups of chicks were fed a basal ration of 92 parts of white corn, 5 parts of yeast, 2 parts of  $\text{CaCO}_3$ , 1 part of salt, and skim milk *ad libitum*. To the basal ration in the various groups were added ultra-violet light, cod-liver oil, and cod-liver meal in amts. varying from 1 to 10% and cod-liver meal and ultra-violet light in combination. Even 10% of the cod-liver meal used did not furnish sufficient vitamin A to protect against rickets, although chicks receiving this amt. survived longer and did not show pathol. symptoms in such a marked degree as those receiving less meal. The cod-liver meal used contains sufficient vitamin D to promote good calcification even when fed at a level of 1%, but not enough vitamin A to protect birds from vitamin A deficiency even when fed at a 10% level. H. L. D.

Vitamins. L. KOFLER. *Pharm. Monatsh.* 10, 57-9(1929).—An address. W. O. E.

Variations in the amounts of the antirachitic vitamin in different samples of cod-liver oil, milk and butter. KATHARINE H. COWARD. *Quart. J. Pharm.* 1, 534-8(1928).—Among the samples of 4 selected oils examd. the vitamin D varied from 50 to 150 units of antirachitic activity per g. A biol. test is needed. 0.4 g. of butter given as a daily dose for 10 days usually produces a degree of healing in exptl. rickets comparable with that of one of the doses of the standard prepn. Two out of 3 samples of milk examd. were almost entirely lacking in vitamin D. W. O. E.

Notes on the chemistry of the fat-soluble vitamins in cod-liver oil. A. L. BACHARACH AND E. LESTER SMITH. *Quart. J. Pharm.* 1, 539-45(1928).—Vitamin D is mainly present in cod-liver oil in a form sol. in EtOH, vitamin A in a form insol. in EtOH. Sapon. renders it sol. in EtOH without affecting its vitamin or chromogen activities. It is suggested that the vitamin A is present in cod-liver oil as an ester, and that a portion of the vitamin D is also sometimes present as an ester. W. O. E.

Influence of changes in body weight of the test rats on the accuracy of the assay of vitamin D by means of the line test. KATHARINE H. COWARD AND MARJORIE R. CAMBLEN. *Quart. J. Pharm. and Pharmacol.* 2, 44-7(1929).—From the numerical data obtained and drawings of sections of the bones it appears that an assay of the strength of the com. prepn. examd. can be computed in the usual way in terms of the Society's standard prepn. of irradiated ergosterol. The more interesting factor in the expt. lies in the degree of healing brought about by a more or less temporary loss of wt. in the rats which received no dose of any substance contg. vitamin D. None of the rats was significantly heavier at the end of the expt. than it was at the beginning, and yet a very severe degree of rickets, indicated by the wide metaphyses and very swollen ends of the bones, had been developed in each one. The figures presented show how far slight variations in wt. of the rats during the exptl. period may affect the calcification of the bones during that time. Far greater irregularities in healing are encountered in rats in which the degree of rickets is so slight that the bones are not enlarged at the ends, and the metaphyses are only somewhat (though definitely) wider than normally, a condition ascribable to the irregularities in feeding prior to the exptl. period, and it must be emphasized again that, unless this post-lactation, pre-exptl. period is controlled as carefully as an exptl. period, uniform results cannot be obtained. W. O. E.

Relation of soil fertility to vitamin A content of leaf lettuce. MARIE DYE AND JOHN W. CRIST. *J. Nutrition* 1, 335-8(1929).—Grand Rapids Forcing variety of leaf lettuce was grown in pots contg. 5 lb. of (I) sandy loam soil of very low fertility; (II) soil plus the addn. of 25 g. of pulverized sheep manure and 1 g. of a mixt. of  $\text{KNO}_3$ ,  $\text{CaH}_2\text{H}_2\text{PO}_4$ , and KCl (1:2:1); (III) soil plus 4 g. of the inorg. mixt. but no org. matter. Animal feeding tests for vitamin A were made during a period of 8 weeks.

Ten rats were used for each treatment. The chem. compn. of the plants was detd. after the 8-week period. The chem. analysis of the lettuce did not aid in interpreting the results. The total gains in wt. were I, 58.2 g.; II, 73 g.; III, 82.4 g. The vitamin A content increased with plant vigor, robustness and with the greenness of the lettuce. Conclusion: The vitamin A content is assocd. with the degree of greenness but not necessarily with vigor apart from differences in chlorophyll. Further expts. on this point are under way.

C. R. FELLERS

Critical analysis of the dental literature dealing with the effects of dietary variation upon the structure of teeth. HENRY KLEIN. *J. Dental Research* 9, 5-9(1929).—The analysis includes 97 papers published during a period of 16 yrs. beginning with 1912. A bibliography is given.

JOSEPH S. HEPBURN

Relation of nutrition to general immunity. SHERMAN L. DAVIS. *J. Dental Research* 9, 11-28(1929).—An address with stress on Ca and vitamins. J. S. H.

Aspects of nutrition and metabolism in China. WILLIAM H. ADOLPH. *Sci. Monthly* 29, 39-43(1929).

E. H.

The action of irradiated ergosterol in the rabbit. MAURICE I. SMITH AND E. ELVOVE. *U. S. Pub. Health Repts.* 44, 1245-56(1929).—The action of irradiated ergosterol has been studied in the rabbit with especial reference to its toxicity, its influence upon serum Ca and inorg. phosphate and its influence upon tissue Ca. Repeated administration of 2 mg. and upwards of irradiated ergosterol given orally or intramuscularly to full-grown rabbits may prove fatal in a relatively short time. Doses of 1 mg. or less given 3 to 4 times a week seem to be well tolerated. Large doses of irradiated ergosterol produce a more or less marked hypercalcemia. Small doses produce variable results. The inorg. phosphate of the serum, though subject to considerable normal fluctuations, also appears to be definitely increased under the influence of the larger doses of irradiated ergosterol. Toxic doses of irradiated ergosterol produce great increases in the Ca of certain tissues. The calcifying action of irradiated ergosterol appears to be highly selective, involving certain tissues, *e. g.*, the aorta, kidney and lungs, but not others, *e. g.*, liver or striated muscle. The relation of the hypercalcemia under the influence of irradiated ergosterol to the tissue Ca is discussed.

J. A. KENNEDY

Digestion from whole plant cells and its significance for the physiology and pathology of digestion in men. VI. Digestion of fat from raw plant tissue. W. HEUPKE AND A. V. MARX. *Arch. Verdauungskrankh.* 44, 23-31(1928); *cf. C. A.* 22, 1601.—Fat found in the whole plant cells (nuts and olives) can be digested (expts. on mice and men). The lipase of the digestion secretions can find its way into the cell. VII. Digestion of starch from raw plant cells. WILHELM HEUPKE. *Ibid* 169-75.—Starch is digested from cells that are not broken mechanically. The diastatic enzymes of the intestinal secretions pass the cell walls of uncooked plants. Different raw starches vary in their availability to digestion.

FRANCES KRASNOW

The value of protein from cacao and cacao products. HANS PULFER. *Arch. Verdauungskrankh.* 44, 115-22(1928).—Cacao and cacao products can be used to supply the protein N in dog and man. Although the fecal discharge is increased as is the case with all plant protein, the utilization of the cacao protein is not markedly reduced. This utilization is increased with continued administration.

FRANCES KRASNOW

Nutritional allergy as a factor in the pathogenesis of initial lung tuberculosis. C. FUNCK. *Arch. Verdauungskrankh.* 44, 356-61(1928).—Report of 2 cases pointing out this relationship.

FRANCES KRASNOW

Nutrition studies in a low protein intake during an interval of 25 months. B. ZUSKIND. *Arch. Verdauungskrankh.* 44, 371-2(1928).—During the first 9 months on a protein intake of 0.69 g. per kg. body wt. there was no change in body wt. In the next 11 months, the protein intake was 0.55 g. per kg. body wt. Slight loss in body wt. was noted. The last 5 months of the expt. showed a loss of 1.5 kg. in wt., the protein intake being 0.58 g. per kg. body wt.

FRANCES KRASNOW

Nitrogen excretion of hogs on velvet-bean rations. EMERSON R. MILLER. *J. Am. Vet. Med. Assoc.* 74, 376-80(1929).—Hogs assimilate a much smaller quantity of N of the velvet-bean than is utilized from other ordinary rations. A relatively large amt. of N is eliminated in the urine.

FRANCIS KRASNOW

Starch digestion in the dog. B. B. ROSEBOOM AND J. W. PATTON. *J. Am. Vet. Med. Assoc.* 74, 768-72(1929).—Dogs are capable of digesting and assimilating starch, both raw and cooked. Their salivary and pancreatic secretions contain amylase.

FRANCES KRASNOW

Studies on the nutritive value of milk. II. The supplementary value of inorganic iron and copper. W. E. KRAUSS. *J. Dairy Sci.* 12, 242-51(1929); *cf. C. A.* 23, 1939.—

Addn. of Fe salts to an exclusive whole milk diet did not prevent anemia. Addn. of Cu salts was beneficial, but addn. of both Cu and Fe salts was very effective. No offspring were produced on this diet, possibly because of a destructive effect of Fe salts on vitamin E. The total nutritive effect, aside from reproduction, of milk obtained under different conditions, might be detd. by the use of a milk diet supplemented with Cu and Fe salts.

AMY LEVESCONTE

**Rickets in rats. VIII. Rickets and tetany.** ALFRED T. SHOHL AND FRANKLIN C. BING. *Am. J. Physiol.* 86, 633-8(1928); cf. *C. A.* 22, 4584.—Rats made rachitic by a high-Ca, low-P diet were cured by (1) cod-liver oil, (2) ultra-violet radiation and (3) added phosphate in the diet. Cod-liver oil or irradiation produced a lessened irritability to galvanic stimuli; the addition of phosphates caused an increased irritability. The condition resulting from the addition of phosphates to the diet of rachitic rats is a transient tetany.

J. F. LYMAN

**The physiology of the vitamins. VI. The effect of insulin on gastric motility in vitamin-B deficiency.** C. J. STUCKY, W. B. ROSE AND G. R. COWGILL. *Am. J. Physiol.* 87, 85-92(1928); cf. *C. A.* 23, 1938.—Gastric motility was definitely lowered in 6 out of 8 dogs suffering from vitamin B deficiency. Insulin injections increased gastric motility of the vitamin-B deficient animals in 25% of the trials (4 out of 16). No relationship between gastric motility and blood sugar level could be demonstrated.

J. F. LYMAN

**Muscle hemoglobin concentration during growth as influenced by diet factors.** G. H. WHIPPLE, A. H. GROTH AND F. S. ROBSCHT-ROBBINS. *Am. J. Physiol.* 87, 185-91(1928).—Pups were fed (1) on a diet unfavorable for blood hemoglobin regeneration and (2) on a diet highly favorable thereto. After 10 weeks feeding no difference in the muscle hemoglobin of the 2 groups was noted. After 15 to 20 weeks the liver-fed pups showed uniformly a distinct increase in blood hemoglobin and muscle hemoglobin concn. above the bread controls, and after 25 to 30 weeks these differences may be more distinct.

J. F. LYMAN

**The effect of yeast feeding on some blood constituents of hens.** A. A. HORVATH. *Am. J. Physiol.* 87, 208-20(1928).—The addn. of active yeast or of taka-diastase to low purine rations fed to hens resulted in a rise of blood uric acid and of plasma inorg. phosphates. Heated (inactive) yeast had little or no such effect. It is suggested that the nuclei of yeast and taka-diastase have the ability to raise the uric acid content of the blood on a low purine diet.

J. F. LYMAN

**The biological value of yeast proteins for the rat.** E. V. STILL AND F. C. KOCH. *Am. J. Physiol.* 87, 225-48(1928).—Raw dried yeast as the only source of protein in a "synthetic" ration for the rat showed a digestibility for proteins of 72%. Cooked yeast showed a protein digestibility of 62%. The biological values of cooked and raw yeast protein as compared with casein were 37.9 and 45%, respectively. The Ca and P balances on the yeast rations were less favorable than those obtained on casein diets.

J. F. L.

**Effect of proteins and vitamins on hemoglobin production in the rat.** G. F. CARTLAND AND F. C. KOCH. *Am. J. Physiol.* 87, 249-61(1928).—See *C. A.* 22, 4583.

J. F. LYMAN

**A short method of calculating energy, protein, calcium, phosphorus and iron in the diet.** EDITH HAWLEY. U. S. Dept. Agr., *Tech. Bull.* 105, 1-20(1929).—A short-cut method is given for calcg. the nutritive value of diets. It usually gives values within 5% of those obtained by the long method and requires only about 42% as much time.

A. L. MEHRING

**Vitamin content of silo juices.** FRITZ DUSCHEK. *J. Landw.* 76, 197-216(1928).—The vitamin content of serradella silage juice was shown, by the betterment of health conditions and increases in live wt. of rats previously fed on vitamin-deficient diet. Under like conditions no beneficial results were observed in growth and development with freshly pressed juice from maize and red clover silage but there was an improvement in health conditions. These effects were not produced with juices from cold-pressed silos. In elec. ensilage practice losses of valuable food material can be prevented by mixing the juices with absorbent material for subsequent feeding purposes.

E. F. SNYDER

**Irradiated ergosterol.** G. TANRET. *Rev. sci.* 67, 38-45(1929).—A review of its discovery, prepn., properties and uses in therapeutics.

P. THOMASSET

**The effect of sunshine on the acidity of the intestinal tract of rachitic rats.** FREDERICK F. TISDALL AND HAROLD W. PRICE. *Bull. Johns Hopkins Hosp.* 41, 432-6(1927).—The  $pH$  values of intestinal contents of normal rats were: upper half small intestine 6.33; lower half, 6.23; cecum, 6.05; colon, 6.75 and feces, 6.90. The same of rats on McCollum's rickets-producing diet were 3142: small intestine, 6.47 and 6.57; cecum, 6.70; colon 6.83 and feces, 7.44. The same of rats on rickets-producing diet and exposed to



sunshine daily were: small intestine, 6.57 and 6.48; cecum, 6.26; colon, 6.26 and feces, 6.72. Short daily exposures produced just as marked changes as long ones. These changes do not parallel the antirachitic effect.

R. C. WILLSON

The story of carbonated beverages. Composition and value (STORMS) 12.

## G—PATHOLOGY

H. GIDEON WELLS

**Chemistry of nephritis with uremia.** P. CRISTOL. *Arch. soc. sci. méd.* 9, 126-67 (1928); *Physiol. Abstracts* 13, 457.—In the investigation of deficiency and renal function it is essential to start with a table of correct proportions of all normal constituents of the blood. Non-protein N varies greatly with the method of dealbumination employed; it is of great importance to have a uniform technic for this, and the best reagent for the purpose is trichloroacetic acid. The coeff. urea N/total N in uremia is high. Urea is the constituent, the retention of which is absolutely and relatively highest. Residual N is the total nonprotein N less urea N. It is better to det. separately each constituent which contributes to it—uric acid, creatinine, etc.—than to consider residual N as a whole. Indoxyl is an important constituent to det. in blood as a mark of renal deficiency; how far the kidney is responsible for changes found in the various constituents of the blood is to be detd. by such criteria as urea concn. in urine, secretory constants, and elimination of methylene blue.

H. L. D.

**Metabolism in heart disease.** D. LASZLO. *Klin. Wochschr.* 7, 1411-5 (1928); *Physiol. Abstracts* 13, 512.—In cases of uncompensated heart disease during rest the N/P ratio in the urine is lower than in the food, indicating a disproportionate loss of P. Administration of Na phosphate for a few days leads to a retention of P. (It is not stated whether the fecal excretion was detd.) The skeletal muscle of persons who have died from heart disease is poorer in P than normal muscle, and the same is true, but to a lesser extent, for heart muscle. The creatinine and uric acid excretion is increased, and the amt. of these substances in the blood is also above normal. After mild exercise the P, uric acid and creatinine excretion are increased. In the blood the creatinine and uric acid increase, whereas the P diminishes. Blood lactic acid also rises above the normal value, and takes an hour to return to the resting level.

H. L. D.

**Coloring matters in functional liver tests.** H. J. D'AMATO. *Semana méd.* (Buenos Aires) 35, 1505-20 (1928); *Physiol. Abstracts* 13, 520.—Methylene blue, indigo carmine, Congo red, neutral red, sulfophenolphthalein, phenotetrachlorophthalein, bromosulfophthalein, phenoltetraiodophthalein and rose bengal have all been used as tests for liver function. Bromosulfophthalein and rose bengal give the best results. H. L. D.

**The relation between cancer and lipid metabolism.** F. BURGHEIM. *Klin. Wochschr.* 8, 828-30 (1929).—Treatment of cancer patients with x-rays leads to a transitory rise in the cholesterol content of the blood. This is not the case with normal individuals, and it is not true of cancer patients that have had the tumor removed by operation. Malignant tumors contain more cholesterol than do benign tumors. The possible relationship between cancer and cholesterol is discussed. MILTON HANKE

**Echinococcus antigen.** JOHANN H. BOTTERI. *Klin. Wochschr.* 8, 836-9 (1929).—A protein-free fluid was obtained from one spleen hydatid. This material was used as antigen in expts. on human beings. This antigen, injected subcutaneously, leads to sensitization of the skin so that a wheal is obtained upon intracutaneous reinjection. Anaphylactic phenomena are not observed when this antigen is injected intravenously into sensitized humans. Injection of fluid from a protein-contg. hydatid gives rise, in a sensitized person, to a wheal (primary reaction) and a deep edema (secondary reaction). The protein-free hydatid fluid produces only the primary reaction. This type of reaction may be due to polypeptides. The secondary reaction is a true protein allergy.

MILTON HANKE

**The action of fluoride on cell metabolism.** WILHELM EWIG. *Klin. Wochschr.* 8, 839-40 (1929).—The fluoride ion has little, if any, action on the O consumption of cells; but it markedly reduces anaerobic glycolysis of all cells. The latter action is particularly striking in the case of cancer cells.

MILTON HANKE

**Antibody formation in experimental syphilis.** ALFRED COHN. *Klin. Wochschr.* 8, 886 (1929).—The injection of dead *Spirocheta pallida* into rabbits, or man, engenders antibodies that appear in the serum. Such sera render spirochetes inactive and lead to their agglutination. No explanation is offered for the fact that such antibodies do not seem to appear in patients afflicted with syphilis.

MILTON HANKE

**The excretion of methylene blue (methylthionine chloride, U. S. P.) by the biliary**

system of the rabbit. Its significance for the conception of hepatogenous stasis in the gall bladder. B. HALPERT AND M. T. HANKE. *Arch. Path.* 7, 473-7(1929).—Expts. with methylene blue on rabbits furnish substantial evidence that the bile does not, under ordinary conditions, leave the gall bladder through the cystic duct. They furnish a striking example of stasis in the gall bladder for which the liver is responsible (hepatogenous stasis). In view of the possibility of creating conditions analogous to those described here for methylene blue, but with agents with more pronounced bactericidal action, they may indicate the road leading to successful chemotherapy of the gall bladder.

HARRIET F. HOLMES

Anaphylaxis in the white rat as influenced by diet. B. C. SEEGAL AND D. KHORAZO. *Arch. Path.* 7, 827-34(1929).—Pronounced symptoms of anaphylactic shock cannot be produced in white rats on a diet of oats, bread, milk and greens. Symptoms of anaphylactic shock can be constantly produced in white rats on a diet of white bread and H<sub>2</sub>O. The suprarenal glands of rats on a diet of bread and H<sub>2</sub>O are considerably smaller than those of animals on a complete diet as far as investigated. The titer of the precipitin and the titer of the precipitinogen content of the serum of sensitized rats on a diet of bread and H<sub>2</sub>O do not differ significantly from the corresponding titers of the serum of sensitized animals on a diet of oats, greens, bread and milk.

H. F. H.

Gastric secretion and its relationship to the urinary reaction. D. T. DAVIES. *Brit. J. Exptl. Path.* 10, 1-9(1929).—A normal secretion of gastric HCl is followed by a definite alk. tide in the urine. In cases of true achlorhydria the reaction of the urine is remarkably const., and it may afford an addnl. means of diagnosis in conditions where achlorhydria is the rule. It also affords a distinction between true and false achlorhydria, a method less fatiguing than the estn. of the total and mineral chlorides of the gastric secretion. An acid tide may be obtained in cases in which there is rapid evacuation of stomach contents and early stimulation of alk. pancreatic juice.

HARRIET F. HOLMES

Blood phosphorus in health and disease. IV. The phosphorus content of the blood in diabetes mellitus. F. B. BYROM. *Brit. J. Exptl. Path.* 10, 10-15(1929); cf. C. A. 22, 3209.—In severe untreated diabetes and in diabetic coma there is a pronounced fall in the org.-acid-sol. P ("ester P") of the blood corpuscles, which appears to be the results of acidosis. After satisfactory treatment by dietetic restriction and insulin, the ester P returns to the normal level. In mild diabetes and in cases of moderate intensity the only abnormality is a small increase in the ester P content of the corpuscles. In fatal diabetic coma the inorg. phosphate rises very considerably, probably as the result of renal damage. The conclusions of Bloor (C. A. 10, 3105) with regard to the lipin content of the blood in this disease are confirmed. There is an increase in the plasma lipin P in many cases of severe diabetes, the amt. of lipin in the corpuscles remaining, as in nephritis, relatively normal. The lipin P in diabetes differs in its reaction to treatment. Whereas the inorg. and ester P are restored to normal after treatment, the lipin frequently remains unchanged or is even increased. This is possibly due to the fact that the av. diabetic diet usually includes appreciably more fat than that of the normal individual or the untreated diabetic.

H. F. H.

The glucolytic action of some tumors and the effect of insulin. S. L. BAKER, F. DICKENS AND E. J. CALLIMORE. *Brit. J. Exptl. Path.* 10, 19-26(1929).—Expts. have shown a marked difference between certain normal tissues and malignant tumors as regards the anaerobic metabolism of glucose. This is in agreement with the work of Warburg (*Biochem. Z.* 160, 307(1925); cf. C. A. 20, 2364). Tumor tissues produced about 5 to 10 times as much lactic acid as was produced by normal tissues under the same conditions. The amt. of lactic acid produced was nearly equal to the amt. of glucose destroyed. The addn. of either insulin or thyroxine produced no demonstrable effect upon the glucose metabolism.

HARRIET F. HOLMES

A method for early serodiagnosis of cancer by use of the Botelho reaction. K. ITCHIKAWA. *Neoplasmes* 7, 326-31(1928).—Certain modifications increase the reliability of the Botelho reaction for the diagnosis of cancer. The percentage of serum albumin and serum globulin in the serum is calcd. by use of the refractometer and viscometer. When the Botelho reaction is pos. while the serum contains a greater percentage of albumin than normal serum, the results are definitely pos. for cancer. If, however, the Botelho reaction is neg. repeat the reaction, reducing the percentage of serum albumin to the normal. A pos. reaction indicates definitely cancer and a neg. reaction noncancer. When the Botelho reaction is neg. while the serum contains a percentage of globulin higher than normal, the results are definitely neg. for cancer. If, however, the Botelho reaction is pos. the result is not definitely pos. for cancer (certain cases of tuberculosis give a pos. Botelho reaction). The reaction is to be

repeated, the albumin being adjusted to the same percentage as in normal serum but with the addn. to the percentage of the albumin in the serum to be examd. of  $\frac{2}{3}$  of the difference between the percentage of the globulin of the serum; this is to be considered as albumin. A pos. reaction now definitely indicates cancer and a neg. reaction, noncancer.

HARRIET F. HOLMES

**The influence of diet in cancer.** M. GUEIRN. *Neoplasmes* 8, 5-41 (1929).—A general review with 117 references. From the point of view of prophylaxis a moderate diet is advised, rich in vitamin A and Mg salts with a restricted use of foods rich in vitamin B and the lipoids, especially cholesterol and its ethers.

HARRIET F. HOLMES

**Diabetic albuminuria—the so-called chronic nephrosis.** ALBERT A. EPSTEIN. *Arch. Verdauungskrankh.* 44, 31-55 (1928).—Discussion.

FRANCES KRASNOW

**New contributions to gastric chromoscopy; the combined gastric function test.** R. A. LURIA AND E. R. MOGILEVSKII. *Arch. Verdauungskrankh.* 44, 55-79 (1928).—The combined gastric function test (the simultaneous study of the acidity curve and chromoscopy) offers a possibility for more detailed information of the secretory function. Generally the neutral red elimination runs parallel to acidity content in that it is accelerated during hyperacidity, decreased during hypoacidity and ceases during anacidity. Chromoscopy helps to det. the source of mucus in gastritis, to differentiate the cases of gastritis due to acidity disturbances from myxorrhoea of vegetative origin and to classify the different types of achylia.

FRANCES KRASNOW

**Anacidity, pseudoanacidity and histamine reaction.** J. VANDORFY. *Arch. Verdauungskrankh.* 44, 176-82 (1928).—The histamine test is valuable in certain cases of anacidity for diagnosis as well as in the detn. of the duration of illness.

F. K.

**Production of specific hemoglobin precipitin.** A. D. GUSSEV. *Deut. Z. ges. gericht. Med.* 13, 270-7 (1929).—Immunization with erythrocyte ext. does not produce strongly specific serum but a serum precipitin and hemoglobin precipitin. Injection of hemoglobin solns. produces highly specific hemoglobin precipitin.

F. K.

**Some of the physicochemical properties of the virus of hog cholera.** H. C. H. KERNKAMP. *J. Am. Vet. Med. Assoc.* 74, 844-63 (1929).—Hog cholera virus is not retained by the plaster of Paris-magnesium oxide filters of Kramer. The virus passed the ultra-filter when 2% collodion membranes were used. It seems that the size of the virus particles is less than 35  $\mu$ .

FRANCES KRASNOW

**Suprarenal insufficiency. II. The relative importance of cortex and medulla in the susceptibility to histamine of suprarenalectomized rats.** L. C. WYMAN. *Am. J. Physiol.* 87, 29-41 (1928).—After removal of both adrenals rats were very much more susceptible to histamine poisoning. The protective action of the adrenal against histamine seems to be furnished by the medullary rather than the cortical tissue. **III. The effect of thyroidectomy and of forcing fluid on suprarenal insufficiency in rats.** *Ibid* 42-50.—The expts. indicate that in the rat dehydration of the blood and tissues is not a factor in subacute and chronic suprarenal insufficiency and the attendant increased susceptibility to intoxication.

J. F. LYMAN

**The utilization of acetoacetic acid by normal and diabetic dogs before and after evisceration.** I. L. CHAIKOFF AND S. SOSKIN. *Am. J. Physiol.* 87, 53-72 (1928).—Muscles of depancreatized dogs utilized acetoacetic acid as rapidly as normal animals. Insulin cannot exert its antiketogenic effect by influencing the rate of utilization of acetoacetic acid. It is suggested that the ketone bodies are formed in the excessive conversion of fat to carbohydrate and that this process is inhibited by insulin.

J. F. LYMAN

**The role of toxins in parathyroid tetany. II. Tissue changes in parathyroid tetany and in guanidine poisoning.** L. A. ELKOURIE AND E. LARSON. *Am. J. Physiol.* 87, 124-30 (1928).—A microscopic comparison of tissues of animals dying of parathyroid tetany with those of others poisoned with guanidine showed quite dissimilar conditions.

J. F. LYMAN

**Metabolism of total base in nephritis.** GLADYS L. BOYD, ANGELA M. COURTNEY AND IDA F. MACLACHLAN. *Am. J. Diseases Children* 36, 16-21 (1929).—The concn. of base in the blood plasma during nephritis varies but little from the normal. Values slightly lower than normal may be assoc. with a renal acidosis together with an increase in the blood phosphate concn., with the end state in chronic interstitial nephritis, or with a positive retention of Na and Cl. The amt. of base in the plasma does not appear to be detd. by the degree of diln. of the blood or the degree of retention of N and bases other than Na. Less base is excreted with the urine during nephritis, and more with the feces.

E. R. MAIN

**The basal metabolism in gynecology. I. The basal metabolism during the various phases of the menstrual cycle and in different forms of ovarian insufficiency.**

G. DELLEPIANE. *Boll. soc. ital. biol. sper.* 4, 110-4(1929).—In normal women the basal metabolism during the various phases of the menstrual cycle oscillated only about 10% from the normal. The basal metabolism of women suffering from ovarian insufficiency and of those rendered sterile by exposure to Röntgen rays or by surgical operations was practically normal. II. The basal metabolism in benignant and malignant neoplasia of the genital system. *Ibid* 115-8.—The increase in the basal metabolism of women suffering from fibromyoma of the uterus was not const.; it varied from 6 to 21% in about one-half the cases. Surgical removal of the tumor produced only a slight decrease. Malignant and benignant tumors of the ovaries did not change the basal metabolism in any const. manner.

PETER MASUCCI

Disturbances of the metabolism of sulfur and their influence on chronic rheumatism. P. CAWADIAS. *Ann. med.* No. 3(1928); *Rev. sud-americana endocrinol. immunol. quimioterap.* 11, 749-53(1928).

A. E. MEYER

Basal metabolism in polycythemia vera. THEODORE L. BLISS. *Ann. Internal Med.* 2, 1155-61(1929).—In 23 cases of polycythemia vera, there was an increase in the basal metabolic rate of 10% above the normal range. There is frequently an increased production of heat, the cause of which is unknown.

JOHN T. MYERS

Vasopressor substances in the liver after obstruction of the common duct. I. S. RAVDIN. *Arch. Surgery* 18, 2191-201(1929).—There is an increase of both histamine and choline in the liver following common duct obstruction. This may account for the so-called liver shock after operations for the release of common duct obstructions.

JOHN T. MYERS

Investigation of complement. III. The addition of ammonium salts to guinea pig serum. H. TOKUNAGA. *Centr. Bakt. Parasitenk.*, I Abt., 111, 470-8(1929); cf. *C. A.* 22, 3217. IV. The action of ammonium sulfate on complement. *Ibid* 478-83.—Treatment with  $(\text{NH}_4)_2\text{SO}_4$  completely inactivated complement, the rate increasing with the temp. Diln. of the serum hastens inactivation. Too much  $(\text{NH}_4)_2\text{SO}_4$  fails to inactivate.

JOHN T. MYERS

The conservation of serum. K. L. WOLTERS. *Centr. Bakt. Parasitenk.*, I Abt., 111, 483-91(1929).—Therapeutic immune sera may be safely and quite permanently preserved by the addn. of 0.1% of quinosol, and diagnostic sera with 0.5%. Chlorophenol (0.25%) or  $\text{HgCl}_2$  (1 : 5000) can be used.

JOHN T. MYERS

Comparisons of native and heated immunogens of the cholera vibrio with special reference to toxicity and antigenic power. R. TORIKATA AND O. UYEDA. *Centr. Bakt. Parasitenk.*, I Abt., 112, 91-108(1929).—Heated "immunogens" have a greater antigenic power than unheated, as regards the production of agglutinins, precipitins and bacteriolysins. Heating decreases toxicity.

JOHN T. MYERS

Recent studies on blood groups. MAX BERLINER. *Folia Haematol.* 38, 52-85(1929).—This is a review of the biol. and chem. concepts in this field with a bibliography of 352 titles.

JOHN T. MYERS

Immune reactions and cancer. F. C. PYBUS AND H. R. WHITEHEAD. *J. Path. Bact.* 32, 195-202(1929).—The serum of rabbits immunized against mouse carcinoma has a harmful effect on mouse carcinoma, and normal heart and kidney growing *in vitro*. There is no marked specificity for the carcinoma. There is no evidence of the existence of antibodies common to the malignant cells of different animal species.

JOHN T. MYERS

Observations on the metabolism of amino acids in health and disease. LESLIE WIRTS. *Quart. J. Med.* 22, 477-91(1929).—The fasting amino N of the blood is maintained at a level of 5.4 to 7.4 mg. % with remarkable constancy in health and disease. After the ingestion of protein or amino acids, the amino N of the blood rises to a peak in 2 hrs. and falls to normal in 6 to 8 hrs. With the largest dose of amino acid possible, the blood does not exceed 15-20 mg. %, the bulk being taken up by the tissues. The blood urea also rises, the peak being reached in 2-4 hrs. with an increase of about 50% over the fasting level. The fasting and post-absorptive amino N is normal in diseases of the liver, with the exception of acute yellow atrophy where cell necrosis and autolysis may cause an increase. Liver diseases do not affect blood urea. In diabetes, the blood urea may fail to rise to the normal extent following ingestion of amino acids. This is not the result of temporary disorder of the liver as it persists over a period of months. It is not entirely remedied by insulin. A similar subnormal increase of urea may occur in disorders which do not affect the liver. Hence amino acid detns. are of no value in the diagnosis of hepatic disease.

J. T. M.

The specific oxygen capacity of the blood coloring matter in pathological conditions. H. ENGELKES. *Quart. J. Med.* 22, 507-17(1929).—The normal S. O. C. (specific O capacity) of hemoglobin is 401 cc. of O under standard conditions per g. of Fe. In 3

cases of autotoxic intraglobular thiohemoglobinemia the "S. O. C." was less than 401. In cases of secondary anemia it was unchanged. In hemolytic anemia, as malaria and pernicious anemia, there is a drop during periods of blood destruction. In malaria the drop is probably due to an intraglobular hematinemia. In pernicious anemia the cause of the drop could not be demonstrated spectroscopically. JOHN T. MYERS

## H—PHARMACOLOGY

A. N. RICHARDS

The effect of  $\beta$ -tetrahydronaphthylamine on the body temperature of rabbits in which heat regulation has been disturbed by the cold puncture or the extirpation of the corpus striatum and thalamus. WATARU TAKAHASHI. *Tôhoku J. Exptl. Med.* 12, 397-405(1929).— $\beta$ -Tetrahydronaphthylamine-HCl causes an increase of body temp. B. C. BRUNSTETTER

Nasal turbidity in man following administration of nitroglycerin. DUNCAN C. WALTON AND EDW. F. KEHR. *Arch. intern. pharmacodynamie* 35, 28-45(1928).

DAVID DAVIDSON

Saponins and digitalis. The influence of saponins on the power of diffusion through and of fixation in a living membrane of digitoxin and bigitaligenin. EDOUARD FROMMEL. *Arch. intern. pharmacodynamie* 35, 46-62(1928).—The saponins shorten the 3 periods of the pharmacodynamic action of digitoxin on the heart of a frog and thus seem to reinforce its power. The arrest is irreversible like that of digitoxin itself. Their action on bigitaligenin is not const.; sometimes they have a neutral action and sometimes a reinforcing action. Like that of bigitaligenin itself, the arrest is always reversible. The saponins lower the threshold of cellular permeability (measured by the dialysis through the living skin of a frog) for digitoxin and bigitaligenin, and allow a rapid penetration of active principle of digitalis. The saponins do not appear to effect the partially reversible physicochem. combination between digitoxin and protoplasm nor the reversible fixation of bigitaligenin to the cell.

DAVID DAVIDSON

Hyperthermic and cardiovascular action of dinitro- $\alpha$ -naphthol in the dog. C. HEYMANS AND JEAN J. BOUCKAERT. *Arch. intern. pharmacodynamie* 35, 63-9(1928).—The intravenous injection into dogs of dinitro- $\alpha$ -naphthol (I) in the dose of 1.33-5.5 cg. per kg. with or without anesthesia causes an increase in temp. to as high as 44.3° without convulsions. I maintains or even augments the temp. of anesthetized dogs whose cervical cord has been cut. I is a peripheral vasodilator but this action is rapidly compensated in the animal by the stimulating action of I on the vasomotor center. Strong doses of I cause systolic arrest of the heart. The hyperthermy is accompanied by hyperglucemia. I is not hemolytic and does not cause edema of the lungs; it does not cause a rise in temp. in the rabbit.

DAVID DAVIDSON

Influence of tetrahydronaphthylamine on the temperature and respiratory exchange—antagonistic action of chloralose and antipyrine. P. REGNIERS. *Arch. intern. pharmacodynamie* 35, 70-83(1928).—Tetrahydronaphthylamine (I) given intravenously in a dose of 1-3 cg. per kg. causes the following phenomena in the dog: excitement, mydriasis, vasoconstriction, salivation, erection of hair and rise of temp. to 43.5°. The respired vol. of air is quadrupled and the CO<sub>2</sub> elimination increased. Chloralose depresses these phenomena. Antipyrine given intravenously in doses of 7 cg. per kg. does not hinder the action of I; in doses of 15-20 cg. per kg. it partially inhibits the effect on temp. and on respiration.

DAVID DAVIDSON

Electrocardiographic changes from cocaine, procaine and butyn. M. L. TANTER, W. DOCK AND N. S. BROWN. *Arch. intern. pharmacodynamie* 35, 102-12(1928).—"Cocaine and butyn, in toxic, subfatal and fatal doses cause changes in the rat, either tradycardia or tachycardia, depress the intracardiac conduction system and irritate the muscle of the ventricle, independent of the autonomic innervation, the effects being characterized by considerable irregularity. Procaine over a considerable range of dosages has relatively little effect on the heart; but the effects of very large toxic doses resemble those of cocaine and butyn. Very small doses of cocaine which can sensitize to adrenaline and desensitize to tyramine and ephedrine on blood pressure cause no demonstrable electrical or other changes on the heart, thus relegating the seat of these peculiar drugs to the blood vessels."

DAVID DAVIDSON

The influence of the alcohols upon the cholagog action of bile salts. ERNST PROKOP. *Z. ges. exptl. Med.* 58, 330-9(1928).—Using urethanized rabbits P. injected the following bile salts intravenously and detd. the cholagog action with a bile fistula; Na cholate, Na dehydrocholate, Na desoxycholate, Na apocholate, and Na biliate. The av. increases in bile flow were, resp., 110, 45, 100, 230 and 0%. Following adminis-

tration of EtOH by mouth prior to the injection of the bile salts, the increases in bile flow were, resp., 46, 89, 92, 53 and 0%, and following amyl alc. the increases were 31, 70, 0, 33 and 0% over the normal flow rates. P. suggests that the bile acids act directly on the liver and that the action of EtOH and amyl alc. is analogous to that of  $\text{CHCl}_3$  on the liver.

F. L. DUNN

The recovery phase following ammonium chloride and diabetic acidosis. FRITZ MAINZER AND ANNA JOFFE. *Z. ges. expil. Med.* 59, 492-508(1928).—M. and J. studied the variations in blood  $\text{CO}_2$ , Cl,  $p_{\text{H}}$ , total base and inorg. P in man following the administration of 5 g.  $\text{NH}_4\text{Cl}$  daily. The diet and water intake were kept const. and the Cl in the urine was detd. The rise in the blood bicarbonate during the recovery phases depends in part upon a lowering of the blood Cl. This may result in an alkalosis due to an acid deficit. The  $p_{\text{H}}$  of the blood returns to normal before the blood bicarbonate as in diabetic acidosis. In the regulation of the blood reaction by respiration the rate of development of disturbances in acid-base balance is of importance as well as the measurement of the amount of disturbance. The quant. consideration of the blood mineral analyses leads M. and J. to suggest that variations in blood concn. and diln. lead to changes in the alkali-binding capacity of the proteins. A bibliography is included.

F. L. DUNN

The regulation of the hydrogen-ion concentration of the blood. III. Experimental studies on the action of strychnine upon the acid-base balance of the blood. SCHAU-KUANG LIU AND R. KRUGER. *Z. ges. expil. Med.* 61, 757-66(1928).—Strychnine had no specific action upon the respiratory center. Small doses frequently raised the blood  $p_{\text{H}}$ . Large doses produced an acidosis, the animal dying quickly. Chloral hydrate reduced the acidosis and the convulsions. The importance of the acidosis in producing the death of the animals was not detd. Bibliography. IV. The action of strychnine on the blood. *Ibid* 767-74.—Strychnine accelerates the reduction of hemoglobin and inhibits its oxidation. A lactic acid soln. with a  $p_{\text{H}}$  of 1.97 has an action on hemoglobin similar to that of strychnine. This action is due to a chem. reaction between strychnine and hemoglobin. Strychnine produces an acidosis by increasing general metabolism, reduction in O content of blood, and direct action on hemoglobin. Bibliography. V. Further observations on the nervous regulation of the hydrogen-ion concentration of the blood. *Ibid* 775-9.—Following bilateral cervical sympathetic or unilateral vagus section in rabbits there is no change in the blood  $p_{\text{H}}$ . From 2 to 3 hrs. after bilateral vagus section the blood  $p_{\text{H}}$  drops. The lowering parallels the failure of the heart and circulation, and with it, the respiration. VI. The action of synthalin upon the acid-base balance of the blood. *Ibid* 780-6.—Synthalin has an insulin-like action but a delayed one. Small intravenous injections often raise the blood  $p_{\text{H}}$  but subcutaneous or intramuscular injections have no effect. Large intravenous doses produce convulsions and lowering of the blood  $p_{\text{H}}$ . Bibliography. VII. The respiratory regulations of the hydrogen-ion concentration of the blood. *Ibid* 787-93.—Injection of small quantities of lactic acid or NaOH produces only momentary changes in the blood  $p_{\text{H}}$ . Injection of distd. water produces no effect. Bibliography. VIII. The action of acids, bases and other toxic material upon the acid-base balance of the blood. SCHAU-KUANG LIU. *Ibid* 794-807.—Conclusions. Bibliography.

F. L. DUNN

Studies on the water economy. II. The action of hypophysis extracts upon salt diuresis. KL. GOLLWITZER-MEIER AND W. BROCKER. *Z. ges. expil. Med.* 62, 97-104(1928).—Under the influence of hypophysis exts. and withholding of water the percentage excretion of Na, K, Cl and P is increased in the urine and the absolute quantity of Na and Cl is increased but that of K and P is decreased. III. The diuretic action of thyroxine. *Ibid* 105-13.—Studies in man show that thyroxine with forced fluids affects the exchange between blood and tissue. There results a streaming of a fluid rich in Na and Cl and relatively poor in K, P and Ca from the tissues into the blood, resulting in a slight lowering or a sharp elevation of Na and Cl with a sharp drop in K and P. The hydreemia was not so marked with thyroxine as it was when only water was given. The amount of Na and Cl in the urine was increased while that of K and P was not changed. G. and B. suggest that the salt mobilization and excretion appear to be the significant changes following thyroxine administration.

F. L. DUNN

Studies with secretin. IV. The influence of secretin upon bile secretion and diabetic acidosis. LADISLAUS TAKACS. *Z. ges. expil. Med.* 62, 114-7(1928); cf. C. A. 22, 2787; 23, 623.—T. found no increase in bile secretion following the administration of secretin contrary to the observation of previous workers. Large doses result in some secretion which T. considers due to the protein content. Secretin lowered the blood sugar and acetone in diabetes mellitus with acidosis.

F. L. DUNN

Insulin substitutes. V. Hypoglucemic substances in cereals and legumes.

F. KAUFMANN. *Z. ges. expth. Med.* 62, 147-53(1928); cf. *C. A.* 23, 436.—Peroral feedings of exts. of the legumes, peas, lentils, beans, and the cereals, oats, rye and wheat to rabbits showed a lowering of the blood sugar beginning in 2-3 hrs. and reaching a max. in 6-8 hrs. Intravenous injections produced more prompt lowerings. K. suggests that the success of oatmeal cures and starch diets in diabetes might be due to the presence of hypoglucemic substances. VI. Experimental studies of the action of the cereal cures in diabetes. *Ibid* 154-9.—The effectiveness of the exts. in lowering blood sugar in rabbits that have received 2 g. per kg. dextrose by mouth is in the following descending order: oats, beans, peas, lentils, wheat and rye. VII. The action of jambul bark extract. *Ibid* 160-4.—The jambul bark ext. has an effect upon glycogenolysis and glycogen storage in exptl. animals. The toxicity of the ext. depends upon the amount of stored glycogen. The lowering of blood sugar in well-fed exptl. animals may not be analogous to that in diabetes in which high blood sugars are associated with low glycogen stores but may correspond to the expt. in which the animals are glycogen-starved and a temporary hyperglucemia is produced by intravenous injections of glucose. The few available results do not indicate that jambul exts. are of much value in diabetes.

F. L. DUNN

The pharmacology of cerebral vessels. M. MUVA, M. OSAKI AND R. SPIROSHITA. *Arch. expth. Path. Pharmacol.* 128, 211-24(1928); *Physiol. Abstracts* 13, 479.—Pituitary and strophanthin produce vasoconstriction, and antipyrine and salicylic acid vasodilatation.

H. L. D.

Experiments with sparteine. W. BURRIDGE AND D. N. SETHI. *Arch. intern. pharmacodynamie* 34, 195-203(1928); *Physiol. Abstracts* 13, 475.—Sparteine exerts independent actions of augmentation and depression on the heart. Augmentation predominates when the drug is used in diln.; depression predominates when the drug is used in great concn.

H. L. D.

Isopropyl alcohol. U. G. BIJLSMA. *Arch. intern. pharmacodynamie* 34, 204-13(1928); *Physiol. Abstracts* 13, 475.—The use of isopropyl alc. as a substitute for EtOH is common in cosmetics, mouth washes, etc., and the question has arisen whether the procedure is harmless or not. Both alcs. have qualitatively the same effect on man and animals. Quantitatively the isopropyl alc. is 2.4 times stronger than EtOH for the same mol. concn. In some female rabbits hematuria occurred with each. The effects of drops in the eyes were the same for both alcs. Local and general toxic effects were similar, the latter being quantitatively somewhat greater with isopropyl alc. It follows that the use of isopropyl alc. in mouth washes and for outward application need cause no concern.

H. L. D.

Hypoglucemic action of colloidal sulfur. G. PENNETTI. *Arch. intern. pharmacodynamie* 34, 214-23(1928).

H. L. D.

The action of solanum pseudocapsicum on the circulatory system. J. M. WATT, H. L. HEIMANN AND E. MELTZER. *J. Med. Assoc. S. Africa* 11, 298(1928); *Physiol. Abstracts* 13, 475-6.—An ext. of the leaf of this plant produces a profound effect on the circulatory system. The leaf contains an alkaloid or alkaloids, but these have not yet been isolated in a pure form. An impure alkaloidal product produced the same effects as the ext.

H. L. D.

Electrocardiographic investigation of the action of insulin on the heart. III. Insulin and the damaged heart muscle. E. v. HAYNAL, L. VIDOVSKY AND G. GYÖRGYI. *Klin. Wochschr.* 7, 1543-9(1928); *Physiol. Abstracts* 13, 511.—An electrocardiographic investigation of the action of insulin on the heart, embracing 33 cases of heart disease of various kinds. In 14 of the cases insulin produced only alterations in the form of the electrocardiogram; in the other 19 changes of rhythm or cond., or both, were observed. The disturbances of rhythm occurred during the hypoglucemic phase, and were resolved by intravenous injection of glucose. They occurred principally in patients with myocardial disease. The authors recommend a high carbohydrate level along with insulin in all diabetics with diseased myocardium, and the injection of glucose along with insulin in all cases of diabetic coma with cardiovascular symptoms.

H. L. D.

Influence of the nervous system on glucemia. II. Effect of sympatho- and parasympatho-mimetic drugs on blood sugar. L. LA GRUTTA. *Rivista patol. sper.* 3, 206-21(1928); *Physiol. Abstracts* 13, 590.—Injection of adrenaline, pilocarpine, and atropine separately produces hyperglucemia in dogs. Muscarine produces slight hyperglucemia, and ergotamine some hypoglucemia. Injected together, adrenaline and pilocarpine, adrenaline and muscarine, adrenaline and atropine produce hyperglucemia; atropine and ergotamine produce some hypoglucemia; and pilocarpine and ergotamine produce some hyperglucemia.

H. L. D.

The supposed neutralization of insulin by blood. G. CAIZZONE. *Rivista patol. sper.* 3, 243-5(1928); *Physiol. Abstracts* 13, 589.—Injection of blood corpuscles produces hyperglucemia, which masks the effect of insulin when the 2 are mixed and injected together. H. L. D.

Insulin sensitiveness of man. K. CSÉPAI AND Z. ERNST. *Wien. klin. Wochschr.* 41, 25-6(1928). H. L. D.

Comparison of the oxytocic, pressor and antidiuretic activities of commercial samples of pituitary extract. U. G. BIJLSMA, J. H. BURN AND J. H. GADDUM. *Quart. J. Pharm.* 1, 493-508(1928).—Four com. exts. of the posterior lobe of the pituitary have been estd. in comparison with the international standard for their oxytocic and pressor power by 3 independent workers. One worker has also tested their antidiuretic power on the unanesthetized dog and another has devised a new method of testing for this action on a normal human being. This method is now described. The results obtained by different workers agree with one another, except that there are differences of opinion as to both the pressor and oxytocic powers of one of the exts. and as to the antidiuretic power of another. It is shown that the antidiuretic effect is not due either to the pressor or to the oxytocic principle. The test for any one of these 3 active principles does not provide a reliable index of the concn. of any other of them in com. exts. The present international standard can only be used as a standard for antidiuretic activity if it is found that different preps. of it contain the same concn. of the antidiuretic principle. W. O. EMERY

Action of drugs on the kidney. E. B. VERNEY. *Quart. J. Pharm.* 1, 546-57(1928).—An attempt has been made to classify drugs with diuretic action into groups, the activity of each of which can be the most readily interpreted in terms of one of the present theories of urinary secretion. In this connection a theory of urinary secretion is delineated. W. O. EMERY

Effect of pituitary extract and adrenaline on ketonuria and liver glycogen. J. H. BURN AND H. W. LING. *Quart. J. Pharm. and Pharmacol.* 2, 1-16(1929); cf. C. A. 22, 3700.—Injections of pituitary ext. reduce the amt. of the ketonuria seen in the spring months when rats are given a diet of butter fat; they also cause the disappearance of glycogen from the liver during the 1st 5 days of fat diet. Injections of adrenaline have various effects on the ketonuria. They may lessen it; they may leave it unchanged; or they may increase it. Anderson and Anderson have previously described the augmentor effect and the present writers have confirmed it, but have not been able to reproduce it with sufficient regularity to investigate its nature. Injections of adrenaline do not seriously affect the rise in liver glycogen, but may reduce its amt. below the normal on the 2nd and 3rd days of the fat diet. When they do, they increase the ketonuria coincidentally. The rise of liver glycogen in the spring months occurs at just as great a rate as in the winter; hence the greater ketonuria in the spring than in the winter months is not connected with the amt. of liver glycogen. W. O. EMERY

Occupational lead poisoning. B. CHAIKES AND C. LEWIN. *Med. Klin* 24, 848-51(1928); *U. S. Pub. Health Eng. Abstracts* E-789c, 6.—A total of 1560 Pb workers have been examnd. at the Berlin-Lankirtz medical center. Org. changes in the blood, kidneys, nervous system, intestinal canal and liver can rightly be attributed to the action of Pb, if as the result of a complete examn. it is shown that the patient had previously suffered from Pb poisoning and, naturally, if signs of this are still present. The diagnosis of Pb poisoning depends mainly on clinical examn.; to base a diagnosis on the presence or absence of the 4 cardinal signs alone is not sufficient. C. R. FELLERS

Lead in the treatment of cancer. H. C. ULLMAN. *Southwestern Med.* 13, 73(1929).—Although it caused marked injury to the blood and kidneys colloidal Pb also had considerable effect on some of the tumors. Insol. Pb phosphate has essentially the same effect on tumors as colloidal-metallic Pb, is much less toxic, has no effect on the kidneys and has little effect on the blood in most instances. The prepn. is stable and apparently does not grow more toxic with age. In many forms of cancer at least, Pb definitely augments the effect of radiation. C. R. FELLERS

Plasmochine in pregnancy. K. V. THAKKAR. *Indian Med. Gaz.* 44, 198(1929).—In pregnancy complicated by malaria, plasmochine is a valuable therapeutic agent. FREDERICK G. GERMUTH

Tattooing of the cornea with chloroplatinic acid solution for leucoma. B. P. BANAJI. *Indian Med. Gaz.* 44, 201(1929).—The application of a 2% soln. of  $H_2PtCl_6$  to the affected surface is of distinct benefit in the treatment of leucoma. Reduction of the Pt salt occurs in about 2 mins. FREDERICK G. GERMUTH

Sionon, a new substitute for sugar. HELMUTH REINWEIN. *Deut. med. Wochschr.*



55, 397-8(1929).—Sionon, a com. prepn. of *d*-sorbitol, is valuable in the treatment of diabetes.

feeding of about 0.5 g. of sucral (a specially prepd. form of  $\text{Fe}_2\text{O}_3$ ) to debilitated and nervous patients, during the course of 10 days, increased the basal metabolic rate in 6 cases of a total of 10.

ARTHUR GROLLMAN

**Hyperthyroidism and sensitivity to insulin.** E. ADLER. *Wien. Arch. inn. Med.* 16, 343-54(1929).—Five insulin units were injected subcutaneously in 8 normal individuals and in 15 cases of hyperthyroidism of different sorts. Blood sugar detns. were made to show the sensitivity to insulin. There was no marked difference in the reaction in the normal cases and in the cases with hyperthyroidism. No definite relation could be made out between the severity of the case and the sensitivity to insulin nor between the stage of the disease and the sensitivity. There was also no definite relation between increase in basal metabolism and sensitivity to insulin. H. F. H.

**Caffeine in thyroid surgery.** CHARLES C. MILLER. *Am. Med.* 35, 30-4(1929).—It is almost impossible to stop a heart under  $\text{CHCl}_3$  anesthesia, if it has been refortified with caffeine. Digitalis does not accomplish this.

FRANCES KRASNOW

**Chronic poisoning by an irritant contained in cooking utensils and tap water.** LEO SPIRO. *Am. Med.* 35, 40-5(1929).—The nature of the irritant is not detd. F. K.

**The thyroid and manganese treatment.** HERBERT W. NOTT. *Am. Med.* 35, 86-9(1929).—Report of a case of epilepsy in a dog, which, after rectal injection of 1 grain of  $\text{KMnO}_4$  in hot water, seemed to show immediate relief. FRANCES KRASNOW

**The effect of hyoscine and morphine on renal function.** ROGER W. BARNES. *Am. Med.* 35, 97-9(1929).—These drugs are not contraindicated in cases of impaired renal function.

FRANCES KRASNOW

**Value of methylene blue-gentian violet 5 per cent in preoperative skin preparation.** KINGLEY ROBERTS. *Ann. Surgery* 89, 183-90(1929).—Good results are claimed.

FRANCES KRASNOW

**Alcohol injection in angina pectoris.** WM. J. MIXTER AND JAMES C. WHITE. *Ann. Surgery* 89, 199-202(1929).—Good results were obtained. FRANCES KRASNOW

**Studies on the venom of a sea serpent.** *Hydrus platurus* of the Pacific Ocean. ERNEST G. NAUCK. *Arch. Schiffs-Tropen Hyg.* 33, 167-70(1929).—The venom is a neurotoxin.

FRANCES KRASNOW

**Influence of soda on activity of the gastric secretory glands.** EUG. BABSKII. *Arch. Verdauungs-Krankh.* 44, 182-94(1928).—Administration of soda during a 16-day period, either by rectum or *per os*, shows no decrease in secretory activity of the gastric glands. There seems to be a tendency toward an increase in salt content.

FRANCES KRASNOW

**Administration of bile-producing substances *per os* and by duodenum.** N. S. ABRASHYEVA. *Arch. Verdauungs-Krankh.* 44, 230-8(1928).—Olive oil, cream-butter and a mixt. of  $\text{MgSO}_4$  and peptone, administered either *per os* or by duodenum, influence alike the secretion of bile into the intestine.

FRANCES KRASNOW

**Urine sugar and blood sugar after abundant glucose feeding.** BARBARA AND JACQUES GOLDBERGER. *Arch. Verdauungs-Krankh.* 44, 315-37(1928).—The blood sugar curve shows a more or less characteristic hyperglucemia during the first 2 hrs. followed by a hypoglucemia. When 100 g. glucose in 400 cc. weak tea is given either to healthy individuals or to sick persons the sugar-regulating mechanism is normal. In cases of liver disorders, there is during the first 3 hrs. a characteristic rise in blood sugar accompanied by marked decrease in diuresis. Following this is a lowered blood sugar curve (not hypoglucemic) accompanied by a very marked diuresis. In non-insulinized diabetics there is a constant relationship between the blood sugar values and the urine sugar values. The increase in sugar elimination is brought about by the abundant urine excretion and produces the picture of "Glucosehyposthenurie."

FRANCES KRASNOW

**Secretory function of the liver, pancreas and stomach after the duodenal administration of magnesium sulfate.** LOUIS HIRSCHBERG. *Arch. Verdauungs-Krankh.* 44, 393-405(1928).—After the duodenal administration of 30 cc.  $\text{MgSO}_4$  (30%) the bile darkened in color and increased in amount. Such treatment also called forth an increase in the pancreatic enzymes as well as rise in the gastric secretion (mucus and acid).

FRANCES KRASNOW

**Studies of the effects of antimony salts. II. The effect of aminostiburea on cases of kala-azar.** E. C. HODGSON, RAM TARAN SEN AND C. DAS. *Indian J. Med.*

**Research 16, 31-4(1928).**—The drug is a valuable addn. to those already discovered for kala-azar treatment. FRANCES KRASNOW

**Gymnema sylvestre in diabetes mellitus.** R. N. CHOPRA, J. P. BOSE AND N. R. CHATTERJEE. *Indian J. Med. Research 16, 115-24(1928).*—The leaves of *Gymnema sylvestre* contain a substance which has a hydrolytic action on cane sugar. There is also an oxidase-like substance which produces glucolysis in a solution containing glucose. When administered subcutaneously to rabbits, the extracts of the leaves or gymnemic acid and its Na salt have no effect on the blood sugar. F. K.

A comparative study of the action of cinchonidine and cinchonine on the heart. R. N. CHOPRA, B. B. DIKSHIT AND J. C. DAVID. *Indian J. Med. Research 16, 125-33(1928).*—Intravenous injections of cinchonidine in animals produce a marked depression of the amplitude of auricular and ventricular contractions accompanied by a fall of blood pressure. Cinchonine produces an apparent stimulation of the auricle and depression of the ventricle. Both cinchonidine and cinchonine temporarily restore the normal rhythm of the heart after it is experimentally made irregular with aconitine. Levo-rotatory cinchonidine is a more powerful depressant than dextro-rotatory cinchonine. FRANCES KRASNOW

The prevalent compounds of antimony in the treatment of kala-azar. III. Aminostiburea: an analysis of the treatment in 52 cases. L. EVERARD NAPIER. *Indian J. Med. Research 16, 141-7(1928); cf. C. A. 23, 2478.*—Aminostiburea is of considerable value. It is of relatively low toxicity to mice and is well tolerated by man. 3.31 g. per 100 lb. body wt. should effect a cure in 91% of the cases. Its special value seems to be in its action on resistant cases. FRANCES KRASNOW

Studies in malaria, with special reference to treatment. IX. Plasmochine in the treatment of malaria. J. A. SINTON AND W. BIRD. *Indian J. Med. Research 16, 159-78(1928).*—Plasmochine was much more effective than quinine in producing a permanent cure in benign tertian malaria. In the treatment of malignant malaria, the latter is more effective. Plasmochine has a narrow margin of safety in the dosage.

X. Quinine-troposan in the treatment of chronic benign tertian malaria. J. A. SINTON, W. BIRD AND W. B. F. ORR. *Ibid 333-9.*—Troposan seems to be a helpful adjuvant to quinine. The relapse rate was less than that usually seen after the cinchona alkaloids or quinine-stovarsol but was greater than after plasmochine. The drug was well tolerated over a period of 3 weeks of continuous treatment but prophylactic measures should always be taken against chance of poisoning. XI. The cinchona alkaloids in the treatment of benign tertian malaria. J. A. SINTON AND W. BIRD. *Ibid 725-46(1929).*—The quinine and alkali treatment seems to be more efficacious than quinine alone. The four crystallizable alkaloids of cinchona bark (quinine, quinidine, cinchonine and cinchonidine) showed almost equal value in preventing relapses. Cinchona febrifuge is equal to other alkaloids in treatment of chronic infections. FRANCES KRASNOW

Action of antimony compounds on the adrenals. R. N. CHOPRA, J. C. GUPTA AND S. G. CHOUDHURY. *Indian J. Med. Research 16, 441-6(1928)*—Expts. on Belgian hares show that after intravenous administration of org. Sb compds., there is a definite increase in adrenaline content of the gland. After 10 injections the content is nearly doubled. FRANCES KRASNOW

The action of insulin on the free muscle sugar of the normal and diabetic heart. E. W. H. CRUICKSHANK AND SHEONATH PRASAD. *Indian J. Med. Research 16, 473-7(1928).*—The addn. of insulin to the normal heart reduces the free sugar. When the diabetic heart is treated with normal blood which contains insulin the effect in reducing the sugar is greater than the change due to merely perfusing the diabetic heart with normal blood. FRANCES KRASNOW

Experimental study of the action of insulin on normal and diabetic hearts. E. W. H. CRUICKSHANK, B. NARAYANA AND D. L. SHRIVASTAVA. *Indian J. Med. Research 16, 479-512(1928).*—The blood sugar of dogs in India averages 0.112% as compared with 0.09% in the West. The glycogen content of the heart is readily depleted by prolonged administration of volatile anesthetics but is not materially affected by amytal. The action of insulin is not affected by anesthetics. The glycogen content of the normal dog heart is 0.55%; that of the diabetic heart (unfed with sugar) is 0.75%. Insulin, in the presence of available sugar, will effect a storage of sugar as glycogen in the heart muscle. Insulin in excess will, by producing hyperglucemia, effect a marked reduction in glycogen. The diabetic heart perfused with diabetic blood will not utilize sugar. There is no great difference between the power of the normal and diabetic heart to utilize sugar, when both sugar and insulin are added to the blood circulating through them. FRANCES KRASNOW

The comparative action of ephedrine and pseudoephedrine from Indian varieties

of Ephedra on the heart. R. N. CHOPRA AND K. VENKATACHALAM PILLAI. *Indian J. Med. Research* 16, 780-7(1929).—Both drugs have a stimulant action on the sympathetic and vagus nerve endings (ephedrine stimulating the sympathetic ganglia also) and a pressor action. Pseudo-ephedrine stimulates the myocardium while ephedrine depresses it.

Emetine poisoning. F. G. CAWSTON. *J. Trop. Med.* 32, 22-4(1929).—Discussion.

Tellurium therapy in leprosy. RODOLFO STANZIALE. *J. Trop. Med.* 32, 33-6(1929).—Good results are obtained. There was a regression of the tubercle and a lysis of the bacilli.

Some observations on plasmochine. H. R. MAJUNDER. *J. Trop. Med.* 32, 47-9(1929).—Plasmochine is a powerful anti-malarial drug; combination with quinine makes it more powerful. It has none of the disagreeable nervous symptoms of quinine and is thus better tolerated. The toxicity of the drug is not very great.

The action on the frog of intracerebrally injected substances. N. EBBECKE. *Z. Biol.* 88, 465-86(1929).—The anions ( $\text{Cl}^-$ ,  $\text{I}^-$ ,  $\text{SO}_4^{--}$ ,  $\text{PO}_4^{--}$ ) are ineffective, but the cations form a definite series: Li, Na—indifferent; Mg, Ca—sedative and paralyzing; K, Rb, Sr—violently exciting, followed by a paralyzing effect; Cs, Ba exciting and paralyzing effect followed by injury. Convulsions of the strychnine type are obtained if the osmotic pressures of the solns. are increased.  $\text{NH}_4\text{Cl}$  gives a similar effect. Narcotics paralyze from the time of injection to the "wearing off." With alkaloids delay in the onset and disappearance of the paralytic effect are characteristic.

Studies on antagonistic nerves. XXXVI. The influence of parasympathetic poisons on the transmission speed of nerve excitation. HAKAN RYDIN. *Z. Biol.* 88, 531-9(1929).—A method is described for graphic representation of nerve stimulation. Atropine retards the speed of nerve transmission, this action being reversible after washing with Ringer soln. Acetylcholine increases the speed of transmission in most cases. XXXVII. Temporary stimulation under the influence of sympathetic and parasympathetic poison. L. ASHER AND N. SCHEINFINKEL. *Ibid* 540-52.—Atropine lengthens the duration of "chronaxie" while acetylcholine has the reverse effect. Both adrenaline and atropine increase the refractory period; acetylcholine and ergotamine decrease it.

The value of acterol (irradiated ergosterol) in the treatment of thyroparathyroidectomized dogs. JOHN C. BROUGHER. *Am. J. Physiol.* 86, 538-41(1928).—Acterol (irradiated ergosterol, 1 cc. = 100 cc. cod liver oil in vitamin D) given intramuscularly to dogs from the day of removal of the thyroids and parathyroids prevented the development of violent tetany provided the animals were able to consume a Ca-rich diet (milk).

The effect of withdrawal of drinking water on the susceptibility of rats to certain drugs. GEORGE CRISLER. *Am. J. Physiol.* 86, 552-5(1928).—Withholding drinking water from rats for 48 hrs. or more caused depression and increased their susceptibility to morphine and  $\text{MgSO}_4$  (depressants), but decreased it to strychnine (stimulant).

The influence of the daily oral administration of magnesium sulfate or lactose on the blood volumes of normal, beriberi and fasting pigeons. O. W. BARLOW AND M. S. BISKIND. *Am. J. Physiol.* 86, 594-8(1928).—The daily addition of cathartics ( $\text{MgSO}_4$  or lactose) to normal pigeons had no significant effect on red cell count, total vol. or sp. gr. of the blood. In fasting pigeons or pigeons having beriberi,  $\text{MgSO}_4$  or lactose did not affect the loss of body wt., did not alter the blood vol., but did tend to limit the fall in the red cell count usually seen in untreated birds.

Changes in blood sugar following injections of peptone in the dog. W. W. BRANDES AND J. P. SIMONDS. *Am. J. Physiol.* 86, 618-22(1928).—Peptone injected into anesthetized dogs caused a hypoglycemia in the peripheral venous blood during the period of low blood pressure. When the blood pressure rose and the liver became less engorged with blood a rather marked rise in blood sugar occurred.

The effect of ergotamine on phlorhizin glucosuria. A. B. ANDERSON AND M. D. ANDERSON. *J. Physiol.* 65, 456-7(1928).—In previous work (*C. A.* 22, 3229) the effect of tyramine on phlorhizin glucosuria was studied. It is now found that ergotamine and ergotamine do not suppress phlorhizin glucosuria; but rather that they cause a rise in the D/N ratio of a phlorhizinized animal. Conclusion: Phlorhizin does not act on the sympathetic nerve endings in the kidney, thus causing glucosuria.

Some factors affecting the response of rabbits towards insulin. KATHLEEN CULHANE AND S. W. F. UNDERHILL. *Proc. Physiol. Soc., J. Physiol.* 65, xx-xxi(1928).—The following animals were found to cause inaccuracies in the test: (1) Rabbits that

had been used on rough tests and had therefore received doses of insulin varying widely from 0.5 unit per kg.; (2) animals below 1600 and above 3000 g. in wt.; (3) animals that had been in use more than one year; (4) females that had been used for breeding; (5) "Ginger" rabbits and Belgian hares.

J. F. LYMAN

The seat of action of strychnine, veratrine, and barium in the striated muscles of the frog. GIUSEPPE RUSSO. *Boll. soc. ital. biol. sper.* 3, 956-9(1928).—An isotonic soln. of  $\text{BaCl}_2$  at  $p_H$  7.4 was allowed to act on the distal and on the proximal portion of the sartorius muscle. While the distal portion reacted regularly to Ba with fibrillary twitchings and contractures, the proximal portion showed only contractures. A curarized muscle responded to the action of Ba with fibrillary twitching and contractures like a normal muscle, whereas a muscle paralyzed by strychnine lost entirely the property to respond to Ba with fibrillary contractions but still exhibited contractures. The frog was paralyzed completely by strychnine and then a soln. of veratrine (1:1,000,000) in Ringer was allowed to act on the muscle sepd. from the body. After a few mins., the muscle gave typical veratrine curves when stimulated by an elec. current. *Conclusions.*—(1) The two most characteristic effects of Ba on the mech. function of the muscle, twitchings and contractures, can be differentiated in the frog. (2) Fibrillary twitchings are produced by a mechanism located in the neuro-muscular synapsis between the seat of action of curare (external) and the curare-like action of strychnine (internal). The mechanism of the contractures is probably situated more internally than the former. (3) Veratrine acts on the muscle of an animal paralyzed by strychnine; hence its seat of action is more internal than that of strychnine, namely, on the interior structures of the muscle fibers.

P. M.

The reaction to adrenaline of the vascular region of inflamed tissues. MARIO GIANOTTI. *Boll. soc. ital. biol. sper.* 4, 3-7(1929).—Adrenaline acted less intensely on the inflamed tissue of rabbit ears than it did on normal tissue. Various hypotheses are advanced to explain this behavior.

PETER MASUCCI

Histological alterations of the nervous system in insulin intoxication. MARIO GOZZANO. *Boll. soc. ital. biol. sper.* 4, 73-6(1929).

PETER MASUCCI

The liberation of sulfite from sodium thiosulfate in the organism. E. MENECHETTI. *Boll. soc. ital. biol. sper.* 4, 107-9(1929).—M. proved that  $\text{Na}_2\text{S}_2\text{O}_3$  when injected into the organism is transformed as follows:  $\longrightarrow \text{S}_2\text{O}_3 \longrightarrow \text{polythionates} \longrightarrow \text{SO}_4$ . The detection of  $\text{SO}_3$  in the presence of  $\text{S}_2\text{O}_3$  and polythionates was accomplished by the following method: (a) The reagent used was an aq. soln. of fuchsin 0.20 g. and methyl green 0.07 g. per l. One drop of this reagent when added to 2 cc. of urine or serum produces a violet-red color; if sulfites are present the color disappears at once. Thiosulfates, polythionates and sulfates do not interfere. In this manner it is possible to detect in 2 cc. of urine 0.00004 g. sulfite ( $\text{Na}_2\text{S}_2\text{O}_3 + 7\text{H}_2\text{O}$  1:50,000); in 2 cc. of serum 0.00005 g. (1:40,000). (b) Thiosulfate was detd. in the presence of  $\text{SO}_3$  by acidifying the urine with HCl so that S sepd. out. 0.0004 g. thiosulfate or  $\text{Na}_2\text{S}_2\text{O}_3 + 5\text{H}_2\text{O}$  1:5000 was detd. by this manner in 2 cc. of urine. Serum was acidified with HCl until acid to litmus; the S sepd. out and was reduced to  $\text{H}_2\text{S}$  which was detected with  $(\text{AcO})_2\text{Pb}$  paper.  $\text{Na}_2\text{S}_2\text{O}_3 + 5\text{H}_2\text{O}$  1:4000 can be detected in this manner. The  $\text{SO}_3$  test is more sensitive than the  $\text{S}_2\text{O}_3$  test. With the above methods,  $\text{Na}_2\text{S}_2\text{O}_3$  and  $\text{Na}_2\text{SO}_3$  were injected intravenously and subcutaneously into dogs. Even by the injection of strong doses of  $\text{S}_2\text{O}_3$  and small doses of  $\text{SO}_3$ , it was not possible to detect the presence of either. The liberation of  $\text{SO}_3$  following the injection of  $\text{Na}_2\text{S}_2\text{O}_3$ , therefore, cannot be demonstrated.

PETER MASUCCI

Colloidal sulfur as an antidote for corrosive sublimate. E. MENECHETTI. *Boll. soc. ital. biol. sper.* 4, 133-5(1929).—Three methods are described to show that S in the organism can form sulfides with salts of Hg. Rabbits and guinea pigs were poisoned with  $\text{HgCl}_2$  administered via the gastric route or injected subcutaneously. Raffo's colloidal S failed to give any protection, but Wackenroder's S allowed animals to survive which had received lethal doses of  $\text{HgCl}_2$ . Therefore, as an antidote for  $\text{HgCl}_2$ , a colloidal S is required whose degree of dispersion and stability is such that it can pass into the general circulation, be fixed by the organs and be released gradually, continuously, and safely, in the form of  $\text{H}_2\text{S}$ . Raffo's S is too highly dispersed and Heffter's S is too little dispersed for this purpose.

PETER MASUCCI

The propagation of the excitement caused by veratrine and nicotine in the sartorius of the toad. G. E. GHIRARDI. *Arch. sci. biol. (Italy)* 13, 185-205(1929).—Nicotine and veratrine applied in minute doses to a part of the muscle cause an excitement that is extended to the other parts and can be discovered by stimulating to contraction. Larger doses produce contractions transmitted to the normal part, completely in the case of nicotine, partly for veratrine. While the tension after veratrine is in-

creased, spontaneous contractions are imposed and transmitted to the normal part of the muscle. Veratrine diffuses slowly through the muscle. The tension and contraction are two different functions of the fibers and the sarcoplasmia. A. E. MEYER

**Vital staining in the eye.** F. P. FISCHER. *Kolloidchem. Beihefte* 28, 333-42 (1929).—Acid dyestuffs pass after intravenous injection from the blood into the aq. humor. They stain the iris, but not the ciliary body. Such dyestuffs are fluorescein, uranin, eosin, Me-eosin, aescorcin and trypan blue. Basic dyestuffs, as methylene blue, toluidine blue, methylene green, alizarin blue S, pyronine G, safranin O, fuchsin basic and Me violet, do not pass, but stain the ciliary epithelium. The ciliary epithelium is an O-producing, or anodic tissue, the iris a cathodic one. The aq. humor is more basic than blood. A. E. MEYER

**Glukhorment in the treatment of diabetes.** MARCEL LABBÉ AND FLORIDE NEPVEUX. *Presse méd.* 36, 913-17(1928).—Glukhorment does not have a disturbing effect on the stomach, as synthalin has. The organism does not become tolerant to it. Its effect is less intense and less reliable than that of insulin. The chem. compn. is not known; it is supposed to be a mixt. of pancreatic ext. and synthalin. A. E. MEYER

**Investigation concerning the diuretic action of urea in the treatment of exudates and transudates.** D. SIMICI, I. MARCON AND M. POPESCO. *Presse méd.* 36, 946-50 (1928).—Urea acts as a diuretic in both health and disease proportionally to the amt. given. The action lasts 24 hrs. after the last dose; blood urea is normal after 24-48 hrs. The dose is 25-50 g. over a period of 4 to 7 days. Chlorides and uric acid also are eliminated in a larger amt. A. E. MEYER

**Study of the action of some double thiosulfate salts in normal and tuberculous guinea pigs.** JORGE GASCON. *Rev. facultad cienc. quim.* 5, Pt. 1, 41-72(1928).—The methods of prepn. of the following compds. are given: *sodium aurothiosulfate*, *sodium argentothiosulfate*, *sodium cuprous thiosulfate*. The Au salt has no hemolytic effect on the red corpuscles of the rabbit, nor on the blood count and hemoglobin content. The lethal dose in guinea pigs is 0.037 g. per kg. The Ag salt has a strong hemolytic action even in  $1/10000$  diln. The soln. ppts. protein soln. Intravenous injections of 0.01 g. in 2 cc. saline have no influence on the blood count and hemoglobin. The lethal dose is 0.25 g. per kg. Subcutaneous injections cause injuries of the tissues. The Na-Cu salt could not be tested for its hemolytic action as it is not stable at 37°. 0.01 g. has no effect on the blood count or hemoglobin content in the rabbit. The lethal dose in subcutaneous injections in the guinea pig is 0.09 g. per kg. The injections are injurious to the tissues. In the expts., the guinea pigs were infected with *B. tuberculosis* and later treated subcutaneously with the salts in doses of 0.0005-0.01 g. The Ag salt cannot be given in higher doses than 0.0005 g. every fifth day. No improvement was observed; the same result was obtained with the Cu salt. The Au salt can be given in higher dose, but had no influence on the disease. A. E. MEYER

**Isolation of methanol from tobacco smoke.** CARL NEUBERG AND MARIA KOBEL. *Biochem. Z.* 206, 240-4(1929).—MeOH was demonstrated in tobacco in the form of a Me ester of pectinic acid and as a ether compd. in lignin. The MeOH has now been isolated and identified by its b. p. and elementary compn. in the tobacco smoke. S. MORGULIS

**Potassium permanganate in the treatment of pneumonia.** JOHN L. CHESTER. *Ann. Internal Med.* 2, 1175-84(1929).—KMnO<sub>4</sub> seems to have a true sp. action on the pneumococcus. Two grains are dissolved in 750 cc. of water and the soln. given in 120 cc. amts. per rectum. JOHN T. MYERS

**Glycogenolysis due to adrenaline in hepatic disease.** SELLING BRILL. *Arch. Surgery* 18, 1801-16(1929).—Patients with widespread disease of the liver will give after the injection of adrenaline an almost flat blood sugar curve. They should be given large amts. of glucose pre- and postoperatively. JOHN T. MYERS

**Creolin therapy in rabbit coccidiosis.** B. J. KRIJGSMAN. *Centr. Bakt. Parasitenk.*, I Abt., 111, 426-8(1929).—The following mixt. was substituted for the drinking water of infected rabbits and had considerable value: creolin, 2.5 cc.; NaHCO<sub>3</sub>, 4.0 g.; syrup simpl., 400 cc.; oil of anise, 4 drops; and water, 2000 cc. JOHN T. MYERS

**The treatment of anemia with novogen.** HAROLD BORCHARDT. *Folia Haematol.* 38, 44-51(1929).—"Novogen" is made from animal blood. It contains, chiefly, hemoglobin, lecithin, Ca phosphate, maltose and Fe and Mg peptones. It is useful in the treatment of anemia in 3 teaspoonful doses daily. JOHN T. MYERS

**The fate of colloidal iron administered intravenously.** II. Long experiments. CYRIL J. POLSON. *J. Path. Bact.* 32, 247-60(1929); cf. C. A. 22, 4651.—The distribution of Fe resulting from intravenous administration was observed for 14 months. It is excreted largely by the cecum and the kidneys. An excess is stored principally

in the liver, but some goes from the liver to the lymph nodes where it remains in the body for some time. Some also goes to the lungs probably by way of the spleen, where it is held for a time, essentially as a foreign substance. JOHN T. MYERS

The treatment of experimental tuberculosis by calcium administration. J. CLIFFORD HOYLE. *Quart. J. Med.* 22, 451-9(1929); cf. *C. A.* 23, 1173.—There is no evidence that Ca exerts a direct therapeutic effect on tuberculosis. Bibliography. JOHN T. MYERS

The pharmacology of the strychnine derivatives (ethylstrychnine or strychnal), MARIO AIAZZI MANCINI. *Arch. farmacol. sper.* 27, 225-38(1929).—The chem. behavior of ethylstrychnine (I) resembles very much that of strychnine (II). I treated with  $K_2Cr_2O_7$  and  $H_2SO_4$  gives a violet coloration, which differs only very slightly from that given by II. The sensitiveness of I toward a few reagents was compared with that of II: with  $HgCl_2$ , I 1:5000, II 1:2000; with Bouchardat's reagent, I 1:30,000, II 1:30,000; with picric acid, I 1:3000, II 1:6000; with Mayer's reagent I 1:350,000, II 1:200,000. The pharmacol. action of I in warm-blooded animals is almost identical with that of II. The fatal doses of I were 25-28 mg. per kg. for the rabbit and 25 mg. per kg. for the guinea pig, while the corresponding fatal doses of II are 0.6 and 3-3.5 mg. per kg. (Schmiedeberg). Thus the toxicity of I is much smaller than that of II. Marked stimulations of the bulbar centers were obtained with I in doses that were non-convulsive and did not primarily affect the blood pressure. Since I is much less toxic than II, I may become of value as a respiratory stimulant. In cold-blooded animals the action of I differs much from that of II, since with I the paralyzing and curarizing action prevails. Rabbits to which a non-convulsive dose was administered did not show convulsions when the same dose was given for about 12 days in succession. From this and from the fact that the pos. test for I in the urine with Mayer-Valzer's reagent disappears within 48 hrs. after the last administration, A. concludes that I has no cumulative action. G. SCHWOCH

Behavior of thyroxine in the animal body. EMIL ABDERHALDEN AND ERNST WERTHEIMER. *Arch. ges. Physiol.* (Pflüger's) 221, 82-92(1928); cf. *C. A.* 22, 4160.—Thyroxine solns. are deprived of active principle by the various tissues to different degrees, muscle being most active, liver of minimal effect. Heated tissue exerts a greater effect than does the fresh organ, and tissue exts., fresh or heated, are without effect. G. H. SMITH

Effect of parenterally introduced foreign stimulating agents upon compensatory renal hypertrophy after unilateral nephrectomy in rats. O. PECZENIK AND E. BEER. *Arch. ges. Physiol.* (Pflüger's) 221, 215-29(1928).—The increase in wt. of the kidney remaining after unilateral nephrectomy in rats is much greater if the rats are injected with caseosan. Since the kidney tissue, as detd. by dry wt., is increased this represents a true hypertrophy. Phlogetan, which lacks protein, exerts practically no stimulating action. Caseosan alone, or in combination with phlogetan, has no effect upon the excretion of water, N, or urea by normal animals, and injections of these substances prior to operation (nephrectomy) prevent the water and urea retention which are observed after operation in uninjected animals. G. H. SMITH

Fixation of potassium in muscle. Reply to Neuschlosz. RUDOLF HÖBER. *Arch. ges. Physiol.* (Pflüger's) 221, 478-85(1929).—The conclusion of Neuschlosz (*C. A.* 20, 3498) to the effect that there is a connection between tonus formation and K fixation is questioned. G. H. SMITH

Formation of urine in the frog kidney. XVI. Effect of caffeine on the oxygen utilization of the kidney and the mechanism of caffeine diuresis. KARL J. ANSELMINO. *Arch. ges. Physiol.* (Pflüger's) 221, 633-40(1929).—By applying Warburg's method to minced kidney tissue it was found that small doses of caffeine do not modify the respiration, although it is inhibited by larger doses. Small doses of caffeine did not materially modify anaerobic glycolysis. G. S. SMITH

Effect of infusion of isotonic saline solutions on the respiration. HERMINE BAER. *Z. Kinderheilk.* 46, 45-54(1928).—No sp. effects of the saline injections upon the metabolism could be detected. G. H. SMITH

Poisoning by tetraethyl lead. F. HEIM DE BALSAC, E. AGASSE-LAFONT AND A. FEIL. *Progrès méd.* 1928, 1275; *Ann. hyg. publ. ind. sociale* 1929, 55-6. G. T.

Cinchophen preparations and their action and mode of action upon the urate excretion. TENMIN KAKU. *Acta Med. Keijo* 11, 47-66(1928).—See *C. A.* 23, 2215. A. J. VORWALD

The pharmacological action of the essential oils from *Atractylis ovata* Thunb. SANGTAE KIM. *Acta Med. Keijo* 11, 83-104(1928).—The Chinese drug "Jutsu," an ext. of *Atractylis ovata* Thunb, when injected into the dorsal lymph sac of frogs causes a

weakening of respiratory movements with a gradual motor paralysis and finally a cessation of respiration. When applied to a beating frog heart either excised or *in situ* it causes a paralysis and finally an arrest of heart beat in diastole. With subcutaneous injections into mice there appears an increased reflex activity, increased perspiration and convulsions with respiratory failure. Subcutaneous injections into rabbits cause a slight motor paralysis of the extremities and a transient respiratory increase and a fall of blood pressure. Perfusion of blood vessels causes a dilatation and when applied to smooth muscle organs there occurs a loss of tonicity. The skeletal muscles and motor nerves are slightly influenced. With greater doses the above effects are increased.

ARTHUR J. VORWALD

**A study of the toxicology of bismuth.** R. FABRE AND M. PICON. *J. pharm. chim.* [8], 8, 249-58, 297-308(1928).—The recent therapeutic use of oil-sol. Bi salts, e. g., camphocarbonate (cf. *C. A.* 23, 2215) in large doses suggested a study of the resulting distribution of Bi in the various organs. First, the methods of detg. small quantities of Bi are reviewed, including the electrolytic methods of Hollard and Bertiaux (*C. A.* 14, 913), Schoch and Brown (*C. A.* 10, 2442) and Pregl's microchem. method (*C. A.* 17, 2253). For quantities less than 1 mg. the Bayle and Amy method (*C. A.* 22, 3108), (app. illustrated), gave excellent results. Of colorimetric (confirmatory) detns., the Labat and Péry method (*C. A.* 18, 1097) is sensitive to 5 mg. Bi per l. in 2 cc. of soln. taken. The method of Laporte (*C. A.* 18, 1259) indicates 0.1 mg. Bi accurately within 3%. By applying the use of the spectrophotometer to this method, an exact method of detg. Bi may be developed based on an observed linear variation of optical density with diln. of Bi at the wave length of 5200 Å. U. (cf. *C. A.* 22, 4402). As to the content of Bi in the various parts of the organism, the Bi, whether introduced by intramuscular (rabbit and dog) or intravenous (rabbit) injection of oil soln. of Bi camphocarbonate, becomes fixed in notable quantities in the liver and the kidneys; very little Bi is found in the brain even after prolonged treatment. The blood carries a notable proportion. Aside from the urinary duct, the salivary secretion, also the hair, play an important part in the elimination of Bi.

S. WALDBOTT

**Chemotherapeutic researches on cancer.** A. T. TODD, *et al.* *Cancer Rev.* 14, 325(1929).—The substance chiefly used in these researches and in the treatment of cases of malignant disease was a colloidal Pb selenide alone or combined with Na thio-sulfate. Thereby it was hoped to combine the supposed specific action of Pb upon cancer cells with the analgesic properties of Se. The dosage first given was 40 mg. of Pb, increasing to 80-100 mg. with a full course amounting to 0.5 g. With the prepn. D4S 5.0 mg. are given, followed by increasing doses at weekly intervals. Numerous patients showed mental symptoms of some severity, and other symptoms of Pb poisoning occurred, but were not very marked. The blood changes during treatment were followed, and the serum lipase was estd., but the value of the latter is not evident. 44 cases of malignant disease in man have been treated. In 8 cases there is stated to have been relief from pain, and retardation of the growth is claimed in 8 cases. Fourteen patients were alive 2-8 months after the cessation of treatment, but the av. survival of 20 out of 25 patients who died was under 6 months. No case of "cure" is recorded. An investigation was also made of the action of different Pb compds. on various enzymes and of their action upon tumor-bearing rats and mice. The results of the latter expts. do not appear to be very conclusive. The prepn. of various colloids of Pb, Se and TI is described. Analysis of various organs and growths after Pb treatment showed no selective deposition of Pb in the growths.

H. G. WELLS

**Electrocardiographic studies on the actions of drugs. I. The vagus in ether anesthesia.** HARRY GOLD, PATRICK L. GRYZWACZ AND VALENTINE A. NOWICKI. *Am. Heart J.* 4, 336-45(1929).—Results were recorded on the susceptibility of the cardio-inhibitory nerves to stimulation by morphine in the dog. Ether depresses the vagus and may abolish partially or entirely the effects of stimulation of these nerves by morphine. After large doses of morphine, deep ether narcosis may abolish vagus effects upon the sinus and not those upon conduction. Inhaled ether in doses which do not paralyze respiration depresses the vagi. Atropine is still effective after the full effects of ether have been induced.

R. C. WILLSON

**An experimental study of the influence of ferromagnetic cubic and paramagnetic amorphous iron oxide on the blood.** C. A. DOAN, F. R. SABIN AND C. E. FORKNER. *Am. J. Med. Sci.* 177, 201-8(1929).—The Fe was administered by mouth in doses of either 3 or 6 mg. per day to rabbits weighing from 1800 to 2800 g. Ferromagnetic  $Fe_3O_4$  failed to aid in the regeneration of hemoglobin after simple anemia and seemed to delay the return to normal.

R. C. WILLSON

**The pharmacology of some ethylene-halogen compounds.** GENÉ H. KISTLER AND

ARNO B. LUCKHARDT. *Anesthesia and Analgesia* 8, 65-74(1929).—EtOH, Et<sub>2</sub>O, C<sub>2</sub>H<sub>5</sub>Br<sub>2</sub>, C<sub>2</sub>H<sub>4</sub>Cl<sub>2</sub>, C<sub>2</sub>H<sub>4</sub>I<sub>2</sub>, paraldehyde and CHCl<sub>3</sub> were used. When injected intravenously in small doses into anesthetized dogs, all the ethylene halides coexhibited depressant effects upon respiration, blood pressure and knee jerk. The toxicity increases in the order: C<sub>2</sub>H<sub>4</sub>Br<sub>2</sub>, C<sub>2</sub>H<sub>4</sub>I<sub>2</sub> and C<sub>2</sub>H<sub>4</sub>Cl<sub>2</sub>. When C<sub>2</sub>H<sub>4</sub>Cl<sub>2</sub> (0.5 cc. per kg.) was administered by mouth to the dog without anesthesia there resulted excitement, incoordination, salivation, vomiting, nausea and depression; all effects appeared within 30 mins. after introduction. Larger doses were vomited.

R. C. WILLSON

The effect of anesthetics on the red blood cells. WILLIAM WEBSTER. *Anesthesia and Analgesia* 8, 106-9(1929).—N<sub>2</sub>O, ethylene, EtCl, CHCl<sub>3</sub> and Et<sub>2</sub>O were examd. There is an increase in the no. but not the size of the red cells.

R. C. WILLSON

The action of different drugs on the blood pressure of the pigeon. TSUNEMICHI HAYAMA. *Folia pharmacol. japon.* 7, 14-5(1928); *Ber. ges. Physiol. expil. Pharmacol.* 47, 347.—Adrenaline and digitalein increase the blood pressure, although larger doses of the latter cause a secondary decrease. Acetylcholine, choline, pilocarpine and oryzanin (a vitamin B prepn.) effect an increase, larger doses causing a secondary decrease. Physostigmine and atropine have no effect.

R. C. WILLSON

The biologic diagnosis of drunkenness. II. The phagocytic capacity in experimental alcoholic intoxication. VINCENZO M. PALMIERI. *Giorn. batteriol. e immunol.* 2, 697-704(1927); *Ber. ges. Physiol. expil. Pharmacol.* 47, 175.—When 8-5 cc. abs. alc. per kg. body wt. was introduced into the stomachs of dogs, there was a decrease in the phagocytic capacity, Simon's index and Wright's index. The depressions reached their height 2-6 hrs. after the ingestion and were parallel with the amt. of alc. introduced.

R. C. WILLSON

The effect of the intravenous administration of magnesium sulfate. Experimental studies. H. J. STANDER. *J. Am. Med. Assoc.* 92, 631-6(1929).—"MgSO<sub>4</sub> in doses ranging from 0.05 to 0.49 g. per kg. body wt., administered to dogs either intramuscularly or intravenously in 10 or 25% soln., did not produce any marked changes in the blood on chem. examn. but did produce definite histological changes in the liver and kidneys, in the form of moderate necrosis in the central part of the liver lobule and moderate degeneration in the convoluted tubules of the kidneys. MgSO<sub>4</sub> when administered in large amts. is toxic and may produce death."

R. C. WILLSON

The action of histamine on the alkaline reserve. SALOMON KATZENELBOGEN. *J. Am. Med. Assoc.* 92, 1240-1(1929).—Intramuscular injections of 0.5-1.0 cc. histamine (1:1000) produced an increase in the blood alk. reserve in 14 of 18 rabbits. The increase is noted even 25 mins. after injection, but is more pronounced after 60 mins., usually returning to the initial value within 100 mins.

R. C. WILLSON

The influence of alkalies on the motility and secretion of the stomach. MAX DEGENER. *Münch. med. Wochschr.* 75, 1838-40(1928).—The stomach was emptied and 300 cc. 5% alc. soln. given to stimulate its action. At the height of its secretion (40-60 mins. later) 2.5 g. magnesia usta in H<sub>2</sub>O was given and its effects were studied. The emptying time of the stomach was shorter. In hyperacidity there was a neutralization up to 30 mins., while in normal acidity this neutralization lasted up to 1 hr.

R. C. W.

The action of bile acids on the heart. T. HOSOKAWA. *Okayama-Igakkai-Zasshi* 39, 593-603(1927); *Ber. ges. Physiol. expil. Pharmacol.* 47, 283.—Cholic acid (0.03-0.01%) added to Ringer soln. increases the beat vol. of the frog heart; 0.002-0.005% desoxycholic acid and Ringer soln. have the same effect. The first decreases, then increases the beat frequency; the latter decreases it. This action is independent of the pH of the soln. and of the vagus nerve. Ringer soln. flowing through the liver increases the beat vol. of the heart but to a smaller degree than Ringer soln. plus 0.03-0.04% cholic acid.

R. C. WILLSON

The influence of larger doses of morphine on the respiration. MASAMI NISISITA. *Okayama-Igakkai-Zasshi* 40, 797-818(1928); *Ber. ges. Physiol. expil. Pharmacol.* 47, 350.—The optimal inhibiting dose in rabbits is 20 mg. per kg. body wt. This dose removes the irritability of the respiratory center toward CO<sub>2</sub> (5-10%). After the completion of the CO<sub>2</sub> inhalation there is a transitory respiratory increase and a "detoxification stimulation." Larger doses of morphine alone or in combination with CO<sub>2</sub> respiration, lobeline and atropine sulfate always increase the reaction capacity of the respiratory center. The chief cause of death is not respiratory paralysis but the convulsant action of morphine.

R. C. WILLSON

Studies on the regulation of blood coagulation from the pharmacological point of view. II. The influence of some sympathetic poisons on the blood coagulation. HISASHI TANAKA. *Okayama-Igakkai-Zasshi* 40, 836-59(1928); *Ber. ges. Physiol. expil. Pharmacol.* 47, 272.—Small doses (0.001-0.01 mg. per kg.) of adrenaline injected intrav-



enously into rabbits reduce the coagulation time by 50–66%, increase the fibrinogen and thrombin and decrease the antithrombin. Large doses (0.03–0.05 mg. per kg.) reverse these changes. The action of small doses of adrenaline is reversed by preliminary administration of atropine or yohimbine. Tyramine (0.005–0.01 g. per kg.) and tetrahydro- $\beta$ -naphthylamine in small doses accelerate blood coagulation, while larger doses inhibit it.

R. C. WILLSON

**Chemical modifications of blood following intravenous injection of urea.** B. VALERA FUENTES, J. DUOMARCO AND A. MUNILLA. *Rev. asoc. med. Argentina* 41, 885–909 (1928); *J. Am. Med. Assoc.* 92, 272.—Intravenous injections of urea (1.5–5.0 g. per kg. body wt.) produced toxic symptoms in dogs similar to those produced by renal deficiency during the evolution of uremia. Death follows when non-protein N reaches 500 mg. per cc. The ratio, coeff. of urea N : total N, which normally is 0.5, reaches 0.9, the total blood N exceeding 100 mg. No modification of the blood uric acid, creatine and creatinine was produced. The mineral metabolism was unchanged as regards Ca, NaCl and inorg. P.

R. C. WILLSON

**The Doeberner reaction.** VII. Syntheses with  $\beta$ -aminoanthracene (CIUSA, MUSAJO) 10. Synthesis of an isomer of thyroxine and of related compounds (HARRINGTON, MCCARTNEY) 10. Synthesis of isomeric ephedrine and their homologs (NAGAI, KANAO) 10. 3,4-Methylenedioxyphenylarsonic acid (BALABAN) 10. Chemotherapy of some Br derivatives of phenylarsonic acids and arsenobenzenes (HAYTHORNTHWAIT) 10. Some derivatives of arylthioarsinous acids (BARBER) 10.

## I—ZOOLOGY

R. A. GORTNER

**The increased consumption of oxygen of marine animals under the influence of high pressures. Its variation as a function of the duration of compression.** MAURICE FONTAINE. *Compt. rend.* 188, 662–3 (1929); cf. C. A. 23, 2502.—In studying the effect of compression on the  $O_2$  consumption of *Pleuronectes platessa* it was found that the percentage above normal consumption increased with time up to 90 mins. and then began to fall. The values for a small animal (0.120 g.) were higher than those for a larger one (0.275 g.). The pressure employed was 100 kg. per  $cm^2$ .

D. D.

**The iodine content in species of fish from the east and west coasts of U. S. A. Preliminary communication.** GULBRAND LUNDE AND JENS BØE. *Tids. Kemi og Bergvesen* 8, 139–40 (1928); cf. C. A. 23, 2193.—Lunde has earlier shown that the I content in species of fish from the Norwegian coast is much higher than that found by other investigators in fish from other places. The authors have examd. a series of samples from the east coast of U. S. A. The samples were collected at Woods Hole, Mass. in June and July, 1928. The results are: examd. material collected at La Jolla, Cal., in June, 1928. *Merluccius* from the northeast coast of N. America contained in mg. I per kg. in the muscle, resp.: *Brevoortia tyrannus* (menhaden), 0.46–0.90; *Pollachis* (cod), 0.42–1.52; *Scomber scombrus* (mackerel), 0.12–0.27; *Melanogrammus* (haddock), 6.74–24.07; *Brosimius brosme* (cusk), 0.17–0.49; *Pseudopleuronectes* (flounder), 0.53–1.89; *Gadus callarias* (cod), 0.79–2.82. Analysis of muscle from the east of southern Calif. gave: *Scomber japonicus* (mackerel), 0.099–0.2; *Paralichthys oblongus*, 0.12–0.18; *Paralichthys biforniensis*, 0.318–1.298; *Paralabrax clathratus* (kelp bass), 0.040–0.068; *Lepidion* (sheepshead), 0.068–0.364; *Emtrioloca jacksoni* (black perch), 0.040–0.068. The I contents found by the authors are much higher than the analyses of fish from the U. S. Bur. of Fisheries, Document No. 967). The I content of the fish from the American coast is much smaller than that of fish from the Norwegian coast. Only the haddock approximates the I content of fish from the Norwegian coast.

A. DROGSETH

**A note on hemerythrin.** G. F. MARRIAN. *Brit. J. Exptl. Biol.* 4, 357–64 (1927); *Physiol. Abstracts* 13, 570.—Hemerythrin solns. have been prepd. from the body fluid of *Phascolosoma* and dissoen. curves drawn between the temps. of 0° and 53°. The dissoen. curve is not appreciably affected by changes of  $p_H$  within the range in which the pigment is relatively stable ( $p_H$  6 to 10). The heat of formation of oxyhemerythrin is calcd. at 10,350 calories per gram mol. The spectroscopic examn. of the various compds. is described. The presence of heme in the mol. has not been demonstrated, nor can the pigment function as a peroxidase.

H. L. D.

**Carbon dioxide from the nerves of cold-blooded vertebrates.** G. H. PARKER. *Am. J. Physiol.* 86, 490–504 (1928).—A colorimetric method for  $CO_2$ , sensitive down to  $2.5 \cdot 10^{-5}$  cc., is described. The leg nerves of the frog produced 0.0022 mg.  $CO_2$  per g. nerve per min. in winter and 0.0034 mg. in summer. The lateral-line nerve of the dog-

fish produced 0.0024 mg.  $\text{CO}_2$  per g. of nerve per min., the nerve fibers producing about 66% more than did the nerve as a whole. Each nerve impulse in a series of impulses passing over 1 cm. of the lateral-line nerve of the dogfish liberated approx.  $2.8 \cdot 10^{-13}$  mg. of  $\text{CO}_2$ . J. F. LYMAN

The oxygen consumption of the frog heart. I. A J CLARK AND A. C. WHITE. *J. Physiol.* 66, 185-202(1928).— $\text{O}_2$  consumption was measured on a Barcroft manometer or by Weizsäcker's method. The resting metabolism of the frog heart was about 25% of that at moderate work.  $\text{O}_2$  consumption due to contraction varied directly with the diastolic vol. and was not influenced by the resistance against which the heart contracted. Heart muscle was very sensitive to acid, being arrested by a fluid of about  $\text{pH}$  6.2 which seemed to be sufficient to inhibit the initial anaerobic break-down process. II. Effect of lipoids, ions and narcotics. *Ibid* 203-16.—Resting metabolism in frog heart was not markedly changed by lack of  $\text{Ca}$ , excess of  $\text{K}$ , narcotics, soaps or lipoids. Ionic changes and narcotics depressed the  $\text{O}_2$  consumption due to contraction. Blood serum, alc ext. of blood serum and  $\text{Na}$  oleate increased the metabolism of hypodynamic hearts. The chem. changes which cause the resting  $\text{O}_2$  consumption appear to be of a different nature from the catabolic processes with contraction. J. F. LYMAN

The tarsal chemical sense of the screw worm fly, *Cochliomyia macellaria* Fab. CYRIL E. ABBOTT. *Psyche* 35, 201-4(1928).—These flies can easily distinguish between pure water and a sucrose soln. when the solns. are allowed to touch the tarsi. Water vapor was not an important factor in the response but water starvation increased the no. of responses. There was no difference in the response of the sexes. Urea solns did not call forth feeding responses; they appeared to be repellent. C. H. R

Insect nutrition and metabolism. A summary of the literature. B. P. UVAROV. *Trans. Entomol. Soc. London* 1928, 255-343.—A very complete summary of the literature upon insect nutrition and metabolism. The information is arranged under the following headings: the food of insects (classification, phytophagous, saprophagous, carnivorous, special foods, food selection); chem. compn. of insects and their products (ash, N substances, fats and allied substances, carbohydrates, pigments, secretions, excretions); enzymes (digestive enzymes and others); metabolism (N substances, fat, glycogen and other carbohydrates, ash); influence of diet on growth and reproduction (N, carbohydrates, fats, mineral elements, vitamins, endocrine glands and their secretions, complete artificial foods for insects); bibliography (24 pages). C. H. R

The relation between temperature and the pedal rhythm of *Balanus*. WILLIAM H. COLX. *J. Gen. Physiol.* 12, 599-608(1929).—The frequency of the pedal movements of the rock barnacle, *B. balanoides*, increases with temp.; the data show 3 groups of thermal increments and 3 critical temps. The values ( $\mu$ ) computed from the Arrhenius formula are largely those previously found to be associated with respiration and neuromuscular activities. C. H. RICHARDSON

The function of nutrients dissolved in water on the metabolism of aquatic animals. X. The significance of the dissolved nutrients for the metabolism of young carps. BORIS KOSTOMAROV. *Arch. Hydrobiol.* 19, 31-65(1928).—Young carps (*Cyprinus carpio*) (3 groups) were (I) not fed, but were kept in nutritive solns., or (II) fed with daphniae, etc., or (III) kept unfed in pure tap water. At the end of the expts. the solid matter and the ash content were detd. separately in head, body and intestines. Peptone + glucose, peptone + saccharose, peptone + glucose + saccharose, ext. of dried daphniae, ext. of dried fish, ext. of meadow hay, yeast ext., concoction of hay, and hemolyzed ox serum served as nutrient solns. The fish of group I were able to utilize the dissolved substances in order to maintain their metabolism, though the amts. taken up were not quite sufficient to allow the fish to maintain all their bodily functions. No formation of new tissue occurred. The decrease of the solid matter was always smaller in I than in III, especially in the heads. From this it is concluded that I did not hunger as much as III. The exts. seemed to be more suited for utilization than the solns. of chemically pure substances. The metabolism was greater in the summer than in the winter. Numerous references are given. G. SCHWOCH

Precipitin reactions with various tissues of *Ascaris lumbricoides* and related helminths. GRAEME A. CANNING. *Am. J. Hyg.* 9, 207-26(1929).—Antigens prepd. from single germ layers of *Ascaris lumbricoides* induce antibodies which give reactions most intense with the homologous antigen. The highest degree of tissue specificity is exhibited by the anti-cuticle serum; specificity is less with anti-egg and anti-sperm sera. As regards species specificity the anti-sperm serum reacts with the greatest range of related ascarids. G. H. SMITH

Surface permeability of marine invertebrates as the cause of the toxicity of sea-water of abnormal composition. ALBRECHT BETHM. *Arch. ges. Physiol.* (Pflüger's)

221, 344-62(1928).—In the forms studied, *Carcinus maenas* and *Aplysia punctata*, the blood gives higher values for Ca and K than does the sea water, while in *Carcinus* the Mg of the blood is lower than that of the water. If brought into an artificial sea water containing a deficiency or excess of an ion the blood changes correspondingly, the change taking place more promptly in *Aplysia* than in *Carcinus*. Permeability was demonstrated for Ca, K, Mg and Cl. Reduction in Ca causes a fall in tonus and reflex irritability, changes which are reversible.

G. H. SMITH

Effect of different concentrations of calcium salts on the frog heart in the early summer. BRUNO KISCH. *Arch. ges. Physiol.* (Pflüger's) 221, 469-73(1929).—The Ca requirements of the heart of the summer frog are greater than those of the winter frog, but the necessity for increased amts. of Ca does not persist throughout the summer. When the Ca is reduced disturbances of heart action result.

G. H. SMITH

Antagonism and synergism in the effect of magnesium and calcium salts on the heart. BRUNO KISCH. *Arch. ges. Physiol.* (Pflüger's) 221, 474-7(1929).—With respect to contractility the frog heart in early summer gives evidence of an antagonism between Mg and Ca salts. In the autumn this is lacking.

G. H. SMITH

Properties of the cutaneous secretions of certain tree-frogs near Rio de Janeiro. J. VELLARD. *Compt. rend.* 188, 1064-6(1929).—The secretions were examd. of *Hyla faber*, *H. albomarginata*, *H. crospedopsila*, *Trachycephalus nigromaculatus*, *Phyllomedusa burmeisteri*. The solns. were rich in mucus, opalescent, and, with exception of that from the last, coagulated by heat, alc., and strong acids. The fourth one had a  $p_H$  of 6.9, the last, 6.7; both of these gave the biuret and xanthoproteic, but not the Millon, ninhydrine, or K ferrocyanide reactions, nor the molybdate reaction characteristic of the venom of *Bufo marinus*. The secretions of the first and third were wholly nontoxic; that of the second caused general contractions in pigeons, but the latter always recovered; those of the last two were very toxic. The venom of *Tr. nigromaculatus* was effective on mammals, birds, batrachians, and reptiles, but the lethal dose could not be determined. It acts on the nerve centers, and later causes hemorrhages. The parotid venom of *Ph. burmeisteri* acts very similarly; its lethal doses were found to be: intravenously in pigeons 0.15 mg., dog (6-8 kg.) 1.8 mg., rabbit (1.5 kg.) 0.5 mg.; intramuscularly, pigeon 3 mg., guinea pig (400 gm.) 4 mg.; orally in *Lachesis jararaca* 0.5 mg. The venom of *Tr. nigromaculatus* lost its toxicity when heated 30 mins. at 45°; that of  $p_H$  was only slightly affected after 15 mins. boiling.

J. J. WILLAMAN

Employment of Paris green at the anti-malarial station of Porto Torres, Sardinia (CLUZEL) 14.

## 12—FOODS

F. C. BLANCK AND H. A. LEPPER

The quartz lamp as a detector in the food industries. THEO KÜHLEIN. *Chem.-tech. Rundschau* 44, 602(1929).—The evacuated and non-evacuated types of Hg vapor lamps are briefly described. The use of these lamps for analytical purposes depends on the fluorescence of substances in ultra-violet light. Sausage may be tested since flesh is red and cartilage bluish. Meat exts. and yeast exts. may be distinguished by means of their yellow-brown and grayish fluorescences. In ultra-violet light whole milk is canary yellow, skim milk, colorless, butter, yellow and margarine, bluish. Adulteration of butter by 25 per cent margarine can be detected by this means. The yellow fluorescence of pure cacao butter is lost on adulteration with coconut or palm-kernel fat. In a similar way ultra-violet light can be applied to the examn. of flours, sugar, fruit juices and alc.

E. PICKERING

Eliminating insect pests from foods by fumigation. L. V. BURTON. *Food Ind.* 1, 366-70(1929).—The use of the vacuum fumigator for the disinfection of cereal products, candies, nuts, cheese, cured meats and dried fruits is described and the principal pests affecting each food are enumerated. Either HCN or CS<sub>2</sub> or combinations of CS<sub>2</sub> and CO<sub>2</sub> are used. The CO<sub>2</sub> decreases the explosion hazard. The CO<sub>2</sub>-CS<sub>2</sub> mixt. may also be used in protected open tanks because the mixt. is heavier than air. In vacuum fumigation of foods, CS<sub>2</sub>-CO<sub>2</sub> mixt. is preferred, the amt. of CS<sub>2</sub> required being from 30 to 14 lbs. per 1000 cu. ft.

C. R. FELLERS

The food value of Eleusine cereals. I. Chemical and biological analysis of Afri-can cereals. A. ORRU. *Boll. soc. ital. biol. sper.* 4, 281-7(1929).—The cereals tested were *Eleusine atra*, *E. fusca* and *E. alba* grown in Eritrea. By feeding 5 rats exclusively with eleusine, it was possible to keep them alive and in good condition for a period of at

least 65 days. The increase in wt. was considerable (av. 209%). *Eleusine* flour has a higher nutritive value than corn meal.

**Cereal chemistry in Europe.** D. W. KENT-JONES. *Food Ind.* 1, 392-3(1929).—A survey. PETER MASUCCI. C. R. FELLERS

**Peroxides in the cereal industry.** G. VAN DER LEE. *Food Ind.* 1, 352-3(1929).—Benzoyl peroxide, known commercially as "Novadelox," is widely used in the bleaching of flour. The action is largely on the carotin of the oil. The oil content of wheat flour is approx. 1% and the carotin content is 0.0001-0.0002%. Active O evolved from benzoyl peroxide combines with the unsatd. carotin, giving a stable colorless carotin (-) compd. Theoretically, 0.0005 to 0.001 g. of benzoyl peroxide can bleach the carotin present in 100 kg. of flour but in practice 2 to 3 times as much is used because a part of the peroxide combines with other flour constituents. Whole-wheat flours cannot be bleached white because of the brown bran fragments. About 24 hrs. is required for the reaction to go to completeness and thorough mixing is advocated. C. R. FELLERS

**A gluten washing machine.** T. R. JAMES. *Cereal Chem.* 6, 244-6(1929).—Illustration and description of a machine for washing glutes and thus eliminating the personal equation. L. H. BAILEY

**Wheat flour studies. XV.** The use of the viscometric method for measuring the proteoclastic activity of flours. ARNOLD H. JOHNSON, B. L. HERRINGTON AND SAMUEL G. SCORR. *Cereal Chem.* 6, 182-96(1929); cf. C. A. 22, 2009.—A viscometric method of detg. the proteoclastic activity of flours is described, according to which the digested flour-water suspension is extd. 3 times with 1 l. of water. The residue in a vol. of 100 cc. is acidulated and the viscosity detd. When a patent flour-water suspension is digested at 30°, for 24 hrs., about 10% of the protein is changed to the extent that it no longer imbibes water on acidulation. The effects of comparable treatment on the proteins are greater in low-grade flours. E. g., 47% of the proteins of a second clear flour no longer imbibed water when the flour-water suspension was digested at 30°, for 24 hrs. Rate of decrease in viscosity was greater at higher temps. Amino N as detd. by both the formol titration and the Van Slyke methods increased during autolysis of flour suspensions. The formol titration is probably the most convenient method of detg. the proteoclastic activity of flours, but information is not given concerning the abs. quantity of protein changed by the hydrolysis. L. H. BAILEY

**Modifications of Rumsey's method for the determination of diastatic activity in flour.** J. G. MALLOCH. *Cereal Chem.* 6, 175-81(1929).—Several modifications of Rumsey's method for the detn. of diastatic activity are proposed. These are (a) control of acidity, (b) correction for the vol. of the flour, and (c) improved procedure for the detn. of the blank. A method for obtaining diastase-free flour is outlined. L. H. B.

**Determination of degree of acidity of flours by colorimetric spot-test.** RAYMOND HERTWIG AND J. S. HICKS. *Cereal Chem.* 6, 162-3(1929).—Flour standards representing different Beta Chlora treatments, as 1.5 oz., 2.0 oz., 2.5 oz., etc., Beta Chlora, resp., per barrel, are used for comparisons with the flours being tested. The unknown flour and the standards are placed in adjoining depressions of a porcelain spot plate. The surfaces of the flours are smoothed with a spatula or "slick" and a drop of suitable indicator such as chlorophenol red, bromocresol green, or bromothymol blue soln. is placed on the center of each flour portion, allowed to remain for 3 to 5 mins. and then the color on the unknown is matched with the standards. Such a method is useful in mill control to ascertain the uniformity of treatment of the flour. L. H. BAILEY

**Hydrogen-ion determination in flour and bakery products.** E. O. WHITTIER AND EMILY GREWE. *Cereal Chem.* 6, 153-62(1929).—The H-ion concn. of a 20 g.-100 cc ext. of a flour, cake, or bread is not the same as that of the unextd. substance. The Bailey electrode method and the capillary quinhydrone method applied to such exts. give results that may, in general, be safely used for comparative purposes, but should not be considered the true values for the unextd. samples. The ball quinhydrone method, in which no water or only a negligible amt. is necessary, gives readily reproducible  $p_H$  values when applied to flours and bakery products in the range 5.0 to 8.0, and the time required is comparatively short. The values so obtained more nearly represent the true H-ion concn. of the samples than those obtained by the other methods discussed. L. H. BAILEY

**Carotinoid pigments in flour.** C. G. FERRARI AND C. H. BAILEY. *Cereal Chem.* 6, 218-40(1929).—Pure carotin concn. can be measured by detg. the transmittancy at wave length 435.8 mm. of its petr. ether soln. A reasonable basis for the assumption that dil. solns. of carotin and petr. exts. of flour are similar has been established. These facts permit the correlation of the transmittancy of flour exts. with carotin concn. in accordance with the procedure described for pure carotin. It has been shown that the

presence of a small quantity of another pigment like xanthophyll would not cause an error of any significance in the estn. of flour color expressed as carotin alone. For the purpose of flour-color measurement the assumption is made, therefore, that the flour pigment is carotin. In carrying out such measurements the transmittancy of a gasoline ext. of flour is detd. The concn. of pigment expressed in mg. of carotin per l. of soln. is learned by consulting the curve showing the relation between per cent transmittancy and carotin concn. The concn. of pigment in the flour is then computed from the proportion of flour and solvent used in prepg. the ext., and the results are expressed as parts of carotin per million parts of flour.

L. H. BAILEY

**Granulation of flour and its relation to baking quality.** C. B. KRESS. *Cereal Chem.* 6, 202-14(1929).—The granulation of a flour makes only a little difference in its baking quality; the big difference is due to the wheat from which it is made. A flour of medium granulation has a tendency to produce a more even grain. Considering vol., color, texture and grain equally, the best flour is found in the 30% to 40% of medium granulation. That is, if one sifts out the coarsest and the finest flour until there is about 40% left of medium granulation, the best baking quality is obtained. The granular flour produces a little more acid than the fine flour during the first, second and third hrs. of fermentation. At the end of 4 hrs. the dough made from the granular flour has the same acidity as that made from fine flour. It is evident, from the rate of evolution of gas, from the increase in acidity and from the vol. of the dough during fermentation, that both fine and medium granular flour, such as is ordinarily made in good milling, has practically the same rate of fermentation.

L. H. BAILEY

**A single-figure estimate of baking scores.** R. K. LARMOUR. *Cereal Chem.* 6, 164-74(1929).—As there is no standard system for reporting bread characteristics, it is necessary for the baker to score the loaves produced, and thereby set a value upon the various characteristics observed. Loaf vol. may be accurately detd. and recorded in definite figures but texture, color, appearance, oven spring, etc., are not so readily detd. Arbitrary values must be placed on these characteristics if they are to be included in scoring. L. suggests weighting the various factors, and having them related; thus 30 cc. loaf vol., 2 points in texture, 3 points in color, 6 points in appearance and 6 points in absorption are each equiv. to 6 points in the final bread score. All the points in the score are added together to form the final bread score.

L. H. BAILEY

**A quick viscometric method for measuring the staleness of bread.** L. P. KARACSONYI. *Cereal Chem.* 6, 241-3(1929); cf. *C. A.* 23, 3029.—Ten g. of the crumb of the bread is broken in small pieces and wetted with distd. water, worked through a No. 5 XXX silk bolting cloth into a porcelain dish, completely transferred to a 250 cc. Erlenmeyer flask, the bread and water to weigh 100 g. K. used a viscometer similar to that of Luers and Ostwald (1919). This instrument had a water equiv. of 74 secs./5. Detns. were made at 20°. Reproducible results were obtained.

L. H. BAILEY

**A technological method for the study of yeast.** E. E. WERNER AND WM. SIEDHOFF. *Cereal Chem.* 6, 196-201(1929).—Yeasts are tested by subjecting them to the same conditions in bread doughs. A standard flour is used. One series of doughs is made by adding little or no sugar and duplicate doughs are made by the addn. of 5% of sugar. Variations in the yeasts will be manifested in these doughs.

L. H. B.

**Present methods for characterizing the watering of milk, particularly the simplified molecular-constant method.** E. CATTELAINE AND L. BLIECO. *J. pharm. chim.* [8], 8, 455-9, 510-8(1928); cf. following abstr.—A critical review is presented of the methods of Villiers and Bertault (detg. the refractive power of the whey, *Bull. soc. chim.* [3], 19, 305-10(1908)), of Winter (1895) (cryoscopy of the milk, cf. *C. A.* 5, 2670), of Gros (1903) (detg. solids not fat, *C. A.* 10, 1899) and of Mathieu and Ferré, (S. M. C. method, *C. A.* 8, 2908, 10, 1899). In practice, the methods of Gros and detn. of the true S. M. C. together permit the definite recognition of the addn. of H<sub>2</sub>O to milk. An extensive bibliography is added.

S. WALDBOTT

**Analyses of milks of the region of Sées (Orne), their apparent and true simplified molecular constant.** L. BLIECO. *J. pharm. chim.* [8], 8, 543-6(1928); see *C. A.* 23, 215.

S. WALDBOTT

**A rapid stain for direct microscopic examination of milk.** N. M. ERB. *J. Lab. & Clin. Med.* 14, 377(1929); *Stain Tech.* 4, 61.—As in the Breed method, 0.01 cc. of milk is spread over 1 sq. cm. on a cover slide, dried and stained for 1 min. with the following soln.: Et<sub>2</sub>O 50 cc., abs. MeOH 50 cc., certified methylene blue 0.59 g. The slide is rinsed in water and dried.

C. R. FELLERS

**The separation of the components of frozen milk by fractional melting.** VIKTOR V. WINTER. *Chem. News* 138, 321-4(1929).—The fat contents in the fractions of re-melted milk may be dependent on the conditions of the freezing and re-melting as well

as on other circumstances. The proportion of the quantity of proteins in relation to that of the sugar and salt is very stable. Instead of Vieth's av. % proportion of 39 : 52 : 9, W. found 40 : 52 : 8. The division of protein is not even as might be expected, probably because of the quality and quantity difference between casein, lactalbumin and lactoglobulin. The % of sugar is increasing toward the end of the melting. The division of the content of salts approaches the division of proteins more than that of sugar, and towards the end of the fractional re-melting the quantity of salts as well as of proteins diminishes. J. C. JURRIGS.

**The sanitary control of ice cream.** F. W. FABIAN. *Am. J. Pub. Health* 19, 590-600(1929).—It is much more satisfactory to require pasteurization of the whole mix since it gives more uniform results and is in accord with the best practice of the industry. With proper care it is possible to produce ice cream with a bacterial count of 100,000 or less per g. Periodic inspection plus regular bacteriological analysis will do much to keep a close check on the sanitary quality of the product. Expts. have shown that *B. typhosus*, *B. diphtheriae* and hemolytic streptococci may remain viable for considerable periods of time in ice cream. Numerous epidemics have been definitely traced to ice cream.

**Mechanical stabilization of emulsion in dairy manufacture.** F. J. DOAN. *Food Ind.* 1, 358-60(1929).—Homogenizers and other emulsion-forming equipment commonly used in ice cream plants and creameries are described. C. R. FELLERS.

**The presence of mixed glycerides in butter.** E. DE COMO AND E. SCOPINARO. *Ann. chim. applicata* 19, 55-65(1929).—The authors have shown the presence of 2 mixed glycerides in butter, stearopalmitin and palmitostearin, both solids. They have not been able, however, to confirm the presence of a liquid glyceride (butyro-palmito olein) as deduced by J. Bell and confirmed by Bleyt and Robertson. A. W. CONTIERI.

**Development of soapiness in margarine.** KARL BRAUN. *Chem.-tech. Rundschau* 44, 345(1929).—Discussion of previous work on development of rancidity in fats by molds and bacteria. Soapiness in margarine was investigated and found not due to the quality of the raw materials. Conclusion: The practice of washing machines, containers, etc., with soda solns. should be abandoned since it penetrated the wood from which it was difficultly removable by washing and where it combined with any traces of free fatty acid to form scraps. E. PICKERING.

**A study of churn sanitation.** NORMAN JAMES. *Sci. Agr.* 9, 649-55(1929).—Filling the churns above the rolls and the working of the churn during sterilization are recommended as important procedures in minimizing the germ content of a churn. Molds and yeasts known to be present in water did not grow when plated on lab. media after the water had been chemically treated for 10 mins. using 4 different solns. The germicidal inhibiting effect of the chemical in the bacteriol. medium may account for this result. Accordingly, conclusions relative to the efficiency of chem. solns. for sterilizing are not warranted. C. R. FELLERS.

**The conservation of egg yolk by lactic acid and glycerol.** F. BORDAS. *Ann. hyg. publ. ind. sociale* 1928, 705-12; cf. *C. A.* 22, 643.—A discussion of the question under what conditions the use of the above agents may be considered hygienically unobjectionable. G. TOENNIES.

**The behavior of sulfur compounds in cooking vegetables.** JEAN SIMPSON AND EVELYN G. HALLIDAY. *J. Home Econ.* 20, 121-6(1928).—Detns. of evolved S compds during cooking of cauliflower or cabbage together with organoleptic examn. of the cooked products show that S compds. of these vegetables tend increasingly to decompose on long cooling and that it is their decompn. products which are responsible for the bad taste and odor which are assocd. with these vegetables when overcooked. L. D. E.

**Chemical composition of the pumpkin (*Curbita maxima*).** G. RIVIÈRE AND G. PICHARD. *J. soc. natl. Hort. France* [4], 28, 274-5(1927).—The varieties Rouge vif d'Etampes and Turban du Natal contained, resp., water, 92.20, 93.42; dry matter, 8.80, 6.58; reducing sugar, 2.68, 0.00; sucrose, 0.32, 0.92; matters capable of forming sucrose, 3.60, 0.00; acidity, 0.00, —; ash, 0.90, 0.09. H. L. D.

**Chemical composition of West Indian seedling avocados.** JENNIE TILT AND MAY WINFIELD. *J. Home Econ.* 20, 43-6(1928).—One hundred twelve samples of Florida avocados representing different varieties and stages of maturity showed the following range and av. figures, resp.:  $H_2O$  81.65 to 83.92, av. 83.02; protein 1.12 to 1.16, av. 1.14; fat 6.43 to 8.09, av. 7.33; carbohydrate 6.72 to 6.92, av. 6.82; crude fiber 1.16 to 1.19, av. 1.17; and ash 1.02%. The ash calcd. on the basis of g. per 100 g. fresh avocado analyzed P 0.0477 to 0.0507, av. 0.0492; Fe 0.0054 to 0.0072, av. 0.0063; Ca 0.0368 to 0.0381, av. 0.0370; Mg 0.0323 to 0.0407, av. 0.0365. A comparison of results obtained in California shows that the Florida avocado is somewhat higher in  $H_2O$  and lower in fat

and protein. Ca, Mg and P agree closely with the California fruit while Fe is approx. half that of the California avocado.

**Modern processing methods in fruit canning.** F. HIRST. *Food Manuf.* 4, 157-9 (1929).—H. outlines the technic of canning from the British standpoint and emphasizes several features which render their problems somewhat different from those experienced in America.

**The effect of sulfur dioxide on the oxidase of fruits.** W. V. CRUICK AND W. Y. FONG. *Fruit Products J. and Am. Vinegar Ind.* 8, No. 10, 21(1929).—SO<sub>2</sub> exerts a strong inhibiting action on the darkening by oxidation of the natural color bases of fruits in addn. to its blanching action on the anthocyan pigments.

**The story of carbonated beverages. Composition and value.** LILLIAN B. STORMS. *Practical Home Econ.* 7, 40-4(1929).—A history of carbonated beverages is given. Carbonated beverages contain 7-17% sugar. Addn. of carbonated beverages to the diet of rats caused better growth and reproduction. The acids used in carbonated beverages are citric, tartaric, acetic, lactic and phosphoric. The CO<sub>2</sub> present increases the death rate of microorganisms. Twenty-nine references are given.

**The copper content of plant and animal foods.** C. W. LINDOW, C. A. ELVEHJEM AND W. H. PETERSON. *J. Biol. Chem.* 82, 465-71(1929).—The Cu content of about 160 samples of common food materials has been detd., ranging from 0.1 mg. per kg. of fresh celery to 44.1 mg. for fresh calf liver. The classes of foods in descending order of Cu content are as follows: nuts, dried legumes, cereals, dried fruits, poultry, fish, animal tissues, green legumes, roots, etc., leafy vegetables, fresh fruits and non-leafy vegetables. The Cu content of leafy vegetables does not place them in the preëminent position which they hold with reference to their Fe content. There is a wide variation in the Cu content of livers from various animals, calf liver being highest and hog liver lowest. Oysters contain a strikingly high amt. and surpass all sea foods in Cu. The degree of variation in the Cu content of foods falling in the same class was less than that of either Mn or Fe. There is a wide distribution of Cu in food materials, no food examd. being without it. Certain milled cereals, such as polished rice and patent wheat flour, are very low in Cu as compared to the whole grain from which they are made.

**The copper content of feedingstuffs.** C. A. ELVEHJEM AND E. B. HART. *J. Biol. Chem.* 82, 473-7(1929).—The Cu content of 47 common feeds is given, the av. content being 1/3 of the Mn and 1/16 of the Fe in 42 of these feeds. The feedstuffs arranged in ascending order of Cu content are as follows: straws and stovers, hays and grasses, and seeds and seed products. The variation in Cu content in general is very small. The Cu content of the crop can be increased within certain limits by fertilization of the soil with a Cu salt. Certain manufactured feeds were unusually high in Cu probably because of contamination.

**Test of hydrocyanic acid in cattle feed.** G. MOUSSU. *Réc. méd. vétérinaire* 13, No. 1, 5-8(1927); *Intern. Rev. Sci. & Practice of Agr.* [N.S.], 18, 610T.—A simple process is described by which it is possible to detect the presence in feeds and industrial residues of products such as cyanogenous glucosides which generate HCN. The suspected production is soaked in tepid water at 35-38° until it has a pulpy consistency. A test-tube is half filled with this pulp. A strip of picro-soda paper (blotting paper plunged first into a concd. aq. soln. of picric acid, then dried and immersed in a 10% soln. of Na<sub>2</sub>CO<sub>3</sub> and again dried) is placed in the upper half of the test-tube and kept in place by the cork only. After 12 to 20 hrs. at ordinary temp. or after 5 to 6 hrs. at stove temp., the glucoside is decomposed and the HCN is set free, producing iso-purpurate of Na, which colors the soda paper red, more or less intense according to the richness in glucoside which generates HCN of the product under suspicion.

**The composition of mineral licks.** W. R. JEWELL. *J. Dept. Agr. Victoria* 27, 231-4(1929).—A satisfactory mixt. of inorg. salts for use in the feeding of animals is compounded in the following proportions: NaCl, 187; ground phosphate rock, 62 or sterilized bone meal, 93; S, 14; FeSO<sub>4</sub>, 9; and MgSO<sub>4</sub>, 7 lbs., and 4 ounces each of KI and MnSO<sub>4</sub>. "Ground rock phosphate is now generally used, and is quite efficient as a source of Ca and P, provided it does not contain appreciable amts. of F, which is harmful to stock. Nauru and Ocean Island phosphates, which constitute the bulk of rock phosphate used in Victoria, contain only small quantities of F, and for that reason are satisfactory. Superphosphate should not be used as it may produce internal disorders."

**Poisonings caused by vetches.** ALBERT GUILLAUME. *Bull. sci. pharmacol.* 36, 293-301(1929); cf. C. A. 23, 3279.—The toxicology is discussed. *Lathyrus* does not contain alkaloids or HCN. The poisoning may be due to a poisonous protein, saponin, phytotoxin or to anaphylaxis.

A. E. MEYER

Labor-saving devices for the commercial protein testing laboratory (WHITCOMB) 1. The Cu content of sugar-beet leaves treated with Cu compounds, and changes in their oxalic acid content (FRIGERIO) 15. Esters [for use as foods] (Fr. pat. 654,535) 10.

**Food product from bananas.** CHARLES JAEGER. Fr. 653,620, April 30, 1928. See Brit. 290,195 (C. A. 23, 916).

**Preserving food.** CHRISTIAN BERTRAM. Fr. 653,809, May 3, 1928. Food such as fruit or vegetables can be kept fresh for months by covering them with a mixt. contg. 992 g. of either chalk, talc or dolomite on the one hand, or paraffin, neat's foot oil or suet on the other hand and colophony 4, Na benzoate 1, benzoic acid 0.5, salicylic acid 1, meadowsweet powder 1, basic carbonate of  $\text{NH}_4$  0.5 g. The prepn. is washed off before using.

**Preserving food.** STUDIEN-GES. FÜR WIRTSCHAFT UND INDUSTRIE M. B. H. Ger. 476,434, Jan. 25, 1925. Foodstuffs are preserved by a combination of the known methods in which colloidal solns. of metals and dild. acid vapors are used. Thus, apples may be treated in a container with an atomized spray of a colloidal soln. of Ag, and before the spray has settled the container is covered with a lid to which a rag satd. with HCl is attached.

**Determination of water content of solid substances such as cereals or flour.** FRANKFURTER FORSCHUNGSMITTEL FÜR GETREIDECHEMIE, G. M. B. H. Fr. 654,422, May 18, 1928; See Brit. 290,645 (C. A. 23, 794).

**Flour.** ERNEST A. FISHER and CHARLES R. JONES. Fr. 654,324, May 15, 1928. An app. is described for improving the cooking quality of flour, in which the flour in the form of a cloud is treated with moist heated air, so that the flour is heated between 54–82° without appreciable loss of water.

**Apparatus for drying and cooling flour or starch.** ALEX. G. HUHN. Fr. 652,858, April 3, 1928.

**Breadmaking.** EUZIM (SOC. ANON.). Fr. 654,056, May 10, 1928. Fermentation of bread dough is activated by adding to the yeast a mixt. contg. Mg phosphate 7,  $\text{NaHCO}_3$  3,  $(\text{Ca}_3\text{PO}_4)_2$ , in which there is 37% of phosphoric anhydride sol. in citrate, 90%

**Bakery furnace.** JEAN DUPIC. Fr. 652,870, April 12, 1928.

**Bakery furnaces using liquid fuel.** PAUL LINKE. Fr. 653,723, Feb. 25, 1928

**Preserving egg material.** EGG PATENTS, LTD. Fr. 654,512, May 21, 1928. See Brit. 296,462 (C. A. 23, 2510).

**Vitamin preparation.** AAGE W. OWE. U. S. 1,715,945, June 4. A vitamin-contg. fatty material such as a fish liver oil is treated with an alk. earth hydroxide such as  $\text{Ca}(\text{OH})_2$  to form a water-insol. metal soap; the soap is pulverized, and vitamins are extd. from it by the use of an edible fat such as cotton oil to form a vitamin-contg. food product.

**Apparatus for curing meat by smoking.** MAX RIND. U. S. 1,715,625, June 4. Structural features.

**Nut-meat food product.** JOSEPH L. ROSENFELD. U. S. 1,716,152, June 4. Nut meats such as those of peanuts are cut into small particles in which some of the oil cells are severed but in which most of the oil is retained in the cells, and mixed with a hard edible oil such as hydrogenated peanut oil to produce a plastic product.

**Coffee preparation.** THOMAS M. RECTOR (to Vitapack Corp.). U. S. 1,716,323, June 4. Coffee is ground in a fatty medium, part of the fatty medium is expressed and the expressed material is added to a fresh batch of coffee, which is also similarly ground and expressed. The product may be used for prep. beverages or as a flavoring.

**Concentrated onion juice.** CARL MARX (one-half to Rudolph Weiss). U. S. reissue 17,324, June 11. A reissue of original pat. No. 1,619,826, issued March 8, 1927 (C. A. 21, 1318).

**Fruit containers.** ARNOLD KUPFER. Swiss 130,911, Dec. 15, 1927. The containers are impregnated with paraffin wax, stearin, ceresin or mineral oil or a mixt. of these.

**Apparatus for preserving fruits.** JACQUES DUPRAT. Fr. 653,038, Sept. 26, 1927.

**Preserving citrus-fruit juices.** VAMAN R. KOKATNUR. U. S. 1,715,932, June 4. An aq. ext. of the skin of citrus fruit such as oranges, lemons, grape fruit or tangerines is mixed with juice of the fruit without addn. of any extraneous preservative; the treated juice is heated to 45–55° for at least 2.5 hrs.



## 13—GENERAL INDUSTRIAL CHEMISTRY

HARLAN S. MINER

**Science in industry.** GUSTAV EGLOFF. *Petroleum Times* 21, 908, 910-11(1929).—A lecture on the place of research in modern mfg. processes. M. B. HART

**Two examples of the smaller industrial research organizations.** WASHINGTON PLATT. *Ind. Eng. Chem.* 21, 659-61(1929).—Research organizations of a baking company and of the American Dry Milk Inst. are described. E. H.

**Structure of an industrial research organization.** CHARLES M. A. STINE. *Ind. Eng. Chem.* 21, 657-9(1929).—The nature of the research organization of E. I. duPont de Nemours & Co. is outlined. E. H.

**Some aspects of chemical patent searches.** FREDERICK H. UNTIEDT. *Ind. Eng. Chem.* 21, 689-91(1929). E. C. M.

**How chemical engineering has improved aircraft.** GEORGE E. WALKER. *Chem. Met. Eng.* 36, 348-50(1929). E. J. C.

**An indirect method of measuring air flow.** A. F. DAY. *Commonwealth Eng.* 16, 387-8(1929). E. J. C.

**Heat transfer between gases with the secondary introduction or removal of heat.** R. NITZSCHMANN. *Metallbörse* 19, 1127-9(1929).—A series of equations and tables for simplifying calcs. in heat transfer. W. C. EBAUGH

**Means of ventilating and freeing chemical factories of dust.** H. REININGER. *Chem. Fabrik* 1929, 205-7, 230-2, 271-3.—Descriptions of proper construction of roofs, of the Körting, Wolpert and Kaüffer ventilators, fan exhausters, sprays, masks, etc. J. H. MOORE

**Results of testing materials with Röntgen rays.** H. BECKER-ROSE. *Chem. Fabrik* 1929, 229-30, 270-1.—A summary of results on catalyzers, ceramics, metals, mineral pigments, double salts, mixed crystals, silk, cellulose, rubber, etc., with 44 references. J. H. MOORE

**1,4-Dioxan.** E. W. REID AND H. E. HOFMANN. *Ind. Eng. Chem.* 21, 695-7(1929).—1,4-Dioxan is adapted for use as a solvent for cellulose esters (alcohol-wet), cellulose acetate, cellulose ethers, resins, oils and waxes, dyes and many other org. compds. Its use is indicated in the manuf. of lacquers and celluloid. It may also be used in many other diversified arts, where its solvent properties are desired. B. H.

**The gravitational flow of fertilizers and other comminuted solids.** W. EDWARDS DEMING AND ARNON L. MEHRING. *Ind. Eng. Chem.* 21, 661-5(1929).—Data are given for the rates of flow of various solids through funnels of different angles and with openings of various sizes. The materials used include crystd. urea and  $\text{NH}_4$  phosphate, crushed rock phosphate,  $\text{KNO}_3$  pellets, glass beads, lead shot, marbles and various varieties of seeds. The rates of flow of such materials depend upon av. particle size, on kinetic coeff. of friction, on apparent density, on diam. of opening and on the vertical angle of the hopper, or in case all the material does not flow out, on the angle between opposite slopes of material at repose. An expression for computing the rate of flow is derived. M. S. ANDERSON

**Status of silicosis.** E. R. SAYRES, E. R. HAYBURST AND A. J. LANZA. *Am. J. Pub. Health* 19, 635-40(1929).—A comm. rept. J. A. KENNEDY

**The effect of added impurities on the breakdown voltage of insulating oils.** A summary of experimental work. ANON. *J. Inst. Elec. Eng.* (London) 67, 750-6(1929).—Water as an impurity may reduce the breakdown voltage to less than 10% of that of the dry oil. C. G. F.

**Lead poisoning in the United States.** CAREY P. MCCORD, DOROTHY K. MINSTER, ROBERT KEHOE. *Am. J. Pub. Health* 19, 631-4(1929).—A comm. rept. J. A. K.

**Ultra-filtration and its industrial applications (GÉNIN) 2.** Rubber composition [for use as insulating material] (U. S. pat. 1,716,478) 30.

**Annuario per le industrie chimiche e farmaceutiche, 1927. Anno X.** Rome: Provveditorato generale dello stato libreria. 662 pp. Reviewed in *Chem. Trade J.* 84, 567(1929).

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**British Chemical Plant Manufacturers' Association Official Directory**, 1929. London: The Assocn. Reviewed in *J. Textile Inst.* 20, P111(1929).

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*Proceedings of the International Congress on Testing Materials at Amsterdam*, 1927. 2 vols. Contains 28 papers in English, 27 in French and 41 in German. The Hague: Martinus Nijhoff. 30 Guilders (\$12).

*Siemens Jahrbuch*, 1929. Berlin: V D I Verlag. 644 pp. M. 12.

*X-rays in Industry*. Rochester: Eastman Kodak Co. 60 pp. Reviewed in *Chemicals* 32, 6(1929).

**Drying materials with waste gases.** OESTERREICHISCHE BAMAG-BÜTTNER-WERKE A.-G. Austrian 113,019, Dec. 15, 1928. The process relates to drying materials such as beet slices, which are usually dried with hot waste gases, and consists in superficially drying the materials with cleaned waste gases or with hot air before completing the drying in the usual way. The products are then less contaminated with ashes and soot. App. is described.

**Drying gases.** ALLGEMEINE GESELLSCHAFT FÜR CHEM. IND. M. B. H. Fr. 652,691, Apr. 14, 1928. An app. is described for bringing gas into intimate contact with a drying liquid such as  $H_2SO_4$ , abs. alc. or  $Ac_2O$ .

**Gas purification.** FRANZ LENZE and ANTON RETTENMAIER. Fr. 653,832, May 3, 1928. Substances such as  $Fe_2O_3$  used for gas purification are desulfurized when exhausted by heating to the temp. corresponding to the first phase of the liquefaction of S, preferably 110–150°, then centrifuged or compressed or both. Solvents for S such as  $C_6H_6$  or paraffin oil may be added before centrifuging and may act as heat carriers for the S.

**Scrubbing effluent gases.** FRANK A. CANON (to Seldon Co.). U. S. 1,716,028, June 4. Gases from vapor phase org. reactions such as in the production and purification of phthalic anhydride are passed over water-insol. carbonates such as  $CaCO_3$  in the presence of water.

**Separating gases.** SOC. ANON. IND. AMMONIACA. Fr. 654,805, May 24, 1928. An app. is described for sepg. a gas from a mixt. of gases by forming a satd. soln. of the gas.

**Separation of gas mixtures.** HERMANN BLAU. Fr. 654,161, Sept. 7, 1927. A mixt. of gases of different solubilities in a liquid is sepd. by subjecting the compressed mixt. to the action of the liquid so that the gas of higher soly. and part of the gas of lower soly. are absorbed, the constituent of lower soly. being subsequently entirely expelled by rectification. An app. is described.

**Separating carbon dioxide from gas mixtures.** GES. FÜR LINDE'S EISMASCHINEN A.-G. Ger. 476,289, Feb. 16, 1924. In sepg.  $CO_2$  from gas mixts. by cooling the mixt. to a temp. below the f. p. of  $CO_2$ , particularly in sepg. residual  $CO_2$  from mixts. from which the bulk of  $CO_2$  has been preliminarily removed by soln. in water under pressure, a hydrocarbon which is gaseous at ordinary temp., e. g.,  $C_2H_6$  or  $C_3H_8$ , is added to the mixt. (if not already present) so that, on cooling, a soln. of  $CO_2$  in the hydrocarbon is obtained. The process may be applied to the liquefaction of air.

**Removing dust from gases.** LÉON DEBRIER. Fr. 654,371, May 16, 1928. An app. of the type in which the gas current is directed against damp surfaces is described.

**Reaction between gases and solids.** I. G. FARBENIND. A.-G. (Hermann S. Schultz, inventor) Ger. 475,555, Apr. 11, 1928. Solid materials are produced in a form suitable for reaction with gases by powdering and allowing a liquid such as water to fall drop by drop on to a layer of the powder to form uniform spherical grains, which are sifted from the powder and dried.

**Extracting volatile substances from aqueous solutions.** HERMANN SUIDA. Austrian 112,980, Dec. 15, 1928. The soln. is distd. in a series of stills at successively decreasing pressures, and the vapor mixt. from each still in extd. in a sep. column with a high-boiling solvent. The residual vapors from each column are used to heat the succeeding still. The process may be applied in working up dil. AcOH. App. is described.

**Purifying liquids by osmosis.** LEONARDO CERINI. Austrian 112,961, Dec. 15, 1928. In the osmotic purification of NaOH solns. from viscose manuf., or of other solns., the dialytic membranes are made from a mercerized vegetable-fiber fabric. The mercerization may take place *in situ*.

**Purifying oils with liquid sulfur dioxide.** ALLGEMEINE GES. FÜR CHEM. INDUSTRIE m. b. H. Ger. 476,464, Dec. 24, 1925. The  $\text{SO}_2$  evapd. from the ext. and from the refined oil is compressed and used to heat the evaporators.

**Revivifying spent clarifying and decolorizing agents.** MARVIN L. CHAPPELL (to Contact Filtration Co.). U. S. 1,715,535, June 4. Decolorizing materials such as have been produced by the  $\text{H}_2\text{SO}_4$  treatment of montmorillonite clay, after use for clarifying or decolorizing mineral oils, are washed with a combined color and oil solvent contg. less than 3%  $\text{H}_2\text{SO}_4$  and which also may contain acetone, alc. and gasoline; they are further washed with a solvent such as an acetone, alc. and gasoline mixt. which is free from  $\text{H}_2\text{SO}_4$ . An app. is described.

**Baffle, impact and gravity systems for separating suspended matter from industrial effluents or other liquids and effecting their clarification.** ROBERT J. MARK. U. S. 1,717,111, June 11. An app. is described.

**Elimination of silica.** ARTHUR ROSENHEIM. Fr. 653,784, April 30, 1928.  $\text{SiO}_2$  is eliminated from liquids, particularly from water, by bringing the liquids in contact with gels of oxides of Fe, Al, Mg, Zr, Sn, etc., or mixts. thereof. The gels may be mixed with inert org. or inorg. substances or with gels contg. basic substances. Hardness may be removed before, during or after the removal of  $\text{SiO}_2$ . The gels are regenerated by reaction with aq. solns. of alkalis or alk. substances, or with substances such as molybdates, which form with  $\text{SiO}_2$  sol. complex silicates, or with steam or hot water, or with water contg.  $\text{CO}_2$  at ordinary or increased pressure.

**Chemical reactions.** RICHARD VETTERLEIN. Fr. 653,124, April 20, 1928. Chemical reactions such as those between salts and acids or between reducing agents and salts, metallurgical treatments or simple liberation of gas are carried out in a furnace having several floors after the system known in the Herreshoff furnaces for roasting pyrites.

**Dielectric substances.** COMPAGNIE FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON. Fr. 654,711, Feb. 18, 1928. Dielectrics such as nitrobenzene oils, nitrotoluenes and other org. liquids or solids, which are liquid when heated, are purified by treatment with fuller's earth or fuller's earth and charcoal and then with an oxide of Al, Ca or Ba. The 2 treatments may be combined in a single filtering. Cf. C. A. 23, 3174.

**Elimination of free halogens.** BRITISH DYESTUFFS CORP., LTD. Fr. 653,032, Apr. 19, 1928. Free Cl or Br is eliminated from gases by passing them through a layer of solid  $\text{C}_{10}\text{H}_8$ ,  $\text{C}_{14}\text{H}_{10}$  or solid olefins, and from liquids by agitating the liquids with these compds.

**Controlling boiling liquids.** ROBERT KRINGS. Ger. 476,211, April 10, 1926. The boiling-over of liquids, e. g., soap, aq. solns., oils and fats, is prevented by assocg. with the boiler a pump which withdraws liquid from the bottom of the boiler and feeds it to a plate or like subdivider arranged above the liquid surface. The height of the plate above the liquid surface should be sufficient to cool the returning liquid considerably.

**Finely divided solids.** BRITISH DYESTUFFS CORP., LTD. Fr. 654,747, April 11, 1928. See Brit. 293,896 (C. A. 23, 1702).

**System for supplying air currents for drying, carbonizing, oxidizing or similar processes.** ROBERT GLINKA. U. S. 1,715,830, June 4. An app. is described.

**Refrigerators.** DAVID F. KEITH. Fr. 654,774, May 10, 1928.

**Refrigerators.** COMPAGNIE FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON. Fr. 653,221, Feb. 4, 1928.

**Refrigerators.** SULZER FRÈRES, SOC. ANON. Fr. 654,791, May 22, 1928 and Fr. 654,796, May 23, 1928.

**Refrigerating machine.** PLATEN-MUNTERS REFRIGERATING SYSTEM AKTIEBOLAG. Ger. 475,565, April 14, 1927. Details of arrangement are given.

**Refrigerating machine.** PLATEN-MUNTERS REFRIGERATING SYSTEM AKTIEBOLAG. Ger. 476,256, Mar. 29, 1925. The absorption refrigerating machines work on a continuous cycle and have an inert gas circulating between the evaporator and the absorber.

Improved means are described for facilitating heat exchange in the evaporator and in the absorber. Cf. C. A. 23, 2229.

Refrigerating machine with top condenser. AKTIEN GESELLSCHAFT BROWN, BOVERI & CIE. Ger. 475,674, Jan. 17, 1925.

Refrigerating system of the absorption type. WILLEM A. SIAGER (to Kodowa Refrigerator Co., Ltd.). U. S. 1,717,173, June 11.

Refrigerating system of the compression type. ALEXANDER T. KASLEY (to Westinghouse Elec. & Mfg. Co.). U. S. 1,715,709, June 4. Structural features.

Absorber for refrigerating machine. ERNST SCHÄREN. Ger. 476,668, July 18, 1923.

Evaporator for refrigerating machines. A. FREUNDLICH, MASCHINENFABRIK. Ger. 475,888, April 5, 1928. Details are given.

Overflow evaporator for small refrigerator. GABRIEL ZIWICKY. Swiss 131,194, Sept. 23, 1927.

Insulating material. EMILE KOLLER. Swiss 131,383, May 7, 1928. The material is composed of paraffin wax, Chatterdon's compd., colophony and bees wax.

Insulatin material from soot. RUSSFABRIK KAHL. Ger. 476,946, Jan. 30, 1927. The soot is mixed with tar, pitch, coal-tar oil, resin, glue or size to a stiff paste and roasted in a muffle furnace.

Insulating device for electrical gas purifiers. METALLGES. A.-G. Ger. 476,854, May 27, 1928.

Heat insulator. WALDEMAR HESSLING. Swiss 131,196, Jan. 25, 1928. Non-conducting material imbued with gaseous CO<sub>2</sub> is enclosed hermetically between outer and inner walls.

Heat-insulation for safes, etc. CHARLES J. BATES, JR., and CARL P. BARTELS (to Mosler Safe Co.). U. S. 1,715,977, June 4. Vermiculite material is used with diatomaceous earth and a binder such as cement or plaster of Paris. Cf. C. A. 23, 224

## 14—WATER, SEWAGE AND SANITATION

EDWARD BARTOW

Town water supply in India. J. W. MADELEY. *Munic. Eng. Sanit. Record* 82, 535(1928); cf. C. A. 23, 1193.—Most large Indian towns are still supplied by water from shallow wells and tanks. Slow sand filtration is most usual. Water must be husbanded.

C. H. BADGER

Recent municipal activities at Stockport (England). HERBERT HAMER. *Munic. Eng. Sanit. Record* 82, 404-5(1928).—Seven pptn. tanks, each 200 ft. by 40 ft. wide, av. depth 7.75 ft., capacity 375,000 gals., are arranged in parallel. 2-42 in. feed pipe lines lead from the pptn. tanks to 5 concrete aeration tanks each 143 by 266 ft., capacity 900,000 gals. at 4 ft. depth. These are divided into a 5.25 ft. continuous channel 7000 ft. long by thin reinforced concrete walls. Agitation is by means of 9 or 10 ft. paddle wheels, 26 per tank. Sludge is pressed into cake and sold or is lagooned. The coarse and fine screens and the accompanying rakes are briefly described.

C. H. BADGER

Some municipal works at Portsmouth (England). RICHARD J. JENKINS. *Munic. Eng. Sanit. Record* 82, 447(1928).—Brief descriptions are given. Salt water is used for street washings with success.

C. H. BADGER

Portsmouth (England) drainage scheme. RICHARD J. JENKINS. *Munic. Eng. Sanit. Record* 82, 446-7(1928).—Seven collecting tanks, total capacity 11,250,000 gals.,  $\frac{1}{4}$  mile from the Eastney pumping station, are filled in less than 3 hrs. max. pumping. A description of the storm tank, consisting of 2-1,000,000 gal. compartments worked in series, is given. The storm water is discharged over weirs to the sea. There are 135 miles of sewers, max. 5 ft. diam. These take the storm water in some districts. The treatment plant of the sep. Cosham drainage district is to be modernized and the district to be completely sewered.

C. H. BADGER

German waterworks in 1928. H. STRINGER. *Engineer* 147, 564-5(1929).—A short account of the water supply of Shanghai, Cologne, Berlin and Hamburg.

D. B. DILL

Water softening for municipalities. EDWARD BARTOW. *Am. City* 39, No. 4, 131-2(1928); *U. S. Pub. Health Eng. Abstracts E-789b*, 60.—A discussion of water softening with a description of methods used at Columbus, Ohio, Okla. City, Springfield, Ill. and other cities. The demand for soft water is increasing and proper provision should be made by municipalities.

C. R. FELLERS

The softening of magnesian water by the lime-soda process. S. R. THOMAS. *Dyer, Calico Printer* 61, 192-3, 268-9(1929).—The various factors affecting the pptn. of magnesia are considered, and a method is described for detg. the best quantity of lime and soda ash in softening.

Chemical constituents of water. W. S. MAHLIE. *Domestic Eng.* (Chicago) 124, No. 9, 31-2, 55(1928); *J. Am. Water Works Assoc.* 21, 444.—M. lists the usual mineral constituents, discusses hardness, alkalinity and acidity; and gives a rapid method for calcn. of softening chemicals.

Detection of traces of phenol in water. H. BACH. *Gas u. Wasserfach* 72, 375-7(1929).—This method for detg. very small amts. of phenolic substances in water involves reaction with Na phenolate, filtration and evapn. of as much as 25 l. of water after oxidation with  $H_2O_2$  (free from aromatic preservatives). The concd. residue is neutralized with chloroacetic acid and distd. Phenol is detd. colorimetrically in the distillate by means of the Folin-Denis reagent. By this method it was found that the taste of the Essen drinking water after chlorination was due to 1 part of phenol in 125,000,000 parts of water due to insufficient biol. purification (of sewage, etc.) during the winter. The method gives good results at a diln. of 1 in 10,000,000 and fair results for 1 part phenol in 100,000,000 parts of water.

The detection of nitrites in drinking water by toluylene red. A. ROCHAIX. *Bull. sci. pharmacol.* 36, 302(1929).—Claim of priority referring to the note of Vergnoux (C. A. 23, 3037).

New treasury department drinking water standards. H. N. OLD. *Pub. Service Mgmt.* 46, 118-20(1929).

Unusual methods of water purification. MARTIN E. FLENTJE. *J. New Engl. Water Works Assoc.* 43, 38(1929).—The problems cited included: control of color and turbidity (alum was satisfactory) and elimination of water fleas and crustacea ( $CuSO_4$ , while satisfactory required too high a dosage and Cl treatment was used instead). Taste resulted in complaints, especially in the winter, owing largely to the short interval between chlorination and use. Dechlorination was resorted to, soda ash being used with the thiosulfate. The method of applying these 2 chemicals was considered worthy of a detailed outline.

Purification of potable waters for industrial purposes. F. DIÉNERT. *Chimie & industrie Special No.*, 182-3(Feb., 1929).—A brief discussion of the purity requirements of water for use in the fermentation industries.

Decolorization by storage in clean-bottomed reservoirs. KARL R. KENNISON. *J. New Engl. Water Works Assoc.* 43, 60(1929).—Two examples are selected where observation was possible and where color was high. From the data obtained the percentage reduction in color seems to be about 20% over 30 days.

The removal of iron from hard ground waters. R. L. MCNAMEE. *J. Am. Water Works Assoc.* 22, 758-67(1929).—The Fe occurs usually as  $FeCO_3$ . When the content exceeds 0.5 p.p.m., it is objectionable, fostering the growth of *Crenothrix* and interfering in laundering, dyeing, cooking, etc. Treatment involves aeration by sprays, falls or contact trays, coagulation usually with lime or an inert clay, sedimentation and filtration by contact beds or sand filters. Details and estd. costs are given.

Water filtration at Auckland, New Zealand. The Huia filter station. D. B. MANSERGH. *Commonwealth Eng.* 16, 329-33(1929).—The Huia filter station is of the Sandy rapid gravity type. It has an ultimate capacity of 28,000,000 g.p.d. Each bed is capable of treating 1,000,000 gal. The sand is specially graded and rests on a filter floor, which is laid on the floor on the water-tight tanks. A longitudinal sunk drain channel is provided in the concrete floor and then rows of special earthenware drain tiles of 3" internal diam. are laid on the floor 6" apart. These butt against one another and are 12" long. In the tops are holes 1" in diam., 6" pitch, to receive the brass nozzles. Then the filter is cemented to the top of the bosses on the nozzle plates. On this rests coarse gravel, medium gravel, coarse sand and fine sand. Tests are given of the filtered  $H_2O$ .

How turbid waters of the Tennessee River are filtered. C. V. SWEARINGEN. *Water Works Eng.* 81, 1265(1928); *J. Am. Water Works Assoc.* 21, 444.—Alum is used almost exclusively. Equipment for settling and filtration is described.

Report on the chemical quality of the surface waters of North Carolina with reference to industrial use. C. E. RAY, JR., and F. E. RANDOLPH. North Carolina Dept. of Conservation and Development, *Econ. Paper* 61, 73 pp.; *J. Am. Water Works Assoc.* 21, 444.—I. the chem. point of view these surface waters would be considered exceptional good.

Chlorine substitute standard valves for chlorine containers under fifteen tons capa-

city. ROBERT T. BALDWIN. *J. Am. Water Works Assoc.* 21, 81, 22, 129.—Specifications are given for a satisfactory standard valve tainers.

Chlorination of pipe lines under construction. JOHN R. MC WATER WORKS ASSOC. 21, 781-3(1929).—The importance of constructed work is emphasized and a method used in both con described.

Chlorination of water supply in the state of Washington. H. WEST. *Construction News* 4, 265-6(1929).—The control of chlorin Chlorinated water is used by 57% of the cities or towns.

Experience in the chlorination of surface water at low temperat GALL. *Arch. Hyg.* 100, 25(1928); *U. S. Pub. Health Eng. Abstracts* F slow sand filtration is used, it is not always possible, because of ta water sufficiently to reduce the total bacterial count to below 10 per absence of *B. coli* in 1000 cc. Cautious chlorination will reduce the 100 per cc. without introducing an excessive amt. of Cl.

The chlorination of running water. JOKAI IGUCHI AND TSUN Health Assoc. (Japan) 4, No. 12, 1-10(1928); *U. S. Pub. Health Eng.* 58.—Running ditch water, highly polluted with org. wastes, had cat teric outbreaks. A bbl.-feed, automatic device for treating the wa powder reduced the nos. of bacteria approx. 80%. An emulsion of and dil. HCl was even more efficient than bleaching powder alone a odor in the water.

Boiler operation at high pressure demands exact water conditio Power 69, 873-5(1929).—Caustic alk. should be 10-25 p. p. m. of phosphate as final conditioning chemical gives independent control of scale formation at desirable low concns. of alkali. Phosphate has vantages of sulfate. Its high protective action is due to its part permeable film. Conc. of Cl in boiler water should be kept low beca properties.

Comparison of behavior of distilled water with that of chemically high-pressure boilers. R. KLEIN. *Wärme* 51, 740-6(1928); *J. Assoc.* 21, 582-3.—Modern evaporator practice and results and ther ment are discussed.

Fundamental principles of feedwater-treatment processes for BALCKE. *Wärme* 51, 747-52(1928); *J. Am. Water Works Assoc.* 21, 2519.—Treatments by evapn. and chemical means are discussed and

Progress in the production and treatment of feedwater. B. 765-8(1928); *J. Am. Water Works Assoc.* 21, 583.—In addition to a distd. and chemically treated water, there is a discussion of methods

The causes and prevention of corrosion in steam boilers. C. Eng. 32, 265-8(1928); *J. Am. Water Works Assoc.* 21, 442.—A genera ing oxygen, electrochem. theory and embrittlement.

Boiler-feed water should be free from oxygen. *Power Plant* (1929).—A description of the newly modified Winkler iodometric met

Prevention of boiler corrosion by the addition of alkalis. Chem. Fabrik 1929, 253-6.—A review, with references, of the literature of corrosion and embrittlement by the proper adjustment of the alkali on the use of  $\text{Na}_3\text{PO}_4$ .

A rational basis for scale prevention in Diesel water jackets Oil Engine Power 7, No. 3, 170-2(1929).—A complete, if somewhat of the causes of scale formation in Diesel engine jackets and methods. Installations of small or moderate size, where the crection of a sof warranted, are given especial consideration.

Salt and sludge removal from boiler water. H. MANZ. *Wärme* J. Am. Water Works Assoc. 21, 583.—The influence of sol. salts is com of changes in concn. in feed water is given; also means is suggested fo

Protection of catchment areas. JOHN F. SKINNER. *J. New E Assoc.* 43, 1-17(1929).—Phys. and public precautions are considered ch

A new kind of pipe for water mains. R. W. MITCHELL. *J.*

*Works Assoc.* 43, 19-31 (1929).—Stresses the advantages of concrete pipe, including the use of asphalt as a waterproofing agent. A method of manuf. is described. D. K. F.

**Mitigating electrolysis of water mains.** W. B. BUCHANAN. *Am. City* 39, 35-6 (1928); *U. S. Pub. Health Eng. Abstracts* E-789b, 58; cf. *C. A.* 22, 2422.—The potential of the pipe line should be kept below that of the railroad tracks at any point to avoid possibility of exchanging currents at any other than bonding points. Any tendency for direct current to flow from the Fe pipe to the soil creates a hazard due to possible electrolysis. C. R. FELLERS

**Identification and control of algae types in water supplies.** L. B. MANGUN. *Water Works Eng.* 82, 607-8 (1929); cf. *C. A.* 23, 1972.—The quant. estn. of plankton and the use of algacides are discussed. Cl is superior in storage reservoirs. E. I. S.

**The activated carbons and their use in removing objectionable tastes and odors from water.** JOHN R. BAYLIS. *J. Am. Water Works Assoc.* 21, 787-814 (1929).—To meet the increasing demand for a palatable drinking water, activated carbons are suggested for the removal of tastes and odors. Bone black and vegetable char are described. Darco from lignite is mentioned. After references to activation, adsorption, revivification and uses of these carbons, exptl. data are given regarding removal of phenols, dechlorination and reduction of oxidizable org. matter, with special reference to Darco, which emphasizes the value of such treatment. D. K. FRENCH

**Sewage and other works (Nuneaton, England).** R. C. MOON. *Munic. Eng. Sanit. Record* 82, 367 (1928).—The sewerage system and the operation of the refuse destructors are briefly described. Refuse is sepd. by screens. Tins are baled. Steam developed is used by the sewage and water works. C. H. BADGER

**Notes on the sewage outfall works (Nuneaton, England).** A. J. CLIFFORD. *Munic. Eng. Sanit. Record* 82, 367 (1928).—Percolating filters occupy 2.75 acres, worked at approx. 65.5 gals. per cu. yd. per day. The dry weather flow is 1,250,000 gals. daily. Sludge and humus are disposed of on land or in lagoons. C. H. BADGER

**Sewage sludge.** J. H. GARNER. *Munic. Eng. Sanit. Record* 82, 589-91 (1928).—A discussion of the methods of sludge disposal by (1) ploughing and trenching into land, considered the best and cheapest if well planned and if land is available, (2) dewatering upon sludge filters, a method used by  $\frac{2}{3}$  of the sewage works, excepting very small ones, (3) filter pressing as used at plants with site restrictions, and (4) sep. digestion of the sludge. C. H. BADGER

**Odor control by the use of chlorine.** WM. J. O'CONNELL, JR. *Proc. 13th Ann. Meeting. N. J. Sewage Works Assoc.* 1928, 4-6; *U. S. Pub. Health Eng. Abstracts* E-789c, 36-7.—Most of the odors in sewage works are due to decompn. of org. matter. At Plainfield, the odor was most marked during the early forenoon of each day. An application of 12 p. p. m. of Cl early in the morning cleared up the trouble. When chlorination is so controlled as to reduce the  $H_2S$  content to nearly 0 p. p. m., the nauseating odors of decompn. are destroyed. The Cl treatment was found most effective when introduced after the screens and ahead of the settling tanks. C. R. FELLERS

**Economy in refuse disposal.** S. W. MOBBS. *Munic. Eng. Sanit. Record* 82, 398-9 (1928).—A compilation and discussion of the different methods of refuse disposal used by 160 local authorities. Av. cost per 1000 population per yr. is £56 and av. cost per ton is 4s. 2d. Pulverization is the most expensive, while crude tipping is the cheapest but is condemned by sanitarians. Controlled tipping or the covering of refuse by soil appears to be the most satisfactory method. C. H. BADGER

**Old and new methods for the disposal and utilization of dairy effluents.** J. BETTELS. *Gesundh.-Ing.* 51, 539 (1928); *U. S. Pub. Health Eng. Abstracts* E-789a, 34.— C. R. FELLERS

**Purification of waste waters from beet-sugar factories with special reference to the Poppleton factory.** H. McLEAN WILSON AND J. H. GARNER. *Pamphlet of W. Riding of Yorkshire Rivers Board, Wakefield, Eng., 1928, 73 pp.*; *U. S. Pub. Health Eng. Abstracts* E-789c, 40-1.—Three kinds of waste waters are produced: (1) from washing and conveying of the beets; (2) from the diffusers and pulp presses; (3) waste lime from carbonation and sulfitation. Wastes of the first type, constituting as much as 75% of the total vol., contain largely soil particles and org. vegetable debris; their clarification consists in removal of suspended solids by sedimentation. The application and design of settling ponds, tanks and screens for this purpose are discussed. Wastes from diffusers and pulp presses are the most difficult to handle, because of their high content of org. matter. Practically all methods applied to the treatment of sewage have been and are being tried. The bulk of the evidence seems to favor a controlled fermentation process. The continuous diffusion process of sugar manuf. eliminates entirely this type of waste.

Spent lime has some com. value as a fertilizer, but is not generally used because of the large amt. of moisture it contains.

**Waste waters from flax retting.** A. I. ROSSOLIMO. *Trans. Central Comm. for Protection of Water Reservoirs from Being Polluted by Ind. Waste Water* (Moscow), No. 8, 7-27(1928).—The waste water from flax retting is treated by means of lime, which causes the water to lose 50-60% of the org. matter dissolved in it. The results are improved by addn. of  $Al_2(SO_4)_3$ ; 4.5 g. per l. of lime and 2.5 g. per l. of  $Al_2(SO_4)_3$  are the most satisfactory proportions. The ppt. is used as a fertilizer. This treatment is followed up by biol. purification and 1:1 diln. with pure water.

**The composition of waste water from flax retting and experiments on its purification by biological treatment.** A. V. EVLANOVA. *Trans. Central Comm. for Protection of Water Reservoirs from Being Polluted by Ind. Waste Water* (Moscow) No. 8, 29-55(1928).—The method of treatment of the raw flax is described in detail. The waste water from the process after the lime treatment is subjected to the action of anaerobic bacteria belonging to *Plectridium* type. However, the water subjected to this treatment is still below the Health Dept. standards.

**Electrolytic oil removal from waste manufacturing liquors.** H. WINKELMANN. *Chem.-tech. Rundschau* 44, 82-3(1929).—By this means oil, even when present in traces, is sepd. from waste liquors as a foamy agglomerate, which can be mechanically removed. Electrolytic sepn. is facilitated by the addn. of hard water or soda, or by treatment of the liquors while hot. Energy requirements vary according to the oil content from 0.15 to 0.20 k. w. hr. for each cu. m. Labor requirements are low.

**Atmospheric pollution in England and Scotland in 1927-8.** JOHN B.-C. KERSHAW. *Engineer* 147, 175-6(1929).—A considerable increase in pollution took place during the year ending Mar. 31, 1928. Fine particles are carried to high levels of the atm. Increase in atm. pollution thus becomes a matter of concern to districts remote from industrial centers.

**Employment of Paris green at the anti-malarial station of Porto-Torres, Sardinia.** CLUZEL. *Arch. Med. Pharm.* 117, 141-53(1927); *U. S. Pub. Health Eng. Abstracts* E-789, 19.—A 1% diln. of Paris green used every 8 days on the sluggish Turitano River effectively controlled malaria in a town of 6000 inhabitants. The malaria incidence was reduced from 60% to 0.1-0.2%. The larvacide was particularly efficient in *Anopheles* destruction.

**Malaria and the malaria danger in certain irrigated regions of southwestern United States.** M. A. BARBER, W. H. W. KOMP AND C. H. KING. *U. S. Pub. Health Repts.* 44, 1300-15(1929).

**Apparatus for dissolving and feeding  $Ca(OH)_2$  into Fe pipes to check corrosion by water, etc.** (U. S. pat. 1,716,205) 1. Baffle, impact and gravity system for separating suspended matter from industrial effluents or other liquids and effecting their clarification (U. S. pat. 1,717,111) 13. Filter for water, etc. (U. S. pat. 1,715,435) 1. Illumination of  $SiO_2$  [from water] (Fr. pat. 653,784) 13. A comparison of Seitz and Mandler filters (LARKUM) 1.

**TELEKY, L.: Results of Dust Investigations.** Berlin: Reichsarbeitsblätter (Reimer Hobbing). 91 pp.

**Softening water.** OSKAR RITSCHEL. Ger. 476,893, Jan. 26, 1926. A heating and filtering app. is described for removing hardness due to carbonates.

**Softening water.** WAYNE TANK & PUMP CO. Ger. 473,913, Oct. 28, 1922. App. for softening water by ground zeolite material is described.

**Apparatus for softening water by use of zeolitic materials.** LEE G. DANIELS. U. S. 1,715,642, June 4. Structural features.

**Base-exchange substances.** THE SELDEN CO. Fr. 654,702, Jan. 31, 1928. See Brit. 286,212 (C. A. 23, 247).

**Apparatus for the rapid aeration of water.** S. A. B. SOC. ANON. BREVETTI. Swiss 130,705, Nov. 25, 1927. Details are given.

**Vacuum-control means for boiler-feed deaerators.** MARTIN EIFERT. Ger. 476,320, May 11, 1926.

**Preventing boiler incrustation.** EUGEN HAASZ. Austrian 112,787, Nov. 15, 1928. The boiler wall is included in an a. c. circuit, no electrodes being employed.

**Scale preventing.** JAMES GORDON & CO. Fr. 654,361, May 16, 1926. See Brit. 299,073 (C. A. 23, 3043).



**Scale preventing.** JAMES GORDON & Co. Fr. 654,362. See Brit. 299,074 (C. A. 23, 3043).

**Treating sewage.** KARL IMHOFF. Ger. 476,068, July 23, 1925. See Brit. 255,833 (C. A. 21, 2949).

**Plant for treatment of sewage with chemical reagents by settling, etc.** JOHN T. TRAVERS (to Travers-Lewis Process Corp.). U. S. 1,715,438, June 4. Structural features.

**Apparatus for digesting sewage sludge.** JOHN R. DOWNES (one-half to S. F. Miller). U. S. 1,717,100, June 11. Structural features.

**Filter floor for sewage disposal tanks, etc.** CLARE H. CURRIE (to Plymouth Clay Products Co.). U. S. 1,715,537, June 4. Structural features.

**Purifying polluted and industrial waste liquids.** JOHN T. TRAVERS (to Travers Process Corp.). U. S. 1,715,877, June 4. Polluted liquids contg. colloidal org. matter, e. g., sewage, are treated with a mixt. formed of lime,  $\text{FeSO}_4$  and a sludge contg. over 15% each of  $\text{CaSO}_4$  and  $\text{CaCO}_3$  such as is obtained by treating waste pickling liquors of steel mills with  $\text{Ca}(\text{OH})_2$  and  $\text{CaCO}_3$ .

**Treating polluted liquids.** THE TRAVERS-LEWIS PROCESS CORP. Fr. 653,771, April 26, 1928. See U. S. 1,672,587 (C. A. 22, 2632).

**Moving screen apparatus for purifying "town waste water," etc.** EUGEN GEIGER. U. S. 1,716,376, June 11. Structural features.

**Septic tank.** WILLIAM F. MILLER (to Rellim Investment Co.). U. S. 1,715,466, June 4. Structural features.

## 15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER

**Recent advances in science : Pedology.** G. W. ROBINSON. *Science Progress* 23, 601-8(1929); cf. C. A. 22, 2020.—A review of recent work on the chemistry and analysis of soils.

JOSEPH S. HEPBURN

**Soil reaction, its measurement and meaning.** S. E. BORISOV AND V. VRBENSKÝ. *Sborník Českoslov. Akad. Zemědělské* 2, 113-49(1927); *Chem. Zentr.* 1928, I, 1089.— $p_H$  detns. were made by the method of Michaelis. Soil is a highly buffered substance. The addn. of 5-20% of a base changed the  $p_H$  from 8.31 to 8.49 and the exchangeable acidity from  $p_H$  7.11 to 7.18. Measuring the soil ext. under const. exptl. conditions gave valuable data such as indication of  $p_H$  changes in the soil through various treatments. To obtain an ext., the preferred method consisted in putting the air-dry soil through a 2-mm. sieve, shaking for 1 hr. with  $\text{H}_2\text{O}$ , then filtering through S. and S. Filter No. 605 and immediately using for  $p_H$  detn. The Michaelis value for  $p_H$  differed from the colorimetric result by 1.8  $p_H$ . The cause of this discrepancy of results is attributed to colloidal matter and salts. Numerous  $p_H$  data on soils are given. C. R. FELLERS

**Influence of the absolute reaction of the soil on the formation and composition of the essential oil of *Artemisia dracunculus*.** M. AND MME. HENRY DEEL. *Bull. soc. chim.* 45, 175-7(1929).—The better yields in wt. and in essential oil of *Artemisia dracunculus* are obtained with a  $p_H$  in the vicinity of 6.2. The  $p_H$  does not influence the % of oil in the plants. The optimum  $p_H$  corresponds to a max. in the phenolic content of the essential oil.

ALBERT L. HENNE

**The laboratory examination of alkaline soils.** A. F. JOSEPH. *Proc. and Papers 1st Intern. Congress Soil Sci.* 4, 490-3(1927).—The object of this paper is to invite discussion as to the methods of examn. of alk. soils.

E. F. SNYDER

**Distribution of acid soils in Jackson Co., Hillsdale Co., Ingham Co., Tuscola Co., Kent Co., Mich.** J. O. VEATCH. *Mich. Agr. Expt. Sta., Circ. Bull.* 118, 119, 120, 121, 122(1929).—A map showing the range of acid soils in each county is given and the degree of acidity.

J. J. SKINNER

**Ammonification in Yahola soils.** HENRY F. MURPHY. *J. Am. Soc. Agron.* 20, 89-92(1928).—All of the comparisons reported show that ammonification, although of importance, is quite a variable biological activity.

E. F. SNYDER

**Studies on the soils in rice field: II. General microbiological investigation.** ARAO ITANO AND SATIYO ARAKAWA. *Ber. Ohara Inst. landw. Forsch.* (Japan) 4, 35-54(1929); cf. C. A. 21, 2951.—The temp. of irrigation  $\text{H}_2\text{O}$  and the temp. at the soil surface reached as high as 34°, which is 4 to 5 degrees higher than that of the air up to Aug. 20th; after that the atm. temp. gradually became higher than the others. The moisture content of the soil of the field, which was irrigated, was 41% and at other times 26-39%. The  $p_H$

value varied between 5.90 and 7.25. Soon after the application of fertilizers, the reaction became alk.  $p_H$  7.25 and toward the end of the season it became slightly acid  $p_H$  5.90. The irrigation  $H_2O$  remained alk.,  $p_H$  7.32-7.94. One g. of soil contained on an av.  $2151 \times 10^4$  bacteria. The same amt. of soil contained  $0.3-5 \times 10^4$  fungi. One cc. of irrigation  $H_2O$  contained about  $8 \times 10^4$  bacteria and  $0.02-2 \times 10^4$  fungi. The ammonification capacity of the soil was strongest at the end of Aug. while it was very feeble in the case of the irrigation  $H_2O$ . The nitrification capacity reached a max. at the beginning of Sept. It was small in the case of the irrigation  $H_2O$ . The denitrification capacity was quite strong through the months of July and Aug. while the field was covered with water. The fixation of N of the soil reached its max. in July. The fixation was very much less in the irrigation  $H_2O$ . The cellulose fermentation was at its max. at the beginning of July. The activity in the irrigation water was rather weak. The respiratory and decompn. powers of the soil were detd., the former increasing from the beginning of July while the latter decreased slightly, approaching each other in Nov.

**III. Microbiological analyses of soil profile in rice field and dry-farm.** *Ibid* 55 66 -- The soil from the rice field contained more humic substance than that of the dry-farm, and showed the wider C:N ratio. In both cases the  $p_H$  was slightly less than 7 in the first stratum and approached 7 as the depth increased. The no. of bacteria, actinomycetes and fungi was detd. aerobically by using 4 different media, the albumin agar giving the best results. The no. of bacteria in a g. of dry soil decreased as the depth increased. The no. of actinomycetes in a g. of dry soil in the rice field showed a tendency similar to that of bacteria in respect to the depth, and the % amounted to 20.7, 20.5 and 28.4 in the first, second and third stratum, resp. In the dry-farm there were 23.4, 25.1 and 11.2% in resp. strata in relation to the no. of bacteria. The majority of colonies, 95-100%, were grayish white and the other colors, such as red or scarlet, orange or yellow, were rather few. The no. of fungi was 20,080, 2310 and 1170 in the rice field and 20,260, 6280 and 2610 in the dry-farm in the resp. stratum. Thus, the no. of fungi is small in comparison with bacteria. Forty-seven strains of bacteria were isolated from the rice field and 44 from the dry-farm, and they were subjected to morphological and cultural tests. The isolated organisms were grouped and their percentages detd. The biochem. action of the isolated organisms was studied and also that of soils. It was found that the soils from the dry-farm manifested a much more vigorous action than those taken from the rice field.

E. F. SNYDER

**Microbiological investigation on the virgin and arable volcanic soils from Sakurajima, Japan.** ARAO ITANO AND SATIYO ARAKAWA. *Ber. Ohara Inst. landw. Forsch. (Japan)* 4, 27-33(1929).—In a brief period of 14 yrs. since the last eruption, the soil is inhabited by the microorganisms throughout. A majority of the organisms are autotrophic in nature. All soils examd. were slightly acid,  $p_H$  less than 7. Eighty four strains of organisms were isolated and most of them found to be cocci or short rods and a comparatively few long rods. More than half of these strains were non-spore formers. Most of them were found to be gram-positive. The ammonifiers, although few, were found in all the soils except in the arable soils. More or less nitrification occurred in all the soils examd. Denitrification was observed in the arable soils only. Fixation of N was observed only in one soil. The fermentation of cellulose was found in the arable soils only. The most striking fact is that so many organisms, which are able to grow on the N-free medium, were found in the virgin soils. The mysterious properties of these soils which produce such big radishes still remain a mystery.

E. F. SNYDER

**A note on the lowering of the carbonate horizon in the soils in the vicinity of Odessa due to irrigation.** V. G. TANFIL'EV. *Pochвоведение (Pédologie)* 23, Nos. 1-2, 96-8 (1928).—T. shows that irrigation practices lowered the carbonate horizon in the steppe soils near Odessa from its normal depth of 55-65 cm. to 89-95 cm. Forestation of the steppe also influences the lowering of the carbonate horizon.

J. S. JOFFE

**Reduction of soil nitrates during the growth of soy beans.** E. P. DEATRICK. *J. Am. Soc. Agron.* 20, 947-58(1928).—Nitrates in soils under maturing soy beans are very low. When the soy bean harvest is so late that the period between the harvest and the planting of the wheat is too short to allow for considerable nitrification, the supply of  $NO_3$  is apparently too low to produce an increase in the yield above normal. It is thought that the decrease in  $NO_3$  is largely due to absorption by the plant. Where it is desired to follow soy beans with winter wheat in a rotation, it appears advisable to plant soy beans of shorter growing periods so as to allow for longer intervals for nitrification in the soil before the planting of the wheat. Pot work results indicate that a long period for nitrification is more beneficial than top dressings of 200 lbs. of  $NaNO_3$  or 8 tons of manure per acre, regardless of whether the soy bean tops are removed or not.

E. F. S.

**The oxidation of sulfur in the soil.** WLADYSŁAW OLSZYŃSKI. *Roczniki Nauk Rolniczych i Lesnych* 18, 231-78(1927); *Chem. Zentr.* 1928, I, 1696.—Exptl. tests proved

that the addn. of  $\text{CaCO}_3$  delayed oxidation of S in soils. Inoculation of soil with *Thiobacillus thiooxidans* increased the speed of S oxidation.  $\text{MnSO}_4$  as well as colloidal Fe accelerated the chem. oxidation of S but retarded the biol. oxidation. C. R. FELLERS

History and technic of the superphosphate industry. VII. Mining of phosphate and the manufacture of superphosphate in Algeria. ANON. *Superphosphate* 2, 101-4 (1929); cf. C. A. 23, 2236. K. D. JACOB

Laboratory and plant experiments with the phosphate ore of Isüm. I. ROSHDESTVENSKII. *Ukrainskii Khem. Zhurnal* 2, Sci. Pt. 179-94; *Chem. Zentr.* 1928, I, 245.—This ore is so poor in  $\text{P}_2\text{O}_5$  that its manuf. into superphosphate is not profitable. By treatment with 0.05 N  $\text{H}_2\text{SO}_4$ , 0.15 N NaCl and 0.1 N  $\text{MgCl}_2$ , it is changed to a form which can be assimilated by plants. F. P. GRIFFITHS

The fertilizer action of sulfur. Recent experiments of the Institute of Agronomic Research. E. Roux. *Compt.-rend. acad. agr. France* 14, 616-21 (1928).—S alone causes an increase in yield in soils rich in org. matter even when these soils contain appreciable amts. of sulfate. On the whole, the results confirm those already obtained by other workers since 1913. S transformed in the soil to  $\text{H}_2\text{SO}_4$  may have a direct alimentary role; but it plays a role still more important in soils rich in org. matter by an active mobilization of microbial origin of nitrogenous reserves. It is under those conditions that it seems capable of practical application, notably in horticulture. A small quantity of very finely divided S is sufficient for obtaining a marked fertilizing action. E. F. SNYDER

Farm trials of artificial manure. W. A. ALBRECHT AND E. M. POIROT. *J. Am. Soc. Agron.* 20, 123-32 (1928).—For artificial manure making, the reagent should be applied at the rate of 150 lbs. per ton of straw and should consist of 45%  $(\text{NH}_4)_2\text{SO}_4$ , 40% limestone and 15% superphosphate. Applying the necessary reagent through the thrasher and putting the straw into flat piles of shallow depths make it possible to depend on the rainfall for moisture and to convert the straw into manure in ample time to be used with the least possible loss of bulk. This practice should encourage the utilization of common farm wastes to increase soil org. matter and to conserve soil fertility with no great expense. E. F. SNYDER

Effect of fertilizers on maintaining stands of alfalfa. B. A. BROWN. *J. Am. Soc. Agron.* 20, 109-17 (1928).—Field expts. are described on the effects of nitrogenous fertilizers,  $\text{P}_2\text{O}_5$  carriers and potash on alfalfa. On plots which received 4 tons of ground limestone per acre in 1914 and none since and which gave a  $p_H$  of 5.8 in 1921 and a CaO requirement of over 1000 lbs. in 1924, better stands of alfalfa have been obtained by applying 100 or 200 lbs. of KCl than by applying 3 addnl. tons of ground limestone, thereby decreasing the  $p_H$  acidity to 6.4 and the CaO requirement to 700 lbs. It is suggested that the relatively large % of  $\text{K}_2\text{O}$  in alfalfa and the assistance which  $\text{K}_2\text{O}$  is supposed to render in the synthesis and translocation of starch in plants may have been responsible for the marked effects of  $\text{K}_2\text{O}$  on the stands of alfalfa. E. F. SNYDER

Triethanolamine oleate for oil sprays. G. L. HOCKENYOS. *Ind. Eng. Chem.* 21, 647-8 (1929).—An excellent miscible oil may be made by boiling 5 pts. of oleic acid with 6 pts. of triethanolamine and adding 15 pts. of free oleic acid and 5 pts. of alc. This may then be dissolved in up to 40 pts. of light or 100 pts. of heavy paraffin oil. Preliminary expts. show no injury to plants other than the oily gloss which usually results from oil sprays. Good kills on mealy bug and red spider resulted both with oil emulsion alone and with oil emulsions having *p*-dichlorobenzene or  $\text{CCl}_4$  dissolved in the oil. The only plant injury was due to excessive dosage of the light flushing oil, which is not so highly refined as the other 2 oils. The most promising method of using the very light oils is to make a soln. of 3 pts. of triethanolamine, 4 pts. oleic acid, 6 pts.  $\text{CCl}_4$  and 30 pts. of oil. Such a soln. is uniform though cloudy. It does not settle out or sep. for several days and, although not miscible in  $\text{H}_2\text{O}$ , it is very easily emulsified. J. J. SKINNER

Apricot scab or shot hole: A synopsis of three years' work on control (with Bordeaux mixture and lime-sulfur) conducted in the Goulburn valley. S. FRSH. *J. Dept. Agr. Victoria* 27, 235-9 (1929); cf. C. A. 22, 1012. K. D. JACOB

The copper content of sugar-beet leaves treated with copper compounds, and changes in their oxalic acid content. M. FRIGERIO. *Giorn. chim. ind. applicata* 11, 67-9 (1929).—The Cu retained by leaves of beets sprayed with Cu salts as insecticide varies very much, depending among other things upon the amt. of rain, etc., subsequent to the spraying. The  $(\text{COOH})_2$  content, however, is quite const. (about 0.8-1.0%), but when the leaves are stored in silos before using as forage, the contents drop down to a mere trace, making it safe for cattle. A. W. CONTIERI

A chemical control for sweet potato wilt or stem rot. R. F. POOLE AND J. W. WOODSIDE. North Carolina Agr. Expt. Sta., *Tech. Bull.* 35, 18 pp. (1929).—The *Fusarium batatas*, the causal organism of sweet potato stem rot, rot root or yellows, is

controlled by dipping the roots and stems in Bordeaux mixt. A 20-20-25 Bordeaux mixt. and a 25% monohydrated  $\text{CuSO}_4$ -lime dust gave good results. J. J. SKINNER

Relation of soil fertility to vitamin A content of leaf lettuce (DYE, CRIST) 11E. The gravitational flow of fertilizers (DEMING, MEHRING) 13. Xanthates [for use in preparing insecticides or fungicides] (U. S. pat. 1,716,273) 10.  $\text{NaNO}_2$  from  $\text{NH}_4\text{NO}_3$  (Ger. pat. 476,145) 18.

ROBINSON, D. H., AND JARY, S. G.: *Agricultural Entomology*. London: Duckworth & Co. 314 pp. 15s., net. Reviewed in *J. Ministry Agr.* 36, 299(1929).

"Plant soil." RICHARD H. MORRIS, 3RD. U. S. 1,717,059, June 11. A "commercial plant soil" suitable for cultivating mushrooms is prepd. by distributing alk. material such as comminuted limestone and phosphate rock upon the surface of a bed of peat, planting soy beans or other legumes in the bed thus prepd. and allowing them to grow, turning the legume plants beneath the surface of the bed, allowing the mass to ferment until the plants are decomposed, and then shredding to break up the fibers.

Fertilizer. AMERICAN CYANAMID CO. Fr. 654,699, Jan. 25, 1924. A fertilizer is obtained by treating dry  $\text{NH}_4$  monophosphate with  $\text{NH}_3$  at 60-150° for a long time.

Fertilizers. EISEN-U. STAHLWERK HOESCH A.-G. Fr. 653,666, May 1, 1928. A fertilizer is made by Thomas slag or other phosphate slag in water, adding  $\text{HNO}_3$  and evapg. Other fertilizers may be added.

Fertilizers. I. G. FARBENIND. A.-G. Fr. 652,702, April 14, 1928. See Brit 292,068 (C. A. 23, 1462).

Fertilizers. I. G. FARBENIND. A.-G. Fr. 653,822, May 3, 1928. See Brit. 292,098 (C. A. 23, 1462).

Fertilizers. I. G. FARBENIND. A.-G. Fr. 654,017, May 9, 1928. See Brit 294,654 (C. A. 23, 1984).

Fertilizer. SOC. D'ÉTUDES CHIMIQUES POUR L'IND. Swiss 131,109, Jan. 3, 1928. Dry  $\text{Ca}_3(\text{PO}_4)_2$  and an acid K salt are intimately mixed to form a fertilizer giving sol. phosphates on contact with water. The example mentions  $\text{KHSO}_4$  and  $\text{Ca}_3(\text{PO}_4)_2$ . Cf. C. A. 23, 1984.

Insecticides. I. G. FARBENIND. A.-G. Fr. 654,416, May 18, 1928. Org. mono- and poly-sulfocyanides other than the monoaliphatic compds. are used in insecticide preps.

Insecticides. I. G. FARBENIND. A.-G. Fr. 654,419, May 18, 1928. Pyridine, quinoline, isoquinoline and their homologs are used as insecticides, particularly for use against weevils.

System for fumigating trees with insecticides in successive applications. RALPH M. JACKSON (one-half to Calif. Cyanide Co.). U. S. 1,715,925, June 4. The process is conducted so as to maintain an efficient insecticidal concn. of the fumigating agent throughout and to overlap the intervals of time between successive applications and for a sufficient time to destroy the pests present.

Disinfectant for seeds. I. G. FARBENIND. A.-G. Fr. 654,376, May 16, 1928. A disinfectant for seeds consists of a mixt. of arsenious and arsenic acids or their salts with phenols mercurized in the ring.

Disinfectant for seeds. I. G. FARBENIND. A.-G. Fr. 654,674, May 24, 1928. Mixts. of complex org. compds. of Hg sol. in alkali and salts of HI, ferricyanides or derivs of cyanamide are used as mordants for seeds. Examples are given of the use of *o*-cresol mercuryhydroxide with KI,  $\text{K}_3\text{Fe}(\text{CN})_6$  and Na cyanamide.

Weed killer. RING GES. CHEM. UNTERNEHMUNGEN M. B. H. and F. WEDERKIND Ger. 476,753, Dec. 19, 1926. A weed killer comprises an aromatic or hydroaromatic ketone or a mixt. of these in the liquid or gaseous state. The ketone may be mixed or emulsified with chlorinated hydrocarbons, cellulose lye, tannin or soap.

Vermin-destroying compositions. HERMANN BOLLMANN and BRUNO REWALD Ger. 476,293, Dec. 8, 1927. Vermin-destroying compns. to be sprayed on plants are improved by addn. of crude or purified lecithin, with or without a little alkali. The dispersion of the active substance is thus increased and its adhesion to the plant improved. A suitable compn. comprises vegetable lecithin 3, water 97 and  $\text{Na}_2\text{AsO}_4$  10 parts.

Vermin-destroying gas mixture. DEUTSCHE GOLD-UND SILBER-SCHNEIDANSTALT VOM ROESSLER. Ger. 476,427, May 23, 1928. A gas mixt. contg. HCN and about 5% of  $\text{CNCl}$  (the latter serving merely as a warning of accidental escape, etc.) is prepd. by

passing Cl into liquid HCN. The reaction is either effected in the presence of non-alk. or feebly alk. substances capable of combining with the HCl produced, *e. g.*,  $\text{Al}_2\text{O}_3$ ,  $\text{ZnO}$ ,  $\text{CaCO}_3$  or  $\text{NaHCO}_3$  or the mixt. is passed over such substances immediately after production. The presence of a small amt. of water facilitates the reaction.

## 16—THE FERMENTATION INDUSTRIES

C. N. FREY

**Acceleration of alcoholic fermentation of cane molasses by the use of vegetable carbons and other inert substances.** WM. L. OWEN AND W. P. DENSON. *Centr. Bakt. Parasitenk.*, II Abt., 77, 481–523(1929).—Alcoholic fermentation of molasses solns. can be greatly accelerated by the addn. of small amts. of vegetable carbons. This occurs with solns. of the usual density but is more pronounced if the density is higher. The minute amt. of the accelerating substances required indicates catalysis, and the fact that substances presumed to carry positive charges are more active than negatively charged colloids indicates that the charge is of significance. The fact that the fermentation of some of the hexoses is accelerated more than that of others suggests that there may be some reaction between the sugars and the catalyst. A prior filtration of the molasses with C tends to decrease the action of the latter, when later used as an accelerator. This effect seems relatively greater when the H-ion concn. is below the fermentation optimum. Part of the effect of the C may be due to a stimulation of yeast growth. A very efficient C for this purpose has been prepd. from bagasse. There is a bibliography of 29 titles.

JOHN T. MYERS

**The colorimetric determination of the higher alcohols in spirits. Modification of the Komarowski-von Fellenberg method.** TH. VON FELLEBERG. *Mitt. Lebensm. Hyg.* 20, 16–29(1929); cf. *C. A.* 5, 2690.—Since *p*-hydroxybenzaldehyde gives clearer solns. and does not react with aldehydes of the fatty series, it is substituted for salicylaldehyde in the former method. The original should be consulted for numerous analytical details.

B. C. BRUNSTETTER

**Boulard's procedure for arresting fermentation at will.** CH. SCHWEIZER. *Mitt. Lebensm. Hyg.* 20, 30–4(1929); cf. *C. A.* 20, 3058.—Boulard's "immunization" of a fermenting grape wine against further fermentation by heating at 45° holds only for the yeast employed. No general protection against infection and refermentation is produced.

B. C. BRUNSTETTER

**Lactic acid fermentation.** ARTTURI I. VIRTANEN. *III. Nord. Kemistmötet* (Finland) 1926, 217–26(1928).—In Swedish. See *C. A.* 22, 1599.

A. R. ROSE

**The production of citric acid by fermentation process.** FREDERICK CHALLENGER. *Ind. Chemist* 5, 181–4(1929).—A very complete historical account is given of the various explanations that have been put forward to account for the mycological production of citric acid from glucose. Recent patent literature on the mycological production of citric acid is discussed. An excellent bibliography is included.

E. G. R. ARDAGH

**Krupp's stainless steel V2A in the brewing industry.** SCHOTTKY. *Deut. Essigind.* 33, 131–2, 139–40, 146–8, 157–8(1929).—An address dealing with the compn. and application of stainless (or rustless) steel in the brewing (fermentation) industry.

W. O. EMERY

**The determination of methanol in gentian brandy.** TH. VON FELLEBERG. *Mitt. Lebensm. Hyg.* 20, 42–4(1929).—The content of MeOH, detd. by Denige's method, in 29 samples of gentian brandies, varied from a trace to 2.9% (av. 1.46%).

B. C. BRUNSTETTER

**Stability and fermentability of wine yeast.** ERICH ARAUNER. *Pharm. Zig.* 74, 713(1929).—A discussion.

W. O. E.

**Molds and chemical manufacture.** HORACE T. HERRICK AND ORVILLE E. MAY. *Ind. Eng. Chem.* 21, 618–21(1929).—A general discussion based on the literature of the application of molds to prepn. of solvents and org. acids.

F. W. TANNER

**The quartz lamp as a detector in the food industries [examination of alcohol] (KÜHLEIN) 12. Purification of potable waters for industrial purposes [for fermentation industries] (DIÉNERT) 14. Heat-resistant races of yeast (RÖNNING) 11D.**

**Treatment of alcoholic liquids.** ERNST REINISCH. *Austrian* 112,976, Dec. 15, 1928. Alc. liquids such as wine, cognac, perfumes, etc., are aged or improved by pretreating the water used in their prepn. with ultra-violet light. The water may

also be aerated or treated with oxidizing agents. The product, after addn. of the water, may also be irradiated.

**Alcohol and glycerol.** E. I. DU PONT DE NEMOURS AND Co. Fr. 654,297, May 14, 1928. See U. S. 1,678,150 (C. A. 22, 3486).

**Glycerol.** E. I. DU PONT DE NEMOURS AND Co. Fr. 654,596, May 23, 1928. Glycerol is sepd. by distn. from different residues or vinasses by pulverizing the residue in the presence of a gaseous medium at a high temp. to vaporize the glycerol rapidly. The vessels used are lined with Cu or other catalytically inactive material. Cf. C. A. 23, 3479, Brit. 300,254.

**Fermentation vats.** CHARLES F. BROCK. Fr. 652,819, Feb. 8, 1928. Constructional details are described.

**Device for charging malt kilns.** WILHELM HARTMANN. Ger. 475,726, Oct. 16, 1925.

**Disinfecting beer vats, etc.** THEODOR ZERNER and ROBERT GLASS. Austrian 112,974, Dec. 15, 1928. Strips of material to be ignited and lowered into the vat are prepd. by drying, molding and cutting a paste prepd. from powd. S, a porous material such as pumice and waterglass.

**Plastic mass from yeast.** FRIEDRICH STEIN. Ger. 476,031, July 20, 1926. The yeast is mixed with the usual fillers, e. g., sawdust or gypsum, and also with brewery waste, e. g., malt dust or dried spent hops, and the mixt. is dried until it can be molded by pressing.

**Arresting glucolysis.** SCHERING-KAHLBAUM A.-G. Fr. 653,214, Jan. 4, 1928. The glucolysis of living cells such as yeast and anaërobic bacteria is arrested without impairing the respiration of the cells by treatment with org. F. compds. such as fluor-acetic, fluorbenzoic or fluorbenzenesulfonic acid. The process may be used in the *manuf. of beer* for tropical countries.

## 17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

**Vanillin as reagent for alkaloids.** A. I. PORTNOV. *Farm. Zhur.* 1929, 109-10. The method of van Italic and Steenhauer (C. A. 22, 842) is modified by the use of a glycerol soln. (0.1 g. vanillin in 10 cc. glycerol) instead of an alc. soln. of vanillin. Thus, a wider application of this reagent is made possible. The presence of antipyrine interferes with this reaction. R. BIELOUSS

**Neroli oil from neroli flowers of Calabria.** P. LUCISANO. *Boll. staz. sper. ind. Essenze* 3, 61-2(1928).—The neroli oil from flowers of Calabria shows identity with the oil from flowers of France, but not with the oil from Spain, Algiers and Sicily. Analysis of oil from samples of the flowering of May show:  $d_{15}^4$  0.8801, linalool acetate 31.05%, acid no. 0.8,  $[\alpha]_{15}^D + 5.60$ ,  $n_{15}^D$  1.4695, soly. 1:1.3 in 80% alc. G. A. BRAVO

**Preparation of a heart-active glucoside from *Convallaria majalis*.** L. WALTER KARRER. *Helv. Chim. Acta* 12, 506-11(1929).—Convallatoxin is prepd. from a kg. macerated flores convallariae leached with H<sub>2</sub>O. The soln. is treated with concd. Pb acetate soln., the filtrate from excess acetate with Na<sub>2</sub>HPO<sub>4</sub>, and added to 500 g. animal charcoal. The dried charcoal adsorbate is extd. 48 hrs. in a Soxhlet app. with CHCl<sub>3</sub>, and the ext. brought to dryness *in vacuo*. The oily crystal needles are dissolved in 150 cc. MeOH, filtered and shaken with petroleum ether. The MeOH soln. is evaporated to dryness *in vacuo*, the residue dissolved in 5-fold vol. of abs. EtOH, and this soln. poured into an 8-fold vol. dry Et<sub>2</sub>O. The ppt., recrystd. several times, m 212°. The F. D. (frog dose, i. e., the min. lethal dose per g. wt. of frog) is 1/3,500,000 g. G. L. CLARK

**Nicotine extraction.** G. BARNIER. *Rev. intern. tabacs.* 3, No. 18, 92-8(1927); *Intern. Rev. Science & Practice of Agr.* [N. S.] 18, 229T.—By the Schloesing method nicotine is extd. from tobacco by hot water and then extd. from the aq. soln. by means of kerosene. Nicotine-H<sub>2</sub>SO<sub>4</sub> is formed by treating the kerosene soln. with a 15% by vol. H<sub>2</sub>SO<sub>4</sub> soln. The method of producing this last reaction has been greatly improved. The sulfate is formed in a special app. where the contact of kerosene and acid takes place through a mass of gravel. The charged kerosene percolates through the gravel, which lies on a false perforated bottom in a leaden tank contg. the acid soln. A second passage of the kerosene through another similar tank removes the last traces of nicotine. The gravel used is siliceous and is between 20 and 50 meshes per dm. in size. H. L. D.

**Nicotine and its applications.** ALTFETER. *Metallbörse* 19, 1069-70, 1125-6 (1929).—A review, with special references to patents concerned. W. C. EBAUGH

**Occurrence of our toxic solanaceous leaves in cut drugs and their recognition.** P. N. SCHÜRHOFF. *Apoth.-Ztg.* 44, 651-3 (1929).—Reference is had to specific cases of harm resulting from the use of certain drugs contaminated with solanaceous leaves, and to the necessity of microscopic control of any questionable product. Photomicrographic preps. of *Belladonna*, *Hyoscyamus* and *Stramonium* are presented showing their characteristic structure. W. O. E.

**Indole.** H. STANLEY REDGROVE. *Perfumery Essential Oil Record* 20, 161-4 (1929).—A general review of its history, properties and occurrence, methods of prepn., principal tests and application in the perfume industry. W. O. E.

**Tegin and its application in pharmacy and cosmetics.** JOSEF GERT. *Pharm. Post* 62, 271-3 (1929).—This is a new salve base, wax-like in character, an org. ester, very similar to the natural fats and readily compounded with substances like S, resorcinol, camphor, talc,  $\text{TiO}_2$ , ichthyol, tar,  $\text{CH}_2\text{O}$ , etc. Various formulas for prep. cosmetic creams are given. W. O. E.

**Johann Philipp Bronner.** ERNST JUNDT. *Süddeut. Apoth.-Ztg.* 69, 10-3 (1929).—An obituary and account of the life and activities of this apothecary (1792-1846). W. O. E.

**Vegetable nostrums.** W. PEYER AND H. IMHOF. *Süddeut. Apoth.-Ztg.* 69, 31-4 (1929). W. O. E.

**History of apothecaries of the margrave city of Bayreuth. II. Mohren apothecary.** W. VON BROCKE AND HANS MAYER. *Süddeut. Apoth.-Ztg.* 69, 46-8 (1929).—An historical treatment of this apothecary, founded in 1672, and illustrating certain app. and containers of that period. III. Residence and palace apothecary. HANS MAYER. *Ibid* 260-2. W. O. E.

**Examination of Peru balsam by means of capillary pictures and the quartz lamp.** C. A. ROTHENHEIM. *Pharm.-Ztg.* 74, 712-3 (1929).—A continuation of the work of Rapp. W. O. E.

**Specific gravity determination via D. A. B. 6.** F. WOLTER. *Süddeut. Apoth.-Ztg.* 69, 63 (1929).—A discussion of the official Ger. method. W. O. E.

**New medicants and pharmaceutical specialties of the fourth quarter of 1928.** F. ZERNIK. *Süddeut. Apoth.-Ztg.* 69, 129-32 (1929).—A compilation. W. O. E.

**When is the preparation of a medicinal mixture patentable?** EMIL MÜLLER. *Z. angew. Chem.* 42, 551 (1929).—Only such mixts. and processes leading thereto as show unexpected therapeutic properties are patentable. W. C. EBAUGH

**The essential oils and oil content of native Hungarian thyme.** BÉLA GAAL. *Ber. ungar. pharm. Ges.* 2, 217-47 (1926); *Chem. Zentr.* 1928, I, 2019.—Several wild thymes were examd. for essential oil content: *Th. brachyphyllus* 0.887% with 31.13% thymol; *Th. Marschallianus* 0.539-0.580% oil contg. 32.99% thymol; *Th. clivorum* Lyka 0.191% oil. C. R. FELLERS

**Ionone.** FRANCISCO HERNÁNDEZ, JUAN JAUMÁ AND LUIS VERDERAU. *Quim. e ind.* 4, 301-9 (1927); *Chem. Zentr.* 1928, I, 1954.—The production, manuf. and properties of lemongrass oil, citral, pseudoionone and ionone are discussed. Citral was isolated from lemongrass oil by the use of  $\text{NaHSO}_3$ . Syntheses of ionone and pseudoionone are given. Com. ionone may be sepd. into  $\alpha$ - and  $\beta$ -ionone. The b. p. curve of  $\alpha$ - and  $\beta$ -ionone between 3 and 9 mm. pressure is given. C. R. FELLERS

**Local anesthetic S. F. 147.** O. WINTERSTEIN. *Münch. med. Wochschr.* 74, 1746-9 (1927); *Chem. Zentr.* 1928, I, 90-1.—S. F. 147 is *N,N*-diethyleucinol ester of  $p$ -aminobenzoic acid. It is less toxic than cocaine but about 2.5 times as toxic as novocaine. For man it is somewhat less toxic than tutocaine. As a local anesthetic it is better than novocaine or tutocaine. FRANCIS P. GRIFFITHS

**Coumarin and umbelliferone-methyl ether in lavender products.** ALBERT ELLMER. *Riechstoffind.* 1927, 206-10, 220-2; *Chem. Zentr.* 1928, I, 268.—Extn. of lavender oil with  $\text{C}_6\text{H}_6$ , EtOH and then treatment with concd.  $\text{Ba(OH)}_2$  gave 3.4% coumarin and 0.9% umbelliferone methyl ether. Distd. oil gave only 0.8% coumarin. The larger yield by cold extrn. is possibly due to enzyme action on the glucosides. A method for sepg. and estg. coumarin by means of  $\text{Ba(OH)}_2$  soln. is described. F. P. G.

**Composition of the volatile oils of *Siler trilobum*.** B. N. RUTOVSKII AND K. GUSSEVA. *Riechstoffind.* 1927, 230; *Chem. Zentr.* 1928, I, 267.—The oil from a no. of samples had a yield of 3.27%,  $d_{20}$  0.8886,  $\alpha_D$  -131.65°,  $n_D^{20}$  1.4862, acid no. 0.05, ester no. 41.58, ester no. after acetylation 59.3. It contained *d*-limonene 55%, tetrabromide m. 103°, and *d*-perillaldehyde 40%, semicarbazone m. 197°, oxime m. 102°. Azulene and  $\alpha$ -pinene were also thought to be present. F. P. GRIFFITHS

**Citronellal.** H. I. WATERMAN AND E. B. ELSBACH. *Bull. soc. chim.* **45**, 137-40 (1929); cf. C. A. **22**, 3628.—The data published by Verley (C. A. **23**, 95) are criticized. The correct values are  $b$ ,  $49.6^\circ$ , calcd. by the Clapeyron equation, or  $50.8^\circ$ , calcd. by Duhring's rule, or  $51^\circ$ , observed by W.;  $n_D^{20}$  1.4458,  $n_D^{20}$  1.4485,  $n_F^{20}$  1.4553,  $n_D^{20}$  1.4610,  $d_4^{20}$  0.855.

ALBERT L. HENNE

**Alkaline media and their effect upon Bacillus acidophilus and its products in the mouth.** BERNARD B. BADANES. *Dental Cosmos* **71**, 618-24(1929).—*B. acidophilus* and related species grow more readily in an alk. medium. Neutralization of the acids, which they form, does not inhibit the activity of the bacteria and their enzymes. Introduction of alk. solns. or dentifrices into the mouth temporarily renders the saliva alk. and obtunds sensitiveness or pain in the teeth, but the saliva soon returns to its normal reaction. The suggestions are made that secret formulae for dentifrices be discouraged, and that the formula for toothpaste be standardized by the dental profession and included in the next revision of the U. S. P.

JOSEPH S. HEPBURN

**Essential oil of Juniperus excelsa.** G. V. FIGULEVSKII AND YU. N. LOVYAGIN. *Trans. Sci. Chem.-Pharm. Inst.* (Moscow) **1927**, No. 17, 151-158.—The table in the German summary gives the const. of the four fractions obtained. Fractions I and II were combined and fractionated again and the new fractions subjected to various analyses: table II gives the b. p. and yields; table III gives the optical properties of the fractions. The fraction b.  $155.5-156^\circ$  was distd. over Na and the presence of pinene was demonstrated by the fact that pinene nitrosochloride was obtained. A crystal. substance from fraction III gave the following const.: m. p.  $83.5-84^\circ$ ,  $[\alpha]_D + 5.26^\circ$ ;  $[\alpha]_D + 7.11^\circ$ ;  $[\alpha]_F + 9.49^\circ$ ;  $[\alpha]_F + 11.72^\circ$ ;  $[\alpha]_F/[\alpha]_C = 2.82$ . Crystallographic examn. indicated the presence of cedrol.

J. S. JOFFE

**The biological assay of ergot preparations.** M. AIAZZI-MANCINI. *Boll. soc. ital. biol. sper.* **4**, 221-2(1929).—The Broom-Clark method can be used only for assaying the alkaloids of ergot; the other active principles, histamine, tyramine and acetylcholine, which also act on the muscle of the rabbit uterus, cannot be detd. by this method.

PETER MASUCCI

**Physiologic assays of aconite.** ANDRÉE MALMANCHE AND MAURICE-MARIE JANOT. *Bull. sci. pharmacol.* **36**, 273-84(1929).—A description is given of the biologic assays for aconitine, benzoyleaconine and aconine based on the action on living animal tissue and the detn. of the minimal lethal dose.

A. E. MEYER

**Studies on the chemistry of tobacco. I. The water of tobacco.** N. I. GAVRILOV AND B. B. EYSLINA. *Biochem. Z.* **208**, 79-90(1929).—The shortcomings of the usual procedure of detg. the moisture content of tobacco by drying at  $95^\circ$  are pointed out. Various other methods are studied critically, such as distg. off the  $H_2O$  from an org. solvent (toluene) mixed with the tobacco, the amt. of  $H_2O$  being detd. volumetrically; by treatment with Grignard's reagent or by drying the tobacco in a current of dry air. Various grades of tobacco are tested. The percent of moisture is within the range of 11-13.

S. MORGULIS

**Microchemical determination of morphine. I. Morphine determination in pure solutions.** PETER FLEISCHMANN. *Biochem. Z.* **208**, 368-91(1929).—The pptn. reagent is made by boiling gently 17.4626 g. molybdic acid and 13.5190 g. anhyd.  $Na_2CO_3$  in 60 cc.  $H_2O$  until soln. is complete, then boiling briskly for a short time. After cooling this is dild. with 40 cc.  $H_2O$ , mixed with 30 cc.  $M/3$  phosphate soln. (1.3617 g.  $KH_2PO_4$  and 4.1566 g.  $Na_2HPO_4$  in 100 cc.) and dild. to 150 cc. One cc. of this reagent should redden phenolphthalein with not more than 0.2 cc. 0.1 N NaOH. In special 8 cc. centrifuge tubes each contg. 5 cc. of the unknown sample and of standards with 0.2 and 1.0 mg. morphine-HCl, the pptn. is carried out by adding 1 cc. 2 N HCl (exact), then drop by drop, 1 cc. of the pptg. reagent. After repeated shaking the tubes are centrifuged 20 mins. later, and the fluid is removed as nearly completely as possible. The ppt. is washed in 0.025 N  $H_2SO_4$  and again centrifuged. The ppt. is dissolved in concd.  $H_2SO_4$ , the quantity required being detd. by a special procedure; all tubes are placed at the same time for 1 hr. in a water bath at  $50^\circ$ . The solns. are of a blue-violet color, the intensity of which is compared in a colorimeter. The method of calcn. is fully discussed.

S. MORGULIS

**Bismuth and its use in pharmaceutical industry.** A. KUFFERATH. *Chem.-tech. Rundschau* **44**, 567(1929).—A brief review of the use in pharmacy of Bi preps., i. e., Bi nitrate, subnitrate, subgallate and subsalicylate. Mention is also made of the Bi compd. of tribromophenol (Xeroform), Bi tannate (Tannismut), oxyiodogallate (Airol), oxyiodopyrogallate, oxybenzoate (Bismogenol), Casbis and Bi  $NH_4$  citrate (Wismulen).

F. PICKERING



**Examination of "dry" magnesium chloride.** PH. CHAPELLE AND E. REGNOULT. *J. pharm. chim.* [8], 8, 171-3(1928).—Examn. of 6 com. samples of "pure, dry  $MgCl_2$ " to be used in the prepn. of solns. intended for injection showed that they were *not anhyd.* They contained 46.0, 44.6, 47.6, 44.6, 40.4, 37.9%  $H_2O$ , corresponding to the compn.  $MgCl_2 = 4.5 H_2O$ . S. WALDBOTT

**The laudanum of Sydenham.** M. BAGROS. *J. pharm. chim.* [8], 8, 263-4(1928).—This prepn. of the French Codex should be classed among the tinctures, notwithstanding its low alc. content (30%). The tabulated directions for prepg. dil. alcohols (90-50%) should accordingly be extended to include diln. to 30%. S. WALDBOTT

**Determination of chloral in sirup of chloral.** P. ANDRON. *J. pharm. chim.* [8], 8, 453-5(1928); cf. *C. A.* 21, 2045.—Rejoinder to François (*C. A.* 22, 1652). Using the technic of F., A. finds that addn. of *sucrose* to a 1% aq.  $CCl_3CHO \cdot H_2O$  soln. causes a loss of 8.2% in titration with NaOH. P. FLEURY AND M. MALMY. *Ibid* 537-42.—A critical exptl. review of the preceding papers. The *speed* of the reaction between chloral and alkali is considerably influenced by *sucrose* and by *temp.* To obtain exact results in the assay of chloral by the technic of F., a temp. not below 21° is essential. S. WALDBOTT

**Determination of chloral in sirup of chloral.** CH. LORMAND. *J. pharm. chim.* [8], 9, 151-3(1929); cf. preceding abstr.—To 10 g. of sirup of chloral (contg. 0.5 g. crystd. chloral) add a soln. of  $AgNO_3$  4 g., KOH 5 g.,  $NH_4OH$  (Codex) 50 cc., and allow to stand 24 hrs. Then heat on the waterbath to remove excess of  $NH_3$ , slightly acidify with  $HNO_3$ , dil. to about 100 cc., again heat, and collect, filter and weigh the  $AgCl$  formed. Chloral hydrate =  $AgCl \times 0.3844$ . Exact results are obtained with this method, which may prove useful in detg. Cl in org. compds. generally. S. W.

**Action of Schiff's reagent on pyrimidone.** A. VALDIGUIÉ. *J. pharm. chim.* [8], 8, 506-10(1928).—An intensely red soln. is formed upon adding a few drops of Schiff's reagent (A) to an aq. or alc. soln. of pyrimidone (B) or to its salts with HCl or  $H_2SO_4$ , to its camphorate or salicylate. Heat, also exposure to air, accentuates the color, which is permanent to light, sol. in  $H_2O$ , EtOH, insol. in  $Et_2O$  and  $C_6H_6$ . In  $CHCl_3$  it is slightly sol. with a bluish tint. Strong acids, alkalis,  $NH_4OH$  or  $SnCl_2$  destroy it. For this reason, excess of  $SO_2$  must be avoided in the prepn. of A. When the liquid, decolorized by  $SnCl_2$  and HCl, is agitated with NaAcO, the color is restored. A pink color is still visible in a diln. of 2 mg. of B in 10 cc. (1:5000) when 3-4 drops of A are added. The mechanism of the reaction is not yet known. S. WALDBOTT

**Plaster of Paris, estimation of the time of setting, behavior of overheated plaster and rational conditions of mixing.** P. BRUÈRE. *J. pharm. chim.* [8], 8, 606-13(1928).—Suggestions for adoption in the next Formulary of the military hospitals concerning plaster of Paris (A) ( $CaSO_4 \cdot 0.5 H_2O$ ; cf. French Codex). To est. the *time of setting*, spread 100 parts of A rapidly over the surface of 60 cc.  $H_2O$  (theory, 18.63 cc.) in a glass dish 8-10 cm. diam., mix uniformly with a bone spatula, then invert the magma upon a glass plate. Setting begins when the edges of a furrow cut into the surface no longer tend to coalesce; setting is ended when the mass no longer yields to gentle pressure, or when on cutting it breaks off into fragments. The interval should not exceed 12 mins., nor the total time 15 mins. To study the *temp. phenomena* of setting, mix 100 g. of A with 60 cc.  $H_2O$  in a rubber cup, stir with a thermometer and note the rise of temp. from min. to min. The results are plotted in curves. With normal A, the interval of setting was 7 mins., and ended in a total of 11 mins. The temp. continued to rise to a short max. (29°+) for 12 mins. after the setting; the total rise of temp. was 13° in 23 mins. The rising curve shows a distinct horizontal "landing" immediately before the setting begins. With normal A contg. 2% of overheated A (>180°), the total rise of temp. was 14° in 21 mins.; here the max. temp. (31°) was const. for 4 mins., probably on account of delay in setting. With A contg. 2% of *accelerators* (alum, soap, cf. Canals, *C. A.* 10, 2468), the rise was 17° in 13 mins., to a short max. of 33°, a temp. probably not easily tolerated by the patient. In the mixing of A with  $H_2O$ , excess of  $H_2O$  counteracting the setting from a supersatd. soln. and undue stirring creating crystal "seeds" should be equally avoided. S. WALDBOTT

**A preliminary report on the chemistry of Phytolacca.** GLENN L. JENKINS. *J. Am. Pharm. Assoc.* 18, 573-6(1929).—The air-dried root of *Phytolacca americana* contained moisture 9.0 and ash 9.4%, of which 71.3% was acid-sol. The ash was bluish green and contained K, Na, Ca, Fe, Si, Al, Mg and Mn combined as sulfate, chloride and phosphate. Petr. ether (b. p. 40-52°) extd. 1.75;  $Et_2O$ , 1.45;  $CHCl_3$ , 1.88; EtOH, 14.55; and  $(CH_3)_2O$ , 3.65%. The petr. ether ext. is an oily mass with characteristic odor and taste. An unknown alkaloid (0.16%) was obtained as a yellowish, gummy, non-crystallizable varnish. The volatile oil (0.08%) had a characteristic odor and a pungent

taste. The root contained  $\text{KNO}_3$  0.21%. A resin and fat-like substance were found and reserved for further study. L. E. WARREN

Influence of the absolute reaction of the soil on the formation and composition of the essential oil of *Artemisia dracunculus* (DEEL, DEEL) 15. A study of the composition of Na bismuth tartrate (YOE, MORE) 6. Isopropyl alcohol (Bijlsma) 11H. Bleaching, washing and disinfectant material (Ger. pat. 476,180) 18. Soaps, cosmetics, disinfectants, etc. (Ger. pat. 476,261) 27. Polysulfide ester of aromatic acids [for use in therapy] (Swiss pats. 131,284 to 131,290) 10. Treatment of alcoholic liquids (Austrian pat. 112,976) 16. Protection of organic compounds against lower organisms (Ger. pat. 475,703) 10.

BIECHLE, MAX: Anleitung zur Erkennung und Prüfung der Arzneimittel des Deutschen Arzneibuches, zugl. e. Leitf. f. Apothekenrevisoren. Auf Grund d 6 Ausg. d. Deutschen Arzneibuches edited by Richard Brieger. 16th ed. (2nd ed. under new editing). Berlin: J. Springer. 754 pp. Linen, M. 17.50.

Therapeutic organic phosphorus-containing product from corn "steepwater." THEODORE B. WAGNER. U. S. 1,716,286, June 4. Steepwater, obtained from corn, is treated with slaked lime and the resultant ppt. is collected.

Use of cinchophen medicinally. MOSES L. CROSSLEY (to Calco Chemical Co.). U. S. 1,716,686, June 11. The therapeutic properties of cinchophen are improved by its use in admixture with a Mg compd. such as  $\text{MgCl}_2$ .

Colloidal solutions. CHEMISCHE FABRIK VON HEYDEN A.-G. (Carl H. von Hoessle, inventor). Ger. 476,926, Dec. 23, 1922. Addn. to 432,717. Colloidal solns. of metal and metalloid compds. in oils, fats, waxes and paraffins for ointment bases are prepd. by the action of acid or acid-forming substances such as  $\text{H}_2\text{S}$ ,  $\text{HCl}$  gas or I on the organosols of the metals or their oxides with exclusion of water.

Anthraquinone glucoside. I. G. FARBENIND. A.-G. (Friedrich Kayser and Karl Schranz, inventors). Ger. 475,938, July 31, 1926. Water-sol. anthraquinone glucoside is obtained from the ext. of certain drugs by treatment with metal hydroxide and evapd. the filtrate to dryness. Thus, cascara sagrada is extd. with 96% alc. The ext. is evapd. to dryness and the residue dissolved in water. Freshly pptd.  $\text{Fe}(\text{OH})_3$  is added and the mixt. stirred for 2-3 hours until no turbidity is shown with  $\text{NaCl}$  soln. The soln. is filtered and evapd. to dryness *in vacuo*. Other examples are given.

Isobutylallylbarbituric acid. CHEM. FAB. VORM. SANDOZ. Swiss 130,848, Sept. 12, 1927. Addn. to 122,692. A deriv. of this acid is prepd. by melting the acid with 1-phenyl-2,3-dimethyl-5-pyrazolone in mol. proportions. The new compd. m. 68-70°, and is used in therapy as a *hypnotic*.

Immunizing products from pathogenic microorganisms. NEWELL S. FERRY (to Parke-Davis & Co.). U. S. 1,717,198, June 11. Pathogenic microorganisms such as typhoid bacillus or pneumococcus are grown on substantially solid culture media, removed from the media and suspended in physiologic salt soln., agitated to wash the antigens from the bacterial cells and centrifuged to sep. the liquid from sediment; the washing liquid is retained for immunizing purposes. Cf. C. A. 23, 1724.

Iodine hormone preparations. GEORG EICHELBAUM. Ger. 476,717, Dec. 1, 1922. Hormone preps. with an accurately fixed I content are obtained by treating hormone-bearing secretory glands, or exts. therefrom, with small quantities of alc. soln. of I at suitable temps. until the desired amt. of I is taken up, and carefully drying. Examples mention ovary prepn., thymus gland and animal testes.

Active substances from male internal secretory organs. SOC. ANON. POUR L'IND. CHIM. A BALE. Swiss 130,635, Sept. 30, 1927. Addn. to 120,097. The ext. of such organs or the distillate of the ext. is purified by treating with sapon. agents with exclusion of acid; the resulting soap is removed. In the example, testicular ext. is dissolved in alc. and sapond. with  $\text{KOH}$ .

Nicotine. GENERAL-DIREKTION DER OESTERREICHISCHE TABAKREGIE. Fr. 653,610, April 30, 1928. An app. is described for removing nicotine from tobacco by a current of warm air or gas. Cf. C. A. 23, 934, 1218.

Perfumes. HEINE & Co. A.-G. Fr. 653,859, May 4, 1928. Acetic esters disubstituted by unsatd. groups, ketones, unsatd. acids, unsatd. acid esters or lactones are added to known perfumes.

Dentifrice. MENDEL DONCHI. U. S. 1,716,035, June 4. Activated vegetable charcoal is used with about 7 or 8 times as much kieselguhr, with or without other ingredients such as soap,  $\text{NaHCO}_3$ , orris, glycerol, saccharin and essential oils.

**Disinfectant.** ASPHALTFABRIK RUDOW. WILHELM SCHLIEMANN A.-G. Ger. 475,947, March 11, 1927. A disinfecting agent is formed by dissolving monochloroxylylene in water, soap or other solvents or dispersing agents. A table showing the action of the disinfectant on various bacteria is given.

**Disinfectant.** C. H. BOEHRINGER SOHN. Ger. 476,467, June 21, 1925. See Brit. 253,918 (C. A. 21, 2534).

## 18—ACIDS, ALKALIES, SALTS AND SUNDRIES

E. M. SYMMES

**Defeating hydrochloric acid corrosion in chemical processing.** SIDNEY SCHEIN. *Chem. Met. Eng.* 36, 355-7(1929).—Materials of construction to resist HCl in tanks, filters, driers, ventilators, drains and buildings are described. E. M. SYMMES

**Use of lead in sulfuric acid manufacture.** A. E. MARSHALL. *Trans. Am. Inst. Chem. Eng.* 20, 149-65(1928).—Historical and a review of the present uses of Pb in  $H_2SO_4$  and other manuf. E. M. SYMMES

**Salts of the Dead Sea.** BRUNO WÄESER. *Metallbörse* 19, 789-90(1929).—Proposals made in 1927 for the formation of an alkali industry using brine from the Dead Sea are criticized unfavorably; such an industry would not be able to compete with German and French alkali (potash) plants. W. C. EBAUGH

**The exploitation of the Dead Sea.** I. MELAMEDE. *Discovery* 10, 128-31, 165-7 (1929).—An analysis of Dead Sea water is given. A solar evapn. scheme for recovery of KCl, MgBr<sub>2</sub> and other salts from Dead Sea brine is outlined. E. I. S.

**Extraction of aluminum oxide from South Dakota cretaceous shales.** RALPH MELAVEN. *Black Hills Eng.* 17, 178-88(1929).—The time is approaching when bauxite deposits will be exhausted. Investigations were made to find means whereby  $SiO_2$  could be removed from shale and  $Al_2O_3$  recovered for subsequent treatment, and to develop a method of extg.  $Al_2O_3$  not requiring removal of  $SiO_2$  even though present in large amts. The literature deals with pottery clays, not shales, e. g., cretaceous shales of South Dakota. Grinding, roasting at 800° for 1.5 hrs. and extn. with dil.  $H_2SO_4$  gives up to 100% extn. of  $Al_2O_3$ . The excess acid can be recovered. Today the cost of such a process is prohibitive because the  $Al_2O_3$  content is too low to compete with bauxite. E. M. SYMMES

**Manufacture of manganese borate.** V. V. ERIN. *J. Chem. Ind. (Moscow)* 6, 254(1929).—The following method is recommended for manuf. of Mn borate used as drier in oil paints and linoleum: A mixt. of 9 parts finely ground pyrolusite and 1 part ground, non-caking coal is heated to 800-900°;  $MnO_2 + C = MnO + CO$ . The MnO yield is about 85%. The hot melt is boiled with a 5-10% excess of 20%  $H_2SO_4$  until MnO dissolves completely, requiring about 1 hr. The soln., filtered through asbestos, must be completely free from Fe, for which purpose the Fe salt is oxidized to Fe<sup>+++</sup> salt by boiling the soln. 30 mins. with a 10% excess of  $HNO_3$ , then heated to 50° and a  $Na_2CO_3$  soln. is added in small portions. After pptg. all Fe the soln. contains  $Na_2SO_4$ , which does not interfere, and  $MnSO_4$ , which does not begin to ppt. until all Fe has been eliminated. The soln. is settled, siphoned off, filtered and treated cold with a 4% borax soln. The end point is detd. by the disappearance of cloudiness when Mn soln. is added to the filtered soln. After settling, the liquid is siphoned off, the ppt. centrifuged, filter-pressed and dried first at 50°, then at 110° until completely dry. BERNARD NELSON

**Problem of the Chili saltpeter industry.** BRUNO WÄESER. *Metallbörse* 19, 845-6 (1929).—Data are now presented showing the extraordinary growth of the synthetic N industry. The Chilian product must be scientifically exploited in order to maintain its position. W. C. EBAUGH

**Leucite industry from the chemicophysical point of view.** N. PARRAVANO. *Giorn. chim. ind. applicata* 10, 501-11(1928).—The importance of the Blanc process for the utilization of Italian leucite (C. A. 19, 1616) is shown by the fact that the laval masses of six extinct volcanoes of Central and Southern Italy contain 105,340 million tons of material, representing 8786 million tons of potash. The leucite, sepd. electromagnetically from the basaltic mass, is treated with HCl or  $HNO_3$ , the products being  $SiO_2$  and a soln. contg. Al and K chlorides or nitrates. Results are now given of detns. of the variation in soly. of these different salts with the temp. and acid concn., and diagrams are shown for the systems: KCl (nitrate)- $AlCl_3$  (nitrate)-HCl (nitric)- $H_2O$  at various temps. The heating curves of  $AlCl_3$ ,  $6H_2O$  and  $Al(NO_3)_3$ ,  $6H_2O$  are also

given. Investigation of the x-ray spectra shows that the  $\text{Al}_2\text{O}_3$  obtained by heating these salts differs at low temps. from that derived from bauxite by the Bayer process, but becomes identical with the latter when heated; indications that the dehydration of hydrated alumina occurs by stages are obtained. B. C. A.

**Magnesite from Jugo-Slavia.** G. PETUNNIKOV. *Metallbörse* 19, 594-5(1929).—Three native companies, one English and one French corporation are working deposits of  $\text{MgCO}_3$  in Jugo-Slavia, producing magnesite comparable to the Greek material. Much of it runs over 97%  $\text{MgCO}_3$ , with about 1.5-2.0%  $\text{CaCO}_3$  and correspondingly small amts. of  $\text{SiO}_2$ ,  $\text{Al}_2\text{O}_3$  and  $\text{Fe}_2\text{O}_3$ . W. C. EBAUGH

**New uses for cadmium.** FRANK. *Chem.-tech. Rundschau* 44, 175-6(1929).—Cd now finds use as an anti-corrosive material, in the form of its sulfide or selenide as a pigment, as the bromide in light-sensitive gelatin films and in special alloys with Cu, Al, Pb-Zn, Au and Hg. E. PICKERING

**Convenient chlorine carrier supplied by new product.** R. E. GAGE. *Chem. Met. Eng.* 36, 295-6(1929).—A new high-test Ca hypochlorite contg. 60% "available Cl" as compared with 0-40% "available Cl" in com. bleaching powder is described. The new product approaches the formula  $\text{Ca}(\text{OCl})_2$ . It is of uniform compn. and maintains this uniformity over long periods, even when stored under tropical conditions. It is sol. in cold  $\text{H}_2\text{O}$ , giving all its available Cl. It is non-deliquescent and does not cake. A. WHITE

**Helium in New Zealand.** C. COLERIDGE FARR AND M. N. ROGERS. *New Zealand J. Sci. Tech.* 10, 300-8(1929).—By use of the analytical method of Cady and McFarlane (*C. A.* 2, 386), a He survey has been made of the New Zealand gas wells. All but 3 of some 81 samples showed He in concns. of 0.002 to 0.12%. A. S. CARTER

**The purification of magnesium.** FRIEDR. VOGEL. *Metallbörse* 19, 453-5(1929).—To det. the cause of black spots in Mg, assumed to be either C, Mg carbide, Mg nitride, Mg suboxide, finely divided Mg, etc., a pure Mg sample was heated in currents of  $\text{H}_2\text{O}$ , O,  $\text{CO}_2$  and  $\text{SO}_2$ , singly or in mixts. With  $\text{H}_2\text{O}$  and O only white  $\text{MgO}$  formed; with  $\text{CO}_2$  no ignition occurred, but the residue was black and had increased in wt. With 1 vol. O in about 20 vol.  $\text{CO}_2$ , ignition occurred, but with no formation of CO, the residue was black and amorphous, surrounded by  $\text{MgO}$ .  $\text{SO}_2$  used instead of  $\text{CO}_2$  gave a gray-black mass covered with white oxide. With H, volatilization of a black substance occurred, which decomposed the glass tube at higher temps. The end point in all cases indicated the formation of  $\text{MgO}$ , soot-like C and volatile Mg hydride (with H). From the above expts. a better purification of Mg than the old process of heating with a current of H was evolved, viz., by using a mixt. of the alkali earth chlorides, fluorides and  $\text{MgO}$ , a mixt. known to the trade as Elrasal (cf. Ger. patents 237,791 and 232,581). W. C. EBAUGH

**Retrospect and prospect in the nitrogen industry.** CHAPLIN TYLER. *Chem. Markets* 24, 587-90(1929). E. J. C.

**Structure and analysis of bleaching earths.** O. ECKART. *Seifensieder-Ztg.* 56, 149-51(1929).—L. Kalusky's conclusion (*C. A.* 23, 3054) that fuller's earth is crystalline is erroneous; its property of aging and its manner of giving off  $\text{H}_2\text{O}$  are characteristic of amorphous substances, like  $\text{SiO}_2$  gel and activated C. The conclusions drawn from analyses of raw and activated earths are also doubtful because the Bavarian deposits, the principal source of these earths, vary so much and even in the same pits; the fact that several pits are worked simultaneously, makes it difficult to trace any given sample through its process to the final delivery. Errors are also pointed out in K.'s calcs. P. ESCHER

**Adsorption phenomena and decolorizing earths.** L. VALLI-DOUAU. *Chimie & industrie Special No.*, 289-92(Feb., 1929).—A brief review of the nature of decolorizing earths, of the mechanism of adsorption, of their action on mineral oils and of the activation of decolorizing earths. A. PAPINEAU-COUTURE

**Adhesive from beet pulp.** V. V. YANOVSKII. *Nauch. Zapiski Sakharnoi Prom.* 7, 333-40(1929).—An adhesive can be successfully manufactured from pulp of beet-sugar factories. The best results were obtained by treating steam-dried pulp with 3% of HCl or  $\text{H}_2\text{SO}_4$  figured on wt. of dry substances in pulp. The viscosity of pulp adhesive is 7 times greater than "GUMMI" of the same concn. and increases sharply upon further concn. of the soln. Adhesiveness of the product is very high and for normal concns. exceeds the best joiner's glue. V. E. BAIKOW

**Preparation of luminescent substances (ZHUKOV) 3. Stainless Fe and its application to the manufacture and transportation of  $\text{HNO}_3$  (MIRCHILL) 9.**

Wissenschaftlichen Veröffentlichungen aus dem Siemens-Konzern. Band VIII, Heft 1. Beryllium-Arbeiten. Berlin: V D I Buchhandlung. M. 32.

**Pure hydrochloric acid.** VEREIN FÜR CHEM. UND METALLURG. PRODUKTION. Ger. 476,597, Feb. 7, 1926. Pure HCl is obtained from impure NaCl by treating a soln. of the latter with Cl and filtering through active C before treating with acid in the usual way.

**Hydrocyanic acid.** I. G. FARBENIND. A.-G. (Wilhelm Michael and Wilhelm Goetz, inventors). Ger. 475,556, July 7, 1925. HCN is prepd. by the catalytic decompn. of  $\text{HCONH}_2$  at high temps. The oxides of the alk. earths, or halides, carbonates and silicates with water of crystn., or active C may be used as the catalyzer. In the examples the  $\text{HCONH}_2$  is heated to  $400^\circ$  or  $450^\circ$ .

**Container for hydrofluoric acid.** FELIX SINGER. Ger. 476,596, April 8, 1927. A porous ceramic container is rendered capable of holding HF by impregnation with paraffin.

**Nitric and sulfuric acids.** ARMAND G. VAUGUÉ. Fr. 654,055, May 10, 1928. Nitrous or sulfuric vapors are recovered and concd. by damping the vapors before recovery by a liquid current in which they are progressively emulsified and which is sent under feeble pressure into a layer of filtering water contg. neutral or catalytic substances whereby soln. of the gas is obtained with rapid supersatn.

**Sulfuric acid.** MANSFELD A.-G. FÜR BERGBAU UND HÜTTENBETRIEB, HANS KREBS and ROLF BORCHERS. Fr. 653,371, April 24, 1928. In the manuf. of  $\text{H}_2\text{SO}_4$ , Fe is used in place of Pb in the plant, Fe being taken to include steel and alloys of Fe.

**Phosphoric acid.** SOC. DES PHOSPHATES TUNISIENS. Fr. 654,954, May 29, 1928. Phosphoric acid is prepd. by charging a mixt. composed of a mineral phosphate, silica and fuel into a tower mounted above the hearth of a heating chamber in which the charge is submitted to the action of the flames; the air descending with the charge being heated serves to burn the fuel and assures the oxidation of the P gases formed.

**Titanic acid.** I. G. FARBENIND. A.-G. Fr. 653,985, May 8, 1928. A white titanic acid, which is resistant to incandescence, is obtained by a second disintegration and hydrolysis of the basic titanic salt from the usual disintegration and hydrolysis of a Ti ore.

**Apparatus for producing solid carbon dioxide.** AKT.-GES. DER MASCHINEN-FABRIKEN ESCHER WYSS & CIE. Swiss 131,443, Jan. 18, 1928. Details are given.

**Nitric oxide.** GEORGE LUTZ. Ger. 475,882, April 21, 1927. Fluid fuel is mixed with N and O under a pressure of 50–100 atm. and burned over contact agents such as W or Ti.

**Oxides of nitrogen.** ELEKTRIZITÄTWERK LONZA. Fr. 653,431, April 25, 1928. Oxides of N either in the production of  $\text{HNO}_3$  by an elec. arc or by oxidation of  $\text{NH}_3$  are absorbed by  $\text{HNO}_3$  of gradually increasing concn. and at temps. between  $-20^\circ$  to  $-30^\circ$ .

**Compounds of oxygen and nitrogen.** LEO BERL. Ger. 476,855, Feb. 25, 1928. Compds. of N and O are obtained by the catalytic oxidation of  $\text{NH}_3$  salts, especially sulfites, by  $\text{NO}_2$  or the mixt. of NO and O obtained by the thermal dissocn. of  $\text{NO}_2$ .

**Sulfur trioxide.** JESSE G. MELENDY (to General Chemical Co.). U. S. 1,716,498, June 11.  $\text{SO}_3$  is subjected to catalytic oxidation in sep. adiabatic stages; the temp. of the gases entering the conversion stages is controlled by pos. cooling, and the conversion in all but the initial stage is caused to proceed only to that point at which the reaction rate begins rapidly to fall off; the reaction is carried to equil. only in the final converter.

**Catalytic synthesis of ammonia.** SOC. ANON. IND. AMMONIACA. Fr. 654,804, May 24, 1928. The catalysts are given the form of turnings to increase the exposed surface and are distributed in the furnace in horizontal zones, in each of which the size of the catalyst increases toward the bottom of the furnace. Fr. 654,806 describes a suitable furnace for the synthesis.

**Catalyst for ammonia synthesis.** SOCIÉTÉ L'AIR LIQUIDE, SOC. ANON. POUR L'ÉTUDE ET L'EXPLOITATION DES PROCÉDÉS GEORGES CLAUDE. Ger. 476,380, Oct. 14, 1920. See Brit. 153,254 (C. A. 15, 929).

**Ammonia condenser.** JACOB H. BECKMAN. U. S. 1,716, 681, June 11. Structural features.

**Combustion of ammonia.** HARRY PAULING. Fr. 653,202, Oct. 21, 1927. The mixt. of  $\text{NH}_3$  and air or O is distributed over the catalyst by a no. of diffuser chambers arranged with the parts of larger cross section toward the catalyst.

**Formation of salts.** ROBERT TERN. Fr. 654,373, May 16, 1928. Salts are formed dry by bringing the starting materials together in a colloidal state, mixing them in a colloid mill and heating them in an inclined rotating cylinder, the gaseous products of the reaction being obtained in an electro-filter and the residue in a heating vessel in an anhyd. state. An example is given of the prepn. of  $\text{NH}_4\text{Cl}$  from  $(\text{NH}_4)_2\text{SO}_4$  and  $\text{NaCl}$ .

**Hydrated sesquioxides.** I. G. FARBENIND. A.-G. Fr. 653,119, April 19, 1928. Hydrated sesquioxides of Ni and Co are made by dissolving the corresponding carbonate in water and treating it while stirring with hypochlorite lye as free as possible from alkali and contg. about 150 g. of active Cl per l.

**Phosphates.** I. G. FARBENIND. A.-G. Fr. 655,062, June 1, 1928. In the treatment of crude phosphates with  $\text{H}_2\text{SO}_4$ , an easily separable  $\text{CaSO}_4$  is obtained by carrying out the reaction in the presence of metaphosphoric acid or one of its salts.

**Aluminum chloride.** HENRY BLUMENBERG, JR. U. S. 1,716,102, June 4. A mixt. of Al sulfide and a chloride of an alkali-forming metal such as KCl is dehydrated, a carbonaceous material such as coal or heavy fuel oil is added, and the mixt. is heated in a closed retort to effect fractional volatilization of  $\text{AlCl}_3$  vapors which are condensed Cf. C. A. 22, 483.

**Aluminum silicate decolorizing agents.** JOHN C. MERRILL and HENRY S. MONTGOMERY. U. S. 1,716,828, June 11. In prepg. an Al silicate clay for use as a decolorizing medium, it is treated with a soln. of an electrolyte, which does not change the chem. constitution of the clay, pressed, dried and ground.

**Ammonium sulfate.** STANLEY ROBSON. Fr. 653,164, April 20, 1928.  $(\text{NH}_4)_2\text{SO}_4$  is prepd. by uniting  $\text{NH}_3$ ,  $\text{SO}_3$  produced by the oxidation of  $\text{SO}_2$  with a catalyst, and water, all in the form of gas or vapor. Any 2 may be united before the addn. of the 3rd. If the  $\text{SO}_3$  contains unchanged  $\text{SO}_2$ ,  $(\text{NH}_4)_2\text{SO}_3$  is also formed. Cf. C. A. 23, 3547.

**Ammonium sulfate.** UNION CHIMIQUE BELGE. Fr. 654,567, May 22, 1928.  $(\text{NH}_4)_2\text{SO}_4$  is produced by washing combustion gases such as gases from industrial furnaces with an ammoniacal soln. to absorb  $\text{CO}_2$ , the gases being first cooled, then treated in a continuous manner with the soln. which is afterwards brought in contact with finely divided  $\text{CaSO}_4$  and reused.

**Di-ammonium phosphate.** GUY H. BUCHANAN (to American Cyanamid Co.). U. S. 1,716,415, June 11. A soln. of acid phosphatic material is caused to react with  $\text{NH}_3$  at the b. p., the temp. is reduced to below  $90^\circ$  before the end of the reaction to produce  $(\text{NH}_4)_2\text{HPO}_4$  and the product is pptd. by cooling.

**Barium carbide.** JOSÉ YLLA-CONTE. Fr. 654,966, May 30, 1928. Compds. of Ba (oxide, hydrate or carbonate) are mixed with coal and fired in a furnace, a stream of O or CO being passed through to maintain the necessary heat for the production of  $\text{BaC}_2$ .

**Barium hydrate.** RHENANIA-KUNHEIM VEREIN CHEMISCHER FABRIKEN A.-G. Fr. 653,346, April 23, 1928.  $\text{Ba}(\text{OH})_2$  is prepd. by the hydrolysis of silicates of Ba, which have been wet-ground to a fine degree. The grinding may be continued during the heating for hydrolysis.

**Calcium cyanamide.** COMPAGNIE DE L'AZOTE ET DES FERTILISANTS S. A. Ger. 476,516, Nov. 8, 1924.  $\text{CNNCa}$  soln. is prepd. from crude  $\text{CNNCa}$  by using water satd. with  $\text{CO}_2$ . The  $\text{CNNCa}$  is added in small quantities, each quantity being added when the evolution of  $\text{H}_2\text{S}$  due to the prior amt. ceases.

**Calcium tartrate.** ALPHONSE V. DRIVON. Fr. 653,050, Oct. 1, 1927. Wine lees are treated at  $65^\circ$  with  $\text{H}_2\text{SO}_4$ , then with  $\text{HCl}$ , dild.; the clear liquid is drawn off and filtered, treated with  $\text{CaCO}_3$  to ppt. the tartrate; the deposit which remains after the liquid is withdrawn from the first dildn. is dild. again and the clear liquid is used for the first dildn. of a next batch.

**Carbon disulfide.** I. G. FARBENIND. A.-G. (Matthias Pier and Karl Winkler, inventors). Ger. 476,598, Jan. 13, 1927. See Fr. 648,889 (C. A. 23, 3314).

**Carbon disulfide.** I. G. FARBENIND. A.-G. Fr. 654,955, May 29, 1928. In the manuf. of  $\text{CS}_2$  the liquid S passes first into supplementary chambers filled with re-factory substances and running the length of the main retort.

**Basic copper sulfate.** HUGO HOFMANN (to American Bemberg Corp.). U. S. 1,716,492, June 11. In producing a product which is suitable for use in dissolving cellulose, use is made of Cu hydroxide (contg. 42% water) 100,  $(\text{NH}_4)_2\text{SO}_4$  72, aq.  $\text{NH}_3$  (0.909 sp. gr.)  $80^\circ$  and  $60^\circ$  B $\phi$ .  $\text{H}_2\text{SO}_4$  92 parts.

**Ferric oxide.** I. G. FARBENIND. A.-G. Fr. 652,846, Mar. 20, 1928. Finely divided  $\text{Fe}_2\text{O}_3$  is obtained by heating the hydrate in alk. soln. at a temp. above  $100^\circ$ .

A soln. of a ferric salt may be pptd. by adding more than the necessary amt. of a basic substance and heating the mixt. under pressure to 100–150°. Cf. C. A. 23, 3058.

**Mercury thiocyanate.** I. G. FARBENIND. A.-G. (Oskar Neubert, Karl Schrang and Georg Wesenberg, inventors). Ger. 475,533, June 9, 1925. Colloidal solns. of  $\text{Hg}(\text{CNS})_2$  are prepd. by mixing a soln. of a Hg salt with a thiocyanate soln. in presence of a protective colloid. Thus, 40 parts albumose is dissolved in 360 parts water and 220 parts NaOH added. To the filtrate is added 20% solns. of KCNS 120 parts and  $(\text{AcO})_2\text{Hg}$  192 parts. The resulting colloidal soln. of  $\text{Hg}(\text{CNS})_2$  is sepd. by dialysis. If evapd. to dryness *in vacuo*, the  $\text{Hg}(\text{CNS})_2$  is obtained as a powder, which will form a colloidal soln. with water.

**Phosphorus pentasulfide.** PAUL DUTOIT. Swiss 131,096, Dec. 1, 1927.  $\text{P}_2\text{S}_5$  is prepd. by heating a mixt. of powd. S and  $\text{Fe}_2\text{P}$  to 700–800°. The S is preferably obtained by heating pyrites.

**Potassium carbonate.** ROBERT D. PIKE, LEO V. STECK and ROSS CUMMINGS (Steck and Cummings to Pike). U. S. 1,716,663, June 11. In sepg. the Na and K contents of carbonate brine, the brine is passed over a K zeolite and the zeolite is regenerated with a K salt soln.

**Sodium borate.** SCHERING-KAHLBAUM A.-G. Ger. 476,956, June 9, 1927. A  $\text{Na}_2\text{BO}_3$  soln. is entirely freed from heavy metals by adding a small quantity of  $\text{BaCl}_2$ ; it is allowed to stand and the ppt. sepd.

**Sodium perborate.** HECTOR R. CARVETH (to Roessler & Hasslachier Chemical Co.). U. S. 1,716,874, June 11. See Brit. 297,777 (C. A. 23, 2791).

**Sodium nitrate; ammonium chloride.** I. G. FARBENIND. A.-G. (Philipp Osswald, inventor). Ger. 476,254, Nov. 1, 1924. A mixt. of  $\text{NaNO}_3$  and  $\text{NH}_4\text{Cl}$  obtained by double decompn. from  $\text{NH}_4\text{NO}_3$  and NaCl is sepd. into its components by a differential settling process, which is preferably carried out directly in the medium in which the double decompn. occurs. Thus, the decompn. may be effected in an aq. soln. of sp. gr. 1.4 comprising  $\text{NaNO}_3$ ,  $\text{NH}_4\text{Cl}$  and  $\text{NH}_4\text{NO}_3$ ; a plant is described wherein this soln. is used cyclically, the soln. passing from a high-level tank to a reaction vessel, wherein  $\text{NH}_4\text{NO}_3$  and NaCl are added, thence to a settling vessel of known type and back again to the high-level tank.

**Sodium nitrate from ammonium nitrate.** ALEXANDER E. MOSER and ILVA LIBINSON. Ger. 476,145, Jan. 30, 1926. A soln. of  $\text{NH}_4\text{NO}_3$  and  $\text{NaHCO}_3$  is heated to 70–75°, whereby  $\text{NaNO}_3$  is formed and a mixt. of  $\text{NH}_3$ ,  $\text{CO}_2$  and  $\text{H}_2\text{O}$  is evolved, which is absorbed in a satd. soln. of NaCl at 30°.  $\text{NaHCO}_3$  for use again is so obtained, together with a mother liquor, which may be treated with  $\text{CaCl}_2$  soln., filtered and evapd. to give an impure  $\text{NH}_4\text{Cl}$  suitable as a fertilizer, or which may be treated with  $\text{Ca}(\text{OH})_2$  for recovery of  $\text{NH}_3$ .

**Granulating sodium sulfide, etc.** KALI-CHEMIE A.-G. (Friedrich Ritsberg, inventor). Ger. 476,218, Feb. 11, 1928. Addn. to 424,193. According to Ger. 424,193, pieces of predetd. size and shape are prepd. from  $\text{Na}_2\text{S}$  and like substances by allowing drops of the molten substance to fall on to a surface of metal, celluloid, ebonite, etc., maintained at a temp. below the m. p. of the substance. This method is now modified by pretreating the surface with highly viscous substances, e. g., suitable oils or fats, in order to prevent spreading of the drops. A sufficiently thin film may be obtained by applying the oil in soln., e. g., cylinder oil in benzine, and evapg. the solvent, or the oil may be applied at a high temp.

**Composition for producing hypochlorite solutions.** MAURICE C. TAYLOR (to Mathieson Alkali Works). U. S. 1,716,014, June 4. An alkali metal compd. forming an alk. aq. soln. such as  $\text{Na}_2\text{CO}_3$  or  $\text{Na}_3\text{PO}_4$  is mixed with a hypochlorite-forming chloramine such as "*p*-toluene-sulfon-benzoyl-nitrogen chloride," which is sol. in the aq. soln. of the alkali metal compd. used.

**Cryolite.** VEREINIGTE ALUMINIUM-WERKE A.-G. Fr. 653,584, April 28, 1928. Cryolite is obtained by treating a soln. of HF and  $\text{H}_2\text{SiF}_6$  obtained by means of F compds. of little value contg.  $\text{SiO}_2$  and by means of  $\text{H}_2\text{SO}_4$  with KF or  $\text{K}_2\text{CO}_3$  or both, sepg. the pure HF from the  $\text{K}_2\text{SiF}_6$  and decomposing the  $\text{K}_2\text{SiF}_6$  with  $\text{K}_2\text{CO}_3$ , reacting the soln. with  $\text{Na}_2\text{CO}_3$ , which gives NaF and  $\text{K}_2\text{CO}_3$ , mixing the pure HF with  $\text{Al}_2\text{O}_3$  and adding NaF obtained above, which gives a pure cryolite suitable for the manuf. of Al.

**Hydrogen.** MARIA CASALE-SACCHI. Swiss 131,095, July 27, 1927, Austrian 112,972, Dec. 15, 1928. H is prepd. from liquid  $\text{H}_2\text{O}$  and CO in presence of a catalyzer at temps. below the crit. temp. and at pressures higher than the vapor pressure of water. The catalyzer is a metal, metallic oxide or metallic salt of a weak inorg. acid, or a mixt.

of these. The catalyzer is carried by the water, which descends a suitable column while the CO ascends.

**Hydrogen from methane.** SOC. DES MINES DE LENS. Fr. 654,277, Oct. 14, 1927. Gases rich in H are obtained from gases rich in  $\text{CH}_4$  by passing lighting gas, coke-oven gas or the like on to a layer of coke or poor coal carried to incandescence by a blast of air. An app. is described.

**Hydrogen-nitrogen mixtures.** LUIGI CASALE. U. S. 1,716,813, June 11. Mixts. suitable for use in  $\text{NH}_3$  synthesis are obtained by distg. liquid air to obtain gaseous N, passing the residual O into a combustion chamber and utilizing it with steam for converting a hydrocarbon material into CO and H, converting the CO to  $\text{CO}_2$ , removing the latter, and adding the gaseous N to the H thus obtained. An arrangement of app. is described.

**Precipitation of hafnium and zirconium.** NAAMLOOZE VENNOOTSCHAP PHILIPS' GLOEILAMPENFABRIEKEN (Jan H. de Boer and Anton E. van Arkel, inventors). Ger. 476,099, Oct. 27, 1925. See Brit. 260,062 (C. A. 21, 3317).

**Phosphorus.** I. G. FARBENIND. A.-G. Fr. 653,440, April 25, 1928. P is displaced from combination with Fe by Si. Thus, Fe-P is mixed with Si, Fe-Si or mixts. giving Si, the amt. employed being such that an Fe-Si commercially usable is obtained. The P which escapes is condensed.

**Phosphorus.** SOC. ITALIANA PER LE IND. MINERARIE ED CHIMICHE. Fr. 653,759, April 17, 1928. Phosphate ores or bones are treated with an acid such as HCl in the presence of a metal (Fe, Al, etc.) and  $\text{SiO}_2$  for the recovery of P. An app. is described.

**Catalysts for reduction or hydrogenation.** I. G. FARBENIND. A.-G. Fr. 33,928, July 25, 1927. See Brit. 286,123 (C. A. 23, 247).

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**Plastic composition.** GOTTWALD SCHWARZ and LUDWIG SACHS. Austrian 112,735, Nov. 15, 1928. A plastic and elastic compn. for stopping the ears comprises unvulcanized rubber, balata or the like with or without mineral fillers, *e. g.*, talc or lithopone.

**Plastic compositions.** WORLDECHO, LTD. Fr. 653,007, April 18, 1928. Articles such as *gramophone disks* are molded from a plastic compn. contg.  $\beta$ -naphthol or the diamine 80, PhOH or resorcinol 60,  $\text{CH}_2\text{O}$  100, petroleum 80,  $\text{Na}_2\text{SO}_4$  10 parts as well as the necessary amt. of a resin made, *e. g.*, from an alc. soln. of gum lac 15-30, colophony 5-15 and sandarac 5-15 parts.

**Plastic material.** MARIE A. LEMATRE. Fr. 652,884, April 14, 1928. A plastic material contains glycerol 750, gelatin 700, carnauba wax 520 and  $\text{ZnO}$  200 g.

**Moldable composition.** JOHN T. COLLINS. U. S. 1,716,623, June 11. A compn. suitable for molding under heat and pressure comprises finely sepd. fibers such as paper-making pulp together with a gummy deriv. such as may be obtained from "black liquor" by pptn. with acid. A phenol-condensation product also may be added.

**Molded articles of indurated fiber.** HORACE H. CLARK (to Clark Fibre Products Corp.). U. S. 1,717,092, June 11. Pulp formed from old cotton cloth is digested in an aq. soln. contg. about 5% NaOH and about 3%  $\text{Na}_2\text{CO}_3$  for about 4 hrs. under a pressure of 30-50 lbs. per sq. in.; a blank is formed from the pulp by flowing it into a mold having perforated walls through which most of the water passes; the blank is dried and impregnated with an indurating liquid such as  $\text{ZnCl}_2$  soln. and is finally compacted and shaped under pressure.

**Kneading device for the production of artificial horn and similar plastic masses.** EUGEN STICH. Ger. 476,748, Sept. 2, 1927.

**Artificial horn.** AKALIT KUNSTHORNWERKE A.-G. Austrian 112,821, Feb. 15, 1928. Artificial horn made from albuminous material, particularly casein, is hardened with  $\text{HCONHCH}_2\text{OH}$  or its homologs. These substances liberate  $\text{CH}_2\text{O}$  under the conditions of temp. and pressure usually employed for hardening.

**Condensation products of aldehydes with urea and thiourea.** KUNSTHARZFABRIK. FRITZ POLLAK, G. M. B. H. Fr. 654,554, May 22, 1928. See Brit. 291,366, C. A. 23, 1227.

**Condensation products of phenol and formaldehyde.** CHEM. FAB. KURT ALBERT, G. M. B. H. Ger. 475,865, Oct. 5, 1918. Condensation products from PhOH and polymers of HCHO, which are liquid at ordinary temps. and stable to heating, are prepd. by heating 1 mol. PhOH with considerable excess (at least  $1\frac{1}{2}$  mol.) of stable polymerized HCHO until complete soln. occurs. The HCHO polymer should not react exothermally or



have a catalytic action at ordinary temps. on the PhOH. Homologs of PhOH may be used. The example mentions cresol and gives the heating temp. as 80–90°.

**Casein.** WM. H. SHERRFIELD. U. S. 1,716,799, June 11. In the manuf. of acid-ptd. casein, acid is added to milk under conditions which will cause formation of a gran curd, the mixt. is agitated while passing through a portion of the app. to complete the reaction, whey is sepd. from the curd immediately after cessation of the agitation, water is added to the curd, and the curd is agitated with the water to effect washing while passing through a sufficient length of the app. used (which is described).

**Furfural reaction product.** WALTER O. SNELLING. U. S. 1,716,606, June 11. Furfural, HCl and water are mixed and allowed to stand until a solid non-resinous reaction product forms which may be used in making crayons, porous C, decolorizing material, etc.

**Burning limestone.** CARL J. WRIGHT (to Combustion Utilities Corp.). U. S. 1,716,572, June 11. Limestone is advanced continuously downwardly in a column through a shaft kiln and is decomposed by contact with a mixt. of superheated steam and CO<sub>2</sub> introduced circumferentially into the mid-portion of the column; the product is cooled by steam introduced at the base of the column and passed upwardly; the vol. of satd. steam thus introduced is controlled to maintain the temp. of the lime at the foot of the column only slightly above the dissocn. temp. of Ca(OH)<sub>2</sub>. An arrangement of app. is described.

**Treatment of fuller's earth, etc.** RUDOLPH RAPHAEL ROSENBAUM. Ger. 476,398, Dec. 17, 1927. See Brit. 284,327 (C. A. 22, 4739).

**Flotation apparatus for refining graphite.** EUGÈNE G. GALPIE. Fr. 653,192, May 18, 1926.

**Filtering material.** SOC. DES ÉLECTRODES DE LA SAVOIE. Fr. 652,778. Sept. 28, 1927. Filtering materials are made having a basis of SiC or fused Al<sub>2</sub>O<sub>3</sub> of the desired size of grain. Substances capable of liberating volatile products by combustion, distn. or decompn. and binding agents are incorporated with the SiC, etc., before molding and baking.

**Bleaching, washing and disinfectant material.** C. F. BOEHRINGER & SOEHNE, G. M. B. H. Ger. 476,180, Dec. 16, 1926. A soln. for immediate use in bleaching, etc., is prepd. by treating with an alk. soln. an adsorbent, *e. g.*, silica gel, which has been charged with Cl. The use of solns. of alkali carbonates or bicarbonates is advantageous, as free HClO is then obtained in soln.

**Dry-washing composition.** CARRARA CHEMISCH-PHARMAZEUTISCHE FABRIKATION PAUL DORFF. Ger. 476,151, Aug. 14, 1925. An emulsion prepd. by treating a suitable wax, *e. g.*, beeswax, with alkalies is mixed with so much abrasive, *e. g.*, marble dust, that a paste is produced, which crumbles when rubbed between the hands.

**Furniture polish.** ERNST NEUHAUSER. Swiss 130,701, Aug. 15, 1927. A furniture polish contains ceresin 150 g., carnauba wax 50 g., paraffin 200 g. and oil of turpentine 700 g., mixed to a cream.

**Wood filling and polishing composition.** WILLIAM F. GOWELL. U. S. 1,717,023, June 11. Turpentine 1 gal., paraffin 0.5 lb., PbO 1 lb. and ammonia 1 oz.

**Projection screens.** ARTHUR C. PAYNE (to Trans-Lux Daylight Picture Screen Corp.). U. S. 1,715,381, June 4. The gum or resinous material is removed from a sheet of georgette crepe, the sheet is stretched and while stretched is placed upon a body of gelatinous plastic material such as described in U. S. 1,151,602 contg. glycerol and gelatin with which its incorporation is effected by capillary action.

**Colored smoke clouds.** JOHN C. SAVAGE. U. S. 1,716,797, June 11. A coloration medium such as a dye dissolved in oil and CCl<sub>4</sub> is vaporized without combustion and ejected into the atm. in conjunction with a smoke base neutral to the coloration medium, such as exhaust engine gases or steam.

**Printing processes.** GIUSTO MANETTI, PRIMO BENAGLIA and MATTIA LUCH-SINGER. Fr. 652,703, April 14, 1928. Pictures are produced in one or more colors on metallic surfaces by printing with transparent colors, so that the picture is illuminated by reflections of the metallic base, and the colors have max. intensity and brilliance. Surfaces to be printed on may be gilded or otherwise treated with metal, the metal or gilded surface being covered with a thin layer of more or less transparent substances, such as lacs or varnishes having a base of nitrocellulose, cellulose, resin or drying oils.

**Protective coating.** RAYMOND BERIN. Fr. 654,238, Jan. 12, 1927. Containers are protected against the action of gasoline, oil, alcs., etc., by a coating contg. cellulose acetate and a soln. of a formo-phenolic substance.

**Rust-loosening composition.** FRANK M. BOYNTON. U. S. 1,715 589, June 4. A

of these. The catalyzer is carried by the water, which descends a suitable column while the CO ascends.

**Hydrogen from methane.** SOC. DES MINES DE LENS. Fr. 654,277, Oct. 14, 1927. Gases rich in H are obtained from gases rich in  $\text{CH}_4$  by passing lighting gas, coke-oven gas or the like on to a layer of coke or poor coal carried to incandescence by a blast of air. An app. is described.

**Hydrogen-nitrogen mixtures.** LUIGI CASALE. U. S. 1,716,813, June 11. Mixts. suitable for use in  $\text{NH}_3$  synthesis are obtained by distg. liquid air to obtain gaseous N, passing the residual O into a combustion chamber and utilizing it with steam for converting a hydrocarbon material into CO and H, converting the CO to  $\text{CO}_2$ , removing the latter, and adding the gaseous N to the H thus obtained. An arrangement of app. is described.

**Precipitation of hafnium and zirconium.** NAAMLÖÖZE VENNOOTSCHAP PHILIPS' GLOEILAMPENFABRIEKEN (Jan H. de Boer and Anton E. van Arkel, inventors). Ger 476,099, Oct. 27, 1925. See Brit. 260,062 (C. A. 21, 3317).

**Phosphorus.** I. G. FARBERIND. A.-G. Fr. 653,440, April 25, 1928. P is displaced from combination with Fe by Si. Thus, Fe-P is mixed with Si, Fe-Si or mixts. giving Si, the amt. employed being such that an Fe-Si commercially usable is obtained. The P which escapes is condensed.

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**Rust-loosening composition.** FRANK M. BOYNTON. U. S. 1,715,589, June 4. A

compn. suitable for loosening rust on nut threads or other articles comprises  $C_2H_2Cl_4$  about 55, "varnolene" about 35 and kerosene about 10%.

**Embossing dies.** EBER G. KNAPP. U. S. 1,715,763, June 4. An inked impression of the matter to be duplicated is produced on chalk board, the impression is dusted with pulverized rosin, the board is heated to fuse the rosin and ink of the impression and is further subjected to treatment (suitably with "chloride of lime" soln.) to dissolve the chalk.

**Gut.** OTTO GERNGROSS. Ger. 476,551, Jan. 7, 1927. Animal gut is treated to a fermenting process before its manuf. into cat-gut or "silk." Pancreatic juice is mentioned as the fermenting agent in the example.

**Fire-extinguishing solution.** RALPH W. AUSTIN. U. S. 1,716,476, June 11.  $K_2CO_3$  is dissolved in a soln. of com.  $CaCl_2$  to form a liquid for "anti-freezing" extinguishers.

## 19—GLASS, CLAY PRODUCTS, REFRACTORIES AND ENAMELED METALS

G. E. BARTON AND C. H. KERR

**Progress in the glass industry.** ANON. *Pottery Gaz.* 54, 363-72(1929).—A review of the manufacturing progress made in recent years in the glass bottle industry with a description of the various types of automatic machines used as well as plate and sheet glass, cooking glassware and anti-glacé glasses. R. A. HEINDL

**The composition of glass.** OSZKAR KNAPP. *Chem. Rundschau Mitteleuropa u. Balkan* 4, 155-6(1927); *Chem. Zentr.* 1928, I, 243.—K. defines the term glass in a technical sense by means of phase diagrams. FRANCIS P. GRIFFITHS

**The manufacture of laminated glass.** W. R. LYTTELTON. *Pottery Gaz.* 54, 274-6(1929).—L. reviews the pioneer work by Woods and also Benedictus on the strengthening of glass with a view to prevent or lessen its shattering effect under impact. An outline of the present-day manuf. methods is given together with some of the difficulties encountered, especially with the cellulose and gelatin sheets either on account of their becoming brittle or discoloring with age under the action of certain light rays. R. A. HEINDL

**The annealing of glass as a function of the temperature.** ANDRÉ THURET. *Chimie & industrie Special No.*, 488(Feb., 1929).—The annealing of glass was studied by means of the change in d.; the curves obtained showed that: (1) the rate of annealing increases with the temp.; (2) for each temp. the degree of annealing is limited, and decreases with the annealing temp., irrespective of the time of annealing. A. P.-C

**Study of the properties of simple enamel glasses.** A. I. ANDREWS. *J. Am. Ceram. Soc.* 12, 390-4(1929).—The systems  $Na_2O-B_2O_3-SiO_2$  and  $Na_2O-PbO-SiO_2$  were studied for acid resistance. Increase in  $SiO_2$  in general improves acid resistance. The effects of  $Na_2O$ ,  $B_2O_3$  and  $PbO$  are dependent upon the compn. to which those oxides are added. Some show considerable promise as acid-proof enamels. C. H. KERR

**Clay sewerpipe manufacture.** VI. Heat-balance determinations. R. E. ARNOLD AND GEORGE H. DUNCOMBE, JR. *J. Am. Ceram. Soc.* 12, 410-22(1929). VII. Low-temperature oxidation. *Ibid* 423-8. VIII. Measurement of draft distribution. C. E. PARMELEE. *Ibid* 429-33. C. H. KERR

**Crushing strength of unfired fireclay bodies.** WALTER C. HANCOCK AND J. G. COWAN. *Trans. Ceram. Soc. (England)* 27, 243-6(1928).—See C. A. 22, 1661. H. F. KRIEGE

**Stoker application to the car tunnel kiln.** CARL B. HARROP AND HOWARD S. ORTH. *J. Am. Ceram. Soc.* 12, 406-9(1929). C. H. KERR

**Some notes on modern ceramic kiln practice and its trend in England and Czechoslovakia.** R. C. CALLISTER. *J. Council Sci. Ind. Research (Australia)* 2, 32-9(1929). L. B. MILLER

**Porcelain making in China—A new turn to an old art.** J. S. LEIBSON. *Bull. Am. Ceram. Soc.* 8, 135-42(1929).—Descriptive. C. H. KERR

**Importance of the glass phase in porcelain.** HOBART M. KRANER. *J. Am. Ceram. Soc.* 12, 383-8(1929).—Probable developments taking place in porcelain during firing and overfiring were studied. Mullite soln. in the glass may be the cause of change of characteristics of the porcelain. The clay-flint-feldspar system and the  $MgO-Al_2O_3-SiO_2$  ternary are discussed. C. H. KERR

**Determination of air in plastic mixes.** VANCE COURTWRIGHT. *J. Am. Ceram.*

*Soc. 12*, 395-8(1929).—Sepn. of air and clay is caused by boiling the sample in  $H_2O$  in a container sealed at the bottom with Hg. The app. is described. C. H. KERR

Refractory materials for the foundry (SEARLE) 9. CuO in the borax bead (BANCROFT, NUGENT) 2.

BOLLENBACH, HERMANN FR., AND KIEFFER, E.: *Laboratoriumsbuch für die Tonindustrie*. 2nd ed. Halle (Saale): W Knapp. 96 pp.

BUSS, ERNST: *Eigenschaftsbestimmungen der Tone*. Berlin: *Tonind.-Ztg.* 60 pp. M. 3.75. Reviewed in *Trans. Ceramic Soc.* 27, A70(1929).

SCHÜEN, W.: *Die Herstellung der Steinzeugröhren*. Berlin: *Tonind.-Ztg.* 113 pp. M. 5. Reviewed in *Trans. Ceramic Soc.* 27A, 48(1929).

Glass. SOC. ANON DES MANUFACTURES DES GLACES ET PRODUITS CHIMIQUES DE SAINT-GOBAIN, CHAUNY & CIREY. Ger. 476,744, May 29, 1925. Molten glass in the furnace is clarified by a current of hot gas blown over the glass at a place where, owing to the construction of the furnace, the depth of the glass is small.

Special glass. RÖHM & HAAS A.-G. Fr. 654,357, May 16, 1928. Polymerized or polymerizable unsatd. org. compds. are united to glass, etc., to form splinterless compd. sheets. Examples of compds. used are methyl cinnamate and ethyl crotonate.

Glass wool. CHEMISCHE FABRIK STOCKERAU FELIX POLLAK. Fr. 652,712, April 14, 1928. The glass is heated to the temp. required for spinning by elec. resistance. Cf. C. A. 23, 683.

Glass-blowing machine. VITREA A.-G. Ger. 476,160, Nov. 28, 1916.

Glass-melting tank and associated apparatus for making plate glass. CHESTER E. HENDERSON (to Pittsburgh Plate Glass Co.). U. S. 1,716,312, June 4.

Electric furnace for glass-making. ARMAND A. P. C. LAPOINTE. Fr. 654,219, April 25, 1928.

Annealing furnace for glass, etc. THERMAL ENGINEERING CORP. Fr. 654,763, April 27, 1928.

Annealing furnace for rolled glass. NAAMLÖÖZE VENNOOTSCHAP MIJ. TOT BEHEER EN EXPLOIT. VAN OCTROOIEN. Ger. 476,927, May 17, 1928.

Glass furnace for drawing continuous sheets of glass. JULES J. QUERTINMONT. U. S. 1,715,568, June 4. Structural features.

Glass furnace for use with bottle-forming apparatus of the suction type. THOMAS C. MOORSHEAD (to United Glass Bottle Manufacturers, Ltd.). U. S. 1,716,456, June 11.

Ceramics. KOMMANDIT-GES. MULLIEZ FRÈRES & Co. Ger. 475,722, April 12, 1927. Imitation marble is prepd. by superposing layers of ground material of dry or slightly damp powder in a mold; the layers have furrows contg. powder to impart the veined effect when the whole sets.

Ceramic products. SCHEIDHAUER & GIESSENG A.-G. Fr. 33,876, Jan. 10, 1927. Addn. to 626,365. In the production of ceramic products from non-plastic substances a small proportion of the raw material in colloidal soln. is used as binding means for the substance in granular form.

Metallized ceramic products. RENÉ É. BRENNER. Fr. 652,748, Sept. 21, 1927. An oxide of a metal or metals (Cu, Sn, etc.) is incorporated along with the necessary C for its reduction with ceramic material, made into a paste and molded into hollow open articles. These are baked in a reducing atm. and afterward dipped in a bath of  $CuSO_4$  and  $(NH_4)_2SO_4$  made feebly acid with  $H_2SO_4$ , in which they form the cathode of an electrolytic bath having an insol. anode. Cu is deposited on the exterior while Cu is dissolved from the interior.

Apparatus for series-drying ceramic articles. JOSEF DENGLER. Fr. 654,388, May 16, 1928.

Refractory material. LOUIS J. TROSTEL (to General Refractories Co.). U. S. 1,716,395, June 11. Cyanite is added to a highly aluminous clay mixt. and the mass is shaped and heated to produce a refractory article such as furnace brick of substantially constant volume.

Refractory composition. THOMAS S. CURTIS (to Pacific-Southwest Trust & Savings Bank). U. S. 1,715,449, June 4. A compn. suitable for making refractory brick, etc., consists of the reaction product of a mixt. of MgO and Fe oxide contg. 35-50% of the Fe oxide. The material is heated sufficiently to cause reaction and sintering.

Enameling metals. HANS EDLER. Fr. 654,016, May 9, 1928. Metals to be

enameled or otherwise coated are heated to the required temp. by Foucault currents produced in the exterior layer of the metal.

Furnace for melting materials for enamel coatings. STETTINER CHAMOTTE-FABRICK A.-G. VORM. DIDIER. Ger. 475,511, May 26, 1928. Structural details are given.

## 20—CEMENT AND OTHER BUILDING MATERIALS

J. C. WITT

Cement flour. ANON. *Cement & Cement Manuf.* 2, 132-6(1929).—A description of an air elutriation device. RAYMOND WILSON

The flourometer: an apparatus for determining the fineness of cements. G. BAIRE. *Chimie & industrie Special No.*, 472-3 (Feb., 1929).—A brief description of the Mayntz-Petersen flourometer, in which the fineness is detd. by an air-elutriation test. Generally speaking, cement leaving a 12% residue on a sieve having 4900 meshes per sq. cm. will leave 38% residue in the flourometer after blowing air for 15 mins. under a pressure of 6 cm. of turpentine, and a cement leaving 2% residue on a 4900-mesh sieve will leave 25.4% residue in the flourometer under the same conditions; but the results can vary with the nature of the cement and of the grinding equipment. A. P.-C

Critical examination of the methods of testing and analyzing cements. PAUL ERCULISSE. *Chimie & industrie Special No.*, 475-87(Feb., 1929).—From a crit. discussion of the methods of testing and analyzing cements, in the light of a knowledge of their compn. and of the mechanism of their setting (which are critically reviewed), E. considers that the evolution of methods for the testing and analysis of cements should be along the following lines: (1) express the results of chem. analysis by means of a formula indicating the stoichiometrical relationships; (2) as regards mech. tests, use sand of definite size of grains, and make a more fluid mortar contg. a little less sand than is used at present and exactly the amt. of water theoretically required for setting, the mortar being prepd. on a shaking table under specified conditions instead of being mixed by hand; (3) study the reactivity by LeChatelier's method. A. P.-C.

Effect of temperature on the setting times of cements and on the strength of cements, mortars and concrete. W. N. THOMAS AND N. DAVEY. Dept. Sci. Ind. Research, *Building Research, Special Rept. No.* 13, 38 pp.(1929).—The setting time in certain cements varies from 20 hrs. at 0° to 4.3 hrs. at 21.1°. A combination of 6 cements varied from 11.7 hrs. at 0° to 5.1 hrs. at 21.1°. There appears to be no direct connection between the setting times and the variations of these setting times with temp.; 2 cements may have the same setting times at 16° and be widely different at 3°. Lowering the temp. from 16 to 3° had a different effect upon various rapid hardening portland cements ranging for initial set from a decrease of 73% to an increase of 217%; for final set, from a decrease of 30% to an increase of 165%. Different aluminous cements also react very differently to temp. and considerable heat is evolved during their setting and hardening. 1:2:4 concrete cylinders of portland cement showed 28-day compression strengths of 2910 lbs. per sq. in. when molded at 25° and 3245 at 11° with the same curing temps. of 16°. By curing 1:2:4 portland cement concrete at 35.3° higher strengths were obtained than at 22.1°. A bibliography is included. H. C. PARISH

Concrete roads in Cardiff (Wales). G. H. WHITAKER. *Munic. Eng. Sanit. Record* 82, 392-4(1928).—A detailed description of their construction is given. C. H. BADGER

How to remove stains from concrete. ANON. *Concrete* 34, No. 6, 31-4(1929).—A compilation of instructions for removing iron, copper, tobacco, fire, oil and other stains from concrete. RAYMOND WILSON

Chemistry of bituminous highway construction; petroleum asphalt. PREVOST HUBBARD. *J. Soc. Chem. Ind.* 48, 108-12T(1929).—The stability test is made on compressed cylindrical briquets of the paving mixt. (sand, mineral filler and asphalt), 2 ins. in diam., by placing the briquet in a cylindrical mold and detg. the max. load developed in forcing the mixt. through a circular-bottom orifice 1 1/4 ins. in diam. The test is made at 60° which represents approx. the most severe temp. attained by asphalt paving mixts. under service conditions in temperate zones. Results are expressed directly in lbs. max. load registered by a dynamometer or spring balance. A drawing of the app. is given. The results so far obtained indicate no practical difference between asphalts produced from Mid-Continent, Mexican, Colombian and Venezuelan petroleums. Large differences in stability of paving mixts. have been noted when

sands from different sources were used although the particle sizes were comparable and no differences in angularity were perceptible under the microscope. The differences seem to be due to adsorption as shown by the following data:

Sand	Stability	Mesh	Asphalt absorbed per 1000 g.
Potomac River	Very high	40-50	0.18
		100-200	0.36
New York (crane)	High	40-50	0.14
		100-200	0.30
Platte River	Very low	40-50	0.10
		100-200	0.20

It would seem that absorption plays an important part insofar as stability of the paving mixt. is concerned. However, if the sands are mixed with a lubricant (castor oil) instead of asphalt, the stability values of such mixts. should be approx. the same. Such was not found to be the case and it is evident that adsorption is not the sole controlling factor in the stability of paving mixts. It is of interest to note that among the factors affecting stability of asphalt paving mixts. the exact penetration of the asphalt within ordinary specification limits is of relatively minor importance. Far greater differences in stability of the mixt. may be caused by variation in sand and mineral filler and normal variations in proportions of filler and asphalt than in the penetration of the asphalt itself within the usual ten-point limit specified. A brief treatment is given of the fluid asphalt products used primarily for surface treatment (excluding asphalt emulsions).

A. J. MONACK

A study of sulfur as a wood preservative. E. F. ENGLISH. *J. S. African Inst. Eng.* 27, 127-41(1929).—Round sticks of *Pinus pinaster*, *Eucalyptus saligna* and *Acacia mollissima* were impregnated with molten S by the open-tank method. The max. absorptions were 23, 17 and 8 lbs. of S per cu. ft., resp. Complete penetration of the sapwood was obtained in each case. Hardness and compression tests on oven-dry pieces of *Euc. saligna*, *Cryptomeria japonica* and *P. pinaster* treated with S showed in general an increase in hardness and a decrease in compression strength as compared with untreated control pieces. The rate of absorption of water vapor is decreased by S treatment and the moisture equil. point is slightly lower. Immersion tests indicated that impregnated S has practically no waterproofing effect. Test pieces treated with S and S contg. 5% naphthalene and untreated controls were exposed to fungus and termite attack by burial in soil and placing in a mine near Pretoria. After 2 years, the treated pieces were sound, whereas the controls were almost destroyed by termites. The same applies to the pieces placed in the mine with reference to fungus attack. S is objectionable for treatment of mine timbers on account of its inflammability and resulting evolution of SO<sub>2</sub>.

ALFRED L. KAMMERER

Density of wood substance, adsorption by wood and permeability of wood. ALFRED J. STAMM. *J. Phys. Chem.* 33, 398-414(1929).—The apparent d. of wood and its constituents is detd. by the pycnometer method using H<sub>2</sub>O, org. liquids and H<sub>2</sub>O solns. as displacing media and the "true" d. by using He in a gas displacement app. The size of the wood particles has no influence on their d. With org. liquids the apparent d. increases with increasing polarity of the liquids, whereas their ds., viscosities and compressibilities have apparently no effect. "True" ds., as obtained by the He displacement method for different species, heartwood only, are: Alaska cedar, 1.536; Sitka spruce, 1.522; western yellow pine, 1.520; yellow poplar, 1.508; red fir, 1.518; western red cedar, 1.503; redwood (extd.), 1.495; redwood (not extd.), 1.484. These values are smaller than those obtained in H<sub>2</sub>O and larger than those in org. liquids. The differences are due to either adsorption compression, as in the case of H<sub>2</sub>O, or a lack of complete penetration, as with C<sub>7</sub>H<sub>8</sub>. The adsorption compression for H<sub>2</sub>O on wood as calcd. from these differences is 433 atm.; hence the effective thickness of the adsorbed H<sub>2</sub>O film is 30 mol. layers or 9.2 mμ, and the total adsorbing surface per g. of wood 310,000 sq. cm. Microscopically only about 0.6% of this surface is visible (cf. C. A. 23, 1931). An increase of the temp. causes a decrease of the d. value, the cubical temp. coeff. being  $3.7 \times 10^{-4}$  per degree for Sitka spruce and practically equal for all species. Different species show differences in d. due to known variations in chem. compn., because the d. of both cotton and Cross-Bevan cellulose is higher and of lignin lower than that of the wood substance itself. H<sub>2</sub>O solns. cause a decrease of the wood d. with increasing concn. of the solute in a parabolic fashion; the depression is greater and different for electrolytes as compared with nonelectrolytes. Evidently this is a function of the total no. of ions plus undissoc. mols. The exceptionally great depression of KOH

is probably a result of its considerable positive adsorption, while the acids and salts show only a negligible negative or hydrolytic adsorption, resp. The decrease in the apparent d. of wood substance with increasing concn. seems to be caused by the decrease of surface adsorption compression and the decrease in penetration of the soln. into wood. In a similar way, the wood substance is less permeable to highly polarized org. liquids.

J. WIERTELAK

An unusual college monument (BONINE) 8.

**Cement.** AMME-LUTHER WERKE BRAUNSCHWEIG DER "MIAG" MÜHLENBAU- UND INDUSTRIE A.-G. Ger. 476,849, Jan. 28, 1927. Portland cement is colored by mixing and burning it with metallic oxides or salts. Cf. C. A. 22, 4756.

**Cement.** CARL PONTOPPIDAN. Fr. 653,695, May 2, 1928. See Brit. 293,035 (C. A. 23, 1489).

**Cement.** SOC. COMMERCIALE DES CEMENTS DE LA CROISSETTE. S. A. Swiss 131,050, Nov. 1, 1928. A hydraulic cement comprises portland cement (about 10%), slag (about 70%) and lime (about 30%).

**Aluminous cement.** ERNEST MARTIN. U. S. 1,716,527, June 11. Before an aluminous cement-forming mixt. is heated, it is incorporated with a catalyzer consisting of a small proportion at least of NaCl which facilitates the formation of hydraulic aluminates.

**Cellular concrete.** JOHN A. RICE (to Bubblestone Co.). U. S. 1,717,319, June 11. A slurry including foam is used such as may be prepd. from sand, cement and a Ca caseinate compn. and during the preliminary part of the setting period at least, the material is subjected to gas pressure which serves to regulate the size of the air cells in the product.

**Faced concrete units.** WILLIAM R. TUCKER. U. S. 1,716,094, June 4. The facing aggregate is partially submerged in water on the bottom of the mold, the water is allowed to freeze, the mold is filled with cold, dense, freshly mixed concrete, the ice is then melted and the resulting excess water is removed. Cf. C. A. 23, 2265.

**Apparatus for incorporating a foam with plastic materials such as concrete mixtures.** ERIC M. RICKARD and JOHN A. RICE (to Bubblestone Co.). U. S. 1,716,932, June 11.

**Artificial stone.** LUDWIG FIALA. Austrian 112,979, Dec. 15, 1928. The manuf. of artificial stone by pressing or molding a mixt. of blast-furnace slag and CaO is improved by correlating the addn. of water to the mixt. and the pressing or molding of the mixt. so that the slaking heat of the CaO is available during the hardening process.

**Artificial stone.** EMIL TELTSCHIK & Co. Ger. 475,859, Dec. 11, 1927. Articles having the appearance of petrified wood are prepd. from Mg cements with ground ivory nut, mixed with alk. or acid liquids, as filling material.

**Marble substitute.** KAREL ŠRÍCHA, JOHANN KNEIFL and JOSEF HURÁČEK. Swiss 130,650, Aug. 25, 1927. A marble-like surface is obtained by cold coating a smooth plate with a mixt. of Na<sub>2</sub>SO<sub>4</sub>, KCl, water glass, water and coloring matter, and polishing the surface of the layer when dry.

**Building material.** GUSTAVE F. JANLET and OSWALD PARDOEN. Fr. 651,770, May 5, 1928. Powd. asbestos is mixed with a mineral having a lamellar structure, stearin, vegetable gum and linseed oil. To prevent a too rapid hardening by the oxidation of the linseed oil, alc. or ether may be added.

**Porous building material.** GEORG O. RICHTER & SCHÄDEL. Fr. 654,765, May 3, 1928. Activated Al powder which liberates a gas in contact with water is used for making a porous building material.

**Plastic material for building purposes.** BAILEY F. WILLIAMSON (to Stone Homes Process, Inc.). U. S. 1,716,749, June 11. A material which, when set is capable of being sawed and of holding nails, comprises Florida shell rock contg. about 95% CaCl<sub>2</sub> crushed so that about 90% will pass through a screen of between a 1 in. and a 2 in. mesh, with a binder comprising 5-15% each of lime and hydraulic cement.

**Roofing and facing material.** FRANZ WINKLER. Austrian 113,143, Dec. 15, 1928. Material of the known kind prepd. by mixing clay or loam with asbestos fibers and water or waterglass is improved by combing while pasty so that the asbestos fibers lie in one direction.

**Treating sheet roofing material with molten asphalt.** AUGUST E. SCHUTTE (to Flint-Kote Co.). U. S. 1,715,392, June 4. The surface of the sheet material is scraped while immersed in a molten asphalt bath, to remove adhering gas bubbles. An app. is described.

**Floor covering.** KARL SCHNEBLE. Swiss 131,023, Oct. 6, 1927. Addn. to 128,176



(C. A. 23, 2265). Floors are covered by a plastic mass made by mixing cork, kieselguhr, cement and water.

Colored tiles. AMI RAY. U. S. 1,716,706, June 11. A sheet of ferrous metal is subjected, in a closed receptacle, to the action of gas from dry distn. of coal, coated with a water-insol. rust-proofing material such as asphalt and then treated with a finely ground mineral coloring material which is preheated to above the m. p. of the asphalt or like coating and is subjected to pressure to embed it in the asphalt coating with portions exposed to form a surface coloring.

Preservative for wood. GINO FRANCIOSI. Austrian 112,983, Dec. 15, 1928. A mixt. of a coal-tar oil with peat tar is used. Up to one-third of the peat tar may be replaced by lignite tar. The mixt. may be emulsified in an aq. soln. of  $\text{ZnCl}_2$ .

## 21—FUELS, GAS, TAR AND COKE

A. C. FIELDNER

Notes on recent developments in fuel technology. R. WIGGINTON. *Fuel in Science and Practice* 8, 151-2, 201-3(1929).—Brief reviews of the following subjects: the Ruhr coking industry, the origin of petroleum, the W-Mo thermocouple, fuel in Japan, producer gas from waste wood, fluorescence of coals and oil shales.

D. A. REYNOLDS

Fuel tests and plant operation. M. DOLCH. *Proc. 2nd Intern. Conference Bituminous Coal* 2, 425-55(1928); cf. C. A. 23, 3325.—A moisture detn. is proposed, based upon the fact that coal mixed with abs. EtOH causes a change in concn. of the latter, and the amt. of  $\text{H}_2\text{O}$  taken up may be detd. quickly by a cryohydric method, noting the temp. at which a kerosene-EtOH soln. becomes turbid. The method takes 8 mins., as against 45 mins. for the xylene process and about 2 hrs. for the standard drying and weighing detn., and the accuracy attained is excellent. For coal analysis a method claimed to be superior to either the ordinary proximate or ultimate analysis is proposed. About 20 g. of sample, reduced to pea size, is placed in a special steel retort provided with an outlet or delivery tube and a tightly fitting cover carrying an inlet tube reaching to near the bottom of the retort. The retort is heated in a resistance furnace to  $105^\circ$  while N or  $\text{CO}_2$  is passed through it slowly;  $\text{H}_2\text{O}$  expelled is caught and weighed. The gas current is stopped and the temp. is then raised slowly to  $530^\circ$ , and the low-temp. or primary tar and the gas are collected. The distn. is continued to  $1000$ - $1100^\circ$  and the tar and gas are again collected and kept sep. from the above. From analyses of the products collected or from detns. in a calorimeter, their calorific values are calcd. This makes it possible to tell how much of the total heat comes from the gaseous, liquid (tar) and solid (coke) portions derived from the coal, a more valuable kind of information for the power or heating plant manager than results from ordinary analyses. Illustrative calcs. are given.

W. C. EBAUGH

Mining and fuel laboratories at Nottingham. W. H. McMILLAN. *Colliery Guardian* 138, 2201-3(1929).—Description of University College labs. E. J. C.

Fuel problems of the iron and steel industry. EDGAR C. EVANS. *Proc. 2nd Intern. Conference Bituminous Coal* 2, 633-56(1928); cf. C. A. 22, 2534, 2908.

W. C. EBAUGH

The use of methanol and ethanol as fuels in internal-combustion engines. M. LOUIS. *Chimie & Industrie Special No.*, 312-29(Feb., 1929).—Action of heat on the air-fuel mixts.—The formation of aldehydes below  $300^\circ$  is insignificant (not over 0.1%); the production of AcH increases very rapidly from  $400^\circ$  (1.5%) to  $440^\circ$  (8.9%), and much more slowly at higher temps. (10.8% at  $510^\circ$ ); there is a certain concordance between the reduction in the rate of formation of AcH and the production of AcOH, but the resp. amts. of aldehyde and acid show that the aldehyde is not oxidized quantitatively to acid. The curves of production of  $\text{CH}_2\text{O}$  and  $\text{HCOOH}$  show that MeOH is more resistant to the action of heat than EtOH. The curves obtained with EtOH or MeOH contg. 40%  $\text{H}_2\text{O}$  are similar to those of the anhyd. alcs., but the amts. of aldehydes, and especially of acids, are much smaller. The results of corrosion tests on the metals generally used in explosion engines (semi-hard steel, cast Fe, brass, Cu, cast bronze, cast phosphor bronze, Al, duralumin and Mg) are given in detail and lead to the following conclusions: The alcs. do not exhibit any specific corrosion of the metals at high temp., being similar to ordinary gasoline in this respect; acetic and formic acids and aldehydes in the amts. used (1%) cause no appreciable corrosion; as a rule, air alone is somewhat less corrosive than the air-alc. mixts., showing that there is not

only oxidation but also probably carburization; the mechanism of the attack varies with the different metals, and was shown fairly clearly from the photomicrographs (which are given). Corrosion tests in the cold (which are not yet completed) indicate that certain metals, particularly Mg and its alloys and Pb, are fairly rapidly attacked by MeOH, the action being apparently due to a reaction between the metal and MeOH, rather than to oxidation. Hence, while MeOH does not seem liable to corrode the engine parts in use, its storage in metal containers may cause trouble. A. P. C.

**Low-temperature carbonization.** DAVID BROWNLIE. *Petroleum Times* 21, 625-7 (1929).—A discussion of the more interesting retorting processes being used in Great Britain with a brief description of their chief features. M. B. HART

**A new method of low-temperature carbonization applicable to agglutinating coals.** CH. AB-DER-HALDEN. *Chimie & industrie Special No.*, 208-12 (Feb., 1929).—Coals having a very low softening or m. p. can be successfully carbonized without excessive power consumption or excessive production of dust (which would be entrained in the tar and from which it would be difficult to sep.) by first drying at about 200° and then rapidly heating above the softening point (about 500°), which requires that it be heated in thin layers (about 10 mm.). This contention is confirmed by the results of tests (which are given). A lab. retort for carbonizing in accordance with this principle is described, and a com. app. is now being perfected. A. PAPINEAU-COUTURE

**Present status of the technic of the low-temperature carbonization of coal and lignite.** CH. BERTHELOT. *Chimie & industrie Special No.*, 205-7 (Feb., 1929); cf. C. A. 23, 2267.—A brief discussion of the possibilities of utilization of the 3 products obtained by low-temp. carbonization: semi-coke, primary tar, gas. A. PAPINEAU-COUTURE

**Coal in 1927.** F. G. TRYON, O. E. KIESSLING AND L. MANN. *Bur. Mines, Mineral Resources of the U. S. 1927*, Pt. II, 327-509 (Preprint No. 27, published May 18, 1929). E. H.

**Analyses of West Virginia coals.** *Bur. Mines, Tech. Paper No. 405*, 343 pp. (1928). **Geology of coal formations in W. Va.** J. BRIAN EBY. *Ibid* 1-5.—W. Va. coal-bearing rocks belong to the Carboniferous system. The subdivision of the system into 3 series, 2 groups and 13 formations is shown in tabular form. Another table gives the names of the principal coal beds and their thickness. Production of bituminous coal in W. Va. has increased from 42,923,708 long tons in 1910 to 143,509,340 long tons in 1926. **Characteristics and distribution of coals.** J. W. PAUL. *Ibid* 6-8.—The characteristics of the coal from the different fields (Northern, Kanawha, New River, Pocahontas and Tug River, and Kanawha-Thacker districts), their special fields of usefulness, for gas or coke manuf., steam generation, or for domestic heating, and the principal markets to which the different fields ship most of their coal are stated. **Mining methods and transportation.** J. W. PAUL. *Ibid* 9-10. **Analyses of mine samples.** A. C. FIELDNER, H. M. COOPER AND F. D. OSGOOD. *Ibid* 11-191.—Proximate and ultimate analyses, the latter on (1) as received, (2) moisture-free and (3) moisture- and ash-free bases, the heating values in calories and in B. t. u., and when made, the softening temp. of the ash are tabulated by counties for about 3000 mine samples of typical W. Va. coals. Volatile matter runs from 30 to 46% in coals from the northern W. Va. fields, around 13 to 20% for the Southern coal beds; ash from 2.5 to 11% usually between 3 and 7%; B. t. u. per lb. coal from approx. 12,500 to 15,860; S from 0.5 to 5%, many samples below 1%; N 1 to 1.8%; H 4.4 to 5.1%; O 1.8 to 13.7% generally lower than 4%, but certain fields run 5 to 8% O. Fusibility of ash from W. Va. coals varies from the low fusing ash (2000° to 2200°F.) of Sewickly and Pittsburgh coals in the northern fields through medium fusible ash (2200-2600°F.) from Preston Co. coals to the refractory ash (2600° to 3000°F.) of the Pocahontas No. 3 coal. **Description of samples.** C. W. OWINGS AND J. N. GEYER. *Ibid* 192-271.—For some of the coal samples field notes describe the coal bed worked, its characteristics, places where the samples were taken and the general condition of mining; references state pages where analyses are given. **Analyses of delivered coal.** N. H. SNYDER. *Ibid* 272-319.—The relative value of analyses of "mine samples" and of "delivered samples," the methods of sampling in each case and interpretations of the analyses are discussed. Proximate analyses, individual and av., calorific values, date and place of delivery are tabulated for some 1700 items showing: (1) yearly av. analyses of samples representing coal delivered for Government use; analyses of samples collected by samplers from the Bureau of Mines; (2) as coal was being loaded into railroad cars at mine tipples, some washed coals included; (3) at tidewater shipping piers as coals were being loaded into vessels; (4) at the sampling plant of the Sewalls Point Coal Exchange (Inc.) at Sewall point, Va. W. W. HODGE

**The maceration method in the microscopic examination of coal.** H. BODE. *Berg-*

*Tech.* 21, 205(1928); *Fuel in Science & Practice* 8, 86-90(1929).—Maceration of bituminous coals is best effected by oxidation with Schulze's soln. ( $\text{KClO}_3$  in  $\text{HNO}_3$ ), and removal of the ulmic substances thus formed by soln. in  $\text{NH}_4\text{OH}$ . This treatment isolates the waxes, resins, fats, cutin and fusain of coal. Microscopic examn. of these residual substances enables the classification of the coal according to both rank and constitution.

D. A. REYNOLDS

Some aspects of the hydrogenation of coal. J. IVON GRAHAM. *Proc. 2nd Intern. Conference Bituminous Coal* 2, 456-84(1928).—A review, with special attention to work done at the Mining Research Lab., Univ. of Birmingham. "The extension of our knowledge of the action of H under high pressure upon coal, either with or without a catalyst, has . . . given justification for the optimistic view held by the supporters of this method of treatment in regard to the eventual com. success of the process. The surest way to realization of this lies . . . in the continuation of researches in which coal is not considered simply as a black mass contg. so much C, H, O, etc., but rather as a mixt. of mol. complexes, each of which will behave in a definite way when subjected to hydrogenation, distn. or oxidation."

W. C. EBAUGH

A new method for the direct determination of the best temperature of hydrogenation for bituminous coals. J. P. AREND. *Proc. 2nd Intern. Conference Bituminous Coal* 2, 485-90(1928).—Coal in powd. form has its expansion curve detd. by means of a sample 25 mm. high placed in a 15-mm. diam.  $\text{SiO}_2$  tube, heated in an elec. furnace, and connected with a lever multiplying device. The first deviation of the expansion curve indicates the first appreciable attack of hydrogenation. The mol. decompn. progresses, and at the temp. when the rate of expansion reaches its max., hydrogenation gives the greatest yields in oils and always the max. of light gasoline. Curves showing the total expansion and the expansion velocity are given. The very pronounced max. of the latter indicates the most intense moment of mol. decompn., and at the corresponding temp. the hydrogenation yields the max. of oils and light gasoline. After the temp. of the max. speed of decompn. has been passed, the light gasolines diminish quickly.

W. C. EBAUGH

Microscopical and chemical investigations of the banded coals of the Ruhr district. H. WINTER. *Glückauf* 64, 653-8(1928); cf. *C. A.* 22, 3973.—Previous work on the banded constituents of coal, their effects on coking properties, plant and other particles found in them and the differences between the English and German systems of naming the bands are briefly discussed. The microscopic appearances of the bands and the microscopically distinguishable entities as found in the vitrain, clarain, durain and fusain of five different types of coals, from high-volatile gas to lean, from the Ruhr district are described and illustrated with 35 photomicrographs. The % available H and the ratio of C to H in the vitrain, clarain, durain and fusain of the 5 coals are tabulated. Conclusions are that the dull coal does not always have a higher content of H and of available H than does the bright coal; the C:H ratio of the pure coal rises in each of the 4 visible constituents with increasing age of the coal, being, resp., for vitrain, clarain, durain and fusain, 16.4, 15.8, 18.8 and 26.3 for one of the gas coals and 22.7, 22.1, 23.2 and 31.7 for the bands in the lean coal. It is recommended that "Vitrain" be universally adopted in Germany to designate all the bright coal (Glanzkohle). The structure of vitrain arises from the embedding of plant residues in an at one time colloidal soln. of humic matter which later went through coagulation processes. The structure and origin of fusain can also be explained through gasification processes (swelling and coking) where the decompn. temp. was reached through the spontaneous heating in sep. places in the coal peat layers.

W. W. HODGE

Investigations on the coking qualities of the layer materials of bituminous banded coals of the Ruhr district. R. KATTWINKEL. *Glückauf* 64, 79-83(1928).—As a basis for later screening and flotation tests, many coking expts. were carried out with fat and gas coals from the Ruhr district. The appearances of the layers of vitrain, clarain, fusain and durain in the coals and seams from which they were obtained are described. Photomicrographs of the 4 constituents after being ground, their % moisture, volatile matter, coke, ash and sp. gr. are given. The gas coal supplied the durain; the fat coal furnished the vitrain, clarain and fusain. Crucible coking tests were made using synthetic mixts. of 2 constituents, viz., vitrain + fusain, 100% + 0%; 90% + 10%; 80% + 20% . . . . to 100% fusain. Similar series of tests were made using clarain + fusain, durain + fusain, vitrain + durain, clarain + durain, vitrain + clarain. Expts. were also performed to det. the differences in coking properties of the fines and the coarse particles of each of the 4 constituents, alone and in 10 and 20% mixts. Photo-illustrations show the great variations in appearances of all the coke buttons formed. The caking index nos. (*C. A.* 20, 1510, 3344) for the cokes are tabulated and results discussed.

Clarain had much less coking power than vitrain; hence clarain must be a transition material toward durain. Fusain and durain had practically no coking properties, but did not hinder the coking property in a mixt. with bright coal, unless present in amts. greater than 20%. Screen seprns. of the materials powd. for analyses gave 86% fines (dust) for fusain, and only 35% dust for the vitrain, clarain and durain. The coking power of the "dust" in the latter 3 portions of coals is markedly greater than that of the coarse particles, but with fusain the reverse holds true: the coarse particles are somewhat coking but the dust is totally devoid of this property. If 10 to 20% fusain dust is mixed with vitrain and clarain, a poor coke always results, especially so the larger the amt. of clarain present. Good coking coals consist chiefly of vitrain and a fusain content up to 20% has only slight effect on its coking property. A bibliography follows the article.

W. W. HODGE

Pulverized coal on gas-fired boilers. A. E. DURAM. *Blast Furnace & Steel Plant* 17, 882-3, 888(1929).—Recent improvements in furnace design by the control of dust and slagging result in high efficiency. Quick response and low operating cost make it an ideal supplementary fuel.

E. J. C.

Explosions in coal mines and permitted explosives: Historical record. FREDERIC L. NATHAN. *Fuel in Science & Practice* 8, 256-95(1929).—A review of European exptl investigation of mine explosions.

D. A. REYNOLDS

A new method for the determination of melting processes in ash. KARL BUNTE. *Proc. 2nd Intern. Conference Bituminous Coal* 2, 231-40(1928).—Ash is composed of (a) ash ingredients, rich in alkalies coming from vegetable matter forming the coal originally, (b) deposited ingredients, i. e., calcareous, siliceous and argillaceous substances, (c) infiltrated ash constituents, like carbonates, sulfates and  $\text{FeS}_2$  and (d) stony material. These 4 kinds of ash may have a completely different character, and it is not evident that the behavior of ash is characteristic for a certain coal bed or district. After burning coal carefully, one can recognize stones and slate distinct from dispersed ash. In prepg. samples grinding and mixing are used, increasing the probability that ash constituents may influence one another to a great extent, in comparison to technical firing. The melting process depends upon the surrounding atm. and oxidation conditions. Detg. ash fusions by the cone method is therefore of little value. A new method involves the use of a C-resistance furnace with a vertical tube into which is put a sample 25 mm. in diam. and height, with provision for regulated increase of temp. A mech recording device shows changes in vol. of the sample until it becomes 7 mm thick. Fusion curves so obtained are divisible into 3 groups, showing fundamentally different melting processes. Curves are given for different types of ash. In some ash samples halting points were shown to be due to secondary reactions of the constituents, especially the fusion of alk. from the org. part with the mineral substances present. Behavior of ash in practice corresponds with that indicated for it by the curve.

W. C. EBAUGH

Gas purification in relation to coal sulfur. F. W. SPERR, JR. *Proc. 2nd Intern Conference Bituminous Coal* 2, 37-64(1928).—Can coals of high-S content be used for gas-making without the necessity of washing them? By the use of liquid purification plants, e. g., Seaboard process of absorption of  $\text{H}_2\text{S}$  in 1-3%  $\text{Na}_2\text{CO}_3$  soln. and later regeneration of absorbent by blowing air through it, it is often possible to employ coal contg. more than 1.5% S for gas-making, rather than natural or prepd. coals contg. 1% or less. If high org. S (chiefly  $\text{CS}_2$  and  $\text{C}_2\text{H}_4\text{S}$ ) be present in gas, a S-recovery process employing Fe compds., Ni catalyst or "Thylox" may have to be used, or scrubbing with petroleum oil resorted to, as these methods are efficient not only for S purification, but also for other impurities like HCN, etc. A discussion of costs shows that even producer gas can sometimes be purified so as to make gas from high-S coal suitable for use in the glass, steel, refractories and other industries. In comparing the relative economies of removing S by coal washing or by the application of liquid purification to producer gas made from unwashed coal, the principal question is the efficiency of the coal-washing process. The latter will be much the cheaper where it can accomplish a reduction of the coal S to 1% or less. However, many coals cannot be washed with the necessary efficiency, and there are many cases where such coals can be obtained at a low enough cost to warrant their use for making producer gas from which  $\text{H}_2\text{S}$  is removed by liquid purification.

W. C. EBAUGH

New developments in gas making. R. S. McBRIDE. *Chem. Met. Eng.* 36, 359-61(1929).

E. J. C.

New gas works at St. Pölten. F. SAHLING. *Z. oesterr. Ver. Gas- u. Wasserf. 69*, 73-8(1929).

A. S. CARTER

Using blast-furnace gas for heating. A. J. EBNER. *Iron Age* 123, 1699-1700

(1929).—Its employment in steel plant furnaces is suggested by European experience. Limiting conditions are outlined. E. J. C.

Carburetion of combustible gas with butane and propane-butane mixtures with particular reference to the carburetion of water gas. WILLIAM W. ODELL. *Bur. Mines, Bull.* 294, 94 pp. (1929).—See *C. A.* 22, 1034. E. C. M.

Blau gas. L. DAL PRATO. *Russ. min. met. ital.* 69, 24-7 (1929).—The manuf. of Blau gas is described, as are some of its industrial uses other than as a fuel, as in the production of synthetic EtOH ( $\text{CH}_2\text{Cl}$ )<sub>2</sub>, and other org. compds., through ethylene; and as a substitute for acetylene in metal cutting or welding processes. A. W. C.

Flue-gas losses. WILHELM GUMZ. *Feuerungstech.* 17, 109-12, 123-5 (1929).—The % of heat lost in the flue gas from coal may be represented within 0.5% by the formula:  $[0.0051 + (0.6281/C)]t$ , where  $C$  is the  $\text{CO}_2$  percentage in the flue gas by Orsat analysis, and  $t$  is the temp. difference between flue gas and air. Similar formulas apply to brown coal, but the consts. are affected by the water content. E. W. T.

Problems in natural gas research. N. A. SMITH AND E. L. RAWLINS. *Oil & Gas J.* 27, No. 51, 210, 213-4 (1929).—Several of the more important opportunities are outlined in which research should be carried out in the field of producing and utilizing natural gas, such as water encroachment, measuring, transmission leakage, more efficient utilization through manuf. of alcs. and other chemicals, liquefied gas and carbon black. In order to carry out such an extensive program in an efficient way, it is recommended that a large organization like the Natural Gas Division of the American Gas Assoc. direct the work. M. B. HART

Recoverable hydrocarbons from natural gas and their relation to the composition of commercial motor fuel. STEWART P. COLEMAN. *Trans. Am. Inst. Chem. Eng.* 20, 79-93 (1928).—All hydrocarbons higher than  $\text{C}_4\text{H}_{10}$  should be recovered as motor fuel. The proportion of  $\text{C}_4\text{H}_{10}$  recovered should depend upon compn. of the gas, relative value of  $\text{C}_4\text{H}_{10}$  as fuel gas or motor fuel, cost of recovery and relation between  $\text{C}_4\text{H}_{10}$  content of the final motor fuel blend and evapn. loss. E. M. SYMMES

Hydrogen sulfide. D. L. JACOBSON. *Oil & Gas J.* 27, No. 46, 116, 119, 122 (1929).—The removal of free  $\text{H}_2\text{S}$  from natural or refinery gases by the Koppers Co. Seaboard process brings them mostly within legal requirements for com. purposes. The troubles caused by this impurity in pipes, valves, engines and compressors are avoided by washing the gases with a weak soln. of  $\text{Na}_2\text{CO}_3$ , according to the Seaboard process. Other processes developed by this company for the recovery of S are much more expensive and not economical for natural gas or refinery gas. M. B. HART

New cracking method is perfected. J. A. YUNKER. *Oil & Gas J.* 27, No. 51, 111, 236, 238 (1929).—Natural gas is broken down completely into  $\text{H}_2$  and C black in a water-gas generator by blasting a coke bed to a temp. above that of the decompn. of  $\text{CH}_4$ . The air is then shut off and natural gas introduced instead of steam. Because of the increasing demand for  $\text{H}_2$  for  $\text{NH}_3$  synthesis, the process is believed valuable. M. B. HART

Cracking of tar acids from coal. JACQUES C. MORRELL AND GUSTAV EGLOFF. *Proc. 2nd Intern. Conference Bituminous Coal* 2, 580-613 (1928).—The sources, compn., methods of treatment and uses of tar acids are outlined, and data obtained from an extensive series of expts. upon such acids and their distn. products follow. W. C. E.

The reducing zone of normal flame. MARCEL PIETTE. *Acetylene J.* 30, 115-6 (1928).—Attention is called to the so-called gray zone, hitherto overlooked in the literature, between the inner cone and the outer envelope of the oxy-acetylene welding flame. This zone, contg. unburned CO and  $\text{H}_2$ , exists when speed of departure exceeds speed of combustion. It is never clearly outlined and disappears when  $\text{O}_2$  is in sufficient excess. It has marked reducing effects. F. S. GRANGER

Ultra-violet spectroscopy of the flames of motor fuels. IV. The practical utilization of a small quartz-prism spectrograph for the determination of lead tetraethyl in gasoline. G. L. CLARK AND H. A. SMITH. *J. Phys. Chem.* 33, 659-75 (1929); cf. *C. A.* 21, 2779.—The flexibility, accuracy and simplicity of a small quartz-prism spectrograph have been demonstrated, as applied to chem. and industrial problems, particularly the estn. of  $\text{PbEt}_4$  in gasoline and of its effect upon a detonation flame. A simple and inexpensive Hg arc and housing adapted for spectroscopic use, and a successful combined still burner for liquid fuels are described; they serve as permanent equipment for analyses of this type. In the system of analysis developed from the small spectra, 5 g. of Pb per 1,000,000 cc. of gasoline has been detected. From the standard spectra, made from solns. of known concn., it is possible to estimate larger quantities with a high degree of accuracy. Seventeen lines in the flame spectrum of Pb have been identified and measured; one additional emission line has been discovered in the flame spectrum of

Pb for the first time ( $\lambda$  2167). The band positions, structures and intensities have been compared for flames, under exactly the same conditions, of gasoline, gasoline plus ethylene bromide, gasoline plus  $\text{PbEt}_4$ , gasoline plus aniline, benzene, alc., acetone, ether and carburetted water gas in the cones of primary, secondary and tertiary combustion. Further evidence is obtained that the detonation suppressor action of  $\text{PbEt}_4$  is not due to this compd. as such but to the process of its decompn. and to the disintegration products.

A. WHITE

Improvements in sieves and dust removers. C. FÖRDERREUTHER. *Arch. Wärme-wirt.* 10, 213-7(1929).—In a discussion of the factors affecting the action of dust removers, F. suggests: an intimate mixt. of powd. coal and air in a burner may be secured by splitting the stream of powder and air, and directing the streams against each other in an enlarged space; dust could be better removed if inertia and gravitation could be made to assist each other; the removal of dust from a centrifugal separator could be accomplished by letting it pass through perforations in the wall, along with a little air. A few small-scale tests are described, and some suggested designs are shown.

ERNEST W. THIELE

Brief survey of modern coking plants. W. N. WARWICK. *Colliery Guardian* 138, 2199-2200(1929).

E. J. C.

Dry quenching plants for coke. R. W. MÜLLER. *Z. oesterr. Ver. Gas Wasserfuch.* 68, 221-3(1928).—The intensive development of processes for the dry quenching of coke and certain organizations which are promoting such processes, especially the licensing agreements of the firm of Sulzer, are mentioned. Outline elevation drawings, descriptions of construction and mechanisms used and methods of operation are given of dry quenching plants for 2 types of gas works: one with 10 vertical retorts producing 100 tons of coke per day, the other a battery of ovens with a daily capacity of 200 tons of coke. The hot coke is conveyed by car or travelling grab-bucket crane and emptied into a quenching chamber equipped with a quickly closing lid which is hermetically sealed by a water valve. Calcns are given for the steam generated with the heat saved by quenching coke in this manner. A no. of cities are named whose gas works have installed dry quenching units. For the Zurich Gas Works with a yearly production of 50,000 tons of coke, by adopting dry quenching of the coke an annual saving of 2200 tons of fuel is estd.

W. W. HODGE

Metallurgical coke, gas coke and semi-coke from coking coals. M. DOLCH AND E. RINDTORFF. *Glückauf* 64, 301-9(1928).—A searching investigation was made on the properties of cokes produced from coking coals by different processes. Kinds of cokes used were: 2 metallurgical, 1 gas (Frankfurt-West process) and 2 semi-cokes (made 1 each in K. S. G. and C. T. G. retorts). The mixts. of coals used in making the cokes, plants in which manufactured, analyses of the cokes for % moisture, ash, fixed C. and volatile matter, and heating value of each coke and of the pure coals from which each coke was derived are given. Volatile matters of the high-temp. cokes were 0.1, 0.2 and 0.4%; of the semi-cokes, 12.3 and 18.7%. Marked differences in the fuel properties of the cokes may be due to the % volatile matter, but that assumption would not always hold. Sep. portions of each coke were crushed, placed in a quartz tube, heated in an elec. furnace and the gases evolved collected in fractions: below 550°, to 750° to 950° to 1150-1200°. The app. is described with the aid of drawings (C. A. 22, 2047). The yields and analyses of each of the fractions of gases are tabulated; these are also shown graphically. Calcd. to 100 kg. coke the yields of gas in cu. m. and the proportion of the total heating value of the coke contained in the gas evolved were, resp., for 2 metallurgical cokes, 5660, 1.9; and 1620, 0.54; for the gas coke 4710, 1.5; and for 2 semi-cokes, 33,100, 19.0; 24,100, 11.8. Approx. 75% of the gases from the high-temp. cokes came off above 950° and were mostly H and CO; from the semi-cokes considerable gas was evolved below 750° and again above 950°, composed mainly of H, CO, and 10-11%  $\text{CH}_4$ . Heating values of the gases from the high-temp. cokes were: 2492, 2385 and 2414; from the semi-cokes 3875 and 3386 cal./cu. m. Tables of data and graphs show the relative reactivities of 4 of the cokes as detd. by their reduction at 800° of  $\text{CO}_2$  to CO: semi-coke 82.7, gas coke 68.9, metallurgical cokes (Stinnes) 60.6 and (Prosper) 45.3. The fineness of the cokes had a marked effect on their reactivity, and no definite relation was observed between a cokes reactivity and either the proportion of the total heating value of the coke contained in the gas evolved or its yield of gas. The apparent sp. gr. of the cokes varied from 0.83 to 0.87, but 7 photographs of cokes of natural size and 7 photomicrographs of cokes at low magnifications show decided differences in the cellular structure of the cokes. In further investigations on cokes the making of thin microscopic sections may yield valuable data as to the changes taking place during the coking processes.

W. W. HODGE

**Experiences with the modern coke-oven installations of the Ruhr district.** W. GOLLMER. *Erdöl u. Teer* 5, 134-5, 150-2, 167-9, 187-9(1929).—The enlarging of oven capacity and reduction of carbonization time have brought about an immense increase in output, and the coördination of oven units to exhaustive utilization of the auxiliary equipment, and the extensive mechanization of operation, an increase in economy.

F. S. GRANGER

**The function of coke in the cupola.** R. HAY. *Foundry Trade J.* 40, 403(1929).—The function of coke in a cupola is to give by its combustion a very high temp. to a narrow zone in the cupola just above the tuyère level. The efficient use of coke in a cupola depends, not only on the ash content and phys. state of the coke, but also on the proper cupola design for the admission of the correct amt. of air to burn the coke.

DOWNS SCHAAP

**New process for briquetting coke.** L. M. JOHNSTON AND J. L. FARRELL. *Oil & Gas. J.* 27, No. 46, 188, 210, 212(1929).—Petroleum coke is pulverized to 30-60 mesh, metallic particles being removed by an electromagnet, mixed with acid sludge and the mixt. fed into a briquetting press of the roll type where pillow-shaped briquets of 3-4 oz. are formed. The briquets are conveyed to a carbonizing furnace where at 350-1100°F. the volatile matter is driven off, and the coke transformed into a clean metallic structure. The carbonized briquets show practically no increase in S content.

M. B. HART

**Steam production at a by-product coking plant.** C. H. NEWBY. *Colliery Guardian* 138, 2109-11(1929).

E. J. C.

**Experiments on a cremating furnace.** HANS KELLER. *Arch. Wärmewirt.* 10, 218-20(1929).—Details of temp. and of coke and air consumption in a crematory are given, together with a discussion of the heat quantities involved.

E. W. T.

A photoelectric smoke recorder (VEDDER) 4. Use of blast-furnace and coke-oven gas in open-hearth furnaces (LEAHY) 9. Results of investigations to establish the cause of the corrosion of sheet metal by motor fuels (WAWRZINIÖK) 9. The corrosion of metals and light metals by liquid fuels (SCHMIDT) 9. Combustion of rigidly dried carbonic oxide-O mixtures (BONÉ) 2. He in New Zealand [in gas wells] (FARR, ROGERS) 18. Viscous oils (Fr. pat. 654,850) 22. Furnaces [for coking of bituminous products] (Fr. pat. 653,942) 1. Apparatus for introducing materials into high-pressure vessels, particularly coal into hydrogenation vessels (Ger. pat. 476,396) 1. Device for determining the quantity of dust in gas currents (Ger. pat. 475,604) 1. Hurdles or grates for gas purifiers (Ger. pat. 476,352) 1. Apparatus for distilling mineral oils and tars in several steps (Fr. pat. 654,729) 22. Distilling petroleum, tar, oils, etc. (Fr. pat. 654,054) 22. Emulsifiers and stabilizers (Fr. pat. 655,044) 22.

BERTHELOT, CH.: *Les houilles, leur marché, leur preparation mécanique, leur utilisation chimique.* Paris: J.-B. Baillière et fils. 350 pp. F. 24.

SCHWARTZKOPFF, H.: *Beitrag zur Klaerung der Frage, wie die Asche nach Menge und Art im Kohlenstaub Enthalten ist, und Welche Wege Gegeben sind, sie Trockenmechanisch zu Beseitigen.* Berlin: V D I Verlag. 24 pp. M. 2.50.

**Liquid fuels from gases.** CURT EPNER. Fr. 654,449, May 19, 1928. Liquid motor fuels are obtained from  $\text{CH}_4$ ,  $\text{C}_2\text{H}_6$ ,  $\text{C}_4\text{H}_{10}$ , etc., coming from "cracking" operations, coke ovens, or low-temp. distn., by passing the gases through an a. c. field of high tension, and frequency above 500, preferably of the order of 10,000 periods at a temp. beyond the b. p. of the products obtained. The product may be fractionated, hydrogenated or polymerized. Cf. C. A. 23, 2020.

**Motor fuel.** SOC. INTERNATIONALE DES COMBUSTIBLES LIQUIDES. (Deutsche Bergin A.-G. für Köhle und Erdölchemie, applicants in Germany). Fr. 653,133, Apr. 20, 1928. Oils, particularly for motor fuel, are extd. by heating fecal matter and liquid manure under pressure in the presence of H and with the addn. of alk. oxide of Fe as a catalyst.

**Low-temperature distillation of fuel.** ADELSON ABRASSART. Fr. 653,932, May 7, 1928. See Brit. 290,205 (C. A. 23, 959).

**Destructive distillation.** METALLGES. A.-G. (Otto Hubmann, inventor). Ger. 476,318, Oct. 24, 1924. The fuel descends a shaft into which are introduced a heating gas for the distn. and a gas for cooling the coke produced. The gas inlets are arranged close together at a point within the shaft, and gas outlets are provided and operated so that the distn. gases and some of the cooling gas are withdrawn at the top of the

shaft, while the cooling gas is withdrawn for the most part from the side. The used cooling gas may be further heated and used for the distn.

**Fuel briquets.** STANLEY W. CARPENTER and GERALD N. WHITE. Ger. 476,971, Aug. 16, 1925. A binding material for fuel briquets is obtained by treating undecomposed vegetable matter with an aerobic fermentation and treating the resulting pectin compds. with the necessary amt. of alkali to form a colloidal soln.

**Briquets.** DEUTSCHE ERDÖL-A.-G. Ger. 475,864, Aug. 7, 1926. A method and app. for drying and cooling fuel briquets by one or more air currents are described.

**Briquetting fuels, ores, etc.** KOKS- UND HALBKOKS-BRIKETTIERUNGS, G. M. B. H. (Ludwig Weber, inventor.) Ger. 476,319, July 25, 1926. The binding agent is a mixt. of clay with decalcified and evapd. sulfite cellulose lye. It may be prepd. by mixing the constituents in water so that an emulsified product results, or alternatively the constituents may be mixed dry with the material to be briquetted and the mixt. kneaded in an atm. of steam. The pressed briquets may be rendered more resistant by heating in known manner.

**Berginization of carbonaceous material.** SOC. INTERNATIONALE DES COMBUSTIBLES LIQUIDES. (Deutsche Bergin A.-G. für Köhle und Erdölchemie, applicants in Germany.) Fr. 653,134, Apr. 20, 1928. Lignite, tars, etc., contg. water, are heated under pressure without elimination of water, with the addnl. oil necessary for berginization; the water is displaced and forms a layer which may be removed and the remaining paste is removed to a high-pressure vessel for treatment. Cf. C. A. 23, 690.

**Low-temperature carbonization.** I. G. FARBENIND. A.-G. Fr. 653,024, Apr. 19, 1928. Coal, particularly coal dust or in fine grains, is mixed with hydrocarbons or their derivs. or the hydrogenation products of coal, tar, mineral oils, etc., or the distn. or extrn. products of coal, and carbonized at a low temp. The carbonization may be carried out in the presence of a catalyst.

**Method and apparatus for compressing and then pulverizing bituminous raw materials.** OTTO SPRENGER PATENTVERWERTUNG JIROTKA. Swiss 130,654, Mar. 29, 1926. Details are given.

**Coal-distilling plant with inner heating.** METALLGESELLSCHAFT A.-G. Ger. 476,580, Oct. 25, 1925. Details of operation are given.

**Drying tubes for lignite.** BÜTTNER-WERKE A.-G. (Carl Ludwig and Fritz Zerres, inventors). Ger. 475,801, Aug. 4, 1927. The tubes are arranged in concentric layers round a central chamber and the heating gas circulates among the interstices of the tubes.

**Hydrocarbon derivatives.** I. G. FARBENIND. A.-G. Fr. 654,316, May 15, 1928. Oxygenated, sulfurized hydrocarbons are prepd. from the waste gases from the hydrogenation of coal, tars, mineral oils, etc., by carrying these gases with the addn. of O or S or compds. yielding them, preferably in the presence of catalysts, to a temp. not sufficiently high to cause decompn. of the  $\text{CH}_4$ . The products may be polymerized to compds. of high mol. wt. An example is given of the recovery by washing with benzene of the waste gases from the hydrogenation of coal and treatment thereof with  $\text{MnO}_2$  at  $700^\circ$ . The product contains higher fatty acids,  $\text{AcOH}$ ,  $\text{AcH}$  and various ketones, also propylene and butylene.  $\text{MnO}_2$  may be replaced by  $\text{ZnO}$  or  $\text{CaO}$ .

**Hydrocarbons and derivatives.** I. G. FARBENIND. A.-G. Fr. 654,534, May 22, 1928. Processes in which gases or vapors are directed on to solids for the production of hydrocarbons or their derivs. such as in the hydrogenation under pressure of coal, etc., or in the carbonization of bituminous substances, the gases or vapors are given a speed in the reaction chamber higher than they would have by simple passage through the chamber, either by imparting a pulsatory movement, or by leading back a part of the gas in the chamber in a closed cycle.

**Apparatus for the automatic removal of gases from wells.** AKTIEN-GESELLSCHAFT ADOLF GUGGENBUHL VORM. GUGGENBUHL & MÜLLER. Swiss 131,303, April 19, 1928.

**Gas purification.** HARALD NIELSEN and BRYAN LAING. Fr. 654,769, May 5, 1928. Dust particles are sep'd. from gas coming from the distn. of coal by spraying with tar or like liquid the walls of the usual cyclone or other dust separator.

**Treatment of coke-oven gases.** C. OTTO & CO., G. M. B. H. Ger. 476,226, Feb. 8, 1928. A part of the gases passing to the cooler is sprayed with water so that their temp. is reduced to  $150^\circ$ , and these gases are mixed with the unsprayed remainder so that the mixt. passing to the cooler has a temp. of  $200\text{--}300^\circ$ . In this way sufficient tar oil is pptd. in the conduit leading to the cooler to avoid incrustations of thick tar, while sufficient tar oil is left in the gases to avoid blockage of the cooler by  $\text{C}_{10}\text{H}_8$ .

**Coal gas.** GAS FÜR LINDE'S EISMASCHINEN A.-G. Ger. 476,844, May 23, 1927. Gases from the distn. of coal have the  $\text{NH}_3$ , N oxides and water vapor removed before



being sepd. by cooling to low temps., to avoid the formation of explosive or resinous compds. The sepg. app. is composed of Cu or Cu alloys coated with Sn.

**Gas from coal and oil.** WALTER E. TRENT (to Trent Process Corp.). U. S. 1,716,673, June 11. Comminuted coal and oil are formed into a bonded mass through which a plurality of passageways are provided and heated gases are directed through these passageways and against their walls to effect vaporization and gasification. An app. is described.

**Apparatus for producing oil gas.** FRANK T. NEWITT, SIMEON H. LAPLANT and LEWIS I. TURNER (to L. T. N. Mfg. & Development System). U. S. 1,715,775-6, June 4. Structural features.

**Mixed water gas and oil gas.** WILLIAM D. WILCOX. U. S. 1,716,676, June 11. Fuel in a generator is blasted with air admitted at an upper level of the generator and the blast gases are passed downwardly and into a regenerator which is heated by burning the blast gases in it; steam is passed into the base of the generator and up through the fuel bed for an interval to generate water gas and reduce the temp. of the blasted fuel, the resulting water gas is withdrawn from the upper end of the generator, and steam and oil are then admitted to the upper part of the regenerator and vaporized by passing downwardly through the regenerator; the heated steam and oil mixt. is then passed through the heated fuel in the generator to form mixed water gas and oil gas which are withdrawn from the upper part of the generator. An app. is described.

**Water gas and oil from oil shale.** AUGUST SCHILLING, RICHARD SACHSE, DIMITRI LIAMIN and THEOFIEL CALLAERT. U. S. 1,716,667, June 11. A confined body of shale is ignited at its upper surface, air for combustion is admitted above the ignited body and steam and combustion gases are drawn downwardly through the shale to produce water gas and hydrocarbon vapors; the water gas is employed to generate steam used in the process, hydrocarbons are condensed and recovered and the supply of air for combustion is automatically controlled in accord with the temp. of the water gas. An app. is described.

**Increasing the viscosity and lubricating power of oils.** I. G. FARHENIND. A.-G. Fr. 654,314, May 15, 1928. The viscosity of tar oils, mineral, vegetable or animal oils is increased and their lubricating power increased by the addn. of montan wax bleached by oxidation.

**Gas producers.** WALTER M. CROSS. Fr. 653,424, Apr. 25, 1928. See Brit. 289,491 (C. A. 23, 692).

**Gas producer for inferior quality fuel.** STETTINER CHAMOTTE-FABRIK A.-G. Fr. 654,345, May 15, 1928.

**Gas-producer construction for motor vehicles.** EARL N. PERCY. U. S. 1,716,084, June 4.

**Gas retort.** HEINRICH KOPPERS (to Koppers Development Corp.). U. S. 1,716,643, June 11.

**Vertical gas retorts.** INDUGAS INDUSTRIE & GASOFEN-BAUGES M. B. H. Fr. 654,369 and 654,370, May 16, 1928.

**Combined wet and dry closure for gas retorts or chambers.** INDUGAS IND. & GASOFEN-BAUGES M. B. H. Ger. 476,582, June 1, 1924.

**Chamber retort for producing gas and coke.** C. OTTO & Co., G. M. B. H. Ger. 476,512, Aug. 3, 1927. The method of operation is described.

**Method of filling a chamber furnace for the production of gas and coke.** C. OTTO & Co., G. M. B. H. Ger. 476,729, Nov. 10, 1927. Details of the method are given.

**Absorbing ammonia and hydrogen sulfide from gases.** I. G. FARHENIND. A.-G. (Christian Hansen, inventor.) Ger. 476,382, Jan. 9, 1927. See Can. 284,390 (C. A. 23, 691).

**Elimination of hydrogen sulfide from gases.** FRANZ FISCHER. Fr. 653,503, Apr. 27, 1928. See Brit. 289,885 (C. A. 23, 780).

**Desulfurizing gases.** I. G. FARHENIND. A.-G. (Gustav Wietzel, Josef Jannek, and Fritz Fried, inventors.) Ger. 476,286, Apr. 15, 1927. Gases contg. reducing constituents are freed from S compds. by mixing them with sufficient O to oxidize the S compds. and passing the mixt. over a catalyst comprising an alloy or compd. of an earth metal or heavy metal with a "metalloid" (other than O) of the 4th, 5th or 6th periodic group. An amt. of  $\text{NH}_3$  sufficient to combine with the  $\text{SO}_2$  or  $\text{SO}_3$  is supplied (if not already present) before or after the oxidation. Suitable catalysts are the carbides, silicides, nitrides, phosphides and sulfides of Fe, Ni, Co, Cu and Al, or alloys of these metals with Ti, Zr or Sb. Examples are given. A suitable catalyst can be prepd. also by impregnating coke with a concd. soln. of  $\text{Ni}(\text{NO}_3)_2$  and heating.

Apparatus for desulfurizing distillation gases. SOC. INTERNATIONALE DES PRO-  
CÉDÉS PRUDHOMME-HOUDRY. Fr. 654,240-1-2, Oct. 6, 1927.

Distillation of tar. THE BARRETT CO. Fr. 653,524, Apr. 27, 1928. See Brit.  
289,832 (C. A. 23, 961).

Apparatus for cooling coke. STEWART R. ILLINGWORTH (to Illingworth Car-  
bonization Co., Ltd.). U. S. 1,716,727, June 11. Structural features.

Charging coke ovens. C. OTTO & CO., G. M. B. H. Ger. 476,021, June 5, 1927.  
The coal is discharged from a wagon by a no. of worms, each communicating with a  
distributing tube, the tubes extending into the oven through holes in the top and being  
adapted to move to and fro. An indifferent gas, e. g., waste oven gases, is supplied  
under pressure to the distributing tubes during the charging.

Regenerative coke oven with horizontal flues. SEMET-SOLVAY CO. Ger. 476,020,  
June 19, 1925.

## 22.-PETROLEUM, LUBRICANTS, ASPHALT AND WOOD PRODUCTS

W. F. FARAGHER

Petroleum in 1927. G. R. HOPKINS AND A. B. COONS. Bur. Mines, *Mineral  
Resources of the U. S. 1927*, Pt. II, 511-93 (preprint No. 28, published May 25, 1929).

Petroleum refineries in foreign countries, 1929. ANON. *Bur. Foreign & Domestic  
Commerce Trade Information Bull.* No. 623, 44 pp.(1929).

Petroleum as a raw material for chemistry and the chemical industries. I.  
PINEAU. *Chimie & industrie* Special No., 123-7 (Feb., 1929).—An address outlining the  
progress already made in the extn. of valuable products from petroleum and the work  
still to be done.

Discrepancies in calculating petroleum cargoes. W. MÖLLER-FERNAU. *Petro-  
leum Times* 21, 589-90(1929).—Various discrepancies in the system of calcg. petroleum  
cargoes are pointed out and the only correct figures for petroleum tables presented.

Hydrogenation of petroleum promises revolutionary development for American  
industry. S. D. KIRKPATRICK. *Chem. Met. Eng.* 36, 332-3(1929).

The fractional distillation of petroleum products. A. FICHOUX. *Chimie & in-  
dustrie* Special No., 234-51 (Feb., 1929).—A general description of the present status  
of the industry in those countries having a well-developed petroleum-refining industry,  
the progress of the last few years, and the present tendencies and possibilities of im-  
provement.

Theory of cracking petroleum. H. A. WILSON. *Proc. Roy. Soc. (London)* A124,  
16-45(1929).—Previous papers designated as EI and EII (cf. C. A. 22, 902 and 4335,  
resp.), give the foundation upon which a method is now constructed for calcg. the  
liquid, vapor, gas, gasoline and unsatd. fractions, which come out of the reaction cham-  
ber in a cracking operation. It is assumed (justified by agreement between calcd. and  
observed results) that the oil remains in the reaction chamber long enough for chem.  
equil. to be established. The theory has been developed only to include oils composed  
of paraffin and unsatd. hydrocarbons. It is assumed that no coke is formed, though  
the formation of a percentage of coke can easily be taken into account. The compn.  
of the oil entering the reaction chamber is represented by  $CH_{x_1}$ , in which  $x_1$  is the number  
of H atoms to one atom of C. The compn. of the liquid coming out of the chamber  
is represented by  $CH_{x'}$ , and that of the vapor by  $CH_{x''}$ . From the previous argument,  
in the vapor of a mixt. of unsatd. and paraffin hydrocarbons in equil., the molar quan-  
tities of the members of each homologous series present form a geometric series for  
which the ratio between successive terms is  $f$ . The wt. of oil coming out as liquid is  
represented by  $q$ . The molar fraction of the vapor which is composed of unsaturates  
is represented by  $y$ . EI gives charts from which can be obtained values of  $f$  for vapor  
and liquid at a given temp. and pressure. The value of  $y$  in both phases can then be  
calcd. from a formula worked out in EII. From  $f$  and  $y$ ,  $x$  for the vapor and  $x'$  for the  
liquid can be calcd.; and with  $x_1$ ,  $x$  and  $x'$  known,  $q$ , the fraction of liquid, may be  
found. The theory of chem. equil. is now shown to be the same for the mixt. of liquid  
hydrocarbons as shown by EI for the vapor. The percentages by wt. of the individual  
paraffins in the vapor of compn.  $CH_{x_1}$ , in which  $x$  varied from 2.2 to 2.8, were calcd.  
in EI. By the same formula the percentages of all the hydrocarbons in the liquid

have now been calcd. for values of C from 1 to 15 and of  $x$ , 2.05, 2.10 and 2.15. The "gasoline" fraction is the sum of the percentages of compds. from  $C_5$  to  $C_{12}$  plus enough  $C_3H_8$  and  $C_4H_{10}$  to give a mixt., the vapor pressure of which is equal to 1 atm. at 104° F. The remainder of the 4 lightest hydrocarbons constitutes the "gas" in the liquid. Percentages of gasoline and gas in vapor and in liquid were tabulated for pressures of 7.5, 15, 30 and 60 atm. and for temps. from 750° to 1050° F. After applying a correction for unsaturates in the gasoline and gas, a table of 16 sections was compiled, giving the calcd. fractions of liquid, gasoline, gas and unsaturates from 4 hypothetical oils cracked at 4 different pressures and at from 6 to 9 different temps. The 4 oils correspond in compn. roughly to heavy crude or fuel oil, crude oil, gas oil and kerosene. In liquid-phase cracking the ratio of gasoline to gas is between 7 and 3 and increases with the pressure. The calcd. value of the unsatd. fraction increases with the temp. rapidly and decreases with the pressure. In vapor-phase cracking the theoretical yield of the unsatd. fraction when the oil is just vaporized is: from oil  $CH_{2.25}$ , 17%; oil  $CH_{2.2}$ , 26%; oil  $CH_{2.15}$ , 32%; oil  $CH_{2.1}$ , 39%; it is nearly independent of the pressure. At higher temps. it theoretically approaches values of 39, 41, 43 and 46% from oils of the same compn. The effect of coke formation upon the compn. of the oil produced and upon equil., the time necessary for the oil to remain in the reaction chamber, and the influence of returning the formed gas to the oil are discussed. EMMA E. CRANDAL

**Some aspects of cracking.** A. E. DUNSTAN AND R. PITKETHLY. *Ind. Eng. Chem.* 21, 643-7(1929).—The formation of coke in cracking is minimized in an invention described by which the oil is kept in highly turbulent motion by surges rapidly imparted to it by a pump as it moves through the heating coil. Liquid-phase cracking may be regarded as the means of quantity production; cracking in the vapor phase yields the material for blending to produce a high-antiknock motor fuel. A lab. app. for observing directly what takes place in cracking has been devised. EMMA E. CRANDAL

**Cracking plant.** P. TRUSDELL. *Natl. Petroleum News* 21, No. 14, 73-6(1929).—The tube and tank units of the S. O. Co. (Ohio) run 1500 hrs. without a shutdown because of the use of 3 soaking drums used in rotation. When coke becomes troublesome, a drum is disconnected and cleaned. The fact that no repairs have been made on tubes or furnace is ascribed to the low temp. in the combustion chambers (max. 1300°F.). Three products are made: (1) gasoline, with a yield of 62% on the gas oil charged, which needs only a caustic-soda wash for finishing and has a very low gum test (5 mg. per 100 cc.) and high antiknock quality; (2) furnace distillate, which is between a heavy kerosene and a light gas oil; and (3) a viscous fuel oil of 6 A. P. I. gravity. The yield of gasoline can be increased by recycling the second cut.

M. B. HART

**Patent protection and cracking industry development in Germany.** HANS MAGNUS. *Erdöl u. Teer* 5, 207-8(1929).—A review.

F. S. GRANGER

**Cracking in the vapor phase.** N. F. SEDUIKH. *Neftyanoe Khozaystvo* 15, 677-91 (1928).—A complete review of American methods; a number of references are given.

A. A. BOEHLINGK

**Modern liquid-phase cracking plant has become a whole refinery.** G. C. HARGROVE. *Natl. Petroleum News* 21, No. 18, 76, 78(1929).—Liquid-phase cracking has been developed so that units built by the M. W. Kellogg Co. using a standard Cross hot-oil recirculating cracking plant for direct charge or together with a high-pressure pipe still can handle every type of cracking stock and also use crude oils with normal gasoline content, producing straight-run gasoline, kerosene and cracked gasoline in one continuous operation. The most recent development is a non-residuum operation, which will give an increased yield from practically any liquid cracking stock.

M. B. HART

**Design new type of refinery still.** L. DE FLOREZ. *Oil & Gas J.* 27, No. 50, 154, 162, 164-5, 169(1929).—An outline of general still construction with regard to heat utilization is followed by a description of a vertical tube still in which the combustion flame heats first a series of tubes by radiation and then another series by convection. The heat is more evenly distributed and the burning of tubes through excessive local heating is avoided. The air-fuel mixt. can be adjusted to the theoretical proportion necessary for complete combustion.

M. B. HART

**The refining of light oil with silica gel at Rochester, N. Y.** RUFUS E. FULREADER. *Ind. Eng. Chem.* 21, 691-3(1929).—Light oil from the manuf. of coal gas and water gas at Rochester, N. Y. is freed from gumming and S compds. by percolating upward through silica gel after removing whatever  $H_2O$  is present by means of a min. of  $H_2SO_4$ . The process is made continuous by the use of two percolators in turn. The spent gel is reactivated by gas heat and superheated steam.

EMMA E. CRANDAL

**The distillation of Esthonian oil shales.** ANON. *Petroleum Times* 21, 665-6 (1929).—A shale distn. method developed by Kulshinsky, Technical Director of Eesti Kivioli, Ltd., consists in placing oil shale in small wagonettes which are passed through a tunnel oven. Oil gases generated in the tunnel are sucked back through the shale whereby distn. is effected. Permanent gases are burnt in the furnace of the oven.

M. B. HART

**Chemical composition of crude oils.** A. N. SAKHANOV AND R. A. VIRABYANTZ *Neftyanoe Khozyaistvo* 15, 316-38(1928); cf. *C. A.* 23, 507.—A critical review is given of methods for the detn. of unsatd., aromatic, naphthene and paraffin hydrocarbons in gasoline and kerosene fractions of crude oil.

A. A. BOEHLINGK

**Refining crude oil from Dundee sand.** W. F. FARAGHER AND J. C. MORRELL. *Oil & Gas J.* 27, No. 49, 108, 110, 113, 116, 121(1929).—The difficulty of refining Dundee crude oil in a profitable manner led to the development of a method which produces a satisfactory motor fuel by blending the straight-run light naphtha with the cracked gasoline made from the topped crude oil or from the reduced crude oil. The cracking process also makes possible a complete utilization of the hitherto unprofitable crude oil. Numerous distn. tests of crude oil and distillates are reported.

M. B. HART

**Propylene from crude oil.** A. DOBRYANSKII, B. ARKHANGELSKII AND R. STEPAN YAN. *Neftyanoe Khozyaistvo* 15, 46-52(1928).—Cuts from gasoline (148-156°), kerosene (198-202°), solar oil (initial b. p. 305°), spindle oil (initial b. p. 350°) and cylinder oil (initial b. p. 500°) were cracked by passing 100 g. at a rate of 0.31 g. per min. through a Cu tube heated to 550-750°. The gas was collected over H<sub>2</sub>O and analyzed. Solar oil gave the highest yield of C<sub>3</sub>H<sub>6</sub> (about 13 g.), the optimum temp. being 600-650°. The C<sub>3</sub>H<sub>6</sub> is decomposed at higher temp., increasing the C<sub>2</sub>H<sub>4</sub> formation. The yield of C<sub>3</sub>H<sub>6</sub> could not be increased by using Ni or Fe as catalysts but Cu acted favorably. The gasoline cut (250 g.) was passed 5 times in succession through the heated tube, giving 23 g. of C<sub>3</sub>H<sub>6</sub> at 550°. The highest yield was obtained in the third cycle.

A. A. BOEHLINGK

**Absorption oils in plant operation.** A. J. HUTCHINSON. *Oil & Gas J.* 27, No. 51, 208, 214(1929).—Vapor pressure calcns. show that light oils are best suited for absorbing media in gasoline-absorption plants. Fractionating columns are necessary to prevent part of the absorbing oil from distg. over with the gasoline. Some plants now use oil of 325°F. initial b. p. and 425°F. end point.

M. B. HART

**Oil-field emulsions. III.** L. C. UREN. *Natl. Petroleum News* 21, No. 20, 61-2, 64-6, 68(1929); cf. *C. A.* 23, 3336.—A discussion of methods and equipment used in breaking crude-oil emulsions, including gravity settling, heat treatment, elec. treatment, chem. treatment, centrifugal process and filtration methods.

M. B. H.

**Specification fuel oil produced from heavy cracked residuum.** R. T. GOODWIN. *Natl. Petroleum News* 21, No. 20, 80-1, 83-5(1929).—The Goodwin process of stabilizing cracked fuel oil produces Bunker oil and a carbonaceous residue, which can be used as a briquet binder or refinery fuel. Spent H<sub>2</sub>SO<sub>4</sub> or acid oil is added to the partly cooled oil in accurately measured quantity and under carefully regulated conditions. The thoroughly agitated mixt. passes into a Dorr flocculator, and then into a Dorr thickener from which Bunker C fuel or a better grade is obtained as overflow, while the sediment is removed by a pump. By filtering the latter through a Dorrco continuous vacuum filter, half of the stabilized oil in this slurry may be recovered.

M. B. HART

**Fuel oil from Dubbs units.** W. T. ZIEGENHAIN. *Oil & Gas J.* 27, No. 47, 130 (1929).—The White Star Refining Co. runs hot residuum from its Dubbs units to 3 vertical 10' × 20' settling tanks in which C settles; the clear oil is drawn off and marketed as fuel oil. The C residue is ground and fed by gravity to burners.

M. B. H.

**Mazout distillation in Germany and a new process developed by the Azneft for extracting oil out of heavy bottoms.** K. V. KOSTRIN. *Neftyanoe Khozyaistvo* 15, 658-63(1928).—A Baku-Sabunchi mazout vacuum-distd. (80% vacuum) in batch stills gave the following fractions: gas oil (distd. off separately), 17.7%; heavv solar oil, 18.3%; machine oil distillate, 25.2%; cylinder oil distillate, 4.4%; "redistillate," 3.4%; bottoms, 29.0%; and loss, 2%. The fractions were collected separately. The redistillate was then redistd. under vacuum, whereby up to 25% of H<sub>2</sub>O was sep'd. (all H<sub>2</sub>O from the steam used in the vacuum distn. of the above fraction is collected in the redistillate, the other fractions being free from H<sub>2</sub>O), and the following oil fractions were recovered: 74.8% of solar oil, 9.3% of spindle oil, 10.1% of machine oil, 3.9% of residue, the loss amounting to 1.9%. The f. p. of the machine oil is -6° to -7° as compared with -15° for the same oil distd. at Baku; this difference is due, as shown by expts., to the small quantity of steam used in the distn. in Germany as against 50% and more used in Baku. The following process was then worked out in Baku: Heavy

lubricating-oil bottoms were mixed with solar oil (1:1) and the mixt. was distd., giving 22.4% of machine-oil distillate and 43.3% of residue, the distillate having a sp. gr. of 0.9145, a viscosity of  $E_{60}$  6.86, and a flash (Brenken) of 209°. Three % of  $H_2SO_4$  was needed for the treating process to produce a good quality of machine oil. The solar oil acts evidently as a carrier for the heavy oil contained in the bottoms.

A. A. BOEHTLINGK

**Products of decomposition in the distillation of mazout.** S. A. VISHETRAVSKII. *Neftyanoe Khozyaistvo* 14, 769-71(1928).—Some cracked oils are obtained on distg. mazout in vacuum stills, more in the first and last stills than in the intermediate ones; this is due to overheating the oil. The following remedies are recommended: the use of more steam, which acts as a vapor carrier, to keep down the oil temp., or the atomization of the oil in the stills, whereby the oil, due to thin layers present, is not so likely to be overheated.

A. A. BOEHTLINGK

**The rotary dispersion of mineral oils of various origins.** EDMOND VELLINGER. *Chimie & industrie Special No.*, 268-70(Feb., 1929).—The rotary dispersion of mineral oils varies with both their origin and treatment. When an active oil is distd. in a cathodic vacuum, the dispersion of the fractions increases with the distn. temp. When the values of the rotary power of the fractions are plotted on a Darms diagram, the straight lines obtained for some oils converge to a common pt. of intersection, showing that the oil contains two active compds., one of which is *l*-rotatory; the proportions of the two compds. vary with the distn. temp. When the straight lines do not converge to a common pt., the oil probably contains more than 2 active compds. with different dispersions.

A. PAPINEAU-COUTURE

**The chemical refining of mineral oils.** G. HUGEL AND M. STONESCU. *Chimie & industrie Special No.*, 302-4(Feb., 1929).—The action of concd.  $H_2SO_4$  varies according to the nature of the asphalt: soft asphalt is dissolved by  $H_2SO_4$  or conversely it causes the  $H_2SO_4$  to dissolve in the oil; slow chem. reactions which change the properties of the asphalt ensue. Hard asphalt is flocculated by concd.  $H_2SO_4$ ; this reaction is irreversible, as is shown by the fact that the asphalt has lost the power to form a colloidal soln. with the oil. In addn. to this flocculation there are chem. reactions, particularly oxidation reactions; the liberation of  $SO_2$  is much greater from hard asphalt solns. than from soft asphalt solns.

A. PAPINEAU-COUTURE

**Mineral oil and graphite lubricate press fits.** N. L. REA. *Power* 69, 782(1929).—Use of lard oil for pressing shafts into couplings or rotors results in rusting. Pure mineral oil plus graphite give good results.

D. B. DILL

**Predicting viscosity of lubricating oil blends.** O. G. WILSON, JR. *Natl. Petroleum News* 21, No. 21, 87-9, 91-2(1929).—The viscosities of all 3 possible binary combinations of high- and low-viscosity paraffin and naphthene oils were studied; formulas and charts are presented for the calcn. of the viscosities for blends of each type. M. B. H.

**Trend toward higher viscosity oils for motors not justified.** CH. MCLEAN. *Oil & Gas. J.* 27, No. 51, 206, 232, 235(1929).—The tendency to use higher viscosity motor oils is not justified and is caused only by sales competition. Oil of very high viscosity causes considerable loss of power and may even cause wear of tight-fitting bearings due to its inability to penetrate to the bearing surfaces. Present motor construction favoring seven-bearing crankshafts does not require such a heavy oil as that using three-bearing crankshafts. Crankshaft ventilation decreases diln. of the oil. M. B. HART

**West Texas may furnish important lubricating oil raw material.** P. TRUESDELL. *Natl. Petroleum News* 21, No. 19, 69, 71-2(1929).—Lubricating oils of high viscosity at high temps. can be manufactured cheaply from crude oil produced in Pecos County, West Texas. This crude oil contains no wax but has many characteristics of a paraffin-base crude. The gasoline produced by direct distn. has a high antiknock value (equiv. to 47% of benzene in mixt. with Pennsylvania straight-run gasoline). The crude oil is practically free from salt and completely free from  $CaCl_2$  or  $MgCl_2$ . Most of the S is present in a rather stable form.

M. B. HART

**Analysis of lubricating oils by distillation in cathodic vacuum.** P. ISELTIN. *Chimie & industrie Special No.*, 265-7(Feb., 1929).—I. suggests that a distn. test in cathodic vacuum be applied to lubricating oils as ordinary distn. is used for many petroleum products. The app. used consists of an Engler flask with condenser, a receptacle provided with a distributing valve so that the fractions can be received in 6 small beakers, and a Hg-vapor pump giving a vacuum of 0.001 mm. Means were subsequently added for passing into the oil a current of an inert gas (preferably H) to insure agitation and uniform distn. The amt. of gas introduced may be regulated so that the abs. pressure beyond the receiver does not exceed a few tenths of a mm. An experienced operator can carry out only 2 distns. a day, but the method could probably be developed for

technical control. It can readily distinguish between different types of oils, such as transformer oils, machine oils, crankcase oils and cylinder oils. The method is described in detail. A. PAPINEAU-COUTURE

The care of switch oil. W. E. WARNER. *Power Plant Eng.* 33, 473 (1929).—Decomposition which takes place in service with the liberation of C and H requires that a very highly refined mineral oil with high dielectric strength, high specific resistance and low sludging value be used. Switch oil should be inspected frequently and, if traces of  $H_2O$  or C are present, the oil should be treated for their removal. D. K. FRENCH

New reconditioning apparatus for transformer and switch oil. F. RUEDEBERG. *AEG Progress* 5, 129-32 (1929).—Portable oil-reconditioning plant, types KEF 10 and KEF 50 of AEG are described. Schematic layout and working diagrams are given. E. I. S.

Investigation of cooling oils in making gears. A. WALLICHS AND K. KREKELER. *Z. Ver. deut. Ing.* 73, 643-7 (1929). A. WHITE

Insulating oils. N. A. BUTKOV. *Izvestiya Teplotekh. Inst. (Trans. Thermo-Tech. Inst.)* (Russia) 1928, No. 6, 3-6.—See C. A. 23, 966. A. A. BOEHLINGK

Transformer insulating materials. W. HAMMERSCHMIDT. *Z. angew. Chem.* 42, 523-5 (1929).—Properties of colophonium, rosin-oil and American asphalt, and of mixtures made from them, were studied and results plotted on 3-coördinate system. Graphs are given for the relative insulating power, dropping (softening) point and acid number of such mixtures. The influence of the rosin oil on such substances is marked. W. C. E.

Testing transmission grease. E. N. KLEMGARD. *Petroleum Age* 23, No. 5, 30-1, 75-7, 79 (1929).—Methods are indicated for determining the consistency of transmission greases. Factors bearing on the consistency of greases and the nature of differences between transmission grease and transmission oil are pointed out. Testing apparatus is shown and described. M. B. HART

Control gasoline and fuel oil quality in cokeless cracking process. P. TRUESDELL. *Natl. Petroleum News* 21, No. 18, 69-70, 72-3 (1929).—A new cracking plant of the Gulf Refining Co. at Bayonne, N. J. uses the principle of heating by radiation according to the de Florez method. No coke is formed; cracking can be conducted to yield products of vapor-phase or liquid-phase type; and the quality and characteristics of the products can be changed by varying temperatures and pressures. Any type of charging stock can be used. M. B. HART

Determination of unsaturated and aromatic hydrocarbons in light oils and motor spirits. ALEX. B. MANNING. *J. Chem. Soc.* 1929, 1014-20.—The percentage of aromatic hydrocarbons in light oil or motor spirits containing no unsaturated hydrocarbons may be determined by vaporizing the sample completely at atmospheric temperature in a U-tube and drawing the vapor into a potash bulb filled with 98%  $H_2SO_4$  containing 2 or 3% of  $Ag_2SO_4$ . When unsaturated hydrocarbons are present, the aromatic and unsaturated hydrocarbons are both absorbed in a nitrating mixture consisting of 98%  $H_2SO_4$  containing 10% of  $HNO_3$  or 16% of  $KNO_3$ . The tube is weighed and nitration is completed by heating 2-3 hours on the water bath. The nitroaromatic hydrocarbons are extracted with 10% NaOH solution and the corresponding percentage of aromatic hydrocarbons calculated by a factor, which is an average for  $C_6H_6$ ,  $C_7H_8$  and  $C_8H_{10}$ . Unsaturated hydrocarbons are found by difference. In both methods a correction must be applied for paraffins absorbed by the acid. EMMA F. CRANDALL

Determination of unsaturated and aromatic hydrocarbons in gasoline. S. S. NAMEYKIN AND E. A. ROBINSON. *Neftyanoe Khozyaistvo* 14, 775-9 (1929).—All unsaturated hydrocarbons are removed from gasoline when it is treated with 98%  $H_2SO_4$  at 0° for 30 minutes. This was proved by detours of the I number and the O number. Aromatic hydrocarbons are only partly removed at the above temperature when treating with 97-97.5%  $H_2SO_4$ ; the extent of the removal depending on the character of the aromatic hydrocarbons; it is lowest for benzene, which is followed by toluene and xylene. A. A. BOEHLINGK

Vapor pressure data on motor gasoline. OSCAR C. BRIDGEMAN, ELIZABETH W. ALDRICH AND HOBART S. WHITE. *J. Soc. Automotive Eng.* 24, 488-97 (1929).—A method and apparatus are described for removing dissolved gases from dried gasolines without apparently affecting the  $C_4H_{10}$  content and otherwise changing their composition. Vapor-pressure measurements, using a small bubble of vapor, were made on 10 motor gasolines over a considerable temperature range. The normal bubble points of the gasolines are the same as the 10% A. S. T. M. temperature (corrected for loss). Initial liquid temperatures in the A. S. T. M. distillation were also found to be equivalent to the 10% A. S. T. M. vapor temperatures and to the normal bubble points obtained from the vapor-pressure data. M. B. H.

Studies on the inflammability of hydrocarbons. A. JEUFRÖY. *Chimie & industrie* Special No., 271 (Feb., 1929).—Sheet metal (Fe or Ni) 0.5 or 1 mm. thick and 45 mm. X 140 mm. was heated electrically, the temperature being measured by an Fe-constantan thermo-

couple soldered to the metal. The temps. to which the metal had to be heated to cause ignition of drops of various liquids were as follows:  $C_6H_6$ , 760°;  $C_7H_8$ , 765°; EtOH, 690°; light tar distillate, 650°; cyclohexane, 607°; Roumanian aviation gasoline, 585°;  $C_8H_{18}$ , 585°;  $C_{10}H_{22}$ , 585°;  $C_7H_{16}$ , 570°; gasoline from shale oil, 560°; green mineral oil, 525°; yellow mineral oil, 505°; and dimethylcyclohexene, 445°. The same ignition temps. were obtained by vaporizing the liquids and passing the vapors over the heated metal.

A. PAPINEAU-COUTURE

**Antiknock ratings of pure hydrocarbons.** S. F. BIRCH AND R. STANSFIELD. *Nature* 123, 639(1929).—Nash and Howes (*C. A.* 23, 3337), thought that a discrepancy between their antiknock rating of trimethylethylene and diamylene and that of B. and S. (*C. A.* 23, 2813) was explained by the fact that the figures in the one case represented the effect of 20% concn. by vol., in the other, 20% by wt. This was disproved by B. and S., as well as the suggestion that they had not taken sufficient precaution to prevent the difference in volatility between the 2 hydrocarbons from influencing their results through the air-fuel ratio. Both parties favor the use of a common supply of the hydrocarbons to be tested.

EMMA E. CRANDAL

**Treatment and utilization of liquid [petroleum] fuels.** AUFHÄUSER. *Z. Ver. deut. Ing.* 73, 651-2(1929).

A. WHITE

**U. S. motor fuel specifications.** P. TRUESDELL. *Natl. Petroleum News* 21, No. 13, 64(1929).—The wide difference of operating conditions for motor fuels requires an elastic specification in order to insure easy starting and to prevent vapor lock. This is possible by omitting the lower temp. limit for the 10% point, leaving the Government the right to set a lower limit on special orders. Since, according to general opinion the 10% point governs both vapor lock and easy starting, a further step is suggested by fixing the upper limit for the 10% point. For the rare cases where a gasoline of such specifications would not serve the purpose, domestic aviation gasoline can be used. Troubles arising from state specifications for winter gasoline are pointed out.

M. B. HART

**U. S. motor specifications.** H. C. DICKINSON. *Natl. Petroleum News* 21, No. 13, 65(1929).—A change in the specifications for U. S. motor fuel is necessary on account of a better knowledge of the properties required. The proposed new specification with a lower limit on the 10% point in order to prevent vapor lock represents closely the av. of gasolines of highest volatility listed in the last Bureau of Mines survey and excludes no acceptable com. product. An optional raising of the lower limit will meet the special requirements.

M. B. HART

**Determining value of pipe coatings.** K. H. LOGAN. *Oil & Gas J.* 27, No. 50, 33, 87, 90, 94(1929).—Accelerated tests for pipe coatings as conducted by the Bur. of Standards consist in exposing the central portion of the coated pipe to moist soil and measuring from time to time with a microammeter the current produced by a dry cell. The resistance of the coating is then computed.

M. B. HART

**Carbon black.** ANON. *Refiner Natural Gasoline Mfr.* 8, No. 2, 87 (1929).—The General Atlas Chemical Co. produces "Gastex," a carbon black, by a smokeless process from sulfurous natural gas. "Gastex" has but 50% of the color of carbon black produced by the channel process; apparent density, 0.384; actual sp. gr., 1.82; ash, 0.08%; moisture, 0.1-0.3%; and acetone ext., 0.2-0.6%.

M. B. HART

**Fire protection by inert gases.** L. C. UREN. *Natl. Petroleum News* 21, No. 17, 59-60, 63(1929).—Practical tests have proved that the fire hazard in oil reservoirs is considerably reduced by keeping the vapor space constantly filled with scrubbed boiler-flue gas, which is supplied at a pressure slightly above atm. The excess gas escapes through standpipes of the reservoir. Explosions are possible only if the tank atm. contains less than 10% of flue gas.

M. B. HART

**Ceresin.** EWALD A. ALTMANN. *Chem.-tech. Ind.* 29, 337-9(1928).—This is a short description of the various products usually sold under the name of ceresin.

A. L. H.

**Emulsified asphalts (asphalt emulsions).** EDGAR S. ROSS. *J. Soc. Chem. Ind.* 48, 112-4T(1929).—A complete review.

A. J. MONACK

**Report on asphalts in south central part of Department of Boyaca.** E. GROSSE. *Bol. minas y petroleos* (Bogota) 1, 99-113(1929).—Petroleum asphalt deposit located at Boyaca, Macheta, Tuta, Paipa, Pesca, La Puerta, Sogamoso, Topaga, Corrales and San Francisco mine are described individually. They are regarded as oxidized petroleum.

E. I. S.

**Modern wood distillation.** M. M. QUINN. *Chem. Markets* 24, 594-6(1929).

E. J. C.

Notes on recent developments in fuel technology (WIGGINTON) 21. Chemistry

of bituminous highway construction; petroleum asphalt (HUBBARD) 20. A new method for the direct determination of the best temperature of hydrogenation for bituminous coals (AREND) 21. Ethanolamine soaps (TRUSLER) 27. Ultra-violet spectroscopy of the flames of motor fuels. IV. The practical utilization of a small quartz-prism spectrograph for the determination of PbEt<sub>2</sub> in gasoline (CLARK, SMITH) 21. Adsorption phenomena and decolorizing earths (VALLI-DOUAIU) 18. Chemistry of the cracking process (SACHANEN, TILICH'EV) 10. Pyrogenic decomposition of aromatic compounds with H under pressure in the presence of a mixed catalyst (IPAT'EV, ORLOV) 10. Purifying oils with liquid SO<sub>2</sub> (Ger. pat. 476,464) 13. Hydrocarbons and derivatives (Fr. pat. 654,534) 21. Hydrocarbon derivatives (Fr. pat. 654,316) 21. Water gas and oil from oil shale (U. S. pat. 1,716,667) 21. Revivifying spent clarifying and decolorizing agents (U. S. pat. 1,715,535) 13. Storage tank with a "breather roof" for holding volatile liquids (U. S. 1,716,947) 1. Automatic vent for "breather roofs" for volatile oil storage tanks (U. S. pat. 1,716,950) 1. Oil for use on leather (U. S. pat. 1,715,892) 29. Steam-heated apparatus for gravity separation of oil and water (U. S. pat. 1,716,934) 1. Increasing the viscosity and lubricating power of oils (Fr. pat. 654,314) 21.

BAILEY, I. W., AND SPOEHR, H.: *Role of Research in the Development of Forestry in North America*. New York: The Macmillan Co. 118 pp. \$1.50.

*Standard Methods of Testing Petroleum and Its Products*. 2nd ed. London Inst. of Petroleum Technologists. 7s. 6d. net.

*Purification of petroleum, etc.* REFINERS, LTD. Fr. 653,833, May 3, 1928. See Can. 284,602 (C. A. 23, 970).

*Distilling petroleum, tar, oils, etc.* OTTO ELSTERMANN and ANTON BAUMHÖR. Fr. 654,054, May 10, 1928. A construction of distg. plant having distn. chambers superimposed in a column is described.

*Converting petroleum oils.* WALTER M. CROSS (to Gasoline Products Co.). U. S. 1,717,007, June 11. Oil is heated in a coil and then collected in a larger mass while under pressure sufficient to maintain the oil in liquid phase; a combustion-supporting gas such as air or O is added to the body of oil to raise its temp. above that of the oil in the heating coil. App. is described. Cf. C. A. 23, 968.

*Cracking petroleum oil.* CARBON P. DUBBS (to Universal Oil Products Co.). U. S. 1,716,306, June 4. After introducing oil to a still, a portion of the oil is passed to succeeding stills, the temp. of which is progressively higher; vapors from each still are independently discharged to a reflux condenser and reflux condensates produced in one still are passed directly to a succeeding still of higher temp. An arrangement of app. is described. Cf. C. A. 23, 273.

*Cracking petroleum, etc.* MICHAEL MELAMID. Fr. 653,102, Apr. 19, 1928. Petroleum, petroleum products or tars and the like are converted into products of lower b. p. by injection along with steam into gas producers contg. hot coke or coal and in which the formation of water gas has already commenced.

*Hydrocarbons.* LASZLO AUER. Fr. 652,796, Oct. 4, 1926. Substances contg. unsatd. hydrocarbons have their viscosity increased or diminished by reacting with electrolytes such as mineral or org. acids, their metallic salts, or organo-metallic compds. Heat and pressure may be employed. The reacting mass may be submitted to the action of ultra-violet rays. In an example, linseed oil, colza oil or mineral oil is heated to 300-350° under reduced pressure with Co linolate and KCNS. The products obtained find application in the *varnish, rubber, soap and candle industry*.

*Purifying hydrocarbons.* THOMAS B. KIMBALL. Fr. 654,860, May 25, 1928. See Brit. 291,379 (C. A. 23, 1260).

*"Cracking" hydrocarbons.* IRA W. HENRY. Fr. 654,622, May 21, 1928. Liquid or fluid hydrocarbons are submitted to the action of an oscillating electromagnetic field of high frequency, without sparking. Blocks of refractory material in elec. contact with one another are fixed in the space contg. the liquid and forming a secondary short-circuit. H and O obtained by dissocn. of superheated steam are introduced into the retort.

*Cracking hydrocarbons.* SINCLAIR REFINING Co. Ger. 475,836, Mar. 8, 1925. The oil is distd. under pressure and is vaporized in pipes heated by flue-gases. The pipes are supplied from the lower part of a container having a sieve and a layer of absorbing material. As the oil above the sieve becomes rich in tar, it is removed and fresh oil added so that the tar content never approaches satn. point. Cf. C. A. 23, 3569.

*Cracking hydrocarbon oils.* JOHN C. BLACK. U. S. 1,715,980, June 4. In order



to crack crude oil residuum with production of a relatively small quantity of low b. p. hydrocarbons, a larger quantity of hydrocarbons of higher b. p. and a residuum suitable for use as fuel oil, the residuum is passed through a series of cracking coils under pressure and at a temp. sufficient to "lightly crack" it; further destructive decompn. is prevented by the introduction of a cooler hydrocarbon oil into the final passes of the last cracking coil. An arrangement of app. is described. Cf. C. A. 23, 2290.

**Cracking hydrocarbon oils.** RUDOLPH C. OSTERSTROM and CARY R. WAGNER. Fr. 654,282, May 15, 1928. In cracking hydrocarbon oils the vapors are raised almost instantaneously to a conversion temp. about 535°. The oil is first heated to 315–420° and then suddenly to 535°, the conversion being completed in less than 2 secs. above this temp. and at a pressure of 2 kg. per sq. cm. Steam is added to the vapors before heating to 535°, and a metal oxide having 2 stages of oxidation such as FeO is used as catalyst. An app. is described.

**Apparatus for cracking hydrocarbon oils.** LUIS DE FLOREZ (to Texas Co.), U. S. 1,715,643, June 4. Vaporizing pipes extend downwardly in a heating chamber with their portions which are most highly heated of less cross sectional area than the portions which are less highly heated; material under treatment is supplied through the less highly heated to the more highly heated portions. Various other structural features of the app. also are described.

**Apparatus for refining hydrocarbon oils by filtration through fuller's earth.** ELMER H. PAYNE (to Standard Oil Co. of Ind.). U. S. 1,716,974, June 11.

**Apparatus for treating hydrocarbon oils with aluminum chloride.** WILLIAM F. DOWNS. U. S. 1,716,372, June 11. A still is provided with a propeller-blade stirrer near its bottom and agitating devices above this in the main portion of the still and is connected with a condenser contg. filtering material. Various structural details are described.

**Apparatus for distilling hydrocarbon oils under pressure.** LYMAN C. HUFF (to Universal Oil Products Co.). U. S. 1,716,136, June 4. Steam is fed first through conduits exterior to a still bottom and protecting it from undue heating by combustion gases, the steam thence passes to conduits within the still and adjacent to its bottom and is discharged through perforations in the last-mentioned conduits so that the steam flows against the inner surface of the still bottom and prevents deposition of coke deposits.

**Vacuum distillation of hydrocarbon oils.** JOHN C. BLACK. U. S. 1,717,002, June 11. In order to produce, under reduced pressure, a reduced lubricating oil stock, with scpn. of an intermediate distillate and lower boiling hydrocarbons and water, from a mixt. contg. these, such as crude paraffinic oil distillate, the reducing and distg. operation is effected under a partial vacuum greater than 24 in. Hg; the mixt. is circulated through heating tubes and an evaporator, a portion of the hydrocarbons is heated to vaporizing temp. and steam is introduced; a sufficiently reduced pressure is maintained to avoid decomposition or cracking of the hydrocarbons; lower b. p. hydrocarbons are passed into a fractionating tower together with the steam and brought into counter-current with condensate of the intermediate distillate; lower b. p. hydrocarbons and water are separately condensed and collected. App. is described.

**Distilling hydrocarbon oils by heat from a submerged combustion burner within the oil.** CARLETON ELLIS (to Ellis-Foster Co.). U. S. 1,716,433, June 11. An app. is described.

**Method and apparatus for the distillation of bituminous materials.** JOHANNES SCHULTE. Ger. 476,660, Dec. 17, 1926. Details of arrangement are given.

**"Sweetening" hydrocarbon oils.** MAX G. PAULUS (to Standard Oil Co. of Ind.). U. S. 1,716,973, June 11. In order to remove S compds. from hydrocarbon oils they are treated with H<sub>2</sub>S and then with "doctor"; the entire treatment is carried out with exclusion of air. App. is described.

**Cracking heavy oils.** JENKINS PETROLEUM PROCESS CO. Fr. 653,916, May 5, 1928. Gasoline is obtained by cracking heavy oils by circulating them rapidly by forced circulation in a tubular heater while imparting a whirling movement to the oil so that at each passage through the tubes the crude oil is heated only a little at a time and the loss of heat from one passage to the next is negligible so that the temp., pressure, dispersion of solids and liberation of gasoline vapors are const. throughout the heater.

**Fractionating shale-oil vapors and generating power.** CLARENCE F. HIRSHFELD. U. S. 1,716,130, June 4. Mixed vapors of different condensing points such as those from shale oil are expanded in successive stages in an app., which is described, to generate power; condensed fractions from the different stages are separately collected.

**Apparatus for distilling mineral oils and tars in several steps.** HANS MAGNUS. Fr. 654,729, Mar. 22, 1928.

**Refining mineral oil.** HENRY BLUMENBERG, JR. U. S. 1,716,103, June 4. Oil such as cracked gasoline is treated with an Al sulfite; the mixt. is heated to about 70° and volatile constituents are distd. The treatment serves to effect decolorization and deodorization. Cf. C. A. 23, 1501.

**Refining mineral lubricating oils.** EDWIN D. GRAY, EARLE L. SCOFIELD and EDWARD C. DEFOR (to Standard Oil Co. of Calif.). U. S. 1,716,632, June 11. The oil is treated with H<sub>2</sub>SO<sub>4</sub> and settled; the sludge is removed; the oil is then passed upwardly through a bed of sawdust and the filtered oil is neutralized.

**Purifying used lubricating oils.** MARTIN CZARNY and FRANK C. FROLANDER. U. S. 1,717,096, June 11. In purifying oils contg. liquid impurities adapted for use in connection with an internal combustion engine, the liquid impurities are abstracted from the oil by capillary action, *e. g.*, by a cotton wick. An app. is described.

**Lubricant.** GEORGE W. GRAY (to Texas Co.). U. S. 1,716,310, June 4. A lubricant suitable for use on railway-track curves comprises cylinder-stock residuum about 60 and residual oil derived from an asphalt base crude petroleum about 40%.

**Separating wax from lubricating oils by double centrifuging.** GEORGE F. OLSEN. U. S. 1,715,670, June 4. Various details of operation and arrangement of app. are described.

**Viscous oils.** I. G. FARBERIND. A.-G. Fr. 654,650, May 1928. Very viscous oils are prepd. from mineral or tar oils or from products from "cracking" or hydrogenation under pressure of coal, etc., by submitting these oils or products to the action of alternating elec. currents of frequency above 500 periods per sec., preferably in the absence of compds. capable of being ionized. Cf. C. A. 23, 3341.

**Emulsifiers and stabilizers.** NAAMLOOZE VENNOOTSCHAP DE BATAAFSCHE PETROLEUM MAATSCHAPPIJ. Fr. 655,044, May 31, 1928. Emulsifiers and stabilizers for insol. or difficulty sol. substances, such as oils, tar, S or rubber, are obtained by transforming higher aromatic or hydroaromatic compds. into sulfonic acids having a mol. wt. above 250.

**Paraffin wax.** AKTIEBOLAGET SEPARATOR-NOBEL. Fr. 654,531, May 22, 1928. See Brit. 296,805 (C. A. 23, 2567).

**Motor fuel containing denatured alcohol and miscible oxidized kerosene.** JOSEPH H. JAMES (to Clarence P. Byrnes, trustee). U. S. 1,716,272, June 4.

**Absorbing noxious substances from combustion gases.** JACOB BILSKY (name now changed to John G. Billings). U. S. 1,716,479, June 11. Gases such as those from "antiknock" motor fuels are passed through a device contg. sep. layers of material, one of which contains Cu<sub>2</sub>Cl<sub>2</sub> and Pd chloride for absorbing CO; another layer contains (CH<sub>3</sub>)<sub>2</sub>N<sub>2</sub>; other absorbents also may be used. U. S. 1,716,480 relates to structural features of a device for treating gases for internal combustion engines with absorbents. U. S. 1,716,481 specifies removal of heavy metal compds. from exhaust gases by passing them through material contg. Na chromate.

**Separation and recovery of gases and vapors by use of solid absorbents.** ALBERT GODEL (to Soc. de recherches et d'exploitations petroliferes). U. S. 1,717,103, June 11. An app. is described suitable for recovery of gasoline from gases and in which regeneration of the absorbent by heat is effected in 2 distinct periods, the first period having for its object the heating of the absorbent mass, without appreciable humidification, by the aid of convection currents created in the gas within the mass, and the second period having for its object the distn. of the absorbed product by the introduction of steam. Cf. C. A. 22, 1418.

**Distilling wood.** RALPH H. TWINING (to Cleveland-Cliffs Iron Co.). U. S. 1,716,745, June 11. The vapors issuing from a wood distn. retort are subjected to countercurrent scrubbing with hot crude-pyroligneous acid obtained from the distn. and from which the tar has been settled. An arrangement of app. is described.

**Milling device for producing charcoal powder.** MAX KÖNIG. Ger. 476,526, Feb. 7, 1928.

## 23—CELLULOSE AND PAPER

CARLETON E. CURRAN

1,4-Dioxan [as solvent] (REID, HOFMANN) 13. Density of wood substances, adsorption by wood and permeability of wood (STAMM) 20. Constitution of cellulose xanthates (LANGE) 10. Mixing apparatus [for use in manufacture of paper pulp] (Ger.

pat. 476,338) 1. Purifying liquids by osmosis [of NaOH solutions, from viscose manufacture] (Austrian pat. 112,961) 13. Basic Cu sulfate [for dissolving cellulose] (U. S. pat. 1,716,492) 18. Moldable composition (U. S. pat. 1,716,623) 18.

**Cellulose.** BROR N. SGERFELT. Fr. 653,285, Apr. 21, 1928. In the production of cellulose by boiling cellulosic substances in acid or alk. liquor in a digester and washing the cellulose obtained in diffusers, the strongest residual liquor from the diffusers, after concn. if necessary, is used for addn. to fresh liquor for the digester to obtain the amt. necessary for boiling. The first washing of the digested paste is carried out with residual liquor having a sp. gr. not below 1.09.

**Cellulose.** I. G. FARBENIND. A.-G. Fr. 653,817, May 3, 1928. Swelling of cellulose or cellulose products such as paper or vulcanized fiber is lessened by impregnation with aq. or freely alk. solns. of condensation products such as artificial resins or substances producing them and treating with  $\text{CH}_2\text{O}$  to render them insol. Cf. C. A. 23, 3097.

**Cellulose.** STECKBORN KUNSTSEIDE. A.-G. Swiss 131,108, July 30, 1927. A mat surface is obtained on cellulose by using a viscose solvent which is decomposed on contact with the acid pptg. bath to deposit minute solid particles on the coagulating viscose. Examples mention  $\beta$ -naphthol and  $\text{CS}_2$  as the solvents.

**Alkali cellulose.** NEUR GLANZSTOFF-WERKE A.-G. Ger. 476,255, Feb. 14, 1925. The cellulose is treated with used caustic alkali lyes and then with fresh lye. The treatment may be applied in a no. of stages with lyes of successively increasing NaOH and decreasing hemicellulose content.

**Cellulose and paper from straw, esparto, reeds, etc.** ERIK L. RINMAN. U. S. 1,716,006, June 4. See Brit. 269,154 (C. A. 22, 1474).

**Saccharification of cellulose.** HEINRICH SCHOLLER. Fr. 654,072, May 10, 1928. See Brit. 273,317 (C. A. 22, 2056).

**Saccharification of cellulose.** SOC. D'ÉTUDES CHIM. POUR L'IND. Fr. 653,419, Apr. 26, 1928. See Swiss 127,238 (C. A. 23, 1268).

**Nitrocellulose.** HERCULES POWDER CO. Fr. 653,489, Apr. 26, 1928. An app. is described for the digestion of nitrocellulose to reduce its viscosity, increase its stability and purify it, in which the washed nitrocellulose and water are caused to pass through a coil of small cross section with a narrowing opening. Cf. C. A. 23, 1750.

**Cellulose esters.** KODAK-PATHÉ (SOC. ANON. FRANÇAISE). Fr. 653,742, Mar. 28, 1928. See Brit. 287,880 (C. A. 23, 512).

**Cellulose ethers and esters.** I. G. FARBENIND. A.-G. Fr. 653,297, Apr. 21, 1928. Films, fibers, etc., are made from solns. of cellulose ethers or esters which contain  $\text{CS}_2$  as an essential ingredient of the mixt. of solvents used. Thus, films with 20-25% more solidity than films from  $\text{C}_6\text{H}_6$  soln. and the same extensibility are obtained from an 8% soln. of triethylcellulose in a mixt. contg.  $\text{CS}_2$  92 and  $\text{C}_6\text{H}_6$  8%. Films with 3 times the extensibility of those from acetone soln. and the same solidity are obtained from a 7% soln. of triethylcellulose in a mixt. contg.  $\text{CS}_2$  96 and acetone 4%.

**Organic esters of cellulose.** HANS T. CLARKE and CARL J. MALM (to Eastman Kodak Co.). U. S. 1,716,422, June 11. In prepg. material such as cotton for esterification such as acetylation, the raw cellulosic material is mercerized with an aq. alk. bath, and dehydrated with a substantially anhyd. neutral org. liquid such as MeOH and ether.

**Use of cellulose esters in wrappers of cigars.** WERNER THIRLE. U. S. 1,716,250, June 4. Cigars are formed with a wrapper of comminuted tobacco leaves mixed with a soln. of cellulose acetate or other suitable cellulose ester or similar combustible binder.

**Ethyl cellulose composition for films, etc.** STEWART J. CARROLL (to Eastman Kodak Co.). U. S. 1,716,418, June 11. A compn. is specified comprising water-insol. ethyl cellulose 100, tribromophenol 20 and more than 300 parts of a common solvent such as MeOAc 90 and MeOH 10% contg. sufficient inorg. alkali to give the compn. a  $p_H$  above 7. U. S. 1,716,419 specifies a similar compn. in which bromocamphor (substantially free from uncombined Br and HBr) is used instead of tribromophenol. U. S. 1,716,420 also relates to similar compns.

**Sheets, slabs and molded articles of celluloid and similar materials.** GUSTAV LEYSIEFFER. U. S. 1,716,379, June 11. Relatively thin sheets from which sufficient solvent has been removed to prevent welding of the sheets under normal conditions of temp. and pressure but still capable of being welded under heat and pressure are thus welded and residual solvent is then removed by drying for a short time at a high temp.

**Ethers of carbohydrates.** LEON LUXENFELD. Ger. 475,884, Apr. 27, 1921.

Ethers of such carbohydrates as cellulose, starch and dextrin are prep'd. by mixing the starting materials with caustic alkali into a homogeneous whole and treating with alkylating, arylating or aralkylating agents. Thus, finely powd. NaOH is thoroughly mixed with finely divided cellulose before being treated with the above-mentioned agents.

**Derivatives of cork.** I. G. FARBENIND. A.-G. Fr. 653,909, May 5, 1928. Cork is put in suspension in a neutral medium and caused to react with org. or inorg. acid radicals in the manner proposed for cellulose. Thus, powd. cork in suspension in PhCl is boiled with  $\text{Ac}_2\text{O}$ , giving a product contg. 38.5% AcOH chemically combined. Similar products contg. 56% of lauric acid and 14% of phosphoric acid are obtained.

**Drying chamber for cellulose sheets.** HERMANN HAAS. Ger. 475,800, Feb. 23, 1928. Details of arrangement are given.

**Production of hollow ware and foils from cellulose esters by dipping the molds in coagulating agent and running in the esters.** KURT BRATRING. Ger. 476,961, Mar. 20, 1925.

**Recovering fibers from liquids.** ADOLF M. R. KARLSTRÖM. U. S. 1,717,223, June 11. Liquids such as back-water from cellulose, paper or wood-grinding mills, from which fiber is to be recovered, are introduced, in admixture with gas such as air, into a tank in an upwardly directed current and a reduced pressure is maintained in the tank so that fibers are lifted up to the surface by adhering gas bubbles, whence they are sep'd. An app. is described.

**Vulcanized fiber.** I. G. FARBENIND. A.-G. Fr. 654,411, May 18, 1928. The quality of vulcanized fiber is improved by soaking it in solns. of org. compds. capable of forming insol. products, and forming these compds. in the fiber. The fiber may be first swelled by heating with water and removing the water afterwards. Examples are given of the formation in the fiber of urea condensation products,  $\text{PhOH}\cdot\text{CH}_2\text{O}$  resins, etc.

**Artificial fibers, films, etc.** I. G. FARBENIND. A.-G. Fr. 653,583, Apr. 28, 1928. Cellulose ethers are ppt'd. from their solns. to form films, etc., by using solvents which have a high soly. in the hydrocarbons which are used as pptg. baths. In examples solns of cellulose Et ether in (1)  $\text{CS}_2$  and  $\text{Et}_2\text{O}$ , (2)  $\text{CS}_2$  and BuOH, (3)  $\text{CS}_2$  and  $\text{C}_6\text{H}_6$ , (4)  $\text{Et}_2\text{O}$  and benzine are ppt'd. by a bath of paraffin oil at  $15^\circ$ .

**Viscose films.** FELDMÜHLE, PAPIER- UND ZELLSTOFFWERKE A.-G. Fr. 654,063, 654,064, 654,065, May 10, 1928. See Brit. 290,252-3-4 (C. A. 23, 981).

**Spinning cell for forming threads of cellulose esters or ethers.** MELITTA KLEIN (to Ruth-Aldo Co.). U. S. 1,716,781, June 11.

**Spinning device for artificial textile fibers.** SYNTHETA A.-G. Swiss 130,385, Feb. 1, 1928. The spinning nozzles are provided with cooling ducts to counteract excessive heating due to the spinning head heating chamber.

**Apparatus for treating artificial silk on perforated bobbins with liquids.** I. G. FARBENIND. A.-G. Fr. 654,668, May 24 1928.

**Artificial filaments.** BERNARD LOEWE. Ger. 476,005, Apr. 4, 1923. See Brit 213,908 (C. A. 18, 2610).

**Apparatus for spinning artificial threads or filaments.** HENRY DREYFUS. Fr. 654,062, May 10, 1928. In dry spinning artificial silk, etc., particularly in downward spinning, the spinning chamber is tapered towards the spinning nozzles or has a plate with holes corresponding with the spinning nozzles, or has an inverted funnel-shaped member whereby max. evapn. effect of the air or gas used is obtained.

**Artificial silk.** ERNEST S. JOHNSON. Fr. 652,947, Apr. 17, 1928. A thread of artificial silk is made up of a central core or cores of a pliable non-metallic substance such as beeswax, paraffin, palm oil, wood oil, resins, gums, etc., surrounded by a cellulose compn. adhering thereto.

**Artificial silk.** ALSA S. A. Fr. 653,337, Apr. 23, 1928. In the production of very light artificial silk, from viscose formed with hollow fibers, coagulating baths contg. a large proportion of  $\text{ZnSO}_4$  (about 6%) are used.

**Artificial silk.** THE NUERA ART-SILK Co., LTD. Fr. 653,856, May 4, 1928. In spinning artificial silk of fine "titres" on centrifugal frames the thread passing on to the delivering roller is sprayed with water.

**Artificial silk.** GRUNERT & GIANNETTI. Ger. 475,871, Dec. 25, 1926. In the method of spinning artificial silk by employing one or more baths, the baths are subjected to air or gas currents to form large bubbles which absorb the smaller bubbles already in the liquid and facilitate their removal. Cf. C. A. 23, 705.

**Artificial silk.** GRUNERT & GIANNETTI. Ger. 475,923, Feb. 6, 1927. The spinning heads are fitted with an acidifying device.

**Artificial silk.** NAAMLOOZE VENNOOTSCHAP NEDERLANDSCHE KUNSTZIJDEFABRIEK. Ger. 476,786, Dec. 31, 1926. Cellulose soln. is dry-spun through fine openings in a chamber with a slowly rising gas which keeps the temp. even.

**Wood pulp.** FRANS K. L. SCHOUTEN. U. S. 1,717,266, June 11. Comminuted wood is subjected to "dry refining" with sufficient friction to vaporize its normal water content, and is then subjected to "wet refining" in mixt. with added water controlled as to quantity so as to permit the frictional heat incident to the refining to elevate the temp. of the mixt. to such a point as to give the pulp a "not ground" character.

**Paper.** JOHN A. HEANY (to World Bestos Corp.). U. S. 1,716,776, June 11. Raw stock is formed into a web, the web is satd. with a moistening and binding soln. such as a starch or dextrin soln. and is compressed and stretched between calendering rolls, and then dried.

**Paper.** SIEBENHIRTNER CHEM. INDUSTRIE-WERK, G. M. B. H. Austrian 113,000, Dec. 15, 1928. Addn. to 111,709. The method of Austrian 111,709 (cf. Brit. 287,559, C. A. 23, 515) is modified by using a "light metal" or alk. earth metal salt, especially a Ba salt, instead of a heavy metal salt.

**Paper.** HANS MÜHLENBEIN. Ger. 476,583, Dec. 24, 1921. Paper pulp is made from vegetable fibers by treating chemically with alkali or acid and oxidizing agent, without pressure-heating, simultaneously with the pulverizing.

**Apparatus for agitating paper pulp.** JOSEPH E. BOND. U. S. 1,716,294-5-6-7-8-9, June 4. Structural features.

**Apparatus for beating paper pulp.** JAMES T. MURPHY. U. S. 1,716,898, June 11. Structural features.

**Apparatus for beating paper pulp.** RALPH WOOD (to Scott Paper Co.). U. S. 1,716,407, June 11. Structural features.

**Paper-making apparatus.** ALONZO ALDRICH and EARL E. BERRY (to Beloit Iron Works). U. S. 1,715,528-9-30-1, June 4. Structural features.

**Paper-making apparatus.** WILLIAM H. MILLSPAUGH. U. S. 1,715,615, June 4. Structural features.

**Highly porous paper-like material.** KIRKE L. MOSES. U. S. 1,716,654, June 11. In producing a paper-like web of sufficient porosity to permit it to be satd. with a filling material contg. rubber and water but having so little strength that it will hardly hold together when wet, the material is strengthened as by incorporation of a latex soln. applied by spraying and is then impregnated with additional filling material.

## 24—EXPLOSIVES AND EXPLOSIONS

CHARLES E. MUNROE

**Report of Explosives Division, Department of Mines, Canada, for 1928.** ANON. 19 pp., Ottawa, 1929.—But one fatal accident occurred in manuf. during the year. This took place in an open ditch beside a catch-box from a settling tank on Jan. 23 when the nitroglycerin, which had escaped to the ditch, was frozen and an assumption is that the man slipped and struck the oversensitive crystals with a scoop. The man was at the time engaged in cleaning-out the catch-box by absorbing the nitroglycerin mud with sawdust. The bag in which this mixt. had been placed was recovered intact. A fire on Sept. 13 was caused by the rapid reaction ensuing on mixing  $\text{Na}_2\text{O}$  with D.N.T. A glaze mill was struck by lightning May 22 and blown up. Molten niter cake dropped by chance beside a niter house set fire to the latter. A steam-heater dynamite-store house was blown up, probably as a result of over-heating. Many instances of mislaid, lost, or abandoned explosives are recorded, such as "ten cases of dynamite were fired abandoned in the bush" apparently by disappointed miners. C. E. M.

**The testing of explosives for use in fiery coal mines.** JOCELYN F. THORPE, *et al.* Safety in Mines Research Board, *Paper No. 51*, 50 pp. (1929).—This investigation sought to ascertain if the methods used in making the official Tests for Permitted Explosives could be improved. The proposed new method is given. The most definite conclusions are to use  $\text{CH}_4$ , fire damp, as the standard gas in testing, and to require that all shots fired in coal mines shall be stemmed.

CHARLES E. MUNROE

**Effect of substituting ethylene glycol dinitrate in permissible explosives.** G. ST. J. PERROTT and J. E. TIFFANY. Bur. Mines, *Repts. of Investigations No. 2935*, 5 pp. (1929).—Comparisons between samples of permissible explosives in which 25% of the explosive oil had been replaced by 25% of ethylene glycol dinitrate and samples in which no change had been made show that the substitution does not have any marked

effect but it does tend to increase the rate of detonation and to increase slightly the sensitiveness by the halved cartridge method, but not to affect the unit deflactive charge, or the limit charge to such an extent that samples contg. the dinitrate should be considered any less safe for use in coal mines.

CHARLES E. MUNROE

**Velocity of propagation of flames in gas mixtures.** W. LINDNER. *Z. Ver. deut. Ing.* 73, 648-50 (1929).—L. investigated the effect of inerts, namely, N, He, A and CO<sub>2</sub>, on the velocity of flame propagation in mixts. of CO and O by the soap bubble method. The inerts lower or raise the velocity of flame propagation depending on the compn. of the mixt., CO<sub>2</sub> lowering it in all cases studied. Rates for mixts. of CH<sub>4</sub> and O without inerts were also measured. The equation  $S = K_f(F)^{n_1}(O_2)^{n_2}$  is offered as a means of calcg. velocity of flame propagation.  $S$  is velocity in cm./sec.,  $K_f$  is the proportionality factor depending on the combustible gas,  $F$  is the partial pressure of the combustible gas in atms.,  $O_2$  is the partial pressure of the oxygen in atms. and  $n_1$  and  $n_2$  are the coeffs. of  $F$  and  $O_2$ , resp., in the chem. equation:  $n_1F + n_2O_2 = xCO_2 + yH_2O$ .

A. WHITE

**Ignition temperatures of mixtures of carbon monoxide and air.** M. PRETTE AND P. LAFFITTE. *Compt. rend.* 188, 1403-5 (1929).—CO contents between 10 and 40% ignite at about 655°, then the ignition temp. rises rapidly, reaching 727° when the CO content becomes 92.9%. Contrary to the case of H, the presence of small quantities of gases of combustion does not alter the ignition temp. of CO. The presence of H<sub>2</sub>O vapor or H reduces appreciably the temp. of ignition of CO and air. E. M. SYMMES

**Influence of gel structure upon the technology of smokeless powder manufacture.** FRED OLSEN. *Colloid Symposium Monograph* 6, 253-64 (1928).—Speed of burning and resultant accuracy of fire depend on the "web" of the grains, i. e., the distance between the interior perforations. This, in turn, depends on gel structure which controls shrinkage during drying. Mixing light and heavy web grains aids uniform firing results.

JEROME ALEXANDER

**Relative aging properties of gelatin dynamites containing nitroglycerin and ethylene glycol dinitrate.** A. B. COATES AND G. ST. J. PERROTT. *Bur. Mines, Repts. of Investigations* No. 2923, 7 pp. (1929).—Firing tests were made of gelatin dynamites of different strengths and dynamites otherwise like the first-mentioned except that 50% of the nitroglycerin oil used in each was replaced by ethylene glycol dinitrate. The propulsive strength is the same for both and is unaffected by age. The sensitiveness to sympathetic detonation is slightly greater for dynamites contg. (CH<sub>2</sub>ONO)<sub>2</sub>. The rate of detonation, with some exceptions, is slightly higher for dynamites contg. (CH<sub>2</sub>ONO)<sub>2</sub> when unconfined; there is a slightly greater increase of rate when primed with 40% straight nitroglycerin dynamite. The aging qualities are slightly better.

CHARLES E. MUNROE

**The evolution of the miners' safety lamp.** T. SHEPPARD. *Colliery Guardian* 138, 2106-9 (1929).

E. J. C.

**Explosions in coal mines and permitted explosives: Historical record (NATHAN)**  
21. Diffusion apparatus for indicating the presence of combustible, explosive or poisonous gases (Austrian pat. 112,720) 1.

**Explosives.** MEXCO, LTD. Ger. 476,531, Sept. 4, 1924. An explosive cartridge for blasting contains chlorate or perchlorate in porous containers so packed that hydrocarbons such as petrolcum, paraffin oil, kerosene and the like can be used as the fuel. Cf. C. A. 23, 1272.

**Propellant explosive.** JOHN B. FIDLAR. U. S. 1,716,434, June 11. A propellant powder is formed of nitrocellulose 35, nitroglycerin 25, dinitrotoluene 5, trinitrotoluene 20 and flame reducing materials such as corn starch and black powder ingredients 10 parts.

**Quick-burning "delay powder."** WILLIAM T. INGRAHAM. U. S. 1,716,313, June 4. Hg fulminate is mixed with about 10% of black powder.

**Nitration apparatus, especially for nitroglycerin.** OTTO SCHULZE. Ger. 476,003, Feb. 12, 1927. The upper part of the nitration vessel is made of glass and supports a removable rose-head made of acid-resistant light metal.

**Miner's benzene safety lamp for testing air for the presence of methane.** HANS FLEISSNER. U. S. 1,716,374, June 11. A metallic strip is mounted vertically inside the lamp casing so as to be exposed to the flame and when the height of the flame is increased due to the presence of CH<sub>4</sub> the strip is heated to incandescence and shows an incandescent patch proportionate to the quantity of methane present. Various details are described.

## 25—DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

**Dyes and their application—recent technical progress.** L. J. HOOLEY. *Chem. Age* (London) 20, Dyestuffs Mo. Suppl. 45-6(1929); cf. C. A. 23, 1752. E. J. C. Making the dyeing "like sample." NOEL D. WHITE. *Cotton* 93, 683-5(1929). R. K. W.

**Preparing the goods for dyeing.** *Cotton* 93, 839-41, 853(1929).—Practical. R. K. W.

**Dyeing raw stock cotton in circulating machines.** SHERMAN CONVERSE. *Cotton* 93, 614-6, 676(1929); *Dyer, Calico Printer* 61, 231-3(1929).—Practical. R. K. W.

**Dyeing cotton plushes and velours.** GEORGE RICE. *Dyer, Calico Printer* 61, 214-5(1929).—Practical. RUBY K. WORNER

**Redyeing weather-worn (wool) garments.** R. TREBOR. *Dyer, Calico Printer* 61, 269(1929).—Directions are given. RUBY K. WORNER

**Shoddy dyeing.** J. NEWSOME. *Dyer, Calico Printer* 61, 216-7(1929).—Practical. RUBY K. WORNER

**Notes on the desizing, washing, bleaching and dyeing of cellulose acetate rayon.** Degumming of natural silk in presence of acetate rayon. JORRE. *Tiba* 6, 279, 281, 559-65, 661, 663, 905-9, 1119-23, 1261-5(1928); 7, 13-9(1929); *Russa* 3, 147, 149, 303, 305, 381, 383, 617, 619, 749-53, 1013-7, 1299, 1301, 1463, 1465(1928); 4, 35, 37 (1929).—Practical operating directions are given for the processing of cellulose acetate rayon. A. PAPINEAU-COUTURE

**Test shows effect of constant standard humidity in the cotton mill.** CHARLES H. FORSAITH. *Textile World* 75, 3589, 3593(1929).—The % of regain was detd. for samples of cotton taken before and after each step in the process of manuf. The results of maintaining a const. humidity throughout the mill were very slight, if any, losses due to regain, better and more uniform-running work, better working conditions and increased production. RUBY K. WORNER

**The elastic properties of wool in water at high temperatures.** J. B. SPEAKMAN. *Trans. Faraday Soc.* 25, 169-76(1929). L. B. MILLER

**Waste waters from flax retting (ROSSOLIMO) 14.** The composition of waste water from flax retting and experiments on its purification by biological treatment (EVLANOVA) 14. Recent advances in science. Organic chemistry [dyes] (DAY) 10. 1,4-Dioxan [as solvent] (REID, HOFMANN) 13. Roller leathers (LAMB) 29. Stereochemistry of aromatic compounds. VIII. Optically active heterocyclic compounds and optically active azo dyes of the dinaphthyl series (KUHN, GOLDFINGER) 10. Differently colored states of anthrahydroquinolcarboxylic acids, and anthrahydroquinol- $\alpha$ -carboxylic lactones (SCHOLL, *et al.*) 10. Benzanthrone derivatives [dyes] (Fr. pat. 652,920) 10. Sulfonic acids of *N*-acetylacetic arylamides [for production of dyes] (Fr. pat. 653,210) 10. *N*-Dihydro-1,2,1',2',-anthraquinoneazine and derivatives [dye] (Fr. pat. 654,686) 10.

SEEM, WARREN P.: *Raw Silk and Throwing*. New York: McGraw-Hill Book Co., Inc. 198 pp. \$5.

**Technologie der Textilfasern.** Band VI, Teil 2. HERMANN LEY: *Technologie der Seide*. 484 pp. E. RAEMISCH: *Die Seidenwirtschaft der Welt*. 52 pp. Berlin: J. Springer. Bound, M. 66.

**Textile Manufacturer Year Book, 1929.** Manchester, England: Emmott & Co., Ltd. 514 pp. 3s. 6d. Reviewed in *J. Textile Inst.* 20, 112(1929).

**Textile Recorder Year Book, 1929.** Edited by JOHN BROOKS. Manchester, England: John Heywood, Ltd. 997 pp. 7s. 6d. Reviewed in *J. Textile Inst.* 20, 112(1929).

**Wool Year Book, 1929.** Compiled by the Editor of Textile Mercury, Manchester, and others. London: Industrial Newspapers, Ltd. 684 pp. 7s. 6d. Reviewed in *J. Textile Inst.* 20, 113; *Textile World* 75, No. 25, 49(1929).

**Dyes.** I. G. FARBENIND. A.-G. Fr. 654,536, May 22, 1928. Dyes are prepd. by causing halodibenzanthrones or haloisodibenzanthrones or their derivs. to react with aromatic polynuclear compds. such as aminoanthraquinones or their derivs. with or without solvents, diluents, catalysts or acid-fixing agents. Thus, tetrabromodibenzanthrone

is boiled with 1-aminoanthraquinone in  $\text{PhNO}_2$  in the presence of  $\text{CuCO}_3$  and  $\text{NaOAc}$ , giving a product which dyes cotton gray to blue-black shades. Several other examples are given.

**Dyes.** SOC. ANON. POUR L'IND. CHIM. A BÂLE. Swiss 130,700, Jan. 11, 1928. Polymethine dyes are prep'd. by condensing cyclic ammonium bases with orthoformate in the presence of tertiary aromatic bases of the type dialkylaniline. In the example 2, 3, 3-trimethylindoleninium methiodide is stirred at 115–120° with orthoformate and dimethylaniline.

**Dye.** SOC. ANON. POUR L'IND. CHIM. A BÂLE. Swiss 131,100, Aug. 4, 1927. A dye is produced by the interaction of  $\text{PhCHO}$ ,  $\text{NaHSO}_3$ , and 1,4,5,8-tetraaminoanthraquinone. The dye gives a blue aq. soln. which colors acetate silk in fast tones of the same color.

**Direct dyes.** BRITISH DVESTUFFS CORP., LTD. Fr. 654,414, May 18, 1928. See Brit. 296,803 (C. A. 23, 2578).

**Azo dyes.** BRITISH DVESTUFFS CORP., LTD. Fr. 653,031, Apr. 19, 1928. See Brit. 294,922 (C. A. 23, 2039).

**Azo dyes.** BRITISH DVESTUFFS CORP., LTD. Fr. 653,029, Apr. 19, 1928. Azo dyes are obtained by coupling tetrazotized 4,4'-diaminodiphenylmono-, di- or trisulfide with 2 mol. proportions of an aminonaphtholsulfonic acid or *N*-substituted deriv. thereof, or with 1 mol. proportion of such an acid and 1 mol. proportion of any coupling component. Several examples are given and a table of components, giving the colors obtained on viscose silk. The dyes may also be used on vegetable or animal fiber.

**Azo dyes.** I. G. FARBERIND. A.-G. Fr. 652,909, Apr. 16, 1928. Azo dyes which may be treated with metallic salts are prep'd. by coupling with any 2,3-hydroxynaphtho-arylamides, diazotized aminohydroxyazo compds. obtained by coupling *o*-hydroxydiazoo compds. and their substitution products with an amine also diazotizable and substituted. In an example the dye obtained from diazotized *o*-aminophenol and amino-hydroquinone dimethyl ether is diazotized and cotton, previously treated with 2,3-hydroxynaphtho- $\beta$ -naphthylamide, is dipped into the diazo soln., giving a deep black which may be heightened by treatment with metallic salts.

**Azo dyes.** I. G. FARBERIND. A.-G. Fr. 653,201, Oct. 17, 1927. New azo dyes are prep'd. by coupling the diazo compds. of *o*-aminonaphthol or its diazotizable derivs. with 1-naphthol-8-sulfonic acid. In examples, a dye giving red shades on wool is obtained by diazotizing 1-amino-2-naphthol-4-sulfonic acid and coupling with 1-naphthol-8-sulfonic acid; after-chroming gives greenish blue shades on wool. The dye obtained from 1-naphthol-8-sulfonic acid and the diazonitrated compd. of 1-amino-2-naphthol-4-sulfonic is after-chromed to dye wool in fast black shades.

**Azo dyes.** I. G. FARBERIND. A.-G. Fr. 653,231, Feb. 20, 1928. Azo dyes are prep'd. by coupling tetrazo compds. of those diamines which have in the position *o*- to the amino groups carboxylic groups, with 2 mols. of acetoaceticarylidesulfonic acids, or by coupling the diazo compds. of those amines which have a carboxylic group in the position *o*- to the amino group with 1 mol. of acetoaceticarylidesulfonic acid and then producing a diazo dye. In examples tetrazotized 4,4'-diaminodiphenylurea-3,3'-dicarboxylic acid is coupled with the Na salt of acetoacetic-*o*-chloranilidesulfonic acid. The product dyes viscose in pure yellow shades and cotton a greenish yellow. It may be after-treated with Cu salts. 5-Nitro-2-aminobenzoic acid is diazotized and coupled with acetoacetic-*o*-anisidesulfonic acid. The nitro group is reduced and transformed by treatment with  $\text{COCl}_2$  into the symmetrical urea. The purified dye dyes viscose and cotton a golden yellow. The symmetrical thiourea compd. is obtained if  $\text{CSCl}_2$  is used instead of  $\text{COCl}_2$ .

**Azo dyes.** I. G. FARBERIND. A.-G. Fr. 654,071, May 10, 1928. See Brit 290,253 (C. A. 23, 990).

**Azo dyes.** I. G. FARBERIND. A.-G. Fr. 654,418, May 18, 1928. Azo dyes contg. an acetoacetic acid chloride in the mol. are treated with arylaminosulfonic acids or their derivs. for the production of new azo dyes. An example is given of a dye obtained by treating 4-chloro-2-nitrobenzenazoacetoacetic acid dissolved in  $\text{PhCl}$ , with 2-anisidine-4-sulfonic acid in pyridine.

**Azo dyes.** I. G. FARBERIND. A.-G. Fr. 654,466, May 19, 1928. Basic azo dyes are prep'd. by forming the azo dye by the combination of a diazotized non-sulfonated aminoarylenethiazolic compd. with a non-sulfonated azo component, and introducing into the thiazolic group, before or after the formation of the dye, a quaternary group by the action of a dialkyl sulfate or an arylsulfonic acid ester. Thus, dehydrothio-*p*-toluidineazo-1-phenyl-3-methyl-5-pyrazolone is boiled in  $\text{PhCl}$  with  $\text{Me}_2\text{SO}_4$ , giving



a product which dyes mordanted cotton a reddish yellow color. Several other examples are given.

**Azo dye.** I. G. FARBENIND. A.-G. (W. Hentrich, Rudolf Knoche and Paul Virck, inventors). Ger. 475,685, Dec. 24, 1926. A monoazo dye is prepd. by combining the diazo compd. of 4-nitro-1-aminobenzene-2-sulfonic acid or its substitution products, or 5-nitro-2-aminobenzene- $\omega$ -sulfonic acid, or the sulfonic acids of 4-nitro-1-aminonaphthalene, with 4'-hydroxyphenyl-2-aminonaphthalene or its substitution products. A table of constituents and colors of the resulting dyes is given.

**Azo dyes.** I. G. FARBENIND. A.-G. (W. Hentrich and Eugen Rimele, inventors). Ger. 476,079, Oct. 27, 1926. Azo dyes are prepd. by coupling with suitable components the diazo compds. from 2-amino-1-carboxybenzenesulfonamides or their derivs. or substitution products. The products may be chromed, coppered, etc., in the known way either in substance or on the fiber. The examples describe the prepn. of the dyes from the following compds.: (1) 2-amino-1-carboxybenzene-5-sulfon-2'-aniside (I) and 1-naphthol-5-sulfonic acid, (yellow-red shades on wool, made bordeaux by after-chroming); (2) I and 2-phenylamino-8-naphthol-6-sulfonic acid, (red-brown shades, made brown-black by after-chroming); (3) 2-amino-1-carboxybenzene-5-sulfonanilide (II) and the pyrazolone from 2-amino-1-phenol-4-sulfo-6-carboxylic acid (yellow-red shades, made greenish yellow by after-chroming or coppering); (4) II and 2-aminonaphthalene-7-sulfonic acid (reddish orange shades, made bordeaux by after-chroming; the Cr compd. gives violet shades when used as a size color); (5) the Cu compd. of the dye 2-amino-1-carboxybenzene-5-sulfonamide (III) and 1-acetyl-amino-8-naphthol-3,6-disulfonic acid (wine-red shades); (6) the Cr compd. of the dye III and 2-aminonaphthalene-7-sulfonic acid (red-violet shades when used as a size color); (7) the Cu compds. of the dyes 2-amino-1-carboxybenzene-5-sulfon-4'-toluide (IV) and 2-naphthol-8-sulfonic acid (orange shades), IV and 1-naphthol-4-sulfonic acid (copper-red shades), IV and 2-naphthol-6-sulfonic acid (red-brown shades), and IV and 3-methyl-1-(4'-sulfophenyl)-5-pyrazolone (greenish yellow shades). The compd. I is prepd. by treating the reaction product of *o*-chlorobenzoic acid and  $\text{ClSO}_3\text{H}$  with *o*-anisidine and replacing the nuclear Cl with  $\text{NH}_2$  by heating with  $\text{NH}_3$  under pressure.

**Azo dye.** I. G. FARBENIND. A.-G. (W. Hentrich and Ludwig Zeh, inventors). Ger. 476,809, Mar. 2, 1926. An azo dye is prepd. by coupling *o*-hydroxydiazocompds. with 1,8-naphthylenediamine or its derivs. and converting to perimidine derivs. In an example the diazo compd. from 6-nitro-2-amino-1-hydroxybenzene-4-sulfonic acid is added to an aq. soln. of 1,8-naphthylenediamine-4-sulfonic acid. The dye is sepd. from the liquid in the usual way and treated with warm water, NaOH and  $\text{AcONa}$ .  $\text{COCl}_2$  is led in at  $40^\circ$ . When the absorption of  $\text{COCl}_2$  is complete, the dihydropyrimidone-(2)-deriv. formed is salted out. Other examples are given.

**Azo dye.** I. G. FARBENIND. A.-G. (Myrtill Kahn, inventor). Ger. 476,810, Oct. 23, 1926. A trisazo dye is prepd. by combining the tetrazo compd. of the intermediate substance from a *p*-diamine and an aminonaphtholsulfonic acid with 2 mols. of a hydroxyethyl-*m*-diamine, or with one mol. of this and 1 mol. of a component of another series. In the example, *p*-phenylenediamine-2-amino-8-naphthol-6-sulfonic acid is converted to the tetrazo compd. and hydroxyethyl-*m*-phenylenediamine added.

**Azo dye.** SOC. ANON. POUR L'IND. CHIM. À BÂLE. Swiss 130,698, Aug. 13, 1927. A Cr-contg. azo dye is obtained by treating the dye from diazotized 6-nitro-2-amino-1-phenol-4-sulfonic acid and  $\beta$ -naphthol with  $\text{Cr}(\text{OH})_3$ . The dye colors silk a fast blue-black in  $\text{AcOH}$  baths.

**Azo dye.** SOC. ANON. POUR L'IND. CHIM. À BÂLE. Swiss 130,699, Sept. 17, 1927. A Cr-contg. dye is prepd. by the action of the dye from diazotized 6-nitro-2-aminophenol-4-sulfonic acid and  $\beta$ -naphthol on the Cr compd. of the dye from 1-amino-2-hydroxy-naphthalene-4-sulfonic acid and  $\alpha$ -naphthol. The dye colors wool and silk in fast blue tones in  $\text{H}_2\text{SO}_4$  baths.

**Azo dye.** SOC. ANON. POUR L'IND. CHIM. À BÂLE. Swiss 131,098, Sept. 10, 1927. A metallic polyazo dye is prepd. by treating the dye from 2 mols. diazotized 4-chloro-2-amino-1-phenol and 1 mol. 5,5'-dihydroxy-2,2'-dinaphthylamine-7,7'-disulfonic acid first with one-half the quantity of Cr agent necessary for complete chroming, and then with sufficient Cu agent for complete satn. of the metallizable groups. The dye colors cotton a fast blue in a neutral or alk. bath.

**Azo dye.** SOC. ANON. POUR L'IND. CHIM. À BÂLE. Swiss 131,099, Sept. 24, 1927. A Cu azo dye is prepd. by treating the dye from diazotized 5-nitro-2-amino-1-phenol and 2-(*o*-anisidyl)amino-5-hydroxynaphthalene-7-sulfonic acid with the products obtained from the action of  $\text{Cu}(\text{OH})_2$  on glycerol in presence of caustic alkali. The dye colors cotton in light-fast blue tones in a neutral bath.

**Azo dyes.** SOC. ANON. POUR L'IND. CHIM. A BÂLE. Fr. 653,931, May 7, 1928. See Brit. 290,179 (C. A. 23, 1279).

**Monoazo dyes.** I. G. FARBENIND. A.-G. Fr. 653,914, May 5, 1928. Yellow monoazo dyes are prepd. by coupling a diazo compd. of anilinemonosulfonic acid with 1-(2'-chloro-5'-sulfophenyl)-3-methyl-5-pyrazolene (I). Examples are given of the coupling with (I) of diazotized sulfanilic acid, and *o*-sulfobenzenediazonium chloride. A list of other substances which may be diazotized and coupled is also given. Cf. C. A. 23, 2301.

**Chromium azo dye.** I. G. FARBENIND. A.-G. (Hans Krzikalla, inventor). Ger. 475,686, Jan. 30, 1927. A black Cr-contg. azo dye is prepd. from 45 parts of the monoazo dye from diazotized picramic acid and Na 2,4-naphtholsulfonate treated with 600 parts water, 20 parts of a paste contg. 26% Cr<sub>2</sub>O<sub>3</sub> and 10 parts 85% HCOOH. The dye is salted out in the usual way. Cf. C. A. 23, 3105.

**Chromium azo dyes.** SOC. ANON. POUR L'IND. CHIM. A BÂLE. Fr. 653,132, Apr. 20, 1928; Swiss 130,837, Aug. 19, 1927. See Brit. 295,944 (C. A. 23, 2301).

**Chromium azo dye.** SOC. ANON. POUR L'IND. CHIM. A BÂLE. Swiss 130,902, Aug. 27, 1927. The Cr compd. of the dye obtained from 1-amino-2-hydroxynaphthalene-4-sulfonic acid and  $\alpha$ -naphthol is allowed to react with the Cr compd. of the dye 5-[(5-carboxy-4,3-cresyl)(2,6-dichlorophenyl)methylene]-2,5-dihydro-2-keto-*m*-toluic acid

**Chromium azo dye.** SOC. ANON. POUR L'IND. CHIM. A BÂLE. Swiss 130,903, Sept. 3, 1927. The dye obtained by the alk. coupling of diazotized 5-nitro-2-aminophenol and 2-amino-5-hydroxynaphthalene-7-sulfonic acid is heated with CrO<sub>2</sub>F<sub>2</sub> in a reflux. The dye colors wool and silk blue in acid baths and cotton the same color in alk. baths.

**Chromium azo dye.** SOC. ANON. POUR L'IND. CHIM. A BÂLE. Swiss 130,904, Sept. 23, 1927. The dye from diazotized 1-amino-2-hydroxynaphthalene-4-sulfonic acid and  $\alpha$ -naphthol is chromed with alkali chromite, nitrated and then reduced, *e. g.*, with Na<sub>2</sub>S. The dye colors wool and silk in fast steel-blue tones.

**Chromium azo dyes.** SOC. ANON. POUR L'IND. CHIM. A BÂLE. Swiss 131,251 to 131,259, Apr. 23, 1927. Addns. to 128,006 (C. A. 23, 2042). Cr azo dyes are prepd. by chroming the *o*-hydroxyazo dyes obtained by combining diazotized 5-nitro-2-amino-1-phenol or a chloro deriv., with aminohydroxynaphthalenesulfonic acid derivs. such as 2-(4'-ethoxy)-phenylamino-5-hydroxynaphthalene-7-sulfonic acid. The dyes color cotton in fast green-blue-violet tones.

**Chromium azo dyes.** SOC. ANON. POUR L'IND. CHIM. A BÂLE. Swiss 131,260 to 131,262, May 7, 1927. Addns. to 128,228, (C. A. 23, 2300). Cr and S azo dyes are prepd. by sulfurizing the chromed dye from diazotized 1,2-aminonaphthol-4-sulfonic acid and  $\alpha$ -naphthol or 5,8-dichloro-1-naphthol in the presence of EtOH or AmOH. The dyes color cotton in light- and wash-fast blue-gray tones.

**Trisazo dyes.** HENRY JORDAN (to E. I. Du Pont De Nemours & Co.). U. S. 1,716,063, June 4. Gray to blue-green and green trisazo dyes are made by diazotizing a disazo compd. prepd. by coupling an aromatic diazo-azo compd. to a 1,8-aminonaphthol compd. having a free amino group attached to the nucleus and coupling the resulting diazo compd. to an acylacetylride, aryl pyrazolone or alkyl ketole. Several examples are given. Cf. C. A. 22, 2846.

**Trisazo dyes.** HAROLD E. WOODWARD (to E. I. Du Pont de Nemours & Co.). U. S. 1,716,098, June 4. Various examples are given of dyes suitable for dyeing cotton, rayon or silk blue or violet shades, which may be prepd. by diazotizing the amino azo compd. prepd. from an aromatic aminosulfonic acid and an aromatic amine or an amino ether, to which amine or ether coupling can take place in the position *p* to the amino group, coupling the resulting diazo azo compd. to *p*-aminobenzoyl-2-amino-5-naphthol-7-sulfonic acid, diazotizing the resulting disazo compd. and coupling with J acid (2-amino-5-naphthol-7-sulfonic acid).

**Trisazo dyes.** I. G. FARBENIND. A.-G. (Hugo Schweitzer, inventor). Ger. 476,080, Feb. 27, 1926. Addn. to 450,998. See Brit. 287,232 (C. A. 23, 525).

**Vat dyes.** I. G. FARBENIND. A.-G. (Walter Mieg, inventor). Ger. 470,550, Jan. 22, 1927. Addn. to 451,495. Vat dyes are prepd. by heating 1-aminoanthraquinone or its derivs. with a halide of Al in the presence of an org. base and in the presence or absence of water. The presence or absence of water may det. the nature of the product. Thus, by heating 1-aminoanthraquinone with AlCl<sub>3</sub> in the presence of dry pyridine, an orange vat dye of unknown constitution is obtained, but if pyridine contg. a small amt. of water is used, the product obtained under otherwise similar conditions is 1,1'-diamino-2,2'-dianthraquinonyl. Detailed examples of these preps. are given. A further example in which 1-amino-6-chloroanthraquinone is treated is given also.

**Vat dyes.** I. G. FARBENIND. A.-G. (Max A. Kunz, Guido Frhr. von Rosenberg and

Eduard Goffarjé, inventors). Ger. 475,687, Aug. 14, 1926. Vat dyes of the anthraquinone series are prepd. by condensing *o*-aminohydroxyanthraquinone with anthraquinonealdehyde or anthraquinone derivs. with aldehydic properties, by heating in presence or absence of solvent. Alternatively, anthraquinone derivs. with one or more oxazole groups, *e. g.*, anthraquinone-1,2-isoxazole, are prepd. by substituting the  $\mu$ -C atom with an anthraquinone residue. Examples are given.

**Vat dyes.** I. G. FARBENIND. A.-G. (Arthur Lüttringhaus and Filip Kacer, inventors). Ger. 475,688, Mar. 11, 1927. A vat dye of the anthraquinone series is prepd. by subjecting bis(2'-carboxy-1'-anthraquinonyl-2,6(or 2,7)-dimercaptoanthraquinone to a ring-closing treatment. Thus, 10 parts bis(2'-carboxy-1'-anthraquinonyl)-2,7-dimercaptoanthraquinone is digested with 200 parts trichlorobenzene. The ring-closing process is completed in about 6-7 hours. The product is a yellow powder which can be used for dyeing without further purification. Another example is given.

**Vat dye.** I. G. FARBENIND. A.-G. (Walter Mieg and Albert Job, inventors). Ger. 475,766, May 28, 1926. A vat dye of the anthraquinone series is prepd. by nitrating diphtaloylacridone and reducing to form the amino deriv. which may then be acylated. Thus, 3,4,5,6-diphtaloylacridone (prepd. according to the method of 268,219) is heated to 80-90° with 80% HNO<sub>3</sub>. The yellow-brown crystals obtained can be used directly as a dye or can be converted to the amino deriv. by treatment with NaHS in presence of alc. Treatment of the amino deriv. with PhNO<sub>2</sub> and benzoyl chloride gives the benzoyl deriv. Another example is given. Cf. C. A. 23, 991.

**Vat dyes.** SOC. ANON. POUR L'IND. CHIM. À BAËLE. Ger. 476,411, Sept. 27, 1927. Vat dyes of the anthraquinone series contg. 1 or more triazine rings, *i. e.*, dyes of the kind prepd. from aminoanthraquinones and cyanuric chloride, are purified with aq. solns. of hypochlorites. Examples are given.

**Vat dye.** SOC. ANON. POUR L'IND. CHIM. À BAËLE. Swiss 131,269 to 131,272, June 8, 1927. Addns. to 129,589 (C. A. 23, 2833). A vat dye deriv. is prepd. by treating leuco-dihalothiindigo or the leuco compd. of indigo with mono-halo AcOH. Examples are given.

**Vat dyes with perylene nucleus.** MAXIMILIAN P. SCHMIDT and WILHELM NEUGEBAUER (to Grasselli Dyestuff Corp.). U. S. 1,715,430, June 4. A dye producing violet-blue tints on cotton from a blue vat is formed by condensing the diimide of dichloro-*perylene*carboxylic acid with phenol and generally similar dyes are also obtained by condensation of various similar perylene nucleus compds. with hydrocarbon derivs. contg. a substituent such as —OH, —SH or —NH<sub>2</sub>. The condensation is preferably effected in the presence of a small quantity of an acid-binding substance such as KOH. Several examples are given.

**Dry pigment dyes.** BRITISH DYESTUFFS CORP., LTD. Fr. 654,745, Apr. 10, 1928. Dry pigment dyes in a fine state of division are obtained by drying a paste of the dye contg. a Ba or other resin or naphthenate insol. in water.

**Halogen-free dye.** FELICE BENSÀ. Swiss 131,101, Aug. 8, 1927. A halogen-free dye is prepd. by heating diacetyldihaloperylene with a metallic cyanide in presence of an org. solvent. In an example the perylene deriv. was heated with CuCN to 190-200° with pyridine. In NaHS baths, it colors cotton red.

**Anthraquinone dyes.** I. G. FARBENIND. A.-G. Fr. 653,701, May 2, 1928. Dyes are obtained by causing hydroxyalkylamines to react with 1,4-dihydroxyanthraquinones or their leuco derivs. or with anthraquinones contg. neg. substituents such as halogens, NO<sub>2</sub> and MeO groups. The products may be sulfonated. In an example  $\alpha$ -chloroanthraquinone is heated with a 20% soln. of hydroxyethylamine in pyridine. The dye is isolated by diln. with MeOH. The SO<sub>3</sub>H deriv. dyes wool red. In the same way 1,4-dihydroxyethyldiaminoanthraquinone is obtained from quinizarin. Other dyes of the same series may be obtained from 1,4,5-trihydroxy- and 1,4,5,8-tetrahydroxyanthraquinone. The unsulfonated compds. dye acetate silk in variable shades. Cf. C. A. 23, 2043.

**Sulfur dyes.** I. G. FARBENIND. A.-G. (Alfred Bergdolt, Theodor Nocken and Wilhelm Neelmeier, inventors). Ger. 475,575, Aug. 21, 1926. S dyes are prepd. by melting indophenol or leucoindophenol with polysulfides with addn. of Cu salt. The indophenol is prepd. by the oxidation of ethers of *p*-hydroxyaryl-1-naphthylamino-monosulfonic acid and *p*-aminophenol, and subsequent reduction. Thus, 31.6 kg. 1-*p*-anisylamino-4-*p*-hydroxyphenylaminonaphthalene-8-sulfonic acid, obtained by the oxidation of *p*-anisyl-1-naphthylamine-8-sulfonic acid and *p*-aminophenol and subsequent reduction to the leuco compd., is dissolved in 125 l. alc. S (32 kg.), 100% Na<sub>2</sub>SO<sub>4</sub> (25 kg.) and CuSO<sub>4</sub> (5 kg.) are added and the mass is digested for 60 hrs. in a reflux condenser. The dye is obtained by distn. with alc., extg. with water and is isolated in the usual way. It colors cotton in green shades in Na<sub>2</sub>S baths. Other examples are given.

**Sulfurized dyes.** I. G. FARBENIND. A.-G. Fr. 653,785, May 1, 1928. Sulfurized dyes are prepd. by heating to 240–300° for several hrs. binaphthylene dioxide with S, halides of S or both and with or without diluents. In an example using S, a dye is obtained which dyes cotton brownish red.

**Brominated 4,4'-dimethyl-6,6'-dichlorothioindigo.** THE NEWPORT CO. Fr. 654,943, May 29, 1928. See Brit. 292,904 (C. A. 23, 1510).

**Anthraquinone derivative.** SOC. ANON. POUR L'IND. CHIM. A BÂLE. Swiss 131,358, Aug. 26, 1926.  $\text{CH}_3\text{CHO}$ , 1-amino-4-anilinoanthraquinone and  $\text{HCOOH}$  are allowed to interact at about 20° to produce the deriv., which is employed for coloring varnish and as an intermediate for other dyes.

**Anthraquinone derivatives.** I. G. FARBENIND. A.-G. Fr. 653,614, Apr. 30, 1928. Condensation products which are *intermediates for dyes* are prepd. by treating aminoanthraquinones, their derivs. or substitution products with alc. alkali at a temp. below 100° in the presence of an oxidizing agent. Thus, 1-aminoanthraquinone is refluxed in a 25% soln. of KOH in alc. while a current of air is introduced; dark brown crystals sep. Compds. may also be prepd. from 2-aminoanthraquinone and 1-aminoanthraquinone-2-sulfonic acid.

**Naphthoquinone derivatives.** I. G. FARBENIND. A.-G. Fr. 654,906, May 26, 1928. See Brit. 291,340 (C. A. 23, 1283).

**Dyes and intermediates.** BRITISH DYESTUFFS CORP., LTD. Fr. 654,005, May 9, 1928. 1-Anilineanthraquinone-2-carboxylic acid is chlorinated in 1 or 2 stages, by heating with  $\text{SOCl}_2$  or  $\text{PCl}_5$  in an org. solvent of high b. p. such as trichlorobenzene whereby the  $\text{COOH}$  group is converted into  $\text{COCl}$ , and then raising the temp. to 180–190° whereby further chlorination takes place and vat dyes are formed. 1-*p*-Tolueno and 1- $\beta$ -naphthylaminoanthraquinone-2-carboxylic acid may be similarly treated.

**Intermediates and dyes.** BRITISH DYESTUFFS CORP., LTD. Fr. 654,813, May 24, 1928. Diaryl sulfones of the type  $\text{contg. SO}_2\text{Ar, OH and COOH}$  in the 1, 2 and 3 positions and substituted in the 5 or in the 5 and 6 or 4 positions, in which Ar denotes an aromatic group, with or without other substituents, are prepd. by condensing 3-carboxy-2-hydroxyaryl-1-sulfonic-5-substituted or 5,6- or 5,4-disubstituted, either with an aromatic nitro compd. having a reactive halogen or with a *p*-quinone monooxime or dioxime. Azo dyes are obtained by diazotizing the above aminodiaryl sulfones and coupling with a coupling component, by acting on a diaminodiaryl sulfone with nitrous acid or by coupling a diazotized aminoazo compd. with a *m*-diaminodiaryl sulfone prepd. in the above manner. Several examples are given.

**Intermediates for dyes.** BRITISH DYESTUFFS CORP., LTD. Fr. 653,595, Apr. 30, 1928. 1,8-Naphthasultone sulfonamides are prepd. by converting 1,8-naphthasultone with P halides to sulfonyl halides which are treated with  $\text{NH}_3$  or an amine in the absence of much water. The products when treated with alkalis give 1-naphthol-8-sulfonic acid sulfonamides, or with  $\text{NH}_3$  soln. give di- or poly-sulfonamide derivs. of  $\alpha$ -naphthol. In examples, 1,8-naphthasultone-3-sulfonic acid is converted to the sulfonyl chloride by  $\text{PCl}_5$ ,  $\text{PCl}_3$  or  $\text{PBr}_5$  and thence to 1,8-naphthasultone-3-sulfonamide and 3-sulfonyl anilide, from which 1-naphthol-3,8-disulfonamide and 1-naphthol-3-sulfonanilide-8-sulfonic acid are prepd.

**Leuco preparations.** J. R. GEIGY. A. G. Swiss 131,083, Aug. 13, 1927. See Brit. 276,023 (C. A. 22, 2471).

**Dyeing with vat dyes.** OBERMAIER & CIE. Ger. 476,267, June 25, 1926. The goods and the bath are surrounded with a non-oxidizing gas until the bath is withdrawn. An app. is described.

**Dyeing textiles.** HENRY DREYFUS. Fr. 653,555, Apr. 28, 1928. Textiles of (or *contg.*) cellulose acetate or other derivs. of cellulose are dyed by projecting on to the material a liquid *contg.* the dye dissolved therein, with or without a swelling agent, the liquid being afterwards evapd. Examples of dyeing are given.

**Dyeing textiles.** NAAMLooZE VENNOOTSCHAP NEDERLANDSCHE KUNSTZIJDEFABRIEK. Ger. 475,879, Dec. 31, 1924. Textiles are given several colors, or have differing glosses imparted to their surfaces, by pptg. S in finely divided form on portions of the fabric and immersing in a dye or finishing bath. Thus, a fabric with a S-*contg.* cotton warp and a S-free cotton weft is immersed in a bath *contg.* alizarin 0.05, NaOH 0.1,  $\text{Al}_2(\text{SO}_4)_3$  1, and  $\text{Na}_2\text{S}$  2% and heated to boiling until the liquor is exhausted. Another example is given.

**Dyeing textiles.** TWO-TONE CORPORATION. Ger. 475,826, Feb. 6, 1925. Thin permeable textiles, especially silk goods, are dyed by placing them in a container and spraying with atomized dye liquor. Cf. C. A. 22, 4258.

**Method of dyeing hanks of yarn.** PAUL MISSY. Ger. 476,659, Sept. 14, 1924.

The hanks are rotated over rollers and sprayed without immersion in the dye. The method is especially applicable to vat, S and O dyes.

**Dyeing yarns and fabrics.** GEORGE H. ELLIS (to Celanese Corp. of America). U. S. 1,716,720, June 11. In methods such as dyeing cellulose acetate and cotton in which strong alkali is usually employed, the latter is at least partially replaced by a sol. salt of a hydroxy compd. of the cyclic org. series such as an alkali metal phenolate, xylenolate, cresolate, resorcinolate, quinolate or naphtholate. Cf. C. A. 22, 1243.

**Dyeing and printing fibers.** HERMANN MÜLLER (to J. R. Geigy S. A.). U. S. 1,717,242, June 11. Ethylenethiodiglycol, which serves to effect fixation at ordinary temps., is introduced into a dyestuff soln., *e. g.*, into one comprising setocyanine,  $H_2O$ , HOAc, tannin and a thickener, and the soln. is applied to fiber such as "acetate silk" without steaming.

**Dyeing animal fibers.** AUGUSTE ESCHACH and JEAN P. WORMS. U. S. 1,716 218, June 4. Silk, wool, leather or other animal fiber is subjected to the action of a sol. metal salt such as  $CuSO_4$  in the presence of nascent  $HNO_2$  at a temp. between atm. temp and about  $100^\circ$ .

**Dyeing cellulose acetate.** GEORGE H. ELLIS (to Celanese Corp. of America). U. S. 1,716,721, June 11. Relatively water-insol. org. compds. capable of coloring cellulose acetate such as 1-amino-4-methylaminoanthraquinone or similar compds. are used in the form of aq. dispersions prepd. by pretreating the compds. with a solubilizing agent comprising a sol. resin soap.

**Dyeing artificial silk.** DURAND & HUGUENIN A.-G. Fr. 33,853, July 7, 1927. Addn. to 571,264. Acetyl silk is dyed or printed with a soln. of an ester of a vat dye, dried, vaporized and afterwards developed by a prolonged oxidation at a high temp. Cf. C. A. 22, 2066.

**Apparatus for dyeing indigo or direct blue or black.** BENOIT BANCILLON. Fr. 653,727, Mar. 6, 1928.

**Dye vat and associated agitating apparatus.** GEORGE E. DRUM and JAMES H. SKITT (to Smith, Drum & Co.). U. S. 1,716 264, June 4. Structural features.

**Apparatus for dyeing thread on bobbins.** J. G. LINDNER. Fr. 652,948, Apr. 17, 1928.

**Support for bobbins during dyeing.** CAMILLE BUREL. Fr. 655,071, June 1, 1928.

**Apparatus for dyeing and lubricating thread as fed to a sewing machine.** ADOLPH F. FILSINGER. U. S. 1,715,649, June 4. Structural features.

**Yarn carrier for hank-yarn dyeing and washing apparatus.** ROBERT HAMPE. U. S. 1,716,128, June 4. Structural features.

**Apparatus for washing, bleaching and dyeing artificial silk in hanks or spinning cakes.** FR. KUTTNER, A.-G. Fr. 652,707, Apr. 14, 1928.

**Finishing textiles.** H. TH. BÖHME A.-G. Fr. 654,386, May 16, 1928. See Brit. 201,094 (C. A. 23, 1288).

**Sizing textiles.** ANDRÉ WEISS. Fr. 653,601, Apr. 30, 1928. Textiles of all kinds are sized by means of a product resulting from the sulfonation of a fatty material in the presence of a hydrocarbon, a gum, a resin and a tannin. Examples are given of the sulfonation of a mixt. of (1) castor oil 250, coconut oil 50, toluene 125, Mamrah gum 25, resin oil 50, sumac extract 10 kg., and (2) linseed oil 250, copra oil 50, stearic acid 25, xylene 50, white resin 60, tannin ( $28^\circ$  B $\acute{e}$ .) 25 kg.

**Sizing textiles.** SOC. POUR LA FABRICATION DE LA SOIE "RHODIASETA." Fr. 655,075, June 1, 1928. Textile fibers such as silk, cotton, wool or artificial silk are sized by treating with an oiling compn. consisting of an oxidized semi-drying oil emulsified in a soln. of soap, and afterwards dipping into a soln. of salts which ppt. the soap and the free fatty acids contained in the oil, and then drying.

**Treating textiles.** H. TH. BÖHME A.-G. Fr. 654,108, May 11, 1928. Products obtained by treating fats, oils or their acids with concd.  $H_2SO_4$  in the presence of org. or inorg. anhydrides or chlorides or very concd. org. acids are added to mercerization, carbonization, bleaching or vat-dyeing baths.

**Treating textile materials.** LEON LILIENFELD. Austrian 112,971, Dec. 15, 1928. Vegetable textile material is given a silky luster by treatment in the following way. It is first treated with  $CS_2$  and an alk. soln. so as to produce sol. cellulose xanthate on the material. It is then treated with a solvent for the xanthate, *e. g.*, NaOH soln., so as to remove at least a part of the xanthate. Finally, it is treated with a reagent capable of decomp. the xanthate.

**Treating textiles and leather.** H. TH. BÖHME A.-G. Fr. 654,624, May 23, 1928. The wetting and impregnating powers of liquors used for treating textiles and leather are increased by the addn. of heterocyclic bases and aromatic sulfonic acids having

aliphatic side chains. Examples are given of the use of (1) propylnaphthalenesulfonic acid or dibutylnaphthalenesulfonic acid and pyridine, (2) isopropyltetrahydronaphthalenesulfonic acid and tetrahydroquinoline.

**Waterproofing textiles.** WOLDEMAR HABERKORN. Fr. 654,968, May 30, 1928. Wool and silk are waterproofed by a soln. of  $\text{Al}(\text{OH})_3$  at about  $70^\circ$ , the  $\text{Al}(\text{OH})_3$  being 1-5% of the wt. of the material treated.

**Moth proofing.** I. G. FARBERIND. A.-G. Fr. 654,712, Feb. 20, 1928. See Brit. 285,825 (C. A. 23, 290).

**Washing textile goods.** EDGAR RIEHL and OTTO LIND (to Henkel & Cie. G. m. b. H.). U. S. 1,716,347, June 4. Washing is effected at temps. below  $70^\circ$  in an aq. liquid contg. soap, mild alk. compds. such as  $\text{Na}_2\text{HPO}_4$ , urea and urease, which serves to assist the cleansing. Cf. C. A. 22, 2472.

**Cleaning fabrics.** FORD H. MCBERTY (to DeLaval Separator Co.). U. S. 1,715,855, June 4. Clothes or fabrics are washed with a soln. of a cleaning liquid such as naphtha or  $\text{CCl}_4$  and paraffin which serves to improve the "sheen," ability to hold a crease and resistance to perspiration.

**Fulling liquors and emulsions for treating textile materials.** KARL DAIMLER, GERHARD BALLE and FRITZ JUST (to Grasselli Dyestuff Corp.). U. S. 1,715,410, June 4. Liquors and emulsions for treating animal textile materials have incorporated in them a sulfonic acid of the benzene or naphthalene series contg. a substituent of the aryl, aralkyl, cyclo-alkyl or acyl groups.

**Textile fibers.** RUDOLF TANDLER. Austrian 112,818, Oct. 15, 1928. Fibers which can be worked up into yarn, etc., are prepd. from animal skins, intestines and bladders by combined chem. and mech. treatment comprising (1) mashing with an acidified salt soln., e. g.,  $\text{NaCl}$ ,  $\text{Al}_2(\text{SO}_4)_3$  or  $\text{Na}_2\text{SO}_4$ , preferably after pretreatment with an alk. soln., e. g.,  $\text{Ca}(\text{OH})_2$ ,  $\text{Na}_2\text{S}$  or  $\text{NaOH}$ , (2) a 2-bath chroming process, (3) a mild treatment with fat, and (4) splitting and tearing.

**Vegetable fibers.** THE ABBEY SYNDICATE, LTD. and DINSHAW R. NANJL. Fr. 654,902, May 26, 1928. Brilliant fibers suitable for spinning are obtained by treating vegetable fibers such as linen, hemp or ramie, with a 1-4%  $\text{NaOH}$  soln. under a pressure of about 10 atm. for 20 to 60 mins. Bleaching may be carried out before or after the treatment.

**Mercerizing vegetable fibers.** SOC. ANON. CELLULOSE. Swiss 130,877, July 8, 1927. Jute, cotton, linen and like fibers are given a silky appearance by removing impurities, carding, opening the fibers and immersing in a bath of  $\text{NaOH}$  at  $20-35^\circ$ . The temp. of the bath rises owing to the reaction of the  $\text{NaOH}$  on the fibers which are removed at  $40-55^\circ$ , rinsed, immersed in a soap bath, and dried.

**Mercerizing.** LEON LILIENFELD. Ger. 476,595, May 20, 1924. See Brit. 231,804 (C. A. 19, 3600).

**Apparatus for charging silk with metallic compounds.** RENÉ CLAVEL. Fr. 654,748, Apr. 11, 1928.

**Artificial silk.** FRANZ J. GAHLERT. Fr. 654,406, May 18, 1928. In a complementary treatment of artificial silk in which the thread is passed through water and drawn, sizing agents such as lightly cooked starch, gum arabic or gelatin are added to the water to produce crepe effects.

**Artificial silk.** FORTUNÉ SÉVERIN. Fr. 654,260, Oct. 11, 1927. Craping of artificial silk is obtained by steeping it in a bath contg. water 100 l., glycerol 200 kg.,  $\text{H}_2\text{O}_2$  1 l., gum tragacanth 0.2 kg., and then passing it to a 2nd bath contg. 500 g of  $\text{HCOOH}$  in 100 l. of water, and drying.

**Apparatus for dehydrating viscose products such as artificial filaments or ribbons.** SAMUEL A. NEIDICH. U. S. 1,717,118, June 11. A closed retort is arranged for treatment of the material with a dehydrating agent such as alc. vapor which is condensed in the retort at the conclusion of the operation and before opening the retort so as to avoid loss of the treating agent by volatilization.

**Fabrics of thermoplastic cellulose derivatives.** THOMAS C. WOODMAN and WILLIAM A. DICKIE (to Celanese Corp. of America). U. S. 1,716,255, June 4. A fabric comprising filaments of material such as cellulose acetate is subjected to heat and pressure to flatten the filaments of the fabric in one direction and increase the impermeability of the material.

**Finishing and stiffening cellulose goods.** GEORGES HEBERLEIN (to Heberlein Patent Corp.). U. S. 1,717,315, June 11. Material such as cotton "mock voile" is treated with caustic alkali of at least  $15^\circ \text{Bé.}$  at a temp. between about  $0^\circ$  and about  $7^\circ$  for at least 20 sec., under tension. U. S. 1,717,316 specifies producing wool-like effects on vegetable fibrous material which has not been subjected to an alkali boiling.

by treating the material, *e. g.*, cotton, in a loose state with caustic alkali which will produce a swelling action on the vegetable fibers and continuing the treatment until full swelling and shrinkage has been effected, then stopping further effect of the alkali (suitably by washing) and drying without such stretching as would substantially reduce the attained shrinkage, and without subsection of the material to alkali boiling.

**Linen.** ÉTABLISSEMENTS AUGUSTE DESCAMPS (S. A. R. L.). Fr. 653,829, May 3, 1928. A tow capable of being spun is obtained from flax straw by breaking to obtain a green tow which is chemically treated and dried. The tow is submitted to one or more treatments with alkali lye in an autoclave, neutralized, oxidized, *e. g.*, with Na perborate, acidified with HCl and dried.

**Wooly effects on threads of acetylcellulose.** RENÉ CLAVEL. U. S. 1,716,423, June 11. Threads and yarns of acetylcellulose are treated with a soln. of a lower aliphatic acid such as an 8% HOAc soln. contg. 0.5% Turkey red oil at about the b. p. of the soln.

**Wool-like effects on cotton goods.** ALBERT BODMER (to Heberlein & Co. A.-G.). U. S. 1,717,322, June 11. The goods are treated with HNO<sub>3</sub>, denitrated to render them less sensitive to alkali prior to any finishing treatment in which alkali is used, and subsequently subjected to a finishing treatment in which alkali is used, as by dyeing in an alk. bath.

**Woolly fibers from waste jute.** JOSEPH VIALLET. Fr. 653,268, Apr. 3, 1928. Waste jute is treated in a bath contg. a small quantity of diastase and a product which will attack the starches and glue, then into the bath contg. K phosphate after which they are disintegrated while damp and sent to the mercerizing and bleaching baths, giving a product similar to wool.

**Bleaching furs.** STEIN FUR DYEING CO., INC. Fr. 653,922, May 5, 1928. Skins to be made up into furs are treated with an aq. soln. of H<sub>2</sub>O<sub>2</sub> contg. NH<sub>3</sub>. Fr. 653,923 describes the treatment of skins with H<sub>2</sub>O<sub>2</sub> and an org. reducing agent such as *o*-aminophenol, or *p*-phenylenediamine which may be chosen to give a desired tint to the finished fur.

**Decolorizing rags.** VIRGINIA SMELTING CO. Fr. 652,696, Apr. 14, 1928. Rags are decolorized by a compn. contg. approx. metallic Zn 28, SO<sub>2</sub> 40 and CH<sub>2</sub>O 1 part in sufficient water.

## 26—PAINTS, VARNISHES AND RESINS

A. H. SABIN

**The painting of inscriptions of the rolling stock of railroads.** A. LEMAIRE. *Peintures, pigments, vernis* 6, 779-81(1929); cf. C. A. 21, 181.—A review of the methods and app. B. HAMILTON

**Ocher and ochery earths.** R. M. SANTMYERS. Bur. of Mines, *Circ. No. 6132*, 20 pp. (1929).—Ocher or ochery earth is defined as "a natural mineral pigment composed largely of clay permeated with hydrated iron (ferric oxide)." It has a sp. gr. of about 3.5 and is classed according to color as: cream, gray, white, golden, green or red, ocher. Ordinary ocher rarely contains over 30% Fe<sub>2</sub>O<sub>3</sub>. Uses and specifications of the varieties are noted and the mining and beneficiation described. Domestic deposits and their mining and production are touched upon. In most cases operation is intermittent. French operation, the organization of the French industry and grades of ocher in its market are outlined. W. H. BOYNTON

**Natural mineral colors.** V. CHARRIN. *Peintures, pigments, vernis* 6, 748-55 (1929).—The natural mineral colors are discussed, including sienna, umber, green earths, ochres, iron oxide or minium of iron, and minium of aluminum. Sienna is naturally a very warm yellow. B. HAMILTON

**Linseed oil of Erythrea.** ANON. *Rass. econ. colonie* (Italy) 17, 139-41(1929).—The flax cultivated on the Erythrean upland is the *Linum usitatissimum* var. *humile*. The seeds contain moisture 7, nitrogenous matter 24, non-nitrogenous matter 30.8 and ash 3.4%. The oil obtained has  $d_{15}^{20}$  0.930-0.934,  $n_D^{20}$  —15° to —18°, sapon. no. 185-190, I no. (Hübl) 190,  $n_{25}^{25}$  81-4, acidity (oleic acid) 0.15-0.17%. G. A. B.

**Ink.** A. J. SCHILLBERG. *Svensk Parn. Tid.* 33, 201-6(1929).—300 g. gallnuts free from the finest particles is soaked in a mushy consistancy for 8 days; this is stirred well each day, and then poured on a percolator, 3 l. percolate being obtained. 25 g. concd. H<sub>2</sub>SO<sub>4</sub> and 120 g. FeSO<sub>4</sub>·7H<sub>2</sub>O in water plus 5 g. phenol and 15 g. phenyl blue are added in this order, are well mixed with the percolate and the whole is made up to 4.5 l. and set aside for 8 days before bottling. This makes an ink which does not

form sediment; it has been time tested over many years. Gum should also be added if "Copy" is required. The ink does not meet the state "normal ink" requirements. The following does: To 25 g. cane sugar in clear sirup warmed over free flame (caramelization being avoided) add 28.8 g.  $\text{FeCl}_3$ . When Fe reduction and evolution of HCl sets in, remove from flame and continue vigorous stirring to liberate excess HCl. Add warm water contg. 23.4 g. tannin, 7.7 g. gallic acid, and boil 3 mins., then add 30 g. gum (arabic?) and 1 g. phenol also in warm water and make up to 1 l. The aniline dye is added with the last liquid. This latter ink has not yet been time tested. Both inks flow very well but both attack steel pens. A. R. ROSE

**Analysis of varnish.** B. TYUTYUNNIKOV. *Masloboino Zhirovoe Delo* (Oil and Fat Ind. (Russia)) 1927, No. 1, 17-20; *Chem. Zentr.* 1928, I, 121; cf. *C. A.* 22, 4842. Various methods of testing varnish, which depend on 1 no., d. and drying time, are unreliable because it is possible to prepare mixed varnishes that have the properties of linseed oil. After mixing 30% sunflower-seed oil and 70% linseed oil with an air blast the product closely resembles pure linseed oil. The *heat test of Eibner*, which consists of observing the m. p. and decompn. p. of a dry film of varnish in a capillary tube, is very sensitive. The admixt. of 5% of other oil causes a lowering of 135-40° in m. p. The second test of Eibner, the detn. of the soly. of the oil film in ether, is unreliable. The *illumination test*, which depends upon reflection from the varnish film, is also unreliable. Further investigation is in progress. F. P. C.

**Practical methods for testing varnish.** A. VILA. *Peintures, pigments, vernis* 5, 730-2 (1928).—Directions are given for sampling and for detn. of color, ignition point, non-volatile matter, solidification and time of drying, viscosity, resistance to water and flexibility. B. HAMILTON

**Ethyl abietate.** ALAN C. JOHNSTON. *Ind. Eng. Chem.* 21, 688-9 (1929).—EtOH and Et abietate, when mixed, constitute a solvent for nitrocellulose, giving a plastic film. The alkyl esters of abietic acid are very sol. in 95% EtOH and dissolve ester gum and dammar gum readily, but Manila copal less readily. The prepn. of Et abietate is described. Et abietate is employed advantageously in lacquers, such films not being tacky, and it imparts good adhesive properties to the films. B. HAMILTON

1,4-Dioxan [as solvent] (REID, HOFMANN) 13. An improved simple viscometer for colored fluids (ROBINSON) 1. New uses for Cd [as pigment] (FRANK) 18. Higher terpene compounds. XXXVII. Agathidicarboxylic acid, the crystalline resin acid,  $\text{C}_{20}\text{H}_{30}\text{O}_4$ , of kauri, hard and soft Manila copals (RUZICKA, HOSKING) 10. Anthraquinone derivative [for coloring varnish] (Swiss pat. 131,358) 25. Treatment of chrome iron ore [pigment or enamel] (Ger. pat. 476,397) 9. Hydrocarbons [for varnish industry] (Fr. pat. 652,796) 22.

SPROXTON, F.: *Vernis et emaux cellulosiques*. Translated by A. Tissot. Paris Dunod. 196 pp. F. 36.

**Paint.** CAMILLE DEGUIDE. Fr. 654,381, May 16, 1928. See Brit. 291,355 (*C. A.* 23, 1293).

**Paint, etc.** KRAUSEWERK A.-G. Fr. 653,517, Apr. 27, 1928. Coloring substances after pptn. and washing are kept damp until the moment of being mixed with oils, lakes, etc., when the water is displaced with alc. and the mud obtained is mixed with the oils, etc.

**Paint containing metallic lead.** OSCAR BRANDENBERGER (to Zähler & Schiess & Co.). U. S. 1,717,140, June 11. See Brit. 276,643 (*C. A.* 22, 2474).

**Pigment.** JAMES B. PIERCE, JR. U. S. 1,715,384, June 4. Pptd.  $\text{BaSO}_4$  is suspended in a soln. contg. 200-500 g.  $\text{ZnSO}_4$  per liter and  $\text{H}_2\text{S}$  is passed into the suspension to form  $\text{ZnS}$  and  $\text{H}_2\text{SO}_4$ .

**Pigments.** TITANIUM, LTD. Fr. 653,301, Apr. 21, 1928. A white pigment is made by mixing a paste of Ti hydrate and a paste of blanc fixe made according to Fr. 611,661, preferably with the addn. of a little C, and heating to 650°. The proportion of  $\text{BaSO}_4$  to  $\text{TiO}_2$  in the heated mixt. is 7:3.

**Ferric oxide pigment.** I. G. FARBENIND. A.-G. Fr. 653,226, Feb. 14, 1928. In the reduction of aromatic nitro compds. by Fe and an acid, a ferric oxide, which is suitable for use as a pigment, is obtained by carrying out the reduction in the presence of hydrates, oxides or difficultly sol. basic salts of trivalent or quadrivalent metals such as Ca, Al, Ce, Th, La.

**Black copying ink.** I. G. FARBENIND. A.-G. (Paul H. Wolff, Curt Jochum and



August Stock, inventors). Ger. 475,689, Dec. 28, 1926. See Fr. 633,311 (*C. A.* 22, 3537).

**Counterfeiting oil paintings.** GEORG MASCHKE. Ger. 476,572, Feb. 8, 1927, and 476,573, May 20, 1927. The picture is printed on canvas coated with a white paste of heavy spar, prepd. chalk, potato flour, glycerin and castor oil emulsion. The paste may be sprayed on the canvas.

**Oil colors and lacquers.** WALTER ZIPPER. Fr. 654,621, May 19, 1928. Oil colors or lacquers for preventing oxidation of Fe are made from a varnish or a soln. of a resin to which are added (1) org. and (or) inorg. salts of metals such that in the presence of water these salts form an alk. electrolyte, and (2) metals which constitute with respect to Fe the anode in the alk. electrolyte formed. An example is given.

**Varnishes or lacquers.** AMERICAN CYANAMID CO. Fr. 654,912, May 26, 1928. Comps. suitable for lacquers or varnishes contain a cellulose ester and an ester of a hydroxyisovalphatic acid.

**Varnishes.** I. G. FARBENIND. A.-G. Fr. 33,924, July 23, 1927. Addn. to 608,301. Varnishes are colored by incorporating in them basic dyes which may also contain acid groups and besides complex acids such as phosphotungstic acid or their salts.

**Varnishes.** I. G. FARBENIND. A.-G. Fr. 653,025, Apr. 19, 1928. Non-inflammable nitrocellulose varnishes are prepd. by adding, to a soln. of nitrocellulose contg. the usual constituents,  $\text{CH}_2\text{Cl}_2$  or its mixts. with  $\text{C}_6\text{H}_4\text{Cl}_2$ , in proportion such that it equals or exceeds the total of all other liquids present. To prevent deposition of nitrocellulose it may be necessary to add cyclic ketones, cyclohexyl acetate, aliphatic alcs. or esters.

**Varnishes, films, etc.** I. G. FARBENIND. A.-G. Fr. 653,026, Apr. 19, 1928. Urea- $\text{CH}_2\text{O}$  condensation products, such as those described in Fr. 641,420, are used in the presence of solvents with increased proportions of nitrocellulose if vegetable oils, such as castor oil previously treated at  $170\text{--}180^\circ$  with an oxidizing gas, are added.

**Varnishing.** LONZA ELEKTIZITÄTSWERKE UND CHEM. FAB. A.-G. Swiss 130,739, July 15, 1927. In coating objects with lacs contg. cellulose esters, the injurious solvent is removed, as by heating or washing, after application of the last coat.

**Varnished or gilt characters.** C. H. GEORG HAASE. Ger. 475,908, Nov. 1, 1927. Cement letters or figures are smoothed with sandstone, coated successively with a soln. of cellulose or celluloid in acetone or  $\text{AcOEt}$ , and linseed-oil varnish, and treated with gold leaf or a further coat of varnish.

**Treating unsaturated compounds.** LASZLÖ AUER. Fr. 653,435, Apr. 25, 1928. Unsatt. compds. are treated with metals, oxides or hydrates or org. bases and at the same time or subsequently with compds. yielding S, the action of the latter being increased if necessary by a vulcanization accelerator. In examples, castor oil is treated with metallic Ca and afterwards heated to  $160^\circ$  with  $\text{Fe}_2\text{O}_3$ ,  $\text{PhNH}_2$  and S, giving a product which may be molded. Resin is heated with  $\text{SnO}_2$  and, after cooling, alc. and  $\text{S}_2\text{Cl}_2$  are added, giving a product which dissolves in turpentine and gasoline to form a varnish.

**Enameling apparatus.** HEINRICH C. JAQUET. Ger. 476,109, Oct. 28, 1927. Improvements are described in app. comprising an electrically heated crucible in which the enamel is melted and from which it is sprayed by compressed gas on to the surface to be enameled.

**Electrodes for heating apparatus [for enameled or lacquered metal objects].** HUNDT & WEBER G. M. B. H. Ger. 476,108, July 31, 1927. Addn. to 468,597. Electrodes for the app. of Ger. 468,597 (*C. A.* 23, 1294) are described.

**Colophony.** JOSEPH FILIPOWICZ. Fr. 653,962, May 8, 1928. Colophony is purified by extrn. of the colored portion thereof from solns. of colophony by means of Russian benzine.

**Artificial resin.** BAKELITE CORP. Fr. 653,004, Apr. 18, 1928. Resins are made by reacting a phenol and a fatty oil such as tung, linseed or rape oil and combining the product with a  $\text{CH}_2$ -contg. hardening agent such as  $\text{CH}_2\text{O}$  or hexamethylenetetramine, and a non-phenolic resin. A soln. of the product in turpentine is used as a varnish. Phosphoric acid or boric acid may be used as catalysts for the phenol-oil reaction, but these may be replaced by acid resins. Cf. *C. A.* 23, 2051.

**Artificial resins.** COMPAGNIE FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON. Fr. 33,936, July 27, 1927. Addn. to 604,198. See Brit. 275,219 (*C. A.* 22, 2282).

**Artificial resins.** I. G. FARBENIND. A.-G. Fr. 654,317, May 15, 1928. White or transparent products are obtained by fusing and hardening a mixt. of urea with solid polymers of  $\text{CH}_2\text{O}$  with the addn. of  $\text{NaOAc}$ , borax, etc., or a small amt. of a feeble

alkali. The production of a transparent product is favored by the addn. of thiocarbamide.

**Synthetic resins.** COMPAGNIE FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON. Fr. 654,175, Jan. 28, 1928. A resin is formed by the reaction between a polyhydric alc., an aromatic polybasic acid and one or more oxidizable fatty acids, particularly an acid derived from a drying oil such as oleostearic, linolic or linolenic acid. Examples are given in which chinawood, linseed or perilla oil is used. The solns. of the products in acetone, etc., form *varnishes*, and the resins themselves may be molded. Cf. C. A. 23, 3589.

**Phthalic-glyceride resin.** HENRY C. P. WEBER (to Westinghouse Elec. & Mfg. Co.) U. S. 1,715,688, June 4. A resin suitable for varnishes and for molding and insulating composites, is obtained by the combination of phenol-furfural resins with glycerol-phthalic anhydride resins; the product has properties which are superior to those of either of its constituents.

**Phenol-resin molding mixture.** LAWRENCE V. REDMAN and VICTOR H. TURKINGTON (to Bakelite Corp.). U. S. 1,716,665, June 11. A molding mixt. is formed comprising a potentially reactive phenolic resin, a filling material such as wood flour and an aldehyde of high b. p. such as furfural. A greater proportion of filling material than of phenolic resin is used and the product is given the requisite flowing property by the aldehyde of high b. p. The material is suitable for making molded articles.

**Ketone-aldehyde intermediate and resinous complex.** CARLETON ELLIS. U. S. 1,716,542, June 11. A substantially water-white sirupy product is obtained by the reaction of a ketone such as acetone with  $\text{CH}_2\text{O}$  in the presence of  $\text{Na}_3\text{PO}_4$ . This product may be used in making *lacquers*, etc. Several examples are given.

**Condensation products.** SOC. ANON. POUR L'IND. CHIM. À BÂLE. Swiss 131,274 to 131,276, June 16, 1927. Addns. to 129,592 (C. A. 23, 3589). See Brit. 292,168 (C. A. 23, 1518).

**Condensation products of phenol and formaldehyde.** KUNSTHARZFABRIK FRITZ POLLAK G. M. B. H. Fr. 653,354, Apr. 6, 1928. See Brit. 290,963, C. A. 23, 1294

## 27—FATS, FATTY OILS, WAXES AND SOAPS

E. SCHERUBEL

**New fatty acids resulting from hydrogenation.** S. TALANZEV. *Masloboino Zhirouoe Delo (Oil and Fat Ind. (Russia))* 1927, No. 1, 23-7; *Chem. Zentr.* 1928, I, 128; cf. C. A. 22, 3793, 4849.—Various isomers of oleic acid are formed upon hydrogenation of plant oils. Myddelton and Barry terms these "new acids of hydrogenation." They constitute about 45% of hydrogenated sunflower seed oil. The presence of these isomers results in a higher quality soap from plant oils. The less of unsatd acids which an oil contains the better is the resulting soap. The hydrogenation of the oil is not necessary as by heating at 100° or treating with NO polymerization occurs and a product results which is suitable for the prepn. of solid soap. FRANCIS P. GRIFFITHS.

**Fatty acid distillation.** D. K. MÜLLER. *Seifensieder-Ztg.* 56, 170-1 (1929).—A fatty acid distn. is advantageous for soap making, but may lead to losses if improperly handled. P. ESCHER.

**Cacao butter.** I. Determination of the unsaturated acids of pressed cacao butter. H. P. KAUFMANN. *Z. angew. Chem.* 42, 402-6 (1929).—Samples of pure pressed cacao butter from 19 different sources showed the following variations in consts. m p (clear) 33.0-35.8°,  $n_D^{40}$  1.4570-1.4575, I no. 34.9-37.6, thiocyanate no. 32.7-34.9, from the last 2 consts. the percentages of oleic and linolic glycerides are calcd., varying from 34.2 to 37.3 and from 2.4 to 4.3, resp. The highest I no. of the liquid unsatd acids was 103.1. By Hazura's method of oxidation with  $\text{KMnO}_4$  a tetrahydroxystearic acid was isolated, m. 156°, showing that it is linolic acid which accompanies oleic acid in cacao butter. Twenty-five references to the literature are given. P. ESCHER.

**New tests on cacao butter.** G. ISSOGLIO. *L'industria chimica* 4, 195-6 (1929).—When 1 g. cacao butter is added to 10 cc. of a soln. made of freshly distd.  $\text{C}_6\text{H}_5\text{NH}_2$ , 15 g.,  $(\text{CH}_3)_2\text{CO}$  55 g. and 95%  $\text{EtOH}$  33 cc., it dissolves completely on heating; on cooling it remains liquid for over 12 hrs., no crystals forming. However, if other fats, such as coconut oil, stearin, lard and paraffin, have been added as adulterants, they solidify and often form crystals. It is also noted that the difference between the m p. of the fatty acid and that of the glyceride of cacao butter is about 20°, which is much greater than that between those of the common adulterants. The following figures

give m. ps. of the fat and of the fatty acid, resp.: cacao butter 26–33°, 48–53°; bone marrow 21–22, 30; steer fat 43–45, 41–47; horse fat 25–39, 36–42; stearin from cotton 29–32, 38–42; coconut oil 20–38, 24–27; palm butter 27–43, 47–50; vegetable fat 35–53, 34–36. This property serves as confirmatory evidence, when the results of the soly. test are doubtful.

A. W. CONTIERI

**The fat of *Phoca sibirica* Gmel.** A. G. FRANK-KAMENETZKII. *Compt. rend. acad. sci. union rép. soviét. social.* 1929, 67–72.—There is an interdependence between the compn. of the fat of seals and the climatic conditions. The fat from *Phoca sibirica* Gmel. had  $d_{15}$  0.929, Zeiss refractometer at 20° 81.7, acidity in % of oleic acid 0.65, acid no. 1.3, ester no. 193.3, sapon. no. 194.6, Reichert-Meissl no. 0.8, Polenske no. 2.25, iodine no. 168.4, Gener's no. 95.6, non-saponifiable fraction 0.44%. The fatty acids had  $d_{15}$  0.915, neutralization no. 202.3, av. mol. wt. 276.5, iodine no. 159.8. These values are similar to those obtained on fat from other seals except in refraction and iodine no., which are higher in the fat of *Phoca sibirica* Gmel. The reason for such differences is that this seal, inhabiting the very cold Baikal Sea, forms and accumulates more unsatd. acids, which are chemically very active.

YETTA POROSOWSKY

**The causes of deterioration of fats and oils.** W. L. DAVIES. *Chem. Age* (London) 20, 489–92(1929).—Fat deterioration is mainly caused by oxidation or by microorganisms. The effects of temp., light, acidity, impurities and metallic catalysts are discussed. If microorganisms are present in fats no autocatalytic oxidation will occur. Deterioration of fat due to bacteria is not so marked as that due to higher organisms such as molds.

E. SCHERUBEL

**The analytical quartz lamp, Original Hanau, in the oil-works laboratory.** A. WAGNER. *Chem.-Ztg.* 53, 398–9(1929).—A table is given showing the luminescence, under the quartz lamp, of raw and refined vegetable oils and their mixts., solvents for extn. and extn. residues, resins, mineral oils, wood oil, glycerol and white pigments. The appearance of these various materials under the quartz lamp gives clues for their identification, purity and source.

E. SCHERUBEL

**Composition of the olive oil residues obtained by various methods of extraction of the oil.** M. BASSARÁN AND F. BAJO. *Ind. pecuaria* 28, No. 920, 539–42(1927); *Intern. Rev. Agr.* [N. S.] 19, 820.—The authors have analyzed many samples of olive oil residues obtained: (1) by the Acapulco-Quintanilla system; (2) by the mixed system Acapulco-Quintanilla and hydraulic press; (3) by hydraulic press; and have detd., using the coeffs. of digestibility established by Kellner's standards, the starch value and the fat-protein ratio, finding an av. 36.89% of starch value and 1:9.42 fat-protein ratio in the first case; 39.33 and 1:16.63%, resp., in the second case, and very similar compn. in the samples of the second and third case. They have compared the degree of oil exhaustion of the residues as obtained by these 3 systems, noting that the fat content of the residues (ether extn.) was, resp., 15.39, 9.02 and 11.31% in respect of the wt. of the residues and 2.41, 9.02 and 11.39 in respect of the wt. of the olives: in the first case, in fact, the residue did not contain stones; in the other two cases it did. Therefore the best exhaustion was obtained by the Acapulco-Quintanilla system, also taking into account the loss of fats caused by the sepn. of the stones, which amt. to 0.30% of the wt. of the olives (80% of pulp, 20% of stones).

H. L. D.

**Castor oil from Ukraine.** N. A. VALYASHKO AND M. A. NEKHAMKIN. *Farm. Zhur.* 1928, 240–7.—Statistics are given on the cultivation of the castor oil bean in Ukraine together with the chemical and physical consts. of the oil.

E. BIELOUSS

**Constituents of soy beans.** B. REWALD. *Seifensieder-Ztg.* 56, 156(1929); cf. C. A. 23, 477, 1769.—R. points out some errors in the calcn. of lecithin and reports the following as representing an av. analysis of the cake: protein 48.00,  $H_2O$  12.00, fat + lecithin 1.5, crude fiber 6.00, ash 6.00, N-free ext. 26.50%. Cf. following abstr.

P. ESCHER

**Constituents of soy beans.** B. REWALD. *Seifensieder-Ztg.* 56, 193–4(1929).—Holtz's calcn. of the % of phosphatides is wrong in principle. Cf. preceding abstr.

P. ESCHER

**Constituents of soy beans.** M. JAKES. *Seifensieder-Ztg.* 56, 186(1929).—J. objects to Holtz's method of calcg. the total P of the soy bean as lecithin, thereby obtaining too high results; it is better to det. the P in the ether ext. directly and to calc. lecithin from it.

P. ESCHER

**Constituents of soy beans.** E. HOLTZ. *Seifensieder-Ztg.* 56, 194(1929).—Lecithin is a colloid; it may vary in compn.; only certain groups may be extd. by ether; one or more extns. would not ext. all the lecithin from within the cells.

P. ESCHER

**Absorption capacity of fuller's earth.** HANS HELLER. *Allgem. Öl- u. Fett-Ztg.* 24, 599–600(1927); *Chem. Zentr.* 1928, I, 271.—The amt. of oil absorbed by fuller's earth

in the bleaching process is calcd. according to the equation  $x = A \cdot p / (100 - p)$ , where  $A$  = the fuller's earth used,  $p$  = the % oil contained in the earth after having been used in the filter press.

FRANCIS P. GRIFFITHS

**Acid soaps.** C. BERGELL AND N. BASKIN. *Seifensieder-Ztg.* **56**, 157-8 (1929).—(1) Fifty g. fat contg. 5 g. free fatty acids was boiled for 30 mins. under reflux with 100 g.  $H_2O$  contg. 2 g. soap, and allowed to settle hot for 30 mins. (2) The above procedure was carried out with addn. of 2 g.  $NaCl$ . (3) Four g.  $NaCl$  was used. The resulting products were analyzed for total fat, free fatty acids and combined fat. No. 1 had 14% free fatty acids associated with the soap; No. 2 had 28% and No. 3 had 30% associated with it. These results show that moist soap absorbs free fatty acids more strongly than neutral fat and that this absorption is much increased by the presence of  $NaCl$ .

P. ESCHER

**Acid soaps.** A. EISENSTEIN. *Seifensieder-Ztg.* **56**, 185-6 (1929).—When oil is refined by an excess of  $NaOH$ , the resulting soap is "wetted" by neutral oil, but when an insufficient amt. of  $NaOH$  is used, the remainder of the free fatty acids will "wet" the soap and a larger yield of neutral oil results.

P. ESCHER

**Ethanolamine soaps.** RALF B. TRUSLER. *Ind. Eng. Chem.* **21**, 685-7 (1929).—Mono-, di- and tri-ethanolamines are synthesized from  $NH_3$  and fundamentally are substituted  $NH_3$  compds. in which one or more H is replaced by the ethanol group,  $HO-CH_2-CH_2$ . Phys. and chem. properties are noted. Soaps made from fatty acids and the ethanolamines possess properties which may bring them into tech. importance. Among the prospective uses are: (1) as emulsifiers for vegetable, animal and mineral oils, (2) as thickeners for lubricating oils, (3) as detergents when incorporated in special compns., (4) as efficient dry-cleaning soaps in the form of oleates which are readily sol. in org. solvents, and (5) numerous possible industrial applications due to their great soly. in almost all liquids.

W. H. BOYNTON

**Soap lather.** I. L. ZAKARIAS. *Z. physik.-chem. Seifenforsch.* **1**, 54-6 (1928). cf. C. A. **23**, 3117.—A general discussion.

P. ESCHER

**Alkalinity of soap solutions as measured by indicators.** JAMES W. MCBAIN AND KATHLEEN HAY. *J. Chem. Soc.* **1929**, 589-601. — Very few indicators are of any value for the study of the alkyl. of soap solns. Detns. are recorded for solns. of pure K and Na soaps at  $20^\circ$  and  $90^\circ$  over a wide range of concn. All the results harmonize with the recognition of 2 factors: (1) that hydrolysis is a property of the free, simple, fatty ion, not of any other ion, mol. species or colloid; (2) that hydrolysis is chiefly due to the fatty acid formed being almost completely removed to form acid soap. Hence, all soap solns. are alk. and none contains even the minute amt. of free fatty acid required to sat. the  $H_2O$ . The results obtained support the conception that soap solns. are crystalloidal when sufficiently dil. and colloidal in higher concns. For example, on the addition of soap to  $H_2O$  the hydroxyl-ion concn. rises, passes through a flat max. and diminishes again as the soap soln. becomes concd. and the simple fatty ions are replaced by ionic micelles. The more colloidal the soap the sooner is the max. hydrolysis alkyl. attained.

E. SCHERUBEL

**Composition of washing compounds.** K. LÖFFL. *Seifensieder-Ztg.* **56**, 167-8 (1929).—The desirable qualities of toilet and laundry soaps are discussed. K favors toilet soaps contg. some lanolin, hydrocarbons, etc., and laundry soaps which contain some bleaching or other beneficial agent and are obtained by spraying.

P. E.

**Structure and analysis of bleaching earths (ECKART) 18.** Hydrocarbons [for soap and candle industry] (Fr. pat. 652,796) **22.** Increasing the viscosity and lubricating power of oils (Fr. pat. 654,314) **21.** Steam-heated apparatus for gravity separation of oil and water (U. S. pat. 1,716,934) **1.** Purifying oils with liquid  $SO_2$  (Ger. pat. 476,464) **13.**

**Apparatus for steam distilling fatty acids.** METALLBANK UND METALLURGISCHE GES. A.-G. Fr. 654,833, May 25, 1928.

**Apparatus for extracting oil from olives, etc.** SOC. JEANJEAN ET CASAS. Fr. 654,217, Apr. 20, 1928.

**Rendering castor oil miscible with mineral oil.** LOUIS J. REIZENSTEIN. U. S. 1,715,785, June 4. Castor oil is heated at atm. pressure with a metallic salt or compd. such as  $Al_2(SO_4)_3$  (suitably at a temp. of about  $200^\circ$ ) and then sep'd.

**Emulsions.** INDUSTRIAL PROCESSES DEVELOPMENT, LTD. Fr. 652,981, Apr. 18, 1928. Emulsions of solvents for fatty substances (preferably a chlorinated hydro-

carbon such as  $C_2H_5Cl_2$  or  $C_2HCl_3$ ) are obtained by means of an emulsifying agent such as Turkey red oil in the presence of bentonite. Cf. C. A. 23, 249.

**Suspensions and emulsions.** I. G. FARBENIND. A.-G. Fr. 652,843, Mar. 15, 1928. The products obtained by treating fatty acids of suint or suint itself with sulfonating agents while adding phenols as described in Fr. 645,819 (C. A. 23, 2057) are used for making emulsions or suspensions of oils, etc.

**Purifying wax.** A. RIEBECK'SCHE MONTANWERKE A.-G. Fr. 654,356, May 16, 1928. See Brit. 299,357 (C. A. 23, 3365).

**Soap.** ADOLF LETTERMANN. Fr. 653,126, Apr. 20, 1928. See Brit. 288,584 (C. A. 23, 727).

**Soap.** ADOLPHE HUMBEL and JULIE RIGOLET. Swiss 131,104, June 1, 1928. A soap is mixed with powd. marble and sol. silicates.

**Soap flakes.** ERNST FLAMMER and CHRISTIAN KELBER. U. S. 1,715,999-1,716,000, June 4. See Ger. 472,047 (C. A. 23, 2589).

**Atomizer for producing soap powder.** GEBR. KÖRTING A.-G. Ger. 476,959, Aug. 28, 1926.

**Soaps, cosmetics, disinfectants, etc.** CARL STIEPEL. Ger. 476,261, Feb. 1, 1925. The waxes, lanolin or glycerol usually employed in the manuf. of superfatted soap, shaving cream and certain cosmetics, disinfectants, cleansing compns., etc., are replaced by aliphatic alcohols having 16-20 C atoms in the mol., particularly by the alcohols obtainable from spermaceti, sperm oil and beeswax. Examples are given.

## 28—SUGAR, STARCH AND GUMS

J. K. DALE

**Colloidal chemistry in its relation with the sugar industry.** J. BERGE. *Bull. soc. chim. Belg.* 38, 31-46(1929).

ALBERT L. HENNE

**The velocity of crystallization of sucrose from its pure solutions.** B. G. SAVINOV. *Nauch. Zapiski Sakharnoi Prom.* 7, 416-29(1929).—It is common knowledge that temp. and supersatn. being equal, the velocity of crystn. increases when a supersatd. soln. is stirred. S. demonstrates the relationship between the velocity of crystn. and the amt. of agitation. Four large, well-shaped crystals of ascertained wt. and area were attached to the arms of an agitator and revolved at known rates in a supersatd. sucrose soln. for definite time intervals. Three solns. were used of supersatns. 1.025, 1.015 and 1.010, resp., and at a temp. of 50°. After every predetd. time interval the gain in wt. of the crystals was detd. The velocity of crystn. increased rapidly with the speed of agitation up to a certain point, 400 r. p. m., after which it became const. for any speed. Practically, such velocities of crystns. are not attainable except in the lab.

V. E. BAIKOW

**Low-temperature injury to stored sugar cane.** GEO. B. SARTORIS. *J. Agr. Research* 38, 195-203(1929).—The f. p. of sugar-cane juice varied from  $-0.468^{\circ}$  to  $-1.090^{\circ}$  in the top nodes; from  $-0.627^{\circ}$  to  $-1.157^{\circ}$  in the lower nodes; from  $-0.575^{\circ}$  to  $-0.814^{\circ}$  in the leaves and from  $-0.72^{\circ}$  to  $-1.64^{\circ}$  in whole mature canes.

A. L. MEHRING

**Improvement of beet-sugar products treated with activated carbon.** I. N. KAGANOV AND B. E. KRASILSHCHIKOV. *Nauch. Zapiski Sakharnoi Prom.* 6, 344-51(1928).—Use of activated carbon (5% of wt. of sugar in solution) decreased the color and increased the speed of crystn. The speed of crystn. of greens increased from 65.8 to 78.3% compared with the speed of crystn. of a pure sucrose solution of the same supersatn. Activated C increased the filtration rate of carbonated juice 53%; of diluted thick juice, 20%. Solns. treated with activated C boiled 3-7% faster than the untreated solns.

V. E. BAIKOW

The Cu content of sugar-beet leaves treated with Cu compounds, and changes in their oxalic acid content (FRIGERIO) 15. Adhesive from beet pulp (YANOVSKII) 18. Purification of waste waters from beet-sugar factories (WILSON, GARNER) 14. Sugar anhydrides. I. Galactosan  $< \alpha 1,5 > \beta 1,6$  (MICHEEL) 10. Unsaturated reduction products of sugars and their derivatives. XI. 2-Desoxycellobiose (celldesose) and derivatives of 2,3-bisdesoxycellobiose (BERGMANN, BREUERS) 10. Drying [beet slices] with waste gases (Austrian pat. 113,019) 13. Ethers of [cellulose] (Ger. pat. 475,884) 23. Adsorbing agents containing  $SiO_2$  [for molasses decolorization] (U. S. pat. 1,715,439) 18.

**Methods of Chemical Control for Cane Sugar Factories and Gur Refineries.** Seorahi, Gorakhpur, India: Sugar Technologists' Assocn. of India. London, 2 St. Dunstan's Hill: Norman Rodger. 10s. 6d. Reviewed in *Intern. Sugar J.* 31, 326 (1929).

**Sugar.** HERMANN CLAASSEN. Ger. 476,715, Sept. 11, 1927. See Brit. 296,985 (C. A. 23, 2595).

**Sugar.** SUGAR BEET & CROP DRIERS, LTD. Fr. 654,632, May 23, 1928. See Brit. 293,946 (C. A. 23, 1766-7).

## 29—LEATHER AND GLUE

ALLEN ROGERS

**The technology of tanning.** GEORGE D. McLAUGHLIN AND FRED O'FLAHERTY. *J. Chem. Education* 6, 1019-34(1929). E. J. C.

**Influence of acids upon the fixation of wattle tannin by hide powder.** ARTHUR W. THOMAS AND MARGARET W. KELLY. *Ind. Eng. Chem.* 21, 697-8(1929).—The rate of tanning of hide powder in wattle-bark liquors as a function of  $p_H$  value was measured for the following acids: acetic, succinic, lactic, formic, citric, tartaric, monochloro-acetic, oxalic and hydrochloric. In the  $p_H$  range 2.5 to 3.0, the rate of tanning, qualitatively, varied inversely proportionally to the dissociation constant of the acid used. J. A. WILSON

**Can the mastic plant which grows in Sardinia be used in industry?** A. SANNA AND G. REPETTO. *Boll. soc. ital. biol. sper.* 4, 273-7(1929).—The leaves of *Pistacia lentiscus*, which grows in Sardinia, contain enough tannin to make them a source of raw material for the production of tannin. The amount of tannin in the leaves reaches the maximum during the blossoming period and then rapidly diminishes. P. M.

**Synton tannage.** ARTHUR W. THOMAS AND MARGARET W. KELLY. *Ind. Eng. Chem.* 21, 698-701(1929).—Studies were made of the tanning actions of quebracho and wattle in the presence of the synton, Leukanol. The addition of synton causes an increased rate of tanning because of its acid reaction, but with many advantages over the use of acids, one of which is that the greater rate of fixation of tannin is not accompanied by a greatly decreased rate of penetration. The synton prevents "dead tanning" or casehardening. J. A. WILSON

**Effect of pretreatment upon hydrolysis of hide powder by saturated calcium hydroxide solutions.** ARTHUR W. THOMAS AND MARGARET W. KELLY. *Ind. Eng. Chem.* 21, 701-2(1929).—The thorough drying of hide powder causes it to become more susceptible to hydrolysis by limewater. Pretreatment of the hide powder with saturated  $\text{Na}_2\text{SO}_4$  solution caused it to hydrolyze in limewater to a lesser extent than pretreatment with water, but to a greater extent than pretreatment with saturated  $\text{NaCl}$  solution. It may be that the  $\text{NaCl}$  caused the removal of the more readily hydrolyzable material prior to treatment with limewater. J. A. WILSON

**Roller leathers.** J. W. LAMB. *Dyer, Calico Printer* 61, 273(1929).—The preparation of these leathers, which are used in the spinning of cotton, is described. R. K. W.

**Determination of the water content of glue and gelatin.** E. SAUER AND H. DILLENUS. *Z. angew. Chem.* 42, 552-5(1929); cf. C. A. 22, 3550.—A 50-80-g. sample of glue or gelatin is covered with 500 cc.  $\text{H}_2\text{O}$  and allowed to stand 24 hrs., then raised to  $70^\circ$  in a water bath for 30 mins., transferred to a 1000-cc. flask, kept at  $40^\circ$  and filled to the mark. After 1 hr. the solution is shaken thoroughly, a sample transferred to a 10-cc. graduated flask, brought to  $40^\circ$  in the thermostat, made up to the mark with the solution, and then poured into a flat Al evaporation dish provided with a cover or kept in a flat weighing bottle. It is dried at  $110^\circ$  to constant weight in an air-bath, about 15 hrs. being required. It is then cooled in a desiccator over  $\text{H}_2\text{SO}_4$ , and weighed in the closed weighing flask, as the glue is very hygroscopic. Comparison analyses prove the accuracy of the method proposed. W. C. EBAUGH

**Treating leather** (Fr. pat. 654,624) 25.

**Tanning.** ORTO RÖHM. Fr. 654,831, May 25, 1928. See Brit. 292,501 (C. A. 23, 1523).

**Leather tanning.** SOC. IND. DES APPLICATIONS CHIMIQUES, SOC. ANON. I. N. D. A. C. Ger. 476,678, June 26, 1928. The usual neutralizing and deliming bath for depilated

hides is improved by the addn. of about 1%  $\text{PhNO}_2$ . The examples mention 1%  $\text{PhNO}_2$  and 99%  $\text{AcOH}$ ,  $\text{HCOOH}$  or  $\text{PhOH}$ .

**Tanning fish skins.** RUDOLF TANDLER. Austrian 112,817, July 15, 1928. In the manuf. of leather from shark and ray skins, the treatments prior to tanning are conducted so that the pearly structure is retained in the final product. The preliminary treatments comprise liming, pickling and treating with an acid soln. of sufficient concn. to ext. only the inorg. constituents of the pearly nodules. An example is given. The skins are finally tanned intensively with mineral, vegetable or fatty agents.

**Treating skins.** PAUL FOURISCOT ET FILS. Fr. 653,519, Apr. 27, 1928. After tanning with S and after a 2nd tanning with quebracho and myrobalan, skins are treated with fatty substances such as castor or codfish oil to make them waterproof.

**Leather.** ROBERT H. PICKARD, DOROTHY J. LLOYD and ALBERT E. CAUNCE. U. S. 1,715,621, June 4. A pelt, hide or skin is at once immersed in a bath of acetone of full strength until it is in equil. with a mixt. of acetone and water of sp. gr. not greater than 0.81; the acetone is removed from the material and it is then subjected to an aq. tannin soln. U. S. 1,715,622 specifies effecting tanning by treating the material in dry condition with gaseous formaldehyde. U. S. 1,715,623 specifies producing a chrome-tanned leather that may be wet back by subjecting the leather in the wet-blue condition to the action of acetone.

**Preserving leather.** THE SALT UNION, LTD. Ger. 475,897, Sept. 14, 1926. Skins and hides are preserved by soaking in brine contg. at least 1%  $\text{CdCl}_2$  or  $\text{SnCl}_4$  or a mixt. of both. Cf. C. A. 22, 3801.

**Oil for use on leather.** ARMAN E. BECKER and ARTHUR B. BOEHM (to Standard Oil Development Co.). U. S. 1,715,892, June 4. A mineral lubricating oil is mixed with an oil-sol. sulfonate contg. free alkali; saponifiable fish oil is added to react with the alkali and the mixt. is heated and stirred to facilitate neutralization; it is cooled, settled and deposited impurities are sepd.

**Dyeing leather.** I. G. FARBENIND. A.-G. (Hans Grotowsky, inventor). Ger. 476,457, April 5, 1927. Leather is dyed with sulfonic or carboxylic acid of benzal-pyrazolones. The use of the condensation product from *p*-diethylaminobenzaldehyde and 1-(3'-methyl-4'-hydroxy-5'-carboxyphenyl)-3-methyl-5-pyrazolone is described in the example.

**Washable printings on leather.** CHARLES S. FRIEDMAN (to Soc. Anciens Etablissements A. Combe & Fils & Cie.). U. S. 1,716,120, June 4. A hide or skin is prepd. for the subsequent printing, steaming and fixing steps by tanning first with formol and then in a sumac bath.

**Apparatus for granulating animal glue, gelatin, etc.** AKTIEN-GESELLSCHAFT FÜR CHEMISCHE PRODUKTE VORM. H. SCHEIDEMANDEL. Ger. 476,328, May 29, 1926. Addn. to 437,346. The glue, etc., is forced by a piston along a cylinder, the end wall of which is formed of a double grating, and one part of which is reciprocated vertically and the other horizontally in directions transverse to the push of the piston. A rotary knife may be arranged on the delivery side of the grating.

**Gelatin from demineralized bone.** ALEXANDER HOWARD TOD. Ger. 476,611, Aug. 19, 1925. The softened bone is heated in an extn. app. with water at about 80° and the gelatin soln. drawn off from the top.

### 30—RUBBER AND ALLIED SUBSTANCES

C. C. DAVIS

Hydrocarbons [for rubber industry] (Fr. pat. 652,796) 22. Emulsifiers and stabilizers [for rubber] (Fr. pat. 655,044) 22.

**Rubber.** ARNOLD R. F. VAN DER MARK and HEIN KREMER. Ger. 476,998, Apr. 23, 1925. Rubber objects are prepd. from freshly coagulated rubber, and their walls expanded by gaseous, liquid or solid pressure media and vulcanized.

**Rubber latex.** I. G. FARBENIND. A.-G. Fr. 33,927, July 25, 1927. Addn. to 630,983. Coagulation of latex is prevented by adding alcs., ketones or hydrocarbons or their derivs. and by adding neutral or alk. salts of acids such as diarylphosphoric and methylsulfuric acids. Latex with the addn. of suitable dispersing agents may be vulcanized with  $\text{SO}_2$  and  $\text{H}_2\text{S}$ . Products having a basis of rubber and resins are prepd. by coagulating mixts. of alk. solns. of hydroxyaryl-formaldehyde condensation products and latex and hardening the product which seps.

**Treating latex.** VEEDIP, LTD. Fr. 652,695, Apr. 14, 1928. Latex contg.  $\text{NH}_3$  is thickened by the addn. of a small quantity of  $\text{ZnO}$ , preferably in a finely divided state. The  $\text{ZnO}$  is made into a paste with water and a few drops of  $\text{NH}_3$  and a little latex are added to produce a thick liquid which is added to the mass of latex. The latex is afterwards heated.

**Rubber articles from latex.** UGO PESTALOZZA (to Soc. Italiana Pirelli). U. S. 1,717,248, June 11. In forming tubes, sheets, gloves or other articles, there is added to latex such a quantity of  $\text{CaSO}_4$  or other suitable coagulating agent as will coagulate the latex solely at a temp. of  $70-100^\circ$ , the latex is then brought in contact with a mold and is heated through the mold to effect coagulation; the coagulated latex is then dried.

**Rubber articles.** THE ANODE RUBBER CO., LTD. Fr. 653,215, Jan. 25, 1928. In the production of rubber articles on molds by dipping or electrophoresis, ultra-accelerators are used which effect the complete vulcanization of the articles during drying. Suitable substances are diethylamine dithiocarbamate, furoic acid and dithiofurates and mercaptobenzothiazole. The vulcanization may be effected by heated air below  $112^\circ$ , or by dipping in hot water. An example is given. Cf. C. A. 23, 2604.

**Deposition of rubber.** THE ANODE RUBBER CO. (England), LTD. Fr. 654,809, May 24, 1928. In forming deposits or coatings from suspensions, particularly of rubber, in liquids, gel-forming substances such as gelatin, agar-agar, carrageen moss, albumins or  $\text{ZnCl}_2$  are added to the liquid. Electrolytes or coagulants may also be added. Deposits may be formed by several dippings, coagulation and drying taking place between each. Cf. C. A. 23, 3598.

**Electrodeposition of rubber or similar substances.** W. A. WILLIAMS. Brit. 299,738, June 28, 1927. Deposition is effected by inserting a pair of electrodes of different materials (such as a Zn anode and a C cathode provided with a depolarizer) into a latex which contains an electrolyte such as  $\text{NH}_4\text{Cl}$  which does not readily cause coagulation and which will not evolve any substance deleterious to the latex or the deposit but will enter into chem. reaction with the anode and act as an excitant of elec. current. A voltage is used which is insufficient to decompose the added electrolyte and such that the total difference of potential between the electrodes is not sufficient to effect electrolysis of water. Fillers, vulcanizing agents and accelerators, etc., may be added to the latex. Cf. C. A. 23, 3376.

**Stabilizing rubber.** SILESIA VEREIN CHEMISCHER FABRIKEN. Fr. 653,479, Apr. 26, 1928. Natural or artificial rubber is stabilized by the products of reaction of amines with polyhydroxyaldehydes such as sugar or with disocn. products of polysaccharides, alone or mixed together or with other stabilizers, an accelerator being used at the same time. Products which may be used are, the reaction product of (1) glucose and  $\alpha$ -naphthylamine,  $\text{PhNH}_2$ , *m*-toluylenediamine, urea or *m*-toluidine, (2) milk sugar and  $\alpha$ -naphthylamine, (3) invert sugar and  $\text{PhNH}_2$  or  $\alpha$ -naphthylamine.

**Rubber composition.** ARTHUR BIDDLE (to United Products Corp. of America) U. S. 1,716,478, June 11. A coating compn. suitable for use also as an insulating material, sealing, making molded articles, etc., comprises rubber 10 lbs. (as contained in latex), dispersed in 100 lbs. of a mixt. of petroleum, castor and linseed oils and 75 lbs. of a casein glue soln. having a 20% casein content. Cf. C. A. 23, 547.

**Rubber composition.** HERBERT A. WINKELMANN (to B. F. Goodrich Co.). U. S. 1,716,474, June 11. In reworking vulcanized scrap rubber, the comminuted material is masticated with a smaller proportion of crude rubber, admixed with pine tar and concd.  $\text{H}_2\text{SO}_4$  and heated to cause a vigorous exothermic reaction.

**Preserving rubber.** ALBERT M. CLIFFORD (to Goodyear Tire & Rubber Co) U. S. 1,717,093, June 11. About 1% of  $\beta$ -dinaphthol or other suitable substance of the general formula  $\text{HO}-\text{R}-\text{R}_1-\text{OH}$ , in which R and  $\text{R}_1$  are naphthyl groups is added to rubber to render it more resistant to oxidation or aging. Cf. C. A. 23, 2603-4.

**Sponge rubber.** REGINALD J. NOAR. U. S. 1,717,168, June 11. Fr. 655,020, May 31, 1928. See Brit. 284,938 (C. A. 22, 4877).

**Vulcanization of rubber.** METALLBANK UND METALLURGISCHE. GES. A.-G. Fr. 654,496, May 21, 1928. See Brit. 291,438 (C. A. 23, 1309).



# CHEMICAL ABSTRACTS

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No. 16

## 1—APPARATUS AND PLANT EQUIPMENT

W. L. BADGER

**Improved reflex furnace.** ROBERT SAXON. *Chem. Age* (London) 20, No. 518, *Monthly Met. Sect.* 43(1929).—The furnace described in *C. A.* 23, 2115 is altered to produce higher temps. and a better utilization of the heat by inserting baffles, which preheat the gas and air and retard the vertical escape of heat. J. H. MOORE

**Protection of boilers and furnaces.** M. SEILLAN. *Rev. gén. élec.* 24, 79-82(1928); *Science Abstracts* 31B, 569.—S. refers to the advantages of graphite as an inert protective covering material for the interiors of boiler furnaces, etc. Hitherto, however, there has been difficulty in applying it to such purposes. Two new solns. have now been produced named "Neutron" and "Capol," by the use of which it is claimed that these difficulties have been surmounted. These contain graphite in a colloidal form and can be applied by a brush or a sprayer, like paint. Cases are mentioned where they have been applied with success. H. L. D.

**Present status of furnace and burner design for the use of pulverized fuel.** E. G. BAILEY. *Fuels and Steam Power* (A.S.M.E. Trans.), 50, No. 33, 187-98(1928).

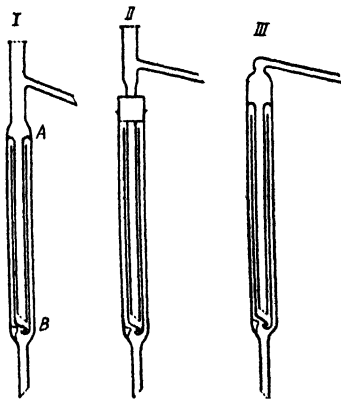
E. I. S.

**Mechanical handling of materials in and about the chemical plant. II. Belt conveyors.** A. K. BURDITT AND W. F. SCHAPHORST. *Ind. Eng. Chem.* 21, 649-54 (1929); cf. *C. A.* 23, 3032.—Principles in design of belt conveyors, different belt and pulley types, power requirements, speeds and capacities are discussed. Illustrations, tables and formulas are given. G. H. VON FUCHS

**A new fractionating column.** G. PICHARD. *Ann. sci. agron.* 45, 358-61(1928).—

The apparatus is simple in construction, of small vol. and high efficiency. It consists essentially of 3 concentric tubes. The outside tube and the central tube are joined at their upper end by a fused joint (I) or a stopper (II). Between the two is a third tube which ends in a siphon to return the condensate to the distg. flask. This tube is supported by projections on the inside wall of the envelope. Form I is used for distn. under reduced pressure and form III for  $\text{NH}_3$  distn. The distance from A to B (I) is 260 mm., the walls are 1 mm. thick and the outside diam. 25, 19 and 12 mm., resp., which provides condensing surfaces of 144, 114 and 79 sq. mm. from outside to inside. The efficiency may be judged by the following distns.

(a) 500 cc. of 1% (by vol.) soln. of alc.; distn. of 0.1 of vol. removes 95% of the alc.; (b) 600 cc. of 15% soln. alc. (equiv. to 90 cc. pure alc.); when 104 cc. of this soln. is distd. off 83 cc. of original alc. is removed; when 127 cc. is distd. off 89 cc. of original alc. is removed. K. S. MARKLEY



**New apparatus materials for chemical industries.** A. KUFFERATH. *Chem.-tech. Rundschau* 44, 12, 49(1929).—Krupp introduced, in 1912, 2 types of non-rusting steels: the VM group contg. 13-15% Cr and a little Ni; the VA group contg. 18-25% Cr and more Ni than VM. The alloy V2A has a high resistance to acids, which is further increased by cooling rapidly from 1170°; m. 1400°; sp. gr. 7.86; heat cond. 0.04 or approx 1/3 that of Fe. This alloy can be cold pressed, rolled, drawn and welded. VA steel is not attacked by  $\text{HNO}_3$  (sp. gr. 1.04-1.40) at ordinary or boiling temp. or by fuming  $\text{HNO}_3$  (sp. gr. 1.52) below 20°, but is attacked at higher temps.; it is not attacked by a 1:1 mixt. of concd.  $\text{HNO}_3$  and concd.  $\text{H}_2\text{SO}_4$ , by concd.  $\text{H}_2\text{SO}_4$  (sp. gr. 1.84) at ordinary temp., by fuming  $\text{H}_2\text{SO}_4$  (free  $\text{SO}_3$  = 60%) at 70°, by  $\text{H}_3\text{PO}_4$  below 45% or by 80%

$H_2PO_4$  at  $60^\circ$ . It resists the action of most org. acids as well, but is attacked by some at higher temp. It is resistant to the action of alkalis, of many dissolved and molten salts, i. e., solns. of Al acetate,  $Al_2(SO_4)_3$ ,  $NH_4NO_3$ , Pb acetate,  $KNO_3$ ,  $KClO_3$ ,  $Cu(NO_3)_2$ ,  $MnCl_2$ ,  $Na_2SO_3$ ,  $ZnSO_4$ ,  $Na_2SO_4$ , of molten  $KNO_3$  and  $AgNO_3$ , and of concd.  $H_2O_2$ . For distn. of solns. of the latter in *vacuo* VA steel is better than Al app. On account of this notable resistance to reagents this steel is particularly suited for use in chem. app. and in containers. The properties and uses of *Monel metal* and *Haveg* are also described. E. PICKERING

**Apparatus for the determination of density of solids.** JEAN BARTHOLOMÉ *J. pharm. Belg.* 10, 319-22(1928).—The app. consists of a calibrated bell-jar glass cover, suitably fitted to a bronze-nickel disk, unaffected by heat, which may be substituted by one of "boromica." A water-tight system is obtained by means of a trace of petrolatum on the inner surface of the cover. The vol. of the solids is taken as the decrease in vol. of the system after the insertion of the solids. For solids lighter than water, another suitable liquid may be used, or the solids may be fixed to the disk by means of a little petrolatum. Other precautions are given as to temp., measuring vols., etc. The app. is then applied to the detn. of the density of the gluten of grain, the general method of sepn. being used. The density is an indication of the value of the gluten. There is a discussion of the controlling factors of the value of a grain. A. G. DU MEZ

**Foamless vacuum distillation.** R. KUMMER. *Chem.-tech. Rundschau* 44, 14 (1929).—A description and drawings of app. are given, which permits *vacuum distn.*, on a lab. scale, of org. substances without excessive foam formation. Its action depends on an automatic pressure control which permits intermittent and momentary influx of air. E. PICKERING

**Apparatus for fractional distillation under vacuum.** ARTHUR A. ASHWORTH. *J. Inst. Petroleum Tech.* 15, 211-3(1929).—This app. for fractionally distg. under vacuum avoids the difficulty of taking off fractions for test during distn. by a 2nd, graduated, receiving chamber under the 1st one, opening from it by a stopcock with wide bore, and itself provided with a stopcock opening to the air. When the desired fraction has collected in the 2nd receiver, the stopcock above it is closed and the fraction is forced out of the lower chamber by displacing with mercury. Withdrawal of the mercury leaves the lower chamber evacuated. EMMA E. CRANDAL

**Technical developments in the use of filling agents for wash towers.** G. WEISSENBERGER AND L. PIATTI. *Kautschuk* 5, 103-6(1929).—A review and discussion of recent developments, with references to certain patents. C. C. DAVIS

**A simplified gas generator.** GREGG M. EVANS. *J. Chem. Education* 6, 1147 (1929).—The gas generator described is readily assembled from three large reagent bottles and glass tubing. C. Z. ROSECRANS

**Apparatus for technical gas analyses.** O. BURKHARDT, A. FISCHER AND FR. FRANK *Gas u. Wasserfach* 72, 504-5(1929).—A new Orsat type of gas analysis app. is described, the special features of which are the provision of a 100-cc. buret for measuring gas and a 60-cc. buret for measuring gas for explosions, as well as the use of a palladium sol pipet for H detns. The latter has a capacity of 7 to 8 liters of H (180-200 cc. of soln.) and is not poisoned by CO. A complete analysis requires 30-60 min., according to the age of the palladium sol. The use of 50% glycerol soln. in the explosion pipet is very satisfactory but leads to high results if used in connection with copper-oxide slow combustion methods as drops of glycerol are carried over. In that case it is preferable to use a satd salt soln. acidified with dil. sulfuric acid in the buret to avoid errors in detg. CO, produced. R. W. RYAN

**A new flue-gas tester.** ADOLF GROSS. *Gas u. Wasserfach* 72, 479-80(1929), cf. C. A. 22, 4013.—This app. consists essentially of an absorption chamber, provided with a special stopcock and contg. slaked lime sufficient for 200-300 tests. The loss in vol. equivalent to the  $CO_2$  content of the gas is measured by the effect of the decrease in pressure on a diaphragm, provided with a calibrated screw which is turned until contact is made with the diaphragm, lighting a small lamp. The app. is very compact and easy to use. R. W. RYAN

**An accurate drop recorder.** O. S. GIBBS. *Science* 69, 649-50(1929); cf. *J. Lab. Clin. Med.* 12, 686(1927).—A soln. of 10%  $Na_2SO_4$  is displaced from a glass chamber and flows into a minute cup, through the bottom of which is a Pt needle to serve as an electrode. A Pt capillary, also to serve as an electrode, is connected with an evacuated reservoir, and is adjusted just above the Pt needle, so that drops are sucked from the cup through the capillary and into the reservoir. The size of drop measured depends upon the shape of the cup used, as well as upon the extent of evacuation and the size of the capillary. Measurement of as many as 600 drops per cc. is readily attained. W. D. LANGLEY

**Pipet for exact analysis of gases.** E. MOLES AND L. R. PIRE. *Anal. soc. españ. fis. quim. (Sec. tecnica)* 27, 107-9(1929). E. M. SYMMES

**Analytical balance for high temperatures.** TAKAYUKI SOMIYA. *J. Soc. Chem. Ind. (Japan)* 32, 249-53(1929); *Suppl. binding* 32, 75-6B.—A new, simple balance is described by which weighing continuously and accurately to 0.1 mg. is possible with the pointer of the balance always on the zero mark, even when the body is heated to temps. as high as 1300°. S. KONDO

**Modern analytical balances.** LUDWIG RAMBERG. *Svensk Kem. Tid.* 41, 106-19 (1929).—A general description of balances including some historical and some theoretical observations. Claims of sensitivity exceeding 0.01 mg. by makers of microbalances are questioned. A. R. ROSE

**Electrical instruments in the chemical industries.** B. P. ROMAINE. *Instruments* 2, 203-8(1929).—A review. J. H. MOORE

**Thermal elements for high temperatures in reducing atmospheres.** J. A. M. VAN LIEMPT. *Rec. trav. chim.* 48, 585-8(1929).—Since it is deemed advisable not to use Pt-PtRd elements for thermocouples for temps. above 1000° and since Pt is rendered very brittle by traces of Si, v. L. studied other elements in an attempt to find a satisfactory substitute. W-Mo, W-PtRd and Mo-PtRd elements were observed. The latter two were found to be satisfactory for use in reducing atms. They also furnished twice as great a thermal e. m. f. per degree as the Pt-PtRd couple for temps. between 1000° and 1600°. The W-Mo couple first showed a positive and then a negative e. m. f. L. L. QUILL

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Air filter for refrigerating chambers, etc. (U. S. pat. 1,717,470) 13.

**Volumetric gas analysis apparatus.** J. G. DALOZ. *Brit.* 300,281, Nov. 10, 1927. Structural details.

**Gas-analysis apparatus.** ARTHUR B. CUNNINGHAM (to Republic Flow Meters Co.). U. S. 1,719,593, July 2. Various structural details are described of an app. adapted for detg. CO<sub>2</sub>. Cf. C. A. 22, 2689; 23, 551.

**Electromagnetic chemical balance.** HANTARO NAGAOKA and JOTO IKEBE (to Zoidan Hojin Rikagaku Kenkyujo). U. S. 1,717,462, June 18. Structural features.

**Carbide-feed acetylene generator.** CHARLES W. BECK. U. S. 1,719,162, July 2. Structural features.

**Catalytic apparatus.** A. O. JAEGER (to Selden Co.). *Brit.* 301,491, Dec. 2, 1927. In a converter of the Tentelew type, at least a part of the reaction mixt. is caused to flow substantially parallel to the catalyst tubes and in indirect heat exchange relation to them and then in reverse direction in intimate contact with the catalyst tubes, and then, after another reversal of direction, through the tubes themselves. The app. is described. Cf. C. A. 23, 2330.

**Colloid mill.** WM. EPPENBACH. *Fr.* 655,774, Nov. 22, 1927.

**Chemically resistant material suitable for conduits for liquids and gases.** WARREN F. BLECKER. U. S. 1,718,627, June 25. Conduits or similar articles are formed of graphite together with a fusible chemically resistant material such as S or pitch mixed to a point of satn.

**Distilling column.** VICTOR P. A. MARCHAND. *Fr.* 655,317, Apr. 30, 1928.

**Filters.** THE ANODE RUBBER CO. (England), LTD. *Fr.* 656,310, June 20, 1928. In filtering liquids such as *aq. dispersions of rubber* which tend to coagulate, the liquid is caused to pass through a fraction of the filtering surface moved intermittently or continuously transversely to the sense of flow of the liquid so that the point of passage of the liquid is displaced along the filtering surface.

**Apparatus for cleaning sand filter and the like.** J. PEEBLES. *Brit.* 301,006, Aug. 23, 1927.

**Drum for wet grinding.** FRIED. KRUPP GRUSONWERK A.-G. *Ger.* 477,135, June 28, 1927.

**Drying drum.** JOHANNES WEISS. *Ger.* 473,132, Oct. 6, 1926.

**Rotary or swinging vacuum drying drum.** AUGUSTINUS E. JONSSON. *Ger.* 477,418, Nov. 24, 1927.

**Homogenizer for rotating drum filter.** FILTERS PHILIPPE (SOC. ANON.) and ÉDOUARD HEIBIG. *Fr.* 656,069, June 18, 1928.

**Rotary suction drum filter construction.** H. NOTZ. *Brit.* 301,541, Sept. 1, 1927.

**Drying apparatus comprising concentric rotary drums.** JEAN B. VERNAY. *Ger.* 477,369, Oct. 25, 1927.

Means for removing the cake from filter drums. MASCHINENFABRIK BUCKAU R. WOLF A.-G. Ger. 477,493, Sept. 2, 1924.

Rotary-compartment drum apparatus for drying, charring or other treatments of ore, coal, shale or other loose materials. OTTO DOBBELSTEIN. U. S. 1,718,542-3-4, June 25. Structural features.

Vertical drying and dehydrating apparatus. MAX BAECHLER. U. S. 1,718,104, June 18. Structural features.

Drying or destructive distillation apparatus. LUDWIG HONIGMANN. Ger. 472,032, Jan. 16, 1927. Addn. to 466,925. The app. of Ger. 466,925 (C. A. 23, 3131) is elaborated by providing a casing in the upper half of the container for each of the conductive plates. Mixing of the heating gases with the distn. gases is thus avoided.

Air heater for drying installations. CORNEILLE LONGTON. Ger. 477,152, Apr. 12, 1928.

Tubular drier. ENGELBERT CALENIUS. Ger. 477,214, Feb. 27, 1926.

Apparatus for carrying out chemical reactions. MME. CASALE (NÉE MARIA SACCHI). Fr. 656,254, June 8, 1927. See Swiss 128,001 (C. A. 23, 1784).

Spray apparatus for mixing liquids and gases. KIRKHAM, HULETT and CHANDLER, LTD. Ger. 477,175, Apr. 30, 1926.

Apparatus for subliming volatile substances. THE NEW ZEALAND SULPHUR CO., LTD. Fr. 655,867, June 11, 1928.

Evaporator of the film type. BURTON S. HUGHES and STANLEY HUGHES. U. S. 1,717,927, June 18. Structural features.

Apparatus for detecting and estimating the presence of vapors, gas, smoke, etc. MAX BUCHHOLZ. Fr. 656,141, June 20, 1928.

Apparatus for condensing vapors by streams of liquid passed in the same direction. I. G. FARBERIND. A.-G. Brit. 301,430, Nov. 29, 1927. Structural features.

Apparatus for evaporating waste sulfite liquor or other liquids in bulk by direct contact with hot flue gases. S. H. LEDIN and J. O. NAUCLER. Brit. 300,590, Nov. 15, 1927.

Device for separating dust from gases by centrifugal force. A. STIEVENART. Brit. 300,921, Nov. 17, 1927.

Tubular heat-exchange apparatus. A.-G. BROWN, BOVERI ET CIE. Brit. 301,291, April 14, 1928. Structural features.

Tubular heat-exchange apparatus. AKTIEBOLAGET SVENSKA JÄRNVÄGSVERKSTADERNA. Brit. 301,426, Nov. 29, 1927. Structural features.

Heat-exchange apparatus suitable for conditioning air. JAMES POSEY (to Two-Season Process, Inc.). U. S. 1,719,080, July 2.

Apparatus for heating liquids or molten materials by submerged flames. O. BRUNLER. Brit. 300,819, Dec. 21, 1927. Various constructions are described suitable for use in cement manuf., in evapg. liquids to effect concn., etc.

Apparatus suitable for making carbon disulfide or for other chemical reactions. THOMAS GRISWOLD, JR. (to Dow Chemical Co.). U. S. 1,719,509, July 2. The app. comprises a separable reaction chamber and a metallic vaporizing pot mounted in a common setting in a position incapable of receiving refuse from the reaction chamber. Various structural details are described. Cf. C. A. 23, 2255.

Apparatus for separating mineral substances by gravity in water. THOMAS M. DAVIDSON. U. S. 1,719,171, July 2.

Apparatus for separation of mineral substances of different densities by use of air currents. W. R. CHAPMAN. Brit. 301,336, June 24, 1927. Structural features.

Apparatus for aerating sewage or other liquids. LLOYD LOGAN (to Koppers Co.). U. S. 1,717,713, June 18.

Apparatus for extracting gum, resin and oils from plants. UMBERTO BELLINI DELLE STELLE. Fr. 655,733, Oct. 18, 1927.

Apparatus for proportionate mixing of cleansing liquids, etc., with water flowing through a pipe. H. J. LLOYD. Brit. 300,341, Sept. 7, 1927. Structural features.

Apparatus for testing materials under tension or compression stresses, etc. A. ESAU. Brit. 300,564, Nov. 14, 1927.

\* Instrument for measuring turbidity or color of fluids. WM. G. EXTON. U. S. 1,717,702, June 18.

Apparatus for making test samples of slivers and like material. PAUL LATSCH. U. S. 1,719,061, July 2.

Baffle system for apparatus for separating oil and gas. MILLARD F. WATERS (to Smith Separator Co.). U. S. 1,718,013, June 18. Structural features.

Filter for oil. HERBERT A. THOMPSON (one-half to Swinney Bros., Ltd.). U. S. 1,719,346, July 2. Structural features.

- Wick filters for oil, etc.** SOC. ANON. DES PROCÉDÉS R. AUDUBERT (S. A. P. R. A.). Brit. 301,507, Dec. 2, 1927. Structural features.
- Furnaces** AMERICAN ENGINEERING Co. Fr. 655,482, June 7, 1928. Method of feeding fuel.
- Furnace.** E. C. LOESCHE. Ger. 477,211, Oct. 15, 1927. Materials to be burnt, sintered, roasted or distd. are forced upwards from below on to the furnace hearth, and a flame or an elec. arc is directed downwards on to the hearth. Cf. C. A. 23, 2857.
- Air preheater (plate type) for boiler furnaces.** SIEMENS-SCHUCKERTWERKE A.-G. (Martin Eule, inventor). Ger. 477,336, Feb. 2, 1926.
- Regenerative inversion furnace.** SOC. DES FOURS À HAUT RENDEMENTS. Fr. 656,251, June 10, 1926. Arrangements of burners, etc., are described.
- Low-temperature carbonization furnace.** INTERNATIONAL HOLDING DE DISTILLATION ET DE COKEFACTION À BASSE TEMP. ET MINIERE (HOLCOBAMI). Fr. 656,448, June 25, 1928.
- Retort furnace setting construction.** LOW TEMPERATURE CARBONISATION, LTD., and C. H. PARKER. Brit. 301,361, May 27, 1927.
- Grate with mechanical feed for furnaces.** AMERICAN ENGINEERING Co. Fr. 655,221, June 4, 1928.
- Tunnel annealing furnace construction.** BIRMINGHAM ELECTRIC FURNACES, LTD., and A. G. LOBLEY. Brit. 300,293, July 6, 1927.
- Furnace for annealing, heat treatment, etc.** CLIFFORD NELSON. U. S. 1,718,798, June 25. Structural features.
- Burners for liquid fuel.** PAUL LINKE. Fr. 656,278, Apr. 21, 1928. The construction of a fuel regulator is described.
- Burner for heavy liquid fuel.** JOANNY CHOIGNARD. Fr. 656,014, Nov. 3, 1927.
- Burners for powdered fuel.** HORACE A. MARSTON. Fr. 656,430, June 25, 1928.
- Burner for powdered coal.** BÜTTNER-WERKE A.-G. Fr. 655,779, Feb. 10, 1928.
- Burner for petroleum.** JOSEPH A. P. DE GUISE. Fr. 655,477, June 7, 1928.
- Burner for mazout.** MARCEL BRASSLER. Fr. 656,323, June 22, 1928.
- Double gas burner.** BURGER EISENWERKE G. M. B. H. Fr. 655,959, June 15, 1928.
- Röntgen-ray apparatus.** F. S. SMITH. Brit. 301,174, Oct. 27, 1927.
- Röntgen-ray apparatus.** SIEMENS-REINIGER-VEIFA GES. FÜR MEDIZINISCHE TECHNIK. Brit. 301,377, Nov. 28, 1927. Structural features.
- Röntgen-ray tubes and similar devices.** F. ROTHER. Brit. 300,547, Nov. 14, 1927. Electrons are released from a cold or incandescent cathode by spraying it with  $\alpha, \beta$  or  $\gamma$  particles from a vaporizable radioactive material. The anode of a Röntgen-ray tube or rectifier may comprise U or Th.
- X-ray tube with a filling of hydrogen or helium.** ALBERT BOUWERS and WILLIAM H. VAN DE S. BAKHUYZEN (to Naamlooze Vennootschap Philips' Gloeilampenfabrieken) U. S. 1,718,849, June 25.
- Temperature indicator for steam-supply pipes, etc.** NIELS CHRISTIANSEN (to Newport News Shipbuilding and Dry Dock Co.). U. S. 1,719,046, July 2. Mech. features.
- Thermostatic electric circuit closer (suitable for use as an alarm device).** OD TEEL. U. S. 1,717,529, June 18. Structural and elec. features.
- Thermostatic control device for electric circuits.** HERBERT J. SAUVAGE (to Electro Thermostatic Control Co.). U. S. 1,717,628, June 28.
- Thermostatic control for heating apparatus such as boiler furnaces.** ANDRÉ M. MERTZANOFF (to American Radiator Co.). U. S. 1,717,993, June 18.
- Thermostatic control for electric heating apparatus.** W. STUWE. Brit. 301,250, Feb. 13, 1928.
- Thermostatic control device for radiator shutters, etc.** F. W. MILLER. Brit. 300,345, Sept. 12, 1927.
- Thermostatic safety cut-off for gas burners.** N. T. SELLMAN (to Spencer Thermostat Co.). Brit. 300,507, Nov. 12, 1927.
- Thermostatic cut-off valve for gas burners.** K. BECK. Brit. 300,966, Nov. 21, 1927. Structural features.
- Thermostatic regulating apparatus for saltpeter baths used in drawing wire, etc.** EVERETT S. NEWCOMB (to Charles Engelhard, Inc.). U. S. 1,719,441, July 2. The supply of fuel to a heating burner is decreased when the temp. of the bath or in a surrounding chamber exceeds a certain point and is increased as the temp. falls.
- Bimetallic material for thermostats.** LAURENCE K. MARSHALL (to Spencer Thermostat Co.). U. S. 1,718,750, June 25. Material such as united Monel metal and

Ni steel is subjected to cold rolling a predetd. no. of passes to effect a certain reduction of cross section and heat-treated; then again it is cold rolled a greater no. of passes to reduce the cross section by a lesser quantity, again subjected to heat treatment at the same temp. as in the first heat treatment (suitably about 800°); this successive rolling and heating is continued until a product of desired thickness and temp. characteristics is obtained.

**Thermostatic electric switch.** H. D. DORFMAN (to Metropolitan-Vickers Electrical Co., Ltd.). Brit. 300,276, Nov. 10, 1927. Structural features.

**Thermally released electric switch.** C. H. CHAPMAN and G. R. TOWNSEND (to British Thomson-Houston Co., Ltd.). Brit. 301,425, Nov. 29, 1927. Structural features.

**Electric discharge devices.** NAAMLÖÖZE VENNOOTSCHAP PHILIPS' GLOEILAMPEN-FABRIEKEN and S. R. MULLARD. Brit. 300,403, Dec. 5, 1927. Tubes such as thermionic valves, x-ray tubes or gas-filled rectifiers have a piece of coherent Zr distinct from the cathode placed so that it is heated during the operation of the tube by heat generated in the tube and absorbs gaseous residues, etc.

**Electric discharge devices.** NAAMLÖÖZE VENNOOTSCHAP PHILIPS' GLOEILAMPEN-FABRIEKEN. Brit. 301,455, Nov. 30, 1927. An arc discharge tube suitable for use as a rectifier contains a Wehmelt cathode, a filling comprising Hg vapor and a gas such as H, N, CO or CO<sub>2</sub> and a small quantity of rare gas such as A. The cathode preferably has a core of refractory metal such as W on which a wire of lower m. p. metal such as Ni is wound, which is coated with a compd. such as BaO. Various details are given.

**Electric discharge lamps.** C. G. FOUND (to British Thomson-Houston Co., Ltd.) Brit. 301,433, Nov. 29, 1927. Various structural features are described of lamps which may have an anode of Fe, Al, Ni or Mo and a cathode of Ni coated with BaO preferably by applying BaCO<sub>3</sub> in a cellulose-compd. binder and heating to about the m. p. of Ni Cf. C. A. 23, 2856.

**Low-pressure mercury discharge tubes.** NAAMLÖÖZE VENNOOTSCHAP PHILIPS' GLOEILAMPEN-FABRIEKEN. Brit. 301,412, Aug. 29, 1927. Various structural features are described of elec. discharge tubes which may contain A or Ne in addn. to Hg vapor and which may be used for luminous purposes. In forming the tube, Mg or Ba is vaporized to remove detrimental gases or vapors.

**Electron-emitting cathodes.** HOWARD T. REEVE (to Western Electric Co.) U. S. 1,719,128, July 2. Cathodes such as those of thermionic devices are formed by making a core of Ba and Sr nickelites and Pt powder, heating the core to reduce the nickelites and working the product into filaments.

**Incandescent cathode for discharge tubes.** PIETER W. DOBBEN, JOHANNES G. W. MULDER and EKKO OOSTERHUIS (to Naamlöoze Vennootschap Philips' Gloeilampen-fabrieken). U. S. 1,718,123, June 18. A core of highly refractory metal such as W or Mo has helically wound on it another metal wire formed mainly of Ni and provided with a coating of high emissivity such as alk. earth oxide.

**Hot cathodes for electron tubes.** ALLGEMEINE ELEKTRICITÄTS-GES. and TELEFUNKEN GES. FÜR DRAHTLOSE TELEGRAPHIE M. B. H. (Ernst Friederich, Hans Rukop and Hellmut Simon, inventors). Ger. 477,232, June 23, 1922. The cathodes are made of difficultly fusible metal, especially W, contg. addns. of rare earth metals or Yt or Sc. The addns. may be derived from the oxides or other compds. of the metals, the compds. being reduced *in situ*, e. g., with hydrocarbons or reducing metal vapors.

**Exhausting vacuum tubes.** HERBERT L. METCALF (to Magnavox Co.). U. S. 1,719,773, July 2. The electrodes and "getters" are heated under low vacuum only, and the device is then subjected to pumping to the limit of a mol. pump and sealed off before the heat of processing has been lost.

## 2—GENERAL AND PHYSICAL CHEMISTRY

FREDERICK L. BROWNE

**Chemical science in Czechoslovakia.** J. G. F. DRUCE. *Science Progress* 24, 105-7 (1929).—The status of chemistry in Czechoslovakia in the past and at present is described.

**Recent advances in science: physics.** L. F. BATES. *Science Progress* 24, 5-15 (1929).—A review of recent work of physico-chem. interest.

**Cosmic chemistry.** S. ROSSELAND. *Tids. kemi og Bergvesen* 8, 121-5, 135-8 (1928).—A survey.

JOSEPH S. HEPBURN  
JOSEPH S. HEPBURN  
ARNE DROGSETH

**Viscosity in the stars.** S. ROSSELAND. *Month. Not. Roy. Astron. Soc.* **89**, 49–53 (1928). H. L. D.

**Electrical conductivity of stellar matter.** S. CHAPMAN. *Month. Not. Roy. Astron. Soc.* **89**, 54–7 (1928). H. L. D.

**Mendelyev's periodic law.** P. PETRENKO-KRITCHENKO. *Ukrainskii Khem. Zhur.* **3**, Sci. Pt., 445–55 (1928); cf. *C. A.* **22**, 3574; **23**, 2092.—A connection is sought between Mendelyev's periodic law and the interrelations of elements or atomic groups within the mol. of compds. In the belief that the cumulative influence of the atoms and atomic groups finds expression in the chem. reactivity of the mol., reaction velocities are studied for exptl. evidence. The absolute velocities of reactions are affected by such extraneous factors as temp., concn., catalysis, substitution and rupture of mols., but the relative shapes of the reaction curves for different members of a series of reactants are not so affected and presumably depend upon definite chem. constns. It is shown, for example, that the character of the reaction curves remains unchanged on altering the temp., concn., solvent, introduction of halogen into Me or Et groups or of COOH or Et into Me. In substitution reactions of the halogen derivatives of  $C_2H_6$ , fission may also occur but it does not alter the character of the reaction curve; the breaking of the bond between C and the first halogen atom dominates the reaction, the fission of the next halogen atom and its consequences being of secondary importance. BERNARD NELSON

**A comparison of the atomic weights of terrestrial and meteoric nickel. III. The analysis of nickelous bromide.** GREGORY P. BAXTER AND SABURO ISHIMARU. *J. Am. Chem. Soc.* **51**, 1729–35 (1929).—Ni extd. from a new meteorite was found to have the same isotopic compn. as terrestrial Ni. The at. wt. of Ni is 58.694. M. D.

**The atomic weight of antimony from different sources.** R. K. MCPALPINE. *J. Am. Chem. Soc.* **51**, 1745–50 (1929).—The at. wt. of Sb obtained from Hungary and Bolivia is found identical, contradicting the results of Muzaffar (*C. A.* **17**, 3433).

MALCOLM DOLE

**Molecular structure and chemical linking.** F. HUND. *Physik. Z.* **29**, 851–2 (1928).—Preliminary. Two-center systems are considered with CN, LiH and  $He_2$  term schemes as examples. B. C. A.

**Improved dilution table for sulfuric acid.** J. P. ROGERS. *Industrial Chemist* **5**, 223–4 (1929).—Available diln. tables for  $H_2SO_4$  call for the addn. of a varying quantity of acid to a definite quantity of water or of a definite quantity of acid to a varying quantity of water, thus giving a varying quantity of the dil. soln. The table here given shows the quantities of acid and water necessary to produce a definite quantity of dil. acid of the required strength. E. H.

**Theory of ferromagnetism.** N. AKULOV. *Z. Physik* **54**, 582–7 (1929); cf. *C. A.* **23**, 764. GEORGE GLOCKLER

**The dielectric polarization of liquids. IV. The dependence of molar refraction upon concentration in mixtures.** C. P. SMYTH, F. W. ENGEL AND E. BRIGHT WILSON, JR. *J. Am. Chem. Soc.* **51**, 1736–44 (1929); cf. *C. A.* **22**, 4045.—The refractive indices  $n_D^{20}$  were measured for the binary mixts. of  $C_7H_{16}$  with  $CCl_4$ ,  $C_2H_5Br$ ,  $C_4H_9Br$ ,  $C_2H_5I$ ,  $C_2H_5OH$ ,  $C_6H_{11}$ ,  $C_4H_9Cl$ ,  $C_7H_{15}Br$  and  $C_4H_9OH$ , resp., and the systems:  $C_2H_5Br$ – $C_2H_5I$ ,  $C_4H_9Cl$ – $C_4H_9Br$ ,  $CCl_4$ – $C_4H_9OH$ ,  $C_4H_9Br$ – $C_4H_9OH$ ,  $C_2H_5Br$ – $C_2H_5OH$  and  $C_2H_5I$ – $C_2H_5OH$ . The mol. refractions calcd. from these data are independent of the concn. to within 0.07%, indicating that the contribution of induced electronic shifts to the polarization of a mol. of one of these substances is not noticeably affected by the surrounding mols. The mol. refraction of the alcs. studied is independent of the compn. and this fact is used as evidence against the hypothesis of an actual sharing of electrons between mols. when assocn. occurs. H. S. V. KLOOSTER

**Measurement of the dielectric constants of liquids, with a determination of the dielectric constant of benzene.** L. HARTSHORN AND D. A. OLIVER. *Proc. Roy. Soc. (London)* **A123**, 664–85 (1929).—The app. for the detn. of dielec. constns. of liquids has been improved to avoid previous errors, by modifications to insure that the air capacity of the test condenser is located entirely in air (no lines of force passing through the container, supports, etc.), and the liquid capacity is located entirely in liquid and geometrically identical with the air capacity. The value  $\epsilon_{20} = 2.2825 \pm 0.0005$  ( $\partial\epsilon/\partial t = -0.001958 \pm 0.00003$ ) was found for pure  $C_6H_6$ . A. S. CARTER

**Size of ions and its influence on the properties of salt-like compounds.** L. PAULING. *Z. Krist.* **67**, 377–404 (1928); cf. *C. A.* **22**, 2086.—The forces operating between ions are discussed from the point of view of quantum mechanics and a simple approx. expression is given for these forces as a function of the size of ions. The derivation of interionic distances to a first approximation by neglect of deviations from additivity is discussed. The influence of radius relationships on physical properties of the alkali halides, and on

the axial ratios of crystals of the rutile type and of anatase, is discussed, together with the question of the relative stabilities of the various crystal structures. B. C. A.

**Influence of tempering, moistening, and plasticizing on the conductivity of ionic crystals.** FRANZ QUITTNER AND ADOLF SMEKAL. *Z. physik. Chem., Abt. B*, **3**, 162-5 (1929); cf. *C. A.* **22**, 907, 1271.—Conductance effects predicted by the loose-space theory of crystals as a result of tempering, moistening and plastic deformation are obtained in the temp. range of loose-ion conduction with rock salt and silvite. Moistened rock-salt crystals undergo alterations of the crystal interior, which persist even after substantially complete drying, and enable one to understand the cohesion expts. of Joffé with moistened crystals. H. W. WALKER

**Conductivity of cuprous oxide.** HANS KOST. *Z. Physik* **54**, 367-71 (1929).—The rectifying properties of  $\text{Cu}_2\text{O}$  films on Cu plates is thought to be a sp. property of the  $\text{Cu}_2\text{O}$  crystals themselves. Cf. *C. A.* **21**, 14. GEORGE GLOCKLER

**The piezoelectric constant of quartz as a function of temperature.** A. ANDREEV, V. FRÉDERICKSZ AND I. KAZARNOVSKII. *Z. Physik* **54**, 477-83 (1929).—The piezoelec. const. depends only slightly on temp. between  $15^\circ$  and  $500^\circ$ . GEORGE GLOCKLER

**The crystal structure of strontium.** A. J. KING. *Proc. Nat. Acad. Sci.* **15**, 337-8 (1929); cf. *C. A.* **22**, 4288.—Measured powder spectrograms show that Sr has a face-centered cubic lattice or very similar structure with a unit cell contg. 4 atoms of unit edge equal to 6.075 Å. U. The calcd. d. is 2.58 as compared with 2.6 by direct measurement. The distance between Sr atoms is calcd. to be 4.295 Å. U. Strong fogging of the film was due to secondary radiation from Sr. H. W. WALKER

**Entropy change of gases during irreversible processes.** D. ENSKOG. *Z. Physik* **54**, 498-504 (1929).—Mathematical. GEORGE GLOCKLER

**The viscosity of liquids above their boiling points.** V. TOSHIKO TITANI. *Bull. Chem. Soc. Japan* **4**, 68-75 (1929); cf. *C. A.* **21**, 3781.—Recent data for ether and acetone enable T. to apply his equations (I and II of previous abstract) at low temp. They do not fit the data well. Eliminating  $\phi$  from these gives  $V_k^{1/3} - V^{1/3} = A(T_k - T)^{1/3}$ , where  $A = C/K$ .  $V_k$  is chosen to give best agreement with the data. This equation fits very well except at the critical temp., where errors of as much as 5% appear. V. F. H

**Viscosity of mercury.** F. SAUERWALD AND W. RADECKER. *Z. Physik* **54**, 844-7 (1929).—Preliminary expts. show that the present values of the viscosity of Hg are correct. GEORGE GLOCKLER

**Vapor pressure at low temperatures.** N. A. KOLOSOVSKII. *J. Russ. Phys.-Chem. Soc.* **60**, 1403-16 (1928).—Planck's formula:  $(d \log p/dT)_{T=0} = \text{const.}/0 = +\infty$  (from which  $S_g = S_l + \infty$ ) is obtained by the extrapolation of an empirical relationship to  $0^\circ\text{K}$ . Such extrapolation assumes that we are dealing with a continuous function and is therefore statistically correct only for a large no. of mols. From the kinetic-theory point of view, pressure is proportional to the no. of gas mols.  $n$ , or  $p = nRT/Nv = nkT/v$ , where  $k$  is Boltzmann's universal const. Substituting this in the integrated form of Planck's equation (cf. his *Vorlesungen über Thermodynamik*, p. 276, 1927), one has  $(C+1) \log T + (B/T) + DT = (A + 24.8687) + \log v - \log n$ . From the known values of  $A$ ,  $B$ ,  $C$  and  $D$ , and setting  $v = 1.5 \times 10^{24}$  l. (the vol. of Einstein's universe),  $n$  is found less than 1 for temps. above  $0^\circ\text{K}$ . in the case of  $\text{H}_2$ , Hg,  $\text{I}_2$ , PhH and Mo. Or,  $p$  is practically 0. In the neighborhood of these temps. and zero pressures the vapor pressure changes in jumps ("pressure quanta") each of which represents the pressure effect of a single mol. Since the free path is very large, temp. equil. between the gas and solid wall obtains only at the moment of impact, i. e. at certain very long intervals. Or  $dQ/dT = 0$  and  $dp/dT = 0$  at lim.  $T = 0$ . The methods of formal mathematics probably cannot be applied in the region where the laws of statistics no longer hold. It seems more nearly correct to consider such phenomena from a phys. (kinetic) standpoint. BASIL C. SOYENKOFF

**Molecular association. I. Relation between the vapor pressure of binary liquid mixtures and the polarity of the molecular constituents.** J. ERRERA. *Compt. rend.* **187**, 727-30 (1928); *Z. physik. Chem., Abt. A.*, **138**, 332-44.—The elec. forces existing between mols. in a binary liquid mixt. may be indicated from vapor-pressure measurements. The magnitude of vapor pressure gives a measure of total mol. assocn. as a function of the no. of free mols. while a measure of polarity only allows for the calcn. of dipolar assocn. Three classes of mixts. are made: (1) Vapor-pressure curves are either straight lines or convex with or without a max. and assocn. is not homopolar since the mols. are not polar. Polarity curves in this case are either straight lines or only weakly curved. (2) If one mol. species is non-polar, the other being polar, both polarization and vapor-pressure curves are either a straight line or convex with or without a max. This is due to the fact that dipolar assocn. is greater than homopolar assocn.



(3) If vapor-pressure curves are concave with or without a min. both mol. species are polar. Increase in temp. decreases assocn. forces and the curves tend to approach a straight line.

RAYMOND H. LAMBERT

**Molecular association. II.** The relation between the viscosity of binary liquid mixtures and the polarity of the molecular constituents. J. FERRERA. *Compt. rend.* 187, 1278-80 (1928); *Z. physik. Chem.*, Abt. A, 140, 273-80 (1929).—Two types of viscosity-compn. curves for binary liquid mixts. are distinguished. In case the curve is concave, at least one of the two components is nonpolar. If both are dipolar the curve is convex. The author lists many mixts. as obtained from the literature upon which he bases his claims. A discussion is given of the effect of polarity on the shape of the curve. An increase in temp. decreases the convexity or concavity of curves.

RAYMOND H. LAMBERT

**The vitreous state.** MICHEL O. SAMSOEN. *Bull. soc. encour. ind. nat.* 1929, 185-204; cf. *C. A.* 22, 1881.—S. gives *thermal dilatation curves* for bottle glass ( $\text{SiO}_2$ , 69.3;  $\text{Al}_2\text{O}_3$ , 2.2;  $\text{CaO}$ , 13.0;  $\text{Na}_2\text{O}$ , 14.1;  $\text{Fe}_2\text{O}_3$ , 1.0;  $\text{MnO}$ , 0.3%), an enamel ( $\text{B}_2\text{O}_3$ , 23.9;  $\text{PbO}$ , 76.1%), a glass contg.  $\text{B}_2\text{O}_3$ , 93.3% and  $\text{Na}_2\text{O}$ , 6.7% and  $\text{B}_2\text{O}_3$ . The following coeffs. of *linear dilatation* ( $\times 10^6$ ) of  $\text{B}_2\text{O}_3$  are given:  $0^\circ$ , 14.30;  $50^\circ$ , 14.75;  $100^\circ$ , 15.18;  $150^\circ$ , 15.65;  $200^\circ$ , 16.12;  $230^\circ$ , 16.41;  $250^\circ$ , 17.12. In all of the above cases there is regular dilatation until a certain temp., several dozen degrees below that of deformation, is reached. The dilatation is then considerably increased. Thermal dilatation curves for several org. glasses showed the same presence of a transformation point in each case. By means of the proper app. it was possible to det. the *cubical dilatation* of  $\text{B}_2\text{O}_3$  and the results were:  $100^\circ$ , 45.54;  $150^\circ$ , 46.95;  $200^\circ$ , 48.36;  $240^\circ$ , 49.80;  $250^\circ$ , 615.2;  $300^\circ$ , 627.9;  $330^\circ$ , 629.4;  $360^\circ$ ,  $631.5 \times 10^{-6}$ . The change in expansion seems to be an allotropic transformation. The transformation point for *lar* is  $14^\circ$ . The increase of vol. below  $14^\circ$  is given by,  $\Delta V = 1.35 \times 10^{-4}t + 0.23 \times 10^{-6}t^2$ ; above  $14^\circ$  by,  $\Delta V = 9.19 \times 10^{-4}(t - 14) + 7.1 \times 10^{-6}(t - 14)^2$ . The ratio of the coeffs. of dilatation before and after transformation is 5.85. The results for *rosin* are: below  $34^\circ$ ,  $\Delta V = 2.21 \times 10^{-4}t + 0.31 \times 10^{-6}t^2$ ; above  $34^\circ$ ,  $\Delta V = 7.40 \times 10^{-4}(t - 34) + 5.91 \times 10^{-6}(t - 34)^2$ ; ratio, 2.89; for *gum lac*: below  $46^\circ$ ,  $\Delta V = 2.73 \times 10^{-4}t + 0.39 \times 10^{-6}t^2$ ; above  $46^\circ$ ,  $\Delta V = 13.10 \times 10^{-4}(t - 46) + 0.62 \times 10^{-6}(t - 46)^2$ ; ratio, 4.08; for *cane sugar* (vitreous): below  $67^\circ$ ,  $\Delta V = 2.34 \times 10^{-4}t + 0.14 \times 10^{-6}t^2$ ; above  $67^\circ$ ,  $\Delta V = 5.02 \times 10^{-4}(t - 67) + 0.43 \times 10^{-6}(t - 67)^2$ ; ratio, 2.15; for *glycerol*: below  $-62^\circ$ ,  $\Delta V = 2.41 \times 10^{-4}t$ ; above  $-62^\circ$ ,  $\Delta V = 4.83 \times 10^{-4}(t + 62) + 0.49 \times 10^{-6}(t + 62)^2$ ; for glassy  $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$ : below  $-42^\circ$ ,  $\alpha = 2.10 \times 10^{-4}$ ; in the liquid state,  $\alpha = 3.62 \times 10^{-4}$ . Calorimetric measurements showed that in the case of industrial glasses there was always absorption of heat followed by an increase of sp. heat.  $\text{B}_2\text{O}_3$  shows a discontinuity in its sp.-heat curve at  $218^\circ$  corresponding to a heat of transformation of about 2.3 cal. The sp. heat changes from 0.32 below  $218^\circ$  to 0.34 above. The heating curve for amorphous glycerol gives values in the temp. range  $-40^\circ$  to  $-190^\circ$  and a discontinuity is found at  $-85^\circ$ . The following results were obtained for a series of glasses of the system  $\text{Na}_2\text{O}-\text{SiO}_2$ :

% $\text{SiO}_2$	Coeff. of dilatation at $20^\circ$	Transformation temp.	Coeff. of dilatation after transformation
49.2	$12.61 \times 10^{-6}$	$420^\circ$	$83 \times 10^{-6}$
53.0	15.55	390	72
55.0	18.78	345	65
57.0	18.52	355	60
60.0	15.50	420	59
63.0	13.80	445	50
66.2	13.45	460	42
70.0	12.85	355	37
75.0	11.06	350	32
82.5	10.02	420	20
85.3	9.05	445	17
92.0	7.07	540	11

It is evident that the additive law which is frequently used for glasses is not even approximated. The curve plotted with transformation temps. as ordinates and %  $\text{SiO}_2$  as abscissas shows a max. at  $460^\circ$ , corresponding exactly to the compn. of  $\text{Na}_2\text{O} \cdot 2\text{SiO}_2$ . The success of Schott's additive rule is due to the fact that definite compds. and pseudo-eutectics are absent in the field of commercial silicate glasses. S. concludes that there is for all bodies existing in the vitreous state a temp. or temp. interval in which a transformation occurs and manifests itself by discontinuities in all physical properties. The

transformation temp. seems to depend only on the viscosity and the transformation occurs when the viscosity is  $10^{12.7}$  poises.

**Studies on glass. III. Dielectric constants of glassy and liquid glucose.** FRANCIS R. CATTOIR AND GEORGE S. PARKS. *J. Phys. Chem.* **33**, 879-82(1929); cf. *C. A.* **22**, 4296.—An elec. resonance method was used for the detn. of the dielec. consts. (Jackson, *C. A.* **16**, 2250). The dielec. cell consisted of 2 coaxial cylinders of Cu, resting vertically in a large Pyrex test tube. This cell was introduced into a 3-liter Dewar jar, equipped with an outer metal jacket which was grounded. The jar was filled with transformer oil for measurement above  $0^\circ$  and with kerosene cooled with solid  $\text{CO}_2$  for work below this temp. The app. was calibrated by means of air,  $\text{CCl}_4$ ,  $\text{CHCl}_3$ , *n*-propyl alc., acetone, EtOH and nitrobenzene. The following values were found for the dielec. consts. of glassy and liquid glucose: (1) Temps. ( $^\circ\text{K.}$ ) increasing; frequency,  $10^6$  cycles per sec.:  $200.0^\circ$ , 3.8;  $209.0^\circ$ , 3.9;  $220.0^\circ$ , 4.0;  $225.0^\circ$ , 4.1;  $232.0^\circ$ , 4.2;  $243.0^\circ$ , 4.3;  $253.0^\circ$ , 4.4;  $260.0^\circ$ , 4.6;  $270.5^\circ$ , 4.7;  $279.1^\circ$ , 4.9;  $284.1^\circ$ , 5.0;  $289.9^\circ$ , 5.4;  $294.3^\circ$ , 5.4;  $299.0^\circ$ , 5.7;  $302.9^\circ$ , 6.3;  $307.9^\circ$ , 6.8;  $322.5^\circ$ , 9.1;  $331.1^\circ$ , 11.2;  $342.2^\circ$ , 14.0;  $352.9^\circ$ , 18.0;  $362.8^\circ$ , 21.7;  $374.1^\circ$ , 23.7;  $382.0^\circ$ , 23.7;  $393.0^\circ$ , 23.0;  $408.0^\circ$ , 22.0;  $413.0^\circ$ , 21.6;  $423.0^\circ$ , 21.0. (2) Temps. ( $^\circ\text{K.}$ ) decreasing; frequency,  $10^6$  cycles per sec.:  $369.9^\circ$ , 23.8;  $368.1^\circ$ , 23.8;  $357.9^\circ$ , 21.5;  $343.7^\circ$ , 15.5;  $333.7^\circ$ , 12.3;  $316.9^\circ$ , 8.0;  $312.1^\circ$ , 7.5;  $303.3^\circ$ , 6.2;  $289.6^\circ$ , 5.2. The abs. error of the dielec. consts. is estimated to be less than 4%.

**Refractive indices of a mesomorphic substance in the solid state.** MILLIE J. ZADOC-KAHN. *Compt. rend.* **187**, 1138-9(1928).—Measurements of the 3 principal  $n$ 's of solid *p*-azoxyanisole, crystd. from light petroleum, for  $\lambda$  0.5893, 0.5780 and 0.5460, have shown that the birefringence is one of the highest known, ( $n_o - n_p$ ) being 0.634, 0.649 and 0.696, resp. The prism method was used, 3 prisms being cut with a microtome and arranged so that in the position of min. deviation each prism furnished 2 out of the 3 indices.

**Capillarity. XI. Diffusion and concentration displacement in capillaries.** KARL SCHULTZE. *Kolloid-Z.* **48**, 15-25(1929); cf. *C. A.* **23**, 3387.—With the aid of his unique system of formulation S. discusses his exptl. data on concn. displacement and crystn. in capillaries.

**The meaning of the adsorption of ions by colloid particles in coagulation by electrolytes.** H. FREUNDLICH, K. JOACHIMSOHN AND G. ETTISCH. *Z. physik. Chem., Abt. A.* **141**, 249-69(1929).—The coagulation value of various electrolytes on  $\text{As}_2\text{S}_3$  and Au sols and the amts. of cations and anions adsorbed at the flocculation point were detd. Equiv. amts. were not adsorbed, but nearly equal amts. of H ion were released in all cases. Monomol. layers of adsorbed ions were found. Freundlich's theories were found inadequate to explain all the observed facts.

**The influence of certain chemical and physical factors on the activity of charcoal.** E. V. ALEKSEEVSKII AND A. I. AVGUSTINIK. *J. Russ. Phys.-Chem. Soc.* **61**, 151-41 (1929).—Samples of wood and animal C were kept in 0.1 *N*  $\text{UO}_2(\text{NO}_3)_2$ ,  $\text{Th}(\text{NO}_3)_4$  or  $10^{-7}$  g./l.  $\text{RaBr}_2$  for 24 hr., dried at  $110^\circ$  and sealed in ampoules each contg. about 1 g. The latter were broken under 0.1 *N* AcOH, and the soln. was titrated after 24 hr. Other samples were opened, with vigorous shaking, in  $\text{C}_2\text{H}_2$ ; equil. was reached in 15-20 min. and the vol. of adsorbed gas was read off. Treatment with the above salt solns was found to decrease the adsorbing capacity of C for AcOH and  $\text{C}_2\text{H}_2$ , especially so in the case of  $\text{Th}(\text{NO}_3)_4$ . Dry birch wood was heated on the water bath for 20 hr. with 0.1 *N* and with 2 *N* solns. of  $\text{Fe}(\text{NO}_3)_3$ ,  $\text{Co}(\text{NO}_3)_2$ ,  $\text{Ni}(\text{NO}_3)_2$ ,  $\text{UO}(\text{NO}_3)_2$ ,  $\text{Th}(\text{NO}_3)_4$ ,  $\text{KNO}_3$ ,  $\text{K}_2\text{CO}_3$ ,  $\text{KOH}$ ,  $\text{K}_2\text{SiO}_3$  and  $\text{ZnCl}_2$ . The wood was filtered off, dried at  $110^\circ$  and carbonized in a current of pure  $\text{N}_2$  at  $800-850^\circ$ . Weighed samples (0.4-1.2 g.) were sealed. Some of the wood was also carbonized after treatment with distd.  $\text{H}_2\text{O}$  instead of any of the above salt solns.  $\text{H}_2\text{O}$ -treated C adsorbed  $\text{C}_2\text{H}_2$  better than salt-treated; weak salt solns. yielded more active preps. than concd.; Ni favored adsorption most of the metals of Fe group, and Th was a better activator than U. Indigo carmine was best adsorbed by Co- and Fe-treated C; U was more effective than Th, and concd. solns. more than dil. solns. of the same salts. Ni was the best activator towards PhH vapor; in all other cases treatment with concd. salt solns. decreased the adsorbing capacity of C; U favored adsorption more than Th. In the case of AcOH, dil. solns. of  $\text{Ni}(\text{NO}_3)_2$  worked best while Co, U and Th in concd. soln. rendered C inactive. Fe, KOH and  $\text{H}_2\text{O}$  proved the best activators for PhOH adsorption; U decreased the activity of C; treatment with dil. salt solns. gave more active preps. than treatment with the concd. solns. Irradiation of the C with ultra-violet light arrests the adsorption of  $\text{C}_2\text{H}_2$  and AcOH. Irradiation of  $\text{C}_2\text{H}_2$  has no effect on adsorption. Sunlight has no effect.

**The chemical effects of high-frequency sound waves. II. A study of emulsifying action.** WM. T. RICHARDS. *J. Am. Chem. Soc.* **51**, 1724-9(1929).—Emulsions produced

by sound waves are due largely to action at the walls of the vessel. Rupture of blood cells, small unicellular organisms, and the like by the direct action of sound waves in liquids is questioned.

A. L. ELDER

**Emulsions: stability, area per molecule in the interfacial film, distribution of sizes, and the oriented-wedge theory.** WM. D. HARKINS AND NORVIL BEEMAN. *J. Am. Chem. Soc.* **51**, 1674-94(1929); cf. *C. A.* **22**, 721.—The sizes of droplets in emulsions were detd. by a statistical method by means of a projection app. in conjunction with a microscope. Na, K and Cs soaps formed emulsions, the particles of which had approx. the same diams. Variation of the hydrocarbon chains of soaps had little effect upon the distribution of particles except in K chaulmoograte, in which the number of the smallest drops was greatly increased above that for the oleate or stearate. No evidence was found to indicate that the interfacial film ever becomes thicker than monomolecular.

A. L. ELDER

**A study of semicolloid solutions.** A. G. KNIGA. *J. Russ. Phys.-Chem. Soc.* **61**, 197-211(1929).—Graham's tungstic acid sol exhibits the properties of a semicolloid, *i. e.*, marked diffusibility, stability toward electrolytes, no Tyndall cone, etc. The sol was prepd by adding slowly, in the cold, 25 cc. 0.5 *N*  $\text{HNO}_3$  to 25 cc. 0.5 *N*  $\text{Na}_2\text{WO}_4$  and dialysis against 10 vols. of  $\text{H}_2\text{O}$ . When the addn. is carried out at  $90^\circ$  a more diffusible sol results. The  $n_D$  of  $\text{Na}_2\text{WO}_4\text{-HCl}$  sols is greater than calcd. for the mixt. of the components, when  $n_D$  is plotted against cc. of added  $\text{HCl}$ , the curve exhibits a sharp change in slope to nearly horizontal. This break corresponds to a transition from complex formation to the colloid stage. The time increase in viscosity served as a measure of the interaction between  $\text{HCl}$  and  $\text{Na}_2\text{WO}_4$ . Excess of acid accelerated the reaction while diln. retarded it. The addn. of alkali chlorides accelerated the reaction in the order  $\text{K} > \text{Na} > \text{Li}$ . The nature of the viscosity-time curve indicates an autocatalytic process reaching max velocity in the colloid phase. The action of electrolytes was tested on a sol (1) prepd according to Graham, and another one (2) obtained at the b. p. and from greater concns. of the reagents. Both preps. when dialyzed until free from  $\text{Cl}^-$  ion failed to show a Tyndall cone. When ultrafiltered, the first was retained by the collodion membrane and the second passed through. Concns. of electrolytes necessary to effect complete coagulation in 24 hr. were detd. Larger concns. were required in the case of sol 1. Activity of cations depended on their valence. Pptn. by salts of Na, K and Li was reversible. A tolerance zone was noted in the case of Zr and Th salts. Addn. of  $\text{EtOH}$  sensitized the sol towards Li, Na, K, Ca and Ba ions, did not influence the action of Al and Ce salts, and protected against Zr and Th ions. A reversible ultrafilterable sol showed a very slight increase in cond. on standing 10 days. A coarser dispersion, exhibiting the Tyndall cone and easily coagulable by electrolytes, increased about 1.5 times in cond. after 10 days. This increase is attributed to the decompn. of polyacids of general formula  $n\text{H}_2\text{WO}_4.m\text{WO}_3$ .

B. SOVENKOFF

**Use of tartaric acid in the synthesis of electronegative sols.** III. Adsorption of sodium tartrate and sodium succinate by aluminum hydroxide. A. DUMANSKII AND A. YAKOVLEV. *Kolloid-Z.* **48**, 151-4(1929).—See *C. A.* **23**, 1333. E. C. M.

**Influence of electrolytes on the viscosity of colloid sols.** N. R. DHAR AND S. GHOSH. *Kolloid-Z.* **48**, 43-9(1929); cf. *C. A.* **22**, 2094.—Viscosity measurements of more than 30 sols showed that the addn. of electrolytes lowered the viscosity. The viscosity of a sol is always lowered when ions with the same charge as the sol are adsorbed. Viscosity increases as the sol is purified, and the sensitivity to added electrolyte is greatest with pure sols. The greater the charge of the sol, the lower the viscosity and the lower the degree of hydration. The stability of a sol does not depend upon the degree of hydration.

L. F. MAREK

**The macroscopic method of determining the cataphoretic velocity of colloid particles.** A. E. ALIEV AND A. F. GERASIMOV. *J. Russ. Phys.-Chem. Soc.* **61**, 275-7(1929).—The moving boundary method gave reproducible results in the case of collargol when the added electrolyte ( $\text{Na}_2\text{CO}_3$ ) did not contain the highly mobile H and OH ions. B. S.

**Electrokinetic migration velocity, peptization and stability of coarse dispersed systems.** A. v. BUZAGH. *Kolloid-Z.* **48**, 33-43(1929).—The cataphoretic migration velocity of (1) animal charcoal in picric acid soln., (2) kaolin in picric acid solns. and (3) bentonite in  $\text{NaOH}$  soln. were measured under varying conditions of electrolyte and solid-phase concns. In all 3 cases the migration velocity at const. solid-phase concn. passed through a max. with increasing electrolyte concn. Also with const. electrolyte concn. the migration velocity passed through a max. with increasing solid phase concn. These 2 effects are interrelated through the charge induced on the particle by adsorbed electrolyte (peptizer). The degree of peptization, *i. e.*, the relative amt. of solid phase held in suspension, was measured with varying solid-phase concns. and found to pass

through a max. for all concns. of the peptizer used. In pure  $H_2O$  the cataphoretic migration velocity of the particles was independent of solid-phase concn. and the degree of peptization was const. for small, and decreased with increased solid-phase concn.

**Kinetic experiments in the system: colloidal iron hydroxide-hydrochloric acid-water.** ERICH HEYMANN. *Kolloid-Z.* **48**, 25-33(1929); cf. *C. A.* **23**, 3389. By measurement of cond. changes as well as concn. of the molecularly dispersed Fe, during the aging of  $FeCl_3$  solns., with and without OH addn., it was detd. that addn. of  $Fe(OH)_3$  strongly accelerates the slow hydrolysis of the  $FeCl_3$ . This effect is limited to  $Fe(OH)_3$ , as  $Al(OH)_3$  does not accelerate. In accord with the viewpoint of Wiegner and Muller, it followed from the expts. that the assemblage of the primary hydrolysis products of  $FeCl_3$  is autocatalytic in nature. The soln. of  $Fe(OH)_3$  particles in HCl is not monomol., but is of a higher order. From this, in accord with Herzfeld's principal, it follows that the reaction takes place in the intermicellar soln. of the colloid particles as well as on the surface of the particles. The hydrolysis of  $NaH_2AlO_4$  was found to be accelerated by the hydrolysis product,  $AlO.OH$ .

**Contributions to general colloid chemistry. XXIV. Conductivity of colloidal salts and mobility of colloids.** WO. PAULI, F. VALKÓ and NORBERT WEINGARTEN. *Kolloid-Z.* **48**, 1-10(1929); cf. *C. A.* **22**, 4028.—The Hittorf method is applicable to colloids for the detn. of the av. colloid mobility per charge, when the charge, mass and mobility distribution do not conflict with the defined conditions, when, e. g., ions of higher mobility and low equiv. wt. are not present in essentially the same amt. as are ions of low mobility and high equiv. wt. The decrease in colloid-ion mobility in an  $Al(OH)_3$  sol on exchange of the oppositely charged Cl ion by  $SO_4$  ion was ascertained and evaluated with the aid of conductivities. The change in colloid-ion mobility in an  $Al(OH)_3$  sol on mixing with HCl and  $H_2SO_4$  was ascertained and discussed together with other electrochem. values. The increase in colloid-ion mobility in an  $Al(OH)_3$  sol with diln. was ascertained. Sols were produced from  $AlCl_3$  by incomplete pptn. of the Cl ion with  $Ag_2O$  and characterized electrochemically.

**The electrical charge on silver iodide in saturated silver iodide solution.** E. LANGE and P. W. CRANE. *Z. physik. Chem., Abt. A*, **141**, 225-48(1929).—The potential of  $AgI$  in satd. soln. has been detd. as  $-4 \pm 1$  mv. The isoelec. point is at approx  $4 \times 10^{-9} N$  in  $Ag$  ion. The theory of ion deformation is used to explain this as well as other exptl. colloid phenomena.

**Grain growth in silver halide precipitates.** S. E. SHEPPARD and R. H. LAMBERT. *Colloid Symposium Monograph* **6**, 265-82(1928).—In ppt. formation, there is first inception or nucleation of the new phase followed by grain growth due to accretion or to aggregation. From the exptl. results it is concluded that "in the first stage of digestion the process of Ostwald ripening is occurring, grains below a certain size are dissolving and grains above a certain size growing by accretion from soln. This process proceeds to exhaustion of the grains whose soly. is appreciably different from that of the largest." A new type of grain growth then appears, due to recrystn. within the aggregates produced by collisions and coalescence. It is also concluded that the type of size-frequency distribution is independent of bromide concn. (solubilizer) and time; probably of temp. also.

**The synthesis and properties of the colloidal hydroxides from metallic aluminum and magnesium.** I. A. YAKOVLEV. *J. Russ. Phys.-Chem. Soc.* **60**, 1551-5(1928).— $Al_2O_3$  and  $MgO$  sols were prepd. by leaving the powdered metal in contact with  $H_2$  under distd.  $H_2O$  for 6-12 hr. The concn. of  $Al$  sols was 1.5-5.04 g.  $Al_2O_3$  per 1 whole  $Mg$  sols were more concd. and often formed gels. The  $Al(OH)_3$  sol was positively charged, could be coagulated by  $KCl$ ,  $NaCl$ ,  $K_2SO_4$ ,  $CaCl_2$ , etc., and varied in particle size (detd. ultramicroscopically) between 45 and  $64\mu$ . Its adsorbing capacity for Na tartrate and succinate was smaller than that of an  $Al(OH)_3$  sol prepd. according to Graham

**The preparation of water-soluble colloidal bismuth and arsenic.** A. F. GERASIMOV. *J. Russ. Phys.-Chem. Soc.* **61**, 269-74(1929).—To Paal's lysalbinic acid soln is added  $AcOH$  until the ppt. redissolves. To the warm mixt. is added a satd. soln. of  $BiOCl$  in HCl of sp. gr. 1.182 followed by a few drops of HCl to redissolve the ppt. The reduction is effected by a slight excess of 25%  $H_3PO_3$  and is complete in 10-15 min. at  $80^\circ$ . The sol is cooled, centrifuged and the supernatant liquid poured off 3-4 times. A few drops of 20%  $NaOH$  brings the colloid again into soln. When more lysalbinic acid is added followed by alkali to complete soln., the resulting  $Bi$  sols can be evapd. to a black powder contg. 17.9%  $Bi$  and sol. in  $H_2O$  with a neg. charge. White sediment is produced on contact with atm.  $O_2$ . Arsenic sols are most easily prepd. as follows. A mixt. of 1 g.

$As_2O_3$  and 8 cc. HCl sp. gr. 1.182 is shaken, allowed to stand for several hr. (to complete liquefaction of  $As_2O_3$ ) and poured into 50 cc. of acidified Paal's mixt. on a water bath. A slight excess of  $H_2PO_2$  is added, the reduction requiring 15 min. The mixt. is allowed to cool and neutralized with  $Na_2CO_3$  to cause complete pptn., centrifuged and the sediment washed. Soln. is effected by a few drops of 20% NaOH; the resulting sol on evapn. gives a water-sol. powder contg. 23–27% As. The aq. solns. are negatively charged and less readily oxidized by air than the Bi sols. B. SOYENKOFF

**Preparation of negatively charged sols by means of tartaric acid.** IV. A. DUMANSKII AND A. YAKOVLEV. *J. Russ. Phys.-Chem. Soc.* 61, 213–5 (1929); *Kolloid-Z.* 48, 155–6.—The adsorption of Na *d*- and *i*-tartrate by a mech. suspension of  $Al_2O_3$  follows the usual isotherm. In concd. solns. (above 0.4 *N*) of Na *d*-tartrate there is gel formation accompanied by an abrupt change in the adsorption curve consts. Na *i*-tartrate is much less adsorbed, possibly because of steric hindrance. V. **Preparation of sulfide sols.** A. DUMANSKII AND A. BUNTIN. *J. Russ. Phys.-Chem. Soc.* 61, 279–314.—Solns. of Pb tartrate in KOH and aq.  $H_2S$  were mixed and allowed to stand for 25 days; stable sols resulted from 0.000132 *M*  $PbC_4H_4O_6$  plus less than the equiv. amt. of  $H_2S$  in an equal vol. of soln. Addn. of NaOH hastened pptn. while the use of weaker alkali ( $NH_4OH$ ) as the solvent for Pb tartrate increased the stability of the resulting sols. When the relative amts. of Pb and  $H_2S$  as well as the final concn. of the sol are kept const., the degree of aggregation and the color intensity increase with the concn. of  $H_2S$  added. Conductance measurements indicate that the formation of PbS proceeds to completion only in the presence of an excess of  $H_2S$ ; when less than the equiv. amt. of  $H_2S$  is added, complexes result. Spectrophotometric studies showed that the color intensity was not proportional to the amt. of added  $H_2S$ . A sol stable for months resulted from 1.035 g. Pb (as tartrate) and 0.385 g.  $NH_3$  in 100 cc.  $H_2O$ , and 0.1530 g.  $H_2S$  in another 100 cc.  $H_2O$ . When dialyzed in the absence of  $CO_2$  to a sp. conductance of  $1.2 \times 10^{-5}$ , the dispersed phase contained less Pb and S than calcd. for PbS. Dil. acids, NaOH, KOH, NaCl,  $Na_2C_4H_4O_6$ ,  $NH_4Cl$ ,  $CaCl_2$ ,  $BaCl_2$ ,  $K_2CrO_4$ ,  $AgNO_3$  and  $AlCl_3$  coagulated the sol;  $NH_4OH$  had no action. Sn sols were prepd. from a soln. of  $Sn(OH)_4$  in tartaric acid (17.6 g. Sn and 24.0 g.  $C_4H_4O_6$  per l.) and aq.  $H_2S$  (1–3 g./l.). Stable reddish yellow sols resulted in the majority of cases, in about 1 hr. after mixing the reagents. The condensation proceeded more rapidly in presence of an excess of  $H_2S$ . Stability increases with the acidity; gelation occurs in neutral media while in alk. media (in presence of  $NH_4OH$ ) colloid aggregates are not formed. A sol prepd. from equal vols. of the above reagents was negatively charged. The dry residue from evapn. contd. more Sn than calcd. for  $SnS_2$ . Alkalies acted as peptizing agents; salt solns. coagulated the colloid. To prep. colloidal  $Fe_2S_3$ , a hot 60% soln. of tartaric acid was satd. with washed  $Fe(OH)_3$ , made alk. with 25%  $NH_4OH$ , dild. 4–32 times and aq.  $H_2S$  (0.00369 g./cc.) added. Gels sepd. in 2 days which underwent rapid synecresis. Addn. of  $NH_4OH$  hastens coagulation. A sol stable for months was obtained by satg. the  $Fe(OH)_3$  soln. with  $H_2S$ . It could be dialyzed against dil.  $H_2S$ , but on dialysis against  $H_2O$  deposited S and passed into an electroneg.  $Fe_2O_3$  sol. The sulfide sol was negatively charged, easily coagulable by salts, and on warming pptd.  $Fe(OH)_3$  and S. The compn. of the dispersed phase approached that of  $Fe_2S_3$ . A NiS sol stable for 2 months was obtained by satg. with  $H_2S$  an ammoniacal tartaric acid soln. of  $Ni(OH)_2$  (0.703 g. Ni, 0.15 g.  $C_4H_4O_6$  and 0.96 g.  $NH_4OH$  per 100 cc.). Dialysis against  $H_2O$  oxidized the sol. The dispersed phase was chiefly NiS. Colloidal  $As_2S_3$  and  $ZnS$  did not adsorb Na tartrate. The formation of sulfide sols in presence of tartaric acid can be regarded as a reaction between the alk. sulfides and sparsely ionized complex metallic compds. which is not influenced by the alkali tartrates formed as the by-products. The protective action of electronegative hydrated oxides may also play a part. B. SOYENKOFF

**Mechanical coagulation of goethite sol.** H. FREUNDLICH AND S. LOEBMANN. *Kolloidchem. Beihefte* 28, 391–406 (1929); cf. *C. A.* 23, 1040.—A quant. study of mech. coagulation of a  $FeO(OH)$  sol was made. The sol was prepd. by addn. of perhydrol to  $Fe(CO)_5$  followed by centrifuging. Coagulation took place in a carefully cleaned stirring app. Samples were withdrawn from time to time. The coagulated particles were sepd. by centrifuging, and the concn. of the supernatant sol was detd. by the Zimmermann-Reinhard method. Equal amts. were coagulated in unit time per unit vol., at const. stirring velocities. Eventually coagulation ceased. The residual sol could not be coagulated by further stirring. The same results were obtained when the acidic lab. air was excluded. The velocity of coagulation is a quadratic function of the velocity of stirring. Changes in optical properties took place during coagulation. Evidence is given to show that the coagulation took place at the interface sol-air. The velocity of coagulation passes through a min. upon addn. of electrolytes in increasing amts. Propyl

alc. in small concns. favors coagulation; in larger amts. it delays it. Isoamyl alc. at all concns. favors, while MeOH inhibits coagulation.

**Lyophilic colloids.** H. R. KRUYT AND H. LIER. *Kolloidchem. Beihefte* 28, 407-50 (1929).—Viscometric detns. were carried out on casein sols prepd. by addn. of acid or alkali to casein made according to van Slyke. The alk. sols were examd. in the absence of  $\text{CO}_2$ . The law of Poiseuille held for all sols examd. The  $p_H$  of all sols was detd. The viscosity max. occurred at  $p_H$  2.6 and 11.5. The acid sols were less stable. Addn. of neutral salts gave an electroviscous effect at const.  $p_H$ . The valence of the cation is decisive for alk. sols, that of the anion for acid sols. Dehydration expts. demonstrated irregular series at const.  $p_H$ , and lyotropic influences. Dehydration by acetone or alc. is abnormal in acid sols. Casein sols are unstable between  $p_H$  3.5 and 6.5. This region includes the isoelec. point. Only electrolytes of the type NaOH and HCl peptized casein. The mechanism of peptization is discussed.

FRANK URBAN

**Influence of electrolytes and nonelectrolytes upon the optical activity and relative resistance to shear of gelatin systems.** J. R. FANSELOW. *Colloid Symposium Monograph* 6, 237-52 (1928).—Numerous curves are given showing influence of temp and concn. on systems at various H-ion activities; of different acids; of several 0.1 N K salts; of various ions on the acid side of the isoelec. point; of varying amts. of salts, of nonelectrolytes and tanning agents. The sol-gel transformation is discussed. Despite complications, F. concludes "that the behavior of gelatin systems can be better explained by the laws obtained from the behavior of highly dispersed heterogeneous systems than by the classical laws of stoichiometry."

JEROME ALEXANDER

**The action of sodium chloride on collargol.** G. S. VOZDVIZHENSII AND A. F. GERASIMOV. *J. Russ. Phys.-Chem. Soc.* 61, 193-6 (1929).—The protective action of NaCl against AcOH diminishes with increasing concn. of Paal's albumin mixt., especially with undialyzed collargol. The collargol diffusates were concd. and used instead of Paal's mixt. in the prepn. of colloidal Ag. The protective action of NaCl on the resulting sol increased strongly with the latter's diln., the effect being equally marked with the samples of the sol previously freed from electrolytes by dialysis. Conclusion: Paal's mixt. contains albuminous substances whose adsorption by colloidal Ag increases with their concn., thus preventing the access of NaCl to the colloidal particles.

B. S.

**The protective action of colloidal silicic acid and hydrated tin oxide on silver sols.** A. V. DUMANSKII AND P. A. SHERSHNEV. *J. Russ. Phys.-Chem. Soc.* 60, 1593-600 (1928).—Ag sols were prepd. by reduction of 0.02%  $\text{AgNO}_3$  by HCHO. They remained stable for 30-40 hr. when dialyzed against water if adjusted to an optimum alky. by the addn. of 0.04 N NaOH. The sols contain particles of varying size when viewed through an ultramicroscope. Colloidal  $\text{SiO}_2$  was prepd. by the addn. of tartaric acid to  $\text{K}_2\text{SiO}_3$  which was negatively charged. The sol was rendered alk. to litmus with NaOH, and HCHO added followed by 0.02%  $\text{AgNO}_3$ . Protected Ag sols resulted which exhibited a Tyndall cone but no discrete particles under the ultramicroscope. The  $p_H$  varied between 10.4 and 11.2. Small amts. of  $\text{SnO}_2$  sol caused coagulation in a few min. while an excess exerted a similar protecting action. The color of Ag- $\text{SiO}_2$  sols was uniformly brown while the color of unprotected sols varied from light orange to violet. Spectrophotometric mixts. show that for protected and for highly dispersed Ag sols the light absorption declines continuously with the frequency while unprotected sols contg. coarse particles show a max. at 550-580 $\mu$ .

B. SOYENKOFF

**Studies of organophilic colloids.** G. S. WHITBY, J. G. McNALLY AND W. GALLAY. *Colloid Symposium Monograph* 6, 225-36 (1928).—Expts. are described to det. whether solvation or structure is chiefly responsible for the high viscosity of org. sols. It appears that the less solvent bound in a sol, the less of a precipitant is needed to produce sepn. The following are also considered: viscosity-temp. relations; swelling and viscosity; polymerization; elastic properties; chem. constitution.

JEROME ALEXANDER

**The influence of liquids on molded cellulose hydrate.** WERNER LÜDKE. *Kolloid-Z.* 47, 341-51 (1929).—The change in strength of cellulose hydrate (synthetic fibers and strips of cellophan) when impregnated with other substances is studied. After contact with org. liquids the strength is greater than when placed in water or solns. of electrolytes. By adding a trace of water to the org. liquids the strength decreases until it reaches the value obtained with water. The chief influence of the liquids depends on their water content, their conduct toward water, and their ability to effect swelling. The change in strength approx. parallels the surface tension, the liquid with the lowest surface tension, ether, giving the greatest increase in strength, and that with the highest surface tension, water, the least.

R. I. RUSH

**Syneresis.** S. LIPATOV. *Kolloid-Z.* 48, 62-3 (1929); cf. *C. A.* 22, 4314; 23, 2090.—A reply to Kuhn (*C. A.* 23, 1553).

L. F. MAREK

**Diffusion of aspherical particles.** R. GANS. *Ann. Physik* [4], **87**, 935-47 (1928).—Mathematical. Equations for the diffusion of oblate and prolate particles are worked out. B. C. A.

**The partition coefficient of substances miscible in all proportions.** S. G. MOKRUSHIN. *J. Russ. Phys.-Chem. Soc.* **60**, 1633-9 (1928).—For a substance of unlimited soly. in 2 immiscible liquids, the kinetic equil. across the liquid boundary is detd. by the soly. attraction of individual polar groups. For dipoles, the coeff. of partition should be either 0.5, 1 or 2. Deviations from these values are attributed to mutual soly. of the 2 liquid solvents, "polypolar" structure of solute mols., solvation, dissocn., etc. B. SOYENKOFF

**The removal of carbon dioxide from gas mixtures by pressure scrubbing.** R. NITZSCHMANN. *Metallbörse* **18**, 1909-10 (1928).—Equations are derived, Henry's law being assumed, by which one can calc. the gas vol. changes and min.  $H_2O$  requirements for the complete removal of  $CO_2$  from gas mixts. by scrubbing at elevated pressures. E.g., the min.  $H_2O$  requirement to remove  $CO_2$  completely from a gas mixt. contg. 34.88%  $CO$ , 1.30%  $CO$  and 63.82%  $H_2$  by scrubbing at  $10^\circ$  and 20 atm. will be 0.05787 cu. m.  $H_2O$  per cu. m. gas. The  $CO$  dissolved will be 2.4% and the  $H_2$  1.64% of the vol. of each of the respective gases treated. The min. energy consumption will be 27,640 m. kg. R. L. DODGE

**The true concentration of solutions.** M. LEVAILLÉ-KZERSKII. *J. Russ. Phys.-Chem. Soc.* **60**, 1391-8 (1928); cf. *C. A.* **22**, 3333.—Raoult's equation is modified to read  $(p - p_1)/p = kn/(N + in)$ , where  $k = 1.03$  for water. The "true concn."  $C = N(p - p_1)/[p_1 + (k - 1)p] = in$ . Or,  $C$  can be calcd. from a vapor-pressure measurement at some temp.;  $C$  being known, the theoretical value of b. p. elevation can be found from  $\Delta t = EC$ , where  $E$  is the proportionality const. for  $\Delta t/C$ . A b.-p. detn. gives the observed value of  $\Delta t$ , from which  $\Delta t \text{ obs.} / \Delta t \text{ calcd.} = i$ ;  $i$  and  $C$  being known,  $n$  can be found for any salt. Values of  $n$  calcd. from the above equations are in good agreement with the exptl. data found in literature with  $NaCl$ ,  $KCl$ ,  $KBr$ ,  $KI$ ,  $KNO_3$ ,  $KClO_3$  and  $BaCl_2$ . BASIL C. SOYENKOFF

**Ionic radius and osmotic activity.** G. B. BONINO AND V. VAGLIO. *Gazz. chim. ital.* **50**, 49-56 (1929).—Modern theories of soln. attempt to foresee the chem.-phys. properties of solns. of strong electrolytes by utilizing data on the charge and the dimensions of the ions with a given solvent and concn. However, the ionic radii which must be introduced into the calcs. to obtain this information do not correspond (even with application of the Debye-Hückel theory) to the actual radii detd. in other ways, for they are diametrically opposite in character to the latter. In the present paper, an investigation already begun (cf. *Coefficiente di attività e deformabilità degli ioni. I. Atti soc. Lig. sci. lett.* **V**, no. 3 (1925)) in earlier work is continued, with the result that it is found that when the ionic deformability as well as the ionic radius and the charge are introduced into the calcs., there results a concordance between the ionic radii derived from the properties of the solns. and those detd. by other methods. Thus an exptl. relation is found which permits the calcn. in an inverse way of the ionic deformability from cryoscopic and ebullioscopic data in different solns. The agreement between these relations and exptl. data is satisfactory. C. C. DAVIS

**The exceptional mobility of the hydrogen and hydroxyl ions.** M. S. SKANAVI-GRIGORIEVA. *J. Russ. Phys.-Chem. Soc.* **60**, 1459-75 (1928).—If the views of Grotthuss and Danneel regarding the mechanism of elec. conduction are correct, the viscosity of the medium should have less influence on the conductance of electrolytes which have one or several ions in common with the solvent. Conductance of  $HCl$ ,  $KOH$  and  $KCl$  in glycerol- $H_2O$  mixts. were measured. The equiv. conductances plotted against  $\log V$  were nearly straight lines in the case of  $KCl$ .  $KOH$  and  $KCl$  exhibited a max. between 10 and 100 l. The lower equiv. cond. of more dil. solns. is attributed to solvation while in the case of more concd. solns. it is due to a rise in viscosity and a change in the degree of dissocn. When equiv. conductance was multiplied by the viscosity, the resulting curves were nearly straight lines in the case of  $KCl$ ; the curves representing mixts. of glycerol and water lay above the viscosity-by-conductance—diln. curve for  $KCl$  in pure water. In the case of  $KOH$ , the water curve approached a straight line; the 10% glycerol curve exhibited a max. while in 20, 40 and 50% glycerol the viscosity-conductance product declined continuously with increasing voltage. The glycerol-water curves in general lay below that for pure water. The viscosity-conductance product for a given concn. of  $HCl$  in concd. solns. of the electrolyte increased with the amt. of glycerol present; in dil. solns. it decreased on the addn. of glycerol. The cond. of  $KCl$ ,  $KOH$  and  $HCl$  decreases in a similar manner when viscosity is increased by the addn. of glycerol. The deviations are caused by changes in the degree of solvation and are not connected with the Grotthuss effect. B. SOYENKOFF

A modification of the moving-boundary method for the determination of transference numbers. H. P. CADY AND L. G. LONGSWORTH. *J. Am. Chem. Soc.* 51, 1656-64(1929).—The novel features of this method are a rising boundary and the automatic formation of an indicator electrolyte and adjustment of its concn. by soln. of the metal electrode. No new transference no. data are given. MALCOLM DOLE

Decomposition of mercurous chloride in concentrated solutions of other chlorides. T. W. RICHARDS AND MARCEL FRANÇON. *J. Phys. Chem.* 33, 936-50(1929).— $\text{Hg}_2\text{Cl}_2$  was treated with solns. of alkali chlorides of various concns. for 6 hr. in a thermostat. The extent of the reaction was obtained by detg. the amt. of Hg dissolved. The same details of procedure as those described by Richards and Archibald (*Proc. Am. Acad.* 37, 13, 347) were used. The data obtained were as follows: (1)  $\text{HgCl}_2$  found in solns. of KCl: 0.75 N, 0.035 g. per l.; 1.62 N, 0.166; 2.73 N, 0.590; 3.70 N, 1.256; 4.05 N, 1.570, 4.17 N, 1.666. (2)  $\text{HgCl}_2$  found in solns. of LiCl: 1.27 N, 0.049; 2.87 N, 0.160; 4.64 N, 0.294; 5.56 N, 0.325; 7.34 N, 0.386. (3)  $\text{HgCl}_2$  found in solns. of CsCl: 2.45 N, 1.35, 1.51 N, 0.324; 0.476 N, 0.0344. (4)  $\text{HgCl}_2$  found in solns. of  $\text{SrCl}_2$ : 3.59 N, 0.283 g per l. The wts. of  $\text{HgCl}_2$  (g. per l. of soln.) for various 2 N solns. were: LiCl, 0.09;  $\text{CaCl}_2$ , 0.08;  $\text{BaCl}_2$ , 0.11; NaCl, 0.14; HCl, 0.15; KCl, 0.28; CsCl, 0.70. The greater the mol. vol. of the elements of the same valence, the more important is the action of the chlorides. It seems hardly possible to explain the differences in the actions of the alkali chlorides on  $\text{Hg}_2\text{Cl}_2$  by the concn. of the Cl ion since the chlorides are practically completely dissocd. The results obtained are analyzed from the viewpoint of thermodynamics and from that of the mechanism of the reactions involved. The data show that the decompn. of  $\text{Hg}_2\text{Cl}_2$  is greatly lessened if the 0.1 N calomel electrode is used in the detn. of H-ion concns. A. J. MONACK

Uniform distribution of catalysts throughout porous solids. HARRY N. HOLMES AND ROBERT C. WILLIAMS. *Colloid Symposium Monograph* 6, 283-5(1928).—Porous  $\text{SiO}_2$  gel was soaked in a salt soln., and dried. A water-sol. gas was then admitted to the gel, which was later immersed in  $\text{H}_2\text{O}$  to allow the salt and the gas to react within the capillary pores. Pairs used were:  $\text{AgNO}_3$  and  $\text{H}_2\text{S}$ ;  $\text{FeCl}_3$  and  $\text{NH}_3$ . Pt and Pd were deposited similarly. JEROME ALEXANDER

The nature of the carbon produced by the catalytic decomposition of carbon monoxide with iron. TOKUNOSUKE WATANABE. *Bull. Inst. Phys. Chem. Research (Tokyo)* 8, 288-92(1929); *Abstract sect. 2*, 37-8(1929); cf. *C. A.* 23, 1560.—The density, particle size, crystallinity and adsorptive power of the C prepd. by the catalytic decompn. of CO at 400-800° were investigated. The graphitic nature of this C was verified by the x ray powder method; the higher the temp. of its formation the more graphitic it becomes. The adsorptive power of the C for  $\text{C}_6\text{H}_5\text{COOH}$  decreases as the temp. of its formation increases. The d. as detd. by the usual liquid immersion method by using toluene increases from 2.078 to 2.206 when the temp. of its formation rises from 400° to 700°. The size of particles is estd. by the method of Svedberg to be of the order of one micron. The reason that the C prepd. by the decompn. of CO shows the adsorptive property in spite of its graphitic nature is the fact that it consists of elementary C in a rather deformed structure. With graphite, because of its perfect crystalline structure, there appears no remarkable effect of adsorption. The d. and cryst. behavior of the C in question as well as its adsorptive power have a marked parallelism with the temp. of its formation, as if in character it stands between graphite and sugar C in every respect. That the view of Debye, Scherrer and Asahara on the allotropic nature of graphite and amorphous C still holds good in the case of the adsorptive C, was found in the present expt. G. CALINGAERT

The catalytic reduction of carbon monoxide under atmospheric pressure. I. Studies by the heating-curve method of the catalytic activity of a few metals. SHINIRO KODAMA. *Bull. Inst. Phys. Chem. Research (Tokyo)* 8, 277-83; *Abstracts sect. 2*, 35-6(1929). (In German).—Ni, Co and Fe are reduced at various temps., and their catalytic activity in the reduction of CO by  $\text{H}_2$  under atm. pressure is measured. The mixt. of 1 mol.  $\text{H}_2$  + 1 mol. CO is passed through 2 tubes, one with, and one without catalyst and heated progressively to 400°. A differential thermocouple records the exothermic reaction. After the reaction, the Ni dissolved in HCl without leaving any residue, while Co left a residue of C. The activity of Ni is thus independent of the temp. of reduction, while the opposite is true with Co. In the absence of  $\text{H}_2$ , both Ni and Co catalyze the decompn. of CO. Fe reduced at 350° and 450° shows an exothermic reaction around 300° which is caused principally by the oxidation of Fe. The Fe catalyst is then no longer active, and is found to be a mixt. of FeO and C. Furthermore, the heating curve with CO alone is practically identical with that of CO +  $\text{H}_2$ . II. Study by the heating-curve method of the influence of a few substances on the catalytic activity of cobalt.



*Ibid* 284-7; *Abstract sect.* 36-7.—The influence of  $K_2CO_3$ , Cu,  $ThO_2$ ,  $Al_2O_3$  and MnO on the activity of a Co catalyst was studied by the method described above. The decompn. of CO with sepn. of C is not evident when  $ThO_2$  or Cu is added to the Co catalyst, while the addition of  $K_2CO_3$  decreases it.  $ThO_2$  and Cu to a less degree increase the activity of Co toward the reduction of CO and the formation of hydrocarbons.  $Al_2O_3$  and MnO are detrimental to the activity of Co.

G. CALINGAERT

Catalytic solution of copper in sulfuric acid. I. B. EVTUSHENKO. *J. Chem. Ind.* (Moscow) 6, 429-30 (1929).—In presence of air  $H_2SO_4$  dissolves Cu but slowly, particularly if the metal has not been finely divided. A catalyst is reported which accelerates this reaction considerably. Cu turnings are placed in a flask,  $H_2SO_4$  ( $17^\circ$  Bé.) is added, an air current is passed through a tube reaching to the bottom of the flask, and the flask is heated on a water bath. Without the catalyst only 5.74% of  $H_2SO_4$  combines with Cu after 3 hr.; with the catalyst, 30%. The catalyst consists of a mixt. of 1 part  $Cr_2(SO_4)_3$  and  $1/2$  part  $HNO_3$  per 100 parts  $H_2SO_4$  taken. The product obtained contains but a trace of Cr alum, and the catalyst remains in the mother liquors and can be recovered.

BERNARD NELSON

Mutual decomposition in the absence of a solvent. VII. Equilibria in systems composed of thallium sulfate and mercury halides. N. K. VOSKRESENSKA. *J. Russ. Phys.-Chem. Soc.* 61, 79-87 (1929).—The appearance of solid phase on cooling could be directly observed except in the case of opaque  $HgI_2$  mixts. Eutectics and polymorphic transformation points were detd. from heating and cooling curves. The liquidus curve of  $Tl_2SO_4$ - $HgCl_2$  alloys is practically rectilinear up to 60% (molar)  $HgCl_2$ . At 64.5%  $HgCl_2$  and  $269^\circ$  the line becomes more nearly horizontal, and at 81.5%  $HgCl_2$  and  $232^\circ$  (the eutectic) the slope changes from pos. to neg. A single complex compd. is formed (probably  $3Tl_2SO_4 \cdot HgCl_2$ ), m.  $269^\circ$ . A double salt,  $5HgCl_2 \cdot 2Tl_2SO_4$ , crystallizes from dil aq solns. on cooling. The liquidus curve of  $Tl_2SO_4$ - $HgBr_2$  shows a eutectic at  $212^\circ$  and 79%  $HgBr_2$ . The cooling and heating curves show a horizontal portion  $10$ - $12^\circ$  above the eutectic corresponding to the decompn. of a complex compd. Mixts. contg. less than 65%  $HgBr_2$  boil below the m. p. at atm. pressure. No indication of a polymorphic transformation was found. No complexes are formed in mixts. of  $HgI_2$  and  $Tl_2SO_4$ . The eutectic lies at 83%  $HgI_2$  and  $249$ - $50^\circ$ . The temp. of polymorphic transformation of  $HgI_2$  is not affected by the addn. of  $Tl_2SO_4$ , showing that no solid solns. are formed.  $Tl_2SO_4$  does not increase the soly. of  $HgI_2$  in water. A comparison of the above systems shows that the miscibility of liquid  $Tl_2SO_4$  and Hg halide decreases with the increasing (negative) heat of soln. Mutual decompn. does not occur. VIII. The singular irreversible system  $TiNO_3 + KBr \rightarrow TiBr + KNO_3$ .—A. P. ROSTKOVSKI. *Ibid* 89-107.—The crit. soly. point lies at  $535^\circ$ . The binary system  $TiNO_3$ - $TiBr$  exhibits a eutectic at 88.5%  $TiNO_3$ , 11.5%  $TiBr$  and  $193^\circ$ . In  $TiBr$ - $KBr$  the liquidus curves intersect at  $KBr$  8.5% and  $457^\circ$ ; the  $TiBr$  branch is practically horizontal. The liquidus curve of the system  $KNO_3$ - $KBr$  consists of 3 portions, the middle one corresponding to the compd.  $KNO_3 \cdot KBr$ , which melts with decompn. at  $342^\circ$ ; the eutectic lies close to the m. p. of  $KNO_3$ . The diagonal section  $KNO_3$ - $TiBr$  of the space model is a binary system of limited mutual soly. Stratification is observed between 14 and 92.5%  $TiBr$ , and the primary crystn. (crystn. from single liquid phase) of  $TiBr$  begins at  $435^\circ$ . The eutectic line is at  $330^\circ$ , and eutectic point corresponds to about 2%  $TiBr$ . In the diagonal section  $TiNO_3$ - $KBr$ , the liquidus curve descends from the m. p. of  $TiNO_3$  to  $190^\circ$  at 92%  $TiNO_3$  and 8%  $KBr$ . Stratification occurs at  $395^\circ$  and 34%  $KBr$ ; here the outer branch of primary crystn. curve of  $TiBr$  intersects the inner branch and the stratification curve. The stratification curve passes through a max. at 50% and  $535^\circ$ . A similar intersection point lies at  $468^\circ$  and 61%  $KBr$ . The diagonal section contains a singular plane (locus of intersection for all curves) which characterizes chem. irreversible systems. The ternary system  $KNO_3$ - $TiNO_3$ - $TiBr$  contains a stratification region and a triple eutectic at  $181^\circ$ , 25.5%  $KNO_3$ , 4.5%  $TiBr$  and 70%  $TiNO_3$ . System  $KNO_3$ - $TiBr$ - $KBr$  contains a transition point at  $336$ - $8^\circ$ , 4.5%  $KBr$ , 1%  $TiBr$  and 93.5%  $KNO_3$ , and the triple eutectic  $327$ - $8^\circ$ , 1%  $KBr$ , 1%  $TiBr$  and 98%  $KNO_3$ , besides the stratification regions. The stratification field occupies 32% of the total surface of the space projection of the ternary system.

B. SOVENKOFF

The heterogeneous equilibrium of tungsten and its oxides with carbon monoxide and carbon dioxide. ZEN-ICHI SHIBATA. *Tech. Repts. Tôhoku Imp. Univ.* 8, 255-70 (1929).—The following reversible reactions exist:  $1/2[W_2O_5] + CO = 1/2[W] + CO_2$ ;  $[W_2O_5] + CO = 2[W_2O_3] + CO_2$ ;  $2WO_3 + CO = [W_2O_5] + CO_2$ . The brackets indicate satd. solid solns. of mutual components. The soly. of  $WO_3$  in  $W_2O_5$  is comparatively large at high temp.; at about  $1000^\circ$  a series of solid solns. is formed until 2% O of  $WO_3$  is reduced. The following exptl. equations were obtained for the relations between the

equil. const. and temp.:  $\log K_{p1} = (321.6/T) - 0.0647$ ;  $\log K_{p2} = (1029.8/T) - 0.7884$ ;  $\log K_{p3} = (1555.5/T) - 1.1427$ . H. C. PARISH

The heterogeneous equilibrium of tungsten and its oxides with hydrogen and water vapor; and the dissociation pressure of the oxides. ZEN-ICHI SHIBATA. *Tech. Repts Tôhoku Imp. Univ.* **8**, 271-7 (1929). H. C. PARISH

The melting point of potassium chromate. DAVID F. SMITH AND F. A. HARTGEN. *Fuel in Science & Practice* **8**, 302 (1929). See *C. A.* **23**, 2640. D. A. REYNOLDS

Dehydration mechanism. D. BALAREFF. *Kolloid-Z.* **48**, 63-70 (1929).—Study of the mechanism of the dehydration of gypsum shows it to be semihydrated in character. Application of the specific character of this dehydration to the results of van't Hoff, Le Chatelier, Linck and Jung, and Balareff concerning the dehydration of gypsum and the semihydrate makes possible an explanation of many contradictions. L. F. MAREK

Use of a recording manometer for studying the decomposition of hydrates (particularly of alumina hydrates). L. HACKSPILL AND E. STEMPEL. *Chimie & Industrie Special No.*, 151-9 (Feb., 1929).—*Gibbsite*, or orthoalumina acid,  $Al(OH)_3$ , is reversibly dehydrated at a perfectly definite temp. ( $220^\circ$ ). A water vapor pressure, even of several atm., can retard, but not prevent, the decomposition. This is not a dissociation phenomenon, but a sharp decomposition. Dehydration is complete and does not take place by progressive loss of  $H_2O$  with formation of lower hydrates. After it has taken place  $H_2O$  is adsorbed by the anhyd.  $Al_2O_3$  crystals, which offer a very large surface. Part of the  $H_2O$  combined as  $Al_2O_3 \cdot 3H_2O$  is converted into adsorbed  $H_2O$  without having left the crystal. The adsorption is reversible as long as the adsorbing substance has not been heated sufficiently to agglomerate the small crystals and decrease the total surface. *Diaspor*, or metaalumina acid,  $HAIO_2$ , behaves like gibbsite; i. e., it is dehydrated in one stage and quite sharply, but at a temp. of  $500^\circ$ . The presence of the intermediate hydrate  $Al_2O_3 \cdot 2H_2O$  was never observed in natural products. Pure *kaolin* has a very different dehydration curve from those of the other elements of bauxite. The curve of *goethite*,  $HFeO_2$ , is similar to that of aluminic acids, but decomposition takes place at about  $320^\circ$ . These data permit determination in a single operation of the approximate composition of a natural bauxite and confirmation of the results of the mineralogical examination. A. P. C.

Thermal decomposition of ozone at low pressures. E. H. RIESENFELD AND H. J. SCHUMACHER. *Z. physik. Chem.* **138**, 268-85 (1928); cf. *C. A.* **22**, 714.—The thermal decomposition of  $O_3$  mixed with  $O$  has been studied at  $85^\circ$  and  $95^\circ$  for partial pressures of  $O_3$  varying from about 60 to 6 mm. At these pressures, the unimolecular reaction predominates, the bimolecular reaction which occurs simultaneously at higher pressures (*C. A.* **22**, 714) being of little account, and the velocity coefficients of both reactions are not appreciably influenced by variations in the partial pressure of  $O$  or by the presence of  $N_2$ , however, and still more  $CO_2$  accelerate the bimolecular reaction. Alteration in the ratio of the surface to the volume of the reaction vessel affects the reaction velocity much less than it would if the unimolecular reaction were purely a wall reaction, so that it seems that the main reaction is homogeneous, although under ordinary conditions there appears to be some slight wall effect in addition. From the facts that in the experiments of Perman and Greaves (*C. A.* **2**, 2325) and of Griffith and McKeown (*C. A.* **20**, 323) variation of the surface of the vessel affected the velocity considerably, and also that the observed velocities were exceptionally high, it appears probable that these authors' results were vitiated by the presence of catalysts in the gas or in the apparatus. The results of the present experiments for the unimolecular reaction may be considered to supersede those of Riesenfeld and Bohnholzer (*C. A.* **22**, 714) on account of their greater accuracy. B. C. A.

The thermal formation of hydrogen chloride. J. A. CHRISTIANSEN. *Z. physik. Chem.*, Aft. B, **2**, 405-27; **3**, 481 (1929).—The rate of formation of  $HCl$  from  $H_2$  and  $Cl_2$  at  $200^\circ$  is almost independent of the concentration of  $H_2$  for definite values of the  $O_2$  concentration. It is approximately proportional to the concentration of  $Cl_2$ , and inversely proportional to the concentration of  $O_2$ .  $Br_2$  does not stop the reaction while  $HCl$  apparently retards it somewhat. A *microburet* is described. In an electric thermoregulator with an Fe-Hg contact, the Fe should be negative. F. D. ROSSINI

Specific heats of acetone, and methyl, ethyl and propyl alcohols at low temperatures. SHINROKU MITSUKURI AND KENJI HARA. *Bull. Chem. Soc. Japan* **4**, 77-81 (1929).—The calorimeter proper containing a heating element and a stirrer is surrounded by a brass cylinder and the whole immersed in a petroleum ether bath cooled by liquid air. In use the bath is cooled and the source of cold removed. The temperature of the liquid is then plotted against time, before, during and after the flow of current. From these data can be plotted a corrected curve of temperature rise due to electric energy. The usual calorimeter corrections are then made. From the energy supplied the specific heats are easily calculated. Results were given in *C. A.* **23**, 2095. V. F. HARRINGTON

**Studies on the heat of fusion and the specific heat of calcium and magnesium.** EDWARD ZALESIŃSKI AND ROMAN ZULIŃSKI. *Bull. intern. acad. polonaise*. 1928A, 479-505 (In German).—In a specially constructed  $H_2O$  calorimeter the sp. heats and the heats of fusion of solid and the av. sp. heats of fused Mg and Ca were detd. Differences in the sp. heat values of Ca lead to an assumption of a new allotropic modification in the neighborhood of the m. p. with a smaller sp. heat. Its existence was proved by measurements of the duration of crystn. of fused Ca, which recalcd. according to Tammann's formula for heat of fusion gave the transition point of this modification at  $800^\circ$ . The sp. heats (in cal./g.) of Ca for different temp. intervals are as follows:  $20-304^\circ$ , 0.1610;  $20-504^\circ$ , 0.1764;  $22-520^\circ$ , 0.1768;  $20-697^\circ$ , 0.1887;  $21-755^\circ$ , 0.1927;  $22-785^\circ$ , 0.1901 (this value obtained when coming from lower to higher temp.);  $22-785^\circ$ , 0.1724 (as obtained when coming from higher to lower temp.);  $22-802^\circ$ , 0.1724;  $810^\circ$  (m. p.)– $930^\circ$ , 0.2670. The corresponding values for Mg are:  $22-625^\circ$ , 8.2823;  $650^\circ$  (m. p.)– $775^\circ$ , 0.2880 or 0.2800. The heat of fusion in cal./g. for Ca is 78.5 (calorimeter), 74.0 (duration of crystn.); the heat of transition of the Ca allotropic modification 5.75. The values for Mg are 55.5 (calorimeter) and 46.0 (duration crystn.). J. WIERTELAK

The internal resistance of spontaneous processes and the entropy changes by which they are accompanied. N. V. TANTROV. *J. Russ. Phys.-Chem. Soc.* 61, 41-52(1929); cf. *C. A.* 19, 2437.—The heat generated by an exothermic reaction is the more quickly dispersed the higher the temp. and the smaller the amt. liberated. Or, the reaction will proceed most readily when  $dS(=dQ/T)$  is at a min. When the mols. react adiabatically this min. entropy change corresponds to min. internal resistance, the latter being detd. by the velocity with which the reacting mols. transmit kinetic energy to their neighbors. The initial stages of a reaction between individual mols. can be regarded as adiabatic, heat (acceleration) being produced by the forces of chem. attraction much more rapidly than dissipated. The formation of cryst. nuclei in supercooled liquids is discussed, starting with the above premises. It is concluded that of several possible solid phases the one of higher m. p. and lower d. and heat of fusion should sep. regardless of whether it is the stable one at the given temp. In crystn. from supersatd. solns. the phase of greatest soly. will sep. Assuming that gas laws hold for supersatd. vapors, condensation at a temp. below the m. p. yields a liquid phase (cf. *C. A.* 22, 2704). Among chem. reactions in systems of one phase, those of least heat effect will most readily take place.

B. SOYENKOFF

**Approach in time of a system to its equilibrium state.** N. V. RASHEVSKY. *Z. Physik* 54, 736-7(1929).—For a thermodynamic system not at equil. equations are given which show how the system approaches equil. in time.

GEORGE GLOCKLER

**Thermodynamics of mixtures.** V. FISCHER. *Z. Physik* 54, 715-23(1929).—Calc. of partial pressure of gases and osmotic pressure of dil. solns. Cf. *C. A.* 23, 327, 2644.

GEORGE GLOCKLER

**Osmosis of ternary liquids, general considerations.** IX. F. A. H. SCHREINEMAKERS. *Proc. Acad. Sci. Amsterdam* 32, 254-63(1929); cf. *C. A.* 23, 2625.—Discussion of the relation between the nature of the liquid and that of the membrane. E. S.

**Osmotic vapor-pressure.** I. F. A. H. SCHREINEMAKERS. *Proc. Acad. Sci. Amsterdam* 32, 264-71(1929); cf. *C. A.* 22, 527.—Thermodynamic discussion of pressure changes in osmotic systems.

E. SCHOTTE

The article by N. A. Kolosovskii "A generalization of the third principle of thermodynamics." YU. G. GOLSHUKH. *J. Russ. Phys.-Chem. Soc.* 60, 1399-1401(1928).—A criticism (cf. *C. A.* 22, 3342).

BASIL C. SOYENKOFF

**Sunglass as source of heat for chemical reactions in former times.** J. TROEGER. *Pharm. Zentralhalle* 70, 357-9(1929).—An account of the use of the sunglass in the early days of chemistry.

W. O. F.

**The gold content of sea water.** A. GLAZUNOV. *Chimie & industrie Special No.*, 426-7 (Feb., 1929).—For the detection of Au in sea water, the latter was passed over a pyrites filter, the Au forming a solid soln. with the pyrites, and the pyrites were analyzed for their Au content. Up to 200 tons of sea water was used in the individual tests. The Au content of sea water in the neighborhood of the French coast was found to be of the order of 1 mg. per ton. By making use of the tide, it is considered that Au could be commercially extd. from sea water contg. 4 mg. per ton. A. PAPINEAU-COUTURE

**Modern views of friction.** JEAN J. TRILLAT. *Metallwirtschaft* 7, 101-8(1928).—If a fatty acid is pressed out on a glass plate, cryst. lamellae are found parallel to the glass surface, which give a characteristic spectrum. Active mols. such as the fatty acids show layers 2 mols. deep, whereas inactive mols. such as the satd. hydrocarbons are monomol. On a metal plate, in addn. to the spectrum of the fatty acid, there is observed the spectrum of the combination of the fatty acid with the metal, occurring in an ex-

traordinarily thin layer, which has a completely lamellar structure, with the carboxyl radicals directed toward the metal. This process also occurs with mineral oil which contains some free acid. There are thus formed a certain no. of superimposed laminae of equal thickness so that the metal is covered with  $\text{CH}_3$  groups in the first layer which slip over the hydrocarbon mols. of the second layer very easily. The active ends of the mols. of the second layer attract an equal no. of mols., which are also oriented, thus giving rise to a series of layers, 100–200 in no., 2 mols. thick. Glycerides, such as tristearin, tripalmitin and trimyristin, orient themselves on metals the same as the free fatty acids, the hydrocarbon being directed away from the metal. It is then between the hydrocarbon residues that the phenomenon of "oiliness" originates. A substance may be defined as possessing *oiliness* which can readily take up an oriented lamellar structure. If one melts amorphous fats, like chicken fat, on a plate, little or no orientation can be recognized but if a small quantity is placed between 2 plates which are moved back and forth under pressure the oriented structure can usually be seen. It is therefore the movement which brings about the laminar structure. It is possible by calcn. of the spacing of the slip-planes and by a study of the lines of the spectra to reach conclusions in regard to the compn. of the lubricant. The oiliness is therefore a latent property which depends upon shear and pressure. This is similar to the phenomenon noticed in the prepn. of films of metal, rubber, etc. Spectrograms of fatty acids on glass, tin, lead, etc., are given. Conclusion: As the mols. orient themselves, they oppose the pressure, placing themselves at right angles to the pressure, they neutralize in part the mol. field of force in order to reduce the total energy to a min. Questions are raised as to the measurement of *adhesion*, as to the degree of satn., etc.

EUGENE C. BINGHAM

Soft x-rays from crystal faces (RICHARDSON, ANDREWES) 3. Soft x-rays from single Ni crystal (RAO) 3.

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### 3—SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

S. C. LIND

The structure of an electron. II. USAKU KAKINUMA. *Proc. Phys.-Math. Soc. Japan* [3], 11, 1–11(1929); cf. *C. A.* 23, 2357.

Two-dimensional orbits in the field of a non-neutral. M. A. HIGAB. *Phil Mag.* [7], 7, 783–92(1929).—A mathematical paper in which the motion of a charged particle in the field of an elec. doublet is discussed. Conditions for periodic orbits are obtained and typical examples are discussed and illustrated.

The collision of a slow electron with an atom. KIICHIRO OCHIAI. *Proc. Phys. Math. Soc. Japan* [3], 10, 120–6(1928).—By means of a wave-mech. treatment of an elastic and a non-elastic collision between a charged particle and a H atom, the probability function is calcd. The angular distribution of intensity of a scattered particle is complicated but in the 1st approximation remains a smooth curve without max. or min. A higher (2nd) approximation is carried out to explain the max. and min. which some expts. show. The wave equation for the disturbed system is  $[H - W, \psi] = 0$ ,  $H = H^0 + U$ , where  $H^0$  is the Hamilton function for the undisturbed system and is equal to  $H^0 +$

$II^p$  in which the indices refer to the atom and the particle, resp.  $U$  is the potential of interaction. The probability for elastic collision  $\phi_{00}$  for very slow electrons is

$$\phi_{00} = 2\pi a^2 \int_0^\pi \psi_{00} \sin \delta \, d\delta \rightarrow \frac{\pi a^2}{4}.$$

Born's first approximation was  $4\pi a^2$  instead of  $\pi a^2/4$ . This form ( $\pi a^2/4$ ) explains the Ramsauer effect more favorably than the 1st approximation for the probability of collision becomes very small for very slow electrons. The 2nd approximation causes a large change of  $\phi$  and cannot be used when the colliding electron is very slow. F. M.

The distribution of charge and current in an atom consisting of many electrons obeying Dirac's equations. D. R. HARTREE. *Proc. Cambridge Phil. Soc.* 25, 225-36 (1929).—Mathematical. The work is based on the assumptions that in a many-electron atom, each electron is in a stationary state in the field of the nucleus and remaining electrons and that the field is central. The distribution of current and the resultant magnetic moment according to a solution of Dirac's equation in a central field of force are obtained. It seems possible to specify the direction of the spin axis for states where the magnetic quantum no. has extreme values  $\pm j$ . WILLIAM E. VAUGHAN

Share of "reflection" in the total effect of the action of slow electrons on gas molecules. R. KOLLATH. *Physik. Z.* 29, 834-6 (1928).—The effective cross-sectional area arises from 3 factors: (a) reflection without loss of velocity, (b) absorption, temporary or permanent, (c) velocity loss, with or without deflection. In an attempt to ascertain the relative importance of these factors it is shown that the first rising portion of the cross-section curves (starting from low velocities) in the A group and the first maxima in the N and CO<sub>2</sub> groups arise from factor (a). With higher velocities factor (b) appears. In some cases the curve connecting cross-sectional area with electron velocity in volt<sup>1/2</sup> shows 2 maxima; the first is always due to "vertical" reflection without velocity loss, but no clear evidence is available as to the origin of the second, or as to the role of factor (c). B. C. A.

Secondary electron emission from solid metal surfaces. C. F. SHARMAN. *Proc. Cambridge Phil. Soc.* 25, 237-54 (1929).—S. describes in detail the app. used in this work. The secondary electron emission was measured by the rate of charge of a sensitive Dolezalck electrometer. The plot of no. of secondaries against retarding potentials shows a max at 3 v. and a dropping off with increased potential. This expt. was performed for several primary energies with consistent results. An inverse-square distribution fits the "falling-off" of the curve quite well. The rapid rise of the curve at the origin to reach a max at 3 v. is probably without phys. significance. Both app. gave concurrent data. The complex distribution found experimentally by other authors may be thought of as a superposition of 2 simple distributions: (1) the true secondary electron (delta ray) emission and (2) the energy distribution of the reflected primary electrons, which is practically const. and level, save for a sudden max. WILLIAM E. VAUGHAN

Thermionic emission through double layers. W. GEORGESON. *Proc. Cambridge Phil. Soc.* 25, 175-85 (1929).—Thermionic emission from surfaces has been treated with the consideration that the atoms in the surface contamination create an elec. double layer. If the layer is pos. with respect to the metal, the work function,  $\psi$ , of extn. is reduced. The subject is treated mathematically. The surface variation of the potential energy has a more gradual gradient than the abrupt discontinuities assumed by other authors. WILLIAM E. VAUGHAN

Liberation of electrons by means of x-rays. H. BEHNKEN. *Physik. Z.* 29, 836-7 (1928).—The no. of electrons liberated from an element under the action of homogeneous x-rays increases in general with increasing at. no. B. C. A.

Waves associated with  $\beta$ -rays, and the relation between free electrons and their waves. G. P. THOMSON. *Phil. Mag.* [7], 7, 405-17 (1929).—T. considers the variation of the speed of electrons in the continuous  $\beta$ -ray spectrum to be due to the dispersion of a short-wave group associated with each ray. The mean velocity is about that to be expected if the group had the form of an error function of sufficient spread to give the observed range of velocity. T. suggests the possibility of a group in the form of a heavily damped wave and an expt. is described concerning the propagation of waves along a thin lath. An expression is also considered for the velocity of an electron associated with a given wave, and it is shown to give consistent results in this problem. It leads to the consequence that the velocity of an electron may vary even in force-free space, which explains Ellis and Wooster's expt. (*C. A.* 22, 537) on the heat generated in the disintegration of Ra E. This variation of velocity is essentially associated with a short-wave train. L. H. REYERSON

Some difficulties in the spontaneous emission of radiation. I. GOLDSTEIN. *Compt. rend.* 187, 1285-6(1928).—The incompatibility which appears to exist between the 2 fundamental notions of the stationary state (Bohr-Sommerfeld) and the continuous change of configuration of the atom is discussed in the light of the Broglie-Schrödinger and Dirac analyses of undulatory mechanics. Conclusion: Existing at. structures provide no real phys. reason for the possibility of the spontaneous emission of radiation. B. C. A.

The production of the H rays of disintegration by the action of the  $\alpha$ -rays of polonium. C. PAWLOWSKI. *Compt. rend.* 188, 1248-50(1929).—A study of the disintegration of Al by  $\alpha$ -rays was effected by the method of scintillations. The H-rays were produced not only by the  $\alpha$ -rays of 3.9-cm. range but also by those of 2.4-cm. range. The ratio of the no. of H particles produced to the no. of  $\alpha$  particles agrees better with the results of Rutherford obtained with longer exciting rays than with those of Schmidt and of Bothe and Franz, who used the rays of Po. The max. range of the H particles emitted from Al under the action of the rays from Po was 48.2 cm. Rutherford obtained rays of 33-cm. range with  $\alpha$ -rays of 4.9-cm. range. H. F. JOHNSTONE

Determination of cathode-particles from Lenard high-power tubes. R. THALLER. *Physik. Z.* 29, 841-6(1928).—A convenient condenser method is described for measuring the output from high-power tubes. B. C. A.

Note on the number of high-velocity  $\beta$ -rays. H. M. CAVE. *Proc. Cambridge Phil. Soc.* 25, 222-4(1929).—C. uses an electroscope placed above a thin-walled glass tube contg. Rn which is located between the flat circular pole-pieces of an electromagnet. The electroscope is shielded from  $\gamma$  radiation by a block of lead. The field may be varied, thus causing a change in the rate of discharge of the electroscope. The field was so adjusted that none of the  $\beta$  rays of the Ra B-C spectrum of high-frequency limit 12,000 Hp could reach the electroscope. Under the exptl. conditions there was present no discharge of the electroscope other than the natural leak. Conclusion: There are very few (1 per 500 or more probably 1 per 1000 disintegrations) if any very fast  $\beta$  rays, contrary to the observations of Yovanovitch and d'Espine (*C. A.* 21, 3821). W. E. V.

The ionization potentials of the rare earth elements in relation to their position in the periodic system. L. ROLLA AND G. PICCARDI. *Phil. Mag.* [7], 7, 286-301(1929).—Assuming that the validity of the mass-action law has been demonstrated for the case of a neutral atom ionizing into an electron and a positive ion, R. and P. develop an exptl. method for detg. the equil. const. ( $K$ ) for the reaction neutral atom  $\rightleftharpoons$  positive ion + electron. From values of  $K$  it is possible to det. ionization potentials. The method employs a flame which may be regarded as a stationary phenomenon. This flame passes through a fine metallic gauze and impinges on a metal plate connected electrically to the gauze. A temp. difference between the plate and the gauze maintains a const. flow of electricity. Atoms capable of ionization are then introduced below the gauze from a bead contg. a known quantity of salt and the change in current is measured. The diff. gives the current due to the positive ions and electrons. From the loss in wt. in the bead and the current due to the positive ions and electrons the authors calc. the equil. const. and from this the ionization potentials. The method was first used to check known ionization potentials for such elements as the alkalis and alkaline earths and then applied to the rare earth oxides. Absolute potentials of the rare earths were found to vary from 5.49 to 7.06 v. Tables of results are given and a figure shows the known ionization potentials of the elements in the periodic system and the periodic changes which occur in these potentials. A discussion is given of these results in the light of the atomic theory of Bohr and Hund. L. H. REYERSON

The mobility distribution and rate of formation of negative ions in air. J. L. HAMSHERE. *Proc. Cambridge Phil. Soc.* 25, 205-18(1929).—A modification of Rutherford's (*Phil. Mag.* 44, 429(1897)) alternating-field method of measuring ionic mobility in a gas was used. The variable field  $X$  is synchronized with an auxiliary field  $X'$ , so that ions enter through the gauze only for a portion of the advancing phase of  $X'$ . Po was used as a source and  $\alpha$  particles were screened out. At atm. pressure in dry air the method gives results showing the upper and lower limits of  $K$ , the ionic mobility. From this is derived a distribution curve which with limits 2.15 and 1.45 has a peak at about 1.8.  $K = 2d/X_0T_0$ , where  $d$  is the distance between plates,  $X_0$  initial field and  $T_0$  initial period for one cycle. At lower pressures (below 100 mm.) the current is resolved into ions and free electrons. From the nos. reaching the electrometer it has been calcd. that the electron makes, on the av.,  $9.4 \times 10^4$  collisions before capture, independent of electron speed in a range of from  $2 \times 10^6$  to  $7 \times 10^6$ . A lengthy bibliography is appended. WILLIAM E. VAUGHAN

Measurements on the ionization of air by means of electron streams. W. SCHMITZ. *Physik. Z.* 29, 847-8(1928).—A new app. is described. B. C. A.

**Efficiency of ionization in hydrogen by positive-ion impact at 7000 volts.** R. W. GURNEY. *Phys. Rev.* [2], 32, 795-8 (1928).—If ionization is not accompanied by transfer of kinetic energy, the method used, in which H at low pressure is bombarded with pos. K ions, permits a comparison of the ionizing efficiency with that of electron impact. Conclusion.—Either the efficiency is less than  $1/160$  of that of 50-v. electrons or ionization is accompanied by transfer of kinetic energy. B. C. A.

**The dielectric constant of ionized gases.** HENRI GUTTON. *Compt. rend.* 188, 1235-7 (1929).—Expts. on the properties of ionized gases in a field of high frequency show the existence of a period of resonance in the gas. On the basis of these results an equation is calcd. that gives the dielec. const. of the ionized gas as a function of the no. of ions per cc. and from which the no. of ions for which the gas is in resonance for a given frequency may be found. The equation is valid outside of the absorption band corresponding to the resonance. H. F. JOHNSTONE

**An examination of reactions in ionized gases from the standpoint of Faraday's law.** SHRIDHAR S. JOSHI. *Trans. Faraday Soc.* 25, 143-7 (1929).—The values of  $M/F$  are considered from the standpoint of a theory of the kinetics of a chem. change in the silent discharge. It is assumed that the photochem. effect may be neglected. Consideration is also given to the conditions under which the photochem. effect must be taken into account. L. B. MILLER

**Scattering of quanta with diminution of frequency.** KARL K. DARROW. *Science* 68, 488-90 (1928); *Bell System Tech. J.* 8, 64-93 (1929).—There are 4, possibly 5, cases in which quanta appear to surrender part, but not all, of their energy in excitation of mols (Raman), in excitation of vibrations in crystal lattices (Raman, Landsberg and Mandelstam), in collisions with free electrons (Compton) and in ionization of atoms by removal of inner electrons (Duane and Clark). In these cases the original quantum does not disappear with the production of a new quantum of smaller energy, but simply loses part of its energy. Electrons also possess the properties of wave motion, the wave length changing with velocity. It could not be claimed that when an electron changes velocity that it is destroyed and a new one formed with a different wave length. In other cases an atom absorbs a quantum of energy and after an interval gives out another with different frequency, the 2 quanta being entirely distinct from one another. G. L. CLARK

**Relationship between effective cross section and quantum jumps.** E. BRÜCHE. *Z. Physik* 47, 114-30 (1928).—A close relationship exists between effective cross section and quantum jumps. B. shows the agreement between the Lenard and Franck-Hertz definitions for the influences which result from impact between electron and mols. and discusses the conceptions of cross section in their significance for no. and products of impacts. The sep. quantum jumps must be manifest on the effective cross section curve, probably as small jumps, and cross section investigations principally permit the detn. of products. The max. of effective cross section curves may be conditioned by the influence of quantum jumps. G. L. CLARK

**Striations in high-frequency discharges [in argon, etc.].** S. P. MCCALLUM AND W. T. PERRY. *Nature* 123, 48-9 (1929); cf. *C. A.* 22, 1724. H. L. D.

**The distribution of range of the  $\alpha$ -particles from radium C' and thorium C'. N. FEATHER AND R. R. NIMMO.** *Proc. Cambridge Phil. Soc.* 25, 198-204 (1929).—From measurements of tracks formed in an expansion chamber, there are obtained distribution curves relative to 2134  $\alpha$  particles from thorium C' and 729  $\alpha$  particles from radium C'. There are fewer short-range particles from the latter than from the former. In either case the most probable range is from 0.2 to 0.3 mm. greater than the mean range. Variations from the distribution curve are explained on the basis of slight inhomogeneity of the beam. Linear straggling coeffs. are estd.; 1.30 mm. (standard air) for Th C'; 1.20 for Ra C' (corrected values). This disagrees with 0.76 for Ra C' obtained by Curie and Mercier. Cf. *C. A.* 21, 698. WILLIAM E. VAUGHAN

**Energy relations in artificial disintegration.** E. RUTHERFORD AND J. CHADWICK. *Proc. Cambridge Phil. Soc.* 25, 186-92 (1929).—Expts. on disintegration of the N nucleus by  $\alpha$  particles and photographs thereof have been studied analytically. In a collision of an  $\alpha$  particle with a nucleus, a proton may be ejected and a residual nucleus formed; in this process there is involved a certain energy of formation,  $W$ , of the new nucleus. From equations involving conservation of momentum and of energy and from the exptl. photographs (from which may be measured the angles of approach and rebound), there has been calcd.  $W$  for 6 disintegration collisions as a fraction of the energy of the  $\alpha$  particle of radium C' ( $7.66 \times 10^6$  electron-volts), thus;  $-0.16$ ,  $-0.02$ ,  $-0.30$ ,  $-0.33$ ,  $-0.11$ ,  $-0.06$ . The value for  $W$  is not definite. The measurements are not in error by so large an amt. However, the velocity of the  $\alpha$  particle at impact may be uncertain.

Consideration of this point does not radically rectify the set of values obtained. Detns. of the magnitude of the energy change in Al disintegration expts. from the ranges of the expelled protons are also in variance. (The ejected bodies were proved by expt. to be protons.) The variance in  $W$  is explained as being due to variations in the internal energy of the original Al nucleus or of the final nucleus (presumably Si). Also there is the possibility that the  $\alpha$  particle is not captured; this results in a three-body problem. The explanation on the basis of variance in internal energy is favored and the evidence

that in the radioactive transformation of Th C  $\xrightarrow{-\beta}$  Th C'  $\xrightarrow{-\alpha}$  thorium Pb involves a different energy change than Th  $\xrightarrow{-\alpha}$  Th C''  $\xrightarrow{-\beta, \gamma}$  thorium Pb, is presented as supporting evidence.

WILLIAM E. VAUGHAN

**Osteogenic sarcoma in dial painters using luminous paint.** H. S. MARTLAND AND R. E. HUMPHRIES. *Arch. Path.* 7, 406-17(1929).—Of some 15 girls whose deaths were attributed to radium-mesothorium poisoning incurred while they were employed at painting watch dials with luminous paint, 2 had osteogenic sarcoma. The paint used consisted of cryst. phosphorescent ZnS rendered luminous by the addition of extremely small quantities of Ra, mesothorium and radiothorium in the form of insoluble sulfates. The mode of poisoning in these cases was by ingestion, from the general habit of pointing their brushes in their mouths. Absorption through the skin and inhalation were not considered significant portals of entry. The deposits in the bones were generalized over the entire skeleton. The outer layers of the cortex seemed to be the final position of storage. Here it was frequently stored in large amounts and probably replaced Ca in these areas. From the fixed deposits of Ra and mesothorium in the bones there was a never-ceasing radiation. Ninety-five percent of the radiation was  $\alpha$ , which biologically and chemophysically is much more destructive to body tissues than either  $\beta$  or  $\gamma$  radiation, the relation being 10,000 to 100 to 1, resp. In addition, the preponderance of mesothorium in this paint is of great toxicologic importance for the reason that mesothorium in equilibrium with its radiothorium emits 5  $\alpha$  particles, whereas Ra emits only 4; also the  $\alpha$  particles of mesothorium and the products of its decay have a greater velocity and penetration than those of Ra and therefore, are chemophysically and physiologically more active.

HARRIET F. HOLMES

**Scattering of x-rays in mercury vapor.** P. SCHERRER AND A. STÄGER. *Annales soc. espagn. fis. quim.* 26, 348-64(1928).—A study of the scattering of x-rays by atoms is one of the few ways of obtaining information about electrons and their distribution, and the study of such scattering by gases is of special interest because of the possibility of interference due to the rigidity and impenetrability of the atoms themselves. Little experimental work of this sort has been done. A study was made of the "coherent" scattered radiation from Hg vapor. A fine vertical jet of Hg vapor at 1 atm. pressure was produced by means of an injector-like device of glass or quartz at the axis of a cylindrical Debye-Scherrer camera. A perpendicular, narrow beam of x-rays was focused on this vapor as it would be on a powder specimen, and the scattered radiation registered on a photographic film. For successful work, both the vapor stream and the beam of x-rays must be very fine; in this work each was about 1 mm. in diam., and the camera 5.5 cm. in diam. The x-ray radiation must be intense and sensitive film used. A Hadding tube with Cu cathode was operated at 30 kv. effective voltage and 15 ma. Agfa double-coated films were used. Great care in the regulation of the boiling of the Hg and good thermal insulation were required to insure that the vapor was free from drops. Precautions had to be taken that no drops of Hg formed on the diaphragms. Secondary and tertiary radiation was eliminated by a brass screen. Since the Hg jet was formed in air and not *in vacuo* the diffusion due to the air was reduced by a suitably placed diaphragm. It was necessary to protect the film from the heat of the Hg vapor. The parts of the app. in contact with the Hg were made of iron. The rest was brass. Finally there was a system of horizontal and vertical wires surrounding the focus. The shadow of this on the film gave an idea of the size and shape of the focus and photometry of these shadows permitted eliminating air radiation. When the app. was complete and tested, 2 runs were made: one with Hg vapor and one with air only. The films showed much more blackening with the Hg and the shadows of the wires were sharp, indicating that the focus was nearly a point. With air, the vertical wires gave indistinct shadows. No max. of intensity could be observed by visual examn. The films were photometered and interpreted (1) by subtracting the blackening resulting from air alone, (2) by using only the Hg film and subtracting the blackening due to the shadows of the wires. The 2 methods gave comparable results. No max. were found. The intensity decreased up to about 120° and then increased slightly up



to  $160^\circ$ . The amplitudes after correcting for polarization showed a gradual decrease. The analysis of the amplitude curve is not yet complete, but the results show that the curve is not undulatory and the electrons must therefore be distributed uniformly. Static distributions such as in the Bohr atom would lead to curves having max. The diffusion called for by wave mechanics is not inconsistent with these results. A. W. K.

The absorption of x-rays from 0.63 to 2 A.U. IVOR BACKHURST. *Phil. Mag.* [7], 7, 353-73(1929).—A description is given of a form of x-ray tube convenient for absorption measurements with homogeneous radiation in the neighborhood of 1 A. U. and the results are given of measurements with Ag, Pt, Al, Au and Cu for wave lengths between 0.62 and 2 A. U. The relation between absorption and wave length was nowhere found to conform exactly to the cube law, the departure from this law often being very considerable. B. considers the possible existence of discontinuities due to multiple ionization. No general law was found that would fit accurately the data obtained for all the elements examined, although that found recently by Edvin Jonsson (Absorptionsmessungen im langwelligen Röntgenbiet und Gesetz der Absorption, Uppsala Universitets Årsskrift 1928, Matematik och naturvetenskap 1) appears to furnish a good approximation. The K-absorption jump of Cu and the L-absorption jumps of Pt and Au were measured and the results compared with theory. L. H. REYERSON

The interpretation of x-ray crystal photographs. I. Use of photographic grids. WM. H. GEORGE. *Phil. Mag.* [7], 7, 373-84(1929).—G. describes a photographic grid method, applicable to any x-ray spectrometer, of measuring x-ray photographs. The photographic plate or film is supported in the x-ray camera entirely by geometric constraints. A flash of light, together with a printing frame, also fitted with geometric constraints, is used to impress upon the x-ray photograph an image of some network suitable for interpretation of the particular type of x-ray photograph. A single calibration photograph is taken, and used to fix accurately the geometric constraints of the printing frame. Any subsequent photograph then shows on development both the x-ray photograph and a correctly aligned interpretative grid. Various modified applications of the method in x-ray crystallography are discussed as well as applications of grid methods to research in other fields. L. H. REYERSON

Soft x-rays from crystal faces. O. W. RICHARDSON AND U. ANDREWES. *Nature* 123, 344(1929).—By a method previously employed 17 discontinuities between 70 and 320 v are observed with graphite, each agreeing with a value previously found with C. Fifteen discontinuities observed with a C target are absent with a graphite target. Thus the no. of discontinuities from a single crystal surface are smaller than those from a polycryst. surface. G. L. CLARK

Soft x-rays from a single nickel crystal. S. RAMACHANDRA RAO. *Nature* 123, 344-5(1929).—From the results of the preceding abstr. an ideal crystal surface should give inflections at 63.8, 72.2, 106.2 and 116.0 v. The former 2 can be assocd. with transitions from the  $M_{II,III}$   $M_I$  level. Surface alteration of the non-cryst. target on electronic bombardment may account for the large no. of inflections which have been reported. G. L. CLARK

X-ray applications in everyday life. GEO. L. CLARK. *Sci. Monthly* 28, 172-8(1929).—A popular account of the achievements and possibilities of radiography and fine structure detn. by x-ray diffraction for materials of practical utility. G. L. CLARK

The K x-ray absorption edge of iron. H. R. VOORHEES AND GEO. A. LINDSAY. *Phys. Rev.* 31, 306(1928).—The K x-ray absorption edge of Fe was photographed by using as reflecting crystals pyrite, hematite, arsenopyrite, epidote and lepidomelane. A complicated fine structure of the edge was observed, extending over 200 v. The spectral range of fine structure due to the stopping of the ejected electron in different virtual orbits would be much smaller than that obtained here; it is, therefore, supposed that at least part of the fine structure is due to the simultaneous ejection of two or more electrons from the atom. W. F. MEGGERS

Fine structure in the K series of molybdenum. BERGEN DAVIS AND HARRIS PERKINS. *Phys. Rev.* 31, 306(1928).—It was shown before (C. A. 22, 1541; 23, 766) that by proper arrangement of crystals the resolving power of the double x-ray spectrometer may be much increased. Now it is found that by placing crystals for higher orders of reflection the resolving power is still further increased. By using both crystals at second order fine structures were observed as follows, all on the long-wave side of the parent line:  $\beta'_1$ , 0.17 X. U. from  $\beta_1$ ;  $\alpha'_1$ , 0.085 X. U. from  $\alpha_1$ ;  $\alpha'_2$ , 0.096 X. U. from  $\alpha_2$ . W. F. M.

A classical derivation of the Compton effect. C. V. RAMAN. *Indian J. Physics* 3, 357-69(1929).—With the aid of an at. model in which the electrons are regarded as a gas distributed in a spherical enclosure surrounding the nucleus, it is shown mathemati-

cally that the classical wave-principles lead directly to a quant. theory of the Compton effect and to an explanation of the known exptl. facts in connection with it.

**Doublet separation of Balmer lines and the molecule of hydrogen in relation to the electromagnetic quantum theory.** CORNELIO L. SAGUI. *Phys. Rev.* **31**, 715(1928). H. W. W.

**A spectroscopic determination of the pressure in the calcium chromosphere.** ALBRECHT UNSÖLD. *Astrophys. J.* **69**, 209-26(1929).—From emission and absorption photographs and photometric traces of the H and K resonance lines of the Ca chromosphere calcs. are made of the partial pressure of the Ca ion. For 3 exptly. chosen layers above the chromosphere it is: 0-2500 km.,  $19 \times 10^{-16}$  atm.; 2500-5600 km.,  $2 \times 10^{-16}$  atm.; 5600-14000 (?) km.,  $0.3 \times 10^{-16}$  atm.; with an av. of  $4 \times 10^{-16}$  atm. The av. velocity of the ions from Doppler measurements is 15 km./sec. Milne's theory that the radiation absorbed by these lines must be just sufficient to support the mass of Ca ion in the chromosphere is substantiated. W. F. MEGGERS

**Is there argon in the corona?** H. N. RUSSELL AND I. S. BOWEN. *Astrophys. J.* **69**, 196-208(1929).—The authors contend that Freeman (*C. A.* **23**, 1057) was in error in attributing most of the lines in the spectrum of the solar corona to Ar. The contention is that measurements were insufficiently accurate and that the no. of coincidences noted by F. were not beyond the limits of probability. GREGG M. EVANS

**Self-reversed lines in the spectrum of mercury.** L. H. DAWSON AND W. H. CREW. *Phys. Rev.* **31**, 308-9(1928).—Spectrograms in the region 6000 A. U. to 1860 A. U. were made of a Hg arc in quartz operating at atm. pressure and excited by a condensed discharge. Eleven arc lines and 2 spark lines were observed to be self-reversed. All of these arc lines except 2536 A. U. represent transitions originating on the  $2^3P$  levels, which are the lowest energy levels of the excited Hg atom. Furthermore, 6 of these lines start on the  $2^3P_1$  level, 2 on the  $2^3P_0$  level, and 2 on the  $2^3P_2$  level, indicating a predominant accumulation of electrons on the supposedly least stable orbit; the frequent collisions due to pressure possibly prevent the usual accumulation on the more stable orbits. W. F. MEGGERS

**Certain characteristics of the spectra of mercury at the higher radiating potentials.** L. R. MAXWELL. *Phys. Rev.* **31**, 711(1928).—Electrons in Hg vapor with velocities greater than 150 v. were confined in a beam by a magnetic field. Perpendicular to the beam an elec. field withdrew positive ions before they recombined. The arc lines emitted showed no increase in density on removing the elec. field. This indicates that recombination contributes very little to the production of these lines, which is contrary to the explanation given for the complete arc spectrum appearing above the ionization potential. Consequently the arc spectrum is explained in the following two ways: (1) as being due to inward transitions of one or both of the valence electrons after being removed to outer orbits, (2) due to the return to the  $1^1S$  state by an electron which has been displaced from a soft x-ray level to a virtual orbit, while simultaneously a valence electron falls in to fill the vacancy of the inner level. W. F. MEGGERS

**Unclassified lines of the indium arc spectrum.** JOHN G. FRAYNE. *Phys. Rev.* **31**, 152(1928).—The arc spectrum of In excited by 6.9-v. electrons showed 5 unclassified lines. Four of them, 3051.19, 2858.30, 2957.01 and 2775.35 A. U. are now identified as the following combinations,  $2p_1 - x_1$ ,  $2p_2 - x_1$  and  $2p_1 - x_2$ ,  $2p_2 - x_2$ , the two new levels  $x_1$  and  $x_2$  having values of 11680 and 10645, resp. The fifth line, 2858.30 A. U., remains unclassified. W. F. MEGGERS

**Characteristics of the neutral and of the singly and doubly ionized spectra of praseodymium, neodymium and samarium.** ARTHUR S. KING. *Phys. Rev.* **31**, 309(1928).—A study of these spectra from 2500 to 7000 A. U. at various temps. of the elec. furnace and in the arc and spark has furnished material for a sepn. of the spectra of neutral and ionized atoms, the identification of a large number of neutral lines previously unrecognized, the temp. classification of the neutral spectrum, the selection of ionized lines of lower atomic level, and the identification of new lines, probably doubly ionized, in the ultra-violet. A notable complexity of line structure was observed in the spectrum of singly ionized Pr. (Cf. *C. A.* **23**, 1056.) W. F. MEGGERS

**The spectrum of beryllium.** W. H. SANDERS AND V. M. ALBERS. *Phys. Rev.* **31**, 151(1928). W. F. MEGGERS

**The vacuum spark spectrum of aluminum.** R. F. PATON AND G. M. RASSWEILER. *Phys. Rev.* **31**, 151(1928). W. F. MEGGERS

**The influence of a hydrogen atmosphere upon the arc spectra of certain metals.** HENRY CREW. *Phil. Mag.* [7], **7**, 312-6(1929).—C. describes a method of introducing  $H_2$  gas between the poles of arcs of Mg, Zn, Al, Cd and C so that pole effects are eliminated

in the spectra.  $H_2$  appears to produce a more marked change in many lines than would be expected by the mere introduction of such a gas.

L. H. REYERSON

**An afterglow spectrum of argon.** CARL KENTY AND LOUIS A. TURNER. *Phys. Rev.* 31, 710(1928).—By using a rapidly rotating disk and commutator the arc spectrum of A is found to persist approx. 0.001 sec. after an arc of 0.5 amp. in pure A at 0.5 mm. pressure is cut off. This spectrum is not caused by direct excitation by electrons since the D lines of Na, which are strong in the arc itself, are absent in the afterglow. Na vapor from a properly impregnated oxide cathode is always present. Dropping the potential to 4–11 v. instead of to zero in the off period brings out the D lines in the afterglow and shortens its duration. Reverse potentials up to 45 v. have no effect. Comparison of photographs of the spectra of the afterglow and of the arc shows that, in the afterglow, lines involving jumps from high  $s$  and  $d$  states to the  $2p$  states are much stronger with respect to  $1s-3p$  lines than in the arc. The absence of the D lines, the relative enhancement of lines involving high energy levels and the shortening of the duration of the afterglow by electrons suggest the hypothesis that the afterglow spectrum results from recombination.

W. F. MEGGERS

**Interpretation of the Raman spectrum for the structure of organic compounds.** A. PETRIKALN. *Z. physik Chem., Abt. B*, 3, 360–6(1929).—Twenty-four compds. were investigated to det. the Raman lines assoc. with single, double and triple C bonds. A wave length between  $3.25$  and  $3.27\mu$  was found for a double-bonded carbon with one H attached, in both aromatic and aliphatic compds.;  $3.32-3.49\mu$  for a carbon with one H and 3 other single bonds;  $4.41-4.48\mu$  for a triple bond of N to C. Expressions are deduced for the amplitude, the energy and the strength of the bonds. The difference in wave length to be expected from isotopes of Cl is calcd. and preliminary investigation of  $CCl_4$  has indicated exptl. verification.

HELEN GILLETTE WEIR

**Infra-red absorption by the N-H bond.** JOSEPH W. ELLIS. *Phys. Rev.* 31, 314 (1928). The infra-red absorption spectra of several primary, secondary and tertiary aryl-, alkyl- and arylalkylamines have been examd. below  $3\mu$  with a recording spectrograph. Bands varying in wave length between  $1.04$  and  $1.07\mu$  and  $1.49-1.55\mu$  are found to be present in all of the primary amines and with less intensity in the secondary amines. Since they disappear in the spectra of the tertiary amines they are assumed to originate in oscillations of the N-H atom pair (cf. *C. A.* 21, 1224; 22, 1542).

W. F. MEGGERS

**The ultra-violet absorption spectra of benzene and toluene in alcoholic solution.** C. V. SHAPIRO AND R. C. GIBBS. *Phys. Rev.* 31, 310–11(1928).—The absorption spectrum of benzene consists of 23 bands and that of toluene of 21. With the possible exception of one band belonging to the absorption spectrum of benzene, all of the bands for each substance can be arranged in a series in accordance with a simple mathematical expression derived from the theory of band spectra.

W. F. MEGGERS

**A new determination by a photographic method of the water absorption band at  $9727\text{ A. U.}$**  J. E. LAMBLY. *Phys. Rev.* 31, 706(1928).

E. J. C.

**Proportion of energy radiated by incandescent solids in various spectral regions.** I. L. HOLLADAY. *J. Optical Soc. Am.* 17, 329–42(1928).—Theoretical. It is shown that from a table of the proportion of spectral energy emitted from a black-body radiator at a given temp. between wave lengths zero and  $\lambda$ , the proportion of energy  $\phi_1$  emitted in a given spectral region may be computed for a black-body radiator of any other temp. Similarly, the energy emitted from the same spectral region by a non-black-body radiator having color temp.  $T_c$  may be computed by multiplying the value of  $\phi_1$  for a black-body radiator at temp.  $T_c$  by a simple factor  $G$ .

B. C. A.

**Extinction law for various atoms.** H. SEYFARTH. *Z. Krist* 67, 422–9(1928).—Mathematical.

H. L. D.

**Luminescence associated with electrolysis.** R. T. DUFFORD. *J. Optical Soc. Am.* 18, 17–28(1929).—Luminescence during electrolysis is fairly widespread. Thus with Al as anode the effect was found in some 25 different substances, mostly neutral salts or bases. Zn, Ag, Ta, W, Mg, Ce, Sb and Hg gave some light with certain solns., but none of the solns. gave the effect with Fe, Cu, Pb, Sn, Ni, Mo or Pt, showing the effect to be a fairly regular accompaniment of mechanical passivity. It is believed that the light is given out by a film of high resistance which covers the electrode. More than 98% of the applied e. m. f. is used in driving current through the film. The brightness ranges from visibility to above  $10^{-6}$  lamberts, increasing with the applied voltage until heating of the film causes it to fall. Differences in concn. produce relatively small changes in brightness.

E. G. VANDEN BOSCH

**Kinetics and temperature coefficients of some photochemical reactions in radiations of different wave lengths.** B. K. MUKERJI AND N. R. DHAR. *J. Phys. Chem.* 33,

850-63(1929).—Reaction rate measurements were made on several photochem. reactions at different temps., to obtain temp. coeffs. The bleaching of diamine mesant, temp. coeffs. citrate and

dark. From results on these and 12 other reactions, M. and D. conclude that the greater the acceleration due to light, the smaller is the temp. coeff. of the photochem. change; and they calc. from the temp. coeff. of the reaction in the dark the "threshold frequency" of radiation which will promote the reaction. Wave lengths of 7304 Å. U. accelerated all the reactions studied. In some cases the "true acceleration" caused by the light was greatest in the region of 5650 Å. U., and the absorption was greatest in this region.

T. H. CHILTON

**Photochemical temperature coefficients.** WILDER D. BANCROFT AND RAYMOND P. ALLEN. *Proc. Nat. Acad. Sci.* 15, 445-8(1929).—The theory of photochem. temp. coeffs. is discussed. The curve of velocity vs. temp. seems to consist of 3 parts, rapid rise at low temp., horizontal over wide range, then rapid rise in region of thermal instability. Expts. on the decompn. of  $\text{CH}_3\text{CHO}$  by oscillatory discharge show a rise of coeff. from 1.003 to 1.10 between 80° and 340°.

G. B. TAYLOR

**The photochemical equilibrium between hydrogen, bromine and hydrogen bromide.** R. W. ARMOUR AND E. B. LUDLAM. *Proc. Roy. Soc. Edinburgh* 49, 91-101(1929).— $\text{H}_2$  and  $\text{Br}_2$  vapor (partial pressure  $\text{Br}_2$  110-140 mm.) were streamed through a silica coil within which was located an Al spark operated by a 0.5-kw. transformer at 9000 v. The strong lines at 185  $m\mu$  were sought. The issuing gases were bubbled through water and the Br was detd. by addn. of KI and titration with thiosulfate; total Br was estd. by reduction of the free  $\text{Br}_2$  by  $\text{H}_2\text{SO}_3$  or hydrazine sulfate and measurement with  $\text{AgNO}_3$  and  $\text{NH}_4\text{SCN}$ . Somewhat less than 1% ( $0.80 \pm 0.10$ ) by weight of the  $\text{Br}_2$  enters into combination under the exptl. conditions. To test whether or not equil. is established, the intensity of the spark was varied ten-fold. The result of  $0.80 \pm 0.17\%$  for the weaker intensity checks the other expts.

WILLIAM E. VAUGHAN

**The part played by the vessel wall in the photochemical reaction  $\text{H}_2 + \text{Cl}_2$ .** A. TRIFONOV. *Z. physik. Chem., Abt. B*, 3, 195-203(1929).—The reaction vessels used in these first expts. were tubes 1065 mm. long and 14 mm. and 27 mm., resp., in diam. A beam of sunlight was passed lengthwise of the cylinder through a mixt. of  $\text{H}_2$  and  $\text{Cl}_2$  and the partial pressures of both gases were measured at different times and for different initial pressures. In a second series, tubes 240 mm. long and 40 mm. and 120 mm. in diam. illuminated with an arc light were used. The ratio of the drop in pressure of the  $\text{H}_2$  in the 2 tubes at different times was then calcd. In the first series this ran from 0.93 to 1.00 and in the second from 3.5 to 0.75, the reaction being more rapid in the narrower tube. A plot of the relative amts. of  $\text{HCl}$  formed in the 2 tubes as a function of  $(P_{\text{H}_2} + P_{\text{Cl}_2})$  shows this ratio to be 1 below 10 mm. and approx. const. at 3.5 above 30 mm. Above 30 mm., then, the chain reactions are practically complete in the free space, whereas below 10 mm. practically all the chains break down at the surfaces of the walls. The results are entirely in accord with the theory of a reaction mechanism  $\text{Cl} + \text{H} = \text{HCl} + \text{H}$  and  $\text{H} + \text{Cl}_2 = \text{HCl} + \text{Cl}$ , but leave open the question whether any energy of activation is necessary.

A. W. KENNEY

**Monatomic iodine and molecular hydrogen.** WILDER D. BANCROFT AND DAVID S. MORTON. *Proc. Nat. Acad. Sci.* 15, 438-41(1929).—An argument is presented that photochemically activated halogens are monatomic. Light and dark reaction of  $\text{Cl}$ ,  $\text{Br}$  and  $\text{I}$  with  $\text{H}$  are discussed. At.  $\text{I}$  does not react with mol.  $\text{H}$ , but  $\text{Cl}$  and  $\text{Br}$  do.

G. B. TAYLOR

**The oxidation of hydrogen iodide in the dark and in the light. III. The constitution of iodine solutions.** CHR. WINTHER. *Z. physik. Chem., Abt. B*, 3, 299-315(1929); cf. C. A. 19, 936.—Five equil. consts. were detd. and their values found at -20° and 30° by measuring the distribution of  $\text{I}$  between  $\text{CCl}_4$  and water,  $\text{HCl}$  and solns. of  $\text{KI}$ , as well as the soly. of  $\text{I}$  in  $\text{HCl}$  and the extinction of light coeffs. of  $\text{I}$  in water and  $\text{KI}$  solns. with the wave length 436  $m\mu$ . E. g.,

$$K_5 = m_{\text{I}_2} \cdot m_{\text{I}^-} / m_{\text{I}_3^-} \quad (m \text{ is the no. of mols. per 1000 g. water.})$$

The substances considered in the soln. were  $\text{I}_2$ , the iodide cation and anion, the triiodide and tetraiodide,  $\text{ICl}$ , and the  $\text{I}_2\text{Cl}$  cation and the  $\text{Cl}$  ion. The consts. found were used to calc. the distribution between  $\text{CCl}_4$  and mixed solns. of  $\text{KI}$  and  $\text{HCl}$ . The extinction coeffs. being compared with the corresponding equil. consts.; the idea arises that the former run counter to the stability of the substance concerned. Tables of data and curves are given. IV. Preliminary discussion of the light sensitivity. *Ibid* 315-36—In connection with the question whether the so-called equivalence law established by

Einstein can be applied to photochem. processes, W. works out a prediction concerning the sensitivity for light in the process of the oxidation of HI. By making certain simple assumptions, it is possible to calc. the velocity of the light reaction from the one in the dark if combined with quant. absorption measurements. These conclusions are based upon extended observations of the effect of varying the no. of moles per 1000 g. water, the time, temp., wave length, energy and density.

MARY E. LEAR  
Action of ultra-violet light on the formation of sugars and complex aldehydes from solutions of bicarbonates and carbonic acid. G. MEZZADROLI, E. VARETON AND T. BAHES. *Chimie & industrie Special No.*, 637-40 (Feb., 1929); cf. *C. A.* 22, 760.—See *C. A.* 23, 2367.

A. PAPINEAU-COUTURE

Se and its use in the arts [in production of light-sensitive cells] (KUPFERATH) 18.  
Optical researches on perylene and its derivatives. II. The visible absorption spectra of several bi-derivatives (DADIEU) 10.

BRICOUT, PIERRE: *Ondes et electrons*. Paris: A. Colin. 220 pp. F. 13.

Luminous surfaces. WARREN F. BLEECKER. U. S. 1,718,626, June 25. A surface is first coated with an adhesive such as varnish, a radio-responsive substance such as ZnS is applied to the adhesive, and this substance is then covered with  $\text{RaCl}_2$  or  $\text{RaBr}_2$  soln or other suitable radioactive material in soln.

Apparatus for producing and polarizing ultra-violet rays. WM. T. ANDERSON, JR. and FREDERIC W. ROBINSON (to Hanovia Chemical and Mfg. Co.). U. S. 1,717,360, June 18.

Packing x-ray plates and films. I. G. FARBENIND. A.-G. (Max Schmidt and Paul Vehl, inventors). Ger. 477,729, Feb. 4, 1928. Addn. to 476,114 (*C. A.* 23, 3630). Figures or words are printed on packages of x-ray plates and films by means of an ink contg a Pb compd. Accidental exposure of the plates, etc., to x-rays then becomes evident when the plates, etc., are developed.

Radioactive bandages, garments, etc. P. E. FREDRIKSSON and A. R. BLOMBERG. Brit 301,479, Dec. 1, 1927.

#### 4—ELECTROCHEMISTRY

COLIN G. FINK

Recent developments in electric furnaces. DONALD F. CAMPBELL. *Mining J.* (London), 165, 310-1, 331-2, 358 (1929).—See *C. A.* 23, 2369. ALDEN H. EMERY

Advances in the construction of high-frequency furnaces. M. TAMA. *Stahl u. Eisen* 49, 499-50 (1929).—Recent developments are reviewed. J. A. SZILARD

The design and operation of vacuum furnaces with carbon resistor tubes. ARTHUR S KING. *Trans. Am. Electrochem. Soc.* 56 (preprint), 13 pp. (1929).—The 2 types of elec vacuum furnaces described are the result of years of study on rendering metallic vapors luminous by "temp. radiation." High temps. alone appear to be necessary to produce the large variety of spectroscopic phenomena observed. No definite type of chem action seems to be necessary. The cylindrical and the hooded types of graphite resistor-tube furnace have a temp. range up to 3500°. Steady conditions of temp. and pressure are quickly reached, after which the light is permitted to pass to the spectrograph. An image of the interior of the tube is projected on the slit, light from the incandescent wall of the tube being excluded. The charge in the tube is vaporized, and the characteristic radiations of the vapor excited under close control of conditions. A long column of uniformly heated vapor is obtained. Various spectroscopic studies are briefly described. C. G. F.

Dimensions, operation and efficiency of German electric steel furnaces. ST. KRIZ. *Stahl u. Eisen* 49, 417-27 (1929).—Data regarding the operation of elec. steel furnaces submitted by a great number of steel works in Germany, covering 56 arc and 13 induction furnaces, are evaluated. J. A. SZILARD

Progress made in the use of electric furnaces for heat treating. A. N. OTIS. *Trans. Am. Soc. Steel Treating* 15, 767-94 (1929); cf. *C. A.* 22, 3586.—A discussion of the present status of elec. furnaces in industry. W. A. MUDGE

A new automatic thermoregulator for an electric (resistor type) furnace. TAKEO WATASE. *J. Study Metals* 5, 455-60 (1928).—There are many devices for the automatic regulation of small elec. resistor furnaces, but none of these is as simple as may be de-

sired when only rough regulation is required. Asahara and Shibata (cf. Shibata C. A. 23, 3845-6) have each devised an app. which can be easily built in a lab. The former attains an accuracy of  $\pm 3^\circ$  at  $300^\circ$  and the latter  $\pm 5^\circ$  at  $600^\circ$ . W. tested both of the app. finding them to be unsatisfactory, the former with respect to the sensitivity, the latter as to construction; he finally devised an app. in which the merits of the two are retained while the defects are eliminated. Since a tolerable constancy of the temp. can be obtained when there is no sudden heat evolution or absorption in the resistor wire itself, by maintaining the elec. current passing through the wire const., W. devised an app. in which an auxiliary resistance is connected in series with the furnace resistor and is regulated automatically with regard to fluctuations in watt input. An all-glass thermoregulator is connected in parallel with the elec. furnace, and when the furnace current fluctuates, there is a corresponding fluctuation of a very weak current passing through a Pt coil in the thermoregulator, which affects the vol. change of PhMe that in turn raises or lowers the Hg column in the head of the app., and thereby closes or opens a relay circuit. By actual test it was found that with this regulator a constancy of  $\pm 2^\circ$  within a temp. range of  $300$ – $1000^\circ$  was obtainable. K. SOMEYA

**Improvements in carbon electrodes.** M. OSWALD. *Chimie & industrie* Special No., 428-43 (Feb., 1929).—A review of progress made in the production of C electrodes for elec. arcs and batteries. A. PAPINEAU-COUTURE

**Commercial fused salt electrolysis.** P. DROSSBACH. *Metall. u. Erz* 26, 88-92 (1929); cf. C. A. 23, 566.—Equations developed previously are enlarged upon and examples of their application given. J. BALAZIAN

**Electrolysis of alkali chlorides.** A. LEVASSEUR. *Bull. soc. franç. élec.* 8, 798-801 (1928); *Science Abstracts* 31B, 636.—Many difficulties are encountered in the process, such as diffusion within the bath, which tend to lower the efficiency. Various methods of overcoming these difficulties are examd.: the use of diaphragms, of circulation, of circulation and diaphragms, the use of a Hg cathode. The theory is given of the formation of chlorates and perchlorates. The use of a Hg cathode, while involving a heavy capital outlay, has notable advantages in that it enables a concd. soln. of NaOH to be obtained directly, which soln., contg. no chlorides, is of special value for the prepn of artificial silk. H. L. D.

**Roasting flotation concentrates of zinc ores.** TORAICHI MIYAZAKI *Japan J. Mining* 45, 1-12 (1929).—M. first describes the history of electrolytic refining of Zn ores. The field of applicability of the refining method is widened by developments in flotation. Results of his studies on the roasting of flotation concentrates are presented. The roasting of sulfide ores is the more rapid the finer the grains of the ore. In M.'s expt. 60% ore was powdered to 200 mesh. It was allowed to fall from a funnel and blown with compressed  $O_2$  into a horizontal tube heated to  $800^\circ$ . The powd. ore burns energetically like powd. coal. Analysis of the flue gas gave S content less than 0.1%. When the powd. ore was allowed to fall from a tube 2 m. high and brought in contact with a mixt. of  $O_2$  and air counter-currentwise, the desulfurization was again found to be complete. In a third expt. the 100- or 200-mesh ore was placed in a rotating elec. furnace and air or air +  $O_2$  passed into the furnace. Roasting also took place in a short time. When the mixt. was ignited by compressed  $O_2$  the desulfurization was completed within 20-30 min., the combustion continuing due to the consequent rapid rise in the furnace temp., even after the elec. current was cut off. The extent of the temp. rise appears to be proportional to the amt. of  $O_2$  added to the air. M. concludes that rotating cylindrical furnaces are preferable to the modern mech. furnaces. K. SOMEYA

**Diaphragm electrolyzers.** DELTON. *Bull. soc. franç. élec.* 8, 816-21 (1928); *Science Abstracts* 31B, 637.—When a soln. of NaCl is electrolyzed in a bath provided with diaphragms, a soln. of gradually increasing concn. of NaOH is obtained as catholyte but the efficiency decreases as the concn. increases on account of secondary reactions. The limit of concn. depends on economical considerations, which are discussed. Various types of anodes and diaphragms are considered. H. L. D.

**Electrolytic production of alkaline chlorates.** BUNET. *Bull. soc. franç. élec.* 8, 805-15 (1928); *Science Abstracts* 31B, 636.—A description of the electrolytic production of  $NaClO_3$  and discussion of the advantages of magnetite and graphite anodes. The latter are more generally employed. The chlorates are removed from soln. by a refrigeration process. H. L. D.

**The electrical potentials of some metals.** L. BOUCHET. *Compt. rend.* 188, 1237-9 (1929).—The normal electrode potentials of several pure metals were measured,  $N$  solns. of the sulfates and a  $N$  calomel or  $H_2$  half-cell being used. With the calomel cell, the voltages, which have been corrected for the liquid junction potential by the

Henderson formula, are:  $Mg$ ,  $-1.766$  v.;  $Zn$ ,  $-1.052$  v.;  $H$ ,  $-0.81$  v.;  $Cu$ ,  $+0.041$  v.; and  $Ag$ ,  $+0.502$  v. The potentials of  $Zn$  toward normal solns. of the chloride and acetate and of  $Mg$  toward the normal chloride soln. differ by a few millivolts from the resp. potentials for the sulfates. The potential of  $Zn$  toward a normal nitrate soln. is only  $-0.99$  v., the low value being due evidently to the rapid oxidation of the metal.

H. F. JOHNSTONE

**Cathode potentials and electrode efficiencies of copper in copper cyanide-sodium cyanide solutions.** GEORGE M. SMITH AND J. M. BRÉCKENRIDGE. *Trans. Am. Electrochem. Soc.* 56 (preprint), 8 pp. (1929).—A record of the kinetic potentials of a  $Cu$  cathode, various current densities and different concns. of  $Cu$  cyanide in  $NaCN$  being used. Electrode efficiencies are given in various concns. of the electrolyte, and at different current densities. The potentials of the cathode become more neg. as the current density and diln. of the electrolyte are increased and as the molal ratio of  $Cu$  to  $NaCN$  is decreased. The change of potential with an increase of current density is most pronounced in the solns. with the highest molal ratio of  $Cu$  cyanide to  $NaCN$ . The efficiency of the cathode decreases with an increase of current density, with a diln. of the electrolyte and with a decrease of the molal ratio of  $Cu$  to  $NaCN$ . If the molal ratio of  $Cu$  to  $NaCN$  is less than 1 to 4, the efficiency is practically zero or even neg. The anode efficiency increases as the molal ratio of  $Cu$  to  $NaCN$  decreases, and decreases as the current density increases.

C. G. F.

**Maxima on current-voltage curves. III. The electrolysis of mercury salt solutions with dropping and steady mercury cathodes.** P. HERASYMENKO, J. HEYROVSKÝ AND K. TANČAKIVSKÝ. *Trans. Faraday Soc.* 25, 152-9 (1929); cf. *C. A.* 22, 1287, 2515.—The maxima on current-voltage curves and the corresponding changes of interfacial tension were investigated in the electrodeposition of  $Hg$  at a dropping cathode as the simplest case of a general phenomenon. Though less reproducible, the same current-voltage phenomena are observable. The current before the discontinuous fall is supported chiefly by absorption. The discontinuous decrease of the current accompanied by concentration polarization is due to the formation of an interfacial layer of solution exhausted of  $Hg$  salts. The thickness of this layer prevents further absorption of  $Hg$  salts to the cathode interface. The absorption velocity is very great, however, as evidenced by the fact that under certain conditions stirring does not affect the max. current. The max. is suppressed by a large excess of an indifferent electrolyte or of absorptive matter. This effect is explained by preferential absorption of the added material.

L. B. MILLER

**Recovery of tin from tin plate scrap.** WM. MASON. *Chem. Eng.-Mining Rev.* 21, 270-1 (1929).— $Sn$  scrap is placed in perforated bottom of a tank contg.  $NaOH$  soln. at  $40^\circ$ . 305 kg. of cans or boxes, contg. 2.5%  $Sn$  and 1%  $Pb$ , were detained in 5 hrs. 70 kg. of  $NaOH$  were used together with 50 kg. of sodium nitrate, which acts as oxidizing material. The scrap is then drained, washed and the stannic liquor electrolyzed in diaphragm cells. Graphite anodes are arranged against the inner sides of the cell on other side of the cathodes. The cathodes of pure  $Sn$  are contained in porous vessels placed in the center of the cells. Spongy deposits of  $Sn$  are obtained at 2-3 v. and 1-2 amp. per sq. dm. of active cathode surface. The deposited  $Sn$  is then washed and melted and cast into ingots. The residual electrolyte is concd. in a tank with a steam coil and, when at the desired concn., is conveyed back to the electrolytic cells. A sketch showing the arrangement of app. is given.

W. H. BOYNTON

**Chromium plating.** J. COURNOT. *Mém. compt. rend. soc. ing. civils France* 1928, 303-11; *J. Inst. Metals* 40, 628.—Methods of overcoming difficulties are suggested.

H. L. D.

**Cathode efficiencies in nickel plating baths operated at high current densities. Effect of oxidizing agents and hydrogen-ion concentration.** BALLAY. *Compt. rend.* 188, 556-9 (1929).—The bath, contg. 450 g.  $NiSO_4 \cdot 7H_2O$ , 22 g.  $NiCl_2 \cdot 6H_2O$  and 22 g.  $H_2BO_3$  per l., was heated to  $50 \pm 1^\circ$ , stirred with air and electrolyzed with a 5 sq. cm. steel cathode at 0.1 amp. per sq. cm. for 15 min. By adding  $Ni(NO_3)_2$  the yield of  $Ni$  is lowered and the deposit is yellowish and cracked. By adding 0.175 g./l. of  $KMnO_4$  the current efficiency is 97% without perceptible evolution of  $H_2$ . With greater amts. of  $KMnO_4$  the efficiency drops to 93.8% and the deposit is brittle. At  $pH$  6.8 the deposit is brittle and the efficiency is 96.2%; at  $pH$  6.1 it is 97.8%; at  $pH$  5.5 to 4.4, it is 95.4 to 94.9% and the deposit is good.

E. G. VANDEN BOSCHE

**Chemicals in electrodeposition.** HEINZ LANGE. *Metallwaren-Ind. u. Galvano Tech.* 26, 249, 267-9, 289-90 (1928); *J. Inst. Metals* 40, 639.—A general discussion of the properties of various chem. substances which are used in electrodeposition.

H. L. D.

Chemical reactions in a lead storage battery. A. P. ROLLET. *Chimie & industrie Special No.*, 444-52 (Feb., 1929).—The method used to prove the existence of  $\text{Ag}_2\text{O}_3$  (C. A. 22, 2334) was applied to a study of the oxidation of the electrodes of a Pb storage battery. The results (given in detail) confirm Féry's theory (C. A. 19, 1099; 20, 1181; 21, 22). R. considers that the older theory of double sulfation represents an accidental and abnormal operation of the battery, e. g., when it is discharged to excess or when the electrodes are attacked directly by the  $\text{H}_2\text{SO}_4$ . Under these conditions the  $\text{PbSO}_4$  formed can be acted upon by the recharging current and readily transformed back to the normal products Pb and  $\text{PbO}_2$ . When  $\text{PbSO}_4$  is present in too large a quantity, its loss cond. prevents it from being reduced and oxidized. A. PAPINEAU-COUTURE

The effect of copper as an impurity in the lead accumulator. J. T. CRENNELL AND A. G. MILLIGAN. *Trans. Faraday Soc.* 25, 165-8 (1929).—The available published information about the effects of Cu is reviewed. H overvoltage at a pure Cu surface has been measured, and is compared with the e. m. f. of the Pb- $\text{PbSO}_4$  reaction. Results obtained indicate that local action, if any, will be slow. The effect of Cu on the rate of sulfation of a negative plate has been measured by collecting the evolved H. The effect of Cu was found to be negligibly small. A table is given showing the rates of loss of capacity of cells due to Cu. In general, Cu has no deleterious effect on the cell. L. B. MILLER

The behavior and effects of chlorine as an impurity in the lead accumulator. J. T. CRENNELL AND A. G. MILLIGAN. *Trans. Faraday Soc.* 25, 159-65 (1929).—The effect of Cl, added to a Pb accumulator as periodical doses of HCl, has been studied. HCl is oxidized to  $\text{Cl}_2$  at the positive plate, reducing the  $\text{PbO}_2$  to  $\text{PbSO}_4$ . Free  $\text{Cl}_2$  in soln. is in turn reduced to chloride ion at the negative plate, oxidizing sponge Pb to  $\text{PbSO}_4$ . A "self-discharge" of both plates is thus caused.  $\text{Cl}_2$  is removed gradually from the cell by evapn. and rapidly by charging; after two or three cycles the cell is freed of  $\text{Cl}_2$ . Wood sheet separators are bleached and ultimately disintegrated by  $\text{Cl}_2$ . L. B. MILLER

Practical mercury arc rectifier installation for charging storage batteries. G. W. MÜLLER AND A. SCHELLENBERGER. *AEG Mitt.* 1929, 360-3.—Wiring diagrams are shown and the installation is described of a Hg arc rectifier for charging storage batteries at an automatically diminishing current rate. H. STOERTZ

The electrochemical preparation of phenylhydrazine. ROBERT E. McCLEURE WITH ALEXANDER LOWY. *Trans. Am. Electrochem. Soc.* 56 (preprint) 11 pp. (1929).—The purpose of this investigation was to prep. phenylhydrazine by the electrochem. reduction of certain benzenediazonium compds., and to study the influence of the usual variable factors common to electrochem. reactions. A current efficiency of 36.5% was obtained by the reduction of benzenediazonium chloride, with a c. d. of 5.12 amp. per sq. dm., a temp. of 0-8°, and a Hg cathode. A current efficiency of 47.6% was obtained by the reduction of K isodiazobenzene sulfonate, with a c. d. of 1.9 amp. per sq. dm., a temp. of 90° to 95° and a Hg cathode. C. G. F

Improvements in the electrolytic preparation of hydrogen. V. PODROUZEK. *Chimie & industrie Special No.*, 463-5 (Feb., 1929).—In the Bayerle-Tamele process (C. A. 19, 2314) the high degree of dissocn. of the Zn salt formed results in a relatively rapid decrease in the current, and consequently in the evolution of H. By using KOH instead of HCl, there is but little decrease in intensity because the  $\text{K}_2\text{ZnO}_2$  is but little dissocd., and moreover the Zn can be easily and economically regenerated by electrolyzing the soln. Although Pt makes the most satisfactory electrodes for the process, it cannot be used commercially. Accordingly, Fe electrodes were electroplated with bright Cu on which was deposited a very thin film of Pt. These electrodes behaved like solid Pt cathodes. In order to lower the overvoltage of the H on Pt, the cathodes were covered with Pt black. The Zn anodes were made by electroplating a platinized wire gauze with c. p. Zn. The two electrodes were wound into parallel spirals and spaced as close as possible. A 30% KOH soln. was used as electrolyte. On connecting the electrodes, pure H was evolved, which contained only a trace (not over 0.05%) of foreign gases from the electrodes or electrolyte. Generation of H continued till all of the KOH had been used up; but care should be taken not to use up all of the Zn, as a thin layer of Zn on the electrodes facilitates restoring the anodes, which can be done efficiently by passing a current through the cell, making the Pt electrode the anode. Addn. of a little  $\text{H}_2\text{O}$  is necessary in the regeneration of the cell because the reaction may be considered as  $2\text{K}_2\text{ZnO}_2 + 2\text{H}_2\text{O} = 2\text{Zn} + 4\text{KOH} + \text{O}_2$ . In order to obtain a bright deposit of Zn, replating should be done at less than 4 v. and at a max. of 0.8 amp. per dm.<sup>2</sup> The  $\text{O}_2$  obtained is as pure as the  $\text{H}_2$ . The improved process was tried out for several weeks with a battery of 4 cells and gave the same amts. of H and O (contg. not over 0.05% impurities) as the ordinary electrolysis of alk. solns. A. P.-C.



**Electrochemistry of oxygen.** V. SIHVONEN. *Ann. acad. sci. Fennicae* A28, No. 1, 1-39 (1928).—N<sub>2</sub> was bubbled over a Pt anode in 2 N H<sub>2</sub>SO<sub>4</sub> and 2 N NaOH solns. and over an oxidized Pt anode in 2 N H<sub>2</sub>SO<sub>4</sub> soln. The potentials were unaffected. Substitution of O<sub>2</sub> for the N<sub>2</sub> results in a distinct depolarizing action. Using O<sub>2</sub> in place of O<sub>2</sub> increases the depolarizing values with the acid soln. but does not affect the values with the alk. soln. The depolarization is accompanied by the formation of H<sub>2</sub>S<sub>2</sub>O<sub>8</sub>. H<sub>2</sub>O<sub>2</sub> forms during the electrolytic production of H<sub>2</sub> from dil. H<sub>2</sub>SO<sub>4</sub> at an oxidized Pt cathode. This is probably due to the presence of PtO<sub>2</sub>. No H<sub>2</sub>O<sub>2</sub> is formed in NaOH soln in which PtO<sub>2</sub> does not exist. Bubbling N<sub>2</sub> over a Pt cathode in H<sub>2</sub>SO<sub>4</sub> or NaOH solns does not appreciably affect the potentials, but with an amalgamated Pt electrode distinct depolarization occurs during electrolytic H<sub>2</sub> evolution. Substitution of O<sub>2</sub> for the N<sub>2</sub> results in depolarization. Ozonized O<sub>2</sub> has a greater depolarizing effect in NaOH soln. but less in H<sub>2</sub>SO<sub>4</sub> soln. Analogous results were obtained with 50% H<sub>2</sub>SO<sub>4</sub> at 15° and 60°. The cathodic depolarization is accompanied by H<sub>2</sub>O<sub>2</sub> formation. Based on electrolytic equil. between PtO<sub>2</sub>, PtO and H<sub>2</sub>O<sub>2</sub>, the values of the O<sub>2</sub> and H<sub>2</sub>O<sub>2</sub> potentials in H<sub>2</sub>SO<sub>4</sub> are simple numerical ratios of the abs. potential of the N H<sub>2</sub> electrode.

J. E. SNYDER

**Influence of electrical discharge on gas containing hydrocarbons at diminished pressure.** FRANZ FISCHER AND KURT PETERS. *Z. physik. Chem., Abt. A*, 141, 180-94 (1929).—A discharge tube with steel electrodes, both cooled by incoming gas, was used. CH<sub>4</sub>, both pure and dild. with H<sub>2</sub>, was drawn through the tube. C<sub>2</sub>H<sub>2</sub> was condensed with liquid air. Most of the CH<sub>4</sub> was converted to C<sub>2</sub>H<sub>2</sub> and H<sub>2</sub>. The influence of gas velocity, tube loading and pressure are shown in tables. A pressure of 50 mm.; gas velocity of 370 l./hr.; and 1.3 k. v. a. power input gave 8.5% C<sub>2</sub>H<sub>2</sub> in the exit gas, at an elec. energy consumption of 31 k. v. a. per cu. m. C<sub>2</sub>H<sub>2</sub>. G. M. E.

The electric furnaces for the firing of majolica and the glazed ornaments (MILANI) 10. The use of Ta as cathode for the electrodeposition of Cu (STROCK, LUKENS) 7. Testing of stoving varnishes used in electrotechnic (MATTHIS) 26. Production of W and Mo [in Russia] (MEERSON) 9. Combined gas and electric plants coupled by steam and producer gas (TILLMETZ, SCHUMACHER) 21. Luminescence associated with electrolysis (DUFFORD) 3. Heat treating automobile parts (PRENTISS) 9. Testing soil by an electrical conductivity system to locate oil-bearing formations (U. S. pat. 1,719,786) 22. Electrophoretic deposition of rubber (Brit. pat. 301,100) 30. Medicinal serums [subjected to electroosmosis] (U. S. pat. 1,718,282) 17. Shaped Cu bodies [deposited by electrolysis] (Ger. pat. 473,376) 9. Electric furnace for glass making (Fr. pat. 655,751) 19. Hollow articles of fused SiO<sub>2</sub> [electric furnace for their making] (Brit. pat. 301,117) 19. Laminations for cores of electric transformers, etc. (Brit. pat. 300,930) 9. Reduction and oxidation (Fr. pat. 655,846) 13.

**Electric batteries with elements formed in layers.** K. SCHENKEL (to Siemens & Halske A.-G.). Brit. 300,640, Nov. 17, 1927. Structural features.

**Battery of electrolytic cells.** R. KAPP. Brit. 301,290, Aug. 29, 1927. Structural features of an assembly of cells suitable for use as a grid bias for thermionic valves.

**Storage and other batteries.** MME. HOLBROOK (NÉE MARGUERITE NOCENZO). Fr. 656,185, June 21, 1928. Constructional details.

**Storage batteries.** SOC. DES ACCUMULATEURS FIXES ET DE TRACTION. Fr. 656,079, June 18, 1928. The construction of plates is described.

**Storage batteries.** PAUL E. CAILLEUX. Fr. 655,628, June 11, 1928. Constructional details.

**Storage batteries.** LOUIS KRIEGER. Fr. 655,994, June 16, 1928. In a battery having a NiO cathode and an alk. soln. as electrolyte, an anode of finely divided Zn contained in an envelope having porous walls is used.

**Storage batteries.** CONCORDIA ELEKTRIZITATS-A.-G. and W. GOSMANN. Brit. 300,451, March 19, 1928. Structural features are described of cells which may be formed of celluloid secured in position by an adhesive such as AmOAc.

**Storage batteries.** I. G. FARBENIND. A.-G. Fr. 655,340, May 16, 1928. Spongy Pb electrodes are obtained by removing by electrolysis the alloying metal from a Pb alloy.

**Storage battery.** HENRY B. TEFFT (to Harry C. McNamer). U. S. 1,719,204, July 2. A high voltage elec. current is passed through ore such as a Au, Ag or Pb ore submerged in water; the water thus treated is mixed with H<sub>2</sub>SO<sub>4</sub> and some of this soln. is mixed with Pb<sub>2</sub>O<sub>3</sub> and PbO to form a paste; the paste is applied to grids to form plates,

the plates are dried, pos. and neg. plates are assembled, immersed in some of the prepd. acid soln., charged at a low rate and discharged at a high rate; the acid soln. is replaced with fresh soln. and the plates are then recharged.

**Storage battery.** THEODORE A. WILLARD (to Willard Storage Battery Co.). U. S. 1,717,863, June 18. Structural features.

**Storage battery.** E. S. ELLIOTT. Brit. 301,173, Oct. 26, 1927. Structural features.

**Storage battery.** JAMES M. SKINNER (to Philadelphia Storage Battery Co.). U. S. 1,718,086, June 18. Structural features.

**Storage battery plates.** WM. H. GRIMDITCH (to Philadelphia Storage Battery Co.). U. S. 1,718,139, June 18. Neg. battery plates carrying wet charged active material are treated with an aq. soln. of an org. substance such as sucrose or other sugar capable of restricting the oxidation in air of the active material; the plates are then rapidly dried. Cf. C. A. 23, 3634.

**Storage battery plates with separators of glass wool.** D. P. BATTERY CO., LTD, and J. WADDELL. Brit. 300,536, Aug. 13, 1927. Structural features.

**Antimony.** NORDDEUTSCHE AFFINERIE. Fr. 656,221, June 22, 1928. In the electrolytic refining of Sb to avoid increases of anodic pressure, the electrolyte is composed of  $\text{SbF}_3$  contg. at least 6% of free  $\text{H}_2\text{SO}_4$  and a little free HF. The  $\text{H}_2\text{SO}_4$  may be replaced by an alkali bisulfate, and the HF by a mixt. of alkali fluoride and  $\text{H}_2\text{SO}_4$ .

**Lead compounds.** MARCEL L. J. HIRIART. Fr. 656,423, June 25, 1928. Pb metal is reduced to a colloidal galvanic deposit electrolytically; an aq. soln. of  $(\text{AcO})_2\text{Pb}$  to which is added  $\text{Na}_2\text{SO}_4$  until the pptd.  $\text{PbSO}_4$  does not redissolve is used as electrolyte. The deposit is mixed in water acidulated with  $\text{AcOH}$  to obtain a paste which swells and gives a porous, spongy product. The deposit may be converted to white lead by treatment in thin layers with  $\text{CO}_2$ , and this may be converted to minimum by roasting in an elec. furnace.

**Mercury from cinnabar.** WM. C. BAXTER. U. S. 1,718,103, June 18. The ore is dissolved in a soln. of alkali metal sulfide and alkali metal hydroxide and the soln. is electrolyzed to sep. the Hg.

**Alloys of aluminum and silicon.** VEREINIGTE ALUMINIUM-WERKE A-G and H. SCHORN. Brit. 300,429, Jan. 23, 1928. Alloys of Al and Si in desired proportions are obtained by adding uncombined Si to a fused bath of alumina and a fluoride during electrolysis at a rate corresponding to the rate of liberation of Al.

**Electrodeposition of chromium.** LANGBEIN-FRANHAUSER WERKE A-G. Brit. 301,478, Dec. 1, 1927. An electrolyte is used comprising a soln. of a trivalent Cr compd., which is maintained as neutral as possible; Cr oxide or basic salts are retained in soln. by the addn. of substances such as Rochelle salt, Na citrate or salts of oxalic acid or phenolsulfonic acid or alc., glycerol or sugar; the  $p_{\text{H}}$  is kept between 4 and 6. Numerous details are given.

**Chromium plating.** TERNSTEDT MANUFACTURING CO. Fr. 655,698, June 13, 1928. See Brit. 292,094 (C. A. 23, 1356).

**Electroplating with cobalt chromium alloys.** LOUIS SCHULTE (to Allegheny Steel Co.). U. S. 1,717,468, June 18. In forming the plating bath a portion of a soln. formed from Co sulfate 50-75,  $\text{Na}_2\text{SO}_4$  30-40, HF 5-15 and water about 250 parts is mixed with a larger proportion of a soln. formed from chromic acid 75, KOH 3,  $\text{H}_2\text{SiF}_6$  10 and water about 250 parts.

**Apparatus for electroplating metal bands.** JOSEPH J. MASCUCH. U. S. 1,717,460, June 18. Structural features.

**Purifying zinc sulfate solutions electrolytically.** METALLGES. A-G. Brit. 301,512, Dec. 1, 1927. Halogen ions are removed from  $\text{ZnSO}_4$  and other metal salt solns., which may be intended for use in electrodeposition of the metal, by quant. anodic introduction of Hg and sepn. of the pptd. mercurous salt.

**Electrolysis of brine in amalgam cells.** I. G. FARBERIND. A-G. Brit. 300,603, Aug. 16, 1927. Brine for electrolysis particularly in amalgam cells is preliminarily purified from Mg and Ca salts by pptn. with  $\text{NaF}$ .

**Prevention of overvoltage in electrolysis.** BAMAG-MEQUIN A-G. Ger. 655,834, June 14, 1928. Overvoltage in electrolytic elements is decreased by deposition on the cathode of metal or metallic compds. in a finely divided or colloidal state.

**Treating gases with electric discharges.** I. G. FARBERIND. A-G. and A. CARPMAEL. Brit. 300,282, Nov. 11, 1927. In the manuf. of liquid or solid products by gaseous reaction under the influence of elec. discharge, as in the synthesis of  $\text{H}_2\text{O}_2$ , deposition of the product on the wall of the chamber corresponding to one of the electrodes is prevented by permitting the temp. at this part of the app. to rise above the point at which deposition would occur.

**Electric furnaces.** COMPAGNIE FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMAS-HOUSTON. Fr. 655,944, June 15, 1928. The construction of heating resistances is described.

**Electric furnaces.** I. G. FARBENIND. A.-G. Fr. 656,282, May 11, 1928. The charged material is directed by plates inside the furnace toward the electrodes.

**Induction furnace.** SIEMENS & HALSKÉ A.-G. (Walther Mareth, inventor). Ger. 477,187, Nov. 13, 1925.

**Electrically heated annular furnace for effecting heat treatments.** METROPOLITAN-VICKERS ELECTRICAL CO., LTD. Brit. 300,862, March 22, 1928. Structural features.

**Electrically heated continuous furnace with rotatable charge-supporting platforms.** ALLGEMEINE ELEKTRICITÄTS-GES. (to International General Electric Co.). Brit. 300,905, Nov. 19, 1927. Structural features.

**Electric arc furnace suitable for making tungsten carbides.** OSCAR L. MILLS (to Mills Alloys, Inc.). U. S. 1,719,558, July 2. Structural features.

**Electric arc furnace suitable for melting and refining steel.** WM. E. MOORE. U. S. 1,718,172, June 18.

**Material for electromagnetic cores.** J. H. GROSS (to Metropolitan-Vickers Electrical Co., Ltd.). Brit. 300,911, Nov. 19, 1927. Core plates for dynamo-elec. app. and transformers or similar magnetic plates with an adherent insulating film are coated with an aq. soln. of Na silicate and one or more carbohydrate compds., e. g., sugar, with or without addn. of a filling material such as talc, clay, magnesia or oxides of Fe or Al. When the plates are annealed after the coating is applied, the carbohydrate breaks down and prevents the adhesion of the plates which otherwise might occur.

**Rectifier for alternating currents.** CLARENCE E. OGDEN (to Kodel Radio Corp.). U. S. 1,718,663, June 25. A metallic rectifying plate has a layer of oxide formed on it and a film of reduced Cu on the oxide. Air channels are provided for cooling by use of an adjacent corrugated plate which may be formed of Sn.

**Electrical precipitation apparatus, etc., for preparing "smoked salt" for treating foods.** JAMES N. ALSOP (to Smoked Products Co.). U. S. 1,719,353, July 2. U. S. 1,719,354 also relates to the production of similar products and describes app.

**Electric dust separating apparatus.** SOC. INDUSTRIELLE D'APPLICATIONS ÉLECTRIQUES (S. A. R. L.). Fr. 656,394, June 23, 1928.

**Precipitating electrode (with transverse collecting slits) for electric gas cleaners.** METALLGES. A.-G. Ger. 477,177, Apr. 8, 1928.

**Furnace electrodes.** SIEMENS-PLANIAWERKE A.-G. FÜR KOHLEFABRIKATE. Ger. 477,331, June 12, 1925. Large furnace electrodes, which are consumed in use, are prepd. with non-tarry binders, e. g., gelatin or PhOH-CH<sub>2</sub>O condensation products, such that the electrodes can be hardened at a low temp.

**Battery-condition indicator for automobiles.** WILLIAM C. ZAGARINO and MARSHALL T. McDONALD. U. S. 1,719,160, July 2. Falling of the electrolyte level serves to admit a heating medium such as exhaust gas to a thermometer in position to be observed.

**Electric cables sheathed with aluminum or aluminum alloys.** FELTEN & GUILLEAUME CARLSWERK A.-G. Brit. 300,920, Nov. 19, 1927. Structural features.

**Internal-combustion engine pistons formed of aluminum, magnesium, etc., electroplated with iron.** CHILDS H. WILLS. U. S. 1,717,750, June 18.

**Discharging electricity from films.** SPICERS, LTD., and H. J. HANDS. Brit. 301,439, Aug. 30, 1927. The elec. charge carried by films of cellulose acetate or other cellulose derivs. after evapn. of the solvent in the process of their manuf. is removed by passing them through an elec. cond. aq. bath connected to earth. Solns. of NaOH, Na H phosphate, NaCl, (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> or Na<sub>2</sub>SO<sub>4</sub> may be used. A softening agent such as alc may be added to the electrolyte bath. An app. is described.

**Alternating current rectifier.** HARRY N. MILLER and EDGAR W. ENGLE (to Fansteel Products Co.). U. S. 1,717,517, June 18. A partially reduced metallic chloride such as a specially prepd. Ag chloride compn. is used in contact with a metal of the group comprising W, Ta, Mo and Cb.

**Electric contact material.** O. S. JENNINGS (to Metropolitan-Vickers Electrical Co., Ltd.). Brit. 301,461, Nov. 30, 1927. Contacts for circuit interrupters comprise finely divided Ag and graphite molded into block form with which Cu and Ni may be assocd.

**Electrical condenser.** EDWARD F. ANDREWS (to Andrews-Hammond Corp.). U. S. 1,717,488, June 18. A condenser adapted for use with a. c. has one electrode with an effective surface of metallic Ni and another with an effective surface of metallic Fe, which may be used with an electrolyte formed from KOH. Cf. C. A. 22, 2720.

**Electric resistance element.** SIEGMUND LOEWÉ (to Radio Corp. of America), U. S. 1,717,712, June 18. A resistor suitable for use as a grid leak is formed by depositing a uniform film from a fine mist of a noble metal soln. such as Pt on the surface of a heated non-cond. carrier such as glass.

**Photoelectric cell.** TELEFUNKEN GES. FÜR DRAHTLOSE TELEGRAPHIE M. B. H. (Fritz Schroeter, inventor). Ger. 477,158, July 9, 1925. The cell has a filling of inert gas and the sensitive electrode is made from K or Na alloyed with not more than 4% of Rb or Cs or a mixt. thereof.

**Photoelectric cells containing active material such as potassium, sodium or rubidium.** FIRM OF O. PRESSLER. Brit. 300,917, Nov. 17, 1927. Various structural features are described.

**Filaments of incandescent electric lamps.** NEUE GLUHLAMPEN GES. (to Falk, Stadelmann & Co., Ltd.). Brit. 301,014, Nov. 23, 1927. Structural features are specified. When long- or single-crystal wire is used, its crystal structure is destroyed at several points by bending it to prevent distortion of the filament in use. Brit. 301,015 also relates to structural features of W filaments.

**Electric incandescent lamps.** GENERAL ELECTRIC CO., LTD., and F. J. G. VAN DEN BOSCH. Brit. 301,143, Sept. 17, 1927. Vapor from white P heated to above 50° is introduced into an evacuated bulb, which is simultaneously or subsequently filled with inert gas such as A or an A-N mixt. which may contain a little H.

**High vacua in lamps, etc.** G. I. FINCH. Brit. 300,516, May 13, 1927. Hg vapor is absorbed in or prevented from access to evacuated lamps or the like by an alloy of 2 or more alkali metals, such as Na and K, liquid at ordinary temps. and with which it forms an amalgam.

## 5—PHOTOGRAPHY

C. E. K. MEES

**Theory of the photographic process.** W. MEIDINGER. *Phot. Korrr.* 65, 100-6 (1929).—A review of the present position of the theory of exposure and development under the headings: (1) structure and properties of AgBr-in-gelatin films; (2) exposure of the sensitive film; (3) development; and (4) density curves.

**Recent application of reflection printing methods in practice.** G. KÖGEL. *Phot. Korrr.* 65, 110-4 (1929).—A Ag and a Cr process of reflection photography are in use in Germany today. The former is Playertype, for which Typon paper and printing equipment are supplied by the Baltische Co., and the latter is the Manul process for photo-engraving.

**New method of obtaining direct positives in photography.** R. SESMA. *Bull. soc. franç. phot.* 16, 108-10 (1929).—Direct positives are obtained on com. sheet film by a process, "reversal by penetration," which consists of the following steps: (1) normal development in elon-hydroquinone; (2) treatment in a citric acid or AcOH stop bath; (3) bleaching in a hardening bleach whose formula is given below; (4) washing and drying; (5) redevelopment in a high carbonate elon-hydroquinone developer; (6) rinsing, fixing, washing and drying. Successful operation of the process depends on the action of the preferential hardening bleach combined with the complete drying before redevelopment. Bleach formula is  $\text{CuSO}_4$  10 g., KBr 8 g.,  $\text{CrO}_3$  1 g. and  $\text{H}_2\text{O}$  1 l.

**Has the temperature of radiation any effect on its photographic action?** R. A. HOUSROUN. *Phil. Mag.* [7], 7, 1139-43 (1929).—To test if the ability of a radiation to ionize a mol. or atom is dependent on its temp., it was desired to deliver 2 quantities of light of the same energy content but different temp. in the same time on equal adjacent areas of the same photographic plate, photographic action being assumed to be essentially a case of ionization. The actual exptl. method used, and assumed to give these conditions, was to have, in the first case, a wide-angle beam of light focused on the photographic plate; and in the second, a narrow-angle beam delivering the same quantity of energy in the same time on the plate. With the series of com. plates used, however, any variation observed in the photographic effect could be accounted for by exptl. error.

**Chemicals of the fixing bath.** STRAUSS. *Das Atelier* 36, 31-3 (1929).—A brief account of the use of bisulfites, AcOH, citric, or tartaric acid to acidify, of common alum to harden, and of  $\text{NH}_4\text{Cl}$  to accelerate, the action of the ordinary photographic fixing bath. Greater hardening is given by formaldehyde or chrome alum used in a sep. bath before fixing.

E. R. BULLOCK

**Methods of sulfide toning.** P. WIGLEB. *Brit. J. Phot.* 76, 344-6(1929).—Direct sulfide toning by the hypo-alum, cold hypo-dextrin, and acidified hypo processes is described, the colloidal S present being the active agent in each case. Other methods depend on the use of alkali polysulfide baths, or liver of S, the latter being especially suitable for rapid work on a large scale. The more recently introduced indirect methods of S toning have the advantage of offering a wider variety of tones. The compn. of bleaching baths is considered. A. BALLARD

**Gaslight prints and transparencies in pleasing tones.** K. JACOBSON. *Das Atelier* 36, 26-8(1929).—An account is given of the method of the Lumières and Seyewetz in which the developed Ag image is bleached to one of AgCuCNS and this used as a mordant for thioflavine T, methylene blue or rhodamine S, or for a mixt. of these basic dyes. A considerable range of tones is thus available. The clearing of the high-lights by means of  $\text{KMnO}_4$  is, however, a very delicate operation. E. R. BULLOCK

**Silver grain size and development.** K. WENSK. *Das Atelier* 36, 51-3(1929).—W. describes the results of his microscopical studies of the development, with an ordinary metol-hydroquinone developer and with alkali-less metol, resp., of a high-speed, coarse-grained emulsion coated in a single-grain layer. About 10 times the exposure was given for the latter developer in order that the densities in each case should be comparable. While the metol-hydroquinone gave deep black grains of irregular shape by the side of completely unchanged ones, the alkali-less metol caused only the appearance of dark tubercles on the edges of individual grains. Alkali-less metol thus causes no graininess, and it is, further, an excellent leveling developer. E. R. BULLOCK

**Further contribution on the graininess of negatives.** A. v. BARSY. *Kinotechnik* 11, 40-1(1929).—B. considers the graininess problem from various angles and summarizes his experiences. Special fine-grained emulsions have too much contrast, and a new combination of fine-grained emulsion and suitable developer is needed. Among developers, a pyro formula is fairly satisfactory. Neol, diluted 1:60, is effective temporarily, and the borax developer is very strongly recommended. B. suggests that occasional abnormal graininess may be caused by atm. conditions affecting the quality of the exposure light. M. L. DUNDON

**Herschel effect.** A. P. H. TRIVELLI. *J. Franklin Inst.* 207, 765-97(1929).—To correct some historical statements concerning its origin and theory the discovery of the Herschel effect is republished. The results of the investigations of A. L. Schoen and R. M. Briggs, who showed that Wratten filter No. 87 is the most suitable for the Herschel effect, are given. The significance of the Herschel effect for the study of desensitizers of the latent image is discussed. It is shown that the Herschel effect shows max. effects detd. by the amt. of the first blue-light exposure and the time of development. A quant. expression for the Herschel effect is discussed. A. P. H. T.

**Intensification of photographic latent image.** III. E. P. WIGHTMAN AND R. F. QUIRK. *Proc. 7th Intern. Congress Phot.* 1929, 235-43; cf. C. A. 22, 547.—The results of previous work are reviewed and the hypothesis which was offered to explain them. Addnl. facts have been obtained, and are presented, which lend further support to this hypothesis. These are: (a) The latent image intensification is largely independent of the developer used. (b) No latent image intensification is obtainable with x-ray exposures. (c) Acetone-semicarbazone, a Br absorber, apparently lessens or prevents intensification of latent image by  $\text{H}_2\text{O}_2$ , but at the same time itself causes a latent image intensification. Org. peroxides as well as  $\text{H}_2\text{O}_2$  are capable of producing intensification of latent image. It is considered that only those substances which act on the latent image specks can produce latent image intensification. It is further considered that those which act in general on the Ag halide to form new specks do not produce latent image intensification but only fog. E. P. WIGHTMAN

**Notes on sensitizing agents in gelatin.** E. CALZAVARA. *Sci. ind. phot.* 9M, 9-10(1929).—A criticism of the theory that sensitizers such as thiosinamine or cystine preexist in naturally active gelatin from the standpoint of the low sensitivity of the chem. reactions characterizing these substances and the reactions involved in the maturing of photographic emulsions. C. E. CLIFTON

**Anti-fogging and anti-sensitizing effects.** S. E. SHEPPARD. *Phot. J.* 69, 37-40(1929).—In previous work with H. Hudson it was shown that the thioanilides could act as anti-sensitizing and anti-fogging agents. It was concluded that in this case they react with Ag halides in the tautomeric form,  $\text{RC}(:\text{NAr})\text{SH}$ . This action is now attributed to a tendency to form first a complex Ag compd. with Ag halide at the interface of sensitizing specks of  $\text{Ag}_2\text{S}$  with  $\text{AgBr}$  or of Ag with  $\text{AgBr}$ . This provides a sp. chem. mechanism in explanation of Lüppo-Cramer's "nucleus isolation" hypothesis of desensitizing by dyes. It is shown that the same mechanism is applicable, completely

to 4,5-disubstituted imidazoles and partially to the phenazine dye desensitizers. In both cases the primary event is an electro-adsorption of the org. substances to Ag halide at the interface of Ag halide-Ag<sub>2</sub>S or Ag halide-Ag, by development of a semipolar double bond. This is followed, in the case of thioanilides and imidazoles, by firmer attachment of the Ag ion to N, whereby these Ag ions become resistant to reduction or sulfiding, so that growth of the isolated speck is inhibited. In the case of phenazine dyes, the electro-adsorption is not followed by firmer union, but oxidative attack of the speck by the dye is facilitated.

**Anti-fogging and anti-sensitizing effects.** S. E. SHEPPARD. *Phot. J.* **69**, 206-9 (1929); cf. preceding abstract.—S. replies to criticisms of the hypothesis that the azine groups of many desensitizing dyes are the seat of their nucleus isolating power, and that their action is similar in principle to that of the imidazoles and thioanilides, and to criticisms of the formulation suggested for the complexes of thiocarbamides and thioanilides with the Ag halides.

**Apparent desensitization by silver nuclei.** LÜPPO-CRAMER. *Camera (Lucern)* **7**, 237-8 (1929).—Colloidal Ag, prepd. by Carey Lea's dextrin method, was added to a motion picture positive emulsion in an amt. equal to 0.2% of its AgBr content. Plates coated with this emulsion, developed in org. developers, particularly *p*-phenylenediamme showed an apparent loss of speed compared with the unsilvered plates and an orange to red fog was produced. No loss was found with ferrous oxalate. The results are explained by the theory that in developers having a slight solvent action on AgBr, some of the introduced Ag nuclei grow in preference to the latent image. Ferrous oxalate shows no loss because it contains no sulfite or other Ag solvent.

**Ammonium persulfate reducer.** H. SPÖRL. *Das Atelier* **36**, 41-4 (1929). As the outcome of his expts. S. recommends a soln. of 5 g. (NH<sub>4</sub>)<sub>2</sub>S<sub>2</sub>O<sub>8</sub> with 5 drops of H<sub>2</sub>SO<sub>4</sub> in 200 cc. of H<sub>2</sub>O for normal use as a reducer for photographic negatives. NaCl up to 0.01 the weight of the (NH<sub>4</sub>)<sub>2</sub>S<sub>2</sub>O<sub>8</sub> may be added if it is desired to reduce considerably while conserving as far as possible the highest lights.

**Little-known point in intensification.** K. JACOBSON. *Das Atelier* **36**, 38-9 (1929).—J. points out that in the majority of cases for the intensification of negatives what is needed is not a proportional effect but an effect greater than this in the shadows and somewhat less in the highlights. The single-soln. HgI<sub>2</sub> method and the two-soln. Welborne Piper method with acidified K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> and development are among those which tend to give this kind of intensification.

**Hypersensitizing for extreme speed of exposure.** K. JACOBSON. *Brit. J. Phot.* **76**, 315-7 (1929).—Hypersensitization results in an increase in the sensitivity of the material to light of the longer wave lengths. The effect is, therefore, much more pronounced in artificial light exposures than in daylight. Various panchromatic plates and films respond to hypersensitization in different degrees. Full directions are given for the treatment of panchromatic material, ammoniacal AgCl being used. The method of sensitization by pre-exposure is described, and is stated to be of value only when the negative is to be used finally with very dim lighting. The negatives should be developed in darkness, or after desensitization, in a green light. A method of development to avoid irradiation is given.

See and its use in the arts [in photographic toning baths] (KUFFERATH) **18**. Manufacture of sensitized papers for photography (ANON.) **23**. Composition of the commoner grades of paper [photographic papers] (RETTORI) **23**. Grain growth in Ag halide precipitates (SHEPPARD, LAMBERT) **2**.

**Photographic developers.** I. G. FARBERIND. A.-G. *Brit.* **300**, 970, Nov. 21, 1927. See Ger. 467,818 (*C. A.* **23**, 572).

**Developing photographic films.** ÉTABLISSEMENTS ÉDOUARD BELIN. *Fr.* 655,925, Oct. 31, 1927. A machine is described for the ultra-rapid development of endless photographic films by projection of the baths on to the band with visual control of the development.

**Color photography.** JOHN H. POWRIE. U. S. 1,717,404-5, June 18. Optical and mech. features.

**Color photography.** HEINRICH FREDERKING. Ger. 477,350, Jan. 5, 1928. A modified 3-color process is described whereby the effects of a 4-color process are obtained. The principal feature of novelty is the intentional addn. of a black color to the pigments used in prepg. the gelatin-pigment layers.

**Film for color photography and cinematography.** SOCIÉTÉ FRANÇAISE DE CINÉMATOGRAPHIE ET DE PHOTOGRAPHIE FILMS EN COULEURS KELLER-DORIAN. Ger. 477,474, Oct. 18, 1928. See Brit. 298,951 (C. A. 23, 2895).

**Photographic plates.** R. S. VILASECA. Brit. 300,809, Dec. 9, 1927. The rear surfaces of glass plates are sand-blasted or treated with HF to remove their polish and provide a surface suitable for direct use for retouching.

**Hydroxyethylaminobenzene derivatives.** I. G. FARBENIND. A.-G. Brit. 300,503, Nov. 12, 1927. A nuclear substitution product of a 4-amino-1-hydroxybenzene is treated with glycol halohydrin or with ethylene oxide at ordinary or at raised temp. and pressure, and if necessary in the presence of an acid-binding agent, a diluent, solvent or catalyst, to obtain N-mono- and di-hydroxyethyl derivs., which are suitable for use as *photographic developers*. Several examples are given.

**Composite films for motion-picture and sound records.** ALBERT F. SULZER (to Eastman Kodak Co.). U. S. 1,717,815, June 18.

**Colored particles for making photographic multicolor screens.** SOC. LUMIÈRE. Brit. 301,516, Dec. 2, 1927. Dyed threads of natural or artificial silk are embedded in a substance such as paraffin, the material is cut as with a microtome and the embedding material is then dissolved to free the particles of thread; mixed colors of the thread particles are then applied to a plate or the like by use of adhesive varnish such as rubber soln. Charcoal may be used for filling interstices between the thread particles.

**Photographic silver halide emulsions.** OTTO MATTHIES, WALTER DIETERLE and JOSEF REITSCHÖTTER (to Agfa Ansco Corp.). U. S. 1,719,711, July 2. The emulsions are treated with a sensitivity-increasing material prepd. by alk. hydrolysis and simultaneous partial oxidation of proteins such as horn shavings or gelatin.

**Coloring or coating portions of cinematograph film to facilitate identification by inspection of the margins without unrolling.** I. G. FARBENIND. A.-G. Brit. 300,991, Nov. 22, 1927. Various methods of coloring are described.

## 6—INORGANIC CHEMISTRY

A. R. MIDDLETON

A suggestion as to the nomenclature and method of writing inorganic compounds. ANGEL SABATINI. *Rev. centro estud. farm. bioquim.* 16, 449-52(1927); *Chem. Zentr.* 1928, I, 1489.—S. proposes that the Spanish practice of writing the electronegative radical first, *i. e.*, ClH, be followed. FRANCIS P. GRIFFITHS

The chemical characterization of the sulfur-nitric oxide compounds of univalent iron, cobalt and nickel. W. MANCHOT AND G. LEHMANN. *Ann.* 470, 255-61(1929).—The authors present exptl. evidence in support of their contention that the NO groups in compds. of this type do not behave as hyponitrite radicals. L. F. AUDRIETH

The constitution of the sulfur-nitric oxide compounds of univalent iron, cobalt and nickel. W. MANCHOT. *Ann.* 470, 261-70(1929).—The properties of compds. of the type, Fe(NO)<sub>2</sub>SR, Co(NO)<sub>2</sub>SR and Ni(NO)SR (where R = alkyl, H or S.SO<sub>3</sub>K) may best be expressed by a consideration of their electronic structures. The NO groups act as neutral constituents linked to the metal by coordinative covalence, whereas the SR groups may involve either electrovalent or covalent linkage, the nonpolar character being most strongly accentuated in the mercaptides (where R = alkyl), less so in the hydrosulfides (R = H), and least in the thiosulfates (R = S.SO<sub>3</sub>K). L. F. A.

**Germanium. XXXI. Alloys of germanium: silver-germanium.** T. R. BRIGGS, R. O. McDUFFIE AND L. H. WILLISFORD. *J. Phys. Chem.* 33, 1080-96(1929); cf. Jordan, Grenell and Hirschman, *C. A.* 22, 54.—Thermal analysis indicates that Ag-Ge forms simple eutectiferous series with no stable intermetallic compds. Conductance of these alloys is remarkably low, indicating that Ge predominates as continuous phase in fine structure. The eutectic contains 74 atomic % Ag and eutectic temp. is 650°. A. P. SACHS

The stability of complex metallic salts. FREDERICK G. MANN. *J. Chem. Soc.* 1929, 651-8; cf. *C. A.* 22, 2335.—Further evidence is presented for M.'s theory that the case with which coordinated mols. can arrange themselves about a square, octahedron or cube has a greater effect on the stability of the salt than whether in coordination the central atom acquires an excess or deficiency of electrons as compared with the next inert gas. Zn is shown to give extremely stable compds. with triaminopropane, like those of Ni, Pt<sup>II</sup> and Pd<sup>II</sup> previously described, in which the coordination no. is 6 although the central atom has an excess of 4 electrons over the number in Kr.

Cd is found to act differently. Like Cu (C. A. 21, 388) it shows a coordination no. of 4 in all its compds. with triaminopropane. Bivalent Pd also unites with this base to form a compd. in which the Pd has its normal coordination no. of 4, which is identical in type with the platinous salt previously described. The following new salts were prepd. (ptn. = 1 mol. of  $\alpha\beta\gamma$ -triaminopropane):  $[Znptm_2]I_2$ ;  $[Pdptm_2]I_2$ ;  $[Pd(ptn-HSCN)_2](SCN)_2$ ;  $[Cd_2ptm_4]I_6$  converted by boiling water to  $[IptnCd]I$ ;  $[Cd_2ptm_4]Br_6 \cdot 3H_2O$  converted by boiling water to  $[BrptnCd]Br$ ;  $[SCNptnCd]SCN$ ;  $[(SCN)_2Cd-ptnHCl]$  slowly loses HCl when exposed to air. F. W. LAIRD

Action of cyanogen bromide and hydrogen cyanide on titanium tetrabromide. F. OBERHAUSER AND J. SCHORMÜLLER. *Ber.* 62B, 1436-41(1929).—An addn. compd.,  $TiBr_4 \cdot 2BrCN$ , is prepd. by mixing 5 g.  $TiBr_4$  in 50 cc.  $CS_2$  and 6 g.  $BrCN$  in 50 cc. of  $CS_2$  with the careful exclusion of moisture. The compd. m. 151-152°, is decomposed by  $H_2O$  to give  $BrCN$  and by alkali to give  $TiO_2$ . A similar compd. is formed with  $CNCl$ . An addn. compd.,  $TiBr_2 \cdot 2HCN$ , is formed by adding dry HCN to  $TiBr_4$ . This decomposes in steps into  $2TiBr_4 \cdot 3HCN$  and  $TiBr_4 \cdot HCN$ .  $NH_3$  and  $BrCN$  interact quantitatively according to  $2NH_3 + BrCN \rightarrow NH_4Br + NH_2CN$ . This may be used for analysis of  $BrCN$  by submitting the sample to the action of 100 cc. dil  $NH_3$  for 20-30 min. in the cold, followed by a short heating on the water bath and diln. with 300 cc.  $H_2O$ . After driving off most of the  $NH_3$  the soln. is made slightly acid with  $HNO_3$  and the soln. is titrated with 0.1 N  $AgNO_3$ . HANS C. DREUS

The behavior of cyanogen bromide and hydrogen cyanide towards iron salts. (A contribution to the theory of oxidation processes.) F. OBERHAUSER AND J. SCHORMÜLLER. *Ber.* 62B, 1482-8(1929).—The unsymmetrical structure of  $BrCN$  makes it especially adapted to follow oxidation processes. The oxidation of  $FeBr_2$  to  $FeBr_3$  shows an intermediate stage in the compd.  $Fe_3Br_8 \cdot 3BrCN \cdot (CN)_2$ , formed by heating  $FeBr_2$  with excess  $BrCN$ . By reduction of pressure this goes over into  $Fe_3Br_8$ .  $Fe_3Br_8$  reacts at room temp. with  $BrCN$  to give  $Fe_3Br_8 \cdot 4BrCN$ , which may be converted into  $FeBr_3$ . A compd.  $Fe_3Br_8 \cdot 5HCN$  has also been prepared.  $3FeBr_3 \cdot 4BrCN$  is in the highest state of oxidation as shown by its tendency to split off  $Br$ .  $Fe_3Br_8 \cdot 4BrCN$ , however, shows the most stable satn. of the residual valences.  $Fe_3Br_8 \cdot 4BrCN$  shows a greater satn. tendency of  $BrCN$  than does HCN in the addn. product  $Fe_3Br_8 \cdot 5HCN$ . The color of the compds. becomes darker with increasing addns. to the nucleus, being bright yellow for  $2FeBr_2 \cdot BrCN$ , light brown for  $Fe_3Br_8 \cdot 3BrCN \cdot (CN)_2$ , dark brown for  $FeBr_3 \cdot BrCN$  and black for  $3FeBr_3 \cdot 4BrCN$ . HANS C. DREUS

The action of oxalic acid and malonic acid upon tetramminocobaltic complexes and their analogs. WALTER SCHRAMM. *Z. anorg. allgem. Chem.* 180, 161-83(1929). On the basis of similarity of behavior of  $H_2C_2O_4$  and  $H_4C_2O_4$  toward compds. contg. complex anions (cf. C. A. 16, 4153; 21, 539, 2230) S. has made a systematic examn. of calcd. quantities of these 2 substances upon numerous  $[CoA_4]$ -complexes ( $A = NH_3, \frac{1}{2}$  ethylenediamine or  $\frac{1}{3}$  propylenediamine).  $H_2C_2O_4$  displaces with more or less facility the  $H_2O, OH, Cl, Br, NO_3, CO_3$  and  $C_2H_3O_4$  groups to give the corresponding oxalatotetramminocobaltic salts  $[CoA_4C_2O_4]X$ . The stability of the resulting compds. toward the mineral acid which is split off permits their formation. The malonato group in  $[Co(NH_3)_4C_2H_3O_4]Br$  is not attacked. The nitro groups in  $[Co(NH_3)_4(NO_2)_2]NO_3$  are displaced only with utmost difficulty. Malonic acid reacts with diaquo-, hydroxoquo-, acidoquo- and diacidoquo-complexes to split off the free mineral acid, which may then partly or entirely react with the cation, or even add on to the latter, to give acidoquo-, diacido- or acid diacido-salts. Dinitrotetramminocobaltic nitrate,  $[Co(NH_3)_4(NO_2)_2]NO_3$ , and the oxalato complexes are not attacked. Malonato complexes,  $[CoA_4C_2H_3O_4]^-$ , are obtained only when the mineral acid, primarily formed, is removed from soln. by hydrolytic cleavage, as in the case of the carbonato complexes where the action of malonic acid causes evolution of  $CO_2$ . Carbonatotetramminocobaltic malonate,  $[Co(NH_3)_4CO_3]C_2H_3O_4$ , reacts with malonic acid to give the diaquo-salt,  $[Co(NH_3)_4(H_2O)_2]_2(C_2H_3O_4)_2$ . The action of  $H_2C_2O_4$  and  $H_4C_2O_4$  upon the sulfato complexes causes primary liberation of free  $H_2SO_4$ , which subsequently reduces the trivalent Co. Attempts to prep. the corresponding succinato and glutarato compds. by the action of the free acids upon the  $CoA_4$ -complexes were unsuccessful. The exptl. results are conveniently tabulated. The following new oxalato and malonato complexes were prepd.: oxalatodiethylenediaminocobaltic nitrate monohydrate,  $[Coen_2C_2O_4]NO_3 \cdot H_2O$ ; oxalatodipropylenediaminocobaltic chloride trihydrate,  $[Coen_2C_2O_4]Cl \cdot 3H_2O$ ; oxalatodiethylenediaminocobaltic chloride monohydrate,  $[Coen_2C_2O_4]Cl \cdot H_2O$ ; oxalatotetramminocobaltic dithionate,  $[Co(NH_3)_4C_2O_4]S_2O_6$ ; malonatotetramminocobaltic chloride,  $[Co(NH_3)_4C_2H_3O_4]Cl$ ; malonatodiethylenediaminocobaltic chloride tetrahydrate,  $[Coen_2C_2H_3O_4]Cl \cdot 4H_2O$ ; malonatotetramminocobaltic bromide,  $[Co(NH_3)_4$



$C_3H_2O_4$ )Br; *malonatotetramminocobaltic selenate trihydrate*,  $[Co(NH_3)_4C_3H_2O_4]_2SeO_4 \cdot 3H_2O$ ; *malonatotetramminocobaltic nitrate monohydrate*,  $[Co(NH_3)_4C_3H_2O_4][NO_3] \cdot H_2O$ . L. F. AUDRIETH

The oxidation of alkali sulfites to dithionates. R. HAC. *Collection Czechoslov. Chem. Comm.* 1, 259-62(1929); cf. *J. prakt. chem.* 80, 229; *Ber.* 34, 3606.—The alkali dithionates were prepd. in 75% yield by heating 1 part each of  $Na_2SO_3 \cdot 7H_2O$  and  $PbO_2$  and 2 parts of water until all the sulfite is in soln., passing in  $CO_2$ , filtering, neutralizing with lactic acid, concg. and crystg. This reaction is not effected by  $MnO_2$  as previously reported. V. F. HARRINGTON

Contributions to the study of phosphorus trioxide. II. The reciprocal action between phosphorus trichloride and phosphorous acid. LUDWIG WOLF, ERICH KALAEHNE AND HERMANN SCHMAGER. *Ber.* 62B, 1441-9(1929).—The authors were unable to verify previous results that  $PCl_3$  and cryst.  $H_3PO_3$  react to give  $P_2O_3$ , but always found the product to be of a sirupy consistency and orange color.  $HCl$  and  $P_2O_3$  gave  $PCl_3$  and  $H_3PO_3$ , which, on standing, passed over into the same sirupy product at  $60^\circ$ . When heated to  $150^\circ$  this product decomposes partially into red P. HANS C. DUUS

Bromamine. WILHELM MOLDENHAUER AND M. BURGER. *Ber.* 62B, 1615-8(1929).—When Br and  $NH_3$  react in ether soln.  $NH_2Br$  is formed. It was not isolated but its compn. was deduced from the distribution of the  $NH_3$  and Br between ether and water. The ether soln. has oxidizing properties. The reaction velocity const. for the decompn. of the amine in water as a monomol. reaction is 0.0056 at  $0^\circ$ ; 0.035 at  $15.1^\circ$ ; and 0.10 at  $24.0^\circ$ . J. B. AUSTIN

New fluorides, especially chlorine fluoride. OTTO RUFF, JOSEPH FISCHER, FRITZ LUFT, ERNST ASCHER, FRIEDRICH LAASS AND HERBERT VOLKMER. *Z. anorg. Chem.* 41, 1289-92(1929); cf. *C. A.* 22, 4398; 23, 785. T. H. CHILTON

Iridium fluorides. OTTO RUFF AND JOSEPH FISCHER. *Z. anorg. allgem. Chem.* 179, 161-85(1929); cf. *C. A.* 22, 4398.— $IrF_6$  was prepd. by passing  $F_2$  over powd. Ir heated in a  $CaF_2$  tube to  $260^\circ$ . Cooled with liquid air,  $IrF_6$  is pale yellow; at about  $-15^\circ$ , it becomes intensely yellow and glassy; it melts to an intensely yellow liquid at about  $44^\circ$ . After standing some weeks, the glassy solid showed distinct crystn., indicating that there might be 2 cryst. modifications. X-ray examn. at  $-150^\circ$  indicates tetragonal structure. By a special pycnometric procedure using liquid  $O_2$ , d. was detd. as 6.0, agreeing with that calcd. from x-ray data (5.56). B. p., estd. from vapor pressure curve, is  $53^\circ$ ; latent heat, 8500 cal. Heat of formation, estd. from temp. rise during prepn., is 130,000 cal.  $IrF_6$  is hydrolyzed by  $H_2O$ , giving  $HF$ ,  $Ir(OH)_3$  and  $O_2$  contg.  $O_3$ . In all reactions, it easily gives up 2 atoms of F. With  $H_2$  or  $CO$ , it is reduced to Ir. It does not form complex salts. An oxyfluoride was formed by the action of moisture or of glass at ordinary temps. or of quartz when heated; its formula is believed to be  $IrOF_4$ . It forms microscopic, gray-white needles.  $IrF_4$  was prepd. by reducing  $IrF_6$  with Ir. It is a viscous, yellow-brown oil, very volatile and hygroscopic, decomposing instantly with  $H_2O$ . T. H. CHILTON

Fluorides of manganese and cadmium. P. NUKA. *Z. anorg. allgem. Chem.* 180, 235-40(1929).—By pptn. of  $MnCl_2$  with  $NH_4F$  in large excess  $NH_4MnF_6$  is obtained. A satd. soln. heated to  $60^\circ$  ppts.  $MnF_2$ .  $NH_4MnF_6$  heated to  $290-300^\circ$  in  $CO_2$  gives  $MnF_2$ . Solubilities of the latter per 100 g. of soln. are  $40^\circ$  0.66 g.,  $60^\circ$  0.44 g.,  $100^\circ$  0.48 g..  $MnF_2$  hydrolyzes and oxidizes in air at room temp. Evapn. *in vacuo* or pptn. of  $MnCl_2$  with  $CdF_2$  gives  $MnF_2 \cdot 4H_2O$ , which loses  $H_2O$  at room temp. This hydrate is sol., 1.05 g. per 100 g. of soln.  $KF$  and  $NaF$  ppt.  $KMnF_6$  and  $NaMnF_6$  from  $MnCl_2$ . Addn. of  $NH_4F$  to  $Cd(NO_3)_2$  soln. gives  $CdF_2 \cdot 2H_2O$ , losing  $H_2O$  slowly in the air. More than 1 crystal form exists. About 1.8 g. of  $CdF_2$  is sol. in 100 g. of soln. The soly. of  $ZnF_2$  and  $NiF_2$  decreases with temp. FOSTER DEE SNELL

Iron tetranitrosyl. W. MANCHOT AND E. ENK. *Ann.* 470, 275-83(1929).—Iron tetranitrosyl,  $Fe(NO)_4$ , may be obtained as a black, cryst. substance by heating carefully Fe carbonyl with NO under pressure in an autoclave at a temp. of  $44-45^\circ$ . The freshly prepd. product fumes in air, possibly because of the presence of volatile higher iron nitrosyls. The non-volatile tetranitrosyl undergoes surficial oxidation in air. It reacts vigorously with liquid  $NH_3$  with probable formation of  $Fe(NO)_3NH_3$ . It dissolves in concd.  $H_2SO_4$  to give a red soln. due to the presence of  $Fe(NO)SO_4$ . With  $NaCN$ , Na nitroprusside is obtained.  $K_2S_2O_8$  gives dinitroso-iron(II)-thiosulfate,  $Fe(NO)_2S_2O_4K$ . It reacts with  $EtSH$  to form dinitroso-iron(II)-mercaptide,  $Fe(NO)_2SC_2H_5$ . KSH yields Pavel's salt,  $Fe_4(NO)_7S_3K$ , and with K xanthogenate, dinitroso-iron(II)-xanthogenate,  $Fe(NO)_2(SCSOC_2H_5)_2$ , is obtained. Fe acts as the NO carrier in these reactions and is itself oxidized to the univalent or bivalent state at the expense of the NO. L. F. AUDRIETH

A methanol compound of iron nitrosyl. W. MANCHOT AND H. GALL. *Ann.* **470**, 271-4(1929).—The interaction of NO with  $\text{Fe}(\text{CO})_5$  at room temp. in the presence of MeOH results in the formation of  $\text{FeNO} \cdot n\text{CH}_3\text{OH}$ , a black, unstable, microcryst. substance. It decomposes on contact with air and loses part of the combined MeOH at  $80^\circ$  and the remainder above  $200^\circ$ . When heated in an atm. of A, it leaves a residue of  $\text{Fe}_2\text{O}_3$ . L. F. AUDRIETH

Note on the recovery of platinum. G. J. HOUGH. *Ind. Eng. Chem., Anal. Ed.* **1**, 162(1929).—The residues and alc. solns. contg. Pt from the detn. of K are treated with  $\text{NH}_4\text{Cl}$ . The ppt. is dissolved in hot water, treated with HCl and magnesium powder. The platinum black is treated with aqua regia and then HCl. A. I. E.

The supposed sesquisulfide of molybdenum. V. MONTORO. *Atti accad. Lincei* [6], **9**, 331-7(1929).—By means of x-ray examn. of Mo sulfide (pure as well as at various stages of desulfurization) and alloy of Mo-C, M. has found that supposed lower sulfides of Mo are  $\text{MoS}_2$  and solid solns. of C in Mo. In this way it has been proved that a sulfide lower than  $\text{MoS}_2$  does not exist. A. W. CONTIERI

Some ammino-pyridino complexes of tervalent iridium. MARCEL DELÉPINE AND JEAN PINRAU. *Bull. soc. chim.* [4], **45**, 228-35(1929); cf. C. A. **22**, 738. The prolonged action of aq.  $\text{NH}_3$  in sealed tubes at  $100^\circ$  was studied. (I =  $[\text{IrCl}(\text{NH}_3)_4\text{Py}]^{++}$ ; II =  $[\text{IrPy}_2\text{Cl}_2]^-$ ; III =  $[\text{Ir}(\text{NH}_3)_3\text{H}_2\text{OPy}_2]^{+++}$ .)  $\text{K}_2[\text{IrPyCl}_5]$  heated 15 hrs gave  $\text{IrCl}_3$  isolated as its compd. with  $2\text{HgCl}_2$ ; after removal of Hg by  $\text{H}_2\text{S}$  and of HCl by evapn. to dryness,  $\text{IrCl}_3$  was obtained anhydrous by crystn. from hot soln., as a dihydrate from cold soln. It is very sol. in water and forms ppts. with  $\text{HgCl}_2$ ,  $\text{K}_2\text{HgI}_4$ , picric acid,  $\text{K}_2\text{Cr}_2\text{O}_7$ ,  $\text{KI}_3$ ,  $[\text{IrPy}_2\text{Cl}_5]^-$  and  $[\text{IrPy}_2\text{Cl}_4]^-$ . NaBr and NaI formed ppts from very concd. solns.  $\text{K}_2\text{CrO}_4$ ,  $\text{K}_4\text{Fe}(\text{CN})_6$ ,  $\text{K}_3\text{Fe}(\text{CN})_6$  and  $\text{K}_2\text{PtCl}_6$  formed no ppts. A sulfate was prepd. by treating  $\text{IrCl}_3$  with  $\text{Ag}_2\text{SO}_4$ . Attempts to replace the Cl of I by  $\text{NH}_3$  were fruitless.  $\text{Na}[\text{IrPy}_2\text{Cl}_4]$  (red trans-isomer) heated 30 hrs. gave [III]-[II]<sub>3</sub>·6H<sub>2</sub>O, which treated with  $\text{PyHCl}$  gave  $\text{Py}[\text{II}]$  and [III]Cl<sub>3</sub>·3H<sub>2</sub>O. On dehydrating at  $115^\circ$  for 3 hrs. the latter loses 4 mols. of water and forms  $[\text{IrCl}(\text{NH}_3)_3\text{Py}_2]\text{Cl}_2$ , which does not ppt.  $\text{K}_4\text{Fe}(\text{CN})_6$  and  $\text{Na}_4\text{P}_2\text{O}_7$ . The aquo-chloride ppts.  $\text{HgCl}_2$ ,  $\text{HgBr}_2$ ,  $\text{K}_2\text{HgI}_4$ ,  $\text{K}_2\text{Cr}_2\text{O}_7$ , picric acid, tannin and concd. solns. of KBr and KI. Heating of [III]-[II]<sub>3</sub>·6H<sub>2</sub>O for 36 hrs. with 12 times its wt. of  $\text{NH}_3$ , d. = 0.92, gave  $[\text{IrCl}(\text{NH}_3)_3\text{Py}_2]\text{Cl}_3 \cdot 2\text{H}_2\text{O}$ , which D. had previously obtained (+4H<sub>2</sub>O) by the action of cold  $\text{NH}_3$  on  $[\text{Ir}^{\text{IV}}\text{Py}_2]\text{Cl}_2$ . These results demonstrate the extraordinary tenacity of the Ir-Py union. I. M. LEVINE

RUDZIK, WALTHER: *Repetitorium der anorganischen Chemie*. Marburg-Lahn Selbstverlag. 136 pp. M. 5.

## 7—ANALYTICAL CHEMISTRY

W. T. HALL

The accuracy of titrations, the critical concentrations of buret solutions and the sensitiveness of indicators. HERMANN RUOSS. *Z. anal. Chem.* **77**, 175-85(1929).—A mathematical discussion of the limits of the accuracy of titrations in acidimetry and alkalimetry. W. T. H.

Simple arrangement for electrometric titrations. ALFRED UHL. *Z. anal. Chem.* **77**, 280-3(1929).—The app. is very simple but is best understood by reference to the cut in the original article. It consists of a tube which is closed at the end with filter paper that has been wet with satd. KCl soln. On top of this is agar-agar jelly and then the comparative soln., which can be a previously titrated soln. At the bottom of the tube; on the outside is fused a strip of Pt; electrical connection is made so that this strip forms one electrode and Pt resting in the comparative soln. is the other. The app. is relatively inexpensive and can be used for acidimetric or oxidimetric titrations. W. T. H.

Iodo-oxidimetric determinations. ALFRED SCHWICKER. *Z. anal. Chem.* **77**, 161-9(1929).— $\text{H}_2\text{SO}_5$  can be titrated directly with  $\text{KIO}_3$  soln. and vice versa. When 3  $\text{H}_2\text{SO}_5$  are present to 1  $\text{KIO}_3$ , the reduction is to colorless  $\text{I}^-$ , but when more  $\text{KIO}_3$  is present,  $\text{I}_2$  is formed. In all cases the oxidation is to  $\text{SO}_4^{--}$ . The reaction can be used for the analysis of substances such as hydrazine, ferrocyanides, thiocyanates, arsenites and antimonous compds.; in every case an excess of  $\text{KH}(\text{IO}_3)_2$  soln. is added to the acid soln. of the reducer and the excess titrated with 0.1 N  $\text{KHSO}_5$  soln. contg. 5-10% of alc. to stabilize it. Toward the end starch is added. The oxidation of

the hydrazine is to  $N_2$ , of the  $Fe(CN)_6^{4-}$  to  $Fe(CN)_6^{3-}$ , of  $CNS^-$  to  $HCN$  and  $H_2SO_4$  of  $As^{+++}$  to  $AsO_4^{3-}$  and of  $Sb^{+++}$  to  $SbO_4^{3-}$ . W. T. H.

Two new reversible oxidimetric indicators and the manganometric determination of hydroferrocyanic acid. J. KNOP. *Z. anal. Chem.* 77, 111–25(1929).—Because of the deep brown color of ferricyanide anions it is difficult to detect the end point in the titration of  $Fe(CN)_6^{4-}$  with  $KMnO_4$ . Diphenylamine, useful in  $K_2Cr_2O_7$  titrations, shows a color change only after the end point has been considerably passed. Indigo-sulfonic acid, which is oxidized to yellow isatinsulfonic acid, also shows a color change somewhat too late. In the series of triphenylmethane dyes, however, *Erioglaurin A* and *Eriogrün*, prepd. by Geigy of Basel, are 2 reversible indicators, which are very sensitive to traces of permanganate but cannot be used in dichromate titrations. The former dyestuff dissolves easily in water, forming a blue soln. The addn. of mineral acid causes the formation of some yellow salt and the soln. becomes green. A trace of  $KMnO_4$  changes the green soln. to a bluish red. At the exact end point the color is pale gray. The second indicator gives a bluish green soln. in water, which becomes a deep yellow upon the addn. of acid; a trace of  $MnO_4^-$  changes the color to orange-yellow. The first indicator is more sensitive than the second. With the help of either, the end point in the titration of ferrocyanide with  $KMnO_4$  can be detd. within 1 drop of 0.05 N soln. The following procedure is recommended: To not over 1 g. of ferrocyanide, add 20 cc. of 8 N  $H_2SO_4$  or HCl and 400 cc. of water. Add 1 cc. of 0.1% aq. soln. of *Erioglaurin A* or 2 cc. of *Eriogrün* soln. of the same concn. and titrate with 0.05 N  $KMnO_4$ . In HCl solns. the less sensitive indicator works better. There is, contrary to the statement of Kessler, a slight induced oxidation of the HCl just as in the titration of HCl solns. of  $Fe^{++}$ , so that the end point does not last long. Other dyestuffs of the triphenylmethane series can also be used, 10 of these being mentioned. W. T. H.

Permanganate titrations of iron with *Erioglaurin A* (G) and with *Eriogrün B* (G) as indicators. J. KNOP AND O. KUBELKOVA. *Z. anal. Chem.* 77, 125–30(1929).—By use of the indicators explained in the preceding abstr., excellent results were obtained in the  $KMnO_4$  titration of  $Fe^{++}$  in Mohr's salt. With samples contg. only 1 mg. of Fe and by use of 0.005 N  $KMnO_4$ , results were obtained accurate to 0.5% of the truth. W. T. H.

Titration of potassium ferrocyanide with diphenylamine as internal indicator. I. M. KOLTHOFF. *Chem. Weekblad* 26, 298–301(1929); cf. C. A. 21, 2238 and 23, 1839.—To 50 cc.  $\frac{1}{40}$  mol.  $K_4FeCy_6$  are added 1 to 4 drops 1% diphenylamine (in concd.  $H_2SO_4$ ), 1 to 5 drops 1%  $K_3FeCy_6$  soln., 10 to 20 cc. 4 N  $H_2SO_4$ . The titration is done with 0.05 mol.  $ZnSO_4$  soln. The color changes from yellow, over grayish, to blue-violet. Excess can be back-titrated with ferrocyanide. The Zn soln. is standardized with pure  $K_4FeCy_6$ . The soln. of  $K_4FeCy_6$  is stabilized by the addn. of 1 g.  $Na_2CO_3$  per l. When substances with reducing action are present 2 to 4 cc. 4 N NaOH and 10 cc. 0.1 N  $Br_2$  soln. are added to 25 to 50 cc. cyanide soln. After the oxidation is finished 10 cc. 0.1 N  $As_2O_3$  is added. In 15 to 30 min. the soln. becomes colorless and is acidified with 10–15 cc. 4 N  $H_2SO_4$  and titrated as above. E. SCHORRE.

Spot analysis. W. P. MALITZKY. *Mikrochem.* 6, 157–60(1928).—A reply to Feigl (C. A. 22, 3599). B. C. A.

Microanalysis and technical methods of investigation. R. LUCAS AND F. GRASSNER. *Mikrochem.* 6, 116–32(1928).—A description of the application of microanalytical methods to technical problems with special reference to the detn. of S, halogens, C, H, N and P in org. materials, to electroanalysis and colorimetric methods. B. C. A.

Sensitive spot reaction for fluoride. F. PAVELKA. *Mikrochem.* 6, 149–51(1928).—The method depends on the fact that the color of a Zr alizarin lake is destroyed by HF. The test-papers are prepd. by moistening filter paper with a soln. of basic Zr chloride to which an excess of an alc. soln. of alizarin has been added. The dried papers are moistened with a drop of 50% AcOH and a drop of the suspected soln. is added. In presence of 0.01 mg. of F a yellow stain appears on the originally red paper. Sulfates, oxalates and phosphates interfere. With insol. fluorides the powd. material is shaken with 5 cc. of dilute HCl contg. 0.5–1.0 g. of borax and a drop of the resulting mixt. taken for the test. About 0.06 mg. of  $CaF_2$  may be detected thus. Alternatively, the fluoride may be treated with silica and  $H_2SO_4$  and the moistened test-paper held in the vapors. B. C. A.

A microchemical color test for sulfur. E. GRÜNSTEIDL. *Z. anal. Chem.* 77, 283–4(1929).—The method depends upon the conversion of the S to  $CNS^-$  and the color developed with very dil.  $FeCl_3$ . Details are given for carrying out the test upon a slide under the microscope. W. T. H.

Determination of sulfur in unalloyed steel, alloyed steel, cast iron and ferrous

alloys by combustion in a stream of oxygen. KARL SWOBODA. *Z. anal. Chem.* 77, 269-77(1929).—The app. is the same as that used for the direct combustion of steel, but the O before entering the furnace should pass through  $\text{KMnO}_4$  soln. (40 g. per l.) or 2.5%  $\text{AgNO}_3$  soln., then through concd.  $\text{H}_2\text{SO}_4$ , through a tube contg. solid NaOH and finally through a  $\text{CaCl}_2$  tube. A temp. of 1150–1200° suffices except for high-speed steel, which requires 1300° for complete combustion. Use 1.0 g. of material and pass the gas from the furnace into 2.5%  $\text{AgNO}_3$  soln. or through 3%  $\text{H}_2\text{O}_2$  soln. The formation of  $\text{Ag}_2\text{SO}_4$  in the absorption tube indicates the approx. quantity of S present. After the combustion is complete, continue passing O through the app. for 3–6 min. to expel all  $\text{CO}_2$  from the absorbent. Then rinse the soln. into a flask with  $\text{CO}_2$ -free water and titrate with 0.005 N NaOH using methyl red as indicator. A pale yellow color is obtained at the end point. The  $\text{AgNO}_3$  soln. must be neutral to methyl red. W. T. H.

Determination of sulfur in galena and in metallic lead. H. LEVSAHT. *Z. anal. Chem.* 77, 209–13(1929).—By heating 0.15–0.21-g. samples of PbS and 2 g. of pure Zn with HBr, d. 1.49, the S was all obtained as  $\text{H}_2\text{S}$ , which could be caught in  $\text{Cd}(\text{OAc})_2$  soln.; the S was detd. iodometrically. W. T. H.

Nephelometric determination of barium sulfate. J. KĀPELKA AND A. KALINA. *Chem. Listy* 22, 545–50(1928).—At concns. of 0.3–1.0 mg. Ba per l. the mean error of nephelometric detns. of sulfate is 0.5%. The suspension should not be kept longer than 30 min. after prepn.; the addn. of glycerol to 10% by vol. greatly augments the stability of these suspensions. The limiting percentage concns. of other salts which may be present without affecting the accuracy of this method are: Na 0.15, H 0.30, Mg 0.003, Zn or Cd 0.006, Hg 0.04 and  $\text{AlCl}_3$  0.002. All these ions, with the exception of Mg, provoke coagulation of the suspension at higher concns. than the above, leading to excessively high results, while Mg has a protective influence, so that the results are low. B. C. A.

The determination of calcium by the methods of Clark and deWaard with proposed modifications and a comparison of results obtained by both methods. G. F. M. J. BĀR. *Endokrinologie* 1, 90–9(1928). S. MORCULIS

The errors in the dry assay for gold and silver, as seen from the scientific standpoint and their remedy. MIKIO KUBARA. *Japan. J. Mining* 45, 13–7(1929).—The fact that the actual yields of Ag and Au in the dry smelting of sulfide ores are usually higher than indicated by fire assay is attributed to the decompn. of Au silicate during smelting by strong base. To overcome this error, K. recommends adding to the assay charge an equimolecular mixt. of  $\text{FeCO}_3$  and  $\text{CaCO}_3$ . According to K. the ordinary roasting of the sulfide ores causes the loss of 4–96% Au and 13–26% Ag, and should be avoided. From the above results K. insists that in smelters where acidic ores are used in a large quantity, the basicity of the slag should be carefully regulated. K. SOMEYA

Rapid determination of silicon in iron-silicon alloys by density measurements. W. DENECKE. *Giesserei-Ztg.* 25, 304–6(1928).—Schlumberger's method is applied to Fe-Si alloys contg. smaller percentages of Si,  $\text{C}_2\text{H}_6$  being used as volumeter liquid. Alloys contg. less than 21% Si gave a remarkable distribution of results. B. C. A.

The use of tantalum as cathode for the electrodeposition of copper. LESTER W. STROCK AND HIRAM S. LUKENS. *Trans. Am. Electrochem. Soc.* 56 (preprint) 9 pp. (1929).—Details of procedure are given. C. G. F.

Method for the rapid detection of tungsten in ores. A. PETROVSKII. *Z. anal. Chem.* 77, 268–9(1929).—Treat 0.1–0.2 g. of the powder with a small piece of Pb and heat 1–2 min. with concd. HCl. If W is present a blue color will develop. On adding 10–15 cc. of water a volatile blue ppt. is formed. If very little W is present or the reduction is carried further, the ppt. is green or brown. If the water is not added after the boiling with HCl, a bluish red soln. is obtained; when the HCl is evapd. off, a blue  $\text{W}_2\text{O}_8$  ppt. is formed and the soln. is yellow with  $\text{WO}_3$ . This test will serve to detect 0.5% of W in an ore. Ti, V, Nb and Mo interfere by giving similar colors upon reduction, but Nb is the only one that gives first a blue and then a brown color. The Nb blue, however, is not as deep and disappears upon addn. of water. W. T. H.

Determination of vanadium in steel. J. KASSLER. *Z. anal. Chem.* 77, 290–8 (1929).—Heat 3.75 g. of steel in a 300-cc. Erlenmeyer flask with 40 cc. of 6 N  $\text{H}_2\text{SO}_4$ . As soon as the evolution of H slackens, stopper the flask with a Contat or Gockel valve contg.  $\text{NaHCO}_3$  soln. Continue heating until all the metal has been attacked and the Fe is practically all in soln. as  $\text{FeSO}_4$ . Remove the valve, dil. with 100 cc. of water and add an aq. suspension of ZnO in small portions until an excess is present as shown by the appearance of turbidity. This serves to ppt. the small quantity of V

that went into soln. while the  $\text{Fe}^{++}$  remains in soln. Stopper the flask and shake vigorously for 1 min. Cool quickly, filter promptly and wash 2–3 times with cold water. There is a slight oxidation of the  $\text{Fe}^{++}$ , but if the manipulation has been correct, not more than 0.25 g. of  $\text{Fe}^{+++}$  at the very most will be found in the ppt. which will contain all of the V. By means of  $\text{ZnO}$ , therefore, a fairly good sepn. of V and Fe can be accomplished. Place the filter in a beaker, add 100 cc. of hot, 6 N HCl and after about 10 min. action at  $90^\circ$  boil gently and oxidize with 10 cc. of concd.  $\text{HNO}_3$ . Allow the hot soln. to stand for about 10 min. to permit the complete oxidation of the W. Filter and wash with hot, dil. HCl. The V in this  $\text{WO}_3$  ppt. is best detd. colorimetrically. To accomplish this, rinse off the  $\text{WO}_3$  from the filter, dissolve it in NaOH soln., add  $\text{H}_2\text{O}_2$  and considerable  $\text{H}_2\text{SO}_4$ . Compare the color with that of a known V soln. treated similarly. If the  $\text{WO}_3$  contained enough Fe to cause a little difference in shade, this difficulty can be overcome in the colorimetric comparison by adding a few cc. of 2%  $\text{FeCl}_3$  to the standard V soln. Take the filtrate from the  $\text{WO}_3$  ppt., which contains almost all of the V, and nearly neutralize with NaOH soln. Add 10 cc. of 3%  $\text{H}_2\text{O}_2$  to oxidize any quadrivalent V and boil 5 min. to remove the excess peroxide. In the case of unalloyed and lightly alloyed steels, add 1 g. of  $\text{FeCl}_3$  to make sure that the Cr is completely pptd. by the next treatment. Pour the clear, hot soln. in a thin stream into 130 cc. of hot, 30% NaOH contained in a porcelain dish. Boil, transfer to a 500 cc. measuring flask, cool, make up to the mark, mix and filter through a hardened filter. Take 400 cc. of the filtrate (3 g. of the steel) in a liter flask, make slightly acid with concd. HCl, boil off the  $\text{CO}_2$  and add 20 g. of  $\text{NH}_4\text{Cl}$ . Neutralize with concd.  $\text{NH}_4\text{OH}$ , add 25 cc. in excess and ppt. the V by adding a soln. of 10 g.  $\text{MnCl}_2$  and 5 g. of  $\text{NH}_4\text{Cl}$  in 50 cc. of water. Boil half a min., cool and filter. Wash the flask and filter with 3 portions of cold water. Place the same flask under the filter and dissolve the  $\text{MnNH}_4\text{VO}_4$  ppt. in 50 cc. of hot, 6 N  $\text{H}_2\text{SO}_4$  contg. 5 cc. of 3%  $\text{H}_2\text{O}_2$ . Boil the soln. to remove excess peroxide, oxidize the last traces with a little  $\text{KMnO}_4$ , reduce the V with  $\text{SO}_2$  in the usual way and finally titrate at  $60^\circ$  with  $\text{KMnO}_4$  after removing the excess  $\text{SO}_2$  with  $\text{CO}_2$ . Test analyses were made by adding  $\text{V}_2\text{O}_5$  to solns. of steel; the results were very good.

W. T. H.

Dilatometric analysis of some non-metallic substances: minerals, rocks and industrial products. A. PORTEVIN AND P. CHEVENARD. *Chimie & industrie* Special No., 343–53 (Feb., 1929).—Expansion curves obtained by means of the Chevenard differential recording dilatometer (C. A. 11, 2743) at various temps. up to about  $1100^\circ$ , with quartz, topaz, orthite, feldspar from Saint-Yrieix, magnetite, siderite, wolframite, pyrolusite, chromite, pyrites, fused  $\text{MgO}$ , hornblende granite, mica shale from Mount Blanc, black mica granite from Calvados, basalt, fine-grained limestone (used as flux in steel making), enamel for crockery ware, refractory clay brick and fused basalt are given and discussed.

A. PAPINEAU-COUTURE

Determination of chromic anhydride in chromites. B. LOGINOV. *J. Chem. Ind. (Moscow)* 6, 430–1 (1929).—Fuse 0.2 g. of chromite for 4 min. with excess  $\text{Na}_2\text{O}_2$  in a glass test tube. Otherwise the procedure is conventional. BERNARD NELSON

Note on the detection of phosphoric acid by means of ammonium molybdate and benzidine. F. FEIGL. *Z. anal. Chem.* 77, 299–300 (1929).—To avoid interference by sol silicates or borates it is now recommended to carry out the test as follows: Place a drop of the soln. to be tested on a filter paper and add 1 drop of  $(\text{NH}_4)_2\text{MoO}_4$  soln. contg. 15% of tartaric acid. Add 1 drop of benzidine and hold the paper over an open ammonia bottle. When the molybdate soln. contains tartaric acid, it is possible to detect 0.0015 mg. of  $\text{P}_2\text{O}_5$  in the drop by the blue color even when considerable arsenite, borate or sol. silicate is present.

W. T. H.

Detection of phosphoric acid in minerals and rocks. H. LEITMEIER. *Mikrochem.* 6, 144–8 (1928).—The sensitive phosphomolybdic acid-benzidine reaction may be applied to the detection of phosphates in minerals, etc. A little of the powd. material on a filter-paper or a scratch on a porcelain plate is treated in the manner described (Feigl, C. A. 22, 4082). The localization of phosphates in minerals may be detd. by pressing a filter paper moistened with nitric acid-molybdate soln. against a section. This paper is then brought into contact with a second paper moistened with benzidine soln. and finally held in  $\text{NH}_3$  vapor. The blue regions correspond with the positions of the phosphatic constituents.

B. C. A.

Iodometric determination of thiocyanate. ALFRED SCHWICKER. *Z. anal. Chem.* 77, 278–80 (1929).—By using a soln. of  $(\text{NH}_4)_2\text{BO}_3$  as neutralizer, the reaction  $\text{CNS}^- + 3\text{I}_2 + 4\text{H}_2\text{O} \rightarrow \text{SO}_4^{--} + 6\text{I}^- + \text{HCN} + 7\text{H}^+$  will proceed to completion within a few min. and the excess I can be titrated with thiosulfate. To 50 cc. of 0.1 N I soln. add 10–30 cc. of thiocyanate soln. (corresponding to 0.5–3 milli-equiv. of I). After

2 min., add 20 cc. of  $(\text{NH}_4)_2\text{BO}_3$  soln. (prepd. by dissolving 20 g. of  $\text{H}_3\text{BO}_3$  in 170 cc. of 6 N  $\text{NH}_4\text{OH}$  and dilg. to 1 l.) and titrate with  $\text{Na}_2\text{S}_2\text{O}_3$  soln. W. T. H.

Some convenient methods for the analysis of galvanizing and tin-plating materials. C. HOPKINS. *Sheet Metal Ind.* 2, 137-8, 179-80(1928); *J. Inst. Metals* 40, 587—Details are given for the detn. of Pb (by the molybdate method), Fe, Cu, Cd and Sn in spelter used for galvanizing, of moisture,  $\text{NH}_4\text{Cl}$  and Fe in galvanizing flux, and of Zn and Cl in flux skimmings, for the analysis of Zn ashes, Sn dross, flue-dust, tinning flux ( $\text{ZnCl}_2$  soln.) and palm-oil, and for the detn. of the amt. of Zn or Sn in galvanized or tinned plates. H. L. D.

Analysis of a lead-barium-calcium alloy with lead as chief constituent. KUMAO TANIYAMA. Tokyo Imp. Univ. *Japan J. Mining* 44, 1004-17(1928).—The method recommended involves the soln. of the alloy in  $\text{HNO}_3$ , electrolytic sepn. of Pb as  $\text{PbO}_2$ , pptn. of the Ba as  $\text{BaCrO}_4$  and of Ca as  $\text{CaC}_2\text{O}_4$ . K. SOMEYA

Decomposition of silicates by strontium salts for the determination of alkali metals. J. KAVINA. *Chem. Listy* 22, 289-94(1928); cf. *C. A.* 23, 1592.— $\text{SrCO}_3$  can be substituted for  $\text{CaCO}_3$  in the J. Lawrence Smith method. W. T. H.

Electrometric determination of small quantities of lead ion. HORACE MILLER. *Trans. Faraday Soc.* 25, 147-52(1929).—A study was made of the electrochem. behavior of Pb in neutral and acid solns. of Pb salts at  $25^\circ$ . A Pb electrode prepd. by electro-depositon of Pb upon Pt in the presence of gelatin functions well in neutral solns. of low Pb ion concns., but less satisfactorily in acid solns. With a Pb amalgam as electrode, very small concns. of Pb may be detd. in acid soln. provided  $\text{O}$  and  $\text{CO}_2$  be excluded. The Pb electrode functions best in solns. of high ionic strength. The observed activity coeffs. of Pb ion may be expressed by a modified Debye-Hückel equation. L. B. MILLER

New analytical determination of the sulfate ion. D. KÖSZEGI. *Z. anal. Chem.* 77, 203-9(1929).—The following modification of the well-known chromate method is proposed: To the hot slightly acid soln. of not over 0.1 g. of sulfate, add an excess of 0.1 N  $\text{BaCl}_2$  corresponding to about 0.25 milli-mol. of Ba. Boil 5 min., add 5-6 g. of  $\text{NaOAc}$  and 20-25 cc. of 0.1 N  $\text{K}_2\text{Cr}_2\text{O}_7$ . Then cool the contents of the flask, make up to exactly 200 cc., mix and filter. In 100 cc. of the filtrate det. the excess  $\text{Cr}_2\text{O}_7^{--}$  by adding 1 g. of KI, 10 cc. of concd.  $\text{HCl}$  and 0.1 N  $\text{Na}_2\text{S}_2\text{O}_3$  to the starch end point. W. T. H.

Methone as aldehyde reagent. D. VORLÄNDER. *Z. anal. Chem.* 77, 241-68(1929).—Methone (5,5-dimethylresorcinol) as a test for the carbonyl group has the advantage that it does not react at all with ketones in aq.-alc. solns. In this paper, the results obtained with methone and some 50 aldehydes are described and the ultimate analysis of the methone-aldehyde compds. agreed closely with the theoretical values. W. T. H.

Some reactions of the primary arsines. S. S. NAMETKIN AND VASEVOLOD NEKRASOV. *Z. anal. Chem.* 77, 285-9(1929).—Expts. with methylchloroarsine, ethylchloroarsine,  $\beta$ -chlorovinylchloroarsine and phenylchloroarsine showed that when 1 cc. of 0.1% aq. soln. was treated with 2-3 drops of satd.  $\text{H}_2\text{S}$  water a distinct turbidity was formed by the reaction  $\text{RASCl}_2 + \text{H}_2\text{S} = 2\text{HCl} + \text{RAS}$ . The test was less satisfactory in alc. solns. Tests with some 8 different salt solns. failed to give any means of characterizing the above substituted arsines but with  $\text{HgNO}_3$  soln it was found that the first of the above-mentioned compds. gave a dark gray ppt. contg. metallic Hg, the second gave a white ppt. which turned gray within a few secs., the third gave a white ppt. which turned gray in 12 hr. and the fourth was not oxidized by the  $\text{HgNO}_3$  even after long standing, giving a white ppt. only. If the soln. is heated, however, even the last ppt. is oxidized by the  $\text{HgNO}_3$  soln. and free Hg is formed. This test with  $\text{HgNO}_3$  is less sensitive than the  $\text{H}_2\text{S}$  test but can be used for the differentiation of these substances. W. T. H.

Quantitative examination of mixtures of benzene, benzene and alcohol. AUG. NOLL. *Chem. tech. Fabrik.* 26, 65-7, 69-70(1929).—An exptl. series of known mixts. of benzene, benzene and alc. was analyzed by treating with varying amts. of sulfonating acids, which led to a quant. method. The presence of alc. is first detected by treating a few cc. of the sample with a small quantity of benzoic acid and a few drops of concd.  $\text{H}_2\text{SO}_4$ ; on heating, the presence of alc. is shown by the characteristic odor of benzoic ethyl ester. Benzene is detected by gently warming the sample with a 1:2  $\text{HNO}_3$ - $\text{H}_2\text{SO}_4$  mixt. and noting the oil of bitter almond odor of nitrobenzene. Quantitative — To 10 cc. of the sample in a flask with a graduated neck add  $\text{CaCl}_2$  soln., d. 1.3, and shake frequently during 15 min.; fill to the mark with  $\text{CaCl}_2$  soln. and read off the resulting contraction in vol. due to alc. and its accompanying  $\text{H}_2\text{O}$ . To det. the % abs. alc.

add to 100 cc. of the sample in a separatory funnel 100 cc. of the  $\text{CaCl}_2$  soln. and shake well. When sepn. is clear, draw off  $\text{CaCl}_2$  soln. and repeat the treatment; unite the 2  $\text{CaCl}_2$  solns., distil 100 cc. and det. the sp. gr. of the distillate to find % of abs. alc. To find % benzene, dry the hydrocarbons left in the separatory funnel with ignited  $\text{Na}_2\text{SO}_4$ , filter, and shake 10 cc. of the filtrate with 50 cc. of " $\text{H}_2\text{SO}_4$ -oleum" mixt. (80 vol.  $\text{H}_2\text{SO}_4$  plus 20 vols. oleum of 20%), fill to mark with concd.  $\text{H}_2\text{SO}_4$ , allow to settle 1 hr. and note reading; the % compn. of the original mixt. can be calcd. from the data found. P. ESCHER

**The determination of aldoses.** F. PIRRONI AND L. IRRERA. *L'industria chimica* 4, 105-6(1929).—The basis of the method is the reaction  $\text{R}\cdot\text{CHO} + \text{I}_2 + \text{H}_2\text{O} = \text{R}\cdot\text{COOH} + 2\text{HI}$ , which takes place in alk. soln. Into a 150-cc. stoppered bottle place 20 cc. of 0.1  $N$   $\text{I}_2$  soln. and 30 cc. of 10%  $\text{Na}_2\text{CO}_3$  soln. Cool to  $0-1^\circ$  and then add 10 cc. of 1% aldose soln. Keep  $2\frac{1}{2}$  hr. at  $0-1^\circ$ . Then add 5 cc. of 2  $N$   $\text{HCl}$  and titrate the excess  $\text{I}_2$  with 0.1  $N$   $\text{Na}_2\text{S}_2\text{O}_3$ . This method has been found satisfactory with erythrose, rhamnose, apiose, glucose and mannose. A. W. CONTIERI

**Determination and characterization of allantoin.** R. FOSSE AND MILLE. V. BOSTYK. *Compt. rend.* 188, 106-9(1929).—Allantoin is hydrolyzed in acid media to give glyoxylic acid (1 mol.) and carbamide (2 mols.). Allantoin may be detected by heating the sample, slightly acidified with  $\text{HCl}$ , for 1 min. at  $100^\circ$  and adding 1% phenylhydrazine- $\text{HCl}$  (4 drops), followed, after cooling, by 5%  $\text{K}_3\text{Fe}(\text{CN})_6$  (2 drops) and concd.  $\text{HCl}$  (1.5 cc.). An immediate red coloration indicates allantoin. B. C. A.

**Sources of error in organic microelementary analysis. II. Determination of carbon and hydrogen.** F. BÖCK AND K. BRAUCOURT. *Mikrochem.* 6, 133-43(1928); cf. Friedrich, *C. A.* 23, 1840; 18, 29.—A critical discussion. Errors due to the presence of C and H compds. in the O, etc., used and impurities given off by rubber connections may be avoided by the insertion of a platinized asbestos catalyst followed by a bubbler and absorption vessel in front of the combustion tube. B. C. A.

**Bromometric determination of phenol and of the cresols.** HUGO DITZ. *Z. anal. Chem.* 77, 202(1929).—Järvinen has recently claimed that all the older methods for the examn. of substances like lysol are unsatisfactory but it is pointed out in this paper at considerable length that J. has merely utilized principles involved in methods previously published by D. and his collaborators and, moreover, the procedure advocated is subject to some criticism. W. T. H.

**Separation and determination of ortho- and pyrophosphoric acids.** W. STOLLENWERK AND A. BAURLE. *Z. anal. Chem.* 77, 81-111(1929).—Pyrophosphates apparently exist in isomeric forms. The soly. in water changes with the duration of heating and by contact with a liquid which does not dissolve the salt. The d. of the sample changes also. Thus, a sample of  $\text{Na}_2\text{H}_2\text{P}_2\text{O}_7$  showed a d. of 2.33 when freshly prepd. and of 2.59 after standing 6 months in contact with xylene. Methods described in the literature for sepg.  $\text{H}_4\text{P}_2\text{O}_7$  from  $\text{H}_3\text{PO}_4$  based on the different solubilities of Ag, Cu, alk. earth, Mg, Be, Al and Pb salts were tested and it was found that the use of alk. earth ions alone permitted a satisfactory sepn. To carry out an analysis it is necessary to make sure that the precipitant ( $\text{Ba}(\text{OH})_2$ ) is protected from the  $\text{CO}_2$  in the air. This is accomplished by the usual soda-lime tube. The reagent should flow into a buret, which is likewise protected, and the buret should lead directly into a stoppered flask through a Y-tube, the open end of which can also be connected to a soda-lime tube. For the detn. of  $\text{NaH}_2\text{PO}_4$ ,  $\text{Na}_2\text{HPO}_4$ ,  $\text{Na}_2\text{H}_2\text{P}_2\text{O}_7$  or  $\text{Na}_4\text{P}_2\text{O}_7$  alone, dissolve 1 g. of the salt in 200 cc. of water and mix well. Take 10-25 cc. of the soln. and dil. to 50 cc. Heat to boiling and add a measured vol. of 0.25  $N$   $\text{Ba}(\text{OH})_2$  soln. (50-200 cc.). Cool out of contact with  $\text{CO}_2$ , make up to exactly 200 cc., mix and allow to stand overnight. Take 100 cc. of the supernatant, clear soln. and det. the excess Ba as  $\text{BaSO}_4$ . The ppt. formed will be  $\text{Ba}_3(\text{PO}_4)_2$  with an orthophosphate and  $\text{Ba}_2\text{P}_2\text{O}_7$  with a pyrophosphate. Or, the excess Ba can be detd. by titration. For the detn. of phosphate and pyrophosphate in the presence of one another, first det. the quantity of Ba required to react with both, by adding a measured vol. of  $\text{Ba}(\text{OH})_2$  soln. and detg. the excess as  $\text{BaSO}_4$ . Then, in another sample, det. the total  $\text{P}_2\text{O}_5$  by v. Knorre's method, which consists in adding  $\text{CaCl}_2$  to the neutral soln. and then titrating with  $\text{Ba}(\text{OH})_2$ , phenolphthalein being used as indicator. Best results are obtained when the  $\text{CaCl}_2$  treatment is made at  $80^\circ$ . From these data the quantities of the 2 phosphates can be computed in the usual way. W. T. H.

Action of  $\text{BrCN}$  and  $\text{HCN}$  on  $\text{TiBr}_4$  (OBERHAUSER, SCHORMÜLLER) 6. The determination of N by the Kjeldahl method as applied to dyestuffs and intermediate products (SISLEY, DAVID) 25. Recovery of Pt (HOUGHT) 6.

WATTERSON, N. F.: **Elementary Qualitative and Volumetric Analysis.** London: Cambridge Univ. 69 pp. 2s. 6d.

## 8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY AND J. F. SCHAIKER

**Optical properties of some artificial minerals.** P. GAUBERT. *Bull. soc. franç. minéral.* 50, 504-15(1927).—Values of  $n_D$  for various artificial minerals are:  $MgAl_2O_4$  (colored red by Cr or blue by Co) 1.721; *gahnite*,  $ZnAl_2O_4$  (colored red by Cr), 1.80; corundum,  $Al_2O_3$ ,  $\omega$  1.7689,  $\epsilon$  1.7609,  $d$  3.988;  $3Ca_3(PO_4)_2$ ,  $CaCl_2$ ,  $\omega$  1.642,  $\epsilon$  1.637;  $3Sr_3(PO_4)_2$ ,  $SrCl_2$ ,  $\omega$  1.658,  $\epsilon$  1.664;  $3Ba_3(AsO_4)_2$ ,  $BaCl_2$ ,  $\omega$  2.14,  $\epsilon$  2.13; *monetite*,  $CaHPO_4$ ,  $n_\alpha$  1.623,  $n_\gamma$  1.604,  $d$  2.928 (trigonal); rhombic  $SrHPO_4$ ,  $n_\alpha$  1.625,  $n_\gamma$  1.608,  $BaHPO_4$ ,  $n_\alpha$  1.635,  $n_\gamma$  1.617; *iron-leucite* 1.619,  $d$  2.59; *K silicoberyllate* 1.523,  $d$  2.531; *Na silicoberyllate*,  $Na_2B_6Si_4O_{37}$ , 1.545-1.532,  $d$  2.552; *Na silicotitanate*,  $Na_4Si_4Ti_2O_{20}$ ,  $n_\alpha$  1.655,  $n_\gamma$  1.623,  $d$  2.88.

**The crystal structure of covellite.** H. S. ROBERTS AND C. J. KSANDA. *Am. J. Sci.* [5], 17, 489-503(1929).—The structure of natural and synthetic covellite as revealed by the spectrometer using the oscillation method and by the x-ray powder method is hexagonal with  $a_0 = 3.802$  A. U.,  $c_0 = 16.43$  A. U., and  $c_0/a_0 = 4.321$ . The unit cell contains 6 Cu atoms and 6 S atoms in Wyckoff's special positions (d) and (f), and (a) and (e) resp. of space group  $D_{6h}^4$ , where  $u_{Cu} = 0.093$  and  $u_S = 0.126$ . No other combinations of special cases in  $D_{6h}^4$  satisfied the test of comparing calculated with observed intensities. The perfect basal cleavage and possible gliding parallel to the base are explained by the assigned structure. H. W. WALKER

**Löllingite from the Hazaribagh district, Bihar and Orissa.** A. L. COULSON. *Records Geol. Survey India* 61, 325(1928).—Three specimens on analysis all showed abundant Fe and As and a little S. The pure löllingite (sp. gr. 7.4) contained a little Sb but no Co or Bi. Of the 2 impure specimens one (sp. gr. 7.05) contained a little Sb and Bi but no Co and the other (sp. gr. 6.55) contained a little Bi but no Sb or Co.

**Leucopyrite from Kodarma.** A. L. COULSON. *Records Geol. Survey India* 61, 206(1928).—Qual. tests showed abundant As, Fe, little S, traces of Sb and no Bi, Co or Ni; sp. gr. = 7.02. The mineral occurs in a mine on the schist foot-wall at a contact with pegmatite. ALDEN H. EMERY

**A zinc spinel from southern India.** W. A. K. CHRISTIE AND A. L. COULSON. *Records Geol. Survey India* 61, 315-7(1928).—A mineral found at Tummalatalapur had the following properties: cleavage indistinct, fracture conchoidal, brittle, hardness 8, sp. gr. 4.55, luster vitreous, color greenish black,  $n_D = 1.802 \pm 0.002$ . It showed on analysis:  $SiO_2$  0.12,  $ZnO$  38.9,  $MnO$  0.52,  $FeO$  4.67,  $Al_2O_3$  54.66,  $Fe_2O_3$  0.81,  $H_2O$  (below  $108^\circ$ ) 0.02,  $H_2O$  (above  $108^\circ$ ) 0.11%. This is a normal *gahnite* with both  $ZnO$  and  $Al_2O_3$  replaced to a small extent by Fe oxides. ALDEN H. EMERY

**Further note on the nomenclature of hollandite.** L. LEIGH FERMOR. *Records Geol. Survey India* 61, 146(1928).—Cf. C. A. 13, 105. ALDEN H. EMERY

**Fine structure of feldspars.** E. SCHIEBOLD. *Trans. Faraday Soc.* 25, 316-20(1929).—See C. A. 23, 1368. E. C. M.

**Mode of occurrence and chemical composition of beryl from Nellore with a note on its industrial and chemical applications.** V. S. SWAMINATHAN. *Trans. Mining Geol. Inst. India* 22, 258-67(1928).—Two new analyses of beryl from the Lakshminarayana and Kubera quarries gave, resp.:  $SiO_2$  67.28, 64.78;  $Al_2O_3$  16.10, 16.56;  $Fe_2O_3$  0.43, 1.99;  $B_2O_3$  13.51, 13.53;  $CaO$  0.48, 0.52;  $Na_2O$  0.64, 0.56;  $Li_2O$  both gave a trace;  $H_2O$  1.60, 2.10; totals 100.04, 100.04%. No new industrial applications are given. J. F. SCHAIKER

**Structural relation between beryl and cordierite.** B. GOSSNER. *Centr. Mineral. Geol.* 1928A, 204-7.—Cordierite has  $a$  9.78,  $b$  17.1,  $c$  9.33 A. U. with 4 mols. of  $Mg_3Si_2O_{12} \cdot 2Al_2O_3$  in the unit cell. The structure is compared with that of beryl. B. C. A.

**Crystal structure of zircon.** L. VEGARD. *Z. Krist.* 67, 482-4(1928).—Polemic (cf. Wyckoff and Hendricks, C. A. 22, 2125). B. C. A.

**Betafite from Sludianka, E. Siberia.** G. CHERNIK. *Bull. soc. franç. minéral.* 50, 485-9(1927).—Betafite, black octahedra, often combined with dodecahedra,  $d$  4.82-4.93, contained:  $MgO$  0.13,  $CaO$  3.93,  $PbO$  0.10,  $MnO$  0.15,  $FeO$  1.20,  $Fe_2O_3$  2.25,  $Al_2O_3$  0.24, Ce earths 1.61, Y earths 13.11,  $UO_3$  26.37,  $ThO_2$  1.30,  $SnO_2$  0.37,  $TiO_2$  16.51,  $SiO_2$  0.59,  $Cb_2O_5$  37.36,  $Ta_2O_5$  1.46,  $H_2O$  2.47%. B. C. A.



The composition and nomenclature of chlorophaeite and palagonite, and the chlorophaeite series. L. LEIGH FERMOR. *Records Geol. Survey India* 60, 411-30 (1928); cf. C. A. 20, 1197, 3414.—Chlorophaeite is a gel-mineral of compn. varying within the limits of the general formula  $2\frac{1}{2} \text{H}_2\text{O} \cdot 5\text{R}_2\text{O}_3 \cdot 20\text{SiO}_2 + n(\text{RO} \cdot \text{H}_2\text{O}) + (80 - 4n)\text{H}_2\text{O}$ . Four analyses from Nagpur, Edinburgh, Scur Mohr and Giant's Causeway give  $n = 7, 8, 11$  and  $14$ , resp. Sp. gr. and refractive indices (1.47-1.54) increase with  $n$ . Analyses showed:  $\text{SiO}_2$  32.95-36.0,  $\text{Al}_2\text{O}_3$  1.0-10.49,  $\text{Fe}_2\text{O}_3$  11.89-22.8,  $\text{FeO}$  1.63-9.18,  $\text{MnO}$  0.08-0.5,  $\text{CaO}$  2.51-5.15,  $\text{MgO}$  4.75-10.52,  $\text{Na}_2\text{O}$  trace -1.68,  $\text{K}_2\text{O}$  trace -0.36,  $\text{H}_2\text{O}^+$  4.98-9.04 and  $\text{H}_2\text{O}^-$  14.16-27.44%. Palagonite is a chlorophaeite-bearing rock. It can be formed by modification and hydration of sideromelane (basalt-glass). Neotocite has  $n = 16$  and may be regarded as a manganese-chlorophaeite. F. advocates the abolition of the term sideromelane in favor of inclusion of this rock under tachylite.

ALDEN H. EMERY

Helium content and the age of meteorites. FRITZ PANETH, H. GEHLEN and P. J. GÜNTHER. *Z. Elektrochem.* 34, 645-52(1928).—App. for detg. the He content of rocks has been modified to det. that of stony and Fe meteorites. They are dissolved or decompd. by fusion in the absence of air. The relation of Th and U content to He is discussed. Portions of meteorites can be identified by detg. the He content, which varies in meteorites from  $2 \times 10^{-10}$  to  $2 \times 10^{-8}$  cc./g., being greater in the stony ones.

J. F. SCHAIER

A new Indian meteorite: The Lua fall. A. L. COULSON. *Records Geol. Survey India* 61, 318-24(1928).—Four stones with a total recovered wt. of 9240.75 g. are known to have fallen in the region of Lua, Dongia and Dabra about 4 p. m., Sept. 14, 1926. All are fractured fragments except the Lua fall (8632 g.). All exhibit chondritic structure (olivine) with nickel-iron and troilite between the chondri. Fibrous enstatite also occurs.

ALDEN H. EMERY

Operative causes in ore deposition. H. C. BOYDELL. *Bull. Inst. Mining Met.* No. 296, 15-24(1929); cf. C. A. 23, 2395.—A further discussion of the silicification of limestones by the reaction of silica-bearing solns. on  $\text{CaCO}_3$ . J. F. SCHAIER

Deposition of ore in pre-existing limestone caves. R. T. WALKER. *Am. Inst. Mining Met. Eng., Tech. Publ.* No. 154, 43 pp.(1928).—The criteria which serve to characterize and distinguish ore bodies occupying pre-mineral caves in limestone are: (1) the presence of pre-mineral cave-earth, breccia and soln. faces; (2) a pipe-like shape; (3) casual and capricious relationship to pre-mineral fissures; (4) erratic and inconst. course; (5) unusual persistency and continuity of mineralization; and (6) uniformity of cross section.

J. F. SCHAIER

Mineralized volcanic explosion pipes. R. T. WALKER. *Eng. Mining J.* 126, 895-8, 939-42(1926).—A description of the field relations of volcanic explosion pipes and their relation to ore deposition.

J. F. SCHAIER

The influence of old glacial levels on the weathering of the ore deposits of Levico-Vetriolo. RICHARD CANAVAL. *Montan. Rundschau* 19, 643-7(1927).—A geological discussion. Analyses of waters are given, that at Levico-well being the most acid and Fe-rich of the group of As-bearing Fe sulfate waters.

J. F. SCHAIER

An example of the periodic precipitation in contact ore deposits. MANJIRO WATANABE Tôhoku Imp. Univ. *J. Petrology, Mineralogy and Ore Deposits* 1, 76-7(1929).—The occurrence of a structure resembling the periodic pptn. in high temp. ore deposits as in contact ore deposits is very rare and has as yet not been described. W. observed recently that in the Kamioka mine, Gifu Prefecture (Japan), galena and sphalerite are arranged in a manner closely resembling that of the pptn. of  $\text{Ag}_2\text{Cr}_2\text{O}_7$  in a gelatin soln., the intervening space being filled with gray ferruginous pyroxene.

K. SOMEYA

The iron ore deposits of the northern Shan States. J. COGIN BROWN. *Records Geol. Survey India* 61, 180-95(1928).—Descriptive.

ALDEN H. EMERY

Manganese-ore mining by underground methods in the Central Provinces. B. V. MELLON. *Trans. Mining Geol. Inst. India* 23, 80-5(1928).—An av. analysis of the ore from the Balaghat deposit shows Mn 50, P 0.07,  $\text{SiO}_2$  5 and Fe 5%.

J. F. S.

The chromium deposit at Pteri in northern Greece. P. LEPEZ. *Métall. u. Erz* 26, 85-7(1929); cf. C. A. 23, 581.—The geography and geology of the district are briefly described. The ore contains 47-52%  $\text{Cr}_2\text{O}_3$ .

J. BALOZIAN

Gold mining in Outer Mongolia. EDWIN W. MILLS. *Mining J.* (London) 165, 399-402(1929).—At least 19 places have a definitely recorded production from 1901 to 1919 of about \$6,000,000 worth of Au. Probably  $\frac{1}{2}$  more is not reported. Au-quartz veins were opened in 1915 and until 1919 had produced about \$350,000 worth of Au. Accessibility of deposits, raw materials and individual operations are discussed.

ALDEN H. EMERY

Some notes on the tin fields of South-west Africa. O. G. HELDRING. *Mining J.* (London) 161, 371-2, 386-7, 410, 432-3, 460(1928).—The Sn deposits of S. W. Africa lie in a wide belt around the Erongo Mts. A detailed description of their geology is given. The metalliferous deposits are zonally arranged in pegmatite-aplite-quartz veins—oxides and oxy-salts of metalloids such as Sn, W, Fe, Ti, Ta, Ni, etc., in the lowest zone, sulfides and arsenides in the middle, and carbonates in the highest. ALDEN H. EMERY

The genesis of the crystalline magnesite deposits of the Alps. MIHÁLY RÓZSA. *Földtani Közlöny* 55, 385-6(1926); cf. C. A. 20, 1046.—Magnesite, which forms large deposits in Austria, is formed by ascending magnesium hydrocarbonate-bearing solns. The dolomite deposits have a similar origin and are formed by the action of these solns. on limestone ( $\text{CaCO}_3$ ). J. F. SCHAIERER

Barite from the Anantapur district, Madras. A. L. COULSON AND A. K. DEY. *Records Geol. Survey India* 60, 431(1928).—Barite veins (3-11 ft. wide) occur in slates and limestones. The color is white to light green and faint pink; sp. gr. = 4.4.

Barite in Orchha State. A. L. COULSON. *Records Geol. Survey India* 60, 431-2 (1928).—Barite assoc. with equal amts. of quartz and a little chalcocopyrite occurs, as a vein in gneiss. ALDEN H. EMERY

General report for 1927. EDWIN PASCOE. *Records Geol. Survey India* 61, 1-140 (1928).—Among other items, P. describes various occurrences of chalcantite, clay, corundum, garnet, gems, Au, Fe ore, kyanite, limestone, malachite, Mn ore, marble, mica, monazite, petroleum, pyrite, pyrrhotite, ruby, salt, sandstone, sapphire, sillimanite, spinel, tin, etc., in India. ALDEN H. EMERY

The mineral production of India during 1927. L. L. FERMOR. *Records Geol. Survey India* 61, 207-93(1928).—The value of mineral production in India in 1927 (about \$115,000,000) decreased 11.2% from 1926. These minerals in order of importance are coal (about \$35,000,000), petroleum (about \$22,000,000), Mn, Pb, Au, bldg. materials, salt, Ag, mica, Zn, Sn, Fe, Cu, saltpetr, chromite, W ore, ilmenite, jadeite, ruby-sapphire-spinel, clay, magnesite, Ni, Sb-Pb, zircon, steatite, gypsum, monazite, diamonds, bauxite, ocher, amber, refractories, alum, fuller's earth, asbestos, Sb, apatite, barite, corundum, soda, Bi, borax and Cu. The production and economic condition of these minerals are individually discussed in some detail. A. H. E.

The mineral wealth of the Black Hills. JOSEPH P. CONNOLLY AND CLEOPHAS C. O'HARRA. South Dakota School of Mines, *Bull.* No. 16, 13-418(1929). This comprehensive bulletin reviews the mineral productivity of the region to date. The manner in which mineral deposition has taken place is discussed and some of the possibilities of future development are pointed out. E. J. C.

Geological aspects of the formation of coal. CYRIL S. FOX. *Mining J.* (London) 164, 203-4, 237, 246-7; *Colliery Guardian* 138, 2204-6, 2309-11(1929).—Coal is found in India in rocks from the Lower Cambrian to the Upper Pliocene. The richest workable seams are of the Lower Gondwana period and occur in the Damuda Valley where the coal-bearing series (Damuda) is 7000 ft. thick. In the Jharia field, the lowest stage of this series (Barakar) has 18 workable seams totaling 200 ft. of coal. In the upper stage (Raniganj) there are 6 seams of 50 ft. total thickness. In both stages shales usually underlie and sandstones overlie the coal. In Assam and Burma (Pegu) the coal measures occur locally faulted and folded in Tertiary rocks closely associated with petroleum. The 2 are usually present in inverse proportion. In N. W. India, Baluchistan, the Punjab Salt Range and Jammu (Kashmir) workable coal occurs in the Laki stage (Eocene) associated with oil. Indian coals range from the brown lignite of Bikanir to the anthracite of Jammu. A table of 34 analyses of Gondwana coals shows a range in composition of (moisture-free basis): volatile matter 14.1-34.8%, fixed C 48.9-68%, ash 9.0-21.13% and moisture 0.65-11.0%. F. concludes that the variety of coal is indicative of the stage of its maturity. The vitrain of Gondwana coals is strongly coking. Petrographic examn. of thin sections of Indian coals shows them to be completely permeated by a substance of remarkable uniformity. In sections parallel to the bedding this behaves as an isotropic mineral; at right angles it behaves as an uniaxial mineral, giving straight extinction parallel to the lamination. It is probably colloidal matter in a state of strain caused by pressure. F. holds that the fundamental coal substance is a colloid, which when freshly formed has been identical in all coals. It is the product of chemical breakdown of cellulose, lignin and suberin to a common jelly, which by hardening and devolatilization forms vitrain. The quality of the vitrain is a measure of the degree of maturity of the coal. Coalification is due to chem. changes and not to bacterial activity, which must have ceased soon after submergence of the debris. ALDEN H. EMERY

**The chemistry of coal.** RICHARD BRUNNER. *Z. oesterr. Ver. Gas- u. Wasserfach.* 68, 211-21 (1928).—The theories on the formation of coal from plant and animal residues and the chem. changes probably involved are outlined. Several diagrams illustrate possible successive changes: of cellulose and lignin to form humic acids and humus coal; of waxes and resins to form polymerized furane and benzol compds.; and of lignins to produce methoxy and phenolic substances. The work of many investigators on the chemistry of coal is reviewed, especially extn. expts. on coals, action of chem. reagents and of heat on coals. The essential differences in compn. and in extn. products obtained from peat, brown coals, lump coal and anthracite are given and their significance is discussed. W. W. HODGE

**Pyritic oxidation—Ravine seam.** H. MACPHERSON, N. SIMPKIN AND S. V. WILD. *Safety in Mines Research Board* (London) *Paper No. 47*, 23 pp. (1928).—The behavior on oxidation in the lab. of the pyrite contained in coal taken from the Ravine seam, Lancashire, and representing the complete seam from top to bottom is compared with the behavior of the corresponding coal *in situ*. Conclusion: While the oxidizable pyrite contained in this coal may assist in a minor degree in the self-heating of the coal, the most important effect of the pyrite is the disintegration caused in the coal by its oxidation to bulkier products. Detailed chem. analyses and descriptions of samples are given. J. F. SCHAIRER

**Note on a contact of basalt with a coal-seam in the Isle of Skye, Scotland: Comparison with Indian examples.** L. LEIGH FERMOR. *Records Geol. Survey India* 60, 358-62 (1928).—Examn. and analysis of coal underlying basalt in Scotland shows change only in the upper 0.5 mm. of the seam, although alteration extends 1-4 ft. from Indian dikes intruded into coal. This is probably due to protection afforded by a steam layer formed between coal and basalt, and quick cooling of basalt by the H<sub>2</sub>O. ALDEN H. EMERY

**Role of resorption in the petrogenesis of Tokajese Nagyhegy.** E. LENGVEL. *Földtani Közlöny* 54, 181-5 (1926).—The interior of the earth with its more or less separately lying fluid magmatic bodies affords ample opportunities for the development of mixts. by processes of soln. and assimilation, especially during the upward journey of such a magmatic body through the solid igneous or sedimentary rocks nearer the surface. Phenocrysts may develop and resorption may alter the character of some of the intruded rocks. At a later stage such processes may result in magmatic differentiation and may develop various highly interesting hybrid rocks, which build up a series chemically and mineralogically between the unaltered magma and the intruded rocks prior to the intrusion. The factors which influenced the development of such hybrid rocks are indicated by the abnormal chem. and mineralogical compn. of these rocks. J. F. SCHAIRER

**The petrology of Iceland.** Preface. G. W. TYRRELL AND MARTIN A. PEACOCK. *Trans. Roy. Soc. Edinburgh* 55, 51-3 (1927). I. **The Basic Tuffs.** MARTIN A. PEACOCK. *Ibid* 53-76.—The finer-grained beds of Icelandic tuffs of early glacial and later age are either sideromelane-tuffs or palagonite-tuffs. *Sideromelane* is a black, lustrous, mostly anhyd. basalt glass, pale colored and translucent in thin section, known only in fragmental volcanic rocks. In Iceland, it is a product of drastically chilled, subglacially extruded basalt magma. *Palagonite* is the hydrogel of sideromelane. It is a yellow, colloidal material contg. up to 28% H<sub>2</sub>O. When hydration has taken place at low temps. by submersion, isotropic gel-palagonite tends to form; when hydration results from hot-spring action, faintly birefracting fibro-palagonite is the main product. The change from sideromelane to palagonite is accompanied by a partial loss of lime and soda, by an almost complete oxidation of Fe and by a progressive lowering of *n*. Palagonite is unstable, tending to crystallize, with partial loss of H<sub>2</sub>O, into chlorites and zeolites. ALDEN H. EMERY

**Hungarian diorite.** FERENC PAPP. *Földtani Közlöny* 55, 341-4 (1926).—Analyses of diorite are included. J. F. SCHAIRER

**Petrochemical studies of the basaltic rocks from Salgótarján, Co. Nógrád, Hungary.** R. REICHERT. *Földtani Közlöny* 55, 344-9 (1926).—Petrographic descriptions of basaltic rocks with 6 new chem. analyses are given. J. F. SCHAIRER

**Igneous intrusions between St. Andrews and Loch Leven.** FREDERICK WALKER AND JOHN IRVING. *Trans. Roy. Soc. Edinburgh* 56, 1-17 (1929).—The igneous intrusives between St. Andrews and Loch Leven are mainly sills and include olivine-dolerites, teschenites, nephelite-basanites, monchiquites and quartz-dolerites. The possible modes of chem. origin of the zeolite minerals are considered. Analyses of analcite-bearing quartz-dolerite and quartz-dolerite are given. J. F. SCHAIRER

The geology of the region of Nagyszal. A. KUBACSKA. *Földtani Közlöny* 55, 327-32(1926).—Mainly geological. An analysis of a dolomitic limestone is given.

Geology of the Buda-Kovácsier Mts. ISTVÁN FERENCZI. *Földtani Közlöny* 55, 349-67(1926).—Analyses of fresh chalk, porous chalk and fresh and altered dolomite are given.

The soil of the Tokajer Mts. (Kopasz) and the surrounding region. GYULA SIMKO. *Földtani Közlöny* 55, 298-309(1926).—Analyses of dust falling on snow at Nyiregyháza and Tokaj are given.

The origin of chernozem and of the South Russian steppe. G. I. TANFIL'EV. *Pochvovedenie* (Pédologie) 23, No. 1-2, 5-23(1928).—T. shows that the ice movements of the various glacial periods were responsible for the accumulation of sol. salts in the loess, which in turn inhibited the growth of forests. The result was the accumulation of org. matter and the formation of chernozem, the Ca being responsible for the resistance of the org. complexes. The forestless areas were, as a result of the climatological and geological conditions, converted into the steppe.

Hydrochemistry of the upper Kama and its tributaries (TRIFONOV) 14. Use of a recording manometer for studying the decomposition of hydrates (HACKSPILL, STEMPFEL) 2.

## 9—METALLURGY AND METALLOGRAPHY

D. J. DEMOREST, R. H. ABORN

Modern selective flotation. FERD. P. EGEBERG. *Tids. Kemi og Bergvesen* 8, 53-6, 75-81(1928).—A survey. The Callow process is especially mentioned. A D

Some remarks concerning modern flotation practice in the United States. O DALEN. *Tids. Kemi og Bergvesen* 8, 138-9(1928).—The paper deals with flotation of porphyritic Cu ores in the west. The most important new acquisitions and reagents are mentioned.

A study of the effect of certain cations on the flotation of galena. NELSON W. TAYLOR AND HENRY B. BULL. *J. Phys. Chem.* 33, 641-55(1929).—A study was made of the decrease in the flotation of galena suspended in H<sub>2</sub>O in the presence of eucalyptus oil, caused by the addn. of certain cations to the soln. The curve of decrease of flotation plotted against the concn. of electrolyte suggests that the cation is adsorbed on the galena surface. The increase in electrostatic charge on the galena particle caused by the adsorption would produce a repulsion to the adherence of air bubbles necessary for flotation. The order of increasing "toxicity" of cations, viz., Co, Ni, Cd, Pb, Ag, is the same as that of decreasing soly. of the sulfides. The highly toxic effect of solns. of Cr and Th nitrates on the flotation, however, cannot be explained by the adsorption theory.

The electrostatics of flotation. H. B. BULL. *J. Phys. Chem.* 33, 656-8(1929), cf. preceding abstr.—The electrostatic charge carried by finely ground galena particles in H<sub>2</sub>O and in solns. of different concns. of salts was measured by detg. the elec. potential established between the top and bottom of a column of the liquid through which the galena was falling. The difference of potential is similar to the  $\xi$  potential suggested by Freundlich for cellulose suspensions, and is due to the potential existing across the immovable adsorbed layer of ions and the boundary layer of movable mols. It amounts to as much as 240 milliv. for a soln. of AgNO<sub>3</sub>. The results probably do not measure the actual  $\xi$  potential but are only proportional to it. There is a connection, however, between the toxicity of Ag, Pb and Co ions on the flotation of galena and the electrostatic charge. This relation does not exist for solns. of Th and Cr nitrates.

Testing reagents for the flotation of carbonate lead-silver ores. L. J. CHRISTMANN AND S. A. FALCONER. *Eng. Mining J.* 127, 951-3(1929).—Tests were run on synthetic mixts. and ores contg. PbCO<sub>3</sub>. Data are given showing the recoveries obtained when oleic acid, K amylxanthate or one of several unnamed reagents was used with pine oil. Phosphoric acid and NH<sub>4</sub>H<sub>2</sub>PO<sub>4</sub> were used effectively as conditioning agents.

Furnaces for foundries and waste metal utilization (exhibited) at the Leipzig spring fair of 1929. H. REININGER. *Giesserei Ztg.* 26, 237-46, 316-22, 346-9(1929).—Foundry melting furnaces, annealing furnaces for steel and temper castings and furnaces for smelting metallic wastes are described and illustrated in detail.

**Investigations in ore dressing and metallurgy.** Canada Dept. Mines, Mines Branch, *Report No. 695* (1929). **Experimental tests of gold ore from the Sylvanite Gold Mine, Kirkland Lake, Ontario.** J. S. GODARD. 4-21.—This material is high-grade Au ore, analyzing 2.0 oz. Au and 0.14 oz. Ag per ton. The Au is free and associated with small quantities of a no. of sulfides and some tellurides. It is refractory and recoveries by cyanidation are low. Tests showed that recoveries were considerably increased by floating in conjunction with cyanidation. Local conditions will det. whether to float before or after cyanidation; recovery is about the same by both systems. If floated first, a high-grade conc. is obtained, which may be roasted and cyanided with a good recovery and low cyanide consumption or sold directly to a smelter. If cyanided first, the flotation feed should be freed from cyanide and sol. lime by washing, as both are depressing on the pyrite with which the Au in the cyanide tailing is mainly assocd. **Experimental tests on ore from the Blue Quartz Gold Mine, Paikiller Lake, Ontario.** J. S. GODARD. 22-8.—This ore consists of free Au associated with sulfides, chiefly arsenopyrite and chalcopyrite. It analyzes Au 0.38 oz. per ton, Fe 15.29, insol. 56.54, Cu 0.08, As 0.97 and lime 7.43%. Recovery of this Au by all methods of test increases with finer grinding. By flotation or tabling and flotation, 30% is the max. recovery. Amalgamation is unsatisfactory. Cyanidation with 2 lb. KCN and 6 lb. lime per ton of ore gives 85-90% recovery of Au. **Experimental work on a gold-silver-lead ore from the Planet Mines, Nicola, British Columbia.** C. S. PARSONS. 29.—This ore, analyzing Cu 0.28%, Pb 1.89%, Zn 1.16%, Au 0.22 oz. and Ag 6.5 oz. per ton, is very clean, free from interfering gang or sol. salts. It gave a recovery of Au 92.4, Ag 95.2, Pb 95.7 and Zn 78.6% by flotation with acid coal-tar creosote (1.25 lb.), xanthate (0.15 lb.) and pine oil. **Experimental work on the lead-zinc ore from the Yankee Girl Mine, Ymir, British Columbia.** C. S. PARSONS AND J. S. GODARD. 30-7.—This ore analyzed Pb 3.12%, Zn 4.6%, Au 0.35 oz. and Ag 2.48 oz. per ton. The ore cyanided readily but with only fair recoveries. Cyanidation followed by flotation gave erratic results. Flotation was successful, and when followed by cyanidation of the tailings added further recoveries. **Flotation of cyanide tailings from Wright-Hargreaves ore.** C. S. PARSONS AND J. S. GODARD. 37-42.—These tailings assay about 0.075 oz. per ton of Au associated with fine pyrite and small amts. of other base-metal sulfides, 80% through 200 mesh. Exptl. flotation recovered 60-65% of the Au in a sulfide conc. Fine grinding, proper pulp conditioning (violent mech. agitation for 10 min. or more) and proper design of conditioning tank are important.  $\text{Na}_2\text{CO}_3$  and  $\text{CuSO}_4$  are the conditioning reagents; xanthate, acid coal-tar creosote and pine oil are used for flotation. **Concentration of a copper-zinc ore from the Amulet Mine, Rouyn, Quebec.** C. S. PARSONS AND A. K. ANDERSON. 42-64.—The ore analyzed Cu 3.85%, Zn 8.75, Au 0.2 oz., Ag 3.78 oz. and free acid (as  $\text{H}_2\text{SO}_4$ ) 9.0 lb. per ton. It was a heavy sulfide type contg. an intimate mixt. of sulfides of Fe, Cu and Zn, mostly pyrite, chalcopyrite and sphalerite, resp. The Cu floated easily and with good recoveries under widely varying conditions. Zn was difficult to float in any but very fresh ore. Au recovery was better with Acrofloat than with xanthate. Recoveries in 2 successful tests were Cu 90, 88; Zn 75, 77; Au 57, 77; Ag 47, 72%. **Experimental tests on gold ore from the Francoeur property, Boischatel Township, Quebec.** A. K. ANDERSON. 64-6.—A fine-grained, pink feldspar porphyry contg. finely divided sulfides of Fe and As carrying 0.37 oz. Au and 0.10 oz. Ag per ton. Flotation of Fe sulfides followed by concn. of the tailing on Wilfley tables to recover values present as free Au and associated with arsenopyrite yielded a 90% or better recovery of Au in a conc. acceptable for smelting. **Experimental tests on gold ore from the Cooper Gold Mine, Michipicoten area, Ontario.** J. S. GODARD. 67-73.—Au in this ore is free and assocd. with small quantities of pyrite, pyrrhotite and chalcopyrite in a quartz gang. Analyses showed Cu trace -0.12%, Fe 1.42-2.75% and Au 0.4-1.33 oz. per ton. Amalgamation gave about 80% recovery. Flotation showed erratic results. When succeeded by tabling, a satisfactory recovery was obtained. Flotation preceded by amalgamation and followed by tabling gave a good recovery but with a low-grade conc. Cyanidation was unsatisfactory especially on the +200-mesh material. **The concentration and recovery of values contained in a lead-zinc-gold ore from the Premier Gold Mining Company, Ltd., Premier, British Columbia.** A. K. ANDERSON. 73-82.—The ore minerals are heavy sulfides of Pb, Zn and Fe intimately associated, carrying values in Au and Ag. The ore analyzed Cu 0.18%, Zn 3.69%, Pb 1.33%, Fe 9.68%, Au 0.34 oz. and Ag 8.08 oz. per ton. Bulk flotation was unsatisfactory. Cyanidation, after fine grinding, easily gave recoveries of 94-96% of the Au and 50% of the Ag. Flotation of residues (carefully washed) gave 25-30% further Ag recovery and commercial concs. of Pb and Zn. **The selective flotation of a copper-zinc ore from the Sherritt-Gordon Mines, Ltd., Manitoba.**

A. K. ANDERSON. 93-8.—This ore, contg. high percentages of sulfides of Cu, Zn and Fe, analyzed Cu 0.53-11.61%, Zn 4.63-21.39%, Au trace —0.08 oz. and Ag 0.72-3.92 oz. per ton. Best results were secured by grinding with cyanide and  $\text{ZnSO}_4$  in a circuit alk. with  $\text{Na}_2\text{CO}_3$ . Cu can then be floated either by adding thiocarbamilide to the grinding mill or Aerofloat or phosphoresylic acid to the classifier overflow or to the head of the Cu flotation cells. Lime and  $\text{CuSO}_4$  should then be added to the tails for conditioning. Aerofloat will now yield a Zn cone. Middlings are reground and retreated. The Au and Ag are associated chiefly with the Cu. **Experimental tests on ore from the Kirkland Premier Mine, Kirkland Lake, Ontario.** J. S. GODARD. 98-102.—The ore contained Au partly free but mostly associated with small quantities of sulfides of Fe and Cu. The analysis showed Cu 0.19%, Fe 5.38%, insol. 75.81%, Au 0.39 oz. and Ag 0.33 oz. per ton. The best flotation recovery was 92% of the Au in a conc. assaying 2 oz. per ton or 4 oz. by cleaning a rougher conc. Tailing the tailings increases Au recovery 2 or 3%. **Experimental tests on cyanide tailings from the Kirkland Lake Gold Mining Company, Ltd.** J. S. GODARD. 102-8.—These tailings are those discharged from the countercurrent decantation mill of the Co.; they contain 40% moisture and an av. of about 0.05 oz. of Au per ton. Best av. recovery was 42.5% at a grade of 0.26 oz. Au per ton. Cleaning to free from cyanides is necessary prior to flotation. **Concentration of copper-gold ore from Archean Mines, Clercy Township, Quebec.** C. S. PARSONS. 109-11.—The ore consisted of disseminated chalcopyrite and pyrite with a little Zn blende and analyzed Cu 0.66%, Zn 0.46%, Au 0.32 oz. and Ag 0.26 oz. per ton. It can be coned. by flotation in a neutral pulp to produce \$75 of Au per ton or by using 20 cents worth of  $\text{Na}_2\text{CO}_3$ , KCN and  $\text{CuSO}_4$  to give \$110 of Au. Free Au is present, which should be removed by amalgamation. **Concentration of the lead-zinc ore of the Stirling Mine, Cape Breton, Nova Scotia.** C. S. PARSONS. 111-4.—This ore is a complex mixt. of chalcopyrite, galena, sphalerite and pyrite, with small values in Au and Ag finely disseminated and associated with an altered talcose gang. The analyses of high- and low-grade ore, resp., are Cu 0.49-0.5%, Pb 4.02-1.16%, Zn 16.11-7.99%, Fe 6.54-5.43%, Au 0.06-0.08 oz. and Ag 2.67-2.14 oz. per ton. The talc floats in all ordinary processes and spoils the grade of product. After adding 5 lb. of  $\text{Na}_2\text{CO}_3$  and 0.4 lb. of cyanide to the ball mill, talc was floated with 0.1 lb. of pine oil. Pb was then floated with Aerofloat (0.1 lb.) and Zn with 2 lb. of  $\text{CuSO}_4$ , 0.1 lb. xanthate and 0.1 lb. of pine oil. This gave recoveries of 76% Pb, 57% Au and 54% Ag in the Pb conc., 55% Zn in the Zn conc. and 30% more in the middling, together contg. additional recoveries of 12% Au and 27% Ag. **Experimental tests on gold ore from Reno Mine, Sheep Creek District, British Columbia.** J. S. GODARD. 115-8.—This high-grade ore contains free Au 2.51 oz. and Ag 1.28 oz. per ton, Cu 0.12, Fe 5.38, As trace, Zn trace, Pb 0.35 and insol. 88.16%. Over 90% of the Au was recovered by amalgamation. Cyanidation was unsatisfactory. **The concentration of the silver ore of the Toric Mine, Alice Arm, British Columbia.** C. S. PARSONS. 119-22.—The chief value of this ore is Ag, occurring native, as argentite and ruby silver (small amt.). Pyrite and galena are present. More than 85% of the Ag left after amalgamation can be recovered by flotation in a conc. exceeding 225 oz. per ton. The tailing should be tabled to recover native Ag. **Concentration of a lead-silver ore from the Confederation Group, Cambourne, British Columbia.** C. S. PARSONS. 122.—This ore analyzed Pb 24.75%, Zn 0.06%, Au trace and Ag 8.93 oz. per ton. Flotation with xanthate and pine oil after  $\text{Na}_2\text{CO}_3$  conditioning gave a conc. contg. 92.6% of the Pb and 89.9% of the Ag.

ALDEN H. EMERY

**Chemical-analysis records on punched cards.** H. STEINHAUS. *Techn. Wirtschaft* 22, No. 2, 47-9(1929).—A discussion of the use of cards for recording chem. combustion of metallurgical products.

J. I. S.

**A hydrometallurgical process for the treatment of stibnite ore and the recovery of metallic antimony.** H. C. MABEE. Canada Dept. of Mines, Mines Branch, *Rept.* No. 695, 158-62(1929).—Stibnite is leached with hot NaOH and electrolyzed cold. High concn. of Sb and low concn. of free NaOH give most adherent deposits. Current efficiencies are high. Pb anodes are better than Fe. **Custom concentrators.** C. S. PARSONS AND A. K. ANDERSON. Canada Dept. of Mines, Mines Branch, *Rept.* No. 695, 173-8(1929).—A discussion of ore-handling methods, sampling, purchasing schemes, etc., for existing custom concentrators.

ALDEN H. EMERY

**A proposed nickel refining process.** FRANK E. LATHE. *Can. Chem. Met.* 13, 174-6(1929).—A short account of the Oxford process and the Mond process is followed by L.'s modification of the oil of vitriol process. When 3% of Fe is left in the converter mat and the latter granulated in water to produce a fine crystal structure, it is possible on grinding to 80 mesh to dissolve 99 to 99.9% of the Ni in "30 percent"

$\text{H}_2\text{SO}_4$  at  $80-100^\circ$  and still leave all the Cu in the insol. residue. S can be recovered from the liberated  $\text{H}_2\text{S}$ . The Fe is removed from the  $\text{NiSO}_4$  soln. by oxidation of part of the latter in a cyclic process and pptn. by  $\text{Ni}(\text{OH})_2$ . From the Ni soln.  $\text{NiSO}_4 \cdot 7\text{H}_2\text{O}$  is crystd. out, dehydrated at  $300^\circ$ , decompd. at  $800^\circ$  and reduced by petroleum coke in a reverberatory furnace. The CuS is melted, blown in a converter and electrolyzed. The precious metals are recovered in a very concd. slime. In dissolving the Ni from the mat, a countercurrent flow is recommended, in which the fresh mat comes in contact with a soln. of low acidity and high  $\text{NiSO}_4$  content, while the nearly exhausted mat comes in contact with the strongest acid to remove the last trace of Ni. Traces of Cu dissolved by the strong acid are later pptd. when the soln. comes in contact with the fresh mat. The process in a single operation gives an almost quant. sepn. of the Ni from the Cu and the precious metals. It provides for the recovery of the Ni and Cu in a condition of high purity, for the recovery of the S as a by-product and for the recovery of the precious metals in a very concd. form. No chemicals need be purchased since the  $\text{H}_2\text{SO}_4$  is regenerated and the small quantity of  $\text{Ni}(\text{OH})_2$  required is made in the plant by electrolysis. E. G. R. ARDAGH

The sizing of minette ore and its influence upon the smelting process. EWALD BERTRAM. *Arch. Eisenhüttenw.* 2, 461-72(1929).—Minette ore, a siliceous oölitic Fe ore of great importance technically, sometimes occurs in a form that splits up or powders easily. No adequate explanation of the phenomenon could be found. Expts. upon smelting such ores in small furnaces were useless, but data obtained from com. blast furnaces using minette ore of various predetd. sizes show that a much more uniform Fe, with better phys. and chem. properties, can be made from the crushed material than from larger lumps. With one furnace a saving of 2-5% in coke was effected, which sufficed to pay for the crushing required. The geological nature of the ore itself is the important factor; one must distinguish carefully between the kind (usually contg. lime) that breaks up into pieces when heated to  $200-300^\circ$  and the others (usually siliceous) which retain their shape in the blast furnace. A drawback to the use of finely crushed minette ore is the increase in dust from the furnace. The sepn. of fines and agglomerating them before charging to the furnace is recommended. W. C. EBAUGH

Handling of fine ores and concentrates in Salt Lake Valley lead smelters. L. D. ANDERSON. *Am. Inst. Mining Met. Eng., Tech. Pub. No. 223*, 15 pp.(1929). E. H.

Concentrator practices at Morenci, Arizona. ARTHUR CROWFOOT. *The Mining J. (Arizona)* 13, 5-8(1929).—The history of concentrator operations and a detailed description of recent improvements are given. E. M. SYMMES

Magnetic roasting of iron ores. WALTER LUYKEN AND ERNST BIERBRAUER. *Mill Kaiser-Wilhelm Inst. Eisenforsch. Düsseldorf* 11, 95-107; *Arch. Eisenhüttenw.* 2, 531-43(1929).—By magnetic roasting is meant the conversion of weakly magnetic Fe mineral into one strongly magnetic, the object being to render it more suitable for an electromagnetic concn. process. Fe ores were heated in an exptl. revolving roasting furnace at  $500^\circ$  and  $700^\circ$  with (a) coal gas and (b) generator gas, for periods of 10-240 min., the total Fe and free Fe were detd. and concn. of the products was effected. Results are given in tables and graphs. To prevent over-roasting,  $\text{CO}_2$  (in place of steam) was used with the reducing gases in certain trials, with successful results. Heating with steam alone gave  $\text{Fe}_3\text{O}_4$  with certain ores, but it was discovered that the reduction was due to an anthracite-like C contained in veins throughout the ore itself; heating them without a reducing agent caused a marked improvement in their magnetic properties. The influence of particle size upon the roasting process was relatively small—at least with particles under 2-4.5 mm. diam. Temps. of  $500^\circ$  were preferable to  $700^\circ$  (approx.). Gaseous reducing agents are better than solid, and H and CO (easily obtained commercially as water gas) are best among the gases used. Fears that a roasted ore would reoxidize upon cooling in air were unfounded—so quenching the roast is not called for. Whether roasting in reducing gas followed by ordinary magnetic sepn. will be more economical than treatment of weakly magnetic ores with magnetic fields of great strength has not been detd. W. C. EBAUGH

How to obtain high-test cast iron. B. OSANN. *Maschinenbau* 8, 284-9(1929).—This study is based on the sepn. of graphite from pig iron. In order to control this and to obtain proper chem. compn., calcn. is necessary, for which 4 basic rules are given. E. I. S.

Developments in the steel industry. ANON. *World Power* 12, 35-40(1929).—Nine illustrations. A review covering in particular the products and works of Hadfields, Ltd. C. G. F.

Blast-furnace gas management in German iron and steel plants. H. BANSSEN.

*Arch. Eisenhüttenw.* 2, 309-20(1928).—A review dealing with the generation and economical utilization of blast-furnace and coke-oven gases. R. D. BUMBACHER

Comparative studies on working results of blast furnaces. G. EICHENBERG AND R. HAHN. *Arch. Eisenhüttenw.* 2, 207-16(1928).—A critical review of work done by Evans and Bailey (*C. A.* 22, 2909). R. D. BUMBACHER

Gas-solid contact in the shaft of a 700-ton blast furnace. S. P. KINNEY AND C. C. FURNAS. *Bur. Mines, Repts. of Investigations*, Serial 2939, 10 pp.(1929).—The gas velocity is fairly high along the wall, drops off to a min. about 2 ft. from the wall and then rises to a high velocity at the center, probably caused by the batter. At the 3-ft. plane, above the batter line, there is no high wall velocity, the max. velocity being almost 6 times the min. In general, the temp curves follow the gas-velocity curves. Where the gas velocity is high, the CO<sub>2</sub> content is low, especially in the center of the furnace. In general, the greater static pressure is in the center of the furnace. Also in *Iron Steel Ind. & British Foundrymen* 2, 335-8; *Blast Furnace & Steel Plant* 17, 1039-43(1929). H. C. PARISH

Beryllium. ALFRED STOCK. *Z. angew. Chem.* 42, 637-9(1929).—A review of the production of Be and its use, particularly in alloys. E. H.

Beryllium. J. SCHLENZIG. *Metallbörse* 19, 1323-4(1929).—Since Be has a sp. gr. only  $\frac{1}{2}$ , as great as that of Al and has properties making it very desirable for air-craft motor construction, demands for it from America have brought about very active prospecting for beryl in South Africa (Leydsdorp district), in the Urals and Siberia (Altai Mountains). Instead of mining beryl simply as a gem, *e. g.*, aquamarine, it is used as an ore. From a price of 1800 M./kg. for metallic Be in 1926 there has been a decrease to about 440 M., and on account of the low Be content of its ores and difficulty encountered in extg. it as metal it is doubtful if its price will fall below 400 M./kg. Soviet Siberia will probably be the detg. factor in fixing the price. Methods for extn and purification are outlined. W. C. EBAUGH

Molybdenum. H. H. SMIDT. *Tids. Kemi og Bergvesen* 8, 66-9(1928).—A statistical, metallurgical, chemical survey. ARNE DROGSETH

The course of the silver market. HANS HIRSCHSTEIN. *Metallbörse* 19, 1321-2(1929).—The changes in the position of Ag during the last 20 years are discussed from economic, geographic and industrial viewpoints. W. C. EBAUGH

Production of tungsten and molybdenum. G. A. MEERSON. *Zhur. Prikladn. Khim.* (Moscow) 2, 133-48(1929).—Several thousand tons of Russian deposits of wolframite, scheelite and molybdenite are sufficient to meet the demands of the native elec. incandescent lamp industry as it requires only a few tons of Mo and W a year. Production and mfg. methods are essentially the same as those used in America. V. KALICHEVSKY

The temperature determination of fused metals. C. SPADON. *Met. ital* 21, 56-73(1929).—A description of the various types of pyrometers, thermocouples as well as optical, for the detn. of temps. of molten metal. A. W. CONTIERI

Cloudburst process for hardness testing and hardening. EDWARD G. HERBERT. *Trans. Am. Soc. Steel Treating* 16, 77-92(1929).—Artificial bombardment at high velocity by hard steel balls will roughen a soft steel surface but will not affect a hard surface. The method permits testing in quantity over whole surfaces. Steel surfaces may be super-hardened by the method. W. A. MUDGE

The cathodic pulverization of metals applied to the photomicrographic study of alloys. L. BELLADEN AND M. DE MARTINO. *Met. ital.* 21, 18-26(1929).—When a current is passed through an evacuated tube the cathode metal evaporates under the influence of the rays striking it. When an alloy is used as cathode the result is an "etched" electrode, which shows up the constituents, pure metal crystals, eutectic crystals, etc., much more clearly than etching with acid, and becomes, therefore, a valuable method for the study of alloy structure. A. W. CONTIERI

Heat-treating automobile parts. F. L. PRENTISS. *Iron Age* 123, 1625-9(1929).—Descriptive. The Oakland Co. uses *elec. furnaces* to heat-treat gears, pinions and axles. E. J. C.

Notch impact tests. Development and criticism. F. FETTWIS. *Arch. Eisenhüttenw.* 2, 625-74(1929).—A thorough survey of the subject, with 700 references to the literature from 1885 to 1928. J. BALOZIAN

Comparison of different hardness numbers. KATSUJIRO ENDO. *J. Study of Steel Manuf.* 8, (7) 1-25(1928).—In ball hardness tests on C steels it was found that the depth of indentation with 15 min. and 30-55 min. loading was almost the same. In impact hardness tests (using a steel cylinder 4 cm. diam., 3 cm. high as the hammer)



on two C steels it was found that the vol. of the indentation cavity and the absorbed energy was not const.

**Surface hardening caused by friction.** KASEJI BITO. *Bull. Army Ordnance* 7, 73-8(1928).—A Norton emery or alundum wheel, coated with Pb to increase the resistance and turned 1000 to 15,000 times per minute, was employed. *Results.*—In C steels the results were negative while in special armor plate a martensitic structure was obtained to a depth of 0.4-0.6 mm. from the surface, the Shore hardness increasing from 30 to 65-72 due to the low heat cond. of the special steel used. By applying the process to the common infantry steel, the Shore hardness could be raised from 41 to 74.

K. SOMEYA

**Change in microstructure of iron at  $A_3$  transformation point.** B. A. ROGERS. *Am. Inst. Mining Met. Eng., Tech. Pub. No. 218*, 13 pp.(1929).—The app. and method are described for observing the change in microstructure of Fe as it goes from the alpha to the gamma state. The results of the investigation confirm the work of previous investigators, in that there is no appreciable change in the microstructure of Fe until the  $A_3$  point is reached, and further, in the case of pure Fe, that the change comes simultaneously with the changes in heat content and space lattice.

DOWNES SCHAAF

**The nature of martensite crystals.** KOTARO HONDA. *Trans. Am. Soc. Steel Treating* 16, 97-112(1929).—A discussion of the nature and properties of  $\alpha$ - and  $\beta$ -martensite as evidenced by x-ray investigations. Values for lattice const., specific vols., magnetizability, elec. resistance and hardness are given.

W. A. MUDGE

**Report of committee A-3 on cast iron.** ANON. *Proc. Am. Soc. Testing Materials* (preprint) No. 11, 28 pp.(1929).—New proposed tentative specifications are submitted for chilled-tread cast-Fe car wheels, and also for grey Fe castings for valves, flanges and pipe fittings. The paper includes reports on the correlation of test bar and casting and on the heat treatment of cast Fe.

DOWNES SCHAAF

**Study of cast iron. IV. Influence of melting temperature upon low-carbon cast iron.** K. TANIMURA. *Bull. Tech. Coll., Kyushu Imp. Univ.* 3, 266-76(1928).—Cast iron contg. 3% C and 1.19-2.5% Si was melted and slowly solidified from different temps. and the ratio of the total to graphitic C as well as the hardness of the resulting specimens were detd. It was found that when the temp. of the melt is high, the degree of graphitization is comparatively small. The hardness is higher the higher the temp. of the melt, the result being opposite to the case of high C, high Si cast iron previously studied by T. The matrix of the specimens melted at a high temp. was relatively heterogeneous, and had many ferrite regions mixed with pearlitic portions.

K. S.

**Sulfur in cast iron.** KUMAHIKO HASEGAWA. *Iron and Steel* (Japan) 14, 1072-83 (1928).—H. has already shown that in the gravimetric oxidation method for detg. S in iron the total quantity of S can be detd., but in the volumetric reduction method only part can be estd. This is due to the difference in the solubilities of S compds. in acids (dependent upon the quantity of Mn present in the iron). When the specimen is tempered, the soly. is increased; this does not take place with steels. The state in which S exists in the cast iron was studied by means of chem. analysis, microscopic examn., heat treatment, etc., various kinds of white and gray cast irons of different Mn, Si and S contents being used. In white cast iron S exists chiefly as FeS and MnS. The coincidence of the results obtained by microscopic examn., volumetric and gravimetric analyses and S print prove this. In gray cast iron most of the S exists as MnS and the remainder as FeS when the Mn content exceeds 0.5%. When the Mn content is below 0.5%, there are acid-sol. and acid-insol. sulfides besides. The insol. sulfides cannot be recognized by S print and microscopic examn.; they are produced when the Si content of the iron is large and the Mn content small. From the fact that the pearlite present is easily spheroidized and that the FeS which is considered to be its decompn. product appears close to the spheroidized cementite, the insol. compd. is concluded to be an unstable compd. formed by the interaction between Fe, S, Fe<sub>3</sub>C and Fe<sub>3</sub>Si, and moreover that this unstable compd. is one of the constituents of the pearlite. The decompn. of this unstable compd. by tempering begins to occur at 600°; it is more marked the higher the temp., the longer the time and the finer the grain of the specimen. When the specimen is in the form of a drilling, the decompn. is completed in 1 hr. at 900°.

K. SOMEYA

**The practical utilization of pearlitic cast iron.** SHIDZUO SETO. *Iron and Steel* (Japan), 14, 1107-33(1928).—S. recommends a product of low C and high Si and Mn content. Practical details are given of the melting and casting processes. The best compn. is: total C 2.8%, Si 1.9%, Mn 1.3%.

K. SOMEYA

**Some notes on Perlite iron.** R. T. ROLFE. *Iron & Steel Ind. and Brit. Foundryman* 2, 283-6(1929).—Perlit Fe made by the Perlit process differs from cold-mold gray Fe

in that it has greater homogeneity, less porosity, greater regularity in obtaining an "all-pearlite" structure with low Si, greater ductility, superior shock resistance, less growth on heating and greater freedom from casting stresses.

**Oxygen dissolved in steel, and its influence on the structure.** MARCUS A. GROSSMAN. *Trans. Am. Soc. Steel Treating* 16, 1-18(1929).—Steel absorbs  $O_2$  as well as C in box carburizing. A high  $O_2$  content favors soly. of cementite with a resultant opportunity for diffusion, and accounts for the phenomenon of "split cementite" in McQuaid-Ehn test and of "boundary cementite" in low-C steels. Different Fe-C diagrams can be drawn from different steels by varying the diagram to accord with the soly. of cementite and diffusion power.

**Cementation of steels by special alloys having a manganese base.** J. COURNOT. *Chimie & Industrie Special No.*, 423-4(Feb., 1929); *Rev. métal.* 25, 669-70(1929).—See C. A. 23, 81.

**The hardening of ingot steel in cyanide salt bath.** F. RAPATZ. *Stahl u. Eisen* 49, 427-9(1929).—Hardening expts. with Duferrit-cyanide hardening compd. (essentially of NaCN dild. with other salts) are described. Hardening a 0.12% C steel 2 hrs at 850° gave C contents from 0.66 to 0.33% at a distance from 0.05 to 0.6 mm. The corresponding figures for N are 0.8 to 0.05%. Thin diffusion layers up to 0.6 mm. are easily obtained; it is difficult, however, to obtain heavier layers. The best bath temp. is 850°. The results for a 4-hr. hardening period at 850°, then of 2- and 4-hr. periods at 950° are also given. The method seems to be well adapted for the hardening of small pieces.

**Some characteristics of pearlite in eutectoid rail steels.** O. V. GREENE. *Trans. Am. Soc. Steel Treating* 16, 57-74(1929).—Pearlite may be fine or coarse, independent of the C content, depending upon velocity of cooling through  $Ar_1$ . No relation exists between Brinell hardness and av. grain diam. A decrease in distance between lamellae results in an increase in hardness and tensile strength.

**X-ray study of steel: use of the high voltage Laue method.** FUSAO OTA. *Study of Steel Manuf.* 105, 322-4(1928).—Laue photographs of an Al plate, electrolytic Fe plate, Si steel plate, Armco iron plate and a mild steel wire were taken by the method of St. John, with the application of 185,000 volts and current at 2.5 milliamperes. Two hrs. exposure is sufficient for a steel plate of 1 mm. thickness. The defect of the method is that the Laue spots always appear near the central spot, and the photograph is not very clear.

**X-ray studies of cold-worked steel.** F. C. ELDER. *Iron Age* 123, 1488, 90(1929).—Several x-ray photographs are shown of prepared specimens 0.006 in. thick of C steel wire. While a single heating through the crit. range tends to reconstitute the preexisting cryst. structure, and tends to remove internal strain, and a 2nd treating brings these effects nearer completion, a multiple heat-treatment is necessary for complete recrystallization.

**The properties of Thomas rail steel.** E. H. SCHULZ AND A. WIMMER. *Stahl u. Eisen* 49, 385-8(1929).—Comparative tests on 2 Siemens-Martin and 2 Thomas-rail steel samples are part of a series of expts., which at present are not yet complete. The analysis of the samples, tensile characteristics and impact strength are given. With practically the same composition the 2 steel types do not show any difference.

**Die steels for aluminum alloy die castings.** A. R. PAGE. *Metal Ind.* (London) 34, 485-6(1929).—W steels behave better than Cr-V steels. All good steels examined contained a smaller no. of foreign inclusions than the poor ones. Such inclusions as existed were of globular form in the good steels and elongated in the bad ones. It appears that elongated MnS inclusions may cause erosion in use. Heat treatment does not seem to be a factor.

**Fatigue of steel (by impact).** TOKUJIRO MATSUSHITA, KIVOSHI NAGASAWA AND JEINOSUKE KOMATSU. *Iron and Steel (Japan)* 14, 985-96(1928).—The max. impact value was obtained with 0.45% C steel quenched and tempered at 250°; the tempering temp. which gives the max. impact value increases with increased C content. In the study of the mechanism of fatigue, since it was found that in quenched samples, or in those annealed at a temp. below 200° the elastic limit is hardly recognizable, it is concluded that fatigue occurs when slipping within the crystal grain has taken place below the so-called elastic limit. Similar expts. were made by means of repeated impact test; the authors conclude that when an alternate stress is applied to a single crystal grain, if slip takes place repeatedly on the same plane, the degree of disturbance between different slip planes is increased, with the consequent increase in the no. of grains of indefinite shape and poor contact, so that the crystal grains slip even

when acted by a very slight external force, and thus the elastic limit is gradually lowered until final failure occurs.

K. SOMEYA

**The system iron-silicon, iron-chromium and iron-phosphorus.** P. OBERHOFFER AND C. KREUTZER. *Arch. Eisenhüttenw.* 2, 449-56 (1929).—Chem., microscopical and x-ray studies were carried out to explain certain details in the systems Fe-Si, Fe-Cr and Fe-P. Special investigations were made to study the influence of Si and Cr on the  $A_1$ - and  $A_4$ -transformation of Fe. No chem. combination of Fe and Cr was found; a series of solid solns. might exist. The x-ray studies proved the existence of a saturated solid soln. at 1.7% P,  $Fe_3P$  at 15.58% P,  $Fe_2P$  at 21.5% P and an unknown compound above 21.3% P. A number of photographs, diagrams and tables are given and a high-vacuum-camera is described.

A. E. BEITLICH

**Heat-treated low-manganese steels.** E. E. THUM. *Iron Age* 123, 1691-5 (1929).—Phys. and metallographic properties are given for heat-treated parts made for Si-Mn steel (0.95% Mn), high Mn carburizing steel (1.00% Mn), forgings (1.60-1.90% Mn), high strength castings (1.10-1.40% Mn), and welds made from high-strength welding rod contg. 0.80% Mn.

DOWNES SCHAAF

**Alloys of chromium and iron.** T. HOLLAND NELSON. *Iron Age* 123, 1478-82 (1929).—Stainless steel is defined as a material contg. under 16% Cr, which will harden by quenching and which is capable of attaining a Brinell hardness of 250 or more by heat-treatment. Stainless Fe is defined as a material containing over 16% Cr with less than 0.12% C which, on quenching, does not harden appreciably, and which will not attain a Brinell hardness of over 200 by heat-treatment. The higher the Cr content the greater the corrosion resistance. The most mobile Fe-Cr alloy to obtain substantial corrosion resistance with sufficient malleability to obtain all structural shapes contains less than 0.12% C and 16-20% Cr. Where high phys. properties are required, Fe-Cr alloys contg. under 16% Cr will be found applicable.

H. C. PARISH

**Study of a 20% chromium steel.** ANDRÉ MICHEL AND PIERRE BÉNAZET. *Rev. métal.* 25, 668 (1928); *Chimie & industrie Special No.*, 391-403 (Feb., 1929).—The Chevenard differential dilatometer, hardness test and microscopical examn. were used to study the behavior of a steel contg. C 0.54, Cr 19.0, Ni 0.80%, after quenching in oil from various temps. up to 1250°. The structure becomes more and more austenitic as the quenching temp. increases, and is completely so at 1250°. The expansion curves showed neg. anomalies at about 150°, 260° and 600°, the first two occurring in the  $\alpha$ -phase and the last in the  $\gamma$ -phase. The 600° anomaly followed by marked expansion on cooling is interpreted as a pptn. of carbide from the supersatd. austenite phase, which permits the austenite  $\rightarrow$  martensite transformation to take place on cooling, owing to a decrease in the passive resistances brought about by the dissolved carbide. In steel which has been quenched from 1250° and tempered to 600° or over, there is an accentuation of the martensitic transformation, which increases with the tempering temp. and the time of cooling; but if the tempering period is extended beyond a certain limit, there is a gradual softening of the metal, and the magnetism, which is practically nil, gradually reappears even at the tempering temp. This behavior is compared with that of a steel contg.: C 0.95, Cr 5.80, W 5.60, Co 25.5%, which, at 700°, shows high expansion and strong recalcence, and assumes a pearlitic structure on cooling. A steel contg.: C 1, Cr 12, W 6, Co 20, exhibited both types of change. Moreover, when the 20%-Cr steel was tempered for a sufficient length of time, it exhibited the 2nd type of change. It is concluded that the 2 types of phenomena (pptn. of carbides at the tempering temp. and martensitic transformation on cooling, on the one hand, and transformation at the tempering temp. itself with formation of pearlite, on the other) are not essentially different, the differences observed depending on the magnitude of the passive resistance to transformation caused chiefly by Cr, and on the time at the tempering temp.

A. PAPINEAU-COUTURE

**Ternary chromium steels.** J. POMEY AND P. VOULET. *Chimie & industrie Special No.*, 401-21 (Feb., 1929).—Cr steels contg. Ni or Co show a pt. of inflection on the expansion curve above the  $A_3$  pt. With a steel contg. Ni 10, Cr 23, W 4%, the  $A_3$  pt. is between 700° and 800° and the  $A_4$  pt. between 975° and 1000°. This pt. is marked by a falling-off in magnetic properties as well as by vol. changes, and occurs at a slightly lower temp. during cooling. The investigation may be considered as an attempt at thermodynamic classification of steels, based on the sepn. surfaces of the  $\alpha$  and  $\gamma$  phases, which leads to attributing a considerable importance to the  $A_4$  pt. It follows from the results given that the  $A_4$  transformation can be rendered visible by fairly simple means, either by magnetic analysis of austenitic steels after quenching or by taking advantage of the fact that in certain alloy steels this pt. is sufficiently low to be studied by means of the Chevenard differential dilatometer.

A. PAPINEAU-COUTURE

Recent developments in nickel-alloyed iron, steel and cast iron. J. S. VANICK. *Iron & Steel Can.* 12, 127-9, 149-51, 157-9(1929).

Effect of heat-treatment on the quality of tungsten steel. F. PÖLZGUTER AND W. ZIEGLER. *Stahl u. Eisen* 49, 521-7(1929).—For each type of W-steel, there is a crit. temp. range in which a sufficiently long annealing causes the sepn. of WC, with corresponding decrease in quality. The compn. of the 2 steels investigated was: (A) 0.75% C, 0.35% Mn, 0.36% Si, 5.46% W and 0.35% Cr, (B) 0.75% C, 0.37% Mn, 0.32% Si, 5.77% W; the heat treatment was for 4 hr. at temp. between 600° and 1250°. Brinell hardness decreased from 675 at 750° for both samples to 550 for the Cu-W-steel and to 450 for the W-steel at 975-1000°, and rose again to 675 for both steels at 1250°. The same types of curves were obtained, plotting the coercive force as a function of the annealing temp. A small amt. of Cr renders the steel less sensitive toward incorrect heat-treatment.

Study of surface-hardening of steel by nitridation. SHIGEYUKI KOYABU. *Iron and Steel (Japan)* 14, 1138-57(1928).—Normalized pieces of Cr-Mn steel, Cr-Ti steel, Si-Mn steel and Cr steel were heated at 560-670° for 5, 15 and 30 hr. in  $\text{NH}_3$ , the change in the hardness and length being subsequently measured. In mild steels the increase of scratch hardness is not marked, but it is very marked in Cr steels. The suitable temp., for obtaining a hard surface is 560-80°, above which temp. range a brittle compd., which is near to  $\text{Fe}_3\text{N}$  in compn., forms. The hardness reaches a max. in 15 hr. By nitridation the length of the specimen increases a little, while the impact value decreases by about 60%. From these results K. concludes that for nitridation low-C-Cr steel is the most suitable.

Mechanism of the decarburization of carburized irons by alkali and alkaline earth chlorides. L. HACKSPILL AND E. SCHWARZ. *Chimie & industrie Special No.*, 386-90 (Feb., 1929).—A study of the decarburization of Fe and steel by  $\text{NaCl}$ ,  $\text{CaCl}_2$  and  $\text{LiCl}$  showed that it is due to the intermediate production of a metal carbide, which subsequently disappears. The mechanism of decarburization by Na, Ca and Li is the same. Na and Ni carbides were produced by direct combination of the elements at relatively low temp. (950° for  $\text{Na}_2\text{C}_2$ , 1050-1100° for  $\text{NiC}_2$ ) under pressure.

Study of the vanadium-carbon system. SHOKICHI OYA AND ATOMI OSAWA. *J. Study of Metals* 5, 434-41(1928).—The authors detd. röntgenographically the phases appearing, inferred the order of solidification of the alloys from their microscopic examn and proposed a qual. constitutional diagram. According to x-ray analysis, V has a body-centered cubic lattice having the lattice const.  $a = 3.024$  A. U. In the alloys of the V-C system there appear 2 phases besides the one ( $\alpha$ ) consisting mainly of V. One of these is the  $\beta$ -phase, having a close-packed hexagonal lattice with the avul ratio 1.59, and the other is the  $\epsilon$ -phase, which has a face-centered cubic lattice. In 1-4% C alloys there are 2 patterns due to the body-centered cubic and the close-packed hexagonal lattices; in 4-6% C alloys only the pattern due to the close-packed hexagonal lattice appears; in 6-14% C alloys the interference patterns due to the close packed hexagonal and the face-centered cubic lattices appear, while at 14-15% C only the face-centered pattern appears. The no. of atoms per unit cube was calcd. from the d. actually detd., from which the chem. formulas of the 2 carbides were shown to be  $\text{V}_3\text{C}$  (the  $\beta$ -phase) and  $\text{V}_4\text{C}_3$  (the  $\epsilon$ -phase). The alloys of the range of compn. for which only the patterns belonging to one of the above compds. appear consist of the homogeneous phases of  $\beta$  or  $\epsilon$ , while those for which the 2 kinds of patterns appear consist of the eutectic of  $\alpha + \beta$  or of  $\beta + \epsilon$ .

Physical properties and methods of test for some sheet non-ferrous metals. J. R. TOWNSEND, W. A. STRAW AND C. H. DAVIS. *Proc. Am. Soc. Testing Materials* (preprint) No. 46, 36 pp. (1929).—Com. hardness limits for 4 brass alloys, and for 2 alloys each of nickel silver and phosphor bronze, have been developed based on a Rockwell hardness-tensile strength relationship. Refinements in the application of the Rockwell hardness test as an inspection instrument have been worked out, and it is shown that agreements of  $1\frac{1}{2}$  Rockwell numbers or better can be obtained between producer and consumer on com. shipments of material.

Crystalline changes in copper due to annealing. F. C. HOWARD AND E. T. DUNN. *Ind. Eng. Chem.* 21, 550-3(1929).—A cold drawn Cu rod was annealed at 700° for a definite time, then allowed to cool in the air and examd. photomicrographically. After examn. the specimen was replaced in the furnace and held there for a further definite time. Conc'd.  $\text{HNO}_3$  disclosed the grain boundaries, twinning, etching pits and fine grain structure.  $\text{NH}_4\text{OH}$  and  $\text{H}_2\text{O}_2$  showed twinning and etching pits, sometimes the fine grain structure but not to the same extent as  $\text{HNO}_3$ . The photomicrograph shows clearly the grain growth accompanying repeated heating.

**Bearing bronzes with and without zinc.** H. J. FRENCH AND E. M. STAPLES. *Proc. Am. Soc. Testing Materials* (preprint) No. 49, 33 pp. (1929).—Bronzes in the Cu corner of the Cu-Sn-Pb system are classified according to the character of service for which they seem to be best adapted, the results being based on lab. tests comprising hardness tests, Izod impact tests, repeated impact tests and wear tests, both with and without lubrication, at temps. within the range 20° to 315°. Bronzes with less than 4% Sn are unsuited for general bearing service. Bronzes with less than about 5% Pb are suited only for service where lubrication can be maintained. Bronzes contg. more than about 5% Pb are best able, of any of the groups studied, to operate for short periods in the absence of lubrication. The addn. of 4% Zn to the bronzes had, in general, small influence upon the properties of the bronzes studied. DOWNS SCHAAP

**Notes on high-resistance bronzes.** DURANTON. *Arts et métiers* 93, 224-5 (1928); *J. Inst. Metals* 40, 511.—The detg. mech. properties of bronzes contg. Cu 90-73%, Sn 5-16%, with or without Zn, Pb and traces of P, and of 62:20:18 Cu-N-Zn and 67:33 Cu-Zn alloys are described. The uses of Delta metal are given and typical compns. suitable for each. High-resistance "Al-bronzes" are of the type 90:10 Cu-Al, and their properties and price here given show them to be suitable for a great variety of industrial purposes. H. L. D.

**X-ray study of castings. I. Perkin's metal.** GUNJI SHINODA. Kyoto Imp. Univ., *Suiyokaishi* 5, 687-94 (1928).—A part of the much disputed Cu-Sn diagram was investigated by x-ray and thermal analysis, elec. resistance measurement and microscopic examn. (1) The soly. of Sn in the  $\alpha$ -solid soln. is 14%. (2) The small thermal effect at 577° is observable in the 14-26% Sn alloys, appears even after annealing for a long time above 700°, and since the quantity of the  $\beta$ -phase increases with increase in Sn content, this thermal effect is caused by the transformation which the said  $\beta$ -phase undergoes. (3) The transformation occurring at 578° for the alloy of the range of 30-38.4% Sn is a peritectoid reaction  $\beta + \text{Cu}_3\text{Sn} \rightarrow \delta$ . (4) There is another eutectoid reaction  $\gamma \rightarrow \beta + \text{Cu}_3\text{Sn}$  occurring at 637°. (5) The range of temp. for which the  $\beta$  and  $\gamma$  phases can coexist lies above 640°. (7) The compd.  $\text{Cu}_3\text{Sn}$  has no soly. on the Cu side. (8) The elec. resistance begins to increase at 120-140°, reaches a max. at 200°, gradually decreases at about 300°, reaches a min. at 330-50°, finally increasing rapidly. (9) The resistance increase occurring at 120-40° is due to some type of decompn. of the  $\beta$ -phase, the min. near 340° is due to the change of the  $\beta$ -phase into  $\alpha$  (which has a small sp. resistance) and some phase which is unstable and richer than  $\delta$  in Sn content, while the rapid increase observed at 420° is due to the formation of  $\delta$  or  $\text{Cu}_3\text{Sn}$ . K. SOMEYA

**Characteristics of very pure and commercial lead.** GEORGE O. HIERS. *Trans. Am. Inst. Chem. Eng.* 20, 131-48 (1928).—Test results are shown on the characteristics of very pure Pb. Similarities of certain varieties of com. Pb, of special use in chem. equipment, are noted. Probably Cu in chem. Pb is present in the most desirable amt. and distribution to account for the marked improvement it imparts to the Pb; Cu may inhibit grain growth. E. M. SYMMES

**Influence of bismuth on the mechanical behavior of lead.** O. BAUER. *Giesserei-Ztg* 25, 298-9 (1928); *J. Inst. Metals* 40, 463.—Bi increases the hardness of Pb and reduces its bending strength very considerably. The rate of corrosion of Pb pipes is seriously increased by the presence of Bi, failure taking place by intercryst. attack. H. L. D.

**Use of lead in mechanical engineering practice.** OWEN W. ELLIS. *Trans. Am. Inst. Chem. Eng.* 20, 167-86 (1928).—The characteristics of Pb and Pb alloys, together with compn. of the latter, are shown. E. M. SYMMES

**Surface charring and scaling of carbon steel in various gases.** W. HÜLSBRUCH. *Mitt. Versuchsanst. Deut.-Luxemburg. Bergwerks-u. Hütten-A.-G. Dortmunder Union* 2, 83-120 (1927); *Chem. Zentr.* 1928, I, 249.—Three steels of different C content (0.50, 0.90, 1.30%) were heated to 750-1050° and the influence of gases upon surface charring and scaling was studied. In blast furnace gas, in the atm. of a red furnace, in tech.  $\text{H}_2$ , in impure  $\text{N}_2$ , charring but no scaling occurred. In steam,  $\text{CO}_2$ , air and oxidizing oven gas there was bad scaling and charring. In  $\text{O}_2$ , dry air, and salt bath there was scaling but less charring. In pure  $\text{H}_2$ , pure  $\text{N}_2$  and imbedded in cast Fe filings there was charring but no scale. In CO and illuminating gas carbonization occurred. A mixt. of  $\text{H}_2$  and  $\text{CH}_4$  was used as an inert medium. FRANCIS P. GRIFFITHS

**Corrosion embrittlement of duralumin. Practical aspects of problems.** H. S. RAWDON. U. S. Natl. Advisory Comm. Aeronautics, *Tech. Notes* 1928, No. 282, 1-11.—An investigation to develop methods of improvement and protection which would assure the reliability and performance of duralumin as a material for aircraft construction is

discussed. Tensile strength and ductility of duralumin sheet are very greatly affected by intercryst. corrosion. The danger from embrittlement decreases as the cross section of duralumin increases. Embrittlement is below the surface. The failure of ordinary coatings is dealt with. Accelerated corrosion tests and the behavior of high-strength aluminum alloys of different compositions. *Ibid* 1928, No. 283, 1-38.—Cu is most closely related to the susceptibility of duralumin to intercryst. corrosion. The microstructural aspects of corroded duralumin are discussed. X-rays are useful for demonstrating the existence of internal stress. R. discusses the method of heat-treatment, which is important in detg. the behavior of the material with respect to corrosion. Effect of previous treatment of sheet material on the susceptibility to this type of corrosion. *Ibid* 1928, No. 284, 1-24.—The effect of variables of heat-treatment of sheet duralumin upon its susceptibility to intercryst. corrosion is discussed. Control of the rate of quenching and avoidance of accelerated aging are the only means of modifying materials so as to minimize intercryst. corrosive attack. The use of protective coatings. *Ibid* 1928, No. 285, 1-31.—Although the corrosion resistance of duralumin sheet is improved by suitable heat-treatment, protection of the surface is still necessary for long life. R. discusses varnish and oxide types of protective coating, metallic coatings, of which Al appears most promising, and test methods. The character of the surface has a noticeable effect upon the rate of corrosive attack. Oxide coatings produced by the anodic method and Al coatings applied by metal spraying are dealt with. From *J. Inst. Metals* 40, 538-9. H. I. D.

Fissuring corrosion (season cracking) of an iron-nickel-chromium alloy. M. SAUVAGEOT. Laboratoire du Creusot des Etablissements Schneider. *Chimie & industrie Special No.*, 421-2 (Feb., 1929).—Ferro-Ni, even when it contains a small proportion of Cr, is subject to the phenomenon of fissuring corrosion (similar to season cracking of brasses) in steam. Although Chevenard has indicated that this can be completely avoided by addn. of massive doses of Cr (at least 10%), a steel contg. C. 0.34, Si 0.33, Mn 1.98, Ni 36.5, Cr 11.4 and Fe 49.8%, when subjected to strains simulating those of the vanes of a turbine in the low-pressure stage, failed by fissuring corrosion.

A. PAPINEAU-COUTURE

The effect of nitrates upon corrosion in tin cans. C. W. CULPEPPER AND H. H. MOON. *Canning Age* 9, 619-20 (1928); *J. Inst. Metals* 41, 545.—Expts. have shown that when solns. of nitrates in tin cans are heated, as in ordinary canning operations, the effect upon the corrosion of the can is often very great. The effect of nitrates is not very great when the acidity is very low, except when very high temps. are used. As the acidity is increased the effect of the nitrate rapidly increases; the effect also increases as the temp. and time of processing are increased. H. L. D.

Critical study of corrosion tests. E. HERZOG AND G. CHAUDRON. *Chimie & industrie Special No.*, 335-42 (Feb., 1929).—Results are given showing that the loss in wt. of metal on corrosion is not a sufficient indication of the change in mech. properties: when there is even and uniform corrosion over the whole surface, the mech. properties are not greatly affected, even with losses in wt. of up to 20%; in the case of corrosion by local action (pitting), fairly small losses in wt. do not greatly affect the breaking load, but the elongation is considerably reduced, and frequently also the resilience. H. and C. consider that the decrease in elongation is the most significant data for indicating local corrosion, though the stamping test may be used for convenience. In the tensile strength test, locally corroded test pieces behave similarly to notched test pieces.

A. PAPINEAU-COUTURE

Action of sea water on ferrous metals. R. GIRARD. *Chimie & industrie Special No.*, 354-65 (Feb., 1929); cf. *C. A.* 20, 573, 3151; 21, 2114.—Previous results are given, together with considerable new data. The technic adopted for the tests is described. Solns. contg. 3 g.  $MgCl_2$  or 1.75 g.  $MgSO_4$  per l. are quite corrosive toward both cast Fe and steel, the latter being attacked to a great extent; O has a decidedly accelerating effect on corrosion. The results with NaCl were previously given (*C. A.* 20, 573). A soln. contg. 1.8 g.  $CaSO_4$  per l. is more corrosive toward steel than cast Fe, in both aerated and deaerated soln., and the Fe<sup>++</sup> corrosion products ppt. better than the Fe<sup>+++</sup>, the adhesion coeff. (ratio of oxides adhering to the metal to oxides theoretically formed, calcd. from the loss of Fe) is considerably higher in deaerated than in aerated soln., the coating of rust formed in deaerated soln. is much more protective (for both Fe and steel) than that formed in aerated soln. With a soln. contg.: NaCl 20,  $MgCl_2$  3,  $MgSO_4$  1.75,  $CaSO_4$  1.8 g. per l., the  $CaSO_4$  seems to exert a fairly strong action by producing a protective coating, which prevents to a considerable extent the corrosive action of the Mn salts, particularly in deaerated soln.; with the same soln. minus  $CaSO_4$ , the corrosive action of the Mg salts preponderates. With a synthetic sea water contg.:

NaCl 27.21,  $MgCl_2$  3.81,  $MgSO_4$  1.66,  $CaSO_4$  1.26,  $K_2SO_4$  0.86,  $MgBr_2$  0.08 g.,  $H_2O$  q. s. for 1000 g., in deaerated soln. the loss in wt. is fairly low and very similar to that obtained with the above-mentioned NaCl- $MgCl_2$ - $CaSO_4$  soln., but the adhesion coeffs. are lower; in aerated soln. the loss in wt. is very great, particularly with steel, and the adhesion coeffs. are decidedly lower than with NaCl- $MgCl_2$ - $MgSO_4$ - $CaSO_4$ . The theoretical and practical conclusions to be drawn from these results are discussed at some length.

A. PAPINEAU-COUTURE

Recent developments in atomic hydrogen welding. P. P. ALEXANDER. *J. Am. Welding Soc.* 8, No. 5, 48-9 (1929).

E. I. S.

The excretion of Pb by mine workers at Broken Hill (TANNAHILL) 11H. Lead excretion of workers at the smelters, Port Pirie (TANNAHILL) 11H. The value of blast-furnace slag as fertilizer (WEISE) 15. Corrosion and protection of metal in gas works (MAASS) 21. The Au content of sea water (GLAZUNOV) 2. New apparatus materials for chemical industries (KUFFERATH) 1. Furnace for annealing, heat treatment, etc. (U. S. pat. 1,718,798) 1. Rotary-compartment drum apparatus for drying, etc., of ore (U. S. pats. 1,718,542-3-4) 1. Slagging gas-producer operation [for forming pig iron] (Brit. pat. 301,241) 21. Apparatus for separating mineral substances by gravity in water (U. S. pat. 1,719,171) 1. Purifying gases [washing blast-furnace gases] (Fr. pat. 656,395) 13. Recovery of metals and metal compounds by chlorination and use of ammoniacal solutions (Brit. pat. 301,342) 18. Oxide of Fe and S (Fr. pat. 655,829) 18. Apparatus for separation of mineral substances of different densities by use of air currents (Brit. pat. 301,336) 1.

Lincoln "Stable-Arc" Welder Instruction Manual. Cleveland: The Lincoln Elec. Co. 94 pp.

SMITHHELLS, COLIN J.: Tungsten: A Treatise on Its Metallurgy, Properties and Applications. London: Chapman & Hall, Ltd. 168 pp. 21s., net. Reviewed in *J. Roy. Soc. Arts* 77, 798 (1929).

Parting composition for foundry use. BENJAMIN F. WALLACE. U. S. 1,717,820, June 18. A finely divided pptd. alk. earth metal carbonate such as  $CaCO_3$  is impregnated with a small proportion of an org. waterproofing substance such as tallow, stearic acid or degrass to form a very light product capable of floating on water for over 14 days.

Apparatus for sintering ores. REED W. HYDE (to Dwight and Lloyd Sintering Co.) U. S. 1,719,114, July 2. Structural features.

Rubber-covered woven metal wire screen suitable for screening minerals. CHAS. F. SHERWOOD (to Oliver-Sherwood Co.). U. S. 1,718,386, June 25.

Apparatus for concentrating ores by washing. ANTOINE FRANCE. Fr. 655,500, June 8, 1928.

Treating sulfur-bearing minerals. MELVILLE F. COOLBAUGH and JOHN B. READ. U. S. 1,719,534, July 2. In order to effect sulfation of minerals such as ores of Cu, Pb, Zn, Au and Ag they are roasted in the presence of a chloride such as NaCl; gases comprising  $SO_3$ ,  $SO_2$  and O are caused to come into contact with the chloride; the S gases present exceed the amt. necessary to expel all chloride and the mineral and gases are moved in the same direction.

Treating ores. SOC. MINIERE ET METALLURGIQUE DE PENARROYA. Fr. 655,615, June 11, 1928. Zn and other ores are calcined or desulfurized by roasting them in a fine state of division with org. material such as saw dust, chaff or waste paper pulp contg. some moisture.

Ores. ALEXANDRE FOLLIET and NICOLAS SAINDERICHIN. Fr. 655,375, May 30, 1928. Zn and mixed ores are enriched by volatilization of the metallic elements by blowing air at a temp. of 650-800° on to a layer composed of the ore in small pieces and mixed with a fuel (coal, lignite, etc.) also in small pieces and a small amt. of an alkali chloride.

Treating antimonial ores. HENRYK GOLDMANN. U. S. 1,719,657, July 2. Sb is leached from ores by use of a non-oxidizing inorg. acid such as HCl contg. a metallic "protoxide salt" such as  $FeSO_4$  having the property of reducing Sb oxide.

Chromium ores. I. G. FARBERIND. A.-G. Fr. 655,793, April 16, 1928. Cr ores are enriched and freed from  $SiO_2$ ,  $Al_2O_3$  and  $MgO$  by treating them above 100° with alkali metal hydroxides or carbonates in the absence of O, preferably under pressure. Cf. C. A. 23, 366.

Tin ores. GUGGENHEIM BROTHERS. Fr. 655,965, June 15, 1928. Crude Sn-contg. material is treated to remove objectionable impurities and reduced in the presence

of a carbonaceous reducing agent and a mixt. of alkali and alk. earth fluxes, preferably lime and soda with excess lime. The charge may be briquetted with molasses, sulfite liquor, etc. The preliminary treatment may consist in heating with a mineral acid and leaching with NaCl and NaOH solns., from which Ag, Bi and Pb may be pptd. by diln. W may be recovered as Ca or Fe tungstate from the NaOH soln. If "hard-head" is treated it is first roasted to oxidize the Sn.

**Treating copper ores.** T. J. TAPLIN, B. TAPLIN and METALS PRODUCTION, LTD. Brit. 300,701, Aug. 19, 1927. In a process as described in Brit. 250,991 (C. A. 21, 1247) in which oxidized Cu ores are heated with a carbonaceous reducing agent in the presence of available halogen, an oxidizing step is interposed after the reduction-halogenation has been carried on for some time and the latter is subsequently resumed. If native Cu or Cu sulfide is present in the initial material, the treatment may commence with an oxidation.

**Treating low-grade iron ore.** A. HOLMBERG. Brit. 300,438, Feb. 11, 1928. In order to render low-grade Fe ore suitable for magnetic concn., it is mixed with powd. fuel and the mixt. is ignited in pans to which air is supplied together with part of the escaping combustion gases in such proportion that the charge is maintained below the sintering temp. A gaseous reducing agent such as producer gas also may be supplied. An app. is described in which the supply of air is varied according to the porosity of the charge by a damper actuated by a relay responsive to the pressure beneath the grate.

**Reducing iron, etc.** M. LAMBOT. Brit. 301,011, Nov. 23, 1927. See Fr. 644,478 (C. A. 23, 1610).

**Magnesium.** WM. KOEHLER. Fr. 655,364, July 29, 1927. See Brit. 300,149 (C. A. 23, 3413).

**Mercury from cinnabar ore.** FRANK M. SCHAD. U. S. 1,718,491, June 25. The finely divided ore is treated with a soln. of a sulfide and sulphydrate such as BaS and NaSH to form a water-sol. Hg compd.

**Removing arsenic from ores, mats, speiss and copper-arsenic compounds.** ERICH KIRMSE and WALTER SCHOPPER (to American Metal Co., Ltd.). U. S. 1,718,825, June 25. The As-contg. material is mixed with materials contg. S and C such as iron pyrites and lignite or coal to form a "self-combustible" mixt.; this mixt. is ignited and its combustion maintained with a limited supply of air to produce an atm. of C oxysulfide in contact with the mixt.

**Treatment of lead-zinc ores.** FRIED. KRUPP GRUSONWERK A.-G. Ger. 477,458, Aug. 9, 1925. Addn. to 473,016. In applying the method of Ger. 473,016 (C. A. 23, 2689) to oxide ores, etc., contg. Pb and Zn, the Pb and Zn are volatilized separately by heating the ore under oxidizing conditions, without addn. of a reducing agent, to volatilize the Pb, and then applying this method to the residue. Cf. C. A. 22, 4451.

**Zinc recovery.** WM. G. HORSCH (to Vulcan Detinning Co.). U. S. 1,719,056, July 2. Material such as galvanized iron scrap is subjected to the action of a solvent such as Na zincate soln. contg. NaOH, which dissolves the Zn but not the Fe to form a metastable soln. as the Zn concn. increases; a Zn-bearing product is recovered from the soln., e. g., by heating with or without addn. of water.

**Zinc.** AUGUSTIN L. J. QUENEAU. U. S. 1,718,378, June 25. ZnO is subjected to the action of a fluid reducing agent such as H or hydrocarbons while held in a molten bath such as chlorides of Na, K and Ca. An app. is described.

**Zinc.** ALEXANDER ROITZHEIM and WILHELM REMY. Ger. 477,457, Nov. 14, 1925. In the manuf. of Zn in continuously operated vertical retorts, the plant is kept in operation for long periods by filling defective retorts with inert material such as sand, and continuing to operate the plant until the no. of defective retorts is uneconomically large. A suitable retort furnace is described. Cf. C. A. 23, 3655.

**Distilling zinc.** NEW JERSEY ZINC CO. Brit. 300,519, Aug. 8, 1927. A porous charge of Zn-bearing material and reducing agent is passed progressively through a horizontal, externally heated reducing chamber without substantial breaking down or relative movement of the agglomerates. Various details of app. are described. Cf. C. A. 23, 2924.

**Metals such as nickel and iron by the carbonyl process.** GENERAL ELECTRIC CO., LTD., L. D. GOLDSMITH and J. F. JACKSON. Brit. 300,691, Aug. 18, 1927. In order to obtain metal powder, the metal carbonyl is decompd. by heat in an enclosure, which is at a temp. below that of decompn. (suitably by mixing the gas stream contg. the relatively cool carbonyl vapor with hot N or CO<sub>2</sub>).

**Shaped copper bodies.** GEBR. SIEMENS & CO. Ger. 473,376, Nov. 10, 1921. Addn. to 454,804. Ger. 454,804 describes the manuf. of shaped Cu bodies by pptg. Cu from a soln. of its salts by means of Fe or Zn, washing the ppt., reducing it with



H at a dark red heat, and shaping the resulting mass by pressure. This method is now modified by using Cu deposited by electrolysis at a high c. d.

**Air and gas supply means for Siemens-Martin and like regenerative furnaces.** MICHEL J. LACKNER. Ger. 477,228, Mar. 8, 1927. Addn. to 436,786.

**Shaft furnace.** CARL LUBER & SOHN. Austrian 111,624, July 15, 1928. A downwardly projecting wall in the shaft prevents the fuel from covering a horizontal grate at the base of the shaft. Air is supplied above the projecting wall through channels, which lead from the space enclosed by a double top cover, the upper member of which has adjustable air inlet holes.

**Supplementary heating means for hearth furnaces.** EISEN- UND STAHLWERK HOESCH A.-G. Ger. 477,063, Mar. 19, 1927.

**Cupola furnace construction.** J. W. JACKMAN & Co., LTD., and F. W. NEVILLE. Brit. 300,405, Dec. 8, 1927. A damper is provided for regulating the effective tuyère area.

**Cupola furnace construction.** P. MARK. Brit. 300,559, Nov. 14, 1927. The lower part of the shaft is surrounded by an annular chamber which communicates with the main shaft through upper and lower openings and serves as a refining chamber for the molten metal. Various structural details are described.

**Cupola furnace construction suitable for melting metals.** WILHELM STEFFE (to Freier Grunder Eisen-und Metallwerke G. m. b. H.). U. S. 1,717,813, June 18.

**Burner construction, etc., for utilizing liquid and gaseous fuels together in open-hearth furnaces or similar apparatus.** GEORGE L. DANFORTH, JR. (to Open Hearth Combustion Co.). U. S. 1,718,732, June 25.

**Blast-furnace top construction.** DAVID BAKER. U. S. 1,717,828, June 18.

**Spray-jet apparatus for washing blast-furnace gas.** SAMUEL STEWART. U. S. 1,718,988, July 2. Structural features.

**Iron oxide.** MAXINE A. MINOT. Fr. 655,258, Sept. 28, 1927.  $\text{Fe}_2\text{O}_3$  extd. magnetically from blast-furnace gas dust is used for purifying coke-oven gas. Residues from roasting pyrites are agglomerated with  $\text{H}_2\text{SO}_4$  and calcined, the gases being led to a Glover tower and crude oxide being obtained.

**Molybdenum-bearing pig iron.** A. KISSOCK (to Climax Molybdenum Co.). Brit. 300,570, Nov. 15, 1927. A Mo-bearing pig iron (which may be made by the process described in Brit. 299,800; C. A. 23, 3432) may be used as an alloying agent in a solid or molten state for admixt. with iron or steel or as part of the charge in a steel-making furnace for the production of gray, white, malleable or semi-steel castings.

**Magnetic elements of iron.** CHARLES H. SEYMOUR. U. S. 1,719,564, July 2. Soft iron elements of electromagnetic devices such as magnet, armature or transformer cores have their susceptibility to heating reduced by heating to redness and quenching in turpentine.

**Cast iron.** MEEHANITE METAL CORP. Fr. 655,602, June 11, 1928. See Brit. 292,164 (C. A. 23, 1382).

**Centrifugally cast-iron pipe.** WM. H. MILLSAUGH (to Paper & Textile Machinery Co.) U. S. 1,717,615, June 18. Pipe is formed with a large proportion of the impurities distributed mainly on the inner portion and forming an irregular surface with interstices filled with a cement lining, thereby being interlocked with the irregularities.

**High-temperature casting investment composition.** CHARLES A. OVERMIRE (to Western Gold & Platinum Works). U. S. 1,719,276, July 2. An investment for casting metals of high m. p. such as Pt or Pd or their alloys comprises at least 50% of  $\text{MgO}$  together with  $\text{CaSO}_4$ .

**Centrifugal metal casting apparatus.** GEORGE W. DAVIS. U. S. 1,719,596, July 2. Structural features.

**Rendering iron surfaces resistant to oxidation.** FLOYD C. KELLEY (to General Elec Co.). U. S. 1,718,563, June 25. In order to render iron resistant to oxidation at high temps., it is heated in H in contact with powd. Cr and Si at a temp. of about  $1350^\circ$ .

**Steel.** FRIED. KRUPP A.-G. Fr. 655,855, June 5, 1928. The limit of drawing in hollow steel bodies, particularly austenitic steel, is increased by forming the alloy by forging, etc., while hot, to a hollow body and expanding this, e. g., by a mandrel, to a degree such that the effort this produced exceeds and increases the original drawing limit.

**Steel.** VEREINIGTE STAHLWERKE A.-G. Brit. 300,553, Nov. 14, 1927. In order to increase the elongation limit and tensile strength of low-C unalloyed or alloy steel, the steel is quenched from a temp. below the range of decompn. of austenite and then stored or heated up to a temp. not exceeding  $250^\circ$ . The steel may contain small proportions of Cr, Ni, Si, Mo or similar elements.

**Hollow drill steel with a lining free from rust.** FAGERSTA BRUKS AKTIEBOLAG. Brit. 301,484, Dec. 1, 1927. Various mech. details of prep. and working hollow drill steel are described.

**Rustproofing iron and steel.** WM. H. COLE. U. S. 1,719,463, July 2. A satd soln. for rustproofing iron or steel is formed by dissolving Al, Zn, Fe and Cr in  $H_3PO_4$  and water. U. S. 1,719,464 relates to the prep. of similar solns. from the metals or oxide. Cf. C. A. 23, 2691.

**Determining foreign substances in iron and steel.** BROR D. ENLUND (to Henning Enlund). U. S. 1,718,687, June 25. The specific elec. resistance of hardened and annealed or normalized test pieces of the material to be tested is compared with known factors to det. the C content.

**Case-hardening.** P. F. M. AUBERT, A. J. P. DUVAL and H. A. M. DUVAL (trading as Aubert et Duval frères). Brit. 300,633, Nov. 17, 1927. Parts of metal articles to be protected from N during nitrogenization are coated with a salt or mixt. of salts or with a glazing or enamel-like material. Chlorides of K, Ba, Ca and Na, Pb oxide, sand and borax, etc., may be used in various mixts.

**Dense sintered metals or metal carbides.** R. WALTER. Brit. 300,972, Nov. 21, 1927. In order to increase the density of a sintered mass of metal or metal carbides such as W, Mo or Ta or their carbides or nitrides, the material is caused to absorb one or more molten metals of lower m. p. such as metals of the Fe or Cr group, or an alloy of Co with a metal of the Cr group, with or without addn. of up to 0.5% of B or Ti or both. An example is given.

**Metallic surfaces.** KOLLOIDCHEMIE STUDIENGESSELLSCHAFT M. B. H., JOHANNES B. CARPZOW, ROBERT LENZMANN, MARTIN MARCH and HERMANN SANDERS. Fr. 656,306, June 20, 1928. Metal surfaces are protected or oxidized metallic surfaces are deoxidized by bringing them in intimate contact with crude mud contg. unsatd  $S_2$  compds. or with active colloidal substances extd. from the mud. The mud may first be allowed to stand for some time in aq. suspension in the absence of air and with the addn. of cultures of bacteria and nutrient therefor.

**Photographic reproductions on metal.** ROBERT W. CARTER. U. S. 1,718,945, July 2. A light-sensitive coating is applied to a metal such as a white heat-resisting alloy and the surface is exposed to light through a half-tone negative; a powder substance such as silicate enamel is then applied for fusing to the metal surface, the light-affected portions are developed and portions are removed together with the powdered material deposited on them; the metal is heated to dissipate the sensitive coating from beneath the deposited material and to fuse the powdered substance to the surface of the metal.

**Superheating metals.** ACIÉRIES DE GENNEVILLIERS. Fr. 656,167, June 21, 1928. Molten metals are superheated by bringing them in contact with a gas carrying a large no. of calories and which is inert to the metal. At. H obtained by circulating mol. H through an elec. arc may be used. Fr. 656,168 describes a method of superheating by means of gases which act exothermally with the metal of the bath, e. g., O or Cl. Addns. such as Mn, C, Si or Al, which combine readily with the gas used, may be added.

**Coating metals.** DR. OTTO SPRENGER PATENTVERWERTUNG JIROTKA M. B. H. Fr. 655,786, Mar. 3, 1928. Al, Mg, Zn, Fe or their alloys are treated in baths contg. sol. permanganates to which substances are added which will ppt. Mn or oxides of Mn. HF, AcOH,  $H_2O_2$  or dichromates are suitable for addn.

**Forming multi-ply metal strips.** H. W. BUNDY. Brit. 300,272, Nov. 11, 1927. Sepd. plies are drawn through a bath of solder and then joined. An app. is described.

**Apparatus for comminuted metal granules to obtain powdered metal.** E. KRAMER and HARTSTOFF-METALL A.-G. HAMETAG. Brit. 300,879, April 27, 1928. The material is subjected to the action of rapidly rotating arms in a hardened steel casing which may contain an inert atm.

**Coating sheet metal containers with paraffin, shellac or similar materials.** CHARLES T. DRAPER (to Draper Mfg. Co.). U. S. 1,718,039, June 18. A meltable substance such as paraffin or shellac is applied to the inner surface of a blank from which a sheet metal container is to be made and, after the container has been formed, it is heated to melt the coating material and rotated to distribute it uniformly and then cooled to effect solidification of the coating.

**Pickling and cleaning metals.** GEORGE D. CHAMBERLAIN (to R. T. Vanderbilt Co.). U. S. 1,719,167, July 2. A small quantity of a condensation product of a nitrogenous base and a ketone, e. g.,  $NH_3$  and acetone, is used with baths such as those formed from  $H_2SO_4$ ; it serves to inhibit attack of the metal. U. S. 1,719,168 specifies the use of  $(CH_3)_2H_4$  as an inhibitor in baths for cleaning or pickling metals. Cf. C. A. 22, 2546 and following abstr.

**Pickling and cleaning metals.** GEORGE D. CHAMBERLAIN (to R. T. Vanderbilt Co.). U. S. 1,719,649, July 2. Metals such as iron or steel are subjected to a non-oxidizing inorg. acid-pickling or cleaning bath such as  $\text{H}_2\text{SO}_4$ ; the chem. action of the acid on the metal is inhibited without interfering with removal of scale or oxide by incorporating in the acid bath a condensation product of an aldehyde such as aldol with an amine such as  $\alpha$ -naphthylamine. U. S. 1,719,650 specifies the use of an inhibiting amine such as dibenzylaniline with thiocarbonyl. Cf. C. A. 22, 2546 and preceding abstr.

**Apparatus for continuous pickling of steel strips.** HARRY M. NAUGLE and ARTHUR J. TOWNSEND (to American Rolling Mill Co.). U. S. 1,718,063, June 18. Structural features.

**Apparatus for pickling strip iron, etc.** HEINRICH BAECKER. Ger. 477,132, Aug. 10, 1927.

**"Oil drawing furnace" for treating steel gears, etc.** ERNEST F. DAVIS (to Warner Gear Co.). U. S. 1,718,779, June 25.

**Tunnel furnace suitable for brazing and annealing in an inert atmosphere.** C. L. IPSEN and J. L. MCFARLAND (to British Thomson-Houston Co., Ltd.). Brit. 301,431, Nov. 29, 1927. Structural features.

**Means for charging annealing furnaces for iron and steel.** FRIED. KRUPP GRUSON-WERK A.-G. Ger. 477,441, Mar. 10, 1926.

**Annealing furnace for sheet iron, etc.** HEINRICH GRÜNEWALD. Ger. 477,178, Feb. 17, 1926.

**Purification of metals.** BRITISH MAXIUM, LTD. Fr. 656,354, Nov. 7, 1927. See Brit. 300,164 (C. A. 23, 3432).

**Coating aluminum.** SPRENGER CORP. M. B. II. Fr. 655,788, Mar. 10, 1928. Coatings are obtained on Al by adding an alkali borate to baths contg. Zn compds., e. g.,  $\text{ZnCO}_3$  and NaCN or  $\text{Na}_2\text{CO}_3$ .

**Refining aluminum.** ALUMINIUM-INDUSTRIE A.-G. Ger. 477,425, Jan. 28, 1926. See Brit. 265,170 (C. A. 22, 195).

**Refining aluminum.** ALUMINIUM-INDUSTRIE A.-G. Ger. 477,500, June 8, 1926. See Brit. 272,246 (C. A. 22, 1737).

**Amalgamating zinc.** BATTERIEN- UND ELEMENTE-FABRIK SYSTEM ZEILER A.-G. Ger. 477,115, Nov. 5, 1927. The Zn containers for small elec. batteries are amalgamated by brushing or swabbing them with a soln. having amalgamating and cleaning properties, e. g., with a soln. of a Hg salt in a solvent promoting the removal of fat, etc.

**Amalgamating zinc.** BATTERIEN- UND ELEMENTE-FABRIK SYSTEM ZEILER A.-G. Ger. 477,684, Mar. 25, 1928. Addn to 477,115. The method of Ger. 477,115 (preceding abstr.) is modified (1) by amalgamating the Zn in sheet form or the like on one side before the containers are formed from it, and (2) by effecting the amalgamation under acid conditions, the excess of acid being removed after the amalgamation with  $\text{CaCO}_3$  or other neutralizing agent.

**Melting and refining bronze, copper, nickel, tin or other non-ferrous metals.** DANIEL CUSHING (to Barrett Co.). U. S. reissue 17,347, July 2. See original pat. No. 1,556,591 (C. A. 20, 36).

**Alloys.** SIEGMUND DEICHES. Fr. 655,487, June 7, 1928. See Brit. 292,936 (C. A. 23, 1383).

**Alloys.** AMERICAN MACHINE & FOUNDRY CO. Fr. 655,510, June 8, 1928. An alloy which may be beaten out to very thin sheets consists of Pb satd. with Mg, i. e., contg. about 0.5% of Mg.

**Alloys.** COMPAGNIE FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON. Fr. 656,128, June 20, 1928. A brazing alloy contains approx. Cu 84, Sn 8 and Ag 8%.

**Alloys.** FREDY W. RAUTH. Fr. 655,208, June 5, 1928. In making alloys for tools, etc., from carbides of W or Mo and metals of lower f. p., sepn. of C is prevented by cooling the alloys rapidly to temps. at which the C is entirely dissolved. The alloy may be submitted to a thermal treatment after the cooling. Fr. 655,216, June 4, 1928, describes the prepn. of alloys from carbides of W or Mo with electrolytic Fe or Cr, or with these metals obtained by ordinary means but in the presence of about 5% of Cu or Mn.

**Alloys.** THE BARBER ASPHALT CO. Fr. 655,708, June 13, 1928. See Brit. 294,233 (C. A. 23, 1864).

**Light alloys.** GAËTAN PY. Fr. 656,364, Nov. 8, 1927. Light alloys of high resistance are made by adding Cu 4-5, Si 0.55 and Mg 0.95% to Al.

**Lead-tin alloys.** HÜTTENWERKE TEMPELHOF A. MEYER. Ger. 477,379, Oct. 12,

1924. Pb-Sn alloys contg. Sb and (or) Cu are converted into other alloys by fusion followed by slow cooling; the constituents which crystallize are sepd. from those which remain liquid. *E. g.*, by fusing and cooling a mixt. of metal scrap compounded so that Pb and Sn are present in the mixt. in the eutectic ratio, a sepn. of Pb and Sn in the eutectic ratio can be effected. Examples are given and a suitable furnace is described.

**Alloys containing magnesium, copper, aluminum and cadmium.** JOHN A. GANN (to Dow Chemical Co.). U. S. 1,718,642, June 25. Alloys which are suitable for casting comprise Mg as principal constituent together with Cu 3-12%, a smaller proportion of Al, and Cd (suitably about 2%). Cf. C. A. 23, 3203.

**Ferro-aluminum alloy.** RALPH P. DeVRIES and HENRY A. DEFRIES (to Ludlum Steel Co.). U. S. 1,718,685, June 25. Iron is melted and treated with a small proportion of Al to effect deoxidation, and then further treated with addnl. Al to bring the Al content of the mixt. to 60%.

**Bearing metal alloy.** ROBERT J. SHOEMAKER (to S. & T. Metal Co.). U. S. 1,717,469, June 18. An "anti-drossing" metal such as Ca and Al is introduced into molten Pb heated to a temp. sufficient to melt the "anti-drossing" metal, the melt is allowed to cool and Na is added to it at a temp. between the m. p. and vaporizing point of the Na.

**Copper aluminum alloys.** EUGEN VADERS. U. S. 1,718,502, June 25. Alloys which may be used for bearings comprise Cu together with Al 5-9.5, Mn 1-6 and Sn 0.01-2.0%.

**Hardening metals and alloys.** F. THIEMANN. Brit. 301,328, Nov. 24, 1927. Hardening is effected by exposure to gaseous HCN at about 800°. Inert gases such as N, NH<sub>3</sub>, or H may be present and compds. producing HCN such as NH<sub>4</sub>CN may be used.

**Chromium and iron-chromium alloys.** H. G. FLODIN. Brit. 300,637, Nov. 17, 1927. Metals such as these are obtained in spongy form by the reduction of briquets by carbonaceous, siliceous or other reducing agents, *e. g.*, finely crushed Fe ore and Cr ore may be briquetted with C, ferro-Si and a binder and the briquets heated progressively to 800-1300°.

**Laminations for cores of electric transformers, etc.** NAAMLÖÖZE VENNOOTSCHAP PHILIPS' GLOEILAMPENFABRIEKEN. Brit. 300,930, Aug. 13, 1927. C contg. Fe or an Fe alloy contg. at least 40% Ni is subjected to a single heating in air or O until not only a substantial decarbonization but a partial oxidation throughout has been effected and an effective permeability showing large and substantially const. values is attained. Sheets of an Fe alloy contg. 50% Ni may be heated at 900° in air for 20 min.

**Molding ingots.** EMIL GATHMANN. U. S. 1,719,542, July 2. An app. is described by which material such as lime or infusorial earth may be deposited from a reservoir on the upper face of the ingot metal and retrieved from the ingots for further use after the ingots have solidified. U. S. 1,719,543 relates to ingot-mold construction. U. S. 1,719,544 relates to the manuf. of ingot molds by treating the upper end only of the core of a forming mold with a metallic material, which is adapted to alloy with molten iron and which is highly heat-resistant to the cutting action of liquid steel, and then pouring the ingot mold metal into the forming mold and around the core so that the heat-resisting material on the core will be transferred to that portion of the ingot mold which forms the lower portion of the ingot-mold chamber.

**Ingot mold.** RADCLYFFE FURNESS. U. S. 1,717,504, June 18. A mold construction is described which provides for a chilling effect on the contained metal decreasing toward the top because of gradual change in the ratio of perimeter to cross section of the cavity by a gradual change in the contour of the cavity.

**Refractory composition for ingot-mold hot tops.** EUGENE L. MESSLER. U. S. 1,717,575, June 18. Flint clay 40-60 and grog 10-20% are used in a compn also contg. plastic clay.

**Hollow drill rods and similar articles.** PERCY A. E. ARMSTRONG (to Ludlum Steel Co.). U. S. 1,718,210, June 25. A hollow ingot is cast around a central core such as a low-C steel tube and the resulting ingot is then subjected to elongation and reduction of cross section.

**Soldering aluminum.** P. ODAM. Brit. 300,969, Nov. 21, 1927. Al-Si alloys contg. 5-12% Si are used as solders.

**Tempering, welding and brazing composition.** COLIN R. BOWERS (one-fourth to JAMES H. ANDERSON). U. S. 1,718,917, June 25. Borax 1 lb., NH<sub>4</sub>Cl 1 oz., Venetian red 1 oz., NaHCO<sub>3</sub> 1 oz., powd. coke 0.25 oz. and salt 1 oz.

**Arc-welding electrodes.** ALLOY WELDING PROCESSERS, LTD., and E. J. CLARKE. Brit. 301,221, Dec. 20, 1927. Metal electrodes for welding or soldering metals other

than Al or its alloys are made with a flux or slag priming coating contg. sawdust to create a reducing atm. around the arc. Various details and examples are given. Cf. *C. A.* 23, 2693.

**Electric-arc welding.** ELIHU THOMSON (to General Electric Co.). U. S. 1,717,530, June 18. Arc welding is effected in a protective gaseous mixt. formed by disassoc.  $\text{CO}_2$  in the presence of H. An arrangement of app. is described.

**Dip brazing.** OTTMAR M. KREMB. U. S. 1,719,512, July 2. A flux-free spelter bath is maintained in molten state beneath a stratum of comminuted micaceous material. An app. is described.

## 10—ORGANIC CHEMISTRY

CHAS. A. ROUILLER AND CLARENCE J. WEST

**The preparation of pure hydrocarbons.** J. KLEPPER. *Chimie & Industrie Special No.*, 261-4 (Feb., 1929).—With a Widmer distg. app. a no. of pure hydrocarbons were prepd. by fractionation, and were found to have the following properties: 2,3-octene,  $b_{760}$  123-123.5°,  $n_D^{20.5}$  1.4145,  $d_4^{30}$  0.7127, I no. 220.8 (calcd. 226.7); 1,2-duodecene,  $b_{15}$  93.5°,  $n_D^{21}$  1.4319,  $d_4^{30}$  0.7512; 1,2-tetradecene,  $b_{15}$  124.5-125°,  $n_D^{22}$  1.4392,  $d_4^{30}$  0.7683, I no. 123.1 (calcd. 129.6); octonaphthene (1,3-dimethylcyclohexane),  $b_{760}$  119-23°,  $n_D^{20.5}$  1.4288,  $d_4^{24}$  0.7671; nononaphthene (1,3,5-trimethylcyclohexane),  $b_{760}$  136-40°,  $n_D^{21}$  1.4304,  $d_4^{25.5}$  0.7521; *o*-xylene,  $b_{760}$  141-3°,  $n_D^{20.5}$  1.5102,  $d_4^{28}$  0.8839; *p*-xylene,  $b_{760}$  136-8°,  $n_D^{21}$  1.5004,  $d_4^{28}$  0.8541; *m*-xylene,  $b_{760}$  137-8°,  $n_D^{21}$  1.5018,  $d_4^{28}$  0.8786; nonane,  $b_{760}$  149-51°,  $n_D^{20.5}$  1.4165,  $d_4^{27.5}$  0.7348; decane,  $b_{757}$  165-7°,  $n_D^{24}$  1.4752,  $d_4^{28}$  0.8203; anthracene, m. 217°,  $b_{760}$  354-5°; *meso*-dihydroanthracene, m. 107-8°,  $b_{13}$  165-70°; tetrahydroanthracene, m. 103-4°,  $b_{14}$  170-3°.

**Contributions of x-ray studies of crystal structure to organic chemistry.** WHEELER P. DAVY. *Chem. Reviews* 6, 143-56 (1929); cf. *C. A.* 23, 10.—A brief review of the results of the x-ray analysis of the paraffin hydrocarbons, their alcs., acids and esters, the geometrically isomeric unsatd. acids, the tartaric acids,  $\text{C}_6\text{H}_6$ ,  $\text{C}_{10}\text{H}_8$ , and cellulose. Twenty-eight references are given.

**Oxidation of the gaseous paraffin hydrocarbons.** GUSTAV EGLOFF AND RAYMOND E. SCHAAD. *Chem. Reviews* 6, 91-141 (1929); cf. *C. A.* 23, 3337.—A review. 123 references are given. A program of research is suggested.

**Vapor-phase oxidation of isomeric octanes. II. Octanes with branched chains.** J. C. POPE, F. J. DYKSTRA AND GRAHAM EDGAR. *J. Am. Chem. Soc.* 51, 2203-13 (1929); cf. *C. A.* 23, 3436.—Data are presented on the vapor-phase oxidation of the 5 isomeric  $\text{C}_8\text{H}_{18}$ ,  $\text{BuEtMeCH}$ ,  $\text{Et}_2\text{PrCH}$ ,  $\text{Et}_2\text{CHCHMe}_2$ ,  $\text{Me}_2\text{CHCH}_2\text{CH}_2\text{CHMe}_2$ , and  $\text{Me}_3\text{CHCH}_2\text{CMe}_3$ . Distinct differences exist in the behavior of these hydrocarbons towards O. With the exception of the data for  $\text{Me}_3\text{CHCH}_2\text{CMe}_3$ , the various curves show a marked similarity in general nature to those for *n*- $\text{C}_8\text{H}_{18}$ , the O-consumption curves, e. g., rising rather abruptly at temps. below 300° and then showing little further rise over a considerable temp. range. The extent to which oxidation proceeds, however, before the reaction slows down, varies greatly among the different hydrocarbons. From the data, which are shown in tables and curves, it seems reasonable to assume for the 1st 4 hydrocarbons that, as in the case of *n*- $\text{C}_8\text{H}_{18}$ , the primary product of oxidation is an aldehyde; that this aldehyde is further oxidized by a chain reaction producing aldehyde, CO and  $\text{H}_2\text{O}$  and by a reaction producing aldehyde,  $\text{CO}_2$  and  $\text{H}_2\text{O}$ ; and that these reactions proceed until products are formed which resist further oxidation until temps. are reached which are high enough for general disintegration to occur, accompanied by complete oxidation to  $\text{CO}_2$  and  $\text{H}_2\text{O}$ . O attacks the Me group at the end of the longest open-end straight chain of the hydrocarbon, forming an aldehyde and  $\text{H}_2\text{O}$ ; the aldehyde is oxidized with the formation of an aldehyde of 1 less C atom,  $\text{H}_2\text{O}$  and either CO or  $\text{CO}_2$ . This reaction proceeds until a branch in the hydrocarbon chain occurs, making the oxidation product a ketone instead of an aldehyde; when this stage has been reached the low-temp. oxidation slows down markedly, as it would be expected that a ketone would resist further oxidation more than an aldehyde. In the case of  $\text{Me}_3\text{CHCH}_2\text{CMe}_3$ , the highly condensed structure evidently renders the hydrocarbon so resistant to oxidation that no reaction occurs at all until such high temps. are reached that the reaction, once started, goes rapidly to completion. There is little relation between the temp. of initial attack and the other oxidation characteristics. Certain points of interest bearing on the general problem of hydrocarbon

oxidation are briefly discussed, for which the original should be consulted. **III. The effect of tetraethyl lead and the relation of oxidation to engine detonation.** *Ibid* 2213-20.—Data are presented upon the oxidation of  $C_8H_{18}$  and of  $C_8H_{18}CHO$  in the presence of  $PhEt_4$ . The effect of the  $PhEt_4$  seems to be chiefly that of slowing down the oxidation of aldehydes to  $CO$ ,  $H_2O$  and other aldehydes. The tendency of the hydrocarbons studied to detonate follows the same order as that of the extent to which this reaction occurs at low temps. and the hydrocarbon showing no low-temp. oxidation has less tendency to detonate than any of the others. Apparently, therefore, both the temp. of initial oxidation and the extent to which such oxidation proceeds are factors involved in the detonation phenomena. The mechanism of engine detonation is also discussed.

C. J. WEST

**Thermochemical studies of the acetylene hydrocarbons.** PHILIPPE LANDRIET AND FRANÇOIS BAYLOCO. *Bull. soc. chim.* **45**, 217-25 (1929); cf. *C. A.* **23**, 2967.—For  $\alpha$ -heptene and  $\alpha$ -octene, resp., the following values were obtained: mol. heat of combustion (const. vol.), 1092, 1243.5 cal.; (const. pressure), 1093.5, 1245.5 cal.; mol. heat of formation, -19.5, -8 cal.

DAVID DAVIDSON

**Aliphatic diolefins. II. The preparation and some physical constants of 1,5-hexadiene.** FRANK CORTESE. *J. Am. Chem. Soc.* **51**, 2266-9 (1929); cf. *C. A.* **23**, 3436.—Detailed directions are given for the prepn. of 1,5-hexadiene from  $CH_2=CHCH_2Cl$  or  $CH_2=CHCH_2Br$  and  $Mg$  in  $Et_2O$ , 27 and 36% yields, resp., being obtained. The following consts. were detd.:  $b_{760}$  59.57  $\pm$  0.05°;  $dn/dp$  (750-70 mm) 0.027  $\pm$  0.001°; m. -140.9  $\pm$  0.1°;  $d_4^{20}$  0.7106,  $d_4^{25}$  0.6863;  $n_D^{20}$  1.4076, 1.4014, 1.4012 for 15°, 20°, 25°. The last 5 values are correct within  $\pm$  0.0002. The compd. has a very penetrating, highly "unsatd.," nauseating odor, inducing anesthesia easily. It has a sweet taste when highly dild. with  $H_2O$ . Ordinary samples develop a sharp odor and deposit a yellow oil on standing. It can be identified as the mono  $H_2SO_4$  ester of hexane-2,5-diol.

C. J. WEST

**The most recent processes for the catalytic production of methanol from carbon monoxide and hydrogen.** ARTHUR ULLRICH. *Metallborse* **19**, 1181-2, 1238 9, 1291-5 (1929).—A review.

W. C. EBBACH

**Polyglycerols.** MAURICE RANGIER. *Chimie & industrie Special No.*, 535 (Feb., 1929).—See *C. A.* **22**, 4468.

A. PAPINEAU-COUTURE

**Carbylamines.** M. PASSERINI. *Mem. accad. Lincei* [6], **2**, 377-98 (1927). A résumé of work previously published (*C. A.* **16**, 555; **21**, 1095). P. discusses the reactions of carbylamines with org. acids, aldehydes and ketones in presence of acids, hydrates of chloro aldehydes, phenol and naphthols and pernitroso derivs.

B. C. A.

**Silver cacodylates.** ENRIQUE V. ZAPPI AND ALICE MANINI. *Bull. soc. chim.* **45**, 154-5 (1929).—A double decompn. between  $Me_2AsO_2Na$  and  $AgNO_3$  yields exclusively  $Me_2AsO_2Ag \cdot AgNO_3$ . In order to obtain pure  $Me_2AsO_2Ag$ , freshly prepd wet  $Ag_2O$  is dissolved in a 88% aq.  $Me_2AsO_2H$ , after 12 hrs. 3 vols.  $HNO_3$  is added, and the 1st crop of crystals is filtered off after 24 hrs. The yield is 50% and the crystals are pure. By treatment of the mother liquid, the yield becomes nearly theoretical.

ALBERT L. HENSE

**Thermic decomposition of organo-magnesium alcoholates.** D. IVANOV. *Compt. rend.* **188**, 1259-60 (1929).—I. tried to arrive at ethers from  $Mg$  alcoholates according to the following scheme:  $2 ROMgX \rightarrow R_2O + MgX_2 + MgO$  ( $X = \text{halogen}$ ). Instead, thermic decompn. produced merely  $MgO$ ,  $MgX_2$ , the corresponding ethylene hydrocarbon, its polymers and the corresponding alc. Small quantities are also formed of halogen derivs. of the ethylene hydrocarbons and of the alc., the corresponding aldehyde, satd. hydrocarbons and  $H_2$ . The decompn. of the  $Mg$  alcoholates occurs at the following temps.: primary 330-50°, secondary and hydroaromatic 190-220°, tertiary 140-60°, arylaliphatic 380-400°, phenolates 500°. The reaction was carried out on  $EtOMgBr$ ,  $iso-PrOMgBr$ ,  $tert-BuOMgBr$ ,  $C_6H_{13}OMgBr$ ,  $PhCH_2OMgBr$  and  $PhOMgBr$ . For the prepn. of the  $Mg$  alcoholates by oxidation of org.  $Mg$  halides see Ivanov (*C. A.* **20**, 3893).

G. TOENNIES

**Reaction of a mixture of methyl chloride and methyl bromide with magnesium in ether.** HENRY GILMAN AND R. J. VANDER WAL. *Bull. soc. chim.* **45**, 135-7 (1929).—Criticism of Rudd and Turner (*C. A.* **22**, 1950). Contrary to their conclusions, a mixt. of  $MeCl$  and  $MeBr$  reacts easily with  $Mg$  in  $Et_2O$  and gives a mixt. of  $MeMgBr$  and  $MeMgCl$ , where the bromide is preponderant.

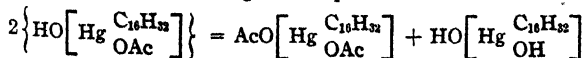
ALBERT L. HENSE

**Mercuric complexes of the olefins.** G. HUGEL AND J. HIBOU. *Chimie & industrie Special No.*, 296-301 (Feb., 1929).—According to Hoffmann and Sand, olefins react with aq.  $Hg(OAc)_2$  solns. to give compds. having the general formula:  $C_nH_{2n}Hg(OH)OAc$ .

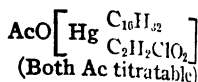
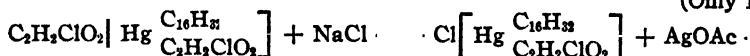
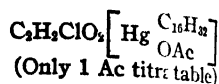
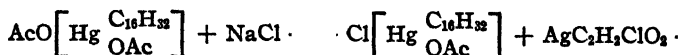
The higher hydrocarbons react only very slowly with cold aq.  $\text{Hg}(\text{OAc})_2$  and the reaction takes place more readily in MeOH, giving compds. of the formula  $\text{C}_n\text{H}_{2n}\text{Hg}(\text{OMe})_2(\text{OAc})_2$ , which would indicate that the fixation of Hg salts by olefins is intimately related with a hydrolysis or an alcoholysis, and that it is therefore necessary (in the case of mineral acid salts of Hg) to neutralize the acid liberated in order to obtain a quant. reaction. Salts which are not hydrolyzed (*e. g.*,  $\text{Hg}(\text{CN})_2$  and  $\text{Hg}(\text{CNS})_2$ ) do not react, and if olefin-Hg complexes are treated with KCN or KCNS, they are decompd. with formation of  $\text{Hg}(\text{CN})_2$  or  $\text{Hg}(\text{CNS})_2$ . In order to det. if such hydrolysis is essential to the fixation of Hg salts, 1,2-hexadecene was treated with  $\text{Hg}(\text{OAc})_2$  in glacial AcOH. The hexadecene rapidly dissolves; on cautious addn. of  $\text{H}_2\text{O}$  there ppts. an oil which rapidly crystallizes and has a compn. corresponding to  $\text{C}_{16}\text{H}_{32}\cdot\text{Hg}(\text{OAc})_2$ . This reaction is quite general for all the olefins, and seems to be also general for the Hg'' salts of a large no. of org. acids. The following compds. were thus prepd.:  $\text{C}_2\text{H}_4\cdot\text{Hg}(\text{OAc})_2$ , 2,3-octene.  $\text{Hg}(\text{OAc})_2$ , 1,2-duodecene.  $\text{Hg}(\text{OAc})_2$ , 1,2-tetradecene.  $\text{Hg}(\text{OAc})_2$ , 1,2-hexadecene.  $\text{Hg}(\text{OAc})_2$ , 1,2-hexadecene.  $\text{Hg}(\text{C}_2\text{H}_2\text{ClO}_2)_2$ , 1,2-hexadecene.  $\text{Hg}(\text{C}_3\text{H}_5\text{O}_2)_2$ , 1,2-hexadecene.  $\text{Hg}''$  palmitate, 1,2-hexadecene.  $\text{Hg}''$  stearate. The reaction with  $\text{Hg}(\text{C}_2\text{H}_3\text{ClO}_2)_2$  was carried out in  $\text{CH}_2\text{ClCO}_2\text{H}$ , while the Hg'' palmitate and stearate were dissolved in excess of  $\text{C}_{16}\text{H}_{32}$ . The reaction is quite rapid in all cases, requiring only a few min. Though addn. compds. can be obtained without hydrolysis in the case of org. Hg'' salts, they cannot be thus obtained with inorg. Hg'' salts; *e. g.*,  $1\text{HgOAc}$  does not react directly with  $\text{C}_{16}\text{H}_{32}$  to give  $\text{C}_{16}\text{H}_{32}\cdot 1\text{HgOAc}$ ; but the latter, which is quite stable, is easily obtained by the action of KI on the addn. compd. obtained with  $\text{Hg}(\text{OAc})_2$ . There are also definite indications of the existence of the corresponding purely inorg. addn. compds. They can also be obtained indirectly, *e. g.*, by adding in excess of a concd. aq. soln. of KI to  $\text{C}_{16}\text{H}_{32}\cdot\text{Hg}(\text{OAc})_2$  in  $\text{Et}_2\text{O}$  or  $\text{CHCl}_3$ . Both Ac groups can be replaced by I; on evapn. the soln. gives an oil which spontaneously changes to highly unstable white crystals which, on touching with a glass rod, decomp. into  $\text{C}_{16}\text{H}_{32}$  and yellow  $\text{HgI}_2$ , ultimately changing to red  $\text{HgI}_2$ . Nearly all the addn. compds. of olefins with  $\text{Hg}(\text{OAc})_2$  are obtained as thick oils which ultimately change spontaneously (possibly by isomerization) into cryst. solids, frequently having high mps and of different solubilities; *e. g.*, the oily  $\text{C}_2\text{H}_4$  addn. compd. is sol. in  $\text{Et}_2\text{O}$ , while the cryst. form is insol. The soly. in  $\text{H}_2\text{O}$  decreases as the mol. wt. increases. In  $\text{H}_2\text{O}$  only slightly more than 1 Ac group of  $\text{C}_2\text{H}_4\cdot\text{Hg}(\text{OAc})_2$  can be titrated with NaOH, there being formed a strong base  $\text{HO}\left[\text{Hg}\begin{smallmatrix} \text{C}_2\text{H}_4 \\ \text{OH} \end{smallmatrix}\right]$ , which is sol. in  $\text{H}_2\text{O}$ . Similarly, in  $\text{CHCl}_3$  only slightly more than 1 Ac of  $\text{C}_{12}\text{H}_{24}\cdot\text{Hg}(\text{OAc})_2$  can be titrated. In  $\text{CHCl}_3$ , 1 Ac of  $\text{C}_{16}\text{H}_{32}\cdot\text{Hg}(\text{OAc})_2$  can be titrated, the end point being quite sharp with formation of  $\text{HO}\left[\text{Hg}\begin{smallmatrix} \text{C}_{16}\text{H}_{32} \\ \text{OAc} \end{smallmatrix}\right]$  (I), which decomp. above  $90^\circ$  without melting and by means of which 1 mol. of NaOH can be titrated according to the reversible equation:  $\text{HO}\left[\text{Hg}\begin{smallmatrix} \text{C}_{16}\text{H}_{32} \\ \text{OAc} \end{smallmatrix}\right] + \text{NaCl} \rightleftharpoons \text{Cl}\left[\text{Hg}\begin{smallmatrix} \text{C}_{16}\text{H}_{32} \\ \text{OAc} \end{smallmatrix}\right] + \text{NaOH}$ . In  $\text{Et}_2\text{O}$ , however, Ac of  $\text{C}_{16}\text{H}_{32}\cdot\text{Hg}(\text{OAc})_2$  can be titrated rapidly, and the 2nd Ac very slowly, the final reaction product pptg. out of the  $\text{Et}_2\text{O}$  and corresponding to  $\text{HO}\left[\text{Hg}\begin{smallmatrix} \text{C}_{16}\text{H}_{32} \\ \text{OH} \end{smallmatrix}\right]$ , which acts with NaCl as follows:  $\text{HO}\left[\text{Hg}\begin{smallmatrix} \text{C}_{16}\text{H}_{32} \\ \text{OH} \end{smallmatrix}\right] + \text{NaCl} \rightleftharpoons \text{Cl}\left[\text{Hg}\begin{smallmatrix} \text{C}_{16}\text{H}_{32} \\ \text{OH} \end{smallmatrix}\right] + \text{NaOH}$ , (II)

and with AcOH according to:  $\text{HO}\left[\text{Hg}\begin{smallmatrix} \text{C}_{16}\text{H}_{32} \\ \text{OH} \end{smallmatrix}\right] + \text{AcOH} = \text{AcO}\left[\text{Hg}\begin{smallmatrix} \text{C}_{16}\text{H}_{32} \\ \text{OH} \end{smallmatrix}\right] + \text{H}_2\text{O}$ . (III)

I, isomeric with I, m.  $55-60^\circ$ , and does not react with NaCl to give NaOH, the  $\text{Et}_2\text{O}$  soln. remaining neutral, so that it reacts according to the equation:  $\text{AcO}\left[\text{Hg}\begin{smallmatrix} \text{C}_{16}\text{H}_{32} \\ \text{OH} \end{smallmatrix}\right] + \text{HCl} = \text{Cl}\left[\text{Hg}\begin{smallmatrix} \text{C}_{16}\text{H}_{32} \\ \text{OH} \end{smallmatrix}\right] + \text{NaOAc}$ . This proves that in the addn. compds. of  $\text{Hg}(\text{OAc})_2$  to olefins, the 2 positions occupied by Ac are not equiv.: I is an unstable form of the addn. compd., and it is shown that the titration of the 2 Ac by NaOH in  $\text{Et}_2\text{O}$  is due to the instability of I, which decomp. according to the equation:



The isomerism of the position of the 2 Ac radicals has also been shown by reactions which may be indicated as follows:



I can react with  $\text{C}_n\text{H}_{2n}\text{-Hg}^{++}$  complexes according to either:  $\text{C}_n\text{H}_{2n}\text{-Hg}(\text{OOCR})_2 + 2\text{I} = \text{C}_n\text{H}_{2n}(\text{I})\text{OOCR} + \text{Hg}(\text{I})\text{OOCR}$ , or  $\text{C}_n\text{H}_{2n}\text{-Hg}(\text{OOCR})_2 + 3\text{I} = \text{C}_n\text{H}_{2n}(\text{I})\text{OOCR} + \text{HgI}_2 + \frac{1}{2}\text{RCOOR} + \frac{1}{2}\text{CO}_2$ . H. and H. have not yet succeeded in identifying the compds. of general formula  $\text{C}_n\text{H}_{2n}(\text{I})\text{COOR}$ , so that the equations were confirmed only as regards the compds.  $\text{Hg}(\text{I})\text{COOR}$  and  $\text{HgI}_2$  and the formation of  $\text{RCOOR}$  and  $\text{CO}_2$ . As regards the constitution of these complexes, they admit the existence of a complex univalent cation contg. the Hg, olefin and 1 acid radical, according to the formula  $\text{Ac}'\text{O} \left[ \text{Hg} \begin{smallmatrix} \text{C}_n\text{H}_{2n} \\ \text{OAc} \end{smallmatrix} \right]$  (' designates the anion, ' the cation), which accounts

sufficiently for the difference in reactivity and isomerism of the 2 acid radicals and which has the great advantage of permitting a simple and clear nomenclature. The preceding results were obtained with a view to finding a satisfactory method for the *detn. of unsatd. hydrocarbons* in mixts. This phase of the work is not yet completed, and the chief results obtained to date are briefly summarized as follows: *To det. unsatd. hydrocarbons* treat the mixt. with  $\text{Hg}(\text{OAc})_2$  in glacial  $\text{AcOH}$ ; the unsatd. hydrocarbons dissolve as  $\text{Hg}''$  complexes, and the vol. of unabsorbed hydrocarbons is measured. The satd. hydrocarbons are partly sol., but can be pptd. practically quant by cautious addn. of  $\text{H}_2\text{O}$ . The unsatd. hydrocarbons can be regenerated by addn. of  $\text{HCl}$  to the  $\text{AcOH}$  soln. and their mean mol. wt. detd. The closer the initial and final b. ps., the more accurate the results. *To det. the degree of unsatn.* treat the mixt. with  $\text{Hg}(\text{OAc})_2$  in glacial  $\text{AcOH}$ , sep. the satd. hydrocarbons, ppt. the  $\text{Hg}^{++}$  complexes by addn. of  $\text{H}_2\text{O}$  and ext. with  $\text{Et}_2\text{O}$ ; as each double bond fixes one Hg, the degree of unsatn. can be detd. by titrating with  $\text{NaOH}$  or by titrating Hg with  $\text{SnCl}_2$ . As it seems difficult to det. the conditions under which the  $\text{Hg}^{++}$  complexes behave uniformly as regards direct titration with  $\text{NaOH}$ , it is simpler to neutralize with  $\text{NaOH}$ , add  $\text{NaCl}$  and titrate the liberated  $\text{NaOH}$ . Bibliography of 25 references.

A. PAPINEAU-COUTURE

The hydrogenation of aliphatic acetals. MLLÉ. M. CABANAC. *Compt. rend.* 188, 1257-9(1929).—The hydrogenation of di-Et, di-Pr, di-Bu and higher acetals, according to Sabatier and Senderens, produced in all cases: the mixed oxide of Et and the acetal-forming alkyl, and the acetal-forming alc. itself, in accordance with the reaction  $\text{CH}_3\text{CH}(\text{OR})_2 + \text{H}_2 = \text{EtOR} + \text{ROH}$ .

G. TOENNIES

Synthesis of 1,5-dimethoxy-2-pentanone. R. PAUL. *Bull. soc. chim.* 45, 152-4 (1929).— $\text{MeO}(\text{CH}_2)_3\text{MgI}$  (200 g. in 4 vols. anhyd.  $\text{Et}_2\text{O}$ ) is added to 24 g.  $\text{Mg}$ , under const. cooling to prevent the formation of trimethylene.  $\text{MeOCH}_2\text{CN}$  (70 g in 1 vol.  $\text{Et}_2\text{O}$ ) is added under strong cooling. These proportions are optimum to obtain a good yield (actual figure not given) of  $\text{MeOCH}_2\text{CO}(\text{CH}_2)_3\text{OMe}$ ,  $b_{25}$  98.9°,  $d_{15}^{25}$  1.001,  $n_D^{25}$  1.42645; semicarbazone, m. 88.5°.

ALBERT L. HENNE

The use of ozone in the determination of the constitution of unsaturated compounds. JEAN DORVILLE. *Bull. soc. chim.* 45, 140-52(1929).—A general article. A bibliography of French publications is given.

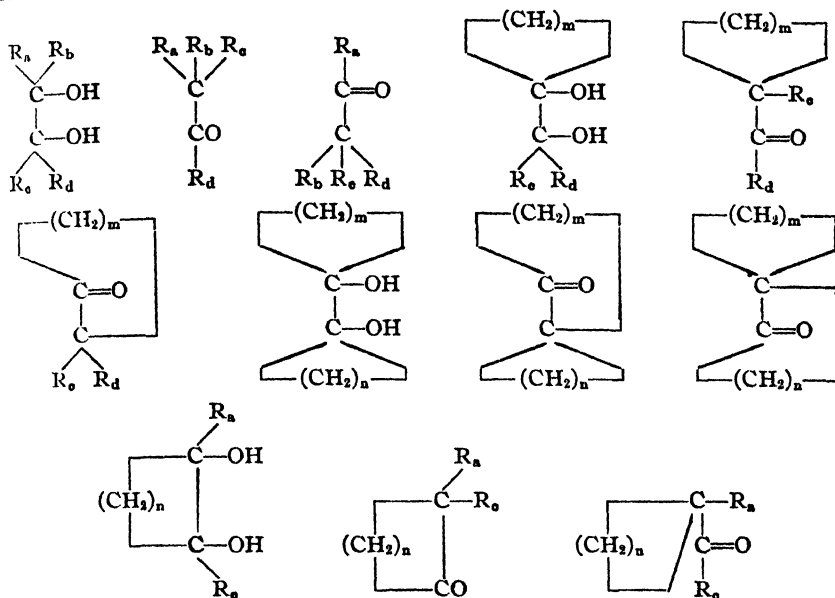
ALBERT L. HENNE

Chloroacetates of cadmium, manganese and cobalt. L. FOGEL, (MISS) T. RUBINSZTEIN AND (MISS) A. TAUMAN. *Roczniki Chem.* 9, 348-53 (353 German)(1929).—By neutralizing the free acids with Cd, Co or Mn carbonates and evapg. in a vacuum desiccator at room temp. the following cryst. salts were prepd.: Cd chloroacetate,  $(\text{CH}_3\text{ClCO}_2)_2\text{Cd} \cdot 6\text{H}_2\text{O}$ ,  $d_{25}$  1.942; dichloroacetate, needles with 1  $\text{H}_2\text{O}$ ,  $d_{25}$  2.131 at 25°; trichloroacetate, needles or rhombs with 1.5  $\text{H}_2\text{O}$ ,  $d_{25}$  2.093. Co chloroacetate  $(6\text{H}_2\text{O})$ , m. 68-9°,  $d_{25}$  2.290; dichloroacetate  $(3\text{H}_2\text{O})$ , m. 115-7°,  $d_{25}$  2.358; trichloroacetate  $(3.5 \text{ H}_2\text{O})$ , m. below 40° (decompn.),  $d_{25}$  1.130. Mn chloroacetate (1.5



H<sub>2</sub>O),  $d_{25}$  1.152; *acid dichloroacetate*,  $3(\text{CHCl}_2\text{CO}_2)_2\text{Mn} \cdot 2\text{CHCl}_2\text{CO}_2\text{H} \cdot 6\text{H}_2\text{O}$ ,  $d_{25}$  1.565; *trichloroacetate* (3.5 H<sub>2</sub>O),  $d_{25}$  1.967. J. KUČERA

**Bicyclic di-tertiary glycol pinacol rearrangements.** JOHN PALMÉN. *III Kemistismölet* (Finland) 1926, 195–208 (1928).—In Swedish. The pinacols may be classified into 4 types each of which has 2 possible rearrangements on dehydration.



1,2-Dimethyl-1,2-dihydroxycyclohexane may become either 1-methyl-1-acetylcyclopentane or 1,1-dimethyl-2-hexanone. The latter has been demonstrated (Nametkin, *C. A.* 18, 2885). To follow this pinacol rearrangement into the bicyclic types it became necessary to synthesize hitherto unknown compds. of santene and camphane origin. The details of this work not being pertinent to the title of this paper are temporarily withheld. Santene glycol on dehydration should give either 1-methyl-1-acetyl-2,5-bicyclomethylenecyclopentane or camphenilone. Dehydration was done with H<sub>2</sub>SO<sub>4</sub> in a freezing mixt. and a 5% yield of camphenilone was isolated. Resinous matter formed simultaneously but the alternative dehydration product was not found. "I have shown that a bicyclic pinacol loses water by simple Me migration without changing the bicyclic system. The chief reaction, however, must be otherwise with a destruction of the mol. since no characteristic products occur. If the glycol has Me substituents in the bicyclic bridge there will be no Me migration on dehydration but a fundamental change resulting in a monocyclic compd. with double bonds. If other substituents than Me are introduced into camphorquinone, the stereo interferences permit only one CO group to react and only keto alcs. result." "If attempt is made to form a carbonyl *o*- to that already present in satenone, colorless hydrates result instead of yellow santenequinone." A. R. ROSE

**Note on the use of aniline in the preparation of amino acids.** H. C. BENEDICT. *J. Am. Chem. Soc.* 51, 2277 (1929).—PhNH<sub>2</sub> can replace C<sub>6</sub>H<sub>5</sub>N in the prepn. of NH<sub>2</sub> acids; alanine is obtained in 50% yield by hydrolyzing a mixt. of AcH (1 mol.), aq. NH<sub>4</sub>Cl (2 mols.) and NaCN (1 mol.) with concd. HCl, evapg. to a thick paste, treating with 10 mols. MeOH, filtering and treating with 1.3 mols. PhNH<sub>2</sub>.  $\alpha$ -Aminoisobutyric and -valeric acids have been prepd. similarly. C. J. WEST

**Relations between rotatory power and structure in the sugar group. XIX. Improvements in the preparation of aldonic acids.** C. S. HUDSON AND H. S. ISBELL. *J. Am. Chem. Soc.* 51, 2225–9 (1929); cf. *C. A.* 22, 3140.—The use of a buffering salt of an org. acid, such as Ba or Ca benzoate, during the oxidation of aldoses by Br-H<sub>2</sub>O, greatly increases the speed of the reaction, because of the maintenance of a relatively low H-ion concn., and permits the oxidation of compound-reducing aldoses, such as lactose, without complications from hydrolysis. The reaction mixt. should be kept

in the dark for the best results. The yields of aldonic acid are nearly quant. With lactose, it is possible to oxidize it to nearly pure lactobionic acid, which can then be hydrolyzed to galactose and gluconic acid, both of which can be obtained in high yields. Examples of the oxidation of glucose, xylose and lactose are given. C. J. WEST

**New derivatives of glycolaldehyde and methylglyoxal.** HERMANN O. L. FISCHER and LEONHARD FELDMANN. *Ber.* 62B, 854-65(1929).—As has been briefly mentioned (*C. A.* 22, 223)  $\text{HOCH}_2\text{CHO}$  (I) and its derivs. can be obtained by ozonizing the appropriate compds. with double bonds and reducing the resulting ozonides with Zn dust and  $\text{AcOH}$ . The prepn. of I from allyl and cinnamic alcs. is now described in detail because others are working along the same line (cf. F. Gottwalt Fischer, *C. A.* 22, 3627). Glucosidic and acyl derivs. of I can be prepd. in the same way. The glucoside *tetraacetate* (II) has not yet been obtained in cryst. form, perhaps because it exists in both a cyclic,  $\text{ROCH}(\text{CH}_2\text{O})$ , and an open form,  $\text{ROCH}_2\text{CHO}$ , but the amorphous

product had the calcd. compn. and with  $\text{HCl}$  in  $\text{MeOH}$  gave a well-crystd. *dimethyl acetal* (III), also obtained from acetobromoglucose,  $\text{Ag}_2\text{CO}_3$  and  $\text{HOCH}_2\text{CH}(\text{OMe})_2$ . Since the ozonization of  $\text{CH}_2=\text{CHCH}_2\text{OH}$  for the prepn. of I gives but a poor yield, other starting materials were sought for. The now technically available monomeric  $\text{AcOCH}:\text{CH}_2$  was treated in  $\text{AcOH}$  with 1 mol.  $\text{Br}_2$  and, without isolating the dibromide, with  $\text{KOAc}$ , which gave a well-crystd. *triacetate* (IV) of I. The free I, however, has thus far been obtained only in poor yield by hydrolysis of IV, nor has it been possible to convert the IV into the cyclomonoacetate of I. IV is also obtained from cryst I and  $\text{Ac}_2\text{O}$ .  $\text{CO}(\text{CH}_2\text{OH})_2$ , refluxed with  $\text{Ac}_2\text{O}$  likewise yields the diacetate  $\text{CO}(\text{CH}_2\text{OAc})_2$  (V) and  $\text{MeCOCHO}$  gives the *dimethyl acetal* (VI) which with cold perhydrol yields a peroxide-like compd.,  $\text{C}_7\text{H}_{10}\text{O}_6$  (VII). The reactions of VII are so anomalous, however, that its structure has not yet been definitely established; it liberates 1 atom I from HI and in  $\text{Ac}$  detns. by the Freudenberg method gives 3 acid groups (probably because the  $\text{MeCOCHO}$  group is oxidized by the O under the conditions of the detn.), on the other hand, with excess of hot  $\text{PhNIINH}_2$ .  $\text{HOAc}$ , it gives the phenylsazone of  $\text{MeCOCHO}$ . The  $\text{MeCOCHO}$  was prepd. by distg.  $\text{CO}(\text{CH}_2\text{OH})_2$  *in vacuo* with  $\text{F}_2\text{O}_2$ , yield, 35-40%. This method of prepg. ketoaldehydes, which has been frequently used for biol. purposes, is now described in detail and a drawing of the app. is given. As the methods mentioned above do not afford a convenient means of prepg. I, the prepn. from dihydroxymaleic acid (VIII) has been improved. With coned  $\text{H}_2\text{O}_2$  the troublesome addn. of fuming  $\text{H}_2\text{SO}_4$  can be entirely avoided. From 200 g. tartaric acid is obtained 48 g. VIII, contaminated with a little Fe salt but admirably adapted to the prepn. of I. The yield of I, m.  $76^\circ$ , from allyl alc. through the ozonide is 20.5%, from cinnamic alc. 6%. *Me allyl carbonate* (63% from allyl alc. and  $\text{ClCO}_2\text{Me}$  in  $\text{C}_6\text{H}_5\text{N}$ ),  $b_{18}$   $38^\circ$ , and yields through the ozonide 39% of *O-carbomethoxyglycolaldehyde*,  $b_{17}$   $78-9^\circ$ , which strongly reduces hot Fehling soln. and with  $\text{HC}(\text{OEt})_3$  and a little  $\text{NH}_4\text{Cl}$  and abs. alc. at room temp. gives after 3 days 50% of the *diethyl acetal*,  $\text{MeO}:\text{COCH}_2\text{CH}(\text{OEt})_2$ ,  $b_{0.3-0.4}$   $72-5^\circ$ ,  $n_D^{20}$  1.4105. II (25-30% from allyl glucoside tetraacetate) is decompd. into I and glucose by hot 0.1 N  $\text{H}_2\text{SO}_4$ . III (40% from II or 12% from  $\text{HOCH}_2\text{CH}(\text{OMe})_2$  and acetobromoglucose), m.  $84^\circ$ ,  $[\alpha]_D^{18} -20.48^\circ$  ( $\text{MeOH}$ ) IV (with GERDA DANGSCHAT), obtained in 16% yield from  $\text{AcOCH}:\text{CH}_2$  or 20% yield from I, m.  $52^\circ$ . V (40% yield), m.  $46-7.5^\circ$ . VI (29%), faintly yellow,  $b_{13}$   $115-6^\circ$ . VII (80%), m.  $78-9^\circ$ , mol. wt. in  $\text{AcOH}$  193. C. A. RUTTLER

**Methyl ethers of diacetyl dioxime.** RICH THILO. *Ber.* 62B, 866-71(1929).—Only a mono- (I) and a di-Me ether (II) of diacetyl dioxime (III) are described in the literature and nothing definite is known as to their structure. I was prepd. by Charrier from  $\text{AcCMe:NOMe}$  with  $\text{NH}_2\text{OH} \cdot \text{HCl}$  in  $\text{Na}_2\text{CO}_3$ ; a repetition of his work gave a 73% yield. The work of Avogadro and Tavola, who obtained II from III with  $\text{Me}_2\text{SO}_4$  in  $\text{NaOH}$ , was also repeated. The yield of II is 65% at most, although no unchanged III remains in the soln. II with fuming  $\text{HCl}$  at about  $60^\circ$  gives, along with unchanged II, only  $\text{Ac}_2$  and  $\text{NH}_2\text{OMe}$ , identified as its  $\text{HCl}$  salt, and I behaves in the same way except that some III can also be extd. with  $\text{Et}_2\text{O}$  from the acid reaction mixt. The residue obtained by evapg. the aq.  $\text{HCl}$  layer reduces Fehling soln. As it is relatively little sol. in alc. and not hygroscopic, it probably consists only of  $\text{NH}_2\text{OH} \cdot \text{HCl}$  and  $\text{NH}_2\text{OMe} \cdot \text{HCl}$ , with no  $\text{MeNH}(\text{OH}) \cdot \text{HCl}$ . With 1%  $\text{HCl}$  at about  $60^\circ$  I gives a mixt. of substances in which were identified unchanged I,  $\text{AcCMe:NOMe}$  and some III;  $\text{Ac}_2$  was present only in traces, if at all. After removal of the  $\text{AcCMe:NOMe}$  and extn. with  $\text{Et}_2\text{O}$ , the soln. on evapg. gave a residue which reduced Fehling soln. If the reaction mixt. is cooled and allowed to stand overnight, all the  $\text{AcCMe:NOMe}$  disappears

and is replaced by **II**; on working up the soln. there are now obtained, together with much unchanged **I**, equiv. amts. of **II** and **III** and the  $\text{Et}_2\text{O}$ -extd. soln. no longer reduces Fehling. Evidently at  $60^\circ$  part of the **I** splits off the  $\text{NOH}$  group and another part the  $\text{NOMe}$  group and on cooling the fragments reunite, partly regenerating **I** and partly forming **II** and **III** in equiv. amts. The cleavage expts. indicate that in both **I** and **II** the ethereal  $\text{Me}$  groups are attached to  $\text{O}$  and the disproportionation of **I** shows that its  $\text{Me}$  group is attached in the same way as those in **II**, a conclusion confirmed by the fact that **I** with  $\text{Me}_2\text{SO}_4$  in weakly alk. soln. gives 91% of **II**. Furthermore,  $\text{AcCMe: NOH}$  with  $\text{NH}_2\text{OMe}$ .  $\text{HCl}$  in faintly alk. soln. gives 80% of **I** and extn. of the reaction mixt. with  $\text{Et}_2\text{O}$  leaves a yellow soln. from which unchanged **I** can be extd. after acidification. This seems to establish beyond doubt the structure of **I** and at the same time of  $\text{AcCMe: NOMe}$ , for this can give **I** with  $\text{NH}_2\text{OH}$  only if the  $\text{Me}$  group in it is on the  $\text{O}$ . Likewise,  $\text{AcCMe: NOMe}$  in alc. with  $\text{NH}_2\text{OMe}$  gives 97% of **II**. All attempts to obtain  $\text{N-Me}$  ethers of **III** have thus far failed. C. A. R.

**Polygalacturonic acid.** WANDA WLOSTOWSKA. *Roczniki Chem.* **9**, 371-89 (1929).—A method of prep. polygalacturonic acid and its  $\text{Na}$  salt as well as its chem. and phys., particularly colloidal, properties are described. J. KUČERA

**Action of phenyl isocyanate on urethans, ureas and thioureas.** HANS LAKRA AND F. B. DAINS. *J. Am. Chem. Soc.* **51**, 2220-5 (1929).—Direct addn. products were obtained with  $\text{PhNCO}$  and  $\text{EtO}_2\text{CNH}_2$ ,  $\text{CO}(\text{NH}_2)_2$ ,  $\text{PhNHCONH}_2$ ,  $\text{CO}(\text{NHPh})_2$ ,  $\text{CS}(\text{NH}_2)_2$  and all isothioureas ethers contg. a free  $\text{NH}$  grouping. In all other cases the results obtained were due either to addn. and subsequent breaking down of the addn. product or dissocn. at the elevated temp. of the urethan, urea, etc., and the reuniting of  $\text{PhNCO}$  and these fission products in various ways. This is illustrated especially by the formation of isocyanuric acid and its derivs. Thiourea ethers, isothioureas ethers and guanidine unite with 2 mols. of  $\text{PhNCO}$  but with only 1 mol. of  $\text{PhNCS}$ . The original should be consulted for the mass of exptl. detail. The following new compds. are reported. *1-Phenyl-4-thiobiuret*, m.  $186^\circ$  from  $\text{PhNCO}$  and  $\text{CS}(\text{NH}_2)_2$  at  $100^\circ$  for 5 hrs.; with  $\text{MeI}$  it gives the *4-Me deriv.*(**I**), m.  $147-8^\circ$ . The  $\text{MeI}$  addn. product of  $\text{CS}(\text{NH}_2)_2$  and  $\text{PhNCO}$  give *methylthiocarbonyldiphenyldiurea*, m.  $142^\circ$ , also obtained from **I** and  $\text{PhNCO}$ . *Thiocarbonyldiphenyldiurea Et ether*, m.  $145^\circ$ , from  $\gamma$ -ethylthiourea and  $\text{PhNCO}$ . C. J. WEST

**Preparation of semicarbazones in pyridine solution.** I. V. HOPPER. *J. Roy. Tech. Coll.* (Glasgow) **2**, No. 1, 52-6 (1929).—Pyridine as a solvent facilitates the prep. of semicarbazones generally and no other reagent need be added to remove  $\text{HCl}$  from the  $\text{H}_2\text{NCONHNH}_2 \cdot \text{HCl}$  as the pyridine is sufficiently basic for this purpose. The aldehyde or ketone is dissolved in pyridine and the theoretical quantity of  $\text{H}_2\text{NCONHNH}_2 \cdot \text{HCl}$  in approx. its own wt. of  $\text{H}_2\text{O}$  is added. The reaction is usually complete within 24 hrs. at ordinary temps. and in some cases the semicarbazone is pptd. immediately. If the semicarbazone is very sol. in  $\text{C}_6\text{H}_5\text{N}$ , it may be pptd. by the addn. of  $\text{H}_2\text{O}$ . The semicarbazones of the following compds. were prepd. by this method:  $\text{MeCOPh}$ , citral,  $\text{AcCH}_2\text{CO}_2\text{Et}$ ,  $\text{B}_2$  and  $\text{MeCOEt}$  (m.  $143^\circ$  after several recrystns.). Attempts to prep.  $[\text{PhC}(:\text{NNHCONH}_2)]_2$  gave no reaction or yielded only diphenyltriazone. Free semicarbazide in anhyd.  $\text{C}_6\text{H}_5\text{N}$  could not be employed on account of its insoly. but  $\text{PhCH}_2\text{NHCONHNH}_2$  is sufficiently sol. to be thus employed.  $\text{PhCH: NNHCONHCH}_2\text{Ph}$  was thus prepd. Acetophenone  $\delta$ -benzylsemicarbazone, m.  $128^\circ$ , sol. in hot  $\text{EtOH}$ ,  $\text{CHCl}_3$ ,  $\text{C}_6\text{H}_6$ ,  $\text{Et}_2\text{O}$ , insol. in  $\text{H}_2\text{O}$ , petroleum, was prepd. from 1.2 g.  $\text{PhCOMe}$  in 20 cc.  $\text{C}_6\text{H}_5\text{N}$  plus 2 g.  $\text{PhCH}_2\text{NHCONHNH}_2 \cdot \text{HCl}$  in 2 cc.  $\text{H}_2\text{O}$ . C. H. PEET

**Synthesis of some alkylxanthines.** D. W. MACCORQUODALE. *J. Am. Chem. Soc.* **51**, 2245-51 (1929).—The following compds. were prepd. because of their possible therapeutic importance. *3,7-Diethyl-8-chloroxanthine* (**I**) (1 g.), m.  $207^\circ$  (cor.), and 15 cc. of 10%  $\text{KOH}$  in abs.  $\text{EtOH}$  give 0.93 g. *3,7-diethyl-8-ethoxyxanthine*, m.  $212^\circ$  (cor.); heating with concd.  $\text{HCl}$  on the  $\text{H}_2\text{O}$  bath for 20 min. gives *3,7-diethyluric acid*, m.  $371-6^\circ$  (cor.) with decompn. **I** and  $\text{MeI}$  with 0.917  $\text{N}$   $\text{KOH}$  give *1-methyl-3,7-diethyl-8-chloroxanthine*, m.  $114.5^\circ$  (cor.); with  $\text{KOH-EtOH}$  this yields the *8-EtO deriv.*, m.  $112^\circ$  (cor.), which with concd.  $\text{HCl}$  gives *1-methyl-3,7-diethyluric acid*, m.  $266^\circ$  (cor.). *1,3,7-Triethyl-8-chloroxanthine*, m.  $79-80^\circ$ ; reduction with  $\text{HI}$  and  $\text{P}$  gives *1,3,7-triethylxanthine*, m.  $113^\circ$ . *3,7-Dibutyl-8-chloroxanthine*, m.  $145^\circ$  (cor.); reduction gives *3,7-dibutylxanthine*, m.  $127^\circ$  (cor.). *1,3,7-Tributyl-8-chloroxanthine*, b<sub>10</sub>  $232-40^\circ$ ; reduction gives *1,3,7-tributylxanthine*, m.  $41-2^\circ$  ( $\text{HCl}$  salt, m.  $131-4^\circ$ ). C. J. WEST

**Acetate of the free aldehyde form of glucose.** M. L. WOLFROM. *J. Am. Chem. Soc.* **51**, 2188-93 (1929).—Glucose ethylmercaptal pentaacetate (**I**) is obtained in 97%

yield by dissolving 5 g. glucose ethylmercaptal in 18 cc. dry  $C_4H_9N$ , cooling in ice and adding slowly 36 cc.  $Ac_2O$ ; after standing overnight the reaction product was poured into 1 l.  $H_2O$  and the ppt. finally recrystd. from  $MeOH$ ; it m.  $45-7^\circ$ ,  $[\alpha]_D^{25} 11.2^\circ$  (1.255 g. in 24.88 cc.  $CHCl_3$ ). I (25.2 g.) in 90 cc.  $Me_2CO$  and 45 cc.  $H_2O$ , treated with 45-50 g.  $CdCO_3$  and 49.5 g.  $HgCl_2$  in 72 cc.  $Me_2CO$ , stirred at room temp. for 24 hrs. with occasional addns. of small amts. of  $CdCO_3$ , then heated at  $50^\circ$  for 15 mins. and finally boiled for 15 mins., gives 10.1 g. of 2,3,4,5,6-pentaacetyl-d-glucose, m.  $116-8^\circ$ ,  $[\alpha]_D^{25} 2.7^\circ$  (0.5028 g. in 10.05 g.  $C_2H_5Cl_4$ ); in  $CHCl_3$ ,  $[\alpha]_D^{24} -4.6^\circ$  (c 4.997),  $-4.8^\circ$  (c 4.725); in  $MeOH$   $[\alpha]_D^{25} 10$  (c 4.980 or 2.013); in the last 2 solvents the rotation slowly changes in the *d*-direction, probably due to acetal formation. The crystals are monoclinic,  $\alpha$  1.460,  $\beta$  1.500-,  $\gamma$  1.515. It gives a positive fuchsin or Schiff aldehyde reaction. It dissolves in  $H_2O$  on slight heating and gives a *d*-glucose semicarbazone pentaacetate, m.  $150^\circ$ . This compd. possesses the open-chain, free aldehyde structure and the name  $\mu$ -*d*-glucose pentaacetate is proposed.

C. J. WEST

**Behavior of glucose on heating in alkaline solution.** F. FISCHLER, K. TAUFEL, AND S. W. SOUCL. *Biochem. Z.* 208, 191-211(1929).—The amt. of acid formed, when the concn. of alkali and glucose as well as the time are const., increases gradually with the temp., reaching a max. between  $140^\circ$  and  $150^\circ$ . The reaction time also causes an increase in the acid production, the relation between the 2 being a linear one, but the duration of the reaction necessary to reach the max. amt. of acid production diminishes with the alk. concn. Thus with 0.69 *N* glycerol-KOH soln. the end value is not yet attained at  $98.5^\circ$  after 6 hrs., whereas with 10 *N* soln. it is reached in less than 15 mins. Other factors being const. the acid production is affected very markedly by changes in alk. concn. The acid production is greatest with very small quantities of sugar and diminishes very rapidly with increasing concns. The end products with 1.2 *N* and 10 *N* KOH are:  $CO_2$ ,  $HCO_2H$ ,  $AcOH$ ,  $EtCO_2H$ ,  $PrCO_2H$ , lactic, succinic, oxalic,  $\beta$ -hydroxybutyric acids. With *N* KOH the following distribution of end products was found on the assumption that the total acid production = 100. Of this 7.2% was removed by ordinary distn.; 10.1% by steam distn., and 49.7% extd. by ether

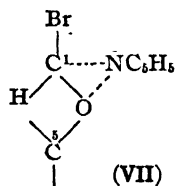
S. MORGULIS

**Sulfuric acid compounds of the sugars. II. A reaction for distinguishing ring-isomeric acylated halogensugars.** HEINZ OHLE, WLADIMIR MARECEK AND WALTER BOURJAU. *Ber.* 62B, 833-54(1929); cf. *C. A.* 19, 2189.—It was shown in the 1st paper that acetobromo- or acetochloroglucose with  $C_4H_9N$  and  $Ag_2SO_4$  gives chiefly tetraacetyl-d-glucosido-1-pyridinium tetracetyl-d-glucosido-1-sulfate,  $AcOCH_2CH(CH(OAc))CH(OAc)CH(OAc)CHOSO_2N(C_4H_9)CH(CH(OAc))CH(OAc)$  (I) and that the reaction is highly characteristic and appar-

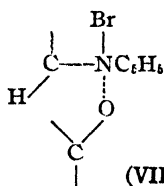
ently limited to acylated 1-halogenosugars. Simpler compds. ( $PhCH_2Cl$ ,  $CICH_2CO_2H$ ,  $PhCOCH_2Br$ ) give exclusively the corresponding pyridinium sulfates;  $MeCHClOEt$  almost instantly splits off all its  $Cl$  as  $HCl$  and gives  $MeCH(OEt)_2$ . To det. whether the specificity of the reaction might not be even more pronounced and whether perhaps only pyroid sugar derivs. would give it, a no. of other halogenosugars were studied. With the completely acylated halogenosugars, ester salts of type I are always formed when the sugar has a pyroid structure (acetobromoglucose, acetodibromoglucose, benzobromoglucose and 3-*p*-toluenesulfonyl-2,4,6-triacetyl- $\alpha$ -*d*-glucosyl 1-bromide (II)), also with the halogenosugars derived from acetylated disaccharides of glucose (acetobromocellobiose, acetobromolactose). The compds. so obtained crystallize well and have good soly. relations and the yields are therefore almost always satisfactory. With the derivs. of furoid glucose it is quite different. 3-*p*-Toluenesulfonyl-2,5,6-triacetyl- $\alpha$ - (III), 2-acetyl-3,5,6-tri-*p*-toluenesulfonyl- (IV) and 2-acetyl-3-*p*-toluenesulfonyl-5,6-dibenzoyl-*d*-glucosyl 1-bromide (V) gave sirupy products. The product from III was sol. in  $H_2O$  and it could readily be shown that it contains all its S in sulfate form and therefore must have the structure  $RN(C_4H_9)OSO_2N(C_4H_9)R$  ( $R$  = sugar residue) (VI). Acetochloro-*l*-arabinose and acetochloro-*l*-xylose gave cryst. esters of type I in good yield and acetobromo-*d*-galactose yielded in addn. a sulfate of type VI. The reaction with pyroid derivs. is therefore not limited to the formation of esters of type I (in other cases also, the formation of sulfates of type VI was observed); this is easily explained, for there are 2 competing reactions: (1) addn. of  $C_4H_9N$  to form a pyridinium bromide, and (2) exchange of the Br for the  $H_2SO_4$  residue. This last reaction apparently occurs the more readily the more difficult the addn. of the  $C_4H_9N$  is. The max. yield of I will therefore be obtained when the 2

reactions proceed with equal velocity. Catalytic influences also seem to play a role; thus,  $C_6H_5N$  adds extraordinarily slowly to acetochloroglucose, the greater part of which is recovered unchanged even after 48 hr. at incubator temp., but in the presence of  $Ag_2SO_4$  I is formed normally within 24 hr., just as with the Br deriv. The difference between the pyroid and furoid sugars, therefore, consists in that with the latter the addn. reaction is very much more rapid than the exchange of Br for the  $H_2SO_4$  residue. It is not surprising, therefore, that with certain pyroid derivs. the yield of sulfate is greatly increased at the expense of that of ester;  $\beta$ -acetochlorofructose and the acetochloro- and acetobromo derivs. of mannose and rhamnose gave sirups contg. relatively much sulfate which could be sepd. into their components only after treatment with  $AcOEt$ ; with the mannoses, neither of the 2 fractions so obtained could be made to cryst. and the rhamnoses even yielded 3 fractions: (1) sirup insol. in  $AcOEt$  and contg. only sulfate S; (2) sol. cryst. compd. of the ester type; and (3) sol. sirup contg. the cryst. ester and another substance, apparently chiefly an isomer, for its  $H_2O$  soln. gave only a very slight sulfate reaction. In general, the esters of type I obtained by the above reaction belong to the series epimeric with that of the original halogen-sugar, but with the rhamnoses the cryst. esters seem to belong to the same series, for their rotations are of about the same order as those of the corresponding acylated methyl-lactolides. The rotations of the sirupy fractions (3) are much smaller than those of the cryst. esters, and it is therefore concluded that these sirups consist chiefly of the ester of type I. The same is true of the mannose derivs.: although no cryst. ester could be isolated the rotations of the sirupy fractions pointed to the presence of a mixt. of the  $\alpha$ - and  $\beta$ -forms. The cryst. ester isolated from  $\beta$ -acetochlorofructose showed only a weak *l*-rotation and it is believed that in spite of its being cryst. it was not homogeneous but contaminated with the  $\beta$ -form. Acetobromorhamnose, to which, on the basis of the authors' findings, must be ascribed a pyroid structure, gives with  $MeOH$  and quinoline 40% of  $\gamma$ -triacetyl-*l*-methylrhamnoside, which contains no 1,5-O bridge. The question is: does acetobromorhamnose really contain a 1,5-bridge or is this only formed during the reaction with  $C_6H_5N$  and  $Ag_2SO_4$ ? Taking, for the sake of simplicity, acetobromoglucose, it can react with  $C_6H_5N$  alone only in 2 ways: (A) Simple addn. of the  $C_6H_5N$  between C atom 1 and the Br, with formation of the glucosidopyridinium bromide, or (B) formation of a mol. compd. (VII) followed by a rearrangement of the primary valences with rupture of the ring between C atom 1 and the O atom, attachment of the pyridine N atom to the resulting free valence of the C and migration of the Br to the N (VIII), and finally reformation of the ring through the new free valence on the C atom, a process which can take place only if the C atom with its substituents rotates  $120^\circ$  about the line of union between C atoms 1 and 2 as an axis, there being thus obtained, starting from  $\alpha$ -acetobromoglucose, the  $\beta$ -glucosidopyridinium bromide (IX). In general, the reaction proceeds according to (B). A mol. compd. (VII) between acetobromoglucose and  $C_6H_5N$  has never been isolated but the fact that the glucosidopyridinium salts do not show mutarotation in soln. would indicate that such a compd. is formed. There is no mutarotation, either, when the  $C_6H_5N$  soln. is treated with  $C_6H_5N \cdot HCl$ , *i. e.*, the salts, when once formed cannot rearrange into each other, and the  $\beta$ -salt can be formed from the  $\alpha$ -acetobromoglucose only at the moment of the reaction. An entirely analogous reasoning can be applied to the reaction in the presence of  $Ag_2SO_4$ . Therefore, if the ester resulting from the reaction is of the same series as the original material there has been no intermediate opening of the O ring, whereas if it belongs to the epimeric series, there has occurred a rupture. With acetobromorhamnose the relationships are in principle the same except that, as indicated by its behavior toward  $MeOH$ , there may be a shifting of Ac groups when the ring is ruptured; thus, the 4-Ac group may migrate to the O of the bridge and the bridge is not reestablished in its original form, the product of the reaction now having a 1,4-bridge and being of the  $\beta$ -series. In other words, if the resulting ester is of the same series as the original material, there has occurred no rupture of the bridge, no shifting of an acyl group, and the product must have the same ring structure as the original material. If the ester belongs to the epimeric series, however, there has occurred a rupture of the bridge and the ring structure of the product remains in doubt. In a study of the question whether other tertiary bases than  $C_6H_5N$  can be used for their reaction, the authors started with  $PhNMe_3$ . Conc'd. solns. of  $\alpha$ -acetobromoglucose in  $PhNMe_3$  deposit in 2-3 days crystals of  $PhNMe_3Br$ ; apparently there is first formed the glucosidodimethylphenylammonium salt which is unstable and decomps. into the glucosidomethylphenylamine and  $MeBr$  and the latter then reacts with the excess of  $PhNMe_3$ . In the presence of  $Ag_2SO_4$  was obtained trimethylphenylammonium tetraacetyl- $\beta$ -D-glucosido-1-sulfate (IX). Benzylpyridinium sulfate

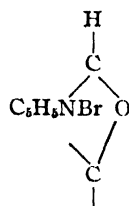
from  $\text{PhCH}_2\text{Cl}$ ,  $\text{Ag}_2\text{SO}_4$  and  $\text{C}_6\text{H}_5\text{N}$ , m.  $117-8^\circ$ , quite hygroscopic. [*Carboxymethyl*]-pyridinium sulfate, from  $\text{HO}_3\text{CCH}_2\text{Cl}$ , m.  $177^\circ$  (decompn.). Phenacylpyridinium sulfate (approx. equimol. mixt. of neutral and acid salts obtained from  $\text{PhCOCH}_2\text{Br}$  and  $\text{Ag}_2\text{SO}_4$  in  $\text{C}_6\text{H}_5\text{N}$ ), m.  $210-25^\circ$ . 2,3,4-Triacetyl- $\alpha$ -l-arabinosido-1-pyridinium 2,3,4-triacetyl- $\alpha$ -l-arabinosido-1-sulfate, from  $\beta$ -acetochloroarabinose, m.  $153^\circ$ , gives a ppt. with  $\text{BaCl}_2$  only after boiling with dil. acids or alkalis, weakly reduces hot Fehling soln.,  $[\alpha]_D^{18}$   $27.97^\circ$  ( $\text{CHCl}_3$ ,  $c$  1.430). 2,3,4-Triacetyl- $\alpha$ -l-xylosido-1-pyridinium 2,3,4-triacetyl- $\alpha$ -l-xylosido-1-sulfate, from  $\beta$ -acetochloroxylose, m.  $143^\circ$ ,  $[\alpha]_D^{18}$   $-41.24^\circ$  ( $\text{CHCl}_3$ ,  $c$  1.68). 2,3,4-Triacetyl- $\alpha$ -l-rhamnosyl 1-chloride (acetochlororhamnose) has been obtained by the Pacsu method (with  $\text{TiCl}_4$ ) in cryst. form, m.  $72.5^\circ$ ,  $[\alpha]_D^{20}$   $-127.03^\circ$  ( $\text{CHCl}_3$ ,  $c$  0.858); 2 g. with  $\text{Ag}_2\text{SO}_4$  and  $\text{C}_6\text{H}_5\text{N}$  gave a sirup sepd. by  $\text{AcOEt}$  into 0.3 g. insol. sirup, 0.12 g. crystals, m.  $142^\circ$ ,  $[\alpha]_D^{18}$   $-51.38^\circ$  ( $\text{CHCl}_3$ ,  $c$  0.331) and 0.7 g. sirup with  $[\alpha]_D^{18}$   $-17.08^\circ$  ( $\text{CHCl}_3$ ,  $c$  1.054). 5-Bromo-2,3,4-triacetyl- $\beta$ -d-glucosido-1-pyridinium 6-bromo-2,3,4-triacetyl- $\beta$ -d-glucosido-1-sulfate (with HEINZ ERLBACH), from  $\alpha$ -acetodibromoglucose, crystals with 2 EtOH, m.  $62-9^\circ$ . 3-p-Toluenesulfonyl-2,4,6-triacetyl- $\beta$ -d-glucosido-1-pyridinium 2,4,6-triacetyl- $\beta$ -d-glucosido-1-sulfate, from II, m.  $145-6^\circ$ ,  $[\alpha]_D^{20}$   $-4.47^\circ$  ( $\text{CHCl}_3$ ,  $c$  1.118). The sirup obtained from III showed  $[\alpha]_D^{18}$   $-4.87^\circ$  ( $\text{CHCl}_3$ ). Tetra benzoyl- $\beta$ -d-glucosido-1-pyridinium tetra benzoyl- $\beta$ -d-glucosido-1-sulfate, from  $\alpha$ -benzobromoglucose, m.  $193-4^\circ$ ,  $[\alpha]_D^{18}$   $15.47^\circ$  ( $\text{CHCl}_3$ ,  $c$  0.646).  $\alpha$ -Acetobromogalactose (4.2 g.) gave 2 g. tetraacetyl- $\beta$ -d-galactosido-1-pyridinium tetraacetyl- $\beta$ -d-galactosido-1-sulfate, m.  $172-3^\circ$ , optically inactive in  $\text{CHCl}_3$ , and tetraacetyl- $\beta$ -d-galactosido-1-pyridinium sulfate, m. about  $170^\circ$  (decompn.) (not enough was available for a detn. of the rotation). The  $\text{AcOEt}$ -sol. part of the sirup obtained with acetochloromannose showed  $[\alpha]_D^{20}$   $18.7^\circ$  ( $\text{CHCl}_3$ ), the insol. part was almost inactive. From  $\beta$ -acetochlorofructose (2 g.) were obtained 2 g.  $\text{AcOEt}$ -sol. crystals, sinter  $97^\circ$ , m. completely  $109^\circ$ ,  $[\alpha]_D^{18}$   $-8.48^\circ$  ( $\text{CHCl}_3$ ,  $c$  1.144). Heptaacetyl-d-cellobiosido 1 pyridinium heptaacetyl-d-cellobiosido-1-sulfate, m.  $194-5^\circ$  (decompn.), seps. with 2.5  $\text{H}_2\text{O}$ ; because of its low soly. its rotation could not be detd.  $\beta$ -d-Lactosido analog, from  $\alpha$ -bromoacetolactose, m.  $185-6^\circ$ ,  $[\alpha]_D^{20}$   $-9.44^\circ$  ( $\text{CHCl}_3$ ,  $c$  0.1388). IX, m.  $163-4^\circ$ , reduces hot Fehling soln., is optically inactive in  $\text{H}_2\text{O}$  but on long standing at  $100^\circ$  shows an increasing positive rotation.



(VII)



(VIII)



(IX)

C. A. ROUVIER

The acrolein group as a most probable component of all plant lignins. PETER KLASON. *III Nord. Kemistmötet* (Finland) 1926, 213-16(1928).—In Swedish. A theoretical conclusion based on previously published exptl. data. A. R. ROSE

Coniferaldehyde (remarks on the communication of H. Pauly and K. Feuerstein: Hadromal, lignin and coniferaldehyde, its preparation and detection). ARNIM HILLMEYER and ERICH HELLRIEGEL. *Ber.* 62B, 725-7(1929).—In connection with expts on the ultra-violet absorption of lignin and compds. of known constitution such as coniferin, isoeugenol, vanillin, etc., attempts were made to prep. coniferaldehyde (I) by the method of Pauly and Wäscher but without success, and in several respects the intermediate methoxymethylconiferaldehyde (II) also differed widely from the description given by P. and W. On the other hand, the paper of P. and Feuerstein (*C. A.* 23, 2982) agrees satisfactorily with the results of A. and H., not only as to the consts. of I and II but also as to the method of prepn. of I. The color of solns. of I is different in different solvents: yellow in  $\text{H}_2\text{O}$ , the lower alcs., glycol, glycerol, very faintly yellow in iso-AmOH,  $\text{PhCH}_2\text{OH}$  and  $\text{C}_6\text{H}_5\text{N}$ , colorless in  $\text{Et}_2\text{O}$ ,  $\text{Me}_2\text{CO}$ ,  $\text{MeCOEt}$ , hexane,  $\text{CCl}_4$ ,  $\text{CS}_2$ ,  $\text{C}_6\text{H}_6$ , xylene; the yellow  $\text{MeOH}$  soln. is decolorized by  $\text{Et}_2\text{O}$  and the dil. aq. soln. on long standing. II, m.  $80.3-1.5^\circ$ , b.  $179-83^\circ$ . I, m.  $82.5^\circ$ . The II was prepd. by heating methoxymethylvanillin at  $65-8^\circ$  for 3 hrs. in  $\text{H}_2\text{O}$ - $\text{EtOH}$  (1:5) and 0.1 N alkali with 2-3 times the calcd. amt. of  $\text{AcH}$  passed through in gaseous form in  $\text{N}_2$ . I acts as an indicator; the change from the yellow alk. color to colorless on acidit-

cation is very sharp; by interpolation from the values for various common indicators, a  $pH$  of 7.6 is obtained for the turning point of I. The absorption spectrum in the ultra-violet of I (and II) is distinctly different from that of vanillin and permits of distinguishing the 2 aldehydes in 0.0001  $M$  solns. The absorption max. for I lie at 321 and 301 $m\mu$ , for II at 312 and 292 and for vanillin at 303 and 282, the characteristic min. at 262, 257 and 248, resp. The extinction coeff. for I and II in the middle ultra-violet is about 3 times that of vanillin.

C. A. ROULLER

**Molecular structure of inulin. Isolation of a new anhydrofructose.** JAMES C. IRVINE AND JOHN W. STEVENSON. *J. Am. Chem. Soc.* **51**, 2197-203 (1929).—When triacetylulinin(I) and  $HNO_3$  in  $CHCl_3$  react for 30 mins., the greater part of the material is converted into triacetylfructose dinitrate, the esterification being preceded by the opening of the anhydro-linkages. One component of I present to the extent of 20% is resistant to the hydrolytic action and is isolated as triacetyl $\alpha$ -anhydrofructose (II), crystg. with 0.5 mol.  $AcOH$ ,  $m.$  123°,  $[\alpha]_D$  1.5° ( $CHCl_3$ ,  $c$  2.272). The same compd. can be obtained in similar yield from other reactions in which I is used as the starting material. Shaking II in  $MeOH$  contg. 5% of  $Me_3NH$  for 20 min. in the cold gives anhydrofructose,  $m.$  143-5°,  $[\alpha]_D$  30.17° ( $H_2O$ ,  $c$  2.32), is highly hygroscopic and does not reduce Fehling soln. This is quant. convertible into fructose but is much more resistant to hydrolysis than the known derivs. of  $\gamma$ -fructose. Methylation gives a *tri-Me deriv.*, isolated in a dimeric form,  $b_{0.1}$  166°,  $n_D$  1.4730,  $[\alpha]_D$  23.8° ( $CHCl_3$ ,  $c$  2.5). These results indicate that inulin is not related exclusively to a single form of  $\gamma$ -fructose but contains 2 classes of components in the approx. ratio of 4:1. Of these, I is relatively much more stable toward hydrolysis. The additional complication introduced into the constitutional study of inulin through these results is discussed.

C. J. WEST

**Notes on a precipitant for aldehydes.** HENRY LEFFMANN AND CHARLES C. PINES. *Bull. Wagner Free Inst. Sci. Phila.* **4**, 15-6 (1929).—Dimethyldihydroresorcinol (dime-done) yields cryst. ppts. with  $HCHO$ ,  $AcH$ , vanillin, ethylvanillin and salicyl aldehyde. The reagent may be dissolved in  $H_2O$ , alc., or  $MeOH$ . The crystals yielded by  $HCHO$  are always fine and needle-like. Those yielded by  $AcH$  usually are large and prismatic and frequently cross like the letter X, occasionally they resemble those given by  $HCHO$ . Microphotographs of the ppts. yielded by  $HCHO$  and  $AcH$  are given.

JOSEPH S. HEPBURN

**Chlorination of *p*-cymene.** WALTER QVIST. *III Nord Kemistmötet* (Finland) 1926, 194 (1928).—Swedish abstract. Attempts were made to substitute  $Cl$  on the side chains of *p*-cymene using catalysts, light and increased temps., but no satisfactory yield was obtained in any given condition.

A. R. ROSE

**Structure of some phenylated olefins.** K. v. AUWERS. *Ber.* **62B**, 693-701 (1929).—Schlenk and Bergmann (*C. A.* **22**, 4493) are so convinced of the validity of their law that "an unsatd. C atom tends to add Na when it is combined with aryl groups" that because certain styrenes do not add Na they believe the structures generally assigned to them (*c. g.*,  $PhCH:CMc_2$ ,  $PhCMe:CMc_2$ ,  $Ph_2C:CHMe$ ,  $Ph_2C:CMc_2$ ) should be changed (to  $PhCH_2CMe:CH_2$ ,  $PhCHMeCMe:CH_2$ ,  $Ph_2CHCH:CH_2$ ,  $Ph_2CHCMe:CH_2$ ). They have no decisive structural proofs for their proposed formulas, which cannot be reconciled with the formation of the olefins from the carbinols with the  $HO$  group in the  $\alpha$ -position from the  $C_6H_5$  nucleus (*c. g.*,  $PhCH(OH)CHMe_2$  can give only  $PhCH:CMc_2$ , for a migration of the conjugated double bond from the  $\alpha$ - to the  $\beta$ -position would be contrary to all experience in this field). Furthermore, the spectroscopic behavior of these substances shows that they have the structures originally assigned to them; thus,  $PhCH:CH_2$ ,  $PhCH:CHMe$ ,  $PhCH:CMc_2$ ,  $PhCMe:CH_2$ ,  $PhCMe:CHMe$ ,  $PhCMe:CMc_2$ ,  $Ph_2C:CH_2$ ,  $Ph_2C:CHMe$ ,  $Ph_2C:CMc_2$ ,  $PhCH:CHPh$ ,  $PhCH:CMcPh$ ,  $Ph_2C:CHPh$  and  $Ph_2C:CMcPh$  all show more or less strong exaltations ( $E_{2D}$  0.5-3.55), indicating that without exception they contain a conjugated system. On the other hand, calcs. from Klages' data for 3  $\Delta^2$ -styrenes ( $PhCH_2CH:CHMe$ ,  $PhCH_2CH:CMc_2$ ,  $PhCHMeCH:CMc_2$ ) give values of 0.21-0.39.  $Ph_2C:CHCHMe_2$ , readily prepd. from  $Ph_2C(OH)CH_2CHMe_2$ , gave values indicating it belongs to the  $\Delta^1$ -styrenes ( $E_{2D}$  0.88), but when  $Ph_2CHCH_2C(OH)Me_2$  was converted into the chloride and boiled with  $C_2H_5N$  it gave a product contg.  $Cl$  and when the carbinol was distd. under atm. pressure the refraction of the product showed that at the high temp. (about 300°) the  $\Delta^2$ - had partly rearranged into the  $\Delta^1$ -isomer. Again, the data on 3 pairs of Eykman's allyl and propenyl derivs. of aromatic compds. show these isomers can be recognized and distinguished with certainty by the optical method. Some attempts to det. the structures of the styrenes by oxidative degradation were also made.  $Ph_2C:CHCHMe_2$ , boiled a short time in  $AcOH$  with  $CrO_3$ , gave no test for  $Me_2CO$  with va-

nillin- $\text{H}_2\text{SO}_4$ , while the  $\Delta^1$ -isomer gave a positive test on oxidation both with  $\text{CrO}_3$  and with  $\text{O}_3$ . S. and B.'s law, therefore, does not hold generally in its simple form. *4,4-Diphenyl-2-methyl-2-butanol*, from  $\text{Ph}_2\text{CHCH}_2\text{CO}_2\text{Et}$  and  $\text{MeMgI}$ , viscous oil,  $b_{12}$  180-2°,  $d_4^{20}$  1.036,  $n_D^{20}$  1.5636,  $E_D^{20}$  0.11, 0.13, 15%, 15% for  $\alpha$ ,  $D$ ,  $\beta$ - $\alpha$  and  $\gamma$ - $\alpha$ . The following values of  $d_4$  and  $n$  for  $\alpha$ ,  $\text{He}$ ,  $\beta$  and  $\gamma$  have been detd. anew.  $\text{Ph}_2\text{C} \cdot \text{CHMe}$ , 0.9710, 1.56534, 1.57329, 1.58958, — at 78.2°;  $\text{Ph}_2\text{C} \cdot \text{CMe}_2$ , 1.0021, 1.58167, 1.58855, 1.60512, 1.62055 at 17.6°;  $\text{Ph}_2\text{C} \cdot \text{CHPh}$ , 1.0373, 1.62918, 1.64012, 1.66798, — at 78.4°;  $\text{Ph}_2\text{C} \cdot \text{CMePh}$ , 0.9956, 1.58414, 1.59253, 1.61146, — at 100.2°;  $\text{Ph}_2\text{C} \cdot \text{CHCHMe}_2$ , 0.9813, 1.57015, 1.57667, 1.59269, 1.60724 at 17.0°;  $\text{Ph}_2\text{CHCH}_2\text{C}(\text{OH})\text{Me}_2$ , 1.0373, 1.55916, 1.56431, 1.57708, 1.58818 at 18.4°. C. A. R.

Some *p*-ethylenic derivatives of bromobenzene and their organomagnesium compounds. II. RAYMOND QUELET. *Bull. soc. chim.* 45, 255-74 (1929); cf. C. A. 22, 1341, 3150; 23, 2157.—Addn. of 40 g. of *p*-bromopropenylbenzene (I), 0.5 cc. of  $\text{Br}_2$  and several drops of  $\text{EtBr}$  in 75 cc. of anhyd.  $\text{Et}_2\text{O}$  to 4.5 g. of  $\text{Mg}$  in 25 cc. of  $\text{Et}_2\text{O}$ , gave a soln. which upon hydrolysis and fractionation contained 10-15% of I, 43% of propenylbenzene,  $b_{12}$  68° (*di-Br* deriv., m. 68°), and a residue of polymer,  $b_{10}$  180-210°, which contained some *p,p'*-dipropenyldiphenyl, m. 186°. In the same manner, *p*-bromostyrene gave practically no reaction; *p*-bromo- $\Delta^1$ -butenylbenzene (II) gave  $\Delta^1$ -butenylbenzene,  $b_{12}$  80° (*di-Br* deriv. 70°), unchanged II, polymers and *p,p'*-*di*- $\Delta^1$ -butenyldiphenyl; *p*-bromoallylbenzene (III) gave allylbenzene,  $b_{730}$  154°, 20% of III, polymers and *p,p'*-diallyldiphenyl; and *p*-bromo- $\Delta^2$ -butenylbenzene (IV) gave  $\Delta^2$ -butenylbenzene,  $b_{12}$  65°, IV and polymers. The  $\text{Mg}$  deriv. (V) obtained from 40 g. of III was oxidized with a stream of  $\text{O}_2$ , hydrolyzed, acidified with dil.  $\text{HCl}$  and the oil layer washed with 2%  $\text{Na}_2\text{CO}_3$ . Distn. after drying over  $\text{Na}_2\text{SO}_4$  gave 5 g. of *p*-allylphenol,  $b_{12}$  120°,  $b_{732}$  235°. Treatment of V with  $\text{CO}_2$  followed by hydrolysis, gave 25% of *p*-allylbenzoic acid (VI), m. 104-5°, after purification from  $\text{Na}_2\text{CO}_3$  and boiling  $\text{H}_2\text{O}$ . With  $\text{Br}_2$  in  $\text{CCl}_4$ , VI gave the *di-Br* deriv., m. 154°. With  $\text{CH}_2 \cdot \text{CHCH}_2\text{Br}$ , V gave, by the usual treatment, a mixt. of III and 10 g. of *p*-diallylbenzene (VII),  $b_{12}$  94°,  $d_4^{11}$  0.915,  $n_D^{11}$  1.526, which were sepd. by distn. after treating with  $\text{Na}$  to convert III to a compd. of high b. p. With  $\text{Br}_2$ , VII gave the *tetra-Br* deriv., m. 109°. With  $\text{HC}(\text{OEt})_3$ , V gave 12% of *p*-allylbenzaldehyde,  $b_{12}$  113°,  $d_4^{15}$  1.015,  $n_D^{15}$  1.555 (*di-Br* deriv.,  $b_{15}$  193-5°; *semicarbazone*, m. 197°). In the same manner, the  $\text{Mg}$  compd. from 40 g. of I gave 5.6 g. of *p*-propenylphenol,  $b_{12}$  136-7°, m. 93°; 30% of *p*-propenylbenzoic acid, m. 215°, sublimes at 190°; 10 g. of *p*-allylpropenylbenzene,  $b_{11}$  107-8°,  $d_4^{11}$  0.918,  $n_D^{11}$  1.559 (*tetra-Br* deriv., m. 73°); and 15% of *p*-propenylbenzaldehyde,  $b_{17}$  132°,  $d_4^{11}$  1.044,  $n_D^{11}$  1.607 (*semicarbazone*, m. 230°). The  $\text{Mg}$  deriv. from 50 g. of I was treated (cold) with 16 g. of  $\text{EtCHO}$ , hydrolyzed with ice and the  $\text{Mg}(\text{OH})_2$  dissolved with  $\text{NH}_4\text{Cl}$ . The oil soln. was dried and distd., giving 10 g. of *p*-propenylphenylethylcarbinol (VIII),  $b_{11}$  143-5°, m. 57° (*phenylurethan* deriv., m. 235-6°). VIII in  $\text{PhH}$  was slowly added to  $\text{P}_2\text{O}_5$ , decanted off, washed, dried and distd., giving *p*-dipropenylbenzene, m. 63-4°,  $b_{12}$  123-5°, *tetra-Br* deriv., m. 168-9°. A. S. CARTER

Reaction between trimethylethylene oxide and benzylamine. YU. O. GABEL. *Ukrainskii Khim. Zhur.* 2, Sci. Pt. 382-6 (1926); *Chem. Zentr.* 1928, I, 199.— $\text{PhCH}_2\text{NH}_2$  (I) and  $\text{Me}_2\text{C} \cdot \text{CHMe} \cdot \text{O}$  (II) form hydroxyamylbenzylamine,  $\text{Me}_2\text{C}(\text{OH})\text{CHMeNH}_2$

$\text{CH}_2\text{Ph}$  (III). The condensation of 1 mol. of I and 2 mols. of II does not take place. Four mols. of I and 1 mol. of II are heated together in a sealed tube at 160-80° for 6-8 hrs. The reaction product is distd. under 20 mm. and III is obtained between 152-4°. By addn. of 1 mol. of  $\text{H}_2\text{O}$  the reaction may be completed by 5 hrs. heating at 90°. III, liquid,  $d_4^{20}$  0.9514,  $d_4^{15}$  0.9437, insol. in cold  $\text{H}_2\text{O}$ , partially sol. in  $\text{EtOH}$ ,  $\text{Et}_2\text{O}$ ,  $\text{C}_6\text{H}_6$ . Gold salt,  $\text{C}_{12}\text{H}_{20}\text{O}(\text{HCl})_3\text{Au}$ , yellow, m. 140-2°, sol. in  $\text{EtOH}$ ,  $\text{Et}_2\text{O}$ . Picrate,  $\text{C}_{17}\text{H}_{22}\text{O}_6\text{N}_4$ , yellow, m. 163-4°.  $\text{HCl}$  salt, m. 155-7° partially sol. in  $\text{H}_2\text{O}$ ,  $\text{EtOH}$ . F. P. G.

Action of the Grignard reagent on azoxybenzene. W. M. CUMMING AND G. S. FERRIER. *J. Roy. Tech. Coll.* (Glasgow) 2, No. 1, 49-51 (1929).—From analogy with the reaction of  $\text{EtMgI}$  on  $\text{PhNO}_2$  and  $(\text{PhN})_2$ ,  $\text{PhN}_2\text{O}$  should react to give either ethylhydrazobenzene or  $\text{PhNHEt}$  and  $(\text{PhN})_2$ .  $(\text{PhN})_2$  was identified as one product together with a basic oil which was not definitely identified but which smelled strongly of  $\text{PhNHEt}$ . C. H. PEET

Tetraaryldiarsyls. I. F. F. BLICKE AND F. D. SMITH. *J. Am. Chem. Soc.* 51, 2272-6 (1929).—Tetraaryldiarsyls can be prepd. readily by the interaction of  $\text{R}_3\text{AsI}$  and  $\text{Hg}$  in  $\text{C}_6\text{H}_6$  in a N atm.  $\text{Ph}_4\text{As}_2$  in  $\text{PhBr}$  absorbs the theoretical quantity of  $\text{O}$ ; it decolorizes  $\text{KMnO}_4$  in  $\text{Me}_2\text{CO}$  and decolorizes I in  $\text{CCl}_4$ , giving  $\text{R}_3\text{AsI}$ . The soln.



of  $\text{Ph}_3\text{As}$ , is stable toward light. Because of their great reactivity, it seems that their behavior can best be explained by the assumption that the  $\text{R}_3\text{As}$ , dissociates spontaneously into  $\text{R}_2\text{As}$ , i. e., bivalent As radicals.

C. J. WEST

**Forced reaction of phenyl isocyanate, phenyl isothiocyanate and benzophenone anil with phenylmagnesium bromide.** An unusual type of 1,4-addition to a conjugated system that is part aliphatic and part aromatic. HENRY GILMAN, J. E. KIRBY AND C. R. KINNEY. *J. Am. Chem. Soc.* 51, 2252-61 (1929).—The forced reaction of  $\text{PhNCO}$ ,  $\text{PhNCS}$  and  $\text{Ph}_2\text{C:NPh}$  with an excess of  $\text{PhMgBr}$  gives *o*-phenylbenzohydrilamine (I), *o*- $\text{PhC}_6\text{H}_4\text{CHPhNHPH}$ , m. 143-4°, in 30-44, 45 and 42% yields, resp.; the  $\text{HCl}$  salt, m. 182.5°. This was also synthesized from  $\text{PhCH:NPh}$  and *o*- $\text{PhC}_6\text{H}_4\text{MgI}$ . *o*-Iodobiphenyl b. 158,  $d_{25}^{25}$  1.6038. I and concd.  $\text{HCl}$  or  $\text{EtOH-HCl}$  give  $\text{PhNH}_2$  and 9-phenylfluorene (II);  $\text{AcCl}$  and  $\text{Ac}_2\text{O}$  also give II. In the reaction of  $\text{Ph}_2\text{C:NPh}$  and  $\text{PhMgBr}$ , 80% of the amine was recovered after heating at 100° for 10 hrs. The formation of I is unique in the sense that it undoubtedly takes place as a result of a 1,4-addn. to the  $\text{—C:N}$  group in the side chain and 1 of the so-called ethylenic linkages in a  $\text{C}_6\text{H}_4$  ring.

C. J. WEST

**Arylamides of aromatic carboxylic and sulfonic acids.** KURT HELLER. *J. prakt. Chem.* [2], 121, 193-203 (1929).—The arylsulfonamides were made from the sulfonyl chlorides and amines by heating with  $\text{Na}_2\text{CO}_3$  and excess  $\text{PhMe}$  or  $\text{C}_6\text{H}_5\text{Me}_2$  (stirring). The  $\text{NO}_2$  groups were then reduced with Fe powder in hot dil.  $\text{AcOH}$ . In many cases the  $\text{NH}_2$  compds. were diazotized and reduced with  $\text{Na}_2\text{SO}_3$  to hydrazines, which were then condensed with  $\text{AcCH}_2\text{CO}_2\text{Et}$  or  $\text{BzCH}_2\text{CO}_2\text{Et}$  to the corresponding pyrazolones. Many of the amides and pyrazolones gave promising *azo dyes* insol. in alkali (not described). The following new compds. are described: 1,5- $\text{H}_2\text{NC}_{10}\text{H}_6\text{SO}_2\text{NHPH}$ , yellow, m. 171°; 1,8-, yellow, m. 139-40°; 1,4-, m. 190°; 1,7-, m. 146-7°; 1,6-, m. 127-8°; 1,5- $\text{Ar}(\text{OC}_6\text{H}_4)_2\text{SO}_2\text{Cl}$ , m. 129°; 2,6-, m. 107°; 1,5- $\text{HIO}_{10}\text{H}_6\text{SO}_2\text{NHPH}$ , m. 200°; 2,6-, m. 104°; 2,4'- $\text{ClC}_6\text{H}_4\text{CONHC}_6\text{H}_4\text{NH}_2$ , m. 153°; 4,2'- $\text{NO}_2\text{C}_6\text{H}_4\text{CONHC}_6\text{H}_4\text{Cl}$ , m. 160°; 4,2'- $\text{NHC}_6\text{H}_4\text{CONHC}_6\text{H}_4\text{Cl}$ , m. 145°; 2,4,4'-( $\text{NO}_2$ ) $\text{MeC}_6\text{H}_3\text{SO}_2\text{NHC}_6\text{H}_4\text{OMe}$ , m. 135°; 2,4,4'-( $\text{NH}_2$ ) $\text{MeC}_6\text{H}_3\text{SO}_2\text{NHC}_6\text{H}_4\text{OMe}$ , m. 128°; 2,4,2'-( $\text{NH}_2$ ) $\text{MeC}_6\text{H}_3\text{SO}_2\text{NHC}_6\text{H}_4\text{OMe}$ , gave a *hydrazine-HCl*, m. 196°, and from this a *methylpyrazolone*, m. 118°; in what follows, the values after each formula are resp. the m. ps. of the *amine*, the *hydrazine HCl*, and the *methyl- and phenylpyrazolone derivs.*: 2,4,4'-( $\text{NH}_2$ ) $\text{MeC}_6\text{H}_3\text{SO}_2\text{NHC}_6\text{H}_4\text{Me}$ , 128°, 168°, 129°, —; 2,4,2'-( $\text{NH}_2$ ) $\text{MeC}_6\text{H}_3\text{SO}_2\text{NHC}_6\text{H}_4\text{Me}$ , 148°, 199°, 116°, —; 2,3- $\text{NH}_2\text{C}_{10}\text{H}_6\text{CONHPh}$ , 192°, 110°, 179°, 186°; 2,3,2'- $\text{NH}_2\text{C}_{10}\text{H}_6\text{CONHC}_6\text{H}_4$ , 110°, 145°, 129°, 155°; 4,3'- $\text{NH}_2\text{C}_6\text{H}_4\text{SO}_2\text{NHC}_6\text{H}_4\text{NH}_2$ , —, 179-80°, 147°, 168°; 4- $\text{NH}_2\text{C}_6\text{H}_4\text{CONHPh}$ , —, 235°, 271°, —; 4- $\text{BzNHC}_6\text{H}_4\text{NH}_2$ , —, 273°, 233°, 268°; 4,2'- $\text{NH}_2\text{C}_6\text{H}_4\text{CONHC}_6\text{H}_4\text{Cl}$ , —, 180°, 231°, 238°; 2,3,4'- $\text{HIO}_{10}\text{H}_6\text{CONHC}_6\text{H}_4\text{NH}_2$ , —, 295°, 310°, 195°; 2,3,3'- $\text{HOC}_{10}\text{H}_6\text{CONHC}_6\text{H}_4\text{NH}_2$ , —, 175°, 203-5°, 194°.

BEN H. NICOLET

**The *m*-hydroxytolyl sulfones and the *m*-cresolsulfonic acids.** JOSEF ZEHENTER, HANS BOHUNEK and EDUARD NOWOTNY. *J. prakt. Chem.* [2], 121, 223-36 (1929).—The action of  $\text{H}_2\text{SO}_4$  on *m*-cresol gives  $\alpha$ - and  $\beta$ -*m*-hydroxytolyl sulfone ([2,4-Me-(HO) $\text{C}_6\text{H}_3$ ] $_2\text{SO}_2$  (I), and [4,2-Me(HO) $\text{C}_6\text{H}_3$ ] $_2\text{SO}_2$  (II), resp.), with I the chief product. In  $\text{Na}_2\text{CO}_3$ , I gives the *mono-Na salt* (4 $\text{H}_2\text{O}$ ); with alc.  $\text{NaOEt}$ , the *di-Na salt* (1 mol.  $\text{EtOH}$ ). In 4 parts concd.  $\text{H}_2\text{SO}_4$  at room temp., I slowly dissolves to form a *disulfonic acid* of I (III) (isolated through the Pb salt), hygroscopic, m. 65-6°; *di-K salt* (4 $\text{H}_2\text{O}$ );  $\text{Ba salt}$ ,  $\text{C}_{14}\text{H}_{11}\text{O}_{10}\text{S}_2\text{Ba}_{1.5} \cdot 9.5\text{H}_2\text{O}$ , loses 8.5  $\text{H}_2\text{O}$  at 140-50°; *Pb salt*, difficulty sol.,  $\text{C}_{14}\text{H}_{11}\text{O}_{10}\text{S}_2\text{Pb}_{1.5} \cdot 8\text{H}_2\text{O}$ . When I is sulfonated 2 hrs. at 100-20°, there is formed, besides some III, an acid probably 2,4-Me(HO) $\text{C}_6\text{H}_3\text{SO}_3\text{H}$ , since at 170° with *m*-cresol and  $\text{P}_2\text{O}_5$ , I was formed; *K salt* (2 $\text{H}_2\text{O}$ ); *Ba salt* (5 $\text{H}_2\text{O}$ ) (loses 3 $\text{H}_2\text{O}$  at 140°); *Pb salt* (4 $\text{H}_2\text{O}$ ). With  $\text{Na}_2\text{CO}_3$  II gave a *salt*  $\text{C}_{28}\text{H}_{27}\text{O}_8\text{S}_2\text{Na} \cdot \text{H}_2\text{O}$ ; in 4 parts concd.  $\text{H}_2\text{SO}_4$  II dissolved and after some days the mass solidified; through the Pb salt a *disulfonic acid* (IV) of II (with 4.5 $\text{H}_2\text{O}$ , m. 139-40°) was obtained; *K salt*,  $\text{C}_{14}\text{H}_{10}\text{O}_{10}\text{S}_2\text{K}_4 \cdot 4.5\text{H}_2\text{O}$ . Sulfonation of II at 100-20° gave no IV, but cresolmono- and -disulfonic acids. With  $\text{Br}_2$  in  $\text{Et}_2\text{O}$ , II yielded a *tetra-Br deriv.*, m. 220° (decompn.). 4,2-Me(HO) $\text{C}_6\text{H}_3\text{SO}_3\text{H}$  (V) was isolated as a solid (? $\text{H}_2\text{O}$ ), m. 109-10°; *Cu salt* (3 $\text{H}_2\text{O}$ ), loses 2 $\text{H}_2\text{O}$  at 100°. Action of  $\text{Br}_2$  on V or on 2,4-Me(HO) $\text{C}_6\text{H}_3\text{SO}_3\text{H}$  in  $\text{Et}_2\text{O}$  or in  $\text{AcOH}$  gave only 2,4,6-tribromocresol; in  $\text{H}_2\text{O}$  there was also formed a small amt. of a less sol., yellow, *isomeric tribromo-m-cresol*, m. 131° (decompn.).

BEN H. NICOLET

**Nitrating phenol.** STIG VERBEL. *III Nord. Kemistmöte* (Finland) 1926, 193 (1928).—Norwegian abstract. Phenols were nitrated in  $\text{H}_2\text{O}$  with 1-14 *N*  $\text{HNO}_3$  and also 0.0009 *N*  $\text{HNO}_3$ . Advanced nitration sets in at 5 *N*  $\text{HNO}_3$  and even at 4 *N* some dinitro deriv. could be detected. The *o*/*p*-ratio increases with the  $\text{HNO}_3$  concn.,

approaching 1. Arnall (C. A. 18, 674, 2142) reports this ratio 1.5 for nitration tests in org. solvents.

**The constitution of some dichlorophenetidines.** G. BARGELLINI (WITH PIETRO LEONE AND LYDIA MONTI). *Gazz. chim. ital.* 59, 16-32(1929).—In view of the possible value of halogen derivs. of phenetidine in pharmacology and dye manuf., a few Cl derivs. were prepd. and their constitution was established as a beginning of an extensive study in this field. The best conditions for the prepn. of the di-Cl deriv. obtained by Jaeger (cf. *Ber.* 8, 895(1875)) were first detd. but did not establish its constitution, so this problem also had to be solved. Ice-cold abs. EtOH (100 cc.) satd. with HCl gas, dry *p*-HOC<sub>6</sub>H<sub>4</sub>NO (I) (10 g.) added slowly (cooling with ice), let stand several hrs. at room temp., dild. with water, the EtOH removed by distn., made alk. with NaOH, steam-distd. and the solidified distillate recrystd. from dil. EtOH, yields 8 g. of 3,5-dichlorophenetidine (II), m. 46°, b. approx. 275°. HCl and H<sub>2</sub>SO<sub>4</sub> salts, by cooling solns of II in the acids, both hydrolyze readily with boiling water. II refluxed with aq. HCl (10 parts, d. 1.70) for 8-10 hr., poured into water contg. Na<sub>2</sub>SO<sub>3</sub>, neutralized with NH<sub>4</sub>OH, and the ppt. recrystd. from boiling water, yields 3,5,4-Cl<sub>2</sub>(H<sub>2</sub>N)C<sub>6</sub>H<sub>2</sub>OH (III), m. 174-5°, which was therefore the compd. obtained by Jaeger from I and HCl in Et<sub>2</sub>O. Aq. K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> added to III in dil. H<sub>2</sub>SO<sub>4</sub>, filtered, steam-distd. and recrystd. from EtOH, yields 2,6-dichloroquinone, m. 118-20° (cf. *Ber.* 3, 646(1870)), which limits the constitution of III to 2,6,4-Cl<sub>2</sub>(H<sub>2</sub>N)C<sub>6</sub>H<sub>2</sub>OH or 3,5,4-Cl<sub>2</sub>(H<sub>2</sub>N)C<sub>6</sub>H<sub>2</sub>OH, and of II to 2,6,4-Cl<sub>2</sub>(H<sub>2</sub>N)C<sub>6</sub>H<sub>2</sub>OEt or 3,5,4-Cl<sub>2</sub>(H<sub>2</sub>N)C<sub>6</sub>H<sub>2</sub>OEt. Whereas aromatic amines condense with aromatic aldehydes and with other compds. which react with NH<sub>2</sub>, II does not react in these ways, probably because of steric impedance which the NH<sub>2</sub> group exercises on the 2 Cl atoms in *o*-position to it, which indicates that the formula of II is 3,5,4-Cl<sub>2</sub>(H<sub>2</sub>N)C<sub>6</sub>H<sub>2</sub>OEt. This was proved by prepn. of the 2,6-compd. which had different properties. II (3 g.) suspended in water (10 cc.), let stand several hrs. with Ac<sub>2</sub>O (10 cc.), and the ppt. recrystd. from MeOH, yields the 3,5-dichlorophenacetin, 3,5,4-Cl<sub>2</sub>(AcHN)C<sub>6</sub>H<sub>2</sub>OEt (IV), m. 129-30°. II or IV refluxed 4-5 hrs. with Ac<sub>2</sub>O (10 parts) and AcONa (2 parts), poured into water and the ppt. recrystd. from dil. EtOH, yields the *di-Ac* deriv., 3,5,4-Cl<sub>2</sub>(Ac<sub>2</sub>N)C<sub>6</sub>H<sub>2</sub>OEt, m. 86-8°, is converted to IV by heating with NH<sub>4</sub>OH and to II by heating with 20% HCl or with 25% KOH. II (1.7 g.) let stand a few mins. with BzCl (1 g.) in anhyd. Et<sub>2</sub>O, distd., the residue filtered, washed with water contg. HCl, and the residue recrystd. from EtOH, yields the *Bz* deriv., C<sub>15</sub>H<sub>13</sub>Cl<sub>2</sub>O<sub>2</sub>N, m. 188°. II (2 g.) heated 1 hr. at 170-80° with C<sub>6</sub>H<sub>5</sub>(CO)<sub>2</sub>O (1.4 g.), dissolved in boiling water and cooled, deposits 3,5-dichloro-1-ethoxyphenyl *phthalimide*, m. 193-4°. In a similar way was obtained 3,5-dichloro-1-ethoxyphenyl *succinimide*, m. 137°. II diazotized in the ordinary way, treated with alk. β-naphthol and the ppt. washed with water and recrystd. from boiling EtOH, yields the compd., C<sub>15</sub>H<sub>11</sub>Cl<sub>2</sub>O<sub>2</sub>N<sub>2</sub>, red, m. 120°. No phenol could be isolated after boiling the diazo compd., and numerous attempts to couple PhN<sub>2</sub>Cl with II and to condense II with BzH, piperonal, ClC<sub>6</sub>H<sub>3</sub>(NO<sub>2</sub>)<sub>2</sub>, CS<sub>2</sub>, PhNCS, KSCN, etc., were unsuccessful. Besides the method of Hollemann (cf. C. A. 12, 1542), 2,6,4-Cl<sub>2</sub>(H<sub>2</sub>N)C<sub>6</sub>H<sub>2</sub>OH (V) can be prepd. conveniently by adding Na<sub>2</sub>S<sub>2</sub>O<sub>4</sub> slowly to hot alk. 2,6,4-Cl<sub>2</sub>(O<sub>2</sub>N)C<sub>6</sub>H<sub>2</sub>OH until colorless, cooling, neutralizing with AcOH and recrystg. from C<sub>6</sub>H<sub>6</sub>. V heated 2-3 hrs. with BzH (equimol. parts) in EtOH, the EtOH evapd., let crystallize and the product recrystd. from petroleum ether, yields 1-hydroxy-2,6-dichlorobenzylideneaniline (VI), yellow, m. 99-101°. VI (6.7 g.) in alc. KOH (6 g. in 30 cc.) refluxed with EtI (10 g.) for 3-4 hr., evapd., the residue dissolved in water, extd. with Et<sub>2</sub>O, the ext. evapd., the residue hydrolyzed by boiling with HCl (1:1) for 2-3 hr., dild. with water, cooled, extd. with Et<sub>2</sub>O, NH<sub>4</sub>OH added to the aq. liquor, and the solidified oily ppt. recrystd. from petroleum ether, yields 2,6-dichlorophenetidine (VII), m. 105-7°, sol. in concd. H<sub>2</sub>SO<sub>4</sub>; HCl and H<sub>2</sub>SO<sub>4</sub> salts, prepd. from VII and the boiling acids. VII (2 g.) suspended in water (5 cc.), agitated several min. with Ac<sub>2</sub>O (5 cc.), water added, filtered, washed and recrystd. from boiling EtOH, yields the *mono-Ac* deriv. of VII, 2,6,4-Cl<sub>2</sub>(AcHN)C<sub>6</sub>H<sub>2</sub>OEt, m. 176-8°. VII diazotized in the ordinary way, the product poured into alk. β-naphthol, the ppt. washed and recrystd. from EtOH, yields the *azo* deriv., C<sub>17</sub>H<sub>11</sub>Cl<sub>2</sub>O<sub>2</sub>N<sub>2</sub>, m. 171-3°. VII (2 g.) and piperonal (1.6 g.) refluxed in EtOH for 4 hr., cooled, and the ppt. recrystd. from EtOH, yield 1-ethoxy-2,6-dichloropiperonalaniline, 3,5,4-Cl<sub>2</sub>(EtO)C<sub>6</sub>H<sub>2</sub>N:CHC<sub>6</sub>H<sub>3</sub>:O.CH<sub>2</sub>:O, m. 133-5°. VII (2 g.) refluxed with 1-(O<sub>2</sub>N)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>Cl (2 g.) in EtOH, cooled and the ppt. recrystd. from EtOH, yields 1-ethoxy-2,6-dichloro-2',4'-dinitrodiphenylamine, golden yellow, m. 160-2°. V (3 g.), CS<sub>2</sub> (5 g.), S and EtOH refluxed for 5 hr., evapd., and the residue recrystd. from dil. EtOH, yield 2,6,2',6'-tetrachloro-1,1'-dihydroxydiphenylthiourea, 3,5,4-Cl<sub>2</sub>(HO)C<sub>6</sub>H<sub>2</sub>

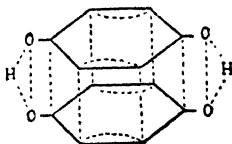
$\text{NHCSNHC}_6\text{H}_4(\text{OH})\text{Cl}_2$ -4,3,5, softens  $200^\circ$ , m. around  $210^\circ$  (decompn.). **V** (2.5 g.) and  $\text{PhNCS}$  (2.5 g.) refluxed in EtOH for 2-3 hrs., cooled, filtered, washed, and the residue recrystd. from boiling EtOH, yield 2,6-dichloro-1-hydroxydiphenylthiourea 3,5,4- $\text{Cl}_2(\text{HO})\text{C}_6\text{H}_2\text{NHCNSNHPH}$ , m.  $138-40^\circ$ . **V** (2 g.), 2,4-( $\text{O}_2\text{N}$ ) $_2\text{C}_6\text{H}_3\text{Cl}$  (2.2 g.),  $\text{AcONa}$  (1 g.) and EtOH (20 cc.) refluxed 4 hrs., cooled, filtered and the residue recrystd. from AcOH, yield 2,6-dichloro-1-hydroxy-2',4'-dinitrodiphenylamine, 3,5,4- $\text{Cl}_2(\text{HO})\text{C}_6\text{H}_2\text{NHC}_6\text{H}_3(\text{NO}_2)_2$ -2,4, red, m.  $208-10^\circ$ . **V** (9.3 g.), piperonal (7.6 g.) and EtOH (50 cc.) refluxed 3 hr., cooled, filtered and recrystd. from dil. EtOH, yield 2,6-dichloro-1-hydroxypiperonalaniline, 3,5,4- $\text{Cl}_2(\text{HO})\text{C}_6\text{H}_2\text{N}:\text{CHC}_6\text{H}_3.\text{O}.\text{CH}_2.\text{O}$ , m.  $151-$

$33^\circ$ . The properties of a dichlorophenacetin (**VIII**), m.  $162^\circ$ , prepd. by Reverdin and During (cf. *Ber.* **32**, 154(1899)) were then confirmed, and its constitution was established. **VIII** and concd.  $\text{HCl}$  (10 parts) refluxed 3 hr., dild. with water, neutralized with  $\text{NH}_4\text{OH}$ , steam-distd., and recrystd. from dil. EtOH, yield 2,5-dichlorophenetidine (**IX**), m.  $64^\circ$  (cf. Reverdin and Düring, *loc. cit.*); *picrate*, yellow, m.  $148-50^\circ$ . **VIII** (10 g.) refluxed 6 hr. with aq.  $\text{HI}$  (d. 1.70), poured in water contg.  $\text{Na}_2\text{SO}_3$ , neutralized with  $\text{NH}_4\text{OH}$ , and the ppt. purified with boiling  $\text{C}_6\text{H}_6$ , yields 2,5-dichloro-4-amino-phenol (**X**), m.  $178-9^\circ$ . Aq.  $\text{K}_2\text{Cr}_2\text{O}_7$  added to **X** in dil.  $\text{H}_2\text{SO}_4$ , filtered, washed and steam-distd., yields 2,5-dichloroquinone, m.  $161^\circ$  (cf. *Ann.* **210**, 138(1881)), which establishes the constitution of **X** and therefore of **IX**. **IX** (3 g.), 2,4-( $\text{O}_2\text{N}$ ) $_2\text{C}_6\text{H}_3\text{Cl}$  (**XI**) (2 g.),  $\text{AcONa}$  (2 g.) and EtOH (20 cc.) refluxed 3 hr., dild. with water, steam-distd., to eliminate EtOH and excess **XI**, filtered, and the residue recrystd. from EtOH, yield 1-ethoxy-2,5-dichloro-2',4'-dinitrodiphenylamine, red, m.  $136-8^\circ$ . **IX** (3 g.) and piperonal (2 g.) refluxed in a little EtOH for 3 hr., cooled, and the ppt. recrystd. from boiling EtOH, yield 1-ethoxy-2,5-dichloropiperonalaniline, 2,5,4- $\text{Cl}_2(\text{EtO})\text{C}_6\text{H}_2\text{N}:\text{CHC}_6\text{H}_3.\text{O}.\text{CH}_2.\text{O}$ , yellowish, m.  $148^\circ$ , gives a yellow soln. in concd.  $\text{H}_2\text{SO}_4$ . Expts.

are in progress to prep. the 4th isomeric phenetidine, *viz.*, 2,3-dichlorophenetidine.

C. C. DAVIS

The juxtaposition of carbocycles and heterocycles in organic molecules. HANS v. EULER and EDVARD BRUNIUS. *Svensk Kem. Tid.* **40**, 233-42, 264(1928); cf. Meyer, *C. A.* **23**, 1623.—A brief review of the question of the relative positions of the rings in  $\text{C}_{10}\text{H}_8$ , anthracene, quinhydrone, and disaccharides. In the absence of  $\text{O}_2$ , quinhydrone solns. have a color which deepens with increasing alky. and which is stronger than that of hydroquinone or quinone alone. The authors conclude that quinhydrone forms a colored ion and propose the following structure for quinhydrone:



D. D.

*p*-Methoxycinnamaldehyde and 5-*p*-methoxyphenyl-1-pentadienal. D. VORLÄNDER and KURT GIESELER. *Univ. Halle. J. prakt. Chem.* [2], **121**, 237-46(1929).— $p\text{-MeOC}_6\text{H}_4\text{CH}:\text{CHCHO}$  (**I**) (20-3 g. from 100 g.  $\text{MeOC}_6\text{H}_4\text{CHO}$ ) was condensed with a no. of amines and ketones, and the tendency of the products to form liquid crystals examd. In the following,  $\text{R} = p\text{-MeOC}_6\text{H}_4\text{CH}:\text{CH}-$ ;  $\text{RCH:NPh}$ , from the components (**I** and  $\text{PhNH}_2$ ) in alc., m.  $125^\circ$  (all m. ps. cor.);  $p\text{-RCH:NC}_6\text{H}_4\text{Me}$ , from alc., m.  $126^\circ$ ,  $138^\circ$ ; from  $\text{C}_6\text{H}_6$ , m.  $122^\circ$ ,  $129^\circ$  (where 2 m. ps. are given, they are for the solid and for the liquid crystals, resp.);  $p\text{-RCH:NC}_6\text{H}_4\text{Cl}$ , m.  $133^\circ$ ,  $147^\circ$  (gives also a 2nd monotropic solid phase);  $p\text{-RCH:NC}_6\text{H}_4\text{OH}$ , m.  $196^\circ$ ;  $p\text{-RCH:NC}_6\text{H}_4\text{OMe}$ , m.  $167^\circ$ ,  $180^\circ$ ;  $p\text{-RCH:NC}_6\text{H}_4\text{OEt}$ , m.  $146^\circ$ ,  $181^\circ$ ;  $p\text{-RCH:NC}_6\text{H}_4\text{N}_2\text{Ph}$ , m.  $168^\circ$ ,  $240^\circ$ ;  $p\text{-RCH:NC}_6\text{H}_4\text{CO}_2\text{H}$ , m.  $200-2^\circ$ , decomp. below the m. p. of the liquid crystals; *Et ester*, m.  $97^\circ$ ,  $129^\circ$ ;  $p\text{-RCH:NC}_6\text{H}_4\text{CH}:\text{CHCO}_2\text{Et}$ , m.  $134^\circ$ ,  $188^\circ$ , on cooling the melt gives also a 2nd liquid crystal form, uniaxial, also optically positive.  $\beta\text{-RCH:NC}_6\text{H}_4\text{H}$ , m.  $171^\circ$  (liquid crystal phase monotropic);  $\text{RCH:NNH}_2$ , m.  $210-2^\circ$ ,  $231^\circ$ . Condensation of **I** with ketones gave  $\text{RCH:CHCMe}$ , m.  $108^\circ$ ;  $(\text{RCH:CH})_2\text{CO}$  (**II**), m.  $168^\circ$ ,  $183^\circ$ ; octobromide of **II**, m.  $164^\circ$  (decompn.); *bis-p*-methoxycinnamylidenecyclopentanone, m.  $237^\circ$ ; *bis-p*-methoxycinnamylidenecyclohexanone, m.  $201^\circ$ ,  $212^\circ$ ;  $p\text{-RCH:CHCO}_2\text{C}_6\text{H}_4\text{OH}$  (**III**), m.  $169^\circ$ ;  $p\text{-RCH:CHCO}_2\text{C}_6\text{H}_4\text{OMe}$ , m.  $112^\circ$ ; *Ac deriv.* of **III**, m.  $134^\circ$  (liquid crystals monotropic). With  $\text{AcH}$  in  $\text{MeOH}$  and alkali, **I** gave 5-*p*-methoxyphenyl-1-pentadienal (**IV**),  $\text{RCH:CHCHO}$  (2 g. b<sub>9-11</sub>  $203-11^\circ$  from

50 g. I);  $\text{Ag}_2\text{O}$  with IV gave *p*-methoxycinnamylidenecetic acid (V), m.  $176^\circ$ ,  $216\text{--}8^\circ$ . From the fraction boiling just above IV in its prepn., was isolated *p*-methoxy- $\alpha,\beta$ -dihydrocinnamylidenecetic acid, m.  $136\text{--}8^\circ$  (proof of structure by  $\text{KMnO}_4$  oxidation to  $\text{H}_2\text{C}_2\text{O}_4$  and *p*- $\text{MeOC}_6\text{H}_4\text{CH}_2\text{CH}_2\text{CO}_2\text{H}$ ) which was shown to be formed during the distn. Condensation products of IV with the following amines were made: *PhNH}\_2, m.  $125^\circ$ ,  $135^\circ$ ; *p*- $\text{MeC}_6\text{H}_4\text{NH}_2$ , m.  $133^\circ$ ,  $180^\circ$ ; *p*- $\text{MeOC}_6\text{H}_4\text{NH}_2$ , m.  $192^\circ$ ,  $218\text{--}20^\circ$ ; *p*- $\text{EtOC}_6\text{H}_4\text{NH}_2$ , m.  $167^\circ$ ,  $217^\circ$ ; *p*- $\text{PhN}:\text{NC}_6\text{H}_4\text{NH}_2$ , m.  $174^\circ$ , decomp. below the m. p. of the liquid crystals;  $\beta$ - $\text{C}_{10}\text{H}_7\text{NI}_2$ , m.  $162^\circ$ ,  $200^\circ$ ;  $\text{PhN}_2\text{H}_3$ , m.  $174^\circ$ ,  $183^\circ$ . B. H. N.*

*p*-Methoxycinnamylidenecetic acid. D. VORLÄNDER AND KURT GIESELER. *J. prakt. Chem.* [2], 121, 247-54 (1929).—With  $\text{H}_2\text{C}(\text{CO}_2\text{H})_2$  and  $\text{Ac}_2\text{O}$ , *p*- $\text{MeOC}_6\text{H}_4\text{CH}:\text{CHCHO}$  gave *p*- $\text{MeOC}_6\text{H}_4\text{CH}:\text{CHCH}:\text{C}(\text{CO}_2\text{H})_2$  (I), red, m.  $182^\circ$ ; monohydrate, orange-yellow. Heated with  $\text{C}_6\text{H}_5\text{N}$ , I gave the stable (*trans-trans*?) *p*-methoxycinnamylidenecetic acid (II), yellow needles, m.  $179^\circ$  (all m. p.'s cor.) to liquid crystals, m.  $222\text{--}3^\circ$ ; in sunlight adds  $\text{Br}_2$  in  $\text{CHCl}_3$  giving a tetrabromide, m. about  $180^\circ$  (strong HBr evolution); reduction of II with Na-Hg (using  $\text{CO}_2$ ) gave *p*- $\text{MeOC}_6\text{H}_4\text{CH}(\text{H})\text{CH}(\text{H})\text{CH}_2\text{CO}_2\text{H}$ , m.  $57^\circ$ , which, boiled 6 hrs. with 10% NaOH, gave the isomeric *p*- $\text{MeOC}_6\text{H}_4\text{CH}_2\text{CH}_2\text{CH}:\text{CHCO}_2\text{H}$ , m.  $136\text{--}8^\circ$  (see preceding abstr.). The following derivs. of II were made: *Me*, m.  $129^\circ$ ; *Et*, m.  $66\text{--}8^\circ$ ; *Pr*, m.  $47\text{--}9^\circ$ ; acid chloride (with  $\text{SOCl}_2$ ), m.  $110^\circ$ ; *p*- $\text{EtOC}_6\text{H}_4$  ester, m.  $150^\circ$ , liquid crystals m.  $211^\circ$ ; anilide, m.  $189^\circ$ ; *p*-toluide, m.  $214^\circ$  (monotropic liquid crystals); *p*-aniside, m.  $193^\circ$ , liquid crystals m.  $218^\circ$ ; *p*-phenetide, m.  $182^\circ$ , liquid crystals m.  $220^\circ$ ; piperide, viscous oil. Heated 17-20 min. at  $158\text{--}60^\circ$  with 0.5 its wt. of quinoline, I gave, in addn. to II, an isomer (*trans-cis*?) (III) of II, m.  $128\text{--}31^\circ$ , about 10% of which could be sepd. with petroleum ether. On melting, III partially changed to II; also, more readily, with a trace of  $\text{I}_2$  in sunlight. When II was dissolved in  $\text{Na}_2\text{CO}_3$  soln. and exposed 120 hr. to ultraviolet light, a portion was converted to further isomers. The 2 fractions, m.  $90\text{--}6^\circ$  and  $106\text{--}10^\circ$ , readily gave II with  $\text{I}_2$  in sunlight, and may be the remaining isomers of II. BEN H. NICOLET

Synthesis of ephedrine and structurally similar compounds. III. A new synthesis of  $\alpha$ -diketones. HAROLD W. COLES, RICHARD H. F. MANSKE AND TREAT B. JOHNSON. *J. Am. Chem. Soc.* 51, 2269-72 (1929); cf. *C. A.* 23, 3454.—1-Phenyl-1,2-propanedione is obtained in 26-8 g. yields by passing  $\text{N}_2\text{O}_4$  into a mixt. of 134 g  $\text{PhEtCO}$ , 35 g.  $\text{CaCl}_2$  and 1 cc.  $\text{EtOH-HCl}$  maintained at  $60^\circ$ , interrupting the reaction after 3-4 hr.; the ketone is isolated through the bisulfite compd. From 60-70 g  $\text{PhEtCO}$  is recovered. Examples of other syntheses are given, the yields varying from 30 to 40%. 1-Phenyl-1,2-butanedione,  $b_p$   $130\text{--}2^\circ$ ; 1-*p*-ethylphenyl-1,2-propanedione,  $b_p$   $138\text{--}40^\circ$ ; 1-[2,5-dimethylphenyl]-1,2-propanedione,  $b_p$   $140\text{--}4^\circ$ . Isonitroso- $\alpha$ -hydrindone exhibits considerable stability toward  $\text{N}_2\text{O}_4$  and when reaction does ensue deep-seated changes result and no diketohydrindone could be isolated. Small amounts of  $\text{N}_2\text{O}_4$  cause rapid and complete decompn. of  $\alpha$ -ketotetrahydronaphthalene. C. J. WEST

Amino alcohols. I. Phenylpropanolamine and *p*-tolylpropanolamine. WALTER H. HARTUNG AND J. C. MUNCH. *J. Am. Chem. Soc.* 51, 2262-6 (1929).—Compounds of the type  $\text{ArCHOHCHRNH}_2$  have been synthesized because of their possible physiol. activity. The method consists of the catalytic reduction of the appropriate isonitroso ketones (Hartung, *C. A.* 23, 599). Isonitrosopropiophenone, prepd. from the ketone and  $\text{BuNO}_2$  in 72.5% yield, on reduction in  $\text{EtOH-HCl}$  with Pd on charcoal, gives 84-98% of  $\text{PhCH}(\text{OH})\text{CH}_2\text{CH}_2\text{NH}_2$ , m.  $103^\circ$ . When the reduction was carried out in the absence of HCl, the reaction was slow and incomplete. *p*-Tolyl- $\alpha$ -oximinobutyrate ketone, m.  $125^\circ$  (74% yield); reduction gives *p*-tolylpropanolamine, m.  $112^\circ$ ; HCl salt, m.  $205^\circ$ . Deamination by means of  $\text{HNO}_2$  gives the original aryl alkyl ketones. Pharmacologically both compds. produce effects paralleling those of ephedrine, they exert as great an effect on the blood pressure of an anesthetized dog as does the natural alkaloid and are also effective when administered orally. Their mydriatic action was found to be greater than that of either ephedrine or phenylethanolamine. Both compds. had a potentiating effect when epinephrine was subsequently administered. The *Ph* deriv. is less and the tolyl deriv. more toxic than ephedrine. C. J. WEST

Is the chloride of anthranilic acid capable of existence? LUDWIG ANSCHUTZ AND HERMANN BORDEKER. *Ber.* 62B, 826-30 (1929).—Anthranilic acid (I) with  $\text{PCl}_5$  gives not the chloride but a compd.  $\text{Cl}_2\text{PONHC}_6\text{H}_4\text{COCl}$  (Uhlfelder), and from their behavior toward salicylic acid  $\text{PCl}_5$  and  $\text{POCl}_3$  would seem still less adapted to prepg. the chloride. Of the ordinary reagents for prepg. acid chlorides, there was left only  $\text{SOCl}_2$ , therefore, which gave some hope of yielding the chloride of I. In view of the experience of Michaelis and Siebert with *m*- $\text{H}_2\text{N}\cdot\text{C}_6\text{H}_4\cdot\text{CO}_2\text{H}$ , it seemed best not to start

from the free I but from 1 of its salts. The Na salt tenaciously holds 1 mol. of  $H_2O$  of crystn. even at high temps. and it was soon given up. The Ba salt is unsuitable for the same reason, but the Ag and Pb salts are anhyd. and the latter, under the proper conditions, gives with  $SOCl_2$  not only anhydrides but also a compd. (II) which proved to be *N*-thionylantranilyl or *o*-*N*-thionylaminobenzoyl chloride,  $O:S:NC_6H_4COCl$ . The course of the reaction also shows why it is not possible to obtain the chloride; A. and B. believe that the  $NH_2$  group in I is attacked in part by the  $SOCl_2$  and in part also by the newly formed  $COCl$  group, thus resulting in the formation of considerable amts. of anhydrides of amide-like structure (or their transformation products). The Pb salt of  $p$ - $H_2NC_6H_4CO_2H$  gave the *p*-isomer of II but the *m*-isomer could not be obtained. II (7.5 g. from 20 g. Ag (or the equiv. amt. of Pb) salt of I in  $Et_2O$  suspension slowly treated with 25 g.  $SOCl_2$  in  $Et_2O$  and gently boiled 3–4 hr.), yellow,  $b_p$  98°, m. 34–5°, exceedingly sensitive to  $H_2O$ , at once liberating  $SO_2$  in the air, reacts very violently with  $MeOH$ , at once gives with *p*-toluidine the  $HCl$  salt of the latter and a substance, m. 150–1°, which is presumably the *p*-toluimide of I (Mehner). C. A. R.

**Mixed glycerides of salicylic acid.** I. W. HUMNICKI. *Bull. soc. chim.* 45, 275–9 (1929).— $HOC_6H_4COCl$  was treated with an equiv. quantity of 1,3-dichloro-2-propanol (I), giving the *salicylate* (II) of I, m. 46–8°, after ether extrn. and recrystn. from  $EtOH$ . II was identical with the product obtained by Fritsch (*Ber.* 24, 779). Heating II with aq.  $KI$  at low pressure or at 150° in a sealed tube, or any usual method for the replacement of  $Br$  or  $Cl$  by  $I$ , gave no result. Two mols. of  $PbI_2$  and 1 mol. of II at 150° gave an unidentified compd. contg. 33.8% of I. Heating 38 g. of  $HOC_6H_4CO_2H$  in 100 g. of glycerol at 130°, while gaseous  $HI$  was bubbled through (8 hrs.), gave a yellow soln. which was extd. with  $Et_2O$ , the oil washed with  $NaHCO_3$  soln. and fractionated, giving 1,3-di-*o*-2-propanol *salicylate*,  $d_{15}$  2.61. II. *Ibid* 279–83.—Two methods have been employed for the prepn. of esters of I: (a) acyl chlorides were treated with  $I$ ; (b) acids and glycerol were subjected to a stream of dry  $HCl$  while heated on a  $H_2O$  bath. The following esters were prepd.: *acetate*, b. 193–5°,  $n_D^{20}$  1.4542,  $d_{20}$  1.281; *isovalerate*,  $b_p$  127–40°,  $n_D^{20}$  1.450,  $d_{20}$  1.444; *caproate*,  $b_{15}$  140–5°,  $n_D^{20}$  1.4403,  $d_{20}$  1.074; *laurate*,  $b_{12}$  200°,  $n_D^{25}$  1.459,  $d_{20}$  1.032; *myristate*, m. 27–9°; *stearate*, m. 36–7°; *oleate*,  $b_{15}$  260–75°,  $n_D^{20}$  1.4754,  $d_{20}$  0.994. With *acetylsalicylic acid*, method (b) gave  $HOC_6H_4CO_2H$  and II. Also in *Roczniki Chem.* 9, 390–5, 396–401 (1929).

A. S. CARTER

**Amino derivatives of hydroxybenzoic acids.** E. PUXEDDU. *Gazz. chim. ital.* 59, 10–5 (1929).—The expts. are a continuation of earlier ones in which a rapid method of prepn. of amino derivs. of hydroxybenzoic acids was described (cf. *Gazz. chim. ital.* 36, ii, 87, 305 (1906); 37, i, 68 (1907)). The method is somewhat modified, *e. g.*, in the purification of the aminohydroxy acids, while several new compds. and a new method of prepn. of gentisinic acid (I) are described. Benzeneazosalicylic acid (II) (5 g.) heated with  $PhHNNH_2$  (III) (12 g.) in a flask (instead of a porcelain dish as in the earlier work), the product washed with  $Et_2O$  and then with boiling  $EtOH$ , dissolved in dil.  $HCl$ , reprecipd. with  $NaHCO_3$ , and the ppt. recrystd. from water (using animal charcoal for purification), yields 2,5- $HO(H_2N)C_6H_3CO_2H$  (IV), bluish rose color, turns brown at 239°, m. 259° (decompn.). There are no previous reliable data in the literature on this compd. 2,5- $AcO(AcHN)C_6H_3CO_2H$  (V) also reacts readily with III, giving IV. Acetylation of II yields, after crystn. from  $EtOH$ , the compd.  $C_{15}H_{12}N_2O_4$ , orange-yellow, m. 145°. Diazotization of *o*-toluidine and coupling with *o*- $HOC_6H_4CO_2H$  yields *o*-tolueneazosalicylic acid,  $C_{14}H_{12}O_3N_2$  (VI), m. 186°. VI is a convenient compd. from which to prep. IV, VI crystg. in purer form from  $C_6H_6$  than II, and reacting more easily with III. IV can be transformed by the method of Goldberg (*J. prakt. Chem.* 19, 359) into diazosalicylic acid (VII), which gave quant. a bluish gray product which exploded at 162°. The product obtained by Auden (*Proc. Chem. Soc.* No. 215) was considered to be  $O.OC.C_6H_3(OH).N:N$  and exploded at 155°. VII

heated 1 hr. in  $H_2SO_4$  (cf. Goldberg, *loc. cit.*), yields I, m. 199°. When VII is heated with aq.  $CuSO_4$ , there is obtained instead of I a compd., m. 173° which gives a blue color with  $FeCl_3$ . It may be a mixt. of hydroquinone and I. IV,  $Ac_2O$  and  $AcONa$  boiled 1 hr., let stand 4 hrs. for the oil to solidify and washed with  $CHCl_3$ , yield a diacetylaminoazosalicylic acid, m. 184°, sol. in aq. alk. hydroxides, insol. in dil. acids. Benzeneazo-*m*-hydroxybenzoic acid (cf. *Gazz. chim. ital.* 36, 305 (1906)) mixed with III, the product washed with  $Et_2O$ , then with boiling  $EtOH$ , and crystd. from boiling water with animal charcoal, yields 6,8- $H_2N(HO)C_6H_3CO_2H$  (VIII), light violet, turns brown at 235°, m. 252° (decompn.) (cf. *Ann.* 263, 234; *Ber.* 27, 1933).  $NaNO_2$  (2.5 g.)

in a min. of water added to an ice-cold filtered soln. of VIII (5 g.) in dil. HCl (8 cc. HCl + 150 cc. water) gives *diazo-m-hydroxybenzoic acid* (IX), explodes at 169°, the product of this decompn. being insol. in all org. solvents, but giving a red soln. in dil. KOH. IX (10 g.) and excess dil. H<sub>2</sub>SO<sub>4</sub> boiled 1 hr., filtered, extd. with Et<sub>2</sub>O, the ext. evapd., and the residue recrystd. from water (with animal charcoal) yields I.

C. C. DAVIS

**New syntheses among the amino acids. III. The behavior of  $\alpha$ -arylideneamino- $\beta$ -cinnamolactones with phenylhydrazine and with hydroxylamine, and a new method for the substitution of hydrogen by the amino group.** GAETANO MINUNNI (WITH I. OTTAVIANO AND V. SPINA). *Gazz. chim. ital.* 59, 116-28 (1929); cf. preceding abstr.—In the earlier expts. it was proved that  $\alpha$ -arylideneamino- $\beta$ -croto lactones react with great ease with PhHNNH<sub>2</sub> (I) with elimination of the arylidene group as a phenylhydrazone, and this fact was of great aid in explaining the reaction between aldoximes and  $\beta$ -ketonic ethers. Nevertheless not even I furnishes a reaction which is suitable for prepg.  $\alpha$ -amino- $\beta$ -lactones, for the present paper shows that when I and arylideneaminocinnamolactones react, the decompn. is not limited to elimination of the arylidene group, for the aminolactone group also reacts and in a 2nd stage addn. occurs. Benzylideneaminocinnamolactone (II) (cf. C. A. 23, 1120) warmed a few mins. with excess I and a little EtOH, cooled, filtered, washed with EtOH, and purified from boiling EtOH, yields  $\alpha$ -amino- $\beta$ -hydroxycinnamic acid phenylhydrazide, PhC(OH):C(NH<sub>2</sub>)CONHNHPh (III), decomp. 148-9°, gives in CHCl<sub>3</sub> a brown soln., which on standing turns brown-violet with pptn. of a trace of a pulverulent substance. III is also formed at room temp. and in C<sub>6</sub>H<sub>6</sub>. Thus II (2 g.) in C<sub>6</sub>H<sub>6</sub> (50 cc.) and I (2.5 g.) let stand several hr., filtered and washed with C<sub>6</sub>H<sub>6</sub>, yields III. In all cases PhCH.NNHNHPh (IV) was obtained as a 2nd product. Similarly anisylideneaminocinnamolactone (V) (cf. C. A. 23, 3676) (4 g.), I (4 g.) and EtOH (50 cc.) heated about 0.25 hr. on a water bath, filtered, washed with EtOH, and the residue purified with boiling C<sub>6</sub>H<sub>6</sub>, and final crystn. from anhyd. AcMe, yields III. Na<sub>2</sub>CO<sub>3</sub> (1 g.) in water (2 cc.) added to HONH<sub>2</sub>Cl (1.5 g.) in water (1.5 cc.), the mixt. added to II (2.5 g.) suspended in EtOH (15 cc.), let stand 1 hr., filtered, the filtrate allowed to evap. (about 1 week), filtered, washed with aq. EtOH (1:2), and the filtrate steam-distd., yields PhCH·NOH, while the residue from the 2nd filtration, purified with boiling C<sub>6</sub>H<sub>6</sub>, yields 80% of  $\alpha$ -amino- $\beta$ -cinnamolactone PhC:C(NH<sub>2</sub>).CO.O (VI), turns brown around 152°, m

154.5-5.0°. With excess Na<sub>2</sub>CO<sub>3</sub> (5 g.) the yield is low. V (2.5 g.) in EtOH (15 cc.), HONH<sub>2</sub>Cl (1.5 g.) in water (1.5 cc.), Na<sub>2</sub>CO<sub>3</sub> (1 g.) in water (2 cc.) let stand several days, filtered washed with dil. EtOH (1:2) and the residue crystd. from EtOH and then from C<sub>6</sub>H<sub>6</sub>, yields 65% of VI, while the EtOH wash liquor contains anisaldoxime. In general, the expts. on the reaction between aldoximes and  $\beta$ -ketonic ethers lead to a new method for substituting H by an NH<sub>2</sub> group, which is applicable to those compds. which can be transformed by aromatic aldoximes, or otherwise, into arylideneamino compds. capable of reacting with NH<sub>2</sub>OH like arylideneaminocinnamolactones, i. e., by elimination of the arylidene group as aldoxime. The general reactions:  $\text{>C(H) + HON:CHAR} \rightarrow \text{>CN:CHAR + H}_2\text{O}$  and  $\text{>CN:CHAR + NH}_2\text{OH} \rightarrow \text{>CNH}_2 + \text{ArCH:NOH}$  represent the 2 stages which in certain cases lead to amino compds. which could not be obtained by any reactions known previously. This is well illustrated by the prepn. of VI, which is the 1st known unsatd. aminolactone and the structure of which suggests many interesting transformations.

C. C. DAVIS

**Preparation of some methylated gallic acids.** R. J. SHRINER AND P. MCCUTCHAN. *J. Am. Chem. Soc.* 51, 2193-5 (1929).—3,4-Dimethylgallic acid, m. 184-5°, was obtained in 20% yield by heating 10 g. 5,3,4-Br(MeO)<sub>2</sub>C<sub>6</sub>H<sub>2</sub>CO<sub>2</sub>H, 200 cc. 8% NaOH and 2 g. Cu 1 hr. at 200°. 3-Methylgallic acid, m. 131-2°, was obtained in 1 g. yield by heating 5 g. 5-bromovanillin with 100 cc. 8% NaOH and 2 g. Cu 1 hr. at 200-10°. FeCl<sub>3</sub> gives a light green color. The diacetate m. 102-3°.

C. J. WEST

**Polynuclear aromatic hydrocarbons and their derivatives. II. 2',3'-Naphtho-1,2-anthracene, its homologs and oxidation products.** E. CLAR, FR. JOHN AND B. ILAWRAN. *Ber.* 62B, 940-50 (1929); cf. C. A. 23, 2966.—It was shown in the 1st paper that polynuclear aromatic ketones with a Me group adjacent to the C:O group condense on heating, with loss of H<sub>2</sub>O, to polynuclear hydrocarbons, just as anthracene derivatives had previously been prepd. from *o*-methylated benzophenones. It has now been found that the method can be used for double ring formation and that *di o* toluylbenzenes (I) and their homologs readily yield *ang*-2',3'-naphtho-1,2-anthracene (II) and its derivs. The angular structure of these compds. is proved by the fact that both *o*- and *p*-I yield the same II, which is not identical with the known *lin*-2,3,6,7-

dibenzanthracene (III) and on energetic oxidation gives *ang*-1,2-*o*-phthalylanthraquinone (IV); furthermore, *o*-bis[2',5'-dimethylbenzoyl]benzene (V) and the *p*-2',4'-isomer (VI) likewise yield the same di-Me deriv. (VII) of II; and finally, the *m*-2',4'-isomer (VIII) of V gives a hydrocarbon (IX) yielding on energetic oxidation a diquinone (X) which, like IV, forms an azine (XI) with  $N_2H_4 \cdot H_2O$ . As was to be expected, the double ring formation takes place in 2 stages. In all these reactions the (sometimes even abundant) formation of anthracene,  $\beta$ -methylanthracene (XII) (in the case of the  $C_{14}H_8(COC_6H_3Me_2)_2$ ) and of 2,5-Me<sub>2</sub>C<sub>6</sub>H<sub>3</sub>CO<sub>2</sub>H (XIII) (in the case of V) was observed; the formation of these compds. can be ascribed only to the cleavage of anthracene ketones. Thus, V probably first forms 2,5-xylyl 7-methyl-1-anthryl ketone which changes partially into VII by loss of H<sub>2</sub>O and partially into XII and XIII by addn. of H<sub>2</sub>O at the high temp. (around 400°). This cleavage is especially troublesome with the *o*-diketones for the intermediate  $\alpha$ -anthracene ketones are decompd. more easily than the  $\beta$ -isomers formed from the *m*- and *p*-diketones. II differs from its Me homologs neither in appearance, m. p., soly. nor fluorescence and the absorption curves in the ultraviolet all follow the same course, any slight deviations observed lying far within the range of exptl. error of the method. Hot benzene solns. are turned red by 2 mols. picric acid but the hydrocarbons sep. unchanged on cooling; only with a 10-fold amt of picric acid are there obtained brown-red picrates which at once decomp. when the excess of picric acid is washed away. *p*-I, from *p*-C<sub>6</sub>H<sub>4</sub>(COCl)<sub>2</sub> and *o*-Me-C<sub>6</sub>H<sub>4</sub>MgBr, m. 82°, sol. in H<sub>2</sub>SO<sub>4</sub> with orange-yellow color; at the same time is formed *p*-*o*'-tolylbenzoic acid, m. 177°, sol. in H<sub>2</sub>SO<sub>4</sub> with greenish yellow color, almost quantitatively oxidized by alk. KMnO<sub>4</sub> to 2,4'-HO<sub>2</sub>CC<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>C<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>II, m. 234°. *o*-I is a viscous, non crystallizable, almost colorless substance. VIII, from *m*-C<sub>6</sub>H<sub>4</sub>(COCl)<sub>2</sub> and AlCl<sub>3</sub> in *m*-xylene, b<sub>12</sub> 243°, solidifies to a glassy viscous mass, sol. in H<sub>2</sub>SO<sub>4</sub> with orange-red color. VI, m. 128°, sol. in H<sub>2</sub>SO<sub>4</sub> with orange-red color. *o*-2',5'-Me<sub>2</sub>C<sub>6</sub>H<sub>3</sub>CO-C<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>II, from C<sub>6</sub>H<sub>4</sub>(CO)<sub>2</sub>O, excess of *p*-xylene and AlCl<sub>3</sub>, m. 147.5°, can be obtained pure without difficulty by recrystn. from PhMe; refluxed with Zn in AcOH, it gives 3-*p*-xylylphthalide, m. 112°, sol. without color in cold, with dark color in hot H<sub>2</sub>SO<sub>4</sub>; thus with 2,5-Me<sub>2</sub>C<sub>6</sub>H<sub>3</sub>MgBr yields 1,3-di-*p*-xylylbenzofuran whose C<sub>6</sub>H<sub>5</sub>-Et<sub>2</sub>O soln. shows the blue-green fluorescence characteristic of isobenzofuran derivs. but the substance could not be isolated in cryst. form; the concd. soln. of the furan, boiled in AcOH (previously purified with CrO<sub>3</sub>) to drive off the C<sub>6</sub>H<sub>6</sub> and Et<sub>2</sub>O and then 10 min. with a 10% excess of CrO<sub>3</sub>, gives V, m. 138.5°, sol. in H<sub>2</sub>SO<sub>4</sub> with brown-yellow color and faint red fluorescence; on heating, the color changes through red-brown and green to a dirty brown; with Zn and AcOH it yields a soln. with blue-green fluorescence, and with excess of N<sub>2</sub>H<sub>4</sub> · H<sub>2</sub>O in boiling alc. 1,4-di-*p*-xylylphthalazine, m. 136.5°, sol. in cold H<sub>2</sub>SO<sub>4</sub> with a golden yellow color which disappears on heating. The yield of hydrocarbons from the *o*-diketones is small, from the *m*- and *p*-compds., 20-5%. II, very faintly greenish yellow, m. 265°, sol. in H<sub>2</sub>SO<sub>4</sub> with dirty brown color. Dil. solns. in org. solvents have a blue-violet, more concd. solns. a blue-green fluorescence. It sublimes under 12 mm. about 230°. 6',7'- (IX) and 7,7'-Di-Me deriv. (VII), from VIII and from V and VI, resp. 6',7'-Dimethyl-1',4'-dihydro-1'(or 4')-keto-2',3'-naphtho-1,2-anthraquinone (XIV), from IX and 4 mols. CrO<sub>3</sub> in boiling AcOH, yellow, m. 323°, sol. in H<sub>2</sub>SO<sub>4</sub> with deep emerald-green color, forms an orange-red Na<sub>2</sub>S<sub>2</sub>O<sub>4</sub> vat from which air throws out a blue ppt. 7,7'-Di-Me isomer, m. 332°. IV, yellow, m. 322-3°, forms an orange-red Na<sub>2</sub>S<sub>2</sub>O<sub>4</sub> vat yielding with air a blue to greenish blue ppt. which becomes faintly red on acidifying. 1',4'-Diketo deriv. (X) of XIV, from 7 g. XIV with 7 g. CrO<sub>3</sub> in boiling AcOH, yellowish to greenish yellow, m. 338°. Dimethyl-1,2,3,4-diphthalylbenzene azine (XI), red-brown, does not m. 380°, sol. in H<sub>2</sub>SO<sub>4</sub> with orange-red color, forms a cherry-red Na<sub>2</sub>S<sub>2</sub>O<sub>4</sub> vat. 1,2,3,4-Diphthalylbenzene-4',4''-dicarboxylic acid, from XIV with dil. HNO<sub>3</sub> at 190-200°, does not m. 380°, sol. in H<sub>2</sub>SO<sub>4</sub> with light red color, forms a dark blood-red Na<sub>2</sub>S<sub>2</sub>O<sub>4</sub> vat turned violet-red by the air; attempts to convert it into IV by decarboxylation failed. III. Anthracenoanthracenes and their quinones. E. CLAR, H. WALLENSTEIN AND R. AVENARIUS. *Ibid* 950-5.—The study of the condensation of ketones to polynuclear hydrocarbons has been extended to 1,5-dibenzoyl-2,6-dimethylnaphthalene (I) and the 1,8,2,7-isomer (II). I is readily obtained from 2,6-C<sub>10</sub>H<sub>6</sub>Me<sub>2</sub>, AlCl<sub>3</sub> and BzCl even in the cold, but 2,7-C<sub>10</sub>H<sub>6</sub>Me<sub>2</sub> gave no homogeneous compd., the product being apparently a mixt. of II and the 1,5-Bz<sub>2</sub> isomer, of which only the former is capable of double ring formation. On heating, I and II yield 2',1'-anthraceno-1,2-anthracene (III) and the 1',2'-isomer (IV), resp., but as at the high temp. required there is also much decompn. of the diketones the yields are poor. Attempts were made to synthesize IV by the condensation of 1,8-di-*o*-tolyl-naphthalene (V) but the decompn. of the V was so great that not enough IV was obtained

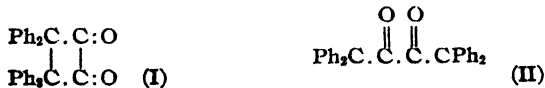
for identification. Only with a 30-fold excess of picric acid can red-brown needles occasionally be obtained from III or IV in  $C_6H_6$ .  $CrO_3$  in AcOH readily converts the III and IV into 1,2,5,6- and 1,2,7,8-diphthalyl-naphthalene (2',1'- and 1',2'-anthraquinone-1,2-anthraquinone) (VI and VII), resp. The absorption of III and IV in the ultraviolet was also measured. I (120 g. from 52 g.  $C_{10}H_8Me_2$  in  $CS_2$ ), m. 262.5-4°, sol. in  $H_2SO_4$  with light red color; with  $Ac_2O$  instead of  $BzCl$  there is obtained only the 1-mono-Ac deriv., b. 310-1°, m. 70-1°, sol. in  $H_2SO_4$  with yellow color (picrate, lemon-yellow, m. 139-40°). The product (70 g.) from 2,7- $C_{10}H_8Me_2$ ,  $BzCl$  and  $AlCl_3$  in  $CS_2$ , sepd from solvents as an oil; on distn. under 12 mm. at about 300° it yielded a glassy mass from which could be isolated no cryst. diketone but only a small amt. of IV. 9,10-Di-tolyl-9,10-dihydroxyacenaphthene (9,10-di-o-tolylacenaphthene-glycol) from acenaphthenequinone and o-MeC<sub>6</sub>H<sub>4</sub>MgBr, m. 164°, sol. in  $H_2SO_4$  with yellow color, gives with  $CrO_3$  in AcOH V, m. 238°, sol. in  $H_2SO_4$  with crimson color. III, intensely yellow, m. about 400°, forms solns. with deep blue fluorescence, dissolves in  $H_2SO_4$  with brown, then green color. IV, golden yellow, m. 308°, sol. in  $H_2SO_4$  with violet color changing on long standing through brown to olive-green, forms solns. with greenish blue fluorescence. VI, golden yellow to brass-colored, m. about 395°, forms a red-brown  $Na_2S_2O_4$  vat, sol. in  $H_2SO_4$  with red-brown color. VII, greenish yellow, does not m. 360°, sol. in  $H_2SO_4$  with orange-yellow color, forms a red-brown vat from which air throws out a green ppt changed to VII on acidification or long standing. C. A. ROHLER

**Asymmetric induction. I. Asymmetric synthesis and asymmetric induction.** ALEX. MCKENZIE AND AGNES GELLATLY MITCHELL. *Biochem. Z.* **208**, 456-70 (1929). - The optical activity of *l*-menthyl benzoylformate in 15 different solvents was investigated with 3 different wave lengths. Mutarotation was observed in Et, Pr, Bu, iso-Bu and in *l*-Am alcs. The interpretation of the results is fully discussed. II. The influence of the solvent of the optical activity of menthyl- and bornyl esters of  $\alpha$ -ketone acids. *Ibid* 471-81. - No mutarotation was observed in solns. of *d*- or *l*-bornyl benzoylformate in acetone, benzene or  $CHCl_3$ ; weak mutarotation in EtOH, and distinct mutarotation in Pr, Bu, iso-Bu and Am alcs. The mutarotation, however, was less pronounced than in the case of *l*-menthyl benzoylformate. The *d*- and the *l*-esters were different in their behavior in MeOH, only the latter displaying mutarotation. The asym. synthesis of *d*-Ph $\beta$ C(OH)CO<sub>2</sub>H was accomplished through the reaction of *d*-bornyl benzoylformate with EtMgI. Certain theoretical expectations were substantiated by the exptl. results. S. MOROGLIS

**The pinene in Cunninghamia konishi Hayata.** TESSAKU IKEDA AND YASUJI FUJITA. *J. Chem. Soc. Japan* **50**, 66-70 (1929). - Very pure pinene was obtained from *C. konishi* and its phys. consts., especially its rotatory power, were detd. The following facts show the complexity of the mol. construction of terpene compds.: (1) When I. and F. tried to get the nitrosochloride by Lynn's method (*C. A.* **13**, 1853), they got a small quantity of inactive and no active nitrosochloride. (2) The rotatory power of the pinene, obtained from the active nitrosochloride by Lynn's method and of that from *C. konishi* Hayata are not equal. (3) Though the pinene from that plant does not form a nitrosochloride by Ihestadt's method, Tsutiihashi and Tasaki got some inactive and active nitrosochloride from the Formosan cypress by the same method. T. IRIE

**Hydration of pinene by Bertram and Walbaum's method.** YASUJI FUJITA. *J. Chem. Soc. Japan* **50**, 70-3 (1929). - F. obtained borneol and isoborneol from pure pinene by applying Bertram and Walbaum's hydration method. He concludes "This shows that to prove the existence of camphene by the hydration method great care must be used." T. IRIE

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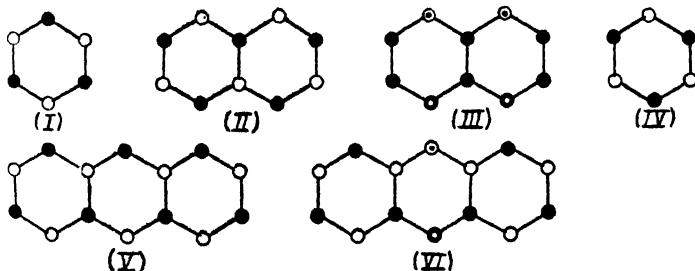
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to construct of such "puckered"  $C_6H_6$  rings a  $C_{10}H_8$  which likewise has a center but no planes of symmetry, there are only the 2 possibilities II or III (dotted circles in a plane

for identification. Only with a 30-fold excess of picric acid can red-brown needles occasionally be obtained from III or IV in  $C_6H_6$ .  $CrO_3$  in AcOH readily converts the III and IV into 1,2,5,6- and 1,2,7,8-diphthalyl-naphthalene (2',1'- and 1',2'-anthraquinone-1,2-anthraquinone) (VI and VII), resp. The absorption of III and IV in the ultraviolet was also measured. I (120 g. from 52 g.  $C_{10}H_6Me_2$  in  $CS_2$ ), m. 262.5-4°, sol. in  $H_2SO_4$  with light red color; with  $Ac_2O$  instead of  $BzCl$  there is obtained only the 1-mono-*Ac* deriv., b. 310-1°, m. 70-1°, sol. in  $H_2SO_4$  with yellow color (*picrate*, lemon-yellow, m. 139-40°). The product (70 g.) from 2,7- $C_{10}H_6Me_2$ ,  $BzCl$  and  $AlCl_3$  in  $CS_2$ , sep'd from solvents as an oil; on distn. under 12 mm. at about 300° it yielded a glassy mass from which could be isolated no cryst. diketone but only a small amt. of IV. 9,10-Di-tolyl-9,10-dihydroxyacenaphthene (9,10-di-*o*-tolylacenaphthene-glycol) from acenaphthene-quinone and *o*- $MeC_6H_4MgBr$ , m. 164°, sol. in  $H_2SO_4$  with yellow color, gives with  $CrO_3$  in AcOH V, m. 238°, sol. in  $H_2SO_4$  with crimson color. III, intensely yellow, m. about 400°, forms solns. with deep blue fluorescence, dissolves in  $H_2SO_4$  with brown, then green color. IV, golden yellow, m. 308°, sol. in  $H_2SO_4$  with violet color changing on long standing through brown to olive-green, forms solns. with greenish blue fluorescence. VI, golden yellow to brass-colored, m. about 395°, forms a red-brown  $Na_2S_2O_4$  vat, sol. in  $H_2SO_4$  with red-brown color. VII, greenish yellow, does not m. 360°, sol. in  $H_2SO_4$  with orange-yellow color, forms a red-brown vat from which air throws out a green ppt changed to VII on acidification or long standing.

#### Asymmetric induction. I. Asymmetric synthesis and asymmetric induction.

ALEX. MCKENZIE AND AGNES GELLATLY MITCHELL. *Biochem. Z.* **208**, 456-70(1929). The optical activity of *l*-menthyl benzoylformate in 15 different solvents was investigated with 3 different wave lengths. Mutarotation was observed in Et, Pr, Bu, iso-Bu and in *l*-Am alics. The interpretation of the results is fully discussed. II. The influence of the solvent of the optical activity of menthyl- and bornyl esters of  $\alpha$ -ketone acids. *Ibid* 471-81.—No mutarotation was observed in solns. of *d*- or *l*-bornyl benzoylformate in acetone, benzene or  $CHCl_3$ ; weak mutarotation in EtOH, and distinct mutarotation in Pr, Bu, iso-Bu and Am alics. The mutarotation, however, was less pronounced than in the case of *l*-menthyl benzoylformate. The *d*- and the *l*-esters were different in their behavior in MeOH, only the latter displaying mutarotation. The asym. synthesis of *d*-PhEtC(OH)CO<sub>2</sub>H was accomplished through the reaction of *d*-bornyl benzoylformate with EtMgI. Certain theoretical expectations were substantiated by the exptl. results.

S. MORRIS.

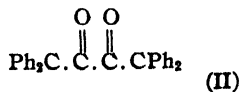
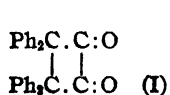
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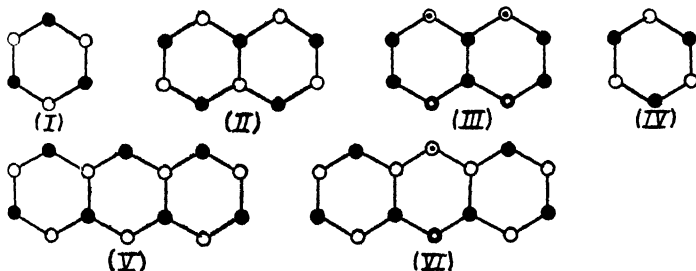
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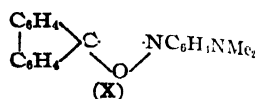
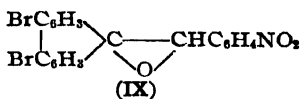
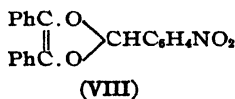
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above, ringed circles in a plane below that of the black circles). In principle, in models with symmetry  $C_1$  monosubstitution products should be asym. and exist in optical antipodes but since, in the gaseous state and in soln., there is the symmetry  $D_{2h}$  the monosubstitution products have a mirror plane and do not become asym. Of a  $C_6H_6$  ring with this symmetry, mirror image disubstitution products would also be expected if the substituents are different. That no such optical antipodes have ever been isolated may be because the form I easily changes into IV. Of anthracene, 2 forms (V and VI) can be built up from "puckered"  $C_6H_6$  rings; anthracene itself and all of its derivs. with a quinoid system should therefore be capable of existing in 2 stereo-isomeric forms and Schlenk and Bergmann have actually obtained 2 isomers in 3 cases. What the relations are in dihydroanthracene (VII) cannot be stated without further assumptions, for VII has not been studied roentgenographically, but there are certain indications that a hydrogenated  $C_6H_6$  ring is plane. Assuming such to be the case, there are 2 possible forms for VII, from 1 of which can be derived 2 mono- and three 9,10-disubstitution products, from the other 1 mono- and 2 disubstituted derivs. Two isomeric monosubstituted and 3 disubstituted derivs. have been obtained in several cases, as would be expected from the 1st of the 2 possible forms of VII; this form, moreover, has the advantage over the 2nd that in it the center of symmetry of an thracene is retained. With phenanthrene and fluorene, the Roentgen analysis sets no limits on the symmetry. For phenanthrene 3 forms can be constructed from puckered  $C_6H_6$  rings, according as all 3 rings are puckered in the same sense or the middle ring or 1 of the outer ones is puckered differently. For fluorene there are 2 possibilities, according as the 2 rings are puckered in the same way or differently; where the 9 C atom is involved in a double bond (in the dibenzofulvenes) each of these possibilities can exist in only 1 form and S. and B. in numerous instances have obtained 2 stereo-isomers; when the  $CH_2$  is normally substituted ( $(C_6H_4)_2C_{ab}$ ), the form with both rings similarly puckered should correspond to 2 isomers, the other form to 1 isomer, or 3 isomers in all. So far, only 2 have been isolated, possibly because of too great instability of the 3rd or because no suitable method of prepn. has yet been devised. For the indene system it is certain, on geometrical grounds, that the 1-, 2- and 3 C atoms of the 5-membered ring are in a plane, but it is not immaterial whether the 3 C atom is united to a C atom of the upper or the lower plane of the  $C_6H_6$  ring; for 1,1,3-triphenylindene 2 stereoisomers would correspond to these 2 possibilities while for 2,3-diphenylindene 2 mirror image isomers would be predicted, conceptions which are fully borne out by the facts. C. A. ROELLER

**Appearance of free substituted methylenes in chemical reactions.** ERNST BERGMANN and JENÖ HERVEY. *Ber.* 62B, 893-916 (1929).—After Schlenk and Bergmann showed (*C. A.* 22, 4498), by the isolation of di-Na tetraphenylallene,  $(Ph_2CNa)_2C$  (I), that free substituted methylenes are capable of existence under certain conditions the question arose whether compds. with bivalent C may not be intermediate stages in certain chem. reactions. The great ease with which I changes into compds. with normal valence indicated that such substances would in general be very short-lived and that it would be necessary to "intercept" (*abfangen*) them, *i. e.*, stabilize them by a reaction, the course of which would give unequivocal evidence of their formation. The formation of  $(p-O_2NC_6H_4CH_2)_2$  from  $O_2NC_6H_4CH_2Cl$  (I) with alc. alkali and of  $((C_6H_4)_2C:)_2$  from 9-chlorofluorene (II) is easily explained by assuming the intermediate formation of free methylene radicals, with elimination of HCl; with  $p-O_2NC_6H_4CHO$ , these radicals can be "intercepted" as the 2-*p,p*-dinitrostilbene oxides and as a *p*-nitrobenzalfluorene oxide (III), resp. To remove the HCl B. and H. finally adopted alc. suspensions of  $K_2CO_3$  instead of the sol. KOH, because otherwise so much of the free methylene is formed at once that it in part polymerizes even in the presence of an intercepting agent. The investigation was extended in 2 directions: the detn. of what substances can act as intercepting agents and of what compds. can yield free methylene radicals. Aromatic aldehydes (also  $Ph_2CHCHO$ ), *o*-diketones, fluorenones, thioketones and NO all proved to be excellent intercepting agents whereas compds. with C:C and C:N bonds are surprisingly unreactive toward free methylenes. But even among C:O compds. there are distinct differences in reactivity; aromatic ketones like  $Ph_2CO$ ,  $(p-MeOC_6H_4)_2CO$ , 9,9-diphenylanthrone, do not react at all. In addn. to I and II the only arylmethyl halides which gave free methylenes were *o*- $O_2NC_6H_4CH_2Cl$  (IV),  $PhCH_2Cl$  and 9-bromoanthrone (V), whereas  $Ph_2CHBr$ ,  $(p-MeOC_6H_4)_2CHCl$  (VI) and 9,9-diphenyl-10-chloro-9,10-dihydroanthracene (VII) did not; with alkali in MeOH or EtOH in the presence or absence of an intercepting agent they yielded only the corresponding Me or Et ether. B. and H. believe that there are 2 groups of aromatic substituted Me halides which behave radically differently toward alkali:

those which, like **II**, primarily form a free methylene, and those, like  $\text{Ph}_2\text{CHBr}$ , which merely exchange their halogen for OR (ROH = alc. medium). Nor is it merely chance, they think, that the halides corresponding to aromatic C:O compds. which are not suitable as intercepting agents are not capable themselves of forming free methylenes while those corresponding to compds. which are intercepting agents do give with alkali radicals with bivalent C. As far as they know, no reaction has been observed which does not agree with the generalization that biphenylenemethylenes, anthronylidenes and monoarylmethylenes are capable of existence while diarylmethylenes are not. **III**, from **II** and  $\text{O}_2\text{NC}_6\text{H}_4\text{CHO}$  boiled in MeOH with  $\text{K}_2\text{CO}_3$ , yellowish, m. 153°. With BzH the expected *9-benzalfluorene oxide*, m. 131–2°, was obtained only once as the chief product; in all the other expts. there was obtained a product with 1 mol. MeOH more, viz., *9- $\alpha$ -hydroxybenzylfluorenyl Me ether*,  $(\text{C}_6\text{H}_4)_2\text{C}(\text{OMe})\text{CH}(\text{OH})\text{Ph}$ , m. 186–7°, identical with a product obtained by decomp.  $(\text{C}_6\text{H}_4)_2\text{C}(\text{OMe})_2$  with Na and treating the resulting  $(\text{C}_6\text{H}_4)_2\text{C}(\text{OMe})\text{Na}$  with BzH. **I** and *p*- $\text{O}_2\text{NC}_6\text{H}_4\text{CHO}$  gave the 2 stilbene oxides, m. 200–1° and 153–4°, sep'd. by crystn. from dioxan, while with *o*- $\text{O}_2\text{NC}_6\text{H}_4\text{CHO}$  were obtained 2 *o,p'*-*dinitrostilbene oxides*, m. 158–60° and 112°, also formed from *o*- $\text{O}_2\text{NC}_6\text{H}_4\text{CH}_2\text{Cl}$  and *p*- $\text{O}_2\text{NC}_6\text{H}_4\text{CHO}$ . *m,p'*-*Isomers*, m. 148° and 116°. *p*-*Nitrostilbene oxide*, obtained with BzH, m. 125–6°. *p*-*Nitro-p'-methoxy analog*, m. 138°. *1 p* Nitrophenyl-2-benzohydrylethylene oxides, from  $\text{Ph}_2\text{CHCHO}$ , m. 147° and 118°. That these compds. are really ethylene oxides and not C O derivs. resulting from their rearrangement is indicated by the fact that they are smoothly converted into the corresponding ethylenes, with liberation of I, when treated with KI in AcOH; the *cis* *trans*-isomers give the same ethylene.  $\text{PhCH}_2\text{Cl}$  gives with *o*- $\text{O}_2\text{NC}_6\text{H}_4\text{CHO}$  only a very small amt. of *p*-nitrostilbene oxide; the main product is *p*-nitrobenzyl Me ether, b.p. 145–7°; the mechanism of its formation is not clear. **V** with BzH gave an exceedingly difficultly separable mixt. of benzalanthrone oxide and anthraquinone; with anisaldehyde it yielded  $\text{C}_6\text{H}_4(\text{CO})_2\text{C}_6\text{H}_4$  exclusively. Benzil with **I** gave the cyclic *p*-nitrobenzyl deriv. (**VIII**) of stilbenediol, m. 138°. *Phenanthrenehydroquinone analog*, yellow brown, m. 153°. **II** and fluorenone yield both *dibiphenylenethene oxide*, m. 234° (decompn.), and the ethene itself; **B**. and **H**. believe that possibly 2 isomeric oxides are formed but only **I** is stable at room temp. while the other decomps. spontaneously into O and the ethene. With **I** fluorenone gives a compd. identical with **III**. *p*-*Nitrobenzal 2,7-dibromofluorene oxide* (**IX**), from **I** and 2,7-dibromofluorenone, yellow, m. 230°. *o*-*Nitrobenzalfluorene oxide*, from *o*- $\text{O}_2\text{NC}_6\text{H}_4\text{CH}_2\text{Cl}$  and fluorenone, m. 111°. *Biphenylenemethylenecanthrone oxide*, from **V** and fluorenone, m. 252–4°. **II** and *p*- $\text{ONC}_6\text{H}_4\text{NMe}_2$  give a carboxy compd. (**X**) which, since these compds. are tautomeric with the nitrones, may be designated as *biphenylenemethylene-N-p*-dimethylaminophenyl nitrone, red-brown rods with violet reflex, m. 223–4° (decompn.). The nitrones can change, by loss of O, into Schiff bases, which explains why **I** and  $\text{ONC}_6\text{H}_4\text{NMe}_2$  do not form a nitrone but *p*-nitrobenzaldehyde *p*-dimethylaminoanil, violet, m. 206°, very similar to but not identical with the product (probably a *cis-trans*-isomer), m. 221°, obtained from *p*- $\text{O}_2\text{NC}_6\text{H}_4\text{CHO}$  and *p*- $\text{Me}_2\text{NC}_6\text{H}_4\text{NH}_2$ ; *di-Et* homolog, ruby-red, m. 136°; *o*-nitrobenzaldehyde *p*-dimethylaminoanil, red-brown, m. 94–5°; anthraquinone mono-*p*-dimethylaminoanil, from **V**, blue-black cubes with metallic reflex, m. 238° (Kaufler and Suchanek (*C. A.* 1, 1280) give 138°). As a representative of the thioketones as intercepting agents, **B**. and **H**. wished to use thiofluorenone. Smedley describes a "dimeric thiofluorenone" (**XI**) which, however, really contains 2 more H atoms and is *di-9* fluorenyl disulfide (**XV**, below): from fluorenone with  $\text{H}_2\text{S}$  in the presence of HCl is obtained a true thiofluorenone (**XII**), but as it is dimeric it was useless for **B**. and **H**'s present purpose. They therefore used Michler's thioketone (**XIII**). The **XII**, m. 232°, mol. wt. in  $\text{CHBr}_3$  370 (in camphor no const. m. p. could be obtained; the 1st detn. indicated a mol. wt. of 579). The ethylene sulfide primarily formed from **I** and **XIII** loses its S and the product is *1,1-bis-p*-dimethylaminophenyl-2-*p*-nitrophenylethylene, m. 175–6°. **V** yields the  $\text{K}_2\text{Cr}_2\text{O}_7$ -colored labile form (**XIV**), m. 238–40°, of  $(\text{C}_6\text{H}_4)_2\text{C}:-\text{C}(\text{C}_6\text{H}_4\text{NMe}_2)_2$ . In these reactions the S is doubtless split off in at. form and might therefore be expected to be especially reactive; as a matter of fact it reacts with the **XIV** to form thiofluorenone and **XIII** which are unstable and reduced to **XV** and *tetra-p*-dimethylaminodibenzohydryl disulfide (**XVI**), both of which were found in the reaction mixt. along with the **XIV**. The **XVI**, red, m. 163–4°, mol. wt. in camphor 569; the **XV**, golden yellow with reddish surface luster, m. 169–70°, is identical with Smedley's **XI**. **XV** is insol. in MeOH but on addn. of a drop of alc. KOH it dissolves at once with red color, showing that it contains substitutable H atoms, and its structure was definitely established by the synthesis of **XV** from **II** and  $\text{Na}_2\text{S}_2$  after it had been shown that  $\text{Na}_2\text{S}_2$  with  $\text{PhCH}_2\text{Cl}$  gives the same  $(\text{PhCH}_2)_2\text{S}_2$ , m. 74°, as is obtained by oxidizing

$\text{PhCH}_2\text{SH}$ . **II** and  $\text{NaSH}$  give the *monosulfide*, becomes discolored  $238^\circ$ , m.  $250^\circ$ . *Benzohydril Me ether*, from  $\text{Ph}_2\text{CHBr}$  and  $\text{KOH}$  in  $\text{MeOH}$ ,  $b_{17}$   $147-8^\circ$ , also obtained with  $m\text{-O}_2\text{NC}_6\text{H}_4\text{CHO}$  and  $\text{KOH}$  in  $\text{MeOH}$ , gives  $\text{Ph}_2\text{CHCSNHPh}$  when treated in  $\text{Et}_2\text{O}$  with  $\text{Na}$  powder and, after decanting, with  $\text{PhNCS}$ . (*p*- $\text{MeOC}_6\text{H}_4$ ) $_2\text{CHOH}$  with  $\text{SOCl}_2$  in  $\text{PhMe}$  gives *di-p-anisylchloromethane*, m.  $83-4^\circ$ , which likewise merely exchanges its  $\text{Cl}$  for  $\text{MeO}$  with  $\text{KOH}$  in  $\text{MeOH}$ . Similarly, **VII** gives *10-Me ether*, m.  $147^\circ$ , and in  $\text{EtOH}$  the *Et ether*, m.  $163^\circ$ .



C. A. R.

**Two supposed cases of isomerism in the aromatic series.** OTTILIE BLUM, *Ber. 62B*, 881-93(1929).—There are in the literature 2 supposed cases of isomerism which might be interpreted as being examples of the new type of isomerism of condensed ring systems observed by Schlenk and his collaborators (C. A. 22, 4493). Brand by an unequivocal although tedious method synthesized 1,1,4,4-tetraphenylbutatriene, yellow, m.  $240^\circ$ , while Purdie and Arup by  $\text{Zn}$  dust distn. of  $\text{Ph}_2\text{C}:\text{CH}:\text{CH}(\text{CPh}_2)_2$

obtained a colorless compd., m.  $158^\circ$  (**I**), to which they assigned the same structure, this substance was also obtained by Bittenberg from  $\text{Ph}_2\text{C}:\text{CHOEt}$  and concd.  $\text{H}_2\text{SO}_4$ . In the course of a study of the behavior of aromatic halogenated ethylenes toward  $\text{Na}$ , Blum treated  $\text{Ph}_2\text{C}:\text{CHBr}$  in  $\text{Et}_2\text{O}$  with  $\text{Na}$  powder and on hydrolysis of the resulting product obtained a hydrocarbon  $\text{C}_{28}\text{H}_{22}$  (**II**) which on gentle oxidation most characteristically lost in part two  $\text{H}$  atoms and yielded **I**. Further oxidative degradation of **I** gave *o*- $\text{C}_6\text{H}_4\text{Bz}_2$  and, as an intermediate product, the *keto acid*, *o*  $\text{HO}_2\text{CCHPhC}_6\text{H}_4\text{CHPhBz}$  (**III**). **II** can therefore be only 1,2,4-triphenyl-1,4-dihydronaphthalene and **I** 1,2,4-triphenylnaphthalene and not  $(\text{Ph}_2\text{C}:\text{C})_2$ . With  $\text{Na}$  and  $\text{AmOH}$  **I** gives chiefly a *tetrahydro deriv.* (**IV**) which, naturally, is not  $(\text{Ph}_2\text{CHCH}_2)_2$ . Toward catalytic hydrogenation it is entirely resistant while **II** takes up 2 atoms of  $\text{H}$  and forms **IV**. The intermediate  $\text{Na}$  compd. in the prepn. of **II** has the compn.  $\text{C}_{28}\text{H}_{14}\text{Na}$  for with  $\text{CO}_2$  it gives an *acid*  $\text{C}_{28}\text{H}_{12}\text{CO}_2\text{H}$  (**V**) and with  $\text{PhNCS}$  the *thioanilide* (**VI**). The reaction possibly proceeds as follows: The  $\text{Ph}_2\text{C}:\text{CHBr}$  is decompd. by the  $\text{Na}$  partly into  $\text{Ph}_2\text{C}:\text{CH}$  and  $\text{Br}$  and partly into  $\text{Ph}_2\text{C}:\text{C}$  and  $\text{HBr}$ ; the  $\text{Ph}_2\text{C}:\text{C}$  at once rearranges into  $\text{PhC}:\text{CPh}$  which combines with  $\text{Ph}_2\text{C}:\text{CH}$ , with migration of  $\text{H}$  and closure of the ring, to form the free radical  $\text{C}_6\text{H}_4\text{CHPhCH}:\text{CPhCPh}$ —(**VII**) and thus adds

$\text{Na}$  in the usual way. Fischer and Besthorn by condensation of  $\text{Ph}_2\text{NH}$  with  $\text{AcOH}$  by means of  $\text{ZnCl}_2$  obtained a base, m.  $98^\circ$ , whereas Bernthsen obtained a base, m.  $114^\circ$ . Condensation of  $\text{Ph}_2\text{NH}$  with acids gives acridines; the 2 substances were therefore presumably 9-methylacridines. Blum likewise obtained 2 products: **VIII**, m.  $117-8^\circ$ , and **IX**, m.  $99-100^\circ$ . Only **VIII**, however, is 9-methylacridine; **IX** is a *new compd.* **VIII**,  $\text{Ph}_2\text{NH}$ . **VIII** adds 2 atoms  $\text{Na}$  and the resulting red-violet soln. on hydrolysis yields 9,10-dihydro-9-methylacridine (**X**), whereas **IX** adds also  $\text{Na}$  with red-violet color but the addn. product reacts with the  $\text{Ph}_2\text{NH}$  to form the 2 colorless products  $\text{Ph}_2\text{NNA}$

and  $\text{C}_6\text{H}_4 \begin{array}{c} \diagup \text{CHMe} \\ \diagdown \text{NNa} \end{array} \text{C}_6\text{H}_4$  and the soln. becomes colorless; hydrolysis yields a mixt

of  $\text{Ph}_2\text{NH}$  and **X**. **IX** is also formed from benzene solns. of  $\text{Ph}_2\text{NH}$  and **VIII**. Other secondary amines can likewise form mol. compds. with acridines. As their formation is accompanied by a deepening in color they are probably quinhydrone-like compds. in which the acridine functions as the quinoid component; this seems to be strong

evidence that acridines have the quinoid structure  $\text{C}_6\text{H}_4 \begin{array}{c} \diagup \text{CH} \\ \diagdown \text{N} \end{array} \text{C}_6\text{H}_4$  rather than a

*meso*-bond. **II** (yield, 10%), m.  $142.5-4^\circ$ , mol. wt. in  $\text{C}_6\text{H}_6$  341. The  $\text{PrOH}$  mother liquors give crystals,  $\text{C}_{14}\text{H}_{14} \cdot \text{C}_{14}\text{H}_{12}$ ,  $b_{24}$   $173-200^\circ$ , m.  $82-4^\circ$ , mol. wt. in camphor 182, add  $\text{Br}$  in  $\text{CHCl}_3$  and can be hydrogenated to a mobile oil, and a yellowish-green oil,  $\text{C}_{28}\text{H}_{26}$ ,  $b_{13}$   $283-5^\circ$ , solidifies to a glass, mol. wt. in  $\text{C}_6\text{H}_6$  316-9. **V**, m.  $238-9^\circ$ , **VI**, yellow, m.  $243-4^\circ$ , partially decompd. by alc. and  $\text{AcOH}$ , mol. wt. in camphor 430. **IV**, m.  $126-9^\circ$ . **III**, m.  $232-3^\circ$  (decompn.), mol. wt. in camphor 396. The action of  $\text{Li}$  on  $\text{Ph}_2\text{C}:\text{CHBr}$  is more complicated; very small amts. of **II** were always obtained but the normal reaction was as follows: the  $\text{Ph}_2\text{C}:\text{CH}$  residues formed primarily stabil-

ized themselves as  $(\text{Ph}_2\text{C}:\text{CH})_2$ , which added Li normally and the  $(\text{Ph}_2\text{CLiCH})_2$ , with alc gave the high-melting  $(\text{Ph}_2\text{CHCH})_2$  (XI), m. 139–40°, and with I or  $\text{PhNCS}$ ,  $(\text{Ph}_2\text{C}:\text{CH})_2$ , m. 200–1°. If the Li is allowed to react only a short time (24 hr.), there is obtained, along with XI, an isomer, m. 126.5–7.5° which is different from the low melting (126–7°) isomer of XI and from IV. It is hydrogenated to an oil  $\text{C}_{24}\text{H}_{26}$  and on oxidation gives  $\text{Ph}_2\text{CO}$  and  $\text{BzOH}$ ; not enough was available to establish its structure. 9-Methylacridine-9,10-dihydro-9-methylacridine mol. compd., from benzene solns. of the components, m. 99–100°. Acridine-diphenylamine mol. compd., lemon-yellow, m. 84–6°.

C. A. ROUILLER

The structure of Boyd's chloroanhydride from triphenylcarbinol and phosphorus trichloride. A. E. ARBUZOV AND B. A. ARBUZOV. *J. Russ. Phys.-Chem. Soc.* **61**, 217–53 (1929); cf. *C. A.* **17**, 2274; **18**, 3178; **21**, 61.—A. and A. modified Boyd's method for prep. the chloroanhydride (I) by working in  $\text{PhH}$ , thus increasing the yield considerably—52 g., m. 189.5–90°, from 42.5 g.  $\text{Ph}_3\text{COH}$  (II)—and cutting down the total time required to 3–4 hrs. B. observed that his I was always accompanied by smaller amts. of triphenylmethylphosphonic acid,  $\text{Ph}_3\text{CP}:\text{O}(\text{OH})_2$  (III) which he explained by supposing the formation of a tautomeric mixt. of  $\text{Ph}_3\text{C}:\text{O}:\text{PCl}_2$  with small amts. of  $\text{Ph}_3\text{CP}:\text{OCl}_2$ . A. and A. have shown that III is probably formed in another manner since they were unable to prep. an isomer of I by treating it in  $\text{PhH}$  with triphenylchloromethane (IV), but could obtain III by various hydrolytic reactions from I and its derivs. They obtained III also by hydrolysis of the product of the interaction of I with II, and suggest that under B.'s exptl. conditions II may locally exist in excess and by reacting with I lead to III. No formation of III was noticed when A. and A.'s modified method was used. A series of the Cl esters corresponding to I and the di-esters of III were prep'd. and these, together with I itself, were hydrolyzed under various conditions. The Cl esters (derivs. of either  $\text{Ph}_3\text{C}:\text{O}:\text{PCl}_2$  or  $\text{Ph}_3\text{CP}:\text{OCl}_2$ ) were obtained by treating the specially prep'd. (cf. *C. A.* **5**, 1397) corresponding K or Na alcoholate (2 mols.) in anhyd.  $\text{PhH}$  with 1 mol. of I. In no case could a di-ester be obtained by treatment of either I or the Cl ester with alcoholate. Chloro esters: *Et*, m. 125–6°; *iso Pr*, m. 164–5°; *iso-Bu*, m. 103–3.5°; *Me* (?), m. 179.5–80°; *Pr* (?), m. 107–8°. The last 2 derivs. gave inconsistent anal. results and were probably impure. The following di-esters of III were prep'd. from IV or triphenylbromomethane (V) and the corresponding alkyl esters (VI) of  $\text{H}_3\text{PO}_3$  with the elimination of 1 mol. of alkyl halide: *Me* (VII) brilliant orange-yellow crystals from  $\text{PhH}$  by pptn. with ligroin, m. 156–7° (8 g. from 10 g. V and 4 g. of VI); also colorless, m. 155–6° (5.8 g. from 15 g. V and 6 g. VI); colorless from  $\text{PhH}$  and ligroin followed by recrystn. from  $\text{Me}_2\text{CO}$ , m. 157–8° (19 g. from 21.2 g. IV and 9 g. VI); and brilliant yellow, m. 158–9° (3.2 g. from 4.5 g. IV and 2 g. VI); *Et* (VIII), m. 120–1° (almost quant. yield from V and VI); *Pr* (IX), m. 109–10° (15.5 g. from 25.5 g. V and 20 g. VI); *iso-Pr* (X), colorless, m. 122.5–23°; also, brilliant yellow, m. 119–20°; and colorless, m. 216.5–17°; *iso-Bu* (XI), m. 96–96.5° (poor yield). The formation of several modifications of VII and X could not be explained. Detns. of the mol. wt. and of P point to the same compn., the products of hydrolysis are the same, and the colored modifications are not decolorized by charcoal. The theoretical amt. of triphenylmethyl diphenylphosphine oxide,  $\text{Ph}_3\text{P}:\text{O}:\text{CPh}_3$ , m. 227.5–28°, was obtained from 5.03 g. V and 3.8 g.  $\text{Ph}_2\text{P}:\text{O}:\text{CHMe}_2$  (cf. *C. A.* **5**, 1397). For purposes of comparison the reaction of 5 g. II on 6 g.  $\text{EtOPCl}_2$  (cf. *Ann.* **139**, 34) was tried, 5 g. of faintly rose product (XII), m. 110–32° (not purified), was obtained. Contrary to B.'s earlier results, A. and A. were able to hydrolyze I in acid, basic, or neutral environment, in some cases, however, only with difficulty. By boiling in acid or alk. solns. either at ordinary pressure or in sealed tubes, I gave II and  $\text{H}_3\text{PO}_3$ . With dil. or abs.  $\text{EtOH}$  at ordinary pressure, II was formed, while in sealed tubes the same substances gave triphenylmethane and  $\text{AcH}$ . It is noteworthy that III was never obtained. III was formed in 21% yield by heating I with aq.  $\text{NH}_4\text{OH}$  and  $\text{NaHCO}_3$ . The Cl esters corresponding to I by hydrolysis with  $\text{HCl}$  or  $\text{H}_2\text{O}$  gave III, as did also XII. Thus these Cl esters may contain ter- or quinquivalent P. The di-esters of III all gave III by hydrolysis with dil.  $\text{HCl}$ . When heated under the same conditions, III itself was recovered unchanged. The above exptl. data do not solve the question of the constitution of I nor that of the mechanism of the formation of III, but they at least require the assumptions of B. to be experimentally confirmed. To this end, the action of  $\text{POCl}_3$  and  $\text{SOCl}_2$  on III and its esters was tried by A. and A., but no definite compd. could be isolated. The attempt to react  $\text{Ph}_3\text{CNa}$  and  $\text{Ph}_3\text{COMgCl}$  with  $\text{POCl}_3$ , also, was without result.

LEWIS W. BUTZ

A new series of sulfonephthaleins. WILTON C. HARDEN AND NATHAN L. DRAKE. *J. Am. Chem. Soc.* **51**, 2278–9 (1929); cf. *C. A.* **23**, 1404.—One of the compds. previously

described, tetrabromophenoltetrabromosulfonephthalein, has been found by Kolthoff to be a better indicator than bromophenol blue; it shows a color change from yellow to blue, just as bromocresol green and bromothymol blue but without the interfering dichromatism. The name *tetrabromophenol blue* is suggested. C. J. WEST

**Halogen-substituted aromatic pinacols and the formation of ketyl radicals  $R_2(IMgO)C$ .** M. GOMBERG AND JOHN C. BAILAR, JR. *J. Am. Chem. Soc.* 51, 2229-38(1929).—The method suggested by G. and Bachmann (*C. A.* 21, 3902) can be applied to the prepn. of many halobenzopinacols, especially those from ketones contg. Br or Cl atoms *m*- or *p*- to the CO group. When the halogen atom is in the *o*-position, however, the Mg of the reducing mixt. tends to remove the halogen atom from the ketone mol. and no pinacol is formed. Thus, *sym*-4,4'- and 3,3'-dibromobenzopinacol result in 94 and 85% yields, resp., while the 4,4',4'',4'''-tetra-Br deriv. results in 94% yield. In the prepn. of  $(3-BrC_6H_4)_2CO$ , m. 140°, there is also formed some diketone (?),  $(m-BrC_6H_4CO)_2C_6H_4$ , m. 172°. 3,3',3'',3'''-Tetrabromobenzopinacol, m. 152-6°; because of the difficulties of purification, only 40% of pure product was obtained. In the prepn. of  $(3-BrC_6H_4)(4-BrC_6H_4)CO$ , there also results a small amt. of the diketone,  $C_{12}H_8OBr_2$ , m. 217-20°. *sym*-3,3',4',4'''-Tetrabromobenzopinacol, m. 160-3°, results in 35% yield after heating the reduction mixt. at 75° for 4 days. 1-Chloro-4'-bromobenzophenone, m. 150° (60% yield); reduction gives *sym*-4,4'-dichloro-4'',4'''-dibromobenzopinacol, m. 169°. 4-, 3- and 2-Bromo-4'-phenylbenzophenone, prepd. from the  $BrC_6H_4COCl$  and  $Ph_2$ , m. 188°, 119° and 88.5°, resp. *sym*-4,4'-(I) and 3,3'-Dibromo-4'',4'''-diphenylbenzopinacol (II), m. 158-9° and 175°, resp. By a study of the iodomagnesium pinacولات from the point of view of Beer's law, the existence of the equil.: pinacolate  $\rightleftharpoons$  ketyl, has been demonstrated. The relative migratory tendencies of the *p*- $BrC_6H_4$ , *m*- $BrC_6H_4$  and *p*- $PhC_6H_4$  groups have been detd. by rearrangement of the appropriate pinacols to pinacolins. The results are in good agreement with those obtained by previous investigators on different examples. I, rearranged by heating with AcOH and AcCl in  $C_6H_6$  for 8 hrs., gives a mixt. of 4,5', of the pinacol,  $PhC_6H_4(p-BrC_6H_4)CCOC_6H_4Ph$ , and 96.5% of the pinacol  $(PhC_6H_4)_2p-BrC_6H_4CCOC_6H_4Br$ , m. 227°. Splitting of the latter pinacol gives 4,4'-diphenyl-4''-bromotriphenylmethane, m. 186°; the corresponding carbinol, m. 248.50°. Rearrangement of II gives a pinacolin,  $C_{18}H_{12}OBr_2$ , m. 202-3°; this rearrangement is due entirely to the migration of the  $PhC_6H_4$  group; splitting gives 4,4'-diphenyl 3'-bromotriphenylmethane, m. 143°; the corresponding carbinol, m. 304°. C. J. WEST

**Resolution of benzoin.** F. J. WILSON AND I. V. HOPPER. *J. Roy. Tech. Coll. (Glasgow)* 2, No. 1, 62-4(1929).—This is the first resolution by means of an optically active semicarbazide and the first resolution of benzoin although the two enantiomorphs have been obtained synthetically. *d*- and *l*-MeCHPhNHCONHNH<sub>2</sub>·HCl and *dl*-benzoin were used both in EtOH and  $C_6H_5N$  in the resolution. Since with *dl*-PhCH(OH)C(NNHCONHCHPhMe)Ph stereoisomerism of the Hantzsch-Werner type is possible, there should be 4 *dl*-modifications:  $\alpha = d-d$ , *trans* and *l-l*, *trans*;  $\beta = d-d$ , *cis* and *l-l*, *cis*;  $\gamma = d-l$ , *trans* and *l-d*, *trans*;  $\delta = d-l$ , *cis* and *l-d*, *cis*. The reaction ran smoothly in  $C_6H_5N$  and 3 of the 4 possible compds. were obtained:  $\alpha$ , m. 174°;  $\beta$ , m. 154°;  $\gamma$ , m. 137° (very small yield). Each gave benzoin on acid hydrolysis. EtOH was a less satisfactory medium,  $\alpha$ ,  $\beta$ , and unaltered benzoin being obtained. *dl*-Benzoin plus *d*-MeCHPhNHCONHNH<sub>2</sub> should give 4 active modifications but only 1 cryst. product was isolated from  $C_6H_5N$  soln., the other product being oily and very sol. This *l*-rotatory substance proved to be a *d*- $\delta$ -[ $\alpha$ -phenylethyl] semicarbazone of *d*-benzoin, m. 181-2°,  $[\alpha]_D^{14} -141.5^\circ$  in abs. EtOH; its constitution was confirmed by its identity with the semicarbazone of synthetic *d*-benzoin  $l$ -PhCHMeNHCONHNH<sub>2</sub>·HCl with *dl*-benzoin gave *l*-benzoin *l*- $\delta$ -[ $\alpha$ -phenylethyl] semicarbazone, m. 181-2°,  $[\alpha]_D^{14} 140.9^\circ$  in abs. EtOH. The *l*-benzoin obtained by hydrolysis of this last deriv. agreed with the properties ascribed to it by McKenzie and Wren. Alkalies racemize active benzoin readily but *d*-benzoin remained optically unchanged after standing 1 week in  $C_6H_5N$  in a quartz vessel. C. H. PERT

**Reduction of aromatic 1,2-diketones by the binary system magnesium iodide (or bromide)-magnesium.** M. GOMBERG AND F. J. VAN NATTA. *J. Am. Chem. Soc.* 51, 2238-45(1929).—The unsatd. halo-Mg glycolates obtained by reduction of various aromatic diketones have been prepd. and their reactions studied. It has been found that  $MgI_2$  alone, even in the absence of metallic Mg, has a decided reducing action on the diketone; the amt. of glycolate formed is dependent upon the equil.: diketone +  $MgI_2 \rightleftharpoons$  glycolate +  $I_2$ . The amt. of I thus set free is from 16 to 50% of the theory. The characteristic color changes during and at the end of the re-



duction process suggest the possibility of the existence in the unsatd. glycolates of mols. contg. each 2 tervalent C atoms  $R(XMgO)C-C(OMgX)R$ . Reduction of

$(p\text{-Me-C}_6\text{H}_4\text{CO})_2$  gave over 90% of toluoin, when the decompn. was carried out with boiled  $H_2O$  in a stream of N. The reduction product from 1.19 g. tolii was treated with a slow stream of dried air and then hydrolyzed, giving 0.33 g. of insol. polymer, 0.54 g. of tolii and 0.32 g. toluoin; on hydrolysis the polymer gives *p*-tolilic acid. *p,p'*-Dimethylstilbenediol dibenzoate, m. 135°. With  $MgI_2$  alone about 42% of the tolii had reacted after 1 month in the dark. Reduction with  $MgBr_2$  and Mg gives 82% of toluoin. On reduction of *p*-anisil with  $MgI_2$  and Mg there results 62% of anisoin; the low yield is due to reoxidation by the air to anisil.  $MgBr_2$  forms a deep yellow insol. addn. compd. and so it was impossible to reduce anisil with  $MgBr_2$  and Mg. *p,p'*-Dichlorobenzil with  $MgI$  and Mg give 91% of the benzoin, m. 85-7°;  $MgBr_2$  could not be used because of the slight soly. of the double compd. With the theoretical amt of I, the glycolate gives after 2 weeks equal parts of benzil and benzoin; after 2 days' passage of air, the glycolate yielded 52% of the insol. anhydride of dichlorobenzilic acid polymer, decomp. 320-40°, 26% of dichlorobenzoin and 22% of the benzil. *p,p'*-Dichlorostilbenediol dibenzoate, m. 200-2°. The equil. with  $MgI_2$  alone was reached when 62% of the benzil had reacted.  $\alpha$ -Naphthoin, m. 138-9°, was obtained in 3.4 g. yield when 26.5 g.  $\alpha\text{-C}_{10}\text{H}_7\text{CHO}$ , 10 g. KCN, 100 cc. EtOH and 50 cc.  $H_2O$  were refluxed 3 hr., 5 g. KCN added and the heating continued for 8 hr.; from the EtO mother liquors there was obtained 3.4 g. naphthil, yellow, m. 188-9°. The prepn. from  $\alpha\text{-C}_{10}\text{H}_7\text{CO}_2\text{H}$  by reduction with  $MgI_2$  and Mg is preferable, because the acid is more accessible and the yield of naphthoin is somewhat larger.  $\alpha$ -Naphthilic acid, m. 137-8° (decompn.). Reduction of the naphthil by  $MgI_2$  and Mg is complete in 3 days, giving 91% of the naphthoin. When dried air is passed through the glycolate and the soln. hydrolyzed, there is no formation of the polymer-anhydride, but 40% formation of naphthilic acid. *p,p'*-Diphenylbenzoin, m. 168-70°, results in 95% yield from *p*-PhC<sub>6</sub>H<sub>4</sub>CHO and KCN; 1 g. dissolves in about 115 cc. cold C<sub>6</sub>H<sub>6</sub> or AcOEt. Oxidation with  $CuSO_4$  in dil. C<sub>6</sub>H<sub>5</sub>N gives 95% of *p,p'*-diphenylbenzil, light yellow, m. 141-2°; the quinoxaline is cream-colored and m. 209-10°. Reduction of the benzil with  $MgI_2$  and Mg gives 88% of the benzoin. The action of dry air gives 35% of the polymer of diphenylbenzilic acid, decomp. 250°. *p,p'*-Diphenylstilbenediol benzoate behaves as though it was a mixt. of 2 isomers, m. about 180° and 203°; when heated at 210° and crystd. from C<sub>6</sub>H<sub>6</sub>, it m. 200-3°. Equil. is obtained with  $MgI_2$  alone when about 33% of the benzil has reacted. *p*-Phenylbenzil, light yellow, m. 105°, in 64% yield from *p*-PhC<sub>6</sub>H<sub>4</sub>COCH<sub>2</sub>Ph; reduction with  $MgBr_2$  and Mg gives *p*-phenylbenzoin, m. 148-51°.

C. J. WEST

**1,8-Dibenzyl-naphthalene and two other isomeric hydrocarbons.** K. DZIEWOŃSKI AND J. MOSZEW. *Roczniki Chem.* 9, 361-9 (369-70, French) (1929).—In addn. to the compds. described in C. A. 23, 3220, there were prepd. in the presence of  $AlCl_3$  at 100°, 1,8-dibenzoylnaphthalene bisphenylhydrazone, m. 270-1°; *PhNH\_2* salt of 1,8-dibenzyl-naphthalene-4-sulfonic acid, m. 252-3°; 1,8-dibenzyl-naphthalene-4-sulfonyl chloride, m. 151°; 1,8-dibenzyl-naphthalene-4-sulfonamide, m. 167°; 1-benzyl-8-benzoylnaphthalene, light yellow, m. 113°.

JAROSLAV KUČERA

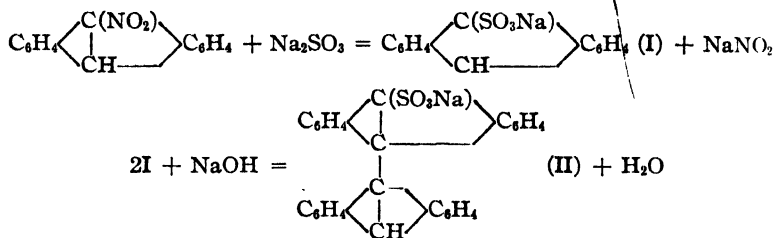
**Preparation of  $\alpha$ -chloronitronaphthalenes.** RYO ASAOKA. *Bull. Tokyo Ind. Research Inst.* 23 [9], 1-26 (1928).—For the study of the industrial use of chloronaphthalene in dye industry first  $\alpha$ -chloronaphthalene, and then its 3 mononitro derivs. and 2 dinitro derivs. were prepd. pure, the m.-p. diagrams for 2 component systems being then constructed. The eutectic points found are: in 1,4-1,5-system, 74-5° (1,4- 57%; 1,5- 43%), in 1,4-1,8-system, 52-3° (1,4- 57%; 1,8- 43%); in 1,5-1,8-system, 66-7° (1,5- 45%; 1,8- 55%). When more than 60% of the 1,8-compd. is present as a component the m.-p. curves of the 1,4- and 1,5-systems all coincide. In the 1,4,5-1,4,8-system the eutectic lies at 117-8°, the compn. being 1,4,5- 34%; 1,4,8- 66%. In prepg.  $\alpha$ -chloronaphthalene, naphthalene was dissolved in  $CCl_4$ , and  $Cl_2$  gas was passed at 50-60° into the soln. with  $FeCl_3$  as catalyst, or the naphthalene was melted and  $Cl_2$  gas was passed into the melt at 100°. The resulting product was fractionally distd. to remove unreacted naphthalene and dichloronaphthalene.  $I_2$ , Zn powder and Fe powder were also tried as catalysts. In prepg. 1,4-chloronitronaphthalene,  $\alpha$ -chloronaphthalene was nitrated by means of  $HNO_3$ , and the product was crystd. several times from EtOH to remove the 1,5- and 1,8-isomers. In prepg. 1,5-chloronitronaphthalene it was found convenient to start from 1,5-dinitronaphthalene, while in prepg. the 1,8-compd.  $\alpha$ -naphthylamine was taken as the starting substance. K. S.

**Mercuration in alkaline solution.** Preliminary paper. A. L. FOX AND FRANK

C. WHITMORE. *J. Am. Chem. Soc.* **51**, 2196-7(1929).—2,3-(HO)<sub>2</sub>C<sub>10</sub>H<sub>7</sub>CO<sub>2</sub>H (30 g.) in 500 cc. H<sub>2</sub>O and 150 cc. of *N* NaOH, heated to boiling and treated, with stirring, with 52 g. Hg(OAc)<sub>2</sub> in 300 cc. H<sub>2</sub>O and 10 cc. AcOH, gives a light yellow powder, probably *anhydro-4-hydroxymercuri-3-hydroxy-2-naphthoic acid*. Similarly 15 g. *o*-HOC<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>H gives 27 g. Hg deriv. and 100 g. PhOH gives 215 g. Hg deriv. The reaction failed with *m*- and *p*-HOC<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>H,  $\alpha$ -C<sub>10</sub>H<sub>7</sub>OH, *o*-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>OH, *o*- and *p*-H<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>H, PhSO<sub>3</sub>H, 1-C<sub>10</sub>H<sub>7</sub>CO<sub>2</sub>H and *o*-C<sub>6</sub>H<sub>4</sub>(CO<sub>2</sub>H)<sub>2</sub>. C. J. WEST

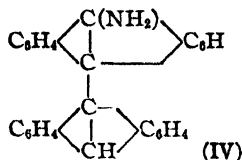
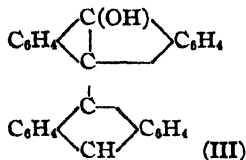
$\beta$ , $\beta$ -Dinaphthyl sulfide as a by-product in the preparation of  $\beta$ -naphthonitrile. Reduction of the sulfone with sodium cyanide. N. A. LANGE AND H. S. HAUPT. *J. Am. Chem. Soc.* **51**, 2277-8(1929).—The unsaponifiable portion of crude  $\beta$ -C<sub>10</sub>H<sub>7</sub>CN, prep'd. by the fusion of  $\beta$ -C<sub>10</sub>H<sub>7</sub>SO<sub>2</sub>Na and NaCN, consists mostly of ( $\beta$ -C<sub>10</sub>H<sub>7</sub>)<sub>2</sub>S, m. 151°; this is probably formed by the reduction of the sulfone, which is present in the Na salt. C. J. WEST

New *meso*-derivatives of anthracene and of bianthryl. V. I. MINAEV AND B. P. FEDOROV. *J. Russ. Phys.-Chem. Soc.* **61**, 143-50(1929).—*Prepn. of the Na salts of ms-sulfonic acids of anthracene and of bianthryl*. Eighteen g. *ms*-nitroanthracene, which has previously been recrystd. from AcOH and finely pulverized, is made up into a paste with 45 g. of 19.3% NaHSO<sub>3</sub> and 3.35 g. NaOH in 10 cc. H<sub>2</sub>O, and the paste is transferred by means of 50 cc. H<sub>2</sub>O into a 200 cc. round-bottomed flask provided with a reflux condenser and heated to slight boiling 3.5-4 hr. When the mixt. turns into



a thick whitish mass it is poured into 50-cc. ice water and the contents of the flask is rinsed with another 50 cc. H<sub>2</sub>O. After 3 hr. the soln. cooled to 5-6° is filtered. The ppt., which consists of unchanged nitroanthracene and of II, is boiled first with a mixt. of 400 cc. H<sub>2</sub>O and 100 cc. EtOH, then with a mixt. of 200 cc. H<sub>2</sub>O and 20 cc. EtOH, being each time filtered boiling through a Büchner funnel, whereupon the filtrate immediately gives a beautiful ppt. of II. To agglomerate the ppt. the filtrate is evap'd. to 300-350 cc. and, while boiling, treated with 100 cc. of a 25% NaCl. After cooling, the beautiful ppt. is filtered and washed. The yield is 1.75 g. crude II and 1.53 g. unchanged *ms*-nitroanthracene. The yellowish brown filtrate obtained after pptg. nitroanthracene and II consists of I and NaNO<sub>2</sub>; it is treated with stirring and cooling by a slow SO<sub>2</sub> current as long as an I-starch paper moistened by dil. HCl ceases to indicate free I. The excess of SO<sub>2</sub> is neutralized by a NaHCO<sub>3</sub> soln., the liquid is evap'd. on a water bath to dryness and the residue is dried *in vacuo* over H<sub>2</sub>SO<sub>4</sub>. To sep. the admixt. of inorg. salts the dry residue is treated with warm EtOH, filtered, and the filtrate is evap'd. and dried. The yield of crude I is 17 g. *Properties of I*.—After several recrystns. from abs. EtOH I presents colorless flat little prisms very readily sol. in H<sub>2</sub>O, slightly in EtOH. On being boiled with dil. inorg. acids it very rapidly emits SO<sub>2</sub>, forming anthracene. This reaction proves that the group SO<sub>3</sub>Na is bound with the *ms*-C atoms, and this is confirmed by the fact that by oxidation with alk. KMnO<sub>4</sub> anthraquinone is formed almost quant. By fusing for a short time 1 g. I in a Ni crucible with 3 g. NaOH and 1 cc. H<sub>2</sub>O at 200-210°, dissolving the melt and filtering into dil. HCl, light-yellow flakes of anthrol, m. 163-4°, are pptd. On heating 1 g. I in a sealed tube with 15 cc. 20% NH<sub>4</sub>OH 4 hrs. at 200°, golden yellow leaves of *ms*-anthramine are obtained (yield, 20-25%). *ms*-Anthramine decomps. 115° without melting. *Properties of II*.—After 2 recrystns. from dil. EtOH, II presents oblong colorless prisms with 1 mol. H<sub>2</sub>O which disappears on drying in a vacuum desiccator at 102-5°. The anhyd. product is hygroscopic, almost insol. in H<sub>2</sub>O, hardly sol. in boiling H<sub>2</sub>O, readily sol. in hot EtOH. On being boiled with dil. inorg. acids it emits SO<sub>2</sub> and almost quant. turns into bianthryl; this reaction proves that SO<sub>3</sub>Na is bound with the *ms*-C atoms. On being fused with NaOH II gives *ms*-hydroxybianthryl (III); on being heated with NH<sub>4</sub>OH in a sealed tube II gives yellowish crystals of *ms*-bianthrylamine (IV), m. 305° (decompn.), III and IV have never hitherto been obtained and present the 1st instances

of nonsym. disubstituted derivs. of *ms*-bianthryl. While *ms*-anthramine is known to behave abnormally during diazotization, forming anthraquinone and diaminobianthryl, IV on the contrary diazotizes quite normally in EtOH and the product gives with  $\beta$ -naphthol a beautiful cherry-red *azo dyestuff* which is alterable on standing and becomes brown. The dyestuff has only a theoretical interest.



BERNARD NELSON

**Chemistry of anthraquinone.** MAX PHILLIPS. *Chem. Reviews* 6, 157-74 (1929).—A review, with 103 references.

DAVID DAVIDSON

**Oxidizing nitration and quinonenitronic acids.** GUSTAV HELLER, ERHARD MERTZ AND ALFRED SILLER. *Ber.* 62B, 928-37 (1929).—Several instances are known, especially in the anthraquinone series, where  $\text{H}_2\text{SO}_4$  and  $\text{HNO}_3$  may not only act as sulfonating or nitrating agents but also introduce HO groups into the aromatic compd. Strecker from alizarin and cold concd.  $\text{HNO}_3$  obtained a  $\text{H}_2\text{O}$ -sol. "pseudonitropurpurin" (I) which readily rearranges into nitropurpurin and the present authors have now been able to obtain in pure form an analogous compd from rubiopin (1,2,5,6-tetrahydroxyanthraquinone) (II). II with nitrating acid gives first a yellow compd. which dissolves in  $\text{H}_2\text{O}$  with violet color; after washing away the mineral acid it can be obtained from AcOH in crystals (III) with 2 AcOH, is quite stable in the solid state and even after drying at  $120^\circ$  remains easily sol. in  $\text{H}_2\text{O}$  with violet color; in soln. mineral acids slowly, but not homogeneously, isomerize it into *dinitrohexahydroxyanthraquinone* (IV), and conversely IV is apparently smoothly converted into III by concd.  $\text{HNO}_3$  or alkali. In analogy with I of the structures proposed by Brasch for I, III can be represented by

HON(:O):C—CO—C.CO.C.C(OH).COH  
the formula  $\begin{array}{c} \text{HOC}:\text{C}(\text{OH}).\text{C}.\text{CO}.\text{C}.\text{CO}.\text{C}.\text{N}(:\text{O})\text{OH} \end{array}$  of a 1,2,5,6-tetra-

hydroxyanthraquinone-4,3,8,7-di[quinonenitronic acid]. III and IV are mutually interconvertible but they are not typical desmotropes, for the rearrangement is not an equil function but is brought about only by reagents and is accompanied in 1 direction by side reactions; also, on cautious dyeing they show characteristic differences, III having but little affinity for mordanted cotton. The violet soln. of III is strongly acid to litmus, forms a cryst. salt with NaOAc and dissolves Mg. On gentle reduction with  $\text{Na}_2\text{S}$  III forms the di[quinone oxime] or 3,7-dinitroso-1,2,4,5,6,8-hexahydroxyanthraquinone (V). The primary process in the formation of III is probably a dehydrogenation (a corresponding amt. of  $\text{HNO}_2$  is formed) followed by union of two  $\text{HNO}_2$  residues through the O atom to form a dinitrate which then isomerizes into III. III can be converted into still another form; when it is dissolved in  $\text{HNO}_3$  and allowed to evap. over KOH *in vacuo* it forms a faintly yellow cryst. substance (VI) (the form usually obtained first in prepg. III) insol. in anhyd. solvents, turned red by cautious addn. of  $\text{H}_2\text{O}$  and violet on further diln. Gentle nitration of II gives the 3,7-dinitro compd. (VII) which can likewise be converted into III. Similarly, from 1,2,7,8-tetrahydroxyanthraquinone (VIII) can be obtained a 3,6-dinitro deriv. (IX) and the 4,3,5,6-di[quinonenitronic acid] (X), which on standing in dil  $\text{H}_2\text{SO}_4$  rearranges even less homogeneously than III. VII, from 5 g. II in 40 cc. AcOH and 7 g. 100%  $\text{HNO}_3$  in 10 cc. AcOH in the cold, light brown, begins to darken  $225^\circ$ , does not m.  $300^\circ$ , difficultly sol. in concd.  $\text{H}_2\text{SO}_4$  with reddish color, forms difficultly sol. dark blue alkali salts, dyes mordanted cotton brown to black-violet, Cr-mordanted wool red-brown, reduced by  $\text{Na}_2\text{S}$  in NaOH to the di-Na salt, blackish needles, of the diamino compd., brown-violet; Ac deriv.,  $\text{C}_{26}\text{H}_{22}\text{O}_{12}\text{N}_2$ , does not m.  $300^\circ$ . III, from 1 g. II in 7 cc. concd.  $\text{H}_2\text{SO}_4$  cautiously nitrated with 2 cc. fuming  $\text{HNO}_3$  and 5 cc.  $\text{H}_2\text{SO}_4$ , dark blue needles with 2 AcOH, deflagrates around  $265^\circ$ , sol. in concd.  $\text{H}_2\text{SO}_4$  with dark blue, in  $\text{NH}_4\text{OH}$  with blue color, forms blue salts with alkalies, dyes mordanted cotton poorly, Cr-mordanted wool dark reddish; di-Na salt. III is also formed from II with  $\text{HNO}_3$  vapors and by nitration of 1,2,4,5,6,8-hexahydroxyanthraquinone in  $\text{H}_2\text{SO}_4$ ; phenylhydrazine salt,  $\text{C}_{26}\text{H}_{22}\text{O}_{12}\text{N}_6$ , red, does not m.  $290^\circ$ ; hydroxylamine salt. IV, red needles or leaflets with green luster, deflagrates around  $290^\circ$ , sol. in concd.  $\text{H}_2\text{SO}_4$  with reddish blue color, dyes mordanted cotton blue to dark brown, Cr-mordanted wool deep dark

blue. V, dark brown, does not m. 300°, sol. in H<sub>2</sub>SO<sub>4</sub> with blue-violet, in alkali with red-violet color, isolated as the *pyridine salt*, m. 224°; 3,7-diamino compd., sol. in concd. H<sub>2</sub>SO<sub>4</sub> with cherry-red, in dil. alkali with violet color, obtained from III or IV with Na<sub>2</sub>S-NaOH or SnCl<sub>2</sub>-HCl or from III in H<sub>2</sub>O with Pd-BaSO<sub>4</sub> and H<sub>2</sub>. IX, bright red, becomes discolored at 260°, m. 295-6° (decompn.), sol. in concd. H<sub>2</sub>SO<sub>4</sub> with yellow-red, in dil. NH<sub>4</sub>OH with crimson, in alkali with red-brown color. X, blue-violet needles with 2 AcOH, sol. in H<sub>2</sub>O with crimson, in concd. H<sub>2</sub>SO<sub>4</sub> with deep blue, in alkali and NH<sub>4</sub>OH with blue-green color, deflagrates about 246°; 1 g. in dil. H<sub>2</sub>SO<sub>4</sub> gives after 3 days 0.4 g. 1,2,4,5,7,8-hexahydroxy-3,6-dinitroanthraquinone, dark brown, deflagrates 285°, sol. in H<sub>2</sub>SO<sub>4</sub> with red-violet, in dil. alkalies and NH<sub>4</sub>OH with dark violet color.

C. A. R.

**Pyrogenic dissociation of some condensed ring systems.** N. A. ORLOV. *Ber. 62B*, 710-9(1929).—See *C. A.* 23, 2174.

C. A. R.

**Pyrogenic decomposition of chrysene under hydrogen pressure.** N. A. ORLOV AND N. D. LICHACHEV. *Ber. 62B*, 719-22(1929); cf. preceding abstr. and *C. A.* 23, 3697.—In conformity with the conclusions drawn from the earlier work, chrysene heated under H pressure was found to give phenanthrene and its tetrahydride and also C<sub>10</sub>H<sub>8</sub>, its homologs and hydrides, and C<sub>8</sub>H<sub>6</sub> hydrocarbons.

C. A. R.

**Optical researches on perylene and its derivatives. II. The visible absorption spectra of several bi-derivatives.** ARMIN DADIEU. *Z. physik. Chem., Abt. B*, 2, 253-61 (1929); cf. *C. A.* 23, 1351.—The influence of the following substituents was studied EtCO, PrCO, o-MeC<sub>6</sub>H<sub>4</sub>CO, COC<sub>6</sub>H<sub>4</sub>OCH<sub>3</sub>(*p*), NO<sub>2</sub>, NH<sub>2</sub>. The effect of these is essentially no different from the formerly investigated substituents. Curves are also given for the 1,12- and 3,10-quinones.

G. L. CLARK

**The structure of the furanmono- and dibasic acids.** I. A. TREFIL'EV. *Ukrainskii Khim. Zhur.* 1, Sci. Pt., 121-296(1925); cf. *Chem. Zentr.* 1906, II, 110; *C. A.* 2, 413, 1269, 3076, 3077; 3, 535, 636; 5, 1413.—A review of all T.'s work in this field, preceded by a historical survey of earlier work. Many references are included. The following new work is reported: By the action of Br in CS<sub>2</sub> on the *di-Et ester of carboxypyrotritaric acid*, HO<sub>2</sub>CC:CMc:O.CMc:CCO<sub>2</sub>H, also in CS<sub>2</sub>, 4 atoms of Br are

added. The bronze-yellow cryst. product decomp. so rapidly, even in a desiccator, that analysis is impossible. The *mono-Et ester* with Br in PhH also gives a *tetrabromide*, bronze-golden crystals, m. 78° (decompn.), which decomp. spontaneously. *Pyrotritaric acid*, CH:CMc:O.CMc:CCO<sub>2</sub>H (I), is obtained from 1 mol. Na malate, one

mol. AcCO<sub>2</sub>H (II) and 1.5 mols. Ac<sub>2</sub>O at 100-30° in 30-40 hr.; also from 1 mol. Na maleate and two mol. II at 105-40° in 30 hr. Since the yield does not change with the 2nd component, I is formed from AcCO<sub>2</sub>Na and AcCO<sub>2</sub>H according to the equation: AcCO<sub>2</sub>Na + 2AcCO<sub>2</sub>H → NaC<sub>7</sub>H<sub>7</sub>O<sub>3</sub> + 2CO<sub>2</sub> + 2H<sub>2</sub>O. Also succinic acid when used in the synthesis of I plays no essential part. For the formation of *methronic acid*, CH:C(CH<sub>2</sub>CO<sub>2</sub>H).O.CMc:CCO<sub>2</sub>H, from AcCH<sub>2</sub>CO<sub>2</sub>Et and succinic acid in the

presence of Ac<sub>2</sub>O, T. suggests the scheme: AcCH<sub>2</sub>CO<sub>2</sub>Et + (CH<sub>2</sub>CO<sub>2</sub>H)<sub>2</sub> → AcCH(CO<sub>2</sub>H)CH<sub>2</sub>CO<sub>2</sub>H → MeC(OH):C(CO<sub>2</sub>H)CH<sub>2</sub>CO<sub>2</sub>H → CH<sub>2</sub>:C(CO<sub>2</sub>H).CMc:O.CO

+ AcCH<sub>2</sub>CO<sub>2</sub>Et - EtO<sub>2</sub>CCHAcC:CH:C(CO<sub>2</sub>H):CMc:O - EtO<sub>2</sub>CCH<sub>2</sub>C:CH:C(CO<sub>2</sub>H):CMc:O. The formation of AcCH(CO<sub>2</sub>H)CH<sub>2</sub>CO<sub>2</sub>H from AcCH<sub>2</sub>CO<sub>2</sub>Et and

(CH<sub>2</sub>CO<sub>2</sub>H)<sub>2</sub> (not from (CH<sub>2</sub>CO<sub>2</sub>H)<sub>2</sub> and Ac<sub>2</sub>O) explains the increase in yield by using an excess of AcCH<sub>2</sub>CO<sub>2</sub>Et, and the elimination of AcOEt in the early stages of the synthesis. The scheme proposed has in its favor the fact that most of the intermediate products have actually been obtained. T. in detail compares his scheme with that proposed by Schroeter (cf. *Ber.* 39, 2129(1906)).

L. W. B.

**Addition reactions with indolenines. III. A procedure for the ketone cleavage of acetoacetic esters.** HERMANN LEUCHS, ARNOLD HELLER AND ALFRED HOFFMANN. *Ber. 62B*, 871-81(1929); cf. *C. A.* 22, 2165.—The reason earlier investigators did not observe the addn. of amines (PhNHNH<sub>2</sub>, NH<sub>3</sub>) or acid anhydrides to indolenines was the lack of reactivity of the -N:CR- group; the present authors were also not able to effect addn. on the indolenines from β-benzyl- and β-phenethyltetralone, which may be considered as carbazolenine derivs. Sometimes, too, there will be necessary for the reaction conditions under which the first product, with appropriate α-substituents, will undergo further transformation if this does not take place so easily that

it will occur under all conditions. In this group apparently belong bases like 3,3-diethyl-2-methylindolenine which with  $\text{Ac}_2\text{O}$  gave 3,3-diethyl-2-methyleneacetylindoline and with  $\text{BzCl}$  the 1-Bz deriv. Related to these compds. is 3,3-dibenzyl-2-methylindolenine (I), to obtain which it was necessary to start from *asym-dibenzylacetone* (II). II had hitherto not been obtained from  $\text{AcC}(\text{CH}_2\text{Ph})_2\text{CO}_2\text{Et}$  (III). The ketone cleavage of such esters is often repressed and Fittig from III obtained only  $\text{AcOH}$  and  $(\text{PhCH}_2)_2\text{CHCO}_2\text{H}$ , the products of acid cleavage. Instead of trying to improve the old methods, the authors used a new procedure based on the Zeisel anal. method; the III was gently boiled 2 hrs. at  $115^\circ$  with 10 parts each of  $\text{AcOH}$  and  $\text{HI}$  (b.  $168-70^\circ$ ), whereupon  $\text{EtI}$  distd. off. Extn. with  $\text{C}_6\text{H}_6$  gave 80% II and left the acid mixt. ready for use again. No  $(\text{PhCH}_2)_2\text{CHCO}_2\text{H}$  was formed. I, prepd. from the phenylhydrazone of II, added neither  $\text{PhNHNH}_2$  nor  $\text{NaHSO}_3$ , but with  $\text{Ac}_2\text{O}$  and  $\text{Bz}_2\text{O}$  gave *N*-acetyl (IV) and *N*-benzoyl-3,3-dibenzyl-2-methyleneindoline (V) which were hydrolyzed to the I and  $\text{AcOH}$  or  $\text{BzOH}$  by  $\text{AcOH}$  at  $100^\circ$  but not by aq.  $\text{NH}_4\text{OH}$  nor by  $\text{NaOH}$  at  $20^\circ$ . This easy hydrolysis must be related to the  $\text{CH}_2$  group and its tendency to attract to itself the H on the N when hydrolysis begins; the authors therefore believe that the 1st stage in the acylation is not the tautomeric rearrangement  $-\text{N}:\text{CMe}- \rightarrow$

$-\text{NHC}(\text{CH}_2)-$  but an addn. of 1 mol.  $(\text{RCO})_2\text{O}$  to  $-\text{N}:\text{CMe}-$  to form  $\text{RCONC}-$

$\text{MeO}_2\text{CR}$  which then splits off 1 mol.  $\text{RCO}_2\text{H}$  and gives  $\text{RCONC}:\text{CH}_2$ . Such a reaction cannot take place if the  $\alpha$ -C atom carries only a H atom or an aryl group or, in general, is combined with a C atom which carries no H. To test the influence of substitution by a simple aryl group, 2-phenyl-3,3-dimethylindolenine (VI) was prepd. from iso-PrCOPh; it added neither  $\text{PhNHNH}_2$  nor acid anhydrides, but with  $\text{BzCl}$  and  $\text{Na}_2\text{CO}_3$  it gave a little (27%) 1-benzoyl-2-phenyl-3,3-dimethyl-2-indolinol (VII). As an example of a compd. with only a H atom on the  $\alpha$ -C atom was taken 3,3-dimethylindolenine (VIII); this also did not add  $\text{PhNHNH}_2$  but with  $\text{Ac}_2\text{O}$  and  $\text{Bz}_2\text{O}$  it easily and smoothly yielded *O*²,1-diacetyl- (IX) and *O*²,1-dibenzoyl-3,3-dimethyl-2-indolinol (X) which with  $\text{MeOH}$  give the 1-acyl-2-methyl ethers (XI and XII) and with  $\text{AcOH}$  both the IX and X and the XI and XII give the free 1-acyl-2-indolinols (XIII and XIV), while with  $\text{NH}_3$  IX and X give 10-20% of the cryst. 1-acyl-2-aminoindolines (XV and XVI). XIV is also obtained in 70% yield from VIII with  $\text{BzCl}$  and  $\text{Na}_2\text{CO}_3$ . The addn. of  $\text{BzCl}$  and the transformation of the 1st product are believed to proceed according to

the scheme  $-\text{N}:\text{CH}- \rightarrow \text{BzNCl}:\text{CH}- \rightarrow \text{BzNCHCl}- \rightarrow \text{BzNCH}(\text{OH})-$ . An addn. of  $\text{BzOH}$  is excluded by the alky. of the soln., as is also that of  $\text{Bz}_2\text{O}$  to di-Bz derivs. of type X, since these are stable even towards alkali at  $20^\circ$ . II, yellowish, m.  $186^\circ$ ; semicarbazone, m.  $153-4^\circ$  (decompn.); oxime, m.  $75-6^\circ$ ; phenylhydrazone, m.  $86-7^\circ$ , easily resinifies in the light and air. I, from the phenylhydrazone and  $\text{ZnCl}_2$ , m. alc. at  $100-20^\circ$  (yield, 50-60%), oil; picrate, yellow, m.  $180-1^\circ$  (decompn.); HCl salt, greenish, m.  $180-2^\circ$ . IV, m.  $96-7^\circ$ , unchanged by  $\text{MeOH}$  at  $100^\circ$  or even by  $\text{AcOH}$  at  $60^\circ$ . V, m.  $164^\circ$ , faintly yellowish. VI, oil, isolated as the picrate, light yellow, m.  $158-60^\circ$ . VII, m.  $138^\circ$ , stable toward aq.  $\text{NH}_4\text{OH}$ . Methiodide of VI, yellow, m.  $203^\circ$ , gives with  $\text{Ag}_2\text{CO}_3$  in alc. 70% of 2-phenyl-1,3,3-trimethyl-2-indolinol, m.  $107-8^\circ$ . 2-Phenyl-3,3-dimethylindoline, prepd. with  $\text{Zn-Hg}$ , m.  $93^\circ$ ; HCl salt, m.  $193-4^\circ$ ; nitrate, m.  $197^\circ$  (decompn.); Ac deriv., m.  $192-3^\circ$ . The base with  $\text{MeI}$  in  $\text{MeOH}$  at  $100^\circ$  gives 2-phenyl-1,3,3-trimethylindoline, m.  $88^\circ$ , and its methiodide, m.  $194-5^\circ$ . IX, m.  $60-1^\circ$ . XI, oil. XIII, m.  $117-8^\circ$ . XV, m.  $78^\circ$ , quite easily sol. in alk. water; picrate, yellow, m.  $159-61^\circ$ . X, m.  $147-8^\circ$ . XII, m.  $71-2^\circ$ . XIV, m.  $202-4^\circ$ . XVI, m.  $115-7^\circ$ , sol. in *N* HCl and repptd. by  $\text{NH}_4\text{OH}$ ; picrate, yellow, m.  $191-4^\circ$ .

C. A. R.

**Indolic compounds with mixed function.** QUINTINO MINGOLA. *Gazz. chim. ital.* 59, 105-15 (1929).—Oddo and Moschini (cf. *C. A.* 6, 3425) prepd. the pyridonium salt of chloromethylpyrrole and then attempted to obtain the corresponding keto alc. by the action of water and of dil. alkalis on the chlorinated ketone. However, the hydrolytic agents resinified the chloromethylpyrrole, and keto alcs. with a pyrrole nucleus have remained an unknown type of compds. This induced M. to prep. the analogous chlorinated indole ketones and their Me derivs. and to obtain the corresponding keto alcs., which have never been described, and then to obtain various derivs., with a mixed function, e. g., keto amines, keto nitriles, keto acids and keto amino acids, and finally to utilize these last compds. for the synthesis of indolic polypeptides, which are not described in the literature. In the present paper the results obtained with  $\alpha$ -methylindole (I) are described.  $\beta$ -Chloroacetyl-methylketole (II), (prepd. from I by the

method of Salway, *C. A.* **7**, 2217) (1 g.) heated nearly to boiling with 2.5% aq. KOH (50 cc.), cooled, acidified, with dil.  $\text{H}_2\text{SO}_4$ , the ppt. washed, dried, and recrystd. repeatedly from  $\text{C}_6\text{H}_6$  and a little AcMe, yields  $\alpha$ -methyl- $\beta$ -indoylcarbinol  $\text{C}_6\text{H}_4\text{.NH.CMe:CCOCH}_2\text{OH}$  (III), lustrous yellow, m.  $196^\circ$ . Unlike II, which was

found to have a highly irritant action on the skin and mucous membranes, III was non-irritant. In dil. EtOH, III gives with aq.  $\text{NH}_3\text{-AgNO}_3$  a *Ag deriv.*  $\text{C}_6\text{H}_4\text{.NAg.CMe:CCOCH}_2\text{OH}$ . III,  $\text{Ac}_2\text{O}$  and  $\text{AcONa}$  boiled 0.25 hr. and the product

recrystd. from EtOH, yields a *di-Ac deriv.*,  $\text{C}_{16}\text{H}_{15}\text{O}_4\text{N}$ , m.  $101^\circ$ . III (0.5 g.) dissolved in hot water by the addn. drop by drop of the necessary dil.  $\text{Na}_2\text{CO}_3$ , aq.  $\text{KMnO}_4$  (0.22 g.) added very slowly, heated 0.5 hr. on a water bath, cooled, filtered, acidified with dil.  $\text{H}_2\text{SO}_4$ , extd. repeatedly with  $\text{Et}_2\text{O}$ , the combined exts. concd., and the ppt. recrystd. from EtOH, yields  $\text{C}_6\text{H}_4\text{.NH.CMe:CCOCO}_2\text{H}$ , m.  $186^\circ$  (cf. Oddo and Albanese,

*C. A.* **22**, 1775). The notable reactivity of the Cl atom in II is not limited to hydrolytic agents. Dil. alc. II (1 g.) and KCN (0.35 g.) refluxed for 0.5 hr., cooled, and the ppt. recrystd. from hot EtOH, yield  $\alpha$ -methyl- $\beta$ -indoylacetonitrile,  $\text{C}_6\text{H}_4\text{.NH.CMe:CCO-}$

$\text{CH}_2\text{CN}$  (IV), yellowish, m.  $249^\circ$ , is non-irritant. Dil. alc. IV sapond. by heating for 2 hrs. on a water bath with 0.5 N KOH, cooled, acidified with dil.  $\text{H}_2\text{SO}_4$ , filtered, the residue washed, dried, and recrystd. from  $\text{C}_6\text{H}_6$ , yields  $\alpha$ -methyl- $\beta$ -indoylactic acid (V), m.  $199\text{--}200^\circ$ , sol. in cold aq. alk. carbonates and bicarbonates. *NI<sub>4</sub> salt*, yellowish, by evapn. of V and  $\text{NH}_4\text{OH}$ . *Hg salt*,  $\text{C}_{24}\text{H}_{20}\text{O}_6\text{N}_2\text{Hg}$ , brick-red ppt. *Ag salt*, yellow ppt. *Cu salt*, yellow ppt. *Ferric salt*, yellow ppt. *Stannous salt*, yellow ppt. No ppts. were formed with  $\text{Pb(OAc)}_2$ ,  $\text{Ba(NO}_3)_2$ ,  $\text{AuCl}_3$ , or  $\text{CaCl}_2$ . V is a homolog of the acid prepd. by Oddo and Albanese (*loc. cit.*). II (1 g.) heated 2 hrs. at  $90\text{--}5^\circ$  in a closed tube with concd. aq.  $\text{NH}_4\text{OH}$ , cooled, concd. and the ppt. recrystd. from AcMe or EtOH, yields methylindoylmethylamine  $\text{C}_6\text{H}_4\text{.NH.CMe:CCOCH}_2\text{NH}_2$  (VI), brick-red,

m. around  $240^\circ$  (decompn.), is non-irritant, gives in concd.  $\text{H}_2\text{SO}_4$  a dark blue color, changing to green. *Ag deriv.* Treated first with HCl and  $\text{NaNO}_2$  and then with alk.  $\beta$ -naphthol, VI forms an orange-red coupled compd. Alc. VI treated with hot satd. alc. picric acid (calcd. quantity) and the ppt. recrystd. from EtOH, yields a *picrate*  $\text{C}_{17}\text{H}_{10}\text{O}_8\text{N}_5$ , yellow, m.  $207\text{--}10^\circ$  (first becoming green). VI dissolved in fuming HCl, evapd. on a water bath, yields a *HCl salt*, which in water gives with Dragendorff reagent a brown-yellow ppt., with Bouchardat reagent a brown-red ppt., with tannic acid a brown ppt. and no ppts. with  $\text{AuCl}_3$ ,  $\text{PtCl}_4$  or  $\text{HgCl}_2$ . II (1 g.) in abs. EtOH heated 4 hr. in a closed tube at  $100^\circ$  with glycocoll (VII) (0.4 g.), yields no  $\text{C}_6\text{H}_4\text{.NH.CMe:CCOCH}_2\text{NHCH}_2\text{CO}_2\text{H}$  (VIII). Further tests with heating up to

$130^\circ$  and for 6 hr., with the acetate of VII and with 95% EtOH, gave only negative results. Likewise II and alanine (equimol. parts) heated 4-6 hr. at  $120^\circ$  in a closed tube gave no  $\text{C}_6\text{H}_4\text{.NH.CMe:CCOCH}_2\text{NHCHMeCO}_2\text{H}$  (IX). If it had been possible

to obtain VIII and IX, it might have been found possible to obtain the corresponding methylketolic dipeptides. The results lend support to the hypothesis maintained by many, viz., that amino acids have the structure of  $\text{NH}_4$  salts formed by the combination of the acid and  $\text{NH}_2$  groups: thus  $\text{RCHNH}_2\text{CO}_2\text{H} \longrightarrow \text{RCH.CO.O.NH}_3$ , as in

taurine, betaine, etc. To confirm this hypothesis, exts. are planned in which II is to be condensed with free amino acids and with their esters to obtain methylketolic dipeptides by the following reactions:  $\text{C}_6\text{H}_4\text{.NH.CMe:CCOCH}_2\text{Et} \longrightarrow \text{C}_6\text{H}_4\text{.NH.-}$

$\text{CMe:CCOCH}_2\text{NHCH}_2\text{CO}_2\text{Et} \longrightarrow \text{C}_6\text{H}_4\text{.NH.CMe:CCOCH}_2\text{NHCH}_2\text{CONHCH}_2\text{CO}_2\text{H}$ .  
C. C. DAVIS

**5,8-Dihydroxy- $\beta$ -anthrapyridinequinones.** H. RAUDNITZ (WITH GRETE LAUBE). *Ber.* **62B**, 938-9 (1929).—Cinchomeric anhydride behaves in the  $\text{Na-AlCl}_3$  fusion like quinolinic anhydride (*C. A.* **23**, 3471), condensing with 1,4-nucleus-hydroxylated aromatic compds. to derivs. of 5,8-dihydroxy- $\beta$ -anthrapyridinequinone (I). Thus with  $p\text{-C}_6\text{H}_4(\text{OH})_2$  it gives I itself ( $\beta$ -pyrquinizarin) and with 1,4- $\text{C}_{10}\text{H}_6(\text{OH})_2$  the 6,7-benzo deriv. (II). I (obtained in 49% yield as the blue-black *Na salt*), bronze-colored leaflets subliming *in vacuo* in bright red scales, m.  $211^\circ$ . II, red-brown needles subliming *in vacuo* in brown-red needles, m.  $343^\circ$ . In continuation of the spectroscopic

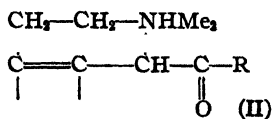
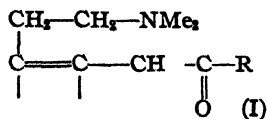
study of the influence of the  $C_6H_5N$  ring on the anthraquinone complex, it was found that the  $\beta$ -N atom has a stronger color-deepening effect than the  $\alpha$ -N atom. Below are given the color and absorption max. in KOH,  $H_2SO_4$  and  $H_2SO_4 \cdot H_3BO_3$ , resp.:  $\alpha$ -I, violet, 600.7, 561.5; crimson, 574, 532.2; pink, 547.5, 506.5, 473.5.  $\beta$ -I, blue, 618, 573; violet, indistinct bands in the yellow-green; red, 559, 518.5, 483.  $\alpha$ -II, red-violet, 586.5, 544; yellow-red, 1-sided absorption from 590; orange, 541.5, 503, 467.  $\beta$ -II, blue-violet, 600.5, 555.5; wine-red, indistinct at 540, 500; orange, 552, 513, 576.

C. A. ROUILLER

**Quinazolines. II. Synthesis of 6-ethoxy-3-[4-ethoxyphenyl]-3,4-dihydroquinazoline.** G. MAFFEI. *Gazz. chim. ital.* 59, 3-9(1929); cf. C. A. 22, 4464.—2,5- $O_2N(HO)-C_6H_3CHO$  (cf. *Ber.* 34, 4000(1901)) (0.9 g.) heated with KOH (0.3 g.) and EtI (1 g.) in a sealed tube for several hr. at 100°, extd. with  $Et_2O$ , evapd., and the residual oil crystd. several times from dil. EtOH, yields 2-nitro-5-ethoxybenzaldehyde (I), m. 62°. I (0.5 g.) heated with  $p-H_2NC_6H_4OEt$  (0.35 g.) at 120° until water is no longer evolved, and the cold product recrystd. repeatedly from dil. EtOH, yields 2-nitro-5-ethoxybenzal-*p*-phenetidine (II), golden yellow, m. 92°, turns red on exposure to light. II (8 g.) in boiling EtOH (200 cc.) poured into  $Na_2S$  (12 g.) in hot 50% EtOH (20 cc.), cooled, and the ppt. recrystd. several times from MeOH, yields 2-amino-5-ethoxybenzal-*p*-phenetidine (III), light yellow, m. 156°, gives an intense color with acids (like its analogs already known). Na (3 g.) added little by little to III (1.7 g.) in hot abs. EtOH (50 cc.), poured into water, and the sepd. oil crystd. from dil. EtOH, yields 2-amino-5-ethoxybenzyl-*p*-phenetidine (IV), m. 81°. IV (0.5 g.) boiled 0.5 hr. with 85%  $HCO_2H$  (3 cc.), cooled, a little water and then dil.  $NH_4OH$  added, and the ppt. crystd. several times from EtOH, yields 6-ethoxy-3-*p*-phenetidino-3,4-dihydroquinazoline (V), m. 140°. Na (5 g.) added little by little to V (3 g.) in boiling abs. AmOH (70 cc.), water added, filtered, and the residue recrystd. from cold EtOH, yields 6-ethoxy-3-*p*-phenetidino-tetrahydroquinazoline, m. 144°. I heated with  $HONH_2Cl$  and NaOAc, and the product recrystd. from dil. EtOH, yields 2-nitro-5-ethoxybenzaloxime (VI), pale yellow, m. 125°. Conc'd.  $NH_4OH$  (300 cc.) added to VI (25 g.), in 50% EtOH (300 cc.),  $H_2S$  passed through the product, first while cold and then while refluxing, for 2 hr., the excess  $H_2S$  expelled, cooled, the solid part of the product dissolved in EtOH, filtered, excess water added to the filtrate, and the ppt. recrystd. repeatedly from  $C_6H_6$  and from dil. EtOH, yields 2-amino-5-ethoxybenzaloxime (VII), m. 132°. VII (1.2 g.) in abs. EtOH (40 cc.) agitated with 2% Na-Hg (60 g.), maintaining the soln. acid by AcOH, after 1.2 hr. dild. with water, the EtOH eliminated *in vacuo*, made alk. with NaOH, extd. with  $Et_2O$ , evapd., and the residue recrystd. from EtOH, yields 2-amino-5-ethoxybenzylamine-HCl,  $C_9H_{14}ON_2 \cdot 2HCl$  (VIII), begins to decomp. around 200°, decomps. completely 235-7°, turns rose on exposure to light and air, has a bitter taste. The free base,  $C_9H_{14}ON_2$ , is an oil, absorbs  $CO_2$  from air, forming the carbonate of VIII. VIII (1 g.) refluxed 1 hr. with  $HCO_2Na$  (0.6 g.) and abs.  $HCO_2H$  (10 cc.), excess NaOH added, and the ppt. recrystd. from EtOH- $Et_2O$  and then from  $C_6H_6$ , yields 6-ethoxy-3,4-dihydroquinazoline, m. 125-7°. V is an anesthetic, but its physiol. properties disappear when it is oxidized, when its C:N double bond is destroyed, when 1 or both of its  $OEt$  groups are eliminated or replaced by Me, and when the  $-C_6H_4OEt$  group is eliminated. On alkylation of the imine group, the anesthetic properties remain, though in a modified way.

C. C. DAVIS

**The structure of narceine.** J. J. L. ZWIKKER. *Pharm. Weekblad* 66, 461-4 (1929); cf. C. A. 23, 3539.—An attempt is made to explain the recent observation that methylnarceine gives a color reaction with  $Na_2Fe(CN)_6NO$  while narceine does not. The accepted formula for narceine contains a  $BzCH_2Ph$  grouping.  $BzCH_2Ph$  was accordingly prep'd. and found to give the nitroprusside reaction. From this it is concluded that the  $CH_3CO$  grouping of  $BzCH_2Ph$  is not present in narceine, but that a ring closure between the  $CH_3$  and a neighboring  $NMe_2$  has occurred whereby the CO group is attached directly to 2 rings and is therefore no longer reactive. The rearrangement may be represented as follows:



Narceine would then have the same ring structure as the parent substance narcotine. If the acidic H of the  $CH_3CO$  grouping, which makes possible a ring closure with the basic  $NMe_2$ , is replaced by Me, ring closure is no longer possible. The resulting methyl-

narceine would then have the  $\text{BzCH}_2\text{Ph}$  structure which is reactive toward nitroprusside. Possibly narceine possesses structure I in acid soln. and structure II in alk. soln. This, however, cannot be demonstrated because the color reaction between  $\text{Na}_2\text{Fe}(\text{CN})_5\text{NO}$  and  $\text{CH}_2\text{CO}$  derivs. in general requires an alk. soln. A. W. DOX

**Alkaloids of *Fritillaria verticillata*, Wild. var *thunbergii*, Baker. I.** MASAO FUKUDA. *J. Chem. Soc. Japan* 50, 74-8(1929).—Yagi had previously studied the alkaloids in the bulb of this plant and found 2 substances: (1) amorphous (m.  $117^\circ$ ) and (2) cryst. (m.  $214^\circ$ ). F. has studied the alkaloids further and succeeded in sepg. the following 4 substances: (A) Colorless needles, m.  $224-5^\circ$ , with mol. formulas corresponding to  $\text{C}_{18}\text{H}_{33}\text{NO}_2$  or  $\text{C}_{17}\text{H}_{35}\text{NO}_2$ . It has one —OMe group. (B) Colorless needles, decomp.  $148-50^\circ$ , with the mol. formula  $\text{C}_{17}\text{H}_{33}\text{NO}_2$ . (C) Amorphous. (D) Pale yellow powder, m.  $130-1^\circ$ , with the formula  $\text{C}_{17}\text{H}_{33}\text{NO}_2$ . It does not crystallize as salt with any kind of acid. T. IRIE

**Bixin.** FRANZ FALTIS AND FRANZ VIEBÖCK. *Ber.* 62B, 701-8(1929).—Kuhn and Winterstein (*C. A.* 22, 2950) concluded, from the similarity of carotene and related plant dyestuffs to their synthetic diphenylpolyenes, that the color and the color reaction with  $\text{H}_2\text{SO}_4$  of these substances are conditioned by the no. of conjugated double bonds, although, since 1,8-dibenzyl-octatetraene is perfectly colorless while the 1,8-di-Ph compd. is a bright greenish chrome-yellow it would seem that immediate proximity of the aliphatic double bond to the  $\text{C}_6\text{H}_5$  nuclei is the essential prerequisite for color. For bixin (I), K. adopts Heiduschka and Panzer's formula  $\text{C}_{25}\text{H}_{40}\text{O}_4$  instead of that of Herzig and Faltis,  $\text{C}_{26}\text{H}_{40}\text{O}_4$ . In this connection, F. and V. refer to H. and F.'s reply to H. and P. On the basis of the  $\text{C}_{25}$  formula for I and of II, and F.'s observation that it adds 18 H atoms on catalytic hydrogenation K. assigns to perhydrobixin (II) the compn.  $\text{C}_{25}\text{H}_{48}\text{O}_4$  and to hydrogenated norbixin (III) the compn.  $\text{C}_{24}\text{H}_{46}\text{O}_4$  which would make it a purely aliphatic di- $\text{CO}_2\text{H}$  acid. On the other hand, on the basis of the  $\text{C}_{26}$  formula III ( $\text{C}_{26}\text{H}_{46}\text{O}_4$ ) would have to contain a ring system in the mol.; this F. and V. consider of material significance for the intense color of I which they regard as a fulvene deriv. Faltis formerly believed that the fulvene ring is at the end of the mol. but more thorough study of the work of Rinkes and van Hasselt on the ozonization of methylbixin and I has shown that the  $\text{CO}_2\text{H}$  groups are at the end of the system and hence the fulvene ring is probably to be sought in the middle of the mol. I with  $\text{O}_3$  gives  $\text{AcCH}:\text{CHCO}_2\text{Me}$  and  $\text{OHCCH}:\text{CHCMe}:\text{CHCO}_2\text{H}$ , indicating the structure  $\text{MeO}_2\text{CCH}:\text{CHMe}:\text{CHCH}:\text{CHCMe}:\text{CHCO}_2\text{H}$  for I, and if the 3 other isoprene units and at the same time a fulvene ring are introduced between the 2 ends of the mol. a structure somewhat like  $\text{MeO}_2\text{CCH}:\text{CHCMe}:\text{CHCMe}:\text{CHCH}:\text{C}:\text{CMe}:\text{CH}:\text{CH}:\text{CCMe}:\text{CHCH}:\text{CHCMe}:\text{CHCO}_2\text{H}$  would result for I. Certain

other expts. bearing on the structure of I are reported. To prove that I does not contain a grouping  $-\text{CO}:\text{CH}:\text{C}(\text{OH})-$  which might perhaps escape catalytic hydrogenation and simulate the presence of  $\text{CO}_2\text{H}$  groups, III was treated with  $\text{PCl}_5$  and the 2 Cl groups thus introduced were replaced by  $\text{NH}_2$ , giving a diamide (IV), also obtained with  $\text{SOCl}_2$  followed by  $\text{NH}_3$ . In attempts to convert III by the Hell-Volhard-Zelinskii method into the dibromide of the  $\alpha,\alpha'$ -dibromodicarboxylic acid, it was found that about five H atoms were replaced by Br. Since in the vacuum distn. of II slight decompn. with elimination of  $\text{CO}_2$  cannot be avoided and the C and H content of the product is therefore somewhat too high, it was converted, before distn., into perhydro-methylbixin,  $b_{12}$  278-85°, C 74.06-74.42, H 11.94-11.53. IV (yield, 20%), sinters  $100^\circ$ , m.  $107-9^\circ$ . C. A. R.

**Synthesis of pyrimidine-nucleosides.** TREAT B. JOHNSON AND GUIDO H. HILBERT. *Science* 69, 579-80(1929).—The lactim ether, 2,4-dimethoxypyrimidine (I), is rearranged by heating above its b. p. to the lactam ether, 1,3-dimethyluracil. At room temp. MeI converts I to the lactim lactam ether, 1-methyl-2-keto-4-methoxy-1,2-dihydropyrimidine (II). Likewise MeI converts 2,4-diethoxypyrimidine into 1-methyl-2-keto-4-ethoxy-1,2-dihydropyrimidine (III). Hydrolysis of II and III with acids yields 1-methyluracil. With bromotetraacetylglucose I yields the pyrimidine nucleoside  $\text{CH}_2(\text{OAc})\text{C}(\text{H})(\text{OAc})\text{CH}(\text{OAc})\text{CHN}-\text{CH}:\text{CH}:\text{C}(\text{OMe})\text{N}:\text{CO}$  (IV), m.  $221^\circ$

(decompn.). No reducing substances are formed on mild hydrolysis with HCl. Intense hydrolysis converts it into sol. reducing substances. DAVID DAVIDSON

**The molecular constitution of cholesterol and the chemistry of bile acids.** L. CUNY. *J. pharm. chim.* [8], 8, 18-34, 62-85(1928).—A detailed review, with bibliography (107 references). S. WALDBOTT



Comparison of the Zennström and other processes for the production of paper pulp and by-products from maritime pine and other resinous woods [recovery of MeOH] (RIVIÈRE) 23. The determination of N by the Kjeldahl method as applied to dyestuffs and intermediate products (SISLEY, DAVID) 25. Infra-red absorption by the N-H bond (ELLIS) 3. Interpretation of the Raman spectrum for the structure of organic compounds (PÉTRIKALN) 3. Alcohols from destructive hydrogenation products (Brit. pat. 301,000) 21. Halogenated hydrocarbons, halohydrins, nitriles, isonitriles and halogenated acid chlorides (Brit. pat. 301,009) 21.

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**Lead tetra-alkyl.** HERBERT W. DAUDT, ALFRED I. PARMELEE and KENNETH P. MONROE (to E. I. Du Pont de Nemours & Co.). U. S. 1,717,961, June 18. Mono-sodium-lead is reacted on with an alkylating agent such as EtCl in the presence of a small proportion of a catalyst such as ether and alc.

**Hexamethylenetetramine.** S. KARPEN & BROS. Ger. 477,051, July 1, 1924. See Brit. 235,015 (C. A. 20, 918).

**Hydrocyclic  $\omega$ -aminoalkyl compounds.** HANS RUPE. Ger. 477,050, Sept. 29, 1925. Corresponds to Brit. 240,814 (C. A. 20, 2167) but gives an addnl. example describing the prepn. from cyanomethone of  $\alpha$ -menthomethylamine,  $b_{10}$  126–128°, the hydrochloride of which m. 205°.

**Benzyl-oxyethanol.** I. G. FARBENIND. A.-G. Fr. 655,871, June 11, 1928. Benzyl-oxyethanol and secondary products are prepd., (1) by treating a metallic benzylate with a halogenated alc., (2) or a metallic glycolate with a benzyl halide, (3) or a benzyl alc. with ethylene oxide. E. g.,  $\text{PhCH}_2\text{ONa}$  heated with  $\text{ClCH}_2\text{CH}_2\text{OH}$  on distn. gives  $\text{PhCH}_2\text{OCH}_2\text{CH}_2\text{OH}$  at 132–135°, and *benzyl-oxyethoxyethanol* at 171–173°. These are also obtained from  $\text{BzOH}$  and  $(\text{CH}_2)_2\text{O}$ .  $\text{PhCH}_2\text{OCH}_2\text{CH}_2\text{OH}$  and *benzyl-oxyethyl benzyl ether*,  $b_{20}$  210°, are obtained from K or Na glycolate and  $\text{PhCH}_2\text{Cl}$ .

**Trichloroethane.** ALBERT MAIER. Fr. 655,930, June 14, 1928. One vol. of  $\text{C}_2\text{H}_4$  is mixed with 2 vols. of Cl at 25° giving  $\text{C}_2\text{H}_3\text{Cl}_3$  70,  $\text{C}_2\text{H}_4\text{Cl}_2$  15,  $\text{C}_2\text{H}_5\text{Cl}$  5, and higher Cl compds. 10%. The first 3 may be used as solvents for fatty substances, resins, etc.

**Halooacylated diphenyl ethers.** OTTO VON SCHICKH (to Schering-Kahlbaum A.-G.). U. S. 1,717,424, June 18. By the suitably controlled reaction of halogenated acyl halides on diphenyl ether or its substitution products (as in the presence of  $\text{AlCl}_3$ ),  $\omega$ -halogenated phenoxyacetophenones and their substitution products are produced, which may be used as *therapeutic agents*. Details are given of the production of dichloroacetylated diphenyl ether, m. 102°, dibromoacetylated diphenyl ether, m. 121°, dichloroacetylated *o*-methoxydiphenyl ether, m. 148°, dichloroacetyl-*p*-hydroxydiphenyl ether, m. 155°, and dichloroacetyl-*o,o'*-methoxydiphenyl ether, m. 154°.

**Complex metal compounds of pyrocatechol.** HANS SCHMIDT (to Winthrop Chemical Co.). U. S. 1,718,492, June 25. Complex compds. many of which are suitable for *therapeutic uses*, contg. metals such as Cd, Fe, Mn, Zn, Cr, Sn, V, Cu, Au, Ca, As, Pb or Bi, are made by causing a compd. of the metal to react with a pyrocatecholsulfonic acid or a salt of such an acid. Numerous examples and details are given. U. S. 1,718,493 relates to similar compds., particularly those contg. Sb.

**8-Hydroxyquinoline, etc.** I. G. FARBENIND. A.-G. Brit. 301,545, Sept. 2, 1927. 8-Hydroxyquinoline and its derivs. are prepd. from 8-aminoquinoline and its derivs. by heating with acid reagents such as  $\text{H}_2\text{SO}_4$ , alc. and aq.  $\text{ZnCl}_2$  or HBr.

**1,3-Diamino-2-hydroxyanthraquinone.** I. GUBELMANN, H. J. WEILAND and O. STALLMANN. Brit. 301,119, Aug. 29, 1927. 4'-Hydroxy-*o*-benzoylbenzoic acid is nitrated to form the 3',5'-dinitro-deriv., the latter is reduced to the corresponding diamino compd., and ring closure is effected by elimination of water as by use of  $\text{H}_2\text{SO}_4$ .

**Xylenes.** I. G. FARBENIND. A.-G. Brit. 300,540, Aug. 20, 1927. See Fr. 639,252 (C. A. 23, 611).

**Acetone.** DR. A. WACKER GES. FÜR ELEKTROCHEMISCHE INDUSTRIE GES. Brit. 300,548, Nov. 14, 1927. Liquors produced in the pptn. of acetylated cellulose or starch

are subjected to vaporization and the crude vapor is passed over a catalyst such as one contg. Ce carbonate at 300–500° to produce acetone. Various details are described.

**Menthol.** WALTER SCHOELLER and HANS JORDAN (to Chemische Fabrik auf Actien vorm. E. Schering). U. S. 1,718,666, June 25. A methylisopropylphenol is acted on, at a temp. of 100–200°, with H in the presence of a hydrogenation catalyst such as Ni, Cu, Co, Fe or their compds. until 8 H atoms have entered into combination.

**Menthol.** HOWARDS AND SONS, LTD. and JOHN W. BLAGDEN. Fr. 655,433, June 6, 1928. See Brit. 297,019 (C. A. 23, 2449).

**Chlorination of methane.** HOLZVERKOHLUNGS-INDUSTRIE A.-G. Ger. 477,494, Dec. 21, 1921. CH<sub>4</sub> is chlorinated at 400° or above in the presence of a gaseous diluent comprising an amt. of added HCl in excess of that produced in the reaction, with or without steam. The necessary heat for the reaction may be supplied by means of the diluents, *e. g.*, with superheated steam. Alk. earth halides may be present as catalysts.

**Hydroxy acids.** I. G. FARBENIND. A.-G. Fr. 655,579, June 11, 1928.  $\alpha$ -Hydroxy acids are prepd. by hydrolysis of the corresponding nitriles in the presence of an indifferent solvent, dissolving the compds. entering into the reaction as well as those produced by the reaction, with the exception of the ammoniacal salt, by means of acids, preferably HCl, and the amt. of water necessary for the sapon. In examples, AcH is added to a mixt. contg. NaOH lye, HCN and dioxan and heated to 80° to form lactonitrile, which is hydrolyzed to lactic acid by adding HCl and boiling. BzH is converted in similar manner, with C<sub>2</sub>Cl<sub>4</sub> as solvent, to phenylglycolonitrile and by sapon. to phenylglycolic acid.

**Mucic acid.** ARLIE W. SCHORGER (to Wood Conversion Co.). U. S. 1,718,837, June 25. In the oxidation of solns. of galactose or galactan with HNO<sub>3</sub>, N oxides given off during the oxidation are recovered by absorption in galactan or galactose solns. and the solns. are heated with HNO<sub>3</sub> to destroy their tendency to foam prior to the absorption.

**Salts of bile acids.** CHEMISCHE FABRIK VORM. SANDOZ. Fr. 655,282, Jan. 5, 1928. Salts of bile acids are obtained by the reaction of these acids with amino- or diamino-acridines or their hydroxyalkyl or haloalkyl derivs. In an example, the cholate of 3,6-diamino-10-methylacridinium is prepd. by adding drop by drop a soln. of Na cholate in water to 3,6-diamino-10-methylacridinium chloride in water. Fr. 655,283 describes the prepn. of salts of bile acids with emetine. Thus the cholate of emetine is prepd. by adding a soln. of emetine in alc. to cholic acid, and the desoxycholate of emetine by adding Na desoxycholate to a soln. of emetine hydrobromide in water.

**Acetic acid.** SOC. ANON. DES DISTILLERIES DEUX-SÈVRES. Brit. 301,415, Nov. 29, 1927. In extg. HOAc from its aq. solns. by a solvent such as AmOAc having a b. p. between that of HOAc and 150°, as described in Brit. 296,974 (C. A. 23, 2449), when the aq. HOAc soln. contains substances such as mucilaginous matter which would hinder the sepn. in the extn. column (as in the case of HOAc from cellulose fermentation), the acid is vaporized and led to the middle of the sepg. column to which the solvent is supplied. An arrangement of app. is described.

**Concentrating acetic acid.** I. G. FARBENIND. A.-G. Brit. 300,923, Nov. 19, 1927. HOAc is sepd. from its aq. solns. by addn. of a chlorinated hydrocarbon deriv. such as C<sub>2</sub>HCl<sub>3</sub> at ordinary temp. and then distg. off the water. Distn. may be effected in a rectifying app. comprising columns and a dephlegmator, the condensate sepg. into 2 layers and the chlorinated hydrocarbon layer being returned to the distn. vessel. The process may be made continuous.

**Extracting acetic or similar acids from aqueous solutions.** HERBERT E. MARTIN (to Celanese Corp. of America). U. S. 1,717,719, June 18. In obtaining concd. acid from various aq. solns. or liquors, solvents are used comprising a methylene halide; *e. g.*, a mixt. of methylene chloride 80 and ether 20% may be used in countercurrent extn.

**Acetic anhydride.** I. G. FARBENIND. A.-G. Brit. 300,563, Nov. 14, 1927. In a process such as described in Brit. 285,090 (C. A. 22, 4539), a dephlegmator is placed at the top of the column used and the org. solvent such as benzene, toluene or benzene and trichloroethylene is admitted at the bottom of the column only. Cf. C. A. 23, 3716.

**Isopropyl acetate.** STANDARD OIL DEVELOPMENT CO. Brit. 300,418, Dec. 24, 1927. Iso-Pr acetate is obtained by distg., at a temp. of 70–76°, a mixt. contg. "commercial" iso-Pr alc., HOAc, water and an esterifying catalyst such as H<sub>2</sub>SO<sub>4</sub>, fractionating the vapors, and condensing and sepg. the iso-PrOAc. Part of the acetate-contg.

layer may be returned to the distn. zone and the operation may be continued until the HOAc becomes dild.

**Condensation products from acetylene and ammonia.** I. G. FARBERIND. A.-G. (Leo Schlecht and Hans Rötger, inventors). Ger. 477,049, Aug. 9, 1927. See Brit. 295,276 (C. A. 23, 2188).

**Benzanthrone derivatives.** I. G. FARBERIND. A.-G. Brit. 300,331, Aug. 25, 1927. Benzanthrone or its substitution products having free 2- and Bz-1- positions are heated with caustic alkali and aromatic hydroxy compds. having a free *p*- or *o*-position (the quantity of alkali not substantially exceeding that required for the formation of a phenolate). Examples are given of the condensation of benzanthrone with  $\alpha$ - and  $\beta$ -naphthols, 6-bromo-2-naphthol, 2-chloro-1-naphthol or *v-m*-xylenol, etc.

**Alcohols.** I. G. FARBERIND. A.-G. Fr. 656,178, June 21, 1928. Uni- or multivalent alcs. are prep'd. by catalytic hydrogenation of mixts. resulting from the condensation of an aldehydic or ketonic compd. on itself or with one or more compds. of the same group in the presence or absence of solvents, at ordinary or raised temp., under pressure, directly or after elimination of the unaltered aldehydes or ketones, but without elimination of the condensing agents. The condensing agents may be converted to insol. compds. before hydrogenating. Examples are given of the prepn. of 1,3-butyleneglycol,  $\alpha$ -ethylhexanol, b. 180-181°, glycerol and glycol with other multivalent alcs., as well as sirupy products.

**N-aminoalkylamino compounds.** I. G. FARBERIND. A.-G. Brit. 301,401, May 24, 1927. N-aminoalkylamino compds. are prep'd. by treating an amine or substitution product such as aniline or 8-aminoquinoline with a salt of an amino alc. sulfonic acid ester such as the hydrochloride of *p*-toluenesulfonic acid ester of  $\alpha$ -diethylamino- $\delta$ -pentanol or the hydrochloride of the  $\gamma$ -*p*-toluenesulfonic acid ester of  $\alpha$ -piperidyl- $\beta$ , $\gamma$ -dihydroxypropane.

**1,8-Naphthoxyphenanthrene, etc.** I. G. FARBERIND. A.-G. Brit. 300,771, Oct. 25, 1927. See Fr. 642,946 (C. A. 23, 1418).

**Catalytic oxidation of aromatic hydrocarbons and other compounds.** A. O. JAEGER (to Selden Co.). Brit. 300,968, Nov. 21, 1927. An app. is described in which vapor of the substance to be oxidized in admixt. with oxidizing gas is passed through heat-exchanging elements at least partly embedded in a catalyst layer in indirect heat-exchange relation with the catalyst, and then in successively reversed flows through the catalyst. Numerous details and uses of the app. are described.

**10-Chloroanthracene-9-aldehyde.** GEORG KALISCHER, HEINZ SCHEYER and KARL KELLER (to Grasselli Dyestuff Corp.). U. S. 1,717,567, June 18. This compd. crystallizes from org. solvents such as alc. as bright yellow needles, m. about 216°, and may be made by reaction between formylmonomethylaniline and P oxychloride and anthrone. Production of the following compds is also described: 3,10-dichloro-9-anthracenealdehyde, m. 174°; 1,5,10-trichloro-9-anthracenealdehyde, m. 197°; 1,2-dimethoxy-10-chloro-9-anthracenealdehyde, m. 172°; 2,6-dimethoxy-10-chloro-9-anthracenealdehyde, m. 233°.

**Azides of sodium and other metals.** O. MATTER. Brit. 300,401, Nov. 25, 1927. Na azide is freed from carbonate to render it suitable for use in the prepn. of azide of Pb or other heavy metals free from carbonate, by the addn. to its aq. soln. of hydrates or salts of alk. earth metals such as those of Ba.

**Alkali metal xanthates.** THOMAS W. BARTRAM and HAROLD P. ROBERTS (to Rubber Service Laboratories Co.). U. S. 1,718,937, July 2. Equimol. proportions of alc. and a metallic hydroxide such as KOH are mixed, cooled to about 20° and an equimol. proportion of CS<sub>2</sub> is added at a rate of 0.1-2.0% per min. while maintaining the temp. of the reacting mixt. between 0° and 50°; on completion of the reaction the product is heated to about 70° to decompose and volatilize unstable by-products. An arrangement of app. is described.

**Oxalates and formates.** GUY H. BUCHANAN, KENNETH D. ASHLEY and GEORGE BARSKY (to American Cyanamid Co.). U. S. 1,717,353, June 18. Ca cyanamide and Ca cyanide are treated with water to dissolve out substantially all the nitrogenous materials and form a soln. contg. a preponderance of Ca cyanamide; this soln. is digested under pressure at a temp. above 60°, NH<sub>3</sub> produced is removed, and the digestion sludge obtained is filtered to sep. solids contg. oxalates from soln. contg. formate. Cf. C. A. 23, 2254.

**Emetine.** CHEMISCHE FABRIK VORM. SANDOZ. Fr. 655,312, Apr. 21, 1928. See Brit. 291,088 (C. A. 23, 1216).

**Synthetic oxygenated organic compounds by catalytic hydrogenation of carbon oxides.** I. G. FARBERIND. A.-G. Brit. 300,294, July 7, 1927. Various compds. such

as alcs., esters and acids are made by passing C oxides and H at an elevated temp. (suitably 250–350°) and either under ordinary or under elevated pressure (which may be up to 1000 atm.) over catalysts comprising a mixt. of considerable amts. of Fe, Co, Ni, Pt, Pd or other metal of the 8th periodic group with Cd or Tl, with or without other materials such as Cu, Au, Ag, Ce, Zr, Al, V, U, Cr, Mo, W, Mn, alkali or alk. earth metals or their compds. Numerous details are given.

**Hydrogenated aromatic amino compounds.** I. G. FARBENIND. A.-G. Brit. 300,285, May 4, 1927. Hydrogenation with H under pressure in the presence of catalysts such as those contg. Ni, Co or Cu or their mixts. is applied to compds. in the liquid phase as in treating ethylaniline and dimethylaniline to produce the corresponding hexahydro compds. and various similar reactions. Compds. of the naphthalene series by this treatment yield tetrahydro compds. and those of the benzene series hexahydro compds. When an acyl group is present, it may be removed from the product by sapon.; a carboxylic ester product may be similarly treated. *ar*-Tetrahydro-1-amino-2-naphthol ethyl ether couples with *p*-nitrodiazobenzene to form a yellowish and with diazoazobenzene to form a brownish red dye. Its diazo compd. couples with 2-naphthol-3,6-disulfonic acid to form a pink dye. Other similar dyes also are described.

**Desulfurizing organic substances.** I. G. FARBENIND. A.-G. Fr. 655,230, June 5, 1928. Org. substances such as industrial benzenes are desulfurized by treatment either as liquid or vapor with H or gases capable of liberating it, at a high temp. under ordinary or raised pressure, in the presence of metallic sulfides stable under the conditions of working and either alone or with activating agents. H<sub>2</sub>S is formed which is easily sepd.

**Anthracene derivatives.** I. G. FARBENIND. A.-G. Brit. 300,407, Dec. 9, 1927. Condensation products (some of which are vat dyes) are obtained from  $\alpha$ - and  $\beta$ -mono or polyhydroxy compds of anthracene and  $\alpha$ -naphthoquinones negatively substituted in the 2- and 3-positions (at least one of the substituents being halogen). Several examples are given. The prepn. of nitro-2,3-dichloro- $\alpha$ -naphthoquinone is described.

**Dibenzanthrone.** I. B. ANDERSON, R. F. THOMSON, J. THOMAS AND SCOTTISH DYES, LTD. Brit. 301,403, July 22, 1927. B<sub>2</sub>-1-B<sub>2</sub>-1-dibenzanthronyl is treated with KOH and an alc. at temps. up to about 130° in the presence of an indifferent solvent or diluent such as kerosene, xylene or "petrol." Examples and details are given.

**Cymene derivatives.** J. SCHNIDELMEISER AND J. A. F. BEAVIS. Brit. 300,760, Oct. 18, 1927. Cymene is nitrated by use of org. nitrates such as alkyl nitrates and diacetylnitric acid or other acylnitric acid; H<sub>2</sub>SO<sub>4</sub> also may be added; cooling is preferably employed and after washing the product is distd. *in vacuo*. Cymene hydroxylamine and aminocymene are produced by reduction of nitrocymene.

**Benzidine and its derivatives.** RALPH A. NELSON (to National Aniline & Chemical Co.). U. S. 1,718,373, June 25. In forming compds. of the benzidine series from hydrazo compds., as in the formation of dianisidine from hydrazoanisole, H<sub>2</sub>SO<sub>4</sub> is added to a soln. of the hydrazo compd. in a solvent of the benzene series of low b. p. and inert character such as C<sub>6</sub>H<sub>6</sub> with vigorous agitation, so that the benzidine compd. seps out as sulfate in the form of a stiff paste.

**Thiourea.** I. G. FARBENIND. A.-G. Fr. 655,457, June 7, 1928. See Brit. 297,999 (C. A. 23, 2725).

**Apparatus for producing benzene by condensation of acetylene.** J. YLLA-CONTE Brit. 301,325, Nov. 26, 1927.

**Hydrogenated amines.** I. G. FARBENIND. A.-G. Fr. 655,810, May 7, 1928. Homologs of PhNH<sub>2</sub> are hydrogenated by heating them under pressure with H at a high temp. and in the presence of catalysts. Examples are given of the hydrogenation of *o*- and *m*-toluidine with a Co catalyst, and of *p*-xylylidine with Ni<sub>2</sub>O<sub>3</sub> as catalyst, and of  $\beta$ -naphthylamine to obtain tetrahydro- $\beta$ -naphthylamine and an alicyclic tetrahydro- $\beta$ -naphthylamine with a Ni catalyst.

**Continuous esterification processes.** IMPERIAL CHEMICAL INDUSTRIES, LTD., AND G. F. HORSLEY. Brit. 301,523, Aug. 3, 1927. In a continuous process for forming iso-BuOAc from iso-BuOH and HOAc or in similar processes in which the ester is removed in the form of vapor of an azeotropic mixt. of ester, alc. and water, water and in some cases ester is added to the reacting mixt. to facilitate the formation of the azeotropic mixt. A catalyst such as H<sub>3</sub>PO<sub>4</sub> may be used. An arrangement of app. is described.

## 11—BIOLOGICAL CHEMISTRY

PAUL E. HOWE

A—GENERAL

FRANK P. UNDERHILL

**The vitality of dental enamel.** WM. J. GIES. *Proc. Soc. Exptl. Biol. Med.* **26**, 69 (1928).—Pulverized normal enamel did not give the conventional reactions for proteolytic and amylolytic enzymes. This substantiates the belief that the contained protein, probably keratin, is not assocd. with intrinsic nutritional changes in the enamel of erupted teeth. C. V. BAILEY

**Stability of luminous substances of luminous animals.** E. NEWTON HARVEY. *Proc. Soc. Exptl. Biol. Med.* **26**, 133-4 (1928).—In 1918 the luminous materials, *luciferin* and *luciferase*, were extd. from the luminous ostracod crustacean, *Cypridina*. The animals were collected, dried quickly over  $\text{CaCl}_2$ , and powdered. Luciferin soln. is obtained by making a hot water ext. Heating destroys luciferase which can be extd. from *Cypridina* with cold water. The luciferin which dissolves at the same time is allowed to oxidize in the air, leaving luciferase alone in soln. These 2 substances when mixed together in water contg.  $\text{O}_2$  become brilliantly luminescent. Dry luciferin and luciferase can be kept unharmed for long periods. An aq. soln. of luciferin is also stable in the absence of  $\text{O}_2$ . Luciferase undergoes destructive changes in water soln. Luciferase pptd. with alc.; the ppt. dried and kept over  $\text{CaCl}_2$  for 10 years gave a good luminescence when mixed with luciferin soln. C. V. BAILEY

**Ultra-violet radiation; stimulation and inhibition in lower organisms.** MARIE A. HINRICHS. *Proc. Soc. Exptl. Biol. Med.* **26**, 175-7 (1928).—The amt. of radiation in a given region of the spectrum, which is absorbed by the protoplasm in a given period of time, detrs. whether there is to be an increase or decrease in the speed of physiol. processes. C. V. BAILEY

**Note on the penetration of electrolytes.** W. J. V. OSTERHOUT. *Proc. Soc. Exptl. Biol. Med.* **26**, 192-7 (1928).—When a weak electrolyte penetrates a living cell, and if the time curve of penetration is of the 1st order, the rate of penetration of undissocd. mols. may be regarded as  $(dx/dt) M = D_M P_M (M_o - M_i)$ , where  $D_M$  is the rate of progress through the protoplasm,  $P_M$  is the permeability of the protoplasm to mols.,  $M_o$  is the external and  $M_i$  the internal concn. of undissocd. mols. The corresponding value, when ion pairs alone enter (in the case of a binary electrolyte with no exchange of ions), is  $(dx/dt) P = D_P P_P K (M_o - M_i)$ , where  $K$  is the disson. const. If the protoplasm is equally permeable to undissocd. mols. and the ion pairs (*i. e.*, if  $P_M = P_P$ ) the penetration of ion pairs will be very small when  $K$  is small. When  $K$  is large the high elec. resistance of the protoplasm in *Nitella* and *Valonia* suggests that either  $D_P$  or  $P_P$  is small (*i. e.*, when a substance is present largely as ions there is very little penetration). If the external concn. remains const. while the  $p_H$  value changes so as to decrease the concn. of undissocd. mols., the rate of penetration will diminish even when the protoplasm is permeable to ion pairs only. These conclusions apply qualitatively when the time curve of penetration is not of the 1st order. With an exchange of ions the rate will be proportionate to the product of the exchanging ions on opposite sides. The fact that certain weak electrolytes enter rapidly and that the elec. resistance of the protoplasm in contact with strong electrolytes is very high suggests that strong electrolytes may enter largely as undissocd. mols. formed at the surface by collision of ions. C. V. BAILEY

**The thermal increments and critical temperatures of biological reactions.** ELLIS I. FULMER AND R. E. BUCHANAN. *Proc. Soc. Exptl. Biol. Med.* **26**, 446-9 (1929).—It is common practice to express temp. effects on rates of biological reactions in terms of van't Hoff-Arrhenius relationship by the use of the equation  $\log K = \mu/4.6T + \text{const.}$  or  $\mu = [4.6(\log K_2 - \log K_1)T_2T_1]/(T_2 - T_1)$ , in which  $K_2$  and  $K_1$  are the velocity coeffs. at abs. temps.  $T_2$  and  $T_1$ . The symbol  $\mu$  has been called the thermal const. Conclusion:  $\mu$  varies continuously with the temp. in the several biological reactions examd. The supposed const. value for  $\mu$  through a given temp. range has probably resulted from the use of a graph with too small scale ordinates to account in full for the exptl. inaccuracy of the velocity coeffs. C. V. BAILEY

**Reaction between proteins and diazotized aromatic amines in neutral solution.** MICHAEL HEIDELBERGER AND FORREST E. KENDALL. *Proc. Soc. Exptl. Biol. Med.* **26**, 482-4 (1929).—True chem. interaction, with resulting dye formation, takes place in neutral mixts. of diazotized aromatic amines and proteins. Neutral solns. contain

mixts. of unchanged protein, unchanged diazo compd. and a small quantity of protein dye; if a buffer or alkali is present to neutralize the acid liberated, the reaction goes in the direction of complete dye formation. Enough colored compd. is formed even in faintly acid soln. to be readily observed and to be detected by the specific precipitin test. The chem. data support Lansteiner's conception of the reaction and are contrary to Klopstock and Selter.

**X-ray diffraction of glycine.** MAURICE H. SIMMERS. *Proc. Soc. Exptl. Biol. Med.* 26, 527-9(1929).—Glycine crystallizes in plate crystals from water and in needle forms when alc. is added to an aq. soln. A study of x-ray diffraction patterns does not indicate any difference in the structure of the glycine mol. in these 2 forms.

**Behavior of pepsin.** F. GALLI. *Folia Clinica* 3, 191-208(1928).—Gross' caseinogen method for detg. the peptic activity of gastric juice is found unsatisfactory and a new method, which depends on the liquefaction of gelatin and gives more certain and exact results, is described. Examn. of a no. of patients suffering from gastric troubles shows that, although as a rule variation of the pepsin content of the gastric juice is accompanied by variation of the content of HCl, there is no fixed relationship between the two. When the free acid is lacking, pepsin also is usually absent but is occasionally present in small proportion.

**Osmotic pressure of egg albumin.** J. MARRACK AND L. F. HEWITT. *Proc. Physiol. Soc., J. Physiol.* 66, v(1928).—The osmotic pressure of isoelectric egg albumin has been measured by the use of NaCl solns. buffered with Na acetate and AcOH as external fluid. The calcd. mol. wt. is 43,000.

**Identity of glucide content in living plasma and in fluoride plasma.** GEORGES FONTÈS AND LUCIEN THIVOLLE. *Compt. rend. soc. biol.* 100, 1196-7(1929); cf. *C. A.* 21, 2712.—Plasma treated with NaF (0.2%) has the same amt of glucides as living plasma. There is no immediate exchange of glucides between plasma and cells.

**The permeability of red blood cells to plasma glucides.** GEORGES FONTÈS AND LUCIEN THIVOLLE. *Compt. rend. soc. biol.* 100, 1198-9(1929).—Red blood cells are only slowly permeable to glucides. Though their glucide content does not increase after a plasma hyperglucidemia of only a few min. duration, yet they show a marked increase in glucides after the plasma hyperglucidemia has been prolonged 30 min to 9 hr.

**A spectrographic study of constitutive lipides.** V. BRUSTIER AND L. BUGNARD. *Compt. rend. soc. biol.* 101, 420-2(1929).—An ext. of the total lipides of the whole rabbit and an ext. of the saponified residue (constitutive lipides) showed in 1% abs. alc solns. 4 absorption bands: 2823, 2684, 2628 and 2550. Conclusion: Ergosterol and its active transformation products exist in the constitutive lipides of the organism.

**Formation of urocanic acid in the tryptic digestion of edestin.** EMIL ABDERHALDEN, WILHELM IRION AND HANS SICKEL. *Z. physiol. Chem.* 182, 201-4(1929).—From the hydrolyzate obtained by 50 days' digestion of 300 g. edestin in 3 l. H<sub>2</sub>O with 48 g. pancreatin and 55 g. Na<sub>2</sub>CO<sub>3</sub>, the residual protein was removed by coagulation and the tryptophan, tyrosine and histidine were pptd. in 2 fractions by means of HgSO<sub>4</sub> in H<sub>2</sub>SO<sub>4</sub>. Fractional crystn. of the 2nd fraction yielded 0.12 g. of urocanic acid. A 2nd expt. under the same conditions gave no urocanic acid, but a 3rd yielded 0.1 g. urocanic acid from 200 g. edestin in 35 days. The substance was probably formed by bacterial action on histidine, despite the fact that the edestin suspension had been boiled and the digestion performed in the presence of CHCl<sub>3</sub> and PhMe. No urocanic acid could be obtained from the H<sub>2</sub>SO<sub>4</sub> hydrolyzate of edestin, nor by tryptic digestion of casein, yeast protein and Witte peptone. Another product obtained in working up the digestion mixt. was at first thought to be hydroxytryptophan, but was identified microscopically as a mixt. of tryptophan and tyrosine. This illustrates the necessity of caution before describing new protein-cleavage products.

**The influence of blood serum from normal and alkaptonuric individuals on homogentisic acid.** FRANZ LANYAR AND HANS LIEB. *Z. physiol. Chem.* 182, 218-26(1929), cf. *C. A.* 23, 2998.—Under the influence of atm. O at room temp. or at 37° free homogentisic acid in aq. soln. does not undergo any appreciable loss. The colorless oxidation product "oxyalkapton" postulated by Katsch and Stern (*Arch. klin. Med.* 151, 329) does not exist. The slight discoloration resulting from several days exposure of aq. homogentisic acid to the air has no effect on the detn. A diminution occurs only when the acid has been neutralized or free alkali is present. When free homogentisic acid in H<sub>2</sub>O or physiol. NaCl soln. is mixed with serum from individuals with normal metabolism a small loss occurs because of adsorption by the protein. This loss varies between 4 and 10% under the exptl. conditions studied. If the acid is par-

tially neutralized to the point where its addn. does not alter the  $p_H$  of the serum, the loss is greater, but this is due to oxidation at faintly alk. reaction by atm. O. The same result is obtained when egg albumin is substituted for serum. The identical phenomena are observed if the blood serum of an alkaptonuric is used. The assumption of Gross (C. A. 8, 1993) that human serum contains an enzyme which oxidizes homogentisic acid, and that of Katsch and Stern who claim that alkaptonuric serum contains a substance which inhibits the oxidation, are not supported by these expts.

A. W. DOX

**Biochemical synthesis of fumaric acid from pyruvic acid.** ALFRED GOTTSCHALK. *Z. physiol. Chem.* 182, 311-2(1929); cf. C. A. 22, 789.—A repetition of the previous expts., in which the fungus *Rhizopus nigricans* grown on a culture medium contg.  $Ac-CO_2H$  produced fumaric acid, failed to yield any trace of fumaric acid. The organism had evidently undergone a mutation, whereby this particular chem. activity had been lost. A similar instance of sudden loss of metabolic activity by another organism is cited from recent literature.

A. W. DOX

**Influence of various substances on lipase action.** ROBERT F. CORRAN. *Biochem. J.* 23, 188-94(1929).—Cholesterol and lecithin have little influence on lipase action. NaCl and KCl oppose the action of  $CaCl_2$ . Cu and Hg inhibit and Pb augments the effect of lipase. By fractionating ox serum, C. has shown that the albumin + pseudoglobulin fraction contains the greater part of the lipolytic co-enzyme. B. H.

**Glucolysis in muscle and other tissues.** EDWIN M. CASE. *Biochem. J.* 23, 210-8 (1929).—In the presence of small quantities of brain and kidney tissue, a muscle enzyme prepn., which alone is incapable of glucolysis, ferments glucose and gives lactic acid. This activation is compared with that brought about by addn. of the substance obtained by Meyerhof from yeast. The activation of glucose by brain and kidney tissue is assocd. with the presence of intact cell structures.

BENJAMIN HARROW

**Phosphoric esters in alcoholic fermentation. I.** The sequence of the formation of phosphoric esters and carbon dioxide in fermentation by dried yeast. ERIC BOYLAND. *Biochem. J.* 23, 219-29(1929).—The ratio of the various enzymes in dried yeast is such that under equil. conditions there is a large amount of hexosediphosphate together with a little monophosphoric ester. In presence of dried yeast the monophosphoric esters are produced late in the reaction with phosphate, and the P found in this form appears to liberate two equivalents of  $CO_2$ .

BENJAMIN HARROW

**The equation of alcoholic fermentation. II.** ARTHUR HARDEN AND FRANCIS R. HENLEY. *Biochem. J.* 23, 230-6(1929); cf. C. A. 22, 249.—The mol. ratio of  $CO_2$  to the total P esterified falls within the limits of 0.9 to 1.1, the tendency being for a low ratio with yeast juice, maceration ext. with zymine, and for a high ratio with dried yeast.

BENJAMIN HARROW

**Preparation and use of the bone phosphatase.** MAJORIE MARTLAND AND ROBERT ROBISON. *Biochem. J.* 23, 237-42(1929).—The phosphatase is extd. from the bones of young growing rabbits by means of water in the presence of  $CHCl_3$  and filtered. It may be further purified by pptn. with alc. and ether, by removing the protein by pptn. at its isoelec. point, and by dialysis and ultrafiltration. Its use in the hydrolysis of hexosediphosphoric acid is illustrated.

BENJAMIN HARROW

**Molecular constitution and accessibility to enzymes.** The effect of various substances on the velocity of hydrolysis by pancreatic lipase. DAVID R. P. MURRAY. *Biochem. J.* 23, 292-308(1929).—Ketones and aldehydes inhibit markedly the velocity of lipase hydrolysis. By converting the ketone to its oxime, this inhibitory power is lost. Secondary alcs. also inhibit, but this may be due to reversal of hydrolysis. A specific affinity exists between the carbonyl group and the active center of the enzyme.

BENJAMIN HARROW

**Recent advances in science : Biochemistry.** P. EGGLETON. *Science Progress* 24, 15-9(1929).—A review of recent work on the synthesis of thyroxine, the production of  $NH_3$  in muscular activity, and the curative action of the liver in pernicious anemia.

JOSEPH S. HEPBURN

**Asymmetric ester hydrolysis by enzymes. II.** The configuration specificity of the liver esterase of different animals and its dependence upon the concentration of the substrate. EUGEN BAMANN. *Ber.* 62B, 1538-48(1929).—The hydrolysis of *d*- and *l*-mandelic acid ethyl esters by the liver esterase of different animals depends upon the concn. of the substrate. The optimum for the (–) ester  $p_H = 7$ , with dog, human and rabbit enzymes, is 0.24 *M*. With increasing concn. the amount of acid formed by these three enzymes decreases. With horse and cattle enzymes, the max. is not yet reached at 0.96 *M*. Only with sheep enzyme has a max. been obtained in the (+) ester substrate because of its limited soly. Dissocn. consts. are tabulated for the dif-

ferent enzymes.  $K(-):K(+)$  equals 1.6:1 for hog esterase and 1.44:1 for sheep. Both esters were hydrolyzed with equal velocity by the hog and sheep enzymes and increase in the substrate concn. favors the (+) ester action. A greater decompn. velocity of the (-) reaction stands opposite a greater affinity of the enzyme for the (+) ester. The human, cat and dog enzymes have a greater affinity for the (-) ester. The checking of the velocity in higher concn. is unequal in the different enzymes. This is shown in the fall of the activity  $[P_n]$  curves for the (-) ester but only by a delay in the rise of the (+) ester curves. This has not yet been explained. With the racemic acid ester as a substrate, the specific rotation depends upon the concn. The change in direction of the rotation on increasing the concn. in small quantities is explained by the cooperation of the affinities of the enzymes for both optically active forms with the decompn. velocity of the (-) and (+) substrate-enzyme compds. With low ester concn. multiple (-) ester enzyme compds. form which cause a negative rotation of the racemate. In most concd. soln. the greater velocity of the (+) ester, the decisive factor for optical choice, reverses the rotation. Methods, data and curves are given

MARY E. LEAR

**The behavior of aromatic esters toward organic extracts. I. The action of pulped organs on the ethyl esters of benzoic and salicylic acids.** GUNSHI YOSHIMATSU. *Acta Schol. Med. Univ. Imp. Kyoto* 11, 599-615 (1929).—Solns. contg. 1.5 g. of  $BzOEt$  or  $o-HOC_6H_4CO_2Et$  in 100 cc. of  $CHCl_3-H_2O$ , 5 cc. of toluene and 3 g. of organ pulp were digested for periods up to 96 hr. at  $37^\circ$ . From time to time 5-cc. portions of the solns. were pipetted off and the amts. of acid split off estd. by titration with 0.1 *N* NaOH. For controls similar ester solns. were digested with 3 g. of organ pulp which had been heated on a water bath for 30 min. Furthermore in order to be certain that the acid formed was due to the splitting of the ester 3 g. of organ pulp, 100 cc. of  $CHCl_3-H_2O$  and 5 cc. of toluene were digested; analyses were made on 5-cc. portions of the controls. At the end of the digestion the benzoic or salicylic acid was recovered and the crystals were identified. The organs employed were (rabbit) kidney, muscle, spleen and pancreas. Liver was the most active with the benzoic ester while kidney was next; muscle was inactive. With the salicylic ester the result was similar to that with the benzoic ester but muscle showed some activity. Pancreas was active in each case but the figures are not comparative as the sample employed was only 0.6 g. **II. The action of organ extracts on the isobutyl, amyl and glyceryl esters of benzoic acid and on the isobutyl and amyl esters of salicylic acid.** *Ibid* 617-38.—In a manner somewhat similar to that described above the ester-splitting power of the glycerol ext. of organs of the hog was measured on various aromatic esters and on tributyrin. The action on isobutyl benzoate decreased in the order: liver, pancreas, kidney, intestinal mucous membrane and stomach mucous membrane, while on tributyrin the order was pancreas, liver, kidney, intestinal mucous membrane and stomach mucous membrane. The hydrolytic effects of the organ exts. on amyl benzoate were much less than on tributyrin; liver ext. was most active. A similar effect was found with glyceryl benzoate. Isobutyl salicylate was scarcely attacked even by liver. Amyl salicylate was still more difficult to hydrolyze in comparison with tributyrin and the effect of liver ext. was almost nil. **III. The action of organ extracts on the phenyl ester of benzoic and salicylic acids.** *Ibid* 639-48.—Phenyl benzoate was more or less split by organ exts. of the hog; liver ext. was the strongest. In comparison with tributyrin phenyl salicylate was but little attacked; liver ext. proved the strongest while pancreas was the weakest. Pig liver and kidney in comparison with pancreas are richer in esterase and poorer in lipase. G. H. W. LUCAS

**The behavior of ethyl- and phenylsulfuric acids towards organ extracts.** GUNSHI YOSHIMATSU. *Acta Schol. Med. Univ. Imp. Kyoto* 11, 649-60 (1929).—The action of the glycerol exts. of liver, kidney, pancreas and stomach and intestinal mucous membranes of the pig were studied on  $KEtSO_4$  and  $KPhSO_4$ ; sulfatase, the enzyme which splits  $H_2HSO_4$ , has been found by Neuberg in muscle and kidney of rabbits and guinea pigs. In the expts. of the author the exts. exerted no influence on these salts, while control expts. on tributyrin solns. showed much action. G. H. W. LUCAS

**The mass and size of protein molecules.** THE SVEDBERG. *Nature* 123, 871 (1929).—By means of measurements of sedimentation equil. and sedimentation velocity in strong centrifugal fields at const. temp. a systematic study of the mass and size of the mols. of various proteins has been carried out. All native proteins can be divided into two groups, hemocyanins with mol. wt. of the order of millions and all other proteins of the order 35,000 to 210,000. Two members of the first group have been studied. The proteins of the second group are divided into 4 sub-groups; the mol. mass, size and shape are about the same for all proteins within such a sub-group. The mols. of sub-groups 1 and 2 are spherical with a radius of 2.2  $\mu\mu$  and 4.0  $\mu\mu$ , while those of group



3 are non-spherical. Mols. of sub-group 4 are easily disaggregated with increasing  $p_H$ . Thus *R-phycoeyan* at  $p_H$  4.6 belongs to the 4th sub-group while at  $p_H$  6.8 it belongs to sub-group 3; its mols. have disaggregated into halves and have lost their spherical shape. In nature it would seem that numerous proteins are all built up according to some general plan which secures for them only a very limited number of different mol. masses and sizes when present in aq. soln. G. H. W. LUCAS

**The surface of the white rat with its application to the expression of metabolic results.** M. O. LEE WITH ELIZABETH CLARK. *Am. J. Physiol.* **89**, 24-33(1929).—Skin areas of 72 rats were measured by applying a coat of quickly drying varnish to the animals before skinning, thus preventing stretching. A modified Meeh-Rubner formula for the calcn. of area from body wt. is proposed, viz.,  $S = 12.54 W^{0.60}$ , where  $S$  = area in sq. cm. and  $W$  = wt. in g. A better formula involves a correction for the nutritional state, viz.,  $S = 10.76 W^{0.61} \times 0.310/N_{obs.}$ ;  $N_{obs.} = W^{1/3}/L$ ,  $L$  = length from nose to anus. The heat production of the rat with reference to body surface, as predicted by these formulas, is brought into closer agreement than hitherto with the heat production of humans. J. F. LYMAN

**Effect of anoxemia, carbon dioxide and lactic acid on electrical phenomena of myelinated fibers of the peripheral nervous system.** PETER HEINBECKER. *Am. J. Physiol.* **89**, 58-83(1929).—Anoxemia,  $CO_2$  and lactic acid, in general, raised the threshold, lengthened the abs. refractory period, decreased the cond. and the amplitude of the action potential of nerves. These effects were reversed during recovery induced by  $O_2$  and washing with Ringer's soln. J. F. LYMAN

**The reversible loss of excitability in isolated amphibian voluntary muscle.** W. DULIERE AND H. V. HORTON. *J. Physiol.* **67**, 152-65(1929).—Isolated frog's sartorius muscles, dissected without the use of Ringer's soln., and suspended at room temp. in moist  $O_2$ ,  $N_2$ , air, air with 5%  $CO_2$ , paraffin oil or Hg rapidly became reversibly inexcitable. This loss of excitability was shown not to be due to changes in phosphagen or to the accumulation of lactic acid in the muscles. Excitability could be restored by immersing the inexcitable muscles in Ringer's soln. It is suggested that inexcitability may be caused by the accumulation of K ions in the interspaces between the muscle fibers. J. F. LYMAN

**The disappearance of histamine from autolyzing lung tissue.** C. H. BEST. *J. Physiol.* **67**, 256-63(1929).—Lung and other tissues (kidney and liver), when suspended in saline and incubated at 37° with toluene, caused the disappearance of naturally occurring or added histamine. The disappearance of histamine was completely prevented by heating the suspension at 90° for 4 min.; it proceeded rapidly during the first period, became slower and practically ceased while there was still histamine available and the addn. of more histamine to this mixt. produced a renewed disappearance of histamine. An enzyme action is suggested. J. F. LYMAN

**The effect of temperature on the equilibrium of carbon dioxide and blood and the heat of ionization of hemoglobin.** G. S. ADAIR, N. CORDERO AND T. C. SHEN. *J. Physiol.* **67**, 288-98(1929).—The  $CO_2$  dissoen. curves of blood and of hemoglobin solns. were measured at 0°, 15° and 38°. The heat of ionization calcd. from the observation was less than that observed by calorimetric methods. The discrepancy can be explained on the assumption that the heat is partly due to the ionization of the COOH groups and partly due to the ionization of  $H_2O$  and the combination of OH ions with the proton. The fraction of the heat due to the ionization of COOH groups is a function of the  $p_H$  and in the calorimetric detns. recorded, the  $p_H$  is greater than that which obtains in the blood. The magnitude of the heat of ionization indicates that neutral proteins may exist as doublet ions. J. F. LYMAN

**Gas tensions at the skin surface of man.** J. A. CAMPBELL. *Proc. Physiol. Soc., J. Physiol.* **67**, viii(1929).—When the hand and lower forearm were enclosed in a glass cylinder in such a way that gaseous equil. could be attained between the gas of the cylinder and the skin,  $CO_2$  equil. was reached at about 40 mm.  $CO_2$  tension. At  $O_2$  tensions of the surrounding gas less than 50 mm.,  $O_2$  neither diffused into the hand nor out of it. At tensions above 50 mm.,  $O_2$  slowly diffused in. Conclusion: The skin is impermeable outwards to  $O_2$ . J. F. LYMAN

**Diffusion through the wall of the living and the dead intestine.** H. E. MAGEE AND J. J. R. MACLEOD. *Proc. Physiol. Soc., J. Physiol.* **67**, xvii(1928).—Glucose or KI diffused much more rapidly through dead intestine than it did through the living intestine. J. F. LYMAN

**Claude Bernard's conception of the internal environment.** J. S. HALDANE. *Proc. Physiol. Soc., J. Physiol.* **67**, xxii(1929).—Bernard first formulated the view that the blood of a living animal is an internal medium kept remarkably const. as regards

its physico-chem. conditions by the coordinated influence upon it of the various organs of the body. Objection is made to the title of L. J. Henderson's book "A Study in General Physiology" when it is, in fact, a study in phys. chemistry, since he regards the blood as something which, as the result of various buffer reactions occurring within itself, is not as readily disturbed in its physico-chem. conditions as other liquids would be.

J. F. LYMAN

The molecular constitution of cholesterol and the chemistry of biliary acids (CUNY)

10.

**Enzymic reactions.** FRIEDRICH F. NORD. Fr. 655,664, June 13, 1928. The speed of enzymic reactions is increased by increasing the surface of the colloiddally dissolved enzymes, before coming in contact with the substratum to be transformed, by an increased peptonization and protecting it with easily absorbable compds. The absorptive layer is produced on the active material or on the substratum or on both by treatment with  $N_2O$ ,  $C_2H_2$ ,  $C_2H_4$ , propylene, butylene, amylene or mixts. thereof

## B—METHODS AND APPARATUS

STANLEY R. BENEDICT

**The peroxidase reaction. XXV. The oxidase and the peroxidase reaction in different leucocytes of the blood.** KOJI TOKUŌ. *Tohoku J. Exptl. Med.* **12**, 445-58 (1929); cf. *C. A.* **23**, 3245.—An extensive review of the literature is given. Reliable counter-stains are developed for the oxidase and peroxidase reactions, which are investigated for each type of leucocyte. Two plates are given. **XXVI. The blood mast cell and its oxidase and peroxidase reactions.** *Ibid* 459-96. Blood mast cells of all the animals examd., including man, are all with the exception of those of the guinea pig, oxidase- as well as peroxidase-negative. Two plates are given. B. C. B.

**The ammoniacal silver solutions used in neuropathology: Their staining properties, chemistry and methods of preparation.** L. S. KUBIE AND D. DAVIDSON. *Arch. Neurol. and Psychiat.* **19**, 888-903 (1928); *Physiol. Abstracts* **13**, 551. H. I. D.

**A chemical study of the Manoilov test for the differentiation of the sexes.** K. G. FALK AND I. LORBERBLATT. *Brit. J. Exptl. Biol.* **4**, 305-12 (1927); *Physiol. Abstracts* **13**, 598.—This test is shown to be independent of the presence of enzymes in the substances tested or the reagents used. Its chemistry is still uncertain, though probably dependent on an oxidation, and possibly on the content of glutathione. An investigation on ovarian and orchidic exts. has indicated various substitutions and simplifications which improve the test. Where  $FeCl_3$  produces obscuring ppts. in the material under examn., the use of permanganate and afterward thiosulfate is recommended. In testing bloods and leaves, cases are recorded in which the normal color reaction is reversed. H. I. D.

**The determination of phosphatides.** BRUNO REWALD. *Allgem. Oel- u. Fetttech.* **25**, 35-6; *Chem. Zentr.* **1928**, I, 1239; cf. *C. A.* **22**, 4591.—In obtaining phosphatides from spinal cord, egg yolk, brains, etc., a single extn. with solvents never gave good results, but yielded a series of more or less sol. phosphatides. The soly. depends upon whether or not the proteins have been sep'd out. The detn. is made most rapidly by washing in a Kjeldahl flask, subsequently dilg. with  $H_2O$  and  $NH_4NO_3$  and pptg. the  $P_2O_5$  by the use of  $NH_4$  molybdate soln. C. R. FELLERS

**Progress in the standardization of stains. Definiteness in staining formulas.** H. J. CONN. *Stain Tech.* **4**, 33-5 (1929); cf. *C. A.* **23**, 403.—A plea is made that investigators be more precise in stating all staining formulas. There are 3 primary types of basic fuchsin and since stains purchased may consist of various mixts. of these 3 compds. it is desirable to state the color index no., dye content and precise methods of procedure. C. R. FELLERS

**The history of staining. Logwood dyes.** H. J. CONN. *Stain Tech.* **4**, 37-48 (1929); cf. *C. A.* **23**, 403.—*Hematoxylin*, a glucoside, is a purified form of the dye present in logwood ext. and is manufactured by extn. with  $Et_2O$  and subsequent crystn. with  $H_2O$ . In staining, hematoxylin must be oxidized into *hematein*. Waldeyer (1863) first used hematoxylin as a biol. stain. The  $SO_2$ -bleached dye proved unsatisfactory. A full bibliography is appended. C. R. FELLERS

**The chemical analysis of thiazine eosinates.** W. C. HOLMES. *Stain Tech.* **4**, 49-52 (1929).—The constituents of blood stains are normal eosinates of the thiazine series of dyes. Methods are outlined for the chem. examn. of blood stains which are based upon the complete reduction of all dye components present in buffered solns. of limited acidity and the reduction of their thiazine components alone in strongly acid solns.

Chem. analysis should include moisture (drying to const. wt. at  $110^{\circ}$ ), thiazine and total dye content. The thiazine content is detd. by dissolving a 0.2 g. sample in 50 cc. glacial AcOH, adding 100 cc. of alc., heating to boiling and titrating with  $N\ TiCl_3$  in a current of  $CO_2$ . The final disappearance of a green tint in the orange soln. is considered the end point. The total dye content is detd. by dissolving a 0.2 g. sample in 100 cc. alc., adding 100 cc. of  $H_2O$  and 50 cc. of a 20% Rochelle salt soln., heating to boiling and titrating under  $CO_2$ . The final disappearance of the pink tint is the end point. The character of the thiazine components of the eosinates in blood stains can be best detd. spectrophotometrically but chem. examn. is a useful supplementary procedure.

C. R. FELLERS

Dialysis of small volumes of serum under sterile conditions. CECIL I. B. VOGEL.

*Biochem. J.* **23**, 185-7 (1929).

BENJAMIN HARROW

Studies on the biochemistry of sulfur. II. Further studies on the distinctive reaction for cysteine and cystine. M. X. SULLIVAN. *U. S. Pub. Health Repts.* **44**, 1421-8 (1929); cf. *C. A.* **20**, 2686.—Heavy metals and oxidizing salts should not be present. Among the new compds. tested were *ergothionine*, Mueller's *thioamino acid*, T. B. Johnson's *disulfide of thiotyrosine*, *cystine amine*, *furfural*, *levulinic acid* and *pyruvic acid*. All of these compds. were found to be neg. with the Sullivan procedure for cystine.

J. A. KENNEDY

Application of transmittancy measurements to biochemistry. FRANK M. SCHERTZ.

*Science* **69**, 631-6 (1929).—An address.

W. D. LANGLEY

The oxidative determination of phospholipid (lecithin and cephalin) in blood and tissues. W. R. BLOOR. *J. Biol. Chem.* **82**, 273-86 (1929).—Bang's principle of measurement of the non-phosphate part of the lecithin and cephalin mol. is followed; oxidation with  $N\ K_2Cr_2O_7$ , and the ordinary method of isolation of the phosphatides by pptn from  $Et_2O$  or petroleum ether with  $Me_2CO$  and  $MgCl_2$  gives satisfactory results on mg. amts. of lecithin and cephalin. Methods are described for whole blood, plasma or serum, corpuscles and tissues. With blood plasma the oxidative and ordinary nephelometric methods agree quite well. With tissues the 2 methods give comparative results, provided the phospholipid is pptd. by  $Me_2CO$  and  $MgCl_2$  before it is detd. nephelometrically. The use of this method avoids the assumptions that (a) all significantly important phospholipids are of the nature of lecithin and cephalin and (b) all alc.- or  $Et_2O$  sol. P is of the lecithin-cephalin type of combination, assumptions generally near enough to the truth for practical purposes but not true nevertheless. A. P. LOTHROP

Acetone as a control substance for respiration and gas analysis apparatus. THORNE M. CARPENTER, EDWARD L. FOX AND ARTHUR F. SEREQUE. *J. Biol. Chem.* **82**, 335-43 (1929).—Acetone possesses certain qualities that render its use superior to that of alc. as a control substance for respiration and gas analysis app. It can be bought in a high degree of purity and therefore does not have to be standardized, it is not hygroscopic, it burns readily in air and the ratio of  $CO_2$  produced to  $O_2$  required in its combustion is 0.75, a quotient within the range of normal respiratory quotients of man. Its use as a substance for control tests of the gasometer method and of the Haldane portable and the Haldane-Carpenter gas analysis app. is described and also the use of combinations of acetone and alc. with the Benedict universal app. No rubber connections can be used with acetone. A. P. LOTHROP

Determination of sugar in blood. I. Observations upon Benedict's alkaline copper solution. MARK R. EVERETT. *J. Biol. Chem.* **82**, 369-76 (1929).—The presence of sulfite in alk. Cu mixts. lowers the apparent blood sugar values regardless of the nature of the other components of the solns. With these reagents there is an unequal and deceptive fading of the colors in the standard and unknown. Benedict's new blood sugar method (*C. A.* **22**, 1375) therefore does not give true blood sugar values. The use of 4 cc. of Folin's acid molybdate soln. is suggested as a possible modification. A. P. L.

The Van Slyke method for the determination of chlorides in blood and tissue. ANNA J. EISENMAN. *J. Biol. Chem.* **82**, 411-4 (1929).—"Although Wilson and Ball (*C. A.* **22**, 4557) claim that the Van Slyke chloride method gives low results in some human and dog sera, we were unable, in a series of 7 bloods and 11 sera (human), to obtain any higher results by the Wilson and Ball modification than by the Van Slyke method. It therefore seems justifiable to assume that the Van Slyke method for the detn. of chlorides is accurate and reliable." A. P. LOTHROP

The colorimetric determination of the serum proteins. DAVID M. GREENBERG. *J. Biol. Chem.* **82**, 545-50 (1929).—The colorimetric method described is based on the color developed with Folin's phenol reagent. Howe's method of sepg. the serum proteins by  $Na_2SO_4$  is employed. The results obtained are accurate to about 5% and the

method provides a rapid and relatively simple means of detg. the serum proteins for clinical purposes. A. P. LOTHROP

**The determination of the inorganic phosphate of the serum on the filtrate from calcium analysis.** LEWIS GUNTHER AND DAVID M. GREENBERG. *J. Biol. Chem.* **82**, 551-3(1929).--A method is described for the detn. of the inorg. phosphate in the supernatant fluid from serum Ca or ultrafiltrate Ca detns. The Fiske and Subbarow method is used, the excess of oxalate from the Ca detn. being removed by oxidation with  $\text{KMnO}_4$ . The supernatant fluid from the Ca detn. on a 2 cc. sample is sufficient. The variation from the direct detn. on the original serum is on an av. less than 3%. A. P. L.

**The determination of the rate of hemolysis by the measurement of light transmission.** H. D. KESTEN AND T. F. ZUCKER. *Am. J. Physiol.* **87**, 263-73(1928).--The transmission of light by dil. blood suspensions to which hemolytic agents had been added was recorded from moment to moment by a potassium hydride photoelectric cell as a measure of the rate of hemolysis. J. F. LYMAN

**An improved method for the determination of cardiac output in man by means of ethyl iodide.** ISAAC STARR, JR., AND C. J. GAMBLE. *Am. J. Physiol.* **87**, 450-73(1928).--The method previously described (*C. A.* **21**, 2712) for the detn. of small amts. of  $\text{EtI}$  in blood has been adapted for larger samples (60 cc.). The distribution coeff. for  $\text{EtI}$  between air and blood at  $37^\circ$  is independent of changes in concn. from 1.2 to 48 mg per 1000 cc. of air. The av. value for 7 normal human subjects was 6.1, varying from 5.6 to 6.5. To det. blood flow the subject breathes a gas mixt. contg.  $\text{EtI}$ . After 12 min. samples of inspired air, expired air and alveolar air are taken for  $\text{EtI}$  detn. The subject then rebreathes 1000 cc. of air for 30 secs., and the rebreathed air is analyzed for  $\text{EtI}$  as a measure of the venous concn. of  $\text{EtI}$ . Blood flow is calcd. from the  $\text{EtI}$  content of (1) inspired air,  $I$ , (2) expired air,  $E$ , (3) alveolar air,  $A$ , (arterial blood), (4) rebreathed air,  $R$ , (venous blood), (5) respiration vol. and (6) distribution coeff. Blood flow =  $(I - E) \times \text{respiration} / (A - \text{corrected } R) \times \text{temp. correction} \times \text{distribution coeff}$ . The method has been checked, perfused dog lungs being used. Consecutive detns. on 2 human subjects supine and at rest give confidence in the method. J. F. LYMAN

**The behavior of ethyl iodide in the body.** ISAAC STARR, JR., AND C. J. GAMBLE. *Am. J. Physiol.* **87**, 474-85(1928).--Contrary to the belief of Henderson and Haggard (*C. A.* **22**, 3184) the  $\text{EtI}$  method of H. and H. of detg. the rate of blood flow in man is faulty because of the stability of  $\text{EtI}$  in the body and its presence in the venous blood.  $\text{EtI}$  behaves in large part like an indifferent gas and distributes itself in blood and tissues according to its soly. in their various components. Because part of the  $\text{EtI}$  is destroyed in blood and tissues satn. of the body at the concn. inspired is delayed and the difference between arterial and venous concns. remains large even after prolonged inhalation. J. F. LYMAN

**Physiological activity and the Manoilov reaction.** OSCAR RIDDLE AND W. H. REINHART. *Am. J. Physiol.* **87**, 517-25(1928).--See *C. A.* **23**, 1149. J. F. LYMAN

**The determination of the cardiac output in man by the use of acetylene.** ARTHUR GROLLMAN. *Am. J. Physiol.* **88**, 432-45(1929).--Acetylene has many advantages to recommend its use as a foreign gas for the detn. of cardiac output by the method of Marshall, Harrop and Grollman (*C. A.* **23**, 2455). Consecutive detns. on the same individual by the method showed a variation of about 2%. The cardiac output, like other bodily functions, is constant for an individual in a relative constant state of rest. J. F. LYMAN

**A microchemical method for determination of the absolute blood volume, with data upon the blood volume of the guinea pig, white rat, rabbit and cat.** STEPHEN WENT AND C. K. DRINKER. *Am. J. Physiol.* **88**, 468-78(1929).--The method employs a capillary scale, the tubes of which contain different known dilns. of vital red. The blood samples, collected after the injection of vital red, are sealed in similar capillary tubes, and, after centrifugalizing, the dye concn. in their plasma is detd. by comparison with the tubes of the standard scale. 0.01 cc. of blood suffices for a single detn. Blood vols. for the guinea pig were from 3.5 to 5.5% of the body wt., for the rat 7.4%, for the rabbit 8.7%, and for the cat 6.2%. J. F. LYMAN

**A method of oxygenating blood.** L. E. BAYLISS, A. R. FEE AND E. OGDEN. *J. Physiol.* **66**, 443-8(1928).--An artificial lung consisting of alternate revolving and stationary plates is described. Its advantages are that the production of foam is avoided and it permits rapid and effective oxygenation of blood. With 54 cc. of blood in the app. at any one moment and operating in  $\text{O}_2$ , it will introduce 19.0 cc. of  $\text{O}_2$  per min. into the blood flowing through it. J. F. LYMAN

**The determination of the carbon dioxide content of the mixed venous blood.** I.

**The effect of oxygenation and the critical oxygen tension.** M. C. G. ISRAËLS AND F. W. LAMB. *J. Physiol.* **67**, 49–61(1929).—If the  $\text{CO}_2$  content of the venous blood is to be detd. by the method of rebreathing a gas mixture until equil. is reached, care must be taken that the final  $\text{O}_2$  content of the rebreathed gas does not fall below the critical point, *i. e.*, sufficient to insure full oxygenation of the mixed venous blood, which is about 25% of an atm. A method is described for carrying out rebreathing expts. without a very rapid lowering of  $\text{O}_2$  tension in the rebreathing bag, and a method for rapid changing from one respiratory circuit to another. J. F. LYMAN

**Mercurimetry as a method for determining alkaloids.** M. AIAZZI-MANCINI. *Boll. soc. ital. biol. sper.* **4**, 222–3(1929).—This method is not adapted for detg. ethyl strychnine in urine. PETER MASUCCI

**Arrangement applicable to the mercury ureometer of A. Leclère.** J. EURY. *Bull. sci. pharmacol.* **36**, 291–2(1929).—The app. consists of a graduated tube with stopcocks on both sides and connected on the lower end by a rubber tube to a glass bulb contg. Hg. The upper end is prolonged into a funnel. A description of the manipulation is given. A. E. MEYER

**Comparative studies on the determination of cholesterol in blood serum by gravimetric and volumetric procedures.** V. N. NEKLUDOV AND S. S. CHALALOV. *Biochem. Z.* **208**, 60–72(1929).—The highest values for total blood cholesterol were obtained with serum boiled for 8 hrs. with 20 or 45% NaOH. The cholesterol is extracted with ether and after evapn. dissolved in hot 96% alc. and detd. by Windaus' method of pptn. with digitonin. For the detn. of the free cholesterol/cholesterol ester ratio the best results were obtained by Fex' procedure which detcs. 97% of the total cholesterol. The colorimetric method of Grigaut in at least a third of the detns. produces a variation from the standard which prevents the correct reading; where this difficulty does not occur the results are usually 8–12% too high. The colorimetric detn. by Krastelswsky' procedure is more reliable and allows the recovery of 95–98% of the total serum cholesterol. S. MORGULIS

**Titrimetric phosphorus determination in small quantities of serum and cerebrospinal fluid.** KURT SAMSON. *Biochem. Z.* **208**, 230 6(1929).—Serum is deproteinized with  $\text{CCl}_3\text{CO}_2\text{H}$ . Five cc. of the clear filtrate (dilm. 1:10 or 1:5) is measured into a 12 cc. centrifuge tube; to this are added 1.5 cc. of a soln. made up by mixing 400 cc. 50%  $\text{NH}_4\text{NO}_3$  with 100 cc.  $\text{HNO}_3$ , sp. gr. 1.4, and then 1 cc. of 10%  $\text{NH}_4$  molybdate soln. After the soln. stands overnight in an incubator, the sides of the tubes are washed with 1–2 cc. of 1%  $\text{KNO}_3$  soln. and the tube is centrifuged for 3–4 min. The ppt. is washed several times with  $\text{KNO}_3$  until the supernatant fluid turns alk. to phenolphthalein on adding a drop of  $N/40$  NaOH. The ppt. is dissolved in 2 cc.  $N/40$  NaOH, or more may be added if necessary. A similar amt. of alkali is measured into another tube (control). For each 2 cc. of the alkali 0.5 cc. of formalin is added and well shaken. The formalin soln. is prepd. by neutralizing 20 cc.  $\text{HCHO}$  in 50 cc.  $\text{H}_2\text{O}$ , contg. 1 cc. of 1% phenolphthalein, with 0.1  $N$  NaOH and dilg. to 100 cc. The soln. should retain a faint pink color. The mixt. is titrated now with  $N/40$  HCl until the phenolphthalein is decolorized. Amts. of P ranging between 0.15 and 0.01 mg. can be detd. with an accuracy of 0.001–0.002 mg. S. MORGULIS

**A new method for the simultaneous determination of pepsin and lipase in gastric juice.** L. GÓZONY AND F. HOFFENREICH. *Biochem. Z.* **208**, 259–61(1929).—To 2 cc. gastric juice enough 0.1  $N$  NaOH or HCl is added to bring the  $p_{\text{H}}$  to 5.6, bromocresol purple being used as indicator, and this is dild. with physiol. saline to 4 cc. A series of dilns. of this juice is prepd. (1:2, 4, 8, 16, etc.), and to each 1 cc. of satd. monobutyrin soln. is added and, after keeping 30 min. at  $37^\circ$ , 1 cc. of 0.2% casein soln. (made by dissolving 0.2 g. casein in 10 cc. 0.1  $N$  NaOH, followed by a little 0.1  $N$  HCl and sufficient physiol. saline to make up to 100 cc.; 0.5% AcOH is then added until a strong opalescence results when the  $p_{\text{H}}$  = 5.6). After another 30 min. in the water bath at  $37^\circ$ , if in certain dilns., the casein ppts. owing to the acidity due to the lipase action. The pepsin activity is detd. by the digestion of the pptd. casein. S. MORGULIS

**Microchemical determination of protein with the aid of the centrifuge.** K. SAMSON. *Biochem. Z.* **208**, 262–73(1929).—In special centrifuge tubes, having a portion of 0.08 cc. capacity calibrated in 0.002 cc., are placed 0.6 cc. of spinal fluid and 0.3 cc. Esbach's reagent, and 0.6 cc. spinal fluid and 0.6 cc. satd.  $(\text{NH}_4)_2\text{SO}_4$ . The solns. are thoroughly mixed and left standing exactly 30 min. and 2 hr., resp. They are then centrifuged at a speed of 3000 revolutions per min. for exactly 40 and 20 min., resp. The value obtained in the first tube represents the total protein content. In the second tube the supernatant fluid is removed with a fine pipet, the ppt. of globulin is dissolved in 0.6 cc.  $\text{H}_2\text{O}$ , then pptd. with 0.3 cc. Esbach's reagent. After standing exactly 30

min. it is centrifuged exactly 40 min. This gives the value for globulin, the albumin being the difference between these 2 results. S. MORGULIS

A new microcolorimetric method for the determination of chloride ions in organic fluids. RICARDO CALATRONI AND EMILIO TSCHOPP. *Biochem. Z.* 208, 274-8(1929).—The deproteinized org. soln. while hot is treated with an excess of a standard 0.005 N AgNO<sub>3</sub> soln. and the insol. Cl removed by centrifuging. To an aliquot of the supernatant fluid are added 0.5% gelatin and H<sub>2</sub>S, the resulting Ag<sub>2</sub>S being detd. colorimetrically. The calcn. is made according to the formula:  $[X - (A \cdot Y \cdot Z / C)] \times \text{factor} = \text{g. NaCl per l.}$ , where  $X$  = amt. of AgNO<sub>3</sub> (8.494 mg. per cc.),  $A$  = reading of known,  $b$  = reading of unknown soln.,  $Y$  = AgNO<sub>3</sub> of known soln. (4.247 mg.) and  $Z$  = diln. of the unknown. S. MORGULIS

A source of error in the blood sugar determination by Bang's microchemical method. EMMY RAITH. *Biochem. Z.* 208, 357-60(1929).—The filter papers, which are sold for the purpose of the blood sugar detn. by Bang's microchem. method, contain substances which reduce Fehling's soln. It is possible to free them from these reducing substances by a special process of washing but this alters their absorption power to such a degree as to make them useless for the analysis. S. MORGULIS

Microchemical determination of morphine. II. Morphine determination in serum and in whole blood. PETER FLEISCHMANN. *Biochem. Z.* 208, 392-414(1929), cf. C. A. 23, 3774—Expts. with sheep rabbit and guinea-pig blood show that it is possible to det. morphine exactly without the need for extraction and purification. The blood is deproteinized with 14.5% uranium nitrate; the excess of uranyl is removed with a very concd. phosphate soln. It was found possible to det. accurately as little as 0.01 mg. morphine per cc. with 5-7 cc quantities of blood. In blood serum, because smaller amts. of uranium nitrate are needed for the deproteinization and the removal of the excess is much less of a problem, the detn. is carried out with greater ease. The errors of analysis in blood and serum are about the same as those in pure solns. S. M

The problem of ashing biological material. II. ROSSENBECK. *Biochem. Z.* 208, 428-42(1929).—A method is described for ashing previously dried material with fuming HNO<sub>3</sub> in a closed system. S. MORGULIS

A simple method for the determination of color shades and color intensities of fluids. ERKKI LEIKOLA AND WM. KERPOLLA. *Skand. Arch. Physiol.* 56, 261-4(1929)

A Walpole comparator with 4 fundamental color solns. (6% Co(NO<sub>3</sub>)<sub>2</sub>·6H<sub>2</sub>O of sp. gr. 1.0323; 0.1% K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>; 15% NiSO<sub>4</sub>; and a mixt. of 5 parts 10% CuSO<sub>4</sub> and 95 parts 5% NH<sub>4</sub>OH), red, yellow, green and blue, is used. Each of these solns. is prepd. in 15 different dilns. The color of the tested fluid is expressed by a formula giving the dilns. of the combination of fundamental colors, thus,  $R_i - Y_i - B_i$ , etc. S. M

The estimation of sugar in small quantities of blood. H. D. BARNES. *J. S. African Chem. Inst.* 10, No. 2, 48-50(1927) C. T. S

Determination of calcium in blood. TEIICHIRO HAMADA. Hokkaido Imp. Univ. Hokkaido J. Med. 6, 173-82(1928).—H. examd. the known methods of Ca detn. in the blood, finding that when the quantity of the blood is above 2 cc. the Clark method, and when it is less than 2 cc. the de Waad method as improved by H., are suitable. Method. Dry 2 cc. of the citric acid-blood mixt. and calcine. Treat the residue with 1 cc. of satd. (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> soln., warm and then further treat with NH<sub>4</sub>OH and glacial AcOH and digest for 10 min. on a water-bath. After allowing to cool, centrifuge the mixt., dissolve the ppt. in 2 cc. of 15% H<sub>2</sub>SO<sub>4</sub> and titrate with 0.01 N KMnO<sub>4</sub>. K. SOMEYA

Study of physiological conditions and functions of organs and glands by biological analysis of urines. I. Diagnosis of pregnancy. CASIMIR FUNK AND HENRI R. OLIVIER. *J. pharm. chim.* [8], 8, 449-53(1928).—The method used for the detection of folliculin (A) in the blood of pregnant women (Frank and Goldberger, *J. Am. Med. Assoc.* 90, 106 (1928)) is applied to urine. Evap. urine to near dryness, take up with EtOH, again evap., take up with Et<sub>2</sub>O or with CHCl<sub>3</sub> (Veler and Doisy, C. A. 22, 4553), dissolve the evapn. residue in olive oil and det. the biol. activity of the soln. by injection into rats (Burn method, C. A. 22, 1789). In urines of non-pregnant women, A could not be detected even in as much as 1400 cc. In the urine of pregnancy, A begins to appear in the 6th week, and may be detected in less than 30-50 cc. This confirms results by previous authors (Zondek, Aschheim, C. A. 22, 1182, 2597, 4600). The method of diagnosis by Zondek (detecting in the urine of pregnancy the hormone of the posterior lobe of the hypophysis) seems less sp. than that of detecting A. In doubtful cases of early pregnancy, a combination of both methods is suggested. S. W.

Detection of biliary pigments in urine. CHARLES KUHN. *J. pharm. chim.* [8], 8, 546-9(1928).—To 20 cc. of urine in a test tube add 2 cc. of soln. A (5% aq. CuSO<sub>4</sub>·5H<sub>2</sub>O,

20 cc.,  $\text{NH}_4\text{OH}$  22°Bé. 10 cc.), mix, add at once 2 cc. of soln. B ( $\text{H}_3\text{PO}_4$  60° Bé. 20 cc.,  $\text{H}_2\text{O}$  20 cc.), mix and at once add 6 drops of  $\text{C}_6\text{H}_5\text{Me}$ ; shake well and upon standing allow the insol. biliverdin to collect on top. Overlay with 3–4 cc. of 95% EtOH. Even small quantities of biliary pigments present in urine cause a green coloration of the EtOH layer. If none is present, the EtOH is colorless or pink, or at most bluish gray. The test is not interfered with by albumin, dextrose, indoxyl, urobilin or uric acid, and compares well with the exact methods based on pptg. bile pigments as Ca or Ba compds. Addn. of  $\text{H}_2\text{O}_2$  to the EtOH may give misleading results; but a 2% addn. of a 40% HCHO soln. may eliminate slight secondary colorations. S. WALDBOTT

**Simple apparatus for the determination of sugar in urine.** H. CITRON. *Z. Urol.* 23, 161–2(1929); *J. Am. Med. Assoc.* 92, 2148.—The app. consists of a glass cylinder with an outlet tube a short distance from the top, and a urinometer, to the top of which is attached an indicator arm that projects through a hole in the cover of the cylinder. Enough urine-yeast emulsion is run into the cylinder so that the zero point of the indicator arm is above the level of the cover of the cylinder. Urine-yeast emulsion is then allowed to escape through the outlet tube until the zero point is on a level with the cover of the cylinder. After a few drops of tributyrin prepn. have been added to prevent excessive fermentation, the apparatus is placed in  $\text{H}_2\text{O}$  heated to 38–40°. The fermentation begins at once and the indicator arm of the hydrometer sinks accordingly. After 4 hrs. the amt. of sugar that was in the urine-yeast emulsion before fermentation began may be read from the scale. R. C. WILLSON

Preservation of animal materials by chemical means (DREWS) 18.

WOOD, P. C., et al.: **Laboratory Technique; The Methods Employed at St. Luke's Hospital, New York.** 3rd ed., revised. New York: J. T. Dougherty. 318 pp. \$3.75.

**Detecting acidity in the mouth.** JOHN O. MCCALL (to Calsodent Co.). U. S. 1,717,723. June 18. Phenolphthalein 8 is used with Congo red 3 parts.

## C—BACTERIOLOGY

CHARLES B. MORREY

**Biochemical studies of streptococci.** FRANCES KRASNOW AND WILLIAM J. GIES. *J. Dental Research* 9, 29–35(1929).—Study was made of the growth of 50 strains of streptococci on 9 different media. The Jablons liver-peptone medium was most useful for longevity of cultures without transplant; 28 strains retained undiminished viability after storage for 3 yrs. without transplant; it was also useful for storage of other bacterial species. JOSEPH S. HEPBURN

**Biochemical studies of streptococci. II. Availability of 671 synthetic media.** FRANCES KRASNOW AND MARGARET L. ROSENBERG. *J. Dental Research* 9, 123–69(1929).—Of the 671 synthetic media used, 441 permitted the streptococci to remain viable through 1 or more transplants. However, only 1 medium supported growth on the 3d series of transplants, and none of the media showed growth on the 4th, 5th and 6th transplants. The media did not permit continuance of normal physiol. function including propagation. Growth in the first two transplants was due to a small reserve store of a necessary nutrient or nutrients, or else to transfer of small amounts of the constituents of the parent culture. A bibliography of 82 references is appended. JOSEPH S. HEPBURN

**Biochemical studies of streptococci. III. Availability of carbon compounds.** FRANCES KRASNOW AND MARGARET L. ROSENBERG. *J. Dental Research* 9, 321–32(1929).—See C. A. 22, 2959. JOSEPH S. HEPBURN

**The oxidation of benzene hydrocarbons by bacteria.** V. O. TAUSON. *Planta (Abt. E. Z. wiss. Biol.)* 7, 735–57(1929); cf. C. A. 23, 1431.—A study was made of the ability of 4 strains of *B. toluolicum* to oxidize benzene and some of its hydrocarbon derivatives. Toluene and ethylbenzene were oxidized readily by all 4 strains, but the greatest no. of compds. was oxidized by strain c. The introduction of one  $\text{CH}_3$  group retarded the reaction. Compds. with long side chains or with either a  $\text{CH}_3$  group or a double bond between 2 Ph groups were not easily oxidized. The bacteria were easily grown in several kinds of nutrient media, those contg.  $\text{NH}_4$  salts as a source of N being more efficient than those contg.  $\text{NO}_3$  salts. A. E. HITCHCOCK

**A simple glycerol water crystal violet potato cylinder medium for diagnostic cultures of tubercle bacilli.** H. J. CORPER AND N. AND N. UYEL. *Arch. Path.* 7, 835–8(1929).—In the  $\text{H}_2\text{SO}_4$  potato culture method for the diagnosis of tuberculosis, 6% glycerol  $\text{H}_2\text{O}$  can be used to replace the 5% glycerol broth previously recommended for the prepn.

of the crystal violet potato cylinder medium. This simplifies the prepn. of the culture medium used in this new diagnostic method. Human and bovine tubercle bacilli grow with equal facility when present in small numbers in tuberculous materials on the crystal violet potato cylinder medium with glycerol  $H_2O$  in the absence of broth.

HARRIET F. HOLMES

A quantitative study of the effect of ultra-violet rays upon the bacteriophage. I. A comparison between the lethal effects of ultra-violet rays upon the bacteriophage, *B. coli* and some enzymes and antibodies. S. I. BAKER AND S. H. NANAVUTTY. *Brit. J. Exptl. Path.* 10, 45-61(1929).—Enzymes and antibodies are much less susceptible to the destructive effects of ultra-violet rays than are bacteria. The susceptibility of the bacteriophage is of the same order as that of bacteria. The relative lethal efficiencies of different regions of the spectrum are the same for the bacteriophage as for *B. coli*. The work of Rivers and Gates (*J. Exptl. Med.* 47, 45 (1928)) indicates that the susceptibility of vaccinia virus to irradiation is of the same order as that of bacteria. The present work, therefore, strongly supports the view that the bacteriophage is of the nature of a virus and has little in common with enzymes. HARRIET F. HOLMES

The exhaustion of media in bacterial culture. J. C. BROOM. *Brit. J. Exptl. Path.* 10, 71-83(1929).—The power of fruit juice to allow of regrowth of an organism on an agar slope on which that organism has already been grown for some days is dependent, not on its vitamin content, but on the presence of C compds. which the organism can assimilate. With regard to the coli-typhoid group, certain evidence has been brought forward to show that the power of a bacterium to inhibit the growth of others is related to its fermentative activities of "sugars" and org. salts. It is suggested that this inhibition is caused by a deficiency of available C due to the original growth, and that this explains why bacteria with greater powers of fermentation inhibit those which are less active in this respect.

HARRIET F. HOLMES

Studies on the metabolism of *Cl. tetani*. II. The bases in the culture medium. H. SIEVERS AND E. MÜLLER. *Z. Biol.* 88, 553-60(1929); cf. *C. A.* 22, 2184. The medium was treated with hot, satd., baryta soln.; the filtrate satd. with  $CO_2$  and coned. to a sirup. This residue was dild. to 1 l. with  $H_2O$ , acidified with  $H_2SO_4$  and phosphotungstic acid added. Upon concn. of the filtrate there appeared fine, slightly yellow crystals, easily sol. in HCl. This was hypoxanthine, which was finally identified as the chloroaurate,  $C_8H_4N_4O_3 \cdot HAuCl_4$ . Carnitine was isolated from the lysine fraction as the chloroaurate,  $C_7H_{15}NO_3 \cdot HAuCl_4$ , m.  $152^\circ$ . The residue from the lysine fraction yielded  $\beta$ -bromobutaine, the aurate of which is  $C_8H_{14}NO_3AuCl_4$ , m.  $205-210^\circ$ , and methylamine, which was obtained as the chloroplatinate. FRANCES KRASNOW

A medium for the isolation of *Salmonella pullorum* and other members of the paratyphoid group from avian tissues. W. W. MALLMANN, FRANK THORP, JR., AND MARGARET SEMMES. *J. Am. Vet. Med. Assoc.* 73, 825-38(1928).—A brilliant green-liver infusion agar is recommended.

FRANCES KRASNOW

Morphologically or physiologically definable iron bacteria. EINAR NAUMANN. *Ber. deut. botan. Ges.* 47, 262-5(1929); cf. *C. A.* 22, 3189.—Reply to Chododui

LAWRENCE P. MILLER

The effect of antiseptics on tissues in vitro. WM. J. GERMAN. *Arch. Surg.* 18, 1920 6(1929).—Calcd. on the basis of a perfect antiseptic, *i. e.*, having a bactericidal action and a tissue viability each of 100%, the max. indices of efficiency for the antiseptics tested were: gentian violet 0.03, acriflavine 0.1914, K Hg iodide 0, mercurochrome 0.0132, and picric acid 0.0975. The tests for antiseptic action were made on *Staphylococcus aureus*, *Streptococcus hemolyticus* and *B. coli*. The tests for cell viability were made on tissue cultures of the skin of embryonic chicks. The index of efficiency was calcd. by multiplying the bacteriostatic effect by the percentage of viability of the tissue cultures.

JOHN T. MYERS

The value of oxidation reactions with *p*-phenyldiamine in bacteriology. W. LOELE. *Centr. Bakt. Parasitenk.*, I Abt., 111, 325-35(1929).—Bacteria can be divided into 4 groups according to their reactions with *p*-phenyldiamine; those which produce oxidases and peroxidases; those which produce only peroxidases; those which produce neither, but form color; and those which produce no oxidizing substances and no color. The bacterial oxidizing substances are called "oxidoreductases" because enzyme poisoning substances and heat inhibit them. Their production by microorganisms varies with species, age of the culture, nature of the medium and the OH and  $H_2O_2$  concn. The *p*-phenyldiamine oxidase gives the indolphenol blue reaction.

JOHN T. MYERS

Comparative studies on the cultivation of the tubercle bacillus by the methods of



Uhlenhuth and Hohn. GERHARD ORZECOWSKI. *Centr. Bakt. Parasitenk.*, I Abt., 111, 362-7(1929). JOHN T. MYERS

An ectoplasmic inhibiting substance in filtrates of old cultures. LEO OLITZKI. *Centr. Bakt. Parasitenk.*, I Abt., 111, 491-3(1929).—Bouillon cultures of *B. proteus* about a month old contained substances injurious to the ectoplasmic substances of proteus bacilli. JOHN T. MYERS

The biological difference between native and heated water-soluble antigen of the cholera vibrio. II. The inhibition of spontaneous phagocytosis. K. FUJIMORI. *Centr. Bakt. Parasitenk.*, I Abt., 112, 11-6(1929); cf. *C. A.* 23, 3510; *Centr. Bakt. Parasitenk.*, I Abt., 109, 93(1928).—The causation of toxicity and of inhibition of phagocytosis is not identical. Heated water-sol. substances of the cholera vibrio have a greater immunizing power, interfere less with phagocytosis and are less toxic than those which are unheated. JOHN T. MYERS

Studies of the B. C. G. strain in relation to the action of lipid material of the tubercle bacillus. M. ISABOLINSKII AND V. GITOVICH. *Centr. Bakt. Parasitenk.*, I Abt., 112, 35-44(1929).—This strain exhibits different biological properties from the usual virulent strain. It is highly resistant to lipolytic agents, as bile, both *in vitro* and *in vivo*. It seems to have considerable antigenic and hence protective action in children. In guinea pigs, its virulence is low and it has almost no antigenic power, as it will not protect against later inoculation with virulent strains. B. C. G. equals *Bacillus Calmette guerin*. JOHN T. MYERS

The question of aerobic cellulose cleavage at high salt concentrations. L. RUBENCHIK. *Centr. Bakt. Parasitenk.*, II Abt., 76, 304-14(1928); cf. *C. A.* 22, 3189. —Some cellulose-cleaving organisms from the mud of the Odessa salt marsh are halo-tolerant and others are halophilic. In some instances salt hastens the action of the organisms and in others slows it. Further work is necessary on the chemistry of aerobic cellulose destruction. JOHN T. MYERS

The assimilation of nitrogen by pure cultures of *Clostridium pasteurianum* and related organisms. ELIZABETH MCCOY, W. M. HIGBY AND E. B. FRED. *Centr. Bakt. Parasitenk.*, II Abt., 76, 314-20(1928). The ability of 37 strains of anaerobic butyric-acid forming bacteria, isolated from soil, to assimilate free N was found quite variable. *Cl. acetobutylicum* Weizmann fixes comparatively little N. The 4 strains studied fixed from 0.69 to 1.06 mg. in 100 cc. of medium. The 33 "true" butyric-acid-forming organisms were of 3 physiol. types. The *Cl. pasteurianum* type is the most active in assimilation, amts. ranging from 0.66 to 3.98 mg. per 100 cc. of medium being found. The *B. saccharobutylicus* type fixed from 0.61 to 2.35 mg., and the plectridia from 0.68 to 2.75 mg per 100 cc. of medium. Study of a single-cell culture of *Cl. pasteurianum* showed a general correlation between N assimilation and the consumption of sugar, although relative efficiency in N assimilation seems to vary with the stage of the growth period. JOHN T. MYERS

The action of streptococci upon casein. G. J. HUCKER. *Centr. Bakt. Parasitenk.*, II Abt., 76, 321-8(1928). —Chemically pure casein was not available to the streptococcus if the organisms were previously washed free from extra cellular enzymes and traces of protein disintegration products. Certain strains of streptococci, especially those isolated from dairy products, utilized casein when a large unwashed inoculum was used. Under similar conditions the pyogenic group would not grow in casein solns. Many of the organisms which will not grow in pure casein solns., when grown in milk, increased the amt. of free amino acids, indicating that casein acts similarly to simple proteins in resisting bacterial attack, if no other available nitrogenous material or enzyme was present to initiate growth. Paracasein behaved in the same way as casein. JOHN T. MYERS

Nitrification at high salt concentrations. L. RUBENCHIK. *Centr. Bakt. Parasitenk.*, II Abt., 77, 1-18(1929).— $N_2O_5$  is always formed when media for the first phase of nitrification are inoculated with mud from the Kujalniczki salt marsh. The richer the specimen in  $H_2S$  the later was the beginning of  $N_2O_5$  formation and the slower its course. Nitrification continued up to a NaCl concn. of 15%. The optimum was 5% and the min. 1%. The newer culture methods of Winogradsky (silicic acid and  $MgNH_4PO_4$ ) are useful in such studies. Nitrite-forming organisms identical with the *Nitrosomonas* of Winogradsky were isolated in pure culture. It is an obligate halophile 0.02% Witte peptone, or 0.05% glucose had a harmful effect. 0.2% peptone or 0.2% glucose prevented growth. Equimol. solns. of NaCl, KCl,  $MgCl_2$  or  $CaCl_2$  had similar stimulating effects. *Nitrosomonas* was not found in brine from the Liman. Media for the second phase of nitrification gave no  $N_2O_5$  when inoculated with either Liman mud or brine. JOHN T. MYERS

The influence of the concentration of sodium chloride on several biochemical processes in the Liman. A. S. ZASLAVSKII AND S. S. CHAIT. *Centr. Bakt. Parasitenk.*, II Abt., 77, 18-21(1929).—The growth of reducing organisms was greatest in salt marsh brines with the highest salt concn. and *vice versa*. JOHN T. MYERS

Production of carbon dioxide by the streptococci. G. J. HUCKER. *Centr. Bakt. Parasitenk.*, II Abt., 77, 145-50(1929).—All the streptococci studied, with certain exceptions, produced small amts. of CO<sub>2</sub> from peptone. This was demonstrated by a corresponding increase in the amt. of CO<sub>2</sub> with increase of peptone in the medium. The presence of sugar in most cases did not markedly affect the production of CO<sub>2</sub>. Representative strains of *Strep. kefir* and *Strep. citrovorus* produced no CO<sub>2</sub> from peptone but relatively large amts. from glucose. Certain strains of *Strep. cremoris*, *milior*, *stenos* and *ignavius* were not affected in their ability to produce CO<sub>2</sub> by the amt. of peptone in the medium; they usually formed only a small amt. in the presence of glucose. JOHN T. MYERS

Biological nitrite formation in organic media. V. RUNOV. *Centr. Bakt. Parasitenk.*, II Abt., 77, 193-205(1929).—The oxidation of NH<sub>3</sub> to NO<sub>2</sub> is possible by heterotrophic but not by prototrophic bacteria. A heterotrophic organism was isolated which produced NO<sub>2</sub> in various org. media. Its cultural characteristics are given in detail. It also reduces NO<sub>3</sub> to NO<sub>2</sub>. JOHN T. MYERS

The effect of filtrates of certain intestinal microbes upon bacterial growth. MARGARET F. UPTON. *J. Bact.* 17, 315-27(1929).—*B. coli* and *M. ovalis* are inhibited in filtrates of cultures of *B. coli*, *M. ovalis* and *B. bifidus* at a *p*<sub>H</sub> of 4.5-5.0, owing to some factor aside from increase in H ions. Acetic and formic acids show similar effects. Lactic acid has a slight inhibitory effect. Under the same conditions, *B. coli*, *M. ovalis* and *B. bifidus* utilize lactose differently, giving different proportions of volatile and lactic acids. The large amt. of volatile acid produced by *B. bifidus* in the intestine of the breast-fed infant may be the factor which inhibits *B. coli* and *M. ovalis*. JOHN T. MYERS

The use of culture media made from commercial dried yeast as a routine substitute for meat infusion peptone media. JAMES M. NEILL, JOHN Y. SUGG, LURLINE V. RICHARDSON AND WM. L. FLEMMING. *J. Bact.* 17, 329-37(1929).—Five % dried yeast broth and agar were satisfactory for all routine purposes for which meat infusion media are commonly used. It is cheap, uniform and easy to prepare. JOHN T. MYERS

Effect of hydrogen-ion concentration on the toxicity of sodium benzoate to microorganisms. W. V. CRUESS AND P. H. RICHERT. *J. Bact.* 17, 363-71(1929).—The retarding value of Na benzoate on the rate of multiplication of *S. ellipsoideus* is much stronger at *p*<sub>H</sub> values of 2.5-4.5 than at 5.0-9.0. A similar effect holds for alc. fermentation by this organism. The concns. of benzoate required to prevent the growth of certain yeasts, molds and bacteria were greatly affected by the *p*<sub>H</sub> value of the medium. Much more benzoate was required near neutrality, *p*<sub>H</sub> 5-8, than in the moderately acid range of 2.5-4.5. Preliminary expts. indicate that similar relationships hold for certain other food preservatives. JOHN T. MYERS

The value of vegetable extracts in culture media. LUTHER THOMPSON. *J. Bact.* 17, 379-86(1929).—Aq. exts. of potato, carrot, spinach, radish and beef heart were sterilized by filtration and added to nutrient broth aseptically. As little as 0.01 cc. of these exts. added to 6-7 cc. of nutrient broth would promote growth of many streptococci which failed to grow in the broth alone, while 0.02 cc. was sufficient to induce the growth of most streptococci. Potato ext. was best because of its keeping qualities and high nutritive value. The deteriorating effect of heat was proportional to the resulting precipitation. Both the protein and non-protein fraction of potato ext. will stimulate growth but not so well as the whole ext. Potato ext. may be used in many instances instead of fresh blood where it is not essential to observe hemolysis. The substance in the ext. responsible for promoting growth is thought to be nitrogenous material rather than food accessory substances. JOHN T. MYERS

The effect of certain factors upon the growth of the pneumococcus. HEDLEY D. WRIGHT. *J. Path. Bact.* 32, 203-27(1929).—For the full growth of the pneumococcus a small amt. of fermentable carbohydrate is necessary (0.2% glucose). Excess leads to high acidity, hastening autolysis. Thermostable nitrogenous substances are adequately supplied by 1% peptone; relatively thermolabile constituents, essential to growth, are present in yeast ext. and blood in large amts., in meat ext. and serum in small amts., and in a slight amt. in peptone. Heating org. fluids, especially peptone, serum and yeast ext., causes them to become inhibitory to the growth of the pneumococcus. This inhibitory effect is lessened or prevented by reducing conditions. The pneumococcus is inhibited by excess of salts, and readily destroyed by salts in the absence of colloids. Small amts. of Ca favor growth in the presence of yeast ext. but not with blood or serum.

The length of the lag and the rate of growth depend on all of the nitrogenous constituents of the medium and not solely on the so-called accessory factors. JOHN T. MYERS

An improved medium for the isolation of *Corynebacterium diphtheriae*; trypticized serum tellurite copper sulfate agar. W. D. ALLISON AND T. H. AYLING. *J. Path. Bact.* 32, 299-308(1929).

The action of x-rays of long wave length on microbes. Establishment of precise measurements of the death of the irradiated bacteria. A. LACASSAGNE. *Compt. rend.* 188, 200-2(1928); cf. Holweck, *C. A.* 23, 1928.—A homogeneous suspension of *B. pyocyaneus* was carefully prepd. and irradiated with the K ray of Al (8 A. U.), and the L ray of Ag (4 A. U.). The number of quanta absorbed by the organism to produce death depends upon the quanta in the sensitive zone of the organism. There is in each organism a sensitive zone and the quanta must act on this zone to be lethal.

M. H. SOULE

Canned vegetable troubles arising from sugar (GORDON) 12.

## D—BOTANY

THOMAS G. PHILLIPS

The physiology of organic acids in green plants. III. *Rheum hybridum*. W. RUHLAND AND K. WETZEL. *Planta (Abt. E Z. wiss. Biol.)* 3, 765-9(1927); *Expt. Sta. Record* 59, 426.—In continuation of accounts previously noted (*C. A.* 22, 3192) the authors here consider, as regards *R. hybridum*, the assimilation of N and of O and the relation between the assimilation of each and that of the other leaf petioles. H. L. D.

The method of formation and the detection of alkaloids in the young tobacco plant. J. CHAZRE. *Bull. Histol. Appl.* 5, 253(1928); *Stain Tech.* 4, 61.—Detection of nicotine and the mode of formation in the young plant was detd. by the use of the 2 following methods. Plants, in the stage where the radicle is just leaving the teguments, were pressed lightly between a slide and cover slip and were treated with a dil. soln. of neutral red. The aleurone granules are shown in the process of transformation into semifluid vacuoles which are colored by neutral red. Since aq. neutral red tends to dissolve the nicotine, use of Bouchardat's reagent is recommended for the demonstration of nicotine in plants at this stage of development. Combination of the 2 above methods clearly demonstrated that nicotine appears in the plant during the process of germination. It was found in the interior of the vacuoles which arise from the hydration of the aleurone granules when these often still contained crystalloid protein. C. R. FELLERS

Hydrostatic-pneumatic system of certain trees: movements of liquids and gases. D. T. MACDOUGAL, J. B. OVERTON AND GILBERT M. SMITH. *Carnegie Inst. Washington Pub.* 397, 1-99(1929).—The chief finding of chem. interest is that the proportions of the component gases in the trunks of trees are widely different from those of the atm.

JOSEPH S. HEPBURN

Role of the young lucerne plant in determining the infection of the root by the nodule-forming bacteria. H. G. THORNTON. *Proc. Roy. Soc. (London)* B104, 481-92(1929).—The appearance of nodules on the root hairs of seedlings of lucerne (*Medicago sativa* L.) coincides with the opening of the first true leaf. However, the active substance inducing infection by the nodule bacteria is not formed by the first true leaf, for removal of this leaf while still closed has no influence on nodule appearance.

JOSEPH S. HEPBURN

Experimental researches on vegetable assimilation and respiration. XX. The energetic efficiency of photosynthesis in green plants: some new data and a discussion of the problem. G. E. BRIGGS. *Proc. Roy. Soc. (London)* B105, 1-35(1929).—A study of photosynthetic efficiency, and of the amt. of energy fixed in the immediate products of photosynthesis.

JOSEPH S. HEPBURN

The molecular structure of the plant cell. HENRI DEVAUX. *Bull. soc. botan. France* 75, 88-96(1928).—A discussion is given of theories relating to cell structure, special emphasis being placed upon the conception that the cell is a dynamic unit. The plasma membrane is regarded as the principal tool of the protoplasm. The membrane is pictured as being the seat of various mol. activities which involve adsorption, orientation, polarity, surface tension phenomena, and purely chem. reactions.

A. E. HITCHCOCK

The necessity of atmospheric oxygen for the growth of roots in water. H. BOUYGUES. *Bull. soc. botan. France* 75, 469-72(1928).—Cuttings of willow (*Salix purpurea*) were placed in H<sub>2</sub>O which had had a 2-cm. layer of oil on the surface to exclude the air. Root growth was noticeably retarded, as compared to that of cuttings in H<sub>2</sub>O without the oil layer. Removal of cuttings from H<sub>2</sub>O with the oil layer to H<sub>2</sub>O without an

oil layer (the oil being carefully washed from the stems) resulted in normal root growth. Since willow cuttings are able to endure comparatively high concns. of  $\text{CO}_2$ , it is believed that the retardation of root growth was due to lack of  $\text{O}_2$  and not to the accumulation of  $\text{CO}_2$ .

A. E. HITCHCOCK

The liberation of free iodine by algae. PIERRE DANGEARD. *Bull. soc. botan. France* 75, 509-19(1928); cf. *C. A.* 22, 3193.—Iodine compds occur in various tissues of algae, but the process by which free I is liberated is confined to the epidermal cells. This process functions for 1-2 days even in detached tissue. Starch paper or cresol blue was used to test for the presence of I.

A. E. HITCHCOCK

Iodides in the cells of algae. G. MANGENOT. *Bull. soc. botan. France* 75, 519-38 (1928).—The localization of iodides in cells of different species of algae was studied by the cresol blue method. The formation of red or blue crystals was confined to the vacuoles. Not all species of algae reacted to this test, although analyses showed a high iodide content. Since the reaction occurs in living cells, this method is believed to be more sensitive than the  $\text{H}_2\text{SO}_4$ -starch paper test. It is suggested that the accumulation and liberation of I represent 2 phases of an excretory process.

A. E. H.

Growth of hypocotyls during geotropic bending in relation to the hormone theory of tropism. N. CHOLODNIL. *Planta (Abt. F., Z. wiss. Biol.)* 7, 702-19(1929).—The growth of hypocotyls of *Lupinus angusti folius* and *Helianthus annuus* during geotropic bending was measured by a "micropotometer." Growth, as detd. by the vol. intake of  $\text{H}_2\text{O}$ , was the same for stems placed vertically as for those placed horizontally. It is believed, therefore, that under the stimulus of geotropic bending there is no increase in growth materials nor is there a formation of special substances such as tropic hormones to account for growth during the bending process. The measurement of a vol. increase is regarded as more significant than that of a linear increase. This app. is sensitive to  $0.1^\circ$  change in temp. and requires 30 mm. on the scale to record an av. stem elongation of 1 mm.

A. E. HITCHCOCK

*Pythium aphanidermatum* (Eds.) Fitz. on *Opuntia dillenii*, Haw. T. S. RAMAKRISHNA AVYAR. *Mem. Dept. Agr. India, Botan. Ser.* 16, 191-201(1929).—The fungus *Pythium aphanidermatum* was isolated from diseased and rotting plants of *Opuntia dillenii* and its growth on several culture media was studied; papaya fruit ext. agar and Quaker oats agar gave the best results. A luxuriant growth of the fungus was obtained on media varying in acidity from -10 to +10 on Fuller's scale and at +25 there was very little growth.

K. D. JACOB

A laboratory study of oily plants. N. M. TULAIOV. *Zhur. Opit. Agron. Yugo Vostoka* 6, No. 2, 105-38(1928).—A partial report is presented on the compn. of sunflower, flax and mustard plants and the accumulation of oil as affected by the type of soil, methods of tilling the soil and care of plants. The soil conditions and the weather influenced the amt. of dry matter accumulated in sunflower. The highest accumulation takes place when the plants fill out, i. e., during the ripening of the seeds; in the early period of growth very little accumulation occurs. The accumulation in the stems and cup takes place up to the time when the seeds begin to fill out, after that in the leaves and seeds. The accumulation drops again in all parts of the plant after ripening of the seeds. With flax the most intensive growth takes place during blooming. The stems give 50% of the dry matter of the crop and the seeds 30%. The transpiration coeff. under field conditions for sunflower was 487 and in the greenhouse 405. For flax the transpiration coeff. varied within wide limits depending on the rainfall. Under field conditions it was 1861 in 1924 and 492 in 1925. The highest amt. of ash in sunflower is found in the leaves. The seasonal variations in respect of moisture and the soil type do not seem to influence the ash content. When the plants have 2 pairs of leaves only the ash content amounts to 17.8% of its dry matter; at the time of cup formation it is 12.5% and at harvest 10.7%. The highest ash content is found in the leaves (50%) and the lowest in the roots (5-8% of the total). Data are given for ash compn. The N content is high in the early period of growth and diminishes with the advancement of the growth of the plant. The accumulation of ash and N in flax takes place up to the time of harvest. In the beginning it is 10% of the total dry matter; it drops as the plants advance until they reach 6-6.5% and this amt. persists up to harvest time. The amt. of N fluctuates around 2.32%, which the plant attains long before ripening. Other analyses are to follow.

J. S. JOFFE

Plant hemagglutinins with special reference to a preparation from the navy bean. VERZ R. GODDARD AND LAFAYETTE B. MENDEL. *J. Biol. Chem.* 82, 447-63(1929).—A non-toxic, sol., and highly potent hemagglutinating protein having the characteristics of an albumin has been prepd. in dry form from the navy bean, *Phaseolus communis*. Electrolytes are indispensable for its action and egg albumin and the serum proteins

have a marked inhibiting influence. Denaturation or hydrolytic cleavage is accompanied by a lessened hemagglutinative potency of the protein. Hemagglutinating preps. of this sort may well have a larger field of usefulness in the prepn. of therapeutic scrums than has hitherto been accorded to them as they can be sterilized and preserved in dry form for long periods ready for instantaneous use. Danger of anaphylaxis can be avoided by giving doses so selected after testing that an excess of unfixed protein will not remain in the serum. A *quant. macroscopic method for measuring hemagglutination* is described.

**The reducing properties of *Aspergillus niger*.** G. ROSSI. *Biochim. terap. sper.* 16, 96-102(1929).—*Aspergillus niger* contains reducing enzymes which are destroyed by heat at 100°. An aq. or glycerol, but not an alc., ext. can be obtained. The glycerol ext. is less active than the aq. The enzymes appear to differ from the reductases found in beer yeast. They reduce S to H<sub>2</sub>S and nitrates to nitrites but do not reduce indigo carmine or nitrobenzene. A 2% colloidal S soln. inhibits the development of *Aspergillus* colonies and the S is not reduced but a 0.4% soln. permits growth and the S is readily reduced. Bubbling air through the exts. diminishes their activity.

A. P. LOTHROP

**Changes in pyrenoids in *Spirogyra* cells during starch formation.** VIKTOR CZURDA. *Ber. deut. botan. Ges.* 47, 181-5(1929).—A criticism of Steinecke and Ziegenspeck, C. A. 23, 2201.

LAWRENCE P. MILLER

**Experiments on the influence of colloidal calcium fluoride and mercurous chloride on *Aspergillus niger*.** E. WEDEKIND AND E. BRUCH. *Biochem. Z.* 208, 273-84(1929).—The expts indicate that the growth-inhibiting effect of colloidal CaF<sub>2</sub> or HgCl<sub>2</sub> is entirely due to the ionized portion.

S. MORGULIS

**Studies on the peroxidase of phanerogams.** D. MICHLIN AND P. KOPELOVICH. *Biochem. Z.* 208, 288-94(1929).—Peroxidase preps. were made from the bark of fir which differ from peroxidase prepds. from the phanerogams by their thermostability and sensitivity to HCN. They contain no Fe and do not give the aldehyde reaction. Oxidized fir bark juice oxidizes HI, but gives no peroxidase reaction or blueing of guaiacol.

S. MORGULIS

**Secretin in Japanese plants.** TOMOZO OKANO. *Japan J. Internal Secretion* 4, 1350-4(1928).—O. treated many fresh plants with warm dil. HCl. The exts. were found to contain either a substance which excites or inhibits the motion of isolated intestine of the rabbit, sometimes both. Both of these substances dissolve in H<sub>2</sub>O or EtOH but are insol. in Et<sub>2</sub>O. The substance which excites the motion is a so-called vegetable secretin, while that which inhibits the motion resembles adrenaline.

K. SOMEYA

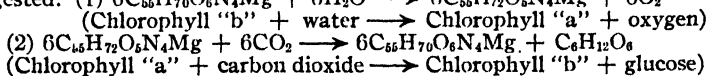
**The action of halogens upon vegetable seeds and their young sprouts, and the relation between the quantity combined with the seed and the degree of poisoning.** TATSUYA SHINTOKU. *Natl. Hyg.* 5, 746-85(1928).—Seeds were immersed in 0.01 N solns. of halogen for from 10 min. to 3 hr. at room temp., washed with H<sub>2</sub>O, and made to sprout on a degreased cotton. The poisoning action of the halogens is in the order I<sub>2</sub> > Br<sub>2</sub> > Cl<sub>2</sub>. Seeds or sprouts were dipped into the halogen solns., then taken out and the quantity of the free halogens was measured in order to obtain indirectly the quantity which has combined with the seeds. The quantities of the combined halogen are in the order Br<sub>2</sub> > Cl<sub>2</sub> > I<sub>2</sub>.

K. SOMEYA

**The variation in the color of plants during the course of desiccation.** The glucoside of *Lathraea clandestina* L. is aucubin. MARC BRIDEL. *Compt. rend.* 188, 1182-4(1929).—A glucoside was obtained by the usual EtOH extn. method from the flowers of *Lathraea clandestina* L. which was hydrolyzable with the formation of a black ppt. One kg. of fresh flowers gave 1.66 g. of the glucoside. The const. of the extd. glucoside were identical with those of aucubin.

M. H. SOULE

**Equations for the photosynthetic reaction.** ROBERT B. GORDON. *Ohio J. Sci.* 29, 131-2(1929).—In contrast to the usual formulas for the photosynthetic reaction wherein it is assumed that CH<sub>2</sub>O is formed and then polymerized to glucose the following two reactions are suggested:



(Chlorophyll "b" + water  $\longrightarrow$  Chlorophyll "a" + oxygen)  
(Chlorophyll "a" + carbon dioxide  $\longrightarrow$  Chlorophyll "b" + glucose)

M. H. SOULE

**Experimental investigations on the glutathione contents of peas at the beginning of germination.** M. I. FIRKET AND Mlle. COMHAIRE. *Bull. acad. roy. méd. Belg.* [5], 9, 93-122(1929).—The exptl. material reported in detail shows the following facts. Glutathione, or at least —SH substances, appear in peas since the beginning of their hydration, as has been observed by others. This appearance of glutathione takes place

in the whole of the reserve material of the pea; it precedes, and probably conditions, the beginning of the germ development. The high content of the reserve and of the germ maintains itself during the first few days of regular growth. There is no parallelism between the intensity of growth and the relative content of glutathione; on the contrary, it is evident that the proportion of glutathione diminishes more rapidly in the normal plants than in plants, the growth of which has been retarded by irradiation of the peas, before germination, with strong x-ray dosages. 15-30,000 are necessary to produce a marked growth retardation. The glutathione is not localized in any predominant manner in the regions of cell multiplication. The glutathione disappears from the plantule in proportion as it grows green. In the plantules that are grown in darkness (the growth sometimes being faster than in the light) the glutathione contents remain high. A number of tables and graphs and a bibliography accompany the paper.

G. TOENNIES

**Titanium in the phanerogamic plants.** GABRIEL BERTRAND AND C. VORONCA-SPIR. *Compt. rend.* 188, 1199-202(1929).—The Ti content of plant ashes was estd. by the orange-yellow color of  $TiO_2$  produced by  $H_2O_2$ . References are given for details of analytical procedure. The conclusions derived from the investigation of 55 species of mono- and dicotyledons may be summarized as follows. Definitely estimable amounts of Ti are present in all phanerogamic plants. The Ti content of the ashes is not due to external contamination by dust, etc. As with other metals a positive relation between the concn. of chlorophyll and of Ti in various parts of the same plant is evident. In seeds almost all of the Ti present is concd. in the tegument. Buck-wheat and leguminous plants are much richer in Ti than the ordinary cereals, while peanut and hazelnut are much poorer, and no Ti was found in the cotyledons of the walnut and the coconut. Storage parts, such as the flesh of fruits, the roots of carrots and the tuber of potatoes are also poor in Ti, while the contents of bulbs formed by modified leaves, such as the onion, are distinctly higher. The quantity of Ti varies between about 1:10,000,000 and 1:200,000 of fresh weight.

G. TOENNIES

**The composition of the cell wall of oats in different stages of growth.** F. ROGÓZIŃSKI AND M. STARZEWSKA. *Bull. intern. acad. polonaise* 1928B, 127-32(In French).—The ash content of both stalks and panicles decreased during the whole period of investigations (145 days). Their cellulose, pentosans and methoxyl content increased, reaching a max. in about 85-100 days, viz., the time of the panicle development, and then remained const. The main constituents of the stalks are lignin and cellulose, those of the panicles, pentosans.

J. WIERTELAK

**Preservation of plant materials by chemical means (DREWS) 18. Study of I in South Carolina [in vegetables] (MITCHELL) 15. The acrolein group as a most probable component of all plant lignins (KLASON) 10.**

## E—NUTRITION

PHILIP B. HAWK

**Relationship between the ability to darken photographic plates and the vitamin-A content of cod-liver oil and pig's fat.** L. S. FRIDERICIA AND S. V. GUDJONSSON. *Bibl. for Laeger* 1927, 12 pp.—No. parallelism was detected.

B. C. A.

**Effect of dextrose on the metabolism of growing rats.** W. ARNOLDI AND S. UENO. *Z. ges. expl. Med.* 61, 424-37(1928).—Protein and fat were gradually replaced in the diet by sugar. There was at first increase in wt., pos. N balance and diminished urinary elimination of C; then (9% protein, 35% fat-cal.) the wt. became stationary and afterwards (6%, 2%) fell.

B. C. A.

**Treatment of diabetes with vitamin B.** C. A. MILLS. *Am. J. Med. Sci.* 175, 376(1928); *Quart. J. Pharm.* 1, 657-8.—Acid alc. exts. of many plants were used. The menstruum employed was 40% EtOH contg. 0.4% of HCl and the plants dealt with were alfalfa, sweet clover, corn silk, onions, carrots, spinach, rice polishings and bran. No heat was used in the prepn. of the exts. All the exts. were treated with NaOH to render them almost neutral, and the protein was filtered off. Thirty cc. of the vitamin soln. thus prepd. was estd. to be roughly equiv. to 30 units of insulin. The use of this in 7 cases reported on by the author affords evidence of the effect of vitamin B in lowering sugar excretion, and he believes that the treatment gives the pancreas an opportunity for functional recovery. It has the advantage of oral administration, and it might, in combination with insulin, give better results than would either alone.

H. L. D.

**A color test for radio-sensitive substances.** C. J. BOND. *Brit. Med. J.* No. 3483,

637(1927); *Expt. Sta. Record* 59, 596.—A simple test for the detection of ergosterol and other substances capable of being rendered active by irradiation is described. As applied to ergosterol, the test is as follows: A small quantity of crystalline ergosterol is rubbed with a heated glass rod on a previously warmed microscopic slide until a thin translucent covering is formed. Half of the slide is then exposed to the rays of a quartz mercury vapor lamp for half an hour at a distance of 12 in., the other half being protected from the rays. The whole film is then covered with a starch soln. which has been boiled in a 5% aq. soln. of KI. After a short time the film of ergosterol on the irradiated slide takes on a rich pink color which, on washing with water, changes into the clear blue of iodized starch. It is stated that the test is so delicate that it shows the different intensities of irradiation in ergosterol irradiated through water and in the air. H. L. D.

The study of the protein in a commercial meat product. R. W. PRANGE, S. M. HAUGE AND C. W. CARRICK. *Poultry Sci.* 6, 302-7(1927); *Expt. Sta. Record* 59, 164.—In a biol. test to det. the amino acid deficiencies of a certain meat-meal product contg. 70% of protein and 9.2% of ash, 4 lots of 18 newly hatched White Leghorn chicks were fed at the Indiana Experiment Station. The basal ration in all lots consisted of ground yellow corn 37.15, wheat middlings 15, wheat bran 15 (except lot 4 which received 25%), cod-liver oil 3, salt 1, meat meal 14.26 and steamed-bone meal 4.59%. In addn. lot 1 received 10% degerminated white corn, lot 2 10% gelatin and lot 3 5% each of degerminated white corn and specially treated casein. Lot 4 grew more rapidly than any of the other lots and was followed in order by lots 3, 1 and 2. Gelatin was used in this test since it was known to be low in the amino acids, tyrosine, cystine and tryptophan. The tyrosine is adequately supplied by the corn and wheat. The special treatment of the casein lowered the cystine content to such a small quantity that it was a negligible factor. This process of elimination indicates that meat meal is deficient in tryptophan. No reasons were apparent for lot 2 growing at a slower rate than lot 1.

H. L. D.

Nutritive value of the garbanza pea. H. S. MITCHELL. *West. Hosp. and Nurses' Rev.* 11, No. 6, 26, 27, 52, 53(1928); *Expt. Sta. Record* 59, 792-3.—The garbanza pea, otherwise known as the chick or Idaho pea, has been found by biol. tests to be somewhat superior to the soy bean and approx. equiv. to casein in the quantity of its protein, to be a rich source of vitamin B, and to have slight potential alky. In the Sherman units the vitamin B value is given as 5 units per gram.

H. L. D.

The part played by the carbohydrates of rations in the formation of milk fat and milk sugar. A. BUSCHMANN. *Z. Tierzücht u. Zuchtungsbiol.* 10, No. 1, 47-68(1927); *Intern. Rev. Agr. [N. S.]*, 19, 473.—Four cows during a period of 112 days received rations poor in proteins and fats, but rich in carbohydrates. The results agree with the hypothesis that a milk cow is able to form the greater part or even the whole of the milk fat from the carbohydrates in her ration, but that the fat content falls when the carbohydrates are given in excess of a definite amt. Appreciable changes in the compn. of the milk fat, especially an increase in the actual content of fatty acids, only occur when large amts. of sugar are given in the ration in conjunction with unchanged amts. of proteins and fats.

H. L. D.

Determination of vitamins A, B and C in collards and turnip greens. G. W. BURTON. *J. Home Econ.* 20, 35-42(1928).—A quant. study of the vitamin B content of turnip greens showed that 0.8 g. raw was sufficient for maintenance of rats over an 8-week period or that 1 g. contained 1.25 units of vitamin B. With raw collards 0.9 g. was sufficient for maintenance of rats over that period. Cooking turnip greens for 30 min. in just sufficient H<sub>2</sub>O to take up the greens at the end of the period resulted in a 10% loss of vitamin B. Similar cooking of collards for 2 hr. resulted in a 40 to 50% loss of vitamin B. No loss of vitamin A was noted. Five-tenths g. raw collard and slightly over 1.0 g. raw turnip greens contained enough vitamin C to protect against scurvy while with cooked collards the equiv. of 10 g. raw did not contain sufficient vitamin C to protect guinea pigs.

L. D. ELLIOTT

The vitamin-A content of avocados. LEROY S. WEATHERBY, J. ELLSWORTH YONTZ AND RUTH V. WATSON. *J. Home Econ.* 21, 360-4(1929); cf. *C. A.* 22, 4155.—Feeding expts. by the curative method with albino rats using the Calavo grade of avocado meeting the highest standards of maturity and oil content showed it to be high in vitamin A. The quantity of avocado necessary to maintain an av. growth of 3 g. per week during an 8-week test period, the standard suggested by Sherman for the unit of vitamin A, would be considerably less than the smallest quantity used, 2.5 g. Based on the U. S. P. unit for vitamin A the quantity of avocado required would be less than that required for the Sherman unit.

L. D. E.

The mineral content of grain. J. E. GREAVES AND C. T. HIRST. *J. Nutrition* 1,

293-8(1929); cf. *C. A.* **23**, 2779.—Max., min. and av. ash analyses of 1755 samples of wheat gave as % minerals 2.94, 1.35 and 1.85; for oats, 4.87, 1.68 and 4.05; for barley, 3.71, 2.08 and 3.00 and for corn 1.79, 1.65 and 1.73. The av. % Ca for oats was 0.117, wheat 0.09, barley 0.086 and corn 0.15. Mg % in wheat was 0.184, oats 0.181, barley 0.181 and corn 0.203. S % in wheat was 0.204, oats 0.19 and barley 0.155. K % in wheat was 0.476, oats 0.57, barley 0.561 and corn 0.39. P % in wheat was 0.331, oats 0.364, barley 0.351 and corn 0.334. Fe % in wheat was 0.005, oats 0.007 and in barley 0.006. Wide variations were attributed to variations in the irrigation water compn. The Ca, Mg and S in grains are higher than are usually reported, while P is lower. The question is raised whether these factors would not materially modify the nutritive value of grains grown on highly fertile calcareous soils. C. R. F.

Blood formation of the albino rat on a standard dietary regime. BARNETT SURE, M. C. KIK AND DOROTHY J. WALKER. *J. Nutrition* **1**, 299-310(1929).—Albino rats were fed a diet consisting of whole wheat 27%, rolled oats 26%, yellow corn 25%, oil meal 15%, com. casein 5%, cod-liver oil 1%, NaCl 0.5%,  $\text{Na}_2\text{CO}_3$  0.5% and a liberal supply of fresh whole milk daily. Hemoglobin detns. and erythrocyte counts were made from the day of birth until the 340th day. Age plays a detg. role in the concn. of hemoglobin and erythrocytes in the blood of the albino rat during the period of growth. Sex plays a relatively insignificant role. The total leucocytes varied so widely in individuals at different stages of growth that the influence of age and sex could not be detd. Pregnancy on the above diet produced anemia which was marked on the day of delivery, but which disappeared with the advance of lactation. A marked drop in serum proteins occurred late in pregnancy. The concn. of hemoglobin and red corpuscles in the lactating rat is greatest near the weaning period of the young when the nurslings begin to partake of the maternal diet. C. R. FELLERS

The effect of purified diets and their modification on growth and testicular degeneration in male rats. KARL E. MASON. *J. Nutrition* **1**, 311-34(1929).—Approx. 200 male rats and 27 diets were used. Wt. of the testes at autopsy as compared with normal is a fairly accurate indicator for their histological condition. Macroscopic and histological examns. for degeneration were also used. Many of the diets were deficient in vitamin E. Testicular degeneration occurred not only when the basal purified diet was fed (18% casein, 51% starch, 15% lard, 9% butter fat, 4% salts and 0.2-0.4 g yeast daily), but was equally bad in animals fed similar dietaries in which the protein constituent was casein, edestin or lactalbumin at a 35% level or meat residue at a 20-30% level. As little as 5 g. of fresh lettuce and 1.6 g. of dried lettuce supplied sufficient vitamin E to prevent degeneration. Daily supplements of 0.68 g. dried lettuce or 0.4 g. dried alfalfa were inadequate. Fresh lettuce was approx. 8 times as rich in vitamin E as its dried equiv. Since both fresh and dried supplements induced very rapid growth, it is possible that vitamin E is associated with a growth factor. Blood counts, as well as adrenals, thyroids, liver, pancreas, lymph glands and spleen were normal in sterile male rats fed vitamin E-deficient diets. The literature on the subject is critically surveyed. C. R. FELLERS

Obesity as a precursor of diabetes. S. FRANKLIN ADAMS. *J. Nutrition* **1**, 339-42 (1929).—From the histories of 673 cases largely from rural districts, it was found that 91% of the patients were overweight and 82.9% were more than 10% overweight when their diabetes began. As age increases to the 5th decade, the candidates for diabetes increase in wt.; after the age 50, the % overweight is slightly lower. Obesity may be an important factor in young persons because more than 30% of persons less than 20 yr. of age were more than 10% overweight before diabetes began. Diabetes appears to be associated with an excessive amt. of total food intake rather than the amt. of carbohydrates. C. R. FELLERS

The heat production of the albino rat. I. Technic, activity control and influence of fasting. FRANCIS G. BENEDICT AND GRACE MACLEOD. *J. Nutrition* **1**, 343-66 (1929).—A closed-circuit respiration chamber, held at 25-28° for 2 hr., was used. Both  $\text{O}_2$  consumption and  $\text{CO}_2$  production were measured. Numerous expts. covering several years show that the ideal expts. are those where muscular repose is complete. Momentary or intermittent excessive activity, if not long continued, causes an increase in metabolism of not over 15-20%. Ocular observation is sufficient in metabolism expts., and only those results obtained when the animal is constantly moving need be discarded. Heat production of rats over 4½ months old, at 26°, decreased from 7 to 13% during the first 17-24 hr. of fast, but remained nearly const. thereafter up to 64 hr. With animals under 4 months old, the metabolism decreased 28% during the first 24 hr. of fasting, i. e., the young and immature do not withstand fasting as well as the mature animals. II. Influence of environmental temperature, age and sex; comparison with



the basal metabolism of man. *Ibid* 367-98.—The heat production, measured 17 hr. after food, decreases as the temp. increases up to 28°, at and above which temp. heat production is const. Heat production is 10-12% lower in summer than in winter. Animals studied at 28° after living 24 hr. at this temp. have a lower heat production (av. 4.5%) than rats studied at 28° after living 24 hr. at 21°. Both male and female rats show a trend of increased heat production with advancing age. This increase cannot be ascribed to increased activity, lactation or pregnancy. Male rats have a higher metabolism than females up to at least 14 months of age, both at 25° and 29°. Heat production showed a very great decrease as death approached, in 3 instances. The female albino rat over 2 months of age at 28° had a basal metabolism averaging 800 cal. per sq. meter of body surface per 24 hr., and with complete muscular repose averaging 720 cal. in females and 800 cal. in males. In spite of a shorter life cycle, small size and high heart rate rats have a metabolism on the body surface basis distinctly low as compared to man. In comparative physiology, the influence upon metabolism of both the active mass of protoplasmic tissue and the stimulus to this mass should be taken into consideration. Possibly the heart rate and blood vol. may serve as approx. measures of this stimulus. C. R. FELLERS

Utilization of fatty oils given parenterally. MARTHA KOEHNE and LAFAYETTE B. MENDEL. *J. Nutrition* 1, 399-443(1929).—Coconut, peanut butter and cod-liver oils, when injected parenterally into albino rats and dogs, were utilized only to a very slight degree if at all. The metabolism of the oils is extremely slow and is surely not a dependable source of energy to animals. Coconut oil was better tolerated than the rest and seemed to have a definite though sparing effect upon protein catabolism. Starvation had little influence in forcing the utilization of oils by the exptl. animals. Both vitamins A and D in cod-liver oil can be utilized by young rats when administered parenterally; the vitamins of butter oil could not be so utilized. The dog is unable to utilize peanut oil. The utilization or non-utilization of fat-sol. vitamins A and D and Sudan III present in an oil at the time of its injection cannot be regarded as proof of the utilization or non-utilization of the oil which held it in soln. Fats administered parenterally are too slowly metabolized to exert a sufficient influence on N catabolism to make this method of evaluation practicable. A bibliography of 44 references is appended. C. R. FELLERS

The influence of ultra-violet rays and vitamin D on the growth of fall farrowed pigs. R. D. SINCLAIR. *Sci. Agr.* 9, 629 48(1929).—Exposure of fall pigs to sunlight resulted in an increase in the percentage of bone ash, and Ca in the ash. By supplying vitamin D with cod liver oil, a marked increase occurred in the total % bone ash and an increase in % of Ca in the bone. While there was some variation on the total amt. of bone ash in the several series, all groups yielded what might be regarded as "strong" bone. Ca and P detns. on the blood, because of individual variability, proved of little value. The small proportion of alfalfa meal supplied in the basal ration combined with the ample Ca and P supply of the supplemental mixt. served greatly to retard development of rachitic symptoms. Ca and P were present in the bone in the ratio of 2:1, and in the ration fed in the ratio of 1.7:1. The role of vitamin D in animal nutrition is thoroughly considered. A bibliography of 22 references is appended. C. R. FELLERS

Irradiated ergosterol, the modern antirachitic principle. FREDERICK R. GREENBAUM. *Am. J. Pharm.* 101, 417-25(1929).—A review with bibliography appended. W. G. GAESSLER

Experimental studies on vigantol prophylaxis. H. EUFINGER, H. WIESBADER and L. FOCSEANU. *Klin. Wochschr.* 8, 826-8(1929).—Colostrum or milk obtained from healthy human mothers does not contain sufficient vitamin D to cure severe rickets in rats. It is possible to enrich these excretions with vitamin D by feeding vigantol. The transfer appears to be an immediate one because severely rachitic rats can be completely cured by feeding either colostrum or milk from human mothers who have been taking vigantol for only a few days. MILTON HANKE

The antirachitic action of a protein-free egg yolk extract (Heliocitin). H. STUDEL. *Klin. Wochschr.* 8, 830-3(1929).—Heliocitin is a concd. vitamin prepn. obtained from egg yolk. Vitamins A and D are present in abundance. It is not an irradiated product and it is, therefore, free from any possible toxic products that might be developed by irradiation. MILTON HANKE

The action of large doses of vigantol on the bones and teeth. J. WEINMANN. *Klin. Wochschr.* 8, 841-2(1929).—The daily administration of 0.5 cc. vigantol to normal rats leads to a cachexic death within 1 to 4 weeks. The lumen of the bones of these animals contains an unusually large number of osteoclasts as well as fine and coarse threads of calcification. The newly formed bone is excessively calcified. The canines

grow less in these animals than in control animals. Changes in the dentine are not unidirectional. Increments of uncalcified fibrous tissue are deposited upon the cementum. The peridontium contains scattered threads of excessively calcified connective tissue. There are no changes in the pulp nor in the dentine of the molars. The cementum has increased in thickness due to a deposition of uncalcified fibrous tissue upon the normal cementum. The alveolar bone surrounding the molars has increased in thickness in a similar manner. In consequence, the cementum and the alveolar bone have become continuous.

MILTON HANKE

**Should whole wheat products displace the refined products?** VICTOR E. LEVINE. *Arch. Pediatrics* 46, 281-96(1929).—The substitution of whole wheat for the refined products would tend to enhance the nutritional quality of the American diet by increasing the intake of Fe, indigestible residue and several vitamins (fat-sol. E, and the water-sol. antiberiberi and antipellagra vitamins). A bibliography of 52 references is appended.

JOSEPH S. HEPBURN

**Study of the antirachitic value of irradiated powdered whole milk.** ADOLPH C. DESANTIS, LESLIE O. ASHTON AND OLIVER L. STRINGFIELD. *Arch. Pediatrics* 46, 297-311(1929).—A group of 30 infants was fed 100% irradiated powdered whole milk for a period of several months without the use of any other antirachitic agent. The infants apparently thrived as well as those fed on mixts. prepd. from liquid cow milk; secondary anemia did not develop; 24 of the infants were wholly protected from rickets; 5 were protected clinically but the x-ray revealed dietary disturbances in the epiphyses of their long bones; 1 was not protected. When a small group of babies was fed 25% irradiated powdered milk, rickets developed in 50% of the subjects. To be antirachitic, powdered whole milk must be 100% irradiated.

JOSEPH S. HEPBURN

**Absorption spectrum of vitamin D.** R. B. BOURDILLON, CATHERINE FISCHMANN, R. G. C. JENKINS AND T. A. WEBSTER. *Proc. Roy. Soc. (London)* B104, 561-83(1929).—Study was made of both the absorption spectra and the antirachitic activity of the products formed by the action of ultra-violet radiation on ergosterol; 3 substances or groups of substances are formed in succession. The first product has an absorption band approx. similar to that of ergosterol (max. 280 A. U.) but more than twice as intense, possesses great antirachitic power and probably is vitamin D. The second product (formed by further irradiation of the first) has a strong absorption band (max. 240 A. U.) and no antirachitic power. The third product (formed by further irradiation of the second) has neither antirachitic power nor marked absorption. The purest preps. studied contained over 50% of vitamin D.

JOSEPH S. HEPBURN

**Nutritive value of ice cream.** I. S. PALMER. *Am. J. Pub. Health* 19, 601-4(1929).—Groups of rats were fed on (1) a basal diet, (2) this same diet mixed with  $\frac{1}{3}$  its wt. of ice cream and (3) an all ice-cream diet. The ice cream contained 30% total solid and 12% fat. The rate of growth of all these animals was considerably slower than that of animals fed the breeding diet; but by the end of 10 months group (2) had reached the same wt. as the breeding animals. The animals of group (3) were still gaining at that time and eventually attained the full mature wt. The animals of group (1) ceased gaining when they attained  $\frac{1}{2}$  this wt. At the end of the 90-day period none of the group (1) animals attained the wt. of the poorest animal fed the diet of group (2), although the mean consumption of the total nutrients was the same. Only 1 animal in group (1) attained the wt. of the poorest animal of group (3). Dry matter consumed for each g. gained per 100 g. body wt. was for group (1) 8.74 g.; for group (2) 6.04 g.; for group (3) 5.44 g.

J. A. KENNEDY

**Biochemical investigation of vitamin B.** H. D. KRUSE AND E. V. MCCOLLUM. *Physiol. Rev.* 9, 126-239(1929).—Review with extensive bibliography. E. R. LONG

**Factors in the metabolism of lactose. IV. The disposal of lactose administered to the rabbit.** RALPH C. CORLEY. *J. Biol. Chem.* 81, 541-4(1929); cf. C. A. 22, 1383.—After intravenous injection of 1 g. of lactose, the unfermentable reducing substances of the blood returned to normal in 3 hr. and within this time over 75% of the lactose was accounted for in the urine. Lactose in the tissues past the intestinal threshold is a very difficultly metabolized sugar; in tartrate nephritis the failure of urinary secretion was associated with a decreased rate of removal from the circulation.

A. P. LOTHROP

**Growth of rats on "fat-free" diets.** AVA J. MCAMIS, WM. E. ANDERSON AND LAFAYETTE B. MENDEL. *J. Biol. Chem.* 82, 247-62(1929).—"In order to study the compn. of body fat yielded by an animal grown under a dietary regime in which there was no ingested fat, a diet of extremely low fat content (consisting of extd. casein, sucrose, Osborne and Mendel salt mixt., yeast concentrate, cod-liver oil concentrate, irradiated ergosterol, and hot H<sub>2</sub>O ext. of liver) was fed to albino rats. Comparatively

good, though by no means optimal, growth has been recorded for these animals. The best growth, however, was exemplified by those animals which received small inclusions of fat (1 drop each of cod-liver oil and peanut oil) in their diet. Whether this apparent beneficial effect of a small quantity of fat is due to its content of vitamin A or other vitamins, or to its action as a vehicle for the fat-sol. vitamins, or whether fat *per se* is essential, is not conclusively demonstrated." A. P. LOTHROP

**Pentose metabolism. III. A comparison of the rates of disposal of *d*-arabinose and *l*-arabinose in the rabbit.** RALPH C. CORLEY. *J. Biol. Chem.* 82, 269-2(1929); cf. *C. A.* 22, 974.—Studies of the rates of disposal of *d*- and *l*-arabinose in the rabbit indicate that both forms are handled with about equal facility. If there is any difference, it is in favor of the *d*-form. The simultaneous injection of insulin had no noticeable effect on the metabolism of *d*-arabinose. A. P. LOTHROP

**Vitamin requirements of nursing young. VI. Anhydremia associated with disturbance in hematopoietic function in nursing young of the albino rats suffering from a deficiency of the vitamin B complex.** BARNETT SURE, M. C. KIK AND DOROTHY J. WALKER. *J. Biol. Chem.* 82, 287-306(1929).—Hemoglobin detns., erythrocyte counts, detns. of total blood solids and studies of the refractive index of the blood serum indicate that the nursing young of the albino rat suffering from a deficiency of the vitamin B complex develop an anhydremia which is also associated with a marked disturbance in hematopoietic function. The entire regulatory mechanism by which this effect is produced is not fully understood but it is suggested that its controlling influence on food consumption may be a detg. factor. A. P. LOTHROP

**Effect of vitamin deficiencies on carbohydrate metabolism. I. Hypoglucemia associated with anhydremia and disturbance in hematopoietic function in nursing young of the albino rat suffering from uncomplicated vitamin B deficiency.** BARNETT SURE AND MARGARET E. SMITH. *J. Biol. Chem.* 82, 307-15(1929).—The lactating mothers were fed an abundance of vitamin F (stable antipellagic factor) in the form of autoclaved yeast which was deficient in vitamin B. The nursing young developed marked hypoglucemia before loss of body wt. had occurred, associated with anhydremia and marked disturbance in hematopoietic function. Vitamin B therapy produced a rapid increase in blood sugar together with a regeneration of blood. A. P. L.

**Tryptophan and growth. I. Growth upon a tryptophan-deficient basal diet supplemented at varying intervals by the separate feeding of tryptophan.** CLARENCE P. BERG AND WM. C. ROSE. *J. Biol. Chem.* 82, 479-84(1929).—"The frequency of administration of tryptophan to animals upon tryptophan-deficient basal diets exerts a marked influence upon the rate of increase in body wt. Feeding half the daily allowance at intervals of 12 hrs. induces better growth than when the total day's allotment is administered at one time. More frequent administration than twice daily appears to exert little further benefit. It is suggested that amino acids may differ as to the frequency with which they must be supplied when fed apart from the other components of the ration, but until more definite information is secured it appears desirable in such studies to administer the supplementing compd. at least twice daily." A. P. L.

**The metabolism of sulfur. XV. The relation of the protein and cystine content of the diet to the growth of the hair in the white rat.** HOWARD D. LIGHTBODY AND HOWARD B. LEWIS. *J. Biol. Chem.* 82, 485-97(1929).—The amt of hair produced in young white rats on diets in which the low cystine content of the protein fed (casein) was the chief factor limiting the rate of growth was related to the protein (and cystine) content of the diet but under the exptl. conditions employed the demand for protein (and cystine) for the growth of the hair appeared to be secondary in importance to the demands for the growth of the more essential tissues of the body. A. P. LOTHROP

**Ultra-violet wave lengths valuable in the cure of rickets in chickens.** GEORGE H. MAUGHAN. *Am. J. Physiol.* 87, 381-96(1928).—The effective wave lengths were between 3130 and 2650 A. U. Those shorter than 2896 A. U. were relatively weak in curative power, while wave lengths of 2968 A. U. were the most potent. **Determination of transmission of glasses.** C. V. SHAPIRO. *Ibid* 396-8.—The measurement of transmission of ultra-violet light by glass filters is described. J. F. LYMAN

**Bone marrow reactions. V. The influence of water- and alcohol-extracted liver on blood regeneration in pigeons.** G. L. MULLER assisted by EMILIE GOODE. *Am. J. Physiol.* 88, 130-42(1929); cf. *C. A.* 22, 3205.—Liver contains an excess of substances that inhibit red cell regeneration, probably by affecting the reticulo-endothelial system. **VI. The adequacy of kidney, pancreas, spleen and brain for blood regeneration in pigeons with nutritional anemia produced by starvation.** G. L. MULLER AND ANGELO SCORPIO. *Ibid* 259-66.—In pigeons, in which partial bone marrow aplasia and thus anemia had been produced by starvation, an exclusive diet of broiled kidney was not

as effective as broiled pancreas or broiled spleen for blood regeneration, while broiled brain was inadequate. J. F. LYMAN

**Proof that the stimulating effect of fat on metabolism is due to the fatty acid radical of the fat molecule and not to the glycerol radical.** F. WILLIAMS, L. D. SEAGER AND W. E. BURGE. *Am. J. Physiol.* **88**, 237-9(1929).—Gold fish were placed in 0.1% glucose soln. contg. small amts. of various Na and K soaps (palmitate, stearate, oleate) or glycerol.  $O_2$  was bubbled through and after 30 hrs. the amt. of glucose remaining in the soln. was detd. Control tests were made by using gold fish in plain sugar solns. and by bubbling  $O_2$  through the various mixtures with no fish present. The presence of the soaps increased the rate of disappearance of the sugar while glycerol had little or no such effect. Conclusion. The fatty acid radical in the fat mol. and not the glycerol radical is responsible for the stimulating effect of fat on sugar metabolism. J. F. L.

**The effect of fasting on certain phases of carbohydrate metabolism.** H. M. HINES, J. D. BOYD AND C. E. LEESE. *Am. J. Physiol.* **88**, 240-4(1929). Fasted dogs showed a lower tolerance toward injected glucose, as shown by increase in blood sugar and excretion of sugar in the urine, than did fed dogs. Fasting probably results in a lowered function of the body as a whole rather than in an impairment of one organ in particular. J. F. LYMAN

**The influence of vitamin-A deficiency on the estrus cycle of the rat.** KATHARINE H. COWARD. *J. Physiol.* **67**, 26-32(1929).—It was impossible to use the vaginal smear test as a criterion in the diagnosis of vitamin-A deficiency. J. F. LYMAN

**Studies on the action of excessive doses of irradiated ergosterol in normal and rachitic animals.** M. COMEL. *Biochim. terap. sper.* **16**, 81-95(1929).—Irradiated ergosterol administered in large doses to young, adult, normal or rachitic rats cures rapidly and completely exptl. rickets, but does not in any way injure or produce any toxic effects in the animals. After it has exercised its Ca-fixing action, ergosterol remains inactive in the organism which perhaps stores some of it but certainly eliminates some of it in the excretions and secretions. PETER MASUCCI

**Experimental studies on the effect of irradiated ergosterol administered in large doses.** BRUNO BORCHI. *Biochim. terap. sper.* **16**, 113-19(1929).—The expts. were made on normal and splenectomized rats. Ten. mg. of ergosterol was injected subcutaneously on alternate days for the period of one month. On autopsy there was no evidence of any changes in the organs which would indicate a picture of hypervitaminosis (deposition of Ca on the walls of the vessels and in various organs). An occasional splenectomized animal showed a swelling of the myocardium and cells in the renal canaliculi. B., therefore, inclines to the view that the toxicity observed after administration of ergosterol was not due to the administration of vitamin D but to the presence of toxic substances associated with it. PETER MASUCCI

**Studies on the consumption of phosphorus, calcium and magnesium in a freely selected diet.** CARL TIGERSTEDT. *Skand. Arch. Physiol.* **56**, 265 90(1929).—An extensive investigation of the P, Ca and Mg intake of people of various social groups in Finland. Data are presented for the av. supply of these mineral components per 1000 cal. at various caloric intakes (2000 to 5000 cal) in the diet: 2.22 g.  $P_2O_5$ , 0.96 g. CaO and 0.50 g. MgO. The av. ratios  $P_2O_5$  : CaO : MgO were for men: 4.31 : 1.83 : 1.00, for women 4.44 : 1.95 : 1.00; and for children 4.07 : 1.72 : 1.00. S. MORGULIS

**Influence of thyroid gland feeding on the protein and fat metabolism.** BURKHARD KOMMERELL. *Biochem. Z.* **208**, 112-26(1929).—Two fasting expts. were performed on a dog at an interval of 5 weeks, thyroid gland being administered during the second period. Daily detns. were made of the basal metabolism and the N balance, from which the protein and fat contribution to the oxidative processes during muscle rest was calcd. Thyroid administration caused an increase of 30.5% in the basal metabolism, and 31.3% of this excess metabolism was accounted for by protein and 68.7% by fat. Under the thyroid influence the N loss of the dog during fasting was about doubled. S. MORGULIS

**The specific dynamic action of meat in dogs fed thyroid gland.** FRITZ MEYER. *Biochem. Z.* **208**, 127 50(1929).—The administration of thyroid gland substance can affect the progress and the extent of the sp. dynamic oxidation increase following meat feeding. With the thyroid the curve of the sp. dynamic action rises more sharply but the level of the curve is actually lower than normally, so that the total effect of the sp. dynamic action is considerably smaller. This is interpreted so that the sp. dynamic calories are made available for the thyroid metabolic increase. S. M.

**The phosphatide content of organs upon feeding of large amounts of phosphatides.** II. BRUNO REWALD. *Biochem. Z.* **208**, 179-84(1929); cf. C. A. **22**, 4591.—Prolonged feeding of large quantities of phosphatides (30 g. per day for 15 months) to dogs had no

ill effects but, on the contrary, improved the state of health. The organs are rich in phosphatides but this is not greater than was obtained in feeding expts. of much shorter duration so that a state of satn. apparently is soon attained and no further increase in phosphatide content follows. A particularly large accumulation of phosphatide was found in such glandular organs as the ovaries, pancreas, thyroid, etc., where the increase in phosphatide content may become double or triple the normal so that one may actually speak of a lipoid fattening in the case of these organs. S. MORGULIS

The changes in metabolism produced by radiation. V. Alterations in carbohydrate metabolism. 2. LUDWIG PINCUSSEN AND TOKIJI KAWAKAMI. *Biochem. Z.* 208, 185-90(1929); cf. *C. A.* 23, 3242.—In radiated animals there is an increase in glycogen at the expense of lactic acid both in liver and muscles. The glycogen lactic acid ratio is raised 55 and 45%, resp. In the heart the change is not outside the limits of error. The view is expressed that radiation acts in a manner similar to insulin. S. MORGULIS

Relation between phosphoric acid and the carbohydrate metabolism of the isolated liver. W. A. ENGELHARDT AND A. N. PARSHIN. *Biochem. Z.* 208, 221-9(1929).—The perfusion liquid of an isolated rabbit liver always contains inorg. P, but whereas this gradually increases in livers from well-nourished animals, it remains const. or diminishes in livers from starved rabbits. If the perfusion is made with a Ringer soln. contg. 0.2% glucose the inorg. P content of the fluid decreases markedly, this effect of the sugar being removed by adding F or increasing the Ca of the Ringer soln. The addn. of insulin to the glucose-contg. perfusion fluid caused a further decrease in the inorg. P content. There was no increase in lactic acid under these conditions, but the addn. of F does produce a marked rise in the lactic acid production. The inorg. P is formed from org. combinations. S. MORGULIS

The calcium and potassium content of serum of fasting dogs. SERGIUS MORGULIS. *Biochem. Z.* 208, 257-8(1929).—It is pointed out that the lowering of the serum Ca in advanced stages of fasting cannot be regarded as evidence of a change in the vegetative nervous reflexes since the K/Ca ratio remains practically const. during inanition. S. MORGULIS

The influence of iron on the resting metabolism of rachitic rats. HANS SEEL. *Biochem. Z.* 208, 295-8(1929).—Expts. on rats show that by feeding bivalent Fe( $\text{FeSO}_4$  or  $\text{Fe}(\text{HCO}_3)_2$ ) the lowering of the oxidative processes in rachitic animals can be prevented but this has no favorable effect on the rickets itself. The Fe, like P, therefore, acts quite differently from vitamin D which not only maintains the metabolism but also brings about healing of the bone lesions. S. MORGULIS

Vitamin activity and surface tension activity. II. Antiscorbutic action of certain plant juices and their surface tension activity. N. F. SHEPILEVSKII. *Biochem. Z.* 208, 334-51(1929); cf. *C. A.* 23, 1942.—A parallelism has been observed between the antiscorbutic and the surface tension activity of plant juices, the juice from plants with greater surface action being also more potent as antiscorbutics. S. MORGULIS

Hexosediphosphatase of chickens suffering from leg weakness. M. SCHLECHTER. *Biochem. Z.* 208, 443-4(1929).—The tissue from the region between the bone and the cartilage in chickens with leg weakness has greater ability to split hexosediphosphate than that of healthy chickens. S. MORGULIS

Studies on vitamin A and D. I. Color reactions of fish-liver oils with condensation substances. WM. KERPPOLA. *Skand. Arch. Physiol.* 56, 173-80(1929).— $\text{SbCl}_3$ ,  $\text{AsCl}_3$  and  $\text{CCl}_3\text{COOH}$  produce a color reaction with cod-liver oil which begins with the yellow, becomes reddish violet and finally blue. On standing exposed to the air the colors undergo a reversible change back to the initial tint. Certain other substances give a color reaction which covers only a very narrow range of the spectrum. Thus, benzoyl chloride together with  $\text{ZnCl}_2$  colors the oil rose,  $\text{H}_2\text{SO}_4$  +  $\text{P}_2\text{O}_5$  blue-violet. The color reaction depends also upon the grade of oil, the solvent used, etc., so that different results may be obtained even with the same reagent. Oxidation and ultra-violet radiation affect the reaction of the oil in about the same way. II. The antimony trichloride reaction in organs of rats on a vitamin-A-free diet. *Ibid* 181-7.—Liver, lung and intestines of healthy rats yield with  $\text{SbCl}_3$  a color reaction which beginning with green-blue ends finally with violet or rose, but in organs from rats on a vitamin-A-free diet the initial green-blue reaction is absent. The brain of healthy rats gives at once a rose color but in vitamin-A-free rats no color at all appears. III. Color reactions of ergosterol with condensation substances. *Ibid* 188-95.—The color reactions of cod-liver oil with  $\text{SbCl}_3$ ,  $\text{AsCl}_3$  or  $\text{CCl}_3\text{COOH}$  can be obtained even more strikingly with the ethereal ext. of the saponified oil. The reaction of the cod-liver oil corresponds very strikingly with that obtained with ergosterol. IV. Color reactions of vegetable

foods with antimony trichloride. *Ibid* 196-200.—The reaction with  $\text{SbCl}_3$  of a great variety of vegetable products is recorded. V. Crystallization of the cod-liver oil chromogen and its relation to cholesterol. *Ibid* 201-6.—Cod-liver oil is saponified with alc. KOH, the residue extd. with ether which is washed until neutral with 1% NaC and finally dried with  $\text{Na}_2\text{SO}_4$ . The dry ethereal ext. is partly evapd., mixed with MeOH and, after the ether is boiled off, cooled. Triclinic crystals separate out from the cold MeOH which resemble cholesterol. The yield of these moist crystals is about 1% of the wt. of cod-liver oil. The reagents produce color reactions with these crystals exactly like those with cod-liver oil. The refractive index is  $\alpha' = 1.496 \pm 0.003$ ;  $\gamma' = 1.548 \pm 0.003$ . The chromogen crystals from the cod-liver oil are considered related to cholesterol. VI. Color reactions of human and animal organs of animal products with antimony trichloride. *Ibid* 207-9.—The strongest reaction is obtained with brain, adrenal and ovarian follicles. VII. The color reaction of the blood with antimony trichloride in certain disease conditions. *Ibid* 210-5.—Human serum gives almost invariably a rose color with  $\text{SbCl}_3$ , accompanied by a green fluorescence. The erythrocytes give the same reaction, only not so strongly. S. MORGULIS

Calcium metabolism in the laying hen. III. Calcium carbonate and hatchability. G. D. BUCKNER, J. H. MARTIN AND A. M. PETER. Kentucky Agr. Expt. Sta., *Bull* 291, 23 pp. (1929); cf. *C. A.* 23, 1941 —In the absence of a  $\text{CaCO}_3$  supplement from the diet of laying hens on a ration consisting of yellow corn, wheat and buttermilk fed with green feeds the hatchability of fertilized eggs was diminished and percentage of infertile eggs was increased. Fewer eggs were laid and they became smaller, and smaller chickens resulted. J. J. SKINNER

Influence of carbohydrate consumption upon the protein metabolism at a high-temperature environment. SEIKO HAMADA AND MASAO IMA. *National Hyg.* 5, 718-34 (1928).—A dog was first fed with a protein-rich food at an ordinary environment (temp. 15-20°, humidity 60-70%) until the urinary N became const. Rice was next given in the same environment after which the animal was placed in an environment of a higher temp (35°, humidity 40-50%) for 3 days. After the animal was allowed to recuperate in the ordinary environment, it was again placed in a high-temp. environment (38°). The above expt. was repeated with the results that although feeding animals with carbohydrate inhibits the decompn. of protein at ordinary temps, it also has the power of reducing the increase of the protein decompn., but the latter inhibiting action is never complete. K. SOMEYA

The irradiation of ergosterol: the action of ultra-violet rays and of soft x-rays. RENÉ DELAPLACE AND G. REBIÈRE. *Compt. rend.* 188, 1169-72 (1929).—An alc. soln of ergosterol, 1.4000, was placed in a quartz dish to a depth of 5 mm. and irradiated at a distance of 25 cm. with a quartz lamp for various intervals of time. The soln became more absorbent when irradiated from 1 to 6 min. After 1 hr. of irradiation the principal band of absorption was between 3022 and 2600 A. U. This band of absorption has been attributed to vitamin D. Powdered ergosterol was placed in a filter paper and exposed to x-rays from a Cu cathode for intervals from 1 min. to 1 hr. The ergosterol was then dissolved in EtOH and examd. spectrographically. After 1 min. irradiation there was an increase in the absorption for the ray 2700 A. U. When irradiated from 10 min. to 1 hr. there was an increase in the transparency of the soln. M. H. SOULE

The role of food equilibrium in the utilization of lactose. MME. L. RANDOIN AND R. LECOQ. *Compt. rend.* 188, 1188-90 (1929).—Pigeons fed on a complete artificial diet contg. yeast and 66% of pure lactose usually died in from 18 to 30 days. A modification of the diet by lowering the amt. of lactose to 35% sustained the pigeons for 5 months. M. H. SOULE

The variations of the bones with the change in diet of albino rats. MEI IRO SAKURAI. *Sei-i-kyōi Med. J.* 48, No. 2, 1-23, Abstract sect. 1-2 (1929).—A very careful histological study was made of the ribs of rats fed yellow corn 160 parts, meat that had been heated 1 hr. at 120°, 20 parts, gelatin 12 parts, NaCl 2 parts and  $\text{CaCO}_3$  6 parts. M. H. SOULE

Influence of mineral salt allowance on magnitude of nitrogen retention during growth. ÉMILE F. TERROINE AND THÉRÈSE REICHERT. *Compt. rend.* 188, 1208-71 (1929).—Each of the single compds. NaCl, KCl,  $\text{K}_2\text{HPO}_4$ , and Ca citrate, is shown to be without influence on the N retention of young pigs, by the exptl. procedure used previously (*C. A.* 22, 973 4) in showing that a considerable increase in N retention is caused by a complex mineral salt mixt. G. TOENNIES

The blood sugar content of animals after feeding different foods. ANNA MITTELSTEDT. *Z. expil. Med.* 1, 87-96 (1928); *Ber. ges. Physiol. expil. Pharmacol.* 48, 222.—

The blood sugar of normal animals fasting for 24 hr. is not constant, but increases and decreases irregularly. The increase after feeding depends upon the type of food, carbohydrates producing a decided increase while the values remain at the fasting normal after feeding meat or milk. In overfeeding with carbohydrates the curve is distorted.

R. C. WILLSON

The nutritive value of pasture grass as influenced by management (FAGAN) 15. Comparative returns in feed units from crop rotation and pasture (WHITE) 15. Cure of Fe starvation (bush sickness) in stock (ASTON) 15. Lime-deficient areas in King-Country (WRIGHT) 15. The role of pasture in the mineral nutrition of farm animals (MAYNARD) 15.

## F—PHYSIOLOGY

E. K. MARSHALL, JR.

**The phosphatide content of various types of muscle.** KURT SORG. *Z. physiol. Chem.* 182, 97-106(1929).—By the following method the phosphatide content of small quantities of organs (0.5-2 g.) may be detd. with an accuracy of  $\pm 1\%$ . In a 100 cc. wide-neck graduated flask contg. 20 cc. MeOH weigh 2-3 g. of finely minced skeletal muscle or 0.5 g. heart muscle. Add 50 cc. MeOH, heat the flask a few min. on the water bath and crush the muscle with a glass rod, the lower end of which is widened like a pestle. Cool, fill to the mark with MeOH and place in the icebox overnight. Filter at icebox temp. through a small folded filter, keeping the soln. well covered. Pipet an aliquot (75 cc.) into an evap. dish, add a small quantity of  $\text{CaCO}_3$  and evap. to dryness at a temp. not exceeding  $35^\circ$ . Add a little anhyd.  $\text{Na}_2\text{SO}_4$ , rub with  $\text{Et}_2\text{O}$  and transfer to a centrifuge tube, rinsing with  $\text{Et}_2\text{O}$ . Centrifuge and decant the  $\text{Et}_2\text{O}$  into a digestion flask, stir the residue with  $\text{Et}_2\text{O}$  and centrifuge again, repeating this washing 4 times. Evap. the combined  $\text{Et}_2\text{O}$  exts., and ash with 2 cc. concd.  $\text{H}_2\text{SO}_4$  and perhydrol. Dissolve the residue in  $\text{H}_2\text{O}$ , neutralize with  $\text{NH}_4\text{OH}$  and det.  $\text{H}_3\text{PO}_4$  gravimetrically as strychnine phosphomolybdate. The value for phosphatide- $\text{H}_3\text{PO}_4$  thus obtained agrees very closely with the value for acid-insol. residual  $\text{H}_3\text{PO}_4$  obtained by difference between total  $\text{H}_3\text{PO}_4$  and total acid-sol.  $\text{H}_3\text{PO}_4$  of the tissue. The 3 types of muscle studied were the biceps femoris, the semitendinosus and the heart of rabbits. The phosphatide content parallels the endurance capacity of the muscle. The heart muscle shows the highest content (up to 0.43%), the red muscle considerably less (up to 0.173%) and the quicker acting but more easily fatigued white muscle still less (up to 0.128%). The acid-insol.  $\text{H}_3\text{PO}_4$  of the heart consists entirely of phosphatides; that of white muscle contains also small quantities of other P derivs. including nucleoproteins. For most purposes the phosphatide content of heart muscle may be obtained by subtracting the acid-sol. from the total  $\text{H}_3\text{PO}_4$ .

A. W. DOX

**The physical chemical behavior of magnesium in serum.** Z. STARY AND R. WINTER-NITZ. *Z. physiol. Chem.* 182, 107-16(1929).—The non-dialyzable portion of the Mg in native serum averages 28%. When serum is dialyzed against physiol. NaCl, the Mg predominates in the dialyate if the reaction is acid, and in the residual soln. if the reaction is alk. The turning point where complete compensation occurs is at  $pH$  5.5, the same as that for Ca. Notwithstanding the increased content of Mg in cerebrospinal fluid as compared to serum, it is shown that in serum the Mg follows the Donnan law.

A. W. DOX

**The cholesterol content of the human intestinal wall.** M. BÜRGER AND H. D. OETER. *Z. physiol. Chem.* 182, 141-7(1929).—According to Sperry (*C.A.* 21, 1295), the excretion of a large part of the fecal sterols occurs through the intestinal wall. By analyses of carefully prepd. segments from various parts of the intestinal tract it should be possible to det. in what region the cholesterol excretion is most active. In mg. per 100 g. dry substance the av. cholesterol values are: esophagus 325, duodenum 427, ileum 397, sigmoid 646. The large intestine thus shows the highest cholesterol content, from which it is inferred that the greatest excretion occurs here. Detn. of the Br-adding capacity of sterol isolated from the intestinal mucosa shows that only cholesterol is present and no coprosterol.

A. W. DOX

**Basal metabolism of Australian aborigines.** H. S. H. WARDLAW AND C. H. HORSLEY. *Australian J. Exptl. Biol. and Med. Sci.* 5, 263-72(1928).

H. L. D.

**Blood coagulation and the control of hemorrhage.** C. A. MILLS. *J. Oriental Med.* 8, 58-62, 85-93(1928).—A review of theories of blood-clotting: those of Bordet and Howell are contrasted and discussed. Tissue fibrinogen and its distribution, chemistry, and manner of action are next dealt with, and fresh and original observations reported. Finally, a new conception of blood-clotting is given. The excitator is placed in the

tissues and in the platelets; the blood no sooner escapes from the blood vessels than it receives some tissue-fibrinogen to start clotting. If no tissue juice is added, the platelets, since they disintegrate on leaving the vessels, supply the tissue fibrinogen by disintegration. H. L. D.

**Chemical processes in muscle.** F. LEHNARTZ. *Klin. Wochschr.* 7, 1225-8(1928); *Physiol. Abstracts* 13, 437.—A 0.01 N soln. of the Na salt of adenylic acid in 2% NaHCO<sub>3</sub> added to the press juice of rabbit muscle causes a rapid diminution of inorg. phosphates. At 14° the min. phosphate concn. is reached in 1 minute; thereafter the phosphate concn. slowly rises. In the first stage, where phosphate disappears, hexosemonophosphate is formed, and in the second, slower, reaction this breaks down to give lactic acid and free phosphate. The synthesis of hexosemonophosphate in the above reaction is accompanied by a rapid breakdown of phosphagen. In the later reaction phosphagen is resynthesized. Inosinic acid or adenosine, unlike adenylic acid, has no influence on the phosphate concn. of muscle press juice. The optimum  $p_H$  for the synthesis of hexosemonophosphate under the catalytic influence of adenylic acid is 7.25, and for the synthesis of phosphagen is 8.0. The latter reaction is not catalyzed by adenylic acid. The source of energy for the resynthesis of phosphagen is discussed, and it is concluded that this cannot be derived from the conversion of lactacidogen into lactic acid. H. L. D.

**Chemistry of hormones.** GUSTAV MOSSLER. *Pharm. Monatsh.* 10, 92-7, 109-11 (1929).—A review. W. O. F.

**Decomposition of glycogen in the vagina.** H. SCHULTHEISS. *Arch. Gynäkol.* 136, 48-65(1929).—Vaginal bacilli were grown under anaerobic conditions in bouillon contg. liver and 1% glycogen. The H-ion concn. and the amt. of glycogen were detd. in control tubes and compared with the values obtained after growth of the bacilli for 3 days. This gave a simple method for demonstrating the decompn. of glycogen by vaginal bacilli. When there was an intense production of acid the bouillon gave with the Uffelmann reagent the reaction characteristic of lactic acid. Pyogenic organisms did not break up glycogen nor did a bacteria-free vaginal secretion. HARRIET F. HOLMES.

**The biology of the vagina.** I. The behavior of the flora and the chemistry of the vagina in the non-pregnant state and its dependence on ovarian function. H. SCHULTHEISS. *Arch. Gynäkol.* 136, 66-93(1929).—The H-ion concn. and the flora of the vaginal secretion were studied in 332 non-pregnant women. The acidity was in direct relation to the bacteria present and was highest in the cases showing chiefly Gram-positive vaginal bacilli and decreased with the increase of other bacteria. This decrease in acidity is due to a disturbed glycogen metabolism in the mucous membrane of the vagina or to an increased flow of an alk. secretion from the upper genital tract. The highest acidity occurs as a rule in the premenstrual period and tends to approach alk. directly after menstruation. In functional ovarian disturbances there is a decrease in the degree of acidity and the vaginal flora becomes mixed. At the onset and during the course of the menopause there is a marked decrease in the acidity of the secretion and an increase in the vulnerability of the vagina. The flora of vaginal bacilli may be replaced by a mixed flora, or the vagina may remain relatively free from other organisms in spite of a low acidity of the secretion. II. The flora and chemistry of the vaginal secretion in pregnancy. *Ibid* 94-110. The H-ion concn. and the flora of the vaginal secretion were studied in 546 pregnant women. The flora of the pregnant women showed a greater degree of purity, and in 3/5 of the cases was composed of vaginal bacilli as compared to 2/5 of the cases in non-pregnant women. In the pregnant as in the non-pregnant women the H ion concn. of the vaginal secretion is related to the vaginal flora but the acidity does not decrease with a mixed flora to the degree that it does in non-pregnant women. This is in part due to an increase in glycogen in the mucous membrane of the vagina in pregnancy and to the presence in the mixed flora of other acid producers. The greatest increase in acidity of the vaginal secretion takes place in the first half of pregnancy and increases but little later. No cyclic changes in the acidity of the vaginal secretion could be made out. HARRIET F. HOLMES.

**Oxidation disturbances in carbon metabolism during pregnancy.** A. BOCK. *Arch. Gynäkol.* 136, 197-212(1929).—In a series of healthy pregnant women the C and N intake and excretion were detd. The ratio of C excreted to N excreted in pregnant women reached the high value of 1.21, which is much higher than is physiologic for a healthy normal person. This result is an indication that pregnancy is accompanied by a lessened oxidation. Similar results were obtained in animals. HARRIET F. HOLMES.

**The relative and absolute acidity of the stomach contents and the acidity coefficient of the gastric juice.** N. ZVONITZKII AND V. ISAEV. *Arch. Verdauungs-Krankh.* 44, 106-13(1929).—The "total acidity" or the HCl concn. of the stomach contents is not



a quant. measure of the acid-building function. The detn. of the acid concn. of the stomach contents in the clinic has no great value without consideration of its abs. quantity in a definite unit of time. Since the acidities in different portions of the stomach contents are really only percentage relationships to entirely different amts., they are not truly comparable. The course of the curve for relative acidity in no way corresponds to the actual course of the acid-building function of the stomach. F. K.

**The gastric function test. II. Absolute evaluation of gastric function.** A. E. LEVIN. *Arch. Verdauungs-Krankh.* **44**, 257-66(1928).—A formula is given. F. K.

**Studies of the secretion and evacuation functions of the stomach.** A. E. LEVIN, O. B. MAKAREVICH AND M. N. SISSMAN. *Arch. Verdauungs-Krankh.* **44**, 338-55(1928).—The secretion after 400 cc bouillon is 100-250 cc. Variations in the same person were never more than 20%. HCl secretion varied between 0.3 and 0.6%. From 400 to 600 cc. of stomach contents was transferred to the intestine in an hr. Increase in acidity ran parallel to the gastric secretion, and depended on the secretion velocity, the evacuation, abs. acidity and the amt. of neutralization by mucus and duodenal contents. FRANCES KRASNOW

**Colorimetric blood reaction to determine sex.** V. N. KRAINSKA-IGMATOVA. *Dent. Z. ges. gericht. Med.* **13**, 278-85(1929).—Checks on the reaction worked out by Bernatzky (resulting from the reduction of rosaniline and methyl green) and Manoilov (ozonizing and chlorination of the *Dahlia* colors and Hb) with the result that neither can be used for sex detn. FRANCES KRASNOW

**The inorganic phosphorus of frog muscle in relation to lactacidogen and phosphocreatine.** G. M. BASTEDO AND LAURENCE IRVING. *Am. J. Physiol.* **86**, 505-19(1928).—The lactate ion showed a pronounced disintegrating action on phosphocreatine when the muscle was anaerobic. In a thin muscle with an adequate  $O_2$  supply no hydrolysis of phosphocreatine was detected even in the presence of lactate. The facts (1) that inorg. phosphates of muscle are const. when synthesis of lactacidogen and hydrolysis of phosphocreatine is taking place; (2) that lactacidogen synthesis is obtained in muscle hash, with a max. at a time when the phosphocreatine has completely disappeared and (3) that anaerobiosis breaks down phosphocreatine without any synthesis of lactacidogen suggests that hydrolysis of phosphocreatine and synthesis of lactacidogen are independent processes, but are indirectly related, in that both compds. are in equil. with inorg. P, and that the amt. of inorg. P liberated by the one process may be used in the synthesis of the other. J. F. LYMAN

**The embryonic circulatory system. I. The influence of hydrogen-ion concentration on the yolk sac blood vessels of the chick embryo.** FREDERICK S. HAMMETT AND DOROTHY ZOLL. *Am. J. Physiol.* **86**, 520-7(1928).—The blood vessels of the yolk sac of the 4-day chick embryo were not detectably influenced by acid ( $p_H$  5.0) or alkali ( $p_H$  9.0), but they were specifically constricted by  $CO_2$ . J. F. LYMAN

**A hormone mechanism for gall bladder contraction and evacuation.** A. C. IVY AND ERIC OLDBERG. *Am. J. Physiol.* **86**, 599-613(1928). A purified ext. of the intestinal mucosa injected intravenously caused the gall bladder to evacuate. The active substance is not histamine or choline. It is probably not secretin. The name *cholecystokinin* is suggested. J. F. LYMAN

**The estrous cycle in the rat. IV. Basal metabolism during the estrous cycle** MILTON O. LEE. *Am. J. Physiol.* **86**, 694-705(1928); cf. *C. A.* **22**, 3688. —An increased basal metabolic rate of 5 to 20% was observed in rats in the last 10 hr. of stage V (diestrus) and in the first 6 hr. of stage I (proestrus). J. F. LYMAN

**Regulation of respiration. XXI. Effects of intravenous injections of sodium cyanide on the hydrogen-ion concentration of the cerebrospinal fluid of the dog.** ROBERT GESELL AND A. B. HERTZMAN. *Am. J. Physiol.* **87**, 8-14(1928); cf. *C. A.* **23**, 3725. —Simultaneous detns. were made of  $p_H$  in the blood and spinal fluid of dogs that had been given NaCN with or without artificial respiration. On the assumption that intracellular acidity increases as a result of impaired oxidation produced by NaCN, and that the acidity of the cerebrospinal fluid represents the acidity of the immediate external environment of the respiratory neurone, increased pulmonary ventilation was assocd. with increased intracellular acidity but variably accompanied by increasing, by const. or by decreasing alky. of the extra-cellular environment. XXII. Effects of low alveolar oxygen on the hydrogen-ion concentration of the cerebrospinal fluid of the dog. A. B. HERTZMAN AND ROBERT GESELL. *Ibid* 15-9. —Changes in acidity of the cerebrospinal fluid, accompanying impaired oxidation produced by limitation of the  $O_2$  supply, were similar to those produced by NaCN administration. XXIII. Effects of hemorrhage and reinjection on the hydrogen-ion concentration of the cerebrospinal fluid of the dog. *Ibid* 20-3. —The impaired oxidation during hemorrhage,

accompanied by increased acidity of the cerebrospinal fluid, is indicative of increased anaerobic acid metabolism. XXIV. A comparison of the effects of mechanical asphyxia with the lungs filled with room air and with oxygen on the hydrogen-ion concentration of the cerebrospinal fluid of the dog. ROBERT GESELL AND A. B. HERTZMAN. *Ibid* 24-8.—Mech. asphyxia with the lungs filled with room air as compared with O<sub>2</sub> increased the acidity of the cerebrospinal fluid more and that of the blood less. It is thus likely that the brain turns more acid during mech. asphyxia when the lungs are filled with room air even though the blood may turn less acid. The greater stimulation of respiratory movements resulting from the greater impairment of oxidation may consequently be accounted for on an acid basis. The fact that the MnO<sub>2</sub> electrode dissolved rapidly in the cerebrospinal fluid of asphyxiated animals suggests the presence of unusually large amts. of reducing substance. J. F. LYMAN

The physiology of reproduction in birds. XXV. The action of the ovarian and placental hormone in the pigeon. OSCAR RIDDLE AND MASAHARU TANGE. *Am. J. Physiol.* 87, 97-109(1928).—The ovarian and placental hormone had an adverse, not favorable, effect upon ovarian development and growth in pigeons. XXVI. The role of the anterior pituitary in hastening sexual maturity in ring doves. OSCAR RIDDLE AND FLORENCE FLEMION. *Ibid* 110-23.—The anterior pituitary contains a hormone which accelerates the attainment of sexual maturity. J. F. LYMAN

Effect of different food substances upon emptying of the gall bladder. W. F. KRAUSE AND L. R. WHITAKER. *Am. J. Physiol.* 87, 172-9(1928).—Fats and fatty acids were active foods in emptying the gall bladder; carbohydrates were practically ineffective; while proteins produced slight emptying. J. F. LYMAN

The hemoglobin of smooth and striated muscle of the fowl. R. P. KENNEDY AND G. H. WHIPPLE. *Am. J. Physiol.* 87, 192-5(1928).—The spectrophotometric analysis of the muscle hemoglobin of the fowl is identical with that of the dog. Chicken gizzard muscle (smooth muscle) contained about twice as much hemoglobin as was present in the skeletal leg muscles. The hemoglobins from the 2 types of muscle appeared to be identical but differed slightly from blood hemoglobin. J. F. LYMAN

The tension of oxygen in human urine. G. A. BUCKMASTER AND H. R. B. HICKMAN. *Proc. Physiol. Soc., J. Physiol.* 65, xv-vi(1928).—CO<sub>2</sub> tension in human urine was about 45 mm. Hg. O<sub>2</sub> tension in human urine varied usually between 50 and 60 mm.; in no case was it less than 39.5 mm. J. F. LYMAN

Carbon dioxide and oxygen tensions in the bladder. J. A. CAMPBELL. *Proc. Physiol. Soc., J. Physiol.* 65, xviii(1928).—Gas mixts. were introduced into the urinary bladder (rabbit) and left for 3 hrs. after which samples were withdrawn for analysis. The CO<sub>2</sub> tensions in the cavity of the bladder varied between 40 and 50 mm. Hg while the O<sub>2</sub> tensions were usually 35-45 mm. J. F. LYMAN

The effect of cold on the adrenaline content of the suprarenal glands. G. P. CROWDEN AND M. G. PEARSON. *Proc. Physiol. Soc., J. Physiol.* 65, xxv.—When cold produced a marked fall in body temp. of the cat there was a considerable depletion of the adrenaline content of the suprarenal gland with normal innervation as compared with the denervated gland. J. F. LYMAN

Placental glycogen. A. ST. G. HUGGETT. *Proc. Physiol. Soc., J. Physiol.* 66, xi(1928).—The glycogen content of the maternal portion of the rabbit placenta at 21 days was unchanged by starvation, carbohydrate feeding, carbohydrate injections, adrenaline or thyroid feeding. Repeated injections of insulin during starvation of several days or repeated injections of phlorhizin caused some decrease of placental glycogen. The only influence having any marked action on the maternal placenta is a profound disturbance of metabolism. J. F. LYMAN

The cholesterol content of normal tissues and the effect of intravenous injections of cholesterol thereon. E. N. CHAMBERLAIN. *J. Physiol.* 66, 249-61(1928).—Cholesterol emulsions injected intravenously into rabbits were rapidly eliminated from the circulation. Following an injection the adrenals showed a decreased cholesterol content; the liver and particularly the spleen gained cholesterol; while the lungs, kidneys, brain and muscle showed no appreciable change. J. F. LYMAN

The production of carbon dioxide during the respiratory inhibition of the duck. U. LOMBROSO AND C. ARTOM. *Boll. soc. ital. biol. sper.* 4, 103-6(1929).—The inhibition of respiratory movements by stimuli acting on the respiratory tract failed to modify, through reflex action, the production of CO<sub>2</sub> by the tissues of the duck. P. M.

The total nitrogen content of rats with blocked renal function. U. LOMBROSO AND S. DI FRISCO. *Boll. soc. ital. biol. sper.* 4, 129-32(1929); cf. C. A. 23, 3492.—If the elimination of urine in rats is impeded, the total N of the animals at death is less than

the amt. they contained before the expt. This again gives rise to the conception that there is a loss of N in the organism that cannot be accounted for. PETER MASUCCI

**Pancreatic secretion from secretin with unblocked vagus and with vagus blocked by stovaine.** U. LOMBROSO AND A. TOMASINO. *Boll. soc. ital. biol. sper.* 4, 136-8 (1929).—The object was to det. if stovaine block influenced pancreatic secretion caused by secretin injections. The results indicate that on dogs with a permanent Pavlov fistula, there is a diminution of secretion as a result of blocking the vagus. P. M.

**Total base in gastric contents and gastric secretion.** KATHERINE M. CLOSE. *Ann. Internal Med.* 2, 1185-93 (1929).—The lowest concn. of total base occurs in cases with hyperacidity and the highest in achlorhydria, particularly following gastroenterostomy. This is true for secretion during fasting and after stimulation by histamine. The secretion of total base after histamine is inverse to that of free and total acid, in the normal human and dog and in various pathological conditions. Gastric secretion includes changes in the concn. of both acid and base, and the study of the latter is worthy of consideration as well as the former.

JOHN T. MYERS

**Separation of the growth-promoting hormone from that producing premature estrus in the anterior pituitary gland.** TRACY J. PUTMAN. *Arch. Surgery* 18, 1699-707 (1929).—The residue left after extn. of beef anterior pituitary glands with mild alkalis, acid, alc., and acetone will produce premature estrus when implanted intraperitoneally in young mice or rats. The effect seems to differ from that of aq. alk. exts. Thus there seems to be at least 2 chemically distinct hormones in the anterior pituitary gland.

JOHN T. MYERS

**Cerebrospinal fluid changes in composition and drainage after intravenous administration of various solutions.** R. G. SPURLING. *Arch. Surgery* 18, 1763 (1929).—Expts. were performed on dogs with freely draining cisterna magna. Isotonic (Ringer's) soln. injected intravenously dild. the blood, increased the drainage, and dild. the spinal fluid. Hypotonic solns. behaved in the same general way. Distd. water gave a surprisingly small increase in spinal fluid. Hypertonic solns. of NaCl or dextrose gave an initial increase in spinal fluid which was almost immediately reversed, the fluid becoming concd. In one instance air was spontaneously drawn into the ventricles. These expts. support the theory that dialysis is responsible for the production of spinal fluid. The interchange of water and solids in blood and spinal fluid is very rapid. The effect of continuous drainage is imperfectly understood.

JOHN T. MYERS

**Studies in blood and urinary chemistry during pregnancy. Blood sugar curves.** E. C. PILLMAN WILLIAMS AND L. WILLS. *Quart. J. Med.* 22, 493-505 (1929).—There is no definite blood sugar change in normal non-glucosuric pregnant women, except a slight drop as pregnancy progresses, and a slight rise during the early puerperium with a return to normal in a few weeks. The renal threshold seems slightly lowered in the majority of normal pregnant women. The incidence of symptomless glucosuria in 640 cases was 5.4%. The incidence of renal leaks after 100 g. of glucose was 60%. These leaks are of no significance.

JOHN T. MYERS

**The chemical composition of follicular liquid (fats, lipoids and mucoids).** MATTEO TESTA. *Arch. farm. sper.* 46, 174-6 (1929).—In continuation of earlier studies (C. A. 22, 2954, 3920) the following values were found in the analysis of follicular liquid: free cholesterol 29.32, cholesterol esters 28.70, neutral fat 13.05, fatty acids 34.66 and phosphatides 30.70 mg. %. A mucoid was isolated with Needham's method (C. A. 21, 3089); it contained 9.192% total N, 0.392% melanin N, 3.721% basic N and 5.075% amino N. The last 3 values were obtained after hydrolyzing the mucoid with 20 parts of 20% HCl for 10 hr. on the water bath. For detg. the reducing substances the mucoid was hydrolyzed with a mixt. of KCl soln. and dil. HCl for 10 hrs. at 120°. The analysis yielded 5.75% of reducing substances (calcd. as glucose). When Needham's method for hydrolyzing the mucoid was used, the value found was 16.49%. G. S.

## G—PATHOLOGY

H. GIDEON WELLS

**Influence of calcium salts on snake-venom hemolysis.** S. KANISAWA. *Acta Dermatol.* 1927, 479-90.—In the cases studied, hemolysis was arrested by Ca chloride or lactate in concns. >0.025% and accelerated in concns. <0.01%. B. C. A.

**Coagulation of the blood in parathyroid tetany.** J. C. BROUGHER. *Am. J. Physiol.* 87, 221-4 (1928).—Blood coagulation is delayed in parathyroid tetany. One ounce of cod-liver oil given by stomach tube restores the coagulation time to normal after a period of 2-4 hrs. B. C. A.

**Dextrose content of the vitreous humor.** F. ASK. *Särl. acta ophthalm.* 5, 23-8

(1928).—In pathol. conditions, especially glaucoma, the vitreous humor contains less dextrose than the aq. humor. B. C. A.

**Immune substances.** TH. THJØRTA. *Tids. Kemi Bergvesen* 8, 88-91, 102-5

(1928).—A survey and discussion of previous work.

A. DROGSETH

**Significance of arsenic in excretions.** K. VOGEL. *Am. J. Med. Sci.* 176, 215 (1928); *Quart. J. Pharm.* 1, 655.—Arsenic is present in the excretions of many individuals without discoverable cause and without giving rise to symptoms. Examin. of 100 cases showed that As occurred with especial frequency in patients with jaundice. If As is found in the urine of a patient with jaundice, eliminative treatment with thiosulfate should, if feasible, be carried out before any operation is undertaken. Arsenic is considered to be a contributory factor in many of the cases reported as acute yellow atrophy of the liver. H. L. D.

**Basal metabolism in blood diseases.** M. R. CASTEX AND M. SCHTEINGART. *Rev. soc. med. internat.* 4, 139-46 (1928); *Physiol Abstracts* 13, 504; cf. *C. A.* 22, 2198.—In leucemia the basal metabolism is constantly increased. Treatment of leucemia with benzene or radiotherapy lowers the basal metabolism coincidently with the no. of leucocytes. H. L. D.

**The relation of the sugar concentration of the blood to that of the urine.** ERNST STEINITZ. *Deut. med. Wochschr.* 55, 871-3 (1929).—The threshold value of the blood-sugar concn. at which sugar appears in the urine varies greatly in the case of diabetics, depending upon the severity of the disease. The clinical significance of this threshold value, in the treatment of diabetes, is discussed. ARTHUR GROLLMAN

**Importance of indicanuria, stool fat, and Schmidt fermentation test in the practice of pediatrics.** ROWLAND G. FREEMAN, EDGAR G. MILLER, JR., AND ROWLAND G. FREEMAN, JR. *Arch. Pediatrics* 46, 269-80 (1929).—Normal children show infrequent indicanuria, and their stools contain less than 6.5% total lipins, and yield less than 4 cc. of gas in the Schmidt fermentation test. Children with symptoms of abnormal alimention practically always show either an indicanuria, an excess of stool lipins, an excessive fermentation, or even all 3 of these phenomena. JOSEPH S. HEPBURN

**Calcium studies in jaundice with special reference to the effect of parathyroid extract on the distribution of calcium.** A. CANTAROW, S. M. DODEK AND BURGESS GORDON. *Trans. Coll. Physicians Phila.* [3], 49, 132-43 (1927).—In jaundice, a functional deficiency in Ca exists, probably due to the increased concn. of bile pigments in the blood and tissues. Detn. was made of the coagulation time and the Ca content of whole blood, plasma and serum at 3-hr. intervals after the injection of parathyroid ext., in jaundice patients and in non-jaundiced individuals. In jaundice, the Ca content of the serum varied slightly (9.3 to 12 mg. Ca per 100 cc.), but the Ca content of the whole blood showed an extremely wide variation (4.8 to 12 mg. per 100 cc.). However, 12 hrs. after administration of the parathyroid hormone, the variation in the Ca of the whole blood was practically identical in jaundiced and non-jaundiced persons. This hormone acts as a mobilizer of Ca, and, in jaundice, tended to restore the normal distribution and functional availability of Ca. Its favorable action on the tendency of jaundiced tissue to bleed was due largely to the increased coagulability of the blood and probably to the decreased permeability of the walls of the capillaries resulting from the increase in functioning Ca. JOSEPH S. HEPBURN

**Lipoids of the blood plasma in internal diseases.** JENO FRIESZ AND GEZA SZABÓ *Z. klin. Med.* 106, 701-16 (1927).—In obstructive jaundice the total cholesterol is appreciably increased, but decreases again with recovery. In arsphenamine jaundice the free cholesterol is increased but the total cholesterol lies within normal values. In catarrhal jaundice the total cholesterol may change, but usually lies within normal limits. Cholelithiasis is accompanied by hypercholesterolemia, even if the blood bilirubin be normal and the patient be free from attacks. In luetic hepatitis the total cholesterol increases as the jaundice decreases. Pernicious anemia shows hypocholesterolemia, a decrease even to 0 of free cholesterol, and hyperbilirubinemia; with recovery both forms of cholesterol increase and the bilirubin decreases. In chlorosis hypocholesterolemia and a decrease in free cholesterol occur. In the leucemias the total cholesterol is approx. normal, the free cholesterol subnormal. In thrombopenia and lymphogranuloma, cholesterol values are normal. In cirrhosis and cardiac decompensations, the cholesterol values are either normal or irregular. Lecithin increases with the jaundice in mechanical, catarrhal, and arsphenamine icterus, and remains normal in pleiochromic icterus, anemias, leucemias, cirrhosis and cardiac diseases. No relationship exists between cholesterol, lecithin and bilirubin in the diseases accompanied by enlargement of the liver. Liver function cannot be measured by the detn. of blood lipids.

JOSEPH S. HEPBURN

**Thiocyanate content of serum and cerebrospinal fluid.** ROBERT BLUM. *Z. klin. Med.* 107, 61-71(1928).—In normal individuals the serum contained from 0.03 to 0.06 mg. thiocyanate per 100 cc. This value remained without any definite change in disease, was not decreased in genuine hypertension, was increased 2-fold and even 4-fold in tobacco users, rose rapidly to 1.5 mg. per 100 cc. after oral administration of thiocyanates and returned to the normal value 3 weeks after administration ceased. The thiocyanate content of cerebrospinal fluid was usually the same as in the serum, never higher, sometimes lower than in the serum. In pathological body fluids, the concn. lay between 0.03 and 0.06 mg. per 100 cc.

JOSEPH S. HEPBURN

**Phosphorus content of the serum in kidney diseases.** K. GRASSHEIM AND E. LUCAS. *Z. klin. Med.* 107, 172-80(1928).—Normally 100 cc. of serum contains 2 to 3.5 mg. acid-sol. P and 7 to 9 mg. org. P. These values, especially the former, are higher in hot weather, and an increase in either or both forms of P runs parallel to renal disturbances. Both forms should be detd., and their total should not exceed 12 mg. per 100 cc.

JOSEPH S. HEPBURN

**Metabolic studies in hepatic diseases. I. Carbohydrate metabolism.** ALBERT OPPENHEIMER. *Z. klin. Med.* 107, 467-75(1928).—The concn. of lactic acid in the blood is not increased in hepatic diseases, even after work or ingestion of sugar. Disturbances in carbohydrate metabolism are compensated by the tissues. J. S. H.

**The etiology of the toxicoses of pregnancy. (Are isoagglutinins, isohemolysins or anaphylactins of etiologic importance?)** F. ISBRUCH AND T. WOHLFEIL. *Arch. Gynäkol.* 136, 19-36(1929).—In a series of 410 mothers and children the blood groups were detd. There was no evidence that the toxicoses of pregnancy occurred more frequently in cases where mother and child belonged to different blood groups. The sex of the child also played no part. A passage of fetal agglutinins through the placenta and an unfavorable action of the fetal agglutinins on the mother can, therefore, not be considered as the cause of the toxicoses of pregnancy. In 18 cases the action of the serum of the mother on the blood corpuscles of the child and that of the serum of the child on the blood corpuscles of the mother were studied but isohemolysis only took place in 3 cases, all of which showed active syphilis. In 2 cases of latent syphilis there was little or no hemolysis. In 15 cases guinea pigs were injected with serum from the mother and after the period necessary for the development of passive anaphylaxis were injected with the serum of the child. No anaphylactic symptoms developed either with serum from normal pregnancies or from cases with toxicosis, indicating that the toxicoses of pregnancy are not due to anaphylaxis.

HARRIET F. HOLMES

**The hydrogen-ion concentration of the cerebrospinal fluid in eclampsia, in reference to the etiology of eclamptic convulsions.** G. SCHPOLJANSKY AND A. DANZIG. *Arch. Gynäkol.* 136, 37-47(1929).—The  $p_H$  of the cerebrospinal fluid in eclampsia varies from a high degree of acidosis to a high degree of alkalosis, 6.36-8.9. Neither the acidosis nor the alkalosis of the cerebrospinal fluid is dependent on the severity of the case, the number of attacks or the functional disturbance of the kidneys. Alkalosis is more frequent before labor and acidosis after labor. In the second half of pregnancy an acidosis of the blood frequently develops, accompanied by a diminution of the alkali reserve of the blood. The higher the alkalosis of the cerebrospinal fluid, the lower is the alkali reserve of the blood. The alkali reserve of the blood binds first the acidosis of the brain and this probably explains a displacement of the cerebrospinal fluid to alkalosis. In addition to a disturbance in the acid-base equil., in the cerebrospinal fluid in eclampsia, there is also a disturbance in ionic equil., particularly of Na, K and Ca, and not only in the cerebrospinal fluid but in the other fluids and tissues of the body. The disturbance of ionic equil., particularly of univalent and bivalent ions, alters the permeability and the excitability of the cells and is probably the immediate cause of the irritability of the motor centers of the cortex.

HARRIET F. HOLMES

**The mineral content of cysts.** A. SCHEPETINSKY AND M. KAFITIN. *Arch. Gynäkol.* 136, 130-40(1929).—The mineral content of follicular cysts varies greatly. The mineral content of corpus luteum cysts as compared with that of persistent follicles is high in Na and Cl and particularly in P. Parovarial cysts as compared with tubo-ovarial cysts have a high Ca, K, P and Cl content but a low Na content. Dermoid cysts have a high Ca and Cl content. Follicular cysts have a low Ca, K and P content as compared with the blood serum, while the Na and Cl contents vary. In corpus luteum cysts the Ca, K and Cl contents and K/Ca coeff. are low and the Na content is high as compared with the blood serum. In cystadenoma simplex Ca, K and P are low as compared with the blood serum, Na and Cl showing little change. In pseudomucinous cysts Ca and P are low as compared with the blood serum while K is high. In parovarial cysts Ca is low as compared with the blood serum while K, K/Ca coeff., Na, P and Cl are

high. In the blood serum the coeff.  $K/Ca$  is usually altered by an increase in either  $Ca$  or  $K$ . HARRIET F. HOLMES

The effect of heat on  $O$  and  $H$  immune bodies. A. FELIX AND L. OLITZKI. *Brit. J. Exptl. Path.* 10, 26-34(1929).—The  $O$  (heat-labile) and the  $H$  (heat-stable) agglutinins for *B. typhosus* and the *Salmonella* group of organisms possess heat resistances as markedly different from each other as those already described in the case of *B. proteus* (4 strains). This const. property of the 2 kinds of agglutinins is additional evidence of the qual. difference between the 2 types of bacterial antigens and immune bodies. Its application as a diagnostic measure, while useful in the special case of typhoid patients' serum, does not appear to be of importance in other infections. Normal and immune agglutinins possess the same resistance to heat. The close relationship between complement binding and bactericidal immune bodies and  $O$  agglutinins already established by other means is also demonstrated by their similar heat resistances. H. F. H.

Distribution of endemic goiter in the United States as shown by thyroid surveys. ROBERT OLESEN. *U. S. Pub. Health Repts.* 44, 1463-87(1929). J. A. KENNEDY

Notes on the work of von Vondorfy: "Anacidity, pseudoanacidity and histamine reaction." ARNOLD FÜRGL. *Arch. Verdauungs-Krankh.* 45, 271-2(1929); cf. C. A. 23, 3737.—Discussion. FRANCES KRASNOW

Lipoid and iron deposition in the adrenals and testes of boys 1 to 15 years old. CARL BLUMENSAAT. *Arch. path. anat. (Virchow's)* 271, 639-69(1929).—The lipid content of the adrenals is influenced by disease in childhood as in adult life. When the lipid content is increased, neutral fats partake least in the addn., phosphatides partake more, and the doubly refracting lipoids most. Lipoid poverty of the adrenals is found particularly in long-continued suppurations and other infections, and in less degree in malignant tumors. In the germ cells of the child's testis, up to the 5th year, neutral fats and phosphatides are rare. Cholesterol esters are quite absent. After the 5th year the lipid content increases slowly. After the 12th year the three types of lipoids are present in moderate concn. and in the same proportion. In the interstitial cells in the early years there is a slight physiological lipid content, which, however, decreases up to the 8th year. It is preponderantly neutral fat. After the 12th year there is marked storing of the three types of lipid in equal amt. and in the same amt. as in the germ cells. The lipid content of the germ cells is not markedly influenced by disease, except in the case of purulent meningitis, in which an increase occurs. In the interstitial cells, on the other hand, slight increase in lipid content is the rule in infectious disease. No relation is to be observed in the lipid content of the cells of the adrenal cortex and the interstitial cells of the testis in childhood. A storage of Fe pigments brought in from the blood stream is not observed in the adrenals and testes in the infectious diseases. The hemosiderin which is occasionally found is of other origin. E. R. LONG

The mode of action of formaldehyde on complement-fixation systems. C. E. REYNER. *J. Immunol.* 16, 1-16(1929).—Low concns. of  $HCHO$  increase the absorption of dye by bacteria, while high concns. diminish the absorptive power. Bacteria treated with certain concns. of  $HCHO$  and washed so that no free  $HCHO$  is left, absorb more homologous antibody than untreated bacteria, but heterologous antibodies are not absorbed in greater amt. There is an apparent relationship between the altered surface tension of a bacterial suspension, due to the action of  $HCHO$ , and the increased absorption of antibodies. Of several aldehydes tested only  $HCHO$  and paraformaldehyde had the effects described. Apparently the mode of action of  $HCHO$  as exhibited in the Wassermann reaction and in sp. complement-fixation systems is primarily due to the reaction of antigen with  $HCHO$ , increasing the capacity and velocity of antibody fixation. Specificity is exhibited in the enhanced fixation capacity. E. R. LONG

Surface tension of blood serum in syphilis. ELIZABETH M. YAGLE. *J. Immunol.* 16, 17-25(1929).—Surface-tension estns. of serum in different dilns. indicate that 1:5000 is the optimum diln. for max. time drop. Av. time drops of 25 negative and 25 positive sera, heated and unheated, show the time drop to be slightly greater in positive than negative sera. The time drop is slightly greater in heated than unheated sera. Study of individual sera shows that there may be a greater difference in time drop between individual sera of the positive or of the negative group, than between positive and negative sera. The drop of surface tension is not correlated with positive or negative complement fixation and pptn. reactions. Surface-tension detns. are therefore of no value as a means of differentiating between syphilitic and normal sera. E. R. LONG

The relation of serum dilution and of antigen density to the non-specific precipitation of fowl serum. S. J. SCHILLING AND G. S. SCHILLING. *J. Immunol.* 16, 61-70(1929).—The presence of organisms in bacterial suspensions or antigens acts as a stabiliz-

ing influence on the unstable element in fowl serum. This element appears to be absorbed or adsorbed to the bacterial bodies and rendered inoperative. Increasing diln. of serum or of density of antigen reduces the amt. of, and tendency to, non-sp. pptn. The most abundant ppts. are frequently found in dilns. of phenolized saline soln. It is probable that in undild. fowl serum the unstable element is held in soln. by assocn. with serum albumin and globulin, but as these colloids become dild. and dispersed in phenolized saline soln. they lose their capacity for holding the unstable element, and hence pptn. follows. A lipoidal element is probably responsible for the non-sp. pptn.

E. R. LONG

**Immunization and the nitrogenous constituents of the blood.** M. F. GUYER AND S. LEPKOVSKY. *J. Immunol.* **16**, 175-207(1929).—When a foreign protein, such as typhoid bacillus vaccine, is injected into the blood stream of rabbits, the following changes occur: (1) a tendency toward diminution in the amino N of the blood (except in moribund animals); (2) a marked rise in non-protein N; (3) an increase in urea, but not enough to account for the full excess of non-protein N; (4) a rise in the number of leucocytes, as a rule; (5) fever, as a rule; (6) a lowering of the alkaline reserve; (7) a lowering of the  $p_H$ ; (8) a rather prolonged inhibition of renal secretion; (9) water retention and lowered sp. gr. of the blood and (10) acidosis of the body tissues. The fact that animals made febrile by infra-red irradiation do not show these changes indicates that they are due to the foreign protein itself rather than the fever caused by its injection.

E. R. LONG

**The effect of formalin on botulinus toxins A, B and C.** ROBERT GRAHAM AND FRANK THORP, JR. *J. Immunol.* **16**, 391-401(1929).—Formalin added to potent botulinus toxins A and B to make a concn. of 0.5% detoxified the toxins at 37°. Lower concns. detoxified the C toxin. Potent toxoids so produced protected a majority of guinea pigs against later injection of toxin.

E. R. LONG

**Studies of the antigenic substances of *Cl. botulinum*. XXXIII. I. Complement-fixing substances in alcoholic extracts.** JEANNE LOMMEL AND JANET B. GUNNISON. *J. Immunol.* **16**, 403-9(1929).—Substances giving strong complement-fixation reactions with antibacterial serums were obtained from *Cl. botulinum* by extn. with 75% EtOH. These contained carbohydrate, as indicated by a strong Molisch reaction, and contained little or no protein. They were insol. in salt soln. and therefore failed to react in the precipitin test. They seemed to possess species specificity. The exts. had neither specificity for the serologic group nor for the toxicologic type. They apparently contained the non-sp. factor responsible for the cross reactions among the serologic groups when intact organisms were used as antigens.

E. R. LONG

**Observations on the proposed gold chloride titration for determining the toxicity of diphtheria toxin.** EVERETT SANDERSON AND JOHN H. YOE. *J. Immunol.* **16**, 429-38(1929).—Six different diphtheria toxins when tested by the gold chloride and guinea pig methods failed to show any parallelism as to toxicity. The green color zone produced in mixts. of gold chloride and toxic broths is not sp. for toxin, for, (a) inactivated (heated) and non-inactivated toxins gave almost identical gold chloride figures; (b) the amt. of gold chloride necessary to bring about the max. green coloration with toxic broths can be entirely altered by changing the initial H-ion concn. and the buffer capacity of the broths; (c) several batches of uninoculated 1% dextrose ext. broth gave a green color zone when mixed with gold chloride. Max. green color in mixts. of broths and gold chloride is obtained at approximately  $p_H$  4.5. The gold chloride test therefore is not satisfactory for standardizing bacterial toxins in its present form.

E. R. L.

**The chemical nature of the constituent of fowl serum responsible for non-specific precipitations.** GEO. S. SCHILLING. *J. Immunol.* **16**, 439-49(1929).—Ultramicroscopic examn. of pptd. sera, non-pptd. clouding sera and normal, non-clouding sera of fowls revealed fat globules in all cases, especially in the pptd. and the non-pptd. clouding serum. Microchem. tests on the ppts. resulting in the agglutination system from the addn. of clouding sera show that these ppts. contain neutral fats and fatty acids. Spontaneous ppts. in fowl sera which induce non-sp. ppts. of serologic antigens carry a significantly higher lipid content than sera which do not produce the cloudy reaction; significant differences in their protein content do not appear. The lipoproteins and neutral fats appear to be the constituents in fowl sera responsible for these non-sp. ppts.

E. R. LONG

**The reaction of the blood in cancer.** HORACE MILLET. *J. Biol. Chem.* **82**, 263-7(1929).—The  $p_H$  values were detd. by means of the glass electrode and no difference was found in the av.  $p_H$  of bloods from normal and cancerous individuals. The cancer cases were fairly advanced and had not been treated. It is suggested that discordant

results obtained by other investigators are due mainly to less satisfactory exptl. methods.

**The lipide distribution in normal and abnormal liver tissue. III. The effect of disease upon the lipide distribution in human liver tissue.** EDWIN R. THEIS. *J. Biol. Chem.* **82**, 327-34(1929); cf. *C. A.* **22**, 2209.—The lipide and fatty acid distribution in human liver tissue is approx. the same as that for beef and rabbit tissue. In pneumonia, tuberculosis and fatty degeneration there is an alteration in the phospholipide-fat ration, the former decreasing proportionally with the stage of the disease. "It has been suggested that both phospholipides and neutral fats are stored in the liver tissue, but the author believes only the neutral fat to be stored material and the phospholipides to be active in the actual metabolism of the organ. In every case in which the actual functioning of the organ is disturbed, the lipide distribution is changed to the disadvantage of the phospholipide content."

**The prevention of the tetany of parathyroidectomized dogs. I. Cod-liver oil.** With a note on the effect of cod-liver oil on calcium assimilation. ISIDOR GREENWALD AND JOSEPH GROSS. *J. Biol. Chem.* **82**, 505-30(1929).—Protection against the occurrence of tetany afforded by the administration of cod-liver oil before thyroparathyroidectomy was much less frequently attained in the present expts. than has been claimed by others and, in fact, the expts., considered by themselves, would indicate that the oil has no protective action. To explain these differences it is suggested that: "(1) Almost all dogs possess accessory parathyroid tissue which is not removed in the course of the ordinary thyroparathyroidectomy. (2) Tetany, following parathyroidectomy, is due not only to the low concn. of diffusible Ca in the plas mabut also to the rapidity with which this low concn. is attained. If the diminution is made sufficiently slowly, the animal may adjust itself to such low level of plasma Ca. (3) The administration of cod-liver oil stimulates parathyroid tissue to increased activity. Therefore, after ordinary thyroparathyroidectomy, animals that have previously been treated with cod-liver oil are left with a larger store of parathyroid tissue than are animals that have not been so treated. Consequently, the concn. of Ca in the plasma falls more slowly and acute tetany is avoided or delayed. The organism is given a longer time in which to adjust itself to the low concn. of plasma Ca or the remaining tissue has a better opportunity to hypertrophy sufficiently to supply the animal's needs. Possibly, both processes are involved. (4) The opinion is expressed that the effect of cod-liver oil, and of the administration of parathyroid ext., upon Ca metabolism will be found to vary with the Ca content of the diet, the age of the animal, and the need for Ca in the organism. II. Lactose-containing diets. *Ibid* 531-44.—"Lactose-contg. diets protect dogs against tetany only if large amts. of Ca are also contained in the diet. It is believed that the lactose acts by making the Ca more available to the animal. Metabolism studies showed the usual retention of P after thyroparathyroidectomy but, on high Ca diets, the retention of Ca seemed to be decreased. Since the N excretion was also increased, the significance of the increased Ca excretion is not unequivocal. In any case, it is believed not to be inconsistent with the hypothesis that the parathyroid hormone, directly or indirectly, increases the soly. of Ca in the blood plasma and other body fluids."

**The catalase of malignant tissue.** MARGARET R. LEWIS AND HARRIET COSSMAN. *Am. J. Physiol.* **87**, 584-93(1929).—The infectious tumor of the chicken contained only small amts. of catalase, resembling in this respect the muscle which it invades. The rat sarcoma and carcinoma contained more catalase than did chicken tumor. Chicken tumor virus was destroyed by dil.  $H_2O_2$  soln.

**Diabetes insipidus. III. The diuretic substance.** HELEN BOURQUIN. *Am. J. Physiol.* **88**, 519-28(1929).—The urine was made slightly acid, evapd. to a sirup, extd. with 95% EtOH, the residue redissolved in  $H_2O$ , neutralized with  $Ba(OH)_2$ , filtered and the final filtrate tested for diuretic action. The urine of dogs with exptl. diabetes insipidus contained a diuretic substance which was not present in like amts. in the urine of normal dogs. A similar diuretic substance was extd. from the mammillary bodies and brains of normal dogs.

**Toxic effects of defibrinated blood when perfused through the isolated mammalian heart.** JULIA HERRICK AND J. MARKOWITZ. *Am. J. Physiol.* **88**, 698-705(1929).—Defibrinated rabbit blood was actively toxic when perfused through the isolated rabbit heart. The toxic substance is "ovasoconstrictin" in action and may be produced from the disintegration of the blood platelets. Blood toxins of the nature here dealt with may take a part in the production of certain pathol. conditions in animals such as shock and arteriosclerosis.

**Experimental studies in gall-stone formation. I.** KATASHI INOUE AND RYUICHI



OHTA. *Japan J. Gastroenterol.* **1**, 14-7(1929).—*In vivo* bile is assumed to consist of hydrosols of cholesterol and bilirubin. These appear hydrophilic due to the action of some protecting substance. In order to establish an analogous system *in vitro* 2 hydrosols were prepd. The first was made by pouring an  $\text{Me}_2\text{CO}$  soln. of cholesterol into warm water followed by distn. *in vacuo* to remove the final traces of acetone. The second hydrosol of cholesterolstearin ester was prepd. similarly except warm  $\text{EtOH}:\text{Me}_2\text{CO}$  served as solvent in place of  $\text{Me}_2\text{CO}$ . Both hydrosols were stable for 6 weeks. The coagulating values of a series of electrolytes upon these emulsions were detd. Inorg. salts can be arranged in the following order:  $\text{Ce} > \text{Ca}, \text{Ba} > \text{K}, \text{Na}$  when the valency of the cations is considered. Acids have a strong coagulating power and fall into the following series:  $\text{H}_2\text{SO}_4 > \text{HCl} > \text{lactic}$ . Alkali fails to show any coagulating effect. Both emulsions exhibited the same degree of stability. C. M. McCAY

A new protest against the methylene blue liver function test. KOKICHI NAKASHIMA. *Japan J. Gastroenterol.* **1**, 29-38(1929).—Clinical observations show that methylene blue has no unique characteristics in its reactions in liver tissue. It is worthless as a test of liver function since its rate of excretion by the liver is independent of the pathol. state of that organ. C. M. McCAY

Carbohydrate metabolism in pulmonary tuberculosis. S. RUSSO. *Boll. soc. ital. biol. sper.* **4**, 215-6(1929).—In nearly all 30 individuals with advanced tuberculosis the glucemic titer before breakfast was 0.038 to 0.07% higher than the normal (0.10%). In 80% of the cases the glucemic curve during fasting was different from that found in normal individuals; there was a gradual increase in the glucemic titer up to the 2nd hr. of fasting and then a lowering which approached the initial titer. The administration of 50-g. glucose before breakfast gave results which varied according to the clinical form of the disease. The results in general indicate that there is a disturbance of carbohydrate metabolism in tuberculosis. PETER MASUCCI

Studies on oxalic metabolism. II. The elimination of oxalic acid in phlorhizin diabetes. P. DELUCIA. *Boll. soc. ital. biol. sper.* **4**, 245-8(1929).—D. confirms his previous results that in phlorhizin diabetes there is an increase in the amt. of oxalic acid eliminated by dogs. III. The elimination of oxalic acid in human diabetes and its behavior following insulin therapy. P. DELUCIA AND F. VELARDI. *Ibid* 249-51.—The elimination of oxalic acid increases in diabetes. The administration of insulin diminishes the elimination of oxalic acid very markedly. The results were obtained on 2 diabetic cases. PETER MASUCCI

The Takata-Ara reaction for cephalorachidian fluids. M. VOLTERRA. *Boll. soc. ital. biol. sper.* **4**, 226-7(1929).—This reaction was tried on 70 fluids with satisfactory results. The test is useful in diagnosing syphilis of the progressive paralysis type, when it is not possible to make a Wassermann test. PETER MASUCCI

The prognostic value of cholesterolemia in pulmonary tuberculosis. J. PALACIO. *Prensa med. Argentina* **1929**, 28. *Rev. sud-americana endocrinol., inmunol., quimioterap.* **12**, 363-4(1929).—The cholesterol in the blood is low in evolutive forms; it is normal in latent forms and high in fibrous forms. A. E. MEYER

Changes in the serum cholesterol content in anaphylaxis. I. M. GOLDBERG AND V. N. NEKL'DOV. *Biochem. Z.* **208**, 285-7(1929).—The serum cholesterol rises markedly during the anaphylactic shock in sensitized rabbits. Injection of antigen into non-sensitized rabbits causes no change, or even a fall in the cholesterol of the serum. S. MORGULIS

The diminished diastase action of the urine in kidney diseases and in diabetes. FRITZ SCHMEREL. *Biochem. Z.* **208**, 415-27(1929).—The low diastase content of diabetic urine is not due entirely to the nature of its medium as can be shown in expts. in which opt. conditions of  $\text{pH}$ , salt or buffering are maintained. Studies on phlorhizinized animals as well as of patients suffering from nephritis and other kidney diseases indicate that the poor permeability of the kidney for diastase may partly explain the slight diastase activity of diabetic urines. No conclusion can be drawn from the urine diastase findings as to the enzyme concn. in the blood. S. MORGULIS

The variation of the blood sugar in cases of abdominal typhus. YOICHI ANAZAWA. *Sei-ka-shi Med. J.* **48**, No. 2, 99-101, Abstract sect., 5-6(1929).—After a very careful study of the blood sugar in cases of typhus fever with and without complications it appears that the disease has a greater influence on the concn. of this substance than medication or nutrition. M. H. SOULE

Analysis of a fluid from a cyst of the spleen. MLLR. S. GRILLON. *J. pharm. chim.* [8], 9, 23-5(1929).—In a woman, 41 yrs., operation on a hard tumor yielded 300 g. of a viscous creamy fluid, d. 1.124,  $\text{H}_2\text{O}$  75.73%, solids 24.27% contg. cholesterol 0.10, al-

bumins 8.25, urea 0.043, fat 2.28, undetd. 0.877, ash 12.72% consisting of Cl 0.43,  $P_2O_5$  5.90, CaO 6.59%. Reducing substances and biliary pigments were absent. S. W.

The  $p_H$  of tumors. ANNA GOLDFEDER. *Z. Krebsforsch.* 29, 134-46(1929).—The  $p_H$  of three inoculable animal tumors (Ehrlich's mouse sarcoma and carcinoma, Rous's chicken sarcoma) lay between 7.5 and 7.7. With necrosis the alky. increases. If large amts. of glucose are given the  $p_H$  of the tumors is reduced. H. G. WELLS

Roff's cancer reaction. L. M. CORREA. *Z. Krebsforsch.* 29, 112-33(1929).—A general discussion of the principles and utilization of this reaction, which is based on the fact that serum of animals with cancer decolorizes neutral red more than normal serum. It often fails to be exhibited in cancer cases, but is almost always negative with noncancer serum. It seems to depend on a physicochemical alteration of the serum that is associated with absorption of  $CO_2$ . H. G. WELLS

The sugar content of the blood in emotional states. KARL M. BOWMAN AND JACOB KASANIN. *Arch. Neurol. and Psychiatry* 21, 342-62(1929).—In a series of 148 cases of mental diseases of various kinds with different types of emotional states, the majority showed normal blood-sugar values (80-120 mg. dextrose per 100 cc blood), in contrast to results of former investigators. The distribution curve was normal. It appears that high blood-sugar values are found in cases showing fever and vague physical symptoms. High values (above 120) were found in 9 women displaying excitement. R. C. WILLSON

The calcium content of the blood in different periods of pregnancy, toxicoes and post-natal diseases. M. SERDYUKOV AND A. MOROSOVA. "Grauertmann," Moscow *Monatsschr. Geburtsh. u. Gynäkol.* 78, 237-48(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 47, 645.—The series was 216 cases. Normal nonpregnant women showed blood Ca values of 9.0-13.7 mg. %, av. 11.25 mg. %; in the first half of pregnancy, 9.44-13.04, av. 11.78. In the second half of pregnancy the serum Ca was 9.24-13.5, av. 11.46. During childbirth the value was subnormal, 9.96-11.5, av. 10.73; during puerperium, 9.5-12.5, av. 11.02. In the amniotic fluid, it was 5.56-9.44, av. 7.37. Contrary to other investigators, the authors found no decrease during the gestation toxicoes. In minor puerperal diseases Ca was unchanged or only slightly decreased, but in severe diseases of the septic or pyemic type there was a Ca decrease. R. C. WILLSON

Report of further study of the poisonous amines as the etiology of toxemias of late pregnancy. HERMAN W. JOHNSON, ROBERT A. JOHNSTON AND H. O. NICHOLAS. *Texas State J. Med.* 24, 636-9(1929).—*B. coli* infection is present in practically every case of late toxemia. Tyramine poisoning produces symptoms and circulatory disturbances similar to those of late toxemia. Enough amino acids are available in the ordinary infarct, if converted rapidly to amines, to cause alarming symptoms. *B. coli* infection may cause kidney dysfunction which results in an increase in blood amino acids which are converted into poisonous amines. In the presence of circulatory handicaps of the pregnant uterus these may cause placental insults which may increase the amines of the blood and if the liver is unable to detoxify them, symptoms of late toxemia result. R. C. WILLSON

Carbon dioxide content of cerebrospinal fluid in paresis. E. KLEMPERER AND M. WEISSMANN. *Z. ges. Neurol. u. Psychiat.* 119, 351-73(1929); *J. Am. Med. Assoc.* 92, 2148.—There is an increase in the cerebrospinal fluid in uncomplicated paresis; this is markedly decreased by malaria treatment. Shortly after the cure the alkalosis of the fluid increases still more, but a few months later returns to normal. Maniac patients with paresis, patients with severe taboparesis and others with severe circulatory and metabolic disturbances do not show the usual increase. R. C. WILLSON

Study of I in South Carolina (MITCHELL) 15.

## H—PHARMACOLOGY

A. N. RICHARDS

Action of intravenous injection of lactic acid on alkali reserve of blood. B. KRAYCHINSKII. *Russ. J. Physiol.* 11, 433-44(1928).—Intravenous injection of lactic acid causes a lowering of the alkali reserve from 10 to 40% of its original value. The degree of lowering depends, not only on the amt. injected, but also on the rate of injection. The alkali reserve returns to normal in the course of 2-4 hr. B. C. A.

Salabrose (tetraglucosan) in diabetes. E. KAUFMANN. *Z. ges. exptl. Med.* 60, 116-32 (1928).—Oral administration of tetraglucosan is usually followed in diabetic and in normal subjects by a rise in the blood sugar, which also follows intravenous injection. With rabbits, tetraglucosan has no effect on insulin hypoglycemia. The use of tetraglucosan in diabetes is discussed. After removal of dextrose by fermentation, the

substance may be detd. polarimetrically or colorimetrically by reduction of picric acid to picramic acid. The latter method is unsuitable for its detn. in urine. B. C. A.

**Action of synthalin.** H. STAUB. *Z. klin. Med.* 107, 607-58(1928); cf. C. A. 22, 4644.—Intravenous administration of synthalin causes in fasting rabbits a primary hyperglucemia and a slight secondary hypogluemia. Continued peroral administration also results in no marked reduction of blood sugar. The incidence of the toxic effect of synthalin is discussed. The liver- and muscle-glycogen is diminished, and the formation of lactic acid is increased. The action of synthalin in no way resembles that of insulin. B. C. A.

**The formation of edema. VII. The influence of colloids on the intermediate water exchange associated with disturbed thyroid function.** CHOMATSU SATO. *Tôhoku J. Exptl. Med.* 11, 489-503(1928); cf. C. A. 22, 4171.—Two % gum arabic in Ringer soln. transfused through surviving rabbit-leg preps. retarded the formation of edema in the case of preps. from normal, from a thyroid and from hyperthyroid rabbits, the amt. of retardation increasing in the order given. Using 2% foreign blood serum in Ringer soln. an acceleration of the formation of edema occurred with preps. from normal and athyroid rabbits; a retardation with preps. from hyperthyroid rabbits was noted. B. C. BRUNSTETTER

**The pancreas hormone and mineral metabolism. III. The influence of the pancreas hormone on the various constituents of thoracic duct lymph and the relation between changes of blood and lymph in normal and in diabetic dogs.** SOSHIRO TAKEUCHI. *Tôhoku J. Exptl. Med.* 11, 568-603(1928); cf. C. A. 23, 888.—Lymph samples were collected from fistulas in the thoracic ducts of normal dogs and of dogs made diabetic by pancreatic extirpation. The effect of subcutaneous insulin injections (2.0-6.5 clinical units per kg.) on the concn. of blood and lymph and on their inorg. constituents was studied. In both blood and lymph, inorg. P and K decreased; Cl increased; no definite changes occurred in Ca and Mg. The % dry wt. and % protein increased in the blood but decreased in the lymph. Numerous quant. details are given. B. C. BRUNSTETTER

**The hyperpneic action of ammonium chloride in cats.** TAISUKE SUZUKI. *Tôhoku J. Exptl. Med.* 12, 417-24(1929); cf. C. A. 17, 2327.—NH<sub>4</sub>Cl was subcutaneously injected (0.7 g. per kg.) into (1) normal cats; into cats splanchnecotomized (2) unilaterally and contralaterally suprarenalectomized; (3) bilaterally; and (4) unilaterally. The av. % increase in respiration frequency, where the frequency before injection is expressed as a % of the max. after injection was: (1) 550; (2) 284; (3) 232; (4) 339. B. C. B.

**The effect of urease, parenterally injected, in normal rabbits.** HIIDEICHI TAKEITA. *Tôhoku J. Exptl. Med.* 12, 433-44(1929).—Urease acts as a diuretic when injected intraperitoneally into normal rabbits. If urea is first injected intravenously, followed by intraperitoneal injection of urease, the former seems to decrease the resistance of the rabbit to the latter. Intravenous injection of 0.5 g. urease into rabbits causes weakness, then convulsions, followed by death. Soon after the beginning of convulsions, the blood NH<sub>3</sub> increases and a striking acidosis sets in. B. C. BRUNSTETTER

**The action of thyroxine upon the protein, water and mineral metabolism. A.** SCUITTENHELM AND B. EISLER. *Z. ges. exptl. Med.* 61, 239-77(1928).—Normal and diseased men, dogs and rabbits were used. The protein metabolism in dogs is only slightly affected so long as the dosage does not exceed a crit. value. The urea excretion is increased and NH<sub>3</sub> decreased. With large doses there is an acidosis with a sharp increase in NH<sub>3</sub> excretion. Thyroxine produces swelling and its marked effect on metabolism appears at the same time. There is an early negative water balance followed by a const.-wt. period, and then with cumulative action a further negative balance. With doses under 2 mg. there is an increased water output in rabbits without a negative N balance. Higher doses produce a negative N balance out of proportion to the water output. In man the protein metabolism is only slightly affected; it shows as a negative N balance and an increased excretion of NH<sub>3</sub>. A slight negative water balance was caused. During menstruation, the action of thyroxine was greater, the N losses being greatly increased. Thyroxine had no effect upon the course of menstruation. It had no effect upon the metabolism and blood picture in pernicious anemia. The protein metabolism in myxedema deviates from the normal in the reduced urea excretion. The mineral metabolism is considerably changed, particularly the S metabolism, a considerable part of the total S being excreted unoxidized. Thyroxine increases the metabolism and shifts it toward the normal. Hippuric acid synthesis is deranged in myxedema. From exogenous benzoic acid there is an incomplete hippuric acid synthesis, which is changed to the normal with thyroxine. Between the congenital and climacteric myxedemas there are only quant. differences. F. L. DUNN

**The question of peroral administration of insulin.** GUSTAV SAMEK. *Z. ges. exptl. Med.* **62**, 707-16(1928).—S. was unable to find any lowering of the blood sugar in dogs receiving insulin perorally alone, or when combined with 0.3-0.5 g. saponin, or with bile preps. F. L. DUNN

**Insulin substitutes. VIII. Antidiabetic substances in yeast and yeast nucleic acids.** E. KAUFMANN. *Z. ges. exptl. Med.* **62**, 739-44(1928).—Peroral feedings of yeast exts. lowered the blood sugar in rabbits, the ext. made with *N* HCl being the most effective. Intravenous injections produced a similar effect. The acid exts. of the fermented yeast contg. the nucleic acids showed a similar effect which was not destroyed by heating to 100°. K. suggests that no true enzyme is involved. In contrast to the results with various plant exts., no hyperglucemic phase was observed. F. L. DUNN

**The influence of calcium feeding upon the carbon : nitrogen ratio in the urine of rabbits.** A. BICKEL and D. MARSCHALKOWITZ. *Z. ges. exptl. Med.* **62**, 747-55(1928).—Using the method of Gomez for C in urine and Kjeldahl for N, B. and M. found that the C output is reduced when Ca is fed to rabbits. The N remained const. resulting in a decrease in the C:N ratio. The amount of Ca used was 0.011-0.024 g. Ca per kg. per day in the form of lactate or as kalzan. B. and M. suggest that the reduction is due to an increase in the rate of oxidation, and that this change should be taken into account in metabolic studies. F. L. DUNN

**Ethylene anesthesia.** H. P. FAIRLIE. *Brit. J. Anaesth.* **1928**, 154; *Quart. J. Pharm.* **1**, 476. H. L. D

**Pyrethrins from *Chrysanthemum cinerariæfolium* as anthelmintics.** J. CHEVALIER. *Bull. acad. med.* **99**, 416(1928); *Quart. J. Pharm.* **1**, 657. H. L. D

**Sulfarsenol as a preventive of puerperal infection.** P. DELMAS and BRÉMOND. *Bull. soc. d'obstét. gynécol.* **1928**, 433; *Quart. J. Pharm.* **1**, 667-8. H. L. D

**Nicotine-chloroform syncope.** A. TOURNADE and J. MALMÉJAC. *Compt. rend. soc. biol.* **99**, 156(1928); *Physiol. Abstracts* **13**, 606.—Excessive secretion of adrenaline is not the only factor in the mechanism of the syncope caused by injection of nicotine into a chloroformed dog. In 2 out of 23 decapsulated dogs a typical syncope was caused by injection of nicotine in CHCl<sub>3</sub> anesthesia. It is enough to show that nicotine without the assocn. of adrenaline can det. the condition. H. L. D

**Antimony poisoning from enameled vessels.** J. A. CHARLES. *Med. Officer* **40**, 59(1928); *Quart. J. Pharm.* **1**, 454.—C. describes an outbreak of sickness from so called "lemonade." The drink was made in enameled buckets from "fruit crystals." Examn. showed that the enamel on the vessels had been attacked by the tartaric acid in the beverage. The enamel contained 5% Sb. The beverage from the pails contained 0.013% of metallic Sb. H. L. D

**Organic arsenical compounds: Use in certain streptococcal infections.** L. COLEBROOK. *Med. Research Council, Special Rept. Series*, No. **119**; *Quart. J. Pharm.* **1**, 478.—A small group of tervalent arsenicals, comprising arspenamine and 2 of its derivs. the monomethylene sulfoxylate (N. A. B.), and the dimethylene bisulfite (sulfarsenol, metarsenobillon and kharsulfan) exhibit certain properties which differentiate them rather sharply from almost every other known compd. which it has been proposed to use for the chemotherapy of bacterial infections. No quinquevalent arsenical has been found to have these properties. When injected into the animal or human body these arsenicals confer upon the blood fluids the peculiar bactericidal qualities which characterize their simple solns.—and these acquired bactericidal qualities are retained by the blood for a considerable time. It seems probable that, owing to the slowness of excretion of these drugs, and also the remarkable slowness with which they enter into combination with the blood corpuscles and the fixed tissue-cells, a considerable fraction of the injected dose is retained for a time in soln. in the blood plasma. In common with other antiseptic agents these arsenicals are capable of destructive action upon human leucocytes, given a sufficient concn. and a long enough period of contact, but there is this important difference—whereas the ordinary antiseptics have a higher affinity for the leucocytes than for the microbes, and, by combining with the former, forfeit their microbicidal potential—these arsenicals have a higher affinity for *certain* microbes (the hemolytic streptococci and pneumococci, for example) than for the leucocytes. It becomes possible, therefore, by suitable dosage, to maintain such a concn. of these arsenicals in a patient's blood as to avoid injury to the leucocytes while conferring a measure of bactericidal potency upon the blood fluids. The compds. so far tested may be placed in the following order of increasing toxicity for human leucocytes: metarsenobillon, kharsulfan and sulfarsenol, approx. equal; stabilarsan; neoarsphenamine; and lastly, Ag arspenamine. H. L. D

**Antidiuretic effect of posterior pituitary lobe extracts.** S. L. GARGLE, D. R. GILLIGAN AND H. M. BLUMGART. *New England J. Med.* **198**, 169(1928); *Quart. J. Pharm.* **1**, 480.—The antidiuretic action of posterior lobe pituitary ext. is inherent in the pressor principle. H. L. D.

**Arsphenamine preparations and the reticulo-endothelial system.** F. JIMÉNEZ DE ASúa AND M. J. KUHN. *Rev. soc. Argentina biol.* **4**, 124-41(1928); *Physiol. Abstracts* **13**, 542.—Injection of arsphenamine compds. is followed by hypertrophy of the reticulo-endothelial cells of the spleen, liver, and lymphatic glands. Granules appear in the cytoplasm of these cells, more especially in the spleen. Biochem. modifications also occur since Ag preps. are more easily fixed by the reticulo-endothelial cells. H. L. D.

**Action of guanidine on the contraction of denervated muscle.** I. SCANNAGATTI. *Rivista patol. sper.* **3**, 181-97(1928); *Physiol. Abstracts* **13**, 575.—Denervated toad muscle is hypersensitive to guanidine during the first day. Subsequently it is less sensitive than normal, in that the simple twitch or tetanus is less altered in character. H. L. D.

**Ammonium chloride as a remedy in colibacilluria.** A. BÉCART AND GAHLINGER. *L'union pharm.* **69**, 196(1928); *Quart. J. Pharm.* **1**, 475-6. H. L. D.

**Poisoning following the use of hexamine and salicylic acid.** H. EDELMANN. *Zentr. Chir.* **1928**, 1230; *Quart. J. Pharm.* **1**, 636. H. L. D.

**The effect of thallium on rats during lactation.** J. VÁSÁRHELYI. *Magyar Orvosi Arch.* **30**, 84-8(1929).—The Tl given *per os* is secreted with the milk. The young animals fed with this milk show the characteristic symptoms of Tl poisoning (hairless skin), whereas no effect can be observed on the lactating animal. G. H. VON FUCHS

**Quantitative measurements of pepsin in gastric juice before and after histamine stimulation.** W. SCOTT POLLAND AND ARTHUR L. BLOOMFIELD. *J. Clin. Investigation* **7**, 57-74(1929).—In normal persons, the concn. of pepsin in the gastric juice falls markedly after stimulation by histamine and follows closely the curve of N concn. The total output of pepsin is usually increased. ARTHUR GROLLMAN

**Dyestuffs in chemotherapy.** G. MALCOLM DYSON. *Z. Farbenind.* **20**, 212-8(1929).—A review. F. C. HAHN

**Lactic acid production after the use of synthalin.** H. HIRSCH-KAUFFMANN AND A. WAGNER. *Klin. Wochschr.* **7**, 1866-7(1928).—The use of synthalin in small, non-toxic but active doses does not lead to an increased production of lactic acid. M. H.

**The relationship between the action of calcium and digitalis.** ERNST BILLIGHEIMER. *Klin. Wochschr.* **8**, 724-6(1929).—The physiol. action of an increased Ca concn. (produced by injecting  $\text{CaCl}_2$ ) and of digitalis appears to be identical. The effects are given in detail; but especial stress is laid upon the fact that both substances reduce the heart rate. The effect of a Ca injection is transitory (20-25 min.) and is identical with the time required for the excess Ca to disappear from the blood. It is significant in this connection that continuous digitalization leads to an increase in blood Ca. The action on the heart is most effective when Ca and digitalis are injected simultaneously. This treatment has been employed very successfully in pneumonia. The beneficial action is to be ascribed to the inflammation-reducing action of Ca and to the combined action of both substances on the vascular system. Extensive bibliography. MILTON HANKE

**Clinical experiences with acedicon.** F. BERTRAM AND W. STOLTENBERG. *Klin. Wochschr.* **8**, 883-6(1929).—Acedicon, acetyldimethyldihydrothebaine, is an analgetic that is effective when administered either orally or subcutaneously. The peroral dose is 0.005-0.02 g., the subcutaneous dose 0.005-0.01 g. As an analgetic 0.01 g. of acedicon is equiv. to 0.007 g. morphine-HCl. It is a very effective anti-cough prepn. It has no effect upon respiration, heart action, blood pressure, peristaltic movements or body temp. It does not lead to albuminuria even in nephritics, and it does not lead to an elevation of the blood sugar in diabetics. A tolerance is not developed in most cases and the drug appears not to be habit forming. MILTON HANKE

**Effect of various solutions and salts on the pulsation rate of isolated hearts from young chick embryos.** WARREN H. LEWIS. *Carnegie Inst. Washington Pub.* **394** (Contributions to Embryology **20**), 173-92(1929).—Hearts isolated from 72 hr. chick embryos were used. Dextrose apparently acted as a stimulant rather than as a food. Prolonged pulsation required the presence of  $\text{NaHCO}_3$ , KCl and  $\text{CaCl}_2$ . Dild. dextrose-free Locke soln. and 0.9% NaCl soln. first increased and then slowed the pulsation rate. Concd. dextrose-free Locke soln. slowed the rate and decreased the strength of the beat. Increase in the concn. of KCl slowed the heart; absence of KCl first accelerated, then slowed, and finally stopped the heart. Increase in the concn. of  $\text{CaCl}_2$  caused a marked reduction in pulsation rate at the end of several hrs. J. S. H.

**Magnesium : a solvent in nephrolithiasis and an aid in preventing salivary calculus formation.** BERNARD B. BADANES. *Dental Cosmos* 71, 251-5(1929).—Sol. Mg salts administered orally have a solvent action on  $\text{CaC}_2\text{O}_4$  calculi in the urinary tract; they also dissolve mucin and globulin. It is recommended that *tooth pastes* contain 0.5%  $\text{MgSO}_4$  and 0.5%  $\text{MgCl}_2$  in order to help dissolve salivary calculi which contain  $\text{CaC}_2\text{O}_4$ , mucin, and globulin. JOSEPH S. HEPBURN

**Effect of soap in dentifrices on the tissues of the oral cavity.** BERNARD B. BADANES. *Dental Cosmos* 71, 474-9(1929).—When a soap is used in a dentifrice, it dissolves the edges of the gums, and thus gives rise to recession of the gums. When both soap and  $\text{CaCO}_3$  are present, in the presence of the saliva white insol. Ca soaps are formed and deposit, e. g., in the interproximal spaces. JOSEPH S. HEPBURN

**Studies in local anesthetics: method for determining anesthetic efficiency by the use of goldfish.** H. T. DAILEY AND H. C. BENEDICT. *Dental Cosmos* 71, 704-7(1929).—Cocaine-HCl is 8.4 times as efficient as an anesthetic as procaine-HCl; of these 2 compds. procaine-HCl is far less toxic. The method is described. JOSEPH S. HEPBURN

**Ceanothyn as a hemostatic.** C. B. THARALDSEN. *J. Am. Inst. Homeopathy* 22, 428-35(1929).—Ceanothyn contains 1 mg. of the alkaloids of *Ceanothus Americanus* (the wild snowball or New Jersey tea) per cc. of hydro-alc. ext. These alkaloids (3 in number) possess hemostatic properties, due to their acceleration of the action of thromboplastin, but cannot produce intravenous clotting, and have no action on the heart, liver or kidneys. Oral administration of 2 to 4 fluid drachms produces, on the av., a decrease of 28% in clotting time; the max. effect occurs in 30 to 45 min. and may be maintained by doses of 2 fluid drachms at intervals of 30 min. JOSEPH S. HEPBURN

**Effect on tonus and reflexes of alcohol applied to the femoral nerve of the decerebrate cat.** J. M. D. OLMSTED AND JOSEPHINE BALL. *Univ. Calif. Pub. in Physiol.* 7, 43-56(1929).—Alc. (13%) was applied to the femoral nerve of the decerebrate cat, and isotonic records were made of the movement of the isolated or nearly isolated quadriceps muscle. Reflexes disappeared in the following order and prior to evidence of failure of response to motor nerve stimulation: (1) stretch and tonus and probably rebound contraction, (2) knee jerk, (3) crossed extension. Recovery occurred in the reverse order. Tonus could be inhibited so long as it could be shown to be present. JOSEPH S. HEPBURN

**Hematoporphyrin excretion in the urine in chronic lead poisoning.** SIGMUND HIRSCHHORN AND WALTER ROBITSCHKE. *Z. klin. Med.* 106, 664-70(1927).—In 6 cases from a total of 77 cases of chronic Pb poisoning, a layer of the urine 5 cm. in thickness gave the spectrum of acid hematoporphyrin. The hematoporphyrin had its origin in the hemoglobin of the erythrocytes. JOSEPH S. HEPBURN

**Salt action and diuresis.** ERNST BLOCH. *Z. klin. Med.* 106, 733-44(1927).—Abundant excretion of urine is accompanied by an increased  $p_{\text{H}}$  value. The excretion of Na and Cl ions is parallel; hence NaCl is being excreted. Intravenous injection of KCl increases the excretion of most ions and of  $\text{H}_2\text{O}$ . Intravenous injection of NaCl produces disturbances in the excretion of  $\text{SO}_4$  and  $\text{PO}_4$  anions. Intravenous injection of  $\text{Na}_2\text{SO}_4$  causes a marked increase in the urinary sulfates and decreases in both the vol. and the excretion of most ions. No definite relationship exists between the action of injected ions and their excretion. JOSEPH S. HEPBURN

**Further communication on insulin hypoglycemia and insulin shock in man.** H. O. KLEIN AND H. HOLZER. *Z. klin. Med.* 107, 94-112(1928); cf. C. A. 22, 816, 3458. In insulin hypoglycemia, the venous blood is bright red, almost as red as arterial blood, apparently due to a high oxyhemoglobin content. JOSEPH S. HEPBURN

**Fatty changes in the Kupfer cells in the liver of the guinea pig in phosphorus poisoning.** J. S. LAWRENCE AND M. M. HUFFMAN. *Arch. Path.* 7, 809-12(1929).—Administration of P in small quantities to guinea pigs produces an accumulation of fatty globules in the Kupfer cells as an early manifestation of P poisoning of the liver. H. F. H

**The effect of small doses of plasmochine on the viability of gametocytes of malaria as measured by mosquito infection experiments.** M. A. BARBER, W. H. W. KOMP AND B. M. NEWMAN. *U. S. Pub. Health Repts.* 44, 1409-20(1929).—Plasmochine in small doses has a definite effect on the viability of crescents as measured by mosquito infection tests. It is probable that the general use, in a population, of such small doses of plasmochine would be safe and effective in reducing the transmission of malaria. J. A. K

**Influence of oral administration of saponin upon intestinal absorption.** N. ENDO, T. MIZOGUCHI AND YET. K. NAITO. *Japan Med. World* 9, 35-8(1929).—Rabbits and mice being used the following substances were tested: potassium iodide, reduced iron magnesium sulfate, cholera bacilli, typhoid bacilli, rat-typhoid bacilli and cholera and typhoid immune sera in the presence of added saponins. It is concluded that when

various chemical substances are mixed with saponin they are more readily absorbed by the intestinal canal. When various bacilli or immune serums are mixed with saponin they become suitable for oral immunizing.

N. KOPELOFF

**The influence of calcium iodide on the heart and the vessels.** JERZY KAULBERSZ. *Méd. Doświadczalna i Społeczna* 9, 458–66 (467 French) (1929).—A very dil. soln. of  $\text{CaI}_2$  has no influence on the blood vessels; more concd. solns. cause a constriction. Small doses increase the systole; larger doses retard the rhythm of the heart. The blood pressure in rabbits does not change after intravenous injection of small amts., but increases after large doses. The usefulness of  $\text{CaI}_2$  in cases of increased blood pressure could not be proved experimentally.

JAROSLAV KUČERA

**The effects of phosphate buffers on intestinal movements, and their inter-relation with calcium.** TORALD SOLLMANN, W. F. VON OETTINGEN AND Y. ISHIKAWA. *Am. J. Physiol.* 87, 293–304 (1928).—The addn. of phosphate to Locke or Ringer soln. tended to reduce the  $\text{Ca-ion}$  concn. by pptn. of  $\text{Ca}$  phosphates and as a result to depress the contractions of excised intestines immersed therein. This danger can be minimized by using only freshly prepd. mixts., by adding the min. amt. of phosphate (preferably not more than 0.024%) in as dil. soln. as possible as  $\text{H}_2\text{PO}_4$  or  $\text{NaH}_2\text{PO}_4$  with subsequent neutralization with  $\text{NaHCO}_3$ .

J. F. LYMAN

**Some chemical changes in muscle produced by drugs.** H. N. ETS. *Am. J. Physiol.* 87, 399–405 (1928).—Pilocarpine injected into anesthetized dogs produced a decrease in the  $\text{Na}$ ,  $\text{K}$ ,  $\text{Ca}$  and  $\text{Mg}$  of the  $\text{CCl}_3\text{CO}_2\text{H}$  ext. of the wall of the small intestine. Atropine produced opposite changes. Adrenaline produced an increase in  $\text{Na}$  and  $\text{Ca}$  and a decrease in  $\text{K}$  and  $\text{Mg}$ .

J. F. LYMAN

**The toxicity of purified bile preparation.** E. U. STILL. *Am. J. Physiol.* 88, 729–36 (1929).—Bilirubin, glycocholic acid, cholic acid, choleic acid and desoxycholic acid were prepd. and tested for toxicity by their effects on respiration and on blood pressure in dogs and their fatal effects on frogs. Bilirubin was non-toxic. The bile acids were toxic in the following descending order: choleic acid, desoxycholic acid, glycocholic acid and cholic acid.

J. F. LYMAN

**Action of calcium ions on the frog heart.** A. J. CLARK, G. H. PERCIVAL AND C. P. STEWART. *J. Physiol.* 66, 346–55 (1928).—The effects produced on the frog heart by variations in the total  $\text{Ca}$  content of the perfusion fluid, or by the addn. of citrate, seem to be due to variations in  $\text{Ca}$  ions. The simplest hypothesis seems to be that the response of the heart is dependent on the presence in the surface membranes of  $\text{Ca}$  soaps or of  $\text{Ca}$  lipid complexes, which are highly labile and dissociate as soon as the ionic concn. of  $\text{Ca}$  in the perfusion fluid is reduced.

J. F. LYMAN

**A vaso-dilator action of acetates.** WALTER BAUER AND D. W. RICHARDS, JR. *J. Physiol.* 66, 371–8 (1928).—Acetate solns. in doses of 25 mg. or more, intravenously in dogs and cats, exerted a vaso-dilator effect. The action seems to be upon the smaller blood vessels and is independent of the central nervous system and is not affected by atropine.

J. F. LYMAN

**The action of insulin in normal persons.** LORNA KING, E. L. KENNAWAY AND ALFRED PINEY. *J. Physiol.* 66, 400–2 (1928).—Injection of insulin in a normal person 3 hr. after breakfast produced profuse sweating, muscular weakness and tremor and extreme hunger, accompanied by an absolute decrease in neutrophil leucocytes and an absolute increase in lymphocytes. Lack of available carbohydrate is probably responsible for the physiol. symptoms.

J. F. LYMAN

**The effect of sodium sulfate on the oxygen usage of the kidney.** A. R. FEE. *J. Physiol.* 67, 14–6 (1929); cf. *C. A.* 22, 3689.—There was no increase in the  $\text{O}_2$  consumption of the kidney after the intravenous injection of  $\text{Na}_2\text{SO}_4$  unless a marked increase in the renal blood flow and a diuresis occurred.

J. F. LYMAN

**The feeding of saccharin to mice. A study of the question of minimal toxic action.** K. B. LEHMANN. *Arch. Hyg.* 101, 39–47 (1929).—The administration of large amts. of saccharin to mice for three generations appeared to have no effect upon their growth, development, or ability to reproduce.

E. R. MAIN

**The effect of technically and hygienically important gases and vapors upon the organism. Brominated hydrocarbons of the aliphatic series.** ERHARD GLASER AND S. FRISCH. *Arch. Hyg.* 101, 48–64 (1929).—Subcutaneous injection showed that  $\text{C}_2\text{H}_5\text{Br}$  is 6 times,  $\text{C}_3\text{H}_7\text{Br}$  4 times and  $\text{MeBr}$  7 times as toxic as  $\text{EtBr}$ . The toxic action of the vapors of  $\text{C}_2\text{H}_5\text{Br}$  and  $\text{MeBr}$  is 8 times greater than that of  $\text{EtBr}$  vapor. The inhalation of  $\text{C}_2\text{H}_5\text{Br}$  vapor is without toxic result. Because of its greater volatility, the danger attending the use of  $\text{EtBr}$  is more than twice as great as that attending the use of the more toxic  $\text{C}_2\text{H}_5\text{Br}$ .  $\text{MeBr}$  is still more dangerous and the greatest caution should be observed in its use (cf. Glaser, *C. A.* 23, 1701). The inhalation of

subnarcotic doses of  $C_2H_4Br_2$  and MeBr may eventually result in death. The animal appear to tolerate larger concns. of the compds. for a short time better than lower concns. for longer periods. EtBr acts more rapidly, but the toxic effect of  $C_2H_4Br_2$  is more lasting. E. R. MAIN

**The status of alcohol and of prohibition liquor from the chemist's standpoint.** CHARLES D. HOWARD. *New England J. Med.* 200, 933-6(1929).—The small quantities of aldehydes, fusel oil or MeOH present in distd. alc. beverages probably produce no toxic effects. The reported harmful results are due, in most instances, to an over-dosage of EtOH or to the use of corn. products, such as radiator alc., canned heat, etc. E. R. MAIN

**Pharmacological studies on certain derivatives of pyrrole. IV. The action of  $\alpha$ -benzoylpyrrole in the frog.** ELENA BIGLIOLI. *Biochim. terap. sper.* 16, 47-58 (1929).— $\alpha$ -Benzoylpyrrole in the frog causes the abolition of spontaneous motor and reflex activity; when applied locally it suspends the activity of the nerve and muscle; it produces local anesthesia; it arrests the activity of the isolated heart; if the isolated heart is washed after the arrest of activity, the heart begins to pulsate again and the normal cardiac activity returns. In general, benzoylpyrrole suspends the functional activity of the tissues and its action is transitory; it has very marked local anesthetic action. PETER MASUCCI

**The toxicity of certain uranium salts.** MARIANO MESSINI. *Biochim. terap. sper.* 16, 120-4(1929).—The salts were injected intravenously into rabbits and their toxicity was:  $UO_2(NO_3)_2 > UO_2(SO_4) > UO_2(OAc)_2$ . There was a marked diminution of the toxicity in proportion to the diln. used. Phosphates did not act as antidotes. There was a noticeable difference in the 3 salts between the immediate m. l. d. (g. equiv. 0.0005-0.0013 for the sulfate) and the delayed m. l. d. (g. equiv. 0.00000023). P. M.

**The convulsant action of the barium ion.** MICHELE MITOLO. *Boll. soc. ital. biol. sper.* 4, 34-7(1929).—The purpose was to test the changes in the reflex excitability induced by Ba on the nerve centers and to study its central seat of action. The expts. were made on the Baglioni prep. which consisted of the isolated cerebrospinal axes to *Bufo vulgaris*, the sciatic nerves and the 2 posterior limbs.  $BaCl_2$  solns. (2.2 and 4.5%) were applied locally on circumscribed areas of the posterior intumescence of the cerebrospinal axes; the applications were made (1) on the ventral side and (2) on the dorsal side of the intumescence. M. concludes that the Ba ion is a convulsant poison of the central nervous system comparable in its action to strychnine and capable of provoking tetanic convulsions, as it acts selectively on the central sensori-coordinator mechanisms of the posterior horn of the spinal medulla (dorsal side of the posterior intumescence). PETER MASUCCI

**Studies on antagonism. II. Camphor and sodium salicylate.** A. CHIODO. *Boll. soc. ital. biol. sper.* 4, 122-5(1929); cf. *C. A.* 22, 3231. PETER MASUCCI

**The action of intravenous injections of acetic acid on the respiratory rhythm.** G. SUNZERI. *Boll. soc. ital. biol. sper.* 4, 126-8(1929).—The rapid injection of 1 cc. N AcOH per kg. body wt. into the external jugular vein of a dog gives rise to an intense dyspnea and to respiratory disturbances. The animal is more resistant if AcOH and AcONa are injected. If the solns. are injected into the femoral artery, the effects are the same quantitatively, but are less intense and do not last as long. P. M.

**The effects of quinine treatment or other medicaments in the prevention of experimental malaria.** D. OTTOLENGHI AND G. BROTZU. *Boll. soc. ital. biol. sper.* 4, 150-3(1929).—Quinine treatment does not kill the sporozoites inoculated by the mosquitoes when the treatment has already begun or has been started soon after. The infection remains latent and then when the treatment is suspended, the disease appears in its typical form. Better results were obtained with plasmochine. P. M.

**The potassium ion and the action of sodium perchlorate on striated muscles.** MARIANO MESSINI. *Boll. soc. ital. biol. sper.* 4, 185-8(1929).—The contraction of striated muscles by  $NaClO_4$  is attributed to a derangement of the equil. of K ions in the interior part of the muscle, and not to the pptn. of  $KClO_4$ . This salt is less sol., less dissoed., and, therefore, the activity of the  $K^+$  ion is diminished. The conditions of equil. in the muscle may be restored by the addn. of small amts. of KCl to the perfusion fluid. PETER MASUCCI

**Pharmacological studies on certain derivatives of pyrrole. II. Pyrrole.** A. RABBENO. *Boll. soc. ital. biol. sper.* 4, 192-4(1929); cf. *C. A.* 22, 2984.—Conclusions: The toxicity of pyrrole in the guinea pig is characterized by a descending type of paralysis and by muscle contracture. Applied locally, it arrests the activity of the muscle, nerve and the cutaneous sensor receptors; allowed to circulate in the heart and in the isolated central nervous system, it arrests the activity. The process is reversible.



Pyrrole has an action approaching that of a narcotic; in the isolated organ the concn. which abolishes the reflexes is 10 times less than that which arrests the heart. **III. The action of  $\alpha$ -propionylpyrrole and  $\alpha$ -butyrylpyrrole in the frog.** *Ibid* 195-8.—The pharmacol. points covered are: fundamental action, local anesthetic action, action on isolated heart and action on the isolated central nervous system. P. M.

**The action of certain organic and inorganic anions on blood vessels and other smooth muscle organs.** G. Russo. *Boll. soc. ital. biol. sper.* 4, 208-11(1929).—The  $\text{HCO}_3$ ,  $\text{SO}_4$ , lactate and  $\text{PO}_4$  ions do not have any appreciable action on the blood vessels when allowed to circulate by perfusion methods; the acetate ion has vasodilator and the citrate ion vasoconstrictor action. The  $\text{HCO}_3$  and lactate ions have no action on the frog stomach, while the  $\text{SO}_4$ , acetate,  $\text{PO}_4$  and citrate ions have a depressor action on the tone and in part on the automatic movements of the organ. P. M.

**The pharmacology of strychnine derivatives (ethylstrychnine).** M. AIAZZI-MANCINI. *Boll. soc. ital. biol. sper.* 4, 219-20(1929).—The pharmacol. properties of ethylstrychnine are enumerated. In general, this substance although much less toxic has the same fundamental properties as strychnine. P. M.

**The pharmacology of the autonomous system.** M. AIAZZI-MANCINI. *Boll. soc. ital. biol. sper.* 4, 224-5(1929).—The pharmacol. action of *p*-methylaninoethanolphenol-HCl (sympatol) was as follows: There was a marked positive inotropism on the heart of the guinea pig and rat. Its action on the blood pressure of the rabbit, cat and dog, with and without anesthetic, and with and without cutting the vagus, was similar to adrenaline but quantitatively less intense. Sympatol is much more resistant to oxidation and its action lasts longer than adrenaline. Unlike adrenaline it retains its physiol. action after ergotamine treatment. In doses of 2-3 mg., it increased the tone of the intestine of a rat without modifying the rhythm.  $1/10$  to  $2/10$  mg. doses arrest the contractions of the uterus and lower its tone. PETER MASUCCI

**Further studies on the action of urotropine on uterine contractions.** C. VERGESI. *Boll. soc. ital. biol. sper.* 4, 278-80(1929); cf. C. A. 22, 3230.—Urotropine administered intravenously offers to the obstetrical clinic an efficacious means of stimulating uterine contractions. V. made use of this clinically in 6 cases with satisfactory results. PETER MASUCCI

**The action of cocaine hydrochloride on a sensitive nerve (lingual nerve of the dog sensory path of the lingual-maxillary reflex).** J. RÉGNIER AND G. VALETTE. *Bull. sci. pharmacol.* 36, 284-91(1929).—A method is given for testing local anesthetics on a nerve able to respond to a single excitation. The method of Cardot and Laugier, *Compt. rend. soc. biol.* 86, 529(1922), is employed. A. E. MEYER

**The therapeutics of trypanosomiasis.** LUIS BAKUNIN. *Rev. sud-americana endocrinol., immunol., quimioterap.* 12, 10-4(1929).—Report on effects obtained with atoxyl, emetic tartar and trypanamide or trypanarsyl. A. E. MEYER

**The mode of action of the thyroid hormone.** RUDOLF WEIL AND MARTIN LANDSBERG. *Biochem. Z.* 207, 186-93(1929).—Thyroxine in a diln. of 1:400000 increases quantitatively tissue autolysis in neutral medium. On the basis of this observation an attempt is made to explain physicochemically the various metabolic effects of thyroxine. S. MORGULIS

**The influence of insulin and thyroxine on liver autolysis.** A. SIMON AND P. WEINER. *Biochem. Z.* 207, 319-31(1929).—Following large insulin doses the autolysis of the liver from starved and non-starved cats at  $p_H$  6.04-6.24 proceeds more slowly than in livers from control animals. This inhibiting action of the insulin cannot be found in *in vitro* expts., nor does thyroxine exert any action under these conditions. S. M.

**The effect of formaldehyde on dilute spleen extract solutions.** OTTO MÜLLNER. *Biochem. Z.* 208, 354-6(1929).—HCHO even in concns. of 0.5-0.2% exerts a strong injurious action on the diastase activity. This effect does not appear at once, and may require a day before its full action develops. S. MORGULIS

**The mode of action of the male sex hormone from substances obtained in the vegetable kingdom.** S. LOEWÉ, H. E. VOSS, F. LANGE AND E. SPOHR. *Endokrinologie* 1, 39-44(1928).—Tokokinines are hormones which are responsible for development of sexual characteristics, and are represented by the female hormone, the lykinine and the male, the androkinine. The presence of the latter could not be demonstrated until a special test was devised. The test consists in following the regenerative changes in certain organs in castrated animals under the influence of the androkinines; it serves both qual. and quant. purposes. Prepns. were made from the male flowers of *Salix caprea* which demonstrate the presence of these androkinines in the plant kingdom. The identity of the androkinines from animal and plant sources cannot be proved,

but certain properties and keeping qualities suggest their chem. identity. Likewise their action manifests strict sex specificity.

S. MORGULIS

**Influence of resorption velocity on the insulin action.** WALTER REDISCH AND B. M. BLOCH. *Endokrinologie* 1, 241-50(1928).—The findings of Bertram that the injection of a protein (caseosar) together with insulin considerably prolongs its action have been corroborated. It was furthermore demonstrated that the same effect could be produced by adding to the insulin a 5% gum acacia soln. so that the retarded action could not be attributed to the protein. Dialysis expts. also show that a gum-acacia-insulin mixt. dialyzes much more slowly through a membrane than pure insulin. S. M.

**The effect of adrenaline on the gaseous metabolism.** F. KLEIN AND R. WEISS. *Endokrinologie* 1, 264-71(1928).—Intravenous injection of adrenaline in doses of 0.001-0.003 mg. per min. has no effect on the heat production but raises the respiratory quotient of lightly or deeply anesthetized rabbits. Large adrenaline doses (0.8 mg.) increase the respiratory quotient of deeply narcotized rabbits, but the total metabolism is generally diminished. The metabolic effect of the adrenaline, both raising or lowering, is a complex phenomenon. Small "physiol." doses of adrenaline increase the metabolism of normal animals and humans. In anesthetized animals this increase in metabolism does not occur. The metabolic effect of large adrenaline doses depends upon the action of the mobilized carbohydrate. In starved animals or in deep narcosis the metabolism falls; in well nourished animals and in light anesthesia the metabolism rises; while under large adrenaline doses the lowering of the metabolism predominates over the metabolism-raising action of the carbohydrate plethora. S. MORGULIS

**The action of synthalin on the gaseous metabolism.** F. KLEIN AND R. WEISS. *Endokrinologie* 1, 321-2(1928).—Synthalin does not affect the gaseous metabolism in a manner comparable to the action of insulin. Non-toxic doses (1 mg. per kg.) do not increase the respiratory quotient. S. MORGULIS

**Experimental therapeutic studies on females with spontaneous cycle insufficiency.** S. LOEWY, H. E. VOSS AND E. PAAS. *Endokrinologie* 1, 323-37(1928).—To 9 sexually ripe female mice manifesting spontaneous insufficiency in the sexual cycle, anterior lobe of the hypophysis was transplanted and this had in 80% of the expts. a more or less definite effect on the development of heat. The hypophysis action depends upon the amt. of transplanted gland, 0.6-3.2 g. per kg. body wt. being either without influence or leading only to the proestrus stage; 6.3 g.-20.0 g. per kg., however, causes a more or less pronounced estrus. In no case did the effect of the anterior lobe of hypophysis last beyond the first estrus. Tyramine, histamine or synthetic cycloethanamine (hexamethyldipyrrollethanamine) neither in small nor in large doses, even when administered continually, have no favorable effect on the sexual insufficiency. S. MORGULIS

**Pharmacodynamics of chlorophyll.** EDUARD RENTZ. *Skand. Arch. Physiol.* 56, 36-117(1929).—Medium doses of chlorophyll increase the tone and increase also the height and frequency of the contraction of the rabbit intestine but large doses generally paralyze the motor function of the intestine followed by a transient improvement. The action of parasympathetic stimuli on the intestine is not noticeably affected by medium doses of chlorophyll while large doses inhibit or prevent their action. Atropinization generally weakens somewhat the chlorophyll effect. The adrenaline action is markedly prolonged while BaCl<sub>2</sub> produces the same strong effect even after large chlorophyll doses. On the isolated rabbit uterus medium chlorophyll doses have a mild motor and tonic effect; but even the largest doses always act like adrenaline. The action is reversible. The adrenaline effect is prolonged, but atropinization inhibits or stops the chlorophyll action. After large atropine doses chlorophyll in large amts. produces a fall in tone. The effect of BaCl<sub>2</sub> is unchanged. Chlorophyll increases the amplitude and diminishes somewhat the frequency of contraction of the isolated frog heart. The adrenaline action is not strengthened. Chlorophyll is equally active before and after the treatment of the heart with ergotamine, but the influence of acetylcholine is inhibited or prevented by large chlorophyll doses. Chlorophyll causes vasodilation, but it also greatly improves the adrenaline action, but has no effect on the influence of BaCl<sub>2</sub> on the vascular system. The rabbit aorta has an increased tonus under the influence of chlorophyll which also improves the adrenaline effect. Chlorophyll produces a slight improvement in the respiration of the rabbit, a slight rise in blood pressure, a dilatation of the kidney and intestinal vessels but has no influence on the vessels of the extremities. In large doses chlorophyll produces an opposite action. Blood pressure expts. with cats give the same results but the adrenaline effect is increased although chlorophyll acting alone on the kidney vessels causes a slight dilatation. It follows therefore that chlorophyll has a marked stimulating effect on muscle, mani-

fects a strong affinity for the vegetative nervous system, especially sensitizing the sympathetic motor nerve endings to adrenaline, but its action on the inhibitory portion of the sympathicus could be clearly observed only in the isolated rabbit intestine. Large chorophyll doses paralyze the vagus and to a lesser extent also the sympathetic.

S. MORGULIS

**Action of strophanthin on the formed elements of the blood, especially on thrombocytes and leucocytes.** PETER WEGGER. *Skand. Arch. Physiol.* 56, 291-301 (1929).—Injections of 0.08-0.15 mg. strophanthin per kg. of rabbit cause a strong and protracted thrombocytosis which does not disappear for about 30 days. In several instances the thrombocytosis was accompanied by a leucocytosis.

S. MORGULIS

**The effect of arsenic on the maturation of red blood cells.** RAPHAEL ISAACS. *Folia Haematol.*, I Abt., 37, 389-404 (1929).—The effect of toxic and non-toxic doses of  $As_2O_3$  and  $As_2O_5$  was studied on normal and tumor-bearing white mice by observing the percentage variation of 2 stages in the development of the red blood cells (granule red blood cell and the reticulocyte stage). Non-lethal doses of As caused a decrease in the percentage of both stages of young red blood cells apparently as long as the As was present in sufficient concn. in the body. After this, if no more As was given there was a tendency for the more immature red blood cells to increase in percentage. In acute poisoning with death within 24 hr. there was no characteristic marked change in the abs. or relative numbers of young red blood cells. In the tumor-bearing mice the depression in the no. of young red cells was not as marked, but a study of red cell formation showed that the bone marrow did not have as much reserve as in the normal mice and that more cells were in the younger stages. The effect of  $H_3AsO_4$  is similar to that of  $H_3AsO_3$ , but its action is less intense and somewhat delayed.

J. T. M.

**Carbon monoxide and veronal (poisoning).** GUYOR. *Ann. mèd. légale criminal. police sci.* 9, 119-21 (1929).—A case is described of attempted suicide by means of veronal and CO (illuminating gas).

A. PAPINEAU-COUTURE

**Therapeutic values of some rare element compounds.** ROSALIE M. PARR. *Trans. Illinois Acad. Sci.* 21, 194-7 (1928).—Preliminary report. P. discusses the use of Ge compds. for the treatment of anemia, and cites several cases where compds. of Ge have produced beneficial results.

L. L. QUILL

**Pharmacology of the crop (esophageal) muscles.** P. J. HANZLIK AND E. M. BUTT. *J. Pharmacol.* 33, 387-441 (1928); cf. *C. A.* 22, 4653.—The pharmacol. action of the following drugs on the intact crop muscles is described: autonomic drugs: apocodeine, arecoline, atropine, choline, ephedrine, adrenaline, ergotoxine, nicotine, phenylethanolamine, physostigmine, pilocarpine; local anesthetics: butyn, cocaine, procaine, saligenin; hypnotics and opiates: alc., Na barbital, NaBr, chloral, morphine, papaverine, chelidonine; proteinogenous agents and organ exts.: guanidine, histamine, peptone, pituitary ext., horse and beef serum, tyramine; muscular stimulant and depressant drugs: Ba, caffeine, nitroglycerin, quinine, quinidine,  $NaNO_3$ , sparteine; phys. agents, salts and ions:  $AcOH$ , agarized serum,  $CaCl_2$ , Ca lactate, camphor, cholesterol, colloidal iron, fuller's earth,  $MgSO_4$ .

C. RIEGEL

**The biologic study of two new pentavalent trypanocidal arsenical compounds: the monosodium salt of 2-p-arsono-anilino-ethanol (etharsanol) and 3-p-arsono-anilino-propanol (proparsanol).** W. K. STRATMAN AND A. S. LOEVENHART. *J. Pharmacol.* 33, 443-57 (1928).—Compds. were administered to mice, rats, guinea pigs and rabbits intravenously, intramuscularly, subcutaneously, intraperitoneally and orally. Clinical symptoms and results of histological examn. are described. The max. tolerated dose of etharsanol is 0.15-1.25 g. per kg., and the m. l. d. 0.25-1.4 g. per kg., depending on the animal used and the method of administration. The max. tolerated dose for proparsanol is 0.2-1.4 g., and the m. l. d. 0.3-1.75 g. per kg. Etharsanol is twice as toxic as tryparsamide, but has a low toxicity compared to other arsenical drugs.

C. RIEGEL

**The influence of chemical and other agents upon the toxicity and antigenic power of ricin.** II. The detoxification of ricin by means of various agencies. EMMETT B. CARMICHAEL. *J. Pharmacol.* 35, 193-221 (1929).—Ricin prepd. from castor bean press cake by the method of Osborne, Mendel and Harris agglutinates red cells and is toxic. The m. f. d. for mice, guinea pigs and rabbits was 0.02 mg. per kg. and for rats slightly more. Ricin lost its toxicity when treated (a) with oxidizing agents, (b) with ultra-violet light and (c) by boiling the aq. soln. Congo red diminished toxicity, the animals developing ulcers, but surviving the injection, whereas neutral red had no effect on the toxic properties of ricin. III. The production of immunity by means of ricin and detoxified ricin. *Ibid* 223-39.—Rabbits and guinea pigs were given injections of ricin detoxified by heating (coagulation). The doses given were sufficient (if not

detoxified) to kill 300 animals. When these animals were subsequently given a lethal dose of untreated ricin (0.02-0.026 mg. per kg.) 6 of 7 animals lived, indicating production of immunity to the toxin. Blood serum of these animals (taken before injection of untreated ricin), when mixed with untreated ricin and injected into other animals, furnished immunity also. Ricin treated with  $\text{KMnO}_4$  in the proportion of 35-70 mg. to 0.3 g. ricin detoxified the ricin. This treated ricin injected into rabbits developed in them an immunity to untreated ricin in amts. equiv. to 100-120 times the lethal dose. Serum from such animals when injected into mice along with untreated ricin used, and length of time of treatment, destroyed both toxic and antigenic principles. The expts. are taken to indicate that ricin has 2 biol. functions, one toxic and the other antigenic, each of which is dependent on a different group or part of the toxin. C. R.

The action of chlorine on men poisoned by toxic smokes. DUNCAN C. WALTON AND W. A. ELDRIDGE. *J. Pharmacol.* 35, 241-56(1929).—When Cl was bubbled through solns. of diphenylchloroarsine, diphenylcyanoarsine or diphenylaminochlorarsine, the As was oxidized to the pentavalent form. The resulting products were non-irritating when breathed by men, and gave no reaction when titrated with I. Men gassed with any of the 3 toxic gases were markedly benefitted if given Cl. C. RIEGEL.

The effect of salicylate administration on the acetone body content of the blood. HAROLD B. MYERS AND CHARLES FERGUSON. *J. Pharmacol.* 35, 313-19(1929).—The acetone and  $\beta$ -hydroxybutyric acid content of the blood in rabbits was not altered by administration of Na salicylate in either therapeutic or toxic doses. The acetone content of blood in 2 human subjects was not altered by salicylate administration. C. RIEGEL.

The action of some tertiary amines related to ephedrine. F. R. CURTIS. *J. Pharmacol.* 35, 321-32(1929).—C. investigated the action of the following tertiary amines on blood pressure of pithed cats, on strips of uterus immersed in a soln. contg them, and on the bronchii of cats with brain, medulla and most of the cervical spinal cord destroyed: (1) methylephedrine, (2) ethylephedrine, (3) ethanolephedrine, (4) *n*-propylephedrine, (5) isopropylephedrine, (6) butylephedrine and (7) diethylnorephedrine. Nos. 1, 2, 3 and 7 were equal in their power of raising blood pressure, but were all far less active than ephedrine. Nos. 4, 5 and 6 were less active than the other four. While small initial doses produce slight rise in blood pressure subsequent doses at first had no effect, and later produced a fall in blood pressure. An injection of ephedrine at the time of this fall caused a small and temporary rise, or even a definite fall. All 7 compds. caused contraction of strips of uterus (more powerful than for ephedrine). Where the action of the compds. on bronchii was detd. lung vol. was recorded. 1, 2 and 7 dilated the bronchii with the same efficiency as ephedrine. 3, 4, 5 and 6 had no effect in non-toxic doses. The results indicate that Nos. 1, 2 and 7 might be used in treatment of asthma in preference to ephedrine because of the lesser effect on circulation. C. RIEGEL.

The pharmacology and toxicology of some new organic mercury compounds. SEYMOUR J. COHEN. *J. Pharmacol.* 35, 343-50(1929).—Me, Et, Bu, tolyl, benzyl, Ph and naphthyl mercuric thioglycollic acids inhibit the growth of the tubercle bacillus in 1:500,000 diln. Aq. solns. of the first 3 compds. (more sol. than the others) were injected intraperitoneally into white rats and intravenously into rabbits. The m. l. d. (smallest amt. per kg. which killed in 24 hr.) in rats was 40, 30 and 30 mg., resp; m. l. d. in rabbits (smallest amt. which caused death regardless of time) was 20 mg. in each of 3 cases. When given to frogs, the drugs produced signs of depression of the central nervous system. In dogs moderate doses caused a fall in blood pressure of 10-30 mm. Hg. The paralysis of the hind legs produced by these compds. given in repeated small doses (the most striking effect) is not due (1) to the Hg ion, (2) to org. Hg ion or (3) to the thioglycollate ion. A similar paralysis was produced by methyl mercuric chloride (in NaOH). The paralysis may be caused by a particular type of organo-mercury combination with a hydrocarbon radical. C. RIEGEL.

The effect of methylguanidine upon the blood pressure of adrenalectomized dogs. RALPH H. MAJOR AND C. J. WEBER. *J. Pharmacol.* 35, 351-4(1929).—In 3 dogs injections of methylguanidine sulfate 10 min. after the adrenals were removed caused a pronounced rise in blood pressure. It is concluded that the pressor action of methylguanidine in the normal animal is not due to excessive activity of the adrenals. C. R.

Morphine habituation: Tolerance to the stimulant action of morphine. HARRY GOLD. *J. Pharmacol.* 35, 355-61(1929).—Cats were given daily doses of 5, 10 and 20 mg. per kg. of morphine sulfate intramuscularly for 9-30 days and symptoms of stimulation of higher nervous centers and of stimulation of the cord were noted. Habitua-

tion developed only slowly and gradually, especially with the 20 mg. dose. Symptoms of brain stimulation diminished more than those of cord stimulation, and with the 20 mg. dose the latter symptoms were not depressed throughout the period of expt. When the drug was withheld after a period of habituation, drowsiness and loss of appetite result, lasting several days. This could be relieved by injection of the drug.

C. RIEGEL

**The treatment of experimental tuberculosis with organic gold and copper compounds.** W. E. DIXON AND J. C. HOYLE. *J. Pharmacol.* 35, 409-15(1929).—Guinea pigs and rabbits with tubercle bacilli were given intravenously or subcutaneously, at intervals of 7-14 days, 0.23-3.0 cc. of 1% aq. solns. of Au or Cu salts, (Cu, 4 etu)  $\text{NO}_3$  and (Au, 2 etu)Cl,  $\text{H}_2\text{O}$ , where etu represents ethylenethiocarbamide. Although in rabbits the Au compd. delayed death, the results on the whole do not indicate beneficial results. All the animals after death showed progressive tuberculous lesions.

C. RIEGEL

**The relation of arsenicals to the glutathione content of animal tissue.** HERMAN BROWN AND JOHN A. KOLMER. *J. Pharmacol.* 35, 417-24(1929).—Dogs, rabbits, guinea pigs and albino rats were exsanguinated after treatment with arsphenamine or neoarsphenamine, and the glutathione contents of defibrinated blood and of tissues detd. Small repeated therapeutic doses of arsphenamine or neoarsphenamine had no effect on glutathione content. Single large doses caused a reduction in the amt. of reduced glutathione. Conclusion: While large doses diminished the amt. of reduced glutathione the toxic effects of these compds. administered therapeutically (pathological changes in liver and kidneys) cannot be attributed to direct action in tissue glutathione.

C. RIEGEL

**Studies in absorption and excretion of magnesium.** W. F. TAYLOR AND J. E. WINTER. *J. Pharmacol.* 35, 435-9(1929).—Two men excreted in the urine 9.48 and 11.26% of a dose of  $\text{MgCl}_2$  given by mouth. A dog excreted 7.55%. Blood serum Mg in dogs increased after giving  $\text{MgCl}_2$ , the increase after 1 g. amounting to 10.4 mg above the normal. No narcosis was observed. When dogs, in which fever had been produced by injection of a hay infusion, were given  $\text{MgCl}_2$  400 mg. per kg. the fall in temp. paralleled the rise in Mg in the blood. Four rabbits were given 800 mg.  $\text{MgCl}_2$  per kg. Two at the stage of light narcosis had a blood Mg of 7.03 mg. per 100 cc. and 11.3 mg., two in deep narcosis 18.2 and 21.1 mg. per 100 cc.

C. RIEGEL

**The action of the post-pituitary principles on the blood.** F. R. CURTIS AND J. W. PICKERING. *Lancet* 215, 695-6(1928).—The 2 fractions of post-pituitary ext.—vasopressin and oxytocin—sepd. in the Parke, Davis and Co., labs. were studied. Vasopressin increased the coagulation of the blood both in fasting animals and in those at the height of digestion. Oxytocin inhibited coagulation but after hemorrhage it increased it.

F. B. SEIBERT

**Iodized tincture of guaiacol in the treatment of synovial and serous affections.** JOHN MABERLY. *Lancet* 216, 437-8(1929).—In cases of pleurisy and synovitis of various types, tinctures of iodoguaiacol had a definite selective antiseptic and antiphlogistic action in these membranes.

F. B. SEIBERT

**Respiratory action of lobeline in the dog.** SAMSON WHITE AND F. R. CURTIS. *Lancet* 216, 439-40(1929).—Doses of 0.15-0.4 mg. per kg. body wt. of lobeline in the dog anesthetized with chloralose produce, as a rule, a marked initial stimulation of respiration. The period of hyperpnea in most of the observations is from 1 to 2.5 min. and the expired  $\text{CO}_2$  per min. may be 2-4 times the resting amts. The hyperpnea is, however, usually transitory.

F. B. SEIBERT

**The use of avertin for anesthesia.** JOSEPH BLOMFIELD AND F. E. SHIPWAY. *Lancet* 216, 546-9(1929).—Avertin,  $\text{CBr}_3\text{CH}_2\text{OH}$ , is a valuable anesthetic. Contraindications are few, but may be rectal, liver and kidney diseases.

F. B. SEIBERT

**Polycythemia vera treated with phenylhydrazine hydrochloride.** W. MACKAY. *Lancet* 216, 762-4(1929).—Phenylhydrazine given by mouth causes destruction of red cells. The bilirubin content of the blood serum increases and occasionally urobilin appears in the urine. It is able to call forth a leucocytosis.

F. B. SEIBERT

**Action of insulin upon gastric secretion.** SHOZO TAKIMOTO. *Hokkaido J. Med.* 6, 938-58(1928).—Insulin accelerates the gastric juice secretion of man and increases acidity and amt. of pepsin.

K. SOMEYA

**Influence of strychnine upon the glycogen consumption and the carbon dioxide production of the spinal cord.** BUNYA KOMORI. *Okayama J. Med.* 40, 1408-16(1928).—The glycogen content of the spinal cord of the frog is decreased by strychnine. The amt of  $\text{CO}_2$  production of the spinal cord is 0.012 mg. per min. on the av., showing an

increase of 9% was compared with the normal production 0.011 mg. per min.

K. SOMEYA

**Effect of phosphorus on nitrogenous substances in the bile.** KIZO SUGIU. *Okayama J. Med.* 40, 1481-506(1928).—When yellow P is given to a dog with a fistula in its gall-bladder the coagulable protein in the bile begins to increase in 4 days, and returns to the normal in 3-4 weeks. Urea begins to increase slightly in 4 days, and returns to the normal in 30 days. When glucose is given perorally and P is then administered, the effect is inappreciable for 2 mg. P per 2 kg. of the wt. of the animal, while with 3 mg. per 2 kg. there is a slight hindrance to the liver function. In hungry dogs, there is sometimes found a coagulable protein even before the P poisoning. After administration of P, there is a marked increase in the amt. of urea,  $\text{NH}_4\text{OH}$  and coagulable protein, which decreases on giving glucose. If adrenaline is injected into hungry dogs and P is then given there is a remarkable increase in the amt. of coagulable protein,  $\text{NH}_4\text{OH}$  and urea also increasing. If insulin is injected, the bile secretion is accelerated, while coagulable protein does not appear even after giving P.  $\text{NH}_4\text{OH}$  and urea slightly increase. The effect of phosphorus on amino acids in the bile. *Ibid* 2202-13.—In normal dogs, the quantity of amino acids in the bile is negligible; it increases on giving P. But if the liver glycogen is increased by giving glucose, or if insulin is injected subcutaneously, the amino acid formation after giving P decreases, the value approaching that of a normal dog. In hungry dogs, or in dogs that have been injected with adrenaline, the amino acid content increases after giving P, in proportion to the degree of hunger or to the quantity of adrenaline.

K. S.

**The fate of injected lactic acid and acetaldehyde.** TARO HACHIYA. *Tokyo Med. News* 1928, 1797-807.—In living bodies both lactic acid and  $\text{MeCHO}$  are transformed into sugar. The latter is also changed into lactic acid, but the conversion of lactic acid into  $\text{MeCHO}$  is difficult.

K. SOMEYA

**The antitoxic action of calcium chloride on sparteine sulfate.** P. L. VIOLE AND A. GIBERTON. *Compt. rend.* 188, 1181-2(1929).—The lethal dose of the sulfate of sparteine for guinea pigs was 10 mg. per 100 g. The antitoxic action of Ca was detd. *in vitro* and *in vivo*. In the former procedure a lethal dose of the sulfate of sparteine was dissolved in 5 cc. of a soln. of  $\text{CaCl}_2$  contg. 0.4 mg.  $\text{CaCl}_2$  per cc. and then injected under the abdominal skin. The animals survived indefinitely. For the *in vivo* tests the alkaloid was dissolved in 5 cc. of distd.  $\text{H}_2\text{O}$  and injected as before; immediately after the injection of the sparteine 2 cc. of an isotonic  $\text{CaCl}_2$  soln. was injected intracardially. The animals survived indefinitely. The Ca salt had no antitoxic action on diphtheria toxin.

M. H. SOULÉ

**Influence of a large quantity of iodine on the internal organs.** M. MINOWADA. *Acta Dermatol* (Kyoto) 11, 531-8(1928); *Ber. ges. Physiol. exper. Pharmacol.* 48, 450.

R. C. WILLSON

**The effect of smaller doses of histamine in stimulating human gastric secretion.** LOUIS M. GOMPERTZ AND WILLIAM COHEN. *Am. J. Med. Sci.* 177, 59-64(1929).—The previously employed doses of 0.5 mg. histamine seem unnecessary since doses as small as 0.25 mg. histamine-HCl are sufficient to demonstrate the action of histamine as a gastric secretory stimulant. With the smaller dose the objectionable systemic effects are averted.

R. C. WILLSON

**Clinical and experimental studies on calcium and cholesterol in relation to the thyroid-parathyroid apparatus.** PRESTON A. WADE. *Am. J. Med. Sci.* 177, 790-816(1929).—Doses of cod-liver oil of 20-50 cc. daily for 14-30 days before operation prolong the lives of thyroparathyroidectomized dogs. The Ca level falls as in control animals, but reaches lower levels. There is evidence of a relationship between the Ca and cholesterol content of thyroparathyroidectomized dogs which indicates a relationship in the metabolism of Ca and cholesterol. A rising cholesterol level in actual tetany was consistent with the occurrence of a decreasing Ca level. In toxic thyroid disease (human) the blood Ca was below normal. After operation the Ca rose above normal. The blood cholesterol level was raised in these cases before operation and rose only slightly thereafter.

R. C. WILLSON

**Increase in blood sugar following the ingestion of glycerol.** JULIUS FERBER AND SOPHIE RABINOWITSCH. *Am. J. Med. Sci.* 177, 827-32(1929).—Glycerol given to a human being on an empty stomach will produce hyperglucemia. The extent of the latter is in direct ratio to the disturbance of carbohydrate metabolism in the individual. In more progressive cases of diabetes glycerol may also produce a glucosuria. These findings indicate that in the human, glycerol is converted into glucose.

R. C. W.

**The anesthetic properties of carbon dioxide.** CHAUNCEY D. LEAKE AND RALPH M. WATERS. *Anesthesia and Analgesia* 8, 17-19(1929).—Anesthesia was produced

in rabbits and dogs with mixts. of 30–50% CO<sub>2</sub> and O. The muscles are relaxed and the reflexes disappear. Respiration is deeper than usual, but the rate is unchanged. Blood pressure is raised during induction, but is about normal during the period of anesthesia. Pulse rate is increased during induction and depressed during anesthesia.

R. C. WILLSON

**Effect of alcohol on the patellar tendon reflex time.** LEE EDWARDS TRAVIS AND JOHN M. DORSEY. *Arch. Neurol. and Psychiatry* 21, 613–24 (1929).

R. C. W.

**The pharmacotherapeutic action of colloidal magnesium hydroxide on toxic hepatitis and nephritis.** EMIL PRIBYL. *Biol. Spisy vysoké školy zverolék Brne* 6, 16 (1927); *Ber. ges. Physiol. expil. Pharmacol.* 48, 125.—Rabbits were poisoned with P, As and uranylacetate and an aq. emulsion of colloidal Mg(OH)<sub>2</sub> was given intravenously. The Mg(OH)<sub>2</sub> effected a general improvement in the animals, as was seen in the blood and urine conditions (rapid recession of the residual N and negative findings in the urine) and in the liver and kidney function. The therapeutic action of the Mg(OH)<sub>2</sub> is ascribed to the alky. of the prepn. and to the sp. action of the Mg ions on the injured tissue.

R. C. WILLSON

**The effects of glycocyamine and glycocyamidine on the blood pressure.** RALPH H. MAJOR AND C. J. WEBER. *Bull. Johns Hopkins Hosp.* 42, 207–11 (1928).—Injections of 18 mg. per kg. dog produced a marked fall in the blood pressure. Glycocyamine also reduces the hypertension produced by methylguanidine. Glycocyamidine produces similar results, although it is not quite so effective against the methylguanidine hypertension and the fall is of shorter duration.

R. C. WILLSON

**The influence of insulin on diabetic lipemia.** I. DONOMAE. *Folia endocrinol. japon.* 4, 45 (1928); *Ber. ges. Physiol. expil. Pharmacol.* 47, 774.—The cloudy serum before the treatment showed an increase in all the lipid fractions; it was greatest in the fatty acids, moderate in lecithin and relatively slight in cholesterol. After insulin treatment the lipid content was reduced; it was greatest and most rapid in the fatty acids, slight in the lecithin and no constant change could be detected in cholesterol.

R. C. W.

**The influence of endocrine preparations on the basal metabolism during hyperthyreosis. II. The influence of insulin.** T. HARA. *Folia endocrinol. japon.* 4, 433–52 (1928); *Ber. ges. Physiol. expil. Pharmacol.* 47, 753.—Insulin (Lilly) given subcutaneously in doses of 9–15 units per day decreased the increased basal metabolism in 6 cases, increased it in 4 and had no effect in 4. The max. effect appeared after 30–40 days. The respiratory quotient was increased in some cases. Body wt. increased in 11 of 15 cases. Cf. C. A. 23, 3506.

R. C. WILLSON

**The influence of endocrine preparations on the basal metabolism in hyperthyreosis. IV. The influence of Lugol solution and of combined therapy with iodine and inner-secretory preparations.** T. HARA. *Folia endocrinol. japon.* 4, 28–30 (1928); *Ber. ges. Physiol. expil. Pharmacol.* 48, 424; cf. preceding abstr.—In 7 cases of hyperthyreosis the decrease in basal metabolism caused by Lugol soln. (distd. H<sub>2</sub>O, 27.0 g.; I, 1.0 g.; KI, 15–20 drops daily) was greater than that following organotherapy. The effect is seen after 7 days (av.). After 11–16 days (av. 14) the Lugol medication begins to show toxic action. The basal metabolism increases again. In toxic adenoma (3 cases) the Lugol medication increased the basal metabolism from the first and aggravated the symptoms. The administration of thymus gland substance subdued in 2 of 3 cases the toxic effect of over-medication with Lugol's soln. After long-continued medication the basal metabolism increased again and was checked only by discontinuing the medication. Suprarenal substance and insulin also checked the increase provoked by the continued Lugol medication.

R. C. WILLSON

**The effects of novocaine on the blood.** FRANCESCO BELLELLI. *Folia med.* 14, 857–75 (1928); *Ber. ges. Physiol. expil. Pharmacol.* 47, 842.—In dogs, cocaine is 4 times as toxic as novocaine. Novocaine acts on the peripheral nerve endings, causing a general lack of sensitivity and kills through respiratory paralysis. It effects a pseudo-leucocytosis in the periphery because of vascular dilatation and stasis. At the same time there is an increase in neutrophils and monocytes and a decrease in lymphocytes and eosinophiles.

R. C. WILLSON

**Comparative studies on the toxicity of various local anesthetics upon the organism, the nerve fibers and the heart of frogs.** ISAO KONDO. *Folia pharmacol. japon.* 7, 17 (1928); *Ber. ges. Physiol. expil. Pharmacol.* 48, 130.—The relative toxicities of the prepn. studied, as compared to cocaine, are: cocaine 100, tropacocaine 60, novocaine 33, alypine 151 and  $\beta$ -eucaine 100. The relative values for the interruption of motor conduction are: cocaine 100, tropacocaine 100, novocaine 50, alypine 25 and  $\beta$ -eucaine

25. Action on the frog heart: cocaine 100, tropacocaine 100, novocaine 6 and alypine and  $\beta$ -eucaine 200. R. C. WILLSON

The influence of the intravenous, subcutaneous and intraperitoneal infusion of Ringer-Locke solution upon the arterial and venous blood pressure. HIDEO KAMON. *Folia pharmacol. japon.* 7, 18(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 48, 229.—Heated Ringer-Locke soln. was given to rabbits and produced the same conditions regardless of the temp. (13–16° and 51–55°). The effects appear later after subcutaneous injection than after intravenous or intraperitoneal administration. The arterial and venous blood pressures increase and just before death reach "a very considerable height." R. C. WILLSON

The influence of different drugs on the growth of pulmonary and ventricular tissue of the hen embryo in vitro. HIDEO KAMON. *Folia pharmacol. japon.* 7, 86–111 (1928); *Ber. ges. Physiol. exptl. Pharmacol.* 48, 292.—In appropriate concns., digitalin, saponin, morphine, cocaine, quinine, atropine, pilocarpine, KCN, Na arsenite and EtOH check the growth of the embryonal heart and lung tissue. Digitalin and Na arsenite in minimal amts. further growth. All these agents act more strongly on the heart than on the lung tissue, with the exception of saponin and EtOH in which no difference was observed. R. C. WILLSON

The peripheral action of picrotoxin. MASAYOSHI OGAWA. Higashiyama Hosp., Kyoto. *Folia pharmacol. japon.* 7, 326–34(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 47, 678. R. C. WILLSON

The action of orally administered drugs of the digitalis group on frogs. MASAYOSHI OGAWA. *Folia pharmacol. japon.* 7, 335–44(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 47, 676.—When introduced into the stomach the cardiac action of convallamarin is weaker than that of helleborein and strophanthin. The action of helleborein increases with increased concn. but that of strophanthin appears not to be dependent upon the concn. These 3 drugs in strong concns. effect a systolic cardiac stagnation, while weak concns. produce a semi or complete diastolic one. Digtoxin in 40% alc., produces a semi-systolic one, while digitalis infusum (1:10) always effects a diastolic stagnation. R. C. WILLSON

Biological research of sterility. III. Influence of drugs and medicines on spermatozoa. SH. UCHIGAKI. *Japon. J. Obstet.* 10, 19–40(1927); *Ber. ges. Physiol. exptl. Pharmacol.* 48, 264.—The tested substances were either applied directly to the spermatozoa of white mice or administered to female mice and their sera applied to the spermatozoa. Spermatozoa treated with the serum of nicotine-poisoned animals live but a short time. Dilute alc. is indifferent; nicotine and caffeine even in dilns. of 1:1000 and 1:10,000 impede the movement of spermatozoa. Opium and morphine are non-toxic to spermatozoa but the sera of animals pretreated with these substances are toxic to them. Cocaine is toxic even in dilns. of 1:100,000. Pb and S shorten the duration of movement. Quinine is toxic to spermatozoa but the serum of animals pretreated with it is inactive. CO<sub>2</sub>, boric acid, lysol, HgCl<sub>2</sub> and H<sub>2</sub>O<sub>2</sub> shorten the duration of life of spermatozoa even in medically permitted doses. R. C. W

The excretion of lead by mine workers at Broken Hill. R. W. TANNAHILL. *Med. J. Australia* 1929, I, 201–5.—The excretion by men not exposed to Pb dust of the mines corresponded with that small amt. excreted by normal men in Sydney. The Pb excretion of men exposed to Pb dust varied widely in different individuals. Men continuously exposed showed higher excretion than others. A higher excretion of Pb follows short as well as long exposure. More Pb was found in the feces than in the urine. There is no relationship between the amt. found in the feces and that found in the urine. R. C. WILLSON

Lead excretion of workers at the smelters, Port Pirie. R. W. TANNAHILL. *Med. J. Australia* 1929, I, 205–8.—Pb excreted ranged from normal limits up to 1.04 mg. per l. in the urine. The general conclusions are the same as those from a study at Broken Hill (preceding abstract). R. C. WILLSON

The blood of workers exposed to lead. R. Y. MATHEW. *Med. J. Australia* 1929, I, 208–15.—Most const. and characteristic changes are found in the red cells in the form of anisocytosis, polychromasia and punctate basophilia. The presence of punctate basophilia is a definite indication of the absorption of Pb and the extent, type and degree of permanency of this factor give some indication as to the extent and degree of permanency of the bodily damage. R. C. WILLSON

The distribution of lead in the body after absorption. R. W. TANNAHILL. *Med. J. Australia* 1929, I, 216–7.—Pb seems to be absorbed through the respiratory tract, entering the systemic circulation from which it is carried throughout the body. Some reaches the liver and is excreted with bile into the intestines and removed from the



body by the feces. Others are removed from the blood into the kidney and excreted in the urine. The greatest amt. is taken up by the bones where it is ordinarily stored. However, it may under some conditions be released from the bones and cause a severe intoxication.

R. C. WILLSON

**The intravenous injection of phosphates: an experimental study with regard to diagnostic and therapeutic possibilities in chronic interstitial nephritis.** ADOLF BOLLIGER. *Med. J. Australia* 1929, I, 650-5.—Na phosphate solns. of varying  $p_H$  values (4.5-8.0) were injected into fasting, catheterized dogs and the urine and blood examd. In normal dogs the urea N and the  $CO_2$ -combining power of the plasma were always within normal limits. The inorg.  $PO_4$  of the plasma rose immediately after the injection, but fell to less than the normal value within 3 hr. In subjects which received as many as 54 injections over a period of 7 months the P elimination gradually decreased. In a dog with experimentally produced rapidly progressing nephritis, during a period of 2 months, the P excretion decreased rapidly, while the blood urea and the blood inorganic P rose steadily. In other nephritic animals the  $PO_4$  injections seemed to exert a beneficial therapeutic action toward the nephritis, particularly the nutritional condition.

R. C. WILLSON

**Vinca rosea: its effect on the blood-sugar level of normal rabbits.** DOUGLAS H. K. LEE AND W. R. M. DREW. *Med. J. Australia* 1929, I, 699-701.—No definite evidence was found that an infusion or ext. of *Vinca rosea* leaves, fed orally to normal rabbits, produces a fall in the blood-sugar level, although large quantities were given. There is a natural daily variation in the blood sugar of normal rabbits and the animals are slow to adapt themselves to the exptl. conditions, so that such expts. must be continued for long periods of time.

R. C. WILLSON

**The action of some diuretics and other drugs on the glomeruli.** MASANORI OKADA. *Okayama-Igakku-Zasshi* 40, 717-25(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 48, 284; cf. *C. A.* 23, 2500.—A tendency toward diuresis (enlarged diams., increase in glomeruli and copious addn. of blood) followed the administration of the following drugs to the exposed kidney: caffeine (0.2-1.0% soln. in drops or 0.05-1.0 cc. 1% soln. injected), caffeine-Na benzoate (same concns.), diuretin (0.1-1.0%), creatine (0.2%), guanidine (0.1%),  $NaNO_2$  (0.8%),  $NaNO_3$  (0.1%),  $Na_2HPO_4$  (2.4%),  $CaCl_2$  (1.0%),  $Ca(NO_3)_2$  (1.5%),  $Ca_3(PO_4)_2$  (2.1%),  $MgCl_2$  (1.5%) and  $MgSO_4$  (4.5%). The same effect was produced by  $1/10$  or  $1/100$  M hydroquinone, phloroglucinol and pyrogallol. No action followed the use of theocine, glucose, NaBr, NaI,  $Na_2SO_4$  and  $NaHCO_3$ . An effect directly opposite to that first reported followed the use of guanidine (0.3-0.8%) and all the K salts: AcOK (0.1-0.5%), KBr (1.5%),  $KNO_3$  (1.2%), KCl (0.9%), KI (1.4%),  $K_2CO_3$  (1.2%),  $KClO_3$  (1.2%),  $K_2SO_4$  (1.5%) and  $KClO$  (0.9%).

R. C. WILLSON

**Experimental studies of diuretin hyperglucemia.** NOBUYOSI SUGIMOTO. *Okayama Igakku-Zasshi* 39, 719-42(1927); *Ber. ges. Physiol. exptl. Pharmacol.* 47, 838.—The degree of diuretin hyperglucemia depends upon the size of the dose and the mode of application: intravenous injections have the strongest action in rabbits, then subcutaneous and intraperitoneal in order. Insulin subcutaneously inhibits the diuretin hyperglucemia, diuretin the insulin hypoglucemia. Atropine (1 mg. per kg.) suppresses the diuretin hyperglucemia.

R. C. WILLSON

**Studies on the regulation of blood coagulation from the pharmacological point of view. III. The influence of some parasympathetic poisons on the blood coagulation.** HISASHI TANAKA. *Okayama Igakku-Zasshi* 40, 1103-13(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 48, 136; cf. *C. A.* 23, 3750.—Pilocarpine intravenously (0.001-0.01 g. per kg. rabbit) slows the coagulation time of the blood, increases fibrinogen and anti-thrombin and decreases thrombin; a preliminary treatment with atropine acts antagonistically. Acetylcholine (0.001-0.003) acts the same as pilocarpine. Atropine intravenously (0.0003-0.001) accelerates the coagulation time, while larger doses (0.03-0.05) stop it.

R. C. WILLSON

**Determination of the strength of the action of senega saponin.** STAN. PETLACH. *Spisy Lekárske Fakulty Masarykovy Univ.* 5, 145-57(1927); *Ber. ges. Physiol. exptl. Pharmacol.* 47, 844.—The action of senega root depends on its saponin content which was detd. by its capacity to hemolyze the erythrocytes of guinea pigs. The limit of hemolyzing concn. was detd. and the hemolytic index calcd.

R. C. WILLSON

**The conduct of aromatic amines in the organism.** H. WEBER AND C. HEIDEPRIEM. *Zentr. Gewerbehyg.* 5, 269-72(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 48, 451.—The proportionate elimination and the toxicological effects of  $\alpha$ -naphthylamine, dimethylaniline and benzidine were studied. Subcutaneously injected  $\alpha$ -naphthylamine and dimethylaniline are eliminated partly unchanged and partly as sulfuric and glucuronic acids coupled hydroxylation products, in which the former is paired

with glucuronic acid, the latter with  $H_2SO_4$ . Toxicologically small doses of  $\alpha$ -naphthylamine produced no symptoms. Dimethylaniline produced general symptoms, methemoglobinemia, increase of the hemoglobin and erythrocyte count and an irritation of the bladder mucous membrane. Benzidine is eliminated partly unchanged but hydroxylation products also appeared. Its toxic effects are indefinite.

R. C. WILLSON

The identity of the action of calcium and adrenaline on the isolated frog heart. S. ZIGANOV. *Zhur. expl. Biol. Med.* 10, 35-46(1928); *Ber. ges. Physiol. expl. Pharmacol.* 47, 604; cf. *C. A.* 23, 3027.—With isotonic Black Sea water as a perfusion fluid, adrenaline accelerates the pulse of the isolated normal frog heart and decreases the work of a contraction. The duration of a complete cardiac contraction (systole and diastole) is shortened. Ca in concns. of 0.02-0.2% produces a slowing of the cardiac contraction and disorders of the rhythm. It reduces the total conduction capacity of the heart and increases the work of a contraction.

R. C. WILLSON

Synthesis of some alkylxanthines (MACCORQUODALE) 10. Se and its use in the arts [in treatment of malignant tumors] (KUFFERATH) 18. The constitution of some dichlorophenetidines [for use in pharmacology] (BARGELEINI) 10. Quinazolines. II. Synthesis of 6-ethoxy-3-(4-ethoxyphenyl)-3,4-dihydroquinazoline [an anesthetic] (MAFFEI) 10.

## 12—FOODS

F. C. BLANCK AND H. A. LEPPER

The composition of the most important vegetable foodstuffs of the Dutch East Indies. C. VAN ROSSEM. *Mededeel. Algem. Proefsta. Landbouw.* (Buitenzorg) No. 24, 76(1927) (with a summary in English); *Intern. Rev. Agr.* [N. S.], 19, No. 5, 465-6. Analyses are given of the principal foodstuffs of vegetable origin in the Dutch East Indies: *Andropogon sorghum*, *Arachis hypogaea*, *Coix lacrima*, *Glycine Max* (*G. soja*), *Oryza sativa*, *Phaseolus radiatus*, *Sesamum orientale*, *Vigna sinensis*, *Voandzeia subterranea*, *Zea mays*, *Canna edulis*, *Coleus tuberosus*, *Dioscorea* sp. div., *Ipomaea batatas*, and *Manihot utilissima*. A table is given indicating the physiol. heat from combustion and also a table of the analyses of the most important European foodstuffs for comparison.

H. L. D

The coloring of foodstuffs. L. WHINYATES. *Can. Chem. Met.* 13, 163-4(1929).—Probably well over 95% of the color used in foodstuffs is synthetic. Three main conditions govern the selection of food colors: (1) the laws where the products are consumed; (2) the colors must be harmless to both user and consumer; and (3) they must be stable in the material to be colored. Argentina is the only important country prohibiting synthetic colors. Great Britain and Canada give specific limits to As, Cu, Pb and Zn. The U. S. regulations are the most stringent now in force, and Canadian, Australian and New Zealand regulations are based on these. Canada has a list of 12 permitted colors of which 10 are on the U. S. list. In Canada the Dept. of Agriculture and the Dept. of Health are responsible for the collecting and listing of samples. The conditions affecting the manuf. of food colors are discussed. Some form of international discussion for the framing of uniform regulations is recommended. E. G. R. A

The contamination of foodstuffs when exposed for sale. G. E. BODY. *J. Royal Inst.* 49, 507-9(1929); *U. S. Pub. Health Eng. Abstracts E-840c*, 27.—Bacon, pork, cake, sweets, bread, cheese, cooked meats and dried fish were examd. bacteriologically and bio-chemically. Of 27 samples 16 showed the presence of *B. coli*. C. R. F.

Metals in our food. F. B. FLINN AND J. M. INOUE. *J. Am. Med. Assoc.* 90, 1010-3(1928); *Bull. Hyg.* 3, 733(1928).—A general discussion of the possible effects of metals taken up from cooking utensils. The authors discuss and study the effect of Cu, Sn, Ni, Zn and Al. Ten rats were used for each metal, being given an average daily dose of 2 mg. Of Cu, Sn and Ni 98.5-99% was excreted in feces; Al, 70% in feces and 30% in urine; Zn is equally divided between the two. There was practically no accumulation in the body. Metal salts ingested with food combine with protein except in excessive amounts and in hyperacidity. The authors' general opinion is that there is no evidence of chronic poisoning from metallic utensils, especially Al.

GEORGE R. GREENBANK

The use of diastatic extracts in bread making. IVAN A. EFFRONT AND ALBERT R. BORDN. *Chimie & industrie Special No.*, 648-9(Feb., 1929).—The use of small quantities of sugar in bread making may be of appreciable advantage when using low-grade flours (with low content of directly fermentable substances) or with yeasts that

are low in glycogen. Substitution of amylolytic enzymes, such as "super-diastase Y" (manufd. by the Société Rapide, Seclin, Nord), is highly advantageous; these enzymes produce the required sugar progressively during the course of the bread making, working more uniformly and rapidly and permitting of increasing the speed of rising with certainty and of regulating the consistency of the crumb and the height of the bread. A. PAPINEAU-COUTURE

The differentiation of wheat and rye flour breads. M. WAGENAAR. *Z. Untersuch. Lebensm.* 57, 37-45(1929).—Microscopic differentiation of the starches and cell elements of wheat and rye flour is made. Polarized light and aniline stains facilitate the sepn. of the 2 grains. In using polarized light, the most characteristic structure is the cross section, followed in order of importance by plant hairs and the epiderm. C. R. F.

Colorimetric determination of ergot in flour. F. S. OKOLOV. *Z. Untersuch. Lebensm.* 57, 63-71(1929).—For rye flour, 10 g. is dried for 1 hr. at 110°, shaken with a mixt. of 500 cc.  $\text{CHCl}_3$  and 60 cc.  $\text{EtOH}$  (sp. gr. 1.415-1.420), and the floating portion is filtered off after 1 hr., dried and shaken with 30 cc. of  $\text{Et}_2\text{O}$  and 1 cc. of  $\text{H}_2\text{SO}_4$  (1 to 4). The next day the glutinous ppt. is filtered off, the flask and paper are washed with  $\text{Et}_2\text{O}$  until 40 cc. of filtrate is obtained and 2 cc. of a satd. soln. of  $\text{NaHCO}_3$  added. After the mixt. has been shaken, the colored aq. layer is compared with standards in a *Walpole colorimeter*. The 2 standards are prepd. as follows: (1) A soln. of 0.1 g. of carmine in a mixt. of 5 cc. of concd.  $\text{NH}_4\text{OH}$  and 95 cc. of  $\text{H}_2\text{O}$ . Portions of 0.05-0.5 cc. are dild. to 10 cc., preserved with 2 drops of  $\text{CHOH}$ , and stored in the dark in stoppered bottles. (2) A soln. of 0.05 cc. of methyl orange in 100 cc. of  $\text{H}_2\text{O}$ , of which 0.2 to 0.5 cc. portions are dild. to 50 cc. after the addn. of 2 cc. of 0.1 N  $\text{NaOH}$  soln. The % of ergot is given by the no. of cc. of the carmine soln. which exactly matches. The methyl orange soln. is used only as a compensator for yellow color. For wheat flour, a 20 g. wheat sample is shaken with 50 cc. of  $\text{Et}_2\text{O}$  and 5 cc. of 1 to 4  $\text{H}_2\text{SO}_4$ , filtered after 1 day, the filtrate dild. to 60 cc. and the procedure for rye flour is followed. The method is independent of the age or type of sample. If less than 3% of ergot was present, the max. exptl. error was 0.2%. C. R. FELLERS

Determination of ergot in flour by a serological method. F. S. OKOLOV AND I. G. AKIMOV. *Z. Untersuch. Lebensm.* 57, 72-6(1929).—From 1 to 5 cc. of an ext. of ergot was injected intravenously into rabbits for antigen prepn. The ext. was purified by removal of  $\text{H}_2\text{O}$ -sol. poisons such as alkaloids and amines by the following treatment: The powd., dried and defatted ergot was twice extd. for 24 hr., dried, mixed with physiol. salt soln. contg. 0.5% of  $\text{NaOH}$  soln. and  $\text{CHCl}_3$ . After 24 hr. the mixt. was neutralized with a 10% soln. of  $\text{H}_3\text{PO}_4$  and filtered. In a 2 months' immunization period, a titer value for the serum of 1:20,000 was obtained. The precipitin ring test was then carried out in an agglutination tube with 2 cc. of serum and 0.5 cc. of a filtered soln. prepd. by extg. 20 g. of the sample with 100 cc. of physiol. salt soln. for 24 hr. An ergot content of 0.1-0.5% gave well-defined rings after incubation at 37° for 25 min.; 0.05% showed more diffuse rings which were intensified after 35 min. at room temp.; while 0.02% gave an opalescence, and ergot-free flour gave no reaction. Specificity tests on 11 weeds gave indecisive results which, however, are not considered to detract from the value of the method. C. R. FELLERS

Aluminum baking powders. G. SCHAEFFER AND G. FONTES. *Bull. soc. hyg. aliment.* 16, 1-24, 49-79(1928); *Bull. Hyg.* 3, 731(1928).—Bread and pastry made with alum and phosphate baking powders do not form insol. compds. upon baking but are readily sol. in the  $\text{HCl}$  of gastric juice. Evacuation of the stomachs of dogs fed on bread contg. these powders shows soly. The Al of the spleen is increased. The fertility of mice fed on this bread is reduced. This is shown to be due to atrophy of the ovary produced by Al. GEORGE R. GREENBANK

Luminescence of a genuine Dutch lard in ultra-violet light. A. VAN DRUTEN. *Z. Untersuch. Lebensm.* 57, 60-2(1929).—Lard from pigs slaughtered in the autumn of 1928 gave a bright blue to blue-violet fluorescence in ultra-violet light at 60°. This is contrary to the findings of van Raalte (*C. A.* 23, 1002). The intensity was increased after bleaching with fuller's earth and 0.25% of norite, but was decreased after heating at 140°. With solid lard, the fluorescence appeared on the surface. C. R. FELLERS

Research on marzipan. J. PRITZKER AND ROBERT JUNGKUNZ. *Z. Untersuch. Lebensm.* 57, 85-90(1929).—Chem. and phys. detns. are reported on various almond-sugar combinations known as marzipan. C. R. FELLERS

Estimation of vanillin in vanilla pods and vanilla sugar. R. EDER AND E. SCHLUMPF. *Pharm. Act. Helv.* 3, 65(1928); *Quart. J. Pharmacy* 1, 612.—The method depends upon the formation of a ppt. on mixing aq. solns. of vanillin and semioxamazide. A 3 to 4 g. sample of the vanilla fruit is taken and an aq. ext. prepd. by extrn. under

reflux 6 to 7 times with 15-20 cc. of water. After filtration and washing, the aq. ext. is shaken 6 to 7 times with much ether, the ethereal ext. dried with  $\text{Na}_2\text{SO}_4$ , and the ether recovered by careful distn. and finally spontaneous evapn. The residue is dissolved in 10 cc. of hot water and filtered through cotton wool into an Erlenmeyer flask. The residue is washed twice with 5 cc. of hot water and a soln. of 0.1 g. of semioxamazide in 10 cc. of hot water added to the cool vanillin soln. through the same filter. The mixt. is shaken for a few min. and left to stand for 12 hr. The ppt. is carefully collected in a weighed glass Gooch crucible and the flask rinsed with 30 cc. of cold water. The crucible and contents are dried to const. wt. at  $105^\circ$  and weighed. The amt. of vanillin present is given by multiplying the wt. of semioxamazide of vanillin by 0.6413 g. and adding 0.003 g. to correct for the soly. of the semioxamazide. When applied to vanillin sugar, 3 g. of this substance is dissolved in 20 cc. of warm water, the semioxamazide soln. added and the process is then conducted as above. The results are more accurate and the method does not possess the disadvantages of colorimetric detns.

H. L. D.

**Determination of sugar and dry matter in root crops.** A. ZADE. *Fortschritte Landw.* 3, 207-10(1928).—Roots are taken at random from each plot to make 100 or 200 per treatment, and sampled in the field by a special contrivance. The mixed sample is preserved with toluene in a flask that may be sealed with paraffin, and at any convenient time up to 14 days this material may be pulverized and analyzed. According to the values given, the greatest change in dry matter is 0.4%, and in sugar 0.6% after a fortnight. The method has been used for 3 years, and is recommended for groups of expts.

B. C. A.

**Utilization of oil-mill residues; the manufacture of edible aleurone meals.** ÉMILE ANDRÉ. *Bull. soc. encour. ind. nat.* 1929, 347-59.—General article on the utilization of valuable, but often wasted, pulp and waste materials from such oleaginous materials as olives, flaxseed, peanuts, sunflower, and sesame.

C. R. FELLERS

**Dairy products among the ancients.** RENÉ PIQUE. *Chimie & industrie Special No.*, 656-68(Feb., 1929).—Historical, with bibliography of 119 references. A. P.-C

**Dr. N. Gerber's acidbutyrometry as a scientific research method for milk.** G. KOESTLER AND W. LOERTSCHER. *Z. Untersuch. Lebensm.* 57, 48-59(1929).—Fat analyses in milk were made by the Gottlieb-Roese, Schmid-Bondzynski and Gerber acidbutyrometric methods. In general, the results agreed very well. The following acidbutyrometer correction scale was obtained as a result of the work. No correction is necessary when the fat content is 0-1.5%; subtract 0.05% between 1.51 and 2.50%; subtract 0.1% between 2.51 and 3.50%; subtract 0.15% between 3.51 and 4.50%; and 0.20% between 4.51 and 5.50%. Duplicate detns. always checked within 0.05% fat. Wider use of Gerber's instrument is advocated.

C. R. FELLERS

**Advantages of filtration over mechanical purification of milk by centrifuging.** H. STASSANO AND A. P. ROLLET. *Chimie & industrie Special No.*, 652-5(Feb., 1929).—It is claimed, with exptl. evidence to support the contention, that centrifuging tends slightly to increase the bacterial content of raw milk.

A. PAPINEAU-COUTURE

**Constants of sterilized milk fats and their mixtures with cacao butter.** HEINRICH FINKE. *Z. Untersuch. Lebensm.* 57, 9-13(1929).—Phys. and chem. consts. of the fats of whole and skimmed milk powder, condensed milk and cacao butter were studied. Similarly, mixts. of butterfat and cacao butter were studied with a view of using the results in the detection of foreign fats in cacao butter. In general, the consts. of the mixts. lie between those of pure butter and pure cacao fat. The data are inconclusive but the investigation is being continued.

C. R. FELLERS

**A contribution to the physical chemistry of milk.** W. GRIMMER AND H. BENDUSKI. *Milchwirtschaft. Forsch.* 7, 76-99(1928).—In the souring of milk the  $p_H$  runs parallel to the acid value for a time but later the  $p_H$  changes much more rapidly than the titratable acidity. The  $p_H$  is an exponential function of the titratable acidity,  $y = c \cdot a^x$ , in which  $y = p_H$ ;  $c = 0.370$  (const.);  $a = 1.325$  (const.);  $x$  = titratable acidity. The refractive index of the  $\text{CaCl}_2$  serum follows one of three rules: (1) The refraction decreases with acid concn.; (2) the refractive index changes rapidly at first, then less rapidly as acidity increases; (3) the refractive index decreases slowly at first and then rapidly as the acidity increases. The refractive index changes more rapidly with increase in  $p_H$  than with increase in titratable acidity.

GEORGE R. GREENBANK

**The fluorescence of milk and milk products in filtered ultra-violet light.** O. GERNGROSS AND M. SCHULZ. *Milchwirtschaft. Forsch.* 6, 567-74(1928).—Fresh milks of the cow, ewe and goat show a strong gold fluorescence; human and dog milks fluoresce to a far less degree. The milks of the lioness, mare and ass show a blue fluorescence. The fluorescent substance is resistant to oxidation but is changed by alkali above  $p_H$  10.

On neutralizing to  $p_H$  6 it reappears. It remains for a month in  $CH_2O$ -preserved milk. Direct sunlight changes it over to a white in a short time. G. R. G.

**The determination of the chlorine content of milk.** R. NESENI. *Z. Fleisch- u. Milchhyg.* 38, 343-4(1928).—The Cl content of milk is used to det. diseased condition of the udder. N. finds present methods of det. of Cl as inaccurate. He recommends the following: mix 5 cc. milk with an equal vol. of 0.1 N  $AgNO_3$  and twice the amt. of halogen-free  $HNO_3$ , boil, add 10% sol.  $KMnO_4$  until the soln. is clear, boil until oxidation is complete, dil. to twice the vol., add a small quantity of  $FeAlSO_4$  and titrate excess Ag with 0.1 N  $NH_4CNS$ . GEORGE R. GREENBANK

**Simple methods of determining the hydrogen-ion concentration of milk.** G. SCHWARZ. *Milchwirtschaft. Forsch.* 6, 458-63(1928).—S. compares the  $p_H$  detd. colorimetrically on milk sera prepd. by pptn. of the protein (1) by satn. with NaCl and (2) addn. of  $CH_3OH$  (92-95%) with that given by the quinhydrone electrode on raw, high- and low-temp. pasteurized milk, skim milk, buttermilk and cream. The alc. serum gives a  $p_H$  more nearly that of the electrometric method. The acidity of each sample studied is given. GEORGE R. GREENBANK

**The change from the colostic to the fresh milk period in cow milk.** GEORGE SCHULZE. *Milchwirtschaft. Forsch.* 6, 445-57(1928).—The curves of lactose and refractive index vs. time after calving intersect on the 14th day; this S. considers the end of the colostic period. After this time there is very little change until the end of the lactation period when the refractive index increases slightly. From the 264th to the 271st day after calving the lactose drops 1.2%. GEORGE R. GREENBANK

**Bacterial counts of pasteurized milk.** G. K. BOWES. *Pub. Health* 41, 364-7(1928); *U. S. Pub. Health Eng. Abstracts* E-840c, 26.—Pasteurization reduced the count on farmers' milk from 82.42 to 99.9% with an av. of 98.66%. In pasteurizing plants where the av. count exceeds 10,000 or where individual counts exceed 20,000, the handling and pretreatment of the raw milk should be carefully scrutinized. C. R. F.

**Advantages of rotary pumps for circulating milk, beer and fruit juices in pasteurizing apparatus.** H. STASSANO AND A. P. ROLLET. *Chimie & industrie Special No.*, 650-1(Feb., 1929); cf. *C. A.* 18, 3234.—One of the important advantages of the closed system of pasteurization is that it retains practically the whole of the  $CO_2$  content of the original liquid and prevents aeration. This advantage is lost to a considerable extent when circulation is effected by means of a plunger pump instead of a rotary pump. A. PAPINEAU-COUTURE

**Investigations on the milk and cheeses of Hungarian ewes.** A. FALTIN. *Kisérlet. Közlemények (Bull. Hung. Agron. Sta.)* 30, No. 2, 125-46(1927) (résumé in German); *Intern. Rev. Agr. [N. S.]*, 19, 386.—The milk of Hungarian and Fries-Racka ewes, resp., averaged  $d_{15}$  1.0368, 1.0362; refraction of serum 17.5°, 41.3, 40.2; dry matter, 20.45, 18.73%; fat, 8.57, 7.29%; fat-free dry ext., 11.98, 11.46%; ash, 0.94, 0.93%. The dry matter and the fat minima are found at the beginning and the maxima at the end of the lactation period. Throughout the lactation period the percentage of fat-free dry ext. remains nearly constant, while the refraction of the serum varies considerably. F. also examd. 31 samples of "Gomolya" (a half-worked cheese) which serves for the preparation of "Brinza" (a soft cheese ready to eat) and 31 samples of "Brinza." Gomolya has an av. water content of 44.07%, and a fat content of 51.45% calcd. on the dry matter. The  $n$  of the fat calcd. at 40° is on the av. 42.8°. Brinza has an av. water content of 40.27% and fat content of 50.35% calcd. on the dry matter. H. L. D.

**Mottling in colored cheese.** G. F. V. MORGAN. *New Zealand J. Agr.* 38, 259-60(1929).—Mottling in cheddar cheese seems to be due to the expresse of the white fatty whey after pressing, rather than during the last stage of cheddaring. This type of whey is rich in fat, albumin and lactose and is an excellent medium for bacterial growth, which accounts for the fact that decompn. frequently begins in the mottled areas. The mottled condition is not the result of bacterial action. K. D. JACOB

**A bottle test for detecting certain butter defects.** W. S. SUTTON. *Agr. Gaz. N. S. Wales* 40, 244-8(1929).—To det. whether butter will develop a "decomposed" odor during storage place about 30 g. of butter in a sterile 200-cc. Erlenmeyer flask, partially submerge in a water bath at 40-50° and agitate until all the butter is melted. Then, for the cotton-wool plug in the flask substitute a sterile cork. Incubate the flask at room temp. (approx. 15-20°) and exam. for odor at the end of 1 and 7 days. Expts. with a no. of samples of butter showed that this test confirms and supplements the results obtained by the bacterial plate count method. Normally, no odor developed when the butter contained less than 100,000 bacteria per g. and odor developed when there were more than 500,000 bacteria per g. In specific instances "decomposed" odors developed in butter contg. less than 100,000 bacteria per g. Butters, graded

as "choicest," which are likely to develop biol. flavors at a later stage, produce odors when submitted to the bottle test.

The butter refractometer. FR. BOLM. *Z. Untersuch. Lebensm.* 57, 91-2(1929).—Temp. corrections for the range 30-80° are tabulated.

Egg-yolk margarine. J. ANGERHAUSEN AND G. SCHULZE. *Pharm. Zentralhalle* 70, 389-92(1929).—The detection of egg yolk in margarine via Fendler is possible only, if, after incorporation with the margarine, it is subjected to temps. not higher than 60°. In an exptl. study of the production of margarine combined with "heliozithin" (a concd. protein-free egg yolk ext.) it is demonstrated that a product of this character cannot rightly be termed "egg yolk margarine," but rather a margarine with heliozithin addn Cf. *C. A.* 23, 2222.

Osmotic activity in eggs of different breeds of the common fowl. F. E. RICE AND D. L. YOUNG. *Poultry Sci.* 7, 116-8(1928); *Expt. Sta. Record* 59, 569.—In an effort to det. the cause of "watery" whites in storage eggs, studies were made of the phys. properties, especially the osmotic activity, of the eggs of 4 breeds of poultry. Numerous investigators have reported that the chem. compn. of eggs of various breeds is quite uniform, and analyses in connection with this study have borne out these conclusions. Refractive index, which is a measure of total solids, and f. p., which is proportional to the osmotic pressure, were detd. in the yolks and whites of the eggs, but the differences found were not significant. The authors conclude that any difference in appearance of the eggs of different breeds could not be attributed to osmotic activity.

Experiments with heat-precipitable horse-flesh albumins as precipitinogens. CH. SCHWEIZER. *Mitt. Lebensm. Hyg.* 20, 69-76(1929); cf. *C. A.* 22, 4163.—The method of Rosenberg for differentiating precipitable albumins in heated meats must be applied with caution. Because of the development of a non-specific turbidity, it does not seem workable with precipitins prepd. by heat-coagulable horse-flesh albumins in detecting cooked horse flesh.

The occurrence of lead in the egg of the domestic hen. WILFRED B. S. BISHOP. *Med. J. Australia* 1929, I, 96-9; cf. *C. A.* 22, 4611.—The Pb content of eggs from different fowls varies widely; that from different eggs from the same fowl varies but within narrow limits.

Canned vegetable troubles arising from sugar. W. HAMILTON GORDON. *Food Manuf.* 4, 171(1929).—This is a brief discussion of the relation of flat sour bacteria, thermophilic anaerobes, and sulfide spoilage bacteria found in sugar to troubles arising therefrom.

Hygienic value of chicory. L. DUCAMP. *Ann. hyg. publ. ind. sociale* 6, 160-8 (1928); *Bull. hyg.* 3, 733(1928).—Analyses show the nature and proportion of the constituents both sol. and insol. The ash contains 25-34% K<sub>2</sub>O. There is no foundation for the suggestion that the K causes heart trouble. It has a laxative value and there appears to be no harmful effects on drinking the infusion.

Maturity of apples in relation to long storage. Some experiments with the iodine test. M. DAVEY. *New Zealand J. Agr.* 38, 172-6(1929).—Some varieties of apples which appeared to be mature when judged by the color of the skin were found to be decidedly immature when tested for starch with I<sub>2</sub> soln. Different varieties of apples seem to vary widely in this respect. Apples from the same tree, having similar external appearance and picked at the same time, frequently showed a wide range of maturity as indicated by the I<sub>2</sub> test. By means of the I<sub>2</sub> test, it was found that when ripening begins, conversion of the starch to sugar is quite rapid, frequently being complete in 8 days. The investigation is being continued to det. the best stage of maturity at which to pick apples in order to minimize the danger of the development of bitter-pit during storage.

Rate of drying of Corinthian grapes. N. C. ROUSSOPOULOS AND G. M. MEYMARIS. *Ann. sci. agron.* 45, 442-52(1928).—It was found experimentally that within the limits of effective measures, the degree of drying of grapes treated with alk. solns was, for any given time period, proportional to their water content, or, in other words, the drying followed the laws of true exosmosis. Treatment with alk. carbonates accelerated the drying by increasing the area of exosmosis. The probable value of  $K^1/K$ , calcd. from the law of exosmosis, can be used as a measure of the efficacy of any agent as an accelerator in drying.

The detection of imitation canned peas. O. LÜNING AND E. BEYER. *Z. Untersuch. Lebensm.* 57, 76-85(1929).—The detection of mature peas soaked to simulate freshly canned immature peas is best carried out by a detn. of total N, insol. N, starch and water content. Freshly canned green peas contained 83.6% H<sub>2</sub>O while soaked

ripe peas of the same varieties contained 73.0%. The protein is approx. 5% higher in the green pea than in the mature soaked pea (dry basis). Insol. N and starch are also higher in the mature peas. C. R. FELLERS

Treatment of frozen potatoes by salt water. ARTHUR CADORET. *Compt. rend. acad. agr. France* 15, 682-3(1929).—Frozen potatoes which had commenced to soften were either soaked 12 hrs. in 10% salt water and dried in lime or dried in warm air. In both cases the results were successful. The tubers thawed normally, hardened without blackening and were in a perfect state of conservation. E. F. SNYDER

"Dry-rot" of swedes. T. WHITEHEAD and W. A. PRITCHARD. *Welsh J. Agr.* 5, 159-75(1929).—No relation could be established between the use of various fertilizer salts and the intensity of the attack by the dry-rot fungus, *Phoma lingam*, on swedes. Flowers of S. powd. lime and formalin were not effective in preventing development of the disease when applied to swedes prior to storage in clamps. Slightly better, but still unsatisfactory results were obtained by dusting the swedes with ground limestone. Formalin damaged the rinds of the bulbs, while S and powd. lime made the bulbs very dirty. K. D. JACOB

The coloring matters of *Carthamus* in bromatology. VICTOR ASTRADA. *Rev. farm.* (Buenos Aires) [2], 2, 159-60, 208-10(1929).—The flowers of *Carthamus* or false saffron have the following compn.:  $H_2O$  9.10, N-contg. substances 17.50, rosin 42.50, cellulose 13.0, fat 3.90, starch 2.90, ash 11.10%. The yellow principle is sol. in  $H_2O$ ; 0.2 g. of the flower gives color to 1 l. It is insol. in  $Et_2O$ ,  $CHCl_3$ ,  $C_6H_6$ , petroleum ether,  $AmOH$  and abs.  $EtOH$ . Prep.: To a 2.5% soln. in  $H_2O$   $AcOH$  and  $Pb$  acetate are added. After being filtered, the ppt. is dissolved in dil.  $H_2SO_4$ , filtered, neutralized with  $NaOH$  and pptd. with 80%  $EtOH$ . The substance is supposed to be a deriv. of quinoxaline. Another yellow substance is contained in the cell membrane of the petals. It is sol. in alkali. A. E. MEYER

The clarification and filtration of fruit juices. M. R. DAUGHTERS. *Canning Age* 8, 503-5(1927); *Expt. Sta. Record* 59, 713.—Successful clarification and filtration of fruit juices and exts. are said to depend upon the use of solubilizing enzymes for the conversion of starch and other undesired substances present in such material into permanently sol. compds., a chem. soln. of mixed enzymes adapted to this purpose, made by extg. suitable cultures of certain molds and having diastatic, proteolytic, milk-coagulating, and lipatic properties, being described. Diagrams and graphs illustrate the type of app. used and the progress of filtration with respect to time for pectin ext. and for sweet apple cider. H. L. D.

Composition of the fruits of *Asimina triloba* Dunal. GUSTAVE RIVIERE and GEORGES PICHARD. *J. soc. hort. France* [4], 28, 160(1927); *Intern. Rev. Science & Practice of Agr.* [N. S.], 18, 594T.—The following is the analysis of the fruits of *Asimina* picked in the botanical gardens of Tours, where this species of the Anonaceae family grows in the open soil. The pulp of the fruit is soft and pasty. Its perfume, the amt. of sugar it contains and its slight acidity make it very palatable. The fruit is an elongated berry, yellowish and rather like a small banana. It is a native of North America. Its chemical composition follows: wt. of a single fruit 22.39 g., d. 1.030, pulp 21.79 g., small fruit stones 0.60 g., total sugar 4.27 g., acidity expressed as  $H_2SO_4$  0.15 g., dry matter 21.80 g., ash 0.60 g. H. L. D.

The preparation of some perfumes and flavoring extracts from furfural and its derivatives. Esters of  $\beta$ -furylacrylic acid. HENRY GILMAN and GEORGE F. WRIGHT. *Iowa State Coll. J. Sci.* 3, 109-12(1929).—The following esters of furylacrylic acid were prepd.: (1) methyl, (2) ethyl, (3) propyl, (4) isopropyl, (5) butyl, (6) amyl, (7) benzyl, (8) furfuryl. Various methods were used in the preps. The yields varied from 20% to 90%. All hydrolyzed easily. The physiol. effects of the esters were not detd. The odors and tastes were as follows: (1) acetophenone odor, raisin taste; (2) excellent constituent for maple, walnut and coffee; (3) fatty odor, tastes like dried apple peels; (4) resembles *Me cinnamate*, reminds one of caraway; (5) like amyl or isobutyl salicylate; (6) sour sharp odor like last stages of rose, apple and slight raisin taste; (7) odor like benzyl benzoate, taste characteristic of raisin; (8) very slight odor. F. E. B.

The artificial drying of fodder. GEORGES RAY. *Chimie & industrie* Special No., 676-81(Feb., 1929).—A brief review of the various processes suggested and tried out by different investigators, with a discussion of their applicability in France. A. PAPINEAU-COUTURE

The utilization of fresh apple residues for cattle food. G. WARCOLLIER. *Rev. zootech.* 6, No. 9, 185-8(1927); *Intern. Rev. Agr.* [N. S.], 19, 472.—The residues after the crushing of apples vary in compn. chiefly according to the process used for extracting the juice. Results of analysis of 3 samples of residues of different origin are, resp.,

water, 80.20, 77.12, 80.12; nitrogenous matters, 0.73, 1.09, 1.03; fatty matters, 0.69, 0.87, 0.76; sugars (expressed as glucose), 6.43, 2.67, 0.37; N-free extract (sugars deducted), 8.39, 12.51, 10.92; crude cellulose, 2.88, 4.47, 6.00; mineral matters, 0.68, 0.67, 0.80; food value per 100 kg. expressed as starch, 12.00, 11.50, 8.40. The nutritive ratio of the fresh residue often lies between 1:20 and 1:25. In richness and in nutritive ratio the fresh residue fairly closely resembles mangels and fresh sugar beet pulp; it may hence be used in conjunction with other more concentrated food in the rations of adult animals for whom the nutritive ratio ought to vary from 1:5 to 1:12 according to the type of animal and the purpose for which they are kept. Ten kg. of residue is equal to 3 kg. of good hay. The residue will be mixed 8 to 12 hours before use with fragments of straw, chaff and chopped hay or straw, and concentrates fairly rich in protein will be added to the ration. H. L. D.

Detection of saponins in foods (KOFER) 17. Study of I in South Carolina [in feedstuffs] (MITCHELL) 15. The effect of nitrates upon corrosion in tin cans (CULPEPPER, MOON) 9. The mineral content of grain (GREAVES, HIRST) 11E. Apparatus for the determination of density of solids (BARTHOLOME) 1. Electrical precipitation apparatus, etc., preparing "smoked salt" for treating foods (U. S. pat. 1,719,353) 4. Alkali perphosphates [for baking powders] (Brit. pat. 300,946) 18.

MOULTON, CHARLES R.: *Meat Through the Microscope; Applications of Chemistry and the Biological Sciences to Some Problems of the Meat Packing Industry*. Chicago: Univ. of Chicago Press. 528 pp.

RENNES, J.: *Le lait loyal et les laits hors du commerce*. Paris: Le François. 202 pp. F. 20.

**Preserving food.** STABAVITE SYNDICATE, LTD. Fr. 655,688, June 13, 1928. Food is covered with a gum such as gum tragacanth capable of swelling in the presence of water without becoming sticky. Antiseptics or preservatives such as an alkali nitrate or bisulfite are then added to the gum.

**Preserving foods.** A. M. KOBOLKE. Brit. 300,529, Aug. 9, 1927. Insects or other "pests" in foods and the like are destroyed in a sealed kiln from which air is evacuated and replaced by CO which is then in turn evacuated and replaced by CS<sub>2</sub> or other suitable fumigant. An app. is described.

**Packing sheets for foods.** FABRIQUE DE FEUILLES D'ÉTAIN BERTHOUD S. A. Fr. 655,147, June 1, 1928. Packing sheets for foods such as cheese are made of metal, preferably Sn, covered on one or both sides with a substance such as white gum lac which is not affected by org. acids.

**Mixing food ingredients or other materials.** FREDERICK L. CRADDOCK. U. S. 1,719,800, July 2. Mech. features.

**Apparatus for dehydrating food products.** ELLARD L. YOUNGER (to Younger Dehydrator Co.). U. S. 1,718,845, June 25. Structural features.

**Treatment of flour with heated air.** E. A. FISHER and C. R. JONES. Brit. 300,291, June 10, 1927. Flour is treated with a current of air of regulated humidity and of such temp. that the temp. of the flour will be raised within a period of 3 hrs. or less to about 55-80° without reducing the moisture content of the flour materially below 10%.

**Heat treatment of flour to improve its quality.** E. A. FISHER and C. R. JONES. Brit. 300,537, June 10, 1927. Flour in suspension is treated with heated and humidified air at a temp. of about 55-80°; intermediate milling products may be similarly treated. An app. is described.

**"Flour improver."** NAAMLÖÖZE VENNOOTSCHAP NOURY & VAN DER LANDE'S HANDELMAATSCHAPPIJ and J. A. L. VAN DER LANDE. Brit. 300,568, May 12, 1927. Flour, wheat or an intermediate milling product is heated to 35-90° in the presence of a small proportion of acid to subject the gluten to a partial coagulation so that 95-30% of it remains retainable in a washing test. The product, in the proportion of about 0.5-2.0%, may be added to untreated flour. O is preferably excluded and moisture retained during the heating.

**"Flour improver."** NAAMLÖÖZE VENNOOTSCHAP NOURY & VAN DER LANDE'S HANDELMAATSCHAPPIJ and J. A. L. VAN DER LANDE. Brit. 300,515, May 12, 1927. Wheat, flour or an intermediate milling product is heated to 70-90° until a considerable portion of the gluten becomes non-retainable in a washing test. A small proportion of the product may be added to ordinary flour.

**Packaged evaporated milk.** GEORGE A. FISHER. U. S. 1,719,760, July 2. A



can is filled to at least 97.27% its capacity with evapd. milk, sealed and then subjected to a sterilizing temp. while agitating.

**Heated drum and scraper apparatus suitable for drying milk.** BOHUMIL BOUDA and GEORGE G. SKELTON (to Collis Co.). U. S. 1,717,491, June 18. Structural features.

**Apparatus for drying milk on a belt conveyor.** K. W. PFEFFERKORN. Brit. 300,655, Nov. 17, 1927.

**Apparatus for sterilizing milk and sealing it in cans.** BORDEN CO. Brit. 301,220, Dec. 19, 1927.

**Removing bleaching chemicals from fruit.** SAUL BLUMENTHAL. U. S. 1,717,869, June 18. SO<sub>2</sub> used for bleaching is removed from fruits such as raisins, apples, pears or cherries by submerging the fruit in a soln. of KClO<sub>3</sub>, agitating and draining and then washing with fresh water.

**Preparing citrus fruits for market.** HENRY B. SLATER (to W. B. Clancy, W. A. Johnson and Geo. A. Sarau, trustees). U. S. 1,719,567, July 2. The fruit is treated with alk. and fungicidal solns., dried, and the oil which has been leached from the fruit is replaced with a non-volatile mineral oil.

**Preparing citrus fruits for canning.** ALEXANDER W. STOTT (to Hills Bros. Co.). U. S. 1,719,631, July 2. An app. is described suitable for treating fruits such as grapefruit with a soln. by spraying and immersion.

**Vitamins.** CASPAR SCHMITT. Fr. 655,181, June 2, 1928. A material rich in vitamins for addn. to foods is obtained from cotton seed by removing the oil and reducing the sarcocarp to a very fine powder and macerating in water or aq. liquid.

**Drying grain, hops, etc.** T. E. DAVIES. Brit. 300,758, Oct. 15, 1927. Drying and slight bleaching is effected by the use of gas obtained by burning water gas or semi-water gas in air. An app. is described suitable for forming and burning the gas.

### 13—GENERAL INDUSTRIAL CHEMISTRY

HARLAN S. MINER

**Newer diaphragm materials for chemical technology.** HEINRICH PINCESS. *Chem. Ztg.* 53, 437-8(1929).—Notes are given on the use of cement (DRP 381,811), cellulose (DRP 421, 120), glass or SiO<sub>2</sub> threads (DRP 442,965), and hard rubber (DRP 423,079), with special praise for the last-named material.

W. C. EBAUGH

**The American chemical industry.** A. H. SWIFT. *U. S. Bur. of Foreign and Domestic Com. Trade Promotion Series No. 78*, 114 pp.(1929).—Production and trade of the current century are summarized.

E. I. S.

**The French chemical industry and the United States.** J. H. LUCAS. *Chimie & industrie Special No.*, 737-8(Feb., 1929).

A. PAPINEAU-COUTURE

**Technical and organization progress of the Polish chemical industry.** THADÉE ZAMOYSKI. *Chimie & industrie Special No.*, 722-6 (Feb., 1929); cf. *C. A.* 23, 1447.

A. PAPINEAU-COUTURE

**Development and corporative organization of the chemical industry in Italy.** P. GINORI-CONTI. *Chimie & industrie Special No.*, 727-32(Feb., 1929).

A. P.-C.

**The development of chemical industry in Italy.** C. PADOVANI. *Chemistry and Industry* 48, 627-8(1929).

E. H.

**The use of porous stone for purification and introduction of gases, especially air, into liquids.** P. MEYER DI PIERRE. *Chem.-Tech. Rundschau* 44, 698(1929).—Gases are usually purified by the Cottrell-Möller process, by washing with water or steam, or by filtration through cloths or metal web. The latter may be satisfactorily replaced by less sensitive porous filter stones. These are obtainable with varying pore sizes for which have been detd. the rates of filtration of air at 50, 100, 150, 200 and 250 mm. pressure. Such stone can also be used to disperse gas being introduced into a liquid.

E. PICKERING

**Complete clarification of liquids by means of centrifugals with filter drums.** A. SCHMÜCKING AND K. DIEHL. *Chem. Fabrik* 1929, 287-8, 298-300.—The Krupp centrifugal combined with a filter cloth is described and operating data are given.

J. H. M.

**Conception of hardness and its practical interest in the study of materials, especially lime, cement and brick.** EDMOND MARCOTTE. *Rev. matériaux construction trav. publics* 1929, 126-30, 171-4, 211-4.—The detn. of a single phys. or mech. property is sufficient for evaluating the others. A Brinell hardness is convenient for the purpose and from it tensile and compressive strengths can readily be calcd., provided the parameters have been detd. by a sufficient no. of preliminary expts.

F. O. ANDEREGG

**Estimation of the distribution of particle sizes in dust-forming substances, especially of cement.** H. W. GONELL. *Zement* 17, 1786-91, 1819-23, 1848-52(1928).—Sedimentation and air elutriation methods of sepg. fine particles are described and discussed. Air elutriation gave the most satisfactory analysis of particles 0-60  $\mu$  in diam.

H. F. KRIEGE

**The theory of fine grinding. IX. Connection between the statistical diameter and the statistical volume of irregularly shaped particles of crushed sand.** GEOFFREY MARTIN AND EDGAR A. BOWES. *Trans. Ceram. Soc.* 27, 247-58(1928).—Five carefully graded air-elutriated samples of quartz sand were chosen with a wide range in av. particle size. By actual count these particles varied in no. from 2188 to 116,520 per g. For particles of irregular shape but similar shape if  $d$  be their statistical diams. and  $V$  the corresponding statistical volume, then  $V/d^3 = \text{const. } B$ , which is called the vol. const. of the powder. This const. was found to vary irregularly between the narrow limits of 0.275-0.284, with an av. of 0.2772 for the 5 sizes studied. Therefore the vol. const. of the crushed particles is sensibly the same, and the av. shape remains the same whether the particles are large or small. **X. The connection between the statistical diameter of crushed sand particles and their statistical surface.** *Ibid* 259-84.—Crushed sand was divided into 19 samples by air elutriation. Microscopic measurements were made to det. the lineal dimensions and the number of particles per g. The range included particles of 0.00333-0.08325 cm. mean diam. If  $S$  be the statistical surface of particles of statistical diam.  $d$ , then  $S/d^2 = \text{surface const. } A$ . This const. was found to vary from approx. 2.0 to 2.49, the higher value belonging to the coarser samples. The fact that this const. is less than that for a sphere (3.1416) is due to the flattened form of the crushed quartz particles, thus exposing the 2 greatest dimensions to measurement. Since the change in surface const. is small, it follows that the av. shape of particles remains the same both in the coarse and the fine grades. **XI. Calculations relating to diameters, surfaces, and weights of homogeneous grades of crushed quartz sand.** GEOFFREY MARTIN. *Ibid* 285-9.—The chief numerical data relating to 20 homogeneous grades of quartz particles, ranging in size from 31,000,000 to 1240 per g., are given. Methods of calcg. the vols., surfaces and wts. of powders of different size are presented.

H. F. KRIEGE

**Ultrafiltration.** E. J. LUSH. *Ind. Chemist* 5, 225-8(1929).—A review. I. H.

**The blood of workers exposed to Pb (MATHEW) 11H. Industrial fuel and power statistics for Ontario, 1925 (MALLOCH, BALTZER) 21.**

GIOVANNETTI, DARIO: *Prodotti chimici, medicinali, materie tintorie e concianti. Manuale di analisi chimico-mercologica applicata alle voci della sezione VII della tariffa doganale italiana.* Bologna-Rocca: L. Cappelli. 188 pp. L. 20.

**Industrial Standardization.** New York: Natl. Industrial Conference Board, Inc. 306 pp. \$3.50. Reviewed in *Chemicals* 32, No. 1, 6(1929).

MORLEY, ARTHUR: *Strength of Materials.* 7th ed., revised and enlarged. London: Longmans, Green and Co., Ltd. 12s. 6d. net. Reviewed in *Engineering* 127, 716(1929).

SACHSSE, RUDOLF: *Die chemische Technik.* 3rd ed., revised. Radebeul: Kupky & Dietze. 199 pp. M. 4.50.

U. S. S. R. *Kriegschemische Verwaltung der Roten Arbeiter- und Bauernarmee. Kriegschemie. Hilfsbuch für die Kommandierenden der Roten Armee.* Translated by J. FISCHMANN. Moscow and Leningrad: Staatsverlag. 448 pp. Rbl. 2.80.

**Gas purification.** HERBERT A. GOLLMAR (to Koppers Co.). U. S. 1,719,177, July 2. Acidic impurities are removed from gas by washing it with a soln. of an alk. earth compd. of a metal of the Sn group of qual. analysis such as  $\text{CaHAs}_2\text{O}$  or  $\text{MgHAs}_2\text{O}$ . Cf. *C. A.* 23, 455.

**Gas purification.** HERBERT A. GOLLMAR (to Koppers Co.). U. S. 1,719,762, July 2. Impurities comprising S compds. are removed from gas by the action of a thio-As compd. such as a partially sulfided soln. of Na arsenite. Cf. *C. A.* 23, 455.

**Gas purification.** DAVID L. JACOBSON (to Koppers Co.). U. S. 1,719,180, July 2. Impurities including S compds. are removed by washing the gas with a soln. of an alkali and a compd. of As, such as a Na arsenite soln.

**Purifying gases.** C. J. HANSEN. *Brit.* 301,061, Nov. 24, 1927. In a process such as that described in *Brit.* 299,302 (*C. A.* 23, 3332) for removing  $\text{NH}_3$  and  $\text{H}_2\text{S}$  from gases, the gases are subjected to a preliminary washing with the spent liquor,

contg. Fe sulfide, from the main scrubbing operation. Various details of procedure are described.

**Purifying gases.** GASTON A. DURR. Fr. 655,123, Oct. 19, 1927. A filter for removing dust, tar and other impurities from gases coming from industrial app. or chem. reactions is composed of a layer of asbestos in the form of fibers or cloth.

**Purifying gases.** I. G. FARBERIND. A.-G. Fr. 656,395, June 23, 1928. Wetting agents such as a sulfonic acid or a sulfonate are added to the liquid used for washing a gas. Thus, 1 to 2 g. per l. of Na benzylnaphthalenesulfonate is added to the water used for washing blast-furnace gases.

**Purifying gases.** SOC. INTERNATIONALES DES PROCÉDÉS PRUDHOMME-HOUDRY. Fr. 655,135, Oct. 20, 1927. Gases coming from heat treatment or distn. of bituminous substances are passed through a preheater to heat them to the optimum temp. for purification before entering the purifiers.

**Gaseous reactions.** IMPERIAL CHEMICAL INDUSTRIES, LTD. Fr. 655,725, Mar. 12, 1928. Inert gases, such as A in the production of  $\text{NH}_3$  from N and H, or  $\text{CH}_4$  in the hydrogenation of coal, are removed by washing the gases with paraffin under pressure.

**Separation of gases by liquefaction.** GES. FÜR LINDE'S EISMASCHINEN A. G. Fr. 655,660, June 12, 1928. Details are given.

**Preventing absorption of gases by liquids.** PAUL LECHLER. Fr. 656,447, June 25, 1928. See Brit. 295,319 (C. A. 23, 2228).

**Liquefaction of nitrous vapors.** I. G. FARBERIND. A.-G. Fr. 655,578, June 11, 1928. In a process of liquefying nitrous vapors the vapor tension of the liquid N oxides is lowered by the addn. of  $\text{HNO}_3$ . The  $\text{HNO}_3$  may be added to the gaseous mixt.

**Eliminating acetylene.** LOUIS TOCCO. Fr. 656,365, Nov. 8, 1927.  $\text{C}_2\text{H}_2$  is removed from gaseous mixts. such as coke-oven gases to be liquefied for the sepn. of H and N to produce  $\text{NH}_3$  by washing the gases with acetone.

**Detection of gases, vapors or smoke.** MAX BUCHHOLZ. Fr. 655,160, June 2, 1928. The presence of decompn. gases, vapors or smoke is detected and their densities are measured, by utilizing the variation of heat absorptive power or permeability to heat rays, when such substances come in the path of heat rays from a source of heat.

**Separating carbon dioxide from gas mixtures.** WERSCHEN-WEISSENFELSER BRAUNKOHLN.-A.-G. Ger. 477,159, Feb. 17, 1927. The sepn. is effected with an alkali carbonate soln. which is used until bicarbonate is pptd. The bicarbonate is sepd. from the lye and heated, and the carbonate so obtained is redissolved in the lye. The method is particularly applicable to fuel distn. gases.

**Discharging solids, liquids and gases simultaneously from high-pressure reaction vessels.** BRAUNKOHLN.-PRODUKTE A.-G. Ger. 477,038, May 23, 1924. The reaction vessel is connected to a vessel in which a lower pressure is maintained through a tapering valve of sufficient cross section to ensure passage of the solid. The method may be applied in the manuf. of oil from coal, in the cracking of tars and oils rich in asphalt, and in hydrogenating fats.

**Reduction and oxidation.** FREDY W. RAUTH. Fr. 655,846, June 2, 1928. Reductions and oxidations are carried out by means of H and O in the nascent state in an alternating high-frequency elec. or magnetic or elec. and magnetic field. Fluids of different elec. conductibilities may be introduced into the field; one of the fluids may be a salt or acid or basic soln. which do or do not take part in the reaction. In the case of reduction, finely divided metals such as Fe or Al may be added to the system.

**Comminuting solid substances.** WALTER OSTERMANN (to Industrial Spray Drying Corp.). U. S. 1,718,184, June 18. The material to be comminuted is formed into a fine liquid dispersion in a colloid mill and this dispersion is then atomized and subjected to spray desiccation. A colloid mill and assoc. drying app. are described.

**Separating sediment from liquids.** CARL H. NORDELL. U. S. 1,718,871, June 25. An app. is described.

**Sterilizing, etc.** GEORG A. KRAUSE. Fr. 656,309, June 20, 1928. See Brit. 293,385 (C. A. 23, 1702).

**Refrigeration.** LOUIS A. BENOIST and GARDNER T. VORHEES. U. S. 1,719,818, July 2. A "low-temp. latent heat of fusion substance" such as a brine is frozen by conducting heat from it to a refrigerant fluid and a "high-temp. latent heat of fusion substance" such as a brine of different sp. gr. is frozen by conducting heat from it to the low-temp. substance. Air is cooled by conducting heat from it to the high-temp. substance and water is frozen by conducting heat from it to the low-temp. substance. An app. is described.

**Refrigerating.** IVAR AMUNDSEN. Ger. 477,037, Apr. 9, 1926. See Brit. 266,683 (C. A. 22, 650).

**Refrigerating system.** SAMUEL RUBEN. U. S. 1,717,584, June 18. Gases are electrolytically liberated from a liquid such as KCl soln. in a closed vessel; one of the gases, such as Cl, is condensed and liquefied, heat is absorbed from a body adjacent the liquefied gas by vaporizing the gas and chemically combining it with another of the liberated gases, such as H, and the product of such chem. combination is absorbed by and combined with the liquid from which the gases were liberated. An arrangement of app. is described.

**Refrigerating system of the compression type.** WILLIS H. CARRIER (to Carrier Engineering Corp.). U. S. 1,718,683, June 25.

**Refrigerating apparatus of the compression type.** MATSON C. TERRY (to Westinghouse Elec. & Mfg. Co.). U. S. 1,719,634, July 2.

**Refrigerating system of the absorption type.** ELIAS WIRTH-FREY (to Sulzer frères Soc. Anon.). U. S. 1,718,283, June 25. Structural features.

**Refrigerating system of the gas compression type.** HERMAN SCHARNAGEL (to Harry W. Dyer). U. S. 1,717,895, June 18. Air may be used as the refrigerating medium.

**Refrigerating system of the absorption type.** BLUFORD W. BROCKETT (to Edmund E. Allyne). U. S. 1,719,208, July 2. An app. is described.

**Refrigerating system of the continuous-cycle absorption type.** PLANTEN-MUNTERS REFRIGERATING SYSTEM AKTIEBOLAG (to Electrolux, Ltd.). Brit. 301,323, Nov. 25, 1927.

**Refrigerating system of the compression type suitable for use with sulfur dioxide.** L. V. MYERS (to Wayne Co.). Brit. 300,621, Nov. 17, 1927.

**Refrigerating apparatus of the intermittent absorption type.** CYRUS H. HAPGOOD. U. S. 1,718,690, June 25. Structural features.

**Refrigerating apparatus of the intermittently operating absorption type.** JULIUS BAYER. U. S. 1,717,909, June 18.

**Refrigerating apparatus of the absorption type.** A. LENNING (to Electrolux, Ltd.). Brit. 300,589, Nov. 15, 1927.

**Refrigerating plant.** GASWERKSBAU UND MASCHINEN FABRIKS-A.-G., FRANZ MANOSCHEK. Fr. 655,329, May 8, 1928.

**Air filter (containing filtering and heat-insulating material) for refrigerating chambers, etc.** ROBERT SPEIDEL. U. S. 1,717,470, June 18. Structural features.

**Air-purifying canister for respirators.** R. H. DAVIS, R. W. G. DAVIS and C. G. ROSLING. Brit. 301,532, Aug. 31, 1927. A canister contg. material for the catalytic oxidation of CO and drying material such as  $\text{CaCl}_2$  is provided with an audible signal device to indicate exhaustion of the layers. This may be operated by a string impregnated with  $\text{ZnCl}_2$  which is affected by moisture on exhaustion of the  $\text{CaCl}_2$ . Other features of similar character are also described.

**Insulating and other compositions from cashew-nut shell liquid.** M. T. HARVEY (to Harvel Corp.). Brit. 300,654, Nov. 17, 1927. To produce a drying product, cashew-nut shell liquid may be heated either alone or in the presence of metals or metal compds such as Cu, Pb, Mn, Pb oxide, Cu carbonate or oleate or cuprous  $\text{NH}_4$  carbonate or while blown with air. Other oils, resins, gums, driers, solvents, etc., may be added for producing insulating or molding compns., varnishes, etc. Cf. C. A. 23, 1000.

**Insulating coatings on aluminum, etc.** L. McCULLOCH (to Metropolitan-Vickers Electrical Co., Ltd.). Brit. 300,912, Nov. 19, 1927. Al or Al alloys such as parts of elec. app. are immersed in an aq. soln. contg. in suspension an alk. earth oxide such as CaO or SrO and an alk. earth metal salt such as  $\text{CaSO}_4$ ,  $\text{Ca}(\text{NO}_3)_2$  or  $\text{CaCl}_2$  or the corresponding Sr salts to form a film on the metal which is then dried and baked at about  $200^\circ$ . An insulating varnish may subsequently be applied.

## 14—WATER, SEWAGE AND SANITATION

EDWARD BARTOW

**The water works of Leipzig.** H. SCHILLING. *Gesundh. Ing.* 52, 337-40, 377-82 (1929).—An historical review of the problem of Leipzig's municipal water supply.

WAYNE L. DENMAN

**The consumption and waste of water.** JOHN BOWMAN. *Munic. Eng. Sanit. Record* 82, 846 (1928).—Av. domestic consumption of a no. of towns in England is lowest in Sunderland and highest in Plymouth.

C. H. BADGER

**Hydrochemistry of the upper Kama and its tributaries.** A. TRIFONOV. *Bull.*

*inst. recherches biol. univ. Perm* 5, 147-56(1927) (German résumé); *Biol. Abstracts* 2, 440.—A study of the water of the Kama River between Perm and the mouth of the Wischera and at the mouths of 7 of its tributaries supports the theory of the universal occurrence of chem. heterogeneity in the cross section of a flowing stream. The  $p_H$  varied between 7.2 and 8.2 at different points along the river, depending chiefly on the balance between acid and salts in the bicarbonate buffer system. In the water flowing in from the western tributaries there were found small quantities of anions of strong acids, but larger quantities of the anions of weak acids; the reverse was true of the eastern tributaries. The difference was attributed to difference in geological structure of the areas drained. The alkali reserve of the main river, however, was remarkably const. in the stretch investigated between the 3rd and 11th of Aug. H. L. D.

Volumetric determination of sulfate in water by the barium chromate method. G. NACHTIGALL AND F. RAEDER. *Arch. Hyg.* 100, 31(1928); *U. S. Pub. Health Eng. Abstracts* E-789a, 56.—Org. substances interfere with the  $SO_4$  detn. by the  $BaCrO_4$  method. Complete oxidation of org. matter in the water sample by the use of  $H_2O_2$  is recommended to obviate this error. C. R. FELLERS

The differentiation of organic substances in water. K. KEISER. *Tech. Gemeindeblatt* 31, 81(1928); *U. S. Pub. Health Eng. Abstracts* E-815a, 72.—A comparison was made between the O demand by Kubel's method and the Cl demand by Froboese's method of a no. of natural waters and aq. exts. The quotient ( $O_2$  demand in mg./l.)  $\div$  (Cl demand in mg./l.) is shown to be a valuable criterion in detg. the quality of a water. For raw river water, this quotient is normally 1:3 and is not much affected by substances of vegetable nature. The presence of substances of animal origin, however, increases the value of the Cl no. many times. The coagulation of water with alum seps. more of the substances which are attacked by O than those which are attacked by Cl. In lab. expts. casein was almost completely removed by coagulation, peptone to a lesser extent and urea scarcely at all. In the process of filtration the Cl demand of a water is reduced by about 25%. Sand filtration, therefore, plays a very important part in the biol. decompn. of substances remaining in water after coagulation. C. R. F.

Calculation of the electric conductivity of water. J. H. LINSCHOTEN. *Chem. Weekblad* 26, 198-202(1929).—Two graphical methods are described, by means of which the electrical conductivity of potable water at 18° is obtained without calcs. The complete diagrams are given in the original paper. ALBERT L. HENNE

The organoleptic qualities of water. Limpidness, color and their correction. A. GUILLERD. *Ann. hyg. publ. ind. sociale* 1928, 449-96.—A lecture surveying, measuring and correction methods used in various countries. Organoleptic qualities of water are defined as such that produce certain physiol. sensations on the human organs. G. TOENNIES

Experiments on sedimentation. K. S. VENKATARAMAN. *Bull. Mysore Eng. Assoc.* 6, No. 3, 15-21(1928).—V. describes a new method for obtaining turbidity on small samples. It depends upon the lowering of a coin and observing the disappearance of the letters on the coin. V. discusses further expts. carried out to study the effect of soda ash and turbidity on settlement as compared with mechanical agitation. J. A. KENNEDY

Water—its problems and their treatment. DUDLEY K. FRENCH. *Chem. Obzor* 4, 138-45(145, English)(1929).—A survey of American methods of water treatment. JAROSLAV KUČERA

The technic of water sterilization by chlorine and its compounds. F. DIENERT. *Ann. hyg. publ. ind. sociale* 1929, 65-87; cf. *C. A.* 22, 3008; 23, 2517.—A critical discussion. G. TOENNIES

Chlorine consumption in water. BESEMAN. *Water Yearbook for Sanit. Chem. and Eng.* 1928, 64-77; *U. S. Pub. Health Eng. Abstracts* E-789a, 50.—Cl consumption in water is caused by org. and inorg. substances;  $p_H$  values do not affect Cl consumption. Light intensity plays a role and it is best to add Cl in the dark. It is immaterial whether a Cl soln. or a  $NaOCl$  soln. is used. Differences in temp. affect Cl absorption, so that in practice the Cl dosage should be changed with the temp. of the water. A detention period of 5 min. is sufficient since practically no difference was observed between 5 and 60 min. contact periods. Residual Cl requires more Cl and it is recommended, in practice, to use the Olszewski method, i. e., just sufficient Cl. C. R. FELLERS

The theory of water chlorination. E. RUNOV. *Centr. Bakt. Parasitenk.*, II Abt., 77, 21-38(1929).—In the chlorination of water with the usual doses not more than 2% of the available Cl is used in the oxidation of bacteria, the larger part being consumed by dead org. matter and salts. The amt. of Cl used by the bacteria cannot be detd. directly in the usual dosage but only by extrapolation from larger doses. The in-

fluence of different electrolytes depends not only on their concn. but on the dose of Cl. For small doses of Cl, the catalytic effects of the following salts increase in the order given:  $\text{NH}_4$ , Ca, Mg, K. For large doses of Cl the order of increase is practically reversed: Ca(K), Mg, K(Ca),  $\text{NH}_4$ . No special action could be traced to any anion.

JOHN T. MYERS

Chemical treatment at Kansas City, Mo. GEO. F. GILKISON. *Munic. News and Water Works* 76, No 1, 31(1929); *U. S. Pub. Health Eng. Abstracts* E-789d, 63-4.—The Missouri River is highly polluted with a turbidity ranging from 15 to 18,000 p. p. m. The chem. treatment consists of presedimentation, followed by coagulation with alum and lime and sterilization with liquid Cl. Approx. 90% of the suspended matter is removed by pre-sedimentation. Alum and lime are added as the water passes from the second settling basin and enters the mixing chamber with a retention period of 1 min. The water then enters the coagulation basins and is pumped to the distribution station. Sedimentation and coagulation alone gave an av. removal of 99.68% of the turbidity. The plant manufactures all of the 5 million lb. of alum required annually at a cost of \$16.22 per ton.

C. R. FELLERS

Experimental plants in water treatment. H. N. JENKS. *Water Works Eng.* 82, 721-2, 751(1929).

E. I. S.

Chemical and mechanical treatment plant at Winston-Salem, N. C. W. J. THRASHER. *J. North Carolina Sect. Am. Water Works Assoc.* 5, 175-90(1927); *U. S. Pub. Health Eng. Abstracts* E-789, 28.—The successive steps are coarse bar screens manually raked; fine screens of self-cleaning, revolving drum, Dorr type; elec. control lime application; mixing tank with conical bottom; 3 electrolyzers (rate capacity 3 million gal. per day each); sedimentation in a single large rectangular Dorr clarifier with detention of about 2 hr.; a 50-ft circular Dorr thickener where  $\text{CaO}$  is added for conditioning; and following this to 2 vacuum-drum-type sludge filters. The raw sewage, about 4.8 million gal. per day, is a mixt. of domestic and industrial waste often highly colored by dyes from textile and finishing plants and stale through long trunk line sewer travel to the plant. The effluent having an  $\text{O}_2$  demand content of 4 to 5 p. p. m. is discharged to Salem Creek in a diln. of about 1 to 1, where it travels 6 miles to a stream twice the size and thence to the Yadkin River, a stream of 1200 sec. feet, 11 miles below the plant. The reduction of total org. solids is 72.6%, total bacteria 99.5%, *B. coli* 99.9%, reduction in  $\text{O}_2$  consumed from 144 to 42 p. p. m. and increase of dissolved  $\text{O}_2$  from 0.4 to 3.7 p. p. m. Numerous tables are appended.

C. R. FELLERS

Influence of quality of water on industry. EDWARD BARTOW. *Chem. Bull. (Chicago)* 16, 191-2, 198, 218 (1929).—A discussion of, and methods of preventing, scale formation, corrosion, foaming and embrittlement in boiler waters.

C. H. B.

Preparation and use of particularly saline ground water. K. HOFER. *Glückauf* 64, 669-72(1928).—Analyses and precautions to be used for boiler-fed water in the Ruhr district.

R. M. SYMMES

The neutralization ("Impfung") of cooling water; a method of preventing scale in surface condensers and various equipment in which water is warmed. W. KÄSTEN. *Chem. Fabrik* 1929, 269-70.— $\text{HCl}$  is added partly to neutralize  $\text{CaCO}_3$  and  $\text{MgCO}_3$ . A cut of the mixer is shown. Cf. Ger. Pat. Nos. 29,747 and 331,292.

J. H. M.

Experiences with fish-pond sewage disposal. ED. MERKEL. *Water Yearbook for Sanit. Chem. and Eng.* 1928, 228-42; *U. S. Pub. Health Eng. Abstracts* E-789, 26.—At Zerkabelshof the sewage is pretreated in a "Dyrvidag" system consisting of a sedimentation basin connected with a digestion tank; the settled sewage flows through the digestion compartment. The 2-acre fish pond receives the sewage from 1500 persons. Only 50% purification occurs in the pond. It is concluded that to be satisfactory (1) a high diln. of the effluent is necessary especially in dry weather; (2) the diln. water should be rich in Ca and (3) acid water is detrimental.

C. R. FELLERS

Discharge of filtered sewage into an otherwise unpolluted stream. HARRISON P. EDDY. *Am. J. Pub. Health* 19, 641-6(1929).—This case is illuminating as to the results which may follow the discharge of effluents from sewage-treatment plants into streams where the natural flow available for diln. compared with the vol. of effluent is small. Two lessons are taught: (1) Well-purified effluents require substantial diln. (2) Extensive easements may be necessary where adequate diln. is not available.

J. A. KENNEDY

Permanganate consumption, chlorine number and chloramine number in water and sewage analysis. F. EGGER. *Water Yearbook for Sanit. Chem. and Eng.* 1928, 56-84; *U. S. Pub. Health Eng. Abstracts* E-815, 8.—With  $\text{NaOCl}$  other values are obtained than with chloramines. The 2 methods should be kept sep. It is proposed

to designate the value obtained with hypochlorite as Cl no. and that found with chloramine as chloramine no. Chloramines attack urine and albuminoids less than hypochlorite, so that the use of chloramines is of less value since feces-polluted water requires more of the latter. The Cl nos. are greatly affected by residual Cl, whereas detns. made by the permanganate method are less affected and consequently of greater value. The 2 methods cannot be compared directly. C. R. FELLERS

A demonstration of color reaction in the test for free chlorine as applied to sewage. C. M. NICHOLS. *Proc. 13th Ann. Meeting, N. J. Sewage Works Assoc.* 1928, 1-2; *U. S. Pub. Health Eng. Abstracts E-789c*, 42.—In order to study the time factor as related to the application of Cl to a sewage-works effluent, N. allowed definite time intervals before testing for free Cl. Samples dosed with 10 p. p. m. of Cl and allowed to stand for 30 min. did not show any free Cl by the KI, AcOH and starch test. A suggested min. contact period for allowing the Cl to act is 15 min. Where pre-chlorination is practiced, it is unnecessary to have Cl present in the tank effluent but usually at some point in the flow chambers of the tanks. C. R. FELLERS

The purification of sewage containing large amounts of dyestuffs by the activated sludge process. A. PRITZKOW and JORDAN. *Wasser u. Gas* 18, 553 (1928); *Wasser u. Abwasser* 24, 219; cf. C. A. 23, 2231.—The complete removal of dyes is effected only by repeated filtration through clinker beds. Lab. expts. indicated that sewage contg. dyestuffs was rendered innocuous by treatment with the activated sludge process. C. R. FELLERS

Sewage treatment Duisburg a. Rh. W. SEEGERT. *Gesundh. Ing.* 52, 258-61, 324-9 (1929).—A description. WAYNE L. DENMAN

Innovations in sewage treatment for the city of Leipzig. MIEDER. *Gesundh. Ing.* 52, 353-61, 392-7 (1929).—Mechanical processes have replaced hand labor to a large extent. WAYNE L. DENMAN

Improvement of sludge digestion in the treatment plant at Halle. HEILMANN and W. J. MULLER. *Gesundh. Ing.* 52, 268-70, 342-4 (1929).—The treatment plant is of the Emscher type and is operated at almost full capacity. Artificial heating increases the efficiency. WAYNE L. DENMAN

Regulation of sludge digestion with lime. H. BACH. *Water Yearbook for Sanit. Chem. and Eng.* 1928, 242-60; *U. S. Pub. Health Eng. Abstracts E-789*, 26.—Using lab. expts. and a controlled  $p_H$ , B. found CaO increased the gas production from fresh sewage solids from 120 l. in 130 days to 200 l. in 80 days. Reaction control is vital in successful sludge disposal plant operation. C. R. FELLERS

Gas production from sewage sludge. HEILMANN. *Water Yearbook for Sanit. Chem. and Eng.* 1928, 228-42; *U. S. Pub. Health Eng. Abstracts E-789*, 26; cf. C. A. 23, 2776.—The compn. of the gases produced at Stuttgart are  $CH_4$  73.5%,  $CO_2$  14,  $H_2$  4.8,  $N_2$  4.7; in Halle:  $CH_4$  77.5,  $CO_2$  17.8,  $N_2$  4.6. The gas in Stuttgart is sold for 7 pf. per cu. m. and at Halle for 4 pf. In Halle the gas production per capita, 3 yr. av., was 116 cu. ft. C. R. FELLERS

Odor control of chlorination. R. F. GOUDY. *Calif. Sewage Works J.* 1, 87-101 (1928); *U. S. Pub. Health Eng. Abstracts E-840*, 58.—The Orange Co. cities, totaling a population of about 70,000, are linked together by an outfall sewer system. This sewage is pumped through an 18 in. main, 2 miles in length, and the detention period in this force main varies from 10 to 20 hr., averaging about 12 hr. Two chlorinators were installed, one of them located just ahead of the force main and the other one located about  $2\frac{1}{2}$  miles below the junction of the force main and the gravity sewer. The results show reduction of  $H_2S$  by chlorination. By destroying the sulfate-splitting organisms before  $H_2S$  was produced in large quantities, and then continuing to inhibit their growth by means of the second chlorinator, the same work was accomplished as if a much larger dose of Cl had been added at the end of the force main. This fact shows the importance of giving proper study to the location of chlorinators on such work, in order that the control may be accomplished economically. C. R. FELLERS

The reconstruction of the Schwerin sewage plant on the OMS principle. RAMSBECK. *Tech. Gemeindeblatt* 31, 62 (1928); *U. S. Pub. Health Eng. Abstracts E-815b*, 48.—The sewage disposal plant at Schwerin, which was built in 1908, contained 6 Emscher tanks. Trouble was experienced with these, because of the deposition of solid matter on the sloping walls of the settling portion and to the collection of a large amt of scum on the restricted surface of the digestion portion. This scum, unless removed daily, prevented the escape of gas, which found its way through the slots into the settling tank and caused putrefaction and odors. In 1925-26, the tanks were reconstructed on the OMS principle, with settling channels lying under the surface of the water and provided with removable covers. The advantage of this arrangement

lies in the limited cross section of the channel which causes the incoming sewage to scour the inside of the settling portion and prevents the deposition thereon of suspended solids. Further, a large surface area is provided for the digestion portion which permits of free escape of gases. Scum in the incoming sewage can pass directly into the settling portion through slots provided in the top of the settling channel. The digestion process is assisted by an arrangement by which the sludge can be flushed with water and the collection of salts, which interfere with the activity of the anaerobic bacteria, is avoided. An investigation of the plant has shown that the removal of suspended matter and digestion of sludge are very complete.

C. R. FELLERS

**The treatment plant of Chemnitz.** H. ROCH. *Gesundh. Ing.* 52, 369-77 (1929).—Sewage to the extent of 35.3 million cu. m. is digested each year.

W. L. D.

**Sewage treatment works in England, Scotland and the United States with special consideration of the activated sludge installations and their importance for the removal of Berlin's sewage irrigation fields.** F. LANGBEIN. *Gesundh. Ing.* 52, 281-4, 405-11 (1929).—A summary of sewage treatment in many of the principal English and American cities with numerous photographs of equipment, etc. Activated-sludge processes are superior and will displace irrigation of sewage on to fields.

WAYNE L. DENMAN

**Operating results of domestic treatment plants in Nuremberg.** J. V. HANFSTENGEL AND ED. MERKEL. *Gesundh. Ing.* 52, 270-3, 424-6 (1929).—Mechanical treatment plants for individual houses are no longer in favor. Most installations now contain several chambers, usually 4, and employ sludge digestion.

WAYNE L. DENMAN

**The Dunbar sewage filter.** E. W. STEEL AND P. J. A. ZELLER. *Texas Eng. Expt. Sta., Bull.* 37, 5-15 (1928); *U. S. Pub. Health Eng. Abstracts E-840*, 58.—A small exptl. Dunbar filter bed 4 ft. deep, having 4 layers of material grading from 3 to 6 in. at the bottom to  $\frac{1}{2}$  to  $\frac{1}{8}$  in. at the top, was operated for a yr. as continuously as the necessary resting and drying periods permitted. The sewage treated was stronger than the av. domestic sewage which had been settled in Imhoff tanks. The quality of the effluent varied with the rate of dosing and to a lesser extent with the character of the applied sewage. At rates up to 2.0 m. g. d. per acre, an 85% reduction in biochem.  $O_2$  demand may be expected. The optimum rate of 1.3 m. g. d. per acre was the highest for good nitrification and high dissolved  $O_2$  in the effluent. Between 1.3 and 2.0 m. g. d. per acre a clear effluent is produced, but nitrification is incomplete and dissolved  $O_2$  is absent. Clogging of the bed, indicated by sewage standing to a depth of 3 to 4 in., occurs after application of 8.0 m. g. of settled sewage per acre (about 6 days' run at optimum rate). Resting is necessary only to allow drying and removal of solids caught upon the surface. In dry weather 36 hr. rest is sufficient. A uniformly good quality of effluent may be expected even with the careless operation anticipated in small cities.

C. R. FELLERS

**Profitable garbage disposal in a town of 1400.** W. L. DOUGLAS. *Am. City* 40, 86-7 (1929); *U. S. Pub. Health Eng. Abstracts E-815c*, 11.—A Beccari type of garbage disposal plant at Dunedin, Fla., composed of 5 cells of 50 tons per month each, is economically operated. Three lb. of  $CaO$  is added to each 100 lb. of garbage to counteract the acids principally due to citrus fruits. At the end of 5 days' digestion, the temp. has reached about  $145^\circ$  and when this temp. begins to decline, the air ports are opened and  $O_2$  is admitted, thus permitting the aerobic bacteria to continue the destruction of the garbage. At the end of 30 days, the garbage is practically dry, contg. about 10% moisture. About 15 to 20% of the original bulk remains. Better results were subsequently secured by the use of 5 to 6 lb. of  $CaO$  per 100 lb. of garbage during the fall when citrus fruits constituted a large bulk of the garbage. About 40 days was required for the drying. The humus had a value of \$20.00 to \$30.00 per ton as fertilizer.

C. R. FELLERS

**The "Mammut" thickener.** STEEN. *Deut. Zuckerind.* 52, 275 (1928); *U. S. Pub. Health Eng. Abstracts E-815b*, 49.—The app. is a tank for the continuous sepn. of sludge from beet transport and washing waters. The tank is circular, and has a W-shaped diametrical cross section, which gives a large surface area for a given vol. The water to be clarified enters the app. centrally and flows radially outward toward the periphery of the tank where it runs into an annular trough and is discharged. The sludge which falls onto the sloping sides of the tank arrives at the bottom in a well mixed condition and is easily pumped. It is removed through a pipe which reaches to the bottom of the tank and which is mounted on a staging which continually revolves about the center of the app. The sludge is collected in a central chamber from which it is discharged to the drying beds. For a plant dealing with 1200 tons of beets per day and discharging about 2200 gallons of transport and wash water per min., a tank of about 74 ft. outside and 19.5 ft. inside diameter is suggested. This would provide a



water surface area of about 3970 sq. ft. About 264,000 gal. of sludge, with a dry solid content of about 400 tons, would be obtained per day in this plant. C. R. F.

**Atmospheric pollution.** J. S. OWENS. *Domestic Eng.* 47, 219-25(1927); *U. S. Pub. Health Eng. Abstracts E-815a*, 6; cf. *C. A.* 22, 2651, 3289.—The av. wt. of soot deposited per sq. mile in London is 300 tons, with a max. at the center of the city of 476 tons. The ratio of domestic and factory soot is best detd. by estg. the % of tar present. Tar forms 25% of domestic soot and but 1% of factory soot. By using the *Owens dust counter*, an av. of 5000 particles per cc. was found in London in winter while 80,000 per cc. were present in a dense smoke fog. The abolition of CO<sub>2</sub> and other obsolete ventilation standards is urged. C. R. FELLERS

**The present position of the hygiene of the atmosphere.** W. LIESEGANG. *Klin. Wochschr.* 7, 463-5(1928); *U. S. Pub. Health Eng. Abstracts E-815*, 3; cf. *C. A.* 22, 4759.—The use of tar is advocated for keeping down street dust. There is no definite proof that smoke has any influence on health. CO in amts. present in Berlin has a pronounced effect on the health of city-dwellers. C. R. FELLERS

**Index of comfort in the ventilation of theaters in Sydney, New South Wales.** C. BADHAM, C. F. ASSHETON and H. E. RAYNOR. Rept. Director-General Pub. Health, N. S. Wales. *Studies in Ind. Hyg.* No. 10, 49-72(1926); *U. S. Pub. Health Eng. Abstracts E-815*, 3.—The ideas of the English school, as contrasted with those of the American group of workers who favor the effective temp. as an index of comfort, are discussed. The effective temp. charts of American workers as an index of comfort in the theaters of Sydney are unsatisfactory. A dry katathermometer cooling time of not less than 6.1 at 60° F. and not less than 4.8 at 70° F. is recommended. In order to control the CO<sub>2</sub> content of the air, an air supply varying from 15 to 30 cu. ft. per person per min. is advised. Based on the recommendations as to air movement, it has been computed that an air change of from 6 to 12 times per hr. is required. C. R. F.

**Public health engineering—scope and policy.** R. S. WESTON, EARLE WATERMAN, W. F. WELLS, V. M. EHLERS and ABEL WOLMAN. *Am. J. Pub. Health* 19, 677-8 (1929).—A comm. rept. "Public health engineering may be defined, briefly, as the practice of those engineering arts which affect public health, or, more elaborately, as the application of the laws of science, including those of physics, chemistry and biology, to the betterment of man's environment." J. A. KENNEDY

**Disposal of wastes by the fermentation process.** ARTHUR BONIFACE. *Proc. 9th Ann. Conference Intern. Assoc. Street Sanit. Officials* 11-2; *U. S. Pub. Health Eng. Abstracts E-815a*, 8(1929); cf. *C. A.* 21, 145.—The Scarsdale, N. Y., 8-cell unit, concrete, fermentation disposal plant as originally built was patterned after the Florence, Italy, plant. The cells were charged to capacity with org. matter, securely closed, then left undisturbed for periods varying from 45 to 60 days, at the end of which time the residue produced was removed and placed in sheds to dry, later being removed and eventually used as fertilizer. Upon removal from the fermentation chambers the humus emitted decidedly objectionable odors and was otherwise very unsatisfactory. The plant was reconstructed to provide for drainage from the cells, and aeration through port holes placed near the floor. A gas vent was inserted through the roof to emit the evolving gases. The cells were charged from the top and discharged from the sides. An air-washing chamber with pump arrangement was connected to the gas vent at the roof to spray the discharged gases with KMnO<sub>4</sub> in order to keep down odor nuisance. Before the cells are filled, the garbage is spread out and treated with Ca(OH)<sub>2</sub> in the proportion of about 1.5% by wt. to effect neutralization, followed by a 10% soln. of (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> to start anaerobic action. The garbage is then dumped into the cells, the cells are closed and allowed to ferment for 30 days. The humus produced is 12 to 16% by wt. of the original charge and high in fertilizing value. Plants have the advantage of low initial cost, low operating and maintenance costs, no noxious odors, destruction of pathogenic organisms and revenue-producing possibilities. C. R. FELLERS

**Sugar-beet waste disposal.** E. NOLTE. *Water Yearbook for Sanit. Chem. and Eng.* 1928, 272-80; *U. S. Pub. Health Eng. Abstracts E-789*, 26.—The waste is settled and digested in a series of lagoons and the effluent is run over filter beds. Sedimentation is accomplished in small lagoons and the effluent when dild. 1 to 10 with river water had no further O demand. The fungus *Sphaerotilus* grows very abundantly in sugar waste waters even after much dild. C. R. FELLERS

**The use of gasoline as a larvicide in wells and similar collections of water used for drinking or domestic purposes.** C. S. RYLES and B. C. MAJUMDER. *Maylayan Med. J.* 2, 144 (1927); *U. S. Pub. Health Eng. Abstracts E-789*, 17.—In preliminary lab. expts., small quantities of gasoline, when dropped on a water surface, stupefied *Culex* larvae, but killed many of the *Anopheles* larvae. Stirring increased the efficacy of the gasoline.

In the lab 2 drams to 95 sq. in. surface produced unfailing results. All signs of the gasoline had gone in 1 hr. and all larvae were dead. Expts. were made on wells and tanks with and without vegetation. Vegetation was killed by the gasoline as were all kinds of mosquito larvae with rapidity and certainty when the application was made at a rate of 24 oz. per 80 sq. ft. at a cost of 15c. Stirring is recommended, but a spray may be used instead. After 3 hrs. no trace of the gasoline is detectable by smell, taste or chem. examn. It is suggested that wells be treated in the evening; by morning the water would show no trace of the application. C. R. FELLERS

The action of toxic substances on adult mosquitoes. A. B. LISCHETTI. *Rev. soc. ent. argent.* (Buenos Aires) 1, No. 2, 29-32(1926); *U. S. Pub. Health Eng. Abstracts* E-789, 17.—Mosquitoes are readily attracted for short distances by honey as bait. Females ate the honey-bait smeared on gauze around caged guinea pigs. Poisoned females were unable to lay eggs. Various poisons such as KCN, K arsenite,  $HgCl_2$ ,  $H_3BO_3$  and K arsenate were used. Of these, K arsenite was most efficacious. KCN, though the most active for a time, soon lost its activity. C. R. FELLERS

Exhaust gases of motor vehicles. W. LIESEGANG. *Gesundh. Ing.* 52, 385-91 (1929).—Many samples of air collected from tunnels, garages, streets, etc., have been found to contain appreciable quantities of CO. A complete bibliography is attached. WAYNE L. DENMAN

An open-air swimming pool supplied by underground water at Neumensten in Holstein. D. JUNGLOW. *Tech. Gemeindeblatt* 30, 315(1928); *U. S. Pub. Health Eng. Abstracts* E-815, 3.—A supply of 350 gals. per bather is thought adequate. In Aug., 1927, the total bacterial count averaged 128 per cc. with 0-3 *B. coli* per cc. C. R. F

Remarks on Junglow's paper. G. NACHTIGALL. *Tech. Gemeindeblatt* 31, 39 (1928); *U. S. Pub. Health Eng. Abstracts* E-815, 3; cf. preceding abstract.—For swimming pool purification at Hamburg the water is continually circulated, treated with alum, passed through 2 filters in series and chlorinated. A small quantity of  $NH_3$  added along with the Cl increases the sterilizing action of the Cl and prevents objectionable odors. *B. coli* is never detected after this treatment. C. R. FELLERS

The effect of small doses of plasmochine on the viability of gametocytes of malarina as measured by mosquito infection experiments (BARBER, *et al.*) 11H. Apparatus for aerating sewage (U. S. pat. 1,717,713) 1.

Treating water or sewage. G. ORNSTEIN. Brit. 300,898, Nov. 19, 1927. A metal salt is formed at the place of use from the basic metal by the action of Cl or HCl in the presence of  $H_2O$  and the resulting soln. is delivered to the liquid to be treated with or without simultaneous addn. of Cl. An arrangement of app. is described.

Treating "Town refuse." A. J. TERWAGNE. Brit. 301,427, Nov. 29, 1927. After drying, refuse is heated to produce combustible gases and C. App. and various details of procedure are described.

Filter construction for use in softening water with zeolites. HARRY M. MARSH and ROBERT STIRLING (to W. J. Westaway Co., Ltd.). U. S. 1,718,244, June 25.

Filtration apparatus adapted for softening water with "permutite." CARL HUF-SCHMIDT. U. S. 1,719,548, July 2. Structural features.

Apparatus for sterilizing water by heating. J. SLATER & Co. (Engineers), LTD., and J. C. ROBINSON. Brit. 300,718, Aug. 27, 1927. Structural features.

Preventing scale deposition in water preheaters. JULIUS ALSBERG (to Superheater Co.). U. S. 1,717,905, June 18. The cold feed water is treated with colloidal chestnut ext.

Base-exchanging material. THOMAS P. HILDITCH and HAROLD J. WHEATON (to American Doucil Co.). U. S. 1,717,777, June 18. A soln. of alkali metal silicate is mixed with a soln. of a neutral alkali metal salt such as  $NaClO_3$ ,  $Na_2HPO_4$  or  $Na_2SO_4$  to produce a gel and the gel is dried to obtain a product which is suitable for softening water.

Mixing apparatus for treating feed-water with emulsions or reagents. FILTRATORS, LTD., and V. SAKS. Brit. 300,664, May 18, 1927.

Furnace for burning sewage sludge, etc. F. VON SPRINGBORN. Brit. 301,295, Jan. 19, 1928. Structural features.

Tank and associated apparatus for collecting sludge such as that from sewage. WM. L. D'OLIER and W. G. PRUCHEN. U. S. 1,717,764, June 18. Structural features.

Apparatus for treating sewage by the "activated sludge" method. KARL IMHOFF. U. S. 1,717,780, June 18. Structural details.

**Apparatus (with a spiral rotatable steam coil) for rendering animal offal and similar materials.** RICHARD L. O'MEARA (to Mechanical Mfg. Co.). U. S. 1,717,465, June 18. Structural features.

**Disinfecting garbage in cans with *p*-dichlorobenzene, etc.** ALEXANDER LOWY. U. S. 1,719,185-6, July 2. A special construction of receptacles is described.

## 15—SOILS, FERTILIZERS AND AGRICULTURAL CHEMISTRY

J. J. SKINNER

**Collection and analysis of soil samples from (African) colonies.** MAURICE MARCHAND. *Rev. botan. appl. agr. colon.* 8, 25-32(1928).—Mech. and chem. analyses of 16 soils are given. M. S. ANDERSON

**Soils of the Punjab.** P. E. LANDER, RAMJI NARAIN AND MEHTA M. LAL. *Mem. Dept. Agr. India*, Chem. Ser. 10, 25-142(1929).—The characteristics of the various types of soil occurring in the Punjab are discussed. Numerous chem. and phys. analyses of the surface and subsoils are tabulated. K. D. JACOB

**Salty soils in Central Otago.** A. D. COLLINS. *New Zealand J. Agr.* 38, 250-3 (1929).—Analyses of surface scrapings from salty soil areas in the Central Otago district of N. Z. showed the presence of sol. Mg salts, principally the sulfate, in quantities that would probably be toxic to plants. Considerable quantities of H<sub>2</sub>O-sol. K and Na, apparently combined principally as the chlorides, were also present. K. D. J.

**Soil types of France.** V. AGAFONOV. *Proc. Intern. Soc. Soil Sci.* (Suppl.) 1, 67-89(1928).—The soils of France are classified: (1) podsolized soils; (2) red and yellow soils and (3) azonal soils (loess and volcanic soils). Samples were studied microscopically and chemically, the latter involving total analysis and estn. of plant nutrients by detn. of constituents sol. in boiling 10% HCl. The podsolized soils, which cover the greater part of France, may be divided into 2 zones by drawing a line in a general northeast southwest direction between Mezières, Chalons Poitiers and then in a southerly direction. The soils to the east of this line are much less podsolized than those to the west. The former are classified as brown soils (Ramann). The red, yellow and gray soils of southern France cannot be classified on the basis of climate, geological material having been of greater influence in their development. The soils of Normandy and those near Paris, Laon and Toulouse are yellow loess soils; those of the central plateau are volcanic. I. A. DENISON

**Some data about alkali soils of Russia.** D. J. VILENSKY. *Proc. Intern. Soc. Soil Sci.* (Suppl.) 1, 50-65(1928).—The genesis, compn. and phys. characteristics of the saline and alkali soils of southwest Russia are considered in the light of the theories of K. Gdroidz. Conclusion: Leaching of saline soils without application of other methods of improvement leads to deterioration since leaching transforms saline soils into alkali soils. I. A. DENISON

**The absorbent power of soils.** J. CLARENS. *Ann. sci. agron.* 46, 166-7(1929).—C. disagrees with the conclusions of Demolon, Burgevin and Barbier (preceding abstract) that the fixation of K<sub>2</sub>O and NH<sub>3</sub> by clay soils is due to adsorption and that it follows Freudlich's adsorption equation. These authors reply to Clarens' criticisms and offer further corroboration of their theory from the literature. K. S. MARKLEY

**Bituminous soil.** B. AARNIO. *Proc. Intern. Soc. Soil Sci.* (Suppl.) 1, 92-5(1928).—Bituminous soil is formed under peat beds by the infiltration of org. substances into the mineral stratum above which the peat lies. Bituminous soils invariably contain wax. Analysis shows that such soils are rich in Al<sub>2</sub>O<sub>3</sub> and poor in SiO<sub>2</sub>. Humic solns., which penetrate the mineral strata, ppt. Al<sub>2</sub>O<sub>3</sub>, while SiO<sub>2</sub> is carried away in colloidal soln. The formation of bituminous soils is everywhere the same, but the beds of Hungary are characterized by very great thickness. I. A. DENISON

**Soil profiles of Spitzbergen.** K. O. BJÖRLYKKE. *Proc. Intern. Soc. Soil Sci.* (Suppl.) 1, 96-107(1928).—Chem. and mech. analyses and  $p_H$  detns. are given for several soil profiles in Spitzbergen. Only slight differences are noted in the compn. of samples taken at different depths except in those cases where much org. matter is present. I. A. DENISON

**Graphical representation of the buffering power of soils.** W. U. BEHRENS. *Fortschritte Landw.* 3, 299(1928).—Polemical. The author holds that buffering power is best characterized by a series of titration measurements plotted with  $p_H$  values for abscissas and "buffering,"  $dS/dp_H$ , for ordinates. Limitations of single- and double-value detns. are pointed out. B. C. A.

The interchange between phosphoric acid and arsenic acid in soils. C. ANTONIANI AND G. FONIO. *Atti accad. Lincei* [6], 9, 344-50(1929).—Soils were treated with a soln. of  $\text{Na}_2\text{HPO}_4$  (400 cc. of 0.087% soln.) and then treated with successive portions (300 cc. each) of  $\text{H}_2\text{AsO}_4$ ; the mg. mols. of arsenate absorbed, as well as of phosphate displaced, was noted. Evidently, the soil is not satd. at first, so a large amount of arsenate is absorbed; this is independent of the exchange with phosphate. Therefore, phosphate in soil is susceptible to displacement by arsenate ions from dil.  $\text{H}_2\text{AsO}_4$ .

Beet soils. JACQUES DE VILMORIN. *Chimie & industrie* Special No., 669-70 (Feb., 1929).—Experience has shown that even under conditions which otherwise might not be very favorable, and more particularly when there is an appreciable deficiency in  $\text{CaO}$ , satisfactory sugar-beet yields can be expected if the sub-soil is deep and of proper texture.

The causes of variation of soil reaction in relation to the sugar beet. DECoux. *Sucr. belge* 48, 309-13, 332-7(1929).—The general causes for the acidification of soils are reviewed. In studying the action of fertilizers on soil reaction, 17 types of fertilizers are used on 4 types of soils. The  $p_{\text{H}}$  values of the fertilizers alone are detd. by shaking a known wt. with 500 cc.  $\text{H}_2\text{O}$  for 24 hrs. and using the filtrate for the colorimetric method. A known wt. of soil is now shaken for 24 hrs. with a fertilizer and water suspension similar to the above: the  $p_{\text{H}}$  of the filtrate is again detd. The results are tabulated. The amt. of fertilizer used is comparable to that of field practice. The author reviews the transformations that these fertilizers undergo in the soil. F. C.-C.

Determining the maximum molecular moisture-holding capacity of soils by centrifuging and the characterization of the mechanical properties of soils by this determination. A. F. LEBREDEV. *Pochvovedenie (Pédologie)* 23, No. 1-2, 49-69(1928) (In English).—With the aid of a centrifuge designed by L., rotating 50,000 revolutions per min., detns. were made on the force necessary to remove gravitational water from different types of soil. It was also shown that the film water cannot be removed even with a force equal to 70,000 gravity. From data on the mol. moisture-holding capacity of various sized particles L. concludes that this capacity is an additive function, and the detn. of it may serve as a basis for the characterization of the mech. compn. of the soil, without, however, giving the actual mech. compn. of the soils. A classification of different soils based on the mol. moisture-holding capacity checks very well with the classification based on actual mech. analyses. Drawings and descriptions of the centrifuge are given.

Notes on the constitution and culture value of soils of various formations in Madagascar. BONNEFOY. *Rev. botan. appl. agr. colon.* 8, 161-75, 185-99, 209-24(1928). Partial analyses of numerous soil samples from various provinces of Madagascar are given. Most of the soils are laterites and show low contents of the plant food elements. The N content serves as a rough index of the fertility of these laterites. As a rule, soils contg. less than 0.1% N are not cultivated. The use of mineral fertilizers is suggested for soil improvement. It is thought that N will be sufficiently fixed from the air if sufficient quantities of the other elements are present.

Influence of calcium phosphate on the yield and nutritive values of Paddy fields. F. ANNOTEL. *Rev. botan. appl. agr. colon.* 8, 397-403(1928).—Chem. analyses of rice grown on 16 fields both with and without Ca phosphate showed a marked increase in protein content of the grain resulting from the fertilization. Variations in other constituents were less consistent. Extensive chem. analyses are given.

The use of gypsum on salt soils. L. TRABUT. *Bull. agr. Algérie* [3], 33, No. 1, 1-8(1927); *Intern. Rev. Science & Practice of Agr.* [N. S.], 18, 261-2T.—General information is here given regarding cultivation on salt soil, and the action of certain salts in neutralizing the harmful effects of Na and Mg chlorates and of  $\text{Na}_2\text{CO}_3$ .  $\text{CaSO}_4$  is considered valuable as counteracting those salts which are harmful to cultivation. In the presence of  $\text{CaSO}_4$  (gypsum), the concn. of harmful salts which the roots can stand is considerably increased. If the salt lies above a calcareous soil it forms  $\text{Na}_2\text{CO}_3$  by reaction of the  $\text{NaCl}$  on the  $\text{CaCO}_3$ , and this has a markedly sterilizing effect through the combination of the Na with a weak acid; the soil becomes black and impermeable, and forms the well known, black salt soil. Thus the value of  $\text{CaSO}_4$  for plant growth on salt soil is thoroughly established.

Liming of soils. VINCENT AND HERVIAUX. *Ann. sci. agron.* 45, 335-57(1928).—Lab. and culture expts. are presented which agree in demonstrating that preliminary, partial or total satn. (of acidic constituents) of colloidal soils permits a more complete assimilation of  $\text{K}_2\text{O}$  by plants, not only of the  $\text{K}_2\text{O}$  added in the form of fertilizer but also of the  $\text{K}_2\text{O}$  adsorbed by the soil. Instead of satg. the colloids by the use of large

amts. of  $K_2O$ , lime may be used; this is not only more economical but is necessary in the case of non-calcareous soils. The use of large amts. of  $K_2O$  is not only uneconomical from the standpoint of the  $K_2O$  consumed but, in addition, results in strong decalcification, necessitating more frequent liming. Liming is recommended as indicated by acidity measurement, limiting the amt. of lime to the predetd. requirements, thus conserving the humus of the soil and assuring max. assimilation of the applied  $K_2O$  salts.

K. S. MARELEY

**Relationship of sulfur content of soils and plants.** F. HENGL AND P. RECKENDORFER. *Fortschritte Landw.* 3, 598(1928).—In considering smoke injury it is essential to know how far the S content of a plant may be affected by that of the soil, especially when sulfate has been added in fertilizers. Crop plants were fertilized with fertilizers contg. chloride and sulfate; at the time of flowering, the respective Cl or sulfate content of plants so treated was considerably above that of the controls, but when the plants were ripe the differences were less, sulfate content in particular being little affected. In field observations no relationship was found, except in extreme cases, between sulfate content of soils and plants; further, natural variations in the S content of plants were greater than increases due to smoke gases.

B. C. A

**Synthetic ammonia in the fertilizer industry.** J. W. TURRENTINE. *J. Chem. Education* 6, 894-8(1929).—Proposals and future developments are discussed.

E. F. SNYDER

**Concentrated fertilizers. Problems for the chemist and agronomist.** A. B. BEAUMONT. *J. Chem. Education* 6, 899-905(1929).—Some of the outstanding problems and opportunities now at hand are discussed.

E. F. SNYDER

**Phosphoric acid in agriculture: Some of its occurrences in agricultural materials, its functions, and evidences of its importance.** FRANK E. CORRIE. *Fertilizer, Feeding Stuffs and Farm Supplies J.* 14, 405-6, 409(1929).

K. D. JACOB

**Inspection of agricultural lime products.** H. D. HASKINS AND M. W. GOODWIN. *Mass. Agr. Expt. Sta., Control Series Bull.* 20, 1-7(1928).—Analysis of 27 samples of com. lime products showed a variation in  $CaO$  content from 30.68 to 66.27% and in  $MgO$  from 0.98 to 33.18%. Any lime material which will pass a 20-mesh sieve is assumed to be available in the soil within a 5 yr. period. On those products which will not wholly pass a 20-mesh sieve, it is assumed that the oxides in that portion which is coarser than 20-mesh will be only 50% effective during the same period.

C. R. F.

**Comparison of Rhenania phosphate with superphosphate and basic slag [as fertilizers].** DENSCH. *Fortschritte Landw.* 3, 356(1928).—In a year's pot and field expts. with several acid soils, superphosphate tended to give the largest increases in yield; there was nothing to choose between Rhenania phosphate and basic slag. The former is accordingly classed as a "high-value" fertilizer.

B. C. A.

**Potash and nitrogen fertilization of potatoes.** H. WIESSMANN AND E. SCHRAMM. *Fortschritte Landw.* 3, 625(1928).—From 11 field expts. in different districts it appeared that (except on one soil which did not respond to N) the total yield of starch was little increased by potash manuring unless N was also added. Further N caused larger increases in starch yield than did further potash. Starch content, as distinct from yield, was highest without potash or N, and lowest with the heaviest applications. Potash (40% salts) depressed starch content, whether or not N was applied, and the depressing effect of potash was greater than that of N.

B. C. A.

**Electrolytic or electroactive fertilizers.** E. BURBAN. *Ann. sci. agron.* 45, 362-72(1928).—B. divides fertilizers into four classes, viz. (1) those insol. in  $H_2O$ ; (2) those sol. in  $H_2O$  but only slightly dissoc.; (3) those sol. in  $H_2O$  and moderately dissoc.; (4) those sol. in  $H_2O$  and highly dissoc. A discussion follows of the action of fertilizers in soil soln. and in contact with soil colloids, as plant nutrients and as herbicides from the viewpoint of their soly., degree of dissocn. and ionic mobility.

K. S. M.

**Fertilizer requirements of the plum lands of the Agenais region (France).** G. GUITTONNEAU, J. KEILLING AND M. BÉJAMBES. *Ann. sci. agron.* 46, 133-65(1929); cf. C. A. 23, 1711.—The limiting factor in the fertility of these soils is the lack of assimilable phosphoric acid. The need for assimilable potash is less certain. Soil analyses do not lead to any precise conclusions regarding their need for sulfur.

K. S. M.

**Influence on adsorption phenomena on certain reactions which can come into play in the fixation of fertilizers by soil.** RENÉ DUBRISAY. *Chimie & industrie Special No.*, 671-5(Feb., 1929).—See C. A. 22, 2633.

A. PAFINEAU-COUTURE

**Evaluation of the root-soluble soil nutrients phosphoric acid and potassium.** GERLACH. *Z. Pflanzenernähr. Düngung* 7B, 579-84(1928).—Differences in the limiting values of root-sol. nutrients as expressed by Neubauer and by Roemer are discussed. In field trials far fewer soils exhibited deficiencies of K or phosphate than when examd.

by the Neubauer and Roemer methods. The different exptl. conditions of the 3 methods of soil examn. are largely responsible for the divergent results obtained.

B. C. A.

**Root solubility of phosphoric acid contained in superphosphate, neutral phosphate, reform phosphate and Algiers phosphate.** C. DREYSPRING, C. KRÜGEL AND R. PANTKEE. *Superphosphate* 2, 61-9, 81-9(1929).—The absorption by barley of the  $P_2O_5$  in superphosphate, reform phosphate, neutral phosphate and ground Algerian phosphate rock was detd. by means of the Neubauer method, equal quantities of total  $P_2O_5$  being used in each case. The quantities of  $P_2O_5$  absorbed by the barley seedlings in 18 days with applications of  $P_2O_5$  varying from 5 to 80 mg. per pot were superphosphate 4.2 to 53.3, neutral phosphate 3.2 to 39.1, reform phosphate 1.4 to 10.7 and Algerian phosphate rock 1.2 to 2.4 mg. In all cases there was a very close relation between the percentages of  $P_2O_5$  absorbed by the seedlings and the percentages of total  $P_2O_5$  sol. in  $H_2O$  and in  $NH_4$  citrate in the original phosphates.

K. D. JACOB

**The value of blast-furnace slag as fertilizer.** CURT WEISE. *Arch. Eisenhüttenw.* 2, 283-6(1928).—Ground blast-furnace slag is used with advantage as a substitute for limestone. The crop increases of the slag over those of limestone are ascribed to the accessory constituents of the slag, viz. Fe, S, Mn, colloidal  $SiO_2$ , etc.

R. D. B.

**Nitrogen fertilization.** F. MÜNTER. *Z. Pflanzenernähr. Füngung* 7B, 553-79(1928).—Results of numerous field trials extending over a number of years are utilized to elucidate the most advantageous use of nitrogenous fertilizers for various soils, crops and climatic conditions. The importance of the soil reaction in this connection is emphasized.

B. C. A.

**The effect of fertilizer treatments upon the quantity and quality of pasture vegetation.** I. Mineral treatments. B. A. BROWN. *J. Am. Soc. Agron.* 21, 673-8(1929).—In most instances little, if any, benefit has resulted from adding potash to P and lime. However, on lighter soils, which at present probably should not be used for permanent pasture anyway, it may be profitable to apply potash. II. Nitrogen treatments. HENRY DORSEY. *Ibid* 679-86. —The early expts. on the use of N alone or with minerals has cast much doubt upon its real value. The use of cheaper minerals has induced clover and other legume growth. This growth has, in turn, been followed by a heavy grass growth, due, no doubt, to the accumulated N fixed by the bacteria in the clover and other legume nodules.

E. F. SNYDER

**Some effects of fertilizers on the production of lucerne root nodules.** W. D. REID. *New Zealand J. Agr.* 38, 103-8(1929).—Lab. tests in agar media and in soil showed that when superphosphate is mixed with inoculated lucerne seed before sowing, a large percentage of the nodule bacteria is killed, but ground rock phosphate and basic slag do not have any deleterious effect. As regards germination, the seed seems to be adversely affected by superphosphate, but not by rock phosphate and basic slag. In both cases, mixts. of equal wts. of superphosphate and lime give results between those obtained with superphosphate alone, and with rock phosphate and basic slag.

K. D. JACOB

**Crabs in paddy fields.** K. VENKATARAMAN. Madras Agr. Dept., *Yearbook for* 1927, 23-33(1928).—An org. fertilizer contg.  $P_2O_5$  0.31,  $K_2O$  0.45 and N 0.20% was prepd. from land crabs by allowing them to rot for 10 weeks in a pit covered with a layer of soil.

K. D. JACOB

**The chemical composition of grass from plots fertilized and grazed intensively.** J. G. ARCHIBALD AND P. R. NELSON. *J. Am. Soc. Agron.* 21, 686-700(1929).—The fertilizer treatment decreased considerably the % of dry matter in the grass and decreased slightly the % of crude fiber and Ca in the dry matter. The % of N, P and ether ext. was increased, the N markedly so. Acre production of all constituents was increased, N being nearly doubled, while P and ether ext. were increased by about one-half. The fertilizer treatment increased the nutritive value of the dry matter of the grass. Seasonal fluctuations in the content of the several constituents detd. were not smoothed out to any great degree by the fertilizer treatment, except with Ca, which showed quite a uniform rate of increase in the fertilized plots as the season advanced. Fluctuations in acre production, however, were somewhat reduced by the system, except N and ether ext., which showed much the same seasonal variations on the fertilized and on the check plots. With one exception, the peak of production on all plots of all constituents occurred in June. Min. production occurred in May in all cases. Grass kept in the vegetative stage by grazing may be quite different in chem. composition from what it was in the spring.

E. F. SNYDER

**Role of pasture in the mineral nutrition of farm animals.** L. A. MAYNARD. *J. Agron.* 21, 700-8(1929).—Irrespective of the question as to whether it is

practicable to increase the mineral content of pasture grass where it is deficient, it is important from the standpoint of animal husbandry that future pasture investigations should give increased consideration to the question of their mineral content.

E. F. SNYDER

**Ecological factors determining the pasture flora in the Northeastern United States.** H. P. COOPER, J. K. WILSON AND J. H. BARRON. *J. Am. Soc. Agron.* 21, 607-27 (1929).—It has been observed that there is not a close correlation between the H-ion concn. of the soil and the growth of pasture plants. It is believed that the quantity and quality of the exchangeable cations in the soil complex may be more important than the  $pH$  value of the soil in detg. its adaptability for the growth of certain plants. Recent work on cation exchange in soil colloids shows that there is a correlation between the exchangeability of the various cations and the standard electrode potentials of the metallic materials. Relatively more cations are removed by extrn. with  $N/1$   $NH_4Cl$  than by electro dialysis. This difference is probably partially due to the relative solubilities of the hydroxides of the various metals in water and in the presence of  $NH_4$  salts. The  $NO_3$  and  $H_2PO_4$  anions are sensitive to visible light radiation. The sensitivity of compds. to visible light may be an important factor in nutrient media. It is probable that there is a closer correlation between the growth of plants and the ratio of colloidal material to the available reactive metals which have relatively high standard electrode potentials than there is between the actual % of these materials in the soils and plant growth. There is a correlation between the chem. compn. of the ash of pasture plants and the available soil constituents. Pasture plants grown on poor acid soils usually contain smaller quantities of material with relatively high standard electrode potentials than plants grown on productive soils. The plants grown on the poor acid soils often contain relatively large amts. of Si and other hard elements with relatively low standard electrode potentials, such as Al, Mn and Fe. It is believed the presence of the hard elements influences the palatability of the pasture plants. The plants grown on the fertile soils usually contain relatively large amts. of the soft elements, such as P, K and Ca, and are usually palatable. The width of the N:C ratio of the org. matter on and in the soils is correlated with the relative amts. of cationic and anionic N available for plant growth. Soils with high nitrifying power apparently produce a better quality of pasture than soils with low nitrifying power. The response of plants and animals to some of the relatively weak ions, such as Mg, Mn, Cu, Fe, Ni, Co, I and others, definitely suggests that the presence of compds. of these weak ions may be very important in the nutrition of both plants and animals.

E. F. SNYDER

**The nutritive value of pasture grass as influenced by management.** T. W. FAGAN. *Welsh J. Agr.* 5, 99-109 (1929).—Close grazing and frequent cutting are important factors. Data showing the effect of various factors on the chem. compn. of pasture grass are given.

K. D. JACOB

**The Wormbold system under Welsh conditions.** J. J. GRIFFITH AND R. PHILLIPS. *Welsh J. Agr.* 5, 83-98 (1929); cf. preceding abstr.—Monthly chem. analyses of the dry matter and ash of closely grazed pasture grass are tabulated for the period, April to October. In general, the protein content was highest in October and lowest in May and June. The  $Et_2O$  ext. diminished fairly regularly until August, but showed a tendency to increase slightly during the autumn. The  $P_2O_5$  content of the ash was decidedly lower in June than at any other time of the season. Nitro-chalk was distinctly superior to  $(NH_4)_2SO_4$  as a N fertilizer for pastures as regards the color and the bulk of the herbage produced by the first applications, but in subsequent applications there was no noticeable difference in the effects of the 2 fertilizers. The investigations are being continued.

K. D. JACOB

**Comparative returns in feed units from crop rotation and pasture.** J. W. WHITE. *J. Am. Soc. Agron.* 21, 589-93 (1929).—The pasture as a general av. has produced 10.9% greater wt. of air-dry matter, 7.4% more total digestible nutrients, and 189% more digestible crude protein than was produced in the grain rotation. Potash has caused an increase of 29% of nutrients on the pasture compared to 43% in case of the grain rotation. N, however, has increased the nutrients in the pasture land 37% and in the rotation system only 6%. The P K N treatment has given 9% increase in nutrients on pasture in excess of the reinforced manure. However, the manure treatment has been 9% more effective than P K N in grain rotation. Even though sol. N has caused an increase of 37% over P K in growth of pasture grasses, its effectiveness would no doubt have been much greater had it been applied annually or even semi-annually. The expts. have demonstrated rather conclusively that fertilizer investments on grazing lands may yield equal or superior returns, in terms of digestible nutrients, to similar investments on rotated crops.

E. F. SNYDER

**Study of iodine in South Carolina.** J. H. MITCHELL. *Clemson Agr. Coll. Science* 69, 650-1(1929).—"The relationship of the mineral content of feeding stuffs grown in South Carolina and of the mineral content of the soils upon which they were grown" is being studied. The iodine content of the soil from 6 different sections of the state, of 36 feedstuffs and vegetables, and of 8 rivers is reported. There is a striking increase from 142-684 to 765-3021 parts per billion in the iodine content of the soil from the surface to 18 in. below the surface.

W. D. LANGLEY

**Lime-deficient areas in King-Country.** C. M. WRIGHT. *New Zealand J. Agr.* 38, 260-6(1929).—Preliminary expts. indicated that so-called "dopiness" in sheep, a disease which is apparently caused by a deficiency of Ca in the vegetation from certain areas in King-Country, N. Z., may be prevented by applying Ca, in the form of *ground limestone* or *gypsum*, to the pastures.

K. D. JACOB

**Cure of iron starvation (bush sickness) in stock.** B. C. ASRON. *New Zealand J. Agr.* 38, 232-7(1929); cf. *C. A.* 22, 3241.—Fe starvation in stock occurs in N. Z. in the light volcanic-loam and pumice-sand districts and is caused by a deficiency of Fe in the vegetation. The disease is prevented by fertilizing the soil with *basic slag*, which contains an appreciable amt. of Fe, or by addn. of sol. Fe salts, such as Fe-NH<sub>4</sub> citrate, to the animals' rations. Recent expts. with finely ground *spathic iron ore* have shown that this material gives good results, without the danger of overdosing, when mixed directly with the rations.

K. D. JACOB

**The composition of some commercial insecticides, fungicides, bactericides, rodenticides and weed killers.** H. J. FISHER AND E. M. BAILEY. *Conn. Agr. Expt. Sta., Bull.* 300, 207-368(1929).—A very full compilation in 33 tables of analytical data compiled from all available sources.

C. R. FELLERS

**Liquid hydrocyanic acid. Its use in citrus fumigation.** A. A. RAMSAY. *Agr. Gaz. N. S. Wales* 40, 55-7(1929).—Cyanide fumigation of citrus trees with liquid HCN has the advantage over the pot system in that the use and transportation of cumbersome equipment are eliminated. The pot system possesses the advantage of simplicity and ease of operation by laborers of ordinary intelligence. More uniform fumigation of the entire tree is obtained by the pot system, while the gas from liquid HCN is most effective at the bottom of the tree and least effective at the top.

K. D. JACOB

**Some observations upon wetting power.** E. L. GREEN. *J. Phys. Chem.* 33, 921-35(1929).—As a part of the study of oil-spray materials an extension of the data of previous investigators has been undertaken. The modifications of surfaces by small quantities of contamination are known and, for this reason, the consideration of the wetting of solid surfaces by liquids such as mixts., solns., dispersions and emulsions must be approached with caution. It must be considered that there must be another fluid already in contact with, and perhaps very strongly absorbed upon, the surface of the solid. That fluid consists of the gases of the atm., and the fact that it is gaseous and not liquid brings about quant. rather than qual. differences in its behavior toward surfaces. It would seem that emphasis upon the necessity of a plane surface as a foundation for angle of contact measurements is superfluous. Nevertheless, several investigators have proceeded to det. the angle of contact of liquids with surfaces, such that even remote accuracy in the orientation of the tangent that is to represent the solid plane surface is out of the question. Such are segmented and otherwise convoluted larvae, more mature insects, leaves with ribs, and stems with nodes and scars. Furthermore, they have not allowed for the effects of hairs and other outgrowths that modify these surfaces. It was intended to relate these measurements to glass so that glass might be used as a reference surface, if it could be shown that parallel variations occurred on tree tissue and glass. This was abandoned for reasons cited. Two cuts of the app. used are pictured.

E. F. SNYDER

The origin of chernozem and of the South Russian steppe (TANFIL'EV) 8.

**Fertilizer.** ANGUS MACLACHLAN (to American By-Product Machinery Co) U. S. 1,718,297, June 25. Material high in casein such as poultry manure is acidified and evapd. to dryness. An app. is described.

**Fertilizer.** A. B. KENSINGTON. *Brit.* 301,105, Aug. 25, 1927. Poultry manure is mixed with absorbent material such as peat moss and dried so as to permit free escape of moisture. An acid or acid salt may be added to neutralize NH<sub>3</sub>. An app. is described.

**Fertilizer.** F. G. LILJENROTH (to Kunstdünger-Patent-Verwertungs-A.-G.) *Brit.* 301,486, Dec. 1, 1927. HNO<sub>3</sub> is caused to react with the CaCO<sub>3</sub> obtained when CaSO<sub>4</sub> is treated with NH<sub>3</sub> and CO<sub>2</sub> (a portion of the (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> formed in this reaction



being left in admixt. with the  $\text{CaCO}_3$ ).  $\text{CaSO}_4$  may be sepd. from the resulting soln. before it is evapd.

**Fertilizer.** STOCKHOLMS SUPERFOSFAT FABRIKS AKTIEBOLAG. Brit. 301,387, Nov. 28, 1927. A mixed fertilizer is prepd. by subjecting a mixt. of a K salt,  $\text{H}_2\text{PO}_4$  and another acid such as  $\text{HNO}_3$  or  $\text{H}_2\text{SO}_4$  in thin layers to the action of gaseous  $\text{NH}_3$  (suitably in a worm-conveyor app., in countercurrent).

**Fertilizers.** I. G. FARBENIND. A.-G. Brit. 300,329, Aug. 24, 1927. Urea is mixed with Al phosphate or Fe phosphate or both, with or without addn. of other fertilizing substances.

**Fertilizer.** I. G. FARBENIND. A.-G. Brit. 300,402, Dec. 3, 1927. The double salt  $\text{NH}_4\text{K}$  sulfate is formed by treating solid  $\text{KHSO}_4$  with gaseous  $\text{NH}_3$  at ordinary temp. A revolving tube furnace may be used and the temp. raised to  $50^\circ$  to complete the reaction. Details for prepg. the  $\text{KHSO}_4$  from  $\text{KCl}$  and  $\text{H}_2\text{SO}_4$  are given.

**Fertilizers.** IMPERIAL CHEMICAL INDUSTRIES, LTD. Fr. 655,360, May 10, 1927. A mixed fertilizer contains superphosphate, a nitrate (Na or Al) and an alkali sulfate.

**Calcium phosphate fertilizers.** J. A. POND. Brit. 300,965, Nov. 21, 1927. A fertilizer comprising a substantial quantity of mono-Ca phosphate, some di-Ca phosphate and a relatively small quantity of unattacked tri-Ca phosphate is obtained by treating ground tri-Ca phosphate with  $\text{H}_2\text{SO}_4$  (suitably of a sp. gr. of about 1.36–1.55) in 10–20% less than the proportion required for complete formation of the mono-Ca phosphate and heating the material to about  $135^\circ$ .

**Preparing fertilizer from organic refuse by fermentation.** L. BOGGIANO-PICO. Brit. 300,607, Nov. 16, 1927. An app. is described.

**Insecticides.** I. G. FARBENIND. A.-G. Fr. 655,852, June 5, 1928. Insecticides or fungicides contain inert substances such as clay, talc, kaolin,  $\text{SiO}_2$  gel,  $\text{Al}_2\text{O}_3$  or charcoal, with org. Hg compds. such as Hg nitrophenol.

**Insecticides and fungicides.** M. LACROIX and H. BREYER. Brit. 300,439, Feb. 13, 1928. Naphthalene, sublimed S and  $\text{BaSO}_4$  are intimately mixed, Cu nitrate and tar oil are stirred in and the mixt. is made into a homogeneous paste with Na silicate; formic acid and K silicate are then added, followed by addn. of fine sawdust which has been boiled in water. The product may be used on plants or in the soil.

**Insecticides formed with ammonium fluosilicate and soluble soaps.** W. H. GROOMBRIDGE and A. J. DICKINSON, LTD. Brit. 301,186, Nov. 10, 1927.

**Insecticides containing derris root or its constituents.** ZAIDAN HOJIN RIKAGAKU KENKYUJO. Brit. 300,606, Nov. 16, 1927.

**Copper oxychloride.** SOC. ELETTRICA ED ELETTROCHIMICA DEL CAFFARO. Fr. 655,157, June 2, 1928. A compd.,  $3\text{CuO} \cdot \text{CuOCl}_2 \cdot 4\text{H}_2\text{O}$ , useful for combating diseases of plants is prepd. by the reaction of  $\text{CuCl}_2$  on alk. earth carbonates in the presence of water and preferably at  $40\text{--}50^\circ$ .

**Stimulating plants or seeds.** JOHANNES HUNDHAUSEN. Ger. 477,401, May 3, 1927. Plants or seeds are stimulated with aq. solns. of glycerophosphates. Thus, seeds may be soaked in a glycerophosphate soln., or the soln. may be introduced into the plant or into its flowers, etc.

**Mordants for seeds.** I. G. FARBENIND. A.-G. Fr. 655,790, Mar. 14, 1928. Colloidal org. As compds. such as  $\text{C}_6\text{H}_5\text{AsO}$  with or without fungicides or bactericides are used as mordants for seeds.

**Preparing cotton seed for planting.** VENUS U. CLOER. U. S. 1,718,332, June 25. A mass of seed in dry condition in an enclosed space is subjected to the action of halogen acid gas under pressure; after removal from the acid atm. the seed is heated to about  $82\text{--}99^\circ$  and agitated to remove the lint. An app. is described. The acid treatment serves to facilitate sepn. of heart seed from lighter seed.

## 16—THE FERMENTATION INDUSTRIES

C. N. FREY

**Theoretical and technical advances in the study of alcoholic fermentation.** FREDERICK CHALLENGER. *Ind. Chemist* 5, 239–42(1929). E. H.

**Analysis of hops.** W. WOLLMER. *Wochschr. Brau.* 46, 121–4(1929).—Full details are given for the detn. of total resins, humulone and soft resins in hops. A. S.

**Analysis of the bitter substances of hops.** W. WINDISCH, P. KOLBACH and M. WINTER. *Wochschr. Brau.* 46, 101–6, 111–17, 124–31(1929).—Humulone decomposes on aging under the action of moisture, heat and oxidation into soft and hard resins.

Special precautions for overcoming the interference of these substances in the detn. of humulone are given. Electrometric titration was of no value in estg. the hop resins.

A. SCHULTZ

**Artificial acidification of mashes and worts.** F. EMSLANDER. *Wochschr. Brau.* **46**, 157-9(1929).—Artificial acidification of mashes and worts may greatly improve the stability of the beer but often produces an "empty" and astringent flavor. The higher the litmus acidity, which comprises the salt-forming proteins, in proportion to the total acidity (with phenolphthalein) the fuller is the flavor of the beer. A. S.

**Determination of moisture in barley and malt.** F. WINDISCH. *Wochschr. Brau.* **46**, 96-8(1929).—Various methods of detg. moisture in org. substances are more or less inaccurate and only give relative values. The dielec. const. method gave the most accurate results. The app. is simple, consisting of a measuring device attached to a condenser and the time for a measurement is only 1 min.

A. SCHULTZ

**Phosphatases in malt.** H. LÜERS AND L. MALSCH. *Wochschr. Brau.* **46**, 143 G, 153-7(1929).—About 90% of the phosphoric acid in barley is in org. combination. This is set free by phosphatases in the sprouting and mashing processes. The opt temps. and  $p_H$  values for the max. activities of these enzymes are: glycerophosphatase, 36°  $p_H$ , 5.2; nucleotidase, 49°, 5.6; phytase, 48°, 5.2-5.3; and saccharophosphatase, 41.5, 6.0. There is an 8-11-fold increase of phosphatases during germination of the barley. During kilning these are weakened and especially phytase and glycerophosphatase. The malting conditions most favorable for the production of these enzymes are slow germination and low temps. on the malting floor.

A. SCHULTZ

**Proteolytic enzymes in green malt.** C. K. MILL AND K. LINDERSTRØM-LANG. *Compt. rend. trav. lab. Carlsberg* **17**, No. 10, 1-14(1929).—Results are explained on the assumption that there are at least 2 proteolytic enzymes in green malt. One is a protease acting on gelatin, edestin and egg-albumin peptone; this protease has an optimum  $p_H$  of 4.3 when acting on edestin at 40°. The other is a peptidase, which breaks up leucylglycine, the optimum  $p_H$  being 7.6-7.9 at 40°. This peptidase is greatly inhibited by phosphates and is easily decompd. when the malt ext. is allowed to stand at ordinary temp. at its natural reaction ( $p_H$  5.9). The exts. were usually prepd by grinding 200-500 g. green malt, autolyzing for 2 hrs. at 30° with  $\frac{3}{4}$  its weight of  $H_2O$  and allowing to stand overnight at 1°. The enzyme soln. was thereupon drawn off and allowed to stand at the same temp., some toluene being added. Under these conditions the activity of the peptidase, which was the most unstable, remained more or less unaltered for 7-8 days.

R. P. WALTON

**Titration by stages.** P. KOHLBACH. *Wochschr. Brau.* **46**, 91-6(1929). In this critical discussion on titrating a wort or beer in stages K. recommends replacing the old range of 7.07 to 9.18  $p_H$  by the range 4.27 to 7.07, which is covered in practical brewing and fermentation.

A. SCHULTZ

**Alterations of the hemicellulose-splitting enzyme during the germination and kilning process.** H. LÜERS AND L. MALSCH. *Wochschr. Brau.* **46**, 163-4(1929).—The enzyme, cytase, plays an important part in dissolving the cell walls during malting. The activity of the cytase in barley diminishes somewhat during steeping but increases rapidly during germination to about 2.5 times that of the original barley. It is mostly destroyed again in kilning so that its value in the finished malt is lower than in the barley.

A. SCHULTZ

**The preparation of diastase.** FERDINAND WINKLER AND FRANZ KÖCK. *Chem.-Ztg.* **53**, 457(1929).—Green malt is crushed in a mortar and treated with chlorinated org. compds. Some warm water and glycerol are added to the crushed malt. The mixt. is percolated, the percolate centrifuged and the upper aq. layer drawn off. This layer is purified by several filtrations and pptd. with alc. The ppt. is dried and constitutes a prepn. analogous to the prepn. found in commerce. It is shown, however, that the filtrate still contains considerable quantities of diastatic substances, which can be obtained by working the liquid in a vacuum. This method involving a preliminary pptn. with alc. is not considered as suitable as a method in which the purified percolate is mixed with acetone. By this latter method a ppt. gradually forms in the course of 24 hr., which is centrifuged off. The remaining liquid is evapd. at a temp. not exceeding 40°. The whitish yellow to yellow substance thus obtained is reported to be more active than the usual com. prepn.

R. P. WALTON

**Lactic acid: its importance in judging the qualities of grapes and its determination by the Möslinger method.** J. SCHINDLER AND V. HULAČ. *Chem. Listy* **23**, 73-7(1929).—A natural formation of lactic acid in grapes is a factor for improving the wines in northern climates especially during unfavorable years. In the southern countries where grape juices are only slightly acid, the formation of lactic acid indicates a decrease

in the quality. The content of lactic acid must be considered together with the non-liquid acids and extd. residues; wines with a high lactic acid content must be judged carefully. The quantity of lactic acid detd. is multiplied by 0.83 and to this is added the sum of non-liquid acids yielding the total acids present. The analytical results of 19 wines show that the Möslinger analyses run several tenths of a g. higher than those of the Kunz method. The Möslinger method is simpler and more rapid; it is recommended for the control of wine quality.

FRANK MARESH

**Activation of yeast by pressure fermentation.** SCHUSTER. *Wochschr. Brau.* 46, 99(1929).—Yeast race R successively fermented under pressure showed a stronger fermentation, had larger cells with fewer granulations and settled less readily in its wort than the normal yeast. This activated yeast is believed to show a greater resistance against infection.

A. SCHULTZ

**Use of closed fermentation vats.** F. WINDISCH. *Wochschr. Brau.* 46, 106–7 (1929).—Fermentation vats should be closed, even though the gas is not collected, because of the protection against infection and of the invigorating action on the yeast.

A. SCHULTZ

**Divinylglycol considered as the agent of the bitter flavor in the "bitterness" disease of wines.** F. VOISENET. *Compt. rend.* 188, 1271–3(1929); cf. *C. A.* 23, 3537.—The bitter product isolated from Bourgogne wine suffering from the "bitterness" disease is  $C_6H_{10}O_2$ , b.  $198^\circ$ , vapor d. 3.72,  $d_{15} 1.0148$ , sol. in  $H_2O$ , EtOH and  $Et_2O$ , oxidizes in the air with formation of acrolein. The properties correspond with those of divinylglycol. Its formation from acrolein by reductases contained in the yeast is considered likely.

G. TOENNIES

The equation of alcoholic fermentation (HARDEN, HENLEY) 11A. Phosphoric esters in alcoholic fermentation. I. The sequence of formation of phosphoric esters and  $CO_2$  in fermentation of dried yeast (BOYLAND) 11A. Advantages of rotary pumps for circulating beer in pasteurizing apparatus (STASSANO, ROLLET) 12. Drying grain, hops, etc (Brit. pat. 300,758) 12. Preparing fertilizer from organic refuse by fermentation (Brit. pat. 300,607) 15.

**Lactic acid and alcohol.** PAUL LINDNER. Fr. 656,432, June 25, 1928. Cane sugar, glucose, or fructose is fermented with the bacterium found in the *Agave americana*, for the production of lactic acid and alc. The cultures may be grown in milk to which one of the above sugars has been added.

**Low-alcohol beverage of the beer type.** HERMAN HEUSER (to United States Process Corp.). U. S. 1,717,685, June 18. A portion of a batch of beer is dealcoholized; another portion is condensed and the condensed portion is subjected to yeast fermentation and is added to the dealcoholized portion in such proportion as to keep the alc. content within the legal limit.

**Low-alcohol beverage from beer.** VALENTINE GILBERT. U. S. 1,717,920, June 18. Excess alc. above that legally permissible is converted into HOAc or lactic acid (suitably by bacterial action) and excess acid is then neutralized with  $NaHCO_3$ .

**Clarifying beer.** BERTRAND SIMON. Fr. 655,288, Feb. 28, 1928. Perforated horizontal plates of Al arranged in stacks are placed in the bottom of the casks to increase the surface of deposition for the yeast.

**Yeast.** LUCIEN LAVEDAN. U. S. 1,718,910, June 25.  $CO_2$  from an external source is introduced during yeast propagation to assist in regulating the process. Various details of procedure are described.

## 17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

**Evaluation of Peru balsam.** A. TSCHIRCH, H. ROSENTHAL AND G. FRIEDLÄNDER. *Pharm. Acta Helv.* 3, 85–8(1928).—The analytical characteristics of Peru balsam are described. The material has  $d_{15} 1.145$ – $1.167$ , and gives a clear mixt. with 1 vol. of 90% alc. but turbidity on addn. of a further 7 vols. of alc.; 3 g. of balsam give a clear mixt. with 1 g. of  $CS_2$ , and yield a brown resin on addn. of 9 g. of  $CS_2$ . The characters of the portions sol. or insol. in ether and light petroleum are described. These and other analytical tests are preferred to detns. of the acid and sapon. values of the crude product.

B. C. A.

**Lemon oil.** J. PRITZKER AND R. JUNGKUNZ. *Pharm. Acta Helv.* 3, 79–83(1928).—

Fresh or suitably preserved lemon oil has  $n_D^{20}$  70–76; values above 77 indicate that the oil is old and altered, unless it is free from terpenes. Old lemon oil changes color and deposits a brown mass; with HCl,  $d_4^{1.19}$ , the acid layer becomes dark brown or black, and the oil layer brownish. A residue on steam distillation of over 4% is abnormal. The normal Eibner-Hue value is 0.6–1.2.

B. C. A.

A new sensitive reaction for the ergot alkaloids, ergotamine, ergotoxine and ergotinine, and its adaptation to the examination and colorimetric determination of ergot preparations. H. W. VAN URK. *Pharm. Weekblad* 66, 473–81(1929).—The violet color reaction between ergot alkaloids and  $p$ -Me<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>CHO in the presence of H<sub>2</sub>SO<sub>4</sub> has certain advantages over the usual AcOH test and is sufficiently delicate to warrant extensive use. As a ring reaction it is capable of detecting 0.01 mg. of alkaloid per cc. With ergot exts. where the color of the soln. would interfere, the alkaloids are extd. by adding NH<sub>4</sub>OH and shaking with Et<sub>2</sub>O. The test may then be performed directly with the Et<sub>2</sub>O ext. or after evapn. of the solvent. For the detn., 1 cc. of the tincture or dild. ext. is made alk. with NH<sub>4</sub>OH and shaken with 5 cc. Et<sub>2</sub>O. Sep. portions of 2.5, 1.0, 0.5, 0.25 and 0.1 cc. of the Et<sub>2</sub>O ext. are evapd., each residue is dissolved in 1 cc. EtOH, 1% soln. of  $p$ -Me<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>CHO in EtOH added, and then H<sub>2</sub>SO<sub>4</sub> allowed to flow to the bottom and form a color ring. After 1–2 hrs. standing, the tube showing the faintest pos. reaction is considered to represent 0.01 mg. of alkaloid, and the concn. of the original soln. calcd. on the basis of aliquots taken.

A. W. DOX

Estimation of chloral. C. BRUGES. *Bull. soc. pharm. Bordeaux* 66, 12–7(1928). Various known procedures are discussed. In all of them an error is introduced by the action of NaOH on the CHCl<sub>3</sub> formed, to produce NaCl. By detn. of this NaCl the quantity of CHCl<sub>3</sub> consumed by the NaOH can be calcd. and thus an accurate detn. of chloral is possible.

A. G. DUMÉZ

Identification of yohimbine by microcrystallography. GEORGES DENIGÈS. *Bull. soc. pharm. Bordeaux* 66, 123–7; *Mikrochem.* 6, 113–5(1928).—Dil. the residue (yohimbine-HCl or the free base), in a drop of ammonia on a glass slide, add a drop of 2% or 3% AgNO<sub>3</sub> soln. Mix and add a few drops of NaOH soln. The mixt. turns brown. After 5 or 6 mins. cover the prepn. with cover-glass. Place under strong magnification of microscope and observe crystalline scattered groups in the form of spirals, isolated or assembled in a mosaic manner, of a yellowish brown color. It is yohimbine (illustrated by figure). To identify the only salt of the alkaloid, yohimbine-HCl (illustrated by figure), dissolve 0.1 or 0.2 mg. of the residue in a drop of water made ammoniacal, evap. by heating until crystals of yohimbine are obtained. Dissolve the product on a slide with a few drops of 10% HCl. Evap. as before and secure rhombic scales of the salt. If a mixt. of sodium ammonium silver nitrate is added to the second residue, crystals of yohimbine will be obtained again. Two longer methods also are described.

A. G. DUMÉZ

Preparation of pure emodin. C. ROULIEF AND R. DUBREUIL. *Bull. soc. pharm. Bordeaux* 66, 145–52(1928).—A proposed method is: Treat a convenient quantity of alder buckthorn with 5 times its weight of 97% alc. Add 1 g. of pure HCl and heat at 75° for half an hr. Cool, strain by expression, and filter the alc. liquor. Distil, avoiding overheating and complete in a vacuum oven. Powder the dry ext. in a mortar and exhaust with benzine. Then place it in a desiccator in a current of dry air. Take up the dried ext. thus obtained in ammonia (5 parts per 100) and ppt. by an excess of HCl in the presence of ether. Exhaust with ether until the latter is colored a yellowish red. Distil the ethereal liquors and complete the concn. in a round-bottomed porcelain container. Harden the brownish residue by freezing, place in the air for 48 hrs. and take up in ammonia (5 parts per 100), discarding the insol. residue. Ppt. the filtrate by using HCl, sep. the mother liquors by centrifugalization, and wash twice with distd. water. Repeat the process of acidification, centrifugalization, etc., and dry the ppt. over H<sub>2</sub>SO<sub>4</sub>.

A. G. DUMÉZ

Pine tar of the Codex. R. MASSY. *Bull. soc. pharm. Bordeaux* 66, 152–4(1928). Vegetable tar is defined as follows: It is a pyrogenous product obtained from trunks and roots of several species of pines and residues coming from their exploitation. Official vegetable tar (pine tar) of the Codex, known also as "Norway tar," has the following characteristics: semifluid; granular; brownish black in mass, and transparent brownish red in thin layer; strong and persistent odor; acid reaction; liquefiable by heat and combustible with smoky flame; insol. in water, sol. in alc., ether, fixed and volatile oils. Other vegetable tars have practically the same properties regardless of the woods from which they are derived. Therefore, M. thinks the Codex should give other tests to distinguish official tar from the others. He states that an excessive quantity of defective material or added adulterants could not be detected readily in official tar be-

cause of lack of tests. He also mentions that a purified vegetable tar is prepd. from the official product, and suggests that the Codex abolish its present method of prepg. official pine tar (vegetable tar).

A. G. DuMez

**Extraction of strychnine and brucine for their determination.** E. DUFRILHO. *Bull. soc. pharm. Bordeaux* 66, 133-9(1928).—A critical explanation is given of the present methods of extg. and detg. strychnine and brucine. Errors in the processes are due to: (1) insufficient exhaustion of the plant, (2) contamination of alkaloids by impurities and (3) detn. of the strychnine and brucine content together in most cases, instead of separately. A proposed method of extn., purification and estn. of the 2 alkaloids is: (a) *Extraction*—Dry 10 g. of a strychnine-bearing drug in No. 30 powder at 60-70°. Det. the moisture. Mix 5 g. of the powd. drug with half its vol. of pumice stone. Moisten with 5 cc. of a mixt. of acetic alc. (99 cc. 70% alc. and 1 cc. glacial acetic acid) and place in the tube of a Soxhlet app. (type described) having a plug of glass wool at the bottom and on the surface of the drug. Place 95 cc. of the acetic alc. in the Pyrex flask and ext. for at least 4 hrs., or until exhaustion is complete. Heat the extd. liquid in the flask on a water bath until a sirupy ext. is obtained. Test for its acidity with litmus; if neg., acidify with a few drops of acetic acid. (b) *Purification*—shake the sirupy ext. in a stoppered flask with 15-20 cc. of ether until emulsification takes place. Let stand, then reject the supernatant ether from the sirupy ext. Repeat until a drop of ether placed on parchment paper leaves no stain. Complete evapn. of the ether by plunging the flask into boiling water away from the flame. (c) *Estimation*—Chill the sirupy ext. in a flask, pour into it 50 g. of ether, 25 g. of chloroform and ammonia until alk. Stopper the flask and agitate for 5 min. Let stand for 1 hr., remove 60 g. of the ether-chloroform mixt. (corresponding to 4 g. of the powd. drug) into a tared, wide, flattened container. Evap. on a water bath. Take up the residue in 10 cc. of ether, evap. and dry in an oven at 100° to const. weight. The product represents the total quantity of pure alkaloids. Weigh, then proceed with the volumetric detn. of strychnine and brucine separately as mentioned before. Advantages of the proposed method are: simplicity, time-saving, perfect control, complete exhaustion, and pure state of alkaloids obtained.

A. G. DuMez

**Apropos the next edition of the Codex.** A. MANSEAU. *Bull. soc. pharm. Bordeaux* 66, 23-4(1928).—M. mentions that many medicaments which are official in the Codex are described too briefly, with the result that pharmacists and students are required to seek information regarding them in other books of chemistry and pharmacy. Examples are: Ca glycerophosphate, ichthyol, barbituric acid derivs., etc. An official commission has been appointed and given the privilege of contributing to the new addition of the Codex any necessary addns. or modifications in the interest of pharmacy. The French pharmaceutical societies are not organized thoroughly to collaborate with the commission. The harmony existing among German pharmaceutical societies which aid in editing the German Codex is cited.

A. G. DuMez

**Alteration of dermatol.** RENÉ GUYOT. *Bull. soc. pharm. Bordeaux* 66, 18-23 (1928).—A summary of the physical properties of dermatol is given, and reasons for its alteration under certain conditions are discussed. The results of Dupuy on the alteration of dermatol are mentioned. The alteration was thought to be due to: (1) impurities in the process of manuf. (methods of Causse and Fischer are given); (2) incomplete washings; and (3) addn. of adulterants. Each of these supposed reasons is discussed. The real cause for alteration is the oxidation of the phenolic functions of the gallate with the production of a violet-colored pigment, known in the industry as galloflavin. This product was prepd. by the action of ultra-violet radiations on dermatol in a dark chamber. Other attempts to reproduce the violet colorations were made with successful results. Conclusion: Dermatol is not absolutely unalterable in the air. A. G. D.

**Alterations by light, heat and agitation of the heavy petroleum oils refined for therapeutic use.** P. BRUÈRE. *Bull. soc. pharm. Bordeaux* 1928, 142-4; *J. pharm. chim.* [8], 9, 26-7(1929).—Actually the products known under the names of liquid paraffin, paraffin oil, liquid vaseline and vaseline oil are obtained by sepn., refining and mixing heavy petroleum oil, and all the names cited above should be considered as synonyms. There are found on the market only those mixts. imposed by the needs of commerce and they are defined by their d. and viscosity. The d. of an official product must be between 0.875 and 0.885, and the limits for the absolute viscosity are from 0.3 to 0.6 at 35° (Baumé viscometer with Et<sub>2</sub>O). These oils can undergo many changes: (1) change by light (photolysis); whence the necessity of keeping liquid

in the same way as photolysis and thermolysis. These changes can easily be detected by Hardy's test: Deposit, with a drawn out stirring-rod having the tip terminating in a bulb, one drop of the product to be tested on a large surface of very clean distd. water which is at rest; two different results may be observed: (a) The droplet takes a lenticular shape and remains in one place; the product is well refined and well preserved. (b) The droplet spreads more or less rapidly; the oil is altered either by light or bad refining, or has deteriorated as a result of agitation. A. G. DuMEZ.

**Composition of spirit of ether.** A. SCHAMELHOUT. *J. pharm. Belg.* 10, 129-31 (1928).—Whether "Aether cum Spiritu" of the Netherland Pharmacopeia could be dispensed for "Spiritus Aethereus" prescribed by a foreign physician is discussed as to names and synonyms and compn. as found in twelve pharmacopeias. The name "Spiritus Aethereus" is given by three pharmacopeias and is of the same compn., 25 parts of ether to 75 parts of alcohol; while "Aether cum Spiritu" contains equal parts by wt. of ether and alc.; others, however, of the same name are of different compn., and others of the same compn. have different names. In all, 6 formulas are stated, ranging from 20 to 50 parts of ether in 100 parts of the spirit of ether. A. G. D.

**Yage.** L. MICHELIS. *J. pharm. Belg.* 10, 247-8 (1928).—Perrot and Hamet, after a histological study, state that yage does not belong to the Apocynaceae or Asclepiadaceae, but that it approaches *Banisteria hassleriana* and *Schizoptera* in the structure of its stems and leaves. M. reviews other literature, giving bibliographic references. Four plates are shown of the drug. Some of the specimens obtained from Colombia were found to contain the alkaloid yageine isolated by Degand. A. G. DuMEZ.

**Silver salt of mercury oxycyanide.** E. HAIRS. *J. pharm. Belg.* 10, 267-8 (1928).—The detection of  $\text{HgCl}_2$  in the oxycyanide by the test as given by the German and Belgian pharmacopeias is misleading. The test adds 1 cc. of  $\text{HNO}_3$  and 2 drops of a 5%  $\text{AgNO}_3$  soln. to a 5% soln. of the mercuric oxycyanide, when no precipitate should form. In the case of the normal cyanide, contg. a trace of the chloride, a ppt. will form; whereas with the oxycyanide, as much as 10% chloride will not form a ppt. Furthermore, a soln. of the oxycyanide will dissolve the ppt. formed by adding a soln. of  $\text{AgNO}_3$  to one of  $\text{HgCl}_2$ . By increasing the amount of  $\text{AgNO}_3$  in the test to 25 drops, a ppt. of fine needles and prismatic crystals was obtained. An analysis of the compd. corresponded to the formula of Woehler, namely  $\text{Hg}(\text{CN})_2 \cdot \text{AgNO}_3 \cdot 2\text{H}_2\text{O}$ . The same compd. was obtained by using the normal cyanide. H. mentions the possibility of using this compd. therapeutically. A. G. DuMEZ.

**Phytochemical study of Polygonum aviculare.** FELIX DAELS. *J. pharm. Belg.* 10, 353-5 (1928).—An attempt was made to det. some of the constituents responsible for the use of *Polygonum aviculare* as a remedy for diabetes. An alc. ext. treated with  $\text{CHCl}_3$  and 10%  $\text{H}_2\text{SO}_4$  gave: In the aq. soln., reducing sugars, identified as dextrose, and some tannin; in the  $\text{CHCl}_3$  soln., the Bornträger reaction, traces of hydroxymethyl-anthraquinone; and in the residue, tannin and some anthraquinone. An ethereal ext. showed 2.5% of fat in the dry drug. An aq. ext. after being first exhausted with MeOH, contained mucilages, tannin, chlorides and silicates; it was also capable of reducing Fehling soln. The aq. soln., clarified and inverted, was capable of considerable reduction. A 20% infusion, comparable to an administerable product, contained a trace of volatile oil and a volatile alkaloid somewhat similar to nicotine or conine. An aq. ext., first treated with MeOH and followed with alc. KOH, although black and hygroscopic, indicated nothing in addition to the above. Traces of tannin and anthraquinone were found in every ext. The results obtained indicate that the drug contains a glucotannin, anthraquinones, essential oil, invertible sugars, and probably a trace of a volatile alkaloid. Tannins are responsible for the relief of the diabetic thirst, and the anthraquinones for the laxative properties. A. G. D.

**Analysis of saffron.** N. WATTIEZ. *J. pharm. Belg.* 10, 371-5 (1928).—The work was originally started to det. biochemically, the amount of added sugar present as adulterant. The adulteration is accomplished by dipping the drug in a suitable sugar solution and then allowing it to dry in air. The resulting drug is slightly drier and more brittle, but the original color and odor persist. When the drug is powdered this adulteration is beyond detection. The resulting reduced ash is raised by the addition of minerals, as sodium sulfate. Some previously used adulterants are also included. Several methods are given for the detn. of added sucrose in saffron, which is simply a detn. of the reducing matter before and after acid inversion, in a 1-2% aq. ext. of the drug. The acid used in the inversion affects other hydrolyzable matter as glucosides present in the drug. Results vary, depending on the length of time allowed for inversion. The test is limited practically, by the use of variable strengths of acid for inversion. The biochem. method is based upon the fact that sucrose is acted upon by invertase,

and the glucosides by emulsin. The drug is extd. 3 times with hot 70% alc., the alcohol removed by distn., the residue dissolved in water and filtered and the soln. (2%) treated with invertase and then emulsin. The alc. stabilized ext. thus prepd. shows negligible retention of sugar by clarifying with ammoniacal acetate, and gives amounts of added sucrose by means of invertase fairly accurately. Comparison of the stabilized extract with an aq. ext. which had stood for 5 days showed fermenting action in the water ext., identical action of invertase and the same total reducing sugars after action of emulsin in both exts. The biochem. method indicates the presence in saffron of 1-1.5% of an unknown sugar, hydrolyzable by invertase, the resulting sugar being l-rotatory; of a glucoside, hydrolyzable by emulsin; and of an enzyme capable of hydrolyzing the glucoside present in the drug. Chemical analysis of the drug showed moisture 17.2, ash 4.72, N 2.30, reducing matter before acid inversion 24.25 and after inversion 25.90%.

A. G. DuMEZ

**Solubility of spirit of turpentine in alcohol.** G. RONCHESNE. *J. pharm. Belg.* 10, 391-2(1928).—The Belgian Pharm. requires that the spirit should dissolve in 12 parts of alc., in contrast to the French Codex, which requires it to dissolve in 7 parts of 90% alc. The turpentine and alc. were measured with calibrated burets and the mixing was carried out in a tall, glass-stoppered, graduated cylinder. To 12 cc. of 94% alc., sufficient spirit of turpentine is added until the mixt. has a slight turbidity, and the addn. of another 0.5 cc. of alc. produces a clear soln. This soln., after some min. becomes cloudy, but the addn. of another 0.5 cc. of alc. makes it clear; this occurs twice more; hence the addn. of another cc. of alc. A lowering in temp. also causes a turbidity, which is corrected by a final 0.5 cc. of alc. Thus, one part of turpentine dissolves in 2.75 parts of 94% alc. Adding the turpentine to the alc. produces similar results. Spirit of turpentine dissolves in 3 parts of 94% alc.

A. G. DuMEZ

**Composition of fruits of *Swartzia madagascarensis*.** P. DEGAND. *J. pharm. Belg.* 10, 427-9(1928).—The fruits are pods, 7-15 cm. long, containing two kinds of seeds: one, blackish, 7 mm. long; the other, which is olive-green, being smoother and larger. The seeds were extd. with alc. acidulated with tartaric acid, the alc. was removed, the ext. treated with water, the aq. soln. treated with acid and alkali and then extd. with ethereal solvents according to the method of Dragendorff. The acid and alk. media gave similar results: petroleum extraction, negative; benzene or chloroform, gave a slight resinous residue sol. in dil. HCl, but negative to Bouchardat or Mayer's reagents, and a slight coloration to Froehde's reagent. The pods contained 6.72% moisture and (on the dry pods) ash 2.79, crude fiber 18.3, albuminous matter 6.23, and ethereal ext. 1.02%; phosphates, Ca, silica, iron and alkali metals were present in the ash. No alkaloids were found in the pods. The pulverized drug moistened with NaOH turned a dark red, indicating anthraquinones; the same was shown with all the exts. obtained in the other detns.; acid, however, restored its original olive-green color.

A. G. DuMEZ

**Determination of colloidal bismuth.** F. DE MYTTENARRE. *J. pharm. Belg.* 10, 443-5(1928).—The analysis of colloidal bismuth preps. used in syphilitic and dermatologic work shows the presence of variable amounts of bismuth ranging from zero to 0.017% in manufactured ampoules. On account of the inconsistency of the prepn. or the instability of the colloid, as is sometimes shown by a black deposit on the walls of the container, or a flocculent bismuth precipitate, controlled products should be used in anti-venereal prophylaxis, or all colloidal preps. which contain these deposits should be rejected. Bi was detd. by the method of Malengreau and Delrue (C. A. 19, 529) and that of Bouillenne and Dumont, which consists of treating the product with HNO<sub>3</sub> and H<sub>2</sub>SO<sub>4</sub>, evapg. to dryness, incinerating, dissolving the ash in a little HNO<sub>3</sub> and making up to vol. Graduated quantities of this soln. are added to 10 cc. of water, and 3 or 4 drops of 10% KI soln. and then 2 drops of a 1% NaHSO<sub>3</sub> soln. are added. The yellow color appearing in 5 min. is compared with the color of a similar series of standards. For Belgian preps., the standard used contained 1:1000 of BiONO<sub>3</sub>, which had been previously dissolved in a little HNO<sub>3</sub>. The soly. of the iodide formed is equiv. to 1.2 mg. of bismuth per 100 cc. of soln.

A. G. DuMEZ

**Sixth supplement of the French Pharmacopeia.** A. SCHAMELHOUT. *J. pharm. Belg.* 10, 513-5, 529-33, 545-7(1928).—Gauzes are recognized as absorbent, dressing, and "tangepts." Tests are given for absorbent power, loss of wt. at 100°, reaction to litmus, water-sol. matter, and ash. Gauze bandages are made like the compresses but are heavier and are covered with a starch base. "Tangepts" differ in that the cotton strands are of different types and are better suited for giving strength. *Arsphenamine* is official under its chem. name; the supplement mentions six other synonyms and trade names. The tests and properties given are similar to those of the U. S. P.

Three soly. tests for differentiating it from neoarsphenamine are included. In one, however, an error is shown in the calcn. of the amount of NaOH necessary for neutralization of the salt. Arsenic is detd. in the same manner as in the U. S. P., except that the supplement does not provide for the addn. of oxalic acid to neutralize the excess of permanganate present after oxidation. S is detd. after destruction of the org. matter by oxidation with  $\text{HNO}_3$  and Br and weighing as  $\text{BaSO}_4$ . The effect of the drug injected into the rabbit and mouse detcs. its toxicity. Rabbits are kept under observation for 7 days after injection, when they should be alive, show no great loss in wt., or develop diarrhea within one hr. after being injected. The dose is 6 cc. of a 2% soln. per kg. body wt. of the rabbit, weighing 1000–1500 g. Similar details are given for the mouse; 8 out of 10 should remain alive after a three-day period. The dose is 0.2 cc. of a 1:300 soln. per g. body wt. of the mouse. The manner of preservation and therapeutic dosage of the drug are practically the same as given in the U. S. P. *Neoarsphenamine* is recognized as sodium diaminodihydroxyarsenobenzenesulfoxylate, which fails to indicate that the drug is a methylene deriv. The formula, however, is not given; statements lead to the opinion that it is not a pure chemical but a mixt. depending upon the method of manuf. Tests are given for proof of As and of the methylene deriv. as formaldehyde. The assays for As and S are the same as for arsphenamine, limiting As to not less than 19%, and S not over 12%. This high allowance of S will permit adulteration of the product, since a disubstituted salt contains less than 12% of S. The dose for the rabbit is 250 mg. per kg. body wt. After 7 days 3 of 4 rabbits should be alive. With the mouse, inject two series of ten each, giving one set 0.5 cc. of a 0.75% soln., and the other set, a like quantity of a 0.85% soln. After 4 days, 7 mice of the first set and 6 of the second should be alive. Other precautions to be observed as to loss in wt., occurrence of diarrhea and feeding of animals are the same as those given for arsphenamine.

Study of alkaloids of *Picalima klaineana*. L. MICHIELS. *J. pharm. Belg.* 10, 561(1928).—A review of the literature.

*Meriandra bengalensis* and its essential oil. S. DEZANI. *Boll. inform. econ. (Rome)* 15, No. 1–2, 72(1927); *Intern. Rev. Science & Practice of Agr.* [N. S.] 18, 477T. *Meriandra bengalensis* Benth, is a shrub of the Labiate family, sub-family Stachyoidae Meriandreae, a native of Abyssinia, which also grows wild over an extensive area in Eritrea, between Adi Caje, Az Taclesan and Adi Ugri. The leaves contain enough ordinary camphor to warrant its industrial exploitation. They also contain eight-celled glands rich in essential oil and these glands are found also, though in smaller numbers, on the twigs and the calyx of the flowers. Submitted to aqueous steam distillation they yield first a yellowish oil and afterwards crystals of ordinary camphor. The oil on cooling forms a butyric mass, which on the separation of stearopten and after purification by repeated crystallizations is found to consist of ordinary camphor.

H. L. D.

Experimental culture of peppermint in Poland. Study of the oil. W. J. STRAŻEWICZ. *Brochure* 24 pp., Warsaw, 1928; *Quart. J. Pharmacy* 1, 641–2.—Peppermint, *Mentha piperita* (L.) Huds., var. *officinalis* Sole, forma *rubescens* Camus, has been cultivated and collected in 1926 and 1927 at the medicinal-plant garden of the Uniwersité Stefan Batory, at Vilno (Wilna). Eleven of the samples of distd. oil showed the following characters:  $-d_{15} = 0.9033$  to  $0.9171$ ;  $\alpha_D^{25} = -23.04$  to  $-31.66$ , esterified menthol 6.25 to 14.0, free menthol 37.77 to 59.98, total menthol 48.17 to 68.18%. Judged by their compn., these oils are of medium quality. A batch of inflorescences of black peppermint gave a superior yield of oil of higher sp. gr. 0.9238, and dextrorotatory,  $\alpha_D^{25} = +13.9$ , rich in esterified menthol, less rich in total and in free menthol. Increase of insolation and temp. during the vegetable period diminishes the proportion of esters in the oil. Steam distillation yields in 20 to 25 min. 0.75 of the oil and the whole in 1 hour. As distn. proceeds, the d., rotation and proportion of menthol esters increase in succeeding fractions of the oil, while the proportion of free menthol diminishes. The yield and compn. of the oil vary with the rapidity and temp. of the distn. The infection of peppermint by *Puccinia menthae* Gers. diminishes the harvest, but has no effect upon the yield and quality of the oil. The use of superphosphates as a fertilizer is efficacious against the disease and increases the harvest. The drug, gathered before flowering, contains a larger proportion of leaves than of stems; if harvested when in full flower, the stem and leaf are present in about equal amts., the inflorescence forming about 0.1 of the whole. When the fresh plant is dried, it loses the greater part of its moisture in the first 15 or 20 hours. Temporary storage of peppermint in well-filled sacks, in a shaded and well-aired depot, does not alter either the content or the quality of the oil.

H. L. D.



**Diuretic mercury compounds of the cyclic series.** S. SCHMIDL. *Bull. gen. therap.* 178, 451(1927); *Quart. J. Pharmacy* 1, 475-6.—Hg salts of the aromatic series, in which the metal is attached to an allyl group, provoke diuresis, after the parenteral injection of their aq. solns., the intensity of which bears no relation to the amt. of Hg present in the mol. Their therapeutic activity is, therefore, distinct from their toxicity. The complex mercuric hydroxyl compd. with salicylallylaminoacetic acid, rendered sol. in water with  $\text{NH}_4\text{Cl}$ , appears to be the most valuable of these. Its action is intense and rapid, and its toxicity is low. It occasions profuse diuresis in the normal subject as well as in cases of disease. Its use is indicated in all cases where a prompt and powerful diuretic effect is desirable. The same contraindications apply to its use as in the case of antisiphilitic mercurial treatment. It must not be injected when a rise of temp. is evident. It may be used to emphasize the action of theobromine, but it does not appear to augment the action of digitalin or of ouabain. The optimal dose is in the region of 1.2 cc. of a 10% soln., which should not be repeated at a less interval than 4 days. The injection should be made intramuscularly. These are as rapid in action as those given intravenously, and more lasting. This route, too, is easier in edematous cases. The diuresis provoked is purely chloro-aq. The amt. of urea is diminished, but ultimately returns to its original figure. H. L. D.

**Determination of alkaloids in Sabadilla seeds.** JÖNSON. *Farm. Revy.* 1928, 184; *Quart. J. Pharmacy* 1, 608.—The following modification of the method of the Swiss pharmacopeia is recommended. Ten g. of the seed, in No. 30 powder, is shaken thoroughly for 10 minutes with a mixt. of 100 g. of ether and 10 g. of  $\text{NH}_3$  soln. As soon as the mixt. has become clear, the ethereal soln. is transferred to a sepg. funnel and shaken twice with 1 cc. of  $N\text{NH}_3$  soln. Fifty g. of the ethereal soln. is weighed out, the ether distd. off, and the residue evapd. with a further 5 cc. of ether. The residue is dissolved in 5 cc. of  $N/10\text{HCl}$ , 50 cc. of  $\text{H}_2\text{O}$  is added, followed by a sufficient amt. of ether and 5 drops of iodoeosin soln., and the excess of acid is titrated back with  $N/10$  alkali. If after shaking out the alkaloid the mixt. should show no sign of becoming clear, it is recommended that the liquid be poured off from the powder and shaken with 5 cc. of water. The dark-colored lower layer is rejected and the ethereal soln. washed with 2 portions of 1 or 2 cc. of  $N\text{NH}_3$ . H. L. D.

**Spanish essential oils.** ERNEST S. GUENTHER. *Am. Perfumer* 24, 160-2(1929).—A survey has been made of the Spanish essential-oil industry, notably in the production and character of spike oil. The chem. and phys. properties of some 8 different provincial samples are listed, in connection with the methods of distn. followed, the yields, cost price and adulteration of the oil. W. O. E.

**Beauty creams.** FRED WINTER. *Am. Perfumer* 24, 165-6, 232, 234(1929).—An attempt is made to enumerate certain details and useful precautions designed to guard the manufr. against defects in his products. In this connection, the theory of the manuf. of beauty creams and raw materials involved are discussed, such as the neutral glycerides, beeswax, lanolin, cacao butter, stearin, petrolatum, spermaceti, kerosene, paraffin, glycerol and water. W. O. E.

**Copper compound of diethylbarbituric acid.** N. V. ROMANOVA. *Arch. Pharm.* 267, 370-2(1929).—Veronal soln. treated with  $\text{Cu}(\text{OAc})_2$  soln. gives a blue ppt.,  $\text{OC.CEt}_2\text{CO.NH.CO.NCuOAc}$ .  $\text{CuSO}_4$  soln. also forms a blue ppt. W. O. E.

**Bolivian drugs.** O. KELLER AND FRANZ GOTTAUF. *Arch. Pharm.* 267, 373-90 (1929).—Among the drugs used locally in Bolivia are I, Chuchuhuasca; II, Yuquilla; III, Anocaperi; IV, Ayahuasca; V, Chacrana; VI, Mamiri; VII, Palo Balsamo Peru; and VIII, Barbaco. The essential ingredients of I are a fatty oil, phytosterol, resin tannin and caoutchouc; II, an alkaloid (1.5% from 100 g. powd. drug), yellow and amorphous, sol. in  $\text{H}_2\text{O}$ ,  $\text{EtOH}$ ,  $\text{MeOH}$ ,  $\text{AcMe}$ , insol. in  $\text{Et}_2\text{O}$ ,  $\text{CHCl}_3$  and  $\text{EtOAc}$ , yellow-brown with concd.  $\text{H}_2\text{SO}_4$ , red-violet with  $\text{Br-H}_2\text{O}$ ; III, fatty oil, resins, piperine or a nearly related alkaloid; IV, tannin, fat and alkaloid,  $\text{C}_{15}\text{H}_{13}\text{N}_2\text{O}$  (nitrate,  $\text{C}_{15}\text{H}_{13}\text{N}_2\text{O} \cdot \text{HNO}_3$ ) nearly related to banisterine or harmine; V, fat, phytosterol, resins, free pyrocatechol, saponin (3.4%) ( $\text{C}_{41}\text{H}_{70}\text{O}_{20}$ ), glucose, rhamnose, pentose and tannin. The condition of the other three drugs did not permit of examn. W. O. E.

**Bolivian drugs.** TH. HERZOG. *Arch. Pharm.* 267, 390-400(1929).—A botanical-pharmacognostic study of ayahuasca, chacrana and anocaperi. W. O. E.

**Macedonian opium.** A. VRGOČ. *Arch. Pharm.* 267, 352-70(1929).—A comprehensive study of the cultivation, production and diseases of opium in connection with the economic factors incident thereto. The article is illustrated. W. O. E.

**Determination of nitrate nitrogen in tobacco.** HUBERT B. VICKERY AND GEORGE W. PUCHER. *Ind. Eng. Chem., Anal. Ed.* 1, 121-3(1929).—A modification of the Jones

method for detg. nitrate N is described which is especially adapted for the investigation of tobacco or its exts. The method consists in the preliminary quant. removal of nicotine by steam distn. of a suspension of the tobacco in an alk. soln. Nicotine may be detd. in this distillate and nitrate in the residue by reduction with acid and reduced Fe. It is necessary to conduct a blank detn. omitting the reducing agent, but the relative magnitude of this blank is small and not highly variable. Data are given showing the wide variability of the proportion of nitrate N in tobacco and its dependence on the type of nitrogenous fertilizer employed in growing the plant. W. O. E.

**Chemical characterization of drugs. VII. Microsublimation in the D. A. B. 6.** L. ROSENTHALER. *Apoth. Ztg.* 44, 744-6(1929).—While the present edition of the Ger. Pharm. provides for microsublimation as a new procedure, L. concludes from a series of expts. with various crude drugs that its adoption by the Pharm. is unwise. W. O. E.

**Indian Ephedra species. Their extraction and assay.** S. KRISHNA AND T. P. GHOSE. *J. Soc. Chem. Ind.* 48, 67-70T(1929).—Five different species of *Ephedra* are known to occur in India, *E. gerardiana*, *E. nebrodensis*, *E. intermedia*, *E. pachyclada* and *E. foliata*, the last of which contains no ephedrine, while *E. intermedia* contains 0.1 to 0.3, and *E. gerardiana* 0.4 to 1.25%. That the altitude has no connection with the alkaloid content is clearly apparent from data now available. The present study shows that the greater the annual rainfall the smaller is the alkaloid content. A sample of *E. gerardiana* grown at an altitude of 12,000 ft., with annual rainfall about 100 in., contained about 0.10% ephedrine, while another sample from an altitude of 10,000 ft. and av. rainfall of about 3 in. had 1.23% alk. Tables are presented showing these marked variations, also the distributions and diagnostic characters of the 3 main species of Indian *Ephedra*. Exptl. studies show the methods of extn. and assay followed, likewise a procedure for large-scale operation. The influence of different solvents on natural and synthetic ephedrine (ephedrine) has been studied. W. O. E.

**Vanadic acid as reagent in pharmacy.** FRITZ WISCHO. *Pharm. Monatsh.* 10, 88-9(1929).—The use of  $V_2O_5$  as reagent, notably for aloin and certain alkaloids, is discussed. Expts. also are described looking to the substitution of *titanic acid* for vanadic. W. O. E.

**Detection of saponins in drugs and foods.** L. KOFLER. *Pharm. Monatsh.* 10, 97(1929).—A discussion of the Fischer and Nevelsky capillary (blood gelatin) test, which permits detection of saponin in drug sections. W. O. E.

**Mercurial salves and cosmetic creams.** P. SCHÜTZ. *Pharm. Ztg.* 74, 784-5(1929).—While mercurial salves and creams for cosmetic purposes are prohibited under the German law, certain preps. appear from time to time which contain salts of Hg, Bi and Zn. Several brands are cited in connection with their formulas. W. O. E.

**Estimation of the optical activity in the D. A. B. 6.** E. SCHROFF. *Pharm. Ztg.* 74, 785-6(1929).—The optical values of some 13 solid substances and 20 essential oils are specified in the Ger. Pharm. In the present paper the  $[\alpha]_D^{20}$  has been detd. for about 50 different compds. and substances, either alone or in definite concns. of appropriate solvents. W. O. E.

**Salve bases for ophthalmological purposes.** C. STICH. *Pharm. Ztg.* 74, 800-1(1929).—Not all brands of com. petrolatum are suited to ophthalmological application, and even the best is alone inadequate. A 10% addn. of lanolin and  $H_2O$  is suggested. Photographic reproductions of the cornea treated with noviform salve are given. W. O. E.

**Chloramine-T.** R. A. FELDHOFF. *Pharm. Ztg.* 74, 756-7(1929).—A review of the properties of and method of manufg. the D. A. B. 6 prep. known as "Chloramin-p-Toluolchloramidnatrium." W. O. E.

**Keeping qualities of certain pharmaceutical preparations.** H. ESCHENBRENNER. *Pharm. Ztg.* 74, 742-4(1929).—Emphasis is placed on the necessity of rendering certain pharmaceutical preps., notably pills, more stable through addn. of appropriate antiseptics. W. O. E.

**The German Pharmacopeia. VI.** ANON. *Am. J. Pharm.* 101, 425-41(1929).—A translation of the General Rules of the German Pharm. VI, 1928. W. G. G.

**Observations on the potency of Indian digitalis.** R. N. CHOPRA AND PREMANKUR DE. *Indian Med. Gaz.* 64, 312-14(1929).—The potency of Indian-grown leaf compares favorably with that imported. Proper storage is an important factor. F. G. G.

**Acid number of ergot.** I. PÁL LIPTÁK. *Magyar Gyógyszerésztud. Társaság közlönete (ber. ungar. pharm. Ges.)* 2, 211-6(1926); *Chem. Zentr.* 1928, I, 1562-3; cf. C. A. 22, 137.—The acid no. increased with the age of the sample. In 5 tests there was a

decrease in strength with increasing acid content. II. *Ibid* 3, 426–30(1927); *Chem. Zentr.* 1928, I, 1563.—Numerous tests were made on ergot for acid no., strength and alkaloid content. If the acid no. was above 2, the strength decreased and the drug did not correspond to pharmaceutical requirements. FRANCIS P. GRIFFITHS

Jasmine aldehyde and other interesting compounds of the perfume industry. OTTO GERHARDT. *Metallbörse* 18, 2752, 2866(1928).—A review. F. C. H.

Standardization of thyroid preparations. J. R. MORCH. *J. Physiol.* 67, 221–41 (1929).—See *C. A.* 23, 1923. J. F. LYMAN

Inorganic constituents of diuretic drugs. K. KONO. *J. Pharm. Soc. Japan* 48, 1098–102(1928).—K. made quant. analyses of the aq. ext. of *Achyranthes bidentata*, Blume, root (I), *Akebia quinata*, D. C., stems (II), *Catalpa ovata*, G. Don., seeds (III) and pods (IV), and *Ephedra sinica* or *E. equisetina*, stems (V) as follows (results given in above order): drug in aq. ext. 59.16, 10.22, 11.81, 9.12, and 21.23%; ash in drug, 7.95, 8.23, 16.26, 13.96, and 15.65%; ash insol. in dil. acids, 0.197, 1.279, 0.248, 0.006 and 0.211%; Fe, 0.453, 0.011, 0.011, 0.005, 0.124%; Al, —, 0.015, —, —, —; Mn, —, trace, —, —, —; Ca, 0.048, 0.057, 0.072, 0.029, 0.033%; Mg, 0.079, 0.049, 0.097, 0.019, 0.178%; K, 1.115, 0.254, 0.444, 0.344, 0.985%; Na, 0.476, 0.140, 0.037, 0.045, 0.081%;  $P_2O_5$ , 0.543, 0.109, 0.566, 0.031, 0.307%. F. I. NAKAMURA

Stabilization of medicinal plants and pharmaceutical preparations by the action of some hydrocarbons. IONESCO-MATIU AND H. VARCOVICI. Univ. de Jassy. *Chimie & industrie Special No.*, 498–503(Feb., 1929).—The stabilizing effects of  $CH_4$ ,  $C_2H_2$ ,  $EtCl$  and  $CCl_4$  on hyoscyamus and belladonna leaves, exts. and tinctures below 50° were investigated. Tinctures and exts. of both hyoscyamus and belladonna, whether prepd. from fresh or dried leaves, all showed appreciable decrease in alkaloid content after a period of 1 yr., the loss in every case being greater with untreated than with treated materials. The most pronounced effect was produced by  $C_2H_2$ . As the loss in alkaloids can be attributed to their hydrolysis and decompn., the stabilizing treatment is considered to retard the decomp. or hydrolyzing reactions. A. P.-C.

Examination of barbituric medicinals. E. V. CHRISTENSEN. *Arch. Pharm. Chem.* 33, 216–28(1929).—*Liq. barbamin* DAK was carefully made up for expts. in control tests of the somnifen type of drugs. There are 4 of these in Denmark: The DAK prepn. (I), somnifen (LaRoach?) (II), Soporol (III) and Guttanal (IV). All are made up of mixts. of barbituric acid derivs.,  $Et_2NH$ , flavoring matter and alc.-glycerol. In I there are the  $Et_2$ ,  $Pr_2$  and  $(C_3H_7)_2$  derivs., 9.9, 4.6, 5.2%, resp., and 4.5% of  $Et_2NH$ . To det. the derivs. weigh 2 cc. sample and mix it with 2 cc. 4 N  $H_2SO_4$ . Shake this with several 10-cc. portions of  $CHCl_3$ . Filter the  $CHCl_3$  layers through cotton and distil off the  $CHCl_3$ . Weigh the residue as barbituric derivs. The av. barbituric recovery for I was 99.7%. The residue was repeatedly taken up in alc. and evapd. to remove volatile esters but there was no change in wt. In  $Et_2O$  extns. there is a change by this treatment. The aq. layer plus cotton filter washings was made strongly alk. and distd. for  $Et_2NH$  detn. just as in detn. of  $NH_3$ . Attempts to det. the individual derivs. were not altogether satisfactory. Diallyl- and allylisopropylbarbituric acids in isolated prepn. gave true values on addition of Br or I and titrating excess but for II and III the values seemed high, probably because of some halogen substitution. Fractional crystn. gave 39%  $Pr_2$  deriv. (m. 147.5°) for IV. Allylisopropylbarbituric acid fractions were more difficult, for II m. 141.5°, and for III m. 143°. The  $Et_2$  derivs. could not be fractionated in this way to a purity giving reasonable melting points. A. R. R.

Making and evaluating decoctions. GUSTAF SÖDERBERG AND WALDEMAR HÖK. *Svensk Farm. Tids.* 33, 49–55, 72–8, 101–6, 139–45, 153–6(1929).—Decoctions of *cortex cinchonae*, *cortex condurango* and *radix senegal* were made according to procedures in Succ. Pharm. editions VIII, IX and X. They gave a progressively better yield except that the IX edition method was not as efficient as VIII for senegal. Tin vessels were somewhat better than porcelain. The ext. dry wt. is a fair measure of drug value. The  $CHCl_3$  no. is good for judging condurango. The drug can also be assayed by a minimetric method in which a series of 0.1 to 1.0 cc. decoction is boiled in satd. NaCl solu. and dild. with water. The disappearance of opalescence is noted. A. R. ROSE

A proposed physiological standard for pituitarium U. S. P. Wm. T. McCLOSKEY AND J. C. MUNCH. *J. Am. Pharm. Assoc.* 18, 31–4(1929).—Eight samples of commercial pituitarium, representing current output, were obtained directly from the manufacturers. Exts. were made by the U. S. P. method and were assayed by the Dale and Laidlaw procedure (*C. A.* 7, 156), with some modifications. A wide variation in the activity of the samples was found. The strength varied from 1.5 to 75% of the activity of the official powder. Most of the powders ranged from 30 to 50% of the standard. It is recommended that manufacturers be required to market a product

for commercial purposes that shows an activity of 50% of the standard U. S. P. powder.

**Studies on the determination of camphor in camphor liniment.** L. E. WARREN, CHARLES F. POE, GOLDNER LIPSEY AND CLARENCE L. VAUGHN. *J. Am. Pharm. Assoc.* 18, 580-6 (1929).—The U. S. P.-X method for detg. camphor in camphor liniment gives low results, because of oxidation of the oil. The error may amount to 1% or more. Various kinds of dishes and different methods of heating were tried but none proved satisfactory. A more satisfactory method was developed which uses a vacuum oven. Details are reserved for a second paper.

**Bioassay of aconite and its preparations. I. Lethal dose of aconite to rats.** J. C. MUNCH AND G. S. GITTINGER. *J. Am. Pharm. Assoc.* 18, 17-24 (1929).—There is wide individual variation in susceptibility of rats to aconitine administered subcutaneously and intraperitoneally, the most resistant animals requiring more than twice the amt. to kill over the most susceptible ones. The rat is capable of detoxicating a fatal dose of aconitine in 3-4 days. The fatal dose of aconitine (killing 2 out of 3), when injected subcutaneously into white rats by the U. S. P. method, is 0.175 mg./kg. Wild rats are equally or somewhat less susceptible. Injected peritoneally the fatal dose is 0.1 mg./kg. Subcutaneous injections appear more reliable than intraperitoneal injections. Great variations in susceptibility of individual rats make it necessary to use a number of test animals. Surviving rats may be used again in 4 days. On the assumption that there was a const. rate of detoxication of aconitine in terms of mg./kg per hr., white rats detoxicated 0.0047 mg. after subcutaneous injection, and 0.0015 mg. after intraperitoneal injection. For the preliminary assay of aconitine, and presumably aconite preps., readily available white rats may be used to conserve the more expensive guinea pigs.

L. E. WARREN

Mg: a solvent in nephrolithiasis and an aid in preventing salivary calculus formation (BADANES) 11H. The method of formation and the detection of alkaloids in the young tobacco plant (CHAZE) 11D. A comparative precipitation method for the qualitative identification for each of the common gums (WEINBERGER, JACOBS) 28. A note on coconut-shell oil (an antiseptic) (KIDAVU, NAMBIYAR) 22. The preparation of some perfumes from furfural and its derivatives. Esters of  $\beta$ -furylacrylic acid (GILMAN, WRIGHT) 12. Separation of unsaponifiable matter from oils (Fr. pat. 655,799) 27. Complex metal compounds of pyrocatechol (therapeutic) (U. S. pat. 1,718,492) 10. Active C (medicinal) (Brit. pat. 301,313) 18. Haloacylated diphenyl ethers (therapeutic) (U. S. pat. 1,717,424) 10. Iodized oils (Ger. pat. 469,233) 27.

ARNOLD, KARL: *Repetitorium der Chemie. Namentlich zum Gebr. f. Mediziner u. Pharmazeuten.* 17th ed., revised by Karl W. Rosenmund. Leipzig: Leopold Voss. 393 pp. Linen, M. 14.80.

HATCHER, ROBERT A., et al.: *Useful Drugs; A List of Drugs Selected to Supply the Demand for a Less Extensive Materia Medica with a Brief Discussion of Their Actions, Uses and Dosage.* 7th ed., revised. Chicago: Am. Med. Assocn. 172 pp.

HORATIUS, THEODOR: *Die Fabrikation der Äther und Grundessenzen.* 4th ed., revised and edited by Wolfgang Gaber. Venna: A. Hartleben. 291 pp. M. 6.50, bound, M. 7.50.

**Iodized oils.** FIRMA E. MERCK (Erich Kornick, inventor). Ger. 469,233, April 4, 1926. Stable iodized oils are prepd. from oils having a high I value by acting on the unsatd. oil with the exact quantity of I compd. necessary for satn., and then splitting off the loosely bound I by a suitable agent. Thus, 3 parts of poppy-seed oil is allowed to stand with 3 parts of gaseous HI for one day, and with 4 parts of HI for another day. The brown product is decolorized by shaking with bisulfite soln., neutralized, washed, dried and filtered, a light brown oil with a 40% I content being formed. Other examples are given.

**Synthetic drugs.** I. G. FARBENIND. A.-G. Brit. 300,695, Aug. 18, 1927. Products producing contraction of the blood vessels and exciting labor pains are obtained by treating resorcinol monomethyl ether with a soln. of Na in alc. and heating with diethylaminoethyl chloride, or  $\alpha$ -dimethylamino- $\beta$ -methyl- $\gamma$ -chlorobutane, in the presence of an alk. substance.

**Medicinal serums.** LUDWIG FEJES and BRUNO BÖTTCHER (to Elektro-Osmose A.-G. (Graf Schwerin Ges.)). U. S. 1,718,282, June 25. A protective or curative serum such as a diphtheria serum is treated with an excess of a sulfate such as  $(\text{NH}_4)_2\text{SO}_4$  to salt out and ppt. the globulins, the ppt. is treated with water and Ba acetate.

thus pptg.  $\text{BaSO}_4$ , and the  $\text{BaSO}_4$  is sepd. from the globulin soln. and the latter is subjected to electroösmosis, and the treatment is continued until at the isoelec. point of  $p_H$  6.4 the euglobulins have become deposited, and the deposit is sepd. from the aq. soln. of pseudoglobulin.

**Therapeutic compound.** CHEMISCHE FABRIK VORM. SANDOZ. Fr. 655,301, Apr. 2, 1928. Isobutylallylbarbituric acid is combined with 1-phenyl-2,3-dimethyl-4-dimethylamino-5-pyrazolone in a solvent such as  $\text{C}_6\text{H}_6$ . The new compd. ppts. as a yellow cryst. powder, m.  $83-85^\circ$ .

**Therapeutic compounds of cadmium, lead, palladium, copper or gold.** G. T. MORGAN AND F. H. BURSTALL. Brit. 300,330, Aug. 25, 1927. Complex compds. are obtained by treating ethylthiourea with a salt of one of the specified metals.

**Therapeutic arsenobenzenes.** A. ALBERT. Brit. 300,716, Aug. 26, 1927. Hypophosphorus acid or one of its salts is used with  $\text{SO}_2$  or one of its salts in an acid medium in effecting the reduction of compds. such as the semicarbazone of 3-aldehyde-1-phenoxyacetic acid-6-arsonic acid, a mixt. of the semicarbazones of 3-hydroxy-1-benzaldehyde-4-arsonic acid and of 3-aldehyde-1-phenoxyacetic acid-6-arsonic acid, the semicarbazone of 1-benzaldehyde-3-hydroxy-4-arsonic acid, the semicarbazone of 1-acetophenone-3-hydroxy-4-arsonic acid or 3-aminobenzene-4-hydroxy-1-arsonic acid. The semicarbazone of 3-aldehyde-1-phenoxyacetic acid-6-arsonic acid is made by the action of chloroacetic acid on the semicarbazone of 3-hydroxy-1-benzaldehyde-4-arsonic acid.

**Therapeutic organic arsenic compounds.** A. D. MACALLUM. Brit. 300,286, May 4, 1927. 3-Amino-4-hydroxy-5-iodophenylarsonic acid is prepd. by reducing a cold alk. soln. of 3-nitro-4-hydroxy-5-iodophenylarsonic acid with excess of freshly pptd. titanous or ferrous oxide or with Na hyposulfite; its Zn and Pb salts are described. Treatment of the product, with or without isolation, with  $\text{Ac}_2\text{O}$ , forms 3-acetamido-4-hydroxy-5-iodophenylarsonic acid, which by reduction gives 3,3'-diacetamido-4,4'-dihydroxy-5,5'-diiodoarsenobenzene. 3-Acetamino-4-hydroxy-5-iodophenylarsenious oxide is formed when the arseno compd. is treated with I and the resulting arsine diiodide then hydrolyzed with aq.  $\text{NaHCO}_3$ .

**Organic arsenic compounds containing iodine.** A. D. MACALLUM. Brit. 300,538, May 4, 1927. 3,3'-Dinitro-4,4'-dihydroxy-5,5'-diiodoarsenobenzene is made by treating a MeOH soln. of 3-nitro-4-hydroxy-5-iodophenylarsonic acid with  $\text{H}_3\text{PO}_2$  at  $55-60^\circ$ . 3-Nitro-4-hydroxy-5-iodophenylarsenious oxide is produced when the arseno compd. is treated with I and the resulting arsine diiodide then hydrolyzed with aq. alkali bicarbonate. The products may be used as *parasitocides*.

**Organic mercury compounds.** TASCH LABORATORY, LTD. Brit. 301,023, Nov. 23, 1927. 1-Phenyl-2,3-dimethyl-4-sulfamino-5-pyrazolone is treated with Hg salts to produce compds. contg. 1 atom Hg to 4 mols. of the pyrazolone, which may be used as *therapeutic agents*.

**Solanaceae alkaloid salts.** WALTER SCHOELLER and HERBERT SCHOTTE (to Chemische Fabrik auf Actien, vorm. E. Schering). U. S. 1,717,585, June 18. A soln. is prepd. of equimol. proportions of 2 different Solanaceae alkaloids such as scopolamine and hyoscyamine and a polybasic acid such as camphoric or tartaric acid in a volatile solvent such as alc. and the solvent is allowed to evap. at low temp.

**Glucosides from squill.** CHEMISCHE FABRIK VORM. SANDOZ. Brit. 300,726, Sept. 1, 1927. The cardioactive glucoside of squill is sepd. in the presence of aq. media, into 2 components by fractional soln., fractional pptn. or fractional extrn. from aq. media by use of org. solvents. Numerous details are given.

**Theobromine.** GERARD C. A. VAN DORP (to Naamlooze Vennootschap Societeit voor chemische Industrie "Katwijk"). U. S. 1,718,093, June 18. See Brit. 287,507 (C. A. 23, 483).

**Thymol and menthol.** SCHERING-KAHLBAUM A.-G. Brit. 301,087, Nov. 24, 1927. Hydroxymenthyl is heated with H and a hydrogenating catalyst (which may be assoc. with a porous catalyst) to split off water and effect addn. of 2 or 8 at. proportions of H. Cf. C. A. 23, 611.

**Quinoline-indole compounds.** I. G. FARBENIND. A.-G. Brit. 300,279, Nov. 11, 1927. Quinoline-indole compds. in which the indole nucleus is connected at its 2,3-position with the aromatic part of the quinoline nucleus are prepd. by converting a benzamidoquinoline into a carbazole or by subjecting an aminocarbazole to the quinoline synthesis. The products may be used as *therapeutic agents* or as *intermediates for the manuf. of other pharmaceutical compds. or dyes*.

**Antiseptic solution containing ethylene iodide.** WM. A. STEPHENS. U. S. 1,719,523, July 2. I crystals and alc. are vaporized and the combined vapors are condensed.

**Detergent.** FARRINGTON DANIELS. U. S. 1,719,595, July 2. A detergent sub-

stantially free from soaps and suitable for use on the skin comprises  $\text{Na}_3\text{PO}_4$  or other alk. phosphate together with a fatty oil such as cottonseed oil and palm oil.

**Perfumes.** VIANOVA G. M. B. H. FÜR CHEM. IND. Fr. 656,445, June 25, 1928. Ethereal oils or perfumes are extd. from substances contg. them by means of liquid  $\text{CO}_2$ .

**Perfumes.** I. G. FARBENIND. A.-G. Fr. 655,958, June, 15, 1928. Aldehyde or keto groups are introduced into aromatic diisopropyl compds., or aromatic aldehydes or ketones which contain no or only one isopropyl group are transformed into diisopropyl compds., or an aldehyde or keto and a second isopropyl group are introduced simultaneously into a mono-isopropylaryl compd. Examples are given of the prepn. of diisopropylbenzaldehyde,  $b_{12-13}$  147–153°, by passing  $\text{CO}$  into boiling diisopropylbenzene contg.  $\text{AlCl}_3$  and  $\text{CuCl}$ , or from 4-isopropylbenzaldehyde and isopropyl chloride in the presence of  $\text{CS}_2$  and  $\text{AlCl}_3$ . The prepn. of diisopropylmethylbenzaldehyde,  $b_9$  148–150°, diisopropylmethylbenzaldehyde,  $b_9$  150–155°, diisopropyl-*ar*-tetrahydronaphthaldehyde,  $b_9$  182–185°, diisopropylacetophenone,  $b_{13}$  145–150°, is also described. The compds. may be condensed with acetone or  $\text{AcH}$ , oxidized to the corresponding acid or reduced to the corresponding alc.

## 18—ACIDS, ALKALIES, SALTS AND SUNDRIES

E. M. SYMMES

**Improvements in the manufacture of sulfuric acid by the lead-chamber process.** R. MORITZ. *Chimie & industrie Special No.*, 466–71 (Feb., 1929).—A review of recent progress, dealing with roasting pyrites, concn. before the Glover tower, lead chambers, cooling, continuous decantation and feeding of niter.

**The synthesis of ammonia in the glow discharge.** A. KEITH BREWER AND J. W. WESTHAVER. *J. Phys. Chem.* 33, 883–95 (1929).—The synthesis of  $\text{NH}_3$  from a 3:1  $\text{H}_2$ - $\text{N}_2$  mixt. in the glow discharge has been investigated by a static system between 4 mm. and 0.1 mm. pressure. The rate of synthesis is found to be proportional to the current passing through the discharge tube, and is independent of the total gas pressure over the range studied. The presence of a magnetic field at right angles to the elec. field materially increases the rate of synthesis, whereas a parallel field has no effect. The formation of  $\text{NH}_3$  is shown to be entirely a gas-phase reaction. The data are interpreted as indicating that the reaction is initiated by the positive ions formed in the discharge, the rate of synthesis being proportional to the rate of formation of ions present, and hence to the current. A new electrochem. law for discharge tubes is suggested.

P. H. EMMETT

**Theory of the ammonia-soda process.** N. I. KIRICHENKO. *Ukrainskii Khim Zhur.* 3, *Tech. Pt.* 141–79 (1928).—When  $\text{CO}_2$  is passed into an  $\text{NH}_3$  soln. at first no carbonate forms; only carbamate is produced. After reaching a definite concn. the carbamate gradually hydrolyzes to  $\text{NH}_4\text{HCO}_3$ . This reacts with  $\text{NaCl}$  to ppt.  $\text{NaHCO}_3$ . The greater the  $\text{NH}_3$  concn. in the soln., the  $\text{CO}_2$  content remaining the same, the greater the carbamate formation and the higher the ratio carbamate to bicarbonate at the moment of equil.  $\text{NH}_3$  thus affects the equil and the presence of large quantities of  $\text{NH}_3$  affects adversely the transformation of carbamate to  $\text{NH}_4\text{HCO}_3$  and  $\text{NaHCO}_3$  pptn. The more  $\text{CO}_2$  present the more rapidly formed and the larger the ppt. when the solns. are mixed with a definite quantity of  $\text{NaCl}$ . The fundamental conditions causing  $\text{NaHCO}_3$  pptn. are the presence in the soln. of  $\text{NaHCO}_3$  greater in amt. than satn. and the presence of active  $\text{OH}$  ions in quantity sufficient for formation of  $\text{NaHCO}_3$  and for "neutralization" of the  $\text{H}$  ions of  $\text{NH}_4\text{Cl}$ , the latter compd. increasing with growth of the ppt. The presence of  $\text{NaHCO}_3$  in quantity greater than satn., is entirely due to the presence of  $\text{NH}_4\text{HCO}_3$  in no more than the equiv. quantity. Until this limit of satn. of the  $\text{NH}_3$  soln. by  $\text{CO}_2$  is reached no pptn. is expected. For each mol. of carbamate transformed into bicarbonate a mol. of  $\text{NH}_3$  is set free. The latter finally increases so that further transformation to  $\text{NH}_4\text{HCO}_3$  becomes impossible and pptn. stops. Complete transformation of carbamate to bicarbonate cannot be attained even by intensifying the  $\text{CO}_2$  current. When equil. is reached the soln. always contains some free  $\text{NH}_3$ . The above reactions are simultaneous. The thermic aspect of the above reactions is considered and an improved method of carbamate detn. in soln. based on Fenton's method (*Proc. Roy. Soc.* 49, 386 (1886)) is given. B. N.

**Synthesis of cyanamide by combination of carbon and calcium nitride.** KADLEC-FLECK. *Compt. rend.* 188, 561–3 (1929).—Mixts. of  $\text{Ca}_3\text{N}_2$  and  $\text{C}$  were heated at temps.

of 800–1100° and were found to react according to the equation  $\text{CaCN}_2 + 5\text{C} \longrightarrow \text{CaCN}_2 + 2\text{CaC}_2$ . E. G. VANDEN BOSCHE

**Atmospheric nitrogen processes in Spain.** RAMON DE IZAGUIRRE. *Ing. y construcción* (Madrid) No. 59, 536–41 (1927); *Intern. Rev. Agr.* [N. S.], 19, 714–6.—Two factories have been at work some years at Flix (Tarragona) and at La Felguera (Asturias) using the Claude process. At Flix H is obtained as a by-product of NaCl electrolysis. It is very pure and can be used without further treatment. At La Felguera H from coke ovens is used, purified and compressed to 30 atmospheres by 3 separate compressions and finally further purified in scrubber towers contg. various substances such as  $\text{NH}_3$  to hold up  $\text{CO}_2$ ,  $\text{H}_2\text{S}$ , etc.,  $\text{H}_2\text{O}$  to retain the  $\text{NH}_3$  carried over from the preceding tower and finally a soln. of NaOH to stop traces of  $\text{CO}_2$ . The gas is then dried by passing into 4 containers holding solid NaOH. A tiered distn. column regenerates the carbonated  $\text{NH}_3$  soln. The gas at the beginning of the process contains:  $\text{CO}_2$  3.5,  $\text{H}_2\text{S}$  1.5,  $\text{C}_2\text{H}_6$  2.5, O 1.0, CO 6.5, H 40.0,  $\text{CH}_4$  26.0,  $\text{C}_2\text{H}_4$  1.5, N 17.5,  $\text{C}_4\text{H}_8$  0.02,  $\text{NH}_3$  traces. At La Felguera 60–70,000 cu. m. of coke-oven gas is treated, yielding 30,000 cu. m. of  $\text{H}_2$ . N is obtained by burning H in air by a special burner; the  $\text{H}_2\text{O}$  of combustion is condensed by refrigerating. The H actually turned to account in this operation is only 6–10% of that used. The  $\text{N}_2 + 3\text{H}_2$  mixt., always contg. 1% CO, is compressed to 900–1000 atm. in a series of 8 cascade hyper-compressors, which give successively 2.5–10–25–60–125–300–600–1000 atms. Catalysis takes place in a special tube of Cr-, Ni- or W-steel, in the presence of a specially activated Fe oxide. About 40% of the  $\text{N}_2 + 3\text{H}_2$  mixt. introduced into the catalyst tube is combined. A series of these catalysts is used, in the first 2 of which, mounted in parallel, 40 cu. m. are combined per every 100 cu. m.; in the second 24 cu. m.; in the third 14.4 cu. m.; and in the fourth, 8.6 cu. m.; 13% remains uncombined. The factory produces 5 tons of chem. pure, anhyd.  $\text{NH}_3$ . Power consumption is 1.4 kw. hrs. per kg.  $\text{NH}_3$ . The La Felguera factory has also a  $\text{H}_2\text{SO}_4$  plant using Huelva pyrites in Herreshoff furnaces. Pb towers with Gaillard turbines for spraying  $\text{H}_2\text{O}$  are used. This system is greatly superior to the Pb-chamber system. There is also a 10-ton Frank-Caro  $\text{HNO}_3$  plant. H. L. D.

**Processes for making pure alumina.** F. C. CHRAMBACH. *Metallbörse* 19, 985, 1041–2 (1929).—A review. W. C. EBAUGH

**Preparation of alumina from volcanic ash as a source of aluminum.** ISAMU SEKI. *Repts. Imp. Ind. Research Inst. Osaka, Japan* 10, No. 2, 22 pp. (1929).—Japan lacks bauxite as a source of Al. Many attempts have been made in the past to prep.  $\text{Al}_2\text{O}_3$ . S. makes  $\text{Al}_2\text{O}_3$  from volcanic ash contg. 15–30%  $\text{Al}_2\text{O}_3$ . Volcanic ash is pulverized after being dried at 130°, heated at 400–700° for 2 hrs. in an elec. oven, and treated with  $\text{H}_2\text{SO}_4$ . The soly. of  $\text{Al}_2\text{O}_3$  is highest (99.5%) when the acid concn. is 30°. Bé, and treatment about 30 min.  $\text{Al}_2(\text{SO}_4)_3$  is best sepd. from  $\text{CaSO}_4$  when the d. of the soln. is about 1.47. Fe is best removed from the  $\text{Al}_2(\text{SO}_4)_3$  soln. by a ferrocyanide soln., but other methods may be used. Under such conditions the product obtained contains  $\text{Al}_2\text{O}_3$  99.08,  $\text{H}_2\text{SiO}_4$  0.86 and  $\text{Fe}(\text{OH})_3$  0.06. F. I. NAKAMURA

**The stock of ferrous sulfide of the world.** STEINAR FOSLIE. *Tids. Kemi og Bergvesen* 8, 30–32, 48–51 (1928).—A statistical survey. A. D.

**Selenium and its use in the arts.** A. KUFFERATH. *Chem.-tech. Rundschau* 44, 438 (1929).—The application of Se to the production of light-sensitive cells is well known. Addn. of 0.01–0.05% Ag to the Se increases the sensitivity of the cell to red and yellow light and makes it sensitive to Röntgen rays. Se is used in rubber vulcanization, in manuf. of ruby glass, its compds. in photographic toning baths and to decolorize Fe-contg. glass, and compds. of Se with eosin and fluorescein have been used unsuccessfully in treatment of malignant tumors. Se is obtained chiefly as a by-product of  $\text{H}_2\text{SO}_4$  manuf. and from anode slimes in Cu refineries. E. PICKERING

**The marketing of antimony.** J. W. FURNESS. U. S. Bur. of Foreign and Domestic Commerce, *Trade Information Bull.*, No. 624, 29 pp. (1929). E. I. S.

**Russian magnesite.** B. BIRUKOV. *Tovind.-Ztg.* 53, 928–30 (1929). F. O. A.

**The extraction of iodine from sea-weeds (red Phyllophora) of the Black Sea.** N. D. AVERKIEV. *Farm. Zhur.* 1928, 176–9.—The sea-weed red *Phyllophora*, found abundantly in the Sevastopol-Dunai-Odessa region, has a very high I content as compared with the sea-weeds of the Pacific Ocean, Scotland, Normandy and the White Sea. During the war a special I-recovery plant was installed in Ekaterinoslav, and from 1915 to 1918 1000 kg. of I was produced. This work was completely interrupted during the civil war. In 1917 an expedition investigated the possibilities of I production on a large scale and submitted a plan for the monthly production of 2100 kg. of I at a cost of about \$7.50 per kg. E. BIELOUSS

**The carbon monoxide process.** R. NITZSCHMANN. *Metallbörse* 19, 1070–2.

(1929).—Equations and tables based upon the primary reactions  $C + O_2 = CO_2 + 97,640$  cal. and  $C + CO_2 = 2 CO - 38,360$  cal. W. C. EBAUGH

The testing of casein for industrial purposes. W. L. DAVIES. *Ind. Chemist* 5, 202-4 (1929); cf. *C. A.* 23, 1478.—Small amts. of ash, fat, acidity, sugars and adulterants limit the use of casein. Com. casein is made by 4 processes: (a) acid casein, (b) rennet casein, (c) buttermilk casein, and (d) natural-sour casein. These processes are briefly described and the impurities each product is likely to contain stated. Casein should be tested for: (a) fineness, (b) color, (c) smell, (d) moisture, (e) fat, (f) ash, (g) sugar, (h) N, (i) acidity, (j) Ca and P. Each of these is described and also the special tests (a) borax suitability test and (b) wax or strength test. Av. analyses of caseins made by the various processes listed above are given. A short list of references is included. E. G. R. ARDAGH

The chemistry of fire-quenching appliances. ANT. STEINHILBER. *Chem. Listy* 23, 86-90 (1929).—A discussion. FRANK MARESH

Preservation of plant and animal materials by chemical means. CURT DREWS *Chem. Tech. Rundschau* 44, 439 (1929).—Review of patent literature relating to means for preserving blossoms and other plant parts and the fixation of animal tissues. E. PICKERING

Comparison of the Zennström and other processes for the production of paper pulp and by-products from maritime pine and other resinous woods [recovery of  $(NH_4)_2SO_4$ ] (RIVIÈRE) 23. Insulating compositions from cashew-nut shell liquid (Brit. pat. 300,654) 13. Apparatus suitable for making  $CS_2$  or for other chemical reactions (U. S. pat. 1,719,509) 1.

Purifying mineral acids. KALI-CHEMIE A.-G. (Friedrich Rüsberg, Fritz Müller and Albert Wehrung, inventors). Ger. 477,100, Sept. 7, 1921. The liquid or vaporized acids are treated with active C.

Hydrochloric acid and ammonia from ammonium chloride. JACOB KESSLER U. S. 1,718,420, June 25. Solid  $NH_4Cl$  is vaporized and the vapors are passed at an elevated temp. through  $NH_4HSO_4$  fused in a closed chamber or retort of refractory material resistant to the chemicals employed in the process; HCl is collected and a rapid current of  $CO_2$ -free air is passed above the reaction mass to drive out residual HCl. Superheated steam is subsequently passed through the residual bisulfate mass, to obtain  $NH_3$ . An app. is described.

Sulfuric acid. HUGO PETERSEN. Ger. 477,266, May 27, 1925. A concg. app. is arranged between the roasting furnace and the denitration app. so that the acid from the denitration app. is concd. by the hot gases from the roasting furnace. Acid of above 60° Bé. may be so obtained. Cf. *C. A.* 22, 1218.

Recovering sulfuric acid. FIRMA CARL STILL. Ger. 477,267, Sept. 21, 1926 See Brit. 277,619 (*C. A.* 22, 2656).

Nitric acid. CHEMICAL CONSTRUCTION CO. Fr. 656,108, June 19, 1928.  $HNO_3$  is concd. by passing it along with a dehydrating agent such as  $H_2SO_4$  through a series of retorts or chambers in cascade, the vapors of  $HNO_3$  passing in opposite direction to the flow of liquid. External heating means is described.

Nitric and sulfuric acids. I. G. FARBENIND. A.-G. Brit. 301,232, Jan. 16, 1928 Mixts. contg.  $NH_3$  and volatile S compds. such as are obtained by heating the  $NH_4$  sulfite produced in washing illuminating gas or by mixing  $NH_3$  with gases obtained by burning S or from ore desulfurization are treated to produce both  $HNO_3$  and  $H_2SO_4$ , after preliminary purification to remove catalyst poisons. Various details and examples of catalytic treatments and of the app. used are given. Cf. *C. A.* 23, 2537.

Hydrocyanic acid. A. R. FRANK and N. CARO. — Brit. 301,093, Nov. 24, 1927 In prep. HCN as described in Brit. 282,379 (*C. A.* 22, 3743) the compds. of alk. earth metals are replaced by Zn compds. Small proportions of metals such as Cu or Ag or their compds. also may be added and the contact substances may be made into compact pieces with waterglass or other binder.

Hydrocyanic acid. I. G. FARBENIND. A.-G. Brit. 300,369, Oct. 13, 1927.  $NH_3$  and CO are passed over a catalyst consisting of a carbide of Fe, Ni or Co, which may be mixed with Mo, Mn, W, Ce, Ti or Cu or their compds., preferably at a temp. of about 450°. The resultant gases may be cooled to sep.  $NH_4CN$  or may be absorbed in caustic alkali soln. Cf. *C. A.* 23, 3779.

Phosphoric acid. PIERRE JOLIBOIS AND LES MINES DOMANIALES DES POTASSES D'ALSACE, and SOC. ANON. DES MINES DE KALI SAINTE-THÉRÈSE. Fr. 655,299, Mar. 29, 1928.  $H_3PO_4$  is obtained by heating  $Ca_3(PO_4)_2$  in the presence of a catalyst such



as charcoal and passing through it CO and Cl or a substance contg. Cl, and treating the  $\text{POCl}_3$  with water to form  $\text{H}_3\text{PO}_4$  and HCl.

**Titanic acid.** I. G. FARBENIND. A.-G. Fr. 655,701, June 13, 1928. A white titanic acid is obtained by carrying out the hydrolysis of the ore with  $\text{H}_2\text{SO}_4$  in the presence of HF or sol. fluorides. Cf. C. A. 23, 3779.

**Catalytic oxidation of ammonia, etc.** F. JOST. Brit. 300,562, Nov. 14, 1927. Exothermic gas reactions such as oxidation of  $\text{NH}_3$  are controlled by removing heat from the reaction through the catalyst body which may be hollow and cooled on one side while the reaction takes place on the other side.

**Purifying sodium hydroxide and similar solutions.** LEONARDO CERINI. U. S. 1,719,754, July 2. In dialytic purification, a diaphragm of mercerized woven fabric is used. Cf. C. A. 23, 2538.

**Alkali and alkaline earth metal nitrates.** KALI-INDUSTRIE A.-G., C. T. THORSSELL and A. KRISTENSSON. Brit. 300,632, Nov. 18, 1927. A nitrate and nitrite soln. such as is obtained by causing a soln. or suspension of alkali or alk. earth hydroxide or carbonate to trickle over the absorption towers of a  $\text{HNO}_3$  plant is freed from nitrite as by treatment with  $\text{HNO}_3$  and steam and then cooled (suitably to about  $0^\circ$ ) to deposit part of the nitrate in solid form.

**Alkali ammonium phosphates.** STOCKHOLMS SUPERFOSFAT FABRIKS AKTIEBOLAG. Brit. 300,903, Nov. 19, 1927. The reaction product of phosphatic materials and acid is treated with alkali sulfate to remove Ca as  $\text{CaSO}_4$  and the resulting soln. is treated with an excess of  $\text{NH}_3$  while cooling the soln. (suitably to  $0^\circ$ ) to effect pptn. of the desired product and leave a mother liquor contg. mainly  $\text{NH}_3$  and suitable for reuse.

**Alkali perphosphates.** S. HUSAIN and J. R. PARTINGTON. Brit. 300,946, Aug. 20, 1927. Pseudo-perphosphates (which may be used for bleaching, disinfecting or in baking powders, etc.) are prepd. by treating a sol. orthophosphate (preferably anhyd.) with a peroxide in the presence of water or a dil. aq. soln. of  $\text{H}_2\text{O}_2$  and evapg. the resulting soln. under reduced pressure at room temp. and over a desiccating agent such as fused  $\text{CaCl}_2$  to obtain a solid product.

**Alkali metal silicates.** BIRGER F. HALVORSEN (to Norsk Hydro-Elektrisk Kvaestofaktieselskab). U. S. 1,718,292, June 25. Alkali metal compds. (such as a nitrate or nitrite) contg. N and O are mixed with silicic acid hydrate and heated to above  $250^\circ$  but below the m. p. of the mass.

**Calcium alkali phosphates.** A. MESSERSCHMITT. Brit. 300,961, Nov. 21, 1927. Citrate-sol. Ca alkali phosphates, e. g., a product corresponding to the formula  $2\text{CaO} \cdot \text{K}_2\text{O} \cdot \text{P}_2\text{O}_5$ , are obtained by sintering together, without fusion, raw phosphates or phosphate mixts., basic or acid substances such as alk. earth oxides, alumina, silica, Fe oxide, etc., clay or other silicates or alkali-contg. minerals, an alkali sulfate or substances contg. it such as K Mg sulfate or crude Stassfurt salts, and a reducing agent such as C or iron pyrites sufficient to effect partial reduction of the sulfate. Various details are given.

**Crystallizing ammonium nitrate, etc.** APPAREILS ET EVAPORATEURS KESTNER. Brit. 301,496, Dec. 2, 1927.  $\text{NH}_4\text{NO}_3$  or other substances which crystallize exothermically are crystd. by strongly agitating their hot satd. solns. while exposed to a current of air to carry off evapd. moisture. An app. is described.

**Citrate-soluble phosphates.** RHENANIA-KUNHEIM VEREIN CHEMISCHER FABRIKEN A.-G. (to Kali-Chemie A.-G.). Brit. 301,022, Nov. 23, 1927. Production of citrate-sol. phosphates by calcining crude phosphates with alkali carbonates or salts or Mg compds. or mixts. of these with silica, with or without use of steam, is effected in 2 stages, the first stage being at a temp. below the fusion point of the original mixt. and being continued until most of the F has been driven out, and the second stage being at a higher temp. but also without fusion.

**Potassium ammonium phosphates.** SOC. DE PRODUITS CHIMIQUES DES TERRES RARES. Brit. 300,919, Nov. 19, 1927, Fr. 657,307, Nov. 19, 1927.  $\text{K NH}_4$  phosphates (which may include a salt of the formula  $\text{NH}_4\text{K}(\text{H}_2\text{PO}_4)_2$ ) are made by reaction between  $\text{H}_3\text{PO}_4$ , KCl and  $\text{NH}_3$ .

**Oxidizing salts.** I. G. FARBENIND. A.-G. Fr. 655,818, May 11, 1928. Metallic salts such as  $\text{FeSO}_4$  (bivalent) are converted to a higher degree of oxidation (tervalent) by treating them in aq. soln. at temps. above  $100^\circ$  with O gas under pressure.

**Purifying zinc sulfate solutions.** THE RHODESIA BROKEN HILL DEVELOPMENT CO., LTD. Ger. 477,290, Sept. 9, 1926. Ni is removed from neutral or feebly acid solns. of  $\text{ZnSO}_4$  by means of powd. Zn in the presence of compds. of As and Cu. The pptn. is hindered by the presence of  $\text{SiO}_2$ ,  $\text{Al}_2\text{O}_3$  and org. substances, and accordingly care is taken to avoid the presence of such substances during the pptn. and preferably also during the sepn. of the ppt. The process may be carried out in app. lined with Pb.

**Calcium hypochlorite.** ANTHONY GEORGE and MAURICE C. TAYLOR (to Mathieson Alkali Works). U. S. 1,718,284, June 25. A slurry contg. lime and an alkali metal compd. is chlorinated to form  $\text{Ca}(\text{OCl})_2$  and alkali metal chloride and the latter is sepd. as a ppt. U. S. 1,718,285 (Anthony George) relates to similar processes. U. S. 1,718,286 (Jesse A. Guyer and Maurice C. Taylor) specifies chlorinating a soln. of caustic alkali and reacting on the product with  $\text{CaCl}_2$ . U. S. 1,718,287 (Robert B. McMullin and Anthony George) specifies chlorinating a mixt. of caustic alkali and lime in water while using an excess of lime over that chemically equiv. to the caustic alkali. Cf. following abstr. and C. A. 23, 3058.

**Calcium hypochlorite.** THE MATHIESON ALKALI WORKS. Ger. 477,386, May 24, 1927.  $\text{Ca}(\text{OCl})_2$  substantially free from  $\text{CaCl}_2$  and  $\text{Ca}(\text{OH})_2$  is prepd. by chlorinating milk of lime until pptn. of  $\text{Ca}(\text{OCl})_2$  begins, then adding caustic alkali, and chlorinating again. The addn. of caustic alkali to the chlorinated milk of lime produces  $\text{NaOCl}$  and ppts.  $\text{Ca}(\text{OH})_2$ , which is converted in the further chlorination to  $\text{Ca}(\text{OCl})_2$  and  $\text{CaCl}_2$ . The  $\text{CaCl}_2$  then undergoes double decompn. with the  $\text{NaOCl}$ . An example is given. Cf. preceding abstr. and C. A. 23, 3058.

**Potassium carbamate and carbonate.** KALI-INDUSTRIE A.-G., C. T. THORSSELL, and A. KRISTENSSON. Brit. 300,629, Nov. 18, 1927. K carbamate is prepd. by reaction between a K salt such as  $\text{KCl}$  and  $\text{NH}_4$  carbamate in the presence of liquid  $\text{NH}_3$ . K carbamate remains as a solid while  $\text{NH}_4\text{Cl}$  goes into soln.  $\text{K}_2\text{CO}_3$  or  $\text{KHCO}_3$  may be formed from the carbamate.

**Calcium cyanamide.** HERBERT WITTEK. Ger. 477,225, Aug. 14, 1925. A perforated container for the carbide is arranged in a furnace to which N is supplied, the arrangement being such that the N is constrained to pass through the mass of carbide.

**Calcium cyanogen compound.** I. G. FARBENIND. A.-G. Brit. 300,348, Sept. 19, 1927. A compd. of the formula  $\text{Ca}(\text{CN})_2 \cdot 2\text{NH}_3$  which is relatively stable in the presence of water and when heated yields Ca cyanide is formed by allowing a mixt. of  $\text{HCN}$  and  $\text{NH}_3$  to act upon  $\text{CaO}$  or  $\text{Ca}(\text{OH})_2$  or sol. Ca salts in the presence of water or org. solvents or suspension media such as alc., ether, benzene or pyridine, or by passing  $\text{NH}_3$  through a concd. soln. of Ca cyanide or by passing  $\text{HCN}$  and  $\text{NH}_3$  over powd. lime.

**Phosphates.** SOC. DES PHOSPHATES TUNISIENS. Fr. 655,616, June 11, 1928. A chart is given showing the relative conditions of sp. gr. and ratio of titration with phenolphthalein and methyl orange for the production from  $\text{Na}_2\text{HPO}_4$  of a neutral  $\text{Na}_3\text{PO}_4$  in contrast to the alk. phosphate of commerce. Fr. 655,617 describes the prepn. of neutral  $\text{Na}_3\text{PO}_4$  by prepg. a soln. of  $\text{Na}_2\text{HPO}_4$  and adding  $\text{NaOH}$  soln. until a ratio of 0.432:0.451 is obtained between the titration with phenolphthalein and methyl orange. The sp. gr. of the soln. should be kept above 1.30.

**Leaching solid raw materials with acid.** F. G. LILJENROTH (to Kunstdünger Patent-Verwertungs-A.-G.). Brit. 301,306, Nov. 26, 1927. In the treatment of raw phosphate or impure  $\text{CaCO}_3$  with  $\text{HNO}_3$  to obtain  $\text{Ca}(\text{NO}_3)_2$  solns., or of bauxite or other Al-bearing material to produce  $\text{Al}_2(\text{SO}_4)_3$  solns., or of raw phosphate with  $\text{H}_2\text{SO}_4$  to produce  $\text{H}_3\text{PO}_4$  or phosphates, liquid obtained from washing the residues is used for prepg. leaching acid as by absorption of nitrous gases,  $\text{SO}_3$ ,  $\text{SO}_2$  and O, or gaseous  $\text{HCl}$ .

**Sulfates of sodium and potassium.** CHEMIEVERFAHREN GES. Brit. 300,630, Nov. 18, 1927. Double decompn. is effected between  $\text{MgSO}_4$  and  $\text{NaCl}$  or  $\text{KCl}$  in a soln. of  $\text{NH}_4\text{Cl}$  in aq.  $\text{NH}_3$ . The sulfate remains in solid form and the  $\text{MgCl}_2$  goes into soln.

**Granulating sodium sulfide and similar substances.** KALI-CHEMIE A.-G. Brit. 301,384, Nov. 28, 1927. See Ger. 476,218 (C. A. 23, 3781).

**Sodium silicate solution.** CHARLES D. WOOD (to Grasselli Chemical Co.). U. S. 1,719,038, July 2. Successive batches of a mixt. of "Na silicate glass" and water are agitated under superatm. steam pressure in a closed rotary cylinder to effect soln. and the resultant soln. is delivered from the cylinder by force of the pressure into a storage vessel.

**Calcium sulfate, etc.** I. G. FARBENIND. A.-G. Brit. 301,210, Dec. 5, 1927. Reaction of  $\text{H}_2\text{SO}_4$  or of sulfates on Ca compds. is effected in the presence of metaphosphoric acid or its salts;  $\text{CaSO}_4$  is obtained in a granular and readily filterable condition.  $\text{KNO}_3$  may be formed by reaction of  $\text{K}_2\text{SO}_4$  on  $\text{Ca}(\text{NO}_3)_2$  in the presence of metaphosphoric acid. The treatment of phosphate rock with  $\text{H}_2\text{SO}_4$  or  $\text{NaHSO}_4$  is also described.

**Zirconium sulfite and oxide.** RHENANIA-KUNHEIM VEREIN CHEMISCHER FABRIKEN A.-G. (to Kali-Chemie A.-G.). Brit. 300,271, Nov. 11, 1927. Solns. obtained by the action of  $\text{HCl}$  on the product produced by heating Zr ores with  $\text{CaO}$  and C are

treated with  $\text{SO}_2$  or a sulfite or bisulfite to ppt. basic Zr sulfite, which is converted into oxide by heating.

**Metal carbonyl compounds.** I. G. FARBERIND. A.-G. Brit. 301,099, June 25, 1927. Mixts. of metals which form carbonyls such as Fe, Ni, Co, Mo, etc., are sepd. by forming the mixed carbonyls, sepg. the carbonyls by fractional distn. or otherwise, and decomp. the sepd. carbonyls. Cf. C. A. 23, 3547.

**Nitrosyl chloride.** GUY B. TAYLOR (to E. I. duPont de Nemours & Co.). U. S. 1,717,951, June 18.  $\text{NO}_2$  is caused to react with an aq. soln. of KCl, the H halide concn. of which is less than that corresponding to a H halide vapor pressure of 1 mm. Hg.

**Atomizing sulfur.** ARTHUR J. CROWLEY and CHARLES S. HALEY (to Humboldt Sulphur Co.). U. S. 1,718,334, June 25. In atomizing S, e. g., for the purpose of finely subdividing it, the S is atomized by a nozzle adjacent the surface of a mass of molten S which serves as a supply for the atomization and also as a source of heat to prevent congealing of the S being atomized. An app. is described.

**Heat-exchange apparatus suitable for use in catalysis of sulfur dioxide to produce sulfur trioxide.** HANS O. C. ISENBERG (to General Chemical Co.). U. S. 1,719,610, July 2. Structural features.

**Silica gel.** I. G. FARBERIND. A.-G. (Richard May and Siegmund Munch, inventors). Ger. 477,101, Mar. 19, 1925. The manuf. of silica gel by the interaction of an alkali silicate soln. and an acid is conducted in 2 stages, in the 1st of which an alk. gel is pptd. and in the 2nd of which the gel is treated with gaseous  $\text{CO}_2$  or  $\text{SO}_2$ , the gel being broken into pieces between the 2 stages. Gaseous  $\text{CO}_2$  or  $\text{SO}_2$  may be used also in the 1st stage.

**Oxide of iron and sulfur.** COMSTOCK & WESCOTT, INC. Fr. 655,829, May 22, 1928. Fe ores, particularly sulfide ores, are chlorinated at about  $375^\circ$  to give  $\text{FeCl}_3$ , which is further chlorinated after removal of diluent gases to  $\text{FeCl}_3$ . This is roasted with air at  $700\text{--}800^\circ$  to give  $\text{Fe}_2\text{O}_3$  and Cl. A small quantity of producer gas may be added to coarsen the oxide produced. Part of the recovered Cl may be passed through molten S to form  $\text{S}_2\text{Cl}_2$ , which is used to chlorinate sulfide ores and part is used to chlorinate the  $\text{FeCl}_3$ . The S formed is recovered. Cl is used in both stages with oxide ores.

**Active carbon.** A.-G. FÜR STICKSTOFFDÜNGER. Brit. 301,330, Nov. 26, 1927. Active C is obtained by sieving or other suitable sorting of ashes from the combustion of coal, lignite, wood or peat and purifying the material. Ashes deposited in flues are especially suitable.

**Active carbon.** I. G. FARBERIND. A.-G. Brit. 301,313. Active C is rendered non-corrosive to iron and other metal app. by treatment with an electrolyte, the anions of which are non-injurious or are easily removable. Nitrate of Fe or Zn, free acids, etc., may be used. C may be prepd. suitable for medicinal purposes, for use in refining glycerol, etc.

**Active carbon.** KALI-CHEMIE A.-G. AND FRIEDRICH RÜSBERG. Ger. 477,372, Feb. 8, 1922. Active C prepd. from lignite and the like by carbonizing in the presence of KOH or  $\text{K}_2\text{CO}_3$ , extg. with water, and washing with acid is freed from ash by washing with an alkali soln. followed, if desired, by a further washing with acid.

**Active charcoal.** AENNE SCHREINER. Fr. 656,193, June 21, 1928. See Brit. 202,566 (C. A. 23, 1481).

**Activation of charcoal.** CHARLES J. V. FÉRY. Fr. 655,092, Oct. 15, 1927. Charcoal activated for elec. uses is prepd. by treating sawdust with NaOH or KOH to remove matter from the pores, drying and impregnating with dil.  $\text{H}_2\text{SO}_4$ ,  $\text{Pb}(\text{NO}_3)_2$  and calcining after drying, or after treatment with NaOH or KOH the sawdust is washed with water, impregnated with a soln. of  $\text{ZnSO}_4$  or  $\text{Zn}(\text{NO}_3)_2$  and calcined at a temp. higher than the distn. point of Zn.

**Carbon black.** LOUIS SIMPSON. Can. 290,539, June 18, 1929. Washed, dried and pulverized albertite is mixed with heated air and sprayed into a restricted space and subjected to successive currents of gas or air at varying temp., whereby the volatile gases in the mixt. are carried off and carbon black deposited.

**Plant construction for production of carbon black by decomposition of hydrocarbon gas.** ROY H. UHLINGER (to Thermoatomic Carbon Co.). U. S. 1,718,720, June 25.

**Lampblack, etc.** COMPAGNIE LORRAINE DE CHARBONS POUR L'ÉLECTRICITÉ. Brit. 300,610, Nov. 16, 1927, Fr. 656,765, Nov. 16, 1927. C blacks are rendered less dusty, while retaining their pulverulent condition, by adding up to 10% of tarry materials such as pine tar or natural asphalt. The product may be used as a filler with rubber or in prep. inks or paints.

**Phosphorus pentasulfide.** P. DUTOIT. Brit. 301,500, Dec. 1, 1927. See Swiss 131,096 (C. A. 23, 3781).

**Storing solid carbon dioxide.** J. W. MARTIN. Brit. 300,985, Nov. 22, 1927.

Solid blocks of  $\text{CO}_2$  are enclosed within paper bags or other wrappers and packed within a storage box.

**Gas comprising hydrogen and carbon monoxide.** I. G. FARBENIND. A.-G. Brit. 300,328, Aug. 24, 1927. An app. is described for burning hydrocarbons with just sufficient O to produce CO and H at temps. above  $1000^\circ$  without use of steam or catalysts.

**Carbon disulfide.** I. G. FARBENIND. A.-G. Brit. 300,579, Nov. 15, 1927. App. for volatilizing S and superheating the vapors is heated separately from the main retorts in which the S vapors react with C. Various structural features are described.

**Dissolving and separating hafnium and zirconium compounds.** ANTON E. VAN ARKEL and JAN H. DE BOER (to Naamlooze Vennootschap Philips' Gloeilampenfabrieken). U. S. 1,718,616, June 25. Hf and Zr phosphates are dissolved with oxalic acid and then fractionally pptd. (suitably with HCl). Cf. C. A. 22, 484.

**Hydrogen.** F. GÜLKER. Brit. 301,499, Dec. 1, 1927. See Fr. 647,257 (C. A. 23, 2539).

**Recovery of metals and metal compounds by chlorination and use of ammoniacal solutions.** I. G. FARBENIND. A.-G. Brit. 301,342, Aug. 24, 1927. Various details are specified for selective reaction and sepn. of metals such as Ag, Ni, Co, Cu and Zn in the presence of compds. of other metals such as Ca, Al and Mg.

**Artificial board.** CLARENCE C. VOGT (to Armstrong Cork Co.). U. S. 1,718,011, June 18. Plant material such as corn stalks is cooked and the fibers are sepd. so as to produce a fibrous mass contg. the natural binder of the plant fibers, suitable phenolic material is added to the mass, it is shaped into board form and the board is baked to form a water-repellent phenolic condensation product binder from the natural binder. U. S. 1,718,012 (C. C. VOGT and ERNEST J. PIEPER) specifies a generally similar process in which a toughening agent such as stearin pitch, wax tailings or asphalt is also added previous to shaping and baking.

**Material for artificial dentures.** SIDNEY W. WILDING (to Amalgamated Dental Co. Ltd.). U. S. 1,718,019, June 18. A translucent gum facing is provided with a backing of a phenol-aldehyde condensation product capable of being indurated by heat admixed with a pigment such as  $\text{ZnO}$ ,  $\text{BaSO}_4$  or Sn oxide, to give the backing the required color and opacity to impart a natural appearance to the gum facing.

**Artificial stone for grinding and polishing.** ERNST P. MARS (to Tribune Co.) U. S. 1,718,827, June 25. A mixt. of tripoli powder 40, rotten stone 8, sugar 2  $\text{PbO}$  80, and glycerol 29 parts may be molded and used for polishing Cu cylinders used in intaglio printing.

**Plastic composition.** ROBERT M. WITTHYCOMBE. Ger. 477,239, June 15, 1926. See Brit. 277,107 (C. A. 22, 2446).

**Plastic materials.** JOSEPH C. PATRICK and NATHAN M. MNOOKIN. Fr. 656,114, June 19, 1928. Plastic substances are prepd. by reaction of olefin halides with sol or insol. polysulfides. In examples,  $\text{Na}_2\text{S}_9\text{H}_2\text{O}$  is dissolved in water and boiled with the addn of S to give principally  $\text{Na}_2\text{S}_4$ , ethylene dichloride is added and the mixt. heated, giving a product resembling soft rubber. A similar product is obtained from  $\text{CaS}_4$  and chlorinated olefins from the cracking of petroleum. Harder products are obtained if lower sulfides such as  $\text{Na}_2\text{S}_2$  or  $\text{Na}_2\text{S}_3$  are used.

**Dispersion agents.** I. G. FARBENIND. A.-G. Swiss 126,575, Oct. 26, 1926. A dispersion agent is made from a non-gaseous fuel, e. g., coal, tar, mineral oils, by treating with H under pressure and at a high temp., followed by dehydrogenation, demethylation or other splitting reaction. The products are used for prepn. of lacquers, rubber solns., paste-like products, e. g., shoe polish, and emulsions for the textile industry.

**Photomechanical printing surfaces.** R. A. GLASER (to Postergraph, Inc.). Brit. 301,031, Nov. 23, 1927. In producing printing surfaces, especially those of large size, a half-tone neg. or transparency is copied or enlarged by projection directly on to a plate sensitized with dichromated gelatin or albumin, suitably on Zn (which may have an underlying coating of hardened gelatin or albumin). After exposure, the plate is flowed with developing ink contg. asphalt which is allowed to dry before development. The asphalt penetrates to the metal where the exposure has taken place, and on development the light-sensitive coating is entirely dissolved away leaving a grayish image of asphalt on the metal. The plate is powdered with soapstone, cleaned with tannic acid and resin and may be further treated with asphalt and touched up before inking for the press.

**Printing from wood surfaces.** JACOB K. SNYDER (to A. C. Horn Co.). U. S. 1,717,945, June 18. The surface of walnut is treated with  $\text{ZnCl}_2$  to place the grain in relief, the softened grain is brushed out and the  $\text{ZnCl}_2$  is neutralized (suitably with NaOH) a precipitant is applied as is also a metallic stearate such as Al stearate and a

binder such as a resin or oil. The surface is then used for printing. U. S. 1,717,946 relates to a generally similar method of treating oak in which caustic soda is used in the preliminary etching treatment. U. S. 1,717,947 relates to similar treatment of mahogany with use of HOAc as etching material. A metallic salt such as  $\text{AgNO}_3$  or  $\text{K}_2\text{Cr}_2\text{O}_7$  may be used for hardening the wood following neutralization of the etching soln.

**Sound records.** J. R. CRAIG. Brit. 300,829, Jan. 16, 1928. Perforated sheets of thin metal such as Al, or of paper, cardboard or asphaltic compn., etc., are coated with thermoplastic material such as a cellulose ester or resinous compn. for producing laminated records. Various details are given.

**Friction material for brake linings, etc.** BRITISH THOMSON-HOUSTON CO., LTD., H. W. H. WARREN AND R. NEWBOUND. Brit. 300,309, Aug. 12, 1927. A filter of metal and asbestos such as a woven brass wire and asbestos cloth is bonded with a condensation product such as may be formed from phthalic anhydride and glycerol which may be plasticized with oleic acid or a similar substance.

**Stereoscopic anaglyphs.** KALLÉ & Co. A.-G. Brit. 301,490, Dec. 1, 1927. The diazo layer for a blue print may comprise fluoborate of 1-ethylamino-2-methyl-4-diazobenzene, 1-amino-8-naphthol-3,6-disulfonic acid and tartaric acid and that for an orange print 1-diazo-2-naphthol-4-sulfonic acid, 1-phenyl-3-methyl-5-pyrazolone and HCl.

**Tarnish-resisting silverware.** DANIEL GRAY, RICHARD O. BAILEY and WM. S. MURRAY (to Oneida Community, Ltd.). U. S. 1,719,365, July 2. Silverware is exposed to Hg in an oven maintained at a temp. suitable for the vaporization of Hg and absorption of the Hg by the ware.

**Shoe-filling composition.** I. G. FARBERIND. A.-G. Brit. 300,924, Nov. 19, 1927. A filling material such as cork cuttings is used with a binder comprising a mixt. of rubber and a cellulose ester or ether and various solvent and modifying materials.

**Condensation products of urea and formaldehyde.** ALPHONSE GAMS and GUSTAV WIDMER (to Soc. anon. pour l'ind. chim. A. Bâle). U. S. 1,718,901, June 25. An initial condensation product sol. in water, made from urea 1 and  $\text{CH}_2\text{O}$  at least 2 mol. proportions, is treated with sufficient urea to bring the proportion of urea to not less than 1.05 mols. to 2 mols. of  $\text{CH}_2\text{O}$  and reaction is effected to form a final insol. product.

**Detergent.** C. H. BISHOP and I. G. JENKINS. Brit. 300,362, Oct. 1, 1927. A cleansing compn. suitable for use in small proportion with boiling water is prepd. by boiling together lime 2 lb., soda 2 lb., borax 2 oz. and water 2 gal., settling and filtering.

**Ice substitutes for skating rinks.** F. E. MÜLLER. Brit. 301,172, Oct. 22, 1927. Equal parts of calcined  $\text{Na}_2\text{CO}_3$  and crystd.  $\text{Na}_2\text{CO}_3$  are mixed with each other and less than half as much of a mixt. of calcined and crystd.  $\text{Na}_2\text{SO}_4$  is added and water is added subsequently. A small proportion of "tragacanth" also may be added and the surface may be treated with castor oil or glycerol.

**Wall finish.** WALTER B. ALLEN (to Craftex Co.). U. S. 1,718,936, July 2. A paint-like soln. comprising an absorbent base such as clay or kaolin and a protein binder such as a casein compn. is applied and over this there is applied a permeating soln. contg. a waterproofing material such as Chinese vegetable wax absorbable by the base and an ingredient such as  $\text{CH}_2\text{O}$  which is reactive with the protein binder to increase its hardness and water-resisting properties.

**Sack for chemical products.** SOC. D'ÉLECTROCHIMIE DE BRIGNOUD (ÉTABLISSEMENTS FREDET-KUHLMANN). Fr. 656,350, Nov. 7, 1927. Sacks which can increase in size with swelling of the material they contain are made with pleats, the walls of which are kept together with fixing means of suitable resistance.

**Coating surfaces.** FABRICE R. HERVÉ, MAXIME HERVÉ and ANDRÉ HERVÉ. Ger. 477,315, June 8, 1926. See Brit. 253,889 (C. A. 21, 2540).

**Shaft furnace for burning lime.** COMPAGNIE DES FORGES DE CHATILLON, COMMENTRY, NEUVES-MAISONS. Fr. 655,748, Oct. 25, 1927.

**Containers for ether.** E. MALLINCKRODT (to Mallinckrodt Chemical Works). Brit. 300,641, Nov. 17, 1927. See U. S. 1,697,320 (C. A. 23, 1230).

**Gaskets for use in double seams of metal cans.** BERTON S. CLARK (to American Can Co.). U. S. 1,717,664, June 18. Gaskets are formed of an emulsified rubber soln., fibrous material such as wood fiber and  $\text{ZnCl}_2$ .

# 19—GLASS, CLAY PRODUCTS, REFRACTORIES AND ENAMELED METALS

G. E. BARTON, C. H. KERR

**Progress of glassmaking in the States.** W. E. S. TURNER. *Glass Ind.* 10, 131-5 (1929). H. F. KRIEGE

**The navy and the glass industry.** G. K. SPENCER. *Glass Ind.* 10, 37(1929).—Various naval uses of glass are discussed, special reference being made to the high quality of gage glass. H. F. KRIEGE

**Chemistry of glass.** W. C. TAYLOR. *Glass Ind.* 9, 248-50(1928).—The principal kinds of glass in general and special use are discussed. Certain lines for fruitful research in glass chemistry are suggested. H. F. KRIEGE

**Some properties of glasses containing zinc oxide.** S. ENGLISH, W. E. S. TURNER AND FRANCIS WINKS. *J. Soc. Glass Tech.* 12, 287-96T(1928).—Glasses of the type  $6\text{SiO}_2 \cdot (2-x) \text{Na}_2\text{O} \cdot x\text{ZnO}$  are discussed. The substitution of  $\text{Na}_2\text{O}$  by  $\text{ZnO}$  brings about a steady increase in  $d$ , from 2.45 to 2.54 for the range of  $\text{ZnO}$  from 1.29 to 11.13%. The annealing temp. is affected very little with  $\text{ZnO}$  addns. below 10%. The thermal expansion is affected more. The optical properties coincide closely with those of glasses in which  $\text{CaO}$  is substituted similarly. H. F. KRIEGE

**Factors affecting the composition of common glassware.** J. B. KRAK. *Glass Ind.* 10, 107-9(1929).—The compn. of common glasses depends chiefly on the qualities desired—namely durability, luster and resistance to thermal and mech. shock. Economic factors such as melting temps. and devitrification ranges help to det. the compn. of the glass selected. H. F. KRIEGE

**Testing of fuel oil as practiced in a well-known glass factory.** W. RONALD LESTER. *Glass Ind.* 10, 163-4(1929).—Standard government and A. S. T. M. methods are followed for the various tests. H. F. KRIEGE

**The weathering of glass. III. Relation between the weathering of glass and the relative humidity.** KOZO TABATA. *J. Soc. Chem. Ind., Japan* 31, 224-5(1928), Suppl. binding 31, 60B; cf. *C. A.* 22, 2038.—When the relative humidity is below 70%,  $\text{Na}_2\text{O} \cdot 2\text{SiO}_2$  tends to dry, whereas a soln. of  $\text{K}_2\text{O} \cdot 2\text{SiO}_2$  remains in sirupy state until about 50% relative humidity is attained. The action of weathering proceeds vigorously when relative humidity exceeds 85% and it is very slow at 70%. S. KONDO

**The devitrification of glass. V. Devitrification of flint glasses and their constitution.** KOZO TABATA. *J. Soc. Chem. Ind., Japan* 31, 225-8(1928), Suppl. binding 31, 60-1.—The phenomena of surface devitrification along assumed boundary lines of devitrification of flint glasses,  $\text{R}_2\text{O} \cdot x\text{PbO} \cdot y\text{SiO}_2$ , were carefully observed. The crystals produced are  $\text{SiO}_2$  and the degree of devitrification varies with the relative contents of the components. Flint glasses, except those very rich in  $\text{PbO}$ , are a mutual soln. of  $\text{R}_2\text{O} \cdot 2\text{SiO}_2$ ,  $\text{PbO} \cdot 2\text{SiO}_2$  and  $\text{SiO}_2$ . Each mol. of  $\text{Na}_2\text{O} \cdot 2\text{SiO}_2$ ,  $\text{K}_2\text{O} \cdot 2\text{SiO}_2$  and  $\text{PbO} \cdot 2\text{SiO}_2$  dissolves 0.25, 4.25 and 0.5 mol. of  $\text{SiO}_2$ , resp. VI. A preliminary experiment on the determination of the heating conditions for flint glasses. *Ibid* 228-33, Suppl. binding, 61-4B.—Samples taken from Marconi M. T. 4 bulb glass were heated at 600°, 625°, 650°, 675°, 700°, 750°, 800°, 850° and 900° for 30 to 120 min. The results are shown with photographs. Radiotron U. V. 199 and Cymotron 201A glasses also were used for the expts. The most vigorous spontaneous crystn. of Marconi M. T. 4 glass occurs at about 700°. The crystal growth is rapid at temps. between 650° and 700°. The form of crystals changes at temps. over 750°. At temps. over 950° the rate of crystal solution is greater than that of crystal production. The content of  $\text{PbO}$  seems to have no great influence on the temp. at which the rate of spontaneous crystn. is greatest. The crystals produced are always  $\text{SiO}_2$  in spite of marked difference in the compns. of the glasses.

**VII. Devitrification of  $\text{R}_2\text{O}-\text{CaO}-\text{SiO}_2$ .** *Ibid* 349-56, Suppl. binding, 82-3B.—The phenomena of devitrification of  $\text{R}_2\text{O} \cdot 0.5\text{CaO} \cdot y\text{SiO}_2$  and  $\text{R}_2\text{O} \cdot 0.8\text{CaO} \cdot y\text{SiO}_2$  have been studied. The conditions of heating for the most vigorous surface devitrification have been detd. The glasses consist of  $\text{R}_2\text{O} \cdot 2\text{SiO}_2$ ,  $\text{CaO} \cdot \text{SiO}_2$  and  $\text{SiO}_2$ ; 1 mol.  $\text{CaO} \cdot \text{SiO}_2$  dissolves 0.25 mol. of  $\text{SiO}_2$  in the state of glassy mass. In treating the phenomena of devitrification of glass, it is better to observe the phenomena of the surface devitrification.

**VIII. Devitrification of  $\text{R}_2\text{O}-\text{BaO}-\text{SiO}_2$ .** *Ibid* 356-61, Suppl. binding, 83-4B.—Expts. have been made of the devitrification of  $\text{R}_2\text{O} \cdot 0.5\text{BaO} \cdot y\text{SiO}_2$  and  $\text{R}_2\text{O} \cdot 0.75\text{BaO} \cdot y\text{SiO}_2$ . The compds. contained in the glasses are  $\text{R}_2\text{O} \cdot 2\text{SiO}_2$ ,  $\text{BaO} \cdot \text{SiO}_2$  and  $\text{SiO}_2$ . The amt. of silica dissolved per mol. of  $\text{BaO} \cdot \text{SiO}_2$  is 0.5 mol. IX. Devitrification of  $\text{R}_2\text{O}-\text{ZnO}-\text{SiO}_2$ . *Ibid* 361-5, Suppl. binding, 84B. The method of surface devitrification has been ap-

plied to  $R_2O \cdot 0.5-2.0ZnO \cdot ySiO_2$ . Constituents of the glasses are  $R_2O \cdot 2SiO_2$ ,  $ZnO \cdot 2SiO_2$  and  $SiO_2$ . No  $SiO_2$  is dissolved by  $ZnO \cdot 2SiO_2$ . X. Devitrification of  $R_2O \cdot MgO \cdot SiO_2$ . *Ibid* 365-8, Suppl. binding, 84B.—The surface devitrification of  $R_2O \cdot 0.5-2MgO \cdot ySiO_2$  has been studied. The glasses consist of  $R_2O \cdot 2SiO_2$ ,  $MgO \cdot 2SiO_2$  and  $SiO_2$ . No  $SiO_2$  is dissolved by  $MgO \cdot 2SiO_2$ . XI. The heating conditions. *Ibid* 369-71, Suppl. binding, 85B.—In the previous expts., the devitrification was observed at the max. rate of crystn. of  $SiO_2$  in the glass. The phenomenon takes place most markedly at sharp edges and is accelerated by surface contraction. The temps. at which the rate of crystn. of  $\beta$ -quartz occurs can be detd. by heating samples for about 60-120 min., during this period the sharpest edges round up slowly. Samples should contain a certain excess of silica. The crystn. of silicates should not occur to such an extent that crystallization of silica is hindered; and also weathered samples should not be used. XII. Devitrification of glasses containing boric anhydride. *Ibid* 372-3. Suppl. binding, 86-7B. Expts. have been made of devitrification of glasses composed of  $R_2O \cdot 0.8-2.0RO \cdot 0.25-0.5B_2O_3 \cdot 3.25-10.5SiO_2$ . The crystals produced by appropriate heat treatment are  $SiO_2$ . B compds. present in the glasses are  $RBO_2$ . The reactivity of  $Na_2O$  toward  $B_2O_3$  may exceed that of  $K_2O$ . S KONDO

**Experiments on coating and welding of glass.** SANGORO MURAKAMI. *J. Japan Ceram. Assoc.* 36, 303-11(1928).—In coating a glass on another, that with larger coeff. of expansion is cracked. In tubes, the cracks have net-like shapes on the inside and are lengthwise straight lines on the outside. Difference in coeff. of expansion should be less than  $60 \times 10^{-8}$  for safe coating. The glass with the larger coeff. should be used on the outside. In welding, the 2 glasses should show a diff. in elongation of less than 50% in the pull test. A flexible tube with spiral cracks can be obtained by coating a glass on both sides of another with smaller coeff. of expansion or by coating thickly a glass on another with smaller coeff. of expansion. S. KONDO

**Soda-zinc glasses.** KITSUZO FUWA, SUKEHARU SAKAI, MASABUMI SATO and FUJIO SUZUKI. *J. Japan Ceram. Assoc.* 36, 135-53, 243-64(1928).—Expts. were made on the influence of chem. compn. of glasses  $0.5-2Na_2O \cdot 0-6ZnO \cdot 6SiO_2$  upon their melting, weathering, devitrification, workability, effect of reheating, coeff. of expansion, elongation, thermal endurance and resistance to chemicals. Glasses within the range  $1.0Na_2O \cdot 0.25ZnO \cdot 0.75Na_2O \cdot 1.75ZnO \cdot 1.0Na_2O \cdot 0.4 \cdot 0ZnO \cdot 1.75Na_2O \cdot 0.5 \cdot 0ZnO \cdot 2.0Na_2O \cdot 2.5ZnO \cdot 1.75Na_2O \cdot 0.75ZnO$  were workable, being free from devitrification, weathering and difficulty of melting. Thermal expansion of the glasses was measured; the constns. given by Winkelmann-Schott and English-Turner are discussed. The former agree better with facts than the latter except for  $(2-x)Na_2O \cdot xZnO \cdot 6SiO_2$ . The constns. given by Winkelmann and Schott, by English and Turner and by the present authors, resp., are for  $SiO_2$   $0.8 \times 10^{-7}$ ,  $0.15 \times 10^{-7}$ ,  $0.722 \times 10^{-7}$ ; for  $Na_2O$   $10.0 \times 10^{-7}$ ,  $12.96 \times 10^{-7}$ ,  $10.65 \times 10^{-7}$ ; for  $Al_2O_3$   $5.0 \times 10^{-7}$ ,  $0.52 \times 10^{-7}$ ,  $0.45 \times 10^{-7}$ ; for  $ZnO$   $1.8 \times 10^{-7}$ ,  $2.1 \times 10^{-7}$ ,  $1.74 \times 10^{-7}$ . In the pull test, the rate of elongation of  $yNa_2O \cdot xZnO \cdot 6SiO_2$  increases with increase of  $x$ . The increase in the rate tends to be weakened with increase of  $y$ . The lowest temps. at which tubes of a fixed size have been cracked when they were dropped into cold water were measured. In general, the zinc glasses endure better than lime or lead glasses and the endurance is not much influenced by the variation in  $x$  as long as  $y$  is small, while it is reduced by the increase in  $x$  when  $y$  becomes large. The formula of Winkelmann-Schott was not valid for the specimens. The glasses are very resistant to water so long as  $x$  is not small. The resistance is not much influenced by the proportion of  $x$  and  $y$ . Glasses  $0.75Na_2O \cdot 1.0-2.0ZnO \cdot 6SiO_2$  are most resistant. The resistance to HCl is much influenced by the variation in  $x$  and  $y$ .  $1.0Na_2O \cdot 1.25ZnO \cdot 6SiO_2$  was most insol. The glasses are not highly resistant to NaOH soln. The variation in the resistance is small except in the glasses with small  $y$  or with certain ranges of  $x$ . The soly. in  $Na_2CO_3$  soln. is not small but not so large as in NaOH. S. KONDO

**Frosting glass by etching.** MINEICHI MASUDA. *J. Japan Ceram. Assoc.* 36, 183-92(1928).—Exptl. work is described which leads to the conclusion that among various theories of frosting phenomenon only the protection theory is correct. A soda-lead and a soda-line bulb glass were etched with a soln. composed of  $NH_4F$  12, HF 8 and water 12 parts. The frosted surfaces showed no double refraction. No difference in refractive index was observable between the cryst. and the unetched parts. The powder of the frosted glasses gave no pattern in x-ray spectra. Grains constituting a white film on the frosted surface of a transparent quartz glass did not act on polarized light and had  $n_D$  1.370.  $(NH_4)_2SiF_6$  prepd. for the sake of comparison had the same index, i. e., 1.370. The white film and the  $(NH_4)_2SiF_6$  gave x-ray spectra. S. KONDO

**The manufacture of laminated safety glass.** JOSEPH ROSSMAN. *Glass Ind.* 10, 1-6, 28-34, 57-64, 88-90(1929).—A history of the development of laminated glass and a

discussion of the U. S. patents relating to the solvents, org. films and machinery used in the manuf. of transparent, reinforced, non-shatterable glass. H. F. KRIEGE

Insulation in the glass plant. J. D. VANVALKENBURGH. *Glass Ind.* 9, 241-8 (1928). H. F. KRIEGE

Red lead for the glassmaker. R. L. HALLOWS. *Glass Ind.* 9, 269-71 (1928).—The manuf. of red lead and satisfactory methods of its analysis are discussed. H. F. KRIEGE

Machine-blown bottles at 300 tons a day. EVERETT P. PARTRIDGE. *Ind. Eng. Chem.* 21, 638-43 (1929).—The automatic bottle-mfg. process as worked out in the Alton plant of the Illinois Glass Co. is described. The article deals with the handling of raw materials in the batch plant, the passage of the mixed batch to the glass furnaces, melting and refining of the batch, blowing of the bottles by means of vacuum-feed and of gob-feed type machines and the delivery of the bottles through continuous lehrs to the packing room. G. H. VON FUCHS

Pressing glass. ROY E. SWAIN. *Glass Ind.* 10, 135 (1929).—The need of proper equipment and skilled labor in the manuf. of pressed ware is stressed. H. F. K.

Alkalinity of Japanese glass. S. KAWADA AND T. SUZUKI. *J. Pharm. Soc. Japan* 49, 464-75 (1929).—Supplementary note. Cf. Annual Rept. of Kurashiki Central Hospital. Vol. 2, 1928. F. I. NAKAMURA

Chromium oxide and its employment in the ceramic industries. P. RENAULT. *Corriere ceram.* 10, 133, 135, 137 (1929).—A review. G. SCHWOCH

Application of colloid chemistry to the study of clays. I. A. ERIC J. VICKERS. *Trans. Ceram. Soc. (England)* 28, 91-100 (1929).—A review. H. F. KRIEGE

What happens when clay is fired? A. T. GREEN. *Claycraft* 1, 334-8 (1928). *Building Sci. Abstracts* [N. S.], 1, 235. H. L. D.

General statements on drying (ceramic materials). CARL LOESER. *Sprechsaal* 61, 921-3 (1928). C. H. LORIG

The occurrence, mining, and properties of Schonhaid sagger earth. E. KIEFFER. *Sprechsaal* 61, 941-3 (1928).—The av. compn. of the earth is clay substance 68.4, quartz 24.5 and feldspar 7.1%. Its cone m. p. is 33-4. C. H. LORIG

Efflorescence in brickwork. W. A. WRIGHT. *Claycraft* 1, 300-5 (1928); *Building Sci. Abstracts* [N. S.], 1, 236. H. L. D.

Some experiments in drying clay. R. S. TROOP AND F. WHEELER. *Trans. Ceram. Soc.* 27, 303-19 (1928); cf. *C. A.* 22, 1661, 1834. H. F. KRIEGE

"Selenium red" as a ceramic color. J. H. POLGREAN. *Trans. Ceram. Soc.* 28, 87-90 (1929).—It is possible to produce Se red powder by careful calcination with fluxes. Its color is lost at temps. above that of the enamel kiln. H. F. KRIEGE

Effect of substituting high-silica sand for some grades in lime-bonded silica bricks. W. HUGILL AND W. J. REES. *Trans. Ceram. Soc.* 28, 62-4 (1929); cf. *C. A.* 22, 1661. —Satisfactory characteristics were developed in bricks made of a high-SiO<sub>2</sub> sand in place of quartzite. H. F. KRIEGE

Some experiences with the use of temperature-measuring installations for the burning of clay tubes. WALTER JAEKEL. *Sprechsaal* 61, 943-4 (1928). C. H. L.

Further note on the crystalline break-up of kaolin. J. F. HYSLOP AND H. P. ROOKSBY. *Trans. Ceram. Soc.* 27, 299-302 (1928); cf. *C. A.* 22, 4746. —Examn. by x-ray shows that (a) the breakdown of the kaolin lattice occurs at 550° with the formation of the cryst. phase  $\alpha$  (4Al<sub>2</sub>O<sub>3</sub>·3SiO<sub>2</sub>); (b) the 870° crit. pt. is associated with the breakdown of a silicate lattice ( $\alpha$ ) and with the appearance of  $\gamma$  Al<sub>2</sub>O<sub>3</sub> and sillimanite; (c) the  $\gamma$  Al<sub>2</sub>O<sub>3</sub> without evidence of  $\alpha$  Al<sub>2</sub>O<sub>3</sub> persists beyond 870° but over 1060° it decreases and finally disappears. Thus the 870° point is not associated with an Al<sub>2</sub>O<sub>3</sub> change and indicates the existence of sillimanite under 1060°. Above this temp. mullite is formed. H. F. KRIEGE

Kilns and kiln firing. I. Introduction and general summary. S. R. HIND. *Trans. Ceram. Soc.* 28, 26-52 (1929).—Kilns for building brick and tile, sanitary ware, refractories and pottery are discussed. H. F. KRIEGE

The melting behavior of china glaze of the system: SiO<sub>2</sub>-B<sub>2</sub>O<sub>3</sub>-Al<sub>2</sub>O<sub>3</sub>-Na<sub>2</sub>O-CaO-PbO. E. LEONHARDT AND E. ZSCHIMMER. *Sprechsaal* 61, 763-7, 785-7, 805-7, 843-7, 961-5, 977-80, 997-1001, 1019-22 (1928).—The deformation points of Seger cones 022 to 010a were detd. for heating rates of 2° and 6° per min. Heating rate has a great influence. Cones between 012a and 1 soften at a higher temp. with slow heating than with rapid heating, because compds. which melt at a higher temp. form on the surface of the cones. The deformation temp. of Seger cones cannot be definitely established. C. H. LORIG

Smoky glazes, glittering ornamentations, metallic colors. JOSEF WOLF. *Sprech-*



*sual* 61, 883-6, 905-7(1928).—A comprehensive review of literature on smoky glazes is given. In prep. mixes for glittering ornamentalations sulfides of Cu, Ag, Bi and Fe are used. They are mixed with ocher or kaolin in a ratio of 1:3 or 1:5. Metallic coloring materials are prep'd. by mixing metallic salts with a resinous soln. of NaOH. C. H. L.

The electric furnaces for the firing of majolica and the glazed ornaments. G. MILANI. *Corriere ceram.* 10, 43-5(1929). G. SCHWOCH

Brilliant gold. F. CHEMNITUS. *Sprechsaal* 61, 748-50, 767-9(1928).—The theory and practice of brilliant gold prep'n. is discussed. It is prep'd. from solns. of Au, Rh, Ir, Bi, Cr, rosin and asphalt. C. H. LORIG

Refractories for the pottery industry. II. Saggars. W. EMERY. *Trans. Ceram. Soc.* 27, 169-219(1928). H. F. KRIEGER

Refractory material used as mortar for laying up refractories. D. A. MOULTON. *Trans. Ceram. Soc.* 27, 329-33(1928).—High-temp. cements can be made from pulverized burnt fireclay of good refractory qualities mixed with 3-6% of bentonite or aquacrylite. The fusion range of the grog is decreased from cone 30-31 to cone 27 with 10% addn. of the colloidal material. The mortar reaches its final set in 4-5 hr. and attains a good structural strength. H. F. KRIEGER

Kilns for burning refractories. WHITFIELD, GIBBONS, WILLIAMSON, TARRANT AND TAUDEVIN. *Refractories J.* 4, 202-44(1929).—A series of papers presented on the various tunnel kilns used in burning refractories. Those discussed were the Robertson, the Dressler, the Woodall-Duckham, the Williamson and the E. I. C. T. tunnel kilns. M. A. EDDY

Solid-fuel laboratory furnace to determine the refractoriness of refractory materials, etc. A. N. SISOEY. *Sprechsaal* 61, 807-8(1928).—A high-temp. lab. furnace burns retort coke. Temps. above 1600° can be obtained. C. H. LORIG

How to reduce furnace refractory costs. J. L. GRAUEL. *Ind. Power* 16, No. 6, 67-8, 122-8(1929).—Installation of SiC refractory furnace linings increased life of the bridge wall at a large paper mill 4 times. By air-cooling the wall, preheated air was furnished for combustion, bringing about further saving in fuel. E. I. S.

Conception of hardness and its practical interest in the study of materials, especially brick (MARCOTTE) 13. The theory of fine grinding (MARTIN, BOWES) 13. Se and its use in the arts (in manufacture of ruby glass and in decolorization of Fe-containing glass) (KUPFERATIS) 18. The vitreous state (SAMSOEN) 2. Studies on glass III. Dielectric constants of glassy and liquid glucose (CATTOIR, PARKS) 2. Refractory composition for ingot mold hot tops (U. S. pat. 1,717,575) 9.

BOLLENBACH, HERMANN: *Keramische Rechentafeln zum Gebrauch in den Laboratorien der Ton-, Glas- u. Email-Industrie*. 2nd ed. Halle: W. Knapp. 113 pp. M. 6.90; bound, M. 8.40.

Composite glass sheets. E. GEISEL. *Brit.* 300,875, April 17, 1928. A textile material such as tulle, muslin, voile or etamine is secured to or between sheets of glass by use of gum arabic or other suitable adhesive (which may be selected to have the same refractive index as the glass).

Compound glass. "MÜHLIG-UNION" GLASHÜTTEN A.-G. Austrian 111,832, Aug. 15, 1928. Celluloid sheets are coated or rubbed on both sides with a fatty or waxy substance, e. g. a glyceryl ester of a lower fatty acid or a lower alkyl ester of a higher fatty acid, which penetrates but slowly into the celluloid and hinders absorption of solvent. A solvent is then applied and the sheets are united with glass sheets by pressure.

Cooler and associated apparatus for use in sheet glass manufacture. LEOPOLD MAMBOURG (to Libbey-Owens Sheet Glass Co.). U. S. 1,718,372, June 25. Structural features.

Glass-making furnace. KURT KUNZEL. *Fr.* 656,175, June 21, 1928.

Electric furnace for glass making. HENRI GEORGE. *Fr.* 655,751, Oct. 25, 1927.

Apparatus for feeding mold charges of molten glass. LEONARD D. SOUBIER (to Owens Bottle Co.). U. S. 1,718,608, June 25. Structural features.

Apparatus for feeding mold charges of molten glass. WM. J. MILLER (to Hartford Empire Co.). U. S. 1,717,802, June 18.

Apparatus for making glass sheets or plates by rolling. J. H. LEMAIRE. *Brit.* 301,083, Nov. 25, 1927. Structural features.

Checker-work and associated construction of a furnace for heating glass-melting

tanks. ROBERT P. CALLARD (to Libbey-Owens Sheet Glass Co.). U. S. 1,718,331, June 25.

Apparatus for forming blown glassware. SOC. ANON. D'ÉTUDES ET DE CONSTRUCTIONS D'APPAREILS MECANQUES POUR LA VERRERIE. Brit. 300,638, Nov. 18, 1927.

Drawing glass tubing. P. BLUM (to P. A. Favre). Brit. 300,646, Nov. 17, 1927. Mech. features.

Rotary inclined horizontal furnace for melting glass batch ingredients together. G. ZOTOS. Brit. 300,576, Nov. 15, 1927.

Drying system for use with annular kilns for ceramic ware, etc. OTTO BUSCH. U. S. 1,718,190, June 18. Structural features.

Hollow articles of fused silica. I. G. FARBERIND. A.-G. Brit. 301,117, Aug. 26, 1927. A mass of fused quartz is inflated against the wall of the furnace after removal of the heating elements. An elec. furnace construction and various details of operation are described.

Pottery-kiln construction. F. BENNION, H. J. PLANT and J. B. CLARKE. Brit. 301,270, April 26, 1928. The kiln lining consists of fireclay boxes filled with diatomite or other suitable non-conductor of heat. Various other structural features are described.

Regenerative tunnel kiln for ceramic materials. FRIEDRICH SIEMENS A.-G. and HUGO KNOBLAUCH. Ger. 477,260, Sept. 17, 1924.

Molded refractory material. G. KNUDSEN, V. M. GOLDSCHMIDT and R. KNUDSEN. Brit. 301,547, Sept. 3, 1927. Powd. or granular olivine rock is treated to effect a recrystn and cementation together of the grains, as by heating in the presence of small quantities of substances such as silicates, borates, chlorides, nitrates and phosphates of alkali metals, nitrates, borates, chlorides and phosphates of Sn, Mn, Fe and alk. earths and silicates, phosphates and borates of tervalent and quadrivalent metals. Various examples and details are given.

Aluminous abrasive. RAYMOND R. RIDGWAY and JOHN B. GLAZE (to Norton Co.). U. S. 1,719,131, July 2. A product which may be used as an abrasive or refractory comprises cryst. alumina grains of high purity in assocn. with reduction products of alumina and with Al sulfide (the sulfide not exceeding 3% of the mass). The material undergoes disintegration when subjected to hydrating conditions.

Reclaiming abrasive materials from bonded scrap, etc. SAMUEL F. WALTON (to Exolon Co.). U. S. 1,718,264, June 25. The scrap is heated and then suddenly cooled to render the bonding material relatively friable and then milled to reduce the bond to a separable condition.

Opacifying pigments. CHARLES J. KINZIE (to Titanium Alloy Mfg. Co.). U. S. 1,719,432, July 2. In making composite colored opacifying pigments for vitreous enamels, a charge comprising a Zr compd such as  $ZrO_2$ , a fluxing agent such as K feldspar,  $NaNO_3$ , borax,  $H_2BO_3$ , ZnO and cryolite and a homogeneously distributed coloring material such as Co oxide is heated to  $950^\circ$  for 3 hr. and the resulting mass is cooled.

Apparatus for molding ceramic insulators under air pressure. STEWART L. MOORE, JR. (to Locke Insulator Corp.). U. S. 1,717,996, June 18. Structural features.

## 20—CEMENT AND OTHER BUILDING MATERIALS

J. C. WITT

Recent developments in the chemistry of cement manufacture. HANS KUEHL. *Pit and Quarry* 18, 84-6(1929). E. H.

The strength of cement and its fineness. A. DAHLGREN. *Rev. matériaux construction trav. publics* 1929, 175.—Two cements having residues of 0.7 and 6% on the sieve 4900 meshes per sq. cm. are found to have almost the same tensile strength. The compressive strength of the finer is slightly higher at early ages but about the same at 28 days. The conclusion is reached, and confirmed by a short treatment with HCl, that the best results are obtained with a cement having a residue of about 15%.

F. O. ANDEREGG

Serving a 14,000 kva load for cement mills. E. G. FLOCK and M. A. HYDE, JR. *Elec. World* 94, 62-5(1929).—4 illus. C. G. F.

Twenty-five years of special cements. C. PRUSSING. *Zement* 17, 1496-500 (1928). H. F. KRIEGER

Storage of cement. VIKTOR BÄHRNER. *Zement* 17, 1556-9(1928).—Twelve brands of Swedish cement were examnd. for fineness, setting time, compressive and tens-

ile strength after storage in the original paper bags for periods up to 6 months. No decrease in quality was found after 1 month's storage. Thereafter a reduction in the fineness and strength resulted with increasing time of storage.

H. F. KRIEGE

**Distribution of particles of cements.** Kozo Fujii. *J. Japan Ceram. Assoc.* 36, 46-57(1928).—Fineness of five cements was detd. successively by means of sieves with 4900, 6400 and 10,000 meshes per sq. cm., an air analyzer and an elutriation app. with EtOH. In general, the % wt. of each fraction increased with decrease in size. The wt.-size curves have a min. at diam. of 4-6 $\mu$ , a max. at 8-10 $\mu$  and another max. at 0-2 $\mu$  or 2-4 $\mu$ . The total surface area of 100 g. of each cement is given. The whole cement and that fraction consisting of particles smaller than 18 $\mu$  in diam., resp., contained SiO<sub>2</sub>, 21.10, 20.42; Al<sub>2</sub>O<sub>3</sub>, 6.01, 6.21; Fe<sub>2</sub>O<sub>3</sub>, 2.29, 2.17; CaO, 63.90, 61.60; MgO, 1.03, 0.91; SO<sub>3</sub>, 1.53, 1.85; loss on ignition, 3.01, 6.50; and showed hydraulic modulus, 2.11, 2.14; SiO<sub>2</sub>/Al<sub>2</sub>O<sub>3</sub>, 3.05, 3.29; and SiO<sub>2</sub>/Fe<sub>2</sub>O<sub>3</sub>, 2.29, 2.44.

S. KONDO

**Early-strength of cement.** I. S. NAGAI. *J. Japan Ceram. Assoc.* 36, 1-11(1928).—Various Japanese portland cements have been compared with 2 imported high early-strength cements, d., sieve, tensile and compression tests being made. It is concluded that 80-90% of the tensile strength is developed in 18-24 hrs. in most of the cements; the increase in compressive strength is much slower; most of the Japanese cements have high early compressive strength, but are inferior to the imported cements in tensile strength; a 2-day test is more rational than a 3-day test.

B. C. A.

**The early strength of cement.** II. SHOICHIRO NAGAI. *J. Japan Ceram. Assoc.* 36, 193-207(1928); cf. preceding abstr.—The early strengths of an alumina cement (Lumnite), a blast-furnace cement made by the Steel Works of the Imperial Government and two domestic early-high-strength port. cements are compared. III. *Ibid* 537-45.—N. gives results obtained in expts. on the early strengths of Velo cement, special cement, Supercement and two Japanese port. cements of high-silica type. IV. *Ibid* 577-87.—Chem. analyses are given of the cements which were used in the comparison tests of the early strength and described in the previous report. Two port. cements were sifted with a No. 300 sieve (about 13,960 meshes/sq. cm.) and the strengths of the coarser part, the original sample and the finer part are compared. The sifting caused no material change in their compn. Loss in strength due to aging was detd. by keeping a sample of cement in a closed vessel connected with a source of CO<sub>2</sub> satd. with moisture for 2 weeks. Aging decreased the tensile strength at one day from 23.3 to 3.9, and at 28 days from 30.9 to 26.2; it decreased the compressive strength at 1 day from 160 to 19, and at 28 days from 522 to 367.

S. KONDO

**Moduli of portland cement.** HESS. *Zement* 18, 36-9(1929).—The discussion deals with the value of three- and four-component systems in understanding the compn. of cement.

H. F. KRIEGE

**Some new moduli and indices relating to main hydraulic components of portland cements.** I. SHOICHIRO NAGAI. *J. Soc. Chem. Ind. (Japan)* 32, 236-42(1929), Suppl. binding 32, 73B.—There is no close relation between strengths and hydraulic modulus  $\text{CaO}/(\text{SiO}_2 + \text{Al}_2\text{O}_3 + \text{Fe}_2\text{O}_3)$ , silica modulus  $\text{SiO}_2/(\text{Al}_2\text{O}_3 + \text{Fe}_2\text{O}_3)$ , index of activity  $\text{SiO}_2/\text{Al}_2\text{O}_3$ , iron modulus  $\text{Al}_2\text{O}_3/\text{Fe}_2\text{O}_3$ , etc. In the lime factor  $\text{CaO}/(2.8\text{SiO}_2 + 1.1\text{Al}_2\text{O}_3)$ , cementation index  $(2.8\text{SiO}_2 + 1.1\text{Al}_2\text{O}_3 + 0.7\text{Fe}_2\text{O}_3)/(\text{CaO} + 1.4\text{MgO})$ , index of acidity  $2.8\text{SiO}_2/(1.1\text{Al}_2\text{O}_3 + 0.7\text{Fe}_2\text{O}_3)$ , etc., the manner of combinations of the main hydraulic component is considered, but they never express useful relations between them and strengths of mortars. II. *Ibid* 243-9, Suppl. binding 73-5B.—N. has proposed some new moduli and indices relating to main hydraulic components of cements and has calcd. their values for many Japanese and foreign port. cements. Some of these newly proposed moduli and indices are: Lime-silica ratio or lime-silica combining ratio =  $\text{CaO} - (1.65\text{Al}_2\text{O}_3 + 0.70\text{Fe}_2\text{O}_3 + 0.70\text{SO}_3 + \text{Free CaO})$ ; lime-silica molar ratio  $m =$

$$1.07 \times \frac{\text{SiO}_2 - 0.80 \times \text{insol. residue}}{\text{CaO} - (1.65\text{Al}_2\text{O}_3 + 0.70\text{Fe}_2\text{O}_3 + 0.70\text{Fe}_2\text{O}_3 + 0.70\text{SO}_3 + \text{Free CaO})} \quad \text{molar}$$

$$\text{ratio of tricalcium silicate to dicalcium silicate} = \frac{\text{molar \% of } 3\text{CaO SiO}_2}{\text{molar \% of } 2\text{CaO SiO}_2} - m - 2.00$$

Eight means of recent Japanese port. cements and five early-high-strength port. cements are plotted on a diagram of ternary system  $\text{CaO-SiO}_2\text{-Al}_2\text{O}_3$ , and merits and demerits of many cements of low-silica and high-silica types of Japanese and foreign port. cements are discussed. Three components CaO, SiO<sub>2</sub> and Al<sub>2</sub>O<sub>3</sub> were calcd. as follows: (1)  $\text{CaO} = \text{Total CaO} - (0.70\text{SO}_3 + \text{Free CaO})$ ; (2)  $\text{SiO}_2 = \text{Total SiO}_2 - 0.80 \times \text{insol. residue}$ ; (3)  $\text{Al}_2\text{O}_3 = \text{Al}_2\text{O}_3 + \text{Fe}_2\text{O}_3$ .

S. KONDO

**Studies on mixed portland cements.** I. SHOICHIRO NAGAI. *J. Soc. Chem.*

*Ind. (Japan)* 32, 343-9(1929), Suppl. binding 32, 101-3B.—There are two sorts of mixed port. cements made in Japan, namely blast-furnace cement and Soliditit. The blast-furnace cement has recently made remarkable progress in the strength of 1:3 mortar, while the Soliditit has made no progress and is far inferior. N. modified the process of making Soliditit by adding one more admixture of siliceous nature. This new mixed port. cement has been named "Neo-Soliditit" and has just been patented (Jap. Pat. No. 80,692). The Neo-Soliditit is a remarkably early-high-strength cement and is comparable to superior foreign early-high-strength port. cement. S. KONDO

Graphical method of calculating cement raw mixture. KOZO FUJII. *J. Japan Ceram. Assoc.* 36, 369-81(1928).—When for raw materials, a hydraulic modulus, a silica modulus and an iron modulus are given, approx. proportion of the raw materials can readily be obtained by graphical method. However, the result must be checked by a mathematical method if accurate proportion is required. By the graphical method the adaptability of a given raw material can be detd. quickly. S. KONDO

Test on Japanese cement. V. SHOICHIRO NAGAI. *J. Japan Ceram. Assoc.* 36, 104-13(1928).—Cements made in Japan in 1927 were finer and produced mortars of slightly higher tensile and compressive strengths than those tested in 1924 and 1926. VI. *Ibid* 265-75.—The following figures give the % compn. of (1) av. of 12 Japanese port. cements, (2) Velo cement, (3) blast-furnace cement and (4) Soliditit, resp.: Loss on ignition, 1.02, 2.59, 0.74, 1.67; insol. residue, 0.25, 2.56, 0.78, 12.80; SiO<sub>2</sub>, 21.87, 20.37, 26.53, 31.51; Al<sub>2</sub>O<sub>3</sub>, 5.58, 6.75, 8.24, 7.26; Fe<sub>2</sub>O<sub>3</sub>, 3.12, 2.43, 3.14, 2.66; MnO, —, —, 1.00, —; CaO, 65.60, 63.57, 54.86, 51.59; MgO, 1.28, 1.17, 1.34, 1.77; SO<sub>3</sub>, 1.30, 2.78, 1.28, 1.70; sulfide sulfur, —, —, 0.65, —; alkalis, —, —, 2.12, 1.80. Recent Japanese port. cements show less long-time strengths as a result of increase in fineness. The relation between their chem. compn. and strengths is discussed. VII. *Ibid* 440-8.—The results of long-time strength tests, chem. analyses, and various indices or ratios between constituents of cements, manufd. in the autumn of 1927 are given. Av. of 12 Japanese port. cements, ferroconcrete, and Luminite, resp., showed loss on ignition, 1.05, 2.39, 2.94; insol. residue, 0.38, 0.48, 2.86; SiO<sub>2</sub>, 21.52, 21.36, 8.03; Al<sub>2</sub>O<sub>3</sub>, 5.17, 5.50, 38.92; Fe<sub>2</sub>O<sub>3</sub>, 3.64, 2.65, 6.82; CaO, 65.55, 65.00, 38.06; MgO, 1.37, 1.18, 0.96; SO<sub>3</sub>, 1.21, 1.66, 0.68%. VIII. *Ibid* 475-83.—The results are given of strength tests on 19 Japanese port. cements, a blast-furnace cement and a Soliditit, all collected at Tokio and Osaka markets in April, 1928, Velo cement (Denmark), special cement (Germany) and Super-cement (England). S. KONDO

The abrasion of cement and cement meal during the mechanical analysis and the most durable time of sieving. FÖRDERREUTHER and HAEGGERMANN. *Zement* 17, 1596-1600, 1627-31(1928).—The best sieve analysis is not necessarily the one giving the least residues per screen. Since abrasion is most serious with the coarser sizes the time for the hand sieving is reduced considerably for the coarser material. H. F. KRIEBE

Action of acid on cement mortar. SHOICHIRO NAGAI. *J. Japan Ceram. Assoc.* 36, 382-94(1928).—The effects of H<sub>2</sub>SO<sub>4</sub> and HCl on the tensile strengths of 1:3 mortars of a port. cement, a blast-furnace cement and a Soliditit have been studied. The action of 0.1 N H<sub>2</sub>SO<sub>4</sub> is fairly strong. HCl acts more severely. S. KONDO

Studies on modulus of rupture of cement mortars. II. SHOICHIRO NAGAI. *J. Soc. Chem. Ind. (Japan)* 31, 1153-8(1928), Suppl. binding, 31, 274-5B.—Tensile strength, modulus of rupture and compressive strength of 1:3 mortar of each cement were nearly the same for three standard sands, if compared at the same hardening age. The coeff. of modulus of rupture to tensile strength was Ca 2.05 for every standard sand mortar. Thus, the Japanese new standard sand is nearly equal to the German and American standards. Form of test piece had little or no influence on the modulus of rupture. S. KONDO

Bending strength of cement mortars. I. SHOICHIRO NAGAI. *J. Soc. Chem. Ind., (Japan)* 32, 431-7(1929), Suppl. binding, 32, 131-3B.—The results of the expts. on the bending strength or transverse strength of cement mortars for seven port. cements and a Soliditit cement, lately made in Japan, and an American high-alumina cement (Lumnite) are described. S. KONDO

Strength formula of cement mortars. I. SHOICHIRO NAGAI. *J. Soc. Chem. Ind. (Japan)* 31, 1159-66(1928), Suppl. binding, 31, 276B.—Unwin's rational formula  $y = a + b(x - 1)^n$ , in which  $a$  is the strength at one week,  $y$  is the strength at  $x$  weeks,  $b$  is a const. of cement, and  $n$  is 1,  $1/2$ ,  $1/3$ , etc., can never be applicable to the early-high-strength port. cements. II. *Ibid* 1268-73, Suppl. binding 301B.—N. modified the parabolic equation between strength and curing age to a linear equation:  $S = A + B \log d$ , where  $S$  is the strength at  $d$  days, and  $A$  and  $B$  are const. for each cement. By applying many results of tests at many curing ages and calcg. by the method of least

squares, consts.  $A$  and  $B$  were obtained for tensile and compressive strengths of each cement. A linear relation between  $B$  and activity index or silica modulus has been observed.  $B = (S - A)/\log d$ ; activity index =  $\text{SiO}_2/\text{Al}_2\text{O}_3$ ; silica modulus =  $\text{SiO}_2/(\text{Al}_2\text{O}_3 + \text{Fe}_2\text{O}_3)$ . S. KONDO

Relation between composition of cement and strength of cement mortar on combined hardening. I. SHOICHIRO NAGAI. *J. Soc. Chem. Ind. (Japan)* 31, 821-7 (1928), Suppl. binding 31, 200B.—The increase in strength of cement mortar on combined hardening over that on common hardening was compared with the activity index ( $\text{SiO}_2/\text{Al}_2\text{O}_3$ ), the silica or silicate modulus ( $\text{SiO}_2/(\text{Al}_2\text{O}_3 + \text{Fe}_2\text{O}_3)$ ), or the iron or flux modulus ( $\text{Fe}_2\text{O}_3/\text{Al}_2\text{O}_3$ ); a close relation was observed between these ratios and strength. II. *Ibid* 941-8, Suppl. binding 225-6B.—In studying the lime-silica combining ratio

$$\left[ \frac{\text{CaO} - (1.65\text{Al}_2\text{O}_3 + 0.70\text{Fe}_2\text{O}_3 + 0.70\text{SO}_3 + \text{Free CaO})}{\text{SiO} - 0.80(\text{insol. residue})} \right], \text{ free lime was detd. by}$$

the method proposed by Lerch and Bogue (*C. A.* 20, 2737) and the factor 0.80 of insol. residue of port. cement is the silica content obtained by analysis of the insol. residue of some port. cements. This ratio is in linear relation with the increase of strength of cement mortar on combined hardening (1 day in wet air, 6 days in water and 21 days in air) to that on common hardening (1 day in wet air and 27 days in water). The Ca silicates ratio and silicate lime ratios are calcd. as follows:  $a = \text{CaO} - (1.65\text{Al}_2\text{O}_3 + 0.70\text{Fe}_2\text{O}_3 + 0.70\text{SO}_3 + \text{free CaO})$ ;  $b = \% \text{ of CaO forming } 2\text{CaO} \cdot \text{SiO}_2 = 2[2.80(\text{SiO}_2 - 0.80 \text{ insol. residue}) - a]$ ;  $c = \% \text{ of CaO forming } 3\text{CaO} \cdot \text{SiO}_2 = a - b$ ;  $d = \% \text{ of } 2\text{CaO} \cdot \text{SiO}_2 = 1.54b$ ;  $e = \% \text{ of } 3\text{CaO} \cdot \text{SiO}_2 = 1.36c$ . Ca silicates ratio =  $e/d = 3\text{CaO} \cdot \text{SiO}_2/2\text{CaO} \cdot \text{SiO}_2$ . Silicate lime ratio =  $c/b$ . These ratios are also in close relation with the increase of strength of combined hardening to that on common hardening. III. *Ibid* 32, 74-80 (1929), Suppl. binding 32, 29B.—The strengths of cement mortars on long combined hardening tests and those on long water hardening or air curing have been compared. On long combined hardening (1 day in wet air, 6 days in water and then in air to 26 weeks), the strength of low-silica cements became const. after 4 or 8 weeks as did those on long water hardening. So the difference of strengths at same ages of these two hardening tests is nearly const. at any curing ages after 8 weeks. But in the case of the high-silica type of cements, the difference of strengths between these long combined and water hardening tests decreased gradually, because of the increase of strength on water hardening. On long air hardening, the strengths are very small compared with those on water hardening or combined curing. The strengths of low-silica cements on long air hardening became const. after 4 or 8 weeks, but in the high-silica cements, the strength increased slowly. IV. *Ibid* 325-31, Suppl. binding, 98-9B.—Tensile and compressive strengths are given for blast-furnace cements and Solidit cement. The increase of strength on combined hardening over that of common curing is smaller in the blast-furnace cements than in the Solidit cements. The effects of admixture upon the strength of mortars in combined hardening have been studied. Acid mixtures, as puzzolana, Keisanhakudo (silica earth), kieselguhr, etc., increased the strength of mortars of cements of low-silica type both in water and combined hardening, while they had little effect on high- $\text{SiO}_2$  cements. V. *Ibid* 355-60, Suppl. binding, 106-8B.—Ordinary combined hardening (1 day in moist atm., 6 days in water and then cured in air to 8, 13 or 26 weeks from the molding), special combined hardening (1 day in moist atm., 27 days in water and then cured in air to 8, 13 or 26 weeks from the molding), and repeated combined hardening (1 day in moist atm., 6 days in water, 21 days in air and again in water to 8, 13 or 26 weeks from the molding) produce a remarkable increase of strength in low-silica cements, while there is little increase or a decrease in high-silica cements. Further, remarkable differences between these low-silica and high-silica cements have been observed in the results of strength tests of 1:4 and 1:5 mortars. S. KONDO

Influence of hardening temperature on the mortar strength of aluminous cement. A. F. ROSCHER LUND. *Zement* 17, 1690-2, 1725-9 (1928); cf. *C. A.* 22, 2042.—A definite reduction in strength is noted with increasing temps. of curing. H. F. KRIEGE

Influence of additions of different modifications of calcium sulfate on the mechanical properties of portland cement. PETER P. BUDNIKOV AND V. M. LESHOEY. *Zement* 17, 1526-9 (1928).—See *C. A.* 23, 2263. H. F. KRIEGE

Compressive strength, transverse strength, shrinkage and swelling, resistance to wear, imperviousness, and resistance to chemical attack of cement mortars and concrete, especially with different gradations of aggregate and with different water content of the mortars. OTTO GRAF. *Zement* 17, 1480-70, 1500-6, 1530-5, 1632-6, 1661-5, 1692-8 (1928).—Detg. the wt. per cu. ft. or the voidage of sand is not as safe a criterion for quality as is the screen analysis, provided the importance of variations in the gradation is understood. The relation between the water : cement ratios and the

transverse strength is fairly regular. The quality of concrete in compressive and transverse strength is in direct relation to the mortar quality. The gradation of the coarse aggregate within the limits studied is of less importance. Dry curing of concrete depressed the transverse strength and increased the compressive strength. Rewetting dried concrete increased its strength. The relation of compressive to transverse strength for mortar ranged from 3 to 12, for concrete 5-12. The shrinkage of mortars during the first drying out was proportional to the water : cement ratio of the batches. The shrinkage of 1:6 mortars was about half that of 1:3 mortars having the same water : cement ratio. The vol. changes of mortar were definitely increased by additions of  $\text{CaCl}_2$ . The resistance to wear under a sand blast decreased with increasing amounts of fine material in the mortar. The  $\text{H}_2\text{O}$  content is of greater effect on the wear resistance with lean than with rich mortars. The gradation of the sand has a pronounced effect on the imperviousness of the mortar to  $\text{H}_2\text{O}$  under pressure, sand gradation No. 5 being the best. Tamped concrete is more impervious parallel to the direction of tamping than at right angles to it. The resistance to chemical attack is affected by the gradation of the cement as well as of the sand, and by the curing history before the test. H. F. KRIEGE

Types of storage of cement test pieces and their strength relationship. JOSEPH KERTH. *Zement* 18, 94-7(1929). H. F. KRIEGE

The action of the caustic alkali constituents in the condensation water of cement on aluminum, protective coatings and organisms with remarks regarding the factor of soaking of cement test specimens. F. HUNDESHAGEN. *Zement* 18, 6-11(1929).—The alk. of the  $\text{H}_2\text{O}$  formed by the "sweating" of new cement or concrete is sufficient to corrode Al and some protective coatings as well as to destroy small plants and animals. It is suggested that the soaking of test specimens during curing dissolves sufficient alkali to alter the cement. H. F. KRIEGE

Composition of insoluble residue of various cements. SHOICHIRO NAGAI. *J. Soc. Chem. Ind. (Japan)* 32, 438-43(1929), Suppl. binding 32, 133-4B.—Insol. residues of many port. cements were analyzed. The principal constituents of the insol. residue are silica (av. 80%), alumina and alkalies. Thus, the insol. residue consists chiefly of alkali aluminosilicate and quartz. S. KONDO

Recent progress in the art of cement manufacture. KOZO FUJII. *J. Soc. Chem. Ind., (Japan)* 31, 660-9(1928). S. KONDO

Preliminary investigation of the Eckel process for the production of iron slag cement. H. C. MABEE. Canada Dept. of Mines, Mines Branch, *Rept. No.* 695, 162-3(1929).—Tests on high-grade ilmenite from Quebec contg.  $\text{TiO}_2$  35-40%,  $\text{Fe}_2\text{O}_3$  50-55%,  $\text{SiO}_2$  5% and low  $\text{CaO}$  and  $\text{Al}_2\text{O}_3$  showed that Ca titanate may be formed at high temps. and as slag may be sepd. from the metallic Fe. In order to produce cement the acid and boric ratios must be carefully adjusted. ALDEN H. EMERY

Laboratory work in the service of construction engineers and architects. E. PROBST AND A. HUMMEL. *Zement* 17, 1601-5(1928).—The importance of the proper distribution of sizes of aggregates, especially the fine aggregate, is stressed. H. F. K.

The ternary system lime-carbon dioxide-silica. An investigation of the manner of hardening of lime mortar. GUSTAV F. HÜTTIG AND EMIL ROSENKRANZ. *Z. Elektrochem.* 35, 308-14(1929); cf. *C. A.* 22, 4728.—Hardening of lime mortar occurs in 2 stages, drying and carbonation. The first may take only a few hrs. Analyses of mortars up to 2500 yrs. old shows that carbonation is not complete even in that time. The presence of  $\text{MgO}$  results in less absorption of  $\text{CO}_2$ . Thermodynamically  $\text{CaSiO}_3$  would be decompd. by  $\text{CO}_2$  up to  $140^\circ$ ; above that the reverse would occur. Liberation of  $\text{CO}_2$  from  $\text{CaCO}_3$  by active forms of  $\text{SiO}_2$  occurred at  $873^\circ$  but not at room temp. Quartz did not show appreciable action on  $\text{CaCO}_3$  at  $800^\circ$ . X-ray examn. showed  $\text{CaCO}_3$  but no  $\text{CaSiO}_3$  in mortars 580 and 970 years old. Tables of analyses of 5 mortars aged 430 to 970 years are given. Talc did not form  $\text{MgCO}_3$  at 80 lb.  $\text{CO}_2$  pressure in 6 hr. at  $200-400^\circ$ . FOSTER DEE SNELL

Heat measurements and water imperviousness in concrete. RUD. G. GÖSCHWITZ. *Zement* 17, 1723-5(1928).—The description of the app. for these physical measurements is given. H. F. KRIEGE

The thermal conductivity of concrete. A. HUMMEL. *Baug.* 9 [29], 528(1928). *Building Science Abstracts* [N. S.], 1, 252-3.—H., referring to a paper by Kleinlogel (*Beton u. Eisen* 27, 38) on monolithic concrete chimney stacks, points out that the coefficient of thermal conductivity of concrete is not a constant. Its value varies from 0.5 to 2.00 and is influenced by the moisture content, type of aggregate and the proportions in which the constituents of the concrete are present. It thus depends largely on the history of the specimen. The lower value should be used in calculating the stresses due to temperature gradients. H. L. D.

**Simple determination of the water requirement of poured concrete.** A. GUTTMANN. *Zement* 17, 1794-5(1928).—The consistency required for practical purposes is detd. with a piece of chute mounted on pipe frame so that its angle of inclination may be adjusted to any desired degree. A charge of 3 l. of the wet batch to be tested is emptied into the top of the 15-m. chute and is caught below to be measured. When the material adhering to the chute is 0.7-1.0 l. the batch has desirable consistency and H<sub>2</sub>O content.

H. F. KRIEGER

**The tensile strength of cement mortar and concrete.** H. OLSEN. *Beton u. Eisen* 28, 204-9, 218-20(1929).—The effects of the amount of mixing water, storage, addition of rock powder and relation between mortar strengths and concrete strengths are given.

F. O. ANDEREGG

**Relation between mortar strength and concrete strength.** H. BURCHARTZ. *Zement* 18, 2-6(1929).—In earth-moist batches 1 and 3 vols. of coarse aggregate added to each mortar did not reduce the 28-day compressive strength. Five vols. reduced the strength 18-30%. In plastic mixes reduction in strength occurred in all cases in proportion to decrease of the cement content and to the increasing H<sub>2</sub>O-cement ratio. The strengths were in no apparent relation to the densities of the specimens.

H. F. K.

**Increase in strength of concrete and mortar with age.** F. KLOKNER. *Intern. Congress Testing Materials* 1927, II, 75-84.—The strength of concrete or mortar  $K = a + b \log D$ , where  $a$  and  $b$  are consts. and  $D$  is the age.

F. O. A.

**Solution of the caustic, especially the alkali, constituents of concrete test specimens, during the usual storage under water.** F. HUNDESHAGEN. *Zement* 18, 34-6(1929).—Sufficient soln. of the alk. constituents occurs to warrant some consideration, especially with cements high in alkali.

H. F. KRIEGER

**Protection of metal work and reinforced concrete against locomotive fumes.** M. SURLÉAU. *Intern. Congress Testing Materials* 1927, II, 625-40.—The deterioration in metal work (rails, sleepers, bridges, hoods, signal bridges and steel depots), in reinforced concrete and in tunnel masonry is described and attributed to sulfuric acid from SO<sub>2</sub> in the gases, to the changes in temp. and to the blasting effect of the gases and cinders. Metal work may be protected by a coating of reinforced concrete, by cement applied with a spray gun, by spray metallizing, by false ceilings, by use of copper steel or homogeneous steel and by ventilation. Reinforced concrete may be protected by brickwork, cement applied under pressure, fibrocement, or false work of reinforced concrete. Engine hoods are best constructed of reinforced concrete, fibrocement or wood covered with the latter. Painting is useful only on slightly exposed surfaces. Stagnation of fumes and deposits of soot are especially to be avoided.

PAUL J. CULHANE

**The apparatus of an ultra-modern plaster factory.** J. PROUTEAU. *Rev. matériaux construction trav. publics* 1929, 201-5.

F. O. ANDEREGG

**The effect of adding trass on the properties of gypsum.** A. STROPOV. *Tonind. Ztg.* 53, 927-8(1929).—The addition of trass lengthens the working time for gypsum and improves the 7-day tensile strength to a certain point, beyond which it drops rapidly.

F. O. ANDEREGG

**Asphaltic pavements. Characteristics of asphalt and the practical methods of its use in road construction.** E. H. SCOTT. *Munic. Eng. Sanit. Record* 82, 702-3(1928).—The proportions and the differences of the materials used in sheet asphalt and asphaltic concretes for making paved roads in Canada are discussed.

C. H. BADGER

**The xylene test for roofing felt.** P. W. CODWISE. *Paper Trade J.* 88, No. 12, 66(1929).—The principle of the test is that of gaging the rate at which a light volatile liquid rises in a vertically suspended strip, the lower end of which dips beneath the liquid contained in a suitable dish. The technic is described in detail. When a report is made on the test, the moisture condition of the felt should be stated. In considering the results each wt. or thickness should be classed by itself when translating the results into terms of satg. machine behavior. The results of the test may be used in conjunction with a test for satg. capacity, such as the "kerosene" test (C. A. 23, 4814).

A. P.-C.

**Conception of hardness and its practical interest in the study of materials, especially lime and cement (MARCOTTE) 13. The theory of fine grinding (MARTIN, BOWES) 13. Improvement of coal for the cement industry (SPENGLER) 21. Estimation of the distribution of particle sizes in dust-forming substances, especially of cement (GONELL) 13. Dehydration mechanism (BALAREFF) 2. Slagging gas-producer operation (with cement production) (Brit. pat. 301,241) 21. Rubber-surfaced pavements (Brit. pat. 300,319) 30. Apparatus for heating liquids or molten materials by submerged flames [in cement manufacture] (Brit. pat. 300,819) 1.**

GRÜN, RICHARD: *Der Hochofenzement und seine Verwendung*. 4th ed. Berlin: Tonind.-Ztg. 175 pp. M. 3; linen, M. 4.20.

REINER, WILHELM: *Handbuch der neuen Strassenbauweisen mit Bitumen, Teer und Portland-zement als Bindemittel*. Berlin: J. Springer. 400 pp. Linen, M. 30.50.

**Cements.** HENRY E. DOUGHTY. Fr. 655,168, June 2, 1928. See Brit. 280,813 (C. A. 22, 3277).

**Cements.** ROBERT STRITTER. Fr. 655,484, June 7, 1928. A powder of hydrated alkali silicate 2, and  $\text{Ca}(\text{OH})_2$  1 part, is added to cement to increase its setting speed and resistance to traction or compression.

**Cements.** "KOLLOIDCHEMIE" STUDIENGESSELLSCHAFT M. B. II. and JOHANNES B. CARPZOW, ROBERT LENZMANN, MARTIN MARCH and HERMANN SANDERS. Fr. 656,-101, June 19, 1928. Naturally moist salt- or fresh-water mud or the like contg. unsatd Si compds. or the colloidal constituents sepd. therefrom are combined chemically or physically with oxides, salts and metal compds. and are then used as building materials, if desired with the addn. of binding media. They produce valuable cements when baked. The mud may be left standing for some time in aq. suspension, if desired, with addn. of anaerobic bacteria cultures and nutrients before mixing with the metal compds.

**Cement.** ERNST MEIER. Ger. 477,212, Dec. 11, 1927. An air blast blows the raw mixt. and powd. fuel into a rotary horizontal combustion chamber.

**Cement.** OTTO F. HONUS. Ger. 477,270, Apr. 1, 1926. Gypsum rich in  $\text{Al}_2\text{O}_3$  is used instead of bauxite in the manuf. of fusible cements,  $\text{SO}_2$  being obtained as a by-product. Thus, the gypsum may be heated with bituminous shale, clay or bog iron ore, or a baryta cement may be obtained by heating the gypsum with residues from the manuf. of  $\text{BaS}$ , if necessary with addn. of Al silicate and sand.

**Hydraulic cements.** C. HINRICHSSEN (to Chemische Fabrik Grünau, Landshoff, & Meyer A.-G.). Brit. 301,509, Dec. 1, 1927. HCl or chlorides such as those of Ca, Al, Ti, Sn, Fe and Sr are used to accelerate setting and hardening and to render the set product water- and oil-proof.

**Cement mixture.** JOSEPH K. BURN. U. S. 1,719,210, July 2. A compn. which is suitable for stopping leaks, is formed of litharge 2, portland cement 1 and powdered iron 1 part, mixed with waterglass or shellac to form a paste.

**Cellular cement compositions.** G. B. HINTON. Brit. 300,842, Feb. 27, 1928. An app. is described suitable for making a frothy mass from a mixt. of cement, water and a frothing agent. Brit. 300,843 specifies a cellular cement material contg. cells of larger size surrounded by cells of smaller size, formed by mixing 2 masses of material contg. bubbles of different sizes. Cf. C. A. 22, 1026, 4757.

**Cooling drum, with sight tube, for rotary furnaces for cement, etc., manufacture.** G. POLYSIUS A.-G. Ger. 477,097, May 12, 1928.

**Coating concrete with bituminous material to prevent evaporation of water during setting.** BARBER ASPHALT CO. Brit. 300,461, April 23, 1928. After laying, concrete is sprayed with a water-external-phase bituminous emulsion (suitably that known as "cold repair cement").

**Artificial marble.** JOHANN KNEJFL and MARIA MOTYKA. Fr. 655,392, June 5, 1928. A glaze contg. water 25, sol. glass ( $40^\circ \text{Bé}$ ) 25,  $\text{K}_2\text{CO}_3$  8,  $\text{K}_2\text{SO}_4$  5, Ca phosphate 2, coloring materials 35 parts is applied to plates of substances which can be molded such as asbestos cement, the glaze being hardened by heating in a bath contg. water 200,  $\text{CaCO}_3$  8,  $\text{KCl}$  2,  $\text{MgCl}_2$  5,  $\text{CaCl}_2$  30,  $\text{HNO}_3$  ( $40^\circ \text{Bé}$ ) 8,  $\text{AcOH}$  ( $80^\circ \text{Bé}$ ) 6,  $\text{H}_2\text{SO}_4$  ( $66 \text{ Bé}$ ) 6,  $\text{NaCl}$  20,  $\text{MgSO}_4$  8 and citric acid 5 parts.

**Porous gypsum plaster composition, etc.** INSULEX CORP. Brit. 301,344, Aug. 24, 1927. A porous compn. is made by forming bubbles in a fluid mixt. of water, calcined gypsum and a small quantity of a substance such as soap or saponin which assists bubble formation and distribution.  $\text{CO}_2$  preferably is generated in the mixt. by reaction of substances such as Al sulfate and  $\text{CaCO}_3$ . Talc, silica, lampblack or gum arabic or like substances also may be added. Brit. 301,359 relates to similar compns.

**Hardening lime plaster, mortar and stucco.** DOUGLAS M. HARRISON (to McKenzie Mortar Co.). U. S. 1,718,955, July 2. A hardener is used comprising pulverized shale material including the ash content such as residue from oil shale distn. together with  $\text{CaCl}_2$  and  $\text{FeS}_2$ .

**Composition bath mats or flooring tiles.** H. E. DEANE. Brit. 301,195, Nov. 19, 1927. Cork is agglomerated (suitably with a cement of casein and glycerol) and coated with a thin layer of rubber.

**Porous building sheets.** JOSEF WEISS and RUDOLF KARG. Ger. 477,365, July 12,



1927. In prepg. porous sheets by immersing fibrous material such as wood wool in a soln. of kieserite in which magnesite is suspended and then drying the mass, the drying is effected in molds having perforations above and below. Cf. Brit. 274,471 (C. A. 22, 2222).

**Shaft furnace for calcining powdered limestone, etc.** EDOUARD P. C. GIROUARD. Ger. 477,261, July 31, 1926.

**Pavement.** WALTER H. FLOOD. U. S. 1,717,445, June 18. A course of stones coated with bituminous material of sufficient thickness to prevent adherence of cement to the stones is used with a hydraulic cement grouting filling the voids and forming a skeleton to hold the stones in place with the bituminous material forming an expansion and compression medium between the stones and cement.

**Bituminous pavement.** MORRIS L. GORDON. U. S. 1,717,769, June 18. A hot, coarse-aggregate, bituminous concrete mixt. is spread in a layer approx. the desired thickness of the complete pavement, compressed to 75% of the compression it will take, and while still hot is covered with a hot, finer-aggregate, bituminous concrete mixt. in a layer approx.  $\frac{1}{4}$  the desired thickness of the complete pavement; this layer also is compressed to 75% of the compression it will take while still hot, and is then covered with a still finer-aggregate bituminous mixt. and the complete pavement is further compressed into a united structure.

**Road pavements.** J. CAPMANY. Brit. 300,828, Jan. 13, 1928. A binder of non-bituminous cement or mortar is placed on a foundation of concrete or macadam and material such as broken porphyry or granite is laid with its smooth faces uppermost in the binding material so that the latter rises and fills the interstices. Asphalt or a thin mixt. of cement and sand may then be applied.

**Road materials.** STADTGEMEINDE DRESDEN REPRESENTÉE PAR SON CONSEIL. Fr. 655,858, June 6, 1928. A substance resembling asphalt for use on roads is prepd. by treating tars or tar mixts. or mixts. of tars and phenols, the content of PhOH of which is higher than that of normal tars at high temps., and lower than that of normal tars at low temps., with oxidizing substances or with S or both, with or without the addn. of contact substances.

**Road material.** NAAMLooZE VENNOOTSCHAP KONINKLIJKE STEARINE KAARSEN-FABRIEK GOUDA. Fr. 655,853, June 5, 1928. Dry pebbles or the like are mixed first with linseed oil, petroleum, petroleum residues or fatty or minerals oils, oleic acid, resin oil or solvents such as xylene, alc., etc., and afterwards with a bituminous emulsion.

**Asphalt-surfaced roofing.** ALAN R. LUKENS and JOSEPH S. MAYNARD (to Flint-kote Co.). U. S. 1,719,118, July 2. An upper layer of asphalt carries a thin surfacing layer of hydrated ferrous oxide combined with Si in powdered form (a "slag powder" from Cu manuf.) sufficient to cut off all actinic light rays from the asphalt.

**Preserving wood.** ALFRED OBERLE (one-half to Thomas E. Scofield). U. S. 1,717,888, June 18. Wood is impregnated with a halogenated hydrocarbon such as chlorinated crude oil having a natural S content sufficient to give it toxic properties and is subjected to a halogen gas such as Cl under pressure.

**"Wood substitute."** E. J. FOSTER (to Woodcrete, Ltd.). Brit. 300,982, Nov. 22, 1927. Planks or other articles are molded from a mixt. of wood dust, shavings, sawdust, etc., and casein. Water and  $\text{NaHCO}_3$  may be used in making up the compn. and a soln. for imparting flexibility to the product comprises aq.  $\text{NH}_3$ , NaF and glycerol. The product may also be treated with  $\text{CH}_2\text{O}$ , Al acetate or  $\text{K}_2\text{Cr}_2\text{O}_7$  and its resiliency is increased by adding an emulsion of S and oil to the casein compn. used.

**Staining or impregnating logs, etc.** SEMER & Co. GRS Brit. 301,244, Feb. 2, 1928. Mech. features.

**Kiln construction and air circulation system for seasoning lumber.** ROBERT Z. DRAKE. U. S. 1,718,221, June 25.

## 21—FUELS, GAS, TAR AND COKE

A. C. FIELDNER

**Radiation and conduction losses in firing and quenching periods with special regard to rubber industry.** E. PRAETORIUS. *Wärme* 52, 405-10, 424-7(1929).—Different kinds of heat losses are discussed. E. I. S.

**Latest literature on motor fuels.** LEOPOLD SINGER. *Petroleum Z.* 25, 513-24 (1929); cf. C. A. 23, 1734.—A very complete review with 227 references. A. A. B.

**Researches upon motor gas producer fuels. I. Thermal fractionation of the**

gaseous products of the pyrogenation of the various fuels subjected to test. P. LEBEAU, H. FIGOUR AND G. VOUT. *Ann. combustibles liquides* 4, 19-64(1929); cf. Haslam, Entwistle and Gladding, *C. A.* 19, 2120.—A series of studies was undertaken upon the reactions in the gas producer of wood charcoal, peat coke, semicoke from coal, various briquetted materials, etc., with the purpose of making clear the reactions of the air  $O_2$ ,  $H_2O$  vapor and  $CO_2$  with the fuel. An elec. furnace was used for heating the 0.5-1.0 g sample of fuel placed in a quartz tube. The total gas evolved within each  $100^\circ$  of temp. rise was measured and analyzed. Curves were plotted for the total gas and for each constituent. Charcoals, charcoal briquets, coal briquets and a semicoke were tested in a gas producer also. The charcoals obtained from a powder factory were from chestnut wood, carbonized at temps. from  $350$  to  $750^\circ$ ; other com. samples were also tested. The graphs show that the temp. of max. evolution of gas from charcoals rises with the temp. of carbonization. The same is true of the temp. of max. evolution of carbon monoxide and  $H_2$ . As a temp. of  $1000^\circ$  is approached the vol. of gas evolved decreases in proportion as carbonization has been more complete, but the % of the combustible gases increases, as well as the  $H_2$  content. % of material volatilized at  $900^\circ$  was also detd. The results were from 1 to 7% higher than those obtained by the thermal fractionation.

EMMA E. CRANDAL

Industrial fuel and power statistics for Ontario, 1925. E. S. MALLOCH AND C. E. BALTZER. Canada Dept. of Mines, Mines Branch, *Report* No. 698, 23 pp. and 12 maps (1928).—This rept. (entirely tabular) shows the industrial use (9561 plants) in 1925 in Ontario of bituminous coal, anthracite, lignite, coke, gasoline, oil, wood, gas, other fuel and electric power. It also shows the distribution of steam engines and turbines, gas engines, oil and gasoline engines, hydraulic turbines and waterwheels, electric motors driven by purchased power, electric motors operated by power generated in each industry and boiler installations.

ALDEN H. EMERY

Survey of cracking plants, January 1, 1929. G. R. HOPKINS. *Bur. Mines, Circ.* 6127, 15 pp.(1929).

E. H.

The condensation of steam. D. F. OTHMER. *Ind. Eng. Chem.* 21, 576-83(1929).—The rate of condensation of steam on an isothermal condensing surface was studied by means of a special app. The effects of small quantities of air in the steam, of temp. drop, and of temp. were investigated. The relation  $\log f = \log \Delta T[1.213 - 0.00242T] + \left[ \frac{\log \Delta T}{3.439} - 1 \right] \times [\log(C + 0.505) - 1.551 - 0.009T]$  expresses in B. t. u. per sq. ft. per hr. per  $^\circ F.$  the logarithm of the coeff. as a function of temp., temp. drop and compn. of the steam. The results are considered from the viewpoint of the resistance concept.

C. W. WHITTAKER

The trend in coal preparation. ANDREWS ALLEN. *Mining & Met.* 10, 330-3 (1929).

E. H.

Studies in the composition of coal. The rational analysis of coal. WILFRID FRANCIS AND RICHARD V. WHEELER. *J. Chem. Soc.* 1928, 2967-79; cf. *C. A.* 21, 2780.—The "reactivity indices" of the ulmin compds. in 17 coals from the Pittsburgh seam (Carboniferous) and 11 coals (Tertiary and Cretaceous) from mines in the Western U. S. A. were detd. These samples represent coals from semi-anthracites to lignites, having on the ash-free dry basis from 89.1 to 73.4% C. The names of the coals tested, their proximate, ultimate and rational analyses, reactivity index of ulmins, and C % on ash-free dry coal are tabulated. Another table compares for 4 coals the % C of the whole coal and for the vitrain only with reactivity indices of their ulmins. The rational analyses were made by drying the coarsely ground coal samples in a vacuum oven, and then extg. in a large Soxhlet app. with pyridine in an atm. of  $N_2$ . The  $\gamma_1$  and  $\gamma_2$  fractions were sepd. with  $CHCl_3$ . The  $\alpha$  and  $\beta$  compds. were then dried in a vacuum at  $105^\circ$ . Samples (10 g.) of the dried material ground to pass a 100 and remain on a 200-mesh sieve (Tyler-U. S. Standard) were placed in glass tubes in a const.-temp. oven at  $150^\circ$  and their rates of oxidation detd. by drawing pure dry air through for several weeks. The time taken for complete conversion of the coal ulmins to alkali-sol. compds. varied with the character of the coals, being 40 weeks for coals with the highest C content. Further expts. were made to det. the rate of formation of sol. ulmins by atm. oxidation of thin layers of coal in a hot-air oven at  $150^\circ$ . Each week a 1-g. portion was withdrawn from the oven, boiled for  $\frac{1}{2}$  hr. with 150 cc. of 1% KOH soln., filtered hot, the ulmins pptd. by adding HCl, filtered through tarred papers, washed, dried and weighed. A table gives % sol. ulmins formed up to 11 weeks and hr. required for 50% formation; time varied for the Pittsburgh coals from 390 to 1800 hr.; for the other coals from 140 to 468 hr. Accelerated oxidation expts. were made with the coals by using a soln. of HCl plus different wts. of  $KClO_3$ ; the tabulated results are very similar to those obtained by atm. oxidation and this rapid

method is considered sufficiently accurate for practical purposes. A satisfactory simplified method for detg. the hydrocarbons and resins was likewise developed. The pyridine ext. of the coal was concd., an excess of  $\text{CHCl}_3$  was added, the pyridine was neutralized with  $\text{HCl}$ , which pptd. the insol.  $\beta$  and the dispersed  $\gamma_3$  and  $\gamma_4$  compds.; the  $\gamma_1$  and  $\gamma_2$  compds. in soln. were estd. by evapg. the  $\text{CHCl}_3$  and weighing the residue. For rapid detn. of the organized plant entities in coals the following procedure was found to give reasonably accurate data: a 0.5-g. sample freed from hydrocarbons and resins was boiled for 7 hrs. under a reflux condenser with an oxidizing soln. composed of different vols. of  $N$  or  $2N$   $\text{HNO}_3$  plus different wts. of  $\text{KClO}_3$ , depending on the % C in ash-free dry coal. The ash-free material insol. in  $\text{KOH}$  soln. after this treatment was estd. to be the resistant plant entities. There is no general relationship between the quantities of hydrocarbons and resins extractable from a coal, or proportions of organized plant entities it contains and the age of the coal or its degree of coalification. A general relationship exists between the C content of coal as a whole, and the reactivity index of its ulmins; the relation is remarkably close for the % C of the vitrain portion of the coal. With coals from the Pittsburgh seam their C content follows closely the rates of oxidation of their ulmins, but among the other coals tested there were notable exceptions. The rate of formation of sol. ulmins for most of the coals was in approx. the same order as their rates of oxidation, but for some of the younger coals, where greater errors in analyses and oxidations are likely, the rate of formation of sol. ulmins cannot be taken as a measure of their rank. Additional evidence (C. A. 20, 811) has been obtained that the external groupings of ulmin mols. are modified with increasing rank of the coal.

W. W. HODGE

The action of hydrogen on coal. J. IVON GRAHAM AND D. G. SKINNER. *J. Soc. Chem. Ind.* 48, 129-36T(1929).—Work on hydrogenation of coal is reviewed. Results obtained by G. and S. on the hydrogenation of a large number of coals are also given in detail.

A. WHITE

Cleaning and hydrogenation of coal. J. F. GRAM. *Tids. Kemi og Bergvesen* 8, 65-6, 81-4(1928).—A technical, chemical survey.

ARNE DROGSETH

Low-temperature carbonization of coal. Its engineering and economic significance. F. FISCHER. *Gewerbezeits.* 108, No. 2/3, 25-34(1929).—General review of processes with notes on German plants and their equipment.

E. I. S.

The x-ray analysis of coal. The radiographic variables and their control. C. N. KEMP. *Trans. Inst. Mining Eng.* (London) 77, 175-85(1929); cf. C. A. 23, 2011.

E. I. S.

Improvement of coal for the cement industry. ADOLF SPENGLER. *Tonind. Ztg.* 53, 852-4(1929).—Low-temp. distillation may improve the coal considerably for cement burning.

F. O. ANDEREGG

Nitrogen compounds in coal. K. ISHIBASHI. *J. Fuel. Soc. Japan* 8, 523-30(1929).—In order to study the N compds. in coal, I. treated coal with  $\text{PhOH}$  and then carbonized the ext. and residue, and the N of their products was detd. by usual methods. The N compds. in the residue contribute to  $\text{NH}_3$  formation while those in the ext. are the source of the basic substances in tar. The N compds. in coal, therefore, may be classified into resinic (phenol-sol.) and ulmic (phenol-insol.) nitrogen.

F. I. NAKAMURA

Assessing the value of coking coals. G. W. J. BRADLEY AND R. A. MOTT. *Colliery Guardian* 137, 2457-60(1928).—Results are given for many kinds of coals from England, Scotland and Wales, whose cokes are classified into 4 groups according to their shatter indices (A). Another test for quality of cokes is the "barrel abrasion test" in which 25 lb. of coke of 2 to 3 in. size is rotated in a steel barrel 9 in. long and 18 in. diameter for 30 min. The % coke remaining on a 1.5-in. screen is tentatively called the "abrasion index" (B). The shatter, abrasion and mechanical strength ( $A \times B/100$ ) indices of 17 cokes are tabulated. Ranges of indices recorded are: shatter 97.2 to 67.3, abrasion 97.6 to 62.8, and mechanical strength 92 to 53.7. Some cokes with high shatter indices are friable, pieces of the coke being easily rubbed off, especially if subjected to the shearing action of settling in a blast furnace; hence the true quality of such cokes is best detd. from their mechanical strength indices. By embedding cokes in plaster of Paris, cutting, polishing and then dusting with plaster of Paris, a rough correlation was obtained between the shatter index and the no. of fractures. These methods of assessing the values of cokes have enabled simple nos. to be assigned which are in agreement with general experience and do not suffer from the faults of visual exams. The following tests are critically reviewed: attempts to correlate coking qualities with % volatile matter, % C, "caking" and "agglutinating" power, swelling power as detd. in the Gray-King assay app. m. p., and "plastic" range. A new simple method of assessing the coking quality of coal consists in measuring vol. changes of a sample of powd. coal heated in a  $\text{SiO}_2$  retort in an

elec. furnace. For most of the coals tested the vol. was unchanged up to about 400°; then a contraction occurred and continued while the temp. increased 20° or more; an expansion then usually occurred suddenly, attaining a max. below 500° and the coke became rigid. The vol. then remained const. until the coke reached a temp. above 700° when a contraction occurred such as that which causes the coke to leave the walls of an oven before the coke can be discharged. The results of these expts. and comparisons with the shatter, abrasion and mechanical strength indices of oven cokes manufd. from the same coals are discussed. In general no direct relationship was observed between coking values of the coals and their temps. of initial contraction nor of initial expansion, but final expansion temps. average higher for the better-coking coals. The av. coking values of the coals arranged in 4 groups according to the approx. mechanical strength indices of oven cokes vary clearly with the av. expansion range of temp. in °C and % expansion as shown by the data, resp.: 90, 47°, 200%; 80, 39°, 168%; 70, 22.5°, 93%, and for the poorest cokes, 60, 20°, 31%. The highest abrasion indices of cokes are usually associated with the largest % expansions of the coals. Only coals which do not swell at all produce cokes having abrasion indices less than 90. An explanation of the observed contraction and expansion phenomena and the formation of different kinds of cokes is given on the basis of the changes undergone by the oil (tar) which first exudes from fine coal when heated and later serves as the binder between the particles of carbonaceous matter. The detn. of % contractions and % expansions appears to be a simple lab. method for assessing the value of coking coals.

W. W. HODGE

**Coking tests made with Gonwanda coals.** CYRIL S. FOX. *Records Geol. Survey India* 61, Pt. 3, 294-314(1928).—F. gives results of large-scale coking tests of Indian coals which open up the following reserves (in millions of tons): coal for highest-grade metallurgical coke 9, for good metallurgical coke 812, for fair metallurgical coke 1,274 and for good coke, not of metallurgical quality 600. Tables of coal analyses are given

ALDEN H. EMERY

**Extraction and recovery of phenols from ammonia liquor.** ROBERT M. CRAWFORD. *Proc. 2nd Intern. Conference Bituminous Coal* 2, 726-34(1928).—The solvent extn. method for the substantial elimination of phenols from  $\text{NH}_3$  liquor and their recovery as a salable by-product in the form of crude tar acids is outlined and app. are described. The free phenols are extd. with solvents such as  $\text{C}_6\text{H}_6$ , motor fuel or coal-tar light oils, removed from the soln. by passing the latter through  $\text{NaOH}$  soln., and then recovered by neutralization of the phenolate formed.

W. C. EBAUGH

**Low-temperature phantom.** F. C. GREENE. *Proc. 2nd Intern. Conference Bituminous Coal* 2, 808-13(1928).—Expts. are described upon the combustion of leaves and coal screenings, whereby the fuel is converted into gas by a current of air impinging upon its surface, rather than passing through it, and the fly-ash is removed as fast as formed, leaving no clinker or covered fuel surface. Very low blast pressure and velocity are needed; gas is made on a low-temp. char surface, and the radiants from the fire-wall are so much in excess of the requirements of gas-making one may find it possible to employ them for generating steam as a by-product.

W. C. EBAUGH

**Report of test by the director of fuel research on the Maclaurin plant installed at Dalmarnock Gas Works, Glasgow.** C. H. LANDER. *Dept. Sci. Ind. Research*, Dec. 1928, 26 pp.—Official test has been made of a Maclaurin carbonization plant. The retort was 20 ft. high, square in cross-section with a max. width of 8.25 ft. at a point 15 ft. from the bottom and tapering to 6 ft. at the top and 6.5 ft. at the bottom. This system was operated by the heat of combustion of a small portion of the coke; products were removed at low temp., but a part of the coke passed the combustion area at which the temp. was over 1000°. Coke was removed by means of 4 water-sealed doors in the bottom; air was introduced 8.5 ft. from the bottom. A max. throughput of 24.3 tons per day (av. 20 tons) was obtained with satisfactory wt., C, and thermal balances, producing, per ton of coal (dry): coke 1212 lbs., tar 17.8 gals., gas spirit 1.5 gals., gas 33,160 cu. ft. (77.26 therms), liquor 48.1 gals., and  $(\text{NH}_4)_2\text{SO}_4$  41.9 lbs. The coke produced was of good quality, equal to that obtained from low-temp. (600°) externally heated retorts, and of approx. the same size as the coal introduced. The construction and operation of the producer are described and illustrated.

A. S. CARTER

**Localized naphthalene removal.** MIETHING. *Gas u. Wasserfach* 72, 477-8 (1929).—A novel means of using oil scrubbing at entrance to customers' services or on mains to remove naphthalene from the gas, is described. The essential feature of this app. is a porous ceramic body which presents a large oil surface to the gas, without introducing appreciable back pressure and permits efficient scrubbing.

R. W. RYAN

**Simplified iodine pentoxide apparatus for determination of carbon monoxide in flue gas.** F. E. VANDAEER AND R. C. GREGG. *Ind. Eng. Chem., Anal. Ed.* 1, 129-33

(1929).—Existing  $I_2O_5$  methods are simplified for flue-gas analysis by elimination of most of the extensive purification train. The modification is suitable for CO as low as 0.002% in the presence of small quantities of  $CO_2$ ,  $O_2$ ,  $H_2$ ,  $CH_4$ ,  $C_2H_6$ ,  $H_2S$ ,  $SO_2$ ,  $N_2$  and oxides of  $N_2$ .

ALDEN H. EMERY

The by-products of gas manufacture and their role in the chemical industry. HANS TIEMESSEN. *Z. angew. Chem.* 41, 1242-4 (1928).—A review. T. H. CHILTON

Some phases of the organic sulfur problem in the manufacture and utilization of gas. WILBERT J. HUFF. *Proc. 2nd Intern. Conference Bituminous Coal* 2, 814-25 (1928).—In addn. to  $CS_2$  (which represents perhaps 80% of the total S in manufactured gas), mercaptans, org. sulfides, thionaphthene, thionaphthene-2-methyl, thiophene, methylthiophene and diphenylene sulfide have been identified in tar oils, and may be present in gas. Expts. are suggested to discover the genesis of such compds., in the hope that modifications of the gas-making processes may be devised to eliminate their formation in practice. Coal whose temp. was changed very rapidly gave large quantities of  $CS_2$  in comparison with the same coal heated slowly. Cracking expts. on oils also indicated that C-S complexes may be important intermediate substances in the production of S compds. found in gas. The use of catalysts may cause such S to come off as  $H_2S$  rather than as an org. S derivs., thus simplifying purification by ordinary processes.

W. C. EBAUGH

Construction and advantages of the Drehrost gas generators. H. WINKELMANN. *Chem.-tech. Rundschau* 44,762, 800 (1929).—This generator utilizes cheap sources of C. The gas may be hot and unpurified or cold and either partially or completely purified. In either case the degree of efficiency is high, often reaching 92-94% of the heating value of the gasified fuel. The combustible part of the residue amounts to less than 1%. The space and stoking required are less than that of other generators. Power consumption is 0.5 to 2 kw.; water requirements are 0.2-0.3 cu. m. per sq. m. of jacket surface for lignite volatilization, and 3-4 cu. m. for anthracite, the water leaving at 70°. Advantages are high efficiency, low-space requirements, economy, durability, etc. The cost of gas is 0.3-0.4 Pf./cu. m. or a reduction of 50% from that of other generators. The construction is described in considerable detail.

E. PICKERING

Combined gas and electric plants coupled by steam and producer gas. FRANZ P. TILLMETZ AND ERNST SCHUMACHER. *Gas u. Wasserfach, Special No.*, 13-16 (Apr. 19, 1929).

R. W. RYAN

Corrosion and protection of metal in gas works. MAASS. *Gas u. Wasserfach* 72, 573-8 (1929); cf. *C. A.* 23, 2411.—A review of the damage caused by rust, with numerous illustrations, as well as a discussion of the mechanism of rust formation and means for avoiding it, such as proper construction, coatings, etc.

R. W. RYAN

Planning for efficient operation in the small water-gas works. R. S. MCBRIDE. *Am. Gas J.* 130, 27-30 (1929).

E. H.

Vancouver's water-gas plant. J. KEILLOR. *West. Gas* 5, No. 6, 23-5, 48 (1929).—An account is given of the erection and operation of an automatically operated, self-clunking carbureted-water-gas plant.

E. I. S.

Hunt's Point gas works in New York City. K. LEMPELIUS. *Gas u. Wasserfach* 72, 602-4 (1929).—Data as to method of gas manufacture and statistics as to quantities of raw material and products are given as well as a map of the region and one of the works.

R. W. RYAN

Preparation, characteristics and uses of modern gas coke. BUCK. *Gas u. Wasserfach, Special No.*, 53-61 (Apr. 19, 1929).—German methods of producing coke, pre-treatment of coal, quenching and properties of the resulting coke are described.

R. W. RYAN

Progress made in the manufacture of foundry coke by a new system of coal carbonization. JULIEN PIETERS. *Proc. 2nd Intern. Conference Bituminous Coal* 2, 707-25 (1928).—Exptl. plants treating 10-50 tons/day in France, Belgium and Italy are described to show P.'s process of carbonization. Vertical retorts with continuous recuperation of total heat, progressive and continuous operation, including coke discharge, the removal and distn. of volatile products, and recovery of coke free from breeze and waste, combine to give an efficient process, said to be applicable to even non-coking coals provided an agglomerating agent like pitch or oil be used with them. It is claimed that 20 cwt of bituminous coal contg. 37% volatile matter, 4% moisture and 12% ash, will yield 3 gal.  $C_6H_6$  and motor spirit, 5 gal. Diesel oils, 11 gal. fuel oils, 4 gal. phenols, 24 lb.  $(NH_4)_2SO_4$  and a gas surplus of 7000 cu. ft. (546 B. t. u.).

W. C. EBAUGH

The heat of combustion of coke and other modifications of carbon. W. A. ROTH. *Arch. Eisenhüttenw.* 2, 245-7 (1928).—The heat of combustion of metallurgical coke, water- and ash-free, with 1% S, detd. in a Pt-lined Langbein-Hugerstoff bomb, is 7966

cal./g.; of  $\beta$ -graphite (sp. gr. 2.22), 7856 cal./g.; of  $\alpha$ -graphite (sp. gr. 2.28), 7832 cal./g. The heat of combustion of non-graphitic black C is as high as 8150 cal./g. and this represents the min. value for amorphous C; sp. heats of combustion between 7856 and 8150 cal./g., calcd. for pure C, indicate therefore a mixt. of graphite and amorphous C.

R. D. BUMBACHER

**Factors influencing the reactivity of coke.** F. J. DENT AND J. W. COBB. *Colliery Guardian* 138, 2208-10(1929); cf. *C. A.* 23, 263.—Coke "binder" or the decomposed fusible part of coal is unreactive compared to the non-fusible constituents. Since heating renders the binder still more unreactive, heat treatment reduces the reactivity of the surface. This is due to a mol. rearrangement, which proceeds very slowly inward. Coals with much binder can, therefore, by heat treatment, be made to resemble graphite in reactivity. Wood charcoal, with the least binder, is in all expts. the most reactive. These facts explain the differences between reactivity I, II and III of the Jones-King-Sinnatt method for detg. reactivity (*C. A.* 22, 1841).

ALDEN H. EMERY

**Coke-oven construction abroad.** FRITZ ROSENDAHL. *Metallhölse* 19, 1097 S, 1154-6, 1265-6, 1377-8(1929).—Descriptions and data concerning coke ovens of Evence Copée.

W. C. BAUGH

**The new coke-oven batteries of the Compagnie des mines de Bethune at Pas de Calais.** A. GREBEL. *Génie civil* 94, 493-7(1929).—Detailed description of construction, equipment and operation of two batteries of the Lecoque system. Gas production per ton of dry coal is 275 to 300 cu. m. Gas analyses are given.

E. I. S.

**Obtaining the maximum fuel value from wood waste.** E. W. MOLINE. *Wood Ind. (A.S.M.E. Trans.)* 1928, 25-28, 6 figs.

E. I. S.

**Apparatus for technical gas analyses (BURKHARDT, et al.)** 1. A new flue-gas tester (GROSS) 1. The chemistry of coal (BRUNNER) 8. Geological aspects of the formation of coal (FOX) 8. Determination of the softening point of a pitch or bitumen (GREEN) 22. The removal of  $\text{CO}_2$  from gas mixtures by pressure scrubbing (NITZSCHMANN) 2. Rotary-compartment drum apparatus for drying, charring, etc., of coal (U. S. pats. 1,718,542-3-4) 1. Desulfurizing organic substances (Fr. pat. 655,230) 10. Separating  $\text{CO}_2$  from gas mixtures [fuel distillation gases] (Ger. pat. 477,159) 13. Discharging solids, liquids and gases simultaneously from high-pressure reaction vessels [in manufacture of oil from coal] (Ger. pat. 477,038) 13. Eliminating  $\text{C}_2\text{H}_2$  [from coke oven gases] (Fr. pat. 656,365) 13. Destructive hydrogenation of carbonaceous material (Brit. pat. 300,703) 22. Purifying oils for Diesel engines (Brit. pat. 300,900) 22. Purifying gases (Brit. pat. 301,061; Fr. pat. 655,135) 13. Iron oxide [from blast-furnace gas] (Fr. pat. 655,258) 9. Treating tarry and similar materials in order to effect dehydration and cracking (U. S. pat. 1,717,884) 22.

**Proceedings of the Second International Conference on Bituminous Coal.** Vol. I, 987 pp. Vol. II, 940 pp. with 40-page index covering both volumes. \$15 (not sold separately). Pittsburgh: Carnegie Inst. of Technology. Reviewed in *Mining Met* 10, 358(1929).

RASCHE, ARTHUR: *Lehrbuch für Installateure und Techniker des Gasfaches*. Frohse-Elbe bei Magdeburg: A. Rasche. 446 pp.

**Ricerche sulla utilizzazione delle ligniti.** Studi compiuti dall'ufficio delle miniere degli S. U. A. Rome: L'industria mineraria. 120 pp. L. 10.

**Thermochemische Versuchs-Anstalt Prof. Dr. Aufhäuser. Brennstoff-Untersuchungen 1927-28.** Kohlentab. Hamburg: Boysen & Maasch. 26 pp. M. 3

**Fuel.** PIERRE A. HOYER. Fr. 655,749, Oct. 25, 1927.  $\text{NH}_3$  is dissolved in liquid fuel such as gasoline, alc.,  $\text{C}_6\text{H}_6$ , etc., for use in explosion motors and decompd. by electric sparks into N and H before mixing with air in the carburetor.

**Fuel.** LUCIEN LIAIS. Fr. 655,724, June 14, 1928. Coal dust to be used in burners is freed from moisture and the pores are closed by treatment with 3-6% of coal tar, petroleum tar, asphalt, etc.

**Coal gas.** ALFRED POTT. Fr. 655,528, June 8, 1928. Coal-distn. water gas, particularly coke-oven water gas, is used for varying the calorific value and d. of coal-distn. gases. The water gas is formed by the interaction of coal-distn. gas with steam alone or with air alone or with a suitable steam-air mixt. to attain the necessary calorific value and d. The amt. of added coal-distn. water gas and its production may be automatically varied.

**Mixed coal gas and water gas.** DESSAUER VERTIKAL-OFFEN GES. and W. BUEB.

Brit. 300,767, Oct. 24, 1927. Steam is passed through coal in an internally heated chamber and the steam and distillates are then passed through coke either in the same or in another internally heated chamber. An app. is described.

**Benzene from coal gas.** C. STILL. Brit. 300,964, Nov. 21, 1927. Light oil obtained as a liquid distillate in distg. wash oil contg. benzene, as described in Brit. 293,702 (C. A. 23, 1740), is rectified in a sep. distg. app. and the resulting naphthalene-charged rectification residue is returned while still warm to the distd. wash oil passing into new circulation. An app. and various details of operation are described.

**Handling powdered coal or other powdered fuels.** J. J. C. BRAND and B. LAING. Brit. 301,413, June 25, 1927. A current of inert gas is used for carrying the fuel and to displace the air in ship holds or other chambers to or from which the fuel is conveyed, to avoid danger of spontaneous combustion. Numerous details are described.

**Purifying coal distillates.** F. HOFMANN and C. WULFF. Brit. 301,420, Nov. 29, 1927. Products of distn. of carbonaceous materials are refined by a soln., in an org. solvent, of an inorg. acid (other than HCl as described in Brit. 298,484 (C. A. 23, 3075)); e. g., a tar oil may be treated with a soln. of  $H_2SO_4$  in alc. after a preliminary treatment with a soln. of HCl in benzene. The use of  $H_3PO_4$  in alc. also is described.

**Refining benzine.** SOC. DU GAZ DE PARIS. Fr. 655,899, Oct. 28, 1927. Benzine from the distn. of coal is refined by fractionating the crude vapors so as to retain only those parts distg. below  $150^\circ$  and directing these warm vapors on to a polymerizing and partially desulfurizing agent such as KOH or alkali or alk. earth sulfide or both at temp. near that of the benzine.

**Low-temperature coal-distillation apparatus.** ALFRED J. A. HERENG. Fr. 655,257, Sept. 27, 1927.

**Apparatus for drying coal or other similar materials.** POVL T. LINDHARD (to F. L. Smidth & Co.). U. S. 1,718,243, June 25.

**Gas purifiers and scrubbers.** R. W. BROADHEAD and BROADHEAD CONSTRUCTIONS, Ltd. Brit. 301,440, Aug. 30, 1927. Purifiers and scrubbers are formed of steel with a protective coating of concrete which may be reinforced. Various details of construction are described.

**Gas producer.** I. G. FARBENIND. A.-G. Brit. 300,277, Nov. 10, 1927. A producer is described suitable for use with small-sized fuel which is agitated strongly throughout the whole depth of the fuel bed. A steam boiler is enclosed in an upper enlarged portion of the producer or in an adjacent dust separator.

**Gas producers.** SOC. ANON. D'EXPLOITATION DES BREVETS COUSIN (called Le Chauffage Industriel.) Fr. 656,347, Nov. 5, 1927.

**Gas-producer construction.** F. L. BROUGHTON and D. HADLINGTON. Brit. 301,208, Dec. 3, 1927.

**Gas generator construction.** F. W. STEERE (to Smet-Solvay Engineering Corp.). Brit. 300,578, Nov. 15, 1927.

**Slagging gas-producer operation.** S. C. G. EKKELUND. Brit. 301,241, Jan. 30, 1928. The fuel is preheated by contact with the producer gas and volatiles, in part at least, are introduced with the producer gas into the hot zone of the producer. According to the character of the slag-forming substances, reagents may be added for forming either pig iron as a by-product or for producing a cement.

**Ash remover for producer-gas generators.** ARTHUR R. PULVER. U. S. 1,719,519, July 2. Structural features.

**Telescopic gas holders sealed with lubricating grease or similar plastic material.** MASCHINENFABRIK AUGSBURG-NÜRNBERG A.-G. Brit. 301,016, Nov. 23, 1927. Structural features.

**Water gas.** PAUL DVORKOVITZ. Fr. 655,183, June 2, 1928. Water gas is enriched by the addn. of oil gas produced separately by gasifying oil at a uniform temp. fixed by the calorific power required.

**Plant construction for water-gas manufacture.** HARALD NIELSEN and BRYAN LAING (to Sensible Heat Distillation, Ltd.). U. S. 1,718,830, June 25. Various structural features are described.

**Enriching water gas, etc.** METALLGES. A.-G. Brit. 301,459, Nov. 30, 1927. Gas such as water gas is enriched in H and  $CH_4$  by reaction with steam under pressure and the pressure thus developed is subsequently utilized for conveyance of the enriched gas.

**Distilling oil residues.** I. G. FARBENIND. A.-G. Brit. 301,130, Sept. 5, 1927. Residues remaining after distn., destructive hydrogenation or similar treatments of carbonaceous materials are heated to above  $300^\circ$  under diminished pressure and gases or vapors contg. liquids of low b. p. such as water,  $C_6H_6$ , toluene or alc. are introduced into

the heated residues, preferably in the state of a mist, to effect further distn. and oil recovery. Various details are given.

**Unsaturated hydrocarbons.** I. G. FARBENIND. A.-G. Brit. 301,402, June 27, 1927. Unsatt. aliphatic hydrocarbons having the same no. of C atoms as the initial material are made by treating hydrocarbons or mixts. (such as those obtained by destructive hydrogenation of coal or mineral oils) at elevated temp. (suitably 450–900°) with catalysts consisting substantially of active charcoal (details of the prepn. of which are given).

**Halogenated hydrocarbons, halohydrins, nitriles, isonitriles and halogenated acid chlorides.** I. G. FARBENIND. A.-G. Brit. 301,009, June 18, 1927. Compds. of these classes are obtained from the products of destructive hydrogenation of carbonaceous materials by addn. of halogens, H halides, hypohalogenous acids, HCN or phosgene to the double bonds. The destructive hydrogenation products may be subjected to a preliminary dehydrogenating, splitting or cracking treatment as described in Brit. 298,584 (C. A. 23, 3074). Catalysts such as active C, Fe oxide, Al, P or I may be used in addition of halogens or halogen halides.

**Alcohols from destructive hydrogenation products.** I. G. FARBENIND. A.-G. Brit. 301,000, June 18, 1927. Products of destructive hydrogenation of carbonaceous materials (if necessary, after a preliminary dehydrogenation, splitting or cracking treatment such as described in Brit. 298,584 (C. A. 23, 3074)) are treated with H<sub>2</sub>SO<sub>4</sub> and the resulting products are hydrolyzed.

**Destructive hydrogenation.** I. G. FARBENIND. A.-G. Brit. 301,059, Nov. 24, 1927. Carbonaceous products to be treated are passed through a series of reaction vessels between which no appreciable cooling of the reacting materials occurs.

**Hydrocarbons of high-boiling point.** I. G. FARBENIND. A.-G. Fr. 655,376, May 30, 1928. Products from cracking, extn. or hydrogenation under pressure of coal, tar, mineral oils, etc., as well as mineral oil or tar fractions are converted into products of higher b. p. and higher viscosity by exposing the said substances to the action of halogen with the simultaneous or subsequent addn. of catalysts, or to the action of halogen compds. capable of liberating halogen, and submitting the products obtained, if necessary after sepn. of any halogen compds. present, to a second condensation, preferably in the presence of a catalyst, the temps. being chosen in each step to avoid production of resins. Elements of the 1st and 2nd group of the periodic system and their compds. are suitable catalysts. Examples are given.

**Carbonization furnaces.** LOUIS WILPUTTE. Fr. 655,529, June 8, 1928. Construction of vertical retorts.

**Distilling carbonaceous materials such as coal and oil shale.** J. W. H. AINSWORTH. Brit. 300,984, Nov. 22, 1927. The material is passed in a continuous stream through an externally heated retort, the temp. of which increases from the inlet to the outlet end and distillates are taken off through openings in the retort wall. Details of the retort construction are described.

**Plant construction for generating steam by solar heat.** E. SPIESS. Brit. 300,995, Oct. 22, 1927.

**Gasifying heavy liquid fuels for internal-combustion engines.** ANTONIO V. DIAZ. U. S. 1,717,767, June 18. A mass of C is heated to redness by heat from exhaust gases, air is aspirated through the mass by suction of the engine so that partial combustion is effected, and liquid fuel which has been vaporized by heat from the exhaust gases is introduced into the heated C mass separately from the air; resulting vapors and gases are fed to the engine. An arrangement of app. is described.

**Lubricating oil rectifier and filter suitable for use with internal-combustion engines.** RALPH L. SKINNER (to Automotive Device Co.). U. S. 1,717,741, June 18. Structural features.

**Sleeve valves for internal-combustion engines.** CHARLES SCHAEFFER (to Soc anon. des anciens établissements Panhard & Levasson). U. S. 1,718,082, June 18. Steel sleeve valves are coated with friction-reducing metal.

**Treatment of high-temperature tar.** ZECHE MATHIAS STINNES. Ger. 477,499, Nov. 20, 1923. Addn. to 430,438. Crude coal tar is stirred with an excess of benzene and the mixt. is allowed to stand, whereby a soln. in benzene of a viscous oil, suitable for lubricating, and an asphaltic residue are obtained. The oil may be freed from its small phenol content by extn. with dil. EtOH and may be rendered more viscous by distg. off its low-boiling constituents under reduced pressure. The asphaltic residue may be used directly or may be distd. to recover the bulk of the phenols.

**Washing coke-oven gas.** W. FRAASS. Brit. 300,275, Nov. 10, 1927. Coke-oven gas, prior to fractional liquefaction, is washed with water under pressure, and dissolved



combustible constituents are recovered in a chamber in which the pressure is reduced. CO<sub>2</sub> remaining in the soln. can be expelled by agitation or released by trickling through coke towers.

**Purifying coke-oven gases or similar gases.** GEORGES CLAUDE (to Soc. l'air liquide, Soc. anon. pour l'étude et l'exploitation des procédés Georges Claude). U. S. 1,717,761, June 18. The gas is treated with a soln. contg. caustic alkali and a polyhydric alc. such as glycerol. Cf. C. A. 23, 505.

**Coke-oven construction.** E. COPPEE ET CIE. Brit. 300,823, Jan. 2, 1928.

**Coke-oven construction.** H. KOPPERS A.-G. (to E. Leyh). Brit. 301,386, Nov. 28, 1927.

**Vertically flued coke-oven construction.** H. KOPPERS A.-G. (to F. Totzek). Brit. 300,278, Nov. 10, 1927.

**Regenerative coking oven.** WILHELM MÜLLER. Ger. 477,434, Sept. 1, 1926.

## 22—PETROLEUM, LUBRICANTS, ASPHALT AND WOOD PRODUCTS

W. F. FARAGHER

**Petroleum refining—general study of introduction of petroleum refining in France.** E. LÉGÉ. *Mem. et compl. rend. trav., soc. ing. civils France* 82, 57-240(1929).—E. I. S.

**Occurrence of higher fatty acids in natural petroleum and origin of petroleum.** YOSHIO TANAKA AND TSUTOMU KUWATA. *J. Faculty Eng. Tokyo Imp. Univ.* 17, 203-303(1928).—Cryst. acids have been isolated from the acid constituents derived from a gas-oil distillate of Ishikari petroleum. The yield was about 7.7% of the total acid constituents, or 0.001% of the distillate. Palmitic, stearic, myristic and arachidic acids were present; palmitic acid predominated. The presence of higher and lower acids was suggested. Similar fatty acids occur in variable amounts in many Japanese petroleum and in some California and Borneo oils. Sharks and whales are believed to be the animals responsible for the formation of petroleum. ALBERT L. HENNE

**Vapor tension of petroleum products at high temperatures.** A. SAKHANOV AND A. DOLADUGIN. *Neftyanoe Khozyaistvo* 13, 66-9(1927); *Chem. Zentr.* 1928, 1, 280.—The vapor tensions of light ligroin, gasoline, crude oil, paraffin oil, cylinder oil, 3 kinds of benzine and 2 kinds of kerosene and of machine oil were detd. in an autoclave at temps. of 100° to 400°. The vapor-tension increase with rise of temp. is least with crude oil and is greater the more homogeneous the oil. The vapor pressure is decreased if the vol. of the liquid relative to the vol. of the gas is reduced. In order to crack the oil in the liquid phase, it is necessary to use a higher pressure. FRANCIS P. GRIFFITHS

**Silica gel as a reagent for the extraction of high-sulfur oils from crude petroleum.** GLADYS R. WOODWARD. *Ind. Eng. Chem.* 21, 693-5(1929).—Silica gel reduced the S content of Inglewood (Calif.) crude petroleum from 2.30 to 1.90%. In naphtha soln. a com. gel removed 18%, a Holmes gel, 37% of the S. The S compds. can be extd. fractionally from the gel up to 90% by using, in turn, naphtha, C<sub>6</sub>H<sub>6</sub>, and Me<sub>2</sub>O; NaOH soln. removes the remainder. EMMA E. CRANDAL

**The crude oil produced in the Salt Creek field, Wyoming.** H. P. RUE AND I. N. BEALL. *Bur. of Mines, Tech. Paper* 449, 27 pp.(1929).—Results of distg. samples of crude oil from the Salt Creek field in a 10-gal. still are reported, together with a description of the app. and method used. Products obtained by steam distn. with redistn. of the tops were:

Gasoline	33%	Gear oil	3.8%
Kerosene	5%	Foots oil	7%
Gas oil	18%	Wax	15.8%
Non-viscous lubricating oil	8.3%	Asphalt	1.1%
Viscous lubricating oil	4.7%	Total losses	3.3%
Products obtained by coking distn. were:			
Gasoline	41%	Foots oil	5.5%
Kerosene	2.3%	Wax	4.1%
Gas oil	26.4%	Total coke and losses	6.7%
Non-viscous lubricating oil	11.5%		
Viscous lubricating oil	2.5%		

These products are very similar to those obtained commercially.

D. F. BROWN

**Distillation. I. Vapor-liquid equilibrium in complex hydrocarbon mixtures.**

(1). ALEX. C. BROWN. *Trans. Am. Inst. Chem. Eng.* 21, 87-91(1928).—An exptl. method is outlined for detg. the extent and direction of deviations from Raoult's law of the components of complex hydrocarbon mixts., in order to obtain exact data for the design of distn. equipment. Bottoms and distillate from a continuous still are analyzed in a true-b. p. still, and the wt. of fraction distd. over plotted against the temp. at the column head. An equation is derived by means of which, knowing the av. mol. wts. of the bottoms and distillate and the reciprocal slopes of the true-b.p. curves of the bottoms and distillate at a given temp., the Raoult's law correction factor,  $k$ , may be calcd. (2). ALEX. C. BROWN AND GEO. C. CAINE. *Ibid* 91-7.—Heavy naphthas from Pa., Calif. and Mid-Continent fields were treated by the method outlined in part (1). A technique of analyzing the data is presented; the true-b.p. curve of the bottoms was calcd. from that of the distillate by assuming that  $k$ , the Raoult's Law correction factor, is equal to unity, and the actual  $k$  detd. by comparison of the curve so obtained with the actual true-b. p. curve of the bottoms. Within the limits of exptl. error, all the components were found to deviate to the same extent and in the same direction from Raoult's Law. Values of  $k$  for each of the three naphthas studied are given for use in engineering calcs. II. Plate efficiency in rectification of petroleum. W. K. LEWIS AND H. D. WILDE, JR. *Ibid* 99-126.—The authors present a modification of the Hausbrand method of calcg. plate efficiency, using the Raoult's Law correction factor, which is necessary for computations involving complex hydrocarbon mixts. The exptl. results of a test of the performance of a com. still cutting between heavy naphtha and the higher-boiling fractions of the crude oils are given. The close correspondence between the computed concns. and direct analytical detns. at different points in the column demonstrates that the computation methods presented are sound and, within the precision of the data, represent the conditions of large-scale operations.

F. E. WALSH

A review of oil cracking. A. F. DUNSTAN. *J. Junior Inst. Eng.* (London) 39, 322-6(1929).

E. I. S.

Cracking of light oils in America. GUSTAV EGLOFF. *Chem. Obzor* 4, 159-63 (163 English)(1929).—A survey of American methods.

JAROSLAV KUČERA

Vapor-phase cracking. C. R. WAGNER. *Oil and Gas J.* 27, No. 49, 46, 47, 149 (1929).—In the Gyro process for vapor-phase cracking, the cold stock from the charging-stock tank is sprayed under 100-lb. pressure into an arrester, reducing the temp. of the hot vapors which enter from the converter at 1100°F. The resulting liquid passes into a hot-oil reservoir. The vapors from the arrester pass to a fractionating tower with the reflux so regulated that the distillate condensed from the vapors leaving at the top has the boiling range desired for the gasoline. The uncondensable gas is treated for the recovery of its gasoline content. All oil not yet converted to motor fuel or gas is collected in the hot-oil reservoir from which an automatically controlled amt. is delivered to an economizer while the remainder returns through heat exchangers or coolers to the charging-stock tank. The oil going to the economizer is heated by the waste heat from the cracking still to 700°F. and passes to an evaporator where the fuel oil is removed as residuum. Superheated steam is introduced at the bottom in an amt. not exceeding 3% of the wt. of the vapors leaving at the top. Steam and vapors are freed from entrained liquid in a separator and pass at 650°F. into the converter where they are heated to 1100°F. and cracked. The advantages claimed for the process are: production of high-grade antiknock fuel; economical, easy, and practically continuous operation; ability to handle any crude or charging stock; high value of fixed gas, and desulfurizing character of the reaction.

M. B. HART

Reducing still operating at profit due to partial cracking. W. T. ZIEGENHAIN. *Oil and Gas J.* 27, No. 1, 165(1929).—An increased amt. of light distillate and a fuel oil of low viscosity are obtained in West Texas and Panhandle refineries which have no cracking plants, by partially cracking the residuum from crude batteries in a reducing still at 1000°-1200°F. The tubes of this still are of small diam. and the necessary heating surface is secured by increasing the no. and length of the tubes. The small diam. minimizes the formation and deposition of coke. The cracked oil is shock-chilled 50-100° upon entering the tower by spraying it downward against a round plate or cone and directing upon it by a funnel the knockdown of the tower. Based on the residuum charged, 10-20% of gasoline and about 78% of fuel oil of low viscosity, very low pour point, and high B. t. u. value are obtained with 5-8% loss as gas.

M. B. HART

The oxidation of mineral oils. MAURICE VAN RYSEELBERGE. *Chimie & industrie Special No.*, 275-88(Feb., 1929).—As the aging of transformer oils is due primarily

to oxidation, the work of Moureu *et al.* has suggested that autoxidation may be involved and that the use of antioxygen compds. might retard it. A no. of preliminary expts. are described to show that oils of different origins having similar phys. properties and oils of the same origin but refined to different degrees have quite different autoxidation curves and that the absorption of  $O_2$  can be considerably retarded by addn. of a trace of hydroquinone. The increase in acidity in artificial aging tests (at  $110^\circ$ ) does not follow the  $O$ -absorption curves. The relative degree of refining of oil of the same origin can probably be ascertained by means of the  $O$ -absorption curves, the most highly-refined oils absorbing  $O_2$  the fastest. From a brief discussion of the behavior of oils in aging, it is suggested that in moderately refined oils the resinous compds., which are easily oxidized, are converted into solids which have a protective action on the hydrocarbons; while in fully refined oils the hydrocarbons themselves are oxidized, with formation of free acids. Autoxidation and artificial-aging tests carried out on used oils as such, after filtration, and after regeneration, showed that they still absorb appreciable amts. of  $O_2$ , and that regenerated oils absorb  $O_2$  more rapidly than used oils, either as such or filtered, but stand up particularly well in the artificial-aging test. The no. of expts. was too small to permit of drawing general conclusions; this line of investigation is considered promising.

A. PAPINEAU-COUTURE

West Texas progressive distillation, de-salting, light cracking in special stills. P. TRUESDELL. *Natl. Petroleum News* 21, No. 22, 65, 67-8(1929).—The method of skimming and cracking West Texas crude as used by the Great West Refining Co. at Big Spring, Texas is described. Crude oil preheated in 2 exchangers by hot fuel oil and gas oil is passed through a tube still where it is heated to  $350^\circ$  and flashed into a horizontal tank ( $8 \times 30'$ ). Here the salts held in suspension settle out. Vapors pass into a common header connected with 4 bubble towers in series. Unvaporized portions from the flash tank are pumped into the low-temp. side of the pipe still where they are heated to  $500^\circ F.$  and flashed into a second chamber from which vapors pass into the common header. Bottoms from the second flash chamber are heated to  $675^\circ F.$  and flashed into No. 3 chamber, from which vapors pass overhead and bottoms to the coils of the high-pressure still at  $790^\circ F.$  and 100-lb. pressure. Cracked vapors are scrubbed with caustic and condensed. Pressure distillate is rerun by pumping over the top of the bubble towers.

M. B. HART

Distilling and treating oil. ANON. *Petroleum Times* 21, 416(1929).—The Dampfkessel and Gasometerfabrik A. G. has developed a plant for distg. and treating crude oil in which the oil passes through a heat exchanger into a vapor-separator where light benzene and steam, derived from water in the oil, are sepd. The residual oil is pumped to a gas-fired tube still from which it passes into a second vapor separator at  $300^\circ$ , where the fractions from heavy benzene to gas oil are sepd., leaving only fuel oil and lubricating oil. The vapors receive a certain amt. of steam and pass to 3 condensing columns where by injection of partially cooled condensate into different parts of the column a quantity of heat corresponding to the desired fraction is withdrawn. The final condensing is done as usual, each fraction having its own condenser. The permanent gases are fired in the tube stills. The desired degree of distn. is obtained complete in one operation and the distillates are chemically refined at a much smaller cost in chemicals and loss of oil than in continuous treatment. The plant occupies very little space. It is apparently designed for straight-run products.

M. B. H.

New methods of testing oils. B. MARSHALCO AND I. BARNA. *Intern. Congress Testing Materials* 1927, II, 415-27.—A viscometer is described by means of which 150 viscosity detns. may be run accurately in 10 hrs. on one sample of oil over a wide temp. range. It is composed essentially of 2 concentric cylinders, a few mm. apart, between which the oil is kept. The outer cylinder is rotated at a const. speed, and the pull on the inner cylinder is measured by a lever fitted with an adjustable counterpoise. The temp. of the oil and cylinders can be controlled over a wide range. The Vogel formula,  $\eta = \eta_\infty (t-t_\infty)/(t-t_0)$ , expresses best the viscosity temp. curves of all the oils tested from  $30^\circ$  to  $300^\circ$ . It defines the whole curve by 3 points as a function of the temp.  $t_0$ ,  $t_1$  and  $t_2$  at which the viscosity is 100, 10 and 2.5 centipoises, or by the 3 differences  $t_1 - t_0$ ,  $t_2 - t_1$ , and  $t_2 - t_0$ . The aging properties of an oil depend almost exclusively on oxidizability. M. and B. describe an oxidation test as follows: a thin film of oil is heated in  $O_2$ , the  $CO_2$  and  $H_2O$  formed being absorbed chemically, and the  $O_2$  consumed is taken as a measure of the aging quality of the oil.

G. CALINGAERT

Oil-testing apparatus. H. HERBST. *Chem.-Ztg.* 53, 344-5(1929).—The app. is designed for the detn. of surface tension, adhesive power, and angle of contact of lubricating oils by the rise in a capillary tube; of the viscosity of pitch, resin, etc., of the

thickness of bodies, and for making manometer readings for slight variations of pressure. Directions and calens. are given. J. H. MOORE

The pyrogenation of mineral oils. G. DIXMIER. *Chimie & industrie Special No.*, 272-4 (Feb., 1929); cf. *C. A.* 22, 4238.—In the test as previously outlined, irregularities are caused by oxidation that takes place only at the surface of the oil; this defect has now been overcome by providing means for renewing the surface in contact with the air by automatically pouring the sample back and forth in two tubes. The results can be duplicated readily. Comparison of the results of the test with the behavior of the oil in motors showed that the test can be of value in foretelling the practical value of the oil as a lubricant. A. PAPINEAU-COUTURE

Processing Winkler crude oil. W. T. ZIEGENHAIN. *Oil and Gas J.* 27, No. 50, 136-7 (1929).—Excessive corrosion of equipment is avoided and a good gasoline made in a new refinery of the Burford Oil Co. at Pecos, Texas. The S content is reduced to pass the U. S. motor specification of 0.1% by limiting the production to 410 E. P. gasoline and heavily treating this with  $H_2SO_4$  and doctor soln. The products made are gasoline of high antiknock value and great volatility, a light gas oil resembling kerosene distillate, and fuel oil. The gasoline vapors are washed with a cold  $NH_4OH$  soln. after leaving the fractionating towers. This removes much  $H_2S$  and has so far prevented any noticeable corrosion of the condenser tubes. The gasoline is then treated with weak  $H_2SO_4$  (50 lb. of 28.3% acid per bbl.) followed by a 2nd treatment with 6 lb. of 93% acid per bbl. This is followed by a water wash, which takes out much free S, and by treatment with caustic and doctor soln. The Jenkins cracking process is used. M. B. HART

Methods of refining sulfurous oils. C. J. WRIGHT. *J. Inst. Petroleum Tech.* 15, 214-44 (1929).— $H_2S$  and mercaptans are the two types of compds. which render a petroleum distillate sour.  $NaOH$  will remove  $H_2S$  and some mercaptans. Lime has a similar action, but must be used in much larger vol. because of its low soly.  $Ca(ClO)_2$  and  $NaClO$  oxidize mercaptans, sulfides and disulfides either to  $H_2O$ -sol. compds. or to compds. that are harmless though dissolved in the oil. Na plumbite removes very little S. With the aid of flowers of S it converts mercaptans to disulfides and leaves a gasoline doctor-sweet.  $H_2SO_4$  removes mercaptans, sulfides, disulfides, and thiophenes.  $H_2S$  and thiophenes are oxidized. Mercaptans are partly oxidized to disulfides, and the disulfides to sulfonic acids. Liquid  $SO_2$  is mainly used for removing aromatic hydrocarbons from kerosene distillates. It also removes mercaptans, disulfides and cyclic S compds. Bauxite is useful for treating kerosene because it decolorizes as well as desulfurizes the oil. Mercaptans are probably oxidized catalytically in the pores of the bauxite by the  $O_2$  dissolved in the oil. The recovery of soda used for washing to remove mercaptans is not economical. It can be used up to 80% efficiency without recovery and only up to 87.5% efficiency if fully recovered; that is, if 25 per cent of the liquid is distilled off, a part of the mercaptans go over with the  $H_2O$  vapor. If the temp. at which a straight-run distillate leaves the still condenser is kept at 90–100°F., at least  $\frac{1}{3}$  less soda is required to remove the  $H_2S$  completely than if the temp. is allowed to drop to 70–80°F. Disregarding the  $H_2S$ , economy would best be served by the use of 10% of 0.5% soda for partial mercaptan removal before the hypochlorite treatment. Considering the  $H_2S$ , the use of 5% of 0.5% of soda soln. followed by bleach treatment in the proportion of 2.2 g. per l. is most economical. Soda soln. can be recovered to the extent of about 5% by the Koppers process. Within this limit it can be used repeatedly for  $H_2S$ , but not for mercaptan removal. If no other alkali than soda were available, it would pay to remove  $H_2S$  by "sulfide soda" only and recover this by the Koppers process; and follow with "mercaptide soda"—washing for the mercaptans; the soda could be recovered by boiling, and after 8 recoveries would be run to waste. It does not pay to recover either sulfide or mercaptide lime. Dil. soda solns. are more efficient desulfurizers and are more easily recovered. Sulfide soda serves to remove elementary S. The speed with which hypochlorite oxidizes S compds. is increased by reducing the excess of alkali. But if the alkalinity is reduced too nearly to the neutral point, the sulfonic acids formed in the oxidation may produce an acid condition, leading to excessive chlorination. The excess alk. in the 0.34 N hypochlorite soln. should be 0.5–1.0 g.  $NaOH$  per l. or 0.2 g. lime per l. EMMA E. CRANDAL

Hypochlorite treatment of oils. A. E. DUNSTAN AND F. B. THOLE. *Oil and Gas J.* 28, No. 1, 190, 194-5 (1929).—In treating oils with hypochlorite, the proper effect depends on the right amt. of free alkali. If too little is present, the hypochlorite soln. is unstable and has a chlorinating tendency; too much alkali slows down the reaction to an impractical degree. For the desulfurization of straight-run gasoline the optimum

is 0.5–1.00 g. free NaOH per l. Cracked distillates can also be sweetened but not completely desulfurized by a modified hypochlorite treatment instead of plumbite; because of the presence of gum-forming hydrocarbons, acid treatment or redistn. cannot be dispensed with entirely. The process is used chiefly for sweetening sour straight-run gasolines which have a total S content low enough to permit their use as motor fuel. The advantages of hypochlorite over  $\text{H}_2\text{SO}_4$  and plumbite are: a non-corrosive, non-poisonous reagent which, when spent, can be discharged into rivers; no reduction of antiknock value; smaller losses; low cost. M. B. HART

**Hypochlorite process of refining.** S. F. BIRCH. *Oil and Gas J.* 28, No. 1, 190, 193–4; No. 2, 38, 108, 170, 172, 174 (1929).—In the hypochlorite process of refining gasoline, the Na hypochlorite has been largely replaced by the cheaper Ca salt which is made by introducing Cl into dil. milk of lime or, where Cl is not available, by dissolving bleaching powder. The prepn. of the reagent is described in the first part of the articles. The treatment of S-contg. straight-run gasoline, discussed in Part 2, can be carried out in 2 ways: enough of the reagent is added to oxidize all or nearly all the S compds. to water-sol. products, giving a desulfurized gasoline, or just enough is added to convert the mercaptans into disulfides. The gasoline is first freed from  $\text{H}_2\text{S}$  by washing with lime water or NaOH. It is then agitated with the hypochlorite soln., sepd., and washed with water. This treatment yields a gasoline of pleasant odor, neg. to doctor soln. and non-corrosive. Part 3 describes the application of the process to natural gasoline, cracked gasoline, kerosene and painter's naphtha. Part 4 gives an account of the chem. reactions involved in the process. M. B. HART

**Rowsey flashing system.** GEORGE REID. *Refiner and Natural Gasoline Mfr.* 8, No. 2, 65–7 (1929).—The first installation of the Rowsey flashing system has been put in operation by the Pampa Refg. Co., Tex. All pumps are motor driven, only a small field boiler being required for distn. The tube still has 2 sections and is fired as 2 stills. Three banks of tubes are placed above the furnaces; the preheating tubes are at the top. Eight small stacks instead of 1 large stack secure an even distribution of heat. The crude oil passes first through heat exchangers heated by fuel oil, then through the preheater tubes from which it expands at  $275^\circ\text{F}$ . into the bottom of the first tower. These towers are both separators and fractionators. The vapors rise through 15 bubble trays and are washed in the upper section by refluxing the product of the tower. The overhead gasoline from the first tower, usually  $68\text{--}70^\circ\text{A. P. I.}$  with  $330^\circ\text{F. E. P.}$ , is the larger part of the gasoline in the crude oil. The outgoing oil from the bottom is heated in the first heating bank to  $540^\circ\text{F}$ . and then passed to the lower section of the second tower. The vapors pass through 15 bubble trays, are washed with naphtha, and are removed as  $58\text{--}60^\circ\text{A. P. I.}$  gravity,  $400^\circ\text{E. P.}$  gasoline. Temps. at the top of all towers are kept const. by control of the reflux with Foxboro automatic temp. regulators. Residue from the bottom of the second tower is heated to  $675^\circ\text{F}$ . in the second section of tubes, to vaporize the remaining gasoline, kerosene and gas oil, which are sepd. in the 3rd and 4th towers. The gasoline-recovery system consists of one absorber without special absorption medium, pumps, gathering lines and a No. 4 Connersville blower which takes suction on the gathering lines to the tanks with a vacuum controlled by a Davis regulator, holding the tanks at atm. pressure. Residual gases from the absorber are burned under the pipe still. All lines are gas-tight and so connected that gases in the oil stream find their way to the gasoline-recovery system. M. B. HART

**Effect savings with efficient restoration of fuller's earth.** K. W. NICHOLS. *Oil and Gas J.* 27, No. 51, 222, 224 (1929).—Fuller's earth is restored efficiently by carefully controlling the temp. according to the amt. and kind of earth to be treated and by washing and steaming as far as possible before it is burned. The color of the burnt earth is not taken as a criterion of its quality since often earth having a light gray color due to C is as good as a red earth and the danger of fusing it is lessened. Each batch is burned individually according to the judgment of the operator. M. B. H.

**Composition of natural gasoline.** G. G. OBERFELL, R. C. ALDEN AND L. A. PO-COCK. *Oil and Gas J.* 27, No. 52, 158, 160 (1929).—In a study of the compn. of natural gasolines it was found that approx. data on com. grades are obtainable from the Engler distn. curve. Natural gasoline contains 3 groups of hydrocarbons with relatively distinct boiling ranges: "butanes and lighter," "pentanes" and "hexanes and heavier." The percentage off at  $100^\circ\text{F}$ . (corrected for distn. loss) was found to be the Engler point which bore the best relationship to the content of "butanes and lighter." This relationship is expressed on a chart based on 113 analyses. The percentage of pentanes was very accurately predicted by the relationship between the percentages off at  $100^\circ\text{F}$ .

and 140°F. on the Engler curve (corrected for distn. loss). The propane content has no significance to the refiner.

M. B. HART

Present grades of natural gasolines require revision. G. G. OBERFELL, *Oil and Gas J.* 28, No. 2, 145-6(1929).—A progress report of the Technical Comm. of the National Gasoline Assoc. of America proposed revision of specifications for com. grades of natural gasoline. The conclusions are: vapor pressure is the most important single characteristic; the Engler percentage off at 100°F. (corrected) is the most satisfactory single intermediate b. p. for specification purposes. Present specifications, namely, gravity and distn. loss, are inadequate. Specifications to be proposed will probably be as follows: Grade 3—Reid vapor pressure at 100°F. in lb. per sq. in. abs., 22-26; and Engler percentage off at 100°F. (corrected), 30-60. Natural gasolines in this range having Engler percentage off at 100° less than 30 or more than 60 will be in Grades 2 and 4, resp. Five grades are necessary.

M. B. HART

Oil absorption of natural gasoline. W. K. LEWIS, *Trans. Am. Inst. Chem. Eng.* 20, 1-7(1928).—The method of Walker, Lewis and McAdams for computing continuous countercurrent absorption systems for the absorption of a single component of a gaseous mixt. by a non-volatile, liquid absorbent in which the other components of the gas are insol., is expanded to solve the more complicated problems met in the absorption of the large no. of components of natural gasoline.

E. M. SYMMES

Progress report of the A. S. M. E. Special Research Committee on Diesel fuel oil specifications. Am. Soc. Mech. Eng., Advance paper, June 24-7, 1929, 6 pp.—Suggested specifications are presented which have been modified to meet the views of industry.

E. I. S.

Determination of the carbureting properties of light motor fuels. N. D. GRAMENITZKII, *Izvestiya Teplolekhn. Inst. (Trans. Thermo-Tech. Inst. (Moscow))* 6, 12-9(1928).—The influence of the nature of motor fuels on their vaporization in the carbureter is discussed. The dependence of the percentage of the whole amt. of the fuel which undergoes vaporization on the temp., pressure, vol. and surface and time of vaporization is considered, and a means of evaluating this percentage is evolved. The relationships between the carbureting properties, viscosities and sp. gr. of various Russian petroleum motor fuels are pointed out.

B. C. A.

Determination of the softening point of a pitch or bitumen. G. M. GREEN, *J. Soc. Chem. Ind.* 48, 114T(1929).—A 3-mm. length of the point-end of an ordinary-sized brass drawing pin is flattened out into the form of a spearhead. The bitumen is molded into a sphere of about 6 mm. diam., that is impaled on the spearhead up to the point where it joins the circular shank of the pin. The pin is dropped into a large-sized boiling tube, fitted with thermometer and stirrer, that contains a soln. of KI satd. at 16°. This soln. has a d. which is higher than that of any bitumen and has no effect on the bitumen. If the temp. is raised slowly (the rate should not exceed 0.5° per min. near the softening point), the bitumen "tails off" and floats to the surface. This temp. may be considered the softening point of the sample. Results are reproducible to 1°.

A. J. MONACK

Investigations on the vapor tensions of lubricating oils in relation with the flash point and cracking. M. BOISSELET AND M. ISELIN, *Chimie & industrie Special No.*, 293-5(Feb., 1929).—Flash tests (made by the open-cup method) on Pennsylvania spindle oil, machine oil and cylinder oil, which were analyzed before and after detg. the flash pt., showed that: the depth of color and fluorescence of the oil increases with the time of heating; the higher the rate of heating, the lower the flash pt.; the slower the rate of heating, the greater the increase in d.; the  $n$  of the oil is lower after the test but does not vary appreciably with the conditions of testing; the tar content is higher than in the original oil, but does not vary regularly with the testing conditions; the acidity increases regularly with the time of heating. From the results of a series of vapor-tension detns. of several oils at temps. up to 300°, the general results only of which are given, B. and I. conclude that this detn. is not suitable, at least at the present time, as a substitute for the detn. of the flash pt.

A. PAPINEAU-COUTURE

Investigations on the vapor tensions of lubricating oils in relation to the flash point and cracking. P. ISELIN, *Ann. combustibles liquides* 4, 69-81(1929).—The vapor tension of an oil is a const. at any given temp. unless cracking is taking place. The possible use of vapor tension to characterize an oil instead of flash point was investigated by measuring the vapor tension at successively higher temps. till the temp. was reached at which it ceased to be a const. The oil sample was placed in a cathodic vacuum in a tube bent in such a way that the oil could be heated in an elec. furnace. The gases absorbed from the atm. were first withdrawn, with the aid of careful heating. The oil was cooled and as it was heated again the vapor-tension measurements were

taken at intervals of 20° to 30°. After each reading the temp. was allowed to drop back to that of the preceding one and raised about 40°, a 2nd reading being taken at the point of the last one, for confirmation. Correction was made for the vapor tension of the Hg, the atm. pressure, the capillarity of the tube and the wt. of the oil column; also, for the expansion of the Hg column in the furnace. Two series of oils were tested, the one Pennsylvanian, the other Russian, including spindle, machine, auto and cylinder oils and one transformer oil. In lubricating oils decompn. begins at about 200°; is not very marked at 260°, but increases rapidly from 300° up. The better-refined oils are probably more resistant to heating. The flash point of the lighter oils is always attributable to vapor tension. Even for cylinder oils, flashing is mainly due to vapor pressure, not to the products of cracking. There seems to be no sufficient ground for substituting vapor tension for flash point detn. Vapor pressure for the heavy oils is too small to be measured accurately till temps. are reached at which it is no longer const.

EMMA E. CRANDAL

The chemical composition of Russian turpentine from the galipot of *Pinus silvestris*. B. ARBUZOV. *J. Russ. Phys.-Chem. Soc.* 61, 255-68 (1929); cf. C. A. 23, 1762.—From a brief survey of the pertinent literature it appears that the turpentine from the galipot of *Pinus silvestris* is made up of three main constituents: *d*- $\alpha$ -pinene (I), nopinene (II) and *d*- $\Delta^3$ -carene (III). The conflicting evidence regarding the two latter constituents, as well as the questionable presence of  $\beta$ -pinene, induced A. to investigate the Russian turpentine obtained from the galipot of *P. silvestris*, produced by a method closely resembling that used for com. production. The turpentine content of the galipot was 18-20%. For comparison the turpentine obtained from the galipot by the canula method was investigated along with that obtained by distn. *Exptl. part: Canula method.*—The liquid portion of the galipot was sepd. from the heavy cryst. ppt., and the turpentine obtained from this by distn. under reduced pressure. 222 g. gave the fractions: A 28 g.,  $b_{15}$  46°; B 40 g.,  $b_{15}$  46-6.5°; C 27 g.,  $b_{15}$  46.5-50°; D 12 g.,  $b_{15}$  56-60°. The total recovery was 48.2%. Fractions A, B and C were combined and redistd. giving the fractions: E 80 g.,  $b_{9.5}$  37.6° [ $\alpha$ ]<sub>D</sub><sup>15</sup> + 40.42°,  $\alpha F/\alpha C$  1.964; F 15 g.,  $b_{9.5}$  37.6-9.6°, [ $\alpha$ ]<sub>D</sub><sup>15</sup> + 38.38°,  $\alpha F/\alpha C$  1.982. Fraction D had [ $\alpha$ ]<sub>D</sub><sup>15</sup> + 24.98°,  $\alpha F/\alpha C$  2.042. After six redistns. *in vacuo*, pinene [ $\alpha$ ]<sub>D</sub><sup>15</sup> + 41.76°, was obtained from E. Hence the content of I in the turpentine was 80.85%. *Distn. method.*—Nearly identical turpentines were obtained from the galipot by distn. with steam and under reduced pressure. The product from steam distn. gave the const.:  $d_{15}$  0.8649, [ $\alpha$ ]<sub>D</sub><sup>15</sup> + 25.87°,  $\alpha F/\alpha C$  1.968; that by distn. under reduced pressure:  $d_{15}$  0.8651, [ $\alpha$ ]<sub>D</sub><sup>15</sup> + 25.55°,  $\alpha F/\alpha C$  1.968. Eighty % of this was pure I,  $b_{15}$  49.6-51.5°  $d_{15}$  0.8625,  $\alpha F/\alpha C$  1.97-1.98. The amt. of I is therefore somewhat less than with the canula method. Three hundred and twenty g. of this last turpentine was washed with Na<sub>2</sub>CO<sub>3</sub> soln. and carefully dried with fused K<sub>2</sub>CO<sub>3</sub>. The product had the const.  $d_{15}$  0.8651, [ $\alpha$ ]<sub>D</sub><sup>15</sup> + 25.87°,  $\alpha F/\alpha C$  1.968. This was fractionally distd. at 750 mm. Since II has the const.:  $d_{15}$  0.8740, [ $\alpha$ ]<sub>D</sub><sup>15</sup> - 22.1° and  $\alpha F/\alpha C$  1.428 (cf. C. A. 2, 3190; 4, 583), it can at most be present only in traces since Darmon has shown that abnormal coeffs. of dispersion result in mixts. of substances with rotations of opposite sign and different rotatory dispersions, while in this case no abnormal values were obtained. The coeffs. of rotatory dispersion obtained for the first fractions indicate pure I. Fractions 14, 15 and 16 agree in odor and in phys. const. with pure III. Calcn. of the compn. of Fractions 1-14 by Biot's formula gives I, 85.23%, and III, 14.77%; the compn. of the original turpentine was then: I, 81%; III, 14%; higher boiling substances, 5%. As the next expt. 903 g. of the turpentine obtained from the galipot by steam distn. and carefully dried was fractionated under reduced pressure. Curves are given. The fraction  $b_{20}$  58-62.5° gave the color test for III described by Aschan (cf. C. A. 22, 2559). It also gave the characteristic nitrosate. From these results it appears that Russian turpentine from the galipot of *P. silvestris* differs in compn. from the *P. silvestris* turpentines of Germany and France, which contain II in addn. to I and III (cf. C. A. 21, 818). The evidence available shows that various turpentines all obtained from the same species of pine may vary considerably in compn. The presence of considerable III in Russian turpentine explains the great susceptibility of the latter to oxidation.

LEWIS W. BURZ

The oxidation of turpentine in the open air. K. N. KOROTKOV. *Zapiski Belaruskai Dzyarzhavnai Akad. Seiskae Gaspadarki* (Ann. Weissruth. Staatl. Akad. Landw. Gorky), 7, 142-53 (1928); cf. C. A. 23, 2289.—K. investigated 2 points: (1) Whether O<sub>2</sub> from the air is absorbed as such or is changed to another form (ozone) by

turpentine and (2) whether the  $O_2$  absorbed is capable of giving certain org. compds. from which  $O_2$  may be recovered by heating the aq. soln. with  $MnO_2$  or other catalytic agents. Five cc. of turpentine and a small vol. of  $H_2O$  were poured into a eudiometer which was placed in a cylinder of water and fastened so that the level of the  $H_2O$  in the eudiometer and the cylinder was the same. The original level of the turpentine in the eudiometer was recorded as well as the temp. and pressure of the air surrounding the eudiometer. These values were recorded daily for a period of 7 days, after which a burning splinter was inserted in the eudiometer. The flame was extinguished and analyses showed that 8.83 cc. of  $O_2$  had been absorbed, the theoretical amt. of  $O_2$  in the air being 8.77 cc. Three other expts., slightly modified, were conducted. In one of them pure  $O_2$  was used in place of air. The results were the same as described. In the pure- $O_2$  expt.,  $CO_2$  was found, showing that this gas is formed in the process of absorption of  $O_2$ . Another series of expts. to establish the 2nd point of the investigation was carried out as follows: 25 cc. of turpentine in a definite vol. of acidified  $H_2O$  (3 cc. of 0.1 N  $H_2SO_4$  in 250 cc. of  $H_2O$ ) was poured into a retort and connected with a buret (200 cc.) which served as a eudiometer. The buret was placed in a cylinder of  $H_2O$  and as the  $O_2$  was absorbed and the  $H_2O$  rose in the buret, more  $H_2O$  was added. When no more  $O_2$  was absorbed, turpentine water was siphoned off and the  $O_2$  absorbed detd. by the method described in a former publication. The results of the expts. are summarized as follows: (1) The oxidation of turpentine in the air takes place at the expense of the ordinary  $O_2$  in the air. (2) The turpentine is capable of giving up 30% of the total amount of  $O_2$  absorbed; this is the active  $O_2$  from the turpentine. (3) Turpentine from different sources differ in capacity to absorb  $O_2$ . The turpentine from *Pinus silvestris* can absorb 34 l. of  $O_2$  per l. of turpentine. J. S. JOFFE

**A note on coconut-shell oil.** M. GOVINDA KIDAVU AND E. K. NAMBIYAR. Madras Agr. Dept., Yearbook for 1927, 33-5(1928).—The shells from 30 coconuts yielded 0.5 lb. of oil by dry distn. The oil is a thick black liquid with an acrid penetrating odor. It is acid to litmus and contains pyroligneous acid, creosote, etc. When lightly painted on wood, it dries quickly with a black, slightly glossy surface which is not removed by soap and is not easily affected by acids and alkalis. The oil is an excellent paint for wood and Fe. It is an antiseptic and is used in Malabar as a medicine for all wounds. K. D. JACOB

Testing of fuel oil as practiced in a well-known glass factory (LÉSTER) 19. Modern views of friction (TRILLAT) 2. Pyrogenic dissociation of some condensed ring systems (ORLOV) 10. Pyrogenic decomposition of chrysene under H pressure (ORLOV) 10. Comparison of the Zennström and other processes for the production of paper pulp and by-products from maritime pine and other resinous woods [recovery of spirits of turpentine] (RIVIÈRE) 23. Alterations by light, heat and agitation of the heavy petroleum oils refined for therapeutic use (BRIÈRE) 17. Vapor-phase oxidation of isomeric octanes. III. The effect of  $PbEt_4$  and the relation of oxidation to engine detonation (POPE, *et al.*) 10. Filter for oil (U. S. pat. 1,719,316) 1. Discharging solids, liquids and gases simultaneously from high pressure reaction vessels in cracking of tars and oils rich in asphalt (Ger. pat. 477,038) 13. Halogenated hydrocarbons, halohydrins, nitriles, isonitriles and halogenated acid chlorides (Brit. pat. 301,009) 21. Lubricating oil rectifier and filter suitable for use with internal-combustion engines (U. S. pat. 1,717,741) 21. Distilling carbonaceous materials such as oil shale (Brit. pat. 300,984) 21. Treatment of high-temperature tar [with lubricant production] (Ger. pat. 477,499) 21. Purifying gases (Fr. pat. 655,135) 13. Rotary compartment drum apparatus for drying, charring, etc., of shale (U. S. pat. 1,718,542 3 4) 1. Hardening lime plaster, mortar and stucco [with hardener comprising pulverized shale material] (U. S. pat. 1,718,955) 20. Carbonization furnaces (Fr. pat. 655,529) 21. Hydrocarbons of high boiling point (Fr. pat. 655,376) 21. Wick filters for oil, etc (Brit. pat. 301,507) 1.

**Petroleum Development and Technology, 1928-29.** New York: Am. Inst. of Mining and Metallurgical Engineers. 623 pp. \$5 to non-members. Reviewed in *Mining Met.* 10, 358(1929).

**Petroleum Products Testing.** Being 2nd ed., revised, of "Standard Methods of Testing Petroleum and Its Products" formulated by the Standardization Committee of the Inst. of Petroleum Technologists. Published by the Institution, Aldine House, Bedford St., Strand, London, W. C. 2. 137 pp. 7s. 6d., net. Reviewed in *Chem. Trade J.* 84, 539(1929).



**Refining crude oil.** PECHELBRONN (Soc. anon. d'exploitations minières). Fr. 656,344, Nov. 5, 1927. Natural crude oils or their residues are refined by treating them dild. in a solvent with  $H_2SO_4$ , the solvent being unattacked by  $H_2SO_4$ , sepg. the acid muds by heating to about  $75^\circ$  and decanting. The acid residues obtained are heated moderately with more solvent and treated as above. The acid oil finally obtained is neutralized and distd. Fr. 656,345 describes the sepn. of  $H_2SO_4$  from the acid tar by dissolving the latter in  $C_6H_6$  or its homologs, heating the soln. thus obtained successively in the presence of residuary or other acids of decreasing concn. to remove completely by successive washings and drawing off all the  $H_2SO_4$ . Fr. 656,346 describes the sepn. of  $H_2SO_4$  by disintegrating and emulsifying the tar or residue in a crude petroleum deriv., etc., preferably with the injection of steam into the mass, and neutralizing with NaOH.

**Purifying oils.** HERMANN BENSMANN. Fr. 656,426, June 25, 1928. Used lubricating oils are purified for reuse by intimate mixt. with 2-5% of a polymerizing agent, decanting and filtering through a hydrated silicate of Al-Mg. Before decanting steam may be passed through to ext. easily volatile hydrocarbons, the particles of water being afterwards sepd. in the filter.

**Destructive hydrogenation of crude oil or other carbonaceous materials.** I. G. FARBENIND. A.-G. Brit. 300,703, Aug. 11, 1927. A catalyst is used contg. 10% of a mixt. of Cu and Zn or Cu and Cd, the remainder comprising one or more of the elements B, Al, Si, Ti, V, Ta, Cr, Mo and W or their compds. or compds. of Co. A high yield of benzine is obtained from crude oil.

**Treating tarry and similar materials in order to effect dehydration and cracking.** ALEXANDER S. KNOWLES (to Tar & Petroleum Process Co.). U. S. 1,717,884, June 18. Material such as tar or petroleum residuum is allowed to flow downwardly into a bed of loose material which is mostly C, in an externally heated closed chamber, heated from below, and gases and vapors from a zone of coking temp. are passed through overlying material and the solid residue is removed as coke. An app. is described.

**Testing soil by an electrical conductivity system to locate oil-bearing formations.** CONRAD SCHLUMBERGER. U. S. 1,719,786, July 2.

**Soaps from sulfonated mineral oil acid sludge.** ORVILLE E. CUSHMAN AND THEODORE W. DOELL (to Standard Oil Co. of Calif.). U. S. 1,718,335, June 25. After a preliminary treatment of mineral oil with  $H_2SO_4$  (which may be of  $66^\circ$  Bé. strength), the sludge is sepd. from the oil and the oil then further treated with  $H_2SO_4$  of a strength over 97% and the sludge thus formed also sepd. Sulfonated products in the second sludge are sepd. from the assoc. free  $H_2SO_4$  and neutralized and the oil-sol. coloring substances are extg. with  $C_6H_6$ .

**Cracking hydrocarbons.** ANGLO-PERSIAN OIL CO. Fr. 655,823, May 15, 1928. During the cracking process liquid hydrocarbons, particularly petroleum, are given a relatively high degree of agitation which may be caused by a pump imparting eddy or wave motions to the oil during its passage through the app.

**Cracking hydrocarbon oils.** F. HOFMANN AND C. WULFF. Brit. 301,395, Nov. 27, 1927. Halides of B or their addn. or substitution products are used as catalysts in cracking processes, with or without use of hydrogenating gases. An example is given of the use of B fluoride at  $380^\circ$  and 150 atm. in treating crude oil.

**Cracking hydrocarbon oils.** HARRY L. PELZER (to Sinclair Refining Co.). U. S. 1,718,375, June 25. In producing gasoline from high-S crude oil, the oil is subjected to vapor-phase cracking and the mixt. thus produced is scrubbed to sep. tar. Caustic alkali is mixed with the crude oil and this mixt. is introduced into the vapors in the scrubbing operation; the vapor mixt. passing from the scrubbing operation is subjected to refluxing and in the refluxing condensation is effected of components heavier than are desired in the gasoline product; reflux condensate is supplied to the vapor-phase cracking operation, and tar and assoc. substances are discharged without return to the cracking operation. An app. is described.

**Cracking hydrocarbon oils in admixture with steam in a pipe coil under pressure.** CHARLES J. GREENSTREET (to Gasoline Corp.). U. S. 1,718,913, June 25. Vapors from the coils after regulated heating are brought directly into contact with liquid water suddenly to chill the products below cracking temp. An app. is described.

**Purifying hydrocarbon oils.** LOUIS LINK AND MAURICE B. AMIS (to Standard Oil Development Co.). U. S. 1,718,714, June 25. An uncracked light hydrocarbon distillate contg. difficultly removable corrosive S is brought into intimate contact with spent alkali from the treatment of a light fraction obtained by cracking petroleum hydrocarbons. An app. is described.

**Hydrogen and carbon by thermal decomposition of hydrocarbons.** ARTHUR

W. BURWELL (to Alox Chemical Corp.). U. S. 1,717,354, June 18. Vaporized hydrocarbon material such as a petroleum fraction is added to a stream contg. "commercial" H or other inert gaseous vehicle heated to a temp. sufficient to effect thermal decomposition of the material, and a closed cycle of operations is followed comprising establishing a zone of thermal decomposition of the material in the vehicle, withdrawing the decomposition products comprising H and C from the zone of decomposition, sepg. C, and withdrawing at least a portion of the gaseous product and preheating the residual components of the stream in the closed cycle to a temp. sufficient to effect further thermal decomposition of hydrocarbon material.

**Apparatus for cracking hydrocarbon oils.** HARRY L. PELZER (to Sinclair Refining Co.). U. S. 1,719,486, July 2. Structural features are described of app. in which the oil is circulated through a bed of finely divided material such as fuller's earth within the distn. app.

**Apparatus for distilling and oxidizing hydrocarbon oils.** JOHN C. BLACK and WIRT D. RIAL (to Pan American Petroleum Co.). U. S. 1,718,679, June 25. An app. is described suitable for blowing asphaltic residuum with air or steam.

**Distilling oil from solid materials such as shale.** CARL POSTEL (to American Shale Reduction Co.). U. S. 1,717,808, June 18. Distn. is effected in an inclined rotary horizontal retort provided with a jacket through which molten metal such as Pb is circulated. Various structural details are described.

**Apparatus (with rotatable annular retort) for distillation of oil shale.** KENNETH E. CLAYTON-KENNEDY (to American Hydrocarbon Co.). U. S. 1,717,786, June 18. Various structural details are described.

**Rotary inclined horizontal retort and associated apparatus for distilling oil shale.** T. M. DAVIDSON. Brit. 301,407, Aug. 25, 1927. Structural features.

**Refining petroleum oils.** ROY CROSS (to Cross Development Corp.). U. S. 1,718,218, June 25. In producing a refined gasoline, a suitable charging stock adapted for cracking is treated with a Na plumbite soln. and with  $H_2SO_4$  and then cracked to obtain gasoline.

**Apparatus for treating petroleum oils with chemical solutions.** JESSE L. TAYLOR and CHRISTOPHER L. HOWSER. U. S. 1,717,744, June 18. Various structural features are specified.

**Centrifugal separation of crude petroleum from sand, water, bottom settlings, etc.** JAMES R. HALL. U. S. 1,718,141, June 18. An app. is described.

**Apparatus for separating oil from exhaust steam.** H. YAMAMOTO. Brit. 300,822, Dec. 30, 1927.

**Treating "sour" naphtha distillates.** JAMES SIMPSON (to Standard Oil Development Co.). U. S. 1,718,713, June 25. A "sour" naphtha distillate is treated with a Na plumbite soln., the soln. is sepd. and a naphtha distillate contg. corrosive S is then subjected to the action of the same soln.

**Rubber-lined tanks for "petrol," etc.** SOC. ITALIANA PIRELLI. Brit. 301,089, Nov. 24, 1927. Structural features.

**Filter for gasoline, etc.** A. COX. Brit. 301,152, Sept. 30, 1927. Structural features.

**Filter for gasoline.** MILTON E. CHANDLER (to Stromberg Motor Devices Co.). U. S. 1,717,875, June 18. Structural features.

**Desulfurizing motor fuel.** W. N. DAVIS and W. H. HAMPTON (to Standard Oil Co. of Calif.). Brit. 301,450, Nov. 30, 1927. Polymerization loss of unsatd. S free hydrocarbons during the desulfurization of materials such as cracked naphthas by treatment with  $H_2SO_4$  is controlled by limiting the max. reaction temp. (preferably to within about  $8^\circ$  of the initial temp. and to below about  $5^\circ$  or lower). An app. is described.

**Liquid motor fuel.** WERNICKE & BEYER. Brit. 301,076, Nov. 25, 1927. Dihydroxybenzene (suitably 0.2-0.5% dissolved in a mixt. of alc. and mineral oil) is added to "petrol, benzole or other motor spirit" to reduce "knock."

**Treating refuse from fuel oils.** H. W. WILDISH. Brit. 301,405, July 28, 1927. Refuse such as that obtained when oil tanks are washed out and the oily water is cleansed by the Perbright process is passed through automatically cleaned strainers to remove sand and heavy sediment, heated to about  $80^\circ$ , and allowed to settle. Floating oil is centrifuged. Water and sediment are passed through a sand filter, water is discharged, and the oily sediment on top of the sand is burned or otherwise destroyed.

**Separating wax from mineral oils.** ROBERT E. WILSON (to Standard Oil Co. of Ind.). U. S. 1,719,350, July 2. A low-viscosity oil contg. naturally assocd. wax is

treated with an oil-miscible liquid such as iso-PrOH which ppts. the bulk of the wax at low temp.

**Paraffin.** CLARENCE A. WARD (to Standard Oil Development Co.). U. S. 1,718,672, June 25. Paraffin slop is chilled and pressed in the presence of a filter aid such as clay, asbestine pulp, paraffin or paper pulp to obtain a pressed oil and a difficultly sweatable slack-wax and the latter is subjected to distn. under cracking conditions to produce a distillate of sweatable slack-wax.

**Lubricating oil mixture.** OLE ROLFSEN. U. S. 1,717,939, June 18. Partially hydrogenated whale oil is mixed with mineral lubricating oil.

**Purifying lubricating oils or oils for Diesel engines, etc.** I. G. FARBENIND. A.-G. Brit. 300,900, Nov. 19, 1927. Crude oils are freed from S impurities, etc., by passing them with H at a temp. of about 300° and under 10 atm. or higher pressure over catalysts immune from poisoning by S (such as Mo trioxide and ZnO treated with magnesia) under conditions which avoid the formation of substantial quantities of products of low b. p.

**Apparatus (with mercury vapor generator and condensers) for distilling lubricating oils.** ARTHUR E. PEW, JR., and HENRY THOMAS (to Sun Oil Co.). U. S. 1,719,235, July 2. Structural features.

**Filter for oil of engine-lubricating systems.** ERNEST J. SWEETLAND. U. S. 1,718,390, June 25. Structural features.

**Bituminous emulsions.** J. A. MONTGOMERIE. Brit. 300,414, Dec. 19, 1927. Aq. emulsions of Mexican asphalt or similar materials are prep'd. by mixing the molten material with a hot aq. soln. contg. normal Na phosphate or other suitable tertiary alkali phosphate or mixts. of such phosphates in a quantity of about 0.5% that of the bituminous material. Other reagents such as alk. hydroxides or carbonates also may be used, as may also stabilizing agents and those increasing wetting, penetrating and spreading power such as Na laurate. Cf. C. A. 23, 698.

**Bituminous emulsions.** J. A. MONTGOMERIE. Brit. 300,415, Dec. 19, 1927. Mexican asphalt or similar material is emulsified by adding it while molten to a hot dil. aq. soln. of an oxidizing alkali such as one formed with a peroxide or percarbonate of Na or K. Other substances also may be present. Cf. C. A. 23, 698.

**Bituminous emulsions.** J. A. MONTGOMERIE. Brit. 300,821, Dec. 24, 1927. Aq. emulsions of Mexican asphalt or like material are prep'd. by mixing the molten material (continuously or in batches) with a hot dil. soln. of Na cresylate or a similar cresylate which may be in the proportion of 0.5% (calcd. as NaOH) of the asphalt. Na laurate or other stabilizing agents, etc., may also be added. Cf. C. A. 23, 698.

**Bituminous compositions.** COLAS PRODUCTS, LTD., W. S. WHITING AND A. G. TERRY. Brit. 301,544, Sept. 2, 1927. Mineral or other aggregate is coated with bitumen by applying it in the form of an emulsion with a small quantity of a salt such as NaCl or Na<sub>2</sub>SO<sub>4</sub> which is a strong electrolyte. A filler such as soft limestone may be added to absorb water set free from the emulsion.

**Removing suspended solid particles from bituminous emulsions.** BURT, BOULTON & HAYWOOD, LTD., and F. J. E. CHINA. Brit. 300,408, Dec. 9, 1927. In order to free emulsions of bituminous materials from solid particles which might block spraying nozzles, the emulsions, on the way to the spraying nozzles, are passed through a pipe in which a helical brush is placed which substantially fills the cross-section of the pipe.

**Aqueous dispersions.** THE FLINTKOTE CO. Fr. 655,355, May 29, 1928. Aq. dispersions of substances such as pitch, bitumens and resins along with insol. mineral powder such as colloidal clay or bentonite are obtained by adjusting and holding the  $p_H$  value within predet'd. const. limits. Thus, with a pitch of acidic character a basic mineral powder such as a metallic oxide or hydroxide is added, which, when incorporated uniformly, makes it possible to disperse more effectively with an acidic clay. The  $p_H$  value of the final system is adjusted to suit more perfectly the final characteristics desired.

**Emulsifying agents.** NAAMLOOZE VENNOOTSCHAP DE BATAAFSCHE PETROLEUM MAATSCHAPPIJ. Brit. 300,574, Nov. 15, 1927. In the production of dispersing, emulsifying or stabilizing agents, mineral oil is treated with liquid SO<sub>2</sub> or other substance of a similar solvent action and is then sulfonated (suitably by the process described in Brit. 291,393 (C. A. 23, 1262)).

**Furnace for carbonizing wood with recovery of tar and pyrolygneous acid.** JAMES R. KONGIER. Fr. 656,293, May 31, 1928.

## 23—CELLULOSE AND PAPER

CARLETON E. CURRAN

**Science and cellulose.** WILDER D. BANCROFT. *Pulp Paper Mag. Can. International No.*, 283-6 (Feb., 1929).—An address. A. PAPINEAU-COUTURE

**Future possibilities in the utilization of cellulose.** CHARLES H. HERTY. *Paper Mill* 52, No. 11, 22-6, 34 (1929).—See C. A. 23, 3342. A. PAPINEAU-COUTURE

**$\alpha$ -Cellulose.** J. H. ROSS AND J. S. G. SHOTWELL. *Pulp Paper Mag. Can.* 27, 379-82, 396-7, 431-4, 454 (1929).—From a review of the literature (with bibliography of 29 references) and an investigation into the effect of variations in the conditions under which the  $\alpha$ -cellulose detn. is carried out, it was found that the amt. of substance extd. from a pulp by NaOH solns. varies with the temp. of extn., the ratio of soln. to pulp, the concn. of the soln. and the time. The following method was evolved and found suitable as a routine method, as it gives closely agreeing results in the hands of different operators: Macerate 3.5 g. of air-dried bleached pulp in 70 cc. of 17.5% NaOH at 20°, mercerize for 2 hrs., filter on a Buchner funnel and pass the filtrate repeatedly till all the fiber is held, suck as dry as possible, suspend the pat in 100 cc. of 17.5% NaOH at 20° for 30 sec., stir well, filter as before, suspend in 200 cc. of 25% AcOH, bring to a boil, filter, wash on the filter with 1 l. of boiling water and dry to const. wt. at 100-5°. A. PAPINEAU-COUTURE

**Hydrolysis of cellulose.** II. RICHARD WILLSTÄTTER AND LÁSZLÓ ZECHMEISTER. *Ber.* 62B, 722-5 (1929); cf. C. A. 7, 3412.—Haber (*Z. angew. chem.* 42, 52 (1929)) believes the new arguments in favor of the view that cellulose is made up of large units joined by primary valences are plausible rather than decisive and do not exclude the possibility that it is built up of short chains. It does not seem superfluous, therefore, to add to the no. of purely chem. proofs of its structure. In 1913 was begun an investigation of the degradation of cellulose with AcBr-HBr and highly concd. HCl, in which it was found that there are first formed dextrin-like\* products and then a mixt. of tetraose, triose, bioses and glucose. The work was interrupted by the war, but it seems appropriate to publish now some of the observations made on these oligosaccharides, which, under the conditions of the expts., cannot be obtained from glucose by reversion. The course of the hydrolysis of cellulose with HCl cannot be brought into harmony with the assumption of small structural units. Pure absorbent cotton (112 g.), dried at 115°, was dissolved in 1100 g. HCl ( $d_{4}^{25}$  1.21, prepd. at a low temp.), allowed to stand 3 days at 19.5°, evacuated 10 min. to remove part of the HCl, poured upon 3 kg. of ice, quickly neutralized with pressed-out  $\text{Ag}_2\text{CO}_3$  sludge, filtered and washed 3 times with 1 l. of  $\text{H}_2\text{O}$ ; the combined filtrates were then freed from most of the dissolved Ag with HCl, concd. *in vacuo* to 1250 cc., filtered from the dextrin-like ppt. and sepd. into 20-30 fractions by fractional pptn. with alc. The more difficultly sol. fractions yielded dextrin-like substances which swelled in  $\text{H}_2\text{O}$ , the more sol. fractions cellobiose, and the last mother liquors glucose. From the intermediate fractions were obtained a *cellostetraose*, sol. in  $\text{H}_2\text{O}$  without swelling, sepg. from hot concd. aq. soln. on addn. of alc. to slight permanent turbidity in cryst. aggregates; it is very faintly sweet, sinters 205°, m. around 240°, loses 6-7% in wt. *in vacuo*, mol. wt. in freezing  $\text{H}_2\text{O}$  648-706,  $[\alpha]_D$  21.0-1.5°, shows no mutarotation, reducing power (Bertrand), 1 mg. corresponds to 0.66-0.72 mg. Cu; and a *cellostriose*, sweetish, m. around 210° (foaming), mol. wt. 456-513,  $[\alpha]_D$  21.2-1.9°, reducing power 0.82-0.83 mg. Cu. C. A. ROUILLE

**Acetylation of cellulose.** ICHIRO SAKURADA. *Cellulose Ind.* (Tokyo) 4, 304-5 (1928).—Cellulose is acetylated by treating alkali-cellulose with acetic anhydride in benzene soln. at room temp. The product approximates to a combination of 1 mol. of acetic acid + 2 mols. of cellulose. B. C. A.

**Unification of the methods for testing cellulose and cellulose esters.** ROBERT GABILLON. *Chimie & industrie Special No.*, 592 (Feb., 1929).—A plea for the unification of such methods, with suggestions as to which detns. would be most suitable. A. PAPINEAU-COUTURE

**The solubility of cellulose acetate.** MAURICE DESCHIENS. *Chimie & industrie Special No.*, 564-70 (Feb., 1929).—A general discussion of the soly. of cellulose acetate and of the methods generally used for detg. it. A. PAPINEAU-COUTURE

**The hydrolysis of lignocellulose.** G. MEUNIER. *Chimie & industrie Special No.*, 553-63 (Feb., 1929); cf. C. A. 16, 1664; 17, 2165; 21, 623.—The theory of the hydrolysis of lignocellulose by dil.  $\text{H}_2\text{SO}_4$  is extensively discussed mathematically, and the results of expts. are described and discussed showing that they agree with the theoretical considerations put forward. The 2 main reactions are hydrolysis of the cellulose to

dextrose and decompn. of the latter by the acid; and the 3 most important factors are time, acid concn. and temp. André's theory of the decompn. of hexoses (*Proc. 4th Intern. Congress Appl. Chem.*, Paris, 1900, p. 165) is extended as follows: under the action of heat and acidity, hexoses lose 1 mol. of  $H_2O$  to form glucosan, to which may be attributed a furfuranic structure. Some of these furfuranic compds. have an aldehydic structure and others a ketonic structure, the former leading to the formation of furfuran and the latter to levulic and formic acids; these can combine (with elimination of  $H_2O$ ) to form furfural-levulic acid, which can condense with loss of  $H_2O$  to form coumarone, or phenofurane, derivs. The production of humic acid is attributed to a rearrangement or condensation of these phenofurane nuclei. The structure of the humic acid is such that it can lose  $CO_2$ , or even  $CH_4$ , giving rise to still more highly condensed phenofuranes. On the other hand, the furfuroles may condense with loss of water to give brown substances having a compn. very similar to that of humic acid. The variations observed in the decompn. products of hexoses according to exptl. conditions are attributed to variations in the relative proportions of the isomeric aldehydic and ketonic glucosans. It is clearly brought out that multiple-stage hydrolysis gives a considerably higher yield of fermentable sugars than single-stage hydrolysis carried to the same degree. The method used for carrying out the exptl. part of the work can be utilized for detg. (with an accuracy of approx. 10%) the optimum conditions for obtaining given results, 4 expts. being necessary, 2 at temp.  $T$  for times  $t_1$  and  $t_2$ , and 2 at temp.  $T_1$  for times  $t_3$  and  $t_4$ .

A. PAPINEAU-COUTURE

The determination of lignin by means of formaldehyde and sulfuric acid. J. H. ROSS AND A. C. HILL. *Pulp Paper Mag. Can.* 27, 541-4 (1929).—The method depends on the fact that all ligneous tissues, when impregnated with  $CH_2O$  soln., will dissolve in concd.  $H_2SO_4$ , especially when the mixt. is slightly warmed, and that the lignin compds. or a portion thereof ppt. on diln. of the soln. The following technic is recommended: Triturate approx. 0.4 g. of dry sample in a 100-cc. beaker with 4 cc. of com. 40%  $CH_2O$  soln., add 4 cc. of 72%  $H_2SO_4$ , stir until the  $H_2SO_4$  has penetrated the mass (usually about 2 min.), add 6 cc. concd.  $H_2SO_4$ , stir vigorously and allow to heat (not above  $70^\circ$ ); when soln. is complete (generally about 10 min.) pour into 200 cc. of distd. water at room temp., add sufficient ignited asbestos to form a good mat on a Gooch crucible, filter on a Gooch crucible, passing the filtrate through repeatedly until a mat capable of holding the floc is obtained, wash with 200 cc. of 5%  $HCl$ , dry to const. wt. at  $105-30^\circ$ , weigh, ignite and weigh again. Attempts to est. the dissolved and the repptd. lignin by volumetric methods were unsuccessful. The amt. of lignin thus found in spruce varies with the preliminary treatment of the wood: when the resins, fats, etc., have been extd., the apparent lignin content is lowered by about  $1/2$  of the material extd.; when the wood is extd. with alkali there is a further lowering of the lignin value. The hardwoods give a lower value by this method than by previously proposed methods, which is not entirely due to the alkali extn., for an alkali-extd. chestnut gives a higher value by the ordinary  $H_2SO_4$  method of detg. lignin. The lignin ppt. obtained as above is insol. in  $H_2O$ , but sol. in alc.,  $Me_2CO$  and  $AcOH$  when these solvents contain a certain amt. of  $H_2O$ ; the ppt. is sol. in concd.  $H_2SO_4$ , even when washed free from  $CH_2O$ , and can be repptd. from and redissolved in this reagent any no. of times. The lignin product reacts with  $Cl$  and with  $HNO_3$  in a manner similar to ordinary lignin; it appears to absorb  $Br$ . The reaction with  $CH_2O$  is so definite that it might be suggested that there is in the ordinary woody tissue a  $-CHO$  grouping or a substance capable of producing this grouping when acted upon by concd.  $H_2SO_4$ , joined to or in close proximity to the lignin bodies; this grouping, when condensed with the lignin compds., gives  $H_2SO_4$ -insol. derivs.; the  $CH_2O$ -condensation product, on the other hand, gives  $H_2SO_4$ -sol. products. As opposed to this view it might be supposed that the lignin value given by  $CH_2O$  would perhaps be considerably lower than that found by means of  $H_2SO_4$  alone, since the  $CH_2O$  would add very little to the wt. of the ppt., unless the lignin bodies had a high mol. wt. It is remarkable that even chips, after being soaked in  $CH_2O$  soln., are entirely dissolved on the addn. of strong  $H_2SO_4$ . Although more rapid at moderately high temps., the reaction proceeds equally well at low temp. The cellulose products pptd. from their soln. are too far degraded to form films.

A. PAPINEAU-COUTURE

Remarks on the 9th communication on lignin and cellulose by K. Freudenberg. KURT HESS. *Ber.* 62B, 924-7 (1929).—Reply to F. (C. A. 23, 3342). C. A. R.

The development of the rayon industry. ROGER UZAC. *Chimie & Industrie Special No.*, 733-4 (Feb., 1929).

A. PAPINEAU-COUTURE

The molecular structure of rayon. ADOLF ROSENZWEIG. *Kunststoffe* 11, 11-13 (1929).—The examn. of a no. of rayon threads has shown that the quality is inversely proportional to the hygroscopicity of the rayon, and is independent of the size of the

filaments, twist, titer and even the chemical character thereof. It is further stated that the consumer can hardly distinguish the better quality from the av. good skeins. The fundamental faults in rayon are not caused by chemical factors and the improvement has to be accomplished through physical methods. These methods consist in variations in pressure, time and temp.

FREDERICK C. HAHN

**Microscopically visible impurities in viscose and viscose rayon.** RUD. BERNHARDT. *Kunstseide* 11, 13-7, 56, 85-90(1919).—The following factors were found to be responsible for the formation of microscopically fine particles in viscose rayon: the content of inorg. and org. foreign materials in the pulp, impurities in the caustic soda, mineral constituents in the water, the absorption of  $\text{CO}_2$  from the air causing the formation of insol. carbonates, Fe (very small but important) dissolved from equipment, particles of incompletely reacted cellulose from the mercerizing and sulfiding operations, and sometimes the proportion of free  $\text{CS}_2$  in the viscose. Air bubbles occur most frequently in the rayon. A synthetic method was used. Various salts were added to an especially purified viscose, and the formed particles were compared with those present in normal viscose. It was shown that  $\text{CaCO}_3$ ,  $\text{MgCO}_3$ ,  $\text{FeS}$ , Ca resinate, Ca salts of fatty acids, and undecomposed particles of pulp were the most important microscopically visible impurities in the rayon. Microchemical reactions were employed also for the identification of the foreign impurities. Oxycellulose and wood gum do not cause microscopically visible particles. Frequently ppts. of resinic and fatty acids cause particles. The particles of cellulose which persist after filtration cause abnormal cross sections in the filaments.  $\text{CS}_2$  exerts a microscopically visible influence at a concn of 1%, but at the normal content, which is 0.15%, nothing is visible. Silicic acid ppts. are present in very small amounts. A method is described for the detn. of O in NaOH soln., and use is made of this method to detect the existence of an intense absorption of O by the dissolved resinic acid. Numerous inhomogeneities of the dyed rayon filament are due to the deposition of dyes on the edges of air bubbles. The dyeing with basic dyes may result in the formation of ppts. Several complicated reactions were observed during the process of dyeing rayon with safranine, which makes this dye not very desirable for the normal optical investigations. With the use of direct dyes impurities are scarcely visible.

FREDERICK C. HAHN

**Hollow and gas-containing rayon.** WILHELM A. DYES. *Kunstseide* 11, 5-11 (1929).—A review and discussion of patents in this connection.

F. C. H.

**Application of the super-centrifuge to problems in the manufacture of viscose rayon.** E. M. NOBLE. *Can. Chem. Met.* 13, 165-6(1929).—A short account of the viscose process is followed by a listing of and discussion of possible applications of the super-centrifuge in the process: clarification of NaOH soln. pressed from the pulp sheets, clarification of the viscose and clarification of the acid fixing bath.

E. G. R. A.

**Viscose. XIX. Pretreatment of alkali-cellulose and the spinning properties, viscosity and surface tension of viscose prepared therefrom.** G. KITA, J. ONOHARA AND K. SAKURADA. *Cellulose Ind.* (Tokyo) 4, 293-7(1928); cf. C. A. 23, 3084.—The effect of varying the periods of steeping and maturation of the alkali-cellulose on the phys. properties of the resulting viscose is examd. Spinning properties and viscosity are closely related. Viscose filaments from alkali-cellulose matured for short periods in closed vessels appear as satisfactory as those from alkali-cellulose steeped and matured for longer periods in air or in an atm. of H. **XX. Comparison of the properties of steeped and pressed alkali-cellulose.** *Ibid* 298-300. Maturing alkali-cellulose in the pressed-out condition resulted in slightly higher viscosity of the viscose prep'd. from it than when the cellulose was steeped for a long period, pressed out and used immediately. Definite differences in spinning properties and in the phys. properties of the spun filaments were also observed.

B. C. A.

**The emission of fumes from artificial silk works.** T. LEWIS BAILEY. *Chem. Age* (London) 20, No. 519; *Dyestuffs Mo. Suppl.* 47-8(1929).—Efficient drafting by fans is required by regulation in the viscose process of mfg. artificial silk. This has caused complaints due to unpleasant odors contained in such air when leaving the works. This air contains a few p. p. m.  $\text{H}_2\text{S}$  and smaller quantities of other noxious compds. which, probably not dangerous to health, are distinctly disagreeable. In some of the larger works this vol. of air amounts to 500,000 cu. ft. per min. The offensive odors seem to be due to small quantities of  $\text{CS}_2$  from the cleaning of the churns and in the decompn. of the viscose soln. in the spinning baths, which contain chiefly  $\text{H}_2\text{SO}_4$  and other inorg. salts, whereby  $\text{H}_2\text{S}$  is produced. Complete boxing-in of the machines is impracticable. Towers contg. NaOH soln. washed out some of the S compds. but did not remove the most troublesome odors. Other methods of using NaOH soln. as a deodorizer and the use of gaseous Cl and  $\text{SO}_2$  were unsuccessful. Some improvement

has been made by adding suitable materials during the manuf., but as the chem. reactions are obscure, more study of absorbents is needed. Glucose has been used in the baths as it absorbs  $H_2S$  readily. Acid effluent should be neutralized and sulfides should be pptd. and removed before the effluent leaves the works. C. H. BADGER

**Review of the sulfite process.** EMIL HEUSER. *Pulp Paper Mag. Can. International No.*, 121-8 (Feb., 1929); *Paper Mill* 52, No. 5, 18-26 (1929).—A review of recent progress and modern practice, covering acid-making, prepn. of the wood, gas and heat recovery, pulp dryers and chemistry of the cooking process. A. P.-C.

**Practical study of the cooking of wood for the production of sulfite pulp.** G. OGDON. *Papeterie Special No.*, 265-76 (1928).—The following are considered to be the optimum conditions for the production of strong sulfite: the cooking liquor should contain 4.5-5.0% total  $SO_2$  at the start and 0.8-0.9% at the end of the cook; pressure should be 4 kg. per sq. cm., the temp. should be raised rapidly to a little under  $110^\circ$ , kept at  $105-110^\circ$  for 3-4 hrs., and raised gradually to  $125^\circ$ ; relieving should be done as seldom as possible consistent with obtaining the required temp.; the time of cooking depends on the rate of exhaustion of the total  $SO_2$ . Results are given of a no. of com. cooks bearing out the above conditions. A. PAPINEAU-COUTURE

**Control and evaluation of sulfite pulp quality.** G. P. GENBERG and E. O. HOUGH-CON. *Paper Trade J.* 88, No. 17, 71-8; No. 18, 53-9 (1929).—The Roe Cl no. detn. (A) (C. A. 18, 2808) and the initial strength test advocated by Roe and developed by the Technical Assn. of the Pulp and Paper Industry sulfite comm. are described, together with their application; they are compared with the other methods in use, and their relation to the various mfg. steps is discussed. Microscopic analysis was found unreliable for the detn. of the relative percentage of sulfite and groundwood in catalog paper; but A was found sufficiently reliable and accurate for the purpose (cf. G. and Jonsson, C. A. 20, 3082). The A of groundwood averages 35.0, but varies for sulfite depending on the grade of the pulp, and the A of the sulfite used must be known in calcg. the compn. of the paper. Working with known mixts. gave a max. deviation between calcd. and true sulfite content of 3.7%, while in over 75% of the cases the deviation was less than 2%, which is much closer than can be obtained by microscopic analysis. Investigation of the effect of size, alum and filler showed that, within certain limits, the presence of these materials had no adverse effect on the detn.; when the amt. of filler was large, however, it was necessary to allow for this in weighing up the sheets prior to the Cl treatment. Comparison of the detn. of sulfite by A with the other methods put forward from time to time was favorable to the former. It has the advantage of being simple in operation, rapid and capable of being checked by inexperienced operators; with the pulps used (A varying from 2.50 to 4.50) the max. deviation from the av. was  $\pm 3\%$ . A gives a direct indication of the bleachability. Plotting A against bleach consumption obtained in lab. tests gives a straight line, and A can be converted into bleach consumption by multiplying it by a factor which is detd. by existing conditions. The straight-line relationship, however, does not hold in mill practice because of operating conditions, there being a rapid increase in bleach requirements for the lower A values and then a continually diminishing rate of increase for the higher A. If the amt. of bleach is corrected for consistency variations and other factors, the relationship approaches more nearly to the theoretical, especially for the lower Cl nos., and is indicative of the bleach required to obtain an av. uniform white. When bleaching to a low color, however, the same ratio of bleach to A being used, pulps of low A give better colors than those of higher lignin content, the color decreasing progressively with increase of A of the unbleached pulp, and the lignin content of the bleached pulp increasing correspondingly. This is explained on the assumption that bleaching takes place in 2 main stages: (a) a reaction between the hypochlorite and the lignin with formation of colored reaction products, and (b) oxidation of these products to produce sol. colorless compds. While there is no apparent relation between A and strength properties of pulp in individual detns., the average of a large no. of tests indicates some relationship between these properties: the bursting strength (Mullen) increases with A; the tear and freeness increase up to an A of about 3.7-3.8, after which they drop again while the Mullen continues to rise though at an increasingly slower rate. This general relationship holds only for a given grade of unbleached sulfite, but not for different grades; in the latter case pulps having practically the same A can have entirely different strength properties. A comparison of 2 sulfite pulps (mill runs, each lasting over several days) produced by 2 types of cooks lasting 10 and 16 hrs., resp., is reported. Practically the same yield was obtained in both cases, although the shorter cooks were carried to about  $10^\circ$  higher than the long cooks. The long cooks, though finished at a higher blow-test of the cooking acid, gave a pulp

with appreciably lower A (3.21 against 4.32) than the short cooks. The strength properties of the bleached pulps were approx. the same in both runs, because of differences in bleaching conditions. There was less variation in the individual cooks with the longer cooking period. In trying to duplicate a European sulfite of low bleach consumption and high strength, it was shown that a slow and careful cook at a low temp produces a pulp of both satisfactory strength and low A, a condition which is difficult to duplicate at a short cooking time and the increased temp. requisite for the high degree of lignin removal desired. Bleaching with NaOCl gave a brighter color and much higher strength properties than bleaching with Ca hypochlorite. Overbleaching caused an appreciable drop in strength properties; in bleaching with the proper amt of bleach the strength first increased and then dropped to a const. value, which was slightly higher than that of the unbleached pulp; at the same time there was progressive decrease in  $\alpha$ -cellulose content. By reducing the bleaching temp., less bleach could be used without much decrease in color but with definite increase in strength of the bleached pulp. The same bleach ratio being used, 2-stage bleaching with intermediate washing gave slightly lower strength properties and  $\alpha$ -cellulose content, but much better color than single-stage bleaching. At 6% consistency, when a lower bleach ratio was used in 2-stage bleaching, the same color was obtained as with the single-stage bleaching, and the total strength and  $\alpha$ -cellulose content were higher. Less time was required to exhaust the same amt. of bleach in single-stage bleaching than in double-stage. Using a high consistency (about 15%) for the 2nd stage of the bleaching considerably reduced the time required, had no effect on the final color and lowered the  $\alpha$ -cellulose value from 0.5 to 1.0%. In the exptl. bleaching there was greater hydration of the stock at low consistency, because there was no mixing, except at the start and occasionally thereafter to ensure an even penetration of the bleach. Bleaching at high consistency, whether in one stage or in the 2nd stage of a 2-stage bleaching system, had a detrimental effect on the chem. purity of the pulp as measured by the  $\alpha$ -cellulose content. The results of strength detns. carried out on the stock over a period of 2 weeks at various stages of the paper mill processing showed that there is a decided increase in total strength in pumping the slush stock from the pulp mill to the paper mill, a mile away; the other variations in strength were such as might be expected. Comparative strength tests of pulp and of the paper made therefrom in the mill showed that the bursting strength of the pulp undoubtedly had a definite influence on the bursting strength of the paper, any change in the former causing a corresponding change in the latter; the changes in tear and total strength of the pulp bear a somewhat similar relationship to the bursting strength of the paper, though their effect is not so pronounced and regular as that of the Mullen test.

A. PAPINEAU-COUTURE

**Action of sulfite liquor upon Douglas fir.** W. L. BRUSCHLEIN. *Paper Trade J.* 88, No. 19, 66-7 (1929).—Exptl. cooks were carried out on extd. Douglas fir (ground to pass a 60-mesh sieve) with liquors contg. 3.10 and 3.99% total SO<sub>2</sub> and 1.05 and 0.96% combined SO<sub>2</sub>, at 130°, 140° and 150°, and for periods varying from 2 to 11 hr. Comparison of the results with those obtained by Miller and Swanson on white spruce showed that the fir pulp has a lower cellulose content, though less of the original cellulose of the wood is removed from the Douglas fir than from the white spruce. Conclusion Douglas fir is more resistant to sulfite liquor, i. e., more difficult to pulp than is white spruce.

A. PAPINEAU-COUTURE

**Hot acid accumulator.** A. D. MERRILL. *Pulp Paper Mag. Can. International No.*, 101-4 (Feb., 1929); *Paper Trade J.* 88, No. 14, 54-6 (1929).—A discussion of the merits of the Chemipulp Heat, Gas and Liquor Recovery and Cooking Process, in which the acid and gas relieved from sulfite digesters during cooking are absorbed under pressure in hot acid, instead of being cooled before absorbing as is the current practice. The direct advantages claimed are steam saving, increased yield, increased gas recovery with a resultant increase in the strength of the acid. The following indirect savings are also claimed: cooking can be controlled so that a soft easy-bleaching or a modified Mitscherlich pulp can be obtained with a great reduction in screenings; the hot gas recovery eliminates the troubles that most sulfite mills experience with the cold gas recovery during the summer months and assures more uniform acid; it is possible practically to eliminate, by recovery and saving, the blowing of obnoxious gases into the atm.; the strength of the pulp is increased, so that less sulfite is required for furnishing such papers as news print or any other paper that requires a mixt., such as groundwood and sulfite.

A. PAPINEAU-COUTURE

**The so-called copper number of pulps.** J. H. ROSS, H. P. STOCKWELL AND A. C. HILL. *Pulp Paper Mag. Can.* 27, 473-5 (1929).—A brief study of the Cu no. of pulp resulted in the conclusion that the Cu no. is too intimately bound up with the phys.



state of the sample to allow of its use as a quant. test for impurities in fibrous substances.

**The baryta resistance of pulp.** J. H. ROSS AND A. I. DAVIDSON. *Pulp Paper Mag. Can.* 27, 508-9(1929).—On treating pulp with boiling  $\text{Ba}(\text{OH})_2$  soln., max. extn. is obtained with a soln. which is satd. at a temp. of  $25^\circ$  (about 4.5%  $\text{Ba}(\text{OH})_2$ ). The residue obtained by boiling 5 g. of bleached sulfite pulp with 250 cc. of this soln. for 30 min. under a reflux condenser, washing with distd. water, then with  $\text{AcOH}$  and again with distd.  $\text{H}_2\text{O}$ , and then drying, corresponds very closely to the actual  $\alpha$ -cellulose content of the pulp.

**Some aspects of freeness testing.** D. S. DAVIS. *Paper Mill* 52, No. 8, 62, 64, 88 (1929); *Paper Trade J.* 88, No. 11, 60-2(1929).—Previously published data are brought together (*C. A.* 20, 3808; 21, 1710; 22, 4812).

**Chromium-nickel alloys for sulfite equipment.** LEE W. GIBBONS. *Paper Trade J.* 88, No. 19, 61-3; *Paper Mill* 52, No. 19, 24-5, 40; *Pulp Paper Mag. Can.* 27, 715-6, 750(1929).—A brief discussion of some of the salient characteristics of these metals, with suggestions as to how to secure the most satisfactory equipment through a better understanding of the limitations of metals of this description.

**The chemistry of sulfite pulping.** XVI. Pulping beech wood by the sulfite process. ERIK HÄGGLUND AND HELMUT URBAN. *Inst. Holzchem. Akad. Abw. Tech. Chem. Papier Zellstoff- Fabr.* 25, 173-8(1928); cf. *C. A.* 22, 3291, 4801, 4805.—With an ordinary cooking acid (0.88 free and 4.18 total  $\text{SO}_2$ ) beech wood gave yields of 45-50% of a reddish pulp, which consumed 10-12%  $\text{Cl}_2$  in bleaching. The bleaching loss was 3-5%. The strength was surprisingly high for such a short-fibered wood. These data confirm the results of Sembritzki (*Wochbl. Papierfabr.* 45, 2309(1914)) and others. Heuser and Ohlsen (*C. A.* 7, 3022) obtained burned pulps, probably because the very strong acid which they used decomposed spontaneously to  $\text{H}_2\text{SO}_4$ . Deins. of yield,  $\text{SO}_2$ , ash, S and acidity during the pulping show that the behavior is very similar to that of spruce. To obtain good results, it is even more necessary than in pulping spruce that the action be stopped at the proper time. Since the liquor turns dark very early in the cook, the color cannot be used as an end test; the titration test of Sander (cf. *C. A.* 14, 2600) is satisfactory.

**Recovery of soda black liquors.** RAYMOND FOURNIER. *Papeterie Special* No., 228 40(1928).—A discussion of the economic advantage of black liquor recovery, illustrated by means of an example of the recovery of black liquor from the cooking of straw.

**Wood consumption in news print mills.** J. S. BATES. *Paper Trade J.* 88, No. 14, 51-2(1929).—The various factors dependent on the wood (species, size, growth, decay, etc.) are discussed, more particularly to show how yield of pulp per vol. (either cord or 100 cu. ft.) of wood can easily vary 15-20% from one mill to another, while the true comparison of wood consumption on the wt. basis may be favorable. A table is given showing the relative wood consumption per ton of finished news print in 2 mills, the consumption being traced through the various stages of the mfg. process.

**Measurement of wood receipts at the mill.** CHESTER W. ALDEN. *Paper Trade J.* 88, No. 16, 53-6(1929).—An outline of some of the systems of measuring wood receipts in use in Canadian mills, showing the necessity for developing a universally workable wood measurement to correlate mill operations and yields with woodlands operations.

**The tinting and coloring of news print.** E. W. CAMP. *Pulp Paper Mag. Can.* 27, 657; *Paper Mill* 52, No. 14, 24; *Paper Industry* 11, 88(1929).—The methods and the necessary precautions in use are discussed briefly.

**The discoloration of paper.** ANON. *Boll. reg. staz. sper.* No. 2(1929); *Pulp Paper Mag. Can.* 27, 461-4(1929).—Some of the chief factors causing discoloration of fine papers which are intended to be preserved for a considerable length of time are discussed briefly.

**United States patents on paper making issued during the first quarter of 1929.** C. J. WEST. *Paper Trade J.* 88, No. 16, 61-2(1929); cf. *C. A.* 23, 977.—A list of the U. S. pulp and paper patents issued during Jan., Feb. and March, 1929.

**Paper research literature.** VII. C. J. WEST AND B. W. SCRIBNER. *Paper Trade J.* 88, No. 16, 57(1929); cf. *C. A.* 22, 3296.—A list of the contributions by the members of the U. S. Bureau of Standards, Dept. of Commerce, during 1928.

**Research as a commercial enterprise.** R. W. HOVEY. *Paper Ind.* 10, 2145-7 (1929).—Observations on the place of research in the pulp and paper industry.

A. PAPINEAU-COUTURE

Work of the United States Bureau of Standards. ANON. *Paper Mill* 52, No. 15, 20; No. 17, 24(1929); *Paper Ind.* 11, 268-9(1929).—Brief notes are given on recent activities of the paper section of the U. S. Bur. of Standards. A. P.-C.

Paper-making value of wild rice (*Zizania latifolia*). F. HEIM DE BALSAC, H. HEIM DE BALSAC AND A. DEFORGE. *Chimie & industrie Special No.*, 580-2(Feb., 1929).—Wild rice straw, consisting of leaves and sheathes and contg. no nodes, on cooling 4.5 hrs. under a pressure of 3 kg. per sq. cm. with 4° Bé. NaOH soln. (28 g. per l.), gave a light brown pulp which bleached readily with NaOCl soln., the combined yield of unbleached and bleached pulps (in approx. equal amts.) being 38.8%. The paper made from the pulp had fairly good tensile strength, rather poor tearing resistance and medium folding resistance. The unbleached and bleached pulp contained on the dry basis (H<sub>2</sub>O 6.70 and 6.61%, resp.); ash 6.87, 4.88; cellulose 74.25, 90.10; furfural (on the cellulose content) 3.45, 1.66; methoxycellulose present, present; lignin 18.88, 5.02%. The compn. of the ash was: SiO<sub>2</sub> 5.15, 3.80; Al<sub>2</sub>O<sub>3</sub> 4.40, 2.65; CaO 90.45, 93.55%. Wild rice straw soda pulp is considered suitable for paper making for the same uses as ordinary rice straw soda pulp. A. PAPINEAU-COUTURE

Comparison of the Zennström and other processes used at the present time for the production of paper pulp and by-products from maritime pine and other resinous woods. R. RIVIÈRE. *Papier* 32, 289-91(1929).—A brief discussion of the profits to be made by the Zennström recovery process, which consists essentially in recovery of MeOH, rosin, spirits of turpentine, (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> and lignin by a distn. of the black liquor, the details of which are not disclosed. A. PAPINEAU-COUTURE

Conductivity and hydrogen-ion measurements. W. N. GREER. *Instruments* 2, 209-12(1929).—Suggestions for the use of electrometric app. for studying, and possibly controlling, processes in the pulp and paper industries. J. H. MOORE

Conductivity measurements. W. N. GREER. *Paper Mill* 52, No. 19, 12, 37 (1929).—Results of preliminary expts. indicating the practicability of cond. measurements for controlling the sulfite cooking process and the washing of chem. pulp. A. PAPINEAU-COUTURE

Manufacture of sensitized papers for photography, plans and tracing. ANON. *Papeterie Special No.*, 29-30(1928).—Formulas and mfg. directions are given for neg. blue-print and brown-print papers, pos. white-print paper, ferrocyanide paper, post cards and note paper sensitized with Cr salts, and tracing paper. A. P.-C.

The manufacture of greaseproof paper. PAPYRO. *Papeterie Special No.*, 81-4 (1928).—Practical directions are given. A. PAPINEAU-COUTURE

Composition of the commoner grades of paper. A. RETTORI. *Papeterie Special No.*, 299-355(1928); cf. C. A. 18, 1907.—The more usual compns. of a large no. of printing, wrapping, tissue, writing, greaseproof, banknote, photographic and specialty papers and cardboards are given. A. PAPINEAU-COUTURE

The manufacture of cigaret papers. J. ODDON. *Paper Trade J.* 88, No. 15, 51-6 (1929).—See C. A. 22, 685. A. PAPINEAU-COUTURE

Recipes for paper and pasteboard. K. G. JUNG. *Paper Ind.* 11, 279-81(1929).—A no. of processes for making paper and pasteboard impervious to moisture or fats are briefly described. A. PAPINEAU-COUTURE

Light-sensitivity of artists' drawing and water-color papers. ERNST TAUBER. *Chem.-Ztg.* 53, 449(1929).—Having reported 3 years ago that artists' papers of German make turned brown upon exposure to light, while Whatman's papers did not, and not having been able to secure improved German papers meanwhile, T. sized some filter paper with glue and with gelatin, and used this home-made drawing paper successfully. The expts. confirmed his belief that the trouble with German papers is due to sizing with resins. W. C. EBAUGH

Paper mill made bleach and caustic soda. J. E. PLUMSTEAD. *Paper Trade J.* 88, No. 11, 59(1929).—Figures are given showing the high return on investment (up to 92%) obtainable from an electrolytic bleach-plant installation in a pulp and paper mill, particularly if the mill is making soda pulp so that the NaOH can be used to supply the make-up soda requirements of the recovery department, but also in connection with sulfite mills where the NaOH can be used (if there is no outside market for it) for the prepn. either of the bleach or of the cooking liquor. Ordinarily, a plant having a capacity of less than 10,000 lbs. per day of 35% bleach would not be recommended. A. PAPINEAU-COUTURE

Losses in pulp and paper mills. W. G. MACNAUGHTON. *Pulp Paper Mag. Can. International No.*, 359-62(Feb., 1929).—A discussion of white water waste, barking drum refuse, pulp screenings, losses through inefficient use of steam and losses in chem. pulp mills. A. PAPINEAU-COUTURE

Chlorine for slime in paper mills. W. L. SAVELL. *Paper Mill* 52, No. 16, 24-6

(1929).—A discussion of the merits of the use of Cl in eliminating slime troubles in pulp and paper mills, giving examples of a no. of mills where it is used successfully for this purpose. A. PAPINEAU-COUTURE

Comments on the design and operation of paper pulp plants. E. G. MILHAM. *Paper Mill* 52, No. 11, 5, 6, 10, 12(1929).—A general discussion of various methods of working up of waste paper stock. A. PAPINEAU-COUTURE

Recording instruments. J. H. FERGUSON. *Paper Mill* 52, No. 15, 18, 23(1929).—A brief discussion of the application of recorders on washers, beaters, jordanans and paper machines. A. PAPINEAU-COUTURE

Temperature of bleaching vs. strength of fiber. WILFRED V. TORREY. *Paper Ind.* 11, 248-9(1929).—The results obtained showed that varying the temp. of bleaching from 25° to 50° had practically no effect on the bursting and tearing strength of the bleached fiber. A. PAPINEAU-COUTURE

Beating. III. Direct measurement of the water of imbibition of [paper] stuff. M. NAKANO. *Cellulose Ind.* (Tokyo) 4, 300-4(1928).—No difference in the water content of sheets made of the stuff whether boiled or unboiled, after pressing them at 20°, was noted. The water of imbibition is very small, and is therefore difficult to det. by any pressing method. B. C. A.

Beating under control. A. B. GREEN. *Paper Trade J.* 88, No. 15, 57-8(1929).—The Green beater drag was developed with a view to controlling the action of the beater by measuring the change which it effects in the stock instead of by measuring the adjustment of the beater roll, as is current practice. The instrument consists of a specially shaped object of smooth surface immersed to a given depth in the stock; the amt. of power required to rotate it at const. speed under known temp. and consistency conditions is measured; it has recently been improved and simplified by replacing the recording wattmeter by a torsion dynamometer and designing it so that it can be bolted to the curb of the beater instead of spanning the tub from the midfeather to the curb. Results obtained in com. beater runs are given to show the accuracy and sensitiveness of the instrument. A. PAPINEAU-COUTURE

The Delthirna sizing process. R. DE SAINT HILAIRE. *Pulp Paper Mag. Can.* 27, 691-3, 706(1929).—Application in mill operations of the process, which consists essentially in treating lump rosin with a dil. NaOH soln. (about 15 g. per l.) at not less than 15°, has shown that it automatically gives a size soln. of practically const. compn. without requiring any attention other than filling the rosin towers; superior sizing is obtained with an approx. 20% lower rosin consumption. A. PAPINEAU-COUTURE

Control of sizing material losses. E. FRANK WHITTINGTON. *Paper Ind.* 11, 68-72(1929).—An investigation carried out to trace the source of a considerable discrepancy between the size and alum consumption of a mill as obtained from purchases and inventories, on the one hand, and from beater room reports, on the other, showed that the discrepancy was attributable to carelessness and inaccuracy in measuring solns. going into the beater. A. PAPINEAU-COUTURE

Modified washing system for old papers. W. K. KIDDER. *Paper Mill* 52, No. 12, 20-3; *Pulp Paper Mag. Can.* 27, 531-3(1929).—The following system is operating successfully, at a decrease in cost over the usual process, and is giving cleaner, brighter stock: the stock is sorted, dusted, run through a hog, blown into the cookers and cooked about 3 1/2 hrs. with 3% NaOH, the cookers being provided with agitators and with a centrifugal pump to ensure circulation; the cooked stock is dumped into an agitator-equipped storage tank, passed into a hollander washer where water is added to bring it to the required consistency, pumped to a metering box whence it flows by gravity into a series of riffle boxes where pins, paper clips, rubber, etc., settle out, then to flat screens where the final screening takes place, and to a thickener consisting of a rectangular screen 30 ft. long by 12 ft. wide, set at an angle of 45° and covered with fourdrinier wire; the thickened stock is washed by passing through a conical cylinder 25 ft. long, 4 ft. in diam. at the inlet and 6 ft. in diam. at the discharge end, covered with 80 mesh wire and revolving at 4 r. p. m., the whole of the ink being removed in the approx 20 min. required for the stock to pass through the cylinder; the washed stock passes to a bleaching tank where it is mixed with bleach contg. about 18 g. per l. of available Cl, requires about 3-4 hrs. to pass through the tank, coming out at the desired color and brightness, is washed and finally sent to the beater storage chest. A. PAPINEAU-COUTURE

The influence of liquids on molded cellulose hydrate (LÖDKER) 2. The acrolein group as a most probable component of all plant lignins (KLASON) 10. Apparatus for evaporating waste sulfite liquor (Brit. pat. 300,590) 1. Fiber or cellulose from straws

and leaves (Brit. pat. 301,226) **25**. Coloring paper (U. S. pat. 1,719,159) **29**. Paper pulp [from sugar cane] (Fr. pat. 655,163) **28**.

**Manufacture of Pulp and Paper, Vol. V.** 2nd ed., revised and enlarged. Prepared under direction of the Joint Executive Committee on Vocational Education of the American and Canadian Pulp and Paper Industry. New York: McGraw-Hill Book Co. \$6. Reviewed in *Mech. Eng.* **51**, 560(1929).

**Cellulose.** OTTO C. STRECKER. Fr. 655,483, Jan. 12, 1927. See Brit. **284**,846 (C. A. **22**, 4815).

**Cellulose solutions.** HERMINGHAUS & CO. G. M. B. H. Fr. 655,649, June 12, 1928. Cellulose is cut up by a single passage through a cutting machine, or is treated for only a short time in a disintegrator and then xanthogenated or dissolved in the usual way; formation of cellulose sol. in alkalis is thereby avoided.

**Artificial fibers.** I. G. FARBENIND. A.-G. (Emil Hubert, Otto Leuchs and Ludwig Lock, inventors). Ger. 477,066, Oct. 19, 1924. The products obtained by spinning acidyl celluloses into salt solns. contg. a solvent or swelling agent for the acidyl cellulose are improved by superposing on the pptg. bath a liquid, such as paraffin oil, which does not mix with the bath and which is a nonsolvent for the acidyl cellulose.

**Artificial fibers.** I. G. FARBENIND. A.-G. Fr. 655,511, June 8, 1928. In unwinding artificial fibers spun in a centrifuge, a hollow rubber or like balloon is inserted into the centrifuge and blown up to form a support for the thread.

**Cellulosic pulp.** ROBERT A. MARR. U. S. 1,717,794, June 18. Cellulosic material such as white birch chips is cooked under pressure and at near the b. p. of the soln. used at the pressure employed, with a soln. contg. as its principally dissolved component a sulfate such as  $\text{Na}_2\text{SO}_4$  and which is free from substantial quantities of sulfide, sulfite and hydroxide, until the interstitial matter is rendered readily crushed and the material is then reduced to a pulp. U. S. 1,717,795 specifies a similar process in which a soln. contg. 0.05–0.2% of sulfates such as  $\text{Na}_2\text{SO}_4$  and  $\text{MgSO}_4$  is used. U. S. 1,717,796 specifies use of a cooking soln. contg. sulfates of Mg and K together with a chloride such as  $\text{MgCl}_2$ . U. S. 1,717,797 specifies rendering the interstitial matter readily friable by cooking in a 1–5% soln. of a salt such as  $\text{NaCl}$  and a sulfate and then pulping by mech. treatment. U. S. 1,717,798 specifies boiling in a dil. aq. soln. of a nitrate such as  $\text{NaNO}_3$  and then soaking in water and mech. pulping. U. S. 1,717,799 relates to sheets formed of cellulosic fibers and assocd. plant material such as are produced by similar processes. U. S. 1,717,800 specifies digesting cane material in a soln. of alkali metal sulfate and  $\text{ZnSO}_4$  to obtain a product which may be used for making brushes, burlap, cordage, etc.

**Drying cellulose films in long lengths, etc.** WOLFF & CO. and R. WEINGAND. Brit. 300,496, Nov. 12, 1927. To avoid tensioning, the cellulose films or like material are passed over drying rollers which are heated and which are rotated by the film itself.

**Recovery of heat and chemicals in the treatment of spent liquor from digestion of cellulosic materials.** GEORGE A. RICHTER and WALLACE B. VAN ARSDEL (to Brown Co.). U. S. 1,719,130, July 2. Gases from the smelting and combustion of spent liquor material resulting from the digestion of cellulosic material with  $\text{Na}_2\text{SO}_4$  or other reagents are passed periodically through one mass of tile, brick or rock or other inert interstitial material and then through another similar mass, thus causing a condensation of water vapor present and formation of a soln. of sol. compds. in the condensate, this soln. is recovered and used for the prepn. of fresh digesting liquor, and heat transfer from one mass of the inert material is effected while the gases are being passed through the other. An app. is described.

**Treating waste liquors from digestion of cellulosic materials.** GEORGE A. RICHTER (to Brown Co.). U. S. 1,719,129, July 2. Liquors—such as those produced by the digestion of wood with a soln. contg.  $\text{Na}_2\text{SO}_4$  and  $\text{SO}_2$  are concd. and the inorg. material is smelted in a reducing atm. and an aq. soln. is prepd. from the smelted product for alk. digestion of raw cellulosic material. An app. is described.

**Treating cellulose to increase its reactivity.** ZELLSTOFFFABRIK WALDHOF, V. HOTTENROTH and O. FAUST. Brit. 301,088, Nov. 24, 1927. Cellulosic material such as air-dried bleached sulfite cellulose is satd. with caustic alkali soln. (suitably a 12% soda lye) and subjected to a ripening process.

**Cellulose derivatives.** ERNEST MULLER. Fr. 655,279, April 27, 1927. In making films, etc., from cellulose derivs., particularly cellulose hydrate regenerated from viscose, a supplying agent such as glycerol or glucose is incorporated in the film, etc., only during the course of or towards the end of the drying.

**Cellulose esters.** KODAK-PATHÉ (SOC. ANON. FRANÇAISE). Fr. 655,803, May 3, 1928. Hydrated or partially hydrated cellulose is esterified by a monocarboxylic acid contg. an ethylenic side chain by heating them together to a temp. below that at which a harmful degradation of the cellulose takes place. Examples are given of esterification with crotonic, cinnamic and undecylenic acids, substances such as PhCl being added to lower the b. p.

**Delustering articles of cellulose esters or ethers.** SOC. POUR LA FABRICATION DE LA SOIE RHODIASETA. Fr. 655,435, June 6, 1928. Articles such as films, threads or cloth made of cellulose derivs. are delustered by treatment with an emulsion or suspension in water of swelling or solvent agents for cellulose derivs. at a temp. below boiling. Suitable swelling agents are cyclohexanone, cyclohexanol, di- and tri-acetins, Me phthalate, AcOAm, anisol, phenetole, nitrobenzene, etc. The agents may be emulsified by means of soap.

**Use of liquid sulfur dioxide in making cellulose esters.** I. G. FARBENIND. A.-G. Brit. 301,036, Nov. 23, 1927. Liquid  $\text{SO}_2$  is used as a vehicle in various esterification processes in which acid anhydrides or acid halides may be used, as in making cellulose acetate or cellulose butyrate. The  $\text{SO}_2$  can be sepd. from the esters by distn.

**Cellulose ethers.** LEON LILIENFELD. Ger. 477,154, May 22, 1912. See Brit. 6,035, 1913 (C. A. 8, 2947).

**Mixed esters and ester-ethers of cellulose.** I. G. FARBENIND. A.-G. Brit. 300,942, May 12, 1927. A cellulose ester or ether contg. reactive OH groups, such as "commercial" cellulose acetate or ethyl cellulose, swollen or dissolved in an org. solvent, is treated with an inorg. acid chloride in the presence of an acid-binding agent (other than pyridine), such as an org. base,  $\text{NH}_3$ , MgO or a carbonate. Radicals of silicic acid, phosphoric acid, phosphorous acid, sulfuric acid, antimonious acid, etc., may be introduced, and by the use of mixed acid anhydrides such as boroacetic acid anhydride and lauric-myristic acid anhydride, mixed esters of const. compn. may be formed. Numerous details are given. Products suitable for *films, lacquers, artificial threads*, etc., are obtained.

**Cellulose acetate.** J. W. BULMER. Brit. 300,824, Jan. 2, 1928. See U. S. 1,692,-622 (C. A. 23, 704).

**Cellulose coating compositions.** W. H. Moss (to British Celanese, Ltd.). Brit. 301,497, Dec. 1, 1927. Naphthalene is used as a plasticizer in coating compns. contg. cellulose esters or ethers and a volatile solvent; they may contain synthetic or natural resins and various other modifying ingredients.

**Apparatus for making transparent films from viscose or cellulose cuprammonium solutions.** C. RUZICKA. Brit. 300,477, May 15, 1928.

**Transparent signs, etc., of cellulosic material.** ALBERT SCHWARZ. U. S. 1,717,738, June 18. Meshes of wire cloth are filled with translucent material, the filled sheet is coated with translucent pigmented material and when the coating is dry it is printed with a second pigmented coating; while the latter is tacky an opaque powder which does not adhere to the first coating is applied.

**Glucose.** THE COMMERCIAL ALCOHOL CO., LTD. Fr. 656,384, June 23, 1928. Cellulosic substances are disintegrated by means of concd. acid, e. g., HCl; the formation of sugar is avoided by using a temp. below  $70^\circ$  and the soln. of cellulose thus obtained is saccharified by treating with steam. An app. is described. Fr. 656,385 describes the use in the same app. of gaseous HCl at temps. below  $0^\circ$  without formation of a paste, followed by saccharification with steam.

**Removing knots from mechanical or chemical wood pulp.** AXEL C. ANDERSEN and ARNE SCHIE. U. S. 1,718,399, June 25. An app. is described.

**Nitrocellulose.** I. G. FARBENIND. A.-G. Brit. 300,551, Nov. 14, 1927. A product of good homogeneity and soly. in alc. is formed by a 2-stage process; in the first stage nitration is effected and in the second stage the soly. of the product in alc. is increased and its N content decreased by heating with water under pressure to above  $100^\circ$ . Brit. 300,552 relates to a similar process.

**Nitrocellulose viscosity reduction, etc.** M. G. MILLIKEN (to Hercules Powder Co.). Brit. 301,267, Feb. 23, 1928. Nitrocellulose and water are forced together under pressure and at considerable velocity through an app. comprising a long narrow passage such as a pipe coil. Various features of the app. are described. The treatment reduces the viscosity and increases the stability and purity of the material.

**Artificial silk.** J. P. BEMBERG A.-G. Brit. 300,572, Nov. 15, 1927. In the manuf. of artificial silk from ammoniacal-Cu-cellulose solns. by a stretch-spinning process in which a circulating pptg. liquid is used, a portion of the liquid is withdrawn

and freed from Cu and  $\text{NH}_3$  in an amt. proportionate to the Cu and  $\text{NH}_3$  added to the bath by the pptn. process.

**Artificial silk.** J. P. BEMBERG A.-G. Brit. 300,896, Nov. 19, 1927. In prepg ammoniacal Cu cellulose solns. for artificial silk manuf., the use of an excess of  $\text{NH}_3$  is avoided by dissolving the cellulose as far as possible with the necessary quantity of solvent and then treating the cellulose mechanically to reduce the size of its particles. The half-prepd. soln. may be filtered through material such as sand.

**Artificial silk.** NAAMLOOZE VENNOOTSCHAP NEDERLANDSCHE KUNSTZIJDEFABRIEK. Brit. 301,017, Nov. 23, 1927. A sized "acetate silk" is obtained directly by the dry-spinning method by adding to the spinning soln. a small proportion of oils or fats such as olive oil, olein, coconut oil, butter fat, beef suet, lard, bone oil or peanut oil.

**Artificial silk.** I. G. FARBENIND. A.-G. Fr. 655,565, June 9, 1928. Artificial silk obtained by centrifugal spinning is given all the necessary treatments for purification, etc., on bobbins of variable diam. or elastic inserted into the spinning pot.

**Artificial silk.** THE NUERA ART-SILK Co., LTD. Fr. 655,519, June 8, 1928. In spinning artificial threads or filaments the spinning is carried out in such a way that the friction arising between the threads and the bath causes a stretching of the threads, *e. g.*, the threads are led through narrow grooves in the spinning bath.

**Artificial silk.** HERMINGHAUS & Co., G. M. B. H. Fr. 655,729, June 14, 1928. Articles made from viscose are desulfurized by substances which exert no or very little swelling action on the articles, and contg. little water. Examples are  $\text{PhOH}$ , crystd.  $\text{Na}_2\text{S}$  in alc., pyridine, glycerol in  $\text{MeOH}$ , or glucose in alc.

**Artificial silk.** HERMINGHAUS & Co., G. M. B. H. Fr. 656,240, June 22, 1928. A viscose artificial silk which is resistant to water is obtained by submitting the thread, more or less coagulated, to an energetic mech. treatment by appropriate means, exerting a friction or tension thereon, *e. g.*, passing it backwards and forwards through an instrument like a comb.

**Spinning artificial silk.** HENRY DREYFUS. Fr. 656,068, June 18, 1928. Valve for controlling the amt. of soln. supplied to the spinning nozzles.

**Spinning artificial silk.** I. G. FARBENIND. A.-G. Fr. 655,468, June 7, 1928. In "pot" spinning artificial silk the threads are given an initial twist in the pot and receive a final twist in a 2nd operation on exit from the pot.

**Apparatus for making artificial silk.** I. G. FARBENIND. A.-G. Brit. 300,581, Nov. 15, 1927. Structural features of spinning nozzles, guides, reels, etc.

**Nozzles for making artificial silk.** H. COLOMB. Brit. 301,080-1, Nov. 25, 1927. Structural features.

**Apparatus for dry-spinning of artificial silk filaments.** SOC. POUR LA FABRICATION DE LA SOIE RHODIASETA. Brit. 300,672, Aug. 10, 1927. A soln. of cellulose acetate or the like is heated before extrusion and a cold evaporative atm. is introduced into the cell adjacent the extrusion nozzles and in such a manner that it moves in the same direction as the filaments.

**Apparatus for making artificial silk by the dry-spinning method.** A. E. GULL. Brit. 301,141, Sept. 14, 1927. The current of air or gas with which the extruded filaments are treated passes through the treating chamber in contact with the filaments in the same direction as the filaments and has a greater velocity at the exit than at the point of entry. Various structural details are described.

**Apparatus for dry-spinning of artificial silk.** BRITISH CELANESE, LTD., E. KINSELLA, J. BOWER, W. I. TAYLOR and H. DREYFUS. Brit. 300,998, May 23, 1927. Various structural features are described, designed to facilitate full evaporative effect of the air or other gaseous medium used adjacent the spinning nozzles.

**Apparatus for making artificial silk by a stretch-spinning process.** J. P. BEMBERG A.-G. Brit. 300,953, Nov. 21, 1927. Structural features.

**Spinning viscose.** JACQUES C. HARTOGS. Ger. 477,312, May 27, 1924. Viscose is spun into acid baths contg. a small quantity, *e. g.*, 1%, of a ferric salt, with or without other salts. A suitable bath contains  $\text{H}_2\text{SO}_4$  9,  $\text{Na}_2\text{SO}_4$  16,  $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$  30,  $\text{Fe}_2(\text{SO}_4)_3$  1 and  $\text{H}_2\text{O}$  45 parts by wt.

**Viscose threads and films.** O. KOHORN & Co. and A. JÄGER. Brit. 301,305, Nov. 26, 1927. Keratin- or glutin-contg. substances, or their decompn. products, are added to the coagulation baths used.

**Paper, etc.** C. DREYFUS and G. W. MILES (to British Celanese, Ltd.). Brit. 301,428, Nov. 29, 1927. Paper pulp is mixed with hydrated cellulose acetate or other suitable cellulose deriv., preferably in the form of fibers; thermoplastic water resistant sheets are formed from the mixt. Various solvents, plastifiers and other modifying ingredients may be added to the compn.

**Coated paper for shop window signs, etc.** H. C. MITCHELL. Brit. 300,303, Aug. 10, 1927. A coating which is removable with a clean fracture by use of a dry pen, pencil or stylo may comprise paraffin with an overlying coating of colored shellac or like compn.

**Gummed paper.** WM. W. MCLAURIN. U. S. 1,719,712, July 2. Paper is coated on one face with a water-sol. adhesive and the latter is protected by a coating of soap.

**Metallized paper.** MOTTALL G. M. B. H. Ger. 477,163, Sept. 21, 1924. Bronze powder is dusted on to sheet paper coated with a binder comprising stearin pitch and wax.

**Impervious paper board.** GEORGE H. ELLIS. U. S. 1,717,878, June 18. A web of absorbent non-adhesive stock is first applied to the felt of a cylinder paper machine and on this there is then deposited an impervious adhesive web contg. liquid bituminous material and another web of pervious stock over the adhesive layer; the webs are compressed and dried together to form a multi-ply board suitable for making boxes. An app. is described.

**Paper, boxboard and like material.** FRED B. WELLS (to Ohio Boxboard Co.). U. S. 1,718,096, June 18. After deposition of a layer of pergameneous material, excess water is withdrawn from the layer, an overlying layer of similar material is deposited on the first layer, and over these two layers there are deposited layers of filler material to provide the desired thickness, excess water is removed and the composite web is treated in a usual manner to form a finished product.

**Finishing mineral coated paper.** DONALD B. BRADNER (to Champion Coated Paper Co.). U. S. 1,719,166, July 2. Paper such as that coated with mineral filler is contacted, while the coating is in plastic condition, with a solid non-adhering surface having a finish substantially the same as that desired on the mineral-coated paper; the coating is rendered non-plastic, as by drying or cooling, and is then sepd. from the assoc. solid surface (which may be formed of Cr, Monel metal or rubber).

**Composition for coating carbon paper, etc.** HAROLD W. A. DIXON. U. S. 1,718,949, July 2. An app. and various treatments are described for prepg. a colloidal compn. of oil and wax, in successive batches.

**Thickening paper pulp.** ANTON J. HAUG and RICHARD J. HAUG. U. S. 1,717,604, June 18. Mech. features.

**Paper-making apparatus.** PAPER PATENTS CO. Brit. 301,287, June 22, 1928. Mech. features.

**Paper-drying apparatus with roll doctors.** JOHN E. ALEXANDER (to Minton Vacuum Dryer Corp.). U. S. 1,719,793, July 2. Various structural features are described.

**Forming and drying continuous sheets of paper.** WM. H. MILLSPAUGH (to Paper & Textile Machinery Co.). U. S. 1,718,573, June 25. An app. is described.

**Forming multi-ply paper sheets in continuous lengths.** WM. H. MILLSPAUGH. U. S. 1,718,574, June 25. App. is described.

## 24—EXPLOSIVES AND EXPLOSIONS

CHARLES E. MUNROE

**Firedamp and its detection.** HEYER. *Z. ges. Schiess- u. Sprengstoffw.* 24, 164-9 (1929).—A discussion of the sources, occurrence in mines, properties and chem. methods for the detection and detn. of  $\text{CH}_4$ . A large proportion of gas explosions in mines have resulted from use of the Davy "Safety Lamp" and similar app. intended for the detection of  $\text{CH}_4$ . Several modern types of  $\text{CH}_4$  detectors are described. C. G. STORM

**The vapor pressure of glycerol trinitrate and certain glycerol dinitrates.** WILLARD DE C. CRATER. *Ind. Eng. Chem.* 21, 670-2 (1929).—Detns. were made of the vapor pressures of glycerol trinitrate, ethylene glycol dinitrate, diethylene glycol dinitrate, propylene glycol dinitrate and trimethylene glycol dinitrate, all prepd. in a high state of purity, by the method of Baxter, Hickey and Holmes. Their ester detns. were made over a temp. range from 15° to 55°.

CHARLES E. MUNROE

**The vapor pressure of nitroglycerin and nitroglycol.** P. NAOUM and K. F. MEYER. *Z. ges. Schiess- u. Sprengstoffw.* 24, 88-90 (1929).—Detns. by a static method at 20° gave for nitroglycerin 0.009 mm. Hg, and for nitroglycol 0.030 mm. Hg; by an aspirator method the results were 0.011 and 0.035 mm., resp., at 20°; 0.036 and 0.115, resp., at 35°. Both methods are described in detail. In the latter method, rapid aspiration must be avoided or the result will be too low. The comparative volatilities of the 2

substances on exposure to air under equal conditions do not agree with the difference between their vapor pressures, nitroglycerin being much more volatile than nitroglycerin. Equal vols. were exposed at room temp. in open dishes 75 mm. in diam. In 2 days nitroglycerin lost 0.0136 g., nitroglycerol 0.0816 g.; in 21 days the resp. losses were 0.0300 g. and 2.6046 g. No explanation is suggested for this marked difference. C. G. STORM

Vapor pressures of nitroglycerin and nitroglycerol. A. MARSHALL. *Z. ges. Schiess u. Sprengstoffw.* 24, 177(1929).—The aspirator method used by Naoum and Meyer, (preceding abstract) gives higher results than the static method of collecting and weighing the volatilized nitroglycerin, because  $H_2O$  and other volatile impurities are driven off by the air current. M.'s tests do not substantiate the claim of N. and M. that different velocities of air current give different values for vapor pressure. C. G. S.

Vapor pressures of nitroglycerin and nitroglycerol. P. NAOUM AND K. F. MEYER. *Z. ges. Schiess- u. Sprengstoffw.* 24, 177(1929).—Contrary to the assumption of Marshall (cf. preceding abstr.), the samples used were carefully purified and dried *in vacuo*, and therefore contained no volatile impurities. Also, the claim that vapor-pressure results are independent of the velocity of the air current is contrary to the published conclusions of other investigators. C. G. STORM

Determination of stability of smokeless powder and guncotton by measurements of hydrogen-ion concentrations. N. L. HANSEN. *Förh. III Nord. kemistmötet* (Finland) 1926, 227–30(1928).—A method for determining the stability of explosives of the nitrocellulose class has been devised based on the formation of acid when the explosive undergoes slow decompn. The material (in the case of smokeless powder, after sifting to obtain grains of 0.35–0.8 mm. diam.) is dried *in vacuo* at 40° for 8 hr., or in the case of guncotton, until the water content is less than 1%. 5 g. of smokeless powder or 2.5 g. of guncotton is weighed out into each of nine glass cylinders, closed by rubber stoppers carrying a capillary tube and stopcock. Eight of the cylinders are placed in a  $CaCl_2$  bath, heated at 110°, and after immersion for 15 min. any condensed moisture is removed. One cylinder is removed each hour, filled with distilled water (free from  $CO_2$ ) after cooling, and the  $p_H$  value of the soln. detd. at once without previous filtration, using a quinhydrone electrode; the  $p_H$  value of the ninth (unheated) sample is similarly detd. The results are plotted, using  $p_H$  values as ordinates and the times of heating in hours as abscissas, the curves obtained indicating the relative stability of the material under examn. Expts. show that in respect to the decompn. of the explosive, 8 hrs. heating under the above conditions correspond to upwards of 30 years' magazine storage at 10°. B. C. A

Explosive priming composition. JOSEPH D. McNUTT (to Winchester Repeating Arms Co.). U. S. 1,718,370, June 25. A fulminate such as that of Hg is used with a metal dioxide such as  $BaO_2$  and a silicide such as that of Ca which together form a non-corrosive priming compn.

Mercury fulminate. JOSEPH D. McNUTT (to Winchester Repeating Arms Co.). U. S. 1,718,371, June 25. Hg fulminate is freed from elemental Hg by heating (suitably at 60° for 16 hr.).

Granular gunpowder coated with a film of nitrocellulose. H. E. ELLSWORTH (to Imperial Chemical Industries, Ltd.). Brit. 300,611, Nov. 16, 1927. The nitrocellulose coating retards the rate of combustion, and the powder is suitable for safety fuses.

Binder for priming compositions for explosives. LAWRENCE W. JORDAN (to Winchester Repeating Arms Co.). U. S. 1,718,358, June 25. A metallic caseinate such as Na caseinate is used as a binder with Hg fulminate compns. or similar priming substances.

Explosive toy bombs molded in the form of fruits. E. GREENHALGH. Brit. 301,219, Dec. 19, 1927. Structural features.

Igniting tip for cigars and cigarets. JUAN E. ANCHONDO. U. S. 1,719,794, July 2. A material for igniting tips comprises an alkali metal chlorate, tinder and a non-combustible filler such as clay and is adapted to burn by forming a live coal without flaring into a flame.

Nitroglycerin, etc. F. E. SMITH, A. P. H. DESBOROUGH, W. T. THOMSON, W. LEDBURY and E. W. BLAIR. Brit. 301,112, Aug. 26, 1927. Glycerol or similar compds. are nitrated by a process in which the heat of reaction evolved is absorbed in 2 or more stages. The first stage may be carried out with  $HNO_3$  and little if any  $H_2SO_4$  and most or all of the  $H_2SO_4$  may be used in the second stage.

Preventing explosions in liquid-air apparatus. ROBERT G. AUBERT. U. S. 1,717,540, June 18. Air contg. an admixt. of combustible gases such as  $C_2H_2$  is subjected to a sufficiently low temp. to cause liquefaction of the air and solidification of the combus-



tible gases; the solidified combustible substances are then sepd. from the liquid air by filtration at a point in the system where the temp. is lowest, before the liquid air reaches the O zone of the app.

## 25—DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

**A study of the soluble lakes of aurintricarboxylic acid.** WALTER E. THRUN. *J. Phys. Chem.* **33**, 977–83 (1929).—The sol. Al lake was produced by mixing various concns. of  $\text{AlCl}_3$  and  $\text{NH}_4$  aurintricarboxyate; the resultant equil. concn. of the sol. lake was detd. at  $\text{pH} = 7.0$  colorimetrically. "Free" aurin is that part of dye not adsorbed by alumina, and "free" alumina is that part of alumina which has not adsorbed any dye. Results indicate:  $K = [\text{free Al}_2\text{O}_3][\text{free aurin}]/[\text{total Al}_2\text{O}_3][\text{lake}]$ . Similar results are obtained with  $\text{FeCl}_3$ ,  $\text{FeCl}_2$  and  $\text{CrCl}_3$ . The reaction with titanilic sulfate indicates existence of two different kinds of lakes of the dye. A. P. SACHS

**Black chrome dye from aminodisulfobenzoic acid.** V. G. GULINOV. *J. Chem. Ind. (Moscow)* **6**, 432–3 (1929).—Having previously shown (*C. A.* **22**, 3648) that aminosalicylic acid can easily be prepd. from nitrososalicylic acid, G. now utilizes the process for the manuf. of the tri-Na salt of 6-hydroxy-3-[4-(2-hydroxynaphthylazo)naphthylazo]-2,4-disulfobenzoic acid, which is a black chrome dye intended to replace the diamond black dyestuff which is at present used in Russia for dyeing wool. The product of sulfite reduction of nitrososalicylic acid is, before further treatment, sepd. from the soln. by acidifying the latter by HCl, boiling the soln. to drive off  $\text{SO}_2$ , and then cooling. After 24 hrs.' standing  $2,4,3,6\text{-(HO}_2\text{S)}_2\text{(H}_2\text{N)(HO)C}_6\text{HCO}_2\text{H}\cdot 2\text{H}_2\text{O}$  is filtered; the  $2\text{H}_2\text{O}$  of crystn. can be eliminated by heating at  $103\text{--}5^\circ$ . A soln. of 37.1 g. of the sulfo acid and 10.6 g.  $\text{Na}_2\text{CO}_3$  in 2 l.  $\text{H}_2\text{O}$  is cooled to  $7\text{--}10^\circ$ , acidified by concd. HCl and diazotized with a 20% soln. of 7 g.  $\text{NaNO}_2$ . On acidifying, the acid salt of aminodisulfo acid seps., redissolves in the soln. with a yellow-brown coloration and, after cooling to  $3\text{--}5^\circ$ , is then, treated by a thin stream of a soln. of 14.3 g.  $\alpha$ -naphthylamine in the equiv. quantity of HCl and the necessary quantity of  $\text{H}_2\text{O}$ . After stirring for 1.5 hr., the mixt. is gradually treated with  $N$  NaOAc to weakly acid reaction. After 24 hrs.' standing, the mixt. is acidified by HCl and heated to  $50\text{--}60^\circ$  in order to free the aminoazo dye obtained from unchanged  $\alpha$ -naphthylamine; then the dye is filtered. The paste obtained is dissolved in a soln. of 10.6 g.  $\text{Na}_2\text{CO}_3$  in 2 l.  $\text{H}_2\text{O}$ , the soln. is cooled to  $0^\circ$  by ice, acidified by HCl and diazotized with a 20% soln. of 6.8 g.  $\text{NaNO}_2$ . The diazotation is continued about 3 hr., the diazonium compd. is poured in a thin stream into an alk. soln. of 14.4 g.  $\beta$ -naphthol, which has also been cooled to  $0^\circ$ . However, it is best first to filter off the diazo compd. and introduce it in form of paste into the  $\beta$ -naphthol soln. The diazonium compds. having been introduced, the alk. soln. is maintained for 1 hr. at  $3\text{--}5^\circ$ , then warmed to  $30\text{--}35^\circ$  and let stand 24 hr. The diazo dyestuff is salted out at  $80\text{--}83^\circ$  with 18% salt and is then filtered. The dyeing is carried out thus: The bath is made up with 20% Glauber salt, 3% AcOH and 5% of the dyestuff and brought to boiling during 30 min. The dyeing takes place in the boiling bath for 30 min., then 5% AcOH is added and the boiling is continued another 30 min. After cooling to  $70^\circ$ , 1% dichromate is introduced and the chromation is continued 1 hr. in the boiling bath. Wool is thus dyed black with a slightly violet shade. The dye is as fast to light, washing, perspiration, water, alkalies, etc., as the diamond black, and is even somewhat more fast toward rubbing. In a similar manner, but with  $p$ -cresol instead of  $\beta$ -naphthol, the dyestuff  $2,5\text{-HOMeC}_6\text{H}_2\text{N}_2\text{C}_{10}\text{H}_6\text{N}_2\text{C}_6\text{H(OH)(SO}_2\text{H)}_2\text{CO}_2\text{H}$  was prepd.; it dyes wool in a brown-black shade. BERNARD NELSON

**Manufacture of  $\beta$ -naphthol.** A. BUNTROCK. *Z. Farbenind.* **20**, 218–9 (1929); cf. *C. A.* **22**, 4823. F. C. HAHN

**Action of light on diazo derivatives and on azo dyes.** A. SEYEWETZ and D. MOUNIER. *Chimie & industrie Special No.*, 513–8 (Feb., 1929); cf. *C. A.* **22**, 2373.—Previously reported work on diazo derivs. is given in greater detail. The action of light on chrysoidine (yellow, basic, monoazo dye), diamine pure blue 2B (diamino acid dye) and roccellin (hydroxyazo acid dye) was studied under the same conditions as for the diazo derivs., leading to the following conclusions: (1) Decolorizing of azo dyes by ultra-violet light is apparently due to an oxidation, as it is increased in presence of oxidizing agents and decreased in presence of reducing agents. (2) The oxidation products obtained by the action of  $\text{H}_2\text{O}_2$  give various color reactions comparable to those given by the decompn. products of the dyes under the action of ultra-violet light. (3) The decompn. products of azo dyes under the action of ultra-violet light act as stabilizers to—

ward the same dyes. (4) The decompn. products obtained by the action of ultra-violet light are apparently the same as those obtained by the action of oxidizing agents on the same dyes.

A. PAPINEAU-COUTURE

**A new white reserve under indigosol.** H. SUNDER. *Chimie & industrie Special No.*, 491-2 (Feb., 1929).—On a fabric bottomed in a bath contg. 12% indigosol and 1.75%  $\text{NaNO}_2$ , good whites can be obtained by printing with:  $\text{Na}_2\text{S}_2\text{O}_3$  200 g., ground chalk and gum tragacanth soln. (1:1) 400 g., 1:1 British gum soln. 400 g., and then developing by passing 15 sec. at 25° in a bath contg. 1.5%  $\text{H}_2\text{SO}_4$  and 1.0% oxalic acid. On leaving the acid bath the white is yellowish, but can be cleared by passing for a few sec. at 70° in a bath contg. 1.5% of 30° Bé.  $\text{NaOH}$  soln. A rapid and satisfactory removal of indigosol can be obtained by printing with the following mixt.:  $\text{NH}_4\text{NO}_3$  150, 1:1 ground chalk and gum tragacanth soln. 200, rongalite C or redol C 50, neutral starch British gum thickener 600, passing 15 sec. at 25° in a bath contg. either 2.5%  $\text{H}_2\text{SO}_4$  and 1.5% oxalic acid or 3.5%  $\text{H}_2\text{SO}_4$ , rinsing and passing through a hot alk. bath as above.

A. PAPINEAU-COUTURE

**The determination of nitrogen by the Kjeldahl method as applied to dyestuffs and intermediate products.** P. SISLEY AND M. DAVID. *Bull. soc. chim.* [4], 45, 312-24 (1929).—A method for the exact detn. of N by the Kjeldahl method is proposed in which the compd. is first reduced with  $\text{Na}_2\text{S}_2\text{O}_4$  and then the analysis carried out in the usual manner, with  $\text{CuSO}_4$  as a catalyst. Data are given on analysis of a large no. of azo dyes and intermediates.

WALLACE R. BRODE

**New method of dyeing with sulfur dyes.** H. SUNDER. *Chimie & industrie Special No.*, 489-90 (Feb., 1929).—Addn. of  $\text{Na}_2\text{S}_2\text{O}_3$  to a S-dye vat increases the intensity of the shade, which is due to a specific intensifying action and not merely to a salting out effect, as the addn. of large amts. of  $\text{NaCl}$  or of  $\text{Na}_2\text{SO}_4$  does not give the same intensity. In some cases the intensity may be twice that obtained in the usual way. Shades equiv. to those obtained by the usual sulfide process can be obtained with  $\text{Na}_2\text{S}_2\text{O}_3$  and  $\text{NaOH}$ , without any  $\text{Na}_2\text{S}$ , but they are not quite as deep nor as bright as those obtained with  $\text{Na}_2\text{S} + \text{Na}_2\text{S}_2\text{O}_3$ .

A. PAPINEAU-COUTURE

**New process for printing vat dyes.** M. JEANMAIRE AND E. EBERSOL. *Chimie & industrie Special No.*, 493-4 (Feb., 1929).—The dye (indanthrene, algal, etc.), is merely thickened and printed on the white fabric, which is jigged in a soln. of  $\text{Na}_2\text{CO}_3$  or  $\text{NaOH}$  contg. a suitable reducer, preferably rongalite. Finishing is carried out as usual. The advantages of the process are: the use of strongly alk. colors is avoided; after printing the goods can be allowed to stand indefinitely before jigging with  $\text{NaOH}$  or  $\text{Na}_2\text{CO}_3$ , multicolored designs can be printed with these dyes in conjunction with oxidation colors. The process can be modified by printing on fabric which has been previously prepd. with  $\text{Na}_2\text{CO}_3$  and reducer. The I. G. has recently described a process which is identical, except that the use of "colloresin D" is said to be indispensable to obtain a sharply defined design. J. and E. have found, however, that its use is not essential. Very good results have also been obtained by using the following "lysogum" thickener: wheat starch 1500 g., 5% lysogum thickener 35 l., glycerol 1 kg.,  $\text{H}_2\text{O}$  12.5 l., the presence of lysogum facilitating penetration, both during jigging and during steaming, and also helping to eliminate by washing the small quantity of starch incorporated with the color.

A. PAPINEAU-COUTURE

**Industrial skin lesions from salts of antimony in the textile industry.** A. B. SELISKY. *Dermat. Woch.* 86, 723-7 (1928); *Bull Hyg.* 3, 723-7 (1928).—A description of 200 cases where Sb salts were used as mordants. Usually arms were affected. The injury is attributed to the acid reaction products. Chalk was used to good advantage in combating the toxic effects.

GEORGE R. GREENBANK

**The hygroscopic properties of artificial fibers derived from viscose.** L. MEUNIER AND R. GUYOT. *Chimie & industrie Special No.*, 585-91 (Feb., 1929); cf. *C. A.* 23, 3103.—Using viscose from a given lot of the com. article, M. and G. studied: (1) the isothermal absorption and desorption of  $\text{H}_2\text{O}$  in normally manufd. viscose; (2) the isothermal adsorption and desorption of  $\text{H}_2\text{O}$  in viscose which had been previously heated 15 hr. at 105°, and the effects of the time of heating at 105° on the hygrometric properties, swelling, dyeing by direct dyes, tensile strength and elasticity; (3) the desorption curves of viscose at different temps.; (4) the modifications in hygrometric properties produced by the more or less complete blocking of the alc. functions by treatment with  $\text{CH}_2\text{O}$ , and the relation between the hygrometric properties and the swelling of the fibers after treatment with  $\text{CH}_2\text{O}$ . Conclusions: the isothermal desorption equil. corresponds to a higher  $\text{H}_2\text{O}$  content than the absorption equil. The  $\text{H}_2\text{O}$  content, detd. at 105° by absorption, is higher than the  $\text{H}_2\text{O}$  content by absorption detd. in dry vacuum, and the same is true for desorption, and in the latter case the difference is greater than for ab-

**sorption.** The various curves show the characteristic S-shape, indicating that at a given point there is a certain modification in the activity of fixation of  $H_2O$ , on the one hand, and of its elimination on the other. On prolonged heating there is a slight decrease in hygroscopicity and a much greater decrease in swelling properties and in the capacity to fix substantive dyes, but the mech. properties are not appreciably affected. The desorption curves detd. at  $0^\circ$ ,  $11^\circ$ ,  $25^\circ$  and  $37^\circ$  showed that for a given hygrometric state the  $H_2O$  content decreases with the temp. of the expt. With viscose which has been treated with  $CH_2O$ , the difference between absorption and desorption (for a given degree of swelling) decreases with the degree of swelling, particularly for low values of the latter, indicating that, on the whole, the hygroscopicity of the fiber is a function of the no of free alc. radicals remaining in the mol. The results are in general agreement with those of Urquhart and Williams (*C. A.* 18, 1754, 2067; 19, 898, 1631, 2749).

A. PAPINEAU-COUTURE

**Studies in flax retting.** ANTOINETTE TREVETHICK, B. B. ROBINSON AND R. M. SNYDER. *Mich. Agr. Expt. Sta. Tech. Bull.* No. 95, 49 pp. (1928); cf. *C. A.* 23, 1754.—The acidity which develops in a ret plays an important role in the retting of flax. Numerous H-ion tests prove that the retting of flax in water proceeds faster if the  $p_H$  is neutral. An acid or alk. retting soln. makes a slower ret than one which is neutral. The speed of the retting depends upon the temp. and with high temps.,  $25^\circ$  or more, the difference in time between a  $p_H$  7 and a  $p_H$  5 or  $p_H$  10 ret might be only a few hr., but with the temp. of  $22^\circ$  the  $p_H$  7 ret will be several days faster. This acceleration in speed of retting would make it practical in medium warm water rets to control the  $p_H$  of the retting soln. especially if the retting water was free of mineral salts. If the retting water contains mineral salts in soln., they will tend to prevent the  $p_H$  from going low. As far as could be detd. from the small quantities of straw used, the quality of the fiber of a  $p_H$  7 ret was better, or, in no case poorer, than the fiber from more acid or alk. rets. Retting with buffers requires a smaller addn. of alkali and gives a faster ret than that without buffer. The fiber from the rets where the buffer was added was considerably stronger for the same degree of retting. The passing of air through a retting soln. keeps the acidity from becoming low. Retts conducted in this manner showed a slightly higher percentage of fiber than the stagnant-water retting, but this may have been due to lack of the same degree of retting. Retting done where the water circulates tends to become acid unless the addn. of fresh water is sufficient to replace the old water at least once in 6 hr. This makes the entire control of acidity impractical. However, the replacing of the old water once in 24 hr. is better than every 6 hr. as it produces a fiber of better quality.

J. J. SKINNER

**Mercerization of cellulose.** F. I. BOGOYAVLENSKII. *Zhur. Prikladnoi Khim.* (*J. Applied Chem.* (Moscow)) 2, 167-78 (1929).—The quantity of NaOH soln. absorbed by cellulose at  $20-22^\circ$  increases with the increase in concn. of NaOH up to 4-5 *N*. For 5-8 *N* NaOH the quantity absorbed is approx. const. (about 12% NaOH) and corresponds to  $(C_6H_{10}O_5)_4 \cdot 2NaOH$ . With 9-10 *N* NaOH up to 16% NaOH is absorbed, suggesting the possibility of the existence of  $(C_6H_{10}O_5)_8 \cdot 5NaOH$ .  $(C_6H_{10}O_5)_8NaOH$  is not formed, contrary to the general belief. The rate of reaction is at a max. with 5 *N* NaOH. Absorption equations are not applicable. In the cold the action of NaOH on cellulose is very complicated and chem. changes undoubtedly take place. Absorption of KOH by cellulose is greater than that of NaOH by wt. but smaller by mol. %. Absorption increases rapidly up to 5 *N* KOH and very slowly with higher concns. With 10 *N* KOH,  $(C_6H_{10}O_5)_4 \cdot 2KOH$  is probably formed.

V. KALICHEVSKY

**The chemistry of jute refining.** HANS J. BRAUN. *Metallhölse* 19, 1293-4 (1929).—Jute is said to contain 60-65%  $\alpha$ -cellulose, 15-20%  $\beta$ -cellulose, 18-22% furfural complexes and 7-9% ketocyclohexene derivs. In refining it 3 steps are used, viz. (1) sepn. of non-cellulose materials, by the action of alk. solns., dil. acids and hydrolysis, or fermentation processes; (2) bleaching, usually by  $CaOCl_2$ , but sometimes by  $NaOCl$  or peroxides; and (3) giving back to the purified fiber its original softness, etc., by the use of soap baths or oil emulsions. Quite recently "N. T. Jute" has been perfected by Viallet; its method of prepn. has not been revealed. Another product is obtained by fermentation with diastase, treatment with K phosphate, bleaching and mercerizing. These products can be used as substitutes for other fibers, even for wool. W. C. E.

**Purification of cotton.** V. SHAPOSHNIKOV AND S. YESERSKII. *Z. Farben-Ind.* 20, 219-21 (1929); cf. *C. A.* 22, 4827.—A study is made of the consumption of Cl during bleaching. 4-5 hrs. bleaching with 0.5-1.0 g. Cl per l. at ordinary temp. is sufficient for bleaching well-cooked cotton fibers.

FREDERICK C. HAHN

**The determination of the silk and cotton content of asbestos yarn.** H. SOMMER. *Gummi-Ztg.* 43, 2103-4 (1929); cf. *C. A.* 23, 2391.—No procedure has been known for

the sep. detn. of silk and cotton in asbestos. An exptl. investigation led to the development of 2 methods. *Cupric-glycerol method*.—Agitate 0.5–1.0 g. of disintegrated and dried sample for 20 min. with 50 cc. of alk. cupric-glycerol soln. (prepd. from 10 g.  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ , 5 g. glycerol, 100 cc. water and enough concd. KOH to dissolve the ppt. formed at first), filter through a weighed Gooch crucible, wash the residue (asbestos and cotton) with cold  $N$  NaOH, then with dil.  $\text{NH}_4\text{OH}$  until Cu is no longer detected and finally with water until no longer alk., dry at  $110^\circ$  and weigh. *Boiling method*.—Boil 0.5–1.0 g. of disintegrated and dried sample in 50 cc. of  $N$  NaOH for 0.5 hr., filter hot through a weighed Gooch crucible, wash the residue (asbestos and cotton) with hot water until no longer alk., dry at  $110^\circ$  and weigh. Since asbestos is partially sol. in the aq. NaOH, the Gooch crucible must be packed with asbestos which has been boiled with  $N$  NaOH and washed and a correction must be made for the partial soln. of the asbestos in the sample. Detns. of the soly. of various types of asbestos in cupric-glycerol soln. and in boiling  $N$  NaOH showed that they are more sol. in NaOH and that there is too much variation to allow a mean correction factor. Therefore, it is advisable to det. the % asbestos ( $a$ ) content by the cuprammonium process, then with a new sample det. silk by the cupric-glycerol or boiling method, and thus obtain the asbestos + cotton ( $g$ ). Then det. the cotton in this mixt. by the cuprammonium process, and obtain by difference the asbestos ( $g_1$ ). The % cotton ( $c$ ) can be calcd. from  $g - g_1$ , while the % silk is  $100 - (a + b)$ . The boiling method is simpler and more rapid than the cupric-glycerol method. In the boiling method, about 3.5% of the cotton dissolves; so with cotton contents below 10%, this error may be ignored, whereas above 10% this correction factor is advisable. The difference between  $a$  and  $g_1$  is an indication whether the asbestos is serpentine or hornblende. If this difference is over 2%, the asbestos is probably hornblende. C. C. DAVIS

**Weighting and dyeing silk.** ADOLF PREISING. *Deut. Färber-Ztg.* **64**, 809 (1928).—A general article. FREDERIC C. HAHN

**Green coloration in wool.** H. R. SEDDON AND T. T. MCGRATH. *Agr. Gaz. N. S. Wales* **40**, 206 (1929).—The greenish and reddish colorations occasionally observed in wool are due to the growth of pigment-producing bacteria. The bacteria were readily cultivated from samples of discolored wool and the condition was reproduced experimentally on sheep. The bacteria require a considerable amt. of moisture for growth and appear to grow better on fine than on coarse wool. When very old the color turns a brownish red, but the green color can be restored by the addn. of alkali, and conversely the green color becomes red on the addn. of acid, both types of discoloration apparently being produced by the growth of the same organism. K. D. JACOB

Oxidizing nitration and quinonenitronic acids (HELLER, *et al.*) **10**. The constitution of some dichlorophenetidines [for use in dye manufacture] (BARGELLINI, *et al.*) **10**. The purification of sewage containing large amounts of dyestuffs by the activated-sludge process (PRITZKOW, JORDAN) **14**. New *meso*-derivatives of anthracene and of dianthrol [dyes] (MINAEV, FEDOROV) **10**. Chemistry of anthraquinone (PHILLIPS) **10**. Aryl amides of aromatic carboxylic and sulfonic acids (HELLER) **10**. Preparation of  $\alpha$ -chloronitronaphthalenes (ASAOKA) **10**. Coloring skins, furs, paper, etc. (U. S. 1,719,159) **29**. Anthracene derivatives [vat dyes] (Brit. pat. 300,407) **10**. Hydrogenated aromatic amino compounds [dyes] (Brit. pat. 300,285) **10**. Quinoline-indole compounds [intermediates] (Brit. pat. 300,279) **17**. Testing strength of rubber or other fabrics (Brit. pat. 301,324) **30**. Dispersion agents [for preparation of emulsions for textile industry] (Swiss pat. 126,575) **18**.

HEERMANN, PAUL: *Färberei- und textilchemische Untersuchungen*. 5th ed., revised and enlarged, of "Färbereichem. Untersuchgn." u. d. "Kolorist. u. textilchem. Untersuchgn." Berlin: J. Springer. 435 pp. Linen, M. 25.50.

HUBER, CHAS. J.: *The Raw Silk Industry of Japan*. New York: Silk Assoc. of America. 50 pp.

**Dyes.** I. G. FARBENIND. A.-G. Brit. 300,432, Feb. 1, 1928. Anthraquinone vat dyes are obtained by condensing a tetrahalo-2,2'-dibenzanthronyl with an aminoanthraquinone, preferably in the presence of acid-fixing agents such as calcined soda and of catalysts such as Cu or its compds. Several examples are given and the prepn. of intermediates including tetrabromo-2,2'-dibenzanthronyl is described.

**Dyes.** I. G. FARBENIND. A.-G. Brit. 300,557, Nov. 14, 1927. Diazotized 1-methyl-2-amino-4-isopropylbenzene or a deriv. is coupled with an aryldide of 2,3-hydroxynaphthoic acid or of  $\beta$ -ketocarboxylic acids. Several examples are given.

**Dyes.** I. G. FARBENIND. A.-G. Brit. 300,683, Aug. 17, 1927. Pyridazinanthrone derivs. of 1,2,5,6-dipthaloylacridone contg. an aroylamino group, which are green vat dyes, are made by the action of hydrazine upon an aroylamino-1,2,5,6-dipthaloylacridone with subsequent ariation of the product. Examples are given.

**Dyes.** I. G. FARBENIND. A.-G. Brit. 300,722, Aug. 29, 1927. The disazo dye formed by coupling equimol. proportions of tetrazotized benzidine, 1-amino-8-naphthol-3,6-disulfonic acid and 1,3-phenylenediamine is converted into a tetrakisazo dye producing greenish black shades on chrome leather either by coupling with 2 mols. of diazotized 4-aminoacetanilide and saponing the product or by coupling with 2 mols. of 4-nitroaniline and reducing the product.

**Dyes.** I. G. FARBENIND. A.-G. Brit. 300,987, Nov. 22, 1927. In producing trisazo and higher polyazo dyes, any initial diazo component is coupled with a 1-naphthylamine deriv. contg. an *O*-alkyl or *S*-alkyl group or a sulfonic or carboxylic acid of such a deriv., capable of coupling in *p*-position to the amino group, and the product is diazotized and coupled with a compd. of the type CyARX, in which Cy represents a cyanuric ring, A represents a substituted or unsubstituted residue of a 1,8-aminonaphthol such as a 1,8-aminobenzoylaminonaphthol or a substitution product or equivalent in which  $\text{-NHC.O-}$  is replaced by  $\text{-NH.CO.NH-}$ , R represents a residue of an aminoazo compd., and X represents either halogen or a residue united to the ring through N, O or S. Numerous examples, details and alternative procedures are described.

**Dyes.** I. G. FARBENIND. A.-G. Brit. 301,197, Nov. 21, 1927. Dibenzanthrone and isobenzanthrone dyes are made by alkali fusion of 5-, 6-, 7- and 8-aminobenzanthrones. Several examples are given of the production of the dyes, the aminobenzanthrones and halogen derivs. from which the amino derivs. may be prep'd.

**Dyes.** I. G. FARBENIND. A.-G. Brit. 301,410, Aug. 29, 1927. Azo dyes yielding clear shades fast to kier-boiling and to light are formed in substance, on a substratum or on the fiber by coupling with any component a diazotized arylamine substituted by a CN group, with or without other substituents. Several examples are given.

**Dyes.** I. G. FARBENIND. A.-G. Brit. 301,423, Nov. 29, 1927. Monoazo dyes are made by combining a non-nitrated *o*-diazophenolsulfonic acid or a halogen deriv. of such an acid with 2-naphthylamine-3-carboxylic acid. When chromed on the fiber, green shades are obtained.

**Dyes.** SOC. ANON. POUR L'IND. CHIM. A BALE. Brit. 301,096, Nov. 24, 1927. Monoazo dyes are made by coupling a diazotized dichloroaniline with a 1-aryl-3-methyl-5-pyrazolonesulfonic acid in which the aryl nucleus contains at least 1 halogen atom. They dye wool and silk yellow in an acid bath and may be used for lakes.

**Dyes.** IMPERIAL CHEMICAL INDUSTRIES, LTD., W. GIBSON, A. J. HAILWOOD, J. B. PAYMAN AND A. SHEPHERDSON. Brit. 300,800, Aug. 29, 1927. Aq. pastes or suspensions of substantially insol. dyes are made by use of a polychloronaphthalenesulfonic acid or a salt of such an acid. Various examples are given.

**Dyes.** DURAND & HUGUENIN A.-G. Brit. 301,329, Nov. 26, 1927. Various specified gallocyanines derived from *m*-substituted alkylanilines are converted into derivs. such as anilino derivs. which are of greater stability than the unsubstituted compds. and are suitable for use in discharge printing. Several examples are given.

**Dye compositions.** BRITISH DYESTUFFS CORP., LTD., H. ADAMS AND A. SHEPHERDSON. Brit. 301,549, Aug. 3, 1927. Dry dispersed dye prepsns. or dye pastes (such as compns. suitable for dyeing cellulose esters and ethers) are made with the acid of a product obtained by heating ligninsulfonic acid with aq. alkali metal hydroxides or carbonates. Details and examples are given.

**Dye.** A. ZINKE AND W. PENNECKE (to F. Bensa). Brit. 300,922, Nov. 19, 1927. A dye giving blue shades on cotton from the hyposulfite vat turning green on exposure to the air is formed by condensing 1:12-perylenequinone with benzoyl chloride in the presence of  $\text{AlCl}_3$  at  $140\text{--}180^\circ$ .

**Dyes.** J. R. GEIGY A.-G. Brit. 300,549, Nov. 14, 1927. Acid wool dyes fast to alkali and light and generally of violet shades are produced by condensing an unsymmetrical *N*-alkylated *p*-phenylenediaminesulfonic acid in which the sulfonic group occupies the *o*-position to the primary amino group, with various specified isorosinduline-6-sulfonic acids which may contain substituents such as halogen, OH, alkyloxy, methyl, acetylamino, alkyl or aryl. Several examples are given.

**Intermediates and dyes.** I. G. FARBENIND. A.-G. Fr. 655,356, May 29, 1928. See Brit. 291,361 (*C. A.* 23, 1283).

**Dye intermediates.** I. G. FARBENIND. A.-G. Brit. 301,311, Nov. 26, 1927. Monoketones are prep'd. by the action of a carboxylic acid chloride or anhydride and  $\text{AlCl}_3$  on a polyhalogen naphthalene with or without a diluent. Examples are given of

the production of 1,4-dichloro-8-benzoylnaphthalene, 8-benzoyl-1,5-dichloronaphthalene, 1,4-dichloro-8-(*p*-chlorobenzoyl)naphthalene, 1,4-dichloro-8-(*o*-chlorobenzoyl)naphthalene, 1,4-dichloro-8-( $\alpha$ -naphthoyl)naphthalene and 1,4-dichloro-8-(*p*-toluyl)naphthalene and similar products.

**Opaque colors.** "KOLLOIDCHEMIE" STUDIENGESellschaft M. B. H. and JOHANNES B. CARPZOW, ROBERT LENZMANN, MARTIN MARCH and HERMANN SANDERS. Fr. 656,066, June 18, 1928. Opaque colors are prepd. by bringing salt- or fresh-water mud or colloids sepd. therefrom by washing, into intimate contact with either org. or inorg. dyestuffs already formed or the components forming the dyestuffs.

**Mixed dyes.** SOC. ANON. POUR L'IND. CHIM. À BAËLE. Fr. 656,133, June 20, 1928. Mixed dyes which together give a rich brown on fibers are obtained by mixing sym. 1,2-thionaphthindigo with sym. 2,1-thionaphthindigo either mechanically or by oxidation of a mixt. of the leuco derivs. or the corresponding hydroxythionaphthene in substance or on the fiber.

**Azo dyes.** I. G. FARBENIND. A.-G. Brit. 300,504, Nov. 12, 1927. Azo dyes fast to kier-boiling, to Cl and to light are formed in substance, on a substratum, or on the fiber by coupling diazotized halogen-substituted 1-amino-3,5-dimethylbenzenes with arylides of 2,3-hydroxynaphthoic acid or of  $\beta$ -ketocarboxylic acids. Several examples are given.

**Azo dyes.** I. G. FARBENIND. A.-G. Brit. 301,175, Oct. 28, 1927. Azo dyes for wool, or cotton, and lakes are prepd. by combining an aromatic diazo compd. with 2,6-naphtholcarboxylic acid. Several examples are given of dyes by which wool is dyed yellowish red to brown, turning to blue to violet to black when after-chromed, and which dye cotton reddish to brownish shades by chrome printing.

**Azo dyes.** I. G. FARBENIND. A.-G. Fr. 655,706, June 13, 1928. Azo dyes are produced on the fiber, by treating any coupling components with diazonium fluoborates or tetrazonium fluoborates. Examples are given.

**Azo dyes.** I. G. FARBENIND. A.-G. Fr. 655,822, May 14, 1928. Azo dyes are prepd. by sulfonating in the aryl ring monoazo dyes obtained by coupling diazotized *o*-nitroarylamines with acetoacetic arylides or by coupling diazotized *o*-nitroarylamines with acetoacetic-arylidiosulfonic acids. In an example 3-nitro-4-toluenazoacetoacetic *o*-chloroanilide is sulfonated with H<sub>2</sub>SO<sub>4</sub> or ClHSO<sub>3</sub>, giving a product which dyes wool a fast greenish yellow shade.

**Azo dyes.** I. G. FARBENIND. A.-G. Fr. 656,050, June 18, 1928. Azo dyes contg. Cr are obtained from the dyes prepd. by combining 1,3-phenylenediamine-5-sulfonic acid with diazotized *o*-aminophenols by treating them with agents capable of liberating Cr. Examples are given of the prepn. of dyes giving brown shades on wool by treating with Cr<sub>2</sub>O<sub>3</sub>, the dyes obtained by coupling 1,3-phenylene diamine-5-sulfonic acid with (1) diazotized picramic acid, (2) diazotized 4-nitro-2-aminophenol-6-sulfonic acid.

**Azo dyes.** I. G. FARBENIND. A.-G. (Josef Halter, inventor). Ger. 477,118, June 29, 1926. Violet azo dyes are prepd. by coupling diazo compds. from aminonaphthol ethers with arylamides of 2,3-hydroxynaphthoic acid. The components may be coupled in substance or on the fiber. The initial materials used in the example are 7-methoxy-1-naphthylamine and the  $\beta$ -naphthylamide of 2,3-hydroxynaphthoic acid.

**Azo dyes.** I. G. FARBENIND. A.-G. (Johann Huismann, Hugo Schweitzer and Richard Stüsser, inventors). Ger. 477,449, Jan. 20, 1927. See Brit. 283,897 (C. A. 22, 4257).

**Azo dyes.** I. G. FARBENIND. A.-G. (Johann Huismann, Hugo Schweitzer, and Richard Stüsser, inventors). Ger. 477,450, July 5, 1927. See Brit. 293,352 (C. A. 23, 1756).

**Azo dyes.** I. G. FARBENIND. A.-G. (Heinz Eichwede, inventor). Ger. 477,151, Dec. 24, 1925. See U. S. 1,694,117 (C. A. 23, 990).

**Azo dyes.** SOC. ANON. POUR L'IND. CHIM. À BAËLE. Fr. 656,179, June 21, 1928. Dyes contg. Cr are obtained by adding to a mixt. of an azo dye with a chroming agent, org. acids or their salts or both or salts of inorg. acids and free org. acids. Examples are given.

**Azo dyes derived from 2-hydroxynaphthalene-3-carboxylic acid arylamides.** HERMANN WAGNER (to General Aniline Works). U. S. reissue 17,364, July 2. See original pat. No. 1,622,690 (C. A. 21, 1714).

**Chromium compounds of azo dyes.** I. G. FARBENIND. A.-G. Brit. 300,425, Jan. 11, 1928. The azo dyes obtained by coupling *o*-hydroxydiazo compds. with acetoacetic esters or arylides are converted into Cr compds. by heating them in aq. soln., under pressure, in the absence of a water-sol. org. solvent, with Cr compds. in such propor-

tions as to provide at least 1 atom of Cr for each chromable group in the dye. Examples are given.

**Disazo dyes.** I. G. FARBENIND. A.-G. Fr. 655,962, June 15, 1928. Disazo dyes are prepd. by coupling an arylide of 2,3-hydroxynaphthoic acid with a diazotized aminoazo compd. of the general formula  $\left[ \begin{array}{c} \text{R}^1-\text{N}=\text{N}-\text{R}^2 \\ -\text{NH}_2 \\ -\text{SO}_3\text{H} \\ -\text{X} \end{array} \right]$ , in which  $\text{R}^1$  and  $\text{R}^2$

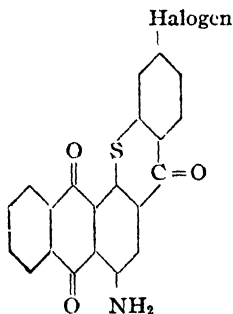
represent aryl groups, capable of being substituted with univalent groups, and X is a sulfonic group or carboxylic group. The dyes dye wool blue to bluish black shades. They may be after-chromed if the aminoazo compd. contains a group capable of being chromed. Examples are given.

**Diazo salt preparations for use in dyeing.** FERDINAND KELLER and KARL SCHNITZPAHN (To Grasselli Dyestuff Corp.). U. S. 1,717,453, June 18. A textile material, impregnated with a 2,3-hydroxynaphthoic acid arylide or other suitable coupling compd. is treated with a neutral 1,5-naphthalenedisulfonic acid diazonium salt of an unsulfonated substituted aromatic amine

**Trisazo dyes.** I. G. FARBENIND. A.-G. (Karl Holzach, inventor). Ger. 477,061, July 6, 1926. Trisazo dyes are prepd. by a series of operations comprising (1) coupling a diazo compd. from aminosalicylic or aminophthalic acid or a deriv. or homolog thereof with a primary aromatic amine coupling in the *p*-position, (2) diazotizing the aminoazo dye so obtained and coupling the diazo compd. with the same amine as before or with another primary aromatic amine coupling in the *p*-position, and (3) again diazotizing and coupling with salicylic acid or a homolog thereof. At least 1 of the amines used in (1) and (2) must contain a sulfo group. The products dye cotton directly in brown shades which are rendered fast by chroming or coppering. The Cr and Cu compds. of the dyes can also be used directly. An example is given in which the initial material is *p*-aminosalicylic acid. The amines used in (1) and (2) are 1,6- and 1,7-naphthylaminesulfonic acid, resp., and the final component is *o*-cresotinic acid.

**Indigoid dyes.** I. G. FARBENIND. A.-G. (Wilhelm Neelmeier and Theodor Nocken, inventors). Ger. 477,062, Apr. 4, 1926. See Brit. 291,825 (C. A. 23, 1285).

**Dyes of the anthraquinone series.** FRANZ ACKERMANN and PAUL SCHETELIG (to Soc. anon. pour l'ind. chim. à Bâle). U. S. 1,719,792, July 2. Dyes giving fast red-violet to brown, gray, blue and green tints are made by causing 1 mol. of a compd. such as cyanuric chloride to react on 1 mol. of a compd. of the general formula



and condensing the resulting condensation product with one mol. of the same compd. of the above specified general formula. Several examples are given.

**Condensation products of the anthraquinone series.** GUSTAV REDDELIEN and WERNER MÜLLER (to Grasselli Dyestuff Corp.). U. S. 1,717,809, June 18. An amino compd. of the anthraquinone series such as 1-aminoanthraquinone is condensed with a halohydrin in the presence of an acid-binding agent with or without a solvent or diluent. Products are obtained which may be used in dyeing "acetate silk," as oil- and fat-sol. dyes, and, generally, in a weak acid bath for dyeing wool, or as intermediates for making other dyes. Several examples are given.

**Dyes of the triarylmethane series.** BRITISH DYE STUFFS CORP., LTD., F. W. LYNCH and E. H. ROBB. Brit. 301,193, Nov. 17, 1927. The process described in Brit. 272,321 (C. A. 22, 1859) for producing triarylcarbinols is carried out at a temp. of about 60° in the presence of a solvent such as benzene.

**Pyrone dyes.** K. CARPMAEL, K. S. CARPMAEL and I. G. FARBENIND. A.-G. Brit. 300,594, June 16, 1927. Pyrone dyes prepd. as described in Brit. 247,003 (C. A. 21,

500) are freed from secondary products, usually of a browner shade, by converting the dyestuff acids into salts and sepg. the more sol. secondary products. Examples and details are given.

**Pyrazolones, etc.** IMPERIAL CHEMICAL INDUSTRIES, LTD., and M. MENDOZA Brit. 300,321, Aug. 19, 1927. Aminodiaryl sulfones such as are described in Brit. 297,855 (C. A. 23, 2724) and aminodiaryl sulfides such as are described in Brit. 299,501 (C. A. 23, 3234) are converted into the corresponding hydrazines and from these into the corresponding pyrazolones, which may be used in the manuf. of dyes. Several examples are given.

**Vat dyes.** I. G. FARBENIND. A.-G. (Max A. Kunz and Guido von Rosenberg, inventors). Ger. 477,394, Mar. 31, 1927. Dyes prepd. by the method of Ger. 475,687 (C. A. 23, 3814-5) and contg. at least 1 free  $\text{NH}_2$  group are treated with fuming  $\text{H}_2\text{SO}_4$  in the presence or absence of accelerators such as I or S. The new dyes so obtained may be alkylated, e. g. with methyl *p*-toluenesulfonate. The products, whether alkylated or not, give deeper shades than the initial materials, generally blue or violet. Examples are given.

**Vat dyes.** I. G. FARBENIND. A.-G. Fr. 655,339, May 16, 1928. Vat dyes are prepd. by treating with alk. agents the 1'-anthraquinonyl-6-aminobenzanthrone or other compds. of the anthraquinonylaminobenzanthrone series not substituted in the 2- and *Bz*-1-positions, or having in the *Bz*-1-position an OR group ( $\text{R} = \text{alkyl, aryl, etc.}$ ) or 1'-anthraquinonyl-2-aminobenzanthrone or its derivs. Examples include the prepn. of dyes from (1) 1'-anthraquinonyl-6(or 7 or 8)-aminobenzanthrone (by condensation of 6(or 7 or 8)-chlorobenzanthrone with 1-aminoanthraquinone), (2) 4'-methoxy-1'-anthraquinonyl-6-aminobenzanthrone (by condensing 6-chlorobenzanthrone with 1-amino-4-methoxyanthraquinone), (3) the condensation product of 6-chlorobenzanthrone with 1,6(or 1,5)-diaminoanthraquinone, (4) 1'-anthraquinonyl-*Bz*-2-aminobenzanthrone (by condensing *Bz*-2-chlorobenzanthrone with 1-aminoanthraquinone), (5) the condensation product of 6-aminobenzanthrone and 1-chloroanthraquinone-2-carboxylic acid, (6) 2'-anthraquinonyl-6-aminobenzanthrone (by condensing 6-chlorobenzanthrone with 2-aminoanthraquinone), (7) the condensation product of bromo-*Bz*-1-methoxybenzanthrone (by brominating *Bz*-1-methoxybenzanthrone in  $\text{AcOH}$ ) and 1-aminoanthraquinone, (8) the condensation product of 6-halo-*Bz*-1-phenoxybenzanthrone (by heating 6-halogen-*Bz*-1-bromobenzanthrone with  $\text{PhOH}$  in the presence of  $\text{K}_2\text{CO}_3$  and  $\text{CuO}$ ) with 1-aminoanthraquinone, (9) 4'-methoxy-1'-anthraquinonyl-2-aminobenzanthrone (from 1-amino-4-methoxyanthraquinone and 2-chlorobenzanthrone), (10) 1',1'-dianthraquinonyl-2,6-diaminobenzanthrone (from 2,6-dichlorobenzanthrone and 2 mols. of 1-aminoanthraquinone).

**Vat dyes.** I. G. FARBENIND. A.-G. (Walter Mieg, inventor). Ger. 477,284, Mar. 25, 1926. See Brit. 291,878 (C. A. 23, 1276).

**Vat dyes.** SOC. ANON. POUR L'IND. CHIM. À BÂLE. Fr. 655,412, June 6, 1928. New derivs. of vat dyes are prepd. by the action of org. acids having a reactive halogen atom on leuco derivs. of vat dyes. These compds. are readily transformed to the dyes by oxidizing agents in the presence of acids or alkalis. In examples leucothioindigo or leucoindigo is dissolved in  $\text{NaOH}$  soln. and a soln. of monochloroacetic acid or  $\beta$ -chloropropionic acid in  $\text{Na}_2\text{CO}_3$  soln. is added, the mixt. being heated for 1 hr. to 75-80°.

**Vat dyeing.** I. G. FARBENIND. A.-G. Fr. 655,231, June 5, 1928. Phosphoric acid or sol. phosphates are used in vat-dye baths contg. alk. earth compds. to prevent formation of alk. earth salts of the dye.

**Dyeing.** CHEMISCHE FABRIK VORM. SANDOZ. Brit. 300,662, Nov. 18, 1927. In processes such as continuous dyeing of printed reserve goods with anthraquinone vat dyes, the stability of the vat is increased by the addn. of a mixt. of aromatic hydroxy compds. and hydroaromatic compds. such as phenols or naphthols and cyclohexanol, methylcyclohexanols, hydrogenated naphthalenes or hydrogenated naphthols.

**Dyeing.** I. G. FARBENIND. A.-G. Brit. 301,166, Oct. 15, 1927. Pptn. of vat dyes which are normally sensitive to Ca and other alk. earth salts present in the dye bath, is prevented by the addn. of  $\text{H}_3\text{PO}_4$  or a sol. phosphate.

**Dyeing textiles.** BENNO BORZYKOWSKI. Fr. 656,043, June 18, 1928. Two or more colors are obtained on cloth by treating part of the fibers, before manuf. of the cloth, in such a way that the treated fibers behave differently toward dyes than untreated fibers. An example is given in which part of the fibers of cotton or artificial silk are treated with a warm soln. of gallnut in water. The cloth is dyed with direct green, 2 different shades being obtained.

**Dyeing animal fibers.** ERWIN SCHWENK, KARL REICHNER and METHODIUS KNOB



(to Verein für chemische und metallurgische Produktion). U. S. 1,718,882, June 25. In producing azo dyes on the material such as wool it is grounded with an aromatic org. compd. contg. the group  $\text{—SO}_2\text{NH—}$  capable of coupling with a diazo compd. to form a dye and the dye is then developed by a diazo compd. Numerous examples are given.

**Dyeing textiles.** EVERHARD E. BOUWMAN. Fr. 655,661, June 13, 1928. A curved plate is arranged in the vat so that the cloth falls on it in pleats. A similar curved plate is placed outside the vat to receive the cloth for oxidation.

**Dyeing furs with spots or mottled designs.** R. R. BALUT. Brit. 300,352, Sept. 23, 1927. Spots of lighter color are applied first, then darker spots, to imitate spotted animal skins, etc. Cf. C. A. 22, 503.

**Impregnating, dyeing and printing textile materials.** POLLOPAS, LTD., and G. SPENCER. Brit. 301,365, June 24, 1927. Yarns, fabrics, etc., such as those formed of cotton are impregnated, prior to dyeing or printing, with a water-sol. condensation product of  $\text{CH}_3\text{O}$  with urea or thiourea. Several examples are given. The condensation product may be rendered insol. before dyeing or printing and may be colored before use.

**Dyeing in multi-color effects.** B. BORZYKOWSKI (to Borvisk Syndicate, Ltd.). Brit. 300,951, Nov. 21, 1927. Part of the fibers or threads are subjected, prior to manuf. of yarn or fabric, to treatment which causes them to act differently in a subsequent dyeing operation, *e. g.*, a cotton or viscose thread may be treated with a hot. aq. ext. of gallnut, washed in cold water contg. tartar emetic, dried and then twisted or woven with untreated fiber or thread. Dyeing treatments are described.

**Dyeing apparatus.** WM. W. BROWN (to H. W. Butterworth & Sons Co.). U. S. 1,717,494, June 18. Mech. features.

**Centrifugal dyeing apparatus.** SOC. KARPELES FRÈRES. Brit. 300,623, Nov. 17, 1927. Structural features.

**Dyeing cellulose silk.** BRITISH DYESTUFFS CORP., LTD. Fr. 655,076, June 1, 1928. Regenerated cellulose silk is uniformly dyed with dyes obtained by combining the tetrazo compds., the 2,2'-substituted derivs. of 4,4'-diaminodiarlys other than 2,2'-dinitrobenzidine with 2 mol. proportions of a coupling component or with 2 different coupling components. An example is given of tetrazotizing 2,2'-dichloro-4,4'-diphenyldiamine and combining with 1 mol. of salicylic acid and 1 mol. of 2-amino-8-naphthol-6-sulfonic acid. A table of coupling components and the colors obtained is given.

**Dyeing artificial silk made from viscose, etc.** SOC. ANON. POUR L'IND. CHIM. À BAËLE. Brit. 300,916, Nov. 19, 1927. Artificial silk "other than acetate and like silk" is dyed from a neutral, slightly alk. or slightly acid bath with a complex metal compd. of a dye contg. a plurality of metals. Examples are given of the use of compds. of azo dyes contg. Cu and Cr or Cu, Cr and Ni.

**Dyeing cellulose derivatives.** SOC. ANON. POUR L'IND. CHIM. À BAËLE. Fr. 656,057, June 18, 1928. Fast shades are obtained on the ethers and esters of cellulose by the use of tetraaminoanthraquinones in which an atom of H of one or both amino groups is substituted by an aryl group. Examples are 1,5-diamino-4,8-diphenylaminoanthraquinone (greenish blue), 1,8-dianilino-4,5-diaminoanthraquinone (blue), 1,5-diamino-4,8-(4',4''-diamino)-dianilinoanthraquinone (bluish green).

**Dyeing cellulose derivatives.** HENRY DREYFUS. Fr. 656,431, June 25, 1928. Cellulose derivs., particularly the acetate, are dyed, printed or stenciled with azo dyes derived from aminonaphthols or naphthylenediamines or their substitution products. The dyes may be applied in the form of aq. dispersions.

**Dyeing cellulose acetate.** GEORGE H. ELLIS (to Celanese Corp. of America). U. S. 1,719,324, July 2. Basic dyes of the anthracene series such as aminoanthraquinones are used in the form of sol. modifications obtained by pretreating them with a sulfonated ricinoleic acid compd. or other suitable solubilizing agent comprising a material of oily or fatty character.

**Dyeing cellulose acetate.** SOC. ANON. POUR L'IND. CHIM. À BAËLE. Brit. 300,299, Aug. 9, 1927. Dry solid preps. of dyes suitable for dyeing cellulose acetate are made by evapg. to dryness, in the presence of sulfite cellulose liquor, a fine dispersion produced by stirring the dye with water in the presence of saponin or a condensation product produced from  $\text{CH}_3\text{O}$  and a naphthalene sulfonic acid. Azo dyes, indophenols or anthraquinone dyes may be used; several examples are given.

**Dyeing cellulose esters and ethers.** BRITISH CELANESE, LTD., G. H. ELLIS and H. C. OLPIN. Brit. 300,929, July 20, 1927. Dyeing is effected by coupling on the material either (1) diazotized amino-( $\beta$ -ketoacidylamino) or amino-( $\beta$ -ketoacidylamino)-azo compds. with suitable components, or, (2) diazotized amines or aminoazo compds. with acetoacetic arylides. Several examples are given.

**Dyes for cellulose esters and ethers.** I. G. FARBERIND, A.-G. Fr. 655,167, June

2, 1928. Dyes suitable for dyeing cellulose esters and ethers are obtained by submitting naphthazarin to the action of aliphatic amines in such a way as to avoid the formation of vat dyes. In examples, naphthazarin is heated for 20 hr. at 60° in an autoclave with a 30% aq. soln. of MeNH<sub>2</sub>, with the addn. of Zn dust. The product obtained represents a tris(methylamino)naphthoquinone which dyes cellulose acetate green shades. If crystal. boric acid is used instead of Zn dust a bis(methylamino)hydroxy-naphthoquinone is obtained giving red shades.

**Dyeing cellulose esters and ethers.** BRITISH DYESTUFFS CORP., LTD. Fr. 655,948, June 15, 1928. Cellulose esters and ethers are dyed fast green shades by salts, *e. g.*, oxalates of unsulfonated triarylmethane derivs. of the formula (R'R''NC<sub>6</sub>H<sub>4</sub>)<sub>2</sub>C(OH)(C<sub>6</sub>H<sub>4</sub>RXY) in which R' and R'' are Me or Et groups, R is an alkyl group, and X and Y are other groups, *e. g.* NO<sub>2</sub>, conveniently chosen. The following derivs. are specified: (1) the 2,4-dimethyl deriv. of Malachite green obtained by oxidizing the condensation product of 2,4-dimethylbenzaldehyde and 2 mols. of PhNMe<sub>2</sub>, or by condensing 4,4'-tetramethyldiaminobenzophenone with 4-chloro-*m*-xylene in the presence of Na as in Fr. 626,703, or by oxidizing the condensation product of 4,4'-tetramethyldiaminobenzohydrol and *m*-xylene (2) the 2,5-dimethyl deriv. of Malachite green prep'd. by condensing 4,4'-tetramethyldiaminobenzophenone with 2-chloro-*p*-xylene in the presence of Na, (3) the 2,4-dimethyl deriv. of Brilliant green from 4,4'-tetramethyldiaminobenzophenone and 4-chloro-*m*-xylene. Cf. C. A. 23, 2836.

**Fiber or cellulose from straws and leaves.** U. GENNARO and G. ROSSI. Brit. 301,226, Dec. 30, 1927. Materials such as straw of wheat, oats or rye or leaves of *Stipa tenacissima* are heated to 40° with a reagent such as a 3 or 4% NaOH soln. to dissolve out the silica, then washed or neutralized and subjected to an enzymic retting process.

**Lightening the color of dyed fabrics.** GEORGE F. LLOYD (to Spectrum Dyes Proprietary, Ltd.). U. S. 1,717,792, June 18. Dyed fabrics are subjected to a uniformly and selectively controlled semi-stripping process with water contg. the reaction products of NaHSO<sub>3</sub> with Zn, with the addn. of coal-tar naphtha.

**Mercerizing fabrics.** ARNOLD BOSSHARD. U. S. 1,717,870, June 18. The fabric is subjected to a series of baths of mercerizing liquid, of gradually increasing concns. and decreasing temps., is subjected to squeezing after each bath, and is subjected to longitudinal tension. An arrangement of app. is described.

**Washing textile materials.** ELISEE C. DUHAMEL. U. S. 1,717,439, June 18. Material such as wool or silk is washed in at least one detergent bath of water and alk. salts of fatty acids and impurities are removed rapidly and continuously from the detergent bath during the washing operation, by sedimentation. An app. is described. U. S. 1,717,440 specifies washing uncarded wool at least once with a bath of suint liquor, collecting the suint in the bath and, during the process, removing portions of the suint liquor contg. settled impurities, purifying them and returning them to the bath for reuse. An app. is described.

**Treating vegetable textile materials with swelling agents.** HEBERLEIN & CO., A-G Brit. 301,392, Nov. 28, 1927. In producing woolly, linen-like or other effects (which may be in the form of a pattern) the material is treated successively with 2 or more swelling agents (of which several examples are given) without permitting intermediate coagulation.

**Treating plant fibers.** CASIMER MASSE (to Soc. Cicile des Procèdes Masse). U. S. 1,719,066, July 2. Fibers such as those of ramie are subjected to the action of a starch soln. to loosen the fibers from the outer skin covering, dried, and then beaten to remove excess starch and sep. the fibers from the skin.

**Treating waste liquor from fiber production.** H. R. FOUQUE. Brit. 301,284, May 30, 1928. See Fr. 650,110 (C. A. 23, 3300).

**Treating cotton fabrics with caustic alkali.** MARCEL MELLIAND (to Meliana Corp. of America). U. S. 1,717,991, June 18. Cotton fabrics are subjected to the action of strong hot solns. of caustic alkalis for a short time, without tension, and are subjected to at least one mercerizing treatment.

**Lustering cotton with alkali and carbon disulfide.** L. LILIENFELD. Brit. 300,663, May 11, 1927. In treating cotton or other cellulosic yarns or fabrics with alkali and CS<sub>2</sub> to give the material a silky luster, a caustic alkali soln. of over 12% strength (or lower concn. at temps. below 0°) is used to produce a sol. xanthate, which is removed at least in part before the material is brought into contact with a viscose-pptg. agent. If the material is allowed to shrink during the treatment a wool-like effect is produced.

**Reducing the tendency to laddering of knitted fabrics containing cellulose acetate or similar materials.** CAMILLE DREYFUS (to Celanese Corp. of America). U. S.

1,719,173, July 2. The material is treated with a substance such as acetone which has a slight solvent action on the org. cellulose deriv. present so that the fibers and threads are caused to adhere slightly together without substantial alteration in texture and appearance.

**Lustering textiles.** H. TH. BÖHME A.-G. Fr. 656,157, June 20, 1928. Emulsions of lustering agents such as paraffin, wax, or stearic acid are added to the dressing bath contg. salt.

**Bleaching fibers, skins, etc.** HANS GOLDARBEITER. Fr. 655,236, June 5, 1928. See Brit. 201,743 (C. A. 23, 1290).

**Mildew-proofing textile materials.** CLARENCE B. WHITE (to Vitatex Processes, Inc.). U. S. 1,717,483, June 18. Textile materials are rendered resistant to mildew and like fungus growth and also repellent to water and more resistant to acids by impregnation with a rare earth metal compd. insol. in alk. solns.

**Carroting animal fibers.** VIKTOR BÖHM. U. S. 1,719,043, July 2. A neutral carroting agent contg. a carbonyl group such as  $\text{CH}_2\text{O}$  or other aldehyde or ketone is used for treating rabbit hair for making hats, etc.

**"M of i-proofing."** M. G. MINAEFF (to Larvex Corp.). Brit. 301,421, Nov. 29, 1927. In treating fabrics or other materials, solns. are used contg. thiourea, phenylthiourea or other thiourea compd. or deriv. in which at least one of the  $\text{NH}_2$  groups is unsubstituted.

**Washing wool or other textile materials.** ELISÉE C. DUHAMEL. U. S. 1,717,375, June 18. The material is soaked in a succession of pairs of baths each utilizing detergent liquid such as soap soln., the liquid is circulated in series through certain of the baths while the circulation of the material is in parallel and in opposite direction to the liquid. An app. is described.

**Degreasing wool.** I. G. FARBENIND. A.-G. Brit. 300,941, Aug. 20, 1927. Raw wool is degreased with a mono- or di-chlorinated hydrocarbon such as monochloride of octane, nonane or xylene or dichloride of hexane or benzene or of branched-chain isomeric compds. Solvent is removed from the wool by washing and aeration and from the wool fat by steaming.

**Degreasing raw wool and other textile fibers.** ALFRED ENGELHARDT (to I. G. Farbenind. A.-G.). U. S. 1,718,548, June 25. Cyclohexanone or a homolog is used as a solvent, alone or in various mixts. prepd. to produce desired effects. Several examples are given. Cf. C. A. 23, 536.

**Curling and increasing the strength and elasticity of cotton fibers.** MARCEL MELLIAN (to Meliana Corp. of America). U. S. 1,717,992, June 18. The fiber is treated with caustic alkali soln. of at least  $50^\circ \text{Bé}$ . at a temp. of  $60\text{--}100^\circ$  without tension.

**Coating fabrics.** M. N. NICKOWITZ (to E. I. Du Pont de Nemours & Co.). Brit. 301,024, Nov. 23, 1927. A casein varnish is applied to a fabric and subsequently halogenated, e. g., with Br. The fabric may be previously coated with other materials such as a rubber compn., pyroxylin or oxidized oil. Numerous details and modifications are given.

**Treating silk fabrics.** R. CLAVEL. Brit. 300,894, Nov. 19, 1927. Silk fabrics are loaded by application (either to one or both sides or in the form of a pattern) of a metal compd. in paste form such as  $\text{SnCl}_2$ , thickened with gum arabic, dextrin, starch, starch degradation products, sugar, etc. The silk is then further treated with other loading baths and substances such as alkali phosphates for converting the metal compds. into insol. form. Mordant and other dyes may be used for producing variegated color effects. Various details and modifications are described.

**Charging silk.** MARKUS WERDER. Fr. 656,424, June 25, 1928. Silk, after treatment in a  $\text{SnCl}_2$  bath, is brought directly into a bath of  $(\text{NH}_4)_2\text{H}_2\text{PO}_4$  and a little  $\text{H}_3\text{PO}_4$  which may be followed by a bath contg.  $\text{Na}_2\text{HPO}_4$ .

**Degumming silk.** J. TAKAMINE (to Takamine Laboratory, Inc.). Brit. 301,419, Nov. 29, 1927. Woven or skein silk is boiled under pressure of about 50 lb. per sq. in. for about 15 min., with agitation, washed and subjected to a similar boiling in a 0.5–1.0% neutral soap soln., again washed, subjected to acid treatment and to a final washing. An app. is described.

**Artificial silk.** SOC. POUR LA FABRICATION DE LA SOIE RHODIASETA. Brit. 301,335, June 22, 1927. Mat or woolly effects are produced on material comprising cellulose acetate by immersion in a soln. of a chloride of Ca, Mg or Li of 10–30% strength and then subjecting for a short time to a boiling dil. acid bath of a concn. not exceeding decinormal. Different specified acids give different effects of texture and color.

**Artificial silk.** C. HENNINGSEN (to DuPont Rayon Co.). Brit. 301,307, Nov. 26, 1927. Yellow discoloration of products formed from viscose is removed, or products of

desired color are obtained, by adding dyes (of which various examples are given) to the viscose before coagulation.

**Artificial silk.** I. B. MERRIMAN (to Manville-Jenckes Co.). Brit. 301,026, Nov. 23, 1927. Artificial silk, such as that formed from viscose, is wound in a compact mass, while still moist with the pptn. bath, and in this condition is subjected to further operations such as washing, desulfurization, oiling, soaping, sizing and dyeing, by forcing liquids through the material. An app. is described.

**Apparatus for loading natural or artificial silk.** RENÉ CLAVEL. Fr. 655,440, June 6, 1928.

## 26—PAINTS, VARNISHES AND RESINS

A. H. SABIN

**A new accelerated test for paints.** W. H. DROSTE AND MAX WERNER. *Farben-Ztg.* **34**, 2131-3(1929).—The Ritter (cf. C. A. **23**, 2048) elec. test is criticized on the ground that it is not merely a cond. test but is a resultant of many factors, such as polarization, concn. cells, etc. The Liesegang ring test is of no value, for paints are never applied to films of gelatin. Advances in accelerated testing will come not from mere mech. improvements but from optimum arrangements of factors already in use, such as water, light, etc.

G. G. SWARD

**Testing the suitability of paints.** PAUL NETTMANN. *Farben-Ztg.* **34**, 2181-3(1929).—N. briefly outlines the intermolecular forces and phys. states existing in paint films. Among them are cohesion, adsorption, surface tension, diffusion, polarization of polar mols., solvation of colloidal particles, etc. The considerations involved in accelerated weathering are tabulated.

G. G. SWARD

**Tentative Australian standard specification for ready mixed linseed oil paint red oxide of iron.** *Australian Commonwealth Eng. Standards Assoc.* No. K40, April, 1929, 18 pp.

E. I. S.

**Australian standard specifications and methods of sampling and testing for zinc oxide, dry, and zinc oxide in oil (genuine zinc white).** *Australian Commonwealth Eng. Standards Assoc.*, Nos. K17 and 18, April, 1929, 22 pp.

E. I. S.

**Paints containing casein.** F. MARGIVAL. *Peintures, pigments, vernis* **5**, 551-3(1928); cf. C. A. **23**, 3585.—Formulas are given.

B. HAMILTON

**Modern practice in paint grinding.** E. W. FASIG. *Paint, Oil and Chem. Rev.* **87**, No. 24, 8-10, No. 25, 14-5(1929).—A review.

G. G. SWARD

**Influence of inerts in tinted paints.** HANS WAGNER. *Farben-Ztg.* **34**, 2011-4(1929).—Chalk imparts less durability to paints than either gypsum or barytes. This is probably due to the flocculated condition of the former. It cannot be due to the influence of light for chalk is less transparent to both visible and ultra-violet light than the other 2 pigments. The opacity of ZnO to ultra-violet light is not due to the absorption of the incident light but may be accounted for by the exceedingly long wave length of the scattered light which is not detected by the photographic plate.

G. G. SWARD

**The drying of raw and boiled linseed oil.** HANS WOLFF AND W. TOELDT. *Farben-Ztg.* **34**, 2069-72(1929).—The progress of the drying of raw linseed oil and of boiled oil prepd. with Mn or Co driers was followed by means of the Wolf "spreading drop" method. For nominal thickness (not given) of film the rate of drying was proportional to the gain in weight. With Co drier, the drying at the beginning proceeded faster than the gain in weight. For thicker films, there was a loss in weight at the beginning, although the drying proceeded in the normal manner.

G. G. SWARD

**Clear mixing lacquers.** R. L. MASTERSON. *Ind. Finishing* **5**, No. 8, 53-4(1929).—Explanation of some interesting characteristics about clear mixing lacquers, and how, where, why, and when to use them in connection with modern wood-finishing operations.

E. I. S.

**Nitrocellulose lacquers and their possible applications to railroad rolling stock.** MAURICE DESCHIENS. *Chimie & industrie Special* No., 581-4(Feb., 1929); cf. C. A. **21**, 3752.—A brief general discussion of the compn. of cellulose lacquers and of their advantages for railroad rolling stock.

A. PAPINEAU-COUTURE

**Pigment and oil.** E. KLUMPP. *Farben-Ztg.* **34**, 2130-1(1929); cf. C. A. **22**, 877.—Grinding dry pigments in a mortar to reduce the particle size did not, as expected, increase the oil absorption. On the other hand, the oil absorption was decreased 20-50%. The anomalous result is ascribed to the coalescence of small particles.

G. G. SWARD

**The microstructure of films and evidence of internal tension.** A. V. BLOM. *Farben-Ztg.* 34, 2127-30(1929).—Photomicrographs of the cross sections of films show a stratification of the pigment and other constituents. Enormous intermolecular forces must therefore be present in a film. Among the special treatments used to reveal the different layers are grinding with a paste of chalk and water, etching with different liquids and coloring with aniline dyes. To explain scaling which sometimes takes place in cold weather, B. introduces the term "thrustability." If the force (thrusting tension) with which a film resists contraction when it is chilled be greater than the adhesion of the film to the metal, the film will scale off the metal. G. G. SWARD

**New aluminous and titaniferous fillers for paints.** J. DE LAROCHE AND G. MEUNIER. *Peintures, pigments, vernis* 5, 590-1(1928).—A disclosure of the use of the residues resulting from  $H_2SO_4$  digestion of bauxite as a paint filler; also of the residues from the manuf. of  $Al_2(SO_4)_3$ . These residues are valuable for their lake-forming properties. B. HAMILTON

**China oil.** A. GERARD. *Peintures, pigments, vernis* 5, 592-6(1929).—A review of the origin, compn., properties and analysis of China oil. B. HAMILTON

**Titanium pigments.** G. GENIN. *Peintures, pigments, vernis* 5, 631-7(1928).—A discussion of the history and occurrence of titaniferous materials usable as pigments and of the methods of prep. Ti pigments. Methods of analysis are outlined. B. H.

**The ultramarines.** A. DUBOSC. *Peintures, pigments, vernis* 6, 782-6, 804-10(1929).—A general discussion of natural and artificial ultramarines. B. H.

**The standardization of colored printing inks and its advantages.** T. W. ANSTEAD. *Printing Industries (A. S. M. E. Trans.)* 50, No. 34, 1-6(1928).—Confusion exists in the color field at present, as discussions and instructions regarding color have no common basis or viewpoint. The materials entering into the manuf. of printing ink are discussed. Standardization of colored inks is really standardization of the pigments involved; proposed methods are considered. E. I. S.

**Testing of stoving varnishes used in electrotechnic.** A. R. MATTHIS. *Chimie & industrie Special No.*, 545-52(Feb., 1929).—A brief discussion of the properties required of such varnishes, with a description of the methods for detg. d., fluidity value,  $H_2O$ -sol acidity, action on Cu, time of drying, resistance to transformer oils at 100°, flexibility, aging and dielec. strength. A. PAPINEAU-COUTURE

**Wood-oil varnish.** A. DUBOSC. *Peintures, pigments, vernis* 5, 527-8(1928).—On suitably cooking the ingredients, an increase in the proportion of wood oil in a varnish dets. an increase in the durability, without which it would be necessary previously to harden the resin with lime. Directions are given for the making of wood-oil varnishes for various purposes. For cheap varnishes a certain amt. of wood oil can be replaced by soy-bean oil. The addn. of Co drier not only increases their drying properties but also clarifies them. For absolutely white varnish, it is advised to use zinc resinate pptd. in the oil and treated with a small quantity of Co drier. B. HAMILTON

**Tung oil.** LOUIS A. JORDAN. *J. Oil and Colour Chem. Assoc.* 12, 113-53(1929).—A review. Tung trees, principally *A. fordii* and *A. montana*, have been known outside of China since 1760, were introduced into America in 1896, Germany in 1897 and England soon after. Expts. on cultivation outside of the native habitat have progressed most rapidly in Florida. Nearly every part of the British Empire has been tried. The most promising part of the latter seems to be the Kenya, Middle East Africa. A complete bibliography is appended. G. G. SWARD

**The catalytic effect of oxygen on tung oil.** JOHANNES SCHEIBER. *Farbe u. Lack* 1929, 284-6.—When tung oil is treated with small quantities of  $O_2$ ,  $I_2$ , etc., the  $\beta$ -glyceride is formed; with large amts. of the reagent a polymerized product is formed. E. g., radial crystal formations of the  $\beta$ -glyceride were formed in tung oil preserved between a microscope slide and a cover glass. If crystals of the  $\beta$ -glyceride be dissolved in warm tung oil they reappear as very min. crystals, but if a trace of the original crystals be undissolved, they recrystallize normally. G. G. SWARD

**Glycerol used to reclaim China wood oil.** EDWARD STEINHOFF. *Paint, Oil and Chem. Rev.* 87, No. 84, 21(1929).—A batch of tung-oil varnish that has gelled may be liquefied by heating with glycerol and litharge, 1 gallon of glycerol and 5 lb. of litharge being used for each 60 gallons of varnish. A second addn. of glycerol and litharge may sometimes be necessary. G. G. SWARD

**Working up low-grade resins.** M. TOMBO. *Anales soc. españ. fis. quim.* 27, 77-106(1929).—Distn. of low-grade gums and galipot gives a limited yield of oil of turpentine and a dry, brown pitch. Total sepn. of  $H_2O$  and impurities is interesting because elimination of  $H_2O$  by distn. prolongs the operation considerably and because the impurities

injure the rosin. The results obtained by addn. of oil of turpentine in the most suitable proportions, with a small loss of turpentine and an advantage of 2 or 3 grades of pitch, are shown. Although the variable quality of the gums studied can be the cause of variations, results are very favorable for a 50% addn. of turpentine. E. M. SYMMES

**Contribution to our knowledge of phenol resins.** G. HUGEL AND M. VINCENT. *Chimie & industrie* Special No., 540-4 (Feb., 1929).—In order to det. the difference between phenol-CH<sub>2</sub>O resins condensed in presence of alkalies and of acids, the effect of varying CH<sub>2</sub>O and keeping NaOH const., and the effect of varying NaOH and keeping CH<sub>2</sub>O const. was investigated. The results showed that the residual CH<sub>2</sub>O is a straight-line function of the total amt. of CH<sub>2</sub>O added when the NaOH is kept const., and that the residual NaOH is a straight-line function of the total amt. of NaOH added when the CH<sub>2</sub>O is kept const., at least up to the point where CH<sub>2</sub>O disappears completely from the residual soln. This shows that there is a partition coeff. of CH<sub>2</sub>O and of NaOH between the resin formed and the residual soln., and that the functions of CH<sub>2</sub>O and NaOH are similar. H. and V. infer that there are 2 distinct phenomena: (1) condensation of CH<sub>2</sub>O with the phenol to form a resin, (2) soln. of CH<sub>2</sub>O and NaOH in the resin. From a discussion of the interpretation of their results, they conclude that there is no basic difference in the constitution of acid and alk. condensation products, that the phenomenon of bakelization is due to the presence of a large amt. of dissolved CH<sub>2</sub>O in the resin, and that this soln. is favored by the presence of small quantities of alkali and hindered by acid. A. PAPINEAU-COUTURE

**The cultivation of lac in the plains of India.** C. S. MISRA. Agr. Research Inst., Pusa, *Bull.* 185, 115 pp. (1929).—This publication discusses all phases of the lac industry in India, including the growing, harvesting, storage, prepn. for the market and adulteration of lac and the *manuf., uses, etc., of shellac.* K. D. JACOB

**The effect of storage on the properties of turpentine.** W. B. BURNETT AND H. K. SALZBERG. *Proc. Am. Soc. Testing Materials* 1929 (preprint) No. 84, 4 pp.—Tests on samples of gum turpentine from tanks in storage for 15 to 18 months at the 2 in 1-Shinola Bixby Corp., Indianapolis, Ind., indicate that turpentine in storage for that time is entirely satisfactory for general commercial use as embodied by the A. S. T. M. Standard Specifications of distn. range, sp. gr., and refractive index for Gum Spirits of Turpentine and Steam-Distilled Wood Turpentine. However, the effects of storage are noticeable, and at the end of this period the turpentine does not meet the German requirements in regard to bromine number and evapn. residue. F. E. WALSH

Comparison of the Zennström and other processes for the production of paper pulp and by-products from maritime pine and other resinous woods [recovery of rosin] (RIVIÈRE) 23. A note on coconut-shell oil [a paint] (KIDAVU, NAMBIYAR) 22. Coating fabrics [with casein varnish] (Brit. pat. 301,024) 25. Apparatus for extracting resin from plants (Fr. pat. 655,733) 1. Trichloroethane [as solvent for resins] (Fr. pat. 655,930) 10. Insulating and other compositions from cashew-nut shell liquid (Brit. pat. 300,654) 13. Lampblack, etc. [for preparing inks or paints] (Brit. pat. 300,610) 18. Mixed esters and ester-ethers of cellulose [for films, lacquers, etc.] (Brit. pat. 300,942) 23. Dispersion agents [for preparation of lacquers] (Swiss pat. 126,575) 18.

**Paint.** JULIUS J. HORAK (to Albert A. Hemmen). U. S. 1,717,924, June 18. A paint which may be used on damp concrete surfaces, etc., is formed from a mineral base such as whiting, ZnO or asbestine, rosin cut in ammonia, linseed oil, a linoleate such as that of Co, Mn or Pb and an aq. soln. of animal glue treated with NH<sub>4</sub>CNS.

**Paint.** SOC. MINÈRE "LA BARYTINE" and MAURICE RAFFIN. Fr. 655,085, Oct. 14, 1927. Ti white is prepd. from Fe-Ti ores, by heating the ores with Na<sub>2</sub>CO<sub>3</sub> and coal to reduce the Fe to the metal, which is removed by treatment with dil. H<sub>2</sub>SO<sub>4</sub>. The Ti is converted to the sulfate by treatment with stronger acid and to TiO<sub>2</sub> by addn. of BaO.

**Paint.** SOZOL (1924), LTD. Fr. 655,475, June 7, 1923. A paint is composed of bitumen with about 10% of neutral wool-fat free from soap dissolved in a volatile solvent such as white spirit. Coloring substances are added as desired.

**Pigments.** SOC. ROCHES ET MINÉRAIS. Fr. 655,905, Oct. 28, 1927. A white pigment is obtained by attacking finely powd. ilmenite with 60° Bé. H<sub>2</sub>SO<sub>4</sub>, with the addn. of sulfates of Fe and Ti, heating to 300° to transform Ti(SO<sub>4</sub>)<sub>2</sub> to TiSO<sub>4</sub> without decomp. the FeSO<sub>4</sub>, treating with water to convert the TiSO<sub>4</sub> to insol. TiO<sub>2</sub> and treating the pptd. TiO<sub>2</sub> with H<sub>2</sub>SO<sub>4</sub> anew to obtain Ti(SO<sub>4</sub>)<sub>2</sub> free from Fe, from which the pigment, titan acid, is extd. by hydrolysis.

**Luminescent paints.** MICHEL DE LEZINIER. Fr. 655,265, Oct. 10, 1927. Phosphoric alk. luminescent earth sulfides are prep'd. by using a mixt. in aq. suspension of sulfides and photogen substances, both being brought to the colloidal state before mixing. The vessels used are covered with porcelain, bakelite, etc.

**Weatherproof paints containing fungicides.** DEUTSCHE GASLÜHLICHT-AUER-GES. Brit. 300,580, Nov. 15, 1927. Weatherproof paints contg. fungicides as described in Brit. 288,601 (*C. A.* 23, 721) are used only for upper coatings or as a finishing coating. Cf. *C. A.* 23, 3587.

**Alkaline earth titanates.** REGINALD H. MONK. Fr. 655,399, June 5, 1928. A pigment consisting of alk. earth titanates is prep'd. by heating pptd.  $Ti(OH)_2$  free from  $SO_4$  to 750–880° with an alk. earth carbonate in the presence of an accelerator such as HCl or an alk. earth chloride. The  $SO_4$  is eliminated by treatment with NaOAc or  $NH_4OAc$  and washing.

**Mixing apparatus for paints, enamels, lacquers, etc.** ROYAL L. VILAS. U. S. 1,717,478, June 18. Mech. features.

**Lacquers containing cellulose esters, etc.** I. G. FARBENIND. A.-G. Brit. 301,133, Sept. 6, 1927. Lacquers are formed contg. cellulose esters such as nitrocellulose together with urea- $CH_2O$  condensation products and vegetable oils such as poppy-seed oil, linseed oil, soy bean or perilla oil, sunflower oil, olive oil or castor oil or animal oils such as fish oils, and solvents, with or without natural resins, etc.

**Material for covering floors, walls, furniture, etc.** A. MÜLLER. Brit. 301,321, Nov. 25, 1927. Products such as those having a marble or jasper effect comprise a backing such as linoleum or tarred board coated with a ground color and then sprayed with different colors to give the design. Various cellulose ester compns. and compns. contg. drying oils and resins, and an app. for applying the compns. are described.

**Linoleums.** HERCULES POWDER CO. Fr. 656,204, June 21, 1928. Compns. for linoleum contain (1) sol. nitrocellulose 28, Et abietate ( $C_{19}H_{29}COOC_2H_5$ ) 31, tricresyl phosphate 7, wood powder 34% or (2) sol. nitrocellulose 18.2, Et abietate 67.3, ground cork 14.5%.

**Coating compositions.** COMPAGNIE FRANÇAISE POUR L'EXPLOITATION DES PRO-  
CÉDÉS THOMSON-HOUSTON. Fr. 655,281, Dec. 28, 1927. See Brit. 284,348 (*C. A.* 22, 4845)

**Coating metals.** WALKER, HUNTER & CO., LTD., and J. WALKER. Brit. 300,764, Oct. 20, 1927. Metal articles or parts are coated with a liquid or paste contg. material such as powd. slate or talc with a vehicle such as "white spirit" and linseed oil; after drying and rubbing down, a dull coating of a nonvitreous enamel to which rubber soln. has been added is applied and the product is baked, coated with a finishing enamel and again baked.

**Fire- and weather-resistant coatings on wood or other surfaces.** NEVIL M. HOPKINS (to Burnot Fireproofing Products, Inc.). U. S. 1,717,561, June 18. A surface such as wood is treated with a primary coating contg. pigments including borax and a linseed oil vehicle having an acid value sufficient to prevent the borax from sapon. the oil, and with an overlying coating of weather-resisting paint contg. Pb carbonate, Pb sulfate, ZnO and a linseed oil vehicle. Cf. *C. A.* 23, 2309.

**Marking composition.** WINTHROP S. LAWRENCE (to Kaumagraph Co.). U. S. 1,718,966, July 2. A mixt. of rosin soap and shellac soap is used for making transfer inks.

**Insulating varnishes.** H. OHTA and ASAHI GARASU KABUSHIKI KAISHA. Brit. 301,341, Aug. 17, 1927. Ingredients of varnishes formed mainly of tung oil and rosin are treated with a sulfide or selenide in the presence of a catalyst such as Al (suitably at a temp. of 240–300°).

**Refining wood rosin.** HARRY E. KAISER and ARTHUR LANGMEIER (to Hercules Powder Co.). U. S. 1,719,431, July 2. The rosin is heated to 260–340° under an abs. pressure of about 3 in. Hg or less and a portion of the material is condensed at a temp. now lower than 175°.

**Artificial resins.** W. DUX. Brit. 300,956, Nov. 21, 1927. Shellac substitutes are made by heating suitable halogen derivs. of unsatd. aliphatic or hydroaromatic acids such as abietic acid, linseed-oil acid, ricinic acid or of the aleuritic or shellol acid type with a similar halogenated compd. or with a suitable hydroxycarboxylic acid such as trihydroxystearic acid, hydroaromatic carboxylic acids, etc.; HCl is split off. Examples are given.

**Artificial resins.** E. VON HERZ. Brit. 301,429, Nov. 29, 1927. Pentaerythritol (or the water-sol. condensation product obtained as a by-product in the manuf. of penta-

erythritol) is condensed with phthalic acid or anhydride. Heating at 140° produces a resin sol. in alc. and acetone which on further heating at 180° loses its soly. in alc. and on still further heating becomes infusible and insol.

**Artificial resins.** RENÉ MEYER. Fr. 655,737, Oct. 22, 1927. The amt. of filling material in artificial resins such as  $\text{PhOH}\cdot\text{CH}_2\text{O}$  resin capable of being molded may be increased up to 95% by adding it during manuf. of the resin. An example is given.

**Artificial resins.** I. G. FARBENIND. A.-G. (Arthur Voss, inventor). Ger. 477,226, Jan. 4, 1925. Resins prepd. by the condensation of  $\text{AcH}$  and other aliphatic aldehydes are rendered available for purposes for which, on account of their poor soly. properties, they have not hitherto been used by heating them with other artificial or natural resins until the end product exhibits the soly. properties of the 2nd component. The heating is effected in the absence of solvents or in the presence of solvents removable by distn. Suitable resins are coumarone resin and colophony. Examples are given.

**Phenolic resin.** GEORGE W. MILLER (to Bakelite Corp.). U. S. 1,717,614, June 18. Cresol is caused to react with furfural in the presence of a basic condensing agent such as  $\text{Ca}(\text{OH})_2$  until a fusible resinous condensation product is formed; more of the basic condensing agent is then added and the reaction is continued.

**Phenol resin composition.** HOWARD L. BENDER (to Bakelite Corp.). U. S. 1,717,600, June 18. A phenol is caused to react with more than an equimol. proportion of  $\text{CH}_2\text{O}$ , and at least a portion of the excess  $\text{CH}_2\text{O}$  is combined with urea or a similar resin-forming reagent. Cf. C. A. 23, 1517.

**Laminated sheet material containing synthetic resins.** BAKELITE CORP. Brit. 300,836, Feb. 10, 1928. Sheets such as paper or cloth for making laminated products are impregnated with an artificial resin of the glycerol-phthalic anhydride type, and the sheets are bonded with a phenolic resin. Various details are given.

**Ornamenting molded articles of synthetic resins, etc.** J. EATON (to British Thomson-Houston Co., Ltd.). Brit. 301,432, Nov. 29, 1927. Articles such as switch plates formed of a glyceride resin, phenolic resin or similar substance are formed in a mold, the surface of which is sprinkled with a finely divided material such as bronze powder or Cu or Al powder against which the material is hot pressed during the molding.

**Glycerol-phthalic anhydride resins.** BAKELITE CORP. Brit. 300,668, July 11, 1927. Colorless resins are obtained from glycerol and phthalic anhydride or similar reacting materials by effecting the initial reaction at a temp. not exceeding 175° and heating the product at a temp. not exceeding 100° until it has attained a rubbery consistency, and finally hardening at a temp. not exceeding 135°. The total heating time may be 1 to 12 weeks. Glycols and malic or succinic acid also may be used.

**Condensation products.** SOC. POUR L'IND. CHIM. À BAËLE. Fr. 655,583, June 11, 1928. New condensation products are obtained by treating primary aromatic amines with  $\text{C}_2\text{H}_2$  in the presence of a catalyst such as salts or oxides of Hg. The products, which are in the form of resins, form salts with mineral acid and find application as lacquers or varnishes resistant to alkalis, and in the rubber industry as vulcanization catalysts and antioxidants. They may be sulfonated, nitrated, reduced or treated with aldehydes. Examples are given. Cf. C. A. 23, 3589.

**Dimethylolurea.** POLLOPAS, LTD. Fr. 656,238, June 22, 1928.  $\text{CO}(\text{NHC}_2\text{H}_4\text{OH})_2$  is prepd. by condensing urea and an aq. soln. of  $\text{CH}_2\text{O}$  in the presence of alkali of an OH-ion concn. equal to a NaOH soln. of between 0.02 and 0.005 N at a temp. below about 35°, giving a pure product m. 138–140°. The product may be condensed to a transparent resin by boiling in a slightly acid aq. soln.

## 27—FATS, FATTY OILS, WAXES AND SOAPS

E. SCHERUBEL

**The effect of clay on rancid fats.** GEO. W. FIERO. *J. Am. Pharm. Assoc.* 18, 491–3(1929).—Rancid coconut oil and rancid lard were treated (1) by simple agitation with clay, (2) by boiling aq. colloidal suspension of clay and (3) by clay with superheated steam under reduced pressure. The rancidity of coconut oil was entirely removed by each method but the first was most satisfactory since no  $\text{H}_2\text{O}$  was used. None of the methods entirely removed the rancidity from lard although it was diminished. L. E. WARREN

**Fractionation of horse fat.** J. ROSELLO. *Chimie & industrie* Special No., 520 (Feb., 1929).—Horse fat (a) was melted below 60° and fractionated by cooling very



slowly (each fraction required about 2 weeks for sepn.) into 5 fractions by removing the portions which were solidified at 40° (b), 30° (c), 16° (d) and the residue which solidified about 12° (e). The liquid fat has a characteristic horse odor, but can be easily and completely deodorized by treating in vacuum with superheated steam. Fractions (b) and (c) consist mainly of dipalmito-linolein. The analysis of a, b, c, d and e gave the following results, resp.,  $d_{15}$  0.914, 0.9219, 0.9214, 0.9184, 0.9186;  $d_{40}$  0.894, 0.8902, 0.8925, 0.8912, 0.8940; m. p. 26°, 41°, 36°, 20°, —; solidifying pt. 34–24°, 39–37°, 35–32°, 25–19°, 15°; oleorefractometer reading at 45° —5, —13, —11, —6, —2; viscosity at 16° —, —, —, —, 0.8834; viscosity at 60° 0.162, 0.170, 0.1703, 0.167, 0.162; acid no. (mg. KOH) 1.11, 0.99, 0.99, 1.06, 1.24; sapon. no. 201, 203, 205, 202, 200; I no. 74, 55, 57.5, 62.7, 75.4; Reichert no. 2.24, 2.12, 1.9, 1.54, 1.45; Ac no. 8.1, 5.6, 3.3, 0, 7.3; unsaponifiable matter % 0.38, 0.44, 0.51, 0.30, 0.48; fatty acids 95, 94.7, 94.6, 95.5, 94.9%; liquid fatty acids 51.2, 35.2, 38.2, 44, 47.4%; solid fatty acids 43.8, 59.5, 56.4, 49.5, 47.5; titer of insol. acids 38.6, 43.8, 42.4, 39, 37; titer of sol. fatty acids 49.8, 51.2, 49.4, 48.4, 47; mean mol. wt. of insol. acids 266, 257.6, 264.6, 259.4, 267; mean mol. wt. of solid acids 260, 255.2, 259.8, 263, 262.4; mean mol. wt. of liquid acids 279.6, 276.4, 275, 276, 276.2; I no. of insol. acids 74.5, 57.6, 60.8, 66.3, 78.4; I no. of solid acids 3, 2.3, 2.8, 3.6, 4.5; I no. of liquid acids 144, 148, 145, 140, 147.

A. PAPINEAU-COUTURE

The saponification of oils and fats. VIZERN AND GUILLLOT. *Chimie & industrie Special No.*, 525–6 (Feb., 1929).—From expts. on tallow and vegetable oils it is concluded that no error is introduced because of the strength of the alc., provided it does not fall below 45–50% at the end of the titration; that sapon. is generally complete in 15 min. and 30 min. is ample for all ordinary purposes; and that a 3-g. sample should preferably be taken, 5 g. giving a less sharp end point and less than 3 g. being inadvisable because of greater weighing or measuring error. From a discussion of the possible errors in the detn. it is shown that duplicate detns. carried out with different standard solns. can vary by up to 6 units; and it is recommended that the acid (generally 0.5 N HCl) be standardized directly against c. p.  $\text{Na}_2\text{CO}_3$  and that detns. be made in duplicate.

A. PAPINEAU-COUTURE

Examination of marine animal oils by Wood's light. HENRI MARCELET. *Chimie & industrie Special No.*, 527–30 (Feb., 1929); cf. *C. A.* 22, 1215.—In addn. to the previously reported results on cod-liver oils, results are also given of the examn. by the same technic of 46 fish and marine animal oils of known origin and purity.

A. P.-C.

Residues from the refining of carnauba wax. V. VESELY. *Chimie & industrie Special No.*, 534 (Feb., 1929).—Analysis of 3 samples of crude wax gave: m. p. 81.1–83.1°, acid no. 4.1–13.8, ester no. 57.0–65.0, sapon. no. 69.1–75.5. Two samples of bleached wax gave: acid no. 0.6, 0.4; ester no. 9.2, 7.4; sapon. no. 9.8, 7.8. Three samples of residue from the refining of the wax gave m. p. 72.0–72.5°, acid no. 4.9–49.7, ester no. 7.3–9.9, sapon. no. 12.6–59.6.

A. PAPINEAU-COUTURE

Pine nuts, pistachio nuts and their oils. W. PEYER. *Apoth. Zig.* 44, 699–700 (1929).—The kernels of pine nuts (*Pinus pinea* L.) and of pistachio nuts (*Pistacia vera*) and their resp. oils have been examd. and the results obtained reported as follows: Kernels: moisture 5.5, 4.4; mineral constituents 4.4, 2.6; fatty oil (petr. ether ext.) 45.6, 50.6;  $\text{Et}_2\text{O}$  ext. 48.1, 52.2; alc. ext. 56.3, 55.5; N 6.5, 2.0; crude protein 40.6, 12.5; wt. 100 kernels 17, 41.2 g. The 1st values apply to pine, the 2nd to pistachio nuts. Pine kernel oil: bright yellow,  $d_{15}$  0.920, sapon. no. 193.1, I no. 118.0, acid no. 4.4, solidification point —20°, unsaponifiable 1.98, elaidin test via D. A. B. 6 partly solid yellowish brown, behavior toward fuming  $\text{HNO}_3$  via D. A. B. 6 viscous orange-brown. The corresponding values for pistachio oil are: bright yellowish brown with green tinge, 0.9179, 192.0, 88.2, 4.0, —9°, 1.02, foamy white solid mass, bright brown solid.

W. O. E.

Determination of the oil content of seeds. PÁL LIPTÁK. *Magyar Gyógyszerésztud. Társaság Értesítője (Ber. ungar. pharm. Ges.)* 2, 155–8 (1926); *Chem. Zentr.* 1928, I, 1562–3.—The acid no. was detd. by crushing the seeds, washing with  $\text{EtOH}$  and titrating the washings. Detn. was made on flax, castor and poppy seed and on walnuts and sweet almonds.

FRANCIS P. GRIFFITHS

Euphorbia esula L. PAUL GILLOT. *Mat. grasses* 21, 8390–2 (1929).—The percentage compn. of the seeds is:  $\text{H}_2\text{O}$  7.81, fats 30.85, protein 22.9, sugars 2.82, ash 5.25, cellulose 30.37. The oil extd. by pressure possesses these const.: color pale yellow, no absorption spectrum,  $d_{15}^{25}$  0.9385,  $n_D^{25}$  1.4829,  $n_D^{15}$  1.4855, Crismer index +64°, f. p. —30°, free fatty acids in mg. KOH for 1 g. 4.4, in oleic acid per 100 g. 2.21, sol. fatty acids in cc. 0.1 N KOH per 150 cc. 6, in butyric acid per 100 g. 1.05, Hehner index

95.2%, volatile fatty acids (sol.) in cc. 0.1 *N* KOH 3, (insol.) 0.5, sapon. index 196.2; I index 207.5, acetyl index 12.5, unsapon. 0.93%, Hehner and Mitchell index 52.3; elaidin, Bellicr, Halphen, Villavecchia and Falris; Blarez, Bellier's arachidic acid tests, all negative, Halphen Br test immediate ppt.; Bellier resorcinol test, oil deep violet and acid yellow. Consts. of total fatty acids:  $n_D^{22}$  1.4735, I no. 217, neutralization index 197.7. Consts. of extd. oil (petroleum ether): color pale yellow, no absorption spectrum,  $d_{15}^{15}$  0.938,  $n_D^{15}$  1.4854, Crismer index +62.5°, free fatty acids, in oleic acid per 100 g., 3.22, sapon. index 196.6, I no. 206.8, Hehner index 95.1, Reichert-Volny index 3.2, unsapon. 0.89%. This oil has the same drying properties as the other oils of this group.

P. THOMASSET

**Determination of the "titer" of fatty acids.** L. MARGAILLAN. *Chimie & industrie Special No.*, 521-2 (Feb., 1929).—The detn. should be carried out in a tube about 26-30 mm. in diam., a tube 14 mm. in diam. giving results about 0.8° too low; the presence of a trace of H<sub>2</sub>O can lower the results about 1°; allowing the acids to cool without agitating with the thermometer introduces an error of about -0.5°.

A. P.-C

**Progress in the soap industry. III. Saponification of neutral fats by means of alkali carbonates.** J. DAVIDSOHN. *Chem. Umschau Fette, Oele, Wachse Harze* 35, 253-4 (1928); cf. C. A. 22, 1697, 3547. **IV. Welter's spray-method.** *Ibid* 254 5 - Manuf. of soda crystals and soap powders. **V. Ammoniacal saponification.** *Ibid* 255 - Review of patented methods.

P. ESCHER

**Errors in the methods of determination of neutral fat in soaps.** K. RIETZ. *Chem Umschau Fette, Oele, Wachse Harze* 35, 258-9 (1928).—R. criticizes Kroper's article under above caption (C. A. 22, 4851) for omitting in his comparison the present standard method of the "Einheitsmethoden" for detg. neutral fat.

P. ESCHER

**Determination of detergency of soap products.** L. T. HOWELLS. *Oil & Fat Ind* 6, No. 6, 23-9 (1929).—A machine known as the Launder-Ometer made by the Atlas Co was used under the following conditions: Distd. H<sub>2</sub>O at 150°F. was used. The suds strength was 0.2% based on original soap. The cloth pieces were 2.5 × 4 in. The jars contained 10 rubber balls 1 cm. in diam. and weighing 1.5 g. A 20-min. suds followed by two 5-min. rinses constituted a wash; and the vol. of the suds bath was 100 cc. and of the rinses 200 cc. The no. of washes required completely to remove the soil from the cloth was taken as an index of detergency. Most of the collaborators reported between 4 and 5 washes. However, when the same cloth samples were placed on a white background and shaded from direct light, outlines of the stripes could be seen up to 16 washes. This method has proved the best thus far suggested. Practical washing tests in standard laundry machines give sharp end points and consistent results. The present lab. machine was found unsatisfactory. The last traces of soil are hardest to remove.

E. SCHERUBEL

**Report of 1928-1929 color committee.** W. D. HUTCHINS, et al. *Oil & Fat Ind* 6, 19-22 (1929).—The committee made the following recommendations: (1) That a standard set of Lovibond glasses consists of yellow 4.0, 6.0, 8.0, 10.0, 14.0, 16.0, 18.0, 20.0, 35.0, 50.0; red 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 2.0, 2.5, 3.0, 3.5, 4.0, 5.0, 6.0, 7.0, 7.6, 8.0, 9.0, 10.0, 11.0, 12.0, 16.0, 20.0; (2) that only one yellow glass, not more than 2 red glasses up to and including 13.0 red and not more than 3 red glasses above 13.0 red be used to make a color detn.; (3) that the Society adopt the enclosed Wesson type tintometer; (4) that only artificial light produced by 100-Watt blue frosted electric bulb be allowed; (5) that the Society adopt the tube for holding the oil samples, eliminating the glass oil sample bottle; (6) the question of filter paper is a problem for the refining as well as the color committee. On off and cold-pressed oils, and those not refined clear, the type of filter paper makes a diff. in color. At present it is sufficient to recommend a good, heavy, close-texture, white paper.

E. S.

**Palm oil from the Belgian Congo.** GEORGE S. JAMIESON AND ROBERT S. McKINNEY. *Oil & Fat Ind*, 6, No. 6, 15-8 (1929).—The constns. found were:  $d_{25}^{25}$  0.9146,  $n_D^{20}$  1.4578, acid value 20.65, sapon. no. 197.9, unsapon. 0.39%, I no. 53.7, acetyl no. 15.27, R.-M. no. 0.10, Polenske no. 0.29, satd. acids 44.3, unsatd. acids 50.6, I no. of unsatd. acids 99.9. The % compn. of the oil was oleic acid 47.2, linolic acid 5.6, myristic acid 0.5, palmitic acid 40.8, stearic acid 5.2, lignoceric acid 0.1.

E. SCHERUBEL

**Utilization of oil-mill residues; the manufacture of edible aleurone meals (ANDRÉ) 12. Apparatus for extracting oils from plants (Fr. pat. 655,733) 1. Trichloroethane [as solvent for fatty substances] (Fr. pat. 655,930) 10. Discharging solids, liquids and gases simultaneously from high-pressure reaction vessels [in hydrogenating fats.] (Ger.**

pat. 477,038) 13. Wick filters for oil (Brit. pat. 301,507) 1. Soaps from sulfonated mineral oil acid sludge (U. S. pat. 1,718,335) 22. Filter for oil (U. S. pat. 1,719,346) 1. Degreasing wool (Brit. pat. 300,941) 25. Degreasing raw wool and other textile fibers (U. S. pat. 1,718,548) 25.

**Ubbelohde's Handbuch d. Chemie u. Technologie d. Ole u. Fette.** Bd. 3, Abt. 1. *Chemie, Analyse, Technologie der Fettsäuren, des Glycerins und der Türkischrothöle.* 2nd ed., revised by HANS HELLER. Leipzig: S. Hirzel. 392 pp. M. 36.

**Oils and fats.** METALLBANK UND METALLURGISCHE GES. A.-G. Fr. 655,458, June 7, 1928. Chem. reactions particularly the production of oils and fats by the neutralization of fatty acids with glycerol, are carried out under a high vacuum obtained by interposing an injector worked by steam between the reaction vessel and a condenser cooled by water.

**Separation of unsaponifiable matter from oils.** JOSEPH K. MARCUS. Fr. 655,799, Apr. 27, 1928. Vitamins A, D and E are sepd. along with the unsaponifiable and difficultly saponifiable matter from fish, vegetable or animal oils, etc., by saponif. and extg. with an org. chloride such as  $C_2H_2Cl_2$ . An example is given of the extn. of cod-liver oil.

**Splitting oils and fats.** IMPERIAL CHEMICAL INDUSTRIES, LTD., and E. CHAPMAN. Brit. 300,360, Sept. 29, 1927. Oils and fats are split by the sulfonic acids or their salts obtained as described in Brit. 274,611 (C. A. 22, 2268) by the condensation of an alc. with sulfonated mineral oil fractions.

**Recovering fats from waste waters, etc.** C. VAN OVERSTRAETEN. Brit. 300,386, Nov. 5, 1927. Wool-washing and similar liquors are strained, settled and treated with acid, "chloride of lime," Al sulfate or the like to ppt. fatty substances. The sepd. solid substances are all combined, washed with a small quantity of water which may contain alkali, to remove fat, and passed through a "mud separator." The soapy emulsions of grease produced are boiled (suitably with further addn. of alkali) and further treated for the sepn. of grease. Various details are described.

**Apparatus for measuring the oiliness of liquids such as oils.** HENRI VOLLET. Fr. 655,705, June 13, 1928.

**Fatty acid peroxides, etc.** WM. B. STODDARD and VAMAN R. KOKATNUR (to Pilot Lab., Inc.). U. S. 1,718,609, June 25. An aliphatic acid chloride such as lauryl chloride is treated with a soln. of an alkali metal peroxide.

**Soap.** ADOLF WELTER. U. S. 1,719,349, July 2. In producing an air-resisting molded soap, com. fatty acids, at about their m. p., are mixed with a quantity of alkali carbonate free from water, sufficient to saponify up to twice the quantity of fatty acids present and, after sapon., grain soap is added and the product is milled.

**Liquid soap compositions.** HENKEL ET CIE. GES. Brit. 301,020, Nov. 23, 1927.  $NH_4$  thiosulfate is used to prevent gelatinization of soap mixts. such as may also contain glycerol and other ingredients.

**Soap flakes.** ERNST FLAMMER and CHRISTIAN KELBER. U. S. 1,717,553, June 18. Soap contg. somewhat less than 15% of water is used with a persalt such as Na perborate and an "oxyhydrocarbon" deriv. such as cetyl palmitate.

**Soap flakes.** BERTRAM W. COLTMAN. U. S. 1,718,778, June 25. Soap flakes are formed comprising small bodies having voids surrounded by thin walls, the surfaces of which have min. cellular formation.

**Shampoo composition.** HARRY M. WEBER (to Ellis-Foster Co.). U. S. 1,719,251, July 2. Anhyd. water-sol. soap substantially free from rancid ingredients is mixed with a dry non-rancid "clean-smelling" vegetable oil such as coconut oil which is substantially stable in the atm., to form a creamy mass of uniform character.

## 28—SUGAR, STARCH AND GUMS

J. K. DALE

The attempts at rationalization by the sugar industry. BEDŘICH NEUMANN. *Listy Cukrovar.* 47, 417-8(1929).—A discussion. FRANK MARESH

The use of conductivity for controlling the manufacture of sugar. K. ŠANDERA. *Listy Cukrovar.* 47, 373-6(1929).—Š. indicates a curve for control work use in refineries. The limits of accuracy and applicability of the conductivity method are indicated. FRANK MARESH

Some crop experiences in 1928. Q. A. D. EMMEN. *Arch. Suikerind.* **37**, 315-24 (1929).—The reasons for mill break-downs are discussed. Max. extn. is possible with proper mill settings without any special app. Boiler trouble is discussed. In mills where a part of the boiler plant was used as reserve and where river water was used in part for feeding, trouble was caused by settling of the river water dirt when the boiler was idle. Trouble with centrifugal pumps for carbonation juice was caused by incrustation; E. advises discharging the pumps when stopped. P. R. P

Polarigraphic measurements in sugar experimentation. K. ŠANDERA AND B. ZIMMERMANN. *Listy Cukrovar.* **47**, 377-82(1929).—The polarographic method as modified by J. Heyrovsky was used in the study of the decompn. of sucrose in dil. and concd. solns. and at various degrees of alky. and acidity. The method was found to be very precise and permitted following the changes in sugar solns. during heating or changes in temp. with greater accuracy than by observing changes in luminescence or surface potentials photometrically. Sucrose was found to be labile in soln. and in the dry state undergoes a decompn. at 70° which is marked when the sugar is damp or when the removal of H<sub>2</sub>O vapor is slow during drying. FRANK MARESH

A colorimetric study of the colors of sugar refinery products. A. RUŽIČKA. *Listy Cukrovar.* **47**, 385-7(1929).—Using the objective photometer modified by Šandera which eliminates subjective errors and allows measurements over a wide range of concns., the validity of the Lambert-Beer law was tested with various solns. of molasses. Comparisons were made against distd. H<sub>2</sub>O. All samples which had been carefully filtered obeyed Beer's law more closely than unfiltered ones. Each was diluted 1/50 before making comparisons in the colorimeter. Filtering molasses through filter paper removes substances which otherwise cause the soln. to deviate from the law. Adding 0.1% of quartz to a sugar soln. is sufficient to cause a deviation and filtering through filter paper does not remove the causative agent. A small amt. of active charcoal has little influence upon a deviation. FRANK MARESH

Technological notes on regenerating activated charcoal. J. KADLEC. *Listy Cukrovar.* **47**, 388-92(1929).—I. Mineral salts are removed from charcoal with the aid of dil. HCl during regeneration. The amount of mineral which is converted into sol. chlorides and removed by washing is quite variable. In plant operations, the chief contaminant is sand while the Ca and Fe content of the ash is very high (60-90%). The affinity between charcoal and Ca and Fe is very great. Examples are given for computing the HCl to be added in order to accomplish full regeneration. II. Gas flue deposits were removed during cleansing operations and boiled to remove the adsorbed methylamines and oily fractions. The activated charcoal is coarse and sinks to the bottom of the tank; unactivated charcoal is finely divided and remains suspended in the water. The Fe content is high and 2 treatments with HCl are necessary for a complete removal of the Fe. In operation, this charcoal is equal to any other commercial grade, but contamination from oil must be watched. FRANK MARESH

Determination of ash in the products of the sugar industry. I. B. MINTZ AND YA. I. ZILBERMAN. *Nauchnuie Zapiski* (Russian) **5**, 227-30(1928); cf. C. A. **21**, 3280—M. and Z. present data which show the accuracy of the oxalic acid method for detn of ash. J. S. JOFFE

Determining the absorption of ultra-violet light by sugar solutions. W. EISEN SCHIMMEL. *Listy Cukrovar.* **47**, 383-4(1929).—The golden color of raw sugar solns suggests high absorption for ultra-violet rays. Sucrose is very transparent to ultra-violet rays; the absorption bands for glucose and fructose are disputed. Extinction curves for various sugars are given. E. suggests using the method for detg. the coloring impurities of raw sugars. FRANK MARESH

Clarification. B. J. VAN SANTEN. *Arch. Suikerind.* **36**, 579-81(1928).—In 1921 the author proposed clarification of concd. juice with the object of fuel economy. Lab tests with raw sirup of 62° Brix resulted in an easy filtering, clear liquor. The author suggests repetition of the expts. utilizing a Honig and Bogstra pressure evaporator. The even and moderate temp. at the outlet of the evapn. is advantageous for the sulfitation. The entire process will be shortened by 1-2 hr. P. R. PEKELHARING

Observation of saturation by conductometric titration. K. ŠANDERA AND J. SCHATZ. *Listy Cukrovar.* **47**, 369-72(1929).—One l. of soln. was satd. at a selected temp. (20° and 85°) in double-walled vessels. The solns. were juices from refineries, or solns. made up to equivalent concns. and decolorized with purified or technical grades of CaCO<sub>3</sub>. The CO<sub>2</sub> came from compressed cylinders. Toward the approach of satn. (when the alky. reached 0.3% CaO), 50-cc. samples were collected, cooled to 20° and titrated with 0.10 N HCl against phenolphthalein. The gained values were

plotted on special diagrams according to the degree of alky. and while  $\text{CaCO}_3$  is being pptd. the number of ions, and hence conductivity, decreases until the soln. becomes neutral; the  $\text{CO}_2$  then saturates the soln. and the conductivity increases. A 15% sugar soln. shows a gradual drop and rise due to a lower mobility of ions. A  $\text{Ca}(\text{OH})_2$  soln. with sugar gives a different curve than either used alone. The cond. of  $\text{Ca}(\text{OH})_2$  is decreased rapidly by small addns. of sugar; for higher concns. the change in cond. is less marked; for a 15% sugar soln. the cond. is decreased 14% and further increases in the sugar concn. have very little effect. The viscosity curve is inversely proportional to the cond. curve, showing a close relation between the two properties. Sugar also decreases the cond. of other dissolved inorg. substances.  $\text{KCl}$  cond. is decreased directly proportional to the sugar concn., a 15% sugar soln. decreasing the cond. 29%. The linear function decrease in cond. also holds for  $\text{NH}_4\text{Cl}$ ,  $\text{KCl}$ ,  $\text{K}_2\text{SO}_4$  and  $\text{MgSO}_4$  solns. The departure from the linear function in alk. solns. is due to the formation of polysaccharides.

FRANK MARESH

Effect of hot molasses on exhausted beet slices. V. KOHN. *Z. Zuckerind. Tschoslovak. Rep.* 53, 157-61 (1928).—On treating exhausted beet slices for  $\frac{1}{2}$  hr. with molasses, d. of 19.6-25.4° Balling, at 85-95°, the following were found to have passed over from the latter to the former material: sugar 0.79-1.87% (of the dry substance of the molasses), N 0.07-0.16% (of the polarization of the molasses soln.), ash 0.94-1.71% (of the polarization of the molasses soln.),  $\text{K}_2\text{O}$  0.60-1.10 and  $\text{Na}_2\text{O}$  0.1-0.3% (of the carbonated ash of the molasses soln.). No transfer of either Ca or Mg took place.

B. C. A.

A comparative precipitation method for the qualitative identification for each of the common gums. WALTER WEINBERGER AND MORRIS B. JACOBS. *J. Am. Pharm. Assoc.* 18, 34-6 (1929).—W. and J. find that each gum when pptd. by EtOH from an aq. soln. has a characteristic appearance and texture. Usually a 1% soln. is used, although for agar and karaya a greater diln. is recommended. To 20 cc. of the soln. 75 cc. of EtOH is added, drop by drop, with notation of the first permanent ppt. The texture, quality, etc. are then compared with the tabulated findings from known gums. The method is an easy, rapid and definite one for the differentiation of the several gums.

L. E. WARREN

The causes of variation of soil reaction in relation to the sugar beet (DECOUX) 15. Beet soils (DE VILMORIN) 15. Sugar-beet waste disposal (NOLTE) 14. The "Mammut" thickener (STERN) 14. Apparatus for extracting gum from plants (Fr. pat. 655,733) 1. Glucose [from cellulose substances] (Fr. pat. 656,384) 23.

CONNON, GEORGE W., AND PHILLIPS, G. W. MACPHERSON: The Design of Cane Sugar Factories to Produce Exportable Power or Exportable Bagasse. Honolulu: Honolulu Star-Bulletin. 16 pp.

SCHIEBL, KARL: Die Maschinenteknik in Zuckerfabriken und Raffinerien. Tl. 2. Der Dampf, dessen Erzeugung, Umformg. u. Verwertz. Die Abwärmeverwertg. Die Warmespeicherg. Magdeburg: Schallehn & Wollbrück. 270 pp. M. 13.50.

Dextrose. CORN PRODUCTS REFINING CO. Brit. 300,698, Aug. 19, 1927. In producing dextrose from corn starch, the converted starch soln. is concd. to a crystg. supersatd. condition and maintained in this condition by the continued extn. of water and the liquid is agitated until the desired point of crystn. has been reached. Numerous details of procedure are given. Cf. *C. A.* 23, 1007.

Sugar and paper pulp. VAZCANE PROCESS, INC. Fr. 655,163, June 2, 1928.

Purifying sugar juice. MAURICE J. D. SAVARY. Fr. 656,335, Nov. 4, 1927. Sugar juice is purified by acidifying with Ca monophosphate, heated to 60-65°, made alk. with  $\text{CaO}$ , filtered, sulfited with  $\text{CaSO}_3$ , filtered, treated with Ca monophosphate again, heated to 80-85° and filtered.

Revivifying kieselguhr after use for purifying sugar solutions. ROBERT CALVERT. U. S. 1,717,661, June 18. Disintegrated filter cake is suspended in hot gas contg. O under such conditions that the temp. of the mixt. after completion of the drying of the filter cake is at least 400°. An app. is described.

Heating system for boiling sirups in sugar factories. F. LAFEUILLE. Brit. 301,304, Nov. 26, 1927.

Tubular rotary crystallizer for sugar, etc. F. LAFEUILLE. Brit. 301,453, Nov. 30, 1927. Structural features.

Centrifugal drier for sugar. ÉTIENNE H. I. COUELLE. Fr. 655,304, April 6, 1928.

Cassava meal. S. W. DUNCAN. Brit. 300,673, Aug. 15, 1927. In producing cassava meal by grinding the roots and drying the product, as described in Brit. 256,008, the starch content is expressed from the roots prior to drying. An app. is described.

## 29—LEATHER AND GLUE

ALLEN ROGERS

Researches of the Institute of Tannery Science, Sapporo, Japan. I. Soluble methylene compounds of tannic anhydride. GEORG GRASSER. *Cuir tech.* 17, 500-10 (1928).—See C. A. 22, 2289. J. G. NIEDERCORN

Drying leather. R. BELANI. *Cuir tech.* 17, 532-6 (1928).—A description. J. G. NIEDERCORN

Waterproofing leather: Le Petit's method. G. VASSE. *Cuir tech.* 17, 530-1 (1928).—Terpenes contained in the latex of certain species of *Euphorbia* abundant in tropical Africa are prep'd. by dissolving sap in  $\text{CCl}_4$ , filtering and evap'g. under reduced pressure. A mixt. of 88% terpenes, 6% Na ricinoleate and 6% Al stearate is kept at 45° for 1 hr. and then applied to leather; no fat-liquoring is necessary. J. G. N.

The application of pigments to leather. J. BOISSEAU. *Cuir tech.* 17, 122-5 (1928).—A description. J. G. NIEDERCORN

The soaking of hides. PIERRE GOURLAY. *Cuir tech.* 17, 542-5 (1928).—A review. J. G. NIEDERCORN

Chemistry of combined chrome-vegetable tannage. G. GRASSER AND HIROSE. *Cuir tech.* 17, 438-45 (1928).—See C. A. 22, 2289. J. G. NIEDERCORN

Determination of insolubles (in tanning extracts) by filtration in the presence of kaolin. A. JAMET AND A. J. GIRARD. *Chimie & industrie Special No.*, 604 (Feb., 1929).—See C. A. 22, 4002. A. PAPINEAU-COUTURE

Comparative testing of vegetable tanning materials. P. CHAMBARD AND J. RIGOLET. *Chimie & industrie Special No.*, 605-7 (Feb., 1929).—The technic followed at the French School of Tanning, Lyon, is described, and a few typical results are given. A. PAPINEAU-COUTURE

Measuring the color of tanning extracts. A. DE LA BRUÈRE. *Chimie & industrie Special No.*, 608-10 (Feb., 1929).—See C. A. 22, 4866. A. PAPINEAU-COUTURE

Tanning value of so-called "Takaout" galls of *Tamarix articulata*. F. AND H. HEIM DE BALSAC AND A. DEFORGE. *Chimie & industrie Special No.*, 593-5 (Feb., 1929).—See C. A. 22, 4866-7. A. PAPINEAU-COUTURE

Resistance to wear of sole leather. URBAIN J. THUAU. *Chimie & industrie Special No.*, 596-603 (Feb., 1929).—See C. A. 23, 1768. A. PAPINEAU-COUTURE

The imitation of glace kid. M. NOUSSINOV. *Cuir tech.* 17, 490-3 (1928).—A description. J. G. NIEDERCORN

Preserving latex [with sulfonic acids having tanning properties] (Brit. pats. 300,194, 300,456) 30. Vulcanizing rubber to leather (U. S. pat. 1,719,101) 30. Bleaching skins (Fr. pat. 655,236) 25.

SMITH, PAUL I.: Glue and Gelatine. London: Sir Isaac Pitman and Sons, Ltd. 162 pp. 8s. 6d.

Leather-like product comprising tanned skin fibers and a latex binder. ANTONIO FERRETTI (to Societa Invenzioni Brevetti Anonima-Torino). U. S. 1,719,802, July 2.

Coloring skins, furs, paper, etc. NIKOLAI WOROSHTZOW. U. S. 1,719,159, July 2. The material is treated with 1-nitronaphthalene-7-sulfonic acid or other suitable nitronaphthalene compds. which contain a nitro group and a sulfonic acid group, and then exposed to light.

Treatment of hides before tanning. C. J. M. M. LE PETIT and FNYZMETAN, LTD. Brit. 300,615, Nov. 16, 1927. A mold culture product for the preliminary treatment of hides and which is obtained from fungi such as *Aspergillus niger* and *Penicillium glaucum* as described in Brit. 250,907 (C. A. 21, 1371) is treated with a plasmolyzing salt such as anhyd.  $\text{Na}_2\text{SO}_4$ ,  $\text{NaHCO}_3$ ,  $\text{MgSO}_4$  and  $\text{MgCl}_2$  or  $\text{NH}_4\text{Cl}$  capable of pro-

moting excretion of enzymes from the mycelium spores or cells. Various details are given.

**Use of compressed gases for removing flesh and hair from hides.** M. MASSIN. Brit. 301,032, Nov. 23, 1927.

**Working up glue and like colloids.** A.-G. FÜR CHEMISCHE PRODUKTE VORM. H. SCHEIDEMANDEL (Albert Obersohn, inventor). Ger. 477,188, Oct. 1, 1925. Glue and like colloids are worked up into small rods, plates, cubes, etc., by running a soln. of the colloid on to a cooled moving surface grooved in the direction of movement. The solidified colloid is removed and the lengths are cut up.

**Apparatus for granulating glue and like colloids.** A.-G. FÜR CHEMISCHE PRODUKTE VORM. H. SCHEIDEMANDEL. Ger. 477,122, Dec. 18, 1927. Addn to 439,357. Means are described for removing the granulated product obtained by adding the colloid dropwise to a solidifying liquid. Cf. C. A. 23, 3827.

### 30—RUBBER AND ALLIED SUBSTANCES

C. C. DAVIS

**Coal-dust firing in the rubber industry.** KARL D'HUART. *Kautschuk* 5, 106-9, 143-4(1929).—A description of recent developments, with diagrams of equipment.

C. C. DAVIS

**What solvents are most suitable for the rubber industry?** F. BOIRY, J. PANEM, WALTER HUTCHINSON, L. SLOIM, GODEL AND C. SERVILLE. *Rev. gén. caoutchouc* 6, No. 51, 9-12(1929).—Comments, from different points of view, on the characteristics of well-known solvents and their individual advantages and disadvantages.

C. C. DAVIS

**Zinc oxide for the rubber industry.** HARRY E. OUTCAULT. *India Rubber World* 80, No. 4, 70(1929).—A general review and description.

C. C. DAVIS

**Isoprene and rubber.** XV. H. STAUDINGER. *Kautschuk* 5, 94-7, 126-9(1929); cf. C. A. 23, 3372.—A detailed review and discussion of recent investigations by different experimenters on the *chem. constitution of rubber, gutta-percha and balata*. Numerous references are included.

C. C. DAVIS

**The dispersion of carbon black in rubber.** Comparison of the heats of wetting of raw rubber and different samples of carbon black. L. HOCK. *Kautschuk* 5, 147(1929).—Tests of the heats of wetting (cf. Hock and Bostroem, C. A. 21, 1335) of 2 C blacks (Durex 1 extra and D 7 of Wegelin A.-G., Köln) gave values of 7.12 and 3.89 cal., resp., per g. of C black immediately after mixing. After standing, the heats of wetting increased, indicating that on standing combination between rubber and pigment progressed further.

C. C. DAVIS

**The dispersion of carbon black in rubber.** Microscopic examination of carbon black in rubber mixtures. M. HÜNEMÖRDER. *Kautschuk* 5, 147-8(1929).—A study of the ease of dispersion and behavior during vulcanization of the 2 blacks examd. by Hock (cf. preceding abstr.) showed that Durex 1 extra is finer and can be dispersed better than the other black. During vulcanization the finer black dispersed still more until plastic flow ceased, whereas the coarser black retained its original state of dispersion.

C. C. DAVIS

**Dispersion of pigments in rubber.** II. ERNST A. GRENQUIST. *Ind. Eng. Chem.* 21, 665-9(1929); cf. C. A. 22, 4875.—Expts. are described which show the microscopic structure of raw rubber under various conditions, the size and shape of C black particles, the wetting capacity of C black in water and in rubber and the behavior of rubber resins, S, ZnO, C black, stearic acid and accelerators in rubber during heating and during vulcanization. Reinforcement of rubber by a pigment depends upon 3 fundamental factors: (1) the free surface energy of the system, which is governed to a considerable extent by the size, shape and uniformity of the particles and their dispersion; (2) the intensity of wetting of the pigments by the rubber or of the rubber by the pigments, which is governed by the state of dispersion, the nature of the surfaces of rubber and pigment and the surface-active substances adsorbed at the interface; and (3) the strength of the rubber matrix, which is governed by the degree of polymerization, the state of globular structure and the action of dissolved substances and compounding ingredients.

C. C. DAVIS

**The electrokinetic potential of rubber.** B. N. GHOSH AND P. STAMBERGER. *Kautschuk* 5, 99-100(1929).—A preliminary note. The electrokinetic potential of rubber

with water and 7 solns. of different concns. was measured, the electroendosmotic capillary transference method with a modified form of the app. described by Briggs (cf. *C. A.* 13, 1784) being used. The rubber capillaries were prepd. from latex and a  $C_6H_6$  soln. of rubber, the same results being obtained in each case. Measurements were made at 200 v. in the usual way. The elektrokinetic potential  $\xi$  was calcd. from the formula  $\xi = 4\pi\eta vl/(ERq)$ , where  $\eta$  is the viscosity of the liquid,  $v$  the quantity of liquid transferred per sec.,  $E$  the voltage (200), and  $l/q$  the ratio of the length to the cross section of the capillary. The following  $\xi$  values were obtained, the data giving the normality of the soln. and the  $\xi$  value in v., resp.: water—, -0.038; NaOH 0.005, -0.048; 0.010, -0.048; 0.025, -0.067; 0.50, -0.060; 0.100, -0.072;  $NH_4OH$  0.08, -0.045; 0.32, -0.059; 0.76, -0.066; HCl 0.033, -0.021; 0.05, -0.023; AcOH 0.23, -0.038; 1.0, -0.052; 2.0, -0.059; KCl 0.02, -0.031; 0.04, -0.028;  $BaCl_2$  0.01, -0.019; 0.03, -0.015;  $Th(NO_3)_4$  0.1, 0.015; 0.3, 0.019. To what extent the elektrokinetic potentials measured in this way correspond to those of rubber latices, and in what way the potential and stability are influenced by changes in compn. are being investigated. The expts. are also to be continued with other substances

C. C. DAVIS

**Mechanical tests of rubber and probabilities.** R. FRIC. *Rev. gén. caoutchouc* 6, No. 51, 3-8(1929).—See *C. A.* 22, 4870.

C. C. DAVIS

**Some observations on rubbers with low nitrogen content.** A. D. CUMMINGS AND L. B. SEBRELL. *Ind. Eng. Chem.* 21, 553-7(1929).—Rubber cannot be prepd. free of N by the method of Pummerer and Pahl (cf. *C. A.* 22, 885) even by continuing the treatment with NaOH for twice as long as recommended by P. and P. The residual 0.004-0.009% N is not protein N, since it can be removed by extn. with acetone to a point where it is so low that it cannot be detd. precisely by the colorimetric method with Nessler soln. Comparison of the results of vulcanizing protein-free rubber with the corresponding results with untreated rubber, and with the results of previous researches, shows that the rate of vulcanization is const. for different conditions of coagulation. Furthermore, the quality of vulcanizates low in N is very good compared with the quality of the corresponding controls and earlier expts. described by Dinsmore (cf. *C. A.* 21, 194). The variation in the rate of vulcanization and in the quality noted by D. was, therefore, a result solely of the condition of the rubber protein resulting from the  $pH$  value during coagulation. After extn. with acetone, protein-free rubber is practically free of N, and it vulcanizes slowly, giving vulcanizates of poorer quality than the corresponding ones obtained from the unextd. protein-free rubber. This effect may, however, not depend wholly upon the absence of N compds. Protein-free rubber can be compounded and cured so that vulcanizates of good quality are obtained, so the protein is not an essential factor governing the phys. properties of vulcanized rubber. The condition of the protein does, however, influence the rate of vulcanization, and consequently affects indirectly the quality of the vulcanized rubber.

C. C. DAVIS

**A new flexing machine for rubber.** PHILIP M. TORRANCE AND LESTER C. PETERSON. *India Rubber World* 80, No. 4, 62(1929).—The new app., which is described and illustrated, is designed to imitate the cracking of tire treads in service. Results show a qual. agreement with road tests. Based on these lab. tests, it was found that some antioxidants reduce tread cracking, whereas others have no such beneficial influence. The conditions during processing and the modulus also influence the tendency to crack. "Cold checks" and grain cause premature cracking, phenomena which are probably related to the premature cracking at the junction of the tread and sidewall of a tire. The app. should be particularly useful in studying temp. effects

C. C. DAVIS

**Sipalin, a new light colored plasticizing agent for rubber.** RUDOLF DITMAR. *Gummi-Ztg.* 43, 1932-3(1929).—Plasticizing agents marketed under the name "Sipalin" (Deutsche Hydrierwerke A.-G., Berlin-Charlottenburg) are esters of adipic acid, e. g., *Sipalin AOM* is the methylcyclohexyl ester of adipic acid and *Sipalin MOM* is the methylcyclohexyl ester of methyladipic acid. They are very effective softeners in that they shorten the time of mixing and allow the use of higher proportions of such pigments and fillers as C black without detriment to the quality.

C. C. DAVIS

**Fossil rubber.** E. KINDSCHER. *Kautschuk* 5, 98-9(1929).—The geological discovery of vulcanized rubber in brown coal deposits (cf. K., *C. A.* 18, 2862; Gothan, *C. A.* 19, 1240; 22, 933) is of great interest from a practical point of view, for it shows that when rubber is completely protected from oxygen it remains in good condition for many thousands of years.

C. C. DAVIS



**Physical characteristics of sponge rubber.** H. F. CHURCH. *Trans. Inst. Rubber Ind.* 4, 533-42(1929).—Data on the phys. properties of sponge rubber are very few. In the present paper an attempt was made to develop a test which would allow accurate measurements and at the same time give a reliable judgment of the quality. Tensile strength tests cannot be made directly and they do not represent conditions prevailing in use. Methods were developed for detg. the "cellularity," compressibility and permanent set. Tests on sponges of different types showed that, in contrast to other types of rubber products, the phys. properties of sponge rubber are governed more by the form of the cell structure than by the phys. properties of the rubber itself. Consequently, the quality of sponge depends relatively little on the compn. of the vulcanizate or on its degree of cure. However, other factors which do depend upon these properties, e. g., the aging, are of importance. Photomicrographs of different forms of sponging are shown. C. C. DAVIS

**Aging tests for sponge rubber.** HENRY P. STEVENS. *Trans. Inst. Rubber Ind.* 4, 486-92(1929).—When rubber sponge is compressed laterally between metal plates and heated at 70° for 2-3 days, the rubber does not recover when the pressure is released, but retains the forms of a flat sheet from which test pieces can be cut and tensile tests obtained. Twelve different types of sponge were aged in this way for 1 month and the progressive changes in tensile properties detd. The same samples were aged for 1 week without compression and consequent protection, and the changes in org. acetone ext. detd. The quant. tests revealed wide differences in properties after the artificial aging, not only among different makes but among different samples from the same source. The tests conformed to the results obtained by general examn. and hand tests before and after the artificial aging. C. C. DAVIS

**The double refraction of stretched rubber.** W. C. VAN GEEL AND J. G. EYMERS. *Z. phys. Chem., Abt. B*, 3, 240-6(1929).—Though the double refraction of rubber has already been measured (cf. *Ann. Physik* 43, 808(1891); Rossi, *Rend. accad. sci. Napoli* [3], 16, 125, 142(1910); *Nuovo cemento* [5], 20, 226, 268(1910); [6], 2, 151(1911)) no relation between elongation and double refraction has been described. Accordingly, expts. were carried out to ascertain the existence of such a relation. Films of raw rubber, prepd. by drying fresh latex, were examd. with a Babinet compensator. Rubber, which had been plasticized by milling, was also examd. in a similar way. With elastic rubber under a const. stress, the elongation reached a const. value in a very short time. When equil. was thus reached, the double refraction was measured. New samples were used for each increased stress, for with the same sample a repeated stress of const. magnitude gave increasing double refractions. The curves showing double refraction as a function of stress were very similar to those showing the double refraction of liquid crystals as a function of field strength in a magnetic field (cf. Ornstein, *C. A.* 18, 2827). An anisotropic alignment of mols. like that suggested by Ornstein probably exists in the stretched rubber. On this assumption, analogous curves were constructed, with the *b* value of the Ornstein formula proportional to the elongation. Comparison of these curves with exptl. curves showed agreement up to a certain stress. Above this limiting stress, the double refraction increased progressively with increase in stress in a strictly linear relation. This linear relation began in all cases at just the same stress (6 kg. per sq. cm.). The elongation being plotted as a function of stress, the curve showed that at this same stress, which corresponded to 70% elongation, the relation between elongation and stress became strictly linear. This crit. value of 70% elongation is the point at which an x-ray fiber diagram was first obtained (cf. Katz, *Naturwissenschaften* 1925, 110), and so this point is a characteristic of raw rubber. It probably depends, however, upon the compn. of the rubber and upon the temp. With raw rubber which had been plasticized, there was no equil., a const. stress causing elongation which increased progressively. Double refraction was a linear function of the stress, as with certain liquids. When the plasticized rubber was held at a const. elongation, the double refraction diminished with time, rapidly at first, but more and more slowly, leaving a residual pos. double refraction and also a residual stress. This residual double refraction and residual stress were almost wholly independent of the initial elongation. C. C. DAVIS

**The value of reclaimed rubber in tread stock.** C. W. SANDERSON. *India Rubber World* 80, No. 4, 53-6(1929).—A typical high-grade tread stock contg. no reclaim and a stock contg. a high proportion of whole tire alkali reclaim were blended in different proportions (0, 25, 50, 75, 100%); the resulting vulcanizates were tested for their relative resistances to abrasion and for other phys. properties, including resistance to tear, fatigue effects, tensile strength and elongation. The results on the different vulcanizates are compared on an abs. basis (cf. Vogt, *C. A.* 22, 1058) and on a basis of

the relative cost per unit of abrasion. The value of reclaim varied from 25 to 42% of the value of new rubber, the highest value being obtained with the stock contg. no new rubber. With rubber at \$.20 per lb., the relative cost of the reclaim per unit of abrasion was above that of rubber in all the stocks, while with rubber at \$.40 per lb., the relative cost of the reclaim was less than that of rubber when there was more reclaim than rubber present. Road tests agreed well with the lab. tests. Tensile strength, lamination tear and abrasion with 30% slip gave the best indication of road wear.

C. C. DAVIS

**Chemical reactions in rubber compounds. I. Reactions between pine tar and litharge.** W. H. REECE. *Trans. Inst. Rubber Ind.* **4**, 526-32(1929).—The expts. are the beginning of an investigation to ascertain what reactions, other than those involving rubber, S and accelerators, take place during vulcanization, knowledge of which is very scant. A com. pine tar with d. 1.07, neutral oils 50.9%, water 1.4%, carbonaceous substances 0.8%, acids (by difference) 46.9% were used. When PbO and anhyd. pine tar were refluxed in  $C_6H_6$  for 24 hr., a reaction ensued with evolution of water (2.45 g. per 100 g. pine tar) and formation of Pb soaps (corresponding to 30.37 g. PbO per 100 g. pine tar). Similar rubber-pine tar (100:15) mixts. prepd. in the same way with and without PbO were let stand 24 hr. and their plasticities (extrusion at 85°) detd. The values were 11 and 2.3 sec., resp., showing the pronounced hardening resulting from the reaction of PbO and pine tar. When the 2 mixts. were heated at 70°, that with PbO remained stiff, whereas the mixt. without PbO showed plastic flow. The acetone exts. were 9.11 and 15.81%, resp., from which calcs. show that 43.3% of the pine tar combined with PbO (any reaction between PbO and rubber resins being disregarded). By a special exptl. technic, it was found that when a mixt. of rubber 200, S 6, PbO 30, pine tar 30 was vulcanized, 1.31 parts of water was evolved, compared with 1.17 in the absence of rubber (*loc. cit.*), the excess probably arising from a reaction between PbO and rubber resins. The results in general show that PbO and pine tar react in a rubber mixt. in essentially the same way that they do in the absence of rubber. The values conform with the assumption that the pine-tar acids react with PbO to form soaps.

C. C. DAVIS

**The distribution of ingredients in rubber mixings.** H. PAGE. *Trans. Inst. Rubber Ind.* **4**, 521-5(1929).—The unforeseen results obtained by Reiner (cf. *C. A.* **22**, 2290, 2855) on the homogeneity of factory rubber mixings induced P. to make similar analyses. The results disprove the general conclusions of R. Detns. of the free S and the ash of 7 different types of rubber mixings before and after calendering showed variations which were all well within a fraction of 1%, and which proved, therefore, that with ordinary care in factory mixing, no such variations as reported by R. are at all necessary.

C. C. DAVIS

**Studies in the oxidation of rubber mixings.** W. CECIL DAVEY. *Trans. Inst. Rubber Ind.* **4**, 493-8(1929).—Vulcanized rubber mixts., unaccelerated and accelerated, were cured to different degrees, were then aged in a Geer oven at 70° and the increase in wt. and changes in acetone ext. detd. as deterioration progressed to an advanced stage. In some cases before aging, the vulcanizates were extd. with acetone, in other cases with acetone and then with  $CHCl_3$ . In still other cases the vulcanizates were given alternate periods of aging and extns. with acetone. *Unextd. vulcanizates.*—The higher the % combined S, the more rapid was the increase in wt. after a given period of aging. During the early stages of deterioration the higher the combined S, the higher the org. acetone ext., whereas in more advanced stages of deterioration the samples with the lowest combined S had the highest org. acetone exts. The formation of acetone-sol. substances was very slow at first; it then became rapid and finally became slow again. *Acetone-extd. vulcanizates.*—Oxidation was rapid, while the acetone-sol. substances increased to a max. proportion and then diminished to a value which remained const. over a long period of subsequent aging. In the early stages, the vulcanizates with the highest combined S showed the highest proportion of acetone-sol. substances, but on further aging these with the lowest combined S eventually yielded the highest acetone ext., so that the higher the vulcanization coeff., the lower the ultimate proportion of acetone-sol. substances. For a given increase in wt., the vulcanizates with the highest combined S gave the smallest acetone ext. *Acetone and  $CHCl_3$ -extd. vulcanizates.*—Oxidation was still more rapid, and the increases in wt. and in acetone-sol. substances were higher throughout than those of the corresponding vulcanizates extd. with acetone alone. *Repeated aging and extn.*—A vulcanizate alternately aged and extd. with acetone and  $CHCl_3$  gave a final insol. residue contg. more O (25.41%) than the same sample alternately aged and extd. with acetone alone (residue contg. 19.15% O). In the early stages of oxidation, the vulcanizate with highest combined S yielded

the highest acetone ext., but in the more advanced stages of oxidation, the converse was true. *Aging of the acetone ext.*—On heating at 70°, the acetone exts. gained wt. and became insol. The longer the vulcanizates had been aged before extn. with acetone, the smaller were the subsequent gains in wt. of the exts. *Aging of the CHCl<sub>3</sub> ext.*—On heating at 70°, the CHCl<sub>3</sub> exts. gained wt. and became insol. in ordinary org. solvents. A vulcanizate accelerated with diphenylguanidine oxidized much more slowly than the corresponding rubber-S mixt., but gained more ultimate wt. and had a higher ultimate acetone ext. The results in general show that there are 3 stages of oxidation: (1) a slight oxidation, with formation of acetone-sol. substances; (2) an intermediate stage, characterized by a rapid gain in wt. and relatively slow formation of acetone-sol. substances; and (3) a period characterized by an increased rate of formation of acetone-sol. substances, but a const. rate of absorption of O. The change of acetone-sol. to acetone-insol. substances is probably reversible. The 3rd stage is not reached in ordinary practice, while the 2nd stage is the most important, for then the resinous components polymerize and become insol., with resultant brittleness. C. C. D.

**Rubber solutions.** CACITEM. *Gummi-Ztg.* **43**, 2099-102 (1929).—A review and description, dealing with the prepn., phys. properties and uses of rubber solns.

C. C. DAVIS

**Is latex a solution of rubber?** FINI G. A. ENNA. *Gummi-Ztg.* **43**, 2043-4 (1929).—A discussion of the colloid chemistry of latex.

C. C. DAVIS

**Concerning antioxidants.** T. L. GARNER. *India Rubber J.* **75**, 623-4, 634 (1929); cf. *C. A.* **23**, 1772.—For ascertaining the general characteristics of an unfamiliar antioxidant, the following mixt. is recommended: pale crepe 100, S 3.5, diphenylguanidine 1, ZnO 3, antioxidant 0.5-1. The vulcanizates should then be tested in a manner which simulates service conditions in the closest practical way. This latter manner of procedure is very important, for there may be little or no relation between the relative merits of 2 antioxidants in preventing oxidation in darkness, cracking from repeated stresses, changes due to sunlight, resistance due to heating or abnormal deterioration caused by overcuring. Tendencies to stain or discolor may also be determinant factors. Tests by G. show that, contrary to general belief, antioxidants have a protective action on gutta-percha and balata.

C. C. DAVIS

**The automatic control of vulcanization.** MATHIAS MOHR. *Kautschuk* **5**, 114-6 (1929).—An illustrated description of app. for temp. control.

C. C. DAVIS

**An attempt at a rational classification of the principal accelerators of vulcanization.** G. MARTIN AND R. THIOLLET. *Caoutchouc & gutta-percha* **26**, 14494-7; *Rubber Age* (N. Y.) **25**, 201-2 (1929).—The object of the study was a classification based not only on activity, but also on other important characteristics of accelerators (cf. Dinsmore and Vogt, *C. A.* **22**, 4273, 4876), viz. (1) the time required for the "fixation" of rubber mixts. at different temps.; (2) the time required at different temps. to effect a cure with the max. mech. properties; (3) the aging; and (4) the plasticizing power of the accelerators and the influence of different charges on their action. The present paper deals with (1) and (2). The following base mixt. was used: pale crepe 100, S —, accelerator —, ZnO 5, palm oil 1, stearic acid 0.5. To define the *point of fixation*, a mixt. was fixed when (1) without being cured it could be removed from an Al mold without sticking and without distortion; (2) cut surfaces could be reunited; and (3) just before the crit. point the mixt. softened when carried quickly to higher temp., and just beyond the crit. point the mixt. acquired more nerve when its temp. was raised. The point of fixation thus indicates the tendency to "scorch." By plotting temps. as ordinate and times of fixation as abscissa, a series of curves showing the characteristics of each accelerator according to the rate of fixation of mixts. contg. the accelerators was obtained. The accelerators which were tested fell into 6 general groups, typified by (1) Zn isopropylxanthate, (2) Zn methylphenyldithiocarbamate (I), (3) thiocarbanilide (II) and ethylidene-aniline (III), (4) mercaptobenzothiazole (IV) and tetramethylthiuramdisulfide (V), (5) *p*-nitrosodimethylaniline and disubstituted guanidines, and (6) triphenylguanidine (VI), anhydroformaldehydeaniline (VII) and anhydroformaldehyde-*p*-toluidine. Those in (1) caused rapid fixation even at low temps.; those in (2) caused slower fixation so that they can be used with caution in milling operations; those in (3), (4) and (5) caused progressively slower fixations and are still safer; and those in (6) caused fixation only at relatively high temps. V is peculiar, however, in that, when once begun, fixation is extremely rapid, an almost "explosive" vulcanization taking place, with resulting danger of scorching. This classification according to the rapidity of fixation or "precocity of action" serves to distinguish accelerators, e. g., II and VI, or III and diphenylguanidine (VIII), which

are ordinarily regarded as similar. Different effects were obtained with combinations of accelerators, mixts. in some cases being more precocious than their components. Thus with 3% S and 0.7% VIII the mixt. was not fixed at 105°, whereas with 2.5% S, 0.4% VIII and 0.3% IV the mixt. was fixed still more rapidly at 105°. Therefore, mixts. of 2 accelerators may be more precocious than either of the components. On the other hand, it is possible to retard the precocity of action of rapid accelerators by the simultaneous use of another. Thus with 1.8% S and 0.7% I, the mixt. was fixed at 100° in 10 min., whereas if 1% VII is added, fixation at 100° occurred only after 30 min. The addn. of accessory ingredients changes these quant. relations, but the results show that it is possible to det. the most suitable degree of acceleration for a rubber mixt. for any particular operating condition.

C. C. DAVIS

**Tetramethylthiurammonosulfide and tetramethylthiuramdisulfide.** HENRI LEDUC *Rev. gén. caoutchouc* 6, No. 51, 20(1929).—Certain important advantages of tetramethylthiurammonosulfide (I) over tetramethylthiuramdisulfide (II) are cited, including the fact that I is far less active than II below temps. around 115° but just as active above this range, which allows far greater ease of handling uncured rubber mixts. contg. I and allows the prepn. and storage of master batches of I. Contrary to Esch (cl. C. A. 23, 1526, 2323) the activity of I is not impaired by the absence of ZnO.

C. C. DAVIS

Se and its use in the arts [in rubber vulcanization] (KUFFERATH) 18. Radiation and conduction losses in firing and quenching periods with special regard to rubber industry (PRAETORIUS) 21. Plant construction for production of carbon black by decomposition of hydrocarbon gas (U. S. pat. 1,718,720) 18. Filters [for aqueous dispersions of rubber] (Fr. pat. 656,310) 1. Condensation products [vulcanization catalysts and antioxidants] (Fr. pat. 655,583) 26. Lampblack, etc. [as filler for rubber] (Brit. pat. 300,610) 18. Dispersion agents [for preparation of rubber solutions] (Swiss pat. 126,575) 18.

**Rubber.** MONTE L. CAMBERN, HERMAN O. LANGSTAFF and CHARLES J. STAPEL FELD. Fr. 656,094, June 19, 1928. A crude rubber-like compd. or compd. suitable for addn. to rubber is obtained by distg. shale and condensing the vaporized portion. An app. is described.

**Synthetic rubber.** I. G. FARBERIND. A.-G. Brit. 301,515, Dec. 2, 1927. 1,3-Butadiene or a homolog or analog may be polymerized in the presence of a water sol. salt of a bile acid or deriv., which serves to accelerate the polymerization. Cf. C. A. 23, 2071.

**Synthetic rubber.** I. G. FARBERIND. A.-G. Fr. 655,785, Mar. 2, 1928. See Brit. 286,272 (C. A. 23, 310).

**Rubber compositions.** C. MACINTOSH & Co., LTD., S. A. BRAZIER and E. H. HURLSTON. Brit. 300,936, Aug. 19, 1927. In the manuf. of transparent or translucent rubber compns., a Zn or Cd salt of an org. fatty acid such as stearic, palmitic, oleic or linoleic acid is incorporated with the mixt. before vulcanization.

**Rubber articles from dispersions.** MERWYN C. TEAGUE (to Naugatuck Chemical Co.). U. S. 1,719,633, July 2. In forming gloves, toys or other articles, a form is repeatedly coated with a rubber dispersion and the dispersion is coagulated on the form. The coated form is washed after each coagulation operation and the coagulated rubber is subsequently dried on the form.

**Rubber sheet material.** DUNLOP RUBBER CO., LTD., R. F. MCKAY and W. H. CHAPMAN. Brit. 301,367, July 25, 1927. In the manuf. of rubber sheets or impregnated fabrics, a creamy deposit is formed electrophoretically from a suitable dispersion, partially dried if desired and then removed from the surface of the drum or like device on which the deposit is formed. Numerous details are given.

**Perforated metal sheets, spools, etc., coated with rubber.** ANODE RUBBER CO., LTD. Brit. 301,300, Nov. 26, 1927. The coating may be formed by dipping the metal sheet or article into latex which may be thickened and mixed with fillers, vulcanizing ingredients, etc. Electrophoresis also may be used for producing the coating after a preliminary coating of the metal with an easily oxidizable metal such as Zn to prevent gas formation. Various details are given.

**Artificial rubber.** I. G. FARBERIND. A.-G. Fr. 656,049, June 18, 1928. Masses resembling rubber are prepd. by polymerizing vinyl alc. in the presence of substances which increase the elasticity, particularly org. N compds. Examples are given of the

polymerization of vinyl acetate in the presence of casein, albumin, glyceroll and benzoyl peroxide, or  $C_{10}H_8$ , and benzoyl peroxide.

**Artificial rubber.** I. G. FARBERIND. A.-G. Fr. 656,428, June 25, 1928. Rubber-like compds. are obtained by heating olefin hydrocarbons such as butadiene, isoprene or dimethylbutadiene with metallic oxides finely divided or sol. in colloids, such as  $PbO_2$ ,  $MnO_2$ , and  $Ag_2O$ . Cf. C. A. 23, 2603.

**Artificial rubber.** I. G. FARBERIND. A.-G. Fr. 655,217, June 4, 1928. The quality of artificial rubber from hydrocarbons is improved by a thorough mixing before vulcanization with finely divided C such as lampblack, active C or graphite. The C may be added to the hydrocarbons before polymerization. An example of both methods is given.

**Artificial rubber.** I. G. FARBERIND. A.-G. Fr. 655,456, June 7, 1928.—See Brit. 292,103 (C. A. 23, 1528).

**Rubber and like substances.** THE ANODE RUBBER CO. (ENGLAND), LTD. Fr. 655,535, June 8, 1928. Very viscous aq. dispersions of rubber, gutta-percha and balata are prepd. by adding polysaccharides, albuminoids or vegetable exts., which do not take a gel form even at high concn. Substances such as gelatin capable of forming gels may be added if hydrolysed after addn. to a form incapable of gel formation, e. g., by  $NH_3$  or amines.

**Electrophoretic deposition of rubber.** DUNLOP RUBBER CO., LTD., and D. F. TWISS. Brit. 301,100, July 25, 1927. In electrophoretic deposition of rubber, balata or the like from natural or artificial dispersions,  $H$  ions are introduced as by adding HOAc in excess of that required for coagulation (coagulation being prevented) and the deposit is formed on a cathode or on a deposition base surrounding the cathode.

**Rubber tubing.** A. S. GREGG. Brit. 300,357, Sept. 27, 1927. Rubber tubing is provided with an external reinforcing of fabric and is then "doped" with a compn. such as one contg. cellulose acetate, nitrocellulose or a phenolic condensation product. The tubing is suitable for use for carrying coal gas and for various other purposes.

**Rubber-working apparatus with a liquid-spray cooling system.** F. H. BANBURY. Brit. 301,372, Nov. 28, 1927. Structural features.

**Testing strength of rubber or other fabrics.** F. SCHUBERT. Brit. 301,324, Nov. 24, 1927. Mech. features.

**Coagulating rubber from latex.** I. G. FARBERIND. A.-G. Brit. 300,719, Aug. 27, 1927. Proteases (such as those contained in succus caricae papayae) are used in the presence of addnl. substances facilitating the reaction or improving the properties of the rubber such as HCN,  $H_2S$  or saline mixts. having buffer properties. Air may be preliminarily passed through latex stabilized with  $NH_3$  until a  $pH$  of 8 is attained.

**Preserving latex.** I. G. FARBERIND. A.-G. Brit. 300,394, Nov. 18, 1927. The process described in Brit. 294,412 (C. A. 23, 2071) is modified by the use, for preserving latex, of salts of sulfonic acids having tanning properties, of which several examples are given. Latex may be thus prepd., which is especially suitable for impregnating fabrics

**Preserving latex.** I. G. FARBERIND. A.-G. Brit. 300,456, April 2, 1928. To latex preserved as described in Brit. 294,412 (C. A. 23, 2071) or Brit. 300,394 (preceding abstract) by the salts of sulfonic acids having soap-like or tanning properties, there is added aliphatic or aromatic alcs. which may contain substituted halogens, ketones, hydrocarbons or halogen, nitro or amino substitution products of hydrocarbons such as heptyl alc., cyclohexanone, tetrahydronaphthalene or  $PhNO_2$ . The mixt. formed is stable and readily penetrates fabrics.

**Treating latex.** W. B. WESCOTT (to Rubber Latex Research Corp.). Brit. 301,077, Nov. 25, 1927. See U. S. 1,690,150 (C. A. 23, 547).

**Forming inner tire tubes, etc., by deposition from latex.** SOC. ITALIANA PIRELLI. Brit. 301,476-7, Nov. 30, 1927. Mech. features.

**Centrifuging rubber latex to remove suspended impurities.** AKTIEBOLAGET SEPARATOR. Brit. 301,085, Nov. 24, 1927.

**Rubber-surfaced pavements.** HAZEL GROVE RUBBER CO., LTD., and T. GARE. Brit. 300,319, Aug. 19, 1927. Structural features.

**Rubber vulcanization.** J. TEPPERMA (to Goodyear Tire & Rubber Co.). Brit. 300,949, Nov. 21, 1927. A mercaptoarylthiazole in which at least one of the H atoms of the aryl ring is substituted, e. g., 5-chloromercaptobenzothiazole, is made to react with an amine, aryl or aliphatic compd., e. g., diphenylguanidine; the reaction product is used as an accelerator. Cf. C. A. 23, 3376.

**Vulcanizing rubber.** RUBBER SERVICE LABORATORIES CO. Brit. 300,287, May 9, 1927. Vulcanizing accelerators are made by treating the condensation products of aldehydes and amines known as "Schiff's bases" or the aldehyde derivs. of such bases with an acid, neutralizing the acid and then reacting on the product with addnl. aldehyde or with  $CS_2$ . Examples are given.

**Vulcanizing rubber to leather.** LEON B. CONANT (to Standard Patent Process, Corp.). U. S. 1,719,101, July 2. See Brit. 275,194 (*C. A.* 22, 2292).

**Steam-jacketted apparatus for vulcanizing rubber articles such as tires.** JOHN R. GAMMETER (to B. F. Goodrich Co.). U. S. 1,719,218, July 2.

# CHEMICAL ABSTRACTS

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## 1—APPARATUS AND PLANT EQUIPMENT

W. L. BADGER

**A laboratory device for vacuum distillation.** TADEUSZ W. JEZIEFSKI. *Przemysl Chem.* 13, 236-7(1929).—The adapter of a vacuum distg. app. is provided with 3 side tubes, one of which leads to the vacuum pump, and the other two form a Y, one branch of which is provided with a one-way stopcock, and the other branch with a 3-way stopcock, and the stem leads to the receiver. When the receivers for fractionation are changed the vacuum in the distg. flask is maintained, and the small quantity of condensate formed in the adapter during this changing is allowed to enter the receiver without splashing by properly manipulating the stopcocks.

A. C. ZACHLIN

**Large-capacity laboratory condensers.** D. F. OTHMER. *Ind. Eng. Chem., Anal. Ed.* 1, 153(1929).—Two types of double-coil glass app. are described. J. H. MOORE

**Rapid calibration of pipets and burets.** ALFRED T. SHOHL. *Ind. Eng. Chem., Anal. Ed.* 1, 152-3(1929).—An accurate method by weighing Hg is given. J. H. M.

**A modified Pauly receiver.** J. B. BROWN. *Ind. Eng. Chem., Anal. Ed.* 1, 160(1929).—A no. of glass-tube legs are sealed into the periphery of the bottom of a Pyrex suction flask, the adapter being shifted over each leg, which stands in its own receiving flask. J. H. MOORE

**A constant-level water-bath.** NORVAL F. WILSON AND R. K. CARLETON. *J. Chem. Education* 6, 1335-6(1929). E. H.

**Simple graduated wash bottles.** EARLE R. CALEY. *Ind. Eng. Chem., Anal. Ed.* 1, 162(1929).—A graduate, or a graduated test tube, may be used. J. H. MOORE

**A modification of the Kjeldahl trap.** GEO. H. W. LUCAS. *Ind. Eng. Chem., Anal. Ed.* 1, 140(1929).—A trap designed for the detn. of small quantities of Br, and for use with frothy liquids and steam distns. where the ordinary trap is useless. J. H. M.

**A large metal Soxhlet extractor.** L. R. BRYANT. *Ind. Eng. Chem., Anal. Ed.* 1, 139-40(1929).—Details are given for constructing an app. to hold about 7 kg. of material. J. H. MOORE

**A simple, efficient refluxing apparatus for quantitative work.** JEROME E. ANDES. *J. Chem. Education* 6, 1337(1929). E. H.

**Bottle for accurate weighing of volatile liquid mixtures.** Z. BLASZKOWSKA. *Ind. Eng. Chem., Anal. Ed.* 1, 170-1(1929).—The app. consists of 2 containers joined by an S-shaped tube. The first liquid is weighed in one container and transferred by means of an S-tube to a second flask. Each of the other liquids is weighed separately in one flask and transferred to the second, the S-tube forming an hydraulic seal, thus preventing volatilization of the previously weighed liquids. J. O. COLLINS

**An improved volumometer.** ALFRED W. FRANCIS AND EDWARD P. OXNARD. *Ind. Eng. Chem., Anal. Ed.* 1, 169-70(1929).—A description of the usual type of volumometer, the known vol. being measured in a calibrated pipet with greater accuracy than in the usual cylindrical tube. An improved air-tight wide-mouth sample bottle is used. J. O. COLLINS

**A new volumeter using water as the measuring medium.** J. A. FRIES. *Ind. Eng. Chem., Anal. Ed.* 1, 123-5(1929).—The vol. of the app. to be measured is calcd. from the expansion of the contained air caused by the drop in a column of H<sub>2</sub>O in a connected buret. The results are quite satisfactory. J. H. MOORE

**The Fairweather recording gas calorimeter.** ANON. *Engineering* 127, 817-20(1929).—The construction and operation of this improved app. are described in detail. Cf. *C. A.* 16, 2773; 17, 3596; 20, 2572. J. H. MOORE

**An improved air-gas ratio apparatus.** CRANDALL Z. ROSECRANS. *Ind. Eng. Chem., Anal. Ed.* 1, 156-8(1929).—An app. of the thermal cond. type, especially designed for measuring the ratio of air to fuel gas. J. H. MOORE

**A stopcock in which contamination with grease is prevented and its application to a problem in gas technic.** HERMAN C. RAMSPERGER. *J. Am. Chem. Soc.* 51, 2132-4

(1929).—A cock for work under high vacuum in which a Hg seal prevents contact between the gas and grease. J. H. MOORE

A new quinhydrone microelectrode. MAURICE DELAVILLE AND PAUL TCHERNIAKOFSKY. *Compt. rend. soc. biol.* 101, 735-7(1929).—The electrode is designed to measure the  $p_H$  of 0.2 cc. of soln., without loss of  $CO_2$ , and with negligible diffusion potential between the satd. KCl soln. and the liquid studied. B. C. BRUNSTETTER

A new plastometer. E. KARRER. *Ind. Eng. Chem., Anal. Ed.* 1, 158-60(1929).—A detailed description is given with 3 cuts. J. H. MOORE

An improved constant current regulator. LEWIS G. LONGSWORTH AND DUNCAN A. MACINNES. *J. Optical Soc. Am.* 19, 50-7(1929). E. H.

A large reciprocating C. T. R. Wilson cloud expansion apparatus. GORDON L. LOCHER. *J. Optical Soc. Am.* 19, 58-64(1929). E. H.

Color measurements with the Moll's "extinctionmeter." M. J. VAN TUSSEN BROEK. *Chem. Weekblad* 26, 374-81(1929); cf. *C. A.* 21, 2402.—The use of glass filters overcomes the difficulty that sep. readings cannot be taken for each wave length. The advantages of the method are rapidity, sensibility and independence of the imperfections or fatigue of one's eyes. E. SCHOTTE

A mercury arc with thin glass windows. SIMON SONKIN. *J. Optical Soc. Am.* 19, 65-7(1929). E. H.

Evolution of the slag-tap furnace at the Charles R. Huntley station of the Buffalo General Electric Co. H. M. CUSHING. *Trans. Am. Soc. Mech. Eng.*, Advance paper No. 7, 8 pp.(May 13-6, 1929).—Reasons are given why powd.-coal firing was chosen for the 60,000-kw. 1926 extension. Expts. on a furnace designed to remove ash in dry form led to development of slag-tap furnaces. Advantages are enumerated. E. I. S.

A new type high-temperature fusion furnace. J. B. SHAW AND G. J. BAIR. *J. Am. Ceram. Soc.* 12, 447-50(1929).—Details of an oxyacetylene furnace are given. C. H. KERR

Experiments on chain-grate furnaces. W. KOENIGER. *Arch. Wärmewirt* 10, 243-8(1929).—Results of many boiler tests are presented, especially to illustrate the effect of load variation. The modern grates tested responded to changes almost as well as powd. coal. ERNEST W. THIELE

The Todd pulverized coal burner. R. C. BRIERLY. *J. Am. Soc. Naval Eng.* 41, No. 2, 191-220(1929). E. I. S.

An apparatus for removing foams from samples of liquors. JOSEF HERNYCH. *Listy Cukrovar.* 47, 449-50(1929).—A thick-walled glass vessel 110 mm. in diam. and 150 mm. high is illustrated. The app. has its bottom removed. It is replaced by a rubber plate about 10 mm. thick which overlaps the edges 20 mm. A glass tube in the form of a T enters the center of the plate; one exit is connected to an aspirator, the other to a tube with a pinchcock. A rubber stopper through which a glass tube passes is inserted into the neck. For use, the rubber base is removed, the vessel filled, and the cover replaced. An aspirator evacuates the vol. above the liquid, draws the cover in, and establishes a firm contact. The foam arises to the surface; the vacuum is broken by releasing a pinchcock; the liquid is drawn out through a tube. FRANK MARESH

Adsorption of gas in a vacuum tube by Mg (CZUKOR) 2. Treating Cu leading in wires of lamps, discharge tubes or similar electrical devices (U. S. pat. 1,719,877) 19.

MELHARDT, HANS: Die Wandstärkenberechnung druckbeanspruchter Gefässe aus Schweisstahl-, Flusstahl-, Kupfer- und Aluminiumblech im Apparatenbau. Monographien zur chemischen Apparatur established by A. J. Kieser. Leipzig Otto Spamer. 61 pp. Paper, M. 7; bound, M. 8.50. Reviewed in *Ind. Eng. Chem.* 21, 802(1929).

Device for lifting laboratory crucibles from supporting triangles, etc. G. S. HARTLEY. *Brit.* 301,685, March 13, 1928. Structural features.

Differential thermometer (comprising two bimetallic strips). HARTMANN & BRAUN A.-G. *Ger.* 478,412, July 16, 1926.

Glass-bulb hydrometers. F. F. W. FLAIG. *Brit.* 302,034, Nov. 16, 1927. Structural features are specified designed to reduce changes in volume due to temp. changes.

Comparison photometer. R. H. DAVIS. *Brit.* 301,665, Jan. 10, 1928. Structural features.

Colorimeter, especially for hemoglobin determinations. JOHANN PLESCH. *Ger.* 478,289, Aug. 3, 1926.



**Bomb calorimeter.** ÉTABLISSEMENTS POULENC FRÈRES (to Soc. des usines chimiques Rhone-Poulenc). Brit. 302,579, Dec. 17, 1927. Structural features.

**Calorimetric apparatus for determining the calorific value of gases.** OTTO DOMMER. U. S. 1,720,782, July 16. Various structural features are described.

**Gas-analysis apparatus.** CARL D. ZIMMERMAN. U. S. 1,719,864, July 9. Various structural details are described of an app. suitable for testing flue gas, etc.

**Apparatus for revaporizing liquefied gases.** SOC. L'AIR LIQUIDE, SOC. ANON. POUR L'ÉTUDE ET L'EXPLOITATION DES PROCÉDÉS G. CLAUDE. Brit. 302,681, Dec. 20, 1927. Structural features.

**Conversion apparatus for catalytic gas reactions.** A. O. JAEGER (to Selden Co.). Brit. 301,799, Dec. 5, 1927. Structural details are described of an app. with a chamber divided by concentric partitions into concentric annuli; alternate annuli are filled with catalyst and the intermediate annuli serve as heat exchangers.

**Apparatus for producing gas mixtures under pressure.** AKTIEBOLAGET GÖTAVÄRKEN. Ger. 477,533, Sept. 18, 1925.

**Apparatus for proportioned admixture of flowing gases or liquids.** T. W. BARBER. Brit. 302,745, Sept. 30, 1927. Structural features.

**Gas filter (comprising grids moistened by a viscous liquid).** ANDERS JORDAHL. Ger. 478,081, Apr. 12, 1925.

**Sector drum filter.** JEAN B. VERNAY. U. S. 1,720,156, July 9. Structural features.

**Filter-pressing and supplemental pressing method for separating liquid and solid materials.** W. B. EDDISON. U. S. 1,720,211, July 9. An app. is described.

**Ultrafilter membranes.** JACQUES DUCLAUX. U. S. 1,720,670, July 16. Cloth is impregnated with a soln. of nitrocellulose and the solvent is permitted to evap. sufficiently to effect solidification of the impregnating nitrocellulose film before the material is immersed in a coagulating bath. Cf. C. A. 23, 981.

**Separator for liquids of different densities.** WHITE OIL SEPARATORS, LTD. Ger. 478,330, Oct. 15, 1924.

**Separator for oil and water.** KOMMANDIT-GES. ROSENTHAL & Co. Austrian 113,339, Jan. 15, 1929.

**Filter for dry-cleaning liquids, etc.** NORMAN SMITH. U. S. 1,720,384, July 9. Structural details of a filter formed in part of spirally wound woven wire.

**Apparatus for clarifying used dry-cleaning liquids or other liquids by precipitation, filtration, etc.** HARRY MILLER. U. S. 1,720,185, July 9. Structural features.

**Apparatus for extracting and rectifying volatile substances.** CHARLES LE MELLE-TIER. Fr. 657,174, July 9, 1928.

**Apparatus for separating suspended solid particles from gases.** WOODALL-DUCKHAM (1920) LTD., and A. W. DUCKHAM. Brit. 302,400, Oct. 8, 1927.

**Combined fan and classifier for solids carried by gases.** ALBERT H. STEBBINS. U. S. 1,720,863, July 16.

**Apparatus for classifying fine solids by the action of an apertured vibrating table and of an air blast.** ALBERT H. STEBBINS. U. S. 1,720,861, July 16.

**Flotation apparatus for graphite or other minerals.** REGINALD DE ROBILLARD. U. S. 1,720,264, July 9. Structural features.

**Apparatus for separating lighter from heavier mica flakes by suction.** JOSEPH M. COFFEY (to Mica Insulator Co.). U. S. 1,720,666, July 16. Structural features.

**Mechanical purifiers.** I. G. FARBENIND. A.-G. Fr. 657,463, July 12, 1928. Distributing disks or wheels in mech. purifiers are constructed so that they retain a certain amt. of the liquid to be treated, the liquid passing over an edge as more liquids collect.

**Apparatus for purifying liquids.** CLAUDE LARDET. Fr. 656,533, June 27, 1928. An app. is described having a well in which impurities heavier than the liquid to be purified collect, and at the bottom of which is a float valve the density of which lies between that of the liquid to be purified and that to be eliminated.

**Apparatus for spray evaporation of liquids.** F. H. DOUTHITT. Brit. 301,952, Sept. 8, 1927. Modifications are described of the app. of Brit. 260,453 (C. A. 21, 3401).

**Distilling and evaporating apparatus.** SWENSON EVAPORATOR Co. Fr. 657,389, May 31, 1928. Liquid to be distd. or evapd. is pumped at a high speed through the heated zone. A heating liquid is pumped in the opposite direction, both liquids reaching their max. speed at the same point.

**Apparatus for mixing liquids with flavoring or other ingredients in constant proportions.** L. L. DA COSTA. Brit. 302,023, Nov. 5, 1927. Structural features.

**Apparatus for intermittent agitation of liquids.** A. C. TUPPER. Brit. 302,387,

Sept. 15, 1927. A reciprocating stirrer operated by a solenoid is further controlled by a second solenoid and dash-pot device.

**Agitating apparatus for hydrogenating liquids.** SCHERING-KAHLBAUM A.-G. Fr. 657,248, July 10, 1928.

**Röntgen-ray tubes and similar apparatus.** ÉTABLISSEMENTS GAIFFE-GALLOT ET PILON. Brit. 301,855, Dec. 7, 1927. Structural features.

**Cathode-ray tube.** H. PLAUSON. Brit. 301,719, Feb. 29, 1928. The window of a cathode-ray tube is made of Be or an alloy high in Be such as one composed of Be 95-98 and Al 5-2 parts, to which a small proportion of Mg may be added. The window may be coated with a thin layer of Au, Pt, Ni or Co.

**Cathode arrangement for x-ray tubes.** KARL W. DAUMANN. U. S. 1,720,210, July 9. Structural features.

**Radio-tube cathode.** RALPH E. MYERS (to Westinghouse Lamp Co.). U. S. 1,719,988, July 9. Electron-emitting cathodes for radio tubes or like devices comprise a core of metal such as Mo of high resistivity, a conductive tube (which may be formed of Pt) around the core and having its outer surface treated for electron-emission purposes, and a filling of refractory insulating material such as MgO between the core and tube.

**Mounting misch metal in radio tubes.** EDWARD W. RYAN (to Westinghouse Lamp Co.). U. S. 1,720,005, July 9. A mount for an electron emission device comprises an electrode of Ni, and an iron support secured to the electrode to support misch metal. Various structural details are described.

**Microphone electrode material.** SIEMENS BROS & CO., LTD., and G. F. DUTTON. Brit. 301,656, Dec. 22, 1927. Finely divided C is mixed with a carbonaceous binder to form a stiff paste; this is shaped and a coating of C or anthracite granules is applied to the surface and the product is baked.

**Three-electrode "salinometer."** EVERSIED & VIGNOLES, LTD. and C. E. PERRY. Brit. 302,498, Dec. 14, 1927. Structural features.

**Vacuum electron discharge tubes.** H. C. THOMPSON (to British Thomson-Houston Co., Ltd.). Brit. 302,307, Dec. 14, 1927. An electrode-emitting cathode is used with at least 2 other electrodes, one of which has a coating comprising a metal of alk. properties such as borates of K, Li, Na, Ba, Sr and Ca, which increases its efficiency as an emitter of impact electrons. Various details of manuf. and modifications and auxiliary features are described.

**Photoelectric cell.** SAMUEL WEIN (to Radio Patents Corp.). U. S. 1,720,651, July 9. A light-sensitive coating is formed on an electrode by the action of a brush discharge, in the presence of H, on a metallic salt such as a nitrate of an alkali metal assocd. with a reducing agent, e. g., hydroxylamine, which has been deposited on the electrode. Various structural details are described.

**Photoelectric cells.** FIRM OF O. PRESSLER. Brit. 302,183, Dec. 9, 1927. Structural features.

**Photoelectric cells.** RENÉ AUDUBERT and GEORGES VALENSI. Fr. 34,054, Apr. 2, 1927. Addn. to 584,723. An auxiliary electrode is used so that the sensitive layer is automatically submitted to alternate periods of work and rest. A differential mounting for the photometer composed of 2 sensitive plates in opposition lit up respectively by the source to be measured and the standard is used.

**Muffle furnace with a flameless hearth.** ROBERT MÜLLER, JR. Ger. 477,776, June 12, 1926.

**Rotating annular-hearth furnace for distillation or drying.** TROCKNUNGS-VERSCHWELUNGS- UND VERGASUNGS-GES. Fr. 656,718, June 26, 1928.

**Movable nozzles in a revolving tube furnace.** G. POLYSIUS A.-G. Ger. 477,743, June 9, 1928. Details of arrangement.

**Annular rotary hearth furnace or oven for heating loose material in a thin layer.** TROCKNUNGS-VERSCHWELUNGS- UND VERGASUNGS-GES. Brit. 301,904, Dec. 9, 1927. Structural features.

**Conserving heat of furnaces.** FELIX SINGER. Ger. 478,493, July 14, 1927. A large no. of bodies of the Dewar vessel type are built into the furnace wall.

**Automatic two-part furnace-draft regulator.** DYNAMIT-A.-G. VORM. ALFRED NOBEL & CO., and RUDOLF SCHRÖDER. Ger. 478,022, Apr. 25, 1926.

**Method of operating doors of electric and other furnaces.** SOC. GÉNÉRALE DES FOURN ÉLECTRIQUES. Fr. 656,973, July 4, 1928.

**Support for furnace walls.** AMERICAN ENGINEERING CO. Fr. 657,373, Apr. 3, 1928.

**Burners for powdered fuel.** SOC. FRANÇAISE DES CONSTRUCTIONS BABCOCK ET WILCOX. Fr. 656,621, June 28, 1928.

**Furnace for coal dust.** FIRMA WILHELM RUPPMANN. Ger. 478,120, Jan. 15, 1922.

**Burner for coal dust.** SIEMENS-SCHUCKERTWERKE A.-G. (Karl Mayr, inventor). Ger. 478,352, June 13, 1926.

**Coal-dust burner for hearth furnaces.** WITKOWITZER BERGBAU- UND EISEN-  
HUTTEN-GEWERKSCHAFT and CARL SALAT. Ger. 478,379, Jan. 25, 1924.

**Arrangement of water tubes in coal-dust furnace.** INTERNATL. COMBUSTION  
ENGINEERING CORP. Ger. 477,559, Dec. 18, 1925.

**Burner for oil fuel.** CHARLES G. HAWLEY. Fr. 657,471, July 13, 1928.

**Cup burner for liquid fuels.** AKT.-GES. PRIOR, PATENTVERWERTUNGS-GES.  
Ger. 477,855, Dec. 5, 1926.

**Burner for gaseous and liquid fuels.** ARTHUR J. SESSIONS. U. S. 1,720,761,  
July 16. Structural features.

**Gas burner.** ALVARADO L. R. ELLIS (to General Elec. Co.). U. S. 1,721,381,  
July 16.

**Gas burners.** ÉTABLISSEMENTS BRACHET ET RICHARD (Soc. anon.). Fr. 656,707,  
June 15, 1928.

**Heat exchanger (fan type).** MASCHINENFABRIK ING. HANS SIMMON. Austrian  
113,190, Jan. 15, 1929.

**Heat-exchange apparatus.** H. FÖGE (to W. F. Kochs & Co., Ltd.). Brit. 302,562,  
July 21, 1928. Structural features.

**Heat-exchange apparatus suitable for use at high temperatures.** ROBERT L.  
FRINK. U. S. 1,721,442, July 16. Portions of a heat-exchange app. such as a recuper-  
ator are formed from a mixt. contg. a refractory material such as sillimanite, a "low  
temp." cement such as Mg oxychloride cement and substances which when heated form  
a glass; the cement is allowed to set and define the form and size of the structure and  
the product is then heated to produce a glass-like bond for the refractory material.

**Heat exchange apparatus suitable for heating air, etc.** JOHN W. YOUNG (to  
Westinghouse Elec. & Mfg. Co.). U. S. 1,720,536, July 9. Structural features.

**Air heater (plate type).** MAX HARTMANN and ERNST HARTMANN. Ger. 478,403,  
Feb. 6, 1926.

**Device for heating air by flue gas.** MAX SCHWABACH. Ger. 477,757, Nov. 28,  
1924. Details of arrangement.

**Apparatus for burning finely divided solid fuels.** W. B. CHAPMAN. U. S. 1,719,-  
874, July 9.

**Apparatus for producing a fuel mixture of predetermined calorific value.** ROLAND  
S. McNEIL (to General Electric Co.). U. S. 1,719,898, July 9. The flame from a test  
Bunsen burner impinges on a metal target assocd. with a thermostatic device which  
controls the pressure of the fuel, which may be an ordinary illuminating gas.

**Ozonizers.** L'AGENCE METALLURGIQUE. Fr. 657,446, July 12, 1928. Construc-  
tional improvements are given.

**Ozonizing device in combination with an air filter and ventilator.** MARIUS P.  
OTTO. Ger. 477,758, June 24, 1924. Details of arrangement.

**Acetylene generator.** MESSER & Co., G. M. B. H. Ger. 477,560, May 17, 1925.  
The generator has several carbide containers which can operate simultaneously or  
separately.

**Acetylene generator.** EMIL MENZ. Ger. 477,785, Mar. 17, 1928. Details of  
arrangement.

**Apparatus for the production of hydrogen peroxide.** OESTERREICHISCHE CHEM-  
ISCHE WERKE G. M. B. H. Fr. 657,188, July 9, 1928. An app. is described for the pro-  
duction of  $H_2O_2$  by distn. of  $H_2S_2O_8$  or persulfates and for the concn. of  $H_2O_2$ . Cf. C. A.  
23, 1650.

**Surface condenser.** WORTHINGTON PUMP AND MACHINERY CORP. Ger. 478,035,  
July 2, 1926.

**Surface condenser.** J. F. KIRGAN (to Ingersoll-Rand Co.). Brit. 302,347,  
Dec. 16, 1927. Structural features.

**Surface condenser.** A. R. SMITH (to British Thomson-Houston Co.). Brit.  
302,167, Dec. 10, 1927.

**Condenser (with a hollow annular nest of tubes) suitable for steam power plants.**  
JOHN H. SMITH (to Westinghouse Elec. & Mfg. Co.). U. S. 1,721,261, July 16. Struc-  
tural features.

**Apparatus for catalytic synthesis in gaseous phase.** UNION CHIMIQUE BELGE. Belg. 355,732, Dec. 31, 1928. Constructional features.

**Apparatus for carrying out highly endothermic reactions.** E. CONNERADE. Belg. 356,944, Jan. 31, 1929. The chamber in which the reaction takes place is heated externally by placing it in a mass of incandescent fuel, and internally by a (preferably gaseous) substance, compatible with the reaction or reactions taking place in the chamber and superheated by being passed through the mass of incandescent fuel.

**Device for discharging cylindrical reaction chambers particularly in the manufacture of superphosphates.** MASCHINENFABRIK. M. EHRHARDT. A.-G. Ger. 477,509, May 16, 1928.

**Apparatus for annealing galvanically plated jewellery and similar ware.** KOLLMAR & JOURDAN A.-G. Ger. 477,597, July 26, 1927. Details are given.

**Digester.** J. W. PENNMAN. Brit. 302,077, Jan. 31, 1928. A false bottom is fitted in a digester so that it is slightly flexible or yielding between the rivets of the joint. Fine saw-cuts may extend radially inwardly from the periphery.

**Pressure-resisting cover for digesters, vulcanizing pan, autoclaves, etc.** D. BRIDGE & Co., LTD., and E. BRADSHAW. Brit. 302,787, Nov. 18, 1927. Structural features.

**Apparatus for feeding detergents into water flowing through pipes.** STANLEY M. HALSTEAD and ANTON I. WICKLAND. U. S. 1,720,326, July 9.

**Device for testing the insulating properties of insulating liquids such as oils.** CHRISTIAN DANTSIZEN (to General Elec. Co.). U. S. 1,721,374, July 16. Structural and elec. features.

**Kiln for the treatment of lime, dolomite, natural cement, etc.** I. HUBEAUX. Belg. 356,177, Dec. 31, 1928. Constructional features.

**Portable kiln-stack blower.** EDWARD G. FINZER. U. S. 1,721,336, July 16. Structural features.

**Sprayer for powdered material, especially metal powder.** FRITZ SCHORI. Ger. 477,505, Sept. 19, 1923.

**Apparatus for drying clay, sand, chalk, etc.** ROBERT DE REYTERE. Fr. 656,913, July 2, 1928.

**Apparatus for treating pipes, bars, etc., with cleaning and pickling liquids.** KURT T. POTTHOFF (to U. S. Galvanizing & Plating Equipment Corp.). U. S. 1,720,525, July 9. An app. is described by which tubular articles may be passed through a tank while the liquid within the article is renewed by passing it in alternately opposite directions within the interior of the article.

**Electromagnetic thermostatic apparatus.** AKT.-GES. DER MASCHINENFABRIKEN ESCHER, WYSS ET CIE. Brit. 302,344, Dec. 15, 1927. Structural features.

**Thermostatic electric switch.** ESTEL C. RANEY. U. S. 1,719,851, July 9

**Thermostatic electric switch.** EUGENE J. RAY (to United Shoe Machinery Corp.) U. S. 1,720,057, July 9.

**Bimetallic thermostatic electric switch.** CLYDE S. SANDERS (to Midwest Reining Co.). U. S. 1,720,294, July 9. Structural features.

**Thermostat suitable for control of electric circuits.** JOHN J. FAGAN. U. S. 1,721,012, July 16. Structural features.

**Thermostatic control device for electric circuits.** ÉTABLISSEMENTS POULENC FRÈRES and A. CHAGNAUD. Brit. 302,454, Oct. 28, 1927.

**Thermostatic cut-outs, etc., for electric circuits.** CUTLER-HAMMER MFG. Co. Brit. 302,840, Dec. 28, 1928. Structural features.

**Thermostatic and electric control system for heating systems.** PARKER DODGE. U. S. 1,720,723, July 16.

**Thermostatic and electric system for controlling burners used for heating baths such as molten metal for coating wire.** RALPH W. NEWCOMB (to Charles Engclhard, Inc.). U. S. 1,720,231, July 9.

**Thermostatic control for gas ovens.** G. KROMSCHRÖDER A.-G. Brit. 302,327, Dec. 15, 1927. Structural features.

**Thermostatic control for the valve of gas burners.** S. J. LONERGAN and H. E. GINTHER (to Bastian-Morley Co.). Brit. 302,735-6, May 28, 1927. Structural features.

**Thermostatic regulator for heating plants.** EMIL T. JOHNSON. U. S. 1,720,792, July 16. Structural features.

**Thermostatic device suitable for controlling valves.** RALPH L. SKINNER (to Skinner Automotive Device Co.). U. S. 1,721,321, July 16. Structural features.

**Thermostatic air control for radiator valves, etc.** ALEXANDER A. RICCIO. U. S. 1,720,572, July 9. Structural features.

**Thermostat suitable for use with die blocks for molding rubber.** LEE P. HYNES and HARRY A. WILLIAMS (to Hynes & Cox Elec. Corp.). U. S. 1,720,837, July 16. Structural features.

## 2—GENERAL AND PHYSICAL CHEMISTRY

FREDERICK L. BROWNE

George C. Stone. H. S. WARDNER. *Ind. Eng. Chem.* 21, 798(1929). E. H.  
Arnoldo Piutti. GUIDO PELLIZZARI. *Gazz. chim. ital.* 59, 225-31(1929).—An obituary. C. C. DAVIS

Charles Mayer Wetherill, 1825-1871. II. EDGAR F. SMITH. *J. Chem. Education* 6, 1215-24(1929); cf. *C. A.* 23, 3607. E. H.

Remsen at the turn of the century. FRIEND E. CLARK. *J. Chem. Education* 6, 12<sup>a</sup> 5(1929). E. H.

Hundredth anniversary of the death of Sir Humphry Davy, discoverer of potassium, May 29, 1929. A. BINZ. *Ernähr. Pflanze* 25, 217-9(1929). L. P. M.

The Alembic Club and the history of chemistry. LEONARD DOBBIN. *J. Chem. Education* 6, 1225-9(1929). E. H.

The history and present status of the Jaber problem. JULIUS RUSKA. *J. Chem. Education* 6, 1266-76(1929).—A contribution to the history of alchemy. E. H.

Selecting a chemistry textbook. C. H. NETTELS. *J. Chem. Education* 6, 1331-4(1929). E. H.

An experiment in chemical education at Yale. JOHN A. TIMM. *J. Chem. Education* 6, 1316-20(1929).—An outline is given of a chemistry course designed for students whose major interests are outside of chemistry. E. H.

Chemical education in sixty-nine state teachers' colleges and normal schools. E. F. WALKER. *J. Chem. Education* 6, 1328-30(1929). E. H.

The fifth census of graduate research students in chemistry, 1928. CLARENCE J. WEST and CALLIE HULL. *J. Chem. Education* 6, 1338-40(1929); cf. *C. A.* 22, 3558. E. H.

Testing laboratory technic in high-school chemistry. KIMBER M. PERSING. *J. Chem. Education* 6, 1321-7(1929). E. H.

President's address—science and labor. ARTHUR D. LITTLE. *J. Soc. Chem. Ind.* 48, 161-7T(1929). E. H.

Some approaches to fundamental theory of the physical sciences. J. M. BELL. *J. Fishu Mitchell Sci. Soc.* 44, 53-62(1928).—A discussion of the relationships existing between various chemical and physical laws. A. L. MEHRING

Topochemical reactions. V. KOHLSCHÜTTER. *Helv. Chim. Acta* 12, 512-29(1929). The term is defined and examples are cited from previous work. Chem. phenomena are divided into topochem. and kinetic, or into localized (as at crystal surfaces) and space reactions. Cathodic sepn. of metals is a case of the topochem. type. The topochem. action of formation of  $\text{Cu}(\text{OH})_2$  by the treatment of solid basic Cu salts with  $\text{NaOH}$  is fully illustrated with photomicrographs and x-ray diffraction patterns. G. L. CLARK

Determination of the organic matter in sea water. OLIMPIO G. IBÁÑEZ. *Inst. español oceanografía Notas y resúmenes Ser. II, No. 26*, 10 pp.(1928).—Tables give the following data for numerous samples of sea water: location, time, depth, temp. of the water and of the air,  $d_4$  of the water, amt. of  $\text{O}_2$  per l., amt. of org. matter (in mg. O per l., as obtained by  $\text{KMnO}_4$  titration), % Cl and ratio of org. matter to  $\text{O}_2$ . A. L. H.

The influence of temperature on the composition of the atmosphere in the uppermost layers. HELGE-PETERSEN. *Physik. Z.* 29, 879-84(1928).—If a static diffusion equil governed the ratio of the constituents of the atm. in the higher strata, He alone should exist above about 200 km. However, no He lines are found in the spectrum of the aurora borealis. Also, the total He content of the atm., calcd. from its partial pressure at the earth's surface, on the assumption of a diffusion equil., appears too small compared to the amt. known to be issuing from the earth. The dissipation of He into space, as a result of the thermal agitation of the mols., has previously been rejected because the temp. of the stratosphere appeared much too low. Since newer investigations indicate that temp. may increase again at high altitudes, the concn. of He has been calcd. on the basis of a "stationary streaming equil." instead of a static diffusion equil. The newer

result indicates that the He concn. decreases more rapidly with height and vanishes at the altitude of the aurora. In spite of uncertainties in the kinetic theory and in the amt of He issuing from the earth, the result is considered to afford a probable explanation of the absence of He at high altitudes. The possibility is pointed out that He atoms may be dissipated as a result of collisions with corpuscular radiation from the sun without raising the higher strata of the atm. to the high temps. necessary according to the kinetic theory of gases.

MERRILL W. SEYMOUR

**The law of periodicity.** P. PETRENKO-KRITCHENKO, A. RAVIKOVICH, V. OPOTZKII, E. PUTYATA AND M. D'YAKOVA. *J. Russ. Phys.-Chem. Soc.* **61**, 29-40(1929).—In previous communications (*C. A.* **22**, 3574; **23**, 3134) P. pointed out that the curves of activity of org. halides are to a certain extent independent of the individual character of the reagents and of considerable fluctuations of temp. and concn. This is confirmed by the circumstance that Tronov's expts. (*C. A.* **22**, 2737), which were carried out at much higher temps. and without solvents, show, nevertheless, the same relative activities of pyridine and piperidine as those obtained by P. under totally different conditions, the solvent and temp. evidently have but an insignificant influence on the character of the curves. It is, therefore, certain that the curves studied really express the relative affinities. The study of the reactions of org. halides with colloidal Ag gave an important result; the curves obtained were practically identical with those obtained in the reactions of halides with KOH,  $\text{NMe}_4\text{OH}$ ,  $\text{NEt}_4\text{OH}$ ,  $\text{Ba(OH)}_2$ ,  $\text{TlOH}$  and  $\text{NaOEt}$ . Wherever there is a deviation of the curves, it must be attributed to the appearance of new chemical forces. The unchanged character of many curves on passing from methane derives to those of ethane, as well as on introducing Ph and COOH in methane compounds, and the similarity of action of widely different alkalies, alcoholates and Ag, show that the most important factor detg. the character of the curves is the rupture of the link between C and the first halogen atom. The substitutions and fissions consequent to this rupture have but a secondary part. Diagrams of curves, tables and descriptions of expts. are given.

BERNARD NELSON

**Chemical valency considered as an electrostatic phenomenon. VIII.** A. E. VAN ARKEL AND J. H. DE BOER. *Chem. Weekblad* **26**, 326-30(1929); cf. *C. A.* **23**, 3384

F. DE LEEUW

**Reactions of atomic hydrogen. I. Behavior toward ethylene.** ALFONS KLEMENS AND FRANZ PATAT. *Z. physik. Chem.*, Aht. B, **3**, 289-98(1929).—The action of atomic H, prepd. by the resonance method, upon  $\text{C}_2\text{H}_4$  is not smooth. Hydrogenation occurs to about 30%. Also  $\text{C}_2\text{H}_4$  can be dehydrogenated to  $\text{C}_2\text{H}_2$ , an intermediate product, then polymerization takes place, the product being a very volatile liquid with a petroleum-like odor. When the product takes up no more H, it appears to have the power of absorbing great quantities of  $\text{O}_2$  and the formation of an alc. is indicated. A diagram of the app. with data for 10 expts. is given.

MARY E. LEAR

**Measurements of the equations of state of solid argon.** FRANZ SIMON AND FRIEDA KIPPERT. *Z. physik. Chem.* **135**, 113-28(1929).—The value of  $\gamma$ , which is of importance in the detn. of the equation of state, was detd. by a direct method. To det. the thermal pressure of A and other gases at const. vol. the gas was condensed at very low temp. in a brass container, the container then closed and heated a few degrees. The increase in pressure was detd. by means of a manganin resistance manometer. The value of  $\gamma$  is calcd. from the thermal pressure from  $\gamma = [(\partial p/\partial T)_v \times V]/C_v$ . The following are values of the thermal pressure obtained, expressed in atm./degree abs.: solid A 38, between 72.0-85.0° abs.; liquid A 25, between 84.5-90.1° abs.; solid  $\text{CH}_4$  28, between 67.0° and 90.1° abs.; liquid O 24, between 67.0° and 90.1° abs.; liquid N 24, between 68.0° and 77.0° abs. The d. of solid A at 76° abs. was found to be 1.505, by 2 different methods. The calcd. compressibility ( $K$ ) in abs. units is for liquid A  $180 \times 10^{-12}$  at 86° abs., for liquid O  $169 \times 10^{-12}$  at 82° abs.; for liquid N  $247 \times 10^{-12}$  at 75° abs. The calcd. value for  $\gamma$  is 4.5, which is in accordance with the value obtained by Simon and v. Simson. Because of its high  $\gamma$  value, solid A is a very suitable material for the detn. of the zero-point energy.

J. A. SZILARD

**The density, compressibility and atomic weight of argon. II.** GREGORY P. BAXTER AND HOWARD W. STARKWEATHER. *Proc. Natl. Acad. Sci.* **15**, 441-4(1929).—A redetn. of the densities of A yielded a value for the normal d. 1.8394 and the limiting d. 1.78204. The at. wt. of A is 39.944 as found previously (*C. A.* **22**, 1503).

G. B. TAYLOR

**Fundamental atomic weights. VIII. The atomic weights of silver and barium.** Analyses of barium perchlorate. O. HÖNIGSCHMID AND R. SACHTLEBEN. *Bayer Acad.*, Munich. *Z. anorg. allgem. Chem.* **178**, 1-32(1929); cf. *C. A.* **23**, 3382. Prepn. of pure  $\text{Ba(ClO}_4)_2$  is described and methods used to change it to  $\text{BaCl}_2$  by heating. The

Cl is detd. by Ag and from detns. made the at. wts. are given: Ag 107.880; Ba 137.355 and Cl 35.457. R. C. ROBERTS

**Periodic phenomena at the anode.** WOLF JOHANNES MÜLLER. *Z. Elektrochem.* 34, 850-2(1928).—Criticism of Strauss and Hinnüber (*C. A.* 23, 3393). Their explanation of passivity on the basis of the  $O_2$  theory is refuted by M.'s previously published expts. (cf. *C. A.* 21, 3526, 3784; 22, 3090, 4346). Remark on the paper by W. J. Müller. J. HINNÜBER. *Ibid* 852-3.—Answer to the criticism of Müller. ALBERT L. HENNE

**The anode reactions of fluorine.** NEWTON C. JONES. *J. Phys. Chem.* 33, 801-24 (1929).—F by virtue of being the most electroneg. of all known chem. agents is shown to be capable of duplicating by purely chem. means any electrochem. anode process or any oxidation process using any other oxidizing agent. A Mg cell is described by which large amounts of F can be prepd. by the electrolysis of molten  $KHF_2$ . F is found to effect the formation of persulfate from acid sulfate solns.; perphosphate, percarbonate, and perborate from the corresponding phosphates, carbonates and borates; hydrogen peroxide from alkali, and ethane from potassium acetate soln.; it oxidizes cobaltous, chromic, manganous and plumbous salts to salts contg. the metal with a higher valence. A critical discussion of the literature pertaining to the above reactions is given. In general the chem. action of F on solns. is the same as the electrolytic anode reaction plus any disturbances due to the HF formed. P. H. EMMETT

**Pure iron and allotropic transformations.** T. D. YENSEN. *Am. Inst. Mining Met. Eng. Tech. Pub. No.* 185, 3-16(1929); cf. *C. A.* 23, 2332. G. L. CLARK

**Question of iron activity.** A. SIMON AND K. KÖTSCHAU. *Süddeut. Apoth. Ztg.* 69, 3-5(1929).—Polemical. W. O. E.

**Berthollet's detonating silver and the formation of silver mirrors.** FRITZ BAUM. *Chem.-Ztg.* 53, 354, 374(1929).—Berthollet called attention to the dangerous properties of detonating Ag 140 years ago. The use of dil. stock solns. is recommended for safety. It is suggested that detonating Ag is an unstable isomeric form of some  $Ag_2O-NH_3$  complex, rather than  $Ag_3N$ ,  $Ag_2O \cdot 2NH_3$  or  $AgNH_2$ . There seems to be little connection with detonating Hg, Pt and Au. The use of  $SnCl_2$  soln. in making silver mirrors probably causes the fixation of Sn ions by exchange with some materials in the glass, and then these act catalytically and as nuclei in causing the deposition of Ag. In spite of advances in the knowledge of Ag reactions in photography, and of colloidal conditions of the noble metals, the chemistry of silver mirror formation is still unexplained. W. C. EBAUGH

**Comparison of Corbino and Hall effects in silver and brass.** K. K. SMITH AND H. M. O'BRYAN. *Phys. Rev.* 31, 149(1928). E. J. C.

**The preparation of a single-crystal tungsten rod from tungsten powder.** IMRE TARIÁN AND PÁL TÓRY. *Chem. Rundschau Mitteleuropa u. Balkan* 4, 165-8(1927); *Chem. Zentr.* 1928, I, 237-8.— $WO_3$  powder contg. 1.5 to 2%  $ThO_2$  was reduced in an atm. of  $H_2$  at 700-950°. After reduction the 85-g. ingot was heated for a short time at a temp. near the m. p. Crystn. took place in cylinder fashion from the inside to the outside. FRANCIS P. GRIFFITHS

**The mutual dependence of atomic bonds.** FR. EBEL AND E. BRETSCHER. *Helv. Chim. Acta* 12, 450-63(1929).—The heat tone of the reaction  $2PF_3 + O_2 = 2POF_3$  is detd. as an example of the rare type  $AC + B = ACB$ . The following data are obtained partly by calcn. and partly by expt., on heats of formation: 1.  $[P] + 3(Cl) = (PCl_3) + 155.0$  kg.-cal.; 2.  $(PCl_3) + \frac{1}{2}(O_2) = (POCl_3) + 63.3$ ; 3.  $[P] + 3(F) = (PF_3) + 286$ , from extrapolation from  $PBr_3$  and  $PCl_3$  and from  $PCl_3$ ,  $SbCl_3$  and  $SbF_3$ ; 4.  $(PF_3) + \frac{1}{2}(O_2) = (POF_3) + 70.6$ . The last step is measured with a new gas calorimeter, which is described in detail. G. L. CLARK

**The true strength of bonds in polyatomic molecules.** FR. EBEL AND E. BRETSCHER. *Helv. Chim. Acta* 12, 443-9(1929).—The strength of the C-O bond from  $C + 2O = CO_2 + 398.3$  kg.-cal. is  $398.3/2 = 199.2$ . The strength of the C-S bond from  $CS_2$  is  $263.3/2 = 131.7$ . The energy of formation of COS should be  $199.2 + 131.7 = 330.9$ , while the actual value is 327.0. For the splitting of S from COS the value is 76.9, which is only half as great as the value predicted by Fanjans, namely the 131.7 above. Hence the S in COS is bound only half as strongly as in  $CS_2$ . Similarly the energy of formation of  $COCl_2$  can be calcd. on the assumption that O is bound as in  $CO_2$  and Cl as in  $CCl_4$ :  $C-O = 199.2$ ,  $C-Cl = 280.8/4 = 70.2$ ,  $COCl_2 = 199.2 + 2 \times 70.2 = 339.6$ , found 331.2. But in the direct splitting of Cl the value is 83.2 instead of the expected 140.4. The theory and calcs. of Fajans are criticized. G. L. CLARK

**Molecular motions in rarefied gases.** ERNEST RUTHERFORD. *Engineering* 127, 319-21; cf. *C. A.* 23, 3609.—This is a review of the kinetic theory of gases as applied to the motion of a gas at very low pressures, how heat is transported at these low

pressures and from one surface to another, thermal transpiration, the radiometer and the condensation of vapors and gases at cooled surfaces. F. V. J., Jr.

**Molecular dimensions of organic compounds. I. General considerations.** T. M. LOWRY AND A. G. NASINI. *Proc. Roy. Soc. (London)* A123, 686-91 (1929).— $C_6H_6$  was compared in phys. properties with  $C_6H_5S$ ,  $PhMe$  with  $\alpha-MeC_6H_5S$ , and  $C_6H_6$  with cyclohexane. Collision areas are altered about 10% when 2 CH groups are replaced by S; in each case, however, a const. decrement of 2 sq. A. U. is observed. The replacement of H by Me shows an increment of 3 sq. A. U.; and replacing CH by N ( $C_6H_6$  to  $C_6H_5N$ ) gives an increment of 1 sq. A. U. Identical properties were not found, but regular increments in the properties were observed to be the rule on passing from one series to another. Properties dependent upon the force fields as well as dimensions of the mols. gave wider differences. **II. Viscosity of vapors: benzene, toluene and cyclohexane.** A. G. NASINI. *Ibid* 692-704. **III. Viscosity of vapors: thiophene and  $\alpha$ -methylthiophene, pyridine and thiazole.** *Ibid* 704-13.—By means of the Smith modification (C. A. 19, 592) of Rankine's viscometer, vapor viscosities ( $\eta$ ) were detd. for  $C_6H_6$  (I),  $PhMe$  (II), cyclohexane (III),  $C_6H_5S$  (IV),  $MeC_6H_5S$  (V),  $C_6H_5N$  (VI) and  $C_6H_5NS$  (VII). From these data, *Sutherland's const.* (S) and the mean collision areas (A) were calcd. The following values are given for I:  $\eta_{0.684} \times 10^{-1}$ ,  $\eta_{100} 0.94 \times 10^{-4}$ , S 380, A 19.0 sq. A. U.; for II:  $\eta_{0.8} 0.789 \times 10^{-4}$ , S 370, A 21.8 sq. A. U.; for III:  $\eta_{11.4} 0.820 \times 10^{-4}$ , S 330, A 22.3 sq. A. U.; for IV:  $\eta_{0.2} 1.031 \times 10^{-4}$ , S 407, A 16.7 sq. A. U.; for V:  $\eta_{0.965} \times 10^{-4}$ , S 400, A 19.9 sq. A. U.; for VI:  $\eta_{0.2} 0.958 \times 10^{-4}$ , S 320, A 20.0 sq. A. U., and for VII (provisional)  $\eta_{99.4} 1.161 \times 10^{-4}$ . Values for other temps. over a wide range are given in tables and curves. A. S. CARTER

**Configuration of quadrivalent atoms.** T. M. LOWRY. *Proc. Cambridge Phil. Soc.* 25, 219-21 (1929).—The tetrahedral configuration of le Bel and van't Hoff is contrasted with the octahedral configuration of Werner. The dimethyltelluronium dihalides are cited as examples of quadrivalent Te representable by a tetrahedral model. Werner's statement that radicals ( $MA_4$ ) are results of "octahedrally conceived radicals ( $MA_6$ ) by loss of two groups A but with no function change in the acid residue" is incorrect. Such a change may result in a new configuration.  $SnI_4$  has a tetrahedral structure, while  $(NH_4)_2(SnCl_6)$  is octahedral. The configurations of salts of Pt, Pd, Zn and others are discussed, and it is asserted that both atomic structures, planar and tetrahedral, are possible, such as the tetrahedral anion of  $K_2(ZnCN_4)$  and the planar  $K_2(PtCl_6)$ . Many references are given. WILLIAM E. VAUGHAN

**Observations and investigations on the electric moments of molecules and the method of determining these moments.** G. B. BONINO AND PIERO CELLA. *Gazz. chim. ital.* 59, 79-105 (1929).—Following a discussion of the importance of the elec. moments of mols. in problems of mol. structure, critical examn. is made of methods based on measurements of dielec. consts. which have been used for detg. these elec. moments. Special attention is called to the value of the const. of the intermol. field, showing certain contradictions that result from the use of the classic value of this const. Expts are then described, the object of which was to utilize the elec. moments for the derivation of consts. of the internal field for 2 liquids, viz.,  $CCl_4$  and  $C_2Cl_4$ . The values obtained are at variance with the classic value, but they are confirmed by the better agreement, resulting from the introduction of the new consts., between the exptl. data and the Debye theory of the dependence of dielec. consts. on the temp. of a liquid. C. C. DAVIS

**Magnetic susceptibility in weak fields.** J. KOENIGSBERGER. *Z. Physik* 54, 511-7 (1929).—A small magnet located in a medium of susceptibility,  $K_1$ , is acted upon by a force if a surface of another medium,  $K$ , is brought near. The arrangement may serve after calibration for the detn. of  $K$ . GEORGE GLOCKLER

**Electric moment of ethylene chloride and ethylidene chloride.** P. N. GHOSH, P. C. MAHANTI AND D. N. SEN-GUPTA. *Z. Physik* 54, 711-4 (1929).—The elec. moment of  $(CH_2Cl)_2$  is  $1.567 \times 10^{-18}$  and of  $CH_3CHCl_2$  is  $2.045 \times 10^{-18}$  e. s. u. Cf. Sircar, C. A. 23, 2333. GEORGE GLOCKLER

**Electrostriction by dissolved dipolar molecules.** GERHARD JUNG. *Z. physik. Chem., Abt. B*, 3, 204-8 (1929).—A mathematical discussion of electrostriction, the contraction of a liquid in a condenser when it is charged, shows that electrically neutral, dipolar mols. have the same order of magnitude of influence as ions. Published data of Tammann's on the internal pressures of electrolytic and non-electrolytic solns. are qualitatively in accord with this, as is also the behavior of  $ClCH_2COOH$  in  $H_2O$  and of EtOH and amyl acetate in  $C_6H_6$ . A. W. KENNEY

**Molecular theory of crystals.** K. WEISSENBERG. *Z. physik. Chem., Abt. A*, 139, Haber Bd., 529-83 (1928).—The fundamental conception of mols. in vapor, soln. and crystal are outlined. The Schoenflies-Federov symmetry rule governs not only the



morphological and phys. properties of the crystal but also its chem. constitution. A guiding lattice hypothesis (Leitgitterhypothese) is presented as the equivalent for crystals of Avogadro's hypothesis for ideal gases and solns. The crystal mol. is the largest particular group whose symmetry elements do not include translations. The no. of such groups possible in a given space group is geometrically fixed by the known symmetry elements of the space group. A table is given for 459 elements and for inorg. and org. compds. of detd. space groups, showing that with 58 exceptions the crystal mol. is identical with the ordinary chem. mol. Polymerization is believed to account for 44 exceptions, and may account for the 14 others in which the crystal mol. is a small integral multiple of the ordinary chem. mol. G. L. CLARK

The crystal structure of acetamide. O. HASSEL AND N. LUZANSKI. *Z. physik. Chem., Abt. B*, 3, 282-8(1929).—Data are given for the x-ray analysis of the crystal from which it is deduced that the form is rhombohedral of the type  $C_{3v}^6$ . Interpretation of the data according to Weissenberg (cf. preceding abstr.) shows that the mol. unit is  $3CH_3CONH_2$  and is, in that sense, polymerized. HELEN GILLETTE WEIR

Crystal-structure types. JOHN W. GRUNER. *Am. Mineral.* 14, 173-87(1929).—The recent investigations of crystal-structure types by V. M. Goldschmidt and others are presented in condensed form. Structure types and their valence coordinate bonds are discussed and illustrated. Morphotropism, polymorphism, the formation of radicals due to deformability of ions and the effects of counter-deformability are explained with the aid of simple structure types. A. M. BRANT

A table of possible reflecting planes in cubic crystals. I. W. MCKEEHAN. *Am. J. Sci.* [5], 17, 548-56(1929).—In order to facilitate the computation of the parameter from data resulting from measurements of the diffraction pattern a table was compiled which gives values of  $Q^2$  from 1 to 360 where  $Q^2 = h^2 + k^2 + l^2$ , ( $hkl$ ) the Miller indices of the plane, values of  $\log 1/Q$  to 5 decimal places, a value of  $z$  for each ( $hkl$ ) where  $z$  is the relative no. of planes of each form in holohedral crystals, and letters  $B, F, D$ , to indicate which values of  $Q^2$  remain of account in body-centered, face-centered and diamond-like arrangements. H. W. WALKER

The determination of crystallographic constants in the triclinic system. A. L. PARSONS. *Am. Mineral.* 14, 154-9(1929).—Formulas and graphical methods are given, by which a high degree of accuracy can be obtained. A. M. BRANT

Spiral markings on carborundum crystals. ALAN W. C. MENZIES AND C. A. SLOAT. *Nature* 123, 348-9(1929).—A photograph and a description are given of spiral markings on smooth hexagonal basal pinacoid surfaces of carborundum crystals. G. L. C.

The possible dissymmetry of etch figures obtained with an active isotropic liquid. L. ROYER. *Compt. rend.* 188, 1176-8(1929).—Friedel's conclusion that the form of etch figures is detd. by the symmetry of the soln. as well as by that of the crystal is confirmed. Hot concd. racemic and inactive tartaric acid solns. produced etch figures on the cleavage faces of calcite which were symmetrical with respect to the trace of the planes of symmetry of the crystal whereas the etch figures with *d*- and *l*-tartaric acid solns. were dissymmetrical. Etch figures with *d*- and *l*-tartaric acid separately on the same face were enantiomorphous and those resulting from the attack by either acid on the six rhombohedron faces were the same for any two opposite faces as (100) and ( $\bar{1}00$ ). Such figures were symmetrical with respect to the binary axes of symmetry of the crystal. The symmetry of calcite according to the action of active acids is  $A^3, 3L^2$  (Bravais) and according to the inactive acids  $A^3, 3L^2, C, 3P$ , the latter being the true symmetry. In each of several other cases where the soln. of the etching agent was active the etch figures were dissymmetrical with respect to the crystal planes of symmetry and symmetrical where the solns. were inactive. H. W. WALKER

The corrosion of a crystal of dolomite by an active isotropic liquid. L. ROYER. *Compt. rend.* 188, 1303-5(1929); cf. preceding abstr.—Etch figures on a dolomite crystal obtained with inactive org. acids are in accord with the true crystal symmetry of one trigonal axis and a center of symmetry, whereas those with active org. acids are such as to attribute only a ternary axis of symmetry to dolomite. Hot concd. solns. of the inactive acids, *dl*-tartaric, mesotartaric, maleic, glyceric, pyruvic, mucic, levulinic and camphoric, gave identical etch figures on the three faces at either end of the trigonal axis and enantiomorphous figures on opposite faces as (100) and ( $\bar{1}00$ ). Solns. of the active org. acids, tartaric, maleic, aspartic, glucosic, and the amino acids, alanine and leucine, produced identical etch figures on the faces (100), (010) and (001) and on the opposite faces ( $\bar{1}00$ ), ( $0\bar{1}0$ ), ( $00\bar{1}$ ). The figures on (100) and ( $\bar{1}00$ ) were no longer enantiomorphous. These results further confirm Friedel's conclusion. H. W. WALKER

Lattice constant of gypsum. SR. V. FRIESEN. *Z. Physik* 54, 679-85(1929).—

Various samples show the same lattice const. to within 0.004%. Cf. *C. A.* 23, 555.

GEORGE GLOCKLER

The elastic constants, lattice constants and densities of metallic solid solutions. ZENJI NISHIYAMA. *J. Study of Metals* 6, 17-41(1929).—The binary solid solns. of Ni, Si, Al, Co, V, W, Cr and Mn with Fe, of Al, Sn, Zn, Mn and Ni with Cu, of Fe and Cu with Ni, and of Zn and Mn with Al were examd. for elastic const., lattice const. and the d. The value of the sp. gr. as detd. by expt. and that calcd. from the x-ray data on the assumption of simple substitution are in good agreement. The change of elastic const. with compn. is very small; so the elasticity has no direct bearing upon the change of hardness due to the formation of solid soln. With a few exceptions the change of at. vol. is parallel to the change of elastic const. Particularly with alloys of the Cu-rich solid solns. the relation can be deduced mathematically.

K. SOMEYA

X-ray investigation of palladium-silver-hydrogen alloy. I. ATOMI OSAWA. *J. Study of Metals* 5, 443-54(1928).—Pd and Ag both have face-centered cubic lattice, with the lattice const. 4.069 A.U. and 3.86-3.874 A.U., resp., and form a solid soln. for all ranges of compn. The relation between the lattice const. and the concn. deviates only slightly from a straight line. Pd absorbs  $H_2$  well on electrolysis, and when satd. with  $H_2$  the lattice const. becomes larger by 3.6-3.87%. Some authors report the formation of the compd.  $Pd_2H$ , but O. considers that it is rather a solid soln. of  $H_2$  in the Pd lattice. Pd-Ag alloys also absorb  $H_2$  well; at 150° the 40% Ag alloy has the greatest absorptive power, the quantity of  $H_2$  absorbed being greater than at ordinary temp. When the Pd-Ag alloy is made to absorb  $H_2$  by electrolysis, the expansion coeff. of the alloys begins to increase from 30% Pd with the increase of Pd content, showing a max. expansion at 100% Pd.

K. SOMEYA

X-ray contributions to the problem of polymerization. GEO. L. CLARK. *Ind. Eng. Chem.* 21, 128-33(1929).—Mention is made of substances in which several mols. associate in the unit crystal cell. X-ray data on rubber, silk, cellulose, etc. show the presence of a small cell or unit of structure, contg. comparatively few mols. of the parent substance. The work of Hengstenberg and Ott on polyoxymethylenes (*C. A.* 22, 728, 1879) shows that this unit cell may contain less than one macromol., though for the lower polymers the length of the macromol. can be measured. The polyoxymethylenes, cellulose, rubber, etc. are long-chain mols., extending through many unit cells, and built by a repetition of identical structure units. This accounts for the presence of a small unit cell. This cryst. structure in the case of rubber appears only on stretching. The unit cell contains 8  $C_6H_8$  groups. Detns. of line breadth and particle size are valuable in studies of regenerated cellulose. X-ray studies on liquids show the possibility of detg. the degree of assocn. The principal spacings of many polymers are the same as those of the parent substance, but the appearance of an inner diffraction ring, corresponding to a large spacing, is characteristic of polymerized substances. G. L. CLARK

The nature of dextrin, gelatin and sodium oleate solutions as revealed by x-ray diffraction. P. KRISHNAMURTI. *Indian J. Physics* 3, 307-29(1929); cf. *C. A.* 23, 1348.—Dextrin, gelatin and sodium oleate were examd. both in the solid state and in aq. solns. at different concns. with monochromatic x-rays by the method of Debye and Scherrer, cutting out the central beam in the expts. Dextrin gave patterns similar to those of the sugars, resembling particularly those for glucose, the hydrolysis product of dextrin. In dil. solns. dextrin gave rise to gaseous scattering at small angles and the calcd. mol. wt. by the Bragg formula was about 600. Highly purified gelatin at concns. up to 1:1 by wt. showed gaseous scattering at small angles and its mol. wt. came to 3000. Sodium oleate solns. up to 1:3 by wt. and down to 1:7 showed a sep. ring just below the water ring, which is believed to be due to the presence of micelles of sodium oleate contg. several simple mols. arranged parallel to one another. A gaseous scattering at small angles and a general scattering inside the water halo were observed. The latter was probably due to Na and OH ions produced by hydrolysis. An excess of scattering adjoining the central spot was probably due to groups of McBain's "ionic micelles." An intense ring at very small angles in addn. to the rings at larger angles appeared in the patterns for powdered gelatin and starch. Three plates of patterns are given.

H. W. WALKER

X-ray diffraction in liquid mixtures. P. KRISHNAMURTI. *Indian J. Physics* 3, 331-55(1929); cf. *C. A.* 23, 1348.—Aq. binary liquid mixts. of phenol,  $Me_3COH$ , piperidine, pyridine, butyric acid, EtOH, glycerol and lactic acid were investigated by means of the  $K_\alpha$  radiation of Cu. Wyckoff's conclusion that the pattern for the mixt. is a superposition of those due to its components is not valid. A very dil. soln. gave a pattern consisting of the water ring and a general scattering inside the ring as in dil. sugar solns. With phenol,  $Me_3COH$  and piperidine in more concd. solns. rings due to the two com-

ponents existed separately for the mixt. With glycerol, EtOH and lactic acid in concd. solns. only one ring was observed, the water ring having contracted and the ring due to the liquid having expanded. In pyridine solns. the pyridine ring had expanded, but the water ring was in the same position. Only one broad ring was found for a soln. of butyric acid. The difference between the two classes of solns. is believed to be due to the difference in attractive forces between similar and dissimilar mols. in the mixts. The non-aq. mixts. of Me salicylate and *o*-nitrobenzaldehyde, and aniline and cyclohexane gave the same patterns as for the pure liquids. But with the dissimilar mols. of cyclohexane and Me salicylate a different pattern was obtained for the mixt. In the aq. solns. the presence of groups contg. several mols. is postulated. The x-ray patterns are pictured.

H. W. WALKER

**Hydrodynamics and the kinetic theory of gases.** Y. ROCARD. *Compt. rend.* 188, 453-4(1929); cf. *C. A.* 23, 1542.—One has a perfect or viscous fluid if the function of distribution of mol. speeds is that of Maxwell or near it; the equations of movement can only be those of Stokes. The problem of interaction of liquids or gases with moving solids must be studied from the kinetic rather than from the classical theory.

E. G. VANDEN BOSCHE

**The equations of state and thermodynamics.** VASILESCO-KARPEN. *Compt. rend.* 188, 496-8(1929); cf. *C. A.* 23, 1792.—A reply to Verschaffelt's criticism of a paper by K. showing that the Maxwell-Clausius relation and Clapeyron's equation can be derived from van der Waals' equation without using the second principle of thermodynamics.

E. G. VANDEN BOSCHE

**The critical state. II. Limiting curve of ethyl ether.** ERICH SCHRÖER. *Z. physik. Chem., Abt. A*, 140, 241-53(1929); cf. *C. A.* 22, 341.—The temp.-d. curve of Et<sub>2</sub>O in the crit. region is detd. by a new app. permitting observations for wide vol. limits. Within the limits of *d* from 0.23 to 0.29 change from the 2-phase to a 1-phase system is independent of the mean *d*. The following values are obtained: *t<sub>c</sub>* = 193.4 ± 0.15°, *p<sub>c</sub>* = 36.15 ± 0.05 kg./sq. cm., *d<sub>c</sub>* = 0.265 ± 0.004 g./cc. The influence of stirring and of adiabatic dilatation and compression on crit. opalescence is attributed to an emulsion of 2 phases before the actual temp. of miscibility is reached. The nature of the temp.-d. curve is explained by the crit. isotherm. **III. Behavior of ethyl ether under isothermal compression in the critical and hypercritical region.** *Ibid* 379-90.—The isotherms of Et<sub>2</sub>O are detd. from 185° to 250° and 30 to 75 kg./sq. cm., and the following values obtained: *t<sub>c</sub>* = 194.6 ± 0.3°, *p<sub>c</sub>* = 36.7 ± 0.2 kg./sq. cm., *v<sub>c</sub>* = 3.77 ± 0.02 cc. The coeff. of compressibility, *β*, calcd. from the diagram of state rises to a sharp max. at a definite pressure; the max. becomes flatter with rise in temp. but still exists at 250°, the position altering only slightly with temp. The variation of *β* with vol. may be represented by van der Waals' equation.

G. L. CLARK

**Fluorine-chlorine, an explosive, gaseous mixture.** KARL FREDENHAGEN AND OSWALD T. KREFFT. *Z. physik. Chem., Abt. A*, 141, 221-2(1929).—The combination of F. with Cl<sub>2</sub> is a strongly exothermic reaction, the heat of reaction being greater than for the combination of Cl<sub>2</sub> with H<sub>2</sub>.

L. B. MILLER

**A problem offered by N. S. Kurnakov (fusion curves of binary systems).** N. V. LIPIN. *Ann. inst. anal. phys.-chem. (Leningrad)* 4, 39-47(1928).—In a study of the m-p curves at various degrees of dissocn. of two component systems which form a compd., Kurnakov encountered a problem which may be described as follows: Given two intersecting curves  $Y = \varphi_1(X)$  and  $Y = \varphi_2(X)$  where  $\varphi_1$  and  $\varphi_2$  are continuous and single-valued functions of *X*. Find a general equation  $F(X, Y, K) = 0$  contg. an arbitrary parameter *K* of a system of curves such that at *K* = 0 the equation should represent the two curves  $\varphi_1(X)$  and  $\varphi_2(X)$ ; at *K* > 0 the equation should give a concave downward curve lying below the intersecting branches of  $\varphi_1(X)$  and  $\varphi_2(X)$  and with increase of *K* the curve should continuously change its shape but at all times satisfy the stated condition. The equation obtained was  $\nu = [(\varphi_1 + \varphi_2)/2] - \sqrt{[(\varphi_1 - \varphi_2)^2/4] + k(\varphi_1 - \varphi_2)(\varphi_2 - \varphi_1) - R}$  where  $\varphi$  is any function of *X*, and where *R* is a definite continuous function that satisfies the equation  $R(x, 0) = 0$ ;  $R(x, 1) = 0$  and the inequality  $-(1 - k)(\varphi_1 - \varphi_2)(\varphi_2 - \varphi_1) < R < 1 < (\varphi_1 - \varphi_2)(\varphi_2 - \varphi_1)$ , which does not fluctuate sharply when the parameter *K* remains const. and the abscissa *X* varies within the given interval. REA MAIZEL

**Expressing the different curves of the melting point of a binary mixture by one general equation.** N. V. LIPIN. *Ann. inst. anal. phys.-chem. (Leningrad)* 4, 48-58(1928); cf. preceding abstract.—Each of the four branches of the phase diagram (or m-p curves) of two-component systems in which a compd. is formed can be expressed by an exponential equation of Shreded  $\log x = (Q/2)[(1/t_0) - (1/t)]$ . Basing his conclusions on this assumption L. shows that his equation discussed in the previous article can

be reduced to  $t = [(\varphi_1 + \varphi_2)/2] - \sqrt{[(\varphi_1 - \varphi_2)^2/4] + KR}$ , where  $\varphi_1 = Q_0/[(Q_0/2) - \log x_1]$ ;  $\varphi_2 = (Q_0/2) \div [(Q_0/2) - \log x_2]$ ;  $x_1 = (x - 1)/[p - 1 - (p + q - 1)x]$ ;  $x_2 = x/[p - (p + q - 1)x]$ . This holds true for all the binary systems where the reaction proceeds according to the formula  $pA + gB = ApBy$ . When dissoen. is present  $K > 0$ , when it is absent  $K = 0$ .

REA MAIZEL

**Constitution of liquids: some new experiments.** H. BRERETON BAKER. *J. Chem. Soc.* 1928, 1051-5.—Drying of a liquid leads to assocn. as shown by (1) increase in b. p.; (2) change of surface tension (*C. A.* 16, 2441); (3) increase in vapor d.; (4) decrease in latent heat of evapn. A table of mol. wt. detns. by vapor d. (V. Meyer's method) is given for  $\text{Br}_2$ ,  $\text{CS}_2$ ,  $\text{CCl}_4$ ,  $\text{Et}_2\text{O}$ ,  $\text{MeOH}$ ,  $n\text{-C}_6\text{H}_{14}$ ,  $\text{C}_6\text{H}_6$  and  $\text{N}_2\text{O}_4$ , dried 2-15 years with  $\text{P}_2\text{O}_5$ . All showed assocn. The latent heat of  $\text{C}_6\text{H}_6$  (dried 3.5 yrs. with  $\text{P}_2\text{O}_5$ ), as calcd. from the vol. of  $\text{C}_6\text{H}_6$  distd. and the rise in temp. of the known wt. of  $\text{H}_2\text{O}$  surrounding the distg. flask, was 57.2 and 58 (2 expts.) for 1 g.  $\text{C}_6\text{H}_6$  (normal, 83). B. p. of the dried  $\text{C}_6\text{H}_6$  was  $94^\circ$ , which by Trouton's rule would make the mol. wt. 136. The best explanation of the action of  $\text{H}_2\text{O}$  in assocn. and dissoen. is J. J. Thomson's (*Phil. Mag.* 36, 320), that charges are induced in drops of  $\text{H}_2\text{O}$  and hence the attraction of the atoms for each other in the nearby mols. of the liquid is lessened. Since, as C. T. R. Wilson showed, the presence of ions in a gas causes the condensation of  $\text{H}_2\text{O}$  in drops on the ions, it should cause dissoen. of the surrounding mols. and hence an increase in reactivity. Silica tubes, contg.  $\text{H}_2$  and  $\text{N}_2\text{O}$  and only a few mg.  $\text{H}_2\text{O}$  to a million l., were heated. The presence of lime and thoria (which increase ionization in gases) increased the rate of reaction 5 and 20 times, resp., over that of the gases with powdered Jena glass present. After 15 min. heating, when a large amt. of  $\text{H}_2\text{O}$  had been formed, the rate of reaction was the same in all 3 cases. Addn. of 2 mg.  $\text{RaBr}_2$  in a sep. expt. caused an explosion on heating. Prevention of the condensation into drops of  $\text{H}_2\text{O}$  in a liquid (as by removal of the ions by an elec. field) also must lead to assocn.  $\text{C}_6\text{H}_6$  (dried with concd.  $\text{H}_2\text{SO}_4$ ) boiled at  $79.6^\circ$ . After an elec. current had been sent through it some hrs. in a tube of 1 cm. diam. with Pt electrodes, it boiled at  $91^\circ$ , while the same  $\text{C}_6\text{H}_6$  untreated boiled at  $79.6^\circ$  in a similar tube. Reapplication of the current during boiling stopped it. Surface-tension detns. indicated a mol. wt. 2-3 times the normal.  $\text{C}_6\text{H}_{14}$  and  $\text{CS}_2$  showed similar behavior.

JANET D. SCOTT

**The apparent influence of an electric field on the boiling point of benzene.** JOHN WM. SMITH. *J. Chem. Soc.* 1929, 788-91.—As shown by Baker (cf. preceding abstract), when an elec. field is applied to  $\text{C}_6\text{H}_6$  in a tube heated in an oil bath, the apparent b. p. registered by a thermometer in the liquid, rises (S. found  $85\text{--}7^\circ$ ). The vapor temp. is normal ( $80^\circ$ ). S.'s work also confirms that of Smits (*C. A.* 23, 1327), that there is no change in the b. p. of  $\text{C}_6\text{H}_6$  exposed to an elec. field when the tube is heated directly with a small flame, and that the vapor pressure is unchanged. S. agrees with Smits that the rise in b. p. must be due to superheating. S. used two types of cell: a tube contg. 2 parallel electrodes of Pt foil, and a flat bulb with silvered parallel sides about 7 mm. apart and with Pt wires sealed through each face. The high b. p. of  $\text{C}_6\text{H}_6$  to which an elec. field had been applied was lowered by stirring, the more so the more vigorous the stirring. Application of the field during boiling to previously untreated  $\text{C}_6\text{H}_6$  had no effect on the b. p.

JANET D. SCOTT

**Theory of anisotropic liquids. VIII. The plane structures.** C. W. OSENF. *Arkiv Mat. Astron. Fysik* 21A, No. 11, 1-13(1928); cf. *C. A.* 19, 3060; 23, 2085. A purely mathematical development of great complexity in terms of free energies. IX. The propagation of light through a helicoidal twisted structure parallel to the axis. *Ibid.* 14-35.—Mathematics of even greater complexity without evident physical or chem. interpretation.

G. L. CLARK

**Liquid drops on the same liquid surface.** J. B. SETH, CHETAU ANAND AND LACHMAN DAS MAHAJAN. *Phil. Mag.* [7], 7, 247-53(1929).—The phenomenon of liquid drops forming and floating on the surface of liquids was studied in some detail. Primary and secondary drops are formed. The primary drops form when the tip of a buret delivering the liquid is maintained at a height of one or two cm. above the surface of the liquid on which they float. Secondary drops form when the drops fall from a sufficient height to splash. Primary drops are as a rule larger than secondary drops. In general, light liquids of low surface tension and low viscosity show the formation of secondary drops with no primary drops or primary drops of very short life. Inorg. substances and their solns. and thick sirupy liquids do not exhibit the phenomenon. Fats and oils at higher temps. exhibit the phenomenon very well, as do solns. of soap, "phenyle" and cresol in water. The latter are best suited for such studies. Viscosity was found to be mainly responsible for the stability and life of the drops, while surface tension detd. their

size. A break in the surface tension-concn. curves for the soap and "phenyle" solns. was found at the point where primary drop formation was best exhibited. L. H. R.

**Rheology. I. The nature of fluid flow.** EUGENE C. BINGHAM. *J. Chem. Education* 6, 1113-9(1929).—A semi-popular treatment of the subject of the flow of matter. Some simple demonstrations are given of hydraulic (or turbulent) as well as viscous (or linear) flow.

EUGENE C. BINGHAM

**Viscosity of ether at low temperatures.** EDM. VAN AUBEL. *J. Chem. Soc.* 1929, 1111.—Values for the fluidity of  $\text{Et}_2\text{O}$  calcd. from A.'s formula,  $\phi = m + n \log (\theta - t)$  (*C. A.* 15, 3779) are compared with the measurements of Archibald and Ure (*C. A.* 21, 2084); good agreement is obtained down to  $-92.2^\circ$ . The consts. used were:  $\theta$   $193.8^\circ$ ,  $m$  4003.46,  $n$  -1599.7.

C. J. WEST

**Ring methods for surface tension measurements.** N. ERNEST DORSEY. *Science* 69, 187-8(1928); cf. *C. A.* 22, 1071.—A discussion of the proper way to use the Du Nouy tensimeter. As a ring is slowly raised from an extended surface of a liquid that wets it, the resultant downward pull of the liquid passes through a distinct max., and if the ring is not too small, it then reaches a lower and const. value before rupture occurs. The surface tension can be derived from either of these values of the pull, but the procedures differ. As the max. pull is the least that will suffice to detach the ring from the liquid, the method based on it could be called "the ring detachment method." The lower and const. pull, observed when the ring is raised sufficiently higher than the position of max. pull, corresponds to the existence of a true double film between the liquid and the ring, and this should be called "the ring film method." In both cases, the surface tension will be computed from empirical tables. The failure to report the method used in the measurements detracts from the value of recent American publications.

ALBERT L. HENNE

**Experimental determination of surface tension by the removal of disks.** J. E. VERSCHAFFELT. *Bull. sci. acad. roy. Belg.* 14, 663-5(1928).—V. simplifies his previously given calcs. by means of successive approximations and gives an application of the method. This method of det'n. of surface tension is claimed to be the most practical and precise of those in use.

F. W. LAIRD

**Distillation. III. The mechanism of rectification.** W. K. LEWIS AND K. C. CHIANG. *Trans. Am. Inst. Chem. Eng.* 21, 127-38(1928).—The analogies and the distinctions between the processes of rectification and of absorption of vapors from gaseous mixts are pointed out. The fundamental diffusion laws are integrated and applied to the case of rectification. The equations given, together with the exptly. detd. liquid-vapor equil., make it possible to compute diffusional processes on the basis of a knowledge of the physical consts. involved, and the area and thickness of the surface films, and to analyze quant. the influence of the various factors affecting rate of rectification and plate efficiency.

F. E. WALSH

**Orientation of organic compounds by cylindrical glass surfaces and superficial orientation of glass.** JEAN J. TRILLAT. *Compt. rend.* 188, 555-6(1929).—A glass cylinder was covered with a thin coating of palmitic acid by dipping it in a  $\text{C}_6\text{H}_6$  soln. and allowing the solvent to evap. By means of K rays of Cu, diagrams were obtained showing perfect radial orientation of the mols. Diagrams of the glass alone showed that the surface of the glass is also oriented.

E. G. VANDEN BOSCHE

**Capillary phenomena in non-circular cylindrical tubes.** W. O. SMITH AND PAUL D. FOOTE. *Ind. Eng. Chem.* 21, 567-8(1929).—The total force sustaining the wt. of a liquid in non-circular capillary tubes was calcd. and results are given for tubes having elliptical cross sections, calcd. from the equation developed and by actual expt. The agreement between the observed and calcd. values with  $\text{CCl}_4$  and  $\text{H}_2\text{O}$  as the liquids is within the error of measurement. The practice of treating non-circular capillaries as circular capillaries of equiv. cross-section or as having a radius equal to the arithmetical mean of the semi-axes of the ellipse leads to erroneous results. Formulas are given showing that the v. p. over a meniscus is diff. for circular and non-circular capillaries of the same cross-sectional area.

J. W. SHIPLEY

**Thickness of an oleic acid film in the saturated condition and the saturation pressure of the film.** FAHIR EMIR. *Compt. rend.* 188, 1284-6(1929); cf. *C. A.* 20, 855.—The temp. and the nature of the supporting liquid have an influence on the speed of decrease of the surface tension of a film of oleic acid. The film is more sol. when the surface density is greater. The soly. is greater with neutral than with acidified  $\text{H}_2\text{O}$  and increases with the temp. Measurements are made with a monomol. film of known surface under 1 dyne/cm. surface pressure. By compression the pressure is increased to 10, 20 and 30 dynes/cm. From this the value of 2.3  $\mu\mu$  is found for the length of the

mol. instead of 2.5 as obtained by Marcelin. Between 15° and 30° the satn. pressure of the film varied from 30.9 to 32.7 dynes/cm. The pressure values detd. by Marcelin are probably more accurate.

E. SCHOTTE

**Adsorption by pure carbon. I. An interferometric investigation of adsorption by pure carbon from non-aqueous binary systems.** F. E. BARTELL AND C. K. SLOAN. *J. Am. Chem. Soc.* **51**, 1637-43 (1929).—The interferometric method is used to measure the adsorption by pure C of  $\alpha$ -bromonaphthalene, benzene and ethyl carbonate from dil. solns. in EtOH. The adsorption tends to be in the same order as the adhesion-tension values of these same solutes (as pure liquids) against C. **II. Adsorption by pure carbon from non-aqueous binary systems over the entire concentration range.** *Ibid* 1643-56.

The interferometric method is employed to measure the adsorption from various non aq. binary systems. An equation is developed representing the preferential adsorption over the entire concn. range, being based on the assumption that the adsorption of each component follows the Freundlich equation. The importance of measurements of adhesion tension values is pointed out, and the Gibbs principle restated in terms of adhesion tension rather than interfacial tension.

R. I. RUSH

**Adsorption of coloring matters by charcoal powder.** SHOSETSU SASAKI. *Kyoto Imp. Univ. Kyoto J. Med.* **25**, 425-7 (1928).—The adsorption of methylene blue and crystal violet on C powder attains equil. only in 1 to several hrs.; the initial stage of the process is represented by  $Kt + l = \log x_{\infty}/(x_{\infty} - x)$ , where  $t$  is the time,  $x$  the quantity of the coloring matter adsorbed in the time  $t$ ,  $x_{\infty}$  that adsorbed at the equil. state and  $k$  and  $l$  are const. Between the quantity of coloring matter adsorbed on unit mass of adsorbent ( $x/m$ ) and that remaining in the soln. ( $c$ ) there holds an exptl. relation  $\sqrt{m} = \alpha/c^{1/n}$ , where  $\alpha$  and  $n$  are const.

K. SOMIYA

**Adsorption of gas in a vacuum tube by magnesium.** KÁROLY CZUKOR. *Chem. Rundschau Mitteleuropa Balkan* **4**, 153-4 (1927); *Chem. Zentr.* **1928**, I, 238. A vacuum tube was exhausted to 0.01-0.001 mm. Hg. The remaining gas was adsorbed by a Mg mirror by means of complicated chem. and phys. processes. It is possible to det. whether the electrode is entirely free from gas by means of the equation,  $dp/dt = k(p - P_{\infty})$ . By plotting the corresponding temp. and pressure in the above equation, in the form  $K = (1/t) \ln(p_t - P_{\infty}) / (P_0 - P_{\infty})$ , a straight line is obtained if the tube is free from gas.

FRANCIS P. GRIFFITHS

**The relation between the electric moment and the potential difference at an interface.** A. FRUMKIN AND JOHN W. WILLIAMS. *Proc. Natl. Acad. Sci.* **15**, 400-5 (1929).—The elec. moment of a mol. detd. from the temp. coeff. of the dielec. const. of the vapor or from this const. and the d. of the binary mixt. is well grounded theoretically. The elec. moment calcd. from potential diff. at an interface by Gans' theory gives only the order of magnitude and the theory is unsound. Similar conclusions can be drawn from either kind of data but any comparison between the two can be but qualitative.

G. B. TAYLOR

**Electrolytic dissociation of colloidal solutions. I.** KOJI TAKATA. *Hokkaido J. Med.* **6**, 577-86 (1928).—In 0.00001 to 0.001 *N* HCl or NaOH soln. contg. mastic sol there is a discrepancy between the calcd. and exptl.  $p_H$  values, which shows that H or OH ion is combined with mastic. Measurement of the elec. cond. of the same soln. showed that it decreases with the addn. of mastic, the change being apparent only when the NaOH concn. lies between 0.0002 and 0.00025 *N*; hence over this range the dissociation of the compd. is complete. In the case of HCl, the corresponding concn. is at 0.001 *N* to 0.004 *N*.

K. SOMIYA

**The dielectric constant of emulsions of water and mercury in oil.** A. PIEKARA. *Bull. intern. acad. Polonaise* **1928**, 201-22.—The various theories proposed for deriving the dielec. const. of mixts. take the general form  $f(\epsilon) = \delta_1 f(\epsilon_1) + \delta_2 f(\epsilon_2)$ , in which  $\delta_1$  and  $\delta_2$  are the relative vols. of the components ( $\delta_1 + \delta_2 = 1$  if no alteration in vol. occurs during emulsification) and  $\epsilon$ ,  $\epsilon_1$  and  $\epsilon_2$  are the dielec. consts. of the mixt. and its components and  $f$  is a function of the dielec. const. which is additive with respect to the relative vols. Expts. on emulsions of water in transformer oil, EtOH and water in paraffin oil, and Hg in paraffin oil showed that: (1) The value of the dielec. const. of the emulsion  $\epsilon$ ,  $\epsilon_1$  and  $\epsilon_2$  and  $\mu$  (diam. of the droplets) being const. depends upon the volume concn.,  $\delta$ , much more than is demanded by the Lorenz and Lorentz formula, the dielec. consts. found being much greater (about 70%) than calcd. Moreover, this relation is not linear for low concns. as this formula would indicate. (2) The value of the dielec. const. of the emulsion ( $\epsilon$ ,  $\delta$  and  $\mu$  being const.) depends upon that of the dispersed phase,  $\epsilon_1$ , much more than would follow from the L. and L. formula. (3) The dielec. const. of the emulsion increases with the degree of dispersion; consequently, it is a function not only of  $\epsilon_1$ ,  $\epsilon_2$  and  $\delta$  but also of the diam. of the drops,  $\mu$ , i. e.,  $\epsilon = f(\epsilon_1, \epsilon_2, \delta, \mu)$ . There is no

appreciable influence of the elec. charge of the drops on dielec. const. in a mixt. whose mols. are not pronouncedly dipolar.

C. H. PERR

**The relation between the dielectric constant of an emulsion of mercury in vaseline and the degree of dispersion of the particles.** A. PIEKARA. *Bull. intern. acad. Polonaise*, 1928, 223-39; cf. preceding abstract.—To escape the secondary effects which might have affected the results obtained in the preceding paper, P. measured the dielec. consts. of emulsions of Hg in petrolatum and in a mixt. of petrolatum, paraffin oil and lanolin. The results obtained were on the whole in accordance with those obtained with freely mobile liquid emulsions. The secondary factors (influence of surface tension at the interfacial surfaces of the 2 phases, possibility of chem. reactions between the components, movement of droplets within the emulsion, effects due to elec. charges upon the droplets, polarization of the dispersing medium due to the charges upon the droplets) exercise only an inconsiderable effect on e.

C. H. PERR

**The adsorption of iodine, bromine and some halogen salts by carbon from different organic liquids. III. Study of the adsorption of iodine from binary mixtures of solvents.** JOSEPH TRIVIDIC. *Rev. gén. colloïdes* 7, 118-23(1929); cf. *C. A.* 23, 3613.—Freundlich's adsorption isotherm holds for the adsorption of I from mixts. of water and alc.,  $\text{CHCl}_3$  and  $\text{CCl}_4$ . I is adsorbed more strongly from toluene than from benzene or alc. and the compn.-adsorption curves are straight lines, all of which is contrary to N. Shilov and Lepin. **IV. Study of the adsorption of bromine from some pure organic liquids or mixtures. Verification of Freundlich's law.** *Ibid* 123-5.—Br is adsorbed in accordance with Freundlich's law from solns. in  $\text{CHCl}_3$ ,  $\text{CCl}_4$  and their mixts. If the adsorption from the pure liquids is known, the adsorption from any given mixt. of these liquids can be detd. from the straight-line relationships. **V. The study of the adsorption of some halogen salts by carbon in aqueous, alcoholic and hydro-alcoholic media.** *Ibid* 125-6.—C adsorbs  $\text{KI} > \text{KBr} > \text{LiCl}$  from water, alc. and water-alc. mixt. They are, however, very weakly adsorbed. Inherent errors in the detn. of the small quantities of the halogens prevent drawing definite conclusions in regard to the amt. of adsorption.

F. W. LAIRD

**The structure of colloids.** AUGUST LUMIÈRE. *Rev. gén. colloïdes* 7, 1-8(1929).—L. reiterates and upholds his theory of colloid structure, and his classification of colloids into 2 fundamental states, namely, the mol. colloidal state and the micellar colloidal state (cf. *C. A.* 19, 2896).

E. P. WIGHTMAN

**Studies on the stability of suspensions of coarse particles dispersed in solution. IV. Formation and disintegration of liquid shells in suspensions of bolus alba (kaolin)—a contribution to the understanding of the sol-gel, or thixotropic changes.** HANS WERNER. *Ber* 62B, 1525-34(1929); cf. *C. A.* 22, 3080.—The flocculent ppt. of bolus alba in water suspensions contg. electrolytes exhibits thixotropic properties. The particles are surrounded by a sheath of liquid. The vol. of this liquid in the floc is from 2.6 to 26.6 times the vol. of the particles and constitutes the dispersing medium. A method is described for detg. the thickness of this liquid layer. Variations in the electrolyte used cause the thickness to vary from 1.0 to 3.4  $\mu$ . The expts. show the presence of the film of liquid on the particles, and the relationship of this film to the flocculation of the particles. The results are used to interpret the action of thixotropic gels.

L. F. MAREK

**Nephelometric study of the colloidal solutions of metallic sulfides.** MANJIRO WATANABE AND CHOSHUN NAKAU. *J. Petrol. Mineral and Ore Deposits* 1, 61-4(1929).—Colloidal solns. of metallic sulfides were made by mixing equal vols. of aq. solns. of various metallic sulfates and of  $\text{Na}_2\text{S}$ . The course of the pptn. was studied nephelometrically. When the concns. of both salts are small but the relative concn. of  $\text{Na}_2\text{S}$  is larger than that of metallic sulfate, the metal sulfide forms ultramicroscopic colloidal particles and does not easily coagulate. The relation between the time required for coagulation and the relative concn. of the 2 solns. was detd. by measuring the change of turbidity by means of a Hellige-Dubosq nephelometer. The result shows that at an initial period the turbidity increases, and is then kept const. for a certain length of time. When coagulation begins to take place, the turbidity decreases suddenly. In some cases the first or the second stage of the above phenomena is not apparent.

K. SOMEYA

**Unsymmetrical metal colloids.** H. ZOCHER. *Metallwirtschaft* 8, 467-9(1929).—Colloidal metal sols are isotropic, are identical with their image or not enantiomorphic. By drying a metal sol on glass and gently brushing, the crystallites are oriented by an action similar to that in wire drawing. The behavior of metal colloids toward light is extraordinarily variable. The colloidal metals exhibit dichroism. The anisotropic properties are more pronounced when the metal colloid is deposited in bundles of cellulose

fibers than in the form of a mirror, and may be evidenced in the sol by application of forces to overcome the random orientation of the particles. Exposure of photo-halides to linear polarized light produces a metal colloid with marked dichroism and double refraction. Circular dichroism is exhibited by partly chlorinated colloidal Ag mirrors which have been exposed to circularly polarized light. The use of polarized light in the examn. of colloids too small for microscopic examn. makes possible an understanding of some of their actions.

L. F. MAREK.

**Catalysis and colloidal transformations. I. Catalytic decomposition of hydrogen peroxide by iron compounds.** E. I. SHPITALSKIY, N. N. PETIN AND E. I. BUROVA *J. Russ. Phys.-Chem. Soc.* 60, 1271-89(1928); cf. *C. A.* 23, 2873.—Cond. measurements were made with the aid of movable Pt electrodes (cf. *C. A.* 21, 3529). The catalytic effect of  $\text{FeCl}_3$  was studied in strongly acid (homogeneous), weakly acid (heterogeneous) and alk. (macroheterogeneous) media. Basic salts ppt. from weakly acid solns. of  $\text{Fe}_2(\text{SO}_4)_3$ , while  $\text{FeCl}_3$  under similar conditions forms stable hydrosols. The catalytic activity varies with  $p_H$  in the same way with both  $\text{FeCl}_3$  and  $\text{Fe}_2(\text{SO}_4)_3$ . In the decompn. of  $\text{H}_2\text{O}_2$  in the presence of Fe salts the const. for 1st-order reaction increases as the  $p_H$  is raised by adding alkali until the stoichiometrically neutral point is reached. Further addn. of alkali results in a decrease, to a min. when the ratio of concns. of Fe and  $\text{NaOH}$ ,  $C_{\text{Fe}}/C_{\text{NaOH}} = 2.4$ , followed by a second increase to a max. at  $C_{\text{Fe}}/C_{\text{NaOH}} = 3$ . At this point an insol. gel is pptd. which is the catalyst in alk. media. In acid media  $\text{Fe}^{10n}$  only exhibits catalytic properties and, being present in  $\text{Fe}_2\text{O}_3$  sols, renders the latter active. Complex ions or other Fe compds. do not influence the rate of decompn. of  $\text{H}_2\text{O}_2$ . The mechanism of catalysis by the Fe ion invites further investigation. **II.** A study of the mechanism of hydrolysis of iron salts and the properties of colloidal hydrosols through the catalytic action of ferric ions. *Ibid* 1291-1316.—In acid solns. the reaction const.,  $K$ , changes only slightly with time, and repeated measurements with fresh portions of  $\text{H}_2\text{O}_2$  give reproducible results. In weakly acid or alk. media  $K$  declines sharply and is not influenced by the addn. of  $\text{H}_2\text{O}_2$ . This aging process is due to the action of  $\text{NaOH}$  since  $\text{FeCl}_3$ - $\text{NaOH}$  mixts., when allowed to stand for 24 hrs. before being used as catalysts, gave low values of  $K$  to begin with. Diln. and preliminary treatment with  $\text{NaOH}$  do not affect the activity of the sols  $C_{\text{Fe}}/C_H$  gradually decreases to an equal value within 10 min. after the sol is dild. with aq.  $\text{H}_2\text{O}_2$ ; any ppt. which may thereafter sep. does not change this ratio. Sp. cond. of the sols does not change during the expt. The aging process (change in  $K$ ) proceeds faster in more alk. media, but  $K$  is in general min. for  $C_{\text{Fe}}/C_{\text{NaOH}} = 2.4$ , because on the alk. side of this point irreversible jellies ppt. which are very active catalysts. On the other hand, any ppt. formed on the acid side is reversible (forms hydrosols on diln.) and inactive. Moreover, such reversible gels decrease the activity of the portion remaining in soln., probably by adsorbing  $\text{Fe}^{10n}$  since the Cl content and cond. of the sol portion remain unchanged during the process. Hydrolysis is viewed as adsorption of Fe ions by the colloid. **III.** Colloid hydrogels and their transformations. *Ibid* 1317-32.—Hydrated  $\text{Fe}_2\text{O}_3$  is the actual catalyst, its activity is detd. by the "age" and the alky. of the reaction medium. The method of prepn. does not seem to have any influence. The catalytic decompn. depends upon the soly. of the hydrated oxide in alk. solns. of  $\text{H}_2\text{O}_2$ , thereby forming Fe compds. which serve as intermediate products in the decompn. of  $\text{H}_2\text{O}_2$ . The "aging" phenomenon, as manifested in a loss of catalytic activity, is attributed to the decrease in soly. of the hydrated oxide of Fe caused by alkali and consequent decrease in the surface of the dispersed phase.

B. SOYENKOFF

**The swelling of gelatin.** W. V. MORACZEWSKI AND E. HAMERSKI. *Biochem. Z.* 208, 299-327(1929).—The swelling of gelatin in salt solns. increases with the concn. of the salt. Only alc. and citrate form an exception to this rule. The swelling is greater the higher the temp. Acids cause greater swelling than salt solns., and  $\text{HCl}$  and  $\text{H}_2\text{SO}_4$  of the same normality produce practically the same effect, causing max. swelling in  $N/60$  ( $p_H$  1.7-1.8).  $\text{AcOH}$  causes swelling more like salt soln. only much more strongly and the swelling curve has a uniform course, while the curves of swelling with mineral acids at first rise slowly, and only after reaching a max. behave like the salt soln. curves. Water has the smallest swelling effect, and only alc. or citrate may under certain conditions produce a smaller effect. The  $\text{SCN}$  is the most effective of the anions, and the citrate and tartrate are the weakest. Among the cations  $\text{Ca}^{++}$  causes the greatest swelling. Mixts. of salts produce an additive effect on swelling, but the cations retain their individual characteristics. Addn. of acid to salt soln. increases, while the addn. of salt soln. to acid diminishes the swelling. Nonelectrolytes in general have a slight effect on the swelling of gelatin but urea and thiourea cause very powerful swelling. It seems that the  $\text{H}^{10n}$  concn. is the most essential factor, next the  $\text{Ca}^{10n}$ , in the matter of pro-



ducing swelling, while the org. anions are inhibitory. Swelling is regarded as a sort of soln. S. MORGULIS

**Desiccation patterns (obtained) from colloidal solutions of aluminum and chromium oxides.** PAUL BARY AND JOSÉ V. RUBIO. *Rev. gén. colloïdes* 7, 97-105(1929); cf. *C. A.* 23, 3389.—The colloidal sesquioxides of Al and Cr in the process of desiccation resemble that of Fe to some extent. The structure of these colloidal solns. consists of a heterogeneous mixt. of an anhyd. or slightly hydrated oxide as the dispersed phase, suspended in a dispersion medium of a stabilizing hydrophilic substance of a similar nature. It is suggested that these solns. be classified as Wo. Ostwald's isocolloids. The aging of these solns. is explained by a more or less slow transformation from a hydrophilic to an anhyd. or less hydrated (hydrophobic) state. Veimarn's theory fails to explain the formation of these patterns. F. W. LAIRD

**Cataphoretic measurements and the theory of the critical potential.** H. R. KRUYT AND D. R. BRIGGS. *Proc. Acad. Sci. Amsterdam* 32, 384-91(1929).—When an electrolyte is added to a sol, flocculation occurs when the crit. potential is reached. For alkali or H ions, the cataphoretic velocity may still be at a high value and in some cases as much as in the original sol. This may be due to the high adsorption at the surface of the particles increasing the dielec. const., and while the cataphoretic velocity may remain high the crit. potential is reduced. Cataphoretic velocities and flocculation values for  $As_2S_3$ , Se and red Au sols were measured with KCl,  $AlCl_3$ ,  $BaCl_2$ , new fuchsin Cl and strychnine nitrate as flocculants. There is indication that the flocculation value in the presence of  $BaCl_2$  decreases with time. Univalent cations which are highly adsorbed and cause flocculation at low concns. reduce cataphoretic migration to approx. the same value as characteristic of multivalent cations at their corresponding concns. A. F.

**The study of the  $p_H$  values which cause flocculation of sols of arsenic sulfide and ferric hydroxide.** A. BOUTARIC AND G. PERREAU. *Bull. sci. acad. roy. Belg.* 14, 666-70(1928).—The  $p_H$  (1.22) at which an  $As_2S_3$  sol (1.55 g. per l.) flocculates infinitely slowly is approx. the same for different strong acids. Weaker acids fail to cause flocculation of this sol. The concn. of the H ions necessary for flocculation varies with the concn. of the sol. Concd. or dil.  $As_2S_3$  sols may be flocculated by weak acids, the  $p_H$  concn. curve passing through a min. Sols of  $Fe_2O_3$  contg. 2.18 g. per l. are flocculated by certain bases whenever the  $p_H$  is about 5.11. F. W. LAIRD

**Sols in crystals.** FRANZ URBACH. *Sitzb. Akad. Wiss. Wien, Abt. IIa*, 137, 147-56 (1928).—A detailed descriptive study is given of foreign particles such as colloidal metals in crystals of simple inorg. salts. G. L. CLARK

**The study of hydration changes by a volume-change method.** H. A. NEVILLE AND H. C. JONES. *Colloid Symposium Monograph* 6, 309-18(1928).—A new type of dilatometer consists of a petrolatum mold enclosed in a bottle and covered with a layer of oil which can rise in a capillary tube, and thus register vol. changes. With plaster of Paris there is a min. vol. at 20 min., corresponding to initial set. Heat of reaction then causes rapid increase in vol. to a max. at 45 min., const. vol. being reached after 4 hrs. Portland cement shows an initial expansion due to thermal effects (e. g., heat of wetting or Pouillet effect; hydration of lime and burned gypsum; hydrolysis of cement components). Subsequent contraction indicates adsorption of water by fine cement particles, and their hydration. Gelatin plus water showed shrinkage compared to the combined vols., but 0.001 N HCl produced no vol. change, though other HCl concns. showed initial increases. The humps on the plaster of Paris and portland cement curves due to thermal effects being eliminated, they resemble the gelatin-water curve closely, indicating that adsorption of water to form hydrated material occurs in gel structure, rather than formation of definite hydrates. JEROME ALEXANDER

**Osmotic investigations with rubber solutions.** H. KROEPELIN AND W. BRUMSDAGEN. *Ber.* 61B, 2441-3(1928).—Collodion sacks supported by extn. thimbles being used, measurements were made on 7 different concns. between 5 and 20 g./l. of the first fraction of an ether-sol. rubber from acetone-extd. crepe in benzene, between 11° and 40°. The size  $b$  decreased with increasing concn. The micelle wt. was calcd. from the formula used by Meyer and Mark:  $M = 22.41(1 + \alpha t)/p(v - b)$ , where, as a first approximation,  $b$  and  $M$  are assumed const. Good agreement of  $M$  values was found, variation being between 185,000 and 227,000. Measurements at 40° are less exact, judging from less consistent values for  $b$ . Micelle wts. agree with those given by Meyer and Mark for benzene solns. in order of magnitude. G. L. CLARK

**Crystalline pepsin.** JOHN H. NORTHROP. *Science* 69, 580(1929).—Dialysis under pressure at  $p_H$  3.0 and 5° of a concd. soln. of com. pepsin (1:10,000 U.S.P.) until a heavy ppt. was formed, stirring at 37° for an hr., filtering and cooling the filtrate slowly gave 1-2% of crystals in several days. Recrystn. was effected by dissolving in dil.  $NaHCO_3$ .

at 37° and pptg. with dil.  $\text{H}_2\text{SO}_4$ . These crystals have the properties of pepsin (hydrolyze gelatin, casein, egg albumin and edestin in acid soln., and are rapidly inactivated by heat) with an activity of 1:20,000 U.S.P., which is somewhat less than some amorphous preps. The crystals are small hexagonal prisms (0.01 to 0.10 mm. long, sep. and in clusters) and remain const. in compn. during 7 successive crystns. Their soly. remains const. on repeated washing with dil. HCl. The crystals are insol. in 0.01M HCl ( $p_{\text{H}}$  3.0) but sol. in stronger acid and in alkali. The material is pptd. by half satn. with  $(\text{NH}_4)_2\text{SO}_4$ , by Cu salts, U acetate,  $\text{Pb}(\text{OAc})_2$ ,  $\text{CCl}_3\text{COOH}$  and safranine and coagulates on boiling. It contains 14.5% N and has a diffusion coeff. in  $\text{H}_2\text{O}$  at 8° of 0.085 sq. cm. per day (corresponding to a mol. wt. of about 10,000).

DAVID DAVIDSON

**Apparent dissociation constants of the amino acids and certain related substances; a summary of the data.** P. L. KIRK AND CARL L. A. SCHMIDT. *Univ. Calif. Pub. in Physiol.* 7, 57-69(1929); cf. *C. A.* 23, 1877.—A tabulation of the data on 44 amino acids and peptides with a bibliography of 57 references and a discussion. J. S. H.

**Combination of proteins, amino acids, etc., with acids and alkalis. II. Titration curves of amino acids in presence of formaldehyde.** LESLIE J. HARRIS. *Proc. Roy. Soc. (London)*, B104, 412-39(1929).—Curves were obtained showing the variation in  $p_{\text{H}}$  (dtd. colorimetrically) on titration of various amino acids: (glycine, alanine, phenylalanine, tyrosine, glutamic acid, aspartic acid), dissolved in aq. HCHO soln., by means of NaOH. With a const. HCHO concn., each amino acid behaved as a simple acid (the methylene deriv. of the amino acid) possessing a determinate  $p_{\text{H}}$  value. In the usual formol titration, the apparent  $p_{\text{H}}$  values are approx. 3 units less than for the corresponding free amino acids in aq. soln.; methylene derivs. are formed in equil. with the amino acid and have resultant NaOH titration curves; the  $p_{\text{H}}$  end points are displaced 3 units to the less alk. side of the  $p_{\text{H}}$  scale, compared with the amino acids themselves, the apparent  $p_{\text{H}}$  value is practically unaffected by the ratio of amino acid to HCHO or by the concn. of the amino acid, provided the concn. of HCHO is kept const. On the other hand, with increasing concn. of HCHO the apparent  $p_{\text{H}}$  value decreased. The apparent basic const. of the amino acid was dtd. by titration with HCl, and was practically unaltered by addn. of HCHO. These results support the zwitterion hypothesis that addn. of HCHO produces no change in the true acidic const. (measured by titration with HCl) but decreases the true basic const. (measured by titration with NaOH).

JOSEPH S. HEPBURN

**Solubility of silicon in hydrofluoric acid.** CH. BEDEL. *Compt. rend.* 188, 1255-7, 1294-6(1929).—The soly. of Si in HF varies with the concn. of the acid. Addn. of oxidizing agents to HF increases the soly. of Si. In the presence of Pt, Ag and Cu, Si is the electroneg. element, while with Pb, Fe, Zn, Mg and Al it is the electropos. element. The nature of the metal present influences the soly. accordingly. E. SCHOTTE

**Kinetics of the solution of cadmium in hydrochloric acid.** K. JABLONSKI AND H. WĄCHSSELFISZ. *Roczniki Chem.* 9, 340-7(347 French)(1929); cf. *C. A.* 23, 3396.—The velocity of evolution of  $\text{H}_2$  by the action of 5 N HCl on metallic Cd was studied. The freshly prepd. cylinders of Cd, cleaned with emery, were dissolved very slowly, the velocity of soln. decreased and became zero after a short time. After 20 hrs. the digestion of Cd in HCl became active and soon  $K$ , measured by the amt. of  $\text{H}_2$  evolved in a min., became const.; 24 hrs. afterward,  $K$  increased more and more, being measured always in the same acid. This is the first case of this kind, for till the present time, in dissolving the metals, the velocity of the reaction increased during the period of incubation. Agitation was without influence on the soly. of Cd. A temp. coeff. = 2.02 was obtained, corresponding to ordinary chem. reactions. The soly. of Cd in HCl is a purely chem. process, independent of diffusion. J. KUČERA

**Solid solutions, isomorphism and symmorphisms among oxides of bivalent metals. I. The systems:  $\text{CaO}-\text{CdO}$ ,  $\text{CaO}-\text{MnO}$ ,  $\text{CaO}-\text{CoO}$ ,  $\text{CaO}-\text{NiO}$  and  $\text{CaO}-\text{MgO}$ .** G. NATTA AND L. PASSERINI. *Gazz. chim. ital.* 59, 139-43(1929).—Bivalent metallic oxides which cryst. in the cubic system with lattices of the NaCl type comprise a very large group of compds., some of which differ notably both in chem. behavior and in the dimensions of their metal ions. It would therefore be expected that many of the oxides, though having identical cryst. lattice forms, would not be isomorphic in the strict definition of the term. Nevertheless it has not been known to what extent true isomorphism exists and where only simple symmorphisms exist. True isomorphism exists only when mixed crystals form. In the present work, an x-ray examn. (powder method) was made of 5 binary systems of CaO and other bivalent metals. The solid solns. were obtained by decompn. of solid solns. of other compds. of the metal obtained by crystn., by fusion or by pptn. The simplest way was to calcine rapidly, and at temps. not much above those required for complete dehydration or evolution of  $\text{CO}_2$ , solid solns. of the hydrox-

ides or carbonates prepd. by pptn. The x-ray photographs of the products were compared with those of the simple oxides and mech. mixts. of the oxides. In the system  $\text{CaO}-\text{CdO}$ , there is complete and perfect miscibility between the 2 oxides in the solid state, and, within exptl. errors, the deformations of the lattice are proportional to the % compn. Identical solid solns. were obtained from mech. mixts. of the pure oxides prepd. by diffusion at temps. above  $600^\circ$ . In the system  $\text{CaO}-\text{MnO}$  there is only partial miscibility between the 2 oxides, which does not vary appreciably with the temp. With the systems  $\text{CaO}-\text{NiO}$ ,  $\text{CaO}-\text{CdO}$  and  $\text{CaO}-\text{MgO}$ , neither solid solns. nor compds. are formed, with  $\text{CaO}-\text{MgO}$  not even at  $1500^\circ$ . In general, in binary systems of  $\text{CaO}$  and other oxides with similar lattices, the soly. in the solid state diminishes rapidly with increase in the difference between the diams. of the metal ions. II. The systems  $\text{CoO}-\text{NiO}$ ,  $\text{CoO}-\text{MgO}$ ,  $\text{CoO}-\text{MnO}$ ,  $\text{CoO}-\text{CdO}$ ,  $\text{NiO}-\text{MgO}$ ,  $\text{NiO}-\text{MnO}$  and  $\text{NiO}-\text{CdO}$ . L. PASSERINI. *Ibid* 144-54.—The expts. were continued with the object of detg. whether there is a quant. relation between the soly. and the at. dimensions. All possible binary systems among  $\text{ZnO}$ ,  $\text{MgO}$ ,  $\text{NiO}$ ,  $\text{CoO}$ ,  $\text{MnO}$ ,  $\text{CdO}$ ,  $\text{CaO}$ ,  $\text{SrO}$  and  $\text{BaO}$  were studied, but in the present paper only the systems  $\text{CoO}-\text{NiO}$ ,  $\text{CoO}-\text{MnO}$ ,  $\text{CoO}-\text{CdO}$ ,  $\text{NiO}-\text{MgO}$ ,  $\text{NiO}-\text{MnO}$  and  $\text{NiO}-\text{CdO}$  are described in detail. The samples were prepd. by calcination at approx.  $350^\circ$  of the solid solns. or of the mixts. of the corresponding hydroxides obtained by pptn. from soln. of the chlorides by  $\text{KOH}$ . The powder method of x-ray examn. was used as in the preceding expts. In the systems  $\text{CoO}-\text{NiO}$ ,  $\text{CoO}-\text{MgO}$ ,  $\text{CoO}-\text{MnO}$  and  $\text{NiO}-\text{MgO}$  miscibility between the oxides is complete, and the displacement of the lattice is proportional to the % compn. In the system  $\text{NiO}-\text{MnO}$  the soly. of the oxides was, under the conditions, only partial. In the systems  $\text{CoO}-\text{CdO}$  and  $\text{NiO}-\text{CdO}$  no solid solns. were formed, which is attributed to the great difference between the diams. of the metal ions. C. C. DAVIS

Addition of H acid as a function of acidity and in presence of strong electrolytes. G. R. LEVI AND G. DELPONTE. *Giorn. chim. ind. applicata* 11, 103-6(1929).—H acid combines with  $(\text{O}_2\text{NC}_6\text{H}_4\text{N})_2$  to the same extent (about 85%) regardless of the alkyl. of the soln. ( $\text{Na}_2\text{CO}_3$ ,  $\text{NaHCO}_3$  and  $\text{Na}_2\text{CO}_3 + \text{NaCl}$  were tried). However, when acids are present the reaction proceeds further.  $\text{AcOH}$ ,  $\text{H}_3\text{BO}_3$ ,  $\text{HF}$ , citric,  $\text{HCOOH}$  and  $\text{H}_3\text{PO}_4$  produced increasing yields, while  $\text{H}_2\text{SO}_4$ ,  $\text{HClO}_4$  and  $\text{HCl}$  increased the yield to 94-95%. Further addn. of a strong electrolyte, as  $\text{NaCl}$ ,  $\text{ClO}_4^-$  and  $\text{SO}_4^{--}$ , decreased the yield to about 90%, probably by decreasing dissocn. of the mineral acid.  $\text{H}_3\text{PO}_4$  had much less effect than its dissocn. const. as an acid would indicate, ranking with  $\text{AcOH}$  and such weak acids. A. W. CONTIERI

Strong electrolytes. H. R. RAIKES. *J. S. African Chem. Inst.* 11, 55-66(1928).—A review of Debye's theory of complete dissocn. in dil. solns. of strong electrolytes and explanations for the irregular mobility of  $\text{Co}$  and  $\text{Li}$  ions. J. W. SHIPLEY

Conceptions of electric potential differences between two phases and the individual activities of ions. E. A. GUGGENHEIM. *J. Phys. Chem.* 33, 842-9(1929).—G. sets forth the principle that the elec. potential difference between 2 points in different media can never be measured and has not yet been defined in terms of phys. realities; it is a conception which has no phys. significance. The electrostatic potential  $\psi$  detcs. the equil. of the hypothetical fluid electricity, whereas the chem. potential  $\mu_i$  detcs. that of an uncharged mol. of type  $i$ . But the equil. of an ion of type  $i$  and charge  $e_i$  is detd. by the function  $\bar{\mu}_i = \mu_i + e_i\psi$ , which it is suggested should be called the "electrochemical potential"; this has a real phys. significance. The principle is illustrated by showing that the phenomena of diffusion, partition between 2 media, membrane equil., cells without and with liquid junctions, and reaction rates are completely describable in terms of  $\bar{\mu}_i$ . E. G. VANDEN BOSCHE

Effect of air on the potential of the mercury-mercurous sulfate electrode. MERLE RANDALL AND HENRY A. STONE. *J. Am. Chem. Soc.* 51, 1752-4(1929).—Cells of  $\text{H}_2-\text{Hg}-\text{Hg}_2\text{SO}_4$ , both with and without air, came to the same equil. in from 24 to 48 hrs. at an e. m. f. of 0.73694 v. for 0.1 molal  $\text{H}_2\text{SO}_4$  and 0.71858 v. for 0.2101 molal  $\text{H}_2\text{SO}_4$ . E. G. VANDEN BOSCHE

Notes on the concentration and activity of hydrogen ions. G. A. BRAVO. *L'industria chimica* 4, 211-3(1929).—This is the first part of a monograph on H ions, including methods for their detn. as well as a study of the laws governing them. There is at present no book on this subject in the Italian language. A. W. CONTIERI

Theory, measurement and application of  $p_H$  values. W. D. JARVIS. *Elec. Times* 4, 80-1(1928); *Science Abstracts* 31B, 573.—For power-house practice, applying the nic theory of corrosion to boilers, the  $p_H$  value range is from 5.6 to 8.0, and the color indicators are: phenol red,  $p_H$  6.8-8.0; bromothymol blue,  $p_H$  5.9-7.7; bromocresol purple,  $p_H$  5.6-6.8. H. L. D.

The calibration of conductivity cells for use with dilute solutions. I. At 18 C. W. DAVIES. *Trans. Faraday Soc.* 25, 129-23(1929).—When interionic forces are taken into account the solvent correction usually applied to salt solns. requires modification. The effect of the correction is to reduce all of Kohlrausch's values by 0.06 unit or more. The correction has been applied to Kohlrausch and Maltby's data for KCl and the equation:  $\Lambda_0 = 129.85 - 79.8 \sqrt{C}$  is put forward as a basis for cell const. detns. at low concns. II. The conductivity of potassium chloride at 25°. J. GRINDLEY AND C. W. DAVIES. *Ibid* 133-7.—Sources of error in detg. the true cond. of KCl soln. are discussed in detail and the calcd. corrections given. The cond. of aq. KCl solns. up to 0.0015 *N* at 25° has been measured. The equation  $\Lambda_0 = 150.59 - 109.0 \sqrt{C}$  is proposed as a basis for cell detns. at this temp.

L. B. MILLER  
The determination of the alkali-combining quantity of the most important sugars. PAUL HIRSCH AND RUDOLF SCHLAGS. *Z. physik. Chem.*, Abt. A, 141, 387-412(1929).—By a method based on elec. cond. measurements, the authors are able to det. the alkali-binding properties of sugar solns. with much greater accuracy than has been done so far. The addn. of sugar to a NaOH soln. lowers the elec. cond. of the latter, because of combination with the sugar. This decrease in cond., which takes a well-defined course, can be accurately measured and used for analytical purposes. The equiv. cond. of the Na-sugar salts can be detd. by means of the H electrode and the amt.,  $\vartheta$ , of the combined NaOH per mol. sugar can be calcd., as well as its dependence upon the  $p_H$ . From the  $p_H$  and  $\vartheta$  curves the conclusion is drawn that all sugars examd. have more than one acid group per mol., confirming the assumption that sugars are dibasic acids. The dissoen. const. of the sugars examd. were also detd. by a special procedure. The following sugars were used: *D*-glucose (anhyd.), *D*-fructose, sucrose, lactose and maltose.

J. C. JURRIJENS  
Equilibrium between the carbonates and bicarbonates of sodium and potassium in aqueous solution at 25°. ARTHUR E. HILL AND STERLING B. SMITH. *J. Am. Chem. Soc.* 51, 1626-36(1929).—No "stable pair" exists in this quaternary system at this temp. A new tetragene salt is found, which does not occur in any of the 3-component systems. It has the formula  $K_2CO_3 \cdot NaHCO_3 \cdot 2H_2O$ . Its crystn. paths were studied exptlv.

R. I. RUSH  
Application of the law of mass action to the double decomposition of [solutions of] salts. LEMARCHANDS AND MME. LEMARCHANDS. *Compt. rend.* 188, 254-6(1929); cf. *Compt. rend.* 187, 601-3(1928).—The equil. const. for the reaction of  $BaSO_4$  with HCl and with  $CaCl_2$  solns. at 100° have been calcd. in reference to the activities of the reacting substances.

B. C. A.  
The equilibrium constant of double decompositions in aqueous solution. MADAME LEMARCHANDS AND M. LEMARCHANDS. *Compt. rend.* 188, 1289-91(1929); cf. preceding abstr.—The reaction const. of the reaction between  $BaCl_2$  and  $H_2SO_4$  is detd. at 18° and found to be 0.0000237. With the help of the reaction const. at 100° the heat of reaction is calcd. The value 10610 cal. is not very different from that found by thermochem. measurements.

E. SCHOTTE  
Equilibrium of esterification and activity of molecules. STEFAN POZNAŃSKI. *Roczniki Chem.* 9, 354-60(360 English)(1929).—In the previous reports (*C. A.* 23, 1559, 2093) the so-called "equil. const."  $K_e$  of the reaction of AcOH and EtOH in the liquid phase was calcd., and varying values were found for different mixts.  $K_e$ , the equil. const. of the same reaction in the gaseous phase, did not vary. A true const.  $K'$ , was calcd. for the liquid phase:  $K_e = 14 (\pm 10\%)$ . This value is, according to Świentosławski,  $K_e = K_e^{z_2 z_4 / z_1 z_3} < z_1(z_2, z_3, z_4)$  representing the change of the fugacity of acid (alc., ester, water) produced by the 3 other ingredients of the mixt. This  $z$ , change of fugacity, was proved to be equal to a ratio of an activity coeff. of the ingredient in the soln. (mixt.) to the activity coeff. as a pure substance. In the same way as for the ions, the ratio of the activity to concn. of mols. was considered as an "activity coeff." The ratio of the 2 activity coeffs. is a relative activity coeff.

J. KUČERA  
Concentration of sugar and velocity of hydrolysis in acid medium. H. COLIN AND A. CHAUDUN. *Compt. rend.* 188, 1291-2(1929); cf. *C. A.* 20, 1936; 22, 4037.—Different acids not only give different ratios of the velocity const. but for each acid this value diminishes with the decrease in concn. of the acid. No simple relation could be found between the velocity and  $p_H$ .

E. SCHOTTE  
Chemical equilibria which involve reactions between two condensed phases. MANFRED MANNHEIMER. *Am. J. Sci.* [5], 17, 534-42(1929); cf. *C. A.* 21, 1743.—The research on equilibria between fused salts and metals is reviewed and a general method is derived mathematically for detg. the reliability of the exptl. results. The method

rests on the fact that the points of the equil. are located on stoichiometrically computable curves independent of the special law of mass action and independent of the true mol. coeffs. Application is made to the systems:  $2\text{Ag} + \text{PbCl}_2 \rightleftharpoons \text{Pb} + 2\text{AgCl}$ ,  $\text{Cd} + \text{PbCl}_2 \rightleftharpoons \text{Pb} + \text{CdCl}_2$ . The general equations of transformation of the coordinate system for change of mol. coeffs. are derived.

H. W. WALKER

The equilibrium between water, the nitrates and the sulfates of sodium and potassium. E. CORNEC, H. KROMBACH AND A. SPACK. *Compt. rend.* 188, 1250-3 (1929).—The study of this system made by Hamid (*C. A.* 20, 1164) at 90° and at 25° is extended over the range between 90° and -2°. The isothermal diagrams show the compns. of the satd. solns. represented on squares, the vertices of which correspond to the simple salts,  $\text{NaNO}_3$ ,  $\text{KNO}_3$ ,  $\text{Na}_2\text{SO}_4$  and  $\text{K}_2\text{SO}_4$ . At 90° 5 salts,  $\text{NaNO}_3$ ,  $\text{KNO}_3$ ,  $\text{K}_2\text{SO}_4$ , anhyd.  $\text{Na}_2\text{SO}_4$  ( $S_0$ ) and glaserite ( $G$ ) can exist in equil. with solns. of different compns. Contrary to the results of Hamid,  $\text{NaNO}_3$  and  $G$  cannot coexist. When the temp. is lowered, the double salt, darapskite ( $D$ ),  $\text{Na}_2\text{SO}_4 \cdot \text{NaNO}_3 \cdot \text{H}_2\text{O}$ , begins to form at 74°. Its field of existence increases and reaches that of  $\text{KNO}_3$  at 60° at a point representing a soln. satd. with the 4 salts. The fields of  $D$  and  $G$  then approach each other and meet at 44°, another inversion point.  $D$  and  $G$  can then coexist. At 32.4° Glauber's salt ( $S_{10}$ ) makes its appearance and at 30.9° its field touches that of  $G$  on the side  $\text{Na}_2\text{SO}_4 \cdot \text{K}_2\text{SO}_4$ . At 24.3°  $S_{10}$  and  $D$  can exist together, while below this temp. the field of  $S_0$  decreases until, at 21.8°, it no longer exists. The increase of the field of  $S_{10}$  continues until, at 17.6°, it reaches the field of  $\text{KNO}_3$ , where another quadruple point exists. Below this the 2 double salts cannot coexist.  $D$  leaves the side  $\text{Na}_2\text{SO}_4 \cdot \text{NaNO}_3$  at 13°, assumes a triangular shape and disappears at 10°.  $S_{10}$  then increases and reaches the side at 1.8°.  $G$  assumes here a triangular form and finally disappears at -2°.

H. F. JOHNSTONE

Melting points of the mixture of cyclohexane and benzene. IWAQ SETO. *Bull. Centr. Research Inst. South Manchurian Railway Co.* 13, 123-5 (1928).—The relation between the d. and the compn. of the  $\text{C}_6\text{H}_{12}$ -cyclohexane mixt. was detd.; a max. vol. expansion was found at 55.56% cyclohexane, the expansion of 1 g. of the mixt. at 20° being 0.013 cc. The m.-p. curve also was detd. There is at -41.9° a eutectic contg. 74.44% cyclohexane.

K. SOMEYA

Iron oxide reduction equilibria—a critic from the standpoint of the phase rule and thermodynamics. OLIVER C. RALSTON. *Bur. Mines Bull.* 296, 326 pp. (1929).—A crit. survey is made of existing data concerning the properties of the common oxides of Fe, their combinations with each other and the reduction equilibria of the various solid and liquid Fe-O compds., in order more logically to study the rate of reduction of Fe ore in a blast furnace.

DOWNS SCHAAF

Free-energy charts for predicting equilibrium pressures and concentrations. RALPH F. NIELSEN. *Ind. Eng. Chem.* 21, 568-71 (1929).—It is suggested that a chart be made for each pure substance in question. The lines on the charts would present const. pressure or const. concn. The abscissa of the chart would be temps., and the ordinates would be some function of free energy or of heat content. Equil. pressures and concns. could be read directly from such charts by those who knew nothing about thermodynamics just as heat-entropy charts are used in engineering. Charts for  $\text{O}_2$  are presented.

F. E. BROWN

Charts for predicting equilibria. MERLE RANDALL. *Ind. Eng. Chem.* 21, 571-2 (1929); cf. preceding abstr.—The free-energy equation  $F = F^\circ + RT \ln (A_{\text{O}_2} A_{\text{R}}^r / A_{\text{L}} A_{\text{M}}^m)$  is changed to  $-F/4.5787 T = (F^\circ/4.5787 T) - \log (A_{\text{O}_2} A_{\text{R}}^r / A_{\text{L}} A_{\text{M}}^m)$ . At equil.,  $F/4.5787 T = 0$  and  $-F^\circ/4.5787 T = \log K$ , where  $K$  is the equil. const. When all activities are unity,  $K = 1$ , and  $\log K$  and also  $-F^\circ/4.5787 T$  are equal to 0. When  $-F/4.5787 T$  or  $\log K$  is plotted against  $1/T$ , nearly a straight line results. Figures to show the application of these graphs to the system  $\text{H}_2$ ,  $\text{O}_2$  and  $\text{H}_2\text{O}$  and to the system  $\text{CO}_2$ ,  $\text{CO}$  and  $\text{C}$  are explained.

F. E. BROWN

The heat capacities of ethyl and hexyl alcohols from 16° K. to 298° K. and the corresponding entropies and free energies. KENNETH K. KELLEY. *J. Am. Chem. Soc.* 51, 779-86 (1929); cf. *C. A.* 23, 1344, 2645.— $\text{EtOH}$  was studied in one glassy and one crystalline state. At 18-90° K. the heat capacities of the glass and crystals nearly parallel each other but diverge a little with rising temps. There is a sharp rise in heat capacity of the glass from 90° to 96° K. and the glass begins to crystallize at 110° K. Hexyl alcohol does not tend to form a glass. The higher alcs. seem to become thermodynamically less stable with successive addns. of  $\text{CH}_2$  groups. The entropies of glasses at 0° K. increase with the complexities of their constituent mols.

F. E. BROWN

The heats of solution of some salts in water and ethyl alcohol solutions. J. R. PARTINGTON AND W. E. SORGE. *Phil. Mag.* [7], 7, 209-47 (1929).—Definitions are

given for such terms as integral heat of soln., intermediate heat of soln., differential heat of soln., etc. A *calorimeter* that can be used either isothermally or adiabatically is described. The calorimeter heater, the method of making the energy measurements, and other details of the app. are fully described. Measurements were made of the heats of soln. and diln. of KCl, KCNS, NaCNS, anhyd.  $\text{CuCl}_2$  and anhyd.  $\text{Ca}(\text{NO}_3)_2$  in  $\text{H}_2\text{O}$ . Heats of soln. of NaCuS, anhyd.  $\text{CuCl}_2$  and anhyd.  $\text{Ca}(\text{NO}_3)_2$  in solns. of EtOH were also measured.

L. H. REYERSON

**The heat of dissociation of nitrogen.** RAYMOND T. BIRGE. *Nature* 122, 842 (1928).—In reply to Gaviola (*C. A.* 22, 4370) Birge agrees that a revision of the Birge and Sponer value is necessary. A new calcn. based on the recent work of Herzberg (*C. A.* 22, 3582) gives 9.5 v. in agreement with Gaviola. The dissocn. heats of other gases are discussed in the light of this revision. The most probable values are, in Birge's opinion:  $\text{NO}$  7 v.;  $\text{CO}$  11 v.;  $\text{O}_2$  7.0 v.

J. B. AUSTIN

**The heat of dissociation of nitrogen.** R. S. MULLIKEN. *Nature* 122, 842(1928).—Mulliken supplements the discussion of Birge (cf. preceding abstr.) and arrives at the same conclusions.

J. B. AUSTIN

**The heat of vaporization of water and the specific volume of saturated steam between 210° and 250°.** M. JAKOB AND W. FRITZ. *Z. Ver. deut. Ing.* 73, 629-36 (1929).—The following figures are, resp., temp. in °C, pressure in kg./sq. cm., heat of vaporization in kg. cal./kg. and sp. vol. of satd. steam in cu. m./kg.: 200, 15.85, 462.8, 0.1271; 210, 19.45, 453.3, 0.1041; 220, 23.65, 443.3, 0.08599; 230, 28.53, 432.8, 0.07146; 240, 34.13, 421.7, 0.05970; 250, 40.55, 409.9, 0.05011. App. and procedure are described in detail.

A. WHITE

**Heat of vaporization of carbon.** IMRE BRÓDY AND TIVADAR MILLNER. *Chem. Rundschau Mitteleuropa & Balkan* 4, 150-1(1927); *Chem. Zentr.* 1928, I, 237.—The heat of vaporization of C was calcd. to be 160,000 cal.

FRANCIS P. GRIFFITHS

The dipole moments of mono- and disubstituted  $\text{C}_6\text{H}_6$  derivatives (WALDEN, WERNER) 10. The magnetostriction of various steels (RANKIN) 9. Dipole moments, association and ultra-violet absorption of aliphatic ketones and their solutions. I. Solvent influence and reaction mechanism from the standpoint of the dipole theory (WOLF) 10.

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### 3—SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

S. C. LIND

**The new quantum mechanics.** J. H. VAN VLECK. *Chem. Reviews* 5, 467-507 (1928).—An "explanation of some of the philosophy and logic underlying the new theory" and a survey of its phys. and chem. applications and possibilities. W. WEST

**Electron theory of valence.** WORTH H. RODEBUSH. *Chem. Reviews* 5, 509-31 (1928).—R. discusses valence from the modern viewpoint and criticizes some of the quantum mech. approaches. His views are applied to polarity in org. compds., as the Grignard compds., to reactivity in org. compds., etc. W. WEST

**Hydrogen-ion wave function.** V. GUILLEMIN, JR., and C. ZENER. *Proc. Natl. Acad. Sci.* 15, 314-8(1929).—An approx. wave function for the ion is developed. Its usefulness is demonstrated by evaluating the energy parameter  $E$  in the Schrödinger differential equation for the  $H_2^+$  ion in the normal state as a function of the internuclear distance. The results agree with those calcd. by Burrau (*C. A.* 21, 1753). H. F. J.

**Remarks on a research of Joh. Kleiber on the luminosity of the atom.** D. G. BOURGIN and E. E. LIBMAN. *Ann. Physik* [5], 1, 1096-8(1929).—A polemical discussion. R. H. FERGUSON

**Ratio of the mass of the proton to that of the electron.** V. ROJANSKY. *Nature* 123, 911-2(1929).—By following a similar procedure to that used by Eddington in evaluating the constant  $ch/2\pi e^2$  (*C. A.* 23, 1809), an "empirical" value of 1849.6 is found for the ratio  $M/m$ . I. J. PATTON

**The energy of the helium atom in the fundamental state.** EGIL A. HYLLERAAS. *Physik. Z.* 30, 249-50(1929).—The first plane model of the He atom proposed by Bohr has been shown to have an ionization potential of 28.15 v. while the space model of Bohr and Kramers gives 20.63 v. The work of Lyman on the He spectrum gives 24.46 v. as the correct value. H. gives a computation of the He atom in its unexcited state, based upon the new quantum mechanics, which gives  $\lambda = -1.45162$  while Lyman's work gives  $\lambda = -1.45175$ . W. W. STIFLER

**Relativistic theory of an atom with many electrons.** J. A. GAUNT. *Proc. Roy. Soc. (London)*, A124, 163-76(1929).—This is a highly mathematical paper in which the ordinary classification of multiplets and the selection and summation rules are derived from Dirac's relativistic equation. It is then shown that the total angular momentum has the same properties in the new theory as in the non-relativistic theory as developed by Born, Heisenberg and Jordan, using matrices, or by Dirac using  $q$ -numbers. Hence the work of these authors can be taken over with little amendment. A selection rule, which heretofore has received little theoretical attention, is then discussed. A wave mechanics theory of multiplets is discussed and the summation rule for intensities in a multiplet is proved to a first approximation. W. W. STIFLER

**The theory of the valence octet in the torulus atom. VIII. Determination of the structure of fluorescence resonators in some classes of organic compounds.** DAN RĂDULESCU and N. BĂRBULESCU. *Bul. soc. stiinte Cluj* 4, 333-56(1929); cf. *C. A.* 23, 1573. —It is shown that the fluorescence resonator for anthracene is identical with the general resonance of the form A, previously developed, the electrons of which are spread over the mol. The structure of the fluorescence resonator has been developed for some polynuclear hydrocarbons, e. g., acridines, etc. An outline of the exptl. procedure and tables of data are included. LOUIS WALDBAUER

**Molecular structure and properties of homopolar compounds. II. Structure of carbon atom and isomerism in homologous series.** A. DIBROVA. *Ukrainskii Khim. Zhur.* 3, Sci. Pt., 435-44(1928); cf. *C. A.* 22, 3347. —Comparing the b. ps. and sp. grs. of isomeric aliphatic hydrocarbons, halogen compds. and alcs., it was observed that normal primary compds. have the highest b. p. and sp. gr. Primary iso compds. and secondary normal compds. have lower b. ps. and sp. grs. Tertiary compds. have the lowest b. ps. and sp. grs. It was concluded that the 4 valence electrons of C atom in the level L are divided by 2 between the two  $2s$  and  $2p$  quantum orbits, thus explaining the relationships in b. ps. and sp. grs. of different structural isomers in homopolar series of aliphatic compds. JAROSLAV KUČERA

The possible occurrence of some important exceptions to the selection principle relative to the total quantum number. The N spectrum of thorium. JEAN THIBAUD. *Compt. rend.* 188, 1394-6(1929).—An examn. of the x-ray spectra, in the region of longer wave lengths by means of a grating, of the elements Ta, W, Pt and Au has revealed a set of doublets which can be fitted into a Moseley diagram, and which lie between 47 and 61 Å. U. From the values of the energies of the N levels as detd. by Bohr and Coster, the observed lines are found to agree with the energies of transition between the sub-levels  $N_{IV} - N_{VI}$  and  $N_V - N_{VI-VII}$ , resp., with an error ranging from 0.5 to 3%. That these lines are due to such a forbidden transition in which  $n$  does not change seems to be the only plausible explanation. The spectra of Ag, Pa, Bi and Th were examd. Only Th yielded any data, but the lines were of the usual type and not the abnormal N doublets. It is concluded that these forbidden transitions occur only when the selection rules for  $j$  and  $k$  are satisfied and in cases where the ratio of the energies of the sub-levels involved is large.

C. J. HUMPHREYS

The formation, predissociation, and dissociation of molecules, explained by the analysis of the vibration spectrum of sulfur monoxide. VICTOR HENRI AND FRANZ WOLFF. *J. phys. radium* [6], 10, 81-106(1929).—New quantum mechanics has shown that the formation of a mol. by 2 closely approaching atoms depends upon the mutual orientations of the magnetic moments of the valence electrons. The valence electrons of the ensemble should be distributed according to the Pauli principle. The analysis of the vibration spectrum makes possible the calcn. of the energy of "normal disscocn" of a mol. AB into 2 neutral atoms, as well as the energies of "excited disscocn." where one or both atoms are excited. The correspondence between the vibration levels of a neutral mol. and those of an excited mol. makes possible the prediction of the moment when the latter passes into the state of predissocn. The emission spectrum produced by an oscillating discharge in  $SO_2$  has been analyzed and shown to be due to SO. The energy of disscocn. has been found to be 148,000 cal., and the moment of inertia,  $j_0$  is equal to  $32 \times 10^{-40}$ . A triatomic mol. of the type  $AB_2$  may be disscocd. by an electronic bombardment into an excited mol. AB and an atom B.

C. J. HUMPHREYS

An isotope of oxygen of mass 17 in the earth's atmosphere. W. F. GIAUQUE AND H. L. JOHNSTON. *Nature* 123, 831(1929).—A no. of lines in the atm.  $O_2$  absorption spectrum obtained by Dieke and Babcock are found to be due to the alternate rotation levels of the 18-16  $O_2$  mol.; this mol. has every rotational state while the 16-16 mol. has only alternate levels, in confirmation of wave-mech. theory. Babcock's plates also show a no. of feeble lines which G. and J. attribute to a 17-16  $O_2$  mol. The normal state of this mol. has  $1/2$  unit of vibration and both odd and even rotational levels exist. Intensity estimates lead to an estimate of the abundance of the 18-16 mols. as 1 in 1250, and of the 17-16 mol. as about 1 in 10,000, as a max.

W. WEST

Some new features of the atmospheric oxygen bands, and the relative abundance of the isotopes  $O^{16}$ ,  $O^{18}$ . HAROLD D. BABCOCK. *Proc. Natl. Acad. Sci.* 15, 471-7(1929).—A new band named A' and attributed to the  $O_2$  mol. but unaccounted for has been described by Dieke and B. (*C. A.* 21, 3828). New data are given on this band and it is now attributed to the isotope of oxygen  $O^{18}$ . Measured positions of the lines are in accord with theoretical predictions and the expected odd-numbered doublets appear. A method is described for detg. the relative intensities of the A and A' bands. For the A band a laboratory source and variable air path are used and for the A' band the solar spectrum. Relative intensity estimates obtained in this way confirm Aston's conclusion that the proportion of  $O^{18}$  is of the order of 1:1000 of  $O^{16}$  and explain why the mass spectrograph has failed to reveal  $O^{18}$ . A series of weak doublets has been observed symmetrically placed between the intense doublets of the P and R branches of both the A and B bands. They appear to be missing isotopic doublets affected by some perturbation of the mol.

C. J. HUMPHREYS

The constitution of oxygen. F. W. ASTON. *Nature* 123, 488-9(1929); cf. Giauque and Johnston, *C. A.* 23, 3623.—No evidence has been obtained from mass spectroscopy which would lead to the supposition that O is other than a simple element. Measurements on packing fractions with O (16) as a standard and the at. wts. of H, F and I detd. in this way agreed with the accepted value to within 1 part in 10,000. Thus if O (18) exists, it cannot be present even to the extent of one part in 1000. In the O spectrum, if O (18) exists, a line O (18) O (16) should appear at 34; the line was found, although faint; A. believes it to be due to S (34). In the  $H_2O$  spectrum the faint line at 20 might be due to Ne (20) or  $A^{++}$  (40) or Si (28)  $C^{++}$  (12). If these two effects are due to O (18), then they correspond to 0.14 and 0.32%, resp.

G. G.

The internal constitution and radiation of stars. TCHESLAS BIALOBRZSKI. *J. phys. radium* [6], 9, 237-48(1928).—A general review of the principal results of modern



research in the field of theoretical astrophysics, with special regard to radiant energy.

**Recent experimental confirmation of the undulatory mechanics in the case of the movements of electrons.** MAURICE DE BROGLIE. *Rev. gén. sci.* 40, 69-71(1929).—A discussion of recent work by a number of investigators, tending to show that a stream of electrons is capable of exhibiting optical properties such as diffraction, refraction and interference.

**Atomic transformations and their relationship to chemistry and physics.** OTTO HAHN. *Sitzb. preuss. Akad. Wiss. Special No.*, 52-60(Jan. 24, 1929).—A review. Considerable discussion of radioactivity and cosmic radiation is given. W. E. V.

**The actinium problem.** G. ELSÉN. *Z. anorg. allgem. Chem.* 180, 304-20(1929).—A review of the existing exptl. work on the heavier members of the Act series and a crit. discussion of the various theories on the genesis of the Act family are given. E. believes that a U isotope of at. wt. greater than U I is the parent substance. J. B. A.

**Conditions of formation of clusters of radioactive atoms.** H. HERSZFINKIEL AND H. JEDRZEJOWSKI. *Compt. rend.* 188, 1167-9(1929).—The expts. were designed to find the conditions for reformation of clusters of radioactive atoms, after evapn. H. and J. detd. the atoms of the active deposit from the surface of such liquids as  $H_2O$ ,  $HCl$  and  $Hg$ . The formation of at. clusters is aided by the presence of impurities, and may be completely absent when proper precautions for cleanliness are taken. The adsorption of active deposit by filter paper is due, not to mol. clusters, but to adsorption of atoms by the filter paper. Radioactive clusters do not penetrate by recoil into the solid acting as support.

**Cosmic radiation and radioactive disintegration.** W. F. G. SWANN. *Nature* 122, 998(1928).—S. discusses the expt. of Maxwell (cf. C. A. 23, 3400) and notes that the modern view of cosmic radiation makes it extremely unlikely that this radiation has anything to do with radioactive disintegration. From the known absorption coeff. of this radiation S. deduces that 1 Po atom would absorb a cosmic ray quantum once in every seventy million years.

**Production of pure uranium.** ERLING BOTOLFSÉN. *Tids. Kemi Berguesen* 9, 66-7(1929).—Uranyl nitrate is heated in air and decompd. to oxide, and then by heating in  $O_2$  oxidized to  $U_3O_8$ .  $U_3O_8$  is then reduced with Ca in a vacuum. For 2 parts  $U_3O_8$  is used 1 to 1.5 parts Ca. The reaction mixt. is placed in a steel tube of 10 cm. length, 2 cm. diam., closed at one end, all placed in a quartz tube, 40 cm. long, 3 cm. diam. U is sepd. as a metallic powder, Ca in excess is evapd. and condensed.  $U_3O_8$  is totally transformed to metallic U. After cooling a mixt. of U in powder, CaO in pieces like drillings, and in distd. Ca in lumps remains. U can be sepd. nearly totally by passage through a sieve. The rest of Ca and CaO was removed by treating with 2% AcOH. The analysis indicated 99.95% U. By x-ray spectral analysis using Siegbahn's method no impurity could be recorded.

**Rate of decay of polonium in different points of the U. S. S. R.** L. N. BOGOVA-VLENSKII. *Nature* 123, 872(1929).—B. in Leningrad deposited Po electrolytically on brass disks, measured the activity of each disk and sent one to each of 18 places about the country. After 5 months the samples were returned to Leningrad, their activities again measured and the rate of decay calcd. for each sample. The half periods found were not identical but ranged from 125.6 days (Tiflis) to 181.6 days (Krasnodar). B. explains these observations on the basis of Perrin's theory of an external source of radiant energy.

**Mass spectrum of lead from bröggerite.** C. N. FENNER AND C. S. PIGGOT. *Nature* 123, 793-4(1929).—The age of the specimen of bröggerite, which was the source of the Pb used by Aston in his mass-spectrum analysis of Pb, is  $919.5 \times 10^6$  years, as calcd. from the chem. analysis for U, Th and Pb. The calcn. made using Aston's estimate of the percentage of  $Pb^{206}$  and  $Pb^{207}$  yields an age of  $908.4 \times 10^6$  yrs., but the estd. intensity of  $Pb^{208}$  gives an age of  $1313 \times 10^6$  yrs. The discrepancy may be due to error in the intensity est. in the mass spectrum, or to an error in the factor expressing the disintegration equiv. of Th in terms of U. A higher degree of precision in the intensity measurements seems required.

**Optical method for analyzing photographs of  $\alpha$ -ray tracks.** J. M. NUTTALL AND E. J. WILLIAMS. *Nature* 123, 799(1929); cf. C. A. 23, 3154.—Accuracy and convenience of stereoscopic photographic method for  $\alpha$ -ray tracks, pointed out by Curtiss, is confirmed by authors, who have been using a method for several years depending on the same essential principle.

**Successive  $\alpha$ -transformations.** G. GAMOW. *Nature* 123, 606(1929).—The paradox that, in successive  $\alpha$ -transformations, it is the slowest particles that come out first is

explained by assuming that all of the  $\alpha$ -particles in question are originally in the same quantum state. The energy with which the particles leave will depend on the nature of the forces acting between them, whether the first ones take more than their share or less. In a radioactive nucleus the attractions of the particles for each other outweigh their repulsions and therefore the first particle is the most difficult to remove.

H. F. JOHNSTONE

**Evaluation of  $\alpha$ -radiation of the active deposit of actinium by the measurement of its  $\beta$ -radiation.** NAHMIA. *Compt. rend.* **188**, 1165-7(1929).—In order to replace  $\alpha$ -ray by  $\beta$ -ray measurements in following a chem. reaction, expts. were carried out to find the ratio between the  $\beta$ -radiation under certain conditions and the total  $\alpha$  radiation of Act derivs. A plate was placed in An to cover it with active deposit. The ionization current  $I_\beta$ , produced in the  $\beta$ -ray chamber by Act C'', and the satn. current,  $I_\alpha$ , produced by the  $\alpha$ -rays of Act C in a chamber where they were completely absorbed, were measured.  $I_\alpha$  was measured after the  $\beta$ -radiation had diminished to  $1/20$  its initial value. The total  $\alpha$ -radiation for the Act family was measured.  $I_\alpha \text{ total} = I_\alpha \times 4.89 = 1320 I$ . Also in *J. chim. phys.* **26**, 319-26(1929).

LOUIS WALDBAUER

**The active volume of the Geiger point counter.** SHUNJI SHIRAI. *Proc. Phys. Math. Soc. Japan* [3], **11**, 12-6(1929).—A brass tube 2 cm. in diam. was used as the counting chamber. The needle point was a Pt wire 0.4 mm. diam. ground to a sharp point and then slightly rounded. A beam 1 mm. wide of  $\alpha$ -rays from a radon tube was applied to one of the holes bored on the sidewalls of the chamber and the no. of  $\alpha$ -particles per 10 min. was counted at various positions for some range, the source being moved away from the hole along the beam. By moving the source parallel to the axis of the chamber the same measurements were repeated at each hole. The actual form of the active vol. is nearly a cone, with the vertex at the point of the needle and the base at the front wall. A plan of the set-up and the methods of making measurements are described in detail.

C. H. BADGER

**Fine structure of the magnetic spectrum of  $\alpha$ -rays of thorium C.** S. ROSENBLUM. *Compt. rend.* **188**, 1401-3(1929).—App. is described for the study of  $\alpha$ -ray velocities, consisting essentially of a source of radiation and a photographic plate mounted in a vacuum chamber, which is placed between the poles of an electromagnet giving a field of about 3600 gauss. The  $\alpha$ -radiation of Th C is found to consist of 4 rays. If the velocity of the strongest is taken as 1, the other 3 have the following relative magnitudes; 1.003, 0.975, 0.961. The results are independent of the form of the radioactive source, the size of the bundle of rays, the position of the source in the magnetic field and the degree of evacuation, which varied between 0.1 and 0.001 mm.

C. J. HUMPHREYS

**The straggling of  $\alpha$ -particles from polonium in passing through gases.** HENRY EYRING. *Phys. Rev.* [2], **33**, 386-8(1929).—The straggling coeffs.  $\alpha$  for  $\alpha$ -particles from Po in several gases have been detd. from the ends of the Bragg ionization curves. The value for air of 0.61 mm. checks closely that obtained by other methods. The values for polyat. gases are greater than the theoretical.

BERNARD LEWIS

**The spatial distribution of the  $\gamma$ -radiation of radium in light-dispersive media.** MARC BRUZAU. *Ann. phys.* [10], **11**, 5-140(1929).—Diffusion renders all calcs impossible. According to recent ideas of Compton, radiation occurs with emission of electrons by shock, and increase in wave length, each primary ray giving a wide, diffuse band; and the  $\gamma$ -rays of diffusion of any medium being softer than the primary  $\gamma$ -rays. Its quality can only be defined by the secondary effective wave length. In order to effect comparisons between the 2 emissions it was necessary to define also the length of the primary wave. The exploration of the diffusing medium was made with the aid of a little chamber of 2-cc. volume, where the current was due almost wholly to wall effect; and was approx. proportional to the product of the intensities of the exciting radiations by the absorption coeff. of the wall. —The sensitivity of such a chamber is then a function of the at. no. of the wall, and of the wave length. The small chamber was calibrated against a large chamber where wall effect was avoided. This large chamber, with gas effect only, permitted the measurement of the energy emitted in the form of  $\gamma$ -rays per sec. by 1 g. of Ra. The results of the exploration of a mass of irradiated water are related to the nature of the walls of the chamber. It is possible to evaluate at each depth the effect produced by secondary  $\gamma$ -radiation. The ratio of the second to the first is greater the heavier the wall, as could be predicted theoretically, and shows the difference in the nature of the two radiations. By means of the absorption coeffs. and the laws of their variation with the wave length one can calc. the wave length of the secondary radiation, and pass from the knowledge of the ionization currents to that of the intensities of the exciting radiations. The method permits the testing of app.

used in Curietherapy, and could also be used to study the spatial distribution of x-rays. Finally, the results of this research suggest some reservations to the measurements by Millikan of cosmic rays in lakes at great altitudes.

L. A. SARVER

**The measurement of the active deposit from radium by penetrating  $\gamma$ -rays.** IRENE CURIE. *Compt. rend.* 188, 64-6(1929).—C. discusses the correction necessary in measuring the quantity of an active deposit of Ra C when some radiation from Ra B also enters the chamber, confirming the work of Slater (*C. A.* 16, 4129).

L. A. SARVER

**Internal absorption of  $\gamma$ -rays.** J. A. GRAY AND A. J. O'LEARY. *Nature* 123, 568(1929).—Corrections are made in the previous est. of the internal absorption of the  $\gamma$ -rays of Ra D and the fraction of the atoms emitting  $\gamma$ -rays (cf. *C. A.* 19, 1530, 1817). On the basis of the relative ionization and av. energies produced by  $\beta$ -rays of Ra E in equil. with Ra D and by the soft and hard  $\gamma$ -rays, and taking into account the fact that  $\beta$ -rays are ejected by the hard  $\gamma$ -rays from M and N levels, the following figures are arrived at: Out of 43 atoms disintegrating, 24 atoms emit  $\gamma$ -rays. Of these, 19 suffer internal absorption. It seems probable that, in the case of all substances, only a fraction of the atoms emit  $\gamma$ -rays after a  $\beta$ -ray disintegration.

H. F. JOHNSTONE

**The existence of radioactive recoil ions of high mobility.** LORA LANE LOEB AND LEONARD B. LOEB. *Proc. Natl. Acad. Sci.* 15, 305-10(1929).—This investigation was made to verify, if possible, the results of Erikson (*C. A.* 19, 602), who found a group of positive ions about recoil atoms of Rn, Tn and An, the mobility of which was 4.35 cm./-sec./v./cm., a value which is greatly in excess of the usual 1.56 and which has not been satisfactorily explained. The results were obtained with the positive ions of Th C formed from recoil atoms of Th C. The Rutherford a. c. method with a high field and a high frequency square-wave potential from a commutator was used. The results show no indications of the faster ions observed by E. The discrepancy may lie in a fundamental difference in the nature of the recoil atoms of Rn and of Th C, or in a contamination of the air blast used by E. by radioactive emanations.

H. F. JOHNSTONE

**Nuclear levels and artificial disintegration.** RONALD W. GURNEY. *Nature* 123, 565 (1929).—The author (*C. A.* 23, 329) and later Gamow (*C. A.* 23, 1807) have suggested the existence of quasi-discrete levels in the at. nucleus and have made applications to artificial disintegration. By treating the nucleus as a simple potential barrier Gamow showed that the probability of penetration of the incident  $\alpha$ -particle steadily decreases with decreasing velocity. If other solns. of the Schrödinger equation are considered, however, the possibility of resonance phenomena exists. This indicates that a variation of the velocity of the  $\alpha$ -particle may be accompanied by great fluctuations in the probability of penetration when the energy enters the range corresponding to one of the possible quasi-discrete levels.

H. F. JOHNSTONE

**Disintegration of aluminum.** C. PAWLOWSKI. *Compt. rend.* 188, 1334-6(1929); cf. *C. A.* 23, 3850.—On plotting the max. range of H-particles from Al against the range of the  $\alpha$ -particles used, the author concludes that the lower limit of the range of  $\alpha$ -particles that can be used to produce H-rays from Al is 1 cm. Using Bothe's formula for calcg. the max. range of the H-rays, he found no agreement with the actual curve. On plotting the relative no. of H-particles (of range greater than 18 cm.) per  $\alpha$ -particle, against the range of the  $\alpha$ -particles used, the curve shows an abrupt increase in the no. of H-rays with great range of  $\alpha$ -particles. There is some disagreement between the exptl. curve and the curve obtained by Gasmow (*C. A.* 23, 1047 and 1807) by the use of wave mechanics.

LOUIS WALDBAUER

**Radioactive isotopes of lead and the ultimate product of the radioactive series.** OTTO ERBACHER. *Metallwirtschaft* 7, 222-4(1928).—General discussion of the products of radioactive processes which lead to Pb isotopes and of the use of the latter in analytical chemistry as indicators of extreme sensitivity.

EMIL KLARMANN

**Refraction of light waves by electrons.** S. K. MITRA AND HRISHIKESH RAKSHIT. *Nature* 123, 796-7(1929).—A theoretical investigation of the electron density required to produce appreciable reflection of light waves ( $\lambda = 10^{-5}$  cm.) by electrons. A beam of light, entering at grazing incidence on the surface of a thoriated W strip at 2300° K., will, after passage over 10 cm., be shifted approx.  $7.8 \times 10^{-4}$  cm. from the surface. This effect should be detectable if suitable expts. can be arranged.

W. WEST

**The recombination of positive ions with free electrons.** R. SEELIGER. *Physik. Z.* 30, 329-57(1929).—A comprehensive survey, with bibliography.

L. W.

**The nature of the ions in air.** HENRY A. ERIKSON. *Phys. Rev.* [2], 33, 403-11 (1929); cf. *C. A.* 22, 4054.—Results are given showing the production and aging of the initial pos. ion in dried air and dried N<sub>2</sub>. Results are also given showing that when the final pos. air ion of mobility 1.36 is passed into moist air the final ions disappear and a swifter 1.87 ion appears. These in turn change back to 1.36 ions. E. assumes that a

neutral  $\text{H}_2\text{O}$  mol. gives up an electron to the final 1.36 two-mol. pos. ion, thus giving a one-mol. pos. ion which has a higher mobility. This  $\text{H}_2\text{O}^+$  ion ages by attaching itself to another mol., forming a slower 1.36 ion. Reasons are given for E.'s view that the initial and final pos. ions consist of 1 and 2 mols., resp.\* BERNARD LEWIS

Some problems relating to the mobility of gaseous ions. A. M. TYNDALL. WITH A NOTE BY C. F. POWELL. *Proc. Phys. Soc. (London)*, 41, 248-57(1929).—A lecture with suggestions as to future progress. P.'s note discusses the elimination of wax seals in the "four gauze" method (C. A. 23, 782) by enclosing the app. in a glass tube and sealing in the electrodes. LOUIS WALDBAUER

Dependence of mobility of ions in air on the relative humidity. EZER GRIFFITHS AND J. H. AWBERY. *Proc. Phys. Soc. (London)*, 41, 240-7(1929).—The relationship between relative humidities and the mobilities of negative ions in air at atm. pressure has been examnd. with a view to possible application in hygrometric measurements. The method employed was a modification of Zeleny's original method, the end of a wind channel being closed by a gauze disk fitted with a guard ring through which a steady stream of air of definite humidity was pumped. The motion of the neg. ions in the air stream was balanced by a counter potential gradient, and the mobility was deduced from the crit. potential required to produce a balance. Efforts were made to construct a direct indicating instrument by amplifying the current sufficiently to obtain deflection on a robust moving-coil indicator, but the variations in the amplification factor were found to be too serious. LOUIS WALDBAUER

Ionization of gases by positive ions. RICHARD M. SUTTON. *Phys. Rev.* [2], 33, 364-72(1929).—With a tube of simple design, pos. ions of K are driven by accelerating potentials up to 750 v. into Ne and A at various pressures. Pressure ranges between 0.05 and 1 mm. give definite variation of ionization with pressure. Ionization by this process does not offer a sharp initial point but a measurable amt. is present in Ne at 100 v. and in A between 100 and 150 v. The efficiency of the effect is less than for electron bombardment in these gases; it is several fold greater in A than in Ne. In neither gas has the efficiency reached a max. at 750 v. though there is evidence with A that the max. efficiency may be found at a slightly higher accelerating potential. The pressure range within which the ionization effect shows itself is higher than would be expected from kinetic theory, which seems to indicate the presence of long mean free paths for the pos. ions, in accord with results of other observers using a magnetic analysis app. BERNARD LEWIS

Theory of ionization in columns. II. GEORGE JAFFÉ. *Ann. Physik* [5], 1, 977-1008(1929).—A theory of ionization in columns, previously developed (cf. C. A. 8, 1541) is now extended to cover several parallel columns, and the possible reciprocal actions between them are considered. Various cases are treated with certain simplifying assumptions for different durations of exposure to the ionizing radiation. Formulas are developed for the production and recombination of ions in a single column, for homogeneous volume ionization, for the rise of ionization pressure, etc. Comparison with exptl. data, especially those of J. Schemel, shows good agreement between theory and expt. W. W. STIFLER

Experimental investigations of the change in the dielectric constants of a very dilute gas by the action of electrons. LUDWIG BERGMANN AND WALTER DÜRING. *Ann. Physik* [5], 1, 1041-68(1929).—The change in the dielec. const. of a gas in high vacuum due to the action of electrons was detd. by the so-called second Drude method, the gas occupying the space between the plates of a condenser set up in such a way in relation to the charging system that a resonance position could be established. This gives a measure of the capacity of the condenser and of the dielec. const. of the gas. A glowing cathode was the source of electrons. The results indicate that with increasing electron density the dielec. const. decreases. Within the exptl. error the detd. abs. values of the dielec. const. agree with the theoretical. The dispersion was also found to correspond to the theoretical. At const. electron density the measured deflection of the resonance position depends upon the wave length. R. H. FERGUSON

Latent carriers of electricity in the gaseous discharge. S. A. RATNER. *Proc. Natl. Acad. Sci.* 15, 318-23(1929).—In some expts. on the discharge of electricity through gases in which large hollow electrodes were used R. has observed considerable ionization currents inside the electrodes. These currents were investigated in a special app. in which precautions were taken to prevent the entrance of any electrons, high-speed positive ions or other carriers of electricity from penetrating into the ionization chamber. In spite of these precautions, however, large currents could be detected. From the nature of the currents the conclusion is reached that they cannot be ascribed to a photoelec. effect or to electrons or high-speed positive ions that may have passed be-

cause of a polarization of the elec. field surrounding the ionization chamber. Metastable atoms capable of being ionized by collision with each other or with gaseous mols. may account for the currents. These latent carriers must exist at a concn. greater than 1 to every  $10^4$  mols. The currents increase more rapidly than the discharge currents producing them since the no. of collisions between the metastable atoms increases as the sq. of the no. of atoms. It is difficult to interpret some other properties of the currents, for instance, the lack of satn. or the sudden increase in the current when the pressure is reduced below a certain value. The expts. may throw light, however, on the complicated phenomena observed behind a perforated cathode and usually ascribed to high-speed positive ions passing through the aperture in the cathode. H. F. J.

**High-frequency discharge in gases.** BHABESH CHANDRA MUKHERJEE AND ATUL KRISHNA CHATTERJI. *Nature* 123, 605(1929).—The general nature of striated discharges appears to be the same for all gases. With external electrodes the striations are generally of the nature of "double layers" and with the internal electrodes they always have a comb-like appearance, excepting at low pressures. The thickness of the striae increases as the pressure is lowered until finally the glow extends beyond the electrodes where striations can be observed. The same glow discharge can be obtained with only 1 external electrode. In this case the discharge is of the form of 2 convergent beams with their apexes away from the electrode. H. F. JOHNSTONE

**The diffraction of electrons by crystalline powders.** M. PONTE. *Compt. rend.* 188, 244-6(1929).—A method is briefly described which enables one to obtain the complete crystal lattice of a substance in a short time on a small plate, with a small sample of powder, small current consumption and no delicate technic with an accuracy of about 2%. It is suggested that the method will prove valuable in the investigation of surface phenomena. L. A. SARVER

**Action of metastable atoms of helium on a metal surface.** M. L. E. OLIPHANT. *Proc. Roy. Soc. (London)* A124, 228-42(1929).—A beam of metastable He atoms was produced by the impact of pos. ions at glancing incidence on the walls of a gas-free Pt canal. On collision with a metal surface, these metastable atoms set free electrons, the max. velocity of which corresponds to the difference between the energy of the metastable state and the work function of the surface. The fraction of the metastable atoms which can be reflected from a metal surface varies with the gas condition of the surface. The production of metastable atoms by glancing impact of pos. ions on a metal surface was proved by direct expt. While some sputtering is produced by the impact of the fast moving neutral atoms, the intensity of such disintegration is far less than that due to the pos. ions. This suggests that the charge of the ion is a factor in the process. W. W. STIFLER

**Emission of positive ions from metals.** H. B. WAHLIN. *Nature* 123, 912(1929).—A detn. of  $e/m$  for the positive ions from heated metals shows: Cu, Fe, Ni and Pt give alk ions only; W, Mo and Ta, when heated to a temp. where vaporization becomes appreciable, give ions of at. wt. agreeing with that of the emitter. I. J. PATTON

**The electronic theory of metals according to Sommerfeld, and the mean free path of the electrons.** L. BRILLOUIN. *Compt. rend.* 188, 242-4(1929).—A criticism of recent work by Houston, Frenkel and Mirobulow (*C. A.* 22, 4354). L. A. S.

**The theory of electron emission from metals.** LOTHAR NORDHEIM. *Physik. Z.* 30, 177-96(1929).—A mathematical derivation of the state of electrons in a metal is made on the basis of the Pauli principle. The distribution of the electrons meeting the surface and a theory of the reflection coeff. of the surface layer are also derived. On these fundamental considerations an explanation of the emission processes taking place from the incandescent state, by the action of an elec. field and by the action of light, is given. The results are considered as proofs for the Fermi-Dirac distribution principles and for the null-point energy of electron gas. H. F. JOHNSTONE

**Laws of scattering of canal rays in passage through solids. A note on the work of E. Homma.** CHR. GERTHSEN. *Ann. Physik* 87, 1000-2(1928).—Homma's estn. of the most probable angle of deflection is criticized; the correction alters essentially the interpretation of the observations. W. WEST

**Effect of various gases and vapors upon the sparking voltage of small tubular electrodes.** KANJI HONDA AND KIYOKI OTSUKA. *Bull. Inst. Phys. Chem. Research (Tokyo)*, 8, 319-34; *Abstract Ed.* 2, 43-5(1929).—When a stream of gas flows into the gap between tubular and disk electrodes, sparking voltage is lowered. Thus with 50-cycle a. c. and a 10-cm. gap, sparking voltage in kv.<sub>max</sub> is 72 for H<sub>2</sub>, for HCl 71, N<sub>2</sub> 70, air 68, N<sub>2</sub>O 67, CO 65, O<sub>2</sub> 63, Cl<sub>2</sub> 58, NO<sub>2</sub> 57, CO<sub>2</sub> 56, H<sub>2</sub>S 56, CH<sub>4</sub> 55, NH<sub>3</sub> 55, NO 54, SO<sub>2</sub> 53 and C<sub>2</sub>H<sub>4</sub> 50. When sparking discharge takes place in an atm. of the above gases, sparking voltage is in the same order as in the case of sphere gap discharge, where

it depends upon the magnitude of ionization potential. This difference is due mainly to the difference in the form of corona discharge at the tip of the tube, this being a pulsating discharge in the first case and a glow discharge in the 2nd. From Townsend's formula,  $v_+ = 1080\sqrt{x}$ , the frequency of the pulsating discharge can be calcd. Here  $v_+$  is pos. ion velocity,  $x$  is the field gradient in v./cm.,  $p$  the pressure of gas in mm. of Hg and the frequency is approx. expressed by  $v_+/g$ , in which  $g$  is the gap length in cm. Good agreement was obtained between calcd. and observed values. Thus with  $g = 2$ ,  $v_+/g$  is 5500 and the observed value 5680; with  $g = 3$ , these values, resp., are 3300 and 3000; with  $g = 4$ , 2000 and 1950. It was observed that vapors of such antiknock materials as  $\text{CCl}_4$  and  $(\text{C}_2\text{H}_5)_2\text{Se}$  always raise the sparking voltage. H. SROERTZ

**Mechanical ionization of gases under extreme pressures at any desired low temperature.** WILHELM ANDERSON. *Physik. Z.* 30, 360-4(1929); cf. C. A. 21, 1228.-From general principles, A. concludes that at extreme pressures the ionization potential of gases becomes zero, which leads to metallic conduction. This is used to explain the paradox stated by Eddington in his book on the Internal Constitution of Stars, that in very dense stars, "the stars will need energy to cool." LOUIS WALDBAUER

**Use of Ebert's ion counter in determination of number and mobility of the small ions in the atmosphere.** V. I. BARANOV AND E. S. SHCHEPOTIEVA. *Physik. Z.* 29, 741-50(1928).—While it has been known for some time that ion counts made by the Ebert aspiration app. are influenced by the presence of ions of av. and small mobility, it is now realized that all measurements made in the ordinary way with the instrument are uncertain on account of the unknown action of heavy ions. Methods of eliminating the effect of heavy ions are described in detail. W. WEST

**Indication of hydroxyl in a water-vapor discharge tube.** G. I. LAVIN AND FRANCIS B. STEWART. *Nature* 123, 607(1929).—The presence of OH in the gas from a water-vapor discharge tube has been demonstrated by photographing the exit tube with a quartz spectrograph. The well-known band at 3060 A. U. was obtained. The intensity of the band is increased by the addn. of a small amt. of  $\text{O}_2$  to the  $\text{H}_2\text{O}$  vapor. The active gas appears to possess both reducing and oxidizing properties. These are illustrated by the reduction of  $\text{CuSO}_4$  and oxidation of metallic Ag. H. F. JOHNSTONE

**Anomalous terms in the spectrum of doubly ionized lead.** STANLEY SMITH. *Nature* 123, 566(1929); cf. C. A. 23, 1054.—The following lines have been classified in the spectrum of Pb III:  $\lambda\lambda 995.75, 1165.05$  form the doublet  $6^3\text{P}_{1/2}-6^1\text{D}_2$ , and  $\lambda\lambda 4004.16, 3925.23$  the doublet  $6^1\text{D}_2-6^3\text{F}_{3/2}$ . The lines at  $\lambda 1439.42$  and  $\lambda 3832.83$  are  $6^1\text{P}_1-6^1\text{D}_2$  and  $6^1\text{D}_2-6^1\text{F}_3$ , resp. These are the only cases on record of the appearance of  $\text{F}\bar{\text{D}}$  combinations for 2 valence electron systems. Of the 3 terms  $6^3\text{P}_{012}$ , only  $6^3\text{P}_1$  has been found. This is in agreement with the known facts regarding Zn I, Ca I and Hg I. H. F. JOHNSTONE

**Astrophysical estimate of ionization potential of vanadium.** A. VIBERT DOUGLAS. *Nature* 123, 606-7(1929).—By the method outlined in a previous note (C. A. 22, 4055) based on the behavior of the spectra of Cepheid variables, the ionization potential of V was found to be 6.74 v. This agrees with that obtained by spectroscopic methods. H. F. JOHNSTONE

**The photoelectric effect of molten tin and two of its allotropic modifications.** ALEXANDER GOETZ. *Phys. Rev.* [2], 33, 373-85(1929).—See C. A. 23, 2358. B. L.

**The longitudinal distribution of photoelectrons.** ANTONIO CARRELLI. *Nature* 123, 836-7(1929).—C. extends Sommerfeld's first approximation for the photoelec. emission and for the impulse acquired by the emitted electrons when the exciting wave length is long compared with the at. radius, to the case where there is no limitation on  $\lambda$ . W. WEST

**The maximum velocity of photoelectric electrons in the selective sensitivity range of potassium.** HORST TEICHMANN. *Ann. Physik* [5], 1, 1069-95(1929).—By use of the Lenard anti-tension method, the velocity distribution of the photoelec. electrons of K was measured. The source of light was a quartz Hg lamp. It is shown that the max. velocity of the emitted electrons in the selective sensitivity range corresponds to the value given by the Einstein equation. Measurements were made for wave lengths of  $\lambda = 436, 405, 365.5, 313, 302$  and 280; the resp. max. velocities were 0.73, 0.79, 0.89, 0.97, 0.99 and  $1.05 \times 10^8$  cm. per sec. There is a relation between the max. velocity and the frequency of the light. The amt. of gas in the metal influences the results so that the contact potential increases as the vacuum is lowered. An app. is described for the prepn. of gas-free electrodes by distn. of the metal under high vacuum. R. H. FERGUSON

The average "forward" momentum of photoelectrons. E. J. WILLIAMS. *Nature* 123, 565-6(1929); cf. *C. A.* 23, 1346.—W.'s exptl. value of 1.40 for the ratio of the av. forward momentum of photoelectrons emitted from  $O_2$  and  $N_2$  by absorption of x-rays to the momentum of the incident radiation shows remarkable agreement with the value of 1.44 calcd. by Sommerfeld on the basis of probability considerations.

H. F. JOHNSTONE

The magnetic susceptibilities of several organic gases. FRANCIS BITTER. *Phys. Rev.* [2], 33, 389-97(1929).—A method for measuring the magnetic susceptibilities of gases similar in principal to that used by Wills and Hector (*C. A.* 18, 1232) but simpler in operation was developed. The following results, given in mol. susceptibility  $\times 10^4$ , were obtained: methane 12.2, ethane 27.3, propane 40.5, butane 57.4, isobutane 56.3, ethylene 12.0 and acetylene 12.5. The standards used were  $H_2$  3.94 and  $N$  11.8. The error given is less than 4% relative to each other. It is shown that the results cannot be reconciled with the assumption that the susceptibility of one of these mol. is equal to the sum of the susceptibilities of the atoms of which it is made up. The hypothesis is suggested that the susceptibilities of these substances are detd. by the binding electrons, and it is shown that this assumption leads to a satisfactory interpretation of the observations if the 2  $CH_2$  groups of ethylene are supposed held together by electrostatic forces and the  $CH$  groups by a bond similar to the ordinary C—C bond, such as in  $C_nH_{2n+2}$  mols. It is shown that among the previous measurements of the susceptibility of  $H_2$  and  $N_2$ , those of Wills and Hector are probably the most nearly correct.

BERNARD LEWIS

Dielectric polarization of liquids. V. Atomic polarization. C. P. SMYTH. *J. Am. Chem. Soc.* 51, 2051-9(1929); cf. *C. A.* 23, 3835.—Values for the at. polarization have been calcd. or taken from the literature for a no. of substances. FRANK URBAN

Observations on the lattice dimensions of the system:  $Fe_x-Sb_y$ . IVAR OFTEDAL. *Z. physik. Chem.*, Abt. B, 4, 67-70(1929).—Previous measurements (cf. *C. A.* 21, 3499) of the lattice dimensions of the system  $Fe_x-Sb_y$  were repeated and identical values found. The results of the system  $Fe_x-Sb_y$  with  $a = 4.123$  and  $c = 5.168$  A. U. are not in agreement with those of Hägg (*Nova Acta Reg. Soc. Sci. Upsal.* 7, No. 1 (1929), viz.:  $a = 4.106$  and  $c = 5.145$  A. U.; O. believes that his detns. were made on a system of a higher Fe content than that of H., because of a different mode of prepn. and rapid cooling.

R. D. BUMBACHER

X-ray study of the system: palladium-hydrogen. J. D. HANAWALT. *Phys. Rev.* [2], 33, 444-58(1929).—A unique grating parameter  $a_0 = 4.017$  A. U. results when Pd is charged with  $H_2$  either electrolytically or from the gas phase in disagreement with the results of Linde and Borelius (*C. A.* 22, 1066). Larger values of  $a_0$  are possible, but are not stable at  $20^\circ$ . A difference in stability between some of the electrolytically charged specimens as compared with those charged from the gas phase is assocd. with the mech. state of the micro-crystals in the 2 cases. The concn.  $Pd_2H$  is assocd. with the value  $a_0 = 4.017$ . The  $L_{III}$  absorption limit of Pd is changed by the presence of  $H_2$ , which causes a shift in the main edge of 0.87 X. U. toward shorter wave lengths, and the occurrence of a secondary absorption 10 X. U. toward shorter wave lengths. These are taken to indicate a chem. combination between Pd and H atoms forming  $PdH$ . Impurities in the Pd affect very markedly its occlusion of  $H_2$ . The unique value of  $a_0 = 4.017$  does not appear but rather all distentions in the range 3.885 to 4.030 are observed.

BERNARD LEWIS

X-ray diffraction in liquids of the terpene series. V. I. VAIDYANATHAN. *Indian J. Physics* 3, 371-89(1929).—A systematic study of the x-ray haloes given by 21 liquids belonging to the terpene series was made by using  $Cu K\alpha$  radiation. A gradual increase in the diam. of the mols. of the liquids and an approx. constancy for each class of liquids are observed. The nature of the haloes is explained by the idea that x-ray diffraction peaks in liquids occur at distances equal to the mean mol. distances, with the conception that the distribution of mols. around any mol. depends on their form and symmetry. The sharpness of the halo and structural symmetry of camphene justify the prediction of a sharp halo in liquids with sym. mols. Five long-chain olefinic terpenes, geraniol, linalool, rhodinol, citral and citronellal, showed peaks at nearly the same angle corresponding to a diam. of 4.95 A. U. Terpeneol had a diam. of 5.08 A. U., the inner halo being more prominent than with geraniol, linalool or rhodinol. The group menthone, carvone and thujone with a CO group in the ring of the compd. showed peaks corresponding to 5.35 A. U. In the transition to the cyclic terpenes of the formula  $C_{10}H_{16}$  there was a further increase in the diam. to 5.45 A. U. and 6 A. U. Of these, terpinene, *d*-limonene, *dl*-limonene, *d*- $\alpha$ -phellandrene and sylvestrene were monocyclic; camphene, *d*-pinene and *l*-pinene were dicyclic. The pinenes gave 2 haloes. The 4 sesquiterpenes,

cadinene, inene, caryophyllene and cedrene, showed a diffuse halo between  $15^\circ$  and  $25^\circ$  outside the principal one.

**X-ray diffraction in liquid alloys of sodium and potassium.** KEDARESWAR BANERJEE. *Indian J. Physics* 3, 399-408(1929).—A series of x-ray diffraction haloes produced by liquid alloys of Na and K of different proportions has been studied with the radiation from a Mo target in a Shearer tube. The alloy is regarded as a soln. of an excess of Na or K in the liquid compd.  $\text{Na}_2\text{K}$  and the results are discussed in accordance with the results of Krishnamurti for x-ray diffraction in aq. solns. The halo is nearly the same as that given by  $\text{Na}_2\text{K}$  when the amt. of dissolved metal is small compared to the amt. of the solute  $\text{Na}_2\text{K}$ , and the halo is practically the same as that given by the metal when either of the metals preponderates to a large extent. In the intermediate stages the effect is regarded as a superposition of the effects due to  $\text{Na}_2\text{K}$  and the metal in excess. From the size of the halo for  $\text{Na}_2\text{K}$  obtained graphically it appears that the 3 atoms of this compd. are placed at the corners of a triangle. A faint inner ring is observed in cases where the excess of either of the metals in  $\text{Na}_2\text{K}$  is small. H. W. WALKER.

**Diffraction of x-rays by two-dimensional crystal lattice.** V. LINNİK. *Nature* 123, 604-5(1929).—When a thin beam of x-rays is passed through a crystal cleft into very thin layers in such a manner that the orientation of the sep. layers is not destroyed the effect of the 2-dimensional lattices will be added. On the other hand, the space effect due to the penetration of the rays will be destroyed by the incoherence of waves produced by scattering from incorrectly spaced layers. Such a crystal may be produced in mica by heating it to redness and cooling. From measurement of the spectra produced the mols. are shown to be at the apexes of equilateral triangles, the sides of which are equal to 5.2 Å. U. Because of the ease of interpretation of these spectra, the method may be of service in the study of crystal structure. Also in *Z. Physik* 55, 502-6(1929). H. F. JOHNSTONE.

**The temperature dependence of electron emission under high fields.** WM. V. HOUSTON. *Phys. Rev.* 33, 361-3(1929).—An expression showing the temp. dependence of electron emission under high fields is secured by combining the results of Fowler and Nordheim (*C. A.* 22, 3829) with the Fermi distribution of velocities used in the Sommerfeld electron theory of metals. The result is similar to that obtained previously by considering the diminution of the work function by the field (*C. A.* 22, 1538). The temp. variation is small and decreases as the external field increases. It is of the right order of magnitude to agree with the most recent observations. B. L.

**The efficiency of quenching collisions and the radius of the excited mercury atom.** E. GAVIOLA. *Phys. Rev.* [2], 33, 309-18(1929).—The evidence for and against the assumption of Foote (*C. A.* 21, 3555) that every collision of a foreign gas mol. with an excited Hg atom is efficient in quenching the resonance radiation is discussed, and a new calcn. of the efficiency of collisions is given based on Stuart's (*C. A.* 19, 2909) measurements. This shows that the efficiency can be assumed to be equal to one for  $\text{CO}$ ,  $\text{H}_2$  and perhaps  $\text{O}_2$  but that it is undoubtedly smaller than one for  $\text{H}_2\text{O}$ ,  $\text{N}_2$ , A and He.  $\text{CO}$  has actually a greater quenching efficiency than  $\text{H}_2$ . The radius of the excited Hg atom is calcd. by using an improved value for the amt. of resonance radiation re-absorbed in the resonance vessel and found to be  $r_{\text{Hg}}' = 2.91 \times 10^{-8}$  cm. or 1.62 times normal values for  $\text{H}_2$ , and  $r_{\text{Hg}}' = 5.5 \times 10^{-8}$  cm. or 3 times normal for  $\text{CO}$ . The apparently higher quenching efficiency of  $\text{O}_2$  than  $\text{H}_2$  is explained by the partial oxidation of the Hg vapor and consequent decrease of the d. of the latter. It is shown that the life of metastable atoms increases with the admission of certain foreign gases into the fluorescence vessel. This is due to the fact that the life of the metastable atom decreases at low pressures because of collisions with the walls of the vessel. B. N.

**Electrode holder for arc-spectrum analysis.** LAURENCE L. QUILL AND PIERCE W. SELWOOD. *Ind. Eng. Chem., Anal. Ed.* 1, 180(1929). R. H.

**Decay of helium lines.** R. VON HIRSCH AND R. DÖPEL. *Ann. Physik* [5], 1, 963-76(1929).—The decay of the He lines was studied by the canal-ray method of Wien, a Steinheil prism spectrograph being used. The intensity of blackening of the plates was measured point by point at intervals of approx. 0.4 mm. Various times of exposure, ranging from 3 min. to 6 hrs., were used, depending upon the sensitiveness of the plates to the particular wave length which was being studied. The possible disturbances due to variations in pressure and the effects of different cathodes were studied in detail. Abs. values of the decay const., and of the time of decay,  $T$ , are given for 10 lines from  $2S$  to  $3P$ , for which  $\alpha > 25 \times 10^7 \text{ sec.}^{-1}$  and  $T < 4 \times 10^{-8} \text{ sec.}$  to  $2p - 5d$  for which  $\alpha = 5.3 \times 10^7 \text{ sec.}^{-1}$  and  $T = 1.7 \times 10^{-8} \text{ sec.}$  The smallest value given is for  $2P - 6D$  for which  $\alpha = 2.0 \times 10^7 \text{ sec.}^{-1}$  and  $T = 5.0 \times 10^{-8} \text{ sec.}$  W. W. STIFLER.

**A new titanium band system.** ANDREW CHRISTY. *Nature* 123, 873-4(1929).—



The work of Birge and Christy (cf. *C. A.* 22, 4369) in classifying the Ti oxide bands of the M-type stars is extended. Twenty bands, including 46 heads, between  $\lambda 7990$  and  $\lambda 6270$  have been assigned to a new system the lower level of which is shown to be the same as in the blue-green system. The heat of disson. for this level is calcd. to be 6.74 v. J. B. AUSTIN

**Spectral displacements in neodymium compounds.** FRITZ EPHRAIM AND PRIYADARANJAN RAY. *Ber.* 62B, 1520-5(1929).—The reflection spectra of the following compds. have been observed:  $\text{NdCl}_3$ ,  $\text{NdBr}_3$ ,  $\text{NdI}_3$ ,  $\text{NdF}_3$  (solid and in soln.),  $\text{Nd}_2\text{O}_3$ ,  $\text{Nd}(\text{OH})_3$ ,  $\text{Nd}_2(\text{SO}_4)_3$ ,  $\text{Nd}_2(\text{SO}_4)_3 \cdot 8\text{H}_2\text{O}$ ,  $\text{Nd}_2\text{O}_3 \cdot \text{SO}_3$ ,  $\text{Nd}_2(\text{C}_2\text{O}_4)_3 \cdot 10\text{H}_2\text{O}$ ,  $(\text{NH}_4)_2\text{Nd}(\text{NO}_3)_4$ ,  $(\text{NH}_4)_2\text{Nd}(\text{NO}_3)_4 \cdot 4\text{H}_2\text{O}$ ,  $\text{Nd}_2(\text{HPO}_4)_3 \cdot 4\text{H}_2\text{O}$ ,  $\text{Nd}_2(\text{HPO}_4)_3$ ,  $\text{Nd}_2(\text{HPO}_4)_3 \cdot 0.5 \text{H}_2\text{O}$ ,  $\text{NdBr}_3 \cdot n\text{NH}_3$ . The change in spectrum produced by changing the anion is briefly discussed. The method of prepn. is given for most of the salts. J. B. AUSTIN

**The "lanthanum contraction" and spectral displacements in compound formation—changes in the samarium spectrum.** FRITZ EPHRAIM AND PRIYADARANJAN RAY. *Ber.* 62B, 1639-50(1929).—The reflection spectra of the following compds. are reported:  $\text{Sm}_2\text{O}_3$ ,  $\text{SmF}_3$  (soln.),  $\text{SmOF}$ ,  $\text{SmCl}_3$ ,  $\text{SmCl}_3 \cdot 6\text{H}_2\text{O}$ ,  $\text{SmCl}_3$  (soln.),  $\text{SmCl}_3 \cdot 8\text{NH}_3$ ,  $\text{SmCl}_3 \cdot 5\text{NH}_3$ ,  $\text{SmBr}_3$ ,  $\text{SmBr}_3 \cdot 6\text{H}_2\text{O}$ ,  $\text{SmI}_3 \cdot 9\text{H}_2\text{O}$ ,  $\text{Sm}(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}$ ,  $\text{Sm}(\text{NO}_3)_3 \cdot 4\text{H}_2\text{O}$ ,  $\text{Mg}_3\text{Sm}_2(\text{NO}_3)_{12}$ ,  $\text{Mg}_3\text{Sm}_2(\text{NO}_3)_{12} \cdot 24\text{H}_2\text{O}$ ,  $\text{Sm}_2(\text{SO}_4)_3$ ,  $\text{Sm}_2(\text{SO}_4)_3 \cdot 8\text{H}_2\text{O}$  (room temp. and in liquid air),  $\text{Sm}_2\text{O}_3 \cdot \text{SO}_3$ ,  $\text{SmPO}_4$  (soln.),  $\text{Sm}_2(\text{C}_2\text{O}_4)_3$  (soln.),  $\text{Sm}(\text{CNS})_3 \cdot 6\text{H}_2\text{O}$ ,  $(\text{CH}_3\text{CO}_2)_2\text{Sm} \cdot 4\text{H}_2\text{O}$ , the ferrocyanide, the lactate, the formate, the acetylacetonate (alc. and  $\text{CS}_2$  solns.). It is claimed that these spectra give evidence of the "lanthanum contraction," i. e., that in rare earth ions of equal valence, the ones with highest at. no. have their electrons most tightly bound to the nucleus. Inner complex formation such as in the acetylacetonate and the lactate shifts the spectrum to the red. "Basic" salts cause a shift in the same direction. The solvent has a marked influence. The method of prepn. is given for most of the salts. J. B. AUSTIN

**Variation of the intensities in the helium spectrum with the velocity of the exciting electrons.** J. H. LEES AND H. W. B. SKINNER. *Nature* 123, 836(1929).—Results are shown for the variation of the intensity of the lines 3889 A. U. ( $2^3\text{S}-3^3\text{P}$ ) and 3965 A. U. ( $2^1\text{S}-4^1\text{P}$ ) with the velocity of the exciting electrons. A photographic method was used, and correction made for secondary excitation. Conclusions: At high electron velocity the triplets are feeble compared with the singlets; at low exciting velocity, the singlets are weak compared with the triplets. This seems to indicate a very close coupling of the spin of the exciting electron with those of the at. electrons. The light of the triplets is confined closely to the electron beam; the light of the singlets tends to spread away from it. The intensity results are not in accord with those of Peteri and Elenbaas (*C. A.* 23, 2883). W. WEST

**The shift in the 1.14 absorption band of some benzene derivatives.** JAMES BARNES AND W. H. FULWILER. *J. Am. Chem. Soc.* 51, 1750-2(1929); cf. *C. A.* 21, 3047.—A continuance of earlier work. An increase in the no. of Me substitutions on a benzene ring causes a shift toward the infra-red of the band at 1.14. Data are included on benzene, toluene, *p*-xylene, and mesitylene. WALLACE R. BRODE

**Arc spectrum of phosphorus.** D. G. DHAVALA. *Nature* 123, 799(1929).—The P arc lines  $4\text{P} - 4\text{S}_2$  and  $\times 4\text{P} - 4\text{P}$  have been found in the infra-red solar lines, as given by the revision of Rowland's preliminary table of solar spectrum wave lengths, at  $\nu = 10555$  to 11095. A 2nd group,  $2M_2(\text{N}_1 \leftarrow \text{O}_2)$  was identified in the region 4600-6000 and found in the solar spectrum. The ionizing frequency is  $\nu = 86521$ , corresponding to 10.68 v., i. e., slightly higher than that of S. W. WEST

**Structure of the OH bands.** ROBERT S. MULLIKEN. *Phys. Rev.* 31, 310(1928); cf. *C. A.* 23, 32.—Each OH band comprises (a) 6 main branches, (b) about 6 weak "satellite" series, (c) another weak branch extending toward high frequencies from each head. The main branches (for which  $\Delta j_k \neq \Delta j$ ) and 4 of the satellite series (for which  $\Delta j_k = \Delta j$ ) agree completely with the Hund's case b predicted structure for  $^2\text{S} \rightarrow$  (inverted)  $^2\text{P}$ , except that these satellite series although weak are much stronger than predicted. Branch (c) is now identified as an R branch ( $\Delta j = 1$ , — but  $\Delta j_k = 2$ ); a companion P branch, as yet unknown, may be expected. Occurrence of branch (c) and high intensity of satellite series show OH here as a transition case between CH  $\lambda 3900$  (good case b, 6 strong branches with  $\Delta j = 0, \pm 1$  and  $\Delta j_k = \Delta j$ ) and HgH (12 strong branches governed by  $\Delta j = 0, \pm 1$  without limitations on  $\Delta j_k - jk$  not being quantized for the  $^2\text{P}$  state here case a). The ZnH bands lie between OH and HgH in all these features. Two satellite series (Dieke and Watson's  $\sigma Q_1$  and  $\sigma Q_2$ ) have  $\Delta j_k = \Delta j$  like main branches, but differ by running counter to the usual "crossing-over" rules of  $\sigma$ -type doubling, constituting the first exception to these rules. C. J. HUMPHREYS

**Intensity of NO  $\gamma$ -bands.** B. POGANY AND R. SCHMID. *Z. Physik* **54**, 779-87 (1929); cf. *C. A.* **22**, 3355, 3584.

**A study of the helium band spectrum. II.** SUNAO IMANISHI. *Sci. Papers Inst. Phys. Chem. Research* (Tokyo) **10**, 237-52 (1929); cf. *C. A.* **23**, 3162.—The green and yellow regions of the He band spectrum have been photographed with hypersensitized plates by aid of a 15-ft. concave grating as described in the previous paper. Two new bands of par-helium  $2S(n=1) - 3P(n=1)$ , first member at  $\lambda$  517 $\mu$ , and  $2S(n=2) - 3P(n=2)$ ,  $\lambda$  521 $\mu$ , have been found and analyzed. The band  $2S(n=1) - 3P(n=0)$  mentioned by Weizel and Flichtbauer has been completed. The band,  $2S(n=0) - 3P(n=0)$ ,  $\lambda$  513 $\mu$ , given by Curtiss, has been extended. Ortho-helium  $2s(n=2) - 5p(n=2)$ ,  $\lambda$  338 $\mu$ , has been found and analyzed. Merton-Pilley-Fujioka bands in the green,  $\lambda$  495 and 535, have been reinvestigated with the more accurate methods of this investigation.

**Spectral displacements in praseodymium compounds. V.** FRITZ EPHRAIM AND PRIYADARANJAN RAY. *Ber.* **62B**, 1509-19 (1929); cf. *C. A.* **22**, 1728.—The reflection spectra of the following compds. are reported:  $\text{Pr}_2(\text{HPO}_3)_3$ ,  $\text{Pr}_2(\text{HPO}_3)_3 \cdot 0.5\text{H}_2\text{O}$ ,  $\text{Pr}_2(\text{HPO}_3)_3 \cdot 3\text{H}_2\text{O}$ ,  $\text{Pr}(\text{H}_2\text{PO}_3)_3$ ,  $\text{Pr}(\text{ClO}_4)_3 \cdot 8\text{H}_2\text{O}$ ,  $\text{Pr}(\text{IO}_3)_3$ ,  $\text{Pr}(\text{IO}_3)_3 \cdot 4\text{H}_2\text{O}$ ,  $(\text{NH}_4)_2\text{Pr}(\text{NO}_3)_6$ ,  $\text{Pr}_2\text{O}_3 \cdot \text{SO}_3$ ,  $\text{Pr}(\text{NO}_3)_3 \cdot n\text{NH}_3$ ,  $\text{PrBr}_3 \cdot n\text{NH}_3$ ,  $\text{Pr}(\text{OH})_3$ , the chloroplatinate, the ferrocyanide, the  $\beta$ -naphthalenesulfonate (anhyd. and with  $2\text{H}_2\text{O}$ ), the succinate ( $2\text{H}_2\text{O}$  and  $5\text{H}_2\text{O}$ ) and the acetylacetonate (anhyd.,  $2.5\text{H}_2\text{O}$ , molten, alc. soln.,  $\text{CS}_2$  soln.). The results are discussed in terms of "positive" and "negative" atoms and the tightness of the at. bonds. Water of crystn. shifts the spectrum to the violet. Changing through the halogens from F to I shifts to the red. O-contg. acid radicals shift to the violet, the shift being approx. proportional to the no. of O atoms. The solvent has a pronounced effect. With the acetylacetonate,  $\text{CS}_2$  shifted the lines to the red, alc. toward the violet. The method of prepn. is given for most of the salts.

**The spectrum of trebly ionized thallium.** K. R. RAO. *Proc. Phys. Soc. (London)* **41**, 361-5 (1929).—Examn. of the vacuum spark data of Carroll (*C. A.* **20**, 1560) has revealed the important combinations between the low  $^3D$  and  $^1D$  levels of the  $d^3s$  state and the triad of triplet and singlet  $F$ ,  $D$  and  $P$  terms of the  $d^3p$  configuration in Tl IV. In addn. to the recurrence of const. frequency differences the classification is justified by aid of the regular and irregular doublet laws and triplet interval ratios, applied to 28 electron-system spectra isoelectronic with Pt I.

**Wave length of the K lines of copper using ruled gratings.** J. A. BEARDEN. *Proc. Natl. Acad. Sci.* **15**, 528-33 (1929).—The method of using ruled gratings in the measurement of x-ray wave lengths is important because abs. values are thus obtained which are more accurate than those resulting from crystal measurements. The optical diffraction formula for computing wave lengths is given. The exptl. arrangement used in the measurement of the K lines of Cu is described in detail, attention being directed to the precautions taken to insure accuracy. The weighted mean of measurements of the 10 best of the 31 plates taken yielded:  $K_\alpha = 1.5422 \pm 0.0002$  A. U.,  $K_\beta = 1.3926 \pm 0.0002$  A. U. Every one of the 31 plates obtained from the 3 gratings used gave wave lengths greater than those calcd. from crystal diffraction data. These results are significant in that they lead to a modification of the values of fundamental const. as follows: the grating space of calcite so calcd. is 3.035 A. U., Avogadro's no.,  $N = 6.022 \times 10^{23}$  per g. atom, the electronic charge,  $e = 4.804 \times 10^{-10}$  e. s. u., Planck's const.,  $h = 6.604 \times 10^{-27}$  ergs, sec.<sup>-1</sup> and the fine structure const.,  $1/\alpha = 136.6$ . The value of the Rydberg const. obtained by using the value of  $e/m$  from diffraction expts. is about 0.4% too high.

**Molecular binding and low  $^4S$  terms of  $\text{N}^+$  and C.** LOUIS A. TURNER. *Proc. Natl. Acad. Sci.* **15**, 526-8 (1929).—The fact that it requires more energy to dissociate a  $\text{N}_2^+$  ion in the normal state by increasing its vibrational quantum no. than is required if it is first excited led Herzberg to conclude that the dissocn. of the normal mol. ion produces an atom and an ion, one of which is excited. Heitler and Herzberg have suggested that the  $\text{N}^+$  ion is in the excited  $2s(2p)^3\ ^4S$  state. Two lines given by Fowler and Freeman at  $\lambda$  4991.22 and  $\lambda$  5012.026 satisfy the expected intersystem combinations with the normal  $(2s)^2(2p)^3\ ^3P$  term, the wave lengths corresponding to 2.48 v. The corresponding combinations have not been found in the available data on C. The spectrum of Si is not well enough known to warrant such a comparison. The chief objection to the interpretation is that the energy of this state is so tremendously different from that of the other states arising from the same electronic configuration, according to Hund's theory. If the suggested interpretation is found to be correct, it will support the theory of Heitler and London of the quadrivalence of these atoms.

**Effect of volume changes on the infra-red vibrations of simple crystals.** E. O.

**SALANT.** *Proc. Natl. Acad. Sci.* 15, 533-7(1929).—By reasoning from the relationship of the law of force to the vibration frequencies of NaCl type crystals; given by Carpenter and Stoodley, formulas are derived by which the variations in the vibration frequencies of such crystals, due to changes of vol. occasioned either by change of pressure or temp. may be computed. Calcns. are given for NaCl, KCl, KBr and KI. The effect on frequencies of reflection bands is also considered. It should be possible to measure changes in vibration frequency experimentally, but it would be more difficult with reflection bands since the shifts are much smaller.

C. J. HUMPHREYS

**Radiation and distribution laws.** B. BRUŽS. *Acta Univ. Latviensis* 20, 433-41 (1929).—A thermodynamic derivation of the equations of Planck, Wien and Rayleigh-Jeans is given without the introduction of quantum assumptions. The phys. picture is of the sublimation of radiation,  $B_\lambda$ , of wave length  $\lambda$  from the black body  $A$ , in the reaction  $A = B_\lambda - Q_\lambda$ , where  $Q_\lambda$  is the heat of sublimation. It is assumed that

$\frac{d \ln p_\lambda}{dt} = \frac{Q_\lambda}{RT^2}$ ; that  $p \int_0^\infty p_\lambda d\lambda = \sigma T^4$ ; and that  $p_\lambda = \lambda^{-5} F(\lambda T)$ . On the

basis of these equations it is shown that Wien's equation results if  $Q_\lambda$  is independent of temp., and is a function only of the individual process; the Rayleigh-Jeans, if  $Q_\lambda$  is a function of the resulting  $p_\lambda$  only, and is zero at  $0^\circ$  abs.; and Planck's equation, without, of course, the quantum postulate, if there is a definite  $Q_\lambda$  at  $0^\circ$  abs. increasing in temp. parallel with the rise in pressure. A generalized equation of the Wien form is also given, which fits exptl. data, has a simple form, seems to have a common basis with Maxwell's distribution law, and seems to include several varieties of special distribution, including spectral lines.

W. WEST

**Some studies in the Stark effect for the diffuse lines of silver and lithium.** RUFUS H. SNYDER. *Phys. Rev.* [2], 33, 354-60(1929).

BERNARD LEWIS

**The Zeeman effect in the Angstrom CO bands.** II. F. H. CRAWFORD. *Phys. Rev.* [2], 33, 341-53(1929).—Certain exptl. improvements are noted over the first part of the work (Kemble, *et al.*, *C. A.* 22, 24). The present results include observations of the Zeeman effect which has been extended from the bands at  $\lambda\lambda$  5610, 5198 and 4835 to include  $\lambda\lambda$  4511 and 4394. Measurements on 30 patterns with  $M = 1$  (where  $M$  is the ordinal no. of the line in a branch) for fields from 18,000 to 36,000 gauss have shown the widths of the Zeeman patterns to be proportional to the field strengths to within 2%, the estd. accuracy of measurement. The weighted av. of the pattern widths for  $M = 1$  is 97.7%  $\Delta\nu_n$  and  $M = 2$  66.3%  $\Delta\nu_n$ , where  $\Delta\nu_n$  is the Lorentz triplet half width. The quantum mechanics predicts 100%  $\Delta\nu_n$  and 66.7%  $\Delta\nu_n$  for these widths, resp., as against 88.9% and 64% on the old quantum theory. Thirteen out of the possible 18 patterns predicted for the first 2 lines of the  $P$ ,  $Q$  and  $R$  branches have been resolved and measured and found to agree with predictions within the error of measurement. The intensity asymmetries reported previously have been found, whenever comparison in both high and low fields was possible, to behave qualitatively (though not quantitatively) as Kronig's (*C. A.* 22, 1101) calcns. predicts. Eight isolated lines ( $M = 23$  to  $M = 35$ ) in 4 bands have been found which show anomalously large Zeeman effects. Three (and possibly 4) new bands have been observed which from their behavior in the magnetic field must belong to the Angstrom group. B. L.

**The excitation of sodium by ionized mercury vapor.** HAROLD W. WEBB AND S. C. WANG. *Phys. Rev.* [2], 33, 329-40(1929).—The excitation of the Na spectrum by ionized Hg distg. from an arc was studied under controlled conditions in a tube. The spectrum produced by excited Hg atoms was compared with that due to Hg ions. The spectrum due to the excited atoms showed the marked "resonance" effect shown earlier by Bentler and Joseply (*C. A.* 21, 3021). The spectrum due to Hg ions also showed excitation corresponding to the excitation energy of the metastable Hg atom. This may be accounted for as due to metastable atoms formed as a result of recombination of Hg ions. An alternative explanation is that the excitation of a Na atom by Hg ion occurs by a 3-body impact involving a Hg ion, a Na atom and an electron. This was suggested by the fact that when Na is introduced into the ionized Hg there is a strong enhancement of the Hg lines originating in the two  $3S$  levels. It seems probable that both this and the above process are of the same nature. It was also noted that the spectrum excited by ionized Hg resembles the chemiluminescence spectrum resulting from mixing Na and  $\text{HgCl}_2$  vapors. The spark line of Hg  $\lambda$  3984, not previously found in the luminous Hg stream, was found when Na was present. B. L.

**Persistence of  $\lambda$  2537 in mercury at low pressures.** HAROLD W. WEBB AND HELEN A. MESSENGER. *Phys. Rev.* [2], 33, 319-28(1929).—The persistence of  $\lambda$  2537 excited by electron impact in Hg vapor was measured for vapor pressures correspond-

ing to the temp. range  $78^{\circ}$  to  $-19^{\circ}$ , the alternating potential method previously described (*C. A.* 18, 3532) being used. Between  $78^{\circ}$  and  $17^{\circ}$  this persistence varied inversely as the first power of the pressure and not inversely as the square of the pressure as predicted by theories of the diffusion of radiation by repeated absorption and reëmission. A modified theory of diffusion of radiation seems necessary to explain the persistence, which is much too small to be explained as dependent upon the life of the metastable atoms. As the pressure is lowered the persistence approaches a limiting value of the order of  $10^{-6}$  sec. The life of  $\lambda$  1849 was less than  $3 \times 10^{-6}$  sec. A radiation process probably assocd. with the 7.1-v. break in the crit. potential curves had a life of  $2.1 \times 10^{-6}$  sec. It is suggested that this is the life of the infra-red transition to the 6.7 v. level followed by the radiation of  $\lambda$  1849. Another process assocd. with an excitation potential lying between 5 and 6 v. had a life of about  $8.3 \times 10^{-6}$  sec. B. L.

The molecular spectrum of ammonia. I. Two types of infra-red vibration bands. G. A. STINCHCOMB AND E. F. BARKER. *Phys. Rev.* [2], 33, 305-8(1929); cf. *C. A.* 22, 4064.—The  $\text{NH}_3$  absorption bands at  $3.0\mu$  and at  $1.9\mu$  have been sufficiently resolved by means of gratings to reveal their fine structure, which proves to be of a different character in the 2 cases. The  $3\mu$  band is assocd. with a vibration of the element parallel to the symmetry axis of the mol., yielding one zero branch and a simple rotation series. At  $1.9\mu$  there is a series of almost equally spaced lines showing a uniformity in intensity so that the envelope is a single broad max. instead of the usual doublet. The band center cannot be selected by inspection. The vibration which gives rise to this band is normal to the symmetry axis. The moment of inertia of the mol. may be detd. about the line normal to the symmetry axis from the  $3\mu$  band, namely,  $I = 2.83 \times 10^{-40}$ . This does not yield the distances between at. nuclei. The  $1.9\mu$  corresponds to one of the 4 fundamental frequencies. Its character shows that it is not harmonic nor a combination of vibration along the axis. The  $10\mu$  and  $6\mu$  bands probably correspond to 2 other fundamentals. Further analyses must be made before the fourth fundamental can be selected and to det. the nature of vibrations involved. B. L.

Some relationships between singlets and triplets in the spectra of two electron systems. WM. V. HOUSTON. *Phys. Rev.* [2], 33, 297-304(1929).—The Darwin-Pauli treatment of the electron is applied to the Schrödinger equation for a 2-electron system. The results show that the division into singlets and triplets is justified only as a limiting case. Expressions are derived which give the position of the levels, the Zeeman effect pattern, and the intensities of the lines when the division into singlet and triplet cannot strictly be made. These expressions are shown to give the observed facts of several spectra. BERNARD LEWIS

Arc spectra in the region  $\lambda$  1600-2100. E. W. H. SELWYN. *Proc. Phys. Soc.* (London), 41, 392-403(1929).—A method is described for photographing spectra in the region  $\lambda$  1600 to  $\lambda$  2100. A vacuum spectrograph is provided with a fluorite window over the slit and a water-cooled arc chamber through which  $\text{N}_2$  is circulated so that a stream constantly passes between the arc and the slit. Pure  $\text{N}_2$  appears to be transparent down to the limit of transmission of fluorite. Sufficient accuracy in the measurements to establish provisional wave-length standards in the region is claimed. New measurements of the spectra of 13 elements are recorded, together with additions to the analysis of Mg I, Be I and B I made possible by the discovery of a no. of new lines. C. J. HUMPHREYS

The Kerr effect in viscous liquids due to radio-frequency oscillating field. S. C. SIRKAR. *Indian J. Physics* 3, 409-24(1929).—The Kerr effect in the viscous higher alcs. octyl, nonyl, decyl and undecyl, has been studied for radio-frequency oscillating field. A peculiar kind of restoration of light between crossed nicols is observed which is a phenomenon entirely different from the Kerr effect and is most conspicuous in the region of frequencies in which there is strong elec. absorption, the liquid becoming translucent in the elec. field at such frequencies. The Kerr effect in undecyl alc. becomes too small to be observed for an oscillating field of wave length 114 cm. showing the existence of a time of relaxation in the Kerr effect which lies between  $10^{-8}$  and  $10^{-4}$  sec. for this alc. H. W. WALKER

Electronic state in hydride molecules. ERIK HULTHÉN. *Arkiv. Mat. Astron. Fysik* 21B, No. 5, 5 pp.(1929).—H. investigated the band spectra of metal hydrides, especially those of the second group of the periodic table, and compared them with the spectra of their at. components. In addn. to the previous transitions, a set of faint  $^2\Sigma' \rightarrow ^2\Sigma$  transitions was found, emitted by very unstable  $^2\Sigma'$  states. These seem to fade out as one passes from  $\text{HgH}$  to  $\text{BeH}$ . Curves and mol. data are given. In the  $\text{HgH}$  spectrum the highly excited vibrational states in  $^2\Pi$  were extended. It was found that in  $^2\Pi_{1/2} \rightarrow ^2\Sigma$ , the higher members of this series appear as "tail"

bands, shaded off toward longer waves. The vibrational limits of  $^1\Sigma$  and  $^3\Pi_{1/2}$ ,  $^3\Pi_{3/2}$ ,  $^3\Sigma'$  fit well into the  $^1S$  and  $2^3P$  at levels of Hg, but no exact relation between the excited mol. states and the at. triplet  $2^3P_0$ ,  $2^3P_1$ ,  $2^3P_2$  could be found. Similar relations hold for the other hydrides studied. Bengtsson's data (C. A. 23, 564) on the AlH spectrum give the information that the  $^1\Sigma$ ,  $^3\Pi$ ,  $^3\Sigma'$  states originate in the normal  $2^3P$  and the excited  $3^3P$  states in the Al atom.

LOUIS WALDBAUER

**The determination of concentration gradients by means of bent light rays. A new method of observation.** OLÉ LAMM. *Z. physik. Chem.*, Abt. A, 138, 313-31 (1928).—This work has been undertaken as a preliminary step to an investigation of starch by means of Svedberg's ultra-centrifuge, since the usual method of detn. of concns. by means of ultra-violet absorption cannot be employed in the case of starch solns. The new method utilizes the deformation of a scale photographed through the layer of a soln. of varying concn. A preliminary expt. on diffusion of cane sugar indicates that the method may be used for accurate detns. of the variations of concn. at every moment.

EMIL KLARMANN

**Quantitative relationships for natural optical activity.** WERNER KUHN. *Z. physik. Chem.*, Abt. B, 4, 14-36 (1929).—Detns. were made to show distribution in various spectral regions of optical activity displayed. In many cases very weak absorption bands play a prominent part. In the theoretical part a quant. relationship is established between circular dichroism and optical rotatory power within and without the absorption bands. Optical activity is a refraction phenomenon:  $\phi = \pi/\lambda_{\text{vac}} (n_l - n_r)$  ( $\phi$  = rotation per unit length,  $n_l$  and  $n_r$  are refractive indices for left and right circularly polarized light). K. shows that even if  $\phi$  is large,  $n_l - n_r$  is in the 6th place of decimals only in visible light, but is much larger in the nearer ultra-violet. Considerations of the contributions made by the various absorption regions lead to the conclusion that rotation in the visible regions must often be subject to reversal of sign. Formulas are given for  $\phi$  within and without absorption bands.

A. P. SACHS

**Invisible oxide films on metals.** F. HURN CONSTABLE. *Nature* 123, 569 (1929).—In the early stages of oxidation the reflecting powers of Fe, Ni and Cu become somewhat smaller over the whole range of the spectrum, but slightly more so at the violet end than at the red, showing the existence of an absorption max. far in the ultra-violet. When reduced, Cu is attacked by  $H_2S$ , the color sequences are produced rapidly. If, however, the Cu surface has previously been exposed to air and then the  $H_2S$  admitted, the interference colors are developed very slowly. Heating the metal to  $300^\circ$  in a  $N_2$  vacuum of  $10^{-3}$  mm. does not remove the oxide film.

H. F. JOHNSTONE

**Comparative study of the Raman spectra of some hydrogen compounds.** M. DAURE. *Compt. rend.* 188, 1492-4 (1929).—An empirical classification of the types of Raman spectra is given, based upon the types of linkages in the mols. to which they are due. Compds. of the type M—H, such as HCl or  $NH_3$ , yield a set of frequencies designated by  $h$ , which lie between 278 and 340 waves per mm. Another group designated by  $l$ , occurring in compds. such as  $C_2H_6$ ,  $C_2H_4$ , etc., lying between 20 and 196 waves per mm. seems to be due to linkages M—M, especially in the C chain. Similar  $l$  lines are found due to compds. with a C=C bond including benzene, toluene and the xylenes.

C. J. HUMPHREYS

**The Raman effect.** C. SCHAEFER. *Z. Physik* 54, 153-4 (1929).—The infra-red frequency of NaCl, LiF and NaF is not found in the Raman effect. The reason is to be sought in the nature and type of vibration.

GEORGE GLOCKLER

**Raman effect in diatomic gases. II.** F. RASETTI. *Proc. Natl. Acad. Sci.* 15, 515-9 (1929); cf. C. A. 23, 2885.—The quantum-mech. explanation of the patterns of Raman lines due to rotational transitions in sym. mols. is given. As shown by Heisenberg and Hund the whole system of terms splits into 2 classes according to the property of the total eigenfunction of being sym. or antisym. in the coordinates of the nuclei. If the nuclei have no spin only 1 of the 2 classes exists. This occurs in  $He_2$  and  $O_2$ . In the presence of a nuclear spin both classes of terms exist but they are practically non-combining because of the extremely weak coupling between nuclear spins.  $N_2$  and  $H_2$  are of this class. The observed patterns are in accordance with the theory.  $O_2$  gives a pattern of 6 or 7 equally spaced lines of diminishing intensity on either side of the unmodified line.  $N_2$  shows a pattern of alternating intensities arising from the 2 types of terms. An important feature of the exptl. work is the use of the Hg line  $\lambda$  2536, which is in a region where the scattering is much stronger than in the visible spectrum and the dispersion great enough to permit the use of a quartz spectrograph.

C. J. HUMPHREYS

**Influence of temperature on the x-ray liquid haloes.** V. I. VAIDYANATHAN. *Indian J. Physics* 3, 391-8 (1929).—The thermal effect on the x-ray diffraction haloes of cam-

phene, mesitylene, AcOH, butyric acid and ethyl alc. was investigated with Cu K $\alpha$  radiation at 30° and 130° to 150°. Camphene has a single halo, whereas the others have two. As a consequence of the temp. rise there is (1) an increase in scattering at small angles, (2) an increase in the diffuseness of the halo, and (3) a contraction of the radius of the haloes as predicted by theory. In the case of AcOH, butyric acid and EtOH, which are associated at ordinary temps. and dissociated at higher temps., the sepn. between the inner and outer halo tends to be strikingly effaced with the temp. increase, the inner halo becoming diffuse more quickly than the outer one. The various phenomena are interpreted on the basis of the theory of Raman and Ramanathan.

H. W. WALKER

**Difference between the absorption and the Raman spectrum.** G. H. DIEKE *Nature* 123, 564(1929).—The fact that Raman lines are found which do not correspond with infra-red absorption frequencies is a proof rather than a contradiction of the validity of Kramer's theory of dispersion, which includes the theory of the Raman effect.

H. F. JOHNSTONE

**Raman effect and fluorescence.** PAUCHANON DAS. *Nature* 123, 607(1929).—Simple probability considerations reveal an interesting relation between fluorescence and the modified scattering of light.

H. F. JOHNSTONE

**The photochemical reaction between glucose and hydrogen peroxide in acid medium with tungstic acid sol as photocatalyst.** I. J. C. GHOSH AND JADULAL MUKHERJEE. *J. Indian Chem. Soc.* 6, 231-8(1929).—G. and M. have studied the photochem. reaction between H<sub>2</sub>O<sub>2</sub> and glucose in HCl solns. with Na<sub>2</sub>WO<sub>4</sub> present as a photocatalyst in the region 330-430 m $\mu$  (Corning filter G 586) from a quartz-Hg arc. There is a period of induction but the monomol. velocity const. with respect to H<sub>2</sub>O<sub>2</sub> after an interval of 1 hr. exposure agree well in themselves (av. 0.0041). The velocity const. is very roughly proportional to the square root of the concn. of the free HCl; the values of the const. pass through a max. as concn. of Na<sub>2</sub>WO<sub>4</sub> varies from 0.025 to 0.0036 M; variation of the glucose concn. is practically without effect. The temp. coeff. is 1.3 for 10°. A mechanism is derived on the basis of the adsorption on the surface of the particles of the WO<sub>3</sub> sol of H<sup>+</sup> and H<sub>2</sub>O<sub>2</sub> (the adsorption to form a peroxide complex is corroborated by other workers). Activation of the peroxide surface is assumed and

from a consideration of possible kinetics is obtained the equation  $dx/dt = k_1 \frac{CH_2O_2}{\sqrt{C_{H^+}}}$

WILLIAM E. VAUGHAN

**Influence of the variation of intensity on the velocity of the decomposition of ferric thiocyanate and the bleaching of neocyanin and some other photochemical reactions.** A. K. BHATTACHARYA AND N. R. DHAR. *J. Indian Chem. Soc.* 6, 197-205(1929).—B. and D. have investigated 7 reactions under the influence of the radiation from a 1000-w. gas-filled W-filament lamp with varying intensities as secured by change in the aperture of an iris diaphragm between the source and the reaction vessel. (a) Decompn. of ferric thiocyanate, (b) bleaching of neocyanin, (c) reaction between citric and chromic acids, and (d) reaction between tartaric and chromic acids all have velocities proportional to the square root of the incident intensity. The reactions of (e) Na lactate and I, (f) Na tartrate and I, and (g) lactic and chromic acids have velocities directly proportional to the intensity of the radiation. The meaning of the results is discussed. The square root relationship seems to hold for reactions which are highly photochem. in nature and have a negligible dark reaction.

WILLIAM E. VAUGHAN

**The light reaction between ferric chloride and oxalic acid.** G. KORNFELD AND E. MÜNCKE. *Z. Elektrochem.* 34, 598-601(1928).—The absorbing materials dissociate into 2 parts. These decompn. products give up the energy which they have absorbed in small quantities to H<sub>2</sub>O mols. until they recombine to form the original material. The oxalic acid takes over the energy from H<sub>2</sub>O mols. and reacts with ferric ion forming ferrous ion and CO<sub>2</sub>. It is also assumed that the CO<sub>2</sub> is first activated and then deactivated by coming into contact with ferric ion and excited oxalic acid and finally gives a ferric complex with ferrous salt by which activated CO<sub>2</sub> is again liberated.

HARRY B. WEISER

**Sensitized photolysis.** EMIL BAUR. *Z. Elektrochem.* 34, 595-8(1928).—The theory of the optical sensitization process is: The sensitizer adsorbs a light quantum and becomes an oxidizer-reducer, comparable to the 2 electrodes of an electrolytic cell. The charged electron returns to its original state through a mol. electrolysis. The energy for carrying on this electrolysis will be derived from increase in the potential of the valence electron during the process of light absorption. The consequences of the theory are: (1) similarity between the sensitized photolysis and the correspond-

ing electrolysis; (2) independence of the anode and cathode processes of the sensitized photolysis; (3) independence of a given sensitized photolysis on the nature of the sensitizer; (4) checking of the photolysis by the photolysis product; (5) protection of the sensitizer by the photolysis produced by it. These several points have been illustrated by formulating sp. photochem. reactions.

HARRY B. WEISER

**The photodecomposition of ethyl iodide.** THOMAS IREDALE. *J. Phys. Chem.* 33, 290-5(1929).—The photochem. decompn. of EtI is a simple process, one quantum effecting the detachment of an I atom from 1 mol. This rules out the second postulate of Job and Emschwiller (*C. A.* 18, 3143), the formation and decompn. of HI, unless it is assumed that the energy furnished by the light in excess of that found from thermal measurements is effective for the decompn. As with HI the decompn. of EtI results in the formation of an excited I atom, the excess energy probably being dissipated as kinetic energy through collisions.

HARRY B. WEISER

**The photochemical dissociation of metallic salts dissolved in organic solvents.** E. PUXEDDU. *Gazz. chim. ital.* 59, 160-4(1929).—A preliminary note. Though much work has been done on the disson. of metallic salts in water by light, there is little information on similar phenomena in org. solvents. The action of light on  $\text{FeCl}_3$  in  $\text{Et}_2\text{O}$  has, however, been described by P. (cf. *C. A.* 14, 3368), and the present work is an extension of these earlier expts., the action of light on  $\text{HgCl}_2$ ,  $\text{PbCl}_2$  and  $\text{TiCl}_4$  in anhyd.  $\text{Et}_2\text{O}$  being studied. The solns. were exposed in hermetically sealed bottles to sunlight for long periods. With  $\text{HgCl}_2$ , a grayish white ppt. formed very slowly, 3.2 g. being deposited from 10 g. of  $\text{HgCl}_2$  after nearly 6 months. This ppt. was  $\text{HgCl}$  contg. an org. substance. The  $\text{Et}_2\text{O}$  contained  $\text{HCl}$ , aldehydes and chlorinated compds. The soly. of  $\text{PbCl}_2$  in anhyd.  $\text{Et}_2\text{O}$  is so extremely low that it was impossible to analyze the products of the reaction. With  $\text{TiCl}_4$  (5 g. in 230 g. of  $\text{Et}_2\text{O}$ ), the soln. turned brown during the 2nd day, and ultimately became clear green and remained so indefinitely. On evapn. of the  $\text{Et}_2\text{O}$  at a low temp., the mixt. became violet, suggesting the green and violet modifications of  $\text{TiCl}_3$ . A cryst. compd. could not, however, be obtained from the dry residue. In conjunction with the earlier expts. with  $\text{FeCl}_3$  (*loc. cit.*) the results indicate that exposure of salts of metals with more than one valency to sunlight causes reduction with formation of salts of the metals with a lower valency. C. C. D.

**The photosensitized and photochemical decomposition of hydrazine.** JOSEPH C. ELGIN AND HUGH S. TAYLOR. *J. Am. Chem. Soc.* 51, 2059-82(1929).—The photochem. decompn. of  $\text{NH}_2$  yields higher than a 3 to 1 ratio of  $\text{H}_2$  to  $\text{N}_2$ . E. and T. propose primary formation of  $\text{N}_2\text{H}_4$ . Anhyd. hydrazine was exposed to light from a Cooper-Hewitt arc.  $\text{NH}_3$  increased to 77% of the theoretical then gradually disappeared. The decompn. is apparently unimol., independent of temp., and unaffected by addn. of  $\text{N}_2$ ,  $\text{H}_2$  or  $\text{NH}_3$ . Thermal decompn. begins at  $250^\circ$ , is heterogeneous, unimol., and yields chiefly  $\text{N}_2$  and  $\text{NH}_3$ . Photosensitized decompn. of  $\text{N}_2\text{H}_4$  by excited Hg atoms activated by light of 2537 Å. U. is exceedingly rapid, proportional to the intensity, and unaffected by addn. of  $\text{N}_2$ ,  $\text{NH}_3$  or  $\text{H}_2$ . Deactivation of Hg in the  $2^1P_1$  state by  $\text{H}_2$  must lead to H atoms which can activate the  $\text{N}_2\text{H}_4$ . The quantum efficiency is at least 13 moles per absorbed quantum. The absorption spectrum of gaseous  $\text{N}_2\text{H}_4$  consisting of 6 or 7 probably continuous bands from 2490 to 2260 Å. U. indicates excited mols. subject to spontaneous primary decompn. Considerations of energetics permit 4 mechanisms. Two of these give only short chains and fail to account for non-retardation by  $\text{H}_2$ . Both the sensitized and the photochem. reactions proceed by either of 2 mechanisms: (a)  $\text{N}_2\text{H}_4 \longrightarrow \text{N}_2\text{H}_3 + \text{H}$ ,  $\text{N}_2\text{H}_3 + \text{N}_2\text{H}_4 \longrightarrow 2\text{NH}_3 + \text{N}_2 + \text{H}$ ,  $\text{H} + \text{N}_2\text{H}_4 \longrightarrow \text{N}_2\text{H}_3 + \text{H}_2$ ; and (b)  $\text{N}_2\text{H}_4 \longrightarrow 2\text{NH}_2$ ,  $\text{NH}_2 + \text{N}_2\text{H}_4 \longrightarrow \text{NH}_3 + \text{H}_2 + \text{H}$ ,  $\text{N}_2\text{H}_4 + \text{H} \longrightarrow \text{NH}_3 + \text{NH}_3$ . The chain reactions are broken up by the wall reactions,  $2\text{H} \longrightarrow \text{H}_2$ ,  $2\text{NH}_2 \longrightarrow \text{N}_2\text{H}_4$  and  $\text{N}_2\text{H}_3 + \text{H} \longrightarrow \text{N}_2\text{H}_4$ . E. and T. propose to study the decompn. of methylamine, which has a fine structure in its absorption spectrum.

F. H. RATHMAN

**The hydrogen-chlorine flame.** E. B. LUDLAM, H. G. REID AND G. S. SOUTAR. *Proc. Roy. Soc. Edinburgh* 49, 156-9(1929).—The H-Cl flame was photographed and in addn. to the continuous spectrum a band spectrum was obtained. The continuous spectrum was thought to be due to the recombination of the Cl atoms before reaching any H atoms. The band spectrum was due to the presence of S obtained from the gas-drying train.

F. W. LAIRD

**Effects of irradiation of crude coal tar by quartz mercury vapor lamps. I. Evidence of chemical changes as shown by changes in absorption spectra.** JULIA HERRICK AND CHARLES SHEARD. *Proc. Soc. Exptl. Biol. Med.* 26, 33-40(1928).—Ether solns. of crude coal tar show increased transmissibility to ultra-violet light after irradiation by an air-cooled quartz Hg vapor lamp. Such solns. on standing have a decreased

transmissibility and become more opaque; the opaqueness disappears when irradiated. These phenomena are more marked in thin films of crude tar than in ether solns. The changes in transmissibility are interpreted as chem. changes in the tar produced by the quartz Hg vapor lamp.

C. V. BAILEY

**Integration of light by photoelectrolysis.** W. R. G. ATKINS AND H. H. POOLE. *Sci. Proc. Roy. Dublin Soc.* 19, 159-64(1929).—A Burt Na cell, used for the integration of light, gave 1.15 microamp. per 1000 meter-candles. On a bright November afternoon, it was possible to detect the production of alkali in a dil.  $\text{NaHCO}_3$  soln. within 10 sec. The current may also be used for the deposition of Cu, 0.1 mg. per day being deposited with the photometer sloped in a south window. The K ethylxanthate method for Cu enables one to distinguish between solns. differing in Cu content by 0.002 mg. per 100 cc.

LOUIS WALDBAUER

**Photodichroism and photoanisotropism. I. Fundamental phenomena and definitions.** FRITZ WEIGERT. *Z. physik. Chem., Abt. B*, 3, 377-88(1929).—W. considers at some length exptl. work on the phenomena that light-sensitive solid layers when illuminated with linearly polarized light become dichroic and anisotropic. He treats in particular photographic processes, wherein Ag salts exposed to radiation exhibit these properties. Photodichroism is stronger if there is present an appreciable quantity of Ag at the beginning of the exposure; the effect becomes weaker with shorter wave length; it is strongest in the red. The process is not a simple one, since it involves auto-sensitization; in the visible metallic Ag is the sensitizer while in the ultra-violet a photolysis of AgCl results. Parallel with the dichroism there occurs a color adaptation of the Ag. Primary dichroism is the simplest case; it is development of the dichroism on exposure of the solid layer to light. Secondary dichroism is the change or disappearance of the phenomenon due to photographic manipulations after the primary process. Induced dichroism is a new phenomenon, whereby, in a primary photoanisotropic system new colored constituents with dichroic properties result. This latter is quite complex. Many references are given. **II. The fundamental phenomena of induced dichroism and the experimental methods.** *Ibid* 389-404.—Induced photodichroism and its effects may be secured for study without disturbance by concurrent primary and secondary dichroism or photographic layers if the plates are fixed after sensitization and then colored Ag produced by a phys. developer. This Ag has dichroic characteristics. Measurements were made with a modified Lippich half-shadow dichrometer.  $D$ , the dichroism of the layer under investigation, is given by  $\log I_e/I_m$ , the log of the ratio of intensities in the directions of the elec. and magnetic vectors, or by  $E_m - E_e$ , the difference in the extinctions. For small values of  $2\alpha$  ( $\alpha$  being the angle of rotation of the dichrometer),  $D = \log \tan(45^\circ \pm 2\alpha)$ . The exptl. technic is fully given. The relation of the new effect to photographic, colloid and other problems is discussed.

WILLIAM E. VAUGHAN

The separation of Th from U by means of ether (MISCIAITELLI) 7. Photochemical formation of  $\text{NH}_4$  salts (PLISSOV) 10. X-ray contributions to the problem of polymerization (CLARK) 2. Dipole moments, association and ultra-violet absorption of aliphatic ketones and their solutions. I. Solvent influence and reaction mechanism from the standpoint of the dipole theory (WOLF) 10. The employment of the quartz spectrograph for the detection of minute quantities of elements (MORITZ) 7. Apparatus for filtering water and treating it with emanations from radioactive material (Brit. pat. 302,095) 14.

SCHRÖDINGER, E.: **Collected Papers on Wave Mechanics.** London and Glasgow. Blackie & Sons. 146 pp. 25s. net. Reviewed in *Science Progress* 24, 146(1929).

**Radioactive preparations.** ALOIS FISCHER and GEORG SCHAPRINGER. Austrian 113,435, Jan. 15, 1929. The use of metal or glass containers for radioactive preps. is avoided by mixing the preps. with a binder such as wax or resin, shaping the mixt. into small rods or fibers, coating with graphite, and then coating with metal. Thus, a coating of Cu may be applied followed by a thin coating of Pt.

**Production of light.** VEREINIGTE GLÜHLAMPEN UND ELEKTRICITÄTS-A.-G. Austrian 113,432, Jan. 15, 1929. Gases or vapors the interaction of which is accompanied by chemiluminescence are brought to reaction at a very low pressure, *e. g.*, 0.01-0.1 mm. An enhanced luminescence is so obtained.



## 4—ELECTROCHEMISTRY

COLIN G. FINK

**Inductor coils for the high-frequency furnace.** C. N. SCHUETTE. *Ind. Eng. Chem., Anal. Ed.* 1, 141-4(1929).—Detailed directions for making high-frequency induction-furnace coils from seamless-soft-drawn-copper tubing, and insulating and mounting them for use are given. A coil can be wound, soldered and tested in a day. Insulation takes half a day. While the coil is drying the base and frame may be made, and on the fourth day the new furnace can be in operation. W. C. EBAUGH

**Does the preparation of close-grained electric-furnace cast iron require basic conditions?** K. F. KRAU. *Gieserei* 16, 88-91(1929).—The metallurgical requirements upon which the prepn. of close-grained elec. furnace cast iron depends are briefly reviewed. Inquiry is made as to whether acid elec. furnaces can be justified. Action of Si in acid practice is that of deoxidizer and degassing agent. C. L. MANTELL

**The Soderberg self-baking electrode.** M. SEM. *Can. Chem. Met.* 13, 177-8(1929). Four illus. The method results in a continuous C electrode for large industrial electric furnaces. S. gives detailed, first-hand information with respect to the paste from which the most satisfactory results have been obtained in practice. E. G. R. A.

**Electrolytic production of potassium ferricyanide from potassium ferrocyanide.** I. G. SHCHERBAKOV. *Zhur. Prikladnoi Khim.* 2, 155-65(1929); cf. *C. A.* 20, 551.—The liquid Hg cathode works satisfactorily. The  $K_3Fe(CN)_6$  produced is free from alkalis and  $K_4Fe(CN)_6$ . The anodic process is essentially the same as in electrolysis with solid cathodes. The cathodic process requires higher voltage with liquid than with solid cathode in app. using clay diaphragms. An av. current density of 1.5-2 amp./sq. in at 20-30° is satisfactory for com. work. An increase in current density from 1 to 4 amp./sq. in. results in an increase in potential of 4-6 v. Per kg. of  $K_3Fe(CN)_6$  0.5 kw.-hr is consumed. If electrolysis is continued after all the  $K_4Fe(CN)_6$  is consumed acid salts are formed. V. KALICHEVSKY

**Electrolytic cell plants using central-station power for dissociation of water.** PAUL McMICHAEL. *Elec. World* 94, 187(1929).—A list of the cities and states of the U. S. in which 71 H-O cells are located. C. G. F.

**Pressure electrolysis—power and fuel.** J. E. NOEGGERATH. *Proc. 2nd Intern. Conference on Bituminous Coal*, Nov. 1928, 2, 400-12.—Electrolysis of water into  $O_2$  and  $H_2$  under pressure requires less power than does electrolysis at atm. pressure. Discussion of the problem, fundamental laws, application of gases generated at high pressure (150 atm.), description of app. and N.'s cells, cell characteristics and operation with specific application to utilization of high-pressure gases in internal-combustion engines using oils, etc., instead of gasoline, are included in the paper. The power, floor space, safety and economic advantages are stressed, particularly the elimination of gas compressors. C. L. MANTELL

**The development of the oxide-coated filament.** B. HODGSON, L. S. HARLEY AND ( ) S. PRATT. *J. Inst. Elec. Eng.* (London), 67, 762(1929).—See *C. A.* 23, 1824(1929) M. McMAHON

**Dependence of resistance of insulating and other materials on potential and frequency and their resulting phenomena.** Experimental determination of space charges. P. BÖNING. *Z. tech. Physik* 10, 82-93, 118-24(1929); cf. *C. A.* 23, 1795.—B. has made an extensive investigation of the behavior of insulating and other materials on the basis of ion adsorption on inner surface levels, particularly the dependence of resistance on potential. Curves are given showing the specific resistance *vs.* field strength for gypsum crystals, glass, "silit" and cotton. Earlier deductions showed that insulating material was characterized by the fact that the apparent value of its dielec. consts. and its resistance decreased with increasing potential. With d. c. there is a simple expression for this dependence. With a. c. the relation is very complicated; a substitute scheme and simplification is introduced. Results show that the apparent resistance of an insulating material on a. c. must be smaller than on d. c. and that the loss at high frequencies is independent of frequency. Results are given for the exptl. detn. of space charge under the influence of elec. field, to whose existence was attributed the behavior of insulating material. Differences in voltage distribution in a condenser with 2 layers, air and insulating material, were detd. when the space charge is present by means of special app. A more satisfactory space charge effect was obtained by choosing a dielec. with more boundary faces and lower cond.: paraffin with colophony or paraffin and wood-flour. The results uphold the conclusion that adsorbed ions which constitute the space charge are pos. Reference was made to an instability phe-

nomenon and to the influence of temp. on the reaction. A loosening of the structure of the investigated material causes an increase in the reaction; a colloidion coating prevented ion exit.

**The lightning problem.** H. M. TOWNE. *Elec. News and Eng.* **38**, 42-50 (1929).—A thorough examn. of the contributing factors of surge disturbances on high-tension lines and an explanation of the progress of the studies in lightning arrester protection.

**A study of lead poisoning in a storage-battery plant.** LEONARD GREENBURG, A. A. SCHAYE AND HERMAN SHLIONSKY. *U. S. Pub. Health Repts.* **44**, 1666-98 (1929)  
M. McMAHON  
C. G. F.  
J. A. KENNEDY

Adsorption of gas in a vacuum tube by Mg (CZUKOR) 2. Volatility of oxides of Pb, Cd, Zn and Sn (FEISER) 9. The treatment of mixed (bulk) concentrates from base-metal sulfide ores (HARRIS) 9. Recent developments in the analysis of C in Fe and Fe alloys (ZIEGLER) 7. New data on saturnism (KOHNS-ABRESE) 13. The precipitation of industrial dusts (BELLON) 13. The anode reactions of F (JONES) 2. Periodic phenomena at the anode (MÜLLER) 2. Treating Cu leading-in wires of lamps, discharge tubes or similar electrical devices (U. S. pat. 1,719,877) 19. Apparatus for purifying starch-converted dextrose solutions by electrolysis and osmosis (Brit. pat. 302,375) 28. Impregnated paper for recording impressions by electric currents (Brit. pat. 301,749) 18. Alloy for water-heating electrodes, etc. (U. S. pat. 1,720,756) 9. Deposition of rubber (Fr. pat. 657,364) 30. Sulfuric acid (for storage batteries) (Fr. pat. 656,857) 18. Method of operating doors of electric furnaces (Fr. pat. 656,973) 1. Treating organic materials such as oils or tars electrochemically (U. S. pat. 1,720,910) 22. Frosting the inside of lamp bulbs by etching (Brit. pat. 302,582) 19. Bulbs for incandescent electric lamps, etc. (Brit. pat. 302,830) 19. Apparatus for coloring the inner surface of electric lamp bulbs (Brit. pat. 301,841) 19. Spray-coating the inner surface of lamp bulbs, etc. (Brit. pat. 302,170) 19. Refractory material obtained as slag (in electric furnace) (Brit. pat. 302,087) 19. Coating metals with rubber (Brit. pat. 302,250) 30. Electrodeposition of rubber goods (U. S. pat. 1,719,984) 30. Electrothermic reduction of oxides for the production of volatile metals such as Zn (Belg. pat. 355,018) 9.

BORTOLOTTI, SILVIO: *Elettrolisi delle soluzioni non-acquose. Prontuarioguida teorico-pratica per ricerche analitiche del genere.* Trent: Arti graf. Tridentum. 51 pp.

**Electric batteries.** EUGENE X. KLEIN. Fr. 656,790, Nov. 17, 1927. In batteries using a soln. of  $\text{NH}_4\text{Cl}$  as electrolyte, formation of crystals is retarded by using an impermeable partition to sep. the cell into 2 connected compartments, the one contg the Zn and the other the pos.

**Primary electric battery.** DON O. WALDEN (to National Carbon Co.). U. S. 1,720,808, July 16. In a battery contg. a mixt. of dry caustic alkali and oil, a Zn electrode is used which is coated with a material such as Na silicate which prevents only particles in the caustic mixt. from adhering to the Zn electrode either before or while the cell is being prepd. for use.

**Electric battery cell construction.** OLDHAM & SON, LTD., and W. D. WILDE. Brit. 302,469, Nov. 10, 1927.

**Storage battery.** JAMES C. HOLDEN and CHESTER COLLIFLOWER. U. S. 1,720,957, July 16. Structural features.

**Storage batteries.** SOC. ANON. LE CARBONE. Fr. 34,087, June 4, 1927. Addn. to 592,836. A metal forming an insol. chloride is incorporated with the active C forming the anode which has been rendered impermeable to liquids but permeable to gas.

**Storage batteries.** I. G. FARBERIND. A.-G. Fr. 657,291, July 11, 1928. The anodes of high capacity batteries are made of Pb contg. other metals which are eliminated by dissoln., while the cathodes are the neg. electrodes used up to now, for com. storage batteries. Cf. C. A. 23, 3861.

**Storage batteries.** I. G. FARBERIND. A.-G. Fr. 657,502, July 13, 1928. Neg. plates are made by oxidizing by electrolysis, until  $\text{PbO}_2$  is formed, the porous Pb plates composed of a frame filled with an alloy of Pb contg. one or more metals which can be eliminated by soln., and reducing the  $\text{PbO}_2$  thus formed to porous Pb. Plates, the active mass of which is prepd. of Pb or  $\text{PbO}$  in the form of a paste, may be used and these are only reduced to porous Pb after oxidation to  $\text{PbO}_2$ .

**Storage batteries.** LOUIS F. J. ROUSSEAU. Fr. 657,322, Nov. 22, 1927. Construction of electrodes are given.

**Storage battery.** ÉTABLISSEMENTS BRANDEL, HOUT, DEVRIENDT & C<sup>ie</sup>. Belg. 354,721, Nov. 30, 1928.—Constructional features.

**Storage battery with a window and specific gravity balls.** G. H. TROTTER. Brit. 302,784, Nov. 16, 1927. Structural features.

**Storage battery electrodes.** ELECTRIC STORAGE BATTERY CO. (to Chloride Electrical Storage Co., Ltd.). Brit. 302,472, Nov. 21, 1927. Structural features.

**Device for maintaining the proper electrolyte level in storage batteries.** J. D. SARTAKOFF. Brit. 302,206, Sept. 9, 1927.

**Galvanic batteries.** G. FERRABINO. Brit. 301,923, Dec. 9, 1927. Mg or a Mg alloy is used for the anode, an aq. soln. of salts such as  $MgCl_2$ ,  $MgSO_4$ , or  $KCl$  is used for the electrolyte together with substances such as sulfites, oxalates, ferrocyanides, chromates, bichromates or Cr salts and alk. hydrates which prevent oxidation of the Mg on open circuit. The cathode comprises a cond. and depolarizing substance such as dioxides of Mn, Pb or Ba; metallic hydroxides, basic Cu sulfate and  $KClO_3$ , also may be used.

**Galvanic batteries with plate electrodes and separating frames embedded in cement.** SIEMENS & HALSKE A.-G. Brit. 301,934, Dec. 9, 1927. Structural features.

**Selenium cell.** HEINRICH KÜCHENMEISTER. Fr. 657,524, July 16, 1928. Constructional details.

**Molded battery box with a transparent window.** PAUL H. HENKEL (to Continental Rubber Works). U. S. 1,720,363, July 9. Structural features.

**Accumulators.** ALBERT J. M. BAILLEUX and ARTHUR F. HILL. Ger. 477,515, Oct. 15, 1927. Construction of casing is given.

**Accumulator plates.** GEORGE F. DOWNER. Ger. 477,627, May 27, 1925. Plates with gratings filled with  $PbO$  are specially treated to prevent loss of the  $PbO$ .

**Accumulator plates.** ADOLFO POUCHAIN. Ger. 477,628, Jan. 11, 1928. The construction of a cathode for Zn accumulators is described.

**Transportable accumulator with spiral electrodes.** DEUTSCHE ELEMENTE FABRIK A.-G. Ger. 478,089, Sept. 20, 1927.

**Semi-solid electric conductor.** HARRY N. MILLER (to Fansteel Products Co.). U. S. 1,720,371, July 9. A compn. suitable for use in electrolytic condensers comprises an electrolyte such as  $NaHCO_3$  incorporated in a gelatin compn. hardened with  $CH_2O$ .

**Cadmium-coated electric conductors.** M. A. BOLTON and J. W. WALKER. Brit. 302,202, Aug. 12, 1927. Cd may be applied to a cond. wire such as Cu or Ag by passing through a bath of metallic Cd or by electrolysis. Other metals such as Sn may be applied under or over the Cd coating and the Cd-coated wire may serve as a bond wire in Pb-sheathed cables or may be insulated by vulcanized rubber, bitumen, etc.

**Rectifier for alternating currents.** E. PRESSER (to Süddeutsche Telefon-Apparate, Kabel-und Drahtwerke A.-G.). Brit. 302,177, Dec. 10, 1927. In making rectifiers comprising a layer of Se or a Se compd. fused, electrolytically deposited or otherwise intimately united with one of a pair of metal electrodes between which the layer is placed, the electrode carrying this layer is heated to between  $80^\circ$  and the m. p. of Se (preferably at least  $175^\circ$ ) to convert the Se from the amorphous to the metallic state without destroying the intimate union of the layer with the electrode.

**Cuprous oxide rectifiers.** SIEMENS-SCHUCKERTWERKE A.-G. Brit. 301,728, Dec. 3, 1927. In the prepn. of plates of  $Cu_2O$  rectifiers, the plates are heated to a temp. above the dissocn. temp. of the Cu oxide (suitably to about  $1025^\circ$  at ordinary atm. pressure).

**Mercury-vapor rectifiers.** WESTINGHOUSE ELECTRIC & MANUFACTURING CO. Fr. 656,958, July 3, 1928.

**Rectifying alternating currents.** E. PRESSER (to Süddeutsche Telefonapparate Kabel und Drahtwerke A.-G.). Brit. 301,839, Dec. 6, 1927. Se or its compds. serve as the rectifying layer between metal electrodes, or the layer may be formed by fusing or electrolytically depositing it on one of the electrodes, or one of the electrodes may be formed of metal of high at. wt. such as Pb or Bi mech. pressed against the rectifying layer. A high degree of asymmetry in the conducting properties of dry rectifiers is secured by any of these constructions. The surface of the electrode with which the layer is intimately connected is preferably made of or coated with Fe, Ni, Co, Cr or Mn; or, an alloy of Cr and Fe may be used with another electrode of Pb or Bi.

**Forming metal panels with inlaid designs by electro-deposition of metals.** A. M. CALLOW. Brit. 302,636, Sept. 19, 1927. Various details of procedure are given. The foundation plate may be formed of Ag-plated Cu or other material covered with Pb and the use of celluloid inlays is also described, which may be covered with cond. material and then with electrodeposited metal.

**Apparatus for electrodeposition of chromium on the inside of hollow articles.** KEVIN W. SCHWARTZ (to Chromium Corp. of America). U. S. 1,720,354, July 9. Structural features.

**Anode for chromium plating.** FREDERICK M. BECKET. U. S. 1,720,312, July 9. Cast anodes are used comprising Cr together with 0.5–7.0% C. U. S. 1,720,313 specifies the use of an electrolyte formed mainly of an aq. chromic acid soln., with a substantially C-free anode comprising Cr together with 0.25–35% Si.

**Electrolysis.** BAMAG-MEGUIN A.-G. Fr. 656,833, June 29, 1928. In electrolysis, particularly in the decompn. of water, diaphragms composed of asbestos threads with a metallic coating are used.

**Apparatus for electrolysis of fused chlorides.** I. G. FARBENIND. A.-G. Brit. 302,881, Dec. 23, 1927. In an app. for electrolysis of  $MgCl_2$  or other fused chlorides, the partitions for sepg. the products are faced with ceramic material such as porcelain plates or may be made of ceramic material.

**Electrolytic cells suitable for producing caustic soda, chlorine and hydrogen, etc.** FRANK H. BUCK and PHILIP MCRAE (to Jessup & Moore Paper Co.). U. S. 1,720,995–6, July 16. Structural features.

**Electrolytic sharpening of tools such as files.** WALTEN B. ROBE (to Rekeen Tool Co.). U. S. 1,721,414, July 16. An elec. current is passed to tools such as files, rasps or dental burrs from an electrode through a soln. formed from  $CuSO_4$ ,  $H_2SO_4$ , borax and  $HOAc$ .

**Electrolytic fat removing.** RIEDEL & CO. FABRIK FÜR CHEM.-TECHN. ERZUGNISSE. Ger. 478,362, Dec. 24, 1927. In the electrolytic fat-removing process means for keeping the surface of the bath free from foam and fat at the part where the bodies under treatment are removed is described.

**Aluminum.** PAUL L. HULIN. Fr. 656,503, Nov. 9, 1927. In purifying Al electrolytically the anode is composed of an alloy of Al having a f. p. lower than that of pure Al, the alloying metal being much more electropos. than Al. The electrolyte is composed of halogen compds. of the same kind, the mixt. having a f. p. lower than that of pure Al. The electrolysis is carried out at a temp. above the f. p. of the anode alloy but below that of the pure Al deposited at the cathode.

**Aluminum-silicon alloys.** RICHARD MÖLLER. Ger. 478,075, July 17, 1925. Al-Si alloys are prepd. by addn. of elementary Si in the required amt. to the fluoride melts ordinarily used in the electrolytic manuf. of Al.

**Working up anode sludge from the electrolytic manufacture of tin.** FIRMA JACOB NEURATH. (Theodor Kittl, inventor). Austrian 113,317, Jan. 15, 1929. Addn. to 102,289. The anode sludge obtained in the process of Austrian 102,289 (see Brit. 240,147; C. A. 20, 2126) is treated with hot  $HCl$ , allowed to weather for a month or more, and then treated again with  $HCl$ . In this way the sludge is rendered completely sol. except for  $PbCl_2$ , which is removed. The soln. may then be treated with Fe to ppt. Cu and Sb, and the ppt. may be weathered again to form basic  $CuCO_3$ , and then treated with  $H_2SO_4$  to sep. the Cu from the Sb.

**Calcium carbide and pig iron.** HILLIARY ELDRIDGE. U. S. 1,719,970, July 9. A mixt. of  $CaCO_3$ , C and iron oxide is subjected to the action of an elec. arc by which CO and  $CO_2$  are evolved and a current of air is injected into the gases above the treated mass and in a direction away from it for effecting combustion and producing suction above the mixt. An app. is described.

**Ore treatment.** BERGBAU- U. HÜTTEN A.-G. Ger. 477,888, May 18, 1926. Fine ores, carbonates and similar substances are agglomerated by mixing with Fe filings and subjecting to an elec. current.

**Apparatus for sterilizing water electrically.** MARIUS P. OTTO. Fr. 656,502, Nov. 9, 1927.

**Filter-press electrolyzer suitable for decomposing water, etc.** RODOLPHE PRCH-KRANZ. U. S. 1,721,407, July 16. Structural features.

**Treating gases and vapors electrically.** I. G. FARBENIND. A.-G. Fr. 657,441, July 12, 1928. For treating gases or vapors by high-tension elec. currents in the form of discharges called "dark," solid or liquid insulating substances such as glass beads are introduced into the reaction spaces.

**Electrical purification of gases.** OSKI-A.-G. (Heinrich Bernhard R., inventor). Ger. 478,034, Feb. 25, 1928. In the treatment of hot gases in a horizontal elec. cleaner, the cold gases accumulating in the bottom of the cleaner are continuously withdrawn and added to the ingoing gases. This may be effected by ejector action.

**Electrical purification of gases.** OSKI-A.-G. (Erich Oppen, inventor). Ger. 478,309, Apr. 30, 1924. In the elec. cleaning of combustible gases or gases carrying

impurities liable to explode, the gases are led up to the cleaning app. at such a velocity that a flame, if produced in the cleaning app., cannot strike back. The gases are passed through the cleaner at a lower velocity suitable for the cleaning. Cf. C. A. 23, 2893.

**Electric gas cleaner.** METALLGES. A.-G. (Fritz Lechler, inventor). Ger. 478,454, Nov. 22, 1925.

**Electric cleaner for gases and insulating liquids.** HERTHA MÖLLER NÉE WEBER, ARNOLD LUYKEN, GERTRUD LUYKEN, ERNST LUYKEN, NORA LAMPING NÉE MÖLLER, ILSE VOGG-CASTENDYK, IRMGARD FREUDE NÉE CASTENDYK, FRITZ K. CASTENDYK, HENDRICH LUYKEN, GERDA LUYKEN, ELISABETH LUYKEN AND JOHANN LUYKEN. Ger. 478,478, Sept. 13, 1921. Addn. to 443,672.

**Electric gas cleaner (with condenser in parallel with the electrodes).** OSKI-A.-G. (Erich Oppen, inventor). Ger. 478,386, Oct. 4, 1925.

**Precipitating electrode for electric gas cleaners.** SIEMENS-SCHUCKERTWERKE A.-G. Ger. 478,377, May 27, 1925.

**Deoxidizing air in electric apparatus.** LELAND H. HILL and WALTER M. DANN (to Westinghouse Elec. & Mfg. Co.). U. S. 1,720,516, July 9. Liquid-insulated elec. app. such as transformers or interrupters contg. oil is provided with means for effecting air circulation in the app. above the liquid level and for absorbing the O in the air. Various structural features are described.

**Apparatus for drying air for electrical transformers by use of desiccating agents.** ALLMÄNNNA SVENSKA ELEKTRISKA AKTIEBOLAGET. Brit. 302,071, Jan. 4, 1928. Structural features.

**Promoting chemical reactions, separating dust from gases, etc., by an oscillating magnetic field.** A. ESAU AND C. LORENZ A.-G. Brit. 301,929, Dec. 8, 1927. An oscillating magnetic or elec. field of a wave length of 10 meters or less is utilized. Brit. 301,930 relates to a similar process.

**Apparatus for electrometric testing or composition control of liquids.** H. D. HATFIELD. Brit. 302,490, Dec. 5, 1927. Various structural and electrical features are described.

**Electric furnace.** E. BORNAND and H. A. SCHLAEFFER. Brit. 301,912, Dec. 8, 1927. A furnace stated to be suitable for the production of alloys of Mg and Al and for deoxidizing iron by use of metallic oxides, or other operations in which materials are treated, one of which is lighter than another, is provided with an electrode adjustable vertically in such a manner as to force portions of the lighter material into the heavier material. Various structural details are described.

**Electric furnace for metal fusing.** EDWARD R. STOEVE. Fr. 656,736, Nov. 9, 1927.

**Electric induction furnace.** E. F. NORTHRUP. Brit. 301,954, Sept. 8, 1927. Structural features.

**Electric induction furnace.** SIEMENS & HALSKE A.-G. Brit. 301,894, Dec. 8, 1927. An "ironless" furnace employs coils of solid material such as Cu bands in an insulating liquid such as circulating oil. The app. is suitable for annealing wire.

**Electric induction furnace for melting metals.** J. HÄRDEN. Brit. 302,308, Dec. 14, 1927.

**High-frequency induction crucible furnace.** WILHELM ESMARCH (to Siemens & Halske, A.-G.). U. S. 1,721,073, July 16. Structural features.

**Electric resistance furnace.** SIEMENS-SCHUCKERTWERKE A.-G. Brit. 302,223, Dec. 12, 1927.

**Electric resistance furnace.** CARL L. IPSEN and ALBERT N. OTIS (to General Electric Co.). U. S. 1,719,888, July 9. Structural features.

**Electric resistance heater suitable for convection heating.** WALTER C. CALCOTT (to Schleicher, Inc.). U. S. 1,719,872, July 9. Structural features.

**Tapping electrode construction and associated features for electric furnaces.** SIEMENS & HALSKE A.-G. Brit. 302,305, Dec. 14, 1927.

**Electrode mounting for electric furnaces.** ERNST WIRZ (to A.-G. Brown, Boveri & Cie.). U. S. 1,719,863, July 9.

**Carbon electrodes suitable for fusion electrolysis.** I. G. FARBENIND. A.-G. Brit. 302,891, Dec. 23, 1927. C electrodes are soaked in or coated with phosphoric acid to protect them from the atm.

**Oxide cathodes.** GUSTAV L. HERTZ (to N. V. Philips Gloeilampenfabrieken). U. S. 1,720,675, July 16. Material such as Pt or Mo or Ni-Cr coated with Cu oxide is coated with an alk. earth metal such as Ba and the coated material is heated in a non-oxidizing atm. to melt the alk. earth metal layer and the latter is at least partly oxidized.

**Oxide cathodes.** KAREL M. VAN GESSEL (to Radio Corp. of America). U. S. 1,721,169, July 16. A core of W, Mo or other suitable refractory metal or alloy which does not readily form an alloy with any of the alk. earth metals is coated with a film of a readily oxidizable metal such as Cu having a comparatively low point of volatilization, the film is at least partially oxidized and the oxidized film is coated with one or more of the alk. earth metals by bringing the film into contact with the vapor of the alk. metal and effecting pptn. of the latter; the product is then heated to convert the alk. earth metal into oxide and to volatilize the Cu. Cf. C. A. 23, 1018.

**Nickel anodes.** THE INTERNATIONAL NICKEL CO. Fr. 656,475, June 26, 1928. Oxides of metals of the Ni group are uniformly distributed throughout a mass of Ni in amt. of 0.5-0.25% of the wt. of Ni, the resulting compd. being electrolytically non-passive.

**Electric ozone generator and control system for operating the apparatus at intervals.** C. J. V. FERVY. Brit. 301,883, Dec. 7, 1927.

**Piezoelectric and pyroelectric materials.** TELEFUNKEN GES. FÜR DRAHTLOSE TELEGRAPHIE. Brit. 302,726, Dec. 21, 1927. Finely divided material such as quartz powder is subjected to an elec. field to cause the particles to take up a definite direction with respect to their elec. moments and the particles are bound together by strong heating and high pressure or with a binder such as paraffin.

**Conversion of calorific energy into electrical energy.** F. DUVIEUSART. Belg. 352,184, Dec. 31, 1928. The process consists in polarizing osmotic cells consisting of membranes impregnated with solns. or which can absorb gases.

**Metallic powders.** SOC. ANON. DES TRÉFILIERIES ET LAMINOIRS DU HAVRE Fr. 656,777, Nov. 16, 1927. Very fine metallic powders are obtained electrolytically by adding a carbonized material in the dispersed state to the bath. Thus, a fine Cu is obtained by adding glucose treated with H<sub>2</sub>SO<sub>4</sub> or sugar-C as an impalpable powder to an electrolyte consisting of a H<sub>2</sub>SO<sub>4</sub> soln. of CuSO<sub>4</sub>.

**Metal-vapor lamps.** HANNS STAMMREICH. Fr. 657,426, July 11, 1928. An alloy of Hg with another metal such as Cd is used in the lamp, the Hg being distd. off first to a sep. compartment which is then closed before the other metal begins to vaporize. The Hg is afterward run back by tilting the lamp.

**Mercury-vapor lamps.** ALEXANDRE MOSINSKI. Fr. 656,631, June 28, 1928. Method of fixing electrodes.

**Electric discharge devices.** SIEMENS & HALSKE A.-G. Brit. 302,583, Dec. 17, 1927. Cathodes of devices such as rectifiers filled with rare gases or Hg vapor are formed by the deposition of rare earth metals such as La, Ce, Yb or Yt or other electron-emitting metals such as Zr on a base of refractory metal such as W or Mo. The active layer may be mixed with Th and may be deposited electrolytically or in other manner which precludes oxidation, as by deposition of Ce *in vacuo* from its vapor or by reducing Ce nitrate with Mg. Cf. C. A. 23, 1019.

**Electric discharge lamp.** L. L. BECK (to Claude Neon Lights, Inc.). Brit. 302,643, Dec. 19, 1927. A lamp giving light from the pos. column contains Hg and a mixt. of rare gases such as A which produces light of a color similar to that produced by Hg, a heat-producing gas such as He and a diluent such as Ne. The light remains constant at low external temps. Brit. 302,668-9 also relate to similar lamps.

**Electric discharge lamps.** PATENT TREUHAND GES. FÜR ELEKTRISCHE GLÜH-LAMPEN. Brit. 302,701, Dec. 20, 1927. Lighting tubes are divided by longitudinal partitions into chambers which are filled with different gases or vapors to produce various lighting effects depending on which chambers are connected in the circuit; e. g., one chamber may contain a mixt. of A and Hg, with or without Ne, another chamber Ne and still another N or CO<sub>2</sub>. Various structural details are described.

**Electric vacuum discharge tubes.** M-O VALVE CO., LTD. and J. W. RYDE. Brit. 302,503, Dec. 23, 1927. In making cathodes, a metal support such as W has deposited on it a highly electropositive metal such as an alkali or alk. earth metal, after treatment with CN. Various details of temps., pressures, etc., are described.

**Incandescent discharge cathodes.** N. V. PHILIP'S GLOEILAMPENFABRIEKEN. Fr. 657,054, June 7, 1927. The cathodes are made of salts of energetically electropos. metals, in particular alkali and alk. earth metals having amphoteric oxides which are less acid than titanous acid. Cf. C. A. 23, 2668.

**Incandescent cathode tubes.** N. V. PHILIP'S GLOEILAMPENFABRIEKEN. Fr. 656,819, June 29, 1928.

**Electric-lighting tubes.** PATENT-TREUHAND-GES. FÜR ELEKTRISCHE GLÜH-LAMPEN M. B. H. (Franz Skaupy and Hans Pulfrich, inventors). Ger. 478,073, Nov.

5, 1926. Elec.-lighting tubes are filled with a mixt. of  $\text{CO}_2$  and an inert gas, especially He, the latter preferably predominating

**Electric incandescent lamps.** J. A. KLOKS. Brit. 301,709, May 26, 1928. P trioxide is introduced with a gas filling which may be prepd. by passing inert gas mixed with a very small proportion of O through liquid P.

**Gas-filled electric incandescent lamp.** GORTON R. FONDA (to General Elec. Co.). U. S. 1,721,384, July 16. In order to prevent damage by arcing in case of burned-out filaments, a hollow section of the supply wires in an incandescent lamp is provided with arc-quenching materials such as sulfates of Cu and Ni, a nitrate of Ni, Cu, Na or Ba or, in some instances, Fe sulfate or  $\text{BaSO}_4$ .

**Tungsten composition suitable for incandescent lamp filaments.** GORTON R. FONDA (to General Elec. Co.). U. S. 1,721,383, July 16. A compn. which has long life and high-lighting efficiency consists mainly of W and also contains less than 1% of Th oxide and B nitride.

**Filaments manufactured from tungsten, molybdenum and other difficultly fusible metals at a temperature below 1000°.** KARL W. ZSCHOCKE. Austrian 113,453, Jan. 15, 1929. Mech. and manipulative features are given.

**Vibration- and sag-resistant filament.** JOHN H. RAMAGE (to Westinghouse Lamp Co.). U. S. 1,720,000, July 9. A filament free from sagging and offsetting and which is resistant to shock and vibration is prepd. by heating a solid-soln. alloy of W and Ta under oxidizing conditions to convert the Ta into oxide, and producing filaments from the resulting product.

## 5—PHOTOGRAPHY

C. E. K. MEES

**Progress in photography in the last ten years.** J. EGGERT AND H. MEDIGER. *Z. angew. Chem.* 42, 700-3(1929). E. H.

**Photochemistry of silver halide.** V. Silver values and the fixing process. H. H. SCHMIDT AND F. PRETSCHNER. *Z. wiss. Phot.* 26, 375-80(1929); cf. *C. A.* 23, 2669.—In all investigated cases, the amt. of free Ag present in the emulsion after fixing is different from the amt. of free Ag present before fixing. In most cases of normal coated plates the amt. was smaller because of the dissolving of free Ag in the fixing bath. The formation of  $\text{Ag}_2\text{S}$  could not be detd. The method of washing of a photographic emulsion has great influence on the Ag values. The present methods of fixation are not suitable for the sepn. of Ag from Ag halide, for high-precision Ag detn.

A. P. H. TRIVELLI  
**Methods and applications of photomicrography.** E. P. WIGHTMAN AND A. P. H. TRIVELLI. *Cuir tech.* 18, 25-36(1929).—A review. J. G. NIEDERCORN

**Light standard for sensitometry and the Davis-Gibson light filter with copper cobalt solutions.** J. M. EDER. *Z. wiss. Phot.* 26, 373-4(1929).—If cobalt ammonium sulfate is not available for use in the Davis-Gibson light filter, E. recommends its prepn. by mixing its components in equiv. quantities. He defends this filter against criticism.

A. P. H. TRIVELLI  
**Magnesium light as a normal light for photographic sensitometry and its relation to the International Standard of Sunlight.** J. M. EDER. *Z. physik. Chem., Abt. A*, 141, 321-30; *Z. wiss. Phot.* 26, 353-62(1929).—E. recommends filtered Mg light for the sensitometry of photographic negative material. The color temp. of the light source can be regulated according to the decision, which was limited to negative material, of the Intern. Congress of Photography, London, 1928. In this way a uniform light standard for the sensitometry of all photographic material can be established.

A. P. H. TRIVELLI  
**Sensitizers and dyes suitable for bleach-out processes.** M. MUDROVČIČ. *Z. wiss. Phot.* 26, 171-92(1928).—M. investigated 44 sensitizers, mostly in 2% alc. or  $\text{H}_2\text{O}$  soln., for use in the bleach-out process of color photography. The best sensitizer was allyldiethylthiourea, already previously mentioned by A. Just (*C. A.* 7, 2519). The best dye for blue was Capri blue GON (Leonhardt); for red, Rosindulin 2B (Kalle); and for yellow, Flavindulin was dissolved in collodion with acetylthiosinamine and coated on glass. Over this was coated a gelatin layer contg. the other two dyes, Rosindulin and Capri blue, and the sensitizer allyldiethylthiourea.

A. P. H. TRIVELLI  
**Mercuric cyanide as a desensitizer.** H. MEYER AND R. WALTER. *Z. wiss. Phot.* 26, 165-70(1928); *Brit. J. Phot.* 75, 692-3(1928).—M. and W. have shown that  $\text{Hg}(\text{CN})_2$  in the form of  $\text{K}_2\text{Hg}(\text{CN})_4$  in soln. with all developers (pyro excepted) is stable

and forms a useful desensitizer in practice. This developer acts as an oxidizer for colloidal Ag and this is regarded as the cause of its desensitizing action. A. P. H. T.

**Influence of carboxyl and carbonyl groups on the developing functions.** A. AND L. LUMIÈRE AND A. SEYEWETZ. *Chimie & industrie Special No.*, 511-2 (Feb., 1929); cf. *C. A.* 23, 2112.—L. and L. and S. have previously shown (*Bull. soc. franc. phot.* 415 (1897)) that a CO group bound to an aliphatic or an aromatic nucleus does not destroy the developing properties of polyphenols, but that these properties are destroyed when 1 or more OH groups are introduced into the aromatic nucleus bound to the CO; e. g.,  $\text{MeCOC}_6\text{H}_4(\text{OH})_3$  and  $\text{PhCOC}_6\text{H}_4(\text{OH})_3$  are developers, whereas  $\text{HOC}_6\text{H}_4\text{COC}_6\text{H}_4(\text{OH})_3$  and  $(\text{OH})_3\text{C}_6\text{H}_4\text{CO}$  are not. It is now suggested that Homolka's explanation (*C. A.* 15, 33) as regards  $\text{CO}_2\text{H}$  groups can also be applied in the case of CO bound to a phenol, it being supposed that, in presence of alkali, there is formed an anhydride between the OH's of the 2 nuclei, one of which has its acidity reinforced by the presence of the CO. When a 2nd CO is substituted in *o*-position to the 1st in polyphenols and aminophenols the developing properties are destroyed. Homolka's hypothesis can also be applied in this case by supposing that, under the action of alkalis, a double anhydride formation takes place, corresponding to each of the 'CO groups, when there are several OH's in the 2 nuclei, so that no developing function remains after dehydration; moreover, the diketone functions of anthraquinone tend to act as oxidizers by absorbing H, resulting in a reaction which is the reverse of developing. When OH's are present in only 1 nucleus, anhydride formation is not possible; but it can be supposed that the absence of developing properties is due to the diketone group which acts as oxidizing agent.

A. PAPINEAU-COUTURE

**Chemistry of Photography Including Developing, Fixing, Toning, Reduction, Intensification.** St. Louis and New York: Mallinckrodt Chem. Works. 65 pp.

**Photography.** I. G. FARBENIND. A.-G. Fr. 656,569, June 27, 1928. Protective layers against halo, particularly for panchromatic materials, are obtained by depositing on one or both faces of the support one or more layers of colloids which take the dyes used to prevent the formation of halo. The dyes used are such as are decolorized in the usual treating baths and have detd. spectral relations between themselves.

**Color photography.** SERGE DE PROCOUDINE-GORSKY. Fr. 656,562, June 27, 1928. See *Brit.* 293,038 (*C. A.* 23, 1359).

**Color photography.** JEAN MEUGNIOT. Fr. 656,769, Nov. 16, 1927. Juxtaposed 3 color screens are obtained by using 3 solid elementary colors (yellow, red, blue or green, orange, violet) sol. in the same solvent which is also a solvent for the support used. The support (gelatin or celluloid) is impregnated with the solvent, and the colors carefully powd. and mixed are sprinkled on the support so that each begins to dissolve and produces a circular colored spot which spreads. When the spots are sufficiently spread the support is dried rapidly. The support may then be varnished and its ready to receive a panchromatic photographic emulsion.

**Photographing transparent objects.** C. G. RÖDER G. M. B. H. Ger. 478,059, Sept. 4, 1928. For the usual preliminary spray-coating to avoid reflection or refraction effects, there is used a soln. of wax in turpentine of such a concn. as to produce a transparent coating of wax.

**Photographic diazotype process.** KALLE & Co. A.-G. *Brit.* 302,184, Dec. 10, 1927. Diazo compds. of aminonaphtholcarboxylic acids in acid, neutral or alk. conditions are used in prep. light-sensitive layers on paper, cellulose film or other supports. If negative pictures are desired, layers in the acid condition are subjected to a short treatment with  $\text{NH}_3$  gas before exposure to light. Metal salts may be included in the layers or applied to the finished pictures to improve the tint and stability of the pictures, and the stability of the layer may also be increased by including in the layers gelatin or a stabilizing agent such as naphthalenetrisulfonic acid, toluenesulfonic acid,  $\text{H}_3\text{BO}_3$ , tartaric acid,  $\text{Na}_2\text{PO}_4$  or thiosulfate. Cf. *C. A.* 23, 2670.

**Method for the production of negatives, positives and printing molds of correct color values in photomechanical reproduction.** DRESDENER ETIQUETTEN-FABRIK SCHUPP & NIERTH A.-G. Ger. 477,808, Feb. 3, 1927.

**Photographic developing.** SOC. DE PHOTOCHIMIE "ELKA." Ger. 478,233, Mar. 5, 1926. See *Brit.* 265,630 (*C. A.* 22, 548).

**Photographic sensitive material.** A. HAMBURGER. *Brit.* 301,962, Sept. 10, 1927. Sensitivity of Ag salts is increased by bathing the emulsioned plate or film, before



exposure, or by treating the emulsion before coating, in a soln. of a double salt of Ag and an alkali with B in the neg. radical, *e. g.*, a salt prepd. from  $\text{AgNO}_3$  and borax. Sensitizing dyes also may be used.

**Photographic sensitive materials.** G. KÖGEL. Brit. 302,282, Dec. 13, 1927. In forming sensitive layers for producing positive prints from negatives, a ferric compd. such as ferric ammonium citrate, tartrate or oxalate is used with a carbonyl compd. capable of reacting with ferrous salts to form colored compds. such as isonitrosoacetylacetone, isonitrosopropionylacetone or nitroso- $\beta$ -naphthol or  $\beta$ -naphthoquinonesulfonic acid. A Ag compd. may be added for producing sepia prints.

**Sensitized paper for the production of photographic proofs imitating crayon or pastel.** F. BUYLÉ. Belg. 355,872, Dec. 31, 1929. A base paper is coated with adhesive and then covered with sand, glass, kaolin, chalk or other finely divided substance; the paper is then sensitized.

**Photographic films.** LOUIS WESTON. Fr. 656,953, July 3, 1928. See Brit. 293,269 (C. A. 23, 1579).

**Thin photographic films sensitized throughout their material.** SOC. INDUSTRIELLE D'APPLICATIONS PHOTOGRAPHIQUES SOC. ANON. Brit. 301,879, Dec. 7, 1927. Cellulose films of a thickness of 0.02–0.06 mm. may be sensitized by the so-called oxalid process by use of diazoic compds. and phenol and developed with  $\text{NH}_3$  or other suitable vapor.

**Film for lenticular-screen color photography.** RODOLPHE BERTHON (to Soc. Civile pour l'étude de la photographie et de la cinematographie au couleurs). U. S. 1,721,244, July 16. One face of a transparent support such as gelatin, celluloid, cellulose or colophony is provided with a backing layer such as celluloid having on its outer surface a multitude of microscopic refracting elements for color-selection purposes. The other face of the support is provided with a layer of material in adhesive form such as a cellulosic compn. which is pervious to gas and is impregnated with a light-sensitive mixt. of a diazo compd. and a phenol which react to form a dark-colored substance when exposed to an alk. atm. such as one contg.  $\text{NH}_3$ . Cf. C. A. 23, 1579.

**Optical system for reproduction of color record photographic images made on lenticular films.** SOC. CIVILE POUR L'ÉTUDE DE LA PHOTOGRAPHIE ET DE LA CINÉMATOGRAPHIE EN COULEURS (to Soc. française cinechromatique procedes R. Berthon). Brit. 301,732, Dec. 3, 1927.

**Noninflammable cellulosic films.** SOC. INDUSTRIELLE D'APPLICATIONS PHOTOGRAPHIQUES SOC. ANON. Brit. 301,878, Dec. 7, 1927. Films of regenerated cellulose are impregnated with aq. solns. of incombustible substances in such proportion that no efflorescence or other injurious action occurs.  $\text{NH}_4$  sulfate, phosphate or chloride may be used, with or without glycerol as a softener of the film. The film may be sensitized with diazo compds. and phenol and developed by  $\text{NH}_3$  or other vapors.

**Production of microscopic diffraction elements on color-cinematograph films.** SOC. CIVILE POUR L'ÉTUDE DE LA PHOTOGRAPHIE ET DE LA CINÉMATOGRAPHIE EN COULEURS. Ger. 477,541, Jan. 28, 1927.

**Photographic prints.** ÉTABLISSEMENTS EDOUARD BELIN. Fr. 657,296, Oct. 28, 1927. Photographic prints are rapidly developed by projecting the ordinary baths on to the emulsion, preferably with vaporization and at a high temp. Cf. C. A. 23, 3866.

**Photographic prints.** RUDOLF FRITSCHÉ. Fr. 656,962, July 3, 1928. See Can. 283,344 (C. A. 22, 4073).

**Photographic prints from documents, etc.** E. TAL. Brit. 301,869, Dec. 7, 1927. Contact printing is effected by use as an illuminant of a surface coated with luminescent matter previously excited by exposure to light and placed in contact with the document or with the back of a sensitive plate used.

**Coloring blue prints.** RUDOLF FRITSCHÉ. Ger. 478,009, May 10, 1928. Blue prints are colored green with a soln. contg. a salt of U, with or without  $\text{K}_3\text{Fe}(\text{CN})_6$  and an org. acid.

**Photomechanical printing surfaces.** MEISENBACH, RIFFARTH & Co., A.-G. Brit. 302,887, Dec. 23, 1927. In producing negatives or screen positives with corrected color values, as for offset printing, an emulsion or wet plate is used which is treated with a hygroscopic substance such as glycerol, so that partial etching can be effected while the plate is in moist condition. Various details of treatment are described.

## 6—INORGANIC CHEMISTRY

A. R. MIDDLETON

A chronological review of books on inorganic chemistry. JAN ZAWIDZKI. *Przemysl Chem.* 13, 204-6(1929).

A. C. ZACHLIN

Valence theory of boron and the constitution of the simplest boron hydride. ERICH MÜLLER. *Z. anorg. allgem. Chem.* 176, 205-8(1928); cf. *C. A.* 20, 2625.—M. questions Wiberg's theory (*C. A.* 23, 2897) on the valency relations of  *diborane* ( $B_2H_6$ ). According to W., 2 of the H atoms hold their 2 electrons jointly with the 2 B atoms, 2 electrons thus revolving about 4 atoms. Each B atom therefore possesses 8 electrons. M. advances the theory that a B atom possesses 2 inner and 3 outer electrons, and if 2 atoms unite to form a doublet, 2 inner electrons can be held jointly, the 2 remaining being available for the outer shell. The inner electrons being designated by x and the outer electrons by dots, the B atom could be indicated thus:  $\cdot xBx\cdot$ , and the formation of a doublet thus:  $\cdot xBx\cdot + \cdot xBx\cdot \longrightarrow \cdot BxxB\cdot$ . The formation of a doublet might occur without use of the inner electrons as follows:  $\cdot \overset{x}{B} \cdot \cdot \overset{x}{B} \cdot$  and  $\cdot \overset{x}{B} : : \overset{x}{B} \cdot$ . The

transformation from one type of doublet to the other  $\cdot BxxB\cdot \rightleftharpoons \cdot \overset{x}{B} \cdot \cdot \overset{x}{B} \cdot$  is the cause for the variation in valency between 3 and 4. Many elements of high at. no. exhibit this same elasticity in the stable form of the outer electron shell, the M shell in Mn or Fe being stable with either 13 or 14 electrons.

H. STOERTZ

Studies on tetrathionates. II. Strontium tetrathionate. R. PORTILLO. *Anales soc. españ. fis. quim.* 27, 351-7(1929); cf. *C. A.* 23, 3416.— $SrS_4O_6$ , obtained by the reaction of I on  $SrS_2O_8$ , has the compn.  $SrS_4O_6 \cdot 6H_2O$  after recrystn. from a mixt. of alc and  $Et_2O$ . It is rather stable in the air, loses  $4H_2O$  *in vacuo* over  $H_2SO_4$ , but the other  $2H_2O$  mols. are not removed with decompn., even on heating to 70-80°.  $SrS_4O_6 \cdot 6H_2O$   $d_{40}^{25} = 2.148$ ,  $SrS_4O_6 \cdot 2H_2O$   $d_{40}^{25} = 2.480$ , soly. 0° 20%, 18° 26.3%, 30° 39%, mol. heat of soln.,  $t^\circ = 17^\circ$ , mol.  $H_2O = 1,000$ ,  $Q = -11.6$ .

E. M. SYMMES

Studies on the nitrites. II. The ammines of nickel nitrite. L. LE BOUCHER. *Anales soc. españ. fis. quim.* 27, 358-67(1929).—A new method of prepn. of red  $Ni(NO_2)_2 \cdot 4NH_3$  is from the pyridinate in which pyridine is replaced by  $NH_3$ . The tetrammine d. = 1.826.  $Ni(NO_2)_2 \cdot 4NH_3$  fixes 2 mols. of  $NH_3$ , giving the violet hexammine. The  $NH_3$  pressure of this compd. has been detd. at temps. between 15° and 115°. The pentammine described by Ephraim is a mixt. of tetra- and hexammine. The red hexammine loses 2 mols of  $NH_3$  when heated to 120° in a current of dry air, leaving a green compd. Heating to drive off  $NH_3$  does not leave the nitrite, but a decompn. product remains.

E. M. SYMMES

Thio salts. VIII. Persulfates. L. FERNANDES. *Atti accad. Lincei* [6], 9, 409-14(1929); cf. *C. A.* 23, 1586.— $HMoS_4$  was prepd. in a new way from normal  $(NH_4)_2MoS_4$  by satg. with  $H_2S$ . The structure  $S_3Mo-S-S-S-NH_4$  is improbable, as the compd. is very stable; also  $H_2S$  could not act as an oxidizing agent to give  $Mo^{VII}$ .  $HCl$  at 40-45° decomps.  $HMoS_4$  into  $MoS_3$ , S and  $H_2S$ ; so the compn. is probably like the alkali polysulfides, *i. e.*  $[Mo_2S_7(S_6)](NH_4)_2$ . The V salt is formed in a similar manner:  $V_2S_5 + 2(NH_4)_2S_2 = (NH_4)_4V_2S_9$ ; the ratio of  $S_{(NH_4)_2S} : S_{V_2S_5} : S_{free} = 2:5:2$  gives a structure  $[V_2S_7S_9]^{S_2}(NH_4)_4$ . Guanidine persulfomolybdate was prepd. by leaving a soln. of  $(NH_4)_2MoS_4$  satd. with  $H_2S$  in contact with guanidine chloride. Guanidine persulfovanadate is formed in a similar manner. The K and TI salts are obtained by digesting the above with  $TiNO_3$  or  $KCl$ , resp.

A. W. CONTERI

The double carbonate of cobalt and potassium. F. DE CARLI. *Atti accad. Lincei* [6], 9, 417-9(1929).—When  $Co(NO_3)_2$  is added to a warm concd. soln. of  $K_2CO_3$  a reddish soln. is obtained from which  $CoCO_3 \cdot K_2CO_3 \cdot 4H_2O$  crystallizes. The isotherms of dehydration at 100° and 120° have been measured. After 7 $\frac{1}{4}$  hr. at 120° the dehydration is complete. The curve of partial pressure of  $CO_2$  against  $T^\circ$  abs. gives 13.74 as sum of the heat of disson. of  $CoCO_3$  and the heat of decompn. of  $CoCO_3 \cdot K_2CO_3$ ; the latter has been detd. calorimetrically as + 5.76 cal. (*C. A.* 23, 1563). Therefore,  $CoO + CO_2 = CoCO_3 + 7.98$  cal.  $Co + O = CoO + 63.8$  (Dulong) or 57.59 (mixture). For the reaction  $Co + 1\frac{1}{2}O_2 + C = CoCO_3 + Q$ , the values of Q calcd. from these data are 169.43 cal. and 163.13. Detd. calorimetrically,  $Q = 173.31$ .

A. W. CONTIERI

**The decomposition of alkaline carbonates in aqueous solution.** B. L. VANZETTI. *Gazz. chim. ital.* 59, 219–24 (1929).—A preliminary note. A crit. review of the literature, many references to which are cited, shows the unsatisfactory state of knowledge regarding the decompn. of alk. carbonates in water. The expts. of Küster and Grüters (cf. *Ber.* 36, 748 (1903)) indicate that the rate of decompn. of  $\text{Na}_2\text{CO}_3$  in boiling 0.1 *N* soln. is not great, whereas expts. by V. show that under these conditions decompn. is very rapid, about 70% of the  $\text{Na}_2\text{CO}_3$  being decompd. in 120 hrs., even with more concd. solns., a definite law of decompn. being established. These results induced V. to study the influence of this decompn. on the decompn. of carbonates by weak acids, already described (cf. *C. A.* 19, 2461; 20, 1186).  $\text{H}_2$  and air (each free of  $\text{CO}_2$ ) were passed through the system and the  $\text{CO}_2$  was recovered in aq. 50%  $\text{KOH}$  and soda-lime as before. The residual  $\text{CO}_2$  was evolved with  $\text{H}_2\text{SO}_4$  and also detd. In conjunction with the previous expts. of V. (*loc. cit.*), the results show that: (1) dil. (approx. 0.2 *N*)  $\text{Na}_2\text{CO}_3$  and  $\text{K}_2\text{CO}_3$  solns. boiled 5–6 days in a current of inert gas lose 70% or more of the  $\text{CO}_2$ , with formation of  $\text{NaOH}$  and  $\text{KOH}$ , resp., provided that there is no  $\text{CO}_2$  in the atm. over the soln.; (2) this decompn. follows a simple law, the % carbonate decompd. being proportional to the square root of the time; (3) the current of inert gas may be replaced by a current of superheated steam, or the boiling may be carried out in an open receptacle with replenishment of water by water free of  $\text{CO}_2$ ; (4) there is almost no decompn. when operating *in vacuo*, because distn. then occurs at too low a temp. for the  $\text{CO}_2$  to be removed from the sphere of action; (5) by doubling the concn. of carbonate (2%) the actual quantity decompd. is greater but not correspondingly so, *i. e.*, not twice the quantity of  $\text{CO}_2$  is obtained, and (6)  $\text{Li}_2\text{CO}_3$  solns. behave in a similar way, the decompn. following the same law, and not reaching an equil. as supposed by Rosenheim and Reglin. The rate of decompn. is, however, less with  $\text{Li}_2\text{CO}_3$  than with  $\text{Na}_2\text{CO}_3$  or  $\text{K}_2\text{CO}_3$  at equal concns., but over 70% was decompd. ultimately. C. C. D.

**Decomposition of barium sulfate.** GERMAINE MARCHAL. *Bull. soc. chim.* 45, 339–43 (1929); cf. *C. A.* 20, 690, 1167.— $\text{BaSO}_4$  (12 g.) was heated with 1.25 g. of  $\text{SiO}_2$  in an alundum boat in a rapid stream of  $\text{N}_2$ . At  $1200^\circ$ , a loss of 6.7% of the wt. of the  $\text{BaSO}_4$  was observed in 1 hr.; at  $1300^\circ$ , 11.9% was lost in 1 hr. and 23.5% in 7 hrs. (theory for total decompn. being 34.2%). At  $1200^\circ$ , a mixt. of 8.12 g. of  $\text{BaSO}_4$  and 2.1 g. of  $\text{SiO}_2$  lost 8.77% in 1 hr. and 17.71% in 5 hrs.; at  $1300^\circ$ , 7.7 g. of  $\text{BaSO}_4$  + 3.4 g. of  $\text{Al}_2\text{O}_3$  lost 12.27% in 1 hr. and 20.65% in 6 hrs.; 7.75 g. of  $\text{BaSO}_4$  + 1.7 g. of  $\text{Al}_2\text{O}_3$  lost 6.29% in 1 hr. and 11.86% in 5 hrs.; 12 g. of  $\text{BaSO}_4$  + 1.54 g. of kaolin lost 9.98% in 1 hr. and 17.27% in 6 hrs.; and 10 g. of  $\text{BaSO}_4$  + 3.17 g. of kaolin lost 17.32% in 1 hr. and 19.18% in 5 hrs.  $\text{BaSO}_4$  heated alone at  $1300^\circ$  under the same conditions lost only 1.36% in 1 hr. and 1.75% in 5 hrs. Addnl. data and curves are given to show the replacement of the more volatile  $\text{H}_2\text{SO}_4$  by  $\text{Al}_2\text{O}_3$ ,  $\text{SiO}_2$ , etc. A. S. CARTER

**Extraction of commercial rare-earth residues with a view to the concentration of Ilinium.** ROBERT W. BALL and J. ALLEN HARRIS. *J. Am. Chem. Soc.* 51, 2107–12 (1929).—Practically complete extn. of double sulfate residues have been obtained for amts up to 300 g. by means of satd.  $\text{NaOH}$  soln. Fusion with  $\text{Na}$  carbonate is equally efficient for larger amts.  $\text{HNO}_3$  and  $\text{H}_2\text{O}_2$  are recommended for the extn. of com. hydrated oxides. FRANK URBAN

**Isotherm at  $20^\circ$  of the three systems:  $\text{La}(\text{NO}_3)_3\text{--Mn}(\text{NO}_3)_2\text{--H}_2\text{O}$ ,  $\text{La}(\text{NO}_3)_3\text{--Mg}(\text{NO}_3)_2\text{--H}_2\text{O}$  and  $\text{Mn}(\text{NO}_3)_2\text{--Mg}(\text{NO}_3)_2\text{--H}_2\text{O}$ .** CLARA DI CAPUA. *Gazz. chim. ital.* 59, 164–9 (1929).—The object of the expts. was to det. whether double salts are formed from aq. solns. satd. with respect to the 2 salts. A temp. below  $25^\circ$  was chosen because at  $25.8^\circ$  there is a transformation of  $\text{Mn}$  salts. There are no references in the literature on the soly. of the 3 salts at  $20^\circ$ . The soly. of  $\text{La}(\text{NO}_3)_3$ ,  $\text{Mn}(\text{NO}_3)_2$  and  $\text{Mg}(\text{NO}_3)_2$  was 60.13, 56.81 and 43.68 g.-%, resp. The system  $\text{La}(\text{NO}_3)_3\text{--Mn}(\text{NO}_3)_2\text{--H}_2\text{O}$  was analyzed by detg.  $\text{La}_2(\text{SO}_4)_3$  +  $\text{MnSO}_4$  and then detg.  $\text{Mn}$  volumetrically by the Knorr method. The system  $\text{La}(\text{NO}_3)_3\text{--Mg}(\text{NO}_3)_2\text{--H}_2\text{O}$  was analyzed by detg.  $\text{La}_2(\text{SO}_4)_3$  +  $\text{MgSO}_4$  and then detg.  $\text{La}_2\text{O}_3$ . In the 3rd system,  $\text{MnSO}_4$  +  $\text{MgSO}_4$  was detd. and then  $\text{Mn}$  by the Knorr method. In all cases the  $\text{H}_2\text{O}$  was detd. by difference. The results, which are given in tables and in triangular graphs, show that no double salts are formed under the conditions used. C. C. DAVIS

**A study of the products obtained by the reducing action of metals upon salts in liquid ammonia solution. I. Introduction. II. The action of sodium upon zinc cyanide.** WAYLAND M. BURGESS and ARTHUR ROSE. *J. Am. Chem. Soc.* 51, 2127–31 (1929).— $\text{Na}$  reacts very readily with  $\text{Zn}$  cyanide in liquid  $\text{NH}_3$  soln., forming a finely divided metallic ppt., extremely reactive with respect to  $\text{H}_2\text{O}$  and air. B. and R. verify the postulation of Kraus and Kurtz (*C. A.* 19, 787) that the formula of the compd. formed is  $\text{NaN}_4$  and give the following equation for the reaction:  $4\text{Zn}(\text{CN})_2 + 9\text{Na} =$

$\text{NaZn}_4 + 8\text{NaCN}$ . A slight excess of Na does not affect the compn. of the ppt. but an excess of  $\text{Zn}(\text{CN})_2$  does change its compn. The oxidation of  $\text{NaZn}_4$  takes place in 2 steps. At first  $\text{O}_2$  is taken up rapidly, with considerable evolution of heat, but no noticeable change in the appearance of the  $\text{NaZn}_4$  takes place. This primary oxidation is followed by a secondary reaction which proceeds at a very slow rate for a long period of time, accompanied by a change in the color of the substance from black through gray to white. Dry air acts in the same way as dry  $\text{O}_2$ . Moist air or moist  $\text{O}_2$  accelerates the oxidation so much that the 2 stages are not apparent. No evidence of the formation of peroxides was obtained in the oxidation expts. Reaction of the compd. with dil. acid liberates 9 equivs. of  $\text{H}_2$  per mol. of  $\text{NaZn}_4$ ; with  $\text{H}_2\text{O}$ , approx. 4.5 equivs. of  $\text{H}_2$  are liberated in 2 months.

A. J. MONACK

**Action of gaseous ammonia on mercuric bromide and mercuric chloride.** MAURICE FRANCOIS. *Compt. rend.* 188, 1500-1 (1929); cf. *Compt. rend.* 129, 296 (1899).—Gaseous  $\text{NH}_3$  conducted slowly over dry  $\text{HgBr}_2$  and  $\text{HgCl}_2$  for a no. of hrs. at room temp. is absorbed in an amt. corresponding to the addn. compds.  $\text{HgBr}_2 \cdot 2\text{NH}_3$  and  $\text{HgCl}_2 \cdot 2\text{NH}_3$ . The reaction between  $\text{NH}_3$  and the solids is slight.

W. C. FERNELIUS

**The reduction of dichromate to basic chromic salts.** G. GRASSER AND T. NAGAHAMA. *Cuir tech.* 18, 2-10 (1929).—See C. A. 23, 1584.

J. G. NIDDERCORN

**New polynuclear coordination compounds of cobalt.** EDMUND G. V. PERCIVAL AND WM. WARDLAW. *J. Chem. Soc.* 1929, 1317-22.—The probable configuration of certain polynuclear amines which contain the  $\text{O}_2$  linkage is discussed. The products formed by the oxidation of such compds. as  $[-(\text{NH}_3)_2\text{-Co-O}_2\text{-Co}(\text{NH}_3)_2] \times 4$  are used as examples. According to Werner, the compd. thus formed has the  $\text{O}_2$  mol. in a more stable configuration than before. It is assigned the formula  $[(\text{NH}_3)_5\text{Co}^{\text{III}}\text{-O}_2\text{-Co}^{\text{IV}}(\text{NH}_3)_5] \times 5$  which postulates the co-existence of ter- and quadrivalent Co. B. and W. have investigated the reactions occurring when dry air is drawn through alc. solns. of  $\text{CoCl}_2$  contg. amines. The reaction with allylamine is confirmed, and satisfactory evidence of the formation of a complex similar to the above was obtained for propylamine and benzylamine. Ethylamine yielded a small quantity of a complex, whereas ethylenediamine, methylamine, diethylamine and piperidine did not. The oxidation of  $\text{CoCl}_2$  in alc. in the presence of amines does not always produce polynuclear complexes, which seem to be formed only in the presence of primary amines contg. the  $\text{CH}_2\text{NH}_2$  group.

L. L. Q

**The formation of hydriodic acid from iodine and water in presence of charcoal.** P. T. DANILCHENKO AND M. I. RAVICH. *J. Russ. Phys.-Chem. Soc.* 61, 123-30 (1929). One g. I, 1 g. charcoal and 200 g. water did not yield any HI when kept for weeks in the dark at room temp.; after a year the concn. of HI reached 0.0102%. No HI was formed in presence of 0.077% KI, 0.056% I and 1 g. charcoal. At 86-92° HI was formed with an appreciable velocity until its concn. reached 0.12%; the equil. is attained at 0.43% HI. On repeated diln. I was completely transformed into HI, although neither HOI nor  $\text{HIO}_2$  was found. HOI is reduced by C as fast as formed and, being a weak electrolyte, has much less influence on the reaction equil. At higher temp. the reaction proceeds faster because of the greater reactivity of HOI and C.  $\text{H}_2\text{O}$  and I vapors were passed over charcoal (ash content 0.23%). At 400-500° little HI is formed, the amt. increasing with the temp. to 98% at 800°. By using more active (porous) charcoal this temp. was lowered to 672°. The yields are higher than could be expected from  $2\text{HI} \rightleftharpoons \text{H}_2 + \text{I}_2$  because of the effect of addnl.  $\text{H}_2$  formed from charcoal and  $\text{H}_2\text{O}$ . The total  $\text{H}_2$  increases with temp., reaching 50% by vol. at 800°, while  $\text{CO}_2$  decreases and the amt of CO remains practically unchanged.

B. SOVENKOFF

**Dichloramine.** ROBERT M. CHAPIN. *J. Am. Chem. Soc.* 51, 2112-7 (1929).—Dichloramine ( $\text{NHCl}_2$ ) is produced by the chlorination of excess  $\text{NH}_4$  ions at  $p_{\text{H}}$  4.4 to 8.5; it is practically the sole ultimate product at  $p_{\text{H}}$  4.5 to 5.0. Monochloramine held at  $p_{\text{H}}$  4.4 to 5.3 undergoes extensive conversion to dichloramine. The reactions leading to dichloramine under the most favorable conditions require at least 1 to 2 hrs. for completion. On the assumption that dichloramine was the sole product present at  $p_{\text{H}}$  slightly above 4.4, the following partition ratios were obtained: Monochloramine in  $\text{CHCl}_3$ , 0.25; dichloramine in  $\text{CHCl}_3$ , 1.88; dichloramine in  $\text{CCl}_4$ , 0.85; dichloramine in ether, 47.3. From the partition ratios of the 2 pure chloramines in  $\text{CHCl}_3$ , the percentage of dichloramine chlorine in total chloramine chlorine may be calcd. from the apparent partition ratio,  $R$ , of a mixt. by the formula,  $44.2 = (4R - 1)/(R + 1)$ . The Cl-N ratio was also used to identify dichloramine.

A. J. MONACK

**Potassium hexathionate.** JAMES R. PARTINGTON AND ALBERT F. TYLER. *J. Chem. Soc.* 1929, 1382-3.—P. and T. confirm in the main details the method used by Weitz and Achterberg (C. A. 22, 1293) for the prepn. of  $\text{K}_2\text{S}_6\text{O}_{12}$ . The  $\text{K}_2\text{S}_6\text{O}_{12}$  was

obtained only when the  $K_2S_2O_8$  used had been prepd. by Foerster and Mommsen's method (C. A. 18, 1254):  $2KSH + 4KHSO_4 = 3K_2S_2O_8 + 3H_2O$ . L. L. QUILL

**The oxidation of tungsten; evidence for the complexity of tungstic oxide,  $WO_3$ .** JOHN STANLEY DUNN. *J. Chem. Soc.* 1929, 1149-50.—The investigation of the oxidation of W by air at temps. between  $700^\circ$  and  $1000^\circ$  showed abnormal variation between  $850^\circ$  and  $900^\circ$ . Conclusion:  $WO_3$  consists of mixt. of  $\alpha$ - $WO_3$  and  $\beta$ - $WO_3$ , whose equil. shifts with temp. since data show that tungstic oxide is in equil. from the beginning of the expt. The color of the oxide is lemon-yellow at ordinary temps. and deep orange at higher temps. M. MCMAHON

**Complex salts. II. The preparation, properties and stability of some bisdicarboxylato copper salts.** HARRY L. RILEY. *J. Chem. Soc.* 1929, 1307-14; cf. C. A. 23, 1076.—It has been suggested that an important factor governing the formation of a coordinate linkage between 2 ions is the distribution of the elec. charges in the donor ions. A comparison of the stabilities of a series of complex ions of the type  $[AX_1]$ ,  $[AX_2]$ ,  $[AX_3]$ , where A is the acceptor ion and  $X_1$ ,  $X_2$ ,  $X_3$  are different donor ions, would give valuable information as to the electron distribution in the series. For that reason, the nature of the compds. obtained when Cu reacts with certain dicarboxylic acids in aq. soln. was studied to det. whether a suitable series of complex ions would be obtained. The Cu forms with these dicarboxylic acids complex salts of the type  $Na_2[Cu(X)_2(H_2O)_2]$  with the Cu probably displaying a coordination no. of 6. The prepn. of the diooxalato-, the dimalonato- and the diphthalato-complex salts has been described. The stabilities of the complexes decrease as follows: oxalato, malonato, phthalato, carbonato and succinato. L. L. QUILL

Equilibrium between the carbonates and bicarbonates of Na and K in aqueous solution at  $25^\circ$  (HILL, SMITH) 2. Configuration of quadrivalent atoms (LOWRY) 2. The mechanism of the abnormal salt formation of pentaphenylchromium hydroxide and a unique H compound of tetraphenylchromium salts (HEIN, *et al.*) 10.

CHÁVEZ, M. JULIO: Contribución al estudio del thiosulfato de sodio. Santiago: Imprenta "San Pablo." 31 pp.

## 7—ANALYTICAL CHEMISTRY

W. T. HALL

**The organization of laboratory work.** A. SULFRIAN. *Metallbörse* 19, 1296-7, 1352-3, 1407-8(1929).—The proper conduct of an analytical lab. for greatest efficiency is discussed in considerable detail. W. C. EBAUGH

**The employment of the quartz spectrograph for the detection of minute quantities of elements.** H. MORITZ. *Metall u. Erz* 26, 247-50(1929).—Cross-sections are brought under the microscope and the particles to be examd. are removed by means of an elec. borer. As much as possible of the powder is brought into soln. and the soln. is concd. by evapn. A spark spectrum is produced with the concd. soln. If the mineral is insol., it is of advantage to produce an arc spectrum. In this case the powder is placed into the hollow part of an excavated + carbon of a micro arc lamp. The elements H, O, N, F, Cl, Br, I, S and Se present difficulties when examd. by the ultra-violet spectrum, because they do not emit lines under normal atm. pressure. Lines will appear, however, when the material under examn. is converted into a salt, the salt fused on top of the electrodes and a spark spectrum produced. Lines are also obtained when a spark spectrum is produced between a Pt spoon (cathode), which contains the material fused with the flux and a Pt wire (anode). Li and K are difficult to recognize because even in a concn. of over 1% a weak line could be detected only in a few cases. Apart from the rare gases, which were not examd., all other elements not mentioned so far emit typical lines, thus making it possible to obtain at once a complete qual. analysis. M. worked out a method of quant. analysis with the quartz spectrograph which is based on the fact that with decreasing concn. of the element, the no. and the intensity of the lines decrease, with exception of the "persistent lines." A series of standards was prepd. which contained decreasing amts. of the element under consideration. By comparing the standards with the sample to be tested the concn. of the element in the unknown sample could be estd. The method is useful at concns. between 0.001 and 1%. In a few cases (Pb, Zn, Cu) the content could be detd. even between 0.001 and 0.0001%. The standard samples should resemble the test samples regarding their state of aggregation. G. SCHWOCH

**The use of the alloy "weta" in analysis.** B. ZIMMERMANN. *Listy Cukrovar.* 47, 435-6(1929).—"Weta" is a new alloy of dispersed carborundum and quartz in Fe, Co and Ni and is superior in quality to porcelain. It is not porous, quite light, and withstands rapid changes in temp. Porcelain crucibles weighing 17 g. heated in a muffle furnace at 700° showed a loss of 0.0003 g. after the 2nd heating, and 0.0001 g. after the 3rd. Weta crucibles weighing 15 g. gained 0.0010 and 0.0032 g., resp., during the same heating indicating an oxidation process. The resistance to the action of HCl is inadequate: soaking the crucibles in cold dil. HCl for 24 hr. showed a yellow color and gave an Fe test. The increase in weight following ignition ranged from 44 to 42.7 mg. Z. recommends the alloy for preps. but not for analytical work. FRANK MARESH

**Notes on the analytical utilization of complex chemical and induced reactions.** F. FEIGL AND P. KRUMHOLZ. *Ber.* 62B, 1138-42(1929).— $\text{H}_2\text{SiO}_3$ , like  $\text{H}_3\text{PO}_4$ , unites with  $\text{H}_2\text{MoO}_4$  to form a complex acid which is capable of oxidizing benzidine to a blue compd. The  $\text{H}_2\text{SiO}_3$  complex differs from the  $\text{H}_3\text{PO}_4$  complex with  $\text{H}_2\text{MoO}_4$  by being quite sol. in water. By adding to 1 cc. of the dil. HCl or  $\text{HNO}_3$  soln. to be tested (the acidity must not be greater than 0.5 N) 2 drops of acid molybdate reagent and heating till the mixt. begins to boil, the silico complex is formed and after cooling and adding 1-2 drops of 0.25% soln. of benzidine in 10% AcOH and an equal vol. of satd. AcOH, a blue ppt., or coloration, is formed which is an extremely sensitive test for Si. The same reaction can be utilized as a test for F. A fluoride heated with  $\text{SiO}_2$  and concd.  $\text{H}_2\text{SO}_4$  gives volatile  $\text{SiF}_4$ , which on coming in contact with a drop of water gives  $\text{H}_2\text{SiO}_3$  and this will respond to the above test. As an example of an induced reaction, the behavior of Pb toward alk.  $\text{Na}_2\text{SnO}_2$  soln. is interesting. When an appreciable quantity of Bi is present, it is easily reduced to finely divided black metal by alk.  $\text{Na}_2\text{SnO}_2$  soln. but Pb salts under similar conditions are reduced only very slowly even upon heating. If, however, a very little Bi soln. is added to the soln. of a Pb salt, the reduction to Pb takes place very quickly. In fact the effect of Bi is so marked that it requires a mere trace of Bi to bring about this reduction of the Pb and the test may be used to detect a very minute quantity of Bi. W. T. H.

**Recommended specifications for analytical reagent chemicals.** W. D. COLLINS, H. V. FARR, JOSEPH ROSIN, G. C. SPENCER AND EDWARD WICHERS. *Ind. Eng. Chem., Anal. Ed.* 1, 171-4(1929).—Specifications are given for Br, cupric ammonium chloride, CuO powd. and granular,  $(\text{C}_2\text{H}_5)_2\text{O}$ ,  $(\text{C}_2\text{H}_5)_2\text{O}$  abs.,  $\text{K}_2\text{CrO}_4$ , K Na tartrate,  $\text{Ag}_2\text{SO}_4$ , zinc low in As, and zinc low in Pb and Fe. E. H.

**Preparation of alloxantin, reagent for ferric iron.** GEORGES DENIGÈS. *Bull. soc. pharm. Bordeaux* 66, 8-12(1928).—Two methods of prepg. alloxantin, a reagent for  $\text{Fe}^{+++}$ , are given: (1) Place in a  $\frac{1}{2}$  l. conical flask 10 g. of pure uric acid, add 10 cc. concd.  $\text{HNO}_3$ , heat and shake. After standing 1-3 min. a vigorous reaction occurs with liberation of  $\text{NO}_2$ . When effervescence ceases add 10 cc. of distd. water and boil gently until the mixt. becomes clear. Pour into the flask 200 cc. distd. water, 1 cc. of pure HCl and introduce a strong current of  $\text{H}_2\text{S}$  for 30 min. The liquid becomes turbid with formation of yellow-white masses. Boil 10 min., filter, boil again, filter and collect filtrate in a porcelain dish. Allow to cool and let stand 2 days. Wash the crystals that have settled out with cold water several times. Drain and dry on filter paper. (2) Place in a round-bottomed flask 15 g. uric acid, 30 g. concd. HCl and 40 cc. distd. water. Heat the mixt. to 30°, add in small portions 4 g. of  $\text{KClO}_3$  during 45 min., filter, dil. with 30 cc. water and sat. the liquid with  $\text{H}_2\text{S}$ . Crystals of alloxantin and S are formed. Filter, wash the ppt. with cold water and dissolve the alloxantin in boiling water. Filter the insol. S, cool the filtrate; alloxantin separates out in the form of prisms. A. G. DuMEZ

**A new qualitative reagent for sodium.** EARLE R. CALEY. *J. Am. Chem. Soc.* 51, 1965-9(1929).—By mixing a 4% soln. of  $\text{U}(\text{OAc})_3$  crystals in 3% AcOH with a 20% soln. of  $\text{Co}(\text{OAc})_2$  crystals in 3% AcOH, a reagent is obtained which, when 20 cc. are shaken with 1 cc. of the soln. to be tested, gives a yellow ppt. of  $[\text{NaCo}(\text{UO}_2)_3]$  acetate even in the presence of over 0.1 g. of K. Attempts to work out a quant. method were unsuccessful. W. T. H.

**Salt error of indicators due to standard alkaline buffers themselves.** II. J. W. MCBAIN, M. E. LAING AND O. E. CLARK. *J. Gen. Physiol.* 12, 695-710(1929); cf. *C. A.* 21, 871.—Previous results on the comparison of colors given by indicators in alk. buffer solns. and pure aq. NaOH soln. have been confirmed. The NaOH soln. used gave theoretical values for concn. of OH-ion. "The slight but distinct neutralizing effect of dil. sols. of alkali has been measured electrometrically and the allowances to be made are recorded graphically. It is found that whereas alizarin yellow G, tropeolin (1) and thymol violet may be used without appreciable error (in accordance with our previous

communication) the grave discrepancies remain for phenolphthalein, *o*-cresolphthalein, thymol blue and phenol red which must be ascribed to salt error in the alk. buffer itself."

C. H. RICHARDSON

**Potentiometric determinations with ferricyanide in alkaline solution. I. Vanadate and hydrosulfite.** CARLOS DEL FRESNO AND LUIS VALDÉS. *Anales soc. españ. fis. quim.* 27, 368–89 (1929).—Ekker, Palmer, Bollenbach and Luchman proposed methods of detn. of various substances by  $K_3Fe(CN)_6$  in alk. soln., using up to a 5 times excess of the latter, titrating the  $K_4Fe(CN)_6$  by  $KMnO_4$  after removal of oxidation products. Since  $K_3Fe(CN)_6$  can be produced in a very pure state, has a large equiv. wt. and its soln. remains almost unchanged for years at ordinary temp. and in the dark, it was applied to direct potentiometric titration in general. Heretofore only  $Ce^{IV}$  and  $Cr^{III}$  have been detd. in this way.  $V_2O_5$  was reduced by  $SO_2$  in  $H_2SO_4$  soln. to  $V_2O_4$ , then made alk. with exclusion of air.  $Na_2S_2O_4$  was used direct. Titrations were made in a current of N. Potentials formed rapidly and the potential differences are rather high. The effect of temp. and alky. upon titration curves was studied, using NaOH at various concns.,  $Na_2CO_3$ ,  $NH_4OH$  and buffered solns. with Na borate and  $H_3BO_3$ . With increase in OH the curves of potential difference are displaced toward the negative potential and the differences increase simultaneously. The quant. agreement is good. With V the inverse reaction was studied. The alk.  $K_3Fe(CN)_6$  soln. was titrated with a slightly acid  $VOSO_4$  soln. and a large difference found, with good quant. agreement.

E. M. SYMMES

**Smith's method for the determination of arsenic.** YU D. GNESIN. *Zhur.* 1928, 442 4.—The method of Smith (as described by J. Gadamer, *Lehrbuch der chem. Toxicologie* 167, cf. C. A. 18, 2668) can be used for the detn. of As in quantities as low as 0.07 mg by G.'s improvement of Smith's app., which consists in providing the latter with a separatory funnel allowing the dropwise addn. of the liquid to be tested. E. B.

**Recent developments in the analysis of carbon in iron and iron alloys.** NICHOLAS A. ZIEGLER. *Trans. Am. Electrochem. Soc.* 56 (preprint) 8 pp (1929).—Modifications and improvements in the "Yensen" method for accurate detn. of C in Fe and Fe alloys are described. The Yensen method consists in heating the sample in a vacuum to  $1050^\circ$  and heating in pure  $O_2$ . The gaseous products of oxidation are slowly passed through a trap immersed in liquid air. All  $CO_2$  freezes out and remains in the trap. If this  $CO_2$  is expanded into a known vol., the pressure is a measure of the amt. of C originally present in the sample. The error in the method is of the order of  $\pm 0.01$  mg., corresponding to  $\pm 0.0005\%$  for a 2-g. sample. With extra precautions the error can be reduced to  $\pm 0.0001\%$ .

C. G. F.

**Cobalt determination in driers, japans, alloys, etc.** OSCAR HEIM. *J. Oil and Colour Chem. Assoc.* 12, 175–6 (1929).—Vogel's qual. test has been made quant. The metals are obtained in a weak HCl soln.  $ZnO$  is added at  $50^\circ$  until only a visible trace remains undissolved. The ppt. is filtered and washed with warm water. The filtrate, concd. to 20 cc., is transferred to a separatory funnel. The total vol. in the funnel must not be more than 50 cc., in which 30 g. of  $NH_4CNS$  is then dissolved. The soln. is extd. with ether-amyl alc. (9:1). The ether soln. is now extd. with 20 cc.  $H_2SO_4$  and washed several times with water. The Co now can be detd. by electrolysis, as  $CoO$ , or as the 3,5-dimethylpyrazole compd.

G. G. SWARD

**Determination of copper in molybdenum ore.** M. G. RAEDER. *Tids. Kemi Bergvesen* 8, 91–3 (1928).—Place 1 g. of concentrates in a 250-cc. beaker, and add 25 cc. of aqua regia and 6–7 cc.  $H_2SO_4$ . Cover with a watch glass and heat gently till the greater part of the ore ( $MoS_2$ ) is dissolved. Evap. to fumes of  $SO_3$ , dissolve in 100 cc. of boiling water and filter into a 500-cc. beaker. Dil. to 2–300 cc., boil, and add  $Na_2CO_3$  until a pale color due to S is obtained. Then boil 3–5 min., filter hot and wash with hot  $SO_2$ -water. Incinerate and det. Cu by the method of Low.

A. D.

**The determination of ferrous iron in silicate rocks. II. Electrometric.** BYRON A. SOULE. *J. Am. Chem. Soc.* 51, 2117–20 (1929).—It has already been found (C. A. 22, 2897) that silicate powder can be decompd. by HCl and HF in an atm. of  $CO_2$  and the  $Fe^{++}$  detd. in the resulting soln. With  $KMnO_4$  however, a correction had to be applied possibly because of As in the glass. By using  $Ce(SO_4)_2$  in place of  $KMnO_4$  and detg. the end point electrometrically, correct values were obtained without the need of applying a correction factor. The  $Ce(SO_4)_2$ , being a weaker oxidizing agent than  $KMnO_4$ , is not affected by any As present.

W. T. H.

**Direct volumetric determination of potassium and sodium, applicable to other alkalies and alkaline earth metals.** F. DÍAZ DE RADA. *Anales soc. españ. fis. quim.* 27, 390–9 (1929).—The Na ion can be detd. directly by volumetric methods with  $Li_2Fe(CN)_6$  in neutral or AcOH soln. if 80–82% alc. is added. The  $Na_4Fe(CN)_6$  formed is practically

insol. under these conditions. The end of the reaction is detd. by the touch method on a  $\text{Co}(\text{NO}_3)_2$  paper, giving a very sensitive green-blue color.  $\text{NH}_4$ , K, Rb and Cs also ppt. completely at various concns. of alc., the reaction being  $\text{Li}_2\text{Fe}(\text{CN})_6 + \text{M}_2\text{SO}_4 = \text{Li}_2\text{M}_2\text{Fe}(\text{CN})_6 + \text{Li}_2\text{SO}_4$ . Mg, Ba, Sr and Ca are also pptd. as simple ferrocyanides. Another, more practical method is to titrate K in the precipitant by  $\text{Li}_2\text{Fe}(\text{CN})_6$  in the presence of a Ca salt such as  $\text{CaK}_2\text{Fe}(\text{CN})_6$ , in 50% alc. soln., in which it is practically insol. Lack of Ca can give serious errors, while an excess does not harm the sensitivity of the indicator. In dil. soln. this method will det. K in the presence of 4 or 5 times as much Na. Detg. first K + Na, then K alone by the latter method, is recommended.

E. M. SYMMES

**A gravimetric and colorimetric method for the direct determination of sodium.** EARLE R. CALLEY AND C. W. FOULK. *J. Am. Chem. Soc.* 51, 1664-74(1929).—By mixing an 8.5% soln. of  $\text{UO}_2(\text{OAc})_2$  in 6%  $\text{AcOH}$  with a 50% soln. of  $\text{Mg}(\text{OAc})_2$  in 6%  $\text{AcOH}$ , and filtering after the soln. has stood for some time at  $20^\circ$ , a reagent is obtained which can be used for the direct gravimetric or colorimetric detn. of Na. Close attention must be paid, in using this reagent, to temp., stirring and concn. At  $20^\circ$  a ppt of  $\text{Na}(\text{OAc})\cdot\text{Mg}(\text{OAc})_2\cdot 3\text{UO}_2(\text{OAc})_2\cdot 6.5\text{H}_2\text{O}$  is obtained, which can be dried at  $105^\circ$  for 30 min. without decompn. and contains 1.53% Na. 1-5 cc. of soln. contg. 1-50 mg. of Na should be mixed with 100-500 cc. of the reagent at  $20^\circ$  and the mixed soln. stirred vigorously for 30-45 min. Filter and wash with alc. satd with reagent. The presence of  $\text{NH}_4$  or small quantities of K does no harm but Li must be absent. The ppt. dissolves in hot water, giving a yellow soln. which, when cold, can be compared with the color produced similarly by known amts. of Na. Not more than 5 mg. of Na should be present for the colorimetric detn.

W. T. H.

**The determination of the tin coating on tin plate.** FRITZ PETER. *Chem.-Ztg.* 53, 438-9(1929).—Weigh a measured piece of tin plate ( $100 \times 200$  mm.), roll it so that its surfaces do not touch, and immerse in  $\text{HCl}$  (d. 1.08) at almost boiling temp. in a high 350-cc. beaker until the coating has dissolved. Some Fe dissolves also, as shown by the more rapid evolution of H. Withdraw the sample, wash with  $\text{H}_2\text{O}$  and abs.  $\text{EtOH}$ , and burn off the latter while shaking. Cool in a desiccator and weigh. Make up the soln. to 500 cc., take a 100 cc. sample, oxidize with  $\text{KClO}_3$ , boil, and det. Fe by Zimmerman-Reinhardt method. To the Fe found add 0.4% (the normal amt. of impurities in the steel); deduct from the loss in wt. of the original sample the total steel calcd. as above, and call the remainder Sn.

W. C. FBAUGH

**The separation of thorium from uranium by means of ether.** PAUL MISCIATTELLI. *Phil. Mag.* [7], 7, 670-4(1929).—See C. A. 23, 1554.

L. H. REYERSON

**Volumetric determination of vanadium, iron, and uranium with titanium salts.** V. G. KHLOPIN AND L. E. KAUFMAN. *Zhur. Prikladnoi Khim.* 2, 91-108(1928).—Salts of tervalent Ti reduce  $\text{V}^{\text{V}}$ ,  $\text{Fe}^{\text{III}}$  and  $\text{U}^{\text{VI}}$  in acid soln. in the following order  $\text{V}^{\text{V}}$  to  $\text{V}^{\text{IV}}$ ,  $\text{Fe}^{\text{III}}$  to  $\text{Fe}^{\text{II}}$ ,  $\text{U}^{\text{VI}}$  to  $\text{U}^{\text{IV}}$  and  $\text{V}^{\text{IV}}$  to  $\text{V}^{\text{III}}$ .  $\text{V}^{\text{V}}$  is titrated with 0.05-0.1 N  $\text{Ti}^{\text{III}}$ ,  $\text{K}_3\text{FeC}_6\text{N}_6$  and  $\text{Fe}^{\text{III}}$  being used as indicators,  $\text{Fe}^{\text{III}}$  is detd. by the method of Knecht and Hibbert (*Ber.* 36, 1551), KCNS being used as indicator, and  $\text{U}^{\text{VI}}$  is titrated with Neublau G(C) as indicator. All titrations are made in an atm. of  $\text{CO}_2$ .

V. KALICHEVSKY

**The potentiometric determination of bromine, octavalent and quadrivalent osmium in hydrobromic acid solutions.** WM. R. CROWELL AND H. DARWIN KIRSCHMAN. *J. Am. Chem. Soc.* 51, 1695-1702(1929).—If a soln. contg. free Br, octavalent Os and HBr is titrated with  $\text{TiCl}_3$  in  $\text{N}_2$ , 3 inflection points are obtained potentiometrically. The first corresponds to the reduction of Br to  $\text{Br}^-$ , the second to the reduction of octavalent to quadrivalent Os and the third to the reduction of Os to the tervalent condition. The first 2 are suitable for the detn. of  $\text{Br}_2$  and Os when present together in HBr soln. but the third inflection is not sufficiently sharp.

W. T. H.

**Determination of chlorine and phosgene in a mixture of the two.** S. PLETNEV. *Lab. Praktika* 4, No. 2(1928); *Farm. Zhur.* 1928, 715.—In a specially designed app the mixt. of Cl and  $\text{COCl}_2$  is collected in one of two tubes. One of them contains a definite quantity of N NaOH which transforms  $\text{COCl}_2$  into the chloride and Cl into NaOCl. By subsequently adding slowly a soln. of  $\text{As}_2\text{O}_3$  and  $\text{Na}_2\text{CO}_3$ , the NaOCl is transformed into chloride too. The total chloride is then detd. by Volhard's method. In a second expt. the gas is brought into contact in the KI soln. and the residual  $\text{I}_2$  (liberated by free  $\text{Cl}_2$ ) titrated with  $\text{Na}_2\text{S}_2\text{O}_3$ . The quantity of  $\text{COCl}_2$  is obtained by subtracting the quantity of free Cl from the total Cl previously obtained.

Y. POROSOWSKY

**Analysis of insecticides containing fluorine compounds.** LESLIE HART. *Ind. Eng. Chem., Anal. Ed.* 1, 133-5(1929).—For preps. contg. alkali fluosilicates and boric



acid, first det. the total acidity by titrating 50 cc. of hot soln. (contg. about 0.4 g.  $\text{B}_2\text{O}_3$ ) with 0.2 N NaOH using phenolphthalein as indicator, adding 30 cc. of glycerol as soon as the first permanent pink is obtained and completing the titration at about 5°. Four mols. of NaOH will be required for each mol. of  $\text{SiF}_6^{--}$  and 1 mol. for each mol. of  $\text{H}_3\text{BO}_3$ . With another sample, remove  $\text{SiF}_6^{--}$  by pptn. with KCl and alc. Then, without filtering, add glycerol and titrate the  $\text{H}_3\text{BO}_3$  at 5°. Deduct the value now obtained from the total acidity to get the  $\text{SiF}_6^{--}$  and run a blank on all the reagents. For preps. contg. water-sol. fluorides and sol. arsenicals, oxidize the As by  $\text{H}_2\text{O}_2$  in  $\text{Na}_2\text{CO}_3$  soln. and ppt.  $\text{Ag}_3\text{AsO}_4$  in carefully buffered soln. Use the ppt. for the As detn., choosing a distn. method. Take an aliquot part of the filtrate, ppt. excess Ag with NaCl, filter and use another aliquot for the F detn., Gooch's gravimetric method being recommended. For the analysis of a mixt. of NaF, NaHF<sub>2</sub> and  $\text{Na}_2\text{SiF}_6$ , det. the total acidity with NaOH and assume 1 NaOH used for NaHF<sub>2</sub> and 4 NaOH for  $\text{Na}_2\text{SiF}_6$ . Then det. the total F by the gravimetric method of Gooch. For the NaHF<sub>2</sub> detn., add 1 g. of KCl to the soln. of 0.5 g. powder in 25 cc. of water and 25 cc. of alc. Cool to near 0° and titrate with NaOH free from carbonate. The analysis of various products showed that a sample of commercial  $\text{Na}_2\text{SiF}_6$  contained a little NaF and NaHF<sub>2</sub>, commercial NaF contained over 4%  $\text{Na}_2\text{SiF}_6$  and some NaHF<sub>2</sub> while commercial NaHF<sub>2</sub> contained about 29% NaHF<sub>2</sub>, 10%  $\text{Na}_2\text{SiF}_6$  and 60% NaF. W. T. H.

**Improvements in the Denigès colorimetric method for phosphorus and arsenic.** EMIL TRUOG AND A. H. MEYER. *Ind. Eng. Chem., Anal. Ed.* 1, 136-9 (1929).—Denigès has shown that a very sensitive test for  $\text{H}_3\text{PO}_4$  and  $\text{H}_3\text{AsO}_4$  is obtained by adding  $(\text{NH}_4)_2\text{MoO}_4$  and  $\text{SnCl}_2$ , a blue color being produced. The method of applying the test is now improved by prepg. a soln. of  $\text{SnCl}_2$  from crystals of this salt and keeping the soln. under white mineral oil. This soln. keeps very much better than the soln. obtained by dissolving Sn in HCl. Better results are also obtained by doubling the quantity of molybdate reagent and increasing the acidity somewhat. Directions are given for applying the test in the analysis of water, soils, minerals, fertilizers, etc. W. T. H.

**Oxygen determination (in gas) by the Lubberger-Wunsch method.** ANON. *Gay u. Wasserfach* 72, 525-6 (1929).—A 3-5-l. cork-stoppered bottle, the vol. of which is known, and which is provided with a side tube closed by a stopcock and with a dropping funnel, is filled with gas. Ten cc. of  $\text{MnCl}_2$  soln. contg. 10 g. of  $\text{MnCl}_2$  in 100 cc. of slightly acidified water, is added per l. of gas. The dropping funnel is then carefully washed out with water and 30 cc. of a sol. contg. 10 g. NaOH, 35 g. Rochelle salt and 85 g. KI in 300 cc. water added for each l. of gas. After equalizing the pressure on the bottle it is shaken mechanically 1.5 hrs. Concd. HCl, 10 cc. per liter of gas, is then added and the soln. shaken. It is then washed into a beaker and titrated with 0.1 N  $\text{Na}_2\text{S}_2\text{O}_3$ , 1 cc. of which equals 0.560 cc. O at 0° and 760 mm. A sample computation is given. If all precautions are followed concordant results are obtained.

R. W. RYAN

**A contribution to the quantitative spectral analysis of solutions.** FR. GROMANN. *Z. anorg. allgem. Chem.* 180, 257-74 (1929).—A new spark gap with metal electrodes and an improved exciting circuit are described and applied to the analysis of very dil. solns. of Hg salts, particularly the sulfide. G. found that adding CuS to the soln. increased the sensitivity of the app. A discussion is given of the technic, sensitivity and accuracy of this method of analysis.

J. B. AUSTIN

**A drop test for the estimation of the stability of emulsions.** G. GOETTSCHE. *Chem. Weekblad* 26, 336-8 (1929).—To det. quickly the stability of fungicidal liquids a method is described which depends upon the shapes taken when a little of the liquid is dropped into water. An app. is described by which it is possible to obtain reproducible results.

F. DE LEEUW

**Lime analysis.** C. A. DOLGOV. *Nauch. Zapiski Sakhornoi Prom.* 8, 22-38 (1929).—For detn. of total CaO, the conventional method is satisfactory. Free CaO can be detd. by using the glycerol-boric acid titration or the following method can be used: Weigh out 5 g. of lime into a 500-cc. flask. Add 400-450 cc. of boiling  $\text{H}_2\text{O}$  and 50 g. of pure granulated sugar. Shake and make up to the mark with boiled cold  $\text{H}_2\text{O}$ . Discard first 150-200 cc. of filtrate and titrate the rest of the filtrate with 0.5 N HCl, phenolphthalein being used as indicator.

V. E. BAIKOW

**Determination of iron oxides in acid furnace slags.** GEORGE T. DOUGHERTY. *Ind. Eng. Chem., Anal. Ed.* 1, 163 (1929).—Routine methods are described for obtaining the  $\text{FeO}$  and  $\text{Fe}_2\text{O}_3$  in steel furnace slag, the samples being decomposed by  $\text{H}_2\text{SO}_4$  and HF in Pb test tubes on a sand bath.

DOWNES SCHAAP

**The analysis of "Glanzmetall."** LEO SCHWEITZER. *Chem.-Ztg.* 53, 457-9 (1929).—"Glanzmetall" is the name given to some bright alloys which are often made by work-

ing up metal wastes. They differ from the usual Cu alloys by contg. more Sb and from common Sn alloys by contg. more Cu. *Detn. of Cu and Pb*.—Digest 0.5 g. of alloy in a porcelain dish with 15 cc. of Br<sub>2</sub> with 9 vols. of 40% HBr. Evap. to dryness, add 10 cc. more of Br-HBr, evap. again and allow the residue to stand at least 15 min. in a warm place and then digest with 40 cc. of 7.5 N HNO<sub>3</sub> and boil till all Br is expelled. Then rinse into a beaker and det. Cu and Pb simultaneously by electrolysis. *Detn. of Sn*. If the Cu content is less than about 12% and As less than 1% choose (I) from the following procedures, and (III) if more As is present. If more Cu is present, use (II) if less than 10% Sb is present and (III) if more than 10% Sb. (I) Treat 0.5 g. of alloy with 50 cc. of Br-HCl, remove excess Br and reduce with *ferrum reductum*, filter and titrate with I<sub>2</sub>. (II) Treat 0.5 g. alloy with a mixt. of 30 cc. HCl and 5 cc. HNO<sub>3</sub>, warming gently. Treat the soln. with excess NH<sub>4</sub>OH and 5–10 g. of (NH<sub>4</sub>)<sub>2</sub>CO<sub>3</sub>. After 3 hrs. in a fairly warm place, filter, wash with hot water and treat the ppt. as in Method I. (III) Digest 0.5 g. of metal with 15 cc. of concd. HNO<sub>3</sub> and dil. with 100 cc. of water. After the ppt. has settled, filter with paper pulp and fuse the ppt. in an Fe crucible with Na<sub>2</sub>O<sub>2</sub>. Ext. the melt with water and stir with HCl until dissolved. Continue as in (I). *Detn. of Sb*. Of the following 3 methods, use (I) when less than 15% of Cu is present and less than 0.5% Fe and 0.5% As; if more Fe is present and the As content is low, use (II) and when more than 0.5% As is present use (III). When more than 15% of Cu is present, use (IV) with less than about 0.8% of Fe present otherwise use (III). (I) Det. the Sb by Low's method of dissolving in concd. H<sub>2</sub>SO<sub>4</sub> and titrating with KMnO<sub>4</sub> in the presence of HCl. (II) Dissolve 1 g. of metal in 30 cc. HCl and 5 cc. HNO<sub>3</sub>, dil. with water and nearly neutralize with NH<sub>4</sub>. Boil and introduce H<sub>2</sub>S, preferably adding 5 g. of oxalic acid to keep Sn in soln. Filter and wash back the ppt. into the original flask, using a little Na<sub>2</sub>S soln. to remove the last traces of ppt. from the filter. Add 25 cc. of concd. H<sub>2</sub>SO<sub>4</sub> and a few crystals of Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub>. Heat to fumes of H<sub>2</sub>SO<sub>4</sub> and continue as in (I). (III) Treat the metal as in the third method given for Sn, eventually fusing with Na<sub>2</sub>O<sub>2</sub>. To the slightly acid soln. obtained after fusing, add H<sub>2</sub>S, filter off the ppt., and treat as in method (II). For the detn. of Ni, Fe and Zn, use the filtrate from the H<sub>2</sub>S pptn. and analyze in the usual way. For the As detn., decompose 2–5 g. of alloy with 5 g. KBr, 50 cc. of satd. FeCl<sub>3</sub> soln., 165 cc. of concd. HCl and 35 cc. of water, and catch the distillate in dil. HCl, eventually titrating with I<sub>2</sub> after neutralizing with NaHCO<sub>3</sub>. If so much S is present that As<sub>2</sub>S<sub>3</sub> ppts. during the distn., weigh the As in this form. For the S detn. boil 2 hrs. with 100 cc. of concd. HCl in a stream of CO<sub>2</sub> and catch the distillate in AcOH soln. of Cd and Zn acetates. Finally treat with CuSO<sub>4</sub> soln., filter off the CuS, ignite and weigh as CuO.

W. T. H.

**Note on the determination of silica in steel.** ROLAND WASMUHT. *Z. anorg. Chem.* 42, 526–7(1929).—P. DICKENS (*Chem. Fabrik* 2, 51(1929)) obtained too high results by the Br-KBr method of Oberhoffer. This difficulty resulted, probably, from the formation of SiBr<sub>4</sub> from FeSi and subsequent hydrolysis of the SiBr<sub>4</sub>. It is easily possible to remove this secondary H<sub>2</sub>SiO<sub>3</sub> by washing the ppt. with dil. Na<sub>2</sub>CO<sub>3</sub>, which does not dissolve the strongly heated SiO<sub>2</sub> in the original metal. A simple shaking device is shown and detailed directions given by which the SiO<sub>2</sub> of Fe and steel can be detd. satisfactorily by the Br-KBr method.

W. T. H.

**Bimetallic electrodes for titrations involving a change of hydrogen-ion concentration.** RAYMOND M. FUOSS. *Ind. Eng. Chem., Anal. Ed.* 1, 125–8(1929).—The following electrode pairs were used for the titration of various acid and basic solns; Sb-Pb, Sb-HgCu, B-Ag, and Cu-CuO. For general use, the Sb vs. amalgamated Cu electrode is most satisfactory. Curves are shown for the titration of NaOH with HCl, HCl with NaOH, Na<sub>2</sub>CO<sub>3</sub> with HCl and AcOH with NaOH and CuSO<sub>4</sub> with NaOH.

W. T. H.

**The solubility of gold in mercury.** ARTHUR A. SUNIER AND BRUCE E. GRAMKEE. *J. Am. Chem. Soc.* 51, 1703–8(1929).—The empirical equation,  $\log N = -1167/T + 0.966$ , expresses the exptl. results up to 160° but not at higher temps. The results agree well with those obtained by Kasanzeff in 1878 but are lower than those obtained subsequently by Parravano and by Britton and McBain. They do not agree at all with the results of Braley and Schneider. For the analysis, the samples were heated in H<sub>2</sub> at about 200° until no more Hg could be seen and then the temp. was raised to about 550° which was necessary to remove the last traces of Hg. Expts. with pure Au and pure Hg showed that the wt. of Au obtained in this way agreed with the wt. taken.

W. T. H.

**Sodium maleate—a buffer for the p<sub>H</sub> region of 5.2–6.8.** J. W. TEMPLE. *J. Am. Chem. Soc.* 51, 1754–5(1929).—The advantage of NaHC<sub>4</sub>H<sub>3</sub>O<sub>4</sub>·3H<sub>2</sub>O + NaOH

for prepg. suitable buffer solns. lies in the fact that the max. buffering power is in the region where phthalate and phosphate buffers have the least efficiency. Directions are given for making the salt and for prepg. 9 solns. of definite H-ion concn. from pH 5.3-6.8. W. T. H.

**Estimation of alcohol in dilute water solutions by the permanganate method.** B. Y. ROZMAN. *Zhur. Prikladnoi Khim.* 2, 191-8(1929).—Mix 50 cc. of the sample and 50 cc. of 0.1 N  $\text{KMnO}_4$  in a 500 cc. Erlenmeyer flask. Add 20 cc. of concd.  $\text{H}_2\text{SO}_4$  in about 4-6 sec. without mixing. After 1 min. add 100 cc. of cold water, mix and add 50 cc. of 0.1 N oxalic acid soln. ( $\text{Na}_2\text{C}_2\text{O}_4$  soln. is permissible.) Heat almost to boiling and titrate the excess of oxalic acid with 0.1 N  $\text{KMnO}_4$ . The method is satisfactory for solns. contg. 0.1-0.05% of EtOH. More concd. solns. should be dild. to this strength. The presence of  $\text{Et}_2\text{O}$  affects the accuracy of the results. V. K.

**Detection of isopropyl alcohol in alcoholic preparations.** C. STAINER AND A. LAUWAERT. *J. pharm. Belg.* 10, 167-9(1928).—A comparative study of some reactions employed in the analysis of alcs. and acetone. With respect to isopropyl alc. it was found:—That Et and Am alc. give acetic ethers with distinct odors while isopropyl alc. does not; that the iodoform test is given by acetone, Et and isopropyl alcs.; that isopropyl alc. does not affect the detection of acetone by Legal's test, of methanol by the U. S. P. test (Trillat and Denigés), or of ethanol in methanol (Denigés test). Denigés reagent ( $\text{HgO}$  50 g., concd.  $\text{H}_2\text{SO}_4$  200 cc., distd. water 1000 cc.). The reagent when brought to a boil is not affected by the addn. of a few drops of the following: Me, Et and Am alc., or ether. With acetone and formaldehyde, it gives a white ppt. after shaking; with pure isopropyl alc. or mixts. of it and any of the above, the reagent gives a yellow ppt. (not white as stated by D.). The test cannot be employed in the presence of hydrocarbons, as petrolatum, which also give a yellow ppt. Directions are given for this test in some special medicaments. A. G. DuMEZ

**Estimation of formaldehyde via the D. A. B. 6.** WALTER MEYER. *Pharm. Ztg.* 74, 771-3(1929).—A crit. review of the official Ger. Pharm. (I method) method with certain other suggested methods (sulfite,  $\text{NH}_3$ , and  $\text{H}_2\text{O}_2$  methods). Working with the purest reagents, the D. A. B. 6 method proved entirely satisfactory, though rather expensive. From the standpoint of cheapness and simplicity, however, both the sulfite and the  $\text{NH}_3$  methods are preferred. The  $\text{H}_2\text{O}_2$  procedure is least satisfactory. W. O. E.

**Rapid method for determination of phenols.** J. A. SHAW. *Ind. Eng. Chem., Anal. Ed.* 1, 118-21(1929).—With a special app., easily made in any lab., 10 cc. of sample is steam distd. to give 25 cc. distillate. This is divided into portions, diluted until the concn. lies between 30 and 35 p. p. m., brought to 20°, Br- $\text{H}_2\text{O}$  added, shaken and the turbidity instantly compared with that in 30 and 35 p. p. m. standards. Alcs., amines, aldehydes, org. bases, oils and inorg. salts interfere. ALDEN H. EMERY

**Detection of  $\alpha$ - and  $\beta$ -naphthol by ultra-violet rays.** T. YOKOI AND M. ISHII. *J. Pharm. Soc. Japan* 49, 475-8(1929). F. I. NAKAMURA

**Determination of glucosides.** L. ZECHNER. *Pharm. Monatsh.* 10, 90-2(1929).—The possible estn. of glucosides by chem., biochem. and physiol. methods is discussed, the latter from various angles. W. O. E.

**A study of combustion catalysis of the sulfur of organic substances.** L. BERMEJO AND A. RANCAÑO. *Anales soc. españ. fís. quím.* 27, sec. tec. 113-28(1929).—Tests were made to find a substitute for Pt foil as catalyst in the Pregl method of combustion of S in org. substances, and to det. if any relation existed between the state of the S in the org. mol. and compn. of the catalyst, but without success. E. M. SYMMES

**Potassium sulfoguaiaicolate D. A. B. 6 as reagent in the detection of methanol in alcoholic preparations.** HERMANN MATTHES. *Apoth. Ztg.* 44, 730(1929).—An account of M.'s experience with this reagent, with the suggestion that the sample prior to use be purified by soln. in  $\text{H}_2\text{O}$  (1 g. in 50 cc.) and evapn. to dryness on the steam bath, otherwise the color tests obtained may prove misleading. W. O. E.

**Iodometric determination of thioisemicarbazide.** A. GAFFRE. *J. pharm. chim.* [8], 9, 19-23(1929).—See C. A. 23, 2676. E. H.

**Lactic acid tests.** H. V. ARNY AND MARGUERITE C. DIMLER. *J. Am. Pharm. Assoc.* 18, 459-62(1929).—All of the tests for lactic acid described in the literature so far as they could be found were tried. The most satisfactory was the resorcinol test of Brauer (C. A. 14, 2772). A method was devised which combines shaking out with  $\text{EtOAc}$  and application of the Brauer test. Shake the prepn. twice with 20 cc. of pure  $\text{EtOAc}$ . Wash the mixed solvent with 5 cc. of  $\text{H}_2\text{O}$  and with 5 cc. of dil.  $\text{H}_2\text{SO}_4$ . Filter the washed solvent through a dry filter and evap. the filtrate on a water bath. Weigh the sirupy residue as lactic acid. Dissolve the residue in 5 cc. of a 1% resorcinol soln.

and layer over  $\text{H}_2\text{SO}_4$ . On standing for 2 min. with gentle rotation a red color develops. L. E. WARREN

**A new reaction of citric acid and its salts.** VICTOR ARREGUINE. *Semana méd* (Buenos Aires) 36, 173-4(1929); *Bull. soc. chim. biol.* 11, 242-5(1929).—From 3 to 4 cc. of a dil. soln. is oxidized by a 4%  $\text{KMnO}_4$  soln., the citric acid being converted into acetonedicarboxylic acid. Add 0.1 g. resorcinol and then slowly  $\text{H}_2\text{SO}_4$  until a red color appears. Cool and shake out several times with  $\text{Et}_2\text{O}$ , add to the  $\text{Et}_2\text{O}$  10 cc.  $\text{H}_2\text{O}$  and some drops of  $\text{NH}_3$ . An intense blue fluorescence is produced if more than 1:1000 parts of citric acid was present in the original soln. The reaction is based on the formation of  $\beta$ -hydroxycoumarinacetic acid. A. E. MEYER

**The factors in the estimation of starch by the iodine method.** E. LÉPIK. *Mitt. Lebensm. Hyg.* 20, 79-88(1929).—The size of the starch particles in the disperse stage depends upon the warming temp., the time of heating and the pressure. The pptn. of the starch-iodide is greater when the particles are small. At higher temp. this pptn. is accelerated if the starch is pure. Impurities hinder the reaction. A pressure over 3 atm. has an inhibitory effect. Certain growths, such as that of *Phytophthora infestans* in potato tubers, will lessen the pptn. It has been found best to use I in  $\text{CaI}_2$  soln. as the precipitant. RUSSEL C. ERB

New data on saturnism (KOHNS-ABREST) 13.

EVERS, NORMAN AND ELSDON, G. D.: **The Analysis of Drugs and Chemicals.** London: Chas. Griffin and Co., Ltd. 349 pp. 25s. net.

STAUDINGER, HERMANN: **Anleitung zur organischen qualitativen Analyse.** 2nd ed., revised and edited by Walter Frost. Berlin: J. Springer. 144 pp. M. 6.60.

## 8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY AND J. F. SCHAIRER

**Selected bibliography of minerals and their identification.** OLIVER BOWLES. *Bur. Mines, Circ.* 6148, 4 pp.(1929). E. H.

**Utilizing staining methods in the identification of minerals.** R. F. HEAD AND A. L. CRAWFORD. *Eng. Mining J.* 127, 877; *Bur. Mines Repts. Investigations* No. 2032, 3 pp. (1929).—H. and C. have developed a method for the differential coloring of minerals chiefly of value in the rapid examn. of crushed ores, concentrates and tailings. The most serviceable test so far developed is a distinguishing test for  $\text{PbSO}_4$  and  $\text{PbCO}_3$  based upon staining with sol. chromates. Bright yellow coatings of equal intensities are produced upon cerussite and anglesite when the mineral grains are treated with a cold satd. soln. of  $\text{K}_2\text{Cr}_2\text{O}_7$  for 15 min. Anglesite in the presence of cerussite is chromated by cold aq. soln. contg. 2%  $\text{K}_2\text{Cr}_2\text{O}_7$  and 0.5%  $\text{NaOH}$  for 1 min. Cerussite in the presence of anglesite is chromated in 1 min. by a cold 1% soln. of  $\text{CrO}_3$ . L. T. FAIRHALL

**Microchemical tests in the identification of opaque minerals.** H. E. MCKINSTRY. *Econ. Geol.* 22, 830-43(1927); cf *C. A.* 22, 4084.—The application of microchem. tests to samples obtained from polished ore sections is discussed. Tests have been checked and are summarized for Ag, As, Sb, Bi, Ni, Co, Fe, Pb, Cu, Te and Zn. E. J. R.

**A lead ore consisting of native lead, leadhillite and lithargite.** EARL V. SHANNON. *Econ. Geol.* 22, 826-9(1927).—A sample of native Pb from near Hailey, Idaho analyzed: Pb 98.66, Ag. 0.33, Cu 0.07, Fe 0.94, Zn trace, Hg, As, Sb none, sum 100.00%. Crusts around the native Pb were detd. to be lithargite, while a whitish material surrounding the latter was identified as leadhillite. A few grains of native Ag also were present. ELLIOTT J. ROBERTS

**Experiments bearing on bornite-chalcocite intergrowths.** G. M. SCHWARTZ. *Econ. Geol.* 23, 381-97(1928).—Upon heating natural bornite-chalcocite intergrowths to 225-400° and quenching, the specimens showed no trace of the intergrowths. One contg. 15% bornite resulted in a completely homogeneous phase while one contg. about 50% lost all evidences of intergrowth and the larger masses faded into one another. On reheating and cooling the specimens very slowly, the intergrowths could be reproduced. Upon heating and slow cooling of specimens low in bornite (3%), one of the resultant phases appeared to be "blue" chalcocite. Bornite and chalcocite therefore form a solid soln. at somewhat elevated temps. ELLIOTT J. ROBERTS

**$\text{K}_2\text{CuCl}_4\cdot 2\text{H}_2\text{O}$  as a product of the activity of Vesuvius.** F. ZAMBONINI AND G.

CAROBBI. *Ann. osservatorio vesuviano* [3], 2, 7-9(1925); *Mineralog. Abstracts* 4, 14.—The compd.  $2\text{KCl} \cdot \text{CuCl}_2 \cdot 2\text{H}_2\text{O}$  was found on the floor of the crater of Vesuvius in 1920. It is given the mineral name *milscherlichite* after the chemist who first prepd. this compd. artificially. Optical data and a qual. analyses confirm its compn. J. F. SCHAIRER

Origin of chert and flint. W. A. TARR. *Univ. Missouri Studies* 1, No. 2, 46 pp. (1926); *Mineralog. Abstracts* 4, 48.—A collection of 21 chem. analyses shows a range in  $\text{SiO}_2$  from 63.67 to 99.47%. Small quantities of  $\text{CaCO}_3$ ,  $\text{MgCO}_3$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{Fe}_2\text{O}_3$ ,  $\text{H}_2\text{O}$  and carbonaceous matter are also present. T. believes that the material has been directly pptd. from sea water as colloidal  $\text{SiO}_2$  and is not an accumulation of org. remains. J. F. SCHAIRER

Observations on wood tin nodules. W. H. NEWHOUSE AND M. J. BUEGER. *Econ. Geol.* 23, 185-92(1928).—Hematite is almost universally present in wood tin nodules. The samples examd. were formed by a crustification process; the color banding cannot be ascribed to the Liesegang phenomenon, but is a deposition one, probably due to variation in Fe content of the depositing solns., or to replacement by hematite. ELLIOTT J. ROBERTS

Investigations on spinels. L. PASSERINI. *Atti accad. Lincei* [6], 9, 338-43(1929).—The spinels  $\text{MgCr}_2\text{O}_4$  and  $\text{NiFe}_2\text{O}_4$  have been obtained by calcining at about  $800^\circ$  the corresponding nitrates and hydroxides, resp. These crystallize in the cubic system. and have the structure of true spinels:  $\text{MgCr}_2\text{O}_4$ ,  $a_0 = 8.290 \pm 0.005$  A. U.,  $d. = 4.49$ ;  $\text{NiFe}_2\text{O}_4$ ,  $a_0 = 8.340 \pm 0.005$  A. U.,  $d. \text{ calcd.} = 5.37$ , ( $d. \text{ obs.} = 5.268$ ). A. W. C.

Changes in the oxidation of iron in magnetite. JOHN W. GRUNER. *Econ. Geol.* 22, 744-9(1927).—G. corrects a misinterpretation by Twenhofel (*C. A.* 22, 2726) of statements in a former paper by G. (*C. A.* 21, 3031) and discusses the results of T. ELLIOTT J. ROBERTS

Changes in the oxidation of iron in magnetite. PERCY A. WAGNER. *Econ. Geol.* 22, 845-6(1927).—A natural occurrence of "ferro-magnetic ferric oxide" in S. Africa is described and the name *maghemite* suggested for this mineral. ELLIOTT J. ROBERTS

Application of thermomagnetic analysis to the study of a few iron ores and of rust. J. HUGGETT AND G. CHAUDRON. *Chimie & industrie Special No.*, 331-4(Feb., 1929).—The results of an investigation carried out by means of the Chaudron-Forrestier recording instrument (*C. A.* 22, 4348) are given, and lead to the following conclusions: (1) thermomagnetic analysis of *magnetite* indicates the well-known transformation at  $570^\circ$ , and with heating in air shows an anomaly at about  $300^\circ$  corresponding to the superficial production of a small quantity of ordinary  $\text{Fe}_2\text{O}_3$ ; (2) *martite* and *specularite* (both  $\text{Fe}_2\text{O}_3$ ) always contain small quantities of magnetic oxide; (3) *goethite* and *lepidocrocite* both give ordinary  $\text{Fe}_2\text{O}_3$  after dehydration; (4) the same method was applied to various silicates and sulfides (the curves are given); (5) the thermomagnetic curve of rust is practically the same as that of lepidocrocite and similar to that of goethite. A. PAPINEAU-COUTURE

An amphibole of the glaucophane group. L. DUPARC. *Compt. rend. soc. phys. hist. nat. Genève* 44, 48-9(1927); *Mineralog. Abstracts* 4, 16.—An amphibole from a quartzite from the Ural shows ordinary glaucophane surrounded by a zone of material with different optical properties which is here named *pseudoglaucophane*. J. F. S.

Minerals of the pegmatites and surrounding rocks from Budislav in eastern Bohemia. RADIM NOVÁČEK. *Časopis Národního Musea* 102, 91-5(1928); *Mineralog. Abstracts* 4, 41.—The biotite-pegmatites of Budislav contain much Mn concd. as *spessartite* which contains  $\text{MnO}$  33.90 and  $\text{FeO}$  7.54%. The biotite contains 0.64%  $\text{MnO}$  and the calcite 0.80%. J. F. SCHAIRER

Minerals of Moravian pegmatites. JOSEF ŠEKANINA. *Časopis Moravského Zemského Musea* 26, 113-212(1928); *Mineralog. Abstracts* 4, 42-3.—A bibliography of 122 publications, and analyses of *tourmaline* and *andalusite* are given. J. F. S.

Contributions to mineralogy of Western Australia. E. S. SIMPSON. *J. Roy. Soc. West. Australia* 14, 45-56(1928); *Mineralog. Abstracts* 4, 9.—*Tantexenite*, a new mineral species, is described. It was found in the tinfields of Pilbara. Its compn. is  $\text{YTi}_2\text{TaO}_6$  with probably  $\text{CaTiTa}_2\text{O}_8$  and  $\text{Y}_2\text{TaO}_8$ . It differs from *euxenite* in having Ta in place of Cb. Sp. gr. = 5.4-5.9; color amber-yellow. Analyses of material from 2 localities are given. Descriptions and new analyses of *grossularite*, *spessartite*, *andradite*, *spodumene*, *cummingtonite* and *corundum* are included. J. F. SCHAIRER

Diffusion in ore genesis. ALFRED R. WHITMAN. *Econ. Geol.* 23, 473-88(1928).—W. studied the diffusion of KI through flawless marble satd. with  $\text{H}_2\text{O}$  under conditions of const. temp. and humidity. One hole in a block of the marble contained a satd. soln. of KI and other holes at various spacings filled with distd.  $\text{H}_2\text{O}$  served as detec-

tors. Quant. analyses of the  $H_2O$  in these holes furnished data from which the value of  $K$  in the equation  $\frac{\partial c}{\partial t} = K \left( \frac{\partial^2 c}{\partial r^2} + \frac{1}{r} \frac{\partial c}{\partial r} \right)$  was detd. to be 1, which is slightly greater than the same coeff. for KI in water. W. then proposes: "That diffusion is a large factor if not the major factor in the formation of metasomatic metalliferous deposits."

ELLIOTT J. ROBERTS

**Mineral association at the George gold-copper mine, Stewart, B. C.** W. V. SMITH-ERINGALE. *Econ. Geol.* 23, 193-208(1928).—Quartz and pyrite are of colloidal origin. Specularite occurs partially altered to magnetite. Arsenopyrite veins and replaces the pyrite. Chalcopyrite is contemporaneous with quartz and often replaces both pyrite and arsenopyrite. The Au is assocd. with the arsenopyrite since the Au value varies directly as the content of this mineral.

ELLIOTT J. ROBERTS

**Gold deposits of Woman, Narrow and Confederation Lakes, District of Kenora (Patricia Portion).** E. L. BRUCE. *Ontario Dept. of Mines* 37, Pt. 4, 1-51(1929).—This region is one of Pre-Cambrian rocks, predominately igneous. Au occurs in lenticular quartz veins and is the only economic mineral found.

ALDEN H. EMERY

**Geology of the Beardmore-Nezah gold area, Thunder Bay district.** GEO. B. LANGFORD. *Ontario Dept. of Mines* 37, Pt. 4, 83-108(1929).—Au accompanied by arsenopyrite, pyrite, pyrrhotite, chalcopyrite, sphalerite, galena, Cu and tourmaline occurs in quartz-filled fractures in a quartzite Fe formation and greenstone. Greenstone carrying 4% of graphite also occurs at one point, and 2 deposits of anthophyllite asbestos are reported.

ALDEN H. EMERY

**Huronian gold mine, Moss Township, District of Thunder Bay.** R. J. WATSON. *Ontario Dept. of Mines* 37, Pt. 4, 109-27(1929).—The region is underlain chiefly by Kewatin rocks of both basic and acid types. Two important ore deposits occur on account of the intrusion of Algoman acidic batholiths. The ore at the Tip Top mine assays Cu 5.3%, Au 0.032 oz. and Ag 0.392 oz. per ton. A quartz vein at the Huronian mine carries chalcopyrite, galena, sphalerite, pyrite, telluride and Au.

A. H. E.

**The Guanajuato mining district, Guanajuato, Mexico.** ALFRED WANDKE and JUAN MARTINEZ. *Econ. Geol.* 23, 1-44(1928).—The Ag ores are argentite, pyrrargyrite and polybasite always intergrown and assocd. with pyrite. With them Au occurs either free, combined with Ag or as a selenide. In the gang, silica, ankerite, calcite and dolomite are common, with rhodochrosite and siderite somewhat less so. The deposit is hypogene and there is no enrichment zone near the surface. The mineralizing solns. varied in compn., quartz replacing calcite pseudomorphically. They had a reducing action, W. and M. estg. that several billion tons of a red conglomerate have had their  $Fe^{+++}$  reduced to  $Fe^{++}$ .

ELLIOTT J. ROBERTS

**The ores of Potosi, Bolivia.** WALDEMAR LINDGREN and J. G. CREVELING. *Econ. Geol.* 23, 233-62(1928).—The genesis of the Ag-Sn ores of Potosi is probably as follows: a rhyolite porphyry intrusion fractured on cooling and allowed mineral bearing aq. solns. to ascend, depositing pyrite, quartz and cassiterite at 200-300°, and later tetrahedrite, andorite, ruby-silver and jamesonite at 100-150°. An analysis of andorite, which occurs as filling between quartz crystals, showed when cor. for impurities (quartz and Fe): Pb 21.12, Ag 13.12, Cu 0.83, Sb 40.67, As 0.49, S 23.77%, corresponding nearly to  $PbAgSb_5S_7$ .

ELLIOTT J. ROBERTS

**A genetic comparison of the Michigan and Bolivian copper deposits.** JOSEPH T. SINGEWALD, JR. *Econ. Geol.* 23, 55-61(1928).—The essential difference between these native Cu deposits and other Cu deposits is not in the character of the mineralizing solns. but in that of the rocks in which deposition took place. The native Cu deposits occur in rocks which originally contained  $Fe_2O_3$  and which now are bleached. The  $Fe_2O_3$  pptd. Cu from the solns. and was itself reduced.

ELLIOTT J. ROBERTS

**Technic of the investigation of iron ores.** FREDERIGH F. OSBORNE. *Econ. Geol.* 23, 442-50(1928).—In etching polished specimens of Fe ores it was found advantageous to confine the etching fluid to a limited area by contg. it in a 6-15 mm. length of 9 mm. Pyrex tubing cemented to the surface. A Pt heating coil immersed in the soln. may be used to heat the reagent in the tube. Magnetite is etched by HCl, HF,  $H_2SO_4$  and acid  $KMnO_4$ ; ilmenite, by HF; hematite, by HCl (though not always); spinel, by none of the above reagents.

ELLIOTT J. ROBERTS

**Lake Savant area, district of Thunder Bay.** E. S. MOORE. *Ontario Dept. of Mines* 37, Pt. 4, 53-82(1929).—Fe, Au, Cu, Pb, Zn and Ni have been found in this area. The magnetite and Au are of no economic importance.

ALDEN H. EMERY

**Platinum-bearing nickel-copper deposits on Lower Shebandowan Lake, District of Thunder Bay.** R. J. WATSON. *Ontario Dept. of Mines* 37, Pt. 4, 123-49(1929).—The rocks are all pre-Cambrian, mostly igneous. Only one mineralized zone seems

worthy of development: a Ni-Cu deposit on Discovery Bay and claims to the west. Sulfide replacements in peridotite schist and assoc. acid intrusions have been found along a zone a mile long and 100 ft. wide. The ore averages Cu 2 and Ni 3%, with a max. of Cu 16 and Ni 20%, also contg. 0.15 oz. of Pt metals per ton. Pyrite, chalcopyrite, pyrrhotite, polydymite and magnetite occur; Ni only in the sheared peridotite. There have probably been 2 periods of deposition.

ALDEN H. EMERY

**The origin of nickel silicates at Webster, N. C.** CLARENCE S. ROSS, EARL V. SHANNON AND FOREST A. GONYER. *Econ. Geol.* 23, 528-52(1928).—Analyses of 7 samples of nickeliferous vermiculite from Webster show 2-11% NiO. Analyses of 4 Ni minerals of the serpentine group show 15.56, 12.08, 2.57 and 4.20% NiO, resp. Analyses of pure vermiculite and some of the same pure vermiculite after treatment with  $\text{NiCl}_2$ -NaCl soln. at  $110^\circ$  for 1-2 months in a sealed tube showed that the vermiculite had taken up 12.52% NiO by replacement of MgO. Analyses of 6 samples of olivine from N. C. show a NiO content of 0.34-0.44%, while bronzite, green diopside and chromite show no NiO. Assoc. secondary minerals show about 0.2% NiO. Conclusion: The original magma from which the olivine crystd. contained NiO but that from which the other primary minerals crystd. did not. Also, the solns. altering the olivine were not Ni-bearing but during replacement most of the Ni from the olivine was carried over into the replacing mineral. Residual soil near Webster contained about 2% NiO, showing a concn. from the original olivine and serpentine about equal to the concn. of  $\text{Fe}_2\text{O}_3$  and  $\text{Al}_2\text{O}_3$ , much MgO and  $\text{SiO}_2$  being lost. Partly weathered dunite also shows about 2% NiO, without a corresponding increase of  $\text{Fe}_2\text{O}_3$  and  $\text{Al}_2\text{O}_3$  or loss of  $\text{SiO}_2$  and MgO. This indicates that NiO has been taken up from solns. descending through the material, probably by base-exchange with MgO in Mg silicates.

ELLIOTT J. ROBERTS

**Newly found bauxite deposits in the Otranto District, Italy.** C. CREMA. *Miniera ital.* 13, 165-6(1929).—Analyses show as high as 56%  $\text{Al}_2\text{O}_3$ .

E. I. S.

**Mineralogical composition of tripoli of Kaluga district, U. S. S. R.** E. M. YANISHEVSKII. *Trans. Inst. Econ. Mineral. Met.* (Moscow) No. 42, 32-50(1929).—The diatomaceous earth of Kaluga district, which is mined in the quantity of 160-320 tons monthly, when moistened, is a sticky mass of dark gray color. The compn. of 3 dried typical samples was:  $\text{SiO}_2$  75.59-78.76,  $\text{TiO}_2$  0.27-0.94,  $\text{Al}_2\text{O}_3$  9.67-10.57,  $\text{Fe}_2\text{O}_3$  3.15-3.74, CaO 0.69-1.05, MgO 1.46-1.72,  $\text{K}_2\text{O}$  0.56-0.78,  $\text{Na}_2\text{O}$  0.27-0.54,  $\text{SO}_2$  0.11-0.29, loss on ignition 4.41-4.70%.

BERNARD NELSON

**Carbon ratios as an index of oil and gas in Western Canada.** I. W. JONES. *Econ. Geol.* 23, 353-80(1928).—The carbon ratio theory of White (C. A. 9, 1291) cannot be applied to Cretaceous coals, in particular those of western Canada, as an index to the oil and gas possibilities of the region.

ELLIOTT J. ROBERTS

**Replaceable bases in the shales and clays overlying petroliferous strata.** E. MCKENZIE TAYLOR. *J. Inst. Petroleum Tech.* 15, 207-10(1929).—T. previously developed a theory (C. A. 23, 2024) for the formation of petroleum from a study of shales and clays overlying oil-bearing sands, which postulates that Ca clays underwent base exchange when submerged in sea water, becoming Na clays; were lifted out of the sea, came in contact with fresh water, and were hydrolyzed; bacteria, working in the alk. medium and under anaerobic conditions, broke down org. matter and the decompn. products accumulated, not being able to escape through the clay. Twenty-three samples of shales from Trinidad, Pechelbronn and Mexico have now been examd. for  $p_H$  value and replaceable bases. The  $p_H$  values and the uniform predominance of replaceable Na over replaceable Ca show that the clays have in fact undergone base exchange with NaCl and have hydrolyzed by coming in contact with fresh water.

EMMA E. CRANDAL

**Mineral industry of Alaska in 1927 and administrative report.** PHILIP S. SMITH. U. S. Geol. Survey, *Bull.* 810-A, 85 pp.(1929); cf. C. A. 22, 1305.

E. H.

**Some queries on rock classification and nomenclature.** F. YU. LEVINSON-LESSING. *Compt. rend. acad. sci. U. R. S. S.* 1928, 139-42; *Mineralog. Abstracts* 4, 40.—Rocks oversatd. with  $\text{SiO}_2$  but showing no quartz are distinguished by the prefix 'oxy'. The limitations of the term keratophyre are discussed.

J. F. SCHAIRER

**Essexite-thermalite-monzonite plutonic rocks from the Kaiserstuhl and their relation to its geological structure.** J. SOELLNER. *Mitt. Badisch. Geol. Landesanstalt* 10, 1-93(1928); *Mineralog. Abstracts* 4, 45; cf. C. A. 22, 4421.—This elaborate petrographic and geologic paper includes 5 new rock analyses.

J. F. SCHAIRER

**A hydrothermal origin of corundum and albitite bodies.** ESPER S. LARSEN. *Econ. Geol.* 23, 398-433(1928).—L. opposes the theory that albitites and plumasites were formed by the desilication of pegmatites due to reaction with the ultra-basic

wall rock. His arguments are: (1) The width of the reaction zones is greater than with ordinary pegmatites and is greater than one would expect. (2) The minerals of the reaction zones (biotite, anthophyllite, actinolite and talc) indicate a hydrothermal rather than an igneous origin. (3) The minerals of the albitites and plumasites, especially the latter, are not such as would be expected from the desilication of a pegmatite or the reaction of a pegmatite with an ultrabasic rock; *i. e.*, under magmatic conditions,  $\text{Al}_2\text{O}_3$ , if present in amts. sufficient to form corundum in quantity, would unite with  $\text{K}_2\text{O}$  present to form leucite, etc. (4) The amt. of material that must be removed from a pegmatite to make an albite rock or an albite corundum rock seem excessive; *i. e.*, quant. calcns. show that at least 74% of the material of a normal pegmatite would have to be removed to form an albite, or 65% to form a plumasite contg. 25% corundum. (5) There is no relation between the width of the border zones and the width of the albite or plumasite. In the Penna. area examd. by L. the reaction zones are always 6-18 in. wide whether the albite body is 5 ft. across or entirely absent. (6) The material added to the border zone is quantitatively very different from the material taken from the pegmatite. Calcns. based on a reaction zone 1 ft. thick of the av. compn. show that this zone could be formed by the albitization of a layer of pegmatite 16.8 cm. wide and made up of 43% each of albite and orthoclase and 14% quartz, and would leave only 7 cm. of albite rock, or, in other words, a dike of albite 6 in. wide would have the reaction zones on each side 12 in. wide. A hydrothermal origin of the deposits and reaction zones avoids all these objections and also accounts for all the phenomena explained by the desilication of pegmatites.

ELLIOTT J. ROBERTS

**Hydrothermal alteration of serpentine.** FRANCIS G. WELLS. *Am. J. Sci.* [5], 18, 35-52(1929).—W. treated olivine with solns. of  $\text{Na}_2\text{CO}_3$ ,  $\text{NaHCO}_3$ ,  $\text{K}_2\text{CO}_3$ ,  $\text{HCl}$ ,  $\text{NaCl}$ ,  $\text{NH}_4\text{Cl}$ ,  $\text{KCl}$ ,  $\text{FeCl}_3$ ,  $\text{AlCl}_3$ ,  $\text{HF}$ ,  $\text{NaF}$ ,  $\text{Na}_2\text{SO}_4$ ,  $\text{K}_2\text{SO}_4$ ,  $\text{H}_2\text{SO}_4$ ,  $\text{NaHSO}_4$ ,  $\text{NaOH}$ ,  $\text{SO}_2$ ,  $\text{CO}_2$ , water glass,  $\text{Na}_2\text{B}_4\text{O}_7$ , freshly pptd.  $\text{SiO}_2$  and  $\text{H}_2\text{O}$  under different pressures (1-301 atm.) and temps. (0-620°), and for varying times (1-15 days). In no case was olivine altered to serpentine, though it always dissolved to some extent, the soln. showing  $\text{SiO}_2$  and usually  $\text{MgO}$ . However,  $\text{MgCO}_3$ , Na silicate and  $\text{H}_2\text{O}$  will react to form serpentine. Under exptl. conditions olivine is more insol. than serpentine. Either the presence of constituents usually not assumed to be present alters the relative solubilities of olivine and serpentine, or higher temps. are necessary. W. believes the latter is the case.

ALDEN H. EMERY

**Birbirite, a new rock.** L. DUPARC, E. MOLLY AND A. BORLOZ. *Compt. rend. soc. phys. hist. nat. Genève* 44, 137-40(1927); *Mineralog. Abstracts* 4, 46.—A new rock from the Abyssinian plateau is described petrographically. The dunite has been altered to a compact brown quartzite ( $\text{SiO}_2$  88.20,  $\text{Fe}_2\text{O}_3$  9.01,  $\text{Cr}_2\text{O}_3$  0.86, etc.) here called *birbirite*. Pt is found in small quantity in the laterite covering the dunite and birbirite. Analysis gave: Pt 79.48, Os-Ir 1.41, Ir 0.82, Rh 0.75, Pd 0.49, Au 0.49 and Fe 16.50%.

J. F. SCHAIERER

**Origin of the siliceous Mowry shale of the Black Hills region.** WM. W. RUEBY. U. S. Geol. Survey *Prof. Paper* 154-D, 153-70(1929).—The Mowry shale is a thin member of hard platy shale in the lower part of the Upper Cretaceous series of the northern Rocky Mountain States. It was derived from the alteration of volcanic ash by long exposure to sea water, from which the dissolved silica was pptd. by decay-ing org. matter.

ALDEN H. EMERY

**Experimental work on red bed bleaching.** W. D. KELLER. *Am. J. Sci.* [5], 18, 65-70(1929); cf. *C. A.* 20, 3672; 22, 3869.—Analyses of rock and lab. expts. are given to prove that bleached spots in red beds are caused by reduction of  $\text{Fe}_2\text{O}_3$  and removal subsequent to such reduction.

ALDEN H. EMERY

**The origin and composition of the sediments of the Black Sea.** SILVIO VARDABASSO. *Ann. scuola ing. Padova* 4, 309-14(1929).—The analysis is given of a sample of sludge removed from the bottom of the Black Sea 100 miles northeast of the entrance of the Bosphorus. The material was viscous, of greenish gray color and of penetrating odor. On drying at 110° it lost 71.16%  $\text{H}_2\text{O}$ . The powder thus obtained was mainly composed of Al silicates, which in the original sample were present in colloidal state. The mech. analysis yielded 4.70% of fine sand just perceptible to the naked eye, the rest was composed of particles of smaller size. The powder contained: material insol in acids ( $\text{SiO}_2$  and insol. silicates) 60.45,  $\text{Al}_2\text{O}_3$  13.21,  $\text{Fe}_2\text{O}_3$  5.87,  $\text{CaO}$  4.94,  $\text{MgO}$  0.47, loss on ignition ( $\text{CO}_2$ , S,  $\text{H}_2\text{O}$ , org. substances) 14.16%. S (detd. separately) was 6.80%; no  $\text{MnO}$  and  $\text{P}_2\text{O}_5$  were present. The pungent odor was due to an opalescent liquid, which could be extd. from the powder by means of  $\text{Et}_2\text{O}$ . Its b. p. was higher than 150°; it was assumed to be a thio compd. of the aliphatic unsatd. series. Examin. under the microscope revealed the presence of the following minerals arranged in order



of their decreasing frequency: quartz, calcite, orthoclase, plagioclase, muscovite, chlorite, talc, biotite, tourmaline, zircon, rutile, apatite, epidote, titanite, hornblende, diopside, spinel. No pyrite was present. Fragments of diatoms, radiolaria, etc., were found occasionally.

G. SCHWOCH

**Preparation of sedimentary materials for study.** CLARENCE S. ROSS. *Econ. Geol.* 23, 334(1928).—Acetone is recommended in place of  $\text{CCl}_4$ , etc., for diluting methylene iodide in heavy liquid sepn., because the methylene iodide may be recovered by merely washing out the acetone with  $\text{H}_2\text{O}$ .

ELLIOTT J. ROBERTS

**Composition of peculiar clinkers found in snags after forest fires.** DUANE T. ENGLIS AND W. N. DAY. *Science* 69, 605-6(1929).—Peculiar greenish, rock-like clinkers sometimes found in hollow snags after forest fires have been suspected of being of meteoric origin, and even of being the cause of forest fires. Three samples from western hemlock snags and the wood from a living tree have been analyzed. The clinkers though from different localities all have the same approx. compn. On comparing the analysis of the wood and that of the clinker from the same locality by using the  $\text{K}_2\text{O}:\text{P}_2\text{O}_5:\text{K}_2\text{O}:\text{SO}_4$ , etc., ratios, very close agreement in compn. was obtained. The greenish color is due to Mn in the manganate form. Their meteoric origin has been disproved, as has the possibility of their starting forest fires.

LOUIS WALDBAUER

**The chemical investigation of Trinidad well waters and its geological and economical significance.** J. S. PARKER AND C. A. P. SOUTHWELL. *J. Inst. Petroleum Tech* 15, 138-82(1929).—The deposits in which oil is found in Trinidad were brought down from the South American continent by a river system flowing to the northeast. The types of deposit in which the oil occurs are varied and irregular both vertically and laterally. Minor faulting in the structures also contributes to the difficulty of understanding sub-surface conditions and interpreting the facts given by well-water analysis. The detn. of Ca, Mg, Cl,  $\text{SO}_4$ ,  $\text{CO}_3$  and  $\text{HCO}_3$  in the Trinidad well waters is necessary; Na, with K, can be calcd. with enough accuracy for the purposes of correlation. All the Trinidad waters thus far examd. contained  $\text{HCO}_3$  or a mixt. of  $\text{HCO}_3$  and  $\text{CO}_3$ , and the amts. of these radicals form the basis for comparison of the waters. The I content is also distinctive for certain fields, though the sea water contains no I. It was detd. by oxidizing the concd. and acidified  $\text{H}_2\text{O}$  with  $\text{H}_2\text{O}_2$ , collecting the I in  $\text{CHCl}_3$ , and estg. it colorimetrically or by titration. Trinidad well waters are usually colored, from pale yellow to dark brown. This is in the majority of cases due to naphthenic acids, but does not appear to be always the result of contact with oil. Color should form a convenient means of comparing such waters. Sp. gr. if taken uniformly at about  $80^\circ\text{F}$ . can be used to compute total solids. Three systems obtain for reporting results of well-water analyses: the ionic system in which the ions are reported as mg. per l. or parts per million; the combination system, in which the ions are combined hypothetically, acidic with basic; and the Palmer system of combining the ions into "primary" and "secondary salinity" and "primary" and "secondary alkalinity," and plotting the 4 points as a small and characteristic graph for each water. In the Parker system percentages by wt. of the several ions found are plotted upward additively from the base line and concn. in g. per l. horizontally. Each ion is thus represented by a rectangle. Alternate rectangles are blacked in. The order followed was  $\text{CO}_3$ ,  $\text{HCO}_3$ , Cl, Na and Ca + Mg +  $\text{SO}_4$ ; or if  $\text{SO}_4$  was a large amt., it was plotted separately, followed by Na and Ca + Mg. The chem. variations in the Trinidad waters are so small as to make it difficult to correlate them usefully with the geological data. Yet it is certain that differences between upper and lower waters in a Trinidad structure can be established by chem. analysis, yielding information which will be a guide to the driller if, for instance, a water breaks into the well. The thorough study which has been given to the waters of certain areas in Trinidad could now give place to simple tests calcd. to bring out such differences as have been proved to exist. But in new developments it would again be necessary to make the more complete analyses till the situation in general was understood.

EMMA E. CRANDAL

**Estimates of the ages of the Whin sill and the Cleveland dike by the helium method.** V. S. DUBEY AND ARTHUR HOLMES. *Nature* 123, 794-5(1929).—Emphasis is laid on the importance of age estn. in igneous rocks by the improved technic for measuring very small quantities of He. The He contents of the Whin sill,  $36 \times 10^{-6}$  cc. per g., and of the Cleveland dike,  $11 \times 10^{-6}$  cc./g., correspond to ages of  $182 \times 10^6$  years and  $26 \times 10^6$  years, resp.

W. WËST

**Lignite in Alamaba (BARKSDALE) 21.** The Fe and Mn ores of the Nordmark District (MAGNUSSON) 9. **Ground and spring water supply of the South Bavarian tertiary region (REUTER) 14.** **Nephelometric study of the colloidal solutions of metallic sulfides**

(WATANABE, NAKAU) 2. Characteristics of the bituminous material in peat (STADNIKOV, TITOV) 21. Crystal structure types (GRUNER) 2. The determination of crystallographic constants in the triclinic system (PARSONS) 2. The corrosion of a crystal of dolomite by an active isotropic liquid (ROYER) 2.

MEINCK, F.: *Über das Vorkommen von Jod in der Natur*. Berlin: Verh. von R. Schoetz. 110 pp. M. 6.50.

## 9—METALLURGY AND METALLOGRAPHY

D. J. DEMOREST, R. H. ABORN

**Ore treatment by flotation process.** A. ROCHELT. *Z. Oesterr. Ing. u. Architekten Ver.* 81, No. 15-16, 135-8(1929).—The ore-treatment plant and methods used in recovery of Cu and Ag of Kogl mines near Brixlegg in Tyrol are described. E. I. S.

**Ore dressing and flotation.** ANON. *Mining J.* (London). *Special Equipment* No. 43-6, 48(July 13, 1929).—Coarse and fine crushing, wet gravity concn. methods, sintering processes, dust recovery, electromagnetic ore sepn., mill power transmission and submerged combustion are briefly considered with names of equipment manufacturers.

ALDEN H. EMERY

**Effect and composition of flotation reagents.** W. PETERSEN. *Metallbörse* 19, 1322-3, 1380-1, 1434-6, 1490-1(1929).—Prior to 1921 the choice of flotation agents was empirical; with Perkins patent (C. A. 15, 663) the correlation of chem. structure and behavior as flotation reagent began. These substances are classified as (1) foaming agents, chiefly slightly sol. materials with polar-nonpolar constitution leading to the formation of monomol. layers with H<sub>2</sub>O and consequent changes in surface tension; (2) collecting agents, with S'' or N''' or similar elements in lower valence; (3) flotation poisons, like metallic cations of high valence, salts of certain metals, cyanides, hydroxides, ferri- and ferrocyanides, arsenates and arsenites, sulfites, sulfates, thiosulfates, colloidal slimes, etc.; and (4) antidotes, such as CaO, Na<sub>2</sub>CO<sub>3</sub>, protective colloids, etc. Many illustrations of the above are discussed.

W. C. EBAUGH

**Theory of concentrating table.** W. LUYKEN. *Metall u. Erz* 26, 297-301(1929); cf. C. A. 23, 2399.—A critical analysis of expts. (reported by others) on concn. with Wilfley tables, etc., leads to the conclusion that the detg. factor in this type of ore dressing is the sp. gr. of the materials used, and not the sizes of the particles present.

W. C. EBAUGH

**Concentrating auriferous pyrite.** FRIED. W. FREISE. *Metall u. Erz* 26, 301-6(1929).—In a rotating roaster pyrite of 0.6-1.4 mm. diam. began roasting between 350° and 390° that of 2.5-5.6 mm. between 390° and 430°, and that of 40 mm. between 465° and 480°. If As be present roasting starts at a lower temp. than indicated above, the order with other metals is As, Sb, Bi, Fe and Cu. The formation of SO<sub>2</sub>, As<sub>2</sub>O<sub>3</sub> and As<sub>2</sub>S<sub>3</sub> began between 300° and incipient redness. Trials of Cl upon Au showed that volatilization began at 100-122°, increased rapidly to 300° (7%), moderately to 450° (9%), rapidly to 650° (15%) and 850° (27%). Expts. with Au-contg. pyrite ores showed that it made no difference whether NaCl is added before or after grinding. If a preliminary roast be given before NaCl is added the Au losses on roasting are less. In all roasting slow heating (not sudden changes of temp.) is best. Pyrites whether rich or poor in Au suffer the same proportional losses with the same treatment. When other metals are present a chloridizing roast is influenced as follows: Ag and Pd are indifferent; Pb causes very small losses; Sb, Zn and Cu cause much greater Au losses.

W. C. EBAUGH

**The treatment of mixed (bulk) concentrates from base-metal sulfide ores.** W. E. HARRIS. Canada Dept. of Mines, Mines Branch. *Rept.* No. 695, 154-7(1929).—Concentrates of a Zn-Cu ore are roasted in an atm. of steam, thus reducing the formation of *ferrites* to a min. The calcines are leached with H<sub>2</sub>SO<sub>4</sub>, pptg. SiO<sub>2</sub> and Fe in the vat. By agitation and boiling the SiO<sub>2</sub> forms a granular filter bed for the pregnant solns. After filtration, the Zn-Cu soln. is electrolyzed, 60-70% of the Cu being recovered. The acid formed is neutralized with ZnO, recovered from the residue, and the remaining Cu is pptd. with Zn dust. After filtering the soln. is purified from Ni, Co, Cd and the last Cu traces with Hg and Zn dust in hot soln. Zn is finally recovered by electrolysis.

ALDEN H. EMERY

**Converting 70,000 tons of concentrates a month into blister copper.** S. M. SOUPCOFF. *Mining Congress J.* 15, 428-30(1929).—The reverberatories of Utah Copper's

Garfield smelter have capacities of 800 to 1000 tons per day. Flow of material through roasters, reverberatory furnaces, converters and casting machines is described.

**Concentrator of the Phelps Dodge Corporation Morenci Branch.** A. CROWFOOT AND D. C. BARNARD. *Mining Congress J.* 15, 448-54(1929).—Cu ore is concd. E. I. S.

**The iron and manganese ores of the Nordmark District.** N. H. MAGNUSSON. *Sveviges Geol. Undersökning* No. 13, 5-98(1929).—The general geology, origin of the Fe deposits and the formation of new minerals through metasomatic alteration are discussed. The Fe ore is poor in Mn. Only in 2 mines have Mn ores been worked; the ore is chiefly hausmannite. E. I. S.

**Lagunillas iron ore and its metallurgical value.** S. WAESSMAN. *Pub. Direccion general Minas, Geol. e Hidrologia* (Buenos Aires) No. 51, 3-4(1929). E. I. S.

**Improvements in milling practice at the Utah Copper Company plants.** H. S. MARTIN. *Mining Rev.* 31, No. 4, 7-10(1929). E. I. S.

**Leaching waste dumps at Tyrone.** E. M. SAWYER. *Mining Congress J.* 15, 538 9(1929).—Spraying was found inadequate. High-pressure hose application was successful. Baled factory scrap is most satisfactory for pptg. base. Scrap consumption is 1.30 lb. per lb. of Cu recovered. E. I. S.

**Early history of lead smelting in the west.** R. WALLACE. *Mining Rev.* 31, No. 5, 7-15(1929). E. I. S.

**The Clifton smelter of the Phelps Dodge Corporation.** I. J. SIMCOX. *Mining Congress J.* 15, 455-8(1929).—Roasting temps. are maintained by an occasional oil boost. Anode treatment is detailed. Low-S oil is used to facilitate low-S content in Cu. E. I. S.

**Historical summary of gold, silver, copper, lead and zinc produced in California, 1848 to 1926.** J. M. HILL. U. S. Bur. of Mines, *Econ. Paper* No. 3, 22 pp.(1929). E. J. C.

**Platinum and gold nuggets.** S. F. ZHEMCHUZHNIK. *Ind. Australian and Mining Standard* 81, 334(1929).—Notes on examn. and study of microstructure and phys. properties of 14 Pt nuggets of different sizes and from various sources, in connection with problem of genesis of Pt; Au and Ag nuggets were also studied, to investigate possibilities of formation from natural solns. E. I. S.

**The Snowflake tin silver vein.** V. DOLMAGE. *Can. Mining J.* 50, 626-7(1929).—The vein developed is in the Revelstoke dist. It is a quartz vein in carbonaceous argillites, sometimes graphitic and with small bodies of Ag-Pb-Zn ore; Sn occurs as stannite. Selected ore assayed 26.65% Sn. E. I. S.

**The aluminum problem in Poland.** LUDWIK WASILEWSKI. *Przemysl Chem.* 13, 93 100, 120 6(1929); cf. *C. A.* 23, 360.—This is largely a survey of economical and technical conditions which have a bearing on the development of an Al industry in Poland. A. C. ZACHLIN

**Control features new type of open-hearth furnace.** NORMAN F. HINDLE. *Foundry* 57, 502-5, 568-71(1929).—A description is given of the new 25-ton open-hearth steel furnace of the American Steel Foundries at Indiana Harbor, and various features of its construction and control devices are illustrated by photographs and drawings. DOWNS SCHAFF

**The electric operation of blast-furnace hoists.** C. H. S. TUPHOLME. *Iron & Steel Ind. and Brit. Foundryman* 2, 309-13(1929). E. H.

**Cupola-furnace slags.** MATTHES MIKLAU. *Die Giesserei* 16, 534-7(1929).—General discussion. HANS DUUS

**Fuel economy in the cupola.** N. D. RIDSDALE. *Iron & Steel Can.* 12, 179-80(1929). E. H.

**Pulverized coal in steel furnaces.** WM. O. RENKIN. *Iron Age* 124, 155-6(1929). E. H.

**Formation of insoluble zinc compounds during roasting.** H. R. HANLEY, CHARLES Y. CLAYTON AND DAVID WALSH. *Am. Inst. Mining Met. Eng. Tech. Pub.* No. 220, 17 pp(1929).—Progressively increasing amts. of powd. pyrite were mixed with powd. marmatite and the mixt. was roasted for 8 hrs. at 625° and 900°. At these temps. about 0.25 g and 0.45 g. Zn, resp., were rendered insol. per g. of free Fe. The combined Fe, as the marmatite constituent, always renders Zn insol. to the extent of 0.584 g. per g. of combined Fe. The generalized effectiveness of free Fe as pyrite to form insol. Zn is about 40-50% of the combined Fe when roasting at 625° and 80-90% at 900°. E. M. S.

**The sand blast in iron foundries.** II. J. McLACHLAN AND C. A. OTTO. *Iron & Steel Ind. and Brit. Foundrymen* 2, 327-30(1929). E. H.

**Test bar results approximate properties in casting.** JOHN W. BOLTON. *Foundry* 57, 509-12, 572-5(1929).—Information from many sources is compiled in the study of the influence of mfg. practice on given grades of cast Fe and the relationship of test bar results to engineering properties of the casting. DOWNS SCHAART

**The carbon content of high-grade gray castings made by steel additions in the cupola, and properties depending upon it.** KARL EMMEL. *Die Giesserei* 16, 605-12 (1929).—Contrary to the accepted idea that the best gray castings must contain less than 3% C, extensive tables of analyses and phys. test results are given for metal obtained on regular runs (not selected values) made by steel addns. to cupola charges, these show that a C content of 3% or slightly more gave optimum values for tensile strength, certainty of quality desired, etc. It is claimed that this special iron has now reached a stage of development entitling it to the full confidence of the iron foundler and ultimate user. W. C. EBAUGH

**Air in the cupola furnace.** A. LEHMANN. *Die Giesserei* 16, 613-6(1929). The importance of air as a part of the charge in a cupola furnace, the neglect often shown this factor, and means for measuring it (Taylor tube, Venturi meter, etc.) are discussed. W. C. EBAUGH

**The theory and application of regenerative principles in the steel industry.** II. T. J. McLOUGHLIN. *Blast Furnace and Steel Plant* 17, 1044-7(1929); cf. C. I. 23, 3425. E. H.

**The elimination of sulfur from the alloys of iron.** K. GIERDZIEJEWSKI. *Foundry Trade J.* 40, 465-6(1929).—A discussion of the methods of desulfurizing by means of slags. C. I. READ

**Volatility of oxides of lead, cadmium, zinc and tin.** FEISER. *Metall u. Erz* 26, 269-84(1929).—Oxides of metals contained in Pt boats or crucibles were heated in elec. furnaces to known temps. while a current of gas, free from reducing agents—especially CO—was passed over the mass; from the loss of wt. of the oxides the volatility was calcd. Tables and curves report results. The oxides are volatile at about the following temps.: PbO 750°, CdO 900°, ZnO 1300° and SnO<sub>2</sub> 1350°. A decrease of vapor pressure of PbO was caused by SiO<sub>2</sub>, Fe<sub>2</sub>O<sub>3</sub> and SnO<sub>2</sub>. The b. p. of PbO is 1472°, and the sublimation temp. of CdO is 1380-1390°. The small vaporization of PbO from mxts. with ZnO points to the existence of compds. between these substances. Al<sub>2</sub>O<sub>3</sub>, CaO, MgO and ZnO did not lower the vapor pressure of PbO. The influence of sintering upon the volatility of PbO was due to the diminution of the surface of the PbO exposed to the high temp. Trials at volatilizing PbO from converter flue dusts showed that it could be done, but that even 2-5% of SiO<sub>2</sub> in the flue dust made removal of the last traces of PbO very difficult. W. C. EBAUGH

**Autogenous welding serving the chemical and process industries.** T. M. JASPER. *J. Am. Welding Soc.* 8, No. 6, 12-7(1929).—Fundamental requirements of welding as applied to containers and pressure vessel construction for oil, chem. and other process industries are outlined. E. I. S.

**Tests of metal arc welds.** ANDREW VOGEL. *Gen. Elec. Rev.* 32, 332-9(1929).—Tests were made to det. unit stresses for design purposes and uniformity and reliability of the welds. The results establish unit stresses of 2000 lb. per linear in. for 1/4 in. welds, 2500 lb. per linear in. for 1/16 in. welds, and 3000 lb. per linear in. for 3/8 in. welds, and show that welding is uniform in strength and entirely reliable. H. STORITZ

**Hammer-welding aluminum and its alloys.** H. REININGER. *Metallhse* 19, 1378-80, 1433-4(1929); cf. C. A. 23, 2408.—Welding Al with gas flames is not effective with pieces of 30-40 mm. thickness, and hammer-welding is resorted to when other methods cannot be used. Pure Al welds more easily than some of its alloys. Hammer-welded Al has only 2/3 to 3/4 the tensile strength of the original metal, whereas autogenous gas-welding gives practically the original value. With many com. Al-alloys about 85% of the tensile strength can be obtained. W. C. EBAUGH

**A new fitting for welded pipe.** E. G. LUENING. *Ind. Eng. Chem., News Ed.* 7, No. 14, 3-4(1929). E. J. C.

**X-ray pattern of metallic crystals.** G. B. DEODHAR. *Nature* 123, 909(1929).—Ring patterns are obtained for Au, Ag and Sn foils. I. J. PATTON

**Reflection of ultra-violet rays from metallic surfaces in relation to their micro-structures.** HAJIME KORÔ. *Mem. Coll. Sci. Kyoto Imp. Univ.* 12A, 81-96(1929).—In Cu-Ag, Cd-Bi, Zn-Cd, Cu-Ni and Mg-Zn alloys a min. in intensity curve for reflection of ultra-violet and visible rays occurs in general at the eutectic, except that Cu-Ag alloys shows no min. for ultra-violet rays. A max. occurs where a compd. is formed. In the case of solid soln. a break or max. in the curve appears. A. P. SACIS

**Röntgen ray investigations in shop practice.** C. KANTNER AND A. HERR. *Metall-*

*wirtschaft* 8, 575-8, 602-6(1929).—Types of shop tests carried out with Röntgen ray app. in the expt. station of the Deut. Reichsbahn Ges. at Wittenberg are discussed and illustrated. Of special value are tests for faulty castings, improper welding, heat treatment, detecting flaws that have been repaired, etc. W. C. EBAUGH

**The effect of annealing upon the solidus temperature of alloys.** J. H. ANDREW AND H. M'NEIL. *J. Roy Tech. Coll.* (Glasgow) 2, No. 1, 64-72(1929).—A wide sepn. between the liquidus and solidus in an alloy system is due to supercooling on freezing, or lack of uniformity of the solid on melting. A bronze contg. 7.89% Sn was annealed to give different degrees of uniformity, and thermal analyses then showed that, as the uniformity increased, the solidus temp. rose greatly, the melting range narrowed, and the liquidus also rose somewhat. Alloys must therefore be thoroughly annealed if an accurate equil. diagram is to be plotted from m.-p. detns. Grain refinement in alloys occurs only during heating through a transformation, and is due to diffusion occurring during the heating. Some typical  $\alpha$ - $\beta$  structures are discussed, and the theory is proposed that  $\alpha$  may exist separately, but with the same space-lattice as  $\beta$ , in the single-phase alloy which first appears on solidification from the melt. G. F. C.

**Effect of section and various compositions on physical properties of cast iron.** R. S. MACPHERRAN. *Proc. Am. Soc. Testing Materials* 1929 (preprint) No. 35, 12-8.—Tensile and Brinell hardness detns. on test bars ranging from  $1\frac{1}{4}$  to 4" in diam. cast from 3 different types of gray Fe, show: (1) the effect of increasing the section on hard low-Si gray Fe and soft high-Si gray Fe is to materially and progressively lower the tensile strength; (2) the removal of extra stock in the hard low-Si gray Fe and the soft high-Si gray Fe is progressively accompanied by loss of hardness; (3) the high-test Fe under the cooling conditions described has practically the same Brinell hardness throughout the section; (4) the tensile strength of the high-test Fe tends to fall off as the section is increased or as the cooling is retarded, though not to the extent shown by the other 2 types. DOWNS SCHAAF

**Static strength of plain and alloy cast iron.** F. B. COYLE. *Proc. Am. Soc. Testing Materials* 1929 (preprint) No. 35, 23-9.—A series of constitutional and strength diagrams are presented showing the effect of compn., particularly the elements Ni and Cr, on the tensile strength and structure of cast Fe. DOWNS SCHAAF

**Heat treatment of cast iron.** F. B. COYLE. *Proc. Am. Soc. Testing Materials* 1929 (preprint) No. 35, 70-4.—The structure, aging and growth of cast Fe, as affected by temp., are briefly described for the following temp. ranges: (1) up to 425°; (2) from 425° to the crit. range; (3) from the critical range to the m. p. DOWNS SCHAAF

**Classification of gray iron alloys.** J. W. BOLTON. *Proc. Am. Soc. Testing Materials* 1929 (preprint) No. 35, 3-11.—In order to classify gray iron alloys the author discusses the following factors which influence the properties of gray iron castings: (1) chem. compn.; (2) structural and mech. make up of charge; (3) melting process; (4) thermal and mech. history; (5) design and workmanship. DOWNS SCHAAF

**Impact testing of cast iron.** H. BORNSTEIN. *Proc. Am. Soc. Testing Materials* 1929 (preprint) No. 35, 44-9.—A comparison is made of the impact test results on a "regular Fe" and a "high-strength Fe." DOWNS SCHAAF

**Wear testing of cast iron.** A. L. BOEGEHOLD. *Proc. Am. Soc. Testing Materials* 1929 (preprint) No. 35, 50-60.—The work of many investigators on wear testing of cast Fe is reviewed, and a brief description is given of a wear test conducted on an automobile engine constructed of individual cylinders of 4 different kinds of cast Fe, which, after running 20,000 miles, demonstrated that the kind of cylinder Fe used had no influence upon the result because of good lubrication between the piston and the cylinder. DOWNS SCHAAF

**Some interrelationships in gray iron metallurgy.** J. W. BOLTON. *Foundry Trade J* 40, 449-54(1929).—The correlation of test results to engineering properties of cast-iron castings is discussed, and numerous curves are plotted showing the effects of various factors on strength, the relationship of the vol.-area ratio to cooling rates, etc. A classification of cast irons based on C and Si contents is given. The raw materials in the charge, melting practice, and thermal and mech. treatment are also important factors influencing the properties of cast iron. The rate of cooling is very important, and is controlled by various factors, especially the vol. to surface ratio of the casting. Results of tests on different-sized castings of one grade of cast-iron are given in detail. Examples are given showing how the strengths of com. castings can be calcd. from test-bar results by allowing for the influence of the various factors discussed above. Test-bars should have similar cooling rates to those of the castings represented. The Fremont shear test on small specimens cut from castings is not generally reliable. The

form and amt. of graphite are most important. Dissolved gases in cast iron do not have serious effects.

**Mechanical properties of cast steel and forged steel of large dimensions.** ZIRO TUZI AND OOSI KADITA. *Bull. Inst. Phys. Chem. Research* (Tokyo) 8, 335-55; *Abstract Ed.* 2, 46(1929).—Two samples of rudder stock, 10 in. in diam. and 18 ft. long, 1 of cast steel and 1 of forged steel, were subjected to chem. analysis, mech. tests, and microscopic examn. The results show much heterogeneity in cast steel pieces and indicate that forged steel is far more reliable.

**Tensile tests on rods and wires of the same iron.** J. MUIR. *J. Roy. Tech. Coll.* (Glasgow) 2, No. 1, 5-11(1929).—Tensile tests of 2 grades of very soft steel rods, 0.2 in. in diam., were made just past the yield point, then the specimens were heated in boiling water and the tests repeated. This procedure gave progressively higher yield points. Rods annealed at various temps. from 500 to 850° were tested in the same way, and the extensions at the yield point for the annealed rods were much greater than for the originals, though the yield point values were similar. No explanation for this difference was found by microscopic examn. In the tests of wires 0.024 in. in diam. annealing was necessary to give any yield point.

**The magnetostriction of various steels.** J. S. RANKIN. *J. Roy. Tech. Coll.* (Glasgow) 2, No. 1, 12-9(1929).—A short review of previous work on magnetostriction is given. An app. is described for measuring the very small changes in length, with oscillating thermionic valves; and its method of use is explained. The changes in length corresponding to various magnetic forces and inductions are plotted for 6 steels, 2 of them contg. Ni. The length change decreased with increasing C content (0.17 to 0.80%) for a given magnetizing force. The steels contg. Ni gave a different form of curve.

**Fundamentals underlying the heat treatment of steel.** O. W. ELLIS. *Can. Chem. Met.* 13, 195-200(1929).

**Blast-furnace gas in heating steel.** A. J. EBNER. *Blast Furnace & Steel Plant* 17, 1031-3(1929); cf. *C. A.* 23, 3792.

**Utilization of mineral oils for thermal treatments of steels.** L. ROY. *Acières speciaux* 4, 171-3(1929); cf. *C. A.* 23, 3427.—R. discusses the volatility, tendency to oxidize, thermal cond. and sp. heats of various oils. By means of a graph, R. shows the speed of tempering of a piece of steel heated to 760° when immersed in a bath contg. 95 l. of liquid, the final temp. of the piece being 345°. Water gives the most rapid tempering, mineral oil the slowest, while a mixt. of 40% mineral oil and 60% cottonseed oil, cottonseed oil and fish oil occupy intermediate positions.

**Tempering changes in steels.** R. HAY AND R. HIGGINS. *J. Roy. Tech. Coll.* (Glasgow) 2, No. 1, 73-80(1929); cf. *C. A.* 22, 3613.—The elements Mo, W, Sn, P, Cr, V and Si are more sol. in  $\alpha$  Fe with body-centered lattice than in  $\gamma$  Fe with face-centered, and therefore when dissolved in Fe they decrease the temp. range in which  $\gamma$  is stable. C, Ni, Al, Cu and possibly Mn are more sol. in the face-centered than in the body-centered Fe lattice, and hence have the opposite effect, increasing the temp. range in which  $\gamma$  is stable. Ni steels, a Cr steel and a Cr-Ni steel were hardened, tempered at various temps. from 25 to 600°, and the Brinell hardness was detd. The Ni-Cr sample was the only one that showed any hardening on tempering at 125°. The fundamental process of tempering is the coalescence of finely dispersed carbide particles. Special elements may stabilize the soln. of carbides, or hinder their coalescence. By sp. vol. calcs. it is shown that the carbide is critically dispersed in steel contg. 0.60% C to obtain max. hardness.

**The normalizing of sheet steel.** W. PARKER. *Engineering* 127, 799(1929).—Sheet steel normalized in small lots in a continuous type furnace has superior phys. properties to box-annealed sheet since the time cycles of heating and cooling of the material are correct for obtaining uniformity in grain structure.

**The lattice-constant of quenched carbon steels.** SINKITI SEKITO. *Science Repts. Tōhoku Imp. Univ.*, 1st Ser. 18, 69-77(1929).—Exptl. results are given to show that the axial ratio of the tetragonal lattice appearing on the surface of quenched C steel diminishes with increasing depth, finally attaining the value 1. On annealing quenched C steel the tetragonal lattice changes immediately into the body-centered cubic form without assuming some intermediate axial ratio. The axial ratio of the tetragonal lattice increases with the C content, as well as with the quenching temp.

**The distribution of the austenite in specimens of quenched carbon steels.** KÔTARÔ HONDA AND ATOMI ÔSAWA. *Science Repts. Tōhoku Imp. Univ.*, 1st Ser. 18, 47-58(1929).—A series of steels contg. 0.3, 0.6, 0.9, 1.5 and 1.7% of C, were quenched in H<sub>2</sub>O from a high temp. After quenching each piece was carefully cut into 2 parts and

hardness detns. were made over the sectional area as well as the outer surface of the specimens. By comparing the lines of the x-ray patterns taken at different points on the surface, it is shown that the amt. of retained austenite in quenched steels is greater in the outer layer than in the inner.

DOWNES SCHAAP

**Recent investigations concerning the hardening of steel.** ERICH SCHEIL. *Arch. Eisenhüttenw.* 2, 375-88 (1928).—By graphs information concerning cooling curves, expansion, sp. vol., temp.-pressure changes, magnetic properties, hardness, lattice parameters, elec. resistance, etc., is presented, and the conclusion drawn that the transformation of austenite into martensite occurs more completely when cooling is brought about more rapidly. Under these circumstances the necessary tension is present.

W. C. EBAUGH

**Properties of materials at high temperatures. The strength at elevated temperatures of low-carbon steels for boiler construction.** R. G. BATSON AND H. J. TAPSELL. Dept. Sci. Ind. Research. *Eng. Research Special Rept. No. 14*, 41 pp. (1929).—At stresses corresponding to the proportional limit and with temps. between 500° and 600° "creep" proceeds at an extremely slow rate at first but gradually increases and leads to final fracture. Results are given for normalized 0.17% C steel and cold-drawn 0.10% C steel annealed at 650°.

H. C. PARISH

**High-carbon copper steels.** A. F. STOGOV AND V. S. MESKIN. *Arch. Eisenhüttenw.* 2, 321-31 (1928).—Previous investigations of Cu steels of low-carbon content are reviewed briefly. The properties of steels of 0.69-1.22% C and 1.19-5.07% Cu are studied. Cu increases the magnetic properties of steel; the crit. point is lowered (to 640° for 5% Cu) and it causes a large temp. hysteresis but without affecting the C content of the pearlite. Quenched and tempered Cu steel shows a high % of elongation and hardens with relatively good ductility and compressive strength. As Cu increases the coercive force of heat-treated steel, it may be assumed that Cu in the steel is not present in the free state.

R. D. BUMBACHER

**Uses of copper bearing steel for structural purposes.** F. P. TURNER, *et al.* *Am. Ry. Eng. Assoc. Proc.* 30, 1015-7 (1929).—Information collected indicates increased use of Cu bearing steel for steel cars, tie plates, track spikes, smoke stacks, boilers, culvert pipe, flashings, ventilators, fencing, structural steel, sash, power line supports, flood light towers and overhead electrification structures for railway tracks.

R. C. B.

**Nickel and nickel-chrome steels, forged and rolled; properties and applications.** ANON. *Aciers spéciaux* 4, 217-9 (1929).—A review.

A. J. MONACK

**Magnetic alloys of iron, nickel and cobalt.** G. W. ELMEN. *J. Franklin Inst.* 207, 583-617 (1929).—After a brief historical sketch of the work done on ferromagnetic alloys since 1913, the properties peculiar to the permalloys (Fe-Ni alloys with more than 30% Ni) and the permalvars (Ni 45%, Co 25%, Fe 30%) are discussed at length. The effects of varying the proportions of the various components, annealing, quenching, etc., on the initial permeability, max. permeability, hysteresis loss, intrinsic induction, resistivity, etc., are presented in a series of three-dimensional plots. The effects of various heat treatments are considered in detail and an explanation is offered on the theory of segregation, although it is recognized that this does not account for the high permeabilities at low fields. The possibility of the formation of a compd. such as FeCO<sub>3</sub> is also considered. A brief account of the applications of these alloys in telephone circuits is included.

W. W. STIFLER

**X-ray investigation of iron and nitrogen alloys.** ATOMI OSAWA AND SHUJIRO IWAIZUMI. *Science Repts. Tôhoku Imp. Univ.*, 1st Ser. 18, 79-89 (1929).—See C. A. 23, 2408.

DOWNES SCHAAP

**X-ray analysis of chromium-nitrogen systems including an investigation of the constitution of ferrochrome metals containing nitrogen.** RAGNAR BLIX. *Z. physik. Chem.*, Abt. B, 3, 229-39 (1929).—An x-ray analysis of a series of Cr-N products prepd. by heating electrolytic Cr in a stream of NH<sub>3</sub> at 800° reveals the existence of 2 intermediate phases in the Cr-N system. One of the phases remains homogeneous over a wide concn. (atomic) range including 33% N. The Cr atoms of this phase are in a hexagonal-close-packed lattice and the N atoms are probably arbitrarily imbedded in the voids of the lattice. The lattice size increases with increasing N content from  $a_1 = 2.747$  A. U.,  $a_2 = 4.439$  A. U., to  $a_1 = 2.770$  A. U.,  $a_2 = 4.474$  A. U. The other phase corresponds to CrN and has the cubic NaCl structure, with a lattice parameter of 4.140 A. U. In the photographs of a ferrochrome metal with 60.3% Cr, 2.4% N, 2.0% Si and 0.21% C there appeared among other patterns those of the hexagonal Cr-N phase so that it is probable that the N of ferrochromes exists in this phase.

H. W. WALKER

**Report of Committee B-2 on non-ferrous metals and alloys.** WILLIAM CAMPBELL. *Proc. Am. Soc. Testing Materials* 1929 (preprint) No. 19, 34 pp.; cf. C. A. 22, 2912;—

Results are given of phys. and chem. studies of die-casting alloys by cooperating labs. Rept. also discusses statistical analysis, radiographic examn. of die-castings and die-casting progress in Europe.

H. C. PARISH

**The resistance of chrome-nickel thermoelements to (corrosive attack by) metal melts.** R. HASE. *Z. Metallkunde* 21, 200-3(1929).—Chrome-nickel and Ni thermocouples of 5-mm. wire were introduced into a melt of 87% Cu, 6% Sn and 7% Zn at a temp. of 1040° for periods of 12 sec. Photomicrographs are given of cross-sections of the wires after 5-, 10-, 25-, 50- and 100-fold immersions. The Ni was much more rapidly attacked than the chrome-nickel, diminishing greatly in cross-section without showing internal structural changes. The chrome-nickel began to show strong corrosion after a 50-fold immersion which appeared to follow fine cracks originating in the surface. This type of thermocouple will endure 100 or more immersions. A melt of 63% Cu, 37% Zn was very much more corrosive, the character of the attack remaining the same as before. Zn is doubtless the cause of the corrosion. It is concluded that such bored-out wires with a surface as free as possible from cracks hold the greatest promise for long-life thermoelements to be used in casting practice.

ROBERT F. MEHL

**An x-ray study of copper which showed directional properties on cupping.** ARTHUR PHILLIPS and GERALD EDMUNDS. *Proc. Am. Soc. Testing Materials* 1929 (preprint) No. 48, 10 pp.—In sheets of Cu reduced 70 and 99% the common orientation was characterized by a predominance of dodecahedral planes in the surface and a 353 direction along the rolling axis. A preferred orientation was found in the annealed sheet which formed ears when cupped. Cu which drew without ears showed random orientation. There is evidence that preferred orientations in Cu, annealed at the usual temps., may be often attributed to excessively high rolling reductions. It is suggested that the formations of ears in drawn Cu may be avoided by limiting reductions to approx 65% and annealing at temps. of 500° to 600°.

H. C. PARISH

**Hardness relationships and physical properties of some copper alloys.** C. H. DAVIS and E. L. MUNSON. *Proc. Am. Soc. Testing Materials* 1929 (preprint) No. 47, 12 pp.—For the several Cu alloys in the alpha phase of binary and ternary systems, the relationship changes progressively from that of pure Cu to that of the alloy of lowest Cu content. The tensile strength-elongation and hardness-elongation relationships are detd. by the compn. and previous history of the material. The tensile strength-hardness relationship of an annealing series of an alloy is a single line.

H. C. P

**Stress cracking in tubing.** CLEMENT BLAZEY. *Metal Ind.* (London) 34, 555-8 (1929).—The distortion undergone by brass tubing contg. 29% Zn and 1% Sn in cold drawing was studied, and the effects on inner and outer crystals of the tube are described. The tendency to crack from internal stresses was greater when the tube was hollow-sunk than when it was drawn normally over a mandrel so that the wall thickness was reduced. The relation between the changes in external and internal diam., and the tendency to crack, is discussed. Frictional drag did not seem to be an important factor so that the exact shape of die does not matter.

G. F. COMSTOCK

**The twinning plane in a zinc crystal.** M. ICHIHARA. *J. Soc. Mech. Eng. Japan* 31, 1043-54(1928).—Twin lamellas on basal, prismatic and diagonal crystallographical planes were observed and the direction of twin lamellas was calcd. graphically. Graph results were identical with observed values. Conditions for producing large single Zn crystals by strain method were investigated.

E. I. S

**The (solid) solubility of copper in silver.** M. HANSEN. *Z. Metallkunde* 21, 181-4 (1929).—Twelve Ag-Cu alloys varying in compn. between 0.68 and 10.22% Cu were prep'd. by melting "purest" Ag and electrolytic Cu in a graphite crucible under charcoal. These were hammered and rolled, then annealed (in 1 cm.<sup>2</sup> pieces) in an elec furnace under an atm. of CO<sub>2</sub>. Oxidation could be detected only in the outer 2 mm layer. After a 20-hr. anneal at 750° alloys with 2.55, 4.57 and 6.16% Cu were quenched after heating for 10-15 min. at a series of increasing temps. and inspected for incipient melting in order to det. the solidus curve. The solid soly. of Cu in Ag was detd. at temps. of 750, 700, 650, 600, 500, 400, 350, 300 and 250°. The alloys were heated at 750°, cooled to quenching temp., then quenched and inspected, except for the detn. of the soly. at the temps. of 350° and less when the alloys were quenched from 700° or 750° and tempered; the soly. at 400° was detd. by both methods with identical results. The soly. was found to be 1.7% Cu from room temp. to 300° increasing to about 9.0% at the eutectic temp. (779°), with an accuracy of 0.5% Cu from 400° upward and a greater accuracy at lower temps.

ROBERT F. MEHL

**Silver solders.** R. R. SEUMAN. *Welding Eng.* 14, 64-5(June, 1929).—Comments on characteristics of Ag solders as a group are made including melting temps., vibration, shock, soundness, corrosion resistance, elec. cond. and speed in using.

E. I. S.



**X-ray study of the internal transformations in silver-zinc alloys.** A. ROUX AND J. CURNOT. *Compt. rend.* **188**, 1399-1401 (1929).—The x-ray crystal patterns of a Ag-Zn alloy contg. 30.23% Zn were detd. in 3 states, annealed at 500°, quenched after heating 10 min. at 500° and quenched and tempered at 210° for 1 hr. The presence of 2 constituents with cubic lattices in the annealed alloy was recognized, but of only one in the quenched alloy. In the quenched and tempered alloy the pattern indicated that the lattice of the single constituent was tetragonal, being deformed by pptn. of the second constituent in small quantity. The microscopic evidence supported these deductions.

G. F. COMSTOCK

**Acid resisting alloys of lead.** MASAO SANO. *Repts. Imp. Ind. Research Inst. Osaka, Japan* **10**, No. 3, 57 pp. (1929).—The following alloys of Pb were prepd: (I) Pb-Sb (4.15-18.10% Sb), (II) Pb-Ni-Sb (0.30-4.05% Ni; 4.40-13.0% Sb) and (III) Pb-Ni (amt. of Ni used was < 5%). The acid-resisting properties of the alloys were studied by immersion in H<sub>2</sub>SO<sub>4</sub>. In I (concn. of acid was 25-80% at 20°, and 15 and 45% at 30° for 7 days) acid corrosion was lowest at the eutectic and highest with 8% Sb. In II (concn. of acid 5-50% at 30° for 7 days; Sb kept at 10% and Ni varied) acid corrosion was inversely proportional to the amt. of Ni. In I acid corrosion was higher at high temp., but in II it was less affected by high temp. In general acid corrosion was higher the more dil. the acid. In II (Ni kept at 2% and Sb varied) acid corrosion was inversely proportional to the amt. of Sb and a min. at 18%. The phys. properties of the above alloys were also studied.

F. I. NAKAMURA

**The texture of cast metals and alloys.** E. SCHMID AND FOSTER C. NIX. *Metallwirtschaft* **8**, 651-4 (1929).

W. C. EBAUGH

**Cast aluminum alloys for pistons.** H. REININGER. *Metallbörse* **19**, 1209-11, 1266 7 (1929).—Tables and illustrations show the compn. and properties of many European and American alloys. In spite of the greater hardness of cast-Fe pistons the life of Al pistons is only about 10-15% less, a factor more than compensated for by their smaller wt. Fe, Ni and Mn give Al alloys of excellent properties; Pb is undesirable; Si alloys are not as suitable for pistons as for other parts of motor vehicles; Zn is not as useful as Fe, Ni or Cu; nor is Sb helpful; Mg can be alloyed to 3.5%, increasing hardness to about twice the extent of Cu. It is an important component, of recent Al pistons. Heat treatment of cast-Al pistons does not seem to yield permanent improvement, due to high motor temp.

W. C. EBAUGH

**Soldering of aluminum to other metals.** L. QUACK. *Chem.-Tech. Rundschau* **44**, 17 (1929).—Al has previously been connected with other metals by welding or soldering, but solders used have been unsuitable and the resulting joints insufficiently resistant to water. Inhoffen has introduced a new mobile, refractory solder which can be used at comparatively low temp. Joints made by this develop no leaks on 14 days exposure to conductivity water. The compn. is not given.

E. PICKERING

**Fatigue resistance of some aluminum alloys.** J. B. JOHNSON AND T. T. OBERG. *Proc. Am. Soc. Testing Materials* **1929** (preprint) No. 43, 5 pp.

H. C. PARISH

**Aluminum alloys for pressure die castings.** SAM TOUR. *Proc. Am. Soc. Testing Materials* **1929** (preprint) No. 51, 18 pp.—Zn in Al alloys causes hot shortness. Ni is usually an advantage and seldom causes trouble. Si added to a no. of Al alloys seems to decrease shrinkage and increase ductility at elevated temps. In many alloys, Fe in proper quantities seems to decrease hot shortness and increase strength at elevated temps. Excessive Fe sometimes causes hot shortness and brittleness. 0.10% Mg seems to decrease fluidity, increases shrinkage, causes some additional hot shortness and decreases strength at elevated temps. Sn causes hot shortness. Practically all alloy additions to Al, except Sn, Zn and possibly Si in some cases, increase hardness as it affects machineability. Si and Sn deaden the luster, while Cu, Ni and Fe improve it.

H. C. PARISH

**Light alloys of high strength.** R. CAZAUD. *Aciers spéciaux* **4**, 174-84 (1929).—A review.

A. J. MONACK

**The corrosion of iron in sodium chloride solution.** W. VAN WÜLLEN-SCHOLTEN. *Arch. Eisenhüttenw.* **2**, 523-30 (1929).—Electrodes of (a) smooth, and (b) rough Fe were dipped into NaCl soln., the outer circuit was completed through an ammeter. In a quiet soln. the smooth electrode became negative; moving the electrodes or stirring the soln. caused reversal of polarity. By measuring single potentials involved and applying Nernst's theory of the cell to det. the e. m. f. produced, it is shown that Fe(OH)<sub>2</sub> and Fe(OH)<sub>3</sub> formed upon the electrodes must be considered not as sep. phases, but as solid solns. When O is admitted to the two poles it alters the potential of both, but the relationship Fe<sup>++</sup>/Fe<sup>+++</sup> does not remain alike for the two poles. Measurements confirmed theoretical values. Similar explanations are offered for the rusting

of Fe; the previous condition of the surface, both as to its phys. state and the  $\text{Fe}^{+++}/\text{Fe}^{++}$  ratio in the rust present, det. the future course of the reaction upon it. W. C. E.

**The corrosion and the rusting of alloyed and unalloyed cast iron.** P. KÖRZSCHEKE AND E. PIWOWARSKY. *Arch. Eisenhüttenw.* 2, 333-40(1928).—In grey cast iron the form of segregation or the quantity of graphite within the usual limits has no influence on corrosion in acids or salt solns. Si, lower than 1.5% for HCl and lower than 3% for AcOH, decreases the corrodibility; a 3% Si cast iron is strongly attacked in caustic solns. Addns. of Ni up to 6% have no pronounced effect on the acid corrosion while it improves the resistance to caustic solns. One % Cr decreases acid corrosion. Neither 0.7-3.0% nor 6% Ni nor 1% Cr show marked influence on rusting in salt solns. A Cu content up to 0.9% does not impart resistance to acid corrosion but with increasing Cu content the resistance toward NaCl solns. is much greater. The resistance of grey cast iron to weather and atmospheric attack is increased by 25% for an addn. of 0.3-0.4% Cu. R. D. BUMBACHER

**Corrosion of cast iron.** H. O. FORREST. *Proc. Am. Soc. Testing Materials* 1929 (preprint) No. 35, 61-70.—Corrosion rates of samples of cast Fe made by different processes have been made at M. I. T. by rotating small samples, cut from standard 8" pipe, in Cambridge water and measuring the loss in wt. over time intervals up to 300 days. The av. corrosion rate for the irons tested approximated 0.01 in. per year, the av. deviation from the mean value of all samples being only 7%. DOWNS SCHAAF

**The influence of corrosion accelerators and inhibitors on fatigue of ferrous metals.** F. N. SPELLER, I. B. McCORKLE AND P. F. MUMMA. *Proc. Am. Soc. Testing Materials* 1929 (preprint) No. 41, 12 pp.; cf. *C. A.* 22, 2732. Under corrosion-fatigue, the endurance decreases as the chloride contents increase. In water with low saline contents even a slight external influence causing localized corrosion reduces the corrosion-fatigue endurance limit, even of stainless steels, decidedly either with or without inhibitors in the corroding soln. The strength of inhibitor required to prevent failure increases with chloride concn. Stress is essential but probably plays only a minor part directly in accelerating corrosion. H. C. PARISH

**Application of corrosion-resisting materials to railroad electrical construction.** R. P. WINTON. *Et. al. Am. Ry Eng. Assoc. Proc.* 30, 482-5(1929).—Al alloys, Cr alloy steel, Cu-coated steel, Ni alloys, Cu brass, bronze and Al, Cd and Mg-Si bronze are considered. R. C. BARDWELL

**Intercrystalline corrosion of duralumin.** F. M. BONDOR. *Aviation (Aeronautical Eng. Sect.)* 26, No. 24, 99-100(1929).—Protection of duralumin airplane parts against intercrystalline and common corrosion is discussed.  $\text{CaCl}_2$  used on fields promotes intercryst. corrosion. Resistance to corrosion is affected by the method of quenching. Various methods of protecting duralumin are outlined. E. I. S.

**Corrosion. A problem in protective coatings.** F. N. SPELLOR. *Iron & Steel Can.* 12, 177-8(1929); cf. *C. A.* 23, 3199. E. H.

**Combating corrosion in a chemical plant.** E. JENSEN. *Ind. Eng.* 87, 315-8 (1929).—Experience of Parlin, N. J., plant of Hercules Powder Co., one of whose chief products is nitrocellulose, in protecting equipment and buildings from corrosion. E. I. S.

**General properties of boiler tubes with special reference to the relation between corrosion and fuel.** M. KINUKAWA. *J. Fuel Soc. Japan* 8, 649-63(1929); Abstract sect. *Ibid* 71-3.—A lecture. F. I. NAKAMURA

Methods and applications of photomicrography (WIGHTMAN, TRIVELLI) 5. Iron and coal (KUROTA) 21. Fe oxide reduction equilibria—a critic from the standpoint of the phase rule and thermodynamics (RALSTON) 2. Investigations of the corrosion of refractory materials. II. Influence of the chemical composition of the slags (SALMANG, SCHICK) 19. Cast iron capable of being enameled (MÜLLER) 19. The elastic constants, lattice constants and densities of metallic solid solutions (NISHIYAMA) 2. X-ray investigation of Pd-Ag-H alloy (OSAWA) 2. Coatings to protect against rust (BRAUN) 26. Refractory material obtained as slag (Brit. pat. 302,087) 19. Method of and means for cooling annealed products (Ger. pat. 478,390) 13. Manufacture of basic products for lining metallurgical furnaces (Belg. pat. 356,350) 19. Function of uniformity in iron and steel practice (BAILLY) 21.

BAUER, O. AND MEMMLER, K.: *Die Eigenschaften des Hartmessings*. Berlin: V. D. I. Buchhandlung. M. 14.50.

D'HUBERT: *Les métaux usuels. Cuivre, zinc, étain, plomb, nickel, aluminium*. New ed. Paris: J.-B. Ballière et fils. 100 pp. F. 5.

**SCHWARZ, OTTO:** *Zufestigkeit und Härte bei Metallen.* Berlin: V. D. I. Verlag. 34 pp. M. 6. Reviewed in *Metals & Alloys* 1, No. 1, 32(1929).

**Taschenbuch für Berg- und Hüttenleute.** Edited by F. KÖGLER. Berlin: Wilhelm Ernst und Sohn. 1207 pp. M. 33.50; leather, M. 36.50. Reviewed in *Colliery Guardian* 138, 2439(1929).

**Workshop Practice, A Practical Work for the Draughtsman, the Mechanic, the Pattern Maker, and the Foundryman.** London: Isaac Pitman and Sons. 3 volumes, each \$1.75.

**Briquetting ores.** EUGEN A. A. GRÖNWALL. Fr. 656,567, June 27, 1928. See Brit. 294,470 (C. A. 23, 1860).

**Rare earth ores.** DEUTSCHE GASGLÜHLICHT AUER-GESELLSCHAFT M. B. H. Fr. 654,465, May 19, 1928. Rare earth ores contg. Zr and Ti are decomposed with  $H_2SO_4$  in a closed cycle, the sulfates obtained being transformed to the oxides by roasting, the  $SO_2$  and  $SO_3$  produced by the roasting with the necessary O or air being passed over finely ground fresh ores which are then decomposed with  $H_2SO_4$ .

**Centrifugal grinder for ores, etc.** MINES DOMANIALES DE POTASSE D'ALSACE. (Lehner Robert, inventor). Fr. 652,921, Apr. 16, 1928.

**Washer for ores.** ADRIANUS C. HOUDIJK. Ger. 478,183, Dec. 12, 1926.

**Treatment of titaniferous ores.** NATIONAL METAL AND CHEMICAL BANK, LTD. Ger. 478,136, May 18, 1926. The powd. ore with its natural moisture content or after addn. of moisture is treated with oleum and the reaction is allowed to proceed without the application of heat.  $TiO_2$  may be obtained from the product by dila. with water.

**Table concentrator for ores.** ALBERT H. STEBBINS. U. S. 1,720,862, July 16. Structural features.

**Froth-flotation ore concentration.** C. H. KELLER (to Minerals Separation, Ltd.). Brit. 301,832, Dec. 6, 1927. Flotation is effected with use of an agent obtained from a hydrocarbon, S, a metal and Cl, e. g., (a)  $C_6H_6$ , S chloride and Zn (b)  $C_6H_6$ , S and  $AlCl_3$ , or (c) *n*-heptane, S chloride and Zn.

**Tank and belt apparatus for "desliming" and classifying ore pulps.** JAMES R. WRIGHT. U. S. 1,720,810, July 16. Structural features.

**A method and apparatus for dressing slime.** THEODOR FRANZ. Ger. 477,657, Oct. 1, 1924.

**Treating solutions obtained from ores after chlorination roasting.** HANS NEUMARK. U. S. 1,720,138, July 9. Cu is pptd. by cementation with Fe, sulfates are removed (suitably by cooling and adding  $CaCl_2$ ) and Zn is pptd. from the resulting soln. by treatment with gases contg.  $H_2S$ .

**Copper extraction from ores.** ANGLO AMERICAN CORP. OF SOUTH AFRICA, LTD. Brit. 301,859, Dec. 7, 1927. Cu occurring in the form of Cu silicate is extd. with an ammoniacal solvent such as  $NH_4$  carbonate. Various details are described. Cf. C. A. 23, 1860.

**Apparatus for separating and concentrating gold from sand by panning.** LEWIS W. BANEY and ERNEST G. MESSER. U. S. 1,719,958, July 9. Structural features.

**Treating tin-bearing materials.** H. L. SULMAN and H. F. K. PICARD. Brit. 301,553, June 13, 1927. Sn is extd. from ores such as cassiterite and from other Sn-bearing materials such as scrap tinned steel by treatment with a sulfidizing agent such as S vapor at a temp. (suitably 750–850°) which will convert the Sn to a sulfide sol. in a suitable reagent such as HCl or alkali or alk. earth metal sulfide solns. and the sulfide is then leached out. Reducing agents may also be used and numerous details and modifications are described.

**Chlorinating tin-bearing materials.** E. A. ASHCROFT. Brit. 302,851, April 5, 1928. Sn-bearing materials such as ores or concentrates contg. cassiterite, slags, alloys or residues are treated with  $ZnCl_2$  or  $FeCl_2$  in the presence of a reducing agent such as Fe or Zn powder or carbonaceous material preferably contg. a little iron. Temps. of 600–900° are suitable and the  $SnCl_2$  formed may be run off or distd. or extd. by lixiviation. Numerous details and examples are given.

**Zinc.** HENRY E. COLEY. U. S. 1,721,373, July 16. See Fr. 647,768 (C. A. 23, 2414).

**Zinc.** GÉORGES LESIC. Fr. 656,917, July 2, 1928. Zn is obtained from calamine earths by submitting the earths to the action of  $FeCl_3$  to obtain  $ZnCl_2$ , and treating the latter with  $MgO$  to obtain  $Zn(OH)_2$  which is dehydrated to  $ZnO$ . The  $MgCl_2$  is reconverted to  $MgO$  by heating it in the presence of  $CaCl_2$  and steam.

**Ore-roasting furnace.** NOEL T. WELLMAN (to General Chemical Co.). U. S. 1,721,265, July 16. A furnace suitable for roasting pyrites to produce  $SO_2$  is constructed

so that the ore is fed to the uppermost of a series of superposed hearths and S is fed by an interconnected device to one of the lower hearths in order to enrich the gas produced.

**Cupola furnace.** P. MARX. Brit. 301,739, Dec. 3, 1927. Oil burners are fitted outside the furnace instead of within the air tuyère, in a furnace otherwise generally similar to that described in Brit. 300,559 (C. A. 23, 3893).

**Gas-burner construction suitable for metallurgical furnaces.** HENRY M. HEVN (to Surface Combustion Co.). U. S. 1,721,484, July 16.

**Gas-fired furnace for heating metal billets.** H. A. DREFFEIN. Brit. 302,651, Dec. 19, 1927. Structural features.

**Gas-fired furnace for heating metal plates.** H. A. DREFFEIN. Brit. 302,652, Dec. 19, 1927. Structural features.

**Gas-fired furnace for annealing or melting metals.** R. GUNKA. Brit. 302,711, Sept. 21, 1927. Structural features.

**Furnace for annealing articles of copper or other non-ferrous metals.** D. BRIDGE & Co., LTD. and W. SHAW. Brit. 302,779, Nov. 7, 1927. Structural features.

**Rotary reducing furnace for use in iron and steel manufacture.** PIERRE J. PEYRACHON. U. S. 1,720,055, July 9. Structural features.

**Apparatus for recovery of sulfur dioxide from pyrites roaster gases, etc.** F. L. WILDER, E. MORRIS, E. SCHIFF and E. S. KING. Brit. 302,386, Sept. 15, 1927. Gas is entrained in a descending column of liquid such as water and released from the liquid subsequently by reduction of pressure.

**Grinding mill for basic slag.** G. POLYSIUS A.-G. Ger. 478,057, May 13, 1928.

**Apparatus for mixing and grinding foundry sand.** A. LENTZ. Brit. 302,664, Dec. 19, 1927. Structural features.

**Molds and molten metal pourers for founding.** JOHANNES WILBERZ. Ger. 477,587, Sept. 25, 1926. Details are given.

**Molds for casting zinc and aluminum alloys.** FELTEN & GUILLEAUME CARLS WERK A.-G. Brit. 302,604, Dec. 16, 1927. An alloy of Fe with about 30% Ni is used for making molds for casting alloys which it is desired shall solidify slowly.

**Ingot mold.** W. H. RAMAGE (to Valley Mould & Iron Corp.). U. S. 1,721,490, July 16. Structural features.

**Ingot mold.** EARL C. SMITH (to Central Alloy Steel Corp.). U. S. 1,720,383, July 9. Structural features.

**Hot-top construction (with an integral brick lining) for ingot molds.** WILLIAM H. RAMAGE (to Valley Mould & Iron Corp.). U. S. 1,721,088, July 16. Structural features.

**Mold-casting machine.** HERBERT EMMERMANN. Ger. 477,585, May 1, 1927. Details of construction are described.

**Die-casting machine.** GELSENKIRCHENER BERGWERKS-A.-G. Ger. 477,586, Oct. 7, 1926. Details are given.

**Cores for electromagnetic apparatus.** I. G. FARBENIND. A.-G. Fr. 33,993, Aug. 16, 1927. Addn. to 619,290. In making cores from metal obtained by the decomposition of carbonyl compounds, the metal is heated in a reducing atm. before being made into cores. Cf. C. A. 22, 1286.

**Magnetic cores.** WALTHER EHLERS and FRITZ FALKENBERG (to General Elec. Co.) U. S. 1,721,379, July 16. The permeability of magnetic cores formed of pressed powdered material is increased by filling hollow spaces in the core after assembly by particles of magnetic material such as colloidal Fe or Fe alloy.

**Material for magnet cores of loading coils, etc.** AUTOMATIC TELEPHONE MFG. Co., LTD. and P. N. ROSEBY. Brit. 301,784, Sept. 5, 1927. Magnet cores or similar articles are formed of powdered iron or an Fe alloy contg. Si 2-8% which is annealed in air-tight pots at about 660° and then treated with synthetic-resin varnish and air-dried while agitated. Numerous details are given.

**Hardening ferrous metals.** H. LINDHORST. Brit. 302,740, Sept. 28, 1927. Articles of iron, mild steel or iron alloys are heated to 720-820° in a hermetically closed chamber with a small quantity (up to 5%) of hardening powder (such as a mixt. of lignite or coke 50, BaCO<sub>3</sub> or other alk. earth carbonate 30 and NH<sub>3</sub> an NH<sub>4</sub> salt, urea, cyanamide, Ca cyanamide or dicyanamide 20%) which decomposes to form CO<sub>2</sub> and other gaseous products which effect the hardening. Parts of the metal which are not to be hardened may be plated with Cu. Cf. C. A. 23, 809.

**Rust-proofing iron.** SOC. ANON. DE HAUTS-FOURNEAUX ET FONDERIES DE PONT-A-MOUSSON. Brit. 301,729, Dec. 3, 1927. Metals of the Fe group are immersed in a hot soln. of phenic acid or phenols to which acids or ferrous salts may be added. An elec-

trolytic treatment may be employed, with the articles treated as anodes and Fe, Zn or other suitable metal as cathode.

**Cast-iron internal-combustion-engine tappet.** GEORGE SCHNEIDER and FREDERICK A. WELSMILLER. U. S. 1,720,353, July 9. The outer surface of the stem of a cast-iron tappet is rendered "nick-resistant" by being made of chilled hardened white iron. The interior axial body of the tappet is made of a core of soft gray iron.

**Use of cerium in refining iron and steel.** I. G. FARBENIND. A.-G. Brit. 302,574, Dec. 17, 1927. Ce (alone or in the form of a ferro-alloy) may be used together with V, Ti, Al, Ca, Mg or Si.

**Separating fine steel or iron oxide particles from mercury, etc.** B. L. NEWKIRK (to British Thomson-Houston Co., Ltd.). Brit. 302,319, Dec. 14, 1927. In sepg. minute particles of steel or Fe oxide from Hg used in a Hg-vapor power system, or in similar sepgs. of minute particles from liquid material which does not wet them, the liquid is passed through a bed of small bodies such as steel balls or gravel which are not wet by the liquid. An app. is described.

**Iron and steel castings.** W. KLEPSCH. Brit. 302,254, Aug. 10, 1927. For rendering iron or steel castings resistant to fire, acids and alkalis, they are cast in molds the sand of which is mixed with sufficient decarbonizing material to produce a superficial layer 0.3–40.0 mm. thick contg. not more than 2.6% (and preferably over 1.4%) C. The iron may contain Al, B, Cr, Co, Cu, Mg, Mn, Mo, Ni, Si, Ti, V or W.

**Process for rendering steel, wrought iron and cast iron non-rusting.** F. DE GROOTE. Belg. 356,056, Dec. 31, 1928. The metal is cleaned and immersed in a bath contg. an acid, an alkali or alk. earth salt, and one or more inert oxides.

**Steel ingot.** JOHN E. PERRY (to Valley Mould & Iron Corp.). U. S. 1,720,857, July 16. Steel ingots adapted for rolling are formed with tapered sides with the taper not to exceed 1.5% and with zones of isocrystn. comprising cupped zones with the mouths of the cups toward the small end of the ingot.

**Protecting steel tubes against corrosion in acid soils and in submerged trenches.** USINES À TUBES DE LA MEUSE. Belg. 355,406, Nov. 30, 1928. The tube is wrapped in a double envelope of jute fabric contg. a layer of CaO or other basic product. Belg. 355,945, Dec. 31, 1928 specifies applying a layer of CaO or other basic product to the tube and wrapping in jute or similar fabric.

**Protecting baths of magnesium or similar metals from oxidation.** GILBERT MICHEL. U. S. 1,720,286, July 9. The surface of the bath is covered with a protective layer such as  $MgF_2$  and the crust thus formed is covered with S. Cf. C. A. 23, 369

**Refining magnesium and its alloys.** GUSTAV PISTOR (to I. G. Farbenind. A.-G.). U. S. 1,720,436, July 9. See C. A. 23, 810.

**Alloys.** RICHARD WALTER. Fr. 656,678, May 12, 1928. Nitrides or carbonitrides of metals or of B or Si are added to metals to increase the hardness thereof. The nitrides are obtained by carburizing first by heating with powd. C or exposing to a current of hydrocarbons, and then treating with  $NH_3$ , cyanamide or carbamide.

**Alloy for steam pipe joint packings, etc.** GUSTAAF VERDICKT. U. S. 1,720,065, July 9. Pb 5, Sb 1 and Zn 0.25 part.

**Alloy for water-heating electrodes, etc.** HENRY A. BEHRENS (one-third each to Clark Nixon and Edward E. Miller). U. S. 1,720,756, July 16. An electrode which undergoes practically no electrolysis on passage of elec. current through it is formed of Sn 2–10, Cu 0.25–2.0, Pb 10–25, Bi 5–20% and Sb.

**Corrosion-resisting alloys.** SOC. ANON. COMMENTRY-FOURCHAMBAULT ET DECAZEVILLE. Brit. 302,249, Dec. 12, 1927. Alloys are formed contg. Ni 20–50, Cr 10–25, Mn 1–5, C less than 1, W 0.5–8.0 or Mo 0.2–5.0 (or W and Mo together 0.2–8.0%) and the remainder Fe. Up to 10% Co and small proportions of V and Ti also may be added.

**Magnetic alloys.** W. S. SMITH, H. J. GARNETT and J. A. HOLDEN. Brit. 302,394, Sept. 16, 1927. An alloy suitable for use as tape or wire for loading signalling conductors comprises Ni and Co with not less than 5% Mn. Up to 6% of one or more of the elements Cr, Mo, W, Si, V or Al may be added to increase the elec. resistance. Wire formed of the alloy may be heated at 900° and cooled in air. Cf. C. A. 23, 2146.

**Aluminum alloys.** D. R. TULLIS. Brit. 302,440, Oct. 12, 1927. Al alloys contg. B together with Zn 3–16, Si 1–6 and Cr 0.2–1.0% are made by adding to a bath of molten Al a Cr-Al alloy rich in Cr, then a Si-Cr alloy rich in Si, and then Zn and afterward treating the bath with  $BCl_3$  as described in Brit. 272,326 (C. A. 22, 1755). Mn may be used instead of Cr.

**Aluminum-silicon alloys.** SOC. D'ELECTROCHIMIE D'ELECTROMETALLURGIE ET

**DES ACIERIES ELECTRIQUES D'UGINE.** Brit. 302,692, Dec. 20, 1927. In making Al-Si alloys of high Al content, with use of a slight excess of reducing agent, heating is continued until the charge is exhausted, a high concn. of power is applied in the reduction zone and a low-tension elec. supply is used. The charge is preferably briquetted and may contain materials such as kaolin, alumina and petroleum coke proportioned to yield alloys contg. definite specified proportions of Al, Si, Fe, Ti and C.

**Iron-chromium-aluminum alloys.** V. B. BROWNE. Brit. 302,640, Dec. 19, 1927. Alloys such as those contg. Cr 5-30 and Al 3-10%, the remainder being iron with as low a C content as possible, are worked from the ingot by forging or rolling in a series of stages each of which is effected at a temp. lower than that of the preceding stage. Strips or wire may be thus made which are ductile and resist oxidation at high temps.

**Iron-chromium-aluminum alloys.** V. B. BROWNE. Brit. 302,644, Dec. 19, 1927. Alloys such as those contg. Cr 5-30 and Al 3-10% (the remainder being iron with as low a C content as possible) are forged or rolled from the ingot in a series of stages each of which is completed at a temp. lower than that of the preceding stage. Various details are given.

**Molybdenum alloys.** CLIMAX MOLYBDENUM Co. Fr. 656,916, July 2, 1928. A compd. of Mo, such as Ca molybdate is put in contact with molten Fe in a fusion or reduction furnace during the fusion or reduction, approx. the whole of the Mo entering the Fe as alloy. Cf. C. A. 23, 1611, 3432.

**Nickel-chromium steel alloys resistant to corrosion or staining.** W. H. HATFIELD AND H. GREEN. Brit. 302,812, Dec. 31, 1927. Alloys are described contg. Ni 11.5-13, Cr 11.5-13 and C not more than 0.2%. They are rendered ductile by heating to 950-1090° (preferably 1000-1050°) and then cooling either quickly or slowly.

**Tarnish-resisting silver alloy.** DANIEL GRAY, RICHARD O. BAILEY and W. S. MURRAY (to Oneida Community, Ltd.). U. S. 1,720,894, July 16. A material suitable for silverware comprises about 90% or more Ag and sufficient Si (suitably about 1/4-3%) to render it substantially non-tarnishing. Cf. C. A. 23, 4031.

**Alloy-steel tubes for steam boilers.** M. PETERS. Brit. 302,317, Dec. 14, 1927. Steam, water, fire and anchoring tubes of steam boilers are made of steel contg. Cr 0.2-10, Ni 0.2-8, or Mo 0.2-2%.

**Apparatus for the decomposition of hydrocarbons.** ELECTRO METALLURGICAL Co. Fr. 657,118, July 6, 1928. The app. used for the heat decompn. of hydrocarbons is made of an alloy contg. Cr 15-40, Ni 2-15, Si 0.7-3, Mn 0.7-3, C less than 1%, the remainder being Fe.

**Protecting metals.** AMERICAN MACHINE & FOUNDRY Co. Fr. 657,039, July 5, 1928. Metals are protected by coating them with Pb contg. Zn 4.5 and Al 0.5% at a temp. of about 468°, and an exterior coating of Pb contg. 2% Sn phosphide applied at 400°. The exterior coating may also contain 0.1% Pb phosphide. Cf. C. A. 23, 2926.

**Metal-spraying device suitable for applying coatings.** CHARLES M. SAEGER, JR. U. S. 1,721,092, July 16. A high-frequency induction furnace is used for melting the metal to be sprayed.

**Coating wire.** METALLDRAHTWERK KARLSHORST G. M. B. H. (Richard Winkler, inventor). Ger. 478,435, Apr. 1, 1927. Wire for elec. purposes is passed repeatedly, before coating, through a heating oven and a wiper, which may be satd. with petroleum or turpentine.

**Coating for metal molds.** ALFRED R. WILLARD (to Willard Storage Battery Co.). U. S. 1,720,356, July 9. Molds such as those used for casting Pb or Pb-Sb alloy battery grids are treated with a waterglass soln. and finely divided cork.

**Manufacture of substances formed by highly endothermic reactions, such as metallic zinc.** E. CONNERADE. Belg. pat. 356,945, Jan. 31, 1929. The roasted Zn ore and a reducing agent are introduced into a chamber surrounded by the incandescent mass of fuel of a gas producer. The producer gas is circulated through the chamber as it is formed.

**Thermic or electrothermic reduction of oxides for the production of volatile metals such as zinc.** O. DONY. Belg. 355,018, Nov. 30, 1928. Reduction is carried out below 1000° by means of a gaseous reducing agent under pressure, which permits of using ordinary metal walls, such as Fe. Condensation is effected out of contact with air in a closed app. under adjustable pressure.

**Working magnetic material.** N. V. PHILIPS' GLOEILAMPENFABRIEKEN. Fr. 657,464, July 12, 1928. Magnetic material is worked by submitting it, previously decarbonized, to a final operation during which the material partially oxidizes; this

may be carried out by decarbonizing for the greater part by heating in the presence of air or O and continuing the heating until the material is partially oxidized.

**Hollow metal articles.** FREDERICK C. LANGENBERG (one-half to Tracy C. Dickson). U. S. 1,720,368, July 9. In forming articles such as large guns, a hollow tubular body is expanded to increase its elastic limit, and a second tubular body is then placed within the first and expanded until the elastic limit of its inner layer is not materially different from that of the outer layer of the first-mentioned body.

**Porous metal bodies.** FRIEDRICH SIGMUND. Austrian 113,314, Jan. 15, 1929. Porous metal bodies are prepd. from powd. or granular metals or alloys by heating them in a non-oxidizing or reducing atm. and under continuous or intermittent pressure to such a temp. that a porous structure is obtained while avoiding the production of a liquid phase. The heating may alternatively be applied *in vacuo*. The manuf. of bodies for use in filtering and in catalytic processes is referred to.

**Pickling bath for metals.** JAMES H. GRAVELL (to American Chemical Paint Co.). U. S. 1,721,389, July 16. In baths such as those of  $H_2SO_4$  used for pickling ferrous metals, a distillate from animal material such as hair, gristle, hides, casein, flesh, ossein or gelatin is used as a combined pickle regulator and foam-producing material.

**Hardening and testing metals.** E. G. HERBERT. Brit. 301,762, Aug. 29, 1927. In hardening or testing metal articles such as gears or internal surfaces such as bores of guns (or for testing or hardening the metal balls used in the procedure), metal surfaces are bombarded with balls moving with a predetd. velocity. An app. and numerous details for conduct of the process are described.

**Heat-treating non-cementable metals and alloys.** CHEMISCHE FABRIK WEISENSTEIN GES. Brit. 302,642, Dec. 19, 1927. Metals or alloys such as copper or brass are heated in fused salt baths of thin consistency which contain oxidizable substances such as cyanides in small proportion (suitably 10% or less) which prevent scale formation or reduce scale present on the metals. The metals may be preheated in waste furnace gases or other O-free or O-low gases.

**Hard-metal composition suitable for cutting tools or wear-resisting articles.** KARL SCHRÖTER (to General Elec. Co.). U. S. 1,721,416, July 16. A sintered hard and tough metal compn. consists mainly of hard metal carbide such as W carbide and an auxiliary metal such as Co cementing particles of the carbide together and having a sintering temp. lower than the m. p. of the carbide, and comprising over 10% of the material.

**Annealing-box made of cast steel.** P. BOEL. Brit. 301,640, Nov. 24, 1927. Structural features.

**Apparatus for continuous flattening and annealing of steel strips, etc.** HARRY M. NAUGLE and ARTHUR J. TOWNSEND (to American Rolling Mill Co.). U. S. 1,721,350, July 16.

**Annealing steel strips.** HARRY M. NAUGLE and ARTHUR J. TOWNSEND (to American Rolling Mill Co.). U. S. 1,721,351, July 16. In order to effect annealing and to clean the surface of a steel strip, the strip is uniformly heated to annealing temp., the surface is deoxidized while in the heated condition, and the material is then cooled, all during a continuous passage through an app. which is described. Cf. C. A. 23, 3435.

**Annealed thorium.** W. B. GERO (to Westinghouse Lamp Co.). U. S. 1,719,975, July 9. In annealing worked bodies of refractory metals such as Th, the latter is surrounded in a hermetically sealed chamber with finely divided, chemically reactive materials such as Th powder which are inert to the metal body under treatment but are capable of combining with atm. gases within the container to form stable compds. at the annealing temp. The container and contents are then heated to annealing temp.

**Welding rod.** J. B. GREEN. U. S. 1,720,039, July 9. A ferrous welding rod or wire has a distributed S content which in the surface portion is less than 0.025% and in the center portion is more than 0.025%.

**Arc-welding electrodes.** IMPERIAL CHEMICAL INDUSTRIES, LTD. and J. H. PATERSON. Brit. 302,064, Dec. 30, 1927. Parallel wire strands which may be formed of Fe, Ni or Cu or their combinations are welded together at intervals and asbestos fibers may be inserted between the strands to act as a flux and may be soaked with  $Na_2CO_3$  soln or otherwise suitably treated to modify the properties of the electrode.

**Electric arc welding.** INTERNATIONAL NICKEL CO., N. B. PILLING and J. G. SCHOENER. Brit. 301,687, March 22, 1928. In welding Ni or its alloys such as Monel metal, preferably contg. up to 0.2% of an alk. earth metal such as Ca or Mg to render the metal malleable, the parts are subjected to fusion in an elec. arc and the malleabilizing substance is maintained in the melt so as to eliminate any S present and prevent

formation of blowholes. An electrode is used formed of Ni or Ni alloy contg. Ca or Mg and preferably also Mn, Si and C which are retained in the melt by use of a coating or core for the electrode contg. a highly reducing metal of high b. p. such as Ti or a low melting alloy of such a metal such as ferro-Ti and a metal of relatively low b. p. such as Ca (preferably in the form of Ca silicide). Numerous details and formulas are given.

**Solder.** E. EGHOLDT. Brit. 301,717, May 29, 1928. Tubes of solder are filled with a flux and deoxidizing material mixed with a substance which burns with only a small residue and renders the filling viscous so that it does not exude in excess during soldering. Glycerol and  $\text{NH}_4\text{Cl}$  may be used.

**Soldering metal.** PAUL ODAM. Fr. 657,312, Nov. 21, 1927. A metal for soldering Al consists of Al and 5-12% of Si.

## 10—ORGANIC CHEMISTRY

CHAS. A. ROUILLER AND CLARENCE J. WEST

**The problem of asymmetric synthesis.** R. BOUSSET. *Compt. rend.* 188, 1407-10 (1929).—A theoretical consideration (1) of the exptl. conditions that must be fulfilled for a true asym. synthesis in distinction from a resolution of racemates, and (2) of the possibility of the transfer of dissymmetry.

JANET D. SCOTT

**Optical activity of mixtures of solvents.** I. P. KRIVOBABKO AND G. E. MUKHIN. *Ukrainskii Khim. Zhur.* 2, Sci. Pt., 331-9 (1926).—On the basis of Winther's theory of optical rotation (*C. A.* 1, 2969) the best explanation is the formation of mol. complexes of the active substances in the solns. and mixts. of solvents. The following constants were obtained in measurements of optical activity of di-Me tartrate at 25° and a concn of 0.25 g. mol. in EtOH,  $\text{C}_6\text{H}_6$ ,  $\text{CHCl}_3$ ,  $\text{PhNO}_2$  and their mixts.: EtOH,  $[\alpha]$  2.781°, —1.224°, —4.784; EtOH +  $\text{C}_6\text{H}_6$ , EtOH (%) 100, 76.76, 51.46, 25.5, 0,  $[\alpha]$  2.781°, 2.337°, 1.557°, —1.335°, —4.45°; EtOH +  $\text{PhNO}_2$ , EtOH (%) 100, 79.31, 70.78, 48.05, 29.52, 15.22, 7.61, 0,  $[\alpha]$  2.781°, 5.117°, 5.955°, 6.897°, 8.445°, 10.123°, 12.682°, 17.91°;  $\text{C}_6\text{H}_6$  +  $\text{PhNO}_2$ ,  $\text{C}_6\text{H}_6$  (%) 100, 71.74, 51.18, 33.99, 15.12, 10.33, 0,  $[\alpha]$  —4.45°, 2.114°, 6.36°, 10.46°, 14.512°, 15.574°, 17.91°. According to Winther, where the solvent and optically active substance do not combine, the action of the solvent upon the optical activity depends solely upon the difference in the internal pressure of these 2 substances. The greater internal pressure causes the depolymerization of optically active substance. The optical activity of di-Et tartrate in  $\text{H}_2\text{O}$  is positive, for the single mols. rotate positively. The optical activity in  $\text{CHCl}_3$  is negative. The mol. wt. of di-Et tartrate in  $\text{CHCl}_3$  is 235 (according to Walden) and the internal pressure of  $\text{CHCl}_3$  is less than the internal pressure of di-Et tartrate. The smaller internal pressure accounts for the assocn. of the optically active substance. Thus the assocn. may be brought in connection with the internal pressure.

J. KUCERA

**Air oxidation of hydrocarbons catalyzed by nitrogen oxides.** I. Natural gas. II. Benzene. CARLISLE H. BIBB AND HOWARD J. LUCAS. *Ind. Eng. Chem.* 21, 633-8 (1929); cf. *C. A.* 22, 4333.—Mixts. of natural gas and air, bubbled through concd.  $\text{HNO}_3$  and then heated to 700-750°, gave yields of  $\text{HCHO}$  up to 4%; the concn of the  $\text{HCHO}$  soln. recovered was 10-25%. Mixts. of  $\text{C}_6\text{H}_6$  vapor and air under similar conditions gave yields of  $\text{PhOH}$  up to 5% on the  $\text{C}_6\text{H}_6$  taken and up to 50% on that attacked.

T. H. CHILTON

**Catalytic production of benzaldehyde.** P. SHORIGIN, I. KIZBERG AND E. SMOL'YANIKOVA. *Zhur. Prikladnoi Khim.* 2, 149-54 (1929).—See *C. A.* 23, 3680. V. K.

**1,6-Heptadiene and 1,8-nonadiene.** LESPIEAU AND JOURNAUD. *Compt. rend.* 188, 1410-1 (1929).— $\text{CH}_2\text{:CBr(CH}_2\text{)}_3\text{CBr:CH}_2$ , as prepd. from epibromohydrin and the mixed Mg compd. from  $\text{CH}_2\text{:CBrCH}_2\text{CH}_2\text{Br}$ , was mixed with its higher homolog and so difficult to sep. that it yielded 1,6-heptadiene (I) contaminated with the  $\text{C}_8$  compd. The action of  $\text{HC:CNa}$  (theoretical amt. of Na) on  $\text{Br(CH}_2\text{)}_3\text{Br}$  or  $\text{Br(CH}_2\text{)}_5\text{Br}$  at ordinary pressure gave chiefly I or 1,8-nonadiene (II). I b. 111.5-2.5°,  $d_{17}$  0.8164,  $n_D^{17}$  1.451, mol. refraction 30.34 (calcd. 30.52). It pptd.  $\text{NH}_3$  solns. of  $\text{CuCl}$ , aq. solns. of  $\text{HgCl}_2$  and  $\text{NH}_3$  or alc. solns. of  $\text{AgNO}_3$ . The last ppt. corresponded to  $\text{C}_7\text{H}_6\text{Ag}_2$ .  $2\text{AgNO}_3$  and with a soln. of I containing  $\text{I}^-$  formed  $(\text{Cl}_2\text{:Cl})_2(\text{CH}_2)_3$ , m. 75.5-6.5°. II b. 55.0-5° m. —21°,  $d_{21}$  0.8159,  $n_D^{21}$  1.452, mol. refraction 39.69 (calcd. 39.75). The ppt. with  $\text{AgNO}_3$  (analogous to that from I) yielded  $(\text{Cl}_2\text{:Cl})_2(\text{CH}_2)_5$ , m. 107-8°.

JANET D. SCOTT

**Rearrangement of acetylenic carbinols into ethylenic ketones.** ANTOINE WILLE-



MART. *Compt. rend.* 188, 1172-4(1929).—New carbinols,  $R^1R^2C(OH)C:CR^3$  were transformed into ketones,  $R^1R^2C:CHCOR^3$  (1) by heating with EtOH and  $H_2SO_4$  or (2) by conversion into esters,  $R^1R^2CCIC:CR^3$ , followed by heating with EtOH. Other authors have noted rearrangements in which  $R^1$ ,  $R^2$  and  $R^3$  are Ph radicals or their derivs. The expts. recorded below indicate that these rearrangements are general. 1,1-Diphenyl-1-hydroxy-2-octene,  $Ph_2C(OH)C:C(CH_2)_6Me$  (I),  $b_1$  179–80°, gives by method (1) 1,1-diphenyl-3-keto-2-octene,  $Ph_2C:CHCO(CH_2)_6Me$ ,  $m$ . 7–8°,  $b_1$  173°. The HCl ester of I could not be prepd. with  $PCl_5$ . 1,1-Diphenyl-1-hydroxy-3-*p*-tolyl-2-propene,  $Ph_2C(OH)C:CC_6H_4Me$ ,  $m$ . 68–9°, gives by both methods, 1,1-diphenyl-3-keto-3-*p*-tolyl-1-propene,  $Ph_2C:CHCOC_6H_4Me$ ,  $m$ . 74–5°. 1,3-Diphenyl-1-hydroxy-1- $\alpha$ -naphthyl-2-propene,  $Ph(C_{10}H_7)C(OH)C:CPh$ ,  $m$ . 137–8°, could not be transformed directly, but gave an HCl ester which gave 1,3-diphenyl-1-hydroxy-3-keto-1- $\alpha$ -naphthyl-1-propene,  $Ph(C_{10}H_7)C:CHCOPh$ ,  $m$ . 107–8°. 1,1-Di- $\alpha$ -naphthyl-1-hydroxy-3-phenyl-2-propene,  $(C_{10}H_7)_2C(OH)C:CPh$ ,  $m$ . 70–1°, gives by both methods 1,1-di- $\alpha$ -naphthyl-3-keto-3-phenyl-1-propene,  $(C_{10}H_7)_2C:CHCOPh$ ,  $m$ . 170–1°. 1,1-Diphenyl-1-hydroxy-3- $\beta$ -naphthyl-2-propene,  $Ph_2C(OH)C:CC_{10}H_7$ ,  $m$ . 99–100°, gives by both methods 1,1-diphenyl-3-keto-3- $\beta$ -naphthyl-1-propene,  $Ph_2C:CHCOC_{10}H_7$ ,  $m$ . 168–9°.

MARGARET W. MCPHERSON

2-Methyl-2,6-heptenol and natural *d*-citronellol. JEAN DOEUVRE. *Bull. soc. chim.* 45, 351–64(1929).—*Geraniol* (I) (300 g.) and 150 g. of KOH were heated for 8 hrs. at 160° with 200 cc. of 95% EtOH. The product was washed with  $H_2O$ , neutralized with HOAc and fractionated, giving (a),  $b_{14}$  76°, resembling 2-methyl-2,6-heptenone (II), (b),  $b_{14}$  78–9° (60 g.), 2-methyl-2,6-heptenol (III), (c),  $b_{14}$  115–25° (100 g.), I and *d*-citronellol (IV), and (d),  $b_{14}$  over 125° (80 g.), unidentified liquids. III,  $b_{24}$  88–9°,  $b_{760}$  177–8° (cor.),  $d_4^{14}$  0.855,  $n_D^{14}$  1.5411, surface tension  $\gamma_{17}$  27.8 dynes/cm. (*allopphanate*,  $m$  99–100°), contained 10% of 2-methyl-1,6-heptenol, as established by the products of  $O_3$  oxidation, corresponding to 10% of the  $\beta$ -form of I present in the original mixt. III (25 g.) and 280 g. of 25%  $H_2SO_4$  were stirred for 20 hrs.; the product was filtered, satd. with  $(NH_4)_2SO_4$  and extd. with  $Et_2O$ . Distn. gave 2-methyl-2,6-heptanedial,  $b_{14}$  124–6°,  $d_4^{12.4}$  0.946,  $n_D^{12.4}$  1.4569. III (12.8 g.) was treated with 88 g. of const.-boiling III in an ice bath, allowed to stand for 36 hrs., heated at 40° for 30 min. and finally extd. with PhH, decolorized with  $NaHSO_3$  and fractionated, giving 6 g. of 2,2,6-trimethyltetrahydropyran (V),  $b_{760}$  127–8°,  $d_4^{12.6}$  0.853,  $n_D^{12.6}$  1.4285. Had III been 2,6-dimethyl-2,6-heptenol, as stated by Barbier (*Compt. rend.* 126, 1423; 128, 110), the product would have been the 2,2,4,4-tetra-Me deriv.,  $b$ . 141–3° (*allopphanate*  $m$ . 108°), instead of V. It is suggested that II is formed from I through consecutive hydrolysis and loss of EtOH which then condenses, forming the high-boiling fraction (d) and in so doing, reduces a part of the ketone to III. This is substantiated by the conversion of II to III in the same manner as the prepn. of III from I. With  $SOCl_2$ , III gave V and 2-methyl-6-chloro-2-heptene,  $b_{15}$  59–61°. Fifty g. of III in 60 cc. of  $CCl_4$  was treated with 40 g. of  $PBr_3$  in 30 cc. of  $CCl_4$  at 0°; after boiling, washing and neutralizing with 5% NaOH, fractionation gave 60% of 2-methyl-6-bromoheptene,  $b_{14}$  71–2°,  $d_4^{17}$  1.146,  $n_D^{17}$  1.4720, which, from the products of  $O_3$  oxidation, appeared to be 22% of the 1-heptene and 76% of the 2-heptene, indicating isomerization. Boiling III with HI gave a small quantity of V and a mixt.,  $b$ . 95–105°, contg. 2-methyl-6-iodoheptene and 2-methyl-duodoheptene. The recovered mixt. contg. I and IV was treated with KOH until all of the I was removed, giving pure IV,  $b_{20}$  119–21°,  $d_4^{17}$  0.866,  $n_D^{17}$  1.4617,  $[\alpha]_D^{18} + 2^\circ 14'$ .  $O_3$  oxidation proved this pure IV to be approx. 20%  $\alpha$ - and 80% of the  $\beta$ -form. This would constitute the compn. of the naturally occurring mixt. Equal wts. of pure IV and  $BzCl$  were heated at 140–60° for 8 hrs. and the benzoate,  $b$ . 190–200°, was sapond. and fractionated, giving repurified IV,  $b_{18}$  119° (cor.),  $d_4^{16}$  0.860,  $n_D^{16}$  1.4572,  $[\alpha]_D^{16}$   $2^\circ 18'$ , *allopphanate*,  $m$ . 104.5–5.5° (cor.), which was 39% of the  $\alpha$ - and 59% of the  $\beta$ -form, indicating isomerization. This shift of C:C is due to HCl (by hydrolysis of  $BzCl$ ) for treatment of IV with dry HCl heated at 150° gave 42%  $\alpha$ - and 54%  $\beta$ -isomer. This is explained by the addn. of HCl at the double bond and its subsequent removal to give C:C in positions 1 and 2.

A. S. CARTER

The ketosulfonic acids. I. Synthesis of some derivatives of thiodiazole. PAWEŁ MAZÁK AND JERZY SUSZKO. *Roczniki Chem.* 9, 431–43 (443 French)(1929).—A certain analogy between  $\beta$ -ketosulfonic and  $\beta$ -ketocarboxylic acids as is the case between acetonesulfonic (I) and acetoacetic acid can be seen in the 2 following points: (a) I is decompd. under the influence of sirupy  $H_3PO_4$  at moderate temps. and under the influence of concd.  $H_2SO_4$  even in the cold with liberation of  $SO_2$ ; (b) the phenylhydrazone,

$\text{MeC}:(\text{NNHPh})\text{CH}_2\text{SO}_3\text{K}$ , of the K salt of I, is condensed by the action of  $\text{PCl}_3$  into 2,5-dihydro-4-methyl-2-phenyl-1,2,3-thiadiazole 1-dioxide, m.  $84-5^\circ$ , which is distinguished by a remarkable resistance toward acids, whereas under the influence of alkalis it undergoes decompn. quite readily with the formation of the phenylhydrazone of I. It has an acid as well as a basic character. Also the phenomenon of tautomerism has been observed. Properties exhibited by the Br derivs. (5-Br, m.  $123^\circ$ ; 5,5-di-Br, m.  $96^\circ$ ) and the 5-nitro deriv., m.  $170-2^\circ$ , permit of drawing the conclusion regarding the position of substituents on C atom 5 of the thiadiazole nucleus (methylene C). J. K.

**Effect of pressure on the formation of Grignard reagents.** HENRY GILMAN, R. J. VANDER WAL AND F. E. BROWN. *Bull. soc. chim.* **45**, 350-1 (1929).—Observation of a decrease in vol. in the prepn. of some Grignard reagents has led to a study of the effect of pressure upon the reaction. The time of formation of  $\text{BuMgBr}$ , as indicated by the color reaction of Gilman and Schulze (*C. A.* **19**, 2473; **22**, 942), was reduced from 8.6 mins. to 8.1 mins. by the application of 2-3 atms. pressure. The slow reaction between  $\text{PhCl}$  and Mg was not accelerated by heating in a sealed tube at  $100^\circ$  or by a pressure of 96 atms. at room temp. A. S. CARTER

**Relative activity of some organic halides. Relative times of formation of some Grignard reagents.** HENRY GILMAN AND R. J. VANDER WAL. *Bull. soc. chim.* **45**, 344-9 (1929); cf. *C. A.* **23**, 1868.—Applying the color test of Gilman and Schulze (*C. A.* **19**, 2473; **22**, 942), 5 cc. of  $\text{Et}_2\text{O}$ , 0.0187 mol. of halide and 0.5 g. of Mg turnings were mixed and portions removed at regular time intervals for test. The following data with regard to the av. time necessary for color development relative to structure were obtained. The order of increasing activity of the halides was F, Cl, Br and I, though the formation of  $\text{R}-\text{R.MgI}_2$  was favored in the case of iodides and the color reaction, which depended upon the formation of  $\text{RMgX}$ , sometimes appeared as rapidly with bromides. A regular decrease in rate resulted with an increase in the no. of C atoms; the following times are in mins.:  $\text{PrBr}$  6.5,  $\text{BuBr}$  7.5,  $\text{C}_7\text{H}_{15}\text{Br}$  12.5,  $\text{C}_8\text{H}_{17}\text{Br}$  16.3,  $\text{MeI}$  3.5,  $\text{EtI}$  4.5,  $\text{PrI}$  6.4,  $\text{BuI}$  7.6,  $\text{C}_6\text{H}_{13}\text{I}$  27.5,  $\text{BuCl}$  no reaction,  $\text{PhI}$  11,  $\text{PhBr}$  20. Owing to the catalytic effect of free  $\text{I}_2$  alkyl iodides which had not been treated with  $\text{Hg}$  during their prepn. reacted more readily than those which had. Complex chains showed greater activity than their normal isomers:  $\text{BuBr}$  7.5, *iso*- $\text{BuBr}$  5.4, *sec*- $\text{BuBr}$  3.5; it was found impossible to test *tert*- $\text{BuBr}$  for the product was  $\text{Bu}-\text{Bu.MgBr}_2$  and not the color-forming  $\text{BuMgBr}$ . The following bromotoluenes indicated the effect of position in the  $\text{PhH}$  ring (with 10 drops of a 5% soln. of  $\text{I}_2$  in  $\text{Et}_2\text{O}$  as catalyst: *p*- $\text{BrC}_6\text{H}_4\text{Me}$  16.5, *m*- $\text{BrC}_6\text{H}_4\text{Me}$  20.5, *o*- $\text{BrC}_6\text{H}_4\text{Me}$  23;  $\beta$ -bromonaphthalene was much more rapid than the  $\alpha$ -compd. when tested without a catalyst; with the catalyst, the times were  $\alpha$  25.8,  $\beta$  21.2. The following were also tested:  $\text{PhCH}_2\text{Cl}$  25 mins., bromocyclohexane 25, chlorocyclohexane no reaction,  $\text{PhCH}_2\text{CHBr}$  no reaction,  $\text{p-C}_6\text{H}_4\text{Br}_2$  no reaction without a catalyst, but with the catalyst, the time was 15 min. A. S. C.

**Further investigations on the color reactions of metallo-organic compounds.** HENRY GILMAN AND LLOYD I. HECK. *Ber.* **62B**, 1379-84 (1929).—See *C. A.* **23**, 1869.

HANS J. DUBS

**Derivatives of hexamethylenetetramine with phenols, phenol derivatives and sugars.** J. E. LABORDE. *Chimie & industrie Special No.*, 504-10 (Feb., 1929).—Hexamethylenetetramine *o*-phenolsulfonate, from 30% aq.  $\text{o-HOC}_6\text{H}_4\text{SO}_3\text{H}$  with aq. hexamethylenetetramine (I) in equimol. proportions evapd. *in vacuo* over  $\text{H}_2\text{SO}_4$ , m.  $140^\circ$ , b.  $180^\circ$ ,  $n_D^{20}$  (0.023 g. in 1 cc.  $\text{H}_2\text{O}$ ) 1.3357, decompd. by boiling water with liberation of  $\text{PhOH}$ , by hot mineral acids with liberation of  $\text{PhOH}$  and  $\text{CH}_2\text{O}$  and by hot alkalis with liberation of  $\text{NH}_3$ ; the crystals in hot  $\text{H}_2\text{O}$  give a red color with Millon's reagent, and a brick-red ppt. on cooling; a hot aq. soln. gives a yellowish white ppt. with Br water or with nascent Br. *Di-I o-phenolsulfonate*, prepd. as above, but with 2 mol. of I, m.  $160^\circ$ ,  $n_D^{20}$  (0.023 g. in 1 cc.  $\text{H}_2\text{O}$ ) 1.3369, gives the same reactions with hot  $\text{H}_2\text{O}$ , acids and alkalis, a reddish brown color with  $\text{FeCl}_3$  and a pinkish white ppt. with Millon's reagent. I *p-phenolsulfonate*, from 1 mol. of  $\text{p-HOC}_6\text{H}_4\text{SO}_3\text{H}$  in 30 cc. of 95% alc. and 1 mol. of I in 30 cc. of 45% alc., evapd. in the air at room temp., m.  $180-2^\circ$ ,  $n_D^{20}$  (0.023 g. in 1 cc.  $\text{H}_2\text{O}$ ) 1.3369, decompd. as above by hot acids and alkalis, gives a violet-brown color with  $\text{FeCl}_3$ , a pink color with Millon's reagent and a pink ppt. on cooling. *Di-I p-phenolsulfonate*, from 2 mol. of I per mol. of  $\text{p-HOC}_6\text{H}_4\text{SO}_3\text{H}$ , m. about  $190^\circ$  with conversion into a brown resinous mass,  $n_D^{20}$  (0.023 g. in 1 cc.  $\text{H}_2\text{O}$ ) 1.3978, not decompd. by alkalis, decompd. by acids with liberation of  $\text{PhOH}$  in the cold and of  $\text{PhOH}$  and  $\text{CH}_2\text{O}$  at higher temp., gives a greenish brown color with  $\text{FeCl}_3$ , and a yellow ppt. with Millon's reagent when hot. Hexamethylenetetramine thymolate, from 1 mol. of thymol and 2 mol. of I, in  $\text{CHCl}_3$ , begins melting at  $40^\circ$  but is not com-

pletely melted until  $180^{\circ}$ ,  $n_D^{20}$  (0.023 g. in 1 g. abs. alc.) 1.3658, decompd. by strong acids with liberation of thymol and  $\text{CH}_2\text{O}$ , not decompd. by alkalis either hot or cold. *I thymolsulfonate*, from equimol. amts. of thymolsulfonic acid in 95% alc. and **I** in 40% alc., decomp.  $250^{\circ}$  with evolution of vapors having a pyridine-like odor; in spite of repeated crystallizations, it could not be obtained pure and well crystallized. *Di-I thymolsulfonate*, from 1 mol. thymolsulfonic acid and 2 mols. of **I** in alc. solns.,  $n_D^{20}$  (0.023 g. in 1 g. abs. alc.) 1.3638, decompd. by hot mineral acids with liberation of thymol and  $\text{CH}_2\text{O}$ , unaffected by hot alkalis. No crystalline products could be obtained with glucose, fructose or maltose. Cryst. derivs. were obtained by mixing equimol. amts. of sugar and **I** in 40% alc. (sucrose, galactose) or  $\text{H}_2\text{O}$  (lactose), evapd. to a sirupy consistency at  $40^{\circ}$  and then in vacuum over  $\text{H}_2\text{SO}_4$  for 2 weeks (3 days in the case of galactose). The *sucrose deriv.* is odorless, sweet, m.  $160^{\circ}$ ,  $n_D^{20}$  (0.020 g. in 1 cc.  $\text{H}_2\text{O}$ ) 1.3348,  $\alpha_D^{15}$  (5% soln.)  $8.10^{\circ}$ , unaffected by hot alkalis, decompd. by mineral acids with liberation of  $\text{CH}_2\text{O}$ ; the sugar portion of the mol. gives the usual reactions for sucrose. The *lactose deriv.* is odorless, less sweet than the sucrose deriv., m.  $180^{\circ}$ ,  $\alpha_D^{15}$  (5%)  $7.40^{\circ}$ ,  $n_D^{20}$  (0.022 g. in 1 cc.  $\text{H}_2\text{O}$ ) 1.3348. The *galactose deriv.* is odorless, sweet, m.  $180^{\circ}$ ,  $n_D^{20}$  (0.020 g. in 1 cc.  $\text{H}_2\text{O}$ ) 1.3355,  $\alpha_D^{15}$  (5% soln.)  $7.40^{\circ}$ , decompd. by hot alkalis with evolution of  $\text{NH}_3$  by mineral acids with evolution of  $\text{CH}_2\text{O}$ .

A. PAPINEAU-COUTURE

**Dipole moments, association and ultra-violet absorption of aliphatic ketones and their solutions. I. Solvent influence and reaction mechanism from the standpoint of the dipole theory.** K. L. WOLF. *Z. physik. Chem.*, Abt. B, 2, 39-76 (1929).—The dipole moment of saturated aliphatic ketones is independent of the length of the C chain and is equal to  $2.74 \times 10^{-18}$ . The solvent displacement of the absorption bands is dependent on the polar groups. There is a direct relation between this displacement and the amount of association of the ketone soln. Both of these phenomena, as well as the case of formation of the bisulfite and oxime compounds, are dependent on the size of the dipole moment and the hindrance of polar groups by indifferent (electro-sym.)  $\text{CH}_2$  groups. The 10 ketones studied belong to the acetone homologous series. The solvents used included hexane, EtOH, MeOH,  $\text{H}_2\text{O}$  and benzene.

WALLACE R. BRODE

**Diazomethane methylations in the presence of catalysts. II.** HANS MEERWEIN, THEODOR BERSIN AND WILLY BURNELEIT. *Ber.* 62B, 999-1009 (1929); cf. C. A. 23, 97. It was reported in the 1st paper that ketones, which, with few exceptions, do not react with  $\text{CH}_2\text{N}_2$ , can be made to react smoothly in the presence of suitable catalysts, with formation of ethylene oxides and homologous ketones. In view of a recent statement by Arndt (C. A. 23, 2441), the behavior of  $\text{Me}_2\text{CO}$  toward  $\text{CH}_2\text{N}_2$  in the absence of catalysts has again been studied (with PAUL PÖHL) and it has been found, as before, that neither undil.  $\text{Me}_2\text{CO}$  nor its solns. in Et<sub>2</sub>O, PhMe, heptane, MeCN,  $\text{CHCl}_3$  or  $\text{Ac}_2\text{O}$  react to any appreciable extent with  $\text{CH}_2\text{N}_2$ . Not only was the velocity of  $\text{N}_2$  evolution followed but at the same time the decrease in the  $\text{CH}_2\text{N}_2$  content of the solns. was detd. in the usual way by titration with BzOH in Et<sub>2</sub>O; in every case the decrease was exceedingly small and can be ascribed to the spontaneous decomposition of the  $\text{CH}_2\text{N}_2$ . Contrary to Arndt, no addn. product of  $\text{CH}_2\text{N}_2$  to  $\text{Me}_2\text{CO}$  was observed. That such addn. products are not decompd. by BzOH in Et<sub>2</sub>O, i. e., that free  $\text{CH}_2\text{N}_2$  can be detd. in this way in their presence, was shown by control expts. with Schlotterbeck's  $\text{CH}_2\text{N}_2\text{-CCl}_3\text{CHO}$  addn. product. Nevertheless, the reaction between  $\text{CH}_2\text{N}_2$  and ketones is quite sensitive toward catalysts and the small decomposition velocities reported in this paper can be obtained only by careful work. As already pointed out, the substances acting as catalysts are in the 1st place electrolytes, i. e., pronouncedly heteropolar substances like acids and salts, and, secondly, compounds with a strong dipolar character, such as  $\text{H}_2\text{O}$  and the alics. To the latter class has now been added another representative, viz.,  $\text{HCONH}_2$ . Its effectiveness is not quite as great as that of  $\text{H}_2\text{O}$ , so it can hardly find practical application; however,  $\text{Me}_2\text{CO}$  with 70% of its wt. of  $\text{HCONH}_2$  reacts quite vigorously with  $\text{CH}_2\text{N}_2$ , giving chiefly *asym*-dimethylene oxide with some  $\text{MeCOEt}$  and probably higher ketones; the  $\text{HCONH}_2$  itself is methylated only in traces at most. This accelerating action of  $\text{HCONH}_2$  supports the view that it is the polar character of these substances which is the decisive factor in detg. their catalytic influence, i. e., that their action depends on the formation of complexes with a greater dipolar moment and which, because of the greater electrostatic forces radiating from them, have a greater additive power toward  $\text{CH}_2\text{N}_2$ . A no. of investigators consider that the hydrates and alcoholates of aldehydes are not normal valence compounds, but complexes,  $\text{RCHO} \cdots \text{HOH}$ . This seemed to be supported by the observation of Arndt and Eistert that  $\text{CCl}_3\text{CHO} \cdot \text{H}_2\text{O}$  and  $\text{CH}_2\text{N}_2$  in Et<sub>2</sub>O give chiefly 3,3,3-trichloropropylene 1,2-oxide (**I**), i. e., the methylation product of free  $\text{CCl}_3\text{CHO}$ . The  $\text{CCl}_3\text{-}$

$\text{CHO} \cdot \text{H}_2\text{O}$  reacts at once with vigorous evolution of  $\text{N}_2$ , whereas free  $\text{CCl}_3\text{CHO}$ , as found by Schlotterbeck, first forms with the  $\text{CH}_2\text{N}_2$  an addn. compd. which evolves  $\text{N}_2$  only when the  $\text{Et}_2\text{O}$  is evapd. off. To clear up this point the action of  $\text{CH}_2\text{N}_2$  on  $\text{CCl}_3\text{CH}(\text{O}) \cdot \text{H}_2\text{O}$  and a series of chloral alcoholates in the corresponding alcs. has been thoroughly studied. From the hydrate in  $\text{Et}_2\text{O}$  were obtained, along with I as the chief product,  $\text{CCl}_3\text{CH}(\text{OMe})_2$  (II),  $\text{MeOH}$ ,  $\text{Me}_2\text{O}$  and a high-boiling N-contg. product (b. 98–103°) which has not been identified. The formation of II can be explained only by the assumption that the hydrate is a normal valence compd.,  $\text{CCl}_3\text{CH}(\text{OH})_2$ , and that the methylation of its OH groups is due to its acidity. Since mol. wt. detns. indicate that the hydrate in solns. at 0° is only very slightly dissociated into its components, the formation of I as the chief product would seem to indicate that the free  $\text{CCl}_3\text{CHO}$ , at least in  $\text{Et}_2\text{O}$ , reacts with  $\text{CH}_2\text{N}_2$  with extraordinarily greater velocity than does the hydrate, the reaction probably being accelerated by the acidic character of the hydrate. To this acid character of the hydrate is also ascribed the fact that the primary  $\text{CH}_2\text{N}_2$ - $\text{CCl}_3\text{CHO}$  addn. product at once evolves  $\text{N}_2$  in the presence of the hydrate. The formation of  $\text{MeOH}$  and  $\text{Me}_2\text{O}$  can also readily be explained as resulting from the methylation of  $\text{H}_2\text{O}$  and  $\text{MeOH}$  under the catalytic influence of the hydrate. With the chloral alcoholates in the corresponding alcs. the reaction is quite analogous. Along with I are formed the unsym. acetals,  $\text{CCl}_3\text{CH}(\text{OR})\text{OMe}$ , and more or less of the Me ethers of the alcs. The relative proportions of I and acetals formed depend greatly on the nature of the alc.; 10.9, 9.6, 23.4, 16.6 and 88.8% of I were obtained in Et, Pr, iso-Pr, Bu and *tert*-Bu alc., resp. In the presence of 25% of its wt. of the weakly acidic  $\text{CCl}_3\text{CH}_2\text{OH}$  (III)  $\text{Me}_2\text{CO}$  reacts extraordinarily vigorously with  $\text{CH}_2\text{N}_2$  and practically only the  $\text{Me}_2\text{CO}$  is methylated, with formation of *asym*-dimethylethylene oxide and  $\text{MeCOEt}$ . The fact that the III itself is not methylated whereas org. acid catalysts ( $\text{BzOH}$  ( $\text{CO}_2\text{H}$ )<sub>2</sub>), react appreciably with the  $\text{CH}_2\text{N}_2$ , would seem to indicate that it is not only the strength of the acid but also the nature of the anion which detts. the ease with which an acid is methylated by  $\text{CH}_2\text{N}_2$ . C. A. R.

**New method for the preparation of pentadecylic acid.** STANISLAS LANDA. *Chimie & industrie Special No.*, 524 (Feb., 1929); cf. C. A. 23, 1872.—In a large flask gradually add hot 1%  $\text{KMnO}_4$  soln. to hot cetene (about 2 parts  $\text{KMnO}_4$  to 1 part cetene); when oxidation is complete let cool, pass  $\text{SO}_2$  till the liquid is clear and the bulky acid collects at the surface of the liquid. To purify the crude acid, dissolve in 3 parts of abs. alc., satd. with  $\text{HCl}$  gas, decant the soln., wash the ester with hot water till free from acid, dehydrate, distil in vacuum (the Et pentadecylate b.<sub>16</sub> 172–4°), sapon. the distillate, acidify, and recrystallize once from petroleic ether (d. 0.718) refined with fuming  $\text{H}_2\text{SO}_4$  (preferable to 70% alc. owing to the ease with which the acid is esterified). The pure acid b.<sub>13</sub> 193–5°, m. 52–52.5°.

**Action of ethylmagnesium bromide on tetraethylsuccinamide.** HUAN. *Compt. rend.* 188, 1174–6 (1929); cf. Blaise and Montague, C. A. 19, 2476; Barré, C. A. 22, 579.— $\text{EtMgBr}$  and  $(\text{CH}_3\text{CONEt}_2)_2$  give 3% of  $(\text{CH}_3\text{COEt})_2$  (I) and 63% of  $\beta$ -propiolyl diethylpropionamide,  $\text{EtCO}(\text{CH}_2)_2\text{CONEt}_2$  (II), b.<sub>12</sub> 142–3°; semicarbazone, m. 138°; phenylhydrazone, m. 107°; *p*-nitrophenylhydrazone, m. 165°. II and 48%  $\text{HBr}$  boiled several hrs. give  $\text{EtCO}(\text{CH}_2)_2\text{CO}_2\text{H}$ . II and excess  $\text{EtMgBr}$  give principally  $\gamma$ -hydroxy- $\gamma$ -ethylcaproic diethylamide,  $\text{Et}_2\text{C}(\text{OH})(\text{CH}_2)_2\text{CONEt}_2$  (III), b.<sub>13</sub> 166–8°, 5% of I, and a  $\gamma$ -ketol, which loses  $\text{H}_2\text{O}$  to become  $\alpha$ -ethyl- $\alpha'$ -diethylidihydrofurfuran (IV), b.<sub>11</sub> 55–6°. IV and semicarbazide in aq.  $\text{EtOH}$  give the semicarbazone of the corresponding  $\gamma$ -ketol, m. 95°. III and  $\text{Ac}_2\text{O}$  give  $\text{AcNEt}_2$ , b. 185°, and  $\gamma$ -diethylbutyrolactone,  $\text{Et}_2\text{C}(\text{CH}_2)_2\text{CO}_2\text{O}$ , b.<sub>10</sub> 107–9°, which gives with  $\text{N}_2\text{H}_4 \cdot \text{H}_2\text{O}$  a compd. m. 78°.  $\text{EtO}-$

$\text{CO}(\text{CH}_2)_2\text{CONEt}_2$  and  $\text{EtMgBr}$  give slightly different yields of the same substances

MARGARET W. MCPHERSON  
**The preparation of pure oleic acid.** E. RAYMOND. *Chimie & industrie Special No.*, 523 (Feb., 1929); cf. Bertram, C. A. 21, 2662.—Bertram's method is complicated and expensive, because of the use of  $\text{Hg}(\text{OAc})_2$ , and moreover it leaves 0.5% of satd. acids, which is no better than Twitchell's method. Better results were obtained by the following method, which is similar to Bertram's but simpler and cheaper: sep. the greater portion of the satd. acids by pressing the fatty acids of almond or olive oil at low temp. (10–12°), dissolve the sepd. unsatd. acids in 4 vols. of alc. contg. 1.5 times the  $\text{Pb}(\text{OAc})_2$  theoretically required to ppt. the satd. acids present, purify the crude oleic acid by recrystn. at  $-15^\circ$  to  $-25^\circ$  from its 50% soln. in alc., which easily removes other unsatd. acids and any traces of satd. acids which remained in the crude acid. Crystn. at low temp. is readily carried out in a tube provided with a perforated piston over which is a filter cloth; the tube is immersed in the  $\text{CaCl}_2$  bath of a refrigerating

machine, and after the oleic acid has crystd. the piston is lowered to the bottom of the tube, the underlying crystals being completely free from mother liquor. After 3 crystns. pure oleic acid is obtained, solidifying at 13°, and giving an isomeric form, m. 16°.

A. PAPINEAU-COUTURE

**A relation between boiling point and molecular architecture of *cis-trans*-ethylenic acids, saturated acids and acetylenic acids.** M. BOURGUEL. *Compt. rend.* 188, 1494-6 (1929).—A study of a certain no. of straight-chain  $\alpha$ -ethylenic acids, *i. e.*, higher homologs of crotonic and isocrotonic acids, has shown a clear relationship in the phys. consts. of the *cis*- and *trans*-series. The ethylenic acids, 1-heptene- and 1-octenecarboxylic acids, were obtained from 1-heptene- and 1-octenecarboxylic acids, resp., by hydrogenation with colloidal Pt (C. A. 20, 2977). Thus obtained, they were considered as *cis*-isomers; treatment with I converts them to the *trans*-isomers. For *cis*-isomers with 4, 5, 6, 8 and 9 C atoms the b. ps. at 15 mm. are 73°, 88°, 101°, 127° and 140°, resp. For *trans*-isomers with 4, 5, 8 and 9 C atoms, the b. ps. at 15 mm. are 93°, 106°, 143° and 154.5°, resp. For both series there is a uniform gradation which may be expressed as a linear function. The b. ps. of the corresponding satd. acids coincide closely with those of the *cis*-ethylenic isomers and the b. ps. of the corresponding acetylenic series coincide closely with those of the *trans*-ethylenic series. D. and  $n_D$  of the *cis*-isomers are consistently lower than those of the *trans*-isomers.

R. P. WALTON

**Action of organo-magnesium derivatives on the ethyl ester of ethylcyanoacetate.** A. MAVRODIN. *Compt. rend.* 188, 1504-6 (1929).—When Et ethylcyanoacetate (I) is treated with organo-Mg halides in boiling ether, the only reaction is the decompn. of 1 mol. of the organo-Mg halide by the enolic HO, with liberation of the hydrocarbon; on hydrolysis I is recovered almost quantitatively. The CN grouping, which in NC-CH<sub>2</sub>-CO<sub>2</sub>Et is attacked in the cold by the Mg halide, is much more resistant in I. The 2 groupings of I are brought into play if it is heated in boiling toluene for several hrs. But while the CN grouping is converted smoothly into the ketone, the ester grouping is not converted to the tertiary alc. as might be expected but stops at the ketonic stage, the resulting product being a sym.  $\alpha$ -alkyl- $\beta$ -diketone, RCOCH<sub>2</sub>EtCOR. By such procedure EtMgI gives ethyldipropionylmethane (II), b<sub>10</sub> 91-2°, in 25-30% yield. II is characterized by the deriv. which it gives with semicarbazide in the cold, *i. e.*, the 3,4,5-triethylpyrazole-1-carboxamide, m. 98°. By the same procedure PhMgBr gives ethyldibenzoylmethane (III) in 60% yield. This substance combines directly with semicarbazide, giving 4-ethyl-3,5-diphenylpyrazole (IV), m. 167°. The picrate of IV m. 161°. Treatment of III with NH<sub>2</sub>OH gives 3-ethyl-2,4-diphenylisoxazole, m. 93-4°. The action of organo-Mg derivs. on the Et alkylcyanoacetates, accordingly, constitutes a practical procedure for obtaining sym. alkyl- $\beta$ -diketones which are difficult to prep. by other means.

R. P. WALTON

**Preparation of acetic anhydride.** E. FRITZMAN. *Zhur. Prikladnoi Khim.* 1, 27-36 (1928).—Introduce 985 g. powd. AcONa and 48 g. S in a 3 l. flask and add 1200 g. of Ac<sub>2</sub>O (CCl<sub>4</sub>, CHCl<sub>3</sub>, C<sub>6</sub>H<sub>6</sub>, PhMe or similar substances might be used). Pass 320 g. Cl<sub>2</sub> for 1 hr. 15 min. while the mixt. is agitated and the flask cooled with water and then keep the mixt. at 90° for 1 hr. more. Distil off Ac<sub>2</sub>O at 100° and 50-100 mm. Hg. The yield is about 90%. On a larger scale cast iron and steel app. can be used, but Pb and Sn are quickly corroded. Al is not affected by Ac<sub>2</sub>O even after 3 hrs. boiling. Another method of prep. Ac<sub>2</sub>O which is commercially promising consists in mixing equimol quantities of anhyd. AcONa and *p*-MeC<sub>6</sub>H<sub>4</sub>SO<sub>2</sub>Cl, the by-product in mfg. saccharin, and distg. the Ac<sub>2</sub>O produced at 170-200°. The yield is 80-90%. V. K.

**Esterification velocity of fatty acids with ethylene glycol-hydrochloric acid.** ANTON KAILAN and ADOLFINE SCHACHNER. *Monatsh.* 52, 23-52 (1929).—Results are reported for C<sub>17</sub>H<sub>35</sub>CO<sub>2</sub>H (I), C<sub>18</sub>H<sub>37</sub>CO<sub>2</sub>H (II), C<sub>19</sub>H<sub>39</sub>CO<sub>2</sub>H (III), iso-C<sub>17</sub>H<sub>33</sub>CO<sub>2</sub>H (IV) and iso-C<sub>18</sub>H<sub>35</sub>CO<sub>2</sub>H (V) in 107 tables. The monomol. velocity consts. for the esterification of I, II and III in C<sub>2</sub>H<sub>4</sub>(OH)<sub>2</sub> catalyzed by HCl show, within the limits of error, the same values as for PrCO<sub>2</sub>H and may be expressed by the same formulas as functions of the H<sub>2</sub>O and HCl concns. The const. for V is about 22.4%, of IV about 70% of that for PrCO<sub>2</sub>H. With all acids these are proportional to this in the case of anhyd. glycol or glycol contg. a little H<sub>2</sub>O, but in glycol contg. much H<sub>2</sub>O this is true only up to about 1/4 N HCl concn; with higher HCl concns. this increases more rapidly in glycol contg. much H<sub>2</sub>O. In agreement with earlier measurements, the retarding action of the H<sub>2</sub>O in the glycol is about the same as with C<sub>2</sub>H<sub>5</sub>(OH)<sub>2</sub> and much less than with EtOH. With 0.03-0.06 mols. H<sub>2</sub>O per 1. the velocity const. in EtOH is about 30-40% greater than in glycol, but in glycol it is about 2.5 times as great as in C<sub>2</sub>H<sub>5</sub>(OH)<sub>2</sub>. Under all the exptl. conditions practically complete esterification occurred. The original should be consulted for the mass of exptl. details.

C. J. WEST

**Derivatives of volemitol.** V. ETTÉL. *Collection Czechoslov. Chem. Comm.* **1**, 288-93 (1929); cf. *Ber.* **28**, 1973; *C. A.* **11**, 2462; **14**, 3647; **22**, 4512.—This work concerns the reported identity of volemitol and  $\alpha$ -sedoheptitol. The properties of volemitol are: m. 153-4°,  $[\alpha]_D^{20}$  2.07° for a 3% soln. and 2.08 for a 10% soln.,  $[\alpha]_D$  20.71° for 0.7955 g. of I and 2 g. of borax in 27.6 cc. water. The consts. for some derivs. are: trimethylacetal, m. 212-3°,  $[\alpha]_D$  -13.84° for a 1%  $\text{CHCl}_3$  soln.; triacetylacetal, m. 161-2°,  $[\alpha]_D$  -72.35° for 1%  $\text{CHCl}_3$  soln.; tribenzoylacetal, m. 200° from alc., 214-5° from toluene,  $[\alpha]_D^{20}$  -1.7°; heptacetate, m. 120-1°,  $[\alpha]_D^{20}$  20.7°; heptaphenylcarbamate, m. 266°, insol. in the usual solvents. Comparison with the references above will show that the identity is doubtful.

V. F. HARRINGTON

**The action of peracids on unsaturated compounds and of benzoyl peroxide on a mixture of paraffin hydrocarbons.** J. BÖESEKEN, W. C. SMIT AND GASTER. *Proc. Acad. Sci. Amsterdam* **32**, 377-83 (1929).—The oxidation of Me 9,12-linoleate (I) by  $\text{BzO}_2\text{H}$  or  $\text{AcO}_2\text{H}$  gave 40% Me dioxidostearate (II), m. 31°. Sapon. of II gave a di-oxidostearic acid, m. 79°. Hydrolysis of the ethylene oxide linkages with dil.  $\text{H}_2\text{SO}_4$  at 80° or with 80%  $\text{H}_2\text{SO}_4$  at 0° gives tetrahydroxystearic acids, m. 95° and 148°, resp. The constitution of 9,11-linoleic acid (III), M. R. 77° 88.9, was detd. by ozonization, the products being azelaic and heptanoic acids. Oxidation of the Me ester of III with  $\text{BzO}_2\text{H}$  in  $\text{CHCl}_3$  gives a Me dioxidostearate, m. 47°, which, when sapond., gives 2 di-oxidostearic acids, m. 89° and 75°.  $\text{BzO}_2\text{H}$  and Me oxidoricinelaide in  $\text{CHCl}_3$  give a mixt. of esters which when sapond. at low temp. give 2 oxidocelaic acids, m. 64° and 59°,  $[\alpha]_D^{17}$  -17.2° and 3.4°, resp. Often the oxidation is followed with hydrolysis, forming 2 trihydroxystearic acids, m. 137° and 112°. The consts. for the velocity of oxidation of oleic, elaidic, ricinoleic and ricinelaic acids by  $\text{AcO}_2\text{H}$  at 18° were 0.036, 0.023, 0.026, 0.016, resp.  $\text{AcO}_2\text{H}$  oxidizes triple bonds much more slowly than double bonds. A no. of org. compds. react with  $\text{Bz}_2\text{O}_2$  without a catalyst at 60-100°, giving the

general reaction  $\text{Bz}_2\text{O}_2 + \text{RH} \begin{cases} \rightarrow \text{CO}_2 + \text{BzOR} + \text{PhH} \\ \rightarrow \text{CO}_2 + \text{BzOH} + \text{PhR} \end{cases}$  (RH = aliphatic hydro-

carbon,  $\text{C}_2\text{H}_5\text{Cl}$ , or cyclohexane).  $\text{Bz}_2\text{O}_2$  and petroleum ether (b. 100-2°) give a heptyl benzoate which on hydrolysis gives a tertiary heptyl alc. This is a new method of synthesizing directly tertiary alcs. starting with paraffins, and it shows that  $\text{Bz}_2\text{O}_2$  is selective. The reaction with normal paraffins even at higher temps. is very slow.

FREDERICK C. HAHN

**The configurational relationship of lactic acid and 2-chloropropionic acid with a further note on the configurational relationship of lactic acid and methylpropylcarbinol.** P. A. LEVENE AND H. L. HALLER. *J. Biol. Chem.* **81**, 703-9 (1929), cf. *C. A.* **21**, 3599; **23**, 100, 1876.—The configurations of lactic and chloropropionic acids have been further correlated by the conversion of *d*- $\Delta^2$ -4-pentenol into 1,4-chloropentene and the latter into *d*-2-chloropropionic acid on the one hand and *l*- $\Delta^2$ -4-pentenol into lactic acid on the other. The method gives a direct way of correlating the configurations of all  $\alpha$ -halo acids to one reference substance, namely, to the halopropionic acid. The configurations of *d*-methylpropylcarbinol and *d*-lactic acid have been correlated by a 2nd method, the conversion of *l*- $\Delta^2$ -4-pentenol into both these substances.

A. P. LOTHROP

**Comparative studies on the influence of the substituent in the amino group of polypeptides on their cleavage by normal alkali, erepsin and trypsin-kinase.** EMIL ABDERHALDEN, L. DINERSTEIN AND S. GENES. *Fermentforschung* **10**, 532-43 (1929).—New derivs. described are *p*-chlorobenzoyl-*dl*-leucylglycylglycine (I), m. 183°, obtained by shaking the tripeptide in NaOH with alternate addns. of *p*- $\text{ClC}_6\text{H}_4\text{COCl}$  and 2 *N* NaOH; *p*-nitrobenzoyl-*dl*-leucylglycylglycine (II), m. 163-5°, in the same manner, with a  $\text{C}_6\text{H}_5$  soln. of *p*- $\text{O}_2\text{NC}_6\text{H}_4\text{COCl}$ ; *p*-chlorobenzoyl-*dl*-alanylglycylglycine (III), m. 246-7°; *p*-nitrobenzoyl-*dl*-alanylglycylglycine (IV), decomp. 228-9°;  $\beta$ -naphthalenesulfonyl-*dl*-alanylglycylglycine (V), not crystd., from the tripeptide in NaOH and  $\beta$ - $\text{C}_{10}\text{H}_7\text{SO}_2\text{Cl}$  in  $\text{Et}_2\text{O}$ . Other derivs. included in these tests, but previously described, are *dl*- $\alpha$ -bromoisocaprolyl-*dl*-leucylglycylglycine (VI), *dl*-leucylglycylglycine (VII), *dl*- $\alpha$ -bromoisocaprolyl-*dl*-leucylglycylglycine (VIII), PhNCO deriv. of *dl*-leucylglycylglycine (IX),  $\beta$ -naphthalenesulfonyl-*dl*-leucylglycylglycine (X), *dl*- $\alpha$ -bromopropionylglycylglycine (XI), *dl*-alanylglycylglycine (XII). No polypeptide contg. a substituent in the  $\text{NH}_2$  group was attacked by erepsin at 37° and  $p_{\text{H}}$  7.8. Trypsin-kinase at 37° and  $p_{\text{H}}$  8.4 hydrolyzed I, II, III, IV, VI, VIII, IX and X, but not the 2 peptides VII and XII, nor the derivs. V and XI. *N* NaOH at 37° hydrolyzed VIII and XI the most rapidly. X was hydrolyzed more rapidly than its free tripeptide, but only at the outset. The other derivs.

of VII, viz., I, II, VIII, IX and X, were hydrolyzed somewhat more rapidly than VII, but the difference was not great. Hydrolysis of the tripeptide XII was compared with that of its  $p\text{-ClC}_6\text{H}_4\text{CO}$ ,  $p\text{-O}_2\text{NC}_6\text{H}_4\text{CO}$  and  $\beta\text{-C}_{10}\text{H}_7\text{SO}_2$  derivs. Of these, the  $p\text{-O}_2\text{NC}_6\text{H}_4\text{CO}$  deriv. was hydrolyzed the most rapidly, and the  $\beta\text{-C}_{10}\text{H}_7\text{SO}_2$  deriv. the most slowly.

A. W. DOX

**The effect of ionization upon optical rotation. IV. Further studies on amino acids and peptides.** P. A. LEVENE, LAWRENCE W. BASS, ALEXANDER ROTWEN AND ROBERT E. STEIGER. *J. Biol. Chem.* **81**, 687–95 (1929); cf. *C. A.* **21**, 3892.—Additional expts. are presented in corroboration of earlier conclusions that the change in rotation on passing from an unionized mol. to the mono-ion, or from the mono-ion to the di-ion, is a linear function of the degree of dissoen. and that this phenomenon can be used to det. dissoen. const. lying in ranges in which electrometric titration does not give accurate results. Data are given for *l*-leucine, *l*-valine, glycyl-*l*-valine, glycyl-*d*-valine and glycyl-*d*-isovaline.

A. P. LOTHROP

**Aromatic levulic amides.** R. LUKEŠ AND V. PRELOG. *Collection Czechoslov. Chem. Comm.* **1**, 282–7 (1929).—Wolff (*Ann.* **299**, 260) by the action of  $\text{NH}_3$  on 2-methyl-5-keto-4,5-dihydrofuran (I) obtained a product to which he assigned an open-chain structure. This has been doubted by Beilstein (4th ed. **3**, 676). L. and P. have prepd. the anilide (II), m. 101–2°, the *p*-toluidide, m. 108–9°, the  $\alpha$ - (m. 105–8°) and the  $\beta$ -naphthalamide of I both by the action of the proper amine on I or  $\gamma$ -acetoxy- $\gamma$ -valerolactone 1-Phenyl-2-methyl-2-hydroxy-5-ketotetrahydropyrrole (III), m. 101°, has been prepd. by the Grignard reaction. A secondary product of this reaction is 1-phenyl-2,5-dimethylpyrrole. II reacts with another mol. of  $\text{PhNH}_2$  to give the anilide of II, m. 145°. III does not. The 2 possible formulas for II are  $\text{MeCOCH}_2\text{CH}_2\text{CONH-}$

$\text{Ph}$  or  $\text{O.CO.CH}_2\text{CH}_2\text{CMeNHPh}$ . The work is to be continued. V. F. HARRINGTON

**Derivatives of cyanomalononic acid.** FRANZ PABST. *Arch. Pharm.* **267**, 325–52 (1929) — After reviewing the studies of Frerichs, Michael and Cobb, and others on this subject, P. describes and characterizes the following derivs.: cyanomalononic Me ester amide,  $\text{NCC}(\text{CONH}_2)\text{CO}_2\text{Me}$ , by heating  $\text{NCCCH}_2\text{CO}_2\text{Me}$  and  $\text{KCNO}$ , m. 116–7°, identical with the product obtained by Frerichs and Hartwig on melting  $\text{NCCCH}_2\text{CO}_2\text{Me}$  with  $\text{KCN}$ , more readily sol. in cold  $\text{H}_2\text{O}$  than the corresponding Et ester; it is acidic, decomg. carbonates and attacking Zn, likewise titratable with phenolphthalein as indicator.  $\text{NCC}(\text{CONHPh})\text{CO}_2\text{Et}$  forms a Ag salt,  $\text{C}_{12}\text{H}_{11}\text{N}_2\text{O}_5\text{Ag}$ .  $\text{NCC}(\text{CONH}_2)\text{CO}_2\text{Et}$  yields with  $\text{KOH}$  and  $\text{PhCH}_2\text{Cl}$  benzylcyanomalononic Et ester amide,  $\text{NCC}(\text{CONH}_2)(\text{CH}_2\text{Ph})\text{CO}_2\text{Et}$ , m. 86°, difficultly sol. in  $\text{H}_2\text{O}$ , easily sol. in EtOH and  $\text{Et}_2\text{O}$ , insol. in caustic alkali and alk. carbonate solns. Dicyanomalonic Et ester amide imide,  $\text{C}_{10}\text{H}_{10}\text{N}_4\text{O}_6$ , has no definite m. p. (Ag salt,  $\text{C}_{10}\text{H}_8\text{N}_4\text{O}_6\text{Ag}_2$ ; Ba salt,  $\text{C}_{10}\text{H}_8\text{N}_4\text{O}_6\text{Ba} \cdot 6\text{H}_2\text{O}$ ). Dicyanomalonic Me ester amide imide,  $\text{C}_8\text{H}_8\text{N}_4\text{O}_6$ , m. 140° (decompn.). Ag salt, of cyanomalonic benzyl ester amide,  $\text{C}_{11}\text{H}_{11}\text{N}_2\text{O}_5\text{Ag}$ , silky flakes. Dibenzylcyanomalonicate,  $\text{C}_{18}\text{H}_{18}\text{N}_4\text{O}_6$ , m. 73–4° (Na salt,  $\text{C}_{18}\text{H}_{14}\text{N}_4\text{O}_6\text{Na}$ , K salt,  $\text{C}_{18}\text{H}_{14}\text{N}_4\text{O}_6\text{K}$ , Ag salt,  $\text{C}_{18}\text{H}_{14}\text{N}_4\text{O}_6\text{Ag}$ ). Benzylcyanomalonic Et ester anilide,  $\text{C}_{19}\text{H}_{18}\text{N}_2\text{O}_5$ , m. 104.5°. Cyanomalonic Me ester anilide,  $\text{C}_{11}\text{H}_{10}\text{N}_2\text{O}_5$ , m. 146° (Ag salt,  $\text{C}_{11}\text{H}_9\text{N}_2\text{O}_5\text{Ag}$ ). Benzylcyanomalonic Me ester anilide,  $\text{C}_{18}\text{H}_{16}\text{N}_2\text{O}_5$ , m. 103°. Cyanomalonic dianilide,  $\text{C}_{16}\text{H}_{14}\text{N}_4\text{O}_6$ , m. 192° (Ag salt,  $\text{C}_{16}\text{H}_{12}\text{N}_4\text{O}_6\text{Ag}_2$ ; Fe salt,  $(\text{C}_{16}\text{H}_{12}\text{N}_4\text{O}_6)_3\text{Fe}$ ). Benzylcyanomalonic dianilide,  $\text{C}_{20}\text{H}_{18}\text{N}_4\text{O}_6$ , m. 215°. Cyanomalonic dimethylanilide,  $\text{C}_{18}\text{H}_{17}\text{N}_3\text{O}_5$ , m. 178°. Cyanomalonic di-*p*-aniside,  $\text{C}_{18}\text{H}_{17}\text{N}_3\text{O}_6$ , m. 215° (Ag salt,  $\text{C}_{18}\text{H}_{16}\text{N}_3\text{O}_6\text{Ag}$ ). Cyanomalonic di-*m*-toluidide,  $\text{C}_{18}\text{H}_{17}\text{N}_3\text{O}_5$ , m. 186°. Cyanomalonic di-*p*-toluidide, m. 221°. W. O. E.

**Acetylmucates of alcohols and phenols.** T. KARIYONE AND S. MOROTOMI. *J. Pharm. Soc. Japan* **49**, 170–3 (1929).—Boiling of 10 g. tetraacetylmucic acid and 25 cc.  $\text{SOCl}_2$  in 10 cc.  $\text{C}_6\text{H}_6$  on the  $\text{H}_2\text{O}$  bath for 3 hrs. gave 7 g. tetraacetylmucoyl chloride (I), m. 185°, sapon. value, 80.58. I promises to be a useful reagent for the identification of alcs. and phenols. Boiling of 3 g. of I and 2.3 g. menthol in 10 cc. PhMe for 3 hrs. gave 1.2 g. dimenthyl tetraacetylmucate, m. 153°. Heating of 16.5 g. santalol and 15.9 g. I in 30 cc. PhMe gave the monosantalyl ester (II), m. 136°; acid value, 86.8. II may be used as a substitute for santalol. It has the advantage over the latter in being cryst., odorless and non-irritative to the stomach. The following alc. and phenolic esters of I were also prepd.: di-Am ester, m. 105°; dithymyl ester, m. 176°; dicarvacryl ester, m. 175°; dieugenyl ester, m. 175°.

NAO UYEI

**Alkoxoniumhexacyanocobaltates.** FRANZ HÖLZL, THUSNELDA MEIER-MOHAR AND FRIEDRICH VIDITZ. *Monatsh.* **52**, 73–82 (1929).— $\text{H}_3\text{Co}(\text{CN})_6$ , prepd. from the K salt and carefully dried, gives, when dissolved in  $\text{EtOH-H}_2\text{SO}_4$  and treated with dry  $\text{HCl}$ , tert. ethoxoniumhexacyanocobaltate (I),  $\text{Co}(\text{CN})_6 \cdot (\text{H.EtOH})_3$ ; when dry  $\text{HCl}$  is passed into a soln. of I in abs. MeOH there ppts. the sec. methoxonium compd.,  $\text{Co}(\text{CN})_6 \cdot$

H.(H.MeOH)<sub>3</sub>, while in PrOH there is formed the *tert. propoxonium compd.*, Co(CN)<sub>6</sub>-(H.PrOH)<sub>3</sub>. The MeOH compd. is slightly hygroscopic; all 3 compds. are easily sol. in H<sub>2</sub>O but do not crystallize therefrom; the soly. in alcs. increases with increasing mol. wt. of the solvent. These compds. behave as very weak bases; their aq. solns. may be titrated as free acids and their alc. solns. yield salt-like compds. with many org. N bases; the addn. of C<sub>2</sub>H<sub>5</sub>N gives a ppt. of Co(CN)<sub>6</sub>.H<sub>3</sub>.(C<sub>2</sub>H<sub>5</sub>N)<sub>3</sub>. By passing in dry HCl or by adding concd. HCl to H<sub>3</sub>Co(CN)<sub>6</sub> in H<sub>2</sub>O there results a cryst. ppt., probably a hydroxonium salt of the complex acid. The nature of these compds. and the method of their formation are discussed.

C. J. WEST

**Alkylation of tetra- and tricyanocadmium acids.** FRANZ HÖLZL AND SEPP KIRCHMAYR. *Monatsh.* 51, 397-419(1929).—AgCd(CN)<sub>4</sub> was prepd. from the K salt and concd. AgNO<sub>3</sub> and purified by digesting with H<sub>2</sub>O at 60°, from which it crystd. on cooling. Shaken with an excess of MeI at room temp. in the dark for 10 days and extd. with CHCl<sub>3</sub>, there resulted a yellow-brown amorphous mass, purified by repeated crvstn. from MeOH-H<sub>2</sub>O; analysis indicated the compd. Cd<sub>4</sub>C<sub>6</sub>N<sub>6</sub>H<sub>12</sub>O<sub>8</sub>, which may be  $\left[ \left( \begin{smallmatrix} \text{CN} \\ \text{Cd} \\ \text{OH} \\ \text{H}_2\text{O} \end{smallmatrix} \right)_4 \cdot \text{CNMe} \right]$  or  $\left[ \left( \begin{smallmatrix} \text{CN} \\ \text{Cd} \\ \text{OH} \end{smallmatrix} \right)_4 \cdot \begin{smallmatrix} (\text{H}_2\text{O})_4 \\ \text{CNMe} \end{smallmatrix} \right]$ . The aq. soln. shows a slightly alk. reaction; on warming there is a strong isonitrile odor. Various formulas are proposed, showing the possible arrangement of the Cd atoms. If the reaction is carried out as above for 1 week and the product crystd. from dry MeOH, there results the compd.

Cd<sub>4</sub>C<sub>6</sub>N<sub>6</sub>H<sub>12</sub>O<sub>8</sub>, which may be formulated  $\left( \begin{smallmatrix} \text{CN} \\ \text{Cd} \\ \text{OH} \end{smallmatrix} \right)_2 \cdot \text{CNMe}$ , for which 2 formulas are proposed. The primary intermediate product of both compds. is assumed to be  $\left( \begin{smallmatrix} (\text{CN})_2 \\ \text{Cd} \\ \text{CNMe} \end{smallmatrix} \right)$ . The action of Me<sub>2</sub>SO<sub>4</sub> upon the K salt gives the compd. Cd<sub>3</sub>C<sub>9</sub>N<sub>7</sub>H<sub>7</sub>O<sub>7</sub>,

obtained by crystg. the solid reaction product from dry MeOH; the mother liquor contains the compd. [Cd(CNMe)<sub>4</sub>(MeSO<sub>4</sub>)<sub>2</sub>] or [Cd(CNMe)<sub>3</sub>(MeSO<sub>4</sub>)<sub>2</sub>]. If the above reaction is carried out at an elevated temp., there is a complete decompn. of the complex. A satd. soln. of the K salt and Me<sub>2</sub>SO<sub>4</sub>, shaken in the cold for 2 days, give the compd. Cd<sub>3</sub>C<sub>9</sub>H<sub>7</sub>N<sub>7</sub>O<sub>7</sub>, for which also various formulas are proposed. EtI and the Ag salt do not react at room temp.; at elevated temps. decompn. occurs. The original should be consulted for the discussion of the formulas proposed for these compds.

C. J. WEST

**Ureides of brominated derivatives of valeric acid.** ST. WEIL, (MISS) J. LANGHERT AND A. KASSUR. *Roczniki Chem.* 9, 464-9(469-70 French)(1929).—Ureides of brominated  $\alpha$ -methylisovaleric and  $\alpha$ -ethylisovaleric acids were prepd. and studied. No stronger narcotic action on rats and cats was found than that exhibited by the brominated ureide of isovaleric acid. The following compds. were prepd.:  $\alpha$ -bromo- $\alpha$ -methylisovaleryl bromide, Me<sub>2</sub>CHCBrMeCOBr, obtained by mixing 25.0 g. methylisovaleric acid with 2.5 g. red P, adding to the mixt. 75.0 g. Br and subsequently heating on the water bath to 90-100° till no HBr was evolved; b<sub>16</sub> 130°, sol. in ether and CHCl<sub>3</sub>;  $\alpha$ -bromo- $\alpha$ -ethylisovaleryl bromide, similarly prepd., b<sub>20</sub> 145°; menthyl  $\alpha$ -bromo- $\alpha$ -methylisovalerate decomps. easily in the light, b<sub>20</sub> 173-5°, sol. in alc., ether and CHCl<sub>3</sub>; menthyl  $\alpha$ -bromoethylisovalerate, decomps. on exposure to the light, b<sub>11</sub> 161°;  $\alpha$ -bornyl bromo- $\alpha$ -methylisovalerate, b<sub>12</sub> 170°, sol. in alc., ether and CHCl<sub>3</sub>, decomps. in the air; bornyl  $\alpha$ -bromo- $\alpha$ -ethylisovalerate, becomes dark in the air and light, b<sub>10</sub> 178°;  $\alpha$ -bromo- $\alpha$ -methylisopropylacetic ureide, Me<sub>2</sub>CHCMeBrCONHCONH<sub>2</sub>, sol. in alc., m. 177-9°;  $\alpha$ -bromo- $\alpha$ -methylisovaleric ureide, m. 197°. J. KUČERA

**The action of heat on allophanic amides.** J. BOUGAULT AND J. LEBOUCC. *Compt. rend.* 188, 1406-7(1929).—The allophanic amides (I) (II) and (III) resp., corresponding to PhNH<sub>2</sub>, *p*-toluidine, and PhNHNH<sub>2</sub>, were prepd. from allophanic chloride, NH<sub>2</sub>CONHCOCl, and the amine. Heated to 200-10°, I and II decompd. into NH<sub>3</sub>, cyanuric acid, and a sym. disubstituted urea ((PhNH)<sub>2</sub>CO from I and *p*-(MeC<sub>6</sub>H<sub>4</sub>NH)<sub>2</sub>CO from II); III (new), m. 218°, formed NH<sub>3</sub> and phenylurazole, PhN.CO.NH.CO.NH,

m. 267°, prepd. (as also the di-Me ether, m. 88-9°) by Pinner's method (*Ber.* 20, 2358; 21, 1223) for identification.

JANET D. SCOTT

**Recent progress in the chemistry of glucides.** P. CASTAN. *Rev. gén. sci.* 40, 361-8(1929).

E. H.

**The cleavage of sugars by alkali.** F. FISCHLER. *Z. angew. Chem.* 42, 682-4 (1929).—Hexoses and other sugars yield trioses (methylglyoxal) (I) when treated with



cold alkali as shown by an  $\text{CHI}_3$  test. This test works well with glucose (II), mannose, lactose, and maltose, less easily with galactose. With fructose, arabinose and xylose the test is very weak. The pentoses are thought to yield glycolaldehyde which consumes the KIO and hinders  $\text{CHI}_3$  formation. Sucrose gives as strong a test as II but requires more time. The reducing action of sugars in alk. solns. is ascribed to their decompn. products. The behaviors of  $\text{CO}(\text{CH}_2\text{OH})_2$  (III), I and II in sulfite-Ost soln. are compared. III is thought to yield I in this soln. The aldo- and keto-structure of the sugars is not questioned. G. C. STROUSE

**Oxidation of sugars in alkaline solution by oxygen.** Influence of  $p_{\text{H}}$  on the production of carbon monoxide. MAURICE NICLOUX AND H. NEBENZAHL. *Compt. rend. soc. biol.* 101, 189-92(1929).—Fructose, galactose and glucose were stored 2-4 days at  $38-40^\circ$  in contact with excess  $\text{O}_2$  and 0.66  $M$  phosphate buffer solns. of  $p_{\text{H}}$  7.38, 7.73, and 8.04 (250 mg. carbohydrate to 20 cc. buffer soln.). The max. vol. of CO produced was, at  $p_{\text{H}}$  7.38: fructose 0.64 cc., galactose 0.38 cc. and glucose 0.16 cc.  $\text{O}_2$  consumption paralleled CO production. Negative results were obtained using 0.066  $M$  phosphate buffer solns. The results support N. and N.'s theory that CO, found in mammalian blood, is a normal metabolic product, derived from the biol. oxidation of carbohydrates. B. C. BRUNSTETTER

**The oxidation of different sugars in alkaline solution by oxygen from the point of view of carbon monoxide production.** MAURICE NICLOUX AND H. NEBENZAHL. *Compt. rend. soc. biol.* 100, 864-6(1929); cf. C. A. 22, 2742, 3179, 3180, 3633.—Arabinose, fructose and galactose in 250 mg. amts. were each shaken 5 min. at  $84-85^\circ$  with 50 cc. 0.1  $N$  KOH and 40-50 cc.  $\text{O}_2$ . The av. production of CO was: arabinose 1.9 cc., galactose 2.1 cc., and fructose 2.4 cc. B. C. BRUNSTETTER

**The oxidation of carbohydrates by molecular oxygen. Study of the action of phosphates.** MAURICE NICLOUX AND H. NEBENZAHL. *Compt. rend. soc. biol.* 101, 720-2(1929).—Under the exptl. conditions noted in the preceding abstract, fructose, glucose and galactose in borate buffer solns. at  $p_{\text{H}}$  7.36 and 7.8 are not oxidized by  $\text{O}_2$ . The subsequent addn. of phosphate buffer ( $p_{\text{H}}$  7.4) to the soln. of fructose and borate buffer resulted in the oxidation of fructose. B. C. BRUNSTETTER

**3-Acetylmonoacetoneglucose and its transformation into 6-acetylmonoacetoneglucose.** KARL JOSEPHSON. *Svensk. Kem. Tid.* 41, 99-106(1929); cf. C. A. 23, 2943.—3-Acetylmonoacetoneglucose (I) is obtained by the treatment of 3-acetyldiacetoneglucose (II) with 75% HOAc followed by subsequent concn. under diminished pressure and recrystn. from EtOAc and petroleum ether (5 g. of II in 10 cc. of HOAc and 3 cc. of  $\text{H}_2\text{O}$  gave after 4 days 2.7 g. of I, corresponding to a 62% yield). I m.  $125.6^\circ$  (cor.),  $[\alpha]_{\text{D}}^{20} = -20^\circ$ . I reverts back to II upon treatment with anhyd. acetone and  $\text{CuSO}_4$ . The stability of I is dependent upon the  $\text{OH}^-$  concn., and even in slightly acid or neutral soln. the transformation of I into the isomeric 6-acetylmonoacetoneglucose (III) proceeds with noticeable rapidity. The velocity of the migration of the acyl group in the transformation of I and II can be followed by polarimetric measurements where the  $p_{\text{H}} = 5.5-8$ , but is already too rapid where  $p_{\text{H}}$  exceeds 9. The data indicate that the transformation velocity is of the same order of magnitude as the mutarotation of a reducing sugar. L. F. AUDRIETH

**Synthesis of sucrose.** GÉZA ZEMPLÉN AND ÁRPÁD GERECs. *Ber.* 62B, 984 (1929).—Irvine, Oldham and Skinner (C. A. 22, 2552) state that the condensation of  $\gamma$ -tetraacetylfructose and tetraacetylglucose under the influence of  $\text{P}_2\text{O}_5$  does not yield sucrose. Z. and G., in similar expts. in connection with a study of the synthesis of sucrose as reported by Pictet and Vogel, observed that disaccharide formation, to the extent of 10-15%, takes place but they were never able to isolate octaacetylsucrose, even on seeding the different fractions contg. the disaccharide mixt. Control expts. showed that even from a mixt. of 50% octaacetylsucrose and 50% tetraacetylglucose or  $\gamma$ -tetraacetylfructose the acetylated sucrose cannot be isolated because of its sensitivity to foreign substances. Evidently quite subtle conditions, which cannot be gotten from P. and V.'s description, are essential for the isolation of the substance. C. A. R.

**Syntheses in the carbohydrate group with the aid of sublimed ferric chloride.** I. Preparation of the biosides of the  $\alpha$ -series. GÉZA ZEMPLÉN. (WITH ZOLTÁN BRUCKNER AND ÁRPÁD GERECs). *Ber.* 62B, 985-90(1929).—In a study of the action of sublimed  $\text{FeCl}_3$  on acetylated sugars in  $\text{CHCl}_3$  Z. found that there was no conversion into aceto-halogen derivs. as with  $\text{TiCl}_4$  (cf. Pacsu, C. A. 22, 4479) but neither were the products identical with the starting materials.  $\alpha$ -Octaacetylcellobiose (I) and  $\beta$ -octaacetylmaltose (II) were studied especially, and the products were found to be heptaacetyl- $\alpha$ -ethylcellobioside (III) and heptaacetyl- $\alpha$ -ethylmalloside (IV), resp. Under the influence

of the alc. in the  $\text{CHCl}_3$  the I and II in the presence of  $\text{FeCl}_3$  split off  $\text{AcOH}$  and form the biosides which, surprisingly enough, are of the  $\alpha$ -series, so that octaacetylbiobioses can be converted directly into acetylated  $\alpha$ -biosides. In alc.-free  $\text{CHCl}_3$  not a trace of bioside is formed. From 100 g. I refluxed in  $\text{CHCl}_3$  about 1 hr. with 15 g.  $\text{FeCl}_3$ , there can regularly be obtained 6-7 g. crystals with a reducing power 2-3% that of glucose. III, m. 169-70°,  $[\alpha]_D^{16}$  49.7° ( $\text{CHCl}_3$ ), reducing power before hydrolysis 2.1-2.27% that of glucose, after hydrolysis 52%, mol. wt. (Rast) 628, is smoothly converted in  $\text{CHCl}_3$  by  $\text{HBr-AcOH}$  at 18° into acetobromocellobiose, m. 180° (decompn.),  $[\alpha]_D^{19}$  90.5° ( $\text{CHCl}_3$ ). Refluxed in  $\text{CHCl}_3$  with  $\text{TiCl}_4$  (which converts  $\beta$ - into  $\alpha$ -glucosides), III gave a product m. 174°,  $[\alpha]_D^{15}$  52.6° ( $\text{CHCl}_3$ ); the small increase in the rotation indicates that the III consists chiefly of the  $\alpha$ -compd., although it is not quite pure, since it still has a slight reducing power and moreover a sample of the  $\beta$ -isomer, with a reducing power of 2.6%, that of glucose and  $[\alpha]_D^{18}$  -19.5° gave with  $\text{TiCl}_4$  a product m. 171°, with  $[\alpha]_D^{17}$  55.6°. IV (133 g. from 150 g. II), powder, sinters 80-5°, m. 90-100°, reducing power 2.3%, before, 51.3% after hydrolysis,  $[\alpha]_D^{17}$  122.2° ( $\text{CHCl}_3$ ), gives with  $\text{TiCl}_4$  a product with  $[\alpha]_D^{17}$  124.4° ( $\text{CHCl}_3$ ). C. A. R.

**Action of aluminum metal and mercuric salts on acetohalogensugars. I. Synthesis of  $\alpha$ -biosides.** GÉZA ZEMPLÉN (WITH ÁRPÁD GERÉCS). *Ber.* 62B, 990-3 (1929), cf. preceding abstr.—Acetobromocellobiose (I) heated in  $\text{C}_6\text{H}_6$  with Al and dry  $\text{Hg}(\text{OAc})_2$  rapidly splits off its Br and gives heptaacetylcellobiose in good yield; in abs. alc. is obtained heptaacetyl- $\alpha$ -ethylcellobioside (II). If PhOH is dissolved in the  $\text{C}_6\text{H}_6$ , heptaacetyl- $\alpha$ -phenylcellobioside (III) is obtained in such pure form that heating with  $\text{TiCl}_4$  does not raise its rotation; with  $\text{HBr-AcOH}$  it smoothly regenerates I, showing that the cellobiose has undergone no transformation or rearrangement in the reaction. The II (88.4% yield) m. 186°,  $[\alpha]_D^{18}$  -19.44° ( $\text{CHCl}_3$ ). III (32.4% yield), m. 217°, reducing power nil before, 50.5% that of glucose after reduction,  $[\alpha]_D^{17}$  81.10° ( $\text{CHCl}_3$ ). In the same way was obtained heptaacetyl- $\alpha$ -cyclohexylcellobioside (63% yield), m. 203.5°, reducing power nil before, 48.2% after hydrolysis,  $[\alpha]_D^{20}$  63.4° ( $\text{CHCl}_3$ ). C. A. R.

**Cleavage of levoglucosan with titanium tetrachloride.** GÉZA ZEMPLÉN AND ZOLTÁN CSÜRÖS. *Ber.* 62B, 993-6 (1929).—Glucose derivs. with a free HO group in the 6-position can readily be obtained by heating triacetyllevoglucosan (I) in  $\text{CHCl}_3$  with an excess of  $\text{TiCl}_4$ ;  $\alpha$ -1-chloro-2,3,4-triacetylglucose (II) is thus formed with no detectable complication, for with  $\text{C}_6\text{H}_5\text{N-AcOH}$  it smoothly gives  $\alpha$ -acetoethylglucose; with  $\text{MeOH}$  and  $\text{Ag}_2\text{CO}_3$  the II yields  $\beta$ -1-Me 2,3,4-triacetylglucoside (III). With  $\text{Ag}_2\text{CO}_3$  in  $\text{C}_6\text{H}_6$  is obtained a tetra-Ac compd. giving a  $\text{MeC}_6\text{H}_4\text{SO}_2$  deriv. identical with Helfferich and Klein's 1,2,3,4-tetraacetyl-6-toluenesulfonyl- $\beta$ -d-glucose. Attempts to convert tribenzoyllevoglucosan into an analogous Cl deriv. failed completely. Under the same conditions as were used to prep. II the substance was recovered unchanged. Pentabenzoylglucose behaves normally, smoothly yielding tetrabenzoyl-1-chloroglucose. Trimethyllevoglucosan gives an amorphous product which contains only 2.2-2.7% Cl; 2,3,4,6-tetramethylglucose decomps and no definite product could be isolated, pentaacetylgluconitrile and hexaacetylmannitol are unchanged. II (33 g. from 50 g. I), m. 124-5°,  $[\alpha]_D^{19}$  191.5° ( $\text{CHCl}_3$ ). III (14 g. from 30 g. II), m. 131-2°,  $[\alpha]_D^{19}$  -13.59° ( $\text{CHCl}_3$ ). C. A. R.

**1,2-Dimethylcyclopropane.** JEAN BAUDRENHIEU. *Bull. sci. acad. roy. Belg.* 15, 53-80 (1929).—In the prepn. of 3-penten-2-ol (I) from  $\text{MeCH:CHCHO}$  and  $\text{MeMgBr}$ , decompn. of the reaction product with dil.  $\text{H}_2\text{SO}_4$  gives mainly  $(\text{MeCH:CHCHMe})_2\text{O}$  (II),  $d_{20}$  0.8047,  $n_D^{20}$  1.4306. The decompn. of the reaction product with water gives 75% I (without II), b. 122°,  $d_{20}$  0.8375,  $n_D^{20}$  1.4277.  $\text{MeCH}(\text{OAc})\text{CH:CHMe}$  (III) is obtained from I and  $\text{Ac}_2\text{O}$ ,  $b_{773}$  138.5-9°,  $d_{20}$  0.8962,  $n_D^{20}$  1.4163.  $\text{MeCHClCH:CHMe}$  (IV), obtained from I and  $\text{HCl}$ ,  $b_{771}$  100.5°,  $d_{20}$  0.8980,  $n_D^{20}$  1.4332. I and  $\text{HBr}$  give  $\text{MeCHBrCH:CHMe}$  (impure) (V), b. 117-20°, decompd. by water, transformed to a resin by  $\text{P}_2\text{O}_5$ . I and  $\text{PBr}_3$  in  $\text{CS}_2$  give 69% of a mixt. of isomeric bromides. IV and  $\text{HBr}$  give an unsatd. bromide, addn. to the double bond occurring very slowly and not being enhanced by sun or ultra-violet light. The  $\text{HBr}$ -treated product after distn and subsequent treatment with  $\text{HBr}$  gives a mixt. (VI) of 2,3- and 2,4-dibromopentanes, this being explained on the basis that the distn. removes a negative catalyst. III (prepd. from V and  $\text{KOAc}$ ) and  $\text{HBr}$  give a mixt. of dibromopentanes similar to the foregoing. III (prepd. from I and  $\text{Ac}_2\text{O}$ ) and  $\text{HBr}$  give  $\text{MeCHBrCH:CHMe}$  (VII). VII (distd.) and  $\text{HBr}$  give a mixt. of dibromopentanes richer in the 2,4-isomer than VI, which, when distd. over  $\text{P}_2\text{O}_5$ , decomps. giving a pentadiene, b. 40°,  $\text{AcOH}$ , and a resin. VI and Zn

in aq. alc. give  $\text{MeCH:CHEt}$  (44%) and  $\text{CH}_2\text{CHMe.CHMe}$  (VIII).  $\text{MeCH(OH)CH}_2\text{-}$

$\text{COMe}$  (IX) and H in the presence of Pt black give  $\text{MeCH(OH)CH}_2\text{CH(OH)Me}$  (X). X is also obtained from aldol and  $\text{MeMgBr}$ . Reduction of  $\text{CH}_2\text{Ac}_2$  (XI) with H, using Pt black, gives X (30%) and  $\text{MeCH(OH)CH}_2\text{Et}$ . Hydrogenation of XI, using Pt black activated with a trace of Fe, gives a mixt. of X and IX. The use of the Pt-Fe catalyst of Adams and Carothers gave poor results. Reduction of XI with Na and alc. gives 70% X and is the best of the methods tried. VIII obtained from VI and Zn consists of two isomeric 1,2-dimethylcyclopropanes (explained on the basis of the presence of asym. C atoms) which were sep'd. by fractional distn., one  $b_{755}$  28.8–29°,  $d_{4-20}$  0.6985,  $n_{D-20}$  1.39641, 1.37129, 1.37617, 1.37997, and the other  $b_{755}$  37.2–4°,  $d_{4-20}$  0.71325, 0.6928,  $n_{D-20}$  1.38023, 1.38223, 1.38702, 1.39109. Also in *Bull. soc. chim. Belg.* 38, 172–93 (1929). F. C. H.

**Oxidation of organic halogen compounds.** CH. COURTOT AND J. PIERRON. *Bull. soc. chim.* 45, 286–93 (1929); cf. C. A. 22, 738 and following abstr.—Compds. which are easily oxidized to ketones or aldehydes possess a Cl atom in the  $\alpha$ -position to a double bond ( $\alpha$ -chloroindene,  $\text{PhCH}_2\text{Cl}$ ). C. and P. verify a theory of Grimaux and Lauth (1877) that mobility of the Cl, the ease with which they hydrolyze, leads to alics. which in turn are readily oxidized. The following exptl. examples are given: 1-chloro-2-cyclohexene hydrolyzed in water at 15° within 48 hrs. or in 75 min. at 65°. The Cl compd. (12 g.) was emulsified in 200 cc. water and 20 g.  $\text{Na}_2\text{Cr}_2\text{O}_7$ , at 60–65°, 30 g. concd.  $\text{H}_2\text{SO}_4$  slowly added, the soln. extd. with ether, and the cyclohexenone dried, rectified,  $b_{74}$  63°; yield 60%. 9-Chlorofluorene hydrolyzed above its m. p., 92° (not below), in less than 1 hr. in pure water. Oxidation of the chloride to fluorenone occurred only at the temp. of hydrolysis. 4-Chloro-2-hexene was oxidized to 2-hexen-4-one (yield 55%),  $d_4^{14}$  0.8838,  $n_D^{15}$  1.4380; M. R. calcd. 29.45, found 29.11. 5-Chloro 4-methyl-3-heptene (like the other examples easily saponifiable) gave 4-methyl-3-hepten-5-one (I) in poor yield, due to simultaneous formation of 4-methyl-3,5-heptadiene. I  $b_{70}$  96.8°,  $b_{735}$  170–2°,  $d_4^{15}$  0.8773,  $n_D^{15}$  1.4510, M. R. calcd. 38.71, found: 38.68. Oxidation of chlorides may assume a practical value since they are readily accessible by addn. of HCl to polyethylene compds. K. H. ENGEL

**$\alpha$ -Ethylenic chlorides and alcohols.** CH. COURTOT AND J. PIERRON. *Compt. rend.* 188, 1501–4 (1929).—Secondary  $\alpha$ -ethylenic chlorides have previously been converted to the corresponding ketones by the action of a mixt. of  $\text{CrO}_3$  and  $\text{H}_2\text{SO}_4$ . To the examples previously given (cf. preceding abstr.) one more is added here.  $\text{PhCHCl-CH}_2\text{Me}$  is converted to the ketone  $\text{PhCOCH}_2\text{Me}$  with 75% yield. The benzene double bond in the  $\alpha$ -position to the Cl does not render it as mobile as an ordinary ethylenic linkage. It is 97% hydrolyzed at 68° in 75 min. Treatment of  $\text{CH}_2\text{:CHCH(OH)Et}$  with the  $\text{CrO}_3\text{-H}_2\text{SO}_4$  at 34–35° gives the corresponding ketone in 45% yield. The immediately higher homolog treated at 40–45° gives the  $\text{CH}_2\text{:CHCOPr}$  in 44% yield. The phys. consts. of the 2 ketones are:  $\text{CH}_2\text{:CHCOEt}$ ,  $b_{200}$  68–70°,  $d_4^{15}$  0.8524,  $n_D^{14}$  1.4275;  $\text{CH}_2\text{:CHCOPr}$ ,  $b_{150}$  88–90°,  $d_4^{15}$  0.8518,  $n_D^{14}$  1.4275.  $\text{NHEt}_2$  attaches itself to the 2 ketones. The *picrates* of these addn. products m. 78° and 81°, resp. R. P. W.

**Constitution of aromatic substances and their chemical and physical properties.** VI. Crystal symmetry. I. PASTAK. *J. chim. phys.* 26, 65–8 (1929); cf. C. A. 20, 1601—From previous comparisons of m. ps. and relative solubilities predictions are made as to the relative degree of crystal symmetry of isomeric disubstituted benzenes (with the same, and with diff. substituents), of isomeric disubstituted biphenyls and of a few  $\alpha$ - and  $\beta$ -naphthalene derivs., the lower-melting, more highly sol. compd. possessing the greater degree of symmetry. Known crystallographic information, (classifications) is cited in support. K. H. ENGEL

**The dipole moments of mono- and disubstituted benzene derivatives.** P. WALDEN AND P. WERNER. *Z. physik. Chem., Abt. B*, 2, 10–26 (1929).—Data are presented on the dielec. consts. and dipole moments of  $\text{PhF}$ ,  $\text{PhI}$ , *o*-, *m*-, and *p*- $\text{C}_6\text{H}_4\text{Br}$ , *o*-, *m*- and *p*- $\text{C}_6\text{H}_4\text{BrI}$ , *o*-, *m*- and *p*- $\text{MeC}_6\text{H}_4\text{Cl}$ , and *o*-, *m*- and *p*- $\text{C}_6\text{H}_4\text{ClNO}_2$ , as detd. in benzene as a non-polar solvent. A very good agreement is shown between the exptl. and calcd. values. For compds. with similar (in elec. nature) substitutions the moment is: *o*-position =  $a\sqrt{3}$ ; *m*-position =  $a$ ; and *p*-position = 0. For compds. with different substitutions the moment is, *o*-position =  $\sqrt{a^2 + b^2 + ab}$ ; *m*-position =  $\sqrt{a^2 + b^2 - ab}$ ; and *p*-position =  $a-b$ , where  $a$  and  $b$  are detd. from the sep. moments of monosubstituted compds. The order of moments in similar disubstituted compds. is  $o > m > p$  (i. e.,  $\text{C}_6\text{H}_4\text{Cl}_2$ , etc.) and in unlike disubstituted compds.  $p > m > o$  (i. e.,  $\text{MeC}_6\text{H}_4\text{Cl}$ ). WALLACE R. BRODE

**Reduction of aromatic nitro compounds by hydrogen in the presence of platinum black.** V. VESELY AND E. REIN. *Collection Czechoslov. Chem. Comm.* **1**, 360-7 (1929). (In French).—See *C. A.* **22**, 1352.

**Nitration of bromoaniline in sulfuric acid.** R. LUKEŠ AND J. FRAGNER. *Collection Czechoslov. Chem. Comm.* **1**, 294-301 (1929).—Nitration of *o*-bromoaniline in excess of concd.  $\text{H}_2\text{SO}_4$  gives 2,5-Br( $\text{O}_2\text{N}$ ) $\text{C}_6\text{H}_3\text{NH}_2$ ; *m*-bromoaniline gives 3,4-Br( $\text{O}_2\text{N}$ ) $\text{C}_6\text{H}_3\text{NH}_2$  (I), m. 173-4°, and some 3,6-compd. The m. p. of 2,3,6,4-Br( $\text{O}_2\text{N}$ ) $\text{C}_6\text{H}_3\text{NH}_2$  is 159°; previous reports were 131° (*J. prakt. Chem.* **56**, 61).

**Photochemical formation of ammonium salts.** A. K. PLISSOV. *Gazz. chim. ital.* **59**, 200-6 (1929).—A review and discussion of the relation of the quantum theory to photochem. reactions in general and to various hypotheses of the formation of  $\text{NH}_4$  salts from amines and alkyl halides leads to the conclusion that in the latter reaction both the halide and the amine are activated. There is a complete series of photochem. reactions where halogenated derivs. react with non-N compds., and where the yields are increased notably by illumination. Therefore, in the formation of  $\text{NH}_4$  salts, frequencies which activate the halide may also activate the amine. Studies of absorption spectra have already shown that the substitution of H in the amine does not change the general character of the absorption curve either in the infra-red or ultra-violet. Accordingly,  $\text{PhNH}_2$  and its derivs. should, when activated during the formation of  $\text{NH}_4$  salts, absorb radiation of the same frequency. This means that the ratio of the velocity consts. for 2 different temps. should be const., as found by Marcelin and Reiss for various amines. If in the formation of  $\text{NH}_4$  salts the halide is activated, the results are far different. To study this problem,  $\text{PhCH}_2\text{Cl}$ ,  $\text{EtBr}$  and  $\text{CH}_2\text{:CHCH}_2\text{Cl}$  were chosen, because they should possess different absorption spectra. In the activation of alkyl halides, radiation of different frequencies should be absorbed, and the ratio of the velocity consts. for 2 different temps. is the same if the same alkyl halide reacts with different amines, and is different if the same amine reacts with different halides. If only the amine is activated, then when the reaction is accelerated by radiation, the ratio: *yield in darkness/when irradiated*, should be const., regardless of the amine or of the alkyl halide. If, on the other hand, both amine and alkyl halide are activated, then the ratio: *yield in darkness/when irradiated*, should be const. for a given alkyl halide with different amines, and should vary for a given amine with different alkyl halides. In the initial expts. the reactions between  $\text{PhCH}_2\text{Cl}$  and  $\text{PhNH}_2$  and *o*- $\text{MeC}_6\text{H}_4\text{NH}_2$ , resp., were studied. The reaction between  $\text{PhCH}_2\text{Cl}$  and  $\text{PhNH}_2$  (2 mols.) was carried out in  $\text{C}_6\text{H}_6$ , at 46° in a quartz receptacle, irradiation being from a voltaic arc. Control tests were run simultaneously in glass with irradiation, and in darkness. After 1.5 hrs. in quartz, the yield of  $\text{PhNH}_3\text{Cl}$  was 51% of the theoretical, and after 3 hrs. it was 82%. After 1.5 and 3 hrs. in glass the yields were 7% and 19%, resp., and in darkness were 6.3% and 15%, resp. The reaction between  $\text{PhCH}_2\text{Cl}$  and *o*- $\text{MeC}_6\text{H}_4\text{NH}_2$  (2 mols.) was also carried out in  $\text{C}_6\text{H}_6$ , but the temp. was 32° and the radiation much weaker. After 3 hrs. in quartz, the yield of *o*- $\text{MeC}_6\text{H}_4\text{NH}_3\text{Cl}$  was 12% and in darkness 5.5%. The results show that ultra-violet light accelerates greatly the formation of  $\text{NH}_4$  salts from alkyl halides and amines, particularly with  $\text{PhNH}_2$ . Further expts. are to be described with  $\text{EtBr}$  and  $\text{CH}_2\text{:CHCH}_2\text{Cl}$  in place of  $\text{PhCH}_2\text{Cl}$ .

C. C. DAVIS

**Nitrations. I. Thermal analysis of the anilides.** FRANCIS ARNALL. *J. Soc. Chem. Ind.* **48**, 157-9T (1929); cf. *C. A.* **18**, 674, 2142.—Nitration of *acetanilide* (I) gave a mixt. (II) contg. *o*-, *m*-, and *p*-nitroacetanilide and some unchanged I. Depressions of the f. p. resulting from the soln. of 0.5 g. of II in 5 g. of each of the pure *o*-, *m*-, and *p*-isomerides and in pure I were detd. Titration of II with  $\text{TiCl}_3$  gave the degree of nitration. Binary fusion curves of the pure compds. contg. small amts. of other isomerides showed that when using the *p*-compd. as solvent, 1° depression = 1.46% of *m* + *o* (the two being equiv. since their mol. wts. are the same); using *m* as solvent, 1° = 1.67% of *p* + *o*; and in *o*, 1° = 2.1% of *p* + *m*. The f. p. in pure I gave the degree of nitration (1° = 1.7%  $\text{O}_2\text{NC}_6\text{H}_4\text{NHAc}$ ) and should agree with the  $\text{TiCl}_3$  value, otherwise an impurity such as the dinitro deriv. is indicated. The depression in  $p = o + m + u$  (unchanged I). *u* was known from the  $\text{TiCl}_3$  value and the quantity of nitro deriv. causing the same f. p. depression was calcd. from their resp. mol. wts. (1 g. of I = 1.33 g. of nitro deriv.). Correcting the 3 equations for *u*, the quantities of *o*, *m*, and *p* were calcd. II. Nitration of the anilides. FRANCIS ARNALL AND THOMAS LEWIS. *Ibid* 159-60T.—Ten g. of anilide was dissolved in 30 cc. of concd.  $\text{H}_2\text{SO}_4$  and nitrated at 20° with the calcd. quantity of  $\text{HNO}_3$  (d. 1.42) in 25 cc. of  $\text{H}_2\text{SO}_4$ . After 12 hrs., this was dild.; boiled to eliminate the acyl group; cooled and neutralized with  $\text{NaOH}$ . The pptd.  $\text{O}_2\text{NC}_6\text{H}_4\text{NH}_2$  was filtered off and the dissolved portion removed

by exhaustive  $\text{Et}_2\text{O}$  extn. The combined product was refluxed with 50 cc. of  $\text{Ac}_2\text{O}$  and 1 drop of  $\text{H}_2\text{SO}_4$ ; after hydrolyzing the excess  $\text{Ac}_2\text{O}$ , the soln. was made alk. with ice  $\text{NaOH}$  and extd. with  $\text{Et}_2\text{O}$ . The resulting  $\text{O}_2\text{NC}_6\text{H}_4\text{NHAc}$  was analyzed for (a) degree of nitration, (b) total yield, (c) *o*-deriv., (d) *m*-deriv., (e) *p*-deriv., giving the following results: nitration of *formanilide* (a) 97%, (b) 97.3%, (c) 18.1%, (d) 2.0%, and (e) 79.7%; *acetanilide* (a) 95.9%, (b) 97.7%, (c) 19.4%, (d) 2.1%, and (e) 78.5%; *propionanilide* (a) 94%, (b) 95.1%, (c) 21.1%, (d) 1.2% and (e) 77.7%; *N-benzalaniline* (a) 99%, (b) 95.6%, (c) 5.5%, (d) 0.6%, and (e) 93.9%. In the same manner nitrations were carried out in  $\text{Ac}_2\text{O}$  instead of  $\text{H}_2\text{SO}_4$ , adding  $\text{H}_2\text{SO}_4$  for the hydrolysis of the acyl group; the following data were obtained:  $\text{O}_2\text{NC}_6\text{H}_4\text{NHAc}$  (a) 86%, (b) 90.5%, (c) 67.8%, (d) 2.5%, and (e) 29.7%;  $\text{O}_2\text{NC}_6\text{H}_4\text{NHCOEt}$  (a) 78%, (b) 80%, (c) 65.8%, (d) 2.2%, and (e) 32.0%. Radiation from a Hg-vapor arc did not vary the results.

A. S. CARTER

The action of diazotates on azoxyphenols. D. BIGIARI AND S. STEFANIC. *Atti accad. Lincei* [6], 9, 326-31 (1929).—Of the 2 isomers of *p*-hydroxyazoxybenzene, the  $\beta$ -form reacts in many ways like *p*-nitrophenol (I):  $\text{PhN}(\text{:O}): \text{NC}_6\text{H}_4\text{OH}$  ( $\alpha$ ),  $\text{PhN}(\text{:O}): \text{NC}_6\text{H}_4\text{OH}$  ( $\beta$ ) and  $\text{O}:\text{N}(\text{:O})\text{C}_6\text{H}_4\text{OH}$  (I). *E. g.*, oxidizing agents, as  $\text{KMnO}_4$  in alk. soln., oxidize the  $\alpha$ -form, whereas the  $\beta$ -form as well as I are stable, the  $\alpha$  derivs. are similar, the  $\alpha$ -deriv. only being readily oxidizable.  $\text{HNO}_2$  on the  $\alpha$ -form gives a mono- $\text{NO}_2$  deriv., the other 2 are not affected. The following reaction of I with diazo-hydrates  $\text{BrC}_6\text{H}_4\text{N}_2\text{OH} + \text{HOC}_6\text{H}_4\text{NO}_2 \rightarrow \text{BrC}_6\text{H}_4\text{N}:\text{N}.\text{O}.\text{C}_6\text{H}_4\text{NO}_2 \rightarrow \text{BrC}_6\text{H}_4\text{N}:\text{NC}_6\text{H}_4(\text{OH})\text{NO}_2$  (II) is also shown by the  $\beta$ -form, a diazo-ether being the intermediate product. The  $\alpha$ -form, however, forms the hydroxyazo compd. directly. The structure of II has been proven by reducing with Sn and HCl, the products being *p*- $\text{BrC}_6\text{H}_4\text{NH}_2$ , and 2,4-( $\text{H}_2\text{N}$ ) $_2\text{C}_6\text{H}_3\text{OH}$ .

A. W. CONTIERI

Determination of the acidity of undissociated acids with dimethylaminoazobenzene as indicator. A. HANTZSCH AND W. VOIGT. *Ber.* 62B, 975-84 (1929).—Earlier work by H. showed that the strengths of acids cannot be calcd. purely physically according to the classical dissoen. theory from their cond. in  $\text{H}_2\text{O}$  because in this solvent they form hydroxonium salts. Their true acidity can be detd. only chemically on the basis of their tendency to salt formation or, which is in principle the same but in practice more convenient, on the basis of the stability of their salts which decompose according to the simple scheme  $\text{X}[\text{HNR}_3] \rightarrow \text{XH} + \text{NR}_3$  for  $\text{NH}_4$  salts. The decompn. can be followed most easily experimentally when the formation and decompn. of the salts is accompanied by a change in color as the result of intramol. rearrangement, *i. e.*, when indicator base anhydrides are used as the basic constituent of the salt. For this purpose was chosen dimethyl yellow,  $\text{PhN}:\text{NC}_6\text{H}_4\text{NMe}_2$  (I). The position of the equil.  $\text{PhN}:\text{NC}_6\text{H}_4\text{NMe}_2 + \text{HX} \rightleftharpoons \text{PhNHN}:\text{C}_6\text{H}_4:\text{NMe}_2\text{X}$  is dependent primarily on the strength of the acid but is also influenced by the nature of the "solvent," especially its dissoen. power or dielec. const. Only the satd. hydrocarbons and, to a lesser degree, their halogen derivs. ( $\text{CCl}_4$ ,  $\text{CHCl}_3$ ) act almost entirely merely as diluents, whereas all O-contg. solvents react chemically with the acids. The strongest acids ( $\text{HClO}_4$ ,  $\text{HI}$ ,  $\text{HBr}$ ) dissolve as oxonium salts; somewhat weaker acids ( $\text{HCl}$ ,  $\text{HNO}_3$ ) are also present in  $\text{H}_2\text{O}$  and alc. solns. of moderate concn. entirely as oxonium salts while in  $\text{Et}_2\text{O}$  at room temp. they dissolve only as etherates and remain in the state of homopolar, ester-like non-electrolytes; the weaker acids the more extensively do they remain, even in  $\text{H}_2\text{O}$ , at high dilns., partially as non-dissociating acid hydrates. For the present work  $\text{Et}_2\text{O}$  and  $\text{CHCl}_3$  were chosen as representatives of the 2 kinds of solvents. Naturally, they had to be freed of  $\text{H}_2\text{O}$  as completely as possible. The I salts of the strong acids were prepd. by pptg. with petroleum ether from  $\text{Et}_2\text{O}$  solns. of equiv. amts. of the components and drying over  $\text{P}_2\text{O}_5$ , while the salts of the weaker acids were obtained only in soln. from equiv. amts. of I and the carefully dried acid in the min. quantity of the solvent in which the measurements of acidity were to be made. In the 1st measurements (with ERNST FISCHER, *Diss. Leipzig*, 1921) the red quinoid salts were produced by adding a const. amt. of I to equiv. solns. of the acid in different solvents and then the solns. were dild. with the same solvent until the color changed to red. Later, the acids in the different solvents were treated with a definite amt. of I and the concn. of acid in  $\text{H}_2\text{O}$  which gave the same shade with the same amt. of I was detd. colorimetrically. The latter is the more accurate method but does not permit of excluding moisture completely and is longer. The 1st method was, therefore, adopted with the modification that equiv. amts. of I and acid were used and the concn. at which the salt is practically completely dissoed. (as indicated by the color change) was detd. The method cannot be compared as to accuracy with the cond. method, especially for the weaker acids, but, contrary to the cond. method, its accuracy increases with in-

creasing strength of the acids and already for the strongest of the  $\text{CO}_2\text{H}$  acids is superior to the cond. method. Below are given, resp., the diln. (l. per mol.) at which the salt is completely dissoed. in  $\text{CHCl}_3$ , the ratio of this diln. to that for  $\text{AcOH}$  taken as 1, and the ratio of the dissoen. const. of the acid (detd. by Ostwald's method) to that of  $\text{AcOH}$  taken as 1:  $\text{AcOH}$  0.06, 1, 1;  $\text{ICH}_2\text{CH}_2\text{CO}_2\text{H}$  0.6, 10, 5;  $\text{HCO}_2\text{H}$  38, 633, 12;  $\text{BrCH}_2\text{CO}_2\text{H}$  63, 1050, 74;  $\text{MeCHBrCO}_2\text{H}$  64, 1067, 58;  $\text{ClCH}_2\text{CO}_2\text{H}$  70, 1167, 83;  $\text{CH}_2(\text{CO}_2\text{H})_2$  243, 4050, 87; *cis*-( $\text{CHCO}_2\text{H}$ )<sub>2</sub> 1365, 22750, 806;  $\text{N}_3\text{CS}_2\text{H}$  1450, 24160, 1290;  $\text{Br}_3\text{CCO}_2\text{H}$  3200, 53330, —;  $\text{Cl}_3\text{CCO}_2\text{H}$  5700, 95000, 10750. The strengths of the acids therefore increase in the same order as their dissoen. const. but much more rapidly and range within an interval almost 10 times greater than do the dissoen. const. This, as has repeatedly been pointed out, is due to the leveling influence of  $\text{H}_2\text{O}$  which makes the strong acids weaker by almost complete hydroxonium salt formation and makes the weak acids seem stronger. This influence of  $\text{H}_2\text{O}$  is shown by the following values for the dilns. in  $\text{CHCl}_3$ , previously shaken with  $\text{H}_2\text{O}$  and filtered, at which the I salts of the acids above are completely dissociated: 0.11, 0.8, 40, 75, 78, 65, 235, 1187, 1980, 4200. In dry  $\text{Et}_2\text{O}$ , the corresponding values are: —, — (too small to be detd.), 0.7, 2, 2, 4.5, 12, 48, 54, 70; in moist  $\text{Et}_2\text{O}$  —, —, 0.7, 2.1, 2, 4.7, 12.2, 52, 59, 80. The acidity of  $(\text{CO}_2\text{H})_2$  could not be detd. because its violet salt with I, which contains 2 mols. acid to 1 of base, is insol. in both  $\text{CHCl}_3$  and  $\text{Et}_2\text{O}$ . The same is true of  $\text{H}_2\text{SO}_4$ . Of the other strong inorg. acids, the I salts are so stable that in dry  $\text{CHCl}_3$  they are not completely dissociated in dilns up to 50,000 l. per mol. The dilns. necessary for complete dissoen. in moist  $\text{CHCl}_3$ , dry  $\text{Et}_2\text{O}$  and moist  $\text{Et}_2\text{O}$ , resp., are:  $\text{HClO}_4$  37500, 15000, 6900;  $\text{HBr}$  34100, 13900, 3000;  $\text{HCl}$  28000, 1900, 1700;  $\text{HNO}_3$  24500, 1400, 2300. To det. the acidities of the strongest acids in dry  $\text{CHCl}_3$  the more weakly basic dianisalacetone (II) was used instead of I (the violet red perchlorate and nitrate, however, do not change color on diln., and HI is oxidized and the violet color of the liberated I makes it impossible to det. the color change of the salt). The dilns. in dry  $\text{CHCl}_3$ ,  $\text{C}_6\text{H}_6$  and  $\text{PhMe}$ , resp., necessary for complete dissoen. of salts of II are:  $\text{HBr}$  29900, 7150, 7910;  $\text{HCl}$  3270, 430, 450;  $\text{Cl}_3\text{CCO}_2\text{H}$  1800, 500, 490 (in  $\text{C}_2\text{H}_2\text{Cl}_4$  1070). C. A. R.

**Aminoazobenzenes and their salts.** A. HANTZSCH and W. VOIGT. *Ber.* 62B, 968, 75 (1929).—As shown 20 yrs. ago, the aminoazobenzenes form 2 differently colored salts yellow azoid,  $\text{PhN:NC}_6\text{H}_4\text{NR}_2\cdot\text{HX}$ , and red quinoid,  $\text{PhNHN}\cdot\text{C}_6\text{H}_4\cdot\text{NR}_2\cdot\text{X}$ . On the other hand, the assumption that besides the yellow azoid salts there exist also much more strongly absorbing salts, which were, therefore, likewise considered to be quinoid, is incorrect, as already shown by Thiel, for from his extinction measurements the 1:1:0 soln. of the violet oxalate of  $\text{PhN:NC}_6\text{H}_4\text{NMe}_2$  (I) does not contain a yellow oxalate but the salt is almost completely dissociated into I and the free acid. This has been confirmed by mol. wt. detns. on more concd.  $\text{Et}_2\text{O}$  solns. of the violet but much more sol.  $\text{Cl}_3\text{CCO}_2\text{H}$  and  $\text{ClCH}_2\text{CO}_2\text{H}$  salts; the former gave values of 225.15–231.2, corresponding to 72.5–68.0% dissoen., the latter 161.1–162.4, corresponding to 98.2–96.7% dissoen. The acid is not liberated as such by the  $\text{Et}_2\text{O}$  but as an etherate,  $\text{RCO}_2\text{H}\cdot\text{OEt}_2$ ; *i. e.*, there occurs an "etherolysis." Alc. likewise produces an "alcoholysis" of the red salts. The  $\text{HCl}$  salts of  $\text{PhN:NC}_6\text{H}_4\text{NH}_2$  (II) and I in 0.0001 N soln. in abs. alc. show absorptions very similar to those of the free bases, *i. e.*, they are extensively dissoed., and only with excess of acid do they become optically const. and are then present completely as the red salts. But whereas N  $\text{HCl}$  suffices to thus convert I completely, 16 N  $\text{HCl}$  is required for II. The stronger basicity of I can only in part account for this difference, which, moreover, does not increase continuously but by steps with increasing mol. wt. of the alkyl groups on the N; the di-Et deriv. (III), because of its slight tendency to form the red salt, is again a poor indicator while the di-Pr deriv. (IV), like I, forms the red salt in smaller acid concns. This is best shown by pptg. the aminoazobenzenes from  $\text{Et}_2\text{O}$  by cautious addn. of concd.  $\text{HCl}$ ; I and III give primarily yellow salts, II and IV red salts. Because of the very slight soly. of the free aminoazobenzenes the red salts are extensively hydrolyzed by  $\text{H}_2\text{O}$ , and other so-called indifferent solvents "solvolyze" them to a greater or lesser extent, such as the  $\text{HCl}$  salt of I in  $\text{CHCl}_3$  or the acetate in  $\text{AcOH}$ . The free aminoazobenzenes also form solvates, a fact not to be neglected in using them as indicators; 0.005 N solns. of I in various solvents have the same color intensity in layers of the following depth  $\text{C}_6\text{H}_6$  7.3,  $\text{Me}_2\text{CO}$  8.5, alc. 9.8,  $\text{Et}_2\text{O}$  11.6,  $\text{CHCl}_3$  11.8, ligroin 12.4, *i. e.*, the  $\text{C}_6\text{H}_6$  solvate

analogous to those of the corresponding aminoazobenzenes. The Me ester of diethylhelianthin (see preceding abstr.), which can have only the azoid structure, has an absorption very similar to that of the yellow azoid Na salt. The unalkylated  $\text{H}_2\text{NC}_6\text{H}_4\text{N}:\text{NC}_6\text{H}_4\text{SO}_3\text{H}$ , which is yellow in solid form, shows in alc. the same absorption as  $\text{PhN}:\text{NC}_6\text{H}_4\text{NH}_2$  and therefore cannot be present in soln. unchanged as an inner salt but, at least in by far the greatest proportion, as an open aminoazobenzenesulfonic acid or, more exactly, as its ethyloxonium salt,  $\text{H}_2\text{NC}_6\text{H}_4\text{N}:\text{NC}_6\text{H}_4\text{SO}_3[\text{H}_2.\text{OEt}]$ . On the other hand, dimethyl-*o*-toluidineazobenzenesulfonic acid dissolves in alc. with yellow color as the inner azoid salt, the soln. absorbing like  $\text{PhN}:\text{NPh}$ ; even in acids it remains yellow and is only partly converted into the open benzoid salt. That the yellow and red helianthins are constitutionally different can be shown chemically by their behavior toward  $\text{N}_2\text{CHCO}_2\text{Et}$ ; only the yellow ones evolve N while the red ones react either not at all or with extraordinarily small velocity with the  $\text{N}_2\text{CHCO}_2\text{Et}$ . C. A. R.

**Esters of aminoazobenzenesulfonic acids**,  $\text{R}_2\text{NC}_6\text{H}_4\text{N}:\text{NSO}_2\text{OC}_2\text{H}_5 + 1$ . A HANTZSCH (WITH FRITZ MÜLLER). *Ber.* 62B, 966-8(1929).—It was of theoretical interest to prep. the hitherto unknown helianthin esters because they are the only constitutionally and therefore optically unchangeable derivs. of these indicators so that comparison of their absorption spectra with those of the free indicators and their salts with bases and acids should give important evidence on their constitution, concerning which there is still in part some disagreement. The Me esters, at least, can be obtained, although in very poor yield, from the free acids with  $\text{CH}_3\text{N}_2$  or from the alkali salts with  $\text{Me}_2\text{SO}_4$ . Of the helianthins which are yellow in the solid state were studied the simple amino- (I) and dimethyl-*o*-toluidineazobenzenesulfonic acid (II), of the red helianthins, monomethyl- (III), dimethyl- (IV) and diethylaminoazobenzenesulfonic acid (V). They react with very different velocities and more or less smoothly, IV the least and V best. Me ester of V (0.1 g. from 0.4 g. V allowed to stand twice 36 hrs. with  $\text{CH}_3\text{N}_2$  in  $\text{Et}_2\text{O}$ ), brick-red, m.  $125^\circ$ , difficultly sol. in alc. and  $\text{C}_6\text{H}_6$  with yellow color, not attacked by NaOH in the cold and only very slowly on heating, but easily hydrolyzed to V by HCl. Me ester of IV, decomp. about  $282^\circ$ , was obtained in such small amt. that it could be characterized only by its similarity to the ester of V in soly. and behavior toward alkalis and acids. Me ester of III, decomp.  $113^\circ$ . Me ester of II, m.  $77-8^\circ$ . I with  $\text{CH}_3\text{N}_2$  vigorously liberates N and yields chiefly IV with traces of the Me ester of the latter. The yellow and the red helianthins do not differ in principle, however, in their reactivity with  $\text{CH}_3\text{N}_2$ ; the red III and the yellow II react with about the same rapidity while the red IV reacts much more slowly and incompletely than II and III and, especially, than the likewise red V. The Me esters of III and V were also obtained by refluxing the Na salts, protected from atm. moisture, in PhMe with perfectly neutral  $\text{Me}_2\text{SO}_4$  dried with  $\text{K}_2\text{CO}_3$  and distd. *in vacuo*. C. A. R.

**The mechanism of the abnormal salt formation of pentaphenylchromium hydroxide and a unique hydrogen compound of tetraphenylchromium salts.** FR. HEIN, O. SCHWARTZKOPFF, K. HOYER, K. KLAR, W. EISSNER, W. CLAUS and W. JUST. *Ber.* 62B, 1151-67(1929); cf. C. A. 22, 2373. — The anomalous reaction of the base  $\text{Ph}_5\text{CrOH}$  with acids or salts yielding phenol and  $\text{Ph}_5\text{CrX}$  has led the authors to study its mechanism. In aq. soln. the reaction is  $\text{Ph}_5\text{CrOH} + \text{KI} + \text{H}_2\text{O} \rightarrow \text{Ph}_5\text{CrI} + \text{PhOH} + \text{KOH} + (\text{H})$ . In anhyd. solvents it is  $2\text{Ph}_5\text{CrOH} + 2\text{KI} \rightarrow 2\text{Ph}_5\text{CrI} + \text{K}_2\text{O} + \text{PhOH} + (\text{H}) + \text{Ph}$ . The facts that  $\text{Ph}_5\text{CrOPh} \cdot \text{PhOH}$  with KI yields only 2 mols. of phenol, hence proving all the Ph groups to be equally firmly held, and that even liquid  $\text{NH}_3$  yielded no aniline but only phenol lead to the conclusion that the base must first solvate, then rearrange and decomp. After much trouble the H, which nowhere made itself manifest, was finally found to be attached to the Cr of the salt in some such way as it may exist dissolved in Pd. This in no way altered any of its properties, except the spectrum. V. F. HARRINGTON

**Dialkyl-diarylelead compounds. Anti-knock studies.** HENRY GILMAN and LADISLAUS BALASSA. *Iowa State Coll. J. Sci.* 3, 105-7(1929); cf. C. A. 23, 1888.—The 4 compounds (I) dibutyl-, (II) diisobutyl-, (III) di-*sec*-butyl- and di-*tert*-butyldi-phenylead (IV) were prepd. by treating  $\text{Ph}_2\text{PbBr}_2$  with the appropriate  $\text{C}_4\text{H}_9\text{MgBr}$ . I, II and III are rather unstable yellow oils having anti-knock effects 0.33, 0.38 and 0.45 as great per mole as that of  $\text{PbEt}_4$ . IV was a solid, sol. in most org. solvents, sinters  $174^\circ$  and m.  $177^\circ$ . It is insol. in gasoline so its anti-knock effect is not accurately known. These compds. induce a malaise characteristic of volatile Pb compds. F. E. BROWN

**The bromination of 1,4-aminophenylarsonic acid.** A. LEULIER and Y. DREYFUSS. *Compt. rend.* 188, 1416-8(1929); cf. C. A. 19, 642; 22, 584. Berthelm (C. A. 4, 1299) from  $\text{H}_2\text{NC}_6\text{H}_4\text{AsO}_3\text{H}_2$  with Br in AcOH obtained in 45% yields the mono-Br deriv.

(I), and with NaOBr the di-Br deriv. (II) with some  $C_6H_5Br_2NH_2$ . L. and D. with HBr and  $H_2O_2$  obtained excellent yields of I, II and 2,4,6- $C_6H_2Br_3NH_2$  (III). I (2.80 g., almost theoretical yield), rose-white needles, does not m. 255°, was prepd. from 3 g. atoxyl in 10 cc.  $H_2O$ , 3 cc. of 48% HBr, and (added drop by drop) 2 cc.  $H_2O_2$  (100 vol.) Cryst. II (3.05 g. or 83%) was prepd. from 3 g. atoxyl, 25 cc.  $H_2O_2$  (10 vol.) and 10 cc. 92% HBr. Excess HBr (10 g.) and  $H_2O_2$  (20 cc. of 10% and 6 cc. of 50 vol.) caused the loss of all the As from atoxyl (3 g.), forming III (3.32 g.), white crystals, m. 119° (Maquenne block).

JANET D. SCOTT

**Stereoisomerism of disulfoxides and related substances.** III. Some pairs of aromatic disulfoxides. ERNEST VERRILL AND GEORGE MACDONALD BENNETT. *J. Chem. Soc.* 1928, 3189-92; cf. *C. A.* 22, 1325.—Oxidation of aromatic disulfides of the general formulas  $RSCH_2CH_2SR$  and  $C_6H_4(SR)_2$  gave in each case a pair of diastereoisomeric disulfoxides. *Dioxides of diphenylthiolethane*.— $\alpha$ , monoclinic plates or tables, m. 166° (decompn.);  $\beta$ , colorless needles with straight extinction, m. 123° (decompn.), much more sol. than  $\alpha$ . *Dioxides of di-p-tolylthiolethane*.— $\alpha$ , insol.  $H_2O$ , rhombic plates with diagonal extinction and high double refraction, m. 173-4° (decompn.),  $\beta$ , more sol. than  $\alpha$ , needles with straight extinction, m. 126-7° (decompn.). *Dioxides of dibenzylthiolethane*.— $\alpha$ , small monoclinic plates from EtOH, AmOH, 50% AcOH, flat prisms from xylene, m. 209°;  $\beta$ , feathery needles with straight extinction from xylene or AmOH, m. 192° (the disulfoxide described by Fromm, Benzinger and Schaefer (*C. A.* 7, 1001) was a mixt., m. 198°, of  $\alpha$  and  $\beta$ ). *Dioxides of 1,3-dimethylthiolbenzene*.— $\alpha$ , plates with high double refraction and straight extinction, m. 147°;  $\beta$ , rhombs with oblique extinction, m. 102° (that described by Zincke and Krueger (*C. A.* 7, 2393) was a mixt., m. 131°, of  $\alpha$  and  $\beta$ ). *Mercurichloride of 1,3-dimethylthiolbenzene*, m. 108°. *Dioxides of 1,3-dibenzylthiolbenzene*.— $\alpha$ , square plates with diagonal extinction, m. 133°;  $\beta$ , more sol., rhombic or hexagonal crystals from PhMe, characteristic spherical aggregates from  $CCl_4$ , m. 123° (the substance described by Z. and K. m. 131°). *Dioxides of 1,4-dimethylthiolbenzene*, sol. in PhMe, EtOH,  $C_6H_6$ , EtOAc and very sol. in  $H_2O$ ,  $\alpha$ , rhombic plates with oblique extinction, m. 183° (Z. and Frohneberg (*C. A.* 3, 2577) found 188°), forms a mercurichloride, silvery plates, sparingly sol.  $H_2O$ , m. 216° (decompn.);  $\beta$ , more sol. than  $\alpha$ , branching needles with oblique extinction, m. 136°, forms a mercurichloride, m. 188° (decompn.). IV. Di- and trisulfoxides of trimethylene trisulfide. *Ibid* 1929, 15-9.—Careful oxidation of pure trimethylene trisulfide by  $H_2O_2$  in  $Me_2CO$  yielded a monoxide (I), needles, m. 187°, shows a straight extinction and high double refraction and is sol. in warm  $H_2O$ , EtOH and  $Me_2CO$  but less sol. in cold  $H_2O$  or AcOH. Oxidation of I by the calcd. amt. of  $H_2O_2$  in AcOH yielded 3 cryst. substances, 2 of which were proven by direct interconversion to be polymorphs of an  $\alpha$ - or *trans*-disulfoxide (II) while the other was a distinct  $\beta$ - or *cis*-disulfoxide (III). The labile form of II, square plates, from  $H_2O$ , decomp. 220-80°, shows high double refraction and has an extinction angle of 16°. Its stable form, also from  $H_2O$ , forms stout monoclinic prisms with an extinction angle of 35°. III crystd. from  $H_2O$  in bundles of pointed needles having an extinction angle of 32° and decomp. 200-15°. Both II and III are sol. in AcOH. Further oxidation of II as before gave  $\alpha$ - or *cis*-*trans*-trimethylene trisulfoxide which crystd. from  $H_2O$  in bundles of radiating minute prisms with oblique extinction, decomp. 230-80°, and insol. in EtOH and  $Me_2CO$  but slightly sol. in AcOH and  $H_2O$ . Similar oxidation of III gave  $\beta$ - or *cis*-*cis*-trimethylene trisulfoxide, crystd. from  $H_2O$  in minute sep. prisms with an extinction angle of 32° and decomp. 220-60°, slightly sol. in EtOH,  $Me_2CO$  and other org. solvents but moderately sol. in AcOH and cold  $H_2O$ . Reduction of any of these oxides by Zn dust and HCl yielded the parent trimethylene trisulfide.

C. H. PEET

**Coupling arylsulfonanilides with diazo compounds.** M. BATTEGAY AND P. SCHNEIDER. *Chimie & industrie Special No.*, 497 (Feb., 1929).—The anilides derived from  $PhNH_2$ , *o*- and *m*-toluidine and *p*-xylylidine couple very easily in slightly alk. medium, always giving the *p*-aminoazo derivs. Coupling is not as clear nor as rapid with *p*-toluidide, the formation of the *o*-aminoazo dye being accompanied by evolution of N due to partial decompn. Asym. *m*-xylylidide gives no azo dye, but the corresponding diazoamino deriv. The behavior of these two amines when substituted in the *p*-position, leads to the supposition that *p*-substitution affects the coupling reaction, and that this position must be free in order to facilitate the formation of an azo deriv. This hypothesis was confirmed by all coupling expts. carried out on *p*-substituted anilides, particularly those that were sulfonated, the latter always giving rise to the formation of diazoamino derivs. *o*-Sulfonated *p*-toluidide, and even more so the corresponding asym. *m*-xylylidide, belong to the same group. Only the derivs. of the 2 naphthylamines regularly give aminoazo dyes.

A. PAPINEAU-COUTURE



**Action of bromine on toluenesulfonanilides.** M. BATTEGAY AND P. BESANZON. *Chimie & industrie Special No.*, 495-6 (Feb., 1929).—On the whole, 1 atom of Br is readily introduced into the mol., with formation of mono-Br derivs. Di-Br derivs. were obtained only in the case of the anilide, and tri-Br derivs. could not be obtained, the mol. apparently losing its stability and breaking down, under the action of the HBr formed, into polybrominated amine and  $p$ -MeC<sub>6</sub>H<sub>4</sub>SO<sub>2</sub>Br. Substitution of Br in the C<sub>6</sub>H<sub>5</sub> ring takes place according to the ordinary rules, being chiefly in the  $p$  position, and very little in the  $o$ -position. With  $o$ - and  $p$ -toluidides, monobromination takes place in the  $p$ - and  $o$ -positions, resp. Introduction of Br in the  $o$ -position relative to the SO<sub>2</sub>NHC<sub>6</sub>H<sub>7</sub> group decreases the stability of the bond between N and SO<sub>2</sub>. MeC<sub>6</sub>H<sub>4</sub>SO<sub>2</sub>NMeC<sub>6</sub>H<sub>7</sub> can be monobrominated at least as readily as the non-methylated compd., but the Br deriv. is much less stable and breaks down more easily in presence of excess Br. These results confirm the analogy brought out by Meyer between the SO<sub>2</sub>NHC<sub>6</sub>H<sub>7</sub> and OH groups, but shows a striking difference, since not more than 2 Br (and generally only 1) can be introduced into the mol. As Wieland (*C. A.* 16, 212) established an analogy between N<sub>2</sub>O<sub>4</sub> (to which he assigns the formula O<sub>2</sub>N.NO<sub>2</sub>) and halogens, the action of N<sub>2</sub>O<sub>4</sub> on toluenesulfonanilides was studied: primary arylsulfonanilides can form trinitro derivs. without breaking down of the mol.; secondary arylsulfonanilides offer considerable resistance to substitution and form only mononitro derivs., even in the presence of excess N<sub>2</sub>O<sub>4</sub>, but the mol. is not broken down.

A. PAPINEAU-COUTURE

**The process of reduction with esters of hydroxybenzenazoic acids.** E. PUX-EDOU. *Gazz. chim. ital.* 59, 212-8 (1929).—It would be expected that the reduction of a hydroxybenzenazoic acid would result in the formation of PhNH<sub>2</sub> and an aminohydroxy acid ester, thus:  $\text{HOC}_6\text{H}_3(\text{N}:\text{NPh})\text{CO}_2\text{R} + 2\text{H}_2 \rightarrow \text{HOC}_6\text{H}_3(\text{NH}_2)\text{CO}_2\text{R} + \text{PhNH}_2$ . However, in the expts. described in the present paper, this reaction did not take place, and instead there was cleavage or hydrolysis of the ester group, with formation of an aminohydroxy acid. A survey of the literature on the reduction of compds. similar to those used in the present expts., except for the absence of the N:NPh group, shows no such reaction except with PI<sub>3</sub> (cf. *Ann.* 133, 321), a much stronger reducing agent than the ones used by P. The anomaly in the present expts. probably depends therefore upon the influence of the N:NPh group. 2,5-HO(PhN:N)C<sub>6</sub>H<sub>3</sub>CO<sub>2</sub>Me (I) was prepd. by 2 different methods. (1) PhN:NCl (from 9.5 g. PhNH<sub>2</sub>, 25 cc. concd. HCl and 35 cc. of 20% NaNO<sub>2</sub>) added slowly to ice-cold  $o$ -HOC<sub>6</sub>H<sub>3</sub>CO<sub>2</sub>Me (15 g.) in 20% KOH (125 cc.) and the product recrystd. from EtOH, yields 70-80%. (2) 2,5-HO(PhN:N)C<sub>6</sub>H<sub>3</sub>CO<sub>2</sub>H (20 g.) refluxed 20 hr. with MeOH (200 g.) and concd. H<sub>2</sub>SO<sub>4</sub> (20 g.), cooled and the product recrystd. from EtOH gives a lower yield. Reduction was carried out with PhHNNH<sub>2</sub> (II) in the general way described in earlier expts. (cf. *Gazz. chim. ital.* 36, ii, 305 (1906); 37, i, 68 (1907)). I (12 g.) and II (12 g.) heated to 120°, let cool to 100° during several min. and reheated to 120° several times, the solidified mass washed with EtOH, and the residue recrystd. from water, yields 0.5-0.7 g. of 2,5-HO(H<sub>2</sub>N)C<sub>6</sub>H<sub>3</sub>CO<sub>2</sub>H (III). No 2,5-HO(H<sub>2</sub>N)C<sub>6</sub>H<sub>3</sub>CO<sub>2</sub>Me (IV) could be detected. Reduced with Sn and HCl in the ordinary way and the 2 HCl salts obtained as products decompd. by NaHCO<sub>3</sub>, II yields III (1.8-2.0 g. from 5 g. of II), while no IV could be detected. 2,5-HO(PhN:N)C<sub>6</sub>H<sub>3</sub>CO<sub>2</sub>Et (V) was prepd. by the same 2 methods used for I. Reduced with II, it yields III, the yield being lower than from I. Reduction with Sn and HCl gave a higher yield than did II. I (5 g.) in 20% KOH (50 cc.) agitated vigorously with Me<sub>2</sub>SO<sub>4</sub> (10 g.) and the ppt. recrystd. from EtOH, yields the *Me ether* of I, 2,5-MeO(PhN:N)C<sub>6</sub>H<sub>3</sub>CO<sub>2</sub>H, red-yellow, m. 66°, insol. in cold aq. alk. hydroxides. A better yield is obtained if Me<sub>2</sub>SO<sub>4</sub> is replaced by a mixt. of MeI and MeONa. In a similar way from V and Me<sub>2</sub>SO<sub>4</sub> or a mixt. of MeI and NaOMe was prepd. the *Me ether* of V, m. 64°, the yield being low. Following the usual procedure for coupling diazonium salts, 2,5-HO(PhN:N)C<sub>6</sub>H<sub>3</sub>CO<sub>2</sub>Ph (in cold KOH) forms 2-hydroxyazo derivs., a monoazo compd. which ppts. and a disazo compd. which remains in alk. soln. This soln. acidified and the ppt. recrystd. from EtOH yields *Ph benzenedisazoaldehyde* (VI), reddish yellow, m. 149°. VI (5 g.) reduced with II (12 g.), the product washed with Et<sub>2</sub>O and purified from water, yields 2,3,5-HO(H<sub>2</sub>N)<sub>3</sub>C<sub>6</sub>H<sub>2</sub>CO<sub>2</sub>H.

C. C. DAVIS

**Photochemical transformation of  $o$ -nitrobenzaldehyde.** RUDOLF WEGSCHEIDER. *Monatsh.* 52, 68-72 (1929).—The expts. of Weigert and Brodman (*Z. phys. Chem.* 120, 24 (1926); cf. *C. A.* 20, 547) on the photochem. transformation of  $o$ -O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>CHO in Me<sub>2</sub>CO are not consistent with the supposition that exactly 2 quanta are assocd. with 1 mol. of the end product,  $o$ -ONC<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>H. The differences between the calcd. and observed values may be explained by assuming a spontaneous inactivation of the

activated mol. in  $\text{Me}_2\text{CO}$ ; this supposition also explains the peculiar behavior of the solid aldehyde observed by Bowen, Hartley, Scott and Watts (C. A. 18, 3548).

C. J. WEST

**A comparative study of methyl- and ethylprotocatechualdehyde.** LVELL KLOTZ. *Am. J. Pharm.* 101, 442-7 (1929).—A comparison of color reactions of the 2 compds. showed that vanillin and ethylvanillin exhibit marked similarity in every instance. Results show that the reactions are due to either the HO or the CHO groups in every case. Substituted groups in the *m*-position have little or no effect on the color reactions of the homologs of vanillin. Reasons for the color changes of these compds. are interpreted according to the theories of Witt and Lewis.

W. G. GAESSLER

**The displacement of the aldehyde group in piperonal and its derivatives.** ALBERT H. PARIJS. *Thesis, Leiden, 1928*, 194 pp.—The displacement of CHO and  $\text{CO}_2\text{H}$  groups by  $\text{NO}_2$ , Cl and Br groups as shown by the literature is reviewed for hydroxybenzene, hydroxynaphthalene and pyrrole derivs. Nitration of 25 g of piperonal yielded 5 g. of 6,3,4- $\text{O}_2\text{N}(\text{CH}_2\text{O})_2\text{C}_6\text{H}_2\text{CHO}$  (I), m. 147°, and 26.4 g. of 1,2,4- $\text{C}_6\text{H}_3(\text{NO}_2)(\text{O}_2\text{CH}_2)$ , m. 95.5° (II). Derivs. of I prep'd. were the diacetate, m. 142°, with  $\text{Ac}_2\text{O}$ ; 6,6'-dinitro-3,4,3',4'-bis[methylenedioxy]benzalazine, m. 257° (decompn.), with  $\text{N}_2\text{H}_4$ ; phenylhydrazone, m. 218.5° (decompn.); *p*-nitrophenylhydrazone, m. 245° (decompn.); semicarbazone, m. 272.5-278° (decompn.);  $\text{NH}_2\text{NHCOCONH}_2$  deriv., m. 325° (decompn.); 5 g. of I on nitration yielded 4.5 g. of 4,5,1,2- $\text{C}_6\text{H}_2(\text{NO}_2)_2(\text{O}_2\text{CH}_2)$  (III), m. 100°. Treatment of III with  $\text{NH}_3$  or amines yielded products in which a  $\text{NO}_2$  group was substituted. The following 4-nitropyrocatechol methylene ethers were prep'd.: 5-amino, m. 196-7°; 5-methylamino, m. 171°; 5-ethylamino, m. 133°; 5-propylamino, m. 115°; 5-butylamino, m. 137°; 5-amylamino, m. 95°; 5-heptylamino, m. 79°; 5-dimethylamino, m. 98°. 1 g. III in MeOH treated with 0.566 g.  $\text{Na}_2\text{S} \cdot 9\text{H}_2\text{O}$  yielded 6,6'-dinitro-3,4,3',4'-dimethylenetetraxydiphenyl sulfide, m. 234°, transition temp. 215-220° to an orange form.  $\text{Na}_2\text{S}_2$  with III yielded a disulfide, m. 266°. Piperonal (25 g.) on chlorination yielded 19 g. 6-chloropiperonal (IV), m. 115°, and 2.5 g. of 4,5-dichloropyrocatechol methylene ether, m. 82°. The derivs. of IV prep'd. were the following: diacetate, m. 133°; benzalazine, m. 303° (decompn.); phenylhydrazone, m. 117-8°; *p*-nitrophenylhydrazone, m. 281-2° (decompn.); semicarbazone, m. 280° (decompn.); semioxamazone, m. 299° (decompn.); 8 g. of IV on nitration yields 7 g. of 4-nitro-5-chloropyrocatechol methylene ether, m. 70°, which on reduction yields an amine, m. 254-5° (decompn.). IV on treatment with amines yields the same compds. as III: treatment with  $\text{Na}_2\text{S}$  or  $\text{Na}_2\text{S}_2$  yields the same disulfide as obtained with  $\text{Na}_2\text{S}_2$  on III. Bromination of 50 g. of piperonal yielded 28.5 g. of 6-bromopiperonal (V), m. 129°, and 4.5 g. of 4,5-dibromopyrocatechol methylene ether, m. 85°. Derivs. of V prep'd. were: diacetate, m. 128°; benzalazine, m. 249-52° (decompn.); *p*-nitrophenylhydrazone, m. 253° (decompn.); semicarbazone, m. 230° (decompn.); semioxamazone, m. 278.9° (decompn.). Nitration of 3 g. of V yielded 3 g. of 4-nitro-5-bromopyrocatechol methylene ether (VI), m. 89°.  $\text{Na}_2\text{S}$  and  $\text{Na}_2\text{S}_2$  with V yielded the same diphenyl disulfide as III and IV. Nitration of 4 g. of VI yielded 4.5 g. of 3,4-dinitro-5-bromopyrocatechol methylene ether, m. 172°. VII with alc.  $\text{MeNH}_2$  gives 35% of 3-nitro-1-methylamino-5-bromopyrocatechol methylene ether, m. 67° (decompn.). Treatment of 4 g. of the diacetate of II with  $\text{HNO}_3$  at a low temp. opens the  $\text{CH}_2\text{O}_2$  ring and yields 2.5 g. of 6,3,4- $\text{O}_2\text{N}(\text{HO})_2\text{C}_6\text{H}_2\text{CHO}$  (VIII), m. 203° (decompn.). Derivs. of VIII prep'd. were: benzalazine, m. 278° (decompn.); semicarbazone, m. 254° (decompn.); phenylhydrazone, m. 203° (decompn.); *p*-nitrophenylhydrazone, m. 290° (decompn.). Three g. of V with  $\text{HNO}_3$  yielded 2 g. of 6,3,4-Br(HO) $_2\text{C}_6\text{H}_2\text{CHO}$  (IX), m. 220°. Derivs. of IX prep'd. were: benzalazine, m. 251° (decompn.); semicarbazone, m. 239°; *p*-nitrophenylhydrazone, m. 243° (decompn.). Fifteen g. of piperonal treated with 2.5 g. of Na in abs. MeOH yielded 3.5 g. of piperonyl alc. and 5 g. of piperonylic acid. The MeONa in this reaction behaves as NaOH in the Cannizzaro reaction. 1.5 g. of III treated with 0.15 g. Na in abs. MeOH yields 1 g. of 4,5-dinitropyrocatechol, m. 177°. III with EtONa yielded 2,4,5-EtO( $\text{O}_2\text{N}$ ) $_2\text{C}_6\text{H}_2\text{OH}$ , m. 113°. Nitration of *o*- $\text{C}_6\text{H}_4(\text{OMe})_2$  gave quantitatively 4-nitroveratrole, m. 96°, which on further nitration gave 90% of 4,5-dinitroveratrole (X), m. 131°. One g. of X with 0.65 cc.  $\text{NH}_3$  (d. 0.91) in 6 cc. MeOH yields 0.6 g. 4-nitro-5-amino-1,2-dimethoxybenzene (XI), m. 175°. XI yields an Ac deriv., m. 198.5°. Other amines used to replace one of the  $\text{NO}_2$  groups of X yielded the following homologs: 5-methylamino, m. 146°; 5-ethylamino, m. 174-5°; 5-propylamino, m. 141-2°; 5-butylamino, m. 114°; 5-amylamino, m. 130-1°. Two  $\text{C}_6\text{H}_3(\text{NO}_2)(\text{OMe})_2$  and 2,4,5-trinitro-1,2-dimethoxybenzene yielded 6,6'-diphenylsulfide, m. 220-220.5°, while the corresponding disulfide, m. 212° (decompn.)

is obtained with  $\text{Na}_2\text{S}_2$ . The reaction velocities of the action of  $\text{NaOMe}$  on dinitro compds., represented by the reaction,  $\text{XNO}_2 + \text{MeONa} = \text{XOMe} + \text{NaNO}_2$ , was studied for *p*-(XII), and *o*- $\text{C}_6\text{H}_4(\text{NO}_2)_2$  (XIII), and X.  $K_{25}$  (reaction velocity const.) for XII was found to be 0.0219, checking Steger's value of 0.0221. For XIII,  $K_{25} = 0.0242$ ,  $K_{45} = 0.069$ ; for X,  $K_{25} = 0.0029$ ,  $K_{45} = 0.0088$ . ARTHUR FLEISCHER

**Alkalines. II. Formation of secondary amino alcohols from aldioximes. I.** S. KANAO. *J. Pharm. Soc. Japan* 49, 157-70(1929); Abstract sect. 26-32.—In order to obtain secondary bases from primary amino alcs. for studying the relation of structure to physiol. action of alkalines, nitro alcs. were reduced to hydroxyamino alcs., and the latter were converted into aldioximes by means of aldehydes. By reducing the aldioximes with Zn and  $\text{AcOH}$ , the desired amino alcs. were obtained. This method of reduction is of value in the reduction of compds. where alk. reduction cannot be used, i. e., as in the case of 34-( $\text{HO}$ ) $\text{C}_6\text{H}_4\text{CH}_2$  derivs. Most of the aldioximes thus obtained were cryst. but they were generally unstable, especially enanth- and citraldioximes. By boiling with dil. mineral acids they decomp. into the corresponding hydroxylamine and aldehyde. Aliphatic aldioximes were more easily reduced than aromatic aldioximes. Alkylated secondary bases of the phenylpropanol series and their oxalates were obtained in good cryst. form, but their  $\text{HCl}$  salts, chloroaurates and chloroplatinates could not be crystd., while most of the alkylated secondary bases and their salts were obtained in good cryst. form. Reduction of  $\text{PhCH}(\text{OH})\text{CH}(\text{NO}_2)\text{Me}$  (I) with Zn and  $\text{AcOH}$  gave  $\text{PhCH}(\text{OH})\text{CH}(\text{NHOH})\text{Me}$  (II), m. 78-9° (yield 60%). Bz deriv., m. 180-1°. II and  $\text{HCHO}$  gave 1-phenyl-2-[methylenecoximino]-1-propanol (III), m. 139°. By catg. the residue of the mother liquor of III with  $\text{C}_6\text{H}_6$ -petroleum ether mixt. the isomer of III, m. 106°, was obtained. Further reduction of I with Zn and  $\text{AcOH}$  in presence of  $\text{MeCHO}$  and  $\text{CuSO}_4$  gave 1-phenyl-2-ethylamino-1-propanol, m. 86° (isolated as the oxalate, decomp. 223°). I,  $\text{Me}_2\text{CHCH}_2\text{CHO}$ , Zn and  $\text{AcOH}$  gave 1-phenyl-2-[isomethylideneoximino]-1-propanol (IV), m. 128°. Further reduction of IV with the aid of  $\text{CuSO}_4$  gave 1-phenyl-2-isomethylamino-1-propanol, b<sub>18</sub> 176°, m. about 50-60° (isolated as  $\text{HCl}$  salt, m. 209-10° (decompn.)). I,  $\text{Me}(\text{CH}_2)_2\text{CHO}$ , Zn and  $\text{AcOH}$  gave 1-phenyl-2-[methylideneoximino]-1-propanol (V), m. 119°. Further reduction with the aid of  $\text{CuSO}_4$  gave 1-phenyl-2-heptylamino-1-propanol (VI), m. 67° (isolated as the  $\text{HCl}$  salt, m. 229°). From the mother liquor of VI, the isomer of VI was isolated as its  $\text{HCl}$  salt, m. 189°. Oxalate, m. 217-8° (decompn.). Chloroaurate, m. 169° (decompn.). I,  $\text{BzH}$ , Zn and  $\text{AcOH}$  gave 1-phenyl-2-[benzylideneoximino]-1-propanol (VII), m. 140°. Further reduction gave 1-phenyl-2-benzylamino-1-propanol, m. 99° (isolated as the oxalate, m. 193°). I, *o*- $\text{HOCH}_2\text{H}_2\text{CHO}$ , Zn and  $\text{AcOH}$  gave 1-phenyl-2-[*o*-hydroxybenzylideneoximino]-1-propanol (VIII) which on further reduction with the same reagents gave the corresponding hydroxybenzylamino compd., m. 117.5°. Oxalate, m. 172° (decompn.); bioxalate, contains 2.5 mols  $\text{H}_2\text{O}$  of crystn. and m. 83° (anhyd., m. 110°). Cu compd., m. 220° (decompn.). I, 2,3- $\text{HO}(\text{MeO})\text{C}_6\text{H}_3\text{CHO}$ , Zn and  $\text{AcOH}$  gave 1-phenyl-2-*o*-vanillylamino-1-propanol, m. 127°. Oxalate, softens 85°, m. 149° (decompn.). Cu compd., m. 166° (decompn.). I, 3,4- $\text{MeO}(\text{HO})\text{C}_6\text{H}_3\text{CHO}$ , Zn and  $\text{AcOH}$  gave 1-phenyl-2-[vanillylideneoximino]-1-propanol, m. 123-4°. Further reduction gave the corresponding vanillylamino compd., m. 144°. Oxalate, m. 197°. I,  $\text{CH}_2\text{O}_2$ - $\text{C}_6\text{H}_4\text{CHO}$ , Zn and  $\text{AcOH}$  gave 1-phenyl-2-[piperonylideneoximino]-1-propanol, m. 138°. Further reduction gave the piperonylamino deriv., m. 85.5° (isolated as the oxalate, m. 206° (decompn.)). 1-Phenyl-2-[3,4-dihydroxybenzylideneoximino]-1-propanol, m. 203° (decompn.) (from I and 3,4-( $\text{HO}$ ) $\text{C}_6\text{H}_3\text{CHO}$ ). 3,4-Dihydroxybenzylamino compd., m. 171° (decompn.). 1-Phenyl-2-[furfurylideneoximino]-1-propanol (IX), m. 150° (from I and  $\text{C}_6\text{H}_5\text{OCHO}$ ). From the mother liquor of IX the isomer of IX, m. 116°, was isolated. Furfurylamino deriv. of IX (X), m. 87°. Oxalate, m. 194.5°. The isomer of X, m. 188° (decompn.). 1-Phenyl-2-[citrylideneoximino]-1-propanol (XI), m. 155-6° (from I and  $\text{Me}_2\text{C}:\text{CH}(\text{CH}_2)_2\text{CMeC}:\text{CHCHO}$ ). Isomer of XI, m. 128°. The  $\text{HCl}$  salt of the citrylamino compd. of XI has a strong local anaesthetic action. N. U.

A homolog of ephedrine. J. SAEM DE BURNAGA SANCHEZ. *Bull. soc. chim.* [4], 45, 284-6(1929).—*p*-Tolyl- $\alpha$ -methylaminoethylcarbinol (methylephedrine) was prepd. and its physiol. properties studied (cf. Adams, C. A. 22, 3154). The *p*-methylephedrine has a weaker hypertensive action than ephedrine. WALLACE R. BRODE

Condensation of aromatic aldehydes with glycine and acetylglycine. H. D. DAKIN. *J. Biol. Chem.* 82, 439-46(1929).—The condensation referred to in the title is complicated by a competing reaction between  $\text{CH}_2(\text{NH}_2)\text{CO}_2\text{H}$  and  $\text{BzH}$ , forming a non-acetylated deriv. possibly of a type resembling a Schiff base. The 2 reactions are shown thus: (1)  $\text{H}_2\text{NCH}_2\text{CO}_2\text{H} \rightarrow \text{AcNHCH}_2\text{CO}_2\text{H} \rightarrow \text{MeC}:\text{N}:\text{C}:(\text{CHPh})\text{CO}_2\text{H}$

→ MeCONHC(:CHPh)CO<sub>2</sub>H. (2) HO<sub>2</sub>CCH<sub>2</sub>NH<sub>2</sub> + BzH → HO<sub>2</sub>CCH<sub>2</sub>NHCHPh (I) or O.CO.CH<sub>2</sub>.NH.CHPh. I may be called benzylideneglycine and was

isolated and analyzed. Because the 2nd condensation product is a non-acetylated compd. its formation can be largely suppressed by acetylating the glycine before the reaction. Correspondingly larger yields of the azlactone of α-acetamidocinnamic acid were obtained. Acetylation was most easily effected by warming glycine suspended in 3 parts of glacial AcOH with the theoretical amt. of Ac<sub>2</sub>O until soln. was obtained. A variety of aldehydes was used although the product from salicyl aldehyde was the most interesting. AcOC<sub>6</sub>H<sub>4</sub>CH:C.N:CMc.O.CO (II) → HOC<sub>6</sub>H<sub>4</sub>

CH:C(NHAc)CO<sub>2</sub>H (III). - O.C<sub>6</sub>H<sub>4</sub>.CH:C(NHAc).CO (IV). II on treating with

alkali and subsequent acidification forms the transient III which quickly passes over to IV. Detailed exptl. data are given.

**cis-trans-Isomerism and steric hindrance.** VIII. Monomethyl *o*-hexahydrophthalates. G. VAVON AND P. PEIGNIER. *Bull. soc. chim.* 45, 299-302(1929).—The *cis*- (I) and *trans*-mono-Me *o*-hexahydrophthalates (II) were prepd. Esterification of I with MeOH goes 1.4 times slower than that of II. Sapon. of I goes 5-10 times slower than that of II.

**Hexahydro-*o*-phthalic acids.** G. VAVON AND P. PEIGNIER. *Bull. soc. chim.* 45, 293-9(1929).—Hydrogenation of mono-Me *o*-phthalate with Pt black as catalyst gives *cis*-hexahydrophthalate (I). The *l*-rotatory isomer of I (m. 148-9°, [α]<sub>D</sub><sup>20</sup> 6.67°, *c* 0.1 in EtOH) gives on sapon. an inactive acid. The *l*-rotatory *cis*-hexahydrophthalamide ([α]<sub>D</sub><sup>20</sup> -15.4°, *c* 0.02 in EtOH), isolated by means of the quinine salt, gives on heating an inactive imide.

**Configuration determinations in the terpene series.** II. The optically active forms of β-isopropyladipic acid and their relation to the optically active limonenes. JULIUS V. BRAUN AND GEORG WERNER. *Ber.* 62B, 1050-8(1929); cf. *C. A.* 20, 2990.—It was shown in the 1st paper that the configuration of the C atom carrying the Me group in the natural *d*-rotatory citronellal, the *d*-rotatory citronellol, pulegone, the *d*-rotatory menthone and *l*-rotatory menthol is the same and corresponds to that of the *d*-rotatory pyrotartaric (I) and of the *d*-rotatory β-methyladipic acid (II) when the formulas of these compds. are so written that the valence to the O-contg. part of the mol. (or the nearer CO<sub>2</sub>H group in the case of II) of the asym. C atom corresponds to that through which in I the CO<sub>2</sub>H group is held. This was shown by establishing the genetic relationship between I and the II which is obtained by the oxidative degradation of some of these compds. It is probable, although not definitely proved, that this configuration corresponds to that of *d*-tartaric acid and the prefix *d*- is accordingly used for the Me-carrying C atom in this series of compds. These results gave rise to the desire to det. whether there is a similar simple relationship as regards another asym. C atom often occurring in this class of compds., viz., the C atom, usually in the 4-, more rarely in the 3-position to the CHMe group, carrying the iso-Pr or isopropenyl residue, and which either alone (as in limonene, carvone, diosphenol, silvestrene) or together with the CHMe group (as in menthone) conditions the optical activity. It is known that in some cases this C atom can be oxidized out as isopropylsuccinic acid and in others as β-isopropyladipic acid (III). Here, however, the problem was much more difficult, for there were in general no exact data in the literature on the optical activity of the 2 expected iso-Pr-contg. di-CO<sub>2</sub>H acids, on the *d*- and *l*-forms prepd. artificially by resolution of the *dl*-forms and, naturally, on the genetic relationship between the tartaric acids and these acids; finally, the inactive III is extraordinarily difficultly available. The 1st problem attacked, therefore, was that of prep. III in sufficient quantities. A repetition of Blanc's work convinced v. B. and W. that this method would not be practical but the fact that *p*-methylcyclohexanol readily yields II on oxidation suggested the use of *p*-isopropylcyclohexanol (IV) as the starting material. *p*-iso-PrC<sub>6</sub>H<sub>4</sub>OH was readily hydrogenated with Ni at 150° to IV and this, after some experimenting to det. the proper conditions, was converted with satisfactory yield into III which by means of strychnine was resolved into the *d*-rotatory form with max. rotation and the *l*-rotatory form with not quite a const. final rotation. To oxidize the optically active 4-C atom out of limonene the 8,9-double bond naturally had first to be eliminated. This, it was found, could not be effected by adding HCl, for extensive racemization occurred in the process and by varying the length of the HCl treatment hydrochlorolimonenes with widely different rotations could be obtained. On the other hand, the dihydrolimonene (V) obtained by hydrogenation of pure *d*-rotatory

limonene with  $H_2$  and Pt gave an optically active *ketoaldehyde* (VI) and *keto acid* (VII) and the latter finally yielded a *III* with the same rotation as that obtained by resolution of the *dl*-form. On the very probable assumption that, like the *d*-rotatory II, it belongs to the *d*-series, the *d*-rotatory hydrocarbon would then be represented by the symbol *d*(+)-limonene. *dl*-III, obtained in 50% yield from IV (in not more than 10 g. portions) shaken 8–10 hrs. below  $10^\circ$  with 3 parts  $KMnO_4$  and 0.5 part KOH in not quite 100 parts  $H_2O$ ,  $b_{12}$  215–8°, m.  $75^\circ$ ; *di-Ester*,  $b_{12}$  145–50°,  $d_4^{20}$  0.9776. *Strychnine salt* of (+)-acid, m.  $182^\circ$ ; *Na salt*,  $[\alpha]_D^{20}$  5.4°; free acid, m.  $66^\circ$ . (–)-Acid, m. around  $60^\circ$ ; *Na salt*,  $[\alpha]_D^{20}$  –4.1°. *Chloride* of the (+)-acid, prepd. with cold  $SOCl_2$ ,  $b_{12}$  145–6°,  $d_4^{20}$  1.1023,  $[\alpha]_D^{20}$  1.134°; *amide*, m.  $169.5^\circ$ ,  $[\alpha]_D^{20}$  9.5° (2.22% aq. soln.); *Et ester*, prepd. with HCl and alc.,  $b_{12}$  145–50°,  $d_4^{20}$  0.9776,  $[\alpha]_D^{20}$  –1.534° (no solvent). With HCl very carefully dried with  $H_2SO_4$  and  $P_2O_5$  v. B. and W. obtained, after satg. limonene in  $CS_2$  for 6 hrs., an analytically pure HCl addn. product,  $b_{12}$  100–1°, with  $[\alpha]_D^{20}$  75.8°; after 8 hrs.  $[\alpha]_D^{20}$  was  $54^\circ$ , after 24 hrs. treatment with a current of HCl, standing another 2 days under HCl pressure and again treating 5 hrs. with HCl it was  $33^\circ$ . The V,  $[\alpha]_{578}^{20}$  118°, was obtained by Vavon's method (Pd, either on charcoal or colloidal in gum arabic, instead of Pt gave a mixt. of unchanged limonene and the di- and tetrahydro derivs.). VI, from V and 3%  $O_3$  in 4 parts AcOH (yield, more than 60%),  $b_{12}$  130–2°,  $d_4^{20}$  0.9393,  $[\alpha]_D^{20}$  –6.97°; *semicarbazone*, m.  $182-3^\circ$ . VII, from VI and cold aq.  $KMnO_4$  (somewhat more than 1 atom O; yield, 75%), thick yellowish oil,  $b_{12}$  188°,  $d_4^{20}$  1.020,  $[\alpha]_D^{20}$  2.5°, gives (+)-III with ice-cold NaOBr (6 atoms Br). C. A. R.

**Some physical properties of nitrophenols.** LOUIS DEVERGNE. *Rev. chim. ind.* 38, 66–9(1929); cf. C. A. 21, 3607.—2,4,6-Trinitro-*m*-cresol recrystd. from  $C_6H_5.HNO_3$  and washed with EtOH and  $CHCl_3$ , m.  $106.47^\circ$ ; soly. in  $H_2O$  at  $17.5^\circ$  0.2372, at  $50^\circ$  0.5662, at  $100^\circ$  2.165; soly. (at  $17^\circ$  and  $50^\circ$ ) in AcOEt 37.269, 76.52;  $Me_2CO$  94.810, 197.43; MeOH 11.772, 43.15; 96% EtOH 5.535, 18.05; abs. alc. 6.174, 18.53;  $C_6H_6$  13.497, 56.10;  $CHCl_3$  3.568, 15.67;  $C_6H_5N$  11.608, 25.15;  $CCl_4$  0.173, 1.08;  $C_7H_8$  14.404, 47.50; anhyd.  $Et_2O$  4.423 at  $17^\circ$ , 6.81 at  $34^\circ$ ;  $CS_2$  0.078 at  $17^\circ$ , 0.34 at  $36^\circ$ ; in contact with  $C_6H_5N$  there is a slight rise in temp. with formation of canary-yellow crystals, m.  $112-3^\circ$ , slightly sol. in  $H_2O$  and EtOH, insol. in cold  $C_6H_6$  and almost insol. in boiling  $C_6H_6$ ; the analysis corresponds with the formula  $2,4,6-(O_2N)_3C_6H(OH)Me$ .— $C_6H_5N$ . 3,5-Dinitroanisole, prepd. by the action of MeONa on 1,3,5- $(O_2N)_3C_6H_3$ , m.  $104.7^\circ$ ; recrystd. from  $HNO_3$  and washed it solidifies (3 detns.) at  $105.48^\circ$ ,  $105.50^\circ$ ; soly. in  $H_2O$  at  $25^\circ$  0.003, at  $50^\circ$  0.006, at  $100^\circ$  0.182, no trace of sapon. after 1 hr. boiling; soly. (at  $20^\circ$ ) in AcOEt 11.132,  $Me_2CO$  22.333; 96% EtOH 0.563; abs. alc. 0.705, MeOH 1.193;  $C_6H_6$  10.404;  $CHCl_3$  14.836; anhyd.  $Et_2O$  2.988;  $C_6H_5N$  18.850;  $CS_2$  0.728;  $CCl_4$  0.728;  $C_7H_8$  10.540. 2,3,5-Trinitroanisole recrystd. from  $HNO_3$ , washed with EtOH, solidifies at  $106.80^\circ$ ; soly. in  $H_2O$  at  $18^\circ$  (48 hrs.) 0.011; at  $50^\circ$  (24 hrs.) 0.052; at  $100^\circ$  (30 min.) 0.278; the  $H_2O$  soln. is yellow due to the splitting of MeOH and formation of  $(O_2N)_3C_6H_2OH$ ; soly. at  $25^\circ$ : AcOEt 47.756;  $Me_2CO$  135.385; 96% alc. EtOH 2.341; abs. alc. 2.571; MeOH 5.533;  $C_6H_6$  18.036;  $CHCl_3$  3.618; anhyd.  $Et_2O$  3.478;  $C_6H_5N$  20.398;  $CS_2$  0.297;  $CCl_4$  0.268;  $C_7H_8$  20.582; with  $C_6H_5N$  it gives an intense red color with rise of temp., then a ppt.; this is partly sol. in  $H_2O$  with deep orange color. 2,3,5,6-Tetranitroanisole gives white crystals when recrystd. from  $HNO_3$ , it solidifies at (3 detns.)  $153^\circ$ ,  $153.5^\circ$ ,  $153.5^\circ$ ; soly. in  $H_2O$  at  $27^\circ$  (48 hrs.) 0.0075; at  $50^\circ$  (24 hrs.) 0.022; at  $100^\circ$  (1 hr.) 0.139; the water soln. is colored due to splitting of MeNO<sub>2</sub> and formation of  $(O_2N)_3C_6H_2OH$ ; soly. at  $29^\circ$ : AcOEt 37.001;  $Me_2CO$  101.148; 96% EtOH 1.875; abs. alc. 2.376; MeOH 4.394;  $C_6H_6$  1.551;  $CHCl_3$  0.787; anhyd.  $Et_2O$  1.656;  $CS_2$  0.077;  $CCl_4$  0.068;  $C_7H_8$  1.019, a slight sapon. takes place with MeOH, EtOH and  $Me_2CO$  and the soln. is canary yellow. With  $C_6H_5N$  a deep red soln. results with strong evolution of N oxides; after evapn. of  $C_6H_5N$  a blood-red residue, sol. in 95% alc. and somewhat in  $H_2O$ , is left.

P. THOMASSET

**Formation and cleavage of glucosides as a method for the chemical and biochemical separation of racemic alcohols into their optically active forms.** C. NEUBERG, K. P. JACOBSON AND J. WAGNER. *Fermentforschung* 10, 491–531(1929).—A new method for the resolution of *dl*-alcs. into their optically active components consists in the prepn. of glucosides and sepn. of these by crystn. In the formation of glucosides between an individual glucose, e. g., the  $\alpha$ - or  $\beta$ -form of *d*-glucose, and the *dl*-alc., the *d*-alkyl *d*-glucoside and the *l*-alkyl *d*-glucoside are not enantiomorphs, but diastereomers with different velocities of formation. This is easily demonstrated by the optical activity of the unreacted alc. remaining when the glucosidification is interrupted before completion. The condensation is performed by treatment of the *dl*-alc. in  $Et_2O$  with

acetobromoglucose in the presence of  $\text{Ag}_2\text{CO}_3$  or quinoline as a condensing agent. Contrary to the prevalent notion, a large excess of the alc. is not necessary. It is thus possible to effect a sepn. into an optically active residual alc. and a glucoside containing the optical isomer which may be recovered by non-specific hydrolysis. This sepn. was demonstrated in the case of *dl*-borneol and *dl*-menthol.  $\text{Ag}_2\text{CO}_3$  leads to formation of  $\beta$ -glucosides, while the quinoline condensation gives both  $\alpha$ - and  $\beta$ -glucosides. In the latter instance the distribution of alc. between  $\alpha$ - and  $\beta$ -glucose is specific. With *dl*-menthol the *d*-form yields a  $\beta$ -glucoside and the *l*-form an  $\alpha$ -glucoside. The  $\beta$ -glucoside thus obtained underwent 100% cleavage by emulsin from almonds, the  $\alpha$ -glucoside 100% cleavage by  $\alpha$ -glucosidase (maltase) from yeast, but with mixts. the reverse order no cleavage occurred. The sepn. of the *dl*-alc. component was not a matter of fractional crystn. After crystg. out the *d*-menthyl  $\beta$ -glucoside tetraacetate the mother liquor yielded the *l*-menthyl  $\alpha$ -glucoside, but no further glucoside was present in the 2nd mother liquor. In other words, the fractionation that would have been required for resolution of a partially racemic mixt. was not employed. The actual resolution had occurred during the process of glucoside formation. With  $\text{Ag}_2\text{CO}_3$ , *dl*-PrMeCHOH formed only the partially racemic glucoside, the resolution of which required continued fractionation. Neither the unreacted alc. recovered by steam distn. nor the alc. obtained by acid hydrolysis of the glucoside was optically active. The racemic mixt. obtained by mixing equal parts of *d*-bornyl  $\beta$ -glucoside and *l*-bornyl  $\beta$ -glucoside can be sepd. by fractional crystn. so that one fraction when hydrolyzed by mineral acid yields *d*-borneol and the other *l*-borneol. The tetraacetate of *dl*-menthyl  $\beta$ -*d*-glucoside can be resolved in this manner, but the sepn. of the free *dl*-menthyl  $\beta$ -*d*-glucoside into its isomers was unsuccessful. Both *dl*-amyl glucoside and its tetra-Ac deriv. may be resolved by fractional crystn. In the biochem. cleavage of the  $\beta$ -glucosides by the appropriate enzyme the *d*- and *l*-alcs. are split off at different rates. Hydrolysis by emulsin yields first *d*-, then *l*-menthol, first *l*-, then *d*-borneol first *l*-, then *d*-PrMeCHOH.

A. W. DOX

**Camphoroglucuronic acid and synthesis of hydroxycamphor glucoside.** M. ISHIDA. *J. Pharm. Soc. Japan* **49**, 336-46 (1929).—On the basis of the previous work by Asahina and I. (C. A. **22**, 2161, 3406), *d*-camphor (I) in the animal body is considered to take the following route. I is first oxidized mostly to *p*(5)-hydroxycamphor (II) and partly to *o*( $\alpha$ )-hydroxycamphor (III). II and III then combine with glucose and form *p*- and *o*-hydroxycamphor glucoside (IV and V) and are finally eliminated in the urine as *p*- and *o*-hydroxycamphoroglucuronic acids (VI and VII), resp. In order to det. whether Schmiedeberg and Meyer's (*Z. physiol. Chem.* **3**, 422) *d*-camphoroglucuronic acid (m. 128-30°) and Magnus-Levy's (*C. A.* **1**, 877) *p*-hydroxycamphoroglucuronic acid (m. 120-30°) have the same structure represented by either IV or V, the glucuronic acid mixt. was prepd. according to L.'s method. By purification with strychnine, only one kind of *cryst. salt*, m. 190-5°, was obtained. The free acid proved to be VI, m. 138°,  $[\alpha]_D^{15}$  -23.08° (anhyd.), m. 130° (hydrated). Neither the strychnine salt of VII nor the free acid could be crystd. They were detected in small amt. in the mother liquor from VI. Contrary to the statement by S. and M., VI and mentholglucuronic acid could be hydrolyzed by means of emulsin if the proper conditions were maintained, i. e., in the presence of a buffer, at  $p_H$  5-6 and 35°. Syntheses of IV and V and another glucoside having Manasse's  $\beta$ -hydroxycamphor (VIII) (*Ber.* **35**, 3816) as its aglycone were accomplished. II, from camphorol, acetobromoglucose and  $\text{Ag}_2\text{CO}_3$  in Et<sub>2</sub>O (Fischer's method) gave tetraacetyl-*p*-hydroxycamphor glucoside (IX), softens 142-3°, m. 147-8°,  $[\alpha]_D^{17.5}$  -11.7° (in C<sub>6</sub>H<sub>6</sub>). Oxime, m. 135-6°. Hydrolysis of IX with Ba(OH)<sub>2</sub> in dil. EtOH gave IV, which could not be crystd. except in a desiccator under reduced pressure. III and VIII were sepd. from their mixt. by the MeOH-HCl method (Bredt, Ahrens and Menniken, *C. A.* **20**, 2157). III, acetobromoglucose and  $\text{Ag}_2\text{O}$  gave tetraacetyl- $\alpha$ -hydroxycamphor glucoside (X), m. 192-3°,  $[\alpha]_D^{25}$  -62.2° (oxime, m. 182-3°. Hydrolysis of X with Ba(OH)<sub>2</sub> gave the free glucoside (V), m. 82-3°,  $[\alpha]_D^{19}$  -6.1° (hydrated), m. 113-4° (anhyd. compd.). Tetraacetyl- $\beta$ -hydroxycamphor glucoside (XI), m. 152-3°,  $[\alpha]_D^{18.5}$  12.1°, was obtained in the same way with VIII as its aglycone. Semicarbazone, m. 116-7°. Sapon. of XI gave the free glucoside, m. 86-8° (decompn.),  $[\alpha]_D^{19}$  -13.7°. Due to negative reactions for the CO group in VIII and its alkyl ethers, Karrer (*C. A.* **19**, 2333) and Bredt (*C. A.* **20**, 2157) proposed a cycloacetal structure for them, but the ease of formation of the semicarbazone in XI shows that it has a free CO group and a cycloacetal structure is not necessary for XI or VIII.

NAO UYEH


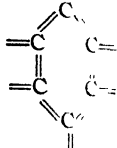
**Camphorone. I. Action of hydroxylamine.** G. SANNA. *Gazz. chim. ital.* **59**, 232 43(1929).—Though the action of  $\text{NH}_4\text{OH}$  (I) on camphorone (II) has been studied by several investigators, the results have been uncertain and the constitution of the compds. which were obtained have been in doubt (cf. Koenings and Eppens, *Ber.* **25**, 260(1892); **26**, 810(1893); Harries and Maftus, *Ber.* **32**, 1343(1899); Kerp and Muller, *Ann.* **290**, 143; Wallach, *Ann.* **331**, 318; Harries, *Gazz. chim. ital.* **39**, ii, 2(1909)). This induced S. to undertake a study of this reaction and allied reactions, the initial results of which are described in the present paper. New derivs. were prepd., the formation of which added a new exptl. confirmation of the theory of Harries (*Gazz. chim. ital.* **39**, ii, 2(1909)), and also gave an indirect proof of the constitution of II and its relation to pulegone. One of the new compds. represents the 1st example of a di-oxime among alicyclic ketones with a pentagonal nucleus. The I deriv. (III) of II described by Harries was prepd. according to his directions and was found to m.  $120^\circ$ . It reduces warm Fehling soln., gives a blue color with yellow  $\text{HgO}$  (characteristic of  $\text{NH}_4\text{OH}$  derivs. with the group on a tertiary C atom in  $\beta$ -position with respect to CO). (CO II), added to III (equimol. parts each in abs.  $\text{Et}_2\text{O}$ ) ppts. the oxalate of III, m.  $154^\circ$ . III in MeOH let stand several days with semicarbazide in dil. AcOH, filtered and the residue recrystd. from dil. MeOH, yields the semicarbazone of III,  $\text{C}_{16}\text{H}_{20}\text{O}_2\text{N}_4$ , decomp.  $190^\circ$ , reduces warm Fehling soln., gives a blue color with yellow  $\text{HgO}$ . Concd.  $\text{HNO}_3$  (d. 1.4) added dropwise to III (1 g.) in cold 26%  $\text{HNO}_3$  (5 cc. of d. 1.16) until  $\text{NO}_2$  vapors are no longer evolved, and until the mixt. no longer reduces Fehling soln., let stand several hrs., extd. with  $\text{C}_6\text{H}_6$ , and the ext. evapd., yields a nitro deriv., m.  $50^\circ$ . Concd. boiling aq.  $\text{HONH}_3\text{Cl}$  (5.6 g.) added to II (8 g.) in EtOH (40 cc.), concd.  $\text{Na}_2\text{CO}_3$  (calcd. quantity) then added, refluxed 2 hrs., filtered, the filtrate evapd. *in vacuo*, the residue let stand overnight until crystd. and then recrystd. from  $\text{Et}_2\text{O}$ , yields the oxime  $\text{C}_9\text{H}_{15}\text{ON}$  (IV), m.  $95^\circ$ , reduces hot Fehling soln., sol. in concd. alkalis and is repptd. only in part on diln. with water, decompd. by hot dil.  $\text{H}_2\text{SO}_4$  to an oil with the characteristics of II; treated in anhyd.  $\text{Et}_2\text{O}$  with  $\text{HCl}$  gas it turns brown and on evapn. *in vacuo* a brown oil is obtained which could not be solidified but which gave the reactions of oximes. I in MeOH (prepd. from 28 g. of  $\text{HONH}_3\text{Cl}$  and  $\text{NaOMe}$  (4 mols.)) added to II (15 g.), let stand 1 week, evapd. to a sirup on a water bath, dissolved in  $\text{Et}_2\text{O}$ , the soln. extd. repeatedly with small portions of 10% KOH (until the ext. satd. with  $\text{CO}_2$  gives no turbidity), the combined alk. exts. satd. with  $\text{CO}_2$ , let stand until the oil solidifies, the solid dissolved in boiling  $\text{Et}_2\text{O}$ , and recrystd. from  $\text{Et}_2\text{O}$ , yields camphoronehydroxylamine oxime,  $\text{C}_9\text{H}_{15}\text{O}_2\text{N}_2$  (V), m.  $160^\circ$ , sol. in acids and in alk. hydroxides, insol. in alk. carbonates, reduces cold Fehling soln., in org. solvents it is oxidized with air present, becoming an intense blue, oxidized still more rapidly by yellow  $\text{HgO}$ . If the oil formed by the action of  $\text{CO}_2$  in the prepn. of V is dried *in vacuo* over  $\text{H}_2\text{SO}_4$ , gas is evolved and a spongy mass remains. Let stand several days, then extd. with  $\text{Et}_2\text{O}$ , a cryst. residue is left, which, washed with  $\text{Et}_2\text{O}$  and recrystd. from  $\text{Et}_2\text{O}$ , yields camphorone oxime,  $\text{C}_9\text{H}_{15}\text{ON}$  (VI), m.  $115^\circ$  (decompn.), reduces hot Fehling soln., does not give a colored compd. with yellow  $\text{HgO}$ . It is an isomer of IV and of the oxime of Kerp and Müller (*Ann.* **290**, 143). The oil which remains after extn. with  $\text{Et}_2\text{O}$  does not crystallize even after a long time *in vacuo* or in the presence of water. It has the odor of mint and behaves like an oxime, though it is probably a mixt. To establish the constitution of V, it was treated with  $\text{BzH}$ , since it is known (cf. Bamberger and Rudolf, *C. A.* **1**, 2590) that  $\text{BzH}$  gives derivs. with the  $-\text{NCHPh.O}$  group.  $\text{BzH}$

(a little greater quantity than equimol.) refluxed with V in abs. MeOH for several hrs., cooled, concd. at a low temp. if not crystd., dild. with water, extd. with  $\text{Et}_2\text{O}$ , the ext. evapd., the residue dissolved in  $\text{Et}_2\text{O}$ -petroleum ether (equal parts), let stand several days, and the ppt. recrystd. from  $\text{Et}_2\text{O}$ -petroleum ether, yields benzalcamphoronehydroxylamine oxime,  $\text{C}_{16}\text{H}_{22}\text{O}_2\text{N}_2$  (VII), m.  $145^\circ$ . Hydroxylamines react with  $\text{BzCl}$ , but with V both the  $\text{NH}_2\text{OH}$  and the  $\text{NOH}$  groups react with formation of a di-Bz deriv. The reaction was carried out by the method of Schotten-Baumann, V being dissolved in  $\text{Na}_2\text{CO}_3$  with excess  $\text{BzCl}$ , cooled after the reaction is over, the ppt. freed of a small quantity of  $\text{BzOH}$  by  $\text{Na}_2\text{CO}_3$ , dissolved in  $\text{AcOEt}$ , and recrystd. from  $\text{AcOEt}$ , yields the di-Bz deriv.  $\text{C}_{23}\text{H}_{26}\text{O}_2\text{N}_2$  (VIII), turns brown  $160^\circ$ , m.  $168^\circ$  (decompn.). V, reduced with Na

(a little greater quantity than equimol.) the results indicate that the constitution of V is  $\text{HON} \cdot \text{C} \cdot \text{CHMe} \cdot \text{CH}_2 \cdot \text{CH}_2 \cdot \text{CH}(\text{NHOH})\text{Me}_2$ , of VI  $\text{HON} \cdot \text{C} \cdot \text{CHMe} \cdot \text{CH}_2 \cdot \text{CH}_2 \cdot \text{C} \cdot \text{CMe}_2$ , of VII  $\text{HON} \cdot \text{C} \cdot \text{CHMe} \cdot \text{CH}_2 \cdot \text{CH}_2 \cdot \text{CHC}(\text{N.O. CHPh})\text{Me}_2$ , of VIII  $\text{Bz} \cdot$

ON: C. CHMe. CH<sub>2</sub>. CH<sub>2</sub>. CHC(NO<sub>2</sub>)Me<sub>2</sub> and of IX H<sub>2</sub>NCH. CHMe. CH<sub>2</sub>. CH<sub>2</sub>. CHC. (NH<sub>2</sub>)Me<sub>2</sub>.

Structural difference between synthetic and Japanese camphor. C. C. DAVIS. *Metallbörse* 18, 2414-6, 2528-9, 2640-1 (1928).—There is no proof of single and double bonds; the idea that double bonds are weaker than single bonds is untenable in a trustworthy structural formula for the terpenes. The energy of formation of liquid and gaseous benzene is different. In liquid benzene during evapn. there are set free unions which may recombine with one another to give the liquid, or with similar unions of other materials; i. e., besides the valence 4 given to the C atom, a further at. energy is possessed which is used in forming C<sub>2</sub>-mol. whether the C atoms are or are not combined with H. The simple mol. CH<sub>4</sub> does not exist, but the double, mol. H<sub>4</sub>C = CH<sub>4</sub>.

The binding power of C is represented by , and a ring of 6 C atoms thus, .

Different means of representing the structures of compds. according to this theory are given. In the chlorination of CH<sub>4</sub> the energy action of Cl on the double CH<sub>4</sub> mol results in the splitting out of 2H atoms from CH<sub>4</sub>, which combine with Cl<sub>2</sub>, and then 2HCl sep. by explosion. The CH<sub>2</sub> left from the CH<sub>4</sub> combines with HCl to give CH<sub>3</sub> - HCl, while the remainder of the HCl is liberated. The reaction is not one in which H is substituted by Cl, and the liberated H wanders to another Cl, but the H of CH<sub>4</sub> exists in 2 like pairs. On the basis of the foregoing theory formulas are derived for the xylenes, cymene, hexahydrocymene, pinene, camphene, isoborneol and synthetic and Japanese camphors. FREDERICK C. HAHN

Polyhydroxychalcones, -hydrochalcones and -flavanones. IV. Synthesis of 3',4'-dimethoxy-5,7-dihydroxyflavanone and the constitution of eriodictyol and homoeriodictyol. J. SHINODA AND S. SATO. *J. Pharm. Soc. Japan* 49, 64-70 (1929); cf. Tutin and Power, *Proc. Am. Pharm. Assoc.* 352, 52 (1906).—Employing the method of T. and P., S and S. have obtained eriodictyol (I) and homoeriodictyol (II) from *Eriodictyon californicum* 3,4-(MeO)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>CH:CHCOCl (3.5 g.) and phloroglucinol (2 g.) in PhNO<sub>2</sub> (30 cc.) with AlCl<sub>3</sub> (5 g.) overnight gave a red-brown resin which, satd. in 10% KOH with CO<sub>2</sub>, gave 3',4'-dimethoxy-5,7-dihydroxyflavanone (III), m. 200° (oxime, m. 252°). Excess of CH<sub>2</sub>N<sub>2</sub> in Et<sub>2</sub>O with III gave 3',4',7-trimethoxy-5-hydroxyflavanone (IV). IV with Ac<sub>2</sub>O and a drop of concd. H<sub>2</sub>SO<sub>4</sub> gave the monoacetate, m. 155°. Acetylation of I and II as above gave acetyleriodictyol, m. 137°, and acetylhomoeriodictyol, m. 115-6°, resp. Oxime of II, m. 224°. I does not give an oxime. Methylation of I, II and hesperetin gave a product similar to IV, m. 136°. V. Synthesis of eriodictyol and homoeriodictyol. *Ibid* 71-8.—S. and S. have shown that the methylation product of eriodictyol (I), homoeriodictyol (II) and hesperetin are identical with 3',4',7-trimethoxy-5-hydroxyflavanone (*C. A.* 23, 836). They have now succeeded in synthesizing I and II. A mixture of carboxyferulyl chloride (4.2 g.) and phloroglucinol (2 g.) in PhNO<sub>2</sub> (30 cc.) with AlCl<sub>3</sub> (5 g.) was kept overnight and the excess of PhNO<sub>2</sub> was distd. off with steam. The residue satd. in 10% KOH with CO<sub>2</sub> gave a yellow ppt., m. 233°, which on recrystn. from AcOH gave colorless needles of II, m. 224-5°; oxime, m. 224°; Ac deriv., m. 163-4°; mono-Me deriv., m. 142-3°; di-Me deriv., m. 136°. The mixt. of dicarboxycaffeyl chloride (4.5 g.) and phloroglucinol (2 g.) in PhNO<sub>2</sub> (40 cc.) with AlCl<sub>3</sub> (7 g.) treated 1 hr. on the water bath and allowed to stand for 3-4 days gave a resinous substance. Reduction of this with Mg and HCl shows no flavanone reaction. It was heated in 5% KOH (200 cc.), in the presence of H, acidified with HCl, shaken with ether, treated with boiling water and filtered. The ppt. gave two constituents: alc.-insol. yellow crystals (III) and an alc.-sol. substance (IV). III, m. 267°, shows no flavanone reaction. IV gave colorless needles of I, m. 267°, which give the flavanone reaction with Mg and HCl, and contain 1 or 2.5 mol. of water of crystn. Tri-Me deriv., m. 136°; mono-Me deriv., m. 215°; Ac deriv., m. 137°. III is C<sub>24</sub>H<sub>18</sub>O<sub>8</sub>·2H<sub>2</sub>O and is identical with the product, m. 267-8°, obtained in the synthesis of naringenin (*C. A.* 23, 2956). F. I. NAKAMURA

Synthesis of substantive dyes derived from dicinnamoylmethane. W. LAMPE, Z. BUCZKOWSKA (Miss), J. FRENKL, E. GLIKSMAN-KORNGOLD, M. TOKARSKA-KOZLOWSKA (Miss), R. NELKEN AND C. SIERADZKA. *Roczniki Chem.* 9, 444-62 (463 German)



**Perylene and its derivatives. XXIII.** KONRAD FUNKE and HERBERT WOLF. *Monatsh.* 52, 1-6(1929); cf. *C. A.* 23, 3223.—3,9-Dichloro-4,10-dinitroperylene, reduced

with  $\text{PhNHNH}_2$  in  $\text{C}_6\text{H}_4\text{Me}_2$ , gives, after boiling 3.5 hr., the *4,10-diamino deriv.* (I), crystg. from 800 parts  $\text{C}_6\text{H}_4\text{Me}_2$  in orange-red needles;  $\text{PhNH}_2$  removes the halogen; cold concd.  $\text{H}_2\text{SO}_4$  gives a brown-red soln. with a strong sky-blue fluorescence, on warming it changes to a garnet-red with red fluorescence.  $\text{C}_6\text{H}_5\text{N}$  and  $\text{PhNO}_2$  give dark red solns. but I does not crystallize therefrom. *Di-Ac deriv.*, yellow-brown needles, sol. in concd.  $\text{H}_2\text{SO}_4$  with a green color and deep green fluorescence, changing on warming to garnet-red with red fluorescence. *Di-Bz deriv.*, yellow needles, sol. in concd.  $\text{H}_2\text{SO}_4$  with a sky-blue color, changing to green with a weak red fluorescence; warming gives a garnet-red color with a red fluorescence. 3,9-Dibromoperylene (5 g.) in 125 g.  $\text{AcOH}$ , 4 g.  $\text{KNO}_3$  in 10 cc.  $\text{H}_2\text{O}$  and 4.5 g. concd.  $\text{H}_2\text{SO}_4$  in 20 g.  $\text{AcOH}$  give 3 g. of the *1,10-dinitro deriv.*, light red needles from  $\text{PhNO}_2$  or  $\text{PhNH}_2$ ; the concd.  $\text{H}_2\text{SO}_4$  soln. is violet, changing to Bordeaux-red on warming. Reduction gives the *4,10-diamino deriv.* (II), crystd. from 1500 parts  $\text{C}_6\text{H}_4\text{Me}_2$ , during which some Br is lost. Heating either I or II with  $\text{PhNH}_2$  for 1 hr. gives *4,10-diaminoperylene*, deep steel-blue needles, sol. in  $\text{C}_6\text{H}_4\text{Me}_2$  with an olive-green color and pale green fluorescence and in  $\text{C}_6\text{H}_5\text{N}$  with a dirty brown color. The concd.  $\text{H}_2\text{SO}_4$  soln. is light violet and on warming shows a light brown fluorescence. *Di-Bz deriv.*, yellow needles, by heating II with  $\text{BzCl}$  in  $\text{C}_6\text{H}_4\text{Me}_2$  for 10 min. *Di-p-bromobenzoyl deriv.*, yellow needles. XXIV. ALFRED PONGRATZ. *Ibid* 7-12.—Perylene-3,9-dicarboxylic acid, obtained from the chloride or bromide through the cyanide, gives with  $\text{PCl}_5$  or  $\text{SOCl}_2$  an *acid chloride*, dark red needles, crystd. from 60 parts  $\text{PhNO}_2$ ; the  $\text{C}_6\text{H}_6$ ,  $\text{PhMe}$  and  $\text{C}_6\text{H}_4\text{Me}_2$  solns. are yellow and have a yellow-green fluorescence; the  $\text{PhNO}_2$  soln. is orange with an olive green fluorescence. With  $\text{C}_6\text{H}_6$  and  $\text{AlCl}_3$  at  $80^\circ$  for 3-4 min., there results 3,9 dibenzoyl perylene, m.  $291-2^\circ$ .  $\text{PhMe}$  gives a *di-m-* or *di-p-toluxyl perylene*, light yellow, m.  $309-10^\circ$ ; the concd.  $\text{H}_2\text{SO}_4$  soln. is blue; the  $\text{C}_6\text{H}_6$  or  $\text{C}_6\text{H}_4\text{Me}_2$  soln. is yellow with a green fluorescence. 3,9-Dinaphthoyl perylene, orange needles, m.  $321-2^\circ$ , sol. in concd.  $\text{H}_2\text{SO}_4$  with a blue color, in  $\text{C}_6\text{H}_6$  or  $\text{C}_6\text{H}_4\text{Me}_2$  with a yellow-brown color and green fluorescence. In  $\text{H}_2\text{SO}_4$ ,  $\text{MnO}_2$  gives a violet-blue compd., probably a dibenzisviolanthrone. XXV. ALOIS ZINKE AND WALTER HIRSCH. *Ibid* 13-22.—3,9,4,10-Tetrachloroperylene, warmed with 100 parts concd.  $\text{H}_2\text{SO}_4$  at  $140^\circ$  in an atm. of  $\text{CO}_2$  for 25 hrs., gives 3,4,9,10 perylene-diquinone, garnet-red needles; this has also been obtained from the 3,10-dinitro, the 3,4,9,10-tetranitro and the 3,9-dichloro-4,10-dinitro derivs. A cryst. product could not be obtained from hexachloroperylene, although it reacts with concd.  $\text{H}_2\text{SO}_4$  at  $140-50^\circ$ . 3,9-Dichloro-4,10-diacetyl perylene and concd.  $\text{H}_2\text{SO}_4$ , warmed 4 hrs. at  $120-5^\circ$ , give 3,9-perylenequinone, violet; the vat is red with an intense deep green fluorescence; with  $\text{BzCl}$  the vat gives the dibenzoate of 3,9-perylenehydroquinone, m.  $312-4^\circ$ ; similarly was prepd. the di-p-bromobenzoate, m.  $359-60^\circ$ . Oxidation with concd.  $\text{H}_2\text{SO}_4$  gives the above diquinone. The same quinone is obtained from 3,9-dichloro-4,10-dibenzoyl perylene and from 3,9-dichloroperylene. C. J. WEST

**The reduction of diphenylglycidic ester by means of sodium and absolute alcohol.** MME. PIERRE BILLON-BARDON. *Compt. rend.* 188, 1412-3 (1929); cf. C. A. 20, 3292. Like the  $\text{RMgX}$  compds. previously studied, Na and alc. react selectively on the ethylene oxide group of  $\text{Ph}_2\text{C}.\text{CH}(\text{CO}_2\text{Et}).\text{O}$  (I), rather than on the ester group. Thus I (1 mol)

with Na (18 atoms) yielded after acidification  $\text{Ph}_2\text{CHCH}(\text{OH})\text{CO}_2\text{H}$ , m.  $159^\circ$ , (about 60%),  $\text{CH}_2\text{Ph}_2$ , and a very small amt. of a product b<sub>16</sub>  $180-215^\circ$ . B. assumes that the first compd. formed is  $\text{Ph}_2\text{CHCH}(\text{ONa})\text{CO}_2\text{Et}$  (or in the previous cases  $\text{Ph}.\text{CRCH}(\text{OMgX})\text{CO}_2\text{Et}$ ) and that the group  $-\text{ONa}$  (or  $-\text{OMgX}$ ) in the  $\alpha$ -position to the  $-\text{CO}_2\text{Et}$  group renders the latter more inert or almost entirely inert toward the reagents used.

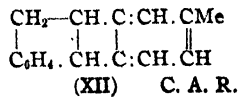
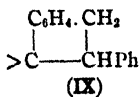
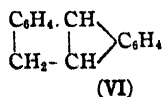
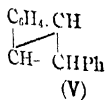
**2,3-Dinitro- and 1,4-dinitronaphthalene.** L. K. CHUDOŽILOV. *Collection Czechoslov. Chem. Comm.* 1, 302-5 (1929).—These compds. have been prepd. by the dehydrogenation of 6,7- and 5,8-dinitrotetralin (m.  $98-9^\circ$  and  $87-8^\circ$ , resp.) which were prepd. from the nitramines (see C. A. 17, 2111; 16, 1763). Attempts to prep. 2,7- $\text{C}_{10}\text{H}_6(\text{NO}_2)_2$  were unsuccessful. The 2,3-dinitronaphthalene was obtained in 10% yield as yellow crystals, m.  $170.5-1.0^\circ$ , sol. in alc. JANET D. SCOTT

**Derivatives of naphthalic acid.** KAROL DZIEWOŃSKI, OLGA GESCHWIND AND LUDWIK SCHIMMER. *Bull. intern. acad. polonaise* 1928A, 507-22 (In German).—Naphthalic anhydride when treated with fuming  $\text{H}_2\text{SO}_4$  at a low temp. yields 3 naphthal-sulfonic acid (naphthalene-1,8-dicarboxylic-3-sulfonic acid) (I). At higher temps. a disulfo deriv. (II) is obtained, which G. Bargellini (*Atti acad. Lincei* [5], 14, II, (688)) described as naphthal-3,6-disulfonic acid. The authors came to another conclusion. II may also be obtained by treating I with a new amt. of  $\text{H}_2\text{SO}_4$ ; thus position 3 of one sulfo group is confirmed. II fused with alkali gives dihydroxynaphthalic acid (III) (anhy-

dride, m. 330°; *di-Me ether*, m. 280°; *diacetate*, m. 260°; *benzoate*, m. 235–236°; *anilide*, m. 365°; *phenylhydrazone*, m. 252°), which can also be obtained by alkali fusion of 4-bromonaphthal-sulfonic acid (IV), a deriv. of 4,1,8- $C_{10}H_5Br(CO_2H)_2$  (V). Hence II can be only naphthal-3,5- or -3,4-disulfonic acid. Because copulation of III with diazo compds. gave no results, III is the 3,4-di-HO acid,  $C_{10}H_4(OH)_2(CO_2H)_2$ , and II the 3,4-di- $SO_3H$  acid,  $C_{10}H_4(SO_3H)_2(CO_2H)_2$ . IV is obtained by the action of fuming  $H_2SO_4$  on 4,1,8- $C_{10}H_5Br(CO_2O)$  and gives III when fused with alkali. The sulfo group is therefore in position 3 and IV is 4-bromonaphthal-3-sulfonic acid (Ba salt, needles; aniline salt, prisms, m. 270°; chloride, m. 183–184°; imido-amide, m. 338°). Similarly 4,1,8- $C_{10}H_5Cl(CO_2H)_2$  gave 4-chloronaphthal-3-sulfonic acid (aniline salt, m. 257°; chloride, m. 180–1°; imido-amide, m. 318°), which when fused with alkali again gave III. In connection with this work the little known  $\alpha$ -bromonaphthalic acid (V) was studied (Me ester, m. 102–3°; hydrazone, m. 217°; dinitro-4-bromonaphthalic anhydride, m. 234–5°). It gives by fusion with alkali 3,1,8- $C_{10}H_3(OH)(CO_2H)_2$ , changing position 4 into 3, as was already found with 4,1,8- $C_{10}H_5Cl(CO_2H)_2$  (cf. C. A. 21, 2682). Its anhydride m. 280°; 4-benzencazo-3-hydroxynaphthalic anhydride, m. 261°.

J. WIERTLAK

**Benzopolymethylene compounds. XVI. Heat rearrangement of  $\alpha$ -arylindenes into  $\beta$ -arylindenes.** JULIUS V. BRAUN AND GOTTFRIED MANZ. *Ber.* 62B, 1059–65 (1929), cf. C. A. 23, 2713.—Graebe in attempting to prep fluoranthene by heating 9-methylfluorene obtained a substance to all appearances identical with 9-methylphenanthrene just as he obtained phenanthrene itself from 9-methylfluorene. This rearrangement, involving, besides the elimination of H, the shifting of 1 of 2 aryl residues bound to the same C atom to an adjacent C atom, is apparently quite difficult in open chain compds.; no indications of it were observed with  $Ph_2CHMe$  or  $Ph_2C-CH_2$ .  $\alpha$ -Phenylindene (I) was accordingly chosen for study. Mayer, Sieglitz and Ludwig had already reported (C. A. 15, 3829) that I at red heat changes into an isomer which melts much higher, gives benzil-*o*-carboxylic acid on oxidation, adds neither Br nor  $H_2$ , is not formed from 2-phenylindanone (II) by reduction to the carbinol (III) and boiling with  $H_2SO_4$  and can therefore not be  $\beta$ -phenylindene (IV); they propose for it the structure V or VI. A repetition of their work has shown that all of it is not correct. The product adds catalytically activated H just as readily as indene, absorbs 2 atoms Br with the greatest ease and is nothing but IV as shown by its ready synthesis in 2 ways: from  $\beta$ -hydrindone with  $PhMgBr$  through the carbinol (VII) and from 2-phenylhydrindone through its oxime, the  $NH_2$  compd. (VIII) and the corresponding quaternary base (IX) which readily decomps into IV, for it is known that it is the H on the  $\beta$ -C atom to the N which is split off in the decompn. of quaternary  $NH_4$  bases. On the other hand, the work of Tiffeneau and his pupils on the so-called retropinacolin rearrangement has shown how greatly in a carbinol of type III splitting off of  $H_2O$  to form IX and then I is favored, and therefore the product obtained by M., S. and L. was probably nothing but I. The isomerization of I, in which short exposure to a high temp. produces a simple interchange in position between a H atom and a Ph group, is, as far as v. B. and M. are aware, without analogy. That no intermediate product such as VI is formed is indicated by the fact that  $\alpha$ -*p*-tolylindene (X) isomerizes to  $\beta$ -*p*-tolylindene (XI), which can also be obtained from  $\beta$ -hydrindone and *p*- $MeC_6H_4MgBr$ , whereas if an intermediate tetracyclic compd. (XII) were formed, the final product should be  $\beta$ -*m*-tolylindene (XIII) which was synthesized for comparison and found to be quite different from the rearrangement product of X. The yield of IV from I depends on the rapidity with which the I is distd. over the heated pumice, e. g., 33% when 10 g. I are distd. in 10 mm. As regards m. p., soly., compn. and mol. wt., the description of M., S. and L. was confirmed. With Pd-charcoal in MeOH it yields a *dihydro deriv.*,  $b_{10}$  162–3°,  $d_4^{20}$  1.0821,  $n_D^{20}$  1.5955. Dibromide, prepd. in  $CS_2$ , m. 130–1°. VII, faintly yellow, very thick oil,  $b_{0.5}$  160–5°. VIII (50% from the indanone oxime in MeOH-AcOH with Na-Hg),  $b_{10}$  180–4°; *picrate*, yellow, decomp. 121–3°, gives with aq.  $Me_2SO_4$  and then with KI-NaOH 70% of the hygroscopic quaternary methiodide (IX). X, from  $\alpha$ -hydrindone and *p*- $MeC_6H_4MgBr$ , thick yellowish oil,  $b_{11}$  184–8°. XI, leaflets with faint bluish fluorescence, m. 183–4°; the intermediate carbinol in its synthesis from  $\beta$ -hydrindone  $b_{0.2}$  155–6°. XIII, m. 99–100°; the intermediate carbinol  $b_{0.5}$  165–70°.



The absorption spectra of *N*-aminonaphthalimide and some of its mono- and disubstituted *N*-derivatives. A. OSTROGOVICH AND ELENA TÂNĂȘESCU. *Bull. soc. stiinte Cluj* 4, 368-98(1929).—*N*-Phenylaminonaphthalimide, and the following di-*N*-derivs. of 1,8- $C_{10}H_6(CO)_2NNH_2$  were prepd. and their absorption spectra studied in the visual portion of the spectra. Methylphenyl, m. 214-15°; ethylphenyl, m. 151-2°; propylphenyl, m. 154-5°; Ph, m. 108-9°; cetylphenyl, m. 97-9°; *o*-tolyl, m. 248-9°; *m*-tolyl, m. 209-10°; *p*-tolyl, m. 207-8°;  $\alpha$ -naphthyl, 277-8° (decompn.);  $\beta$ -naphthyl, m. 268°; *o*-nitrophenyl, m. 281-2°; *p*-nitrophenyl, m. above 300°. The following  $\alpha$ -alkyl- $\alpha$ -phenylhydrazine-HCl salts were also prepd.: Pr, m. 130-1°; hexyl, m. 77-8°; cetyl, m. 62°. WALLACE R. BRODE

The oxidation of anthracene with nitric oxide. M. IL'INSKII AND B. MAKOROV. *Z. Farbenind.* 20, 210-2(1929); cf. *C. A.* 22, 3888.—Pure anthracene and NO in  $PhNO_2$  give anthraquinone.  $PhNO_2$  is not affected by the NO. By means of this process crude anthracene may be converted to anthraquinone which may be sep'd. from the by-products which accompany crude anthracene. FREDERICK C. HAHN

Synthesis of trihydroxymethylanthraquinone derivatives. II. Constitution of chrysarone. S. KEIMATSU, I. HIRANO AND T. TANABE. *J. Pharm. Soc. Japan* 49, 419-25(1929).—In a previous publication (*C. A.* 23, 3464) the authors have reported the synthesis of a trihydroxymethylanthraquinone and shown that it was identical with the chrysarone of Hesse, but its structure was not studied. *Trichloromethylanthraquinone* (I) (3 g.) and Br (9 g.) at 160-70° gave 2-*o*-dibromomethyl-3,5,6-trichloroanthraquinone (II) m. 245-6°. II (9.6 g.), concd.  $H_2SO_4$  (65 cc.) and 25% fuming  $HNO_3$  (12 cc.) at 110-30° gave 3,5,6-trichloroanthraquinone-2-aldehyde (III), m. 235-6°. Oxidation of III (3.5 g.) with  $K_2Cr_2O_7$  (3 g.) in  $AcOH$  (20 cc.) gave 3,5,6-trichloroanthraquinone-2-carboxylic acid (IV), m. 305-6°. IV heated at 305-10° gave 3,5,6-trichloroanthraquinone (V), m. 259-60°. IV (1.2 g.) and  $MeONa$  treated at 150-70° for 7 hrs. gave 3,5,6-trimethoxyanthraquinone-2-carboxylic acid (VI), m. 254-5°. VI (0.7 g.) heated at 254-5° for 1 hr. gave 3,5,6-trimethoxyanthraquinone (VII), m. 200-1°. VII is identical with anthrapurpurin tri-Me ether (cf. Graebe and Bernhard, *Ann.* 349, 226). VII (0.6 g.) and 60°  $B_6$   $H_2SO_4$  (20 cc.) heated for 3 hrs. gave 3,6-dimethoxy-5-hydroxyanthraquinone (VIII), m. 240-1°. VIII is identical with the anthrapurpurin 2,7-di-Me ether of Graebe. VII (0.3 g.) with Br and  $AcOH$  (30 cc.) heated for 6 hrs. gave 3,5,6-trihydroxyanthraquinone (IX), m. 372-4°. IX decomp. at its m p and the product is identical with anthrapurpurin, m. 369° (cf. Romer and Schunk, *Ber* 11, 972). It is certain that I and chrysarone are 3,5,6-trichloro- and 3,5,6-trihydroxy-2-methylanthraquinone, resp. F. I. NAKAMURA

Hydrogenation of anthroic acid and the question of the existence of two isomeric 9,10-dihydroanthracene-9-carboxylic acids. HANS MEERWEIN AND ARMIN MIOGE. *Ber.* 62B, 1046-50(1929).—Among the isomers observed by Schlenk and Bergmann which cannot be explained by present conceptions on stereochemistry and which led them to suggest that the planes of the rings in condensed cyclic systems are inclined to each other (*C. A.* 22, 4495) are two 9,10-dihydroanthracene-9-carboxylic acids (I and II). They obtained I by the action of  $CO_2$  on the mono-Na addn product of anthracene and II by the hydrogenation of anthracene-9-carboxylic acid (III) in boiling  $PrOH$  with  $H_2$  and  $Pd-BaSO_4$ . Strangely enough, however, both yield the same Me ester with  $CH_3N_3$  and this led M. and M. to repeat their work. As regards I, they fully confirmed the results of S. and B.; the product obtained m. 204-5°. Its Me ester m. 97-8°. The reduction of III, however, gave them results different from those of S. and B. During the hydrogenation  $CO_2$  was split off and from the  $Na_2CO_3$ -sol part (about 20-30%) of the product they isolated 1,2,3,4-tetrahydroanthracene, m. 104-5°, and smaller amts. of the 1,2,3,4,5,6,7,8-octahydro deriv., m. 72-4°. The  $Na_2CO_3$ -sol. part of the product was also a mixt. of I and, chiefly, tetrachloro-9-carboxylic acid (1,2,3,4-tetrahydroanthracene-9-carboxylic acid) (IV). None of S. and B.'s II was obtained, and it is probable that their product was a mixt. IV, m. 204.5-5.5°, Me ester, m. 67-8°.  $CrO_3$  oxidizes IV to tetracenequinone, m. 157-8°. Under cathode rays III shows intense yellow-green fluorescence, I a greenish yellow glow and bluish afterglow, IV an intense light blue glow and tetracene a violet glow. C. A. R.

The tautomerism of  $\alpha$ -diketones. The states of equilibrium. HENRI MOUREU. *Compt. rend.* 188, 1413-6(1929); cf. *C. A.* 22, 1341, 3155; 23, 2705.—The same state of equil. is reached by starting from either 1 of 2 tautomers, as shown, e. g., by a detn. of  $n$ . For  $PhCH_2COCOMe$ ,  $n_D^{20}$  of the equil. mixt. at 80° (the point of the greatest deviation between the 2 series of measurements) = 1.592 starting from tautomer A (heating it), or 1.595 from B, when the  $n$ 's for pure A and B are resp. 1.627 (calcd.) and 1.519 (detd.). From  $n$  the compn. at equil. can be detd. A curve is given showing

the % of A (always more than 50) at different equil. temps. obtained by starting from each isomer. The alkyl. of the glass walls or a very small amt. of  $C_6H_{11}N$  with a trace of  $H_2C_2O_4$  serves as catalyst. With  $PhCH_2COCOPh$  the equil. is strongly in favor of B. The agreement at equil. of the transformations in opposite directions is surprisingly good. **Heat of transformation of tautomers.** *Ibid* 1557-8.—The heat of transformation ( $Q$ ) calcd. from the integrated form of van't Hoff's equation,  $Q = \log (K_2/K_1) \times 1985 T_1T_2/(T_1 - T_2)$ , was 2.6 large cal. per mol. (mean of 4 values) for  $PhCH_2CO-COMe$  (I) and 2.7 for  $PhCH_2COCOPh$ . Calcd. from the heats of combustion the values for the same compds. were resp. 2.1 and 2.3 (in the case of I, since isomer A is solid and B liquid, the heat of fusion,  $L$ , of A enters into the calcn. of  $Q$  and is calcd. from  $L = 0.01985 T^2/k$ ,  $T$  being the abs. temp. of the m. p. of A, and  $k$  the f. p. const. of A, detd. by measuring the lowerings of the m. p. of A in mixts. of A and B. The values for  $Q$  are close, considering how different are the 2 methods used.  $Q$  for  $\alpha$ -diketones is hence of the order of 2.5 large cal. per/mol. JANET D. SCOTT

**Indoline and  $\alpha$ -methyl- $\beta$ -tetrahydroindole.** G. PLANCHER. *Ber.* 62B, 1088-9 (1929).—In connection with Ferber's report (*C. A.* 23, 2714) on a new synthesis of  $\alpha$ -dihydroindole (indoline) and the comparison of his product with that of v. Braun, P. points out that he and Ravenna had prepd. the compd. 7 yrs. before v. B. (*Atti accad. Lincei* [5], 14, I, 632(1905)). P. also calls attention to his prepn. with Zambonini of  $\alpha$ -methyl- $\beta$ -tetrahydroindole from  $AcCH_2CO_2Et$  and  $\alpha$ -chlorocyclohexanone, followed by sapon. of the resulting carbethoxy deriv. and distn. over lime (*Atti soc. progresso science Roma*, 1911, 828). C. A. R.

**Halogenated ketones of indole.** I. G. SANNA. *Gazz. chim. ital.* 59, 169-81 (1929).—Expts. on the prepn. of diketones of indole and methylindole (cf. *C. A.* 11, 1639, 2883) were continued by the prepn. of halogenated derivs. These derivs. should be of importance because from them it should be possible to synthesize other compds. which are similar to decompn. products of albuminoids and which are constituent parts of certain alkaloids. To avoid the ambiguity of some authors in designating widely differing groups by the term indoyl and to simplify the nomenclature, the radicals  $C_8H_7NH$ ,  $CH$ ,  $CCOCH_2$ ,  $C_6H_4$ ,  $NH$ ,  $CMe$ ,  $CCOCH_2$ —and  $C_6H_4$ ,  $NH$ ,  $C(COCH_2)$ —C—

Me, are termed *indacyl*,  $\alpha$ -methylindacyl and  $\beta$ -methylindacyl, resp. This agrees with the current usage for the corresponding aromatic radicals.  $ClCH_2COCl$  (10 g.) in anhyd  $Et_2O$  (3 vols.) added drop by drop to ice-cold magnesiummethylindole (I) (from 2.1 g. Mg, 10 g.  $EtBr$  and 11.5 g. methylketole), let stand cold for 12 hr., ice added and agitated vigorously, the  $Et_2O$  layer decanted, the aq. layer filtered, the residue washed with  $Et_2O$ , and recrystd. repeatedly from boiling  $C_6H_6$ , yields 60% of  $\alpha$ -methylindacyl chloride ( $\beta$ -chloroacetyl- $\alpha$ -methylindole),  $C_6H_4$ ,  $NH$ ,  $CMe$ :  $CCOCH_2Cl$  (II), m.

220°, burns the skin and mucous membranes, sol. in aq. alkalis and in concd.  $H_2SO_4$ ; its soln. in  $HNO_3$  is yellow and in  $HCl$  pale rose; it is repdtd. from its acid soln. by great diln.; it reduces hot Fehling soln. and  $NH_3$ - $AgNO_3$ ; with  $HgCl_2$ ,  $HgNO_3$ ,  $AuCl_3$ , and  $PtCl_4$ , it gives white ppts.; with alkaloid reagents it gives variously colored ppts. Dil  $NH_3$ - $AgNO_3$  added to hot very dil. aq. II in darkness, filtered and the ppt. washed with water,  $EtOH$  and  $Et_2O$ , yields the *Ag deriv.*,  $C_6H_4$ ,  $NAg$ :  $CMe$ :  $CCOCH_2Cl$ . With-

out  $NH_3$  there is no ppt. Dil.  $Na_2CO_3$  added drop by drop to II (0.50 g.) suspended in hot water until soln. is completed,  $KMnO_4$  (0.73 g. in 40 cc. water) added drop by drop, heated until colorless, cooled, filtered, acidified with dil.  $H_2SO_4$ , extd. repeatedly with  $Et_2O$ , the ext. agitated with concd. aq.  $Na_2CO_3$ , the 2 layers sepd., the aq. layer acidified with dil.  $H_2SO_4$ , again extd. with  $Et_2O$ , the ext. concd., and the ppt. recrystd. from dil.  $AcOH$ , yields  $\alpha$ - $C_6H_4(CO_2H)NHAc$  (III). II in dil.  $AcOH$  heated gently for 0.5 hr. with aq.  $PhNHNH_2OAc$  (1 mol.), let stand several days, dild. with water until turbid, heated gently a few min., let stand, and the ppt. recrystd. from  $C_6H_6$  or  $Et_2O$ , yields a *phenylhydrazone*,  $C_6H_4$ ,  $NH$ :  $CMe$ :  $CC(NNHPh)CH_2Cl$ , m. 134° (decompn.).

II (0.50 g.) heated a short time in pure  $C_6H_5N$  (10 cc.) below its b. p., cooled, the excess  $C_6H_5N$  decanted, the residual oil dissolved in  $EtOH$ , and purified from this solvent, with recrystn. from  $Et_2O$ , yields  $\alpha$ -methylindacylpyridonium chloride,  $C_6H_4N(Cl)CH_2CO$ :  $CMe$ :  $NH$ :  $C_6H_4$  (IV), m. 332°; its aq. soln. is alk. and gives the reactions of the  $Cl$

ion (giving ppts. with metallic chlorides). With 50%  $KOH$ , concd. aq. IV ppts. a yellow compd. (V) which was not analyzed because of its small quantity but which was probably  $C_6H_5N(OH)CH_2CO$ :  $CMe$ :  $NH$ :  $C_6H_4$ . Treating I with  $BrCH_2COCl$  under

the same conditions used in the prepn. of **II**, yields 70% of  $\alpha$ -methylindacyl bromide,  $C_6H_4.NH.CMe:CCOCH_2Br$  (**VI**), m.  $204^\circ$ , attacks the skin and mucous membranes,

has the same general properties as **II**. *Ag salt*. Oxidation with  $KMnO_4$  forms **III**. With  $C_6H_5N$ , and quinoline, it forms *addn. compds.* and also with  $PhNH_2$ , coumarone, oxazole, thiazole, thiazoline, quinoxaline, pyrazine, etc., which will be studied further. Fused with  $KOH$  it forms  $C_6H_4.NH.CMe:CCO_2H$ . **VI** also reacts with  $NH_3$  and with

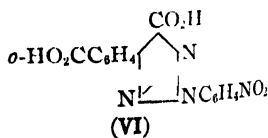
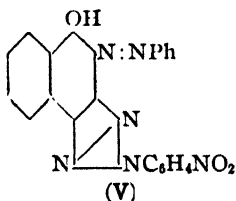
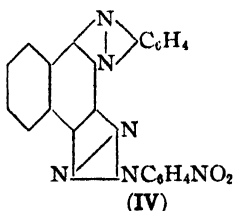
$K$  phthalimide. In general its  $Br$  atom is more labile than the  $Cl$  atom in **II**. **II** and **VI** react extremely slowly with  $NH_2OH$ , perhaps because they exist in either one of 2 tautomeric forms:  $C_6H_4.NH.CMe:CC(OH):CHCl$  or  $C_6H_4.NH.CMe:CCH.CHCl$ , O,

which may exist in equil. with the normal form.  $\alpha$ -Methylindacyl iodide,  $C_6H_4.NH.CMe:CCOCH_2I$ , was prepd in a similar way to **II** and **VI**, and also by the

action of  $KI$  on **VI**. It will be described fully in a forthcoming paper. C. C. D.

**Imidazole derivatives. IV.** The breakdown of histidine to  $\gamma$ -hydroxyornithine, WOLFGANG LANGENBECK and RUDOLF HUTSCHENREUTER. *Z. physiol. Chem.* 182, 305-10(1929); cf. *C. A.* 22, 2356.—The unsatd. tribenzoyltri amino acid ester,  $Bz.NHCH:C(NHBz)CH_2CH(NHBz)CO_2Me$ , obtained by treatment of *L*-histidine  $Me$  ester with  $BzCl$  in  $Na_2CO_3$  soln., is structurally related to ornithine, and should be capable of yielding ornithine derivs. It was converted to the keto ester,  $BzNHCH.COCH_2CH(NHBz)CO_2Me$ , by treatment with  $MeOH-HCl$  according to Windaus, Dörries and Jensen (*C. A.* 16, 1427). Simple hydrogenation of this keto ester was then expected to yield ornithine. However, catalytic hydrogenation reduced the  $CO$  only as far as  $CHOH$ , and the secondary alc. grouping then condensed with the  $CO_2Me$  to form the lactone of  $\alpha,\delta$ -di[hexahydrobenzoylamino]- $\gamma$ -hydroxyvaleric acid, m.  $222^\circ$ . The mother liquor yielded a small amt. of an isomer, m.  $248^\circ$ . The lactone dissolves slowly in dil. alkali and from this soln. the free acid, m.  $236-40^\circ$ , may be obtained by careful addn. of  $AcOH$ . Even at  $0^\circ$  the  $Na$  salt becomes partially racemized and addn. of acid then yields some of the higher-melting lactone. Sapon of the lactone by  $HCl$  gave hexahydrobenzoic acid which was extd by  $H_2O$ , but no hydroxyornithine could be isolated from the aq. soln. Either the hydroxyornithine is destroyed in the sapon, or its phosphotungstate is sol. Perhaps for that reason it has not yet been found among the hexone bases. A. W. DOW.

**2-N-Nitrophenyl-1,2-naphtho-1,2,3-triazolequinones.** M. GALLOTTI (WITH ALBERTO ERCOLI). *Gazz. chim. ital.* 59, 207-11(1929).—By the action of  $HNO_3$  on 2-N-phenyl-1,2-naphtho-1,2,3-triazolequinone, Charrier and Manfredi obtained a dinitro deriv. to which they assigned a structural formula (cf. *C. A.* 20, 2859), which they believed was well proved. Nevertheless it was considered by G. that further expts should be carried out to establish the constitution of this dinitro deriv. and of similar derivs. The present paper, which is a preliminary one, deals with the prepn. of  $NO$  derivs. of 2-N-phenyl-1,2-naphtho-1,2,3-triazole (**I**), from which it was likely that by oxidation the corresponding nitrophenylnaphthotriazolequinones would be obtained.  $CrO_3$  (27 g. in a min. of water) added during 3 hr. to 2-N-o-nitrophenylnaphthotriazole (**II**) (cf. *J. Chem. Soc.* 59, 373(1891)) (15 g.) in a mixt. of glacial  $AcOH$  (800 g.) and  $Ac_2O$  (250 g.) at  $110^\circ$ , cooled, and the ppt. recrystd. from glacial  $AcOH$  and  $PhMe$ , yields 13 g. of 2-N-o-nitrophenyl-1,2-naphtho-1,2,3-triazolequinone (**III**), orange-yellow, m.  $267^\circ$ . o- $C_6H_4(NH_2)_2$  and **III** in boiling  $AcOH$  ppt. the phenazine (**IV**) of **III**, light



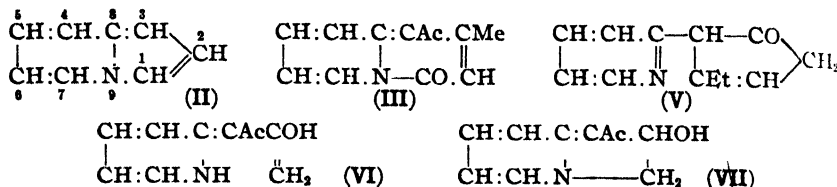
yellow, m.  $277-8^\circ$  (after recrystn. from xylene). **III** and  $PhHNNH_2Cl$  in boiling  $AcOH$  ppt. the hydroxyazo deriv. (**V**) of **III**, lustrous red, m.  $229^\circ$  (after recrystn. from boiling xylene). Oxidation of **III** with alk.  $KMnO_4$ , or oxidation of **II** or of o-nitrophenylazo- $\beta$ -naphthylamine with  $CrO_3$  in glacial  $AcOH$  and  $Ac_2O$ , and the product purified by

repeated salification with NaOH and reprecipitation with HCl, yields 2-*N*-*o*-nitrophenyl-1,2-naphtho-1,2,3-triazole (VI), m. 260°. Similarly to the preparation of III, 2-*N*-*m*-nitrophenyl-1,2-naphtho-1,2,3-triazole, m. 226.5° (cf. 223–4° of Meldola and Hughes, *J. Chem. Soc.* **59**, 379 (1891)), forms 2-*N*-*m*-nitrophenyl-1,2-naphtho-1,2,3-triazolequinone (VII), light yellow, m. 237–8°. Similarly to the corresponding derivs. of II were prepared the following 3 derivs. of VII: phenazine, yellowish, m. 328°; hydroxyazo deriv., orange-red, m. 255°; 2-*N*-*m*-nitrophenyltriazole-phenyl-*o*,*o'*-dicarboxylic acid, m. 274°. Similarly were prepared 2-*N*-*p*-nitrophenyl-1,2-naphtho-1,2,3-triazolequinone, lemon-yellow, m. 207°, and the following 3 derivs.: phenazine, m. 312°; hydroxyazo deriv., red, m. 240°; 2-*N*-*p*-nitrophenyltriazole-phenyl-*o*,*o'*-dicarboxylic acid, m. 267°. C. C. DAVIS

**Chloropyridino derivatives of rhodium. Tripyridinorhodium trichloride.** Dipyrindinorhodium tetrachloride. MARCEL DELÉPINE. *Bull. soc. chim.* **45**, 235–49 (1929).—A close parallelism is found with trivalent iridium pyridino compds., extending to solubilities and color of the two series: *cis*, orange; *trans*, red. 3 g.  $\text{RhCl}_6\text{Na}_3 \cdot 12\text{H}_2\text{O}$  and 2.4 g.  $\text{C}_5\text{H}_5\text{N}$  dissolve in 12 g.  $\text{H}_2\text{O}$ . Heating yields a yellow cryst. mixture. Boiling the  $\text{CHCl}_3$ -alc. mixt. leaves the insol.  $\text{RhPy}_2\text{Cl}_3 \cdot 2\text{CHCl}_3$ , orange-red, octahedral, losing 2  $\text{CHCl}_3$  on exposure to the air. Boiling alc. abs. extracts the yellowish orange *cis* form, which crystallizes without alc.  $\text{NH}_3$  at waterbath temp. changes it to  $[\text{RhCl}(\text{NH}_3)_2\text{Cl}_2]$ , pyridine to  $[\text{RhCl}_2\text{Py}_2\text{Cl}]$ . Heating the tripyridino trichloride with aq. pyridine in sealed tubes, at 130° yields  $[\text{RhCl}_2\text{Py}_4]\text{Cl} \cdot 6\text{H}_2\text{O}$ , bright yellow leaflets. Agitating  $\text{RhCl}_3\text{Na}_3$  with pyridine (6 mols.) and its HCl salt (4 mols.) in the cold yields *cis*- and *trans*- $[\text{RhPy}_2\text{Cl}_4] \cdot \text{C}_5\text{H}_5\text{N}$ . Extn. with hot water leaves the more difficultly sol. red (*trans*) crystals. The yellow (*cis*) form easily hydrolyzes to the hydrate salt  $[\text{Rh}(\text{H}_2\text{O})\text{Py}_2\text{Cl}_3]$ . KOH in dil. soln. displaces the basic pyridine, forming the dipyrindino (*cis*) compd.:  $[\text{RhPy}_2\text{Cl}_4] \cdot \text{K} \cdot 11\text{H}_2\text{O}$ , orange needles, of the same habit as the corresponding Ir salt. It loses 1  $\text{H}_2\text{O}$  at 100°. Adding  $\text{CaH}_2\text{NCl}$  to a soln. of the latter changes it to  $[\text{RhPy}_2\text{Cl}_4] \cdot \text{C}_5\text{H}_5\text{N}$ ,  $\text{NH}_4\text{Cl}$  and  $\text{AgNO}_3$ , similarly, produce  $[\text{RhPy}_2\text{Cl}_4] \cdot \text{NH}_4$ ,  $1\text{H}_2\text{O}$  and  $[\text{RhPy}_2\text{Cl}_4] \cdot \text{Ag}$ . The hydrate salt  $[\text{Rh}(\text{H}_2\text{O})\text{Py}_2\text{Cl}_3] \cdot 11\text{H}_2\text{O}$  did not yield  $[\text{RhPy}_2(\text{OH})\text{Cl}_3] \cdot \text{Ag}$ , as expected, but added  $\text{AgNO}_3$  completely:  $[\text{RhPy}_2(\text{H}_2\text{NO})\text{Cl}_3] \cdot \text{Ag} \cdot 2\text{H}_2\text{O}$ , long yellow needles. Corresponding red (*trans*) salts were prepared.  $[\text{Rh}(\text{H}_2\text{O})\text{Py}_2\text{Cl}_3] \cdot 1\text{H}_2\text{O}$ , (*trans*), loses 1  $\text{H}_2\text{O}$  at 110°, but 1.5  $\text{H}_2\text{O}$  at 130°, undergoing a constitutional change, since it is no longer sol. in alkali:  $\text{Rh}_2(\text{HO})\text{Py}_4\text{Cl}_6$ , fine, red needles.  $\text{RhCl}_6\text{Na}_3 \cdot 12\text{H}_2\text{O}$ , mixed with  $\text{C}_5\text{H}_5\text{N}$  only yields an additional product, insol. in  $\text{NH}_3$ , the analysis indicating a complex substance:  $[\text{RhPy}_2\text{Cl}_4] \cdot [\text{RhPy}_3(\text{H}_2\text{O})\text{Cl}_2]$ . The orange (*cis*) dipyrindino salt, on heating with pyridine, goes directly to the tetrapyrindino compd.; the corresponding red (*trans*) salt yields an insol., salmon-colored intermediate  $[\text{RhPy}_2\text{Cl}_4] \cdot [\text{RhPy}_3(\text{H}_2\text{O})\text{Cl}_2]$ . Attempts to prepare dipyrindino compds. of quadrivalent Rh were unsuccessful, which is surprising in view of the ease with which a corresponding Ir compd. may be prepared. K. H. ENGEL

**The picolide of M. Scholtz and the acetyl derivatives of indolizine and 2-methylindolizine.** A. I. CHICHIBABIN AND P. N. STEPANOV. *Ber.* **62B**, 1068–75 (1929).—By heating picoline with  $\text{Ac}_2\text{O}$  at 200–20° Scholtz obtained a compd.  $\text{C}_{12}\text{H}_{11}\text{O}_2\text{N}$  (I), designated by him as picolide, which with boiling concd. HCl gave II, first known as pyrrocoline but which may now more appropriately be named indolizine or pyrrodine. Since only one Ac group can be detected in I with the usual ketone reagents, S. assigned to it the structure III. With  $(\text{EtCO})_2\text{O}$   $\alpha$ -picoline does not give a product analogous to I but a compd.  $\text{C}_{12}\text{H}_{13}\text{ON}$  (IV) which S. and Fraude represented by the formula V. It seemed to C. and S. much more probable, however, that I and IV both contain the II nucleus, I being the 1,3-di-Ac and IV the 1-methyl-3-propionyl deriv. The formation of I could then be explained as follows: the  $\alpha$ -picoline first forms the  $\omega$ -di-Ac deriv.,  $\alpha\text{-C}_5\text{H}_7\text{NCH}(\text{OAc})_2$ , which, in its tautomeric form VI changes through the compd. VII into the 3-Ac deriv. of II and this is converted by a 2nd mol. of  $\text{Ac}_2\text{O}$  into I. With  $(\text{EtCO})_2\text{O}$  the reaction stops at the 3-acyl deriv. (IV) because there is a Me group on the 1-C atom. The only fact which is in a way not in harmony with this view is that no ketone reactions could be detected for the second Ac group in I. But there are many indications in the literature that the ease with which ketone reactions take place is diminished in *N*-methylpyrrole derivs. with acyl groups in the  $\alpha$ -positions, and accordingly C. and S. made a thorough study of the Ac derivs. of II and its readily available 2-Me homolog (VIII). With boiling  $\text{Ac}_2\text{O}$  and  $\text{NaOAc}$  VIII gave a cryst. mono-Ac deriv. (IX), which is beyond doubt the 1-Ac deriv.; it gives the usual ketone reactions only with great difficulty, does not react with  $\text{NH}_2\text{OH}$  or  $\text{PhNHNH}_2$  under the usual conditions, reacts only difficultly with organo-Mg compds. and apparently does not give the normal products. With  $\text{Ac}_2\text{O}$  at 220° it forms a di-Ac deriv. (X), believed to be the 1,3-compd., in which, as in I, only one Ac group readily gives the

usual ketone reactions; *e. g.*, with  $\text{PhNHNH}_2$ , it forms a monophenylhydrazone. When **X** is heated under the conditions used by Scholtz to obtain **II** from **I**, it regenerates **VIII**. His mono-Ac deriv. (**XI**) of **II** with  $\text{Ac}_2\text{O}$  at  $220^\circ$  gives **I**. These results prove beyond doubt that **I** is the 1,3-di-Ac deriv. of **II**. **IX**, yellowish,  $b_p$   $159-60^\circ$ ,  $b_d$   $174-5^\circ$ ,  $m$ .  $83^\circ$ , does not change in the air when perfectly pure, is slowly volatile with steam; alc. solns. give a cherry-red pine splinter reaction. **X** (3.75 g. from 10 g. **IX**), yellowish,  $m$ .  $123^\circ$ ; alc. solns. give no pine splinter reaction even after several hrs. although on very long standing there gradually appears a red color; phenylhydrazone, yellow,  $m$ .  $210^\circ$  (decompn.). **XI**,  $b_p$   $148-9^\circ$ , gives a bright cherry-red pine splinter reaction.



C. A. P.

**Condensation of quinaldine with chloro aldehydes.** H. KONDO AND T. MATSUNO. *J. Pharm. Soc. Japan* 49, 445-57 (1929).—Condensation of quinaldine with  $\text{CCl}_3\text{CHO}$  was previously reported by Einhorn (*cf. Ber.* 18, 3465). Employing the same method, condensation of quinaldine with mono- and dichloroacetaldehyde was studied. Condensation of  $\text{C}_{10}\text{H}_7\text{N}$  (10 g.) with  $\text{Cl}_2\text{CHCHO}$  (15 g.), using  $\text{ZnCl}_2$  (0.5 g.), gave 2-[ $\gamma$ -dichloro- $\beta$ -hydroxypropyl]quinaldine (**I**),  $\text{C}_{12}\text{H}_{11}\text{NOCl}_2$ ,  $m$ .  $143^\circ$  (yield 5% of theory). Condensation of quinaldine with  $\text{CH}_2\text{ClCHO}$  under different conditions (control of the reaction temp., time and condensing agent) failed to produce any product. Dehydration of **I** (2 g.) in  $\text{CHCl}_3$  with  $\text{PCl}_5$  (3 g.) or **I** (2.5 g.) in  $\text{Et}_2\text{O}$  with  $\text{SOCl}_2$  (2 g.) gave  $\gamma$ -dichloro- $\alpha$ -[2-quinolyl]propene (**II**),  $m$ .  $131^\circ$  (yield 1-2 g.). Reduction of **II** (1.5 g.) in  $\text{AcOH}$  with  $\text{Pd}$  and **C** gave  $\gamma$ -dichloro- $\alpha$ -[2-quinolyl]propane (**III**).  $\text{Pt}$  salt of **III**, decompn.  $192-4^\circ$ . Further reduction of **III** (1.2 g.) with 38%  $\text{HCl}$  (10 g.) and  $\text{Zn}$  (5.5 g.) gave 2-[ $\gamma$ -dichloropropyl]-1,2,3,4-tetrahydroquinoline (yield very small). Reduction of **II** (2 g.) with 38%  $\text{HCl}$  (20 g.) as above gave 2-[ $\gamma$ -dichloropropenyl]-1,2,3,4-tetrahydroquinoline (**IV**). Reduction of **IV** (0.2 g.) with  $\text{Pd}$  and **C** gave **V**,  $m$ .  $235-48^\circ$ . Picrate of **V**  $m$ .  $160^\circ$ ; a mixed  $m$ . p. with picrate of **IV** ( $m$ .  $158^\circ$ ) gives  $159^\circ$ , hence **V** is identical with **IV**. The properties of the tri-Cl deriv. (condensation product of  $\text{CCl}_3\text{CHO}$  and quinaldine) were also studied. F. I. NAKAMURA

**Condensation of o-aminobenzaldehyde with esters of ketodicarboxylic and diketocarboxylic acids.** GEORG KOLLER, HILDEGARDE RUPPERSBERG AND ELSE STRANG. *Monatsh.* 52, 59-67 (1929); *cf. Koller and Strang, C. A.* 22, 3663.—Condensation of 3.55 g.  $\text{CO}(\text{CH}_2\text{CO}_2\text{Et})_2$  and 2.13 g.  $o\text{-H}_2\text{NC}_6\text{H}_4\text{CHO}$  (**I**) in 25 cc.  $\text{EtOH}$  with 0.02 g.  $\text{NaOH}$  gives 3.9 g. of the compd.  $\text{C}_{18}\text{H}_{17}\text{O}_4\text{N}$ ,  $m$ .  $64-6^\circ$ , which is probably a di-Et homu-acridinate; sapon. gives 2-methylquinoline-3-carboxylic acid, it being impossible to isolate the di- $\text{CO}_2\text{H}$  acid. **I** (1.7 g.) and 2.2 g.  $\text{AcCH}_2\text{COCO}_2\text{Et}$  in  $\text{EtOH}$ , condensed with a little  $\text{KOH}$ , give 1.5 g. of the compd.,  $\text{C}_{14}\text{H}_{13}\text{O}_3\text{N}$ ,  $m$ .  $92-3^\circ$ . Alk. sapon gives an acid,  $\text{C}_{12}\text{H}_9\text{O}_3\text{N}$ ,  $m$ .  $141^\circ$  (decompn.), which, heated at its  $m$ . p. *in vacuo*, splits off  $\text{CO}_2$  and gives the compd.  $\text{C}_{11}\text{H}_9\text{ON}$ ,  $m$ .  $100-1^\circ$ ,  $b_d$   $182^\circ$  (phenylhydrazone,  $m$ .  $165-6^\circ$ ; oxime,  $m$ .  $206-7^\circ$ ); oxidation with  $\text{CrO}_3$  in  $\text{H}_2\text{SO}_4$  gives 3-quinolinecarboxylic acid, condensation with  $\text{BzH}$  gives the compd.  $\text{C}_{18}\text{H}_{13}\text{ON}$ ,  $m$ .  $223-4^\circ$ . 2,4-Dihydroxyquinoline-3-carboxylic amide, pale yellow,  $m$ .  $295^\circ$  (decompn.); heating with  $\text{POCl}_3$  in a sealed tube gives 2,4-dichloro-3-cyanoquinoline, catalytically reduced to 3-cyanoquinoline,  $m$ .  $108^\circ$ ; since the yield was poor, it was also obtained by heating the amide of 3-quinolinecarboxylic acid,  $m$ .  $195^\circ$ , with  $\text{POCl}_3$ ; this does not yield definite products with Grignard reagents. **I** and  $\text{CO}(\text{CH}_2\text{COCO}_2\text{Et})_2$  give the compd.  $\text{C}_{18}\text{H}_{17}\text{O}_4\text{N}$ ,  $m$ .  $129^\circ$ . C. J. WEST

**Action of ammonia on monobromoacetaldehyde and the preparation of pyrazine from the latter.** A. E. CHICHIBABIN AND M. N. SHCHUKINA. *Ber.* 62B, 1075-80 (1929).—Attempts to prep. pyrazine (**I**) directly from  $\text{BrCH}_2\text{CHO}$  (**II**) and  $\text{NH}_3$  did not give satisfactory results; on heating in alc. in sealed tubes, chiefly an insol resin, with only insignificant amts. of **I**, was formed. Accordingly the products formed by replacing the  $\text{Br}$  in **II** by  $\text{NH}_2$  (see below) were oxidized with  $\text{Hg}^{++}$  salts; even under these conditions the yields of **I**, based on the **II**, were not higher than 17%. The action of  $\text{NH}_3$  on **II** varies widely with the conditions; it depends not only on the temp. but also on the velocity with which the  $\text{NH}_3$  is passed in and especially on the solvent.



Under certain conditions cryst. products of definite compn. can be isolated but resinous substances are also always formed and sometimes are the chief products. The reactions probably proceed in 2 directions: (1)  $\text{NH}_3$  adds to the  $\text{C}=\text{O}$  group and the intermediate  $\text{BrCH}_2\text{CH}(\text{OH})\text{NH}_2$  loses  $\text{H}_2\text{O}$  to form  $\text{BrCH}=\text{NH}$  which polymerizes to *tribromomethylhexahydrotriazine* (III) which was isolated in 17% yield when the reaction was carried out in  $\text{C}_6\text{H}_6$  at  $10-5^\circ$ ; (2) the Br is replaced by  $\text{NH}_2$  and the resulting  $\text{BrH} \cdot \text{NH}_2\text{CH}_2\text{CHO}$  under certain conditions reacts further to form  $\text{NH}_3$  derivs. of different structures and mol. wts. in which the Br is present as  $\text{HBr}$ , *i. e.*, is pptd. quantitatively from  $\text{H}_2\text{O}$  by  $\text{AgNO}_3$ . When the reaction was carried out in  $\text{Et}_2\text{O}$  there was obtained a cryst. product whose compn. was not always const. in different expts. and which could not be further purified because of its instability, but in the majority of cases its compn. agreed quite well with the formula  $(\text{H}_2\text{NCH}_2\text{CH}=\text{NH})_3 \cdot 3\text{HBr} \cdot \text{NH}_3 \cdot 11\text{H}_2\text{O}$  (IV); in a few cases its compn. approached the formula  $(\text{H}_2\text{NCH}_2\text{CH}=\text{NH})_3 \cdot 3\text{HBr}$ ; if the passage of the  $\text{NH}_3$  through the cold  $\text{Et}_2\text{O}$  soln. was continued for a long time there was formed a thick transparent oil which, when the  $\text{NH}_3$  was stopped and the temp. was allowed to rise, boiled with evolution of  $\text{NH}_3$  and gradually crystd. to IV. With  $\text{PhNHNH}_2$  these substances gave glyoxal phenyllosazone. III decomps.  $100^\circ$ , mol wt. in  $\text{C}_6\text{H}_6$  342.3–352.4, insol. in  $\text{H}_2\text{O}$ , decmps. on boiling into  $\text{NH}_3$  and II, decmpd. into II by cold dil. acids, appreciably reduces cold  $\text{NH}_3 \cdot \text{AgNO}_3$  only on very long standing but on boiling quickly forms a Ag mirror; on standing the crystals become dull, then yellow and in 1.5–2 months change into a brown powder. C. A. R.

The relation of chemical structure to the rate of hydrolysis of ketopiperazines. I. Hydrolysis of *N*-methylketopiperazines by alkali. P. A. LEVENE, LAWRENCE W. BASS AND ROBERT E. STEIGER. *J. Biol. Chem.* 81, 697–702(1929).—Glycylglycine, glycylsarcosine and sarcosylsarcosine anhydrides are hydrolyzed very rapidly at  $\text{pH}$  13.4, the 1st most rapidly and the other 2 at a lower rate. The rate is much lower when a Me group is substituted on the  $\alpha$ -C as in *N*-methylalanylsarcosine anhydride and the effect is still more pronounced in *N*-methylvalylsarcosine anhydride. These compds. were studied to obtain data required for the interpretation of observations on the racemization of proteins by alkali. A. P. LOTHROP

Acridine. IV. Formation of diacidryl derivatives from *N*-methylacridone. KURT LEHMSTEDT AND HEINRICH HUNDERTMARK. *Ber.* 62B, 1065–7(1929); cf. C. A. 23, 3229. —Decker and Duntan obtained from *N*-methylacridone and Zn dust in  $\text{AcOH}$  a difficultly sol. yellow ppt. which they converted with boiling  $\text{HNO}_3$  into dimethyl-diacridinium dinitrate (I); they assumed that the pinacol  $[\text{MeN}(\text{C}_6\text{H}_4)_2\text{C}(\text{OH})_2]$  (II) was further reduced to the diacidrene,  $[\text{MeN}(\text{C}_6\text{H}_4)_2\text{C}]_2$  (III) which was converted by the  $\text{HNO}_3$  into the I. Ehrlich and Benda, on the other hand, found that 3,6-diamino-10-methylacridone is reduced by Zn dust and  $\text{HCl}$  to the pinacol which rearranges directly into the quaternary chloride without passing through any intermediate product analogous to III. A repetition of D. and D.'s work confirmed their results; both II and III were isolated. The course of the reaction observed by E. and B. probably depends less on the influence of the substituents than on the medium; apparently the pinacol rearranges into the quaternary salt too rapidly in the  $\text{HCl}$  to permit of the reduction of appreciable amts. to the diacidrene. II is easily obtained by making a boiling soln. of I alk. with  $\text{NaOH}$ ; D. and D.'s statement that the diacidridinium salts give no turbidity or ppt. in  $\text{H}_2\text{O}$  with alkalis holds only for low temps. and short intervals of time; at  $0^\circ$  the alk. soln. of the nitrate gradually becomes reddish brown and begins to get turbid after 1 hr. 10,10'-Dimethyl-9,9'-diacidrene (III), light yellow, melts at a very high temp., insol. in  $\text{H}_2\text{O}$ , sol. only in traces in  $\text{Et}_2\text{O}$ , alc.,  $\text{Me}_2\text{CO}$  and  $\text{C}_6\text{H}_6$ , its solns., especially in  $\text{C}_6\text{H}_5\text{N}$ , show a beautiful green fluorescence; it dissolves in hot dil.  $\text{HNO}_3$  and on cooling seps. almost quantitatively in the yellow leaflets of I. 10,10'-Dimethyl-9,9'-dihydroxy-[9,10,9',10'-tetrahydro-9,9'-diacidryl] (II), brown, m. above  $300^\circ$ , rapidly sol. in hot dil.  $\text{HCl}$  with light yellow color, gives with concd. KI the red diacidrylium diiodide, crystals with 1  $\text{H}_2\text{O}$  which they lose at  $105^\circ$ , turning brown, and reabsorb from the air. The salts of 9,9'-diacidryl are so greatly hydrolyzed by  $\text{H}_2\text{O}$  that the free base seps. Whereas acridine is easily methylated with  $\text{Me}_2\text{SO}_4$  at  $100^\circ$ , diacidryl reacts only to the extent of 30% after 10 hrs. at  $185^\circ$ . with KI it then gives the red quaternary diiodide. As the D. and D. method gives only 0.9 g. from 10 g. *N*-methylacridone, L. and H. prepd. it by heating 2 g. 9-chloroacridine with 2 g. "Naturkupper C" 2 hrs. at  $140^\circ$ ; yield, 1.2 g. C. A. R.

Some new aryliminoxy- $\gamma$ -triazidinic derivatives. I. ADRIANO OSTROGOVICH AND VITTORIA BENA MEDIAN. *Gazz. chim. ital.* 59, 181–98(1929).—A preliminary note. Previous expts. have shown (cf. O., *Gazz. chim. ital.* 39, i, 540(1909)) that  $\text{BzH}$  condenses with guanylurea (I) and with biuret in the presence of concd.  $\text{H}_2\text{SO}_4$  to form  $\gamma$ -tri-

azidinic derivs. The present paper deals with the condensation of I with *o*- (II), *m*- (III) and *p*-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>CHO (IV) and *p*-Me<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>CHO (V). The products were aryl-iminoxy- $\gamma$ -triazidines, showing in conjunction with the earlier work that the condensation reaction is a general one for aryl aldehydes. I let stand 2-3 days at room temp. with II in concd. H<sub>2</sub>SO<sub>4</sub>, poured into ice-water and purified with HCO<sub>2</sub>H and animal charcoal, yields *o*-nitrophenyliminoxy- $\gamma$ -triazidine sulfate, (C<sub>6</sub>H<sub>5</sub>N<sub>5</sub>O<sub>3</sub>)<sub>2</sub>·H<sub>2</sub>SO<sub>4</sub> (VI), m. 249-50° (decompn.), turns dark brick-red when exposed to light. Treated with NH<sub>4</sub>OH or better with concd. aq. Na<sub>2</sub>CO<sub>3</sub>, VI forms *o*-nitrophenyliminoxy- $\gamma$ -triazidine (VII), m. 208-9°, turns brown-red in light (more sensitive than VI), sol in cold aq. alk. hydroxides. *HCl salt*, C<sub>6</sub>H<sub>5</sub>N<sub>5</sub>O<sub>3</sub>·HCl·H<sub>2</sub>O, m. 235-6° (decompn.), its H<sub>2</sub>O of crystn. is difficult to eliminate and is readily reabsorbed. *Chloroplatinate*, (C<sub>6</sub>H<sub>5</sub>N<sub>5</sub>O<sub>3</sub>·HCl)<sub>2</sub>·PtCl<sub>6</sub> (VIII), Cu-color, m. 233-4°, rapidly turns golden yellow on exposure to light. The normal salt could not be obtained, in contrast to the corresponding derivs. of III and IV. This is the 1st case of a quadrivalent Pt complex in which there are 4 mols. of a HCl salt of a base. It may have the structure [PtCl<sub>6</sub>](H·C<sub>6</sub>H<sub>5</sub>N<sub>5</sub>O<sub>3</sub>)<sub>4</sub>, in which Pt has the coordination no. 8, as with complexes of Mo, W and other elements. *Nitrate* of VII, C<sub>6</sub>H<sub>5</sub>N<sub>5</sub>O<sub>3</sub>·HNO<sub>3</sub>, m. 216-8° (decompn.) becomes carmine-red when exposed to sunlight in aq. suspension with a little HNO<sub>3</sub>, and a trace of Ag ion. *Monopicrate* of VII, C<sub>6</sub>H<sub>5</sub>N<sub>5</sub>O<sub>3</sub>·C<sub>6</sub>H<sub>5</sub>N<sub>3</sub>O<sub>7</sub>, yellow, m. 213-5°, becomes more intensely yellow when exposed to light; dissolved in hot aq. picric acid (satd. when cold) it forms a *dipicrate*, hydrolyzes extremely easily. Hot aq. VII and AgNO<sub>3</sub> ppt. a *Ag salt*, [Ag(C<sub>6</sub>H<sub>5</sub>N<sub>5</sub>O<sub>3</sub>)<sub>2</sub>](NO<sub>3</sub>), m. 200° (decompn.). Aq. AgNO<sub>3</sub> added to VII in hot NH<sub>4</sub>OH, or aq. NH<sub>3</sub>·AgNO<sub>3</sub> added to hot aq. VII ppts. the *Ag salt*, C<sub>6</sub>H<sub>5</sub>N<sub>5</sub>O<sub>3</sub>Ag, which is the true Ag salt with the enolic structure of VII. In a similar way from I and III was obtained *m*-nitrophenyliminoxy- $\gamma$ -triazidine sulfate, m. 257-8° (decompn.), and *m*-nitrophenyliminoxy- $\gamma$ -triazidine (IX), m. 222°. Compared with VII, it is relatively insensitive to light, though it ultimately turns pale yellow. Its salts are quite stable in light and change little or not at all. *HCl salt* turns yellow at 260°, m. 268°. *Chloroplatinate* has the normal hexachloroplateate form, (C<sub>6</sub>H<sub>5</sub>N<sub>5</sub>O<sub>3</sub>)<sub>2</sub>·H<sub>2</sub>PtCl<sub>6</sub>, orange-yellow, m. 255-6° (decompn.). No compd. analogous to VIII was obtained. *Nitrate*, m. 250° (decompn.). *Monopicrate*, C<sub>6</sub>H<sub>5</sub>N<sub>5</sub>O<sub>3</sub>·C<sub>6</sub>H<sub>5</sub>N<sub>3</sub>O<sub>7</sub>·H<sub>2</sub>O, canary-yellow, m. 210-11°, stable, could not be hydrolyzed. *Dipicrate*, pale yellow, very readily hydrolyzed, contains no H<sub>2</sub>O of crystn. *Complex Ag salt*, [Ag(C<sub>6</sub>H<sub>5</sub>N<sub>5</sub>O<sub>3</sub>)<sub>2</sub>](NO<sub>3</sub>). *Normal Ag salt*, C<sub>6</sub>H<sub>5</sub>N<sub>5</sub>O<sub>3</sub>Ag. Both these Ag salts were formed as before. Following the same procedure as before, I and IV form *p*-nitrophenyliminoxy- $\gamma$ -triazidine sulfate, m. 253-4° (decompn.). *p*-Nitrophenyliminoxy- $\gamma$ -triazidine, from dil. EtOH, m. 180° (decompn.). *HCl salt*, m. 250° (decompn.). *Chloroplatinate*, (C<sub>6</sub>H<sub>5</sub>N<sub>5</sub>O<sub>3</sub>)<sub>2</sub>·H<sub>2</sub>PtCl<sub>6</sub>, from hot water, reddish orange, m. 246-7° (decompn.). *Nitrate*, from hot water, m. 230-1° (decompn.). *Monopicrate*, dark yellow, turns darker in light, m. 212-3° (turning brown-red). *Dipicrate*, by heating the monopicrate with excess concd. alc. picric acid, yellow, is readily hydrolyzed, could not be obtained pure. *Complex Ag salt*, [Ag(C<sub>6</sub>H<sub>5</sub>N<sub>5</sub>O<sub>3</sub>)<sub>2</sub>](NO<sub>3</sub>). *Normal Ag salt*, C<sub>6</sub>H<sub>5</sub>N<sub>5</sub>O<sub>3</sub>Ag. I, *p*-Me<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>CHO and concd. H<sub>2</sub>SO<sub>4</sub> let stand 2-3 days at room temp., poured into ice-water and almost neutralized with Na<sub>2</sub>CO<sub>3</sub>, ppts. *p*-dimethylaminophenyliminoxy- $\gamma$ -triazidine sulfate, (C<sub>11</sub>H<sub>12</sub>N<sub>5</sub>O)<sub>2</sub>·H<sub>2</sub>SO<sub>4</sub> (X), m. 252-3° (decompn.), turns yellow in sunlight; heated with 2N H<sub>2</sub>SO<sub>4</sub> and cooled it ppts. another sulfate, C<sub>11</sub>H<sub>12</sub>N<sub>5</sub>O·H<sub>2</sub>SO<sub>4</sub> (XI), m. 208-10° (decompn.), not colored by sunlight, hydrolyzed on diln. with water to X. X or XI dissolved in excess concd. H<sub>2</sub>SO<sub>4</sub>, a relatively large vol. of EtOH-Et<sub>2</sub>O (equal parts) added, yields a 3rd sulfate, C<sub>11</sub>H<sub>12</sub>N<sub>5</sub>O·2H<sub>2</sub>SO<sub>4</sub> (XII), m. 120-2° to a milky liquid which becomes green at 180-90°, hydrolyzes very easily to XI and thence to X, is not colored by sunlight. Excess concd. Na<sub>2</sub>CO<sub>3</sub> added to X, XI or XII, filtered, washed with water and the residue recrystd. from boiling water or hot dil. MeOH or EtOH, yields *p*-dimethylaminophenyliminoxy- $\gamma$ -triazidine (XII), C<sub>11</sub>H<sub>12</sub>N<sub>5</sub>O·H<sub>2</sub>O, m. 220-1° (decompn.); its H<sub>2</sub>O of crystn. is eliminated *in vacuo* at 140° and is reabsorbed on contact with the atm.; it is much less sol. than VII and IX in aq. alk. hydroxides, which must be hot to dissolve it. It becomes intensely yellow in sunlight. Its hot aq. solns. are distinctly alk., which suggests that the mol. of H<sub>2</sub>O is bound to the Me<sub>2</sub>N group, forming a true NH<sub>4</sub> hydroxide. This would be the first known stable hydroxide of an org. tertiary amine. This would explain why XII gives stable non-hydrolyzable salts, even with HCO<sub>2</sub>H and AcOH, whereas its analogous compds. do not. *Mono-HCl salt*, C<sub>11</sub>H<sub>12</sub>N<sub>5</sub>O·HCl, by evapn. of XII in 2 N HCl (calcd quantity), m. 212-4° (becoming green just below the m. p. and ruby-red just above the m. p.). XII evapd. with excess 2 N HCl and a little AcMe added to facilitate crystn. yields the *di-HCl salt*, C<sub>11</sub>H<sub>12</sub>N<sub>5</sub>O·2HCl·H<sub>2</sub>O, turns emerald-green at 180°.

in 222–3° (decompn.), also formed by passing dry HCl over dry XII. AcMe added to XII in 2 N HCl ppts. the *di-HCl salt*,  $C_{11}H_{15}N_5O \cdot HCl \cdot 2H_2O$ , m. 200° (first becoming emerald-green). A cryst. *chloroplatinate* could not be obtained, the product always being a sirup. XII dissolved in dil. HNO<sub>3</sub> and AcMe added ppts. the *nitrate*,  $C_{11}H_{15}N_5O \cdot HNO_3$ , rose-colored, m. 215° (decompn.). XII dissolved in hot dil. AcOH, and the product recrystd. from water, yields the *acetate*,  $C_{11}H_{15}N_5O \cdot AcOH$ , yellowish, m. 202–3° (decompn.). XII dissolved in dil. HCO<sub>2</sub>H yields the *formate*,  $C_{11}H_{15}N_5O \cdot HCO_2H$ , m. 213° (decompn.). Aq. picric acid (XIII) added to hot aq. XII (equimol. parts) ppts. the *mono-picrate*,  $C_{11}H_{15}N_5O \cdot C_6H_3N_3O_7$  (XIV), bright red, m. 220° (decompn.), also formed by agitating XII (moist freshly prepd. powder) with excess aq. XIII, and recrystg. from water. XIV suspended in cold satd. aq. XII is transformed into the *tri-picrate*,  $C_{11}H_{15}N_5O \cdot 3C_6H_3N_3O_7$  (XV), lemon-yellow, softens 185°, m. 190° (decompn.), is hydrolyzed in hot water to XIV. It is probable that the 1 mol. of XIII in XIV is fixed to the Me<sub>2</sub>N group, while the other 2 mols. of XIII in XV are bound to the triazidine nucleus. Besides adding 2 more mols. of XIII to form XV, XIV has the power to add other acids, *e. g.*, HCl, HNO<sub>3</sub> and H<sub>2</sub>SO<sub>4</sub>, forming mixed salts. All the latter are readily hydrolyzed to XIV. XIV and N HCl (calcd. quantity) let stand and the product dried, form the *picromonohydrochloride*,  $C_{11}H_{15}N_5O \cdot C_6H_3N_3O_7 \cdot HCl$  (XVI), light yellow, turns red around 130°, softens and becomes dark green at 185°, and m. 190° (decompn.). XIV and 3 N HCl let stand overnight deposit the *picrotetrahydrochloride*  $C_{11}H_{15}N_5O \cdot C_6H_3N_3O_7 \cdot 3HCl$ , (XVII), yellowish, m. 153–5° (decompn.). Kept *in vacuo* over soda lime a long time, XVII forms the *picrodihydrochloride*  $C_{11}H_{15}N_5O \cdot C_6H_3N_3O_7 \cdot 2HCl$ , yellowish, m. approx. 176° (decompn.). By hydrolysis, all 3 mols. of XIII in XV can be eliminated, XIV being formed when hot, while at ordinary temp a lemon-yellow *monopicrate* (XVIII) is formed. This monopicate contains no Cl ions, yet has the phys. properties of XVI, including its m. p., the only difference between XVI and XVIII being that XVI turns green around its m. p. The difference between XIV and XVIII is being studied. All these derivs contain in the triazidine nucleus a CO group bound to 2 NH radicals and are sol. in aq. alk. hydroxides, first passing to the acid enolic form. Nevertheless, this enolic form is stable only as metallic salts and could not be obtained in the free state, since it reverted immediately to the original CO form when its alk. solns. were neutralized with AcOH or even with CO<sub>2</sub>. Furthermore, by dissolving in hot NH<sub>4</sub>OH, the compds. are recovered unaltered on cooling, without the formation of any NH<sub>4</sub> salts. The carbimidyl group (the C atom of which is an integral part of the triazidine group) probably represents the only stable form, for Ac derivs. could not be obtained which should be formed even if the compds. were partially of the amine structure or if the seminuclear imine were to be transformed tautomerically during the reaction to the amine structure. For these reasons the compds. in the present paper are considered to be derivs. of the hypothetical sym. hexahydrotriazidine  $\gamma$ -triazidine. In virtue of the asymmetry of the triazidine nucleus, these derivs. should all be racemic and it should be possible to resolve them into optical antipodes by a suitable acid. II. Additions and corrections to the preceding note on the same subject. *Ibid* 198 200.—Further expts. on derivs. of *p*-dimethylamino-phenyliminoxy- $\gamma$ -triazidine modify certain results already obtained (*cf.* above). The picromonohydrochloride is very difficult to obtain repeatedly with the same compn., for there is a strong tendency for the reaction:  $2 C_{11}H_{15}N_5O \cdot C_6H_3N_3O_7 \cdot HCl \rightarrow C_{11}H_{15}N_5O(C_6H_3N_3O_7)_2 + C_{11}H_{15}N_5O \cdot 2HCl$ , to take place. This reaction was confirmed by quant. analysis. The di-HCl salt remains in soln., while the *dipicrate*,  $C_{11}H_{15}N_5O(C_6H_3N_3O_7)_2 \cdot 1.5H_2O$ , ppts. The latter turns red around 140°, softens around 185° and m. 190° (to a black-brown liquid). If, instead of adding a strictly equimol. quantity of HCl to the monopicate, a slight excess is added, then the dipicrate adds HCl, forming a *dipicromonohydrochloride*,  $C_{11}H_{15}N_5O(C_6H_3N_3O_7)_2 \cdot HCl$ , yellow, m. 185–90° (to a greenish brown liquid). The HCl is eliminated *in vacuo* at 100°. The yellow monopicate (*cf.* preceding abstr.) does not exist, and it was only the dipicrate. The red monopicate treated with dry HCl gas forms a *picrotetrahydrochloride*  $C_{11}H_{15}N_5O \cdot C_6H_3N_3O_7 \cdot 4HCl$ , unstable, losing HCl slowly in air. The base in high excess, subjected for a long time with aq. picric acid forms a *semipicrate*,  $(C_{11}H_{15}N_5O)_2 \cdot C_6H_3N_3O_7$ , golden yellow, m. 205–6°, does not turn red when heated dry or in water. C. C. D.

**Alkaloid of *Stemona japonica*.** I. K. SUZUKI. *J. Pharm. Soc. Japan* 49, 457–64 (1929).—Alc. exts. from the root of *Stemona japonica* in 0.01% yield stemonidine,  $C_{17}H_{27}NO_5$ , m. 116°, contains the following groups: =NH, —OMe, —CO.O— and OH. It is different from hodorine,  $C_{16}H_{21}NO_5$  (Furuya, *J. Pharm. Soc. Japan*; Sept., 1911; *cf.* C. A. 8, 550). S. proposes the formula  $C_{17}H_{21}(:NH)(OMe)(COO)(OH)_2$ .

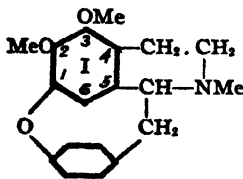
F. I. NAKAMURA

**Synthesis of coptisine.** ERNST SPÄTH AND ROBERT POSEGA. *Ber.* 62B, 1029-33 (1929).—It was hoped that by hydrolyzing the MeO groups in palmatine chloride and treating the resulting product in alk. soln. with  $\text{CH}_2\text{I}_2$ , coptisine (I) would be formed. The amorphous product obtained in the last step, however, yielded no tetrahydrocoptisine (II). Delépine's methylene sulfate (mol. wt. detns. in  $\text{Me}_2\text{CO}$  indicate it has the formula  $(\text{CH}_3\text{SO}_4)_2$ ) gave no better results, although with  $o\text{-C}_6\text{H}_4(\text{OH})_2$ , it gives 15% of the methylene ether. Tetrahydropalmatine was then hydrolyzed with fuming  $\text{HCl}$  to the compd.  $\text{C}_{17}\text{H}_{19}\text{O}_4\text{N} \cdot \text{HCl}$  (90% yield; also obtained in the same way from tetrahydrojatrorrhizine), 3.2 g. of which, when placed with  $\text{CH}_2\text{Cl}_2$ ,  $\text{NaOMe}$  and  $\text{MeOH}$  in a bomb at  $-80^\circ$ , evacuated to 1 mm., sealed and heated 6 hrs. at  $100^\circ$ , the operation being repeated after addn. of fresh  $\text{CH}_2\text{Cl}_2$  and  $\text{NaOMe}$ , gave 0.06 g. II, m.  $228-9^\circ$  (evacuated tubes); Kitasato found  $217-8^\circ$  in open tubes. The II was identical with a product obtained from protopine converted with  $\text{Na-Hg}$  into the carbinol base, then into the quaternary iodide with  $\text{NaI}$  and distd. in a high vacuum to split off  $\text{MeI}$ . C. A. R.

**Carnegine.** ERNST SPÄTH (IN PART WITH JOSEF PASSL). *Ber.* 62B, 1021-4 (1929).—1-Methyl-6,7-dimethoxy-3,4-dihydroisoquinoline (I), prepd. from 3,4-( $\text{MeO}$ ) $_2\text{C}_6\text{H}_3\text{CH}_2\text{NHAc}$  and  $\text{P}_2\text{O}_5$ , in boiling  $\text{PhMe}$  (C. A. 23, 2443), yields with  $\text{MeI}$  at  $100^\circ$  a *methiodide*, crystals with 3  $\text{H}_2\text{O}$ , m.  $100-2^\circ$  and anhyd.,  $176-8^\circ$ , which is reduced by  $\text{Sn}$  and  $\text{HCl}$  to the *tetrahydroisoquinoline* (II), identical with Heyl's carnegine (C. A. 23, 1211). II is a thick oil, b.  $170^\circ$  (bath temp.):  $\text{HCl}$  salt, m.  $210-1^\circ$ ; *picrate*, m.  $212-3^\circ$  (decompn.) in an evacuated capillary; *2,4,6-trinitro-1,3-cresolate*, m.  $169-70^\circ$  (evacuated tube); *methiodide*, m.  $210-1^\circ$  (vacuum tube). The identity of the synthetic and natural substances was proved by mixed m. p. detns. on the above derivs. Furthermore, that I and II are the 1-methyl-6,7-dimethoxy derivs. and not the 1,7,8-isomers, as would be the case if, in the prepn. of I, the ring had closed in the  $o$ -position to 1 of the  $\text{MeO}$  groups, is shown by the fact that oxidation of I with  $\text{KMnO}_4$  gives *m*- and not ordinary hemipinic acid. It is worthy of note that natural II, like the peltoline in *Anhalonium williamsi*, is optically inactive. C. A. R.

**Constitution of isochondodendrine.** III. FRANZ FALTIS AND KAROLINE ZWERINA (WITH A. B. GAHLIB ATTIA). *Ber.* 62B, 1034-41 (1929); cf. C. A. 22, 1777.—It was shown in the 2nd paper that the tri- $\text{CO}_2\text{H}$  acid formed by oxidation of the compd  $\text{C}_{18}\text{H}_{16}\text{O}_8$  which is obtained by Hofmann degradation of isochondodendrine (I) is 1,2,3,4-(or 6), 5-( $p\text{-HO}_2\text{CC}_6\text{H}_4$ )( $\text{MeO}$ ) $_2\text{C}_6\text{H}(\text{CO}_2\text{H})_2$  (II); whether one of the  $\text{CO}_2\text{H}$  groups is in position 4 or 6 will have to be detd. by synthesis. For methylisochondodendrine, whose constitution had been completely established except for the point of union of the phenyl ether O with nucleus I, the formula was accepted as almost certain, for union through C atom 6, i. e., in the  $o$ -position to the two-C atom bridge, seems very improbable on sterical grounds. If the above formula is correct, oxidation should give a II with a  $\text{CO}_2\text{H}$  group in the 4-position. 3,4-Dimethoxy-1,1'-diphenylether-5,6,4'- (III) and -5,6,3'-tricarboxylic acid (IV) have been synthesized by condensation of the di-Me ester of 6-bromohemipinic acid (V) with the Na salts of *p*- and *m*- $\text{HOC}_6\text{H}_4\text{CO}_2\text{Me}$ , whereby it has for the first time been proven that II cannot be derived from hydroxyhydroquinone. No condensation with *o*- $\text{HOC}_6\text{H}_4\text{CO}_2\text{Me}$  could be effected.

Bromoopianic acid, m.  $204^\circ$ , obtained in 90% yield from opianic acid in  $\text{H}_2\text{O}$  at  $60-70^\circ$  slowly treated with a 2-3 fold excess of  $\text{Br}$ , gives on cautious heating in 80%  $\text{MeOH}$  with 1 mol.  $\text{NH}_4\text{OH} \cdot \text{HCl}$  90% of bromoopianoxime anhydride which, when boiled several hrs. in 100 parts  $\text{H}_2\text{O}$ , yields the acid  $\text{NH}_4$  salt of V, and after filtering the imide of V, addn. of  $\text{HCl}$  and concn. gives the *anhydride* of V, m.  $193^\circ$ , dissolving in hot  $\text{H}_2\text{O}$  as the acid and stable toward concd.  $\text{H}_2\text{SO}_4$  at room temp.; slowly treated alternately with  $\text{Me}_2\text{SO}_4$  and 20%  $\text{KOH}$  it yields 59% of the *di-Me ester*, m.  $56-7^\circ$ . *Tri-Me ester* of III (56% from the ester of IV, *p*- $\text{KOC}_6\text{H}_4\text{CO}_2\text{Me}$ , "Naturkuper C" and  $\text{Cu}(\text{OAc})_2$  at  $150-70^\circ$ ), m.  $108-9^\circ$ , is different from the tri-Me ester of II whose m. p. ( $99-102^\circ$ ) it depresses to  $82^\circ$ . Free III, m.  $242^\circ$  (decompn.), gives a flocculent orange-yellow ppt. with  $\text{FeCl}_3$ , seps. with 2  $\text{H}_2\text{O}$  and changes into the anhydride above  $100^\circ$ . *Tri-Me ester* of IV (yield 70%), resin partly crystg. when rubbed with  $\text{MeOH}$ ; m.  $111-2^\circ$ , depresses the m. p. of the ester of IV  $8^\circ$ ; free IV sinters  $177^\circ$ , m.  $179-83^\circ$  on slow,  $185^\circ$  (decompn.) on rapid heating, shows no tendency to anhydride formation, gives an orange-yellow ppt. with  $\text{FeCl}_3$ , depresses the m. p. of III. III when demethylated with boiling  $\text{HI}$  loses a  $\text{CO}_2\text{H}$  group; the *nor-acid*,  $\text{C}_{14}\text{H}_{10}\text{O}_7$ , is a powder, m. above  $250^\circ$  (decompn.), gradually turns brown in the air, gives with  $\text{NH}_4\text{OH}$  a pink color



turning to green on boiling, with very dil.  $\text{FeCl}_3$  a transient light blue color, with dil.  $\text{Na}_2\text{CO}_3$  a violet-red color changing to fiery red, with very dil.  $\text{HCl}$  a violet color changing to blue with pptn. of a dark ppt. The *nor-acid* from IV, yellow powder, m.  $248^\circ$  (decompn.). C. A. R.

**4,5-Dimethoxyhemimellitic acid.** FRANZ FALTIS AND FRITZ KLOIBER. *Ber.* 62B, 1041-5(1929).—4,5-Dimethoxyhemimellitic acid (I) has been obtained by replacing the diazo group in diazohemipinic acid (II) by CN and, without isolating the nitrile, hydrolyzing with  $\text{HCl}$ . Under the proper conditions (by using the K salt obtained by cautious neutralization of II with 1 mol.  $\text{KOH}$ ), I is obtained in quite good yield as the sole product of the reaction; otherwise there is also obtained 5,2,3- $\text{HO}(\text{MeO})_2\text{-C}_6\text{H}_3\text{CO}_2\text{H}$ . I agrees in its properties in general with Gorter's description (*C. A.* 16, 2470), except that the Ca salt has 5 instead of 3 mols.  $\text{H}_2\text{O}$ . The transformation into methemipinic anhydride (III) is also not so simple in working with larger amts. because of the volatility of an *anhydride acid*,  $\text{HO}_2\text{C}(\text{MeO})_2\text{C}_6\text{H}(\text{CO})_2\text{O}$  (IV), m.  $180^\circ$ , which I forms at  $120\text{--}30^\circ$ . *In vacuo* at  $240\text{--}50^\circ$  IV distills over slowly but almost completely and when  $\text{CO}_2$  is passed over I at  $250^\circ$  some of the IV deposits entirely undecompd. in the cold part of the tube; only by brisk heating to  $300\text{--}20^\circ$  and subsequent vacuum distn. can a mixt. contg. III, along with IV, be obtained. IV dissolves in  $\text{Na}_2\text{CO}_3$  with green fluorescence which disappears within 0.5 hr. as the IV is hydrated to I; in  $\text{NaOH}$  the disappearance of the fluorescence is very rapid, in  $\text{NaOAc}$  it is considerably slower. With  $\text{CH}_3\text{N}_2$  I gives a tri-Me ester, m.  $86\text{--}7^\circ$ , whose identity with an oily ester obtained from the oxidation product of laurotetanine was shown by the fact that the oil crystd. when seeded with the synthetic compd. and the 2 substances did not depress each other's m. p. C. A. R.

**A synthesis of *rac*-corydalines.** ERNEST SPÄTH AND ERICH KRUTA. *Ber.* 62B, 1024-9(1929).—One of the arguments against the plausible assumption that the berberine-like bases are formed in plants from derivs. of tetrahydropapaverine (I) by condensation with  $\text{HCHO}$  was the fact that in the reaction between I and  $\text{HCHO}$  the ring is not closed in the *o*- but in the *p*-position to 1 of the  $\text{MeO}$  groups, giving norcorydaline (II) instead of tetrahydropalmatine (III). Recently, however, it was shown (*C. A.* 23, 1644) that if the  $\text{MeO}$  groups in I are sapond. before the treatment with  $\text{HCHO}$  and the product is then methylated with  $\text{CH}_3\text{N}_2$  there are obtained both II and III. This method has now been applied to the synthesis of the *rac*-corydalines (IV). Methylpapaverine, obtained by condensing papaverine with 40%  $\text{HCHO}$  at  $125^\circ$  and reducing the resulting methylene deriv. with Pd-charcoal, gives on elec. reduction at a Pb cathode in 25%  $\text{H}_2\text{SO}_4$  the *py-tetrahydro deriv.* (V), probably a mixt. of the 2 possible *rac*-bases, about 0.5 of which was obtained as a *cryst. hydrate*,  $2\text{C}_{21}\text{H}_{27}\text{O}_4\text{N}_2\cdot\text{H}_2\text{O}$ , m.  $93\text{--}5^\circ$  (evacuated tubes); *picrate*, orange-yellow, m.  $215\text{--}6^\circ$  (decompn) in evacuated tubes; *N-Bz deriv.*, amorphous, non-basic. The  $\text{MeO}$  groups in the crude V were sapond. with fuming  $\text{HCl}$  at  $150\text{--}5^\circ$  and the resulting *compd.*,  $\text{C}_{17}\text{H}_{19}\text{O}_4\text{N}_2\cdot\text{HCl}$ , m.  $238\text{--}40^\circ$  (evacuated tubes), was condensed with  $\text{HCHO}$  and methylated with  $\text{CH}_3\text{N}_2$ ; yield of methylated product (VI), about 10%. The sepn. of the components of VI presented difficulties. Crystn. from a little  $\text{Et}_2\text{O}$  at  $0^\circ$  yielded pure *ms*-corydaline (about 10% of the VI). The tertiary were sepd. from the other bases by conversion with hot alc. I into the yellow quaternary iodides which were reduced by Zn and  $\text{AcOH}$  to the more easily separable tetrahydro bases; fractional pptn. of the acid solns. of these bases with  $\text{KBr}$  gave ppts. from which a small amt. of IV was isolated. These results indicate that plants probably manuf. the berberine-like bases not from completely methylated but from wholly or partially demethylated bases C. A. R.

**Alkaloid of *Lycoris radiata*.** III. H. KONDO AND K. TOMIMURA. *Imp. Univ. Tokyo. J. Pharm. Soc. Japan* 49, 438-44(1929).—In a previous publication (cf. *C. A.* 22, 2948) it was reported that the root of *Lycoris radiata* contains lycorine and sekisanine. K. and T. extd. new compds. and named them sekisanoline (I) and homolycorine (II), resp. I,  $\text{C}_{19}\text{H}_{21}\text{NO}_6$ , decomp.  $152^\circ$ , sol. in ordinary org. solvents,  $[\alpha]_D^{25} -60.27^\circ$  in  $\text{CHCl}_3$ . Sekisanoline-MeI decomp.  $117\text{--}22^\circ$  and corresponds to  $\text{C}_{19}\text{H}_{21}\text{NO}_6\cdot\text{MeI}$ . I contains neither  $\text{OMe}$  nor  $\text{NMe}_2$  groups. It gives a positive Gaebler reaction and contains a  $\text{CH}_2\text{O}_2$  group. The Pt salt and picrate decomp.  $211^\circ$  and  $127\text{--}33^\circ$ , resp. Acetylsekisanoline decomp.  $155^\circ$  and corresponds to  $\text{C}_{19}\text{H}_{21}\text{NO}_6\cdot(\text{COMe})_2$ . I contains 2 phenolic OH groups and the N is of tertiary nature. II,  $\text{C}_{19}\text{H}_{21}\text{NO}_4$ , m.  $175^\circ$ ,  $[\alpha]_D^{25} 65.10^\circ$  in alc. II forms many salts:  $\text{HCl}$  salt, Pt salt, picrate and methiodide decomp.  $285^\circ$ ,  $267^\circ$ ,  $268^\circ$  and  $256^\circ$ , resp. II has no phenolic OH, but contains 2  $\text{OMe}$  groups. The N is of tertiary nature. The di-Ac deriv. decomp.

173° and corresponds to  $C_{17}H_{21}NO_4(OMe)_2$ . K. and T. propose the structures  $C_{17}H_{19}O_4(O_2CH_2)(OH)_2(:N)$  and  $C_{17}H_{19}(OMe)_2(OH)_2(:N)$  for I and II, resp. F. I. N

**Solanine.** GIUSEPPE ODDO. *Gazz. chim. ital.* 59, 155-60(1929).—See C. A. 23, 2978. C. C. DAVIS

**Synthetic morphine.** OTAKAR WEBER. *Chem. Listy* 23, 79-81(1929).—Synthetic morphine was prepd. according to recent methods on a lab. scale. It was recrystd. from EtOH yielding brilliant prismatic needles; morphine from a vegetable source was also recrystd. from EtOH and used as a control. Fröhde's reagent (0.1 g Na molybdate in 10 cc. concd.  $H_2SO_4$ ) gives the same color reaction with morphine from both sources and with mixts. of both kinds of morphine. Concd.  $H_2SO_4$  dissolves the morphine of both sources and forms a colorless soln. Concd.  $HNO_3$  dissolves the morphine (synthetic) forming a blood-red soln. which becomes yellow gradually, the addn. of  $ZnCl_2$  converts the yellow color to a violet. Synthetic morphine in concd.  $H_2SO_4$  was heated for 10 min. and, after cooling, the addn. of  $HNO_3$  produced a red color. Both varieties of morphine responded identically to Marquis' reagent ( $HClO$  -  $H_2SO_4$  mixt.). With  $Me_2NC_6H_4CHO$  in  $H_2SO_4$ , the synthetic morphine yielded an immediate clear red color; the natural morphine gave a faint color which is due to a contamination by other alkaloids. Morphine from both sources had no definite m. p. and began to decomp. 230°. Synthetic morphine prepd. according to McLang is 99-99.5% pure and can be used in prepg. morphine-HCl directly without going through the di-Ac deriv. This prepn. gives all of the reactions of the HCl salt prepd. from natural morphine. Codeine from synthetic morphine is a white cryst. powder, it gives the chem. reactions of codeine from natural morphine. Synthetic morphine was acetylated according to McLang and yielded quantitatively diacetylmorphine which when recrystd. m. 171.5-2°. Ethylation of synthetic morphine yielded dionine which gives a dark blue color with Marquis' and a green color with Fröhde's reagent, and m. 123°. Apomorphine from synthetic morphine is a white amorphous powder which forms a colorless soln. in  $H_2SO_4$  and a red color with  $HNO_3$ . A mixt. of a 1% soln. of apomorphine, 4 drops 0.3%  $K_2Cr_2O_7$ , and 10 cc.  $AcOEt$  yielded a violet color which turned green after adding  $ZnCl_2$ . Attempts are being made to produce synthetic morphine on a semicommercial scale. The pharmacol. studies are to be made

FRANK MARESH

**The amine oxides of hydrastine and of narcotine.** MAX POLONOVSKI and MICHEL POLONOVSKI. *Compt. rend.* 188, 341-3(1929).—Hydrastine (I) treated in cold  $AcOH$  with 30%  $H_2O_2$  for several days and neutralized with  $Na_2CO_3$  yielded a pasty ppt. which when washed with satd.  $AcONa$  gave a slightly colored honey-like mass, very sol. in  $H_2O$ , EtOH,  $Me_2CO$  and  $CHCl_3$ . Evapn. *in vacuo* left the amine oxide (II) of I, a white substance,  $\alpha_D$  88° (3% in  $CHCl_3$ ), which reacts with  $SO_2$  in  $H_2O$  or  $CHCl_3$  to form a sulfuric ether, reddened by heating and converted by boiling with  $H_2O$  to I sulfate. II heated with  $Ac_2O$  gives a strong red which is characteristic of amine oxides. It forms a HCl salt, m. about 125°,  $\alpha_D$  160° (12% in  $H_2O$ ), sol. in  $H_2O$ ,  $Me_2CO$ , less sol. in abs. EtOH; *picrate*, amorphous, m. 128°. II is very unstable even at ordinary temps. and on heating it assumes a yellow form, neutral to litmus, insol. in  $H_2O$ , very slightly sol. in EtOH and  $Me_2CO$ , and possessing no optical activity. This new product (empirical formula,  $C_{20}H_{19}O_7NCH_3$ ), m. 189°, lacks all the properties of an amine oxide. It is not reduced by  $SO_2$  and gives no red color with  $Ac_2O$ . It forms a HCl salt, m. 196°. Narcotine (III) subjected to the treatment outlined yields an amine oxide (IV) of vitreous consistency, very sol. in  $H_2O$ , EtOH and  $CHCl_3$ ,  $\alpha_D$  135° (in  $CHCl_3$ ), easily reduced by  $SO_2$  to the original III. IV gives the characteristic red color with  $Ac_2O$  and forms well crystd. salts with dil. acids. IV.HCl, m. 195°,  $\alpha_D$  100°, is very sol. in  $H_2O$ ; *picrate*, m. 130°; *chloroplatinate*, m. 175°. IV readily changes into a compd., m. 228-9°, with the same soly. behavior as that resulting from II and similarly possessing no optical activity. This transformation product is identical with that described by Drummond and McMillan (C. A. 21, 247) save for its optical activity which is ascribed to IV which escaped these observers. C. H. PERR

**The preparation of active sandaraco-pimaric acid and its derivatives.** FR. BALÁŠ AND J. BRZÁK. *Collection Czechoslov. Chem. Comm.* 1, 306-14(1929).—The isolation of pure cryst., optically active natural sandaraco-pimaric acid,  $C_{20}H_{30}O_2$ , from sandarac in 0.7% yield is described. The properties, including crystallographic detns. of the acid, its Na, K,  $NH_4$ , Ag, di- $\delta$ -amylamine, piperidine and cinchonidine salts and its Me and Et esters are given. It m. 173°,  $[\alpha]_D$  -18.8° in 1.6% alc. soln. and -13.0° in 1.6%  $CHCl_3$  soln. V. F. HARRINGTON

**The digitalis glucosides. III. Gitoxigenin and isogitoxigenin.** WALTER A. JACOBS AND EDWIN L. GUSTUS. *J. Biol. Chem.* 82, 403-9(1929); cf. C. A. 23, 149 -

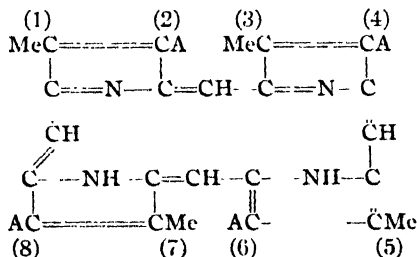
Facts now available show that isogitoxigenin (I) like the other iso-compds., is a lactone or the lactol form of a hydroxyaldehyde. I when sapond. displays great stability towards alkalis. Me isogitoxigenonate ( $C_{24}H_{34}O_6$ ) consumes only 1 equiv. of 0.1 N alkali when sapond. by the method which opened both ester and lactone groups. With stronger alkali and higher temp., it is now possible to detect the presence of a relatively resistant lactone group. This ester is therefore a ketolactone ester. Iso-gitoxigeninic acid upon oxidation with hypobromite yields isogitoxigenic acid ( $C_{28}H_{34}O_6$ , but formerly reported as  $C_{21}H_{30}O_6$ ), a lactone isomeric with isoperiplogenic and isosarmentogenic acids. Gitoxigenin (II) possesses 1 secondary alc. group and a tertiary HO which is presumably  $\gamma$  to the aldehydic C. The retention of the secondary HO in I is shown by its oxidation to the lactone, isogitoxigenone. It is assumed that differences in chem. properties of II and digitoxigenin are due to the position of the extra tertiary HO of II. It is definitely concluded that II, like digitoxigenin, is a tetracyclic  $\Delta^{\beta,\gamma}$ -lactone in which a C atom presumably  $\gamma$  to the lactone  $\gamma$ -C atom carries a tertiary HO group.

RUSSELL C. ERB

**Conversion of chlorophyll derivatives into phylloerythrin.** HANS FISCHER AND RUDOLF BÄUMLER. *Sitzb. math.-naturw. Abt. bayer. Akad. Wiss. München* 1929, 77-83.—The energetic alk. decompn. of chlorophyll leading to porphyrins is drastic and at best gives but a 30% yield. Enzymic means seem more attractive. When tried with pheophorbide a (I), chlorine (II), and pheophytin (III), the results were disappointing and unexpected as expts. by others have indicated that in the digestive tract of ruminants, enzymes split MeOH and phytol from chlorophyll. Since reduction goes on in the alimentary tract enzymically, chem. reducing agents, such as Na-Hg, Zn and HOAc, HI and HOAc, were employed. I and II in ether with 2% Na-Hg and NaOH, for from 11 to 18 hrs., became colorless, because of the presence of leuco compds.; on reoxidation by a stream of air, the red color was restored. The yield was very poor as only traces of porphyrins could be detected. I with Zn and HOAc gave a leuco compd. and oxidation of it produced a porphyrin. In contrast to the leuco compd., this is very sol. in pyridine. This product is phylloerythrin and is different from the porphyrin from the b component. The best results were obtained when I was heated for 7 min. at 100° with HOAc and HI (d. 1.69). The porphyrin, *i. e.*, phylloerythrin, was easily isolated by crystn. Its identity was established by the formation of a *mono-Me ester*, m. 260° (cor.), alone and when mixed with an authentic sample. A *second porphyrin*, in lesser amt., accompanied the above, and while the analysis  $C_{33}H_{36}N_4O_6$  is the same, the absorption spectrum is further toward the violet. III and Et chlorophyllide, subjected to similar treatment, behaved as did I. II by mold action gave a new porphyrin.

G ALBERT HILL

**Porphyrin synthesis. XXIII. Syntheses of coproporphyrin III and IV; a contribution to the knowledge of porphyria.** H. FISCHER, K. PLATZ AND K. MORGENROTH. *Z. physiol. Chem.* 182, 265-88(1929); cf. *C. A.* 23, 2184.—Four isomeric coproporphyrins are theoretically possible, depending on the location of the four Me and the four  $CH_2CO_2H$  groups (A) around the porphin nucleus.



These group arrangements are as follows:

Coproporphyrin	Methyls	Acid groups
I	1,3,5,7	2,4,6,8
II	1,4,5,8	2,3,6,7
III	1,3,5,8	2,4,6,7
IV	1,4,6,7	2,3,5,8

Other arrangements are not possible if each pyrrole ring carries both substituents and the porphin structure is to remain intact, which seems probable from the fact that after reduction of porphyrins to their leuco compds. oxidation gives back the original

porphyrins. I and II have already been synthesized. I is the natural coproporphyrin which occurs in porphyria and in yeast. The structure represented by III is present in hemin. The natural coproporphyrin cannot therefore be derived from the blood pigment but must be formed by a primary synthesis. The 4 coproporphyrins are readily distinguished by the sharp m. ps. of their esters. Physiologically they are of great interest because of the possibility that pathological conditions might give rise to other forms than the commonly occurring I. The syntheses were performed by succinic acid fusions of the appropriately substituted dipyrromethenes. The 1st prepn. of coproporphyrin IV were obtained from di[2,5-dimethyl-3-carboxyethylpyrryl]methene-HBr and di[2-bromo-3-methyl-4-carboxyethylpyrryl]methene-HBr by the succinic acid method and also by means of HBr-AcOH in a sealed tube. Both procedures gave poor yields. Better yields were obtained by the succinic acid fusion of di[2-bromomethyl-3-carboxyethyl-4-methylpyrryl]methene-HBr with di[2-bromo-3-methyl-4-carboxyethylpyrryl]methene HBr. The evolution of HBr begins at 150° and reaches its max. at 175-80°. The HCl ext. of the reaction mixt. has an intense bluish red color. Esterification by the usual procedure gives a tetra-Me ester, m. 168-9°. Spectroscopically the product is identical with the other coproporphyrins. The tetra-Et ester, prepd. by treatment of the free porphyrin with EtOH and HCl, m. 152°. Complex Cu salt of the tetra-Me ester, m. 216-7°; of the tetra-Et ester, m. 180-1°. The corresponding hemin was prepd. by treatment of the Me ester with AcOH and Fe, whereby the color changed from red to brown, and the product crystd from AcOH. For the prepn. of coproporphyrin III the aldehyde of hemopyrrolecarboxylic acid was required. This was obtained by suspending the acid in  $\text{CHCl}_3$ , adding HCN and satg. with HCl, then sapon. with NaOH the imine-HCl which crystd. out. The product m. 155° (semicarbazone, m. 190°; oxime, m. 152°; Me ester, m. 89°). The aldehyde was condensed with cryptopyrrole by means of HBr to 49% [4,5-dimethyl-3-carboxyethylpyrryl][5',3'-dimethyl-4'-ethylpyrrolenyl]methene-HBr, which decomp. 217°. In the same manner the Me ester of the aldehyde acid was condensed with cryptopyrrolecarboxylic acid to yield 80% of [4,5-dimethyl-3-carbomethoxyethylpyrryl][5',3'-dimethyl-4'-carboxyethylpyrrolenyl]methene-HBr, m. 138°. The latter when heated with di[2-bromo-3-methyl-4-carboxyethylpyrryl]methene yielded coproporphyrin III, which was isolated in the form of its cryst. ester. This ester exists in 2 isomorphic modifications, m. 145° and 172°, the higher-melting form being the more stable. Of considerable biol. interest is the fact that this synthetic coproporphyrin III is identical with the coproporphyrin recently isolated by Hijmans van den Bergh, Regniers and Muller (*Arch. Verdauungs-krankheiten* 42, 306) from the urine and feces of a case of congenital porphyria. It is not necessary to assume here a secondary synthesis from normal blood pigment. Coproporphyrin III and protoporphyrin are so closely related that the former could result from a simple addn. of  $\text{CH}_2\text{O}_2$  to the latter. This mode of formation is considered more probable than a primary biol. synthesis such as occurs in the formation of coproporphyrin I.

A. W. DOX

**The rate of hydrolysis of ribonucleotides.** P. A. LEVENE AND ERIK JORPES. *J Biol. Chem.* 81, 575-80(1929).—The rate of hydrolysis of the base from pyrimidine-nucleosides can be enhanced by hydrogenation of the base, hence hydrogenated cytidine-phosphoric acid was used in the expts. It behaves exactly like the purine-nucleotides not only with respect to the rate of hydrolysis of the base but also of the  $\text{H}_3\text{PO}_4$ . "The earlier conclusion, therefore, as to the allocation of the  $\text{H}_3\text{PO}_4$  in the pyrimidine-nucleotides has to be abandoned in favor of the view that the  $\text{H}_3\text{PO}_4$  in these nucleotides as well as in the purine-nucleotides is allocated on a secondary C atom." Guanylic acid derived from the pancreas gland behaves like adenylic acid derived from yeast-nucleic acid rather than like inosinic acid on hydrolysis so that it is evident that not all ribomononucleotides occurring in animal tissues are derived from an identical phosphoribose.

A. P. LOTHIROP

**The molecular binding power of bile acids and sterols.** HEINRICH RHEINBOLDT. II. Hyodesoxycholic acid. ALBERT LAUBER. *Z. physiol. Chem.* 182, 251-4(1929), cf. C. A. 23, 1906.—Hyodesoxycholic acid differs from the isomeric desoxycholic acid in its inability to form choleic acids. Further proof of this fact is now presented in thawing point and m. p. diagrams of binary systems contg. hyodesoxycholic acid with palmitic, stearic, stearolic, brassidic and behenolic acids and cetyl alc. In all cases the eutectic point was reached with 1% of the hyodesoxycholic acid. III. Cholic acid. ALBERT LAUBER. *Ibid* 255-8.—Similar diagrams for mixts. of the above fatty acids with cholic acid showed that the latter likewise fails to form mol. compds. with fatty acids. The eutectic point was invariably obtained with the mixt. contg. only 1% of the higher-melting component.

A. W. DOX



**Isoquinoline derivs. I. The synthesis of 6-methoxy-7-ethoxy-3,4-dihydroisoquinoline and its derivatives.** KONDO AND S. TANAKA. *J. Pharm. Soc. Japan* 49, 59-64 (1929); cf. *C. A.* 23, 2979.—Heating 3-methoxy-4-ethoxy-1-( $\beta$ -aminoethyl)benzene with  $\text{HCO}_2\text{H}$  at 180–200° gave, after recrystn. in alc., *N*-(3-methoxy-4-ethoxyphenethyl)-formamide (I), m. 86.5°. Heating of I, toluene and  $\text{POCl}_3$  at 105° gave colorless crystals of 6-methoxy-7-ethoxy-3,4-dihydroisoquinoline,  $\text{C}_{12}\text{H}_{15}\text{O}_3\text{N}$  (II), m. 86–7°. II forms many salts: *HCl* salt, decomp. 202°; chloroplatinate, decomp. 202°. Catalytic reduction of II.HCl in water with 1%  $\text{PdCl}_2$  soln. and active C (after 1.5 hrs. 1 g. takes up about 90 cc. H) gave 6-methoxy-7-ethoxytetrahydroisoquinoline (III); *HCl* salt, m. 206–7°. The methochloride of II as above, gave *N*-methyl-6-methoxy-7-ethoxytetrahydroisoquinoline (m. 64–4.5°). *HCl* salt, m. 227–8°. F. I. NAKAMURA

**Addition of antimony trichloride and tin tetrachloride to unsaturated hydrocarbons.** HANS VON EULER AND HARRY HELLSTRÖM. *Svensk Kem. Tids.* 41, 11–5 (1929). (In German.)—Many cases are cited in which  $\text{SbCl}_3$ ,  $\text{SnCl}_4$ ,  $\text{AsCl}_3$  and  $\text{TiCl}_3$  react with conjugated double bonds in org. compds. giving colored products. Some spectrometric data are included. Diergosteryl phosphate and  $\text{SnCl}_4$  are brought together in  $\text{CHCl}_3$  soln. and a green fluorescence results, becoming violet and again green on diln. There is at first absorption at  $434\mu$  and in the later diln. at  $620\mu$ . This is the explanation of the Carr-Price color reaction for vitamin AH since this reaction is identical with carotoid (*C. A.* 23, 3009, 3013). A. R. ROSE

**X-ray contributions to the problem of polymerization (CLARK) 2.** Configuration of quadrivalent atoms (LOWRY) 2. Comparative studies on the breakdown of polypeptides, their derivatives, and amides by normal alkali, erepsin and trypsin or trypsin-kinase (ABDERHALDEN, ZEISSET) 11A. Further comparative studies on the breakdown of polypeptides and their derivatives at various H-ion concentrations and by erepsin and trypsin-kinase (ABDERHALDEN, SCHMITZ) 11A. The problem of specific relations of erepsin and trypsin to definite atomic groupings in polypeptides (ABDERHALDEN, HERRMANN) 11A. The determination of the alkali-combining quantity of the most important sugars (HIRSCH, SCHLAGS) 2. Molecular dimensions of organic compounds (LOWRY, NASINI) 2. Anserine, a new constituent of avian musculature (ACKERMANN, *et al.*) 11A. Molecular structure and properties of homopolar compounds. II. Structure of C atom and isomerism in homologous series (DIBROVA) 3. Orientation of organic compounds by cylindrical glass surfaces and superficial orientation of glass (TRILLAR) 2. The shift in the 1.14 absorption band of some  $\text{C}_6\text{H}_5$  derivatives (BARNES, FULWEILER) 3. Polyoxymethylene a model of cellulose (STAUDINGER) 23. Apparatus for the decomposition of hydrocarbons (Fr. pat. 657,118) 9.

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RODRIGUEZ, L. INÉS: **Estudio sobre la ionona y productos intermedios.** Santiago: Escuela tip. salesiana "La Gratitude nacional." 25 pp.

ROESLER, PAUL: **Contribution a l'etude des benzothiadiazole.** STRASSBURG: Editions universitaires. 83 pp.

**Organic bases.** I. G. FARBENIND. A.-G. Brit. 302,939, Dec. 23, 1927. In producing org. bases by the catalytic treatment of mixts. of  $\text{C}_2\text{H}_2$  with  $\text{NH}_3$  or org. bases, as described in Brit. 283,163 (*C. A.* 22, 3892) and Brit. 296,423 (*C. A.* 23, 2722) and Brit. 269,423, the mixt. leaving the catalytic chamber is washed with the condensation products formed in the reaction (or with selected fractions of the condensate), preferably at a temp. below 0°. The washing may be in 2 stages, first with fractions b. above 100° to recover the bases and then with fractions b. below 120° to recover  $\text{C}_2\text{H}_2$  from the waste gas which is mainly H. Cf. *C. A.* 23, 2185.

**Reducing organic compounds.** DONALD G. ROGERS (to National Aniline & Chemical Co.). U. S. 1,721,319, July 16. In the production of a leuco deriv. from indigo or in similar reductions, the compd. to be reduced is mixed with Zn and a soln. of  $\text{NaHSO}_4$ , the quantity of  $\text{NaHSO}_4$  used being insufficient to interact with all the Zn present, and during the reaction there is continuously added a quantity of  $\text{H}_2\text{SO}_4$  sufficient to form and maintain the presence of  $\text{NaHSO}_4$  from the  $\text{Na}_2\text{SO}_4$  present.

**Reducing or hydrogenating organic substances.** I. G. FARBENIND. A.-G. Brit. 301,577, Sept. 19, 1927. In producing  $\text{PhNH}_2$  from  $\text{PhNO}_2$  or in other reduction or hydrogenation processes, H is used under pressure in the presence of a catalyst prepd. by pptg. a metal from a soln. of its salt by means of a Si and O compd. contg. a smaller proportion of O than does  $\text{SiO}_2$ , e. g., by treating a soln. of Ni acetate with oxydisilin or

by the similar treatment of salts of metals such as Cu, Zn, Pd, Pt, Au, Sn, Ag, Co, Pb, Ti and Bi.

**Hydrogenation.** I. G. FARBENIND. A.-G. Fr. 657,179, July 9, 1928. Aromatic bases are hydrogenated by adding alkali or alk. earth compds. to the catalysts. Examples are given of the hydrogenation of PhNH<sub>2</sub> in the presence of Ni<sub>2</sub>O<sub>3</sub> contg. Na<sub>2</sub>CO<sub>3</sub> or CaO and of *o*-toluidine in the presence of CO<sub>2</sub>O<sub>3</sub> contg. CaO.

**Catalytic hydrogenation.** GRS. FÜR TEERVERWERTUNG, MEIDERICH and H. KAFFER. Brit. 302,912, Dec. 23, 1927. The residue remaining from the hydrogenation of coal by the Bergius process is used as a catalyst for the hydrogenation of hydrocarbons such as C<sub>10</sub>H<sub>8</sub> and "benzene."

**Separating gaseous or low-boiling-point hydrocarbons.** I. G. FARBENIND. A. G. Brit. 302,203, Sept. 8, 1927. Hydrocarbon mixts. such as a mixt. of ethylene, propylene, butylene and butadiene produced by decompn. of cyclohexane vapor at 600° in a quartz tube filled with Ca aluminate as described in Brit. 297,398 (C. A. 23, 2722) are liquefied and then subjected to fractional distn. under pressure. Various details are given.

**Distilling hydrocarbons, etc.** PREUSSISCHE GEWERKSCHAFT RAPHAEL. Fr. 657,413, July 2, 1928. In using molten salts or metals for distg. hydrocarbons or other substances a constant temp. is obtained by passing the molten material in a circuit successively to a heating chamber and to the treating chamber.

**Side-chain halogenation of aromatic hydrocarbons.** NIKOLAUS ZELINSKII and SCHERING-KAHLBAUM A.-G. Ger. 478,084, Nov. 29, 1923. Side-chain halogenation to the desired stage and without production of isomers is attained by conducting the halogenation in daylight or artificial light and in the vapor phase but at a temp. below the b. p. of the desired product and under such conditions that the product is immediately removed from the halogenating chamber. Thus, in prepg. C<sub>6</sub>H<sub>5</sub>CH<sub>2</sub>Cl, C<sub>6</sub>H<sub>5</sub>CHCl<sub>2</sub> may be boiled in a vessel connected with a chlorinating chamber through a reflux condenser maintained at a temp. between 110° and 176°, the arrangement being such that the C<sub>6</sub>H<sub>5</sub>CH<sub>2</sub>Cl flows back into the vessel as soon as it is formed.

**Chlorinating hydrocarbons.** HOLZVERKOHLLUNGS-INDUSTRIE A.-G. Ger. 478,083, Nov. 16, 1923. In the direct chlorination of CH<sub>4</sub> and other hydrocarbons at a high temp., the formation of HCl is avoided by addn. of O to the mixt. Diluents such as steam, CO<sub>2</sub> or N should be added also.

**Chlorinating hydrocarbons.** THE B. A. S. Co. Fr. 657,518, July 16, 1928. See U. S. 1,717,136 (C. A. 23, 3713).

**Apparatus for catalytic depolymerization of hydrocarbons.** J. MERCIER. Brit. 302,899, Dec. 22, 1927. Structural features of an app. with retorts filled with catalyst.

**Polymer of vinyl chloride.** IWAN OSTROMISLENSKY. U. S. 1,721,034, July 16. A polymerized vinyl chloride is prepd. which is sol. in PhCl and is purified from the acetone sol. polymer until it has the property of forming films of durable flexibility from its PhCl solns.

**Polymerizing diolefin hydrocarbons.** HERMANN STAUDINGER and HERMAN A. BRUSON. U. S. 1,720,929, July 16. Isoprene, indene or other diolefin hydrocarbon contg. 4 or more C atoms to the mol. is treated with a solvent such as C<sub>6</sub>H<sub>6</sub> or CHCl<sub>3</sub> and with a halide salt of Sn such as SnCl<sub>4</sub>. The product can be vulcanized like rubber.

**Diolefins.** I. G. FARBENIND. A.-G. Brit. 301,898, Dec. 9, 1927. Butadiene and its homologs are produced by passing the vapor of 1,3-butylene glycol or a homolog over acid salts such as KH<sub>2</sub>PO<sub>4</sub> or K<sub>2</sub>H<sub>2</sub>P<sub>2</sub>O<sub>7</sub> (suitably assocd. with pumice and at a temp. of about 400-10°).

**Alkyl halides.** I. G. FARBENIND. A.-G. (Karl Dachlauer and Erich Eggert, inventors). Ger. 478,126, Nov. 28, 1924. Addn. to 441,747. Alkyl halides are prepd. by passing a mixt. of an aliphatic alc. vapor with a H halide at a raised temp. over a catalyst comprising active C and H<sub>3</sub>PO<sub>4</sub>. The examples describe the prepn. of MeCl, MeBr and PrCl.

**Alkyl cyclohexanols.** SCHERING-KAHLBAUM A.-G. (Hans Jordan, inventor) Ger. 478,273, July 5, 1925. Alkyl cyclohexanols are prepd. by hydrogenating the condensation products of ketones with phenols in the presence of a catalyst until 14 atoms of H have been taken up. Examples are described.

**Alkyl phenols.** I. G. FARBENIND. A.-G. Fr. 656,908, July 2, 1928. Alkyl phenols and their hydrogenation products are obtained by treating dihydroxydiphenylmethane derivs. with H and a hydrogenation catalyst at temps. above their decompn. point. Thus, thymol may be prepd. by treating 4,4'-dimethyl-2,2'-dihydroxydiphenyldimethylmethane in this way. Several examples are given.

**Alkyl phenols.** SCHERING-KAHLBAUM A.-G. Fr. 657,293, July 11, 1928. See Brit. 294,238 (C. A. 23, 1908).

**Alkylene phenols.** SCHERING-KAHLBAUM A.-G. Fr. 657,122, July 6, 1928. 3-Methyl-6-isopropenylphenol is prepd. by heat dissocn. of 4,4'-dimethyl-2,2'-dihydroxydiphenyldimethylmethane with or without a surface catalyst such as francanite. *p*-Isopropenylphenol is obtained from 4,4'-dihydroxydiphenyldimethylmethane, and *p*-isobutenylphenol from 4,4'-dihydroxydiphenylmethylmethane.

**Alkylene oxides.** TH. GOLDSCHMIDT A.-G. Fr. 656,996, July 4, 1928. Alkylene oxides are prepd. by passing a chlorohydrin soln. and an alkali or alk. earth soln. or suspension continuously through a still by a path of great length.

**Aliphatic alcohols.** E. I. DUPONT DE NEMOURS AND CO. Fr. 657,124, July 6, 1928. In the catalytic production of alcs. from CO and H the yield of higher alcs. per unit of vol. and time is increased by increasing the flow of gases to more than 5 times the flow used for the production of MeOH, and by using catalysts favoring the formation of higher alcs., such as basic Zn-NH<sub>4</sub> chromate contg. 15% K<sub>2</sub>CrO<sub>4</sub>, or Zn chromite or ZnO contg. K<sub>2</sub>SO<sub>4</sub>.

**Esters of higher aliphatic acids.** I. G. FARBENIND. A.-G. Brit. 302,411, Sept. 22, 1927. In affecting esterifications such as those of the fatty acids from coconut oil or olive oil with glycerol, soaps of Al, Mg, Sn and Zn are used to facilitate the reaction.

**Esters of dicarboxylic acids.** I. G. FARBENIND. A.-G. Brit. 302,041, Nov. 28, 1927. Water-sol. esters are formed by acting on 1 mol. proportion of a dicarboxylic acid such as phthalic, succinic or tartaric acid with at least 2 mol. proportions of an alkylene oxide such as ethylene oxide (suitably in a diluent or solvent and in the presence of a catalyst such as alkali metal salt of hydrohalic acid). Mention is made of the use of the products as plasticizers for cellulose esters and ethers.

**Alkyl esters of abietic acid.** HERCULES POWDER CO. Fr. 656,821, June 29, 1928. Abietic acid from ordinary resin (colophany) or other resin is treated with an alkyl halide, *e. g.*, EtCl in the presence of a base such as NaOH, preferably dissolved in EtOH, to produce the corresponding ester. Cf. *C. A.* 22, 3892.

**Polysaccharide esters.** I. G. FARBENIND. A.-G. (Leo Rosenthal, inventor). Ger. 478,127, Jan. 31, 1924. Polysaccharide esters of higher fatty acids having more than 1 double bond are prepd. by treating the polysaccharide with a halide of the acid in the presence of a tertiary org. base. The products are sol. viscous liquids or masses which are readily oxidized by air. They become insol. when oxidized or when heated in an inert gas. The examples describe the prepn. of saccharose, starch and cellulose linoleates and of the starch and saccharose esters of the acids of tung oil. Cf. Brit. 239,726 (*C. A.* 20, 2167).

**Diketones and ketonic esters.** IMPERIAL CHEMICAL INDUSTRIES, LTD., and S. COFFEY. Brit. 302,750, Oct. 6, 1927. Acyl derivs. of  $\beta$ -diketones and  $\beta$ -ketonic esters are prepd. by treating an alkali metal compd. of the ketone with an org. carboxylic acid anhydride. Examples are given of the prepn. of ethyl diacetoacetate, ethyl propionylacetoacetate and ethyl butyrylacetoacetate. The C-derivs. are sepd. from the O derivs. by selective soln. of the former with dil. NaOH soln. or the like.

**Aliphatic ketones.** HOLZVERKOHLUNGS-INDUSTRIE A.-G. and K. ROKA. Brit. 302,759, Oct. 18, 1927. Aliphatic ketones are made from primary aliphatic alcs. with 2 or more C atoms in the mol. such as EtOH, from the aldehyde or aliphatic ester derivs. of these alcs. or from mixts. of these substances with each other or other derivs. such as HOAc or with inert substances, by treating the starting materials with water vapor at an elevated temp. (suitably 250–650°) in the presence of catalysts such as superficially oxidized iron with a promoter such as CaCO<sub>3</sub> or similar materials. Details for the production of acetone from acetaldehyde, etc., are given.

**Cycliketones and quinones.** I. G. FARBENIND. A.-G. Fr. 657,245, July 10, 1928. See Brit. 293,768 (*C. A.* 23, 1756).

**Diazonium salts.** I. G. FARBENIND. A.-G. Fr. 657,041, June 5, 1928. Aq. solns. of diazonium salts such as aryldiazonium fluoborates are stabilized and preserved by the addn. of acids such as HCl, AcOH, oxalic acid, fluoboric acid or polysulfonaphthalene acids, or salts having an acid reaction such as NaHSO<sub>4</sub>, K bixolate or Al<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub>. Examples are given.

**Organic acids.** BRANDON, SIMONNOT RINUY. (Wm. J. Hale and Wm. S. Halde-man, inventors). Fr. 650,771, Mar. 12, 1928. Primary aliphatic alcs. b. below 350° are converted into the corresponding acids by passing the vapor of the alc. in contact with a reduced metal such as Cu, which removes H, and converts it into the aldehyde and then in contact with a metal oxide, *e. g.*, Cu<sub>2</sub>O<sub>3</sub> from which it takes O to form the acid. The oxide may be placed in a tower, the reduced oxide being withdrawn at the base, reoxidized and introduced at the top. An example is given of the conversion of EtOH to AcOH.

**Acids from aldoses.** FABRIQUE DE PRODUITS CHIM (VORM. SANDOZ). Fr. 656,863, June 30, 1928. Aldoses are converted to the corresponding acids by treating the sugars with Cl in alkali carbonate soln. and in the presence of small quantities of Br or I compds. In examples, lactose is converted to lactobionic acid, and glucose to gluconic acid.

**Fatty acids.** OEL- & FETT-CHEMIE G. M. B. H. Fr. 657,228, July 10, 1928. See Brit. 296,079 (C. A. 23, 2313).

**Sulfonating fatty acids.** N. V. CHEMISCHE FABRIEK "SERVO" and MEINDERT D ROZENBROEK. Fr. 657,161, July 7, 1928. See Brit. 293,690 (C. A. 23, 1765).

**Concentrating acetic and other aliphatic acids.** I. G. FARBENIND. A.-G. Brit. 302,174, Dec. 8, 1927. Aq. solns. of acetic, propionic, butyric or similar acids are extd with a solvent for the acid and an addnl. substance, *e. g.*, EtOAc with C<sub>6</sub>H<sub>6</sub>, tetrahydro naphthalene, trichloroethylene or hexahydrobenzene, or benzyl alc. with C<sub>6</sub>H<sub>6</sub>, or methylcyclohexanone with C<sub>6</sub>H<sub>6</sub>, followed by distn. of the ext. to recover the acid and solvents. Various details and modifications are described and other solvents and auxiliary substances are enumerated. Cf. C. A. 23, 3932.

**Concentrating acetic and similar acids.** H. E. MARTIN (to British Celanese, Ltd.) Brit. 301,734, Dec. 3, 1927. Dil. or waste acetic, propionic or similar acids are concd by extn. with methylene chloride (which may be mixed with ether) and then distg. the ext.

**Acetic acid and other acids from aqueous solutions.** HOLZVERKOHLEUNGS-INDUSTRIE A.-G. Brit. 302,268, Dec. 13, 1927. An aq. soln. of an acid such as HOAc is treated with a salt capable of forming a solid acid salt such as NaOAc and, without sepg the acid salt, the mixt. is subjected to distn. under reduced pressure to first obtain a dil. acid and then the acid such as HOAc (which may be recovered at about 170–220°) Brit. 302,269 describes the concn. of similar acids from their solns. in org. solvents by treating the latter with salts such as NaOAc as described in Brit. 291,434 (C. A. 23, 1141) and then distg. the acid from the acid salt in the form of a paste or soln. without previous sepn. of the salt in solid form. The distn. may be under reduced pressure at 170–220°.

**Acetic acid.** HERMANN SUDA. Fr. 33,971, Aug. 5, 1927. Addn. to 593,091. Concd. AcOH is obtained from dil. AcOH by extn. of a superheated mixt. of steam and acid by a solvent having a b. p. appreciably higher than that of the AcOH, and only slightly or not sol. in water, such as acyl or acetyl derivs. of aliphatic polyalcs. or of higher alcs. or acyl or acetyl derivs. of the tars or creosotes used in the prior case. Cf. C. A. 23, 2449.

**Acetic acid from acetaldehyde.** HOWARD W. MATHESON (to Canadian Electro Products Co., Ltd.). U. S. reissue 17,377, July 16. See original pat. No. 1,410,207 (C. A. 16, 1781).

**Butyric acid.** LEFRANC & CIE. Ger. 478,116, July 29, 1922. See Brit. 186,572 (C. A. 17, 324).

**Anthraquinonedisulfonic acid.** DONALD G. ROGERS and HAROLD T. STOWELL (to National Aniline & Chemical Co.). U. S. 1,721,317, July 16. In the production of 1,5- and 1,8-disulfonic acids from anthraquinone, sulfonation is effected in the presence of Hg at a temp. of about 140–60° with oleum contg. about 24–26% free SO<sub>3</sub> which is used in sufficient quantity to sulfonate all of the anthraquinone with the free SO<sub>3</sub> present, and heating of the mixt. is continued until the sulfonation mass is substantially completely sol. in water.

**Naphthenic acid.** STEWART P. COLEMAN (to Standard Oil Development Co.) U. S. 1,720,821, July 16. In treating material such as petroleum oils or fractions, high-boiling org. acids are sepd. from the bulk of assoc. oil by converting the acids to salts with alkali, dissolving the salts in water and sepg. aq. and oily layers. The acids are liberated from their salts by treating the aq. soln. with inorg. acid and the liberated acids are withdrawn, the acids are reconverted to salts with alkali and the material is distd. *in vacuo* to remove all traces of oil and the unvaporized salts are withdrawn and acids are recovered from them. An arrangement of app. is described.

**3'-Nitro-4'-acylamino-*o*-benzoylbenzoic acid.** ROGER ADAMS and WENDELL W. MOYER (to Newport Co.). U. S. 1,720,751, July 16. 3'-Nitro-4'-chloro-*o*-benzoylbenzoic acid is condensed with an acyl substituted ammonia such as *p*-toluenesulfonamide in the presence of a Cu catalyst. From the nitro compds. thus obtained, the corresponding 3'-amino-4'-acylamino-*o*-benzoylbenzoic acids may be obtained by treating the nitro compd. in alc. with powdered Fe and dil. acid, making alk., filtering off the iron sludge and neutralizing the filtrate with acid to ppt. the product. U. S. 1,720,752 relates to the production of amino derivs. by this method.

**Aliphatic anhydrides.** HENRY DREYFUS. Fr. 656,901, July 2, 1928. Ac<sub>2</sub>O and other anhydrides are produced by heating the vapors of the acids which may be dil.,

the anhydrides being condensed and the water carried away by vapor of  $\text{CCl}_4$ , petrol,  $\text{C}_6\text{H}_6$ , or mixts. of these or of ether with petroleum ether, etc., which do not dissolve the anhydride and boil below  $100^\circ$ . An app. is described. Fr. 656,902 describes the production of the same anhydrides, the water being sepd. from the anhydrides by passing the vapors under the surface of a cooled extn. liquid such as  $\text{C}_6\text{H}_6$ ,  $\text{CHCl}_3$ , mixts. of ether or  $\text{CHCl}_3$  with one or more light hydrocarbons (petroleum ether), gasoline,  $\text{C}_4\text{H}_{10}$ , or its homologs, which dissolve the anhydride. An app. is described. Cf. C. A. 23, 2447.

**Aliphatic anhydrides.** HENRY DREYFUS. Fr. 657,423, July 11, 1928.  $\text{Ac}_2\text{O}$  and other aliphatic anhydrides are produced by mixing the acid as spray or vapor with an inert gas such as steam, superheated steam, N or H heated to  $600$ – $1200^\circ$ , the acid being preferably preheated to  $150$ – $300^\circ$ . The anhydride may be sepd. by fractional condensation, passing through a solvent such as chlorobenzenes, benzyl ether, tetrachloroethane, acetins, anisole, *p*-cresyl acetate, phenetole, paraffin oil or mixts. thereof, or by means of an entraining liquid or water-binding substance. An app. is described.

**Acetic anhydride.** I. G. FARBENIND. A.-G. Brit. 301,562, Sept. 6, 1927. Water vapor is sepd. by diffusion (as through a heated graphite tube within a quartz tube) from a mixt. contg.  $\text{Ac}_2\text{O}$  such as may be produced by heating  $\text{HOAc}$ , and after repeated diffusion sepn. the  $\text{Ac}_2\text{O}$  and assocd.  $\text{HOAc}$  are sepd. by distn. Cf. C. A. 23, 3932.

**Phthalic anhydride.** VEREIN FÜR CHEMISCHE UND METALLURGISCHE PRODUKTION. Ger. 478,192, Dec. 13, 1924. In the manuf. of phthalic anhydride from  $\text{C}_{10}\text{H}_8$  by oxidation with air in the presence of a catalyst such as  $\text{V}_2\text{O}_5$ , improved results are obtained by supporting the catalyst on a smooth or polished metal carrier. Thus, a contact mass may be prepd. by immersing small pieces cut from a polished sheet of Al into molten  $\text{V}_2\text{O}_5$ .

**Acetaldehyde.** H. S. HIRST and IMPERIAL CHEMICAL INDUSTRIES, LTD. Brit. 302,515, Jan. 25, 1928. Gases contg. relatively small proportions of  $\text{C}_2\text{H}_2$  are used as sources of  $\text{C}_2\text{H}_2$  for acetaldehyde production by washing in counter-current with a catalytic medium such as a liquor contg.  $\text{H}_2\text{SO}_4$  10–20,  $\text{HgSO}_4$  1 and  $\text{Fe}_2(\text{SO}_4)_3$  7%. Various details and auxiliary features of procedure are described.

**Acetaldehyde.** I. G. FARBENIND. A.-G. Fr. 657,027, July 5, 1928.  $\text{AcH}$  is prepd. from  $\text{C}_2\text{H}_2$  or gaseous mixts. contg.  $\text{C}_2\text{H}_2$  by treating the gases with a soln. of an alkali bisulfate contg. Hg compds. and other heavy metal compds. An example is given in which a gaseous mixt. obtained by treating  $\text{CH}_4$  in an elec. arc, or pure  $\text{C}_2\text{H}_2$  is passed through a soln. of  $\text{KHSO}_4$  contg. Hg oxide and 0.5%  $\text{CuSO}_4$  at  $70^\circ$ .

**Ether.** NEDERLANDSCHE GIST- EN SPIRITUSFABRIEK. Ger. 478,388, July 19, 1924. Corresponds to Brit. 219,272 (C. A. 19, 524), but gives addnl. exptl. details.

**Ethyl chloride.** I. G. FARBENIND. A.-G. (Hermann Suida, inventor). Ger. 478,082, June 13, 1924. The manuf. of  $\text{EtCl}$  by the combination of  $\text{C}_2\text{H}_4$  and  $\text{HCl}$  under pressure in the presence of a catalyst is conducted at a temp. below  $100^\circ$  in a liquid medium which dissolves the reagents under the prevailing conditions without undergoing chem. change.  $\text{EtCl}$  itself is the preferred solvent.

**Trichloroethylene.** CONSORTIUM FÜR ELEKTROCHEMISCHE INDUSTRIE GES. Brit. 302,321, Dec. 14, 1927. Acetylene tetrachloride vapor is passed at high speed and a temp. of about  $500^\circ$  over large surfaces in a reaction chamber to effect partial conversion into trichloroethylene. Among the contact materials which may be used are: pumice, wood charcoal, active C and silica gel. Metal oxides and salts also may be used as catalysts.

**Ethylene glycol.** ALBERT MAIER. Fr. 656,651, June 29, 1928.  $\text{C}_2\text{H}_4(\text{OH})_2$  is prepd. from  $\text{C}_2\text{H}_4\text{Cl}_2$  by sapon. with water at temps. above  $120^\circ$ , under pressure. Any  $\text{HCl}$  formed is neutralized by the continuous addn. of an alkali or appropriate metallic oxide. Most of the water is distd. off and the glycol is extd. from the mud by means of alc.

**Catalyst for the preparation of ethylidene diacetate.** HOWARD W. MATHESON and FREDERICK W. SKIRROW (to Canadian Electro Products Co.). U. S. 1,720,184, July 9. A Hg oxide is dissolved in  $\text{HOAc}$  and fuming  $\text{H}_2\text{SO}_4$  is added to combine with the water in the resulting aq. Hg acetate soln. and ppt. the Hg as a finely divided and reactive sulfate which is suitable for use as a catalyst in making ethylene diacetate from  $\text{C}_2\text{H}_4$ .

**Chlorohydrins.** TH. GOLDSCHMIDT A.-G. Fr. 656,947, July 3, 1928. See Brit. 293,754 (C. A. 23, 1651).

**Formamide.** I. G. FARBENIND. A.-G. Brit. 301,974, Sept. 17, 1927. See Fr. 646,815 (C. A. 23, 2191).

**Synthetic ephedrine (phenylmethylaminopropanol).** E. FOURNEAU (to Soc. des usines chimiques Rhône-Poulenc). Brit. 302,940, Dec. 23, 1927.  $\alpha$ -Methylamino-

ethyl phenyl ketone is hydrogenated (suitably in the form of its hydrochloride dissolved in alc.) with use of finely divided Pt as catalyst. The starting material is produced by the reaction of bromopropiophenone with methylamine in  $C_6H_6$  or alc. soln. Bromopropiophenone is prepd. either by direct bromination of propiophenone or by treating  $C_6H_6$  with bromopropionyl bromide in the presence of  $AlCl_3$ .

**4-( $\beta$ -Hydroxyethylamino)phenol.** I. G. FARRENIND. A.-G. Brit. 301,808, Dec 5, 1927. Hydroquinone is heated with 2-aminoethanol, without necessity of employing a condensing agent. Several examples with details are given. Cf. C. A. 23, 1420.

**Civetone.** LEOPOLD RUZICKA (to M. Naef & Co.). U. S. 1,720,748, July 16. The quantity of civetone obtainable from neutral civet oil is increased by oxidizing the civetol in the oil to civetone. Several modes of treatment are described. Cf. C. A. 22, 1163.

**Thymol.** RHEINISCHE KAMPFER-FABRIK G. M. B. H. Fr. 657,416, July 3, 1928. See Brit. 293,753 (C. A. 23, 1651).

## 11—BIOLOGICAL CHEMISTRY

PAUL E. HOWE

A—GENERAL

FRANK P. UNDERHILL

**Comparative studies on the breakdown of polypeptides, their derivatives, and amides by normal alkali, erepsin and trypsin or trypsin-kinase.** EMIL ABDERHALDEN AND WALTER ZEISSET. *Fermentforschung* 10, 544-85(1929).—New polypeptides were prepd. in the usual manner by coupling a di- or tripeptide with a halogenacyl halide and aminating with  $NH_4OH$ . *dl- $\alpha$ -Bromoisovaleryl-glycyl-glycine*, m. 117°,  $\rightarrow$  *dl-valyl-glycyl-glycine*, m. 241-2° (decompn.); *dl- $\alpha$ -bromoisovaleryldiglycyl-glycine*, m. 171-3° (decompn.),  $\rightarrow$  *dl-valyldiglycyl-glycine*, decompn. 230-5° without melting; *dl- $\alpha$ -bromoisocapronylglycyl-dl-valine*, m. 143-5°,  $\rightarrow$  *dl-leucylglycyl-dl-valine*, m. 244-5° (decompn.); *dl- $\alpha$ -bromoisovaleryl-glycyl-dl-leucine*, m. 169°, *dl-valylglycyl-dl-leucine*, m. 242-4° (decompn.); *dl- $\alpha$ -bromoisovaleryl-glycyl-dl-valine*, m. 179-80°,  $\rightarrow$  *dl-valyl-glycyl-dl-valine*, m. 233-5° (decompn.); *chloroacetyl-glycyl-dl-valine*, m. 170°,  $\rightarrow$  *glycyl-glycyl-dl-valine*, m. 219-21° (decompn.); *chloroacetyldiglycyl-dl-valine*, m. 169-71° (decompn.),  $\rightarrow$  *glycyldiglycyl-dl-valine*, m. 147-9°; *chloroacetyl-glycyl-dl-leucine*, m. 153°,  $\rightarrow$  *glycylglycyl-dl-leucine*, m. 240° (decompn.); *chloroacetyldiglycyl-dl-leucine*, m. 176-7° (decompn.),  $\rightarrow$  *glycyldiglycyl-dl-leucine*, m. 206-8° (decompn.); *bromoacetyl-dl-leucylamide*, m. 173-4°,  $\rightarrow$  *glycyl-dl-leucylamide* -IIBr, m. 175-9°; *dl- $\alpha$ -bromoisocapronyl-dl-leucylamide*, m. 141-3°,  $\rightarrow$  *dl-leucyl-dl-leucylamide* -IIBr, m. p. not stated. *dl*-Valylglycyl-glycine had previously been prepd. and found to be resistant to *N* alkali at 37°. This later prepn. under the same conditions underwent hydrolysis. The difference in behavior is left unexplained. The intermediate bromoisovalerylglycyl-glycine in the 2 preps. showed different cryst. forms, but otherwise appeared to be identical. As already noted with other peptides, a multiplicity of glycyl groupings renders these peptides more susceptible to cleavage by alkali. It makes apparently no difference at which end of the peptide chain a glycine grouping is placed. The 3 peptide amides undergo hydrolysis with a splitting off of the amide group. The halogenacyl derivs. are strongly hydrolyzed by alkali, the chloroacetyl even more readily than the corresponding bromoisovaleryl derivs. Not only is the peptide linkage broken, but halogen is also split off. Differences were noted in the cleavage of peptides by different preps. of erepsin. *dl*-Valylglycyl-glycine was not attacked by an erepsin prepn. which was active toward the other peptides, but it was readily hydrolyzed by other erepsin preps. Erepsin hydrolyzed *dl*-leucylamide, but not glycylamide; *dl*-leucylglycylamide readily, glycyl-dl-leucylamide slightly and *dl*-leucyl-dl-leucylamide not at all. Erepsin-free trypsin did not attack any of the amides. It was without action on glycine chains from the di- to the hexapeptide. Of the polypeptides contg. *dl*-valine or *dl*-leucine in addn. to glycine, only those were hydrolyzed which carried more than 1 valyl or leucyl group. An exception was the tetrapeptide glycyldiglycyl-dl-leucine which, however, showed only 12% cleavage in 24 hrs. This observation is in harmony with previous experience that a terminal leucine aids tryptic hydrolysis. A. W. D.

**The problem of specific relations of erepsin and trypsin to definite atomic groupings in polypeptides.** EMIL ABDERHALDEN AND OSKAR HERRMANN. *Fermentforschung* 10, 586-90(1929).—One method of detg. the point of attack on polypeptides by sp.

enzymes consists in observing the change in rotation of optically active tripeptides. The sp. rotation of the tripeptide, and of its 3 amino acid and 2 dipeptide components, must all be known. There must also be sufficient difference in rotation between the 2 possible mixts. of cleavage products to make their identification possible. *d-Alanyl-glycyl-l-phenylalanine*, m. 220°,  $[\alpha]_D^{20}$  34.02°, showed a decrease in *d*-rotation after ereptic digestion and a change to *l*-rotation after tryptic digestion. In this case *l*-phenylalanine is the only possible product with *l*-rotation, and the change in sign of rotation after tryptic digestion indicates the liberation of this amino acid. A cleavage into *d*-alanine and glycyl-*l*-phenylalanine, on the other hand, should increase the *d*-rotation. But in both digestions it appears that the dipeptide formed undergoes further hydrolysis. This tripeptide was prepd. from the dipeptide by the usual procedure via *d*- $\alpha$ -bromopropionylglycyl-*l*-phenylalanine, m. 150°. It is not well adapted to the purpose in view. The tripeptide, *l*-leucylglycyl-*d*-alanine, is more suitable for distinguishing between ereptic and tryptic hydrolysis. A splitting off of *d*-alanine should increase the *d*-rotation, whereas a splitting off of *l*-leucine should invert it. These opposite effects were obtained with trypsin and erepsin, resp. Yeast maceration, kidney press juice and liver press juice all behaved like erepsin. The observations confirm the view previously expressed that erepsin splits off the amino acid contg. the free NH<sub>2</sub> and trypsin that contg. the free COOH.

A. W. Dox

Further comparative studies on the breakdown of polypeptides and their derivatives at various hydrogen-ion concentrations and by erepsin and trypsin-kinase. Studies on the optimal hydrogen-ion concentration for the action of these enzyme complexes. EMIL ABDERHALDEN AND ADOLF SCHMITZ. *Fermentforschung* 10, 591-609(1929).—A no. of polypeptides and their PhNCO and halogenacyl derivs. were tested with respect to the influence of varying  $p_H$  values, with and without enzyme, on the rate of cleavage. Hydrolysis by alkali occurs more readily with the halogenacyl derivs., and still more readily with the PhNCO derivs. than with the free peptides at the same  $p_H$ . The length of the peptide chain is also of considerable influence. Different peptides show different optimum  $p_H$  values for cleavage. Trypsin-kinase gives a max. cleavage of *dl*-leucylglycyl-*dl*-leucine at  $p_H$  7.8, of *dl*-leucylglycyl-*l*-tyrosine at both 9.0 and 7.8 and of glycyl-*dl*-leucylglycyl-*dl*-leucine at 9.0. Halogenacyl derivs., on the other hand, undergo cleavage most readily near the neutral point, but even here differences are noted between different substrates. The problem is complicated by a no. of factors: (1) the intermediate products of hydrolysis represent new substrates with different  $p_H$  optima for cleavage; (2) it is probable that neither the erepsin nor the trypsin complex is an individual enzyme; (3) different substrates are probably dissoed. to different extents at different  $p_H$  values; and (4) the possibility must be reckoned with that the optimum  $p_H$  for dissoen. and that for formation of enzyme-substrate complex are not the same. New preps. described are: *dl*-leucylglycyl-*l*-tyrosine PhNCO deriv., decomp. 130°, and glycyl-*dl*-leucylglycyl-*dl*-leucine PhNCO deriv., decomp. 144-5°.

A. W. Dox

Further studies on the influence of various additions— $\alpha$ - and  $\beta$ -amino acids, hippuric acid, sarcosine, aniline, dipeptides—on the rate of cleavage of polypeptides by the erepsin and the trypsin-kinase complex. EMIL ABDERHALDEN AND OSKAR HERRMANN. *Fermentforschung* 10, 610-6(1929).—The effect of addn. of various substances, mainly amino acids, on the enzymic hydrolysis of *dl*-valylglycine, *dl*- $\alpha$ -aminobutyrylglycine, *dl*-leucylglycyl-*dl*-leucine and the ClCH<sub>2</sub>CO derivs. of *l*-tyrosine and *l*-phenylalanine was studied. No direct relationship could be established between the nature of the added substance and the enzyme complex employed. The promoting or inhibiting action varied as much with different substrates as with different enzymes.

A. W. Dox

Anserine, a new constituent of avian musculature. D. ACKERMANN, O. TIMPE and K. POLLER. *Z. physiol. Chem.* 183, 1-10(1929).—The discovery of  $\gamma$ -butyrobetaine in reptilian muscle by Keil, Linneweh and Poller (*C. A.* 22, 1601) suggested the possible occurrence of an unknown base in avian muscle. The flesh from a large no. of geese was extd. with H<sub>2</sub>O and the ext. examd. by the Kutscher method for the sepn. of bases. The so-called lysine fraction contained a new base precipitable by alc. picric acid and by alc. HgCl<sub>2</sub> and capable of isolation as the chloroaurate. The base, for which the name *anserine* is proposed, has the formula C<sub>10</sub>H<sub>16</sub>N<sub>4</sub>O<sub>3</sub>. It was found also in the Ag-Ba ppt. A still better precipitant is flavianic acid, which may be added directly to the concd. ext. without preliminary purification by tannin or Pb(OAc)<sub>2</sub>. Finally, the Dietrich method for isolation of carnosine was found to be the most satisfactory for isolating this substance. It consists in pptg. the concd. ext. by 10% HgSO<sub>4</sub> in 10% H<sub>2</sub>SO<sub>4</sub> and adding EtOH, or better, MeOH. The ppt. is washed with MeOH and

boiled with  $\text{H}_2\text{O}$ . It is then decompd. by  $\text{H}_2\text{S}$ , the  $\text{H}_2\text{S}$  removed from the filtrate by aeration, and the soln. nearly neutralized by  $\text{Ba}(\text{OH})_2$ . Addn. of  $\text{HgSO}_4$  in  $\text{H}_2\text{SO}_4$  without  $\text{MeOH}$  then removes impurities, and addn. of  $\text{MeOH}$  with more  $\text{HgSO}_4$  to the filtrate reprecipitates the base, the liberation of which is performed as before. Boiling with  $\text{CuCO}_3$ , and octyl alc. to prevent foaming, and concn. of the filtrate yields crystals of *anserine Cu*. The latter occurs in 2 modifications, an ultramarine blue and a reddish lilac. Each is convertible into the other and neither contains  $\text{H}_2\text{O}$  of crystn. The red modification is less sol. than the blue. Both decomp.  $230-2^\circ$  with foaming. The *free base*, m.  $238-9^\circ$ ,  $[\alpha]_D^{18}$   $11.26^\circ$ , is obtained by dissolving the  $\text{Cu}$  deriv. in warm dil.  $\text{H}_2\text{SO}_4$ , removing the  $\text{Cu}$  by  $\text{H}_2\text{S}$  and the  $\text{H}_2\text{SO}_4$  by  $\text{Ba}(\text{OH})_2$ . The *nitrate*, m.  $216-8^\circ$  (foaming), is pptd. cryst. by  $\text{MeOH}$ ; *chloroplatinate*, decomp.  $215-20^\circ$ ; *chloroaurate*, m.  $90-5^\circ$ ; *monopicrate*, decomp.  $205-8^\circ$ ; the last 3 sep. as oils which soon become cryst. Anserine is pptd. by phosphotungstic acid, alc.  $\text{HgCl}_2$ , aq.  $\text{Hg}(\text{NO}_3)_2$ , Hopkins' reagent with  $\text{MeOH}$  or  $\text{EtOH}$ , incompletely by aq.  $\text{HgCl}_2$ , and gives a cloudiness with picrolonic acid, ammoniacal  $\text{Ag}$ , and an oily sepn. with alc. picric acid and Dragendorff's reagent. An impurity rather difficult to remove gives the Pauly diazo reaction. Millon, Hopkins' glyoxylic acid, Sakaguchi, Knoop's Br, biuret and murexide tests are neg. The ninhydrin reaction is pos. From 5.7 kg. of fresh goose meat 8.4 g. anserine  $\text{Cu}$  was obtained, corresponding to a 0.12% yield of free base. A. W. DOX

**Fractionation of the water-soluble proteins of blood serum.** STEFAN GOLDSCHMIDT and HERBERT KAHN. *Z. physiol. Chem.* 183, 19-31(1929).—The albumin fraction, obtained by satn. of the blood serum with  $(\text{NH}_4)_2\text{SO}_4$  after removal of the globulin fraction by 0.5 satn., is of diagnostic significance since its amt. is greatly diminished when any considerable tumorous growth is present. It was desired to ascertain whether this albumin fraction represents an individual substance or a mixt. By fractional pptns. of bovine serum with  $(\text{NH}_4)_2\text{SO}_4$  in increasing concns. 3 sep. fractions were obtained. These were examd. to det. whether they differed merely in phys. characteristics such as size of the particles, or whether chem. differences could be demonstrated. Elementary analyses of the 3 successive fractions showed a progressive increase in S, the values being 1.78, 1.85 and 2.20%, resp. N distribution, as detd. by the Van Slyke method, showed a no. of differences, the most striking of which were the histidine values, 0.25, 0.52 and 6.60%, resp. Tryptophan decreased from 1.1 to 1.05 to 0. A biol. difference was the absence of anaphylaxis following injection of fraction III into other animal species. Thus the so-called serum albumin is not an individual substance. The most sol. fraction (fraction III) comprises 4% of the total albumin. Its high histidine content suggests a biol. relationship to globin. A. W. DOX

**Blood coagulation. Inhibition and acceleration.** ERNST WALDSCHMIDT-LEITZ, PAUL STADLER and FELIX STRIGERWALDT. *Z. physiol. Chem.* 183, 39-59(1929)—See C. A. 23, 1424. A. W. DOX

**Chemistry of the blood pigment. X. Specificity of the hemoglobins and the v. Krüger reaction.** FELIX HAUROWITZ. *Z. physiol. Chem.* 183, 78-87(1929); cf. C. A. 23, 3238.—As far back as 1888 v. Krüger detd. the rates at which the blood pigment of different animals is decompd. by alkali. His method consisted in measuring the time interval between the addn. of 0.2 vol. 0.25 N  $\text{NaOH}$  and the disappearance of the 2 absorption bands of oxyhemoglobin. The time varied between 40 and 50 sec. for human and 24 hrs. for bovine hemoglobin. It is now shown that differences in velocity of denaturation of the globin component are the cause of the variations in resistance of hemoglobin to  $\text{NaOH}$ . Denatured globin can be pptd. by  $1/3$  satn. with  $(\text{NH}_4)_2\text{SO}_4$  in the presence of  $\text{NH}_4\text{OH}$ , leaving native globin in soln. This sepn. was made at different periods in the alkali decompn.; the protein in each fraction was pptd. by tungstic acid and the N detd. by the Kjeldahl method. The content of unaltered hemoglobin was also detd. colorimetrically and found to be in close agreement with the value obtained by the salting out method. Furthermore, the rate of transformation of oxyhemoglobin into catemoglobin was detd. by spectroscopic observations and calens from the extinction coeffs. The rate of decompn. of hemoglobin from different animals was the same as that reported by v. Krüger, viz., man, dog, rabbit, horse, guinea pig and steer, in decreasing order. A. W. DOX

**The purine bases in the urine of the dog.** H. LETHAUS. *Z. physiol. Chem.* 183, 98-102(1929).—By working up a large quantity (100 l.) of urine collected from 3 dogs the following purines were isolated and identified: uric acid, adenine, xanthine and probably hypoxanthine. The excretion of these purines by the dog, an animal with more than the usual capacity for destroying uric acid, is considered significant. A. W. DOX



**Reduced hematin and hemochromogen.** R. HILL. *Proc. Roy. Soc. (London)* B105, 112-30(1929).—Reduced hematin has a soly. ranging between  $10^{-4}$  and  $10^{-5}$  M, according to the salts present in the soln. Pyridine, nicotine and alkali cyanide (2 mol.) and reduced hematin (1 mol.) are present in pyridine-, nicotine- and cyano-hemochromogen, resp. These hemochromogens behave as simple compds. of the type  $HtnA_2$ , in which Htn represents reduced hematin and  $A_2$  the 2 mol. of nitrogenous compd.; however, they readily aggregate in concd. soln. At a temp. of  $16^\circ$ , the dissocn. consts. of these hemochromogens were: pyridine-  $8.9 \times 10^{-6}$ , nicotine-  $1.1 \times 10^{-7}$ , cyano-  $4.8 \times 10^{-8}$ . A hemochromogen was also obtained contg. 1 mol. nicotine, 1 mol. cyanide and 1 mol. reduced hematin; its dissociation const. was approx.  $0.38 \times 10^{-8}$ . The so-called hemochromogen, which contains 1 mol. KCN and 1 mol. reduced hematin, is analogous to CO-reduced-hematin, and should be designated cyano-reduced hematin; its dissocn. const. is approx.  $1.3 \times 10^{-8}$ . Hemochromogen and reduced hematin can be detd. by means of the spectroscope. JOSEPH S. HEPBURN

**The purification of pepsin.** J. C. FORBES. *J. Chem. Education* 6, 1277-81(1929).—A review. E. H.

**Recent researches on the biochemistry of the nitrogen cycle.** GILBERT J. FOWLER. *Chemistry & Industry* 48, 673-8(1929); cf. *C. A.* 23, 2729. E. H.

**The solubility of urinary uric acid.** RUGGERO ASCOLI. *Biochim. terap. sper.* 16, 205-13(1929); cf. *C. A.* 23, 163, 168, 3482.—A general review. PETER MASUCCI

**The influence of ultra-violet radiations on the blood sugar of the rabbit.** F. G. HALL AND R. W. ROOT. *J. Elisha Mitchell Sci. Soc.* 43, 187-92(1928).—Rabbits irradiated with Hg quartz lights show a decided increase in blood sugar concn. Radiations from the same lamp after being filtered through glass raise the blood sugar concn. less than unfiltered rays. Development of a resistance to the effects of light is indicated by a lessened response after several exposures. A. L. MEHRING

**The specificity of animal proteases. XVI. Dipeptidase and polypeptidase from intestinal mucous membrane.** ERNST WALDSCHMIDT-LEITZ, ARNOLD K. BALLS AND JOHANNA WALDSCHMIDT-GRASER. *Ber.* 62B, 956-62(1929); cf. *C. A.* 22, 2381, 3173; 23, 3244.—Erepsin is a mixt. of a dipeptidase and a polypeptidase. The affinity of both for  $Al_2O_3$  is nearly the same. This permits their sepn. from pancreatic trypsin. They are sepd. from each other by adsorption with  $Fe(OH)_3$ . Eighty cc. glycerol ext. is purified with AcOH and 3 cc. acetate buffer of  $p_H$  3.8 and 10 cc. of a suspension of  $Fe(OH)_3$  contg. 327.6 mg. are added. The polypeptide remains in the soln. The dipeptide is washed out with alk. liquid. The optimum for the dipeptide is  $p_H$  8, for the polypeptide  $p_H$  7.0. The effect of the dipeptide was detd. by observing the action on *dl*-leucylglycine, that of the polypeptide on *dl*-leucyldiglycine, by using 0.001 mol. peptide at  $p_H$  7.0 and  $30^\circ$  in a vol. of 10 cc. The polypeptidase unit used is 1000 times the amount of enzyme giving the const. 0.001 for the monomol. reaction. A. E. MEYER

**The molecular weight of proteins; the molecular weight of hemocyanin from the blood of the snail (*Helix pomatia*).** CH. BAUMELER. *Rev. gén. colloïdes* 7, 145-52 (1929).—A review of the work of Svedberg is given by which he has detd. the mol. wts. of a no. of proteins by supercentrifugal methods. A comparison is given of these results with those furnished by other methods, especially the method of ultrafiltration. The hemocyanin of the snail has a much higher mol. wt. than that of other proteins; nevertheless hemocyanin crystallizes readily. L. B. MILLER

**Glucose fixation by the red blood cells.** F. HÖGLER, A. THOMANN AND K. ÜBER-  
RACK. *Biochem. Z.* 209, 1-31(1929).—The factor of swelling plays an important role in the study of glucose fixation by erythrocytes by Loewi's method, since it affects the absorption of glucose. But even when this swelling factor is taken into consideration certain discrepancies appear in both insulin and dialysis expts. that cannot be explained. A careful recalcn. of the method reveals that the degree of accuracy of the Loewi method is not sufficient to allow any definite conclusion from the small variations observed. Human red blood corpuscles freed of their sugar by repeated washing take up glucose from a glucose soln. by a process of diffusion. It is indicated that in the expts. by Loewi's method the taking up of sugar by the cells is likewise principally a diffusion process. S. MORGULIS

**Inhibition of the hematin catalysis by hydrogen sulfide.** HANS A. KREBS. *Biochem. Z.* 209, 32-3(1929); cf. *C. A.* 23, 1917.—Hemin acts as an oxidation catalyzer and this catalysis is affected by CO or HCN just as is cell respiration. The inhibition of catalysis by  $H_2S$  can be also demonstrated when linoleic acid instead of cysteine is used as substrate. This is made up by dissolving 0.2 g. linoleic acid in 20 cc. of pyridine borate of  $p_H$  10.3 (3 M pyridine and 0.5 M borate buffer). The oxidation of this

by 0.01 mg. hemin per cc. soln. is completely inhibited by  $4 \times 10^{-4}$  M  $H_2S$ .

S. MORGULIS

**The sulfur content of melanotic pigments.** F. SCHAAF. *Biochem. Z.* 209, 79-82 (1929).—Typical, S-rich melanins prepd. according to the methods described in the literature from horse hair as well as from liver metastases of a primary melanocarcinoma of the skin could be very largely freed of their S content without in any way affecting the other pigment properties. The melanin could not be freed from the traces of Fe as well as of S, and the latter is probably of as little importance as a pigment ingredient as the former is known to be.

S. MORGULIS

**Diffusion experiments on sugar protein solution.** D. KRÜGER. *Biochem. Z.* 200, 119-27 (1929).—Diffusion expts. were made with glucose-protein as well as glucose-amino acid solns. over which was placed solns. free from either protein or amino acid and the results show that the diffusion of the glucose proceeds as if no protein or amino acids were present. Conclusion: No appreciable condensation of glucose and protein takes place.

S. MORGULIS

**The absorption of dyestuffs and of their leuco compounds as a preliminary to the photobiological sensibilization in the ultra-violet.** W. HAUSMANN AND O. KRUMPELL. *Biochem. Z.* 209, 142-7 (1929).—The absorption in the ultra-violet is compared for a 2-nuclei pyrrole dye and its leuco compd. The absorption of the latter indicates the possibility of photobiological sensibilization in that spectral region. Likewise the absorption in ultra-violet of meso-porphyrinogen indicates that photobiological sensibilization can be achieved with this precursor of porphyrin.

S. MORGULIS

**Inactivation of enzymes by tannins.** A. OPARIN AND A. KURSANOV. *Biochem. Z.* 209, 181-94 (1929).—Enzyme detn. on tannin-contg. leaves is very difficult, since the tannins go into soln., mix with the enzymes and inactivate them. However, the addn. of egg albumin or peptone to such enzyme exts. restores completely their action. The regenerated enzymes can now be detd. The inactivation is due to the adsorption of the enzymes by the pptd. protein, while the regeneration is due to the elution of the adsorbed enzymes by the egg albumin or the peptone solns.

S. MORGULIS

**Studies of tyrosinase. I. The oxidation and reduction potentials of the tyrosinase system.** DAISABURO OKUYAMA. *J. Biochem. (Japan)* 10, 463-79 (1929).—Tyrosinase gives a high reduction potential with *p*-cresol and glycine in N gas. Tyrosine itself shows a sufficiently high reduction potential which is not increased by tyrosinase even in the presence of glycine. The reduction potential of catechol or hydroquinone, but not that of resorcinol, is increased by tyrosinase in the presence of glycine.

S. MORGULIS

**Investigations of carbohydrates by bacteriological methods.** B. KLEIN. *Centr. Bakt. Parasitenk.*, I Abt., 112, 447-50 (1929).—A rapid method for the study of carbohydrate fermentation in Barsiekow medium is suggested. One cc. of medium is inoculated with 2 loops (agar culture) of bacteria. Acid formation can be read in 1 to 4 hrs. ordinarily. *B. coli communis* ferments dextrose in 0.5 hr., levulose, galactose and mannose in 1 hr., arabinose in 2 hrs., xylose in 3-4 hrs., rhamnose in 4-5 hrs., maltose in 1.5-3 hrs., polyatomic alcs. as mannitol in 1-1.5 hrs., glycerol and dulcitol in 20 hrs. There is a definite relationship between the chem. formula of the carbohydrate and the time required for fermentation. Steriosomerism plays a part.

J. T. M.

**The prearginine in edestin and its resistance to hydrolysis.** HENRY S. SIMMS. Rockefeller Inst. *J. Gen. Physiol.* 12, 231-9 (1928).—The name "prearginine" is given to that portion of the protein mol. having a basic group which ionizes at about *pH* 4.6 and yields arginine on hydrolysis. It may be composed of one or more amino acids. Expts. show that all the arginine found on the hydrolysis of edestin is "prearginine." The extra ionizable groups of histidine, lysine and tyrosine in edestin are free in the quantities found on hydrolysis. Part of the extra carboxyl groups of aspartic and glutamic acids are bound as amides; 50% are bound in some other manner, possibly as anhydrides, and about 6% of these groups are free to ionize. The prearginine is not converted into arginine on hydrolysis with pepsin up to 18% of the total hydrolysis. On still further hydrolysis the conversion is masked by the high buffer effect of the soln. Complete hydrolysis converts prearginine into arginine which can be isolated. Hydrolyzed edestin promotes the growth of sarcomatous fibroblasts whether hydrolysis is 5, 14 or 18% completed.

C. H. RICHARDSON

**Chemical antagonism of ions. I. Effect of Na-Mg and K-Mg mixtures on the activity of oxalic diion.** HENRY S. SIMMS. *J. Gen. Physiol.* 12, 241-58 (1928).—Mg ions decrease the activity of bivalent org. anions much more than do Na ions, the effect being especially large with short chain acids like oxalic. The addn. of Na or K ions produces a marked decrease in the effect of Mg ions on the activity of oxalate ions. An

equation is given which is obeyed by 0.005 *M* solns. of oxalic diion over wide ranges of concns. of  $MgCl_2$ , and of  $NaCl$  or  $KCl$ . The equation is valid in the physiol. range. This constitutes a definite chem. antagonism in pure, non-colloidal soln. It is hoped the results will throw some light on physiol. and colloidal antagonisms. **II. Antagonism between anions and also between cations and anions in their effect on oxalate activity.** *Ibid* 259-67.— $SO_4$  ions produce an anomalous effect on the ionization of oxalate diion, opposite in direction to the effect of  $Mg$  ions. This effect of sulfate is antagonized by the presence of  $Cl$  ions according to the equation:  $k = (f' - 1) \times (2SO_4^{--} + Cl^- + A)/(SO_4^{--})^{1.5}$ , where  $f'$  is the antilog of the increase in  $pK'$ , due to the sulfate. In solns. containing up to 0.03 *M*  $MgSO_4$  the effect of  $Mg^{++}$  predominates over that of  $SO_4^{--}$ . Above 0.1 *M* the effect of  $SO_4^{--}$  predominates and tends to neutralize the initial deviation. In solns. containing fixed amts. of  $MgCl_2$  and varying amts. of  $Na_2SO_4$  (or *vice versa*) the effects of these two salts sharply antagonize each other in all proportions. C. H. RICHARDSON

**The effect of valence of ions on cellular permeability to water.** BALDWIN LUCKÉ AND MORTON McCUTCHEON. *J. Gen. Physiol.* 12, 571-80(1929).—Permeability of unfertilized eggs of the sea urchin, *Arbacia punctulata*, to water, as measured by rate of swelling in hypotonic glucose soln. is greatly affected by the addn. of low concns. of electrolytes. Permeability to water decreases with increase in valence of the cation of the electrolyte. Cobaltamine chlorides with valence of 1 to 6 were used in these expts. Increase in permeability to water occurred when the valence of the anion increases as shown by a series of K salts. The effect of electrolytes on permeability to water depends chiefly on the sign and no. of elec. charges on the ion, positive ions decreasing, negative ions increasing permeability of the eggs to water. The effectiveness of the ion is greater the higher its valence. The method employed may be used to study *ion antagonism*. Antagonism was demonstrated between cations and anions. C. H. RICHARDSON

**Pyridine hemochromogen.** A. E. MIRSKY AND M. L. ANSON. *J. Gen. Physiol.* 12, 581-6(1929).—Cyanide hemochromogen probably contains 1 CN group for each heme group. The equil. between pyridine hemochromogen and its components, pyridine and reduced heme, is complicated by the pptn. of reduced heme and the aggregation of pyridine hemochromogen. Hill's conclusion (*C. A.* 21, 595) that pyridine hemochromogen contains 2 pyridine groups is not considered to be proven. C. H. R.

**Capillary analysis of the secretions of the embryo and aleurone layer.** J. GRÜSS. *Wochschr. Brau.* 45, 539-42(1928).—Diastase and peroxidase are chemically bound. Peroxidase is the parent substance of diastase. The antioxi-dase found in the aleurone layer is not an enzyme; neither is it an albumin nor lipid. It belongs to the aromatic compds. The aleurone cells also secrete diastase plus peroxidase, cytase, invertase, pepsin and trypsin. The purpose of the antioxi-dase is to prevent the autooxidation of the diastase. A. SCHULTZ

**Combined sugar in serum albumin, egg white and the peptone solution.** KUNITARO KITAMURA. *J. Kyoto Prefectural Med. Coll.* 3, 20-4(1927).—K. examd. the presence of combined sugars in the above substance as a study of the nature of combined blood sugar. In the serum albumin from Kahlbaum free sugar is not contained, but there is 1.2-2.6% of combined sugar. In egg white there was found 0.428-0.536% of free sugar and 0.204-0.364% of combined sugar. In the Teruchi or Witte peptone there is 0.6-1.0% of free sugar, but there is no combined sugar, from which fact K. concludes that where there is combined sugar, there is always protein. K. SOMEYA

**Study of the fat-decomposing enzyme. XII. The activation of lipase by bile, and the relation between the stomach lipase and the activating action of bile.** KEN-SUKE GYOTOKU AND SEIKO MATSUBARA. *Tokyo J. Med.* 42, 2147-61(1928); cf. *C. A.* 23, 3724. —The splenic lipase of the dog is activated by the bile of man or of the dog. The activating action begins immediately after mixing, reaches a max. in 20-30 min., and then gradually decreases, until finally the activity becomes less than that of lipase to which no bile has been added. The weakening is more marked when the quantity of the added bile is smaller. With old bile, the activating action gradually decreases but it can cause no weakening of the lipase action after activating the lipase. The activating effect occurs at  $pH$  5-8.6 and is most intense at about  $pH$  7.6, decreasing rapidly when this point is passed. With unactivated specimens the influence of the  $H$ -ion concn. is small. The stomach lipase is also activated to a marked extent when purified; so various lipases cannot be differentiated by the presence or absence of the activating action. The activating agent of the bile is not dialyzable and resists heating, but dried bile dissolved in  $H_2O$  has no activating action. K. SOMEYA

The ideas of acidity, alkalinity and neutrality; their physico-chemical interpreta-

tion and their biological interest. L. HALLION. *Rev. prat. biol.* 21, 225-32(1928) --A detailed explanation, according to the general theories, of these terms for the benefit of the medical man. G. TOENNIES

The weak acids and the weak bases, the principal constituents of the acido-basic equilibria in the organism. L. HALLION. *Rev. prat. biol.* 21, 257-70(1928); cf. preceding abstr. G. TOENNIES

The defensive processes of the organism against acidosis and alkalosis. I. HALLION AND RENÉ GAYET. *Rev. prat. biol.* 21, 289-300(1928); cf. preceding abstr. G. TOENNIES

Chemical change of Taka-diastase solution by heating. T. KAWAKAMI. *J. Pharm. Soc. Japan* 49, 346-55(1929).—Since com. Taka-diastase prepn. contains various enzymes besides the main active principle, proteolytic and amylolytic changes in Taka-diastase soln. were studied when the soln. was kept at a moderately high temp. At 65° or above no appreciable increase in alkali no. or formol no. was noted, showing that proteases do not act at such high temp. At 55°, the proteolytic change is most rapid, especially in the first 1-2 hrs. After 5 hrs. it slows up and nearly ceases after 6 hrs. At 45° the change is very slow and is still in action even after 80-90 hrs. At higher temps. the increase in formol no. is greater than that of alkali no., while at lower temps., the two nos. run almost parallel. Amylolytic change is evident even at such a high temp. as 75°, at which the reaction is very rapid and the rate of reaction decreases very rapidly. After 2 min. it decreases to  $\frac{1}{4}$ , after 6 min. to  $\frac{1}{50}$  and after 60 min. it entirely stops. NAO UYEI

Influence of tea and coffee on the amylolytic action of Taka-diastase. T. KAWAKAMI. *J. Pharm. Soc. Japan* 49, 356-61(1929).—Exts. of tea (both green and black), coffee and tannic acid or caffeine had no inhibitory influence on the hydrolysis of starch by Taka-diastase, if proper conditions were maintained during hydrolysis. N U

Influence of ultra-violet rays on the enzymic action of Taka-diastase. T. KAWAKAMI. *J. Pharm. Soc. Japan* 49, 361-5(1929).—Contrary to the statement of Pineussen and Renzo (*C. A.* 17, 1647; 18, 3068), no inhibitory influence of ultra-violet rays on the hydrolytic action of Taka-diastase was noted. K. used a quartz-Hg lamp as the source of the rays, using 10 times the voltage and amp. several times stronger than those used by P. and R. In order to avoid the influence of temp., irradiation was carried out at a distance of 40 cm. instead of 20, which was used by P. and R. No buffer was used to avoid the influence of rays on it. In samples where diastase soln. was cooled during irradiation no change in the rate of hydrolysis was noted for 4 hrs., whereas without cooling the rate of hydrolysis decreased very rapidly. NAO UYEI

The conditions of activation of washed zymin in relation to the coenzyme problem. A. A. STHERMAN. *Proc. Acad. Sci. Amsterdam* 32, 426-34(1929).—Zymin washed once with H<sub>2</sub>O in the ordinary way, when added to a soln. of glucose and K<sub>2</sub>HPO<sub>4</sub> caused no fermentation; re-activation was obtained by the addn. of AcH, methylene blue, hexose biphosphate or the "coenzyme" soln. (the clear soln. from once-washed zymin). The 1st washing of zymin extd. most of its hexose biphosphate; the second washing apparently extd. all of the biphosphate. This hexose biphosphate can serve as a hydrogen acceptor when in sufficient quantity, although it is supposed also to perform another more specific function. Zymin washed twice with water when added to a soln. of glucose and K<sub>2</sub>HPO<sub>4</sub> caused no fermentation; addn. of methylene blue or AcH had no effect; addn. of hexose biphosphate, however, produced a nearly quant. fermentation. It is considered that these two washings removed practically all the biphosphate, whose presence was essential to the fermentation. Fructose did not behave the same as glucose in this expt. although it did in the first. Zymin washed twice but more intensively than before was not activated by hexose biphosphate; it was necessary to make the further addn. of an ext. of zymin "free from coenzyme" or else to add some of the concd. washings, which latter are capable of fermenting glucose without any other accessory such as the hexose or potassium phosphate. In order to obtain the zymin ext., which is considered a "protein soln. free from coenzyme," zymin was washed 3 times with water and the proteins were extd. by boiling dil. potassium phosphate soln. Zymin washed 3 times would not ferment glucose even after the addn. of hexose biphosphate in large amts. and of the "protein solution free from coenzyme," while the addn. of the boiled washing still produced a fermentation. This indicates that, besides the 3 already known factors indispensable for a normal cell-free fermentation, at least one more must be added. In zymin subjected to 3 washings more intensive than the previous ones the zymase was inactivated so that even the addn. of the boiled washing would not reactivate it. R. P. WALTON

Determination of the organic matter in sea water (IBÁÑEZ) 2. Combination of proteins, amino acids, etc., with acids and alkalies. II. Titration curves of amino acids in presence of  $\text{CH}_3\text{O}$  (HARRIS) 2. Apparent dissociation constants of the amino acids and certain related substances: a summary of the data (KIRK, SCHMIDT) 2. Oxidation of sugars in alkaline solution by O. Influence of  $p_H$  on the production of CO (NICLOUX, NEBENZAHL) 10. Formation and cleavage of glucosides as a method for the chemical and biochemical separation of racemic alcohols into their optically active forms (NEUBERG, *et al.*) 10. Comparative studies on the influence of the substituent in the amino group of polypeptides on their cleavage by normal alkali, erepsin and trypsin-kinase (ABDERHALDEN, *et al.*) 10. Camphorolglucuronic acid and synthesis of hydroxycamphor glucoside (ISHIDATE) 10.

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## B—METHODS AND APPARATUS

STANLEY R. BENEDICT

Detection and utilization of hormones and vitamins in animal experimentation. H. KREYTMAIR. *Pharm. Monatsh.* 10, 116-7(1929).—Purely discursive. W. O. E.

New thermopile for the measurement of nerve heat production. A. C. DOWNING AND A. V. HILL. *Proc. Roy Soc. (London)*, B105, 147-52(1929). J. S. H.

The colorimetric determination of total and inorganic sulfates in blood serum, urine and other body fluids. E. G. WAKEFIELD. *J. Biol. Chem.* 81, 713-21(1929).—The colorimetric method of Hubbard (*J. Biol. Chem.* 74, v) has been modified to give the most consistent results and the revised procedure is a microchem. method adaptable for clinical use. Procedures are described for the estn. of total, inorg. and conjugated sulfates in blood serum, urine and in the fluids which collect in the peritoneal cavity, thorax and elsewhere in edematous conditions. The following normal values for sulfates of human blood serum in mg. of  $\text{SO}_4$  per 100 cc. of serum were obtained: inorganic, 0.5 to 1.8 (av. 1.2); total, 2.3 to 4.5 (av. 3.7); conjugated, 0.8 to 3.0 (av. 2.5).

A. P. LOTHROP

A new melting-point determination and accessory apparatus for working with minute quantities of substance. W. FRIEDEL. *Biochem. Z.* 209, 65-73(1929).—The app. is described. S. MORGULIS

Factors in the estimation of starch by the I method (LEPIK) 7. Colorimeter, especially for hemoglobin determinations (Ger. pat. 478,289) 1.

## C—BACTERIOLOGY

CHARLES B. MORREY

Effect of secondary rays from Lipiodol and bismuth subnitrate paste on *Staphylococcus aureus* and *Bacillus coli communis*. MARGARET E. FRIES AND MAURICE LENZ. *Proc. Soc. Exptl. Biol. Med.* 26, 14-16(1928).—Secondary rays emitted from BiONO<sub>2</sub> powder when exposed to x-rays inhibited the growth of *Staphylococcus aureus* and of *Bacillus coli communis*. Under similar conditions neither BiONO<sub>2</sub> paste nor Lipiodol (40% I<sub>2</sub>) inhibited the growth of these organisms. Possibly the fat interferes with the effect of the secondary rays. C. V. BAILEY

Effect of cholesterol activated by ultra-violet irradiation on growth of tubercle bacilli in vitro. ALAN R. MORITZ. *Proc. Soc. Exptl. Biol. Med.* 26, 43-4(1928).—No effect was detected. C. V. BAILEY

An endeavor to adapt a trypsin-susceptible bacteriophage to the action of trypsin. E. W. SCHULTZ AND E. A. GREEN. *Proc. Soc. Exptl. Biol. Med.* 26, 97-100(1928).—Possibly some increase in resistance to trypsin is acquired by the bacteriophage in the course of a number of serial exposures to suitable concns. of trypsin. C. V. B.

Inactivation of *Staphylococcus* bacteriophage by methylene blue. E. W. SCHULTZ AND A. P. KRUEZER. *Proc. Soc. Exptl. Biol. Med.* 26, 100-1(1928).—A no. of races of bacteriophage were tested as to their susceptibility to several dyes. No appreciable influence on any of the bacteriophages was noted with the single exception of the effect produced by methylene blue on 2 trypsin-susceptible *Staphylococcus* bacteriophages. These were completely inactivated in 6-12 hrs. by concns. of the dye as low as 0.002%. C. V. BAILEY

**Destruction of botulinus toxin by *Bacillus subtilis*.** C. N. STARK, J. M. SHERMAN AND PAULINE STARK. *Proc. Soc. Exptl. Biol. Med.* **26**, 343-4(1929).—In 14 da. *Bacillus subtilis* reduced the toxin titer of the botulinus filtrate from 300 M. L. D. to about 10 M. L. D. per cc. as detd. by guinea pig inoculations. C. V. BAILEY

**The bactericidal action of indole.** R. B. KILBORN, H. B. PIERCE AND R. P. TITTLER. *Proc. Soc. Exptl. Biol. Med.* **26**, 391-2(1929).—A soln. of indole 1-1000 filtered by pressure through a Seitz filter hindered the growth of all microorganisms studied. *Escherichia coli* was the most resistant; nevertheless its growth was prevented in the presence of 0.1% indole. *Salmonella paratyphi* was very susceptible to indole. *Escherichia typhi*, *Salmonella schotmulleri*, *Aerobacter aerogenes* and *Salmonella enteritidis* were also studied. C. V. BAILEY

**The isolation of *B. typhosus* from sewage and shellfish.** W. JAMES WILSON. *Brit. Med. J.* **1928**, I, 1061-2; *U. S. Pub. Health Eng. Abstracts* **E-660b**, 62-3(1928).—By the use of a new technic the presence of 1 typhoid bacillus in each cc. of Ballast sewage is demonstrated. The medium used was glucose-sulfite-Fe-Bi-brilliant green. Its efficacy depends on 2 factors: (1) *B. typhosus* in the presence of a fermentable carbohydrate is able to reduce a sulfite to a sulfide, and so to form a black colony in the presence of an Fe salt; (2)  $\text{Bi}_2(\text{SO}_4)_3$  in the presence of a certain excess of Na-SO, suppresses the growth of most coliform bacilli; in the presence of brilliant green, the selective action is intensified. Black colonies with a metallic halo are developed and also light green colonies. *B. typhosus* is sought among the black colonies. The green ones are *B. proteus*. The use of saccharose in a modified Endo medium enabled W. to distinguish rapidly between *B. typhosus* and those simulating it. The isolation of *B. typhosus* from enteric stools is one of the easiest procedures in applied bacteriology. The method has extremely important applications. C. R. FELLERS

**Differential medium for *Salmonella pullorum*, *Salmonella gallinarum*, *Pasteurella avicola* and *Escherichia coli*.** W. L. MALLMANN AND DOROTHY SNYDER. *J. Infectious Diseases* **44**, 13-15(1929). JULIAN H. LEWIS

**Effect of oxygen on the viability of young cultures of *Cl. botulinum*.** GAIL M. DACK AND ELIZABETH H. WILLISTON. *J. Infectious Diseases* **44**, 26-32(1929) JULIAN H. LEWIS

**The efficacy of the lactobacteriotherapy from the chemical standpoint.** CARLOS A. SAGASTUME AND LUIS J. VIVIANI. *Semana med.* (Buenos Aires) **35**, 800 5(1928). As an index of the putrefaction in the intestine the reducing effect of  $\text{Fe}_2\text{O}_3$ , given by mouth, was investigated. Feces (0.2 g.) were dissolved in dil. HCl, heated on a water bath for  $\frac{1}{2}$  hr., cooled, filtered and 3 cc. taken 2 times. One part was first oxidized with  $\text{H}_2\text{O}_2$ , then 5 cc. of 3% KCNS soln. added to each and filled up to 25. The solns were compared colorimetrically. The ratio  $(\text{Fe}^{++}:\text{Fe total})$  multiplied by 100 is the index of putrefaction. A mixt. of the acid-forming bacilli is more efficient than *B. bulgaricus* or *acidophilus* alone. A. E. MEYER

**Further experiments with agar-gelatin in bacteriology.** VOJIN DIMITRIJEVIĆ SPETH. *Centr. Bakt. Parasitenk.*, I Abt., **112**, 17-25(1929); cf. *Centr. Bakt. Parasitenk.* **1** Abt., **100**, 289-92(1926).—The value of the medium is confirmed. J. T. M.

**The value of synthetic culture media for the diagnosis of typhoid, paratyphoid, enteritidis and colon bacilli.** KARL PESCH. *Centr. Bakt. Parasitenk.*, I Abt., **111**, 171-7(1929).—The following stock medium was prepd.: agar 30 g.,  $\text{K}_2\text{HPO}_4$  1.0 g.,  $\text{MgSO}_4$  0.5 g., NaCl 0.2 g.,  $\text{FeSO}_4$  trace,  $\text{Ca}_3(\text{PO}_4)_2$  trace,  $\text{NH}_4\text{Cl}$  1.63 g., and distd. water 1000 cc. The  $\text{pH}$  was adjusted to 7.8 with NaOH. To this was added, for medium 1, glucose 1%; for medium 2, Na citrate 1%; for medium 3, rhamnose 0.5%. Growth or absence of growth occurred as follows for medium 1, 2, and 3, resp.: typhoid, —, —, —; paratyphoid B, +, +, —; *B. aertrycke*, +, +, +; *B. enteritidis*, —, —, —; coli type 1, +, —, +; coli type 2, —, —, —; coli type 3, —, —, +. JOHN T. MYERS

**Application of bismuth hydroxide to the treatment of staphylococcal infection.** L. JALOUSTRE AND P. LEMAY. *Chimie & industrie Special No.*, 519 (Feb., 1929); cf. Fourcade, J. and L., *C. A.* **16**, 3702; L. and J., *C. A.* **19**, 999.—Clinical evidence is quoted showing the specificity of the action of Bi on staphylococcus. A. P. C.

Two outbreaks of food poisoning probably due to *B. cloacae* (BUCHANAN, MEGRAW) 12. Detoxifying, diffusing, germicidal and surface-tension-depressing properties of soaps (DAVISON) 27. The intestinal bacteria of fishes from the standpoint of the hygienic estimation of drinking water (MINKEVICH, TROFIMSK) 14. New paths of therapy (antiseptics) (HOFMAN) 17.

## D—BOTANY

THOMAS G. PHILLIPS

**Action of several disinfectants on yeast.** FRED W. TANNER AND GEORGE D. BOULAS. *Proc. Soc. Exptl. Biol. Med.* 26, 154-6(1928).—Yeasts like bacteria are positive or negative to the Gram stain. Gram-positive yeasts are destroyed when stained for 1 hr. with 5 drops of a satd. aq. soln. of *gentian violet*; Gram-negative yeasts are also gentian violet-negative and are unaffected by this treatment. When the medium contains 1:80,000 gentian violet, positive fungi are destroyed; 1:140,000 inhibits growth. A tolerance can be developed. *Mercurochrome-220* sol. at a concn. of 0.4% destroys yeast cultures; a tolerance is not developed. *Tincture of iodine* (U. S. P.) in a diln. of 1:100 completely destroys yeast cultures; no tolerance is developed.

C. V. BAILEY

**Factors affecting penetration of methylene blue and trimethylthionine into living cells.** MATILDA MOLDENHAUER BROOKS. *Proc. Soc. Exptl. Biol. Med.* 26, 290-2 (1929).—Contrary to Irwin (C. A. 22, 4580), B. found only methylene blue present in the vacuole of living plants of *Nitella* and *Valonia* when the cells were placed in solns. contg. this dye. An analysis of the differences in methods used by Irwin and B. is given with particular reference to  $pH$  value, impurity of the dye, the concn. of dye in external soln., the presence of light and of injury to the cell.

C. V. BAILEY

**Mannitol agar in the differentiation of the fungi of the type blastomyces.** ALDO CASTELLANI. *Proc. Soc. Exptl. Biol. Med.* 26, 544(1929).—Ordinary agar to which 4% mannitol has been added is placed in extra large culture tubes. From 2 to 3 weeks later after inoculation and incubation at 26° certain *Blastomycoidea* produce black pigmentation, others occasionally pigment the medium, and still others produce no pigment. To the 1st group belong *B. immitis*, to the 2nd *B. dermatitidis*, and to the 3rd *B. tularensis*.

C. V. BAILEY

**A mannitol-fermenting Monilia.** ALDO CASTELLANI. *Proc. Soc. Exptl. Biol. Med.* 26, 544-5(1929).—More than 30 species of *Monilia* are known, none of which ferment mannitol. A fungus was recently isolated from sputum from a case of chronic bronchitis; it is unique in that it ferments mannitol with the production of gas. In addn. it ferments glucose, galactose, maltose, levulose and dextrin. The name *Monilia mannitofermentans* is suggested for this *Monilia*.

C. V. BAILEY

**Death from low temperature and resistance of plants to cold.** GUNNAR NILSSON-LEISSNER. *Quart. Rev. Biol.* 4, 113-7(1929).—A review.

J. B. BROWN

**Experimental chemical contributions to genetics.** HANS V. EULER, HARRY HELLSTROM AND DAGMAR RUNEHJELM. *Z. physiol. Chem.* 182, 205-17(1929).—Hybrids obtained by crossing mutants of barley representing strains with normal chlorophyll content and strains deficient in chlorophyll and subject to Mendelian cleavage were examined for catalase activity. The seeds were germinated in the dark and sep. detns. were made with the white and yellow seedlings. During the first 6-16 days of germination the yellow seedlings showed 2-3 times the catalase activity of the white ones. The same ratio was observed after drying, although the activity was thereby considerably diminished. In one series of hybrids the difference in activity diminished from the 8th to the 15th day, the white seedlings gaining more rapidly in catalase content until they practically equalled the yellow seedlings. The yellow pigment is xanthophyll, and when exposed to light the yellow seedlings rapidly become green. The transition from yellow to green pigment was followed spectroscopically by means of a microphotometer. Amylase and redoxase activity are also subject to Mendelian cleavage but the differences were found to be much less striking, while peroxidase activity differed only within the limits of individual variations.

A. W. DOX

**Slime staining.** PÁL LIPTÁK. *Magyar Gyógyszerészud. Társaság Értesítője* 4, 17-8; *Chem. Zentr.* 1928, I, 1559.—When sap or plant slimes were stained with phosphomolybdic acid soln. and  $I_2-ZnCl_2$ , the various cells were clearly differentiated.

FRANCIS P. GRIFFITHS

**Depsides.** ISMAEL ASTRADA. *Rev. centro estud. farm. bioquim.* 16, 437-46(1927); *Chem. Zentr.* 1928, I, 1551.—According to Fisher and Freudenberg, depsides are tannin-like substances contg. a pyrogallol group. The following plants contain depsides: flowers of the red rose; nutgall; bark and leaves of witch-hazel; leaves of the walnut.

FRANCIS P. GRIFFITHS

**The ether-soluble substances of cabbage leaf cytoplasm. V. The isolation of  $n$ -nonacosane and di- $n$ -tetradecyl ketone.** HAROLD J. CHANNON AND ALBERT C. CHIBNALL. *Biochem. J.* 23, 168-75(1929); cf. C. A. 22, 1790.—When acetone is added to an ether fraction, the ppt. contains not only true phosphatides, but 2 other sub-

stances which do not contain P. The latter can be sepd. from the true phosphatide fraction by extn. with boiling acetone. On cooling, they sep. in cryst. form, and it is shown that the main constituents are *n*-nonacosane,  $C_{29}H_{60}$ , and di-*n*-tetradecyl ketone,  $C_{14}H_{30}$ ,  $CO.C_{14}H_{28}$ . VI. Summary and general conclusions. ALBERT C. CHIBNALL and HAROLD J. CHANNON. *Ibid* 176-84.—220 g. of material contains (in g. chlorophyll ( $\alpha$  and  $\beta$ ), 20.5; carotin, 1.1; xanthophyll, 1.7; Ca phosphatide, 40.6; unidentified Ca salts, 11.3; unidentified Fe compd., 6.7; glycerides and waxes contg. palmitic, stearic, linolic and linolenic acids, 38.3; glycerol, 2.8; unsaponifiable matter, satd. fraction, chiefly nonacosone and di-*n*-tetradecyl ketone, 27.0; sterols (by digi-tonin), 9.8; unidentified products, probably alcs. and hydrocarbons, 29.2

Nature of the pectic substances of flax. A preliminary investigation. BENJAMIN HARKOW and FREDERICK W. NORRIS. *Biochem. J.* 23, 195-8(1929).—The results obtained favor the ring formula for pectic acid, suggested by Nanji, Paton and Ling (cf. *C. A.* 19, 2327), rather than the galactose-tetragalacturonic acid formula of Henderson (cf. *C. A.* 23, 1118)

The state of iodine in *Falkenbergia doubletii* Sauv. E. CHEMIN. *Bull. soc. botan. France* 75, 540-2(1928).—Upon the addn. of starch to a slightly alk. 1% soln of KI a blue color is not formed. Acidifying this soln. with  $H_2SO_4$ , HCl, or  $HNO_3$  produces a blue color. Using tissue of the alga, *Falkenbergia doubletii* Sauv., instead of starch and KI in the above reaction gave similar results. It is concluded, therefore, that I in alga tissue is in the combined state and that volatilization does not occur as a normal function. Certain positive tests for the presence of  $I_2$  are probably the result of an instantaneous chem. reaction during which  $I_2$  is liberated. A. E. HITCHCOCK

Potash requirements of the opium poppy. J. GAROLA. *Ann. sci. agron.* 46, 169-75 (1929).—In order for the opium poppy (*Papaver somniferum*) to attain its full development, it is necessary to make a large quantity of potash available toward the end of the vegetative state. A rapid fixation of potash occurs at flowering. K. S. M

Evolution of hydrocyanic acid by ferns. ALFRED HEILBRONN. *Ber. deut. botan. Ges.* 47, 230-3(1929).—Tissue of *Polypodium aureum* var. *tetraploidea* when subjected to a temp. of  $-17^\circ$  for 5 min. and then brought to room temp. gave off the odor of HCN, the presence of which was verified by tests with Na picrate and the Berlin blue reaction of Treub. Maseration without freezing also liberated HCN. A comparison with *Prunus laurocerasus* on the effect on *Drosophila melanogaster* indicated that the amt. of HCN present is about half that of this species. LAWRENCE P. MILLER

Fermentation and respiration in chlorophyllous plants. L. GENEVOIS. *Rev. gén. botan.* 40, 654-74, 735-44(1928); 41, 49-63, 119-28, 157-84, 252-71(1929); cf. *C. A.* 22, 1791.—Manometric methods, essentially those of O. Warburg (*Stoffwechsel der Tumoren*, 1926), were used. Respiration and fermentation were studied in the following algae, *Chlorella pyrenoides* Chick, *Scenedesmus basilensis* Chodat, *Coclostrium proboscideum*, *Haematococcus pluvialis*, *Stichococcus bacillaris*, *Pseudonocardium basilense* Vischer. In detg. the effects of various chemicals on the intensity of respiration ( $I_0$ ), larger differences were obtained if the algae used were grown under sub-optimum conditions as regards nutrition and light. By working largely with *Chorella* it is shown that substances contg. a C=O group, i. e., fermentable sugars, fatty acids, aldehydes, amino acids and keto acids, increase  $I_0$ . The effect is largely independent of the concn., and the no. of mols. oxidized per unit of time, calcd. from the O consumed, is a decreasing function of the mol. wt. In mixts. of 2 substances the net effect is intermediate between either one and can be calcd. from the no. of mols. of each substance present. These substances serve as nutrient materials while certain dyes as methylene blue, thionine, neutral red, and safranin, increase  $I_0$  through some catalytic action. The effect remains even after the excess color has been washed from the cells. If glucose and a dye are both present the effects are additive. Results with species other than *Chorella* were similar except that with *Haematococcus*  $I_0$  was not increased but was even depressed by substances contg. a C=O group, while the dyes were stimulating, although feebly so. KCN decreased  $I_0$ . Under anaerobic conditions in the presence of sugar fermentation takes place. When the respiration was stopped by KCN fer-

mentation in air ( $F_{CO_2}^O$ ) was equal to that in N ( $F_{CO_2}^N$ ) and to that in N without KCN. Fermentation and respiration in *Lathyrus odoratus* in different plant organs in various stages during the life cycle were studied. Values for  $I_0$  and  $r_{CO_2}^N$  were high in embryonic tissue. Respiration is considered as consisting of 2 phenomena, one of oxida-



tion and the other a synthesis of carbohydrates from the products of fermentation. The latter is known as the reaction of Pasteur (Meyerhof). By use of the proper concn. of KCN it was possible with *Lathyrus* to arrest the reaction of Pasteur without stopping respiration. Results are discussed from the point of view of the similarity between the relations of fermentation and respiration in both plant and animal tissue.

LAWRENCE P. MILLER

Studies on the growth of root hairs in solutions. IX. The  $p_H$  molar rate relation for collards in calcium nitrate. CLIFFORD H. FARR. *Ann. Missouri Bot. Gardens* 16, 53(1929); cf. *C. A.* 23, 3487.—A study was made of the root and root hair elongations of collards grown in solns. of  $\text{Ca}(\text{NO}_3)_2$  and  $\text{CaCl}_2$  at various  $p_H$  values. The curves obtained for max. rate of root hair and of root elongation and for max. length of root hairs correspond to those for av. root hair elongation. A complete condensation of data shows the influence of  $p_H$  in each of the salt concns. used, with important differences in the growth and appearance of the plants.

N. M. NAYLOR

Some chemical and physiological studies on the nature and transmission of infectious chlorosis in variegated plants. EVERETT F. DAVIS. *Ann. Missouri Bot. Gardens* 16, 145(1929).—Hydrogen-ion detns. were made on the juices of green areas and of chlorotic areas of the leaves of *Evonymus japonica* vars. *aurea*, *argenteo* and *medio-picta*. Chlorotic areas of all varieties except *aurea* were higher in initial acidity than were the green areas. The  $p_H$  of the juice decreases in direct proportion to the time in min. of exposure to air. The total acidity of the juice of green leaves increases on exposure to air, but not that of the juice from chlorotic areas. These observations are discussed in the light of their botanical significance.

N. M. NAYLOR

Spectrophotometric studies of penetration. V. Resemblances between the living cell and an artificial system in absorbing methylene blue and trimethylthionine. MARIAN IRWIN. *J. Gen. Physiol.* 12, 407-18(1929); cf. *C. A.* 22, 4580.—The living plant cell may be represented by the following diagram: aq. sap in vacuole | vascular interface | non aq. protoplasmic layer | external interface. Dye penetration was studied in an artificial system consisting of (1) the same dye solns. as were used for the living cells; (2)  $\text{CHCl}_3$  to represent the non-aq. protoplasmic layer; (3) sap freshly extd. from living cells or artificial sap.  $\text{CHCl}_3$  is only a crude representation of the non-aq. layer; therefore the system may resemble the living cell only qualitatively. The artificial system and the living cell behave alike toward methylene blue and azure B (trimethylthionine) which supports the idea that there is a non-aq. layer in the cell protoplasm. A close resemblance between penetration of these dyes into *Valonia* cells and into the artificial system at  $p_H$  9.5 was noted. In *Nitella* cells, however, at  $p_H$  9.2, the sap in the artificial system takes up relatively more azure B from methylene blue soln., in which it exists as an impurity, than does the vacuole of the living cell. Both the living cell and the artificial system take up azure B much more rapidly than methylene blue. A comparison of the 2 systems at  $p_H$  5.5 cannot be made because injury to the living cell occurs before the dye penetrates in quantities sufficient for analysis. The resemblances between *Valonia* and *Nitella* become less as cell injury increases owing to the penetration of methylene blue into the vacuoles of the injured cells.

C. H. RICHARDSON

The penetration of strong electrolytes. W. C. COOPER, JR., M. J. DORCAS and W. J. V. OSTERHOFF. *J. Gen. Physiol.* 12, 427-33(1929).—The entrance of strong electrolytes into *Valonia* is very slow unless the cells are injured. They may penetrate largely as undissoc. mols. formed at the surface of the protoplasm by the collision of ions. KCl may be adsorbed to the extent of  $3 \times 10^{-8}$  mols. per hr. per sq. cm. surface. Preliminary expts. showed that a no. of other substances penetrate to some extent. In sea water the sp. gr. of which was increased by the addn. of  $\text{CsCl}$ , *Valonia* floated for over a year without penetration of Cs except as the result of injury. The penetration of  $\text{NH}_4\text{Cl}$  decreases the sp. gr. of the sap, causing the cells to float, under which conditions they live indefinitely. Probably  $\text{NH}_3$  or  $\text{NH}_4\text{OH}$  penetrates as such and is then changed to  $\text{NH}_4\text{Cl}$ .

C. H. RICHARDSON

Respiration and geotropism in *Vicia faba*. I. A. E. NAVEZ. *J. Gen. Physiol.* 12, 641-67(1929).—Seedlings of *V. faba* give a const. secretion of  $\text{CO}_2$  over fairly long periods if the temp. is controlled very accurately. The  $Q_{10}$  ratio, derived from the exptl. data, is not const.; the value for  $\mu$  (Arrhenius formula), 16,250, is consistent with values previously obtained for  $\mu$  in respiratory oxidative processes in similar organisms. The relation between the reaction time for the geotropic curvature of the root of *V. faba* and temp. was also calcd. from the Arrhenius formula,  $\mu$  being 16,110, which stands in quant. agreement with values deduced from earlier similar data. It

is believed that a respiratory oxidative process controls the onset of geotropic curvature.

C. H. RICHARDSON

**Origin of ethereal oils in plants.** L. FRANCESCONI. *Rivista ital. essenze profumi* 10, 33-6(1928).—Lemongrass oil contains citral, citronellal, geraniol, linalool, dipentene, methylheptenone and capraldehyde. Pelargonium essence contains citronellol, linalool, geraniol, rhodinol, citral, menthone, isoamyl alc. and valeric acid. The presence of isoamyl alc. or better of isovaleric acid confirms the transitory existence of citronellal. From the isoamyl alc. can be obtained isovaleraldehyde and citronellal. The formation in the plant can be proved by the presence of citronellol and menthone. If the formation speed of isovaleraldehyde and citronellal is small, that of the trans formation of this into citronellol, geraniol and menthone is large. Lab. reactions prove that menthone is formed from rhodinol. Citronellal is converted directly to rhodinol and to menthone through a ring closure. This is confirmed by the presence of rhodinol in pelargonium oil. Rhodinol is therefore also admissible. This would be a transition product that on reduction goes to rhodinol and by condensation to menthone. Rhodinol on oxidation in the plant again forms rhodinol, which passes to menthone, formed at the time of flowering, when the quantity of O fixed by the tissues is noteworthy. Rhodinol is, therefore, a reserve material for the genesis of rhodinol, menthone and citronellal. Among the components of pelargonium essence are also pinene, phellandrene and tiglic acid. From the hydration of geraniol and successive elimination of water pinene originates.

R. SANSONE

**Origin of ethereal oils in plants.** L. FRANCESCONI. *Rivista ital. essenze profumi* 11, 78-83(1929).—To detect isovaleric acid in lemon juice, shake 20 cc. in a separatory funnel with an equal quantity of 10%  $\text{Na}_2\text{CO}_3$ , ext. the alk. soln. with ether to eliminate the essence, decompose the Na salts by distg. with  $\text{H}_2\text{SO}_4$ , neutralize the distillate with  $\text{Ba}(\text{OH})_2$ , eliminating excess with  $\text{CO}_2$  in the warm, and filter. Use a part of this soln. for pptn. reactions. Evap. the rest to dryness, redissolve in a little  $\text{H}_2\text{O}$  and filter. Evap. a few drops of this soln. and compare the residual crystals with those of Ba valerate. On a little of the residue a drop of concd.  $\text{H}_2\text{SO}_4$  develops the odor of valeric acid, and on adding  $\text{EtOH}$  the odor of Et valerate. In the essence was found isovaleraldehyde. An aq. ext. of the integral lemon juice (20 cc. essence and 10 cc.  $\text{H}_2\text{O}$ ) gave a reaction with Fe alum for isoamyl alc. These components are intermediate substances for the formation of other more useful products. Genetic plans are given for lemon juice, mandarin oil, orange oil and bergamot oil.

R. SANSONE

**Some properties of the laminarin from Laminaria.** H. COLIN AND P. RICARD. *Compt. rend.* 188, 1449-51(1929); cf. *C. A.* 9, 1923; 16, 722; 17, 2291.—Aq. exts of 38 kg. *Laminaria flexicaulis* were boiled with  $\text{Ba}(\text{OH})_2$ , the excess was removed and the laminarin was pptd. by  $\text{EtOH}$ . The dry product was repeatedly cold extd. with 85%  $\text{EtOH}$ , dissolved in  $\text{H}_2\text{O}$ , defecated by Pb and finally pptd. with  $\text{EtOH}$ . Repeated repptns. yielded a product free of mannitol and contg. only 0.6% ash. The yield is 400 g. The substance crystallizes in the form of slightly doubly refractive spherulites. The formula  $(\text{C}_6\text{H}_{10}\text{O}_5)_x$ ,  $x$  being 6 or 7, is probable.  $[\alpha]_D^{25} = 11.5$ . After acid hydrolysis  $[\alpha]_D = 49^\circ$ . Only glucose was found after hydrolysis. The substance does not melt; it begins to turn brown at  $200^\circ$ . The anhyd. product reabsorbs 16.5%  $\text{H}_2\text{O}$  in 3 days without change of appearance. Twenty-one g. is sol. in 100 g.  $\text{H}_2\text{O}$  at  $15^\circ$ ; 16.5 g. is sol. in 100 g. 60%  $\text{EtOH}$ , insol. in 85%  $\text{EtOH}$  even on boiling. The Ba deriv. is sol. in  $\text{H}_2\text{O}$  and pptd. by  $\text{EtOH}$ ; it is not decompd. by  $\text{CO}_2$ .

G. TOURNIES

**A chemical study of the rind of California oranges.** MARION B. MATLACK. *J. Am. Pharm. Assoc.* 18, 24-31(1929).—The peel was freed as far as possible from extraneous material and subjected to the usual methods for plant analysis. Oleic, linoleic, linolenic, stearic and palmitic acids were found in the form of their glycerol esters. Two phytosterols were isolated. One appears to be sitosterol and the other  $\beta$ -phytosterol. A phytosterolin was obtained apparently identical with sitosterol  $d$ -glucoside. Ceryl alcohol, small amts. of resin and carotinoid coloring matter were identified.

L. E. WARREN

**The exchange of ions between yeast cells and solutions of ammonium chloride.** PAUL GENAUD. *Compt. rend.* 188, 1513-4(1929).—If living yeast is bathed with a soln. of  $\text{NH}_4\text{Cl}$  at  $p_H$  7 the following facts appear: (1) The concn. of Cl ions does not change; (2) the concn. of  $\text{NH}_4$  ions in the soln. diminishes from  $n_0$  to  $n_1$  ( $n_1/n_0$  is const. for all concns. of  $\text{NH}_4\text{Cl}$  and of yeast cells, and  $(n_0 - n_1)$  is const. for all concns. of yeast, but increases with the concn. of  $\text{NH}_4\text{Cl}$ ); (3) K and Ca appear in the soln., and their am. is approx. equal to  $(n_0 - n_1)$ . The living cell behaves like an inert insol. salt, of

which the anion is always insol., and of which the cation undergoes exchange with the cations of the soln. In this respect it in general obeys the law of mass action.

J. J. WILLAMAN

**Function of caffeine in the metabolism of *Ilex paraguayensis* St. Hil.** T. WEEVERS. *Proc. Acad. Sci. Amsterdam* 32, 281-7(1929).—This plant contains caffeine and not matein, as formerly supposed. It occurs as the xanthine deriv. in leaves and bark, but is absent from wood and fruit. During the growth of the leaves the relative quantities decrease, but the abs. amt. increases. After full growth there is a marked decrease, so that 2-year old leaves contain only half as much as those 1 year old. This is not brought about by migration to the bark, but is a result of its consumption during metabolism. Excised leaves placed in water lose caffeine in the light, but gain it in the dark.

J. J. WILLAMAN

**Function of alkaloids in the leaves of *Cinchona succiruba* Pavon.** T. WEEVERS AND H. D. VAN OORT. *Proc. Acad. Sci. Amsterdam* 32, 364-70(1929).—Brief expts. are described which indicate that the alkaloids increase in the leaves in the dark, especially in excised ones. The authors' interpretation is that the alkaloids are products of degradation processes, probably of protein metabolism.

J. J. WILLAMAN

## E—NUTRITION

PHILIP B. HAWK

**Phosphorus and its relation to calcium metabolism.** BERNARD B. BADANES. *Dental Cosmos* 71, 817-23(1929).—A review with a bibliography.

J. S. H.

**The antimony trichloride reaction of liver oils.** HANS V. EULER, MARGARETA RYDBOM AND HARRY HELLSTRÖM. *Biochem. Z.* 208, 73-8(1929).—Extn. of liver oil with 96% EtOH increases the intensity of the SbCl<sub>3</sub> reaction. After double extn. the color intensity is 4 times as great as that of the original oil. The absorption band at 320 mμ is characteristic for the vitamin A. Other fats and oils contg. carotinoids beside the liver oils can likewise be enriched in carotinoid, whereby inactive substances are removed.

S. MORGULIS

**The iodine factor in animal nutrition.** FRANK F. CORRIE. *Pharm. J.* 121, 181-2(1928); cf. *C. A.* 22, 286, 1995, 2219.—The relation of I to growth and resistance to disease in animals is shown.

S. WALDBOTT

**Test for vitamin A in margarine, butter and other fatty foods (ANDERSEN, NIGHTINGALE) 12.** New paths of therapy [vitamins] (HOFMAN) 17. Addition of SbCl<sub>3</sub> and SnCl<sub>4</sub> to unsaturated hydrocarbons [vitamin A color reaction] (VON EULER, HELLSTRÖM) 10.

## F—PHYSIOLOGY

E. K. MARSHALL, JR.

**Behavior of the diastase in the blood, urine, and feces of the dog before and after ligation of the pancreatic ducts.** P. GALLI. *Folia clin.* 3, 120-33(1928); cf. *C. A.* 23, 646. In dogs with the pancreas intact, the amt. of diastase in the blood is always greater than that in the urine, but the max. and min. values in the 2 cases never correspond. Ligation and resection of the pancreatic ducts always cause very great increases of the amts. of the enzyme in the blood and urine, but here again no fixed relationships are observed; with the blood this increase persists a week after the ligation, but the diastase content of the urine gradually diminishes. The lack of pancreatic secretion in the intestine causes the disappearance from the feces of the amylolytic enzyme, which is not found in the feces a week after the ligation.

B. C. A.

**Does a gastric lipase exist?** G. MELLI AND M. RADICI. *Folia clin.* 3, 169-90(1928).—The authors conclude that the lipase, the existence of which in the gastric juice is affirmed by some and denied by others, is actually the lipase which occurs normally in the gastric mucosa and leaves this accidentally as a result of trauma following probing. The functions of this lipase are probably limited to the interior of the individual cells. The stomach plays no part in the digestion of fats.

B. C. A.

**Pancreatic secretion.** R. CARUSI. *Folia clin.* 3, 209-55(1928).—An internal and an external pancreatic secretion exist, but changes in the secretions are not always accompanied by corresponding histological changes. The external secretion is composed of trypsin, lipase and amylase. The internal secretion is produced by the islets of Langerhans and is able to act on carbohydrates. The various methods suggested for detg. the enzymes are discussed and a modified method for detg. amylase is given.

B. C. A.

**Secretions of digestive glands and blood chemistry. I. Alkali reserve and chlorides in blood.** S. I. PRIKLADOVITZKII AND M. P. BRESTKIN. *Russ. J. Physiol.* 11, 445-69(1928).—Normal digestive activity causes a fluctuation in the alkali reserve depending on the kind of food taken. Feeding with lean meat raises the alkali reserve in the course of the first 2 hrs. It gradually returns to its initial value. It is also raised by feeding white bread. Feeding with fat causes a fall followed by a rise. Fluctuations of alkali reserve in the course of digestion are generally accompanied by inverse fluctuations of the chloride content of the blood.

The adrenal glands. G. N. STEWART. *Arch. Internal Med.* 43, 733-66(1929).—A lecture.

Underlying disturbances of metabolism of the nervous child. HECTOR C. CAMERON. *Brit. Med. J.* 1929, I, 185-7.—A lecture.

Chemical factors in the control of the circulation. H. H. DALE. *Brit. Med. J.* 1929, I, 1093-6.—A lecture.

Factors which influence tryptic digestion in the intestine. H. J. VONK AND H. P. WOLVEKAMP. *Z. physiol. Chem.* 182, 175-200(1929).—Statements in numerous textbooks that protein digestion in the intestine occurs at about  $p_H$  8, the optimum for trypsin, are erroneous. The reaction of the intestinal contents is practically neutral, the variations being more frequently on the acid than on the alk. side. Two factors facilitate digestion at a  $p_H$  below the optimum. The first of these is the continual movement and kneading of the mass undergoing digestion in the intestine. The same effect is obtained *in vitro* by mech. stirring. This effect is sufficient to compensate the unfavorable influence, in the case of fibrin, of a deviation of 2 units from the  $p_H$  optimum. It is not a specific effect, since it increases the reaction velocity even at the optimum  $p_H$ . The 2nd factor, which is probably specific, is the activation of the action of trypsin on solid protein at slightly acid reaction through the agency of the bile salts. At  $p_H$  6 the digestion velocity in the presence of  $1/20$  vol. of bile is equal to that at  $p_H$  8 in the absence of bile. In low concns. the effect of bile, Na taurocholate, or the multivalent ion of  $K_4Fe(CN)_6$  is slightly inhibitory; at high concns. the effect is a marked acceleration. The influence of bile on the digestion of Witte peptone is negligible. The optimum here for trypsin is much broader, and the difference between  $p_H$  7 and  $p_H$  8 is insignificant. Other possible factors that might compensate the unfavorable  $p_H$  of digestion *in vivo* are the continual removal of cleavage products by active absorption through the intestinal wall, a possible change thereby in the  $p_H$  optimum, and the continual supply of fresh enzyme. None of these factors is present in the usual digestion expts. *in vitro*. In the digestion of Witte peptone by trypsin a peculiar minimum was consistently noted at  $p_H$  7.6, for which no explanation is offered.

Resorption of cerebrospinal fluid through the choroid plexus. H. S. FORBES, F. FREMONT-SMITH AND H. G. WOLFF. *Arch. Neurol. and Psychiat.* 19, 73-7(1928)

The normal blood of some domesticated animals. C. E. HAYDEN AND P. A. FISH. *Cornell Vet.* 18, No. 2, 197-203(1928); *Expt. Sta. Record* 59, 876.—Detns. were made for sugar, urea, uric acid, total nonprotein N, creatinine, chlorides, Ca, inorg. phosphates, acid-sol. phosphates, n, and the serum protein of the blood of the cow, goat and chicken, as well as the hemoglobin, erythrocyte and leucocyte counts, including the differential count of the leucocytes.

Blood sugar in the normal child in earliest infancy. M. ACUNA AND P. WINOCTR. *Rev. especialidades* 3, 5-15(1928); *Physiol. Abstracts* 13, 523.—In 54 normal infants the av. blood sugar was 0.0933 g. %, the lowest 0.061 %, the highest 0.114 %.

The distribution of residual nitrogen in human blood. HERMANN STEINITZ AND HERMANN SIMCHOWITZ. *Klin. Wochschr.* 8, 732-4(1929).—Residual N as detd. on whole blood is, usually, not very different from that detd. in the serum or plasma. The values fluctuate considerably. Sometimes the whole blood gives higher values; sometimes it is the serum.

The behavior of young and of old animals toward asphyxiation. M. REISS AND F. HAUROWITZ. *Klin. Wochschr.* 8, 743(1929).—Old mice succumb rapidly in an atm. of  $CO$ ,  $H_2$  or  $CO_2$ . Young animals survive a long time under the same conditions. Old mice die rapidly from a lethal dose of strychnine or after their necks are placed in a clamp. Young mice live a long time under these conditions. Ten mg of HCN kills old mice in a few seconds. Young mice survive for 80 min.  $CHCl_3$  kills mice with equal rapidity regardless of age.

**Isolation of methylglyoxal as an intermediary substance in glucolysis.** MARTHA VOGT. *Klin. Wochschr.* 8, 793-4(1929).—This is an extension to animal tissue of the work of Neuberg and his co-workers on yeast. Digestion of muscle, liver or kidney of pigs or rabbits with water removes the coenzyme almost completely and leaves apozymase in the insol. residue. The apozymase converts hexose diphosphate into methylglyoxal. Apozymase does not convert glucose into methylglyoxal. The enzyme that converts glucose into hexose diphosphate is either destroyed or extd. in prepg. the material. Coenzyme converts methylglyoxal into lactic acid. Methylglyoxal is produced from hexose diphosphate by animal tissue only when the coenzyme is destroyed or extd.

MILTON HANKE

**Preparation of a substance that reduces the calcium content and one that reduces the phosphate content of serum.** II. Demonstration in the spleen and in the lymph glands. A. NIRSCHKE. *Klin. Wochschr.* 8, 794(1929).—It is possible, by suitable extn. methods, to obtain a substance from the thymus gland which, when injected into animals, reduces the Ca content of the serum to an av. of 7 mg. % and leads to tetany and elec. hyperexcitability. Another substance can be isolated that has no effect upon the Ca but that reduces the P content of the serum by 50% without producing any systemic effects. Since extirpation of the thymus does not, regularly, lead to systemic effects, it was conjectured that certain other of the body glands may have a function similar to that of the thymus. This conjecture has been verified. Exts. have been prepd. from spleen and lymph glands that are identical in properties with those described above for thymus.

MILTON HANKE

**The action of gas mixtures containing carbon dioxide on the respiration.** A. VIETHEN AND F. GRÜNEBERG. *Klin. Wochschr.* 8, 887(1929).—Air or O that contains 1% of CO<sub>2</sub> has no effect upon respiration in children past 6 yrs. of age. In younger children the respiratory vol. may be increased 33 to 50%. A mixt. contg. 2 or 3% of CO<sub>2</sub> is effective at all ages. Lung vol. is increased 50-100%. The respiratory rate is not increased. A mixt. contg. 4% of CO<sub>2</sub> increases the respiratory vol. 100-150%. The respiratory rate is also increased.

MILTON HANKE

**Creatine-creatinine excretion and serum calcium in normal male children.** M. KARSHAN, R. G. FREEMAN, JR., AND E. G. MILLER, JR. *Arch. Pediatrics* 46, 323-6 (1929).—The subjects were male children 5-9 yrs. of age. They were tonsil-adenoid patients and were clinically normal otherwise. In a series of 54 cases, the creatine of the urine, expressed as % of the total creatinine, was from 2.1 to 62.9. In a series of 72 cases, the Ca content of the blood serum in the post-absorptive state ranged between 9.3 and 13.2 mg. per 100 cc. Age made no significant difference. The creatine-creatinine metabolism in a given child varied from day to day.

J. S. H.

**New theory of the chemistry of blood clotting.** RUSSELL C. ERB. *Catalyst* 14, No. 6, 14-5(1929).—When horse blood is drawn, a clot forms after the leucocytes have become coned. In the animal, clotting is initiated by a localized and intense leucocytosis. The leucocytes then supply thrombogen in such quantities that the antagonistic action of heparin is overcome; the Ca ions then produce active thrombin which immediately converts fibrinogen into fibrin.

JOSEPH S. HEPBURN

**Loss of water and salts through the skin, and the corresponding physiological adjustments.** W. HANCOCK, A. G. R. WHITEHOUSE AND J. S. HALDANE. *Proc. Roy. Soc. (London)* B105, 43-59(1929).—Loss of H<sub>2</sub>O through the skin is due partly to evapn of H<sub>2</sub>O which passes through the skin by osmosis, and partly to sweating; the latter process is commonly in complete abeyance in temperate or cold climates. Insensible perspiration is entirely independent of sweating. Loss of H<sub>2</sub>O, when small, occurs by osmosis and evapn. When the loss becomes marked, true sweating occurs, the loss of chlorides increases, and the ratio NaCl:KCl becomes approx. 9:1. The chloride anion content of true sweat increases markedly with the duration of sweating, and, to a lesser extent, with the available NaCl or KCl in the body, and with a reduction in the supply of H<sub>2</sub>O; it is always lower than in blood plasma, and is reduced only slightly by abundant ingestion of H<sub>2</sub>O or by reduction of the supply of chlorides in the body. The sweat glands have a very limited role in the regulation of the compn. of the blood plasma; and their secretion is always hypotonic.

JOSEPH S. HEPBURN

**Glutathione, cytochrome and hydrogen-ion concentration in developing chick embryos.** H. YASU. *Japan Med. World* 9, 38-41(1929).—A gradual increase in the glutathione content is evident during the first half of the developmental period, reaching a max. on the 12th to the 14th day, after which there is a gradual decrease. This holds true for sep. organs as well as for the whole chick embryo. Cytochrome was found in negligible quantity from the 4th to the 11th day of incubation, the period of very rapid growth. It is only at the beginning of development of tissue that it is

relatively acid. Then it becomes more alkaline until the 14th or 15th day, when it becomes still more alkaline and reaches the final constant  $p_H$  value. N. KOPELOFF

**Investigation of glycogen of the inner ear.** HYOSAKU TANAKA. *Sei-I-Kwai Med. J.* 48, No. 1, 33-45, Abstract Sect. 2-3(1929); cf. *C. A.* 23, 3498.—The conclusions of previous work are summarized. W. D. LANGLEY

**The solubility of gases in blood and blood fluids.** ARTHUR GROLLMAN. *J. Biol. Chem.* 82, 317-25(1929).—The solubilities of  $C_2H_4$  at varying pressures in  $H_2O$ , dog blood plasma and dog hemoglobin solns. follow Henry's law. The blood lipoids increase the soly. of  $N_2$ ,  $C_2H_2$  and  $C_2H_4$  in aq. solns. The soly. of  $C_2H_2$  in human, dog and rabbit blood and blood fluids is much more const. than that of  $C_2H_4$ ; this difference is undoubtedly due to the much greater soly. of  $C_2H_4$  in lipoids. A. P. LOTHROP

**Does cabbage fed to rabbits increase serum calcium?** ROBERT KAPSINOW AND FRANK P. UNDERHILL. *J. Biol. Chem.* 82, 377-84(1929).—Although there were occasional indications that cabbage may have an effect in raising the serum Ca, they were too vague to state definitely that cabbage contains a substance analogous to the parathyroid hormone in its effect on serum Ca. Daily bleedings in rabbits have a severe effect and the 5 cc. necessary for a Ca detn. may possibly have interfered with a consistent effect produced by cabbage. The specific Ca action of cabbage was restudied because of Culhane's conclusions (*C. A.* 22, 267) that cabbage definitely raises the serum Ca of rabbits. A. P. LOTHROP

**Benzoylated amino acids in the animal organism. IV. A method for the investigation of the origin of glycine.** WENDELL H. GRIFFITH. *J. Biol. Chem.* 82, 415-27(1929); cf. *C. A.* 20, 2875.—In the urine of rats following the ingestion of  $BzONa$  hippuric acid constituted 66-95% of the total  $BzOH$ ; it was, therefore, the principal product in the detoxication of the ingested  $BzONa$ . Survival and growth of young rats on diets contg.  $BzONa$  occurred only when these diets furnished a supply of glycine or precursors of glycine which was adequate for the detoxication of the  $BzONa$  and for the formation of new tissue proteins. The rate of growth of young rats on a diet contg.  $BzONa$  can be used in detecting the presence of glycine or its precursors in the diet and this method is being used in a study of the origin of glycine in the animal organism. A. P. LOTHROP

**The specificity of the intracellular dehydrogenases. II. The effect of poisons upon the dehydrogenase systems of frog and of fish muscle.** MARY E. COLLETT AND MIRIAM F. CLARKE. *J. Biol. Chem.* 82, 429-33(1929); cf. *C. A.* 22, 4177.—Selenite, arsenate, phenol and benzoate were used with 5 donators, succinic, glycerophosphoric, *l*-malic, lactic and citric acids. "Poisons, which with fish muscle show the same order of toxicity with the donators studied, vary significantly in toxicity with frog muscle. As these variations are not due to poison-donator reactions, they must be due to poison-enzyme reactions, and therefore indicate the presence of at least 3 specific dehydrogenases; viz., citric, glycerophosphoric and lactic." III. **The dehydrogenases of frog muscle.** MARY E. COLLETT, MIRIAM F. CLARKE AND JOYCE MCGAVRAN. *Ibid* 435-7.—Since the reaction time for decolorization of methylene blue is hastened by the addn. of a second donator in optimum concn., it follows that frog muscle contains specific dehydrogenases, one for each of the 5 donators tested. A. P. L.

**Chemical studies of muscle contracture. III. The change in glycogen during shortening produced by tetanus toxin.** H. A. DAVENPORT, HELEN K. DAVENPORT AND S. W. RANSON. *J. Biol. Chem.* 82, 499-504(1929); cf. *C. A.* 23, 424, 3257.—The glycogen content of guinea pig and rabbit gastrocnemii is usually reduced by tetanus toxin in the early stages of contraction but in rats there is little change under the same conditions. Contractures resulting from dorsal root section of spinal nerves show no change in glycogen. The variability in reaction among different species and during different stages of tetanus contracture indicates that it does not have a cause and effect relationship to the contracture. There is no change produced in glycogen content by tetanus toxin in denervated muscles. A. P. LOTHROP

**The automatic regulation of gastric acidity.** HUGH MACLEAN AND W. J. GRIFFITHS. *J. Physiol.* 66, 356-70(1928).—The concn. of  $HCl$  in the normal stomach is regulated automatically by the  $p_H$  of the gastric juice. The presence of a certain  $p_H$  in the stomach inhibits secretion of acid, with the result that a neutral fluid containing chloride is secreted which, by diln., reduces the acidity of the gastric contents. The peptic activity of the stomach fluid rises parallel with the increased neutral chloride. J. F. LYMAN

**The supposed relation between surface area and hemoglobin content in the red cells of mammalia.** ERIC PONDER. *J. Physiol.* 66, 379-86(1928).—The number of red cells per cu. mm. of blood cannot be calcd. from the red-cell diam. by means of

Emmons formula:  $N = 4.56967 \times 10^3/D (D + 3.6)$ . The total area of the red cells per cu. mm. blood showed remarkably poor correlation with hemoglobin content.

J. F. LYMAN

**The respiratory quotient after evisceration in cats.** L. G. KILBORN. *J. Physiol.* 66, 403-15(1928).—After evisceration in fasting cats the respiratory quotient rose from the fasting level (0.71 to 0.8) to unity or over, indicating a change in metabolism from fat to carbohydrate. The results show, however, that after evisceration, reduction in  $O_2$  absorption was relatively greater than that of  $CO_2$  elimination and that there was a simultaneous decrease in the  $CO_2$  content and capacity of the blood. Conclusion. The high respiratory quotient obtained in decapitated, eviscerated cats is an artificial phenomenon and is not a trustworthy guide to the type of metabolism proceeding in the tissues.

J. F. LYMAN

**A non-specific pressor principle derived from a variety of tissues.** J. B. COLLIP. *J. Physiol.* 66, 416-30(1928).—A pressor substance, sol. in  $H_2O$  and in acetone, was prep'd. from a wide variety of tissues. It did not affect blood sugar; its response was augmented by small doses of ergotamine; atropine did not affect its action; nicotine did not diminish its pressor effect; small amts. had little or no effect upon isolated intestine, uterus or heart; large doses were depressant. The pressor response was directly related to size of dose within certain limits and repeated injections at short intervals did not alter the character of the response.

J. F. LYMAN

**The effect of muscular exercise on the oxygen capacity of the blood in man.** T. R. HARRISON, C. S. ROBINSON AND G. SYLLABA. *J. Physiol.* 67, 62-5(1929).—Blood from the hand veins after immersion in water at  $45^\circ$  was the same in  $O_2$  content as arterial blood while the subject breathed air. It has a slightly lower  $O_2$  content than arterial blood when the inspired gas contained 10 to 15%  $O_2$ .  $O_2$  capacity of the blood was increased during exercise. The  $O_2$  satn. of the arterial blood sometimes increased and sometimes decreased during exercise, but more often it increased.

J. F. L.

**The hydrogen-ion concentration of the isolated uterus.** PHYLLIS T. KERRIDGE AND F. R. WINTON. *J. Physiol.* 67, 66-76(1929).—The  $p_H$  of minced uterus was very little affected by that of the soln. in which it was immersed; therefore, the effect of  $p_H$  of a soln. on the tone of a uterus cannot be attributed to the sign or magnitude of the difference of  $p_H$  between the muscle and the soln. The effect of  $p_H$  on Ca ions in a soln. is discussed. There was no evidence of acid formation associated with uterine contraction.

J. F. LYMAN

**Pneumin.** A respiratory autacid from the adrenal cortex discharged into the circulation via the lymphatics. SWALE VINCENT AND J. H. THOMPSON. *Proc. Physiol. Soc., J. Physiol.* 67, iii(1929).—Something is discharged from the adrenals by way of the lymphatics which is essential to normal respiration in decerebrate cats. It is probably formed in the cortex. The name *pneumin* is suggested.

J. F. LYMAN

**Hydrogen in the tissues.** J. A. CAMPBELL. *Proc. Physiol. Soc., J. Physiol.* 67, vi(1929).—In rabbits the tension of H in the peritoneal cavity varied from 2.9 to 13.8, in cats from 1.9 to 8.9 and in monkeys from 2.9 to 20.7 mm. Hg. After a few days' starvation H completely disappeared from the peritoneal cavity. It probably is produced in the intestine as a result of fermentation.

J. F. LYMAN

**Saponin hemolysis of normal human blood with some observations on anemia blood.** H. D. KESTEN AND T. F. ZUCKER. *Am. J. Physiol.* 87, 274-9(1928).—The rate of saponin hemolysis of different normal human blood samples was essentially the same under the same conditions of temp., red-cell concn. and saponin concn. Hemolysis was inversely proportional to the cell concn. and directly proportional, through the greater portion of the reaction, to the square of the saponin concn. Blood from persons with severe secondary anemia showed a somewhat lower rate of saponin hemolysis than did normal blood.

J. F. LYMAN

**Saponin hemolysis of reticulocyte-containing blood.** T. F. ZUCKER AND H. D. KESTEN. *Am. J. Physiol.* 87, 280-7(1928).—Severe secondary anemias were produced in rabbits by the withdrawal of blood, thus reducing the red-cell count 50% or more and increasing the reticulocyte percentage up to around 20%. Comparison of the rates of saponin hemolysis of normal and reticulocyte-contg. bloods shows that reticulocytes hemolyze at a lower rate than do the normal cells.

J. F. LYMAN

**Physical development and the excretion of creatine and creatinine by women.** PAULINE HODGSON AND HOWARD B. LEWIS. *Am. J. Physiol.* 87, 288-92(1928).—In 14 athletic college women the ratio between mg. of urinary creatine N excreted in 24 hrs. and body wt. in kg. was 8.5 (av.), which is of the same order of magnitude as for men. Urinary creatinine seems to be independent of sexual variations and is an index of the proportion of muscular tissue to body wt. The frequency of creatine excretion

in these subjects was similar to that usually observed in women, but there was no definite relationship of creatinuria to menstruation.

**The development of secondary sex characters in capons by injections of bull testes.** L. C. MCGEE, MARY JUHN AND L. V. DOMM. *Am. J. Physiol.* 87, 406-35(1928).—Exts. contg. the lipoids of bull testes, injected into capons, stimulated the growth of the comb, wattles and ear lobes. The most active prepn. was obtained by: (1) Extn of the fresh ground tissue with twice its wt. of 95% EtOH, evaporation of the ext. to a sludge; (2) extn. of the sludge with benzene; (3) concn. of the benzene ext. to 0.1 its original vol. and the addn. of 7.5 vols. of acetone and filtering after 24 hrs.; (4) concn. of the acetone ext. to a sirup under reduced pressure, absorption of the sirup on strips of filter paper and extn. with liquid NH<sub>3</sub>. From 168 g. of benzene-sol. solids, 6.7 g. of NH<sub>3</sub>-sol. active lipoids were obtained.

**The effects of injecting lipid extracts of bull testes into castrated guinea pigs.** CARL R. MOORE AND L. C. MCGEE. *Am. J. Physiol.* 87, 436-46(1928).—A lipid fraction of bull testes, sol. in dil. alc., in benzene and in acetone, injected into castrated guinea pigs prolonged the survival time of the spermatozoa remaining in the epididymides of the operated and treated animals as did the hormones produced by the intact living testicle.

**Distribution of testicular growth-stimulating principle in tissues.** T. F. GALLACHER. *Am. J. Physiol.* 87, 447-9(1928).—The active principle of testicular tissue which stimulates the comb growth in capons was not obtained from any other bull tissue except epididymis.

**The physiology of the liver. XVI. The respiratory quotient and basal metabolic rate following removal of the liver and injection of glucose.** F. C. MANN AND W. M. BOOTHBY. *Am. J. Physiol.* 87, 486-96(1928).—Gaseous metabolism in trained dogs before and after the removal of the liver and before and after the injection of glucose showed that (1) the total heat production was not changed by the total loss of the liver, (2) the respiratory quotient increased immediately after the removal of the liver; and (3) glucose had a greater specific dynamic action in the dehepatized animal than in the normal one. **XVII. The effect of removal of the liver on the specific dynamic action of amino acids administered intravenously.** C. M. WILHELMJ, J. L. BOLLMAN AND F. C. MANN. *Ibid* 497-509.—The intravenous injection of alanine and glycocoll into dogs whose livers had been removed failed to produce elevation in the O<sub>2</sub> consumption but did produce elevation of the respiratory quotient. Conclusion: The specific dynamic action of amino acids is not the result of direct stimulation brought about by the presence of amino acids in the tissues.

**The carbon dioxide capacity of the human body and the progression effects of carbon dioxide upon the breathing.** E. F. ADOLPH, F. D. NANCE AND M. S. SHILING. *Am J Physiol.* 87, 532-41(1928).—When the human body was satd. at a new level of CO<sub>2</sub> tension, from 82 to 97% of the CO<sub>2</sub> was absorbed by the tissues and from 3 to 18% by the blood. When air contg. 4.5% CO<sub>2</sub> was rebreathed for 30 min. no steady state was reached; but ventilation, alveolar tension, respiratory quotient and dead space varied. At the close of the CO<sub>2</sub> rebreathing 30 min. or more was required for the normal respiratory equilibrium to return.

**The alleged presence of carotin in pig liver.** L. S. PALMER. *Am. J. Physiol.* 87, 553-7(1929).—Pig liver does not contain carotin, but it does contain a small amt. of a pigment resembling carotin in soly. and adsorption properties which gives some color reactions similar to those given by the carotinoids, but which fails to give others. The spectroscopic properties of the liver pigments are totally unlike those of carotin.

**The glycogenic function of skeletal muscle in the dehepatized dog, with special reference to the role of insulin therein.** J. MARKOWITZ, F. C. MANN AND J. L. BOLLMAN. *Am. J. Physiol.* 87, 566-83(1929).—Muscle glycogen was deposited when a dog, whose liver had been removed, was given intravenously at least 1 g. of glucose for each kg. of body wt. each hr. The presence of the pancreas is necessary for this effect for in its absence the giving of glucose is not followed by deposit of muscle glycogen unless large amts. of insulin were given.

**Human physiology. I. The metabolism and body temperature (oral) under basal conditions.** F. R. GRIFFITH, JR., G. W. PUCHER, KATHERINE A. BROWNELL, JENNIE D. KLEIN AND MABLE E. CRAMER. *Am. J. Physiol.* 87, 602-32(1929).—There was no significant correlation between the intra-individual variations of temp. and metabolism, wt. and metabolism or protein and total metabolism. There was the usual inter-individual correlation between wt. and metabolism and a negative correlation between the inter-individual correlation between wt. and metabolism and a negative



correlation between the inter-individual values for temp. and metabolic rate. Sleep or vacations did not affect the metabolism appreciably. The basal oral temp. probably undergoes a seasonal variation with its lowest value in the spring. Neither the protein or non-protein metabolism nor the  $\text{CO}_2$  excretion showed concurrent seasonal variations with the different subjects. J. F. LYMAN

Effect of corpus luteum and ovarian extracts on the estrus of the guinea pig. D. I. MACHT, A. E. STICKELS AND D. L. SECKINGER. *Am. J. Physiol.* 88, 65-76(1929).— $\text{H}_2\text{O}$  exts. of corpus luteum injected into guinea pigs inhibited estrus. J. F. L.

The secretion of uric acid by the fowl. O. S. GIBBS. *Am. J. Physiol.* 88, 87-100 (1929); cf. *C. A.* 23, 3022.—When a tube was placed in a fowl's ureter so that secretion pressure would be balanced by a column of liquid in the tube, equil. was reached at between 10 and 20 cm.  $\text{H}_2\text{O}$  pressure in most cases, max. = 42 cm. Back pressures in the ureters interfered with or stopped uric acid excretion by the kidneys, the uric acid content of the blood rising meantime. It is believed that  $\text{H}_2\text{O}$  and uric acid are excreted independently by the kidney,  $\text{H}_2\text{O}$  probably by filtration and uric acid by active secretion. J. F. LYMAN

The effect of massaging the thyroid on the basal metabolic rate of dogs. C. S. SMITH AND O. B. DE COUTO-E-SILVA. *Am. J. Physiol.* 88, 183-6(1929).—No effect on basal metabolism in dogs was noted after vigorous massage of the thyroid glands. J. F. LYMAN

The influence of suprarenal cortex and medulla on the growth and maturity of young (white leghorn) chicks. A. G. EATON, W. M. INSKO, G. P. THOMPSON AND F. E. CHIDESTER. *Am. J. Physiol.* 88, 187-90(1929).—Chicks fed desiccated suprarenal medulla grew almost the same as the controls for the first 3 weeks; after this their growth was less rapid than that of the controls. Dried suprarenal cortex produced a decrease in the rate of growth, but after 8 weeks' feeding growth was more rapid than in the controls. The testes of the cortex-fed males were larger and those of the medulla fed males were smaller than those of the controls. J. F. LYMAN

The influence of desiccated suprarenal cortex and medulla on the growth and maturity of white rats. F. E. CHIDESTER, A. G. EATON AND G. P. THOMPSON. *Am. J. Physiol.* 88, 191-4(1929).—The growth of young white rats was retarded when they were fed 0.5 g. dried suprarenal cortex or medulla daily, especially at first by cortex. Young female rats fed dried cortex reached sexual maturity sooner than controls or those fed dried medulla. J. F. LYMAN

The effect of ergotamine on the blood sugar level. L. B. SHPINER. *Am. J. Physiol.* 88, 245-50(1929).—Ergotamine injected into dogs prevented the development of adrenalectomy hyperglucemia and glucosuria; it lowered the blood sugar and stopped glucosuria in dogs whose pancreas glands had been partially removed and that had been fed thyroid; but it had no effect on the hyperglucemia and glucosuria in dogs made diabetic by total removal of the pancreas. J. F. LYMAN

The effect of prolonged general anesthesia and of decerebration on the lactic acid and glycogen contents of mammalian skeletal muscle. J. C. HINSEY AND H. A. DAVENPORT. *Am. J. Physiol.* 88, 286-94(1929).—The lactic acid content of the blood and tonic muscles of decerebrate cats was higher than that of resting normal animals, while the muscle glycogen content of the tonic and atonic muscles was essentially the same. Under ether anesthesia the muscle lactic acid content was initially high but tended to drop as anesthesia progressed. Under amylal anesthesia the glycogen content of rat and guinea pig muscle did not decrease during 3.5 hrs. J. F. L.

The regulation of respiration. XXV. Variations in the lactic acid metabolism in the intact brain. D. A. MCGINTY. *Am. J. Physiol.* 88, 312-25(1929).—A comparison of the lactic acid content of blood supplying the brain with that returning from it showed that with normal oxidations in the brain tissue lactic acid was absorbed from the arterial blood and utilized by the brain cells. With impaired oxidations, induced by NaCN or by partial or complete occlusion of the cerebral blood supply an excessive production of lactic acid in the brain cells with an outward diffusion into the blood stream occurred. XXVI. Total carbon dioxide content of the brain as affected by hemorrhage and the injection of sodium cyanide. E. E. KLEINSCHMIDT. *Ibid* 251-8.—A method is described for prep. brain tissue for  $\text{CO}_2$  analysis. Conditions of lowered oxidation in the brain, produced by hemorrhage or by NaCN injection, resulted in a falling off of  $\text{CO}_2$  within the brain. The buffering capacity of the normal brain is less than that of the normal blood and both are decreased with impaired oxidation. The data are in accord with the view that the  $p_{\text{H}}$  of the center is an important factor in the control of respiration. XXVII. The effect upon salivary secretion of varying the carbon dioxide and oxygen contents of the inspired air. NATHAN B. EDDY. *Ibid*

534-45.—The submaxillary gland of the dog, secreting at const. rate under the influence of pilocarpine, was stimulated to increased secretion by increasing the  $\text{CO}_2$  of the inspired air. Decreasing the  $\text{O}_2$  of the inspired air decreased the rate of secretion. Both procedures increased the vol. flow of blood through the gland. **XXVIII. Lymph acidity and lymph flow during administration of sodium bicarbonate and carbon dioxide.** ROBERT GESELL. *Ibid* 546-53.—The intravenous injection of  $\text{NaHCO}_3$  into dogs decreased the H-ion concn. of blood and thoracic lymph equally. The administration of  $\text{CO}_2$  by the inspired air increased the acidity of blood and lymph. The capillaries of the liver and gastrointestinal tract seem to be highly permeable to  $\text{NaHCO}_3$  and to  $\text{CO}_2$ . **XXIX. Lymph acidity and lymph flow during impaired oxidations produced by cyanide.** ROBERT GESELL. *Ibid* 554-61.—The effects of  $\text{NaCN}$  on the  $\text{pH}$  of the lymph were different when the animal was allowed to control its ventilation and when ventilation was artificially maintained at const. vol. The early effects, in general, were decreased hydrogen-ion concn. during normal ventilation and increased H-ion concn. during const. ventilation. This agrees with the findings of Gesell and Hertzman on the cerebrospinal fluid. Cf. *C. A.* 23, 3963. J. F. LYMAN

**Physiology of the corpus luteum. II. Production of a special uterine reaction (progestational proliferation) by extracts of the corpus luteum.** G. W. CORNER AND W. M. ALLEN. *Am. J. Physiol.* 88, 326-39(1929).—An ext. of corpus luteum was prepd. by (1) extn. with hot alc. and evapn. of the alc. and (2) pptn. and removal of the phospholipins from an ethereal soln. of the alc.-sol. lipins by the addn. of acetone. Such exts., freed of phospholipins, when injected into castrated adult female rabbits induced a characteristic alteration of the endometrium identical with the progestational proliferation known to be due to the presence of corpora lutea in the ovaries. Conclusion: The exts. of corpora lutea used contained a special hormone which has for one of its functions the prepn. of the uterus for reception of the embryo. Estrin or exts. of human placenta did not produce progestational proliferation of the uterus. **III. Normal growth and implantation of embryos after very early ablation of the ovaries, under the influence of extracts of the corpus luteum.** W. M. ALLEN AND G. W. CORNER. *Ibid* 340-6.—Female rabbits whose ovaries were removed by operation at the 18th hr of pregnancy and treated subsequently with alc. ext. of corpus luteum showed normal implantation and growth of the embryos. Conclusion: In the rabbit the corpus luteum is an organ of internal secretion which has for one of its functions the production of a special state of the uterine mucosa which makes possible the nourishment and protection of the free blastocytes and their implantation on the uterine wall. J. F. LYMAN

**The optimal water requirement in renal function. I. Measurements of water drinking by rats according to increments of urea and of several salts in the food.** J. L. GAMBLE, M. C. PUTNAM AND C. F. MCKHANN. *Am. J. Physiol.* 88, 571-80(1929). When 2 millimols. or more of  $\text{NaCl}$ ,  $\text{KCl}$ ,  $\text{KHCO}_3$  or urea per g. of food was added to the diet of rats an approx. stationary concn. in terms of water intake was established. The values for  $\text{NaCl}$  were 0.63  $M$  and for urea 1.01  $M$ . The optimal water requirement for each of the salts was identical, or nearly so, and for salt mixts the water requirement was additive or nearly so. For mixts. of salts and urea the water requirement was not additive, but the same as for an equiv. amt. of urea alone. J. F. L.

**The metabolism of muscle. II. The respiratory quotient of exercising muscle.** H. E. HIMWICH AND M. I. ROSE. *Am. J. Physiol.* 88, 663-79(1929); cf. *C. A.* 23, 3445.—Respiratory quotients for (1) non-isolated muscles, (2) isolated muscles and (3) for the animal as a whole were detd. on dogs. The respiratory quotient obtained from the blood of exercising muscle usually agrees with that obtained for the resting animal as a whole. There is thus no evidence pointing to exclusive carbohydrate utilization during exercise; rather the working muscles seem to oxidize foodstuffs in the same proportion as the whole organism during rest. J. F. LYMAN

**The respiratory quotient of testicle.** H. E. HIMWICH AND L. H. NAHUM. *Am. J. Physiol.* 88, 680-5(1929).—The respiratory quotients of the testicle indicate that this organ oxidizes the usual combination of foodstuffs. J. F. LYMAN

**The carbon dioxide absorption curve and buffer value of the blood in physical hyperthermia.** M. GARCIA BANUS WITH J. M. WILCOX. *Am. J. Physiol.* 88, 709-23(1929).—In anesthetized dogs whose temp. was raised and maintained at  $40^\circ$  and  $41^\circ$  for 8 hrs. or longer there was an increase in the total solids of the blood, a decrease in  $\text{O}_2$  capacity and an increase in labile, loosely bound base. The hemoglobin which disappeared from the blood as  $\text{O}_2$  capacity may have been transformed into a substance with a smaller acid dissocn. const. J. F. LYMAN

**The inversion effect on blood pressure of preparations from the posterior lobe of the pituitary gland.** R. L. STANLEY. *Am. J. Physiol.* **88**, 724-8(1929).—The posterior lobes of cattle were preserved in acetone. After draining off the acetone the glands were ground and heated with water to boiling and the insol. material sepd. by centrifuging. Washings from the insol. material were combined with the first soln. and the combined solns. clarified by the addition of colloidal iron and filtration. The filtrate was evapd. under reduced pressure at 50° to small vol. and absolute alc. added to complete pptn. The ppt. was sepd. by centrifuging and the alc. soln. discarded. The alc.-insol. material was washed with absolute alc. and dried in a vacuum desiccator. Preps. as described above showed no reversal of action on blood pressure upon repeated injections at 10-min. intervals. J. F. LYMAN

**The blood plasma calcium of normal and parathyroidectomized albino rats.** W. R. TWEDDY AND S. B. CHANDLER. *Am. J. Physiol.* **88**, 754-60(1929).—Removal of both parathyroid glands in rats was followed by a rapid drop in blood plasma Ca (9.25 to 12.5 mg. Ca per 100-cc. plasma in normal rats to 5 to 8 mg. in operated rats). Parathyroidectomized rats were 2 to 3 times more reactive to parathyroid hormone injections than were normal rats. J. F. LYMAN

**Studies on the labile phosphorus of the blood.** G. DE TONI. *Boll. soc. ital. biol. sper.* **4**, 161-5(1929).—The effect of time and temp. on the labile P in sterile citrated blood was studied. The amt. of inorg. P in the blood kept at 1-2° for 24 hrs. remained unchanged. There was an increase of 10-40% in blood kept at 16-18° for 24 hrs. There was an enormous increase in inorg. P in blood kept at 37° for 24 hrs.; the amt. of P was in some cases 8 times the original titer. Such variations are less pronounced in plasma and still less are the variations in the  $\text{CCl}_3\text{CO}_2\text{H}$  blood filtrates kept under similar conditions. In a second series of expts. the temp. was kept const. (16-18°) and the time was varied. The results showed that in  $\text{CCl}_3\text{CO}_2\text{H}$  filtrates there is a decided tendency for the inorg. P to increase gradually. PETER MASUCCI

**The intestinal elimination of iron studied in animals by means of vital stains.** P. MASCHERPA. *Boll. soc. ital. biol. sper.* **4**, 178-81(1929).—During the elimination of Fe, the intestine takes the vital stain more intensely. The mobile cells which transport Fe from the blood vessels to the secretory epithelia of the intestine are not leucocytes but are cells belonging to the reticulo-endothelial system. PETER MASUCCI

**The limits of the action of the hydrogen-ion concentration on the blood vessel tone.** G. RUSSO. *Boll. soc. ital. biol. sper.* **4**, 206-8(1929).—By means of perfusion methods with the Trendelenburg-Läwen frog prepn., R. obtained the following results: (1) The vessels are sensitive to a variation of 0.2  $p_H$  from the normal  $p_H$  7.4;  $p_H$  7.2 cause vasodilation and  $p_H$  7.6 vasoconstriction. (2) An indifferent zone exists,  $p_H$  5.6-6.6, in which the vessels are not sensitive to changes in  $p_H$ ;  $p_H$  6.6 is the max. point of vasodilation. (3) The changes in  $p_H$  which provoke the sharpest vasomotor reactions are those close to the normal  $p_H$  of biol. fluids. PETER MASUCCI

**Studies on oxidases. V. Recent studies on the oxidases of spermatozoa.** E. SERENI. *Boll. soc. ital. biol. sper.* **4**, 230-8(1929).—Exptl. data are given tending to support the importance of the epididymis as the organ in which the physiological maturation of the sperm is accomplished. In the epididymis and probably through the action of its secretion, the spermatozoa become more mobile, and the duration of their mobility outside the organism lasts longer; their resistance to heat is increased. Paralleling these modifications, the spermatozoa acquire a marked power to oxidize the  $\alpha$ -naphthol-dimethyl- $p$ -phenylenediamine reagent. As long as the spermatozoa are devoid of mobility, they are also free from oxidase granules; these appear, however, when the spermatozoa become mobile. PETER MASUCCI

**Hydroxyl ions and the spinal medulla.** MICHELE MITOLO. *Boll. soc. ital. biol. sper.* **4**, 259-62(1929).—The application of alkalis on the dorsal surface of the spinal medulla of the frog (Baglioni's prepn.) causes tetanic convulsions and strychnine-like tetany. The OH ions act on the sensor-coördinator elements. If the alkalis are applied on the ventral surface, then they induce clonic convulsions of the phenolic type. The OH ions act on the motor centers of the spinal medulla. PETER MASUCCI

**The acid-alkali equilibrium and kidney function.** L. DAMAS. *Bull. sci. pharmacol.* **36**, 303-9(1929).—A general discussion. A. E. MEYER

**Physical chemistry of body fat. A contribution to the problem of the physiology of fattening.** WALTER SPRANGER. *Biochem. Z.* **208**, 164-78(1929).—The viscosity of Ringer soln. is not noticeably altered by the addn. of Na oleate, Ca oleate, lecithin, cholesterol or cholesterol esters in physiological concns. In the absence of neutral fat no antagonism is observed between these substances. Albumin, lecithin and Na oleate in a physiological model act as oil/water emulsifying agents. An increased

addn. of cholesterol or lecithin causes not a greater dispersion of the fat but a sepn. of the phases that manifests itself in a fall of viscosity. Cholesterol esters are even more strikingly effective in this respect than the cholesterol. By reducing the  $H_2O$  + protein + lecithin phase and increasing the fat quantity, cholesterol ester produces sepn. and actual reversal of phase from the oil/water to the water/oil. The optimum condition for the oil/water emulsion exists when of the total cholesterol only about 60% is in the form of esters and the rest is free, and a shift in proportion in either direction leads to sepn. and reversal of phases. In the body fat depots the emulsion behaves like a water-in-oil emulsion.

S. MORGULIS

**Lactic acid excretion in urine and sweat in different sports.** I. SNAPPER AND A. GRÜNBAUM. *Biochem. Z.* **208**, 212-20(1929); cf. *C. A.* **23**, 3500.—Football players, during a double game of 45 min. each, on a warm day excrete lactic acid in the urine, 11% of the players eliminating over 60 mg. On cold days 50% of the players excrete over 60 mg. lactic acid; on warm days 468 mg. lactic acid and 846 mg. Cl were recovered from their shirts. This leads to the supposition that the total elimination by way of the sweat was 1-2 g. lactic acid. 28 out of 39 participants in bicycle races (6-8 min. for a 2-km. course) had more than 60 mg. lactic acid in the urine; in a very difficult race over a similar distance 24 out of 27 bicyclists had more than 60 mg. lactic acid in the urine (max. 1.425 g.). Their shirts yielded an av. of 97.5 mg. lactic acid and 84 mg. Cl. Fast runners (time 9 min. to 2.5 hrs. over distances of 3, 5, 10 or 12 km.) have as a rule little lactic acid in the urine, so that when the exertion lasted more than 9 min. a "steady state" was evidently established during running. Swimmers whether over 400 m (5 min.) or 1500 m. (20-22 min.) and waterball players (twice 7½ min.) all excrete much lactic acid in the urine (max. 1.76 g.), so that in swimming even after 15 min. the "steady state" has not been established. Albuminuria occurs very seldom among trained football players, bicyclists or runners, but is frequent among swimmers. Glucosuria was observed only in one football and in one waterball player.

S. MORGULIS

**The decomposition of creatine phosphoric acid in relation to the activity of the muscles.** II. D. NACHMANSOHN. *Biochem. Z.* **208**, 237-56(1929); cf. *C. A.* **23**, 877.—The relation between the decompn. of creatine-phosphoric acid and the tension developed by a muscle has been quant. studied under different conditions. For this purpose the isometric coeff.  $K_m$  (kg. tension  $\times$  cm. muscle length/mg.  $H_3PO_4$  set free) as well as the isometric times coeff.  $K_z$  (kg. tension  $\times$  cm. muscle length  $\times$  seconds/mg.  $H_3PO_4$ ) were detd. The av. value for  $K_z$  for 2-second tetanus is 15, for 5 sec. 32, for 10 sec 50. The anaerobic resynthesis for tetanus of various durations is more or less proportional to the amt. decomposed, namely about 30%. In curarized muscles, on the contrary, the  $K_z$  value even for a 2-second tetanus is relatively large and does not vary with further prolongation of the tetanus. When muscles are placed in Ringer soln. contg. P, creatine-phosphoric acid synthesis occurs beyond the normal content of muscle, so that about 95% of the creatine becomes esterified. In the isometric contractions much less phosphagen is decomposed at high than at low temp., although the developed tension and the lactic acid production under these conditions are the same. The  $K_m$  value for 30 to 50 single contractions is 70-100 at 4° and 40-60 at 24°.

S. MORGULIS

**The citric acid content of normal human urine.** OTTO ÖSTBERG. *Biochem. Z.* **208**, 352-3(1929).—Normal human urine contains an av. of 0.025-0.18% citric acid.

S. MORGULIS

**The respiratory quotient of nerves during rest and activity.** OTTO MEYERHOFF AND F. O. SCHMITT. *Biochem. Z.* **208**, 445-55(1929).—The av. value of the resting respiratory quotient of frog nerve was 0.77, but in the four best expts. the av. was only 0.69. During activity the av. respiratory quotient was 0.87 (variations 0.71 to 1.03).

S. MORGULIS

**The asymmetric utilization of *p*-sec.-butylphenol in the animal organism.** CLAUDE FROMAGNOT. *Biochem. Z.* **208**, 490-2(1929).—When synthetic, optically inactive *p*-sec-butylphenol is fed to animals, the urine always yields *l*-sec-butylphenol, showing that the dextro component must have been utilized by the organism.

S. MORGULIS

**The effect of lecithin and cephalin on the working capacity of the surviving frog muscle.** NILS NIELSEN. *Skand. Arch. Physiol.* **56**, 216-24(1929).—Pure lecithin and cephalin have been prepd. from brain tissue by the method of Levene and Rolf. No effect was observed on the frog heart when the Göthlin perfusion fluid was exchanged for one contg. lecithin or cephalin. Other expts. were made on the frog gastrocnemius perfused either with Göthlin's soln. + glucose, or with the same soln. contg. emulsified phosphatide, or with serum, the work consisting of 300 contractions with a 20-g. wt. Changing over from Göthlin's soln. to serum increased the working capacity. Chang-

ing over from Göthlin's soln. to the same contg. a 0.01–0.1% emulsion of lecithin in no instance affected the working capacity of the muscle, but a slight increase was observed in a 0.01% emulsion of cephalin.

S. MORGULIS

**Influence of room temperature upon the quantity of oxygen consumption in an intestinal canal and the relation between the oxygen consumption and the intestinal motion.** RYOSUI SAMEISHIMA. *Hokkaido J. Med.* 6, 893–913(1928).—The O consumption of the rabbit intestine increases with the rise of temp. in the temp. range of 18–41°, the sugar absorption being also larger at higher temp. The temp. coeff. of the former action is 2.2–2.7, while that of the latter action is 1.7. The O consumption suffers no change even when the absorptive power of the intestine is destroyed by  $\text{HgCl}_2$ , from which fact S. concludes that the oxygen consumption of the intestine is chiefly due to its motion and has little relation to the absorbing action. K. S.

**Neutralization of acids and alkalies in the intestinal canal.** RYOJUN KINOSHITA, SEIKEN SUKAI AND HIROSHI NAKAMURA. *J. Exptl. Digestive Diseases* 3, 723–35(1928).—The intestinal canal of a rabbit was washed, physioli. NaCl soln. was poured into it, and the reaction of the soln. was measured after 45 min. The change of the reaction was also examd. after 1 hr. by adding 0.1 N acid or 0.01 N alkali. Evidence was found that in the intestine the reaction is regulated by the blood, the intestinal juice and the mucous membrane. K. SOMEYA

**Influence of temperature upon the acetaldehyde production.** CHOJI KAWAMURA. *J. Kyoto Prefectural Med. Coll.* 2, 211–22(1928). (In German).—K. added to rabbit blood or to pulped organs  $\text{CaSO}_4$  and a phosphate buffer ( $p_H$  6.5) and allowed the mixt to stand for 5 hrs. at 30°, 34° and 38°, and then measured the  $\text{MeCHO}$  content by a modified method of Neubury, Ripper, etc. In the liver, blood and muscle,  $\text{MeCHO}$  production was max. at 38°. The amt. produced in the liver was 2.4 mg. %, in muscle 1.13 mg. % and in blood 1.08 mg. %.

K. SOMEYA

**The appearance of glycogen in the mucous membrane of the alimentary canal.** XVI-XVII. KYUHAN YOSHIDA. *J. Study of Microorganisms* 22, 2385–402, 2403–24 (1928).—Subcutaneous or intravenous injection of starch, insulin or glycogen into a rabbit seldom caused formation of glycogen in the alimentary mucous membrane. The liver glycogen was only slightly increased by the injection of glycogen. The appearance of glycogen is attributed to a polymerizing action of the superficial intestinal cells on the excessive accumulation of blood sugar. On NaCl injection the increase of the blood sugar is small and there appears no glycogen in the mucous membrane. K. SOMEYA

**Change of hydrogen-ion concentration in the urine at low atmospheric pressure.** SEICHOKU MATSUKA. *Naval J. Med.* 17, 261–3(1928).—Two healthy men were put into a low-pressure chamber, and the pressure was gradually decreased up to the pressure prevailing at the height of 5000 m. The alkali excretion in the urine was increased. With const. low O pressure, the amt. of alkali excreted increases with the time. The total urine increases at atm. pressures equiv. to heights above 3000 m.

K. SOMEYA

**Distribution and variation of glycogen in the intestinal mucous membrane of the mammal embryo.** ICHIRO MARUYAMA. *Okayama J. Med.* 40, 1296–333(1928).—In the intestinal canal of the 20-day-old rabbit embryo there is 0.79% glycogen, while in the 30-day-old rabbit there is 0.53%. In a marmot embryo weighing 8.71 g. and 5.24 cm. long 0.677% of glycogen was found, while in another weighing 62.07 g. and 12.5 cm. long, there was found 3.223% of glycogen. In the intestinal mucous membrane of a dog embryo measuring 5.98 cm. in length, there was found 0.839% glycogen, while in another measuring 15.42 cm. in length, 0.066% of glycogen was found. The quantity of the free  $\text{H}_3\text{PO}_4$  in the intestinal mucous membrane of the rabbit or of the dog increases with lapse of time after conception both in its absolute amount and the percentage, while in marmots the absolute amt. increases but the percentage decreases. The quantity of the lactacidogen phosphoric acid increases in its abs. amt. in the first two animals but the percentage decreases while in marmots both increase. The quantity of the inorg. constituents and the free  $\text{H}_3\text{PO}_4$  in the rabbit embryo increases with the lapse of time after conception, while the lactacidogen phosphoric acid decreases, the contrary being the case in marmots. The intestinal mucous membrane of marmots contains a considerable quantity of an insulin-like substance, while that of a dog contains only a small quantity of the same substance. K. SOMEYA

**Testicles and the water metabolism.** TARO YAMAMOTO. *Okayama J. Med.* 40, 1467–80(1928).—In a week after removal of both testicles there is a slight change of  $\text{H}_2\text{O}$  and NaCl metabolism; this change increases up to 3 weeks. Injection of spermatin into the animal appears to restore the metabolic function to a small extent. K. S.

**Glycogen I.** The glycogen deposition in the pelvis of the kidney, ureter and bladder epithelium. SADAJI HARADA. *Sei-i-kwai Med. J.* 48, No. 1, 46-83, Abstract sect. 4-5 (1929).—The glycogen in the kidney, pelvis of the kidney, ureter and bladder epithelium is not a simple deposit of the substance but is formed in the cells themselves from blood and urine sugar and serves as a reserve substance.

**Glycogen in the central nervous system of some mammals. III. Effects of inanition upon the glycogen content.** HYOSAKU TANAKA. *Sei-i-kwai Med. J.* 48, No. 2, 51-81, Abstract sect. 4-5(1929); cf. *C. A.* 23, 3257.—Guinea pigs and rabbits were starved 24 and 72 hrs. A detailed comparative examn. of sections stained by Best's carmine method was made. The glycogen content of the cerebral cortex, glia of the spinal cord and ganglion cells in the posterior end of the spinal cord decreased somewhat in the guinea pigs starved for 72 hrs. but was only slightly affected in the rabbit starved for 72 hrs. A marked decrease in the glycogen content of the liver was produced by starvation for 72 hrs. The extracellular glycogen was more markedly influenced by starvation than the intracellular.

A comparison of blood calcium levels between and during menstrual periods. EDWARD ALLEN AND H. C. GOLDTHORPE. *Am. J. Obstet. and Gynecol.* 17, 789-94 (1929).—Normal Ca values in healthy women range from 9.3 to 13.6 mg. per 100 cc plasma. The differences seem to be due to seasonal or climatic changes and variations in the concn. of the blood. No appreciable or constant effect of the normal menstrual period on the Ca content of the blood was detd.

Some factors which influence the reaction of the urine. ARMAS and IMARI VARTIAINEN. *Duodecim.* 44, 497-507(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 48, 231.—NaHCO<sub>3</sub> taken into the fasting stomach soon releases a strong alk. urinary reaction which passes rapidly. At meal time the reaction produced is weaker but more prolonged. Fruit salts taken while fasting at first produce an acid urinary reaction which later changes into an alk. one. The original acid reaction is attributed to the Na tartrate in the fruit salts. The latter taken at meal time produce an enduring and somewhat moderate action, the urine remaining alk. even on the following day.

Chemical studies of the menstrual blood. ANDOR RONA AND OLGA WALDBAUM. *Zentr. Gynäkol.* 52, 997-1005(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 47, 644-5. Total protein and plasma protein showed no essential changes. Residual N showed an increase in 23 of 33 cases, on the first day in 88% of the cases averaging 38.19%, and on the second day in 50% of the cases averaging 16.83%. Increase of amino acids in 16 of 20 cases averaged 25%. There is also a protein decompn. which must come from the uterine mucous membrane.

The influence of insulin on the glycogen formation in the macerated liver or muscle substance and in the liver during perfusion with sugar-saline solutions. KENZO OTANI. *Okayama-Igakkaï-Zasshi* 40, 727-45(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 47, 572.—Macerated liver of the toad, *Bufo japonicus*, can form glycogen from either glucose or fructose, while resected muscle can convert only glucose. The addn. of insulin reduces the glycogen content of both muscle and liver. The presence of glucose and fructose slows the decompn. of glycogen in the resected liver; glucose has the same effect on resected muscle. When the liver is perfused with a sugar-saline soln glycogen is formed both from dextrose and levulose. Insulin accelerates this in levulose while it retards such formation in dextrose.

New paths of therapy [hormones] (HOFMAN) 17.

## G—PATHOLOGY

H. GIDEON WELLS

Post-operative blood chemical studies. KNUTE REUTERSKIÖLD AND EDMUND ANDREWS. *Proc. Soc. Exptl. Biol. Med.* 26, 17-8(1928).—The Ca-K ratio in the blood was greatly lowered in dogs following surgical operations under ether anesthesia. This was accompanied by an increased permeability of the tissues and a tissue dehydration. Return to normal usually occurred in 24 to 36 hrs.

Occurrence of cystine in sweat of cystinurics. HOWARD B. LEWIS. *Proc. Soc. Exptl. Biol. Med.* 26, 69-70(1928).—From a cystinuric, by the use of pilocarpine and heat, 100 cc. of sweat was collected in 50 min. No cystine was detected by the colorimetric method of Folin and Looney. Wollaston's test, applied to purified sweat, was also negative.

Cause of death following intravenous injection of ox and dog serum into rabbits. JACOB RABINOVITCH. *Proc. Soc. Exptl. Biol. Med.* 26, 117-9(1928).—Both ox and

dog serum when injected in lethal doses intravenously into rabbits cause death through thrombosis, which with ox serum consists of agglutinated erythrocytes and with dog serum of fibrin thrombi.

C. V. BAILEY

**A mechanism maintaining the hyperglucemia of diabetes.** H. E. HIMWICH, W. H. CHAMBERS, Y. D. KOSKOFF, L. H. NAHUM AND M. A. ADAMS. *Proc. Soc. Exptl. Biol. Med.* 26, 120-1(1928).—Fourteen completely diabetic depancreatized dogs were put under amytal anesthesia and samples of blood were synchronously drawn from the femoral artery, femoral vein, portal vein and hepatic vein. Glucose and lactic acid were detd. The results showed that the liver forms carbohydrate from the lactic acid liberated by muscle and that the glucose is not stored in the liver but passes into the blood stream and constitutes a factor in maintaining the hyperglucemia of diabetes.

C. V. BAILEY

**Hemagglutination by tumor extracts.** K. LANDSTEINER. *Proc. Soc. Exptl. Biol. Med.* 26, 134-5(1928).—Exts. of tumors of human or lower animal origin have a distinct agglutinating effect on rabbit red blood cells. This activity disappears rapidly as a result of oxidation. The deterioration is markedly delayed by addn. of cysteine 1:500 and by covering the ext. with liquid paraffin. The action is different from agglutination by serum. Saline exts. of normal organs do not show this phenomenon.

C. V. BAILEY

**Experimental edema.** LOUIS LEITER. *Proc. Soc. Exptl. Biol. Med.* 26, 173-5 (1928).—Dogs were bled twice daily; 400 to 500 cc. of blood was withdrawn and the corresponding quantity of erythrocytes, suspended in Locke's soln., was reinjected into the saphenous vein. 1500 cc. of 0.85% NaCl soln. was given daily by stomach tube. Anasarca developed about the 5th day. Edema usually appeared when the plasma proteins had fallen to 3% or less. Ascitic or subcutaneous edema fluid had a protein content of 0.25 to 0.1%. The massive edema and ascites did not impair the good general condition of the dog.

C. V. BAILEY

**Tetany and blood calcium after thyroparathyroidectomy in the goat.** E. LARSON AND LEO A. ELKOURIE. *Proc. Soc. Exptl. Biol. Med.* 26, 210-3(1928).—In the goat the usual operation for the removal of the thyroids and parathyroids does not result in tetany; under these conditions the goat can maintain a normal or nearly normal blood Ca.

C. V. BAILEY

**Use of paramacia for studying toxins and antitoxins (measles, scarlet fever and diphtheria).** RUTH TUNNICLIFF. *Proc. Soc. Exptl. Biol. Med.* 26, 213-7(1928).—Paramacia can be used to det. toxin production of certain bacteria; the method is crude as the toxins are not sufficiently potent to be dild. Paramacia may be helpful in detg. the strength of antitoxins.

C. V. BAILEY

**Precipitin production with phosphorized caseinogen.** E. E. ECKER AND M. A. SIMON. *Proc. Soc. Exptl. Biol. Med.* 26, 222-4(1928).—Both native and phosphorized caseinogen are precipitinogenic. The reactions occur in higher dilns. when the homologous proteins are employed. Antisera against either form will ppt. the other. Phosphorylation of the caseinogen does not destroy its antigenic character.

C. V. B.

**Antipneumococcus protective substances in normal pig serum.** RICHARD H. P. SIA. *Proc. Soc. Exptl. Biol. Med.* 26, 284-6(1929).—White mice weighing about 20 g. were each given intraperitoneal injections of 1 cc. of pig serum and 4 hrs. later varying amts. of an actively growing culture of a virulent Type I pneumococcus. Sera from susceptible animals, the rabbit and the guinea pig, were used as controls and these conferred no protection. Normal pig serum protected mice against 10,000 times the min. fatal dose. By absorption expts. normal pig serum was found to contain type specific protective substances for Types I and II and to a less degree for Type III.

C. V. BAILEY

**Effect of liver autolysis in vivo.** JAMES C. ELLIS AND LESTER DRAGSTEDT. *Proc. Soc. Exptl. Biol. Med.* 26, 304-5(1929).—The uncontaminated liver of normal healthy adult dogs regularly contains anaerobic spore-bearing bacteria; probably this causes death in "in vivo aseptic autolysis of the liver" expts. in which parts of the animal's own liver are placed free in the peritoneal cavity. When fetal liver or autoclaved adult liver is used, toxic symptoms do not develop.

C. V. BAILEY

**The sensitizing dose in respiratory anaphylaxis (asthma).** BRET RATNER AND HELEN L. GRUEHL. *Proc. Soc. Exptl. Biol. Med.* 26, 327-8(1929).—Guinea pigs were exposed to air laden with horse dandruff dust. Hypersensitiveness was proved by an intravenous injection of 0.3 to 0.5 cc. of horse dandruff ext. after an interval of 3 weeks. A suggestion of sensitiveness may result from an exposure lasting  $\frac{1}{4}$  hr.; definite sensitization is produced in 1 hour. Some individuals apparently cannot be sensitized at all.

C. V. BAILEY

**Transitory character of the achlorhydria during fever demonstrated by the histamine test.** HILDING BERGLUND AND H. CHIEN CHANG. *Proc. Soc. Exptl. Biol. Med.* **26**, 422-3(1929).—By substituting the histamine test for the test meal the gastric secretion was studied during severe fevers without inconvenience to the patient. The fasting stomach was emptied; 0.5 mg. of *ergamine* (Burroughs Wellcome) was injected subcutaneously and the gastric contents withdrawn for analysis at the end of the 20. min. period. Under these conditions achlorhydria was found in 23 patients with fever varying from 38.4° to 40.4°. In most cases convalescence was accompanied by a recurrence of free acid and the amt. of gastric secretion was increased. C. V. BAILEY

**Increase in guanidine-like substances in acute liver injury and eclampsia.** A. S. MINOT AND J. T. CUTLER. *Proc. Soc. Exptl. Biol. Med.* **26**, 607-11(1929).—In certain clinical types of liver disease and in eclampsia the blood showed an increase in guanidine, as detd. by the method of Major and Weber, and a decrease in sugar. Ca medication furnished prompt relief in a few clinical cases. C. V. BAILEY

**Occurrence of heat-labile toxins in closed intestinal loops.** J. T. MCCLINTOCK AND H. H. HINES. *Proc. Soc. Exptl. Biol. Med.* **26**, 654-5(1929).—An unheated Berkefeld filtrate from closed intestinal loops was more toxic for guinea pigs than fluid heated for 1 hour at 65°. C. V. BAILEY

**Is the sensitizing effect of cholesterol for antigen used in the complement-fixation test for syphilis due to the contaminating sterol, ergosterol?** ELIZABETH MALTANER. *Proc. Soc. Exptl. Biol. Med.* **26**, 677-8(1929).—The sensitizing action of cholesterol purified by the dibromide method was equal to that of the unpurified sample containing ergosterol. C. V. BAILEY

**Pancreatic function. III. The pancreatic secretion in disturbed gastric secretion.** SEIZABURO OKADA, TSUNAMOTU IMAZU, KWANICHI KURAMACHI, MASAKA MATSUBARA AND TOSHIO TSUKAHARA. *Arch. Internal Med.* **43**, 413-9(1929); cf. *C. A.* **23**, 1673. The enzymic activity of the pancreatic juice was detd. in 7 cases of achylia gastrica and in 5 cases of cancer of the stomach with achlorhydria. No evidence was obtained for disturbance of pancreatic function with disturbance of gastric secretion. In some cases increased pancreatic activity was noted. HCl is not necessary to stimulate normal pancreatic secretion. It is suggested that some other powerful stimulating mechanism than secretin exists. J. B. BROWN

**The Andrewes diazo reaction in nephritis.** J. S. EASTLAND AND E. G. SCHMIDT. *Arch. Internal Med.* **43**, 472-82(1929).—The Andrewes diazo reaction on blood serum or plasma is a simple test for advanced renal damage. It was always found to be associated with marked retention of N. J. B. BROWN

**The metabolism in pernicious anemia.** HOWARD L. ALT. *Arch. Internal Med.* **43**, 488-503(1929).—The metabolism of 5 cases of pernicious anemia was studied during treatment with liver ext. Voluntary caloric intake increased rapidly. A negative N balance became positive. A decrease in urine output later became greater than fluid intake. The basal metabolic rate was normal at first, was low during the generation of red cells and finally returned to normal. J. B. BROWN

**Cutaneous and venous blood-sugar curves. II. In benign glucosuria and in diabetes.** MYER FRIEDENSON, M. K. ROSENBAUM, F. J. THALHEIMER AND J. W. PETERS. *Arch. Internal Med.* **43**, 633-52(1929); cf. *C. A.* **23**, 874.—Arterial and venous blood-sugar curves were studied in patients with nondiabetic glucosuria and with diabetes after administration of glucose or mixed meals with and without insulin therapy. Benign glucosuria and diabetes can not be distinguished by the presence or absence of a positive arterial-venous blood sugar difference. J. B. BROWN

**Studies in fat metabolism. II. The character of blood lipides in hepatic disorders, including migraine.** C. W. McCLURE AND MILDRED E. HUNTSINGER. *Arch. Internal Med.* **43**, 715-30(1929); cf. *C. A.* **22**, 800.—The blood lipides were studied in patients with various diseases of the liver. Hyperlipemia and unusually high I numbers of the fatty acids were indications of disturbances in lipide metabolism. Changes in the character of the lipides were produced by ingestion of foodstuffs. The type of food was not important. It is suggested that the lipide changes are due to mobilization from the body tissues. The cholesterol fraction gave an unusually low I no. Ingestion of food did not affect lecithin-P concn. of the blood. J. B. BROWN

**Hyperinsulinism.** FRANK N. ALLAN. *Arch. Internal Med.* **44**, 65-70(1929).—A report of two cases with clinical findings. J. B. BROWN

**The effects of anesthesia, operation and certain other factors on glucemia.** ERIC MEKIE AND HUGH MILLER. *Brit. Med. J.* **1929**, I, 244-7.—High pre-operative blood sugar may be found with acute infection, peritoneal irritation, shock and nervousness.



Following operations there is usually a rise in blood sugar, also with post-operative shock. The rise is slight with spinal anesthesia. J. B. BROWN

The influence of treatment with hypertonic sodium chloride solutions in patients with acute abdominal lesions. R. S. ANDERSON AND REED ROCKWOOD. *Surgery, General, and Obstet.* 49, 48-53(1929).—Ninety patients with low blood Cl associated with acute abdominal lesions were treated with intravenous hypertonic NaCl soln. with a resultant reduction of operative mortality of  $1/2$ . Fall in blood Cl parallels severity of toxemia. Compared with detn. of blood non-protein N and  $\text{CO}_2$  capacity, the Cl detn. is most significant. J. B. BROWN

The behavior of the blood sugar in the night and in the morning. HERMANN LANGE AND JACOB SCHLOSS. *Arch. expil. Path. Pharm.* 139, 274-89(1929).—Blood sugar was detd. at frequent intervals from 9 P. M. to 9 A. M. In 16 diabetic cases, the concn. of blood sugar began to increase suddenly some time between 3 A. M. and 5 A. M. There is a marked parallelism between the rate of increase and the attendant difficulty in carbohydrate metabolism. Data are also presented on 9 non-diabetic cases. B. C. BRUNSTETTER

Hemolytic poisons and the changes in the liver. B. ALTOSI. *Atti accad. Lincei* [6], 9, 358-63(1929).—Five series of expts. were made on dogs; 1st, ligation of the bile duct; 2nd, acute poisoning; 3rd, chronic poisoning; 4th, poisoning followed by ligation of the bile duct; 5th ligation, followed by poisoning. Case I. After 42 days ligation the animals were killed; they showed no notable changes either on the hepatic cells or on the erythrocytic app. Case II, A. With toluylenediamine, jaundice appeared at once; death occurred in 9 days. The liver had increased in size, and showed atrophy of the hepatic lobes; the Kupffer cells were pigmented with bile. B. Pyridine caused death in 5 days, little jaundice and no noticeable changes in hepatic cells; the Kupffer cells had increased in size and had excess red corpuscles. C. Tellurite caused death in 4 days; the only change was the deposition of black specks of Te in the Kupffer cells. The jaundice depends on the changes in the hepatic cells which are most affected by the diamine. Case III was similar to case II, except that death occurred after a longer period, and the changes were less marked. Case IV. With diamine and ligation after 18 days, the jaundice increased greatly after ligation. The autopsy showed enlargement, and fatty degeneration of the hepatic cells. Pyridine, followed by ligation after 26 days, caused slight jaundice, and pigmentation with bile as above. Tellurite with ligation showed no jaundice, but showed Te, as above. Case V. Diamine was given 12 days after ligation; jaundice was intense at first, but diminished even with increasing amts. of poison. Some atrophy was noted on autopsy, and some change in the hepatic cells. With pyridine, there was little jaundice, and autopsy showed slight changes in the hepatics, but heavy deposits of bile in the Kupffer cells. Evidently ligation after poisoning, by causing the most damage to the hepatics, caused the most changes, and indicate that these are involved intimately in the elimination of bile, and when they are destroyed the bile gets into the blood stream. A. W. CONTIERI

Comparative results of colloidal gold, colloidal mastic and colloidal benzoïn tests of cerebrospinal fluid. C. F. REYNER. *Arch. Dermatol. Syphilis* 1928, 833; *Rev. hyg. mèd. prév.* 51, 462-3.—In 2160 trials with cerebrospinal fluid, colloidal Au and colloidal mastic gave comparable results in 91.6% of the cases. Colloidal Au and colloidal benzoïn agreed in 71% while benzoïn and mastic agreed in 81% of the trials. Colloidal benzoïn was particularly effective in aiding the detection of syphilis of the nerves. Mastic was not specific. The use of both Au and benzoïn simultaneously is recommended. C. R. FELLERS

The lipolytic enzymes of blood, lymphocytes and the von Pirquet reaction in tuberculosis. GUEGUETCHKORIS. *Rev. Tuberc.* 9, 391(1928); *Rev. hyg. mèd. prév.* 51, 452.—Normal humans have a lipolytic index of 12-13 while in grave cases of tuberculosis the index is from 3 to 6. The prognosis is poor with a falling index. C. R. F.

Hypersensitiveness of the skin to substances that have a quinone structure. R. L. MAVER. *Klin. Wochschr.* 7, 1958-9(1928). MILTON HANKE

Hydrogen-ion concentration and the calcium and phosphorus content of the feces of rachitic children. THIRZA REDMAN. *Biochem. J.* 23, 256-60(1929); cf. *C. A.* 22, 2198.—There is a "certain degree of correlation" between  $p_H$  and the percentage of Ca in the feces of rachitic children. BENJAMIN HARROW

Idiopathic or hypoparathyroid tetany in children with special reference to certain psychic manifestations. W. RAY SHANNON. *Arch. Pediatrics* 46, 346-70(1929).—In idiopathic parathyroid tetany, psychic phenomena may predominate in the attack.

In 5 cases during the attack, the blood Ca ranged between 6.13 and 9.8 mg. per 100 cc. of serum. A bibliography (22 references) is appended. JOSEPH S. HEPBURN

Review of the dental literature on the etiology of dental caries. HAROLD J. NOYES. *Dental Cosmos* 71, 810-7(1929).—A review of chem. interest, with a bibliography.

JOSEPH S. HEPBURN  
The chloride content of the blood and its partition among its constituents in hemopathological, especially anemic, conditions. A. EUGSTER. *Z. klin. Med.* 107, 224-55 (1928).—A decrease in the hemoglobin is usually accompanied by a more or less marked increase in the chlorides of the whole blood. Whenever a marked decrease in hemoglobin occurs, e. g., in severe anemia, a relative displacement takes place between the hemoglobin and the NaCl of the erythrocytes. In nephritis with N retention, pneumonia and diabetes mellitus anemia occurs accompanied by a decrease in the chlorides of the serum and an increase in the chlorides of the erythrocytes. In uremia, the chloride content may be equal in serum and erythrocyte. J. S. H.

Anaphylactic studies with extracts of hydatid scolices. C. H. KELLAWAY. *Brit. J. Exptl. Path.* 10, 115-25(1929); cf. *C. A.* 22, 3217.—The general result of these expts is to bring the hydatid scolex into line with other helminths, the tape-worm and the fluke. The substances in scolex which are insol. in acetone but sol. in abs. alc. and which act as "partial antigens," causing sensitiveness but being unable to discharge it, may possibly owe their activity *in vivo* to union with some body protein in the guinea pig producing a foreign complex to which antibody can be produced. There is, however, in addn. a water-sol. substance present in saline exts. of scolices which can function as an anaphylactic antigen. Because of the difficulty of freeing scolices from the protein substances in hydatid fluid it is not certain that this substance is not derived from hydatid fluid. Host (sheep) serum protein is present in exts. of scolices and extn. with pure dry acetone and with abs. alc. does not guarantee its absence from the resulting exts. HARRIET F. HOLMES

Determination of fat cleavage in the duodenal juice for clinical research. KARL H. STAUDER. *Arch. Verdauungs-Krankh.* 45, 197-208(1929).—The lipase content of the fasting intestine was found to be practically const. In all normal cases, it was greater at the height of digestion than during fasting. There was no regularity in the findings on pathol. cases. Bile enhances fat cleavage to a greater degree in normal cases, than in pathol. ones. There is no relation between gastric acidity and fat digestion. FRANCES KRASNOW

Experimental cholecystopathy and the secretory function of the stomach. S. O. BADILKES. *Arch. Verdauungs-Krankh.* 45, 254-64(1929).—As a result of foreign bodies and inflammation of the gall bladder, there was a decrease in gastric secretion, in acid content and in the time of secretion. FRANCES KRASNOW

Studies on the acceleration and inhibition of hemolysis. I. The inhibition of saponin and taurocholate hemolysis by sucrose. J. FRANKLIN YEAGER. *Quart. J. Exptl. Physiol.* 19, 219-35(1929).—Curves are given expressing the relation between the amt. of isotonic NaCl and the amt. of isotonic sucrose in the hemolytic system and the value of the resistance const. for saponin and Na taurocholate hemolysis. Rate of change of the resistance const. is inversely proportional to the completeness of the system with respect to the electrolyte, NaCl. Neither saponin nor Na taurocholate will produce hemolysis in a system in which all of the electrolyte is replaced by isotonic sucrose. Such electrolyte-free systems have not been obtained, since the replacement of all the electrolyte NaCl of a human red cell suspension by isotonic sucrose itself results in hemolysis. The local inactivity of Na taurocholate in concns. of about 1 in 1000 passes through a max. and finally tends to disappear as increasingly greater amounts of isotonic sucrose are contained in the system. FRANCES KRASNOW

The effect of shivering on the respiratory quotient in pancreatic diabetes. I. L. CHAIKOFF AND J. J. R. MACLEOD. *Quart. J. Exptl. Physiol.* 19, 291-5(1929).—Shivering in response to colds raises the R. Q. and the O<sub>2</sub> consumption of normal and depancreatized dogs to a similar extent. There is no disturbance in the acid-base equil.; hence there is increased carbohydrate oxidation. The increase is marked at the beginning, returning to basal level although O<sub>2</sub> consumption is still maintained. This indicates that "oxidation of preformed carbohydrates is the only process which is stimulated when shivering starts but that a process of gluco-neogenesis sets in later and thus depresses the quotient although as much carbohydrate is still oxidized." FRANCES KRASNOW

The treatment of typhoid fever with detoxicated vaccine. W. B. WHERRY, T. J. LEBLANC, L. FOSHAY AND R. THOMAS. *J. Infectious Diseases* 43, 189-93(1928).—

By treating typhoid vaccines with formaldehyde according to Ramon's method they can be detoxicated so that 82 to 164 million can be injected into patients without any harm. Typhoid fever in patients treated with such vaccines showed a shorter course of the disease, less complications and a death rate of 0. JULIAN H. LEWIS

The approximation of the toxicity of diphtheria toxin *in vitro*. ARTHUR LOCKE AND E. R. MAIN. *J. Infectious Diseases* 43, 420-5(1928); cf. C. A. 22, 4624.—A simple, practicable method is reported, whereby the  $L_0$  titer of an unmodified diphtheria toxin may be predicted, *in vitro*, with an accuracy of 85 to 95%. The method is based on the use of a formula correlating the properties of toxicity and antitoxin-binding avidity. It consists of a modified flocculation titration, wherein the latter property is evaluated in terms of  $L_1$  titer and "unit flocculation time," the results being converted into toxicity units by reference to the basic formula. JULIAN H. LEWIS

The units of protective antibody in antipneumococcus serum and antibody solution. LLOYD D. FELTON. *J. Infectious Diseases* 43, 531-42(1928).—A method is outlined for the standardization of antipneumococcus serum and pneumococcus antibody concentrate in which the unit is that fraction of a cc. of serum or antibody soln. which will protect against 1,000,000 fatal doses of an 18-hr. serum broth culture of such virulence that 3-10 organisms injected intraperitoneally into a mouse result in death in 36-48 hrs. JULIAN H. LEWIS

Concentration of pneumococcus antibody. LLOYD D. FELTON. *J. Infectious Diseases* 43, 543-53(1928).—The antiserum is dild. with equal vols. of  $H_2O$ , warmed to 40° and 20% dry anhyd.  $Na_2SO_4$  added. The ppt. is dialyzed free of sulfate and the contents of the sac are adjusted to a  $pH$  of 4.6-4.8 at which point a ppt. of an inert protein and lipid is formed. The clear supernatant fluid is adjusted to  $pH$  6.8 and dild. 4-5 fold with cold distd.  $H_2O$ . The ppt. dissolved in NaCl is high in protective power and, for intravenous injection, is practically free from severe chill-producing characteristics. JULIAN H. LEWIS

The absence of heterophilic antigen in certain foods. I. DAVIDSOHN. *J. Infectious Diseases* 44, 44-6(1929).—Cabbage, lettuce, carrots, potatoes, wheat, corn and oats do not contain heterophilic antigen of the Forssman type. JULIAN H. LEWIS

Hemolysin and hemagglutinin for sheep corpuscles in human serums of all isoagglutinative groups. ETHEL B. PERRY AND G. BERNICE RHODES. *J. Infectious Diseases* 44, 65-7(1929).—Hemolysin for sheep corpuscles is present in human serums of all isoagglutinative groups, though not in all serums of any group, while the heterophilic hemagglutinin is present in nearly all human serums. The hemolysin is independent of the isoagglutinin and is absorbable by guinea-pig kidney or liver. JULIAN H. LEWIS

Hemolysin for sheep corpuscles in precipitin serums from rabbits. LUDVIG HEKTOEN AND ETHEL B. PERRY. *J. Infectious Diseases* 44, 68-72(1929).—Precipitin serums from rabbits immunized with egg white, cow milk, blood (beef, chicken, dog), sheep serum, swine euglobulin, human pseudoglobulin and hemoglobins, fibrinogens and thyroglobulins of many different species contain hemolysin for sheep corpuscles. Tests repeated after absorption of the serums with the homologous antigen and with sheep corpuscles indicate that the hemolysin is independent of the precipitin. The possibility of traces of lipid (also of other substances) must be considered since in the sepn. of serum proteins the lipids are known to be pptd. with the globulins. JULIAN H. LEWIS

The proteins of egg white. II. The transformation of crystallized ovalbumin into the noncrystallizable conalbumin. LUDVIG HEKTOEN AND ARTHUR G. COLB. *J. Infectious Diseases* 44, 165-6(1929); cf. C. A. 22, 4623.—Tests made with the precipitin reaction indicate that crystd. ovalbumin, when subjected to putrefactive processes, is not converted into conalbumin. It is also shown that such a putrefying soln. of ovalbumin loses its power to react with its sp. antiserum even while it still contains a considerable amt. of coagulable protein (cf. Sørensen and Høyrup, C. A. 12, 2575). JULIAN H. LEWIS

Immune reactions to acid-treated bacteria. An attempt to produce immunity without antibodies demonstrable *in vitro*. ORAN I. CUTLER. *J. Infectious Diseases* 44, 203-14(1929).—No support was obtained for the theory that artificial immunity could be attained without the presence of antibodies in the circulation, for when bacteria are treated with chemicals they appear to lose their ability to incite antibody production in close proportion to their power to produce immunity. When immunity to live typhoid bacilli was demonstrated, agglutinins for the organisms were also found, at least in low titer. Bacteria, which are not completely destroyed by chemicals with which they are treated, may be changed so that new antigens are formed, to which

rabbits respond by the production of antibodies sp. for the altered bacteria. Antibodies formed for typhoid bacilli treated with  $\text{HNO}_3$ , which were different from those formed for live organisms, were not demonstrated to be bactericidal for live bacteria. The antibodies formed for typhoid bacilli treated with 0.5 N acid appear to be the same whether  $\text{HNO}_3$  or  $\text{HCl}$ ,  $\text{H}_2\text{SO}_4$  or  $\text{AcOH}$  is used. JULIAN H. LEWIS

**Hypersensitiveness to diphtheria bacilli.** Passive transfer of types of immunity represented by different skin reactions. JAMES M. NEILL AND WM. L. FLEMING. *J. Infectious Diseases* 44, 224-34(1929). Quantitative correlation of the responses to diphtheria culture filtrate and to ragweed pollen extract in sensitized skin. *Ibid* 308-20. Lack of correlation between the responsiveness to histamine in the normal skin and to specific antigens in the sensitized skin. JAMES M. NEILL, WM. L. FLEMING AND LURLINE V. RICHARDSON. *Ibid* 321-6. Weak reactions to diphtheria bacteria and strong reactions to a diphtheroid. JAMES M. NEILL AND WM. L. FLEMING. *Ibid* 397-402. JULIAN H. LEWIS

**Anticomplementary power of heparin.** ENRIQUE E. ECKER AND PAUL GROSS. *J. Infectious Diseases* 44, 250-3(1929).—Heparin inhibits hemolysis in a hemolytic system because of action on complement. Apparently the third component of complement is affected. JULIAN H. LEWIS

**Preparations of specific serums and technic of agglutination test with *Pasteurella pestis* detoxified with formaldehyde.** A. BATCHELDER. *J. Infectious Diseases* 44, 402-7(1929). JULIAN H. LEWIS

**Incidence and properties of isohemolysins.** CORNELIA M. DOWNS, H. P. JONES AND KENNETH KOERBER. *J. Infectious Diseases* 44, 412-9(1929).—Isohemolysins were present in 65.9% of the serums from white persons and in 49.5% of the serums from Indians. The failure of hemolysin in the fresh serums tested seems to be due to the absence of hemolysin rather than of complement. Only a small percentage of the serums may be reactivated after heating by the addn. of complement. This is due to masking rather than to destruction of the hemolysin. A distinct but not type sp. inhibitory effect could be demonstrated by the addn. of heated serum to the active serum and cells. Isohemolysins behave like natural heterohemolysins and immune heterohemolysins in regard to absorption by their sp. cells in the cold and their dependence on complement. No concn. by pptn. methods could be demonstrated. No hemolysin for corpuscles contg. the C factor could be demonstrated. No hemolysis or agglutination was observed in testing serums of groups A, B and AB against cells of group O. JULIAN H. LEWIS

**The content of complement components in ammonium sulfate serum precipitated with ammonium sulfate.** H. TOKUNAGA. *Acta Schol. Med. Univ. Imp. Kyoto* 11, 587-9(1929); cf. *C. A.* 23, 3738.—Ammonium sulfate serum has been fractionated with ammonium sulfate. The albumin fraction contains either none or a trace of complement while the complement action of the globulin fraction is almost quantitative with heated serum. G. H. W. LEWIS

**Suprarenal insufficiency. IV. Blood sugar in suprarenalectomized rats.** I. C. WYMAN AND B. S. WALKER. *Am. J. Physiol.* 89, 215-22(1929).—Blood sugar in normal rats ranged from 61 to 110 mg. per 100 cc. blood; av. = 82. After the removal of both adrenals blood sugar fell to between 50 and 60 mg., coincident with the appearance of marked symptoms of subacute insufficiency. Successful cortical transplants maintained the blood sugar at the normal level. Conclusion: The cortex is concerned with the steady maintenance of a normal blood sugar level, while the medulla is an important adjunct for rapid adjustment under emergency conditions. J. F. LAMAN

**Carbohydrate metabolism in parathyroidectomized dogs.** C. I. REED. *Am. J. Physiol.* 89, 230-8(1929); cf. *C. A.* 22, 2981.—Glucose fed to or injected into dogs whose parathyroids had been removed protected them from tetany and prolonged their lives. Attacks of tetany were relieved by glucose administration. The effects of glucose injections on blood Ca and P were variable except that the Ca/P ratio was always increased. During attacks of tetany glucose tolerance was decreased. Carbohydrate metabolism seems to be involved in tetany. J. F. LAMAN

**Experimental studies on the existence of the hemolytic complement in the human cerebrospinal fluid. I. The complement in the normal human cerebrospinal fluid.** TAKESHI OKADA. *Sei-i-kwai Med. J.* 48, No. 3, 41-61, abstract sect. 5-6(1929).—O. wished to det. if hemolytic complement is present in normal human cerebrospinal fluid. Negative tests were obtained in the 15 cases studied. Normal spinal fluid shows complement activity after the addn. of human serum which has been inactivated by heating 15 min. at 51°. This activity is much decreased if the serum has been heated 30 min. at 51°. The complement activity of the spinal fluid is lost if it is heated

15 min. at 51°. The normal spinal fluid did not acquire any complement activity by adding "end piece" which is a portion of the complement. The addn. of "mid-piece," another portion of the complement, produced no effect, however, if the spinal fluid had been heated 15 min. at 51°. Normal spinal fluid may acquire a weak complement action after the addn. of inactive guinea-pig serum which has lost its complement by shaking. If the spinal fluid has been shaken beforehand, the mixt., after the addn. of the above guinea-pig serum is inactive. The normal spinal fluid acts as complement after the addn. of euglobulin pptd. from fresh serum with  $(\text{NH}_4)_2\text{SO}_4$ . Activity fails with pseudoglobulin or albumin. After heating at 51° for 15 min., normal spinal fluid is inactive after euglobulin addn. The failure of spinal fluid to act as a complement is due to the deficiency in the "mid-piece." Such a condition is termed "para-complementoid" by O. C. M. McCay

**Further studies on antitryptic activities of sera.** GORO YAMANAKA. *Sei-i-kwai Med. J.* 48, No. 3, 62-78, abstract sect. 6-7 (1929).—The av. antitrypsin value of normal rabbit serum is 164.1 when detd. by Wago's modification of the Fuld-Gross method. The same detn. for normal human sera yields an av. value of 164.9. In the female this increases during menstruation. In pathol. conditions the antitryptic activity of the sera is greater in acute diseases than in chronic ones. The antitryptic activities of rabbit sera increase after ultra-violet radiation or after treatment with the vaccine of *B. coli comm.* or egg albumin. These increases are accompanied by a leucocytosis in which there is an increase of both lymphocytes and large monocytes and a decrease in polymorphs. After the injection of adrenaline into normal rabbits the antitryptic value of the serum increased as the blood sugar rose and fell to normal parallel with the blood sugar. Adrenaline also produced a leucocytosis but the polymorphs increased and the lymphocytes and large monocytes decreased. During fasting the antitryptic activity of the serum decreases. C. M. McCay

**Interpretation of the values of the alkali reserve of the blood plasma during ketacidoses.** PAUL CRISTOL. *Compt. rend.* 188, 1451-2 (1929).—It has been reported frequently that in cases of pronounced keto-acidosis a practically normal alkali reserve was found according to the Van Slyke method. This is due to an inaccuracy of this method: acetoacetic acid which is accumulated in the blood undergoes extensive decarboxylation in the Van Slyke app.; thus the  $\text{CO}_2$  values found are not due solely to the alk. reserve but also to the  $\text{CO}_2$  split off from acetoacetic acid. G. TOENNIES

**Relation of bacteria to so-called "chemical pneumonia."** A. R. KOONTZ AND M. S. ALLEN. *J. Exptl. Med.* 50, 67-79 (1929). C. J. WEST

**Immunological studies in relation to the suprarenal gland. IV. The effect of repeated injections of epinephrine on the hemolysis formation in suprarenalectomized rats.** DAVID PERLA AND J. MARMORSTON-GOTTESMAN. *J. Exptl. Med.* 50, 87-92 (1929); cf. *C. A.* 22, 3696. —Adrenaline dild. with physiol. salt soln. or with isotonic glucose solns. and injected in amts. of 0.2 mg. per kg. twice daily into suprarenalectomized rats raises their antibody-forming capacity. This result is not entirely dependent on the effect of the dilg. fluid. V. The effect of repeated injections of solutions containing sodium salts and glucose on the hemolysin formation of normal and suprarenalectomized rats. J. MARMORSTON-GOTTESMAN AND D. PERLA. *Ibid* 93-102.—Suprarenalectomy is followed by a disturbance in the antibody-forming mechanism of the body. The suprarenal gland plays a role in the  $\text{H}_2\text{O}$  metabolism of the tissues. Restoration of the  $\text{H}_2\text{O}$  exchange in the tissues to a normal level is sufficient to raise the antibody-forming capacity to normal. Repeated injections of large amts. of isotonic NaCl or  $\text{AcONa}$  solns. restore the antibody titer to normal. The effect of these solns. is not due to diuresis alone, since isotonic glucose soln. does not affect the titer, nor to the Na alone, since hypertonic solns. of NaCl in small vol. have little influence on the titer. Both the Na ion and the  $\text{H}_2\text{O}$  volume are necessary in the restoration of the titer. C. J. WEST

**Biometry of calcium, inorganic phosphorus, cholesterol and lecithin in the blood of rabbits. IV. Effects of a malignant tumor.** ALVIN R. HARNES. *J. Exptl. Med.* 50, 109-20 (1929); cf. *C. A.* 23, 3505.—Expts. are reported in which it is shown that the Ca, inorg. P, cholesterol and lecithin in the blood of normal rabbits were influenced by inoculation with a malignant tumor. Animals in which death was due to tumor showed a marked increase in inorg. P of blood serum and cholesterol of whole blood following inoculation. The ratios of cholesterol to Ca and lecithin to Ca increased in trend, while the Ca to inorg. P, lecithin to cholesterol and lecithin to inorg. P ratios showed a marked decrease in trend. The ratios cholesterol-lecithin were all negative. C. J. WEST

## H—PHARMACOLOGY

A. N. RICHARDS

**Action of ephedrine on intestine and bronchi.** J. T. HALSEY. *Proc. Soc. Exptl. Biol. Med.* 26, 16-7(1928).—Contrary to the findings of Chen (*C. A.* 20, 1870, 21, 2321) and of Kreitmair (*C. A.* 21, 1307, 1498) in over 100 expts. no evidence of a depressant action of ephedrine on isolated rabbit intestine was found. In a limited no. of expts. a bronchodilatory effect of ephedrine was observed; possibly this effect is produced only under certain conditions. C. V. BAILEY

**Magnesium sulfate as a factor in retention of calcium and phosphorus in cattle.** L. S. PALMER, C. H. ECKLES AND D. J. SCHUTTE. *Proc. Soc. Exptl. Biol. Med.* 26, 58-62(1928).—Intakes of  $MgSO_4$  comparable to that consumed by cattle in regions where they are forced to drink water contg. this salt may cause serious and continuous losses of Ca from the body tissues when the P content of the ration is low. The effect on P balance seemed to be detrimental only in the younger animals. C. V. B

**Effect of foreign protein and of insulin administered by mouth after oxgall.** M. F. GUYER AND P. E. CLAUS. *Proc. Soc. Exptl. Biol. Med.* 26, 65-7(1928).—Lens protein (*beta crystallin*) given by mouth following oral doses of oxgall resulted in the production of lens precipitins in rabbits. Insulin similarly administered yielded negative results in 3 rabbits but gave positive shock effects in 5 out of 6 guinea pigs. C. V. B

**Adrenaline and fatiguability of muscle of adrenalectomized rats.** L. B. NICE, D. S. GREENBERG AND S. L. GREENBERG. *Proc. Soc. Exptl. Biol. Med.* 26, 136-7(1928).—A series of adrenalectomized rats were given subcutaneously 1 cc of 1:50,000 adrenaline chloride (Park, Davis & Co.) daily for periods of 7 days to 14 weeks. The animals were then urethanized and a fatigue curve of a gastrocnemius muscle was obtained. There was no evidence of increased work done by the muscles of these rats after the daily administration of adrenaline. C. V. BAILEY

**Chemical and pathological changes in livers of copper-fed animals.** WM C VON GLAHN AND FREDERICK B. FLINN. *Proc. Soc. Exptl. Biol. Med.* 26, 200(1928).—Cu does not cause pigmentation or cirrhosis of the livers of rabbits, rats or guinea pigs. The pigment found in the liver of rabbits is probably of exogenous origin. C. V. BAILEY

**Effects of aconitine in the rat.** R. CUNNINGHAM, ELIZABETH CLARK AND M. O. LEE. *Proc. Soc. Exptl. Biol. Med.* 26, 221-2(1928).—The lethal dose of aconitine for the adult rat is 0.026 mg.; the minimum lethal dose is approx. 0.025 mg. Urethan anesthesia exerts a definite effect in preventing death from what would otherwise be lethal doses of aconitine. C. V. BAILEY

**Blood pressure in unanesthetized animals affected by "vasopressin," "oxytocin," pituitary extract and other drugs.** CHARLES M. GRUBER. *Proc. Soc. Exptl. Biol. Med.* 26, 243-4(1928).—In the dog and the cat pituitary ext. caused a rise in blood pressure; "oxytocin" had no definite effect. Acetylcholine caused a decreased blood pressure and an increase after the injection of atropine in dogs. "Vasopressin" caused its typical fall in blood pressure after atropine; its action is probably not due to choline or histamine. C. V. BAILEY

**Effect of methanol and ethyl alcohol mixtures on behavior of rats in a maze.** DAVID I. MACHT AND HARRIET LEACH. *Proc. Soc. Exptl. Biol. Med.* 26, 330-1(1929).—The intraperitoneal injection of 2 cc. of 2 to 4% EtOH was definitely depressant, similar doses of MeOH were less depressant and showed a definite stimulating effect. Half the above doses, injected synchronously, produced a very marked depression. C. V. BAILEY

**Duration of anticoagulant action of heparin in vivo in relation to dosage.** PAUL GROSS. *Proc. Soc. Exptl. Biol. Med.* 26, 383-7(1929).—The intravenous injection of heparin is followed by an immediate increase in clotting time; return to normal is very rapid for  $\frac{1}{3}$  of the duration of the heparin action and then progressively slow. There is an approx. relationship between the dose of heparin per kg. of body wt and the duration of the heparin effect in rabbits. C. V. BAILEY

**Effect of neoarsphenamine on the number of blood platelets.** JUI-WU MU. *Proc. Soc. Exptl. Biol. Med.* 26, 407-9(1929).—Novarsenobenzol "Billon" was given intravenously in doses of 0.1 g. per kg. of body wt. In 14 patients the platelets were counted before the injection and at intervals from 10 min. to 1 day after the injection for 5 days. In 10 cases diminution of platelets occurred during the 1st day; this was followed by a moderate thrombocytosis never exceeding 450,000 platelets per cu. mm. The normal count is 350,000. The variations were more marked in cases developing a febrile reaction. C. V. BAILEY

**Responses of the kidney and spleen to subcutaneously injected adrenaline.** THEODORE KOPPÁNYI AND M. S. DOOLEY. *Proc. Soc. Exptl. Biol. Med.* 26, 443-5(1929).—Massage of areas subcutaneously injected with adrenaline may produce marked localized vasoconstriction; the general blood pressure may remain unaffected; the kidney and spleen become markedly constricted. The vol. changes of these organs may be used as a reliable criterion in the bioassay of adrenaline. C. V. BAILEY

**Effect of feeding small doses of potassium iodide on the thyroid gland.** S. H. GRAY AND J. RABINOVITCH. *Proc. Soc. Exptl. Biol. Med.* 26, 468-71(1929).—The daily feeding of 0.0001 g. of KI to guinea pigs does not increase the no. of mitoses and does not affect the structure of the thyroid gland; 0.001 g. of KI daily causes a slight increase in mitoses and produces an otherwise histologically active thyroid gland. The gland is stimulated in all its histological phases when the daily dose is 0.01 g. of KI. C. V. BAILEY

**Hyperglucemia following the portal injection of insulin.** WM. S. COLLINS AND JOHN R. MURLIN. *Proc. Soc. Exptl. Biol. Med.* 26, 485-90(1929).—Dogs, starved 24 hrs. and under amnytal anesthesia, were used. Blood sugar was detd. by the Folin-Wu method. Each expt. consisted of alternate injection of the same amt. of insulin into the portal or jugular vein at weekly intervals. The dose of insulin was usually 0.1 unit per kg. of body wt.; the vol. never exceeded 1 cc. In every expt. the portal injection of insulin resulted in a sharp rise in the blood sugar of 20 to 80 mg. per 100 cc., the rise occurred within 5 min. and was followed by a rapid decline. No such rise occurred following the systemic injection of insulin. The phenomenon results from either the discharge of an antinsulin substance in the liver, or the insulin causes glycogenolysis in the liver; the latter is probably true. C. V. BAILEY

**The action of calcium on the vertebrate heart.** WRAY LLOYD. *Proc. Soc. Exptl. Biol. Med.* 26, 506-8(1929).—The hearts of 1 turtle, 2 cats, 3 dogs and 46 rabbits were perfused with oxygenated Locke soln. by a modified Langendorff technic. Ca was introduced into the perfusing fluid in varying quantities of a 0.25% soln. of  $\text{CaCl}_2$ . The characteristic and practically const. effect was cessation of the heart action in systole with a well-marked Ca rigor. C. V. BAILEY

**Anticomplementary action of purified heparin.** PAUL GROSS AND E. E. ECKER. *Proc. Soc. Exptl. Biol. Med.* 26, 4508-9(1929).—Heparin, purified by the recent method of Howell, operates upon complement in the same qual. manner as does unpurified heparin, namely upon the 3rd component. The purified product is definitely increased in activity. C. V. BAILEY

**Effect of calcium on the action of pilocarpine and atropine.** WM. SALANT AND HENRY WASHEIM, JR. *Proc. Soc. Exptl. Biol. Med.* 26, 512-5(1929).—Pilocarpine, in the absence of Ca, stimulates intestinal movements; tonus is only slightly increased. Excess Ca depresses the effect of pilocarpine on the intestine. Pilocarpine sensitizes the intestine to Ca. Pilocarpine in Ringer soln. minus Ca is without effect on the isolated frog heart. Excess Ca antagonizes the depression produced by pilocarpine. The action of atropine is reversed by Ca deficiency; this causes a slowing of the heart. C. V. BAILEY

**Toxicity of eucupine in local analgesia.** RAYMOND J. MILLZNER AND CHAUNCEY D. LEAKE. *Proc. Soc. Exptl. Biol. Med.* 26, 526-7(1929).—Solns. contg. eucupine give satisfactory prolonged analgesia, but the severe local reactions such as erythema, induration, delayed healing and sloughing preclude it for clinical use. C. V. B.

**The action of volatile fatty acids on the gastric motor mechanism in dogs.** ROBERT L. WILDER AND FREDERICK W. SCHULTZ. *Proc. Soc. Exptl. Biol. Med.* 26, 624-5(1929).—The introduction into the quiescent stomach of a 0.5% soln. of butyric acid caused an immediate fall in gastric tonus and an inhibition of tonus rhythm lasting from 1 to 15 min. Caproic and caprylic acids have similar but less marked effects. C. V. BAILEY

**Some further observations on sodium isoamylethylbarbiturate as a laboratory anesthetic.** CHARLES C. LEIB AND MICHAEL G. MULINOS. *Proc. Soc. Exptl. Biol. Med.* 26, 709-11(1929).—Solns. of Na amnytal injected intravenously depress the circulation; they cause prolonged but temporary paralysis of the vagus to the heart. The solns. show no increased toxicity after standing 2 months. C. V. BAILEY

**The effect of synthalin on the respiratory quotient of the diabetic patient.** W. G. KARR, C. SCHUMANN AND O. H. PETTY. *Arch. Internal Med.* 43, 384-92(1929).—When synthalin is given before a dextrose meal, there is increased utilization of carbohydrate as indicated by increased respiratory quotient. In some cases there is increased dextrose tolerance as measured by sugar in the blood and urine. J. B. B.

**Opium addiction. IV. The blood of the human addict during the administration of morphine.** WALTER G. KARR, ARTHUR B. LIGHT AND EDWARD G. TORRANCE. *Arch. Internal Med.* 43, 684-90(1929).—There was a tendency toward low red cell and high leucocyte count, and also high cholesterol and diminished phosphate in addicts receiving morphine sulfate hypodermically. Lactic acid was uniformly high. No other changes of consequence were noted. **V. Miscellaneous observations on human addicts during the administration of morphine.** ARTHUR B. LIGHT AND EDWARD G. TORRANCE. *Ibid* 878-89.—During administration of morphine to human addicts no changes from the normal were observed in the stomach, kidney, liver, basal metabolism, thymus, temp. and dextrose response to adrenalin and to morphine. The exceptions noted were a slight delay in response of gastric secretion to a test meal, albuminuria in 17% of cases, wide variations of basal metabolism although the average was normal and a delay in the return of blood sugar to normal after giving dextrose by mouth. J. B. BROWN.

**The effect of magnesium salts on blood sugar concentration.** S. LÄNG AND L. RIGÖ. *Arch. expl. Path. Pharmacol.* 139, 1-9(1929).— $MgCl_2 \cdot 6H_2O$  in doses of 0.0025-0.10 g. per kg. and  $MgSO_4 \cdot 7H_2O$  in doses of 0.0025-0.005 g. per kg. were injected subcutaneously into rabbits, causing a decrease in blood sugar. Larger doses caused an increase. B. C. BRUNSTETTER.

**Pharmacological studies on the bronchial musculature. I. Methods.** KURT TIEFENSEE. *Arch. expl. Path. Pharmacol.* 139, 129-38(1929). **II. The importance of the condition of the blood for the tonus of the bronchial muscles and their response to poisons.** *Ibid* 139-53.—Displacement of blood  $p_H$  to the alk. side increases the strength of pilocarpine spasms; increased acidity of the blood causes pilocarpine spasms to be weakened or to disappear. There is no change in the action of pilocarpine on the heart. Changes in the alkali reserve of the blood are without effect on the reaction of the bronchial muscles to pilocarpine. Atropine annuls the effect of pilocarpine on the bronchioles and on the heart, under all conditions. The paralytic action of adrenalin could be demonstrated only on contracted bronchial muscles. T. discusses the relation between the results of this work and the onset of asthma. B. C. B.

**The effect of choline on gas exchange.** H. TANGL. *Arch. expl. Path. Pharmacol.* 139, 220-5(1929).—Choline, subcutaneously injected into rats in doses from 20-80 mg., increases metabolism. The max. effect occurs 2-6 hrs. after injection, at a time when, according to other authors, hypoglycemia is most pronounced. B. C. B.

**The effect of secretin on gaseous exchange.** H. TANGL AND F. THAN. *Arch. expl. Path. Pharmacol.* 139, 226-30(1929).—Injection of secretin into rats increases the respiratory quotient because of decreased  $O_2$  consumption. B. C. BRUNSTETTER.

**The cholagog action of magnesium chloride.** ÉTIENNE CHABROL AND MAURICE MAXIMIN. *Compt. rend. soc. biol.* 100, 3-5(1929).—Intravenous injection of  $MgCl_2$  into dogs in a dose of 0.07 g. per kg. had no effect on the rate of bile secretion but a dose of 0.01 g. per kg. caused a doubling of the rate within half an hr. B. C. B.

**The hyperglucidemic action of adrenaline.** GEORGES FONTÈS AND LUCIEN THIVOLLE. *Compt. rend. soc. biol.* 100, 1200-2(1929); cf. *C. A.* 21, 2311; 22, 3185, 23, 627.—The glucemia value obtained after pptn. by tungstic acid is higher than that obtained after pptn. by  $Hg(NO_3)_2$ . The former is considered to be due to glucose and "glucide x"; the latter, to glucose alone, since "glucide x" is pptd. by  $Hg(NO_3)_2$ . The diff. in these values gives an approx. measure of "glucide x." The subcutaneous injection of adrenaline into dogs (1 mg. per kg.) caused a greater increase in "glucide x" than in glucose, not only in plasma but in whole blood. Compression of the portal vein, and injection of morphine caused an increase in glucose, but had no effect on "glucide x." B. C. BRUNSTETTER.

**The repartition of glucose between cells and plasma.** GEORGES FONTÈS AND LUCIEN THIVOLLE. *Compt. rend. soc. biol.* 101, 171-3(1929).—After injection of 45 units of insulin into dogs there were no immediate changes in cellular glucides, though marked decreases occurred in the plasma glucides; after  $1\frac{1}{2}$  hr. the concn. of glucides in plasma and cells became equal. B. C. BRUNSTETTER.

**The hypoglycidemic action of insulin.** GEORGES FONTÈS AND LUCIEN THIVOLLE. *Compt. rend. soc. biol.* 101, 173-5(1929); cf. *C. A.* 23, 627.—After injection of large doses of insulin into dogs, the diff. in reducing power of blood or plasma filtrates from tungstic acid and  $Hg(NO_3)_2$  pptns. rapidly decreases to approx. zero. This is regarded as additional proof of the glucidic nature of "glucide x." B. C. BRUNSTETTER.

**A fatal case of insulin poisoning.** BJARNE DAHL. *Norsk Mag. Laegevidenskab* p. 89, 40-55(1928).—D. describes the first fatal case of insulin poisoning in Scandinavia.



The patient failed at one dinner to eat the calcd. portion of carbohydrate, and that is supposed to be the cause of death. ARNE DROGSETH

**Development of therapeutics during the 16th to 18th centuries.** WINKLER. *Pharm. Monatsh.* 10, 112-3 (1929).—An address. W. O. E.

**The pharmacology of the alkaloids of ergot.** E. ROTHLIN. *Arch. expl. Path. Pharmacol.* 138, 115 (1928); *Squibb Abstract Bull.* 2, A-31 (1929).—The estn. of the pharmacol. activity of the ergot alkaloids requiring further data in view of the contrasting results reported by various writers, R. undertook the study of the 2 pairs of ergot alkaloids, *ergotinine* and *ergotoxine* (ergotinine plus 1 mol. water yields hydroergotinine or ergotoxine; the action is reversible); and ergotaminine and ergotamine (isomers). No confirmatory evidence was procured for the contention that ergotoxine has less pharmacol. action than ergotamine. Rather the 2 are equiv. in effect, the stimulation threshold for both being very high; in isolated guinea-pig uteri the action of either in 1 100-200,000,000 is equal to that of histamine. For ergotamine activity may be expressed as 1, that of ergotaminine as  $\frac{1}{10}$ ; ergotoxine 1, and ergotinine  $\frac{1}{200-300}$ ; for the tartrates the pharmacol. action of ergotamine and ergotoxine is equal, while ergotaminine displays  $\frac{1}{4}$  of the activity of the above and ergotinine  $\frac{1}{100}$ . C. R. F.

**The intensive treatment of kala-azar by neostibosan.** II. L. EVERARD NAPIER AND M. N. MULLICK. *Indian Med. Gaz.* 64, 314-5 (1929).—The subsequent history is given of 30 cases considered in the previous paper. FREDERICK G. GERMUTH

**An experimental study of some bismuth compounds of arsenic acids from the point of view of their therapeutic action in experimental syphilis.** C. LEVADITI. *Brit. J. Ven. Dis.* 4, 25-43 (1928); *Bull. Hyg.* 3, 874 (1928).—A study of sol. bistoal,  $C_6H_5(OH)(NHCOCH_3)AsO_3Bi(OH)_2$ , shows that 0.005 g. per kg. injected intramuscularly has remarkable therapeutic action, sterilizing with a dose that is  $\frac{1}{35}$  of the max. tolerated. Its therapeutic index is more favorable than that of the insol. form, which has an index of  $\frac{1}{10}$ . When taken by mouth 0.217 g. per kg. was sterilizing. Bismuth arsaniolate in a 10% oily suspension gave results equal to those of bistoal with the advantage of being painless. Bismuth tryparsamide, when given in an oily suspension, is less active than the two previous compds. GEORGE R. GREENBANK

**Therapeutic effect of the pyridine series.** A. BINZ AND C. RATH. *Tierarztl. Rundschau* 1928, No. 48, 3-7; *Chem. Zentr.* 1928, I, 1547; cf. *C. A.* 23, 1686.—Compds. contg. As united with a heterocyclic compd. such as pyridine should prove better than asphenamine.  $C_6H_5H_4NOI$  is useful in treating coccus infection. F. P. G.

**Insulin and gluconeogenesis.** MAURICE W. GOLDBLATT. *Biochem. J.* 23, 243-55 (1929).—Insulin can stimulate the new formation of glycogen from endogenous sources. The theory that insulin inhibits gluconeogenesis is considered untenable. B. H.

**Formic acid in its therapeutic relation to joint diseases.** H. M. SYLVESTER. *J. Am. Inst. Homeopathy* 22, 570-86 (1929).—Minute doses of  $HCOOH$ , administered intravenously or hypodermically, may benefit the periarticular tissues; but the success is questionable or negative if the inflammatory infiltrate has become definitely organized into a fibrotic mass. Synovitis responds readily, while the bony structures do not respond. The cartilaginous parts are influenced only in the very earliest stages of inflammation. JOSEPH S. HEPBURN

**Recent advances in therapeutics.** DAVID ANCHEL. *J. Am. Inst. Homeopathy* 22, 617-21 (1929).—A review, with bibliography, of recent work on the parathyroid hormone, ephedrine, cardiazole and novasurol. JOSEPH S. HEPBURN

**The action and uses of Cocculus.** L. J. BOYD. *J. Am. Inst. Homeopathy* 22, 653-5 (1929).—*Cocculus indicus* and its active principle, picrotoxin, are of value in cases of autonomic imbalance, especially when gastroenteric symptoms are also present. JOSEPH S. HEPBURN

**Drug pathology.** ALBERT E. HINSDALE. *J. Am. Inst. Homeopathy* 22, 683-746 (1929).—A description of the changes produced in exptl. animals by toxic (usually fatal) doses of 38 elements, compds. and drugs. The histological changes are illustrated by 51 cuts. JOSEPH S. HEPBURN

**Pharmacology.** ALBERT E. HINSDALE. *J. Am. Inst. Homeopathy* 22, 747-59 (1929).—An account (published posthumously) of original studies on the pharmacology of 15 compds. and drugs. JOSEPH S. HEPBURN

**Insulin hypoglycemia in man.** III. Behavior of the protein fraction of the blood, the bilirubin, the concentration and coagulation of the blood, especially in diseases of the liver. O. KLEIN AND M. KMENT. *Z. klin. Med.* 107, 476-87 (1928).—In patients with liver diseases, insulin shock produced the following blood changes: (1) a decrease in the bilirubin content, (2) a decrease in the coagulation time, (3) an increase in the total protein content of the serum, (4) an abs., and frequently a relative, increase in

the fibrinogen content of the plasma, (5) frequently an increase in the plasma globulin, (6) certain series of changes in plasma vol., blood concn. and vol. of the individual erythrocyte.

JOSEPH S. HEPBURN

**Influence of "Moorbehandlung" on the acid content of the gastric juice.** G. I. LEWIN. *Arch. Verdaunungs-Krankh.* 45, 59-66(1929).—"Moor" has a depressing effect on the acid secretion in the greater number of cases. Temp. is not the detg factor. The effect probably depends upon the mineral content of the "Moor," which stimulates the end organs in the skin and indirectly the vegetative nerve reflexes.

FRANCES KRASNOW

**Fractional removal of stomach contents. The action of atropine on the gastric secretion.** EMIL KELLERMANN. *Arch. Verdaunungs-Krankh.* 45, 67-80(1929).—Atropine in small doses effects a decrease in the free HCl; with large doses the fall is not great, but the emptying time is lengthened. The action is similar in hyperacidity, anacidity and normal cases. The backflow of intestinal juice is regularly inhibited by atropine.

FRANCES KRASNOW

**Strychnine in the treatment of gastric ulcers.** D. A. KOGAN. *Arch. Verdaunungs-Krankh.* 45, 231-5(1929).—Strychnine in combination with other treatment is of value.

FRANCES KRASNOW

**The influence of continuous subcutaneous injections of strychnine on gastric function. Observations by continuous sampling.** D. A. KOGAN. *Arch. Verdaunungs-Krankh.* 45, 235-8(1929).—Strychnine has no influence in achlorhydria. It increases the acidity in hypoacidity, in normal cases and even more in hyperacidity. It also strengthens gastric motility.

FRANCES KRASNOW

**Experiments with adrenaline.** W. BURRIDGE AND D. N. SETH. *Quart J. Exptl. Physiol.* 19, 201-14(1929).—At all dilns. ( $10^{-12}$  to  $10^{-4}$ ) adrenaline is an augmentor. At low dilns. ( $10^{-4}$  to  $10^{-6}$ ) it also has a depressing action. The drug in a diln. of 1 part in 10 millions was shown to revive an exhausted heart, to make an exhausted heart worse, to accelerate or not to accelerate, to produce tone or not to produce tone, according to exptl. conditions.

FRANCES KRASNOW

**The action of adrenaline and of certain drugs upon the isolated crustacean heart.** W. A. BAIN. *Quart. J. Exptl. Physiol.* 19, 297-307(1929).—A method for the perfusion of the isolated heart (crabs, *Maia squinado*, *Cancer pagurus* and *Carcinus maenas*) is described. Adrenaline produces a marked acceleration of the rhythm and an increase in tone of the heart muscle; in addn. in cancer, there is a pronounced increase in the amplitude of the beats. This action is not reversible. Ephedrine has no effect, ergotoxine has a depressant action but does not antagonize or reverse the action of adrenaline. Pilocarpine acts similarly to adrenaline. Atropine antagonizes the effect of pilocarpine.

FRANCES KRASNOW

**Influence of phosphorus on the state of the carbon and oxidation quotient of the urine.** HISAO KUBO. *Arch. path. Anat. (Virchow's)* 272, 504-30(1929).—The introduction of P in exptl. animals in such amts. as to cause no symptoms or at the most only mild poisoning, causes no consistent change in the C:N ratio in the urine. In P poisoning leading to death in 2-10 days the C:N ratio remains practically unaltered during the first few days, although occasionally slight increases or decreases of the quotient occur. If the animals live longer than this period, a decrease in the quotient occurs, which is attributable to an increase in urinary N. In severe acute, but non-fatal P poisoning, the quotient is similar at first to that seen in acute fatal poisoning, but after this the quotient rises to a point higher than the original normal value. Later it sinks back to the original figure. The O:N ratio behaves similarly, but does not exactly parallel the C:N urinary quotient.

E. R. LONG

**The pressure-volume curve of the peripheral blood vessels. III. The influence of drugs.** S. SUGIYAMA. *Acta Schol. Med. Univ. Imp. Kyoto* 11, 579-86(1929).—Adrenaline chloride, camphor and caffeine sodium benzoate administered intravenously decreased the dilatibility while strychnine nitrate and pilocarpine-HCl made no appreciable change. Hypotonal, pantopon and highly concd. d-glucose soln. caused a small increase.

G. H. W. LUCAS

**Adrenaline and hyperglucemia.** G. S. EADIE. *Am. J. Physiol.* 89, 48-9(1929).—One and one-half hr. after the administration of adrenaline to fasted cats under amylal anesthesia the glycogen content of the muscles was unaltered while liver glycogen was reduced almost to zero.

J. F. LYMAN

**The effects of insulin on parathyroidectomized dogs.** C. I. REED. *Am. J. Physiol.* 89, 239-42(1929).—Insulin in normal and in parathyroidectomized dogs, not in tetany, increased blood Ca and decreased blood inorg. phosphate. Insulin relieved parathyroid tetany, usually completely. After insulin administration in

tetany the inorg. phosphates of the blood decreased, blood Ca responded variably, but the Ca:P ratio was always increased. J. F. LYMAN

**The passage of hydrogen sulfide into the joint cavities.** MARIANO MESSINI. *Boll. so. ital. biol. sper.* 4, 97-8 (1929).—Colloidal S prepd. by the Wachenroder method was introduced by various routes at regular intervals into rabbits. A suspension of  $\text{PbCO}_3$  was injected into various parts of the animal. The  $\text{H}_2\text{S}$  formed by the reduction of S reacted with the Pb to form black  $\text{PbS}$ . The max. intensity was observed in the pleural cavity, joint cavity, in the muscles and under the skin. The reaction was more intense when the S was given intravenously than when given by the gastric, intramuscular or subcutaneous routes. In interpreting the therapeutic efficiency of colloidal S, the action of  $\text{H}_2\text{S}$  which passes into the joint cavities should be considered.

PETER MASUCCI

**A pharmacodynamic study of some phenylcholines and homologous substances.** Y. DE LESTRANGE AND JEANNE LÉVY. *Bull. sci. pharmacol.* 36, 353-79 (1929).—[ $\alpha$ -(Hydroxymethyl)benzyl]trimethylammonium chloride ( $\alpha$ -phenylcholine) ( $\text{PhCH}(\text{CH}_2\text{OH})\text{NMe}_3\text{Cl}$ ) (I), m. 157°, was obtained by reduction of phenyldimethylaminoacetic ester (40 g.) with Na and EtOH, which gives 20 g. phenyldimethylaminoethanol,  $b_{18}$  148.5°. The methiodide m. 100°. The phenyldimethylaminoethanol acetate b. 142-3° in the vacuum; its HCl salt m. 112°. I produces in the dog a decrease in the arterial pressure and an increase of peristalsis. In the isolated intestine, the tension is increased by small and reduced by large doses; then the peristalsis is inhibited. [ $\alpha$ -(Hydroxymethyl)phenethyl]trimethylammonium chloride ( $\alpha$ -benzylcholine) ( $\text{PhCH}_2\text{CH}(\text{CH}_2\text{OH})\text{NMe}_3\text{Cl}$ ) (II), m. 196°, is prepd. from dimethylaminophenylpropanol. Et phenyldimethylaminopropionate (III) is prepd. as follows: the bisulfite compd. of phenylpropionaldehyde is treated with KCN, then with a soln. of 0.5 mol.  $\text{Me}_2\text{NH}$  in  $\text{C}_6\text{H}_6$ ; the product is dissolved in HCl, washed with  $\text{Et}_2\text{O}$  and the base isolated with  $\text{Na}_2\text{CO}_3$ . The phenyldimethylaminopropionitrile  $b_{20}$  140-50°. The hydrochloride m. 118-20° (decompn.). The acid m. 95°. When reduced with Na, III gives phenyldimethylaminopropanol. The methiodide m. 198-200°. II produces in large dose a slight decrease of the tonus and excitation of peristalsis in the isolated intestine and strong contractions of the isolated uterus. ( $\beta$ -Hydroxyphenethyl)trimethylammonium chloride ( $\beta$ -phenylcholine) (IV), m. 218°, was prepd. from phenylethanol, 100 g. of which gives at 50 mm. pressure and 350-80° 70 g. styrene, b. 145-6°,  $b_{23}$  54°. Fifty g. styrene gives 30 g. phenyldimethylaminoethanol (V),  $b_{18}$  139°, through the iodohydrin. The acetate of V, m. 201°, benzoate, m. 210°, phenylacetate, m. 182°, methiodide, m. 223° (acetate, m. 194°, phenylacetate, m. 156°). IV exerts a hypertension in animals of warm blood and inhibition of the peristalsis. In the isolated uterus it produces contractions. In the frog, a curare-like effect was observed. ( $\beta$ -Hydroxy-*p*-methoxyphenethyl)trimethylammonium chloride ( $\beta$ -*p*-anisylcholine) (VI), m. 184°. AcH and  $\text{CH}_3\text{OC}_6\text{H}_4\text{MgBr}$  give *p*-anisylmethylcarbinol and methoxystryrene. The latter is treated with I and HgO, and the iodohydrin thus obtained is treated with  $\text{NHMe}_3$ , giving *p*-anisyl-dimethylaminoethanol, whose benzoate-HCl m. 163°. VI decreases the tonus and peristalsis of the isolated intestine. The ( $\beta$ -hydroxy- $\alpha$ -methylphenethyl)trimethylammonium chloride decreases the tonus and the peristalsis of the isolated intestine and inhibits the contractions of the uterus. ( $\beta$ -Hydroxy- $\gamma$ -phenylpropyl)dimethylamine,  $b_{23}$  123°, (methiodide, m. 148°). Methochloride, ( $\beta$ -benzylcholine) increases the tonus and peristalsis of the intestine and produces contractions in the insulated uterus. The 1-phenyl-4-dimethylamino-3-butanol b. 152-3°, the methiodide b. 171°. ( $\beta$ -Hydroxy- $\delta$ -phenylbutyl)trimethylammonium chloride ( $\beta$ -phenethylcholine), b. 176°, reduces the arterial pressure and excites the peristalsis. The contractive action on the uterus is weak. ( $\beta$ -Hydroxy- $\alpha$ -phenylpropyl)trimethylammonium chloride m. 220°; the iodide m. 228.9°. The former has a slightly reducing action on the blood pressure and no influence on the peristalsis. In the isolated intestine the peristalsis is increased, the tonus increased by small, decreased by large doses. In the uterus it produces contractions. ( $\beta$ -Hydroxy- $\beta$ -methylphenethyl)trimethylammonium chloride m. 244°. It decreases the blood pressure and produces peristalsis. It has no influence on the isolated intestine and produces contractions of the uterus. (2-Hydroxycyclohexyl)trimethylammonium chloride m. 250. It produces peristalsis in the isolated intestine and contractions of the uterus. If the OH of a secondary alc. is near the aromatic group, the action is a hypertensive one and similar to that of nicotine and curare. The peristalsis is inhibited. If the compd. contains a primary or tertiary OH, or if the secondary is not next to the aromatic group, the arterial pressure is reduced and the peristalsis increased, as in muscarine. A. E. MEYER

**The therapeutic use of esters of cholesterol.** JUAN R. GOYENA AND NICOLÁS A. DÍAZ. *Semana méd.* (Buenos Aires) 35, 813-20(1928).—Cholesterol palmitate and oleate were used with success in pleuritis. A. E. MEYER

**Potassium cyanide poisoning treated with sodium thiosulfate.** JACOBO ZIMMAN. *Semana méd.* (Buenos Aires) 35, 1235(1928).—A child of 18 months, poisoned with KCN, was successfully treated with an intracardial injection of 3 cc. 30% Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub> soln. combined with adrenaline and camphor oil. A. E. MEYER

**The increase of the calcium index in certain pathologic conditions by the use of animalized lime.** JOSÉ E. YGARZÁBAL. *Semana méd.* (Buenos Aires) 35, 1331-32(1928).—The use of citosal is recommended. It is a prepn. of ground oyster shells. A. E. MEYER

**The use of a new iodine preparation (endoiodine) in the treatment of suppurating trichophytosis of beard.** ENRIQUE P. FIDANZA. *Semana méd.* (Buenos Aires) 36, 170-2(1929).—Gram's soln., diluted with saline, produces sclerosis of the veins, after intravenous injection. Endoiodine, a 20% soln. of hexamethyldiaminoisopropyl diiodide, contains 0.18 g. I per cc. The intravenous dose is 2 cc. daily. It is well tolerated and good effects were obtained. A. E. MEYER

**Glucosuria and disturbance of the sugar content of the blood caused by sodium fluoride.** LEON GOLDBERG. *Semana méd.* (Buenos Aires) 36, 1479-81(1929). (In French).—Doses of 0.3 g. of NaF produce in lambs and kids within 2 hrs. after injection a strong glucosuria. 0.5, 1 and 5 mg. per kg. injected in the vein produce in dogs first a decrease, later an increase of the blood sugar. In one expt. in man a decrease of blood sugar was observed after ingestion of 0.1 g. A. E. MEYER

**Continued studies on the influence of parenteral infection and intoxication on the chlorine, calcium and magnesium metabolism.** NILS MALMBERG. *Acta paediatrica* 6, 265-301(1927). E. C. M.

**Pharmacological action of Siliaceae, especially the Allium sativum.** I. Action on the heart. RENZO AGNOLI AND GIUSEPPE LIO. *Arch. intern. pharmacodynam.* 33, 251-66(1927). E. C. M.

**Intoxication by means of several secondary monoamines (methylamine, amylamine, dimethylamine and trimethylamine) as septic poison.** O. KÜNNEMANN. *Deut. tierarztl. Wochschr.* 36, Special no., 79-81. E. C. M.

**The action of nicotine on the vasomotor nervous system.** ITALO SACCHETTO AND HERTHA WITTNE. *Giorn. clin. med.* 8, No. 6, 18 pp(1927). E. C. M.

**Pharmacological investigations of some sympathomimetic amines comparison of adrenalons and tetrahydro- $\beta$ -naphthylamines with adrenaline and tyramine.** MASAO FUJITA. *Okayama-Igakkai-Zasshi* 39, 240-2(1927). E. C. M.

**The effect of surgical solution of chlorinated soda (Dakin solution) in the pericardial cavity.** CLAUDE S. BECK. *Arch. Surgery* 18, 1659-71(1929).—Dakin soln. injected into the pericardial cavity of the normal dog produced pain and tenderness due to erosion of blood vessels immediately when 40 cc. was injected. The end result was pericarditis with effusion or generalized adhesive pericarditis. J. T. M.

**The pharmacology of bismuth salts.** V. Tissue distribution of bismuth. CLIFFORD S. LEONARD. *J. Pharmacol.* 34, 333-46(1928).—In rabbits the av. order of percentage content of Bi in the organs 24 hrs. after intramuscular injection of Na K Bi tartrate was kidney (highest), spleen, adrenals, liver, lung, brain, heart; 24 hrs. after Na Bi citrate, adrenals (highest), spleen, kidney, liver, other organs variable; 3 weeks after di-K Bi tartrate, kidney (highest), liver, spleen, lung. VI. The permeability of the placenta to bismuth. CLIFFORD S. LEONARD AND ROBERT B. LOVE. *Ibid* 347-54.—Pregnant rabbits and cats were given intramuscular injections of di K Bi tartrate and Na Bi tartrate 3-4 days before the expected date of delivery. The animals were killed 48 hrs. after injection. When the dose was  $\frac{1}{3}$  of the lethal dose for the mother the feti and placenta showed no Bi. When the dose was  $\frac{1}{2}$  the lethal dose, Bi could be detected in the placenta but not in the fetus. With doses above the amt. likely to kill in 48 hrs., Bi could be detected in fetal kidneys (large no. bulked together), but not in fetal livers. Hence the placenta is not markedly permeable to Bi. VII. The concentration of bismuth in the blood of dogs after intramuscular injection of bismuth antiluetics. CLIFFORD S. LEONARD AND ALFRED F. SELBERT. *Ibid* 355-64.—Dogs were given intramuscular injections of 40-50 mg. Bi per kg. If the injection was followed by massage at the site of injection Bi appeared in the blood in 2 hrs. after the injection. Without massage Bi was not found in the blood until 24 hrs. later. The Bi concn. remained at a const. level for 2-48 hrs. (0.001 to 0.003 mg. per cc.) and then decreased. Bi usually disappeared

from the blood in 21–30 days. The concn. of Bi in the 24-hr. specimen of urine was always higher than the blood concn. in the same animal. C. RIEGEL

**Clinical and experimental studies on phototherapy in pernicious anemia.** DAVID I. MACHT AND WM. T. ANDERSON, JR. *J. Pharmacol.* **34**, 365–89(1928).—Blood serum from pernicious anemia patients was irradiated by ultra-violet rays of various wave lengths. Its toxicity to the growth of *Lupinus albus* seedlings was detd. Radiation with ultra-violet light decreased the toxicity of the serum, waves of 2967–3660 Å  $\mu$  being most effective. Addn. of certain drugs like eosin which acted as photosensitizers caused a further decrease in toxicity. Polarized light had only slight detoxifying properties. Several patients with pernicious anemia were given ultra-violet ray treatments and their condition was markedly improved, especially if the light treatment were combined with a liver diet. C. RIEGEL

**The action of chlorates, in particular potassium chlorate, on blood in animals.** JOHN L. ULRICH AND VLADIMIR A. SHTERNOV. *J. Pharmacol.* **34**, 391–406(1928).—When  $\text{KClO}_3$ ,  $\text{NaClO}_3$ ,  $\text{Mg}(\text{ClO}_3)_2$ , or  $\text{Ca}(\text{ClO}_3)_2$  was given *per os* or intraperitoneally to cats, dogs, guinea pigs, rabbits and albino rats, the order in which they caused formation of methemoglobin was the reverse of that *in vitro*; i. e.,  $\text{NaClO}_3$  was most active in forming methemoglobin, and  $\text{KClO}_3$  only slightly effective, while  $\text{Mg}(\text{ClO}_3)_2$  and  $\text{Ca}(\text{ClO}_3)_2$  did not cause production of methemoglobin. Destruction of blood corpuscles occurred along with formation of methemoglobin. C. RIEGEL

**The pharmacodynamics and value of bismuth subnitrate in hypertension.** EDWARD J. SIEGELTZ. *J. Pharmacol.* **34**, 407–23(1928) — No parallelism was found between variations in systolic and diastolic pressure and the chloride concn. in blood of normal human beings or of patients with arterial hypertension. Administration of bismuth subnitrate caused a fall in chloride concn. in blood. In pregnancy with hypertension there was improvement under bismuth subnitrate therapy. It is concluded that the beneficial action of bismuth subnitrate in arterial hypertension is due to (1) reduction of chloride ions in blood by diuresis induced by the  $\text{NO}_3$  ion, and (2) gradual vasodilation produced by absorption of small quantities of  $\text{NO}_2$  ions. C. RIEGEL

**Ethylisoamylbarbituric acid (amytal) as a laboratory anesthetic for cats.** MICHAEL G. MULNOS. *J. Pharmacol.* **34**, 425–35(1928).—0.1–0.13 g. per kg. of amytal in 10% soln. in NaOH was given subcutaneously to cats. Anesthetization was complete in 1–2 hrs., recovery in 5 hrs. The blood sugar remained normal and const. for 4 hrs. Disturbance of the animal during anesthesia (as by introduction of a rubber balloon into the stomach through the esophagus) caused a rise in blood sugar. Insulin given during amytal anesthesia reduced the blood sugar. C. RIEGEL

**The uric acid of the blood (investigations on the variations of uric acid in the plasma and in the corpuscles as produced by the action of different substances).** D. LIOUHA. *Arch. farmacol. sper.* **46**, 241–58(1929).—The expts. were conducted on dogs and humans. The uric acid of the plasma and that of the corpuscles were estd. according to Grigaut's method. Insulin, casein, and exts. of the adrenals, hypophysis, corpus luteum and thyroid were administered to dogs on a bread and water diet. With insulin there was an increase in the total uric acid and the plasma uric acid, and a reduction of the uric acid of the corpuscles. Similar results were obtained with thyroid ext. With the other drugs only slight changes were produced, though L. believes he has demonstrated that the pituitary and suprarenal exts. caused a diminution of the total uric acid and an increase of the plasma uric acid. In the expts. with humans, patients were selected in whom the uric acid metabolism was not affected. The patients who did not receive any medicaments that might influence the elimination of uric acid were kept on a purine-free diet for 4–5 days. In 3 diabetics, after administration of insulin, the total and plasma uric acid showed a raise, while the uric acid in the corpuscles was diminished. Casein, pituitary and adrenal ext. had no particular effect. Numerous references are given. G. SCHWOCH

**Acute and chronic poisoning with hyoscyamine and scopolamine.** VITTORIO SUSANNA. *Arch. farmacol. sper.* **46**, 267–74(1929). G. SCHWOCH

**The employment of acetylarsan against spirochetosis in birds.** H. NORMAND. *Arch. Inst. Pasteur Tunis* **17**, 355(1928).—A young cock suffering from spirochetosis recovered completely within 2 days after a single subcutaneous injection of 0.5 cc. of acetylarsan. G. SCHWOCH

**Comparison of the cardiovascular actions of the two stereoisomers, tropanol and pseudotropanol.** MICHEL POLONOVSKI AND RENÉ HAZARD. *Compt. rend.* **188**, 1441–3(1929).—Tropanol is hypotonic and its cardiac action is simply depressive; pseudotropanol is hypertonic and it exerts upon the heart a complex action of the nicotine

type. These differences show the importance of the stereometric position of the aldehyde hydroxyl in the pyrrolidine-piperidine nucleus. G. TOENNIES

Treatment of burns and scalds by tannic acid. W. C. WILSON. *Brit. Med. J.* 1928, II, 91-4; *Pharm. J.* 121, 244(1928). S. W. WALDROTT

Biology of metals. VII. Influence of lead on the development of the chick embryo. FREDERICK S. HAMMETT AND VILMA L. WALLACE. Lankenau Hospital, Philadelphia. *J. Exptl. Med.* 48, 659-65(1928).—The Pb ion has the following effects on the development of the chick embryo: Gross growth is retarded; somite growth is retarded to a degree greater than that exhibited by body length and width, the head and optic analagen are regions of particular sensitivity; their differential development is markedly inhibited. C. J. WEST

The volatile oil contained in the comb of the bumble bee, *Xylocopa circumlans* S. M. RYUZO OBARA. *Folia pharmacol. japon.* 7, 20(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 48, 31.—O. prepd. a volatile oil from this source, which is used as a home-remedy anthelmintic and is very toxic to earthworms. Its action is first paralytic to the motor nervous system and the muscles in which voluntary and reflex movements are prevented. In frogs it causes a central paralysis of the nervous system and a cardiac standstill. In rabbits and cats these symptoms are not caused by proportionately larger oral doses but nephritis and albuminuria develop, the latter even after small doses. R. C. WILSON

Emetine (ANON.) 17. New paths of therapy (HOFMAN) 17. Ureides of brominated derivatives of valeric acid (WEIL, et al.) 10.

## I—ZOOLOGY

R. A. GORTNER

Action of hydrocyanic acid in frogs. V. KARASSIK. *Russ. J. Physiol.* 11, 339-50 (1928).—The arterial color of venous blood of frogs poisoned with HCN becomes darker when the frogs are warmed and reappears on cooling them. There is an increase in the absorption of O by the tissues during the period of warming. B. C. A.

The chemical senses of insects. DWIGHT E. MINNICH. *Quart. Rev. Biol.* 4, 100 (1929).—A review. J. B. BROWN

Respiration of insects. MILTON O. LEE. *Quart. Rev. Biol.* 4, 213-32(1929) —A review. J. B. BROWN

Enzymes and bacteria in the honey bee. F. M. BROWN. *Am. Mus. Novitates* 304, 5(1928); *Exptl. Sta. Record* 59, 562.—B. reports upon examns. made of the flora of the digestive tracts of 72 presumably normal and healthy honeybees. Care must be taken in work on the enzymes of the digestive tracts of insects to exclude those produced by microorganisms present. Normal intracellular enzymes similar to digestive enzymes must be recognized. The normal native enzymes of the digestive system of honeybees are an invertase, both peptic and tryptic proteolytic enzymes, and a lipase. Other carbohydrases may be present under special conditions. One cause of bee dysentery is probably an infection of diastase-producing bacteria. H. L. D.

Lactic acid in fish and crustacean muscle. A. D. RITCHIE. *Brit. J. Exptl. Biol.* 4, 327-32(1927); *Physiol. Abstracts* 13, 572.—Estns. of lactic acid and glycogen in fish and crustacean muscle, where adequate precautions are taken to avoid post mortem change, suggest that the chemistry of such muscular contraction probably resembles that of land-living vertebrates. The low lactic acid values found are in accordance with the small tensions developed, and the more sluggish the nature of the fish the lower are these values. Thus the highest concn. found (haddock 0.26%) is comparable to that found in mammalian heart muscle, the lowest (hake, 0.06%) to that found in reptilian smooth muscle, and is of the same order as that found in the resting abdominal muscle of the lobster. H. L. D.

The relation of *Spirostomum ambiguum* to the hydrogen-ion concentration (alkaline range). P. M. JENKIN. *Brit. J. Exptl. Biol.* 4, 365-77(1927); *Physiol. Abstracts* 13, 562.—At the  $pH$  of its interior, 7.4, *Spirostomum* can survive indefinitely. Increasing alk. decreases the survival time, as estd. by ability to recover when transferred to a normal medium between  $pH$  7.6 and 9.0. Very slight changes in  $pH$  between 7.4 and 7.6 cause considerable and quite disproportionate decreases in the time of survival. Increase in alk. is thought to act because of the increased permeability it sets up in the body wall, causing swelling and eventual bursting. H. L. D.

The lethal action of soluble metallic salts on fishes. K. E. CARPENTER. *Brit. J. Exptl. Biol.* 4, 378-90(1927); *Physiol. Abstracts* 13, 607.—The survival time of fishes

in solns. of salts of Pb, Zn, Fe, Cu, Cd and Hg varies as the logarithm of the reciprocal of the concn., Pb being lethal in a concn. of 1 in 3,000,000. The speed of the reaction depends upon the total quantity of metallic ion present, as well as upon the actual concn., and varies inversely with the size and wt. of the fishes employed. H. L. D.

**Relation of the liver to hyperglucemia in frogs.** J. M. D. OLMSTED AND W. W. SIMPSON. *Univ. Calif. Pub. in Physiol.* 7, 71-2(1929).—Etherization increases the blood sugar 200 to 300% in normal frogs over a period of 3 hrs., but does not increase the blood sugar in frogs from which the liver has been completely removed.

JOSEPH S. HEPBURN

**A method for the preparation of glycogen and a study of the glycogen of the abalone, *Haliotis rufescens*, Swainson.** LOUIS G. PETREE AND CARL L. ALSBERG. *J. Biol. Chem.* 82, 385-95(1929).—The glycogen is extd. from the tissue by 3 extns. with boiling  $H_2O$ , the proteins in the ext. are pptd. with picric acid and the glycogen is pptd. from the protein-free filtrate by alc. It is purified by 4-5 repts. and finally washed with alc. and ether and dried *in vacuo*. Glycogen prepd. by this method from the red abalone contains 0.047% of  $P_2O_5$  which could not be removed by prolonged electrodialysis with ultrafiltration. It could not be obtained free from ash in which were very small quantities of Ca and Fe in addn. to the  $P_2O_5$ . No evidence was obtained that electrodialysis separates unheated glycogen into 2 fractions, one poor in, or free from,  $P_2O_5$  and the other rich in  $P_2O_5$ . No evidence was obtained that abalone glycogen is a mixt. of chem. individuals. During electrodialysis of opalescent glycogen solns., the glycogen sinks to the lower part of the contg. vessel without visible flocculation. A. P. LOTHROP

**A chemical study of Ch'an Su, the dried venom of the Chinese toad, with special reference to the isolation of adrenaline.** H. JENSEN AND K. K. CHEN. *J. Biol. Chem.* 82, 397-401(1929).—The blood-pressure-raising principle of Ch'an Su has been isolated in cryst. form and found to be adrenaline. A report of the study of other chem. constituents will be made later. A. P. LOTHROP

**The influence of varying oxygen tensions upon the rate of oxygen consumption in marine fishes.** F. G. HALL. *Am. J. Physiol.* 88, 212-8(1929).—The scup (an active fish) showed very little variation in  $O_2$  consumption with changes in  $O_2$  tension between 40 and 120 mm. Hg. The puffer (less active fish) showed a change in  $O_2$  consumption with any variation in the  $O_2$  tension of its environmental water up to 100 mm. In the toadfish (sluggish fish) the  $O_2$  consumption varied directly with variations in the  $O_2$  tension between 0 and 118 mm. J. F. LYMAN

**The metabolism of insect metamorphosis.** J. G. H. FREW. *Brit. J. Exptl. Biol.* 6, 205-18(1929).—In the blow-fly during the pupal period the mean R. Q. is 0.65. This can be explained by assuming a partial oxidation of some body substance which never reaches the stage of  $CO_2$  and  $H_2O$ . There is a marked synthesis of glucose during this period. The R. Q. value is too low to account for its complete oxidation, whether it is formed from fat or protein. Since the alc.-ether constituents of the body fail to diminish during the first part of the pupal period, lipides are not the source of glucose. There is no glucose storage in the form of glycogen or other higher carbohydrate in the body of the mature larvae. Although protein must serve as the source of glucose during the earlier part of the pupal period, there is no loss of N by the body. During the latter half of the pupal period the fat content of the body diminishes continuously; this renders possible the conversion of fat to carbohydrate. C. M. McCAY

**Rhythmic susceptibility changes in the cleaving Arbacia eggs.** I. H. PAGE. *Brit. J. Exptl. Biol.* 6, 219-28(1929).—A marked peak of resistance to cytolysis by hypotonic sea water occurs very shortly after fertilization in the sea urchin egg. The same type of resistance phase occurs when saponin is the cytolyzing agent. NaCl and KCl inhibit the production of the resistant phase, while  $CaCl_2$  and  $MgCl_2$  prolong this period. During the resistant phase the eggs swell to a considerably greater extent before cytolysis occurs than at later periods following insemination. Aging reduces the length of the period of cytolytic resistance. C. M. McCAY

**Studies on the intestine of reptiles. II. The acidity of the gastric juice of *Tropidonotus natrix*.** M. VIALLI. *Boll. soc. ital. biol. sper.* 4, 189-91(1929).—The acidity of the gastric juice of *Tropidonotus natrix* is due partly to free HCl. PETER MASUCCI

**The influence of hydrogen-ion concentration on the fertilized and unfertilized eggs of sea urchins.** RIVKA ASHBEL. *Boll. soc. ital. biol. sper.* 4, 239-41(1929).—Fertilized eggs. At  $pH$  4.3 lipid drops sepd. from the cytoplasm and a shrinkage of the cell occurred. On staining with neutral red there was a diminution in coloration from  $pH$  7.5 to 4.3 at which the color disappeared completely. On making the reaction more acid, the coloration reappeared. Unfertilized eggs. No appearance of lipid drops was observed but there was a shrinkage of the cell. The behavior with neutral

red was the same except that the color did not reappear on making the reaction more acid.

**Physico-chemical phenomena during regeneration. II. Measurement of hydrogen-ion concentration in the regenerating limbs of the crab, *Paralithodes camtschatica*.** N. OKUNEV. *Biochem. Z.* **208**, 328-33(1929); cf. C. A. **22**, 4663.—An initial increase in acidity is observed in the region of the regenerating extremity. S. MORGULIS

**The glycogen metabolism of the snail.** MASANORI OKADA. *Okayama J. Med* **40**, 1402-7(1928).—The glycogen content of the snail at the period when it begins to be active after ending its hibernation was: max. 2.39%, min. 0.82%, mean 1.63%. When it is most active (during the rainy season), the max. is 0.81%, min. 0.35%, mean 0.61%. In the period of its hibernation or when it is just entering the hibernation period the max. was found at 7.61%, the min. at 3.52%, mean 4.63%. K. SOMEYA

**Seasonal variation of the glycogen content in the oyster, *Ostrea circumpicta* Pils.** KATSUMI OKAZAKI AND SATARŌ KOBAYASHI. *Science Repts. Tōhoku Imp. Univ.*, 4th Series, **4**, 183-91(1929).—Oysters grown wild were collected from a definite place in Mutsu Bay. The soft body was removed from the shell and was weighed after the body surface was quickly wiped. To prevent the loss of the body fluid, the adductor muscle was dissected out and weighed separately. The samples thus obtained were heated for 10 min. in boiling water to prevent alteration of the glycogen. The heated materials were then dissolved in 60% KOH and the glycogen was detd. by Pflüger's method. The glycogen content varied widely not only with the seasons but with the individuals. A steady increase was shown from Sept. to July, 1 to 4%. Breeding occurred in Aug. at which period the glycogen content reached a min. The glycogen content of the adductor muscle was less than that in the rest of the body. M. H. S.

**Lactic acid and glycogen in the adductor muscles of the oyster, *Ostrea circumpicta* Pils.** SATARŌ KOBAYASHI. *Science Repts. Tōhoku Imp. Univ.*, 4th Series, **4**, 193-205(1929).—The large and small adductor muscles were quickly sepd. from freshly collected oysters. The lactic acid content was detd. by the colorimetric method of Mendel and Goldscheider. There were wide variations in the lactic acid content among the individuals: large adductor muscle 0.0369-0.0810%; small adductor muscle 0.0548-0.1319%. The post-mortem production of lactic acid in the muscles was also detd. With the increase in time after incubation both the large and small adductor muscles showed a steady increase in acid production. The small muscle produced a larger amt. than the large muscle throughout the incubation period. This difference in acid production by the 2 muscles suggests a functional difference. In the muscles fatigued by loading, the lactic acid content of the large adductor muscle was slightly less than that of the small adductor muscle. In the fresh condition the small adductor muscle contained more glycogen than the large adductor muscle. M. H. S.

**The  $p_H$  and carbon dioxide content of the blood, pericardial fluid and the body fluid of the oyster with special reference to their response to the altered condition of sea water.** SEIJI KOKURO. *Science Repts. Tōhoku Imp. Univ.*, 4th Series, **4**, 207-51(1929).—The oyster, *Ostrea circumpicta* Pils., was studied. The pericardial fluid and the blood were carefully withdrawn with a syringe; about 15 cc. of each were obtained from a large oyster. The body fluid was collected after the sea water was carefully removed from the mantle cavity. The  $p_H$  was detd. with the H electrode and the  $CO_2$  was estd. by Van Slyke's method. The normal  $p_H$  values were: blood 7.24, pericardial fluid 7.16 and body fluid 7.11. The  $CO_2$  values were 4.22 vol. % for the blood and 4.00 vol. % for the pericardial fluid. The  $p_H$  of these 2 fluids decreased in early summer and increased in winter. The  $p_H$  of the blood and pericardial fluid of the oyster rapidly decreased when it was subjected to respiration in water of high acidity. The lower limit *in vivo* was  $p_H$  5.40. This decrease of  $p_H$  appeared to be due to the penetration of acid from breathing water into the body. The  $CO_2$  content of the blood and pericardial fluid gradually increased when it respired in the  $H_2O$  of high acidity. The max. limit of this increase *in vivo* was 55.69 vol. %. This increase of  $CO_2$  content was considered to be due partly to the formation of  $Ca(HCO_3)_2$  and partly to the free  $CO_2$  dissolved in the blood and the pericardial fluid. The  $p_H$  of the blood and the pericardial fluid rapidly increased when the animal was submerged in the breathing  $H_2O$  of high alk. The upper limit of this  $p_H$  increase *in vivo* was  $p_H$  8.45. This increase of  $p_H$  was due to the penetration of the OH ion from the breathing water. The  $CO_2$  content of the blood and the pericardial fluid remained unaffected by the increase of blood  $p_H$ . This was probably due to the selective permeability of plasma membrane, which enabled the OH ion alone to permeate, because if Na ion or NaOH mol. penetrated into the blood the  $CO_2$  content must increase, as they will combine with the  $CO_2$  evolved from the tissue. The  $CO_2$  content of the blood and the



pericardial fluid increased and the  $p_H$  of these fluids decreased when the animal was exposed to the atm. air. The former increase was probably due to the formation of  $\text{Ca}(\text{HCO}_3)_2$  in the blood, and the latter decrease to the increase of  $\text{CO}_2$  in the blood. The critical concn. of low blood  $p_H$  which killed the oyster within 48 hrs. was detd. to be in the neighborhood of  $p_H$  5.00. Susceptibility of oyster to high alk. (0.01  $N$   $\text{NaOH}$ ) was greater than to high acidity ( $p_H$  1.20). In the former case the oysters survived for 48 hrs. while in the latter case they usually died within 48 hrs.

M. H. SOULE

**Chemical analysis of the pericardial fluid and the blood of *Ostrea circumpecta* Pils.** MASAO KUMANO. *Science Repts. Tôhoku Imp. Univ.*, 4th Series, 4, 281-4(1929).—The materials were collected during the month of July, 1928. The blood was withdrawn from the heart and usually 8-12 oysters were used for a single detn. The pericardial fluid used was collected from the same oysters. The per cent of  $\text{H}_2\text{O}$  in the pericardial fluid was 96.38, in the blood 96.26. The following table contains the data expressed in g. per 100 cc.

	Pericardial fluid	Blood	Sea water	Method
Na	1.1019	1.1960	1.1634	Michael Balint
K	0.0354	0.0362	0.0357	Kramer and Tisdall
Ca	0.0416	0.0425	0.0431	Kramer and Tisdall
Mg	0.1303	0.1530	0.1373	Hammett and Adams
Cl	1.9520	2.1060	1.9428	Rusznayak
$\text{SO}_3$	0.2673	0.2821	0.2627	Denis

M. H. SOULE

**Some physico-chemical properties of the pericardial fluid and of the blood of the Japanese oyster, *Ostrea circumpecta* Pils, with reference to the change of the external medium.** MASAYASU YAZAKI. *Science Repts. Tôhoku Imp. Univ.*, 4th Series, 4, 285-314 (1929).—Adult healthy oysters were used. The sp. gr. was detd. with the Ostwald modification of the Sprengel pycnometer, the sp. cond. by the Wheatstone bridge method, the f.-p. depression with the Beckmann thermometer, the surface tension with Traube's stalagmometer, the viscosity with Determann's viscometer, and the  $\text{NaCl}$  was detd. by the Rusznayak method. From the large amt. of data presented the following conclusions are drawn: The pericardial fluid is perfectly transparent, while the blood is opalescent with a yellowish tint in transmitted light, and with a bluish tint in reflected light. The quantity of  $\text{NaCl}$  contained in the pericardial fluid is less than that of the blood, and the latter is less than that of the sea water in which the animal lives. The amt. of  $\text{NaCl}$  in the pericardial fluid corresponds to 94 per 100 of osmotic concn. of dry substances, while in the blood it corresponds to 93 per 100. The sp. gr. of the pericardial fluid ranged from 1.022 to 1.024 and that of the blood from 1.023 to 1.028 while the sea water gave from 1.022 to 1.024. These values are affected by the change in the surroundings when the animal is kept in  $1/2$  diluted sea water. The f. p. of the pericardial fluid is about  $0.06^\circ$  higher than that of the blood; this difference corresponds to 0.75 atm. at  $0^\circ$ ; consequently these fluids are not in a state of osmotic equality with each other. When the oysters, which had been kept for a long period in a diluted sea water, were removed into the normal sea water, the sp. gr. and the osmotic pressure of the blood and the pericardial fluid returned to their normal values more rapidly than they were changed by the external conditions when the animals were transferred from the normal to the diluted sea water. These changes were much slower in the pericardial fluid than in the blood. This phenomenon was due probably to the existence of some regulative power in the animal. The product ( $\eta \cdot \kappa$ ) of viscosity and cond. of the blood is nearly const. in the majority of animals of different groups examined, and lies between the narrow limits 0.060 and 0.069. In the blood of the oyster the value of  $\eta \cdot \kappa$  was 0.063 while in the pericardial fluid it was 0.061. The difference in the surface tension between the pericardial fluid and the blood seems due to the difference of protein content rather than to the difference in amt. of  $\text{NaCl}$  in those 2 fluids.

M. H. SOULE

**Normal and abnormal respiration in the oyster, *Ostrea circumpecta* Pils.** AKIRA NOZAWA. *Science Repts. Tôhoku Imp. Univ.*, 4th Series, 4, 315-25(1929).—The respiration of the oyster was detd. under normal conditions and when subjected to a severe strain by hanging a wt. on it. The  $\text{O}_2$  and  $\text{CO}_2$  were estd. by the method of Van Slyke. The gaseous metabolism was accelerated under abnormal conditions. The respiratory quotient at the earlier stage of the oyster on which a heavy load was hung was smaller than that of an oyster without load, but the former suddenly increased

over the latter after some hrs. The metabolism differed at different temps.; the metabolism was diminished at temps. lower and higher than 26°. The rate of O<sub>2</sub> consumption was independent of the O<sub>2</sub> tension until the pressure was reduced to 0.1%.

M. H. SOULE

The digestive enzymes of *Ostrea circumpicta* Pils. EISHIRÔ SAWANO. *Science Repts. Tôhoku Imp. Univ.*, 4th Series, 4, 327-34(1929).—The distribution of amylase and milk-clotting enzyme in the body of the oyster was detd. Butyrase, protease and gelatinase were demonstrated in the crust. style.

M. H. SOULE

## 12—FOODS

F. C. BLANCK AND H. A. LEPPER

Food control in Rotterdam in former times. M. WAGENAAR. *Pharm. Weekblad* 66, 585-93(1929).—Historical.

A. W. DOX

Food protection. W. M. WILLOUGHBY. *Munic. Eng. Sanit. Record* 82, 600 (1928).—H<sub>2</sub>S is formed by the chem. action of SO<sub>2</sub> on Sn when SO<sub>2</sub> is used as a preservative in tinned goods. Synthetic creams made from fats other than milk fat might lead to fraud.

C. H. BADGER

Two outbreaks of food poisoning probably due to *B. cloacae*. ENOS B. BUCHANAN AND EMERSON MEGRAIL. *J. Infectious Diseases* 44, 235-42(1929).

JULIAN H. LEWIS

Study of the neutralization curve and buffer-coefficient curve of some foods (bread, milk, flour). MADELEINE GEX. *Chimie & industrie Special No.*, 698-9(Feb., 1929).

Curves are given for French and English breads, flour and milk. The p<sub>H</sub> value was detd electrometrically by means of 2 Sb electrodes connected differentially, the reference electrode contg. HCl, the p<sub>H</sub> value of which (approx. 1) was accurately detd. It is suggested that this detn. might give valuable information from the standpoint of adulteration and of alimentary hygiene.

A. PAPINEAU-COUTURE

Color of wheat flour. ARTHUR C. HARDY, PRENTISS I. COLE AND CHARLES W. RICKER, JR. *Ind. Eng. Chem., Anal. Ed.* 1, 151-2(1929).—Thirty-five samples of bleached and unbleached flour were examd. by means of a recording color analyzer of improved design. The curve of reflecting power of the samples for different wave lengths of light was obtained. The brilliance score is the reflecting power of the sample at 556 mμ (green). The yellow score is the difference between this and the reflecting power at 440 mμ (blue). The brilliance score decreases with increasing ash content and the yellow score increases.

FRANCIS P. GRIFFITHS

Benzoyl peroxide; its detection in bleached flour. A. LEJEUNE. *Ing. chim* 17, 30-3(1929); cf. Rothenfusser, *C. A.* 19, 1740, 2988.—Jorgensen method; agitate 2.5 g. *p*-diaminodiphenylamine sulfate with 250 cc. of 95% EtOH during 1 hr. Let stand overnight; mix 0.7 g. flour with 2.5 cc. of petroleum ether, add 1 cc. reagent and agitate, on standing, the supernatant liquid has a bluish green color in presence of the peroxide. If the amount is large the flour is also colored. Destree method: put 0.1 g. of *p*-diaminodiphenylamine sulfate in 100 g. of 95% EtOH, heat 30 min. on the steam bath with a reflux condenser, cool. For test put 5 g. of flour in a small flask, add enough reagent to form a paste; after a few min. intense green points appear on the surface. A test can be obtained more than a month after bleaching.

P. THOMASSET

Report of an outbreak of alleged ergot poisoning by rye bread in Manchester. M. T. MORGAN. *J. Hyg.* 29, 51-61(1929).—Some ergotoxin was found in old rye, which would suggest that the fresh rye had been actively toxic.

JOHN T. MYERS

Milk, a biologically balanced food. RAOUL LECOQ. *Bull. sci. pharmacol* 36, 342-4(1929).

A. E. MEYER

The microscopy and chemistry of milk. JAMES SCOTT. *Food Manuf.* 4, 125-7, 195-7(1929).—This is a general survey in which S. briefly discusses color of milk, formation of cream, *Oidium lactis*, lactose, lactic acid and lactic acid bacilli, casein and nuclein, albumin, milk fat and minerals.

J. A. KENNEDY

Rating your milk supply. LEONARD V. PHELPS. *Am. J. Pub. Health* 19, 740-6 (1929).—In the formula for general rating =  $[A + (B + C)/2] + 2$ , A = raw to retail rating, B = raw to plant rating, C = plant process rating and  $(B + C)/2$  = combined rating. A chart for elimination of arithmetical work is given. The federal general rating formula is too inaccurate and misleading to justify a continuance of its use. A general rating should be based, without regard to the % of milk pasteurized, on (a) retail raw score, (b) raw to plant score and (c) plant process score. A general rating should

show the degree with which the community complies with the regulations in the Standard Milk ordinance. J. A. KENNEDY

**Studies of the composition of milk.** O. R. OVERMAN, F. P. SANMANN AND K. E. WRIGHT. Univ. Ill. Agr. Expt. Sta., *Bull.* 325, 174 pp. (1929).—The results of analyses of 1998 milk samples are tabulated, studied by statistical methods and comparisons are made with the results of other investigations into the compn. of milk. The samples were 3-day composites taken at 5-week intervals throughout the lactation periods of individual cows and were distributed as follows: 208 samples of Ayrshire milk, 321 samples of Guernsey milk, 268 samples of Holstein milk, 199 samples of Jersey milk and 1002 samples of milk from Guernsey-Holstein crossbred cows. It should be pointed out that the protein content of milk as detd. from these investigations is higher in relation to the fat content than is usually reported in the literature, and that the lactose does not regularly increase with increasing fat up to a certain fat content and then regularly decrease but that it is nearly const. in % to about 5.0% of fat and then tends to decrease with further increases in fat. Nine tables and 55 figures are included. E. F. SNYDER

**Salts in milk and their importance in dairy work.** The heat coagulation of evaporated milk. H. H. SOMMER. *Butter and Cheese J.* 20, No. 11, 44-8 (1929).—Unless an appreciable acidity has developed, the main factor in the coagulation of milk by heat is the salt compn., particularly Ca and Mg citrates and phosphates. For max. stability toward heat, a proper balance between these anions and cations is necessary. a high albumin content and certain rennet-producing bacteria also make milk coagulate more readily. In most cases of unbalanced salts there is an excess of Ca. This condition can be corrected by the addn. of  $\text{Na}_2\text{HPO}_4$  or Na citrate or by  $\text{NaHCO}_3$  in the milder cases. As a result of several hundred tests it was never found necessary to add more than 0.007% of  $\text{Na}_2\text{HPO}_4$  (calcd. to  $\text{P}_2\text{O}_5$ ) or 0.092% Na citrate (calcd. to citric acid). The amts. of salts used in com. practice are well within the normal variations of these salts in milk. In the rare cases where Ca was in excess in milk, the coagulation was prevented by the addn. of lactic or citric acid. The action of  $\text{NaHCO}_3$  in improving milk contg. excessive Ca is indirect; it is due to transformation of  $\text{NaH}_2\text{PO}_4$  to  $\text{Na}_2\text{HPO}_4$ , thus often correcting an unbalanced salt condition. C. R. FELLERS

**Solubility of metals in milk.** G. N. QUAM. *Ind. Eng. Chem.* 21, 703-4 (1929).—The solubilities of metals in raw whole sweet milk are compared. The solubilities of Al, Sn and steel at 25-70° are negligible. The max. solubilities of Cu, Ni and Zn are obtained at 75-80°. From the standpoint of least soly., special steel (Cr) proved most satisfactory. JOHN T. WOLF

**Nature of iodine compounds in milk.** K. SCHARRER. *Pharm. Monatsh.* 10, 118 (1929).—Except in certain exptl. samples of milk, the conclusion is drawn that the I regularly present in milk is in small part only inorg., the far greater portion being in org. combination with constituents of the serum. The proteins carry a smaller and varying quantity of I. Little or no I is normally carried in the fat. W. O. E.

**Supplementary experiment on the hull substance of milk-fat globules.** K. HATTORI. *J. Pharm. Soc. Japan* 49, 332-6 (1929).—H. previously succeeded in isolating the pure hull substance (I) of milk-fat globules and called it *haptein* (*C. A.* 19, 2380). It is a protein but differs from casein (II) especially in its soly. in dil. NaOH. To support his view the following expt. was made. II was pptd. from fresh milk by various methods, *i. e.*, by AcOH, rennin,  $\text{HgCl}_2 + \text{HCl}$  alum,  $\text{CaCl}_2$ ,  $\text{CuSO}_4$  (Ritthausen's method) and by dialysis. The ppt. was sepd. by centrifugation. By simply mixing the ppt. with  $\text{H}_2\text{O}$  fat globules sepd. from the ppt. On examn. under the ultramicroscope these globules showed a normal shape and were free from the evidence of coagulation. After repeated washing with  $\text{H}_2\text{O}$ , fat was estd. in the washings as well as in the supernatant fluid of the first centrifugate. Except for a sample pptd. with  $\text{CuSO}_4$ , all others gave a quant. yield of fat. If I were composed of II or substances similar to II it would have been impossible to sep. it from the ppt. by simply mixing with  $\text{H}_2\text{O}$ , since the latter substances would undergo irreversible changes. This is addnl. evidence to support the view that I is a different substance from II, which is contrary to the view of others (cf. Titus, *C. A.* 22, 979). NAO UYEI

**Evaporated milk and its relation to public health.** FRANK E. RICE. *Am. J. Pub. Health* 19, 777-83 (1929); cf. *C. A.* 23, 2766. J. A. KENNEDY

**Stability of commercial sterilizers in the presence of milk.** G. N. QUAM AND SIDNEY N. QUAM. *Am. J. Pub. Health* 19, 737-9 (1929).—Data are given to emphasize the fact that NaOCl sterilizers may vary greatly in stability and activity. The conditions under which the sterilizer is to be used, as well as properties of the various com. products, must be considered. Com. sterilizers used were: I. Liquid NaOCl prepn.,

strongly alk. with NaOH. II, NaOCl soln. III, A cryst.  $\text{Na}_3\text{PO}_4\text{-NaOCl}$  prepn. IV, A chloramine-T prepn. In all cases, IV was unusually stable, though a decrease in stability with rise in temp. and extended exposure was noticeable. The order of increasing rate of deterioration of the other 3 was found to be I, II, III. For each sterilizer there was a definite uniform decrease in stability with increase of time for any given temp. The importance of maintaining relatively low temps. during the sterilization of dairy plant equipment seems obvious.

J. A. KENNEDY  
Sterilization (disinfection) of milk bottles in soaker type washers. LEWIS SHERR AND GERALD L. HOEFFT. *Am. J. Pub. Health* 19, 747-50(1929).

J. A. KENNEDY  
The comparative accuracy of the direct microscopic and agar plate methods in determining numbers of bacteria in milk. JAMES D. BREW. *J. Dairy Sci.* 12, 304-19 (1929).

E. H.  
Bacterial counts in sanitary milk control. ROBERT S. BREED. N. Y. State Agr. Expt. Sta., *Bull.* No. 567, 25 pp.(1929).

E. H.  
The influence of ultra-violet rays on liquids in an atmosphere of carbon dioxide. ALFRED SALMONY KARSTEN. *Ind. Chemist* 5, 237-8(1929).—App. is described (including 4 illustrations) that has been specially designed for exposing milk in a "Vitamilk" cell to ultra-violet light from a quartz lamp.

E. G. R. ARDAGH  
The mold and yeast count as an index of the keeping quality of butter. H. MACY AND H. B. RICHIE. *J. Dairy Sci.* 12, 351-66(1929).

E. H.  
Test for vitamin A in margarine, butter and other fatty foods. A. ANDERSEN AND E. NIGHTINGALE. *J. Soc. Chem. Ind.* 48, 139-40T(1929).—By using a modified  $\text{CHCl}_3\text{-SbCl}_5$  colorimetric test on the unsaponifiable matter in butter, margarine, cod-liver oil and cakes, results closely agreeing with the animal testing method were obtained. The final reading was made by detg. the greatest dilm. at which the blue color was just visible. The av. dilm. figure given by 100 samples of medicinal cod-liver oil was 1950, unsaponifiable matter from cod-liver oil, approx. 1,000,000; butter, 25-60; ordinary vegetable margarine, 0; oleomargarine, trace; Viking vitaminized margarine, 52-62. Several tests on oleo oils showed a vitamin A potency below butter but ahead of vegetable fats and oils. There was no const. relationship between natural color and vitamin A content in oleo oils. In applying the method to cakes, bread, eggs and emulsions, the product is either sapond. directly or the  $\text{Et}_2\text{O}$ -extd. fat is used to obtain the unsapond. portion. An extension of the method to the assay of milk and milk products is in progress.

C. R. FELLERS  
The relation of hydrogen-ion concentration to the texture of Emmenthal or Swiss cheese. PAUL D. WATSON. *J. Dairy Sci.* 12, 289-303(1929).—Variations in the colloidal structure of the cheese, as shown by the difference in the binding of the  $\text{H}_2\text{O}$ , exert an important effect upon the texture. Further work is necessary. The choice of starter is an important factor in the control of the H-ion concn., ripening, and texture of Swiss cheese.

J. A. KENNEDY  
Studies in cereal chemistry. IV. The role of moisture in wheat and flour. T. H. FAIRBROTHER. *Ind. Chemist* 5, 243-5(1929); cf. *C. A.* 23, 3517.—The  $\text{H}_2\text{O}$  content of wheat varies with the locality in which it is grown and the time of year it is used. It detts. the  $\text{H}_2\text{O}$  content of the flour, which in England may be as high as 17%. In flour a high  $\text{H}_2\text{O}$  content promotes growth of mites, bacteria and fungi. In wheat a high  $\text{H}_2\text{O}$  content lowers the bushel weight and increases the respiration and heating. For best results in milling, the  $\text{H}_2\text{O}$  should be concd. in the bran, with the endosperm dry and friable.

AMY LEVESCONTE  
Determination of honey in honey cakes. II. R. T. A. MEES. *Chem. Weekblad* 26, 334-6(1929); cf. *C. A.* 23, 1182.—Baking tests showed that the fructose content of honey cake did not change during the baking, when 55% of the sugar mixt. used was honey. Change of glucose to fructose can take place when the baking powder gives the dough an alk. reaction. For honey cake the % fructose can be accepted to express the amt. of honey used. Sugar was detd. by the method of Schoorl (*C. A.* 23, 2675).

F. DE LEEUW  
Effect of hydrogen-ion concentration on the steam distillation of mixtures of lactic and acetic acids. B. E. LESLEY. *Fruit Products J. and Am. Vinegar Ind.* 8, No. 11, 14-15(1929).—The effect of H-ion concn. on the distn. ratios of acetic and lactic acids was found to be of great importance. A method of steam distn. for the detn. of these acids in their mixtures is presented and its accuracy has been demonstrated. A modification of the Hortvet app. was used.

J. A. KENNEDY  
Sulfuring of sultanas. ARTHUR SKIBBE. *Farming in S. Africa* 3, 1199-1200 (1929).—A method for sulfuring sultana grapes to give a product contg. less than 0.075%  $\text{SO}_2$ , as required by the British regulations, is described. The  $\text{SO}_2$  content of sultanas,

contg. more than 0.075%  $SO_2$ , may be reduced by dipping in water for 2 min. and draining, the process being repeated 3 times during the course of one day, and finally drying in the shade for several days. K. D. JACOB

Factors in the estimation of starch by the I method (LEPIK) 7. The prevention of odor nuisance in the disposal of creamery wastes by treatment with  $Cl$  preliminary to broad irrigation (REINKE) 14. New data on saturnism (KOHN-ABREST) 13. Spray drying and the drying of dairy products (NYROP) 13. Action of  $NaCl$  on hide and animal tissues (PONTE) 29. A chemical study of the rind of California oranges (MATLACK) 11D.

Food. REHMANN & Co. METALLWARENFABRIK. Ger. 477,722, May 24, 1925. A device for sterilizing and preserving food is described.

Preserving foods by coating. I. G. FARBENIND. A.-G. Brit. 302,447, Oct. 17, 1927. Eggs, fruit, etc., are coated with a compn. formed with a condensation product of urea and  $CH_2O$  to which various preservatives, etc., also may be added.

Frozen food products. R. J. ALLNUTT (to Homfreeze Corp.). Brit. 302,883, Dec. 23, 1927. Frozen preps. are formed from agar agar, water and flavoring substances such as fruit juices, fruit acids and sugar.

Food fats. N. V. NEDERLANDSCHE N. V. FRANSCHHOLLANDSCHE OLIEFABRIEKEN NOUVEAUX ÉTABLISSEMENTS CALVEDELFT. Brit. 301,750, Dec. 3, 1927. In order to improve the aroma of products such as margarine or artificial cream, diketones, or substances capable of being transformed into diketones, are added during manuf. The use of diacetyl, and of methylacetylcarbinol and oxidizing agents is described.

Apparatus for sterilizing milk by the "holding" process. R. SELIGMAN. Brit. 302,743, Sept. 29, 1927. Structural features.

Milk filter with conical pre-filter above the main filter pad. KRISTALL-GES. FÜR MOLKEREI-EINRICHTUNG HERM. VOM STEIN M.B.H. Ger. 477,592, July 27, 1926.

Flow regulator for degasifier for milk and cream. PAUL RÜTERS. Ger. 478,003, Mar. 14, 1928.

"Reconstructing" milk, etc. AAGE JENSEN. U. S. 1,721,121, July 16. A fluid mixt. of liquids and normally solid or semi-solid substances is passed between closely spaced elongated surfaces such as a rotating drum and a surrounding casing while subjected to progressive heating. Various details of the app. are described, which may be used for producing products such as margarine emulsions, mayonnaise, fruit emulsions, chocolate and malted milk compns.

Dried milk food. J. GOLDING and DECO, LTD. Brit. 302,439, Oct. 10, 1927. Milk and whey are fed separately but simultaneously on to a heated drying or evapg. surface of the drying-roll type so that they are dried together. Various details of procedure are described.

Treating grain. EFRAÏM RABINOWITSCH. Fr. 657,459, July 12, 1928. Grain is germinated and then fermented under pressure, the pressure being suddenly released to cause the disintegration of the cellular tissue, aleurone and cellulose of the husk to render them digestible in bread made from the treated grain.

Baking powder. C. H. BOEHRINGER SOHN. (Heinrich Schneider and Franz Rahn, inventors). Ger. 478,165, May 31, 1925. See Brit. 252,695 (C. A. 21, 2342).

Phosphorus pentoxide. VICTOR CHEMICAL WORKS. Ger. 477,658, Jan. 23, 1925. A method and app. are described for prepg.  $P_2O_5$  for the manuf. of baking powder, by heating natural phosphates,  $H_2SiO_3$  and C, and oxidizing the P obtained.

Meat-cheese loaf. CLINTON H. PARSONS (to Swift & Co.). U. S. 1,721,406, July 16. A mold is partly filled with a hot cheese emulsion, cooked meat is embedded in the emulsion and the product is sealed in tinfoil while still hot.

Dietary composition containing vitamins and inositol hexaphosphate and its salts. FRITZ GOEDECKE. U. S. 1,721,214, July 16. A compn. which may contain both vitamins and inositol hexaphosphate and its Ca salts is prepd. by use of the same plants as the source of these substances. The compn. may be used as an addn. to chocolate, soups, tea, etc.

Apparatus for heating oleaginous fruits before pressing. KARL SOHLER (to Fried. Krupp Grusonwerk A.-G.). U. S. 1,720,974, July 16. Details are described of an app. with superposed spaced floors and a vertical shaft carrying radial arms with scrapers. Pectin. PECTINERIE DU KERVOR. Brit. 302,734, Dec. 21, 1927. See Fr. 645,993 (C. A. 23, 2225).

Apparatus for aerating beverages. MARCEL MARTIN. Fr. 656,771, Nov. 16,

1927. An app. is described for aerating beverages and treating them with ultra-violet rays.

**Purifying coffee infusions by filtering through active carbon, etc.** J. PÄFFGEN. Brit. 302,332, Dec. 16, 1927. Various details and modifications of procedure and an app. are described. It is stated that caffeine is retained by the filter and may be recovered.

**Food for animals.** J. E. NYROP. Brit. 301,651, Dec. 14, 1927. A milk-like product is prepd. by grinding soy beans, maize or earth nuts with water or skimmed milk and this is emulsified with a fatty or oily substance contg. vitamin A such as deodorized whale oil.

**Animal food formed from ground barley, fish meal and aniseed.** F. R. BELL and R. F. BILTON. Brit. 301,566, Sept. 7, 1927.

### 13—GENERAL INDUSTRIAL CHEMISTRY

HARLAN S. MINER

**American chemical industry, production and foreign trade in the first quarter of the twentieth century.** U. S. Trade Promotion Series No. 78, 114 pp.(1929)

E J C

**British chemical industry in 1928.** U. S. Trade Information Bull. 621, 40 pp (1929).

E J C

**The chemical industry of Manchester and its county.** REX FURNESS. *Chemist & Industry* 48, No. 28 Suppl., 1-5(1929).

E H

**German chemical developments in 1928.** U. S. Bur. of Foreign and Domestic Commerce, *Trade Information Bull.* No. 605, 39 pp.(1929).

E J C

**Directions for securing patents in the Polish Republic.** ANON. *Przemysl Chem* 13, 180-3(1929).

A. C. ZACHLIN

**Economic factors in chemical plant location.** CHAS. W. CUNO. *Ind. Eng. Chem* 21, 738-40(1929).—C. discusses the migration of different classes of industries and gives 12 factors which influence plant location.

L. A. PRIDGEON

**Fused silica in chemical plant construction.** W. W. WINSHIP. *Can. Chem. Met* 13, 185-7(1929).

E H

**The handling and packing of chemicals.** REX FURNESS. *Chem. Age* 20, 606-8 (1929).

E H

**Factors in applying spray drying to chemical production.** A. W. FARRALL. *Chem Markets* 25, 59, 61, 63(1929).

E H

**The precipitation of industrial dusts.** M. BELLON. *Ann. hyg. publ. ind. sociale* 1929, 317-40.—A description and discussion of the mech. and elec. methods used in the industries of cement, carbon black, As, Cu, Sn, Hg, Pb, Zn, Ni, etc.

G. TOENNIES

**Technical processes for removing sulfur from gases.** HORST BRÜCKNER. *Metallbörse* 19, 1352-3, 1464-5(1929); cf. C. A. 23, 3560.—A review, with bibliography

W. C. EBAUGH

**The recovery of solvents from enriched wash oil by continuous steam distillation.** OTTO KREBS. *Gummi-Zig.* 43, 1984-6(1929).—A process for recovery of solvent benzene absorbed in wash oil by stripping with steam is described. Steam distn. gives better sepn. of the benzene from the wash oil than does topping by means of a direct-fired still. The cost is low; the fire risk is at a min.

A. WHITE

**Viscous liquid mixed and dried in 80 per cent less time.** R. D. JESSUP. *Chem. Met. Eng.* 36, 413-4(1929).—In the manuf. of a rosin insulating compd. the introduction of circulation of the liquid and application of vacuum to drying reduced the time of operation to  $\frac{1}{5}$  that previously required.

E. H

**Spray drying and the drying of dairy products.** J. E. NYROP. *J. Soc. Chem. Ind* 48, 136-9T(1929).—The several types of driers are described and drying formulas are developed mathematically. High-grade rubber was prepd. by spraying rubber latex in this equipment. Tanning exts., molasses, sugar, fruit juices, blood, cocoa, milk and butter may be dehydrated by this method. CO<sub>2</sub> is the most favorable drying medium for fatty substances because O<sub>2</sub> of the air induces rancidity.

C. R. FELLERS

**Rapid graphical method for calculation of steam distillation problems.** EDWIN M. BAKER AND E. E. PETTIBONE. *Ind. Eng. Chem.* 21, 562-4(1929).—Steam distn. problems are calcd. by using Dühring lines. Graphs are shown using Dühring lines for steam distn. of CS<sub>2</sub>, acetone, chloroform, CCl<sub>4</sub>, benzene, isopropyl iodide, chlorobenzene, aniline and 8 different mixts. of the paraffins occurring in gasoline.

L. A. PRIDGEON

**Technical aspects of slurry filtration.** C. H. SONNTAG. *Pit and Quarry* 18, No. 7, 81-3; No. 8, 46-8, 53(1929).

**Chronic lead intoxication.** ERNST W. BAADER. *Metallwirtschaft* 7, 231-4 (1928).—Lead poisoning is caused mostly by those forms of Pb which are either sol. or upon entering the human body are made sol. Thus Pb and PbO dust in lead around factories cause intoxication while PbS dust in the mines is much less dangerous. Symptoms of Pb intoxication appear sooner when Pb enters the system through the respiratory organs than when it is absorbed from the gastrointestinal tract. A description of the more common symptoms is given. Reference is made to some legal regulations in Germany which aim at the protection of the workers in German Pb industry. E. K.

**New data on saturnism.** E. KOHN-ABREST. *Chimie & industrie Special No.*, 741-2(Feb., 1929).—A case is cited of a young man who, after working some months in a Pb storage battery plant and leaving it in apparently good health, died of saturnism. Analysis of the viscera showed a total of 139.25 mg. Pb, equiv. to 19.5 p. p. m. The Pb contents usually found in human viscera are approx. as follows, in p. p. m.: lungs 2, heart 0.5, liver 2, stomach 3, intestines 1, brain 2, kidneys 2, urine 0.75 and blood 0.5. The following technic is recommended for the toxicological detn. of Pb: destroy org. matter with  $H_2SO_4-HNO_3$ , dil. with 2-3 vols.  $H_2O$ , boil, cool, add an equal vol. of alc., let stand 24 hrs., sep. the ppt. first by decantation and then by alternate washing with alc and centrifuging, evap. the last traces of alc., dissolve the ppt. in 25%  $NH_4OAc$ , pass  $H_2S$ , let stand, centrifuge, wash repeatedly with satd.  $H_2S$ -water, dissolve in hot  $HNO_3$ , evap., verify the presence of Pb by adding KI and identifying  $PbI_2$ , evap. in presence of  $HNO_3$ , dissolve in  $NH_4OAc$  and ppt. the Pb as chromate. Foods generally contain only a few p. p. m. of Pb, at the most; but some white wines have been found to contain up to 5 p. p. m., while the lees can contain up to 15-20 p. p. m. A. P.-C.

Autogenous welding serving the chemical and process industries (JASPER) 9.  
Dependence of resistance of insulating and other materials on potential and frequency (BONING) 4.

**Annual Reports on the Progress of Applied Chemistry, 1928.** Vol. XIII. London: Society of Chem. Industry. 760 pp. 12s. 6d. Reviewed in *Chem. News* 139, 13 (1929)

**Proceedings of the International Solvay Institute of Chemistry. Report of the Third Congress on Chemistry held at Brussels, April 12 to 18, 1928 (in French).** Paris: Gauthiers-Villars et Cie. 560 pp. F. 70. Reviewed in *Chem. Trade J.* 85, advertising page following page 40 (1929).

THOMAS, PEARL E.: **Cork Insulation.** Chicago: Nickerson and Collins Co. 534 pp \$3.50; morocco, \$4.50.

WIMPERIS, H. E. and SMITH, F. E.: **Physics in Industry.** London: Oxford Univ. Press. 54 pp. 2s. 6d. net. Reviewed in *Science Progress* 24, 149(1929).

**Purifying gases.** THE KOPPERS CO. Ger. 478,140, July 27, 1927. See Brit. 280,165 (C. A. 22, 3005).

**Treating gases.** SOC. INTERNATIONALE DES PROCÉDÉS PRUDHOMME-HOUDRY. Fr. 656, 785, Nov. 17, 1927. Reaction vessels contg. contact material acting as absorbents for gases or catalysts for gaseous reactions have annular sections connected at their ends to inlet and outlet pipes and are surrounded both interiorly and exteriorly with a jacket for circulating a heating or cooling liquid.

**Modifying the composition of gas or vapor mixtures.** TH. GOLDSCHMIDT A.-G. Ger. 478,453, June 10, 1921. See Brit. 181,376 (C. A. 16, 3720).

**Treating liquids with gases.** I. G. FARBENIND. A.-G. Fr. 657,203, July 10, 1928. In treating liquids with gases or vapors, the liquids and gases or vapor are introduced simultaneously at the bottom of a vessel contg. indifferent or catalytic material, the liquid flowing off at the top either to another vessel or back to the bottom of the same vessel. Cf. C. A. 23, 2514.

**Separating liquids.** I. G. FARBENIND. A.-G. Fr. 657,442, July 12, 1928. Mixts. of liquids are sepd. by treating them at ordinary or raised temp. with adsorbent agents, e. g.,  $SiO_2$  gel.

**Separating water from slime.** WILHELM LEONARDY. Ger. 477,843, Feb. 24, 1924. The slime is placed in a funnel-shaped vessel with coiled heating tubes and an outlet for clear water at the top.

**Preparation of crystals.** I. G. FARBENIND. A.-G. Fr. 656,642, June 29, 1928. Large crystals, particularly of fertilizing salts, are prepd. by passing a gas or vapor through a soln. of the salt in such a way that the bubbles of gas act as cooling surfaces and cause the continuous formation of germs of crystn., the floating of the growing crystals, the removal of superfluous germs and the circulation of the soln. An app. is described.

**Crystallizing processes.** KARL BAUER and GALICYJSKIE TOWARZYSTWO NAFTOWE "GALICJA" SP. AKC. Austrian 113,327, Jan. 15, 1929. The method of crystg. difficultly crystallizable substances in which a volatile diluent is added to the soln. at a low temp is conducted under superatm. pressure. Examples are given of the crystn. of paraffin from heavy mineral oil and of menthol from peppermint oil. Diluents such as homologs of  $\text{CH}_4$  and  $\text{C}_2\text{H}_4$ ,  $\text{Me}_2\text{O}$ ,  $\text{Et}_2\text{O}$ ,  $\text{Me}_2\text{NH}$  and  $\text{EtNO}$ , may be used, or gases may be passed in, which dissolve in the soln. and reduce its viscosity.

**Method for determining the degree of turbidity of substances by the transmission of light therethrough.** FRIEDRICH HAHN. Ger. 477,640, Apr. 10, 1926. Details are given.

**Drying materials.** MORITZ HIRSCH. Ger. 478,324, Apr. 2, 1926. In drying with hot air, the materials under treatment are rapidly brought to the highest permissible temp. by means of very hot air, and sufficient cooler air is then added to maintain the materials at that temp.

**Recovery of volatile solvents.** I. G. FARBENIND. A.-G. Brit. 302,297, Sept. 12, 1927. Products having a b.p. above  $200^\circ$  obtained as by-products in the catalytic hydrogenation of C oxides to form MeOH are used for washing gases and vapors such as result in the production of lacquers, artificial silk or in cleaning fabrics, e. g., air carrying  $\text{C}_6\text{H}_6$  vapor.

**Dehydration products of sorbitol.** I. G. FARBENIND. A.-G. Brit. 301,635, Dec. 19, 1927. Products which may be used in gelatinizing cellulose esters or ethers or as wetting or emulsifying agents are obtained by dehydrating sorbitol or a mixt. of sorbitol with other polyhydric alcs. (suitably by heating *in vacuo* or in the presence of catalysts such as active silica, C or alumina). Several examples are given.

**Thermal decomposition.** BRITISH DVESTUFFS CORP., LTD. Fr. 657,097, July 6, 1928. Substances are transformed into their decompn. products by heating in a tube, the opening of which is cooled to avoid premature heating of the substance introduced, the remainder being heated, e. g., in a bath of fused salts, or molten Pb.

**Manufacture of substances formed through highly endothermic reactions, particularly nitrogen compounds.** E. CONNERADE. Belg. 356,946, Jan. 31, 1929. In the manuf. of N compds, such as NaCN, cyanamide, Al nitride, etc., the combustible mass is heated to as high a temp. as possible by passing air through it; when this temp. has been reached the admission of air is stopped and N is passed through the incandescent mass.

**Emulsions of oils, etc.** B. REDLICH. Brit. 302,761, Oct. 20, 1927. Emulsions or colloidal suspensions of oils, S, waxes, resins, etc., dissolved in solvents are prepd. by intimately mixing the liquids or dissolved materials with colloidal pptd. inorg. powdery substances such as dried pptd. silicic acid, alumina or ferric oxide and stirring the mixt. into water. Examples are given of a peanut-oil emulsion and an emulsion of S dissolved in  $\text{CS}_2$ . Soap or other protective colloid or stabilizer may be added. Cf. C. A. 23, 1502.

**Purifying air that contains hydrogen sulfide.** ALBERT CHARBONNEAU. Fr. 656,801, Nov. 18, 1927.  $\text{H}_2\text{S}$  in the atm. of artificial silk factories and other places is treated with ozone from ozonizers.

**Storing cesium or similar oxidizable metals in capillary tubes.** W. A. RUGGLES (to British Thomson-Houston Co., Ltd.). Brit. 302,315, Dec. 14, 1927. In sealing readily oxidizable metals such as Cs in capillary tubes, as described in Brit. 296,347 (C. A. 23, 2538), Na Mg borosilicate glass is used so that when the ends of the tubes are fused to seal them the Cs or like metal reacts with the glass at the ends and forms a vitreous material having a coeff. of expansion different from that of the intermediate portions of the tube. This facilitates subsequent removal of the tube ends for liberation of the contents without shattering of the main body of the tube. A method of use with electron discharge devices is described together with various structural features.

**Method of and means for cooling annealed products.** AKT.-GES. BROWN, BOVERI & CIE. Ger. 478,390, Mar. 18, 1927.

**Refrigerators.** LÉO SZILARD. Fr. 657,490, July 13, 1928.

**Refrigerators.** SOC. DES ATELIERS DE CONSTRUCTIONS MÉCANIQUES ESCHER WYSS & CIE. Fr. 656,641, June 29, 1928.



- Refrigerating system suitable for use with liquefied gas such as carbon dioxide.** PETER J. MUENCHEN (to Arctic Refrigeration Mfg. Corp.). U. S. 1,721,312, July 16.
- U. S. 1,721,311 relates to a refrigerating vessel suitable for cooling beverages.
- Absorption refrigerating machine.** GEBRÜDER SULZER A.-G. Ger. 478,339, Dec. 31, 1926.
- Absorption refrigerating machine.** JENS O. BOVING. Ger. 478,336, May 18, 1927.
- Absorbers for absorption refrigerating machines.** GEBRÜDER SULZER A.-G. Ger. 478,337, Feb. 3, 1926 and 478,338, Aug. 25, 1926.
- Refrigerating apparatus of the absorption type.** GUIDO MAIURI and FORTUNATO N. MORASCHI (to Anton E. Anderson and Raoul F. Bossini). U. S. 1,720,603, July 9.
- Structural features.**
- Refrigerating apparatus of the absorption type.** A. J. E. MUTERS. Brit. 301,941, Aug. 2, 1927.
- Refrigerating apparatus of the absorption type.** ELIAS WIRTH-FREY. U. S. 1,720,160, July 9. Structural features.
- Refrigerating system of the absorption type.** H. KEMMER. Brit. 301,837, Dec. 6, 1927. Waste heat from gas plants is used to heat the generator of an absorption refrigerating app. and the refrigerating effect of the app. is utilized to make ice or to cool the gas produced to effect condensation of tar, etc. An arrangement of app. is described.
- Refrigerating apparatus of the compression type.** CLARENCE M. DAVISON (to Poole Engineering and Machine Co.). U. S. 1,720,171, July 9. Structural features.
- Refrigerating apparatus of the compression type.** C. L. HEISLER (to British Thomson-Houston Co., Ltd.). Brit. 301,833, Dec. 6, 1927. Structural features.
- Refrigerating apparatus of the compression type.** HARRY B. HULL (to Frigidaire Corp.). U. S. 1,719,841, July 9. Structural features.
- Refrigerating apparatus of the compression type.** CHARLES L. MCCUEN (to Frigidaire Corp.). U. S. 1,720,797, July 16. Structural features.
- Refrigerating apparatus of the compression type.** C. STENSTRUP (to British Thomson-Houston Co., Ltd.). Brit. 301,746, Dec. 3, 1927. The oil bath of the app. is heated (as by an elec. resistance heater) during the periods when the app. is inactive, in order to prevent collection of condensed refrigerant in the oil.
- Refrigerating apparatus of the compression type.** NORMAN T. WILCOX. U. S. 1,720,310, July 9. Structural features.
- Compression refrigerating machine.** CHICAGO PNEUMATIC TOOL CO. Ger. 478,199, Mar. 4, 1927. Addn. to 473,414 (C. A. 23, 3034).
- Device for deaerating the liquid separated in a compression refrigerating machine.** GEB. SULZER A.-G. Ger. 477,846, Mar. 3, 1927.
- Refrigerating compressor.** MAX GOMPERTZ. Ger. 478,335, Jan. 14, 1927.
- Rotary refrigerating machine.** OTTO HARDING. Ger. 477,775, Apr. 16, 1926.
- Details of the condenser.**
- Cooling the condenser of a rotary refrigerating machine.** AKT.-GES. BROWN BOVERI & CIE. Ger. 477,774, Dec. 7, 1926.
- Insulating electric conductors.** GEORGE L. SCHNABLE (to Western Elec. Co.). U. S. 1,720,749, July 16. Material such as wire is provided with a baked laminated insulation one layer of which is formed from a cellulose deriv. such as cellulose acetate and a synthetic resin such as one formed from a phenol and another layer of which is formed from a solid hydrocarbon material such as ozocerite and a non-drying vegetable oil such as castor oil.
- Electrical insulation with tricresyl phosphate.** WILLIAM F. DOERFLINGER. U. S. 1,721,295, July 16. Tricresyl phosphate is used as a dielectric in transformers, switches, etc.

## 14—WATER, SEWAGE AND SANITATION

EDWARD BARTOW

- The Oasis of Farafrah and its springs.** A. AZADIAN. *Bull. inst. Egypte* 10, 49-59 (1929).—Complete mineral analyses of the waters of 29 springs found upon the Oasis of Farafrah showed that all but one (Ain Ghanem) contained good potable water.
- K. S. MARKLEY
- Ain Syra spring.** A. AZADIAN. *Bull. inst. Egypte* 10, 45-8 (1929).—The level of the water of this spring undergoes a marked seasonal variation which results in a

similarly marked variation in its chem. compn. Complete chem. analyses made at 3 month intervals over a period of  $2\frac{1}{2}$  yrs. showed a considerable variation in its content of Mg and Na salts. During the period of low water in the Nile the mineral content of the water of the spring was found to be only half as great as during the high stage. Since the water is not of const. compn. it should not be used as a mineral purgative.

**The Cologne water system and the new water works at Weiler.** E. H. PRENGER. *Gas. u. Wasserfach Special No.*, 31-3(Apr. 19, 1929). K. S. MARKLEY

**Yankton abandons artesian wells for Missouri River.** F. G. BRUECKMANN. *Eng. News-Record* 102, 990-2(1929).—Water obtained from artesian wells had a total hardness of 960 p. p. m., permanent hardness of 830 p. p. m., and Fe content of 2.5 p. p. m., the latter causing widespread staining of plumbing fixtures. To obtain water from the river, intake shafts were constructed in the piers of the Meridian highway bridge; inlet openings were provided at two elevations, just below mean water level and below the stream bed. Single coarse screens were placed in the upper openings and 2 screens with coarse gravel between were provided in the lower openings. If satisfactory water is obtained through the latter the supply will be treated only with  $\text{Cl}_2$ , but if river water from the higher inlets has to be employed provision has been made for construction of a plant for treatment by coagulation and filtration in addn. to chlorination. R. E. T.

**Elimination of red water trouble at Asbury Park, N. J.** STUART K. KNOX. *Eng. News-Record* 102, 1040(1929).—The plant of Asbury Park consisted of 5 deep wells pumped by air lift, 0.2-million gallon settling basin and pressure filters with a nominal capacity of 1.6 million gallons per day, the latter often being operated at twice the rated capacity. The well water is soft and contains 27.5 p. p. m. free  $\text{CO}_2$  and 8.5 p. p. m. Fe. The corrosive nature of the effluent, together with its Fe content, resulted in red water. To correct this condition an aerator consisting of a series of steel pans with alternate perforated and plain sections was installed, timber inlet and outlet flumes were constructed in the basin to eliminate short circuiting and 2 additional 0.5-million gallon per day filters were added. The sand in the old filter units, which had an effective size of 0.92-1.03 mm., was replaced with sand having an effective size of 0.49 mm., and a 25,000-gallon wash water tank was erected so that all the filters could be washed with filtered water. These improvements eliminated the overloading and provided effective filtration.

**Ground and spring water supply of the South Bavarian tertiary region.** LOTHAR REUTER. *Gas u. Wasserfach* 72, 593-602(1929).—A discussion of the geological and hydrological aspects of the ground and spring water in South Bavaria, with mention of mineral water springs and gas and sulfur water wells. R. E. THOMPSON

**The subterranean water resources of Great Britain.** EDGAR MORTON. *Munich. Eng. Sanit. Record* 82, 600(1928).—A brief progress report is made on the mapping of water-bearing formations. R. W. RYAN

**Chemical investigation of subterranean waters.** N. E. KUSHLYANSKII. *Zh. Prikladnoi Khim.* 2, 179-89(1929).—Subterranean waters in the district of Smolensk were investigated. Pollution is at its max. in March and April. Exptl. results showing  $\text{Cl}$ ,  $\text{HNO}_3$ ,  $\text{HNO}_2$  and  $\text{NH}_3$  content of waters over a period of 8 months are tabulated. C. H. BADGER

**Chemical water statistics of German communities.** K. THUMM. *Gas u. Wasserfach* 72, 337-44, 370-3, 404-7, 430-5, 450-5, 470-5, 498-503 and 532-7(1929). The chem. compn. of water of 706 German communities is given. This is also available as a reprint. V. KALICHEVSKY

**Chemical analysis of twelve samples of water collected on an expedition to Sinai.** N. GEORGIADÈS BEY. *Bull. inst. Egypte* 10, 105-14(1929).—Complete chem. analyses were made of the waters obtained from the saline deposits and springs of Moses or Ayun Moussa where according to biblical tradition the Jews were supposed to have ended their flight from Egypt, the oasis of Garandel, Tahib, Ouadi, etc. Some of these waters are potable while others are highly mineralized. R. W. RYAN

**Chemical study of the waters from the wells of the Libyan desert.** N. GEORGIADÈS BEY. *Bull. inst. Egypte* 10, 1-10(1929).—Complete mineral analyses of the waters of a no. of wells in the Libyan desert are presented together with the analysis of saline deposits found in their vicinity. K. S. MARKLEY

**Note on the waters of Ayun Hamman Moussa.** A. AZADIAN. *Bull. inst. Egypte* 10, 11-17(1929).—Analyses show these waters contain a large amt. of  $\text{NaCl}$  and  $\text{CaSO}_4$ . They may be classified as slightly sulfurous but they cannot be compared to the waters of Héluan which contain a high proportion of  $\text{H}_2\text{S}$ . They can be utilized as baths because of their high temp. K. S. MARKLEY

**Tulsa building a 24-m. g. d. water purification plant.** F. M. VEATCH. *Eng. News-Record* 102, 964-6(1929).—A purification plant, at present under construction, and other improvements, are described and illustrated. The settled water will be aerated by compressed air introduced through diffuser plates in the flume connecting Mohawk Lake and the plant, coagulated with lime and alum, filtered through 6 rapid sand filters and finally chlorinated. Interesting features of the plant will include a slotted stilling baffle in the coagulation basin and brass filter underdrain laterals with 2 rows of impact orifices. R. E. THOMPSON

**Water softening plant at Marion, Ohio.** GEORGE WHYSALL. *Munic. News and Water Works* 75, 209-10(1928); *U. S. Pub. Health Eng. Abstracts* E-785c, 46.—Well water is softened by the lime-soda process; the future installation of zeolite softeners is provided for. Details of the treatment are described. The lime reaction is completed before the soda ash is added to the water in the mixing tanks. Alum doses of 0.2 to 0.23 gr. per gal. are added to facilitate coagulation. A Dorr clarifier is used to settle the softened and coagulated water. The turbidity of the effluent of the clarifiers is approx. 2.0 p. p. m. The water can best be carbonated as it enters the clarifying tank and the alum dose is most effective when added at this point. The effluent from the final settling tank following carbonation has an av. turbidity of about 0.5 p. p. m., whereas previously it was as high as 10 to 15 p. p. m. By carbonation the total alk. is decreased from an av. of 55 to 30 p. p. m. and at times to 20 to 25 p. p. m. C. R. FELLERS

**Methods of providing drinking water at coach yards, including study of hydrants, nozzles, connections, etc.** C. M. BARDWELL, et al. *Am. Ry. Eng. Assoc. Proc.* 30, 202-6(1929).—The sanitary handling of supplying drinking water to passenger coaches where through trains are watered is handicapped by lack of time. Better instruction of forces is recommended. R. C. BARDWELL

**Value of a water purification laboratory to a municipality.** NORMAN J. HOWARD. *Contract Record and Eng. Rev.* 43, 735-7(1929).—An outline and discussion of the activities of the Toronto Filtration Plant Laboratories. R. E. THOMPSON

**Hygienic control of water supplies.** BERNHARD BÜRGER. *Gas u. Wasserfach Special No.*, 21-8 (Apr. 19, 1929). R. W. RYAN

**The Provincial Department of Health's relation to the water-works engineer.** A. E. BERRY. *Contract Record and Eng. Rev.* 43, 733-4(1929).—The activities of the Ontario Provincial Dept. of Health in the field of water supply are briefly discussed. Of the 270 water systems in operation in Ontario, 184 are supplied from surface sources and 86 from wells and springs. Seventy-five % of the water used for domestic purposes is chlorinated. The standard requirement for  $\text{Cl}_2$  dosage is a residual of 0.1 to 0.3 p. p. m. free  $\text{Cl}_2$  after 15 min. contact, depending on local conditions. There are now 21 activated sludge plants in operation in Ontario municipalities and 10 in institutions. R. E. T.

**Coöperation produces results in water treatment.** R. E. COUGHLAN. *Ry. Eng. and Maintenance* 25, 158-61(1929).—The water supply used on the 10,215 miles of the Chicago and Northwestern railroad varies from a total dissolved solid content of 3.0 to 209.74 gr. per gal. The first water-softening plant was built in 1904 and 53 are now in service. At other points, a boiler compd. made by company forces is used through a special device attached to the locomotives. A blow off schedule is in effect and a corrosion investigation is under way. R. C. BARDWELL

**Operating aspects of water service.** C. R. KNOWLES. *Ry. Age* 86, 1569-71 (1929).—A general review of Ry. Water Service Activities is given including an est. of 200 billion gallons treated annually at a cost of \$10,000,000. R. C. BARDWELL

**Mechanically cleaned sedimentation tanks for water treatment.** C. T. LEANDER. *Contract Record and Eng. Rev.* 43, 738-41(1929).—There are 30 mechanically cleaned sedimentation basins in operation in United States and Canada. The cost of operation is low,  $\frac{3}{4}$  h. p. being required for a 50-foot unit and 2.78 h. p. for a 200-foot unit. The gentle stirring by the revolving rakes increases the density of the sludge, reducing its water content 5 to 10%. Substantial savings in the cost of chemicals can frequently be effected by preliminary sedimentation of highly turbid water in mechanical clarifiers. R. E. THOMPSON

**Building water stations "out of face."** C. R. KNOWLES. *Ry. Eng. and Maintenance*, 25, 204-8(1929).—The Illinois Central railroad has provided 8 new plants with a total annual capacity of 336,000,000 gal. for new 169-mile line from Edgewood, Ill. to Fulton, Ky. On account of the ground water being limited and of poor quality, reservoirs were required to conserve surface supplies. Standardization was followed, as far as possible, with oil engine power units, centrifugal pumps, pipe lines, and 100,000 gal. capacity creosoted pine storage tanks. R. C. BARDWELL

Watch your water supply's turbidity. J. R. BAYLIS. *Water Works Eng.* 82, 525-6, 550, 553(1929).—A discussion of the significance of and methods for detn. of filter-plant turbidities; of size of particles; of effect on bacteria of turbidity removal; of flocc detectors; of erratic results; and of how Baltimore controls turbidity-measurement standards. E. I. S.

Water consumption varies with standards of living and fluctuations in industrial conditions. ABEL WOLMAN. *Eng. News-Record* 102, 943-8(1929). R. E. T.

Municipal water supplies and the effect of trade wastes in relation to the use of water in power plant practice. V. BERNARD SIEMS, et al. *Fuels and Steam Power (A.S.M.E. Trans.)* 51, No. 12, 87-9(1929).—This is a progress report of Sub-Committee No. 7 on Municipal Water Supply in Relation to Boiler use. There is included a bibliography of 61 titles. E. H.

Control of chlorination of water supplies. ELLIOTT H. PARKS. Ind. State Board of Health, *Mo. Bull.* 32, 35-6(1929); *U. S. Pub. Health Eng. Abstracts E-856a*, 85.—The amt. of Cl used per million gals. of water in Indiana water supplies varies from 2-20 lb. A measurable excess of Cl of 0.1-0.3 p. p. m. in all drinking water is recommended. C. R. FELLERS

Chlorination of waters for industrial use [especially tannery water]. MARTIN AUERBACH. *Cuir tech.* 17, 428-9(1928).—See C. A. 23, 1705. J. G. N.

Chlorine control for a small direct-pressure water system. EARNEST BOYCE. *Eng. News Record* 102, 1042(1929).—For Cl<sub>2</sub> control adopted for a small supply (0.25 m. g. d.) in Kansas obtained from an infiltration gallery and pumped directly into the mains, a small concrete well was constructed which serves both as a mixing tank for the Cl<sub>2</sub> and as a suction well for the centrifugal pump. The water flows from the infiltration gallery into the well at a const. rate, controlled by a fixed orifice with const. but manually controllable head, slightly in excess of the max. pumping rate and an overflow is provided to waste the difference between the inflow and the amt. being pumped into the mains. This arrangement permitted the installations of a relatively less expensive type of chlorination equipment. R. E. THOMPSON

Feeding chlorine through long pipe proves satisfactory. AUGUST V. GRAP. *Eng. News Record* 102, 938(1929).—At the Chain of Rocks plant, St. Louis, Cl<sub>2</sub> is introduced at the point of application of the secondary coagulant at the north end of the filter plant, 800 ft. from the unloading floor. In a room built on the unloading floor 6 batteries of 8 Cl cylinders were connected to manifolds, which in turn were connected to a 3/4-inch galvanized pipe; this conveys the Cl to the chlorinators at the north end of the plant. Liquefaction of the Cl<sub>2</sub> in passing through the pipe gallery, where the temp. is always low, has been eliminated by the installation of a reducing valve in the line in the Cl<sub>2</sub> room and by maintaining a pressure of less than 100 lb. per sq. in. R. E. THOMPSON

Electrolytic chlorine for the destruction of algae. WM. T. BAILEY. *Am. City* 40, 103-5(1929); *U. S. Pub. Health Eng. Abstracts E-846a*, 80.—At Council Bluffs, Ia., the periodic use of CuSO<sub>4</sub> quickly destroyed algae growths in the water supply. Expts indicate that 0.8-1.0 p. p. m. of Cl almost completely stopped the growth of algae in the settling tanks and greatly inhibited their growth in the clear water basins. Electrolytic cells were installed for the manuf. of Cl. The current input of the cells was regulated to produce from 0.5-1.0 p. p. m. of Cl. Cl obtained from the electrolytic cells and com. Cl were compared as to efficiency but no differences were noted providing equal amts. of each were used. C. R. FELLERS

The destructive action on aqueous bacterial suspensions of small doses of chlorine introduced under violent agitation and by means of metallic powders. E. TECHOUEVRES. *Rev. hyg. méd. prév.* 51, 393-425(1929).—As little as 0.1 mg. of Cl added to 1 l. of river water and carefully mixed, either destroys or profoundly alters such bacteria as *B. coli* and *B. typhosum*. This amt. of Cl could not be detected by taste. With *B. typhosum* the Cl acting for 1 hr. on a suspension of 91,800 bacteria per l. destroyed 91.8%. Complete sterilization required from 0.2 to 0.3 mg. of Cl. per l. Thorough mixing was essential for best results. *B. coli* proved somewhat more resistant to Cl than *B. typhosum*. Simple agitation of colon or typhoid bacilli in distd. H<sub>2</sub>O for 6 min. reduced the numbers from 80 to 100%. Metallic Pb, Sn, Cu, Zn, brass and bronze powders (0.01 g. per 100 cc. of distd. H<sub>2</sub>O) were added to *B. coli* suspensions. Although some sterilizing action was effected after several hours exposure, there was only slight immediate effect. Brass powder reduced an original count of *B. coli* of 185 (av.) to 47 immediately after mixing; 211 to 5, after 3 hr.; and 104 to 1 after 24 hr. When bacterial suspensions were filtered over beds of powd. metals, a considerable reduction in nos. of organisms was effected, the rate of destruction being, in general, proportional to the time exposed. C. R. FELLERS

**Corrosive action of water corrected by hydrated lime treatment.** E. SHERMAN CHASE. *Eng. New-Record* 103, 70(1929).—The water supply of Falmouth, Mass., pumped from a natural pond, is practically free of mineral constituents,  $\text{CO}_2$ , Fe and color, supersatd. with dissolved  $\text{O}_2$  and highly corrosive. The water delivered to the consumers was discolored, particularly during the winter months when the consumption was low and the water remained in contact with the pipes for a considerable period. Lab. tests indicated that the corrosiveness could be corrected more efficiently with  $\text{Ca}(\text{OH})_2$  than with  $\text{Na}_2\text{CO}_3$  or  $\text{Na}_2\text{SiO}_3$ . The 83 lb.  $\text{Ca}(\text{OH})_2$  required per million gallons will increase the hardness about 10 p. p. m.

R. E. THOMPSON

**Study and report on incrustation in pipe lines and methods of prevention particularly where treated water is used.** E. M. GRIME, et al. *Am. Ry. Eng. Assoc. Proc.* 30, 154-7(1929).—Softening of water to one gr. per gal. or less will reduce incrustation materially.  $\text{CO}_2$  treatment is not desirable in boiler-water supplies. R. C. B.

**The causes and extent of pitting and corrosion of locomotive boiler tubes and sheets, giving consideration to quality of water, character of metals, methods of manufacture and types of construction.** O. T. REES, et al. *Am. Ry. Eng. Assoc. Proc.* 30, 126-32(1929).—With a review of railroad conditions, the following recommendations are made to reduce pitting and corrosion; use corrosion-resistant material, eliminate defects in manuf., equalize strains by proper design, remove gases from water by feedwater heaters, remove Mg salts from water, reduce H-ion concn., carry excess NaOH in boiler waters, and protect boilers from corrosion during storage.

R. C. BARDWELL

**Control of boiler-water treatment to prevent embrittlement.** FREDERICK G. STRAUB. *Mech. Eng.* 51, 366-7(1929).—Boiler water should be analyzed to find out if the sulfate-alky. ratio conforms to that recommended by the Am. Soc. of Mech. Eng. boiler construction code. If not, it should be treated to prevent embrittlement (cf. C. I. 23, 2231). Either  $\text{Na}_2\text{SO}_4$  in direct proportion to the total alky. or Na phosphate at a definite set figure largely independent of the alky. are most used in boiler water as inhibiting agents. To check the treatment rapid and simple detns. are needed. Alky. is detd. by titrating 100 cc. of the boiler water with 0.19 N  $\text{H}_2\text{SO}_4$ . Turbidimetric detns. of sulfate are more suited to boiler-rooms than the gravimetric detn., but, as the fineness of the ppt. depends upon the manner of its pptn., it must be checked frequently against the gravimetric method. Phosphate is detd. by measuring the vol. of the ppt. of phosphomolybdate in a bulb having a graduated capillary tube, or if inconvenient to heat the solns. is detd. by the following modified colorimetric method. Measure 50 cc. of sample into a 250-cc. volumetric flask with 10 cc.  $\text{H}_2\text{SO}_4$  (3 + 22). Add 5 cc. of molybdic acid soln. (made by dissolving 125 g. pure  $(\text{NH}_4)_2\text{MoO}_4$  without heat in 2000 cc. water, adding slowly 75 cc. concd.  $\text{H}_2\text{SO}_4$  and making to about 2500 cc. vol. with water) followed by 5 cc. hydroquinone soln. (made by dissolving 50 g. pure hydroquinone in about 2500 cc. phosphate-free water to which 3 cc. concd.  $\text{H}_2\text{SO}_4$  is added). After 5 min. 15 cc. of carbonate-sulfite soln. (made by dissolving 1500 g. com. soda ash in 6000 cc. distd. water and adding 225 g. Na sulfite dissolved in 1500 cc. water) is added and the flask made to vol with water. The blue color developed is compared with that formed in standard phosphate solns. prepd. in the same manner. The stock phosphate soln. is made by dissolving in water 0.1432 g.  $\text{KH}_2\text{PO}_4$  dried at  $105^\circ$  for 3 hrs., adding 5 cc. concd.  $\text{H}_2\text{SO}_4$  and making to 1000 cc. 1 cc. = 0.1 mg. phosphate. High Fe content and certain highly colored org. matter interfere with this test. Comparisons must be made in 15 min. after the addn. of the carbonate soln. as the color fades. This method should be checked against the gravimetric detn.

C. H. BADGER

**Combating boiler corrosion.** C. H. KOYL. *Boiler Maker* 29, 164-5(1929).—Presence of NaOH in treated waters has nearly annihilated corrosion of all kinds. Use of soda-ash on hard-water division between Perry, Ia. and Council Bluffs, Ia. has nearly done away with pitting.

E. I. S.

**Cost of impurities in locomotive water; report on methods of water treatment where complete lime and soda-ash treating plants cannot be justified or pending their construction.** C. H. KOYL, et al. *Am. Ry. Eng. Assoc. Proc.* 30, 133-8(1929).—Soda ash, Na aluminate and proprietary compds. are recommended. R. C. B.

**Cost of impurities in locomotive water; review progress in water treatment on railroads and report on possible future development.** C. H. KOYL, et al. *Am. Ry. Eng. Assoc. Proc.* 30, 139-42(1929).

R. C. BARDWELL

**Biochemical oxygen demand of certain substances.** G. E. SYMONS WITH A. M. BUSWELL. *Ind. Eng. Chem., Anal. Ed.* 1, 161-2(1929).—Using the diln. method for detg. biochem. O demand, the O demands of pure substances such as starch, urea, Na palmitate, lactose, cellulose and peptone were detd. Compds. contg. both C and N show two-stage oxidation.

A. L. ELDER

**Report on the use of gravity and pressure filters.** D. A. STEEL, *et al.* *Am. Ry. Eng. Assoc. Proc.* **30**, 158-70(1929).—A survey indicates that only a small percent of railway water supplies are equipped with filters. A rapid gravity type is preferred. A general description outlining fundamental principles is given. R. C. BARDWELL.

**Active charcoal filter for improving taste of potable water.** IMHOFF AND SIERP. *Gas. u. Wasserfach* **72**, 465-6(1929).—Chlorophenols, algae and mineral substances giving a bad taste to drinking water may be removed by passing the previously purified and chlorinated water over an active charcoal filter. The resultant filtrate is free from taste. A plant for treating about 25,000 cu. m. of water daily cost 20,000 M. R. W. RYAN.

**Rapid sand filtration plants. Important factors to be considered in designing modern plants.** T. C. HERSEY. *Water and Water Eng.* **31**, 227-9(1929).—See C. 1 23, 2516. J. A. KENNEDY.

**Specifications for filter sand and gravel.** ANON. *Am. City* **40**, 92-3(1929).—Filter sands and gravels are discussed with respect to their use in water filtration plants and sewage treatment works. The effective size and chem. compn. are presented in tables. C. R. FELLERS.

**Coal and sand as filter media.** O. J. RIPPLE. *Water Works Eng.* **82**, 327 & 358(1929).—R. describes Denver water-works expts. designed to det. the advantages in combination of sand and anthracite coal as filter material and proper proportions of each. E. I. S.

**Observations on ice.** P. BALAVOINE. *Mitt. Lebensm. Hyg.* **20**, 77-8(1929).—The cloudiness in the center of blocks of artificial ice is only partly due to the gas dissolved in the water. It may also be caused by the mineral matter in hard water putg out, during the freezing process, as shown by the presence of a ppt. in the melted ice, and to droplets of satd. solns. of these salts. When ice is to be analyzed it should be melted in a closed vessel, since in melting it tends to absorb  $\text{NH}_3$  from the air. This fact may explain the presence of  $\text{NH}_3$  in cistern water obtained from melted snow.

**Modern Venturi water meters.** G. EGGERS. *Gas u. Wasserfach Special No.*, 43-53(Apr. 19, 1929).—Discussion, with diagrams and many illustrations of German types. R. W. RYAN.

**Recent advances in public health bacteriology.** W. T. WILSON. *Munic. Eng. Sanit. Record* **82**, 600(1928).—The great majority of typhoid "carriers" are non-infective. C. H. BADGER.

**How Lunéville eliminated typhoid fever.** DELORME. *L'eau* **22**, 51-4(1929).—Since the javellization of the city water supply from the River Meurthe in 1914, the typhoid and paratyphoid fell from an annual av. of 23 cases to less than 1 case per year. C. R. FELLERS.

**Typhoid fever in the large cities of the United States in 1928.** ANON. *J. Am. Med. Assoc.* **92**, 1674-6(1929); *J. Am. Water Works Assoc.* **21**, 963-74. E. H.

**The intestinal bacteria of fishes from the standpoint of the hygienic estimation of drinking water.** I. E. MINKEVICH AND N. A. TROFIMNK. *Z. Hyg.* **109**, 39(1928), *U. S. Pub. Health Eng. Abstracts E-840a*, 78.—Coliform bacteria in the intestines of fish were cultured on 2% glucose peptone soln. and incubated at 46°. Gas formation in this medium, in a majority of cases, indicates the presence of *B. coli* of animal or human origin. The intestinal tracts of fish are inimical to the growth of genuine *B. coli* from warm-blooded sources, even when the fish are taken from polluted waters. C. R. F.

**Water and sewage control for state institutions.** GEORGE L. HALL AND W. W. BLOHM. *Eng. News-Record* **103**, 52(1929).—A plan developed in Maryland for supervision of water and sewage works at state institutions is described. Results obtained to date at 4 of the 9 state institutions have been encouraging. R. E. THOMPSON.

**The Kew experimental sewage-treatment plant.** H. A. WOOD. *Australian Munic. J.*, 1929, 398-403; *U. S. Pub. Health Eng. Abstracts E-840b*, 66.—The Kew plant consists of a 2-story tank, filter bed, humus tank and sludge beds. The per capita flow is 23 imp. gal. per day. The raw sewage contained 1680 p. p. m. total solids and 920 p. p. m. suspended solids. The treatment reduced the suspended solids 90% and the  $\text{O}_2$  consumed at least 95%. C. R. FELLERS.

**The efficiency of settling tanks in sewage-treatment plants.** M. B. TARK. *Am. City*, **40**, 99-100(1929); *U. S. Pub. Health Eng. Abstracts E-856*, 72; *cf. C. A.* **23**, 3040.—Essential features in the design of sedimentation tanks are (1) means for decreasing the velocity of flow, (2) provision of a zone of quietness for the accumulation of solids and (3) means of removing the accumulated solids. Rectangular vertical-flow tanks give a higher % removal than horizontal-flow tanks. The speed of the sludge removal mech-

anism should be as low as possible, and not in excess of 3-5 ft. per min. Intermittent operation once a day in cool weather and twice a day in warm weather gives best results.

C. R. FELLERS

**Sewage purification with special attention to gas recovery.** BLECH. *Gas u. Wasserfach* 72, 579-84(1929).—Methods of removing solids from sewage are reviewed and compared, with special attention to the methods (Emscher, etc.) involving fermentation of the sludge with gas recovery. Results of an exptl. plant at Waldenburg are presented which indicate that it is desirable to heat the fermentation chamber in cold weather to secure max. gas production, as this occurs (at Waldenburg) at 32°. The rate of gas evolution over a period of 2 months is shown graphically. Sufficient gas should be produced to supply all heat and power requirements for the disposal plant and leave an excess for sale.

R. W. RYAN

**Sewage material and various treatment processes for its removal.** PRÜSS. *Gesundh. Ing.* 52, 246-8(1929).—Of the total sewage material, about  $\frac{3}{4}$  is insol. and  $\frac{1}{4}$  is sol. Two-thirds of the insol. sewage material will settle and  $\frac{1}{3}$  will not. The insol. sewage material consists of 30% mineral matter and 70% org. matter. One-fourth of the total sewage material is org. and is about  $\frac{1}{3}$  colloidal and  $\frac{2}{3}$  crystalloidal. Mech. sludge removal will remove about 95% of the insol. sewage material. Biol. treatment in conjunction with mech. sludge removal will remove all but 5% of the total sewage material.

WAYNE L. DENMAN

**Sludge digestion.** C. G. GILLESPIE. *Calif. Sewage Works J.* 1, 75-86(1928); *U. S. Pub. Health Eng. Abstracts E-840*, 69.—If digestion is too prolonged, decompn. accompanied by offensive odors occurs. A properly functioning tank must maintain a balance of approx. 50 times the amt. of ripe sludge (dry basis) as raw sludge. In Calif. most tanks are operated at too low a sludge level, i. e., the tanks contain only semi-digested and raw sludge. Agitation materially reduces the time of digestion. CaO proved very useful in neutralizing raw sludge acidity and thus accelerating digestion.

C. R. FELLERS

**The associations opportunity for promoting railway sanitation.** H. W. VAN HOVEN-BERG. *Am. Ry. Eng. Assoc. Proc.* 30, 207-9(1929).—Possible saving to be effected warrants study and standardization of items involving railway sanitation.

R. C. B.

**Kentucky swimming-pool regulations.** KENTUCKY STATE BOARD OF HEALTH. *J. Am. Assoc. for Promoting Hyg. and Pub. Baths* 10, 68-9(1928); *U. S. Pub. Health Eng. Abstracts E-840a*, 7.—Excess Cl limits shall be 0.2 to 0.5 p. p. m. when Cl compds. are used. When alum is used water shall test alk. Water shall be clear enough to show a 6-in. disk at the deepest pt. from a distance of 10 yds. Water should not be heated to over 22°. 2°.

C. R. FELLERS

**River pollution and its effects.** J. H. COSTE. *Munic. Eng. Sanit. Record* 82, 600(1928).—A brief discussion on the careful treatment and protection given to the water supply of London, England by authorities.

C. H. BADGER

**The prevention of odor nuisance in the disposal of creamery wastes by treatment with chlorine preliminary to broad irrigation.** E. A. REINKE. *Calif. Sewage Works J.* 1, 128-32(1928); *U. S. Pub. Health Eng. Abstracts E-840b*, 61.—Chlorination of fresh creamery wastes followed by irrigation at Waco, Calif., effectively controlled the odors in creamery waste disposal. The chlorinator was set up at the creamery discharging directly into the sewer. The wastes were about 1 hr. old when they reached the 15 $\frac{1}{2}$  acre irrigation farm. Approx. 125,000 gal. of waste was handled daily. A Cl dose of 20 p. p. m. was the min. required to control odor. Over-chlorination produced offensive chem. or medicinal odors at times. The total cost of disposal (av. 3 months) was 0.096¢ per gal.

C. R. FELLERS

**Treatment of paper-mill wastes.** ABEL WOLMAN. *Munic. News and Water Works* 76, 131(1929); *U. S. Pub. Health Eng. Abstracts E-856*, 72.—The waste treatment of the large plant of the Congoleum-Navin Co. is discussed. A treatment of 90 grains per gal. of CaO and 50 grains per gal. of alum, produced an effluent approx. equal to that obtained with alum at the rate of 140-180 grains per gal.

C. R. FELLERS

**The toxicity to animals of alkaline effluents.** L. HUGOUNENG, A. MOREL AND A. JUNG. *Ann. hyg. publ. ind. sociale* 6, 43-9(1928); *Bull. Hyg.* 3, 754(1928).—Alkali effluents emptied into the river at low stage killed fish and caused diarrhea in animals which drank it. Analysis showed 0.04 g. of NaOH and 0.212 g. of NaHCO<sub>3</sub> per l. Small quantities of Sn, Pb and Na were present. A soln. of less strength caused diarrhea and wasting for several days.

GEORGE R. GREENBANK

A process for rendering harmless the waste waters from a beet sugar factory (BACH)  
28. General properties of boiler tubes with special reference to the relation between

corrosion and fuel (KINUKAWA) 9. Effect of nitrate O upon tannery effluent (THEIS, LUTZ) 29. The isolation of *B. typhosus* from sewage and shellfish (WILSON) 11C. Study of protective coatings for interior of steel tanks and underground pipe lines (DAVIDSON, *et al.*) 26. Sewage sludge as fertilizer (RUDOLFS) 15. Failures in steam boilers (POMP, BARDENHEUER) 21. Filter-press electrolyzer suitable for decomposing water (U. S. pat. 1,721,407) 4.

CONTRERAS, T. RAFAELA: *Ultimos procedimientos empleados para análisis de agua*. Santiago: Imprenta "San Pablo." 24 pp.

EHRENFELD, CHAS. H. and GIBBS, RALPH E.: *Water for Ice-Making and Refrigeration. A Treatise on the Questions Involved in Water Analysis and Its Interpretation*. Chicago: Nickerson & Collins. 152 pp. Linen, M. 3.50; leather, M 4.50.

SWINSON, E. THOMAS: *The Sanitation of Buildings*. New York: Oxford Univ Press, Am. Branch. 465 pp. \$10.

**Apparatus for filtering water and treating it with emanations from radioactive material.** F. L. MAIN. Brit. 302,095, March 19, 1928. An app. is described having a sand and charcoal filter and contg. a receptacle which may be charged with ore contg. carnotite.

**Open-tank filter.** A. C. HANDLEY. Brit. 302,446, Oct. 15, 1927. A filter is described suitable for treating sewage and "trade effluents" and which may contain coir fiber and sand.

**Apparatus for softening water by treatment with zeolites.** ANDREW J. DOTTERWEICH. U. S. 1,721,105, July 16. Structural features.

**Apparatus for softening water with zeolites and regenerating the used material.** CLIFFORD F. SMITH. U. S. 1,719,908, July 9. Structural features.

**Apparatus for softening water with base-exchange substances.** UNITED WATER SOFTENERS, LTD., and H. S. LAWRENCE. Brit. 302,744, Sept. 29, 1927. Salt for regenerating the water-softening material is formed into a sludge or scurry and drawn into the app. by use of an ejector. Various structural details are described.

**Base-exchange silicate.** ROBERT O. FRIEND and EDWIN M. PARTRIDGE (to Permutit Co.). U. S. 1,720,074, July 9. A batch of greensand is treated with Na silicate, washed thoroughly, and Al sulfate is then added to the batch in a quantity greater than can be neutralized by the remaining Na silicate, so as to impart an acid character to the soln. Cf. C. A. 22, 4694.

**Base-exchanging silicates.** A. ROSENHEIM. Brit. 302,690, Dec. 20, 1927. Silicates such as glauconite or artificial alkali Al silicates are stabilized and have their base-exchanging capacity increased by treatment first with acid-reacting aq. solns. of salts of metals which are at least divalent and then with aq. solns. of neutral alkali metal salts such as NaCl. Salts of Fe, Mn, Al, Cr, Ni, Cu, Zr, Zn, Sn or Ti may be used in the first stage of the treatment. Various examples are given.

**Treating boiler-feed water.** PHILIPP SCHENITZA. Ger. 478,450, Jan. 30, 1925. A compn. to be added to the water for preventing and removing incrustation comprises a resin, gum, borax and waterglass, suitably in the relative proportions 60, 20, 10 and 10, resp.

**Distilling boiler-feed water.** NAAMLOOZE VENNOOTSCHAP NECKAR WATERREINIGER MAAATSCHAPPIJ and H. NOORDENDORP. Brit. 301,666, Jan. 10, 1928. Steam obtained by expanding the sludgy water from a boiler is used to evaporate the make-up feed water for the boiler. An arrangement of app. is described.

**Incrustation preventive and remover for use in boilers.** JOHN H. OBERHOLTZER (one-half to Robert C. Murphy). U. S. 1,720,565, July 9. Starch (0.5-5.0 lb.) is used with a soln. of 1-5 lb. alkali meta hydroxide in 20-100 gals. water in which 0.5-5.0 bu. of decayed wood have been digested.

**Distributing liquids on filter beds, cooling ponds, etc.** J. FORD. Brit. 302,817, Jan. 11, 1928. Mech. features.

**Biological purification of household refuse based on the principle of cesspools with colloidizers and nitrifying filters.** M. VAN ACKER. Belg. 355,669, Dec. 31, 1928. An app. is specified.



## 15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER

**Determination of total replaceable bases in soils.** R. H. BRAY AND F. M. WILHITE. *Ind. Eng. Chem., Anal. Ed.* 1, 144(1929); cf. *C. A.* 23, 462.—When the filtrate from a soil leached with a neutral  $\text{NH}_4$  acetate soln. was taken to dryness, carbonates of the replaceable bases were formed as a result of heating the acetates. This suggested the idea of detg. the total amt. of replaceable bases by titrating the carbonates or oxides thus formed.

E. F. SNYDER

**The hydrometer method for studying soils.** B. A. KEEN. *Soil Sci.* 26, 261-3 (1928).—Factors involved in the hydrometer method (*C. A.* 22, 292) for studying soils are given. The results show differences in hydrometer readings between top and bottom halves of the same suspension of between 10 and 30%, depending on the soil and the time of standing.

M. S. ANDERSON

**The microscopic method of studying bacteria in soil.** H. J. CONN. *Soil Sci.* 26, 257-9(1928).—An improved technic is described for staining bacteria in soils. The presence of a minute trace of a Ca salt decreases the soly. of the dye and improves staining power.

M. S. ANDERSON

**The hydrogen peroxide-hydrochloric acid treatment of soils as a method of dispersion in mechanical analysis.** G. B. BODMAN. *Soil Sci.* 26, 459-70(1928).—A comparison was made of the  $\text{H}_2\text{O}_2$ -HCl method and rubbing in dil.  $\text{NH}_4\text{OH}$  as a means of dispersion of 5 soils. A much higher degree of dispersion was obtained for a highly org. soil and for a calcareous one when the  $\text{H}_2\text{O}_2$ -HCl treatment was used. For a hardpan soil the  $\text{H}_2\text{O}_2$ -HCl treatment was entirely inadequate, and rubbing with  $\text{NH}_4\text{OH}$  was much more effective. A "black alkali" soil and a highly ferruginous clay soil were equally well dispersed by both methods. The advisability of treating Ca-satd. soils with  $\text{H}_2\text{O}_2$  and HCl is questioned. Comparisons made between the pipet-sedimentation method and the indirect  $\text{H}_2\text{O}$  vapor adsorption method for detn. of colloidal content of soils showed higher results by the latter method in each case. Black alkali soil showed excessively high results by the  $\text{H}_2\text{O}$  adsorption method.

M. S. ANDERSON

**Retention of phosphate by hydrated alumina and its bearing on phosphate in the soil solution.** LEWIS B. MILLER. *Soil Sci.* 26, 435-9(1928).—The extent to which the  $\text{PO}_4$  ion is carried down by pptg. alumina at different H-ion concns. was detd. in the following manner: 0.02 M  $\text{AlCl}_3$  contg. an equiv. quantity of  $\text{KH}_2\text{PO}_4$  was treated with varying quantities of NaOH in a total vol. of 500 cc. The  $p_H$  was detd. colorimetrically in the supernatant liquid after settling. The ppt. was washed and analyzed. From the  $p_H$  value at which pptn. begins up to a  $p_H$  value of 4.5 the mol. ratio of  $\text{Al}_2\text{O}_3$  to  $\text{P}_2\text{O}_5$  is 1:1; that is, the ppt. has the compn.  $\text{AlPO}_4$ . At higher  $p_H$  values the  $\text{PO}_4$  content of the ppt. rapidly decreases. The H-ion concn. at which the  $\text{PO}_4$  content of the ppt. becomes zero is not realized, since the ppts. formed at the higher  $p_H$  values are extremely colloidal and difficult to study. The indications are, however, that the  $p_H$  values above 8.5 the  $\text{PO}_4$  becomes small. It is thought permissible to apply these results to some extent to the hydrated  $\text{Al}_2\text{O}_3$  and  $\text{Fe}_2\text{O}_3$  of the soil colloids.

M. S. ANDERSON

**The effect of different proportions of calcium nitrate and potassium dihydrogen phosphate on the growth of wheat in sand cultures.** DUKE D. BROWN. *Soil Sci.* 26, 441-6(1928).—A high ratio of  $\text{Ca}(\text{NO}_3)_2$  to  $\text{KH}_2\text{PO}_4$  increased tillering and caused heavy succulent growth. High  $\text{KH}_2\text{PO}_4$  produced the heaviest root growth. Ca, K, P and S were absorbed in proportion to the concns. of these elements in soln. An increase of K decreased absorption of Mg. Fe and Al were practically const. in the ash of all plants. High Ca slightly inhibited absorption of  $\text{NO}_3$  ion. Total ash was high in all expts. but was highest in those showing chlorosis. Apparently growth abnormalities and low yields were due to the unusually high absorption of mineral elements from soln.

M. S. ANDERSON

**The ratio of sulfur to phosphorus in western Oregon soils and losses of sulfur through drainage and cropping.** J. S. JONES. *Soil Sci.* 26, 447-53(1928).—Chem. analyses of Oregon soils show wide variation in their content of S and P as well as ratio of S to P. The P content of a variety of crops grown in this region shows a slightly wider variation in P than in S. It is thought that no particular ratio of these two elements is indicative of optimum conditions from the standpoint of soil fertility. Absolute amts. of each element are, however, considered of first importance.

M. S. ANDERSON

**Exchangeable cations in soils as determined by means of normal ammonium chloride and electrodialysis.** BENJAMIN D. WILSON. *Soil Sci.* 26, 407-21(1928).—The exchangeable bases of 12 soils were studied by means of extn. with  $N \text{ NH}_4\text{Cl}$  and

by electro dialysis. Soils of different types varied widely as to quantity of cations extd. The quantity of cations present was to some extent an index of the fertility of the soils. The quantities of Ca replaced by  $NH_4Cl$  and by electro dialysis were in close agreement. Larger quantities of Mg and in some cases more K was extd. by  $NH_4Cl$  than by electro dialysis. When electro dialyzed soils were treated with  $NH_4Cl$  considerable Al was liberated, signifying a partial decompn. of the aluminosilicic complex. Titration of diffusates was found to be a more satisfactory measure of the cation content than detn. of  $NH_4$  adsorbed from  $NH_4Cl$ . Electro dialyzed soil when freed from sol. anions approached a reaction value of  $pH$  4.0. Cations extd. by  $NH_4Cl$  may include certain cations not held in the adsorbing complex of the soil, and hence, not exchangeable cations, as the term is usually employed.

**Crop response to lime on acid soils.** R. E. STEPHENSON. *Soil Sci.* 26, 423-34 (1928).—The exchangeable Ca of acid Oregon soils is much higher at the surface than in lower horizons. The soils appear to be inherently deficient in Ca as shown by the low exchangeable Ca and the high acidity of the parent soil-forming material  $CaCO_3$  treatments significantly increase the  $pH$  at the surface but the effect on the subsoil is very slight. There is a marked crop response to liming.

**Colloids and soil fertility.** A. DEMOLON. *Ann. sci. agron.* 46, 46-66(1929) — See C. A. 23, 1198.

**Lime, potash and alfalfa on Piedmont soils.** R. P. BLEDSOE. *J. Am. Soc. Agron.* 21, 792(1929).—It appears that rust or  $K_2O$  hunger in cotton following alfalfa is caused by the lime which is always applied for alfalfa in this section (South Carolina). The old idea that lime liberates  $K_2O$  does not seem to be true on these soils. Either the lime locks up the  $K_2O$ , so that the cotton plant cannot get it, or the lime greatly increases the need of cotton for this element.

**Rapid microchemical determination of potassium in soils and vegetation.** IDA LONSTEIN. *J. S. African Chem. Inst.* 10, No. 2, 27-31(1927).—Use is made of the cobaltinitrite method for detg. small quantities of  $K_2O$  in soils and vegetation. The general method, precautions, accuracy of the method, method for vegetation and soils and the time factor are discussed.

**Method for comparing the value of ammonia, nitrogen and nitrate nitrogen.** WM. G. FRIEDEMANN. *Science* 70, 43-4(1929).—The dry weight of cotton plants grown in solns. contg. (a)  $NH_3$  as a source of N and (b) nitrate as a source of N was used as a basis for comparing the nutrient value of these 2 sources of N. Except for the above difference the nutrient solns. were practically identical in chem. compn. They were buffered at a  $pH$  of 5.8; the osmotic pressure was approx. 1 atm. The  $pH$  was maintained const. upon the roots by mech. stirring by aeration and by const. soln. renewal at a rate of flow of 1.4 cc. per min. per plant. The plants were harvested and their dry weights detd. at the age of 6 weeks. Comparative values were thus obtained.

**Determination of phosphoric acid in mineral phosphates and phosphate fertilizers.** GUNNER JORGENSEN. *Ann. fals.* 22, 199-207(1929); cf. C. A. 19, 2613; 20, 1773. The technic of J.'s method for the detn. of total  $P_2O_5$  in mineral phosphates, total  $H_2O$ -sol. and citrate-sol.  $P_2O_5$  in superphosphates, and total and citric-sol.  $P_2O_5$  in basic slags is described in detail.

**Influence of mineral fertilizers on the osmotic pressure of some agricultural plants and the special action of potassic fertilizers.** E. BLANCHARD AND J. CHAUSSIN. *Compt. rend. acad. agr. France* 15, 678-82; *Compt. rend.* 188, 1515-7(1929).—The application of mineral fertilizers in increasing the rapidity of growth and the yields acts certainly, apart from the contribution of the plastic elements, by physico-chem. action, in increasing the osmotic pressure. An important part of this action is due to the potassic fertilizers, in sylvite and KCl.

**The use of additional nitrogenous fertilizers on autumn wheat.** F. PARISOT AND E. GIRARD. *Compt. rend. acad. agr. France* 15, 700-3(1929).—The time of fertilizer application and yields are discussed.

**Fertilizer ratios for Prince George County.** A. G. MCCALL. *Maryland Sta. Bull.* 294, 35-51(1928).—A study of the effect of different fertilizer ratios on some of the more important soil types of Prince George County. The fertilizers used were com. grades of  $NaNO_3$ , acid phosphate and KCl and the soil types included Leonardtown Silt Loam and Loam, Collington Sandy Loam, Norfolk Sand and Sassafas Loam. The crop yields on the different soil types and the fertilizer ratios are given.

**History and technic of the superphosphate industry.** ANON. *Superphosphate* 2, 133-6(1929); cf. C. A. 23, 3769.

**Sewage sludge as fertilizer.** WILLEM RUDOLFS. *Soil Sci.* 26, 455-8(1928).—The N content of sewage sludges varies with the type of treatment. Aerobically treated sludge contains about 5.0% N, while anaerobically treated sludge averages about 2.25% N. It is estd. that 150,000 to 200,000 tons of N is lost annually in this material, much of which might be saved for fertilizer. M. S. ANDERSON

**Chemical notes.** Manurial value of dadaps and gliricidia leaves, stems and branches. A. W. R. JOACHIM. *Trop. Agr. (Ceylon)* 71, 7-8(1928).—Fresh leaves and tender stems of dadaps and gliricidia contain  $H_2O$  69.8 and 73.1, N 1.09 and 0.79,  $CaO$  0.58 and 0.77,  $K_2O$  0.34 and 0.37,  $P_2O_5$  0.14 and 0.19 and ash 1.84 and 2.58%, resp. A. L. MEHRING

**The influence of fertilization with iodine on the growth and composition of food plants.** E. MAURER, W. SCHROPP AND H. DUCKRUE. *Münch. med. Wochschr.* 75, 1246-7(1928).—Fertilization with KI (2.5 kg. per hectare) caused an increase in the I content of various vegetables, the increase ranging from 20 to 7900%. There was sometimes a non-essential increase in the mineral content. R. C. WILLSON

**Comparative experiments with sodium nitrate, Chile saltpeter and calcium nitrate.** J. WEIGERT. *Mitt. deut. Landw.* 44, 261-5(1929).—There were no significant differences between the 3 fertilizers tested on wheat, oats and hay. Tested on potatoes,  $NaNO_3$  (Chile) gave the highest,  $Ca(NO_3)_2$ , the lowest, and  $NaNO_3$  (artificial) intermediate yields. B. C. BRUNSTETTER

**Symptoms of potash deficiency in oat plants.** KÖSTLIN. *Ernähr. Pflanze* 25, 224-8(1929).—The appearance of plants grown in pots under potash-deficient conditions is described and illustrated. LAWRENCE P. MILLER

**Physiologic reaction of potash salts.** W. WICHMANN. *Ernähr. Pflanze* 25, 209-12(1929).—From expts. with soils conducted mostly in dishes as used in Neubauer analyses (*C. A.* 18, 877) and with plants in the early stages of growth, it is concluded that potash salts are physiologically neutral. LAWRENCE P. MILLER

**Is the blackening of potato tubers a potash deficiency phenomenon?** F. MERKEN-SCHLAGER. *Ernähr. Pflanze* 25, 275-6(1929).—Some observations of the Eigenheimer variety indicate that melanin formation is more rapid in tubers grown under low potash conditions. LAWRENCE P. MILLER

**The distribution and accumulation of the important potash salts in potato stems.** W. VON BREHMER AND J. BÄRNER. *Ernähr. Pflanze* 25, 300-6(1929).—Plants were grown in pots with increasing amts. of sulfate, phosphate, nitrate, and chloride of K. At the end of the vegetative period sections of the stems were tested with  $H_2PtCl_6$ . Conclusion: The  $K_2O$  content and development of those tissues most important to the life of the plant are proportional to the amt. of  $K_2O$  available. This is no longer true if growth is depressed by excess  $K_2O$ . LAWRENCE P. MILLER

**The so-called marginal leaf scorch of currants and its control.** T. A. C. SCHOEVEERS. *Ernähr. Pflanze* 25, 297-300(1929).—An expt. is described in which potash fertilization corrected this condition. LAWRENCE P. MILLER

**Investigations on the influence of fertilization on the susceptibility of flax to the rust fungus (*Melampsora lini*).** E. BUDBERG. *Ernähr. Pflanze* 25, 220-4(1929).—Plants grown on plots fertilized with potash were more resistant. L. P. M.

**Combating organisms harmful to plants and fertilizing with sulfur.** BRUNO WÄSER. *Metallbörse* 18, 733-4, 845-6(1928).—A discussion and review. E. F. S.

**Fish oil as an adhesive in lead arsenate sprays.** CLIFFORD E. HOOD. U. S. Dept. Agr. *Tech. Bull.* 111, 1-28(1929).—The use of fish oil as an adhesive in lead arsenate sprays for gypsy-moth extermination and general control work permits a reduction in the quantity of lead arsenate used from 6.25 to 5 lb. per 100 gal. of water. If the spraying is done when the larvae are less than half grown the proportion of lead arsenate in the mixt. can be still further reduced. Fish oil is likewise a good adhesive to use with Bordeaux mixt. or a combined lead arsenate and Bordeaux mixt. It should be added to the spray mixts. at the rate of 4 oz. by wt. per lb. of lead arsenate powder or insol. matter used. W. H. ROSS

**Experiments with pine oil preparations (as insecticides).** ERNEST N. CORY. Univ. Maryland Agr. Expt. Sta., *Bull.* 298, 184-6(1928).— $p-C_6H_4Cl_3$  was dissolved in pine oil, the soly. being about 1 g. in 2 cc., and the soln. was then emulsified with soap. The dil. emulsion is effective against the peach borer (*Aegeria exitiosa*) without injury to apple or peach trees. The higher fractions of pine oils seem to be the more toxic to insects. C. H. RICHARDSON

**The effectiveness of several grades of carbon disulfide (as insecticides).** ERNEST N. CORY. Univ. Maryland Agr. Expt. Sta., *Bull.* 298, 192-5(1928).—Com. grades of

CS<sub>2</sub>, compared favorably with C. P. grades as fumigants for insects. Conditions for fumigation with CS<sub>2</sub> are discussed. C. H. RICHARDSON

An apparatus for obtaining measured areas of sprayed foliage for chemical analyses. JOSEPH M. GINSBURG. *J. Agr. Research* 36, 1007-9 (1928).—An app. which cuts circular disks from leaves is described. Amts. of As<sub>2</sub>O<sub>3</sub> and SO<sub>2</sub> on apple leaves sprayed with mixts. contg. PbHAsO<sub>4</sub>, S and Fe<sub>2</sub>O<sub>3</sub> were closely similar whether the analysis was made upon entire leaves or from leaf disks cut by the app. described. C. H. R.

Utilization of chloropicrin against scale insects destructive to the orange tree and date palm. ANDRÉ PIÉDALLU AND A. BALACHOWSKY. *Compt. rend.* 187, 671-3 (1928).—Chloropicrin is used to fumigate trees covered by tents as with HCN. The compd. is evapd. by means of alc. or petroleum oil lamps. Fifteen to 20 g. per cu. meter killed scale insects of 7 species on orange trees and date palms. Tender growth and blossoms of the orange are injured by this dosage but the winter foliage is not. Winter is also advised for treatment of young date palms. Cf. Bertrand, C. A. 14, 2526. C. H. R.

Insects and chemistry. WILLEM RUDOLFS. *J. Chem. Education* 6, 1100-12 (1929).—The question of insect control can be divided into 2 parts: (1) the physiology and chemistry of insects and (2) production of cheap and efficient insecticides. E. J. C.

The use of sugar-cane waste products as cheap and effective larvicides. E. R. RICKARD, P. DÍAZ QUIETA AND ALBERTO NÚÑEZ. *Semana méd.* (Buenos Aires) 36, 174-6 (1929).—Larvae never develop in the waste waters of the distilleries, but the larvicide action of fusel oil, second runnings and residues is not strong enough to justify their use as larvicides when transportation is required. A. E. MEYER

The extermination of the fungus *Cercospora beticola* on beets. F. X. KREŠL AND ARNOLD PESKA. *Listy Cukrovar.* 47, 439-42 (1929).—Three sprayings at 8- and 30-day intervals were made on a com. scale in July and Aug. An aq. suspension of Bordeaux mixt. produced plants 10 cm. taller than untreated ones and free from *Cercospora* "Peronoid" (a dry mixt. of CuSO<sub>4</sub> and CaO) was less effective. "Cusisa" (a Cu-As prepn.) was ineffective. FRANK MARESH

Seed treatment for black-leg disease of crucifers. E. E. CLAYTON. N Y State Agr. Expt. Sta., *Tech. Bull.* 137, 58 pp. (1928).—A report of expts. with seed treatments for black-leg (*Phoma lingam* (Tode) Desm.) on cabbage and Brussels sprouts. The dust disinfectants tested included Semesan, Semesan Jr., Bayer dust, Cu carbonate and many others. None of the dust treatments can be recommended for use against black-leg. The liquid chem. treatments included HgCl<sub>2</sub>, Semesan, Uspulun and Germisan. Germisan was very effective against black-leg, but the treatment was liable to injure the seed. Uspulun was safe, but little more effective than standard HgCl<sub>2</sub>. Semesan liquid treatment was much less effective than HgCl<sub>2</sub>. None of the chem. soaking treatments can be recommended for black-leg. Hot-water treatments at 50°, 55° and 69° were tested, and effective black-leg control was secured at all temps. by regulating the length of exposure. It is recommended that cabbage and Brussels sprouts seed be soaked 25 min. in water at 50° as the most satisfactory protection against black-leg infection. E. F. SNYDER

Potash requirements of the opium poppy (GAROLA) 11D. Analysis of insecticides containing F compounds (HART) 7. A drop test for the estimation of the stability of emulsions (GOETTSCH) 7. Products for use in fungicides, insecticides, etc (Brit. pat. 302,666) 29. Wood-preserving composition (U. S. pat. 1,720,905) 20.

Fertilizer. CHEMIEVERFAHREN GES. Brit. 302,148, Dec. 10, 1927. Crude phosphate is treated with K<sub>2</sub>SO<sub>4</sub> and HNO<sub>3</sub> in sufficient quantities to form CaSO<sub>4</sub>, KNO<sub>3</sub> and H<sub>2</sub>PO<sub>4</sub>, the CaSO<sub>4</sub> is sepd. by filtration, and the filtrate is neutralized with NH<sub>3</sub> and evapd. to dryness.

Fertilizers. COMPTOIR COMMERCIAL DES ENGRAIS PARIS-AUBY. Fr. 673,085. Apr. 19, 1928. A dry non-hygroscopic fertilizer is prepd. by mixing vinasses from distilleries and sugar factories with a basic substance such as CaO, CaCO<sub>3</sub>, Na<sub>2</sub>CO<sub>3</sub>, Ca(CN)<sub>2</sub> or dephosphorization slags, in the presence of an excess of acid such as H<sub>2</sub>SO<sub>4</sub>, HNO<sub>3</sub>, HNO<sub>2</sub>, H<sub>2</sub>SO<sub>3</sub> or phosphoric acid.

Fertilizer from town refuse. A. FABERJ. Brit. 302,290, Dec. 13, 1927. Town refuse is converted into a nitrogenous fertilizer by treatment with hot SO<sub>2</sub> in a tower to which air is also supplied which converts SO<sub>2</sub> into SO<sub>3</sub> which forms H<sub>2</sub>SO<sub>4</sub> with the moisture present so that the acid fixes the N in the refuse. Various details are given. The product may be mixed with phosphorite or other fertilizing materials.

**Fungicide.** JOHANN H. HORST. Ger. 477,502, Aug. 16, 1924. Addn. to 427,075. A prepn. for preventing the growth of fungus, especially peronospora, consists of a mixt. of finely powd.  $\text{CuSO}_4$ , lime, kieselguhr, casein,  $\text{Na}_2\text{SO}_3$  and  $\text{Na}_2\text{SiF}_6$  with the further addn. of powd.  $\text{NaHCO}_3$ . Starchy substances such as flour may also be added.

**Fumigating composition for plants.** I. G. FARBENIND. A.-G. (Friedrich Wissing, inventor). Ger. 477,532, Mar. 18, 1922. A  $\text{SO}_2$ -liberating agent for destroying pathogenic spores on plants is made by mixing S(94%) with noninflammable indifferent material such as kieselguhr (6%).

**Fumigating composition for plants.** I. G. FARBENIND. A.-G. (Martin Müller-Cunradi and Josef Jannek, inventors). Ger. 477,660, Sept. 5, 1924. Plants are preserved from pests and vermin by  $\text{SO}_2$  generated by active C mixed with S and oxidizing material such as  $\text{NaNO}_2$ .

**Treating seeds.** BAYERISCHE STICKSTOFF-WERKE A.-G. Ger. 478,123, May 24, 1924. In stimulating seeds by treatment in known manner with suitable solns., the seeds are heated at 30–55° before the treatment and are air-dried as completely and rapidly as possible after the treatment.

**Weed killer.** CHEMISCHE FABRIK LUDWIG MEYER. (Fritz Wolff, inventor). Ger. 478,446, Aug. 31, 1927. Addn. to 441,213. According to Ger. 441,213, a soln. of a heavy metal nitrate, particularly  $\text{Cu}(\text{NO}_3)_2$ , of 1.5–7% concn. is used as a weed killer. A proportion, suitably one-third, of the nitrate is now replaced by the corresponding sulfate.

**Vermin-destroying compositions.** CHEMISCHE FABRIK HUGO STOLTZENBERG. Ger. 478,445, May 21, 1925. Comps. for spraying on plants are prepd. by heating an alc. soln. of resin with a small amt. of caustic alkali and dilg. the product with water.

**Vermin-destroying compositions.** IGNATZ KREIDL. Austrian 113,334, Jan. 15, 1929. Vermin-destroying comps. to be applied by dusting are prepd. by soaking starch or like colloid in a soln. or suspension of a fungicide, insecticide or disinfectant, etc., and then filtering and drying.

## 16—THE FERMENTATION INDUSTRIES

C. N. FREY

**Making and grading industrial alcohol.** H. W. HAINES. *Chem. Markets* 25, 41–3(1929). E. H.

**The effect of certain metals on the acetic acid fermentation.** M. ROZENBLATT and M. MORDKOVICH. *Biochem. Z.* 209, 83–9; *Ukrainskii Khim. Zhur.* 4, Tech. Pt. 1–10(1929).—The activating effect of Ni and of Co rises very rapidly but falls just as suddenly with increasing concn. of the metal. On the contrary, Fe and Mn have a much less pronounced catalytic effect on the AcOH fermentation but the inhibiting action likewise occurs at relatively much greater concns. as compared to Ni or Co. Thus at a concn. of  $\frac{1}{1000}$  % Ni and Co only 51 and 86%, resp., of the AcOH (control) is formed whereas Fe or Mn has no effect. From the point of view of the paralyzing action on the enzymes of AcOH fermentation, the metals fall into this series Ni > Co > Fe > Mn.

S. MORGULIS

**Timely pointers on the production and marketing of cider.** PAUL F. YOUNG. *Fruit Products J. and Am. Vinegar Ind.* 8, No. 9, 10–12; No. 10, 9–11; No. 11, 7–9 (1929).

J. A. KENNEDY

**Malt vinegar and its manufacture.** PAUL HASSACK. *Fruit Products J. and Am. Vinegar Ind.* 8, No. 3, 19–20; No. 5, 24–6; No. 7, 30–1; No. 9, 18–9; No. 11, 19–21 (1929).—H. describes a simple form of manuf. wherein barley is employed as the prime material. Formulas and operations are discussed; also such details as pitching of sweet wort with yeast, fermentation of the wort, prevention of infection, storage of guiles, double tiers of packing to increase production of generators, storage and treatment of the crude malt vinegar. H. describes a typical English acetifier. J. A. KENNEDY

**The influence of the malting process on the fat content of barley.** K. TÄUFEL and M. RUSCH. *Biochem. Z.* 209, 55–61(1929).—During malting of barley there is a loss of liquid fat acids, chiefly of oleic acid.

S. MORGULIS

**Heating of the vintage (before pressing).** J. DUBAQUIÉ. *Ann. fals.* 22, 211–3 (1929).—A certain proportion (about  $\frac{1}{10}$  to  $\frac{1}{5}$  of the vintage) of the grapes is heated, before stemming and pressing, for several hrs. at about 40–50°; it is then pressed, and added to the remainder of the must after tumultuous fermentation is completed. The heating destroys any germs present on the grapes, results in the retention of a higher

proportion of the pectins, imparts a remarkable brilliancy to the finished wine and improves the mellowness and flavor such as would result from aging. A. P. C.

**General method for the determination of corrected volatile acidity of wines.** R. MARCILLE. *Ann. fals.* 22, 224-5(1929).—Mathieu's method (*C. A.* 21, 3418) is not applicable to wines having a high aldehyde content; the production of a large amt of aldehydes is caused by the use of large doses of  $\text{SO}_2$ . The true org. volatile acidity is given by total volatile acidity—free  $\text{SO}_2$ —0.7 of the combined  $\text{SO}_2$ .

**The detection of fruit juice (fruit wine) in grape wine.** J. WERDER. *Mitt. Lebensm. Hyg.* 20, 7-14(1929); cf. *C. A.* 23, 1928.—Adulteration of grape wine by the addn of 10% or more of other fruit wines is detected by the identification of sorbitol, present in fruit wines other than grape. Sorbitol is sepd. as dibenzalsorbitol by treating the sample concd. to a sirup, with an approx. equal amt. of 1:1  $\text{H}_2\text{SO}_4$  and  $\text{BzH}$ . B. C. B.

**The formation of hexaacetylsorbitol from dibenzalsorbitol.** C. ZACH. *Mitt. Lebensm. Hyg.* 20, 14-5(1929); cf. preceding abstr.—Dibenzalsorbitol which cannot be purified by recrystn. and has no definite m.p. is split by heating at least 0.05 g. with 2 cc. *N*  $\text{H}_2\text{SO}_4$  1 hr., extg. the  $\text{BzH}$  with ether, removing  $\text{H}_2\text{SO}_4$  as  $\text{BaSO}_4$ , concg. to a sirup, then acetylating by Tutin's technic (heating 1 hr. with 0.5 cc.  $\text{Ac}_2\text{O}$  and 1 drop pyridine, then adding 5 cc.  $\text{H}_2\text{O}$ ). B. C. BRUNSTETTER

**The detection of fruit wine by the sorbitol method.** FIESSELMANN. *Mitt. Lebensm. Hyg.* 20, 45-6(1929); cf. preceding abstr.—The sorbitol method for detecting adulteration of grape wine with other fruit wines is recommended as a certain lab. method which can be easily and quickly performed. B. C. BRUNSTETTER

**The wines of the coöperative cellars of the Hérault (1928 vintage).** E. HUGUES AND R. CHEVALIER. *Ann. fals.* 22, 207-11(1929).—Analyses of 18 wines of known origin and purity are tabulated and briefly discussed. A. PAPINEAU-COUTURE

**New data on saturnism (KOHN-ABREST) 13.** An apparatus for removing foams from samples of liquors (HERNYCH) 1. Retting flax fiber [with alcohol as by-product] (Brit. pat. 302,300) 25. Saccharification of wood [with fermentation or "working into yeast" of waste liquors] (Brit. pat. 302,313) 23.

**Citric acid.** MONTAN UND INDUSTRIALWERKE VORM. J. D. STARCK. Brit. 302,338, Dec. 16, 1927. In effecting fermentation of carbohydrates by mold fungi such as *Aspergillus niger*, the mold stock is cultivated in alternating stages including cultivation in solid media of the gelatin and agar agar type, cultivation in liquid media under conditions of industrial fermentation, and cultivation on vegetable culture media such as fruit pulp, contg. org. acids and vitamins. Various details and auxiliary treatments are described. Cf. *C. A.* 23, 3300.

**Fermented beverages of low alcohol content.** HERMAN HEUSER (to U. S. Process Corp.). U. S. 1,720,329, July 9. An alc. fermented cereal wort is heated to remove alc. and reduce the alc. content to below the legal limit, treated with heccone ext., cooled and subjected to a secondary fermentation.

**Malt kiln.** WENZL A. KURZ and KARL KOLLER. Austrian 113,312, Jan. 15, 1929.

## 17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

**The commercial utilization of Java citronella oil.** BRENDAN O'DONOGHUE, JAMES DRUM AND HUGH RYAN. *Sci. Proc. Roy. Dublin Soc. [N.S.]* 19, 113 20(1928).—A sample of oil  $d_{15}^{20} 0.8918$ ,  $[\alpha]_D^{20} -2^\circ 48'$ , contained acetylatable material and esters 83.3% and aldehyde (citronellal) 45%. Citronellal was pptd. with  $\text{NaHSO}_3$ . The oil remaining was hydrolyzed by alc. KOH and the geraniol sepd. by forming a cryst. double compd. with  $\text{CaCl}_2$ . The geraniol was sepd. from this compd. by decompn. with  $\text{H}_2\text{O}$ , and steam distn. Attempts to sep. citronellol were unsuccessful. The citronellal was reduced to citronellol electrolytically with Pb electrodes and dil. alkali as electrolyte. PAUL BOONE

**New paths of therapy.** J. J. HOFMAN. *Pharm. Weekblad* 66, 569-77(1929).—An address, touching briefly upon recent developments in antiseptics, ph. adjustment, isotonic solns., hormones, vitamins and x-ray chemicals, from the viewpoint of the pharmacist. A. W. DOX

**Investigation of moors (bogs) for balneological purposes.** K. STOCKFISCH AND W. BENAIDE. *Z. angew. Chem.* **42**, 663-8(1929).—Results of chem. and phys. examn. of 9 "moors" used for therapeutic reasons are reported, together with the methods of analysis employed. Included are proximate analyses for  $H_2O$ , sand, ash and org. matter; analysis of dry substance for oxides of Fe, Ca, Mg and S (also S as sulfide), bitumen, total humus, cellulose and hydrolyzable substances; water-sol. salts, pH, degree of conversion into peat, sp. gr.,  $H_2O$  capacity, distribution no. (ratio of vol. sample of peat +  $H_2O$  needed for satn.: vol. of sample), sp. heat (5% dry substance), and relative speed of heat transfer (5% dry substance.) W. C. EBAUGH

**Helabon (formerly helamon).** C. A. ROJAHN AND F. GEWEHR. *Apoth. Ztg.* **44**, 807-8(1929).—Recent analysis of this product indicates a mixt. of antipyrine about 70, pyrimidone 16.7, veronal 13.3%. W. O. W.

**Use of the yeast product "Zyma" in the manufacture of pills.** WOLFGANG BRANDRUP. *Apoth. Ztg.* **44**, 855-8(1929).—Expts. are described using this yeast as a vehicle in connection with the manuf. of pills contg. digitalis, Fe compds., alkaloids, exts., resins, plant juices, balsams, essential oils, guaiacol, creosote and a variety of special combinations with org. and inorg. salts, some 50 in no. W. O. E.

**Capsifor.** C. A. ROJAHN AND MAX HERTER. *Apoth. Ztg.* **44**, 858(1929).—A gelatinous product for external application in the treatment of rheumatism has an odor of Me salicylate, menthol and oil of rosemary, and contains in addn. to these substances  $NH_4$ , camphor and capsicum. The Me salicylate originally incorporated has in some measure been saponified into Na and  $NH_4$  salicylates. W. O. E.

**Skatole.** H. STANLEY REDGROVE. *Perfumery and Essential Oil Record* **20**, 193-5(1929).—A discussion of the relationships existing between skatole and indole, its known and possible isomers, in connection with their use in perfumery. Three different tests, the Ehrlich, vanillin and dimethylaniline tests, for differentiating skatole from indole are outlined. Mention is made of the several chem. methods for prepg. indole, skatole and similar compds. designed as substitutes for civet. W. O. E.

**Examination of pharmaceutical specialties and nostrums.** C. A. ROJAHN AND FRANZ STRUFFMANN. *Pharm. Zentralhalle* **70**, 325-32, 341-6, 405-9(1929).—A comprehensive scheme of analysis (including preliminary tests) for the detection of crude drugs, their active principles and unknown mixts. with other materials. W. O. E.

**Production of crude drugs in Poland.** JAN MUSZYNSKI. *Pharm. Zentralhalle* **70**, 438-41(1929).—An account of the collection and traffic in crude drugs (naturally grown) in or adjacent to the district of Swienciany. W. O. E.

**Scientific pharmacy.** RAPP. *Pharm. Ztg.* **74**, 903-6(1929); cf. *C. A.* **23**, 3304.—A comprehensive treatment of the tablet industry, notably the mech. appliances involved, the preliminary prepn. of the material (therapeutically active agents) to be compressed, granulation, binders, fillers, lubricants, disintegrators, etc. W. O. E.

**Relation of potassium to iron in the combustion of cigar leaf tobacco.** D. E. HALEY AND OTTO OLSON. *Science* **70**, 17-8(1929); cf. *C. A.* **23**, 479.—Exptl. evidence has been developed indicating that good combustion of cigar leaf tobacco is assocd. with K compds. which give rise to  $K_2CO_3$  during combustion, and that the presence of such compds. may serve to intensify the catalytic effects of Fe on this process. W. O. E.

**New medicaments and pharmaceutical specialties of the first quarter of 1928.** F. ZERNIK. *Sudder. Apoth. Ztg.* **68**, 410-12, 417-8(1928); cf. *C. A.* **23**, 3773.—A compilation H. G.

**Quantitative determination of formaldehyde in a pharmaceutical preparation.** OSCAR HEIM. *Ind. Eng. Chem., Anal. Ed.* **1**, 128(1929).—To 10 cc. of sample contg. about 0.2%  $CH_2O$  add 2 cc. of concd. HCl and 10 cc. of N  $AgNO_3$ . Shake and add immediately 4 cc. of 50% NaOH. Shake and let stand 30 min. with occasional shaking. If formaldehyde is present the  $AgCl$  ppt. will at once turn black. Filter, wash with hot water and dissolve the reduced Ag with 3.75 N  $HNO_3$ . Dil., add HCl and weigh the resulting  $AgCl$ .  $2 AgCl = 1 CH_2O$ . W. T. H.

**Synthetic perfumes.** H. STANLEY REDGROVE. *Science Progress* **24**, 72-80(1929).—A concise outline of the syntheses of the org. compds. which are the active principles of the natural perfumes. JOSEPH S. HEPBURN

**The decomposition products of anesthetic ether and their determination.** B. SAMDAHL. *Norg. Apotekerfor. Tids.* **37**, 148, 161, 181(1929).—A lecture. K. H.

**The examination of cultivated gorli seeds.** M.-TH. FRANÇOIS. *Bull. sci. pharmacol.* **36**, 339-42(1929).—*Oncoba echinata* Oliver was cultivated as a possible source of chaulmoogra oil. 100 l. of the seeds weighs 60 kg. and contains 48% of oil. This m.  $44^\circ$ ;

$d_{20} 0.944$ ;  $n_D^{20} 1.4732$ ;  $\alpha_D = +49^\circ 55'$  in 5%  $\text{CHCl}_3$  soln. and calcd. for the pure oil; acidity practically 0; sapon. value 190; I value Hanus 95. The fatty acids m.  $58-59^\circ$ ; satn. value 203; av. mol. wt. 275; I value Hanus 96.9;  $\alpha_D = +50^\circ 20'$ .  
A. E. MEYER

The determination of the total alkaloids of the cinchona. M. MASCRÉ. *Bull. sci. pharmacol.* 36, 351-2(1929).—The difficulties presented by the method of the Belgian pharmacopeia are discussed.  
A. E. MEYER

A study of the Japanese peppermint oil. III. YEINOSUKE SHINOZAKI AND TORIHI NAGAZAWA. *Repts. Imp. Ind. Research Inst. Osaka, Japan* 10, No. 4(1929); cf. *C. A.* 21, 1690.—The oil of *kusa-hakka*, grown wild in Hokkaido, resembles peppermint oil. It is slightly acidic; it is yellow-green but on standing it changes to brown,  $d_{20}^{20} 0.9181$ ,  $n_D^{20} 1.4675$ ,  $[\alpha]_D^{20} -14.54^\circ$ , sapon. value 11.30, and sapon. value after acetylation 105.80. It gives Liebermann's reaction. *Kusa-hakka* oil contains *l*-menthone (40-50%), pulegone (20%), *l*-menthol (30%) and minor constituents such as  $\text{HCOOH}$ ,  $\text{AcOH}$ , water-sol. compd. m.  $187-8^\circ$ , certain phenolic compds. m.  $185-6^\circ$ , *l*-limonene, pinene, *d*-isomenthone and certain alcohols. The use of *kusa-hakka* oil with a view to produce menthol is discussed. IV. *Ibid* No. 5.—The chief constituents of Japanese peppermint oil are *l*-limonene, menthone, inactive isomenthone, *d*-isomenthone, menthone, *l*-menthol,  $\alpha$ -pinene, camphene, ethylamylcarbinol,  $\beta$ , $\gamma$ -hexenol and certain free and combined acids. Index of refraction of the hexenol was 1.44 instead of 1.48 as reported by Walbaum (*C. A.* 12, 2230). The phys. properties of the mixt. of menthol and menthone, menthol and acetylmenthol in different concn. were also studied with a view to make it a standard for future use.  
F. I. NAKAMURA

Investigations into buffer antiseptics. J. K. GJALDBAEK. *Dansk Tids. Farm.* 3, 1-75(1929).—"Buffer antiseptics" include all forms of antiseptic medicines which contain a supply of an antiseptically active compd. in a more or less latent or inactive form and are able to transfer the active antiseptic to liquids, e. g.,  $\text{H}_2\text{O}$ , tissue juices, etc., with which they come in contact. *A*-activity (*A* = antiseptic) is defined as *A*-concn. (usually g. per 100 g. soln.) of an aq. soln. in equil. with buffer-*A*. *A*-capacity is the total quantity of removable *A* (in g.) per 100 g. buffer-*A*. The *A*-buffer power is the ability of the buffer-*A* to maintain a certain activity. A buffer-*A* is thus characterized by the following properties: (1) The total *A*-concn. (active and inactive form) is greater than the *A*-activity. (2) When *A* is partially removed the *A*-activity decreases less than does the *A*-concn. Examples of buffer-*A* of the type, "chemically bound *A*" are  $\text{NaAgS}_2\text{O}_4$ , which liberates antiseptically active  $\text{Ag}^+$  while the undissoed. mol. forms the inactive supply, and  $\text{I-KI}$  solns., where the  $\text{I}_2$  is the active *A*, and  $\text{I}_2$  the inactive supply. Examples of buffer-*A* of the type "ordinary solns." are solns. of phenols in glycerol,  $\text{EtOH}$  and fatty oils. The degree of satn. in every solvent furnishes an approx. measurement of the activity of the solute. Examples of buffer-*A* of the "adsorption" type are  $\text{I}_2$ -carbon mixts.  $\text{I}_2$  adsorbed by *C* is inactive, while  $\text{I}_2$  in  $\text{H}_2\text{O}$  is active. Extns. of a large no. of phenol preps. were made at  $18^\circ$  and  $37^\circ$ . The partition coeff. of phenol between oil and  $\text{H}_2\text{O}$  was detd. as 0.12. Oleic acid and several fatty oils except castor oil all showed a partition coeff. of 5-6, while in castor oil and camphor the partition coeff. varied with concn. of phenol. From the results obtained G. proposes to express the formulas of official preps. in such a manner that physicians may prescribe phenol preps. of known properties.  
A. O. NELSON

Pharmacological investigation with ergot preparations. TULLIO MENECHINI. *Arch. farmacol. sper.* 46, 259-66(1929).—The method of Broom and Clark (*C. A.* 18, 153) for estg. the content of ergot alkaloids in ergot preps. was studied and found to be accurate.  
G. SCHWOCH

The behavior of protargol solution (Bayer) in presence of several chemical products. V. ZANOTTI. *Boll. chim. farm.* 68, 395(1929).—A 0.5% soln. of protargol (Bayer) was mixed with solns. of different chemicals and the following changes were noted: with pyrazolone (S. chim. des usines de Rhône), no change; with antifebrin, no change; with  $\text{EtOH}$ , turbidity; with acetylsalicylic acid (Rhodine), flocculent gray ppt.; with aspirin (Bayer), flocculent gray ppt.; with phenacetin (Bayer), no change; with antipyrine (Knole), no change; with pyrimidone (Meister Lucius), reddish brown color, gray in transparent light. When 50 mg. of pyrimidone (Meister Lucius) was added to 2 cc. of a 1% protargol soln. and the mixt. was agitated slowly, the pyrimidone dissolved and the yellow color changed to reddish brown. After about 30 min. the whole soln. became turbid. The last 3 reactions are of possible value for the distinction of antipyrine and pyrimidone.  
G. SCHWOCH



**Emetine.** ANON. *Hyg. du travail*, Geneva 1929; *Ann. hyg. publ. ind. sociale* 1929, 369.—Emetine is an alkaloid obtained from the ipecacuanha root and used especially in tropical medicine. The formula is  $C_{23}H_{16}N_2O_4$ . Its toxic effects are discussed.

**Pharmacognostical investigation of ginger or "Rhizoma Zingiberis."** K. KIMURA AND M. WATANABE. *J. Pharm. Soc. Japan*, 49, 366-76 (1929).—"Japan ginger" has 3 kinds of starch grains, *i. e.*, simple, compound and partially compound. The partially compound starch grains are very common in Japanese ginger and constitute a majority of the larger grains, which makes the "Japan ginger" differ from other varieties. NAO UYEI

**An appliance for filling amyl nitrite capsules.** W. A. N. MARKWELL. *Pharm. J.* 121, 124 (1928).—The supply of amyl nitrite (*A*) is contained in a large pear-shaped separatory funnel whose stem is bent upward in U shape and drawn out at the end to about 2 mm. width. *A* is withdrawn from the end of this tube and put into capsules by means of a graduated glass hypodermic syringe. When the level of the liquid in the tube becomes low, it can be easily raised by giving the vessel a slight clockwise turn and clamping it in this position.

**Examination of the adsorptive properties of medicinal kaolin.** J. RAE. *Pharm. J.* 121, 150-1 (1928); cf. Grettie and Williams, *C. A.* 22, 1510.—From examn. of 14 samples of kaolin for medicinal use, this test is deduced: Two g. dried to const. wt. when shaken occasionally during 30 min. with 70 cc. of a 0.04% aq. soln. of methylene blue, should yield a colorless filtrate. In 5 samples of kaolin, 2 g. adsorbed 30, 26, 24, 20 and 18 cc. of 0.01 *N* piperidine. NaCl, oxalic and citric acids were not adsorbed.

**The pharmaceutical laboratory of the University of Utrecht.** HENRY G. GREENISH. *Pharm. J.* 121, 156-8 (1928).—Descriptive of courses, with photographs of buildings and interiors.

**Scientific Japan, its contribution to modern pharmacy.** BERNARD E. READ. *Pharm. J.* 121, 199-201 (1928).—An historical and descriptive account is given of Japanese activities in medical botany, chemistry and pharmacy, with photographs and references.

**The pawpaw (Carica papaya).** S. G. WILLIMOTT. *Pharm. J.* 121, 219 (1928).—An account is given of the botany, distribution, the fruit and the cultivation of the pawpaw tree, and of the properties of *papain*, the proteolytic enzyme of the fruit, seeds and leaves.

**Ammonium carbonate, Brit. Pharm. in dispensing.** R. A. CRIPPS AND F. W. HOVLAND. *Pharm. J.* 121, 236-7, 270 (1928); cf. Self and Corfield, *C. A.* 20, 2562.— $NH_4$  carbonate ( $NH_4HCO_3 \cdot NH_4NH_2CO_3$ ) (*A*) by exposure loses about 33% of the total N present in 2 hrs. The loss probably depends both on temp. and moisture in air. Soln. of *A* if kept in a well-closed bottle retains its alky. Accurate dispensing is therefore possible with a standardized soln. of *A* (1 in 8 or 1 in 10) prepd. from the salt in translucent non-powd. lumps, dissolving it in the  $H_2O$  in a closed vessel. It is suggested that  $NH_4HCO_3$  be made official in place of *A*, on account of its greater stability. The dose will then have to be increased to a max. of 15 grains.

**The keeping properties of hydrargyrum cum creta, Brit. Pharm.** J. R. WALMSLEY. *Pharm. J.* 121, 254-5 (1928).—When kept under av. conditions, there is no loss of Hg from folded powders of the mixt., which contains 33.5% Hg. When exposed to the sun's rays, or in proximity to metallic surfaces which tend to absorb Hg (Al foil, tin, etc.), there may be a slight loss of Hg, *i. e.*, 0.6 to 1%. However, storage in a warm place, *e. g.* near a stove, may cause a rapid and even complete loss of Hg.

**Studies of anesthetic ethylene: 1. The odor of ethylene.** H. S. BOOTH AND M. B. CAMPBELL. *Anesthesia and Analgesia* 8, 221-6 (1929).—Pure ethylene, obtained by numerous fractional distns., has a characteristic sweet, musty odor, which is apparently inherent in ethylene itself. Commercial anesthetic ethylene (made by dehydration of alcohol) purified in the same way has the same odor, indicating that it is practically pure. Commercial anesthetic ethylene made by cracking hydrocarbons has an odor distinctly different from that prepd. from alc.; it is offensive, rather strong and to some is nauseating.

**The detection of small traces of carbon monoxide in ethylene.** BURNHAM S. WALKER AND OTIS EDWARD ALLEY. *Anesthesia and Analgesia* 8, 227-9 (1929).—All methods for the detn. of CO in ethylene that involve removal of ethylene by Br-water or fuming  $H_2SO_4$ , are subject to error caused by oxidation of CO to  $CO_2$ . The reagent of Manchot and Scherer (AgOH in pyridine) appears to be specific for CO in the presence of ethylene under certain conditions of alky. Of other methods, the pyrotannic acid

method of Sayers, Yant and Jones is recommended as most satisfactory for use in hospital laboratories.

R. C. WILLSON

**The stability of digitalis and its preparations.** HARVEY B. HAAG AND ROBERT A. HATCHER. *J. Am. Med. Assoc.* 93, 26-9 (1929).—Six specimens of powdered digitalis were examd. after intervals of 1-16 yrs.; in no case was deterioration noted. A sterile infusion of digitalis undergoes little change within several months, and deterioration results then in diminished activity, not increased toxicity. Official tincture of digitalis retains its activity with comparatively little change during several years, and that change merely calls for a corresponding increase in dosage. The liquid preps. of digitalis are not as stable as powdered digitalis kept with ordinary care in a corked glass bottle. Aqueous solns. of strophanthin, ouabain and other digitalis principles, kept in ampoules of soft glass, deteriorate rapidly. Ouabain soln. in hard glass decomposes slowly.

R. C. WILLSON

Detoxifying, diffusing, germicidal and surface-tension-depressing properties of soaps (DAVISON) 27. A chemical study of the rind of California oranges (MATLACK) 11D. Determination of glucosides (ZECHNER) 7. Detection of isopropyl alcohol in alcoholic preparations (STAINIER, LAUWAET) 7. Depsides (ASTRADA) 11D. Synthetic morphine (WEBER) 10. The digitalis glucosides. III. Gitoxigenin and isogitoxigenin (JACOBS, GUSTUS) 10. Origin of ethereal oils in plants (FRANCESCONI) 11D.

THOMS, HERMANN F. M.: *Grundzüge der pharmazeutisches und medizinischen Chemie.* Berlin: J. Springer. 639 pp.

**Medicines.** EDUARD JENA. Ger. 478,167, Mar. 20, 1921. Therapeutically active water-sol. and stable preps. are obtained from albumins and their degradation products by acidifying them with a weak org. acid such as lactic acid and then treating with  $(CH_2)_6N_4$ , which may be in excess. Examples are given.

**Medicine comprising quinine and hematoxylin.** ELMER H. KING. U. S. 1,720,278, July 9. A medicinal prep. which may be used for treating sarcoma, carcinoma, etc., is prepd. by adding hematoxylin to an aq. soln. of quinine-HCl and neutralizing with  $NaHCO_3$ . Prep. of other similar compds. also is described.

**Hydrogenated cinchona alkaloids.** JOHN W. BLADEN (one-half to Howards & Sons, Ltd.). U. S. 1,720,462, July 9. Quinine, dihydroquinine, cinchonidine hydrochloride or other cinchona alkaloids, their dihydro derivs. or salts of the alkaloids or dihydro derivs., are subjected to the action of H in a solvent and in the presence of a catalyst of the Ni group, and during at least the later stages of the treatment a reaction temp. of 40° or higher is maintained.

**Quinoline derivatives.** I. G. FARBERIND. A.-G. Brit. 301,947, Sept. 1, 1927. Mono- and di-ethers of 6,8-dihydroxyquinoline such as the methoxy or ethoxy derivs. are prepd. by alkylation or from derivs. of 4-amino-1,3-resorcinol by Skraup's reaction, and may be used as *therapeutic agents*. Several examples are given.

**Anesthetic.** I. G. FARBERIND. A.-G. Brit. 302,337, Dec. 16, 1927. A rectal anesthetic is formed by use together of tribromoethyl alc. and amylene hydrate.

**Papaverine salts.** KARL FLEISCHER and OTTO HIRSCH-TABOR. Ger. 477,577, Apr. 29, 1924. Salts of papaverine are prepd. by treating salts of the base with cyclic aromatic urea compds. Thus, papaverine-HCl is heated with Na diethylbarbiturate, giving crystals m. 138°. Other examples are given.

**Salts of biliary acids.** CHEMISCHE FABRIK VORM. SANDOZ. Fr. 657,350, Dec. 16, 1927. Cinchona alkaloids such as quinine, quinidine, cinchonine, hydroquinine or synthetic preps. such as the higher alkyl ethers of hydrocupreine are combined with biliary acids to produce salts. Examples are given of the prep. of quinine cholate, quinidine cholate, ethyldihydrocupreine cholate and quinine desoxycholate. Cf. C. A. 23, 3932.

**Pyrazolone barbituric acid compounds.** CHEMISCHE FABRIK VORM. SANDOZ. Brit. 301,727, Dec. 3, 1927. Double compds. of 5,5-disubstituted barbituric acids such as isobutylallyl-, diethyl-, isopropylallyl-, phenylethyl- and *n*-butylallyl-barbituric acids with 1-phenyl-2,3-dimethyl-4-dialkyl (e. g., dimethyl)-amino-5-pyrazolones are prepd. by interaction of the salts of the components in a solvent such as a satd. aq. soln. of the pyrazolone compd. The products are *analgesics and soporifics*.

**(Dimethylamino)-*sec*.-butyl *m*-aminobenzoate.** ÉTABLISSEMENTS POULENC FRÈRES, E. FOURNEAU and J. TREFOUËL (to Soc. des usines chimiques Rhone-Poulenc). Brit. 301,845, Dec. 6, 1927. Details are given of a process for introducing the *m*-amino-

benzoyl group into the OH group of dimethylamino-2-butanol. The *product possesses anesthetic properties*. Its hydrochloride also is described.

**Oxime ethers.** I. G. FARBENIND. A.-G. Brit. 301,956, Sept. 9, 1927. Aminoalkyl ethers of oximes and their salts are prepd. by treating oximes of aldehydes and ketones with aminoalkyl halides. *Therapeutic products* are obtained. Cyclohexanone oxime, camphor oxime or anisaldoxime may be treated with diethylaminoethyl chloride in the presence of NaOEt.

**Theobromine.** A. BOHRINGER. Brit. 302,207, Sept. 12, 1927. Theobromine is extd. from materials such as cacao husks with dil. alk. solns. such as milk of lime on the counter-current principle.

**Removing the bitterness of cascara sagrada.** MAX PENSCHUCK. Ger. 477,858, Dec. 30, 1927. Cascara sagrada is warmed in a powd. condition with distd. water and neutral Na tartarate to 95–98°.

**Compounds for treating sarcoma, etc.** ELMER H. KING. U. S. 1,720,279, July 9, 1927. Compds. suitable for treating sarcoma, carcinoma and similar diseases are prepd. by the interaction of alkaloidal substances such as quinine, quinicine or caffeine with "desaccharated" glucosides such as hematoxylin. Numerous examples, details and modifications are described.

**Swab for applying antiseptics.** JOHNSON and JOHNSON. Brit. 301,572, Sept. 9, 1927. A portion of a swab formed of cotton or like material is satd. with an antiseptic such as a soln. of I or mercurochrome and the remainder of the swab material is treated with ceresin or other suitable liquid-repellent so that it may serve as a handle for the swab.

**Bacterial preparations, etc., analogous to tuberculin.** I. G. FARBENIND. A.-G. Brit. 302,226, Dec. 12, 1927. The process described in Brit. 285,087 (*C. A.* 22, 4726) for prepg. tuberculin is applied to other bacteria and fungi such as *Mycobacter lacticola* or *Streptothrix leproides*, to obtain substances having an action resembling that of tuberculin.

**Dentifrice.** KARL R. VIGANO. Ger. 478,355, Dec. 14, 1926. A dentifrice comprises glyceryl monoformate, with or without ethereal oils.

**Extracting gums, etc., from tobacco by use of acetone.** B. SEFERIADIS. Brit. 302,863, March 19, 1928. An app. is described.

**Extracting nicotine from tobacco.** H. FEDERMANN. Brit. 302,560, July 17, 1928. Fr. 657,840, July 19, 1928. Nicotine is extd. by  $\text{NH}_3$  and the excess of  $\text{NH}_3$  is removed by  $\text{CO}_2$ , in an app. which is described. The  $\text{NH}_3$  charged with nicotine passes to a washer contg.  $\text{C}_2\text{HCl}_3$  or  $\text{CCl}_4$ .

## 18—ACIDS, ALKALIES, SALTS AND SUNDRIES

E. M. SYMMES

**Comparison of modern chamber sulfuric acid plants.** THOMAS R. HARNEY. *Chem. Met. Eng.* 36, 402–6(1929). E. H.

**A new contact sulfuric acid process.** A. O. JAEGER. *Ind. Eng. Chem.* 21, 627–32 (1929); cf. *C. A.* 23, 3053.—A new converter developed embodies double counter-current heat-exchange elements in the upper layers of the catalyst; the lower layers used for completing the reaction are either cooled by radiation or for larger units by heat exchange with cold gas or air. The newly developed catalyst contains V in the non-exchangeable nucleus of non-siliceous base-exchange bodies. It is immune to the poisons for Pt catalysts, and gives high conversions. T. H. CHILTON

**High pressures in the manufacture of synthetic ammonia.** ANON. *Chemistry and Industry* 48, 591–8(1929).—Recent designs in compressing plants are described.

E. M. SYMMES

**The influence of methane upon the synthesis of ammonia.** R. NITZSCHMANN. *Metallbörse* 18, 2525–6, 2583–4, 2753, 2807–8, 2864–6(1928).— $\text{CH}_4$  may occur in the gases used for synthesizing  $\text{NH}_3$ ; it is removed with much more difficulty than are O and CO. Tables and curves are given showing the effect of the  $\text{CH}_4$  upon the synthesis of  $\text{NH}_3$ . W. C. EBAUGH

**The manufacture of commercial anhydrous aluminum chloride.** A. M. MCAFEE. *Ind. Eng. Chem.* 21, 670–3(1929).—The difficulties overcome during a period of many years in developing the manuf. of  $\text{AlCl}_3$  on a com. scale are recounted, and the present process by which Gulf Refining Co. is making 75,000 lb. of  $\text{AlCl}_3$  per day at a cost of

not over 5 cents per lb., using bauxite and Cl, is described. Further improvements resulting in a still further reduction in cost are forecast. Six illustrations are included.

E. G. R. ARDAGH

**Cheap aluminum chloride after fifteen years of chemical engineering development.** A. M. MCAFEE. *Chem. Met. Eng.* 36, 422-4(1929). E. H.

**Caustic soda.** WILHELM KOLB. *Metallbörse* 18, 2581-2, 2638-40, 2693-4, 2750-1, 2806-7, 2861-4(1928).—Although KOH is made from KCl by electrolysis in Germany, NaOH is prep'd. chiefly by causticizing  $\text{Na}_2\text{CO}_3$  obtained by the Solvay process. The processes involved, the app. used, analysis of raw materials, intermediate and finished products, data concerning production, etc., are given.

W. C. EBAUGH

**Methods of preparing basic magnesia.** B. G. PANTELEIMONOV. *Zhur. Prikladnoi Khim.* 2, 199-213(1929).—A 16% soln. of  $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$  was mixed in equiv. proportion with an 8.6% soln. of  $\text{Na}_2\text{CO}_3$  at  $20^\circ$  and the ppt. decomp'd. at  $50-90^\circ$  for 10-60 min. At  $50-60^\circ$  the ignition losses of the product were higher than those allowed by the Brit. Pharm. The lightest product was obtained by heating for 20 min. at  $90^\circ$ . As the true sp. gr. increases with the treating temp. the apparent sp. gr. is within certain limits inversely proportional to the true sp. gr. With simultaneous pptn. and decompn. a normal product was obtained at  $60^\circ$  and higher. The product was slightly heavier than that obtained by the former method. Accelerated drying at  $110-115^\circ$  gives good results, contrary to the general belief that the max. permissible temp. is  $100^\circ$ . The ppt. can be washed under pressure without seriously affecting its lightness. Contamination with Ca salts may arise from washing the ppt. with hard water. This can be avoided either by shortening the time of washing or by using chemically treated water. The use of distd. water in the last washing is desirable. Ca salts present in the brine can be settled by boiling the soln. or by adding small quantities of  $\text{Na}_2\text{CO}_3$ . Contrary to the general belief, magnesia is slightly hygroscopic. On exposure to the atm. 3.0024 g. of a carefully purified sample absorbed 0.0008 g. of moisture in 12 hrs., and 0.0017 g. in 66 hrs.

V. KALICHEVSKY

**Production and uses of helium gas.** R. R. BOTTOMS. *Trans. Am. Soc. Mech. Eng.*, Advance paper, May 27-30, 1929, 9 pp. E. I. S.

**Activated carbons.** A. S. SIPYAGIN AND I. M. SOKOLOV. *Zuhr. Sakharnoi Prom.* 1, 17-22(1927).—A review. V. E. BAIKOW

**Adsorption by several charcoals of technical importance.** H. I. WATERMAN, J. GROOT AND M. J. VAN TUSSEN BROEK. *Kolloid-Z.* 48, 146-51(1929).—Adsorptive powers of Carboraffin, Merck's blood charcoal, Purit A and Norit T for Orange ENL (Cassella) and for Schaffer's  $\beta$  salt decrease in the order given.

FRANK URBAN

**Synthetic nitrogen.** SIDNEY B. HASKELL AND H. F. MAHLE. *Chem. Markets* 25, 34-6(1929).—The meaning of the projected increase in nitrogen capacity to markets and prices is discussed. E. H.

**Muscle shoals and the new nitrogen picture.** HARRISON E. HOWE. *Am. Fertilizer* 71, No. 2, 60-4(1929).—A review and discussion of the economic factors involved in the developments that have recently taken place in the fixation of atmospheric N.

W. H. ROSS

**Bentonite.** J. H. FRYDLENDER. *Rev. prod. chim.* 32, 325-8, 357-62(1929).—These articles describe the extn., compn., properties and uses of bentonite. P. T.

**Status of the magnesite industry in the United States.** J. M. HILL. *Eng. Mining J.* 128, 48-51(1929). E. H.

**Treatment of finely divided caliche in factories "T," "U" and "V."** C. M. AUTY, E. B. DONALD, W. H. CLAYTON, AND L. L. MALM. *Caliche* 10, 343-60(1928).—Fines contg. particles up to 3 mm. were treated, resp., (T) in tanks by the Trent process (cf. *Caliche* 3, 352(1921); 5, 433(1924); 9, 35(1927)); (U) by rotary pressure filters after leaching and (V) by vacuum leaf filters after leaching. In T about 2 m. depth of liquids of decreasing density, heated by pipes to about  $80^\circ$  and agitated about 2 hrs., yielded a first ext. that was treated subsequently in the usual Shanks process. Further extns. were returned to the fines system. (U) employed Burt filters after boiling in a tank, and (V) Butters filters. Pressure gave better results than vacuum filtering.

HOWARD FLINT

**Mineral wool.** J. R. THOENEN. *Bur. Mines, Circ. No. 6142*, 13 pp.(1929).—Methods of manuf. are described and production statistics are given. E. H.

**Rolls for printing presses.** E. H. RIESSENFELD AND H. WILLSTAEDT. *Z. angew. Chem.* 42, 677-82(1929).—Information concerning inking rolls for printing presses is guarded as a trade secret, and nothing of value can be learned from the literature. Methods have been developed for detg. tensile strength, water absorption and loss, strength of gel, resistance to pressure, flowing and dropping points, adhesive power,

gelatin content, sugar and  $H_2O$ . Of greatest importance in estg. the quality of a roll are detns. of tensile strength, adhesive properties, strength of gel and the dropping point.

**Cements for marbles.** F. MARGIVAL. *Peintures, pigments, vernis* 5, 614-5 (1928).—Compns. of cementitious character adapted to fill cavities in surfaces of natural marble are described.

**The care and maintenance of hand fire extinguishers.** SIDNEY G. GAMBLE. *Munic. Eng. Sanit. Record* 82, 649(1928).—If chem. extinguishers are filled properly they need not be recharged annually but should be inspected for possible tampering. With little care and attention they should be efficient if needed many yrs. later. "Foam" extinguishers are not safe with electricity. It is dangerous to use  $CCl_4$  and soda-acid extinguishers together.

W. C. EBAUGH

B. HAMILTON

C. H. BADGER

**Manufacture of substances formed through highly endothermic reactions, particularly N compounds.** (Belg. pat. 356,946) 13. Production of  $H_2SO_4$  from substances containing  $CaSO_4$  (Belg. pat. 354,788) 20. Kiln for the treatment of lime, dolomite, natural cement, etc. (Belg. pat. 356,177) 1.

MAUGÉ, LUCIEN: *Les industries de l'azote*. Paris: Ch. Béranger. 684 pp. F. 160.

**Boric acid.** AMERICAN POTASH & CHEMICAL CORP. Fr. 657,452, July 12, 1928. In a cyclic process for the production of  $H_3BO_3$ , a soln. contg.  $Na_2B_4O_7$  is treated with  $H_2SO_4$  to form  $H_3BO_3$  and  $Na_2SO_4$ ; the  $H_3BO_3$  is sepd. by cooling and  $Na_2B_4O_7$  is added and dissolved; the  $Na_2SO_4$  is sepd. with water as water of crystn. and the treatment with  $H_2SO_4$  repeated. The  $Na_2B_4O_7$  used should contain less than 6 mol. of water of crystn. to reduce the amt. of water, and increase the amt. of  $H_3BO_3$  which seps.

**Hydrofluosilicic acid.** WILHELM MÖLLER and WILHELM KRETH. U. S. 1,720,965, July 16.  $SiF_4$  is brought into contact with the surface of a thin film of an aq. medium (such as water on rotating disks) which is successively replaced with another film of the aq. material for further reaction with the  $SiF_4$ . An app. is described.

**Phosphoric acid; hydrogen.** I. G. FARBERIND. A.-G. (Wilhelm Wild and Gustav Wietzel, inventors). Ger. 478,018, Dec. 4, 1925. In the manuf. of  $H_3PO_4$  and H from  $H_2O$  and P at 600-700°, a part of the steam required is raised by using the heat of the reaction gases. Thus, the  $H_3PO_4$  may be condensed at 100° or above in tubes in a boiler at atm. pressure or above, and the residual H-steam mixt. may then be used to raise steam at sub-atm. pressure.

**Phosphoric acid and phosphates.** F. G. LILJENROTH (to Kunstdünger-Patent-Verwertungs A.-G.). Brit. 301,864, Dec. 7, 1927. In production of  $H_3PO_4$  or sol. phosphates by leaching raw phosphates and sepg. the Ca from the soln. as  $CaSO_4$ , a temp. of at least 80° (suitably 95°) is employed for the sepn. so that a cryst. form of sulfate which settles readily is obtained. Various details and modifications of the process are described.

**Sulfuric acid.** MARCEL E. DERRY. Fr. 656,857, June 30, 1928.  $H_2SO_4$  of 12° Bé. and stronger is solidified by pouring into  $Na_2SiO_3$  contg. water. Thus, 100 cc. of  $Na_2SiO_3$  is mixed with 50 cc. of water and made up to 1 l. by pouring in  $H_2SO_4$  of 22° Bé. The product solidifies in less than 1 hr. The product may be used in *storage batteries*, as the acid liquifies under the action of the charging current, and remains solid during discharge and prevents sulfating of the electrodes.

**Sulfuric acid.** SOC. GÉNÉRALE MÉTALLURGIQUE DE HOBOKEN. Fr. 656,615, June 28, 1928. In the manuf. of  $H_2SO_4$  by the chamber process, the reaction towers are placed between the Glover and the first chamber or between the Pb chambers, and are sprayed with a soln. having high concn. in oxides of N, or with a large amt. of a soln. of low concn., in such a way that the evacuated acid from these towers contains less than 0.5% of N compds. calculated as  $HNO_3$  of 36° Bé.

**Solid carbon dioxide.** GES. FÜR LINDE'S EISMASCHINEN A.-G. Brit. 301,741, Dec. 2, 1927.  $CO_2$  is liquefied, cooled almost to its freezing point and the pressure on it is reduced. An app. and various details of operation are described.

**Solidifying carbon dioxide.** W. HESSLING. Brit. 302,359, Dec. 15, 1927. Solid  $CO_2$  is obtained by expansion of the compressed liquid which is cooled by evapn. of an external cooling agent such as  $NH_3$  in an app. which is described. Cf. C. A. 23, 2790.

**Solidifying carbon dioxide.** DRYICE CORP. OF AMERICA. Brit. 302,070, Jan. 17, 1928. An app. is described in which  $CO_2$  is obtained as snow by releasing the pressure on compressed liquid  $CO_2$ . Cf. C. A. 23, 3056.

**Apparatus for supplying carbon dioxide in liquid or solid form by use of solid carbon dioxide.** H. DEHOTTAU. Brit. 301,764, Aug. 30, 1927. Structural features.

**Storing liquid carbon dioxide.** DRYICE CORP. OF AMERICA. Brit. 302,782, Nov. 15, 1927. A definite wt. of solid  $\text{CO}_2$  is placed in a container which is then hermetically sealed. Structural features of a receptacle for this purpose are described.

**Carbon monoxide.** W. C. ARSEM (to Commercial Solvents Corp.). U. S. 1,719,867, July 9. A mixt. of  $\text{CO}_2$  and H is heated rapidly to  $1000\text{--}1200^\circ$  in the presence of a catalyst and the gaseous mixt. is then cooled rapidly to below  $100^\circ$ , condensed water is removed and rapid alternate heating and cooling is continued for the further production of CO.

**Ammonia synthesis.** I. G. FARBENIND. A.-G. Brit. 302,620, Sept. 17, 1927. Waste gases from the destructive hydrogenation of carbonaceous materials are used in  $\text{NH}_3$  synthesis after conversion of their hydrocarbon content into H and purification, which may include removal of S compds. and conversion of CO into  $\text{CO}_2$ , followed by removal of the  $\text{CO}_2$ .

**Ammonia synthesis.** WALTER H. KNISKERN (to Atmospheric Nitrogen Corp.). U. S. 1,721,455, July 16. In an app. comprising an  $\text{NH}_3$  converter, a heat-exchange system and a refrigerating system for liquefying the  $\text{NH}_3$  produced in the converter, a temp.-reducing device in which the cooling medium is at prevailing natural temps is interposed between the heat-exchange system and the refrigerating system in the gas line leading from the former to the latter and anterior to its entrance into the latter for removing low-temp. heat from the gas in the line at this point. Various details of app. arrangement are described. Cf. C. A. 23, 1479.

**Ammonia synthesis.** HANS HARTER. Ger. 478,455, Feb. 24, 1924. A no. of units for the manuf. of  $\text{NH}_3$  by combined high- and low-pressure synthesis are arranged in parallel to form a battery, and 2 or 3 such batteries are arranged in series. The gases from the first battery are united prior to removing  $\text{NH}_3$  by water-cooling, and the residual gases are passed to the next battery. Cf. U. S. 1,570,485 (C. A. 20, 802).

**Ammonia synthesis.** GASVERARBEITUNGSGESELLSCHAFT M.B.H. Fr. 656,963, July 3, 1928. See Brit. 293,361 (C. A. 23, 1726).

**Gases for ammonia synthesis.** SOC. D'ÉTUDES MINIERES ET INDUSTRIELLES. Brit. 302,306, Dec. 14, 1927. The gases are purified from O or from oxidizable impurities such as CO and  $\text{C}_2\text{H}_2$  and other hydrocarbons and reducible impurities such as S and P compds. by passage (at a temp. not exceeding  $600^\circ$ , except with N) over wood charcoal or similar carbonaceous material. A small quantity of water vapor must be present and O or air or H may be added as necessary, and pressure may be employed. The conversion products formed from the original impurities are removed by suitable absorption agents of which examples are given.

**Apparatus for ammonia synthesis.** RUDOLF ROHDE. Ger. 478,313, Nov. 12, 1924

**Oxidation of ammonia.** E. I. DU PONT DE NEMOURS AND CO. Fr. 657,467, July 12, 1928. An alloy of Pt, resistant to high temps., is used as a catalyst of the oxidation of  $\text{NH}_3$ , e. g., Pt-Rh alloys contg. 2-50% of Rh, preferably 5-25%. Other metals with a f. p. sufficiently high to increase the amt. of  $\text{NH}_3$  transformed and to diminish the loss of catalyst may also be used.

**Inorganic halides.** NAAMLLOOZE VENNOOTSCHAP ELECTROCHEMISCHE INDUSTRIE. Brit. 302,927, Dec. 22, 1927. Mixts. of oxides or oxygenated compds. (such as Ca phosphate, barytes or bauxite) with a reducing agent such as C are subjected to the action of a free halogen such as Cl at  $200\text{--}1000^\circ$ . The reaction may be promoted by agitation or by use of actinic rays.

**Purifying metallic salts.** I. G. FARBENIND. A.-G. Fr. 656,928, June 28, 1928. Salts, such as  $\text{ZnCl}_2$ , which have been used in textile, paper or other industries are freed from org. substances by treating with O under pressure at temps. above  $130^\circ$ .

**Metal carbonyls.** I. G. FARBENIND. A.-G. Brit. 301,778, Sept. 5, 1927. See Fr. 652,594 (C. A. 23, 3547).

**Alkali metal cyanides.** I. G. FARBENIND. A.-G. Brit. 301,565, Sept. 6, 1927. Fr. 656,810, June 29, 1928. Cyanides are formed by the action of  $\text{NH}_3$  and CO at temps. of  $400\text{--}800^\circ$  upon alkali metal hydroxides, oxides or salts such as  $\text{Na}_2\text{CO}_3$ , formate, acetate or sulfate, etc. Inert fillers such as MgO and catalysts such as Fe cyanides may be present. Diluent gases may also be added and the reaction may be carried out under pressure.

**Alkali and ammonium phosphates.** I. G. FARBENIND. A.-G. (Otto Schliephake and Friedrich Henning, inventors). Ger. 478,387, Feb. 22, 1928. The reaction between  $\text{CaHPO}_4$  and the bisulfate of an alkali metal or  $\text{NH}_4$  is effected by heating a mixt. of the solid reagents to a moderate temp. not exceeding the sintering temp. The

product is extd. with water and the soln. worked up in known manner. Cf. *C. A.* 23, 2790.

**Decomposition of alkaline earth metal chloride and sulfates in molten form by steam.** JULIUS KERSTEN. U. S. 1,721,485, July 16. Carbonaceous material and a fusible substance such as rock salt are added to the material under treatment such as  $\text{MgCl}_2$ ,  $\text{MgSO}_4$  or  $\text{CaSO}_4$  and the mixt. is melted by blowing in heating gases, and superheated steam is blown through the molten mass.

**Reduction of alkaline earth sulfates.** SALZWERK HEILBRONN A.-G., THEODOR LICHTENBERGER and KONRAD FLOR. Ger. 478,310, May 9, 1925. The sulfate is dissolved in fused  $\text{NaCl}$  and reduced with coke. When reduction is complete, the  $\text{NaCl}$  is decanted off from the melt and the alk. earth sulfide is then worked up.

**Mercury salts.** HUGH S. REID and AYLMER H. MAUDE (to Canadian Electro Products Co.). U. S. 1,721,188, July 16. In forming  $\text{Hg}$  salts such as sulfates, metallic  $\text{Hg}$  is treated with a strong non-oxidizing inorg. acid such as  $\text{H}_2\text{SO}_4$  in the presence of  $\text{HNO}_3$  and  $\text{O}$  is supplied to regenerate  $\text{HNO}_3$  while maintaining a temp. between  $20^\circ$  and  $80^\circ$ .

**Nitrophosphates.** ELEKTRIZITÄTSWERK LONZA. Fr. 657,288, July 11, 1928. Nitrophosphates with better powdering properties are prepd. by treating crude phosphates with  $\text{HNO}_3$  the water content of which is not sufficient to form tetraaquanitrates. The reaction is carried out at a low temp. and then with more intense heating. Ordinary nitrophosphates may be dehydrated at a temp. below  $40^\circ$ , or they may be fused and then powd. A small amt. of urea (not more than 2%) may be added to nitrophosphates to avoid formation of oxides of  $\text{N}$ .

**Colloidal dispersions of phosphates and arsenates.** AUGUST CHWALA. Ger. 478,190, Apr. 8, 1928. Phosphates and arsenates of the alk. earth and heavy metals are dispersed colloiddally in water by mech. disintegration in the presence of a protective colloid and of an alkali metal salt of an arsenic or phosphoric acid other than the ortho acid. Examples are given.

**Sodium-nitrogen compounds.** DEUTSCHE GOLD UND SILBER-SCHNEIDANSTALT VORM. ROESSLER. Fr. 656,614, June 28, 1928. See Brit. 293,040 (*C. A.* 23, 1418).

**Treatment of chlorinated zinc products or residues.** L. GRANGE. Belg. 355,843, Dec. 31, 1928. Double decompn. is effected between the  $\text{Zn}$  chloride or oxychloride and an alk.-earth hydrate or hydroxide so as to obtain insol.  $\text{Zn}(\text{OH})_2$  in the soln. of the corresponding alk.-earth chloride, which is eliminated by washing.

**Zinc salt solutions.** METALLGES. A.-G. (formerly Metallbank und Metallurgische Ges. A.-G.). Brit. 302,924, Dec. 23, 1927. Treatment of crude oxide-contg. materials with acid is effected so that any local excess of acid with respect to the  $\text{ZnO}$  content of the material is avoided, in order to minimize dissolving of impurities.

**Apparatus for obtaining divided alumina.** ELEKTRIZITÄTSWERK LONZA. Fr. 34,047, Sept. 10, 1927. Addn. to 639,645 (*C. A.* 23, 592). An app. is described for obtaining divided  $\text{Al}_2\text{O}_3$  in which dispersed or pulverized molten  $\text{Al}_2\text{O}_3$  is forced by gas under pressure through a shower of water before bringing it into a vessel of cooling water. Cf. *C. A.* 23, 3057.

**Alumina.** JULIETTE SKAPPEL NÉE WILHELMSSEN. Fr. 656,677, May 11, 1928. See Brit. 290,586 (*C. A.* 23, 946).

**Aluminum oxide.** S. I. P. SOCIETÀ ITALIANA POTASSA. Fr. 657,444, July 12, 1928. Chemically active anhyd.  $\text{Al}_2\text{O}_3$  is obtained by heating hydrated  $\text{Al}$  salts at a low temp. ( $140$ – $180^\circ$ ), such as the chloride or nitrate. The  $\text{Al}_2\text{O}_3$  may be used for the producing of  $\text{Al}$  or  $\text{Al}_2(\text{SO}_4)_3$ .

**Heavy granular concentrates from dilute solutions such as aluminum sulfate.** ARTHUR B. JONES (to Industrial Associates, Inc.). U. S. 1,721,452, July 16. The dil. soln. is subjected to spray drying to obtain light solids, these solids are liquefied (suitably by admixture with dil. soln.) and the liquefied solids are dispersed in a solidifying atm. An app. is described.

**Ammonium vanadate, etc.** J. A. WEIL, H. RAWLINSON and IMPERIAL CHEMICAL INDUSTRIES, LTD. Brit. 302,129, July 3, 1928.  $\text{NH}_4$  vanadate is purified by forming from it an approx. satd. aq. soln., removing undissolved impurities, and repptg. by adding an  $\text{NH}_4$  salt such as the nitrate which yields non-reducing gaseous products on thermal decompn. The purified material is suitable for making  $\text{V}_2\text{O}_5$  for use as a catalyst. Various details are described.

**Barium oxide.** CHEMISCHE FABRIK SIESEL G.M.B.H. Ger. 478,166, Feb. 26, 1925. Addn. to 431,617. A mixt. of  $\text{BaCO}_3$  and  $\text{C}$  is heated in a furnace, without stirring, by radiant heat from elec. heaters, and a pressure only slightly below that of the atm. is maintained in the furnace. A porous product is so obtained.

**Carbon disulfide emulsions.** I. G. FARBENIND. A.-G. Brit. 301,561, Sept. 6, 1927. Aq. emulsions of  $\text{CS}_2$  are prepd. by use of an alc. (preferably  $\text{AmOH}$  or  $\text{BuOH}$ ) and soap.

**Apparatus for making carbon disulfide.** I. G. FARBENIND. A.-G. (Eberhard Legeler and Hermann Kob, inventors). Ger. 478,378, June 1, 1927. See Brit. 291,382 (C. A. 23, 1481).

**Chromium oxide.** I. G. FARBENIND. A.-G. Brit. 302,178, Dec. 10, 1927. A chromate or dichromate is caused to react with red P in a quantity insufficient for the formation of appreciable amts. of Cr phosphates (suitably by igniting a mixt. of the reacting materials). K phosphate or the like which may be present in the product is leached out, leaving Cr oxide as a residue.

**Litharge and minium.** RICARDO SANZ CARRERAS. Fr. 656,937, July 8, 1928.  $\text{PbCO}_3$  obtained by electrolysis is decomposed and oxidized, in a 2-floor furnace, to litharge in the upper and from thence to minium in the lower.

**Potassium phosphate.** ÉDOUARD URBAIN. Fr. 656,525, Nov. 10, 1927. An  $\text{NH}_4\text{-K}$  phosphate ( $\text{NH}_4\text{KHPO}_4$ ) is produced by dissolving  $\text{KPO}_3$  in a soln. of  $\text{NH}_3$ .

**Sodium hypochlorite.** MALCOLM P. APPELEBEY and CHARLES CARTER. Fr. 656,653, Apr. 6, 1927. See Brit. 274,197 (C. A. 22, 2036).

**Trisodium phosphate.** SOC. DES. PHOSPHATES TUNISIENS. Fr. 656,905, July 2, 1928. A cryst. compn. contg.  $\text{Na}_3\text{PO}_4$  and  $\text{NaCl}$  is obtained by dissolving  $\text{H}_3\text{PO}_4$ ,  $\text{Na}_2\text{CO}_3$ ,  $\text{NaCl}$  and  $\text{NaOH}$  in water and cooling, or by neutralizing  $\text{H}_3\text{PO}_4$  with  $\text{Na}_2\text{CO}_3$ , filtering and adding  $\text{NaCl}$  and  $\text{NaOH}$  to the  $\text{Na}_2\text{HPO}_4$  formed.

**Purification of sodium sulfide.** SOCIÉTÉ INDUSTRIELLE DES APPLICATIONS CHIMIQUES I. N. D. A. C. Belg. 356,203, Dec. 31, 1928. The  $\text{Na}_2\text{S}$  is mixed with  $\text{NaOH}$  soln., treated in an autoclave with steam under pressure, and the soln. is decanted, filtered, concd. and crystd.

**Zinc oxide.** LACKWERKE JAPONIKA G.M.B.H. Ger. 467,588, July 11, 1926. Processes of the kind known for burning coal dust are applied to Zn dust, which is burnt directly in a stream of air. The continuous use of an auxiliary source of heat is dispensed with.

**Magnesia.** SALZBERGWERK NEU-STASSFURT. Brit. 301,751, Dec. 3, 1927. Burnt dolomite is treated with an  $\text{NH}_4$  salt such as  $\text{NH}_4\text{Cl}$  to extract the lime content as a sol. salt. Waste liquors from the Solvay soda process or from the treatment of  $\text{Mg NH}_4$  carbonate with  $\text{KCl}$  may be used for the extrn.

**Bleaching powder.** SOC. ELETTRICA ED ELETTROCHIMICA DEL CAFFARO, ACHILLE CARUCHI and CARLO PAOLONI. Fr. 654,149, May 12, 1928. Bleaching powder contg. more than 40% active  $\text{Cl}$  is prepd. by the action of  $\text{Cl}$  on  $\text{Ca(OH)}_2$  suspended in an inert liquid such as  $\text{CCl}_4$  which dissolves neither the  $\text{Ca(OH)}_2$  nor the bleaching powder, the  $\text{Ca(OH)}_2$  being ground in the liquid before or during the reaction. It may be obtained cryst. by reacting above  $40^\circ$  and then cooling below  $20^\circ$ .

**Dehydrating and dehydrogenating catalysts.** E. I. DU PONT DE NEMOURS AND Co. Fr. 657,505, July 13, 1928. Substances which modify or control the dehydrating and dehydrogenating action of catalysts on org. compds. are incorporated with the catalysts. Substances modifying the dehydrating action are oxides alk. under the conditions of working, and substances modifying the dehydrogenating action are oxides acid under the conditions of working. Thus, in the production of acetone from iso- $\text{PrOH}$  the amt. of propylene formed is greatly reduced by adding 4.5% of  $\text{Na}_2\text{CO}_3$  to the  $\text{ZnO}$  catalyst. If 7% of  $\text{ZnSO}_4$  is added instead of  $\text{Na}_2\text{CO}_3$  the amt. of propylene formed is greater than the amt. of acetone. In passing  $\text{EtOH}$  over  $\text{U}$  oxide, if  $\text{K}_2\text{CO}_3$  is added to the catalyst 10 mols. of  $\text{AcH}$  are formed for 1 mol. of  $(\text{CH}_3)_2$ , but if the  $\text{K}_2\text{CO}_3$  is replaced by 15% of  $\text{H}_3\text{BO}_3$  only 0.09 mols. of  $\text{AcH}$  are formed for 1 mol. of  $(\text{CH}_3)_2$ .

**Catalysts for oxidizing sulfur dioxide, etc.** B. LAMBERT and NATIONAL PROCESSES, LTD. Brit. 301,853, Sept. 6, 1927. Catalysts are obtained by permitting a Cr oxide hydrogel to absorb an insol. or slightly sol. base (suitably by use of acetates of Ca, Mg, Ni, Co, Mn and Zn).

**Catalytic production of oxygenated carbon compounds.** W. A. LAZIER. Brit. 301,806, June 12, 1926. Catalysts for use in reactions such as that of  $\text{CO}$  with  $\text{H}$  or steam or in dehydrogenation of compds. such as  $\text{EtOH}$  are prepd. by heating to decomn. a double chromate of a nitrogenous base such as  $\text{NH}_4$ , or pyridine and one of the metals Zn, Cu, Cd, Mg, Mn, Ag and Fe. The catalysts may be rendered more active by leaching with a "weak" acid such as 5-10%  $\text{HOAc}$ . Examples are given of the production of  $\text{MeOH}$  and higher alcs. from  $\text{CO}$  and  $\text{H}$ . Prepn. of basic Zn  $\text{NH}_4$  chromate, Mn  $\text{NH}_4$  chromate and Zn bichromate tetrapyridine is described.



**Reactivating catalysts used for removing nitrogen oxides from hydrogen mixtures.** Soc. L'AIR LIQUIDE, Soc. ANON. POUR L'ÉTUDE ET L'EXPLOITATION DES PROCÉDÉS G. CLAUDE. Brit. 301,736, Dec. 3, 1927. Regeneration of catalysts used in processes such as described in Brit. 287,577, (C. A. 23, 488) is effected by washing them with a dil. alk. soln. such as one contg.  $\text{NH}_3$  and its compds. and used for decarbonating the gas mixt. under treatment.

**Catalytic production of hydrogen.** I. G. FARBENIND. A.-G. Brit. 301,969, Sept. 15, 1927. Catalytic conversion of mixts. of hydrocarbons with water vapor or  $\text{CO}_2$  into H and CO is effected in elongated chambers in which the catalyst is indirectly heated to 600–1000°. The reaction mixt. is preferably preliminarily freed from S compds. by passing over heated metallic oxides. An app. is described.

**Separation of oxygen from a mixture.** G. LIBBRECHT. Belg. 355,396, Dec. 31, 1928. The mixt is brought into contact with a compd. which can be easily oxidized and de-oxidized under the influence of a variation in the surrounding medium; *e. g.*, the mixt. is brought into contact with animal hemoglobin which combines with the  $\text{O}_2$ , and the reaction product is subjected to vacuum to liberate the absorbed  $\text{O}_2$ .

**System of mining sulfur by fusion.** WILBER JUDSON (to Texas Gulf Sulphur Co.). U. S. 1,719,981, July 9. In the treatment of partially exhausted underground S deposits, a pressure is maintained in the deposit by withdrawing water from the cold lower portion of the deposit and withdrawing hot water from the upper portion of the deposit and reintroducing the withdrawn hot water into the deposit.

**Sulfur burner operation.** EDWIN J. MULLEN (to General Chemical Co.). U. S. 1,720,742, July 16. S is distd. under such conditions as to form a gas consisting substantially of S vapor without  $\text{SO}_2$  and the S vapor is burned in heat transfer relation to the S undergoing distn.  $\text{SO}_2$  is thus produced which is substantially free from impurities originally present in the S. An app. is described.

**Carbon.** LOUIS GUMZ. Ger. 477,508, Mar. 23, 1927. App. is described for producing graphite-like C from natural gas by pyrogenic decompn. Cf. C. A. 23, 2539.

**Active carbon.** METALLBANK UND METALLURGISCHE GES. A.-G. Brit. 302,774, Nov. 1, 1927. Fine-pore vegetable materials such as plum stones, coconut shells, and other hard shells, broken into small pieces, are heated with a concd.  $\text{ZnCl}_2$  soln. (suitably contg. about 70% as much  $\text{ZnCl}_2$  as the wt. of the material treated). The mixt. is dried at about 200° and then heated to 700°, the  $\text{ZnCl}_2$  is extd. with HCl and water and the residue is dried, broken up and sieved.

**Active charcoal.** LA CARBONISATION (Soc. générale d'exploitation des carbonnes). Fr. 657,545, Nov. 24, 1927. Decolorizing active charcoal is made by solubilizing the salts contained in the charcoal by treating with  $\text{MgCl}_2$ , then with HCl or  $\text{HNO}_3$  or a mixt. thereof, afterward solubilizing the hydrocarbons of the charcoal by treatment with NaOH or carbonates, drying and heating to 400–500°, washing with water and heating to 500–1500° in the absence of air.

**Reactivating decolorizing carbon.** VEREIN FÜR CHEMISCHE UND METALLURGISCHE PRODUKTION. Ger. 478,311, Jan. 23, 1926. See Brit. 264,799 (C. A. 22, 307).

**Silica gel.** KUNO WOLF and MAX PRAETORIUS. Ger. 478,312, Sept. 27, 1927. Streams of concd. acid and concd. waterglass soln. are continuously discharged from tanks so that the waterglass soln. stream surrounds the acid stream. The gelatinous product falls on to and is disintegrated by rollers, from which it is removed and worked up in the usual way.

**Plastic material.** JACQUES POBEREJSKY. Fr. 656,760, Nov. 15, 1927. Articles are molded under heat and pressure from a mixt. of powd. ebonite and a powd. resin such as bakelite.

**Plastic compositions.** J. C. PATRICK and N. M. MNOOKIN. Brit. 302,270, Dec. 13, 1927. Products sol. in  $\text{CS}_2$  but insol. in most org. solvents and which may be made to resemble either hard or soft rubber are obtained by reaction between halogen addn. compds. of olefins such as ethylene or propylene dichloride and dibromides and sol. polysulfides such as those of the alkali metals, alk. earth metals and  $\text{NH}_3$ . The reaction is promoted by heating but may be effected at ordinary temp.

**Plastic compositions containing cellulose esters or ethers, etc.** I. G. FARBENIND. A.-G. Brit. 302,615, Sept. 12, 1927. Plastic compns. and lacquers are formed with nitrocellulose or other cellulose esters or ethers and various other substances such as solvents, graphite, talc, mica, asbestos, slag wool, wood, cork, brown coal, millet, coconut fiber, tapioca, maize, lithopone, white lead, powdered slate, pumice, kieselsguhr, chalk, resins, plasticizers and coloring substances. Brit. 302,616 specifies "knifing compns." of somewhat similar character contg. over 3 times as much of a filler such

as kieselguhr, powdered pumice or levigated chalk as the quantity of nitrocellulose or other cellulose deriv. used in the compn. Cf. *C. A.* 23, 2540.

**Plastic composition containing a phenolic aldehyde condensation product.** ROBERT A. NORTON (to Selden Co.). U. S. 1,720,051, July 9. A compn. which is readily machined and given a high polish is formed from a phenol-aldehyde condensation product, initially fusible and capable of being hardened by heat, homogeneously mixed with Bu palmitate, Am stearate or other suitable ester of a "polybasic" aliphatic acid and alcs having less than 3 OH groups.

**Artificial [condensation] substances.** HANS KAPPELER. Fr. 657,477, July 13, 1928. See Brit. 293,872 (*C. A.* 23, 1729).

**Non-turbid aldehyde condensation products.** ROBERT A. NORTON (to Selden Co.) U. S. 1,720,052, July 9. In producing hard, infusible, relatively non-turbid aldehyde condensation products, reaction in the presence of an alk. condensing agent such as  $\text{Na}_2\text{CO}_3$  is effected between an aldehyde, e. g.,  $\text{CH}_2\text{O}$ , and a "resinophoric compd." such as phenol capable of reaction to produce a resin that can be hardened by heat, a polycarboxylic acid compd. such as Na phthalate is added, free water is substantially removed, and the product is then hardened by heating.

**Phenol-aldehyde condensation products.** I. G. FARBENIND. A.-G. Brit. 302,600, July 14, 1927. Products which may be rendered infusible and insol. by heat and pressure are obtained by condensing phenols with aldehydes such as  $\text{CH}_2\text{O}$  in the presence of compds. such as butylamine, mono- or di-ethanolbutylamine, cyclohexylamine, di cyclohexylamine, cyclohexylethanolamine or dicyclohexylethanolamine in small quantities.

**Urea-formaldehyde condensation products.** KUNSTHARZFABRIK F. POLLAK GES. Brit. 301,798, Dec. 5, 1927. Transparent products from carbamides and aldehydes contg. no free aldehydes may be obtained by condensing less than 2 mols aldehyde in acid soln. with 1 mol. of the amide under such conditions as to maintain some free aldehyde in the reacting mixt. at all stages of the reaction. Various details of procedure are given. Cf. *C. A.* 23, 1729.

**Urea-formaldehyde condensation products.** POLLOPAS, LTD., E. C. C. BALY and E. J. BALY. Brit. 301,626, Nov. 11, 1927. Vitreous and transparent condensation products are obtained by condensing dimethylolurea having a m. p. of at least  $134^\circ$  (which may be obtained by the method described in Brit. 299,487 (*C. A.* 23, 3236)) The condensation may be effected by boiling under reflux an aq. soln. of a  $p_H$  between 5 and 7. Various details are given.

**Forming tubes, sheets, etc., from mica flakes and varnish containing a phenol-urea-aldehyde condensation product.** A. LLOYD and BAKELITE, LTD. Brit. 302,612, Aug. 15, 1927.

**Molded telephone transmitters of phenolic condensation product with metal inserts.** FREDERIC S. KOCHENDORFER (to Western Electric Co.). U. S. 1,720,681, July 16 Structural features.

**Rubber-bonded dry molding compositions.** W. B. WESCOTT (to Rubber Latex Research Corp.). Brit. 302,151, Dec. 10, 1927. Granular or fibrous fillers are treated with dild. latex contg. a protective colloid such as hemoglobin, and preferably  $\text{ZnO}$ , and the mass (which may contain as little as 5% rubber) is dried and comminuted or shredded. Various substances such as asbestos, cotton, comminuted old tire material, whiting, talc, and S and accelerators may be added. Numerous details are described.

**Molding casein.** P. HAESSLER. Brit. 302,545, May 21, 1928. An app. is described in which casein powder under high pressure is forced through a sieve to render it plastic and then injected through a nozzle into a mold. The casein may be heated to  $90\text{--}110^\circ$  as it is charged into the app.

**Adhesive and impregnating compositions.** I. G. FARBENIND. A.-G. Brit. 302,710, Sept. 17, 1927. Stearin pitch, cotton-oil pitch or wool-fat pitch or similar materials are heated with animal or vegetable oils and S or S-yielding substances and S-bearing compds. extd. from tar with solvents are added. Cf. *C. A.* 22, 4214.

**Adhesive paper or fabric.** I. G. FARBENIND. A.-G. Brit. 302,588, Dec. 17, 1927. One side of the material is coated with gum or rubber and the other side with cellulose laurate or other ester, mixed ester or ether-ester of cellulose with a higher aliphatic acid. The latter facilitates unrolling by preventing sticking.

**Adhesives containing cellulose esters.** W. PLINATUS (to Compagnie française d'exploitation des procédés Plinatus). Brit. 302,324, Dec. 14, 1927. Dry adhesives (suitable for use in joining materials together under the action of pressure and heat) comprise cellulose esters such as nitrocellulose contg. a solvent of high b. p. in a state

of fine distribution in the compn., with or without addnl. substances such as resins. The adhesive may be used as a powder or foil.

**Plastic stone-like composition made with vegetable ivory and magnesium oxychloride cement.** E. TELTSCHIK & Co. Brit. 301,893, Dec. 9, 1927. Ground vegetable ivory is treated with dil. acid or alk. soln., washed with water, dried, satd. with  $MgCl_2$  soln. and  $MgO$  is added. Waterproofing substances such as solns. of rubber, celluloid, or synthetic resin and coloring matter may be added.

**Cement.** BURR W. TUTTLE. U. S. 1,719,914, July 9. A cement which is suitable for repairing ceramic ware comprises asbestos 2 and  $ZnO$  1 part mixed with sufficient waterglass to form a thick paste.

**Cement crystallization vessel.** ARTHUR WILHELMI. Ger. 477,669, Nov. 17, 1925. Details of construction and arrangement are given.

**Acoustic diaphragms.** W. J. RICKERS. Brit. 302,746, Oct. 1, 1927. A diaphragm of paper, linen, silk, artificial silk, mercerized cotton or like material is treated with a synthetic condensation product of urea, thiourea or their compds.

**Diaphragms for telephones, etc.** ROBERT REINERT. U. S. 1,721,038, July 16. A disk of metal such as Al alloy of the desired final shape is placed between 2 blocks which may be formed of iron and which conform to the shape of the surfaces of the diaphragm and subjected to heating and then to slow cooling to remove internal stresses of the metal of the diaphragm due to the mechanical operations in its manuf.

**"Bakelite" diaphragms for "loudspeakers," etc.** W. K. WEBSTER. Brit. 302,459, Nov. 2, 1927. Structural features.

**Brake drums.** VINCENT BENDIX (to Bendix Brake Co.). U. S. 1,720,815, July 16. A Cr surface coating is cemented to a drum of ferruginous metal, in order to increase strength and lessen corrosion.

**Brake drums.** RAYMOND J. NORTON (to Bendix Brake Co.). U. S. 1,720,853, July 16. Drums of ferruginous metal are provided with an exterior coating of material of greater heat conductivity such as by calorizing with Al which serves to facilitate dissipation of heat.

**Brake lining material.** W. B. WESCOTT (to Rubber Latex Research Corp.). U. S. 1,720,407, July 9. An integral body of gelled rubber derived *in situ* from latex is permeated with asbestos fibers and reinforced with wire.

**Curing friction material suitable for brake or clutch facings.** ELMER R. ROSS (to Raybestos Co.). U. S. 1,721,135, July 16. A material with a base of asbestos fiber is treated with a primarily liquid binder such as a soln. of gilsonite in gas oil and then cured by heating in a liquid medium such as molten type metal substantially incompatible with the binder at a temp. below that which would carbonize the base, at a temp. sufficiently high to uniformly cure and harden the binder.

**Stencil sheet.** RICHARD DAMME. U. S. 1,719,926, July 9. Stencil sheets are prepd. with a compn. comprising collodion, oleic acid, lithopone, soap, castor oil, glycerol,  $AmOAc$  and a dye.

**Dry stencil.** HENRY H. HAWLING. U. S. 1,720,897, July 16. A base such as paper is treated with a compn. comprising casein, an alkali hydroxide and Na tungstate.

**Impregnated paper for recording impressions by electric currents.** R. POLLAK-RUDIN. Brit. 301,749, Dec. 3, 1927. A paper strip is impregnated with a portion only of the components forming the substance for chemical reaction and necessary ions for the reaction are derived from one or more electrodes used. Among the materials suitable for such use together are: dimethylglyoxime and Ni; tannin and Fe;  $NH_4$  molybdate and Mo. Org. dyes of their leuco compds. also may be used and reaction with them effected by O or H ions evolved at the electrodes. Various details and modifications are described.

**Preventing condensation on glass or other polished surfaces.** F. W. WELCH. Brit. 301,585, Sept. 24, 1927. The surface is rubbed with a mixt. formed from soap 16, glycerol 1 and water 24 parts. The soap and water are boiled together and then cooled and reheated before adding the glycerol.

**Rendering containers or wrappings of paper or cloth impermeable.** W. DAUWITZ. Brit. 301,861, Dec. 7, 1927. Coating is effected by use of hardened oils or fats such as hardened coconut oil, peanut oil or train oil (suitably after a preliminary impregnation with glue, gelatin, cellulose, cellulose esters or like materials).

**Liquid containers.** I. G. FARBENIND. A.-G. Fr. 657,440, July 12, 1928. Containers for liquid air or O have several walls between which adsorbents such as active  $SiO_2$  are placed to create a vacuum between these walls.

**Composition for polishing metals.** F. HAIGH. Brit. 302,423, Sept. 29, 1927.

Flaked stearin 2, coconut oil 1, peanut oil 1, tripoli powder 4, "polishing earth" 4, paraffin oil 1 and "petrol" 1 part.

**Treating silverware with mercury vapor.** DANIEL GRAY, RICHARD O. BAILEY and W. S. MURRAY (to Onaida Community, Ltd.). U. S. 1,720,215, July 9. Treatment of the ware with Hg vapor is effected in an atm. free from O or other reagents which would interfere with the absorption of the Hg by the ware. U. S. 1,720,216 specifies silver-plated ware in which the plating consists of an intimate mixt. of Ag and Hg with a Ag content of about 90% or more.

**Printing with non-drying inks.** JACOB E. HYDEMAN. U. S. 1,721,397, July 16. In printing an absorbent paper that may be used at once, a non-drying ink is used in the intaglio printing process.

**Stereotype mats.** ARLIE W. SCHORGER (to C. F. Burgess Laboratories, Inc.). U. S. 1,720,243, July 9. Stereotype dry mats are made of fibrillated  $\alpha$ -cellulose mixed with a filler such as clay.

**Shoe-stiffening material.** W. J. LUND and LUCIEN P. MELLERIO (to Celastic Corp.). U. S. 1,720,795, July 16. A gelatinizable stiffening substance in fibrous form such as cellulose acetate is used in making stiffener blanks which may be softened with a solvent. Cf. C. A. 23, 3316.

**Apparatus for generating gas such as hydrocyanic acid for killing rodents in burrows.** HARRY C. ELKINS. U. S. 1,720,321, July 9.

**Cleaning the bore surfaces of firearms.** WILBERT J. HUFF. U. S. 1,719,933, July 9. The bore surfaces are treated with a free-flowing non-corrosive aq. emulsion contg. a large proportion of water together with an oil phase such as lard oil and light lubricating oil and a peptizing agent, e. g.,  $\text{NH}_4$  oleate, and the liquid and assoc. materials are removed by swabbing.

**Fireproofing.** SOC. LEMERCIER FRÈRES. Fr. 656,693, June 1, 1928. Ammonium phosphate alone or with Na stannate is used for fireproofing. Fr. 656,694 describes a process by which fireproofing substances are crystd. in the cloth.

**Fireproofing and fire-extinguishing compositions.** I. G. FARBERIND. A.-G. Brit 302, 172, Dec. 10, 1927. A small quantity of an alkylated or aralkylated sulfonic acid or water-sol. salt of such an acid such as Na butylnaphthalene sulfonate or  $\text{NH}_4$  benzyl-naphthalene sulfonate is used with other substances such as Al sulfate and  $\text{NaHCO}_3$ ,  $\text{NH}_4\text{Cl}$  or  $\text{CCl}_4$ .

## 19—GLASS, CLAY PRODUCTS, REFRACTORIES AND ENAMELED METALS

G. E. BARTON, C. H. KERR

**The glass industry in North America.** W. E. S. TURNER. *Pottery Gaz.* 54, 927-33 (1929); cf. C. A. 23, 4032.—The production and sale of various kinds of glass and glassware are discussed. T. includes in his discussion the use of Ba sulfate in the glass batch, effective mixing of the batch, care with the cullet, glass pots and pot furnaces, furnace design and glass-forming machines as used in American glass manuf.

R. A. HEINDL

**Chemical glassware manufactured by the Russian governmental plant "Druzhnaya Gorka."** V. E. TISHCHENKO. *Zhur. Prikladnoi Khim.* 2, 3-19 (1929).—Chem. resistivity of this glass is superior to any other grade of chem. glass manufactured in other countries, though it is less resistant to heat than Jena glass and especially Pyrex.

V. KALICHEVSKY

**Coloring of glass by bismuth.** II. KITSUZO FUHA. *Mazda (Japan)* 3, 295-324 (1928); cf. C. A. 23, 1731 (1929). (In English.)—Basic Bi carbonates and Bi nitrates added to glass or porcelain produce a color that depends upon the compn. of the glass. Upon heating, the glass turns deep brown, gray or milk-white. With  $\text{KNO}_3$  as oxidizing agent, the color is light and its nuance depends upon the compn. of the glass. If K tartarate is used as the reducing agent, no marked color is obtained. With arsenious acid the coloration is weakened, probably by the pptn. of metallic Bi.

K. SOMEYA

**Coloring incandescent lamps on the inner surface.** A. F. LINDSTROM. *Chem. Mat. Eng.* 36, 410-1 (1929).

E. H.

**Flocculation action of hydrophilic sols on suspensions of clay, and its practical uses.** TSURUJI OKAZAWA and TERUKICHI SANO. *Bull. Inst. Phys. Chem. Research (Tokyo)* 8, 356-68; *Abstract Ed.* 2, 46-8 (1929).—Suspensions of 0.5 g. of clay in 20 cc. of solns.

ranging from 0.0002 *N* NaOH to 0.002 *N* HCl were treated with gelatin sol to give from 0.025% to 0.00005% gelatin and the state of flocculation was observed after vigorous shaking and 30 sec. standing. With NaOH stronger than 0.0002 *N* no flocculation was obtained, while flocculation was complete in neutral soln. with 0.005 and 0.0025% gelatin. Casein, albumin, gum arabic and starch give very small flocculation values, while a sol of "Konnyaku-ko" (a powder obtained from the root of devil's tongue) gives enormously high values. Concns. as low as 0.0025% Konnyaku-ko gave complete flocculation between 0.0002 *N* NaOH and 0.002 *N* HCl, while with 0.00005% Konnyaku-ko complete flocculation of a clay suspension is obtained in acid soln. This flocculation of clay suspensions aids in their filtration, a soln. of 10 g. infusorial earth in 450 cc. of 30% raw sugar soln. requiring 150 min. for filtration with no gelatin sol present and only 90 min. on the addition of 4 cc. of 1% gelatin sol.

H. STOERTZ,

**Quality of Endai fire clays.** MASAJI KAJIWARA. *J. Japan Ceram. Assoc.* 36, 58-65(1928).—Endai grog clay is a very compact shale with an oily feel. It is vitrifiable and melts at cone 34. It contains SiO<sub>2</sub> 42.44, Al<sub>2</sub>O<sub>3</sub> 38.41, Fe<sub>2</sub>O<sub>3</sub> 2.84, CaO 0.57, MgO 0.34%; loss on ignition is 16.48%. Grog from the clay was slag-proof, dense and smooth. Bricks rich in fine grog were excellent regardless of their porosity. In chem. compn. and refractoriness, the Endai clay resembles the best Fukushu clay, which is widely used in Japan. However, the Endai clay is finer and more plastic than the Fukushu clay.

S. KONDO

**The load test of refractories. II.** MINORU NAKAMOTO. *J. Japan Ceram. Assoc.* 36, 94-103(1928).—Expts. were made on the load-bearing property of Kokaseki, a pumice-like volcanic rock produced in Niishima, Island of Izu. A light reddish brown and a white specimen, resp., contained SiO<sub>2</sub> 78.27, 77.41; Al<sub>2</sub>O<sub>3</sub> 14.66, 13.34; Fe<sub>2</sub>O<sub>3</sub> 3.71, 2.49; CaO 1.23, 1.17; MgO 0.81, 0.77; alkalis (by diff.) 1.32, 4.82%. The specimens show no abnormal expansion in heating and behave in softening like silica brick.

S. KONDO

**The softening temperature of fire brick under load.** SEIJI KONDO. *J. Japan Ceram. Assoc.* 36, 208-17, 519-27(1928).—The softening behavior of 48 different fire brick made by 15 manufacturers under a load of 2 kg./sq. cm. has been studied. Forms of height-temp. curves, relation between the softening temp. and refractoriness, and that between softening temp. and chem. compn. are discussed.

S. KONDO

**The heat-resisting properties of bricks, tiles and cement wares.** SEIJI KONDO. *J. Japan Ceram. Assoc.* 36, 528-36(1928).—Tests were made on the refractoriness and softening behavior under a load of 2 kg./sq. cm. of common bricks, hollow tile, paving brick, wall tiles, stove tile, cement-asbestos slate and various mixtures of a portland cement and the standard sand or a sand of the Tama river. Softening temp. and curves of the cement-asbestos slate are markedly influenced by the direction of pressure. Specimens made of neat cement or portland cement and standard sand show peculiar softening curves, probably due to changes other than melting.

S. KONDO

**An example of Japanese kaolinite clays.** MINEICHI MASUDA. *J. Japan Ceram. Assoc.* 36, 433-9(1928).—A clay produced at Jishahara, near Sawatari hot spring in Shimotsuke, consists chiefly of minute kaolinite crystals and a small proportion of hydromica. It contains no colloidal kaolin. The kaolinite is mainly hexagonal plates, angle 120°, almost uniform in size, and the length of a side of the hexagon about 0.01 mm.; the crystals are almost colorless and transparent, interference color dark gray, double refraction weak,  $n_D \alpha$  1.560,  $\gamma$  1.567; hence max. double refraction is 0.007. The hydromica is fibrous and minute, though most crystals are a little larger than those of the kaolinite, almost colorless and transparent, double refraction strong,  $n_D$  1.575-1.590. The associated minerals are iron pyrites and some quartz; tourmaline and the other minerals usually accompanying kaolinite are rare. A sample, chiefly composed of kaolinite crystals and poor in iron pyrites, gave loss on ignition 14.02, SiO<sub>2</sub> 47.06, Al<sub>2</sub>O<sub>3</sub> 36.48, Fe<sub>2</sub>O<sub>3</sub> 0.93, CaO 0.36, MgO trace, alkalis (by diff.) 2.25%. The clay softens at cone 26. An x-ray photograph by the powder method is shown. No very distinct lines were obtained. Heat absorption occurring at 400° and 650°, and heat evolution occurring at 1000° and 1200° are discussed. Temp.-contraction curves of primary and secondary heatings are shown. The max. linear expansion occurring at 600° is 1.7% and shrinkage at 1330° is 11.7%.

S. KONDO

**Study of clay slip. I. Experiments on electrolytes, fluidity and hydrogen-ion concentration.** TOSAKU YOSHIOKA AND TATSUO IRIS. *J. Japan Ceram. Assoc.* 36, 312-23(1928).—Fluidity and  $p_H$  value of the clay slips are increased by the addition of alk. electrolyte within certain ranges; the action of acidic electrolyte is the reverse. The deflocculating action of Na silicate or NaOH is far stronger than that of Na<sub>2</sub>CO<sub>3</sub>.

or  $\text{NH}_4\text{OH}$ ; 0.16–0.24% of the alkalis is sufficient for the min. viscosity and the corresponding  $p_H$  value varies from 7.50 to 10.00. The fluidity is a little increased by aging. S. KONDO

**Reversible expansion of clayware.** V. TOSAKU YOSHIOKA. *J. Japan. Ceram. Assoc.* 36, 484–92(1928); cf. *C. A.* 23, 2280.—A study was made of the effect of method of prep. test pieces upon their reversible thermal expansion. VI. *Ibid.* 567–76.—Expts. were made of thermal expansion of Zettlitz kaolin, Kato kaolin and Gairome clays (plastic kaolins) of Seto, Tokiguchi and Seikirei. The curves showing the relation between temp. and linear expansion are nearly straight. Heat treatment exerts a marked effect upon the expansion. Some of the clays heated at  $1300^\circ$  or  $1400^\circ$  show an abnormal expansion at temps. under  $250^\circ$ . The curves of the clays heated at  $1500^\circ$  are practically straight and the expansions are smallest, the coeff. of expansion ranging from 0.0528 to 0.0535. S. KONDO

**Progress report on investigation of sagger clays.** V. Preparation of experimental sagger bodies according to fundamental properties. R. A. HEINDL AND L. E. MONG. *J. Am. Ceram. Soc.* 12, 457–80(1929).—Data indicate that bodies having (1) porosity of less than 25%, (2) a low modulus of elasticity, (3) as high transverse strength as is compatible with the low modulus of elasticity, and (4) low thermal expansion below  $250^\circ$ , are the most desirable. C. H. KERR

The relation of a modulus of grain size to the mechanical strength of sagger mixtures. RAYMOND E. BIRCH. *J. Am. Ceram. Soc.* 12, 451–4(1929).—Batches having the same classification modulus will give about the same fired, transverse strength. Grog mixts. having classification moduli of about 1.5 will make the strongest saggars, both dry and burned. C. H. KERR

Some absorption properties of clay bricks. L. A. PALMER. *Bur. Standards, J. Research* 3, 105–27(1929). E. H.

**The bonding of silica bricks.** W. J. REES. *Refractories J.* 4, 104–9(1929).—Of the bonds tried, lime has come into the most general use. Sol. bonds tried were Na silicate,  $\text{NH}_4$  alum,  $\text{Al}_2(\text{SO}_4)_3$  and  $\text{CaCl}_2$ ; most of these are patented for the purpose. The disadvantage of sol. bonds is that they produce a glassy skin liable to spall, with a weak core. Org. bonds have been used with some success, notably tar, dextrin, starch paste, and wood by-products. These gave no strength after burning. With lime the purer the silica the more bond is required. The  $\text{CaO}$  reacts with feldspathic impurities and  $\text{SiO}_2$  to form a  $\text{Ca-Al}$  silicate, approx.  $\text{CaO}$  23%,  $\text{Al}_2\text{O}_3$  15%,  $\text{SiO}_2$  62%. This begins to melt at  $1150^\circ$ . As the temp. rises this aids in the conversion of quartz to tridymite and cristobalite. A high % of tridymite is desirable because of the higher expansion coeff. of cristobalite. Expts. with clay for a bond showed 2% to be sufficient, but the best results were obtained with  $3\frac{1}{2}\%$  clay and 0.2% Na silicate. In com. tests clay-bonded bricks showed a slight advantage in resistance to spalling.  $\text{Fe}_2\text{O}_3$  and  $\text{P}_2\text{O}_5$  have both been used as catalysts to increase the proportion of tridymite, but their value has not been definitely established. M. A. EDDY

**The silica firebrick.** GEOFFREY W. M. REES. *Refractories J.* 4, 142–7(1929).—Both ganister and quartzite are satisfactory raw materials. Inversion changes are sluggish except in the presence of certain fluxes. Na tungstate produces a fairly rapid change. By rapid heating the inversions were prevented and the m. ps. of the forms were quartz  $1500^\circ$ , tridymite  $1670 = 10^\circ$ , cristobalite  $1710 = 10^\circ$ . Repeated burning raises the % of inversion slowly. Storage conditions affect the strength of the finished brick. Bricks exposed to the weather for 5 months showed a cold-crushing strength of 1400 lbs., covered by a roof only, 2100 lbs. and kept in a dry room 2350 lbs. per sq. in. M. A. EDDY

**Analysis of refractory materials.** II. H. J. VAN ROYEN. *Arch. Eisenhüttenw.* 2, 371–3(1928); cf. *C. A.* 22, 3082.—A report on standard methods of analysis of magnesite and its products, adopted by the German Iron Smelters Association. Moisture is detd. by drying at  $105^\circ$  for 2 hrs., except in burned products that absorb  $\text{CO}_2$ , and then the detn. is omitted. Loss on ignition is obtained by heating to bright redness in a porcelain crucible to const. wt.  $\text{SiO}_2$  is detd. by the ordinary process of double evapn. with  $\text{HCl}$ , filtering, igniting the combined residues and volatilizing  $\text{SiO}_2$  with  $\text{HF}$  and  $\text{H}_2\text{SO}_4$ . The ignited residue is then treated with  $\text{HF}$  and  $\text{H}_2\text{SO}_4$ , evapd. until  $\text{SO}_3$  appears, taken up with  $\text{HCl}$  and added to the main filtrate. The latter solu. is made up to 500 cc. and aliquot portions are taken for analysis. To det. Fe treat with  $\text{H}_2\text{O}_2$ , boil, add  $\text{HCl}$  and  $\text{NH}_4\text{CNS}$ , and titrate with  $\text{TiCl}_4$ . For  $\text{Al}_2\text{O}_3$  ppt. with  $\text{NH}_4$  phosphate soln. after reduction with  $(\text{NH}_4)_2\text{S}_2\text{O}_8$  in  $\text{AcOH}$  soln., and weigh as  $\text{AlPO}_4$ . For  $\text{CaO}$  remove Fe, Al and Mn by pptn. with Br and  $\text{NH}_4\text{OH}$ , redissolve and reppt. twice. Finally ppt.  $\text{CaC}_2\text{O}_4$  with  $(\text{NH}_4)_2\text{C}_2\text{O}_4$  in presence of  $\text{AcOH}$ ; redissolve and

rept., dissolve in  $H_2SO_4$  (1:4) and titrate warm ( $60^\circ$ ) with  $KMnO_4$ . To det.  $MgO$  ppt. the filtrate from  $CaC_2O_4$  with  $NH_4$  phosphate in presence of  $NH_4OH$ , shake, filter and det.  $MgO$  from weighed, purified  $Mg_2P_2O_7$ . Mn is detd. in a sep. sample by soln. in  $HCl$ , treatment with  $ZnO$ , filtration of aliquot portion, and titration of the latter (hot) in the presence of a slight excess of  $ZnO$  by means of  $KMnO_4$  (Volhard method).

W. C. EBAUGH

**Magnesite refractories.** N. H. HORN. *Chem. Eng. Mining Rev.* 21, 261-4 (1929).—The geographical distribution of magnesite, methods of calcination, the properties of caustic and dead-burned magnesite and the manuf. and properties of magnesite bricks are briefly discussed. The thermal cond. of magnesite brick is high and decreases with temp. rise. The thermal expansion at high temps. is about 1.56%.

W. H. BOYNTON

**Insulation and refractories in furnaces.** GUY A. BARKER. *Iron Age* 123, 1642-3 (1929).

DOWNES SCHAAP

**Investigations of the corrosion of refractory materials. II. Influence of the chemical composition of the slags.** HERMANN SALMANG and FRIEDRICH SCHICK. *Arch. Eisenhüttenw.* 2, 439-47 (1929).—Quant. tests were made to study the corrosive strength of slag on fireclay crucibles. The strength of the pure oxides decreases in the order:  $PbO$ ,  $FeO$ ,  $MnO$ ,  $CaO$ ,  $Fe_2O_3$ ,  $K_2O$ ,  $Na_2O$ ,  $Mn_2O_3$ . Mixts. of the oxides have a smaller influence than the pure oxides. Boric acid attacks the crucible, but  $Al_2O_3$  and  $SiO_2$  do not. Addns. of  $FeO$  and  $MnO$  to slag with high  $CaO$  contents (over 40%) increase the attack.

A. E. BEITLICH

**Optical methods as an aid to the study of refractories.** T. N. MCVAY. *J. Am. Ceram. Soc.* 12, 455-6 (1929).—A general discussion.

C. H. KERR

**The use of a small cupola in testing cupola refractories.** JAMES T. MACKENZIE. *J. Am. Ceram. Soc.* 12, 443-6 (1929).

C. H. KERR

**Apparatus for determining the crushing strength of refractory materials at very high temperatures: study of fused magnesia.** G. CHAUDRON, M. GARVIN and A. VILLACHON. *Chimie & industrie Special No.*, 330 (Feb., 1929).—In order to see if large  $MgO$  crucibles would have the required mech. strength for use on a com. scale in a furnace such as described in *C. A.* 22, 4384, an app. was designed for accurately detg. the crushing strength of refractories above  $1600^\circ$ . Pure  $MgO$  behaves satisfactorily at  $2200^\circ$ , undergoing only a viscous deformation; addn. of 1.6%  $SiO_2$  considerably increases the fragility at high temp.;  $Al_2O_3$ ,  $Cr_2O_3$  and  $Fe_2O_3$ .  $CaO$  apparently do not affect the mech. properties of pure  $MgO$ , the  $Fe_2O_3$ .  $CaO$  even reducing the viscosity slightly.

A. PAPINEAU-COUTURE

**The effect of sodium silicate on casting slips.** K. SILK and N. D. WOOD. *Pottery Gaz.* 54, 272-3 (1929).—The authors discuss the comparative effects on earthenware slip of varying  $Na_2O:SiO_2$  ratios in Na silicate. The fluidity of the casting slip showed a marked similarity between the results obtained with Na silicate of different sp. gr. In every case most of the deflocculation obtainable had been achieved at a concn. corresponding to 0.02%  $Na_2O$  of the body. Increasing the proportion of  $SiO_2$  in the Na silicate slightly thickened the slip. The effect of an increasing  $Na_2O:SiO_2$  ratio on an earthenware body was found to be the reverse of the effect on a china body.

R. A. HEINDL

**Increasing dried-ware strength with lignin extract.** R. M. KING. *Brick and Clay Record* 73, 97-8 (1928).—Gum arabic, dextrin, coal tar, molasses, and other org. binders have been used to increase the dry-strength of ceramic wares. Lignin ext. has been used for many years to strengthen the cores of foundry molds. By adding 2% lignin to sagger bodies their strength was increased 91%. 0.5% lignin increased the dry-strength of a tile body 125%. The addn. of lignin to ceramic bodies is suggested as a substitute for some of the plastic ball clay.

H. G. SCHURECHT

**Modern practice crystallized in new tunnel kiln.** GEORGE S. HOUSMAN and GILBERT E. SKIL. *Chem. Met. Eng.* 36, 340-3 (1929).—A new Dressler tunnel kiln is described.

C. H. KERR

**A coke-fired gas producer for the ceramic industry.** H. C. BARRETT. *J. A. Ceram. Soc.* 12, 435-42 (1929).

C. H. KERR

**Present practice in whiteware periodic kiln design.** R. G. MILLS. *J. Am. Ceram. Soc.* 12, 481-90 (1929).

C. H. KERR

**The incrustation of ceramic ware.** THEODORE LENCHNER. *J. Am. Ceram. Soc.* 12, 498-501 (1929).—A history and general description are given of the application of gold and other precious metals over acid-etched designs on glass, china and enamel ware.

C. H. KERR

**Kiso-stone as a raw material for pottery.** JIROKICHI KUMAZAWA. *J. Japan. Ceram. Assoc.* 36, 552-4(1928).—Kiso-stone is a liparite contg.  $\text{SiO}_2$  72.28,  $\text{Al}_2\text{O}_3$  15.18,  $\text{Fe}_2\text{O}_3$  1.30,  $\text{CaO}$  0.37,  $\text{MgO}$  0.39,  $\text{MnO}$  0.06, alkalis 5.62%. Loss on ignition is 4.25%. If cut, it looks like a well-grained wood. Plates of the material are used raw or fired to about  $1100^\circ$ . Scrap produced in making plates is utilized by manufacturers of terra-cotta and tiles. Bodies composed of Kiso-stone 55-65, Kibushi clay of Seto 20-30 and feldspar of Yodo, Tokigun, 15%, with an ordinary raw glaze, fired at cone 6a, have given satisfactory results. They are cream-colored and suitable for the manuf. of terra-cotta, tiles, sanitary ware, etc. S. KONDO

**Linoleum block printed pottery.** SADIE LOSHINSKY. *J. Am. Ceram. Soc.* 12, 502-4(1929). C. H. KERR

**Copper ruby glaze.** II. TOSAKU YOSHIOKA AND SHO HIRAOKA. *J. Japan. Ceram. Assoc.* 36, 154-60(1928); cf. *C. A.* 23, 2261.—Frits of 0.25  $\text{Na}_2\text{O}$ , 0.15  $\text{K}_2\text{O}$ , 0.60  $\text{CaO}$ , 0.25  $\text{Al}_2\text{O}_3$ , 3.0  $\text{SiO}_2$ , 0.25  $\text{B}_2\text{O}_3$  + 1%  $\text{CuO}$  + 1 to 5%  $\text{Fe}_2\text{O}_3$ ,  $\text{PbO}$ ,  $\text{SnO}_2$  or  $\text{ZnO}$  were prepd. in a heavy-oil kiln and were reheated in an atm. of  $\text{N}_2$  or  $\text{CO}_2$  at  $600^\circ$ ,  $700^\circ$ ,  $800^\circ$  or  $900^\circ$  for 1 hr.  $\text{PbO}$  and  $\text{ZnO}$  seem rather to counteract the production of red. Both  $\text{Fe}_2\text{O}_3$  and  $\text{SnO}_2$  give deep ruby reds in  $\text{N}_2$  and  $\text{CO}_2$  atm.  $\text{SnO}_2$  gives more beautiful reds than  $\text{Fe}_2\text{O}_3$ . The suitable amt. of the oxides ranges from 2 to 4%. The best reheating temp. is  $700^\circ$ .  $\text{CO}_2$  produces reds at lower temp. but less clear than  $\text{N}_2$ . The same frits contg. 2-4%  $\text{SnO}_2$  prepd. in an atm. of  $\text{N}_2$  and reheated in the same gas at  $700^\circ$  or  $800^\circ$  had red colors, though they were lighter than those described above. Then the same frits contg. 1-5%  $\text{SnO}_2$  were prepd. from batches, to which the theoretical amt. of cane sugar required for the reduction of  $\text{CuO}$  to  $\text{Cu}_2\text{O}$  had been added, in an atm. of  $\text{N}_2$ . The frits were greenish when cooled quickly, and deep red if cooled slowly. Beautiful deep red frits were obtained by reheating the frits contg. 2-4%  $\text{SnO}_2$  at  $700^\circ$ . Too long heating gives the frits brownish tints and makes them opaque; the time is influenced by the content of  $\text{SnO}_2$ . S. KONDO

**Salt glazing.** FELIX SINGER. *Chem. Fabrik* 1929, 309. J. H. MOORE

**Cast iron capable of being enameled.** A. MÜLLER. *Giesserei-Ztg.* 26, 247-50 (1929); cf. *C. A.* 23, 3065.—The ratio of shrinkage between cast iron and enamel increases with increasing C and Mn contents, and decreases with increasing Si and P contents. Graphite-rich irons show a smaller shrinkage than graphite-poor irons. Shrinkage in hot-cast pieces is smaller than in cold-cast pieces. Cast iron of the following compn. may be enameled: C 3.6-3.7, Si 2.3-2.6, Mn 0.6-0.9, P 0.6-0.9 and S 0.08-0.1%. J. W. W. SULLIVAN

**Cause and control of color variation in cast-iron and sheet-iron enamels.** W. F. WENNING. *J. Am. Ceram. Soc.* 12, 491-3(1929).

**A deformation study of cobalt oxide-iron oxide-silica mixtures.** JOHN F. SHEPHERD. *J. Am. Ceram. Soc.* 12, 494-7(1929).—The deformation eutectic temp of  $\text{Fe}_2\text{O}_3$ - $\text{Co}_3\text{O}_4$  is  $1410^\circ$  and the compn. is 46%  $\text{Co}_3\text{O}_4$  and 54%  $\text{Fe}_2\text{O}_3$ . The eutectic 36%  $\text{Co}_3\text{O}_4$ , 42%  $\text{Fe}_2\text{O}_3$  and 22%  $\text{SiO}_2$  melts at  $1150^\circ$ . The color of the fused cones is uniformly steel-gray. Either of the two eutectics is similar in phys. properties to fused  $\text{Co}_3\text{O}_4$  and might be substituted for it in ground-coat enamels with a lowering in firing temp. and in cost. C. H. KERR

**A laboratory slagging test for boiler-furnace refractories (HURSH) 21.** A study of crystalline compounds formed in slags on boiler-furnace refractories (KLINEFELTER, REXFORD) 21. Apparatus for drying clay, sand, chalk, etc. (Fr. pat. 656,913) 1. Cement [for repairing ceramic ware] (U. S. pat. 1,719,914) 18. Method of and means for cooling annealed products (Ger. pat. 478,390) 13.

**D'HUBERT: Les chaux, les ciments et les produits ceramiques.** New ed. Paris: J.-B. Ballière et fils. 96 pp. F. 5.

**Working glass and similar substances.** J. VIATOUR. Belg. 355,730, Dec. 31, 1928. The flame is obtained by means of a gaseous hydrocarbon of high calorific value (except  $\text{CH}_4$ ), preferably a mixt. of  $\text{C}_2\text{H}_2$  and  $\text{O}_2$ .

**Device for regulating the flow of molten glass from tank furnaces or forehearth.** SOC. ANON. DES MANUFACTURES DES GLACES ET PRODUITS CHIMIQUES DE ST.-GOBAIN, CHAUNY, ET CIRÉY. Brit. 301,919, Dec. 8, 1927. Structural features.

**Feeding and circulating molten glass.** KARL E. PEILER (to Hartford-Empire Co.). U. S. 1,721,487, July 16. Mech. features.



- Apparatus for delivering mold charges of molten glass.** ALBERT F. TREMBLAY. U. S. 1,720,496, July 9. Structural features.
- Furnace, gravity-flow apparatus, etc., for sheet glass manufacture.** WILLIAM E. BOCK (to Erie Glass Co.). U. S. 1,720,029, July 9.
- Apparatus for sheet glass manufacture.** SOC. ANON. DES MANUFACTURES DES GLACES ET PRODUITS CHIMIQUES DE ST.-GOBAIN, CHAUNY, ET CIREY. Brit. 302,283, Dec. 13, 1927.
- Drawing sheet glass.** ENOCH T. FERNGREN (to Libbey-Owens Sheet Glass Co.). U. S. 1,720,547, July 9. Three streams of glass are caused to flow downwardly; one of the outer streams is heated and the other is cooled and the three streams are merged and consolidated. An app. is described.
- Apparatus for drawing sheet glass.** CLIFFORD A. ROWLEY (to Libbey-Owens Sheet Glass Co.). U. S. 1,720,527, July 9.
- Apparatus for plate glass manufacture.** W. OWEN (to Pittsburgh Plate Glass Co.). U. S. 1,720,745, July 16.
- Fused silica sheets.** QUARTZ ET SILICE. Brit. 302,895, Dec. 23, 1927. Panes or sheets for windows are made of transparent fused silica by submitting a mass of opaque fused silica, which has been heated to about 2000°, to a high pressure (suitably 200–600 kg. per sq. cm.) which is maintained until solidification occurs.
- Apparatus for molding bottles or other glass articles.** SYDNEY HUNT. U. S. 1,720,552, July 9. Structural features.
- Apparatus for making bottles or other blown glassware.** ROBERT F. HALL. U. S. 1,720,598, July 9. Structural features.
- Apparatus for manufacture of lamp bulbs or other blown glassware.** NAAMLIOOZE VENNOOTSCHAP MAATSCHAPPIJ TOT EXPLOITATIE VAN UITVINDINGEN. Brit. 302,153, Dec. 10, 1927.
- Apparatus for coloring the inner surface of electric lamp bulbs.** J. T. FAGAN and R. G. PHELPS (to British Thomson-Houston Co., Ltd.). Brit. 301,841, Dec. 6, 1927. An app. is described suitable for applying powdered pigment to the etched inner surface as described in Brit. 300,179 (C. A. 23, 3553).
- Spray-coating the inner surface of lamp bulbs, etc.** A. M. HAGEMAN and A. F. LINDSTROM (to Westinghouse Lamp Co.). Brit. 302,170, Dec. 9, 1927. An app. is described having a nozzle which may be cleaned by use of a steam jet and may be used for applying coatings such as those contg. Na silicate, kaolin and pigment.
- Frosting the inside of lamp bulbs by etching.** ELEKTRISCHE GLÜHLAMPENFABRIK WATT A.-G. Brit. 302,582, Dec. 17, 1927. After a first etching with a compn. such as may be formed from  $\text{NH}_4\text{F}$ ,  $\text{HCl}$ ,  $\text{CaCl}_2$ , water,  $\text{HF}$  and  $\text{BaSO}_4$ , a further etching with a weaker soln. derived by hydrolysis or dissocn. from the first soln. is effected to round off the sharp edges formed during the first etching.
- Bulbs for incandescent electric lamps, etc.** M. PIPKIN (to British Thomson-Houston Co., Ltd.). Brit. 301,830, Dec. 6, 1927. Opal, white or other natural colored bulbs are frosted on the inside, preferably by etching. All or a portion of the outside may be coated (suitably as described in Brit. 196,843 (C. A. 17, 3766)).
- Apparatus for manufacture of glass stoppers or similar pressed glass articles.** W. B. MITCHELL. Brit. 302,193, Aug. 11, 1927. Structural features.
- Lehr for annealing glassware.** JOHN MAYO (to Thermal Engineering Corp.). U. S. 1,719,897, July 9. Structural features.
- Treating copper leading-in wires of lamps, discharge tubes or similar electrical devices.** CHARLES T. DEGROAT (to General Electric Co.). U. S. 1,719,877, July 9. While annealing a glass stem through which a Cu leading-in wire extends, the latter is surrounded by a shielding tube which may be formed of Cu and which is of slightly larger diam. than that of the wire; this tube is removed after the annealing operation.
- Tunnel kiln construction suitable for burning bricks, tile, etc.** W. L. HAWLEY, JR. U. S. 1,720,550, July 9.
- Chamber kiln for bricks, lime, etc.** FIRMA K. H. PAUL, LUDWIG. Ger. 478,182, Feb. 15, 1927.
- Refractory material.** DEUTSCHE GOLD- UND SILBER-SCHNEIDANSTALT VORM. ROESSLER. Fr. 657,406, June 25, 1928. See Brit. 292,958 (C. A. 23, 1487).
- Refractory materials.** FELIX J. MALHERBE. Fr. 656,923, July 3, 1928. Refractory materials particularly furnace hearths are hardened by impregnation with  $\text{Na}_2\text{SiO}_3$  or  $\text{K}_2\text{SiO}_3$  or both, so that the silicates penetrate into the interior and dry there, while the exterior is freed from silicate. The silicates may be used in soln. in petroleum.

**Refractory material obtained as slag.** T. R. HAGLUND. Brit. 302,087, Feb. 18, 1928. In reducing oxides or ores in an elec. furnace for the production of iron or other metals or alloys such as those of Cr, the charge is so made up (as by adding magnesite and bauxite) that a highly refractory slag is obtained contg. less than 15% silicic acid and otherwise formed mainly of MgO and  $Al_2O_3$ . Oxides of Cr and Fe also may be present and up to one-fourth of the Mg may be replaced by Ca. The slags may be cast or may be used with colloidal binders.

**Manufacture of basic products for lining metallurgical furnaces.** P. RIES and F. BICHEROUX. Belg. 356,350, Jan. 31, 1929. Tar and a powdered mineral flux are added to a basic refractory which has been fritted and coarsely ground. The mixt. is heated to a temp. slightly below the combustion temp. of the tar, the mass is molded under pressure and finally baked at such a temp. as will give it the strength of ordinary refractories.

**Abrasive sheet material.** C. KLINGSPOR. Brit. 302,430, Oct. 5, 1927. Abrasive powder is secured to a backing such as paper by an adhesive comprising animal glue and a phenol- $CH_2O$  condensation product which is hardened and rendered waterproof by heating to a temp. not exceeding  $150^\circ$ . Various details of manuf. are given.

**Abrasive paste.** PAUL TIETZ. Ger. 478,260, Oct. 19, 1924. The abrading ingredient, *e. g.*, pumice or emery, is mixed with a concd. soln. of a hygroscopic salt. A soln. of Ca lactate is preferred, and with this soln. there may be incorporated, before addn. of the abrading substance, finely divided metal oxides, especially ZnO or lithophone.

**Ceramic material.** BORGESTAD FABRIKKER. Fr. 34,049, Sept. 14, 1927. Addn to 623,573. A ceramic material is made from particles of natural olivine rock agglomerated with Mg orthosilicate obtained artificially, *e. g.*, from talc and magnesite. The olivine rock may be replaced partially or wholly by particles of Mg orthosilicate. Cf. C. A. 23, 946.

**Ceramic products.** RUDOLF POLLAK and WILHELM WEBER. Austrian 113,330, Jan. 15, 1929. Ceramic products of improved properties are obtained from alkali-free Mg silicates such as serpentine, chlorite and steatite by mixing with the silicates an alkali-free alk. earth compd. ( $BaCO_3$ ) and  $Al_2O_3$  in a total amt. not exceeding 10%, the finely ground mixt. being molded and fired in the usual way. Graphitic objects can also be obtained by mixing 30% or so of graphite with the mixt. as above.

**Ceramic ware.** CERAMIC PATENT HOLDINGS, LTD., and J. W. MELLOR. Brit. 302,519, Jan. 31, 1928. In order to reduce the temp. required for firing unglazed ceramic ware, the material of which it is formed is admixed with 2-5% of a flux composed of an alkali silicate or a borate of an alk. earth metal or Mg (or a mixt. of such compds.).

**Ceramic glaze.** DEUTSCHE GOLD- UND SILBER-SCHNEIDANSTALT VORM. ROESSLER. Fr. 656,829, June 29, 1928. See Brit. 293,317 (C. A. 23, 1732).

**Enamels and glazes.** DYNAMIDON-WERK ENGELHORN & CO. G. M. B. H. Ger. 477,800, Nov. 18, 1927. The resistance of enamels and glazes to chemicals is increased by addn. of sillimanite or corundum.

**Enamel with a cement base.** E. J. PEETERS. Belg. 355,628, Dec. 31, 1928. The enamel is composed of a single kind of cement (nature not specified), roasted clay ("gaize"), paraffin,  $CaCO_3$  and coloring oxides. Cf. C. A. 23, 2545.

**Enamel ware.** I. G. FARBENIND. A.-G. and EISENWERK KAISERSLAUTERN A.-G. Ger. 477,721, Dec. 20, 1927. Cast- and wrought-iron objects are subjected to a vacuum during or after the application of the enamel coating, and are then re-subjected to atm. pressure.

**Spark plug insulation.** SIEMENS & HALSKE A.-G. Brit. 302,893, Dec. 23, 1927. The insulation or that portion of it nearest the combustion chamber is made of fused  $Al_2O_3$  such as artificial sapphire or ruby and the exposed surface is polished to minimize deposits on it.

## 20—CEMENT AND OTHER BUILDING MATERIALS

J. C. WITT

**Thermal expansion of cement and its mixtures.** SHICHIRO UCHIDA. Sendai Higher Tech. School. *Bull. Sendai Higher Tech. School* 7, 425-78(1928); cf. C. A. 23, 2799.—Portland cement, alumina cement and mixed cement were studied alone and with addns. of volcanic ash, calcite, siliceous earth, diatomaceous earth and sand. Pure cement expands up to  $100^\circ$ , then contracts, so that above  $200^\circ$  the length be-

comes smaller than at the outset. At 300–400° the rate of contraction becomes a little less rapid; above 400°, the contraction is again considerable up to 700°. Many mixed cements have marked expansion above 400°. The expansion coeff. slightly increases with temp. and differs a little with the amt. of H<sub>2</sub>O and added substance. Alumina cements generally show small expansion coeff. K. SOMEYA

Tentative specifications, finish coat portland cement stucco. Report of Subcommittee 1 of Committee C-3. W. E. HART, W. D. M. ALLAN, et al. *Proc. Am. Concrete Inst.* 25, 561–5(1929). J. C. WITT

Volumetric changes in portland cement mortars and concretes. RAYMOND E. DAVIS AND G. E. TROXELL. *Proc. Am. Concrete Inst.* 25, 210–60(1929); cf. C. A. 22, 4753.—The work has extended over a period of nearly 4 years, and at present more than 400 concrete and mortar specimens are under observation. The test program includes richness of mix, gradation of aggregate, quantity of mixing water, character of aggregate, moisture conditions including variations in humidity, conditions of curing, the effect of alternating periods of water soaking and drying, the effect of admixtures and the effect of the surrounding medium. J. C. WITT

The mechanism of corrosion of portland cement concrete with special reference to the role of crystal pressure. F. O. ANDEREGG. *Proc. Am. Concrete Inst.* 25, 332–43 (1929).—A. summarizes the work as follows: All building materials are undergoing a slow disintegration in which the presence of water is the most important factor. Portland cement concrete cannot escape the laws of nature; all that can be hoped for is to make its resistance similar to that of the most resistant natural rocks. Concrete must withstand, when rain or ground water comes in contact with it, a leaching out of lime, a reaction with the sulfate always present in natural waters (even in rain water), a crystal pressure resulting from efflorescent action which is aided both by evapn. from a surface and by drops in temp. Therefore the importance of preventing water from entering and passing through the concrete should be emphasized. An accelerated method of detg. the resistance of concrete to crystal pressure has been developed in which the chem. attack of the sulfate is minimized, by taking advantage of crystn. behavior with slowly falling temp. Expts. have been made with cement flour contg. 4.5–6.5% SO<sub>3</sub>. Retrogressions in strength at early ages were noted, but readjustments occurred so that after storage for 28 days and longer remarkably high strengths were obtained. The crystals present were practically all of lime. The results fail to develop any evidence that the presence of gypsum in amts. that will react with the aluminate before the concrete had begun to set is dangerous. This has bearing on the SO<sub>3</sub> specification. A method for the mech. molding of specimens has been developed which is especially valuable for making smaller specimens, but which can also be used very advantageously for larger ones. The conclusions of Klein and Phillips about the dangers resulting from the pressures developed by lime crystals have been confirmed, but these effects are usually only temporary because of the property of concrete flowing to a slight extent under pressure. J. C. WITT

Influence of added salts upon the time of setting of portland cement. MANJIRO NAKAHARA. *Bull. Tokyo Ind. Research Inst.* 23, 1–24(1928).—Portland cement clinker was finely powdered and the influence of the addn. of various sol. and insol. substances on the setting time was tested. The influence of added salts is not necessarily due to the negative or to the positive radical alone, but both the positive and the negative groups have some effect. Hence the time of setting may be lengthened to a suitable limit not only by gypsum, which is now commonly used, but also by some other substances. In studying the effect of added reagents upon cement the reagent must be added to the clinker itself, or the influence upon the time of setting is not clearly evident, because of the disturbing effect of CaSO<sub>4</sub>. K. SOMEYA

Exposure to calcium dusts generated in the manufacture of portland cements. L. R. THOMPSON AND DEAN K. BRUNDAGE. *J. Ind. Hyg.* 11, 182–93(1929).—The phys. analysis of numerous air samples taken at various places in a portland cement plant showed that the no. of particles under 10 $\mu$  ranged from 337,000 to 105,630,000 per cu. ft. and the no. of particles over 10 $\mu$  ranged from 8500 to 1,069,000. The total solids amounted to 0.025–5.675 mg. per cu. ft. The chem. analysis of the dust gave the following results: 15.00–21.30% SiO<sub>2</sub>; 4.20–9.10% Fe<sub>2</sub>O<sub>3</sub> + Al<sub>2</sub>O<sub>3</sub>; 36.11–60.88% Ca; 2.06–2.97% MgO; 1.75–4.08% SO<sub>3</sub>; loss on ignition 4.75–40.40%. The uncombined silica was about 6.5% before the cement was burned in the kiln; afterwards the free silica in the dust of the resp. rooms was reduced to 1%. The exposure to the Ca dusts seemed to predispose the workers to certain diseases as acute bronchitis, diseases of the nasal fossae, pharynx and tonsils, skin, eyes and ears, digestive system, and influenza and grip. G. SCHWOCH

**The rate of hydration of cement clinker.** F. O. ANDEREGG AND D. S. HUBBELL. *Proc. Am. Soc. Testing Materials*, No. 60 (preprint) 11 pp. (1929).—The cement clinker was sepd. into suitable fractions by means of a Pearson elutriator (Bur. of Stand. *Tech. Paper* No. 47) and expts. were made. Conclusions: (1) The rate of hydration is rapid at first and then falls off. (2) The presence of  $\text{CaSO}_4$  appears to decrease the rate of hydration between the 1st and 28th day of storage. (3) At 24 hrs. the depth reached by the hydration of a typical portland cement clinker is about 0.5 micron, at 7 days about 1.5, at 28 days above 3.5 and at 90 days about 5 microns, in the presence of  $\text{CaSO}_4$  and for particles of 15 to 30 microns dimension. (4)  $\text{CaCl}_2$  does not seem to affect the rate of hydration. (5) Hydration over short periods of time seems to be retarded by low temps. and hastened by high temps.; but after storage of 7 to 28 days, the amt. of hydration is apparently very nearly the same over the temp. range 32 to 100°F. (6) The high-early-strength portland cement did not appear to have a greater rate of hydration at 24 hrs. than the others, although at 7 and 28 days an appreciably greater rate was observed. (7) A preliminary est. gives the increase in vol. of portland cement during hydration as about 50%. (8) The hypothesis of Giertz-Hedström and Werner (*C. A.* 23, 2264) that the compressive strength of cement and concrete is proportional to the square of the part of the cement hydrated is confirmed. However, this confirmation is probably accidental; for instance, on increasing the water-cement ratio the hydration would not be decreased, while the early strengths are affected more than later ones.

A. J. MONACK

**Comparison of methods of determining moisture in sands.** WM. R. JOHNSON. *Proc. Am. Concrete Inst.* 25, 261-79 (1929).—The following methods were compared by testing in turn 3 samples of sand, each with 4 percentages of moisture: elec. resistance moisture meter, drying to const. weight in oven, drying to const. weight with denatured alc., displacement method using cylindrical container, displacement method using A. S. T. M. flask, sp. gr. method using a salt soln. hydrometer. The best results were obtained with the methods requiring the simplest manipulation—the drying methods ranking first in accuracy, the displacement methods next and the hydrometer last.

J. C. WITT

**Science and art of concrete manufacture.** L. W. SKOV, *et al.* *Am. Ry. Eng. Assoc. Proc.* 30, 804-12 (1929).—Moisture in aggregate and the method for detn. is stressed.

R. C. BARDWELL

**Durability of concrete—progress report of Committee E-6.** A. E. LINDAU. *Proc. Am. Concrete Inst.* 25, 27-82 (1929).

J. C. WITT

**Concrete products plant operation.** Report of Committee P-6. E. GRANT LANTZ, *et al.* *Proc. Am. Concrete Inst.* 25, 573-601 (1929).

J. C. WITT

**Three and one-half years' experience of the Detroit Edison Company in concrete control.** A. S. DOUGLASS AND J. S. NELLES. *Proc. Am. Concrete Inst.* 25, 100-51 (1929).

J. C. WITT

**A scientific trial method for designing concrete mixtures.** R. E. ROBB. *Proc. Am. Concrete Inst.* 25, 280-91 (1929).—R. describes the use of some special app. and a no. of charts for arriving at the desired results.

J. C. WITT

**Water tables and curves for use in designing and estimating concrete mixtures.** HERBERT J. GILKEY. *Proc. Am. Concrete Inst.* 25, 292-313 (1929).

J. C. WITT

**The absolute basis of proportioning concrete and its economy.** JOSEPH A. KITTS. *Proc. Am. Concrete Inst.* 25, 741-50 (1929).—The factors involved are the abs. vols and gradation of sizes of particles in a mix, the water required for workability and the cement required for the strength or other properties of the concrete. Aggregates from the same source vary widely from day to day in a no. of characteristics and sufficient information must be obtained before proportioning can be carried out in a satisfactory manner.

J. C. WITT

**Researches on concrete materials and on plain and reinforced concrete.** Report of Committee E-3. H. F. GONNERMAN, *et al.* *Proc. Am. Concrete Inst.* 25, 432-96 (1929); cf. *C. A.* 22, 3274.—The report is outlined as follows: researches on cement (constitution, workability, testing); researches on aggregates (types of aggregates, durability, grading, abrasion, detn. of moisture); researches on plain concrete (absorption, admixtures, autogenous healing, bond, chem. analysis, concrete products, crazing, curing, dams, durability, extensibility, fatigue, field control, flow under load, freezing and thawing, jiggling, modulus of elasticity, Poisson's ratio, pavements, permeability, placing, proportioning, protective treatments, compressive strength, flexural strength, temp. effects, tests and test methods, time of mixing, vol. changes, water-proofing, wear); researches on reinforced concrete (arches, beams, bond, bridges, reinforcing steel); suggested researches on concrete and related subjects (cement,

aggregate, concrete, reinforced concrete); references to papers and reports on researches published during 1928. J. C. WITT

**Characteristics of concrete for fire resistance.** Report of Committee E-4. N. D. MITCHELL, et al. *Proc. Am. Concrete Inst.* 25, 812-17(1929).—Most concretes are resistant to fires. In general the character of the aggregates is more important than that of the cement. The relative values of the common types of aggregates are discussed, and a bibliography on the fire resistance of concrete is given. J. C. WITT

**Specifications for concrete aggregates.** Report of Committee E-5. R. W. CRUM, et al. *Proc. Am. Concrete Inst.* 25, 656-68(1929). J. C. WITT

**Effect of temperature on the curing of concrete.** R. A. FOLEY. *Proc. Am. Concrete Inst.* 25, 566-72(1929).—High temps. during the initial curing period assist in producing high early strengths. The rate of increase of strength decreases with age of the product. Economic limits for the initial curing period are 48 hrs. during the summer months and 60 hrs. during the winter months at max. temps. of 90° to 110°F. Plain concrete pipe and similar thin-wall concrete products are more sensitive to temp. changes during the curing period than are mass products such as concrete block and brick. J. C. WITT

**High early strength concrete.** EDWARD E. BAUER. *Proc. Am. Concrete Inst.* 25, 314-31(1929).—The rate at which concrete gains strength depends on the kind of cement, water-cement ratio, temp., admixts., curing, and time of mixing. The effect of each of these is studied, and the results of a series of tests are presented. J. C. WITT

**Testing concrete for absorption.** FRED WEIGEL. *Proc. Am. Concrete Inst.* 25, 514-21(1929).—Permeability is the controlling factor with respect to the resistance of a material to the effects of fire, freezing and long periods of exposure to water and general weathering conditions. The samples, procedure, equipment and results are discussed. J. C. WITT

**The limitations of the absorption test for concrete products.** RAYMOND WILSON. *Proc. Am. Concrete Inst.* 25, 522-49(1929).—The absorption test as now made is of little value as a criterion of the quality of concrete products, because neither of the assumptions on which it is based is applicable to concrete. A form of specification based on the rate of absorption is suggested. J. C. WITT

**Concrete exposed to alkali ground waters.** J. C. MACKENZIE. *Proc. Am. Concrete Inst.* 25, 763-7(1929).—According to M. the significant findings of the past few years are (1) the actions of  $\text{Na}_2\text{SO}_4$  and  $\text{MgSO}_4$ , which formerly were supposed to be similar, differ materially and affect different cements in different ways; (2) concretes and mortars made from portland cements from different mills and from different raw materials may differ widely in their stability in alkali waters; (3) strength tests are not indicative of the relative sulfate resistances of different cements; (4) some high-alumina cements are very resistant to attack by  $\text{MgSO}_4$  and are more resistant to  $\text{Na}_2\text{SO}_4$  than most portland cements, but, on the other hand, they are quite easily attacked by  $\text{Na}_2\text{CO}_3$ , which is present in many localities in the West in the form of so-called "black-alkali"; (5) if even a lean concrete made from a cement of low natural resistance to alkali be steam-treated at a temp. not lower than 212°F. for a sufficient length of time, it can be made absolutely immune to attack by  $\text{Na}_2\text{SO}_4$  and very resistant to attack by  $\text{MgSO}_4$  and it is concluded that if a rich, strong, impermeable concrete made from a cement of high resistance to alkali be so steam-treated it will be not only immune to attack from  $\text{Na}_2\text{SO}_4$  but will be also practically immune in  $\text{MgSO}_4$  waters. If the temp. be less than 212° such resistance is not developed and under certain conditions the resulting product may be made even less resistant. J. C. WITT

**Concrete for resisting sea water.** HARRY E. SQUIRE. *Proc. Am. Concrete Inst.* 25, 751-62(1929).—It may be stated with assurance that the methods of ordinary good practice will produce a concrete (plain) so durable in sea water that for the engineer's purposes it can be considered permanent. Durability is obtained not through the chem. inertness of the cement itself but through the mech. resistance of the concrete to the circulation of sea water in the interior mass. With reinforced concrete there are limitations of concrete in protecting steel exposed to the electrolytes of the sea, and there is the necessity of maintaining these structures by periodic painting and occasional repairs. Progress in constructing more resistant reinforced structures must come in a large part from the metallurgist in developing non-corrosive coatings for the steel. J. C. WITT

**Tests of retempered concrete.** H. F. GONNERMAN AND P. M. WOODWORTH. *Proc. Am. Concrete Inst.* 25, 344-87(1929).—The investigation included a study of the effect of the following factors or treatments on the strength and workability of concrete of a

wide range of water-cement ratios, after standing for periods up to 6 hrs. in air-tight cans or in pans exposed to the air of the lab. before use: remixing without the addn. of water; remixing with addn. of water to restore the concrete to its original condition of workability as measured by the flow test; type of aggregate; addn. of aggregates to cement pastes which stood for periods up to 6 hrs.; dry and soaked aggregates; admixts. of hydrated lime or celite; premixing cement and water for periods up to 30 min. before adding aggregate and mixing for addnl. periods of  $\frac{1}{2}$  to 10 min. There is only a small loss in compressive strength, due to standing for periods up to 6 hrs. (protected from evapn.) of concrete remixed without the addn. of water. When remixed with the addn. of water to restore the original flow the strength decreases with increase in the water-cement ratio. When unprotected from evapn. there is an increase in strength. A bibliography is given.

**Specifications for cast stone. Report of Committee P-3.** L. A. FALCO, *et al* *Proc. Am. Concrete Inst.* **25**, 550-60(1929). J. C. WITT

**The physical properties of commercial cast stone.** JOHN TUCKER, JR., and G. W. WALKER. *Proc. Am. Concrete Inst.* **25**, 501-13(1929).—This paper presents some of the data which have been accumulated at the Bureau of Standards in connection with an investigation for the purpose of writing specifications on this material. Compressive strength, modulus of rupture and absorption tests have been made. The results presented in tables and graphs indicate a very wide range in the properties of cast stone.

**Accelerators and retardors for gypsum.** P. P. BUDNIKOV. *Zhur. Prikladnoi Khim.* **1**, 323-7(1928).—Addn. of acids, bases and normal and double salts to gypsum affects the character of the time-temp. curves during the process of setting. This can be explained by the increase or decrease of the soly. of gypsum and by the change in the rate of coagulation of the gel. It can be also due to formation of double compds and to the reactions which may occur between gypsum and the added substances.

**Open-trough impregnation of wood poles with the aid of the perforating process.** ROBERT NOWOTNY. *Z. angew. Chem.* **42**, 717-21(1929).—Expts. are reported upon the process of perforating wood to improve impregnation (cf. C. A. **19**, 880). Various arrangements and depths of holes were made, and treatments with NaF and HgCl<sub>2</sub> solns. for different times followed. The results showed better impregnation than with control specimens that were not perforated.

**Experimental production of roofing felts (SHAW, *et al.*) 23.** The study of hydration changes by a volume-change method (NEVILLE, JONES) **2**. A new acid-resisting cement for sulfite digesters (KREUGERS) **23**. Study of protective coatings for interior of steel tanks and underground pipe lines (DAVIDSON, *et al.*) **26**. Kiln for the treatment of lime, dolomite, natural cement, etc. (Belg. pat. 356,177) **1**.

**Einflüsse auf Beton. Ein Auskunftsbuch für die Praxis. Part I.** Edited by A. KLEINLOGEL. Berlin: Wilhelm Ernst und Sohn. M. 6.

**Cement.** WILHELM O. ZIMMERMANN. Ger. 477,609, Apr. 26, 1928. Addn. to 448,030. A cement is made by mixing wet sand with lime, and wet cement with sand and then mixing the whole together.

**Cement.** ALESSANDRO MAZZA. Fr. 656,892, July 2, 1928. Lime which has been used for defecating sugar solns. is mixed with clay and burnt to produce hydraulic lime or cement.

**Cements, paints, etc.** RODWELL'S COMPOUNDS, LTD. Fr. 657,512, July 16, 1928. A vehicle for paints and cements consists of an alkali silicate and NaNO<sub>2</sub>. An example contains com. Na<sub>2</sub>SiO<sub>3</sub> (140° Tw.) 60, water 35, satd. aq. soln. of NaNO<sub>2</sub> 5 vol. The compn. may be used for coating cement, etc., or for binding purposes with fireclays.

**Rotary kiln for burning wet cement materials, etc.** JOHAN S. FASTING (to F. L. Smidth & Co.). U. S. 1,720,786, July 16. Structural features are described, among which is a rapidly rotating distributing device in a slurry chamber connected with the kiln which discharges slurry into the chamber in finely divided condition by centrifugal action.

**Production of sulfuric acid and artificial portland cement from substances containing calcium sulfate.** H. MEURIS. Belg. 354,788, Nov. 30, 1928. Complete combustion of the reducing C is effected before it enters the clinkering zone, by reduction of CO<sub>2</sub> to CO, with addn. of a certain amt. of heat. The SO<sub>2</sub> is converted into H<sub>2</sub>SO<sub>4</sub>.

**Expansion joints for use with concrete, etc.** GEORGE W. MILLS, JR. (to Philip Carey Mfg. Co.). U. S. 1,720,229, July 9. A body of asphaltic compn. or similar bituminous material carries a superficial film of non-adhesive water-sol. material such as soap which serves to prevent adhesion during handling and storage before use.

**Pavement.** GEORGE M. SOUTER. U. S. 1,720,101, July 9. A pavement is formed comprising an asphalt-coated rock base, a thin layer of a mixt. of sand, dust and asphalt upon the base to waterproof it, and a surface of rock coated with asphaltic material pressed into the layer so that a substantial portion of the rock surface with interstitial spaces remains exposed to form a non-skid surface.

**Bituminous road-making composition.** W. H. SCHMITZ. Brit. 301,891, Dec. 8, 1927. Stone aggregate is first coated with mineral, vegetable or animal oil and then mixed with bitumen emulsion. Cf. C. A. 23, 3556.

**Bituminous composition for road surfaces.** G. COBB. Brit. 302,808, Dec. 28, 1927. A graded aggregate (such as crushed rock of various specified dimensions) is used with 3.5–5.0% of bitumen, tar or like material.

**Plastic masses.** FIRMA PAUL LECHLER. Ger. 477,760, July 9, 1925. Material for tarring roads is mixed with water. In an example pitch, coal-tar oil, bitumen emulsion and water are mixed to form a coating for roads.

**Infusible asphalt masses of high elasticity.** RICHARD LICHTENSTERN. U. S. 1,720,487, July 9. A batch of asphalt contg. not more than 10% of a condensing agent such as  $\text{FeCl}_3$ ,  $\text{AlCl}_3$  and  $\text{ZnCl}_2$  is heated to a temp. not over  $300^\circ$  (suitably about  $270$ – $80^\circ$ ) and then admixed with Chinese wood oil (not exceeding the quantity of asphalt used) and heating is continued until coagulation is effected. The product may be used on roads, floors or for treating pasteboard, etc.

**Slaking lime.** W. H. BARTON (to Blue Diamond Co.). U. S. 1,720,026, July 9. Quicklime is mixed with water at about the b. p. in proportions to form a lime putty.

**Coloring magnesium oxychloride stucco.** MAX Y. SEATON (to National Kellastone Co.). U. S. 1,720,972, July 16. A Mg oxysulfate coating is applied to the stucco in order to correct non-uniformity of coloring at the surface.

**Draining damp walls.** ERNST MURMANN. Ger. 478,466, June 21, 1925. Dampness in walls is ascribed to the presence of nitrates of Ca and Mg and, in order to drain the walls, these salts are decompd. by means of  $\text{K}_2\text{SO}_4$ . Thus,  $\text{K}_2\text{SO}_4$  may be added to the mortar, or a layer of mortar contg.  $\text{K}_2\text{SO}_4$  may be interposed between the stone and the plaster. Alternatively, a loose mortar comprising  $\text{K}_2\text{SO}_4$ , sand and sawdust or kieselguhr may be inserted into holes in the wall and the wall then plastered as usual.

**Building material.** JAMES H. YOUNG (to H. H. Robertson Co.). U. S. 1,720,708, July 16. Shingles or the like comprise a portion of cement and asbestos or other fibrous material, a covering of a relatively thin layer comprising irregularly shaped particles of metal such as Zn or Pb fused together without destroying their individual contour, and an outer thin layer of Cu bonded to the first-mentioned metal layer.

**Wall board.** CALEB PAYNE (to Gypsum Engineering & Mfg. Co.). U. S. 1,720,-855-6, July 16. Mech. and structural features and an app. are described.

**Cellular plaster.** HARRY E. BROOKBY. U. S. 1,720,032, July 9. A cellular product is formed by gaging with water a mixt. contg. partially calcined gypsum as the main ingredient together with  $\text{NaHCO}_3$ , Mg fluosilicate, soap bark and  $\text{Ca}(\text{OH})_2$ .

**Tiles of asbestos compositions or similar articles coated with an adherent layer of resinous condensation product.** LAWRENCE E. BARRINGER (to General Elec. Co.). U. S. 1,721,367, July 16. Products are described suitable for use in making refrigerators, for building construction, etc.

**Floor covering composition.** JOHN C. WICHMANN (to Cactus Rubber Co. of America). U. S. 1,720,533, July 9. Ground cork 25, pumice 15, magnesite 10, diatomaceous earth 10, linseed oil 5 and a rubber compd. derived from cactus 35 parts.

**Waterproof floor-covering material.** CLIFFORD S. COOLEY. U. S. 1,720,780, July 16. A fibrous material of light color such as a felt is impregnated with a compn. of neutral color which contains rosin oil and may also contain "lead and manganese dryer."

**Flexible floor and wall-covering material.** P. C. VAN DER WILLIGEN and N. V. NEDERLANDSCHE LINOLEUMFABRIEK. Brit. 301,901, Dec. 8, 1927. Coating materials for making linoleum or similar products, in the form of colloidal solns. or emulsions are mixed and the colloids are afterward coagulated (suitably by adding an electrolyte or passage of an elec. current). Various examples, details and modifications are described.

**Graining wood.** E. E. SPARGO. Brit. 302,027, Nov. 10, 1927. The effects may be made more distinct by a preliminary treatment of the wood with a soln. of  $\text{Na}_2\text{CO}_3$

or with an aniline dye. An app. is described for forming grooves or indentations in the surface of the wood which may then be planed down to the bottom of the indentations which show markings from the compression.

**Protecting wood, iron and other surfaces from the atmosphere.** JAMES R. HATMAKER. U. S. 1,720,177, July 9. The surface is snugly fitted with a covering of fibrous material knitted in tubular form and this material is then impregnated with a protective compn. such as described in Brit. 272,142 (C. A. 22, 1862).

**Preserving and waterproofing wood.** I. G. FARBENIND. A.-G. Brit. 302,698, Dec. 20, 1927. Wood is impregnated with cellulose trilaurate, starch laurate or other suitable higher aliphatic esters, ether-esters or mixed esters of carbohydrates.

**Wood-preserving composition and fungicide.** ALBERT L. KLEES and ROLAND P. SOULE (to Combustion Utilities Corp.). U. S. 1,720,905, July 16. A refined dehydrated product is prepd. comprising primary acid tars of which at least 50% distil above 220°.

## 21—FUELS, GAS, TAR AND COKE

A. C. FIELDNER

**Liquid fuels.** E. GENSKE. *Chem.-tech. Rundschau* 44, 734, 763(1929).—The storage, handling and evaluation of petroleum fractions, benzene and alc. are discussed. Benzene produces more soot on combustion than does benzine; the difference can be lessened by admixt. with benzine or alc.

**The problem of engine fuel requirements.** J. M. SHOEMAKER. *Aviation* 26, 2274-7(1929).—Discussion of characteristics of aircraft fuels and important part they play in efficient and economic operation. The development in aviation gasoline used in Naval aircraft is outlined.

**Fuel briquets in 1928.** O. E. KIESSLING AND J. M. CORSE. Bur. Mines, *Mineral Resources of the U. S. 1928*, Pt. II, 1-11 (preprint No. 1 published June 7, 1929).

**Natural and manufactured smokeless fuel.** J. ROBERTS. *Power Eng.* 24, 279-81 (1929).—The smoke and fuel problem are considered from the standpoint of coal distn. under headings: initial decompn., formation temps., incombustible volatile matter, manufd. smokeless fuel and low-S coals. Curves showing temps. of initial decompn. of coal are given.

**Fineness of pulverized fuel as affected by mill types.** L. T. WORK. *Fuels and Steam Power* (A. S. M. E. Trans.) 50, No. 23, 87-95(1928).—Various principles of mill action make fuels of different degrees of fineness. Air-classifying schemes are outlined and W.'s turbidimetric method for measuring superfine is described.

**Pulverized-fuel firing.** J. O. TWINBERROW. *Power Eng.* 24, 285-6, 290(1929).—Recent developments are reviewed.

**Alcohol in industry.** M. C. WHITAKER. *Engrs. and Eng.* 46, No. 6, 147-8 (1929).—There are no technical difficulties remaining, either in making of alc. suitable for fuel blends or in use of fuels made therefrom. The problem is now solely one of suitable economic conditions, and one of public will.

**Atomization in carburetors.** J. SAUTER. *Natl. Advisory Comm. for Aeronautics—Tech. Mem. No. 518*, 10 pp.(1929).

**Presidential address [fuels].** M. BRAND. *Trans. Inst. Mining Eng.* (London) 77, 139-55(1929).—B. discusses fuel research; low-temp. carbonization; oils, tars and cracking to produce automotive fuels; powd. fuel; boiler firing; coal prepn., sampling, analysis, sizing and grading; hydrogenation of coal; safety; standardization; mechanization; hydroelec. power developments.

**Low-temperature carbonization. Modern practice on the commercial scale. II. The "Maclaurin" process.** DAVID BROWNIE. *Chemistry & Industry* 48, 619-22 (1929); cf. C. A. 23, 3790.—A description of the Maclaurin process and equipment. Cf. Lander, C. A. 23, 1244.

**The Bamag-Hellar low-temperature carbonization system.** W. KARSTEN. *Teer u. Bitumen* 27, 241-3(1929).—The app. and its operation are described and its advantages discussed. The unique feature is the passage of the coal by gravity through an inclined rotating multi-tubular drum retort, constructed of refractory material, previously heated by the upward passage of burning distn. gases. There is no other source of heat. Continuous operation is secured by operating 2 retorts in conjunction so that the distn. from each alternately furnishes fuel for the other. The heat-storing



and distn. periods are each  $\frac{1}{2}$  hr. The counter-flow principle, short heating time, manner of heat distribution and transfer, etc., result in high general efficiency and nearly ideal conditions for the production of a high yield of primary tar and thoroughly and uniformly exhausted semi-coke.

F. S. GRANGER

**Low-temperature coal processing for power production.** E. H. SMYTHE. *Power Eng.* 24, 277-8(1929).—Possibilities of coördinating coal processing and power production are considered, and a plant is described.

E. I. S.

**The hydrogenation process of the I. G. Farbenindustrie A.-G.** ANON. *Mining J.* (London) 165, 536(1929).—Synthetic  $\text{NH}_3$  is produced at Oppau and Leuna. The yearly production of N amounts to 130,000 tons at Oppau and 570,000 tons at Leuna, equiv. to  $3\frac{1}{2}$  million tons of fertilizer, about 770 million cu. ft. of air being used. At Oppau 800 tons of coke is used daily for water-gas production and 500 tons of brown coal for power gas. At Leuna brown coal is used for both purposes. Brown coal is also carbonized at low temps. to give tar for hydrogenation. The catalysts used in the hydrogenation process det. whether gasoline, kerosene, gas oil, fuel oil or lubricating oil will be produced.

ALDEN H. EMERY

**The hydrogenation of coal.** A. W. NASH. *Fuel Econ. Rev.* 8, 10-12(1929).—The Bergius process yields 90-130 gal. of tar per ton of coal and involves very much greater capital outlay, operating and maintenance costs than petroleum oil cracking processes. The chief value of fractions from the hydrogenation of coal by the Bergius process would be either as a motor spirit or a fuel oil. The nature of the product depends very largely upon the nature of coal used. By the use of catalysts greater flexibility is claimed and a decrease in reaction time without altering the optimum temp. and pressure. Catalysts now include oxides of Zn, Ni, Co and Cu. A mixt. of CO and H has been shown to be capable of yielding liquid fuels.

H. C. PARISH

**Study of some factors in removal of ash as molten slag from powdered-coal furnaces.** R. A. SHERMAN, P. NICHOLLS AND E. TAYLOR. *Trans. Am. Soc. Mech. Eng.* Advance paper, May 13-6, 1929, 12 pp.

E. I. S.

**A study of crystalline compounds formed in slags on boiler-furnace refractories.** T. A. KLINEFELTER AND E. P. REXFORD. *Trans. Am. Soc. Mech. Eng.* Advance paper, May 13-6, 1929, 2 pp.—Progress report of work done to date, of methods used, and difficulties encountered in lab. study of the equil. relation of oxides composing slags on boiler-furnace refractories at high temps. No data or conclusions are presented.

E. I. S.

**A laboratory slagging test for boiler-furnace refractories.** R. K. HURSH. *Trans. Am. Soc. Mech. Eng.* Advance paper, May 13-6, 1929, 6 pp.—Particulars of simulative service test of refractories with coal-ash slag made in a lab. furnace in which test brick form the lining of a cylindrical chamber rotated about a vertical axis. Tests have been made with slags representing coals used at five power stations where field tests were conducted.

E. I. S.

**Varieties of carbon and their reactivities.** R. V. WHEELER (experimental part by W. L. Wood). *Chaleur ind.* 9, No. 102, 160-1(1928).—Expts. indicate that it is erroneous to conclude that on cracking,  $\text{CH}_4$  gives only brilliant C while  $\text{C}_2\text{H}_4$  gives only the dull variety. Either, and even a third form, may be obtained depending upon the nature of the cracking surface, temp. and speed of gas.  $\text{C}_2\text{H}_4$  cracked at  $700^\circ$  to brilliant C;  $\text{CH}_4$  under the same conditions gave no C. The velocities of reduction of  $\text{CO}_2$  at  $1000^\circ$  with brilliant or with dull C from  $\text{CH}_4$  or  $\text{C}_2\text{H}_4$ , natural graphite, artificial graphite or fir-wood charcoal are 1-1.2, 19.1, 29.6 and 530.7, resp. The term "graphitic C" is not appropriate for coke with a metallic luster and luster of coke is no criterion of its reactivity.

S. L. B. ETHERTON

**Iron and coal.** TAIZO KUROTA. *J. Fuel Soc. Japan* 8, 607-20(1929).—The relation between the coal and iron industry with reference to the fuel problem is discussed.

F. I. NAKAMURA

**A microscopical study of some coals from Szechuan, S. W. China.** C. Y. HSIEH. *Bull. Geol. Soc. of China* 8, No. 1, 95-78(1929).—A description of the microscopic structure and constituents of 19 samples of coal, 6 of the Carboniferous age and the rest of the Jurassic.

E. I. S.

**Burning characteristics of different coals.** H. KREISINGER AND B. J. CROSS. *Fuels and Steam Power (A. S. M. E. Trans.)* 50, No. 23, 11-24(1928).—American coals have particular burning characteristics which differ according to the geological age of the coal and its chem. compn., phys. structure, moisture content and size. The geological age is shown by C, H and O contents. Characteristics of flame are affected by the compn. of the gases rising from the fuel bed and manner in which O is supplied

for their combustion. A comparison is made of processes of combustion in the fuel bed and in powd.-coal furnaces.

**Constitution and classification of coal.** A. C. FIELDNER. *Fuels and Steam Power* (A. S. M. E. Trans.) 50, No. 33, 1-9(1928); *Fuel Science Practice* 8, 36-45(1929).—Summary of considerations which are being kept in mind in classification of coal by the Am. Soc. Eng. Standards Committee.

**Properties and structural constituents of Ruhr coals.** W. RITTMEISTER. *Glückauf* 64, 589-94, 624-37(1928).—Coal from Wilhemine Victoria (gas coal) had 20-30% durain, 6-8% fusain, 30-40% vitrain and the rest was clarain. The Mansfeld mine coal has 85-90% vitrain, 2-3% fusain and the rest was durain. Lean coal from Demelsberg had 15% durain, 6-8% fusain, 30-40% vitrain and the rest was durain. R. met with samples of clarain that could not be distinguished from vitrain, though in other samples the clarain had the woody structure mentioned by Stopes. Durain could hardly be obtained pure, while fusain was always easily recognized. Phys. and chem. properties were detd. by crucible heating, elementary analyses, ash and sp. gr. detns., distn. according to Bauer, and CO<sub>2</sub> and CH<sub>4</sub> detns. The appearance of individual constituents of coal dust is discussed.

**The purification of coal.** R. BULMER. *Fuel Econ. Rev.* 8, 6-9(1929).—A review.

**Washing and preparation of coal.** H. D. SMITH. *Fuels and Steam Power* (A. S. M. E. Trans.) 50, No. 23, 25-31(1928).—Both wet-washing and dry-cleaning processes are considered.

**Determination of the moisture content of coal and similar substances.** MANFRED MANNHEIMER. *Ind. Eng. Chem., Anal. Ed.* 1, 154-6(1929).—Pulverized coal is agitated in methanol. A glass floater of the same density as the methanol is placed therein and the temp. adjusted until it just floats. The change of temp. necessary for this compensation is a measure of the H<sub>2</sub>O content. Detns. can be made in 5 min with an accuracy as great as that for any other moisture detn.

**The reducing action of various kinds of coal in water solution.** V. S. KRIM AND S. I. PANCHENKO. *Brennstoff-Chem.* 10, 63-4(1929).—Stadnikov and Proskurnina have indicated (C. A. 20, 3342) that the rank of a coal can be detd. by its adsorptive capacity for Fe(OH)<sub>3</sub> in FeCl<sub>3</sub> soln. The authors present results of exptl. work to show that the action is reduction of FeCl<sub>3</sub> rather than adsorption of Fe(OH)<sub>3</sub>. They contend that many factors (e. g., concn. of FeCl<sub>3</sub>, reaction time, grain size of sample) so affect the results that the method is worthless, at least without careful re-standardization. Reply. G. STADNIKOV AND N. PROSKURNINA. *Ibid* 65.—It is impossible to deny the tendency of coals to adsorb electrolytes and colloids from soln. and to assume that such substances as bituminous coal and coke will reduce Fe(OH)<sub>3</sub> in H<sub>2</sub>O soln. Reply. V. S. KRIM AND S. I. PANCHENKO. *Ibid* 65.—They further contend that FeCl<sub>3</sub> is reduced by bituminous coal and present data to show that ferrous Fe is found in solns. resulting from treatment of the coal with FeCl<sub>3</sub>.

**Modification of Parr's total-carbon determination in coal.** R. E. BREWER AND E. P. HARDING. *Ind. Eng. Chem., Anal. Ed.* 1, 145-8(1929).—Parr's app. has been modified to give better temp. control, eliminate the need for compressed air and make possible greater accuracy because of better control of exptl. conditions. The new app. is pictured and the procedure described.

**The expansion pressure and swelling of bituminous coals.** II. G. LAMBRIS. *Brennstoff-Chem.* 10, 44-50(1929); cf. following abstr.—A method previously described (C. A. 23, 2807) for detn. of the swelling power of bituminous coal during coking is applied to a large no. of coking coals and the results of tests are given in tabular form. The main conclusions are: (1) Swelling is enhanced by rapid heating and also by very fine preliminary grinding of the coal; (2) there is no direct relation between coke yield and swelling; (3) max. swelling is obtained by L.'s method wherein complete enclosure of the coking mass by coke shells is prevented.

**The swelling and expansion pressure of bituminous coal.** PAUL DAMM. *Brennstoff-Chem.* 10, 65-6(1929); cf. preceding abstr.—D. comments on a paper by Lambris (C. A. 23, 2807). The tendency of a coal to swell may be detd. by the crucible test, but this tells one nothing of the expansion pressure exerted during the plastic state of the charge, which in practice tends to force apart oven walls. The following definitions are given with particular application to coking practice: 1. Swelling is that vol. change (referred to the original coal) which a charge undergoes when allowed to expand freely during coking. 2. Expansion pressure is that pressure exerted (kg./sq. cm.) during coking when the charge is confined as by oven walls. A coal may be strongly swelling and still not exert much pressure on the oven walls during

coking. Neither the swelling tendency nor the pressure exerted during coking detrs. the tendency of a charge to stick in the oven. Sticking is caused by failure of the coke to shrink during the last stages of gasification.

J. D. DAVIS

**Study of the degasification of different types of bituminous coal.** P. SCHLÄFFER AND H. RUF. *Schweiz. Ver. Gas u. Wasserfach. Monats-Bull.* 9, 5-11, 47-59, 76-91, 112-23, 149-57 (1929).—The more important work on high-temp. distn. of coal is critically reviewed with special reference to heat consumption. A new *app. for the distn. of coal samples* up to 1 kg., with adjustable final temp., is described. The dependence of quantity and compn. of all distn. products on the carbonization temp. and coal species is demonstrated. With coking coals, the migrating plastic zone is practically impervious to gases, thus separating the charge into two regions of very different degasification conditions. In the central region, only small quantities of gas but large quantities of steam are generated. These wander before the plastic zone toward the center, and escape from the charge in large quantities only shortly before the coking zones come together, thus undergoing secondary decompns. from contact with the highly heated coke layers and retort walls. This decompn. is manifested by a sudden increase in  $H_2$  and delay in the falling off of the  $CH_4$  yield. It depends mainly on the carbonization temp., the kind of coal and the possibility of secondary decompns. The heat consumption varies during the distn. The total heat depends on the final temp. and coal species as well as on the possibility of secondary pyrogenic decompns. The relationships observed by others, between coal and product compns., yields, temps., etc., are confirmed, and, in part, supplemented. The existing knowledge of the fusion phenomena and temp. migrations, during carbonization, also is extended. F. S. G.

**Electrostatic method for determining fusain in bituminous coal.** J. D. DAVIS AND J. A. YOUNKINS. *Ind. Eng. Chem., Anal. Ed.* 1, 165-7 (1929).—The fusain is sepd. in the impure state from the 60-mesh air-dried coal by gravity and subsequently purified in inert gas by an electrostatic field. The purity of the recovered fusain may be checked by the microscope.

H. C. PARISH

**Apparatus for determining the range and degree of plasticity of coking coals.** G. AGDE AND L. V. LYNCKER. *Brennstoff-Chem.* 10, 86-7 (1929).—The app. consists of an electrically heated Cu or Al cylinder in which 2 holes are drilled from the top to admit two 11-mm. tubes, one contg. the coal sample and the other a thermo-element around which coal is also packed. A weighted steel needle rests on the coal to be tested. A thin wire attached to the projecting end of the needle passes over a roller to which a pointer is attached and terminates in a counterweight. A circular scale is provided, so that the softening of the coal on gradual heating ( $5^\circ$  per min.) is indicated by passage of the pointer over the scale. A charge consists of 3 cm. of coal sized between 1 and 2 mm. Before the tube is filled 1.5 cm. of sea sand is placed in the bottom of the tube to absorb tar. From temp. readings at  $5^\circ$  intervals together with indications of the pointer the plastic range of the coal tested can be plotted. J. D. DAVIS

**Apparatus and method for determination of the rate of gasification of coking coals.** G. AGDE AND L. V. LYNCKER. *Brennstoff-Chem.* 10, 89-90 (1921).—A 3-g. sample of the coal (sized to 0.5 to 1 mm.) is gasified at  $1200^\circ$  in a special electrically heated tube and the gas evolved is caught in one of two burets whereby the amount corresponding to each 5-min. interval can be measured. The tube is of glazed porcelain (Barlin, K.-Masse) designed to be gas-tight at  $1200^\circ$ . It is set vertically in a platinum-wound furnace designed for heating at the rate of  $7^\circ$  per min. Gasification curves wherein rate of gas evolution is plotted against temp. are given for raw coal, "oily" and "solid" bitumen and extd. coal.

J. D. DAVIS

**Present and future of chemical utilization of brown coal.** A. THAU. *Brennstoff-Chem.* 10, 41-4 (1929).—There is increased activity in briquetting, briquets being now largely used as generator and producer fuel. For this use they must be uniformly dry; otherwise they fall to pieces during preliminary distn. Furthermore bitumen-rich material must be pulverized before briquetting. Extn. of montan wax is on the wane. The Rolle method of carbonization is gradually being relinquished because of its high installation costs and low capacity. Newer methods involve larger capacity and combination of tar recovery with utilization of coke for power or gas production. Better methods of refining tar are being evolved. Purification of paraffin in one stage has been perfected, but in spite of the import tax, foreign competition has injured the industry. The future of the candle market is uncertain. Household use of "Grude-Koks" is falling off. The Bergius hydrogenation plant at Mersburg may be considered technically successful. This method, however, will probably not entirely replace other ones as at first supposed. As regards complete gasification as a means of

manuf. of city gas, recent studies have demonstrated the possibility of making approx. 2300 cu. ft. of 450 B. t. u. gas of 0.52 sp. gr. from 1 ton of brown-coal briquets.

J. D. DAVIS

**Brown coals and bituminous shales of Hesse and their utilization.** A. SANDER. *Brennstoff-Chem.* 10, 21-6, 141-8(1929).—The history of mining development in the Grand Duchy of Hesse together with production statistics is given. Proximate and ultimate analyses as well as carbonization assay results are given for the more important deposits.

J. D. DAVIS

**Lignite in Alabama.** JELKS BARKSDALE. Geol. Survey of Ala., *Bull.* 33 (1929).—The Ala. lignite occurs in the Cretaceous and Tertiary areas of S. and W. Ala. Numerous outcrop sections and 16 analyses are given.

ALDEN H. EMERY

**Calculating lignite drier with psychrometric chart.** IRVIN LAVINE and R. L. SUTHERLAND. *Chem. Met. Eng.* 36, 425-8(1929).

E. H.

**Characteristics of the bituminous material in peat.** G. I. STADNIKOV and N. G. TITOV. *Zhur. Prikladnoi Khim.* 1, 328-30(1928); cf. *C. A.* 23, 2808.—Exptl. work shows that in the process of formation of peat and coal the org. matter may form not only hydrocarbons but also insol. polymers.

V. KALACHEVSKY

**The acids of montan wax.** HANS TROPSCH and H. KOCH. *Brennstoff-Chem.* 10, 82-6(1929).—Raw montan wax was saponified with KOH in H<sub>2</sub>O soln. under pressure and the soap formed was freed from neutral material by extn. with C<sub>6</sub>H<sub>6</sub>. The acids were then set free and converted into their methyl esters, which were fractionated under 5 mm. pressure. The fractions were now saponified and the acids fractionally pptd. with Mg(OAc)<sub>2</sub>. Besides fatty acids C<sub>25</sub>, C<sub>27</sub> and C<sub>29</sub>, previously found, an acid C<sub>31</sub>H<sub>62</sub>O<sub>2</sub> was identified. Its amount was 4.7% of total acids present. The acid C<sub>30</sub>H<sub>60</sub>O<sub>2</sub> was not present in the wax examd.

J. D. DAVIS

**Progress report of the technical committee of the Natural Gas Association.** G. G. OBERFELL. *Refiner and Natural Gasoline Mfr.* 8, No. 6, 112-8(1929).

J. L. ESSEX

**Natural gas storage practice.** G. M. DAVIDSON. *Refiner and Natural Gasoline Mfr.* 8, No. 6, 102-8(1929).

J. L. ESSEX

**Gas-producer practice.** R. J. SARJANT. *Fuel Econ. Rev.* 8, 30-5(1929).—S. reviews conditions that are essential to efficient operation and describes the Broughton-Hadlington producer. Inasmuch as the selection of a coal, which can be gasified satisfactorily, is preferably confined to neutral or non-coking types, a simple coking test is a ready means of distinguishing suitable fuels. The major problems of gas producer practice lie in the direction of making available for gasification a wider range of fuels.

H. C. PARISH

**Gas-works practice.** H. HOLLINGS. *Fuel Econ. Rev.* 8, 25-9(1929).—The stationary conditions in an intermittently operated type of vertical retort appreciably widen the choice of suitable coals. There is a fairly definite relationship between the CO<sub>2</sub> concn. in the air-free waste gases and the thermal equivalent of gas lost in the setting

H. C. PARISH

**The decomposition of methane, and coke-oven gas in particular, at low pressures by electric discharge.** FRANZ FISCHER and KURT PETERS. *Brennstoff-Chem.* 10, 108-13(1929); cf. *C. A.* 23, 3861.—Orienting expts. were made at atm. pressures and temps. —185 to +750° wherein CH<sub>4</sub>, coke-oven gas and water gas were passed through a high-frequency type ozone tube. Very little decompn. of CH<sub>4</sub> resulted, and the method was changed in that the discharge was passed directly through the gas maintained at low pressures, a Geissler type tube of glass being used. The best conditions for decompn. of CH<sub>4</sub> were: pressure 40 mm. Hg, gas flow 367 l./hr., reaction tube diam. 35 to 60 mm., voltage drop between electrodes spaced at 40 cm. 5000 to 7000 v. room temp. By starting with gas analyzing 2.8% CO<sub>2</sub>, 1.5% illuminants (C<sub>2</sub>H<sub>2</sub> free), 1.2% O<sub>2</sub>, 5.4% CO, 52.3% H<sub>2</sub>, 23.4% CH<sub>4</sub> and 13.4% N<sub>2</sub> a gas contg. 8.5% C<sub>2</sub>H<sub>2</sub>, 67.7% H<sub>2</sub>, and 4.8% CH<sub>4</sub> was obtained by one passage through the tube. The main reaction is considered to be 2CH<sub>4</sub> = C<sub>2</sub>H<sub>2</sub> + 3H<sub>2</sub> — 4000 cal. About 15% of the energy supplied does useful work. Tar pptd. in the reaction tube is easily removed by passing water gas or air through the tube, elec. discharge being maintained. Expts. in which C<sub>10</sub>H<sub>8</sub> was introduced into the reaction tube with H<sub>2</sub> and N<sub>2</sub> showed the reaction C<sub>10</sub>H<sub>8</sub> + H<sub>2</sub> + 5N<sub>2</sub> = 10HCN to take place.

J. D. DAVIS

**Dust and acid removal from boiler flue gases.** J. B. C. KERSHAW. *Power Eng.* 24, 268-71, 275(1929).—An account of methods of treatment.

E. I. S.

**Steam-raising plant at the works of the Washington Chemical Company, Ltd.** R. S. ROBINSON. *Fuel Econ. Rev.* 8, 81-6(1929).

E. H.

**Failures in steam boilers.** ANTON POMP and PETER BARDENHEUER. *Mill.*

*Kaiser-Wilhelm Inst. Eisenforsch. Düsseldorf 11*, 185-91(1929).—Three sep. cases of failure were investigated. In one case the elastic limit of the rivet had been exceeded. This resulted in brittleness which had been promoted by high temp. and alkyl. in the priming water. In the second case the boiler was too shallow and the mech. specifications for the material were deficient with respect to elastic limit and tenacity. In the third case a fissure had developed from corrosion initially started around the rivets which was promoted by the alkyl. of the priming water. HANS DUUS

**Pyrogenous decomposition of coal tar in presence of hydrogen and under pressure.** V. N. IPAT'EV AND A. D. PETROV. *Zhur. Prikladnoi Khim.* 1, 172-6(1928).—More liquid products are obtained by heating coal tar under pressure of  $H_2$  than by distg. with  $H_3PO_4$ . The yield of low-boiling fractions is also higher.  $H_2$  favors formation of satd. compds. Short heating in  $H_2$  atm. results in decompn. of phenolic ethers, unsatd. cyclic ketones and acids. Aromatics and phenols are formed. Long heating with  $H_2$  converts phenols and satd. cyclic ketones into aromatics and polymethylenes. The max. amt. of liquid products is obtained at 440-60° with excess of  $H_2$  and in presence of catalysts. High-boiling fractions obtained by heating with  $H_2$  have a good odor and stable color and might be used as solvents, lubricants, etc. V. K.

**The methods for the determination of water and steam-volatile solvents in tar and oil.** R. KATTWINKEL. *Teer u. Bitumen* 27, 181-5, 201-4, 217-22(1929).—A review. F. S. GRANGER

**Test for coal-tar pitch in natural asphalt, asphalt from petroleum, and in the presence of colophonium.** F. J. NELLENSTEIJN AND J. C. M. SAUERBIER. *Z. angew. Chem.* 42, 722(1929).—Superior to the diazo and other tests usually applied for the detection of coal-tar products in asphaltum is a test with Millon's reagent, a carefully prepd. Hg nitrate soln. stable for only 24 hrs. Boil 10 g. of material with about 25 cc. *N* NaOH for 20 min., filter, and treat with  $HNO_3$  until slightly alk. Conc. to 5-10 cc., treat 5 cc. with 5 cc. Millon's reagent, and heat the mixt. in a test tube placed in boiling  $H_2O$  30 min. With asphalt or colophonium no color develops, but even 1-2% of coal tar will cause a coloration. W. C. EBAUGH

**The determination of coke yields for the coke plant based on a distillation test.** L. LITINSKY. *Instruments* 2, 239-42(1929).—A glass tube 14 by 530 mm. closed at one end is filled as follows: 20 g. dried powd. coal, 2 asbestos wool plugs, finely divided well-dried fire clay (140 mm.) and an asbestos plug. This is placed in a combustion furnace and connected to a train contg. a cotton-filled tube (to collect tar), a naphthalene-collecting tube, a 0.1 *N*  $H_2SO_4$  wash bottle (to collect  $NH_3$ ), a 1:3 KOH tube (to collect  $H_2S$  and  $CO_2$ ), 5 special paraffin-oil-filled flasks in an ice bath, and a gas-collecting flask. The coke made in practice is equal to a mean between the value from this assay and that from the ordinary crucible method. Tar is slightly less than that obtained commercially. Actual  $NH_3$  output is 10% less than the assay. A. H. E.

**Estimation of the amount of tar coke contained in normal coke.** G. AGDE AND L. v. LYNCKER. *Brennstoff-Chem.* 10, 88-9(1929).—If coal from which the bitumens have been extd. is distd. *in vacuo* practically all of the tar can be removed without such extensive thermal decompn. as to deposit free C. By comparing coke yields obtained in this way with those from the raw coal distd. in the usual manner approx. figures for the proportion of coke normally derived from decompn. of the tars are obtained. Figures given for several coking coals vary from 6 to 8%. J. D. DAVIS

**Review of coke-oven technology during the year 1928.** G. E. FOXWELL. *Fuel Econ. Rev.* 8, 16-23(1929). E. H.

**Development and progress in coke-making equipment.** G. SCHNEIDER. *Brennstoff-Chem.* 10, 2-8, 27-8(1929).—Early coke ovens—the meiler and beehive—are discussed briefly and development of the by-product oven in Germany is dealt with in detail. Cuts of the latest types of combination ovens—Collin, Hinsellman, "Kogag," Koppers, Otto and Still—are given and features of design peculiar to each are noted. The recent tendency is toward ovens of large size. These are regenerative or combination ovens; *i. e.*, they are designed for both rich and lean gas heating. S. deploras the slow development of coke dry quenching, but cites a long list of patents covering dry quenching methods. J. D. DAVIS

**The function of uniformity in iron and steel practice.** F. J. BAILEY. *Fuel Econ. Rev.* 8, 35-7(1929).—The most critical feature in blast-furnace operation is the maintenance of the required temp. in the hearth zone. In Germany regularity in coke quality has been brought about by large-scale blending plants. This has contributed toward a very considerable increase in Fe production of existing furnaces. The effects of grading the size of coke are beneficial as well as charging of whole burden in a more uniform condition. H. C. PARISH

General properties of boiler tubes with special reference to the relation between corrosion and fuel (KINUKAWA) 9. S compounds of [coal tar] (CHALLENGER) 22. A coke-fired gas producer for the ceramic industry (BARRETT) 19. An improved air-gas ratio apparatus (ROSECRANS) 1. Air oxidation of hydrocarbons catalyzed by N oxides. I. Natural gas. II. Benzene (BIBB, LUCAS) 10. C ratios as an index of oil and gas in Western Canada (JONES) 8. Treating tars electrochemically (U. S. pat. 1,720,910) 22.  $\text{NH}_3$  synthesis [using waste gases from destructive hydrogenation of carbonaceous materials] (Brit. pat. 302,620) 18. Catalytic hydrogenation [catalyst from residue from hydrogenation of coal by Bergius process] (Brit. pat. 302,912) 10. Emulsions of asphalt, [tar], etc. (Brit. pat. 301,805) 22.

**Sixth Report of the Joint Benzole Research Committee of the National Benzole Association and the University of Leeds.** London, Wellington House: The Natl Benzole Assocn. 212 pp. Reviewed in *Colliery Guardian* 139, 39(1929).

**Fuel for internal-combustion engines.** ÉDOUARD J. L. A. GERME. Fr. 656,773, Nov. 16, 1927. A fuel for internal-combustion engines contains  $\text{C}_{10}\text{H}_8$  50-75,  $\text{C}_6\text{H}_6$  50-25%.

**Fuel for explosion engines.** WALTER STEIGER. Fr. 656,832, June 29, 1928. A fuel for explosion engines is composed of alc., which may contain up to 20% of water, mixed with turpentine oil satd. with  $\text{C}_2\text{H}_2$ . Distn. products of crude petroleum may be added to the mixt. and lysol or a soln. of cresol and neutral soap to ppt. the resins in the turpentine.

**Effecting complete combustion of fuels such as gas.** ARTHUR A. BLANCHARD. U. S. 1,720,757, July 16. An oxidizing material such as Cu oxide is used to assist the combustion and to compensate for temporary deficiencies or excesses in O supply by giving up or taking up O to or from the mixt. supplied for the combustion. An app is described.

**Hydrogenating carbonaceous materials.** C. H. LANDER, F. S. SINNATT, J. G. KING and A. CRAWFORD. Brit. 301,720, Aug. 4, 1927. Coal, lignite, sawdust or similar carbonaceous material is subjected to the action of H at 370-460° under 230-300 atm pressure to effect modification (and partial desulfurization in treating coal) and obtain a thermoplastic product suitable for making fuel briquets which may be used in gas distn. retorts or producers.

**Destructive hydrogenation.** J. M. F. D. FLORENTIN and A. J. KLING. Brit. 302,354, Dec. 15, 1927. In producing products such as hydrocarbons of low b p from materials such as tars, lignites or brown coal, as described in Brit. 253,507 (C. A. 21, 2556), Brit. 263,082 (C. A. 21, 3908) and Brit. 276,007 (C. A. 22, 2479), hydrogenating catalysts are used consisting either of reduced metals such as Fe, Ni or Co or of unstable metal compds. such as suboxides, sulfides or nitrides of the multivalent metals such as W, V, Mo, U, Mn, Fe or Cr. An example is given of the treatment with H under 100 atm. pressure at 380-440° of a mixt. of brown coal and tar from brown coal, in the presence of alumina,  $\text{AlCl}_3$ , reduced Fe and Fe oxide to obtain a liquid product contg. 40% of hydrocarbons distg. under 205°.

**Destructive hydrogenation.** COMPAGNIE INTERNATIONALE POUR LA FABRICATION DES ESSENCES ET PÉTROLES. Brit. 302,683, Dec. 20, 1927. Gaseous products from the destructive distn. of carbonaceous materials are hydrogenated in the presence of hydrogenating gases and catalysts intermediate to purifying operations. An app. and various details of operation are described. Ni may be used as catalyst.

**Destructive hydrogenation of carbonaceous materials.** C. H. LANDER, F. S. SINNATT and J. G. KING. Brit. 302,629, Sept. 17, 1927. Concn. of gaseous and vaporous products in contact with material undergoing hydrogenation in a high-pressure vessel is controlled by withdrawing, through a by-pass, a portion only of the products and passing this portion through a purifying or other treating vessel and thence back to the inlet end of the same or another hydrogenation vessel.

**Destructive hydrogenation of carbonaceous materials.** I. G. FARBENIND. A.-G. Brit. 302,253, June 9, 1927. Hydrocarbon mixts. b. below 200° and contg. mainly aromatic and unsatd. aliphatic and hydroaromatic compds. are obtained by the action of an excess of H (preferably in the presence of catalysts) at temps. above 550° under pressures above 20 atm. on materials such as coals, tars, mineral oils, pitches and their conversion products. Catalysts used should be of a "cracking" character such as elements of the 3rd and 4th groups of the periodic system and elements of the second group in conjunction with Ru chloride. Catalysts such as Mo having also hydrogenat-

ing properties should only be used so that cracking properties predominate as in admixture with compds. of elements of the second and third groups of the periodic system. Various details are given. Cf. C. A. 23, 3074.

**Destructive hydrogenation of carbonaceous materials.** J. A. A. ZACON. Brit. 301,949, Sept. 7, 1927. Carbonaceous material such as coal is purified and emulsified with oil and water and the emulsion is charged into a high-pressure reaction vessel and there subjected to the action of an elec. arc or spark at about 150–200° and under 150 atm. pressure. Various details of procedure and of app. are described.

**Carbonizing bituminous fuel and recovery of by-products.** J. M. RUSBY and W. I. BATTIN. Brit. 301,796, Dec. 5, 1927. An app. is described in which bituminous fuel is carbonized and resulting coal gas, tar and other by-products are recovered, and the coke formed is burned below a steam boiler so that the app. serves as a gas-making plant and a power plant for steam generation.

**Low-temperature carbonization of fuels.** A. ABRASSART. Brit. 302,875, Jan. 12, 1928. Partially distd. or devolatilized fuel is formed into briquets which are then passed continuously through a retort on a flexible conveyor. Various details of the app. used are described. Cf. C. A. 23, 959.

**Low-temperature carbonization of bituminous carbonaceous materials.** I. G. FARBENIND. A.-G. Brit. 301,975, Sept. 19, 1927. Hot gases or vapors (which may be inert or may contain O) are blown through the materials so as to keep the fuel in active movement on its bed, but avoiding combustion or gasification to a greater extent than is necessary to produce a temp. for carbonization (suitably 400–600°). An app. and various details of procedure are described.

**Low-temperature distillation of bituminous material such as coal.** TROCKNUNGS-VERSCHWELUNGS- UND VERGASUNGS-GES. Brit. 301,907, Dec. 9, 1927. The material, in fine granular condition, is spread in layers of a thickness of less than 2 mm. and heated to a temp. not exceeding 380° (suitably on a revolving annular hearth such as described in Brit. 289,137 (C. A. 23, 698)).

**Low-temperature destructive-distillation plant with inclined grate.** WALTHER KOENIGER. Ger. 478,477, Feb. 28, 1925.

**Destructive distillation.** METALLGES. A.-G. Ger. 478,017, Jan. 11, 1924. Relates to processes of the kind in which the fuel descends a shaft in which it is first dried and then distd. To avoid passage of gases from the drying space into the distn. space, or *vice versa*, a gas-withdrawing conduit is arranged in the shaft between the 2 spaces, and the pressure in the conduit is made to correspond to that in the drying or the distn. space, whichever is the lower. Cf. C. A. 23, 3795.

**Hydrocarbons from distillation gases.** CARL STILL. Fr. 657,040, July 5, 1928. In the extn. of hydrocarbons from distn. gases by means of washing oils contg.  $C_{10}H_8$ , the content of  $C_{10}H_8$  in the oil is such that no further absorption of  $C_{10}H_8$  from the gas takes place and is kept at this value during the use of the oil.

**Hydrogenating coal, etc.** ALFRED POTT and HANS BROCHE. Fr. 657,409, June 27, 1928. See Brit. 293,808 (C. A. 23, 1740).

**Hydrogenation of coal, etc.** I. G. FARBENIND. A.-G. Fr. 33,955, Aug. 2, 1927. Addn. to 632,850. In the hydrogenation of coal, tars, mineral oils, etc., the app. coming in contact with the heated org. substances are coated with special steels contg. Co, Mo, W, V or Mn and Ni. Cf. C. A. 23, 1739.

**Hydrogenation of coal, etc.** I. G. FARBENIND. A.-G. Fr. 33,972, Aug. 6, 1927. Addn. to 616,237. In the hydrogenation of coal, etc., pressures of 50 atm. and more are used, using H in movement and in large excess, and having as catalysts active C, or metalloids such as B, Si, P, As, Se, Te or their halogen compds. or elements of groups 4 to 8, particularly of the 6th, *e. g.*, Mo, or their compds. along with elements of groups 2 to 7, or Cu or Au or their compds., the latter with the exception of elements of groups 2 and 3, being present in small amt., or catalysts contg. a small amt. of Ag, or mixts. of Cu with Zn or Cd, free or combined, and also containing B, Al, Si, Ti, V, Ta, Cr, Mo, W or Co free or combined, the last only in the combined state, or their mixts. or a precious metal or Pb, Sn or their compds. on supports of  $MgO$  or  $Cr_2O_3$  may be used.

**Refining coal.** MINERALS SEPARATION, LTD. Ger. 478,065, July 9, 1920. Coal is refined by a froth-flotation process in which a sol. frothing agent such as cresol and a small amt. of an insol. frothing agent such as paraffin oil are used together, suitably in a medium of  $Na_2SiO_3$  soln. If the process is carried out in sea water, the sol. frothing agent can be wholly or partly omitted.

**Coal-distillation products.** THE BARRETT CO. Fr. 657,468, July 12, 1928. See Brit. 294,106 (C. A. 23, 2023).

**Coal-carbonizing apparatus.** EDMUND ROSER. Fr. 657,250, July 10, 1928.

**Separating clay and like material from coal, etc.** CHEMISCHE FABRIK IN BILLWARDER, VORM. HELL & STHAMER A.-G. and F. L. KÜHLWEIN. Brit. 302,082, Feb. 8, 1928. The material is treated with solns. of alkali xanthates and subjected to sepn by fine sieves. An app. is described.

**Use of solvents for obtaining oils, etc., from coal and similar materials.** I. G. FARBENIND. A.-G. Brit. 301,946, Sept. 1, 1927. Coal is preheated in a closed vessel (preferably at "over 100-600°" for several hrs.) under such conditions as not to cause caking and then heated under pressure (suitably 100 atm.) with a solvent such as  $C_6H_6$ , which may dissolve 60% of the coal. The product or mixed materials may be treated with solvents for sepn. of wax or resins or may be destructively hydrogenated or cracked in the presence of activated Al and HCl.

**Cooling apparatus for oil.** KARL WILKE. Ger. 478,168, June 28, 1925. App. is described for directly cooling with water a washing oil which has been used to absorb  $C_6H_6$  from gases and freed from  $C_6H_6$  by distn.

**Montan wax.** I. G. FARBENIND. A.-G. Brit. 302,626, Sept. 15, 1927. Montan wax is bleached (in the absence of HOAc or other org. solvent) by suspending it in an aq. soln. of  $H_2SO_4$  or of a Cr salt (or both), adding a chromic acid soln. and heating to above 100°. Similar treatment is stated to be suitable for bleaching other waxes or paraffin. Various details are given. Cf. C. A. 23, 3074.

**Gas manufacture.** ALFRED AICHER. Ger. 478,459, June 27, 1925. Gas of good quality is obtained from poor fuels such as lignite by a process comprising (1) low-temp. distn. of the fuel to produce gas, tar and semi-coke, (2) conversion of the tar oils to oil gas, (3) mixing the gases from (1) and (2) and adding water gas to the mixt., and (4) thermally decomp. the tar residues from (2) and mixing the gaseous products with the gases obtained in (3).

**Combustible gas from bituminous fuel.** JOHN M. RUSBY and CHARLES W. ANDREWS (to U. G. I. Contracting Co.). U. S. 1,720,403, July 9. Bituminous fuel is charged into a gas producer so as to form a fuel bed with voids between the fuel lumps; the fuel bed is air-blasted while it remains quiescent, to form combustible gas until the top portion of the fuel bed is coalesced and the voids partly eliminated; the air blast is then stopped, the coalesced fuel portion is stirred, more bituminous fuel is added, and the fuel bed is further air-blasted. An app. is described.

**Gas rich in olefins from bituminous coals.** I. G. FARBENIND. A.-G. Brit. 301,775, Sept. 1, 1927. Coals such as brown coal in pulverized or granulated form are rapidly heated to about 800° and the gas and coke formed are rapidly cooled. The coal may be assocd. with inert material such as sand and may be passed by the aid of superheated steam through a Cr-Ni-Fe alloy pipe which is externally heated. Wet coal should be preliminarily dried to avoid the water-gas reaction. Tar formed may be returned to the process for retreatment. An app. is described.

**Purifying gas.** JEAN H. BRÉGEAT. Fr. 656,524, Nov. 10, 1927. Lighting gas is purified by washing with hydroaromatic or alicyclic compds. such as tetralin, decalin or cyclohexanol. The extn. is carried out with heat and the extd. products are sepd. by cooling. Cf. C. A. 23, 2557.

**Treating gaseous hydrocarbons.** EMPIRE GAS AND FUEL CO. Fr. 657,394, June 13, 1928. See Brit. 295,356 (C. A. 23, 2186).

**Treating gaseous hydrocarbons.** EMPIRE GAS AND FUEL CO. Fr. 657,383, May 16, 1928. See Brit. 290,613 (C. A. 23, 846).

**Gas producer.** J. BELLAY. Belg. 355,276, Nov. 30, 1928. Constructional features.

**Gas producer.** MOTORENFABRIK DEUTZ A.-G. Brit. 302,607, Dec. 16, 1927. The temp. in the fire zones of gas-producer plants, having 2 zones in one producer or more than one fire zone in sep. producers, is regulated automatically in accord with the temps. in these zones or the pressures in the air-inlet pipes to these zones. Various structural features are described.

**Gas producer for use with fuel dust.** ALBERT LEDEBUR. Ger. 477,581, June 3, 1925. Details of construction are described.

**Lean gas producer.** J. VAN HEMELRYCK. Belg. 354,660, Nov. 30, 1928. Constructional features.

**Gas-producer operation.** H. C. READING and T. G. TULLOCH. Brit. 302,033, Nov. 16, 1927. The temp. of a suction gas producer is controlled automatically by a thermostat placed in the hot air or steam supply pipe, which operates a valve in this pipe to admit cold air and maintain the temp. of the incoming air and steam constant. Various structural details are described.



**Operating molten-slag gas producers.** HENRI J. F. PHILIPON (to Soc. anon. "l'Air Chaud"). U. S. 1,720,290, July 9. A temp. of about 2000° or higher is maintained in a limited zone adjacent to the bottom of the charge in the gas-generating chamber by delivering an air blast heated to 500° or higher at this zone, so that non-volatile residues of the charge are slagged or liquefied. An app. is described.

**Treating coal gas.** WOLF J. MÜLLER. Austrian 113,333, Jan. 15, 1929. The CO content of coal gas or of mixts. of coal gas with water gas is eliminated by treating the gases with steam in known manner in the presence of  $\text{Fe}_2\text{O}_3$ , and removing the  $\text{CO}_2$  so formed by washing with  $\text{K}_2\text{CO}_3$  soln.

**Coal-gas retorts.** FREDERICK J. WEST, ERNEST WEST and WEST'S GAS IMPROVEMENT Co., LTD. Ger. 477,706, May 5, 1927. A coke-separating device for vertical retorts is described.

**Operating gas retorts.** GAS LIGHT & COKE Co., H. HOLLINGS and J. NEATH. Brit. 302,437, Oct. 6, 1927. The pressure in intermittently charged gas retorts or ovens is automatically controlled to suit conditions at different stages of carbonization and during charging and discharging. Various details of the app. are described.

**Fuel-feeding device for water-gas generators, etc.** POWER-GAS CORP., LTD. and N. E. RAMBUSH. Brit. 302,852, April 13, 1928. A device is provided for cutting off the feed of fuel during certain periods, *e. g.*, during the blow period of a water-gas generator.

**Water gas.** HUMPHREYS & GLASGOW, LTD. Ger. 477,756, Mar. 13, 1925. A water-gas plant is described.

**Apparatus for the thermal decomposition of natural gas.** LOUIS GUMZ. Ger. 478,191, Jan. 12, 1928.

**Oven for producing gas and coke.** HEINRICH KOPPERS and OSWALD PEISCHER. Ger. 478,250, July 1, 1924.

**Tar from coke-oven gas.** F. COOKE. Brit. 301,645, Dec. 2, 1927. Tar is condensed from coke-oven gas and withdrawn from an air-cooled main at a temp. of 160–190° through a branch leading to a seal pot; part of the tar passes to a tank which may be variably cooled and is returned to the end of the bench main in a manner controlled to regulate the temp. of condensation. A plant arrangement and various details of further treatment of the gas and tar to obtain  $\text{NH}_3$ , benzene and creosote oil are described.

**Separating acid from tar.** F. CURT BUNGE. Fr. 651,950, Mar. 29, 1928. The crude tar is emulsified with water and a little soap and treated with a solvent for the acid, such as alk. solns., alc. or acetone.

**Vaporizing tar oil, etc.** KOHLENVEREDLUNG A.-G. Fr. 657,120, July 6, 1928. In cracking or distg. tar oil or tar products, they are finely sprayed on rotating disks heated by circulating gases or steam.

**Coke oven.** J. VAN ACKEREN (to Koppers Co.). Brit. 302,365, Dec. 15, 1927.

**Coke oven.** H. KOPPERS A.-G. (to F. Totzek). Brit. 302,225, Dec. 12, 1927. In a coke oven with regenerator tunnels running the length of the battery, the connecting passages between the regenerators and the heating-flues include a pair of flues running longitudinally beneath the sole of each oven. Various details of construction are described.

**Coke oven (with porous hollow columns in the heating flues for the admission of combustion air).** ADOLF ORT. Ger. 478,066, June 11, 1924.

**Oven for the production of semi-coke and similar products.** SOCIÉTÉ GÉNÉRALE DE FOURN A COKE. Belg. 355,326, Dec. 31, 1928. Constructional features.

**Charging coke ovens.** KOPPERS Co. Brit. 302,188, June 11, 1927. Charging is effected from openings in the roof near both ends of the oven and, subsequently, through an intermediate opening; and smoke and gas generated are withdrawn into gas-collecting mains from the spaces on the 2 sides of the intermediate mound of coal through outlets at both ends of the oven. Various structural details are described. Brit. 302,189 also relates to a coke-oven construction and charging system.

**Leveler bar construction for coke ovens.** JOSEPH VAN ACKEREN and JOHN I. THOMPSON (to Koppers Co.). U. S. 1,720,805, July 16.

## 22—PETROLEUM, LUBRICANTS, ASPHALT AND WOOD PRODUCTS

W. F. FARAGHER

**Comparison of Russian and American petrolatums.** A. S. VELIKOVSKII AND S. S. NIFONTOVA. *Neftyanoe Khozyaistvo* 15, 477-89(1928).—The following are for American, Grozny and Baku petrolatums, resp.: sp. gr. (60°) 0.820-0.875, 0.880, 0.869; viscosity ( $E_{60^\circ}$ ) 10.34-14.68, 3.94, 10.3; color (Duboscq) 18-157 mm., 21 mm., 9 mm.; acidity (%  $SO_3$ ) 0.0008-0.006, 0.020, 0.051; ash 0.0002-0.0162, 0.371, 0.130, asphaltenes none, none, 0.34%; iodine no. 9-15, 8.12, 3.1; oxygen no. 0.73-4.30, 2.67, 4.45; % paraffin wax 32.88-61.5%, 19.01%, 19.52%. To improve Russian petrolatums by increasing their paraffin content ordinary Grozny petrolatum was dissolved in naphtha (1:1) with initial b. p. 150°, the soln. was cooled from 38° to -10°, the upper layer decanted, and the solvent distd. from the lower layer. A petrolatum of 42° pour test with 26% of paraffin and a consistency of 200 was then obtained which went down 3° after remelting and then remained stable. Surakhanui crude oil also yielded a good petrolatum by the above method.

**Method of preparation of artificial petroleum and of carboniferous decolorizing substances from raw rubber scrap or vulcanized scrap.** H. NISHIDA. *Caoutchouc & gutta-percha* 26, 14625(1929).—A description of the chemistry involved in a recent patent (cf. C. A. 22, 3772).

**Fuel economy in the petroleum industry.** F. SCHWARTZ. *Mon. pétrole roumain* 29, 361-7(1929); cf. *Petroleum Times* 21, 1072(1929).—S. proposes a steam-boiler plant producing steam at about 8 atm. pressure to drive a turbine, the steam entering at full boiler pressure and leaving at 2.5 atm. The turbine operates the elec. generators and the exhaust steam from the turbine is used for processing and heating. The steam necessary for this system is only 60% of that required for ordinary steam-driven pumps, and the cost of the system, including operation, etc., is 64% of the present steam system and 75.5% of the Diesel-engine system.

**Manufacture of automotive and household petroleum specialties.** E. N. KLEM-GARD. *Refiner and Natural Gasoline Mfr* 8, No. 6, 58-62(1929).—Formulas are given for automobile polishes, cleaning fluids, fly sprays, etc., that utilize various petroleum products.

**Volumetric estimation of sulfur in crude petroleum.** GLADYS WOODWARD. *Ind. Eng. Chem., Anal. Ed.* 1, 117-8(1929).—An adaptation of the Nikaido method [cf. *J. Am. Chem. Soc.* 24, 774(1902)], using Pb nitrate soln. to det. the S by the bomb-explosion method. For oils of high-S content, the method is accurate to about 1%, while for oils of low-S content it is accurate to about 3%. Prepn. of soln. and procedure are described.

**Determination of sulfur in petroleum oils.** R. C. GRIFFIN. *Ind. Eng. Chem., Anal. Ed.* 1, 167-9(1929).—In the detn. of S in oil by the O. bomb, part of the S is converted to sulfonic acid and is not pptd. by  $BaCl_2$ . This S can be recovered by refluxing the filtrate from the Ba pptn. with HCl. Mercaptans cannot be correctly estd. by either the bomb or the lamp method.

**Sulfur compounds of shale oil and petroleum.** FREDERICK CHALLENGER. *Chemistry & Industry* 48, 622-6(1929).—Thiophene and its homologs and derivs. have been found in coal tar and shale oil. "Thiophanes" ( $C_nH_{2n}S$ ) were found in Canadian petroleum by Mabery. Persian petroleum has been shown to contain sulfides and mercaptans. The  $H_2S$  contained in Persian oils as they come from the wells is partly oxidized in the air to S. This S probably reacts with the hydrocarbons in the oil to give the S compds. found in the gasoline and kerosene fractions. Part of the thiophene compds. in coal tar and shale oil may originate in this manner. They are probably the product mainly, however, of thermal decompn. of S compds. in the coal or kerogen substance. In what form the S occurs in the coal conglomerate is not known. There is need for study of the S compds. which can be removed from coal by low-boiling solvents. A classified bibliography of 75 references is appended, covering the literature upon S compds. in coal tar, shale oil, petroleum, etc., published 1926-8.

**Report of Committee D-2 on petroleum products and lubricants.** F. A. HULL, et al. *Proc. Am. Soc. Testing Materials* 1929 (preprint) No. 72, 40 pp.—Tentative revisions of standard methods of test are proposed for viscosity of petroleum products and lubricants and distn. of gasoline, naphtha, kerosene and similar petroleum products. The proposed tentative method for expressible oil and moisture in paraffin wax

is the well-known press method, applicable to crude, semirefined and refined paraffin wax melting at or above 108°F. The results bear no relation to the actual oil content. The proposed tentative method of test for S in motor fuels, naphthas and illuminating oil (lamp method) yields good results if the dimensions of the app. are adhered to closely. The present tentative method of test for pptn. no. of lubricating oil is satisfactory if the naphtha used as a diluent has an aniline point of 58–60°. A new gravimetric method for the pptn. no. is proposed. Results of detg. crankcase diln. of used oils by the steam-distn. method are 3% higher than by the vapor-temp. method. The Sligh method approaches the steam-distn. method. There is material present in used oil which is neither gasoline nor motor oil. The pour points of 10 fatty oils by the standard method were found reliable; the cloud points were found unreliable.

ARTHUR FLEISCHER

**Cracking.** BUTKOV. *Neftyanoe Khozyaistvo* 15, 674–8(1928).—Oil was cracked in the vapor phase in a modified Rittman app. at a pressure of 0.25 to 5 atm. and a temp. of 425° to 575°. The rate of charging was 1.7 g. per min. From 300 g. of Emba solar-oil distillate, 19.7 to 5% gasoline and 0 to 36 l. of gas (per 100 cc. charging stock) were obtained, depending on the temp. and pressure applied. Raising the pressure at const. temp. increases the yield of gasoline and decreases that of gas, while raising the temp. at const. pressure increases the cracking rate of the solar oil and produces more gas. Decalin (b. 187°) yielded 11 l. of gas per 100 cc. when heated at 478° under 5 atm. pressure. Tetralin (b. 205°) cracked very little at 484°, while at 533° compds. b. 130° to 200° were obtained with no appreciable naphthalene or gas formation. At 575° hydrocarbons b. 94° to 200° were formed as well as considerable naphthalene and gas; i. e., dehydrogenation prevailed. When the 150–155° and 170–175° fractions of com. turpentine were cracked at 5 atm. and 460°, up to 7 l. of gas per 100 cc. and a series of liquid hydrocarbons (initial b. p. 56°) were obtained. A mixt. of new products is obtained when individual hydrocarbons are cracked. The temp. affects both the speed and the character of the reaction. A small bomb provided with a pressure gage and thermocouple pocket was used to study the pressure developed by various degrees of cracking. The increase in pressure vs. time when a cylinder oil was heated from 323° to 525° was noted. The reaction is endothermic and the speed passes through a max. and drops off, gradually approaching zero.

A. A. BOEHLINGK

**Progress in cracking.** LEOPOLD SINGER. *Petroleum Z.* 25, 741–8(1929).—A review of recent literature (with 108 references) and patents (with 22 references).

A. A. BOEHLINGK

**The cracking process from the technical and practical point of view.** M. NAPHTALI. *Auto-Tech* 18, No. 5, 8–10(1929).—A review. Cf. *C. A.* 22, 3765.

A. A. B.

**Skimming, cracking, lubricating-oil making from Ranger crude oil.** PAUL TRUESDELL. *Natl. Petroleum News* 21, No. 23, 73, No. 25, 78, No. 26, 80(1929).—This is the method of refining crude oil used by the Trans-Continental Oil Co.

J. L. E.

**Addition of hydrogen chloride to unsaturated cracked gases.** A. F. DOBRYANSKII AND M. NEMTZOV. *Neftyanoe Khozyaistvo* 15, 472–6(1928).—A  $C_3H_6$  concentrate, sp. gr. about 1.6, composed of 65–70% of  $C_3H_6$ , some butylenes, and up to 20% of higher homologs, and less than 3% of  $C_2H_4$ , was subjected to the action of HCl (gas) at a temp. not exceeding 150°, with  $BiCl_3$  as a catalyst. Up to 92.4% of the  $C_3H_6$ , 90% of the  $C_4H_8$ , and 8.5% of the  $C_2H_4$  reacted with the HCl. The catalyst was poisoned quickly.

A. A. BOEHLINGK

**Roumanian refineries.** H. E. CASSIDY. *Refiner and Natural Gasoline Mfr.* 8, No. 6, 69–73(1929).—A survey is made of the refining business in Roumania.

J. L. ESSEX

**Dephlegmators.** K. V. KOSTRIN. *Neftyanoe Khozyaistvo* 14, 762–8(1928).—A lab. investigation of Bibi-Eibat crude oil indicates that a better sepn. of fractions and a more efficient utilization of equipment can be effected by passing the vapors in dephlegmators downwardly, instead of upwardly as usual.

A. A. BOEHLINGK

**Vacuum distillation.** S. A. VISHETRAVSKII. *Neftyanoe Khozyaistvo* 14, 769–71(1928).—When fuel oil is distd. in vacuum stills, some cracking is apt to occur, principally in the first and last stills. The overheating of the oil can be prevented by (1) the use of more steam, which acts as a carrier, and (2) by using the oil in finely divided form, which can be effected by atomizing it into the still.

A. A. BOEHLINGK

**Handling vacuum-distilled wax-bearing products.** EARL PETTY. *Refiner and Natural Gasoline Mfr.* 8, No. 6, 62–8(1929).

J. L. ESSEX

**Aluminum chamber oven for low-temperature assay of bituminous materials.** A. WEINDEL. *Brännstoff-Chem.* 10, 67–9(1929).—The oven is rectangular (60 cm,

long by 10 cm. wide and 11 cm. high) and is of cast Al. A cast door fits into one end and is held in place by a screw clamp; a vapor off-take is provided at the other. An inlet for superheated steam is placed at the oven top near the charging end. The oven is mounted on steel legs which also support an asbestos-lined sheet-steel mantle and 3 gas burners for heating. The charge of coal used is about 5.3 kg. The app. is made by Andreas Hofer, Mulheim-Ruhr.

J. D. DAVIS

**U. S. motor gasoline specifications changed and a new grade established.** J. C. CHATFIELD. *Natl. Petroleum News* 21, No. 25, 27(1929).—The Federal Specification Board has revised the distn. specifications for U. S. Motor Gasoline and also published specifications for a new grade of gasoline to be known as Motor Fuel V which is more volatile than the U. S. Motor Gasoline. In the U. S. Motor Gasoline specification, the 20%-point has been dropped and the substitution of a max. and min. 10%-point has been instituted. Requirements now are that when 10% has been recovered in the receiver the thermometer shall not read more than 80° nor less than 50° provided that for each percent of distn. loss less than 4% detd. in the A. S. T. M. distn., the min. temp. requirement shall be lowered 3°. Gasoline which is to be stored in tropical climates has a min. 10%-point of 60°. The 50%, 80% and end points were not altered. The substitution of the min. 10%-point was made to avoid the possibility of vapor locking. The U. S. Motor Gasoline specifications which have been adopted by 12 states will automatically be changed in 6 of these 12 states. The others will perhaps have to ratify the changes. As a substitute for a winter gasoline, the board adopted a new specification for U. S. Motor Fuel V. The requirements for this fuel are that the 10%-point shall not be more than 65° nor less than 50° with the same correction for distn. loss as adopted for U. S. Motor Gasoline. The 50%-point shall not be more than 125°; the 90% point shall not be more than 180°; and the end point shall not be higher than 205° and at least 95% shall be recovered. The S and corrosion requirements are the same as those for U. S. Motor Gasoline.

J. L. ESSEX

**American unblended gasolines.** S. A. VISHETRAVSKII. *Neftyanoe Khozyaistvo* 16, 59-61(1929).—A distn. chart of American casinghead, straight-run and cracked gasolines and a chart of Russian com. gasolines are given for comparison.

A. A. BOEHLINGK

**Stabilizing Grozny casinghead gasoline.** A. N. SAKHANOV AND A. I. DOLADUGIN. *Neftyanoe Khozyaistvo* 15, 464-71(1928).—Casinghead gasoline was stabilized in an app. having the following features: unstabilized gasoline was introduced at the middle point of a tower filled with Raschig rings of about 1-in. size. The temp. at the bottom of the tower was kept at 60-70° by a steam coil. The stabilized gasoline was withdrawn from the bottom and passed through a cooler. The vapors were condensed by a condenser in the upper part of the tower and the condensate was sprayed over the Raschig rings. The pressure of the system was kept at 1-2 atm.; a higher pressure produced an unstable gasoline.

A. A. BOEHLINGK

**Results of the exploitation of the first gasoline-kerosene plant in Baku.** K. V. KOSTRIN. *Azerbeidzyanskoe Neftyanoe Khozyaistvo* 1928, No. 8/9, 40-60; No. 12, 38-50.—Details are given of the performance of the "second" battery, furnaces, tubular preheaters, evaporators, rectifying columns, steam boilers, pumps, the distribution and consumption of steam, the efficiency of furnaces and tubular preheaters with evaporators. A list of 68 references is given.

A. A. BOEHLINGK

**The effect of gum in gasoline.** V. VOORHEES AND J. O. EISINGER. *J. Soc. Automotive Eng.* 24, 584-92(1929).—See C. A. 23, 2286.

J. L. ESSEX

**Economic fuel volatility and engine acceleration.** D. B. BROOKS. *J. Soc. Automotive Eng.* 24, 609-16(1929).—The results of tests to det. the effect of the American Society for Testing Material (A. S. T. M.) 50%-point on acceleration and on the most economical fuel volatility from the standpoint of acceleration are given as a continuation of previously reported tests. The effect of the A. S. T. M. 50%-point on engine acceleration or on the quantity of fuel required to give the same acceleration as the standard U. S. Motor Gasoline appears to be negligible except under summer-operating conditions, in which case the acceleration improves and the quantity of fuel consumed decreases with increase in the A. S. T. M. 50%-point, unless some special accelerating device is provided. Current practice in carburetor adjustment makes it possible for some increase in fuel consumption to follow an increase in the A. S. T. M. 50%-point. Tests were run with manifold temps. from -10° to 100°, which represent the extremes of winter warming-up and summer-driving temps. The results show a consistent variation in the relative acceleration obtained with the 4 fuels tested as the manifold temp. varied. The test engine used was a 3 $\frac{1}{8}$ "  $\times$  4 $\frac{1}{2}$ ", 6 cylinder, 3-port overhead valve, 1926 model, equipped with a Sprague elec. dynamometer and operated to dupli-

cate level road conditions in high gear. The semi-automatic spark advance was set to give optimum spark advance at the mixt. ratio for max. power at the mean speed of the range of the acceleration tests. The 4 fuels used showed A. S. T. M. 50% points of 105°, 122°, 140° and 165°, as against 137° for U. S. Motor Gasoline. At manifold temps. of -10°, engine speeds of 300-700 r. p. m., and air-fuel ratio of 12.5 to 1, there is practically no difference between the 4 fuels; at manifold temps. of 10°, engine speeds of 300-700 r. p. m., and air-fuel ratio of 10.2 to 1, the accelerations are in the reverse order of the 50%-point volatility; at a manifold temp. of 90°, engine speeds of 300-700 r. p. m., and air-fuel ratio of 16.5 to 1, the accelerations are in direct order of the 50%-point volatility.

J. L. ESSEX

**Effects of knock-suppressing and knock-inducing substances on ignition and partial combustion of certain fuels.** RAYMOND E. SCHAAD AND CECIL E. BOORD. *Ind. Eng. Chem.* 21, 756-62(1929).—Hot-wire ignition curves were detd. for toluene, isoamyl acetate and kerosene between the upper and lower limits of inflammability. The current required by an electrically heated Pt wire for ignition of the most easily ignitable mixt. of air and the above substances was increased by the addn. of a knock suppressor such as PbEt<sub>4</sub>, PbMe<sub>4</sub>, SeEt<sub>4</sub> and aniline. Addn. of knock inducers, such as isoamyl nitrite, nitrobenzene, and propyl nitrite, decreased the required current. The work was repeated with a break-spark app; knock suppressors and inducers had no effect. The minima of hot-wire ignition curves are near to the calcd. temp. for combustion to CO, while the minima for the break-spark curves correspond to the calcd. temp. for combustion to CO<sub>2</sub>. The difference is probably due to pre-ignition in the former app.; knock suppressors decrease such pre-ignition combustion while knock inducers increase it.

ALDEN H. EMERY

**Capillarity of lubricating oils.** N. A. BUTKOV. *Izvestiya Teplo-Tekhn. Inst. (Trans. of the Thermo-Techn. Inst. (Russia))* No. 5, 29-31(1928).—Viscosities in abs. units according to Ostwald are as follows:

	80°	100°	184°	212°	284°
Vapor "L" . . .	0.652	0.294	0.0446	0.0292	0.013
Vapor "M" . . .	0.6675	0.334	0.0483	0.03105	0.01395
Vapor "T" . . .	0.825	0.428	0.0558	0.0364	0.0156
Viskozoin 3 . . .	0.4415	0.1973	0.03306	0.02134	—
Viskozoin 7 . . .	1.092	0.5337	0.06288	0.03967	0.0180
Viskozoin 10 . . .	1.454	0.6157	0.0692	0.04185	0.0180

Surface-tension measurements gave somewhat higher values at 21° for the Viskozins than for the Vapor oils, indicating lower stability and poorer lubricating qualities. The ratio of power of adhesion to surface tension gives the true indication of the lubricating quality of an oil. Certain Russian and American oils are compared in this respect. Acid treatment of an oil lowers its capillarity, increases the angle of contact, and so reduces the lubricating value. Addn. of oxidized vegetable oils decreases the angle of contact.

A. A. BOEHLINGK

**Apparatus for testing the dilution of lubricating oil in the automobile and airplane motor.** H. KIEMSTREDT. *Chem.-Ztg.* 53, 459(1929).—A portable app. provides for steam-distg. the mixt. of motor fuel and lubricant, and condensing and measuring the oil distillate. The still consists of an outer cylinder contg. H<sub>2</sub>O, to be heated electrically, and a container for the oil sample fitting tightly into the upper part of the cylinder. Tubular openings in the bottom of the oil container lead the steam upward through an inverted U and deliver it near the bottom of the oil sample. The condensate is collected in a measuring tube which connects by a bent tube with a cylinder. The motor fuel distd. off remains in the measuring tube and the specifically heavier H<sub>2</sub>O passes over into the cylinder.

E. E. CRANDAL

**Oxidizing lubricating-oil bottoms.** A. D. DEMCHENKO AND C. N. OBRVADCHIKOV. *Netnyanoe Khozyaistvo* 15, 360-6(1928).—A charge of 263 kg. of asphaltic bottoms was placed in a vertical still, heated to 235-252°, and blown with air for 19¼ hrs. 490 l. of H<sub>2</sub>O, 70 l. of emulsion, and 65 l. of distillate were collected in the process of oxidation. The gases obtained contained an av. of 97.6 N<sub>2</sub>, 0.04% CO<sub>2</sub>, 1.6% O<sub>2</sub> and 0.7% of combustible gases. The acidity of the distillate collected increased with time. The quantity of resins present in the bottoms did not change in the first 10 hrs. The oil content decreased and that of asphaltenes increased. The second 10 hrs. showed a very slow decrease in oil, the resins decreasing rapidly while the asphaltenes increased. The oxidation process required 4580 cu. m. of air. The heat of the oxidizing reaction to obtain a pitch m. 47° is calcd. at 48 cal. per kg. of bottoms. The total heat required for the process is 2½ times greater than that required by the formation of H<sub>2</sub>O

in the above process. This is explained by the cracking reaction, splitting off of  $H_2$ , etc.

**Insulating oils.** G. STADNIKOV AND Z. VOZZHINSKA. *Petroleum Z.* **25**, 651-8 (1929); cf. *C. A.* **22**, 4240.—When an oil is oxidized which contains sulfonic acids or their salts and which has not been freed entirely from resinous substances, acids, alcs. and carbonyl compds. are formed which are condensed with the resins to colloidal compds. of high mol. wt. This change prevents sludge from being formed immediately; the new compds. remain in the oil because the resins act as protective colloids. This oil is frequently passed in inspections, its acid no. being low because the acid enters the condensation products. It is unstable and ppts. sludge after the resinous substances have been consumed. The acid no. then rises. An oil contg. sulfonic acids and their salts but no resins forms sludge very rapidly. This reaction may be retarded when untreated distillates are added because of the presence of resins in the m. Numerous expts. confirming this theory were made. Conclusion: Most of the transformer oils contained traces of sulfonic acids formed during treating. The acid no. is not a criterion of the oxidizability of the oil. The oil must be very thoroughly washed with water after treating, to remove the last traces of sulfonic acids, and finally filtered through an adsorbent. The degree of purity can be checked by adding small quantities of  $AcH$  and  $AcOH$  and heating. The presence of even very small quantities of sulfonic acid is shown by a darkening of the oil.

**Nomenclature of various crude-oil products.** ANON. *Petroleum Z.* **25**, 858 (1929).—A table gives the names used in 20 countries.

**Lord Kelvin's law applied to mineral-oil fractions.** M. RAKITIN. *Neftyanoe Khozyaistvo* **15**, 493-7 (1928).—Kelvin's law is applied to bubble towers.

**Emulsified and saponified oils. IV.** V. LEOPOLD SINGER. *Petroleum Z.* **25**, No. 19, Motorenbetrieb u. Maschinen-Schmierung sect. 7-10; No. 24, 9-10 (1929); cf. *C. A.* **23**, 2560.—A review of the literature with 55 references to papers and patents.

**Manufacture of transformer and switch oils.** TYPKE. *Petroleum Z.* **25**, 819-24 (1929).—A review of refining and testing methods for transformer and switch oils including 33 literature references.

**Contribution to the determination of the tar number in transformer and switch oils.** EUGEN LOCHER. *Chem.-Ztg.* **53**, 470 (1929).—Heat 50 g. of the oil for 24 hrs. at  $120^\circ$  with 10 cc. of  $NaOH$  soln. made by dissolving 7 g. of  $NaOH$  in 100 cc. of  $H_2O$ ; and, without sepg. the  $NaOH$  from the oil, proceed as with the referee method. Results agree fairly well with those yielded by the longer, more expensive process.

**Making cutting and soluble oils.** H. L. KAUFFMAN. *Oil and Gas J.* **28**, No. 4, 46, 75 (1929).—Cutting oils are usually made by compounding mineral oil with a smaller proportion of lard oil. Specifications of a no. of cutting oils on the market are given. Soap in a  $H_2O$ -alc. solvent commonly forms the base of sol. cutting oils. For example, a mixt. of Na oleate 40%, rosin acids 35%, alc. 10-11%,  $H_2O$  14-15%, may be combined with a mineral oil in the proportion of 1 to 4. The quantity of  $H_2O$  to be used depends upon the proportion that gives the most stable emulsion.

**Toluene in the oil of Maikop.** B. E. DOLGOV. *Zhur. Prikladnoi Khim.* **1**, 287-91 (1928).—About 1% of toluene is present in the Maikop crude oils, from which it can be sepd. by fractional distn.

**Treating oil by use of chemicals.** R. T. BRIGHT. *Oil and Gas J.* **28**, No. 5, 40-1, 80-1 (1929).—Dow (*C. A.* **19**, 2561) divides the chemicals used for treating oil emulsions into 6 classes according to the manner in which they affect the protective film around the  $H_2O$  globules. Class 4, the compds. that help to break the protective film by their tendency to form the opposite type of emulsion, are considered best for treating cut oil. In a plant described for treating with chemicals of this class, a force-feed pump, preferably, introduces the chem. into the oil as close to the well as possible and before the oil passes through the separator. Where the vol. and rate of oil flow warrant it, better mixing of the chemical with the oil is attained by introducing 1 or 2 joints of baffled pipe into the line. After mixing, the emulsion is heated, usually to  $120$ - $150^\circ F.$ , either by passing through a boiler or heater before it goes to the wash tank, or by warming the water to be used for washing. Most of the emulsion is broken in the tank, where agitation is kept to a min., and the water and unchanged emulsion are drawn off at the bottom. The unchanged emulsion is recycled and the oil goes to a settling tank and finally to storage.

**Iodine number of turpentine oil.** CYRIL KRANZ, VLADIVOJ HRACH AND IVAN FRANTA. *Chem. Obzor* **3**, 365-7 (1928).—Diagrams obtained by plotting I nos. against

the amt. of oil used, show that with increasing concn. of I soln. the I nos. increase till max. of 370–380 is reached. It is recommended, therefore, to weigh approx. 0.1 g. of turpentine oil and treat this, keeping all other conditions as prescribed by Hübl's method, with an I soln. of which 25 cc. would correspond to about 100 cc. 0.1 N  $\text{Na}_2\text{S}_2\text{O}_4$ .

**Analyses in oil absorption operation.** W. W. ROBINSON. *Oil and Gas J.* 28, No. 3, 54, 182, 184, 186, 188, 190, 192, 195(1929).—An effort is made to show how the principles of phys. chemistry and mathematics can be applied to the operation of a natural gasoline absorption plant. JAROSLAV KUČERA

**Selective adsorption of oil tars.** A. F. DOBRYANSKII. *Neftyanoe Khozyaistvo* 14, 780–95(1928).—The selective adsorption of tarry substances by adsorbents is due to the size and the internal surface of the pores of the adsorbing material. Compds. with large mols. cannot enter small pores and are not adsorbed to the same extent as small mols. If the tar mols. enter the pores, the oil has a brighter appearance. The size of the pores of silica gel can be changed by treatment with metal oxides, followed by drying and dissolving the oxides with  $\text{HNO}_3$ . The oxides with the highest mol. wt. give the largest pores. The adsorptive power of various adsorbents after they were heated to different temps. was studied. E. E. CRANDAL

**Transfer on tube and tank battery makes 2000-hour runs a rule.** PAUL TRUESDELL. *Natl. Petroleum News* 21, No. 26, 78(1929). A. A. BOHRLINGK

**Determination of the specific gravity of asphalt by means of a hydrometer.** HUGH R. BERRY, EDISON H. SMITH AND F. R. LANG. *Ind. Eng. Chem., Anal. Ed.* 1, 164 (1929).—Sp. gr. of asphalt can be detd. quickly by heating a sample to 300° F. and inserting a hydrometer. A table is given for converting the ° A. P. I. read to sp. gr. at 60° F. J. L. ESSEX

**Wood distillation still prospers in Southern States.** NORMAN W. KRASE. *Chem. Met. Eng.* 36, 397–8(1929).—Operation of a plant of the Tennessee products corporation is described. E. H.

**Liquid fuels (GENSKE) 21.** Progress in technology and organization of the Polish chemical industry [work on separation of petroleum emulsions] (ZAMOYSKI) 13. Test for coal-tar pitch in natural asphalt, asphalt from petroleum, and in the presence of colophonium (NELLENSTEIJN, SAUERBIER) 21. Brown coals and bituminous shales of Hesse and their utilization (SANDER) 21. The hydrogenation process of the I. G. Farbenindustrie A. G. (ANON.) 21. C ratios as an index of oil and gas in Western Canada (JONES) 8. Dialkyldiaryllead compounds. Anti-knock studies (GILMAN, BALASSA) 10. Replaceable bases in the shales and clays underlying petroliferous strata (TAYLOR) 8. Utilization of mineral oils for thermal treatment of steels (ROY) 9. Apparatus for the decomposition of hydrocarbons (Fr. pat. 657,118) 9. Hydrogenation [of mineral oils] (Fr. pat. 33,955) 21. Separator for oil and water (Austrian pat. 113,339) 1. Naphthenic acid [from petroleum oils or fractions] (U. S. pat. 1,720,821) 10. Montan wax [bleaching paraffin] (Brit. pat. 302,626) 21. Emulsions of oils (Brit. pat. 302,761) 13.

**Industrial plant lubrication.** Philadelphia: E. P. Houghton & Co. 60 pp. Reviewed in *Rubber Age* 25, 318(1929).

**New and Revised Tag Manual for Inspectors of Petroleum.** Edited by R. M. WILHELM. New York: C. J. Tagliabue Mfg. Co. 120 pp. \$2. Reviewed in *Instruments* 2, p. 19 of advertising section (1929).

**Petroleum distillation.** N. V. BATAAFSCHE PETROLEUM MAATSCHAPPIJ. Brit. 302,346, Dec. 15, 1927. In distg. crude petroleum, volatile acid ingredients which are readily emulsifiable with caustic alkalis are fixed (either in the fractions in which they occur or in the undistd. oil) by adding a base such as NaOH, KOH or lime. The fixed ingredients are set free after distn. by adding acids such as HCl or  $\text{H}_2\text{SO}_4$  to the distn. residues. Examples are given of the treatment of Venezuelan crude asphalt. Various details and auxiliary treatments are described.

**Purifying petroleum distillates with liquid sulfur dioxide.** ALLGEMEINE GES. FÜR CHEMISCHE INDUSTRIE. Brit. 301,955, Sept. 9, 1927. After treatment with, and removal of, liquid  $\text{SO}_2$ , a distillate such as illuminating oil is treated with an alk. soln. of Pb oxide to which S may be added. Reference is also made to successive use of liquid  $\text{SO}_2$  and  $\text{H}_2\text{SO}_4$ .

**Cracking hydrocarbons.** N. V. BATAAFSCHE PETROLEUM MAATSCHAPPIJ. Brit. 302,349, Dec. 16, 1927. Cracking is effected in the presence of halogens or halogen

compds. (including I and its compds. when gaseous hydrocarbons are treated but not when liquids are treated). The halogen compds. may contain H, S, P and O and activators such as Cu, Fe or their salts, O or S may be added. Propane heated with I at 575° yields a product contg. 15% of unsatd. compds.

**Cracking hydrocarbons and resultant products.** SOCIÉTÉ D'ÉTUDES ET RÉALISATION "ERÉAL." Belg. 356,044, Dec. 31, 1928. The cracking is carried out at a relatively const., but much lower, temp. (800°) than that generally used. An app. is specified.

**Manufacture of mixtures of hydrocarbons.** SOCIÉTÉ D'ÉTUDES ET RÉALISATION "ERÉAL." Belg. 352,537, Dec. 31, 1928. An app. is specified embodying heat-recovery features in the cracking of hydrocarbons.

**Manufacture of mixtures of hydrocarbons.** SOCIÉTÉ D'ÉTUDES ET RÉALISATION "ERÉAL." Belg. 356,043, Dec. 31, 1928. App. embodying heat-recovery features in the cracking of hydrocarbons.

**Improvement in the process of manufacture of mixtures of hydrocarbons.** SOCIÉTÉ D'ÉTUDES ET DE RÉALISATION "ERÉAL." Belg. 355,302, Jan. 31, 1929. The main reaction is regulated by means of an auxiliary reaction, the products of which take part in the main reaction and which itself depends on the main reaction.

**Distilling hydrocarbon oils.** CLIFTON J. PRATT. Fr. 657,085, July 4, 1928. An app. is described for the conversion of hydrocarbon oils to a state possessing max. value as motor fuel, the oils being heated in successive phases, the products of the different phases being mixed and the mixt. fractionated.

**Cracking hydrocarbon oils.** STANDARD DEVELOPMENT Co. Brit. 302,211, Sept. 12, 1927. In the operation of a cracking plant as described in Brit. 274,763 (C. A. 22, 2267) comprising a cracking coil, digester drum, still and dephlegmator, crude oil is first injected into the still, vapors produced are fractionated in the dephlegmator and condensate from the bottom of the latter is led to the cracking coil and digester. Numerous details of app. and procedure are described.

**Cracking hydrocarbon oils.** STANDARD DEVELOPMENT Co. Brit. 302,415, Sept. 22, 1927. The oil is passed under pressure and at high velocity through a heated coil and thence to a digestion drum maintained at the same temp. and pressure by introducing addnl. oil of appropriate temp. along with the heated oil at the inlet of the drum. Various details of the app. are described. Cf. C. A. 23, 3569.

**Cracking oils in liquid phase.** JOHN C. BLACK. U. S. 1,720,070, July 9. A confined stream of oil is heated under superatm. pressure (suitably in a pipe coil) to crack the oil; the temp. of the oil is measured by pyrometers at different places along the stream and oil is injected at points in the stream where fluctuations in temp., as indicated by the pyrometers, are observed, in order to maintain the oil in liquid phase. An arrangement of app. is described. Cf. C. A. 23, 4060.

**Extracting oil from schist.** NAT H. FREEMAN. Fr. 656,542, June 27, 1928. See Brit. 291,475 (C. A. 23, 1261).

**Recovering entrained oil from filter-press cake.** GEORGE F. OLSEN. U. S. 1,720,144, July 9. In order to recover lubricating oil having a Saybolt universal viscosity in excess of 150 sec. at 38° from a filter-press cake in which the oil is entrained, a lubricating oil of a viscosity between 75 sec. and 150 sec. is forced through the cake *in situ*.

**Pressing wax-containing oil.** FREDERICK W. SULLIVAN, JR., W. J. MCGILL and HARRY L. WALKER (to Standard Oil Co. of Ind.). U. S. 1,720,300, July 9. Wax-bearing hydrocarbon oil is forced through a filtering surface to build up a cake of wax on the surface, and oil is then removed from this wax cake by forcing water through it at a temp. below the m. p. of the wax. An app. is described.

**Heat-interchange apparatus suitable for use in oil refining, etc.** EDWARD B. McCABE and GUY C. CHAMBERLAIN (to Carbondale Machine Co.). U. S. 1,720,912, July 16. Structural features.

**Oil filter suitable for use on internal combustion engines.** EDWARD R. HEWITT (to International Motor Co.). U. S. 1,720,475, July 9. Structural features.

**Detection of water in oil.** MAX BUCHHOLZ. Ger. 477,639, July 4, 1926. Substances which evolve gas in presence of water are added to the oil and the buoyancy of the bubbles so formed is used to actuate a mechanical or elec. contact device.

**Purifying oil gas.** C. CHILOWSKY. Brit. 302,292, Dec. 13, 1927. Gaseous products produced by the partial combustion of oil gas in air are passed upwardly over inclined or vertical water-cooled metal surfaces down which the condensation products trickle. Details of the app. used are described. Cf. C. A. 23, 693.

**Condenser for purifying oil gas.** C. CHILOWSKY. Brit. 302,370, Dec. 15, 1927. Structural features.



**Oil-gas plant for use with vehicle engines.** C. CHILOWSKY. Brit. 302,322, Dec. 14, 1927. Structural features.

**"Petrol-air gas" generator.** WILLIAM A. CHAMBERLAIN. U. S. 1,720,539, July 9. Structural features.

**Apparatus for recovery of gasoline or other volatile substances from gaseous mixtures such as natural gas.** MASATOSI OKOCHI. U. S. 1,721,033, July 16. Various details are described of a plant comprising adsorption towers, compressor, coolers, etc. Solid adsorbents such as silica gel or C may be used in the towers.

**Apparatus for recovery of oil and gasoline from gas from wells.** IRWIN L. DUNN and LESLIE C. MINGUS (to Dunn & Lewis). U. S. 1,721,010, July 16. Various structural features are described.

**Treating organic materials such as oils or tars electrochemically.** CARLO LONGHI. U. S. 1,720,910, July 16. Portions of material such as crude oils or tars in liquid form, within a body of the liquid, are subjected to recurring elec. arc discharges of high temp. and the resulting gaseous products are quickly sepd. after each arc discharge and before the effect of the succeeding discharge becomes unfavorable with respect to the compn. of these gaseous products. The  $C_2H_2$  content of the gas may thus be maintained at high proportion. An app. is described suitable for producing  $C_2H_2$ , which may be sepd. or polymerized to form  $C_6H_6$ , etc.

**Lubricating oils.** HUGH L. CALLENDAR, ROBERT O. KING and ERNEST W. J. MARDLES. Fr. 657,377, May 2, 1928. See Brit. 295,230 (C. A. 23, 2291).

**Lubricating oils.** SUN OIL CO. Fr. 657,368, Mar. 16, 1928. Lubricating oils of improved properties are obtained by distg. lubricating fractions from crude oil in a system closed against O, passing the oil through a series of vaporizers in which it is distributed over large surfaces and brought into contact with Hg vapors in such a way as to avoid cracking, progressively higher fractions being sepd. in successive vaporizers. Odor-producing gases are sepd. by reflux condensation under vacuum of the sep. distillates and causing the oil to flow under very high vacuum over large surfaces. An app. is described.

**Filter for lubricating oils, etc.** GEORGE H. GREENHALGH (to Ernest J. Sweetland). U. S. 1,721,250, July 16. Structural features.

**Apparatus for reclaiming used lubricating oils by settling, filtration and evaporation of volatile substances.** CLARK F. BARB. U. S. 1,721,328, July 16.

**Insulating oil for transformers, switches, etc.** SIEMENS-SCHUCKERTWERKE A.-G. Brit. 301,876, Dec. 7, 1927. In distg. oil for use as insulation, local overheating is avoided so as to prevent the formation of cracked products. The distn. may be effected in closed receptacles through which Hg vapor is passed.

**Furnace for melting bitumen in drums.** ROBERT BREINING. Ger. 478,208, Apr. 14, 1928.

**Emulsions of asphalt, oils, rubber, etc.** N. V. DE BATAAFSCHE PETROLEUM MAATSCHAPPIJ. Brit. 301,805, Dec. 5, 1927. Emulsions of materials such as asphalt, pitch, tar, wax, mineral or vegetable oils, paraffin or rubber are stabilized by adding sufficient stabilizing agent (such as casein or other suitable protective colloid or sulfonic acid) to prevent pptn. during subsequent treatment and then treating the mass with an electrolyte (such as a dil.  $AlCl_3$  soln.) in the presence of finely divided substances (which may be formed by reaction between alkali present and a portion of the electrolyte).

**Phenols from beechwood-tar oils.** HERMANN SUIDA and ANTON WACEK. Austrian 113,324, Jan. 15, 1929. Heavy beechwood tar oils and their fractions are heated with concd. HCl at  $180^\circ$  under pressure, whereby the phenol ethers in the oil are decompd. and a mixt. of phenols is obtained which may be sepd. in known manner. Examples are given.

**Saccharification of wood.** E. HAGGLUND (to Holzhydrolyse A.-G.). Brit. 302,313, Dec. 14, 1927. The saccharification product obtained by the action of HCl on wood is freed from traces of acid by wet-grinding it with an oxide or hydroxide of an alk. earth metal (suitably in a porcelain ball mill), immediately centrifuging and washing with a small quantity of water. The waste liquors may be fermented or "worked into yeast."

## 23—CELLULOSE AND PAPER

CARLETON E. CURRAN

**Portuguese eucalyptus plantations and their use in cellulose fabrication.** OTTO CYREN. *Svensk Pappers-Tid.* 32, 272-7(1929).—The eucalyptus plantations at Abrantes, Comporta and Caima are described. Pulp made from eucalyptus is compared with

that made from spruce. In spite of the shortness of the fiber it forms a satisfactory substitute, especially when mixed with longer-fibered pulp. W. SEGERBLOM

**The utilization of tropical fiber-producing plants.** CARL G. SCHWALBE. *Z. angew. Chem.* **42**, 713-7(1929).—Reasons for not working up tropical plants by methods that have proved successful in the temperate zones are pointed out, and the recommendation is made that bamboo be converted into semi-pulp, shipped to Europe and there used to replace a part of the wood pulp now required. W. C. EBAUGH

**The enzymic decomposition of cellulose (wood) and cotton.** O. FAUST AND P. KARRER. *Helv. Chim. Acta* **12**, 414-7(1929).—The decompn. of wood pulp (87%  $\alpha$ -cellulose) by snail cellulase, prepd. for the manuf. of rayon or cotton yarn is accelerated by mercerization (cf. Karrer, *C. A.* **21**, 493) but is not affected by bleaching or, with the rayon cellulose, by a short subsequent ripening process. A longer ripening period (4 days) apparently retards the decompn. Cotton mercerized under tension is decompd. to a lesser degree than that mercerized under no tension. In this connection, x-ray examns. show very little, if any, change in the structure diagram of cellulose mercerized under strong tension and a great change when mercerized under no tension. C. E. HRUBESKY

**The molecular weight of cellulose.** I. K. HESS. *Rec. trav. chim.* **48**, 489-91(1929).—H. believes that the mass action equation which assumes the kinetic independence of the  $C_6H_{10}O_5$  group is valid and opposed to the conception of MacGillavry (cf. following abstr.). II. *Ibid* 583-4.—H. claims that the ambiguous conclusions of MacGillavry regarding the mass-action relation between Cu and cellulose in Schweitzer's reagent rests upon the wrong assumption that the reaction velocity between the Cu base and a glucose residue in a large cellulose mol. is independent of the amt. of Cu. F. A. SIMMONDS

**The molecular weight of cellulose.** D. MACGILLAVRY. *Rec. trav. chim.* **48**, 492-3(1929); cf. preceding abstr.—The behavior of the rotatory power of cellulose in Schweitzer's reagent can be explained by the assumption of equiv. glucose residues, without being obliged to consider the size of the mol. Conversely, if the assumption is correct the size of the mol. cannot be detd. from this behavior. F. A. SIMMONDS

**Drying of cellulose by the Fidalgo system.** GUNNAR BROLIN. *Svensk Pappers-Tid.* **32**, 197-9(1929).—The app. is described. W. SEGERBLOM

**Polyoxymethylene a model of cellulose.** H. STAUDINGER. *Oesterr. Chem.-Ztg* **32**, 98-9(1929).—A homologous series of polymers (polyoxymethylenes and derivs.) was built up through polymerization of formaldehyde. Means of detg. the cryst. structure, phys. properties and chem. constitution were outlined. R. Signer obtained a homolog showing a fiber diagram similar to that of cellulose. Conclusion: The secondary mol. structure of cellulose is no longer tenable. The structure of cellulose should be studied through synthesis of carbohydrate polymers. F. A. SIMMONDS

**Proposed tentative specifications and tests for soluble nitrocellulose.** ANON. *Proc. Am. Soc. Testing Materials* 1929 (preprint) No. 71s, 10 pp.—The properties and tests included are appearance, ash, nitrogen, stability, consistency (viscosity), soly. and appearance of the soln., film test and toluene diln. test. Drawings of the app. for the nitrogen and stability detns. are shown. F. A. SIMMONDS

**Study on celluloseglycolic acid.** ICHIRO SAKURADA. *Z. angew. Chem.* **42**, 640-3(1929).—See *C. A.* **22**, 1849. F. A. SIMMONDS

**Artificial silk cellulose.** H. E. WAHLBERG. *Svensk Pappers-Tid.* **32**, 236-8(1929).—Descriptive résumé. W. SEGERBLOM

**Steam and warm water distribution in sulfate pulp plants.** TORBJORN MOLIN AND JONAS BOJJA. *Svensk Pappers-Tid.* **32**, 200-1, 240-1(1929); cf. *C. A.* **23**, 3089. M. questions B.'s previous statement concerning a yield of 50% oven-dry pulp in sulfate plants and recalcs. figures on the heat balance between the black liquor and the soda house. B. answers that a 50% yield has been obtained at the Iggesund sulfate plant and comments on the revised calcs. W. SEGERBLOM

**Contribution on the knowledge of the sulfite process.** I. The action of bisulfite liquor on various sugars. TSUNEYA MARUSAWA, DEN-ICHI NAITO AND JUN-ICHI UCHIDA. *Mem. Ryojun Coll. Eng.* **1**, 351-93(1929).—In aq. soln.,  $NaHSO_3$  combined at room temp. with glucose, mannose and xylose, but not levulose, to form loose readily dissoed. compds. and at 130° with each of the sugars in monomol. ratios to form at least 2 solid compds., "A" and "B," entirely different from those formed at room temp. The "A"-compd. which forms first is readily decompd., with increasing temp. and H-ion concn., into thiosulfate, sulfate and polythionates, the first of which catalyzes the decompn. of the  $SO_3$  ion. This tendency toward thiosulfate formation is greatest with glucose and least with levulose. If the H-ion concn. is sufficiently low, the cyclic

"B"-compd. is formed, probably by an intramol. rearrangement of the "A"-compd.

C. E. HRUBESKY

**Theoretical and experimental details on the preparation of sulfite pulp from pine wood.** O. ROUTALA AND J. SEVÓN. *Cellulosechemie* 10, 97-107(1929).—In seeking a practical means of removing resins from pine and other resinous woods R. and S. reviewed previous methods of extn (cf. Hågglund, *C. A.* 22, 4805) and present a new method of converting unextd. resinous woods into pulp using a mixt. of  $\text{NaHSO}_3$  and  $\text{MgHSO}_3$ . A series of cooks using ordinary  $\text{CaHSO}_3$  liquor (I) and  $\text{MgHSO}_3$  and  $\text{NaHSO}_3$  liquor (II) was made. General cooking conditions were: time 16-18 hrs. at  $140-5^\circ$  under 5-7 atm. pressure. Yields: (I) pulp 46.1 and 50.5% (24-33.7% unconverted), (II) 45.3, 44.7 and 45.2% (2.4, 2.7 and 1.1% unconverted). Conclusions: The replacement of Ca by Mg and Na in the sulfite liquor permits a satisfactory conversion of well-seasoned wood of high resin content and irregular compn. The resulting pulp was dark and rich in resin. The addn. of weak acids such as  $\text{AcOH}$  and phosphoric acid or their alkali salts permits a shorter cook period (12 hrs.) and gives good yields (43.4-48.7%) and higher-quality pulp. The addn. of the salt or acid causes the resin to dissolve more readily and prevents the deposition of  $\text{CaSO}_3$  in wood pores. Resins may be partially (20%) removed from pulp by shaking with small quantities of  $\text{NaOH}$  liquor.  $\text{HNO}_3$  disintegration of pine wood yields good pulp but is not practical on a large scale. Application of these results to the control of com. sulfite cooks is discussed.

C. W. SONDERN

**The catalytic action of selenium on calcium bisulfite pulping solution.** N. F. YERMOLENKO. *Chem.-Zig.* 53, 343-4(1929).—All pyrites used for the prepn. of sulfite liquor contain a varying amt. of Se which collects in the liquor. The catalytic effect of Se in converting  $\text{H}_2\text{SO}_3$  to  $\text{H}_2\text{SO}_4$  is about 500 times that of free S. When wood chips are subjected in an autoclave to the action of sulfite liquor contg. varying amts. of Se, there is an increased darkening of the liquor, charring of the wood and pptn. of  $\text{CaSO}_4$ , but a decreased formation of  $\text{CaSO}_3$  as the temp., pressure and concn. of Se are increased. 1.4 mg. Se per l. of liquor causes an intense darkening of the soln. and charring of the wood when kept in the autoclave 10 hrs. at a temp. of  $125-130^\circ$  and a pressure of 3-4 atm.

C. E. HRUBESKY

**A new acid-resisting cement for sulfite digesters.** H. KREUGERS. *Svensk Pappers-Tid.* 32, 239-40(1929).—An unusually high chimney to carry off strongly acid gases occasioned the prepn. of a new acid-resisting cement (compn. not given) with lime content claimed to be reduced about half that in similar cements. The new cement after 20 days was only slightly affected by 5-20%  $\text{H}_2\text{SO}_4$ ; with 50%  $\text{H}_2\text{SO}_4$  it was rapidly attacked and disintegrated. Ordinary cement disintegrated after 20 days with 5%  $\text{H}_2\text{SO}_4$ ; 10-50% needed only 10 days.

W. SEGERBLOM

**Critical study of methods of measuring the bulk of paper.** F. T. CARSON. *Bur. Standards J. Research* 2, 1039-56(1929).—A standard method is proposed for measuring bulk which permits either the measurement of a pack of paper 0.1 inch or more in thickness with a thickness gage of standard type, or the measurement of a 1-inch pack under a pressure of 5 lb./sq. in. by means of a pressure bulker. It is recommended that the results be expressed as (a) bulking thickness, or the thickness in hundredths of an inch of a 100-sheet pack; and (b) specific bulk, or the ratio of bulking thickness to the standard ream wt. of the paper measured.

F. A. SIMMONDS

**Automatic control developed to maintain uniform density of suspensions.** ANON. *Chem. Met. Eng.* 36, 362-3(1929).—A Bradley-Osbourn viscosity control was put ahead of a Jordan in a kraft paper mill. An even power load, uniform Jordan operation and a smooth even stock on the paper machine resulted. A complete description of the machine and set-up are given.

F. A. SIMMONDS

**Experimental production of roofing felts.** MERLE B. SHAW, GEORGE W. BICKING AND O. G. STRIETER. *Bur. Standards J. Research* 2, 1001-16(1929).—The effects of substituting low-grade materials for considerable amts. of the common felt-making materials used in the production of roofing felts were favorable toward substitution. The materials used were No. 2 roofing rags, old jute and manila bagging, old newspapers and finely ground wood saw-dust. The phys. properties of exptl felts are tabularly compared with those of commercial felts.

F. A. SIMMONDS

**Treatment of paper-mill wastes (WOLMAN) 14.** Dehydration products of sorbitol [for gelatinizing cellulose esters or ethers] (Brit. pat. 301,655) 13. Neutralizing  $\text{H}_2\text{S}$  [in atmosphere of artificial silk factories] (Fr. pat. 656,801) 13. Recovery of volatile solvents [in production of artificial silk] (Brit. pat. 302,297) 13.

**The Manufacture of Pulp and Paper, Vol. V.** 2nd ed. Edited by J. N. STEPHENSON. New York: McGraw-Hill Book Co., Inc. 732 pp. \$6. Reviewed in *Chem. Met. Eng.* 36, 431(1929).

**Cellulose acetates.** I. G. FARBENIND. A.-G. Brit. 301,755, Dec. 2, 1927. In the production of acetone-sol. cellulose acetates, there is used as catalyst  $\text{ZnCl}_2$  together with free  $\text{H}_2\text{SO}_4$  and  $\text{HCl}$ , or a substance yielding  $\text{HCl}$ , preferably in the proportion of 6.0:4.0:0.5. The acetylation product may be hydrolyzed.

**Ethers of cellulose and starch.** I. G. FARBENIND. A.-G. Brit. 302,191, Aug. 9, 1927. Materials such as cotton, wood pulp or starch are treated with alkali as by soaking in  $\text{NaOH}$  soln. and then treated with vaporous alkylating agents such as  $\text{MeCl}$  or  $\text{EtCl}$ . The ether obtained from sulfite cellulose may be used for making *artificial fibers or lacquers*, and the methylstarch obtained may serve as an *adhesive for paper or cardboard*.

**Carbohydrate derivatives.** I. G. FARBENIND. A.-G. Fr. 656,861, June 30, 1928. In alkylating, aralkylating or arylating carbohydrates such as cellulose, or starch, the reaction is carried out under vacuum, a gas such as  $\text{CO}_2$  which is afterward absorbed by the  $\text{NaOH}$  used being passed through the material.

**Sulfonated carbohydrates.** WILHELM TRAUBE. Fr. 657,204, July 10, 1928. Cellulose, starch or the like is treated with  $\text{SO}_3$  in soln. in  $\text{H}_2\text{SO}_4$  or  $\text{CS}_2$  or dild. with air or other gas for the production of sulfonated derivs. which may be used as *protective colloids* or as *intermediates for the production of acetyl- or nitro-cellulose*.

**Films, threads, etc., from ethylcellulose or similar materials.** I. G. FARBENIND. A.-G. Brit. 302,667, Dec. 19, 1927. In forming films, threads or the like from solns. contg. volatile solvents such as  $\text{CS}_2$ -ether, which dissolve gases, evapn. of the solvent during working up of the soln. is effected, during at least the early part of the process, at a low temp. (suitably  $10^\circ$  to  $-20^\circ$ ) to prevent the formation of an impervious skin and to facilitate escape of dissolved gas at a later stage of the process.

**Artificial films, fibers, etc.** I. G. FARBENIND. A.-G. Fr. 657,522, July 16, 1928. Films, fibers, etc., are prepd. clear and free of bubbles from solns. of cellulosic derivs. contg. gases, with easily volatile solvents which show a high dissolving power for the gases, by evapg. the solns. at the start at low temps., *e. g.*,  $+10^\circ$  to  $-20^\circ$  or below, and afterward evapg. at higher temps. Examples are given.

**Ammoniacal copper-cellulose solutions for artificial-silk manufacture.** K. HESS and C. TROGUS. Brit. 301,752, Dec. 3, 1927. The cellulose used is pretreated with ammoniacal  $\text{Cu}$  solns. to which caustic alkali has been added to effect such absorption of  $\text{Cu}$  that the cellulose will dissolve in very dil. ammoniacal  $\text{Cu}$  solns. or in  $\text{NH}_3$  solns. or even in water.

**"Viscose silk."** H. KINDERMANN. Brit. 301,811, Aug. 6, 1927. Coagulation of filaments is effected in 2 baths, the first comprising an acid and the second an aq. soln. of a compd. such as the chloride, nitrate or sulfate of  $\text{Cu}$ ,  $\text{Cd}$ ,  $\text{Sn}$ ,  $\text{Pb}$ ,  $\text{Hg}$ ,  $\text{Bi}$ ,  $\text{Sb}$ ,  $\text{Se}$  or  $\text{Te}$ . Such baths permit the treatment of unripe viscose. Use of an  $\text{As}$  compd. in the second bath is also mentioned.

**Artificial silk.** ARTIFIL-VEREDELUNGSGESELLSCHAFT M. B. H. Fr. 656,600, June 28, 1928. Threads of artificial silk are strengthened by passing them through a paste of fatty soap, glycerol and potato starch or albumin or gum.

**Artificial silk.** I. G. FARBENIND. A.-G. Brit. 301,563, Sept. 6, 1927. The process described in Brit. 280,628 (*C. A.* 22, 3300) for the stretch-spinning of ammoniacal- $\text{Cu}$  cellulose solns. at low temp. such as  $20-30^\circ$  or lower is modified by increasing the length of the vertical column of water used as coagulant (preferably to 50-80 cm.). Solns. prepd. from cotton as well as those prepd. from wood pulp, straw or grasses may be used.

**Creped artificial silk yarns.** Soc. INOXI. Brit. 302,340, Dec. 16, 1927. The yarns before twisting are at least partially dehydrated by heat and are then treated with a soln. of  $\text{Al}$  acetate or other suitable inorg. salt soln. in aq. solns. of acids which prevent appreciable rehydration before the twisting, which then ensues.

**Artificial silk from ammoniacal copper cellulose solutions.** J. P. BEMBERG A.-G. Brit. 302,890, Dec. 22, 1927. By the process described in Brit. 299,038 (*C. A.* 23, 3099) an artificial yarn is produced consisting of continuous practically endless individual filaments of 1.5 deniers or lower. The yarn has a tear resistance of more than 220 gr. per 100 deniers in the dry condition and more than 140 gr. when wet.

**Apparatus for spinning artificial silk.** J. P. BEMBERG A.-G. Brit. 302,846, Dec. 19, 1927. Structural features.

**Luminous silk.** ÉDOUARD M. SANDOZ. Fr. 656,997, July 4, 1928. Phosphorescent salts are incorporated in artificial silk during manuf.

**Artificial wool.** JACQUES DELPECH. Fr. 656,743, Nov. 14, 1927. An artificial wool contg. about 6% of S and of good heat-insulating properties is obtained by spinning viscose solns. without desulfurizing, and with the addn. of sol. polysulfides to the viscose soln.

**Paper manufacture.** GEORGES A. PAULIN, MAXIMILIEN RYNDZUNSKY and EUGÈNE TRINQUESSE. Ger. 477,539, Nov. 1, 1922. Pulp is made from vegetable matter by steeping in a bath of alk. agglutinant, casein and alkali resinate.

**Cellulose pulp for paper manufacture.** JOAQUIN J. DE LA ROZA, SR. (to Bagasse Products Corp.). U. S. 1,721,376, July 16. In producing pulp for the manuf. of snow-white paper of great strength, cellulose-contg. material such as wood, corn stalks or bagasse is treated in a hot aq. soln. contg. free S and is subsequently treated in a hot dil. alk. soln. (both treatments being at 160-73°) and then refined and washed.

**Apparatus for beating paper pulp.** J. WHITE, D. H. THOMSON and H. MILNE. Brit. 301,648, Dec. 7, 1927. Structural features.

**Steam-heated drying cylinders for paper-making apparatus.** A. D. HARRISON. Brit. 302,116, May 8, 1928. Structural features.

**Light-weight paper.** R. MCGILL. Brit. 301,682, March 6, 1928. A jelly-like mixt. formed of starch, glue, Na silicate and water (with or without precipitants, preservatives or the like) is mixed with pulp in a beater before addn. of size and of alum for fixing. Production of fluff in the manuf. of "antiques" for light-weight books is thus prevented. Various specified cellulosic pulps may be used with similar compns.

**Finishing paper and paper boards.** GEORGE F. BLOMBERG. U. S. 1,720,716, July 16. A liquid finishing compn. is used comprising rubber latex, colloidal clay and other sizing or surfacing materials such as casein, talc and blanc fixe.

**Waterproof paper and pasteboard.** I. G. FARBERNIND. A.-G. Brit. 301,807, Dec. 5, 1927. The cellulose derivs. of higher aliphatic acids mentioned in Brit. 289,063 (C. A. 23, 703) are mixed with paper pulp at any stage of its manuf. before it reaches the paper machine.

**Impregnated corrugated packing paper, etc.** A. KUPPER. Brit. 302,367, Dec. 15, 1927. The material is impregnated or coated with paraffin, stearin, beeswax, lacquers or rubber.

**Purifying oils.** SOC. MEUSIENNE DE PRODUITS CHIM. Fr. 656,728, June 29, 1928. Resinous oils recovered in the manuf. of paper are made available for soap manuf. by mixing with H<sub>2</sub>SO<sub>4</sub> and passing superheated steam through for 3-4 hrs., decanting and drying, and hydrogenating with H and a Ni or other catalyst.

## 24—EXPLOSIVES AND EXPLOSIONS

CHARLES E. MUNROE

**A gas explosion in a rock-dusted mine.** G. S. McCAA. Bur. Mines, *Circ.* 6144, 5 pp.(1929).—The explosion occurred at a place in the mine where the fall of the coal deposit had been pushed back 38 ft. from the rock dusting and at a time when the rock-dusting machine and a car of rock dust was being pushed to the spot by an elec. locomotive. Evidently gas in considerable concn. accumulated at the high point and the mixt. was ignited possibly by a stray elec. arc. The explosion extended but little beyond the gas-filled area, and did not extend through the rock-dusted mine.

CHARLES E. MUNROE

**Sampling dust in rock-dusted mines.** C. W. OWINGS. Bur. Mines, *Circ.* 6129, 8 pp.(1929).—The methods advocated for sampling are described in detail, with examples from practice. It is recommended in the interest of safety that a set of samples be taken throughout the mine at least once each month.

CHARLES E. MUNROE

**Hazards in the use of delay-action detonators in coal mines.** D. HARRINGTON and S. P. HOWELL. Bur. Mines *Circ.* 6147, 2 pp.(1929).—In using delay-action detonators gas or dust may be released by the cut shot to form dangerous explosive atms. in the coal mine, and the atms. may be exploded with serious results by the dependent shots fired by the delay-action detonators.

CHARLES E. MUNROE

**A method of studying factors influencing the rate of burning or pressure development of black blasting powder.** A. B. COATES and J. E. CRAWSHAW. Bur. Mines, *Repts. of Investigations*, No. 2940, 9 pp.(1929).—The weighed charge of explosive was fired in the Bichel pressure gage in the customary manner except that the revolving

drum on which the time-pressure record is taken was run at a reduced speed, that speed of the drum was measured by a belt-driven tachometer, and that an induction coil in series with the elec. squib or electric detonator was introduced to mark on the time-pressure record the instant at which the squib or detonator was fired.

CHARLES E. MUNROE

**Inflammability of mixed gases.** G. W. JONES. *Bur. Mines, Tech. Paper* 450, 38 pp. (1929).—Results are given of expts. on mixts. of H, CH<sub>4</sub>, and CO with H and CO<sub>2</sub> in varying proportions. Data were obtained on the extinctive action of N and CO<sub>2</sub> on each of the 3 others from which curves were drawn and tables compiled whereby the inflammable limits of mixts. of each of the combustible with the inert gases can be obtained. By use of these data and the application of Le Chatelier's law it is possible to calc. the limits of inflammability in any mixt. of these gases. From the data one may also ascertain the O content below which the atm. must be maintained to render it non-inflammable. This is of special importance in safety work.

C. E. M.

**Inflammability of mixtures of ethyl alcohol, benzene, furfural and acetone.** G. W. JONES AND J. R. KLINK. *Ind. Eng. Chem.* 21, 791-3 (1929).—The following lower inflammable limits were detd. for solvents mixed with air at 125°: EtOH (d. 0.817, 5% H<sub>2</sub>O, b. 76-80°) 3.85%; PhH (b. 78-82°, d. 0.882) 1.53%; 2-furaldehyde (b. 161°, d. 1.159) 2.1%; AcMe (c. p., b. 55-7°) 2.92%; AcMe (com.) 3.18%. Mixts. of EtOH with PhH, furaldehyde and with AcMe were detd.; in all cases agreement within 0.24% was obtained with values calcd. from Le Chatelier's law (C. A. 22, 3976).

A. S. CARTER

**Determination of the compressive force of explosives.** K. F. MEYER. *Z. ges. Schiess-Sprengstoffw.* 24, 6-10 (1929).—The detn. of the compressive force of an explosive is of limited value in judging the practical value of the explosive. Valuable conclusions can be drawn from this test, however, as to the relative brisance of similar explosives. Different types of explosives vary as to their initial velocity of detonation, a factor of importance in the test. The method might be improved by providing strong confinement for the explosive. Both the method of Kast (with Cu cylinders) and that of Hess (with Pb cylinders) give varying results depending on the position of the detonator in the charge. The max. compression is obtained when the detonator is at the end of the charge opposite the cylinder. In practice, therefore, the detonator should be nearest the opening of the drill-hole.

C. G. STORM

**Spontaneous combustion in North Staffordshire—record of analyses of air samples taken during the combating of a gobfire.** T. DAVID JONES. *Colliery Guardian* 138, 2395-2400 (1929).—J. points out the value of air analyses in a coal mine to det. the progress made in combating a fire in one of the seams. In using the combustion period both the CO<sub>2</sub>/O<sub>2</sub> ratio and CO/O<sub>2</sub> ratio are high. Also in *Iron Coal Trades Rev.* 118, 902-3 (1929).

L. C. MILLER

**Measurement of explosive pressures of pure acetylene and acetylene saturated with water and acetone vapors.** W. RIMARSKI. *Autogene Metallbearbeitung* 22, No. 10, 134-40; *Acetylen in Wiss. u. Ind.* 32, No. 5, 73-7 (1929).—Explosive pressure of pure C<sub>2</sub>H<sub>2</sub> up to 9 kg. per sq. m. initial pressure is about 11 times the initial pressure. Water and acetone vapor reduce explosive pressure, but not to any great extent.

E. I. S.

**Temperatures of explosive decomposition of acetylene in relation to pressure and velocity of flow.** W. RIMARSKI. *Autogene Metallbearbeitung* 22, No. 10, 130-4; *Acetylen in Wiss. u. Ind.* 32, No. 5, 69-73 (1929).—Below 500° and at superpressures of 3 kg per sq. cm., explosive decompn. takes place. The pressure required to bring acetylene to explosive decompn. under adiabatic compression is about 170 kg. per sq. cm.

E. I. S.

**Colored-light compositions.** F. FEISTEL AND H. FISCHER. *Z. ges. Schiess-Sprengstoffw.* 24, 22-3 (1929).—A criticism of Henkel (C. A. 23, 2035). Objection is made to the use of NaNO<sub>3</sub> and NaClO<sub>3</sub> in pyrotechnic mixts. on account of hygroscopicity; to CuSO<sub>4</sub> because of danger of spontaneous decompn. The use of KClO<sub>4</sub> and S in any mixt. is condemned as dangerous even though brimstone, and not flowers of S, is prescribed.

C. G. STORM

Berthollet's detonating Ag and the formation of Ag mirrors (BAUM) 2.

**Explosive containing ammonium nitrate and hexamethylenetetramine.** JOSEPH A. WYLER (to Trojan Powder Co.). U. S. 1,720,459, July 9. An explosive which is readily detonated comprises NH<sub>4</sub>NO<sub>3</sub>, 76-96 and (CH<sub>2</sub>)<sub>6</sub>N<sub>4</sub>, 4 parts, with or without nitrostarch, NaNO<sub>3</sub>, ZnO, hydrocarbon oil, etc.

A filling material for containers for explosive gases. JOSEPH HAUSEN. Fr. 657,141, July 7, 1928. A filling material for containers for explosive gases is composed of mineral substances, having a size of grain of 0.5 mm. and below but excluding powd. material. The material may be used alone or mixed with larger grains of the same or a different material.

## 25—DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

The one-bath, the two-bath and the acid methods of dyeing silk hosiery. W. C. DODSON. *Cotton* 93, 953-7, 983(1929).—Practical. Methods and formulas are given

RUBY K. WORNER

Dyeing wool with direct cotton dyes. A. E. PORAT-KOSHITZ. *Zhur. Prikladnoi Khim* 1, 11-20(1928).—Wool was dyed in a neutral bath with  $\text{NH}_4$  salts of Benzopurpurin 4B and Diamine Violet N which were prepd. from Na salts by pptg. free acids with  $\text{HCl}$  or  $\text{H}_2\text{SO}_4$ , washing the ppt. with distd. water (dialysis was resorted to for the complete removal of sulfate and chlorine ions from Diamine Violet N as the dye is sol. in water), dissolving the ppt. in 30%  $\text{NH}_3$  soln. and evapg. the resulting soln. to dryness. The  $\text{NH}_4$  salt of Diamine Violet N thus prepd. contained 57% of Na salt as impurity, while the  $\text{NH}_4$  salt of Benzopurpurin 4B was practically pure. On boiling these salts with water they are hydrolyzed. Expts. are described from which it was found that some  $\text{NH}_3$  was retained by wool. When wool was boiled with aq.  $\text{NH}_3$  some  $\text{NH}_3$  was also adsorbed. When wool thus satd. with  $\text{NH}_3$  was boiled in distd. water or dyed in the manner described above, part of the  $\text{NH}_3$  was liberated. Cotton adsorbed  $\text{NH}_3$  salts (also Na salts) of these dyes as such. Conclusions: Unlike cotton, wool adsorbs only sulfo acids.

V. KALICHEVSKY

Tanning, dyeing and preservation of fishing nets. JAMES W. DURANT. *Dyer, Calico Printer* 61, 345(1929).—Deterioration of fishing nets is due to attack on the fiber by bacteria present in fish oil and by marine microorganisms, to general wear and tear and to oxidation of the fiber. To reduce tendering due to bacterial attack to a min., tanning is generally adopted. Methods are described.

RUBY K. WORNER

General specification for textile materials (methods of physical and chemical tests). ANON. Bur. Standards U. S. Government Master Specification No. 345a(1929).—(Supersedes F. S. B. No. 345 and B. S. Circular No. 293.)

E. H.

Electrical conduction in textiles. II. Alternating-current conduction in cotton and silk. E. J. MURPHY. *J. Phys. Chem.* 33, 200-15(1929); cf. *C. A.* 23, 1273.—The a. c. capacity of cotton increases rapidly with humidity. It undergoes a large reduction at high humidities when the amt. of electrolyte material present is decreased. The capacity of cotton at high humidities is considered due chiefly to the electrolytic polarization capacity of the water paths, forming a kind of electrolytic cell with the electrodes. The a. c. and d. c. conductivities are practically equal at humidities above 80 to 85%. At lower humidities, the a. c. cond. is higher than the d. c., the difference increasing with decreasing humidity; the d. c. cond. forms less than 1% of the a. c. cond. at humidities below about 25% for samples of normal electrolyte content and at humidities below about 45% for samples of low electrolyte content. Except at very low humidities, the electrolyte content of the textile affects the part of the a. c. cond. not due to the d. c., almost as strongly as the d. c. cond. With increasing humidity, the a. c. cond. increases with frequency less rapidly, the two becoming practically independent of each other at very high humidities. These relations apply to the a. c. and d. c. cond. of silk and other similarly behaving moisture-absorbing materials. In a c. conduction, a textile may be considered to act as an electrolytic cell in parallel with a dielectric, the water-paths forming the electrolyte. The a. c. capacity and cond. of the textile are due chiefly to the electrolytic cell component at high humidities, chiefly to the dielec. at very low humidities, and to a combination of both at intermediate humidities. III. Anomalous properties of conduction in textiles. *Ibid* 509-32.—The insulation resistance of cotton is a decreasing function of the applied voltage under all conditions. The ratio of the resistance at 40 v. to that at 400 v. appears to be approx. const. over the whole range of humidity, although the resistances themselves varied by a factor greater than  $10^8$ . The difference between the resistance at 40 v. and that at 400 v. is less the greater the electrode sepn. and the smaller the amt. of electrolytic material in the samples. For voltages greater than about 40, consideration of the ions adsorbed by the cellulose-water interface in the aq. conducting paths in cotton may largely explain the decrease of resistance with increasing voltage; probably in con-

sequence of a modified Wien effect, these ions may contribute more to the cond. the higher the applied voltage. The results of this investigation do not appear to support Evershed's interpretation of the "Evershed effect." The residual e. m. f. in cotton after the removal of an external e. m. f. was measured at several humidities, and was found to vary considerably with humidity. At humidities lower than about 25% the residual e. m. f. is a function of the applied voltage, but at high humidities, the observed values do not exceed the order of magnitude of decompn. potentials and over-voltages. The passage of a current through a textile tends to increase its resistance, the rate of change being rapid above 70-80% humidity but slow between 20 and 70% for cotton. The current produces a non-uniform distribution of resistance in the textile which may remain for several hrs. after the removal of the applied voltage. The distribution depends on the nature of the electrode material; for brass electrodes the resistance concentrates in the anode section, while for platinum electrodes, it concentrates in the middle of the thread. The anomalous properties of conduction in textiles at humidities above 20-30% can be explained in terms of electrolytic cells whose properties are somewhat modified by the distribution of the electrolyte in the solid dielectric. This conclusion is in accord with the conception of conduction in textiles previously proposed with regard to d. c. resistivity and a. c. capacity and cond. R. K. W.

**Adsorption of vapors by animal and vegetable fibers.** E. V. ALEKSEEVSKII, *Zhur. Prikladnoi Khim.* 1, 184-9(1928).— $\text{CCl}_3\text{NO}_2$  is best adsorbed by dyed new wool and dyed used silk while linen is the poorest adsorbent. It does not affect the fiber strength.  $\text{AsCl}_3$  is best adsorbed by wool, hairs and rubber. Paper is the poorest adsorbent, but disintegrates quickly, while the strength of wool fibers is not affected. Most of the adsorbents darken on exposures because of deposition of As.  $(\text{CH}_3)_2\text{SO}_4$  is slowly adsorbed by wool and quickly by cotton, but cotton and silk retain it tenaciously while wool loses it quickly through ventilation. It does not affect the fiber strength.  $\text{PhCH}_2\text{Cl}$  is adsorbed more quickly by animal than by vegetable fibers. Its adsorption is increased by moisture. Ventilation is not effective for its removal.  $\text{AcCH}_2\text{Br}$  is better adsorbed by animal than by vegetable fibers. Moisture also favors its adsorption. Strength and color of fabrics are affected to a considerable extent. V. K.

**Cloth finishing processes in relation to tensile strength.** ALEXANDER YEWDALL, *Wool Record* 35, 1169-71, 1237-9, 1309-11(1929).—A study of the effect of each step in the finishing process on the tensile strength of the fabric shows that the strength gradually decreases during each successive stage unless counteracted by some factor which increases the density of the fabric. Such processes as scouring, crabbing, blowing and boiling affect the fiber principally, whereas cutting and raising affect chiefly the thread structure. Milling increases the strength of the fabric on account of the larger no. of threads and picks in the same area and the support given by the fiber entanglement, although the fiber itself is weakened in the process. The effect was also studied of 4 different styles of finish, Melton, Clear-cut, Moss and Dress-face, on the tensile strength of the same basic structure. These arranged themselves in the order named, the Melton style giving the strongest fabric. RUBY K. WORNER

**Coupling arylsulfonanilides with diazo compounds (BATTEGAY, SCHNEIDER) 10.** Synthesis of substantive dyes derived from dicinnamylmethane (LAMPE) 10. Products for use in (dyeing) (Brit. pat. 302,666) 29. Recovery of volatile solvents (in cleaning fabrics) (Brit. pat. 302,297) 13. Fireproofing (of cloth) (Fr. pat. 656,693) 18. Reducing organic compounds (as in production of a leuco derivative from indigo) (U. S. pat. 1,721,319) 10. Apparatus for clarifying used dry-cleaning liquids (U. S. pat. 1,720,185) 1. Filter for "dry cleaning" liquids (U. S. pat. 1,720,384) 1.

ALLEN, NELLIE B.: **Cotton and Other Useful Fibers.** Boston and New York: Ginn and Co. 368 pp.

**Cotton Year Book, 1929:** London: Industrial Newspapers, Ltd. 696 pp. 7s 6d. Reviewed in *J. Soc. Dyers Colourists* 45, 183; *J. Textile Inst.* 20, P126(1929).

FARRELL, FRANK J.: **Dyeing and Cleaning.** 5th ed., rewritten by Franklin W. Walker. London: Chas. Griffin and Co., Ltd. 320 pp. 12s. 6d., net.

MAUGET, CH.: **Tableaux synoptiques pour l'examen des tissus et l'analyse des fibres textiles.** Paris: J.-B. Ballière et fils. 80 pp. F. 5.

**Dye.** BRITISH DYESTUFFS CORP., LTD., WM. H. PERKIN and ALEXANDER W. RYFE. Ger. 478,280, Aug. 21, 1925. See Brit. 238,717 (C. A. 20, 2078).

**Dyes.** L. J. HOOLEY, J. THOMAS and SCOTTISH DYES, LTD. Brit. 301,769, June



1, 1927. Anthraquinoneacridinesulfonic acids dyeing wool bright bluish red shades are obtained by heating  $\alpha$ -arylaminoanthraquinones and their derivs. (other than those contg. a carboxylic acid group or an amino group in *o*-position to the arylamino group) with  $\text{H}_2\text{SO}_4$  of over 90% strength or oleum, at  $130^\circ$  or higher (suitably  $160$ – $70^\circ$ ).

**Dyes.** J. R. GEIGY SOC. ANON. Brit. 301,726, Dec. 3, 1927. Diazo dyes sol. in oil or fat are obtained by coupling, with unsulfonated components, tetrazotized diamines of the type  $\text{NH}_2\text{RCH}_2\text{R}'\text{NH}_2$  or  $\text{NH}_2\text{RCHR}'\text{R}'\text{NH}_2$  in which R and R' are substituted or unsubstituted aryl residues. Several examples are given.

**Dyes.** I. G. FARBENIND. A.-G. Brit. 302,928, Dec. 23, 1927. Acid wool dyes are made by reaction of a 4-halo-1-aminoanthraquinone-2-sulfonic acid with a monoacyl compd. of the *m*-phenylenediamine series contg. an alkyl, aralkyl or hydroaromatic residue in the acylamino group, e. g., by the reaction of Na 1-amino-4-bromoanthraquinone-2-sulfonate with *m*-aminomethylacetanilide by heating in the presence of  $\text{NaHCl}_2$  and  $\text{CuSO}_4$  soln.

**Dyes.** I. G. FARBENIND. A.-G. (Ottmar Wahl, inventor). Ger. 477,634, May 11, 1926. Triphenylmethane dyes capable of an after-chroming are prepd. by condensing 2 mols. of an aromatic *o*-hydroxycarboxylic acid with 1 mol. 4-benzylamino-3-sulfobenzaldehyde and oxidizing the leuco acid. Cresotic acid is mentioned in the example and the chroming of the oxidized leuco acid formed gives a fast violet color to wool.

**Dyes.** I. G. FARBENIND. A.-G. (Richard Herz and Wilhelm Hechtenberg, inventors). Ger. 477,697, Feb. 13, 1927. A fast blue S dye is prepd. by sulfurizing the quinone vat dye obtained by the condensation of the arylamino derivs. of *o*-aminoarylmecaptan of the general formula  $2,5\text{-H}_2\text{N}(\text{RR}'\text{N})\text{arylSH}$ , ( $\text{R}' = \text{aryl}$  and  $\text{R} = \text{H}$ , alkyl or aralkyl) with arylquinone or derivs., as described in 445,270.

**Dyes.** I. G. FARBENIND. A.-G. (Erwin Kramer, Ludwig Zeh and Bernhard Bollweg, inventors). Ger. 477,698, Jul. 1, 1927. A S dye is prepd. by heating binaphthylene dioxide with S to  $240$ – $280^\circ$ .

**Dyes.** SOC. ANON. POUR L'IND. CHIM. À BÂLE. Fr. 656,886, July 2, 1928. Dyes giving rich violet shades are prepd. by mixing isoviolanthrone with halogenated isoviolanthrone such as dichloroisoviolanthrone either mech. or by oxidation of mixts. of the corresponding leuco derivs. either in substance or on the fiber.

**Dyes.** SOC. ANON. POUR L'IND. CHIM. À BÂLE. Fr. 657,272, July 11, 1928. Chromed azo dyes are prepd. by treating azo dyes capable of being chromed with hydrated oxides of Cr in the presence of alk. reducing agents such as alkali sulfides or  $(\text{NH}_4)_2\text{S}$  or alkalies in combination with reducing agents such as glucose, cane sugar or the sol. disintegration products of starch or cellulose. The reaction may be carried out in an open or a closed vessel, with or without the addn. of colloidal or protecting substances or org. or inorg. salts.

**Dyes.** VEREIN FÜR CHEMISCHE UND METALLURGISCHE PRODUKTION. Fr. 656,691, May 29, 1928. Azo dyes are produced on wool, silk, leather, etc., by impregnating in the presence of  $\text{CH}_2\text{O}$  with coupling components contg. one or more  $\text{SO}_2\text{NH}$  or  $\text{SO}_2\text{NH}_2$  groups and developing with a suitable diazo compd. Thus, a yellow dye is obtained on wool from 1-(2'-methyl-5-sulfamido)-phenyl-3-methyl-5-pyrazolone and 2-chloroaniline. Several examples are given.

**Preserving dyes in a state of fine subdivision.** FELIX RISSE and ERICH FISCHER (to Grasselli Dyestuff Corp.). U. S. 1,719,944, July 9. An alkylcellulose such as methylcellulose is incorporated with insol. or difficultly sol. dyes at the time of their production or shortly thereafter. Examples are given.

**Azo dyes.** I. G. FARBENIND. A.-G. Brit. 302,173, Dec. 10, 1927. Azo dyes are made by diazotizing a 4-aminonaphthalimide deriv. in which the imide H may be substituted by alkyl, aryl or aralkyl (which derivs. may be substituted or not) and coupling with a 2,3-hydroxynaphthoic acid arylide in substance or on the fiber. Examples are given which produce bluish claret, blue-bordeaux, violet-brown, claret-red, violet and chocolate-brown dyeings.

**Azo dyes.** I. G. FARBENIND. A.-G. Brit. 302,251, Dec. 12, 1927. Azo dyes, insol. in water, are produced in substance, on a substratum or on the fiber by coupling with an arylide of 2,3-hydroxynaphthoic acid a diazotized dihalo-2-anisidine in which one halogen is in *p*-position to the methoxy group. The products are orange to claret-red dyes of good fastness to light and are fast to steaming without addn. of chromate so that they are especially suitable for use in printing processes. Several examples are given.

**Azo dyes.** I. G. FARBENIND. A.-G. Brit. 302,599, Dec. 17, 1927; Fr. 657,529, July 16, 1928. Azo dyes, insol. in water and of good fastness to light, are produced,

in substance or on the fiber, by coupling with arylides of 2,3-hydroxynaphthoic acid diazotized dihalo-2-aminotoluenes having one halogen in *p*-position to the  $\text{CH}_3$  group and having at least one halogen other than Cl. Several examples are given of dyes dyeing bluish red shades. Brit. 302,600 describes dyes giving generally various red shades formed by coupling diazotized 2,5-dihalogen-2-aminotoluenes with arylides of 2,3-hydroxynaphthoic acid. Brit. 302,601 relates to similar dyes formed by coupling diazotized 3,6- or 5,6-dihalogen-2-aminotoluenes with arylides of 2,3-hydroxynaphthoic acid. Various examples are given.

**Azo dyes.** I. G. FARBENIND. A.-G. Fr. 656,575, June 27, 1928. Insol. azo dyes are prep'd. by combining the diazo comp'd. obtained from 3,6-diamino-7-methoxy-10-(2'-methoxyphenyl)phenazonium chloride with the arylides of 2,3-hydroxynaphthoic acid, in substance or on the fiber. An example is given using 2,3-hydroxynaphthoyl *p*-phenetidine giving a deep black. A list of other arylides which may be used is given.

**Azo dyes.** I. G. FARBENIND. A.-G. Fr. 657,115, July 6, 1928. Azo dyes are prep'd. by coupling diaminodisazo comp'ds. obtained from benzidinesulfonic or -carboxylic acids or their derivs. with 2 mols. of middle components capable of being diazotized anew and coupling the diazo derivs. with 2 mols. of sulfonic acids of 2-amino-8-naphthol, their derivs. arylated in the  $\text{NH}_2$  group or their derivs. sulfonated or carboxylated in the aryl ring. In an example, benzidine-*m*-disulfonic acid is diazotized and coupled with an AcOH soln. of 1-naphthylamine-6-sulfonic acid. The disazo dye is isolated, diazotized and coupled with 2,8-aminonaphthol-3,6-disulfonic acid. The polyazo dye dyes silk in black to blue shades. A number of other components which may be used are mentioned.

**Azo dye.** I. G. FARBENIND. A.-G. (Winfried Hentrich and Rudolf Knoche, inventors). Ger. 477,912, Mar. 13, 1927. Diazo comp'ds. are allowed to react with components to which an arylhydroxy fatty acid residue is coupled by a N atom. Thus, the Na salt of the monoazo dye obtained from the acid coupling of 1 mol. 4-nitro-1-aminobenzene-2-sulfonic acid with 1 mol. 2-( $\omega$ -aminoethylamino)naphthalene-7-sulfonic acid, is coupled with the diazo comp'd. from 4-nitro-1-aminobenzene-2-sulfonic acid. The new dye colors wool in fast red-violet tones. Other examples are given.

**Production of azo dyes on the fiber.** I. G. FARBENIND. A.-G. (Erwin Hoffa and Carl Seib, inventors). Ger. 478,031, June 14, 1927. See Brit. 292,100 (C. A. 23, 1513).

**Polyazo dyes.** I. G. FARBENIND. A.-G. Fr. 656,948, July 3, 1928. Tris- and tetra-azo dyes are prep'd. by coupling monoaminodiaz or aminodisazo comp'ds. which may be obtained from any diazo or diazoazo comp'ds. or amino or thioamino ethers of the  $\text{C}_6\text{H}_6$  or  $\text{C}_{10}\text{H}_8$  series and coupling in position *p*- to the  $\text{NH}_2$  group with *N*-aminobenzoylaminobenzoylaminobenzoyl- or *N*-aminobenzoylaminobenzoyl-*peri*-aminonaphthols (one or more of the CONH linkages in these comp'ds. may be replaced by  $\text{NH.CO.NH}$ ) then diazotizing again and coupling with pyrazolones, derivs. of  $\beta$ -ketoaldehyde, methylketol or its homologs or substitution products, sulfazones, 1,3-dihydroxyquinoline, salicylic acid and their derivs. capable of coupling. Examples are given.

**Trisazo dyes.** I. G. FARBENIND. A.-G. (Hugo Schweitzer and Johann Huismann, inventors). Ger. 478,045, May 18, 1926. Addn. to 450,998. See Brit. 287,232 (C. A. 23, 525).

**Chromium compounds of azo dyes.** I. G. FARBENIND. A.-G. Brit. 302,709, Sept. 15, 1927. Monoazo dyes obtained by coupling a diazotized *o*-aminonaphthol mono-sulfonic acid with a 1-sulfo-phenyl-3-methyl-5-pyrazolone free from sulfamide and OH groups are converted into Cr comp'ds. (suitably by reaction with Cr formate). Examples are given of dyes which give various pink or red shades. Cf. C. A. 23, 4080.

**Chromium compounds of azo dyes.** SOC. ANON. POUR L'IND. CHIM. A. BAILE. Brit. 301,772, Aug. 4, 1927. The parent azo dye is treated with a Cr-yielding agent comprising an org. Cr salt or an inorg. Cr salt and an acid-binding substance, in the presence of a salt of an org. acid, or a free org. acid, or both, or a salt of an inorg. acid together with a free org. acid. Several examples are given.

**Vat dyes.** BRITISH DYE-STUFFS CORP., LTD. Fr. 656,648, June 29, 1928. New vat dyes are prep'd. by condensing with  $\text{NH}_2\text{OH}$  or its salts, in the presence or not of  $\text{FeSO}_4$ , the products obtained by alk. fusion of the homologs or sulfonated derivs. of benzanthrone such as the condensation of  $\text{NH}_2\text{OH}$  with the product of alk. fusion of (1) sulfonated chlorobenzanthrone, and (2) sulfonated methylbenzanthrone.

**Vat dyes.** I. G. FARBENIND. A.-G. (Paul Nawiasky and Julius Müller, inventors). Ger. 478,047, Oct. 6, 1926. The green vat dye prep'd. according to example 1 of Ger. 475,342 (C. A. 23, 3353) is treated with oxidizing agents, in substance or on the fiber.

whereby it is converted into a fast brown vat dye. Examples are given describing the oxidation in substance with  $\text{CrO}_3$  and on the fiber with  $\text{CaOCl}_2$ .

**Vat dyes.** I. G. FARBENIND. A.-G. (Albert Job, inventor). Ger. 477,510, Aug. 26, 1926. See U. S. 1,690,786 (C. A. 23, 526).

**Brown vat dyes.** I. G. FARBENIND. A.-G. Brit. 302,489, Dec. 5, 1927. Brown vat dyes are made by halogenating the product obtained by "mild oxidation" of the leuco compd. of the brown vat dye described in example 2 of Brit. 289,980 (C. A. 23, 980). Various examples are given.

**Dyes of the pyrazolanthrone-yellow series.** I. G. FARBENIND. A.-G. Brit. 302,772, Oct. 31, 1927. Pyrazolanthrone-yellow, or its substitution products such as have not more than one univalent substituent on the N, are condensed with an aldehyde such as benzaldehyde, paraformaldehyde or paraldehyde in the presence of a chloride of P, Al or Sb (preferably in a diluent) at 100–200°, to form yellow to gold-orange vat dyes.

**Dyes of the thioindigo series, etc.** I. G. FARBENIND. A.-G. Brit. 302,175, Dec. 8, 1927.  $\text{P}_2\text{O}_5$  applied to a powdered or porous carrier such as anhydrous silicic acid is used for ring closure of arylthioglycolic acids. Examples are given.

**Anthraquinone dye.** ROLAND G. ROGERS (to National Aniline & Chemical Co.). U. S. 1,721,318, July 16. In the production of a leuco compd. of a diaminodihydroxyanthraquinonemonosulfonic acid, a diaminodihydroxyanthraquinonedisulfonic acid is subjected to the action of Zn and  $\text{NaHSO}_3$ . Cf. C. A. 23, 716.

**Sulfurized dyes.** I. G. FARBENIND. A.-G. Fr. 656,897, July 2, 1928. Sulfurized dyes giving reddish brown shades are prep'd. by heating to a high temp.  $\beta$ -binaphthol with halides of S such as  $\text{S}_2\text{Cl}_2$ , with or without the addn. of S and indifferent solvents

**Sulfurized dyes.** I. G. FARBENIND. A.-G. Fr. 656,907, July 2, 1928. Sulfurized dyes are prep'd. by sulfurizing indophenols or their leuco compds. with polysulfides in a soln. of aromatic hydroxy derivs., partially or entirely hydrogenated, such as cyclohexanol, methylcyclohexanol, tetralol or decalol. Cf. C. A. 23, 3816.

**Dyes and intermediates.** I. G. FARBENIND. A.-G. Brit. 302,773, Oct. 31, 1927. Arylides of 2-arylmino-8-naphthol-6-carboxylic acids are formed from 2,6-naphthol-carboxylic acid by sulfonation, converting the sepd. 8-sulfonic acid (cf. Brit. 291,965; C. A. 23, 1139) into 8-hydroxy-2-naphthol-6-carboxylic acid by alkali fusion, heating this product with a primary arylamine and treating the 2-arylmino-8-naphthol-6-carboxylic acid thus obtained with an arylamine and a dehydrating agent as described in Brit. 13,237 (C. A. 8, 3864). By using these arylides with various diazo compds. (of which several examples are given), azo dyes are obtained which dye wool reddish to black shades, cotton olive to black, and are suitable for making lakes.

**Dyes and intermediates.** I. G. FARBENIND. A.-G. (Arthur Lüttringhaus, Paul Nawiasky and Arthur Krause, inventors). Ger. 478,492, Oct. 26, 1926. New products useful as vat dyes or as intermediates for dyes are prep'd. by treating anthrapyrimidone and its derivs. and substitution products with alk. reagents. An example is given in which anthrapyrimidone is treated with alc. KOH at 180°.

**Dye intermediates.** I. G. FARBENIND. A.-G. (Leopold Laska and Arthur Zitscher, inventors). Ger. 478,331, Oct. 6, 1925. Sulfo derivs. of hydroxyaryl carboxylic acid arylides, the sulfo group being in the arylide radical, are prep'd. by treating a mixt. of an hydroxyaryl carboxylic acid and an aminoaryl sulfonic acid with  $\text{PCl}_3$  in the presence of an indifferent base such as  $\text{PhNMe}_2$ . Thus, 2,3-hydroxynaphthoylemetanilic acid can be prep'd. from 2,3 hydroxynaphthoic acid and metanilic acid. Other examples are given.

**Naphthalene derivatives.** IMPERIAL CHEMICAL INDUSTRIES, LTD. Fr. 657,176, July 9, 1928. Polychloronaphthalenesulfonic acids are prep'd. by sulfonating polychloronaphthalenes contg. 3 to 4.5 Cl atoms in the mol. The products have wetting out properties and are used for making aq. pastes or suspensions of dyes. The prepn. of pastes from Duranthrene golden orange Y, thioindigo, and 2,4-dinitrobenzeneazo- $\beta$ -naphthol with trichloronaphthalenesulfonate is described.

**Naphthalene derivatives.** I. G. FARBENIND. A.-G. Brit. 302,770, Oct. 28, 1927. 2,8-Dihydroxynaphthalene-6-carboxylic acid is made by fusing 2-naphthol-8-sulfo-6-carboxylic acid with caustic alkali. By its use as an intermediate together with aromatic o-hydroxydiazo compds. (of which several examples are given), mordant dyes are obtained which dye wool brownish tints turning to fast brown to black shades when after-chromed.

**Anthraquinone derivatives.** I. G. FARBENIND. A.-G. (Paul Tust, inventor). Ger. 478,046, Apr. 10, 1926. New products useful as vat dyes or as intermediates for dyes are prep'd. by condensing benzoylaminoanthraquinones contg. halogen in the ben-

zoyl nucleus with aminoanthraquinones or their derivs. or substitution products. The condensation proceeds with elimination of H halide from the  $\text{NH}_2$  group or groups of the aminoanthraquinone and the halogen in the benzoyl nucleus. The reaction is generally conducted at a raised temp. in a diluent medium in the presence of an acid binding agent such as NaOAc and of a catalyst such as Cu. Examples are described.

**Anthraquinone derivatives.** I. G. FARBENIND. A.-G. (Robert E. Schmidt and Robert Berliner, inventors). Ger. 478,048, Jan. 26, 1927. New N-contg. products of uncertain constitution, some of which are useful as *dyes* for acetate silk and as *intermediates* for *dyes*, are prep'd. by the action of  $\text{NH}_2\text{CH}_2\text{CH}_2\text{NH}_2$  on hydroxyanthraquinones. The reaction generally proceeds at a slightly raised temp. Examples are given describing the manuf. of products from quinizarin, purpurin and 1,4,8-trihydroxyanthraquinone. The product from 1,2,4,5,8-pentahydroxyanthraquinone is described also.

**$\omega$ -Aminoalkylaminonaphthalenecarboxylic acids.** I. G. FARBENIND. A.-G. and W. HENTRICH. Brit. 302,212, Sept. 12, 1927. These products, which are *dye intermediates*, are obtained by the reaction of an alkylenediamine and a sol. sulfite on a hydroxy- or an amino-naphthalenecarboxylic acid (other than one contg. the OH or NH group in *o*-position to the COOH group). Examples are given of the production of these intermediates and of *dyes* from them.

**4-Chloro-1-aminoanthraquinone-2-sulfonic acid.** I. G. FARBENIND. A.-G. Brit. 302,171, Dec. 8, 1927. This comp'd. (which may serve as a *dye intermediate*) is prep'd. by treating well-cooled 1-aminoanthraquinone-2-sulfonic acid in aq. soln. or suspension with Cl or a substance yielding Cl. A temp. below  $0^\circ$  is suitable for the reaction.

**Aminoaryl mercaptans.** I. G. FARBENIND. A.-G. Fr. 657,183, July 9, 1928. *o*-Aminoaryl mercaptans are prep'd. by heating 2-aminoarylthiazoles with alk. lvs. in the presence or not of org. solvents or diluents. The products are *intermediates* in *thioindigo dyes*. The process may be applied to 2-aminothiazoles in which the *p*-position to the N atom is substituted or blocked, which are prep'd. according to Fr. 620,799. The mercaptans react with  $\text{ClCH}_2\text{CO}_2\text{H}$  to form thioglycolic acids and their anhydrides.

**Dyeing processes.** RENÉ CLAVEL. Fr. 657,003, July 4, 1928. White or colored discharges are produced more easily upon materials made of, or contg. cellulose esters or ethers by a preliminary mordanting of the material with metallic salts capable of forming compds. with the dyestuffs. The salts of Sn, Zn, Al, Fe or Cr or mixts thereof are applied in the form of printing pastes in the presence of acids or acid salts, and the treated material is dyed and then discharge printed. Examples are given of the use of an Al salt, and of Zn phosphate.

**Dyeing with vat dyes.** I. G. FARBENIND. A.-G. (Julius Höpker, inventor). Ger. 478,032, May 7, 1927. See Brit. 290,177 (C. A. 23, 994).

**Dyeing textiles.** THE MANCHESTER OXIDE CO., LTD. Fr. 656,827, June 28, 1928. Carbonylferrocyanides of alkali or alk. earth metals are used in oxidizing processes in dyeing textiles. They may be used in chlorate decolorizing pastes instead of the usual prussiate.

**Dyeing cellulose esters and ethers.** I. G. FARBENIND. A.-G. Brit. 301,564, Sept. 6, 1927. Non-phototype dyeings are obtained by use of azo dyes produced by coupling diazotized aminomonosulfonic or aminomonocarboxylic acids or substitution products of such acids with  $\alpha,\gamma$ -diketohydrindene or its derivs. Examples are given for dyeing "acetate silk" yellow.

**Dyeing cellulose esters and ethers.** I. G. FARBENIND. A.-G. (Erich Fischer, inventor). Ger. 477,507, Sept. 18, 1925. Cellulose esters and ethers are dyed with primary disazo dyes contg. one sulfo group, at least one amino or substituted amino group, and one naphthalene nucleus. The dyes are prep'd. by coupling 2 mols. diazo comp'd. with 1 mol. of a mono- or a dihydroxy comp'd. of the benzene or naphthalene series capable of coupling twice. Thus, acetate silk is dyed with the dye sulfanilic acid  $\rightarrow$  phenol  $\leftarrow$  *p*-phenylenediamine. Other examples are given.

**Dyeing cellulose esters and ethers.** SOC. ANON. POUR L'IND. CHIM. À BAËLE. Ger. 478,476, Nov. 2, 1926. Fast green or blue shades are produced on cellulose esters and ethers by dyeing with indophenols of the formula  $\text{R}_1(\text{R}_2)\text{N}-\text{R}_3-\text{N}=\text{R}_4=\text{O}$ , where  $\text{R}_1$  and  $\text{R}_2$  may be H or an alkyl, aryl or aralkyl residue,  $\text{R}_3$  is an aryl residue which may be substituted, and  $\text{R}_4$  is an aryl residue substituted in the nucleus with at least 1 halogen atom. Such indophenols may be prep'd. by joint oxidation of a halogenated *p*-aminophenol and an aromatic amine having the *p*-position free, or by condensing a halogenated *p*-nitrosophenol with an aromatic amine having the *p*-position free, or by joint oxidation of a suitable *p*-diamine and a halogenated phenol having the *p*-position

free. A no. of initial materials are specified from which suitable indophenols can be prep'd. An example is given. Cf. C. A. 23, 1514.

**Dyeing cellulose derivatives.** HENRY DREYFUS. Fr. 656,931, June 28, 1928. Materials made of or contg. org. substitution derivs. of cellulose are dyed, printed or stenciled by oxidation of one or more amines on the material by means of a chloroamide. Examples are given. Cf. C. A. 23, 4083.

**Dyeing cellulose derivatives.** I. G. FARBENIND. A.-G. Fr. 656,995, July 4, 1928. In dyeing cellulose esters or ethers isocyclic bases such as hexahydroaniline, or its homologs or substitution products or their salts or their salts with acid dyes are added to the dye bath, whereby deeper shades are obtained than without them.

**Dyeing cellulose derivatives.** HENRY DREYFUS. Fr. 657,181, July 9, 1928. Materials made of or contg. cellulose derivs. are dyed or otherwise colored with compds. obtained by introducing one or more  $\beta$ -ketoacidyl groups into coloring matters contg. suitable  $\text{NH}_2$  groups. The coloring matters may be of the azo, nitrodiarylamine, nitrodiaryl, nitrodiarylmethane, or anthraquinone series and are usually unsulfonated. They may be prep'd. by heating the dyestuffs contg. one or more  $\text{NH}_2$  groups with an acylacetic ester either in excess or in the presence of a diluent such as naphtha,  $\text{PhCl}$ ,  $\text{C}_{10}\text{H}_8$ , and may contain addnl. groups, e. g., amino, hydroxy, alkoxy, halogen, carboxyl or mercapto groups. A list is given of suitable compds. and the shades obtained there-with and examples of dyeing with these compds. are also given.

**Dyeing "viscose silk."** I. G. FARBENIND. A.-G. Brit. 301,754, Dec. 2, 1927. Uniform dyeings are obtained by use of secondary disazo dyes comprising: (a) a diazo component free from nitro or salicylic groups, (b) any customary middle component, and (c) a substituted or unsubstituted naphthol or naphthylamine coupling in *o*-position to the OH or  $\text{NH}_2$  group (*N*-substituted 2-amino-8-naphthol-6-sulfonic acids being excepted). Examples are given of dyes producing various bluish shades.

**Dyeing loosely woven articles.** HERBERT E. GRIER (to R. H. Comey Brooklyn Co.). U. S. 1,720,595, July 9. Articles such as those of loosely woven paper which tend to become soft and to lose their shape when wet are treated with a soln. contg. Japan wax, Carnauba wax or other suitable wax dissolved in a solvent such as  $\text{C}_6\text{H}_6$  or xylene contg. also a dye. U. S. 1,720,596 specifies the use of similar solns. contg. also a resin such as gum dammar.

**Coloring cellulose derivatives.** CAMILLE DREYFUS. Fr. 656,466, June 26, 1928. See Brit. 293,022 (C. A. 23, 1514).

**Printing fabrics.** I. G. FARBENIND. A.-G. (to Durand et Huguenin Soc. anon.), Brit. 302,291, Dec. 13, 1927. Fast-colored discharges are obtained on dyeings which are destroyed by oxidizing agents by use of enolic esters of vat dyes; e. g., goods dyed with indigo or Gallomarine blue 2 GD are printed with pastes contg. the ester salts of 6,6'-diethoxythioindigo (for orange discharges), 4,4'-dimethyl-6,6'-dichlorothioindigo (for pink discharges), quinone-di-*p*-chloroanilide (for yellow discharges), or dimethoxy-dibenzanthrone (for green discharges), followed by drying, steaming, treating with waterglass soln. and washing. Various auxiliary ingredients for use in the printing pastes are specified.

**Printing fabrics with vat dyes.** E. I. DUPONT DE NEMOURS & Co. Brit. 302,252, June 8, 1927. A hydroxyalkylamine such as monoethanolamine, diethanolamine, triethanolamine, products obtained by the interaction of olefin oxides with  $\text{NH}_3$  or alkylammonias or methyl-di-( $\beta$ - $\gamma$ -dioxypentyl)amine is used as an assistant in printing fabrics with vat dyes.

**Apparatus for dyeing hanks and various loose materials.** J. SYKES & SONS, LTD. and E. P. SYKES. Brit. 302,486, Dec. 1, 1927. Structural features.

**Apparatus for dyeing and other treatments of artificial silk skeins.** JOHN BRAND-WOOD. U. S. 1,720,760, July 16. Structural features.

**Apparatus for treating lengths of fabric with dyeing, bleaching or washing liquids.** FARBREI WEIDMANN A.-G. Brit. 302,598, Dec. 17, 1927. Structural features.

**Apparatus for washing, dyeing or mixing operations.** E. FREUND. Brit. 302,316, Dec. 14, 1927. Structural features.

**Screw propeller for circulating liquor in dye vats.** E. CONSTANT and L. CONSTANT (trading as Soc. E. et L. Constant). Brit. 302,186, Dec. 10, 1927. Structural features.

**Dye stick of stainless steel.** C. CALLEBAUT and J. DE BLICQVY. Brit. 302,857, May 10, 1928. Structural features.

**Use of glycol ethers in dyeing liquids.** H. T. BÖHME A.-G. Brit. 301,824, Dec. 6, 1927. The degree of dispersion of colloidal dye solns. is reduced and the efficacy of the liquid enhanced by use of compds. such as ethylene glycol monomethyl ether.

**Textiles.** TOOTAL BROADHURST LEE CO., LTD. Fr. 657,348, Nov. 30, 1927. See Brit. 291,473 (C. A. 23, 1289).

**Artificial textiles.** GUSTAV BONWITT. Fr. 34,038, Sept. 8, 1927. Addn. to 640,644 (cf. C. A. 23, 982).

**Sizes for textile materials.** A. F. GALVIN. Brit. 302,358, Dec. 15, 1927. A size is prep'd. by melting in gasoline or the like Japan wax, carnauba wax or gum dammar or other benzine-sol. gum, tallow, stearin or paraffin, benzine soap or saponifiable oil or similar materials.

**Preparing cut fibers.** I. G. FARBENIND. A.-G. (applicant in U. S. M. F. Thomas). Fr. 657,352, Dec. 26, 1927. Cut fibers are treated in a bath to render them supple, brilliant and hygroscopic and in another bath to render them soft to the touch. The first bath may contain glycerol, an alkali, soft soap, oil soap, and glucose and the second AcOH, HCOOH or oil soap contg. traces of H<sub>2</sub>SO<sub>4</sub>.

**Improving fibrous materials.** OBERRHEINISCHE HANDELS-GES. Brit. 301,881, Dec. 7, 1927. Cotton, wool, artificial silk, etc., are curled and rendered more suitable for spinning or use as stuffing material by treatment with liquids such as water, or aq. solns. contg. soap, alkali, acid, oil, fatty acids or bleaching agents, and drying in the loose state.

**Retting flax fiber.** M. WADDELL and H. C. WATSON. Brit. 302,300, Sept. 14, 1927. See U. S. 1,708,812 (C. A. 23, 2582).

**Retting stem fibers.** C. E. BAIRE. Brit. 302,052, Dec. 14, 1927. A disintegrating liquor such as an ammoniacal or alk. carbonate soln. is used together with cholesterol or a material such as fish oil, egg yolk, egg oil, wool fat or cerebral substance; the treatment may be effected by boiling under pressure for 12 hrs.

**Mercerizing loose cotton fibers.** C. AHNERT. Brit. 301,591, Oct. 3, 1927. Unspun cotton is mercerized by impregnation at a high temp. with the usual lye and stretching by centrifugal force while exposed to the action of the lye. An app. is described which may comprise a drum lined with spongy rubber.

**Apparatus for cooling caustic liquids used in mangle tanks of mercerizing apparatus, etc.** S. S. HAMMERSLEY and J. A. BOLTON. Brit. 302,004, Oct. 12, 1927.

**Drying and bleaching fabrics.** M. M. KASANOF. Brit. 301,783, Sept. 5, 1927. Tubular fabrics are drawn over a hollow perforated stretching device through the perforations of which compressed air or bleaching agents may be passed. Various structural details are described.

**Bleaching process for textiles.** A. DE CARVALHO. Belg. 355,916, Dec. 31, 1928. O<sub>3</sub> is used, preferably in gaseous form.

**Apparatus for bleaching textiles with solutions liberating oxygen.** DEUTSCHE GOLD-UND SILBER-SCHNEIDANSTALT VORM. ROESSLER. Fr. 656,816, June 29, 1928.

**Decorating textile fabrics.** P. PEYRET. Brit. 302,328, Dec. 16, 1927. Decorations are made by application of a thin layer of a plastic material having a "mother-of-pearl effect" such as "mother-of-pearl lacquer." Solvents such as Et lactate, EtOH, MeOH, EtOAc, and the like may be used and cellulose acetate may be included in the lacquer.

**Coating natural textile materials with regenerated cellulose, etc.** L. LILIENFELD. Brit. 302,115, June 20, 1927. Yarns or fabrics such as those of flax, hemp, linen, ramie, jute, cotton or wool are dressed, sized or printed with solns. of cellulose (of which several examples are given) from which the cellulose may be pptd. or regenerated. A gas such as air, N, CO<sub>2</sub> or H<sub>2</sub> is emulsified with the cellulose soln. under pressure or substances such as an alkali carbonate, sulfite or sulfide are mixed with the soln. so that bubbles are formed in the coating material as regenerated or pptd. Sizing or softening agents, fillers or coloring substances, etc. also may be added.

**Design effects on fabrics containing artificial silk.** C. DREYFUS (to British Celanese, Ltd.) and G. RIVAT. Brit. 302,592, Dec. 16, 1927. Fabrics composed in part only of cellulose acetate or the like are treated in selected portions with pastes contg. inorg. acids or salts which attack cellulose acetate so that its selective removal from the fabric may be effected. Various auxiliary substances and treatments are described. Cf. C. A. 23, 2305-6.

**Ornamental effects on fabrics of cellulose acetate, etc.** C. DREYFUS (to British Celanese, Ltd.). Brit. 302,363, Dec. 16, 1927. Fabrics comprising cellulose acetate or other cellulose esters are locally treated with a saponifying agent such as KOH and then with a carbonizing soln. such as AlCl<sub>3</sub> or HCl by which the regenerated cellulose is removed. Cf. C. A. 23, 172.

**Ornamental effects on pile fabrics.** BRITISH CELANESE, LTD., G. H. ELLIS, H. C. OLPIN and E. E. WALKER. Brit. 302,208, Sept. 12, 1927. Selected portions of the

back of a pile fabric the pile of which comprises filaments of cellulose acetate or the like with a ground of other material are treated with a substance which will soften or weaken the cellulose deriv. pile filaments and the loosened pile is removed as by brushing or suction.

**Treating yarns and fabrics of cellulose derivatives.** BRITISH CELANESE, LTD., and G. H. ELLIS. Brit. 302,775, Nov. 2, 1927. Materials such as cellulose acetate products, other cellulose esters or ethers or "immunized cotton" are rendered more resistant to hot treatments such as ironing and given a good affinity for dyes by treating them with alk. solns. of Sn such as solns. of Na or K stannate.

**Artificial-silk fabrics.** C. DREYFUS (to British Celanese, Ltd.). Brit. 302,361, Dec. 15, 1927. Stiff fabrics are made of yarns of cellulose acetate or other org cellulose derivs. (with or without natural fibers) which are given a high twist and are preferably above 200 denier. Stiffening in some cases is effected by treatment of the fabric with ethylene dichloride or other suitable solvents, softening or swelling agents.

**Artificial silk.** RICHARD DIETSCHY. Fr. 657,007, July 4, 1928. Textiles, particularly artificial silk, are given a mat surface by loading them with insol. alk. earth salts such as  $\text{BaCl}_2$ .

**Artificial silk.** INOXI (S. A. R. L.). Fr. 34,071, May 14, 1927. Addn. to 639,197 (C. A. 23, 705). The crêpe effects on artificial silk, particularly acetate silk, is increased by dehydrating the silk as completely as possible before sizing.

**Relustering and printing artificial silk.** BLEACHERS' ASSOCIATION, LTD., W. KERSHAW, F. L. BARRETT and R. GAUNT. Brit. 301,567, Sept. 7, 1927. Pattern effects are produced on yarns or fabrics formed at least in part from fibers produced from cellulose esters, by a process including delustering and then effecting local regeneration by use of ethyl lactate (which may be applied in the form of a printing paste). Various details are given of the delustering process, etc. Brit. 301,568 relates to a similar process in which local regeneration is effected with ethylene glycol monoethyl ether.

**"Imitation linen."** RICARDO MIRET. U. S. 1,721,082, July 16. Cotton or a similar material is treated with a starching prepn. and the goods are then passed between stone calenders mounted so as to provide a slight slippage, at a high pressure. The calenders have slightly roughened surfaces so that they exert a slight gripping effect on the material.

**Felting woolen and similar fabrics incorporated with wool powder.** ETIENNE RICALES. U. S. 1,721,470, July 16. Fabric to be felted is repeatedly passed through a soap bath contg. in suspension wool powder and the latter is incorporated with the fabric by pressure (suitably by the action of rollers in an app. which is described).

**Repairing knitted or woven fabrics with patches of cellulose ester or other fabric applied by heat and pressure.** W. STELKENS and C. LIEDTKE. Brit. 302,858, May 11, 1928.

**Extraction and treatment of neutral greases from wool-washing baths.** E. MERTENS. Belg. 355,533, Dec. 31, 1929. The grease-charged wash-water is circulated through troughs in which paddle wheels are rotated so as to form a scum in which the grease concentrates. The scum is drawn off into a sep. trough, where a fine spray is played on it, the impurities are sepd., and the scum is then treated in an autoclave to give anhyd. and deodorized grease.

**Wetting and emulsifying substances, etc.** I. G. FARBERNIND. A.-G. Brit. 302,258, Sept. 8, 1927. Condensation products such as those produced from 1,3-butyleneglycol (or ethylene glycol or ethylene glycol monoalkyl ether) by heating with chlorosulfonic acid and naphthalene (or chlorinated, nitrated, hydrogenated or other substitution products of naphthalene or other hydrocarbons) may be used in acid, neutral or alk. baths such as those employed for washing, fulling, dyeing, printing, carbonizing, dressing, mercerizing, greasing, bast scouring, oiling, spinning, larding, sizing, bleaching, impregnating, tanning, destroying pests and in producing plastic compns.

**Sulfonated oils.** ORANIENBURGER CHEMISCHE FABRIK A.-G. Fr. 657,220, July 10, 1928. See Brit. 293,806 (C. A. 23, 1765-6).

**Treating covers for aircraft.** KARL HÜRTLE (to Goodyear Zeppelin Corp.). U. S. 1,721,302, July 16. A moisture-repelling material such as paraffin or Al oxide is applied to the inside surface of the cover only, the cover is secured under tension to the framework of an airship and the outer surface is subsequently coated with a protective contractive dope.

**Waterproofing and flameproofing composition for use on textile fabrics.** FRANK I. ROMAN (to Western Elec. Co.). U. S. 1,720,747, July 16. A compn. suitable for use on textile fabrics comprises a 30% rubber latex 75, a 25%  $(\text{NH}_4)_3\text{PO}_4$  soln. 300 and  $\text{NiH}_4$  polysulfide 1 part.

**Fireproofing composition.** TAISAN SHIGA (to Tei Kawata). U. S. 1,720,926, July 16. A compn. suitable for use on fabrics is prepd. by mixing a soln. of  $\text{NH}_4$  phosphate and  $(\text{NH}_4)_2\text{SO}_4$  in water with a clear soln. of Mg borate in boric acid soln.

**Purifying gasoline, etc., used for "dry cleaning."** CAMERON MACLEOD (to Baeuerle & Morris, Inc.). U. S. 1,720,604, July 9. Liquid contg. soaps and other impurities is vaporized *in vacuo* and impurities are sepd. by centrifugal action in an app. which is described.

## 26—PAINTS, VARNISHES AND RESINS

A. H. SABIN

**The 4th paint meeting in Munich.** A. EIBNER. *Farben-Ztg.* 34, 2183-5, 2239-43, 2295-8, 2350-2 (1929).—A review of the papers on drying oils presented at the 1929 meeting of the V. D. I. at Munich.

**Progress in paints.** ZYGMUNT KLONOWSKI. *Przemysl Chem.* 13, 199-203 (1929). A brief review of the theory of drying of linseed oil and similar paints, and of testing them.

**White paints.** J. S. AABYE. *Kem. Maanedstid Nord. Handelsblad Kem. Ind.* 10, 22-8 (1929).—The durability as regards weather was examd. for zinc white, lead white, Kronos titanium white Standard A, Timonox white G. S. 1., a German and a Dutch lithopone and mixts. of these contg. lime and  $\text{BaSO}_4$ . Titanium white and Timonox white were found to be most durable and can be recommended in cases where there is no danger that the paint will be rubbed off.

**The significance of radio in paint technology.** PAUL NETTMANN. *Farben-Ztg.* 34, 2238-9 (1929).—The use of radio app. in certain tests is suggested. *E. g.*, the change in the dielec. const. of a film drying on the plate of a condenser could be followed. The charge on spray particles could be measured in a Faraday cage and the effect of radiations on films could be noted by the use of a Geiger ionization chamber.

**Film-forming solids in house paint.** ANON. Am. Paint & Varnish Mfrs'. Assoc., *Circ.* No. 351, 491-8 (1929).—Standard high-grade house paints contain approx. 90% by vol. of film-forming material (oil and pigment) while many low-priced inferior paints contain as low as 55% of film material. These facts account for the inferior service of the latter products. The analysis of 6 low-priced paints disclosed important discrepancies between the formulas on the containers and the actual compn.

**Pigments.** H. BRAIDY. *Cuir tech.* 18, 22-4, 47-51 (1929).—A description.

**Titanium oxide pigments.** A. VILA. *Tech. moderne* 21, 397-402 (1929).—A review of the history, sources and manuf. of these products.

**A new ultramarine oven.** M. A. AISENBUD. *Farbe u. Lack* 1929, 310-11. Instead of entering the oven directly through the floor, the hot gases, after passing through a network of flues along the sides and top, enter through a passage in the dome. Better distribution of heat is claimed.

**The effect of rubbing down and scraping by dry process of lead-painted surfaces of iron and steel structure.** L. C. MCNATR AND C. W. PRICE. *J. Ind. Hyg.* 11, 175-81 (1929).—An analysis was made of the air close to the mouth of workers engaged in dry-chipping, scraping and wire-brushing lead-painted iron and steel work. The amts. of Pb found were influenced greatly by the location factor and ranged between 0 and 194 mg. per 10 cu. m. of air. Four samples of paint debris were analyzed for total Pb and Pb sol. in 9.25% HCl, the sol. Pb amounting to 41.2-62.2% of the total Pb present. When the processes were carried out in the open, the amt. of Pb in the air was small and supposedly harmless. The amt. of Pb was much greater with indoor work and high enough to be injurious to health. Chipping and scraping are less dangerous than wire-brushing. The Pb inhalation is not assumed to decrease when the surface of the structure is wetted with linseed oil before wire-brushing. Turpentine is likely to give better results but its use is not feasible because of different obstacles.

**Coatings to protect against rust.** JULIUS BRAUN. *Metallbörse* 19, 1239-40 (1929).—A review of customary rust-preventing paints.

**Study of protective coatings for interior of steel tanks and underground pipe lines.** J. H. DAVIDSON, *et al.* *Am. Ry. Eng. Assoc. Proc.* 30, 143-53; *Ry. Eng. and Maintenance* 25, 244-7 (1929).—A coating of portland cement grout, prepn. of a petroleum base into which rust-inhibiting chemicals have been compounded or asphaltic liquid paints appear to have given better results for protection on the interior of steel water tanks



than red lead and linseed oil customarily used. In underground pipe lines, records indicate that portland cement is much the best, bituminous coatings wrapped are next and paint coatings give the lowest increase in life.

**Blooming (of coatings).** ROBERT BÜRSTENBINDER. *Farbe u. Lack* 1929, 323.—Tarnishing, blooming or blushing is caused by a variety of conditions, but principally by the presence of free fatty or resin acids formed by the hydrolysis of metallic soaps. Any condition, e. g., presence of alcs., which tends to inhibit this hydrolysis, reduces the formation of bloom. The formation of bloom is less with fused than with pptd. driers.

**Climatic effects on the quality of linseed oil.** WITOLD PŁOSKI. *Przemysł Chem.* 13, 167-8(1929).—On the basis of expts. extending over a period of some 14 yrs. Ivanov (C. A. 22, 4149) concluded that the chem. compn. of linseed oil characterized among other ways by  $I_2$  value changes markedly in relation to climate. Not only geographical latitude but also longitude and altitude affect its content of unsatd. bonds. The  $I_2$  value increases in the South-North direction at about the rate of 2 units per degree latitude for linseed oil, 0.65 units for rapeseed oil, and 1.3 units for sunflower seed oil. Furthermore flaxseed from the North is more vigorous than that from the South. P explains the preferential demand for Polish linseed oil before that from La Plata on the basis of the above observations of Ivanov. Cf. Leppert, C. A. 23, 2048.

**The course of stand oil formation.** H. MUNZERT. *Farben-Ztg.* 34, 2298-2300 (1929).—There are tabulated a no. of const. for linseed oil sampled at hourly intervals during its conversion to stand oil at a temp. of 290-300°.

**Solvent production and the lacquer industry.** J. G. DAVIDSON. *Chem. Markets* 25, 44-6(1929).

**Nitrocellulose for lacquers.** A. D. LUTTRINGER. *Mat. grasses* 21, 8392-3, 8483(1929).—A review of the manuf. of this product.

**Properties of the "yellow lacquer."** HOYO YASUDA. *Bull. Exptl. Lab. of Government of Korea*, 10, 15-20(1928).—The yellow lacquer is a yellow juice obtained from *Gilbertia trifida* Makino, and used as a paint for house-hold utensils and the Korean fan and has no poisoning action on the skin. The constituents are 24.22%  $H_2O$ , essential oil 14.95, resinous matter 51.8, rubber-like matter 1.79, insol. matter 6.71. The chief constituent is the resinous matter and may be regarded as a natural lacquer.

**Rapid testing of varnish raw materials (resins).** HANS BRENDL. *Farben-Ztg.* 34, 781-3(1929).—The acid and sapon. values, soly. in selected solvents and specific color reactions are usually sufficient to establish the identity and quality of the common resins. The following resins are discussed: rosin, copals, dammar, benzoin, acaroid, elemi, mastic, sandarac, shellac and asphalt.

**A new method for the determination of the melting point of resins.** THOS. H. DURRANS. *J. Oil and Colour Chem. Assoc.* 12, 173-5(1929).—Three g. of resin is melted in a test tube (15 cm.  $\times$  17 mm.) in a bath of  $H_2SO_4$ . The thermometer with a bulb long enough to extend above the melt is inserted in the molten resin. The tube is then withdrawn from the bath and, when the resin has hardened, exactly 50 g. Hg is poured on to it. The tube is then replaced in the bath which is so heated that the temp. rises 2° per min. The m. p. is the temp. at which the resin first appears above the Hg. Some typical results are given.

Co determination in driers, japans, etc. (HEIM) 7. Recovery of volatile solvents [in production of lacquers] (Brit. pat. 302,297) 13. Paints (Fr. pat. 657,512) 20. Plastic compositions [lacquers] containing cellulose esters or ethers, etc. (Brit. pat. 302,615) 18. Printing with non-drying inks (U. S. pat. 1,721,397) 18. Flexible floor and wall-covering material (Brit. pat. 301,901) 20. Ethers of cellulose and starch [for lacquers] (Brit. pat. 302,191) 23. Emulsions of [resins, waxes, etc.] (Brit. pat. 302,761) 13.

BIANCHI, C.: **Cellulose Varnishes (in Italian)**. Milan: V. Hoepli. 324 pp. L. 35. Reviewed in *J. Oil Colour Chem. Assoc.* 12, 177(1929).

HENGVELD, H., et al.: **Practical Railway Painting and Lacquering**. Chicago: Finishing Research Labs., Inc., New York: Simmons-Boardman Pub. Co. 242 pp. \$3 50.

**Paints.** JUANA M. NOVELLAS NÉE GUASCH. Fr. 657,276, July 11, 1928. Examples of paints contain (1) soln. of celluloid (10%) 80, castor oil, 5, soln. of callithrix

or thuya resin (30%) 10, soln. of oxidized terrene (30%) 5g. (2) soln. of celluloid (50%) benzoic acid 1, salicylic acid 1, castor oil 5, soln. of resin (30%) 8, soln. of oxidized terrene (30%) 7g. The latter has an antiseptic character.

**Paint for stenciling signs with an air-brush.** E. O. CASTLETON. Brit. 301,683, March 10, 1928. A water-sol. paint is used consisting of a color pigment, previously ground in water, mixed with casein, borax, aq.  $\text{NH}_3$ , turpentine and a material such as eucalyptus oil for preventing decompn. of the casein.

**Plastic paint.** ARTHUR MILLS. U. S. 1,720,135, July 9. A paint which may be used as a wall finish is composed of 70 parts of a mixt. formed of lithopone 65, powdered mica 7, silica 7, portland cement 3 and plaster of Paris 18% and 39 parts of a mixt. formed of linseed oil 41, "mineral spirit" 55, dryer 3 and moisture 1%.

**Titanium paints and pigments.** VEREIN FÜR CHEMISCHE UND METALLURGISCHE PRODUKTION (to Soc. de produits chimiques des Terres Rares). Brit. 302,659, Dec. 19, 1927. Ti paints and pigments comprise  $\text{TiO}_2$  sepd. from  $\text{H}_2\text{SO}_4$  solns. and dehydrated by heat, and preferably 10–30%  $\text{BaCO}_3$ , with or without dilg. substances.

**Pigments.** AKT.-GES. GEORG EGESTORFF'S SALZWERKE UND CHEMISCHE FABRIKEN. (Robert Müller, inventor). Ger. 478,119, Apr. 16, 1921. Red pigment contg. Fe are prepd. by treating a concd. soln. of a ferrous or ferric salt with a hydroxide or carbonate of an alkali or alk. earth metal, treating the pptd. hydroxide, if desired after aeration, with a soln. of a ferrous or ferric salt, and washing and calcining.

**White lead.** FRANK T. BAILEY and WILSON AUSTIN. U. S. 1,720,196, July 9. An aq. mixt. of Pb oxide and HOAc is introduced into a closed container in which it is whipped in atm. suspension while the container is revolved, and a controlled circulation of air and of  $\text{CO}_2$  through the container is maintained. An app. is described. Cf. C. A. 22, 1862.

**Mill for grinding paints, etc.** A. E. G. MACCALLUM. Brit. 301,781, Sept. 5, 1927. Structural features.

**Manufacture of artificial drying or semi-drying oil, and product obtained thereby.** A. DE CARVALHO. Belg. 355,353, Nov. 30, 1928.  $\text{O}_3$  is passed through the oil at a temp. of about 130–50°.

**Printing inks.** I. G. FARBENIND. A.-G. Fr. 657,516, July 16, 1928. Printing inks which may be decolorized so that the paper may be reused have a basis of acid dyes for wool, taken in an insol. form, either alone or mixed with colored lakes or suitable dyes. In an example, black Agalma 10 BX is dissolved in water and  $\text{BaCl}_2$  is added, the pptd. lake being filtered off and mixed with a varnish for printing. Paper printed with this ink is decolorized by  $\text{NaOCl}$ .

**Treatment of printing press rolls.** L. DEJARDIN. Belg. 355,723, Dec. 31, 1928. In order to prevent the ink from drying on printing press rolls when they are not running, they are treated with mixt. of 1 part spirits of turpentine and 2 parts castor oil, contg. 5 g. of oil of cloves per l.

**Lacs and varnish.** I. G. FARBENIND. A.-G. (Hans Grotowsky, inventor). Ger. 477,618, Apr. 5, 1927. A varnish is colored by the condensation products of pyrazolone with aromatic aldehydes. In the example, a light-fast orange varnish is obtained by adding the condensation product of *p*-diethylaminobenzaldehyde and phenylmethylpyrazolone.

**Nitrocellulose lacquer.** GERALD R. BARRETT (to Merrimac Chemical Co.). U. S. 1,720,992, July 16. A lacquer is formed contg. an oxidizable resin such as rosin glycerol ester together with nitrocellulose soln., pigment and hydroquinone in a concn. of about 0.5–1.0% of the oxidizable resin. The hydroquinone serves to inhibit oxidation.

**Nitrocellulose lacquers.** I. G. FARBENIND. A.-G. Brit. 302,390, Sept. 15, 1927. Non-inflammable nitrocellulose lacquers are prepd. by adding to the lacquers methyl chloride with or without ethylene chloride in quantity at least equal to that of the nitrocellulose solvents which are present. Numerous other possible constituents of the lacquers also are mentioned.

**"Dope materials" containing cellulose esters.** I. G. FARBENIND. A.-G. Brit. 302,280, Dec. 13, 1927. Materials for use in producing non-transparent coatings, comprising cellulose esters such as nitrate or acetate, softening or gelatinizing agents and coloring substances (of which examples are given) with or without other materials are subdivided and mixed as by rollers under pressure without bringing the coloring matter into colloidal condition. The pliant elastic products may be dissolved in low b. p. solvents to form lustrous varnishes. Oil also may be added.

**Resins.** A. SCHULTZE & Co. Fr. 657,114, July 6, 1928. Resins obtained from dead wood are improved by distn. under high vacuum.

**Phenolic resin.** FRAZIER GROFF and GEORGE W. MILLER (to Bakelite Corp.).

U. S. 1,720,895, July 16. A fusible non-reactive resinous reaction product is formed from a fusible phenol-methylene resin, a basic condensing agent such as lime, caustic alkali or alkali carbonate and furfural. The product is suitable for use in molding compns. Cf. 23, 4090.

**Phenolic resins.** BRITISH DYESTUFFS CORP., LTD. Fr. 656,647, June 29, 1928. Resinous condensation products of PhOH are purified by partial or entire elimination of the phenols and sol. products by extn. with a solvent such as water after incorporating in the resin a filling material such as sawdust, cotton waste or asbestos. The extn. with water is preceded and followed by an adjustment of the H-ion concn. to  $p_H = 3.5$  to 7.

**Resinous condensation product of phenol and cellulose.** EMIL E. NOVOTNY and CHARLES J. ROMIEUX (to John S. Stokes). U. S. 1,721,315, July 16. A mixt. comprising only a phenolic compd. such as PhOH and cellulose is heated to above  $120^\circ$  (suitably about  $250^\circ$ ) to cause reaction and formation of a sol. fusible resinous condensation product which may be further modified by use of  $NH_3$ ,  $CH_2O$ ,  $(CH_2)_nN_4$ , furfural, etc.

**Press masses from phenol-formaldehyde resins.** FRITZ SEEBACH (to Bakelite G. m. b. H.). U. S. 1,720,062, July 9. Unstable colloidal solns. of phenol- $CH_2O$  resins are mixed with fillers such as wood meal or paper pulp and the resins are pptd. in a pure finely divided form by use of water without decreasing the basic content of the soln.

**Urea-formaldehyde condensation products.** I. G. FARBERIND. A.-G. Brit. 301,696, Nov. 6, 1926. Instead of using dimethylolurea as a starting material, in the process described in Brit. 261,029 (C. A. 21, 3431), there are used products of higher mol. wt. obtained from it by "cautious treatment" with an alk. reagent. Lacquers or resinous or glass-like masses are obtained depending on whether or not the solvent is allowed to remain in the product. Various specified fillers, etc., may be added. Cf. C. A. 23, 678.

**Phenol-formaldehyde condensation products.** E. S. HOLE. Brit. 302,098, June 20, 1927. A water-sol. condensation product is made by boiling together PhOH and  $CH_2O$  in the presence of a small quantity of an alk. condensing agent, adding water, cooling and further adding water contg. a chromic acid salt. Methods described in Brit. 278,460 (C. A. 22, 2645) may be employed. The product is suitable for use in varnish or impregnating compns.

**Moldable composition.** HARRY M. WEBER (to Ellis-Foster Co.). U. S. 1,720,406, July 9. A compn. which is suitable for hot molding comprises a resin of insufficient fusibility such as a phenol-aldehyde resin, a filler and a small proportion of an added hexamethylenetetraminetriphenol which acts as a flux for the resin.

**Moldable composition.** ARCHIE J. WEITH and ORTO HOLZMAN (to Bakelite Corp.). U. S. 1,720,192, July 9. A compn. which is suitable for hot-press molding comprises a potentially-reactive resin such as may be formed from phenol and  $CH_2O$ , a fibrous cellulose ester such as cellulose acetate and a phenyl ester such as mono-phenyl dicresyl phosphate.

**Synthetic resins.** SOC. ANON. POUR L'IND. CHIM. À BÂLE. Brit. 302,737, Dec. 21, 1927. Water-insol. resins are obtained by adding to a urea- $CH_2O$  reaction mixt., before or at any stage of condensation, in an alk. medium, a substance capable of forming with  $CH_2O$  or its condensation products in the presence of OH ions a water-insol. resin, and heating. Some of the substances which may be added are given. Alc.-sol. products suitable for making lacquers may be obtained, and the resins obtained are suitable for use with basic pigments.

**Synthetic resins.** BAKELITE CORP. Fr. 656,748, Nov. 14, 1927. Polymerization of synthetic resins is carried out in an oven with an entry for heated air under pressure and an exit for vapors of all kinds to prevent the harmful action of the vapors on the resins after polymerization.

**Article made from artificial resins.** SAÜRESCHUTZ G. M. B. H. (Johann K. Wirth, inventor). Ger. 477,836, Apr. 4, 1926. Tubular structures are made from the artificial resins, obtained by condensing phenols with HCHO, by molding when plastic.

**Joining surfaces of artificial resins.** AMBRASIT-WERKE KUNSTHARZFABRIK G. M. B. H. Austrian 113,524, June 15, 1928. Paper or the like impregnated with a reactive artificial resin is interposed between the surfaces to be joined and the union is then heated to  $80$ – $90^\circ$  in a press. The reactive resin may be partly hardened before use. The method is particularly intended for resins of the Bakelite type.

## 27—FATS, FATTY OILS, WAXES AND SOAPS

E. SCHERUBEL

**Cacao butter** (*Oleum cacao*). SCHELLBACH. *Pharm. Ztg.* **74**, 875-6(1929).—This product is considered from the standpoint of the Ger. Food Law of July 5, 1927, notably the methods and sources of recovery, phys. consts., etc. W. O. E.

**Emulsions of fats and hydrocarbons and their industrial applications.** LOUIS MEUNIER. *Cuir tech.* **18**, 64-72, 88-94(1929).—See C. A. **23**, 2052. J. G. N.

**Turbidity time numbers and solidifying point of solid fats, especially of cacao butter.** W. SPRINGER. *Chem. Umschau Fette, Oele, Wachse u. Harze* **36**, 165-7(1929).—The app. used is a squatly flask with inlet and outlet for  $H_2O$  and a tubulure for a thermometer; it carries in its neck a titer tube, 23 mm. diam. and within this a 19 mm. titer tube and another thermometer; the 19-mm. tube has a vertical blue line, 1 mm. wide, at its back. The flask is filled with  $H_2O$ , kept at  $20^\circ$ , and the space between the 2 titer tubes is filled with "vaseline oil." Method: Neutralize 100 g. of cacao butter with 2 g.  $MgO$ , filter, remove the 19-mm. titer tube, place 10 cc. of the filtered cacao butter in it, heat to  $50^\circ$ , replace, stir with the thermometer until the blue line becomes invisible, using a 25-watt light in the background. The time interval in sec. between start and finish is noted by means of a stop watch. Continue the test without stirring and note the highest temp. reached by the thermometer. The time interval between the turbidity point and the highest temp. point is expressed in min. In some cases different results are obtained; the test is then immediately repeated. Results are tabulated for various cacao butters, varying in turbidity point between 510 seconds for pure, pressed cacao butter and 1140 seconds for hull-extd dark cacao butter, and between 75 min. and 265 min. in the titer time in the first test. The 2nd detn. varied between 450 and 1020 sec. and 66 and 233 min., resp. American lard (2nd test) showed 360 seconds for turbidity and 8 min. for titer; tallow 75 sec and  $1\frac{1}{4}$  min.; hardened fish oil 90 sec. and  $1\frac{1}{2}$  min. and hardened coconut oil 330 sec and 9 min. P. ESCHER

**The unsaturated fatty acids of chrysalis oil.** WASABURO KIMURA. *Chem. Umschau Fette, Oele, Wachse u. Harze* **36**, 185-90(1929).—See C. A. **22**, 2478. P. E.

**Colorimetry of oils and fats.** G. GREITEMANN. *Chem. Umschau Fette, Oele, Wachse u. Harze* **36**, 167-8(1929).—Lovibond's tintometer is the standard instrument for international trade, but is too expensive for general use; likewise Zeiss' "Stufen-photometer" which measures the light permeability of the spectrum. It is proposed to measure the intensity of the color rather than its exact tint, by comparison with I soln. in KI of 25 mm. depth, contained in sealed glass tubes. The color no. then expresses the no. of mg. of free I in 10 cc. KI soln., measured in a layer 25 mm. deep. P. E.

**Gas masks in the oil and fat industry.** O. NEUSS. *Chem. Umschau Fette, Oele, Wachse u. Harze* **36**, 190-3(1929).—I. A description of the Degea gas mask is given with the absorption by wt. and vol. of acetone, benzene, phosgene,  $SO_2$ ,  $HCl$ ,  $Cl$ ,  $NH_3$ ,  $HCN$ ,  $H_2S$ ,  $PH_3$  and  $As_2H_3$ . P. ESCHER

**Combined oil refining methods.** K. LÖFFL. *Seifensieder Ztg.* **56**, 205-6(1929).—The "Wecker" method for removing free fatty acids (C. A. **23**, 2587, 3361) shows no advantage, since the removal of fatty acids by distn. down to  $\frac{1}{2}\%$  introduces an extra factory operation. P. ESCHER

**Bleaching dark oils.** M. DITTMER. *Seifensieder Ztg.* **56**, 210-11, 224-5(1929).—When the loss of color in oil refining or bleaching is judged, it is necessary to det. the oxidized acids by the petroleum ether method. If the fatty acids sol. in petroleum ether have a lighter color than the fat or oil itself, the preliminary purification and the refining must be carried far enough to approach the color of the fatty acids before any bleaching with fuller's earth is attempted; palm oil may be bleached directly without refining. Every bleaching or refining process should leave the "dirt" chemically unchanged, in order to ensure its normal behavior during the settling of the soap in the kettle. P. ESCHER

**Studies on decolorization of oil.** R. ERSBAK. *Kem. Maanedblad Nord. Handelsblad Kem. Ind.* **10**, 64-7(1929).—The use of aqueous solutions of methylene blue for detg. decolorizing power is criticized. Curves and tables are given for the decolorizing effect of floridin, Tonsil A. C. decolorizing carbon and mixtures of these on palm-kernel oil. KRISTIAN HØJENDAHL

**The regularity of the variations of the character of oils extracted from an animal as a function of the point of sampling.** L. MARGAILLAN. *Compt. rend.* **188**, 1630-2

(1929).—Studies on 3 varieties of the Delphinidae showed wide variations in the properties of oils selected from different parts of the same animal. These variations follow a definite order, the I no. increasing from the nose to the tail, except that near the eye, nose and mouth there are local variations. This regular variation is quite general.

AMY LEVESCONTE

**Iodine values on menhaden fish oil.** C. H. BANKES AND A. R. LANGE. *Oil & Fat Ind.* 6, No. 7, 31, 3(1929).—The Wijs and the Hanus methods were compared on 3 samples of oil contg. 2.75, 4.08, and 10.39% free acid, resp. The figures show that the Wijs method requires less time and the I nos. by both methods increase relatively to the time allowed for I adsorption. The Wijs method is more reliable and faster than the Hanus.

E. SCHERUBEL

**Report of committee on crude mill operations.** A. K. SCHWARTZ, *et al.* *Oil & Fat Ind.* 6, No. 7, 20–1(1929); cf. *C. A.* 22, 2674.—Two cooking conditions were established representing a variation in rate of heating, time of cooking and amt. of  $H_2O$  added to an extent liable to occur in ordinary mill operation. The results confirm the generalization that the most important cooking factor governing the quality of the oil is the rate of heating of meats, that governing the extent of extn. being the time of cook with a corresponding increase or decrease in the  $H_2O$  of the meats.

E. SCHERUBEL

**Report of the Kreis test committee.** A. S. RICHARDSON, *et al.* *Oil & Fat Ind.* 6, No. 7, 28–9(1929).—Six wintered cottonseed oils were studied from the viewpoint of uniformity of the Kreis test, its value as an index of the degree of rancidity, as well as the degree of rancidity developed after further exposure of the samples to air. The results obtained varied widely; and the most significant result to date is the failure of different labs. to agree on whether the Kreis test is pos. or neg. for a given sample. The av. grading of the samples fails to show any relation between intensity of the test and rancidity or quality of the oil as judged by flavor, but no definite conclusion can be drawn from the erratic results obtained.

E. SCHERUBEL

**Methods for cottonseed analysis.** G. S. JAMIESON AND R. S. MCKINNEY. *Oil & Fat Ind.* 6, No. 7, 11–3(1929).—The results of work on the following detns. are discussed: moisture,  $NH_3$ , free acid and oil in seed.

E. SCHERUBEL

**By-products in manufacturing abietic essential oils. Abietic extracts.** P. A. BOBROV. *Zhur. Prikladnoi Khim.* 1, 189–94(1928).—Abietic exts. can be consumed by the tanning industry.

V. KALICHEVSKY

**Sulfonated oils. I. Preparation of pure sodium salt of the acid sulfate of ricinoleic acid and its isolation from commercial sulfonated oils.** KYOSUKE NISHIZAWA AND KINZIRO WINOKUTI. *Chem. Umschau Fette, Oele, Wachse Harze* 36, 79–81(1929).—The Grün-Wolzenberg's method (*C. A.* 3, 1749) was followed for prepg. pure sulfuric ester. The Ba salt was prepd. from its aq. soln. and the free acid sulfate of ricinoleic acid liberated with strong acid as a yellow oil. An alc. soln. of this was neutralized with NaOH, the pptd.  $Na_2SO_4$  filtered off and the filtrate crystd. at low temp. repeatedly. The final product was rhombic needles, belonging optically to the biaxial positive crystals, showing extinction between crossed nicols. It is very hygroscopic, sol. in  $H_2O$  and nearly insol. in org. solvents. It is difficultly sol. in 98% alc., but lesser concns. of alc. and high temps. increase its soly and this fact was utilized for further purification of the Na salt of the acid sulfate of ricinoleic acid (I),  $(CH_3(CH_2)_7CH(OSO_3Na)CH_2CH:CH(CH_2)_7COONa)$ . On account of retarded crystn. through foreign admixtures it is not possible to obtain the I by neutralizing an alc. soln. of the sulfonated oil with NaOH. But by adding HCl and ether to the sample ("Monopol" oil, "Monopol soap and Turkey red oil") and with above method as modified by N. and W. good results were obtained in isolating I, proving that this acid is actually present in com. sulfonated castor oils. II. **Saponification of the acid sulfate of ricinoleic acid or its sodium salt.** *Ibid* 97–102.—N. and W. investigated systematically the reaction when sapon. pure I, alone and in the presence of acids and alkalis. Sapon. was complete with  $N$  HCl in 25–30 min. and with 2  $N$  HCl in 15–20 min. at  $100^\circ$ . With  $N$   $H_2SO_4$  sapon. is complete at  $100^\circ$  in 40–50 min. and with 2  $N$   $H_2SO_4$  in 20–30 min. The organically combined  $H_2SO_4$  in sulfonated oils can be found by titration after boiling with the proper quantity and proper concn. of  $H_2SO_4$ . The aq. soln. of the Na sulfate of ricinoleic acid is neutral toward methyl orange. The free ester in its  $H_2O$  soln. is salted out as the acid salt by large addns. of NaCl, etc.; and during the sapon. the  $HSO_3$  group is split off as  $NaHSO_4$  and not as  $H_2SO_4$  as stated by Herbig. The stability of the Na salt of the ester was tested by keeping a 0.1  $M$  aq. soln. for 5 hrs. in the thermostat at  $75^\circ$ , showing 2.86% sapon. and at  $100^\circ$  18.54%. Addn. of 10  $N$  NaOH at  $100^\circ$  as in the manuf. of "Monopol" soap caused only a trace of  $BaSO_4$  ppt. after 1 hr. 0.93  $N$  NaOH after 5 hrs. caused 12.55% and 4.54  $N$  NaOH only 5.64% sapon., thus showing a fair stability toward OH ions

but instability toward H ions. In alc. NaOH soln. the salt is more stable in weak in concd. solns.

**The sodium hydroxide saponification number.** W. NORMANN. *Chem. Umschau Fette, Oele, Wachse u. Harze* **36**, 197-8(1929).—For convenience of factory use the sapon. no. of oils and fats should be expressed in terms of NaOH. Tables of these nos. and of "free fatty acids" are appended.

**Glycerol in the oil and soap industry.** J. LEIMDORFER. *Seifensieder-Ztg.* **56**, 208-10(1929).—It is now possible to combine fatty acids with glycerol in a homogeneous system at low temp.; no details of the method are given.

**Proposed methods for the examination of waxes and wax products.** BUCHNER. *Chem. Umschau Fette, Oele, Wachse u. Harze* **36**, 203-8(1929).—An addnl. set of proposed analytical methods, issued by the German Commission for Fat Analysis, is given in full.

**Metal soaps and their uses.** HANS J. BRAUN. *Metallbörse* **19**, 1461-2(1929).—Soaps contg. Cu, Mg, Zn, Cd, Hg, Ca, Ba, Al, Pb, Bi, Cr, U, Mn, Fe, Ni and Co are described.

**Potash soaps and liquid soaps.** EUGENE SCHUCK. *Am. Perfumer* **24**, 221-3, 279-80(1929).—The manuf. of potash soaps is discussed. In making a coconut oil base soap 24 to 25 lb. of KOH per 100 lb. oil is used in place of the theoretical 28 lb., as the latter would make the soap too strong. The chem. properties of a base soap for liquid soap are low free KOH, low unsapond. oil, absence of sugar and alc., a specified % H<sub>2</sub>O and min. insol. in alc. Expts. show that soaps with low % of anhyd. soap filter rapidly, and carrying with them a large amt. of K stearate on account of their higher diln., are more sensitive to changes in temp than the concd. solns.

**Triethanolamine soaps in toilet preparations.** RALF B. TRUSLER. *Aromatics* **10**, No. 5, 27-9(1929).—The prepn., properties and application of these soaps are discussed.

**Carbon dioxide and soap in water-alcohol mixtures.** O. SCHÜTTE. *Seifensieder Ztg.* **56**, 85-6, 93-4(1929).—Ald. solns. of pure fatty acids were sapond. under reflux with 10 N KOH. After neutralization with 2 N AcOH, washed CO<sub>2</sub> was passed through at 20° for 15 min. Ppts. of the compn. 1 mol. acid and 1 mol. K salt of fatty acid were formed for stearic, palmitic, myristic and erucic acids. Oleic, linolic and lauric acids did not yield any soap ppt. under these conditions. Dioleate of K could only be obtained by pptn. at 0°. Hardened fat in tallow can be detected by CO<sub>2</sub>: 5 g. fat is saponified with 65 cc. alc. and 6 cc. 10 N KOH; neutralized with AcOH and filled up to 130 cc. with H<sub>2</sub>O. Through this soln. is passed a rapid stream of washed CO<sub>2</sub> at 8-10° for 15 min. The ppt. of acid soaps is filtered with suction through coarse-pored filter; washed once with 50% alc. (vol.) at 8-10°; dissolved in 65 cc. warm alc., neutralized with 2 N KOH, filled with H<sub>2</sub>O to 130 cc. and pptd. with CO<sub>2</sub> as before at 8-10° for 15 min.; filtered; and washed 3 times with 50% alc. The fatty acids are liberated and the I no. is detd. If the I no. lies above 10, an addn. of 15% or more of hardened fat is established. The I no. of the solid acids of 5 tallows by above method ranged from 5.6 to 7.6 and those of hardened fish and peanut oil from 30.24 to 67.44.

**Detoxifying, diffusing, germicidal and surface-tension-depressing properties of soaps.** FORREST R. DAVISON. *J. Infectious Diseases* **43**, 292-9(1928).—Twelve common soaps were prepd. and the above properties studied. Castor oil, coconut oil, linseed oil and cottonseed oil soaps have the highest detoxifying ability, the highest germicidal ability, an outstanding dialyzing ability but are correspondingly ineffective surface-tension depressants.

**Colloidchemical changes in fatty oils (AUER) 30.** Detection of water in oil (Ger pat. 477,639) **22.** Emulsions of oils (Brit. pat. 302,761) **13;** (Brit. pat. 301,805) **22.** Purifying oils (Fr. pat. 656,728) **23.** Montan wax [bleaching other waxes] (Brit. pat. 302,626) **21.** Separator for oil and water (Austrian pat. 113,339) **1.** Extraction and treatment of neutral grease from wool-washing baths (Belg. pat. 355,533) **25.**

**Fatty acids.** RAYMOND VIDAL. Fr. 34,067, May 10, 1927. Addn. to 637,271 (C. A. **23**, 536). Fatty acids or fish and cetacean acid oils are heated before the treatment with aq. solns. of alkali hypochlorites or hypobromites.

**Fatty acids.** RAYMOND VIDAL. Fr. 34,097, June 17, 1927. Addn. to 637,274 (C. A. **23**, 536). A small amt. of a mineral or org. acid is added to the fatty acids, fatty acids and mineral oil, or animal, mineral or vegetable oil before the treatment with alkali hypochlorites or hypobromites.

**Extraction of oil from green palm fruit by liquid solvents with or without separation**

of the palm or palmetto oil. R. WALLON. *Belg.* 354,998, Nov. 30, 1929. A heavy liquid solvent is used, b. above  $100^{\circ}$ , and the extn. is carried out above  $100^{\circ}$  so as to evaporate the  $H_2O$  of the fruit.

Extraction of oil from green palm fruit by liquid solvents with or without separation of the palm or palmetto oil. R. WALLON. *Belg.* 355,473, Dec. 31, 1928. The process is carried out under partial vacuum, so that steam under pressure can be used to reduce the distn. of the solvent.

Extraction of oil from green palm fruit by liquid solvents with or without separation of the palm or palmetto oil. R. WALLON. *Belg.* 355,878, Dec. 31, 1929. An app. for carrying out the process is specified.

## 28—SUGAR, STARCH AND GUMS

J. K. DALE

Economies in sugar technology. J. HAMOUS. *Listy Cukrovar.* 47, 442(1929).—A discussion. FRANK MARESH

Manufacture of sugar according to the New Oxford Process. ODON VAJDA. *J. fabr. suc.* No. 49(1928).—A review. E. A. FIEGER

The presence of zinc in the products of sugar manufacture. O. SPENGLER AND K. ZABLINSKY. *Z. Ver. deut. Zuckerind.* 79, 251-42(1929).—The Zn content of sugar products is very much less than that of other food products, though it is present in most sugar-factory products. The zinc content of the beet itself is the source. Zinc-coated surfaces are very resistant to sugar liquors while tin-coated iron surfaces are impractical because they rust readily, darken the liquors and cause development of acidity. With Zn the  $p_H$  change was small. From this evidence it seems futile to forbid the use of zinc-coated app. in refineries. F. CAMPS-CAMPINS

Final reports 1928 of mill control and fuel control. ANON. *Arch. Suikerind.* III, *Mededeel. Proefsta. Java-Suikerind.* 1929, 137-230. P. R. PEKELHARING

Sugar-house and refinery raw sugars and massecuites. J. BERGÉ. *Chimie & industrie Special No.*, 641-7(Feb., 1929).—Refined sugar with a min. sucrose content of 99.50% can be obtained directly from raw sugar or massecuite by means of centrifugal force approaching 40,000 times gravity (1200-2500 times being normally employed). In certain exceptional cases, where concn. has been carried too far, the residual mother liquor forms a sort of a lacquer around the sugar, but by exposing to suitable atm. conditions the product may absorb sufficient moisture to permit of refining by centrifuging as above. Though the process has not yet reached the stage of industrial application and will first require further improvements, its commercial application is considered as assured. The merits of the process are briefly discussed. A. P.-C.

The use of the rotary tubular Lafeuille apparatus for the crystallization of sugar. M. LAFEUILLE. *Bull. assoc. chim. suc. dist.* 46, 155-9(1929).—The operating results of the rotary tubular Lafeuille crystallizer, and of the crystallizer pan are reviewed. F. CAMPS-CAMPINS

Conductivity control of the products of centrifuged sugar. V. NETUKA. *Listy Cukrovar.* 46, 564-6(1928).—Prior to using the cond. method, N. tried a polarimeter method of controlling the centrifuging process. Without technical control 60% of products fell outside the stipulated limits; with the polarimeter for control only 13% exceeded the limits. Cond. methods will be tried for this control. F. M.

The influence of planting, harvesting and age on the sugar and cane production of 2878 POJ during crop 1928. G. BOOBERG. *Arch. Suikerind.* III, *Mededeel. Proefsta. Java-Suikerind.* 1929, 289-458. P. R. PEKELHARING

The application of decolorizing carbons in the cane-sugar industry. P. HONIG & J. F. BOGTSTRA. *Arch. Suikerind.* III, *Mededeel. Proefsta. Java-Suikerind.* 1929, 231-88.—A historical review is given of the results obtained in Java with decolorizing carbons. These were favorable only on remelted sugars. Expts. were carried out at Somobito, a carbonation mill, the object being to find out if the quality of the sugar was improved by graining the first strikes on a soln. of final sugar in thin juice which had been clarified and decolorized. A soln. of final sugar in thin juice at 60 Brix was treated with lime and  $CaHPO_4$  simultaneously to 7.2  $p_H$  and heated to  $75^{\circ}$ . Hyflo Supercel was added and the soln. filtered through Scheibler filters then through four Scheibler filters, charged with 38 kg. carboraffin each. Total decolorization amounted to 50-60%. The chem. clarification and prefiltration removed considerable more colloids than the carboraffin filtration. Sugar boiled from the latter was of ex-

cellent quality, but sugar boiled from the prefiltered soln. was of equal quality if sufficiently well washed. The expts. did not show a correlation between the color of the soln. and the coloring matter incorporated in the crystals boiled from that soln.

**A new method for purifying the juices of sugar beets.** A. I. LITZYAGA <sup>nn</sup> *Weissruth. Staatl. Akad. Landw. Gorky* 7, 315-21(1928).—L. presents the method of *skatelo* for clarifying diffusion juice by satn. of limed juice with  $MgSO_4$ . A complete sepn. of the org. and inorg. impurities takes place. This treatment brings into the sugar juice some  $CaSO_4$ , and in the sugar one may find as high as 0.4% gypsum. This time-saving process eliminates several steps in the satn. process. J. S. JOFFE

**Diffusion experiments with dried sliced beets.** V. STANEK AND K. SANDERA. *Listy Cukrovar.* 47, 407-14(1929).—Beets from the Eynsham district (Bohemia) were sliced and dried. Diffusion was carried out in batteries of cells of 1 l. capacity. A very complete analysis of the beets, liquor and residue permitted a detn. of the distribution of the products especially N compds. Albuminoid N remains in the beet residue; other forms of N compds. are distributed as in the diffusion of fresh undried beets. The diffusion liquor is very acid and contains 2.2 pts. invert sugar to every 100 of sucrose. Drying did not decompose the amides as they appear in large quantities in both the diffusion liquor and residue. FRANK MARESH

**Plant reproductive cells. III. Constituents of the pollen grains of the sugar beet.** A. KIESEL AND B. RUBIN. *Z. physiol. Chem.* 182, 241-50(1929).—Sugar-beet pollen collected during 2 seasons gave the following proximate analyses: Total N, 5.25, 5.61; protein N, 3.55, 4.15; non-protein N, 1.70, 1.46; free fat, 4.56, 4.33; total fat, 10.92, 10.92; lecithin, 2.87; glucose, 0.85, 0.80; sucrose, 4.83, 5.34; maltose, 4.03, 3.36; starch, dextrin and hemicelluloses, 7.63, 8.99; ash, 7.26, 6.02%. The ash contd. 4.82, 5.15%  $CaO$ ; 21.2, 21.1%  $K_2O$ ; 6.61, 7.31%  $MgO$ . From the  $H_2O$  ext. a hydrocarbon  $C_{12}H_{22}$ , m. 61.5-63.5°, was obtained in a yield corresponding to 2% of the dry pollen. Its function is evidently to render the grains impervious to  $H_2O$ . The  $H_2O$  ext. contained about 40% lecithin as judged from its P and N content. Adenine was isolated in 0.04% yield. A striking observation was the high betaine content which amounted to 2.96% of the dry pollen or  $1/5$  of the non-protein N.  $Me_3N$  was not present as such. The occurrence of  $Me_3N$  reported by Stift must have resulted from decomposition of betaine during the analysis. The mother liquor from the betaine contained a small amt. of choline, which was identified as the chloroplatinate. A. W. DOW

**A process for rendering harmless the waste waters from a beet-sugar factory.** H. BACH. *Z. Ver. deut. Zuckerind.* 79, 241-50(1929).—Waste waters of beet-sugar factories introduced into streams, may cause the death of fish since they contain substances which combine with the oxygen dissolved in the water. The waters also contain substances toxic to fish but in too great diln. to cause trouble. Only the water from the diffusion battery and the presses is harmful. A remedy is aeration of the waste waters either before or after introduction into the stream. F. C. C.

**The removal of condensed vapors from distillates, vacuum pans and heaters without the use of sieves.** FR. PAULIK. *Listy Cukrovar.* 47, 481-2(1929).—A plant arrangement is discussed. FRANK MARESH

**Saturation.** J. DEDEK. *Listy Cukrovar.* 47, 495-500(1929).—A discussion. FRANK MARESH

**Sectional vacuum-pan system of A. A. Shumilov, Yu. D. Lyubchenko and R. R. Krauss.** E. R. KRAEVSKII. *Zhur. Sakharnoi Prom.* I, 356-72(1927). V. E. B.

**The advantageous zone of  $p_H$  for refinery liquors.** M. I. NAKHMANOVICH. *Nauk. Zapiski Sakharnoi Prom.* 7, 265-81(1929).—Refinery liquors adjusted to  $p_H$  values within the limits of 5.9 to 9.3 were heated. Refinery liquor slightly alk. or neutral to phenolphthalein, ( $p_H \approx 8$ ) increased in color on heating for 1 hr. at 95° or 2 hrs. at 85°. The danger of producing color is less at  $p_H$  from 8.0 to 7.0. At  $p_H$  7.0 heating 3 hrs. at 95° had no effect on the liquor. Destruction of sugar begins below  $p_H$  7.0. According to the expts.,  $p_H$  7.0 to 7.5 is the most advantageous zone for filtering refinery beet-sugar liquors. V. E. BAIKOV

**Saccharification of wood by weak acids.** E. DESPARMET. *Chimie & Industrie Special No.*, 571-7(Feb., 1929).—In lab.-scale expts. sawdust was hydrolyzed with 3-5 parts of 2-4%  $H_2SO_4$ , a pressure of 4-12 kg. per sq. cm., and a period of 3-30 min. The rate of formation of reducing sugars (essentially dextrose) was extremely rapid, reaching a max. in 3 min. The rate of destruction of dextrose was also rapid. At high pressures (about 12 kg), sugar yield plotted against pressure gave a curve showing a 2nd max.; this is explained as follows: wood contains 2 groups of polysaccharides hydrolyzed at different rates; the rate of hydrolysis of the 1st polysaccharide group is



very high and is little affected by pressure or acid concn. while that of the 2nd group is appreciably lower and is distinctly influenced by pressure and acid concn. Three-min. hydrolysis with 3 vols. of 2%  $H_2SO_4$  at a pressure of 8 kg., washing with  $H_2O$ , followed by a 5-min. hydrolysis with 3.7 vols. of 4%  $H_2SO_4$  at 12 kg., gave a total yield of 36.5% reducing sugars, with a simultaneous loss in wt. of 47.6%. The hypothesis of the existence of 2 types of polysaccharides in wood is sustained by the fact that prolonged hydrolysis (30 min.) at low pressure (about 8 kg.) gives a residue resembling the original sawdust, while short hydrolysis (5 min.) at high pressure (12 kg.) leaves a fine powder of much smaller vol. and higher d. than the original sawdust.

A. PAPINEAU-COUTURE

The use of sugar-cane waste products as cheap and effective larvicides (RICKARD, *et al.*) 15. Spray drying (for molasses and sugar) (NYROP) 13. An apparatus for removing foams from samples of liquors (HERNYCH) 1. Factors in the estimation of starch by the I method (LEPIK) 7. The extermination of the fungus *Cercospora beticola* on beets (KREŠL, PRSKA) 15. Cement (from lime used for defecating sugar solutions (Fr. pat. 656,892) 20. Sulfonated carbohydrates (from starch) (Fr. pat. 657,204) 23. Carbohydrate (starch) derivatives (Fr. pat. 656,861) 23.

Apparatus for purifying starch-converted dextrose solutions by electrolysis and osmosis. CORN PRODUCTS REFINING Co. Brit. 302,375, Aug. 15, 1927. A cell is described in which colloids and metal hydroxides are sepd. at the cathode and acid radicals of the metallic compds. migrate to the anode, thus reducing acidity of the solu in the cathode compartment and promoting further coagulation of the colloids there present.

## 29—LEATHER AND GLUE

ALLEN ROGERS

Report of German Leather Industry Research Institute, 1928. PAESSLER. *Gerber* 55, 69-71, 80-2(1929).—Results of analyses of tanning materials and accessories are given

H. B. MERRILL

Histological structure of skin and its relations to the quality of the finished leather. I. Histological structure of skin. MADGE KAYE. *J. Intern. Soc. Leather Trades Chem* 13, 73-87(1929).—The general histology of skin is discussed, and the fibers are considered in detail. Collagen, elastin and reticulin fibers are distinguished. Reticulin fibers, very fine and delicate in form, have hitherto been classed either as elastin or as collagen. They can be distinguished from collagen and elastin by means of staining reactions, acid and alkaline swelling and selective enzyme digestion. Reticulin fibers permeate the whole of the fibrous portion of the skin, forming a very delicate connecting and supporting tissue. Reticulin is very resistant to the action of acid and alkali, but is readily attacked by bacteria and is gradually attacked by  $Na_2S$ . Reticulin fibers are destroyed by putrefaction and ruptured by drying or by excessive swelling of the skin. It is necessary to break down the reticular structure in order to produce a leather at once full and supple, but once this is done the stock must be treated with care to avoid loose leather. Relation of structure and arrangement of fibers to quality of leather. *Ibid* 118-54.—Factors considered are (1) type of "weaving," (2) internal structure of bundles, (3) packing and (4) uniformity. These differ in different parts of the skin, are interrelated, and may be good or bad depending upon the kind of leather to be produced.

H. B. MERRILL

Preservation of hides with brine and salt. MADGE KAYE. *J. Soc. Chem. Ind.* 48, 141-87(1929).—Pieces of oxhide cut within 15 min. of the death of the animal were kept in the air for from 0 min. to 8 days, then samples of each were brined with solns. contg 10-33%  $NaCl$ , or salted with dry  $NaCl$ . Microscopic examn. of samples before brining showed that delay of even .5 hrs. before brining caused noticeable changes. Changes occurring up to 8 days included progressive destruction of cell nuclei; loosening and destruction of epidermis; shrinking and destruction of fat and sweat glands; contraction, shrinkage and destruction of erector pili muscles; breaking away of follicles from hairs, beginning at roots; collapse of blood vessels; breaking away of elastin fibers from other tissues (fibers themselves were apparently not altered); increasing shrinkage, sepn. into fibrils, and straightening of collagen fiber bundles. All these effects except damage to muscles and elastin fibers are visible after 11 hrs. Treatment with solns. contg. 23%  $NaCl$  or more is sufficient to arrest damage, when the temp.

is 22°, but at higher temps. 27% NaCl is the lowest effective concn. The influence of the common denaturants used in continental Europe was studied; the best results were obtained with NaHF<sub>2</sub> or Na<sub>2</sub>CO<sub>3</sub>; K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> does not seem to produce permanent stains on hide, but CuSO<sub>4</sub> sometimes does. Defects in hides and leather traceable to improper salting preservation include "marbled" grain, pipiness, thin grain, tender and loose leather, veininess and greasiness (due to excessive absorptivity for oil).

H. B. MERRILL.

**Action of sodium chloride on hide and animal tissues.** A. PONTE. *Boll. ufficiale staz. sper. ind. pelli mat. concianti* 7, 97-119(1929).—The employment of NaCl in the tannery and for preservation of foods is discussed and the theory of its action given. The changes in vol. occurring in hides when immersed in pure NaCl solns. of different concns. were detd. experimentally. Including the results obtained in former studies the vol. of hide corresponding to 100 g. of dermic substance dried at 100° was 70 cc., that of hide dried in air (12% H<sub>2</sub>O), 85 cc., of partially dehydrated hide (59 and 64% H<sub>2</sub>O, resp.), 214 and 247 cc., resp.; of hide in the normal state (79.5% H<sub>2</sub>O), 450 cc. Treatment with 5.8% NaCl soln. caused the vol. to increase to 464 cc., while treatment with solns. contg. 11.7, 17.5 and 23.4%, resp., of NaCl soln. brought about a reduction of the vol. to 347, 221 and 194 cc., resp.

G. SCHWOCH.

**Salt stains.** FRITZ STATHIER. *Cuir tech.* 18, 110-6, 134-41, 155-60(1929) See C. A. 23, 1303.

J. G. NIEDERCORN

**Unhairing with *Aspergillus oryzae*.** CH. BERLINER. *Cuir tech.* 18, 132-3 (1929).—The use of the enzymes of *Aspergillus oryzae* on a large scale is described.

J. G. NIEDERCORN

**Studies on the disinfection of anthrax-infected hides. II. The sodium sulfide method.** G. BROTZU. *Boll. soc. ital. biol. sper.* 4, 154-6(1929); cf. C. A. 22, 2289. Normal solns. of various inorg. salts were added to equal parts of N NaOH and Na<sub>2</sub>S and the mixt. was tested for germicidal activity on anthrax-infected hides and on filter paper satd. with a strain of anthrax of medium resistance. K<sub>2</sub>AsO<sub>4</sub> was the most effective in strengthening the germicidal power of NaOH and Na<sub>2</sub>S. Anthrax-infected hides were completely freed of spores when treated by this mixt. The results with filter paper were irregular.

PETER MASUCCI

**Some studies of the science and practice of bating.** GEO. D. McLAUGHLIN, JOHN H. HIGHBERGER, FRED O'FLAHERTY AND E. KENNETH MOORE. *J. Am. Leather Chem. Assoc.* 24, 339-78(1929).—In beamhouse procedure corium gains more wt. than whole skin at every stage. Elastin from ligamentum nuchae of steer and calf gained wt on treatment with satd. Ca(OH)<sub>2</sub> soln. and lost wt. after treatment with oropon. Elongation under pull of 500 g. decreased on liming and increased on bating. Loss of N of elastin showed only negligible amts dissolved in bating for 4 hrs., compared to amts dissolved in soak and lime. Involuntary muscle from uterus of calf lost 2% N in soak, 14.6% in lime and 2% in oropon bate (24 hrs.). These findings indicate that digestion of elastin and erector pili muscles is not an important function of bate. Swelling (H<sub>2</sub>O-imbibition) was detd. for whole skin, involuntary muscle and elastin after soak, after lime, after bate and after resoaking in H<sub>2</sub>O at 50°F. following bating. Bating was done for 1 or 2 hrs. with either oropon, lactic acid or NH<sub>4</sub>Cl. Involuntary muscle swelled more than other tissues after liming; the difference was decreased by bating but reappeared on cold-water treatment. The decrease brought about by bating and the subsequent increase was the same for purely chemical and for enzyme bate. Swelling of erector pili muscles accounts for roughening of goat skins observed when they are plunged into cold H<sub>2</sub>O after bating. It is deduced from photomicrographs that reticular tissue is dissolved during bating. S and N contents are tabulated for calf hair, hair and scurf, epidermis, upper 15% of skin, corium, whole skin, keratose and metaprotein from lime liquor. Of total N dissolved in the beamhouse, about 25% is dissolved in the soak, about 50% in the lime and the rest in the washes and bate. Total N removed from skin in washes and bate increases only slightly with time of bating, and total S removed in washes and bate does not increase at all with time of bating. Increased time of bating causes relatively more of each material to be removed in the bate and relatively less in the subsequent wash. Slightly more N is removed up to 3 hrs. by the active bate, and no more S is removed by the active than by the inactive bate. Removal of keratose is not an important function of the bate, since keratose is rich in S. N removed up to 3 hrs. is ascribed to digestion of coagulable dissolved protein. At 3 hrs., rate of digestion of N by active bate increases sharply; this is attributed to digestion of collagen. Rate of soln. of N and S in bating is independent of whether skin was soaked in pure H<sub>2</sub>O or in 10% NaCl. Total N dissolved in beamhouse is greater when skins are soaked in salt solns. **Conclusions.**—Principal functions of bating

are removal of sol. coagulable protein (inter-fibrillary substance), and reticular tissue.

H. B. MERRILL

**Contribution from the institute of tannery science. IV. G. GRASSER AND H. NAKANISHI. *J. Faculty Agr. Hokkaido Imp. Univ.* 23, 87-90(1929). 1. Tanning action of alcoholic tannin solutions.** Plates of dry gelatin (0.5 g.) were placed in solns. contg. 5 g. dry tanning material in 50 cc. EtOH for 3 days. The following materials were employed: oak gall tannin, oak wood ext., quebracho ext., Neradol D, quinone, HCOOH (40% aq. soln.). The m. p. of the gelatin plates and wt. of H<sub>2</sub>O absorbed on swelling in 0.1 N NaOH and HCl were detd. before and after treatment. These tests showed that HCOOH had marked tanning action (the m. p. was raised from about 35° to 94.5°), quinone a very slight, and the other materials no tanning action in EtOH soln. The tanning action of HCOOH is accounted for by the H<sub>2</sub>O introduced in the 40% soln. employed. In a duplicate series, in which the gelatin was allowed to imbibe H<sub>2</sub>O before being placed in the EtOH soln., HCOOH and quinone raised the m. p. to a value higher than 100°; the other materials showed no tanning properties even in the presence of the small quantity of H<sub>2</sub>O introduced with the gelatin. 2. **Tanning action of complex chromium salts.** *Ibid* 90-3.—Strips of skin were tanned in solns. of Na dioxalato-diaquo-chromate to which was added Na<sub>2</sub>CO<sub>3</sub> to produce basicities of 53%-98%. On boiling, all the leathers shrank 62-72% of their original lengths. 3. **Effect of inert substances on alkaline swelling.** *Ibid* 93-110.—When 2 g. of unharmed and delimed skin is treated with 50 cc. of 0.01 N alkali or alk. salt, the swelling produced (judged from increase in wt. of skin) increases in the following order: Na<sub>2</sub>HPO<sub>4</sub>, Ca(OH)<sub>2</sub>, Na<sub>2</sub>CO<sub>3</sub>, NaOH, Na<sub>2</sub>S. The latter produces the most rapid as well as the greatest eventual swelling. On addn. of increasing amts. of neutral salts, swelling first increases, then decreases. Sugars decrease swelling and alcs. increase it. 4. **Chemistry of chrome salts.** G. GRASSER AND K. HIROSE. *Ibid* 110-25—(a) **Basic Cr salts.**—Na<sub>2</sub>CO<sub>3</sub> was added to solns. of Cr alum up to the pptn. point. Pptn. occurred when the % basicity was about 66. It is stated that this basicity forms the boundary line between crystalloid and colloid Cr salts, and that therefore "max tanning intensity" should be exhibited by a salt of the empirical formula [Cr<sub>6</sub>(SO<sub>4</sub>)<sub>2</sub>(OH)<sub>12</sub>]<sub>2</sub>. Hypothetical structural formulas of this and similar hypothetical compds. are given. (b) **Influence of age and temp. on acidity of Cr and Fe salts.**—Acidity is measured by the vol. of Na<sub>2</sub>CO<sub>3</sub> soln. required to produce a permanent turbidity when added to 10 cc. of the Cr or Fe salt soln. ("pptn. figure"). 0.125 M soln. of CrCl<sub>3</sub>, Cr<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub> and Cr alum were employed. Upon heating to 15-100°, the pptn. figure of CrCl<sub>3</sub> is const. up to 60°, then declines; that of Cr<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub> increases from 15° to 60°, then declines; that of Cr alum falls from 15-100°. On standing at room temp. for 42 days, the pptn. figure of CrCl<sub>3</sub> does not change; those of Cr<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub> and Cr alum fall slightly. On boiling for periods of from 1 min. to 48 hrs., pptn. figures for CrCl<sub>3</sub> and Cr alum vary irregularly; that of Cr<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub> increases markedly. Fe salt employed were FeCl<sub>3</sub> and FeSO<sub>4</sub>·(NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>. The pptn. figure of each salt soln. falls with increasing temp., but is unaltered by standing at room temp. On boiling, both solns. pptd. without addn. of alkali.

H. B. M.

**Qualitative analysis of tanning materials by means of ultra-violet light. V. KUBELKA AND V. NEMEC. *J. Intern. Soc. Leather Trades Chem* 13, 113 7(1929).—The fluorescence of tanning materials dissolved in (Et<sub>2</sub>O, AcOEt or EtOH) is stronger and more characteristic than in H<sub>2</sub>O. For Et<sub>2</sub>O or AcOEt, shake 20 cc. analytical tannin soln. with 10 cc. solvent for 5 min., sep. the ethereal layer and exam. under quartz light (1) soln. as prepd., (2) after acidification, (3) after making alk., (4) after drying on cotton wadding. For EtOH soln., ext. the dry tanning material with 50% EtOH and proceed as above. Fluorescence colors of 13 natural tanning materials, 13 syntans and sulfite-cellulose ext., are tabulated. *Specific reaction for gambier.* Add 5 cc. EtOH to 5 cc. aq. tannin soln., shake 1 min., and place under the lamp. In presence of gambier a gray-violet fluorescence is produced. Make alk. with NaOH, add 10 cc. petroleum ether, shake well, sep. petroleum ether layer, and exam. under the lamp. A brilliant pale green fluorescence is produced even in the presence of very small amounts of gambier.**

H. B. MERRILL

**Methods employed for the determination of the pH value of tan liquors and lime purrs. WINNIFRED BERTHA PLEASS. *J. Soc. Chem. Ind.* 48, 152-6T(1929).—Three methods are compared: (1) colorimetric (a), comparator, (b) "capillator;" (2) electro-etric methods involving the direct measurement of e. m. f. between a soln. contg. ions and standard electrode, (a) H electrode, (b) quinhydrone electrode; (3) electro-etric method depending upon e. m. f. between an exptl. liquor and buffer soln. sep'd. by glass membrane. The capillator is considered simpler and better than the compara-**

tor. In the capillator method the soln. under examn. is mixed with an equal vol. of a standard indicator soln. and drawn into a capillary, and the color compared with the color of a standard indicator soln. in a sealed capillary. Salt error is considered negligible. The color of the liquor interferes, but can be lessened by diln. and compensated for by introducing a special cell filled with a 2-fold diln. of the unknown soln. between the standard capillary tube and the eye. The capillator method is thought to be accurate to about 0.3  $p_H$  units. The H-electrode method gives satisfactory results, except in the presence of sulfides and sulfites. The quinhydrone electrode is of no use for  $p_H$  values greater than 8. The glass membrane cell gives satisfactory results for all types of tan liquors and lime liquors. Comparison of results obtained with capillator, H electrode, and so-called glass electrode for tan and lime liquors, to which were added varying amts. of  $Na_2S$  or  $Na_2SO_3$ , showed that the capillator checked the glass electrode for all concns. of  $Na_2S$  and  $Na_2SO_3$  in tan liquors; the H electrode checked the glass electrode in tan liquors when  $Na_2S \leq 0.0003\%$  and  $Na_2SO_3 \leq 0.05\%$ ; in lime liquors when  $Na_2S \leq 0.1\%$ . The capillator is not adapted to lime liquors because of the lack of suitable indicators. H. B. MERRILL

**Proposed official method of the I. S. L. T. C. for analysis of one-bath chrome liquors.** R. FARADAY INNES. *J. Intern. Soc. Leather Trades Chem.* 13, 111-2 (1929).—Cr is detd. by oxidation with  $H_2O_2$ . Decompn. of  $H_2O_2$  is catalyzed by Fe, or alternately by  $KMnO_4$ . In either case, soln. is filtered and Cr detd. with  $Na_2S_2O_3$  as usual. Ppt. of  $CaO_2$  sometimes forms in old liquors, but is removed by filtration. Acidity is detd. as usual, and  $p_H$  value electrometrically. H. B. MERRILL

**Notes on tannery laboratory equipment.** C. H. SPIERS. *J. Intern. Soc. Leather Trades Chem.* 13, 8-10 (1929).—S. suggests the use of stainless-steel balance pans which are said not to react with tan liquor, pipets of special sizes and other labor-saving devices. A simple comparator is described. H. B. MERRILL

**Some phenomena in vegetable tanning.** CESARE SCHIAPARELLI AND GIOVANNI BUSSINO. *Cuir tech.* 18, 147-51 (1929).—See C. A. 23, 1301. J. G. NIEDERCORN

**Vegetable tanning of lizard skins.** E. AMSTERDAMSKY. *Cuir tech.* 18, 111-6 (1929).—A description. J. G. NIEDERCORN

**The wattle-bark industry.** ANON. *Bull. Imp. Inst.* 27, 169-83 (1929).—An account of the attempts which have been made to utilize the by-products of the wattle bark industry, with a discussion of the bearing of the question on the future of the wattle-bark industry in countries of the British Empire. A. PAPINEAU-COUTURE

**Tanniferous barks of Madagascar.** I. MIMOSA. A. DEFORGE, J. MAHIEU AND F. HEIM DE BALSAC. *Halle aux cuirs* 1929, 49-57, 84-92; cf. C. A. 23, 3592. Advantages of mimosa as a source of tannin to replace vanishing European supplies are (1) rapid growth (bark harvested at 8-12 yrs.), (2) high tannin content, (3) high tannin-non-tannin ratio in ext., (4) ease of extn., and (5) low fermentability of ext. Tanning properties are so similar to those of chesnut that direct substitution is often possible. The red color imparted to the leather can be avoided by admixt. with suitable materials, e. g., with myrobalams. Analyses of 5 samples are given. III. "Rotra" (*Eugenia* sp.). *Ibid* 175-83.—Analysis of the bark showed:  $H_2O$  13.7%, tannin 12.6%, non-tannin 12.2%, insol. matter 61.2%; the ext. is very turbid; reducing sugars are present only in traces; it contains both catechol and pyrogallol tannin. The high non-tannin content indicates that the material is little astringent, and highly fermentable. These properties may make it valuable as one constituent of a tanning liquor. H. B. M

**The synthetic tannins in chrome tanning.** ENRICO SIMONCINI. *Boll. ufficiale staz. sper. ind. pelli mat. concianti, Suppl. tec.* 4, 51-6, 79-84 (1929).—S. distinguishes between "mild" and "strong" synthetic tannins. The "strong" synthetic tannins, among which figure the cresol derivs. (I), are of instantaneous action, while the "mild" synthetic tannins, whose type is represented by the naphthol derivs. (II), have a slow action. With I the intensity of the reaction between synthetic tannin and hide diminishes with decreasing acidity of the bath, while with II a change in the degree of acidity is of little influence on the velocity of the reaction. When samples of cow hide were given a treatment with II before the chroming, the quality of the resulting leather improved considerably. With I the results were less favorable. The concn. of the syntans influenced the amt. of  $Cr_2O_3$  absorbed during chroming, the absorbed  $Cr_2O_3$  decreasing with increased concn. of the syntans. G. SCHWACH

**Formaldehyde tannage.** B. ZIROULSKY. *Halle aux cuirs* 1929, 163-70.—Hide powder samples were digested with solns. of  $HCOOH$  under varying conditions of time, concn., and acidity or alkali. The decrease in  $HCOOH$  concn. of the soln. during the expt. was assumed to be a measure of the  $HCOOH$  taken up by the hide. Results

indicated that equil. is established in about 5 hrs., and that absorption increases with concn. of  $\text{HCOOH}$  and with concn. of  $\text{Na}_2\text{CO}_3$ , but decreases with concn. of  $\text{H}_2\text{SO}_4$ .

H. B. MERRILL

**Effect of nitrate oxygen upon tannery effluent.** EDWIN R. THEIS AND JOHN A. LUTZ. *Ind. Eng. Chem.* 21, 763-6(1929).—Soak-water from steer hides was treated with varying amts. of  $\text{NaNO}_3$  for varying periods, and amt. of reduction, vol. and compn. of gas evolved, and pressure produced was measured. Large vols. of  $\text{N}_2$ , with some  $\text{CO}_2$ , and a little  $\text{O}_2$  are produced; the %  $\text{N}_2$  in the gas increases with time.

H. B. MERRILL

**Pigment finishes [for leather].** M. C. LAMB. *J. Intern. Soc. Leather Trades Chem.* 13, 231-9(1929).—A review.

H. B. MERRILL

**Colloid chemistry in the leather industry.** GEORGES GÉNIN. *Halle aux cuirs* 1929, 44-7, 71-5, 115-8, 139-43, 184-8.—A review.

H. B. MERRILL

**Effect of heat on wetted vegetable-tanned leather.** III. W. J. CHATER. *J. Intern. Soc. Leather Trades Chem.* 13, 24-36(1929); cf. *C. A.* 23, 2596.—Strips of leather or pelt were variously treated, and their expansion and contraction curves upon heating in  $\text{H}_2\text{O}$  were detd. by the method previously described. The effect of borax stripping of vegetable leather is to increase the expansion up to shrinkage temp. and to lower the temp. of shrinkage. The effect becomes more marked the longer the leather is exposed to the borax. The effect of increasing the time that calf pelt is limed in satd.  $\text{Ca(OH)}_2$  soln. is to decrease the expansion up to shrinkage temp., and to lower the temp. of shrinkage. When strips of calf pelt are soaked in buffer solns. of various  $p_{\text{H}}$  values, the temp. of shrinkage is a max. when the soaking is done at  $p_{\text{H}}$  10, and decreases when  $p_{\text{H}}$  of the soak is either increased or decreased.

H. B. MERRILL

**Some present-day problems with special reference to measurement of properties of sole leather and effect of sulfuric acid.** D. BURTON. *J. Intern. Soc. Leather Trades Chem.* 13, 178-91(1929).—Recent work on the following topics is discussed: (1) measurement of properties of sole leather; (2) significance of sp. gr. of leather, (3) degree of tannage, (4)  $\text{H}_2\text{SO}_4$  in leather, (5) influence of method and degree of liming on yield of sole leather, (6) method for sterilizing anthrax-infected hides, (7) methods for analyzing bate liquors, (8) methods of preventing deposits from myrobalsams ext., (9) relation between constants of fats and oils and the properties they impart to leather, (10) difference between tanning liquors made from exts. and by leaching.

H. B. MERRILL

**Sulfuric acid in vegetable-tanned leather.** R. FARADAY INNES. *J. Soc. Chem. Ind.* 48, 149-52T(1929); cf. *C. A.* 22, 4003.—Hide was tanned in a vegetable tan liquor until partly struck through; it was then suspended in dil.  $\text{H}_2\text{SO}_4$  ( $p_{\text{H}}$  1.6) and tannage was completed in a series of vegetable-tan liquors. After acid treatment, before further tanning, the untanned portions of the skin contained more acid than the tanned portions, and as tanning progressed the acid content of the leather became less and less, showing that tannin hinders the taking up of  $\text{H}_2\text{SO}_4$  by collagen, and displaces that previously taken up. When  $\text{H}_2\text{SO}_4$  is added to solns. of chesnut, myrobalsams or mimosa, the liquor manifests a considerable neutralizing power for acid, sometimes in excess of that corresponding to the alk. of the liquor ash. Collagen sulfate (*i. e.*, skin contg. about 4%  $\text{H}_2\text{SO}_4$ ) is not damaged on storage up to 7 years, and on heating is not decompd. up to  $180^\circ$ . Vegetable-tanned leather contg. only half as much acid is decompd. on heating to  $140^\circ$ . The difference is that in pelt the acid is combined, while in leather it is free or readily hydrolyzable. The kind of tannin seems to be a factor in the decompn. of leather by acid. Conclusion: Treatment of skins with  $\text{H}_2\text{SO}_4$  before or during tanning does not damage the resulting leather; treatment after tanning may do so.

H. B. MERRILL

**Acidity control of chrome leather.** J. S. MUDD AND P. L. PEBODY. *J. Intern. Soc. Leather Trades Chem.* 13, 205-14(1929).—Samples of chrome leather were neutralized with varying amts. of borax and fat-liquored with sulfonated oil. The fat content of the leather decreased with increasing neutralization up to 2 parts borax per 100 leather; on further increasing the proportion of borax, % fat absorbed increased slightly. Samples of defatted leathers were boiled with  $\text{H}_2\text{O}$  for varying periods, and  $p_{\text{H}}$  value and titratable acid of ext. detd. Equil. is established in 45 min. or less. The  $p_{\text{H}}$  value of ext. increases with increasing degree of neutralization, and is characteristic of the acidity of the leather. Ionogenic  $\text{SO}_4$  detd. by extn. with 4% aq. pyridine, decreases with increasing neutralization, but complexly bound  $\text{SO}_4$  detd. by extg. with  $\text{NaOH}$  after pyridine extn., is not much diminished until excess of borax is very large. Basicity of leather increases with increasing neutralization, but basicity of Cr complex is not altered unless borax is used in large excess.  $\text{NaOH}$  and  $\text{Na}_2\text{CO}_3$  have the same effect as equiv. amts. of borax, but "sodium phosphate" (basicity not stated)

has a smaller displacing effect on sulfate than the other neutralizing agents used.

**Moisture in leather.** H. BRADLEY, A. T. MCKAY AND B. WORSWICK. *J. Intern. Soc. Leather Trades Chem.* 13, 10-24, 87-106(1929).—In the equation  $a = (\alpha p T / 273x) / (1 - \beta p T / 273x)$ ,  $a$  = amt.  $H_2O$  vapor taken up,  $p$  = % relative humidity,  $T$  = °K,  $x$  = 2 or a multiple of 2, and  $\alpha$  and  $\beta$  are consts. with respect to  $a$  and  $p$ , but vary with  $T$ . The equation agrees well with the exptly. detd. curves for various leathers over "quite a considerable range of humidity." Values of  $\alpha$  and  $\beta$  are given for 7 kinds of leather as well as for wood, cotton and wool.  $\beta$  is nearly constant for all these materials, and hence  $\alpha$  is a measure of absorptive power. Values for  $\alpha$  varied from 1.5 for a sole leather to 0.5 for a curried vegetable split. In general,  $\alpha$  decreases with increasing fat content. At high relative humidities leather gives up and takes on water at approx. the same rate, but at low relative humidities it gives up water very slowly and takes it on again very rapidly. No difference was observed in rate of diffusion of water through sole leather from grain side towards flesh side and *vice versa*. Values of  $H_2O$  vapor cond. const. are tabulated for 20 leathers. For the absorption of liquid  $H_2O$  is derived the equation  $Q/Q_m = 1 - (8/\pi^2)(e^{-\pi^2 kt/4a^2} + 1/9e^{-\pi^2 9kt/4a^2} + \dots)$ , where  $Q$  = quantity of water in leather at time  $t$  and  $Q_m$  = quantity at satn. This equation fits exptly. detd. absorption-time curves for leather remarkably well, proving that absorption may be regarded as a pure diffusion process.  $Q_m$  is not so important a criterion of water-proofness as the time,  $\tau$ , required to produce practically complete satn. When  $Q(\text{initial}) = 0$ ,  $\tau = (\text{Thickness})^2 / \text{Diffusivity}$ . Values for diffusion const. and for  $\tau$  are given for numerous leathers.

**Determination of fat in leather.** FINI G. A. ENNA. *J. Intern. Soc. Leather Trades Chem.* 13, 37-8(1929).—E. advocates drying the leather in an atm. of  $CO_2$  prior to extn.

**The manufacture of glazed kid.** GEORGES POUTZKARNIK. *Cuir tech.* 18, 73-7, 94-101(1929).—A description.

Chlorination of waters for industrial use [especially tannery water] (AUERBACH) 14. Methods and applications of photomicrography (WIGHTMAN, TRIVELLI) 5. The reduction of dichromate to basic chromic salts (GRASSER, NAGAHAMA) 6. Tanning of fishing nets (DURANT) 25. By-products in manufacturing abietic essential oils. Abietic extracts [for tanning industry] (BOBROV) 27. Sulfonated oils [for leather industry] (Fr. pat. 657,220) 25.

**Removal of wool from skins without attacking the wool or hair.** SOCIÉTÉ INDUSTRIELLE DES APPLICATIONS CHIMIQUES "INDAC." Belg. 355,180, Nov. 30, 1928. The skins are immersed in an unhairing bath through which is passed air or an inert gas to prevent packing of the skins and effect circulation of the bath. Cf. C. A. 23, 2066.

**Rapid tanning.** P. PAWLOWITSCH. Brit. 302,408, Sept. 20, 1927. The hide is first treated with a vegetable tanning ext. in soln. of a  $pH$  of 6 to 12 and then with a soln. of  $pH$  of 2 to 5 (suitably at a temp. of 30-37°). The concn. is varied somewhat according to the nature of the tanning material which may be derived from quebracho, chestnut oak, pine bark, etc., and in the second stage acids or acid synthetic tanning substance may be added gradually.

**Tanning agents.** MICHAEL MELAMID. Ger. 478,272, June 17, 1923. Humic acid or other humous substance is heated with aq.  $HCl$  or  $H_2SO_4$  and then sulfonated with fuming  $H_2SO_4$ .

**Products for effecting emulsifications and for use in tanning, foaming, etc.** I. G. FARBENIND. A.-G. Brit. 302,666, Dec. 19, 1927. Substances such as condensation

highly concd. solns. of sulfonic acids of aromatic or hydroaromatic or condensation products of such acids. The products may be used in tanning, as foaming or emulsifying agents, in dyeing, fungicides, insecticides, etc. Several examples with details of procedure are given.

**Tanning and wetting agents, etc.** I. G. FARBENIND. A.-G. Brit. 302,938, Dec. 23, 1927. In a modification of the process described in Brit. 302,666 (preceding abstract) there are employed, instead of the aromatic compds. with OH in the nucleus or condensation products of such compds., mixts. of such compds. with substances of high mol. wt. such as resins, oils, waxes, fats or fatty acids. Several examples with details are given.

**Diastasic products.** CHARLES J. M. M. LE PETIT. Fr. 656,770, Nov. 16, 1927. Plasmolyzing salts are added to mold cultures to liberate rapidly the diastases. A dehydrating agent may also be added to obtain a dry powder. An example is given in which *Aspergillus oryzae* is mixed with  $\text{Na}_2\text{SO}_4$  and a little  $\text{NaHCO}_3$  and  $\text{H}_3\text{BO}_3$ . The products are used in tanning.

**Coating leather, hides, skins, etc.** J. R. C. JORGENSEN. Brit. 301,554, July 6, 1927. A highly viscous or highly concd. and easily solidifying cellulose ester or ether soln. such as a soln. of cellulose acetate 12 in acetone 79 parts is applied to the material in regulated thickness to give the final desired thickness of coating. Various details and modifications are given.

**Treating leather for shoes with solutions of resin and nitrocellulose.** C. BERGER. Brit. 302,627, Sept. 15, 1927. Details of applying coatings for patent leather shoes are described.

**Stiffening insole leather with sodium silicate solution.** W. E. IANE. U. S. 1,720,223, July 9. The tanned leather is dipped in a dil. aq. soln. of the silicate.

**"Artificial leather" (coated fabric).** W. PLINATUS (to Compagnie française d'exploitation des procédés Plinatus). Brit. 301,759, Dec. 3, 1927. An app. is described for uniting sheets of textile fabric or paper with thin rolled sheets which may be formed of cellulose esters or ethers together with softening and gelatinizing agents, etc. Various details of manuf. are given.

### 30—RUBBER AND ALLIED SUBSTANCES

C. C. DAVIS

**Professional saturnism in the rubber industry.** F. HEIM DE BALSAC, F. AGASSE-LAFONT AND A. FEIL. *Chimie & industrie Special No.*, 739(Feb., 1929).—Investigations carried out in 2 plants showed that danger of saturnism exists in the rubber industry, but that it can be prevented by the usual prophylactic measures. A. P.-C.

**Plasticity determinations in crude rubber. VII. Relation between structure and plasticity of rubber prepared in different ways.** O. DE VRIES AND N. BEUMÉE-NIEUWLAND. *Arch. Rubbercultuur* 13, 283-353(1929). (In shorter form in English 354-70.)—Numerous papers in recent years on the relation between the structure of raw rubber and its plasticity have contained interesting hypotheses dealing with the structure of the globules, but have not been supported by exptl. data. On the other hand the investigations of de V. and his collaborators have dealt with the influence of the non-rubber substances and with different methods of coagulation and prepn. These latter investigations have been recently reviewed (cf. *C. A.* 22, 2077; *India Rubber J.* 75, 511(1928)), while the present paper is also a crit. review and discussion in amplified form, with tables of quant. data, and with numerous references. This long discussion leads to certain general conclusions. The sol. serum substances have a marked effect on plasticity, rubber with a high content of serum substances becoming harder during storage, whereas rubber with a low content sometimes becomes softer on storage, and when creped is softer even when fresh. The substances which are pptd. from the serum during coagulation (the network of proteins) have little influence on plasticity. Centrifuging and washing the cream gives a plastic rubber which has no tendency to become tacky or to deteriorate on storage, so that this seems one of the few practical ways of obtaining a more plastic raw rubber. Swelling with org. solvents, such as  $\text{C}_6\text{H}_6$  and  $\text{PhMe}$ , which causes fusion of the rubber globules and union into large units, has an unexpectedly little influence on plasticity, not only when latex is treated with the solvent but also when rubber is dissolved in the solvent and recovered by evapn. This phenomenon is worthy of further study because of its importance in explaining the relation between the structure of rubber and its plasticity. C. C. DAVIS

**Importance of temperature and humidity control in rubber testing. II. Resistance to abrasion.** W. A. GIBBONS, et al. *Ind. Eng. Chem., Anal. Ed.*, 1, 174-80(1929); cf. Partenheimer, *C. A.* 22, 511; 23, 1306.—The earlier investigation was continued with a study of the influence of the temp. and of the relative humidity between mixing and curing on the resistance to abrasion. Four different types of mixts. were tested on two different abrasion machines. The results, which are recorded in tabular and graphical form, and are discussed in detail, admit of certain general conclusions. In detg. resistance to abrasion, the temp. should be controlled within  $1^\circ$  to avoid significant errors from this cause. The relative humidity at which either an uncured or cured mixt. is maintained need not be considered in comparative tests, though when the relative

humidity varies over an abnormally great range, greater precision may be attained by conditioning uncured and cured mixts. The temp. at which vulcanizates are ordinarily stored has little effect on their resistance to abrasion. C. C. DAVIS

**The influence of the temperature on the strength of fabrics.** L. STOLL. *Gummi-Ztg.* 43, 2218-21(1929).—The results are of importance in rubber manuf. because of the heating which fabrics undergo during vulcanization. Samples of a fabric cord were heated at 60°, 80°, 100°, 110°, 140°, 150°, 170°, 200° and 220° for 0.25, 2, 4, 6, 8 and 15 hrs. and the elongation and breaking strength before and after the heating detd. The exptl. results, which are recorded in tables and graphs, admit of certain general conclusions. The higher the temp. and the longer the time of heating the greater is the loss in breaking strength and in elongation. Even after 15 min. of heating, there was a considerable loss of strength, viz., around 4% at 100°, 12% at 150° and 20% at 200°. Up to 110° the loss in elongation and strength may be considered relatively small, while at 140-150° the loss of strength becomes considerable, e. g., around 15% after 2 hrs. C. C. DAVIS

**The action of sulfammonium on rubber.** R. FRIC. *Chimie & industrie Special No.*, 538-9(Feb., 1929).—NH<sub>3</sub> was condensed on S at -80°, a strip of rubber was introduced into the tube, which was then sealed; after 48 hrs. the tip of the tube was broken and during the rapid evapn. of NH<sub>3</sub> the rubber gradually swelled till it practically filled the tube, its surface became coated with pulverulent S, and as the NH<sub>3</sub> escaped by diffusion it gradually regained approx. its original size, though still retaining a notable deformation. The feel, detn. of combined S, swelling in benzine and mech. strength tests indicated it had undergone at least a slight partial vulcanization, which F. attributes to the action of the nascent S liberated in the decompn. of sulfammonium

A. PAPINEAU-COUTURE

**The influence of sunlight on the color of rubber mixtures.** H. RIMPEL AND P. HERRMANN. *Gummi-Ztg.* 43, 2270(1929).—The exptl. facts described by DRIES and Naunton (C. A. 23, 2068) were also discovered by R. and H. and are incorporated in a patent, in which they are utilized for the production of pictures or designs on rubber goods (cf. German Patent 448,972). Evidence is given to prove that D. and N. are incorrect in believing that the initial effect of the irradiation is a surface vulcanization and that the discoloration is a result of over-vulcanization on the surface of the vulcanizate. Designs are formed on rubber not only by heating or by vulcanization after exposure, but also by treatment with strong reducing agents, as with light-sensitive AgBr-gelatin. If the reducing agent is mixed into the rubber, it is possible to form designs or pictures directly by exposure to light. When 4 mixts., each contg. rubber, lithopone and ZnO, and the 1st also S, the 2nd accelerator, the 3rd S and accelerator, and the 4th no addn., were exposed to sunlight for 3 hrs. and were then heated at 143° for 30 min., the 1st and 4th mixts. remained unchanged, whereas the 2nd and 3rd mixts. became discolored to an equal extent. This indicates that such discoloration depends only upon the accelerator and that it has no direct relation to the state of cure. The accelerator thus behaves like the reducing agents described in the patent of R. and H. (*loc. cit.*), and the phenomenon is similar to that of a AgBr photographic plate. C. C. DAVIS

**Colloidchemical changes in rubber and fatty oils.** LASZLO AUER. *Trans. Inst. Rubber Ind.* 4, 499-520(1929).—A crit. review and discussion of present knowledge, with certain new points of view and new data. From a colloidal point of view, raw rubber may be regarded as a jelly,  $\beta$ -rubber being the gel skeleton and  $\alpha$ -rubber the dispersion medium.  $\beta$ -Rubber therefore corresponds to metastyrene and  $\alpha$ -rubber to liquid styrene.  $\beta$ -Rubber is probably only a more concd. soln. of the disperse phase itself, whereas  $\alpha$ -rubber is more concd. with respect to the dispersion medium of the jelly than is  $\beta$ -rubber, but it is not the dispersion medium itself. In expts by Pummerer (cf. C. A. 22, 885, 4873) a better agent than Et<sub>2</sub>O could not be found for their sepn., and so in the expts. of P. probably the only result was the concn. of one of the two phases of the jelly, the pure phase not being isolated at all. X-ray investigations agree with this (cf. Bary and Hauser, C. A. 22, 4005), diagrams of frozen rubber indicating an increase in  $\beta$ -rubber at the expense of  $\alpha$ -rubber. That coagulating agents aggregate rubber and solvents disaggregate it is supported by unpublished expts. of Stamberger, who has found that when org. solvents, e. g., CCl<sub>4</sub> or Et<sub>2</sub>O, are added to latex, and the water and solvent are then evapd., the film has not its usual solid character but is a very sticky paste. After a few days this stickiness disappears and the film acquires a normal condition. In this case the disaggregating agent probably retards the aggregation by air. A discussion of the drying of fatty oils and the extensive expts. of A. in this field, which led to the gas coagulation theory of drying.



(cf. C. A. 20, 3827; 21, 3475, 3789; 22, 1695; 23, 2089) led to the conclusion that the coagulation of latex on exposure to air is caused by the coagulating action of O. In prep. Para rubber, the gases in the smoke cause coagulation and aggregation, and the smoking process for smoked sheets involves a similar action. Rubber jelly has a smaller adsorptive power toward coagulating gases than the jelly of fatty oil films, hence the better aging of rubber. Rubber may be considered as a jelly composed of 2 phys. different phases of the hydrocarbon, the structure thus being like a gelatin hydrogel, plasticizing of rubber being like the mech. working of other jellies. Ions act as coagulants, and in gas coagulation gaseous ions are the active agent. Ultra-violet rays ionize gases and their action on fatty oils may be due to the ionization of dissolved O. Just below the b. p. of an oil the gas is evolved and the friction may change the gas electrically and so alter the colloidal structure of the system. In expts. on the *bodying of oils in vacuo*, large proportions (12–61% of the total acids obtained by hydrolysis) of acids insol. in petr. ether were formed, whereas before heating the proportion was small. This shows that the change from sol. to insol. acids is not a result of oxidation. The *mastication of rubber* may be explained by the 2-phase theory, but possibly gas peptization assists the mech. working, *i. e.*, the latter may cause gas peptization. The jelly contains adsorbed O which may be ionized by the friction. This agrees well with facts observed by Fry and Porritt (C. A. 22, 4870). Gases other than O can also cause peptization, but longer times are required (cf. Pummerer and Pahl, C. A. 22, 885). When rubber mixts. contg. considerable C black are stored before curing, the plasticity disappears and the mixt. acquires some of the properties of vulcanized rubber. When sep. layers are plied and cured under pressure the layers do not unite because a thin film on each surface is formed as a result of coagulation by adsorbed gases. The impossibility of extg. all S from vulcanized rubber does not necessarily signify a chem. combination. Removal of an adsorbed substance can be accomplished by (1) a substance which is more readily adsorbed by the adsorbing product than is the previously adsorbed substance (S), or (2) a solvent with a higher affinity for the adsorbed substance (S) than has the isocolloidal rubber or fatty oil. In each the agent must come into intimate contact with the adsorbed substance (S). S is enclosed in an aggregated system and the agent must also be a disaggregating agent. Therefore so-called combined S has not been removed except by such agents as  $\text{PhNH}_2 + \text{K}$  and by concd. HCl. Moreover, the adsorptive power of some systems is stoichiometrical, so even if an apparent limiting value of "combined" S has been found by most investigators (cf., however, Stevens, C. A. 23, 3596) it may signify merely a satn. of the adsorptive power. Bacon (cf. C. A. 22, 3804) did not necessarily wet the aggregated rubber with his desulfurizing agents. His fractional peptization expts. are difficult to reconcile with the chem. combination theory, and finally his limit of 0.5% combined S represents the threshold value of S adsorbed during the aggregation of rubber contg. an accelerator. A discussion of the two most satisfactory theories of *vulcanization*, *viz.*, the S coagulation or aggregation theory and the chem. theory (cf. Stevens, C. A. 22, 1703), points to the former as the more probable, with the accelerator playing the part of a sensitizer of coagulation by S, like the sensitizing action of Co linoleate on  $\text{HCO}_2\text{H}$  in the coagulation of fatty oils (cf. A., C. A. 21, 3789). When rubber is heated for a long time *in vacuo* at  $250^\circ$  it fuses to a viscous liquid, which on cooling does not revert to the original condition. The loss of wt. is only about 1% and no chem. decompn. can be detected. This *disaggregated rubber* resembles viscous heat-bodied stand oils, and can be vulcanized to products similar to the latter. Both this aggregated rubber and vulcanized rubber have corresponding types in fatty oil derivs., and the new solidified oil derivs. contg. electrolytes are the initial attempts to obtain *oil products resembling raw rubber*. In vulcanized form, these solidified oils have properties more nearly like rubber than any previously known oil product. Data show the *tensile strengths and elongations of rubber mixts. contg. vulcanized solidified oils* compared with those of the corresponding mixts. contg. ordinary vulcanized oils (factice). *Vulcanized solidified oils* are excellent ingredients; *e. g.*, when 50 parts are added to 100 parts of rubber, the vulcanizates have tensile strengths as high as, or even higher than, the corresponding vulcanizates contg. no such addn. of oil product, in contrast to ordinary vulcanized oils, which greatly lower the tensile strength of vulcanized rubber. The jelly system of solidified fatty oils can be further aggregated. S aggregates solidified fatty oils as it does rubber and raw oils. The solidified oils require less S than raw oils and in *varnishes* they require less O than raw oils. Accordingly *varnishes* contg. solidified oils dry more rapidly than the corresponding *varnishes* contg. raw oils, with correspondingly smaller adsorption of O. The latter fact explains the better aging of solidified oils. When

electrolytes are milled into raw rubber and the mixts. are then heated, products resembling the thermoplastic rubber products of Fisher (cf. C. A. 22, 887) are obtained. The latter were regarded as simply isomerization products, and the fact was overlooked that they were polydisperse systems in which the presence of the reagents or their decomposition reagents are necessary to the resulting properties. The excess reagent used by F. can be washed out, leaving the essential adsorbed part. The case is therefore analogous to the vulcanization of rubber with S partly extractable by acetone. The reactions of F. are also analogous to the action of electrolytes on fatty oils, in each case the dispersed phase being increased. The white powders pptd. by acetone from solns. of thermoplastic rubber products are probably the gel skeletons of the original jellies. Both with thermoplastic rubber products and with solidified oils, the aggregating action of the reagents is more limited than that of S or of gases, and both products may be further aggregated by S or by gases. The increased solv. of thermoplastic rubber products in org. solvents corresponds to the property of solidified oils of being readily emulsified in water. This probably does not depend upon a lower degree of aggregation of the jelly, but because the adsorbed reagent has a higher affinity for the solvent than for the jelly in which it is adsorbed. The solvents may, however, be disaggregating agents.

C. C. DAVIS

**Preparation and properties of aqueous rubber dispersions.** H. L. TRUMBULL, *Colloid Symposium Monograph* 6, 215-24 (1928).—Aq. dispersions of rubber can be obtained by masticating rubber or reclaim with protective colloids like glue, Na resinate, gum arabic, gluten, Na alginate blood albumin and casein (see U. S. P. 1,498,581). Such dispersions differ from latex in being free from pear-shaped particles, giving a dried film different in texture, tackiness and strength and being under control of the maker.

JEROME ALEXANDER

**The reduction of rubber stress-strain determination.** W. B. WIEGAND AND H. A. BRAENDLE, *Ind. Eng. Chem., Anal. Ed.* 1, 113 7 (1929).—The aim of the work was to find a means of eliminating the personal equation in interpreting stress-strain data. Reduction of 95 tests of an inner tube by statistical methods showed that the stress-strain data did not obey strictly the law of accidental error, the skew being neg. for the values at rupture and pos. at intermediate points. The true values are not therefore the arithmetic means but the modes, which in every case differed from the arithmetic means to an extent greatly exceeding the probable error of such means. By using these true values and dividing the 95 tests into groups of 5, these groups were weighted by 4 empirical methods and the results compared with the modal values. The method of choosing the highest 3 elongations out of 5, with the corresponding tensile strengths, approached most closely the modal values. This method is accordingly suggested as a starting point for a *standardized method of interpreting tests of rubber*. The work is in part a confirmation of expts. on the same subject by Fric (cf. C. A. 23, 4098).

C. C. DAVIS

**The use of a group of performance tests for evaluating rubber compounds that must withstand repeated compression.** HARLAN A. DEPEW AND E. G. SNYDER, *Proc. Am. Soc. Testing Materials* 1929 (preprint) No. 87, 11 pp.—Specifically the present paper gives data on the comparative resistance to abrasion and to pounding of 2 solid tires cured with different proportions of S. The underlying object is, however, to show that by a properly chosen set of lab. tests it is possible to judge the performance of rubber products in actual service. It may be necessary to include with the standard tests an addnl. test which is specially adapted to the particular product which is being developed. The solid tires, which serve as an example, were tested for tensile strength and ultimate elongation, for their hardness and for their resistance to tear, to abrasion and to pounding at different cures. They were also aged in a Geer oven to correlate the phys. properties mentioned above with the uniformity of cure and state of cur at different points in the tires. In the pounding test which is described and illustrated, the samples are subjected to very rapid impacts of high force, and the increases in temp. ascertained. The comparative tests of the 2 tires indicate that a low proportion of S minimizes variability of cure, that the proportion of S does not affect the uniformity of cure throughout the tire when sufficiently long cures are used, and that a high S content tends to low temps. in the tire in service.

C. C. DAVIS

**Rubber equipment for the chemical industry.** ANON. *Ind. Chemist* 5, 229-30 (1929).—An illustrated description of mfg. operations at the plant of Macinlop, Ltd (Manchester, England), including rubber-lined tanks, rubber-covered rolls for the paper, bleaching and dye industries, rubber hose, acid valves, acid-proof hose, rubber-lined pumps, fans and ball mills and conveyor belting, with the lab. control of the various processes.

C. C. DAVIS

**Instrument for reading the hardness or plasticity of rubber optically.** R. FRIC. *Caoutchouc & Industrie Special No.*, 536-7 (Feb., 1929).—The hardness of vulcanized rubber is detd. by placing on the rubber a ball of given diameter, attached to a vertical rod which in turn is connected to a balanced lever arm, and then weighting the end of the arm as required. The deflection of the lever (which depends on the depth to which the ball has penetrated into the rubber) is read by means of an optical device that greatly magnifies the displacement. To det. the plasticity of soft rubber, the same device is used to det. the rate of penetration of a cylinder of given diam. A. P.-C.

**French rubber sponges.** H. DE POIX AND F. DE POIX. *India Rubber World* 80, No. 5, 69-70 (1929).—A general description of present developments, with typical formulas. C. C. DAVIS

**Who was the first to utilize rubber for erasing? A needed correction.** MAX SPETER. *Gummi-Ztg.* 43, 2270-1 (1929).—Historical. Original references are cited to show that neither Priestley nor Magchaens was the originator of the idea of using rubber for erasing pencil marks. The credit should go to Nairne, a maker of mathematical instruments of London, who devised the eraser before 1770. C. C. DAVIS

**The rational use of scrap and reclaimed rubber.** H. BAUFARON. *Rev. gén. caoutchouc* 6, No. 52, 14 (1929).—Four formulas are suggested for molded products contg. scrap and reclaims. C. C. DAVIS

**An inquiry into the use of reclaimed rubber.** WALTER HUTCHINSON. *Déchets et régénères* 1, No. 1, 5 (1929).—The first of a series of articles to deal with the relative value of reclaimed and new rubber, the future of reclaimed rubber and the desirable properties of reclaimed rubber, and to give representative mixts. in which reclaimed rubber is of special advantage. These points are covered briefly. C. D. DAVIS

**Aging of rubber.** B. V. BIZOV. *Zhur. Prikladnoi Khim* 1, 6-11 (1928).—Soft gray rubber was cured in steam at 35 lb. per sq. in. for 10-60 min. and then aged at 70° for 24-96 hrs. The modulus of elasticity, the hysteresis, the product of these 2 quantities (or the "working capacity") and the swelling in AcOAm were detd. for individual samples and served to judge the degree of aging. The results obtained by these different methods were often contradictory. Properly vulcanized rubber undergoes smaller changes on aging than undercured rubber. The changes are probably due to a continuation of the vulcanizing process at the elevated temp. used in artificial aging tests. Artificial aging produces changes in rubber which are different from those observed in natural aging, and new accelerated testing methods must be developed which do not require an elevated temp. V. KALICHEVSKY

**Laboratory apparatus for studying the aging and the vulcanization of rubber.** R. FRIC. *Rev. gén. caoutchouc* 6, No. 52, 9-10 (1929); cf. C. A. 22, 4876.—An app. for the O-bomb aging test and an app. for vulcanizing lab. samples are described and illustrated. The chief feature is the manner of heating, utilizing induced (Foucault) currents with the attendant hysteresis effects, the principle being the same as the Ribaud high-frequency method of heating furnaces. The cost of operation is economical and a sufficiently precise control of temp. is claimed. C. C. DAVIS

**The outlook for synthetic rubber.** OSCAR L. BRAUER. *J. Chem. Education* 6, 1286-92 (1929). E. H.

**Organic accelerators of vulcanization.** HAN TANAKA AND YOSHIYUKI HARA. *Repts. Imp. Ind. Research Inst. Osaka Japan* 10, No. 1, 29 pp. (1929).—To make a comparative study of org. accelerators of vulcanization the authors tested the following: PhNISCNlPh (I), PhN:C(NHPh)<sub>2</sub> (II), *p*-NOC<sub>6</sub>H<sub>4</sub>NMe<sub>2</sub> (III), aldehyde-ammonia (IV), *p*-C<sub>6</sub>H<sub>4</sub>(NH<sub>2</sub>)<sub>2</sub> (V), (CH<sub>2</sub>)<sub>6</sub>N<sub>4</sub> (VI), HN:C(NHPh)<sub>2</sub> (VII) and C<sub>8</sub>H<sub>10</sub>NCSSH.C<sub>6</sub>H<sub>5</sub>N (VIII). The accelerator was mixed in the proportions of 0.25, 0.5, 0.75, 1.0, 2.0, 3.0, 4.0 and 5.0 per 100 of rubber mixt. The accelerating powers were in the order: VIII (0.25-0.5) (the figure indicates the amt. of accelerator used per 100 rubber mixt.), III (0.25-1.0), VII (0.5-2.0), V (0.5-3.0), VI (0.5-4.0), II (0.5-4.0), IV (0.75-4.0) and I (1.0-4.0). VIII is an ideal accelerator but needs careful attention in its treatment. VII is the best of all accelerators studied. F. I. NAKAMURA

**The mode of action of organic accelerators of vulcanization.** L. PAUL BARY. *Rev. gén. caoutchouc* 6, No. 52, 3-8 (1929).—An historical review and discussion of different types of org. accelerators. Tables giving the trade name, chem. compn., phys. state, odor, activity and manufacturers of 24 aldehyde-amines, 14 salts of thio acids, guanidines and 10 miscellaneous classified compds. are included. C. C. D.

**Action of adipic esters (Sipaline) on accelerators of vulcanization.** Vulkan colors and rubber antioxidants. RUDOLF DITMAR WITH ALF. MATHIESEN AND KARL H. REUSSE. *Caoutchouc & gutta-percha* 26, 14618-20 (1929); cf. C. A. 23, 4098.—Tables

show the soly. of various accelerators, Vulkan colors and antioxidants in isopropyl methyladipate, in dimethylcyclohexyl methyladipate and in methylcyclohexyl adipate and the characteristic fluorescent colors of Vulkan colors in ultra-violet light. C. C. D

**The influence of various accelerators on the surface vulcanization of rubber by ultra-violet radiation.** RUDOLF DITMAR. *Gummi-Ztg.* 43, 2325(1929).—By continuing expts. (cf. C. A. 23, 2602) it is shown that when ordinary activators are omitted from accelerated rubber mixts., ultra-violet radiation has itself an activating effect. This activation is accompanied by oxidation of the rubber, and this oxidation is more effective than the vulcanization, so that from a practical point of view satisfactory vulcanization is possible only when a red or a yellow protective pigment, e. g., Se red, is added. With an activator like ZnO present in an accelerated mixt., ultra-violet radiation brings about vulcanization in a short time, so that the time must be carefully controlled to prevent oxidation, undercuring or overcuring. Ultra-violet radiation has the most favorable effect on rubber mixts. accelerated by tetramethylthiuram disulfide and contg. an activator. Surface vulcanization is complete in 45 min. without oxidation even in the absence of a protective red pigment. C. C. D

**The activating effect of various metallic oxides on the accelerating system piperidine pentamethylenedithiocarbamate and cyclohexylethylamine dithiocarbamate in the vulcanization of rubber in air.** RUDOLF DITMAR AND ALF MATHIESEN. *Chem.-Ztg.* 53, 479(1929).—The expts. are part of a study of the effect of metallic oxides on individual accelerators and on combinations of accelerators. From mixts. of pale crepe 100, colloidal S 3.5, piperidine pentamethylenedithiocarbamate 0.7, cyclohexylethylamine dithiocarbamate 0.7, "Agerite" 0.2 and metallic oxide or other compd. 10, in C<sub>6</sub>H<sub>6</sub>, films were prepd. by dipping and drying. These films were then cured in air with a rise of 30 min. to 100° and 60 min. at 100°. The following data give the oxide or other compd., its activating effect, the appearance of the vulcanizate, and the condition of the vulcanizate, resp.: CaO, strong, transparent, very good (the best of all); Ca stearate, none, transparent, tacky; SrO, strong, transparent, supple and very good; Sr stearate, none, transparent, tacky; SrCO<sub>3</sub>, none, milky, tacky; SrS, none, gray, tacky; SrO + Sb<sub>2</sub>O<sub>3</sub> + wax, none, milky, tacky; BaO, considerable, transparent, good but somewhat tacky; MgO, none, opaque, tacky; ZnO, strong, opal, very good and tight; ZnS, none, transparent, tacky; ZnSO<sub>4</sub> 5NH<sub>3</sub>, strong, almost transparent, very good; CdO, considerable, brown-red, very supple and good; CdS, none, yellow, tacky; HgS, none, red, tacky; BeO, none, transparent, tacky; Al<sub>2</sub>O<sub>3</sub>, none, transparent, tacky; Fe<sub>2</sub>O<sub>3</sub>, hardly any, red-brown, tacky; Ni<sub>2</sub>O<sub>3</sub>, none, approaching transparency, tacky; Co<sub>2</sub>O<sub>3</sub>, none, black, tacky; MoO<sub>3</sub>, none, opaque, tacky; SnO<sub>2</sub>, somewhat, milky—glass-like, tacky; SnS<sub>2</sub>, none, yellow-brown, tacky; Bi<sub>2</sub>O<sub>3</sub>, none, milky, tacky; Bi<sub>2</sub>S<sub>3</sub>, none, transparent, tacky; As<sub>2</sub>O<sub>3</sub>, considerable, transparent, good, Sb<sub>2</sub>O<sub>3</sub>, strong, orange-yellow, very good; Sb<sub>2</sub>S<sub>3</sub>, none, red, tacky; stearic acid, none, transparent, not vulcanized. It is considered that for this type of mixt., cured in air and required to be transparent, CaO and SrO are the best activators. C. C. DAVIS

**The consumption of accelerator during vulcanization.** L. v. WISTINGHAUSEN. *Rubber Age* (N. Y.) 25, 261-4, 319-21(1929).—An English version of C. A. 23, 3597. C. C. DAVIS

**Spray drying [in rubber preparation] (NYROP) 13. Method of preparation of artificial petroleum and of carboniferous decolorizing substances from raw rubber scrap or vulcanized scrap (NISHIDA) 22. Emulsions of rubber (Brit. pat. 301,805) 22. Rubber-bonded dry molding compositions (Brit. pat. 302,151) 18. Thermostat suitable for use with die blocks for molding rubber (U. S. pat. 1,720,837) 1. Plastic compositions [resembling hard or soft rubber] (Brit. pat. 302,270) 18.**

**Encyclopedie du caoutchouc et des industries qui s'y rattachent.** Edited by the SYNDICAT DU CAOUTCHOUC ET DES INDUSTRIES QUI S'Y RATTACHENT. Paris, 18 Rue Duphot: La revue générale du caoutchouc. 500 pp. Reviewed in *Rubber Chem. Tech.* 2, 1x(1929).

**KIRCHHOF, F.: Les progrès de la technologie du caoutchouc.** Paris: Ch. Berger. 259 pp. F. 55.

**Cellular rubber.** YVES CORNIC. Fr. 657,147, July 7, 1928. Substances capable of liberating CO<sub>2</sub>, NH<sub>3</sub>, or CH<sub>4</sub> are added to latex, which is then coagulated and vulcanized.

**Rubber articles.** ISTVÁN DOROGI, LAJOS DOROGI and DOROGI ES TARSÁ GUMMÓYAR R. T. Fr. 656,661, Jan. 27, 1928. Articles having thin walls are composed

one or more layers of rubber or the like and one or more layers of cellulose derivs. adhering to the rubber.

**Rubber articles.** SOC. ITALIANA PIRELLI. Fr 656,473, June 26, 1928. Rubber articles are made direct from latex by the addn. to the latex of oxides or hydroxides of bi- or ter-valent metals such as Zn, Mg, Ca, Al, assocd. with  $\text{NH}_4$  salts. Cf. C. A. 23, 3828.

**Deposition of rubber.** THE ANODE RUBBER CO. (ENGLAND), LTD. Fr. 657,364, Feb. 21, 1928. Deposition of rubber-contg. liquid dispersion prepd. with vulcanized rubber such as rubber regenerated from waste rubber or like substitutes of natural rubber is obtained on permanent supports. The deposition may be carried out according to any of the processes described in Fr. 574,552, 638,504, 619,649, 632,144, 619,682, 628,296, 647,413 (C. A. 23, 2603) or 647,232 (C. A. 23, 2603).

**Electrodeposition of rubber goods.** PAUL KLEIN and ANDREW SZEGVARI (to Anode Rubber Co., Ltd.). U. S. 1,719,984, July 9. In effecting electrodeposition of solids from an aq. rubber dispersion on to a depositing backing such as a gypsum-coated anode, liquids are removed from the dispersion concurrently with the deposition of solids from it and modification of the effectiveness of the electro-osmotic action is effected by varying the relative pressures to which the dispersion and removed liquids, resp., are subjected. An app. is described.

**Forming rubber tire tubes, etc., by deposition of superposed layers from thickened latex on a mandrel.** W. B. WESCOTT (to Rubber Latex Research Corp.). Brit. 302,182, Dec. 10, 1927. Each layer is dried before the next is applied. An app. is described.

**Crepe-rubber soles made from latex and containing an abrasive substance.** SOC. FINANCIÈRE DES CAOUTCHOUCS. Brit. 301,900, Dec. 9, 1927. Different methods are described of forming shoe soles or tread material from latex and finely divided materials such as silica, pumice or carborundum.

**Coating metals with rubber.** A. JENNY. Brit. 302,250, Dec. 12, 1927. Metals such as Al, Zn, Fe or their alloys are coated by use of an alk. dispersion of rubber such as latex and an alk. soln. of stick lac or shellac, in an electrophoretic deposition process. Vulcanizing agents may be added to the dispersion.

**Sheeting, strips and coatings of rubber.** DUNLOP RUBBER CO., LTD., D. F. TWISS and E. A. MURPHY. Brit. 302,201, Aug. 12, 1927. A concd. unvulcanized rubber latex compn. in the form of a cream is spread upon a moving surface and subjected to heat to effect setting or gelling as quickly as possible (the setting in the case of manuf. of coated fabrics occurring before the water in the dispersion penetrates the fabric to any substantial extent). Compns. as described in Brit. 290,313 (C. A. 23, 1012) or Brit. 219,635 (C. A. 19, 750) may be used, with or without various specified fillers and compounding and auxiliary ingredients.

**Bundle dipping process for coloring rubber bladders or toy balloons.** JOHN C. GIBSON (to Pioneer Rubber Co.). U. S. 1,720,594, July 9. Mech. features.

**Bonding rubber to metal surfaces.** HAROLD GRAY (to B. F. Goodrich Co.). U. S. 1,719,930, July 9. Previous to assocn. of a rubber compn. with a metal surface such as steel and vulcanization of the rubber under pressure, the metal is pretreated with substances such as  $\text{H}_2\text{SO}_4$ ,  $\text{HNO}_3$ , selenic acid, Se oxychloride,  $\text{SbCl}_5$ ,  $\text{SbBr}_3$ ,  $\text{Cu}_2\text{Cl}_2$ ,  $\text{FeF}_3$ , Pb chromate,  $\text{HgCl}_2$ , Ni chloride,  $\text{POCl}_3$ ,  $\text{PCl}_5$ ,  $\text{PCl}_3$ ,  $\text{AlCl}_3$ ,  $\text{FeCl}_3$ , chlorosulfonic acid,  $\text{TiCl}_4$ , Co chloride,  $\text{CuCl}_2$ ,  $\text{Me}_2\text{SO}_4$ ,  $\text{Et}_2\text{SO}_4$ ,  $\text{C}_2\text{Cl}_6$ ,  $\text{C}_2\text{HCl}_6$ , benzotrichloride, benzyl chloride,  $\text{CHI}_3$ , naphthalene tetrachloride, benzenesulfonylchloride, or *p*-nitrobenzoyl chloride, which serve to promote good adhesion between the metal and rubber. Cf. C. A. 23, 309.

**Coating iron or other metal surfaces with rubber.** F. AHNENS and HARZER ACHSENWERKE GES. Brit. 302,935, Dec. 21, 1927. The metal surface is first etched with a strong acid and there is then applied (repeatedly if necessary) a soln. of rubber  $\text{AmOAc}$  with or without  $\text{CCl}_4$ , to which swelling agents may be added, and a sheet of rubber is finally pressed on to the prepd. surface and, if not already vulcanized, may be vulcanized *in situ*.

**Rubber with variegated colorations.** GUMMI-UND BALATAWERKE MATADOR A.-G. and F. GREG. Brit. 302,102, April 2, 1928. Marbled, veined or streaked sheet material is formed by rolling or otherwise suitably working together portions of differently colored primary masses to which graded proportions of gas-forming and softening substances have been previously added. The primary materials may be partially vulcanized in order to secure sharper definition between the colors when they are combined.

**Adhesive rubber composition.** MERWYN C. TEAGUE (to General Rubber Co.). U. S. 1,719,948, July 9. See Can. 280,523 (C. A. 22, 2856).

**Preserving rubber.** A. M. CLIFFORD (to Goodyear Tire & Rubber Co.). Brit. 302,271, Dec. 13, 1927. Aging qualities of rubber are improved by addn. of compds. such as  $\beta$ , $\beta$ -dinaphthylamine or  $\alpha$ , $\beta$ -dinaphthylamine or other suitable secondary amines in which hydrocarbon radicals (preferably aryl) are of the same series. Details are given of the manuf. of the 2 compds. mentioned.

**Preserving rubber.** A. M. CLIFFORD (to Goodyear Tire and Rubber Co.). Brit. 302,144, Dec. 10, 1927. The "aging qualities" of rubber are improved by the addn. to the reaction product of an aromatic amine and an aliphatic acid or ester of such an acid, such as formnaphthalide,  $\beta$ -naphthylaminoaceto- $\beta$ -naphthalide, naphthylmonoformamide of ethylenediamine or the reaction product of  $\alpha$ - or  $\beta$ -naphthylamine and Et acetoacetate. Brit. 302,147 specifies the use of substances such as  $\alpha$ -chloro- $\beta$ -naphthol or  $\alpha$ -amino- $\beta$ -naphthol. Cf. C. A. 23, 3828.

**Preserving jelutong.** BEECHNUT PACKING CO. Brit. 302,850, March 29, 1928. Coagulated jelutong is preserved from oxidation by treating it with Na or  $\text{NH}_4$  primary or secondary phosphates or (less suitably) with  $\text{NH}_4$  tartrate, sulfate, chloride or acetate.

**Apparatus for stirring up dispersions particularly of rubber in water.** THE ANON. RUBBER CO. (ENGLAND), LTD. Fr. 656,660, Jan. 16, 1928.

**Vulcanization accelerators.** IMPERIAL CHEMICAL INDUSTRIES, LTD. Fr. 657,177, July 9, 1928. Dithiocarbamates and thiuram sulfides of morpholine and its C-substituted derivs. which are used as vulcanization accelerators are prepd. by treating morpholine or its C-substituted derivs. with  $\text{CS}_2$ .

**Vulcanizing rubber.** CLAYTON W. BEDFORD (to B. F. Goodrich Co.). U. S. 1,719,920, July 9. A polysulfide of a thioamine such as *N*-dithioaniline is used as a vulcanizing agent or an accelerator. Cf. C. A. 23, 698.

**Vulcanizing rubber.** J. TEPPEMA (to Goodyear Tire and Rubber Co.) Brit. 302,142, Dec. 10, 1927. Vulcanization is accelerated by use of the reaction product of a 2-halobenzothiazole such as 2-chlorobenzothiazole and a dithiocarbamate such as Na diethyldithiocarbamate. The prepn. of the reaction product of 6-nitro 2-chlorobenzothiazole and Na diethyldithiocarbamate is also described and salts of piperidyl- and benzyldithiocarbamates, etc., also are referred to. Brit. 302,143 specifies the use as an accelerator of the reaction product of a benzoylnitrophenylsulfur halide such as 2-benzoyl-4-nitrophenylsulfur bromide and an alkali salt of an org. sulfide such as Na diethyldithiocarbamate. Cf. C. A. 23, 4103.

**Rubber vulcanization.** S. M. CADWELL (to Naugatuck Chemical Co.) Brit. 302,176, Nov. 1, 1926. An accelerator is used comprising a hydrolyzed halogen-free deriv. of aldehydeamine condensation products from an aldehyde having a plurality of C atoms in open chain such as the condensation product from heptaldehyde and aniline. Cf. C. A. 23, 1309.

**Rubber vulcanization.** WINFIELD SCOTT (to E. I. DUPONT DE NEMOURS & Co.) U. S. 1,721,057, July 16. A ditolyguanidine is used as an accelerator.

**Rubber vulcanization.** A. VOSHAGE. Brit. 301,802, Dec. 5, 1927. Vulcanizing molds are treated (suitably by spraying) with a soln. such as sugar and dextrin, to clean them and prevent formation of crust or scale.

**Synthetic rubber.** J. BAER. Brit. 302,399, Sept. 16, 1927. An elastic rubber-like product is obtained by the action of sulfides of  $\text{NH}_4$  or alkalis or alk. earths as polymerization agents on satd. halogenated hydrocarbons such as methylene or ethylene dichlorides, dibromides or diiodides. Cf. C. A. 23, 3376.

**Synthetic rubber.** I. G. FARBENIND. A.-G. Brit. 302,733, Dec. 21, 1927. A mixt. is formed of various polymerization products of the same hydrocarbon of the butadiene type, such as various polymerization products of isoprene. Cf. C. A. 23, 2324.

# CHEMICAL ABSTRACTS

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No. 18

## 1—APPARATUS AND PLANT EQUIPMENT

W. L. BADGER

"New filter cylinders" for filtration apparatus. K. WAGENMANN. *Chem.-Ztg.* 53, 490(1929).—An upright glass tube attached to a horizontal flat disk, with a suitable opening, is inserted through a cork into a filter flask so that the disk forms a platform above. On these suction platforms are placed the "new" glass filter cups. These are interchangeable and of different sizes.

Simple extraction apparatus for liquids. H. BACH. *Chem.-Ztg.* 53, 517(1929).—An improved Baas and Bosmann app. (*Pharm. Weekblad* 9 (1893)) has a cock in the bottom of the extractor and a horizontal side-arm overflow connected into the vapor tube from the boiling flask to the top of the extractor and into the cooler. J. H. M. RUSSELL C. ERB

New bubble towers from old stills by use of special trays. PAUL TIESDELL. *Natl. Petroleum News* 21, No. 30, 65-8(1929). J. L. ESSEX

A pycnometer for viscous liquids. E. H. RIESENFELD AND T. HAMBURG. *Chem.-Ztg.* 53, 547(1929).—A shallow, thick-walled, glass vessel, of about 1.7-cc. capacity, is provided with a flat, ground-glass cover a little larger in diam. than the vessel. The pycnometer is filled so that the liquid to be examd. reaches a little above the edge. Then the cover is slipped on in such a way as to exclude air bubbles and the outside is wiped with filter paper. The cover will remain in position even if the pycnometer is inverted.

E. H.

A new differential pressure gage. A. R. OLSEN AND L. L. HIRST. *J. Am. Chem. Soc.* 51, 2378-9(1929).—The gage is simple and accurate and permits the study of very slow gas reactions at any pressure, even where an all-glass gage is needed. J. H. M.

Rapid-indicating continuous-reading vacuum and pressure gages. H. G. ANDERSON. *Ind. Eng. Chem.* 21, 795-7(1929).—The basic principles, the design, calibration and applications are given for 2 hot-wire gages which require no manipulation in the range from atm. pressure to 0.25 micron or less.

J. H. MOORE

[Apparatus for] experimental crystal structure analysis. A. GELLER. *Schweiz. mineral. petrog. Mitt.* 7, 219(1927). B. C. A.

Apparatus for incinerating plants for microscopical examination of the ash. O. WERNER. *Mikrochemie* 7, 110-5(1929).—The material to be ashed is placed between 2 perforated Al disks which fit into a thin cylindrical framework so as to leave a space between the disks. The framework is carried on an asbestos-covered iron gauze stretched on a rectangular framework over Teclu burners. The ash is mounted for microscopical examn. in fused phenol between two cover glasses joined around their circumferences with paraffin wax. For permanent mounting Canada balsam is used in place of phenol.

B. C. A.

Standard valves for chlorine containers. ROBERT T. BALDWIN. *Chem. Markets* 25, 169, 171, 173(1929); cf. *C. A.* 23, 3763-4. E. H.

Electrical measuring instruments for use in teaching electrochemistry. HENRY C. PARKER. *Met. Ind.* (London) 35, 55-8(1929); cf. *C. A.* 23, 2890. E. H.

An inexpensive Pyrex conductivity cell. W. BOYD CAMPBELL. *J. Am. Chem. Soc.* 51, 2419-20(1929).—An easily constructed cell, gas-tight at 5-atm. pressure, is described.

J. H. MOORE

A hydrogen microelectrode. R. WERNICKE AND F. MODERN. *Compt. rend. soc. biol.* 100, 133-5(1929).—An electrode vessel whose vol. is 0.4 cc. and whose design permits the measurement of 0.05-0.4 cc. is described. Loss of CO<sub>2</sub> is not prevented.

B. C. BRUNSTETTER

A quinhydrone microelectrode. L. BOËZ. *Compt. rend. soc. biol.* 101, 524-6(1929).—The microelectrode consists essentially of a Pt sheet in contact with quinhydrone between 2 cover-glasses, held fast by 2-3 drops of the liquid to be examd.

B. C. BRUNSTETTER

An improvement in thermostats with electric heating (remarks on P. Van Campen's

article of same title). L. HOCK AND C. L. NOTTEBOHM. *Z. Elektrochem.* **35**, 458 (1929).—Duane and Lory's app. (*Z. phys. Chem.* **36**, 613(1901); *Am. J. Science*, **9**, 179-82(1900)) has been improved so that a 50 l. thermostat may be held for hrs. at a temp. const. of  $1.10^{-1}$ . Cf. *C. A.* **23**, 3603.

A thermostat constant to one-thousandth of a degree centigrade. F. R. WINTON. *J. Sci. Instruments* **6**, 214-7(1929).  
J. H. MOORE  
E. H.

The thermoclement Te-Bi and its practical applications (LEVITSKII, LUKOMSKII) 2. The measurement of gas temperatures up to  $1500^{\circ}$  in radiation fields of changing anisotropy (SCHMIDT) 2.

**Thermometer.** WILLIAM G. ZIEGLER (to Consolidated Ashcroft Hancock Co., Inc.). U. S. 1,722,619, July 30. Structural features.

**Viscometer (of the rotating body resistance type).** I. G. FARBERIND. A.-G. Brit. 303,853, Jan. 11, 1928. Structural features.

**Filters.** SOC. ANON. DES PROCÉDÉS R. AUDUBERT. Fr. 657,693, Dec. 2, 1927. Forms of filters of the type having a network of fibers lying in the direction of filtration are described.

**Suction filter.** GEORGE H. DEAN. U. S. 1,722,626, July 30.

**Rotary filter for liquids.** H. A. VALLEZ. Brit. 303,707, April 23, 1928. Structural features.

**Laminated filter device.** V. R. HEFTLER. Brit. 303,153, Dec. 30, 1927. Structural features.

**Filter for air.** O. STOTT and MATTHEWS & YATES, LTD. Brit. 303,961, Nov. 10, 1927. Structural features.

**Air filter for use with internal-combustion engines.** C. BROWN and BROWN & BARLOW, LTD. Brit. 303,763, Oct. 4, 1927. Structural features.

**Oil-coated fabric air filter for internal combustion engines.** H. G. KAMRATH (to AC Spark Plug Co.). Brit. 303,807, Jan. 9, 1928. Structural features.

**Air purifier with moistened corrugated plates carried on an endless chain.** A. SCHIRP. Brit. 303,740, Jan. 7, 1928. Structural features.

**Filter press.** JOHN P. FOSTER. U. S. 1,722,497, July 30.

**Fractionating condenser.** DAVID T. WILLIAMS. U. S. 1,723,637, Aug. 6. Structural features.

**Rotary spraying device for treating liquids.** N. BENDIXEN. Brit. 302,980, Sept. 24, 1927. A device is described suitable for use in such operations as aging, blending, sterilizing, homogenizing, emulsifying or treating liquids generally with gases, rays or chemical emanations.

**Spray desiccation of milk, soap solutions, latex, etc.** N. J. NIELSEN. Brit. 303,576, Oct. 10, 1927. An app. is described in which a mixt. of hot air and superheated steam is used for treating the material. Two "drying cyclones" in series are used.

**Apparatus and system of spray desiccation for materials containing vitamins or other liquids.** WILLIAM S. BOWEN. U. S. 1,722,175, July 23.

**Float device for controlling heating apparatus (to prevent milk or other liquids from boiling over when heated).** T. W. A. RUSCHE. Brit. 303,372, Dec. 31, 1927. Structural features.

**Liquid distribution system suitable for hot water supply systems.** ERNEST J. AUTREY (one-half to Russell M. Simmons). U. S. 1,722,884, July 30. Structural features.

**Crystallizing apparatus.** FERNAND LAFEUILLE. Fr. 657,663, Nov. 30, 1927.

**Apparatus for centrifugal purification of liquids such as oils.** WILLIAM R. CHADBURN (to DeLaval Separator Co.). U. S. 1,723,329, Aug. 6. Structural features are described including connections for exhausting atm. air and substituting a neutral gas such as  $\text{CO}_2$  or N in the app. in order to prevent changes in the oil. Boiler-feed water may be similarly freed from O. Cf. *C. A.* **23**, 2078.

**Apparatus for vacuum distillation of oils, etc.** C. R. BURCH, F. E. BANCROFT and METROPOLITAN-VICKERS ELECTRICAL CO., LTD. Brit. 303,078, Sept. 21, 1927. The material is distd. in a highly evacuated chamber and condensed on a surface so located that the distance travelled by a particle of vapor is commensurate with the mean free path of a mol. of vapor of the residual gas such as Hg in the chamber. Various details of app. and procedure are described. Brit. 303,079 relates to similar app.

**Vacuum drying and distilling apparatus.** Firm of E. Mæxck. Brit. 303,661, Jan. 21, 1928. A wax, fat, fatty acid or the like in molten condition is used in a sealing channel of an app. which is described.



**Vacuum evaporating apparatus suitable for evaporating milk, etc.** GUSTAVE A. ZEITLER. U. S. 1,721,760, July 23. Structural features.

**Detecting leaks in high-vacuum apparatus.** W. DÄLLENBACH. Brit. 303,512, Jan. 5, 1928. High-vacuum app. of metal or glass is tested for leaks, prior to evacuation, by introducing a chemically active gas under pressure and covering the exterior surface with an indicator for the gas used. The use of  $\text{NH}_3$  with Nessler's reagent and other examples are described.

**Producing high vacua.** HUGH S. COOPER (to Kemet Laboratories Co., Inc.). U. S. 1,721,544, July 23. In devices such as x-ray or radio tubes, a metal of the alk. earth group is liberated by a non-gas-forming reaction, *e. g.*, by reaction of  $\text{BaO}$  with  $\text{Mg}$  induced by eddy currents, so that it absorbs gases present and forms solid compds. with them.

**Switch contacts operating in vacuum.** SIEMENS-SCHUCKERTWERKE A.-G. Brit. 303,899, Jan. 12, 1928. Contacts are made of material of high heat and elec. cond. which can be thoroughly freed from gases and the vacuum employed is higher than that usually employed in incandescent lamps.  $\text{Cu}$  or  $\text{Cu}$  alloys such as bronze are suitable and the dissipation of heat from the contacts is assisted by use of  $\text{Pb}$  in conductors with large surfaces.  $\text{Mg}$  may be used in forming the vacuum.

**Anodes for x-ray tubes.** COMPAGNIE FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON. Fr. 657,755, July 10, 1928. Method of molding anodes from finely powd. refractory metals by agglomeration.

**Electron-discharge bulbs.** SOC. ANON. DES ÉTABLISSEMENTS GAIFFE-GALLOT ET PILON. Fr. 658,189, Dec. 7, 1927.

**Electron-discharge tubes.** COMPAGNIE FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON. Fr. 34,278, Aug. 26, 1927. Addn. to 629,840.

**Electron-discharge device.** L. F. PERROTT and J. J. FITZPATRICK (to British Thomson-Houston Co., Ltd.). Brit. 303,381, Dec. 31, 1927. A cathode, formed from a refractory metal such as  $\text{Ni}$ , a  $\text{Ni}$  alloy,  $\text{Mo}$ ,  $\text{W}$ , or  $\text{Pt}$ , is coated with a compd. of an alk. earth metal such as  $\text{BaCO}_3$  or a mixt. of such compds., and heated to above  $1050^\circ$  until the surface becomes shiny and metallic in appearance. Various details of construction and procedure are described.

**Electron-discharge device.** SOC. DES ÉTABLISSEMENTS INDUSTRIELS DE E. C. ET DE A. GRAMMONT. Brit. 303,369, Dec. 31, 1927. The cathode is formed of a metal such as  $\text{Pt}$  or  $\text{Pd}$  (or may be formed of  $\text{W}$  coated with  $\text{Pt}$  or  $\text{Pd}$ ) and is provided with highly emissive material by first rendering it porous, coating it with an emissive substance such as  $\text{Ba}$ ,  $\text{Th}$ ,  $\text{Cs}$  or their salts, and is then restored to its original condition. Various details of treatment are described.

**Electron-discharge device.** JAMES R. WILSON (to Western Electric Co.). U. S. 1,722,121, July 23. A cathode is used with a thermionically active coating such as oxides of  $\text{Ba}$  and  $\text{Sr}$ , an anode, and a grid which is coated with  $\text{Al}$  and  $\text{Al}_2\text{O}_3$  or other suitable material capable of combining with particles from the cathode to form a thermionically inactive compd. and capable of fixing gases evolved within the device.

**Electron-emitting apparatus.** LE MATÉRIEL TÉLÉPHONIQUE (S. A.). Fr. 658,058, July 25, 1928.

**Electron-emitting cathodes.** LA RADIOTECHNIQUE. Fr. 34,112, July 6, 1927. Addn. to 637,962 (C. A. 23, 6).

**Thermionic tubes.** COMPAGNIE FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON. Fr. 658,088, July 26, 1928.

**Thermionic valve.** W. S. SMITH and N. W. MCLACHLAN. Brit. 303,037, Aug. 26, 1927. Structural features.

**Thermionic valves.** MARCONI'S WIRELESS TELEGRAPH CO., LTD. Fr. 658,049, July 25, 1928.

**Photoelectric cell.** LEE DE FOREST (to General Talking Pictures Corp.). U. S. 1,722,280, July 30. Structural features.

**Furnaces.** LOUIS H. FOURNIEUX. Fr. 657,698, Apr. 7, 1928. Method of operating doors.

**Furnaces burning powdered coal.** GEORGE P. HAYNES. Fr. 657,850, July 20, 1928.

**Rotating muffle furnace.** GEWERKSCHAFT SACHTLEBEN and JOHANN KÜPPERS. Fr. 34,200, Oct. 3, 1927. Addn. to 629,222.

**Regenerative furnace.** GEORGE H. ISLEY (to Morgan Construction Co.). U. S. 1,721,735, July 23. Structural features.

**Regenerative furnace suitable for open hearth or soaking pit installations.** GEORGE E. ROSE. U. S. 1,721,885, July 23.

**Apparatus for reversing and controlling regenerative furnaces.** GEORGE H. ISLEY (to Morgan Construction Co.). U. S. 1,722,701, July 30.

**Furnace for treating articles of circular or elliptical cross-section.** ANCIENS ETABLISSEMENTS LOY ET AUBÉ. Brit. 303,830, Jan. 10, 1928. Structural features.

**Furnace linings.** D. F. CAMPBELL and ELECTRIC FURNACE Co., LTD. Brit. 303,574, April 16, 1928. In forming furnace linings *in situ* (from refractory materials such as sand, ganister, silica, alumina or MgO, with or without clay, powdered glass, Na silicate etc.) the lining material is placed around a plug of graphite, W, or other high m. p. cond. material and the plug is heated by elec. currents from a surrounding coil. The plug may be wrapped with paper, the charred residue of which facilitates sepn. of the plug at the conclusion of the process.

**Gas burner.** J. and C. S. BOLINDERS MEKANISKA VERKSTADS AKTIEBOLAG and K. R. WESTER. Brit. 303,696, March 26, 1928.

**Gas burner.** HARRY E. KERR (to Cleveland Gas Burner & Appliance Co.). U. S. 1,723,180, Aug. 6.

**Gas burner.** HARRY C. TABLER (to American Heater Corp.). U. S. 1,722,066, July 23.

**Bunsen burner.** ERICH BANDOLY and HERMAN P. SACHSE (to Central Scientific Co.). U. S. 1,723,002, Aug. 6.

**Burner construction and control for oxyacetylene welding and similar operations.** J. L. ANDERSON (to Air Reduction Co.). Brit. 303,896, Jan. 13, 1928.

**Heat-exchange apparatus suitable for use as a condenser, still, etc.** ERNEST J. AUTREY (one-half to Russell M. Simmons). U. S. 1,722,883, July 30. Structural features.

**Apparatus for heating water or other liquid by heat from mercury vapor.** A. R. SMITH (to British Thomson-Houston Co., Ltd.). Brit. 303,013, Dec. 24, 1927. Structural features.

**Pressure vessels for gas.** PAUL BENKWITZ. Fr. 658,051, July 25, 1928. See Brit. 294,943 (*C. A.* 23, 1785).

**Apparatus for catalytic exothermic gas reactions.** I. G. FARBERIND. A.-G. Brit. 303,192, Sept. 23, 1927. The catalyst is contained in a plurality of tubes closely packed together to form a bundle and the interspaces between the tubes are so restricted relatively to the cross-section of the tubes and to the d. of the catalyst within the tubes that the incoming gas, which passes first on the outside of the tubes, travels at a higher velocity than it does within the tubes. Various structural details are described.

**Gas indicator operating on the diffusion principle.** HERMANN SEWERIN. U. S. 1,721,977, July 23. Structural features are described of a device suitable for use in mines.

**Gas-washing apparatus.** JOHN C. HAYES, JR. (to Freyn Engineering Co.). U. S. 1,722,466, July 30. Structural features.

**Gas holder.** MASCHINENFABRIK AUGSBURG-NÜRNBERG A.-G. Brit. 303,471, Jan. 4, 1928. A thin continuous metal sealing closure ring which may be formed of Fe, Cu or Al strips welded or riveted together and which is of such thickness and resiliency as to conform with irregularities in the shape of the gas holder is pressed by levers against the holder wall and may be faced with felt or similar material. Various structural details are described.

**Ozonizer.** CHARLES J. V. FÉRY. Fr. 657,932, Dec. 7, 1927.

**Sealed joints between metal and glass.** SIEMENS-REINIGER-VEIPA GES. FÜR MEDIZINISCHE TECHNIK. Brit. 303,348, Dec. 31, 1927. An alloy of Ni and Cr (preferably contg. Ni 60-90%) is used at the place of sealing, in the *manuf. of vacuum tubes* or other articles.

**Apparatus for centrifugal casting or lining of pipes with metal or cement.** R. A. WHITSON. Brit. 303,829, Jan. 10, 1928. Structural features.

**Apparatus for handling crucibles such as those used in making metal castings.** HOLLEY G. WELLMAN. U. S. 1,722,777, July 30. Structural features.

**Upward-current apparatus for washing and classifying ores, coal, etc.** L. HOVOIS. Brit. 303,810, Jan. 9, 1928. Structural features.

**Apparatus for mixing, compacting, degassing or grinding viscid materials in thin layers.** ASBJORN SONSTHAGEN and GUDOLF M. PÖVERUD. U. S. 1,722,115, July 23. Structural features.

**Apparatus for mixing subdivided solids with liquids by jets of compressed air or gas.** P. HIRSCHFELDER (D. Stewart & Co., Ltd.). Brit. 303,839, July 11, 1928. Structural features.

**Apparatus for impregnating and drying sheet materials.** HORACE M. EATON (to Norman Edmunds). U. S. 1,723,336, Aug. 6.

**Apparatus for applying paraffin, resin, asphalt, or other waterproofing material to wet fibrous webs.** HAROLD L. LEVIN (to Flintkote Co.). U. S. 1,723,361, Aug. 6. Structural features.

**Penetrator apparatus for testing the hardness of various materials.** ROBERT K. BARRY and LEONARD BOWEN. U. S. 1,722,263, July 30. Structural features.

**Apparatus for testing the dielectric strength of insulating materials.** ARTHUR O. AUSTIN (to Ohio Brass Co.). U. S. 1,721,847, July 23.

**Control device for warning signals of buoys or other apparatus actuated by variations in light.** J. NEALE. Brit. 303,224, Oct. 12, 1927. Structural features of app. controlled by a light-sensitive cell.

**Acetylene generator of the carbide-feed type.** CLARENCE J. COBERLY, ROBERT G. WULFF and WALTER H. HOLLAND (to Union Carbide and Carbon Research Laboratories, Inc.). U. S. 1,723,679, Aug. 6. Structural features.

**Luminous electric discharge tubes.** REGNIER FRANCOITTE. U. S. 1,723,929, Aug. 6. Gases occluded in the electrodes are eliminated, during manuf., by exposure to elec. discharges in a sep. tube filled with N, at a regulated current intensity; the purified electrodes are mounted in end branches of the tubes, the branches are fused to the tubes and the luminous tube thus formed is purified by means of elec. discharges in a N filling with subsequent absorption of residual gases by an auxiliary electrode of Pd; the tube is emptied and filled with a purified rare gas such as He or Ne.

**Thermocouple apparatus for measuring superheat in boilers.** THOMAS R. HARRISON (to Brown Instrument Co.). U. S. 1,721,556, July 23. Structural and elec. features.

**Thermostatic control for water heaters.** EMIL HOWE. U. S. 1,723,239, Aug. 6. Structural features.

**Thermostatic control for electric circuits.** ALBERT E. WHITTIER. U. S. reissue 17,391, July 30. See original pat. 1,713,578 (C. A. 23, 3381).

**Thermostat for control of electric circuits.** EUGENE T. VINCENT. U. S. 1,722,186, July 23. Structural features.

**Thermostat with alternating current.** I. E. DMITRIEV. Russ. 5773, June 30, 1928.

## 2—GENERAL AND PHYSICAL CHEMISTRY

FREDERICK L. BROWNE

**The life of Sir Humphrey Davy.** J. MCCRAE. *J. Chem. Met. Mining Soc. S. Africa* 29, 244–53 (1929). E. H.

**Charles Moureu.** CAMILLE MATIGNON. *Chimie et industrie* 21, 1129–30; *Chemistry & Industry* 48, 735–6 (1929).—An obituary. A. PAPINEAU-COUTURE

**Eugène Risler (1828–1905).** His life and work. ALBERT BRUNO. *Bull. soc. ind. Mulhouse* 95, 209–16 (1929).—Biographical, with a bibliography of his principal publications. A. PAPINEAU-COUTURE

**Vladimir Efimovich Grum-Grzhimailo (1864–1928).** LÉON DLOUGATCH. *Rev. métal.* 26, 391–2 (1929).—Biographical, with portrait. A. PAPINEAU-COUTURE

**Memorial service for Edgar Fahs Smith.** The Provost of the University of Pennsylvania presiding. WILLIAM B. IRVINE. Auditorium University of Pennsylvania, December 4, 1928. Brochure, 62 pp.—Contains a portrait of Smith, a biographical summary, a bibliography of his publications and of Ph.D. theses prepd. under his direction, the invocation and benediction by Richard Montgomery, and memorial addresses by Francis Xavier Dercum, Marston Taylor Bogert and Josiah Harmar Penniman. JOSEPH S. HEPBURN

**The Kaiser Wilhelm Gesellschaft zur Foerderung der Wissenschaften.** EDOUARD VINCENT. *Chimie et industrie* 21, 1298–1304 (1929).—A brief outline of the origin and of the chem. activities of this society. A. PAPINEAU-COUTURE

**The Physical Institute of the Technische Hochschule at Munich.** J. ZEMNECK. *Physik. Z.* 30, 433–58 (1929).—The design and equipment of the institute are described. E. H.

**Bibliography of bibliographies on chemistry and chemical technology.** CLARENCE J. WEST and D. D. BEROLZHEIMER. *Natl. Research Council Bull.* 71, 161 pp. (1929). E. H.

**Discovery of the gas laws. II. Gay-Lussac's law.** W. S. JAMES. *Science Progress* 24, 57–71 (1929); cf. C. A. 22, 4284.—An account of the studies concerning the

influence of the temp. on the vol. of (a) air and (b) gaseous elements and compds., from the researches of Amontons (1699-1702) to those of Gay-Lussac (1802-1816), with a summary of the subsequent history of the law.

JOSEPH S. HEPBURN

**A rational method for balancing exceptional chemical equations.** BART PARK. *J. Chem. Education* 6, 1136-8(1929).—An extension of the method of balancing equations involving oxidation and reduction, using changes in valence of oxidizing agent and reducing agent to indicate how many mols. of each need be taken, demands additional algebraic assumptions if the processes are very complicated. Such processes are illustrated by equations like (a)  $2K_4Fe(CN)_6 + 24H_2SO_4 = 4K_2SO_4 + Fe_2(SO_4)_3 + 6(NH_4)_2SO_4 + 11SO_2 + 10CO_2 + 2CO$  and (b)  $2K_4Fe(CN)_6 + 12K_2S_2O_8 = 12KCNS + 9K_2SO_4 + K_2S + 2FeS$ , which are balanced step by step.

W. C. EBAUGH

**Nomography.** OTTO LIESCHKE. *Chem. Fabrik* 1929, 305-6.—A chart for heat loss due to incomplete combustion of flue gas. Cf. *C. A.* 23, 2552.

J. H. MOORE

**Vacuum contraction of density bulbs.** MARCEL BECKERS. *J. Am. Chem. Soc.* 51, 2042-51(1929).—A detailed description of the technic used in detg. contraction of evacuated flasks is given. It can be calcd. by means of the empirical equation  $\eta = KV/W$ , where  $\eta$  is the compressibility per l. and atm.,  $V$  the vol. in l.,  $W$  the wt. of the glass minus the stopcock in g. and  $K = 16$ . The accuracy is within a few percent. The contraction is a linear function of the pressure.

FRANK URBAN

**Note on the platinum thermometer temperature scale.** F. E. HOARE. *Phil. Mag.* [7], 7, 384-6(1929).—A useful expression is obtained for calcg. the difference coeff. for Pt thermometers. By using this expression temps. are obtained which are correct to  $0.1^\circ$ .

L. H. REYERSON

**Empirical formulas for platinum—90% platinum + 10% rhodium thermel.** MOTOTARO MATSUI. *J. Soc. Chem. Ind. (Japan)* 32, 33-8(1929); Suppl. binding 32, 12-4B.—Seven types of interpolation formulas for the thermels and convenient methods of computation are discussed. For the temp. range  $300^\circ$  to  $1200^\circ$  the best formulas are:  $e = -a + bt + ct^2$  and  $e = a + bt + ct^2 + dt^3$ . The formula  $t = a + be - ce^2$  is convenient for calcg. the temp. from the e. m. f. measured ( $e =$  e. m. f. in  $\mu V$  and  $t =$  temp. in degrees C. and  $a, b, c$  and  $d$  are consts.) For Pt—90% Pt + 10% Rh thermel of the first quality, the consts.  $a, b$  and  $c$  of the first and the last of the above formulas are always the same.

S. KONDO

**The measurement of the electromotive force of the thermel at the freezing point of standard pyrometric samples.** MOTOTARO MATSUI AND SEIZO OKA. *J. Soc. Chem. Ind. (Japan)* 32, 38-43(1929); Suppl. binding 32, 14-6B.—The e. m. fs. of Pt—90% Pt + 10% Rh thermels, supplied by Siemens-Halske and Leeds-Northrup, were measured at the f. ps. of standard pyrometric samples certified by the U. S. Bureau of Standards. The f. ps. of the pure metals of different origins were computed by the empirical formulas and compared with those fixed by the Physikalische-technische Reichsanstalt in 1924.

S. KONDO

**The thermoelement tellurium-bismuth and its practical applications.** M. A. LEVITSKII AND M. A. LUKOMSKII. *Physik. Z.* 30, 203-5(1929).—Since Te and Bi stand at the 2 extremes of the thermoelec. series, the pair should be the most sensitive for use as a thermocouple. Te has a transition point at  $354^\circ$  and its resistance and other elec. properties are variable after it has been heated. For small differences in temp., however, the metal can be used with Bi for temp. measurements after calibration. On account of its high resistance the contact should be made large and constantan wire used as the leads. Such a couple gives a current of 360 microvolts per degree, or about 3 times that of the Fe-constantan couple. It has been used for measuring the energy of radiation, including that of the H lines.

H. F. JOHNSTONE

**Chemical reactions of dried substances. I. Ammonia and phosphorus pentoxide.** LOUIS HARRIS AND CHARLES B. WOOSTER. *J. Am. Chem. Soc.* 51, 2121-6(1929).—Pure  $P_2O_5$  absorbs rapidly appreciable quantities of carefully dried  $NH_3$ . The reaction product apparently forms a protective film upon the  $P_2O_5$  and retards further absorption.

N. M. BOUDER

**Revision of the weight of a normal liter of carbon monoxide gas.** L. R. PIRE AND E. MOLES. *Anales soc. espñ. fis. quim.* 27, 267-72(1929).—Very pure CO, obtained by dehydration of  $HCOOH$  with  $H_2SO_4$ , purified and dried over KOH and concd.  $H_2SO_4$  and  $P_2O_5$ , was used. The mean value of 7 detns. agreeing well, with corrections, was  $1.25011 \pm 0.00005$ . With the most probable value for deviation from Avogadro's law  $1 + \lambda = 1.00050$  the at. wt. of C = 12.006, somewhat higher than the international value but agreeing with the latest Aston results.

E. M. SYMMES

**Atomic weight of phosphorus.** MOWBRAY RITCHIE. *Nature* 123, 838 (1929).—The normal d.  $L_0^{760}$  of phosphine is at 1 atm., 1.5317; at  $1/2$  atm., 1.5243. If the compressi-

bility factor is linear, the value of  $(1 + \lambda)$  is 1.0097, which, in conjunction with the normal d. of  $O_2$  of 1.4290 and  $(1 + \lambda) = 1.0009$ , leads to the mol. wt. of 34.00 (2) for  $PH_3$  and 30.97 (9) for the at. wt. of P. Some results obtained at  $1/4$  atm. give  $L_0^{760} = 1.5208$ , for which  $(1 + \lambda) = 1.0096$  and  $P = 30.98$  (2). The Sub-committee of the Chemical Society adopts the value  $P = 30.98$  (2) based on mass spectrographic analysis. (*J. Chem. Soc.* 1929, 216-7) while the German commission adheres to the older value 31.02, based mainly on gravimetric analysis.

**The atomic weight of copper.** W. M. HICKS. *Nature* 123, 83<sup>o</sup> (1929).—In connection with Richards and Phillips' detn. of the at. wt. of Cu as 63.557 (cf. *C. A.* 23, 1536) it is pointed out that the spectroscopic value of the at. wt. of Cu, depending on the doublet sepn. of the  $p(1)$  term, is  $63.5569 \pm 0.060$ .

**Para- and ortho-hydrogen.** K. F. BONHOEFFER AND P. HARTECK. *Z. physik. Chem.*, Abt. B, 4, 113-41 (1929); cf. *C. A.* 23, 2614.—A calcn. of the probability of transition of the symmetrical into the antisymmetrical hydrogen by spontaneous radiation is presented by Wigner. Spectral properties of parahydrogen are discussed. Ortho- and para-systems are forecast for  $C_2$ ,  $N_2$ ,  $F_2$ ,  $Cl_2$  and  $I_2$ . The ratio ortho/para for  $N_2$  is probably 2:1, for  $F_2$  it is 3:1.

**Report on the vapor pressure of solid and liquid neon and liquid helium.** J. E. VERSCHAFFELT. *Comm. Phys. Lab. Univ. Leiden*, Suppl. 64, 31-6 (1929).—Measured values for the vapor pressure of solid Ne (in atms.) from  $15.47^\circ$  to  $24.53^\circ K$ . may be expressed according to the equation  $\log_{10} p = -(112.8/T) + 4.22$ . For liquid Ne from  $24.58^\circ$  to  $44.43^\circ K$ . is given the equation  $T \log_{10} p = 28.100 + 3.600(T - 35) + 0.003333(T - 35)^2 + 0.000400(T - 35)^3 + 0.00002667(T - 35)^4$ . Combining the equations gives for the triple point  $T = 24.40^\circ K$ . and  $p = 0.394$  atm. The heat of vaporization of solid Ne is calcd. to be 25.7 cal. per g. Just how the vapor-pressure curve for He extends around abs. zero is not definitely known.

**Solid elements.** W. HERZ. *Z. anorg. allgem. Chem.* 180, 284-6 (1929); cf. *C. A.* 23, 2338.—Since  $S\sqrt{s} = K$  and  $S\sqrt{L} = K'$ , it follows that  $\sqrt{L}s = K''$ .  $S =$  entropy;  $s =$  sp. heat of the solid element;  $L =$  heat of vaporization. Use as alternatives to the law of Dulong and Petit is suggested.

**Boiling temperatures of magnesium, calcium, strontium, barium and lithium.** H. HARTMANN AND R. SCHNEIDER. *Z. anorg. allgem. Chem.* 180, 275-83 (1929).—The vapor pressure of each liquid metal was measured and the b. p. detd. by plotting  $\log p$  vs.  $1/T$  and extrapolating to atm. pressure. The following values were found: Mg  $1380^\circ \pm 5$ , Ca  $1712^\circ \pm 5$ , Sr  $1639^\circ \pm 5$ , Ba  $1810^\circ \pm 10$ , Li  $1609^\circ \pm 5$ . Values for the mean mol. heat of vaporization, the Trouton const., the chem. const. and the crit. point were calcd., for each metal.

**Comment on a paper by A. M. Berkenheim, entitled: New regularities in the series of ionic radii of elements.** V. M. GOLDSCHMIDT. *Z. physik. Chem.* Abt. A, 141, 451-2 (1929); cf. *C. A.* 23, 2860.—Polemic against the use of the present author's exptl. data on ionic radii in conjunction with Berkenheim's calcd. radii to discredit the values calcd. by Pauling and others. At present some of the calcd. values are preferred to the exptl. ones, and vice versa.

**Contribution to the anodic behavior of aluminum.** W. J. MÜLLER AND K. KONOPICKY. *Z. physik. Chem.*, Abt. A, 141, 343-77 (1929); cf. *C. A.* 22, 3090.—On the basis of exptl. data obtained from measurements on an Al anode in a rectifier, a cataphoretic theory of the rectifying action is developed. A quant. formula of the same form as that derived previously is found to be in good agreement with the exptl. results, and the cataphoretic theory confirmed.

**Magnetic properties of isolated atoms of cobalt.** F. W. CONSTANT. *Nature* 123, 943-4 (1929).—In alloys of 10 or 5% Co with 90 or 95% Pt, resp., it is assumed that the Co atoms are isolated by being surrounded by the non-ferromagnetic Pt atoms. These alloys are ferromagnetic with Curie points at  $249^\circ$  and  $49^\circ$ , resp. Between liquid-air temp. and the Curie point, the intensity of magnetization,  $I$ , at first increases with rise of temp. for low fields (i. e.,  $H$  less than 100 gauss), but for higher fields it decreases steadily with increase in temp. The greatest values for  $I$ , viz., 364 c. g. s. units for the 10% and 254 c. g. s. units for the 5% alloy, were obtained for  $H = 565$  gauss. These values correspond to magnetic moments for the Co atom greater by 25% and by 60%, resp., than that calcd. from the satn. value for pure Co. The hysteresis loops vary with the previous heat treatment. When hard-drawn, the 5% alloy gave the larger and more rectangular loops. After annealing, the hysteresis was greatly reduced and the coercive force for the 5% alloy was 20 gauss against 28 gauss for the 10%. This last result is in accord with Heisenberg's theory of ferromagnetism. W. W. STIFLER

Relation of shared electrons to potential and absolute polar valences. WILLIAM A. NOYES. *Chem. Reviews* 5, 549-56(1928). W. WEST

Chemical valency considered as an electrostatic phenomenon. IX. A. E. VAN ARKEL AND J. H. DE BOER. *Chem. Weekblad* 26, 386-9(1929). Cf. C. A. 23, 4112.

F. J. G. DE LEEUW

Valence forces as calculated from specific heats and spectra. DONALD H. ANDREWS. *Chem. Reviews* 5, 533-48(1928).—A review of some applications of classical mechanics to the study of the chemical bond. W. W.

Magnetostriction and the phenomena of the Curie point. R. H. FOWLER AND P. KAPITZA. *Proc. Roy. Soc. (London)* 124A, 1-15(1929).—A summary is given of Heisenberg's theory of ferromagnetism, but in the calcn. of the partition function for a magnetized crystal certain terms are retained which were irrelevant in the primary investigation since they do not depend upon the applied magnetic field. The results of this calcn. are then applied to the general explanation of the nature of the Curie point, the changes in sp. heat and in size at the Curie temp. and magnetostriction. These fit satisfactorily into Heisenberg's theory, although at present only a rough quant. comparison is attempted. W. W. STIFLER

The two Curie points, ferromagnetic and paramagnetic. ROBERT FORRER. *Compt. rend.* 188, 1242-4(1929).—The temp. at which ferromagnetism disappears is called the ferromagnetic Curie point,  $\theta_F$ . The paramagnetic Curie point,  $\theta_P$ , is the temp. given by the Weiss law  $\chi(T - \theta) = C$ . As a rule  $\theta_P$  is from 15° to 40° higher than  $\theta_F$ . For Ni, the form of the cycle and the ratio of the remanent magnetization to the satn. value suggest the hypothesis that half of the elementary magnetic moments are parallel, and half perpendicular to the field. The crit. field is then the field necessary to reverse those parallel to the field. In the neighborhood of  $\theta_F$ , this crit. field is an almost linear function of the temp. and it has a definite finite value at  $\theta_P$ . When extrapolated, the curve cuts the temp. axis very nearly at  $\theta_P$ , 14° above  $\theta_F$ . The existence of the two Curie points reveals the simultaneous existence of two different properties: The region above  $\theta_P$  is characterized by the existence of a spontaneous orientation. But the region of hysteresis extends just to  $\theta_F$ . In this region the reversal of the magnetic moments requires a certain definite field. The reversal becomes spontaneous for  $\theta_P$  and the region above it. For Ni, Fe and Co,  $\theta_P$  is above  $\theta_F$  and this is considered the normal case. It is also true for most ferromagnetic alloys but for the ferrocobalt studied by Preuss,  $\theta_P$  lies below  $\theta_F$ . To obtain a spontaneous magnetization, the existence of a magnetic moment and a spontaneous orientation is not sufficient. Hysteresis also is necessary. Ferromagnetism does not exist except below the two Curie points. On the contrary, paramagnetism is limited uniquely by  $\theta_P$ . W. W. STIFLER

Magnetic properties of the sesquioxide of iron and of certain ferrites above their Curie point; conservation of the constant paramagnetism in these compounds. MILLE A. SERRRES. *Compt. rend.* 188, 1239-41(1929).—Measurements on 2 samples of  $Fe_2O_3$  at several temps. between 700° and 750° gave a mean value for the susceptibility of  $19.70 \times 10^{-6}$ , accurate to about 0.3%. This gives a susceptibility per g. of Fe of  $28.17 \times 10^{-6}$ . This value lies between the extremes of those given by various authors for  $\gamma Fe$ ; whence S. concludes that the paramagnetism of  $\gamma Fe$  is conserved in combination. Measurements on 4 ferrites ( $Fe_2O_3 \cdot NiO$ ,  $Fe_2O_3 \cdot PbO$ ,  $Fe_2O_3 \cdot CuO$ ,  $Fe_2O_3 \cdot MgO$ ) in the same temp. range did not give a linear relation between temp. and reciprocal of susceptibility. This is contrary to the results of Kopp on magnetite. But on correcting for the paramagnetism of the Fe, the relation becomes linear. Thus the hypothesis of a const. paramagnetism superimposed upon a variable paramagnetism is confirmed. W. W. STIFLER

Ferromagnetic properties of the ferrites. SUZANNE VEIL. *Compt. rend.* 188, 1293-4(1929).—Previous work has shown that the ppt. obtained by treating with soda a cold soln. of a ferric salt mixed with a nickelous or cobaltous salt of the same anion gives, when calcined, a ferromagnetic anhydride. This effect is particularly pronounced when the two salts are mixed in mol. proportions. The work is now extended to solns. in which Cu is substituted for the Ni or Co, with similar results. Although before calcination the hydroxides are paramagnetic, heating for some hrs. at 120° in sealed tubes renders them ferromagnetic. On substituting Ni or Co for Fe, the mixed ppts. do not exhibit ferromagnetism when heated to 120°. Also the increase in coeff. of magnetization on heating is comparatively slight and decidedly less than that shown by the Cu ferrite. It is therefore concluded that Fe is sharply distinguished, ferromagnetically, from Ni and Co. W. W. STIFLER

Diamagnetism and crystal structure. C. V. RAMAN. *Nature* 123, 945 (1929).—Ehrenfest has suggested that the high diamagnetic susceptibility of Bi may be due to

the existence in the crystal lattice of electron orbits of such large area as to include several atoms within their radius. R. applies this idea to explain the differences between the diamagnetic susceptibilities of graphite ( $-5.1 \times 10^{-6}$ ) and diamond ( $0-.49 \times 10^{-6}$ ). This hypothesis of electron orbits circulating around the plane hexagonal rings of C in the crystal lattice may also explain the observations of Honda and Owen that the susceptibility of graphite is several times as great in a direction normal to the planes of cleavage as it is parallel to them.

W. W. STIFLER

**Crystal structure and ferromagnetism.** W. SCHMIDT. *Physik. Z.* 30, 259-61 (1929).—When the temps. at which various transformations occur in Fe are expressed on the abs. scale, it is found that they can be expressed to a fair approximation by  $T = nT_c/m$ , in which  $T_c$  is the m. p. (for Fe =  $1803^\circ$  abs.);  $m = 14$ , and  $n$  is an integer between 1 and 13 inclusive. The values of  $T$  corresponding to values of  $n$  from 1 to 13 are tabulated and the corresponding phenomena are noted. No transformations are known corresponding to  $n = 1, 5$  and 6. In general, the agreement is only approx.; e. g., for  $n = 12$ ,  $T = 1545.6$ , while the Curie temp. =  $1553^\circ$ . The same equation can be applied to Sn.

W. W. STIFLER

**The fundamental law of paramagnetic magnetization of a crystal and the law of paramagnetic rotary dispersion.** JEAN BECQUEREL AND W. J. DE HAAS. *Compt. rend.* 188, 1156-8 (1929).—The paramagnetic rotary power of tysonite as a function of  $H/T$  is represented by a hyperbolic tangent law. ( $H$  = magnetic field;  $T$  = abs. temp.) Within the limits of error with which low temps. can be measured, this gives a magnetic moment of one Bohr magneton. B. and de H. apply Ladenburg's formula, neglecting the diamagnetic effect which is negligibly small in tysonite compared to the paramagnetic. The calcd. results are in excellent agreement with the exptl. The hyperbolic tangent law is concluded to be an indication of a reversal of sense of the magnetic moment. Certain theoretical conclusions follow.

W. W. STIFLER

**Magnetic behavior of organic crystals.** C. V. RAMAN. *Nature* 123, 605 (1929).—In general, the optical and magnetic characters of aromatic compds. are related. For naphthalene the axes of max. diamagnetic susceptibility and of min. optical dielec. const. are approx. coincident. For aliphatic crystals, however, the magnetic and optical characters are more varied. In  $\text{CH}_4$  the axes of max. magnetic susceptibility and optical dielec. const. are parallel, while in urea they are crossed.

H. F. JOHNSTONE

**Diamagnetism of certain binary halogen compounds.** R. HOCART. *Compt. rend.* 188, 1151-3 (1929).—Measurements by 2 different methods were made on solns. of NaCl, KCl and HCl, and on solid NaCl and KCl. Special precautions were taken to insure purity; the exptl. error is less than 0.5%. The mol. susceptibilities are: for HCl,  $-22.0 \times 10^{-6}$ ; for NaCl in aq. soln.,  $-30.8 \times 10^{-6}$ ; for solid NaCl,  $-30.1 \times 10^{-6}$ ; for KCl in aq. soln.,  $-39.60 \times 10^{-6}$ ; and for solid KCl,  $-39.1 \times 10^{-6}$ . The discrepancies between solid and soln. for NaCl and KCl are interpreted as indicating that the diamagnetism of the ions is not strictly additive. Susceptibilities for other compds., accurate to about 1%, are: KBr,  $-49.1 \times 10^{-6}$ ; KI,  $-63.8 \times 10^{-6}$ ;  $\text{MgCl}_2$ ,  $-47.4 \times 10^{-6}$ ;  $\text{CaCl}_2$ ,  $-54.4 \times 10^{-6}$ ;  $\text{SrCl}_2$ ,  $-63.0 \times 10^{-6}$ ;  $\text{BaCl}_2$ ,  $-72.6 \times 10^{-6}$ .

W. W. STIFLER

**Diamagnetism of the crystal of azoxyanisole and the Larmor precession.** G. FOËX. *Compt. rend.* 188, 1154-6 (1929).—Measurements on two crystals (monoclinic) of *p*-azoxyanisole gave, as the susceptibility along the axis of symmetry,  $\chi_1 = -6.65 \times 10^{-7}$  while in the plane of symmetry the values were  $\chi_2 = -6.34 \times 10^{-7}$  and  $\chi_3 = -4.08 \times 10^{-7}$ . Between room temp. and  $-79^\circ$ ,  $\chi_3$  is const. within 1%. From these data F. concludes that Larmor's theorem is not applicable to this crystal. He also calls attention to certain other possible theoretical deductions.

W. W. STIFLER

**The properties of dielectrics. II. The dielectric constant.** F. M. CLARK. *J. Franklin Inst.* 208, 17-44 (1929).—A review of the effect of temp., pressure, frequency and voltage on the dielec. strength of gases, liquids and solids.

ARTHUR FLEISCHER

**X-ray evidence for intermolecular forces in liquids.** J. A. PRINS. *Nature* 123, 908-9 (1929).—The diffraction pattern of liquids inside the principal halo is related only to the mutual arrangement of the mols. Small diffraction angles are a measure of the tendency to assocn. in a dynamic rather than a static sense. The x-ray affords an exceptionally sensitive method of studying intermol. forces.

I. J. PATTON

**Dehydration of benzene.** J. J. MANLEY. *Nature* 123, 907 (1929).—Measurements of the refractivity of  $\text{C}_6\text{H}_6$  in contact with  $\text{P}_2\text{O}_5$  show a curve with two distinct smooth portions, having different slopes, the first probably representing the rate of removal of mechanically admixed water, and the second the rate of withdrawal of combined water. The conclusion that  $\text{C}_6\text{H}_6$  forms one or more hydrates is strengthened by some expts. on the sp. vol. of  $\text{C}_6\text{H}_6$  in the presence of  $\text{P}_2\text{O}_5$ .

I. J. PATTON

**Optical properties of some salts of gluconic acid.** GEORGE L. KEENAN AND SAMUEL M. WEISBERG. *J. Phys. Chem.* 33, 791-4 (1929).—The  $\text{NH}_4$ , Na, K, Ba and Pb salts of gluconic acid as well as the gluconic  $\gamma$ -lactone were prepd. and their optical properties (refractive indices and effect of polarized light) studied so as to obtain data for their identification.

**The differences of potential between metals and air.** MARIE ANDAUER. *Z. physik. Chem., Abt. A*, 138, 357-68 (1928); cf. *C. A.* 21, 1400.—Metal plate was inserted under the opening in the bottom plate of an  $\alpha$ -electroscope. The air between the bottom plate and the inserted metal plate was ionized by means of Po, and the influence of the potential between the metal plate and the grounded electroscope upon the velocity of discharge was detd. Potentials thus found were: Al  $-0.83$  v., Zn  $-0.74$  v., Ni  $-0.32$  v., Fe  $-0.15$  v., Sb  $-0.16$  v., Sn plate  $-0.12$  v., brass  $-0.10$  v., Bi  $-0.07$  v., Cu  $+0.13$  v., Ag  $+0.16$  v., Pt  $+0.25$  v.

**The nomenclature of the thirty-two crystal classes.** FRIEDRICH RINNE. *Abhandl. math.-phys. Klasse sächs. Akad. Wiss.* 40, No. 5, 1-8 (1929). E. H.

**A new derivation and nomenclature of the 230 crystallographic space groups.** ERNST SCHIEBOLD. *Abhandl. math.-phys. Klasse sächs. Akad. Wiss.* 40, No. 5, 9-204 (1929).—The text is accompanied by an atlas, under sep. cover, of the 230 space-group projections. E. H.

**Crystal structure and chemical constitution.** V. M. GOLDSCHMIDT. *Trans. Faraday Soc.* 25, 253-83 (1929); cf. *C. A.* 23, 2618.—The fundamental law of cryst. chem. is defined by the statement that the structure of a crystal is detd. by the relative nos., by the relative sizes and by the polarization properties of atoms, atom groups and ions. The inductive method for detg. the laws of cryst. chem. is explained. The phenomena of *isomorphism*, *morphotropism* and *polymorphism* are taken up from the viewpoint of the above mentioned law. A classification of crystals according to coordination types rather than by macro-cryst. symmetry is used. Tables of coordination types, of ionic radii, of the radius quotient  $R_A:R_X$ , changes in atomic distances, etc., are included. Ionic and non-ionic crystals are used as examples in the discussion. Substances of the  $\text{AX}$ ,  $\text{AX}_2$ ,  $\text{A}_2\text{X}_3$ ,  $\text{ABX}_3$  types are taken up. Specific examples used are the fluorides, oxides and carbonates of Mg, Ca, Sr and Ba, titanates, sulfides, selenides, tellurides, iodides, etc. L. L. QUILL

**The crystal structure of solid methane.** J. C. McLENNAN AND W. G. PLUMMER. *Phil. Mag.* [7], 7, 761-74 (1929); cf. *C. A.* 23, 1029.—X-ray examn. of  $\text{CH}_4$  crystals gave close agreement between exptl. spacings and those calcd. for a face-centered cubic cell of edge 6.35 A. U. Calcn. shows 4 mols. per unit cell. The investigation confirms the conclusion that a cubic form of  $\text{CH}_4$  really exists and disproves the recently expressed view that it must be pyramidal. No evidence of the existence of a pyramidal modification was found, but its probable existence is not disputed. L. H. REYERSON

**Crystal structure of nickel films.** G. P. THOMSON. *Nature* 123, 912 (1929).—Films of Ni deposited on rock salt by spluttering, in residual gas or A, show hexagonal structure on removal from the rock salt and examn. by cathode ray diffraction. The values of the axes are:  $c = 4.06$  A. U.;  $a = 2.474$  A. U. ratio = 1.64, agreeing with the ratio 1.633 for closest packing. Ni thus resembles Co, in crystg. in both cubic and hexagonal closest packing. The calcd.  $d$  is 8.86, in agreement with that of the metal in bulk. I. J. PATTON

**Birefringence and dichroism of thin layers of iron obtained by distillation.** MARCEL CAU. *Compt. rend.* 188, 57-8, 246-9 (1929); cf. *C. A.* 22, 2705.—The previous results were confirmed on all samples. A positive rotation and positive ellipticity are obtained when the axis is parallel to the incident vibration. The dispersion in the region of the visible spectra is normal for the ellipticity and abnormal for the rotation. The effect increases when the thickness of the Fe layer increases or when the generating wire is brought closer to the film. The Faraday effect is not influenced within the limits of error by the optical effects. The effect on reflected light is the same as for the transmitted, but with the opposite sign. The formula  $E = (d/2 \sin 2A - d/2) h \sin 4A$  is derived.  $A$  = azimuth,  $d$  = relative delay suffered by the vibration parallel to the axis, and  $E$  = ellipticity. The data agree with the equation. ARTHUR FLEISCHER

**Simple method of obtaining a single crystal of zinc with approximately any desired orientation of its principal axis.** SHUVO ITO. *Mem. Coll. Sci. Kyoto Imp. Univ.* 12A, 97-105 (1929).—By welding a single crystal of Zn, with orientation of the principal axis known from the Laue photograph, to a Zn plate brought just to fusion and allowing the system to cool from the weld toward the other end a large single crystal is obtained with the principal axis oriented approx. in the same direction as the mother crystal. An asbestos-lined box is used as furnace in which welding and fusing are carried out by a Bunsen burner moved by hand. Crystals as large as 9 cm. in length, 7 cm. in breadth and



0.15 cm. in thickness were obtained. Axes other than the principal are not controlled by this method.

**Periodic and spiral forms of crystallization.** ERNEST S. HEDGES. *Nature* 123, 837-8(1929).—Crystn. in concentric rings takes place readily with benzil, benzoin, benzophenone, menthol, *m*-dinitrobenzene and acetanilide. A photograph is shown illustrating the spiral growth of crystals of  $K_2Cr_2O_7$  made by allowing a thin film of soln. to evap. on a warm microscope slide, crystn. having started from the periphery and traveled inward. The specimen of carborundum described by Menzies and Sloat (cf. C. A. 23, 4115) may have crystallized in this way.

**The relation between the lattice constant and the density of solid solutions.** SHINKITI SEKITO, *Science Repts. Tôhoku Imp. Univ.* 1st Ser. 18, 59-68(1929).—The lattice-const. of Cu solid solns. was detd. and found to follow the substitution law of Vegard. The d. of these alloys calcd. from the lattice const. agrees very well with that obtained by expt.

**New determinations of the lattice constants of potassium fluoride, cesium chloride and barium fluoride.** FINAR BROCH, IVAR OPTEDAL AND ADOLF PABST. *Z. physik. Chem., Abt. B*, 3, 209-14(1929).—Lattice const. calcd. from x-ray powder method measurements of especially purified salts were KF, 5.333 Å. U. with d. 2.5283; CsCl, 4.113 Å. U. with d. 3.9905; BaF<sub>2</sub>, 6.184 Å. U. with d. 4.8943.

**Is the lattice of tetragonal mercuric cyanide a molecular or radical lattice?** O. HASSEL. *Z. anorg. allgem. Chem.* 180, 370-3(1929); cf. C. A. 21, 1210.—Redetn. of Hg(CN)<sub>2</sub> lattice by the Bragg method checked H.'s previous work, which disagrees with Fricke and Havestadt (C. A. 22, 4019). R. FRICKE. *Ibid* 374-6.—A redetn. checked F.'s previous work. H.'s values, which check his own Bragg measurements are the mean of measurements which do not check as closely as the agreement. A. F.

**X-ray analysis of platinum deposited cathodically in the presence of helium.** R. SALVIA. *Anales soc. españ. fis. quim.* 27, 285-9(1929).—X-ray analysis of the deposit of Pt obtained by cathodic pulverization in a He atm. gave results both on the direct deposit and the fine powder. Calcn. of the planes on which selective reflection is produced shows that these planes belong to a cubic lattice with unmixed indices, characteristic of cubes centered on the faces or the characteristic structure of Pt. Calcn. shows also that taking into consideration dimensions of the elementary cube and the radius of the Pt atom, no space remains to introduce He atoms, so that it is not a matter of definite compds. of these 2 elements.

**X-ray studies on the nitrides of iron.** GUNNAR HÄGG. *Nature* 122, 962(1928); cf. C. A. 22, 4056, 4290.—All Fe-N preps. of max. N content (about 11% N) show certain split lines due to a new phase  $\eta$ . In this phase the Fe atoms form an orthorhombic lattice with the elementary dimensions  $a = 2.758$  Å. U.,  $b = 4.819$  Å. U. and  $c = 4.419$  Å. U. The limited homogeneity range of the  $\eta$ -phase indicates that it is probably Fe<sub>2</sub>N. Three Fe-N phases, therefore, exist in the concn. range now investigated; Fe<sub>2</sub>N with a cubic structure, the  $\epsilon$  phase with a hexagonal close-packed arrangement of Fe atoms, and the  $\eta$  phase. It has not been possible to det. the position of the N atom in the last two phases.

**General survey of the effects of pressure on the properties of matter.** P. W. BRIDGMAN. *Proc. Phys. Soc. (London)* 41, 341-60(1929).

**Contributions to the study of mesophases (intermediate states of aggregation).** I. The existence of mesophases. H. ZOCHER AND V. BIRSTEIN. *Z. physik. Chem., Abt. A*, 141, 413-23(1929).—Definitions are given of the terms to be employed in later papers, and the mechanical properties of the nematic and smectic mesophases are discussed. The authors point out the influence of mol. forces on the statistical uniformity in such phases, causing mol. grouping or "swarming." The possible existence of more than 2 mesophases is considered.

**The rectilinear diameter of density curves as a starting point of natural classification of pure elements or compounds.** E. MATHIAS. *Comm. Phys. Lab. Univ. Leiden*, Suppl. No. 64, 11-4(1929).—The parameter  $a$ , which characterizes the rectilinear diam., can be used to classify substances by arranging them in order of increasing values of  $a$ ; thus in homologous series  $a$  increases as mol. wt. increases.

**Comparison of nitrogen and oxygen according to the law of corresponding states.** G. P. NIJHOFF. *Comm. Phys. Lab. Univ. Leiden*, Suppl. No. 64, 49-52(1929).—Virial coeffs.,  $B$  and  $C$ , for the equation  $pv_A = A_A[1 + Bd_A + Cd_A^2 + \dots]$  are calcd. Substances with low crit. temps. have greater deviations from the law of corresponding states. O<sub>2</sub> and N<sub>2</sub> do not correspond in their deviations, contrary to results reported by other authors.

**The second virial coefficient of helium and hydrogen.** G. P. NIJHOFF. *Comm.*

*Phys. Lab. Univ. Leiden*, Suppl. No. 64, 17-27(1929).—Values are given for  $B$  in the equation  $p v_A = [A_A + B_A d_A + \dots]$  for both He and H<sub>2</sub>. Calcd. and measured values of  $B$  for H<sub>2</sub> agree at low temps., but at high temps. there are unexplained variations. Values of  $B$  for He agree more closely. E. G. VANDEN BOSCH

The measurement of gas temperatures up to 1500° in radiation fields of changing anisotropy. HERMANN SCHMIDT. *Arch. Eisenhüttenw.* 2, 293-9(1928).—Rapid changes in gas temps. are accurately measured by a resistance-heated and water-cooled gas pyrometer. A complete description and drawings are given. R. D. BUMBACHER

A new method for measuring the relative viscosity of gases and vapors. A. WEISSWEILER. *Physik. Z.* 30, 364-7(1929).—By suspending a quartz fiber in a tube sealed into a horizontal one through which a gas streams at known velocity, and measuring the deflection of the fiber by a telescope with micrometer eye-piece, the relative viscosities could be calcd. after calibrating with a gas of known viscosity. The precision is  $\pm 0.5\%$ . Full details of the app. and calibration are given. LOUIS WALDBAUR

Compressibility of carbon monoxide at 0°, at surrounding temperatures and at pressures between 50 and 130 atmospheres. SEVERIANO GOIG BOTELLA. *Anales soc. españ. fís. quim.* 27, 315-50(1929).—The compressibility of CO was detd. at pressures greater than 50 atm. at temps. of 0°, 12.44° and 20.22°, exceeding in each case the min.  $p v$  isotherm. In each isotherm values of  $p v$  and deviation coeffs. from the Boyle-Mariotte law referred to atm. pressure were obtained. The results are accurate to 0.02%. The compressibility of CO is normal; and the analogy between CO and N as regards phys. properties is confirmed. E. M. SYMMES

Microanalytical determination of vapor density. JOSEPH B. NIEDERL. *Z. anal. Chem.* 77, 169-74(1929).—The principle of the Victor Meyer and Hofmann methods is adapted to work with very small quantities of an org. substance. The app. and method of carrying out an analysis are described in detail. W. T. H

The vapor pressure of isopropyl acetate. CECIL J. HAGGERTY and JOSEPH P. WEILER. *J. Am. Chem. Soc.* 51, 1623-6(1929).—The vapor pressure of isopropyl acetate was measured over the range 0° to 90° by means of the isotenscope recommended by Smith and Menzies (*C. A.* 5, 232). The molal entropy of vaporization at the b. p. was 21.8 cal. per degree, in agreement with the value for a normal liquid. P. T. NEWSOME

The densities of coexisting liquid and gaseous nitrous oxide. ELTON L. QUINN and GRANT WERNIMONT. *J. Am. Chem. Soc.* 51, 2002-8(1929).—The d. of coexisting gaseous and liquid phases of N<sub>2</sub>O have been detd. over a temp. range from 30° to -50°. Values from 30° to 0° agree closely with those obtained by Villard over that range. The crit. d. is 0.459 and the mol. vol. at zero abs. 28.1 cc. when calcd. from Sugden's equation. N. M. BOUDER

Intensive drying of liquids. S. LENHER. *Nature* 123, 907-8(1929); cf. *C. A.* 23, 320.—The abnormal rise in b. p. observed by Baker and Smits with dried C<sub>6</sub>H<sub>6</sub> is due to superheating, since, by using their app. and procedure, similar results were obtained with ordinary C<sub>6</sub>H<sub>6</sub>. Conditioning factors are: (1) the use of a heating bath; (2) the immersion of the thermometer bulb in the liquid being investigated; (3) allowing a liquid to stand in contact with a flocculent solid; (4) distn. of the liquid into a clean flask before detg. the b. p. Repetition of Baker's work on the application of high d. c. potentials to C<sub>6</sub>H<sub>6</sub> indicates that the same source of error occurs in the rise of b. p. observed by him. I. J. PATTON

The relation of the internal pressure of fluids with some physicochemical properties. IONEL N. LONGINESCU. *Univ. of Paris. Thesis*, 108 pp.(1928); *J. chim. phys.* 26, 314-6(1929).—The force acting between mols. is represented by the expression  $K\mu/d^2$ ,  $\mu$  representing a quantity defined as the attractive mass;  $d$  is the distance. By introducing this quantity, neglecting the repulsive forces, into the classical equations for the internal pressure at the crit. temp. and pressure, an expression is derived in which  $x$  found by trial is 5.0 ( $4.5 < x < 5.5$ ). The attractive mass of a mol. is the sum of the attractive masses of its component atoms. The attractive mass of an atom depends upon its valence and chem. combination; for example, C with single, double and triple bonds has the values 0.18, 0.36 and 0.54, resp. The assocn. of a substance can be calcd. by taking the ratio of the attractive mass calcd. from exptl. data, and the ideal (non-assocd.) attractive masses calcd. by addn. of the known attractive masses of the atoms. The values calcd. for H<sub>2</sub>O, NH<sub>3</sub>, CH<sub>3</sub>OH, C<sub>2</sub>H<sub>5</sub>OH, etc., agree with Traub's values. By the use of the approx. fundamental formula  $0.360 (T_c)^{1/3} (V_c)^{1/3} = a_1 + a_2 + \dots \sum a_n$  G. G. Longinescu and Walker's empirical formulas are derived. Equations are derived for calcg.  $T_c$ , b. ps. and heats of vaporization. The values agree with exptl. values within 5%. Some new relations, such as  $T_c/p_c = A$ , proportionality between crit. values and the no. of atoms in a homologous org. series are pointed out. The mol. forces vary inversely

as the fifth power of the distance in the liquid phase, while they vary only as the fourth power in the gas phase. The difference is due to the change in the repulsive forces. For homologous nonassocd. org. series, the no. of electrons taking part in mol. attraction is equal to the square root of the total no. of electrons. The attractive mass at a const. temp. is proportional to the mol. surface. By making a comparison of external pressure (such as, the pressure of a gas) with internal pressure, L. deduces that  $P_e V$  is approx. const. *Avogadro's law* may be extended to liquids by the statement that at const. temp. two liquids at the same internal pressure have the same no. of mols. per unit vol. This gives a direct method of detg. the mol. wts. of liquids ARTHUR FLEISCHER

**Boiling points of hydrocarbons.** BORIS NEKRASOV. *Z. physik. Chem., Abt. A*, **141**, 378-86(1929); cf. *C. A.* **23**, 3390.—It was shown, on the basis of the empirical formula  $T_b = \text{const.} (M - \Sigma) / \sqrt{E}$ , (where  $T_b$  = abs. b. p.,  $M$  = mol. wt.,  $\Sigma$  = the sum of certain equiv. const. = 29.0) that the b. p. of hydrocarbons can be calcd. closely from their structural formulas. From the equivs. C = 2.00, H = 1.00 a double bond = 1.00, the b. p. of pinene calcd. to be 428° while the exptl. value is 429° abs. The formula was found to hold to within 5° for 260 out of 316 compds. LOUIS WALDBAUER

**Anomalies encountered in concentrated alcoholic solutions.** B. M. KOYALOVICH. *Zhur. Prikladnoi Khim.* **1**, 260-2(1928).—Density isotherms of mixts. of EtOH and water show a discontinuity at concs. close to 95% EtOH. V. KALICHEVSKY

**Recalculation of the densities of water-alcohol mixtures from the experimental data of Mendelyev.** A. N. GEORGIEVSKII. *Zhur. Prikladnoi Khim.* **1**, 207-19(1928).—The original data were cor. to the international H temp. scale and for the recently redtd. water. V. KALICHEVSKY

**Experimental data used by the Russian Bureau of Measures and Weights for calculating density tables of water-alcohol mixtures.** M. S. VREVSKII. *Zhur. Prikladnoi Khim.* **1**, 160-72(1928).—Exptl. data of Mendelyev are considered more accurate than those of the U. S. Bureau of Standards which are, however, close seconds and were used for mixts. contg. 0-35% EtOH and not measured by Mendelyev. For temps. below 0° exptl. data of Recknagel (*Sitzber. Bayer. Akad. Wissenschaft* 1866) are the most reliable, but more work is required for this region. V. KALICHEVSKY

**Densities of water-alcohol mixtures calculated in 1927 by the Russian Bureau of Measures and Weights.** B. M. KOYALOVICH. *Zhur. Prikladnoi Khim.* **1**, 219-60(1928).—Complete d. tables are given for the temp. range -25° - -30°. Methods used in calcg. are explained. V. KALICHEVSKY

**The density of molten metals and alloys.** YOSIHARU MATUYAMA. *Science Repts. Tohoku Imp. Univ.* 1st Ser. **18**, 19-46(1929).—The ds. of Sn, Cd, Bi, Pb and Zn and of the alloys, Sn-Cd, Sn-Bi, Bi-Pb, Sn-Zn, Bi-Cd, Cd-Pb, Cd-Zn, Sn-Bi-Cd, Bi-Cd-Pb, Sn-Bi-Pb, Sn-Cd-Pb, Sn-Cd-Zn and Cd-Pb-Zn were measured at different temps. by a method devised by the author. The expansion coeff. of molten metal is almost independent of temp., but has a slight tendency to decrease with rise of temp. The d. of molten metals at the m. p. as obtained by the extrapolation of the d.-temp. curve agrees very well with the value calcd. from the expansion coeff. of the solid metal and its change of vol. during melting. The at. vol. of molten alloys is greater than the mean of the at. vol. of the components, the amt. of the max. deviation being of the order of 1%. DOWNS SCHAAP

**Report on researches concerning the structure of substances in the solid and liquid states at low temperatures, carried out between the Fourth and the Fifth International Congress of Cold.** W. H. Keesom. *Comm. Phys. Lab. Univ. Leiden*, Suppl. No. **64**, 39-45(1929).—A report of the study, by means of x-rays, of the structure of substances which are either liquid or solid at ordinary temps. also of liquefied or solidified gases. A brief account of the work on polymorphic transformation of substances at low temps. also is given. E. G. VANDEN BOSCH

**A property of superconducting metals.** JAMES H. BARTLETT, JR. *Nature* **123**, 869-70(1929).—Polemical with Kapitza (*C. A.* **23**, 2860). Reply. P. KAPITZA. *Ibid* 870-1. J. B. AUSTIN

**Density of alkaline earth carbonates.** T. BATUECAS, A. RANCAÑO AND J. IBARZ. *Anales soc. españ. fis. quim.* **27**, 290-304(1929).—With the exception of calcite the literature on d. of alk. earth carbonates is old and inexact. The d. was detd. by pycnometer, using as counterpoise another receiver of the same shape and external vol. and as liquid pure toluene distd. over  $\text{CaCl}_2$ . Kahlbaum pptd.  $\text{CaCO}_3$  = 2.690; prepd. by igniting  $\text{CaC}_2\text{O}_4$ , purity detd. by spectroscopy, = 2.705; calcite = 2.713; aragonite = 2.929. The Kahlbaum sample was found to contain traces of Mg and was eliminated. Kahlbaum pptd.  $\text{SrCO}_3$  = 3.586; strontianite = 3.712; Kahlbaum pptd.  $\text{BaCO}_3$  = 4.290; witherite = 4.284. Except for pptd.  $\text{SrCO}_3$ , these values agree with those Wilson found

by x-ray methods. From these ds. calcn. gives for mol. vol. and contraction, resp., of aragonite 34.2, 0.55; of strontianite 39.8, 0.58; of witherite 46.1, 0.61. This shows that the contractions of alk. earth carbonates, instead of being const., as stated by Saslawsky, diminish with increase in at. wt. of the metal. E. M. SYMMES

The melting point of organic substances capable of being used as reference points at low temperatures. JEAN TIMMERMANS. *Comm. Phys. Lab. Univ. Leiden*, Suppl. No. 64, 3-8(1929).—The compds. studied were carefully prepd. and of highest purity. The compds. together with their m. ps. are:  $\text{CCl}_4$  —22.85°,  $\text{C}_6\text{H}_5\text{Cl}$  —45.35°,  $\text{CHCl}_3$  —63.5°,  $\text{EtOAc}$  —83.6°,  $\text{C}_6\text{H}_5\text{CH}_3$  —95.0°,  $\text{CS}_2$  —111.8°,  $\text{Et}_2\text{O}$  —123.3°, methylcyclohexane —126.85°, isopentane —160.0°. E. G. VANDEN BOSCHE

The molecular volume of organic components in complex salts. I. The space requirements of *o*-phenylenediamine in its compounds with metallic salts. WALTER HIEBER AND KARL RIES. *Z. anorg. allgem. Chem.* 180, 225-34(1929).—The mol. vol. of  $\text{o-C}_6\text{H}_4(\text{NH}_2)_2$  increases in compds. with Cd salts in the order Cl, Br, I. The vol. of each mol. of diamine at 25° decreases with the no. combined with one mol. of metal salt. Ni salts are similar, except the bromide, which gives an abnormally small vol. for the  $\text{o-C}_6\text{H}_4(\text{NH}_2)_2$ . With Co salts there is 1 exception, the vol. with 6 mols. of diamine with the chloride is greater than with 4 mols. With Zn salts the I compd. occupies less vol. than the Cl compd. In combination with sulfates the di  $\text{o-C}_6\text{H}_4(\text{NH}_2)_2$  compds. have approx. the same vol. per mol. of diamine with Co, Ni, Cu and Zn. The vol. is less with Cd. The order of vols. is not the same with chlorides of these metals at —78° as at 25°. The min. vol. of  $\text{o-C}_6\text{H}_4(\text{NH}_2)_2$  is estd. at about 80, a greater value than the *p*-compd. Factors influencing the vol. are the structure and kind of metal salt, and temp. Biltz' rule for ammoniates does not apply. Apparently the strength of the bond to the salt is a factor. FOSTER DRE SNELL

The form of the electrocapillary curves of soap solutions. D. TALMUD. *Kolloid-Z.* 48, 164-5(1929).—In the electrocapillary curves of solns. of K oleate in 0.1 *N* KCl soln. at concns. of 0.0003 *M* to 0.01 *M* there is observed a marked shifting of the max. In a 0.2 *M* soln. in water the shift is to the left, indicating a positive adsorption potential at the interface Hg soln. At increasing diln. the max. is shifted to the right (negative adsorption potential), and the appearance of the curves approaches that of electrolytes with an active anion. Similar results were obtained with a nonelectrolyte, *p*-toluidine, which indicates a reorientation of the mol. R. I. RUSH

Evaluation of adsorbents by thermal methods. E. V. ALEKSEVSKII. *Zhur. Prikladnoi Khim.* 1, 182-4(1928); cf. *C. A.* 20, 2609.—Animal C (*Carbo animalis purissimus* Merck) was mixed in a calorimeter with 19 org. substances and water and the temp. rises detd. The method of Berl and Andress (*C. A.* 17 1677) for estimating the relative powers of adsorbents is practical. V. KALICHEVSKY

The heat of adsorption of oxygen on charcoal. MELVILLE J. MARSHALL AND HAROLD E. BRAMSTON-COOK. *J. Am. Chem. Soc.* 51, 2019-29(1929).—The differential heat of adsorption of O on activated coconut C was measured. *Q*, the heat of adsorption per mol. of O, reached a max. of 89,600 cal. at the lowest concn. of O. The curve obtained by plotting *Q* against the concn. of O on the surface shows a tendency to flatten at 70,000 cal. and a sharp change in slope at 8000 cal. P. H. EMMETT

The influence of temperature upon the adsorption of gases. H. ZEISE. *Z. physik. Chem.*, Abt. A, 138, 289-99(1928).—The values of  $c_1$  and  $c_2$  in Langmuir's equation are functions of the temp. although not so indicated by the equation. Z. shows that the influence of the temp. upon  $c_1$  may be expressed by  $c_1 = a_1 - b_1T$  and upon  $c_2$  by  $c_2 = 10^{a_2/T^{b_2}}$ , wherein  $a$ ,  $b$ ,  $a_2$  and  $b_2$  are the neg. direction coeffs. in the system with the coordinates  $c_1$ ,  $T$  and  $\log c_2$ ,  $\log T$ , resp. EMIL KLARMANN

A case of reversal of adsorption. H. FREUNDLICH AND L. L. BURGESS. *Z. Elektrochem.* 35, 362-6(1929).—PbS, pptd. by the interaction of  $\text{Pb}(\text{OAc})_2$  and  $\text{Na}_2\text{S}$  under proper conditions will change its sp. surface as time progresses. A basic dye like rhodulin violet and an acid dye like fast acid violet, which are initially highly adsorbed from soln., are returned to the soln. This desorption takes place autocatalytically. The rate of desorption in the case of the true-acid violet was but slightly dependent on the dye concn., rapidity of stirring and temp. and thus the rate of crystn. of the PbS was measured. The rapidity of desorption in this case was greater than in the case of the rhodulin violet, which is explained by Marc's statement that a more highly adsorbed substance impedes the rate of crystn. more than a weakly adsorbed one. In older expts. on desorption, e. g., with HgS and S and basic dyes, not only the rate of crystn. but also the rate of pptn. of the sol was measured. I. J. PATTON

The adsorption of electrolytes by crystalline surfaces. II. L. DE BROUCKÈRE. *Bull. sci. acad. roy. Belg.* [5], 15, 170-82; *J. chim. phys.* 26, 250-75(1929); cf. *C. A.* 22,

2092; 23, 751.—The previous method of detg. the isotherm was applied to  $\text{CdCl}_2$ ,  $\text{HgCl}_2$ ,  $\text{LaCl}_3$  and  $\text{PbCl}_2$ . A new sample of  $\text{BaSO}_4$  was prepd. of which 1.41 g. was equal to 1 g. of the previous prepn. As previously found, the adsorption equil. was reached by either increasing or decreasing the concn. of the electrolyte. Capillary effects were too small to cause errors. Anions and cations are adsorbed in equiv. quantities. At satn., the isotherms are arranged with decreasing adsorption with increasing at. wt. The results for bivalent chlorides are in accord with a unimol. layer. Also in *Bull. soc. chim. belg.* 38, 212-22(1929). A. F.

**Adsorption of ions and the physical character of precipitates.** HARRY B. WEISER AND G. E. CUNNINGHAM. *Colloid Symposium Monograph* 6, 319-41(1928); *J. Phys. Chem.* 33, 301-16(1929).—Factors other than percentage supersatn. which influence the phys. character of ppts. are the sp. tendency of particles to adsorb the solvent, the shape of the particles and the effect of adsorbed ions. The phys. character of pptd. S varies more or less continuously from gelatinous and reversible to plastic and completely non-reversible when thrown down in the presence of the lyotropic series of ions from Li to Cs and from Mg to Ba. Ultramicroscopic observations of the change taking place when a highly hydrated cation is removed from a gelatinous S clump by displacing with a less hydrated, more strongly adsorbed cation, shows a very marked shrinkage as the result of the loss of adsorbed  $\text{H}_2\text{O}$  and the coalescence of the particles. Motion pictures were made of the process. A reversible ppt. of any substance will be obtained when a sol is neutralized under such conditions as to prevent coalescence (a) by the intervention of a film of adsorbed solvent or (b) by preventing collision of the neutralized particles. In either case the adsorption of the neutralizing ion must be sufficiently weak to permit its removal by washing. The fundamental nature of pptd. S clumps depends upon whether or not the conditions under which pptn. is carried out favor the coalescence of the ultra-microns, which in turn depends upon the nature and hydration of the adsorbed ions. H. B. WEISER

**Brownian movement apparatus.** HARRY C. DOANE AND WM. A. DOW. *J. Chem. Education* 6, 1099(1929).—A beam of light is projected just below the surface of a colloidal soln. of  $\text{As}_2\text{S}_3$ . The Brownian movement is observed against a dark field by a microscope at 100  $\times$  magnification. The soln. is prepd. by adding a satd. soln. of  $\text{H}_2\text{S}$  drop by drop to a dil. soln. of  $\text{H}_3\text{AsO}_3$  till, by shaking, a slight yellow color appears. The  $\text{H}_3\text{AsO}_3$  is prepd. by refluxing 2 g.  $\text{As}_2\text{O}_3$  with 100 cc. distd.  $\text{H}_2\text{O}$  till dissolved, then dilg. with 9 vols. distd.  $\text{H}_2\text{O}$ . C. Z. ROSECRANS

**Changes in physicochemical properties in the transition region between colloidal and molecular dispersed systems. I.** WO. OSTWALD AND ALFRED QUAST. *Kolloid-Z.* 48, 83-95(1929).—Diffusion coeffs. of purified dyestuffs in alc.-water mixts. of varying compn. were detd. by the method of Auerbach. From these the relative particle size was calcd. according to A. Einstein. All dyestuffs examd. (night blue, crystal violet, Congo red, benzopurpurin, Nerol, sulfocyanine, new fuchsin, brilliant green) showed a max. degree of dispersion in a mixt. contg. 40-60% alc. The radii calcd. according to Einstein varied in the ratio 1:100, depending upon the compn. of the dispersion medium. II. *Ibid* 156-64.—B.-p. elevations of night blue and crystal violet in  $\text{H}_2\text{O}$ -alc. mixts. show a max. particle size in 40-60% alc. The surface tension of water-alc. mixts. after addn. of these dyestuffs is practically independent of the compn. of the mixt., except at high water concns. A min. sp. viscosity and max. foaming are observed in the intermediate region of water-alc. mixts. contg. these dyestuffs. FRANK URBAN

**The theory of the change in charge of colloidal particles.** A. EUCKEN. *Z. physik. Chem., Abt. B*, 1, 375-8(1928).—The change in charge of colloidal particles on adding electrolytes to sols is explained by the aid of the Debye theory of strong electrolytes instead of by the assumption of selective adsorption of ions. The Debye-ion atmosphere runs parallel with the elec. double layer which exists at a solid-liquid interface, e. g., the surface of colloidal particles. Changing the ion atmosphere changes the distribution of the charge on the double layer, thereby altering the charge on the colloidal particles. HARRY B. WEISER

**Cataphoresis of lead sulfate.** EUGENE L. JEWETT. *J. Phys. Chem.* 33, 1024-6(1929).—Cataphoresis expts. show colloidal  $\text{PbSO}_4$  to be positively or negatively charged depending upon the method of prepn. When  $\text{H}_2\text{SO}_4$  is electrolyzed between Pb plates,  $\text{PbSO}_4$  is formed and held to the plate more strongly by cataphoresis than by adsorption. The use of a. c., causes pptn. of  $\text{PbSO}_4$  at each electrode. Slow reversal of the current minimizes the cataphoretic effect and increases that of adsorption. Cataphoresis may explain the theory of the electrolytic prepn. of insol. salts and the detn. of Pb. F. W. LAIRD

**Plastometric studies of the formation of boundary layers.** A. DE WAELE AND G.

L. LEWIS. *Kolloid-Z.* 43, 126-41(1929).—Plastometric studies were made of carbon black in oxidized linseed oil, in mineral oil with and without added polar mineral oil, of violet lake in oxidized linseed oil and in mineral oil, of wool grease-water emulsions, mineral oil-dil. sulfonated oil emulsions, aq. suspensions of china clay and bentonite suspensions of ultramarine in blown rapeseed oil, and nitrocellulose in AcOAm. The existence of a pseudo-solid or "bound" layer enveloping the dispersed particles of such systems is shown. The calcd. ratio of the thickness of this boundary layer to the av. radius of the dispersed particles may be used for characterizing a colloidal system. It is closely related to the plastic flow and the general colloidal properties. The value for the ratio depends on the size of the dispersed particles, is inversely proportional to the degree of dispersion and is const. for a given solid-liquid system over a wide range of concns. The viscosity of the liquid directly adjacent to the "bound" layer of liquid is very great. If a solid dispersing agent is added to a liquid contg. a dispersed material, the dispersing agent is adsorbed on the surface of the particles already present. From a thermodynamic point of view, the plastic flow of solid-liquid and liquid-liquid systems is not directly related to the lyotropic state, or the formation of a pseudo-solid layer.

CORNELIA T. SNELL

Peptization of dyestuffs by neutral salts. WO. OSTWALD. *Ber.* 62B, 1194-6 (1929).—Free Congo red dye acid may be rendered sol. in water by addn. of 0.5 N KCl or  $MgCl_2$ . A blue Congo acid sol turns red upon addn. of neutral chlorides, iodides, bromides, chlorates, nitrates, sulfates, etc., of univalent and multivalent cations. Flocculation takes place at higher concns. Ammonium salts, however, cause a bathochromic color displacement. Absorption curves were detd. before and after addn. of NaCl. These show the enormous hypsochromic displacement of the absorption max. F. U.

The flocculation of colloidal solutions. A. BOUTARIC. *J. pharm. chim.* 7, 395-401, 456-67(1928).—A comprehensive résumé. Cf. *C. A.* 19, 2291, 2292, 2767; 20, 3257; 22, 3080; 23, 1040.

S. WALDBOTT

The flocculation of hydrosols of gold. A. BOUTARIC AND Mlle. M. DUPIN. *Bull. soc. chim.* 45, 28-9(1929).—When the time required for flocculation of an  $As_2S_3$  sol. or a  $Fe(OH)_3$  sol is plotted against the quantity of coagulating electrolyte added, the graph asymptotically approaches a line representing the min. concn. of electrolyte which will produce flocculation. In the case of a Au hydrosol, there are three significant concns. of multivalent electrolyte such as  $AlCl_3$ ,  $FeCl_3$  and Th chloride, *a*, *b* and *c*. Concns. of electrolytes between *a* and *b* produce red gelatinous flocculations. Concns. between *b* and *c* produce a change of charge on the colloid. Concns. above *c* produce blue granular particles which are positively charged.

F. E. BROWN

Oxidation of colloidal sulfides of arsenic, antimony and copper. M. SWIDER-KA, W. KOSTANECKA AND P. WARSZAWSKA. *Roczniki Chem.* 9, 411-6(416-7 German)(1929).—The oxidation of  $As_2S_3$ ,  $Sb_2S_3$  and CuS in colloidal soln. by air was measured. After prolonged action of air  $As_2S_3$  gives  $H_3AsO_3$ ,  $H_2SO_4$  and free S. After the oxidation of  $Sb_2S_3$  with air, only  $H_2SO_4$  is found in the filtrate; no S is in the ppt. of unchanged  $Sb_2S_3$ . In the presence of  $H_2S$  CuS gives only free S, the amt. of which increases with the time of the action of air. Only after all  $H_2S$  has been expelled from the soln. do Cu ions appear in the filtrate. The free oxidation of sulfides renders all detns. doubtful when they are performed in the presence of air with considerable amts. of colloidal sulfides, particularly of  $As_2S_3$ .

J. KUČERA

Colloidal sulfur. M. LORA Y TAMAYO. *Anales soc. españ. fís. quím. (sec. tercia)* 27, 110-2(1929).—S hydrosol of sufficient stability to be used for injection is obtained by pouring 100 cc. of a hot soln. of S in alc. gradually into 100 cc. of a 1% aq. gelatin soln. prepd. according to Wo. Ostwald. The mixt. is then heated under reduced pressure to remove half the alc. The hydrosol does not deposit within 7 days, and after that agitation is sufficient to disperse it again.

E. M. SYMMES

Formations obtained by desiccation of colloidal solutions of alumina and chromium oxide. PAUL BARY AND JOSÉ V. RUBIO. *Anales soc. españ. fís. quím.* 27, 273-84 (1929).—Attempts were made to reproduce with  $Al_2O_3$  and  $Cr_2O_3$  the same phenomena noted previously with  $Fe_2O_3$  (*C. A.* 22, 3080). Results obtained confirmed the former, but were less pronounced. It is concluded that metallic sesquioxides in soln. are formed of a mixt. of 2 oxides of like compn. but unequally hydrated, 1 being a hydrophilic suspension of the other, protecting it. Aging of colloidal solns. of this type causes slow transformation of the hydrophilic to the hydrophobe colloid. Formations obtained on glass by desiccation of solns. cannot in this case be explained by the Weimarn theory.

E. M. SYMMES

Jellies and gels. F. KIRCHHOF. *Kautschuk* 5, 100-3, 140-2(1929).—A review. C. C. DAVIS

**Calcium acetate gels.** I. P. C. L. THORNE AND C. G. SMITH. *Kolloid-Z.* **48**, 113-25(1929).—By pouring varying amts. of a satd. soln. of anhyd.  $\text{Ca}(\text{OAc})_2$  into 95% alc., gelatinous ppts. and gels may be obtained. The characteristics of these gels depend on the salt concn. and on the total  $\text{H}_2\text{O}$  content of the mixt. If the latter is 12% or more, sols and not gels, are formed. The viscosity of the sols reaches a max. when the acetate soln. is 50% of the total vol. No sharp change in viscosity occurs with a change from sol to gel. The stability of the gels varies from a few hrs. to a few days, after which they gradually soften and  $(\text{AcO})_2\text{Ca}$  ppts. in small clusters. If the gel contains much  $\text{H}_2\text{O}$ , needle-like crystals radiate from the nuclei. The addn. of  $\text{Me}_2\text{O}$ , glycerol, Na, K or Fe oleate, stearin or oleic acid, stabilizes the gels for periods up to 6 months. The fibrous structure of these gels may be seen with the naked eye. The addn. of Na oleate causes syneresis. Gels contg. K or ferric oleate shrink slowly. Materials such as  $\text{CHCl}_3$  and  $\text{CCl}_4$  have little influence on the stability. Acids and alkalis cause the gels to set more slowly and shorten the period of stability. Salts vary in their effects; bivalent cations retard the speed of gel formation more than univalent cations. The temp. of prepn. does not affect the stability of the gels. The gel retains its form for a long time on drying, becoming more and more turbid. The alc. evaps., and after 4-6 weeks, the  $(\text{AcO})_2\text{Ca}$  dissolves in the remaining  $\text{H}_2\text{O}$ . CORNELIA T. SNELL

The thixotropy of dispersions of low concentration. E. A. HAUSER. *Kolloid-Z.* **48**, 57-62(1929).—The term thixotropy, first used by Peterfi, refers to an isothermal, reversible gel-sol transformation by means of shaking or other mechanical influences. The thixotropy of a bentonite (aluminum silicate) dispersion depends on the diam. of the container, as well as on the concn. of the dispersed substance. Thixotropic properties of native bentonite disappeared after dialysis, but could be restored by addn. of electrolytes. Ultramicroscopic examn. of dialyzed bentonite dispersions of low concn. showed that addn. of electrolytes first removed the translational, next the rotational component of Brownian motion. Further addn. caused aggregation and coagulation. Thixotropic  $\text{Fe}_2\text{O}_3$  sols also were studied, as well as the influence of other colloidal dispersions on thixotropic sols. An attempt is made to explain thixotropy by hydration, and orientation of the mols. of the dispersion medium. FRANK URBAN

Studies on adsorption and swelling. V. KUBELKA AND J. WAGNER. *Cuir tech.* **17**, 514 20(1928); cf. *C. A.* **23**, 1038. J. G. NIEDERCORN

The combination of gelatin with hydrochloric acid. II. New determinations of the isoelectric point and combining capacity of a purified gelatin. DAVID I. HITCHCOCK. *J. Gen. Physiol.* **12**, 495-509(1929); cf. *C. A.* **16**, 3672; **17**, 1252, 3682; **18**, 696—A com. gelatin purified according to Northrop and Kunitz (*C. A.* **22**, 2699), and isoelec. at  $\text{pH}$  5.05 as detd. from osmotic pressure and max. opacity measurements, was used in these expts. From H-electrode measurements with KCl-agar junctions, coned. titrations and e. m. f. measurements with the cell  $\text{Ag}, \text{AgCl}, \text{HCl} + \text{gelatin}, \text{H}_2$ , without liquid junction, it is concluded that this gelatin combines with approx.  $9.4 \times 10^{-4}$  equivs. of  $\text{H}^+$  and  $1.7 \times 10^{-4}$  equivs. of  $\text{Cl}^-$  per g. gelatin. C. H. RICHARDSON

The change of surface tension of gelatin with changing  $\text{pH}$  and at low electrolyte concentrations. N. YERMOLENKO. *Kolloid-Z.* **48**, 141-6(1929).—The surface tension of 0.1% gelatin sol showed a min. at  $\text{pH}$  4.7 and max. at  $\text{pH}$  2.85 and at 8.3. The  $\text{pH}$  was detd. colorimetrically. The gelatin contained 0.83% ash. At electrolyte concns. of less than  $10^{-12}$  N no influence on the properties of the reversible colloid was noticed. FRANK URBAN

The structure of gelatin solutions. N. MARINESCO. *Compt. rend.* **188**, 1163-5 (1929); cf. *C. A.* **23**, 3614.—The sp. inductive capacity of aq. solns. of gelatin increases rapidly and linearly as the concn. increases until a sharp max. is reached at dielec. const. 108 and concn. 0.6%, after which it falls off sharply again. The max. coincides with the min. concn. at which gelation is possible. At concns. below this critical point the solns. are optically empty, do not exhibit viscosimetric rigidity, and are powerful protective agents for hydrophobe colloids. It is concluded that gelatin mols. are very highly polar—more so than  $\text{H}_2\text{O}$  mols.—and that below 0.6% concn. they exist in soln. as single mols. Above 0.6% concn. the gelatin mols. unite in aggregates having zero elec. moment. F. L. BROWNE

Orientation and pseudo crystallization resulting from the action of traction in colloidal gels. JEAN J. TRILLAT. *Compt. rend.* **188**, 1246-8(1929).—Films of cellulose nitrates and acetates were subjected to traction by stretching them in one direction and the resulting changes in x-ray patterns observed. The unstretched films showed the halos characteristic of amorphous material. Stretching gave rise to patterns which prove that the long chain-like mols. become oriented parallel to the direction of stretch-

ing. The effect increased as the stretching was increased. Eventually a pseudo cryst. state was reached in which there still remained some residual amorphous material.

F. L. BROWN

**The formation of the secondary system of Liesegang's layers.** II. M. S. DUNIN AND F. M. SHEMYAKIN. *Kolloid-Z.* **48**, 167-70(1929); cf. *C. A.* **21**, 1738-9.—A tube of gelatin gel to which a soln. of  $\text{AgNO}_3$  was added was allowed to stand in a dark room for about a year and a half. Five supermacroscopic layers were observed, the width of the layers and the space between being alternately large and small. Also 5 supermacroscopic layers of  $\text{Ag}_2\text{Cr}_2\text{O}_7$  and 9 of  $\text{PbI}_2$  were obtained, and the phenomenon of complex periodicity is plainly recognized. Microscopic layers of  $\text{Ag}_2\text{Cr}_2\text{O}_7$  and  $\text{Ag}_3\text{PO}_4$ ,  $\text{Ca}_3(\text{PO}_4)_2$ ,  $\text{PbI}_2$  and  $\text{Cu}_2\text{Fe}(\text{CN})_6$  cyanide have the same appearance and obviously are united to form macroscopic layers. In the case of  $\text{Ag}_3\text{PO}_4$  and also of  $\text{PbI}_2$  microscopic, macroscopic, and supermacroscopic layers were observed. The transition of layers of one class into another is possible through a series of external factors. It is postulated that there are three concns. corresponding to the formation of the three kinds of rings. The analogy between the phenomenon of complex periodicity and the so called "zones of silence" or "death zones" is pointed out.

R. I. RUSH

**Studies on permeability of membranes.** VII. Conductivity of electrolytes within the membrane. ARDA A. GREEN, A. A. WEECH AND L. MICHAELIS. *J. Gen. Physiol.* **12**, 473-85(1929); cf. *C. A.* **23**, 1655.—The elec. cond. of dried collodion membranes in contact with electrolyte solns. of various concns. was measured by two methods. Each membrane with each electrolyte showed a max. level of resistance at a certain electrolyte concn. which was probably detd. by the collodion rather than by the electrolyte soln. In relatively concd. solns., cond. was approx. proportional to concn. With different electrolytes at the same concn. conductivities varied much more than in simple solns. without a membrane and followed the order  $\text{HCl} > \text{KCl} > \text{NaCl} > \text{LiCl}$ . A membrane satd. with either  $\text{HCl}$  or  $\text{KCl}$  (0.5 *N*) had nearly the same total content of electrolyte, whereas the same membrane in contact with  $\text{LiCl}$  contained only one-half the quantity. Two factors probably cause the divergent conductivities obtained with different electrolytes: (1) the quantity of electrolyte that can enter the pores of the membrane which depends upon pore size and the vol. of the larger of the two hydrated ions of the electrolyte; (2) differences in the mobility of the various cations within the membrane due to friction between ions and pore walls. The difference in cond. between  $\text{KCl}$  and  $\text{LiCl}$  is largely detd. by (1); that between  $\text{KCl}$  and  $\text{HCl}$  is explained by (2). A method for detg. the electrolyte content of a membrane in contact with different chloride solns. is described. VIII. The behavior of the dried collodion membrane toward bivalent cations. A. A. WEECH AND L. MICHAELIS. *Ibid* 487-93(1929).—A study of the behavior of dried collodion membranes toward  $\text{Ca}$  ion shows: (1) that a p. d. is not established across a membrane sepg. two  $\text{CaCl}_2$  solns. of 0.1 and 0.01 *N* concns.; (2) that the transfer nos. of  $\text{Cl}^-$  and  $\text{Ca}^{2+}$  are both approx. 0.5; (3) that the membrane in equil. with a soln. of  $\text{CaCl}_2$  has an elec. resistance which is much higher than is produced by solns. of any of the univalent chlorides; (4) that the total electrolyte content of a membrane in equil. with  $\text{CaCl}_2$  soln. was only 20% of that obtained with  $\text{LiCl}$  soln. and 10% of that for  $\text{KCl}$  soln. These results are probably due to the inability of the  $\text{Ca}$  ion to penetrate any but the largest of the pores in the collodion membrane.

C. H. R

**The permeability of dry collodion membranes.** II. JOHN H. NORTHRUP. *J. Gen. Physiol.* **12**, 435-61(1929); cf. *C. A.* **22**, 1513.—The rates of penetration and solubilities of  $\text{H}_2\text{O}$ ,  $\text{N}$ ,  $\text{NH}_3$ ,  $\text{H}_2\text{O}$ ,  $\text{HCl}$  gas,  $\text{CO}_2$ ,  $\text{HCOOH}$ ,  $\text{AcOH}$ ,  $\text{CH}_2\text{ClCOOH}$ ,  $\text{CHCl}_2\text{COOH}$ , glycerol,  $\text{C}_6\text{H}_5\text{OH}$  and  $\text{HgCl}_2$  in dry collodion membranes were measured. The rate of penetration of  $\text{H}$  and  $\text{CO}_2$  is the same whether the gas passes through the dry membrane or whether the membrane is immersed in water. The soly. of  $\text{CO}_2$ ,  $\text{AcOH}$ ,  $\text{C}_6\text{H}_5\text{OH}$  and water in collodion is reversible and proportional to the concn. or vapor pressure in low concns. and independent of the surface of the collodion. The results obtained by calcn. of pore size from the vapor pressure of water and from the rate of flow of water through the membrane do not agree and are not consistent with the observed rates of penetration. The rates of penetration bear no relation to the density of the gas. When the results are expressed as diffusion coeffs. in collodion they show that the diffusion coeff. increases rapidly with the decrease in mol. wt.

C. H. RICHARDSON

**An explanation of the "electrocapillary" Becquerel phenomenon.** H. FREUNDLICH AND K. SÖLLNER. *Z. physik. Chem.*, Abt. A, **138**, 349-56(1928).—Becquerel's phenomenon depends upon the pptn. of metal on a porous membrane sepg. the soln. of a metal salt from the soln. of another salt which forms an insol. ppt. with it; the metal is always deposited on the side which faces the soln. of the metal salt. F. and K. find that this phenomenon is observed only when the insol. ppt. deposited in the pores of the membrane



is capable of "metallic" or at least "semimetallic" cond. Moreover the potential of the concn. chain between the soln. of the metal salt which contains the high concn. of metal ions and the other soln. with a very low concn. must be greater than the decompn. voltage required to deposit the metal. While in Becquerel's work the soln. of the metal salt was allowed to react with a  $\text{Na}_2\text{S}$  soln., even better results are obtained with  $\text{Na}_2\text{Se}$ . In systems such as  $\text{AgNO}_3\text{--KOH}$  or  $\text{CuSO}_4\text{--KOH}$  the metal is deposited only upon addn. of an anodic depolarizer which is capable of lowering the decompn. voltage sufficiently. No deposition of metal occurs in the system  $\text{CuSO}_4\text{--K}_4\text{Fe}(\text{CN})_6$ ; this is explained by the fact that the ppt. of  $\text{Cu}_2\text{Fe}(\text{CN})_6$  does not show the property of "metallic" cond.

EMIL KLARMANN

**Flotation and  $p_H$ .** I. Flotation ability of hydrophobe powders and  $p_H$ . D. TALMUD. *Kolloid-Z.* 48, 165-6(1929).—The flotation of electrode C is detd. at various  $p_H$  values, with the standard buffer solns. of Sørensen (borate citrate and phosphate) to control the  $p_H$ , and purified kerosene and benzene as the flotation reagents. A max. is obtained near the neutral region. Very slight impurities in the reagents change the form of the curve completely. Similar results were obtained with S crystals. In the case of S flowers the relation is complicated by the oxidation of S. These results seem to substantiate the theory that there is a potential difference at the interface hydrophobe powder-soln. whose magnitude depends on the  $p_H$  of the soln. R. I. RUSH

**Radioactive methods in physical chemistry.** J. EßTERMANN. *Z. Elektrochem.* 35, 368-73(1929).—A brief summary of the use of radioactive elements in measurements of soly., diffusion, ionic phenomena, etc.

I. J. PATTON

**Solubility in a mixture of solvents.** II. The solubility of a substance which is miscible in all proportions with one of the solvents. F. ANGELESCU. *Z. physik. Chem.*, Abt. A, 138, 300-10(1928); cf. *C.* 4, 22, 1885.—The equation  $S_0 - S_\infty = KC^p$  which was previously derived holds also in this case where the dissolved substance (PhOH) is miscible with one of the components of the system dihydroxybenzene- $\text{H}_2\text{O}$ . Resorcinol, pyrocatechol and quinol were used.

EMIL KLARMANN

**Solubility of calcium carbonate (calcite) in certain aqueous solutions at 25°.** G. L. FREAR and JOHN JOHNSTON. *J. Am. Chem. Soc.* 51, 2082-93(1929).—Data are given for the soly. of  $\text{CaCO}_3$  in  $\text{H}_2\text{O}$  at 25° under partial pressure of  $\text{CO}_2$  from 0.00032 to 10 atm. The relation between  $r$  (the ratio of the soly. at  $t^\circ$  to that at 25°) and  $T$  is  $\log r = 830/T - 2.78$ . Data for soly. of solns. satd. with both  $\text{CaCO}_3$  and  $\text{CaSO}_4$  are given for partial pressures of  $\text{CO}_2$  from 0.121 to 0.962 atm. The soly. of  $\text{CaCO}_3$  in  $\text{NaCl}$  solns. is given for  $\text{CO}_2$  pressures from 0.965 to 0.968 atm. The soly. product const. of calcite at 25° in terms of the activities is  $4.8 \times 10^{-9}$ . No indications were found of a change in the nature of the solid phases  $\text{CaCO}_3$  and  $\text{CaSO}_4$ . Activity coeffs. of  $\text{Ca}(\text{HCO}_3)_2$  were calcd. from soly. measurements.

A. J. MONACK

**Solubility of magnesium carbonate (nesquehonite) in water at 25° and pressures of carbon dioxide up to one atmosphere.** WALTER D. KLINE. *J. Am. Chem. Soc.* 51, 2093-7(1929).—The methods of Walker, Bray and Johnston (*C.* 21, 2214) were employed. Data are given for the observed mean molalities of solns. in equil. with a series of pressures of  $\text{CO}_2$  at 25° ranging from 0.000107 atm. to 0.9684 atm.

A. J. M.

**The solubility of ammonium bicarbonate in water up to the melting point.** E. JÄNECKE. *Z. Elektrochem.* 35, 332-4(1929).—To avoid decompn. of the salt the soly. was detd. by placing known mixts. of salt and water in a sealed tube in a thermostat with suitable slaking. The temp. at which the last trace of salt disappeared was detd. Values are given for the cryohydric point,  $-3.9^\circ$ , to the m. p.,  $107.5^\circ$ . At lower temps. agreement with previously published results is excellent but differences of almost 100% from values (extrapolated) of Terres and Weiser appear at  $100^\circ$ .

H. G. W.

**The mutual salting-out of ions.** J. A. V. BUTLER. *J. Phys. Chem.* 33, 1015-23 (1929).—The effect of the forces exerted by the elec. field of an ion on the solvent molts., on the distribution of other ions in its vicinity, is discussed. An expression for the salting-out of substances by electrolytes is developed and shown to be equiv. to that obtained by Debye and McCauley on a different basis. The result is applied to the mutual salting-out of ions. The effect may be of prime importance in detg.  $B$  in the equation  $\log f = -A\sqrt{\mu} + B\mu$ .

F. W. LAIRD

**Exceptional mobility of the hydrogen and hydroxyl ions in aqueous solutions.** M. S. SKANAVI-GRIGOR'YEVA. *Z. anorg. allgem. Chem.* 181, 337-46(1929).—See *C.* A. 23, 3843.

E. J. C.

**The measurement of change in volume on solution.** E. ROGER WASHBURN. *J. Chem. Education* 6, 1144-6(1929).—An expt. that has proved of value with students of elementary phys. chem., requiring about 3-4 hrs. for completion, is described. A series of solns. is prepd. contg. the same components in different proportions, the change

in vol. noted, brought to room or thermostat temp., the ds. detd. and the change in vol. calcd. from the original vols. and the measured ds. by (a) change in d., (b) change in vol. or (c) on the basis of sp. vol. Results are plotted.

W. C. EBAUGH

The transportation of carbon dioxide by paraffin oil and some other substances. SAMUEL E. HILL. *Proc. Soc. Exptl. Biol. Med.* 26, 590-2(1929).—The time in hrs. required for 1 atm. of  $\text{CO}_2$  to diffuse through the test substance and decolorize 1 cm. of phenolphthalein in NaOH agar was used for comparison. The passage of  $\text{CO}_2$  through lighter paraffin oils is greatly decreased by preventing convection currents. This was accomplished by placing disks of blotting paper or tightly packed cotton in the oil layer. Substances found impermeable or relatively so to  $\text{O}_2$  were also impermeable to  $\text{CO}_2$ ; the most striking differences were with rubber and dry collodion, through which  $\text{O}_2$  passes with difficulty and  $\text{CO}_2$  with the greatest ease.

C. V. BAILEY

Cryoscopic determination of the molecular equilibria of resorcinol in aqueous solutions of sodium chloride. F. BOURION AND CH. TURTLE. *Compt. rend.* 188, 1496-8 (1929); cf. *C. A.* 22, 3337; 23, 3395.—The equil. const. for the change  $n \text{ C}_6\text{H}_3\text{O}_2 \rightleftharpoons (\text{C}_6\text{H}_3\text{O}_2)_n$  in NaCl solns. was studied. In the NaCl solns. studied  $n = 2$  up to 0.6 M in resorcinol and  $n = 3$  from 0.9 to 2.0 M. In 0.5 M solns. of NaCl the equil. const.  $K_2 = 0.98$ ,  $K_3 = 1.63$ . In 1.225 M solns.  $K_2 = 1.05$  and  $K_3 = 1.50$ . The cryoscopic const. for water is 18.4 for 0.5 M solns. of NaCl, 23.4, for 1.225 M solns., 28.0. It is less for KCl. The assocn. of resorcinol is more marked in chloride solns. than in water. By thermodynamic reasoning alkali chloride solns. should have cryoscopic consts. about the same as water. The divergence is explained by assuming adsorption of water by the salt. The degree of this hydration was calcd. and found to be between 11 and 23 mols. of water per mol. of alkali chloride. Also in *J. chim. phys.* 26, 291-311(1929).

A. C. HIGGINS

Ebullioscopic determination of the molecular equilibrium of resorcinol in solutions of lithium chloride. F. BOURION AND E. ROUYER. *Compt. rend.* 188, 626-8(1929); cf. *C. A.* 22, 1082, 1712.—In aq. LiCl solns., there is an equil. between single and triple resorcinol mols. at concns. below 1.75 M. In solns. above 1.75 M in resorcinol the equil. is between single and quadruple mols. There are differences between consts. found in solns. of KCl, of NaCl and of LiCl which can be explained by assuming that the ions of these alkali metals are unequally hydrated and that the hydration varies in the same order as the ionic activities.

F. E. BROWN

Newer conceptions of electrolytes. NIELS BJERRUM. *Ber.* 62B, 1091-1103 (1929).—An address.

FRANK URBAN

Law of equilibrium of electrolytes and hydration of ions. K. JABLONCZYŃSKI AND C. SEIDENGART. *Roczniki Chem.* 9, 418-30(430 French)(1929).—Cryoscopic measurements were made with KCl,  $\text{NH}_4\text{Cl}$ , NaCl, LiCl and HCl separately and then with their mixts. The mol. wts. of urea and mannitol were detd. by the cryoscopic method in the solns. of the same electrolytes having various concns. The exptl. results permit complete verification of the equation of equil. established by Jablonczyński and Wisniewski (*C. A.* 23, 3390) as well as the hydration of the ions.

JAROSLAV KUČERA

The number of water and alcohol molecules bound to the silver ion. GERHARD C. SCHMIDT AND MECHTILD KELLER. *Z. physik. Chem., Abt. A*, 141, 331-42(1929).—On the addn. of  $\text{NH}_3$  or  $\text{C}_6\text{H}_5\text{N}$  to  $\text{AgNO}_3$  soln., the complex ions  $\text{Ag}(\text{NH}_3)_2$  and  $\text{Ag}(\text{C}_6\text{H}_5\text{N})_2$  are formed; these are more stable in MeOH than in  $\text{H}_2\text{O}$ . It seems probable that these ions are not hydrated. From the change in transference velocity of the Ag ion on the addn. of  $\text{NH}_3$  and of  $\text{C}_6\text{H}_5\text{N}$ , the authors conclude that two mols. of solvent are combined with the Ag ion. In aq. soln. an equil. exists between  $\text{Ag}$ ,  $\text{Ag}(\text{H}_2\text{O})$  and  $\text{Ag}(\text{H}_2\text{O})_2$  ions, and an analogous one exists in alc. solns.

LOUIS WALDBAUER

Metal-nonmetal electrodes. B. KAMIENSKI. *Z. physik. Chem., Abt. A*, 138, 345-8(1928).—Carborundum electrodes are recommended for potentiometric titration

EMIL KLARMANN

Lead oxide-lead sulfate electrode. WARREN C. VOSBURGH AND D. NORMAN CRAIG. *J. Am. Chem. Soc.* 51, 2009-19(1929).—An  $E_0$  value of  $1.060 \pm 0.001$  v. at  $25^\circ$  was found for the  $\text{PbO}_2\text{-PbSO}_4$  electrode. For the lead storage cell, an  $E_0$  value of 2.030 v. was detd. at  $25^\circ$ . Activity coeffs. for  $\text{H}_2\text{SO}_4$  at various molalities were calcd., as well as the free-energy change, the entropy change and the heat of reaction for the reaction  $\text{PbO}_2 + 2\text{Hg} + 2\text{H}_2\text{SO}_4 = \text{PbSO}_4 + \text{Hg}_2\text{SO}_4 + 2\text{H}_2\text{O}$ .

FRANK URBAN

The determination of hydrogen-ion concentration with quinhydrone electrodes. V. CUPR. *Chem. Listy* 23, 81-6(1929).—A treatise in which 16 papers are reviewed.

FRANK MAREŠ

Methods of colorimetric  $p_H$  determination. B. G. SAVINOV. *Nauch. Zapiski Sakharnoi Prom.* 8, 12-21(1929).—A review of methods and app.

V. E. B.

**The use of decinormal hydrochloric acid for standardizing electrometric  $p_H$  measurements.** NOEL F. MACLAGAN. *Biochem. J.* 23, 309-18(1929).—Some of the factors influencing the p. d. at the liquid junction 0.1 N HCl | satd. KCl were investigated and a method of forming the junction, as well as a new type of flowing junction, is described.

**Polarographic studies with the dropping mercuric cathode.** I. The amphoteric nature of ferrous hydroxide. B. SCHRAGER. *Collection Czechoslov. Chem. Comm.* 1, 275-81; *Chem. News* 138, 354-6(1929); cf. *C. A.* 19, 2905.—By the polarograph, previously described, the alkali hydroxides have been found to dissolve  $Fe(OH)_2$  according to the equation  $Fe(OH)_2 + OH^- \longrightarrow Fe(OH)_3^-$ . In N soln. this is  $5 \times 10^{-8}$  g. equiv. per l. The deposition of iron occurs at  $-1.50$  volts from the calomel electrode.  $[Fe^{++}][OH^-]^2 = 7 \times 10^{-18}$  and  $[Fe(OH)_3^-] + [OH^-] = 5 \times 10^{-8}$  and  $[Fe(OH)_3^-] + [Fe^{++}][OH^-]^2 = 7 \times 10^{-17}$ . Cobalt and manganese behave similarly. V. F. H.

**Volume changes during neutralization.** I. I. ZASLAVSKII, E. G. STANDEL AND V. V. TOVAROV. *Z. anorg. allgem. Chem.* 180, 241-51(1929).—The vol. changes during neutralization have been measured at various concns. for the following systems: KOH - HOAc, NaOH - HOAc, NaOH - HNO<sub>3</sub>, NH<sub>3</sub> - HNO<sub>3</sub>, NaOH - H<sub>2</sub>SO<sub>4</sub>. In every case the max. vol. change occurred at the point of neutral-salt formation; the formation of intermediate salts could also be detected. NH<sub>3</sub> solns. showed a contraction, the amt. of which was approx. proportional to the concn. At high concns. the HOAc system showed a small contraction at the beginning of neutralization but later showed an expansion. The other systems showed an expansion. J. B. AUSTIN

**The temporary change of surface tension in solutions of some univalent chlorides.** ERNST O. SEITZ. *Ann. Physik* [5], 1, 1099-108(1929).—A temporary change in surface tension is observed in salt solns. in which complex mols. or ions are formed by polymerization or solvation. On a fresh surface these complex mols. are present in the same concn. as in the interior of the soln., but, having a greater mol. energy than the simple mols., when they travel into the body of the liquid the surface tension is lowered. In the present work surface tensions were measured by capillary rise in various solns. of HCl, NaCl, KCl and LiCl at 5°, 10°, 15°, 20°, 28° and 35°. Fresh surfaces were obtained by an air stream. The non-volatile salts exhibited a linear increase in the final static value of the surface tension with increasing concn. at const. temp., while HCl showed a linear decrease. In all cases the initial surface tension was greater than the final. The period during which the surface tension changes ( $\tau$ ) decreases with rise in temp. The ratio of  $\tau$  for pure water to  $\tau$  for the salt solns. agrees with the Kohlrausch degree of dissocn. at the various temps. The temp. coeff. of  $\tau$  is compared with the temp. coeffs. of inner friction and ionic mobilities. R. H. FERGUSON

**The kinetics of the hydrogenation of ethylene on a copper catalyst of measured surface area.** F. HURN CONSTABLE. *Z. Elektrochem.* 35, 105-10(1929).—The proportions of adsorbed H<sub>2</sub> and C<sub>2</sub>H<sub>4</sub>, the activity of the catalyst and the area of its surface changed with repeated oxidation and reduction. The compn. of the gas mixt. showing max reaction rate changed as the reaction temp. increased, approaching stoichiometric proportions at the higher temps. The total surface was sufficient to accommodate almost a unimol. layer of adsorbed H<sub>2</sub> at 0°, and considerably more than a unimol. layer of C<sub>2</sub>H<sub>4</sub>. It was concluded that at 0° part of the surface was completely free from adsorbed H<sub>2</sub> and that the C<sub>2</sub>H<sub>4</sub> covered a larger part of the available surface. R. L. DODGE

**Kinetics of the oxidation of iodide ion by acid dichromate solutions in presence of a neutral salt.** RALPH F. BEARD AND NELSON W. TAYLOR. *J. Am. Chem. Soc.* 51, 1973-85(1929).—The velocity of the reaction,  $Cr_2O_7^{--} + 6I^- + 14H^+ \longrightarrow 2Cr^{+++} + 7H_2O + 3I_2$ , was measured at 25° with various concns. and in presence and absence of NaCl. For 1.5 M NaCl soln., the results confirm Brønsted's theory that reactions which ordinarily give anomalous reaction nos. may give integrals in the presence of a neutral salt. Two simultaneous reactions are proposed:  $H^+ + I^- + Cr_2O_7^{--} \longrightarrow HI \cdot Cr_2O_7^{--}$ ; and  $2H^+ + 2I^- + Cr_2O_7^{--} \longrightarrow (HI)_2 \cdot Cr_2O_7^{--}$ . The observed velocity const. is  $14.6 [H^+][I^-] + 53,000 [H^+]^2[I^-]^2$ . J. H. REEDY

**Rate of recombination of atomic hydrogen.** HUGH M. SMALLWOOD. *J. Am. Chem. Soc.* 51, 1985-99(1929).—At. H from a Wood tube was passed through a straight tube, and the degree of dissocn. at various points was detd. by measuring the heat effect on Pt foil. The rate of recombination was detd. for a range of 0.5-0.9 mm. of Hg, and was found to conform to the three-body mechanism for exothermic binary reactions. One-sixth to one-fifth of the at. H, under the conditions of the expt. reacted with S, while NO catalyzed the recombination of the at. H. J. H. REEDY

**The ketonic decomposition of  $\beta$ -ketocarboxylic acids.** KAI J. PEDERSEN. *J. Am. Chem. Soc.* 51, 2098-107(1929).—From expts. on the decompn. of  $\alpha$ ,  $\alpha$ -dimethylace-

toacetic acid (I) in HCl solns., the velocity const. for the decompn. in water of the undissocd. acid is found to be 0.000723 at 18°. Measurement of the velocity in glycolate and acetate buffer gives a velocity const. of 0.000004 for the decompn. of the dimethyl-acetoacetate ion. The dissocn. const. at 18° for I is 0.000314. NaCl and undissocd. glycolic acid catalyze the decompn. slightly, while aniline has a great accelerating effect. Undissocd. I decomposes 4.5 times as fast as undissocd. acetoacetic acid. The keto form of  $\beta$ -keto acids is unstable.

ARTHUR FLEISCHER

**Action of hydrochloric acid on alcohol. Effect of electrolytes on the reaction velocity.** S. KILPI. *Z. physik. Chem., Abt. A*, **141**, 424-50 (1929).—The equil. coeff. of the previously developed velocity equations for the action of HCl on EtOH were detd. in aq. mixts. contg. 25 and 50 mol. % of EtOH, and calcd. to temps. of 96.5° and 110°. Measurements were made also in solns. to which had been added KCl and NaCl. The value of the equil. coeff.  $c_2/c_1$  increased with the concn. of the electrolyte (0.05-0.8 *M*), more slowly as the concn. became higher. Since  $c_2$  was shown to be independent of the concn. of the electrolyte, at the concns. used, the value of the velocity coeff.  $c_1$  for the action of HCl on EtOH must decrease as the concn. rises. With the concns. employed, no difference was observed in the action of HCl alone and HCl with NaCl or KCl. An attempt was made to explain the relation between reaction velocity and concn. of electrolyte with the aid of the theories of Brønsted and of Debye and Hückel. In the D and H formula  $A'\sqrt{C}/(1 + \alpha'\sqrt{C})$ ,  $A'$  and  $\alpha'$  were calcd. from the measurements and the value of the coeff. found to agree with the theoretical value. It appears that the velocity of reaction of HCl on EtOH varies with the concn. of electrolyte proportionally to the product of the electrometrically measured activities of H ion and Cl ion. I. J. P.

**Calculation of the water-gas equilibrium by means of the exact Nernst heat equation.** ED MAURER AND W. BISCHOF. *Z. anorg. allgem. Chem.* **178**, 371-80 (1929).—From vant Hoff's isochore by the method of least squares the water-gas equil. was calcd. The values, at 200° intervals from 327° to 1717°, are given and compared with the values given by Luggin, by Hahn, by Haber and Richards, by Engels, by Reinders and by Neuman and Kohler. Log  $K$ , as calcd., is greater than the reported values below 1000° and lies near the value reported by Engels at higher temps. F. E. BROWN

**The velocity of saponification of methyl acetate by sodium hydroxide at 25°.** W. T. GOOCH AND ETHEL M. TERRY. *J. Am. Chem. Soc.* **51**, 1959-65 (1929); cf. *C. A.* **21**, 3526; **22**, 2307, 2703.—MeOAc from three different sources in concns. of 0.008 and 0.016 *M* was hydrolyzed by 0.01 and 0.02 *M* NaOH, resp., at temps. near 25°.  $K$  was calcd. by the equation,  $K = [2.303/(t_2 - t_1)(B - E)] [\log (B - X_1)(E - X_2) / (B - X_2)(E - X_1)]$  where  $E$  = initial concn. of ester,  $B$  of base,  $X$  = concn. of either used up at time  $t$ .  $K_{25,000}$  was found to be  $11.67 \pm 1\%$ , in good agreement with Walker's value 11.7 by the cond. method (*Proc. Roy. Soc. (London)* **A78**, 158 (1906)).  $dK/dT$  was found to be 0.0087 per 0.01°. No difference for  $K$  was found in diffuse daylight and in abs. darkness. An app. is described for shaking a soln. during titration; also one for the rapid measurement of solns. without exposure to air.

F. H. RATHMANN

**Catalysis and atomic physics.** LUDWIG KAUL. *Metallbörse* **18**, 734-5, 846 (1928).—K. attempts to bring observations of Moureu on autoxidation to the support of his own unconventional theories of catalysis.

T. H. CHILTON

**Remarks on the theory of catalysis.** A. BERTHOUD. *J. chim. phys.* **26**, 120-4 (1929).—Dubrisay (*C. A.* **23**, 2093) revives Arrhenius' doctrine of active and inactive mols. Even if such a condition did exist, the introduction of a small amt. of a foreign substance into the system could not effect a change in their concns. J. H. REEDY

**Contact catalysis on metals.** GEORGE B. KISTIAKOWSKY. *Metallwirtschaft* **7**, 676-9 (1928).—General review of catalysis and its industrial application with particular attention to the prevailing theories of the mechanism of the action of metallic catalysts, the effect of promoters and poisons.

R. L. DODGE

**The retarding action of catalysts on the decomposition of hydrogen peroxide.** S. A. DUNAIEV. *Farm. Zhur.* **1928**, No. 3 23-4.—From the 8 catalysts tested, luminal, quinine sulfate, veronal, phenacetin, acetanilide, aspirin, benzoic and salicylic acids, the first two (in additions of 0.02:100.0) gave the best results in tests extending over a period of six months.

E. BIELOUSS

**Action of benzyl bromide and chloropicrin vapors on smooth metallic surfaces.** E. V. ALEKSEEVSKI AND N. S. ALEKSEEV. *Zhur. Prikladnoi Khim.* **1**, 194-200 (1928).—At room temp.  $\text{PhCH}_2\text{Br}$  is less destructive than  $\text{CCl}_3\text{NO}_2$ .  $\text{PhCH}_2\text{Br}$  is more active in dry atm., while  $\text{CCl}_3\text{NO}_2$  is more active in humid atm.  $\text{CCl}_3\text{NO}_2$  in dry atm. and  $\text{PhCH}_2\text{Br}$  in either dry or humid atm. do not destroy metals completely as metals gradually acquire passivity. In presence of moisture  $\text{CCl}_3\text{NO}_2$  completely destroys metals. Vola-

tile compds. are sometimes formed (action of  $\text{CCl}_3\text{NO}_2$  on Zn and Sn in dry atm.). Curves of the reaction rates show that the process is of a very complicated nature.

V. KALICHEVSKY

The catalysis of the reaction between persulfate and iodide ion. II. Remarks on Saal's article "The velocity of ionic reactions. III." A. v. KISS. *Rec. trav. chim.* 48, 508-16(1929); cf. C. A. 21, 2593; 22, 4322.—New data are presented which support the author's earlier interpretation of the mechanism of the reaction between persulfate and iodide ions when catalyzed by ferric ions. An error in Saal's calcs. is indicated. The velocity of the ferric ion-iodide-ion reaction was measured in dil. soln. T. H. C.

A more general statement of the phase rule. PAUL KUBELKA. *Z. Elektrochem.* 35, 335-7(1929).—New terms are introduced into the statement of the phase rule to take care of the independent concns. and energy potentials which may be present in a complicated system. The applicability to a galvanic element is shown in which all other terms are known and the new terms thereby detd. HELEN GILLETTE WEIR

Equilibrium between metals and salts in fusion mixtures. XII. Displacement of the equilibrium in fusions of  $\text{Cd} + \text{PbCl}_2 \rightleftharpoons \text{Pb} + \text{CdCl}_2$  by the addition of a metal phase. RICHARD LORENZ AND MARGARETE HERING. *Z. anorg. allgem. Chem.* 177, 1-12(1929); cf. C. A. 22, 3337.—The effect of adding an indifferent metal phase to the equil.  $\text{Cd} + \text{PbCl}_2 \rightleftharpoons \text{Pb} + \text{CdCl}_2$  is found to be two-fold: (1) One of the original metal phases is ennobled as compared to the other. (2) The equil. isotherms approach the ideal mass-action law and tend to take on the form of a symmetrical hyperbola. Nine ratios of Cd to  $\text{PbCl}_2$  were used and five different amts. of Sb were added. With increase in the amt. of Sb added, the reaction is displaced toward the left, Cd becoming more noble as compared to Pb. Antimony forms compds. with Cd, but this is not the explanation, because Bi forms no compds. with either Cd or Pb and yet it displaces the equil. in the same direction as Sb. ANELLA WIEBEN

Equilibrium between metals and salts in fusion. XIII. The displacement of the equilibrium in fusions of  $\text{Cd} + \text{PbCl}_2 \rightleftharpoons \text{Pb} + \text{CdCl}_2$  by the addition of a salt phase. RICHARD LORENZ AND MARGARETE HERING. *Z. anorg. allgem. Chem.* 178, 33-9(1929); cf. preceding abstract.—The ratios of  $\text{PbCl}_2$  to Cd were 3:1, 2:1, 3:2, 5:4, 1:1, 4:5, 2:3, 1:2 and 1:3. A mixt. of KCl and NaCl in equimolar proportions was added. The molar ratios of total salt (KCl + NaCl) to  $\text{PbCl}_2$  were  $1/2$ , 1, 2, 3 and 4. Nine tables of data and two graphs show that the addition of the salt mixt. always ennobles the Pb as compared to Cd. XIV. Displacement of the equilibrium in fusions of  $\text{Cd} + \text{PbCl}_2 \rightleftharpoons \text{Pb} + \text{CdCl}_2$  by the addition to both phases simultaneously. *Ibid.* 40-8.—The addn. of mixts. of KCl and NaCl shifts the equil. from left to right. The addn. of Sb shifts the equil. from right to left. When equimolar parts of the salts and of Sb are added simultaneously the equil. is shifted from left to right throughout the range of ratios between Pb and Cd except when Pb is very large. F. E. BROWN

Equilibrium between metals and salts in fusion mixtures. XV. The displacement of the point of equivalence in the equilibrium  $\text{Cd} + \text{PbCl}_2 \rightleftharpoons \text{Pb} + \text{CdCl}_2$ . RICHARD LORENZ AND MARGARETE HERING. *Z. anorg. allgem. Chem.* 178, 337-45(1929); cf. preceding abstract.—By point of equivalence is meant that point in the equil. isotherm which results when equiv. amts. of the substances are added, as 1 atom Cd and 1 mol.  $\text{PbCl}_2$ . Addn. to the metal phase displaces equil. to the left; addition of salt (NaCl + KCl) to the salt phase displaces equil. to the right. When equiv. addn. is made to both phases simultaneously, addn. to the salt phase brings about a stronger displacement than the addn. of Sb to the metal phase and still stronger than the addn. of Bi to the metal phase. ANELLA WIEBEN

Determination of transition point by the dilatometric method. MOTOTARO MATSUI, SUTSUO OGURI, HEISCHICHI ISHIKAWA AND SHIRO ISHIDA. *J. Soc. Chem. Ind. (Japan)* 32, 48-54(1929); Suppl. binding 32, 19-23B.—Mathematical development of the theory of the method. S. KONDO

The two crystalline forms of beryllium hydroxide and the system  $\text{BeO}-\text{Na}_2\text{O}-\text{H}_2\text{O}$ . R. FRICKE AND H. HUMME. *Z. anorg. allgem. Chem.* 178, 400-10(1929).— $\text{Be}(\text{OH})_2$  crystallizes in two forms, both having the compn.  $\text{BeO} \cdot \text{H}_2\text{O}$ , but differing in cryst. structure. By aging  $\text{Be}(\text{OH})_2$  gel in cold dil. soln. the metastable form is obtained. This on prolonged shaking with various concns. of NaOH at  $30^\circ$ , or on hydrolyzing  $\text{Na}_2\text{BeO}_2$  or recrystg. from hot, concd. alkali, gives the stable form. The stable form is less sol. in NaOH than the metastable. The soly. of crystd.  $\text{Be}(\text{OH})_2$  in NaOH is independent of the relative amts. of the undissolved phase. At  $30^\circ$ , BeO and NaOH are practically in the ratio 1:1 at equil. When the concn. of NaOH is high, the undissolved phase consists of fine needles easily sol. in  $\text{H}_2\text{O}$  and having the compn.  $\text{BeO} \cdot \text{NaOH} \cdot \text{H}_2\text{O}$ . When

the concn. of NaOH is lower, the undissolved phase consists of stable cryst.  $\text{Be}(\text{OH})_2$ .

ANELLA WIEBEN

**Equilibrium studies concerning the system calcium-sulfur-oxygen.** I. RUDOLF SCHENCK AND KARL JORDAN. *Z. anorg. allgem. Chem.* **178**, 389-99(1929).—Birnbaum and Wittich (*Ber.* **13**, 651(1880)) found indications that at  $500^\circ$ ,  $4\text{CaO} + 4\text{SO}_2 \rightleftharpoons 3\text{CaSO}_4 + \text{CaS}$  (1). It is now found that at  $600^\circ$ , CaO and  $\text{SO}_2$  do not unite mol for mol. Since a deposit of S was observed,  $4\text{CaO} + 6\text{SO}_2 \rightleftharpoons 4\text{CaSO}_4 + \text{S}_2$ . Sestini (*Ber.* **7**, 1295(1874)) reported  $\text{CaSO}_4 + \text{S}_2 \rightleftharpoons \text{CaS} + 2\text{SO}_2$  (2). It is concluded, therefore, that the reaction of CaO and  $\text{SO}_2$  takes place in the two steps (1) and (2). An attempt was made to det. the equil. pressure at the univariant point and to explain and evaluate the equations on the basis of the phase rule and the mass-action equation. It is suggested that the presence in nature of S deposits together with gypsum in the neighborhood of  $\text{CaCO}_3$  may be explained by  $4\text{CaCO}_3 + 6\text{SO}_2 \rightleftharpoons 4\text{CaSO}_4 + \text{S}_2 + 4\text{CO}_2$ .

ANELLA WIEBEN

**The system ferric nitrate-nitric acid-water at  $25^\circ$ .** G. MALQUORI. *Atti accad. Lincei* [6], **9**, 324-5(1929); cf. *C. A.* **22**, 191.—In prepn. for a study of the system  $\text{Fe}(\text{NO}_3)_3 \cdot \text{KNO}_3 \cdot \text{H}_2\text{O}$ , M. studied the above equil. Equil. curves are shown.  $\text{Fe}(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}$  is prepd. by the action of  $\text{N}_2\text{O}_5$  on the satd. soln. of the  $\text{Fe}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$  in  $\text{HNO}_3$  (d. 1.52). The solid phase was analyzed after pressing out all the liquid between porous plates.

A. W. CONTEMI

**The system:  $\text{MgSO}_4\text{-Na}_2\text{SO}_4\text{-H}_2\text{O}$ .** W. FROELICH. *Z. angew. Chem.* **42**, 660-2(1929).—A critical discussion of both older and more recent data on the system  $\text{MgSO}_4\text{-Na}_2\text{SO}_4\text{-H}_2\text{O}$ , with tables, phase diagram and bibliography. W. C. EBAUGH

**The heat of decomposition of hydrazoic acid.** W. A. ROTH AND FR. MUEHLER. *Ber.* **62B**, 1188-94(1929).—The heat of decompn. of pure liquid hydrazoic acid was obtained by subtracting the heat equivalents of the groups  $\text{C}_6\text{H}_5$  and  $\text{CH}_3\text{COOC}_2\text{H}_5$  from the heats of combustion of phenyl azide and Et azidoacetate. It was found to be 67 cal.  $\pm$  5%. The value calcd. from the data of Berthelot for a dil. soln. was 53 cal. The heat of formation of phenyl azide was more negative by about 70 cal. than that of benzene, while that of Et azidoacetate was smaller by 77 cal. than that of ethyl acetate. The fact that abnormally large amts. of  $\text{HNO}_3$  were formed during combustion of azido and diazo compds. is discussed from an energetic point of view.

FRANK URBAN

**Entropy and its chemical uses.** J. A. V. BUTLER. *Chemistry and Industry* **48**, 598-600(1929).—A short elementary discussion of the entropy and free energy changes in chem. reactions, with applications to a few org. reactions for which these changes may be calcd.

J. B. AUSTIN

**The specific heat of pure iron at high temperatures.** SABURO UMINO. *Science Repts. Tôhoku Imp. Univ.*, 1st Ser., **18**, 91-107(1929).—The mean sp. heat and true sp. heat were obtained for electrolytic Fe by measuring its heat content at various temps. from  $680^\circ$  to  $1560^\circ$  by the method of mixt. The true sp. heat has a const. value between the  $A_2$  and  $A_4$  points, and between the  $A_4$  point and the m. p.; but it increases between the  $A_3$  and  $A_4$  points. The mean sp. heat shows an abnormal increase at the 3 change points, and linearly increases between the adjacent 2 of them with rise of temp. D. S.

**Calculating the specific heats of hydrocarbon vapors.** W. K. LEWIS AND W. H. MCADAMS. *Chem. Met. Eng.* **36**, 336(1929).—Direct exptl. detns. of the sp. heats of  $\text{C}_2\text{H}_6$ ,  $\text{C}_4\text{H}_{10}$  and a mixt. of  $\text{C}_2\text{H}_6$ ,  $\text{C}_3\text{H}_8$  and  $\text{C}_4\text{H}_{10}$  were made by the continuous-flow calorimeter method. The range  $25\text{-}75^\circ$  was covered. Results for the hydrocarbons were about 10% higher than earlier values detd. by indirect methods. For paraffin hydrocarbons at low pressure  $M_c p = 4.4 + 4.4n + (0.012 + 0.006n)t$ , where  $t = \text{temp.}$ ,  $n = \text{number of C atoms per mol.}$ , and  $M_c p = \text{molal heat capacity in g. calories per degree per g.-mol.}$  Rather large deviations from the above equation were found below  $0^\circ$  and at temps. higher than  $75^\circ$ . The equation is directly applicable to mixts. when  $n$  is known.

C. Z. ROSCRANS

**The thermal conductivities of copper and nickel, and some alloys of nickel.** W. C. ELLIS, F. L. MORGAN AND F. G. SAGER. *Rensselaer Polytech. Inst. Bull.*, No. **21**, 23 pp. (1928).—King's method was found to be satisfactory for detg. thermal cond. of metal and alloy wires. The ratio of thermal to elec. cond. for the alloys investigated was somewhat higher than for elementary metals, and not even approx. const. The values were of the same order of magnitude.

E. I. S.

**Determination of the coefficient of heat conductivity.** O. VLASOV. *Izv. Vyssh. Teplotekh. Inst. (Trans. Thermo-Tech. Inst. (Russia))* **1928**, No. **6**, 32-44.—The coeff. of heat cond. of refractory materials, etc., is detd. in a specially constructed app. which has the following features: A water cooler section on the bottom, followed by an insulating layer, an elec. heating element, a thermocouple, a second insulating layer, a thermo-

couple, a heating element, a thermocouple, the material under test and a water cooler on the upper part provided with a thermocouple. The whole is pressed together, the elements are heated by d. c. to insure a uniform temp., which is very essential. The following advantages are claimed. The total amt. of heat measured is equal to the amt. of heat passing through the sample at the given difference in temps., the influence of side losses is actually eliminated. A very complete explanation and calcn. is given, also many details of the temp. measurements. A. A. BOBITLINGK

The thermal equilibrium between ethylene, iodine and ethylene diiodide. R. B. MOONEY and E. B. LUDLAM. *Proc. Roy. Soc. Edinburgh* 49, 160-9(1929).—The pressure of  $C_2H_4$  in equil. with solid  $I_2$  and solid  $C_2H_4I_2$  was measured at temps. between  $10^\circ$  and  $65^\circ$ . The vapor pressure of undissocd.  $C_2H_4I_2$  was measured at 4 temps. between  $15^\circ$  and  $55^\circ$ . From these data the mol. heat of sublimation was found to be 15,700 cal. Equil. const. were calcd. and the heat of formation was calcd. to be 22,300 cal. at  $50^\circ$  for gaseous  $C_2H_4I_2$ . The decompn. of  $C_2H_4I_2$  in  $CCl_4$  was studied at  $100^\circ$ . Expts. were performed on the rates of formation and decompn. of  $C_2H_4I_2$  which showed the reaction to be non-homogeneous. These expts. were carried out in the absence of light. F. W. LAIRD

The crystal structure of tricalcium aluminate (STEELE, DAVY) 6. Freezing temperature of organic compounds. XI. Compounds in  $C_6$  and  $C_8$  (SIMON) 10.

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### 3—SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

S. C. LIND

Further progress in crystal analysis. WILLIAM BRAGG. *Chem. News* 139, 55-6 (1929) E. H.

Conversion of energy into matter. G. I. POKROVSKII. *Z. Physik* 55, 771-7 (1929).—Gravitational attraction is thought to be a possible cause of condensation of energy into matter. GEORGE GLOCKLER

Mutual destruction of protons and electrons. C. LÖNNQVIST. *Z. Physik* 55, 789-800(1929).—L. discusses possible methods for the mutual destruction of protons and electrons and hopes to accomplish the feat by bombarding a concd. acid with cathode rays. The resulting radiation would have a wave length of  $\lambda = 0.0000131$  A. U. and a mass absorption coeff. of 0.0001. One mg. of Ra as source should show the effect if every impact is efficient, or a cathode-ray tube could be used. GEORGE GLOCKLER

Terms of hydrogen molecule. G. H. DIEKE. *Z. Physik* 55, 447-50(1929); cf. *C. A.* 23, 3398.—Theoretical interpretation and term designation in the mol. spectrum of H are discussed. Cf. Richardson and Davidson, *C. A.* 23, 3405. G. G.

**Electron distribution in the normal state of helium.** H. BETHE. *Z. Physik* 55, 431-6(1929).—The calcs. of Hylleraas (*C. A.* 23, 3626) of the energy and the eigenfunctions of He in the normal state make it possible to check former methods of calcn. of electron distribution. The method of Hartree (*C. A.* 22, 1269) of the self-consistent field gives excellent checks.

GEORGE GLOCKLER

**Optical behavior of hydrogen atoms in very strong electric fields.** R. VON TRAUBENBERG. *Physik. Z.* 29, 895(1928).—The effect of sudden changes in field strengths up to 420,000 v./cm. on H atoms has been studied by means of Stark's arrangement of sept fields, and the Stark effect measured in the second order for Balmer lines. The proportionality with the square of the field strength is confirmed for all components of  $H_\gamma$ . The results for the middle component agree better with the theory of Schrödinger than with that of Epstein, but considerable deviations from Schrödinger's values are shown for the higher components.

B. C. A.

**Dissociation of pure mercury.** E. S. KEEPING. *Nature* 122, 728(1928).—Bradley's results (*C. A.* 23, 745) are criticized. Values of  $p/q$ , where  $p$  and  $q$  are the av. nos. of free electrons per atom of the metal X and Hg, resp., are recorded for In, Mg, Tl, Ge, Sb, Y, Ce, Ga, Cu, Cd and Ag.

B. C. A.

**Kerr effect and molecular structure.** H. A. STUART. *Z. Physik* 55, 358-70(1929).—The importance of the Kerr effect for questions of mol. structure is discussed. Equations contg. the elec. moment, and optical and elec. anisotropy are compared with equations of mol. refraction. The Kerr constant is sept. into two members relating to the dipole moment and the anisotropy of the mol. The optical polarizabilities of HCl,  $NH_3$  and  $SO_2$  are calcd.

GEORGE GLOCKLER

**Quantum mechanics of molecules.** H. LUDLOFF. *Z. Physik* 55, 304-26(1929).—Wave-mechanical calcs. lead to term values of the  $H_2$  mol. in fair agreement with expts. Cf. R. T. Birge, *C. A.* 22, 1722.

GEORGE GLOCKLER

**Isotope effect in the spectrum of neon.** HANTARO NAGAOKA AND TADAO NISHIMA. *Proc. Imp. Acad.* (Tokyo) 5, 200-2(1929).—A tube of Ne was immersed in liquid air and observed transversely to avoid self-reversal through an unsilvered part of the Dewar vessel. When the air plate was about 4 cm. thick, every strong line in the red and yellow portions of the spectrum was associated with a weak one, nearly in the middle between succeeding fringes. This character is evidently different from ordinary close doublets or hyperfine structure and as the difference in wave length did not show much deviation from the calcd. value for Ne(22) by the change in Rydberg const. it must be attributed to the isotope effect. A table gives the position of the lines relative to the usually accepted lines of Ne.

C. J. WEST

**Radioactive disintegration and relativity theory.** CHR. MØLLER. *Z. Physik* 55, 451-66(1929).—The calcs. of Gamov (*C. A.* 23, 1047), Gurney and Condon (*C. A.* 23, 2647) and Kudar (*C. A.* 23, 2352) of radioactive disintegration as based on wave mechanics are repeated. M. considers the problem mathematically from the point of view of relativity theory.

GEORGE GLOCKLER

**Counting of  $\alpha$ -particles by Wulf's method.** MILE M. DESMET AND MILE M. VAN HAEPEREN. *Ann. soc. sci. Bruxelles* 48B, 1, 100-13(1928).—A comparison of the improved ionization-chamber method of counting  $\alpha$ -particles of Wulf (*Physik. Z.* 26, 382(1925)) with the scintillation method. By using as a const. source of  $\alpha$ -particles a small sphere of polished steel activated by means of Rn, the optical method gave 15 particles/min. Wulf's method gave values of 10-13 in the most favorable cases with dull pointed needles, and only 3-5 with fine-pointed needles. Particular attention was paid to the cleaning of the needles, shape of the point, and sign and magnitude of the voltage applied. Since the scintillation method almost certainly gives a low result, Wulf's method is not considered suitable as an accurate quant. method.

B. C. A.

**Variations in the ionization effect due to single  $\alpha$ -rays.** A. PICCARD AND E. STAHEL. *Helv. Phys. Acta* 1, 437-40(1928)(In German); *Science Abstracts* 32A, 242. P and S investigate a no. of causes which may produce variations in the amt. of ionization. These include chance encounters of two or more  $\alpha$ -rays, deviations of  $\alpha$ -rays through large angles, "absorption" of  $\alpha$ -rays by nuclei with which they collide, variations which take place when the  $\alpha$ -ray and the elec. field are not parallel, changes in the charge of the  $\alpha$ -ray during its course. None of these causes is capable of explaining the variations observed by Greinacher and by Ramelet. Hoffmann obtains quite different results from those of these experimenters.

H. L. D.

**Researches upon the transformation of elements.** L. THOMASSEN. *Metallwirtschaft* 7, 703-8(1928).—A review. The expts. of Smits (*C. A.* 20, 2449) in the transmutation of Pb into Hg and Tl in a quartz-Pb lamp are repeated with negative results.

ROBERT F. MEHL



**Electrons and quanta.** C. J. DAVISSON. *J. Optical Soc. Am.* **18**, 193-201(1929).—Several aspects of the evidence for the inter-relationship of electrons and waves are presented. D. discusses the diffraction of electrons and the wave length of such particles as compared to x-rays and their behavior. The expts. of Nishikawa and Kikuchi are mentioned, as being of potential importance. WILLIAM E. VAUGHAN

**Ionization potentials and atomic number.** R. PETERLS. *Z. Physik* **55**, 738-43 (1929).—The trend of ionization potentials in B, C, N, O, F and Ne as found exptly. is deduced theoretically from wave-mechanical considerations. Cf. Alexander, *C. A.* **23**, 2877. GEORGE GLOCKLER

**Wilson cloud chamber for small pressures.** J. PETROVÁ. *Z. Physik* **55**, 621-7 (1929).—A modified app. is described which permits the study of both  $\alpha$ - and  $\beta$ -ray tracks at pressures of 3 cm. Hg and higher. GEORGE GLOCKLER

**Range of  $\beta$ -rays from radium D by the Wilson cloud-chamber method.** J. PETROVÁ. *Z. Physik* **55**, 628-45(1929).—The app. described in the preceding abstract was used to det. the ranges of  $\beta$ -rays from Ra D at various pressures. The two strongest secondary  $\beta$ -ray groups have av. normal ranges ( $20^\circ$ , 760 mm.) of 0.80 and 1.58 cm., resp. Their max. ranges are 1.3 and 2.4 cm. The existence of a primary  $\beta$ -ray group of Ra D is inferred. GEORGE GLOCKLER

**Theory of diffusion of electrons through gases.** H. BARTELS. *Z. Physik* **55**, 507-32(1929).—The diffusion of electrons through a gas layer is analogous to the scattering of a light beam. A mathematical discussion is given. Cf. G. Hertz, *C. A.* **19**, 2908. GEORGE GLOCKLER

**Electron terms of the singlet system in the molecular spectrum of hydrogen.** W. WEIZEL. *Z. Physik* **55**, 483-501(1929).—All of the known electron terms in the mol. spectrum of H can be interpreted as due to jumps of one electron while the other electron is in the lowest  $1s\sigma$  state. All the terms are calcd. and the ionization potential of H is 15.75 v., in agreement with the value 15.9 v. obtained by electron impact expts. Cf. *C. A.* **23**, 769. GEORGE GLOCKLER

**Ramsauer effect of argon.** J. HOLTSMARK. *Z. Physik* **55**, 437-46(1929); cf. *C. A.* **22**, 3836. The av. field of the A atom is calcd. after Hartree (*C. A.* **22**, 1269) and the polarization produced by the impinging electron is taken into account. On this basis the effective cross-section of A towards impinging electrons is calcd. in agreement with expt. GEORGE GLOCKLER

**Determination of H-rays with the tube electrometer.** E. A. W. SCHMIDT AND G. STETTER. *Z. Physik* **55**, 467-82(1929).—Expts. are described of the counting of H-rays and the detn. of their ionization by means of a tube electrometer. The sp. ionization of H-rays and  $\alpha$ -rays is in the ratio 1:4. This ratio is const. for various velocities and angles. Measurements by the scintillation method give higher values than by the elec. method. Cf. Ortner and Stetter, *C. A.* **23**, 3623. GEORGE GLOCKLER

**Wave mechanics.** C. F. HAGENOW. *Sci. Monthly* **1929**, 109-16.—A review. E. H.

**Absorption of Hertzian waves in ionized gases.** HERMANN DÄNZER. *Ann. Physik* [5], **2**, 27-62(1929).—D. has designed a Hertzian wave detector capable of receiving any desired wave length, operating on the bolometer principle. The construction of the sender and the receiver is carefully described. The absorption of A, H, N, O and air in a discharge tube with Mg electrodes was investigated and also the "life-period" of free electrons,  $T$ , in these gases. (By life-period is meant the time between excitation and total cutting-off of the absorption.) Pure A absorbs 97% (max.); mixt. of A and H<sub>2</sub>, about 97%; slightly impure A, 84%; very impure A, 90%; H<sub>2</sub>, 100%; N<sub>2</sub>, 78%; air, 94%; O<sub>2</sub>, 87%.  $T$ : A,  $2 \times 10^{-3}$  to  $1 \times 10^{-1}$ ; H<sub>2</sub>, about  $3 \times 10^{-4}$ ; N<sub>2</sub>,  $3 \times 10^{-4}$ ; O<sub>2</sub>,  $1 \times 10^{-4}$ ; air,  $1 \times 10^{-4}$ . A long theoretical discussion is given wherein are derived the equations  $1 - n^2 = (1/\pi c^2) \cdot (Ne^2/m)\lambda^2$  and  $\mu = (ze\lambda^2/2\pi c^3) \cdot (Ne^2/m)$ , in which  $n$  is the refractive index,  $\mu$  the absorption coeff.,  $e$  and  $m$  are the ion charge and mass,  $Z$  is the no. of impacts per ion per sec. and  $\lambda$  the wave length.  $N$  is the detg. factor for the absorption. WILLIAM E. VAUGHAN

**Ionization in stellar atmospheres. I. Generalized Saha formulas, maximum intensities, and the determination of the coefficient of opacity.** E. A. MILNE. *Month. Not. Roy. Astron. Soc.* **89**, 17-49(1928).—Mathematical. II. **Absolute magnitude effects.** *Ibid.* 157-75.—Formulas are obtained which det. the variation with  $g$ , at const.  $T$ , of the no. of atoms responsible for the formation of a given absorption line. The behavior depends on whether the coeff. of general absorption,  $\kappa$ , is const. throughout the stellar atm. or is proportional at each point to the electron pressure  $P$ . The fact that lines of both neutral and ionized atoms increase in intensity from dwarfs to giants favors the adoption of  $\kappa \propto P$ . When  $\kappa \propto P$  the mass of the reversing layer increases with decreas-

ing pressure and more than counterbalances the reduction in the proportion of neutral atoms due to increased ionization. The observed strengthening of the Balmer lines from dwarfs to giants now receives theoretical explanation. B. C. A.

**Theoretical contours of absorption lines in stellar atmospheres.** E. A. MILNE. *Month. Not. Roy Astron. Soc.* 89, 3-17(1928).—Math. The no. of atoms per cc. in a stellar atm. is calcd. on the assumption of no surface of demarcation between atm. and photosphere. B. C. A.

**Nature of streamers in electric sparks.** MICHIO MIYANISHI. *Japan. J. Physics* 5, 67-82(1928).—The streamers emanating from the anode and cathode of a spark have been examd. spectrographically and found to consist of positively and negatively charged particles, resp. Their velocity and duration of luminosity have also been measured. B. C. A.

**Critical potentials of methane.** F. PIETSCH AND G. M. SCHWAB. *Z. Physik* 55, 231-3(1929).—The interpretation of the processes taking place at the ionization potentials of  $\text{CH}_4$  by Hogness and Kvalnes (*C. A.* 23, 2650) is discussed. At 15.4 v.  $\text{CH}_4$  decomposes into C and  $2\text{H}_2$  and  $\text{CH}_3^+$  ions are formed. GEORGE GLOCKLER

**A proposed method for determining whether or not an electron has a magnetic moment comparable with that of a hydrogen atom.** V. M. ALBERS AND T. E. PIPPS. *Phys. Rev.* 31, 149(1928).—In order to decide whether or not the magnetic moment of the H atom is due to the electron in the atom, an expt. is proposed similar to Brillouin's except that the electrons will be generated within the magnetic field and will then travel parallel to it. H. R. MOORE

**Ionization of water vapor.** H. A. BARTON AND J. H. BARTLETT. *Phys. Rev.* 31, 154-5(1928).—The method of electromagnetic analysis was used to study the nature of ions formed by electron impact in  $\text{H}_2\text{O}$  vapor.  $(\text{H}_2\text{O})^+$  and  $(\text{OH})^+$  were predominant. The ionization potential of the former was  $13 \pm 1.5$  v. H. R. MOORE

**Time lag differences of the Faraday effect in several mixtures and chemical compounds.** FRED ALLISON. *Phys. Rev.* 31, 313(1928); cf. *C. A.* 22, 1507.—The Faraday effect lags behind the magnetic field longer in one liquid than another. The effect has now been studied systematically with several org. liquids. Since mixts. of 2 or more liquids gave lags characteristic of their components, the method may have possible application in detecting the presence of certain constituents present. H. R. MOORE

**Concentration and dilatation effect produced by a longitudinal magnetic field on a beam of slow electrons.** J. THIBAUD. *Compt. rend.* 188, 158-60(1929), cf. *C. A.* 23, 3156. B. C. A.

**Influence of a magnetic field on the fluorescence of mercury vapor.** H. NIEMOŁ NICZAŃSKI. *Z. Physik* 55, 676-89(1929).—The strengthening of the resonance radiation reported by Franck and Grotrian (*C. A.* 15, 3585) is not found. Other effects are noted. GEORGE GLOCKLER

**Selective photoelectric effect.** R. SUHRMANN AND H. THEISSING. *Z. Physik* 55, 701-16(1929); cf. *C. A.* 22, 2512, 3831.—Monatomic and thicker layers of K films were studied. GEORGE GLOCKLER

**Note on the effect of temperature on the auto-electronic discharge.** N. A. DE BRUYNE. *Proc. Cambridge Phil. Soc.* 24, 518-20(1928).—In the presence of both thermionic and auto-electronic emission sepn. may be made by subtracting thermionic current, obtained by the Schottky relation, from total measured current; the diff. equals auto-emission at the temp. considered. The auto-emission is found to be independent of temp. up to  $1944^\circ$  (highest temp. investigated) contrary to the expts. of Millikan and Eyring and Millikan and Lauritsen (*C. A.* 22, 1272). Auto-emission appears to be independent of thermionic emission. M. McMAHON

**The effect of gases on the electric charges developed by heated metals.** DONALD H. BANGHAM AND DOUGLAS R. LEWIS. *J. Chem. Soc.* 1929, 1140-9.—Hartley's expts. (*C. A.* 8, 2102) on detg. charges of metal surfaces heated in contact with various gases were repeated with particular emphasis on the magnitude of the currents obtained. The metal surface investigated was a roll of Au gauze. With O at temps. of  $468^\circ$  and  $497^\circ$  there was a positive displacement of "equil. potential," a function of its pressure. The observed effects are due to an exchange of ions between metal surface and glass wall. M. McMAHON

O. With H there was a negative displacement of "equilibrium potential" with increase of pressure. Occluded O and N diminish the emission of ions from metal; H increases emission at low pressures. M. McMAHON

The resolving power of an octahedral crystal for x-rays. CARLETON C. MURDOCK

*Phys. Rev.* **31**, 304(1928).—A study of the relation between the size of octahedral crystals of the cubic system and the width of the lines of their x-ray powder spectrogram has led to an equation very similar in form to that of Scherrer. Computations of particle vol. for colloidal particles such as Au and Pt, which ordinarily crystallize in the octahedral form give results 20% less than those based on the assumption that the particles are cubes. H. R. MOORE

An attempt to find a unidirectional effect of x-ray photons. A. H. COMPTON, K. N. MATHUR AND H. R. SARNA. *Phys. Rev.* **31**, 159(1928).—Expts. were carried out to test the idea that x-ray pulses excited by the impact of cathode particles on a target might emit more photons with their elec. axes antiparallel to the cathode stream than parallel to it. It was thus anticipated that more photoelectrons would be ejected parallel to the cathode rays. The expts., however, were neg., or at least below the limits of detection, 1 part in 500. H. R. MOORE

The soft x-ray emission from various elements after oxidation. L. P. DAVIES. *Proc. Roy. Soc. (London)* **A124**, 268-77(1929); cf. *Proc. Roy. Soc.* **A119**, 543(1928).—The effect of oxidation on the total soft x-ray emission from Si, Mn, Co, Ni, Cu, Mo, Pd and W was studied. The efficiencies are leveled up after oxidation, which suggests that the efficiency of the oxide is the av. efficiency of the O and element present. The mean value for the efficiency of O calcd. on this basis is  $3.61 \times 10^{-6}$  at 600 v.,  $3.15 \times 10^{-6}$  at 500 v.,  $2.82 \times 10^{-6}$  at 400 v. and  $2.06 \times 10^{-6}$  at 300 v. H. W. WALKER

X-radiation from the impacts of electrons against gas atoms. WILLIAM DUANE. *Phys. Rev.* **31**, 708(1928); cf. *C. A.* **22**, 4057.—X-rays produced by impact of electrons on Hg atoms have been shown previously to possess an av. wave length somewhat longer than the short-wave length limit given by the quantum equation. A further extension is described on measurements of radiation at right angles to the electron stream, in which thinner windows were used, and also expts. on radiation emitted in the direction of motion of the electrons. H. R. MOORE

Absolute measurements of intensity of Röntgen rays. O. GAERTNER. *Ann. Physik* [5], **2**, 94-122(1929).—The intensity of filtered radiations from a hot cathode tube with Cu or Mo anode is measured with a thermopile (calibrated electrically). The detd. intensities are compared with the ionization produced by the radiation in H<sub>2</sub>, N<sub>2</sub>, O<sub>2</sub>, A and air. The ratio volt per ion-pair is detd. for N<sub>2</sub>, 40.8; air, 36.4; O<sub>2</sub>, 34.4; A, 29.6 (all for av. wave length 1.38 A. U.). WILLIAM E. VAUGHAN

Indices of refraction of platinum for x-rays of long wave length. ELMER DERSHEM. *Phys. Rev.* **31**, 305(1928).—By a reflection method the refractive indices of Pt measured over the wave length range 1.279-701 A. U. yield values of  $1-\mu$  of  $27.3 \times 10^{-6}$  to  $663 \times 10^{-6}$ . H. R. MOORE

Diffraction of x-rays by ruled gratings. Spectrographic function of x-rays and ultra-violet rays. J. THIBAUD. *Ann. soc. sci. Bruxelles* **48B**, ii, 145-68(1928); cf. *C. A.* **22**, 2713.—An account of the author's work on the diffraction of x-rays and ultra-violet rays showing the various stages in the development of the grating method with tangential incidence. This method is compared with the rotating-crystal method, and is shown to be very suitable for the investigation of the region between x-rays and ultra-violet rays. The theory of the diffraction grating with tangential incidence is summarized and a detailed description of the improved form of vacuum spectrograph with glass grating is given (cf. *C. A.* **21**, 1593). B. C. A.

Use of optical gratings for x-rays of one to two A. U. H. SEEMANN AND K. F. SCHOTZKY. *Z. Physik* **55**, 252-72(1929).—Glass gratings of 142 lines per mm. give x-ray spectra with Cr rays of 2.3 A. U. Gratings with more lines cannot be used. G. G.

X-ray spectra of gases. A. BJORKESON. *Z. Physik* **55**, 327-37(1929); cf. *C. A.* **22**, 4057.—Several methods are described for photographing x-ray spectra of gases. Na, K and S are used. The common principle of the methods is the use of a beam of electrons which crosses a beam of the vapor. GEORGE GLOCKLER

The third orbit of the ionized atoms P II, S II, S III and Cl III. Quadruplets of Cl III. J. GILLES. *Compt. rend.* **188**, 1158-60(1929); cf. *C. A.* **23**, 1570, 2103.—Previous work of Ingram on S II and of the author on S III is referred to, which indicate that in these ions the 3rd orbit is very close to 4s. In P II, however, which is isoelectronic with S III, the 3rd orbit is at a normal distance from 4s. Quadruplets of Cl III due to the following combinations are given:  $a3d^4P - a4p^4S$ ,  $a3d^4P - a4p^4P$ , and  $a3d^4P - a4p^4D$ . The values of the terms are computed from Bowen's published terms. It appears that in Cl III the 3d orbit comes between 4s and 4p. C. J. HUMPHREYS

Electromagnetic equations in the quantum theory. C. G. DARWIN. *Nature* **123**, 203(1929).—Mathematical. H. L. D.

Elementary processes in emission and absorption of light. J. STARK. *Ann.*

*Physik* [4], **87**, 909-26(1928); cf. *C. A.* **23**, 2652.—An earlier theory given by Stark is extended and applied to a series of exptl. cases. In the emission of light, first the electron in its stationary state in the atom is displaced from equil. and approaches indefinitely close to a lower energy level. Second, a light quant. is formed in the electronic field. Third, there is a mutual action between the electron and the light quant. resulting in the emission of the quant. in a definite direction with the velocity of light, and fixing of the electron in the new energy level. The time required for each of these processes is discussed. Consideration is given to excitation by cathode rays, and the theory predicts that the emission of characteristic frequencies in consequence of transfers of the at electron from one energy level to another is accompanied by the emission of a continuous spectrum in the infra-red or the beginning of the visible spectrum; also, that if the energy of the impinging electron is less than that required to raise the at. electron to the next higher level an aggregate of atoms will give rise to a continuous spectrum. The theory provides an explanation of the continuous x-ray spectrum. The theory is applied to all kinds of absorption, including continuous, selective and photoelectric absorption, and absorption due to scattering. B. C. A.

**Photometric and spectrophotometric investigations. VI. Reflection spectroscopy.** K. SCHAU. *Z. wiss. Phot.* **26**, 97-110(1928)—Measurements were made with the Köning-Martens spectrophotometer. Data are given for the following materials; pigments; samples of silk, cotton and paper colored with some azo dyes; and a few colored mirrors. The method of investigation is described at length. A. P. H. TRIVELLI

**Effect of the addition of hydrogen and water on the radiation emitted from the carbon monoxide flame.** WM. E. GARNER AND F. ROFFEY. *J. Chem. Soc.* **1929**, 1123-40.—The addn. of H<sub>2</sub> or water decreases the radiation from the flame and increases the speed of flame. The difference between the effects of the two gases is slight. There is a crit. region at 0.02-0.04% of H<sub>2</sub>, where the radiation falls abruptly, and the properties of the flame undergo a marked change. Radiation-compn. and radiation-speed curves give a break at this point. Logarithmic relationships are found to hold between the speed of flame and the radiation emitted. These apply to mixts. above and below the crit. point. They support the "energothermic" theory of catalysis. The step on the radiation curves is considered to be due to a change in the nature of the chem. reaction L. L. QUILL

**Ultra-violet bands of sulfur.** J. GILLES. *Compt. rend.* **188**, 1607-8(1929) - Tables are given of ultra-violet bands from sulfur. GREGG M. EVANS

**Heat spectrum of solid and liquid iron.** R. HASE. *Physik. Z.* **29**, 904-7(1928) — The spectral energy distribution of the radiation emitted by solid and liquid Fe resembles that from a black body, but the abs. intensity depends largely on surface oxidation. The wave length of max. emission for smooth solid Fe is shifted in the direction of shorter wave lengths as the temp. rises, so that Wien's law is obeyed. The intensity *E* at the max. varies as  $CT^6$ , *T* being the abs. temp. and *C* = 2890. Mat. slag-free Fe emits approx. "gray" radiation approaching the black-body condition as the temp. rises. The heat spectrum of liquid Fe closely resembles that of the smooth solid metal both as regards intensity and spectral distribution. B. C. A.

**Hyperfine structure of doublet spectra and the determination of nuclear moments.** H. SCHÜLER AND H. BRÜCK. *Z. Physik* **55**, 575-80(1929).—The appearance of hyperfine structure of spectral lines necessitates the adoption of a new quantum no. representing the magnetic moment of the nucleus. Energy-level diagrams are discussed and for TI the nuclear moment is  $1/2$ . GEORGE GLOCKLER

**Ultra-violet bands of the hydrogen molecule.** A. SCHAAPFMA AND G. H. DIEKE. *Z. Physik* **55**, 164-86(1929).—Most of the lines between  $\lambda$  1250 and 1700 Å. U. are assigned to the *B-A* band system. Cf. Kemble and Guillemin (*C. A.* **23**, 1053) and Richardson and Davidson (*C. A.* **23**, 2883). GEORGE GLOCKLER

**Intensity in the hydrogen Stark effect.** H. MARK AND R. WIERL. *Z. Physik* **55**, 156-63(1929); cf. *C. A.* **23**, 2363. GEORGE GLOCKLER

**Light scattering in quartz and silicates.** E. GROSS AND M. ROMANOVA. *Z. Physik* **55**, 744-52(1929).—The Raman effect is studied in quartz and glass. The glasses show the Raman lines of quartz as diffuse bands. GEORGE GLOCKLER

**Absorption spectra and constitution of azo and azoxy compounds.** I. SZEGÖ. *Ber.* **62B**, 736-44(1929); cf. *C. A.* **23**, 337.—Ultra-violet absorption spectra are given for azo- and azoxybenzene and the nitro, hydroxy, methylamino and bromo derivs. of azobenzene and the  $\alpha$ - and  $\beta$ -azoxybenzene. J. G. McNALLY

**The polarization of light from hydrogen canal rays.** F. G. SLACK. *Phys. Rev.* **31**, 312(1928).—Light emitted at right angles to a stream of H canal rays is partially polarized. Thus the resultant light is partially polarized with its elec. vector parallel to the

beam. The computed ratios of parallel intensity to perpendicular intensity are in agreement with the recent expts. H. R. MOORE

**Measurement of optical rotation in the further ultra-violet.** WERNER KUHN. *Ber.* 62B, 1727-31(1929).—In view of the relationships between rotation anomalies and absorption bands, any work on the relationship between optical rotation and chem. constitution with the simpler compds., which generally lack absorption bands in the visible regions, must be carried out in the ultra-violet, where absorption bands do occur. K. describes a new polarization app. using quartz instead of calcite Rochon or Sénarmont prisms, with spectrograph for eye-piece, giving photographic records for interpretation of readings. A. P. SACHS

**Photometric study of the Raman effect.** PIERRE DAURE. *Compt. rend.* 188, 1605-6(1929).—Measurements on Raman lines from  $\text{AsCl}_3$ ,  $\text{PCl}_3$  and  $\text{CCl}_4$  show that within the limits of exptl. error, the relation  $r$ , between the intensity of the pos. and neg. rays from the same excitation follow the equation  $r = e^{-nhc/kT} = e^{-nhcN/RT}$ , where  $n$  is the difference between the exciting and the Raman radiation frequency, and the other symbols have their usual meaning. The intensity of the Raman emission varies with the fourth power of the exciting frequency. The Raman energy attains in certain cases  $1/10$  that emitted by mol. scattering. GREGG M. EVANS

**Selection rules in the Raman effect.** F. RASETTI. *Nature* 123, 757-9(1929).—In order that a Raman shift corresponding to the transition  $i \rightarrow k$  may be observed, both  $i$  and  $k$  must combine at least with a third state  $l$ ; the Raman scattering becoming particularly intense when the energy  $h\nu$  of the impinging quantum is near to  $E_l - E_i$ . Using the Hg line 2536, R. has photographed Raman lines from O, N and H and finds that the observed values support the above statement. Lines due to rotational transitions are observed on either side of the 2536 line in O. The measurements support the hypothesis that in  $\text{N}_2$  only even rotational states are present. GREGG M. EVANS

**New properties of polarized fluorescence of liquids.** S. I. VAVILOV. *Z. Physik* 55, 690-700(1929).—The polarization of the fluorescence of dye solns. in glycerol is different on transverse than on longitudinal observation. The degree of polarization changes periodically with the wave length of the exciting light. Both effects are thought to be due to light pressure. GEORGE GLOCKLER

**Phosphorometer for the rapid measurements of the intensities of phosphorescences.** R. COUSTAL. *Compt. rend.* 188, 326-7(1929).—The intensity or decrease of phosphorescence of the substance to be examd is matched by means of mixts., in known proportions, of varying amts. of two  $\text{ZnS}$  from the same batch, of which only one has been rendered phosphorescent. The surface ds. of such mixts. are proportional to the concns. of the active sulfide. The intensities of phosphorescence show the same rates of decrease with time and the Güntz formula was confirmed. B. C. A.

**Chemiluminescence.** ERIC K. RIDEAL. *Chem. News* 139, 33-6(1929); *Proc. Roy. Inst. Gl. Britain* (preprint), Feb. 15, 1929, 6 pp.—A review. E. H.

**Diffusion of photoluminescence.** G. A. GAMBURZEV. *Z. Physik* 55, 533-45(1929).—Resonance light can travel through a gas by repeated process of absorption and emission and thereby suffer considerable retardation. The problem is treated mathematically. This retardation is considerable in resonance radiation but it is not very marked in the luminescence of uranyl salts. GEORGE GLOCKLER

**Band fluorescence and heat of dissociation of mercury molecules.** S. MROZOWSKI. *Z. Physik* 55, 338-57(1929).—The intensity relations in bands obtained in fluorescence of Hg vapor are studied as a function of temp. and vapor density. The measurements give 1700 cal./mol. for the heat of disson. of Hg mols. Cf. C. A. 23, 39. G. G.

**Study of fluorescent power of solutions. Influence of concentration. Action of antioxygens.** F. VITTE. *J. chim. phys.* 26, 276-87(1929).—By means of a fluorometer designed by F. Perrin, the change of fluorescent power of fluorescein in 0.1 N NaOH and  $\text{NH}_4$  in glycerol,  $\text{H}_2\text{O}$ , and alc. and of erythrosin in very dil. solns. were measured. The results agree with J. Waruloff. The effect of viscosity of the solvent is slight. Curves for fluorescent power in presence of KI and resorcinol were detd. A. F.

**Thermoluminescence excited by high-voltage cathode rays.** FRANCES G. WICK AND EDNA CARTER. *Phys. Rev.* 31, 713(1928); *J. Optical Soc. Am.* 18, 383-92(1929).—Specimens of powdered calcite, fluorite and  $\text{MgSO}_4$  were irradiated with a powerful stream of electrons from the Coolidge cathode-ray tube. The activation was preserved by immersion in liquid air. Photometric measurements of max. brightness and the decay of thermoluminescence were observed under various conditions. H. R. M.

**A luminescent effect in electrolysis at mercury electrodes.** A. DUMANSKI. *Z. CHEŠHEVA AND A. BANOV. Z. physik. Chem., Abt. B*, 3, 440-2(1929).—In electrolysis of salt solns. where Hg is the positive electrode a luminescence with formation of insol.

compds. is observed. In those salt solns. which do not form insol. compds. there is none. The intensity increases with concn. of solns. up to about 0.1 *N*, but the duration is inversely proportional to the concn. With 0.1 *N*  $\text{AlCl}_3$ , the spectrum extended from 510 to 617  $\mu$ , and with 0.1 *N*  $\text{NaCl}$ , between 510 and 607  $\mu$ . The effect is independent of the material of the neg. electrode.

GREGG M. EVANS

A proposal for the designation of a quantity of light in photochemistry. MAX BODENSTEIN AND CARL WAGNER. *Z. physik. Chem., Abt. B*, 3, 456-8(1929).—In order to make the nomenclature of photochemistry consistent with ordinary chem. symbolism B. and W. propose the following conventions. By analogy with electrochemistry, a unit of  $6.06 \times 10^{23}$  quanta is to be called one "light equiv." or "einstein" and is to be denoted by the letter *E*. The number of einsteins is to be denoted by *L*. The intensity of the absorbed light,  $J_{\text{abs}}$ , is to be expressed in einsteins per sec. The symbol [ $J_{\text{abs}}$ ] is to denote the number of einsteins absorbed per liter per sec.

J. B. AUSTIN

The photochemical formation of phosgene. IV. Changes at low pressures and an improved conception of the mechanism of the reaction. MAX BODENSTEIN, SAM LENCHER AND CARL WAGNER. *Z. physik. Chem., Abt. B*, 3, 459-78(1929).—Exptl. observations on the formation of  $\text{COCl}_2$  at room temp. and pressures below 30 mm. Hg show that the reaction proceeds more slowly than is to be expected from the velocity equations at higher pressures. This leads to the conclusion that the Cl atoms disappear not only through events taking place in the gas space, but also wander to the walls and recombine there. The bearing of this observation on the present conception of the mechanism of phosgene formation is discussed at some length.

J. B. AUSTIN

Photochemical decomposition of benzaldehyde in vapor state. MARC DE HEMPTINNE. *J. phys. radium* 9, 357-64(1928); cf. *C. A.* 22, 2717.—Vapor-phase photochem. decompn. of benzaldehyde is produced by a region of ultra-violet corresponding to complete absorption. With rising temp. longer wave lengths cause the decompn. Thermal decompn. without a catalyst above 400° gives similar products. Decompn. by electromagnetic, thermal or electronic bombardment (silent discharge) energy leads to the same products, and in case of the first two the use of either one decreases the quantity of the other necessary to cause decompn.

A. P. SACHS

The use of a new actinometric material. W. EISENSCHIMMEL. *Listy Cukrova* 47, 451-2(1929); cf. *C. A.* 22, 356.—Artificial light has no effect upon the chloramine, all reactions were studied under sunlight. Red and green light have no effect on the reaction; the greatest reaction rate occurred in the blue. Changes in temp. ( $0-10^\circ$ ) have no effect upon the rate of reaction. Diln. of the soln. increases the rate of reaction.

FRANK MARESH

Photochemical reaction between ethylene glycol and dichromate. J. H. RIENSEN-FELD AND O. HECHT. *Z. wiss. Phot.* 26, 369-72(1929).—The  $\text{H}_2\text{O}$ -free dichromate soln. in glycol is more light-sensitive than that of the  $\text{H}_2\text{O}$ -contg. dichromate. Quant. detns. were made. Within the concn. limits of a 0.2-0.6%  $\text{Na}_2\text{Cr}_2\text{O}_7$  in ethylene glycol, the amt. of photochemically changed material is proportional to the time of exposure. With the light intensity used, independently of concn. and thickness of layer, 50 milli-equivs. of  $\text{Na}_2\text{Cr}_2\text{O}_7$  were reduced (1 milli-equiv. is 1.31 mg. of  $\text{H}_2\text{O}$ -free  $\text{Na}_2\text{Cr}_2\text{O}_7$ ).

A. P. H. TRIVELLI

New light reaction of ergosterol. A. STEIGMANN. *Z. wiss. Phot.* 26, 363-8(1929).—S. describes several qual. light reactions of ergosterol with methylene blue and anthraquinone in pyridine and alc. with an O atm.

A. P. H. TRIVELLI

The effect of radiation upon chemical and biochemical reactions. WALTER GERLACH. *Z. angew. Chem.* 42, 693-7(1929).—The fundamentals of energy-change in terms of the quantum theory are presented.

W. C. EBAUGH

Photographic action from metals, woods, etc. J. G. STRACHAN. *J. Roy. Tech. Coll. (Glasgow)* 2, No. 1, 20-9(1929).—Expts. are described showing that Cd, Zn, Ni, Ag, Al, Pb, Bi, wood, resin, linseed oil and such materials affect photographic plates at distances of 1 to 2 mm. in the dark when the time of exposure is 2 hrs. or more.

R. H. F.

The collision processes accompanying the combination of nitrogen atoms in active nitrogen. BERNARD LEWIS. *Phys. Rev.* 31, 314(1928); cf. *C. A.* 22, 3097.—The results of Bonhoeffer and Kaminsky are explained on the assumption that the N mol. can be formed in a two-body process since it possesses quantum states, corresponding to the energy of combination plus the relative kinetic energy of the atoms, from which it can radiate.

H. R. MOORE

The relative activation of a nitrogen-hydrogen mixture by electrons and by potassium ions in the formation of ammonia. C. H. KUNSMAN. *Phys. Rev.* 31, 307(1928).—( $\text{N}_2 + 3\text{H}_2$ ) mixts. at pressures of 1 mm. or less were introduced into a bulb contg. a W filament, an Fe-K pos. ion source, and a fine Pt gauze cylinder as the collector. The

rate of clean-up of  $\text{NH}_3$  was most rapid with electrons of 17 v. and over, while no appreciable increase is observed with  $\text{K}^+$  ions up to 330 v. speed. H. R. MOORE

Further studies in the effect of x-rays upon optical properties of liquids and glass. FRED ALLISON. *Phys. Rev.* 31, 306-7(1928).—Magnetic and optical rotations induced in several liquids when exposed to x-rays have been previously observed. By varying the field strength the induced magnetic and optical rotations may be made to compensate. In sugar and tartaric acid solns. x-rays increase the right-handed rotation roughly in proportion to the concn. H. R. MOORE

Relation of shared electrons to potential and absolute polar valences (NOYES) 2. Radioactive methods in physical chemistry (FSTERMANN) 2. Valence forces as calculated from specific heats and spectra (ANDREWS) 2.

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#### 4—ELECTROCHEMISTRY

COLIN G. FINK

The electric steel furnace in Germany, Austria, Hungary and Czechoslovakia. VEREIN DEUTSCHER GIESSEREIFACHLEUTE. *Die Gießerei* 16, 437-43(1929).—A detailed report based upon 18 responses received to a questionnaire sent to all steel works in the above countries. The report includes 1 acid direct arc and 23 basic indirect arc furnaces, ranging from 1-ton to 15-ton capacity. Voltages range from 60 to 200. Statistics are given on energy consumption and refractory consumption. Many other details, such as furnace and electrode dimensions, are included. C. G. F.

Production of iron and steel in the electric furnace. ALFRED STANSFIELD. *Fuels and Furnaces* 7, 87-95, 251-76(1929).—The author discusses the various types of arc and induction furnaces for melting cold steel, for finishing molten steel and melting gray iron. Details regarding furnace construction, method of charging, slagging and furnace operation are presented together with a description of the various makes of arc melting furnaces. Special reference is made to the Frick furnace (6.5-ton capacity) 700 kw., 5000 v. and 15 to 5 cycles, and the Ajax coreless induction furnace. A. D. S.

The electrometallurgy of die-casting and bearing metals (tin-lead). FRIEDRICH VOGEL. *Metallborse* 18, 1265-6, 1490-1, 1657-8, 1769-70(1928); cf. *C. A.* 22, 3099.—A review. The electrolytic, wet, recovery process for pure Sn and Sn-Pb alloy from Sn-Pb-Sb-Cu alloy scrap and sculls is cheaper than the older, dry, furnace processes. At the end of a preliminary smelting operation the alloy is cast into anodes consisting of 50% Sn, 35% Sb, 10% Cu and 5% Pb. The fluosilicate bath is used; a little sulfate or iodide is added to ensure pptn. and accumulation of the Pb in the anode sludge. The electrolytic Sn-Pb alloy produced is free from Cu and has but 0.5% Sb. C. G. F.

The fundamentals of electroplating. HERBERT KURREIN. *Metallwirtschaft* 7, 314-9(1928); 10 illus.—A review. C. G. F.

Cadmium plating. I. TOSHIO WATANABE and CHORYO TSUCHIMOTO. *J. Mining and Met.* (Japan) 7, 3-10, 34-40(1929).—In plating Cd from cyanide soln. on Fe the current efficiency at the cathode does not change much up to the point of gas evolution, which lies at 1.75 amp./sq. dm. At too low c. d. the deposited metal becomes cryst. The p. d. between the two electrodes increases almost linearly up to the point of gas evolution, but then becomes a little slower; so in practice a wide range of c. d. may be utilized. The concn. has little effect on current efficiency. With the increase of concn., however, the c. d. necessary to obtain a good deposition tends to increase. The p. d. curve varies rapidly at first up to 0.2 N and then increases only very slowly, so that although the time of deposition may be shortened by increasing the concn. there is little difference economically between using a 0.2 N and a 0.5 N  $\text{Cd}(\text{CN})_2$  soln. With const.  $\text{Cd}(\text{CN})_2$  concn. and increasing KCN concn. the c. d. required increases slightly. The character of the deposit is good above 1.5 N KCN, the increase in KCN

causing an increase in the luster of the deposit. In the range over which the p. d. rapidly decreases with the increase of KCN, the deposit becomes cryst., while in the range over which the p. d. decreases only very slowly the deposit becomes uniform and good, so that a considerable excess of KCN is necessary. The optimum temp. is 30°. The presence of carbonate makes the deposit slightly more cryst. but has no effect upon the current efficiency. When EtOH or pyrogallol is added, there is a slight increase of the metallic luster. Gelatin, glue, etc., have no good effect. Peptone has a very good effect and the excess of KCN required may be decreased. Amalgamating the anode did not affect the current efficiency. The range of the c. d. over which the anode dissolves without any particular change is confined within definite limits, the range increasing rapidly with the increase in KCN. Since Zn and Cd act as anode against Fe, even when the covering is incomplete, the electrochem. action prevents corrosion. With Ni, Sn and Cr, the corrosion proceeds further in consequence of galvanic action. The p. d. between Cd and Fe is small and consequently the galvanic action is small, and moreover Cd itself is less readily corroded than Zn, and has a greater covering action upon Fe; hence Cd is concluded to be more effective as a protecting material for Fe.

K. SOMEYA

**Electroplating with cadmium.** JOSEPH ROSSMAN. *Metal Ind.* (N. Y.) 27, 330-2, 375-6(1929).—A review of the United States patents.

E. H.

**The chromium electroplating tank.** KARL A. HERRMANN. *Metal Ind.* (N. Y.) 27, 335-7(1929).—The health and property hazards peculiar to Cr plating are discussed.

E. H.

**Fundamental factors involved in chromium plating.** L. WEISBERG AND W. F. GREENWALD. *Metal Cleaning and Finishing* 1, No. 1, 85-8, 112(1929).—The necessity of technical control in compn. of soln. is discussed; also temp. of operation, c. d., design of racks and cost.

E. I. S.

**Anodic pickling of small metal parts, using an auxiliary (tungsten) anode.** E. FENSKE. *Metallborse* 18, 1322(1928).—The metal parts of incandescent-lamp stems or of radio-tube stems are readily pickled and cleaned by using an auxiliary W anode in an acid bath. For example, the mounted grid is immersed in the dil. acid bath and brought into contact with the W anode. Immediately the voltage drops from 70 to 6 v., in consequence of the oxide film formed on the W anode.

C. G. F.

**Electrolytic preparation of hydrogen.** II. KANJI TERANO AND HIROMICHI SHIMOYAMA. *Bull. Coll. Eng. Kyushu Imp. Univ.* 3, 227-41(1928).—The least corrosion is observed when Ni is used as electrode material; next in order are Ni-plated steel, steel, Co steel and Ni steel. With alkali carbonate solns. the corrosion is rather large. The cathode overvoltage is the lowest with Ni; Ni-plated steel and Co-plated steel are next. The anode overvoltage is in the same order, but is very small. Cathodic overvoltage is less with the more rough surfaces. The increase in the temp causes decrease in the overvoltage. For the electrolyte 20% NaOH is best in respect to gas evolution. In regard to cond. and electrode corrosion it is no different from 15% NaOH soln. With 30% NaOH the p. d. may be decreased, but the corrosion is greater. To prevent mixing of the gases evolved from the 2 electrodes an asbestos diaphragm is better than a diaphragm constructed from glass plates.

K. SOMEYA

**Hydrogen in the electrical industry.** W. R. WHITNEY. *Elec. News* (Toronto) 37, 48-50(1928); *Science Abstracts* 32B, 80; cf. *C. A.* 23, 341.—The first use of H was for the annealing of transformer iron; since then its use has been extended to the production of alloys of W, Mo and other rare metals. Three processes employing H are used in cutting or welding metals: the direct flame, the elec. arc in an atm. of H, and the at. H arc. It is stated that 99% of the frames of large elec. generators are now of welded construction. In brazing, H serves as a flux, as it cleans the surfaces by reducing any oxides to their resp. metals. Melted Cu in the presence of H has the tendency to flow into the narrowest crevices in steel, so that by thus impregnating Fe with Cu it is possible to build vacuum-tight app. Finally, H is coming into use instead of air for cooling elec. generators, on account of its greater heat-dissipating properties.

H. L. D.

**Electromotive forces of silver-silver chloride-calomel cells.** W. M. MAZZE. *Ind. Australian and Mining Standard* 81, 352, 372(1929).—An investigation of conditions of prep. Ag-AgCl electrodes reproducible within 0.1 mv. The potentials found varied from 42.2 to 46.6 mv. at 25°; the latter is considered as the real potential.

E. I. S.

**The electrolytic protection of iron.** W. VAN WULLEN-SCHOLTEN. *Metallborse* 19, 1240-1, 1295-6, 1517-20(1929).—The Cumberland process of protecting boilers, etc., from corrosion, by employing an outside elec. current to oppose that produced



locally, has not given satisfaction in certain (German) post-war vessels. Expts. were conducted with smooth and roughened iron electrodes in baths in contact with air, under H, and with air currents led through them. Bauer's recommendation for the protection of Fe in such conditions gives about 0.050–0.067 ma./sq. cm.; in the expts. were used 0.010, 0.025, 0.050 and 0.100 ma./sq. cm. The c. d. 0.010 ma./sq. cm. was insufficient. Under H a c. d. of 0.100 ma./sq. cm. was needed for prolonged protection of the Fe. When air was led through the baths a higher c. d. was needed than when the soln. was quiet, but in contact with air. Losses in wt. of the electrodes were detd. with difficulty. After 20–24 hrs. potentials assumed const. values. The calcd. and actual current densities required for protecting the Fe agreed very well.

W. C. EBAUGH  
The work of the chemist in the storage-battery industry. B. HEAP AND E. C. McKINNON. *Chemistry & Industry* **48**, 689–91 (1929).

R. H.  
Preparation of a stabilized electrode and its application to the determination of the halogens. N. JOASSART AND Ed. LECLERC. *Bull. soc. chim. Belg.* **38**, 121–31 (1929).—The electrode of Oosterheld and Honegger (cf. *C. A.* **13**, 3106) has been simplified. Fill a small glass tube with a hot mixt. contg. 1.62 g. KNO<sub>3</sub> and 0.34 g. NaNO<sub>3</sub> in 10 cc. H<sub>2</sub>O and 5.5 g. gelatin. Insert a small Ag spiral, allow to cool and cut the bottom. For the electrometric titration of the halogens with AgNO<sub>3</sub>, the gelatin electrode is dipped into the soln. to be titrated. The Ag coil constitutes the positive pole, while the negative one is a rotating Ag plate which is used to stir the electrolyte. It is advantageous to titrate in the presence of MnO<sub>2</sub> (except iodides); the acid concn. does not matter; HNO<sub>3</sub> can be substituted for H<sub>2</sub>SO<sub>4</sub>, except when detg. iodides. When the gelatin contracts in its tube, cut the tube to insure a fresh surface of contact. A. L. H.

The preparation of potassium permanganate by electrolysis. J. ROUDNIK. *Bull. soc. chim. Belg.* **38**, 147–59 (1929).—The influence of the following variables on the yield of KMnO<sub>4</sub> formation by electrolysis has been investigated: nature of the electrolytic bath, temp., c. d., anode potential, distance between the electrodes, ratio of the electrode surfaces and nature of the anode. The best results were obtained with a large anode, made of 80% Mn-Fe, a Ni wire as cathode, a short distance between the electrodes, a low temp., and a 7 N K<sub>2</sub>CO<sub>3</sub> electrolytic bath.

ALBERT L. HENNE  
Investigation of the Leclanché cell. I. Behavior of natural and artificial manganese dioxide. V. P. IL'INSKII AND N. P. LAPIN. *Zhur. Prikladnoi Khim.* **1**, 176–80 (1928).—Artificial MnO<sub>2</sub> increases the capacity of the element as compared with the natural MnO<sub>2</sub>. MnO<sub>2</sub> produced by oxidizing a mixt. of MnCl<sub>2</sub> with HNO<sub>3</sub> and KClO<sub>3</sub>, and MnO<sub>2</sub> from electrolysis of manganous salts give best results. MnO<sub>2</sub> prepd. by electrolytic oxidation of MnSO<sub>4</sub> soln. gave almost theoretical figures, and MnO<sub>2</sub> prepd. by reducing KMnO<sub>4</sub> is almost as good, but deteriorates faster. Concn. of MnO<sub>2</sub> in pyrolusites is of little importance. An av. cell loses 1.5–2% of its capacity per month when stored for 5–10 months. Many cells discharged considerably more than the theoretical amt. of energy.

V. KALICHEVSKY  
The electrochemical oxidation of anthracene to anthraquinone with a new type of electrode. C. H. RASCH WITH ALEXANDER LOWY. *Trans. Am. Electrochem. Soc.* **56**, (preprint) 6 pp. (1929).—A new type of electrode consists of a base or framework of metal, which supports the oxide of the metal intimately mixed with an organic depolarizer. Exptl. work was conducted to oxidize anthracene to anthraquinone by using a lead grid filled with a mixt. of PbO<sub>2</sub> and anthracene as the anode. The new type electrode gave a much greater yield and current efficiency than where the depolarizer was suspended in the electrolyte. This principle is recommended with other electrode combinations for org. electrolytic reductions and oxidations.

C. G. F.  
Electrolytic reduction of aromatic arsonic acid. KYUWA NAKADA. *Collected Lectures Inst. Chem. Research (Japan)* **1**, 94–8 (1929).—3,4-O<sub>2</sub>H(HO)C<sub>6</sub>H<sub>3</sub>AsO<sub>3</sub>H<sub>2</sub> is best reduced to H<sub>2</sub>N(HO)C<sub>6</sub>H<sub>3</sub>AsH<sub>2</sub> by 2.6 amp. in 1 1/3 hrs. with 2 g. of the substance in 2 N HCl soln. Variations of c. d. and temp. cause variations in the yield but no change in the resulting product. Optimum temp. is 25°. Above 60° there is some decompn. When the HCl concn. is small arsonic acid compds. are formed, while with more concd. HCl arseno compds. are formed. Arsanilic acid forms arsenoaniline while O<sub>2</sub>N(HO)C<sub>6</sub>H<sub>3</sub>AsO<sub>3</sub>H<sub>2</sub> forms arspenamine above 5 N acid. Phenolarsonic acid becomes arsenophenol at a high acid concn. Arsonic acids are reduced by cathodes of Hg, Pb and Pb-Hg, while with Pt, Ni and Cu cathodes only the nitro radical is reduced to form amino or other intermediate derivs., the yield being proportional to the over-voltage of the electrodes.

K. SOMEYA  
Investigations on the electrolytic oxidation of some organic compounds. C. MARIE AND G. LEJEUNE. *J. chim. phys.* **26**, 237–49 (1929); cf. *C. A.* **22**, 4345.—Work

was extended to include secondary alcohols, aromatic amines and phenols. The results confirm the previous work.

ARTHUR FLEISCHER

**Electrochemical oxidation of 1,3-xylene-4-sulfonic acid.** MORIAKI YOKOYAMA. *Helv. Chim. Acta* 12, 756-85(1929).—Anodic oxidation of molar solns. of 1,3,4-Me<sub>3</sub>-C<sub>6</sub>H<sub>3</sub>SO<sub>3</sub>H (I) with 20% H<sub>2</sub>SO<sub>4</sub> as the catholyte, a PbO<sub>2</sub>-Pb anode and a porous clay diaphragm, at 0.04 amp./sq. cm., *T* = 75-80°, results in either (a) oxidation of the side chains with formation of such substances as HCOOH, HOAc, 6-sulfo-*m*-toluic acid, 4-aldehydo-2-sulfobenzoic acid, with 4 sulfoisophthalic acid as the final product or (b) hydroxylation of the nucleus with the intermediate formation of a quinone, subsequent migration of Me group from the 3 to the 2 position and complete oxidation of the nucleus to give dimethylmaleic anhydride (II) (above 75° only) and possibly fumaric acid. That both reactions (a) and (b) may take place together is indicated by the identification of 5,6-dihydroxy-4-sulfo-*m*-toluic acid (III). Use of a Pt anode gives only II and III as products. Anodic oxidation of xyloquinone (IV) yields 2,3-dimethylmaleic acid as one of the products, whereas 1,3,6,4-Me<sub>4</sub>(HO)C<sub>6</sub>H<sub>2</sub>SO<sub>3</sub>H (V) yields both II and III, indicating that IV and V must be regarded as possible intermediates in the electrochem. oxidation of I. The formation of a peroxide or a peracid which enhances the anodic effect is postulated to account for the variety of products and the completeness with which both oxidation of the side chains and hydroxylation of the nucleus take place.

L. F. AUDRIETH

**The origin of voltaic electricity. II. The concept of electromotive force or the energy principle.** C. J. BROCKMAN. *J. Chem. Education* 6, 1293-303(1929); cf. *C. A.* 22, 2516.

E. H.

**Photographic determination of the temperature of the tungsten cathode in the electric arc.** ERNEST K. G. STUECKELBERG. *Phys. Rev.* 31, 771(1928).—The W arc burned in carefully purified N between small spheres of W. The true temp. had a uniform value over the sphere, independent of pressure, and varied between 2600° to 3300°K.

H. R. MOORE

**Electric gas purifiers and their application.** E. BLAU. *Elektro-J* 9, 11 4, 21 4 (1929).—A general article.

E. J. C.

**Anodic nickel and cobalt triacetate and the Kolbe reaction.** C. SCHALL AND CH. THIEME-WIEDTMARCKTER. *Z. Electrochem.* 35, 337-44(1929).—Following the method of Schall and Markgraf (*C. A.* 18, 944), the authors find disagreeing results; no max. or min. in equiv. cond. curve of Ni and Co diacetates; evidence of trimol. triacetates instead of monomol. With Ni the Kolbe reaction depends on the water content. The probable mechanism of the oxidation is given in detail.

HELEN GILLETTE WEIR

**Experimental determination of the voltage distribution in insulating materials when applying direct current voltages.** P. BÖNING. *Elektrotechn. u. Maschinenbau* 47, 613-20(1929).

C. G. F.

**The ideal lightning arrester. What is it? Can it be produced?** A. L. ALBERTSON. *Elec. J.* 26, 366-74(1929).

C. G. F.

**Electric impregnation of CuSO<sub>4</sub> solution through Japanese cedar wood (MURAKAWA 20. PbO<sub>2</sub>-PbSO<sub>4</sub> electrode (VOSBURGH, CRAIG 2. The manufacture of glass for electrical incandescent lamps (TISCHER 19. Spotting of plated or finished metals (BARROWS 9. Rubber deposition (Brit. pat. 303,765; Fr. pat. 657,948) 30. Electrodeposition of rubber from latex (Brit. pat. 303,214) 30. Electrodeposition of rubber together with S (U. S. pat. 1,723,083) 30. Electric deposition of rubber (Brit. pat. 303,561) 30. Alloy for electrical conductors (U. S. pat. 1,723,867) 9. Reclaiming metal from electrical condensers (U. S. pat. 1,722,372) 9. Furnace linings (Brit. pat. 303,574) 1. Alkali bicarbonates (Brit. pat. 303,857) 18.**

**FULMEN: Manuel pratique des batteries de démarrage.** CLICHY: Fulmen 256 pp. F. 25. Reviewed in *Chimie & Industrie* 21, 415(1929).

**SCHUSCHARDT, G: Kohlenelektroden für elektrische Öfen, ihre Herstellung, Prüfung und Verwendung, nebst einer Übersicht der deutschen Patente.** Berlin A. Seydel. 33 pp. Reviewed in *Chimie & Industrie* 21, 1345(1929).

**Electric batteries.** ÉTABLISSEMENTS GAFFE-GALLOT ET PILON. Fr. 31,108. July 1, 1927. Addn. to 636,664. Construction of electrodes.

**Electric batteries.** C. H. EVERETT and G. R. CARR. Brit. 303,472. Jan. 4, 1928. Structural features are described including hollow arms carrying corrugated strips and supporting active material on the electrodes, so as to facilitate penetration of the active material by the electrolyte.

**Electric dry cell battery.** REUBEN ECKSTEIN. U. S. 1,723,727, Aug. 6. Structural features.

**Electric battery cells.** W. R. EDWARDS and R. EDWARDS & Co., LTD. Brit. 303,-690, March 13, 1928. Structural features.

**Electric battery assembly.** GEORGE P. TARVER. U. S. 1,723,586, Aug. 6. Structural features.

**Storage battery.** SOC. ANON. DES ÉTABLISSEMENTS TECALEMIT. Brit. 303,799, Jan. 9, 1928. The gas vent is provided with a catalyst such as Pt sponge for the purpose of causing combination of escaping H and O, with formation of water which is returned to the battery. Various structural details are described.

**Storage batteries.** COMPAGNIE GÉNÉRALE D'ÉLECTRICITÉ. Fr. 657,721, June 6, 1928. The acid is divided up by irregular zig-zag perforated Pb plates.

**Storage batteries.** PÖRSCKE ELEKTRICITÄTS-GES. m. b. H. Fr. 657,882, July 20, 1928.

**Storage batteries.** A. POUCHAIN. Brit. 303,823, Jan. 10, 1928. A battery electrode on which Zn is to be deposited consists of a support of metal (such as brass or Cu coated with Ag) which is a better conductor than Zn, covered with Zn where the latter is to be deposited and elsewhere with an insulating varnish or rubber or other suitable material. For storage, the electrode may be coated with a soln. of Na silicate and gum arabic which dissolves when the electrode is immersed in the electrolyte. Brit. 303,824 specifies structural features of a battery with Pb plates. Cf. C. A. 22, 3590.

**Preparing storage batteries for service.** W. H. GRIMDITCH (to Philadelphia Storage Battery Co.). U. S. 1,722,210, July 23. The battery is treated with steam and electrolyte is then supplied to replace the steam in the pores of the battery plates and separators.

**Battery jar of vulcanized rubber.** JAMES H. WAGENHORST. U. S. 1,722,650, July 30. Structural features.

**Liquid for filling storage batteries prior to charging.** GUSTAV SCHMAUS. U. S. 1,722,343, July 30.  $\text{H}_2\text{SO}_4$  is used with  $\text{NH}_4$  and Al salts such as the sulfates and with a basic acetate such as that of Al which serve to facilitate rapid charging.

**Electrodeposition of metals in powdered form.** SOC. ANON. TREFILERIES ET LAMINOIRS DU HAVRE, ANCIENS ÉTABLISSEMENTS L. WELLER, SOC. COOPÉRATIVE DE RUGLES, ET LA CANALISATION ÉLECTRIQUE REUNIS. Brit. 303,984, Dec. 3, 1927. In effecting the deposition of metals such as Cu, Zn, Cd, Sn, Pb, etc., a carbonized compd. in a state of dispersion as near as possible a colloidal soln. (such as glucose carbonized with  $\text{H}_2\text{SO}_4$  or finely divided "sugar charcoal") is added to the electrolyte.

**Electrodeposition of chromium.** SOC. NOUVELLE DE L'ORFÈVRERIE. Brit. 303,884, Jan. 12, 1928. The electrolyte is formed from  $\text{NaHCO}_3$ , chromic acid and chromic fluoborate, with or without a small addition of fluoboric acid. Pb or Cr anodes may be used.

**Electrodeposition of lead from solutions containing ferrous chloride.** S. I. LEVY and G. W. GRAY. Brit. 304,054, Feb. 10, 1928. Solns. such as those obtained by treating with HCl the product derived from iron pyrites by heating in the absence of air or by treatment with Cl, and contg. Pb with high concns. of  $\text{FeCl}_2$  are electrolyzed; an iron anode and an e. m. f. less than that required to decompose the  $\text{FeCl}_2$  are used. Various details and modifications of the process are described.

**Electroplating apparatus.** ALBERT H. HANNON. U. S. 1,723,480, Aug. 6. Structural features.

**Apparatus for electroplating annular articles with nickel or other metals.** DUNLOP RUBBER CO., LTD., and H. TREVASKIS. Brit. 304,029, Jan. 19, 1928. Structural features.

**Electroplating with aluminum.** DANIEL GRAY, RICHARD O. BAILEY and W. S. MURRAY (to Oneida Community, Ltd.). U. S. 1,723,277, Aug. 6. A material to be coated is used as cathode with an anode of Al and an electrolyte comprising an Al salt of an aminobenzenesulfonic acid.

**Plating and polishing anode for refinishing plated metal articles in situ.** PHILIP E. EDELMAN. U. S. 1,721,949, July 23. Substances such as Ni and  $\text{NH}_4$  sulfates,  $\text{MgSO}_4$ ,  $\text{NH}_4\text{Cl}$  and  $\text{H}_3\text{BO}_3$  are held within a fabric cover together with a polishing powder such as infusorial earth. In use, the electrode is applied as a rubbing pad.

**Electrolysis of dilute electrolytes while heated.** E. CITOVICH. Brit. 303,027, Dec. 24, 1927. Electrolytic processes are carried out with a dil. electrolyte at a temp. between  $100^\circ$  and the crit. temp. so that the processes are reversible, e. g., an alk. soln. is electrolyzed at  $300^\circ$  to produce H and O which are collected in high-pressure receivers initially filled with steam; by slightly raising the temp. the steam pressure is raised

so as to cause gas to reënter the electrode chambers whereupon the reaction is reversed and the app. functions as a galvanic battery. The anode may be in contact with CO or other reducing gas or vapor or with an org. substance such as an oil which is oxidized by the electrolytic action. Gaseous fuel may be formed from solid or liquid fuels. In generating O an electrode of ferric or Cu oxide is suitable. Precious metals, alloys, iron, Ni, oxides, sulfides and graphite also may be used as electrodes.  $\text{CaCl}_2$  may be dissolved in the electrolyte to reduce the vapor pressure. C, Br and I may be produced and  $\text{PhNO}_2$  reduced to  $\text{PhNH}_2$  by the process. An app. is described.

**Electrolyzing ferrous chloride solutions.** S. I. LEVY and G. W. GRAY. Brit. 304, 053, Feb. 10, 1928. A concd. soln. of  $\text{FeCl}_2$  is electrolyzed at a temp. of 90–100° in a cell comprising an anode of C or the like in a compartment contg. a concd. soln. of  $\text{NaCl}$ ,  $\text{CaCl}_2$ ,  $\text{MgCl}_2$  or other chloride of a metal which forms only one chloride. The  $\text{FeCl}_2$  flows through the cell at such a rate that the issuing spent liquor contains 20%  $\text{FeCl}_2$ . Fe is deposited on the cathode. Various other details of app. and of procedure are described.

**Electrolytic rectifier.** WILLIAM H. GRIMDITCH (to Philadelphia Storage Battery Co.). U. S. 1,723,154, Aug. 6. Electrodes of Al and an Fe alloy contg. not less than 10% Si are used with an electrolyte soln. comprising monobasic K phosphate, dibasic  $\text{NH}_4$  phosphate and malic acid. U. S. 1,723,155 specifies a soln. of an alkali metal phosphate, an org. acid such as malic acid and a substance contg. the benzoate radical such as Na benzoate. Cf. C. A. 23, 346.

**Electrolytic cell suitable for rectifiers, condensers, lightning arresters, etc.** ISRAEL A. SHULIMSON (to American Bosch Magneto Co.). U. S. 1,721,886, July 23. A cathode comprising Al is used with an anode which may be formed of Cr-Ni steel and an electrolyte contg. a neutralized soln. of  $\text{NH}_4$  phosphate and  $\text{K}_2\text{Cr}_2\text{O}_7$ .

**Aluminum and its alloys.** A. PACZ. Brit. 303,755, Jan. 7, 1928. Compsds of 2 or more of the alkali metals such as Na, K or Li are used in the charge for producing Al or its alloys by electrolytic or electrothermal methods. Alloys with Ti, Zr, B and Si are referred to, and various details are given.

**Tungsten alloys.** OSCAR L. MILLS. U. S. 1,721,966, July 23. In carrying out a continuous process, a W compd. including W oxide 3–20% is mixed with reclaimed W carbide alloy and metallic W 15–20% and the mixt. is fused by a C elec. arc; waste material from the product is reclaimed in the form of W carbide and at least a portion of the reclaimed waste material is oxidized to form W oxide, which is used for continuing the process. An app. is described.

**Electric furnace for magnetizable metals.** LOUIS D. J. TISSEYRE. Fr. 657,895, Nov. 23, 1927.

**Electric furnace for producing glass, water glass, cement or phosphates.** C. E. CORNELIUS. Brit. 303,798, Jan. 9, 1928. See Can. 283,657 (C. A. 22, 4391).

**Electric resistance furnace adapted for heat treatments.** FRANK T. COPE and ROLAND F. BENZINGER (to Electric Furnace Co.). U. S. reissue 17,388, July 30. See original pat. 1,647,726 (C. A. 22, 196).

**Electric resistance furnace suitable for heating the ends of rock drills.** A. IMBERY. Brit. 303,222, Oct. 10, 1927. Structural features are described of a furnace having automatic temp. control.

**Electric resistance-heated furnace suitable for heat treatment of steel.** IRVING B. SMITH (to Leeds & Northrup Co.). U. S. 1,721,840, July 23. Structural features.

**Electric resistances.** THOMAS S. KEMBLE (to Universal Gas Electric Co.). U. S. 1,721,910–11, July 23. Structural features.

**Electric resistance heater of the enclosed wire type.** R. A. F. JACKSON and J. D. PLACE. Brit. 303,606, Nov. 8, 1927. Structural features.

**Electric resistance heated oven with thermostatic control.** C. HAWKINS. Brit. 303,280, Jan. 13, 1928. Structural features.

**Electrode for electric furnaces.** MATHIAS O. SEM (to Norske Aktieselskab for Elektrokemisk Industri). U. S. 1,723,582, Aug. 6. See Fr. 646,310 (C. A. 23, 2110).

**Electrode for electric "luminous" arc lamps.** W. IRBY (to General Elec. Co.). U. S. 1,722,146, July 23. Electrodes are formed of ilmenite 69.0, chromite 3.0, magnetite 14.92, NaF 0.28 and ferro-Ti 12.8%. Cf. C. A. 22, 2116.

**Electric cables.** BELL TELEPHONE LABORATORIES, INC. Brit. 303,561, Oct. 6, 1927. In making a loaded signalling cable a tape of magnetic material such as an alloy of Ni or Fe is wound on a Cu core and adhesion to the latter is prevented by an intermediate coating on the core formed of a metal such as Ni having a m. p. above the annealing temp. of the magnetic wrapping. Various details of manuf. are given.

**Promoting various chemical reactions by high-frequency electric currents.** O.

ARENDET. Brit. 303,822, Jan. 10, 1928. An app. is described in which reactions are effected by high-frequency currents by producing a cloud of dust particles (such as iron or Fe oxide) between the high-frequency electrodes, the dust particles producing spark fields for the "working current." The method is stated to be suitable for use in forming compds. of N and P, forming complex products from CO and H, steam or CH<sub>4</sub>, condensation of isoprene and synthesis of NH<sub>3</sub>.

**Incandescent cathode-discharge tube.** N. V. PHILIPS' GLOELAMPENFABRIEKEN. Fr. 657,936, July 21, 1928.

## 5—PHOTOGRAPHY

C. E. K. MEES

**Mechanical action on the photographic plate.** A. REYCHLER. *Bull. soc. chim. Belg* 38, 168-71 (1929).—The statements made by R. (C. A. 20, 1361) that the rubbing of a blunt metal or glass stylus would be shown by a black trace after development having been challenged by Berthoud (*Photochimie*, 299; cf. C. A. 22, 732), R. has repeated his expts. with a variety of materials and plates. He again finds that AgBr emulsions are affected by mechanical contact and are very sensitive to it, whereas AgCl emulsions are very much less affected. An explanation is proposed to account for the similar effect of mechanical pressure and light on the AgBr grains.

ALBERT L. HENNE

**Studies in photographic sensitivity. V. Effects of heat on the absorption spectrum and photo-electric conductivity of silver bromide, and their relation to the photographic action.** O. MASAKI. *Mem. Coll. Sci. Kyoto Imp. univ.* 12A, 127-34 (1929).—Increase in temp. of the Ag halides caused an extension of the absorption spectrum toward the red. The max. in the photoelec. cond. curve of AgBr was also displaced towards the same side on raising the temp. Heat affects the absorption and photoelec. cond. of AgBr in a way similar to its effect on the photographic action, indicating a close connection among these 3 phenomena.

W. VANSELOW

**The sensitivity of photographic emulsions.** K. CHIRISOV. *Zhur. Prikladnoi Khim.* 1, 37-53 (1928).—Graphical comparison of the sensitivity units of Eder-Scheiner, Hurter and Driffield, Eder-Hecht, and Chapman-Jones.

V. KALICHEVSKY

**Primary process in the formation of the latent photographic image.** S. E. SHEPPARD. *Nature* 123, 979-80 (1929).—The hypothesis of liberation of electrons from AgBr, by light, is now well substantiated. It appears desirable, however, to emphasize that the primary process is limited to the sepn. of the electron from the bromide ion. The formation of a latent or visible image is detd. by the processes immediately following. Formation of the latent image involves both the segregation of Br and the aggregation of the Ag atoms produced.

E. W. H. S.

**Physical development and the nature of the latent image.** R. F. OWEN. *Phot. J.* 69, 278-80 (1929).—Lumière and Seyewetz believed that they had shown that the latent image was not composed of metallic Ag, on the basis of some expt. in which CH<sub>2</sub>O was found incapable of phys. development unless development had been initiated by another developer (amidol, metol-hydroquinone, etc.). Kieser (C. A. 23, 2894), however, has shown that the image of a plate, fixed in thiosulfate, consists to a large extent of Ag<sub>2</sub>S, which probably exerts a protective effect on the original latent image of Ag. If this be true, the results of Lumière and Seyewetz should be exactly reproducible with suspensions of colloidal Ag<sub>2</sub>S in gelatin, and this is found to be the case. Their expt., therefore, cannot be regarded as disproving the metallic Ag theory of the latent image.

E. W. H. S.

**Fixation.** F. F. RENWICK. *Phot. J.* 69, 310-4 (1929).—The nature of the reactions involved in the removal of Ag halides from an emulsion by Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub> is briefly considered. The activity of every hypo bath depends not only on the amt. of Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub> it contains, and its temp., but on the amt. of Ag salts which have already been dissolved in it. Curves show the effects of concn. of Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub>, of temp., and of increasing amt. of dissolved Ag halides. The effect of addn. of KBr is shown, and also the relation between coating wt and fixing time. The various factors influencing the rate of fixation are enumerated.

A. BALLARD

**Chemistry of fixation.** H. BAINES. *Phot. J.* 69, 314-7 (1929).—The complex Ag-Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub> formed as intermediate and final products in the reactions between Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub> and Ag halides have been isolated and their formulas found to be, resp., Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub>-Ag<sub>2</sub>S<sub>2</sub>O<sub>3</sub>·2H<sub>2</sub>O (or more probably NaAgS<sub>2</sub>O<sub>3</sub>·H<sub>2</sub>O) and Na<sub>3</sub>Ag<sub>2</sub>(S<sub>2</sub>O<sub>3</sub>)<sub>4</sub>·2H<sub>2</sub>O. In soln. of these salts, the Ag is present almost wholly in the form of the anions AgS<sub>2</sub>O<sub>3</sub><sup>-</sup> and

$\text{Ag}_3(\text{S}_2\text{O}_3)_4$ . A slight secondary dissocn. of the former ion is postulated, giving rise to a small concn. of Ag cations. The satn. point of the bath is reached when the product of the Ag cation and halide anion concn. attains a value equal to the soly. product of the Ag halide.

**Methods of sulfide toning.** P. WIEGLEB. *Brit. J. Phot.* **76**, 363-5(1929); cf. *C. A.* **23**, 3865. The compn. and efficiency of bleaching baths are considered. Bleaching soln. contg. Cu, Hg or Pb ferrocyanide will in many cases produce a considerable intensification of the image through formation of the corresponding sulfides, which mask the individual color of the  $\text{Ag}_2\text{S}$ . Various sulfiding baths are described, including  $\text{Na}_2\text{S}$ ,  $(\text{NH}_4)_2\text{S}$ , BaS, liver of sulfur,  $\text{Na}_3\text{SbS}_4$ .

**Selenium toning processes.** A. SEDLACZEK. *Brit. J. Phot.* **75**, 784-5; **76**, 1-6, 29-31, 44-6(1929); *Phot. Ind.* **26**, 1190-2, 1218-20, 1247-9(1928).—S. reviews in detail the chemistry of many Se compds. and their suitability for toning purposes. Analogous *Te compds.* and *S compds.* also are discussed. An extensive description is included of references, including patents.

**Solarization and denucleation.** LÜPPO-CRAMER. *Kinotechnik* **11**, 285-7(1929).—L.-C. describes some results of over-exposure in the first reversal of the solarization of photographic plates before and after treatment with chromic acid. Two photographic emulsions, pptd. with different excesses of  $\text{NH}_4\text{Br}$ , gave entirely different results. This fact is explained by differences in the structure of the Ag halide grains.

**Prevention of the Herschel effect by silver ions.** LÜPPO-CRAMER. *Phot. Ind.* **27**, 662(1929); cf. *C. A.* **20**, 2290.—L.-C. has made expts. with AgBr collodion emulsion, which gives excellent Herschel effects. After a diffused pre-exposure and a bath of 1%  $\text{AgNO}_3$  and 1% citric acid no further Herschel effect could be detected. L. C. considers that this observation supports the regression theory of the Herschel effect. The collodion emulsion also gave a Herschel effect under yellow and blue glass.

A. P. H. TRIVELLI

**Handbuch der wissenschaftlichen und angewandten Photographie. Band III. Photochemie und photographische Chemikalienkunde.** Edited by A. Coehn, G. Jung and J. Daimer. Vienna: Verlag von Julius Springer 296 pp. M. 28; bound, M. 30.80.

WALL, EDWARD J.: **Photographic Emulsions.** Their preparation and coating on glass, celluloid and paper, experimentally and on the large scale. Boston: American Photographic Pub. Co. 256 pp.

**Color photography.** UNION PHOTOGRAPHIQUE INDUSTRIELLE ET ÉTABLISSEMENTS LUMIERE ET JOUGLA RÉUNIS. Fr. 657,902, Dec. 2, 1927. Colored particles for making multicolor screens are produced by dyeing threads of artificial silk, embedding them in paraffin wax, feeding them to a microtome, and dissolving the wax from the particles so produced by  $\text{C}_6\text{H}_6$ ,  $\text{CCl}_4$ , trichloroethylene, etc. The screen is made by spreading a mixt. of such particles of 3 or more colors on a plate or film coated with an adhesive and rolled. Any interstices may be filled with fine charcoal, etc.

**Color screens (with dyed solutions) for use in color photography.** SOC. CIVILE POUR L'ÉTUDE DE LA PHOTOGRAPHIE ET DE LA CINÉMATOGRAPHIE EN COULEURS (to Soc. française cinéchromatique procédés R. Berthon Soc. anon.). *Brit.* 303,170, Dec. 30, 1927. Structural features.

**Photographic method of preparing printing blocks or plates for wood grain finishes.** KOCH & KIENZLE (to Masa Ges. zur Herstellung künstlicher Oberflächen). *Brit.* 303,804, Jan. 9, 1928.

**Light-sensitive material.** KALLE & Co. A.-G. Fr. 657,851, July 20, 1928. See *Brit.* 294,247 (*C. A.* **23**, 1832).

**Cinematograph film material.** P. REHLÄNDER. *Brit.* 303,752, Jan. 5, 1928. A celluloid support has mixed throughout its mass a material of a high degree of whiteness such as  $\text{MgO}$ , white lead or lithopone so that a high proportion of incident light is transmitted with the strongest possible dispersion. *Brit.* 303,794 relates to somewhat similar film supports. Cf. *C. A.* **23**, 1072.

**Developing and finishing photographic films.** J. E. THORNTON. *Brit.* 303,262, Dec. 6, 1927. In producing a series of relief images of hardened colored colloid upon a continuous film which has been printed by exposure to light until portions of its colloid layer have been rendered insol., the film is treated with solvents to remove sol. colloid in 2 or more stages, and there is then applied to the film a bath or spray of a hardening agent such as alum or  $\text{CH}_2\text{O}$  soln. An app. is described.

## 6—INORGANIC CHEMISTRY

A. R. MIDDLETON

**Germanium. XXX. Halogen substitution products of monogermane.** L. M. DENNIS AND P. R. JUDY. *J. Am. Chem. Soc.* **51**, 2321-7(1929).— $\text{GeH}_3\text{Cl}$  and  $\text{GeH}_2\text{Cl}_2$  were prepd. by reaction of  $\text{GeH}_4$  and  $\text{HCl}$  in the presence of  $\text{AlCl}_3$ ; they were sepd. by fractionation and some of their chem. and phys. properties studied.  $\text{GeH}_3\text{Cl}$ , m.  $-52^\circ$ , b.  $28^\circ$ ,  $d_{20} 1.75$ .  $\text{GeH}_2\text{Cl}_2$ , m.  $-68^\circ$ , b.  $69.5^\circ$ ,  $d_{20} 1.90$ . The corresponding Br compds. were obtained in an analogous manner.  $\text{GeH}_3\text{Br}$ , m.  $-32^\circ$ , b.  $52^\circ$ ,  $d_{20} 2.34$ ,  $\text{GeH}_2\text{Br}_2$ , m.  $-15^\circ$ , b.  $89^\circ$ ,  $d_{20} 2.80$ , begins to decompose at  $50^\circ$ . Similar reaction with  $\text{HI}$  gave  $\text{GeI}_2$ ,  $\text{GeI}_4$  and  $\text{H}_2$ , as end products, the iodine substitution products being quite unstable. T. H. CHILTON

**Metal carbonyls.** ROBERT L. MOND. *Chimie et industrie* **21**, 681-700, 937-40 (1929).—An address reviewing the prepn., properties and applications of metallic carbonyls, with a bibliography of 91 references to articles, 51 to Brit. pats., 3 to Can. pats., 4 to Fr. pats., 3 to Ger. pats. and 8 to U. S. pats. A. PAPINEAU-COUTURE

**Univalent iron, cobalt and nickel. V. The formation of nickel carbonyl.** W. MANCHOT AND H. GALL. *Ber.* **62B**, 678-81(1929); cf. *C. A.* **23**, 785.—When  $\text{Ni}(\text{NO})_2 \cdot 6\text{H}_2\text{O}$  is treated with  $\text{CO}$  at  $100-140^\circ$ ,  $\text{NO}$  is replaced by  $\text{CO}$  with formation of  $\text{Ni}(\text{CO})_4$ . A better yield is obtained when  $\text{CO}$  is allowed to act upon an alk. mixt. of  $\text{NiSO}_4$  and  $\text{C}_2\text{H}_5\text{SH}$  or one of  $\text{NiSO}_4$  and  $\text{KSH}$  in water. In the latter case the reaction may be represented by the equation:  $\text{Ni}(\text{SH})_2 + 4\text{CO} = \text{Ni}(\text{CO})_4 + \text{S}_2\text{H}_2$ ; it is probable that an intermediate product is formed according to:  $2\text{Ni}(\text{SH})(\text{CO})_n \longrightarrow \text{Ni}(\text{SH})_2 + \text{Ni}(\text{CO})_4$ . VI. **Compounds containing iron, sulfur and nitrogen oxide.** W. MANCHOT AND S. DAVIDSON. *Ibid.* 681-7.—When  $\text{FeSO}_4$  in 50%  $\text{EtOH}$  is satd. with  $\text{NO}$  at  $0^\circ$  and a soln. of K xanthate added, dinitrosoferrous xanthate,  $\text{Fe}(\text{NO})_2(\text{S.CS.OC}_2\text{H}_5)_2$ , is formed; it is purified by crystn. from  $\text{CS}_2$ . The paper contains a survey of work which points to the existence of univalent compds. of Fe, Co and Ni. E. K.

**The action of mercury salts on iron pentacarbonyl. II.** H. HOCK AND H. STUHL-MANN. *Ber.* **62B**, 431-7(1929); cf. *C. A.* **23**, 351.—When  $\text{HgSO}_4$  in 10%  $\text{H}_2\text{SO}_4$  is treated with  $\text{Fe}(\text{CO})_5$  at room temp. with continuous shaking,  $\text{Fe}(\text{CO})_4\text{Hg}$  forms in a yield of 85%; it is obtained in a pure state by washing with dil.  $\text{HCl}$ ,  $\text{H}_2\text{O}$  and acetone. The same compd. is obtained together with metallic Hg when  $\text{Hg}_2\text{SO}_4$  is used. No  $\text{H}_2\text{S}$  is pptd. from this compd. by  $\text{H}_2\text{S}$ . I in  $\text{CS}_2$  leads to  $\text{Fe}(\text{CO})_4\text{I}_2$ .  $\text{CuCl}_2$  reacts with both  $\text{Fe}(\text{CO})_5$  and  $\text{Fe}(\text{CO})_4\text{Hg}$  with liberation of  $\text{CO}$  and formation of  $\text{FeCl}_2$ . From  $\text{Fe}(\text{CO})_4\text{Hg}$  and  $\text{HgSO}_4$  the double compd.  $\text{Fe}(\text{CO})_4\text{Hg.HgSO}_4$  is formed. The double compds.  $\text{Fe}(\text{CO})_4\text{Hg.HgBr}_2$  and  $\text{Fe}(\text{CO})_4\text{Hg.HgI}_2$  are obtained from the corresponding Hg halides. Hg acetate reacts with formation of  $\text{Fe}(\text{CO})_4\text{Hg.Hg(OOCC}_2\text{H}_5)_2$ . EMIL KLARMANN

**The existence of higher oxides of nitrogen.** H. J. SCHUMACHER AND G. SPRENGER. *Z. anorg. Chem.* **42**, 697-700(1929).—By supplementing the findings of Raschig and Prahl (*C. A.* **23**, 2787) concerning the non-existence of higher oxides of N, it is shown that  $\text{NO}$  must exist as an intermediate product in the reaction of  $\text{N}_2\text{O}_5$  and  $\text{O}_2$ , being considered as a "chain reaction" and treated from the standpoint of chem. kinetics. On the contrary, when  $\text{NO}$  and  $\text{O}_2$  react no such compd. as  $\text{NO}_3$  is found. W. C. E.

**The preparation of antimony-free arsenious oxide and the estimation of minute amounts of antimony in arsenious oxide.** C. W. FOULK AND P. G. HORTON. *J. Am. Chem. Soc.* **51**, 2416-9(1929).—By treating 150 g. of  $\text{As}_2\text{O}_3$  with 350 cc. of concd.  $\text{HCl}$  and distg. in a stream of  $\text{HCl}$ , a distillate is obtained consisting of an oily layer of  $\text{AsCl}_3$  and a layer of  $\text{HCl}$  and water. By shaking the oily layer with  $2/3$  of its vol. of concd.  $\text{HCl}$ , the trace of  $\text{SbCl}_3$  present is completely dissolved in the acid layer. By treating the acid layer with  $\text{H}_2\text{S}$  all As present is pptd. as  $\text{As}_2\text{S}_3$ . Then, after filtering and dilg. with 3 vols. of water,  $\text{H}_2\text{S}$  will give an orange ppt. of  $\text{Sb}_2\text{S}_3$  if any Sb is present. The test will indicate 0.001% of Sb. By slowly adding the oily  $\text{AsCl}_3$  to considerable boiling water, pure  $\text{As}_2\text{O}_3$  can be obtained by hydrolysis. W. T. H.

**Studies on cobalt oxides and their systems with oxygen.** M. LEBLANC AND F. MORIER. *Z. physik. Chem., Abt. A*, **142**, 151-76(1929).—There is much confusion in the literature regarding Co oxides. LeB. and M. prepd. pure  $\text{CoO}$  by decomp. the carbonate *in vacuo* at  $320-460^\circ$ ; the method is more feasible and satisfactory than the older ones. This oxide has the property of absorbing oxygen to give a compd.  $\text{CoO} \cdot n\text{O}_2$  without change in structure as detd. by chem. and x-ray analysis. This complex when heated at  $100^\circ$  goes over into  $\text{Co}_3\text{O}_4$ , a well-defined compd.  $\text{Co}_3\text{O}_4$  also absorbs  $\text{O}_2$  to give a complex without change in structure.  $\text{Co}_2\text{O}_3$  cannot be prepd. in the dry

way but only by pptn. from a soln. of  $\text{Co}^{++}$  by  $\text{OH}^-$  ion.  $\text{Co}_3\text{O}_4 \cdot n\text{H}_2\text{O}$  when heated gives  $\text{O}_2$  and  $\text{Co}_3\text{O}_4$ ;  $\text{Co}_3\text{O}_4 \rightleftharpoons 3 \text{CoO} + \frac{1}{2} \text{O}_2$ ; the system  $\text{Co}_3\text{O}_4 \cdot n\text{H}_2\text{O}$  is divariant. At  $1250^\circ$  the dissocn. pressure of  $\text{CoO}$  is less than 0.1 mm. Hg. The  $\text{O}_2$  evolved from these complexes is capable of oxidizing oxalic acid in the presence or absence of  $\text{H}_2\text{SO}_4$ .  $\text{Co}_2\text{O}_3$  and  $\text{Co}_3\text{O}_4$  also react quantitatively with oxalic acid. The solution of  $\text{Co}_3\text{O}_4$  in  $\text{H}_2\text{C}_2\text{O}_4$  is accelerated by the presence of  $\text{H}_2\text{SO}_4$ , although otherwise it is very slow.  $\text{Co}^{++}$  hastens the oxidation of oxalic acid by atm.  $\text{O}$  at  $100^\circ$ . WILLIAM E. VAUGHAN

**The crystal structure of tricalcium aluminate.** F. A. STEELE AND WHEELER P. DAVY. *J. Am. Chem. Soc.* **51**, 2283-93(1929).—Tricalcium aluminate is a mixed ionic compd.; its most probable crystal structure is given. The method of prepn. is described.

J. B. AUSTIN

**Hydrated polycalcium aluminates.** A TRAVERS AND SCHNOUTKA. *Compt rend* **188**, 1677-9(1929).—The ppt. formed when solns. of  $\text{Ca}(\text{NO}_3)_2$  and K aluminate (cf. C. A. **22**, 3850) are allowed to react vary in compn. as well as in cryst. form with increasing alkali of the soln. At  $p_{\text{H}}$  11.62-11.79 there are produced spherical groups of crystals,  $\text{Al}_2\text{O}_3 \cdot 3.75\text{CaO}$ ; at  $p_{\text{H}}$  11.79-11.89, hexagonal crystals; above  $p_{\text{H}}$  11.89, hexagonal crystals and rhombohedra of  $\text{Ca}(\text{OH})_2$ . All contain more  $\text{CaO}$  than the *tricalcium aluminate*,  $3\text{CaO} \cdot \text{Al}_2\text{O}_3 \cdot 21\text{H}_2\text{O}$  (I), despite similarity in cryst. form. These various ppts. are believed to be solid solns. of varying amts. of  $\text{CaO}$  in I. The free  $\text{CaO}$  is much more rapidly dissolved from the dehydrated powd. substance by 6 N  $\text{HCl}$  than I; hence after repeated treatment the residue is I. T. and S. question the existence of *bi-calcium aluminate hydrate* described by Allen and Rogers.

E. R. SCHIERZ

**The preparation of anhydrous hydrogen iodide.** ROBERT T. DILLON AND WILLIAM G. YOUNG. *J. Am. Chem. Soc.* **51**, 2389-91(1929).—Four methods of prep. anhyd.  $\text{HI}$  are compared. The method recommended is to drop concd.  $\text{HI}$  on  $\text{P}_2\text{O}_5$ , bubble through satd.  $\text{CaI}_2$ , dry with  $\text{P}_2\text{O}_5$  and cool to  $-30^\circ$ .

GERALD M. PETTY

**Reaction of cupric salts with thiosulfate.** J. HANUS AND V. HOVORKA. *Collection Czechoslov. Chem. Comm.* **1**, 65-82(1929).—Boiling  $\text{Cu}^{++}$  salt solns. with thiosulfate gave ppts. consisting of a mixt. of varying percentages of  $\text{Cu}_2\text{S}$  and  $\text{CuS}$ . The compn. depends on the duration of the boiling, the amt. of thiosulfate and the acidity. Tabulated data are given.

R. C. ROBERTS

**Formation of acid lithium aluminate.** D. PROCIV. *Collection Czechoslov. Chem. Comm.* **1**, 95-103(1929).—When  $\text{Al}$  dissolves in  $\text{LiOH}$ , an acid lithium aluminate is obtained. These solns. were studied by conductance and cryoscopic methods to explain the phenomenon of supersatn. Before pptn. takes place the  $\text{Al}$  is mainly in the form of normal aluminate ions. Soly. of acid lithium aluminate detd. by conductance at  $25^\circ$  is  $1.2 \times 10^{-4}$ , at  $80^\circ$ ,  $3.3 \times 10^{-4}$  g. equiv. per l. Detection and detn. of  $\text{Li}$  are possible by pptg. the acid lithium aluminate by  $\text{Al}$  salt soln. from solns. alk. with  $\text{NaOH}$  or  $\text{KOH}$ .

R. C. ROBERTS

**The capacity of certain complex saturated compounds for further addition.** O. E. ZVYAGINTZEV. *J. Russ. Phys.-Chem. Soc.* **61**, 515-9(1929).—Satd. salts of the types  $[\text{Me}^{\text{IV}}\text{X}_6] \text{R}_2$  and  $[\text{Me}^{\text{III}}\text{X}_6] \text{R}_3$  may add mols. of water, e. g.,  $[\text{IrCl}_6] \text{Na}_2 \cdot 12\text{H}_2\text{O}$  and  $[\text{RhCl}_6] (\text{NH}_4)_3 \cdot \text{H}_2\text{O}$ . Compds. other than  $\text{H}_2\text{O}$ , e. g.,  $\text{NH}_4\text{NO}_3$  may be added. The elec. cond. of  $[\text{RhCl}_6] (\text{NH}_4)_3 \cdot \text{NH}_4\text{NO}_3$  (I) (C. A. **21**, 868) in aq. soln. was detd. at several concns. As the salt is unstable, it must be dissolved with caution. The mol. cond. changes only slightly as the solns. stand, after 49 hrs. with a 4 M soln. the cond. changed only 2.9%. To make sure that the salt in soln. had not decompd. control expts. were made with boiled solns., when the conds. were always decidedly higher and changed appreciably on standing. The data thus obtained confirm the earlier expl. findings that I dissociates in soln. into five ions, one of which is bivalent. Since the three  $\text{NH}_4$  groups are replaceable by  $\text{Ag}$ ,  $\text{Pb}$  or  $\text{Hg}$ , by double decompn., while the  $\text{NH}_4\text{NO}_3$  remains intact, it follows that three of the five ions are  $\text{NH}_4^+$ . That the remaining univalent ion is nitrate and not  $\text{NH}_4^+$  is shown by quant. pptn. with nitron. The bivalent ion then consists of the remaining groups,  $\text{RhCl}_6\text{NH}_4^-$ , and I may be formulated

as follows: 
$$\begin{array}{c} \text{NH}_4 \left[ \begin{array}{cc} \text{Cl} & \text{Cl} \\ \text{Cl} & \text{Rh} & \text{Cl} \\ \text{Cl} & & \text{Cl} \end{array} \right] \text{NO}_3 \cdot \text{NH}_4 \left[ \begin{array}{cc} \text{Cl} & \text{Cl} \\ \text{Cl} & \text{Cl} \end{array} \right] \text{NH}_4 \end{array}$$

The possibility of the existence of a secondary center of complex-formation in complex compds. is thus confirmed.

I. W. B.

**Complex oxalates of quadrivalent molybdenum.** HENRY M. SPITTLE AND WILLIAM WARDLAW. *J. Chem. Soc.* **1929**, 792-9; cf. C. A. **23**, 2898.—Contrary to expectations, the previously known oxalate of quadrivalent  $\text{Mo}$ ,  $\text{MoO}(\text{C}_2\text{O}_4) \cdot 3\text{H}_2\text{O}$ , is not satisfactorily formulated as the dibasic acid,  $\text{H}_2[\text{MoO}_2(\text{C}_2\text{O}_4)] \cdot 2\text{H}_2\text{O}$ , but rather as  $\text{H}_2[\text{Mo}_2\text{O}_7(\text{C}_2\text{O}_4)_3 \cdot x\text{H}_2\text{O}]$ , a member of the series  $\text{R}_2[\text{Mo}_3\text{O}_{10}(\text{C}_2\text{O}_4)_3 \cdot 5\text{H}_2\text{O}]$ . New members of this series, where  $\text{R} = \text{K}$ ,  $\text{NH}_4$  or  $\text{C}_6\text{H}_5\text{N}$ , have been prepd. and their formulation as



ternary electrolytes has been confirmed by mol. cond. detns. The method is that previously described by Wardlaw, Nicholls and Sylvester (cf. C. A. 19, 20), and Wardlaw and Parker (cf. C. A. 19, 2609) with special precautions to remove  $\text{NH}_3$  and  $\text{NH}_4$  salts as completely as possible. Alc. added to the molybdenyl oxalate soln., the so-called "Solution A," resulted in a clear blood-red soln. from which the various complex oxalates were obtained by the addn. of the appropriate base. *Dipyridinium trimolybdenum-tetroxytrioxalate*,  $(\text{C}_5\text{H}_5\text{N})_2[\text{Mo}_3\text{O}_4(\text{C}_2\text{O}_4)_3 \cdot 5\text{H}_2\text{O}]$ , *dipotassium trimolybdenum-tetroxytrioxalate*,  $\text{K}_2[\text{Mo}_3\text{O}_4(\text{C}_2\text{O}_4)_3 \cdot 5\text{H}_2\text{O}]$  and *diammonium trimolybdenum-tetroxytrioxalate*,  $(\text{NH}_4)_2[\text{Mo}_3\text{O}_4(\text{C}_2\text{O}_4)_3 \cdot 5\text{H}_2\text{O}] \cdot 1.5\text{C}_2\text{H}_5\text{O}$ , were thus prepd., but attempts to prep. the Na and Ba salts similarly resulted in mixts. contg. the required salt with the free metallic oxalate. With the exception of the  $\text{NH}_4$  compd., which pptd. in the form of purplish red crystals contg. both  $\text{H}_2\text{O}$  and  $\text{C}_2\text{H}_5\text{OH}$  of crystn., all the salts described are bluish pink amorphous solids. All are very sol. in  $\text{H}_2\text{O}$ , giving red solns., but insol. in  $\text{C}_2\text{H}_5\text{OH}$  or acetone. Addn. of alkali or  $(\text{NH}_4)_2\text{C}_2\text{O}_4$  to aq. solns. gives a blue coloration, but addn. of any acid restores the red color. The oxalate ion is not detected in aq. soln. by the usual ionic reactions, nor is molybdenum hydroxide pptd. immediately by the addn. of alkali in the cold. Hot KOH gives an immediate ppt. of black flocculent hydroxide, whereas with NaOH a light green form may be obtained. The solns. have marked reducing properties, reducing  $\text{AgNO}_3$  to Ag on boiling.  $\text{Pb}(\text{C}_2\text{H}_3\text{O}_2)_2$  gives a voluminous bluish pink ppt., changing to brown on warming. The hydrolysis of  $\text{MoO}(\text{C}_2\text{O}_4) \cdot x\text{H}_2\text{O}$  also was studied. Conc. of Solution A with subsequent addn. of acetone gave a purple product,  $\text{Mo}_5\text{O}_6(\text{C}_2\text{O}_4)_4$ , contg. both acetone and  $\text{H}_2\text{O}$ . The reactions probably occurring are symbolized as follows: (a)  $5\text{MoO}(\text{C}_2\text{O}_4) + \text{H}_2\text{O} \rightleftharpoons \text{Mo}_5\text{O}_6(\text{C}_2\text{O}_4)_4 + \text{H}_2\text{C}_2\text{O}_4$ ; (b)  $\text{Mo}_5\text{O}_6(\text{C}_2\text{O}_4)_4 \rightleftharpoons \text{Mo}_4\text{O}_5(\text{C}_2\text{O}_4)_3 + \text{MoO}(\text{C}_2\text{O}_4)$ , or  $4\text{Mo}_5\text{O}_6(\text{C}_2\text{O}_4)_4 + \text{H}_2\text{O} \rightleftharpoons 5\text{Mo}_4\text{O}_5(\text{C}_2\text{O}_4)_3 + \text{H}_2\text{C}_2\text{O}_4$ . *Pentamolybdenum hexaoxytetroxalate*,  $\text{Mo}_5\text{O}_6(\text{C}_2\text{O}_4)_4$ , was obtained as a purplish brown cryst. solid, readily sol. in  $\text{H}_2\text{O}$  forming a red soln., but insol. in acetone or alc. *Tetramolybdenum pentoxytrioxalate*,  $\text{Mo}_4\text{O}_5(\text{C}_2\text{O}_4)_3$ , a brown compd., was obtained from the above compd. and also by atm. oxidation of a suspension of the insol.  $\text{Mo}_4\text{O}_5(\text{C}_2\text{O}_4)_3 \cdot 12\text{H}_2\text{O}$  in aq. or  $\text{H}_2\text{C}_2\text{O}_4$  soln. Either of these compds. can be converted into molybdenyl oxalate by treatment with appropriate concn. of  $\text{H}_2\text{C}_2\text{O}_4$ .

RUBY K. WORNER

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RIESENFELD, E. H., AND KLEMENT, R: *Anorganisch-chemisches Praktikum. Qualitative Analyse und anorganische Präparate*. Leipzig: S. Hirzel. 371 pp. M. 8. Reviewed in *Chimie & industrie* 21, 1345(1929).

## 7—ANALYTICAL CHEMISTRY

W. T. HALL

**Assaying and sampling.** H. W. DANNATT. *Mining J.* (London) **Special Equipment**, No. 53(July 13, 1929).—There has been no marked change in assaying practice during the past decade. The increased use of mech. and elec. appliances is naturally reflected in the lab. in mech. grinders, samplers, "chainomatic" and similar balances, greater use of elec. heat, etc.

ALDEN H. EMERY

**Aminosulfonic acid as primary standard in volumetric analysis.** K. MISUCH. *Farm. Zhur.* 1928, 310-13.—Aminosulfonic acid,  $\text{NH}_2\text{SO}_3\text{OH}$ , and HCl give identical results when titrated with NaOH,  $\text{Na}_2\text{CO}_3$  or Na borate.

B. C. A.

**Reduction bead test as a simple preliminary test.** H. BRINTZINGER. *Z. anal. Chem.* 76, 149-50(1929).—The substance is mixed with about three times its wt. of a reducing flux, such as 2 parts of  $\text{Na}_2\text{C}_2\text{O}_4$ , 2 parts of  $\text{K}_2\text{C}_2\text{O}_4$  and 1-1.5 parts of borax and heated on magnesia in the reducing flame. Characteristic metallic beads are produced in many cases.

B. C. A.

**The benzidine reaction in the analysis of minerals.** M. DOMINIKIEWICZ. *Przemysl. Chem.* 13, 233-6(1929).—The benzidine reaction has been applied to microchem. work for distinguishing between rhodochrosite and siderite as well as for the recognition of ferric and manganic calcites and dolomites, and of cerussite. Small crystals of the mineral with 10% aq. NaOH and a drop of Br are heated on a watch glass on a steam bath for 10-15 min. After the mineral is rinsed off with water it is similarly treated for another 5 min. but this time without Br, and thoroughly washed with water to remove all Br. When a soln. of benzidine is poured over the crystals siderite produces no color

at all while rhodochrosite colors up brightly. This difference in behavior is explained by the relative instability of  $\text{Mn}(\text{OH})_2$  which is formed during the attack by  $\text{NaOH}$ , and which liberates active O. The characteristic coloration is not produced by  $\text{H}_2\text{O}_2$  or  $\text{O}_2$ . Positive reaction is obtained with pyrolusite, manganite, hausmannite and ilmenite. Limonites, hematites, natural magnetites free from Mn, chromite and cassiterite do not react.

**New colorimetric method for estimating copper in Babbitt metal.** N. V. MANDRIKA, *Zhur. Prikladnoi Khim.* 2, 317-9(1929).—Heat 0.5-1 g. of Babbitt metal with 15-25 cc. of concd.  $\text{H}_2\text{SO}_4$ . Cool, dil. carefully with water and add 50-150 cc. of concd.  $\text{HCl}$  until the ppt. redissolves. Dil. to exactly 250 cc. Take 25 cc. of this soln. contg. 5-15 cc.  $\text{HCl}$ , add 25-15 cc. of concd.  $\text{HCl}$  (total amt. of  $\text{HCl}$  must be 30 cc.) and dil with water to exactly 50 cc. Compare this soln. in a colorimeter with a standard soln. prepd. as follows: Dissolve 0.5 g. of pure Cu in 15 cc.  $\text{HNO}_3$  (d. 1.2). Apply heat. Cool, add 5 cc. concd.  $\text{H}_2\text{SO}_4$  and evap. to fumes. Cool, and dil. to 500 cc. To 62.5 cc. of this soln. add 120 cc. concd.  $\text{HCl}$  (d. 1.19) and dil. to 200 cc. with water.

**Microchemical separation of barium and calcium.** R. STREIBINGER, *Mikrochemie* 7, 100-5(1929).—The microchem. detn. of Ba by pptn. with  $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$  in  $\text{NH}_4$  acetate soln. followed by collection of the ppt. in a filter tube and weighing after drying at  $140^\circ$  yields slightly high results, but good results are obtained if the ppt. is dissolved in dil.  $\text{HNO}_3$ , the chromic acid reduced with alc. and the Ba pptd. with  $(\text{NH}_4)_2\text{SO}_4$ . Ca is detd. in the filtrate from the  $\text{BaCrO}_4$  by pptn. with  $(\text{NH}_4)_2\text{C}_2\text{O}_4$  and weighing as  $\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$  after drying at  $110^\circ$ .

**The precipitation of calcium oxalate in the presence of iron, aluminum, titanium, manganese, magnesium and phosphates, with special reference to the determination of total calcium.** H. D. CHAPMAN, *Soil Sci.* 26, 479-86(1928).—Data are given showing the degree to which Ca is pptd. as oxalate in solns. of different  $p_{\text{H}}$  values together with other ions. A method is described whereby it is possible to ppt.  $\text{CaC}_2\text{O}_4$  completely and alone at  $p_{\text{H}}$  4.0 in the presence of Fe, Al, Ti, Mn, Mg and  $\text{PO}_4$  ions. This method is applicable to the detn. of total Ca in soils, soil exts., plant tissue and other cases where the proportion of the various elements is somewhat similar to those used in the exptl. work recorded.

**Microchemical mineral analysis. [Detection of nickel, cobalt, copper, zinc and cadmium.]** A. MARTINI, *Mikrochem.* 7, 30-2(1929).—Addn. of  $\text{NH}_4\text{CNS}$  and pyridine to a neutral Co soln. produces a rose-colored ppt. which becomes sky-blue and cryst. on addn. of  $\text{HNO}_3$ . An ammoniacal Cu soln. to which  $\text{NH}_4\text{CNS}$  has been added yields with pyridine green crystals of the compd.  $3(\text{C}_6\text{H}_5\text{N} \cdot \text{HCNS}) \cdot \text{Cu}(\text{NH}_3)_4(\text{CNS})_2$  and with quinoline sulfate green monoclinic crystals of the compd.  $3(\text{C}_6\text{H}_5\text{N} \cdot \text{HCNS}) \cdot \text{Cu}(\text{NH}_3)_4(\text{CNS})_2$ .  $\text{ZnSO}_4$  yields with a dil. acid soln. of aniline-HCl colorless triclinic crystals of Zn aniline chloride,  $\text{C}_6\text{H}_5\text{NH}_2 \cdot \text{HCl} \cdot \text{ZnCl}_2$ . Ammoniacal solns. of Cu, Ni and Cd salts yield with  $\text{NH}_4\text{CNS}$  and aniline characteristic cryst. compds. of the type  $2(\text{C}_6\text{H}_5\text{NH}_2 \cdot \text{HCNS}) \cdot \text{M}(\text{NH}_3)_4(\text{CNS})_2$ ; the Cu compd. seps. in green, triclinic rosetts, the Ni compd. in pale green, highly refracting, triclinic prisms and the Cd compd. in monoclinic colorless prisms. Co solns. give a rose-colored cryst. ppt. with  $\text{NH}_4\text{CNS}$  and aniline.

**Determination of manganese and iron by successive titration with the permanganate solution.** I. S. TELETOV and N. N. ANDRONNIKOVA, *Zhur. Prikladnoi Khim.* 2, 289-92(1929).—The soln. contg.  $\text{Fe}^{+++}$  and  $\text{Mn}^{++}$  is treated with  $\text{NaOH}$  (12% soln.) and  $\text{H}_2\text{O}_2$  (30% soln.). The ppt. is washed with water and heated in the presence of a known amt. of 0.1 N oxalic acid soln. and  $\text{H}_2\text{SO}_4$ . Mn is detd. by titrating the remaining oxalic acid with N  $\text{KMnO}_4$ . The soln. is then filtered through electrically reduced Cd in order to reduce  $\text{Fe}^{+++}$  to  $\text{Fe}^{++}$ . The resulting soln. is again titrated with  $\text{KMnO}_4$  soln. for  $\text{Fe}^{++}$ .

**Estimation of nickel in steels.** C. L. THOMAS, *J. Elisha Mitchell Sci. Soc.* 43, 214-6(1928).—If the steel is not highly alloyed and does not contain more than 1% Ni, satisfactory results can be obtained by treating the fully oxidized soln. with an excess of  $\text{NH}_4\text{OH}$ , filtering and pptg. Ni in the filtrate with a 3% soln. of dimethylglyoxime in acetone.

**Analysis of steel for manganous oxide.** U. S. DEPARTMENT OF COMMERCE, *Metals and Alloys* 1, 17(1929).—The Dickenson method is not applicable because the  $\text{MnO}$  of slag inclusions is dissolved in the acid with the steel. Expts. have shown that electrolysis may be substituted for the acid soln. In the method in its present age of development the sample is used as the anode in an electrolyte of  $\text{FeSO}_4$ . The Fe is plated out on the cathode and the inclusions fall to the bottom as a slime. The Fe must plate

out in a solid adhering layer to avoid contamination of the residue by metallic Fe. Oxidation of  $\text{Fe}^{++}$  in soln. must be prevented.

**The use of steam in Kjeldahl nitrogen determinations.** F. T. ADRIANO. *Philippine Agr.* 17, 509–10 (1929).—The advantages of steam distn. instead of direct heating to carry over  $\text{NH}_3$  from the digested sample are pointed out and a successful installation for accomplishing it is illustrated.

**The determination of nitrate nitrogen by alkaline reduction with aluminum powder.** A. SEYEWETZ. *Bull. soc. chim.* [4], 45, 463–5 (1929).—Nitrates, nitrites, sulfonitrates and nitrated cotton can be analyzed for nitrate N content by reduction to  $\text{NH}_3$  in alk. soln. with impalpable Al powder (which is gray and not to be confused with bright Al powder used in varnishes, etc.) and absorption of  $\text{NH}_3$  in standard  $\text{H}_2\text{SO}_4$  soln.

**Tests for hydrogen peroxide solution.** P. A. BERRY. *Australasian J. Pharm.* 9, 62 (1928); *Quart. J. Pharm.* 1, 268; cf. *C. A.* 22, 2808, 3371.—The gasometric method of estn. of the B. P. is inaccurate and the necessary corrections for temp. and pressure ... tedious to carry out. The  $\text{KMnO}_4$  method is quick and accurate, but certain of the preservatives used affect the result. The iodometric method, when carried out as described below, is accurate, and neither preservatives nor variations in temp. interfere. This method is recommended for inclusion in the pharmacopeia. Twenty cc. of the soln. of  $\text{H}_2\text{O}_2$  is dild. with distd. water to 200 cc. Twenty cc. of the dild. soln. is placed in a 750-cc. flask and 20 cc. of dil.  $\text{H}_2\text{SO}_4$  acid (1 to 9 by vol.) added. About 2 g. of solid KI is added, shaken until dissolved, the mouth of the flask covered with a watch glass and the mixt. allowed to stand for 15 min. It is then titrated with 0.1 N  $\text{Na}_2\text{S}_2\text{O}_3$  sol. starch soln. and water to make 200 cc. being added toward the end. One cc. of 0.1 N  $\text{Na}_2\text{S}_2\text{O}_3$  is equiv. to 0.0017 g. of  $\text{H}_2\text{O}_2$ . This soln. is standardized under similar conditions by treating 25 cc. of 0.1 N  $\text{K}_2\text{Cr}_2\text{O}_7$  soln. with the same quantities of  $\text{H}_2\text{SO}_4$  and KI. Phenolphthalein should be used instead of methyl orange for estimating the acidity. The B. P. limit of residue is too high and 0.25 per cent is recommended. The U. S. P. test for preservatives should be included in the B. P. while the standard of strength should be 28 to 3.2% wt. in vol.

**Qualitative microanalysis. III. Detection of thiocyanate, fluoride and copper, two methods of distinguishing between tap water and distilled water, detection of alkali in water, and a drop reaction for ammonia.** F. FEIGL [WITH G. HIRSCH AND I. TAMCHYNA]. *Mikrochemie* 7, 10–20 (1929); cf. *C. A.* 19, 1108.—Addn. of thiocyanate to a 0.1 N-I soln. contg. 1.3 g./100 cc. of Na azide catalyzes the reaction  $2\text{NaN}_3 + \text{I}_2 = 2\text{NaI} + 3\text{N}_2$  and the soln. becomes decolorized with evolution of N; as little as 0.03 mg. of thiocyanate is readily detected in the presence of most inorg. oxyacids and the common org. acids by this test, but sulfides and thiosulfates interfere and must be previously removed by  $\text{HgCl}_2$ . For the detection of fluoride in insol. substances the substance is treated with a HCl soln. of the violet Zr alizarin compd. (de Boer, *C. A.* 19, 793), which becomes yellow if F is present. Traces of Cu in soln. may be detected by adding a few drops of dilute  $\text{Zn}(\text{NO}_3)_2$  soln. followed by a soln. of 8 g. of  $\text{HgCl}_2$  and 9 g. of  $\text{NH}_4\text{CNS}$  in 100 cc. of water; with 0.00075 mg. of Cu per cc. a violet, cryst. ppt. is obtained. Tap water may be distinguished from distd. water by the reddish violet color it gives on the addn. of a few drops of a blue ammoniacal soln. of 2,3-dihydroxyanthraquinone or by the red, cryst. ppt. it produces with a soln. of the Na salt of 2,4,5,7-tetranitro-1,8-dihydroxyanthraquinone; both these reactions are due to the presence of Ca and Mg in tap water. Addn. of a soln. of the compd.  $\text{Hg}(\text{CN})_2 \cdot \text{AgNO}_3$  to water contg. free alkali produces a turbidity due to the formation of  $\text{AgCN}$ . To detect  $\text{NH}_3$  in a neutral or slightly acid soln. 1 drop of the liquid is mixed with 1 drop of a dil. soln. of *p*-nitro diazobenzene in HCl on a small watch-glass and a small piece of quacklime is dropped into the mixt.; if  $\text{NH}_3$  is present, a red ring appears round the lime.

**The oxidation of mercuric cyanide by sodium hypobromite. Its application to the determination of mercury cyanide and cyanate.** J. GOLSE. *Bull. soc. chim.* 45, 177–83 (1929).—To titrate a  $\text{Hg}(\text{CN})_2$  soln., treat with an excess of  $\text{NaBrO}$  soln., which transforms  $\text{Hg}(\text{CN})_2$  into  $\text{HgO}$  and  $\text{NaCNO}$ . Add KI and  $\text{AcOH}$ , and titrate the I liberated with  $\text{Na}_2\text{S}_2\text{O}_3$ . The  $\text{NaBrO}$  soln. must be standardized immediately before use. To titrate  $\text{Hg}$  after the preceding oxidation, add  $\text{NH}_3$  and boil; to eliminate the excess of  $\text{NaBrO}$ , add an excess of  $\text{NaCN}$  soln. which dissolves the  $\text{HgO}$  ppt., and titrate the excess  $\text{NaCN}$  with  $\text{AgNO}_3$  in the presence of KI and  $\text{NH}_3$ . ALBERT L. HENNE.

**Microchemical determination of hydrocyanic acid by the Brunswik reaction.** V. P. MALITZKII AND M. T. KOSLOVSKII. *Mikrochemie* 7, 94–9 (1929).—The sensitivity of the Brunswik reaction is increased by the use of a  $\text{AgNO}_3$  soln. acidified with

**HNO<sub>3</sub>.** The material to be tested is placed in a small tube together with a few drops of a satd. soln. of oxalic acid and 2-3 drops of KMnO<sub>4</sub> soln. if sulfides are present; the tube is covered with a watch-glass to the bottom of which is attached a small drop of the AgNO<sub>3</sub> soln. colored with methylene blue. If cyanides are present a turbidity due to AgCN appears in a few minutes; under the microscope blue needles are seen. The sensitivity of the test is  $6 \times 10^{-8}$  g. of HCN. B. C. A.

**Detection of sulfurous acid with Bettendorf's reagent.** S. A. DUNAIEV. *Farm. Zhur.* 1928, 379.—If Bettendorf's reagent is covered with a soln. contg. sulfite, reduction to sulfide produces a yellowish brown ring of Sn sulfides; 0.06% of sulfite can be detected. B. C. A.

**The use of organic reagents in the identification of cations.** ARMANDO NOVELLI. *Rev. farm.* (Buenos Aires) [2], 2, 148-58(1929).—The reactions of Al, Ni, Co, Mg and Zn with org. substances are described. A. E. MEYER

**The use of organic reagents in the identification of anions.** ARMANDO NOVELLI. *Rev. farm.* (Buenos Aires) [2], 2, 205-7(1929).—The reactions of Cl, Br and I with org. substances are described. A. E. MEYER

**Carbon determination in organic compounds and in soils by means of permanganic anhydride.** LUIGI U. DENARDO. *Ann. sci. agron.* 46, 9-13(1929).—Carbonaceous substances contained in a small flask are decompd. by the addn. of a mixt. KMnO<sub>4</sub> and H<sub>2</sub>SO<sub>4</sub> and the evolved CO<sub>2</sub> is absorbed in KOH after passing through a purifying train consisting of H<sub>2</sub>SO<sub>4</sub>, asbestos and pumice. The reaction is complete in a few seconds. Pure org. compds. were found to give theoretical results while soil samples gave almost identical values with those obtained by combustion methods. K. S. M.

**Potentiometric determination of reducing sugars.** H. TRYLLER. *Z. Spiritusind.* 52, 27-8(1929).—The end point in the detn. of reducing sugars by titration against Fehling soln. is ascertained electrometrically by means of Cu electrodes and a galvanometer. As the end point of the reaction is approached the galvanometer deflection approaches zero and is very sensitive to slight change of Cu content, i. e., to 0.1 cc. of sugar soln. A. SCHULTZ

**Microchemical detection of glycerol, ethylene glycol and d-mannitol.** H. ALBER. *Mikrochemie* 7, 21-9(1929).—The sensitivity of the following tests for the detection of glycerol, glycol and mannitol has been detd. and the conditions for carrying them out microchemically have been standardized: Fischer and Tafel's hypobromite method and its various modifications (*Ber.* 20, 3384-90), Gläser and Moravski's formic acid method (*Monatsh.* 10, 578-84), and Rose's boric acid method (*Diss.*, Erlangen, 1902). B. C. A.

**Determination of phenols and alcohols.** ALBERT VERLEY. *Am. Perfumer* 24, 233-4(1929).—By means of a pipet remove 10 cc. of the acetylation mixt. (2 pts. C<sub>2</sub>H<sub>5</sub>N, 1 pt. Ac<sub>2</sub>O contg. 5% AcCl) to a suitable flask, dil. with H<sub>2</sub>O and make neutral to phenolphthalein with N NaOH. Into a perfectly dry, round-bottomed flask introduce about 2 to 3 g. (0.01 mole) of the sample accurately weighed in a small glass tube about 4 cm. in length, closed at one end, so that it can be introduced easily into the flask. Now add 10 cc. of the acetylating mixt., close the flask with a rubber stopper provided with a reflux condenser, then place on a water bath for a time which varies according to the alc. and nature of the alc. group. After cooling, rinse the inside of the tube, the outer surface of the stopper and neck of the flask carefully with distd. H<sub>2</sub>O, and est. the excess acid by means of N NaOH soln. Although the end point in the titration of the acetylating mixt. alone with NaOH is distinct, it is much less so after contact with the alc. to be acetylated. Then it is necessary to use considerable indicator, possibly 10 to 15 drops. In general, 1-2 hrs. heating suffices for primary, and 2-3 hrs. for secondary alcs. The error due to weighing is negligible if a balance sensitive to 1/10 mg. is available, but the probable error arising from the removal of 10 cc. of the acetylating mixt. is on the contrary far from negligible. Actually, 10 cc. of the mixt. corresponds to 83 cc. of N NaOH soln. If an error of only 0.05 cc. is made in the withdrawal, this involves an error of 0.42 cc. N NaOH, which would give an error of 3.27% in the titration of menthol (2-g sample). It is thus necessary in order to obtain strictly accurate results to work always at the same temp. and with the same pipet, which should have an upper limb very finely calibrated. The estn. of an alc. can prove exact in the absence of other substances liable to acetylation. Consequently, this method is ill-advised when the mixt. contains a tertiary alc., a phenol, a primary or secondary amine, or an aldehyde. However, the presence of an aldehyde in small amts. in an essential oil will not affect the accuracy of the estn. Inaccurate results may also be expected with any alc. below the pentanol. Otherwise the method should yield results with accuracy approaching 1 in 500. W. O. E.

**A volumetric process for the estimation of phenazone.** J. RAE. *Pharm. J.* **121**, 575(1928).—Phenazone (A) forms with picric acid (B) a compd. insol. in excess of B. Prep. a 0.1 N soln. of B in 90% EtOH (23 g. in 1000 cc.) and standardize it against 0.1 N NaOH (phenolphthalein). 1 cc. of soln. of B = 0.0188 g. A. To det. the purity of a sample of A, dissolve 1 g. of A in 100 cc. H<sub>2</sub>O; to 10 cc. of this soln. add 25 cc. 0.1 N soln. of B and H<sub>2</sub>O to make 100 cc. Allow to stand for 10 min., shaking occasionally, and filter. In 50 cc. of the filtrate det. excess of B by titration with 0.1 N NaOH. With samples of known strength, av. recovery was -2.09% (0.6-3.92%). Similar work by Borloz (*C. A.* **21**, 3582) was overlooked.

S. WALDBOTT

**The estimation of diphenylamine and diphenylnitrosamine in the presence of their derivatives.** H. RYAN, J. KEANE AND J. DUNNE. *Sci. Proc. Roy. Dublin Soc.* [N. S.], **19**, 85-100(1928).—Ext. nitrocellulose powder with alc. and reduce the extractive with SnCl<sub>2</sub> and HCl. Pass a current of steam through the reduced mixt., which a definite amt. of diphenylamine distills. Ext. with CHCl<sub>3</sub> and det. diphenylamine volumetrically by Br in CHCl<sub>3</sub>. Adsorption of Br was greater than the theoretical quantity, when mixts. of 2 nitro derivs. of diphenylamine were examd., especially when one was diphenylnitrosamine.

PAUL BOONE

The influence of some nitrogenous substances upon the determination of invert sugar in refinery products (HERLESOVA) **28**. Metal-nonmetal electrodes (KAMIENSKI) **2**. The preparation of Sb-free As<sub>2</sub>O<sub>3</sub> and the estimation of minute amounts of Sb in As<sub>2</sub>O<sub>3</sub> (FOULK, HORTON) **6**. Formation of acid Li aluminate (PROCI) **6**. Oxidation of colloidal sulfides of As, Sb and Cu (ŚWIDERSKA, *et al.*) **2**. The use of decinormal HCl for standardizing electrometric *pH* measurements (MACLAGAN) **2**. The origin of reducing substances during the heating of an alkaline solution of sucrose and their analytical behavior (HERLESOVA) **28**. Preparation of a stabilized electrode and its application to the determination of the halogens (JOASSART, LECLERC) **4**.

DENNIS, L. M.: **Gas Analysis**. Revised ed. New York. The Macmillan Co. FALCIOLA, P.: **Trattato di chimica analitica qualitativa**. Vol. I. Milan. S. A. Istituto editoriale scientifico. Reviewed in *Chimie & industrie* **21**, 1124(1929).

WILLERS, FR. A.: **Methoden der praktischen Analysis**. Berlin and Leipzig: Walter de Gruyter & Co. 344 pp. M. 20; bound, M. 21.50. Reviewed in *Chimie & industrie* **21**, 1123 (1929).

**Tablets for titration of alkaline substances.** JOHN H. BUCHANAN (to American Bottlers of Carbonated Beverages). U. S. 1,721,809, July 23. Standard tablets are formed contg. KHSO<sub>4</sub> with an indicator such as tetrabromophenolsulfonephthalein.

## 8- MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY AND J. F. SCHAIRER

**New occurrences of germanium.** I. JACOB PAPISH. *Econ. Geol.* **23**, 660-70 (1928).—P. examd. samples of stannite, pyrrargyrite, native Cu and calamine from different localities in an arc spectrograph, the method being described, and found Ge in some samples of all these minerals. The Ge content of a sample of pyrrargyrite from Colquechaca, Bolivia was estd. to be over 1%, while samples from several other localities showed none. An outline of the known occurrences of Ge in minerals is given.

ELLIOTT J. ROBERTS

**Electrical conductivity and polished mineral surfaces.** ROGER D. HARVEY. *Econ. Geol.* **23**, 778-803(1928).—Using 2 methods, H. has measured the approx. elec. resistivity of a large suite of minerals in polished section. One method used was the Wheatstone bridge method, making contact with the polished surface through Pt-Ir needles set 0.085 mm. apart. The other method involved the use of 4 needles in line, the outer two, of Cu, 0.41 mm. apart, being in series with a source of direct current and an ammeter; the inner two, of Pt-Ir, 0.17 mm. apart, were connected to a potentiometer and galvanometer, with which the potential drop through the 0.17 mm. of mineral was measured. Contact resistance is eliminated in this latter method, but fluctuations of 400% in the readings still occur, due to variations in orientation and size of the grains.

ELLIOTT J. ROBERTS

**Variation of the axial ratio, interfacial angle and volume of calcite due to heating and its dissociation phenomena.** SHUKUSUKU KÔZU, HOICHI MASUDA AND JUN'ICHI

URDA. *Tohoku Imp. Univ., J. Petrol., Mineral. and Ore Deposits (Japan)* 1, 1-12 (1929).—A pyramidal calcite crystal from Cumberland, England, was measured as to thermal expansion along axis  $a$ , and one from Ashio along axis  $c$ . The highest temp. at which this has been measured previously was 598°; K., M. and U. measured it at the temp. range of 25 to 1000° with a differential dilatometer, finding that on heating calcite expands along  $c$  and contracts along  $a$ . At 20–700°, the expansion along  $c$  is given by  $l_1 = 0.0023221 t + 0.0000013648 t^2$ , the contraction along  $a$  by  $l_2 = 0.000739 t + 0.0000002932 t^2$ . The curve bends slightly upwards above 700° and rapidly above 800°. Along  $c$ , calcite expands by 2.21% of the amt. of expansion at 20°, while along  $a$  it contracts by 0.37%. Tables and figures showing the calcd. and observed values of expansion and contraction are given. Taking for the axial ratio of calcite the value of Rinne (*C. A.* 18, 1408(1924)),  $a:c = 1:0.8549$ , at 700°,  $a:c = 1:0.8770$ , the interfacial angle  $r \wedge r' = 74^\circ 56' 47''$  at 20° and  $76^\circ 4' 39''$  at 700°. Tables showing the angles at various temps. are also given. The vol. change and the change of  $d$  with temp. have also been calcd., showing that the vol. expansion amounts to 1.46% of the value at 700°. In the  $d$ . calcn. the value  $d_{700} = 2.7102$  was adopted as the standard, giving  $d_{700} = 2.671$ . The  $d$ . values at different temps. are shown by tables. The rapid change of thermal expansion at 700–800° is due to the decompn. of calcite into  $\text{CaO} + \text{CO}_2$ . The measurement of the dissocn. temp. was carried out by heating powd. calcite in air under 1 atm., the result showing that the dissocn. occurs at 700–930°. For measuring the true dissocn. temp. the expt. must be carried out in an atm. of  $\text{CO}_2$ . K. SOMEYA

**The meteoric stone of Hinojo, province of Buenos Aires.** ENRIQUE H. DUCLOUX *Rev. facultad cienc. quim.* (Univ. La Plata) 5, Pt. 2, 1-7(1929).—The dark heterogeneous mass,  $d$  3.407–3.411, weighed 1155 g. Sepns. on 3 samples with a magnet gave magnetic fractions of 30.46, 17.86 and 19.77%, resp. The chem. analyses were: magnetic fraction, insol. residue 41.525,  $\text{Al}_2\text{O}_3 + \text{Fe}_2\text{O}_3$  23.885,  $\text{CaO}$  0.266,  $\text{MgO}$  9.000,  $\text{NiO}$  1.89,  $\text{Fe}$  21.482,  $\text{Ni}$  0.908,  $\text{Co}$  0.046,  $\text{S}$  1.766–1.853,  $\text{P}$  0.104,  $\text{Cr}$ ,  $\text{Mn}$  traces; stony fraction,  $\text{SiO}_2$  37.320,  $\text{Al}_2\text{O}_3$  2.410 2.425,  $\text{FeO}$  13.360,  $\text{Fe}_2\text{O}_3$  17.975,  $\text{MnO}$  0.652,  $\text{Cr}_2\text{O}_3$  trace,  $\text{NiO}$  1.516–1.614,  $\text{CoO}$  0.046,  $\text{CaO}$  2.475,  $\text{MgO}$  21.787,  $\text{K}_2\text{O}$  0.207,  $\text{Na}_2\text{O}$  1.653,  $\text{P}_2\text{O}_5$  0.480,  $\text{H}_2\text{O}$  and loss 0.119; total compn. calcd. from analyses of fractions,  $\text{SiO}_2$  34.33,  $\text{Al}_2\text{O}_3$  2.22,  $\text{FeO}$  12.29,  $\text{Fe}_2\text{O}_3$  16.53,  $\text{MnO}$  0.59,  $\text{Cr}_2\text{O}_3$  trace,  $\text{NiO}$  1.39,  $\text{CoO}$  0.04,  $\text{CaO}$  2.27,  $\text{K}_2\text{O}$  0.19,  $\text{Na}_2\text{O}$  1.52,  $\text{P}_2\text{O}_5$  0.44,  $\text{Fe}$  6.61,  $\text{Ni}$  0.27,  $\text{Co}$  0.01,  $\text{S}$  0.54,  $\text{P}$  0.03,  $\text{H}_2\text{O}$  and loss 0.69%. The mineralogical compn. is also calcd. W. L. HULL

**Remarks on the meteorite, El Mocovi.** ENRIQUE H. DUCLOUX *Rev. facultad cienc. quim.* (Univ. La Plata) 5, Pt. 2, 9-12(1929).—The meteorite,  $d$  7.632–7.710, wt. 732 kg., was found in Los Guanacos. D. analyzed 4 samples of drillings, a representative being: siliceous material 0.210,  $\text{Fe}$  93.135,  $\text{Ni}$  5.680,  $\text{Co}$  0.304,  $\text{C}$  (graphite) 0.239,  $\text{S}$  0.141,  $\text{P}$  0.166,  $\text{Cr}$  trace,  $\text{Mn}$  0.010, ( $\text{Ir}$ ,  $\text{Ru}$ ,  $\text{Os}$ ) 0.035–0.087. The probable minerals present were:  $\text{Fe}_{14}\text{Ni}$  77.178,  $\text{Fe}_7\text{S}_8$  0.357,  $(\text{Fe}, \text{Ni}, \text{Co})_3\text{P}$  1.080,  $\text{Cr}_2\text{O}_3$  trace,  $\text{Fe}$  20.810,  $\text{C}$  0.239. W. L. HULL

**Data on the meteoric stone of Cachari.** ENRIQUE H. DUCLOUX. *Rev. facultad cienc. quim.* (Univ. La Plata) 5, Pt. 2, 13-23(1929).—This meteorite, wt. 21 kg.,  $d$  3.13, was found in the province of Buenos Aires. Of a sample from the predominating gray zone 39.09% was sol. in  $\text{HCl}$ . Analyses of the sol. and insol. portions, resp., were:  $\text{SiO}_2$  17.705, 30.970,  $\text{Al}_2\text{O}_3$  12.650, 1.960,  $\text{Fe}_2\text{O}_3$  traces,  $\text{FeO}$  1.440, 18.486,  $\text{MnO}$  0.321, 0.420,  $\text{Cr}_2\text{O}_3$  none, 0.065,  $\text{NiO}$  trace, none,  $\text{CoO}$  none,  $\text{TiO}_2$  trace, 0.078,  $\text{CaO}$  5.802, 3.102,  $\text{MgO}$  1.131, 5.680,  $\text{P}_2\text{O}_5$  0.055, none. The former contained also  $\text{CO}$ , 0.060,  $\text{S}$  trace, and the latter  $\text{K}_2\text{O}$  0.132,  $\text{Na}_2\text{O}$  0.903%. Total compn. from the av. results of analyses of gray and dark parts were: loss at red heat 0.196,  $\text{SiO}_2$  48.475,  $\text{Al}_2\text{O}_3$  13.945,  $\text{Fe}_2\text{O}_3$  0.237,  $\text{FeO}$  19.803,  $\text{MnO}$  0.783,  $\text{Cr}_2\text{O}_3$  0.062,  $\text{CoO}$  none,  $\text{TiO}_2$  0.072,  $\text{CaO}$  8.617,  $\text{MgO}$  6.840,  $\text{K}_2\text{O}$  0.127,  $\text{Na}_2\text{O}$  0.919,  $\text{P}_2\text{O}_5$  0.058,  $\text{SO}_3$  0.056%,  $\text{NiO}$ ,  $\text{S}$  traces. The total compn. is compared with that of all known meteorites of the type to which it belongs. W. L. HULL

**The meteorite of Renca, province of San Luis.** ENRIQUE H. DUCLOUX AND FRANCO PASTORE. *Rev. facultad cienc. quim.* (Univ. La Plata) 5, Pt. 2, 111-20(1929).—Analyses of the meteorite, probable wt. 300 g.,  $d$  3.410–3.411, were: magnetic fraction 9.06,  $\text{Fe}$  86.535,  $\text{Ni}$  8.741,  $\text{Co}$  0.528,  $\text{S}$  2.160,  $\text{P}$  0.088,  $\text{Cr}_2\text{O}_3$ ,  $\text{FeO}$  1.672%,  $\text{TiO}_2$  trace, stony part 90.94,  $\text{SiO}_2$  42.190,  $\text{Al}_2\text{O}_3$  3.330,  $\text{FeO}$  22.860,  $\text{MnO}$  0.855,  $\text{Cr}_2\text{O}_3$  0.510,  $\text{CaO}$  1.584,  $\text{MgO}$  21.779–22.030,  $\text{NiO}$  1.240,  $\text{K}_2\text{O}$  0.634–0.684,  $\text{Na}_2\text{O}$  2.602,  $\text{SO}_3$  0.068,  $\text{S}$  2.844%,  $\text{Fe}_2\text{O}_3$ ,  $\text{TiO}_2$ ,  $\text{CoO}$  traces; total compn.,  $\text{SiO}_2$  38.392,  $\text{Al}_2\text{O}_3$  3.030,  $\text{FeO}$  20.802,  $\text{MnO}$  0.778,  $\text{Cr}_2\text{O}_3$  0.464,  $\text{CaO}$  1.441,  $\text{MgO}$  20.047,  $\text{NiO}$  1.128,  $\text{K}_2\text{O}$  0.577,  $\text{Na}_2\text{O}$  2.367,  $\text{SO}_3$  0.062,  $\text{S}$  2.588,  $\text{Fe}$  7.788,  $\text{Co}$  0.787,  $\text{P}$  0.008%,  $\text{Fe}_2\text{O}_3$ ,  $\text{TiO}_2$ ,  $\text{CoO}$ ,  $\text{P}_2\text{O}_5$  traces. Under the microscope magnetic pyrite, olivine and orthorhombic pyroxene were recog-

nized. The compn. is compared with that of the meteorites, La Colina (*C. A.* 21, 369) and Santa Isabel (*C. A.* 19, 2318). W. L. HILL

**Report of the committee on processes of ore deposition.** W. LINDGREN. *Econ. Geol.* 23, 591-611(1928); cf. *C. A.* 22, 3604.—L. surveys the field and divides the problems into 5 classes, 2 of which are: mineralogical and chem. features, and physico-chem. investigations of the processes of ore deposition. In order to make significant advances in this field there must be coöperation among geologists, as well as between geologists on one hand and chemists and physicists on the other hand. E. J. R.

**The time sequence of hypogene ore mineral deposition.** W. H. NEWHOUSE. *Econ. Geol.* 23, 647-59(1928).—N. finds, by an examn. of the literature, that the order of introduction of the metals is approx. that of increasing at. wt. except for Sn, W, Bi and Mo. The same holds for the acidic elements. The minerals which are deposited first have a higher heat of formation than the later ones. The simple sulfides except for Bi are introduced in the order of decreasing soly. N. explains this on the basis that during the crystn. of the parent magma, the more sol. sulfides were given off first and the less sol. later when more H<sub>2</sub>O had been liberated by the crystn. processes.

ELLIOTT J. ROBERTS

**Dolomitization and ore deposition.** D. F. HEWETT. *Econ. Geol.* 23, 821-63 (1928).—Dolomitization of limestone wall rocks is most commonly found near Zn and Pb deposits, but in a few places it is near Cu deposits. Rock alteration preceded the deposition of metal sulfides. It is doubtful whether the Mg was derived from similar sources in the different districts. Dolomitization may sometimes be used as a local aid in searching for ore bodies.

ELLIOTT J. ROBERTS

**Certain magmatic titaniferous iron ores and their origin.** F. F. OSBORNE. *Econ. Geol.* 23, 724-61, 895-922(1928).—Certain titaniferous Fe ores in anorthosites, gabbros and related rocks are magmatic injections—not magmatic segregations nor of hydrothermal origin. Their temp. of solidification was between 800° and 1100°. Filter pressing is the explanation advanced to account for the ore bodies in the anorthosite. Lamellas of ilmenite and spinel in magnetite, and of hematite in ilmenite, are due to the unmixing of solid solns. which were stable at the temp. of formation. A content of FeO in the residual magma greater than that necessary to form ilmenite and ortho- or metasilicates gives rise to magnetite with the ilmenite. Otherwise hematite is formed with the ilmenite. Evidence is adduced for the solid soly. of magnetite in hematite.

ELLIOTT J. ROBERTS

**Geologic structure of the Cuyuna iron district, Minnesota.** CARL ZAPFFE. *Econ. Geol.* 23, 612-46(1928).—Z. finds 2 major bands of ore in the north part of this district. In both, the lower horizon is manganiferous; but the lower of the two major bands is predominantly the more so.

ELLIOTT J. ROBERTS

**The ancient mining works of Cassandra, Greece.** CORNELIO L. SAGUI. *Econ. Geol.* 23, 671-80(1928).—The deposits contain Au, Ag, Pb, Zn and some Cu. The minerals include pyrite, galena, zinc blende, arsenopyrite, lollingite, quartz, calcite, rhodochrosite and rhodonite, of which the last 2 have been altered to pyrolusite near the surface. Some of the mines must have been worked for 25 centuries before 300 B. C.

ELLIOTT J. ROBERTS

**Copper veins on Susie Island, Lake Superior.** G. M. SCHWARTZ. *Econ. Geol.* 23, 762-72(1928).—Bornite, chalcocite, chalcopyrite, pyrite, covellite and malachite occur in a calcite-quartz-barite gang. The ore assayed 0.16 oz. Ag per ton and showed no As. A pronounced zoning of the calcite occurs, due to minute inclusions of chalcocite. Pyrite has been replaced by chalcocite and more rarely by bornite or chalcopyrite. Chalcopyrite is often replaced by bornite and *vice versa*; chalcocite is replaced by bornite. The sulfides occur in peculiar concentric, roset and scallop-like structures in the calcite.

ELLIOTT J. ROBERTS

**Notes on the nickel and copper deposits in the norite complex west of the Pilansberg district, Rustenberg, Transvaal.** J. A. L. ORTLEPP. *J. Chem. Met. Mining Soc., S. Africa* 29, 233-6(1929).—In a discussion of Schoch's paper (*C. A.* 23, 2910), O. gives certain results of assays and concn. tests on similar ore. ALDEN H. EMERY

**The upland diamond deposits of the Diamantina district, Minas Geraes, Brazil.** LESTER S. THOMSON. *Econ. Geol.* 23, 705-23(1928).—There are 2 sources of the diamonds: a breccia which was probably originally a basic igneous intrusion which entrained fragments of the country rock through which it was forced; and 2 series of conglomerates, one of which is older than the breccia. The diamonds and attendant minerals (quartz, rutile, anatase, ilmenite and kyanite) in the breccia are not water worn and therefore primary while those in the conglomerates are water worn and

therefore secondary; and, since one of the conglomerates is older than the breccia, another source for these diamonds must be postulated. A similar double source is necessary in the case of the South African deposits.

ELLIOTT J. ROBERTS

**Some geological consequences of the selective adsorption of water and hydrocarbons by silica and silicates.** P. G. NUTTING. *Econ. Geol.* **23**, 773-7(1928).—Water, adsorbed on silica and silicates as H and OH ions, may be displaced by the stronger (brown or black) alkyl hydrocarbons but not by the weaker lighter ones. Petroleum may enter and fill sands previously filled with water or water solns. provided it contains basic constituents stronger than OH, thus changing the film adsorbed on the silicates from OH to alkyl hydrocarbon, and reversing the character of the silicate from hydrophilic to hydrophobic. The most efficient flotation oils for sulfide ores are those composed of hydrocarbons just a little weaker than OH ions. The thickness of the adsorbed film of strong alkyl hydrocarbons on some pure quartz oils and was detd. to be  $8 \times 10^{-8}$  cm.

ELLIOTT J. ROBERTS

**A contribution to the knowledge of the transformations of fatty acids in the course of geologic periods.** I. G. L. STADNIKOV AND ANNA WEIZMANN. *Brennstoff-Chem.* **10**, 61-3(1929).—According to the Engler theory bituminous minerals and petroleum have resulted by transformation of plant and animal fatty acids through the action of heat and pressure into hydrocarbons. The authors ext. Siberian boghead coal with  $C_6H_6$ ,  $CHCl_3$ , and alc. NaOH and convert the extd. acids into methyl esters. These are sepd. by fractionation and various fatty acids from  $C_8$  to  $C_{22}$  are identified. By similar studies of materials representing various coalification stages they hope to show how chem. transformation therein has progressed under "natural conditions" II. G. L. STADNIKOV AND Z. VOZZHINSKA. *Ibid* 81-2.—A sample of Matagansky boghead coal was extd. and examd. for fatty acids by the method used above. Thirty g of satd. and unsatd. acids of the fatty acid series were recovered. This was approx 5% of the wax sample examined. The presence of lactones and anhydrides was indicated. The amount of material available was too small for positive identification of individual compds. Cf. *C. A.* **23**, 2128.

J. D. DAVIS

**Gilsonite deposits of the Uintah Basin.** JOHN BRISTOL. *The Mining J.* (Arizona) **13**, 5-6, 63(1929).

E. M. SYMMES

**Physicochemical factors controlling magmatic differentiation and vein formation.** CLARENCE S. ROSS. *Econ. Geol.* **23**, 864-86(1928).—R. discusses the origin and properties of the water-rich differentiate of a crystallizing igneous mass.

E. J. R

**The origin of corundum aplite.** ALEX L. DU TOIT. *Econ. Geol.* **23**, 806-9(1928).—T., the proponent of the theory that albitites and plumasites were formed by the desilication of pegmatites, replies to Larsen's criticisms of that theory (*C. A.* **23**, 4169), and upholds his previous views (*C. A.* **14**, 514).

ELLIOTT J. ROBERTS

**Origin of white clays and bauxite, and chemical criteria of peneplanation.** W G WOOLNOUGH. *Econ. Geol.* **23**, 887-94(1928); Cf. *C. A.* **23**, 1086.—One essential criterion of a high degree of perfection of peneplanation is that the rocks show evidence of very deep and very complete chem. alteration by meteoric waters. If the residual material consists entirely of the most insol. products of rock weathering, a uniformly moist climate may be postulated during the last stages of peneplanation. If, on the other hand, there is a crust of concretionary, amorphous material, chiefly  $Al_2O_3$ ,  $Fe_2O_3$ , or amorphous  $SiO_2$ , resting upon a substratum of insol. residual constituents, the final stages of peneplanation took place under climatic conditions marked by sharply defined alternations of satn. and desiccation.

ELLIOTT J. ROBERTS

**A study of a fossil resin of the Republic of Argentina.** JUANA CORTELEZZI. *Rev. facultad cien. quim.* (Univ. La Plata) **5**, Pt. 2, 25-63(1929).—In an exhaustive study, including comparative data and illustrative cuts, the following conclusions were reached (1) The material belongs to the lower Tertiary and is cotemporaneous with known beds of amber; (2) its properties approach those of amber and copal; and (3) on account of its peculiar properties it should be considered as a new species. The reddish yellow, transparent or semi-transparent resin, a nodular, amorphous, brittle material possessed conchoidal fracture, was without odor or taste, acquired a —elec. charge and contained remains of plant life. It showed feeble birefringence,  $n_D = 1.529$ , sp. gr. = 1.0527, hardness 2-3, heat of combustion 8540 cal. per g., and on heating modifications were noted at 160°, 220°, 260°, 300° and 335° (b. p.). The chem. analysis was: C 76.550, H 10.202, O 13.188, S (Hempel) 0.059, N negative, ash (K, Fe, Ca, Mg,  $SiO_2$ ,  $SO_3$ ) 0.08,  $H_2O$  at 100° 2.30%; sol. in alc. 49.60, in ether 59.63, in chloroform 98.4, essential oils 5.30, bitter substances 7.22, free acids 1.34; acid number 42.15, saponification number 109.6. Qual. tests indicated the presence of acids, alcohols and resins.

W. L. HILL



The nature and origin of the soils of Madagascar (ERHART) 15. Oil fields of Burma (STAMP) 22. The benzidine reaction in the analysis of minerals (DOMINIKIEWICZ) 7. Soils and vegetation of the Troitzk region, Ural Province (NIKITIN) 15.

## 9—METALLURGY AND METALLOGRAPHY

D. J. DEMOREST, R. H. ABORN

**Progress in metallurgy during 1928.** H. C. H. CARPENTER. *Iron Coal Trades Rev.* 118, 142(1929). LESLIE B. BRAGG

**The history of flotation.** CH. BERTHELOT. *Rev. métal.* 26, 364-6(1929).—A brief sketch. A. PAPINEAU-COUTURE

**The concentration of the ores of western Quebec.** J. S. GODARD. Can. Dept. Mines, Mines Branch, *Rept.* No. 695, 164-72(1929), cf. C. A. 23, 1845.—These ores are complex mixts. of sulfides of Cu, Zn and Fe carrying values in precious metals. They may be classified as (I) milling ores, (II) direct smelting ores and (III) concg. ores, and can be further divided as follows: I (a) predominately arsenopyrite with Au in fractures in quartz, (b) predominately pyrite with values of Au; II (a) heavy sulfides of Cu and Fe with Cu above 4% and the Au in the Cu, (b) highly siliceous Cu and Au ores used as flux in Cu converters; III (a) disseminated chalcopyrite-rhyolite ore bodies not used as flux, (b) disseminated pyrite with Au (distinguished from I (b) only by proximity to the smelter), (c) disseminated ZnS with pyrite (d) disseminated ore contg. small amts of chalcopyrite, sphalerite, and pyrite whose chief value is Au, (e) heavy sulfides of Cu and Fe with pyrrhotite predominating—too low in Cu and Au to belong to II (a), (f) heavy-sulfide ores predominately pyrite and low in Cu, Zn and because of unfavorable ratio of Cu to Zn, oxidized condition of ore and the assocn. of precious metals, (g) heavy-sulfide and disseminated-sulfide ores of Cu, Zn and Fe, pyrrhotite predominating and contg. some values in Au and Ag, difficult to conc. because of unfavorable ratio of Cu to Zn, oxidized condition of ore and the assocn. of precious metal values. Examples of each are given and concn. tests on 7 samples described. ALDEN H. EMERY

**Studies on the roasting of zinc blende.** FRANZ KLEIN *Metall u. Erz* 26, 217-25 (1929).—The work is confined to the consideration of the influence exerted by the phys. nature of the ZnS, the temp., and the compn. of the roasting gas during the several stages of the roasting process. One sample of ZnS was chemically pptd. contg. 64.8% Zn, 34.6% S, 0.4% Fe and 0.05% Pb. Another sample was cryst. ZnS contg. 64.4% Zn, 34.6% S, 0.3% Fe and a trace of Pb. Roasting was done in a horizontal elec. tube furnace in which the amt and nature of air could be controlled. Roasting of pptd ZnS began at 345°, and that of cryst. ZnS at 350°. The progress of the roasting process is influenced by the size of the particles. In the temp. interval 470-550° ZnS ignites. At about 700° an endothermic reaction occurs, the ZnSO<sub>4</sub> decomposes into ZnO + SO<sub>3</sub>. Roasting velocity is greater for pptd. ZnS than for cryst. ZnS. The amt. of ZnSO<sub>4</sub> formed is dependent on the gas compn. The % ZnSO<sub>4</sub> is greater the more favorable the condition for the formation of SO<sub>3</sub> from SO<sub>2</sub> and O<sub>2</sub>. C. H. LORIG

**The hydrometallurgical treatment of high-grade iron-copper sulfide concentrates.** R. J. TRAILL, W. R. MCCLELLAND AND J. D. JOHNSTON. Investigations in Ore Dressing and Metallurgy, Canada Dept. of Mines, Mines Branch, *Rept.* No. 695, 138-53(1929); cf. C. A. 23, 341.—A chalcopyrite-pyrite or pyrrhotite conc. is roasted with excess S present. Elemental S is collected. The calcine is leached with FeCl<sub>3</sub> and the Cu and Fe are removed as chlorides. Cu is pptd. by Fe, roasted (oxidizing), leached with H<sub>2</sub>SO<sub>4</sub>, and electrolyzed. The Fe soln. is freed of Pb, Zn, etc., and electrolyzed to produce pure Fe. Methods for their removal have given inconsistent results and so pure Fe can only be obtained when the ore contains few impurities. A. H. E.

**Foundry iron smelting and remelting parallels.** J. E. FLETCHER. *Fuel Econ. Rev.* 8, 38-47(1929).—In 5 out of 7 furnaces, all producing the same grade of foundry Fe of hematite grade, the wt. of air per lb. of coke C was insufficient completely to convert the C to CO. A properly designed and operated cupola is not a producer of combustible gases. Under this condition the coke expenditure is little more than 5.5% of the Fe melted. A top-gas analysis from 1 cupola may be similar to that from another while the coke consumption per ton of Fe melted, and the rate of melting may be different. H. C. PARISH

**Carbon elimination in the basic Siemens-Marten furnace.** EM. LUBOJATZKY.

*Montan. Rundschau*, 21, 217-8(1929).—The elimination of C in a steel bath is expressed by the following equation  $[2/(1 - 2x)]_x^0 = k_d t$ .  $x$  is the decrease in concn. of C in the melt for an element of time  $t$ , and  $k_d$  is a factor which depends on the kind and size of furnace, excess air, burner construction, fuel and materials such as ore and mill scale used in eliminating C from the bath. Results calcd. by the equation and the detd. values of rates of C elimination are in agreement. C. H. LORIG

**Cupola furnace with water injector.** D. HARR. *Die Giesserei* 25, 567-70(1929).—H<sub>2</sub>O is injected into the cupola through small tubes placed in each tuyère. Each tube has a small specially designed nozzle which forces the H<sub>2</sub>O into the melting zone in a finely divided stream. The advantages of H<sub>2</sub>O in the cupola are: The temp. of the melting zone is raised; coke is saved or the iron and slag are greatly superheated, the amt. of slag is lessened; less S is picked up by the metal; the melting operation is accelerated; the furnace lining has a longer life; and the cost of materials and repairs are reduced. The temp. of the melting zone is raised 50° to 60°. Several probable explanations of the function of H<sub>2</sub>O in combustion reactions are given. It may act as an O<sub>2</sub> carrier according to the equations  $\text{CO} + \text{H}_2\text{O} = \text{CO}_2 + \text{H}_2$  and  $2\text{H}_2 + \text{O}_2 = 2\text{H}_2\text{O}$ , or it is probable that at high temps. the reaction  $2\text{H}_2\text{O} + \text{O}_2 = 2\text{H}_2\text{O}_2$  momentarily takes place. H<sub>2</sub>O<sub>2</sub> reacts with CO to form CO<sub>2</sub> and H<sub>2</sub>O, the latter reaction occurring with a greater velocity than the action of O<sub>2</sub> on CO. C. H. LORIG

**Cupola with water injector, and the Schürmann furnace in continuous operation.** G. OTT. *Die Giesserei* 16, 111-3(1929).—Two cupolas of 1100 mm. diam. were operated at 1350°, first with the addn. of 3 l. of H<sub>2</sub>O per hr. per cupola, and then without the H<sub>2</sub>O addn. The bed and charge coke were accurately weighed. 89,300 kg. of Fe was produced with 8820 kg. coke in the test with H<sub>2</sub>O, while 77,500 kg. of Fe was produced with 9036 kg. coke in the test without H<sub>2</sub>O. The saving in coke requirement was 15% in the test with H<sub>2</sub>O. The operating results with a Schürmann furnace are briefly touched upon. C. H. LORIG

**Open-hearth furnaces of Central and Southern Russia.** K. G. TROUBINE. *Rev. métal.* 26 (Extraits), 231-5(1929).—Data obtained (answers to 162 questions) on 42 Russian open-hearth furnaces are discussed in detail, and numerous formulas deduced as regards construction and operation. A. PAPINEAU-COCHURE

**Chemistry of open-hearth operations.** C. H. HERTY, JR. *Blast Furnace and Steel Plant* 17, 1034-8(1929).—Data are given on the changes in slag and metal compn. on a heat of killed steel, samples being taken at various intervals of time after tapping. C. L. READ

**A melting record of three acid open-hearth heats.** W. E. GRIFFITHS AND C. E. MEISSNER. *Trans. Am. Soc. Steel Treating* 16, 257-75(1929).—Complete logs are given for three, 25-ton acid open-hearth heats; they show the effect of adding Si in ladle or furnace and various alloy addns. on the slag compn. and metal bath analysis. W. A. MUDGE

**Fuel control in open-hearth practice.** J. LLOYD BENTLEY. *J. Inst. Fuel* 2, 101-8(1928).—A discussion. LESLIE B. BRVGG

**The use of liquid fuel in open-hearth furnaces.** MARTIN J. CONWAY. *J. Inst. Fuel* 2, 100-3(1928).—A discussion. LESLIE B. BRVGG

**Fuel control on hot-blast stoves.** J. B. FORTUNE. *J. Inst. Fuel* 2, 116-26(1928).—A discussion. LESLIE B. BRVGG

**Fuel control in forge and rolling-mill practice.** H. C. ARMSTRONG. *J. Inst. Fuel* 2, 108-15(1928).—A discussion. LESLIE B. BRVGG

**Application of pulverized coal to metallurgical furnaces.** H. W. HOLLANDS AND E. C. LOWNDES. *Colliery Guardian* 139, 226-8, 325-6(1929); *Foundry Trade J.* 41, 41-4. E. H.

**Study of the Bessemer process as practiced in Southern Russia.** V. A. KAMENSKY AND M. A. TATAROV. *Rev. métal.* 26 (Extraits), 227-31(1929).—Results are given of observations of the compn. and temp. of the metal, slag and gases at various stages of the converting (Bessemer) process as carried out in Southern Russia. The process is conducted according to the so-called English method, at a temp. (of the metal) of 1200-1300°, characterized by the production of a metal contg. S 2%, Mn 1%, C 3.5%, P  $\approx$  0.17%, S  $\approx$  0.06%. Under the conditions prevailing in Southern Russia, it would be preferable to use the so-called American method, which would give an Fe contg. 1.2-1.5% Si and 1% Mn. The temp. of the metal is higher than that of the gases at the beginning and lower at the end of the operation. The rise in temp. of the metal at the beginning is due chiefly to combustion of Si and at the end to combustion of C and Fe. The rise in temp. of the flame is due mainly to combustion of CO outside the converter. Other conditions being equal, the rate of elimination of the elements

depends on the temp. When the slag is acid and thick, the Fe is more oxidized at the start than when the slag is fluid. Heat losses by radiation and losses due to the heating of the lining can vary 4-10% of the total amt. of heat and vary with operating conditions.

Recovering silver from scrap material and preparing the metal for the trade. F. A. COLLINS. *Eng. Mining J.* 128, 164-6(1929). E. H.

Gold, silver, copper, lead and zinc in Idaho and Washington in 1927. C. N. GERRY. *Bur. Mines, Mineral Resources of the U. S. 1927*, Pt. I, 573-98(preprint No. 22, published July 16, 1929). E. H.

Zinc in 1927. ELMER W. PEHRSON. *Bur. Mines, Mineral Resources of the U. S. 1927*, Pt. I, 479-507(preprint No. 19, published June 17, 1929). E. H.

The application of science to the steel industry. W. H. HATFIELD. *Trans. Am. Soc. Steel Treating* 15, 474-502, 652-69, 817-36, 986-1026(1928); 16, 121-54, 278-97(1929).—The third Edward De Mille Campbell memorial lecture. W. A. MUDGE

The physical chemistry of rimmed steel. J. E. CARLIN. *Trans. Am. Soc. Steel Treating* 16, 293-7(1929).—See C. A. 23, 1603. W. A. MUDGE

Comparative study of oxidation and de-oxidation phenomena in the manufacture of rails by the Thomas and Martin processes. JOS. WAGNER. *Rev. métal* 26, 287-96(1929).—The FeO formed in blowing and superblowing in the Thomas process merely serves to supply the required O for oxidation of Si, C and P, in the same way as the FeO or oxidized scrap used in the Martin process. The O content after de-oxidation is practically the same in the 2 processes. A. PAPINEAU-COUTURE

The chemical composition an insufficient measure of quality. F. PIWOWARSKY. *Die Gießerei* 16, 318-21(1929).—It is a known fact that the quality of pig iron influences the quality of the cast iron. P. utilizes his expts. and those of others to illustrate differences in phys. and structural properties of cast irons whose chem. compns. are nearly identical. C. H. LORIG

New developments in metals and alloys. O. W. ELLIS. *Can. Chem. Met.* 13, 223-4(1929). E. H.

Metals and alloys for industrial applications requiring extreme stability. JEROME STRAUSS. *Trans. Am. Soc. Steel Treating* 16, 191-226(1929).—A discussion of com. metals and alloys for corrosion, erosion and high-temp applications. Cu, Al, Ni, brasses, bronzes, light Al alloys, nickel silvers, cast Fe, Ni-Cu, Ni-Cr alloys and alloy steels are included. W. A. MUDGE

Two decades of precipitation hardening alloys. ZAY JEFFRIES. *Metals and Alloys* 1, 3-4(1929). A. J. MONACK

Preparing thin specimens [of metals] for microscopic examination. R. A. RAGATZ. *Mining Met* 10, 372-9(1929). E. H.

X-ray metallography in 1929. GEORGE L. CLARK. *Metals and Alloys* 1, 14-7(1929).—Illustrated review. A. J. MONACK

So-called "accelerated" endurance testing of metals, with a review of Ikeda's method. H. W. GILLET. *Metals and Alloys* 1, 19-21(1929). A. J. MONACK

Demands of chemical industry on metallurgy. B. D. SAKLATWALLA. *Metals and Alloys* 1, 8-13(1929).—S. discusses the fundamental factors of corrosion, with a chart showing the interrelation of secondary and primary factors. The various alloys and metals for use in different chem. industries are treated. A table shows the chem. compns., tensile strengths, and fields of application of typical corrosion-resistant alloys. A. J. MONACK

The use of light metals in air-cooled radial motors. FRITZ GOSSLAU. *Z. Metallkunde* 21, 224-7(1929). ROBERT F. MEHL

Metals for the construction of airplanes. H. STENDEL AND G. BOCK. *Z. Metallkunde* 21, 213-23(1929). ROBERT F. MEHL

Materials for the construction of airplane propellers. F. SEEWALD. *Z. Metallkunde* 21, 227-30(1929). ROBERT F. MEHL

Methods of testing cast iron. A. LE THOMAS AND R. BOIS. *Foundry Trade J.* 41, 19-21, 32, 46-8, 50, 65-7(1929). E. H.

The influence of graphitization of cast iron. E. DIEFSCHLAG. *Foundry Trade J.* 41, 23-6(1929).—The quality of cast iron is influenced by the chem. compn., by the rate of cooling and the degree of super-cooling, and by the microstructure of the pig iron or scrap used in the remelt unless the remelting temp. is so high as to destroy this structure. On slow cooling, plate-like graphite tends to sep. This interrupts the structure of the metal and reduces the transverse strength. Rapid cooling of a melt confined within certain ill-defined limits of chem. compn. gives a good distribution of graphite eutectic. HANS C. DUUS

**The influence of chromium in cast iron.** J. W. DONALDSON. *Foundry Trade J.* 40, 489-92(1929).—The alloys used were prepd. by adding ferrochrome to an ordinary cast iron, the resulting alloys contg. Cr in amounts up to 0.9%. The addition of the Cr increased the stability of combined C up to 550°; it caused the alloys to decrease in vol. on heat treatment; and it made the alloys slightly less subject to corrosion.

C. L. READ

**The double diagram of the iron-carbon system.** KOTARO HONDA. *Trans. Am. Soc. Steel Treating* 16, 183-9(1929).—An argument, based principally on x-ray data, in favor of the single diagram for the Fe-C system.

W. A. MUDGE

**The Ac<sub>1</sub> range of carbon steel and related phenomena.** AXEL HULTGREN. *Trans. Am. Soc. Steel Treating* 16, 227-56(1929).—A microscopic study was made of the transformation of pearlite into austenite. The three factors causing this transformation to take place in a range are (a) presence of alloy elements, (b) heterogeneity due to segregation on solidification and (c) slow diffusion rate of C, and probably other elements, in a temp. range including and extending beyond, the Ac<sub>1</sub> range.

W. A. M

**The phenomena during the tempering of high-tempered steels.** PIERRE CHIEVE NARD AND ALBERT PORTEVIN. *Compt. rend.* 188, 1670-2(1929).—The authors take exception to the conclusions of previous workers (cf. C. A. 23, 2683) relative to the interpretation of phenomena occurring during the tempering of certain steels (On heating a steel (C 1.5%, Mn 2.26%) above 400° the change is austenite → Fe<sub>3</sub>C + αFe (sorbite); on cooling no reaction occurs because equil. has been established (On heating steel (C 1.5%, Cr 2.26%), austenite → complex carbides of Fe and Cr + austenite with less C; upon cooling austenite → martensite (secondary tempering). These two examples are entirely different, though they show the same effect on the hardness (Brinell increase of 200). They are, however, not characteristic for these classes of steel.

E. R. SCHIERZ

**Investigations on the tenacity and strength of cold-rolled and heat-treated steels of varying previous treatment.** ANTON POMP AND HERMANN POELLEIN. *Mitt. Kaiser-Wilhelm Inst. Eisenforsch. Düsseldorf* 11, 155-84(1929).—Steels of different C contents (0.10-1.44%) were tested for tenacity, tensile strength and hardness. The examn of the structure showed no change in spherical cementite, but the lamellar cementite was broken up and sepd. during rolling. During heat treatment cementite tended to form grains, although true grains were not obtained until a temp. of 650° was attained.

HANS C. DUES

**A new method of testing the depth of case on carburized steel.** F. A. FIRESTONE AND E. J. ABBOTT. *Metals and Alloys* 1, 18(1929). The object was to develop a method for testing depth of case without destroying the specimen tested. The actual quantity measured is the difference in magnetic permeability of a standard ring or specimen and a sample ring or specimen being tested. The compn. and heat treatment of the steel influence the magnetic permeability as well as the C content.

A. J. MONACK

**Study of an alloy of the iron-silicon type and its applications: Duriron.** A. MANGIN. *Aciers spéciaux* 3, 426-9(1929).

A. J. MONACK

**A contribution to the knowledge on the system: nickel-iron.** G. F. SIZOO AND C. ZWICKER. *Metals and Alloys* 1, 29-30(1929).—See C. A. 23, 3428.

A. J. M

**Investigation of the effect of nitrogen.** R. S. DEAN, R. O. DAY AND J. L. GREGG. *Heat Treating and Forging* 15, 448-50(1929).—Com. irons owe their property of hardening by reheating after cold work, as well as their increase in tensile strength in the range of 100° to 300°, to the soln. of small amts. of Fe nitride present.

H. C. PARISH

**Effect of nitrogen on alloy steels and experiments on nitrogenization.** SHUN-ICHI SATOH. *Rev. métal.* 26, 248-58(1929).—See C. A. 23, 1855.

A. PAPINEAU-COUTURE

**Study of a forgeable acid-resistant aluminum bronze and its applications: Alcumite.** A. MANGIN. *Aciers spéciaux* 3, 429-30(1929).

A. J. MONACK

**Monel metal.** JEAN DESMURS. *Aciers spéciaux* 3, 363-8(1929).—A review with charts.

A. J. MONACK

**Nickel as an alloying constituent in bearing metal.** CH. L. ACKERMANN. *Metallwirtschaft* 7, 752-3(1928); 8, 81-2(1929).—The effect of Ni in high-Pb bearing metal (69% Pb, 15.5% Sb, 14% Sn, 1.5% Ni) is to increase its resistance to frictional wear. The improvement is ascribed to the formation of Ni<sub>3</sub>Sb<sub>3</sub>. A proper choice of the concns. of Sb and Sn and of such strengthening constituents as As, P and Cd, will produce cheap bearing metals with sufficient impact value and long life. On high-Sn bearing metals (60-82% Sn) Ni exerts a marked hardening effect and increases corrosion resistance; simultaneously the m. p. is raised and the alloy is made brittle. The effect of Ni in Pb-special bronzes is to permit the production of useful bearing metals through the elimination of the miscibility gap between Pb and Cu. These bearing

metals are unexcelled for heavy loads and are suitable where the best phosphor-bronze and the most expensive tin-white metals are inadequate. ROBERT F. MEHL

**Light alloys of high strength.** R. CAZAUD. *Aciers spéciaux* 4, 225-8(1929); cf. C. A. 23, 4179.—C. discusses the use of duralumin type alloys in aviation. A. J. M.

**Corrosion of aluminum and light alloys.** R. CAZAUD. *Aciers spéciaux* 3, 352-60 (1929).—A review. A. J. MONACK

**Have heat-treated aluminum alloys a true endurance limit?** H. W. GILLETT. *Metals and Alloys* 1, 21(1929). A. J. MONACK

**X-ray examination of aluminum at high temperatures.** A. I. ALICHANOV. *Metals and Alloys* 1, 30(1929).—See C. A. 23, 3428. A. J. MONACK

**The mechanism of corrosion.** FRANÇOIS ROEKAERT. *Aciers spéciaux* 3, 346-52 (1929).—R. classifies corrosion as chem., electrochem., and atm. Chem. corrosion may result in coatings of oxides, chlorides, bromides, iodides and sulfides. The effectiveness of oxide coatings in resisting further corrosion depends, in general, upon whether or not the oxide produced is greater or less in vol. than the metal used in producing it. If the vol. of oxide is the greater, corrosion is decreased. Electrochem. corrosion is of 2 types: (1) that which involves an elec. current produced externally and (2) that which does not necessitate the presence of an external elec. current. Atm. corrosion is due to moisture and polluting gases. A. J. MONACK

**Protection against corrosion.** COURNOT. *Bull. soc. franç. élec.* 7, 692-706(1928); *Science Abstracts* 32B, 81.—A review of electrochem. methods. H. L. D.

**Experiences with pipe protection.** C. H. WARING. *Gas Age-Record* 63, 485-6 (1929).—Protective coatings, the proper cleaning of the pipe surfaces and methods of application of the coatings are discussed. LESLIE B. BRAGG

**Corrosion and stainless steels.** ANDRÉ MICHEL. *Aciers spéciaux* 3, 387-97 (1929).—A review. A. J. MONACK

**Corrosion tests.** ALBERT MANGIN. *Aciers spéciaux* 3, 378-80(1929).—A review. A. J. MONACK

**Iron-silicon acid-resisting alloys.** ALBERT MANGIN. *Aciers spéciaux* 3, 374-7 (1929).—A review. A. J. MONACK

**Special corrosion-resisting industrial alloys.** PAUL BRES. *Aciers spéciaux* 3, 368-74(1929).—The following alloys are discussed: I. (1) Fe-Cr, (2) Fe-Cr-Ni, (3) Fe-Si, (4) Fe-Cr-Si alloys; II. (1) Cu-Ni, (2) Cu-Si, (3) Cu-Al alloys; III. (1) Ni-Cr alloys. A. J. MONACK

**Pickling sheets with sulfuric acid before galvanizing.** HEINZ BABLIK. *Iron Coal Trades Rev.* 117, 732-3(1929).—The advantages of  $H_2SO_4$  over HCl for use in pickling operations are that less acid is used and the time required is greatly reduced. Some operating details and cautions are given. LESLIE B. BRAGG

**Methods of covering or coating pipes to prevent corrosion.** W. MOELLER, JR. *Gas Age-Record* 63, 675-6(1929).—A general discussion. LESLIE B. BRAGG

**The place of the complete corrosion survey in industry.** HENRY W. HOUGH. *Gas Age-Record* 63, 172-5, 181-2(1929).—The methods and the utility of a complete study of the sub-soil and other factors bearing on the corrosion of a pipe line, in connection with the application of sufficient corrosion-protective material, are carefully discussed. LESLIE B. BRAGG

**Corrosion surveys for distribution systems.** HENRY W. HOUGH. *Gas Age-Record* 63, 859-60, 867(1929).—A discussion of the methods and utility of the corrosion survey. (Cf. preceding abstract). LESLIE B. BRAGG

**Pipe-line corrosion.** B. B. LEGG. *Gas Age-Record* 63, 551-4(1929).—App. for the coating of pipe with pitch is described and the costs of the coating process and its practical corrosion-prevention results are discussed. LESLIE B. BRAGG

**Spotting of plated or finished metals.** W. P. BARROWS. *Bur. Standards J. Research* 2, 1085-1116(1929); cf. C. A. 23, 43.—Two types of spots are found, "crystal spots" and "stain spots." Crystal spots appear in the form of dendritic crystals on metal finishes contg.  $Cu_2S$ ,  $Ag_2S$  or  $NiS$  and subsequently lacquered. Their formation is caused or accelerated by S in even minute amts., such as may be derived from S or  $H_2S$  in the atm. or from rubber bands, wrapping paper or cardboard cartons. Remedies proposed are exclusion of S, use of certain lacquers which retard spotting, application of a thin film of grease such as petrolatum to the lacquered surface, and the use of waxed paper for wrapping. Stain spots are caused by absorption of acid or alk. compds. in the pores of the metal during plating. This exudes upon the surface later in consequence of absorption of  $H_2O$  and produces the stains. B. suggests reduction of porosity as much as possible, exposure of the articles to a high humidity before the

final finish, and application of a lacquer which is less permeable to moisture than nitro-cellulose lacquers. Phenol condensation lacquers tend to retard stain spotting.

H. STOERTZ

**Artificial corrosion of special Japanese alloys.** DENZO UNO. *Korrosion Metallschutz* 5, 121-30(1929).—Schakudo, a Cu-Au alloy contg. from 0.5 to 10% Au, and schibuizi, a jeweler's alloy of Cu-Ag contg. about 20-25% Ag, were treated with chlorides, chlorates, sulfates, sulfites, sulfides, nitrates, nitrites, carbonates, oxalates, bromides, iodides, fluorides, cyanides, hydroxides, peroxides, acetates, tartrates, citrates, chromates, dichromates, permanganates, arsenites, phosphates and tungstates of various metals, as well as org. and inorg. acids. The desired coloring action is not limited to Cu salts; best results are obtained if the reagent has little solvent action on the alloys. Acids and oxidizing agents are not suitable. The color is said to be due to contact oxidation of Cu atoms in the surface.

H. STOERTZ

**Measuring the corrosion resistance of alclad.** ERICH RACKWITZ AND ERICH K. O. SCHMIDT. *Korrosion Metallschutz* 5, 130-41(1929).—The corrosion resistance of alclad plate is studied in comparison with duralumin and Al plate. Immersion in 3% NaCl contg. 1% H<sub>2</sub>O<sub>2</sub>, and a spray test with 20% NaCl, were used on plates of various thickness and with varying degrees of cold working. The effect of combination with pure Al or duralumin was also studied, and the extent of the attack was measured by loss in wt. as well as decrease in mech. strength. Although the loss in wt. of alclad was of about the same order as that of duralumin, the loss in mech. strength was much less. Plating Al upon duralumin would increase its resistance to corrosion.

H. STOERTZ

Blast-furnace gas on coke ovens (THACHER) 21. The relation between the lattice constant and the density of solid solutions (SEKITO) 2. Cupola linings (SCHMIDT) 19. Testing of hypodermic needles (BATTI) 11B. H in the electrical industry (WHITNEY) 4. Apparatus for handling crucibles such as those used in making metal castings (U. S. pat. 1,722,777) 1. Upward-current apparatus for washing and classifying ores (Brit. pat. 303,810) 1. Burner construction and control for oxyacetylene welding (Brit. pat. 303,820) 1. Apparatus for centrifugal casting or lining of pipes with metal (Brit. pat. 303,820) 1.

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KIPPENBERGER, ALBRECHT: *Die Kunst der Ofenplatten*. Dargestellt an der Sammlung des Vereins deutscher Eisenhüttenleute in Düsseldorf. Düsseldorf: Verlag Stahleisen. 52 pp. M. 22.50. Reviewed in *Mining and Met.* 10, No. 272, p. 20 of advertising section(1929).

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**Treating ores.** COMPTOIR TECHNIQUE ALBERT KNAFF ET LEON MAYER and PAUL GREDT. Fr. 655,296, Mar. 23, 1928. Briquets of Mn, Cr, W, V, Mo, Ti, Ni, Co or P ores are made by adding along with the necessary C a lower oxide of Fe or powder metallic Fe and an oxidizing agent. By its oxidation the Fe or lower oxide forms an agglomerating agent, and by its final reduction forms an alloy with the other metal.

**Ore concentration.** ALBERT E. PAUL. Australia 13,657, June 5, 1928. Ores are concd. in a chamber over inclined screen while being subjected to the action of air blown through from below and to a bumping motion, whereby the heavier material moves in an upward direction.

**Ore concentration by flotation.** JAMES L. STEVENS. U. S. 1,722,598, July 30. An ore pulp contg. various minerals is prepd. for flotation by treatment with a material comprising a suitable earthy matter admixed with an alkali metal xanthate or other flotation-collecting agent.

**Froth-flotation concentration of ores.** CARL P. LEWIS (to Minerals Separation North American Corp.). U. S. 1,723,243, Aug. 6. Successive flotation sepn.s. of different floatable constituents such as those of Pb-Zn ores is effected by use of a xanthate and a sol. material such as cresylic acid to effect the flotation of the first constituent floated such as a Pb concentrate and then effecting another flotation sepn. of the other floatable constituent. In this latter sepn., lime,  $\text{CuSO}_4$ , K xanthate and pine oil may be used for effecting the flotation of a Zn concentrate. Cf. *C. A.* 22, 2733.

**Froth-flotation of ores.** ADOLPHE H. NEY. U. S. 1,723,295, Aug. 6. Crushed ore such as sulfidic Cu ore is subjected to froth-flotation in the presence of an alkyl deriv. of thiosulfuric acid such as Na ethyl thiosulfate.

**Apparatus for flotation of ore pulps.** STEPHEN E. MEYER. U. S. 1,722,705, July 30. Structural features.

**Oil for mineral flotation.** ROYER LUCKENBACH. U. S. 1,722,528, July 30. A heavy petroleum residuum 50–70% is mixed with 30–50% of a diluent frother contg. 30–50% pine pitch and kerosene. Cf. *C. A.* 23, 84.

**Separating mixed sulfide ores by flotation.** WILLIAM D. GREEN (to Combined Metals Reduction Co.). U. S. 1,721,993, July 23. Minerals such as those contg. sulfides of Pb, Ag, Zn and Fe are subjected to flotation sepn. in the presence of an "immunizing sulfite" such as  $\text{Na}_2\text{SO}_3$ ,  $\text{CaSO}_3$  or  $\text{ZnSO}_3$  and  $\text{ZnSO}_4$  and in the absence of added free inorg. acid.

**Platinum from ores.** JOSEF SAVELSBERG (to C. Schlesinger & Trier, Kommanditgesellschaft auf Aktien). U. S. 1,723,444, Aug. 6. Ores are heated with reducing agents such as coal and then after cooling are subjected to a magnetic sepn.

**Production of metals.** VEREINIGTE STAHLWERKE A.-G. Fr. 657,865, July 20, 1928. See *Brit.* 294,246 (*C. A.* 23, 1863).

**Roasting zinc blende, etc.** ERZRÖSTUNG GES. *Brit.* 303,055, Dec. 27, 1927. Zn blende or other ore contg. S is roasted in a superposed hearth furnace through which air passes in counter-current to the ore with such regulated velocity that it penetrates the ore layer completely. An app. and various details of operation are described.

**Treating tin-bearing flue dust.** F. KRUPP GRUSONWERK A.-G. *Brit.* 303,144, Dec. 30, 1927. Sn-bearing flue dust is treated in a reverberatory furnace (suitably of the rotary tube type) while kept in motion on the bottom of the furnace, to produce a sintered and purified Sn oxide. Chloridizing may be employed to assist in volatilizing impurities.

**Apparatus for separating iron from slag.** WALTER DIETRICH. Fr. 34,376, Oct. 25, 1927. Addn. to 621,059.

**Pot suitable for carburizing metal articles in cyanide baths.** GROVER R. GREENSLADE, FREDERICK K. LANDGRAF and JOHN R. FLANNERY (to Flannery Bolt Co.). U. S. 1,721,994, July 23. Structural features.

**Binder for use with core sand.** WM. R. PATE and JOSEPH A. GITZEN (to Lindsay-McMillan Co.). U. S. 1,723,982, Aug. 6. Rosin is used with a solvent comprising petroleum derivs. and linseed oil.

**Sand molds and cores.** A. STAHN. *Brit.* 303,858, Jan. 11, 1928. Sand is used (suitably with a small proportion of clay, loam, lime or the like) together with an inorg. binder such as  $\text{H}_3\text{BO}_3$  or  $\text{H}_3\text{PO}_4$  which forms a glassy melt when heated above  $150^\circ$  but below  $400^\circ$  and which loses its binding power at casting temps. above  $1000^\circ$ . An org. binder may also be used.

**Molds of austenitic manganese steel for centrifugal casting of iron and steel, etc.** GUSTAV A. REINHARDT. U. S. 1,722,354, July 30.

**Coating for protecting metal molds.** HARRY P. KIMBER (to Earl Holley). U. S. 1,722,998, July 23. A compn. suitable for coating molds of cast iron comprises an inert refractory material such as powdered chrome ore together with Na chromate or other sol. chromate or Na tungstate which serves as a binding agent. Cf. *C. A.* 23, 1381.

**Linings for metal molds.** L. J. BARTON. *Brit.* 303,205, Aug. 31, 1927. A lining material which can be applied with a brush or the like comprises a powdered refractory material or carbonaceous material mixed with an oily carbonaceous liquid such as a petroleum oil or tar oil. Powdered clay, lime, sand, quartz, bauxite, brick-flotation tailings, coal, coke, charcoal or graphite may be used.

**Chill roll-casting mold.** W. H. NICHOLS. U. S. 1,721,969, July 23. Structural features.

**Ingot mold suitable for casting bimetallic ingots of different steels, etc.** WALTER J. GREEN. U. S. 1,723,345, Aug. 6. Structural features.

**Casting ingots.** A. G. EGLER. Brit. 303,157, Dec. 30, 1927. Ingots are cast in molds supported on a platform which is jarred while the metal is molten. An app. is described.

**Apparatus for casting metal ingots.** ALEXANDER W. CARROLL. U. S. 1,723,601, Aug. 6. Structural features.

**Apparatus for making small castings.** PAUL A. PITMAN. U. S. 1,723,071, Aug. 6. Structural features.

**Die casting.** WILLIAM J. DURING (to Precision Castings Co.). U. S. 1,722,281, July 30. In producing die-cast articles, such as those of an alloy contg. Al 92, Cu 3 and Ni 5%, a wooden core is supported within a die and the molten die-casting metal is forced into the die under high pressure at a temp. higher than the combustion point of wood. An app. is described.

**Casting copper alloys in metal molds.** CARL ADEY and CARL PIEL. U. S. 1,722,124, July 23. Mech. features.

**Core-roasting furnace with horizontal retorts arranged one above another.** RAY A. BENNETT. U. S. 1,723,006, Aug. 6. Various structural features are described.

**Rotary furnace for roasting or reducing ores.** C. P. DEBUCH. Brit. 303,072, July 27, 1927. Structural features.

**Rotary furnace for roasting or reducing ores.** C. P. DEBUCH. Brit. 303,096, July 27, 1927. Structural features of a furnace adapted for treating Zn blende, etc.

**Cupola furnace suitable for melting non-ferrous metals.** D. CUSHING. Brit. 303,042, Sept. 26, 1927. Structural features.

**Blast-furnace operation.** S. G. ALLEN. Brit. 303,206, Aug. 30, 1926. An oxygenated blast is used such as would ordinarily cause an excessive smelting capacity as compared with shaft-reduction capacity, and the ratio of ore to coke in the charge is proportionately increased. If the shaft temp. becomes too low, addnl fuel such as powdered coal or fuel oil may be introduced above the mantle. Brit. 303,207 relates to the production of ferro-alloys in blast furnaces by a similar process in which a blast is used so enriched with O that the temp. of the exit gases is preferably about 150°. Production of ferro-Mn is described.

**Furnace for heat-treating metal shapes, etc.** ERNST WIRZ (to Akt.-Ges. Brown, Boveri & Cie). U. S. 1,723,319, Aug. 6. Structural features.

**"Normalizing" furnace for treating metal sheets.** FRANK J. WINDER (to Surface Combustion Co.). U. S. 1,723,109, Aug. 6. Structural features.

**Hearths of metallurgical furnaces.** HIRSCH, KUPER, UND MESSINGWERKE A. G. (to Vakuumschmelze Ges. and W. Rohn). Brit. 303,417, Jan. 2, 1928. In the process described in Brit. 226,801 (C. A. 19, 2116), for production and repair of hearths of metallurgical or other furnaces, a quartzite is used consisting of small grains of quartz cemented together by a siliceous binding material.

**Converter for desulfurizing and dephosphorizing pig iron.** CARBONISATION SOC. GÉNÉRALE D'EXPLOITATION DES CARBONES. Brit. 303,891, Jan. 12, 1928. Various structural features and details of procedure are described.

**"Normalizing" iron and steel sheets.** HOWARD T. GRAFTON (one-third each to Wm. R. Grimsley and Jay S. Irvin). U. S. 1,723,152, Aug. 6. Mech. features relating to normalizing sheets in packs.

**Molybdenum steels with a nitride-hardened surface.** HENRY A. DEFRIES (to Ludlum Steel Co.). U. S. 1,723,015, Aug. 6. Articles are formed with nitride hardened surfaces from steel substantially free from Al and contg. Cr 1-9, Si 0.5-3.5, Mo 0.15-2.0 and C 0.1-1.0%.

**Purifying metals and alloys.** F. W. CORSALLI. Brit. 303,094, June 23, 1927. In a process of purifying and refining molten metals and alloys as described in Brit. 297,759 (C. A. 23, 2690), the metal is conveyed directly into a collecting vessel in which it is submitted to an "intershaking," swinging or dashing movement produced by an eccentric device. An app. is described.

**Alloys.** HÜTTENWERK NIEDERSCHÖNEWEIDE A.-G. Fr. 657,940, July 21, 1928. The liquation of substances contg. Sn, Pb, Sb and Cu is carried out in a trough-shaped furnace heated from above, the thickness of the layer of material being such that the parts liquefied in the upper part of the charge undergo, in their passage through the charge, repeated solidification and liquefaction. Cf. C. A. 23, 1863.

**Alloy for electrical conductors.** MICHAEL G. KORSUNSKY (name changed to Michael G. Corson) (to Electro Metallurgical Co.). U. S. 1,723,867, Aug. 6. An alloy of Cu contg. Cr 0.5-3.0%, in a condition in which it has high tensile strength, is subjected to an annealing operation at 400-700° for such time that the cond. of the cold



alloy is increased to at least 75% M.S. and the tensile strength is not reduced below 70,000 lbs. per sq. in.

**Aluminum alloy.** PIERRE BERTHELEMY and HENRY DE MONTBY. U. S. reissue 17,385, July 30. See original pat. 1,599,869 (C. A. 20, 3442).

**Antimony alloys.** H. HARRIS. Brit. 303,328, May 29, 1928. Alloys such as those of Sb with Pb are purified by bringing the molten alloy into intimate contact with a mixt. of caustic alkali and alkali chloride such as NaOH and NaCl at temps. between the m. p. of the alloy and 550°. Other auxiliary treatments also are described.

**Copper alloys.** METALLBANK UND METALLURGISCHE GES. A.-G. Brit. 303,684, Feb. 29, 1928. Cu alloys are described contg. Ni and Fe and 1-4% of Si. The quantity of Ni is preferably 1-5% and Fe 4-6% and other metals may be added such as Zn up to 20%, Al, Mn and Sn up to 1% of each, and up to 0.5% of an alkali or alk. earth metal. The alloy may be annealed at 750-950° and is then quenched and drawn at 350-600°. Cf. C. A. 23, 594.

**Copper-cobalt alloy.** MICHAEL G. CORSON (to Electro Metallurgical Co.). U. S. 1,723,922, Aug. 6. The phys. strength of Cu is improved by alloying it with Co 2-5%, heating the alloy to above 850° and quenching from that temp.

**Alloy containing copper, magnesium and manganese.** EDWARD C. BURDICK (to Dow Chemical Co.). U. S. 1,721,768, July 23. A relatively small proportion of cupro-Mn contg. Cu and Mn in approx. the ratio of 7:3 is interfused with Mg.

**Alloy of lead, antimony and arsenic.** KAARE S. SELJESAETER (to Western Elec. Co.) U. S. 1,722,358, July 30. Alloys which are suitable for battery grids, bearings and sheaths for elec. cables, etc., are formed of Pb together with not more than 4% Sb and not more than 1% As. Cd, S, Bi, Te and Tl may be used instead of As.

**Iron-nickel alloys.** F. KRUPP A.-G. Brit. 302,994, Dec. 24, 1927. Fe-Ni alloys of high sp. resistance and high initial permeability contain about 33-48% Ni and 0.3-5.0% Si.

**Alloy steel.** FREDERICK C. LANGENBERG. U. S. 1,723,868, Aug. 6. An alloy steel which forms sound castings of high strength contains Mn 3% or less and Mo 1.25% or less and Zr 0.1-0.5%.

**Treating copper-nickel mat.** F. F. LATHE. Brit. 303,066, Dec. 27, 1927. Various details of refining Cu-Ni mat and auxiliary treatments for recovery of precious metals, etc., are described. Cf. C. A. 22, 2735.

**Reclaiming metal from electrical condensers or similar materials.** CECIL A. HALLAM (to Western Elec. Co.). U. S. 1,722,372, July 30. In treating articles comprising metal foil and waxed paper or like materials, combustible material present is ignited to melt the metal forming a part of the material and to exert a sufficient reducing action to prevent oxidation of the metal, the latter is sepd. (in an app. which is described) with assistance of agitation, and deposition of the residue and of the metallic material is effected in the same receptacle.

**Treating tinned scrap iron carrying lead peroxide.** ARTURO DOSSMANN. U. S. 1,723,414, Aug. 6. See Brit. 298,103 (C. A. 23, 2692).

**Hardening metals.** HEINRICH LINDHORST. Fr. 34,217, Oct. 10, 1927. Addn. to 640,681 (C. A. 23, 809). Metals are hardened by placing them with a powder which afterward volatilizes in a closed container. The powder, which may be carbonized leather, BaCO<sub>3</sub> and NH<sub>3</sub>, is preferably agglomerated into briquets so that the exact amt. required may be used.

**Hard material for tools and dies.** F. C. KELLEY (to British Thomson-Houston Co., Ltd.). Brit. 303,751, Jan. 7, 1928. A mixt. of W, Co and C (with or without a temporary binder) or similar materials is heated to a sintering temp. Various details are given.

**Hardening steel molds, etc.** INTERNATIONAL DE LAVAUD MFG. CORP., LTD. Brit. 303,487, Jan. 6, 1928. The surface of smooth-finished steel articles such as molds used for centrifugal casting of pipes is hardened (with only microscopic roughening) by impact from hard metal balls of small diam. An app. is described.

**Apparatus for hardening the heads of railway rails.** EISENWERK-GES. MAXIMILIANSHÜTTE. Brit. 303,739, Jan. 7, 1928. An app. is described by which the heads of the rails are immersed in liquid held in troughs. Cf. C. A. 23, 809.

**Steel car wheels of high-manganese, pearlitic steel containing 0.5-2% chromium.** WINFIELD C. HAMILTON and CLARENCE E. SIMS (to American Steel Foundries). U. S. 1,721,555, July 23.

**Apparatus for heat treatment of metal conductors such as those loaded with magnetic alloy.** GUSTAF W. ELMEN (to Western Electric Co.). U. S. 1,722,079, July 23. Structural features.

**Apparatus for heat-treating and quenching metal rods, tubes, etc.** GEORGE E. BARNHART. U. S. 1,722,449, July 30. Structural features.

**Heat-treating magnetic alloys such as those of nickel with iron.** BELL TELEPHONE LABORATORIES, INC. Brit. 303,928, Oct. 14, 1927. The permeability of materials such as alloys contg. over 60% Ni, with Fe, and having high permeability at low magnetizing forces with low hysteresis losses as compared with Fe, is made substantially const., for magnetizing forces up to at least 0.1 gauss, by heating to 600-900° for at least 2 hrs. and then permitting cooling at a rate not greater than 10° per min. Small quantities of Cr or other suitable substances may be added to the alloy to increase its resistivity.

**Pickling bath.** JOSEPH G. DAVIDSON (to Carbide & Carbon Chemicals Corp.) U. S. 1,723,923, Aug. 6. A hydroxyalkylamine such as a mixt. of tri- and di-ethanolamines is used as an inhibitor in pickling baths such as those contg.  $\text{H}_2\text{SO}_4$  and used for treating metals such as iron and steel.

**Apparatus for pickling metals.** CHARLES W. KINTER. U. S. 1,722,001, July 23. Structural features.

**Wires and tapes for loading telephone conductors.** WILLOUGHBY S. SMITH and HENRY J. GARNETT. U. S. 1,723,215, Aug. 6. C-free loading wires or tapes are formed of Ni 30-33, Fe 58-65 and Cu 2-6%.

**Drawn tungsten wire.** RICHARD JACOBY (to General Elec. Co.). U. S. 1,723,862, Aug. 6. A filament is produced having zones of longitudinally disposed crystals, one surrounded by the other, the crystals in one zone overlapping the crystals in the other, and with each zone forming a longitudinal section of the filament distinguishable from the other. Cf. C. A. 22, 359.

**Colored coatings on metal articles by dipping.** ALADAR PACZ. U. S. 1,723,067, Aug. 6. Metal articles such as iron, steel, Sn, Al, Pb and Mg are dipped in a soln. contg. Na molybdate or other suitable sol. molybdate and a sol. F compd. such as Na fluosilicate which produces a dense protective colored coating on the material. Oxalates or  $\text{AlCl}_3$  may be used in some cases. Cf. following abstr.

**Coating and coloring metals.** A. PACZ. Brit. 302,943, June 22, 1927. Metallic articles formed mainly of metals such as Fe, Al, Sn, Pb, Zn, Mg or Cd are treated with a soln. contg. a sol. molybdate and a salt of oxalic, polysilicic, hydrofluoric or fluosilicic acids (in the absence of a simple salt of a metal of the Fe group other than Fe). Iron articles may be coated with Cu and then treated with a soln. contg. a sol. molybdate and fluoride and the articles may be subsequently treated with a soln. of chromates. In treating Zn and Cd  $(\text{NH}_4)_2\text{SO}_4$  is mixed with the molybdate before use. Al is pickled with a fluosilicate soln. before coating. Cf. preceding abstr.

**Coating metals with nitrocellulose and synthetic resin.** CARLETON ELLIS (to Ellis-Foster Co.). U. S. reissue 17,379, July 23. See original pat. 1,529,056 (C. A. 19, 1502).

**Coating ferrous metals with chromium or cobalt.** I. G. FARBENIND. A. G. Brit. 303,034, June 25, 1927. The metal is preliminarily coated with Ni, Cr or Co as a diffusing agent and the diffusion is effected in an inert atm. such as H or *in vacuo* at temps. at which the diffusing metal does not melt; e. g., iron is coated with a thin deposit of Ni plated with Cr and heated at 1100-1300° for several hrs. in H.

**Coating ferrous metal sheets with zinc and aluminum.** EARL R. WEHR, CARL C. MAHLIE and JOHN R. CAIN (to American Rolling Mill Co.). U. S. 1,722,949, July 30. The sheets are passed through a flux and into a bath of molten Zn and thence through a molten alloy of Zn and Al floating on the surface of the Zn. An app. is described.

**Forming superposed designs on metal plates.** WILLIAM H. WHEELER (to Fedco Number Plate Corp.). U. S. 1,722,778, July 30. A removable coating such as a varnish is applied to certain parts of a plate of Cu or other metal carrying a design, and a metal of different color such as Ni is applied to the remaining parts of the surface, a second design is embossed over the first, and the removable coating is then removed.

**Protecting copper.** SOC. CHIM. DES USINES DU RHÔNE. Fr. 34,166, Sept. 20, 1927. Addn. to 629,906. Vessels made of Cu or alloys thereof are protected against the action of org. acids, particularly AcOH, by adding  $\text{K}_4\text{Fe}(\text{CN})_6$  or other substances capable of pptg. Cu in acid medium.

**Inhibiting rust of ferrous metals.** R. FIBERHARD. Brit. 303,035, July 26, 1927. A rust-inhibiting compn. is prepd. by dissolving in  $\text{CH}_2\text{O}$  or other water-sol. compd. of aldehydic character a compd. produced by reducing with uric acid one or more compds. of Cr, Mo or W in the acidic state or of these metals or of Pb in the oxidic or peroxidic state. The reduction with  $\text{CH}_2\text{O}$  is effected in the presence of a catalyst such as powd.

the parts is mixed with a brazing flux and binder which may contain powdered Cu and Fe, borax and water and the whole mass is heated nearly to the m. p. of the copper section and molten brass is introduced within the pocket recess, followed by slow cooling of the united parts.

**Flux holder for welding operations.** JOHN C. LINCOLN (to Citizens Savings & Trust Co.). U. S. 1,722,929, July 30. A semi-permanent holder such as a metal or paper tube carries a predetd. charge of solid fluxing material such as  $\text{Na}_2\text{CO}_3$  with which is incorporated an air-excluding protective material, *e. g.*, resin.

**Arc-welding electrodes.** ALLOY WELDING PROCESSES, LTD., AND E. H. JONES. Brit. 303,996, Dec. 13, 1927. The coating of a metallic arc-welding electrode is provided with a film impermeable to moisture which may be formed by dipping the coated electrode in a cellulose acetate or nitrocellulose varnish or by mixing such a varnish or lacquer with the materials of which the coating is formed. Various compns. and details are described. Cf. *C. A.* 23, 3896.

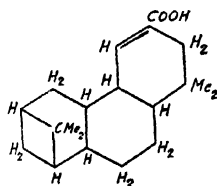
**Welding and soldering composition.** CHRISTOPH DÜRSCH. U. S. 1,722,040, July 23. A compn. suitable for use in uniting metals such as cast iron, Al, Cu or brass is formed by melting together brass, lead and borax 1 part each and mixing this mixt. with a second mixt. prepd. from powdered borax 1, pulverized soda 1 and pure salt 0.2 part and with water to form a paste.

**Soldering composition.** KARL GEISEL (to Aluminum Solder Corp. of America). U. S. 1,721,814, July 23. A compn. having a soldering temp. of about  $260^\circ$  which is suitable for soldering Al and Al-alloy castings comprises approx. Al 4.3, Zn 66.7 and Sn 29.0%.

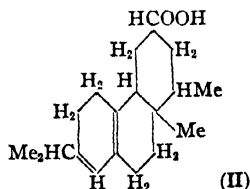
## 10—ORGANIC CHEMISTRY

CHAS. A. ROULLER AND CLARENCE J. WEST

The saturation capacity of rosin acids. IV. B. M. MARGOSCHES, K. FUCHS AND W. RUZICKA. *Chem. Umschau Fette, Oele, Wachse u. Harze* 36, 115-8 (1929).—Grün and Jancko showed that in the I no. detn. of rosin by iodometry a larger quantity of acid is found than can be explained by substitution, which probably has its origin in the splitting off an added halogen; pinene shows the same phenomenon and probably has the same unsatd. character, so that abietic acid also possesses a bridge bond and double bond. Then abietic acid is the result of a union of 1 mol. of  $\alpha$ - and  $\beta$ -pinene to form  $\text{C}_{20}\text{H}_{32}$  which on oxidation becomes I,  $\text{C}_{20}\text{H}_{30}\text{O}_2$ . Ruzicka's formula is based on the fact that abietic acid furnished an I no. that corresponds with the theory, indicating no substitution but a complete satn. of the bonds. If the  $\text{CO}_2\text{H}$  group were adjacent to the double bond (tertiary position) the latter would not be fully satd. in the I no. detn. But because of the difficulty of esterifying a primary union, the  $\text{CO}_2\text{H}$  group must be in a secondary position at some distance from the double bond.



(I)



(II)

Ruzicka reduced a Me ester of abietic acid; no hydrogenation occurred, but would have taken place if  $\text{CO}_2\text{H}$  had been adjacent to the double union. By fixing the  $\text{CO}_2\text{H}$  position through a series of reactions with  $\text{PCl}_5$  upon abietinol, the formula II has been worked out. With the exception of the *d*-primary acid all of the acids can be converted into the *l*-form of abietic acid, m.  $158^\circ$ . P. ESCHER

**Autooxidation of hydrocarbons.** P. DUMANOIS AND P. MONDAIN-MONVAL. *Bull. soc. ind. Mulhouse* 95, 243-72 (1929).—See *C. A.* 23, 2694. A. PAPINEAU-COUTURE

The connection between the zig-zag structure of the hydrocarbon chain and the alterations in the properties of odd- and even-numbered chain compounds. ALEX MÜLLER. *Proc. Roy. Soc. (London)* A124, 317-21(1929); cf. *C. A.* 23, 30.—Distinct structural differences between the odd and even members of hydrocarbon chains are shown by models. The alterations of the properties between odd- and even-numbered substances such as no. of mols. along the "c" axis, crystal habit, angle  $\beta$ , m. p., mol. vol., heat of crystn. and lattice energy are attributed to these differences.

**Melting points of normal paraffins.** J. H. HILDEBRAND AND A. WACHTER. *J. Am. Chem. Soc.* 51, 2487-8(1929).—A criticism of the m. ps. reported by Levene, West and van der Schuer (C. A. 9, 1610) for certain normal paraffins. From a curve of m. ps. of the hydrocarbons contg. 19 to 36 C atoms, the following "best values" are suggested (no. of C atoms and m. p. given): 19, 32°; 20, 36.5°; 21, 40.5°; 22, 44°; 23, 47.5°; 24, 51°; 25, 54°; 26, 57°; 27, 59.5°; 28, 62°; 29, 64°; 30, 66°; 31, 68°; 32, 70°; 33, 72°; 34, 73.5°; 35, 75°; 36, 76°.

**Polymerization and ring formation. I. Introduction to the general theory of condensation polymers.** WALLACE H. CAROTHERS. *J. Am. Chem. Soc.* 51, 2518-59 (1929).—Linear polymers conform to the type  $-R-R-R-R-$ , etc., which is characterized by a recurring structural unit. The structural unit  $R$  is a bi-valent radical. Two types of polymers are recognized. (1) Addn. or A polymers, the polymeric mol. is converted by heat into a monomer having the same compn as the structural unit, or the polymer is formed by the mutual addn. of a no. of such monomers. (2) Condensation or C polymers: the polymeric mol. is converted by hydrolysis or its equiv. to a monomer which differs in compn from the structural unit by one  $H_2O$  (or  $HCl$ ,  $NH_3$ , etc.). or the polymeric mol. is formed from nos. of the monomers by a process of polyintermol. condensation. Rubber, polystyrene, polyoxymethylene and paracetaldehyde are A polymers. Cellulose, silk fibroin and hexaethylene glycol are probably C polymers. Substances of the type  $x-R-x$  and  $y-R-y$  are called bifunctional. In these formulas  $-R-$  represents a bivalent radical and  $x$  and  $y$  are functional groups capable of reacting with each other in a known fashion to form the new functional group,  $z$ . Reactions of the type  $x-R-y \rightarrow \text{product}$  are called bifunctional and those of the type  $x-R-x + y-R-y \rightarrow \text{product}$  are called bi-bifunctional. Such reactions will lead to compds. contg. the structural units  $-R-z-$  and  $-R-z-R-z-$ . Bifunctional reactions will be intramol. and will lead to

the monomeric product,  $R-z$  when this can be a 5- or 6-ring. If the monomeric product

can only be a larger-than-6-ring, reaction will usually be intermol. and the product a polymer of the type,  $-R-z-R-z-R-z-R-z-R-z-$ , etc. II. Polyesters. W. H. CAROTHERS AND J. A. ARVIN. *Ibid* 2560-70.—The following esters have been prepd. by heating the acid and 5% excess of the glycol for about 3 hrs. at 175-85° and then at 200-50° and 0.2 mm. for 3 hrs. *Ethylene malonate*, liquid; *succinate*, m. 108°; *adipate*, m. 50°; *sebacate*, m. 79°; *trimethylene succinate*, m. 52°; *adipate*, m. 45°; *sebacate*, m. 56°; *hexamethylene succinate*, m. 57°; *adipate*, m. 56°; *sebacate*, m. 57°; *decamethylene succinate*, m. 58°; *adipate*, m. 77°; *sebacate*, m. 74°; *ethylene trimethylene*, *hexamethylene* and *decamethylene phthalates*, and *ethylene fumarate* and *maleate*. That the esters are not monomeric is indicated by their phys. properties and by their mol. wts. The lowest mol. wt. observed for any of the solid esters was 2300 and the highest 5000; the mean of all detns. is 3200. Such a mol. wt. corresponds with a value of 8 to 20 (depending on the length of the chain of the structural unit) for  $n$  in the general formula  $-(CO.R'.CO.O.R''.O-)_n-$ . While the disposition of the valences at the ends of the chains in the above formula cannot be definitely decided, it is provisionally assumed that  $HO$  groups are present at each end of the chain because of the presence of 1 more mol. of glycol than acid; the analytical values agree more closely for such a formula than for a cyclic formula. The phys. properties of these compds. are discussed.

**Synthesis of the isomeric 2-butenes.** WM. G. YOUNG, ROBERT T. DILLON AND HOWARD J. LUCAS. *J. Am. Chem. Soc.* 51, 2528-34(1929).—Starting with  $MeEtCO$ , the *cis*- and *trans*-2-butenes have been synthesized in a high state of purity. Necessary details are given for the prepn. and purification of the intermediate compds. ( $EtCH(OH)MeCO_2H$ , angelic and tiglic acids and their  $HI$  addn. compds.).

**Reaction between dichloroacetic acid and amylenes.** L. M. ANDREASOV. *Ukrainski Khim. Zhur.* 4, Sci. Pt., 93-4(1929).—A study was made of the reaction between amylenes and  $Cl_2CHCO_2H$  at 18° in the following solvents: benzene,  $CHCl_3$ ,  $CS_2$ .

EtOH and ether. The reaction did not proceed in presence of alc. or ether. In the presence of the other above-mentioned compds. it progressed very slowly. According to the velocity of reaction, the highest rate was observed in the presence of benzene, medium in  $\text{CHCl}_3$  and lowest in the presence of  $\text{CS}_2$ . ROBERT SCHLESS

**The limit of reaction of formation of trichloroacetoamylic ester in a mixture of solvents.** L. M. ANDREASOV. *Ukrainski Khim. Zhur.* 4, Sci. Pt., 89-92(1929); cf. C. A. 23, 3145, 3207.—A study was made of the limits of reaction between amylene and  $\text{Cl}_3\text{CCO}_2\text{H}$  in mixts. of solvents:  $\text{C}_6\text{H}_6\text{-CCl}_4$  and  $\text{CCl}_4\text{-CS}_2$  at  $25^\circ$ . These solvents are inactive, i. e., they do not lower the limits of esterification, and it was expected that the limits of reaction between amylene and  $\text{Cl}_3\text{CCO}_2\text{H}$  in a mixt. of inactive solvents should follow a straight line. This was not confirmed by expts.; they follow a curve the shape of which depends on the concn. of the reacting substances. ROBERT SCHLESS

**The preparation of amylene with a theoretical hydrogen value.** H. I. WATERMAN, P. VAN'T SPYKER AND H. A. VAN WESTEN. *Rec. trav. chim.* 48, 612-5(1929).—Amylene with a theoretical H value was prepd. from a Kahlbaum prepn. of amylene which on fractional distn. gave a fraction b.  $36^\circ$  with  $n_D^{20^\circ}$  1.3786,  $n_D^{20^\circ}$  1.3811,  $n_F^{20^\circ}$  1.3872 and  $n_F^{20^\circ}$  1.3924, the Br value being 208.4 (calcd. 228.1). On bromination in  $\text{CCl}_4$  with the theoretical amt. of Br, a mixt. of bromides was obtained in 50% yield,  $b_{17}$   $58\text{--}62.5^\circ$ . This mixt. was debrominated by heating with water and a freshly prepd. Zn-Cu couple, an amylene being obtained in 50% yield which  $b_{780}$   $36.8\text{--}8.4^\circ$ ,  $n_D^{20^\circ}$  1.3830,  $n_D^{20^\circ}$  1.3856,  $n_F^{20^\circ}$  1.3918 and  $n_F^{20^\circ}$  1.3973, had a Br value of 229.0 (calcd. 228.1), a thiocyanogen Br value of 228.5 (calcd. 228.1) (cf. Kaufmann, C. A. 22, 4845) and a H value of 100.8% (cf. Waterman, Perquin and van Westen, *J. Soc. Chem. Ind.* 47, 363T(1928)). The pentane obtained on hydrogenation had a Br value of 0.1,  $n_D^{20^\circ}$  1.3526,  $n_D^{20^\circ}$  1.3545 and  $b$   $28.85^\circ$ . According to the consts. given in the literature for several pentanes, this pentane chiefly consists of 2-methylbutane and it may, therefore, be assumed, that the original amylene prepn. consists chiefly of 2-methyl- $\Delta^2$ -butene.

C. F. VAN DUIN

**The additive properties of  $\alpha$ -diacetylenic hydrocarbons.** V. GRIGNARD AND TCHÉOUFAKI. *Compt. rend.* 188, 1531-4(1929); cf. C. A. 23, 2931.—Tetradeca-6,8-diene (I) with  $\text{Br}_2$  at room temp. yields  $\text{C}_{14}\text{H}_{22}\text{Br}\cdot\text{CBr}\cdot\text{CBr}\cdot\text{CBr}\cdot\text{C}_6\text{H}_{11}$ , m.  $118^\circ$  with resinification. At  $5^\circ$  there results a yellow liquid,  $\text{C}_{14}\text{H}_{22}\text{Br}_2$ , which darkens rapidly and on distn. gives 1-bromoheptene and a resin. Diphenyldiacetylene with  $\text{H}_2$  in  $\text{Et}_2\text{O}$ -EtOH with Pt O yields 20% *cis-cis*-diphenylbutadiene, 20% dibenzylacetylene and a liquid,  $b_{14}$   $185.7^\circ$ , which in light yields *trans*-diphenylbutatriene (II), m.  $95^\circ$ , which with  $\text{O}_3$  and then  $\text{Na}_2\text{SO}_4$  yields  $\text{BzH}$ . I with  $\text{HBr}$  yields 1,4-diphenyl-1-bromobutatriene, m.  $92^\circ$ , which on reduction yields II. All these addns. are 1,4. V. F. H.

**1,12-Dodecanediol and the diacetylenic hydrocarbons  $\text{C}_{14}\text{H}_{20}$  and  $\text{C}_{20}\text{H}_{34}$ .** R. LESPIEAU. *Bull. soc. chim.* 43, 1189-93(1928); cf. C. A. 19, 1850.—In addn. to the results given in C. A. 23, 817, the following work is reported.  $(\text{CH}_2)_7(\text{MgBr})_2$  (prepd. from  $(\text{CH}_2)_7\text{Br}_2$  and Mg) and  $\text{Br}(\text{CH}_2)_7\text{Br}$  give  $\text{CH}_3\cdot\text{CBr}(\text{CH}_2)_9\text{CBr}\cdot\text{CH}_3$  (I),  $b_{16}$   $180^\circ$ ,  $d$  1.274,  $n_D$  1.497, and  $\text{CH}_3\cdot\text{CBr}(\text{CH}_2)_{16}\text{CBr}\cdot\text{CH}_3$ ,  $b_{11}$   $249\text{--}52^\circ$ ,  $d$  1.120,  $n_D$  1.4915. I and alc. KOH give  $\text{CH}_3\cdot\text{C}(\text{CH}_2)_9\text{C}\cdot\text{CH}_3$ ,  $b_{12}$   $115.5^\circ$ , m.  $-3^\circ$  to  $-2^\circ$ . Analogously  $\text{CH}_3\cdot\text{C}(\text{CH}_2)_{16}\text{C}\cdot\text{CH}_3$  (II), m.  $54.6^\circ$ , was prepd. II and  $\text{AgNO}_3$  form  $\text{C}_{20}\text{H}_{32}\text{Ag}_2\cdot\text{CH}_3\cdot\text{C}(\text{CH}_2)_7\text{C}\cdot\text{CH}_3$ ,  $\text{EtMgBr}$  and  $\text{CO}_2$  give  $\text{CO}_2\text{HC}\cdot\text{C}(\text{CH}_2)_9\text{C}\cdot\text{CCO}_2\text{H}$  (III), m.  $111.5\text{--}2.5^\circ$ . III and H in the presence of Pt black give  $\text{CO}_2\text{H}(\text{CH}_2)_{11}\text{CO}_2\text{H}$ .

FREDERICK C. HAHN

**The partition of sodium between sodium hydroxide and sodium ethoxide or sodium methoxide in ethyl alcohol or methanol sodium hydroxide solutions.** J. M. F. CAUDRI. *Rec. trav. chim.* 48, 589-92(1929).—A peculiar sapon. curve was observed in the hydrolysis of phthalide with NaOH in aq. alc. solns. when the alc. content was between 50 and 80 vol. %, and an explanation of this fact was sought in the possible large diminution of the NaOEt on account of the formation of NaOH, when a little water is added to abs. alc. solns. (cf. C. A. 23, 3393). This hypothesis is supported by an investigation of Kremann (*Monatsh.* 26, 279(1905)) on the alk. sapon. of AcOEt in mixts. of MeOH, EtOH and PrOH and water. With increasing % of water the curve representing the connection between the reaction const. and the % of water added, is initially very flat with MeOH, somewhat steeper with EtOH and much steeper with PrOH, especially the latter curve being similar in shape to the curves found by C. (l. c.) for the hydrolysis of phthalide in mixts. of EtOH and water. It is concluded therefore that these similar curves emanate from a similar cause. The conclusion that NaOEt is decompd. to a considerable extent in abs. alc. soln. on the addn. of water

is in conflict with the assumption of Lobry de Bruyn and Steger (*Rec. trav. chim.* 18, 311(1899)) that even in dil. aq. alc. solns. of NaOH the Na is present chiefly in the form of the ethylate. These authors found that the addn. of water diminished the velocity of ether formation from alkyl iodides and NaOEt in EtOH while in MeOH the velocity of etherification first increased on the addn. of water, passed through a max. and then decreased again. C. has already shown (*l. c.*) that the conclusion of L. de B. and S. is not justified when subjected to a more searching math. investigation and now puts forward the following explanation. It is assumed that the velocity of ether formation in alcs. will be increased on the addn. of water just as is the case with the alcoholysis and hydrolysis of  $\text{Ac}_2\text{O}$  (to be published later by C.) and also, most probably, with the hydrolysis of esters by NaOH in mixts. of water and org. solvents (except alcs.), which may be compared with ether formation when the abnormal effect which has been attributed to the action of "dry" ions or mols., does not manifest itself. Alongside this increase there occurs also a decrease due to the reduction of the quantity of alcoholate, which is partly decompd. by water. If the above conclusion is correct, it at once follows that the decompn. of NaOEt in abs. alc. on the addn. of water, is fairly considerable, while the decompn. of NaOMe in aq. MeOH is much less. This is in agreement with the expts. of Kremann, mentioned above.

C. F. VAN DUIN

**Freezing temperature of organic compounds. XI. Compounds in  $\text{C}_6$  and  $\text{C}_8$ .** IWAN SIMON. *Bull. soc. chim. Belg.* 38, 47-70(1929).—Numerous phys. properties of 19 very pure compds. have been tabulated. The degree of accuracy is specially good. Among the most important data given: AmOH, m.  $-78.5^\circ$ , b. (cor.)  $138.00^\circ \pm 0.02$ ,  $d_4^{20}$  0.82897,  $d_4^{15}$  0.81837,  $d_4^{30}$  0.80764; AmCl, m.  $-99^\circ$ , b.  $108.35^\circ \pm 0.02$ ,  $d_4^{20}$  0.90137,  $d_4^{15}$  0.88657,  $d_4^{30}$  0.87163; AmBr, m.  $-95.25^\circ$ , b.  $129.70^\circ \pm 0.02$ ,  $d_4^{20}$  1.24264,  $d_4^{15}$  1.22367,  $d_4^{30}$  1.20456; AmI, m.  $-85.6^\circ$ , b.  $157.00^\circ \pm 0.02$ ,  $d_4^{20}$  1.54572,  $d_4^{15}$  1.52381,  $d_4^{30}$  1.50181;  $\text{Am}_2\text{S}$ , m.  $-51.33^\circ$ , b.  $230.1^\circ \pm 0.05$ ,  $d_4^{20}$  0.85538,  $d_4^{15}$  0.84394,  $d_4^{30}$  0.83243; AmPh, m.  $-78.25^\circ$ , b.  $205.3^\circ \pm 0.1$ ,  $d_4^{20}$  0.87411,  $d_4^{15}$  0.86261,  $d_4^{30}$  0.85100;  $\text{C}_{10}\text{H}_8$ , m.  $-30.1^\circ$ , b.  $173.75^\circ \pm 0.05$ ,  $d_4^{20}$  0.74571,  $d_4^{15}$  0.73443,  $d_4^{30}$  0.72306; AmH, m.  $-91.5^\circ$ , b.  $103.7^\circ \pm 0.1$ ; AmCN, m.  $-79.4^\circ$ , b.  $163.95^\circ \pm 0.02$ ,  $d_4^{20}$  0.82157,  $d_4^{15}$  0.80939,  $d_4^{30}$  0.79710;  $\text{AmCO}_2\text{H}$ , m.  $-3.9^\circ$ , b.  $205.35^\circ \pm 0.02$ ,  $d_4^{20}$  0.94423,  $d_4^{15}$  0.93136,  $d_4^{30}$  0.91832;  $\text{AmCO}_2\text{Et}$ , m.  $-67.5^\circ$ , b.  $167.85^\circ \pm 0.02$ ,  $d_4^{20}$  0.88956,  $d_4^{15}$  0.87583,  $d_4^{30}$  0.86196;  $\text{AmCOCl}$ , m.  $-87.3^\circ$ , b.  $152.60^\circ \pm 0.02$ ,  $d_4^{20}$  0.99541,  $d_4^{15}$  0.98047,  $d_4^{30}$  0.96540;  $\text{AmCONH}_2$ , m.  $101.0^\circ$ , ( $\text{AmCO})_2\text{O}$ , m.  $-40.6^\circ$ ,  $b_{14.8}$   $142.9^\circ$ ,  $d_4^{20}$  0.93630,  $d_4^{15}$  0.92397,  $d_4^{30}$  0.91155; MeCOAm, m.  $-35.5^\circ$ , b.  $151.45^\circ \pm 0.02$ ,  $d_4^{20}$  0.83239,  $d_4^{15}$  0.81966,  $d_4^{30}$  0.80680;  $\text{Am}_2\text{CO}$ , m.  $14.6^\circ$ , b.  $228.0^\circ \pm 0.05$ ,  $d_4^{15}$  0.82862,  $d_4^{30}$  0.81690; MeC(NOH)Am, m.  $0.9^\circ$ ,  $b_{12}$   $99.65^\circ$ ,  $d_4^{20}$  0.90677,  $d_4^{15}$  0.89494,  $d_4^{30}$  0.88298;  $\text{Am}_2\text{CNOH}$ , m.  $-20.4^\circ$ ,  $b_{12}$   $144.2^\circ$ ,  $d_4^{20}$  0.89012,  $d_4^{15}$  0.87945,  $d_4^{30}$  0.86869; AmCOPh, m.  $24.7^\circ$ , b.  $265.2^\circ \pm 0.1$ ,  $d_4^{25}$  0.95761,  $d_4^{30}$  0.95306;  $\text{C}_6\text{H}_{11}\text{Ph}$ , m.  $-66.8^\circ$ , b.  $227.35^\circ \pm 0.1$ ,  $d_4^{20}$  0.87527,  $d_4^{15}$  0.86394,  $d_4^{30}$  0.85259.

ALBERT I. HENNE

**Catalytic oxidation of alcohol. I.** YA. KARPOV. *Zhur. Prikladnoi Khim.* 1, 121-6(1928).—EtOH was oxidized to AcH with air in the presence of oxidized Cu, Fe and Ni gauzes, and  $\text{Cr}_2\text{O}_3$ , CoO,  $\text{Mn}_2\text{O}_4$ , CuO and  $\text{BaO}_2$  deposited on asbestos.  $\text{Fe}_2\text{O}_3$ ,  $\text{Mn}_2\text{O}_4$ , CuO and  $\text{Cr}_2\text{O}_3$  were the best catalysts. With Ni and Co some C was formed. AcH was further oxidized in presence of  $\text{Ni}_2\text{O}_3$  and  $\text{CrO}_2$  to AcOH. Decompn. of AcOH into  $\text{CH}_4$  and CO was higher at higher temps. With excess of  $\text{O}_2$ , HCHO,  $\text{H}_2\text{O}$  and  $\text{CO}_2$  were formed. The time of contact is important. The use of twice the theoretical amt. of air is recommended. With  $\text{Ni}_2\text{O}_3$  the best temp is  $170-90^\circ$  and with  $\text{CrO}_2$   $170-220^\circ$ .

V. KALICHEVSKY

**Trifluorated alcohols. II. Trifluoroisopropyl alcohol.** FRÉDÉRIC SWARTS. *Bull. soc. chim. Belg.* 38, 99-109(1929).— $\text{CF}_3\text{COMe}$  is quantitatively and rapidly reduced to  $\text{CF}_3\text{CHOHMe}$  (I), by mol. H under 48 atms. in the presence of Pt black. I is obtained in an anhyd. state only by distn. from concd.  $\text{H}_2\text{SO}_4$ , which does not attack it. Its phys. consts. are: m.  $-52^\circ$ ,  $b_{14}$  (cor.)  $77.7-0.9^\circ$ ,  $d_4^{15}$  1.2799,  $n_D^{16}$  1.32021,  $n_D^{15}$  1.31720,  $n_D^{14}$  1.31613,  $n_D^{25}$  1.32253, viscosities at  $15^\circ$ ,  $25^\circ$ ,  $35^\circ$ ,  $45^\circ$  and  $55^\circ$ , 0.02590, 0.02590, 0.01714, 0.01311 and 0.00995, resp., the solubilities in  $\text{H}_2\text{O}$  at  $0.1^\circ$ ,  $18^\circ$  and  $25^\circ$  are 1 part alc. in 3.7, 4 and 4.3 parts of water, resp., the mol. cond. of a 0.1694 N soln. at  $25^\circ$  is 0.42, the ionization coeff. is  $\alpha_{25} = 1.07 \times 10^{-4}$ . The alc. group is decidedly more acid than a phenolic group and decomp. carbonates, with formation of stable alcoholates. I is extreme stable toward dehydrating agents, even at high temps.

I treated with  $\text{H}_2\text{SO}_4$  and  $\text{BaSO}_4$  gives a stable complex salt:  $\text{Ba} \left[ \text{SO}_4\text{C}_5\text{H}_4\text{F}_3 \right]_2 \cdot \text{H}_2\text{O}$ . The bromide of I cannot be obtained from I and  $\text{HBr}$ , or I and  $\text{PBr}_3$ ; in the latter case  $\text{C}_5\text{H}_4\text{F}_3\text{OPBr}_2$  (II), m.  $48^\circ$ ,  $d_4^{15}$  1.988, is formed; II reacts violently with  $\text{H}_2\text{O}$ ,  $\text{EtOH}$  or  $\text{Br}$ . The pyrolysis of the reaction product obtained from 1 mol. II and 2 atoms Br gives  $\text{CF}_3\text{CHBrMe}$  (III), b.  $49^\circ$ ,  $d_4^{15}$  1.633. I and  $\text{AcCl}$  give  $\text{CF}_3\text{CHMeOAc}$ , b.  $85.6^\circ$ ,  $d_4^{15}$  1.1823,  $n_D^{15}$  1.33021,  $n_D^{15}$  1.3314,  $n_D^{15}$  1.33520,  $n_D^{15}$  1.33806, viscosities at  $20^\circ$ ,  $30^\circ$ ,  $40^\circ$  and  $50^\circ$ , 0.00726, 0.00625, 0.00546 and 0.00480, resp. The allophanate of I, m.  $159.7^\circ$  (decompn.). ALBERT L. HENNE

**Promoter action with oxide catalysts for the decomposition of alcohols.** HOMER ADKINS AND PAUL E. MILLINGTON. *J. Am. Chem. Soc.* 51, 2449-60 (1929).—The effect upon the ratio of simultaneous reactions of alcs. of the addn. of small amts. of various acidic and basic oxides to Zn, Fe, Ti and Al oxide catalysts has been exptly. investigated. The direction of the shift in the ratio of 2 competing reactions is not dependent upon the acidity or basicity of the promoter; both the direction and amt. of change in the ratio is sp. for the alc. and the catalyst; the relative rate of competing reactions may be modified by means other than through the addn. or removal of a compd. from the catalyst. These and other facts have been considered in their bearing upon the hypotheses which have been previously advanced to account for the variation in the ratio of competing reactions over various catalysts. C. J. WEST

**Reactions of allyl alcohol over aluminum and zinc oxide catalysts.** PAUL E. WESTON AND HOMER ADKINS. *J. Am. Chem. Soc.* 51, 2430-6 (1929); cf. *C. A.* 22, 3132.— $\text{CH}_2=\text{CHCH}_2\text{OH}$  (I) is converted to  $\text{EtCHO}$  (II) over  $\text{Al}_2\text{O}_3$  at  $330^\circ$ . This conversion apparently involves an intramol. rearrangement. This is in contrast to the conversion of I to II over ZnO, which depends at least in part upon the reduction of  $\text{CH}_2=\text{CHCHO}$  (III) by a mol. of alc. The activity of  $\text{Al}_2\text{O}_3$  for the conversion of I to II was reduced by the addn. of 1%  $\text{H}_3\text{BO}_3$ ,  $\text{CrO}_3$ ,  $\text{NaOH}$  or  $\text{H}_2\text{SO}_4$ . All except the last of these materials promoted the activity of ZnO toward I. A study has been made of the effect of modifications of ZnO catalysts upon the relative amts. of III or II produced from I at  $330^\circ$ . The source of the ZnO determines its selective action toward the 2 reactions of I; e. g., ZnO from Zn oxalate gave a higher % of III than did ZnO from  $\text{Zn(OH)}_2$ . The oxide from Zn oxalate could be reproduced easily, but that from  $\text{Zn(OH)}_2$  could not. The introduction of acidic or basic substances, such as  $\text{H}_3\text{BO}_3$ ,  $\text{CrO}_3$ ,  $\text{H}_2\text{WO}_4$ ,  $\text{H}_2\text{SO}_4$  and  $\text{NaOH}$ , into the ZnO caused a selective activation toward 1 or the other of the 2 reactions, but the effect seems to be sp. for the particular substance and does not depend on its acidic or basic character. C. J. WEST

**Aliphatic hydroterpenes.** V. LONGINOV AND MILLE E. MARGOLISS. *Bull. soc. chim.* [4], 45, 156-67 (1929).—Geraniol is reduced exclusively to tetrahydrogeraniol (I) by means of Pt black in alc.; in  $\text{Et}_2\text{O}$ , some 2,6-dimethyloctane is also formed. The direct dehydration of I to 2,6-dimethyl-7-octene (II) cannot be realized. I is transformed into its bromide (III),  $b_{10}$   $91-2^\circ$ ,  $d_4^{20}$  1.0368,  $n_D^{20}$  1.4534, by  $\text{HBr}$  in sealed tubes. III heated with quinoline gives II,  $b_{738}$   $154^\circ$ ,  $d_4^{20}$  0.7396,  $n_D^{20}$  1.4212. II is transformed into 2,6-dimethyl-6-octene (IV),  $b_{753}$   $161^\circ$ ,  $d_4^{20}$  0.7473,  $n_D^{20}$  1.4272, by adding  $\text{HBr}$ , then removing it with quinoline. The structure of IV is demonstrated by oxidation with cold  $\text{KMnO}_4$ , which gives  $\text{Me}_2\text{CH}(\text{CH}_2)_3\text{COMe}$ ; semicarbazone, m.  $155^\circ$ .

ALBERT L. HENNE

**Preparation of boric esters.** E. S. KHOTINSKII AND S. L. PUPKO. *Ukrainski Khim. Zhur.* 4, Sci. Pt., 13-8 (1929).—Boric esters are of some interest as they may serve as starting point for a series of syntheses. Fused borax is offered for the reaction of esterification, which is then thought to proceed as follows:  $3\text{Na}_2\text{B}_4\text{O}_7 + 6\text{HCl} + 15\text{EtOH} \rightarrow 6\text{NaCl} + 5\text{B(OEt)}_3 + 7\text{H}_3\text{BO}_3$ . Expts. have shown that this is a general method which can be employed in the lab. for prep. small amts. of boric esters without the aid of an autoclave. ROBERT SCHLESS

**Tertiary phosphines containing the higher alkyl radicals.** WALTER C. DAVIES, PERCY L. PEARSE AND WM. JACOB JONES. Univ. College, Cardiff. *J. Chem. Soc.* 1929, 262-8; cf. Davies and Jones, *C. A.* 23, 2150.— $\text{PCl}_3$  (12 cc.) in 50 cc.  $\text{Et}_2\text{O}$ , added to the Grignard reagent from 56 cc.  $\text{PrBr}$ , gives 10 g. tripropylphosphine,  $b_{50}$   $103.5^\circ$ ,  $b_{750}$   $187.5^\circ$ ,  $d_4^{20}$  0.807;  $\text{CS}_2$  compd., m.  $108^\circ$ ; mercurichloride, m.  $137^\circ$ . Methyltriethylphosphonium iodide, m.  $212.5^\circ$ ; tetrapropylphosphonium bromide, decomps.  $200^\circ$ .  $\text{PhPCl}_2$  (19 cc.) and the Grignard reagent from 36 cc.  $\text{PrBr}$  give 17 g. phenyldiethylphosphine,  $b_{50}$   $159^\circ$ ,  $d_4^{25}$  0.925; mercurichloride, m.  $192.5^\circ$ ; phenylmethyldiethylphosphine,

phonium iodide, m. 137°; phenyltripropylphosphonium bromide, m. 131.5°. *p*-MeC<sub>6</sub>H<sub>4</sub>PCl<sub>2</sub> (20 cc.) and the Grignard reagent from 36 cc. PrBr give 14 g. *p*-tolylidipropylphosphine, b<sub>60</sub> 174°, d<sub>4</sub><sup>25</sup> 0.921; mercurichloride, m. 129.5°; *p*-tolylmethylidipropylphosphonium iodide, m. 81.5°; *p*-tolyltripropylphosphonium bromide, m. 125.5°, hygroscopic needles, formed with difficulty. PCl<sub>3</sub> (14 cc.) and the Grignard reagent from 94 cc. iso-BuBr give 12 g. triisobutylphosphine, b<sub>60</sub> 126°; the CS<sub>2</sub> compd. forms highly unstable red crystals; mercurichloride, m. 191.5°. PhPCl<sub>2</sub> (11 cc.) and the Grignard reagent from 47 cc. iso-BuBr give 10 g. phenyldiisobutylphosphine, b<sub>60</sub> 168°, d<sub>4</sub><sup>25</sup> 0.910, mercurichloride, m. 158.5°; phenylmethylidiisobutylphosphonium iodide, m. 166.5°; *p*-MeC<sub>6</sub>H<sub>4</sub>PCl<sub>2</sub> (15 cc.) and the Grignard reagent from 47 cc. iso-BuBr give 6 g. *p*-tolylidiisobutylphosphine, b<sub>60</sub> 182.5–4.5°, d<sub>4</sub><sup>25</sup> 0.915; the HgCl<sub>2</sub> compd. could not be obtained pure; *p*-tolylmethylidiisobutylphosphonium iodide, an oil which crystallizes on long standing. PCl<sub>3</sub> (10.5 cc.) and the Grignard reagent from 78 cc. AmBr give 9 g. triamylphosphine, b<sub>60</sub> 185.5°, d<sub>4</sub><sup>25</sup> 0.820; CS<sub>2</sub> compd., m. 55°. Phenyldiamylphosphine, in 10 g. yield from 11.5 cc. PhPCl<sub>2</sub> and the Grignard reagent from 42 cc. AmBr, b<sub>60</sub> 210°, d<sub>4</sub><sup>25</sup> 0.902, only partially miscible with abs. EtOH at 15°; mercurichloride, m. 108°; phenylmethylidiamylphosphonium iodide, m. 90.5°. *p*-Tolylidiamylphosphine, b<sub>60</sub> 220°, d<sub>4</sub><sup>25</sup> 0.898; 11 g. yield from 11 cc. *p*-MeC<sub>6</sub>H<sub>4</sub>PCl<sub>2</sub> and the Grignard reagent from 51 cc. AmBr; this is less completely miscible with abs. EtOH than the Ph deriv., mercurichloride, m. 112°; *p*-tolylmethylidiamylphosphonium iodide, an oil which crystallizes on long standing. Tri-[dl-β-methylbutyl]phosphine, b<sub>10</sub> 113–7°, poor yield. Phenyl-di-[dl-β-methylbutyl]phosphine, b<sub>60</sub> 198°, d<sub>4</sub><sup>25</sup> 0.906, in 8 g. yield from 14 cc. PhPCl<sub>2</sub> and the Grignard reagent from 51 cc. of EtMeCHCH<sub>2</sub>Br; mercurichloride, m. 120°; phenylmethyl-di-[dl-β-methylbutyl]phosphonium iodide, m. 150°. *p*-Tolyl-di-[dl-β-methylbutyl]phosphine, b<sub>60</sub> 210–1°, d<sub>4</sub><sup>25</sup> 0.902, in 7 g. yield from 11 cc. *p*-MeC<sub>6</sub>H<sub>4</sub>PCl<sub>2</sub>; mercurichloride, m. 99°; *p*-tolylmethyl-di-[dl-β-methylbutyl]phosphonium iodide, m. 131°. Triisoamylphosphine, b<sub>11</sub> 131°, results in 9 g. yield from 10.5 cc. PCl<sub>3</sub> and the Grignard reagent from 78 cc. iso-AmBr, the reaction and purification being carried out in a CO<sub>2</sub> atm.; CS<sub>2</sub> compd., red, m. 79.5°; methyltriisoamylphosphonium iodide, an oil which solidifies on keeping. Phenyldiisoamylphosphine, b<sub>60</sub> 198.5°, d<sub>4</sub><sup>25</sup> 0.900, results in 10 g. yield from 14 cc. PhPCl<sub>2</sub>; mercurichloride, m. 152°; phenylmethyl-diisoamylphosphonium iodide, m. 181.5°. *p*-Tolyl-diisoamylphosphine, b<sub>60</sub> 210°, d<sub>4</sub><sup>25</sup> 0.894, mercurichloride, m. 107°; *p*-tolylmethyl-diisoamylphosphonium iodide, m. 150°. Phenyl-di-[δ-methylamyl]phosphine (phenyldiisohexylphosphine), b<sub>60</sub> 219, results in 7 g. yield from 13 cc. PhPCl<sub>2</sub>; the phenylmethyl- and ethyl-di-[δ-methylamyl]phosphonium iodides m. 146° and 115.5°, resp. *p*-Tolyl-di-[δ-methylamyl]phosphine, b<sub>60</sub> 234–5°, d<sub>4</sub><sup>25</sup> 0.888, mercurichloride, m. 110.5°; methiodide, difficult to recrystallize. No tert phosphine could be obtained when Grignard reagents from iso-PrBr and sec.-BuBr were employed

C. J. WEST

**Dichloromethylarsine.** ENRIQUE V. ZAPPI AND VENANCIO DEULOFEU. *Bull. soc. chim.* **43**, 1230–2(1928).—This compd. is obtained in 83% yield from Me<sub>2</sub>AsO<sub>2</sub>Na·3H<sub>2</sub>O and concd. HCl.

FREDERICK C. HAHN

**The yields of large-sized preparations of some organomagnesium halides.** HENRY GILMAN, EDITH L. ST. JOHN AND NINA B. ST. JOHN. *Rec. trav. chim.* **48**, 593 (1929).—The previous work of G. and his collaborators on the yields of a no. of typical organomagnesium halides under optimal conditions was carried out with about 0.05 mole of reactants. It was assumed in those studies that the yields as detd. in small runs would hold with larger preps. The present work establishes the validity of such an assumption, preps. of several typical RMgX compds. showing essentially the same yields. In general, the halide, dissolved in no more than 6 equivs. of ether, was added in 30–45 min. to commercially available Mg turnings, the reaction being completed by refluxing for 10 min. on the water bath. Then, after cooling, 5 cc. aliquots were withdrawn and titrated by the acid method of G., Wilkinson, Fisher and Meyers (cf. C. A. **17**, 530–1), the bulk of the Grignard compd. being converted into the corresponding CO<sub>2</sub>H acid by means of CO<sub>2</sub> according to the method of G. and Parker (cf. C. A. **19**, 467). The following results were obtained, the yields of the Grignard compds. as well as of the acids being given: BuBr 90%, 66%; PhCH<sub>2</sub>Cl 91%, 76%, PhBr 98%, 66%; α-C<sub>10</sub>H<sub>7</sub>Br 96%, 72%.

C. F. VAN DUIN

**Acetoxymercuric chloride.** FRANK C. WHITMORE AND G. J. LEUCK. *J. Am. Chem. Soc.* **51**, 2590–1(1929).—HgCl<sub>2</sub> and Hg(OAc)<sub>2</sub> in H<sub>2</sub>O give acetoxymercuric chloride, ClHgOAc, instead of the double salt as stated by Dimroth (*Ber.* **35**, 2044(1902)).



This salt is stable in soln. and cannot be used in place of  $\text{Hg}(\text{OAc})_2$  as a mercurating agent (negative results with  $\text{PhOH}$ ,  $p\text{-MeC}_6\text{H}_4\text{OH}$  and  $\text{PhNMe}_2$ ). C. J. WEST

**Detection of active hydrogen atoms with zinc ethyl.** F. HAURWITZ. *Mikrochemie* **7**, 88–93 (1929).— $\text{ZnEt}_2$  dissolves readily in pyridine with the evolution of heat and the formation of a yellow liquid which fumes only slightly in contact with air. This soln. forms a delicate test for the presence of active H in org. compds. in place of  $\text{MgMeI}$  as recommended by Zerevitinov (*Ber.* **40**, 2023–31 (1907)), but the test is not quant., as only 60–95% of the active H forms  $\text{C}_2\text{H}_6$ . With  $\text{BzOH}$  about 66% of the theoretical yield of  $\text{C}_2\text{H}_6$  is obtained, the remainder of the  $\text{BzOH}$  forming apparently a complex compd. with  $(\text{BzO})_2\text{Zn}$  which is unaffected by excess of the  $\text{ZnEt}_2$ . B. C. A.

**Action of hydrazine on some unsaturated acids**— $\text{C}_n\text{H}_{2n-2}\text{O}_2$ ,  $\text{C}_n\text{H}_{2n-4}\text{O}_2$ ,  $\text{C}_n\text{H}_{2n-6}\text{O}_2$ . J. HANUŠ AND J. VOŘÍŠEK. *Collection Czechoslov. Chem. Comm.* **1**, 223–7 (1929).—(Oleic acid (I) is reduced to stearic acid (II) when acted upon by  $\text{N}_2\text{H}_4 \cdot \text{H}_2\text{O}$  at room temp. The I salt of  $\text{N}_2\text{H}_4$  is an intermediary product. When I is refluxed with the reagent, II hydrazide is obtained but II itself is formed when the K salt is so treated. Elaidic acid and a mixt. of linoleic and linolenic acids give the same products as does I. J. M. LRVINE

**Methylated crotonic nitriles.** FR. DE LAET. *Bull. soc. chim. Belg.* **38**, 163–71 (1929).— $\text{Me}_2\text{C}:\text{CHCN}$  is best prepared from iso-PrCHO, through dehydration of the cyanohydrin with  $\text{P}_2\text{O}_5$ . The yield is 50% and the purification is an easy task. A 60% yield can be obtained from  $\text{ClCH}_2\text{CO}_2\text{Et}$  and  $\text{EtMgBr}$ , through treatment of the reaction product with KCN in alc. and final dehydration over  $\text{P}_2\text{O}_5$ , but the purification is almost impossible. The phys. properties are:  $b_{757}$  141.6–0.8°,  $d_4^{20}$  0.83136,  $n_D^{20}$  1.43396,  $n_D^{20}$  1.43720,  $n_B^{20}$  1.44598,  $n_\gamma^{20}$  1.45367. The nitrile is easily transformed into its amide, m. 107–8°, by digestion in 66%  $\text{H}_2\text{SO}_4$ .  $\alpha,\beta$ -Dimethylcrotonic nitrile is obtained from iso-PrCOMe, through dehydration of the cyanohydrin,  $b_{11}$  89°. Its phys. consts. are:  $b_{766}$  157.0–0.4°,  $d_4^{20}$  0.84321,  $n_\alpha^{20}$  1.44223,  $n_D^{20}$  1.44554,  $n_B^{20}$  1.45395,  $n_\gamma^{20}$  1.46117. Its amide, m. 130.5°, is obtained by digestion in concd.  $\text{H}_2\text{SO}_4$ . It was impossible to prep.  $\text{Me}_2\text{C}:\text{CHCN}$  from iso-PrCOEt by a similar method, because the dehydration of the cyanohydrin regenerates the original ketone. ALBERT HENNE

**Butenoic esters.** P. BRUYLANTS. *Bull. soc. chim. Belg.* **38**, 133–45 (1929).—Et vinylacetate (I) is best prepared from 1 mol. of the acid, 3 mols. of abs. EtOH and 15 cc. concd.  $\text{H}_2\text{SO}_4$ . Its phys. consts. are:  $b_{755}$  124.0–0.2°,  $d_4^{20}$  0.91224,  $n_\alpha^{20}$  1.40777,  $n_D^{20}$  1.41054,  $n_B^{20}$  1.41651,  $n_\gamma^{20}$  1.42154; its isomerization with NaOPh gives exclusively Et crotonate (II). The best method of prepn. of II is similar to that of I. Phys. consts. of II are:  $b_{748}$  136.6–0.8°,  $d_4^{20}$  0.91752,  $n_\alpha^{20}$  1.42196,  $n_D^{20}$  1.42524,  $n_B^{20}$  1.43266,  $n_\gamma^{20}$  1.43911. Et isocrotonate is best prepd. as I and II: it  $b_{749}$  125.5–6.0°,  $d_4^{20}$  0.91820,  $n_\alpha^{20}$  1.42124,  $n_D^{20}$  1.42423,  $n_B^{20}$  1.43137,  $n_\gamma^{20}$  1.43774. Et methylacrylate is best prepd. from Et  $\beta$ -chloroisobutyrate and pyridine in the presence of KI; it must be redistd. *in vacuo* on Ag powder to be absolutely pure, and will only then become stable:  $b_{88}$  56.6°,  $d_4^{20}$  0.91063,  $n_\alpha^{20}$  1.41179,  $n_D^{20}$  1.41472,  $n_B^{20}$  1.42111,  $n_\gamma^{20}$  1.42656. It can also be obtained from Et  $\alpha$  bromoisobutyrate and  $\text{PhNEt}_2$ , but is less easily purified. Et trimethyleneformate,  $\text{CH}_2\text{CH}_2\text{CHCO}_2\text{Et}$ , obtained as I,  $b_{750}$  132.4–0.6°,  $d_4^{20}$  0.96078,  $n_\alpha^{20}$  1.41640,  $n_D^{20}$  1.41902,

$n_B^{20}$  1.42426,  $n_\gamma^{20}$  1.42897.  $\text{CH}_2\text{CH}_2\text{CHCO}_2\text{H}$ ,  $d_4^{20}$  1.0885,  $n_\alpha^{20}$  1.43639,  $n_\gamma^{20}$  1.43901,  $n_B^{20}$  1.44529,  $n_D^{20}$  1.45051.  $\text{CH}_2\text{CH}_2\text{CHCN}$ ,  $d_4^{20}$  0.89461,  $n_\alpha^{20}$  1.42044,  $n_D^{20}$  1.42293,  $n_B^{20}$  1.42880,  $n_\gamma^{20}$  1.43355. ALBERT L. HENNE

**The preparation of phosphoacetic ester.** A. F. ARBUZOV AND G. KH. KAMAI. *J. Russ. Phys.-Chem. Soc.* **61**, 619–22 (1929).—Et phosphoacetate (I) was first prepd. by Arbuzov and Dunin (cf. *C. A.* **8**, 2551) by the action of  $\text{BrCH}_2\text{CO}_2\text{Et}$  on Et phosphide. Nylen (cf. *C. A.* **18**, 3167) obtained I in 50% yield by the action of halogen-substd.  $\text{AcOEt}$  on  $\text{NaEt}_2\text{PO}_3$  (II). The present study was undertaken to devise a method giving a larger yield of I. The reaction-solvent and the coagulation of the colloidal NaCl formed were found to be of great importance.  $\text{Et}_2\text{HPO}_3$  (III) prepd. by the usual method (cf. *Chem. Zentr.* **1906**, **II**, 749) was added dropwise to NaOEt, giving

**II**, which with  $\text{ClCH}_2\text{CO}_2\text{Et}$  gives **I** and  $\text{NaCl}$ . Yields of **I**: with ligroin as solvent, 56%; with  $\text{Et}_2\text{O}$ , 59.5%; with abs.  $\text{EtOH}$ , 94.6%. These yields were obtained only when the  $\text{NaCl}$  was rendered cryst. by addn. of 2-3 cc.  $\text{H}_2\text{O}$  to the reaction mixt. Coagulation of the  $\text{NaCl}$  by boiling with activated charcoal gave lower yields.

LEWIS W. BUTZ

**Syntheses with phosphoacetic ester.** A. E. ARBUZOV AND A. I. RAZUMOV. *J. Russ. Phys.-Chem. Soc.* **61**, 623-8(1929); cf. *C. A.* **20**, 2928; **21**, 1627; and refs. in preceding abstr.—Earlier attempts to prep. higher homologs of phosphoacetic acid were either unsuccessful or resulted in small yields. These should be useful in synthetic work since the H is easily replaced by Na and K, giving derivs. that react with halogen compds. by splitting out metallic halide. The present paper concerns itself with the interaction of  $\text{MeI}$  and of  $\text{PhCH}_2\text{Cl}$  (**I**) with the Na and K derivs. of phosphoacetic ester (**II**).  $\text{MeI}$  with **II** (Na deriv.) gave only 40.5% of the expected *tri-Et*  $\alpha$ -phosphopropionate,  $(\text{EtO})_2\text{POCHMcCO}_2\text{Et}$  (**III**), and only 50%  $\text{NaI}$ .  $\text{EtI}$  and the acid ester of  $\alpha$ -phosphopropionic acid (*mono-Na salt*) (**IV**) were formed as by-products.  $\text{MeI}$  and the K deriv. of **II** gave **III** in 85% yield. It is suggested that the Na deriv. of **II** exists in 2 tautomeric forms. The reactions with **I** were more difficult to study, since **I** reacts much less easily than  $\text{MeI}$ , and the org. product is less readily sepd. from the metallic halide. Sapon. of **III**,  $b_p$  126.5-7°, as well as of the free di-Et ester obtained from **IV**, by heating in sealed tubes with  $\text{HCl}$ , gives white, hygroscopic  $\alpha$ -phosphopropionic acid,  $(\text{HO})_2\text{POCHMcCO}_2\text{H}$  (**V**), m. 119-32°, sol. in  $\text{H}_2\text{O}$ ,  $\text{EtOH}$ , and other org. solvents. Salts of **V**, prepd. from **V** and metallic carbonates, could not be crystd. With **I** it was necessary to heat the mixt. throughout the reaction, and only the K deriv. of **II** gave a weighable yield of *benzylphosphoacetic ester* (**VI**). **VI** was obtained in 22% yield by heating the mixt. 5-6 hrs. on the  $\text{H}_2\text{O}$  bath, as a colorless liquid,  $b_p$  180-0.5°,  $d_4$  1.1349. Sapon. of **VI** gave white, extremely hygroscopic *benzylphosphoacetic acid*,  $(\text{OH})_2\text{POCH}(\text{PhCH}_2)\text{CO}_2\text{H}$ , m. 137-45°, sol. in  $\text{H}_2\text{O}$ ,  $\text{EtOH}$ , petroleum ether, and other org. solvents.

LEWIS W. BUTZ

**Interaction of bromine with acetic anhydride.** V. Bromination and chlorination compared. Some properties of acetic chloroacetic anhydride. HERBERT BEN WALSON AND CECIL EDWARD GREGORY. *J. Chem. Soc.* **1929**, 1373-5; cf. *C. A.* **23**, 819.  $\text{ClCH}_2\text{CO}_2\text{Ac}$ , on heating, decomps. into mol. quantities of  $\text{Ac}_2\text{O}$  and  $(\text{ClCH}_2\text{CO})_2\text{O}$ , refluxed with a mol. proportion of  $\text{ClCH}_2\text{CO}_2\text{H}$ ,  $\text{AcOH}$  and  $(\text{ClCH}_2\text{CO})_2\text{O}$  are formed.  $\text{HCl}$  gives  $\text{AcCl}$  and  $\text{ClCH}_2\text{CO}_2\text{H}$ . Refluxing 120 g.  $\text{AcOH}$  and 225 g.  $\text{ClCH}_2\text{COCl}$  at 100° gives  $\text{HCl}$  (loss in wt., 60 g.), a fraction of 50 g. of  $\text{AcCl}$ , 30 g., b. 54-150°, giving some  $\text{AcCl}$  and  $\text{Ac}_2\text{O}$  but principally  $\text{AcOH}$ , 70 g. b. 150-200°, giving some  $\text{AcOH}$  and a mixt. of  $\text{ClCH}_2\text{CO}_2\text{H}$  and its anhydride, m. 38-47°, and 135 g.  $(\text{ClCH}_2\text{CO})_2\text{O}$ . If, after removing the  $\text{AcCl}$ , the remaining mixt. is distd. at 20 mm., a fraction b. 80-5°, consisting mainly of  $\text{ClCH}_2\text{CO}_2\text{Ac}$ , is obtained. The scheme previously put forward to represent the halogenation of  $\text{AcOH}$  is thus completely confirmed, with the single modification that the reaction  $\text{XCH}_2\text{COX} + \text{AcOH} \rightleftharpoons \text{AcX} + \text{XCH}_2\text{CO}_2\text{H}$  may be written in 2 stages:  $\text{XCH}_2\text{COX} + \text{AcOH} \rightleftharpoons \text{XCH}_2\text{CO}_2\text{Ac} + \text{HX}$ ;  $\text{XCH}_2\text{CO}_2\text{Ac} + \text{HX} \rightleftharpoons \text{XCH}_2\text{CO}_2\text{H} + \text{AcX}$ ; for the exptl. results lead inevitably to the conclusion that the halogen reacts with the acyl halide, the monohalogenated acid being formed as the result of a reaction between the acid and the substituted halide.

C. J. WEST

**The glycol industry.** HANS SCHRADER. *Z. angew. Chem.* **42**, 541-6(1929).—The technical methods of prepn. are given for ethylene glycol, ethylene oxide, propylene oxide, 1,4-dioxan and the esters, ethers and amines of both glycols. Diethylene glycol is also described. Statistics on production and factors affecting the price are discussed.

J. G. McNALLY

**Tetramethylene glycol and tetramethylene chlorohydrin.** W. R. KIRNER AND G. HOLMES RICHTER. *J. Am. Chem. Soc.* **51**, 2503-6(1929).—The following synthesis was based on the work of Bennett (*C. A.* **19**, 2640) and B. and Hock (*C. A.* **21**, 1639). The following steps were involved (yields are given, the over-all yield being 11%):  $\text{PhCH}_2\text{Cl} + \text{NaOCH}_2\text{CH}_2\text{OH} \rightarrow \text{PhCH}_2\text{OCH}_2\text{CH}_2\text{OH}$  (65%)  $\rightarrow (\text{SOCl}_2 + \text{C}_6\text{H}_5\text{N}) \text{PhCH}_2\text{OCH}_2\text{CH}_2\text{Cl}$  (86%)  $\rightarrow (\text{Na} + \text{CH}_2(\text{CO}_2\text{Et})_2) \text{PhCH}_2\text{OCH}_2\text{CH}_2\text{CH}(\text{CO}_2\text{Et})_2$  (75%)  $\rightarrow$  (hydrolysis)  $\text{PhCH}_2\text{O}(\text{CH}_2)_2\text{CO}_2\text{H}$  (97%)  $\rightarrow (\text{EtOH} + \text{H}_2\text{SO}_4) \text{PhCH}_2\text{O}(\text{CH}_2)_2\text{CO}_2\text{Et}$  (77%)  $\rightarrow (\text{Na} + \text{EtOH}) \text{PhCH}_2\text{O}(\text{CH}_2)_2\text{OH}$  (45-55%)  $\rightarrow (\text{HBr}/\text{HO}(\text{CH}_2)_2\text{OH})$  (70%). Muller's method (*C. A.* **22**, 3391), involving the reduction of di-Et succinate, appears to be cheaper, simpler and more rapid. The glycol in  $\text{C}_6\text{H}_5\text{N}$  and  $\text{SOCl}_2$  give 47% of  $\text{HO}(\text{CH}_2)_4\text{Cl}$ ,  $b_p$  84-5°,  $d_4^{20}$  1.0883,  $n_D^{20}$  1.4518; *phenylurethan*, m. 54°;  $\alpha$ -naphthylurethan, m. 69-70°.

C. J. WEST

**Determination of the configuration of polyalcohols by means of boric acid.** J. BÖRSEKEN. *Bull. soc. chim. Belg.* 37, 385–402 (1928).—A lecture. H. L. D.

**Several syntheses of bromomethiononic acid.** H. J. BACKER. *Rec. trav. chim.* 48, 616–21 (1929).—Bromomethiononic acid can be prepd. as follows: (1) by sulfonation of  $\text{CH}_2\text{BrCO}_2\text{H}$  or  $\text{HO}_2\text{SCHBrCO}_2\text{H}$  (cf. Backer, *C. A.* 20, 900); (2) by hydrolysis of  $\text{HCOCBr}(\text{SO}_3\text{H})_2$  with alkali; (3) by bromination of  $\text{CH}_2(\text{SO}_3\text{H})_2$ ; (4) by decompn. of  $\text{N}_2\text{C}(\text{SO}_3\text{H})_2$  with  $\text{HBr}$ ; (5) by interaction of  $\text{Br}_2\text{CHSO}_3\text{K}$  with  $\text{K}_2\text{SO}_3$ . Methods (2), (3), (4) and (5) are described in this paper, method (2) giving the best results. The hydrolysis of  $\text{HCOCBr}(\text{SO}_3\text{H})_2$  was carried out by heating 37.7 g. of the K salt of the acid (cf. Backer, *C. A.* 23, 3209), 30 cc. water and 20 cc. 5 *N* KOH until everything has passed into soln.; after cooling down the normal K salt is obtained in 86% yield by the addn. of 50 cc. alc. On recrystn. from water this K salt may be obtained without or with 1 mole of water of crystn.; at 25° 100 g. water dissolves 40.8 g. of the anhyd. salt  $\text{BrCH}(\text{SO}_3\text{H})_2$  easily gives a normal strychnine salt, which is difficultly sol. in water and may be used for the purification of the acid as well as for the prepn. of the free acid and other salts; it contains 3  $\text{H}_2\text{O}$ . The following salts were prepd. in the usual way: normal Ba, contg. 4 or 4.5  $\text{H}_2\text{O}$ ; normal Na, contg. 2  $\text{H}_2\text{O}$ , monoclinic crystals with the following properties:  $a:b:c = 0.9719:1:10.9457$ ,  $\beta = 71.56'$ , observed forms,  $a(100)$ ,  $q(110)$ ,  $o(111)$ ,  $r(011)$ ,  $\omega(\bar{1}11)$ ,  $c(001)$ ; normal Ti, anhyd.; monoclinic crystals;  $a:b:c = 1.3572:1:1.8728$ ,  $\beta = 70.27'$ , observed forms,  $a(100)$ ,  $\omega(111)$ ,  $p(101)$ ,  $c(001)$ ,  $o(111)$ ; 100 g. of water dissolves at 25° 16.7 g. of the anhyd. Ti and 22.80 g. of the anhyd. Ba salt. From the latter was prepd. the free acid, which contains 211.0 and m. 125–6°. The bromination of  $\text{CH}_2(\text{SO}_3\text{H})_2$  was carried out by heating 0.05 mole of the acid, 10 g. water, 9 g. Br and 5 cc. of a satd. HBr soln. during 5 hrs. at 250°; yield 25% after purification by means of the Ba salt. In order to convert  $\text{N}_2\text{C}(\text{SO}_3\text{H})_2$ , prepd. according to v. Pechmann and Manck (*Ber.* 28, 2377 (1895)) into  $\text{BrCH}(\text{SO}_3\text{H})_2$ , 14.8 g. was brought into 40 cc. concd. HBr at 0°; yield 70% after purification by means of the strychnine salt. The interaction of  $\text{BrCHSO}_3\text{K}$  (Backer, *C. A.* 21, 2871) with  $\text{K}_2\text{SO}_3$  is not suitable for the prepn. of  $\text{BrCH}(\text{SO}_3\text{H})_2$ , reduction taking place simultaneously with formation of  $\text{CH}_2(\text{SO}_3\text{H})_2$ . C. F. VAN DUIN

**Partial esterification of polyhydric alcohols. VIII. Proposed standards of reference in work on the configuration of glycerol derivatives.** ARTHUR FAIRBOURNE. King's College, London. *J. Chem. Soc.* 1929, 1151–3; cf. *C. A.* 23, 2152.—Hibbert, Whelen and Carter (*C. A.* 23, 818) state that all 5 of the possible glycerol Me ethers have been isolated:  $\alpha$ - and  $\beta$ -mono-Me;  $\alpha,\beta$ - and  $\alpha,\gamma$ -di-Me and  $\alpha,\beta,\gamma$ -tri-Me. It is now shown that the  $\alpha,\beta$ -di-Me ether of Gilchrist and Purves (*C. A.* 20, 376) is identical with the  $\alpha,\gamma$ -di-Me ether of Zunino (*Atti accad. Lincei* 6, 348 (1897)), both yielding the same *p*-nitrobenzoyloxydimethylmethoxypropane, m. 43°. One di-Me ether, therefore, is still unknown, and the structure of the known ether is still unproved. C. J. W.

**Note on the paper, "Configuration of Pentaerythritol," by Böresken and Felix.** A. SEMENTZOV. *Ber.* 62B, 514 (1929); cf. *C. A.* 22, 2367.—A theoretical discussion of the steric configuration of the C atom on the basis of the results of B. and F. E. K.

**Biochemistry of sulfur. III. Chemical groups involved in the naphthoquinone reaction for cysteine and cystine.** M. X. SULLIVAN AND W. C. HESS. *U. S. Pub. Health Repts.* 44, 1599–1608 (1929); cf. *C. A.* 20, 2686; 23, 3941.—S. and H. give the method of prepn., a modification of Hofmann's potash fusion of a thiazole, of *o*-aminophenyl mercaptan, and its disulfide  $(\text{H}_2\text{NC}_6\text{H}_4)_2\text{S}_2$  and cystine-amine. Since aminothiophenol is negative and especially since cystine-amine  $(\text{H}_2\text{NCH}_2\text{CH}_2)_2\text{S}_2$  fails to give the typical reaction given by cystine it would seem that, for the Sullivan cystine reaction, 3 nonsubstituted groups are necessary, the (SH),  $(\text{NH}_2)$  and  $(\text{CO}_2\text{H})$  groups, and that it is given (A) only by cystine  $\text{HSCH}_2\text{CH}(\text{NH}_2)\text{CO}_2\text{H}$  or cystine  $[\text{HO}_2\text{CCH}(\text{NH}_2)\text{CH}_2]_2\text{S}_2$  after reduction or (B) by compds. of the same configuration of the aliphatic series. Insofar as is known, cysteine and cystine, free or combined, are the only compds. of this nature occurring in vegetable or animal tissue or exts. thereof. It is planned to test out the effect of lengthening the C chain and thus sepg. the reacting groups and to test the reaction of isomers such as isocysteine and isocystine. J. A. KENNEDY

**Methylation of *dl*-glyceraldehyde.** H. GORDON REEVES. *J. Chem. Soc.* 1929, 1327–9.—Methylation, hydrolysis and reduction should distinguish between the 2 possible structures,  $\text{HOCH}(\text{CH}_2\text{OH})\text{O}$  and  $\text{HOCH}(\text{CH}(\text{OH})\text{CH}_2\text{O})$ , since the

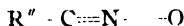
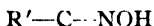
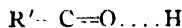
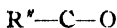
1st should give  $\text{HOCH}_2\text{CH}(\text{OH})\text{CH}_2\text{OMe}$  and the 2nd,  $\text{MeOCH}(\text{CH}_2\text{OH})_2$ . However, it has not been possible to obtain a completely methylated deriv.  $\text{Me}_3\text{SO}_4$  and  $\text{NaOH}$ , at increasing temps. up to 100°, gave 10% of a pale yellow oil, which did not reduce

Fehling soln. and in which MeI and Ag<sub>2</sub>O did not increase the MeO content; the formula suggested is:  $\text{O} \cdot \text{CH}(\text{CH}_2\text{OH}) \cdot \text{CH}(\text{OMe}) \cdot \text{O} \cdot \text{CH}(\text{CH}_2\text{OH}) \cdot \text{CHOMe}$ . Heating the

aldehyde in MeOH at 100° for 24 hrs. gives a non-reducing brown oil, with 22.3% MeO, which could not be methylated further. Shaking the aldehyde in MeOH (100 cc. contg. 4 g. HCl) for 24 hrs. gives a *mono-Me deriv.*, m. 204.5° (av. yield of 10 expts., 5%), which does not reduce Fehling or Benedict soln. even when hot; Fischer and Taube (C. A. 22, 223) obtained a bimol. Me cycloacetal, m. 158.5–9.5°, from the di-Ac deriv.

C. J. WEST  
**Dioximes. LII.** G. B. SEMERIA AND B. SOMIGLIANA. *Gazz. chim. ital.* 59, 258 (5 (1929); cf. C. A. 23, 754, and Ponzio and Melone, C. A. 23, 3665.—The conclusions reached by Ölander in his work on the kinetics of formation of Me<sub>2</sub>CNOH (I) (cf. C. A. 22, 344) induced S. and S. to study the influence of the *p*<sub>H</sub> value on the reaction in which oximes of compds. contg. an oximino group are formed, i. e., where dioximes are formed from so-called isonitroso ketones of the form R'CO(:NOH)R". MeCOC(:NOH)H (II) was chosen because it is sol. in water and forms on oximation a dioxime MeC(:NOH)C(:NOH)H (III) which exists in but 1 form which is sol. in water. Since it was impossible to det. rapidly II and III, the method used by Ölander was used, i. e., detg. iodometrically the NH<sub>2</sub>OH (IV) consumed in very dil. solns. of *p*<sub>H</sub> 7.4, in which the iodohydroxylamine equiv. was kept const. The exptl. results show that in solns. of an acidity from *p*<sub>H</sub> 1.2 to 12.0, the formation of III from II, thus: II + IV → III + H<sub>2</sub>O, is not satisfied by the simple formula of bimol. reactions; in fact, by calcg. the reaction velocity const. K for each acidity by the formula  $K = (T - T_n) / (CT_n(t_n - t))$ , for various titers (T) and corresponding times (t) the values obtained differ even more than 1 unit in the 1st significant figure. Nor is the relation of Ölander for the formation of I from AcMe (which would agree with the simple relation above for the reaction in solns. with *p*<sub>H</sub> 5–8) applicable. Moreover, unlike I, the formation of which is rapid at *p*<sub>H</sub> 5–8, is slower at higher *p*<sub>H</sub> values, and is rapid again in strongly basic solns., the formation of III increases with increase in *p*<sub>H</sub>. The hypothesis of Ölander that the intermediate compd. Me<sub>2</sub>C(NHOH)OH is formed may apply in the present case, where the compd. would be Me(HO)C(NHOH)C(:NOH)H. But the increase in velocity of the reaction with increase in *p*<sub>H</sub> can be explained only by the fact that II, whose structure in soln. is MeCOC(:NOH)H, is gradually transformed (as the soln. becomes more basic) to a yellow salt in which both carboxyl and metal have secondary valences. On the other hand a study of the absorption spectra of isonitroso ketones led Baly, Marsden and Stewart to the conclusion (cf. *J. Chem. Soc.* 89, 966(1906)) that they behave as cyclic non-carbonylic compds., thus:  $\text{R} \cdot \text{C} : \text{CR}'' \cdot \text{N}(\text{OH}) \cdot \text{O}$ , which as salts in soln. are in equil. thus:  $\text{R}'\text{NaC}(\text{N}(\text{O})\text{C}(\text{O})\text{R}''$

$\rightleftharpoons \text{R}'(\text{NaON})\text{CC}(\text{O})\text{R}''$ . The expts. of S. and S., which are based on entirely different concepts, are not at variance with these ideas if the equil.:



is displaceable toward the right with increase in *p*<sub>H</sub>. Solns. with *p*<sub>H</sub> values of 4.6–9 were prepd. by mixing 1/15 mol. Na<sub>2</sub>HPO<sub>4</sub> with 1/15 mol. KH<sub>2</sub>PO<sub>4</sub>, those with *p*<sub>H</sub> above 9 from 0.1 N NaOH with 0.05 mol. Na<sub>2</sub>HPO<sub>4</sub>, those with *p*<sub>H</sub> 3 from 0.1 N HCl and 0.1 mol. Na citrate, and those with *p*<sub>H</sub> below 3 from 0.1 N KCl. With these solns. there was no change in acidity. Detns. of *p*<sub>H</sub> were made by the Hellige method, instead of the electrometric method, because of the rapidity necessary and because the H and quinhydrone electrodes were impossible for chem. reasons. Five cc. of 0.1 M II soln. and 5 cc. of 0.1 M HONH<sub>2</sub>Cl soln. at 20° were added with const. agitation to 500 cc. of *p*<sub>H</sub> soln. at 20°, 5-cc. samples were withdrawn periodically during 2 hrs., and by addn. of suitable NaOH, HCl, Na<sub>2</sub>HPO<sub>4</sub>, or KH<sub>2</sub>PO<sub>4</sub> solns. the *p*<sub>H</sub> of 7.4 was reached in the shortest possible time. Five cc. of I soln. were then added immediately and the soln. titrated with Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub>. The II used in the expts. was crystd. from very dil. solns. in CCl<sub>4</sub>, in which case it m. 68–9°. Unlike the product from other solvents, it does not then alter with time. The results, which are given in tabular and graphical

$\text{PhC:N.O.N(:O):CH}$  and  $\text{PhC:N(:O).O.N:CH}$  are the same compd., *i. e.*, an impure

Ph peroxide arising from impure reagents; (2) hydrogenation of  $\alpha\text{-PhC(:NOH)C(:NOH)H}$  (I) with  $\text{N}_2\text{O}_4$  gives a compd. (m.  $112^\circ$ ) which is quite different from its isomer (m.  $108^\circ$ ) prepd. from  $\beta\text{-PhC(:NOH)C(:NOH)H}$  (II) by 4 *N*  $\text{HNO}_3$ ; (3) the compd.  $\text{PhC:N.O.N:COH}$  does not exist (cf. Scholl, *Ber.* 23, 3503(1890)); (4)  $\text{PCl}_5$  with the

peroxide of Wieland and Semper (cf. *C. A.* 2, 1012) (from I) does not form  $\text{PhC:N.O.N:CH}$  (III) but  $\text{ClC:N.O.CPh:N}$ , and (5) neither of the 2 products of

the dehydrogenation of I and II can have the structure  $\text{PhC:N.O.N(:O):CH}$  (IV) or

$\text{PhC:N(:O).O.N:CH}$  (V), *i. e.*, cannot be furoxans. Reasons have already been given

(cf. Ponzio and Avogadro, *C. A.* 21, 1976) why the deriv. of I is  $\text{PhC(:NOH)C:N:O}$  (VI) and that from II is  $\text{PhC:N.O.O.N:CH}$  (VII). To these reasons should be added

that while the asym. azoxy derivs.  $\text{R'N(:O):NR''}$  can both be reduced to  $\text{R'-N-NR''}$  derivs. (cf. *Rend. accad. Lincei* 21, I, 155(1912)), only VI can be reduced by  $\text{SnCl}_2$  to III. VII with no extranuclear O is stable toward  $\text{SnCl}_2$ . To this discussion is now added a new exptl. proof, which is based on purely phys. data. Conforming to the idea of Bruni (cf. *Sammlung Chemisch-technischer Vorträge* 6, 415(1901)) that the formation of solid solns. (and resulting cryometric abnormalities) depend upon similar structures of solute and solvent, VI and VII should show normal wts. in III, and by analogy  $p\text{-MeC}_6\text{H}_4\text{C(:NOH)C:N:O}$  (cf. Avogadro, *C. A.* 18, 1491) and  $p\text{-MeC}_6\text{H}_4\text{C:N.O.O.N:CH}$  (cf. Ponzio and Avogadro, *C. A.* 21, 1976) should show

normal wts. in  $p\text{-MeC}_6\text{H}_4\text{C:N.O.N:CH}$  (VIII), whereas IV and V and the furoxans

$\text{MeC}_6\text{H}_4\text{C:N(:O).O.N:CH}$  and  $\text{MeC}_6\text{H}_4\text{C:N.O.N(:O):CH}$  should form solid solns.

with the corresponding furazans (III and VIII), which should show abnormal mol. wts. Since the compds. of the 2 series are all solids, since they melt without decompn. at relatively low temps. and since they can readily be obtained in a pure state, it was to be expected that very precise phys. measurements could be made. Cryometric measurements of the mol. wts. of the dehydrogenation products of I, of II and of  $p\text{-MeC}_6\text{H}_4\text{C(:NOH)C(:NOH)H}$  (IX), each in III and in VIII, were made. In all cases normal mol wts were found, *i. e.*, no solid solns. were formed, and therefore the presence in the dehydrogenation products of a penta-atomic furazanic ring is excluded. Consequently, as already shown by chem. reactions, the dehydrogenation products of I, II and IX are not furoxans.

C. C. DAVIS

**Condensation of acetaldehyde with methylmalonic ester. Methylations with methyl bromide.** HOWARD J. LUCAS AND WM. G. YOUNG. *J. Am. Chem. Soc.* 51, 2535-8(1929).— $\text{MeBr}$  may satisfactorily replace  $\text{MeI}$  in the prepn. of the Me derivs. of  $\text{CH}_2(\text{CO}_2\text{Et})_2$  and  $\text{AcCH}_2\text{CO}_2\text{Et}$ . An app. is described for carrying out the prepn. of the  $\text{MeBr}$  and the bromination in 1 step. Heating  $\text{MeCH}(\text{CO}_2\text{Et})_2$ ,  $\text{AcH}$  and  $\text{Ac}_2\text{O}$  at  $140^\circ$  for 50 hrs. gives 63% of *di-Et 3-hydroxybutane-2,2-dicarboxylate*,  $b_{3-6}$   $100\text{--}6^\circ$ ,  $d_4^{21}$  1.0732; *diamide*, m.  $209.5^\circ$  (cor., decompn.). The ester could not be sapon. by alc.  $\text{KOH}$  to the acid.

C. J. WEST

**Walden inversion.** II. HANS N. K. RØRDAM. *J. Chem. Soc.* 1929, 1282-90; cf. *C. A.* 23, 101.—R. has proposed a new hypothesis of the reaction mechanism of the Walden inversion, the fundamental assumption being that the optically active mol., after splitting off 1 of the radicals linked to the asym. C atom, oscillates between 2 configurations, each of which, by the addn. of a new radical, will produce only 1 of the 2 possible optical antipodes. From the point of view of this hypothesis 2 distinct types of inversions are postulated, depending upon the character of the non-asym. component in the reaction: (I) Reactions where the splitting of the optically active mol. either occurs spontaneously or is caused by some mol. which is neither identical with nor contains the entering radical; in this type both *d*- and *l*-forms are produced in amts. which depend upon the concns. (II) Reactions where the splitting of the optically active mol. is brought about by a mol. contg. the radical which displaces the ejected radical. Reactions must also be expected which represent a transition stage between the 2 types, or which actually proceed simultaneously in the 2 different

typical ways. In this paper a reaction of type I has been chosen in order to investigate the influence upon it of systematic variation of the concns., the ionic strength (and consequently the activity factor  $F$ ) being kept const. and of the ionic strength, the concn. being kept const. *l*-Bromosuccinic acid and K xanthogenate were used. The results are given in tables and curves.

C. J. WEST

**Identity of the two possible isomeric methyl ethyl  $\beta$ -methyl- $\alpha$ , $\gamma$ -dicyanoglutaconates.** Y. URUSHIBARA. *Bull. Chem. Soc. (Japan)* 3, 261-5(1928); cf. *C. A.* 22, 2551.—Proof of the identity of the Na compds. obtained by either condensation (*C. A.* 23, 375) is obtained by converting each specimen into the cryst. Ag deriv. by the action of aq. AgNO<sub>3</sub> and examn. of their  $n$ . X-ray spectra of both specimens obtained by the Debye-Scherrer method with the  $K\alpha$  Mo line are identical, the most intense line corresponding with a lattice distance 3.56 Å. U. Either specimen, or one obtained by mixed crystn. of the 2, gives the same  $n$ 's, elongation occurring in the direction of the optical elasticity axis  $X$ ,  $n_1$  (the  $n$  for the faster wave) being equal to  $\alpha$ , the value of  $\alpha_D^{27}$  being  $1.503 \pm 0.001$ , and the zone of elongation being neg. Similar results were obtained with the Ag deriv. of di-Me  $\beta$ -methyl- $\alpha$ , $\gamma$ -dicyanoglutaconate, while the Ag deriv. of the di-Et ester elongates in the direction of the optical elasticity axis  $Z$ , the zone being pos. and  $\alpha_D^{27}$  1.580. The results do not decide between the constitutions  $C(CN)(CO_2Et):CMcNa(CN)CO_2Me$  and  $C(CN)(CO_2Me):CMcNa(CN)CO_2Et$ , but the fact that the presence of a  $\beta$ -Me group causes no change in the course of the condensation favors the mechanism given previously (*loc. cit.*). Me ethoxyethylideneacyanacetate, m. 76-7°, is described.

B. C. A.

**Existence of liquid racemates.** ALAN N. CAMPBELL. Univ. of Aberdeen *J. Chem. Soc.* 1929, 1111-23.—From an examn. of the phys. consts., the conclusion is irresistible that in the case of the liquid esters of tartaric acid there is a marked difference in the chem. nature of the active and inactive forms. As the series of esters is ascended from the Et to the Am members, the difference in the degree of assocn. decreases, at room temp., so that Am tartrate appears to be but little more assocd. than its *dl*-form. As the temp. rises, the active form dissociates more than the *dl*-form, so that Bu racemate has become identical with its active form. At the same time it must be supposed that sometimes the racemate (which must also be assocd. to some extent) dissociates at a different rate from the active form, for, e. g., the order of viscosities of iso-Pr *d*- and *dl*-tartrate is reversed at 40°, whereas the viscosities of the Am esters, almost identical at 18°, show a considerable difference at 40°; at 80° the consts. are still closer. *Pr racemate*, m. 25°,  $b_{11}$  167°,  $b_{765}$  286°,  $d_4^{20}$  1.1256 (values are also given for 18°, 40°, 60° and 80°),  $\eta$  1.4861, 0.2965, 0.0461 at 18°, 40° and 80°, resp.,  $n_D$  1.4413,  $n_F$  1.4523 at 18°,  $\gamma$  27.32, 25.32 at 40° and 80°, resp., *iso-Pr ester*, m. 34°,  $b_{12}$  154°,  $b_{765}$  275°,  $d_4^{20}$  1.1166 (values also at 18°, 40°, 60° and 80°),  $\eta$  5.8243, 0.6150, 0.0647 at 18°, 40° and 80°, resp.,  $n_D$  1.4374,  $n_F$  1.4461 at 18°,  $\gamma$  26.58, 25.70 at 40° and 80°, resp., *Bu ester*,  $b_{12}$  185°,  $b_{765}$  320°,  $d_4^{18}$  1.0879 (values are also given for 15°, 40° and 80°),  $\eta$  0.9455, 0.2475 and 0.0445 at 18°, 40° and 80°, resp.,  $n_D$  1.4451,  $n_F$  1.4568 at 18°,  $\gamma$  28.36 and 26.17 at 40° and 80°, resp. *Isobutyl ester*, m. 58°,  $b_{13}$  195°,  $b_{765}$  311°,  $d_4^{20}$  1.0160,  $d_4^{100}$  1.0124,  $\eta$  0.0595 at 80°,  $\gamma$  24.79 at 80°. The original should be consulted for the other phys. data collected from the literature or detd. by C. on the Et, Pr, iso-Pr, Bu, iso-Bu and Am tartrates and racemates on the m. p., b. p., d. and coeff. of expansion, viscosities, refractivities and dispersions, surface tension, and sp. rotations. The f. p. curve of mixts. of iso-Bu *d*- and *l*-tartrates is given; the eutectic is at 53.4° with 32.8% of the *l*-ester. The soly. of these esters in EtOH is reported for 0°, 18° and 25°, resp.

C. J. WEST

**The velocity of cyclic transformation of 1,4-diketones.** I. A. TREFIL'EV AND RAZUMOV. *Ukrainskii Khim. Zhur.* 4, Sci. Pt. 19-35(1929); *J. Russ. Phys.-Chem. Soc.* 61, 699-712(1929).—T. set forth (*C. A.* 23, 3926; 21, 3899) that carbopyrotritaric ester (I) forms in concd. HBr a yellow bromide, which on a drying plate is rapidly changed to a garnet-red, and then finally decomposed to the original I in the form of a yellow oil. By this method of formation of halofurfuran derivs., the velocity of the furfuran ring formation from *p*-diketones was studied. Knorr (*Ber.* 17, 2863(1884)) had shown that on dissolving the diethoxydiacetosuccinic acid (II) in concd. HCl there is produced monoethoxycarbopyrotritaric acid (III). T. and R. suggest that first under the influence of concd. HCl the closing of the 1,4-diketone with formation of a furfuran ring and liberation of H<sub>2</sub>O takes place, and is then followed by sapon., with the dil. HCl, of one of the ester groups of the diester with formation of III. If the presence of diethoxycarbopyrotritaric acid could be demonstrated, there would be a ground

to presume that the velocity of cyclic transformation of the 1,4-diketone to the furfuran is greater than the sapon. of one of the ester groups. **II** was brominated by treating it in HBr (d. 1.78) with Br in concd. HBr, the yellow ppt. of bromide was dried first in a desiccator filled with HBr fumes, and then over NaOH until the decompn. of the bromide to diethoxycarbopyrotritaric acid, a yellow oil, b. 275–8° was completed. From this it may be concluded that these yellow and red bromides obtained from **II** are derivs. of diethoxycarbopyrotritaric acid, while the product of their decompn., after loss of Br, is a pure diester of this acid, and secondly that in Knorr's expt. the cyclic closing of 1,4-diketones to a furfural ring proceeds much faster than it is evident from his data.

CHAS. BLANC

**Addendum to the paper on "Pyridine-containing iron carbonyls."** W. HIEBER AND F. SONNEKALB. *Ber.* 62B, 422(1929); cf. *C. A.* 23, 837.—The method of prepn. of Fe carbonyls contg. pyridine is to be stricken from the literature, since it is based upon an incorrect gas analysis.

EMIL KLARMANN

**Monoarylguanidines. II. Benzoxazoleguanidine.** G. B. L. SMITH, J. H. KANE AND C. W. MASON. *J. Am. Chem. Soc.* 51, 2522–7(1929); cf. *C. A.* 23, 1399.—o-H<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub> (100 g.) in 100 cc. concd. HCl and 100 cc. 95% EtOH, heated 15 min., then treated with 80 g. (CNNH<sub>2</sub>)<sub>2</sub> and heated for 2 hrs., gives 130 g. benzoxazoleguanidine(I), as the HCl salt, NH<sub>3</sub> being also formed. I seps. with 1 mol. H<sub>2</sub>O in very pale yellow plates. The anhyd. I m. 182–4°; the HCl salt, m. 254–5°, sulfate, m. 280–1°, nitrate, m. 219–20°, and picrate, m. 247–8°, were also prepd. Di-Ac deriv., m. 209–10°; methiodide, m. 192–4°. Crystallographic data are given for the monohydrate and the salts of I. The above reaction gives direct proof of the presence of the CN group in the (CNNH<sub>2</sub>)<sub>2</sub> mol., which probably is a tautomeric compd. and an equil. product H<sub>2</sub>NC(:NH)NHCN  $\rightleftharpoons$  H<sub>2</sub>NC(:NCN)NH<sub>2</sub>.

C. J. WEST

**Constitution of the red isomeride of creatinine picrate responsible for Jaffe's color reaction.** WINSTON K. ANSLOW AND HAROLD KING. *J. Chem. Soc.* 1929, 1210–6.—The existence of a red isomeric form of creatinine picrate (I) (cf. Greenwald and Gross, *C. A.* 18, 2130) is confirmed but the constitutional formula proposed by Greenwald (*C. A.* 19, 1853) is criticized, A. and K. proposing that combination of creatinine and picric acid in alk. soln. takes place through coordination of the NO<sub>2</sub> group with the enolic group and development of a new center of acidity. Detailed directions are given for the prepn. of I, using 1 mol. of each of the components; it seps. with 1 mol. H<sub>2</sub>O, turns yellow between 160° and 70° and m. about 213°; the excess of picric acid suggested by G. is unnecessary. Boiling I with H<sub>2</sub>O until a clear yellow soln. is obtained and cooling give the yellow isomer (II), m. 220–1°. Shaking I or II with satd. Ba(OH)<sub>2</sub> for 0.5 hr. gives the red Ba salt, which is the Ba salt of a dibasic acid. In the presence of 2 equivs. of Ba(OH)<sub>2</sub> a normal Ba salt is formed, while with an excess of Ba(OH)<sub>2</sub> a partly basic salt results. Concd. HCl liberates I. Addn. of creatinine to alk. solns. of 2,4-(O<sub>2</sub>N)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>OH and of 3-methylpicric acid gives orange-red solns., although a few min. is required for the color to develop; alk. solns. of these compds., 2,6-(O<sub>2</sub>N)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>OH and 2,4,7-(O<sub>2</sub>N)<sub>2</sub>HO<sub>2</sub>SC<sub>10</sub>H<sub>4</sub>OH contg. creatinine, gradually treated with N HCl, give a transient red color which at neutrality pervades the liquid and is temporarily stable, but disappears on addn. of excess of acid. 2,4-(O<sub>2</sub>N)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>OH in abs. EtOH and Me<sub>2</sub>CO gives with EtONa a deep red soln., from which ppts. a brick-red ppt., which explodes on heating; it is a mixt. of about 84.5% C<sub>6</sub>H<sub>3</sub>O<sub>5</sub>N<sub>2</sub>Na. C<sub>3</sub>H<sub>5</sub>ONa and 15.5% C<sub>6</sub>H<sub>3</sub>O<sub>5</sub>N<sub>2</sub>Na.

C. J. WEST

**The constitution of quinovose.** F. VOTOČEK. *Collection Czechoslov. Chem. Comm.* 1, 231–8(1929).—Quinovose (I), a methylpentose derived from quinovin, a principle of various species of cinchona, was proved to be an aldose. It was oxidized with Br<sub>2</sub> water and the quinovinic acid (II) thus obtained was reduced with Na-Hg, yielding I. Furthermore, I responds positively to the Rosenthaler fuclisin test. The [α]<sub>D</sub> of I is 35°. An aq. soln. of II, freshly prepd., is d-rotatory but the rotation diminishes as it stands, probably as the result of the severing of the lactone ring. On the other hand, when 0.5012 g. of the Ba salt was dissolved in 20 cc. of 0.2 N HCl the rotation in a 20-cc. tube (Fric's app.) [α] rose from an immediate reading of 10° to 20° after 22 hrs., after which time no further change took place. II does not reduce Fehling soln.

I. M. LEVINE

**The identity of quinovose with d-glucomethylose (isorhodeose).** F. VOTOČEK AND F. RÁČ. *Collection Czechoslov. Chem. Comm.* 1, 239–44(1929); cf. *C. A.* 22, 2740; 23, 2939.—Quinovose is found to be identical with isorhodeose, since when reduced with Na-Hg (3%) they both yield isorhodeitol. The identity of the dibenzylidene deriv. of the latter confirms this. This finding was missed by earlier workers because the

m. p. of the osazone of quinovose was too high, perhaps because of the presence of another sugar, the osazone of which melts very high.

**Structure of  $\alpha$ -methyl xyloside.** F. P. PHELPS AND C. B. PURVES. *J. Am. Chem. Soc.* **51**, 2443-9 (1929); cf. *C. A.* **22**, 3140.—Trimethyl- $\alpha$ -methylxyloside, prepd from pure cryst.  $\alpha$ -Me xyloside and purified by distn., shows  $n_D^{25}$  1.4397,  $[\alpha]_D^{20}$  121.5° (CHCl<sub>3</sub>), 112.7° (H<sub>2</sub>O), 122.2° (MeOH). The  $\beta$ -deriv. was prepd. from cryst.  $\beta$ -Me xyloside and also from pure xylose, using the Me<sub>2</sub>SO<sub>4</sub>-NaOH method. After purification by recrystn., the product from the 1st method m. 51°,  $[\alpha]_D^{20}$  -69.5° (CHCl<sub>3</sub>), 81.7° (H<sub>2</sub>O), while that from the 2nd method has  $[\alpha]_D^{20}$  -59.6° (CHCl<sub>3</sub>). As this value, which is about 10° low, did not change appreciably on recrystn., it is concluded that this method gives a less pure product. On hydrolysis both products yield the same cryst. trimethylxylose; thus these 2 substances contain the same ring structure, forming an  $\alpha$ - and  $\beta$ -pair. They have thus been definitely correlated for the 1st time and likewise the parent substances,  $\alpha$ - and  $\beta$ -Me xylosides, from which they were derived. The purified trimethyl- $\alpha$ -xylose m. 91-2°,  $[\alpha]_D^{20}$  24.2° (CHCl<sub>3</sub>, final); 64.5° (H<sub>2</sub>O, initial), 17.7° (final). For the most part the consts. given differ markedly from those previously recorded.

I. M. LEVINE

J. Am. Chem.

Soc. 51, 2443-9 (1929); cf. C. A. 22, 3140.—

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C. J. WEST

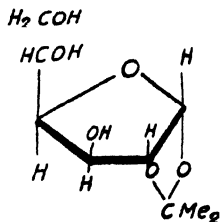
**Mechanism of tautomeric interchange and the effect of structure on mobility and equilibrium.** IV. Further evidence relating to the mechanism of acid catalysis in the mutarotation of nitrogen derivatives of tetraacetylglucose. JOHN WM. BAKER *J. Chem. Soc.* 1929, 1205-10; cf. *C. A.* **22**, 3634.—In *C. A.* **22**, 3395, 2 types of catalysts for the mutarotation of certain N derivs. of sugars were recognized: Those which attack the ionizing proton directly and those which facilitate its liberation indirectly, this class including strong acids. In the case of derivs. of very strong bases, it was considered possible that actual coordination of the catalyst proton might occur. The resulting salt might thus have acquired the necessary mobile H and exhibit mutarotation consequent on the equil of the cationic system. In order to test this possibility various tetraacetylglucose derivs. of the type required have been prepd.; the solns of their HCl derivs. in abs. or 90% EtOH do exhibit a change in rotation in accordance with the kinetics of unimol. reaction. The change, however, does not appear to be due to the interconversion of the  $\alpha$ - and  $\beta$ -forms but to slow fission of the deriv. into the parent tetraacetylglucose and the HCl of the base. A similar phenomenon is observed when the free sugar derivs. are examd. in AcOEt in the presence of a little HCl. On the basis of these negative results, it seems probable, therefore, that for mutarotation, dependent on the simple isomeric change, to be possible, the original sugar deriv. itself must contain a separable H atom (cf. Baker, Ingold and Thorpe, *C. A.* **18**, 972). *p*-Methylbenzylmethylamine,  $b_p$  84°; *HBr* salt m. 166°; *di*-*p*-methylbenzylmethylamine,  $b_p$  about 180°; *p*-Cl deriv.,  $b_p$  101° (*HBr* salt, m. 196°); *di*-*p*-Cl deriv.,  $b_p$  about 200°; *p*-CN deriv.,  $b_p$  143° (*HBr* salt, m. 209-10°); *di*-*p*-CN deriv., m. 65° (*HCl* salt, m. 250° (decompn.)). Tetraacetylglucosidyl bromide (I) (1 mol) and the amine (2 mols.), gently warmed in Et<sub>2</sub>O until most of the Et<sub>2</sub>O evaps., give the following derivs. of the tetraacetylglucose: Benzylmethylamide, m. 125° (*HCl* salt, m. 80°), *p*-methyl deriv., m. 99-100° (*HCl* salt, m. 175° (decompn.)), *p*-Cl deriv., m. 104.5° (*HCl* salt, m. 137° (decompn.)); *p*-CN deriv., m. 85.6° (*HCl* salt, m. 146° (decompn.)). When 30 g. I is added to 50 cc. piperidine at 0-10° and then a large vol. Et<sub>2</sub>O added, *piperidide A*, m. 123°, is formed (*HCl* salt, m. 126°); when the I is added in 0.5 g. portion to the piperidine dild. with 0.5 its vol. Et<sub>2</sub>O, there results *piperidide B*, m. 136° (decompn.); the *HCl* salt is unstable, m. 130.1° (decompn.), if rapidly crystd., slower crystn. appears to give a deacetylated deriv., m. 126-7°. The *diethylamide-HCl*, m. 152-3°; the *dimethylamide-HCl*, m. 159-60°. Data are given for the rate of fission of the various derivs. in 90% EtOH and abs. EtOH at 24.5°.

C. J. WEST

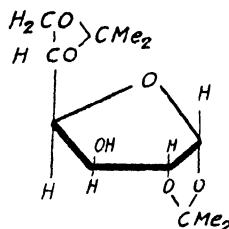
**Constitution of glucosemonoacetone, glucosediacetone and of the derived 3,5-trimethylglucose and 3-monomethylglucose.** CAMERON G. ANDERSON, WM. CHARLTON AND WALTER N. HAWORTH. *J. Chem. Soc.* 1929, 1329-37.—Glucosediacetone, m. 109-10°,  $[\alpha]_D^{17}$  -18.6°, yields a mono-Me deriv.,  $b_p$  105-6°,  $[\alpha]_D^{21}$  -31.4°,  $n_D^{17}$  1.451; which, on hydrolysis, yields 3-methylglucose, m. 160-1,  $n_D^{17}$  1.043°  $\rightarrow$  55; (after 19.5 hrs., H<sub>2</sub>O,  $c$  1.33); proof of the position of the Me group is furnished by methylation, which gives the usual tetra-Me glucopyranose, m. 90.4° (anilide, m. 135°); the phenylosazone, m. 178-9° (Irvine and Scott, *C. A.* **7**, 2383, gives 164-5° and may be identical with that from 3-methylfructose, since the m. p. and rate of mutarotation appear to be identical. Trimethylglucosemonoacetone,  $[\alpha]_D^{20}$  -29.5° (MeOH,  $c$  1.55),  $n_D$  1.4470, on hydrolysis yields 3,5,6-trimethylglucose,  $b_p$  104.5°



134°,  $[\alpha]_D -44.1$  (EtOH,  $c$  1.49),  $-25.9$  (H<sub>2</sub>O,  $c$  1.3); phenylosazone,  $m.$  70-2°; methylation gives 2,3,5,6-tetramethylglucose, and a by-product,  $m.$  97-8°, contg. 53.9% MeO. The identification was supported by conversion into 2,3,5,6-tetramethyl- $\gamma$ -gluconolactone,  $m.$  25.5-6°. These results indicate that the structural form of glucose in its Me<sub>2</sub>CO derivs. is that of glucofuranose and support the following constitutional formulas for the monoacetone (I) and the diacetone (II):



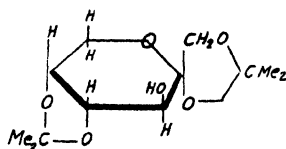
(I)



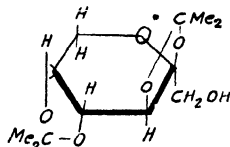
(II)

C. J. WEST

**Constitution and  $\alpha$ - and  $\beta$ -fructosediacetones.** The alleged oxidative degradation of the derived monomethyl- and tetramethylfructose. CAMERON G. ANDERSON, WM. CHARLTON, WALTER N. HAWORTH and VINCENT S. NICHOLSON. *J. Chem. Soc.* 1929, 1337-46.— $\alpha$ -Fructosediacetone (I) yields a Me deriv. having the consts. given by Irvine and Hynd (*C. A.* 3, 2933); the 3-methylfructose (II) obtained therefrom  $m.$  128-30°,  $[\alpha]_D^{20} 84.1^\circ$  (after 15 min.)  $\rightarrow -53.5^\circ$  (H<sub>2</sub>O,  $c$  0.92); phenylosazone,  $m.$  177-9° (I and H. give 142-4°; cf. preceding abstr.). I. and H. state that this is oxidized with Br-H<sub>2</sub>O to MeOCH<sub>2</sub>CH(OH)CH(OH)CO<sub>2</sub>H; repetition of this expt. shows that II is not attacked by Br-H<sub>2</sub>O or only very slightly; II forms a complex with Ba(OH)<sub>2</sub>, which accounts for the Ba salt of the supposed degradation product of I and H. Oxidation of tetramethylfructose and hydrolysis of the ester, followed by oxidation with KMnO<sub>4</sub>, gives *d*-2,3,4-trimethyl- $\delta$ -arabonolactone,  $m.$  44°,  $[\alpha]_D^{18} -177.3^\circ$ , diminishing to  $-111.4^\circ$ ,  $-83^\circ$  and  $-10.2^\circ$  after 1 hr., 2 hrs. and 2 days, resp. Combined hydrolysis and methylation of K fructuronate dilactone from  $\beta$ -fructosediacetone (III) give Me tetramethylfructuronate (IV),  $m.$  102-3° (amide,  $m.$  118-9°). Hydrolysis of the K salt by heating with *N*H<sub>2</sub>SO<sub>4</sub> for 24 hrs., followed by methylation, gives IV and a liquid ester,  $b.$  87°, whose amide  $m.$  100-1°, identical with that obtained by the oxidation of tetramethyl- $\gamma$ -fructose (*C. A.* 21, 3182). These results indicate the following formulas:



(I)



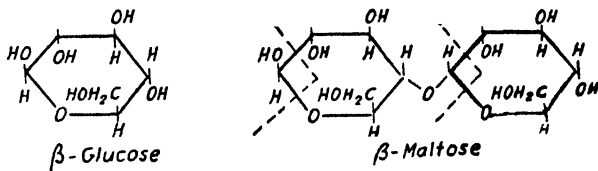
(III)

C. J. WEST

**Cellulosexanthoacetic acid.** TADASHI NAKASHIMA *Z. anorg. Chem.* 42, 546-9 (1929); cf. *C. A.* 22, 2744.—The prepn. of cellulosexanthoacetic acid (I), HO<sub>2</sub>CCH<sub>2</sub>SO cellulose, from cellulose xanthate and ClCH<sub>2</sub>CO<sub>2</sub>H is described. The Na salt he acid is sol. in water but the free acid is insol. The alk. soln. decomps. on standing regenerates cellulose and HSCH<sub>2</sub>CO<sub>2</sub>H. The Cu, Ag, Hg, Ba and Zn salts of the were prepd. by adding the metallic salt soln. to an alk. soln. of I. The Cu salt is and the others are white. J. G. McNALLY

**Constitution of starch.** KURT H. MEYER, HEINRICH HOPFF and H. MARK. *Ber.* 1103-12 (1929).—Since maltose derivs. are formed from starch not only by enzymic degradation but also by relatively simple chem. reactions (e. g., treatment with *tr*) it may be assumed that maltose is already in some way preformed in starch and  $\alpha$ -unions are present in starch but it is still a question whether or not  $\beta$ -unions mate with the  $\alpha$ -unions. As with cellulose (*Z. physik. Chem.*, Abt. B, 2, 115 (1929)), authors have now used the Hudson rule as a guide in detg. the constitution of st. As shown in the accompanying figure the increments of the rotation of  $\beta$ -ose (corresponding to the 1-C atom and to the rest of the mol., resp.) are all present -maltose also and the latter contains a glucose residue corresponding completely glucose residue in an  $\alpha$ -1,4-union in a chain. By subtracting the mol. rotation of

$\beta$ -glucose from that of  $\beta$ -maltose it is possible, therefore, to calc. the mol. rotation of a compd. consisting of 1,4-glucosyl groups united to each other through  $\alpha$ -bridges. Since the rotation of starch in  $H_2O$  varies widely and is difficult to det. because of the opalescence of the solns.,  $HCONH_2$  was used as the solvent; 0.5 g. starch, dried 12 hrs. at  $90^\circ$  over  $P_2O_5$  at 0.1 mm. pressure, was heated on the  $H_2O$  bath in 100 cc. freshly



distd.  $HCONH_2$ , a clear soln. generally resulting in 2 hrs. Only rice starch did not dissolve completely in 5 hrs. and on standing most of the dissolved part sepd. as a viscous jelly. The following values for  $[\alpha]_D^{21}$  were obtained: native potato starch,  $198^\circ$ ; potato starch extd. 11 times with 10 parts of  $H_2O$  for 6 hrs.,  $208^\circ$ ; amylopectin (Pringsheim),  $216.6^\circ$ ; amylose (P.),  $204^\circ$ ; native arrowroot starch,  $204^\circ$ ; arrowroot starch, defatted and pptd. from  $HCONH_2$  with alc.,  $210^\circ$ ; native wheat starch, defatted,  $220^\circ$ ; glycogen,  $201^\circ$ . Starch, therefore, in  $HCONH_2$  has a rotation of about  $220^\circ$ , while the calcd. value for a chain consisting solely of  $\alpha$ -1,4-glucosyl residues is  $226^\circ$ , as shown by the table below;  $\beta$ -unions should betray themselves by a lower rotation, for a chain of purely  $\beta$ -1,4-glucosyl unions has a sp. rotation of only about  $20^\circ$ .

	$[\alpha]_D^{21}$	Mol. rotation	Mol. rotation $\alpha$ -1,4-glucosyl res
$\beta$ -Maltose	$112^\circ$	$403.2^\circ$	
$\beta$ -Glucose	$20^\circ$	$36.0^\circ$	$367.2^\circ$
Equil. maltose	$126.0^\circ$	$453.6^\circ$	
Equil. glucose	$52.6^\circ$	$94.68^\circ$	$358.92^\circ$
			$221.6^\circ$

In boiling  $H_2O$  the rotation first increases as dispersion and solvation of the micelles progresses, and then begins to fall because of beginning hydrolysis; the highest value obtained ( $212^\circ$ ) therefore probably comes nearest to the true rotation; from the observed values of  $[\alpha]_D$  given below for 4 pairs of compds., the calcd. values for the  $\alpha$ -1,4-chain in  $H_2O$  are  $231^\circ$ ,  $230^\circ$ ,  $216^\circ$ ,  $230^\circ$ , resp.:  $\alpha$ -maltose  $168^\circ$ ,  $\alpha$ -glucose  $141.2^\circ$ ,  $\beta$ -maltose  $118^\circ$ ,  $\beta$ -glucose  $17.5^\circ$ ;  $\beta$ -Me maltoside  $78.8^\circ$ ,  $\beta$ -Me glucoside  $34.2^\circ$ , equil maltose  $136^\circ$ , equil. glucose  $52.5^\circ$ . The great variability of starch indicates a much greater variation in the length of the primary valence chains than in the case of cellulose. A study of the kinetics of starch cleavage showed that acid cleavage remains of the same order of magnitude from the beginning to the end and has the velocity of a glucosidic hydrolysis. With 50 cc. of 1% maltose and 50 cc. of  $N H_2SO_4$  quite a good const. for a monomol. reaction was obtained ( $k_2 \cdot 10^3 = 1.07-1.14$  at  $70^\circ$ , 2.18-2.54 at  $80^\circ$ , 10.7-13.5 at  $90^\circ$ ). Amylose also gave a fairly good const. (0.36-0.47, 1.28-1.54, 4.1-5.6, resp.); only at  $90^\circ$  did there seem to be an indication of a slow uniform rise. As a matter of fact, the hydrolysis of amylose must be considered as a complex series of reactions, the last stage of which (hydrolysis of the maltose) is known. As a first approximation, a 2-stage reaction was taken as the basis of calcn.; the values of  $k_1 \cdot 10^3$  so calcd. were 1.0 at  $70^\circ$  and 2.4 at  $80^\circ$ . Therefore the union of the glucose residues in amylose must be essentially the same as that of the 2 residues in maltose. The large temp. coeff. indicates that the process is a normal chem. reaction and not a diffusion phenomenon. Roentgenographic studies on starch have thus far established only that certain parts of starch have a lattice arrangement which is related to the presence of  $H_2O$  of hydration. It has thus far been impossible, by spinning of threads, tension or pressure so to orient the starch micelle that it showed a fiber diagram; on the other hand, the lattice structure of starch is much more easily destroyed than that of cellulose and, when once destroyed, it cannot be regenerated. Under 20,000 atm. pressure starch loses its roentgenogram. Likewise, starch swollen in  $HCONH_2$  is amorphous when pptd. out. Of amylose and amylopectin only the latter is crystalline. The fact that the starch micelles can be oriented not at all or only with difficulty suggests that the primary valence chains are shorter than in cellulose and not parallel in elongated bundles but in some other, not yet clearly recognized arrangement.

C. A. R.

A crystalline difructose anhydride from hydrolyzed inulin. RICHARD F. JACKSON

AND SYLVIA M. GOERGEN. *Bur. Standards J. Research* **3**, 27-38(1929).—Inulin upon hydrolysis with dil. acids yields solns. contg. in 100% solid matter 91.8% fructose (I), 94.8% reducing sugar and a 5.2% unfermentable residue. The residue has a  $[\alpha]_D^{20}$  55° and is hydrolyzed solely to I. It is 25 times as resistant to hydrolysis as the remainder of the inulin mol. Acetylation of the original residue yielded a mixt. of acetates, one of which crystd. in 30% yield in the form of prismatic needles of  $[\alpha]_D^{20}$  0.54°. This was found to be the hexaacetate of a disaccharide contg. but 6 hydroxyl groups. The mother liquors from the cryst. acetate contained one or more acetylated difructoses with a mean  $[\alpha]_D^{20}$  31°. The cryst. hexaacetate upon deacetylation yielded a cryst. difructose anhydride of  $[\alpha]_D^{20}$  27°. The latter was hydrolyzed to I. G. C. STROUSE

**The action of ozone on cyclogeraniolenes.** RENÉ ESCOURRON. *Bull. soc. chim.* **43**, 1277-9(1928).—Ozonides of cyclogeraniolene (I), methyl-(II) and phenylcyclogeraniolene (III) were prepd. by treatment with  $O_3$ . During the treatments, white fumes were evolved and the odor of  $CH_2O$  was apparent. Decompn. of the ozonides with boiling water gave  $CH_2O$  and a strong menthol odor resembling cyclic ketones of this series. On the basis of the results obtained the following formulas are given, resp., for I, II and III:  $Me_2C.CH_2.C(:CH_2).(CH_2)_2.CH_2$ ,  $Me_2C.CHMe.C(:CH_2).(CH_2)_2.CH_2$  and  $Me_2C.CHPh.C(:CH_2).(CH_2)_2.CH_2$ . Tieman's methylcyclohexene formula for II should in reality be a methenecyclohexane.

**Synthesis of isoamylcyclopentane.** JOHN MCA. HARRIS, JR. *J. Am. Chem. Soc.* **51**, 2591(1929).—Isoamylcyclopentanol, from cyclopentanone and iso-AmBr,  $b_{17}^{101}$ ,  $d_4^{26}$  0.8848,  $n_D^{26}$  1.4549; dehydration with  $p-MeC_6H_4SO_3H$  gives isoamylcyclopentene,  $b_{760}^{168-70}$ ,  $d_4^{25}$  0.8010,  $n_D^{25}$  1.4467; catalytic reduction gives isoamylcyclopentane,  $b_{760}^{168-70}$ ,  $d_4^{25}$  0.7837,  $n_D^{25}$  1.4321. C. J. WEST

**Hydrolysis of naphthenic acids at elevated temperatures and cracking under pressure of hydrogen.** V. N. IPAT'EV AND A. D. PETROV. *Zhur. Prikladnoi Khim.* **2**, 327-35(1929).—Exptl. work was done with acids b. 260-360° and having an acid no. of 233 and an av. mol. wt. of 240. Heating for 5 hrs. at 440-60° (temp. measurements were approx.) and 210 atm. of 100 g. acids, 50 cc. water, and 10 g.  $Al_2O_3$  resulted in a yield of 80 cc. of oil and 55 cc. of water contg. AcOH and other acids of the same series. The oil had an acid no. 131.4 and on distn. yielded 19 g., b. 65-150° (5% sol. in NaOH and 20% in  $H_2SO_4$  of d. 1.84), 90 g., b. 150-260° (35% sol. in NaOH and 25% in  $H_2SO_4$ ; acid no. 101), and 80 g., b. above 260° (2 g. of yellow oil, 40 g. of acids with acid no. 176.7 and residue of d. < 1). Fractions b. below 260° contained paraffins, naphthenes, some aromatics, 20-25% unsatd. hydrocarbons, 10-15% ketones, naphthenic acids deprived of their disagreeable odor and other O compds. Heating for 4 hrs. at 440° and 250 atm. of 100 g. acids, 50 cc. water, and 15 g. NaOH, yielded 20% unsatd. compds. or considerably less than by heating under atm. pressure (C. A. **20**, 2152). Heating for 8 hrs. at 460-70° and 240 atm. of 100 cc. tetralin, 50 cc. water, and 10 g.  $Al_2O_3$  yielded 40 cc. of water layer and 90 cc. of hydrocarbons contg. only little  $C_6H_6$ , but large amts. of aromatic hydrocarbons of high b. p. The yield of low boiling fractions was smaller than in cracking in presence of  $H_2$  (C. A. **22**, 396). Heating for 6 hrs. at 460° and 215 atm. of 35 cc. hexahydrotoluene, 50 cc. water, and 20 g.  $Na_2CO_3$  was of no effect and only traces of carbon were found. Heating at 460° and 175 atm. for 3 hrs. of 60 g. paraffins (m. 56-8°), 50 cc. water, and 10 g. NaOH yielded 27 cc. of cracked products. On longer heating up to 70% of liquid cracked products was obtained. 80% of these products b. below 200° and contained about 10% unsatd. compds. Palmitic acid could not be decompd. under similar conditions, which indicates stability of fatty acids of the paraffin series. Heating for 8 hrs. at 460° and 190 atm. of 75 cc. naphthenic acids and 5 g.  $Al_2O_3$  in presence of  $H_2$  showed that less O compds. were obtained than by cracking in presence of water, while the amt. of low-boiling compds. was higher. V. KALICHEVSKY

**The catalytic condensation of cyclohexanone and cyclohexene during heating.** A. D. PETROV. *Bull. soc. chim.* **43**, 1272-6; *J. Russ. Phys.-Chem. Soc.* **60**, 1435-40 (1928).—Heating cyclohexanone (80 g.) to 320° under 30 atm. with  $Al_2O_3$  for 24 hrs. results in both dehydration and pyrogenic disocn., giving a cyclohexylidene-cyclohexanone fraction  $b_{15}^{142-5}$  (I) and a fraction  $b_{14}^{214-9}$  corresponding to dicyclohexylidene-cyclohexanone and dodecahydrotriphenylene (15 g.), m. 224-5°. Semicarbazone of I m. 178-9°. Cyclohexene (60 g.),  $Al_2O_3$  (6 g.) for 24 hrs. at 400-40° gave a gas ( $C_nH_{2n+2}$ ), aromatic hydrocarbons, and higher-boiling fractions. F. C. H.

### Catalytic influences in three-carbon tautomerism. I. Sodium alkoxides.

A. R. KON AND REGINALD P. LINSTAD. *J. Chem. Soc.* 1929, 1269-82.—On the ionic view of the mechanism of tautomeric change, the formation of the active form in a 3-C prototropic change, *viz.*, the anion, will be influenced, apart from structural factors, by the nature of the catalytic medium. The more affinity the medium has for the proton, the more ready will be the tautomeric interconversion. The standard conditions chosen were 1 equiv. of *N* EtONa at 25°. Using cyclohexylideneacetone (I) and cyclohexenylacetone (II), both ketones pass rapidly into the equil. mixt., which contains 30% of I. The rate of equilibration and the point of equil. are the same when com abs EtOH is used in place of the specially dried solvent, but large amts. of H<sub>2</sub>O diminish the rate of equilibration. II reaches equil. in about 60 min., while I requires much longer. The difference is more marked with MeONa and an equil. mixt. is not obtained from I even at the end of 48 hrs. 1-Ethoxycyclohexylacetone semicarbazone, m. 174°. *MeO deriv.*, m. 181-2°. Other alkyl oxides produce the same equil. mixt., the order of efficiency being iso-PrONa, PrONa, EtONa, MeONa, the iso-PrONa being the most active. NaOH in 75% EtOH is much less effective than EtONa. The action of EtONa upon Et cyclohexylideneacetate (III) and Et Δ<sup>1</sup>-cyclohexenylacetate (IV) was also studied. III gives an equil. mixt. contg. 57% of IV, a gradual change taking place through 250 hrs.; IV gives the same mixt. but this value is attained in 63 hrs. The retarding effect of H<sub>2</sub>O is not attributed to a sp. anticatalytic action but merely to greatly increased hydrolysis which removes both the ester and the catalyst. IV is hydrolyzed more rapidly than III; this does not, however, affect the equil. The true equil. is considered to be 62% of IV. *Et 1-ethoxycyclohexylacetate*, b<sub>p</sub> 122°, d<sub>4</sub><sup>20</sup> 0.9865, n<sub>D</sub><sup>20</sup> 1.45753.

C J WEST

**Superheating of homogeneous organic compounds. V. Naphthenic aryl esters and experiments on the mechanism of their transformations.** SIEGFRIED SKRAUP AND OTMAR BINDER. *Ber* 62B, 1127-38(1929); cf. *C. A.* 21, 2463.—As model expts for the behavior of aryl naphthenates in general, other ring systems have been studied to det. whether the observation made with Ph cyclohexanecarboxylate (I) holds good in general. Such proved to be the case, for Ph cyclopentane- (II), cyclobutane- (III) and (probably) cyclopropanecarboxylate (IV) isomerize into the corresponding *o*-hydroxy phenyl ketones, characterized by analysis and the Dimroth boric ester reaction. The sensitivity to temp. increases quite uniformly in the order I → II → III, the temps. required for isomerization being about 360°, 330° and 300°, resp. When the C atom carrying the CO<sub>2</sub>H group also carries a Me group, the compds. are markedly more resistant and remain practically unchanged at 360°; at 390° they do not isomerize but decomp. into methylcyclohexene or -pentene and HCO<sub>2</sub>Ph, the latter decompg. further into PhOH and CO. It had been suggested that in the isomerization of cyclohexyl Ph ether into *o*-C<sub>6</sub>H<sub>11</sub>C<sub>6</sub>H<sub>4</sub>OH the ether first breaks down into cyclohexene and PhOH. I-III could similarly be conceived as breaking down into PhOH and cyclic ketenes but this would not be possible with their *α*-alkyl derivs. To be sure, Ph<sub>2</sub>C:CH<sub>2</sub> gently heated with PhOH forms not *o*-Ph<sub>2</sub>CHCOC<sub>6</sub>H<sub>4</sub>OH but Ph<sub>2</sub>CHCO<sub>2</sub>Ph, however, as found with J. KAUPP, when Ph<sub>2</sub>CHCO<sub>2</sub>Ph or PhCH<sub>2</sub>CO<sub>2</sub>Ph is heated in H at 300° it splits off 85-95% of the theoretically possible amt. of PhOH in a few hrs. and the resulting ketene polymerizes, but if the decompn. is effected under a reflux or in sealed tubes the PhOH reacts with a part of the ketene to form the ketone *o*-Ph<sub>2</sub>CHCOC<sub>6</sub>H<sub>4</sub>OH or *o*-PhCH<sub>2</sub>COC<sub>6</sub>H<sub>4</sub>OH. With catalysts (Cu bronze, silicates, etc.) the decompn. temp. can be greatly lowered (down to 140°) and the yield of HO ketone materially improved. Again, the intermediate formation of ketenes can be detected by means of PhN:NPh, which with Ph<sub>2</sub>C:CH<sub>2</sub> yields a heterocyclic compd Ph<sub>2</sub>C.NPh.CO yielding, on superheating, chiefly Ph<sub>2</sub>C:NPh and PhNCO.

both of these substances, along with PhOH, were readily obtained when Ph<sub>2</sub>CHCO<sub>2</sub>Ph was heated with PhN:NPh, and PhNCO was identified with certainty when PhCH<sub>2</sub>CO<sub>2</sub>Ph was similarly heated. 1-Methylcyclohexane-1-carboxylic acid (V) was obtained rather surprisingly by alk. KMnO<sub>4</sub> oxidation of the methylcyclohexylphenol obtained by Schrauth and Quasebarth from PhOH and methylcyclohexene. The splitting of

of HCO<sub>2</sub>Ph observed in the esters of the type

$$\begin{array}{c} \text{---CH}_2 \\ \text{---CH}_2 \end{array} \text{C} \begin{array}{l} \text{Me} \\ \text{CO}_2\text{Ph} \end{array} \quad (\text{VI}) \text{ had hitherto been}$$

noted only with CH<sub>2</sub>:CHCO<sub>2</sub>Ph, which thereby yields C<sub>3</sub>H<sub>2</sub> and had been assumed to be an intermediate product in the cleavage of satd. paraffins from fatty acid Ph esters. The above observation suggested that in this reaction the fatty acid ester first

splits off  $\text{HCO}_2\text{Ph}$  with formation of a  $\Delta^1$ -alkylene, which then decomps. into  $\text{C}_2\text{H}_2$  and a satd. paraffin. This suggestion was tested with hexadecylene (VII), which is thus obtained from Ph margarate, but the VII yielded no  $\text{C}_2\text{H}_2$ ; except for the formation of a dimer and still higher-boiling products it remained for the most part unchanged. Investigations by v. Braun, which are still under way, have shown that in the greater part of the naphthenic acids in petroleum the  $\text{CO}_2\text{H}$  group is several C atoms removed from the alicyclic ring, thus occupying an intermediate position between the above alicyclic nucleus- $\text{CO}_2\text{H}$  acids and ordinary fatty acids, and it seemed of interest to det. how their Ph esters would behave on superheating. Expts on an acid  $\text{C}_{10}\text{H}_{18}\text{O}_2$  (VIII) from Galician petroleum showed that the aryl esters behave like neither those of the nucleus-carboxylated naphthenic acids nor those of the fatty acids;  $\text{CO}_2$  is split off and the "naphthenyl" and Ph residues combine to an alicyclic-substituted benzene,  $\text{C}_{11}\text{H}_{17}\text{Ar}$  (IX), the aromatic character of which can be shown by sulfonation. The aryl esters were prepd. by heating the acid chlorides (obtained with  $\text{SOCl}_2$ ) with an excess of PhOH at 100–40°. The superheating and working up of the products were carried out as described in earlier papers. Cyclopentanecarboxylic acid, obtained in 91.6% yield from cyclopentanecarboxylic acid in MeOH with  $\text{PdCl}_2$ -gum arabic and H at room temp.,  $b_{14}$  112–3°. Ph ester (II) (65% yield),  $b_{13}$  137°, does not solidify –15°; heated 72 hrs. at 340°, 4.5 g. gives 0.25 g. cyclopentyl *o*-hydroxyphenyl ketone, pale yellow,  $b_{13}$  125–35°, does not solidify –15°. III (54%),  $b_{13}$  127°,  $d_{17}^{20}$  1.0747; 13 g. yields after 72 hrs. at 300° 1.8 g. cyclobutyl *o*-hydroxyphenyl ketone,  $b_{13}$  139–40°, gives a dark violet color with alc.  $\text{FeCl}_3$  (as by-product was obtained 0.4 g. of the Me ester of the acid,  $b_{13}$  40°, whose vapors produced coughing). Cyclopropanecarboxylic acid, obtained in 38.4% yield from the di- $\text{CO}_2\text{H}$  acid after 8 hrs. by slowly heating it in 3 parts  $\text{C}_{10}\text{H}_8$  to 200°,  $b_{13}$  182–4°. Ph ester (IV) (53%),  $b_{13}$  117–8°; 10 g. gave after 72 hrs. at 360° 0.5 g. substance,  $b_{13}$  85–6°, which gave the boric ester reaction and a brown-red color with alc.  $\text{FeCl}_3$  and contained 76.86% C and 7.94% H (calcd. for  $\text{C}_{10}\text{H}_{10}\text{O}_2$ , 74.04, 6.21). V (yield, 21%),  $b_{13}$  127–8°. Ph ester (65.4%),  $b_{13}$  149–50°. Ph 1-methylcyclopentane-1-carboxylate (69%),  $b_{14}$  137°; the 1-methylcyclopentene formed by superheating was identified by comparison with a product, m. 32°, obtained in 65% yield from 1-methylcyclopentanol slowly heated in H with anhyd.  $(\text{CO}_2\text{H})_2$ ; oxidation with  $\text{CrO}_3$  gave  $\text{AcOH}$  and  $(\text{CH}_3\text{CO}_2\text{H})_2$ . Dimer of VII, m. 52–3°, mol. wt. m camphor 441. Ph ester of VIII (70%),  $b_{13}$  161–71°; 21 g. heated 42 hrs. at 320° and 24 hrs. at 350° gave 0.5 g. of the hydrocarbon IX (Ar = Ph). Anisyl ester (88%), pale yellow,  $b_{13}$  198–210°; 32 g. heated 72 hrs. at 340° gave 0.8 g. anisyl-naphthene,  $b_{13}$  150°, easily sol. in cold concd.  $\text{H}_2\text{SO}_4$  with deep orange-red halochromism.

C. A. R.

**Preparation of pure cyclohexene.** H. I. WATERMAN AND H. A. VAN WESTEN. *Rec trav chim.* 48, 637–9 (1929).—Pure cyclohexene was prepd. from a prepn. of Poulenc, which showed a Br value of 180.1 (calcd. 194.7) and a much too low H bromine value, in the following way. On fractional distn. an almost pure product could be obtained with a hydrogen bromine value 186.2 (calcd. 194.7) and with refractometric consts. which are in rather good agreement with those mentioned in the literature for cyclohexene; on hydrogenation, however, this product yielded some water, thus showing the presence of an impurity contg. O. On fractionating the purified product over Na, pure cyclohexene was obtained with the theoretical bromine and hydrogen bromine values,  $b_{769}$  82.8°,  $n_D$  1.4436,  $n_D$  1.44637,  $n_F$  1.45312,  $n_G$  1.45874 at 20.05.

C. F. VAN DUIN

**The properties of some very dry organic compounds.** JEAN TIMMERMAN. *Bull. soc. chim. Belg.* 38, 160–2 (1929).—Benzene, *p*-xylene, cyclohexane and  $(\text{CH}_2\text{Br})_2$  have been submitted to drastic drying over  $\text{P}_2\text{O}_5$  for a period of 35 months. This treatment did not affect the m. p. or the surface tension. These observations agree with those made by Briscoe and co-workers (C. A. 23, 3140). The results obtained with benzene contradict those obtained by Baker.

ALBERT L. HENNE

**Early history of the synthesis of closed carbon chains.** WM. HENRY PERKIN, JR. *J. Chem. Soc.* 1929, 1347–63.—The first Pedler lecture.

C. J. WEST

**Condensation of aromatic aldehydes with nitromethane.** MYSORE GURU SRINIVASA RAO, COLLURAYANA SRIKANTIA AND MYSORE SETHA IYENGAR. *Helv. Chim. Acta* 12, 581–3 (1929).—Condensation of  $\beta$ -resorcyraldehydes with  $\text{MeNO}_2$  was obtained with  $\text{AcONH}_4$  and glacial  $\text{AcOH}$  as catalysts. 2,4-HO(MeO) $\text{C}_6\text{H}_3\text{CHO}$  gives 2-hydroxy-4-methoxy- $\omega$ -nitrostyrene, m. 171–2°. 2,4-(MeO) $\text{C}_6\text{H}_3\text{CHO}$  gives 2,4-dimethoxy- $\omega$ -nitrostyrene, m. 104°. 4,2-MeO(EtO) $\text{C}_6\text{H}_3\text{CHO}$  gives 2-ethoxy-4-methoxy- $\omega$ -nitrostyrene, m. 102°. 5,2,4-O $_2\text{N}$ (MeO) $\text{C}_6\text{H}_3\text{CHO}$  gives 5- $\omega$ -dinitro-2,4-dimethoxy-styrene, m. 214°.

F. J. G. DE LEEUW

**Vapor-phase hydrolysis of phenyl chloride and bromide.** LYMAN CHALKLEY, JR. *J. Am. Chem. Soc.* 51, 2489-95 (1929).—This work was undertaken as a part of a search for new methods for the synthesis of PhOH. PhCl and PhBr are readily hydrolyzed to the extent of at least 25 to 40% by passage of their vapor mixed with steam over silica gel at 500-50° and ordinary pressures. The ability to catalyze the hydrolysis of the phenyl halides is not peculiar to silica gel but is possessed by a variety of hydration catalysts: silica gel, titania,  $Al_2O_3$ ,  $ThO_2$ ,  $ZrO_2$  and blue W oxide. A sample of kaolin showed little activity. Silica gel and  $TiO_2$  appear to be the most active. With silica gel as the catalyst the reaction proceeds at a measurable speed at 300° and above. The products of the reaction are: the halogen acid, PhOH,  $Ph_2O$  and probably smaller quantities of other org. compds. No pronounced halogenation of the PhOH obtained in the primary reaction was noticed and no  $H_2O$ -insol. gases were evolved. The activity of silica gel or  $TiO_2$  which has been fouled by use may be restored by heating the catalyst in air or  $O_2$ . C. J. WEST

**The action of nitrogen chloride on toluene and cyclohexene.** NORBERT STOLL. *Bull. soc. chim. Belg.* 38, 71-96 (1929).—In the light,  $NCl_3$  reacts by substitution with PhMe: both the nucleus and the chain are affected. In the dark, in the presence of  $C_6H_6$ , it reacts by addn. with cyclohexene. However, traces of  $C_6H_5Cl$ , PhCl, HCl and  $NH_3$  have been detected indicating that some substitution occurs. The formation of PhCl is explained by induction due to the simultaneous formation of  $C_6H_5Cl$ . No traces of  $C_6H_5Cl_2$  have ever been detected. ALBERT L. HENNE

**Derivatives of 2,5-dibromonitrobenzene.** L. CHAS. RAIFORD AND B. C. BREN. *J. Am. Chem. Soc.* 51, 2539-41 (1929).—The following derivs. were prepd. by the usual methods. *Tetrabromoazoxybenzene*, m. 217°, 15% yield; *tetrabromoazobenzene*, red, m. 247°, 13% yield; *tetrabromodiazaminobenzene*, yellow, m. 185°, nearly quant. yield; *di-bromophenyldiazonium chloride*, which does not give a phenol when boiled with  $H_2O$  but couples with  $\beta$ - $C_{10}H_7OH$  to give a red dye,  $C_{16}H_{10}ON_2Br_2$ ; the diazoamino compd. could not be rearranged into the isomeric aminoazo compd.; reduction of the diazonium salt with  $SnCl_2$  and HCl did not give the expected hydrazine but regenerated the amine and split off  $NH_3$ . *5,5'-Dibromoazoxy-o-anisole*, straw-colored, m. 121°, 60% yield; *5,5'-dibromoazo-o-anisole*, red, m. 238°, 81% yield; *5,5'-dibromohydrazo-o-anisole*, m. 120-1°, very small yield. *6,6'-Dibromodianisidine*, fawn-colored, m. 168° (th. Bz deriv., m. 274°; dye from diazo compd. and  $\beta$ - $C_{10}H_7OH$ , amorphous red powder, 5,5'-dibromohydrazo-o-phenetole, m. 171-2°, 14% yield. C. J. WEST

**Schiff bases derived from 5-chlorovanillin.** RAYMOND M. HANN, GEORGE S. JAMIESON AND E. EMMET REID. *J. Am. Chem. Soc.* 51, 2586-8 (1929).—The following *5-chlorovanillin* derivs. were prepd. by heating with the amine in 95% EtOH: *o-toluidine*, m. 115° (all m. ps. cor.) (*picrate*, yellow, m. 224°); *p-toluidine*, canary-yellow, in 142° (*picrate*, golden yellow, m. 230°); *m-nitroaniline*, light yellow, m. 160° (*picrate*, orange, m. 190°); *p-chloroaniline*, orange-yellow, m. 128° (*picrate*, orange-yellow, m. 215°); *cymidine*, yellow, m. 146-7°; *p-anisidine*, straw-colored, m. 131° (*picrate*, bright orange, m. 229-30°); *benzidine*, yellow, m. 251-2° (*picrate*, orange, m. 250-60° (decompn.)); *m-aminobenzoic acid*, yellow, m. 207° (*picrate*, orange-red, crystg. with EtOH, m. 211°); *p-aminophenol*, brick-red, m. 150° (*picrate*, orange, m. 224-5° (decompn.)); *o-dianisidine*, orange, m. 188° (*picrate*, golden yellow, decompn. 225°); *bis-nitro-p-toluidine*, yellow, m. 125° (*picrate*, bright yellow, m. 148°). No derivs. could be obtained from *o*- and *p*- $O_2NC_6H_4NH_2$ , 2,4- $Cl_2C_6H_3NH_2$  and  $(O_2N)_2C_6H_3NH_2$ . C. J. WEST

**Action of aromatic amines on nitric esters.** HUGH RYAN AND MICHAEL T. CASEY. *Sci. Proc. Roy. Dublin Soc. [N.S.]*, 19, 101-11 (1928).—The course of the reactions between primary aromatic amines and nitric esters seems to be indirectly hydrolytic. Thus aniline, *o*- and *p*-toluidine, and *m*-xylidine reacted with Et, Bu and Am nitrates to form the nitrate of the base. In those cases which were fully investigated the alkyl deriv. of the base was also formed. The chief reaction between a secondary amine and a nitric ester seems to be one of oxidation, a slight degree of nitration also occurring. Thus PhNHMe and BuNO<sub>2</sub> formed a red viscous product, while Ph<sub>2</sub>NH and EtNO<sub>2</sub> gave a green amorphous solid. Ph<sub>2</sub>NNO was also formed. Tertiary amines are also oxidized by nitric esters. PhNMe<sub>2</sub> was converted into a violet viscous solid, with evolution of oxides of N. The reactions between PhNMe<sub>2</sub> and the nitric esters of polyhydric alcs. are much more rapid than those between the base and the monohydric alcs. If the relative speeds of decompn. of nitric esters be measured by the colors produced with PhNMe<sub>2</sub>, the speeds of decompn. of Et, Bu, Am, cellulose and mannitol nitrates, when heated for 40 hrs. with PhNMe<sub>2</sub>, are in the ratio 1, 2.85, 0.175, 0.4 and 22.9, resp. PAUL BOONE

**New series of anesthetics. Acylaniline derivatives.** WALTER H. HARTUNG AND

J. C. MUNCH. *J. Am. Chem. Soc.* 51, 2570-4 (1929).—Acylanilines and acyltoluidines have anesthetic properties, particularly their HCl salts, if there is at least a butyrophenone skeleton. The following intermediate  $\text{NO}_2$  derivs. were prepd.: *m*-Nitrovalerophenone,  $b_p$  145-50°; 3-nitro-4-methylphenyl *Pr* ketone, m. 77.5° (semicarbazone, m. 215-6°); *iso-Pr* deriv., m. 41.0; *Bu* deriv., m. 48.0° (semicarbazone, m. 210°); *iso-Bu* deriv., m. 54.5° (semicarbazone, m. 214°). These were reduced to the  $\text{NH}_2$  derivs. *m*-Aminovalerophenone,  $b_p$  160-3° (HCl salt, m. 155.5-6.0°); 3-amino-4-methylphenyl *Et* ketone,  $b_p$  190-5°, m. 85.5-6° (*Ac* deriv., m. 131.5°; HCl salt, m. 204° (decompn.)); *Pr* deriv.,  $b_p$  150-65°, m. 69.0° (*Ac* deriv., m. 130.5°; HCl salt, m. 168°); *iso-Pr* deriv.,  $b_p$  150-3° (HCl salt, m. 167.5°); *Bu* deriv.,  $b_p$  170-85°, m. 61.0° (*Ac* deriv., m. 93-4°; HCl salt, m. 91.5-3.0°); *iso-Bu* deriv.,  $b_p$  165-70° (*Ac* deriv., m. 117.5°; HCl salt, m. 142.5°). Preliminary data are given on the m. l. d. of the HCl salt and the duration of anesthesia when applied to the rabbit cornea. C. J. WEST

Constitution of the normal diazotates and diazo hydrates. A. HANTZSCH. *Ber.* 62B, 1235-41 (1929).—H. cannot agree with Cambi and Szegő (*C. A.* 22, 337) that the normal diazotates are not *syn*-stereoisomers of the *anti*-diazotates but structurally isomeric nitro derivs. C. A. R.

Organic derivatives of silicon. XXXIX. The action of sodium on phenoxychlorosilicane. REGINALD AUBREY THOMPSON AND FREDERICK STANLEY KIPPING. *J. Chem. Soc.* 1929, 1176-9; cf. *C. A.* 23, 2954.—A very few compds. of the type  $\text{R}_2\text{SiCl}$  are known to be converted into derivs. of silicoethane when they are heated with Na (Kipping, *C. A.* 15, 2416) but  $\text{Ph}_2\text{SiCl}_2$  does not yield a deriv. of silicoethylene; the action of Na on  $\text{Ph}_2(\text{PhO})\text{SiCl}$  did not yield the desired product,  $(\text{PhOSiPh})_2$ . It therefore seemed of interest to study the action of Na on various phenoxychlorosilicane.  $\text{PhOH}$  (2.5 mols.) in an approx. equal vol. of  $\text{C}_6\text{H}_6$ , dropped into 1 mol. boiling  $\text{SiCl}_4$  and the mixt. heated at 200° for 3-4 hrs., gives a mixt. of 4 products: *Phenoxytrichlorosilicane*,  $b_{60}$  183-6°, fumes strongly in moist air and readily hydrolyzed by  $\text{H}_2\text{O}$  (about 20% yield); *diphenoxydichlorosilicane*,  $b_{60}$  199.5-202°,  $b_{60}$  215-8°, viscous, fuming liquid (35-40%); *triphenoxychlorosilicane*,  $b_{25}$  235-9°,  $b_{60}$  252-6°, very viscous, fumes only slightly in moist air (about 35%);  $\text{Si}(\text{OPh})_4$ , m. 48° (2-5%). Heated with excess of Na in boiling  $\text{C}_6\text{H}_5\text{Me}_2$ , the Cl derivs. are slowly attacked, giving a dark bluish black deposit; the whole of the Cl is finally eliminated as NaCl. The filtered soln. contains  $\text{Si}(\text{OPh})_4$ , the yield of which shows that practically all of the PhO groups in the original halogen compd. are obtained in the form of the ester. Since the Cl compds., when heated alone, do not undergo any change, some  $\text{PhONa}$  must be formed, which then reacts with the remainder to give the ester. The original insol. material is largely Si, most of which is converted into  $\text{SiO}_2$  or silicoformic acid by the action of  $\text{H}_2\text{O}$ . XL. Attempts to prepare unsaturated compounds from phenylsilicon trichloride. FREDERICK STANLEY KIPPING, ARTHUR GEORGE MURRAY AND JOHN GWILLIAM MALBY. *Ibid* 1180-91.—At the present time there is no evidence of a compd. contg. the group  $\text{Si C}$ ; when dichlorides,  $\text{R}_2\text{SiCl}_2$ , are heated with Na, the products do not contain the complex  $:\text{Si}:\text{Si}:$ , but are either open- or closed-chain structures consisting of  $-\text{SiR}_2-\text{SiR}_2-$  groups. The action of Na upon  $\text{PhSiCl}_3$  under different conditions does not give  $\text{PhSi}:\text{SiPh}$  but a mixt. of very complex products, most of which apparently are satd. compds.  $\text{PhSiCl}_3$ ,  $b_{200}$  152-3°, is easily obtained pure by using 2 mols.  $\text{SiCl}_4$  and 1.5 mols.  $\text{PhMgBr}$  (100 g. from 170 g.  $\text{SiCl}_4$ ). At about 180°, in the absence of a solvent,  $\text{PhSiCl}_3$  and Na slowly but almost quant. give a grayish insol. powder, with 25.1-26.8% Si, which does not react with I or Br and is not attacked by a mixt. of piperidine and aq. alkalis. In boiling  $\text{C}_6\text{H}_6$  or  $\text{PhMe}$ , the action of Na is inappreciable. In boiling  $\text{C}_{10}\text{H}_8$ , the reaction with Na is definitely exothermic and is completed much more rapidly than without a solvent. The proportion of product insol. in org. solvents is small and contains 33.9-34.7% Si and gives 1-1.2 atoms of H per atom Si readily with NaOH. The main product, fractionated from various solvents, gives preps., all of which contain O, while some contain  $\text{SiPh}_2$  groups and possibly  $\text{C}_{10}\text{H}_7$  radicals; various analyses are reported. In boiling  $\text{C}_6\text{H}_6$  at about 150° in a sealed tube or in boiling  $\text{C}_6\text{H}_5\text{Me}_2$ ,  $\text{PhSiCl}_3$  is attacked by Na fairly readily at first but prolonged heating is necessary to complete the reaction; K is therefore added towards the end of the operation in most of the expts. with  $\text{C}_6\text{H}_5\text{Me}_2$ . With either solvent there is only a small proportion of insol. product, similar to that obtained with  $\text{C}_{10}\text{H}_8$ . The sol. matter from the  $\text{C}_6\text{H}_5\text{Me}_2$  solns., prepd. in a N atm., is a pale yellow resin, contg. only a small proportion of unsatd., probably tervalent, Si atoms. Fractionation gives a series of colorless powders and gelatinous products, all of which appear to be complex mixts., which either char without melting or liquefy over a wide range of temp. The more sol. ones contain  $\text{SiPh}_2$  groups. Analyses of the freshly prepd., unfractionated sol.

material indicates the presence of at least 4% O; a further quantity of O is absorbed at 120°, the material becoming much less sol., but its glue-like character at that temp. prevents very accurate detns.; it does not seem to oxidize in the air at room temp. The source of the O in the unexposed products has not been ascertained. The results of many analyses seem to show that the more sparingly sol. fractions are composed principally of compds. contg. oxidized SiPh groups, whereas the components of the more sol. fractions contain in addn. a considerable proportion of SiPh<sub>2</sub> groups. F p detns. in C<sub>6</sub>H<sub>6</sub> and camphor show that the av. mol. wt. of the components of the more sparingly sol. fractions is about 5000, that of the substances in the most sol. material being about 900. The crude product, therefore, seems to be mixts. of compds. contg. from about 6 to at least 50 Si atoms in their mols. All the fractions are attacked by aq. piperidine and by aq. alkalis in the presence of an org. solvent, with evolution of H and fission of Si-Si linkages. The only fission product isolated was Ph<sub>2</sub>Si(OH)<sub>2</sub>, the difficulties of the identification of the products of fission are pointed out. The results indicate that under all the different exptl. conditions the PhSiCl<sub>3</sub> is converted into a complex mixt. of products, the components of which contain not only SiPh and SiPh<sub>2</sub> groups but also Si atoms uncombined with C; some of the Si atoms seem to be unsatd., probably tervalent, but most of them have become satd. by combination with O. The mechanism of the reaction is discussed. C. J. WEST

**New observations upon improved active magnesium-copper alloys for the preparation of the Grignard reagent.** HENRY GILMAN AND LLOYD L. HECK. *Bull. soc. chim.* **45**, 250-4(1929); cf. C. A. **22**, 1134.—A series of Mg-Cd alloys varying in compn. from 0 to 19.6% Cu to be used in the prepn. of the Grignard reagent was studied. Several of these were found superior to Baeyer's active Mg. An alloy with 14.5% Cu was found to be most active of those investigated. ROBERT F. MEHL

**The Grignard reagents prepared from *p*-dibromobenzene.** HENRY GILMAN, N. J. BEABER AND H. L. JONES. *Rec. trav. chim.* **48**, 597-602(1929).—In general polyhalogen aromatic compds. undergo a reaction with Mg, which is almost exclusively confined to the prepn. of a mono-organomagnesium halide. Particular exceptions have been noted with some poly-I compds. where varying quantities of polyorgano magnesium iodides form (Votocek and Kohler, C. A. **8**, 2385; Thomas, C. A. **19**, 3085; Bruhat and Thomas, C. A. **20**, 3451). The reaction between *p*-C<sub>6</sub>H<sub>4</sub>Br<sub>2</sub> and Mg in ether is, however, according to the results of previous investigators, confined to one of the Br atoms, the formation of *p*-C<sub>6</sub>H<sub>4</sub>(MgBr) being only reported in a few cases. Houben (*Ber.* **38**, 3796(1905)) obtained a 1.25% yield of *p*-C<sub>6</sub>H<sub>4</sub>(CO<sub>2</sub>H)<sub>2</sub> by adding CO<sub>2</sub> to the Grignard reagent, prep'd from *p*-C<sub>6</sub>H<sub>4</sub>Br<sub>2</sub>, whereas Pink (C. A. **18**, 669) states that the di-Grignard reagent is only formed in traces. On refluxing *p*-C<sub>6</sub>H<sub>4</sub>Br<sub>2</sub> with an excess of Mg for 12 hours and subsequent hydrolysis Quelet (C. A. **22**, 231, 23, 2157) obtained 12% of benzene, 70% of PhBr and 10% of (*p*-BrC<sub>6</sub>H<sub>4</sub>)<sub>2</sub>. The present authors have found that under ordinary conditions there is no evidence of the appreciable formation of *p*-C<sub>6</sub>H<sub>4</sub>(CO<sub>2</sub>H)<sub>2</sub> from CO<sub>2</sub> when no catalyst is used in the Grignard reaction. With 15-mesh Mg and no catalyst but with extended refluxing in an ether-benzene mixt. the apparent (see below) yield of C<sub>6</sub>H<sub>4</sub>(CO<sub>2</sub>H)<sub>2</sub> was 4.2%. On using the highly active 12.75% Cu-Mg alloy of G. Peterson and Schulze (C. A. **22**, 1134), it was possible to get an apparent yield of 23.5% of C<sub>6</sub>H<sub>4</sub>(CO<sub>2</sub>H)<sub>2</sub> as follows. The Grignard reaction was allowed to take place between 28.8 g. (0.8 atom) of the freshly reactivated alloy and 23.6 g. of C<sub>6</sub>H<sub>4</sub>Br<sub>2</sub> (0.1 mole) in 200 cc. ether; when the reaction was over, the greater part of the ether was distd. off and replaced by benzene and the mixt. refluxed for 6 hrs. After the reaction with CO<sub>2</sub> according to the method of G. and Parker (C. A. **19**, 467) the crude mixt. of acids was collected in the usual way, dried and extd. with CHCl<sub>3</sub> in order to remove *p*-BrC<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>H as well as any phenolic compds. that might have been present. The yield of C<sub>6</sub>H<sub>4</sub>(CO<sub>2</sub>H)<sub>2</sub> was 23.5%, but this acid gave a Na fusion test for Br while the neutralization value indicated only a yield of 7.7% of C<sub>6</sub>H<sub>4</sub>(CO<sub>2</sub>H)<sub>2</sub>, assuming that the contaminant was *p*-BrC<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>H. By assuming the intermediate formation of free radicals and of MgX the possibility exists that several transformation products are formed from the *p*-BrC<sub>6</sub>H<sub>4</sub> radical (cf. G. and Kirby, C. A. **23**, 2953) so that a large no. of Grignard reagents may be formed. A development of this type is helpful in understanding the fact that the C<sub>6</sub>H<sub>4</sub>(CO<sub>2</sub>H)<sub>2</sub> is not pure but contains other acids to a lesser extent. C. F. VAN DUIN

**Nitro- and halonitrobenzenesulfonic acids.** J. N. FLIGERSMA. *Rec. trav. chim.* **48**, 752-64(1929).—Several nitro- and halonitrobenzenesulfonic acids have been prep'd in a pure condition, viz., free from isomers, according to the method of Blankensma (*Ver. slag. Akad. Wetenschappen Amsterdam* **8**, 299(1899); **9**, 401(1900); *Rec. trav. chim.* **19**, 111(1900); **20**, 121(1901)) by replacement of a mobile halogen atom or a mobile



nitro group in a (halo-)nitrobenzene by S by means of Na polysulfide and subsequent oxidation of the disulfide to the corresponding (halo-) nitrobenzenesulfonic acid by means of fuming  $\text{HNO}_3$ . The following compds. are described: *2,2'-dinitrodiphenyl disulfide*, m.  $195^\circ$ ; *2-nitrobenzenesulfonic acid*; *4,4'-dinitrodiphenyl disulfide*, for which the m. ps.  $170^\circ$  and  $181^\circ$  are given in the literature and which shows a characteristic transition point at  $134^\circ$  (Blanksma, *Rec. trav. chim.* **20**, 128(1901)) which is denoted by the sudden disruption of the crystals (cf. Leuckart, *J. prakt. Chem.* (2) **41**, 199 (1890)); Zincke, *C. A.* **7**, 3746; Willgerodt, *Ber.* **18**, 331(1885); Kehraman and Bauer, *Ber.* **29**, 2366(1896); Ekbohm, *Ber.* **35**, 655(1902); Fromm and Wittman, *C. A.* **2**, 2932; Bamberger and Kraus, *Ber.* **29**, 282(1896); Fries and Schürmann, *C. A.* **8**, 2382; Chalenger and Collins, *C. A.* **18**, 2689). It is now shown by E that this disulfide exists in 2 forms: 36 g. of crude disulfide, m.  $155-66^\circ$ , was extd. with 80 cc boiling alc., which is far too small an amt. to dissolve the whole mass. The residue, 32 g., m.  $176-8^\circ$  and was extd. with boiling  $\text{AcOH}$ ; the residue, 1 g., m.  $181^\circ$ , while the  $\text{AcOH}$  soln. on cooling deposited colorless crystals, m.  $170^\circ$ . Both substances retained the same m. p. after recrystn. from  $\text{EtOH}$  and both showed the characteristic transition point noted by Blanksma. *4-Nitrobenzenesulfonic acid*; *2,2',4,4'-tetranitrodiphenyl disulfide*, m.  $280^\circ$ ; *2,4-dinitrobenzenesulfonic acid*,  $\text{C}_6\text{H}_3(\text{NO}_2)_2\text{SO}_3\text{H} \cdot 3\text{H}_2\text{O}$ , non-hygroscopic needles, m.  $108^\circ$ ; *2,2'-dinitro-4,4'-dichlorodiphenyl disulfide*, m.  $212.8^\circ$ ; *2-nitro-4-chlorobenzenesulfonic acid*, m.  $114-5^\circ$  in the anhyd. state; aniline salt, m.  $207^\circ$ ; this salt is formed on heating the  $\text{SO}_3\text{H}$  acid with aniline at  $185^\circ$ , the  $\text{SO}_3\text{H}$  group being not replaced by the  $\text{NHPh}$  group in this way as in  $2,4-(\text{O}_2\text{N})_2\text{C}_6\text{H}_3\text{SO}_3\text{H}$ . The constitution of this acid was proved by reduction with Zn dust to *2-amino-4-chlorobenzenesulfonic acid*, leaflets with a sweet taste, which, on treatment with Br water, passes into *2,4,6-tribromo-3-chloroaniline*, m.  $123-4^\circ$ . *2,2'-Dinitro-5,5'-dichlorodiphenyl disulfide*, m.  $171-2^\circ$ ; *2-nitro-5-chlorobenzenesulfonic acid*. *3-Nitro-6-chlorobenzenesulfonic acid* was obtained from Schuchardt and on recrystn. from water m.  $169^\circ$  and contains  $\text{H}_2\text{O}$ ; the structure was proved as follows: (a) on boiling the acid with alkali it was converted into  $6,3\text{-HO}(\text{O}_2\text{N})\text{C}_6\text{H}_3\text{SO}_3\text{H}$ , which, on treatment with Br water, yields  $2,6,4\text{-Br}_2(\text{O}_2\text{N})\text{C}_6\text{H}_2\text{OH}$ , m.  $145^\circ$ ; (b) the acid was converted by means of alc.  $\text{NH}_3$  at  $130^\circ$  into the  $\text{NH}_4$  salt of  $3,6\text{-O}_2\text{N}(\text{H}_2\text{N})\text{C}_6\text{H}_3\text{SO}_3\text{H}$ , which, on treatment with 2 moles  $\text{NaNO}_2$  and boiling with  $\text{EtOH}$ , gave  $m\text{-O}_2\text{NC}_6\text{H}_4\text{SO}_3\text{H}$  (chloride, m.  $61.5^\circ$ ), while on treatment with Br water  $2,6,4\text{-Br}_2(\text{O}_2\text{N})\text{C}_6\text{H}_2\text{NH}_2$ , m.  $206^\circ$ , was obtained. *2,2'-Dinitro-4,4'-dibromodiphenyl disulfide*, m.  $174^\circ$ ; *2-nitro-4-bromobenzenesulfonic acid*, which, after standing over  $\text{P}_2\text{O}_5$  for 14 days still contains 1 mole  $\text{H}_2\text{O}$ , m.  $120^\circ$ .

C. F. VAN DUIN

The preparation and solubility in water of some salts of the nitro- and halonitrobenzenesulfonic acids. J. N. ELGERSMA. *Rec. trav. chim.* **48**, 765-9(1929); cf. preceding abstract.—The results are given in the following tables:

I Water of crystn.

	Cs	Rb	K	Na	$\text{NH}_4$	$\text{Li}$
2 Nitrobenzenesulfonic acid	0	0	0	..	..	..
3-Nitrobenzenesulfonic acid	0	0	0	..	..	..
4-Nitrobenzenesulfonic acid	0	0	1	..	..	..
2,4-Dinitrobenzenesulfonic acid	1	$3\frac{1}{2}$	0	..	..	..
2-Nitro-4-chlorobenzenesulfonic acid	0	0	0	0	..	1
2-Nitro-5-chlorobenzenesulfonic acid	0	0	0	..	..	..
3-Nitro-6-chlorobenzenesulfonic acid	0	0	0	1	1	..
2 Nitro-4-bromobenzenesulfonic acid	0	0	0	1	..	..

II Soly. at  $25^\circ$  (the figures give the amt. of anhyd. salt dissolving at  $25^\circ$  in 100 g. of water)

	Cs	Rb	K
2-Nitrobenzenesulfonic acid	20.74	16.08	9.63
3-Nitrobenzenesulfonic acid	37	6.09	3.04
4 Nitrobenzenesulfonic acid	5.46	5.80	5.95
2,4-Dinitrobenzenesulfonic acid	2.50	3.90	4.70
2-Nitro-4-chlorobenzenesulfonic acid	6.98	1.93	0.87
2-Nitro-5-chlorobenzenesulfonic acid	2.25	1.07	1.59
3-Nitro-6-chlorobenzenesulfonic acid	1.51	1.32	2.83
2-Nitro-4-bromobenzenesulfonic acid	6.09	1.80	1.68

Of all the K salts investigated, that of  $4,2\text{-Cl}(\text{O}_2\text{N})\text{C}_6\text{H}_3\text{SO}_3\text{H}$  appeared to be most sparingly sol. and it was found that in a diln. 1:300 K may be detected with certainty,

brilliant crystals being formed in the course of 4 min. Thus this acid may be used as a qual. reagent for K. From the 2nd table it follows that the introduction of a  $\text{NO}_2$  group in  $\text{PhSO}_3\text{H}$  decreases the soly. of the Cs, Rb and K salts, the further introduction of a halogen atom or a  $\text{NO}_2$  group causing a further decrease in the soly. independent of the position of the groups in the benzene ring. A relation between structure and soly. cannot be traced.

C. F. VAN DUIN

**Nitro- and halonitrobenzenesulfonic acids. III.** J. N. ELGERSMA. *Rec. trav. chim.* 48, 770-7(1929); cf. preceding abstrs.—The equiv. cond. in  $\text{H}_2\text{O}$  at various dilns. as also the equiv. cond. at infinite diln. was measured for 2-nitro-, 3-nitro-, 4-nitro-, 2,4-dinitro-, 2-nitro-4-chloro-, 2-nitro-5-chloro-, 3-nitro-6-chloro- and 2-nitro-4-bromobenzenesulfonic acids and some of their salts. The value for  $\lambda_\infty$  varies for all these acids only between the values 376 and 378, while the measurements of the cond. of the K salts of 2- and 3- $\text{O}_2\text{NC}_6\text{H}_4\text{SO}_3\text{H}$  as well as of the Na salt of the 2-nitro-4-chloro acid are in harmony with those of the acids itself. In practice the values of  $\lambda_\infty$  are the same for all the acids investigated, even for the non-isomeric ones. The rule of Ostwald (*Z. physik. Chem.* 2, 850(1888)), that  $\lambda$  is equal for isomeric ions, is thus confirmed, and the values found for  $\lambda_\infty$  are in agreement with the rules of Walden (*Das Leitvermögen der Lösungen*, II, 130(1924)) and of Rimbach (*Kleines physikalisch-chemisches Praktikum*, 84(1921)) but not with the rule of Ostwald-Luther (*Physiko-chemische Messungen* 481 (1910)). From the degree of dissoen. calcd. from these measurements, it follows that the acids investigated belong to the strong acids and in this respect are comparable with the strong inorg. acids. When 1 mole is dissolved in 16 l. water, the degree of dissoen. is about 93%, except for 2,4- $(\text{O}_2\text{N})_2\text{C}_6\text{H}_3\text{SO}_3\text{H}$ , the strongest of the acids used, which is practically completely split up into its ions in this diln. For all the figures detd. experimentally as well as for details the original paper must be consulted.

C. F. VAN DUIN

The reaction between phenylmagnesium bromide and some amides of sulfonic, sulfinic and sulfenic acids. HENRY GILMAN AND C. C. VERNON. *Rec. trav. chim.* 48, 745-7(1929).—Under ordinary conditions, viz., in ether soln. at room temp., there is no appreciable reaction between *p*-toluenesulfonyldiphenylamine, di-*p*-toluenesulfimide, benzenesulfanilide and benzenesulfonyldiethylamine with  $\text{PhMgBr}$ . Except in the latter case a reaction was not observed when the reaction was carried out at higher temps. in ether-toluene mixts. Benzenesulfonyldiethylamine, however, reacted under these forced conditions with the formation of  $\text{Ph}_2\text{S}$  and  $\text{NH}_4\text{Et}_2$ .

C. F. VAN DUIN

**Syntheses in the diphenyl ether series. I. Preparation of some simple derivatives.** C. M. SUTER. *J. Am. Chem. Soc.* 51, 2581-5(1929).—In the nitration of  $\text{Ph}_2\text{O}$  best results were obtained by using 100 cc. fuming  $\text{HNO}_3$  (d. 1.52) in 300 cc. glacial  $\text{AcOH}$ , added over a period of 2 hrs., to a well-stirred soln. of 340 g.  $\text{Ph}_2\text{O}$  in 400 cc.  $\text{Ac}_2\text{O}$  at 25-30° and pouring the mixt. into  $\text{H}_2\text{O}$  after 3.5 hrs.; 370 g. or 80% of the mono- and di- $\text{NO}_2$  derivs. were obtained, the first  $b_{14}$  193-210°, 700 g. of the mono- $\text{NO}_2$  mixt. at 0° deposited 270 g. *p*- $\text{O}_2\text{NC}_6\text{H}_4\text{OPh}$ ; the remaining oil contained about 25% of the *p*-isomer, so that the original mixt. contained 54% of the *p*-deriv., m. 57°, yields under various conditions are reported. Reduction with Zn and  $\text{CaCl}_2$  in  $\text{H}_2\text{O}$  gives the *p*- $\text{NH}_2$  deriv.,  $b_{14}$  187-9° (cor.). The mixt. of  $\text{NO}_2$  compds., on reduction, gives 54% *o*- and 21% *p*- $\text{NH}_2$  derivs., the latter being pptd. as the sulfate; the *o*- $\text{NH}_2$  deriv.,  $b_{14}$  172-3° (cor.), m. 44-5° (*Ac* deriv., m. 81°). *p*-Cyanodiphenyl ether, from the *p*- $\text{NH}_2$  deriv. through the diazo reaction,  $b_{14}$  187-8° (cor.), m. 47°; the *o*- $\text{CN}$  deriv.  $b_{14}$  188° (cor.). *p*-Bromo-*p*-aminodiphenyl ether, by reduction of the  $\text{NO}_2$  deriv. with Fe and HCl, m. 109° (84% yield); *Ac* deriv., m. 162-3° (cor.). A Br atom in 1 ring of  $\text{Ph}_2\text{O}$  affects only slightly substitution in the 2nd ring, which is in contrast to the influence of the  $\text{NO}_2$  group.

C. J. WEST

**Conjugated systems. I. Chlorination of phenylbutadiene.** IRVING E. MUSKAY AND K. A. HUGGINS. *J. Am. Chem. Soc.* 51, 2496-502(1929).—Chlorination of  $\text{PhCH=CHCH=CH}_2$  gives the 3,4-*di*-Cl deriv. (I),  $b_s$  125°; the structure of I was detd. by the decompn. of the ozonide, the acid portion giving  $\text{BzOH}$ , the aldehyde,  $\text{BzH}$ . I is further chlorinated in  $\text{CHCl}_3$  to a *tetra*-Cl deriv., which is a mixt. of stereoisomers,  $b_s$  155-66°, partially reduced by Zn to I and completely reduced to  $\text{PhCH}_2\text{CHCH}_2\text{CH}_2$ . Heating I with aq. KOH at 90° for several hrs. gives nearly quant. 1-phenyl-4-chlorobutadiene (II),  $b_s$  115.5°, m. 53°, also obtained in 60% yield by refluxing I for several hrs. The structure of II was established by hydrolysis and oxidation to  $\text{PhCH}_2\text{CHCH}_2\text{CO}_2\text{H}$ . II absorbs 1 mol. Cl, giving 1-phenyl-4-chloro- $\Delta^1$ -butene 3,4-dichloride (1-phenyl-3,4,4'-trichlorobutene),  $b_s$  140°, whose structure was proved by ozonization; excess Cl gives 1-phenyl-1,2,3,4,4'-pentachlorobutane,  $b_s$  162°. Straus' work (*C. A.* 3,

2697) on the bromination of  $\text{PhCH:CHCH:CH}_2$  was confirmed in every particular.

C. J. WEST

**Mobility of symmetrical triad prototropic systems. V. A new triad system (methylenazomethine).** CHRISTOPHER KELK INGOLD and CHARLES WM. SHOPPE. *J. Chem. Soc.* 1929, 1199–204; cf. *C. A.* 23, 2958.—The present position relating to the study of mobile H tautomerism (prototropy) is summarized, the principles of which are applied to a new triad prototropic system, termed the "methylenazomethine" system,  $\text{CHN:C} \rightleftharpoons \text{C:NCH}$ . *p*- $\text{MeOC}_6\text{H}_4\text{CHO}$  and  $\text{PhCH}_2\text{NH}_2$ , heated at  $100^\circ$  for 0.5 hr. in H, give *p*-methoxybenzylidenebenzylamine (I), m.  $42^\circ$ . Hydrolysis with 2 N  $\text{H}_2\text{SO}_4$  by boiling 0.5 hr. gives the 2 components. The *picrate*, m.  $198^\circ$  (decompn.).  $\text{BzH}$  and *p*- $\text{MeOC}_6\text{H}_4\text{CH}_2\text{NH}_2$  give benzylidene-*p*-methoxybenzylamine (II),  $b_{17}$   $217^\circ$ ; *picrate*, m.  $188^\circ$  (decompn.); *benzoate*, m.  $135^\circ$ . Hydrolysis gives the 2 components. Either I or II, heated 2 hrs. with 30 parts 1.45 N  $\text{EtOH-EtONa}$  at  $85^\circ$ , gives a mixt. consisting of 21.1% II and 78.9% I.  $\text{PhCH}_2\text{N:CH}_2$ , in  $48^\circ$ , is stable to boiling 2.92 N  $\text{EtOH-EtONa}$  and is hydrolyzed by hot 2 N  $\text{H}_2\text{SO}_4$  to  $\text{HCHO}$  and  $\text{PhCH}_2\text{NH}_2$ . Fusion with KOH at  $300^\circ$  or heating with 1.45 N  $\text{EtOH-EtONa}$  at  $190^\circ$  for 7 hrs. causes partial conversion into  $\text{PhCH:NMe}$  (III). However, III is not converted into the tautomer under similar conditions.

C. J. WEST

**Reduction with alcohols of cinnamaldehyde to  $\beta$ -phenylpropionaldehyde.** PAUL F. WESTON and HOMER ADKINS. *J. Am. Chem. Soc.* 51, 2589 (1929).—By the method of reducing  $\text{CH}_2\text{:CHCHO}$  described in *C. A.* 22, 3132, 100 g.  $\text{PhCH:CHCHO}$  gives about 55 g. unchanged aldehyde, 20 g.  $\text{PhCH}_2\text{CH}_2\text{CHO}$  and 15 g. of a dark brown, viscous liquid b. above  $250^\circ$ ; thus, about 35% of the aldehyde reacted and 60% of the part reacting is converted into  $\text{PhCH}_2\text{CH}_2\text{CHO}$ ; about 50% of the alc. was used in the formation of  $\text{EtCHO}$  and  $\text{PhCH}_2\text{CH}_2\text{CHO}$  while most of the remainder forms  $\text{Pr}_2\text{O}$ . Similar reactions occurred and approx. the same yields of  $\text{PhCH}_2\text{CH}_2\text{CHO}$  were obtained from 50 g.  $\text{PhCH:CHCHO}$  in 100 cc.  $\text{MeOH}$ ,  $\text{EtOH}$  or  $\text{PrOH}$ . C. J. W.

**Question of the tautomerism of *o*-nitro compounds.** F. ARNDT. *Ber.* 62B, 1167–71 (1929).—Reply to Tanasescu (*C. A.* 23, 1126).

C. A. R.

**$\beta$ -Phenylisobutyl methyl ketone and its derivatives. Synthesis of  $\alpha$ - and  $\beta$ -phenylisovaleric acids.** ALFRED HOFFMAN. *J. Am. Chem. Soc.* 51, 2542–7 (1929).— $\text{Me}_2\text{C:CHAc}$ ,  $\text{C}_6\text{H}_5$  and  $\text{AlCl}_3$  give about 80% of  $\beta$ -phenylisobutyl Me ketone (I),  $b_{22}$   $134^\circ$ ,  $b_{700}$   $252^\circ$  (cor.),  $d_{25}^{20}$  0.972; *semicarbazone*, m.  $163\text{--}4^\circ$ ; *oxime*, m.  $52\text{--}4^\circ$ ; *tetra-Br deriv.*, m.  $96\text{--}8^\circ$ . I and  $\text{ZnCl}_2$  at  $180^\circ$  give a mixt. of hydrocarbons, from which the *compd.*  $\text{C}_{21}\text{H}_{24}$ ,  $b_{18}$   $195^\circ$ , m.  $130.5\text{--}1^\circ$  (cor.), is obtained from the fraction,  $b_{18}$   $150\text{--}230^\circ$ ; it does not react with Br but yields a *tri-NO}\_2* deriv., m.  $180\text{--}4^\circ$ . Reduction of I gives  $\beta$ -phenylisobutylmethylcarbinol,  $b_{17}$   $132\text{--}3^\circ$ ,  $d_{25}^{20}$  0.960, dehydrated by  $\text{ZnCl}_2$  to the hydrocarbon  $\text{C}_{12}\text{H}_{16}$  (probably  $\text{Me}_2\text{PhCCH:CHMe}$ ),  $b_{17}$   $96\text{--}8^\circ$ ,  $d_{25}^{20}$  0.889; Br reacts instantly; oxidation with  $\text{CrO}_3$  gives a complex mixt. of ketones. Oxidation of I with  $\text{NaBrO}$  gives  $\beta$ -phenylisovaleric acid, m.  $58\text{--}8.5^\circ$ ; *Me ester*,  $b_{11}$   $120^\circ$ , anilide, m.  $122\text{--}3^\circ$ ; *NO}\_2* deriv., m.  $169\text{--}72^\circ$ . This was synthesized from  $\text{PhMe}_2\text{CCl}$  and  $\text{CH}_2(\text{CO}_2\text{Et})_2$ , the resulting product being hydrolyzed and then heated at  $200^\circ$  until  $\text{CO}_2$  evolution ceased. The  $\alpha$ -acid was similarly prepd from  $\text{PhCH}(\text{CO}_2\text{Et})_2$  and  $\text{Me}_2\text{CHI}$ , and  $b_{14}$   $159\text{--}60^\circ$ , m.  $60^\circ$ , .1g salt; *anilide*, m.  $132\text{--}3^\circ$ . These results show that the acid obtained by oxidation of the product from  $\text{C}_6\text{H}_5$ ,  $\text{Me}_2\text{C:CHCO}_2\text{H}$  and  $\text{AlCl}_3$  (Rijkman) is the  $\beta$ - and not the  $\alpha$  acid, as he assumed.

C. J. WEST

**Formation of bases from carbonyl compounds. III. A synthesis of *dl*-ephedrine and other amino alcohols.** A. SKITA and F. KEIL (in part with L. BOENTE). *Ber.* 62B, 1142–51 (1929); cf. *C. A.* 23, 111.—In the earlier paper the conversion of  $\text{CH}_2\text{Ac}_2$  in the presence of cyclohexylamine into  $\text{MeCH(OH)CH}_2\text{CH(NHC}_6\text{H}_{11})\text{Me}$  was described as an example of the transformation of diketones into  $\text{NH}_2$  alcs. by catalytic reduction in basic soln. Some time later Manske and Johnson reported the synthesis of *dl*-ephedrine,  $\text{PhCH(OH)CH(NHMe)Me}$  (I), from  $\text{AcBz}$  in  $\text{MeNH}_2$  (*C. A.* 23, 1404). They ascribe the entrance of the  $\text{MeNH}$  group next to the alkyl group to the peculiar influence of the Ph residue, but it has been established that in all unsym. diketones, even the purely aliphatic 1,2-, 1,3- and 1,4-diketones, the keto group next to the smaller radical has the greater power of condensation, so that aryl alkyl 1,2-diketones like  $\text{AcBz}$  occupy no special position in this respect. Moreover, with their Pt oxide or Pt sponge catalyst M. and J. obtained only 25–40% yields of I while the authors with their method (colloidal Pt) were able to convert 0.1 g. mol. of  $\text{AcBz}$  into I within an hr. and to isolate 50% of pure I; because of the appearance of M. and J.'s paper they therefore feel impelled to describe a few more examples of the application of their method sooner than they had intended.  $(\text{CH}_3\text{Ac})_2$  reduced in the presence of  $\text{C}_6\text{H}_{11}\text{NH}_2$  gave

on the 1 hand 5-cyclohexylamino-2-hexanol (II) and on the other hand a *N*-cyclohexyl-2,5-dimethylpyrrolidine (III), formed by reaction of the  $(\text{CH}_3\text{Ac})_2$  with the  $\text{C}_6\text{H}_{11}\text{NH}_2$  with elimination of  $\text{H}_2\text{O}$ , and reduction of the resulting pyrrole deriv.  $\text{MeCHAc}_2$  gave only 1 product, 4-cyclohexylamino-3-methyl-2-pentanol (IV), but  $\text{BzCH}_2\text{Ac}$  in the presence of  $\text{MeNH}_2$  gave a mixt. of 2 diastereomeric 1-phenyl-3-methylamino-1-butanols (V and VI) sepd. through their picrates.  $\text{Bz}_2$  in the presence of  $\text{MeNH}_2$  gave 1,2-diphenyl-2-methylamino-1-ethanol (VII) and  $\text{MeCOPr}$  yielded 2-methylamino-3-hexanol (VIII) and a pyrrolidine deriv. (IX) formed by the action of  $\text{MeNH}_2$  on the  $\text{PrCOMe}(\text{OH})$ .  $\text{CH}_3\text{COAc}$  produced from the  $\text{PrCOMe}$  in basic soln., and subsequent reduction of the resulting pyrrole deriv. The I obtained by this method contained no pseudophedrine. Catalytic reduction of I in the presence of  $\text{HCHO}$  gave the tertiary *dl*-*N*-methylphedrine (X). These tertiary bases can also be obtained directly from the diketones in the presence of secondary bases; thus,  $\text{CH}_2\text{Ac}_2$  in  $\text{NHMe}_2$  gave 4-*N*-dimethylamino-2-pentanol (XI). II (2 g. from 13.7 g.  $(\text{CH}_3\text{Ac})_2$ ),  $b_{21}$  153°, m. 76-7°; *picrate*, m. 150-1° III (6 g.),  $b_{16}$  100°,  $d_4^{20}$  0.8927,  $n$  1.47067, 1.47339, 1.47973 for  $\alpha$ , D and  $\beta$  at 20°,  $E_D$  -0.14, -0.13, -0.15, 3% for  $\alpha$ , D,  $\beta$  and  $\beta - \alpha$ , gives the pyrrole pine-splinter reaction after rapid heating in a test tube; *picrate*, light yellow, m. 111-4°. IV,  $b_1$  104° ... H; *picrate*, m. 157-9°. V,  $b_{16}$  155-6°,  $d_4^{20}$  1.0101°  $n$  1.52032, 1.52421, 1.53443 for  $\alpha$ , D and  $\beta$  at 20.5°,  $E_D$  -0.17, -0.17, -0.14, 4% for  $\alpha$ , D,  $\beta$  and  $\beta - \alpha$ ; *picrate*, light yellow, m. 193-4°. VI,  $b_{16}$  155-6°,  $d_4^{20}$  1.0079,  $n$  1.51902, 1.52298, 1.53331,  $E_D$  0.15, -0.15, -0.12, 4%; *picrate*, dark yellow, m. 118-9°. VII,  $b_{20}$  195-200°, m. 134°, *HCl* salt, m. 250°; *acetate*, VIIAcOH, m. 144-5°. 2-Cyclohexylamino analog, m. 162-3°; *HCl* salt, m. 264-5°. VIII (8 g. from 23 g.  $\text{PrCOMe}$ ),  $b_{18}$  81°, m. 78° *HCl* salt, m. 146-7°. *N*-Methyl-2-[1-butanol]-4-hydroxy-4-methyl-5-propylpyrrolidine (IX) (4 g.), light yellow,  $b_{15}$  154-6°, gives the pine-splinter reaction after heating in a test tube, mol. wt. in freezing  $\text{C}_6\text{H}_6$  235; *diacetate*, yellow sirup,  $b_{16}$  165-8°. I, m. 75°; *HCl* salt, m. 185-6°. X, m. 63-4.5°; *HCl* salt, m. 205°. XI,  $b_{11}$  61.2°. C A R

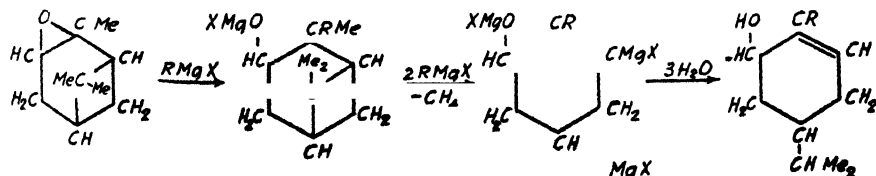
"Oxidizing" actions of alkalis. II. Aromatic hydroxy aldehydes. GUNTHER Lock. *Ber.* 62B, 1177 88(1929); cf. C. A. 23, 827.—Like *o*- $\text{HOC}_6\text{H}_4\text{CHO}$ , the *m* and *p*-comps. on fusion with  $\text{KOH}$  decomp. almost quantitatively into  $\text{H}_2$  and  $\text{KOC}_6\text{H}_4\text{CO}_2\text{K}$ , but while the *o*- and *p*-comps. begin to evolve  $\text{H}$  below 110°, the *m* compd. (I) begins to react only at about 190°, and moreover the yellow color which is produced when the aldehyde is mixed with the powd.  $\text{KOH}$  gradually disappears without any external heating. The cause of these phenomena is that I undergoes the Cannizzaro reaction with solid  $\text{KOH}$  or its soln. at room temp. and at 190° the  $\text{KOH}$  further reacts with the *m*- $\text{HOC}_6\text{H}_4\text{CH}_2\text{OH}$  resulting from the disproportionation. The gradual disappearance of the yellow color at room temp. marks the 1st reaction, the yellow phenolate changing into the colorless salts of  $\text{HOC}_6\text{H}_4\text{CO}_2\text{H}$  and  $\text{HOC}_6\text{H}_4\text{CH}_2\text{OH}$ . The old rule that a phenolic  $\text{HO}$  group prevents the disproportionation into alc and acid holds, therefore, only when the  $\text{HO}$  group is in the *o*- or *p*-position to the  $\text{CHO}$  group. With aq.  $\text{KOH}$  I reacts at room temp. without evolution of gas and gives more than 90% of the acid and alc. In parallel expts. with I and  $\text{KOH}$  on the 1 hand and the alc. and  $\text{KOH}$  on the other, to det. whether a Cannizzaro reaction precedes the evolution of  $\text{H}$ , the evolution of  $\text{H}$  in both cases began at 190°, showing that it is produced from the alc. The 6-Br deriv. of I reacts visibly more sluggishly with 50%  $\text{KOH}$ , the mixt. must be slightly warmed but the end result is the same as with I itself. The 4- and 6- $\text{NO}_2$  derivs. likewise do not undergo the Cannizzaro reaction as readily as I, giving 38-9 and 70%, resp., of the corresponding alc. The 4-nitro-3-hydroxybenzyl alc. (II) so obtained m. 97° but depresses about 30° the m. p. of the 3,4-isomer, likewise m. 97°, obtained by Stoermer by introducing the  $\text{CH}_2\text{OH}$  group into *o*- $\text{O}_2\text{NC}_6\text{H}_4\text{OH}$ . There are conflicting data in the literature as to whether or not *p*- $\text{HOC}_6\text{H}_4\text{CHO}$  (III) changes into the alc. and acid with alkalis at room temp.; L. finds that it undergoes no change when allowed to stand 5 weeks, protected from the air, in excess of 50%  $\text{KOH}$ ; on fusion it begins to evolve  $\text{H}$  at about 110° while the alc. does not react below 165°. 3,4-( $\text{HO}$ ) $_2\text{C}_6\text{H}_3\text{CHO}$  (IV) behaves quite like III both on fusion with  $\text{KOH}$  and with 50%  $\text{KOH}$  at room temp. Since the *p*- $\text{HO}$  group in IV prevents the Cannizzaro reaction, its 2 Me ethers, vanillin (V) and isovanillin (VI) should, and as a matter of fact do, behave differently. V is unchanged at room temp. but on fusion evolves  $\text{H}$  at 110° and gives a mixt. of 3,4-( $\text{HO}$ ) $_2\text{C}_6\text{H}_3\text{CO}_2\text{H}$  and about 24% 4,3- $\text{HO}(\text{MeO})\text{C}_6\text{H}_3\text{CO}_2\text{H}$  after 3 hrs. at 150-210°, while VI is converted into the alc. and acid and does not evolve  $\text{H}$  below about 190°. 6-Bromo-3-hydroxybenzyl alc. (yield, 70%), m. 142°, has a burning taste and causes sneezing, gives a blue-violet color with aq.  $\text{FeCl}_3$ , a yellowish color with alkalis, a flocculent ppt. with  $\text{Br}$  water, does not react with  $\text{NH}_3\text{-AgNO}_3$ , dis-

solves in concd.  $\text{H}_2\text{SO}_4$  without color. *6-Nitro compd.*, m.  $120.5^\circ$ , forms a yellow aq. soln. turned intensely yellow by alkalis, gives a red-violet color with  $\text{FeCl}_3$ , forms an intensely S-yellow salt with basic Pb acetate, does not react with  $\text{NH}_3\cdot\text{AgNO}_3$ , dissolves in concd.  $\text{H}_2\text{SO}_4$  with yellow color. II is cream-yellow while Stoermer's compd. is green-yellow; otherwise the 2 isomers greatly resemble each other; both form green-yellow aq. solns., give no characteristic color with  $\text{FeCl}_3$ , form red-yellow solns. with aq. alkalis, do not react with  $\text{NH}_3\cdot\text{AgNO}_3$ , even on boiling, form almost colorless ppts. with Br water; with concd.  $\text{H}_2\text{SO}_4$  II forms a deep red soln. and with aq.  $\text{Pb}(\text{OAc})_2$  yields a cinnabar-red ppt. while the S. compd. dissolves in  $\text{H}_2\text{SO}_4$  with yellow color and forms a reddish yellow Pb salt. *Isovanillyl alc.* (yield, 80%), m.  $132^\circ$ , gives a green color with  $\text{FeCl}_3$ , dissolves in  $\text{H}_2\text{SO}_4$  with Bordeaux-red color. C. A. R.

Optically active isomers of *N*-phenyl- $\beta$ -methylglycineamide-*p*-arsonic acid and their use in the resolution of ephedrine. E. FOURNEAU AND V. NICOLITCH. *Bull. soc. chim.* **43**, 1232-64 (1928).— $\text{MeCHBrCONH}_2$  and  $p\text{-NH}_2\text{C}_6\text{H}_4\text{AsO}_3\text{HNa}$  give 74% *N*-phenyl- $\beta$ -methylglycineamide-*p*-arsonic acid (I). By the use of quinine (strychnine or quinine is unsatisfactory) I is resolved into the *l*-acid (less sol. quinine salt),  $[\alpha]_D^{20} -15.50^\circ$ , and *d*-acid,  $[\alpha]_D^{20} 16.6^\circ$ . Both of these forms of I may be used to resolve ephedrine.  $\alpha$ -Bromopropionylaminophenyl-*p*-arsonic acid is prepd. from  $\text{MeCHBrCOBr}$  and  $p\text{-NH}_2\text{C}_6\text{H}_4\text{AsO}_3\text{H}_2$  (II) in 70% yield. Hydrolysis of  $p\text{-NO}_2\text{C}_6\text{H}_4\text{CH}_2\text{CN}$  with  $\text{H}_2\text{SO}_4$  gives 65%  $p\text{-NO}_2\text{C}_6\text{H}_4\text{CH}_2\text{CO}_2\text{H}$  (III), m.  $149.5^\circ$ . The acid chloride of III and Br give the corresponding bromoacetyl chloride or bromide, which with  $\text{NH}_3$  gives  $p\text{-NO}_2\text{C}_6\text{H}_4\text{CHBrCONH}_2$  (IV), m.  $148^\circ$ . Condensation of IV with II gives  $\alpha,\alpha\text{-di-}p\text{-nitrophenylsuccinamide}$ , m.  $212^\circ$ .  $\text{PhCHBrCONH}_2$  and II give 56% phenylglycineamide-*p*-arsonic acid (V). Attempts to resolve V by means of quinine were unsuccessful. Br and  $\text{EtCOCl}$  at  $80^\circ$  give  $\text{MeCHBrCOBr}$ , b.  $153\text{--}5^\circ$ . Other bromides prepd. were:  $\text{Et}_2\text{CHCOBr}$ , b.  $153\text{--}8^\circ$ ;  $\text{Et}_2\text{CBrCOBr}$ , b.  $98\text{--}100^\circ$ ;  $\alpha$ -bromoisovaleryl, b.  $90^\circ$ ;  $\alpha$ -bromoheptyl, b.  $135^\circ$ ;  $\alpha$ -bromolauryl, b.  $188^\circ$ ; bromophenylpropionyl, b.  $160^\circ$ ;  $\alpha$ -bromophenylacetyl (84% yield), b.  $150^\circ$ , and the chloride, b.  $123^\circ$ . The homologs of trypanamide prepd. show little action on trypanosomiasis animals. It is necessary to use approximately toxic doses to obtain therapeutic action. F. C. H.

Catalytic hydrogenation of cyano derivatives. The reduction of esters of phenylcyanopyrroacetic acid, benzoylcyanacetic acid and benzilideneacyanoacetic acid. H. RUPE AND BERNHARD PIEPER. *Helv. Chim. Acta* **12**, 637-49 (1929).—The reduction with Ni as a catalyst of CN ketones and CN acids gives always the product most suitable for ring formation, if this is at all possible. The reduction of Et phenylcyanopyrroacetate goes as far as the primary amine which splits off EtOH with closing of the 5 ring and gives 4-phenyl-2,3-diketopyrrolidine (I). Yield of crude product 95%. Recrystd. from glacial AcOH it is obtained as white laminas, m.  $295^\circ$ . I gives with  $\text{BzCl}$  and NaOH a Bz deriv., m.  $218^\circ$ , with NaOEt and MeI a mono-Me deriv., m.  $197\text{--}8^\circ$ , with  $\text{PhNHNH}_2$  a phenylhydrazone, m.  $224\text{--}5^\circ$ . The catalytic reduction of  $\text{NCCHBzCO}_2\text{Et}$  gives Et  $\alpha$ -benzoylpropionate, b.  $143\text{--}4^\circ$ . The reduction of Et benzilideneacyanoacetate gives the half aldehyde of benzylmalonic acid (II) and a new amino acid,  $\alpha$ -benzyl- $\beta$ -aminopropionic acid (III). II and III condense together to a Schiff base, which is obtained as a resin and can be sepd. into its components with mineral acid. The constitution of III was proved by the formation with HCNO of 5 benzylhydrouracil. F. J. G. DE LEEUW

The oxide of  $\alpha$ -pinene in the Grignard reaction. II. N. PRILEZHAEV AND V. VERSHUK. *J. Russ. Phys.-Chem. Soc.* **61**, 473-82 (1929).—It was shown earlier that hydration of the oxides of  $\alpha$ - and  $\beta$ -pinenes is always accompanied by decompn. of the unstable glycols, formed as primary products, into unsatd. alcs. of the cyclohexene series. In the case of  $\alpha$ -pinene at least the reaction with Grignard reagents where R is Me, Et or iso-Pr proceeds quite analogously as follows, yielding homologs of 1-menthen-6-ol:



The evolved gases were not analyzed, but the other products strongly indicate the above scheme. Where R is of greater mol. wt.—Bu or Ph—satd. alcs. are obtained. Thus

it appears that the instability of the primary products is a function of the polarity of R as compared to Me, rather than of the spatial relationship of the component parts of the mol. The oxide of 1- $\alpha$ -pinene (I) with MeI and Mg gave 1-menthen-6-ol (II),  $b_{18}$  109–10°,  $d_{15}^{20}$  0.9275,  $\alpha_D^{20}$  +7.90°,  $n_D^{15}$  1.4769. II could not be reduced by the catalytic methods of Skita, Willstätter, or Zelinskii nor with Na metal or amalgam. Reduction by Sabatier's method gave an alc. with intense odor of menthol and wormwood, probably 1-menthanol,  $b_{180}$  223–4°,  $d_4^{20}$  0.9241,  $d_{15}^{15}$  0.9116,  $n_D^{15}$  1.4654. Oxidation of II with  $BzO_2H$  gave 1-menthen-6-ol oxide (III), golden-yellow liquid with camphor odor,  $b_{17}$  147–8°,  $d_4^{15}$  0.9960,  $n_D^{15}$  1.47068, easily sol. in  $H_2O$ , and not further oxidizable by  $KMnO_4$ . Hydration of III gave a triol which on distg. split out 1 mol.  $H_2O$  giving presumably a menthenediol,  $b_{21}$  170–5°. The oxide of  $\delta$ - $\alpha$ -pinene (IV) with EtI and Mg gave 1-ethyl-4-isopropyl-1-cyclohexen-6-ol,  $b_{80}$  142–43.5°,  $d_4^{25}$  0.9315, with an odor recalling geraniol, easily oxidized by  $KMnO_4$ , and adding 2 atoms Br.  $EtCO_2H$  was a product of oxidation I with iso-PrCl and Mg gave presumably 1,4-diisopropyl-1-cyclohexen-6-ol,  $b_{17}$  132–3°,  $d_4^{20}$  0.9246,  $d_{15}^{15}$  0.9176. IV with iso-BuBr and Mg gave a nonhomogeneous product. A small amt. of substance of empirical formula  $C_{10}H_{16}(OH)CH_2CHMe_2$  was obtained,  $b_{17}$  140–3°, having unsatd. properties due ostensibly to the presence of a labile bridge I with PhBr and Mg gave  $C_{10}H_{16}(OH)Ph$ , viscous liquid easily oxidized by  $KMnO_4$ ,  $b_{17}$  189–90°,  $d_4^{15}$  1.0126,  $n_D^{15}$  1.53554.

LEWIS W. BUTZ

**Photobromination of coumarin.** DAVID M. WILLIAMS. *J. Chem. Soc.* 1929, 1383–4.—Berthoud and Nicolet (*C. A.* 22, 1912) showed that the photobromination of  $\alpha$ -phenylcinnamitrile in  $CCl_4$  leads to an equil. The same is true of coumarin (I). The light source was a Hg vapor quartz lamp and the solns. were in quartz tubes 18 in. from the lamp. With concns. of I and Br of  $1/_{60}$  M in  $CCl_4$ , equil. was reached in 25 min. and 85.6% of the Br had reacted; in  $CHCl_3$  equil. was reached in 45 min. and 65.8% of the Br had reacted. With the nitrile under identical conditions, equil. was reached in about 60 min. in  $CCl_4$  at 40.2% addn. and in about 150 min. in  $CHCl_3$  at 35.4% addn. In the thermal reaction the velocity of bromination was invariably greater in  $CHCl_3$ ; it seems that the reverse is true for the photobromination

C. J. WEST

**Ozonide of nopinene.** GEORGES BRUS AND G. PEYRESBLANQUES. *Bull. inst. pin.* 1929, 157–8.—See *C. A.* 23, 829.

A. PAPINEAU-COUTURE

**Contribution to the study of retene.** LI MAN CHEUNG. *Bull. inst. pin.* 1929, 159–64, 183–90, 215–20; cf. *C. A.* 23, 3467.—A more detailed account of the investigation is given, together with a bibliography of 36 references. A. PAPINEAU-COUTURE

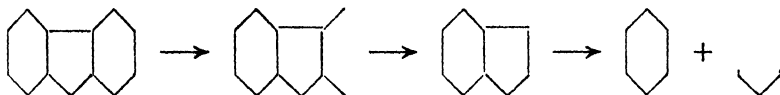
**Chemistry of the caryophyllene series. II. Clovene and isoclovene.** GEO. G. HENDERSON, ROBT. O. O. MCCRONE AND JOHN M. ROBERTSON. *J. Chem. Soc.* 1929, 1368–72; cf. *C. A.* 20, 1072.—Wallach and Walker (*Ann.* 271, 283 (1892)) showed that when carophyllene alc. (I) is heated with  $P_2O_5$ , clovene (II) is produced; other methods of dehydrating I are now shown to give the same result; in no case is carophyllene (III) obtained. Other reactions which are reported indicate that under the influence of mineral acids and other reagents, III readily undergoes ring closure with formation of II or of another tricyclic sesquiterpene which is very similar to II in its phys. properties. II is attacked by  $KMnO_4$  but so far no definite oxidation products have been isolated; all attempts to prep. an alc. from II by hydration have been unsuccessful; II does not appear to yield eudalene or cadalene when heated with S and therefore does not belong to either the eudesmene or the cadinene group of the sesquiterpenes.  $P_2O_5$  (90 g.) added to 70 g. of  $\beta$ -I, m. 96°, at its m. p., gives a mixt. of II and isoclovene (IV),  $b_{10}$  115–8°, isolated as the mono-HCl deriv., m. 87°; the mono-HBr, m. 75°. If the above expt. is carried out at the b. p. of the alc., only II is formed. Pure IV, isolated from the HCl deriv. with AcONa and AcOH,  $b_{12}$  130–1,  $d_4^{19}$  0.943,  $n_D^{19}$  1.5039,  $[\alpha]_D^{14}$  –56.6°,  $[R_L]_D$  64.11. IV is much more unstable than II, resinifying quickly when exposed to air and becoming sticky and resinous even when enclosed. Heating IV with  $P_2O_5$  at its b. p. completely decomps. it. IV united with 1 mol. Br, but the dibromide is also very unstable. The HCl deriv. is stable when pure. The HCl salt of IV and AcOAg in AcOH in the dark for 4 days gives isoclovene acetate, m. 25–6°; hydrolysis with MeOH-KOH gives the alc., m. 98°,  $[\alpha]_D^{25}$  227° (EtOH, c 0.5714). It does not add Br and does not yield esters with  $Ac_2O$ ,  $(C_6H_5CO)_2O$  or  $p$ - $O_2NC_6H_4COCl$ ;  $Ac_2O$  dehydrates the alc. The relation of IV to II remains for the present unsettled.

C. J. WEST

**The reaction between carboxylic acid halides and organomagnesium halides.** HENRY GILMAN, R. E. FOTHERGILL AND H. H. PARKER. *Rec. trav. chim.* 48, 748–51

(1929).—G. and Heckert (*C. A.* 22, 2741) have found that an excellent yield of  $\text{Ph}_3\text{COH}$  can be obtained in the reaction between  $\text{BzCl}$  and  $\text{PhMgBr}$ ; they suggested the possible use of acid chlorides as a satisfactory method for the prepn. of tert. alcs. The present paper deals more fully with these reactions and with some preliminary expts. on the prepn. of ketones from acid chlorides and Grignard reagents. The following compds. were prepd. by the addn. of 0.2 mole of the acid chloride to a well-cooled soln. of 0.5 mole  $\text{PhMgBr}$ :  $\text{Ph}_2\text{CMeOH}$ , yield 39%;  $\text{Ph}_2\text{CEtOH}$ , 57%; 1,1-diphenylbutene, 84%, the tert. alc. having lost water with formation of the olefin;  $\text{PhCEt}_2\text{OH}$  from  $\text{BzCl}$  and  $\text{EtMgBr}$ , 93%;  $\text{PhCPr}_2\text{OH}$  by means of  $\text{PrMgBr}$  and  $\text{BzCl}$ , 81%. On using only 0.17 mole of  $\text{BzCl}$  and 0.5 mole  $\text{PhMgBr}$  96.6% crude  $\text{Ph}_3\text{COH}$  was obtained and 91.5% of the pure product, recrystd. from benzene. An attempt to prep. aldehydes or sec. alcs. from nascent  $\text{HCOCl}$ ,  $\text{CuCl}$  and a Grignard reagent did not give the desired result. When 0.5 mole  $\text{PhMgBr}$  was added slowly (in the course of 2 hrs.) to 0.5 mole  $\text{BzCl}$  in 500 cc. well-cooled ether, 29% of  $\text{Ph}_2\text{CO}$  and 38.0% of  $\text{Ph}_3\text{COH}$  were obtained; on adding only 0.3 mole of the Grignard reagent to the same amount of  $\text{BzCl}$  the yield of  $\text{Ph}_2\text{CO}$  was 45.2%. C. F. VAN DUIN

**Pyrogenic decomposition of the perhydrides of fluorene and acenaphthene under hydrogen pressure.** N. A. ORLOV and M. A. BELOPOLSKI. *Ber.* 62B, 1226–34 (1929); cf. *C. A.* 22, 75.—In the earlier paper it was shown that under the action of a high H pressure and high temps. on some condensed aromatic hydrocarbons the partial hydrogenation, which is the 1st reaction, diminishes the stability of the mols. and causes a rupture of the union between the resulting  $\text{CH}_2$  groups. Because the so-called polynaphthenes are an important constituent of many raw materials which are subjected to heat treatments of various kinds in industry, O. and B. chose for a similar study the readily available acenaphthene and fluorene perhydrides as examples of such polynaphthenes. The pressure hydrogenation product of fluorene (which, in addn. to the true perhydride, always contains a mixt. of its cleavage products) was subjected to berginization at  $380^\circ$  under 70–5 atm. initial H pressure; the light fraction of the product (up to  $150^\circ$ ) contained a mixt. of monocyclic naphthenes and the following fraction gave indications of the presence of bicyclic naphthenes; the formation of such substances is readily explainable by the scheme:



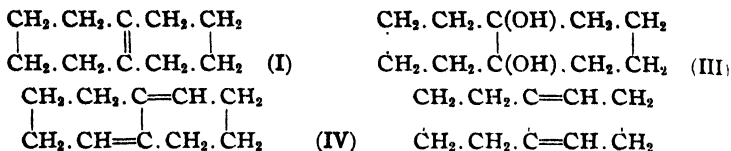
The identification of perhydridene would have confirmed this view but perhydridene, especially when it is mixed with its homologs, is not readily characterized; mild dehydrogenation gives only bicyclononadiene instead of indene and higher temps. decomp. it into  $\text{C}_6\text{H}_6$  and its homologs. After it had been found that when pure perhydridene is dehydrogenated in a tinne-Fe tube at  $750^\circ$  indene can be detected in the products, along with cyclopentadiene,  $\text{C}_{10}\text{H}_8$  and chrysene, the higher fractions of the above berginization product were subjected to the same process, with similar results. The berginization of perhydroacenaphthene is somewhat more difficult and accompanied by the formation of larger amts. of gaseous products; direct cracking gives indene, its homologs, cyclopentadiene,  $\text{C}_6\text{H}_6$  hydrocarbons and unidentified unsatd. compds. C. A. R.

**Compounds of metal chlorides and polyenes.** HANS V. EULER AND HARRY WILLSTAEDT. *Arkiv Kemi, Mineral. Geol.* 10B, No. 9, 1–6 (1929). (In German); cf. *C. A.* 20, 215, 3020; 23, 1941.—Carotin and carotinoids give color reactions with  $\text{SbCl}_3$  and certain other metal chlorides. The colored products, not hitherto isolated, may be mol. compds. of metal chlorides and the  $-\text{CH}:\text{CH}-$  group of polyenes. v. E. and W. have studied the metal chloride compds. of simple members of the diphenylpolyene series. Stilbene and  $\text{SbCl}_3$  in anhyd.  $\text{CHCl}_3$  gave  $(\text{PhCH}:\text{CH})_2 \cdot 2\text{SbCl}_3$ , colorless crystals, sintering at  $100^\circ$  and m.  $106-7^\circ$ . Isostilbene gave the same product. Both stilbene and isostilbene and  $\text{FeCl}_3$  gave  $(\text{PhCH}:\text{CH})_2 \cdot 2\text{FeCl}_3$ , which is almost colorless and may be heated to  $326^\circ$  without melting. Dimethylfulvene and  $\text{SbCl}_3$  or  $\text{FeCl}_3$  gave dark solns. from which only resinous products could be sepd. Diphenylbutadiene and  $\text{FeCl}_3$  gave  $(\text{PhCH}:\text{CH})_2 \cdot 2\text{FeCl}_3$ . Carotin and  $\text{SbCl}_3$  gave the characteristic blue color in max. intensity only with a very large excess of  $\text{SbCl}_3$ . Carotin seemed to combine with a max. of  $8\text{SbCl}_3$ , but upon purification and recrystn. the product became progressively less blue and approached the compn.,  $\text{C}_{40}\text{H}_{56} \cdot 2\text{SbCl}_3$ . M. W. MCP.

The structure of the octalin (octahydronaphthalene) obtained from tertiary decalol (hydroxydecahydronaphthalene). S. S. NAMEKIN AND E. V. GLAGOLEVA. *J. Russ.*

*Phys.-Chem.* 61, 535-40(1929).—Nametkin and Madaeva-Sulcheva earlier (cf. *C. A.* 20, 1802) investigated the following series of reactions: Decalin (decahydronaphthalene)  $\xrightarrow{\text{HNO}_3}$

$\xrightarrow{\text{tert-nitrodecalin}} \xrightarrow{\text{tert-aminodecalin}} \xrightarrow{\text{tert-decalol}} \xrightarrow{-\text{H}_2\text{O}}$  octalin (I). The structure of I (2 are possible) was left undetd. The action of  $\text{BzO}_3\text{H}$  on I is now reported, yielding octalin oxide (II) convertible to a glycol (III) which by dehydration gives hexalin (hexahydronaphthalene) (IV). This indicates the ditertiary structure for III, and hence the structure shown below for I, since secondary-tertiary alicyclic glycols yield ketones by dehydration (cf. *Ann.* 396, 268). The structure of IV was not detd



II was prepd. according to Prilezhaev; yield 8 g.,  $b_p$  82-3°,  $d_4^{20}$  1.003,  $n_D^{20}$  1.4847, from 16.2 g. I. 7.5 g. II gave 5 g. III, consisting of a mixt. of the *cis*- and *trans*-isomers, which were not sep'd. The fact that III was impure is traced to the decalin used, which probably contained both *cis*- and *trans*-isomers. Three g. III by dehydration in a sealed tube at 150° with dil.  $\text{H}_2\text{SO}_4$  gave 3 g. IV,  $b_p$  75-6°,  $d_4^{20}$  0.9726,  $n_D^{20}$  1.5322. IV with concd.  $\text{HNO}_3$  gives a rose color, changing to deep violet on shaking; with a 1:1 mixt. of EtOH and  $\text{H}_2\text{SO}_4$ , IV gives a rose color which gradually becomes red and then reddish violet.

**Hydrogenation of ar-1,3-dibromo-2-tetralol by means of bromine.** MILOSLAV JAKŠ. *Chem. Obzor* 1, 285(1926); *Collection Czechoslov. Chem. Comm.* 1, 215-56 (1929); cf. *C. A.* 16, 4201; 19, 3486.—Since nitronaphthalene is obtained when ar-nitrotetralin is heated with 2 mols. of  $\text{Br}_2$  at 100° and the resulting dibromotetralin is decompd. at 140-80°, it was expected that 1,3-dibromo-2-tetralol (I) would undergo the same type of reactions to yield 1,3-dibromo-2-naphthol. However, a mixture of 3,6-naphthol (II), m. 124-5°, and 3,7-dibromo-2-naphthol (III), m. 185-6°, was actually obtained. The Br in position 1 is lost. The compd. II was also obtained by addn of the product of diazotization of 3,6,2- $\text{C}_{10}\text{H}_6\text{Br}_2\text{NH}_2$  to boiling  $\text{H}_2\text{SO}_4$  (62.5%) and hot satd. aq.  $\text{CuSO}_4$ . The compd. m. 134-5° to which Franzen and Stauble (*C. A.* 16, 1945) assigned structure II is shown by J. to be 4,6-dibromo-2-naphthol (III). When 1,4,6-tribromo-2-naphthol which yields IV upon reduction with tin and HCl is treated with  $\text{HNO}_3$  it yields a dibromonaphthoquinone m. 150°, different from the 3,6 dibromonaphthoquinone m. about 200° (decompn.) prepd. from 1,3,6,2- $\text{C}_{10}\text{H}_4(\text{NO}_2)_2(\text{NH}_2)_2$ . Neither II nor III is reduced by tin and HCl but with Na-Hg (2.5%) they yield 6,2-naphthol and 7-bromo-2-naphthol, m. 132-3°, resp. The latter compd. was also prepd by addn. of boiling 2-hydroxy-7-naphthylhydrazine in dil. HBr to hot  $\text{CuBr}_2$  in the same solvent. Bromination of II gives a quant. yield of 1,3,6-tribromo-2-naphthol (V), reduction of which with tin and HCl yields II. V is also obtained when the acetate of I is heated with more than 2 mols. of  $\text{Br}_2$ . With 2 mols. it yields the same mixt as does I.

**The methylated nitronaphthylamines.** V. VESELÝ AND A. VOJTĚCH. *Collection Czechoslov. Chem. Comm.* 1, 104-18(1929).—Methylation of 3,1- $\text{C}_{10}\text{H}_6(\text{NO}_2)\text{NH}_2$  with  $\text{Me}_2\text{SO}_4$  gave 45% of the *di-Me* deriv., m. 64-5°; its *picrate*, m. 188.9°. Similarly 1,3- $\text{C}_{10}\text{H}_6(\text{NO}_2)\text{NH}_2$  gave 40% of its *di-Me* deriv., m. 65°; its *picrate*, m. 194.6°. Methylation of the 4,1-compd. is more difficult and gave some of the *mono-Me* deriv., m. 184-5°, as well as a small yield of the *di-Me* deriv., m. 65-6°. Nitro-1-dimethylaminonaphthalene,  $b_{14}$  182-4°, was prepd. by treating 1,2- $\text{C}_{10}\text{H}_6(\text{NO}_2)_2$  with  $\text{NHMe}_2$ . Heating with concd. NaOH gave 2-nitro-1-naphthol, m. 127-8°. 5,1- $\text{C}_{10}\text{H}_6(\text{NO}_2)\text{NH}_2$  gave a *di-Me* deriv.,  $b_{14}$  194-6°, with  $\text{Me}_2\text{SO}_4$ . Methylation of the 8,1-compd gave only 8-nitro-1-methylaminonaphthalene, m. 81°. The 5,2-compd. gave a *di-Me* deriv., m. 74°, obtained from its *picrate*, m. 176-7°. Similarly the 8,2-isomer gave a *di-Me* deriv., m. 77°, obtained either from its *picrate*, m. 174-6°, or its *perchlorate*, and the 6,2-compd. gave a *di-Me* deriv., m. 164°, identified by its *picrate*, m. 158-60°. 6-Nitro-2-methylaminonaphthalene, m. 185-6° (*picrate*, m. 138-40°), was obtained by saponif. 6-nitro-2-methylacetamido-2-naphthalene, m. 186-7°. Nitration of 1- $\text{C}_{10}\text{H}_7\text{NMe}_2$  in AcOH gave 2,4,1- $\text{C}_{10}\text{H}_6(\text{NO}_2)_2\text{NMe}_2$ , m. 88°, which with concd. NaOH gave 2,4,1- $\text{C}_{10}\text{H}_6(\text{NO}_2)_2\text{OH}$ . Carrying out the same nitration in  $\text{H}_2\text{SO}_4$  gave a compd. m. 137-8° whose N content corresponded to a dinitro deriv. but the position of the nitro groups



was not established. The mother liquor gave a *picrate*, m. 162–4°, from which a *compd.*, b<sub>14</sub> 192–5°, corresponding to 5,1-C<sub>10</sub>H<sub>6</sub>(NO<sub>2</sub>)NMe<sub>2</sub> was obtained. Nitration of 2-C<sub>10</sub>H<sub>7</sub>NMe<sub>2</sub> in AcOH gave a *dinitro deriv.*, m. 157–8°, but the position of the nitro groups was not detd. A similar nitration but in H<sub>2</sub>SO<sub>4</sub> gave an eutectic, m. 52°, composed of a mixt. of 5,2- and 8,2-C<sub>10</sub>H<sub>6</sub>(NO<sub>2</sub>)NMe<sub>2</sub>. These were identified by nitrating the eutectic and forming the corresponding dinitro derivs. Treating 1,8,2-C<sub>10</sub>H<sub>7</sub>(NO<sub>2</sub>)<sub>2</sub>NMe<sub>2</sub> with NaOH gave 1,8,2-C<sub>10</sub>H<sub>6</sub>(NO<sub>2</sub>)<sub>2</sub>OH, m. (decompn.) 198–9°. Attempts were made to prep. dyes from these nitrodimethylnaphthylamines and their derivs. but with only slight success.

R. C. ROBERTS

*N*-Methyl derivatives of 2-phenylnaphthylene-1,3-diamine. WM. S. KENTISH. *J. Chem. Soc.* 1929, 1169–75.—The isomerism of  $\alpha$ -(I) and  $\beta$ -*N,N'*-dimethyl-2-phenylnaphthylene-1,3-diamines (II) (Lees and Thorpe, *C. A.* 2, 125; Gibson, Kentish and Simonsen, *C. A.* 22, 4501) can be explained by assuming either definite structural differences between I and II or by an interlocking of the Ph and Me groups producing *cis-trans* isomerism. Arguments against the latter assumption are given; among these is the behavior with HNO<sub>2</sub>, which converts I into II, the mechanism of which is now examd. I (7 g.) in 70 cc. 15% HCl and 1.95 g. NaNO<sub>2</sub> in 10 cc. H<sub>2</sub>O give 70% of  $\alpha$ -3-nitrosomethylamino-1-methylamino-2-phenyl-1,2-dihydronaphthalene (III), which first seps. as the unstable form, yellow needles, and quickly passes into orange-red prisms, m. 154°. Reduction of III with Sn and concd. HCl in glacial AcOH gives nearly quant. I. III and excess of NaNO<sub>2</sub> in 20% HCl slowly give the  $\beta$ -dinitrosoamine, m. 179°. III does not react with *p*-MeC<sub>6</sub>H<sub>4</sub>SO<sub>2</sub>Cl in C<sub>6</sub>H<sub>6</sub>N after heating 4 hrs. at 100° and is not methylated by Me<sub>2</sub>SO<sub>4</sub> in NaOH-MeOH. The slow reaction of III with HNO<sub>2</sub> indicates that the transformation occurs when the second NO group is introduced. In order to discover whether the transformation was in any way specifically assocd. with the first NO group, the action of HNO<sub>2</sub> upon various derivs. was studied. The Ac deriv. and a slight excess of NaNO<sub>2</sub> in 10% HCl give  $\beta$ -3-acetylmethylamino-1-methylamino-2-phenylnaphthalene, m. 147°, which is not appreciably hydrolyzed by boiling with 40% NaOH or alc. H<sub>2</sub>SO<sub>4</sub>; refluxing with concd. HCl for 4 hrs. gives a good yield of II. The *p*-MeC<sub>6</sub>H<sub>4</sub>SO<sub>2</sub> deriv. and HNO<sub>2</sub> give *nitroso-p-toluenesulfonyl-beta-N,N'-dimethyl-2-phenylnaphthylene-1,3-diamine*, pale yellow, m. 183°. Reduction and hydrolysis give II. The transformation is thus seen to be unassocd. with the nature of the 1st substituent in I and the evidence shows that HNO<sub>2</sub> effects a definite structural transformation. II and 1 mol HNO<sub>2</sub> in 20% HCl give a small amt. of the  $\beta$ -mononitrosoamine (IV), deep-red needles with violet fluorescence, m. 248°, most of the II being recovered unchanged. IV yields a yellow HCl salt, rather sparingly sol. in H<sub>2</sub>O; the EtOH and C<sub>6</sub>H<sub>6</sub> solns. of IV are deep crimson, whereas those of III are only slightly colored. The acetylacetate of 2-phenylnaphthylene-1,3-diamine (Atkinson and Thorpe, *J. Chem. Soc.* 89, 1906(1906)) is not a true salt, as, on treatment with NaOH, it passes immediately into the di-Ac deriv., m. 272°.

C. J. WEST

Transposition and purity of the methyl naphthyl ketones. L. CHOPIN. *Bull. soc. chim.* 45, 167–8(1929).—Two isomerides ( $\alpha$  and  $\beta$ ) of C<sub>10</sub>H<sub>7</sub>COMe have been previously obtained (Durand, *C. A.* 18, 1466).  $\beta$  is unstable and spontaneously isomerizes into  $\alpha$ . The transformation requires germs of  $\alpha$ , and several yrs. to be completed. NaOH does not have any influence on the transformation; heat or HCl favors it very much, H<sub>2</sub>SO<sub>4</sub> less and H<sub>3</sub>PO<sub>4</sub> very little. The solvents used in the synthesis reaction are without effect. The  $\alpha$ -compd. can be prepd. in a very high degree of purity, but the  $\beta$ -form contains always traces of PhNH<sub>2</sub> and PhN:C, which favor its deterioration. A purification with H<sub>3</sub>PO<sub>4</sub> yielded only mediocre results.

ALBERT L. HENNE

The preparation of  $\beta$ -naphthoic acid from  $\beta$ -naphthylmagnesium bromide. HENRY GILMAN AND NINA B. ST. JOHN. *Rec. trav. chim.* 48, 745–7(1929).—Recently Loevenich and Loeser (cf. *C. A.* 21, 1649) found that  $\beta$ -C<sub>10</sub>H<sub>7</sub>Br could only be induced with some difficulty, with the aid of MeI as a catalyst, to enter into reaction with Mg and that the  $\beta$ -C<sub>10</sub>H<sub>7</sub>MgBr, thus prepd. did not give  $\beta$ -naphthoic acid on treatment with CO<sub>2</sub>. According to G., Zoellner and Dickey (cf. *C. A.* 23, 2934), however,  $\beta$ -C<sub>10</sub>H<sub>7</sub>Br reacts easily with Mg, giving the Grignard compd. in 83% yield, while almost invariably the yield of CO<sub>2</sub>H acids from Grignard reagents and CO<sub>2</sub> is distinctly high and approaches the quantity of available Grignard reagent within 15–20%, lower and higher yields being observed occasionally. Accordingly the authors prepd.  $\beta$ -C<sub>10</sub>H<sub>7</sub>MgBr from 0.1 mol  $\beta$ -C<sub>10</sub>H<sub>7</sub>Br, 0.1 atom Mg and 60 cc. of ether with a yield of 80%. This soln. gave on treatment with CO<sub>2</sub> (G. and Parker, *C. A.* 19, 467) 62.7% crude  $\beta$ -naphthoic acid, m. 165°, which was completely pure after one recrystn. from dil. alc. C. F. VAN DUIN

Color and chemical constitution. XXV. Quantized phenomenon—halochromic color of the doubly-linked diphenylene compounds. JAMES MOIR. *Trans. Roy. Soc.*

*S. Africa* 18, Pt. 2, 137-42(1929); cf. *C. A.* 23, 383.—The following compds., practically all the possible ones in which 2 benzene rings are connected, in *o*-positions, by 2 identical or different elements, or their related oxidized groups, were prepd. and examd in  $H_2SO_4$  soln., dihydroanthracene, anthracene, anthranol, anthraquinol, anthraquinone, dihydrophenazine, phenazine, phenazonium, phenozine (diphenylene dioxide) (I), thianthrene (V), thianthrene monoxide, thianthrene dioxide, thianthrene trioxide, thianthrene tetroxide, selenanthrene (VI), selenanthrene oxide, dihydroacridine, acridine, acridone, xanthene, xanthidrol, xanthone, thioxanthene, thioxanthidrol, thioxanthone, selenoxanthone, phenoxazine, phenoxazonium, phenthiazine, phenthiazonium, phenarsenazine, phenarsenazonium, phenthioxine (II), phenthioxine oxide, phenthioxine dioxide, phenoxselenine (III), phenoxselenine oxide, phenoxtellurine (IV), phenoxtellurine oxide, phenoxtellurine quinhidrone, phenoxtellurine dioxide. The colors depend largely on the fact that all the mols. are of the same shape, and all are nearly of the same size. The recorded wave numbers,  $\nu$ , of the strongest lines of most of the substances can, by certain divisions, be made to yield the same quotient. For I the divisor is 6, for II and for III 7, for IV 8, for V 7.5, and for VI 5.5 and 8.5. These give as the quotients for each approximately 2440. This, in turn, is divided by 4, giving 610. If this latter value be permitted to vary from 594, for the lowest element, to 612, for the highest, all the observations may be represented by this "const." multiplied by integral nos. These range rather widely, from 22-51, yet show some regularities. Replacing  $CH_2$  by O reduces the relative integer by 3, while with  $NH$ , for  $CH_2$ , the alteration is  $\pm 1$ . The whole phenomenon seems to depend on the rings rather than the linkages. Variations of the latter change the const., 610, by about 1-2%. While the no. of valency electrons, in the benzene ring 30, and in the mols. of most of the substances utilized 68, is doubtless concerned in these results, no satisfactory accounting of the values has been arrived at. Similarly,  $\nu$  values for some of the members of the  $Ph_3COH$  series, dihydroxybenzhydrol, benzaurin, malachite green, aminomalachite green, diaminobenzhydrol, fuchsin, dimethyldiaminofuchson, give integers ranging from 34 to 84.

G. A. HILL

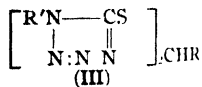
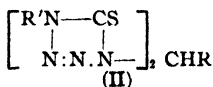
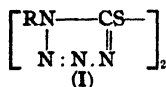
**Sulfonation of phenanthrene. I. New monosulfonate.** LOUIS F. FIESER *J. Am. Chem. Soc.* 51, 2460-70(1929); cf. Werner, *Ann.* 321, 248(1902).—The *p*-toluidine salts are suitable for the identification of the phenanthrenesulfonic acids; 1, m. 267° (cor.); 2, m. 291°; 3, m. 222°; 9, m. 235°; by these salts a few mg. of the acid or of any of its metal salts may be identified. In working up the sulfonation mixt it is more convenient to prepare first a Na salt mixt. and to treat a soln. of this with only enough  $BaCl_2$  to cause the pptn. of the Ba 2-salt. Sulfonation at 120-5° for 4 hrs. gives 18% of the 2-acid and 27% of the 3-acid, but the most suitable conditions for these acids is sulfonation with 2 mol. equivs. of concd. acid at 120-5°. Sulfonation at 60° gives 18% of the 2-acid, 19% of the 3-acid, 13% of the 9-acid and 4% of the 1-acid, although at least 8% are formed. The original should be consulted for the details of the sepn. of these products. *K phenanthrene-1-sulfonate*, plates, sparingly sol. in EtOH, the Ba and Fe" salts were prepd.; *Me ester*, m. 102°;  $CrO_3$  and the K salt give *K phenanthrenequinone-1-sulfonate*, orange-yellow plates; the concd.  $H_2SO_4$  soln is deep red. Alkali fusion and acetylation give *1-acetoxyphenanthrene*, m. 135-6°; alk hydrolysis gives *1-phenanthrol*, m. 157° (cor.); *Me ether*, m. 105° (picrate, m. 154° (cor.)); *1-acetoxyphenanthrenequinone*, orange, m. 206° (cor.); *1-HO deriv.*, fiery red, m. 227° (cor.). Through the azo dye and 4-amino-1-phenanthrol, there results *1,4-phenanthrenequinone*, yellow, m. 155° (cor.). *Triacetyl-4-amino-1-phenanthrol*, m. 143°; *1,4-Diacetoxyphenanthrene*, m. 137-8°; *1,4-diacetoxy-9,10-phenanthrenequinone*, golden yellow, m. 184° (cor.). **II. Disulfonation.** *Ibid* 2471-86.—In order to gain an idea of the compn. of the mixt. of disulfonates which is produced by the action of  $H_2SO_4$  on phenanthrene, the 2- and 3-mono- $SO_3H$  acids were sulfonated and the products were at least partly identified by sepg. the mixt. of diacetoxyphenanthrenes which were obtained as the results of alkali fusion and acetylation. The second substituent enters the unsubstituted terminal nucleus in the 6-, 7- and 8-positions. No attempt will be made to abstract the details of the sulfonations or the method of identification of the compds. isolated. *Diacetoxyphenanthrenes*: 2,6-, m. 122-3°; 2,7-, m. 183.5° (cor.); 2,8-, m. 125°; 3,6-, m. 124.5°; 3,8-, m. 186° (cor.). *Dihydroxyphenanthrenes*: 2,6-, m. 239° (all cor.); 2,7-, m. 265°; 3,6-, m. 225°; 3,8-, m. 253°; 2,8-, m. 205° *Dimethoxyphenanthrenes*: 2,6-, m. 87°; 2,7-, m. 167-8°; 3,6-, m. 105°; 3,8-, m. 117°. *Diacetoxy-9,10-phenanthrenequinones* (all m. ps. cor.): 2,6-, golden yellow, m. 220-1°; 2,7-, orange, m. 244°; 2,8-, orange, m. 223-4°; 3,6-, yellow, m. 232°; 3,8-, orange-yellow, m. 221-2°. *Dihydroxy-9,10-phenanthrenequinones*: 2,6-, reddish brown; 3,6-, orange-red; color reactions are given for the 5 isomers with  $H_2SO_4$ , 0.1 N and 6 N



**Reactions of sugars and their decomposition products with nitrogenous substances.**  
**I. Formation of imidazoles.** K. BERNHAUER. *Z. physiol. Chem.* **183**, 67-73 (1929).—The prepn. of methylimidazole by treatment of a sugar with  $\text{NH}_4\text{OH}$  contg.  $\text{Zn}(\text{OH})_2$  depends upon the intermediate formation of  $\text{AcCHO}$  and  $\text{CH}_3\text{O}$ . At room temp. the reaction requires 6 months for completion, but at  $40^\circ$  it is complete in 24 hrs. and at  $100^\circ$  in 2 hrs. The best yields are obtained with 20-5%  $\text{NH}_4\text{OH}$  satd. with  $\text{Zn}(\text{OH})_2$ .  $\text{AcCHO}$  gives a better yield than glucose, but here the addn. of  $\text{CH}_3\text{O}$  is necessary. Apparently the  $\text{CH}_3\text{O}$  required results from breakdown of sugar but not from that of  $\text{AcCHO}$ . Addn. of  $\text{AcH}$  gives rise to the formation of methylimidazole and dimethylimidazole in the proportions of 3:2 or 2:1. The intermediate formation of  $\text{AcCHO}$  from glucose was demonstrated by isolation and identification of the phenyllosazone, the *p*-nitrophenyllosazone and the disemicarbazone.

**Mechanism of the azide rearrangement.** GARFIELD POWELL. *J. Am. Chem. Soc.* **51**, 2436-9 (1929).—In testing the univalent N hypothesis of azide rearrangement, the decompn. of  $\text{BzN}_3$  in the presence of  $\text{Ph}_3\text{C}$  was studied; no reaction with  $\text{Ph}_3\text{C}$  took place and  $\text{BzN}_3$  decompd. in the presence of  $\text{Ph}_3\text{C}$  as easily and smoothly as when alone. *Dibenzylacetazide*, m.  $51-3^\circ$ ; on standing for 1 day, it decomp.; the same decompn. takes place on warming or melting, giving *dibenzylmethyl isocyanate*, thick liquid, which, on warming with  $\text{EtOH}$  for 1 hr., gives *dibenzylmethylethylurethane*, m.  $106.7^\circ$ , while  $\text{PhNH}_2$  in  $\text{C}_6\text{H}_6$  gives *dibenzylmethylphenylurea*, m.  $153-4^\circ$ . **2-Phenyl-4-quinolylformohydroxamic acid** (*atophanhydroxamic acid*), m.  $155-6^\circ$ , is formed from the Me ester and  $\text{NH}_2\text{OH}\cdot\text{HCl}$  with  $\text{MeONa}$ ; Cu salt, emerald-green; Bz deriv., m.  $150.1^\circ$ .

**Action of diazo compounds on tetrazolyl disulfides.** R. SROLLÉ, FRITZ HENKE-STARK AND HERTHA PERREY. *Ber.* **62B**, 1112-8 (1929); cf. Schönberg, Schütz and Peter, *C. A.* **23**, 3216.—The authors have some time since (Henke-Stark, *Diss. Heidelberg*, 1928; Perrey, *Ibid.*) studied the action of  $\text{CH}_2\text{N}_2$ ,  $\text{MeCHN}_2$  and  $\text{N}_2\text{CHCO}_2\text{Et}$  on 1-substituted bis-[5-tetrazolyl] disulfides (I). Two classes of compds. were obtained, sometimes together. To one is assigned the structure (II) of methylene addn. products; they give with  $\text{AgNO}_3$  ppts. which are apparently not homogeneous, for analysis gives no values corresponding to  $\text{AgNO}_3$  addn. products;  $\text{CH}_2\text{N}_2$  cannot be made to react with other disulfides, and the results of cleavage, reduction and oxidation thus far obtained agree best with the structure II. The second type of compds. obtained are mercaptals (III), also prepd. for comparison by the action of the dihalogen derivs. on the Na salts of the corresponding 5-mercaptotetrazoles. They give no ppts. with alc.  $\text{AgNO}_3$ . *Methylenebis-[1-phenyl-4,5-dihydro-5-tetrazolyl] disulfide* (II, R = H, R' = Ph) (61 g. from 64 g. I (R = Ph) and  $\text{CH}_2\text{N}_2$  in cold  $\text{Et}_2\text{O}$ ), yellowish, m.  $124^\circ$ , begins to decomp. about  $160^\circ$ , mol. wt. in  $\text{C}_6\text{H}_6$  332, the  $\text{Et}_2\text{O}$  filtrate yields, when evapd. and treated with  $\text{MeOH}$ , 1 g. of *dimercaptomethane bis-[1-phenyl-5-tetrazolyl] ether* (III, R = H, R' = Ph), also obtained from Na 1-phenylmercapto-5-tetrazole and  $\text{CH}_2\text{I}_2$  or  $\text{CH}_2\text{Cl}_2$  in boiling alc., m.  $136^\circ$ , decomp. about  $175^\circ$ .  *$\alpha,\beta$ -dimercaptoethane homolog* (6.5 g. from 10 g. of the Na tetrazole and  $(\text{CH}_3\text{Br})_2$  refluxed 3 hrs.), m.  $150^\circ$ , deflagrates on rapid heating. *Methylenebis-[1-p-tolyl-4,5-dihydro-5-tetrazolyl sulfide]* (30.7 g. from 32.2 g. I (R = *p*- $\text{MeC}_6\text{H}_4$ ), m.  $108^\circ$ , begins



to evolve gas at  $160^\circ$ . *o-Tolyl isomer* (yield, 85%), m.  $118^\circ$ , begins to decomp.  $160^\circ$ . *Dimercaptomethane bis-[1-p-tolyl-5-tetrazolyl] ether*, from the tetrazole and  $\text{CH}_2\text{Cl}_2$ , m.  $136^\circ$ , begins to decomp.  $145^\circ$ ; *o-isomer*, decomp.  $161^\circ$ . *Methylenebis-[1-m-xylyl-4,5-dihydro-5-tetrazolyl sulfide]* (1.8 g. from 2 g. of the I), m.  $106^\circ$ . *Dimercaptomethane bis-[1-methyl-5-tetrazolyl] ether* (20%, together with a very small amt. of a substance m.  $133^\circ$ , from the I and  $\text{CH}_2\text{N}_2$ , and quant. from the tetrazole with  $\text{CH}_2\text{I}_2$ ), m.  $157^\circ$ ; on  $\text{CuO}$  it imparts a distinct light green color to a flame. *Ethylidenbis-[1-phenyl-4,5-dihydro-5-tetrazolyl disulfide]* (7.4 g. from 7.1 g. of the I with  $\text{MeCHN}_2$ ), decomp.  $177^\circ$ .  *$\alpha,\alpha'$ -Dimercaptoethane bis-[1-phenyl-5-tetrazolyl] ether*, obtained in poor yield from the tetrazole and  $\text{MeCHBr}_2$ , m.  $93^\circ$ . *Carbethoxymethienylbis-[1-phenyl-4,5-dihydro-5-tetrazolyl sulfide]* (50% from the I with  $\text{N}_2\text{CHCO}_2\text{Et}$ ), m.  $104^\circ$ , begins to decomp. about  $150^\circ$ , dissolves in  $\text{NaOH}$  (probably with decompn.) but not in  $\text{Na}_2\text{CO}_3$ . *Et dimercaptoacetate bis-[1-phenyl-5-tetrazolyl] ether* (about 50% from the tetrazole and  $\text{Cl}_3\text{CHCO}_2\text{Et}$  in  $\text{C}_6\text{H}_6$  at  $150^\circ$ ), m.  $110^\circ$ , gives with alc.  $\text{AgNO}_3$  a gradually increasing ppt.; when pptd. in finely divided form from alc. by  $\text{H}_2\text{O}$  it dissolves in hot  $\text{NaOH}$

with decompn. for on acidification it evolves  $\text{H}_2\text{S}$ . *Carbomethoxymethylenbis*-[1-phenyl-4,5-dihydro-5-tetrazolyl sulfide] (50%), decomp.  $139^\circ$ . I (R = Ph) shaken with Hg gives Hg 1-phenyl-5-mercaptotetrazole, decomp.  $223^\circ$ .  $\text{CS}(\text{NPh})_2$  with excess of alc.  $\text{AgNO}_3$  forms an addn. compd.,  $\text{C}_{21}\text{H}_{20}\text{N}_2\text{S}$ .  $\text{AgNO}_3$ , decomp. about  $240^\circ$ . C. A. R.

**5-Aminotetrazole.** R. STOLLÉ (WITH E. SCHICK, F. HENKE-STARK AND L. KRAUSS). *Ber.* 62B, 1118–26(1929).—5-Aminotetrazole (I), leaves or prisms with  $\text{H}_2\text{O}$ , m.  $119^\circ$ , is obtained almost quantitatively from aq.  $\text{HN}_3$  and  $\text{NH}:\text{C}(\text{NH}_2)\text{NHCN}$ ; it gives no ppt. with basic or normal Pb acetate in  $\text{H}_2\text{O}$ ; nitrate, decomp.  $174^\circ$ ; *HBr* salt, begins to shrink  $110^\circ$ , m.  $118^\circ$ , evolves gas about  $150^\circ$ . The urea could not be obtained but with  $\text{PhNCO}$  at  $100^\circ$  it readily yields *N*-phenyl-*N'*-5-tetrazolylurea (18 g. from 8.5 g. I), m.  $245^\circ$  (decompn.); the suspension obtained by pptn. from alc. with  $\text{H}_2\text{O}$  is distinctly acid to litmus and dissolves in  $\text{Na}_2\text{CO}_3$  and alkalis; in alc. it gives with  $\text{AgNO}_3$  a white ppt. which is only difficultly sol. in both alc.  $\text{NH}_3$  and concd.  $\text{HNO}_3$ . 5-Tetrazolylurethan (15 g. from 8.5 g. I refluxed in  $\text{CICO}_2\text{Et}$ ), m.  $256^\circ$  (decompn.), forms a strongly acid  $\text{H}_2\text{O}$  soln., gives a Ag salt sol. in  $\text{NH}_3$  and  $\text{HNO}_3$ . With excess of  $\text{AcCl}$  on the  $\text{H}_2\text{O}$  bath, I gives the mono-Ac deriv., m.  $269^\circ$  (decompn.), but when refluxed 8 hrs. with  $\text{Ac}_2\text{O}$  it splits off a mol. of  $\text{N}_2$  and yields 2-methyl-5-acetyl-amino-1,3,4-furodiazole, m.  $180^\circ$  (8.5 g. from 8.5 g. I), identical with the product obtained by acetylating 2-methyl-5-amino-1,3,4-furodiazole. I (10.3 g.) converted into the diazonium sulfate and slowly added to a suspension of  $\text{Cu}(\text{OH})_2$  in  $\text{H}_2\text{O}$  at  $60^\circ$  gives 6.5 g. of 5-hydroxytetrazole, m.  $254^\circ$  (decompn.), whereas with  $\text{H}_3\text{PO}_4$  and  $\text{CuSO}_4$  is obtained tetrazole. The diazonium chloride from 10.3 g. I with  $\text{CuCl}_2$  gives 11.9 g. of the light blue *Cu* salt, detonates on rapid heating, of 5-chlorotetrazole, m.  $73^\circ$ , begins to decomp. about  $120^\circ$ , not attacked by  $\text{SO}_2$ ,  $\text{Na}_2\text{SO}_3$  or  $\text{NaOEt}$  even on long heating. In the same way is obtained the green *Cu* salt (15 g. from 10.3 g. I) of the 5-Br deriv., m.  $156^\circ$  (decompn.). 5-I compd. (70% from diazotized I and KI), decomp. about  $190^\circ$ , reduced by  $\text{SO}_2$  and  $\text{Na}_2\text{SO}_3$  and by  $\text{NaOEt}$  to tetrazole and converted by long boiling with 60%  $\text{NaOH}$  into the 5-HO compd. Diazotized I coupled with  $p\text{-O}_2\text{NC}_6\text{H}_4\text{NH}_2$  gives 75% of *N*¹-5-tetrazolyl-*N*²-4'-nitrophenyltriazene, yellowish, deflagrates about  $169^\circ$  on the Maquenne block, forms with alc.  $\text{AgNO}_3$  an orange-yellow ppt. (probably a mono-Ag salt) turned reddish by alc.  $\text{NH}_3$ , cautious addn. of  $\text{Na}_2\text{CO}_3$  or alkali to the fine suspension obtained by pptn. from alc. with  $\text{H}_2\text{O}$  gives first a yellow soln. which changes quite sharply to red as soon as the acid imino H atom has been neutralized; the triazene is also obtained, together with more or less di-[4-nitrophenyl]-triazene, from  $p\text{-O}_2\text{NC}_6\text{H}_4\text{N}_2\text{Cl}$  and I. The diazo-amino compd.  $\text{C}_7\text{H}_7\text{N}_7$  from tetrazole-diazonium chloride and  $\text{PhNH}_2$  deflagrates  $97^\circ$ . 5-Guanylaminotetrazole nitrate (90% from  $\text{NH}:\text{C}(\text{NH}_2)\text{NHCN}$  in hot  $\text{H}_2\text{O}$  with  $\text{HN}_3$  and  $\text{HNO}_3$ ), deflagrates weakly about  $183^\circ$ , gives on repeated crystn. from  $\text{H}_2\text{O}$  the free base, does not m.  $300^\circ$ , which is also obtained from  $\text{NCNH}_2$  and I in  $\text{H}_2\text{O}$  on the  $\text{H}_2\text{O}$  bath and with  $\text{H}_2\text{O}$  at  $200^\circ$  decomp. into I,  $\text{NH}_3$  and  $\text{CO}_2$ , together with a certain amt. of N. C. A. R.

Action of alcoholic hydrochloric acid on methyldiphenyltetrahydropyrone. HUGH RYAN AND J. J. LENNON. *Sci. Proc. Roy. Dublin Soc.* [N. S.] 19, 121–4(1928).—The object was to prove that the 1st stage in the reaction of BzH on methyldiphenyltetrahydro- $\gamma$ -pyrone in the presence of alc. HCl was conversion into methyldiphenylcyclopentenone. A large vol. of the concd. acid gave a product which could be isolated as slightly yellow crystals, m.  $73\text{--}8^\circ$ . PAUL BOONE

New condensations of ketones with phenols. III. Condensation products of mesityl oxide and monohydroxybenzenes. JOSEPH B. NIEDERL (WITH NATHAN AMBINDER, RICHARD CASTY, DE WITT C. KNOWLES, IRVING RAPAPORT AND WM. SASCHER). *J. Am. Chem. Soc.* 51, 2426–30(1929); cf. C. A. 23, 2431.—Addn. of 1 mol. concd.  $\text{H}_2\text{SO}_4$  (in small amts.) to a mol. mixt. of  $\text{AcCH}:\text{CMe}_2$  and  $\text{PhOH}$  at  $0^\circ$  and the mixt. allowed to stand 1 week at  $15\text{--}20^\circ$  gives 2,2,4-trimethylchroman-2-ol (I), m.  $89^\circ$ ; di- $\text{NO}_2$  deriv., m.  $155^\circ$ .  $m\text{-O}_2\text{NC}_6\text{H}_4\text{OH}$  gives the 7- $\text{NO}_2$  deriv. of I, m.  $148^\circ$  and  $p\text{-O}_2\text{NC}_6\text{H}_4\text{OH}$  gives the 6- $\text{NO}_2$  deriv., m.  $132^\circ$ .  $o\text{-MeC}_6\text{H}_4\text{OH}$  gives the 2,4,4,8-tetramethylchroman-2-ol, m.  $120^\circ$ , and  $m\text{-MeC}_6\text{H}_4\text{OH}$  (article says trinitro-*m*-cresol) gives the 2,4,4,7-tetramethyl deriv., m.  $120^\circ$  and also by dehydration di-[2,4,4,7-tetramethylchromanyl] 2-ether, m.  $58^\circ$  (tetra- $\text{NO}_2$  deriv., m.  $145^\circ$ ).  $p\text{-MeC}_6\text{H}_4\text{OH}$  gives only di-[2,4,4,6-chromanyl] 2-ether, m.  $57^\circ$  (tetra- $\text{NO}_2$  deriv., m.  $167^\circ$ ). 3,6-MeCIC $_4$ - $\text{H}_3\text{OH}$  gives di-[5-chloro-2,4,4,7-tetramethylchromanyl] 2-ether, m.  $71^\circ$ . 2,4-Me $_2$ C $_6$ H $_3$ OH gives di-[2,4,4,6,8-pentamethylchromanyl] 2-ether, semi-solid (tetra- $\text{NO}_2$  deriv., m.  $155^\circ$ ). Carvacrol gives di-[2,4,4,8-tetramethylisopropylchromanyl] 2-ether, semi-solid (di- $\text{NO}_2$  deriv., m.  $185^\circ$ ). Thymol gives di-[2,4,4,5-tetramethyl-8-isopropylchromanyl] 2-ether, m.  $136^\circ$  (di- $\text{NO}_2$  deriv., m.  $201^\circ$ ). Reduction of these compds. with HI or Zn and

HCl gives chromans, while on distn. they lose 1 mol.  $\text{H}_2\text{O}$  and form the corresponding chromenes. These products are valuable intermediates for the prepn. of Ph-substituted aldehydes and acids (by oxidation) and by the distn. of the acids or their Na salts so obtainable, the corresponding iso-Pr and iso-Bu phenols can be synthesized; hence this condensation process furnishes an additional means for the introduction of alkyl groups into the  $\text{C}_6\text{H}_5$  ring.

**Benzanthrone.** J. MARTINET AND A. DROBATSCHIEFF. *Chimie & industrie* 21, 227-42, 1149-60 (1929).—A review, with bibliography of 95 references. A. P. C.

**Rotenone.** I. Reduction products of rotenone. F. B. LAForge AND I. E. SMITH. *J. Am. Chem. Soc.* 51, 2574-81 (1929); cf. Kariyone, *C. A.* 17, 3025; 19, 1708, 2485; Butenandt, *C. A.* 22, 3630.—Rotenone (I), the active insecticidal principle of *Derris elliptica*, m.  $163^\circ$ ; a fairly good sample of *Derris* root contains 2.5% I. Catalytic reduction of I with Pt oxide gives, after the absorption of 1 equiv. of H, about equal amts. of dihydrorotenone (II),  $\text{C}_{23}\text{H}_{24}\text{O}_6$ , m.  $164^\circ$  (K. gives  $216^\circ$ ),  $[\alpha]_D^{20} -225^\circ$  (0.3153 g. in 15 cc.  $\text{C}_6\text{H}_6$ ), and an acid (III),  $\text{C}_{23}\text{H}_{24}\text{O}_6$ , m.  $209^\circ$ ,  $[\alpha]_D^{20} 36.2^\circ$  (0.3154 g. in 15 cc.  $\text{CHCl}_3$ ); Pd-BaSO<sub>4</sub> gives the same results, though II predominates in the reduction product. Further reduction of II or III gives the same product, an acid,  $\text{C}_{23}\text{H}_{24}\text{O}_6$ , m.  $215^\circ$ . Reduction of I oxime or II and  $\text{NH}_2\text{OH} \cdot \text{HCl}$  give the oxime of II, m.  $256^\circ$  (decompn.); with concd. HCl this gives quant. an isoxime, m.  $270^\circ$  (decompn.). The benzenesulfonyl deriv. of II m.  $143^\circ$ . The quantities of rotenol (IV) and derritol (V) obtained from I may be varied by varying the % of KOH used: 5%, 2.0 g. IV, 0.1 g. V; 10%, 1.1 and 0.65 g.; 15%, 0.9, 0.95 g.; 20%, 0.2, 1.15; IV m.  $164^\circ$ ; V m.  $120^\circ$ ,  $[\alpha]_D^{20} -66.2^\circ$  (0.1700 g. in 5 cc.  $\text{CHCl}_3$ ); a by-product, m.  $161^\circ$ , with 17.65% MeO is obtained in small yields. Contrary to B., II is converted into dihydrorotenol and dihydrorotenol with Zn in alk. EtOH. Isorotenone yields isoderritol and isorotenol by the same treatment, m.  $133^\circ$  and  $150^\circ$ , resp. The formation of V is independent of an unsatd. bond in I.

C. J. WEST

**A synthesis of 5,7,2',4'-tetrahydroxyflavone and of 7,2',4',6'-tetrahydroxyflavone.** NICHOLAS MICHAEL CULLINANE, JOSEPH ALGAR AND HUGH RYAN. *Sci. Proc. Roy. Dublin Soc.* [N. S.], 19, 77-83 (1928).—The tri-Me ether of phloracetophenone treated with an equal wt. of  $\text{AlCl}_3$ , at  $110^\circ$  yields phloracetophenone 4,6-di-Me ether (I) which upon condensation with 2,4-(MeO)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>CO<sub>2</sub>Me (II) in the presence of Na gives 2-dihydroxy-4,6,2',4'-tetramethoxybenzoylacetophenone (III), m.  $151^\circ$ . On treatment with HI, the diketone (III) was converted into 5,7,2',4'-tetramethoxyflavone; this with further HI gave 5,7,2',4'-tetrahydroxyflavone, yellow plates almost insol. in water,  $\text{CHCl}_3$  or petroleum. The similar condensation of phloracetophenone tri-Me ether with II produced 2,4,6,2',4'-pentamethoxybenzoylacetophenone (V), m.  $153^\circ$ , readily sol. in hot alc. Treated with HI (d. 1.94) it yielded 7,2',4',6'-tetrahydroxyflavone (VI), m.  $240^\circ$ , minute yellow plates, slightly sol. in  $\text{CHCl}_3$ ; in concd.  $\text{H}_2\text{SO}_4$  the soln. is yellow with greenish blue fluorescence.

PAUL BOONE

**1-Methoxy derivatives of thioxanthone.** KENNETH C. ROBERTS AND SAMUEL SMILES. King's College, London. *J. Chem. Soc.* 1929, 1322-6.—That the basic character of the thioxanthone nucleus as indicated by the stability of its salts is promoted by the presence of the MeO group has been shown in *C. A.* 23, 3706; this influence depends on the position rather than the no. of the MeO groups. The influence of the 1-MeO group is most pronounced. Further evidence of this is now given *p*-MeOC<sub>6</sub>H<sub>4</sub>OH and 2-HSC<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>H, condensed with concd.  $\text{H}_2\text{SO}_4$  at  $15^\circ$  for 15 min. give a mixt. of 1-hydroxy-4-methoxythioxanthone (I) and 4-hydroxy-1-methoxythioxanthone (II), sep'd. by the insolv. of I in 2 N aq. NaOH. I, orange-red, m.  $182^\circ$ ; it does not form a HCl salt or a perchlorate; EtONa in  $\text{C}_6\text{H}_6$  gives a purple Na deriv.; Ac deriv., m.  $138^\circ$ ; diacetoborate, deep red, m.  $205^\circ$ , decompd. by boiling  $\text{H}_2\text{O}$ ;  $\text{H}_2\text{O}_2$  gives the dioxide, orange, m.  $184^\circ$ ; Na salt, red. II, yellow, m.  $270^\circ$  (decompn.); di-HCl salt, crimson; perchlorate; Ac deriv., yellow, m.  $133^\circ$ ; II is decompd. by  $\text{H}_2\text{O}_2$ . 2,3-Dimethoxythioxanthone yields a chlorostannate, yellow; that of the 1,4-di-MeO deriv. is crimson. Absorption curves are given for the HCl derivs. and diacetoborates of various methylated derivs.

C. J. WEST

**Reaction of piperidine and piperazine with oxides of ethylene, isobutylene and trimethylethylene.** K. A. KRASUSKII AND K. G. KOSENKO. *Ukrainskii Khim. Zhur.* 4, Sci. Pt., 37-59 (1929).—The reaction of piperidine and piperazine with  $\alpha$ -oxides proceeds with the formation of  $\alpha$ -amino alcs. and those with oxides of isobutylene and trimethylethylene result in the formation of amino alcs., developing considerable heat. Theoretical and exptl. data are given concerning these reactions. ROBERT SCHLESS

**The action of piperazine upon the oxide of isosafrole.** T. S. KUSNER. *Ukrainskii*

*Khem. Zhur.* 4, Sci. Pt. 85-8(1929); cf. *C. A.* 23, 2162.—The piperazine (I) deriv. of isosafrole oxide (II),  $\text{CH}_2\text{O}_2\text{C}_6\text{H}_3\text{CH}(\text{OH})\text{CH}(\text{CH}_3)\text{N}(\text{CH}_2)_4\text{NH}$ , was prepd. when 5.3 g. of I in 10 g. of alc. and 11 g. of II in 10 g. of alc. were allowed to stand at room temp. for 28 hrs., the ppts. being removed every 2 days for 10 days, then after 4, 6 and 8 days; yield, 10.7 g. of a white powder, insol. in org. solvents, m.  $238-40^\circ$  (decompn.). The HCl salt was formed on boiling the base in  $\text{H}_2\text{O}$  and adding HCl until dissolved.

CHAS. BLANC

**10-Chloro-5,10-dihydrophenarsazine and its derivatives. IX. Synthesis of nitromethylphenylamine-6'-arsonic acids and their conversion into nitromethyl derivatives of 10-chloro-5,10-dihydrophenarsazine.** Constitution of 10-chloro-5,10-dihydrophenarsazine. CHARLES S. GIBSON AND JOHN D. A. JOHNSON. *J. Chem. Soc.*, 1929, 1229-62; cf. *C. A.* 23, 3709.—This is a study of the cyclization of diphenylamine-6'-arsonic acids in greater detail than has previously been reported, since, if the ring-formation process follows the course which has been suggested, all substituted acids having a  $\text{NO}_2$  or other strongly electronegative group in the *o*-position to the :NH group should yield isolable dichloroarsines on reduction in the presence of HCl; further evidence regarding the constitution of the reduction product of 3-nitrodiphenylamine-6'-arsonic acid is also presented. 2-Bromo-3-nitrotoluene,  $b_p$   $135-6^\circ$ ,  $b_m$   $157^\circ$ , m  $41-2^\circ$ , results in 67% yield from the 2- $\text{NH}_2$  deriv. through the diazo reaction. Notes are given on the prepn. of the other 7 known isomers. 4,2-Me( $\text{H}_2\text{N}$ ) $\text{C}_6\text{H}_3\text{AsO}_3\text{H}_2$ , *o*-Br $\text{C}_6\text{H}_4\text{NO}_2$ ,  $\text{K}_2\text{CO}_3$ , AmOH and a trace of Cu powder, boiled 5 hrs., give 66% of 2-nitro-3'-methylphenylamine-6'-arsonic acid (I), golden yellow, m.  $215-7^\circ$  (decompn.); the alkali salts give deep red solns.; the Mg salts form on boiling with magnesia mixt. Reduction of I in a mixt. of EtOH and HCl contg. a trace of I with  $\text{SO}_2$  gives 2-nitro-3'-methylphenylamine-6'-dichloroarsine, bright yellow, m.  $129.5-30^\circ$ ; if the crude product is boiled in AcOH for 1.5 hrs., HCl is evolved and there results 72% of 10-chloro-4-nitro-7-methyl-5,10-dihydrophenarsazine, deep red, m.  $201-2^\circ$ , oxidized by  $\text{H}_2\text{O}_2$  in AcOH in 15 min. at  $100^\circ$  to 4-nitro-7-methylphenarsazinic acid, yellow, m.  $300-3^\circ$  (decompn.); the Na salt is orange; 4- $\text{NH}_2$  deriv., needles which do not m. at  $310^\circ$ , by reduction with  $\text{Fe}(\text{OH})_2$ , which is further reduced by  $\text{SO}_2$  in EtOH-HCl to 10-chloro-4-amino-7-methyl-5,10-dihydrophenarsazine-HCl, grayish yellow, m.  $216-20^\circ$  (decompn.). 3-Nitro-3'-methylphenylamine-6'-arsonic acid, prepd. like I from *m*-Br $\text{C}_6\text{H}_4\text{NO}_2$ , yellow, m.  $191-2^\circ$  (73% yield); reduction with  $\text{SO}_2$  in EtOH-HCl gives 10-chloro-1(or 3)-nitro-7-methyl-5,10-dihydrophenarsazine, deep red, m.  $253-5^\circ$  (decompn.); in EtOH-HBr the 10-Br deriv., deep red, m.  $248-50^\circ$  (decompn.). *p*-Br $\text{C}_6\text{H}_4\text{NO}_2$  gives 89% of 4-nitro-3'-methylphenylamine-6'-arsonic acid, yellow, m.  $276^\circ$  (decompn.). 5,2-Me( $\text{H}_2\text{N}$ ) $\text{C}_6\text{H}_3\text{AsO}_3\text{H}_2$  and *o*-Br $\text{C}_6\text{H}_4\text{NO}_2$  give 65% of 2-nitro-4-methylphenylamine-6'-arsonic acid, deep bronze-yellow, m.  $226-7^\circ$ , decompn.  $234^\circ$ ; the alkali salts give deep red solns. Reduction with  $\text{SO}_2$  in HCl gives an oily dichloroarsine which, boiled with AcOH for 2 hrs., gives 10-chloro-4-nitro-8-methyl-5,10-dihydrophenarsazine, red, m.  $206^\circ$ ; oxidation with  $\text{H}_2\text{O}_2$  gives 4-nitro-8-methylphenarsazinic acid, orange-yellow, decompn.  $297-300^\circ$ ; the salts are characteristic: Na, bronze-yellow needles;  $\text{NH}_4$ , deep red needles whose aq. soln. evolves  $\text{NH}_3$ ; Ba, reddish yellow needles; Ca, orange-yellow needles; Mg, orange plates; salts of the heavy metals are amorphous. 2,6-Br( $\text{O}_2\text{N}$ ) $\text{C}_6\text{H}_3\text{Me}$  and *o*- $\text{H}_2\text{NC}_6\text{H}_4\text{AsO}_3\text{H}_2$  give 68% of 3-nitro-2-methylphenylamine-6'-arsonic acid, pale yellow, m.  $223-4^\circ$  (decompn.); Na salt, pale yellow needles;  $\text{NH}_4$  salt, yellow; Ba and Ca salts, pale yellow. Reduction with  $\text{SO}_2$  in HCl gives 10-chloro-3-nitro-4-methyl-5,10-dihydrophenarsazine, yellow, m.  $216.5^\circ$ ; 10-Br deriv., orange-yellow, m.  $216.5^\circ$ . Oxidation of the Cl deriv. with  $\text{H}_2\text{O}_2$  gives 3-nitro-4-methylphenarsazinic acid, pale yellow, does not m.  $306^\circ$ . 2,5-Br( $\text{O}_2\text{N}$ ) $\text{C}_6\text{H}_3\text{Me}$  gives 73% of 4-nitro-2-methylphenylamine-6'-arsonic acid, pale yellow, m.  $277^\circ$  (decompn.); salts: Na, golden yellow needles;  $\text{NH}_4$ , orange-yellow needles, giving a deep red aq. soln.; Ba, yellow plates; Ca, orange-yellow plates; Mg, orange, amorphous; Hg salts, yellow needles; Ag and Pb, yellow.  $\text{SO}_2$  in HCl gives 10-chloro-2-nitro-4-methyl-5,10-dihydrophenarsazine, deep yellow, m.  $303-5^\circ$  (decompn.); 10-Br deriv., orange-yellow, m.  $301-2^\circ$  (decompn.); either deriv., oxidized with  $\text{H}_2\text{O}_2$ , gives 2-nitro-4-methylphenarsazinic acid, pale yellow, does not m.  $306^\circ$ ; salts:  $\text{NH}_4$ , yellow needles, whose aq. soln., on boiling, evolves  $\text{NH}_3$ ; Ba, pale yellow needles; Ca, orange-yellow prisms; Ag, yellow, amorphous; Mg, yellow prisms; Hg, pale yellow, amorphous; Pb, deep yellow, amorphous; K, golden yellow prisms, giving an orange-red concd. or pale yellow dil. aq. soln., changed to deep purple on addn of 25% KOH; Na, orange-yellow needles. 2,5-Br( $\text{O}_2\text{N}$ ) $\text{C}_6\text{H}_3\text{Me}$  gives 56% of 5-nitro-2-methylphenylamine-6'-arsonic acid, light yellow, m.  $224-6^\circ$  (decompn.); the alkali salts form deep red aq. solns.; Ba salt, yellow plates; Ca salt, bright yellow

needles;  $\text{Hg}^{++}$  salt, yellow needles;  $\text{Mg}$  salt, colorless. Reduction with  $\text{SO}_2$  in  $\text{HCl}$  gives 5-nitro-2-methyldiphenylamine-6'-dichloroarsine, bright yellow, m.  $173^\circ$ , which gives in boiling  $\text{AcOH}$  10-chloro-1-nitro-4-methyl-5,10-dihydrophenarsazine, deep red, m.  $258-60^\circ$ ; the corresponding dibromoarsine and 10-Br deriv. yellow, m.  $164^\circ$  and deep red, decomp.  $272^\circ$ . Oxidation of the Cl deriv. with  $\text{H}_2\text{O}_2$  gives 1-nitro-4-methylphenarsazinic acid, orange-yellow, darkens  $295^\circ$  but does not m.  $305^\circ$ . 2,3-Br( $\text{O}_2\text{N}$ )- $\text{C}_6\text{H}_4\text{Me}$  gives 35% of 2-nitro-6-methyldiphenylamine-6'-arsonic acid, golden yellow, m.  $195-7^\circ$ ; the salts are yellow to orange-yellow; reduction gives 2-nitro-6-methyldiphenylamine-6'-dichloroarsine, orange-yellow, m.  $104-5^\circ$ ; the dibromoarsine, bronze-orange, m.  $97-8^\circ$ . 4,3-Br( $\text{O}_2\text{N}$ )- $\text{C}_6\text{H}_4\text{Me}$  gives 2-nitro-4-methyldiphenylamine-6'-arsonic acid, golden yellow, m.  $227-9^\circ$  (decompn.); the 6'-dichloroarsine, orange-yellow, m.  $91-3^\circ$ ; 10-chloro-4-nitro-2-methyl-5,10-dihydrophenarsazine, deep red, m.  $187-8^\circ$ ; 10-Br deriv., deep crimson, m.  $186-8^\circ$ ; 4-nitro-2-methylphenarsazinic acid, yellow, decomp.  $305^\circ$ ; the Ba salt, deep yellow needles, and the Ca salt, plates, are characteristic. 3,5-Br( $\text{O}_2\text{N}$ )- $\text{C}_6\text{H}_4\text{Me}$  gives 88% of 5-nitro-3-methyldiphenylamine-6'-arsonic acid, pale yellow, m.  $228-30^\circ$  (decompn.); salts: Ca, yellow needles; Ba, yellow plates; Na, deep reddish brown; Mg, yellow needles. Reduction with  $\text{SO}_2$  gives 10-chloro-1(or 3)-nitro-3(or 1)-methyl-5,10-dihydrophenarsazine, orange, decomp.  $245-7^\circ$ ; 10-Br deriv., red, m.  $237-42^\circ$ . 1(or 3)-Nitro-3(or 1)-methylphenarsazinic acid, yellow, does not m.  $300^\circ$ . 4,2-Br( $\text{O}_2\text{N}$ )- $\text{C}_6\text{H}_4\text{Me}$  gives 3-nitro-4-methyldiphenylamine-6'-arsonic acid, bright yellow, m.  $165-6^\circ$ , isolated through the Ba salt, golden yellow plates with  $\text{H}_2\text{O}$ . Reduction with  $\text{SO}_2$  gives a mixt. of 10-chloro-2-methyl-3-nitro- and 10-chloro-1-nitro-2-methyl-5,10-dihydrophenarsazine, orange-yellow, m.  $257-8^\circ$  (decompn.) and bright red, m.  $225-6^\circ$  (decompn.); the oxidation products, 1- and 3-nitro-2-methylphenarsazinic acids, yellow, do not m.  $297^\circ$ , could not be distinguished from each other. 3,6-Br( $\text{O}_2\text{N}$ )- $\text{C}_6\text{H}_4\text{Me}$  gives 86% of 4-nitro-3-methyldiphenylamine-6'-arsonic acid, pale yellow, decomp.  $200^\circ$ ; reduction gives 10-chloro-2-nitro-1(or 3)-methyl-5,10-dihydrophenarsazine, orange-yellow, m.  $236-8^\circ$  (decompn.), oxidized to 2-nitro-1(or 3)-methylphenarsazinic acid, yellow, does not m.  $308^\circ$ ; Na salt, crimson needles. The following general conclusions may be drawn from the above and earlier work: All substituted nitrodiphenylamine-6'-arsonic acids (II) in which the  $\text{NO}_2$  group is in the  $\alpha$  position to the  $:\text{NH}$  group, on reduction in the presence of  $\text{HCl}$ , yield dichloroarsines, all II in which the  $\text{NO}_2$  group is in the  $p$ -position to the  $\text{NH}$  group on reduction yield the corresponding cyclic Cl compd.; this is also true of all II in which the  $\text{NO}_2$  group is in the  $m$ -position to the  $\text{NH}$  group, with the exception of the 5-nitro-2-methyl deriv. All substituted 10-chloro-4-nitro-5,10-dihydrophenarsazines are crimson, have lower m. ps. than other nitro-10-chloro derivs. and are volatile under diminished pressure at the ordinary temp. All substituted 10-chloro-2-nitro derivs. are yellow, are sol with difficulty in the usual solvents and generally have very high m. ps. There is a greater tendency for ring closure in the case of Br compds. than in the case of the Cl compds.

C. J. WEST

**Meriquinoid derivatives of the phenarsazine series.** II. G. A. RAZUVAEV, *Ber* 62B, 1208-20(1929); cf. C. A. 23, 3708.—It was shown in the earlier paper that As substituted derivs. of dihydrophenarsazine add, with varying ease, 1 atom of  $\text{H}$  to form intensely colored solns. of meriquinoid derivs. From a careful study of the action of  $\text{O}$  on these colored solns. it follows that 2 reactions take place: a very rapid splitting off of the added  $\text{H}$  and a slow further oxidation to the phenarsazinic acid,  $\text{C}_6\text{H}_4\text{NH} \cdot \text{C}_6\text{H}_4 \cdot \text{AsO}_2\text{H}$ ; the absorption of  $\text{O}$  is at first very rapid and then suddenly

slows down, the soln. becoming colorless. About 0.5 atom of  $\text{O}$  is absorbed, the further oxidation requires many days. To det. the influence of nucleus substituents on the addn. of  $\text{H}$ , the 2(or 4)-Me (I), 2,7(or 4,5)-di-Me (II), 1,2-benzo (III), 3,4,5,6-dibenzo and 3,6-dinitro derivs. of 10-chloro-9,10-dihydrophenarsazine (IV), and also 10-chlorophenoxarsine were studied. Only I, II and III added 1 atom  $\text{H}$  on heating with  $\text{HCO}_2\text{H}$ , as detd. from the amt. color of the reduced solns.

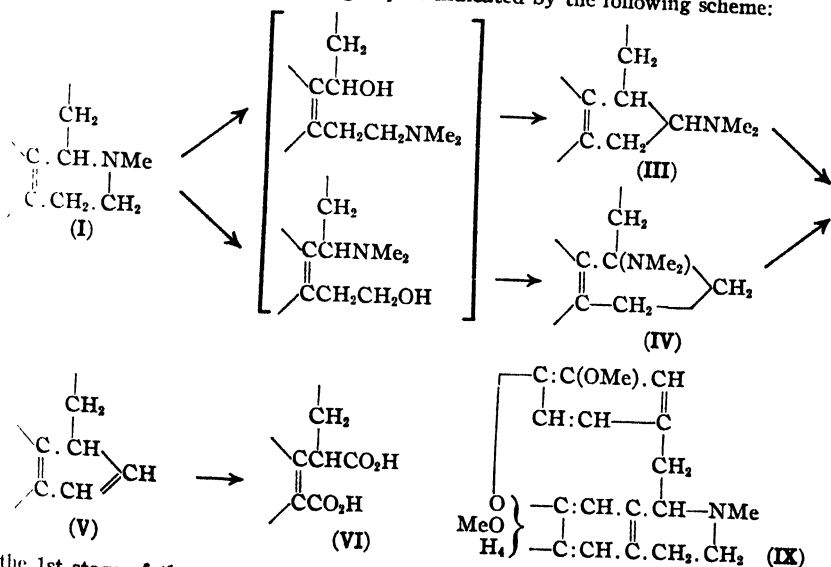
spends to 1 atom;  $\text{HCl}$  is split off and the halogen replaces the  $\text{H}$  in the  $\text{NH}$  group. With I and II the reduced solns. are intensely red, with III dark violet. phenarsazinic acid formed by oxidizing the reduced soln. of IV m. about  $325^\circ$  (decompn.); with III it is so unstable that it could not be isolated. 10-Br deriv. of III, from the reduced soln. with Br, m.  $209^\circ$ ; 10-I compd., orange-red, m.  $202-3^\circ$ , sol. in concd.  $\text{H}_2\text{SO}_4$  with red color. I, from  $m\text{-MeC}_6\text{H}_4\text{NHPh}$  and  $\text{AsCl}_3$  in  $o\text{-C}_6\text{H}_4\text{Cl}_2$ , yellow, m.  $195-6^\circ$ ; 10-Br deriv., yellow, m. about  $220^\circ$  (decompn.); I compd., orange-red, m.  $188^\circ$ . II, from  $(m\text{-MeC}_6\text{H}_4)_2\text{NH}$  and  $\text{AsCl}_3$ , yellow, m.  $250-2^\circ$ ; 10-I deriv., m.  $241-4^\circ$ . C. A. R.



P. HAAS. *Mikrochemie*  
microdetn. of the methylimino  
are almost invariably obtained,  
:NMe group. The errors  
the :NMe from the substance

and to the incomplete absorption of the HI by the red P suspension even when 2 or 3 absorption vessels are used.

**Alkaloids of Sinomenium and Cocculus. XXV. Alkaloids of *Stephania tetrandra***  
S. Moore. 2. H. KONDO AND K. YANO. *J. Pharm. Soc. Japan* 49, 315-32 (1929); Abstract sect. 49, 51-4; cf. *C. A.* 22, 2359.—In paper 1 was reported the isolation of 3 kinds of alkaloids from *Stephania tetrandra*, one of which was called *tetrandrine* (I), and it was suspected that I might contain the benzyltetrahydroisoquinoline nucleus further proof for the presence of II in I. *Des-N-tetrandrine*, m. 221°, which was obtained by Hofmann's decompn. of I, shows the presence of 1 double bond by Wijs' method. This fact is difficult to explain since compds. contg. II usually give a compd. having 2 double bonds. By repeating H.'s decompn. of I, an  $\alpha$ -methine (III) (Et<sub>2</sub>O-sol., m. 172°, [ $\alpha$ ]<sub>D</sub><sup>14</sup> 11.09°) and a  $\beta$ -methine (IV) (Et<sub>2</sub>O-insol., m. 227° (decompn.), [ $\alpha$ ]<sub>D</sub><sup>18</sup> 14.64°) were obtained at the 1st stage of the decompn. These compds. contained only 1 double bond. In the 2nd stage of the decompn., the same *des-N-tetrandrine* (V), m. 221°, [ $\alpha$ ]<sub>D</sub><sup>16</sup> 11.69, was obtained from III or IV. It also contained only 1 double bond. Since oxidation of V gave a di-CO<sub>2</sub>H acid with the same no. of C atoms bound instead of 2 in V, it is assumed that in H.'s decompn. of I, the dehydration takes place in the direction of  $\alpha, \alpha'$ -positions to the N atom instead of the  $\alpha$  N-positions due to the stability of H<sub>2</sub> in the PhCH<sub>2</sub>-group as indicated by the following scheme:



In the 1st stage of the oxidation of V with KMnO<sub>4</sub>, *des-N-tetrandrinedicarboxylic acid* (VI) (MeO)<sub>2</sub>C<sub>14</sub>H<sub>10</sub>O(CO<sub>2</sub>H)<sub>2</sub>, m. 130°, was obtained. Further oxidation gave *des-N-tetrandrinedicarbonylic acid*, (MeO)<sub>2</sub>C<sub>13</sub>H<sub>8</sub>CO(CO<sub>2</sub>H)<sub>2</sub>, m. 145° (*semicarbazone*, m. 305°. Direct oxidation of I with an excess of KMnO<sub>4</sub> also gave VII. VII and HBr gave an acid (VIII), m. 282-5°. Methylation of VIII with Me<sub>2</sub>SO<sub>4</sub> gave VII. KOH fusion of VII gave 3,4-(HO)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>CO<sub>2</sub>H and HOC<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>H. This fact shows that VII has the structure of 2-methoxydiphenyl ether-4,4'-dicarbonylic acid. From the reactions given above the structure IX is proposed for I.

Properties of nicotine and its derivatives. I. Molecular extinction coefficients.

NAO UYER

THOMAS M. LOWRY AND WM. VIVIAN LLOYD. *J. Chem. Soc.* 1929, 1376-82.—Nicotine and its derivs. show a strong absorption band at 2850 A. U., which is twice as strong in the  $\text{ZnCl}_2$  compd. and in the methiodides but is 10 times weaker when the base is dissolved in  $\text{H}_2\text{O}$ . It is therefore suggested that the aq. soln. may contain an unionized hydrate or pseudo-base of the type investigated by Decker in the isoquinoline series (*C. A.* 6, 225). Curves are given for nicotine in  $\text{H}_2\text{O}$  and cyclohexane, for the  $\text{ZnCl}_2$  compd. in  $\text{H}_2\text{O}$  and for the isomethiodide, isomethiodide HI and dimethiodide in  $\text{H}_2\text{O}$ .  
C. J. WEST

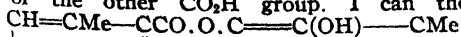
**Nicotine tetrachloriodide.** FREDERICK D. CHATTAWAY AND GEORGE D. PARKES. *J. Chem. Soc.* 1929, 1314-7.—Nicotine (I) (10 g.) in 20 cc. cooled concd. HCl and a soln. of  $\text{ICl}_3$  (prepd. by satg. a suspension of 8 g. I in 100 cc. concd. HCl with Cl) give quant. nicotine tetrachloriodide (II),  $\text{C}_{10}\text{H}_{14}\text{N}_2 \cdot 2\text{HICl}_4$ , orange, m.  $150^\circ$ , which is very stable; it does not lose weight when exposed for a considerable period in a vacuum desiccator over  $\text{CaO}$ ; it is decompd. by aq. alkalis and more slowly by  $\text{H}_2\text{O}$  alone, giving mainly a mixt. of I and nicotinic acid (III), together with iodate and iodide. III (10 g.) in 150 cc. concd. HCl and 20 g. I, satd. with Cl, give nearly quant. the tetrachloriodide, yellow, m.  $137^\circ$ . Methyl *N*-methylnicotinate tetrachloriodide, bright yellow, m.  $110^\circ$ . Trigonelline tetrachloriodide, bright yellow, m.  $122^\circ$ . Decompn. of II by  $\text{Na}_2\text{SO}_3$  gives 90% of I. Two recrystns. of crude II from glacial AcOH freed it from the tetrachloriodides of the other bases present in technical I. From 200 g. dried dark rag tobacco, ground with 80 g. NaOH in 1 l.  $\text{H}_2\text{O}$  and steam-distd. until 1800 cc. distillate had been collected, there were obtained 22 g. pure II and from this, 4.5 g. pure I.  
C. J. WEST

**Kauri-resins.** J. R. HOSKING. *Rec. trav. chim.* 48, 622-36(1929).—This research was undertaken with the view to investigate the compn. of kauri-resins of different ages, viz., (a) Kauri-resin, freshly prepd. from the tree; (b) the same resin after exposure to the air during 1.5 or 4.5 years ("Buschharz"); (c) fossil kauri-resin ("range gum"); (d) kauri-resin, obtained from the peat-moors ("Sumpsharz"), the method of investigation being as follows. The resin was first distd. with water and sepd. in this way into essential oil, water-sol. gum and resin, which were further investigated more fully. The gum was obtained in a dry condition by concentrating the aqueous distillate to a small vol. and adding alc., the process being repeated once more with the filtrate. Only in the case of the freshly prepd. resin was a sufficient amt. of the gum obtained for further investigation; it was, however, possible to show that in all cases the gum contains a small amt. of Mn. On hydrolysis of the gum (case a) with 5%  $\text{H}_2\text{SO}_4$  and destruction of the galactose in the soln. obtained, an osazone could be prepared m.  $158^\circ$  and a *p*-bromophenylhydrazone m.  $162^\circ$ , showing that the pentose present in the gum is *l*-arabinose. The filtrate from the prepn. of the gum yields an osazone m.  $186-90^\circ$ , indicating the presence of *d*-glucose. The resin was sepd. into neutral components, low-melting resinic acids ( $\alpha$ -resin) and high-melting resinic acids ( $\beta$ -resin) in the following way (cf. Baker and Smith, *Pines of Australia* 343(1910)). The pulverized resin was extd. with ether, in which the neutral components and the  $\alpha$ -resin are sol. while the  $\beta$ -resin is not. The neutral components were then sepd. from the  $\alpha$ -resin by means of the K salts, while small amts. of the  $\alpha$ -resin present in the  $\beta$ -resin and small amts. of the  $\beta$ -resin present in the  $\alpha$ -resin were obtained by conversion of the resinic acids into the K salts in alc., the K salts of the  $\alpha$ -resin being sol. in EtOH and those of the  $\beta$ -resin insol. in this solvent. The essential oil from the fresh resin consists almost entirely of *d*- $\alpha$ -pinene,  $d_4^{25}$  0.8535,  $n_D^{20}$  1.4658,  $[\alpha]_{D_{401}}^{20}$  22.20°, which was obtained after several fractionations in 92% yield. In case b only the components of a 4.5-year old specimen were investigated in detail; the essential oil again almost entirely (89%) consisted of *d*- $\alpha$ -pinene,  $d_4^{25}$  0.8529,  $n_D^{25}$  1.4633,  $[\alpha]_{D_{401}}^{25}$  10.08°. Fractional distn. of the essential oil from "range gum" (case c) gave 63% *d*- $\alpha$ -pinene,  $d_4^{15}$  0.8662,  $n_D^{15}$  1.4604,  $[\alpha]_{D_{401}}^{15}$  10.90°, and 6% of a high-boiling fraction of camphor-like odor, which probably contains fenchyl alc. The essential oil obtained in case d gave 30.5% *d*- $\alpha$ -pinene,  $b_{788}$  155-6°,  $d_4^{15}$  0.8632,  $n_D^{25}$  1.4653,  $[\alpha]_{D_{401}}^{15}$  11.24°; 38.5% dipentene, contg. some *d*-limonene,  $b_{788}$  175-7°,  $d_4^{14}$  0.8460,  $n_D^{14}$  1.4752,  $[\alpha]_{D_{401}}^{14}$  2.36°; 12.9% *d*-fenchyl alc. (from which 7.5% were isolated) and a resinous residue, amounting to 12.4%. It thus appears that the % of pinene decreases regularly with increasing age of the resin, the optical rotation of the pinene decreasing in the same sense. Probably the dipentene and the fenchyl alc. are formed from the pinene under the influence of water and salts. The investigation of the resins left behind after the distn. of the crude resins with water, gave the following results for acid no.,  $\alpha$ -resin,  $\beta$ -resin and non-

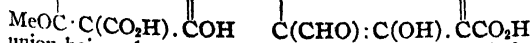
volatile neutral components, resp.: (a), 103, 63%, 19%, 10%; (b), 77, 39%, 45%, 9%; (c), 65, 35%, 48%, 9%; (d), 64, —, —, —; from which it appears that the amt. of  $\alpha$ -resin decreases and that of  $\beta$ -resin increases with increasing age of the crude resin; probably the latter is formed from the  $\alpha$ -resin. The amts. of water-sol. gum were 1.1, 0.3, 0.2 and 0.2% in (a), (b), (c) and (d); the m. p. of the  $\alpha$ - and  $\beta$ -resins: (a) 121–4° and 233–6°, (b) 120–4° and 235–7°, (c) 120–5° and 232–7°; the yield of essential oil: (a) 9.6%, (b) 5.0%, (c) 4.0%, (d) 1.0%; and the amt. of the  $\alpha$ - and  $\beta$ -resins: (a) 89.1%, (b) 94.7%, (c) 95.8%, (d) 98.8%.

C. F. VAN DUIN

**Lichen substances. V. Constitution of thamnolic acid. I.** YASUHIKO ASAHINA AND SETZUJI IHARA. *Ber.* 62B, 1196–207 (1929); cf. C. A. 23, 2982.—According to Hesse, thamnolic acid (I), from *Thamnolia vermicularis*, has the compn.  $C_{20}H_{18}O_{11}$  and on heating with  $Ba(OH)_2$  decomps. into thamnolinic acid,  $C_{16}H_{20}O_9$  (II), MeOH and 3  $CO_2$ . Recently A. and I. obtained from *Cladonia flabelliformis* Flk. v. *polyductyla* (Flk.) Wainio 0.34% *l*-usnicic acid and 1.2% I; the properties of the I agreed well with those given in the literature but the C and H contents (54.46, 3.99%) were somewhat lower than those found by H. I was therefore prepd. from *T. vermicularis* also and found to be identical with the other product. H.'s higher C content was probably due to the fact that the I is unstable, and, on unnecessarily long drying at a high temp., loses  $CO_2$  and becomes contaminated with substances richer in C. Because of its low soly., b.-p. detns. of the mol. wt. are also not reliable and even in Rast's micromethod  $CO_2$  is evolved during the heating with camphor. Although I is turned yellow by alkalis and therefore the end point is not sharp it can be approximately titrated with 0.1 N alkali and hematoxylin; there were thus obtained the values 423 and 442 (calcd. on the basis of a tribasic-acid) for its mol. wt.; the MeO content (7%) gives a mol. wt. of 440 on the assumption that I contains one MeO group. On the basis of these results A. and I. assign to I the formula  $C_{19}H_{16}O_{11}$ , which they have confirmed by degradation expts. The presence of a C:O group in I was shown by the formation of hydrazones. Heated with  $KHCO_3$ ,  $Ba(OH)_2$  or KOH it gave orcinol mono-Me ether (III) and everninic acid (IV), but none of H.'s II could be detected. The m. p. of IV varies greatly according to the method of crystn. and values ranging from 145° to 170° are given in the literature. The highest m. p. (172°) was obtained after recrystn. from petroleum ether, but the same prepn. recrystd. from  $H_2O$  or alc. melted lower (153°, 168°, etc.), and it is quite likely that H.'s acid, m. 163°, was really IV. With  $PhNH_2$  at 200°, I gives the anilide of IV; with hot MeOH only the Me ester of IV was obtained. When it is heated in an open vessel with AcOH, I remains for the most part unchanged but in a sealed tube at 150° it undergoes deep-seated decompn. and gives III, methyl-*p*-orsellinic acid (V) and a yellow substance, thamnol,  $C_8H_8O_4$  (VI), which is of pronounced acid character and at the same time an aldehyde, for it dissolves in  $NaHCO_3$  and in  $NaHSO_3$  and forms an anil and hydrazones. Only about 0.2 g. VI was obtained in this way from 2 g. I, but when 5 g. I was heated in an open dish with pelargonic acid to 200°,  $CO_2$  was evolved (beginning at 170°) and by extg. the resulting dark oil with hot  $NaHSO_3$ , acidifying and shaking out with  $Et_2O$ , about 2 g. VI was obtained; steam distn. of the pelargonic acid mixt. left III behind. VI contains 1 atom of O more than atranol (*p*-orsellinic aldehyde) (VII), which it greatly resembles in appearance and chem. properties. Reduction of VI by the Clemmensen method gave a phenol  $C_8H_{10}O_3$  (VIII) which is exceedingly sensitive to alkalis. If VI is a hydroxyatranol, VIII should be *hydroxy- $\beta$ -orscinol*, 1,4,2,3,5- $C_8H_8Me_2(OH)_3$ ; this compd. was synthesized (see following abstr.) and proved to be identical with VIII. VI must therefore be 4-methyl-2,3,5-trihydroxybenzaldehyde (the other possible structure, with the Me and CHO groups reversed, seems less probable). When I in  $KHCO_3$  was heated with  $Na_2SO_3$ , the dark color of the soln. being discharged by addn. of  $NaHSO_3$  from time to time, there sepd., on acidifying and cooling, a di- $CO_2H$  acid  $C_{10}H_{10}O_6$  (IX), which lost  $CO_2$  at 205° and yielded III. IX must be the mother substance of IV and V which it forms according as it splits off  $CO_2$  from the one or the other  $CO_2H$  group. I can therefore be assigned the structure



, the position of the depside

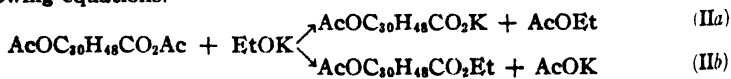


union being chosen arbitrarily. I, best recrystd. from  $Me_2CO$ , m. 212–4° (decompn.), gives a brownish red color with alc.  $FeCl_3$ , sol. in alkali carbonates and hydroxides with deep yellow color, in hot KOH plus  $CHCl_3$  with red color and greenish fluorescence; aniline salt, from the components in hot alc., orange-yellow, m. 206–8°, sol. in alkalis with red color turning yellow on heating, in  $Et_2O$  with yellow color discharged by shaking with dil. HCl; phenylhydrazone, yellow, m. 173–4°; *p*-nitrophenylhydrazone,

orange-yellow, m. 238–9°. Neither hydrazone is attacked by cold dil. HCl. *Anilide* of IV, m. 175°. *Me ester*, m. 67–8°, gives a violet color with traces of alc. FeCl<sub>3</sub>. V, m. 171–2°, gives a red-violet color with traces of alc. FeCl<sub>3</sub>, loses and forms III on heating, identical with the product obtained with Me<sub>2</sub>SO<sub>4</sub> and CH<sub>3</sub>N<sub>3</sub> from *p*-orsellinic acid (m. 171–2°, loses CO<sub>2</sub> at 176°), which was prepd. in 71% yield from orcinol and KHCO<sub>3</sub> at 130°. VI, m. 185°, sol. in alkalis with intensely yellow color, gives with alc. FeCl<sub>3</sub> a green color which gradually darkens; H<sub>2</sub>O turns it olive-green, NaHCO<sub>3</sub> dark wine-red; heating with alkali and CHCl<sub>3</sub> gives a red but not fluorescent soln., H<sub>2</sub>SO<sub>4</sub> a red-brown soln. changed to yellow by H<sub>2</sub>O; with phloroglucinol and hot dil. H<sub>2</sub>SO<sub>4</sub> is formed an orange-red soln. or brown ppt. *Anil*, brownish, m. 128–9°, gives with alc. FeCl<sub>3</sub> a green, then yellow-green color, is insol. in Na<sub>2</sub>CO<sub>3</sub>; *phenylhydrazone*, brown-red, m. 194° (decompn.), gives a brown-red color with alc. FeCl<sub>3</sub>; *p*-nitrophenylhydrazone, brown-violet, m. about 320° (decompn.), sol. in hot Na<sub>2</sub>CO<sub>3</sub> with blood-red color, *triacetate*, from VI and Ac<sub>2</sub>O on the H<sub>2</sub>O bath, m. 133°, is not colored by alc. FeCl<sub>3</sub>, mol. wt. (Rast) 289, forms an *anil*, m. 129°. VIII, m. 157° mol. wt. (Rast) 148, dissolves in H<sub>2</sub>O with light purple color turned to dark violet by heat or by traces of alkali, in alc. with light red color changed to yellow by FeCl<sub>3</sub>, instantly reduces NH<sub>4</sub>-AgNO<sub>3</sub>, is turned green and then dark violet by rubbing with solid KOH; *triacetate*, m. 108° *Methylorcinoldicarboxylic acid* (IX), light brownish, m. 205–6° (decompn.), sol. in alkalis and carbonates without color, gives a brown- to wine-red color with alc. FeCl<sub>3</sub>.

C. A. R  
**Hydroxy-β-orcinol** (1,4-dimethyl-2,3,5-trihydroxybenzene). YASUHIKO ASAHINA AND EI-ITI ISHIBASHI. *Ber.* 62B, 1207–8(1929); cf. preceding abstr.—*p*-Xyloquinone, Ac<sub>2</sub>O and concd. H<sub>2</sub>SO<sub>4</sub> heated on the H<sub>2</sub>O bath until the yellow color of the quinone disappears and poured into H<sub>2</sub>O give the *triacetate*, m. 108°, of *hydroxy-β-orcinol*, m. 158°, obtained from the triacetate with boiling HCl; with Bz<sub>2</sub>O in C<sub>6</sub>H<sub>5</sub>N the orcinol forms a *tribenzoate*, m. 156°.

C. A. R  
**The action of acetic anhydride on carboxylic acids.** A. W. VAN DER HAAR. *Rec trav. chim.* 48, 607–11(1929).—According to some authors the interaction of Ac<sub>2</sub>O and CO<sub>2</sub>H acids leads to the formation of mixed anhydrides, whereas others hold the opinion that only simple anhydrides are formed (cf. van der Haar, C. A. 22, 424, 1342, 1979). From his expts. with the reaction products of several sapogenins, BzOH and *p*-Me<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>H v. d. H. (*l. c.*) has drawn the conclusion that mixed anhydrides are not formed in this reaction but addn. products of the anhydride of the acid investigated with 1 mole of Ac<sub>2</sub>O of crystn. This view was based on the fact that on titration of the reaction products in abs. EtOH with alc. KOH, 2 moles of KOH were consumed for the conversion of the Ac<sub>2</sub>O into 2 AcOK and 2 moles for the sapon. of the acetylated OH groups of the sapogenin anhydride, the "ester no." being twice as great as the "acid no." Caudri (*Diss. Leiden* 1928) has found, however, that Ac<sub>2</sub>O on titration with alc. KOH does not give 2 moles of AcOK, but 1 mole of AcOK and 1 mole of AcOEt and thus the explanation of v. d. H. of the fact that the "ester no." is twice as great as the "acid no." cannot be correct. This fact is just as well in agreement with the following course of the reaction: (AcOC<sub>30</sub>H<sub>48</sub>CO<sub>2</sub>)<sub>2</sub>O + Ac<sub>2</sub>O + 2KOH → AcOK + AcOEt + AcOC<sub>30</sub>H<sub>48</sub>CO<sub>2</sub>K + AcCOC<sub>30</sub>H<sub>48</sub>CO<sub>2</sub>Et (I) when it is taken into consideration that esters of sapogenins are sapond. only with difficulty. If the reaction product be a mixed anhydride, the titration with alc. KOH might proceed according to the following equations:



and again the same relation between "acid no." and "ester no." would hold, and a decision between the simple and mixed anhydride formulas cannot be given from the titration values. If, however, after the detn. of the acid no., the AcOEt formed in this reaction is distd. off and estimated quantitatively by sapon., it is possible to draw a conclusion, the alkali necessary for the sapon. of the AcOEt being half the amt. necessary for the neutralization in the case I, equal to that amt. in the case IIa, whereas it should be somewhat smaller if the reaction IIb occurs to some extent. Actually it was found with ursolacetic anhydride, that the amt. of alkali necessary for the sapon. of the AcOEt is somewhat smaller than the amt. consumed in the detn. of the acid no. From these considerations it follows that the interaction of CO<sub>2</sub>H acids with Ac<sub>2</sub>O gives rise to the formation of *mixed anhydrides*. These conclusions only hold for the non-aldehydic and non-ketonic CO<sub>2</sub>H acids; for the aldehydic and ketonic CO<sub>2</sub>H acids, the views published previously (v. d. H., *l. c.*) still hold.

C. F. VAN DUIN

**Lignin. I. Chemical and physical investigation of phenol-lignins.** E. WÄGERKIND AND J. R. KATZ. *Ber.* 62B, 1172-7(1929).—Unlike most lignin preps. the simple phenol-lignins on acetylation yield with surprising ease derivs. having the same compn. when prepd. under different conditions. These Ac derivs. differ strikingly from the original phenol-lignins in their much greater soly. Mol. wt. detns. in AcOH gave remarkably low values (250-70 for 0.5% solns.) and in PhOH and  $C_{10}H_8$  was obtained a min. value of 1800, but in  $CHBr_3$  no depression of the f. p. was observed and ultra-filtration expts. showed that not only in  $CHBr_3$  but also in  $CHCl_3$  and even in AcOH and  $Me_2CO$  the acetylphenol-lignin (I) is present largely in colloidal condition. No attempt is made to explain the apparent discrepancy between these observations and the mol. wts. obtained in AcOH, but it is evident that osmotic measurements will not lead far in this field and it therefore seemed more important to subject I to a more chemical investigation. The smallest possible formula which can be derived for I from its compn. is  $C_{19}H_{20}O_6$ ; it contains one MeO and two Ac groups. Presumably in the formation of phenol-lignin (II), 1 mol. PhOH condenses with the complex  $C_9H_{10}O_3$ , its HO group remaining free. A complex with such a low mol. wt. (166) for the simplest lignin skeleton cannot be reconciled with any of the constitutional formulas which have been proposed, but if the formula for I is doubled ( $C_{38}H_{40}O_{12}$ ) its compn. and that of acetylresorcinol-lignin (III) would correspond with the calcd. values as well as can be expected of amorphous compds. From the various empirical formulas which have been deduced in recent years for the mother substance of lignin, the at. relation C:H:O is 110:100:39, whence it is evident that lignin is not of purely aliphatic character; provisionally Jonas' formula (a combination of 2 cyclohexane, 3 hydrogenated furan and 2 cyclohexene rings) seems useful; the reaction with PhOH could then be explained as consisting in addn. of the PhOH at the double bonds and the calcd. compns. would agree with those found by analysis. As all lignins, including the phenol-lignins, have a colloidal character, the problem of the polymerization which must be assumed falls in the field of highly polymerized substances which is now being so widely investigated. It was of interest, therefore, to apply to the lignins the modern methods of Röntgen spectrography and study of monomol. layers. II generally shows only a ring with the appearance of an amorphous ring, except that it is somewhat broader and more indistinct, somewhat like the principal ring of amorphous C. I and III have rings whose identity period is about 4 Å. U., a no. agreeing approximately with the thickness of a  $C_{10}H_8$  or conjugated system of  $C_6H_6$  rings. Willstätter's lignin showed 2 rings: the inner, much smaller ring is difficult to measure because of its indistinctness. No indications of crystallinity could be detected in any case. The remarkable soly. of I, III and methylphenol-lignin (IV) made it possible to apply to them Katz and Samwel's method (C. A. 22, 3986) of spreading high-mol. substances in monomol. layers on  $H_2O$ . On the basis of the formulas  $C_{38}H_{40}O_{12}$ ,  $C_{42}H_{46}O_{16}$  and  $C_{36}H_{40}O_9$  for the 3 compds., the surface per mol. and the thickness of a monomol. layer, resp., are: I, 83.7, 11.4; III 100.8, 10.2; IV 82.5, 10.1 Å. U. Assuming that the mols. in a homogeneous monomol. layer are as closely packed as possible it follows that these phenol-lignin derivs. have large slab like mols. Either they lie flat on the surface of the  $H_2O$ , in which case they would be remarkably thick for a condensed ring system, or they overlap, like the shingles on a roof. It is very probable that there exists a macromol., in Staudinger's sense, having the form of a large slab; this, in connection with the chem. nature of lignin, would point to a remarkable difference between the 2 chief components of wood; while the cellulose mol. most probably has a linear extension, lignin would have rather a superficial extension.

C. A. R.

**Chemistry of lignin. III. Destructive distillation of lignin from corn cobs.** MAX PHILLIPS. *J. Am. Chem. Soc.* 51, 2420-6(1929); cf. C. A. 22, 3143.—Lignin prepd. from corn cobs by the alkali method (I), the fuming HCl method of Willstätter (II) and by the 72%  $H_2SO_4$  method (III) was subjected to destructive distn. under ordinary atm. pressure and at a temp. of 380-400°. From I there were obtained (av. of 4 expts., calcd. on the basis of ash-free, dry I): 15.5% aq. distillate, 17.7%  $H_2O$ -insol. oily distillate, 52.2% C residue (calcd. on the amt. of lignin used); 13.5% gas (by difference) 0.13%  $Me_2CO$ , 1.9% MeOH, 0.05%  $H_2O$ -sol. acids (calcd. as AcOH). The oily distillate analyzed as follows (the results are expressed as % by wt. of the oil): acids 8.6%; phenols (fraction sol. in 5% KOH and insol. in 5%  $NaHCO_3$ ) 84%; hydrocarbons and neutral compds. 7.2%. In the phenolic portion of the oil guaiacol and eugenol were identified. In the case of II and III the % of aq. distillate was about the same as that obtained from I, whereas the oily distillate was only about 0.5. The % of C residue from II and III were considerably greater than that obtained from I. The % of  $Me_2CO$  and AcOH were considerably greater in the case of II and III than in I, whereas the

% of MeOH was less. This higher % of MeOH is probably due, in part, to the greater MeOH content of I than that of II and III. A possible explanation for the lower yield of AcOH obtained from I is presented.

**Plant pigments. XIII. Bixin.** P. KARRER, A. HELFENSTEIN, ROSE WIDMER AND Th. B. VAN ITALLIE. *Helv. Chim. Acta* 12, 741-56(1929); cf. *C. A.* 23, 2975.-Analytical data indicate that the formula  $C_{24}H_{27}O_3(OCH_3)$  must for the present be accepted for bixin (I). Sapon. of I with MeOH-KOH at 20° and 65°, followed by treatment

a. of I with boiling EtOH gives small amts. of II and varying quantities of *isonorbixin* (III), which is to be differentiated from its isomer by the formation of difficultly sol. alkali salts. III is stable in air and does not melt even at 300°. II can be converted into III by boiling with aq. KOH. Treatment of I in HOAc with  $I_2$  gives *isobixin* (IV), m. 216-7° (decompn.). *Methylbixin* (V),  $C_{24}H_{29}O_2(OMe)_2$ , m. 163-4°, prepd. from I in  $CHCl_3$  with  $CH_3N_3$  in  $Et_2O$ , may under the same conditions be converted into *isobixin Me ester* (VI), m. 200-1°. I and its derivs. are less stable than the corresponding compds. of the isobixin series. Reduction of one mole of II in warm  $NH_4OH$  with 2 moles  $TiCl_3$  and subsequent acidification of the filtrate give *dihydronorbixin* (VII),  $C_{24}H_{30}O_4$ , which sinters at 197°. Under similar conditions I is converted into *dihydrobixin* (VIII),  $C_{25}H_{32}O_4$ , m. 207-8°. Excess of  $TiCl_3$  in the reduction of I yields *perhydrobixin* (IX),  $C_{25}H_{40}O_4$  (?), which may be methylated to give *perhydrobixin Me ester* (X),  $C_{26}H_{40}O_4$ , b.p. 3-4° 203-4°,  $d_4^{19} = 0.924$ . Conversion of perhydronorbixin into the chloride followed by treatment with concd. aq.  $NH_3$  yields *perhydronorbixin diamide* (XI),  $C_{24}H_{38}O_2N_2$ , m. 111°. XIV. **Zeaxanthin, a new carotinoid pigment in maize.** P. KARRER, H. SALOMON AND H. WEHRLI. *Ibid* 790-2(1929).—Prolonged extrn. of maize with EtOH, subsequent treatment with petroleum ether, removal of fats by sapon., purification of the residues with  $Et_2O$  followed by crystn. from petroleum ether yields a new natural xanthophyll pigment, *zeaxanthin*,  $C_{40}H_{56}O_2$ , m. 201-2°.

**Bixin. V.** I. J. RINKES. *Rec. trav. chim.* 48, 603-6(1929); cf. *C. A.* 23, 101.—On ozonization of methylbixin R. had obtained previously a cryst. degradation product  $C_8H_{10}O_3$ , which he supposed to be Me 1-formyl-2 or 3-methyl-1,3-pentadienecarboxylate (I), while the compd. obtained from I by oxidation and sapon., was regarded as *trans-β-methylmuconic acid* (*Chem. Weekblad* 25, 564(1928)). The correctness of this supposition is now proved by oxidation of I with  $Ag_2O$  and sapon. of the oxidation product to a *β-methylmuconic acid*, m. 229°. The same product was also obtained on heating *cis-cis-β-methylmuconic acid* for 5 hrs. with concd. alkali and thus the structure of I, except for the position of the Me group, is proved as well as its *trans*-configuration. The *β-methylmuconic acid* of Pauly and Will (cf. *C. A.* 13, 573) is to be considered as the *cis-cis*-compd. because of its formation from a cyclic compd., 4,3- $HO(O_2N)C_6H_3Me$ , and because of the easy cyclization of its diurethan. For the degradation product  $C_8H_8O_2$  from bixin ozonide, R. had already put forward the structure of a methylfumaryl or methylmaleic dialdehyde (cf. *C. A.* 12, 472), which on hydrogenation should give methylsuccindialdehyde. The synthesis of the latter compd. was attempted in the following way: *cis-cis-β-methylmuconic diamide*, m. 218° (cf. Pauly and Will, *C. A.* 13, 573) was converted in MeOH suspension into *isoprene diurethan*, m. 160-1°, by means of NaOCl. On sapon. of this diurethan with 5%  $H_2SO_4$  methylsuccindialdehyde was not formed, ring closure taking place with the formation of *Me β-methylpyrrole-N-carboxylate*,  $b.p. 80^\circ$ , which on sapon. with alkali yields *β-methylpyrrole* and  $CO_2$ .

**Brasiliin and hematoxilin question. IX. Compounds of the phenoxyacetone series.** P. PREIFFER AND J. WILLEMS. *Ber.* 62B, 1242-50(1929); cf. *C. A.* 23, 150.—The work described in this paper is the 1st step in the direct synthesis of compds. of the brasiliin and hematoxilin series which still contain the alc. HO group of these 2 substances. Among the degradation products of trimethylbrasiliin (I), brasiliic acid,  $MeOC_6H_3.O.CH_2.C(OH)(CH_2CO_2H).CO$  (II), contains such a HO group. In order

to synthesize II, *γ-[m-methoxyphenoxy]citramalic acid*,  $m-MeOC_6H_4OCH_2C(OH)(CO_2H)CH_2CO_2H$  (III), was prepd. by condensing  $m-MeOC_6H_4OCH_2CO.Et$  (IV) and  $BrCH_2CO_2Et$  in the presence of amalgamated Zn to *Et γ-[m-methoxyphenoxy]acetoacetate* (V), adding HCN to form the corresponding *HO nitrile* (VI) and hydrolyzing the VI to III.  $PhOCH_2CO_2Et$  and  $PhCH_2CN$  in the presence of NaOEt gave the nitrile  $PhOCH_2COCH(CN)Ph$  (VII), converted by MeOH and HCl into the ester  $PhOCH_2COCH(CO_2Me)Ph$  (VIII), which gives no color with  $FeCl_3$  unless it is first melted and then dissolved in alc., when it at once gives a deep violet-red color. With boiling concd. HCl the keto ester is sapond. and splits off  $CO_2$ , giving 1-phenoxy-3-

phenylacetone (IX), which with HCN yields the *HO nitrile*  $\text{PhOCH}_2\text{C}(\text{OH})(\text{CH}_2\text{Ph})\text{CN}$  (X).  $\text{PhOCH}_2\text{COCH}_2\text{CO}_2\text{Et}$ , obtained in 2–3% yield from  $\text{PhOCH}_2\text{CO}_2\text{Et}$ ,  $\text{BrCH}_2\text{CO}_2\text{Et}$  and  $\text{Zn}$  in  $\text{C}_6\text{H}_6$ , faintly brown oil;  $\text{Cu}$  salt, light green, m. 155.5–6°; *p*-nitrophenylhydrazone, yellow, m. 136–7°. The ester (0.5 g.) with HCN in  $\text{Et}_2\text{O}$  gives 0.05 g. of the *HO nitrile* as a brownish oil. *Di-Me* [*m*-methoxyphenyl]malonate (22% (as the Na salt) from  $\text{PhOCH}_2\text{COCl}$  and  $\text{CHNa}(\text{CO}_2\text{Me})_2$  in  $\text{C}_6\text{H}_6$ ;  $\text{Cu}$  salt, green, m. 154.5°), m. 51.5–2.5°, gives an intense  $\text{FeCl}_3$  reaction. V (9 g. from 60 g. IV),  $b_{0.2}$  176°;  $\text{Cu}$  salt, green, m. 121°. VI, light yellow viscous oil, can be distd. in small amts. (0.5 g.) in a high vacuum, after addn. of a trace of  $\text{H}_2\text{SO}_4$ , without decompn.; benzoate, green-yellow oil, can be distd. without decompn. in a high vacuum. III, faintly brown viscous liquid purified through the *Ca* salt. *Di-Me* [(*m*-methoxyphenyl)acetyl]malonate (from [*m*-methoxyphenyl]acetyl chloride,  $b_{15}$  145–6.5°), m. 55–6°, gives an intense red color with  $\text{FeCl}_3$  and instantly decolorizes  $\text{Br}$  water. [2,3-Dimethoxyphenyl]acetic acid, from 2,3-(MeO) $_2\text{C}_6\text{H}_3\text{OH}$  in  $\text{NaOH}$  with  $\text{ClCH}_2\text{CO}_2\text{H}$ , m. 102.5–3°; chloride,  $b_{12}$  162°, gradually decomp. on standing, condenses with  $\text{NCCHNaCO}_2\text{Me}$  in  $\text{C}_6\text{H}_6$  to *Me* [(2,3-dimethoxyphenyl)acetyl]cyanoacetate, m. 87–8°, gives an orange-red color with alc.  $\text{FeCl}_3$ . 1-Phenoxy-3-phenyl-3-cyanoacetone (VII), m. 126–7°, gives a moss-green color with alc.  $\text{FeCl}_3$ . *Me* 3-carboxylate (VIII), m. 75.5–6°. IX, m. 43–4°; phenylhydrazone, very unstable, faintly yellow to brown crystals, begins to sinter 65°, m. 94–6°; semicarbazone, m. 151–2°. X, softens about 83°, m. 94–5°. C. A. R.

**Constitution of anserine.** W. LINNEWEH, A. W. KEIL AND F. A. HOPPE-SEYLER. *Z. physiol. Chem.* 183, 11–8 (1929); cf. *C. A.* 23, 4233.—The formation of a  $\text{Cu}$  salt indicates the presence of a  $\text{CO}_2\text{H}$  group in anserine. Further evidence of  $\text{CO}_2\text{H}$  was obtained by esterification with  $\text{EtOH}$  and dry  $\text{HCl}$ . The product isolated was *anserine Et ester chloroplatinate*, m. 225–30°. The Van Slyke detn. on free anserine showed 1  $\text{NH}_2$ , and the  $\text{Ag}$  I method 1  $\text{NMe}$ . These observations, together with similarities in properties and the difference of  $\text{CH}_2$  in the empirical formulas, suggested that anserine might be a homolog of carnosine. The decompn. products finally obtained by hydrolysis proved the assumption to be correct. Distn. over soda lime in a current of  $\text{H}$  yielded 1,4-dimethylimidazole, isolated as the chloroaurate, m. 220–5°. Hydrolysis with  $\text{Ba}(\text{OH})_2$  6 hrs. at 140° yielded *dl*-methylhistidine, decomp. 248–52° with foaming (*nitrate* decomp. 144–6° with foaming), and  $\beta$ -alanine, isolated by means of the  $\alpha$ - $\text{C}_{10}\text{H}_7\text{NCO}$  deriv. The negative diazo reaction of anserine and its decompn. products, dimethylimidazole and methylhistidine, places the  $\text{Me}$  on the  $\text{N}$  of the ring. Anserine is, therefore,  $\beta$ -alanylmethylhistidine. As a methylated condensation product of histidine it presents a certain analogy to creatinine, which is a methylated cleavage product of arginine, both contg. the imidazole ring. A. W. DOX

**The action of formic acid on hydroxy- and chlorohemin.** A. HAMSKE. *Z. physiol. Chem.* 183, 103–12 (1929).—When hydroxyhemin is dissolved in  $\text{MeOH}$  contg.  $\text{KOH}$ , the soln. poured into an acid ( $\text{CH}_2\text{O}_2$ ,  $\text{AcOH}$ , alc.  $\text{HCl}$ ,  $\text{H}_2\text{SO}_4$ ,  $\text{C}_2\text{H}_5\text{O}_4$ ), and immediately dild. with  $\text{H}_2\text{O}$ , the original substance is reprecipitated. Formation of the corresponding hemin deriv. requires a longer contact with the concd. acid. Chlorohemin is formed the most rapidly, then formylhemin, then acetylhemin, while oxalyl- and sulfate-hemin are the slowest to form. Hence the prepn. of chloro- and formylhemin is the easiest, and that of the others the most difficult and incomplete. These hemins may be obtained directly from blood or indirectly from hydroxyhemin. From oxyhemoglobin or from hydroxyhemin K the pigment can be extd. by acids without alteration of its original  $\alpha$ -modification. Linkage to K protects the pigment group in the same way as linkage to globin. The extn. is best performed by means of  $\text{EtOH}$  or  $\text{AcMe}$  contg.  $\text{C}_2\text{H}_5\text{O}_4$ . Extn. by  $\text{CH}_2\text{O}_2$  in place of  $\text{C}_2\text{H}_5\text{O}_4$  gives a poorer yield, while  $\text{H}_2\text{SO}_4$  tends to alter the pigment. Although oxyhemoglobin and hydroxyhemin K may be extd. with acid solvents, dry hydroxyhemin should not be so treated because the  $\alpha$ -modification thereby becomes altered. To obtain an acid soln. the hydroxyhemin is first dissolved in  $\text{MeOH-KOH}$  and this soln. poured into acid. Chlorohemin, however, can be obtained directly from hydroxyhemin by boiling with  $\text{AcOH}$  and  $\text{NaCl}$ . Likewise formylhemin can be obtained directly by placing freshly prepd. hydroxyhemin in  $\text{CH}_2\text{O}_2$ . But the  $\text{CH}_2\text{O}_2$  must be properly dild. if the conversion of hydroxyhemin into a pseudo form is to be avoided. The pseudo form on removal of  $\text{Fe}$  yields a pseudoporphyrin, instead of protoporphyrin.  $\text{MeAc-chlorohemin}$ , when boiled with 95%  $\text{CH}_2\text{O}_2$ , is converted into a pseudo modification, but 80%  $\text{CH}_2\text{O}_2$  dissolves it less readily and causes less alteration. However,  $\text{MeAc-chlorohemin}$  dissolved in pyridine- $\text{CHCl}_3$  is more sensitive to  $\text{CH}_2\text{O}_2$ .  $\text{AcOH-chlorohemin}$  is more resistant. The protoporphyrin is purer when obtained by 85% than by 95% acid; in the latter case there is formation of pseudoporphyrin and pseudohematin. A. W. DOX

**The bile acids. XXIV. Two new hydroxamic acids derived from bilianic acid, and the action of nitric acid on  $\alpha$ -diketocholanic acid dioxime.** MARTIN SCHENCK AND HENRY KIRCHHOF. *Z. physiol. Chem.* 183, 88-97(1929); cf. *C. A.* 23, 2985.—Treatment of  $\alpha$ -diketocholanic acid dioxime with  $\text{HNO}_3$  does not yield the expected hydroxamic acid but splits off both oxime groups and opens up ring I, with formation of desoxybilianic acid. It is possible, however, that the hydroxamic acid is first formed and immediately undergoes hydrolysis. On the other hand, from the nitrohydroxamic acid,  $\text{C}_{24}\text{H}_{44}\text{N}_2\text{O}_9$ , obtained from the trioxime of dehydrocholic acid and  $\text{HNO}_3$  and described in the previous paper, 2 new hydroxamic acids were prepd. The 1st was obtained by reduction with Zn dust and  $\text{NH}_4\text{OH}$ . It is an *oximinohydroxamic acid*,  $\text{C}_{24}\text{H}_{44}\text{N}_2\text{O}_8$ , decomps.  $224-6^\circ$ , and represents simply a reduction of the  $\text{NO}_2$  group in the mother substance. It gives an intense reddish violet color with  $\text{FeCl}_3$ . Oxidation of this oximino deriv. with  $\text{HNO}_3$  gave a product identical with the nitroso compd. previously obtained from the mono- and dioxime of bilianic acid. The reaction that occurred was, therefore, a splitting off of the hydroxamic acid group. This explains also the failure to isolate the intermediate hydroxamic acid in the oxidation of diketocholanic acid. The 2nd *hydroxamic acid*,  $\text{C}_{24}\text{H}_{44}\text{NO}_8$ , decomps.  $225^\circ$ , was obtained by partial hydrolysis of the oximino deriv. by  $\text{HCl}$ . The reaction here is simply a splitting off of  $\text{NH}_2\text{OH}$ , leaving a CO group at  $\text{C}_{12}$ . The product gives a cherry-red color with  $\text{FeCl}_3$ . Further hydrolysis of this hydroxamic acid, or complete hydrolysis of the oximino deriv., yields bilianic acid. A. W. Dux

**Enzymic fission of sucrose (WEIDENHAGEN) 11A. Magnetic behavior of organic crystals (RAMAN) 2. Microanalytical determination of vapor density (NIEDERL) 2. The rectilinear diameter of density curves as a starting point of a natural classification of pure elements or compounds (MATHIAS) 2. The ketonic decomposition of  $\beta$ -keto-carboxylic acids (PEDERSEN) 2. Calculating the specific heats of hydrocarbon vapors (LEWIS, McADAMS) 2. Boiling points of hydrocarbons (NEKRASOV) 2. Optical properties of some salts of gluconic acid (KEEMAN, WEISBERG) 2. Thermochemical investigations of petroleum. Thermochemical transformation of squalene (ABE, SHIBAYASHI) 22. The estimation of diphenylamine and diphenylnitrosamine in the presence of their derivatives (RYAN, *et al.*) 7. The electrochemical oxidation of anthracene to anthraquinone with a new type of electrode (RASCH, LOWY) 4. Electrolytic reduction of aromatic arsonic acids (NAKADA) 4. Electrochemical oxidation of 1,3-xylene-4 sulfonic acid (YOKOYAMA) 4. Dibasic acids (U. S. pat. 1,721,959) 22. Absorption spectra and constitution of azo and azoxy compounds (SZEGÖ) 3.**

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SCHMIDT, JULIUS: Jahrbuch der organischen Chemie. XIII. Jahrgang. Die Forschungsergebnisse und Fortschritte im Jahre 1926. Leipzig and Vienna: Franz Deuticke. 256 pp.

TERWOGT, P. C. E. MEERUM: Inleiding tot de organische Chemie. Amsterdam H. J. Paris. 202 pp. Fl. 3.25; bound, Fl. 3.90.

**Catalytic oxidation of organic compounds.** ALPHONS O. JAEGER (to Selden Co.) U. S. 1,722,297, July 30. See Brit. 296,071 (*C. A.* 23, 2185).

**Organic thiocyanate compounds.** I. G. FARBERIND. A.-G. Brit. 303,813, Sept. 5, 1927. The thiocyanate group is introduced into org. compds. by treatment with a halogen (suitably Br) and an inorg. thiocyanate (suitably that of Na, K or  $\text{NH}_4$ ) in the presence of a neutral org. solvent such as MeOH in which all the reacting substances dissolve. Examples are given.

**Chlorination products of hydrocarbons.** EWALD SPER. U. S. 1,721,873, July 23.  $\text{CH}_4$ ,  $\text{C}_2\text{H}_6$ , or other satd. hydrocarbon, in the gaseous state, and Cl gas in sufficient quantity to produce the desired deriv. are allowed to react at a proper temp. in a chamber filled with small pieces of graphite.

**Chlorinating methane.** KOLOMAN ROKA (to Holzverkohlungs-Industrie A.-G.) U. S. 1,723,442, Aug. 6.  $\text{CH}_4$  is chlorinated in the presence of steam as a diluent at a temp. of  $400-500^\circ$  and the temp. is kept below the point at which substantial quantities of oxides of C would be formed.  $\text{CH}_3\text{Cl}$  is formed.  $\text{CaCl}_2$ ,  $\text{CuCl}_2$ ,  $\text{MgCl}_2$ , or  $\text{FeCl}_3$  may be used as catalysts. Cf. *C. A.* 23, 4228.

**Diolefins.** I. G. FARBERIND. A.-G. Brit. 303,323, April 30, 1928. Diolefins such



as butadiene and its homologs are sepd. from gas mixts. by treatment with a salt (preferably in soln.) of a heavy metal from the 1st or 2nd group of the periodic system. Various details and examples are given. Cf. C. A. 23, 4228.

**Olefins and diolefins.** I. G. FARBENIND. A.-G. Brit. 303,998, Dec. 14, 1927. Olefins and diolefins are obtained by catalytic treatment in a vaporous state of paraffins, olefins, or mixts., which may be cyclic, at 500–800°, using as catalyst lustrous C which is deposited from hydrocarbons at temps. above 650°. Various carriers, auxiliary catalysts, details of procedure, etc., are described. Cf. C. A. 23, 2722.

**Aldehydes and ketones.** MARTIN LUTHER and KURT PIEROH (to I. G. Farbenind. A.-G.). U. S. 1,723,458, Aug. 6. In recovering aldehydes and ketones formed by the catalytic dehydrogenation of alcs. contg. at least 3 C atoms, the alc. used in the dehydrogenation is used for absorbing the dehydrogenation product from the assocd. gas mixt.

**Aromatic aldehydes.** PARFUMERIE HOUBIGANT (S. A.) and LÉONCE BERT. Fr. 657,691, Dec. 2, 1927. Aldehydes of the phenylacetic series and homologs of phenylacetic aldehyde are obtained by condensing the Mg compds. of Cl derivs. such as  $R_3C_6H_4$ ,  $CH_2Cl$ ,  $R_3C_6H_4Cl$ ,  $R_3C_6H_4Cl$ , with Me or Et formate, whereby acetates are formed which pass easily to the aldehydes. An example is given of the prepn. of 1,4-dimethylphenylacetic aldehyde ( $b_p$  104–105°) from the Mg compd. of 3,4-Me<sub>2</sub>C<sub>6</sub>H<sub>3</sub>CH<sub>2</sub>Cl and HCOOEt. Several other examples and examples of the prepn. of the Mg compds. are given.

**Esters.** HOLZVERKOHUNGS-IND. A.-G. Fr. 657,812, July 19, 1928. See Brit. 295,275 (C. A. 23, 2187).

**Aminophenol ethers.** ERNST F. GREYER (to Dow Chemical Co.). U. S. 1,722,417, July 30. In prepg. aminophenol ethers such as *p*-ethoxyphenylamine, an arylamine such as aniline is diazotized, coupled with a phenol such as PhOH, alkylated, *e. g.*, with EtBr, and the product is subjected to reduction by heating with Fe and an Fe salt such as the acetate in the presence of water.

**Carbazole derivatives.** I. G. FARBENIND. A.-G. Brit. 303,520, Jan. 5, 1928. Substitution products of carbazole are formed by subjecting the diazo compds. of aminocarbazoles (other than 3-aminocarbazole) to reactions such as are customarily employed in treating aromatic amines. Examples are given of the production of 1- and 2-hydroxycarbazoles, 2-chlorocarbazole, 2-cyanocarbazole, carbazole-1-carboxylic acid and carbazole-2-sulfinic acid (which may be oxidized to the sulfonic acid or reduced to the mercaptan or disulfide), etc. Cf. C. A. 23, 3715.

**Ethylene derivatives.** COMPAGNIE DE BETHUNE. Brit. 303,176, Dec. 29, 1927. Coal distn. gases are treated to sep. a mixt. of C<sub>2</sub>H<sub>4</sub> and C<sub>2</sub>H<sub>6</sub> and the C<sub>2</sub>H<sub>4</sub> is absorbed in H<sub>2</sub>SO<sub>4</sub>, and the C<sub>2</sub>H<sub>6</sub> is heated to produce C<sub>2</sub>H<sub>4</sub> and H which are returned to the raw gas whence the C<sub>2</sub>H<sub>4</sub> formed is subsequently recovered. The EtHSO<sub>4</sub> is then worked up into desired products such as EtOH or glycol, ether, etc. An app. is described.

**Dimethylaminopentanol derivatives.** ÉTABLISSEMENTS POULENC FRÈRES, ERNEST FOURNEAU and JACQUES TREFOUËL. Fr. 657,931, Dec. 6, 1927. *m*-Nitrobenzoyldimethylaminopentanol is prepd. by heating to about 50° dimethylaminopentanol with *m*-nitrobenzoyl chloride in soln. in C<sub>6</sub>H<sub>6</sub>. This compd. is reduced by SnCl<sub>2</sub> and HCl. M. p. of the HCl compd. is 189°.

**Diazo compounds.** KALLE & Co. A.-G. Fr. 657,852, July 20, 1928. See Brit. 294,248 (C. A. 23, 1908).

**Morpholine compounds.** IMPERIAL CHEMICAL INDUSTRIES, LTD. Fr. 657,860, July 20, 1928. See Brit. 298,336 (C. A. 23, 2723).

**Substituted guanidines.** I. G. FARBENIND. A.-G. Brit. 303,044, Sept. 26, 1927. See Fr. 640,017 (C. A. 23, 847).

**Monocyclic lactones.** SOC. ANON. M. NAEF & CIE. Fr. 657,971, July 23, 1928. Monocyclic lactones having 14 to 18 links are obtained by heating with monopersulfuric acid to 30–60° monocyclic ketones having 13 to 17 links. Examples are given of the prepn. of the lactone of 14-hydroxytetradecane-1-carboxylic acid (m. 31–32°,  $b_p$  176°), the lactone of 12-hydroxydodecane-1-carboxylic acid (m. 26–27°,  $b_p$  148°), the lactone of 13-hydroxytridecane-1-carboxylic acid (m. 29–30°,  $b_p$  165°), the lactone of 15-hydroxypentadecane-1-carboxylic acid (m. 35–36°,  $b_p$  188°), the lactone of 16-hydroxyhexadecane-1-carboxylic acid (m. 41–42°,  $b_p$  194°), and the lactone of 14-hydroxymethyltetradecane-1-carboxylic acid ( $b_p$  180°).

**Catalytic hydrogenation of nitroenous compounds.** I. G. FARBENIND. A.-G. Brit. 304,000, Dec. 20, 1927. Hydrogenation of open-chain compds. contg. N in unsatd. union is effected in the liquid phase in the presence of a hydrogenating catalyst and of an electrolyte supplying acid ions in quantity at least equiv. to the base produced; *e. g.*,

KCN in aq. soln. is hydrogenated with the aid of a Ni catalyst in the presence of  $\text{FeSO}_4$  to produce methylamine. Various other examples are given.

**Chloriodides of 2-aminopyridine salts.** MAX DOHRN and RALPH DIRKSEN (to Chemische Fabrik auf Actien, vorm. E. Schering). U. S. 1,723,457, Aug. 6. When ICl is allowed to act in acid soln. on  $\alpha$ -aminopyridine and its derivs., there are formed pptts. which are insol. in acids and which are salts of the ICl compds. of  $\alpha$ -aminopyridine or its derivs. In the majority of cases these salts are well crystd. and substantially stable. They are not decomposed when boiled in acid soln. and, on cooling such a soln., sep. as crystals. All these compds. are capable of forming in alk. soln. the corresponding  $\beta$ -iodo derivs. of the base. Several examples are given.

**Indoles.** I. G. FARBENIND. A.-G. Brit. 303,467, Oct. 4, 1927. Substituted indoles are prepd. by heating a monoacylamino compd. of the aromatic series having a Me group in the *o*-position, such as aceto-*o*-toluidine, with sodamide in the presence of a diluent such as naphthalene, dimethylaniline or diethylaniline. Various examples are given.

**Converting cyanonaphthalenesulfonic acids.** RICHARD HERZ, FRITZ SCHULTE and WERNER ZERWECK (to Grasselli Dyestuff Corp.). U. S. 1,721,882, July 23. When cyanonaphthalenesulfonic acids, contg. at least one sulfonic group in *o*- or *p*-position to the cyano group, are treated with an alk.-acting agent at elevated temps. this sulfonic group, standing in *o*- or *p*-position to the cyano group, is easily exchanged for other univalent radicals. The products thus obtained correspond to the general formula,  $\text{C}_{10}\text{X}_6(\text{OY})\text{Z}$ , in which the group OY stands in *o*- or *p*-position to the group Z, the X's mean H atoms, of which one or more may be replaced by a univalent substituent, Y means H or an alkyl residue, Z the groups CN,  $\text{CONH}_2$  and  $\text{COOH}$ . By acting with milder alk. agents, the cyano group of the cyanonaphthalenesulfonic acids remains unattached and hydroxycyanonaphthalene compds. are formed corresponding to the above formula, Y being H and Z being CN; by acting with stronger alk. agents the cyano group is saponified to the carboxamido or to the carboxy group whereas the sulfonic group is exchanged by hydroxyl, when the applied alk. agent is an aq. caustic alkali, or by an alkoxy group, generally when applying caustic alkalies in the presence of an alc. In this manner alkoxynaphthalenecarboxamides and hydroxy- and alkoxynaphthoic acids are obtained corresponding to the above formula. Various details and examples are given. Cf. C. A. 22, 3170.

**Anhydrous formic acid.** SOC. ANON DES DISTILLERIES DES DEUX-SEVRES. Brit. 303,742, Jan. 7, 1928. Aq. formic acid is distd. with an "entraining" material such as iso-Bu formate, capable of forming with water an azeotropic mixt. of minimum b. p., and with a diluent liquid such as Am formate which prevents the formic acid from distg. over with the azeotropic mixt. The resulting mixt. of formic acid and diluent may be sepd. by fractional distn. or distn. with entraining substances such as  $\text{C}_6\text{H}_6$ , toluene, xylene, certain petroleum hydrocarbons, BuCl and chlorinated derivs. of  $\text{C}_2\text{H}_4$  and  $\text{C}_2\text{H}_2$ . Formic esters, such as Bu, Am, and iso-Am formates, or di-Bu ether, may serve both as "entrainer" and as "diluent." An app. is described.

**Glacial acetic acid.** AYLMEYER H. MAUDE (to Rubber Service Laboratories Co.) U. S. 1,722,532, July 30. HOAc contg. about 10% water is concd. in a single-stage distn. by heating with about 20% its volume of  $\text{C}_6\text{H}_6$ .

**Aliphatic anhydrides.** HENRY DREYFUS. Fr. 657,604, July 17, 1928. Aliphatic anhydrides, particularly  $\text{Ac}_2\text{O}$ , are prepd. by the reaction of liquid aliphatic acid and (or) metallic salts of such acids with phosphoric acid having a degree of hydration less than that of  $\text{H}_2\text{PO}_4$  and (or) with salts of such phosphoric acid. The temp. used is preferably 150-180°.

**Aliphatic anhydrides.** HENRY DREYFUS. Fr. 658,111, July 26, 1928. Aliphatic anhydrides, particularly  $\text{Ac}_2\text{O}$ , are prepd. by passing the vapor of the aliphatic acid through a reaction zone composed of or contg. one or more reducible metals such as Cu, Ni or Sn and heated to a relatively high temp. (500-700°), H or another reducing gas being passed through the reaction zone during the passage of the acid and (or) before this passage. Cf. C. A. 23, 4230.

**Acetic anhydride, etc.** BRITISH CELANESE, LTD., H. DREYFUS and C. I. HANEY. Brit. 303,772, July 7, 1927. Anhydrides such as  $\text{Ac}_2\text{O}$  are produced by heating the vapors of the corresponding acid (which may be dil.) and are condensed while carrying away the water by the vapor of an "entraining liquid" such as  $\text{CCl}_4$ , "petrol," benzene, mixts. of 2 or more of these substances, or mixts. of ether with "petr. ether" (but avoiding liquids which are solvents for the anhydride and have a b. p. higher than the b. p. of water). Various details are given and an app. is described.

**Methanol.** COMMERCIAL SOLVENTS CORP. Fr. 34,361, June 21, 1927. Addn. to

635,023. A catalyst for the synthesis of MeOH from CO and H is prepd. by combining ZnO, Cr(NO<sub>3</sub>)<sub>3</sub>, Fe(NO<sub>3</sub>)<sub>3</sub>, and ZnCl<sub>2</sub> in aq. mixt. and transforming the nitrates into oxides. Cf. C. A. 23, 1910.

**Isoeugenol.** T. S. CARSWELL (to Graesser Monsanto Chemical Works., Ltd.). Brit. 303,021, Dec. 22, 1927. The mixt. of alkoxyisoeugenol and alkoxyisochavibetol, such as may be obtained by heating safrol or isosafrol with alc. KOH under pressure, is sep'd. by utilization of the difference in the solubilities of their Ca salts in alc. (the Ca salt of the alkoxyisochavibetol being the less sol.). The sep'd. alkoxyisochavibetol may be methylated and then hydrolyzed to produce isoeugenol. Various details of procedure are given.

**Dinitrophenol.** DONALD B. BRADNER and FRANK H. BEALL. U. S. 1,723,761, Aug. 6. In effecting reaction of HNO<sub>3</sub> and C<sub>6</sub>H<sub>6</sub> in the presence of a Hg catalyst, the reacting mass is agitated and the reaction is carried out in the presence of an aliphatic acid such as HOAc which considerably increases the soly. of the C<sub>6</sub>H<sub>6</sub> in the HNO<sub>3</sub> and accelerates the reaction without being itself consumed. An app. is described.

**Alkylisopropylphenols.** CHEMISCHE FABRIK AUF ACTIEN (VORM. F. SCHERING). Fr. 34,369, Oct. 21, 1927. Addn. to 636,267 (C. A. 23, 156). The mixt. of alkylisopropylphenols and alkylcumarones described in Fr. 636,228 (C. A. 23, 156) and 638,483 (C. A. 23, 154) is first hydrogenated by H and a catalyst until 2 to 8 H atoms are fixed, and the mixt. of hydrogenated products is then sep'd.

**1-Phenyl-3-methyl-5-pyrazolone.** HANS FINKELSTEIN and HANS HAUBER (to J. G. Farbenind. A.-G.). U. S. 1,723,545, Aug. 6. See Brit. 274,366 (C. A. 22, 1983).

**Polymerized formaldehyde.** I. G. FARBENIND. A.-G. Brit. 303,258, Dec. 2, 1927. Solid polymers of CH<sub>2</sub>O are prep'd. by treating an aq. soln. of CH<sub>2</sub>O with a small quantity of an alk. reagent such as Na<sub>2</sub>CO<sub>3</sub> or NaOH without using gelatinizing agents such as soaps or similar substances. The soln. should be free or nearly free from MeOH.

**$\alpha$ -Naphthylamine from mixed  $\alpha$ - and  $\beta$ -naphthylamines.** HENRY J. WEILAND and IVAN GUBELMANN (to Newport Co.). U. S. 1,722,026, July 23. Sufficient acid such as HCl is added to the mixt. in a dispersion medium such as water to convert substantially all the  $\beta$ -naphthylamine into its corresponding salt dissolved in the dispersion medium, and the  $\alpha$ -naphthylamine in solid form is sep'd. from the soln. thus formed.

**Camphene from pinene hydrochloride.** HERMANN GAMMAY. U. S. 1,721,990, July 23. Pinene hydrochloride is reacted on with less than a stoichiometrically equiv. proportion of a converting agent such as PhOH or oleic acid and the consumed part of the converting agent is regenerated by an alk. comp'd. such as NaOH in a continuous operation.

**Cuprene.** N. V. ELECTRO-ZUURSTOF-EN-WATERSTOFFFABRIEK. Brit. 303,797, Jan. 9, 1928. Cuprene having such adsorbent properties that it is suitable for use instead of charcoal for decolorizing or deodorizing liquids, etc., is obtained by treating C<sub>2</sub>H<sub>2</sub> with a metal or metal-oxide catalyst such as the oxides of Cu, Ni or Fe, or these metals themselves, to which a small proportion of Mg is added. A temp. of 200–400° is suitable and cuprene free from the usual metals may be used with a small addn. of Mg as a catalyst for producing more cuprene. The Mg may be removed from the product with acid and the product may be used for decolorizing blue "methylated spirit" or for cleaning dirty water.

**Ketene.** HANS T. CLARKE and CHARLES E. WARING (to Eastman Kodak Co.). U. S. 1,723,724, Aug. 6. Vapors such as those of acetone which are decomposed by heat into substances including ketene are passed through a chamber contg. a network of metal such as Cu (free from Fe or Ni) having high thermal cond. and a m. p. above the reaction temp. (which may be about 650–670°).

**Styrene.** THE NAUGATUCK CHEM. CO. Fr. 657,990, July 23, 1928. See U. S. 1,687,903 (C. A. 23, 156).

## 11—BIOLOGICAL CHEMISTRY

PAUL E. HOWE

A—GENERAL

FRANK P. UNDERHILL

**Colloid chemistry of cerebrospinal fluid.** J. KISS. *Deut. Z. Nervenheilk.* 98, 227–72 (1927).—Cerebrospinal fluid is best studied by means of gold sol. B. C. A.

**Enzymic fission of sucrose.** II. R. WEIDENHAGEN. *Z. Ver. deut. Zucker-Ind.* 78, 781–7 (1928); cf. C. A. 23, 3237.—Of the two sucrose-splitting enzymes in

yeast, *viz.*,  $\alpha$ -glucosidase and  $\beta$ -*h*-fructosidase, the former is present in much smaller quantity than the latter and is inactive at  $p_H$  4.7, the optimum reaction for fructosidase. Their behavior toward raffinose affords a means of distinguishing them, since  $\alpha$ -glucosidase has no action, while the fructosidase produces melibiose and levulose. *Melezitose*, a glucosidofructosidoglucose in which the fructosidoglucose portion of the mol. is supposed to have the constitution of sucrose, is not attacked by fructosidase, but is completely hydrolyzed to hexoses by  $\alpha$ -glucosidase; hence it appears to be  $\alpha$ -glucosido- $\beta$ -*h*-fructosido- $\alpha$ -glucoside.

**Specificity of enzymic fission of maltose.** R. WEIDENHAGEN. *Z. Ver. deut. Zucker-Ind.* 78, 788-95(1928); cf. *C. A.* 23, 3237.—Leibowitz has assumed the existence of 2 types of maltase, *viz.*, glucosido-maltase present in yeast, and gluco-maltase present in barley and in takadiastase, the latter type being incapable of hydrolyzing  $\alpha$  methyl-glucoside or maltosazone (cf. *C. A.* 20, 211, 3173). This view is not shared by the author, who found that  $\alpha$ -methylglucoside is readily hydrolyzed by barley maltase if sufficiently concd. enzyme solns. are used. The fact that maltase in different materials may exert its max. activity at different  $p_H$  values does not disprove the identity of the enzyme in the different materials, since the effect of activating and inhibiting substances has to be considered.

**Study of glucosides by means of enzymes.** MILLE BRÄCKE. *J. pharm. Belg.* 10, 463-6, 479-82, 495-8(1928).—The method of study is based on the specificity of the enzymes. The enzymes are used as reagents revealing the principles on which they exert their action. The study is divided into the following divisions: 1. *Saccharose detected by invertin.*—Invertin acts on certain polysaccharides, as raffinose and gentianose, by releasing *d*-fructose or levulose from the remainder of the sugar mol. The invertin is prepd. from bakers' yeast. The glucoside is obtained by extg. with 90% alc., which destroys the action of the enzymes, and  $\text{CaCO}_3$  is used for the neutralization of the plant acids. The glucoside-contg. soln. is polarized, invertin then added, and again polarized. From the readings, the index of enzymolytic reduction is obtained. This index is the wt. in mg. of reduced product, expressed as glucose, found in 100 cc. of the soln. under the action of invertin, causing a change of  $1^\circ$  in rotation, and using a 200-mm. tube. The application of this method revealed the presence of saccharose in numerous plants, its variation as reserve in these plants, and the more frequent occurrence of raffinose and stachyose. It also led to the discovery of *verbalucose*. 2. *Trehalose of the fungus by trehalase.*—Trehalase divides the biglucide into 2 mols of *d*-glucose. The method of prepg. a soln. from *Aspergillus niger* is more suitable for biochem. analysis than the previous method of Bourquelot. It permits detections in certain species, in which the old method was useless. The trehalose exists in the fresh fungi; it disappears upon desiccation, being transformed into glucose and some mannitol.  $\text{CHCl}_3$  prevents the formation of mannitol, but not of glucose. It is best to prep. the soln. by boiling in alc. as soon as possible after collecting. The presence of trehalose is essential to all mushrooms. 3. *Heteroglucosides derived from d-glucosidase  $\beta$  by emulsin.*—The active element can be called glucosidase  $\beta$ . The emulsin is prepd. by extg. crushed almonds with  $\text{CHCl}_3$  water, pptg. the plant casein with  $\text{AcOH}$ , then the emulsin with alc. and finally drying over  $\text{H}_2\text{SO}_4$ ; yield 1.5%. The test is carried out on the soln. remaining after the action of invertin, by first heating on a water bath to destroy the invertin; then adding emulsin, incubating and polarizing. This method permits the detection of heteroglucosides, their detn. in the various plants and the detection of the alteration of plants during desiccation, and during the prepn. of pharmaceutical products. 4. *Sinigrin by myrosin.*—Myrosin liberates *d*-glucose from complexes contg. sulfated bases. The myrosin is prepd. by macerating white mustard with water, expressing, pptg. the mucilages with 80% alc., and finally pptg. the enzyme with 90% alc. In the transformation of the sinigrin, neutralize the acid sulfate formed by means of  $\text{K}_2\text{CO}_3$ . No new glucoside has yet been found in this class. 5. *Glucosides detected by means of a fermenting substance obtained from the plant.*—The principle in this case is of a general order. If it cannot be applied to all glucosides, it is due to the absence of the corresponding enzyme. The fermenting powder is made by extg. the plant with strong alc. The alc. is first used to ext. the principles and then to ppt. the enzymes. Dry at a low temp., polarize, and test for reducing substances. Geoside and grease, having an eugenol base, are given as examples. 6. *Glucosides hydrolysed by rhamnodiastase.*—Rhamnodiastase is prepd. by extg. the grains of *Rhamnus utilis* Dene. with  $\text{Et}_2\text{O}$  for the removal of oil and coloring matter, then extg. with thymol water, pptg. the enzyme with 95% alc., washing and drying. The rhamnodiastase is less sp. than emulsin, which the latter sometimes resembles in its action. Rhamnodiastase also acts upon some glucosides insol. in water, and some that are pptd. by

lead ext. The amt. used in a test is 0.05–0.10 g. per 100 cc. of soln., under which conditions the enzyme is inactive with respect to glucosides hydrolyzed by emulsin. The glucosides acted upon are divided into classes depending upon one of the end products: (a) *Primeverosides*.—These are further divided into 5 subdivisions depending upon the aromatic principle. All of them form primeverose; the aromatic principle is methyl salicylate or a deriv. The primeverose is a diose composed of xylose and glucose. (b) *Rutinosides*.—Datiscoside and rutoside form rutinose and are found in 16 families of the dicotyledons. Rutinose is a rhamnoglucose. (c) *Rhamninoside*.—Rhamninoside or xanthorhamnoside, found in yellow berries, splits to form rhamnetol and rhamnose. The latter splits further to form rhamnose and galactose. (d) *Robinoside*, found in *Robinia pseudoacacia*, splits to form kaempferol (1,3,4-trihydroxyflavonol) and a triose, robinose, which is isomeric with rhamnose. (e) *Glucosides*, the study of which is not complete, include a polydatoside, obtained from *Polygonum cuspidatum*, hydrolyzing to form polydatogenol and a levo-sugar; and ulexoside from *Ulex europaeus* forming a sugar and ulexogenol, m. 261°. The polydatogenol is equally acted upon, but more slowly, by emulsin, giving the same end products as rhamnodistase. Another case of similar effects is found with one of the primeverosides, which when classified as a  $\beta$ -glucoside easily explains the matter. The difference between the two is that the primeverosides hold the glucose combined with xylose as primeverose. For all the 6 classes, a bibliographic list of glucosides belonging to that class, with their source and discoverer, is given. B. also gives a late classification of the glucosides and glucoses

A. G. DUMKZ

The organic matter of sea water and its relation to plankton production. H. H. GRAN and BR. RUND. *Avhandl. Norske Vidensk. Akad. Oslo 1926; Intern. Rev. ges Hydrobiol. Hydrograph.* 19, 340(1928); *Wasser u. Abwasser* 25, 225.—The use of  $\text{KMnO}_4$  to det. the org. content of filtered and unfiltered sea water by oxidation was studied. The method is unreliable in giving the true org. content of unfiltered water because of the plankton organisms and bacteria present.

C. R. FELLERS

The coagulation of proteins of bovine endocrine glands. A. JANEČEK. *Biol. sp. zverolék.* 6, 269–81(1927). (Czech, with English summary); *Physiol. Abstracts* 13, 662.—The coagulability of proteins from bovine thyroid, thymus, suprarenals, pituitary body, and sexual glands differs from that of proteins from other organs. The typical precipitants of proteins of the endocrine glands are  $\text{CuSO}_4$  and sulfosalicylic acid.

H. L. D.

Physicochemical theory of the cause of sweet and bitter taste. N. W. TAYLOR. *Protoplasma* 4, 1–17(1928).—A discussion.

H. L. D.

Chemistry and its relation to medicine. R. W. TANNAHILL. *Chem. Eng. Mining Rev.* 21, 355–7(1929).

E. H.

William Küster. P. PFEIFFER. *Z. angew. Chem.* 42, 785–7(1929).—An obituary with a brief review of K.'s investigations on blood pigments.

E. H.

Buffer intensities of milk and milk constituents. I. The buffer action of casein in milk. F. O. WHITTIER. *J. Biol. Chem.* 83, 79–88(1929).—Max. buffering in normal milk occurs at approx.  $pH$  5.50. The buffer action of casein is exerted principally between  $pH$  4.50 and 5.70 with a max. at approx. 5.2 so that casein is evidently one of the chief factors in the buffer action of milk in this range. The buffer intensity curves of purified caseins indicate that differences in methods of isolation and purification produce caseins differing from one another and from casein as it exists in milk. The addition of rennet to milk causes a disappearance of the pronounced node in the buffer intensity curve; apparently rennet converts casein into a substance with several dissociation consts. within the range of  $pK$  values from 4.0 to 7.5

A. P. LOTHROP

The presence of aluminum in animal and plant matter. LOUIS KAHLBERG and JOHN O. CLOSS. *J. Biol. Chem.* 83, 261–4(1929).—The materials were ashed in Pt dishes at dull red heat and the ash was examd. with a Kriess quartz-prism spectrograph. In every substance analyzed Al was found in sufficient quantity to be detected with certainty with the spectrograph. "It is clear, then, that Al is actually present in plant and animal matter and that the conclusion of McCollum, Rask and Becker ('*A.* 22, 3198) that 'Al is not a constituent of either plant or animal matter' is founded upon error and cannot be maintained."

A. P. LOTHROP

Enzymic proteolysis. V. The structure of animal skeletal substance. ERNST WALDSCHMIDT-LEITZ and GUSTAV V. SCHUCKMANN. *Ber.* 62B, 1891–6(1929).—Keratin was split by treating 24 g. of hair for 4 weeks with 24 g. of Br in 200 cc.  $\text{AcOH}$ . The insol. prepn. B was sepd. by centrifuging. Prepn. A pptd. upon adding  $\text{H}_2\text{O}$  to the supernatant liquid from the centrifuge. Both fractions were purified by dissolving weak  $\text{NaOH}$  and pptn. with  $\text{AcOH}$ . Fraction C, not pptd. by water, was obtained

by evapg. the filtrate from *B* to dryness. Fractions *A* and *B* were partly digested by trypsin but not by erepsin, while *C* was split slightly by erepsin. Analogous fractions were obtained by treating 10 g. of silk fibroin with 10 g. Br and 85 cc. AcOH. The residue thus obtained was sepd. by centrifuging. It was insol. in H<sub>2</sub>O and dil. NaOH. The supernatant liquid contained little N. Both the sol. and the insol. fractions were only slightly affected by trypsin and almost undigested by erepsin. A second series of products was prepd. from keratin by treating 20 g. of hair for 4 weeks with 24 cc. of perhydrol and 160 cc. of 4 *N* H<sub>2</sub>SO<sub>4</sub>. The residue was sepd. by centrifuging and purified by repptn. from weak NaOH with AcOH. The supernatant liquid from the centrifuge was freed from H<sub>2</sub>SO<sub>4</sub> with Ba(OH)<sub>2</sub> and evapd. to dryness. Twelve g. of silk fibroin was treated similarly. Both fractions from keratin were digested markedly by trypsin and considerably by erepsin. The analogous products from fibroin were almost unaffected by the same enzymes. "Peptones" were prepared from both fibroin and its compd. formed from reaction with perhydrol. Both "peptones" were attacked by trypsin and erepsin but the digestion was incomplete when compared with that obtained with H<sub>2</sub>SO<sub>4</sub>.  
C. M. McCAY

The soluble enzymes of the fungus *hymenomycetes*. The alkaloids and their antioxygen function. L. LUTZ. *Compt. rend.* 188, 1342-4(1929).—Alkaloids having a free phenol group decreased the velocity of oxidation of guaiacol and  $\alpha$ -naphthol by the mycelium *hymenomycetes*, but if the phenol group is substituted no effect is observable.  
J. G. McNALLY

The constant presence of phosphoglycerase in the enteric juice secreted by a Vella intestinal loop. A. CLEMENTI. *Boll. soc. ital. biol. sper.* 3, 1267-9(1928).—The enteric juice secreted by a Vella intestinal loop, either spontaneously or mechanically, or by stimulating with Liebig's extract. dil. HCl solns. or fatty acids and centrifuging, rapidly hydrolyzes the glycerophosphoric acid mol. in the presence of toluene at 37°. This hydrolyzing power disappears if the juice is previously boiled for one or two min.  
PETER MASUCCI

The coagulation of sodium soaps. M. CHIÒ. *Boll. soc. ital. biol. sper.* 4, 336-41(1929).—The conditions best adapted to produce soaps from fatty acids and oils are detd. The state and behavior of soaps in equil. and under conditions which approach those in blood are discussed.  
PETER MASUCCI

The hemolytic action of soaps. E. BALLICU. *Boll. soc. ital. biol. sper.* 4, 312-4(1929).—A very dil. soln. of Na oleate in Ringer soln. is by itself inactive in hemolyzing red blood corpuscles, but is activated by H<sub>2</sub>CO<sub>3</sub>, and this is again inactivated by heating to 60° for 30 min.  
PETER MASUCCI

The coagulation of milk [by soap]. M. CHIÒ AND S. REPETTO. *Boll. soc. ital. biol. sper.* 4, 345-9(1929).—Na oleate and Na stearate coagulate milk at different velocities and a mixt. of the two at a proportional velocity. Ca oleate, the Ca soap of butter fat, and Ca stearate modify the velocity of coagulation of milk. The oleate tends to retard, the stearate accelerates, and the soap made from butter fat which contains both radicals has an action somewhat intermediate.  
PETER MASUCCI

The isoelectric point of the proteins of the crystalline lens. N. SCALINCI. *Boll. soc. ital. biol. sper.* 4, 359-61(1929).—The isoelec. point of the proteins of the nuclear part of the lens is about *p<sub>H</sub>* 4.5; those of the proteins in the peripheral part are *p<sub>H</sub>* 3.5-4.0.  
PETER MASUCCI

The emission of ultra-violet rays by some phosphatides after irradiation. C. SERONO AND A. CRUTO. *Presse méd.* 36, 1158-9(1928); cf. *C. A.* 22, 4361; 23, 398.—*Lecithin* and *cerebrin* do not fluoresce during irradiation but later emit ultra-violet light. *Cholesterol* has a strong fluorescence, but no emission of light afterward. *Ergosterol* is weak in both.  
A. E. MEYER

Studies on iodine as a biogenous element. XII. The iodine content of normal animal organisms. E. MAURER AND H. DUCRUE. *Biochem. Z.* 193, 356-9(1928); cf. *C. A.* 21, 1299, 2296; Scharrer and Schwartz, *C. A.* 21, 3646.—The I<sub>2</sub> content of various tissues and organs from normal rabbits was found on the av.: thyroid, 15,800; ovary, 700; uterus, 100; spleen, 70; submaxillary, 65; hair, 30; heart, 20; kidney, 20; liver, 14; skin, 9; lung, 9; brain, 8; fat, 3  $\gamma$  %. Of the body fluids the following were examined: bile, 40; blood, 30; blood plasma, 40; blood cells, 21  $\gamma$  %. XIII. Effect of oral administration of small quantities of inorganic iodine on the iodine content of the animal organism. *Ibid* 360-3(1928).—The oral administration of inorganic iodine to rabbits produces a very large accumulation, especially in the organs of elimination (skin, lung, kidney), but after a period of 96 hrs. this is almost entirely gone. Daily administration of I<sub>2</sub> for therapeutic purposes is advocated in preference to administration at intervals. XIV. The effect on the blood iodine level of a single administration

of inorganic iodine. *Ibid* 364-71(1928).—The effect of  $I_2$  administration on the blood  $I_2$  is not uniform. In man the effect is entirely worn off after 24 hrs.; in rabbits and sheep the effect is more lasting, in the latter persisting for 6-11 days. The retention of  $I_2$  is not influenced by the activity of the thyroid gland. S. MORGULIS

The effect of water on the hydrogen peroxide-splitting capacity of barley malt catalase. II. M. O. CHARMANDARIAN. *Biochem. Z.* 207, 462-71(1929); cf. C. A. 23, 1922.—The catalase activity of malt is greater when water is added to it first, then  $H_2O_2$ . The amt. of  $H_2O_2$  decomposed is variable, depending upon the mol. of  $H_2O$  and the  $H_2O_2$  concn. The process of soln. of the catalase in  $H_2O$  is most rapid at the beginning and stops completely while the meal still contains much catalase. The addn. of toluene causes a small increase in the catalase reaction. The catalase in soln. undergoes inactivation, which is accelerated by high temp., light and stirring. Another property of catalase from barley malt. III. *Ibid* 207, 472-5(1929).—The catalase activity of malt is gradually lost. This process is much more rapid in the case of the meal than of the whole grain. The loss of the activity is, however, not a continuous process, and in the beginning is even interrupted by temporary increases. Malt preserved over  $H_2SO_4$  loses its catalase action very rapidly. In an atmosphere of  $CO_2$  the catalase disappears slower than in air. S. MORGULIS

The effect of electrolytes on glycerophosphatase. KENTARO INOUE. *J. Biochem. (Japan)* 10, 395-408(1929); cf. C. A. 23, 1427.—The activity of purified glycerophosphatase is inhibited only by F, oxalate and  $SO_4$  ions which are also anticoagulants for fibrinogen. Their interference with blood coagulation is ascribed to the fact that Ca ions are converted either to an insol salt or to an unionizable compd. However, the conception, that the glycerophosphatase inactivation may likewise be conditioned upon a removal of the Ca ion, meets with the serious difficulty that the various inhibiting ions exert a different effect at various degrees of acidity. S. MORGULIS

Phosphoric acid esters of sugar. CARL NEUBERG. *Wochschr. Brauw.* 46, 1-5 (1929).—A discussion with literature citations on phosphoric acid esters of sugar. A. SCHULTZ

Formation of diastase by *Aspergillus oryzae*. G. L. FUNKE. *Rec. trav. botan. Néerlandais* 24, 583-630; *Chem. Zentr.* 1928, II, 1444; cf. C. A. 21, 3927.—On buffered solns (addn. of 0.5%  $K_2HPO_4$ ) *Aspergillus oryzae* forms very large amts. of diastase, which are secreted into the fluid. In this process the chem. compn. of the nutritive soln. is without influence. Glucose, galactose, mannose, fructose, sucrose, maltose, lactose, starch, inulin, lichenin, glycerol and Ca lactate were examd. The amt. of diastase formed was the same with 5%, 1% or 0.5% carbohydrate soln. *Aspergillus* grows less on non-buffered solns.; it forms more acid and hardly any diastase; furthermore, anaerobic respiration occurs. The acid formed is probably oxalic acid, which possibly inactivates the enzyme by chem. union. G. SCHWOCH

Quantity of cysteine in living tissue proteins and its biological significance. YU-ZURU OKUDA. *Proc. Imp. Acad. (Japan)* 5, 246-8(1929).—A method is given for the detn. of cysteine in proteins under conditions avoiding oxidation. The cysteine and cystine contents of proteins were detd. as follows: muscle, hen, 0.818, 0.002%; carp, 0.856, 0.087; eel, 0.839, 0.026; lobster, 0.931, 0.027; liver, ox, 0.601, 0.382; hen, 0.517, 0.142; egg white, 0.683, 1.122; egg yolk, 0.322, 1.195; human hair, 0.440, 11.630. The O uptake of proteins, with and without the addn. of cystine or glutathione (disulfide), is also reported; fresh muscle protein shows a considerable increase in O absorption on addn. of these substances, while oxidized muscle protein and gelatin show no difference. This is taken to indicate that the SH group in fresh muscle protein or active tissue protein reduces cystine or glutathione into cysteine or reduced glutathione, which absorbs O. C. J. WEST

Oxidation by catalase. H. v. EULER, D. RUNEHJELM AND S. STEFFENBURG. *Arkiv. Kemi Mineral Geol.* 10B, No. 7, 1-6(1929); cf. C. A. 23, 2728, 3395.—In the oxidation of phenolphthalein to phenolphthalcin by means of  $H_2O_2$ ,  $CuSO_4$  was found to have a catalytic action similar to that of catalase of blood, tissues and other biol. materials. The trace of Cu found in most tissues may explain the catalase activity of the latter. The Cu is believed to be in the form of the anion,  $HOCuO$ . J. J. W.

Biochemistry of S (SULLIVAN, HESS) 10. The bile acids (SCHENCK, KIRCHOF) 10. Effect of radiation upon chemical and biochemical reactions (GERLACH) 3.

NORD, F. F.: Mechanism of Enzyme Action and Associated Cell Phenomena. Baltimore: The Williams & Wilkins Co. 78 pp. \$2. Reviewed in *J. Franklin Inst.* 208, 308(1929).

## B—METHODS AND APPARATUS

STANLEY R. BENEDICT

**An automatic drop recorder.** M. S. BISKIND AND MORRIS DAN. *Proc. Soc. Exptl. Biol. Med.* 26, 52-5(1928).—A description is given of an app. designed for perfusion and excretion expts. where a continuous record of outflow is desired. C. V. B.

**A method for determination of lipin phosphorus.** FRANCES KRASNOW AND A. S. ROSEN. *Proc. Soc. Exptl. Biol. Med.* 26, 67-8(1928).—A detailed description of a satisfactory technic is given. The method is applicable to blood and other biol. fluids.

C. V. BAILEY  
**A method for determination of volatile fatty acids in stools.** W. H. OLMSTED AND WALTER WHITAKER. *Proc. Soc. Exptl. Biol. Med.* 26, 108-9(1928).—Collect stools in an equal vol. of 10% NaOH soln.; neutralize 100 g. of the alk. mixt. with strong  $H_2SO_4$  and add 175-200 cc. of a 10%  $HgCl_2$  soln. Add solid  $Ca(OH)_2$  until the soln. is strongly alk. to litmus. Make up the vol. to 500 cc. and centrifuge. Acidify two 100-cc. portions to litmus with  $H_2SO_4$ . Ppt. excess Hg with  $H_2S$  and remove the latter by an air current. Filter, add 70 g.  $MgSO_4$  and 2 cc. of 50% soln. of  $H_2SO_4$ . Pass steam through the mixt. at such a rate that 10-15 min. is required to collect each 100-cc. fraction of distillate. Collect 6 fractions. Keep the vol. of the salt soln. const. The filtrates are almost free from  $N_2$  and from higher insol. fatty acids and sugar. The principal volatile fatty acids in the stools are acetic and butyric. C. V. BAILEY

**The physiological salt- and Locke-Ringer solutions.** M. E. BERGOLTZ. *Farm Zhur.* 1928, 444-8.—A discussion of the functions of the different constituents of these solns. and certain precautions to be taken in prepg. them. E. BIELOUSS

**A new apparatus for the clinical measurement of the respiratory quotient.** RENÉ WOLFF. *Compt. rend. soc. biol.* 101, 660-2(1929).—Benedict's basal metabolism app. is modified so as to measure the respiratory quotient. **Experimental results.** *Ibid.* 731-3.—The av. of 6 expts. for  $CO_2/O_2$  of alc. was 0.679 (0.658-0.699). The mean error of respiratory quotients of 6 patients varied from 0.619 to 1.7 with one case at 4.8

B. C. BRUNSTETTER

**A new colorimetric urea method with 0.1 cc. of blood.** SHUN-ICHI YOSHIMATSU *Tôhoku J. Exptl. Med.* 13, 1-5(1929).—Blood urea is pptd. by xanthhydrol, dissolved in  $H_2SO_4$ , digested with  $H_2O_2$ , and treated with Folin's phenol reagent. B. C. B.

**The occurrence of methylguanidine in the animal organism.** III. The use of benzenesulfonyl chloride for the separation of methylguanidine. I. A. SMOKODINTSEV AND A. N. ADOVA. *Z. physiol. Chem.* 182, 259-64(1929); cf. *C. A.* 23, 2451.—The quant. isolation of methylguanidine from tissue exts. is complicated by the presence of creatinine, which may serve as a source of this substance. A reagent which would ppt. methylguanidine and leave creatinine in soln. is highly desirable. The  $PhSO_2$  deriv. of methylguanidine has been described by Ackermann (*Ibid.* 48, 382) and is stated to be sol. in 2500 parts of  $H_2O$  at room temp., while creatinine forms no insol. deriv. Attempts were therefore made to sep. a mixt. by treatment with  $PhSO_2Cl$  and NaOH. The max. yield of benzenesulfonylmethylguanidine, however, from the pure base was only 31.4%, and from a mixt. contg. creatinine it was only 10%. As a reagent for methylguanidine,  $PhSO_2Cl$  is unsatisfactory. A. W. DOX

**Alkalimetric microchemical determination of amino acids and peptides.** W. GRASSMANN AND W. HEYDE. *Z. physiol. Chem.* 183, 32-8(1929).—The method is based on the Willstätter and Waldschmidt-Leitz principle, solns. of usual concn. being used but in special micro-app. Amino acids may thus be titrated in 0.004 millimol. quantities, e. g., 0.3 mg. glycine, with the same relative accuracy as in the macro-titration, the error being less than  $\approx 1\%$ . The app. required are (1) 1 cc. volumetric flasks of the usual design with ground-glass stoppers, (2) capillary pipets of 0.5, 0.2 and 0.1 cc. capacity graduated in 0.001 cc., (3) 5, 10 and 15 cc. Erlenmeyer flasks, and (4) a 2 cc. micro-buret graduated in 0.01 cc. The tip of the pipet below the graduations should be sufficiently long and slender to reach easily to the bottom of the flask. The outside should be wiped off each time with filter paper and the liquid delivered slowly. With a fine tip the buret will deliver alk. KOH (0.01 N in 90% EtOH) in drops of about 0.005 cc. Procedure: To the soln. to be titrated (e. g., 0.2 cc.) add 2 drops of 0.1% alc. thymolphthalein, and alkali from the buret until a distinct blue color appears. From a pipet add 9 vols. (e. g., 1.8 cc.) abs. EtOH, which discharges the blue color, and titrate to the end point. The final color should correspond to that of a 1/400 M soln. of  $CuCl_2$  in excess  $NH_4OH$ . A blank titration performed in the same way is then deducted. Titration of 5 amino acids and 4 polypeptides gave values in close agreement with the theory. The method was tested also in digestion expts. where



*dl*-leucylglycylglycine was hydrolyzed by yeast polypeptidase, gelatin by papain-HCN, and *dl*-leucylglycine by yeast dipeptidase. A. W. DOX

**Testing of hypodermic needles.** G. BATTÀ. *J. pharm. Belg.* 10, 927-30(1928).—The 3 principal causes of corrosion of needles are (1) action of the medicament, (2) continuous action of moist air and (3) the action of the metal of the mandrel, which can form a couple with the metal needle in the presence of ionizable medicaments. To det. Cr in the needles dissolve 100 mg. of needles in 0.2 N H<sub>2</sub>SO<sub>4</sub>, add a few drops of fuming HNO<sub>3</sub>, followed by 25 cc. of KMnO<sub>4</sub> soln. (2.5%), boil 15 min. and cool. Add 50 cc. of ammonia, boil 15 min. or until the KMnO<sub>4</sub> is decompd., cool, add 15 cc. concd. H<sub>2</sub>SO<sub>4</sub>, boil 10 min., and det. the chromate by reduction with Mohr's salt and KMnO<sub>4</sub>. Tests were carried out on needles contg. various percentages of Cr and of pure Ni. Corrosion was detd. as loss in wt. of the needles in the following media: 10% HNO<sub>3</sub>, 10% AcOH, and 10% NaCl after immersion for 2 hrs. at 20°. The needles contg. above 10% Cr were unaffected. Ni needles lost wt. in HNO<sub>3</sub>, were blackened by AcOH, and were unaffected by the salt. In the test to det. the effect of electrolytic action, the needles were partly immersed in a 5% NaCl soln. for 2 hrs., and then exposed for 50 hrs. to moist air. By this treatment Ni needles tarnished while steel was only slightly affected. In the case of the mandrels, Ni and nicked brass were resistant while steel became rusted in 30 min. of contact. Needles high in Cr content resisted much better than their mandrels. In moist air for 60 hrs. at 50° only the steel mandrels showed signs of rust. B. proposes that hypodermic needles be made of steel contg. a min. of 12-13% of Cr, and that the mandrels be plated with Ni, Cu or other suitable non-corroding metal. Steel mandrels should be entirely discarded. A. G. DUMÉZ

**Colorimetric estimation of minute quantities of sugar in the urine.** C. STRICH. *Pharm. Zentralhalle* 70, 437(1929).—The reagents required are: (a) 1% glucose soln. (exactly standardized), (b) Fehling soln., (c) K<sub>4</sub>Fe(CN)<sub>6</sub> soln. (1:20), and (d) NH<sub>4</sub>OH. Heat 5 cc. each of a and b in a Dahlen pressure water pot about 1 hour to complete pptn. in a centrifuge glass. After centrifugation, decant the supernatant liquid, wash twice, dissolve the residual Cu<sub>2</sub>O in about 3 cc. pure HNO<sub>3</sub>, dil. to 100 cc., then add 1 to 2 cc. of the resulting soln. to 100 cc. for colorimetric examn. with c (1 cc. = 0.1 mg. sugar) and d (10 cc. = 1 mg. sugar). By means of 3 to 10 cc. of the above Cu nitrate soln. the required color scale is obtained for comparison. For measuring the sugar content of urine a qual. test suffices for detg. the amt. of control soln. in comparing the intensity of color tone. W. O. E.

**Ultra-filtration methods and their application in bacteriologic and pathologic studies.** W. J. ELFORD. *Brit. J. Exptl. Path.* 10, 126-41(1929); cf. *C. A.* 22, 2095.—A simple and convenient method for prepg. impregnated AcOH collodion membranes with uniformity of thickness throughout. The complete concn. range is described. Also a suitable technic for prepg. such membranes in sterile condition by use of an ultra-violet light chamber is outlined. Evidence that ultra-filtration methods should prove of positive value in filterable virus studies is definitely established. However, intelligent cognizance of detg. factors in surface phenomena is imperative since the conception of filtration as consisting simply of a sifting process with relative pore size the sole controlling factor is wholly inadequate when dealing with truly colloidal and sub-colloidal systems. HARRIET F. HOLMES

**Hematoporphyrin test in the diagnosis of occult blood.** M. AHMANN AND A. KALLNER. *Arch. Verdauungs-Krankh.* 45, 169-72(1929).—It was not possible regularly to demonstrate hematoporphyrin in the stools. In some cases as many as 4 days elapsed between the disappearance of negative benzidine and pyramidone reaction and the appearance of hematoporphyrin. FRANCES KRASNOW

**The hydrogen-ion concentration of the feces and a simple method for its determination.** A. TILGER. *Arch. Verdauungs-Krankh.* 45, 221-4(1929).—Variations obtained ranged from 6.0 to 7.7. Boiled neutral water (5 cc.) was added to 7 tubes. Cresol red, naphtholphthalein, phenol red, bromothymol blue, neutral red, bromocresol purple and methyl red (4 drops), resp., were added to these tubes. Three to 4 drops of the material to be tested was added and the color matched with charts. FRANCES KRASNOW

**The occurrence and behavior of methemoglobin in the cadaver.** W. LAVES. *Deut. Z. ges. gericht. Med.* 12, 549-75(1928).—There may be formation of methemoglobin during the course of putrefaction. With careful spectrometric examn. sulfhemoglobin may be differentiated from alkali and acid methemoglobin. The post-mortem induction of methemoglobin begins in the vessels of the abdomen, continues in the heart blood and only later in the peripheral blood. Nitrite poisoning is recognizable through a gradual change of the methemoglobin into the very stable NO-hemoglobin. F. K.

**The determination of carbon monoxide in blood.** W. M. M. PILAAR. *J. Biol. Chem.* **83**, 43-50(1929).—See *C. A.* **22**, 4139.

**Gasometric determination of fermentable sugar in blood and urine.** A. P. LOTHROP, D. D. VAN SLYKE AND JAMES A. HAWKINS. *J. Biol. Chem.* **83**, 51-70(1929); cf. *C. A.* **23**, 404.—Procedures are described for applying the gasometric ferricyanide reduction method to detn. of fermentable sugar in blood and urine. Fermentable sugar is measured by the decrease in reducing material caused by brief contact with yeast under conditions producing complete removal of glucose. The usual normal urine contains about  $0.15 \pm 0.10\%$  of total reducing substances, of which on the av. only about  $1/10$  is fermentable. Only 3 urines out of 27 showed more than  $0.023\%$  of fermentable sugar. The normal fermentable sugar values are somewhat higher than Eagle's (*C. A.* **21**, 1296), which were below  $0.01\%$ , but confirm him in showing that only a relatively slight proportion of the reducing material usually encountered in normal urine can be glucose. The ingestion of 1 g. of glucose per kg. by 3 normal men did not in any of them increase significantly the concn. or output rate of fermentable sugar in the urine, this result again confirming Eagle. Manometric measurement of the  $\text{CO}_2$  formed by yeast indicated in normal urine fermentable sugar contents averaging  $0.03\%$  higher than those obtained from the decrease in reducing power. The extra  $\text{CO}_2$  is attributable to non-glucose urine constituents, of which amino acids and  $\alpha$ -keto acids have previously been shown to yield  $\text{CO}_2$  under influence of yeast carboxylase. In glucosuric urines the amt. of extra  $\text{CO}_2$  formed by yeast from non-glucose substances is relatively unimportant, and in such urines results by the  $\text{CO}_2$  method do not deviate significantly from those by the fermentation-reduction method.

**Tyrosine and tryptophan determination in one-tenth gram of protein.** OTTO FOLIN AND A. D. MARENZI. *J. Biol. Chem.* **83**, 89-102(1929).—The colorimetric methods for the detn. of tyrosine and tryptophan of Folin and Ciocalteu (*C. A.* **21**, 3210) have been modified so that accurate detns. can be made on 100 mg. of material

**An improved colorimetric method for the determination of cystine in proteins.** OTTO FOLIN AND A. D. MARENZI. *J. Biol. Chem.* **83**, 103-8(1929).—Refinements of the Folin-Looney method for the detn. of cystine have been made which render the method more accurate. A uric acid reagent free from phenol reagent is used (cf. following abstr.) and the amt. of  $\text{Na}_2\text{SO}_3$  has been so reduced that the blank occasioned by it becomes quite negligible. A better range of true proportionality between colors produced from different amts. of cystine is obtained; 0.5 mg. of cystine can be accurately detd. with a 1 mg. standard. The cystine contents of proteins detd. by the revised method are as follows: casein 0.30, gliadin 2.19, edestin 1.35, zein 1.03, crystalline egg albumin 1.22, recrystd., serum albumin  $6.02\%$  (all corr. for moisture content). In all cases except the gliadin the results are higher than those obtained by the Folin-Looney method. The value for casein is the highest that has been reported for that substance.

**The preparation of uric acid reagent completely free from phenol reagent.** OTTO FOLIN AND A. D. MARENZI. *J. Biol. Chem.* **83**, 109-13(1929).—The new reagent is far superior to the old not only for cystine but also for uric acid detns.; it is very active, yet possesses the highest obtainable degree of specificity and so gives the min. of blanks, with sulfite, cyanide, etc., and does not give a trace of color with tyrosine. In addition it shows less tendency to give disturbing ppts. In the prepn. of the reagent most of the uncombined molybdate which remains when just the right amt. of  $\text{H}_3\text{PO}_4$  is added to a  $\text{Na}_2\text{WO}_4$  soln. is pptd. by  $\text{H}_2\text{S}$  and the portion which is converted into sol. sulfomolybdates is removed by extn. with alc. It is possible to convert 100 g. of  $\text{Na}_2\text{WO}_4$  into 1 l. of uric acid reagent completely free from phenol reagent in 2 hrs. by the method described.

**An improved form of Folin's microchemical method for blood sugar determinations.** OTTO FOLIN AND HAQVIN MALMROS. *J. Biol. Chem.* **83**, 115-20(1929); cf. *C. A.* **23**, 2198.—The method has been so revised that with 1 standard and 1 detn. a range between 25 and 400 mg. % can be covered and approx. values can be obtained of blood sugars as high as 700 or 800 mg. %. The problem involved was how to measure Prussian blue in the presence of a large surplus of yellow  $\text{K}_3\text{Fe}(\text{CN})_6$  and it was found that the disturbing effects could be removed by the use of a light screen of filter paper stained a deep yellow with picric acid. The method thus becomes rather more photometric than colorimetric for the blue color is mostly replaced by light absorption and the end point in the colorimeter adjustment is more or less like what one observes in a polariscope and is easier to make than the usual color comparisons. The original range was from 50 to 200 mg. % so that the method could not be used for diabetic bloods. It has been

found that solns. made with gum ghatti instead of gum arabic keep practically indefinitely.

**A new plethysmograph and the actions of various drugs examined with it.** S. SUGIYAMA AND T. FURUKAWA. *Acta Schol. Med. Univ. Imp. Kioto* 11, 591-7(1929).—The accuracy of the ordinary plethysmograph for measuring vol. changes in limbs has been questioned; the authors have improved the plethysmograph so that its record is reliable. A rubber cuff (14 × 40 cm.) is connected to a glass T-piece; one open end of the T-piece connects to a funnel which is used to fill the rubber cuff with water. The other end is connected to an irrigator of glass (300 cc. content) which is provided with a glass stopcock. A glass ampoule (100 cc. capacity) contg. lead shot like a sp. gr. spindle floats in the fluid in the irrigator vessel and operates a lever as it rises or falls when the fluid changes its level in the vessel. The cuff is placed about the thigh of the patient and is then covered with a bandage to prevent expansion of its periphery. Water at 33° is poured through the funnel, fills the rubber cuff, pressing it close to the thigh and fills the irrigator vessel. The funnel is then clamped off and 15-30 min. is allowed for the level in the irrigator vessel to become constant. After drugs are given if there is a dilation of blood vessels water is forced from the cuff into the irrigator vessel—as the level rises the float ascends and pushes the writing lever up—a record is made on a drum. The results obtained with this plethysmograph are: (1) Adrenaline-HCl, Hypotonal, camphor and whisky increased the vol. of the blood vessels of the thigh. (2) Digalen, digifolin, caffeine, sodium benzoate, papaverine-HCl and  $\text{CaCl}_2$  decreased the vol. (3) Strophanthin, highly concd. grape sugar soln. and narcocon produced no change.

G. H. W. LUCAS

**The determination of the carbon dioxide content of the mixed venous blood.** II. Carbon dioxide equilibria between mixed venous blood and rebreathed air. M. C. G. ISRAELS AND F. W. LAMB. *J. Physiol.* 67, 315-24(1929); cf. *C. A.* 23, 3943.—The following details of technic are proposed for the detn. of the  $\text{CO}_2$  tension of the oxygenated venous blood: (1) The rebreathing bag should be filled with 4000 cc. of a mixture of 93.5%  $\text{O}_2$  and 6.5%  $\text{CO}_2$ . (2) Samples should be taken from the last of the air expired into the rebreathing bag from a deep expiration at the end of a rebreathing period. (3) The subject should respire to and from the bag at a slow rate, best suited to himself. (4) The length of the rebreathing period should be from 10 to 12 sec. in the normal resting subject. Under the conditions of exercise or disease the proper rebreathing time must be detd. for each subject.

J. F. LYMAN

**Direct determination of potassium and sodium in plants.** GABRIEL BERTRAND. *Ann. sci. agron.* 46 1-8(1929).—The plant material contained in a Pt, quartz or fused silica capsule (but not porcelain) is carbonized by heating in a furnace to faint redness in order to avoid fusing the ash or volatilizing the K and Na salts. When most of the carbon has disappeared the capsule is allowed to cool and its contents are extd. several times with hot  $\text{H}_2\text{O}$ . After being transferred to a filter, the filter and residue is dried, re-ignited and the extn. repeated. The combined filtrate is divided into 2 portions for separately detg. K and Na. To det. K, acidulate 20 cc. of soln. with HCl, ppt.  $\text{H}_2\text{SO}_4$  with  $\text{BaCl}_2$  in slight excess, filter, concentrate filtrate and washings to 20 cc., add 2 cc. concd.  $\text{HClO}_4$ , evap. almost to dryness, add 1 cc.  $\text{HClO}_4$ , dil. to 15 cc. with  $\text{H}_2\text{O}$  and again evap. to the 1st appearance of white fumes. Cool, add 20 cc. of 96% alc. contg. 0.2%  $\text{HClO}_4$ , let stand a short time, and decant the supernatant liquid through a tared Gooch crucible; repeat the operation 2-3 times. Free the  $\text{KClO}_4$  remaining in the capsule from foreign salts by recrystn. and dry to const. wt. at 125-30°. For the detn. of Na 2 reagents are required: (A) 100 g.  $\text{UO}_2(\text{C}_2\text{H}_3\text{O}_2)_2 \cdot 2\text{H}_2\text{O}$  plus 60 g.  $\text{CH}_3\text{COOH}$ , dild. to 1 l. and (B) 333 g.  $\text{Mg}(\text{C}_2\text{H}_3\text{O}_2)_2 \cdot 4\text{H}_2\text{O}$  plus 60 g.  $\text{CH}_3\text{COOH}$ , dild. to 1 l. A is used for removing phosphates. Equal quantities of A and B are mixed, allowed to stand, several hrs. and any ppt. formed is filtered off. This forms the reagent for pptg. the Na. To 20 cc. of unknown soln. in a centrifuge tube add 5 cc. soln. A, centrifuge and filter; repeat a 2nd time, using 10 cc. of soln. A. Add 60 cc. of the pptg. reagent and after a short time test a few cc. of supernatant liquid for completeness of pptn. Let stand several hrs., filter on a tared Gooch crucible, wash several times with 10-cc. portions of the reagent, followed by 15-30 cc. 95% alc. and dry to const. wt. at 110°. Factor 0.0165.

K. S. MARKLEY

**The mercurimetric method for titrating alkaloids in biological material.** Studies on the curve of elimination of ethylstrychnine. GIUSEPPE GRAZIANI. *Biochim. terap. sper.* 16, 160-6(1929).—Ethylstrychnine was administered in 2 cg. daily doses to a rabbit, the urine collected, and the alkaloid detd. by the Votocek-Kasperek method. This method was not found adapted for studying the curve of elimination of the drug. The cause is due to insufficient concn. of the alkaloid in the urine. The alkaloid does

not reach the limits of concn. (0.01 to 0.03 g.) given by the authors in order to get satisfactory results. PETER MASUCCI

**Peroxidase reactions and new reagents.** A. CASOLARI. *Biochim. terap. sper.* 16, 167-74(1929).—Toluidine blue in the presence of fresh milk and HCHO acts as a H acceptor similar to methylene blue (Schardinger's reaction). Other reagents which reveal dehydrogenation and form dyes belonging to the rosaniline group are: (1) the leucobase of acid green (the Na salt of the sulfonic deriv. of diethyldibenzzildiaminotriphenylcarbinol); (2) dimethylaniline 5 drops, glacial AcOH 10 drops, H<sub>2</sub>O 10 cc.; (3) aniline 0.093 g., *p*-toluidine 0.053 g., H<sub>2</sub>O 10 drops, AcOH 10% 5 drops; (4) aniline 0.093 g., *p*-toluidine 0.017 g., *o*-toluidine 0.017 g., AcOH 10% 5 drops + 10 cc H<sub>2</sub>O. These reagents are sensitive in detecting blood, raw milk, the rancidity of fats and the presence of peroxidases in ethyl ether. PETER MASUCCI

**The determination of the coagulation of blood.** DAVID BARILARI AND D. FOSSATI. *Semana méd.* (Buenos Aires) 35, 963-9(1928).—A survey and description of the methods are given. A. E. MEYER

**The determination of bismuth in humors and tissues.** ORESTE CALCAGNO. *Semana méd.* (Buenos Aires) 35, 1397-1412(1929).—The different ways of elimination of Bi from the organism are discussed. The analytical methods of Mueller, Christiansen, Fournau, Dezani, *et al.*, are described and criticized. C. employs the method of Fresenius-Babo for the destruction of the org. matter. The acid soln. is pptd. with H<sub>2</sub>S, washed first with a soln. of H<sub>2</sub>S in H<sub>2</sub>O, later with H<sub>2</sub>O, then with EtOH. After the sepn. of As with (NH<sub>4</sub>)<sub>2</sub>S the Bi is dissolved in HNO<sub>3</sub> while the HgS can be filtered off. A usual As detn. is described. The Bi soln. is used for detn. according to Leger, or Aubry or Ganassi. These methods are completely discussed. A. E. MEYER

**New type of respiration chamber.** T. J. MANEY, P. L. HARDING AND H. H. PLACGE. *Science* 70, 44(1929).—A study was made of the respiratory activity of fruit held under various conditions of maturity, humidity and temp. Suitable air-tight chambers of low cost for carrying out the expt. were made from 5-gal. pickle jars. L. B. M.

**Calorimetric microchemical determination of non-protein nitrogen in blood and serum.** B. GROÅK. *Biochem. Z.* 209, 148-53(1929).—Place in a centrifuge tube 4 cc H<sub>2</sub>O. Then measure out 0.1 cc. blood or serum with a capillary pipet and thoroughly mix with the water. Then add 0.9 cc. 30% CCl<sub>3</sub>COOH and centrifuge after 10 min. The detn. is carried out on 1 cc. of the clear liquid, which should give no turbidity when tested with sulfosalicylic acid. Measure this into a medium-sized test tube and mix with 3 drops H<sub>2</sub>SO<sub>4</sub> and 0.5 cc. H<sub>2</sub>O<sub>2</sub>, and finally add a trace of K<sub>2</sub>SO<sub>4</sub>. Heat the tube over an asbestos gauze until the contents are clear. With 2 portions of 5 cc. H<sub>2</sub>O transfer this to another tube and mix thoroughly with 0.2 cc. 40% NaOH and 1 drop of gum arabic. This gum arabic mucilage must be freed from every trace of NH<sub>3</sub> by dialyzing 12-24 hrs. against running water. The concn. should be so adjusted that 1 drop added to 10 cc. H<sub>2</sub>O will not manifest the least opalescence in diffuse light. Now follow the gum arabic by 0.2 cc. Nessler reagent, and match the colors after 15-20 min. S. M.

**The staining of the lipid granules of leucocytes, including considerations of the refractoriness of lipoids toward the oxidase staining reaction.** J. GOLDMANN. *Centr. Bakt. Parasitenk.*, I Abt., 112, 445-6(1929).—The leucocytic granules which stain with fat stains as Sudan III are morphologically identical with those demonstrated by the oxidase or peroxidase reaction. A different degree of resistance toward the oxidase reaction characterizes the granules of the various leucocytes. The granules of eosinophiles are most resistant and those of monocytes least, with neutrophils intermediate. JOHN T. MYERS

**The vital staining substance of erythrocytes.** RAPHAEL GAVRILOV. *Folia Haematol.*, I Abt., 38, 216-32(1929).—The lipid theory of the mechanism of vital staining fails to accord with many facts. Fat solvents do not remove the basophilic staining properties, even when the cells are left apparently fat-free. It is probable that the vital staining substance is a protein which may be combined with a lipid. The staining mechanism of polychromasia and vital staining are identical. The ground substance in an immature erythrocyte is in a state of dispersion. Various fixing and staining methods can by different types of coagulation of these colloidal particles produce various pictures from polychromasia to vital structure. Air-drying of a film with later fixation coagulates with fine particles. Application of a basic stain to an unfixed film produces some chem. reaction with the pptn. and coagulation of coarse particles. The more slowly water is removed from the cell the more complete and definite is the coagulation. Granulations of varying size can often be seen in the same prepn. Staining depends on chem. reaction between dye and cell substance. A low H-ion concn. is favorable. This influence of  $\phi_{\text{H}}$  speaks against the lipid-dye soly. theory of supravital

staining. Presence of vital staining material is the surest sign of a young erythrocyte.

**Heme and tissue iron.** M. L. ANSON AND A. E. MIRSKY. JOHN T. MYERS. *J. Gen. Physiol.* 12, 401-5(1929).—A method is described for estg. the heme in yeast and the wing muscles of bees. The density of the  $\alpha$  band of hemochromogen in the complete tissue-pyridine mixt. is compared with the density of the  $\alpha$  band of a series of known solns. of pyridine-hemochromogen. Certain difficulties of the method are discussed. About 40% of the total iron of baker's yeast and the wing muscles of the bee is the form of heme.

**Modification of the Northrop-Kunitz microcataphoresis cell.** C. H. RICHARDSON. HAROLD A. ABRAMSON. *J. Gen. Physiol.* 12, 469-72(1929).—The cell differs from the Northrop-Kunitz cell (C. A. 19, 2966) as follows: (1) Electrode vessels are fused to the cell; (2)  $\text{CuSO}_4$  electrodes are used in electrolyte-free agar or in salt solns. contg. agar depending upon the type of expt.; (3) the drop in potential is calcd. from Ohm's law to avoid errors due to accidental resistances.

**The salicylates.** VII. The alleged inefficiency of the phosphoric acid-distillation method of estimating salicylic and salicyluric acids. CHARLES C. JOHNSON. *J. Pharmacol.* 34, 437-44(1928).—A comparison was made of recovery of salicyl from various solns. by the Thoburn-Hanzlik procedure, and by Holmes' modification of it. Recovery of salicylic acid from aqueous solns. of sodium salicylate was, by the Thoburn-Hanzlik method, 89-98.3%; by Holmes' method 55.6-85.1%. Recovery of salicyl from the urines of human subjects taking  $\text{NH}_4$  or Na salicylate was 5-25% higher by the Thoburn-Hanzlik method. Recovery of synthetic salicyluric acid added to urine, and to water, was by the Thoburn-Hanzlik method 81-97.3%; by Holmes' method 0-52%. The results refute Holmes' criticism of the Thoburn-Hanzlik method, and indicate that Holmes' modification of it is unsatisfactory.

**Quantitative biochemical analysis of allantoin in the presence of urea.** R. FOSSE, A. BRUNEL AND P. DE GRAEVE. *Compt. rend.* 188, 1418-21(1929); cf. C. A. 23, 3875.—The detn. of allantoin in pure solns. means detn. of the urea produced by the successive action of alkali and acid; this method is not applicable in presence of urea or its derivs. If, however, the alkali is replaced by *Soja hispida*, the allantoinase transforms the allantoin into allantoic acid. Heat a soln. contg. 1 g. or less allantoin per l. on the water bath for 5-6 hrs. at 60° or for 10 hrs. at 40°, in presence of "ammonium subcarbonate" and  $\text{CHCl}_3$ . Neutralize 5 cc. of the filtered liquid in presence of methyl orange, add *N* HCl to make the titer 0.05 *N*, heat for 30 min. at 60°, make alk. with "soda" and clarify with "acetic iodo-mercurate." Filter and wash into a graduated test tube, add to the liquid (about 10 cc.) twice its vol. of  $\text{AcOH}$  and  $\frac{1}{20}$  of the total vol. of methylxanthhydrol, let stand 4 hrs. The ratio of allantoin to xanthylurea = 0.188. The method and its accuracy, demonstrated by tables, are not changed if urea is used instead of ammonium carbonate.

**Application of the biochemical determination of allantoin to urine.** R. FOSSE, A. BRUNEL AND P. DE GRAEVE. *Compt. rend.* 188, 1632-4(1929); cf. preceding abstract.—Glyoxylic acid and urea are formed in the soy-bean fermentation and subsequent acid hydrolysis of uric acid just as in the case of allantoin. Therefore, any uric acid present in the fluid to be tested for allantoin has to be eliminated before the fermentation. This is accomplished by means of the reagent of Denigès (acid Hg sulfate), which ppts. uric acid in concns. upward from 1:100,000 (Denigès, *Chimie analytique*, 5th ed., pp. 203 and 53 (1920)). The results of allantoin detns. on a number of animal urines are given in a table.

**Device for determining cholesterol in blood.** SAMUEL L. LEIBOFF. U. S. 1,722,435, July 30. Structural features.

**Clarifying blood.** EMMET P. SHEERAN (to Fostoria Serum Co.). U. S. 1,723,212, Aug. 6. Serum is sepd. from the heavy portion of the blood with a slight residue of such heavy portion remaining in the serum and the serum is then passed through a rotating bowl for further sepn. and clarification. An app. is described.

## D—BOTANY

THOMAS G. PHILLIPS

Some reactions of seedlings to weak concentrations of hydrochloric acid and calcium. JOHN R. SKEEN. *Soil Sci.* 26, 471-8(1928).—*Agrostis alba* in balanced nutrient solns. showed a growth independent of  $\text{pH}$  within the limits 3.7-6.0. *Lupinus albus* responded markedly to traces of Ca and derived no additional benefit when the concn. exceeded 3 p. p. m. *Phaseolus*, on the other hand, did not respond significantly

to concns. of less than 5.0 p. p. m. of the same element, and the benefit was greater with higher concns. *Phaseolus* did not survive a  $pH$  with HCl lower than 4.5, whereas a  $pH$  of 4.1 had little effect on lupins. Distd.  $H_2O$  showed a greater toxicity to *Phaseolus* than to *Lupinus albus*. It is thought that some soils are toxic to *Phaseolus*, not because of the toxicity of the H ion but because of the absence of ions in the soils.

M. S. ANDERSON

**The factors in the process of oil formation in plants.** SERGIUS IVANOV. (*Osterr. Chem.-Ztg.* 32, 89-90(1929); cf. *C. A.* 23, 2313.—A report of a lecture in which the results of I.'s 25 years' investigation in this field are summarized. The process of oil formation in plants is similar within a given genus. The oils of the species in a given genus are similar in chem. compn. Seeds from plants cultivated in northern Europe or at a high altitude contain oils whose I no. and drying capacity are always higher than those of oils from the plants cultivated in southern Europe or at a low altitude. This climatic effect is believed to be due chiefly to the influence of temp. Climatic conditions have little or no effect on the I no. of the fats of non-drying oils.

B. C. BRUNSTETTER

**The phytosterol of stinging nettle.** L. ZECHMEISTER AND P. TUZSON. *Z. physiol. Chem.* 183, 74-7(1929).—An alc. ext. of dried, finely ground nettle leaves (*Urtica urens*) was used for the prepn. of xanthophyll by concn. and pptn. with petroleum ether. The mother liquor, after concn. and addn. of EtOH, yielded crystals of a sterol which was identified as sitosterol free from stigmasterol. The yield of pure substance was 6 g. from 28 kg. of dried plant. The unavoidable losses being taken into account, the sterol content is estimated at 0.04% on the dry basis.

A. W. DOX

**Apparatus for the determination of carbon dioxide in the respiration of apples.** P. L. HARDING, T. J. MANEY AND H. H. PLAGGE. *Science* 70, 125-6(1929).

E. H.

**Chlorotic diseases of fruit trees: Their causes and remedies.** I. DE V. MALHERBE. *Farming in S. Africa* 4, 49-50, 54(1929).—The relation of the phys. and chem. compn. of soils to chlorosis in fruit trees is discussed. Chlorosis may result from a deficiency of available Fe, N or Mg compds. in the soil, from the presence of excessive quantities of alkali salts, or from too much or too little moisture. In acid soils, too high concns. of Mn salts cause true chlorosis, while the chlorotic condition of trees growing on highly calcareous soils may often be remedied by applications of Mn salts. Chlorosis due to a deficiency of available N is best combated by application of nitrate fertilizers. Trees growing on moderately acid soils, or soils abundantly supplied with org. matter, do not suffer from chlorosis due to a deficiency of available Fe. K. D. J.

**Experiments with barley of the same stock but of varying nitrogen content.** ANON. *J. Dept. Agr. Ireland* 28, 183-4(1929).—A lower yield of barley was obtained from seed having a high N content than from seed of the same stock having a low N content, but there was no difference in the quality of the grain.

K. D. JACOB

**Chemical activity of plants in relation to climate.** S. L. IVANOV. *Zhur. Prikladnoi Khim.* 1, 299-315(1928); cf. *C. A.* 22, 4149.—Mild warm climate favors formation of satd. fatty acids and of unsatd. acids with one double bond. Cold climate favors formation of unsatd. acids with 2 and 3 double bonds. Temp. and light are of special importance in these processes. Careful study of this new branch of science (hulegeography) is urged.

V. KALICHEVSKY

**Variations of iodine in one of the Florideae.** F. CHEMIN. *Compt. rend.* 188, 1624-5(1929); cf. *C. A.* 22, 2965.—*Trilliella intricata* filaments gathered in March gave a test for I when dipped in acid. This combined I is concd. in a portion of the secretive cells, possibly as a result of the cellular activity of the assimilative cells. As growth slows up, the I test becomes weaker and disappears entirely in April.

AMY LEVESCONTE

**The action of Wood's rays during the germination and the first periods of growth of plants.** S. COLLA. *Boll. soc. ital. biol. sper.* 4, 298-301(1929).—Wheat, beans and lentils were studied. The formation of chlorophyll is due to the action of ultra-violet rays (3300-3900 A. U.) without the aid of the visible rays. It seems also that under the action of the ultra-violet rays the anthocyanin disappears.

PETER MASUCCI

**Chemical composition of apple juices as affected by climatic conditions.** JOSEPH S. CALDWELL. *J. Agr. Research* 36, 289-365(1928); cf. *C. A.* 22, 3000, 4182.—A 6-year study was made of the variations in compn. of the expressed juices from 216 varieties of apples grown near Wash., D. C., and of their relations to the annual variation in climatic conditions. The compn. of the crop of a given year, when the results are considered collectively, shows a definite relationship to the amt. and distribution of the climatic factors during the growing season of that year. These climatic factors exert an effect upon compn. which manifests itself as a modification in like direction and degree of the compn. of the fruit of a large number of varieties of widely diverse

character and degree of adaptation to locality. Variations in amts. of sunshine and temp. were most effective in detg. the compn. of the crop; variation in pptn. was the least effective. An increase or decrease in the amt. of sunshine and temp. over normal results in a corresponding change in sugar content. The climatic conditions conducive to the development of a high content of sugar and acid in apples are also conducive to the reduction to a low level of the content of astringent materials therein and *vice versa*. In consequence the acid-astringent-sugar ratio of a given variety will vary quite widely from year to year in a locality having a wide variation in seasonal conditions and will have relatively narrow variations in a region having a narrow range of variation in seasonal conditions.

W. H. ROSS

**Variations in potassium content of alfalfa due to stage of growth and soil type and the relationship of potassium and calcium in plants grown upon different soil types.** JOHN F. FONDER. *J. Am. Soc. Agron.* 21, 732-50(1929).—The stems and leaves and their juices from alfalfa plants grown upon different soil types were analyzed for K at a no. of growth stages. Variations in the K content at different hrs. of the day were noted as was also the relationship of K to the sp. gr. of the expressed juice of the plant parts. The distribution of K in the sap and in the woody tissue of the plants was detd. A consideration of the physiol. relationship between K and Ca was made. Soil type differences were responsible for marked variation in the K content of alfalfa stems and leaves and of their juice. The greatest amts. of K were present in the plants grown upon the light sandy soils; medium amts. were present in the plants obtained from the very heavy soils; and the smallest amts. were present in the plants from the sandy loam soils. The K content of the plants was not an exact function of soil texture. Greater amts. of K were present in alfalfa stems than in the leaves, while about equal amts. were present in the expressed juice of the 2 plant parts. As the growth period advanced there was a decided decrease in the % of K present in the stems and leaves and their juice. About equal amts. of K were present in the plants of the first and second crops and apparently the K content of the soil was not depleted at any time to the extent that it controlled the % of K contained in the plants. K was evidently not an important cation in detg. the sp. gr. of the expressed juice of alfalfa stems and leaves, an increase in the sp. gr. usually occurring in spite of a decrease in the concn. of K in the juice. The K present in the green material of the alfalfa stems and leaves existed largely in soln. in the plant sap, very little of it being held intimately in the woody tissue. About equal amts. of K were present in the woody tissue of the stems and leaves, although slightly more was deposited in the woody tissue of the leaves by the full-bloom stage. In the plants obtained from some soil types increasing amts. of K were deposited in the woody tissue, while in the plants from the other soil types a decrease occurred during the growth period. A physiol. balance between K and Ca appeared to exist in the alfalfa plants. An inverse correlation was established between these 2 elements in the plants obtained from the different soil types, an increased Ca content being found to be accompanied by a decreased K content, both at different stages of growth and in the different plant parts. K and Ca appeared to be interchangeable in the plants, although not necessarily alike functionally. The K content of the plants depended upon the Ca content, which in turn appeared to be dependent upon the available supply of this element in the soil, although the last cannot be definitely stated without further data. E. F. SNYDER

**Luxury consumption of potassium by plants and its significance.** R. P. BARTHOLOMEW and GEORGE JANSSEN. *J. Am. Soc. Agron.* 21, 751-65(1929).—Plants absorb considerable more K during the early periods of growth than is necessary for the normal processes of growth. This applied to alfalfa, Hubam clover, cowpeas, soy beans, oats, wheat, Sudan grass, corn, cotton and tomatoes. The K in the tomato is practically all water-sol. K can be translocated within the plant and re-utilized to prevent starvation when the supply of available K is insufficient to supply the needs of the growing regions. E. F. SNYDER

**Quantitative changes in the chloroplast pigments in the peel of bananas during ripening.** HARRY VON LOSSECKE. *J. Am. Chem. Soc.* 51, 2439-43(1929).—The pigments, chlorophyll ( $a + b$ ), xanthophylls and carotin were detd. in the peel of bananas. The data indicate that the chlorophyll content of the peel ranges from 102.9 to 51.7 mg. per kg. of fresh peel in the unripe fruit at discharge from the boat and decreases as the fruit ripens. Chlorophylls decrease as a straight-line function of time. The total yellow pigments (xanthophyll + carotin) remain approx. constant throughout the maturation of the fruit. The amt. of xanthophylls is always greater than the amt. of carotin, the range of the former being from about 5 to 7 mg. per kg. of fresh peel, while the range of the latter is from 1.5 to 3.5 mg. per kg. of fresh peel.

C. J. WEST

**Chemical composition of corn (*Zea mays*) seedlings. I. Isolation of xylan and cellulose from the cell walls.** KARL PAUL LINK. *J. Am. Chem. Soc.* **51**, 2506-16 (1929).—Corn seedlings grown at 12° and 24° to the stage where the coleoptile ruptures the leaf sheath contain 10-12% xylan and 16-18% cellulose. Of the xylan 85-90% can be extd. with 5% NaOH (xylan A) and the remainder with 10% NaOH (xylan B); in the pure state both xyans are sol. in hot H<sub>2</sub>O, are strongly levorotatory and can be quantitatively hydrolyzed to *d*-xylose. The cellulose is composed entirely of glucose residues and resembles the cellulose of cotton in its chem. reactions and also in its high mol. complexity. No sugars other than xylose and glucose have been detected in the hydrolysis products obtained from the cell wall constituents of the corn seedling. Temp. did not alter the qual. nature of the xylan and cellulose constituents laid down in the cell walls but alters slightly their quant. distribution. The original should be consulted for the details of exptl. procedure. **II. Isolation of a dextrin similar to the trihexosan obtained by the thermal depolymerization of potato starch.** *Ibid* 2516-22.—A dextrin has been isolated from the radicle and plumule of corn seedlings, which appears to be similar to the trihexosan obtained by the thermal depolymerization of potato starch. The dextrin comprises approx. 65% of the total dextrin content of the corn seedlings. Since the dextrin belongs to the starch dextrin series, it appears probable that it is a polysaccharide substance used in the respiratory process of the seedlings. C. J. W.

**Occurrence of ergosterol in phytosterols.** I. M. HEILBROD AND W. A. SEXTON. *Nature* **123**, 567 (1929).—In addition to the reduction of sitosterol to sitostanol, it may concurrently undergo oxidation to ergosterol. J. J. WILLAMAN

Plant pigments (KARRER, *et al.*) 10.

HAAS, PAUL AND HILL, T. G.: **An Introduction to the Chemistry of Plant Products. Vol. II. Metabolic Processes.** 2nd ed., enlarged. 220 pp. London: Longmans, Green & Co. 220 pp. 10s. 6d. Reviewed in *Chem. News* **139**, 60(1929).

ONSLow, MURIEL W.: **Practical Plant Biochemistry.** London: Cambridge Univ Press. 206 pp. 12s. 6d. net.

## E—NUTRITION

PHILIP B. HAWK

**Effect of infra-red radiation on growth of rachitic rat.** ETHEL M. L. CLAUSEN. *Proc. Soc. Exptl. Biol. Med.* **26**, 77-8 (1928).—A 10 min. daily exposure to near infra-red radiation (ranging from 720 to 1120 $\mu$ ) of an intensity 0.132 g. cal. min./sq. cm will produce in young rats fed upon a rickets-producing diet increased growth and prolongation of life for 4-6 weeks, without any effect upon the disease. There is an associated hypertrophy of the thyroid and of the parathyroid glands. C. V. BAILEY

**Influence of arsenic, ferrous sulfate and copper sulfate on rats furnished a vitamin-A-free diet with iron added.** F. F. CHIDESTER AND A. G. EATON. *Proc. Soc. Exptl. Biol. Med.* **26**, 141-2 (1928).—Two male rats were given Sherman vitamin A-free diet No. 380 to which was added 0.01 mg. Cu in the form of CuSO<sub>4</sub>, 0.5 mg. of Fe in the form of FeSO<sub>4</sub>, 0.379 mg. As in the form of Fowler's soln. and 0.01 mg. irradiated ergosterol. From an av. wt. of 42 g. they reached a max. wt. of 175 g. at the end of 9 weeks, after fluctuating around 170 g. for 2 weeks, a rapid decline resulted in death at the end of 13 weeks. Similar results were obtained with a group of 4 female rats. C. V. BAILEY

**Influence of wheat germ oil on fertility of rats fed fat-free rations.** AMY L. DANIELS AND DOROTHY P. JORDAN. *Proc. Soc. Exptl. Biol. Med.* **26**, 185-8 (1928).—The effectiveness of wheat germ oil as an antisterility agent is due to the presence of some substance (vitamin E) contained therein, and not to any retarding action which this may have on the oxidation of vitamin A. C. V. BAILEY

**Growth and reproduction of rats on vitamin-C-free diet.** ERNEST T'SO. *Proc. Soc. Exptl. Biol. Med.* **26**, 276-7 (1929).—The addn. of antiscorbutic vitamin had no growth-promoting effect when given to rats which for 2 generations or more had been reared on a vitamin-C-free diet. C. V. BAILEY

**The possible significance of *d*-xyloketose (urine pentose) in normal metabolism.** ISIDOR GREENWALD. *Proc. Soc. Exptl. Biol. Med.* **26**, 321-2 (1929).—*d*-Xyloketose *p*-bromophenylhydrazone, prepd. by a modification of the method of Levene and LaForge, 127-8°, decomposed 165°; in 1% soln. in alc.  $[\alpha]_D^{20} = 1.87^\circ$  shortly after prepn., and 2.43° after 24 hrs. For the free ketose, prepd. by reaction with BzH,  $[\alpha]_D^{20} = 34.8^\circ$ . The glucose equiv. of 1 g. of pentose calcd. from the *p*-bromophenylhydrazone was 1.25 g. by Sumner's method, 1.45 g. by the NaOH-picric-acetone method and 1.18 g. by the Na<sub>2</sub>CO<sub>3</sub>-picric method of Benedict and Osterberg. Ninety cc. of this soln. (equiv. to 3.05



g. pentose) in 5 injections at intervals of approx. 2 hrs. increased the sugar content of the urine of a dog about 6% of the amount injected. A few days later the dog received a similar series of injections of *l*-xylose; about 60% appeared in the urine. Another control expt. with glucose gave no increase in the excretion of sugar. *d*-Xyloketose can be further metabolized by the organism. C. V. BAILEY

**Influence of whole wheat upon hemoglobin regeneration in albino rats.** MARY S. ROSE, ELLA MCC. VAHLTRICH AND EMILY L. BLOOMFIELD. *Proc. Soc. Exptl. Biol. Med.* 26, 322-3(1929).—Young rats weaned at the age of 3 weeks from mothers on a uniform diet were made anemic by exclusive feeding of pasteurized milk. After 11 weeks the hemoglobin, as detd. by the Newcomer method with the Newcomer disk, showed values between 5.8 and 4.5 g. per 100 cc. of blood. One-half of the rats were then fed daily 6 g. of whole wheat contg. 0.2 mg. of Fe. The hemoglobin rapidly increased and in a few weeks values ranged from 15 to 19 g. per 100 cc. of blood. All the controls continued to decline. C. V. BAILEY

**Effect of an exclusive meat diet on chemical constituents of the blood.** CLARENCE W. LIEB AND EDWARD TOLSTOI. *Proc. Soc. Exptl. Biol. Med.* 26, 324-5(1929).—Two healthy men lived exclusively on meat for 11 months and remained in excellent health. There was no evidence of renal impairment. The chem. compn. of the blood showed a slight increase in uric acid and a temporary lipemia following the ingestion of unusual amts. of fat. C. V. BAILEY

**Effect of hydroquinone in vitamin A deficiency.** HOWARD H. BEARD, ELIZABETH POMIERNE AND REGINALD A. SHIPLEY. *Proc. Soc. Exptl. Biol. Med.* 26, 328-9(1929).—Rats were fed a diet free from vitamin A and each day were given by mouth 5 drops of a soln. of hydroquinone equiv. to 7 mg. of the phenol. Others were given the diet plus 0.1 g. of hydroquinone per 100 g. of food. The phenol had no effect in preventing loss of wt., ophthalmia and death. C. V. BAILEY

**Influence of epinephrine on blood-sugar utilization of functionally hepatectomized rats.** CARL F. CORI AND GERTY T. CORI. *Proc. Soc. Exptl. Biol. Med.* 26, 345-7(1929).—Rats that have fasted for 24 hrs. contain  $5.8 \pm 1.4$  mg. of liver glycogen per 100 g. rat. The tolerance limit for intravenously injected glucose is at a rate of 250 mg. per 100 g. rat per hr. When 0.03 mg. of epinephrine is injected subcutaneously and glucose supplied at a rate of only 100 mg. per 100 g. rat per hour, 75% of the injected glucose remains unutilized in the blood and body fluids. In functionally hepatectomized rats the sugar and lactic acid contents of the blood were higher after glucose plus epinephrine than after glucose alone. The results are attributed to the inhibiting action of epinephrine upon the utilization of glucose in the tissues. C. V. BAILEY

**Fundamental food requirements for growth of rat.** L. S. PALMER AND CORNELIA KENNEDY. *Proc. Soc. Exptl. Biol. Med.* 26, 427-30(1929).—Rats were fed diets contg. various amts. of fat without lettuce or liver supplements and the efficiency of the food utilization was studied. The results do not support the postulation of Evans and Burr of an essential growth vitamin F associated with fat. C. V. BAILEY

**Influence of superheating on antirachitic properties of irradiated foods.** AMY L. DANIELS AND DOROTHY JORDAN. *Proc. Soc. Exptl. Biol. Med.* 26, 453-5(1929).—A comparison was made over a period of 10 weeks of rats receiving a rachitic ration with rats receiving similar rations irradiated, and an irradiated ration subsequently autoclaved at 15 lb. for 6 hrs. Similar tests were made with the addn. to the diet of boiled milk and in other tests evapd. milk. Superheating, as in this expt., does not affect the antirachitic properties of food. C. V. BAILEY

**An attempt to secure "refection" in rats.** LAFAYETTE B. MENDEL AND HUBERT B. VICKERY. *Proc. Soc. Exptl. Biol. Med.* 26, 552-5(1929).—The authors failed to reproduce the "refection" reported by Fridericia, *et al.* (cf. *C. A.* 22, 1383). C. V. B.

**Effect of feeding whale oil on the depot fat of the white rat.** J. B. BROWN AND A. L. RAWLINS. *Proc. Soc. Exptl. Biol. Med.* 26, 704-5(1929).—Equil. between food fat and depot fat is established within 4-6 weeks on a given diet. The characteristic highly unsatd. fatty acids of whale oil are apparently deposited as such and when once stored are removed slowly; a considerable quantity remained in the depot fat 3 weeks after the resumption of the control diet. C. V. BAILEY

**Vitamin A as an anti-infective agent.** F. MELLANBY AND H. N. GREEN. *Brit. Med. J.* 1929, I, 984-6.—Treatment of 5 cases of puerperal septicemia with prepn. rich in vitamin A resulted in complete recoveries. Vitamin A raises the body resistance against infective microorganisms. J. B. BROWN

**The influence of diet on blood sugar regulation.** E. GEIGER AND HILDE KROFF. *Arch. exptl. Path. u. Pharmacol.* 139, 290-301(1929).—Alimentary blood sugar curves were much lower after feeding oats than after a green fodder diet. Such curves were

raised by the addn. of acid to the green fodder diet, but lowered by the addn. of alkali. The decreased sugar tolerance after a green fodder diet is not due to lack of glycogen in the liver. The increased sugar tolerance after an oats diet is decreased by the addn. of acid to the diet.

**The importance of inorganic compounds for animal nutrition.** A. SCHÜNBERT. *Mitt. deut. Landw.* 44, 336-42(1929).—A review, with special reference to German agricultural conditions.

**The occurrence of vitamin A in blood and blood serum of domestic animals, in cow milk, milk products and in some feeds.** BIRGER RÖSIÖ. *Z. physiol. Chem.* 182, 289-304(1929).—Detns. of vitamin A content were made with  $\text{CHCl}_3$  exts. of the materials examd., using the  $\text{SbCl}_3$  color reaction and the Lovibond tintometer. Blood serum from a no. of animals was examd. to det. whether quant. differences in reactivity to  $\text{SbCl}_3$  might be due to such factors as species, age, sex and pregnancy. On the basis of this reaction it appears that the blood of cattle contains more vitamin-A (or carotinoid) than that of horses, and that of pregnant more than that of non-pregnant females. From birth to old age there is a steady decrease in vitamin-A content except during periods of pregnancy. Cream from the milk of different breeds of cows was examd. in the same way. The best grades of milk gave the strongest reactions. Less reactive were certain feeds, e. g., turnips, beets, mangold and soy meal.

**Calcium and phosphorus metabolism in dairy cows. III. The adequate ration for high-producing cows and the effect of exercise on calcium, phosphorus and nitrogen balances.** WM. A. TURNER AND ARTHUR M. HARTMAN. *J. Nutrition* 1, 445-54(1929); cf. *C. A.* 20, 2694.—Two cows receiving a high quality, dry ration consisting of well-cured alfalfa hay, mangel beets and a good grain mixt. (Ca/P ratio 1.09-1.19), and yielding 27 and 22 kg. of milk daily, remained in prevailing neg. Ca and P balances throughout a 7 weeks' period. This occurred in the early part of the lactation period. During the last 3 weeks of the expt. the introduction daily of  $\frac{1}{2}$  hr. of exercise produced slight and probably insignificant effects on the Ca and P metabolism but a very marked effect on N metabolism. Without allowing for exercise, the animals received 5% more than their energy requirements calcd. on the basis of the Savage standard.

**The effect of heat on the antineuritic vitamin of milk.** AMY L. DANIELS, MATE L. GIDDINGS AND DOROTHY JORDAN. *J. Nutrition* 1, 455-66(1929).—The object was to test the vitamin B potency in dried (spray and roller), canned, boiled, and pasteurized (open and closed methods) milk, since all of these preps. are used in infant feeding. With the exception of the milk dried by the roller process, all the super-heated milks gave evidence of considerable destruction of vitamin B. The results with the open-method pasteurized milk also showed a slight loss of vitamin; this was much less, however, than in either evapd. or milk dried by the spray process. Milk pasteurized by the closed method gave no evidence of vitamin-B destruction. Milk heated quickly to the b. p. and slowly cooled was affected approx. to the same degree as open-tank pasteurized milk. If boiled quickly and rapidly cooled, milk loses little or none of its vitamin-B potency. Temp. and aeration are important factors in detg. the degree of destruction of vitamin B in milk.

**Chemical detection of vitamin C.** B. GLASSMANN AND A. POSDEW. *Z. Untersuch. Lebens.* 17, 191-200(1929).—A close relationship was found between color produced by the Bezssonow phosphomolybdotungstic acid reagent (*C. A.* 18, 2191, 3207) and the carbohydrate content of a no. of fruit juices contg. vitamin C. Tannins seriously interfere with the test. Juices contg. from 0.5 to 1.5 mg. of tannic acid in 10 cc. gave a color similar to that of the hydroquinone. Conclusion: Animal expts. are at present the only reliable means of detg. the antiscorbutic properties of foods.

**The vitamin C content of fresh and frozen milk.** WALTER SALECK. *Milchwirt. schaft. Forsch.* 6, 464-85(1928).—S. finds that it requires between 10 and 15% of body wt. of fresh milk to protect guinea pigs against scurvy but over 15% of the same milk after freezing.

**Vitamin D from sterols of mummified Egyptian brain.** HAROLD KING, OTTO ROSENHEIM AND ARTHUR WEBSTER. *Biochem. J.* 23, 166-7(1929).—The authors prepd. cholesterol esters from the brain of the mummy. The esters showed the blue color with  $\text{CCl}_4\text{CO}_2\text{H}$  said to be sp. for ergosterol (cf. Rosenheim, *C. A.* 23, 2733); they also gave a green color with Br soln. when dissolved in  $\text{CHCl}_3$ , a reaction said to be characteristic for ergosterol and not given by pure cholesterol (cf. Häussler and Branchli, *C. A.* 23, 2735). The absorption spectrum of ergosterol (280-290 $\mu$ ) was also obtained. Antirachitic action was obtained by irradiating these esters and feeding them to rats.

**Effect of excessive doses of irradiated ergosterol on the calcium and phosphorus**

content of the blood. LESLIE J. HARRIS AND CORBETT P. STEWART. *Biochem. J.* 23, 206-9(1929).—In the young rat, the administration of a complete synthetic diet (normal Ca-P ratio) contg. 0.1% of irradiated ergosterol was followed by a 50% increase of inorg. phosphate and a 25% increase of serum Ca. In adult rabbits on a normal mixed diet, the administration of 10 mg. *per diem* of irradiated ergosterol per animal gave rise to a 50% increase in the inorg. phosphate, but to no significant increase in Ca, although abnormal deposits of Ca had already appeared in the body. BENJAMIN HARROW

Hypervitaminosis and vitamin balance. II. The specificity of vitamin D in irradiated ergosterol poisoning. III. The pathology of hypervitaminosis D. LESLIE JULIUS HARRIS AND THOMAS MOORE. *Biochem. J.* 23, 261-73(1929); cf. *C. A.* 23, 1937.—Excessive vitamin D induces a condition of specific hypervitaminosis. "Radiostol"—a commercial prepn.—activated in oil, and irradiated ergosterol, activated in alcohol, when fed at the same vitamin D levels produced hypervitaminosis of the same degree of severity. Death from hypervitaminosis D results in enormous deposits of Ca in kidneys, heart musculature, etc., and in presence of urinary calculi. In exptl. hypervitaminosis there is a tendency toward diminished  $p_H$  of feces, diminished heart rate and, at death, atrophy of the thymus. BENJAMIN HARROW

Further studies of the chemical nature of vitamin A. JACK CECIL DRUMMOND AND LESLIE CHARLES BAKER. *Biochem. J.* 23, 274-91(1929); cf. *C. A.* 20, 1816.—Vitamin A is present in liver-oil concentrates in amounts so minute that direct attempts at its isolation by the ordinary chem. methods are of little use. BENJAMIN HARROW

Mineral hunger in sheep. Successful treatment by pellet-feeding method. B. C. ASTON. *New Zealand J. Agr.* 38, 10-6(1929).—Formulas are given for the prepn. of pellets, composed primarily of inorg. compds., for use as mineral supplements for sheep grazing on (1) areas deficient in Ca, (2) Fe-deficient pumice soils and (3) areas where a general mineral deficiency exists in the soils and vegetation. K. D. JACOB

High protein content of pasture. B. C. ASTON. *New Zealand J. Agr.* 38, 97-8(1929).—A brief review is given of the apparent relation of high-protein pastures to breeding difficulties in cattle, as indicated by the work of other investigators. K. D. JACOB

Whey paste as a pig food. M. J. SCOTT AND R. W. GRAHAM. *New Zealand J. Agr.* 38, 112-4(1929).—Pigs fed on whey scoured badly appeared to suffer much from cold and grew very hairy, but in general made satisfactory growth after reaching a wt. of 70 lb. Better results were obtained by supplementing the daily ration with 0.5 lb. of meat meal. Young pigs did not thrive on whey alone. The compn. of the solid and liquid portions of the whey was: dry matter 58 and 45, protein 6.6 and 5.2, chlorides (as NaCl) 2.4 and 2.1 and acidity (as HCl) 0.7 and 0.8%, resp. K. D. JACOB

Grape sugar as diet. A. BICKEL. *Arch. Verdauungs-Krankh.* 45, 16-9(1929).—Grape sugar is a slightly weaker secretory excitant than beet sugar. "Maizena" added to cow milk gives rise to a fine flocculent coagulum of the milk during gastric digestion. FRANCES KRASNOW

A new deficiency disease produced by the rigid exclusion of fat from the diet. GEORGE O. BURR AND MILDRED M. BURR. *J. Biol. Chem.* 82, 345-67(1929).—The data presented apparently "definitely settle the uncertainty as to the necessity for fats in the diet of the rat and prove not only that ingested fats have a beneficial effect upon the animal but that under the exptl. conditions used they are essential constituents of the diet. When dietary fats are reduced below a certain minimum, the rat develops a characteristic disease and dies at an early age." The disease is characterized by a caudal necrosis and is readily prevented or cured by the addn. of 2% of fatty acid to the diet. The non-saponifiable fraction of fats and also glycerol are ineffective. As little as 3 drops of fat daily has a measurable beneficial effect. With fat-free basal rations, storage fat can be almost entirely eliminated and it seems probable that the amt. of body fat can be controlled over a wide range by the addn. of minute quantities of fat to the diet. "If the effect is not due to the ordinary fatty acids, then we must look for a new substance of the nature of an  $Et_2O$ -sol. org. acid which must be present in exceedingly small amts. This acid would be classed as a vitamin until its isolation permitted the assigning of a definite chem. formula and name. No conclusion can be drawn from the data at hand and for the present this dietary deficiency will be spoken of as due to the absence from the diet of the acids present in fats." The fat-free diet used contained especially prepd. and purified casein, sucrose, a salt. mixt., vitamin B from extd. yeast and vitamins A and D from the non-saponifiable matter from high-grade cod-liver oil. A. P. L.

Physiology of the vitamins. VII. Hemoglobin, solids, sugar and chloride changes in the blood of vitamin-B-deficient dogs. C. J. STUCKY AND W. B. ROSE. *Am. J. Physiol.* 89, 1-17(1929); cf. *C. A.* 23, 3734.—Vitamin-B(2 or more factors)-deficient dogs

showed a somewhat greater degree of anhydremia than was noted in control dogs. In the advanced stages of vitamin-B deficiency hemoglobin increased 13.7%, blood total solids increased 5.7% and after the administration of vitamin B to the polyneuritic dogs, hemoglobin decreased 21.5% and total solids decreased 15.1%. Blood sugar and blood chlorides were essentially alike in the vitamin-B-deficient dogs and in the controls. There is evidence that vitamin B influences the  $H_2O$  intake of the animal. J. F. L.

**The nutrition of the white mouse. V. The experimental production of rickets in mice.** H. H. BEARD and ELIZABETH POMERENE. *Am. J. Physiol.* **89**, 54-7(1929).—Mice fed the Osborne, Mendel and Park diet with a low P-high Ca salt mixt showed definite rickets at the end of 7 days with evidence of spontaneous healing after 28 days. Similar results were obtained with the diet 2965 of Steenbock and Black. Osteoporosis was present in many cases, especially after healing had taken place. J. F. LYMAN

**Changes in the serum calcium of cats during fasting.** S. MORGULIS and ANNE M. PERLEY. *Am. J. Physiol.* **89**, 213-4(1929); cf. *C. A.* **23**, 3959.—Serum Ca remained unchanged in cats during the early fasting periods, and diminished only in the more advanced stages. J. F. LYMAN

**Changes in the bones of rats fed various diets.** MEIJIRO SAKURAI. *Sen i-kwai Med. J.* **48**, No. 3, 78-111, Abstract sect., 7-9(1929); cf. *C. A.* **23**, 3960.—The rib bones of albino rats reared upon diets commonly used for feeding horses were studied histologically. Group 1, fed a mixt. of barley 150, ground meat residue 30, starch 20 and NaCl 2 (contains enough vitamin A and P but deficient in Ca) developed rickets. A drop of cod-liver oil fed every other day made no difference. When this diet was supplemented with  $CaCO_3$ , so that the Ca/P ratio became 1/0.67, the bone development was normal. If the Ca value was increased to 5 times the above the bones showed porosity. This same high Ca diet produced slightly porous bones even when cod liver oil was fed. Group 2, fed a ration of oats 150, meat residue 30, starch 20 and NaCl 2, developed the bone changes of rickets. Supplements of cod-liver oil and Ca produced the same results as those in group 1. Group 3, fed a diet of wheat bran 100, meat residue 30, starch 70 and NaCl 2 (the Ca, P and vitamin A contents are identical with those of the preceding diet), also developed rickets. Cod-liver oil supplement in this case produced a normal bone, however. S. concludes that bran is more favorable for bone development than oats. C. M. McCAY

**Azotemia as a consequence of salt deficiency.** LEON BLUM, P. GRABAR and VAN CAULAERT. *Presse méd.* **36**, 1411-3(1928).—A deficiency in salt effects a decrease of the mol. concn.; this is compensated by an increase in urea. A. F. MEYER

**The vitamins in medicine.** CARLOS P. MATHEU. *Semana méd.* (Buenos Aires) **35**, 977-82(1928). A. F. MEYER

**Gossypol, progress report.** E. P. CLARK. *Oil & Fat Ind.* **6**, No. 7, 15-9(1929), cf. *C. A.* **23**, 2944.—White rats respond to the toxic action of gossypol, and may be used to det. physiologically the free gossypol content of cottonseed meal. Growth rates of rats fed upon diets contg. high levels of cottonseed meal are accelerated by a protein supplement. The growth rates are also influenced by the compn. of an added mineral supplement. Bound gossypol has no influence upon the growth rate of rats. Rats fed on autoclaved cottonseed meal prepd. by the Menaul process show growth rates inferior to those obtained with untreated meal. In live stock feeding the proper method of using cottonseed meal apparently is as a protein supplement. E. SCHERUBEL

**The digestibility and metabolizable energy of soy-bean products for sheep.** T. S. HAMILTON, H. H. MITCHELL and W. G. KAMMLADE. *Illinois Sta. Bull.* **303**, 237-95 (1928).—Digestion coeffs. apply to the edible portion of the feed only, and should not be used in connection with wts. of feed offered in computing the digestible nutrients of rations. Such coeffs. do not have a general applicability, since the inedible portion of the roughage will vary with the conditions under which it was grown or prepd. for the animal. Soy-bean straw and soy-bean hay are roughages of this character, and the use of the digestion coeffs. and metabolizable energy values obtained for them must be tempered by the above considerations. E. F. SNYDER

**The formation of creatine at the expense of protein substances.** EMILE F. TERROINE and P. DANMANVILLE. *Compt. rend.* **188**, 1439-41(1929); cf. Terroine and Mahler-Mendler, *C. A.* **22**, 973.—Expts. on pigs lead to the conclusion that in the course of growth alimentary protein material causes a formation of creatine which is the greater the smaller the N retention following its absorption. The classification of proteins according to their creatinogenic value is exactly inverse to their classification according to biol. value. G. TOENNIES

**Factors influencing calcium balance.** VERSA V. COLE, JOHN H. SPEER and FRED W. HEVL. *J. Am. Pharm. Assoc.* **18**, 36-42(1929).—For rats the amount of Ca barely

able to keep equil. in a Ca-deficient diet was about 4 to 5 mg. given as lactate. At this level the influence of systemic alk. on Ca, P and Mg balance was studied. With  $\text{CaCO}_3$  the animal came into equil. at about the same rate. This salt produces a better utilization of P than the lactate. Small addns. of alkali citrate to the Ca lactate induced better utilization of Ca and P. Alky. probably favorably influenced the Mg balances.

I. E. WARREN

Ultra-violet irradiation of food on a tonnage basis (DORCAS) 12.

## F—PHYSIOLOGY

E. K. MARSHALL, JR.

**Influence of spinach on gastric secretion.** KARL HANG. *Arch. Verdauungs-Krankh.* 45, 20-43 (1929).—A soup from 100 g. spinach produces an extraordinarily large rise of the HCl in 11 out of 15 cases. The increase in acid and quantity of secretion is not as great in hyperacidity as in hypo- or normal acidity. The aqueous ext. from 100 g. of spinach produced increased acid secretion in 8 out of 9 cases. The influence of the spinach remained unaffected by atropine. After a caffeine test drink, 2 of 4 anacidity cases showed free HCl, and one showed a higher value than that obtained after histamine. Spinach feeding is indicated in cases of hypo- or anacidity, but contraindicated in hyperacidity.

FRANCES KRASNOW

**Summit metabolism.** G. GIAJA. *Compt. rend. soc. biol.* 101, No. 23, 3-23 (1929).—A review. There is an extensive bibliography.

B. C. BRUNSTETTER

**A histologic study of the formation of bile pigment.** K. O. HALDEMAN. *Arch. Path.* 7, 993-1011 (1929).—The Berlin blue method for the demonstration of Fe-contg. pigment in the tissues provides a means of identifying the cells that are concerned with at least one stage of the conversion of hemoglobin into bilirubin. The intravenous injection of hemoglobin in dogs is often followed within an hour by a striking increase in the number of droplets of Fe-contg. pigment in the reticular cells of the bone-marrow and occasionally by a moderate increase in such pigment in the stellate cells of the liver. The connective tissue macrophages, or histocytes, are probably responsible for the local formation of bilirubin resulting from the injection of hemoglobin into the pleural cavity or under the scalp. The cells that contain an increased amount of Fe are all a part of the reticulo-endothelial system. Bone-marrow plays the major role in the formation of bilirubin with the liver, spleen and possibly the lymph nodes having a lesser part in this process.

HARRIET F. HOLMES

**The lactic acid in the blood.** F. MUSANTE. *Fol. clin. chim. microscop.* 1, No. 6; *Rev. sudamericana endocrinol., inmunol., quimioterap.* 12, 406-11 (1929).—The origin and transformation of lactic acid in the blood are discussed, a method of its detn. is given, and its role in the normal and abnormal organism explained.

A. E. MEYER

**TRENDELENBURG, PAUL: Die Hormone. Band I. Keimdrusen, Hypophyse, Nebennieren.** Berlin: J. Springer. 351 pp. M. 28; Linen, M. 29.60.

## G—PATHOLOGY

H. GIDEON WELLS

**Enzymes in the fluid of ovarian cysts.** I. Amylase. T. TACHIBANA. *J. Kinki Gynaecol. Soc.* 10, 1-14 (1927).

B. C. A.

**Splenic substance in Gaucher's disease.** F. EPSTEIN AND H. LIEB. *Klin. Wochschr.* 7, 1085 (1928).—Examination of the spleen in Gaucher's disease has never revealed the presence of cerebrin (phrenosin) as well as kersin (cf. *C. A.* 22, 3692).

B. C. A.

**Sugar tolerance in arthritis.** I. Chronic infectious arthritis. BENJAMIN H. ARCHER. *Arch. Internal Med.* 44, 37-46 (1929).—In 20 typical cases of chronic infectious arthritis no evidence was found of diminished sugar tolerance.

J. B. BROWN

**The reducing power of blood serum.** GIULIO BUCCIARDI. *Biochim. terap. sper.* 16, 196-204 (1929).—The reducing power of serum filtrates freed from proteins by the usual method was detd. (a) before hydrolysis and (b) after hydrolysis with 1.7% HCl for 20 min. at 120°; a gave the free sugar and b-a the potential sugar. (c) The reducing power of whole serum was detd. after hydrolysis with 1.7% HCl (total sugars); c-b gave the protein sugar. In the blood serum of diabetics there was no const. relation in the distribution of sugar among the various fractions. The administration of insulin to diabetics diminished the free sugar in the serum, slightly increased the potential and protein sugar and decreased the total sugar.

PETER MASUCCI

The cure of experimental pancreatic diabetes by surgical enervation of the suprarenal glands. A. CIMINATA. *Boll. soc. ital. biol. sper.* 3, 1251-60(1928).—The diabetic symptoms shown by depancreatized dogs disappear by surgical enervation of the suprarenal glands. Glucemia diminishes, glucosuria disappears, the threshold tolerance for carbohydrates increases and the dogs gain wt. even though the animals receive a mixed diet contg. carbohydrates.

Blood chemistry in eclampsia. Studies on uric acid. O. M. BERNARDI. *Boll. soc. ital. biol. sper.* 3, 1261-6(1928); cf. *C. A.* 23, 3509.—The av. uric acid content in the blood of normal women kept on a normal diet was 2.33 mg. %; that of normal pregnant women was 2.44 mg. %; and that of eclamptic women was 4.27 mg. %. P. M.

The relation between hypochloremia and vomiting. C. CIPRIANI AND G. C. DOGLIOTTI. *Boll. soc. ital. biol. sper.* 4, 308-9(1929).—Two clinical cases were studied. The hypochloremia met with in intestinal obstruction is to be attributed not to vomiting but to a state of intoxication which damages the regulating mechanism of chloride equilibrium.

Studies on oxalic metabolism. IV. The elimination of oxalic acid in certain forms of hyperglucemia. P. DE LUCIA. *Boll. soc. ital. biol. sper.* 4, 356-9(1929); cf. *C. A.* 23, 3971.—Hyperglucemia was induced in dogs by the administration of glucose *per os* or by subcutaneous injection, and by subcutaneous injection of adrenaline. There was a hyperoxaluria in hyperglucemia regardless of how it was provoked; the greater the hyperglucemia the greater the amt. of oxalic acid eliminated.

The nature of immunity. VI. The specific hyperreceptivity of tumors. AMILCARE ZIRONI. *Boll. soc. ital. biol. sper.* 4, 374-5(1929).—A theoretical discussion in which Z. advances the hypothesis that the complete removal of a tumor gives rise to a state of immunity and that the incomplete removal leaves behind a state of increased receptivity.

The cellular immunity and its influence on the pharmacodynamic action of cobra poison. J. SAINATI. *Inaugural thesis, Sao Paulo* (1928); *Rev. sudamericana endocrinol., immunol., quimioterap.* 12, 461(1929).—The poison of *Lachesis lanceolatus* has a stimulating action on the smooth muscle of the rabbit; in rabbits previously immunized against the poison no stimulation of the muscle was observed. The immunity is not only a humoral but also a cellular one.

Uric acid and calcium in the different stages of gout and rheumatism. F. RATHERY AND P. L. VIOLE. *Presse méd.* 36, 1073-5(1928).—Normal plasma contains 40-50 mg. uric acid per l. and 100 mg. Ca. The urinary elimination is 450-500 mg. for uric acid and 140 for Ca in 24 hrs. In myelogenous leukemia the uric acid in the plasma is unchanged, but the elimination is increased to 1.6 g. The elimination of Ca is lower. The uric acid in the plasma is low in acute gout and it decreases more, while the elimination is high; it has its origin in the tissues. The elimination of Ca is first low and increases during the attack to above normal; then it decreases again, when the uric acid is still increasing. In subacute gout the conditions of uric acid are the same, but less pronounced; Ca elimination is above normal. In chronic gout the uric acid in urine is high, Ca changing. In rheumatism no rules could be established.

Alkalosis and alkaline diathesis. R. GOIFFON. *Presse méd.* 36, 1109-11(1928).—A deflection toward higher alk. in the humors influences almost every organ in its activity or in the perfection of exchanges.

The physicochemical conditions of blood serum during nephritis. PR. MERKLEN, J. CHAUMERLIAC, J. GUILLAUME AND Mlle. ACHARD. *Presse méd.* 36, 1169-72(1928).—Variations of the Cl content in the plasma in the different forms of nephritis are described. A decrease in Cl is accompanied by an increase in uric acid. If the uric acid is const., an increase of the electrolyte exerts a decrease of the dissozn.

The magnesium halides and cancer. PIERRE DELBET. *Presse méd.* 36, 1473-7(1928).—Mg salts are recommended for cancer prophylaxis.

The physicochemical relationships of the diphtheria bacillus to the proteins of the animal organism. II. The toxic properties of the protein fractions and the biochemical formation of diphtheria toxin. V. N. KRISHANOVSKII. *Centr. Bakt. Parasitenk.* I Abt., 112, 161-75(1929); cf. *C. A.* 23, 1678.—The diphtheria bacillus reacts with the proteins in the medium surrounding it. A portion of the diphtheria bacillus of unknown chem. constitution, called the virulence factor, produces the strongest toxin. This factor has an affinity for fibrinoglobulin and to a less extent for albumin. Another fraction of the bacillus called the toxogenic factor can produce strong toxin from albumin. Hence virulence depends on the amt. of these factors in the cell plus the presence of fibrinoglobulin and albumin in the surrounding medium. Thus the yield of toxin depends on the physicochem. structure of the bacterial cell and the medium.

JOHN T. MYERS

**Arterial carbon dioxide pressure in cardiac dyspnea.** F. R. FRASER, C. F. HARRIS, R. HILTON AND G. C. LINDER. *Quart. J. Med.* 22, 1-20(1929).—In cardiac dyspnea there must be a stimulus at the cardiac center independent of the quality of the blood at the center which causes increased pulmonary ventilation with a lowering of the arterial  $\text{CO}_2$  pressure. The stimulus may be due to low O tension of the tissues in the center, the result of lowered minute vol. of the circulation. In pulmonary disease or severe congestion, in addn. to heart failure, the  $\text{CO}_2$  pressure is raised, because of inefficient pulmonary ventilation or gaseous exchange. This may mask the effect of the additional stimulus, because of the added  $\text{CO}_2$  stimulus at the respiratory center. In one case there was evidence of retention of non-volatile acids causing increased H-ion concn. and low arterial  $\text{CO}_2$ .

JOHN T. MYERS

**d-Lactic acid in the gastric juice.** TOKUYA KUBO. Kyoto Imp. Univ. *J. Kyoto Prefectural Med. Coll.* 2, 261-92(1928).—K. collected a large quantity of gastric juice from patients with various stomach diseases, prepd. Zn and Li lactates from the lactic acid contained in it and measured their optical rotation and the content of the  $\text{H}_2\text{O}$  of crystn. He found that d-lactic and inactive lactic acids are present as a mixt. Then he detd. the kind and quantity of lactic acid present in the stomach in gastric cancer, with 5 kinds of gastric juice classified according to acidity. In the stomach unaffected with cancer, the usual acid is only the fermented lactic acid, although lactic acid is almost always found if the acidity is larger than 20. In the stomach affected with cancer, calcn. from the rotatory power and the  $\text{H}_2\text{O}$  of crystn. of the Zn lactate shows that in usual cases  $\frac{1}{3}$  of the ordinary lactic acid is composed of d-lactic acid. That lactic acid contained in the stomach affected with cancer is independent of the acidity of the gastric juice or the presence or the absence of any food residue in the stomach was proved to be true even in the case of the patient to whom only  $\text{H}_2\text{O}$  was given. Hence, K. infers that the presence of d-lactic acid is peculiar to the stomach affected with cancer, and that this acid probably comes from the involved portion of the inner stomach wall. K. SOMEYA

**The cholesterol in pathological liquids.** BONNAMOUR, REVOL AND MISS ROUCHÉ. *J. méd. Lyon* 4, 5(1928); *Rev. prat. biol.* 21, 242-3.—The quant. distribution of cholesterol in various liquids and the pathol. conclusions to be derived from it are discussed.

G. TOENNIES

**Carbohydrate metabolism in eclampsia.** H. J. STANDER AND E. P. HARRISON, JR. *Am. J. Obstet. Gynecol.* 17, 17-27(1929).—There is a tendency toward hyperglucemia in most cases of eclampsia. In general the blood-sugar level remains fairly const. throughout the disease. Following eclamptic convulsions there is a slight rise in blood sugar. A patient may have such convulsions with the blood sugar at different levels and these levels are not greatly disturbed by the convulsions.

R. C. WILLSON

**Fluctuations in blood sugar during eclampsia. III. The relationship between the blood plasma sugar and the corpuscular sugar variations in eclampsia as shown by serial curves. Preliminary report.** PAUL TITUS AND E. W. WILLETTTS. *Am. J. Obstet. and Gynecol.* 17, 27-35(1929).—It is suggested that fractional blood-sugar values be detd., the sugar of the blood plasma and that of the corpuscles being considered separately. Preliminary results indicate that the circulating sugar which is most mobile or most readily available is in the plasma and that it is not until the corpuscles are deprived of their sugar that a convulsion occurs. The first evidence of recovery is an increase in plasma sugar; after this the plasma sugar values subside as the corpuscular sugar increases. These fluctuations and the eclamptic convulsions can be stopped at any point by the hypodermic administration of morphine and the intravenous administration of dextrose solns. **IV. Analysis of Titus-Willetts data to determine effects of anticoagulant on plasma-volume and cell-volume relationships.** H. D. LIGHTBODY. *Ibid* 36-7.—The variations in the reported sugar values for cell and plasma cannot be accounted for by alteration in cell vol. due to the use of varying amts. of salt anticoagulant provided the cell existence as a suspended particle is maintained.

R. C. W.

**An iodine survey of Nebraska.** W. H. ADOLPH AND F. J. FROCHASKA. *J. Am. Med. Assoc.* 92, 2158-60(1929).—I content of Nebraska water supplies was 8.8-30.0 parts per 100 billion; that of soils was 0-15 part per 100 billion. I content of foods compared favorably with the amts. found in non-goitrous regions.

R. C. WILLSON

**Importance of chlorides in the chemical semeiology of the cerebrospinal fluid in diseases of the nervous system in infants.** P. BOSIO AND G. B. SEGREZZO. *Riv. clin. pediatrica* 27, 203-19(1929); *J. Am. Med. Assoc.* 93, 244.—By estg. 7.22 g. per l. as the normal Cl value, there is an early and marked diminution in tuberculous meningitis (6.7-5.7). This decrease is less marked in other forms of meningitis. In cerebrospinal meningitis the Cl value rose to normal in direct proportion to the patient's improvement.

R. C. WILLSON

The specific dynamic action of protein in relation to mental diseases. K. E. APPEL AND C. B. FARR. *J. Nervous and Mental Diseases* 70, 43-50(1929).—In a series of 28 cases (26 with miscellaneous psychoses and neuroses) diminution of the sp. dynamic action of protein was found in 5 (1 early uncomplicated dementia precox, 4 toxic or nutritional factors). Other cases showed normal reactions.

The amino acid content of the blood in leucemia. ERNST WIECHMANN. *Munch. med. Wochschr.* 75, 1115-6(1928).—In leucemia the content of amino acids is normal in the plasma and erythrocytes and high in the leucocytes.

R. C. WILLSON

R. C. WILLSON

## H—PHARMACOLOGY

A. N. RICHARDS

Opium addiction. VI. The effect of abrupt withdrawal followed by readministration of morphine in human addicts, with special reference to the composition of the blood, the circulation and the metabolism. ARTHUR B. LIGHT AND EDWARD G. TORRANCE. *Arch. Internal Med.* 44, 1-16(1929).—In 4 cases 24-hour withdrawal resulted in mild symptoms and only negligible changes in basal metabolic rate. In 10 cases of 48-hour withdrawal severe symptoms resulted, with leucocytosis concn. of the blood and slight rise in cholesterol. In two cases albuminuria occurred. Blood  $pH$ , urea N and sugar did not change. The changes following readministration of the drug were also studied.

J. B. BROWN

The effect of calcium, potassium, and sodium chlorides and potassium and sodium citrates in certain cases of delayed healing. W. L. T. ADDISON. *Can. Med. Assoc. J.* 18, 700-2(1928).

A. T. CAMERON

Symptoms of nitrous oxide—oxygen anesthesia. THOMAS C. BONNEY. *Dental Cosmos* 71, 805-9(1929).

JOSEPH S. HEPBURN

The hepatotoxic action of the derivatives of phenylquinoline. RODOLFO DASSEN. *Semana méd.* (Buenos Aires) 36, 368-71(1929).—Cinchophen, atophanyl and atoquinal produce liver poisoning and jaundice in cases of insufficiency of the kidneys. The treatment consists in intravenous injection of a soln. of dextrose and insulin.

A. E. M.

A new substance for the treatment of tuberculous abscesses. ARESKY AMORIM. *Semana méd.* (Buenos Aires) 36, 403-16(1929).—Colloidal *Cu morrhuate* (Gadusan) was used with success.

A. E. MEYER

Purinopoiesis and purinolysis (uricopoiesis and uricolysis) produced by radioactive salts. SIMÓN LIBEDINSKY. *Semana méd.* (Buenos Aires) 36, 417-20(1929).—The injection of radioactive salts produces leucemia and consequently a large increase of purine derivs. in the urine. The fresh urine reduces Fehling soln. in the cold, but no more after some days. This is due to the presence of adenine, which later is oxidized to uric acid. A description of the *prepn. of adenine from tea leaves* is given. It reduces cold Fehling soln.

A. E. MEYER

Synthalin in the treatment of diabetes. B. VARELA FUENTES AND P. RUBINO. *Semana méd.* (Buenos Aires) 36, 1416-26(1929).—The glucosuria is reduced by synthalin, but it has no marked influence on the hyperglucemia. The max. dose for adults is 25 mg. daily. It exerts an injurious action on the liver.

A. E. MEYER

The avertine anesthesia. A. GALINDEZ AND I. GONÍ MORENO. *Semana méd.* (Buenos Aires) 36, 1637-43(1929).—Avertine gave good results in rectal application. In the case of decompn. of the substance, HBr is developed, which presents a serious danger.

A. E. MEYER

Further studies on the influence of electrolytes on the effectiveness of specific diuretics and on the normal secretion of urine. DANIEL BERGER. *Biochem. Z.* 209, 218-35(1929).—Filling the peritoneal cavity with 100 cc. of 1-2% urea soln. causes a powerful inhibition on the diuretic action of a sp. diuretic. The addn. of electrolytes to the urea soln. injected intraperitoneally depending upon the concn. at once restores the effectiveness of the sp. diuretic. Intraperitoneal injection of a 2% urea soln. without the diuretic eufhylline exerts a very negligible diuretic action in spite of the increased  $H_2O$  and urea content of the organism. The evidence therefore supports the view that the effectiveness of a sp. diuretic depends upon the electrolyte migration from blood into the tissues in the mobilization of water and the extreme sensitivity of kidney cells to these changes. This also applies to normal secretion of urine.

S. MORGULIS

Studies on the action of insulin together with cyanic acid. NOBUO HOSODA. *J. Biochem.* (Japan) 10, 383-8(1929).—Intravenous injection of KCN causes hyperglucemia in the rabbit. By the administration of insulin the hyperglucemia can be reduced to the normal level or even below that.

S. MORGULIS

Drugs from the Kamerun region. II. Dimone, bulule and meninga remedies



against snake bite and dysentery. C. G. SANTESSON. *Skand. Arch. Physiol.* 57, 1-11(1929).—Dimone is the leaf of a plant identified as *Jatropha strigosa*, a water decoction of which is used against snake bite. It contains some glucosic non-toxic substances but no demonstrable alkaloids, and chem. as well as physiol. studies fail to show any reason for its therapeutic action. Bulule is the bark of a large tree, *Kigelia acutifolia*, and is used in conjunction with dimone against snake bite. This likewise contains only a non-toxic glucoside but no alkaloids or tannins. This last fact is particularly significant because the bark is used as an adjunct to meninga as a remedy against dysentery. The meninga is likewise a bark but of an unknown tree, and aside from a harmless glucoside seems to contain no other substance. S. MORGULIS

Effect of the cinchona alkaloids on the sympathico-motor innervation of the rabbit uterus. TORSTEN STAKE. *Skand. Arch. Physiol.* 57, 52-76(1929).—The various cinchona alkaloids in very small doses increase the automatism and raise slightly the tonus of the uterus. In somewhat larger doses these substances produce inhibition and finally paralysis of the uterine contractions. This effect is generally not reversible, and the uterus does not respond even to  $\text{BaCl}_2$ . In large doses quinine causes an inversion of the adrenaline effect, which is now inhibitory, so that quinine must paralyze the sympathetic motor nerves. Quinidine and cinchonine exert the same action. Quinoline produces similar effects without, however, disturbing the action of  $\text{BaCl}_2$  on the muscles. Cinchophen can to a certain extent increase and prolong the motor effect of adrenaline. Eucupine is a general muscle cell paralyzer. S. MORGULIS

Effect of the cinchona alkaloids on the sympathico-motor innervation of the frog. TORSTEN STAKE. *Skand. Arch. Physiol.* 57, 77-105(1929).—Quinine-HCl has a vaso-dilating action, suppressing or weakening the vasoconstricting action of adrenaline. It alters the musculature of the vessels, however, so that it becomes more or less refractory to constrictive influences. Quinidine- $\text{H}_2\text{SO}_4$  in general acts in a similar manner but not so strongly, and the adrenaline effect is completely restored after washing with saline soln. Quinoline tartrate is the most potent vasodilator so that it inverts the adrenaline action most markedly, which thus also becomes a vasodilator. The normal adrenaline reaction, however, is quickly restored after washing with physiological saline. The same is also true for cinchonine-HCl. All these alkaloids thus act by paralyzing the motor portion of the sympathetic innervation. S. MORGULIS

Chlorophyll and the blood picture. EDUARD RENTZ. *Skand. Arch. Physiol.* 57, 121-37(1929).—Intravenous injections of chlorophyll into rabbits produce an unusually strong and persistent rise in the number of thrombocytes and a marked increase in the polymorphonuclear leucocytes. The sympathetic innervation, as well as the stimulating action of the chlorophyll on the blood forming elements of the bone marrow, may be involved. S. MORGULIS

The action of ephedrine. N. REINITZ. *Skand. Arch. Physiol.* 57, 138-58(1929); cf. C. A. 22, 2212.—The action of ephedrine on the intestine is partly inhibitory and partly motor. It appears as if ephedrine in very small amts. may increase the irritability of the parasympathetic nervous system. Large doses destroy the irritability not only of the motor-parasympathetic, but also of the inhibitory-parasympathetic system. This effect, however, is not entirely due to nervous influences but is actually accompanied by a diminished muscle cell irritability. Following a parasympathetic stimulant like pilocarpine ephedrine which ordinarily has a motor effect now produces a definite inhibition instead. This inversion of the ephedrine effect is regarded as evidence that in large doses ephedrine must have a paralyzing effect on the parasympathetic nerve endings of the intestine. S. MORGULIS

Studies on the cardiovascular effects of insulin. CARL E. RATHÄ. *Skand. Arch. Physiol.* 57, 243-328(1929).—Intravenous injection of insulin causes a diminution of the minute vol. of the heart. This diminution continues for some time and in certain cases is followed by a transient increase. A second injection does not affect the minute vol. as much as the first and may even be without any action. The reduction in the minute vol. is due to a diminution of the beat vol. of the heart. The blood pressure in the aorta falls for about 10-30 min. after an intravenous insulin injection, this fall being sometimes preceded by a brief rise in pressure. The fall in pressure is caused by the diminished minute vol and only very rarely also to vasodilation. Generally the fall in the aortic pressure is accompanied by a constriction of the vessels which may become so pronounced that it is responsible for the observed secondary rise in pressure, and this vasoconstriction is attributed to the outpouring of adrenaline under the influence of insulin. Immediately following an insulin injection the pressure in the pulmonary artery increases owing to a vasoconstriction. The occasional lowering of the pulmonary arterial pressure seems to be due to the adrenaline effect. Following an insulin injection the effect of vagus stimu-

lation on the heart is more or less reduced, but this diminution does not generally occur if adrenaline is injected before the vagus is stimulated. These cardiovascular effects of the insulin are shown to be due to changes in the K and Ca content of the circulating medium produced by the insulin.

The treatment of pernicious anemia with liver extract. CYRUS C. STURGIS, PAPHIAEL ISAACS AND MILLARD SMITH. *Ann. Internal Med.* 1, 983-95(1928).—A liver ext. prepd. according to the method of Minot, Cohn, *et al.*, produced the same effect on the regeneration of blood in 28 patients as had previously been noted to follow the daily administration of 0.5 lb. of liver daily.

Pharmacological study of amino-acid derivatives. VI. Action of histidine methyl ether. SHINGO GOTO. *Osaka J. Med.* 28, 195-206(1929); cf. *C. A.* 23, 2214.—*Histidine methyl ether*, m. 195-7°, prepd. by G., was tested pharmacologically. The effect is the same in type as that of monocyclic amino acid derivs.

The oligodynamic action of silver. RAÚL WERNICKE AND FERNANDO MODERN. *Anales asoc. quim. Argentina* 16, 158-69(1928).—See *C. A.* 23, 1441.

The hepatic lesions of barbiturism. TRÉMOLIÈRES, A. TARDIEU AND CARTEAUD. *Acad. méd.* 12, 26(1928); *Ann. hyg. publ. ind. sociale* 1929, 370.—The action of compds like diallylbarbituric acid and diallylmalonylurea is dealt with.

Danger of thallium acetate pomades. SABOURAUD. *Soc. franç. dermatol. et syph.* 1, 10(1929); *Ann. hyg. publ. ind. sociale* 1929, 372.

The action of the benzyl cinnamate on the anatomic focus. J. JACOBSON. *Arch. maladies appareil digestif* March, 1928, *Rev. prat. biol.* 21, 188-9.—Under the influence of the substance (Jacobson soln.) edema, congestion and infiltration recede. The cinnamic radical inhibits the development of staphylococci, streptococci, diphtheria bacilli and of certain races of colon bacilli. The benzyl radical neutralizes toxins, provokes a temporary vasodilation and has catalytic properties.

The action of benzyl cinnamate on ulcerations. ANON. *Rev. prat. biol.* 22, 191(1929); cf. preceding abstr.—The substance (Jacobson soln.) injected into the organism acts upon inflammatory lesions in such a manner that the irritation and compression at the level of the nerve endings and the consequent pain are lessened. The substance is more efficacious in cases of continuous pain than in cases of recurrent pain.

The combination of iron with liver extract in the treatment of anemia. I. HALLION. *Rev. prat. biol.* 22, 65-72(1929).

Optically active isomers of *N*-phenyl- $\beta$ -methylglycineamide-*p*-arsonic acid and their use in the resolution of ephedrine (FOURNEAU, NICOLITCH) 10. New series of anesthetics. Acylaniline derivatives (HARTUNG, MUNCH) 10.

## 12—FOODS

F. C. BLANCK AND H. A. LEPPER

Official inspections. Foods and drugs. JAS. M. BARTLETT. *Mc. Agr. Expt. Sta., Official Insp. Bull.* 131, 1-16(1929).—Of the 41 samples of shucked oysters, 3 contained excessive free liquids and were adulterated. N. Atlantic oysters contain an av. of 20% solids as against 16% for S. Atlantic oysters. N. Atlantic oysters are considered adulterated if the H<sub>2</sub>O content exceeds 16%. Twenty-three samples of sausage out of 61 were adulterated by the addn. of cereal. The addn. of 10% cereal to sausage increases the moisture content from 10 to 20%. Since some of the ready mixed sausage seasoners contain starch, mfrs. may unwittingly add starch in this manner. Of the 113 samples of *spirit of peppermint*, 24 samples were adulterated in that less than 10% of peppermint oil was present.

Ultra-violet irradiation of food on a tonnage basis. M. J. DORCAS. *Food Ind.* 1, 504-5(1929).—A mech. set-up of app. for irradiating foods to increase their vitamin D content. A thin layer of the product, 1/8 in. deep, flows on a moving belt and is exposed to ultra-violet lamps.

Fluorescence and conservation of irradiated foodstuffs. Infant foods. L. M. SPOLVERINI. *Riv. ital. actinol.* 2, 1-19(1927); cf. *C. A.* 22, 2189, 2592.—Ultra-violet irradiation of foods causes phys. and chem. changes tending to greater stability, and facilitates their conservation. The foods become more or less radioactive. With certain foods irradiation is harmful.

The permissible arsenic content of foods. E. WASSER. *Mitt. Lebensm. Hyg.* 20, 147-52(1929).—The max. As tolerance in foods should be 0.1 mg. per kg. A general discussion of the question of As in fruits.

**The detection of rye flour in wheat flour.** CH. SCHWEIZER. *Mitt. Lebensm. Hyg.* 20, 119-22(1929).—Rye flour contains a nearly const. amt. of *trifurclosen* and 10% of rye flour can be detected in other flours by the use of the Trifurclosen method (C. A. 23, 912). S. found the technic to be reliable and accurate. C. R. F.

**Chemical composition of certain food pastes and the modifications they undergo when boiled in water.** L. SETTMJ. *Atti accad. Lincei* [6], 8, 314-7(1928).—Results of analyses of various qualities of materials of the macaroni type are given. After being boiled in water, these substances exhibit phys. modifications resulting from the imbibition of water, and contain about 20% of sol. starch, 6% of reducing sugars calcd. as dextrose and appreciably less sol. N compds. than the original material. The fat present is not modified by the boiling. B. C. A.

**Heat coagulation of milk as a function of its acidity.** ARMAND TAPERNOUX AND K. KATRANJEFF. *Compt. rend. soc. biol.* 101, 828-9(1929).—Changes in acidity (degrees Dornic;  $p_H$  by quinhydrone electrode) and temps. required for coagulation of a mixed, pasteurized lot of milk, stored at 14°, were followed. As the acidity increased, the coagulation temp. decreased. B. C. BRUNSTETTER

**Alkali value of milk.** F. E. NOTTBOHM. *Milchwirtschaft Forsch.* 4, 336-51(1927).—The alkali value ( $Na_2O:K_2O$ ) of milk is 2-10; the value for colostrum is generally greater than 2. Toward the end of lactation lower values are obtained. Immediately after establishment of equil. or excessive values for Na the content of lactose falls and that of Cl rises. B. C. A.

**Determination of silicic acid in milk.** O. KETTMANN. *Milchwirtschaft Forsch.* 5, 73-106(1927).—Milk contains 1.6 mg. of silica per kg. (0.021% of the ash), with fairly wide variations independent of those of other ash constituents, but dependent on the silica content of the fodder. In colostrum the silica content is above the av. Inflammation of the udder greatly reduces the silica content of the milk. B. C. A.

**Detergent properties of alkaline dairy-washing compounds.** MILTON E. PARKER. *Am. J. Pub. Health* 19, 751-7(1929).—Chem. purity is vital if consistent cleansing action is to be assured. J. A. KENNEDY

**Rapid method for the analysis of butter.** N. CHARLIERS. *Chimie et industrie* 21, 931-6(1929); cf. Tchétéroff and C., C. A. 22, 4664.—The following method has been devised so as to retain the chief advantages of the Kuhlmann and Grossfeld method (C. A. 20, 2373) and permit of the detn. of the sapon. no. on the same portion of sample, and at the same time avoid the use of glycerol and also of EtOH (with the attendant complications in the technic) by substituting *n*-propanol: To 5 g. butter fat in a 300-cc. Erlenmeyer flask add 25 cc. *N* KOH (heat 1 l. propanol to boiling, add 60 g. KOH in small pieces, heat gently under a reflux condenser till soln. is complete, cool and keep in a brown-glass bottle contg. a few crystals of  $K_2CO_3$ ) which has been prepd. for at least 12 hrs., add a few glass beads, reflux 20 min., add 0.2 cc. of 2% phenolphthalein in propanol, titrate with *N*  $H_2SO_4$  and calc. the sapon. no.; add 31.8 *n* cc. distd.  $H_2O$  (*n* = no. of cc. *N*  $H_2SO_4$  in the sapon. no. detn.), 100 cc. of K stearate soln. (saponify 10 g. pure stearic acid with 4 cc. of 75% KOH in presence of 10 cc. of propanol and dil. to 1 l.), 5 cc. of 1:2  $H_2SO_4$ , 15 g. anhyd.  $Na_2SO_4$  and a little infusorial earth, shake, let stand 30 min., filter through a fluted filter, to a 125-cc. aliquot in a 500-cc. flask add 50 cc.  $H_2O$  and a few pieces of pumice stone, dist. 110 cc. and titrate with 0.1 *N* NaOH. If *k* = cc. NaOH and *l* = cc. NaOH of a blank detn. (preferably carried out on fresh cacao butter), the butyric no. is given by  $1.75(k - l)$ . The addn. of  $Na_2SO_4$  throws the propanol out of soln. together with the fatty acids higher than butyric; the amt. of propanol remaining in soln. is insufficient to dissolve any of the higher acids or to produce partial alcoholysis of the butyric acid; there is no danger of the propanol being oxidized by impurities, which would cause an error in the results obtained for the sapon. no. and butyric no.; the pptd. propanol carries down an amt. of butyric acid which varies with different fats, and even with different butters, but the addn. of K stearate is considered to make the amt. of butyric acid thus entrained const. The following butyric nos. were found: pure cow butter 19-22, cacao butter 0, coconut oil 0.77-1.22, palm oil 1.57, palmetto oil 1.75. Comparison of the results obtained by the present method and by the Lefmann-Beam, Kirschner, Kuhlmann-Grossfeld and xylene (Van Raalte) methods showed that the Charliers method can detect adulteration with at least the same degree of accuracy as the others.

A. PAPINEAU-COUTURE

**The effect of the method of preparation on the keeping qualities of butter.** E. HAGLUND, B. PLATON, E. WALLER AND E. SÖDERBERG. *Medd. Centralanstalt. försöks-vasendet jordbruks.* No. 347, Mejeriavdel. No. 37, 25 pp.(1929).—The investigation confirms the previous result that the keeping quality of butter decreases with increasing

acidity of the cream. The keeping quality is independent of the acidity of the butter plasma; this acidity is decreased by washing the butter; the washing does not affect the keeping quality. It is indicated that the washing only very slightly affects the acidity of the butter fat; that the  $p_H$  of the butter plasma is mainly detd. by the acidity of the cream at the time of churning; that the actual acidity of the plasma is not appreciably changed by the washing, and that consequently it is possible, by detg. the actual acidity of the butter plasma, to indicate the acidity of the cream from which the butter is produced.

M. A. DAHLEN

**Estimation of yeasts and molds in butter. Influence of the hydrogen-ion concentration of the medium on the mold and yeast counts.** P. CLERKIN. *J. Dept. Agr. Ireland* 28, 199-207(1929).—In detg. yeasts and molds in butter the  $p_H$  value of the medium must be reduced to about 3.5 before the yeast count can be considered to be entirely free from bacteria. At  $p_H$  4.5 a large no. of bacteria colonies were included in the yeast count. The H-ion concn. did not seem to have any marked effect on the mold count over the range studied ( $p_H$  3.5 to  $p_H$  6.5). A high yeast and mold count in butter indicates recontamination after pasteurization. Sixteen citations to the literature are given.

K. D. JACOB

**Modern manufacture of margarine.** H. W. VAHLTEICH. *Food Ind* 1, 436-40 (1929).

C. R. FELLERS

**Diffusion of sodium chloride in cheese.** O. MROZEK. *Milchwirtschaft Forsch* 4, 391-402(1927).—The distribution of NaCl and water after immersion of the cheese in salt soln. and slow ripening is described.

B. C. A.

**The occurrence of rennet in cheese.** CHR. BARTHEL, E. SANDBERG AND E. HAGLUND. *Medd. Centralanstalt. försöksväsendet jordbruks*. No. 342, Bakteriöl. avdel No 48, Mejeriavdel. No. 35, 15 pp.(1928).—A previous paper (C. A. 23, 448) described a method for obtaining the liquids from cheese, and discussed the study of these with a view to obtaining information about the ripening of cheese. The present work has demonstrated that one can show the presence of rennet in all except Emmen-thal cheese directly by coagulation means. The inactivity of the rennet enzyme in Emmen-thal cheese is probably due to the high scalding temp. used in prep'g this cheese. The ripening of this cheese must be due entirely to the proteolytic enzymes of lactic acid bacteria.

M. A. DAHLEN

**Action of rennin.** E. MUNDINGER. *Milchwirtschaft Forsch* 4, 369-90(1927) — "Degree of acidity" and  $p_H$  are both of importance in the prep'n. of rennin. Sunlight confers on rennin solns. the ability to decompose  $H_2O_2$ .

B. C. A.

**Evaluation of rennin.** E. MUNDINGER. *Süddeut. Molkerei-Ztg* 19, 4 pp (1927) — The influence of  $p_H$ , CaO and protein content, and dispersion is considered. B. C. A.

**The importance of control in mayonnaise manufacture.** D. M. GRAY, C. E. MAIER AND C. A. SOUTHWICK, JR. *Glass Packer* 2, 311-4(1929).—Mayonnaise is considered as a dispersion of an edible oil in a continuous medium. "Continuous" is used in contradistinction to "dispersed," the emulsion being thought of as a network extending in 3 directions. The egg yolk is more concd. at the surface of the oil particle than elsewhere in the aq. phase. This concn. or adsorption is greatly influenced by the quality of the egg yolk. The oil should have a free fatty content of not more than 0.05% and the Kreis test must be neg.; otherwise rancidity often results. The oil plus egg content must be at least 78% in order to comply with the Federal standard. Freezing destroys the emulsion. At best mayonnaise must be considered a semi-perishable product.

C. R. F.

**Glass-packed chicken. How it is prepared and processed.** C. R. FELLERS AND F. P. GRIFFITHS. *Glass Packer* 2, 315-8(1929).

C. R. F.

**The Bull method for the estimation of the fat content in fish, meat and other animal or vegetable products through extraction.** JOHN SEBELIEN. *Chem. Ztg* 53, 489-90(1929).—To 5 g. of the sample add 7.5 g. dried  $Na_2SO_4$  or 15 g.  $CaSO_4$ . This makes the fat more accessible to the solvent.  $CaSO_4$  is better for salted material. Shake this mass with 40 cc.  $C_6H_6$ , draw off 16 cc. of the clear fat soln. and place in the warm pan of the "percentage-balance." This balance is constructed so that the pan holding the fat soln. is surrounded by a metal cylinder contg. an elec. heating unit. Balancing is accomplished by riders on the other arm, which is graduated to read percentage of fat.

RUSSELL C. ERB

**Tryptic hydrolysis of haddock muscle.** ARTHUR M. WYNNE. *Contributions to Can. Biol. and Fisheries* [N. S.] 4, 319-41(1929).—Variations in the Foreman titration values obtained by titration of haddock muscle-trypsin digestion mixts are detd. Fish muscle that has been salted, smoked or treated with  $CH_3O$  vapor all are digested more slowly than the untreated muscle.

W. D. LANGLEY

**Storage of fruit juices without injury to color or flavor.** M. A. JOSLYN. *Glass Packer* 2, 271(1929).—Discoloration in grape juice is due to (1) enzyme action, (2) combination between 2 or more substances in the juice resulting in a brown colored substance or (3) oxidation by atm.  $O_2$  or  $O_3$  in soln. of some constituent in the juice resulting in a brown colored substance. Frozen grape juice retained its characteristic flavor and odor and suffered no deterioration during storage. The product is indistinguishable from fresh juice.

**Color solutions as sources of spoilage in beverages.** PAUL J. BEARD, MAX LEVINE AND J. H. BUCHANAN. *Glass Container* 8, No. 9, 22-4(1929).—Color solns. for use in beverages should be sterilized after bottling to prevent spoilage of the foods in which they may be used.

**Removing cream of tartar from grape concentrates.** P. H. RICHERT. *Glass Packer* 2, 285(1929).—In addn. to the usual settling and racking methods, the use of Ca salts yielding insol. Ca tartrate is described. The resulting sirup is alk. and has an objectionable burnt taste. Grape juice possesses an excess of neutral K tartrate over the bitartrate. The neutral salt is very sol. and remains in soln. in the sirup. Acids such as  $H_3PO_4$  react with this salt to form the relatively insol. bitartrate, which can be removed. By acidifying the sirup first, the desirable acidity is maintained.

**The causes of crystallization of raspberry sirups and means for prevention.** VL. STANEK AND P. PAVLAS. *Listy Cukrovar* 47, 575-82(1929).—A home prepn. which had been cooled to  $-2^\circ$  yielded 10 g. per l. of a mixt. of sucrose and glucose with one mol. of  $H_2O$  of hydration. Commercial prepn. yielded glucose only. The crystn. is caused by a high concn. of sugar, excessive cooling and an inversion of sucrose to glucose and fructose. Maintaining a concn. of sucrose below 60% and avoiding low temp. prevented the crystn. of sucrose. The crystn. of glucose is prevented by preventing inversion. The rate of inversion of sucrose from raspberries by invertase from yeast was studied. Inversion was prevented by boiling the sirup or juices for 10 min. The acidity varies with the degree of ripeness. Sour juices should be treated with  $NaHCO_3$  to decrease the acidity. Sirups made by different processes invert sucrose at the same rate. Sirups contg. 50% or more invert sugar showed cryst. deposits at  $0^\circ$  after a few days and crystn. continued (the total quantity of sugar present was 66%). Microscopic tests confirmed the actual trend of the large supply and may be used to predict the behavior of a sirup; all sirups which formed permanent crystals on a slide at the end of 1 hr. at  $0^\circ$  crystallized after 10-15 days in the large batches. The crystallizing sirups may be saved by mixing with sirups with less invert sugar so that the total invert sugar is below 50% in the mixt.

**Chemical composition of mustard and turnip greens and losses of iron in cooking.** A. M. FIELD, M. T. PEACOCK, R. COX AND I. P. EARLE. *West. Hosp. and Nurses' Rev.* 11, No. 5, 26-8(1928); *Expt. Sta. Record* 60, 190.—Turnip and mustard greens compared favorably with spinach in all respects and were markedly higher in Ca and Fe. When cooked in varying quantities of distd. water for 45 min., the losses in Fe varied from 5 to 25%, depending upon the vol. of water used. Tap water caused more than twice as great a loss of Fe as was caused by an equal vol. of distd. water.

**Sterilization of green fodder by liquids.** C. BRAHM, G. ANDRESEN AND R. PRILLWITZ. *Fortschritte Landw.* 3, 769(1928).—Fingerling's suggestion for preserving fodder materials with dil. HCl was tested, but it gave a product no better than ordinary silage at a greater cost. Analyses of the grass used, before and after treatment, and of the press liquors over a period of 9 months, showed that the HCl tended to disappear during storage, and was not able to prevent the occurrence of other processes than lactic acid fermentation, nor prevent the disappearance of lactic acid.

**Cyanogenetic glucosides in Acacia.** H. FINNEMORE AND W. C. GLEDHILL. *Australasian J. Pharm.* 9, 174(1928); *Quart. J. Pharm.* 1, 238.—The leaves of *Acacia glaucescens* Willd., *A. Cheelii* Blakely, *A. Cunninghamii* H. K. and *A. Doratoxylon* A. Cunn., which are used as fodder in Australia, all contain a cyanogenetic glucoside. None of them contains an enzyme capable of hydrolyzing it, so that it is only when stock eat at the same time other plants which contain such an enzyme, or have sufficient HCl present in their stomachs to hydrolyze the glucoside that poisoning of stock is observed. Fifty-eight other Australian species of *Acacia* were examd. and found not to contain a cyanogenetic glucoside.

**The feeding of minerals to cattle and pigs.** J. P. DREW AND D. DEASY. *J. Dept. Agr. Ireland* 28, 1-6(1929).—The results of expts. on the mineral requirements of pigs are tabulated, and previous investigations are discussed.

**Calcium and phosphorus carriers in live stock feeding.** JOHN M. EVVARD *Feed-stuffs* 1, No. 2, 10-1 (1929).—A mixt. of  $\text{CaCO}_3$  and  $\text{CaSO}_4$ , the latter being derived from bone as a by-product in the manuf. of  $\text{H}_3\text{PO}_4$ , is a more efficient source of Ca for the feeding of stock than either compd. alone. Because of its high F content (cf. C. A. 22, 2527) phosphate rock should not be used as a source of P and Ca. E. J. marizes and discusses the results of expts. showing the deleterious effect of F. The P of raw rock phosphate can be utilized by animals but, at present, the bone products seem to be the safest forms of P for animal feeding. K. I.

**Denatured raw sugar as a cattle food.** EGON KRAUS. *Listy Cukrovar* 47, 400-8 (1929).—A discussion. FRANK MARESH

**Toxicity of cyanogenetic linseed cake.** E. KOHN-ABREST AND M. QUENTIN *Chimie & industrie* Special No., 682-91 (Feb., 1929).—A discussion of the danger attending the use of cyanogenetic linseed cake, with detailed descriptions of the symptoms in a no. of cases of intoxication of cattle and sheep which were attributed to HCN from linseed cake. A previous article (C. A. 15, 3347) is also reproduced.

A. PAPINEAU-COUTURE

**Chemical composition of apple juices as affected by climatic conditions** (CALDWELL) 11D. Peroxidase reactions and new reagents [for detecting raw milk and rancidity of fats] (CASOLARI) 11B. Apparatus for the determination of  $\text{CO}_2$  in the respiration of apples (HARDING, *et al*) 11D. The coagulation of milk [by soap] (CHIÓ, REPETTO) 11A. Tea in northeast India (CARPENTER) 15. Buffer intensities of milk and milk constituents (WHITTIER) 11A. Report of the Imperial Entomologist [control of insects in stored wheat] (ISAAC) 15. Report of the Imperial Agricultural Chemist [adulteration of butter and ghee with animal fat] (HARRISON) 15. Report of the Imperial Agricultural Bacteriologist (JOSHI) 15. Frozen yeast (STAIGER, GLAUBITZ) 16. Chemical detection of vitamin C (GLASSMANN, POSDREW) 11E. Vacuum evaporating apparatus for milk, etc. (U. S. 1,721,760) 1. Preserving fatty and oily materials (Brit. pat. 303,059) 27. Spray desiccation of milk (Brit. pat. 303,576) 1. Float device for preventing milk or other liquids from boiling over when heated (Brit. pat. 303,372) 1. Apparatus and system of spray desiccation for materials containing vitamins (U. S. pat. 1,722,175) 1.

FERRÉE, C. J.: *De Sojaboon en duurzaam Sojameel*. Amsterdam: J. H. de Bussy. 96 pp. Fl. 2.50.

**Index to the Literature of Food Investigation. No. 1, March, 1929.** Compiled by Agnes Elisabeth Glennie for Department of Scientific and Industrial Research London: H. M. Stationery Office. 85 pp. 2s., net.

**Treating grain.** K. DIENST. Brit. 302,992, Dec. 24, 1927. Cleaned, washed and husked grain is passed through drying columns or vessels either directly or after sep. moistening or soaking, and is then heated to about  $70^\circ$ , cooled to about  $20^\circ$ , cleaned and finally milled.

**Bleaching and improving flour and other milling products.** VAMAN R. KOKATNAR and STROCKTON G. TURNBULL (to Pilot Laboratory, Inc.). U. S. 1,722,501, July 30. Flour or like material is treated with a small proportion of a compn. including an org. peroxide such as benzoyl, fumaryl or phthalyl peroxide and a flour "improver" such as ammonium lactate,  $(\text{NH}_4)_2\text{SO}_4$ ,  $(\text{NH}_4)_2\text{CO}_3$ ,  $\text{NH}_4\text{Cl}$ , tartaric acid or its salts,  $\text{MgSO}_4$  or fumaric and other unsatd. acids and their salts, to effect bleaching and other improvement in the properties of the flour. Several examples are given. Cf. C. A. 23, 220.

**Flour and bread-dough treatment.** CURTIS J. PATTERSON and CHASTAIN G. HARRIS (to Bakeries Service Corp.). U. S. 1,722,677, July 30. Tartaric, citric, lactic or other suitable non-toxic org. acid is added in proportion to bring the gluten of the flour to "optimum condition" during the formation of the dough.

**Baking powder.** L. WERN. Brit. 303,353, Dec. 31, 1927. A neutral alk. earth pyrophosphate such as that of Ca is used as a stabilizer and filler in baking powders and similar compns.

**Sterilizing and activating milk and other foods by ultra-violet rays.** JACQUES W. D. CHENEY (to Chesney Process, Inc.). U. S. 1,723,603, Aug. 6. The material treated is slightly acidulated and exposed to ultra-violet rays of not less than 2000 Å. U. while excluding air.

**Treating milk to remove objectionable volatile flavors and odors.** OTTO F. HUN-

**PIKER** (to Pfaudler Co.). U. S. 1,723,860, Aug. 6. After being standardized to a definite acidity, milk is rapidly circulated, continuously and repeatedly, at a high temp. and in a state of relatively fine subdivision, through a partial vacuum where it is treated with a current of air for removing undesirable flavors and odors, and is subsequently agitated and cooled to churning temp. An app. is described.

**Heat treatment of milk in cans.** ALBERT R. THOMPSON (to Anderson-Barngrover Mfg. Co.). U. S. 1,721,751, July 23. The cans are passed successively through a preheating chamber and a "preheat-holding" chamber, both at a temp. below that of sterilization and then through a sterilizing chamber in which a superatm. pressure is maintained, and then through a cooling chamber also under pressure. Various details of the app. are described. U. S. 1,721,752-3 relates to structural features of canning app.

**Powdered milk-serum product.** NINNI M. KRONBERG. U. S. 1,721,867, July 23. Skimmed milk is heated in an autoclave, then allowed to cool, inoculated with pure lactic cultures and treated with salts and saccharine substances, allowed to stand for a time, treated with a vegetable fat and a diastatic material and dried and powdered.

**Treating bovine milk to simulate mothers' milk.** THEODORE C. MANCHESTER. U. S. 1,723,188, Aug. 6. Pasteurized whole bovine milk is divided into major and minor proportions of approx. 85% and 15%, resp., cream equiv. to about 10% of the original quantity of milk is removed from the major portion, and the proportions of protein, lactose and other constituents are adjusted by abstraction and blending (details of which are described) to produce a final product contg. approx. 3.52% fat, 6.50% lactose, 0.74% ash and 12.34% solids.

**Milk for infant feeding.** LORE A. ROGERS (to the Government and people of the United States). U. S. 1,722,710, July 30. Milk is pasteurized by heating at about 62.5° for about 30 min., homogenized at a pressure of about 2800 lbs., then cooled to about 42.5°, inoculated with a milk culture of the *Lactobacillus* group and maintained for about 48 hrs. at a temp. of about 42° and to develop a pH of about 3.5 to prevent the growth of bacteria and yeasts in the milk.

**Cocoa-milk beverage.** C. E. NORTH. Brit. 303,187, July 27, 1927. A milk beverage with cocoa held in relatively stable suspension is prepd. by use of a gelatinous thickener and by heating the mixt. under pressure. Cf. C. A. 23, 2768.

**Almond milk food composition.** HERMANN HOFER-MASSARD. U. S. 1,721,522, July 23. Grated almonds 1 mixed with full cream milk 6 parts are pressed, the liquid is subjected to moderate heat for about 1.5 hrs. and the sirup is drawn off and may be mixed with water without sepn. of its ingredients.

**Chilling rolls for treating margarine emulsions.** A. A. POSTNI OFF and W. R. A. PICKERSGILL. Brit. 303,191, Sept. 20, 1927. Structural features.

**Preserving liquid egg material.** PULVO, LTD., W. F. BOLTON and C. V. B. READ. Brit. 303,530, July 4, 1927. Egg yolks or mixed yolks and whites are preserved by adding NaCl, boiling *in vacuo* at a temp. insufficient to cause coagulation (suitably about 55°) and then adding lactic acid. An app. is described.

**Canning meats.** JAMES W. RICHARDSON and PERCY W. WOOLLETT. U. S. 1,723,710, Aug. 6. S compds. are eliminated from meats before they are packed in cans by the action of flowing steam at a sufficiently high temp. to evolve and carry away gaseous sulfurous compds.

**Apparatus for drying fish or other foods.** W. H. HASLAM. Brit. 303,591, Oct. 21, 1927.

**Evaporating fruit juices, etc.** M. K. SERAILIAN. Brit. 303,956, Nov. 8, 1927. See Fr 644,180 (C. A. 23, 1899).

**Blanching celery and other green vegetables.** RODNEY B. HARVEY (to University of Minnesota). U. S. 1,721,595, July 23. C<sub>2</sub>H<sub>4</sub> is used in admixt. with air in quantity 100 to 100,000 times that of the C<sub>2</sub>H<sub>4</sub>.

**Crystallizing sweetmeats in circulating sirup.** A. G. HULME, BAKER PERKINS, LTD. and ANCIENS ÉTABLISSEMENTS A. SAVY, JEANJEAN, ET C<sup>IE</sup> SOC. ANON. Brit. 303,605, Nov. 7, 1927. An app. is described with various details of operative procedure.

**Coffee cakes suitable for making coffee beverage.** JOHN P. PAULY (to Measure-Rite Coffee Co.). U. S. 1,723,069, Aug. 6. Ground browned coffee is formed into a cake and the latter is baked until the adhesive material of the coffee grains unites and hardens.

**Flaked cattle food formed from cottonseed meal and molasses or similar materials** JOSEPH F. RUMSEY. U. S. 1,723,210, Aug. 6. Mech. details of manuf. are described.

## 13—GENERAL INDUSTRIAL CHEMISTRY

HARLAN S. MINER

**Science and progress in the industries.** JOHN J. CARTY. *Natl. Research Council Reprint and Circ. Series No. 89*, 8 pp.; *N E L A Bull.* **16**, 469-72(1929). E. H.

**Process development.** ARTHUR D. LITTLE. *J. Soc. Chem. Ind.* **48**, 202-9T (1929). E. H.

**The industrial uses of gas.** FRANCIS W. GOODENOUGH. *J. Inst. Fuel* **2**, 258-86 (1929).—A rather complete illustrated discussion of the various uses of gas in industry. LESLIE B. BRAGG

**The problem of the recovery of volatile solvents.** GEORGES GENIN. *Rev. gén. mat. plastiques* **4**, 459-69, 707-19(1928); **5**, 257-677, 317-29(1929).—An outline of the 3 principal methods of solvent recovery (gas washing, condensation, solid absorbents), giving the principles on which each is based, outlining the technic followed in each case, and showing by means of concrete examples the efficiencies of various apparatus operating under stated conditions. Recent improvements in the Brégeat, Neu and Lincrusta-Walton systems of solvent recovery are described. A P-C.

**A table of common hazardous chemicals.** Prepared by committees of the NATIONAL FIRE PROTECTION ASSOCIATION AND AMERICAN CHEMICAL SOCIETY. *Textile Colorist* **51**, 444-8(1929).—This table lists the names of the chemicals, the usual shipping container, fire hazard, life hazard and directions for storage. RUBY K. WÖRNER

BALCKE, F.: *Die Organization der Wärmeüberwachung in technischen Betrieben*. Munich and Berlin: R. Oldenbourg. 312 pp. M. 17.50. Reviewed in *Chimie & industrie* **21**, 1126(1929).

DOLCH, M.: *Betriebsmittelkunde für Chemiker*. Ein Lehrbuch der allgemeinen chemischen Technologie. Leipzig-Reudnitz: Verlag von Otto Spamer M 18, bound, M. 20.

*Jahrbuch der Deutschen Braunkohlen-Steinkohlen-Kali- und Erz-Industrie*, 1929 Issued by Deutscher Braunkohlen Industrie Verein. Halle (Saale): Wilhelm Knapp 373 pp. M. 16. Reviewed in *Chimie & industrie* **21**, 1122(1929).

*50 Jahre Kältetechnik, 1879-1929. Geschichte der Gesellschaft für Linde's Eismaschinen A.-G., Wiesbaden*. Berlin: VDI-Verlag. 192 pp.

MATHIAS, LOUIS J., JR., AND WEISER, RAYMOND S.: *Unit and Laboratory Manual of Chemistry*. Toledo: the authors 234 pp.

**Gas absorption.** SOC. DE RECHERCHES ET D'EXPLOITATIONS PÉTROLIFÈRES. Fr. 34,240, Aug. 30, 1927. Addn. to 612,386. The absorbent material, *e.g.*, charcoal, used in gas absorption is dried and cooled by submitting it to a closed cycle of gas cooled at one point of the cycle by contact with cold surfaces or other means.

**Separating mixed gases such as oxygen and nitrogen by progressive solubility.** WM. L. DEBAUPRE (to Samuel G. Allen, trustee). U. S. 1,722,458, July 30 The gaseous mixt. is introduced under pressure at an intermediate point in a tray section (of an app. which is described) and a solvent of different nature such as water is introduced into the upper end of the section to flow out of the bottom end; heat is added below and abstracted above the inlet, and the solvent is subjected to reduced pressure to free the constituent desired (the gaseous mixt. before compression being subjected to the solvent at the reduced pressure).

**Desulfurizing gases.** SOC. INTERNATIONALE DES PROCÉDÉS PRUD'HOMME-HOUDRY. Fr. 34,142, Aug. 8, 1927. Addn. to 639,774 (C. A. **23**, 678). The treatment of substances used for desulfurizing gases, *i.e.*, treating with reducing gas and then with air or O, is followed by blowing a reducing gas through it to decompose the small quantities of basic sulfates which are formed during the regeneration.

**Extracting acetylene from gas mixtures by use of acetonitrile as a solvent.** I. G. FARBENIND. A.-G. Brit. 303,068, Dec. 27, 1927.

**Chemical reactions between substances, one in liquid and another in gaseous form.** M. POLANYI and S. VON BOGDANDY. Brit. 303,900, Jan. 12, 1928. Substances which cannot be subjected to heating in liquid form (as in an inert solvent) are passed at high velocity and with continual renewal of the outer surface of the liquid, past vapor of another reaction substance. The method is stated to be suitable for effecting combination between org. substances and those which are only volatile at high temps such as Cu, Ag, C and metallic oxides. When the vapors of the heated substances are not sufficiently reactive their activity may be increased by superheating, use of elec. dis-



charges, etc. This is stated to be necessary in the case of substances such as As, Sb, Bi, S and Se. An app. is described.

**Separating oil and vapor from hot mixtures.** JOHN PRIMROSE (to Foster Wheeler Corp.). U. S. 1,723,748, Aug. 6. In treating materials such as hot mixts. from oil stills an initial sepn. of oil and vapor is effected by passing the mixt. into a portion of a closed chamber intermediate its top and bottom in rapidly flowing jets which impinge against surfaces within the chamber and are broken up with liberation of a portion of the vapor; oil from the broken jets is passed in film-like and broken streams through a lower portion of the chamber, vapor liberated from the streams is collected and mixed, without contact with the descending oil, with the vapor initially liberated in the chamber, and entrained oil is sepd. from the vapor mixt. in the upper portion of the chamber. An app. is described.

**Purifying chemicals for use in the manufacture of products containing active oxygen (such as peroxides and persalts).** WALTER WEBER and MAX JACOBI. U. S. 1,722,871, July 30. Catalytically acting substances such as small quantities of Mn and Cu compds. and exceedingly small traces of Pt or other heavy metal compds. which interfere with production of percompds. in good yield are removed from the starting materials such as borax or soda solns. by use of silica gel.

**Dispersions.** J. R. GEIGY A.-G. Fr. 658,180, Dec. 6, 1927. A mixt. in soln. of colloidal  $\text{SiO}_2$  and sulfite lye, such as is obtained in the manuf. of cellulose, is used as an emulsifying and colloid-protecting agent.

**Refrigerators.** PIERRE M. LE ROY. Fr. 657,735, June 26, 1928.

**Refrigerating apparatus.** ALBERT R. MCLEOD. Australia 14,675, July 26, 1928.

**Refrigerating apparatus using air and metallic mercury.** ALLGEMEINE ELEKTRICITÄTS-GES. (to International General Electric Co.). Brit. 303,864, Jan. 11, 1928. Structural features.

**Refrigerating apparatus of the absorption type.** PLATEN-MUNTERS REFRIGERATING SYSTEM AKTIEBOLAG (to Electrolux, Ltd.). Brit. 303,521, Jan. 6, 1928.

**Refrigerating apparatus of the absorption reversing type.** D. F. KEITH (to Perfection Stove Co.). Brit. 303,069, Dec. 27, 1927. Structural features.

**Refrigerating system of the absorption type.** SIEMENS-SCHUCKERTWERKE A.-G. Brit. 303,504, Jan. 5, 1928.

**Refrigerating system of the absorption type.** BALTZAR C. VON PLATEN, CARL GEORG MUNTERS and SIGURD M. BÄCKSTRÖM (to Electrolux Servel Corp.). U. S. 1,723,453, Aug. 6. Structural features.

**Condenser for refrigerating apparatus.** HAROLD A. GREENWALD (to Thomas C. Whitehead). U. S. 1,722,699, July 30. A heated medium such as a refrigerating agent is intermittently passed through a cooling conduit having a deliquescent substance such as solid  $\text{CaCl}_2$  in thermal contact with it, and a cooling effect is produced during the passage of the heated medium by evapn. of the liquid in the deliquescent substance, and moisture is absorbed in the latter when the heated medium is not in circulation.

**Mercury-forcing device for use in refrigerating apparatus, etc.** A. EINSTEIN and L. SZILARD. Brit. 303,065, Dec. 27, 1927. Structural features.

**Separator for refrigerating vapor and lubricating oil of refrigerating apparatus.** C. H. COOK AND SERVEL, LTD. Brit. 303,425, Sept. 3, 1927. Structural features.

**Insulating coatings on wires.** BRITISH THOMSON-HOUSTON CO., LTD., H. W. H. WARREN and A. T. WARD. Brit. 303,936, Oct. 22, 1927. An insulating coating is used which comprises a glycerol-phthalic acid resin (which may be plasticized with oleic acid and mixed with various other specified substances), and an oil varnish is afterward applied as an overlying coating.

**Electric insulation on wire.** ALLGEMEINE ELEKTRICITÄTS-GES. (to International General Electric Co.). Brit. 303,868, Jan. 11, 1928. Wire, before being insulated with vulcanized rubber, is coated with a lacquer formed mainly of a reaction product of polyhydric alcs. and polybasic acids and which may also contain drying oils or their acids to increase the elasticity of the lacquer.

**Electric insulating material.** MICAFIL A.-G. Brit. 303,125, Dec. 28, 1927. In forming insulation of layers of paper or woven fabric coated on one side with artificial resin, shellac or other insulating adhesive material, the other side of the paper or fabric is coated with other insulating materials such as oil, paraffin, asphalts or resins or their mixts.

**High-tension insulators formed of formaldehyde condensation products.** RHEINISCH-WESTFÄLISCHE SPRENGSTOFF-A.-G. VORM. W. LAHMEYER & CO. Brit. 303,883, Jan. 12, 1928. After formation and dehydration of the condensation product, it is cast while still liquid and hot, and is hardened by heating.

## 14—WATER, SEWAGE AND SANITATION

EDWARD BARTOW

**Operating experiences at the Sacramento filtration plant.** RALPH A. STEVENSON. *J. Am. Water Works Assoc.* 21, 929-40(1929).—The supply, taken at the junction of two rivers, is subject to rapid variation. The real problems relate to algae and turbidity. Alum and Cl, both manufd. at the plant, are used. Many details of operation are given. The results are considered satisfactory. D. K. FRENCH

**Simple test for delayed alum floc in filtered water.** FRANK E. HALE. *Am. J. Pub. Health* 19, 813(1929).—Flocculation is frequently induced by passage through the fine sand (60-120 mesh) used for concg. a sample for microscopic examn. To facilitate its recognition it is best to leave a fair-sized air bubble and rotate this around the cell several times. This gathers the floc into large masses of rather characteristic appearance. To distinguish the floc from ordinary amorphous matter, add sufficient "Alizarin S" (0.1% filtered soln. of com. Alizarin S, the Na salt of alizarinmonosulfonic acid) to give a slight color to the liquid. The air bubble is then rotated and the floc gathers all the dye and leaves the liquid colorless. Ordinary amorphous matter will not take up the dye in this fashion. The method also distinguishes delayed alum floc from Al in clay which is included in any chem. quant. method. J. A. KENNEDY

**Open and covered reservoirs at Washington.** D. C. CARL J. LAUTER. *J. Am. Water Works Assoc.* 21, 947-54(1929).—The advantages of the covered reservoir are strongly emphasized. D. K. FRENCH

**Protection of an impounded water supply from oil field drainage and irrigation water.** N. T. VEATCH, JR. *J. Am. Water Works Assoc.* 21, 955-62(1929).—Lake Wichita is the water supply for Wichita Falls. Its quality is soft and good. Lake Kemp, nearby, is extremely hard and unfit for domestic use. Surface drainage, influenced by nearby oil wells, is apt to be salty. It is important to guard Lake Wichita from such contamination. Methods proposed are outlined but no results are yet available. D. K. FRENCH

**Determination of the hardness of water by means of soap solution.** G. BRUHNS. *Chem.-Ztg.* 53, 469-70(1929).—A discussion of the method of Boutron and Boudet. RUSSELL C. EBB

**Colon bacilli in pressure tank water systems.** W. L. MALLMANN. *J. Am. Water Works Assoc.* 21, 944-6(1929).—A condition is cited where all tests of tank water confirmed for *Escherichia coli*. A sample taken directly from the supply was free from *B. coli*, indicating that the tank was the source of contamination. D. K. FRENCH

**The *B. coli* content of mineral waters.** L. GARBANO. *Zentr. ges. Hyg. Grenz.* 18, 773-4(1928); *Wasser u. Abwasser* 25, 227.—In 6 mineral waters small nos. of *B. coli* gradually increased in no. for several days; in very hard waters the rate of increase was less, while in soft water there was no increase. Cl, NO<sub>3</sub>, PO<sub>4</sub> and alky. were beneficial while SO<sub>4</sub> was inimical. *B. typhosum* died out in a few days in mineral water. C. R. FELLERS

**Mineral analysis of the waters of Kama and its tributaries.** A. A. VAROV. *Bull. biol. Research Inst. Univ. Perm* (Russia) 35-49(1928).—Samples were taken at the end of July and at the beginning of August when the mineral concn. of the water is about 3 or 4 times as great as that in spring and about 1/3 to 1/4 that in winter. The dependence of elec. cond. of the water upon its mineral content is established. Analyses are given. REA MAIZEL

**Boiler water conditioning.** A. F. JOSEPH AND J. S. HANCOCK. *J. Am. Water Works Assoc.* 21, 975(1929).—Polemic with Hall, *et al.* (*C. A.* 23, 3287). D. K. F.

**Materials for cast-iron [water] pipe joints.** W. C. MABEE. *J. Am. Water Works Assoc.* 21, 995-1004(1929). E. H.

**A few details of sewage treatment in Germany and England.** SAMUEL A. GREELEY. *Municipal News and Water Works* 76, 73-4(1929).—In the Ruhr valley oil is removed from suspended particles by 3 to 5 min. aeration. The tendency in England is toward longer displacement periods in settling tanks. Sep. sludge digestion with gas collection seems to be growing in favor and such tanks are being used in the Ruhr valley in conjunction with 2-story tanks having small sludge compartments. C. C. R.

**The sewage-disposal plant of Aurora, Ill.** L. R. HAWSON. *Municipal News and Water Works* 76, 141-5(1929).—This plant, being constructed on the unit plan, is to serve a population of 75,000 people and treat 6,500,000 gal. per day by 1940. The intercepting sewer is 32,200 ft. in length, varying in size from 18 in. to 69 in. The plant is to consist of mechanically cleaned coarse screens and grit chamber, sludge-

digestion tanks, sludge-drying beds, pumping station and sprinkling filters. The gas from digestion tanks is collected and used for heating the main building and for heating water that is circulated through the digesters to maintain a uniformly high temp. at all times.

C. C. RUCHHOFF

**Scarborough sewage-disposal plant.** W. D. PROCTER. *Can. Eng.* 56, 486(1929).—The plant is a spiral-flow activated-sludge type and includes coarse bar screens, detritor, aeration tanks, settling tanks and glass-covered sludge drying beds. Provision has been made for the future addition of separate sludge-digestion chambers. The capacity is one million g. p. d.

E. HURWITZ

**The Dunbar sewage filter bed.** ANON. *Municipal News and Water Works* 76, 151-3(1929).—Expts. were conducted at the Texas Eng. Expt. Station with a type of filter developed by Dunbar. The filter consists of several layers of stone in varying sizes and thicknesses. At a rate of 2,000,000 gal. per acre per day there is a 5-day B. O. D. reduction of 85%. For good nitrification and high dissolved O in effluent the optimum rate should be 1,300,000 gal. per acre per day. The filter clogs after application of 8,000,000 gal. of settled sewage per acre of bed surface. Resting of the filter bed for about 36 hours is necessary to allow drying and removal of solids from surface.

C. C. RUCHHOFF

**Sewage purification with activated sludge.** AD SEISER. *Ergebnisse Hyg. Bakt. expil. Therap.* 9, 343-84(1928); *Wasser u. Abwasser* 25, 246, cf. C. A. 22, 2225.

C. R. FELLERS

**Experiments on the dewatering of sewage sludge with a centrifuge.** C. E. KEEFER AND HERMAN KRATZ, JR. *Sewage Works J.* 1, 120-45(1929).—Expts. conducted at Baltimore, Md., indicate that sludge from sep. sludge-digesting tanks can be dewatered at a rate as high as 42 gal. per min. The removal of dry solids averaged 65.1% and moisture in the cake was 71.05%. Well digested sludge can be dewatered more readily than semi or undigested sludge. The centrifuge effluent contained 2.7% solids and had a 5-day B. O. D. of 10,000 p. p. m. Several methods for disposal of the effluent (none was entirely satisfactory) are discussed. The cost of dewatering Baltimore sludge with a centrifuge is \$1.33 per cu. yd. as compared with \$1.30 for air drying on sludge beds. The article includes a historical summary of the development of the Shaefer-ter Meer centrifuge used and a detailed description of the mechanism and operation.

E. HURWITZ

**Digestion of activated sludge.** WILLEM RUDOLFS AND H. M. HEISIG. *Sewage Works J.* 1, 146-59(1929).—Semi-plant-scale digestion expts. were conducted at Milwaukee over a period of 288 days. After 20 days activated sludge was added daily in definite vol. Decompn. of volatile matter added as activated sludge amounted to 49% fat 36%, N lost 32%. The digestion schedule for the first 106 days equaled 17½ days. Good, readily draining sludge was produced. The digestion schedule for the whole period of 288 days equaled 23 days. The authors conclude that activated sludge digests more rapidly than fresh sewage solids and requires no greater digestion capacity.

E. HURWITZ

**Gas production from sewage sludge.** S. I. ZACK AND G. P. EDWARDS. *Sewage Works J.* 1, 160-86(1929).—A critical discussion of data obtained on gas production in lab. expts. and on plant scale by American and European investigators. A summary of data on gas production for the installations discussed is contained in a table. Lab. data indicated that the amount of gas produced under conditions of alternate pressure and vacuum and under a continuous vacuum of 15 in. Hg was the same as that obtained at atm. pressure. General conclusions from all studies are: optimum  $p_n$  between 6.5 and 7.6; optimum temp., 77° F.; av. compn. of gas, methane 75%,  $CO_2$  20%, N and other gas 5%; B. t. u. per cu. ft. 700-800. A list of references is included.

E. HURWITZ

**Modern systems of garbage disposal.** ANON. *Can. Eng.* 56, 497(1929).—Report of the commissioner of streets shows that 160,000 tons of garbage was incinerated at the four Toronto plants. The article gives descriptions of the machinery at each plant and compares their costs of operation over a number of years.

E. HURWITZ

**The Beccari plant at Scarsdale, N. Y.** ARTHUR BONIFACE. *Municipal News and Water Works* 76, 75-8(1929).—The plant designed to treat the garbage from a high-class residential population of 10,000 people consists of an eight-cell unit. Each cell has a capacity of 20 cu. yards. The gas outlet from the cells is connected to a washing chamber in which a 1:500 soln. of  $KMnO_4$  is sprayed for odor control. Before the cells are charged the garbage is treated with about 1.5% of lime and an  $(NH_4)_2SO_4$  soln.

C. C. RUCHHOFF

**Results obtained in phenolic wastes disposal under the Ohio River Basin Interstate Stream Conservation agreement.** F. HOLMAN WARING. *Am. J. Pub. Health* 19, 758-70(1929).—W. discusses (1) location of by-product coke ovens, (2) source of phenolic wastes, (3) effect of phenolic wastes upon public water supplies, (4) experiences with phenolic wastes and early efforts of industry to eradicate them, (5) application of industrial science to the problem, (6) reaction of the public to the program, etc. Data on phenol removal are given for Ohio, Ky., W. Va. and Penn. **Discussion.** WM. L. STEVENSON. *Ibid* 817-8; C. A. HOLMQUIST. *Ibid* 819-20; ELLIS S. TISDALE. *Ibid* 820-2. J. A. KENNEDY

**Effect of atmospheric pollution upon incidence of solar ultra-violet light.** J. H. SHRADER, MAURICE H. COBLENTZ AND FERDINAND A. KORFF. *Am. J. Pub. Health* 19, 717-24(1929).—Solar ultra-violet light has been measured by the lithopone method of Clark and checked by 3 other chem. methods. Dust-cups and koniometer measurements indicate that atm. pollution is heaviest in the center of the city and falls off to approx. one sixth as much in the country. The amt. of ultra-violet light in the country is 50% greater than in the city. The amt. of settled dust on the top of a tall city building was materially less than at street level, and the incidence of solar ultra-violet light on the building was greater than at street level. Measurements made on "clear" days showed somewhat greater incidence of ultra-violet light than on cloudy days. The passage of ultra-violet light through confined air artificially polluted with fuller's earth, street sweepings and lamp black, resp., shows that they are increasingly effective in the order mentioned in occluding solar ultra-violet light. **Conclusions:** (1) The lithopone method is dependable for field use. (2) The belief that atm. pollution occludes ultra-violet to a very great extent is well founded. (3) The constituents of atm. pollution in summer are greater in quantity and different from those in winter. (4) Skyshine is equiv. to about 70% direct sunshine in content of ultra-violet light. (5) C as tarry products is materially more inhibitive to the incidence of ultra-violet light than siliceous materials. J. A. KENNEDY

**Treating waste water from Reading gas plant (KUNBERGER) 21.** Pharmacies [and medicinal springs] in Czech Silesia (DRUCE) 17. An I survey of Nebraska (ADOLPH, PROCHASKA) 11G. The electrolytic protection of Fe (VAN WULLEN-SCHOLTEN) 4.

KRAUSE, G. A.: **Neue Wege zur Wassersterilisierung.** Munich: J. F. Bergmann. 28 pp. M. 1.20. Reviewed in *Chimie & industrie* 21, 446-7(1929).

**Mineral waters.** SCHERING-KAHLBAUM A.-G. Fr. 657,778, Nov. 21, 1927. An artificial mineral water is made by dissolving Fe salts such as  $\text{FeSO}_4$  simultaneously with substances capable of forming  $\text{CO}_2$ .

**Device (suitable for use adjacent faucets) for filtering water through activated carbon, etc.** GEORGE C. LEWIS. U. S. 1,723,564, Aug. 6. Structural features.

**Clarifying and softening water.** MOXIE L. FRISCHER (to Western Boiler Compound and Chemical Co.). U. S. 1,722,137, July 23. A soln. for clarifying and softening water comprises an aq. soln. of a water-softening agent,  $\text{Al}(\text{OH})_3$ , and sufficient  $\text{NaF}$  to dissolve the  $\text{Al}(\text{OH})_3$  and prevent pptn. of Al compds.

**Softening water.** EDWARD T. TURNER. U. S. 1,722,603, July 30. Hard water to be softened is passed through softening material such as zeolite or glauconite capable of taking up substances which harden the water and the softening material is regenerated by the action of sea water and then cleansed with clear water. An app. is described.

**Apparatus for softening water with zeolites.** CARL H. NORDELL (to Permutit Co.). U. S. 1,722,938, July 30. Structural features.

**Forming milk of lime and mixing it with water in desired proportions.** WALTER H. GREEN (to General Zeolite Co.). U. S. 1,722,571, July 30. An app. is described.

**"Deactivator" apparatus for removing corrosive gases from water, etc.** PERRY WEST (to Elliott Co.). U. S. 1,723,105, Aug. 6. Structural features.

**Accelerating sludge digestion for sewage treatment.** MAX PRÜSS. U. S. 1,722,945, July 30. The sludge is held in a closed container in which heavy portions of the sludge settle, and material deposited at the bottom of the container is elevated to a point adjacent but below the surface whence it again descends, all without introducing air below the surface.

## 15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER

**Report of the Imperial Agricultural Chemist.** W. H. HARRISON. Agr. Research Inst., Pusa, *Sci. Repts.* 1927-28, 30-9(1928).—*Effect of fertilizer constituents on the quality of sugar-cane juice and gur:* Fertilizing with  $K_2O$  yielded juices which from November to February had the highest coeff. of purity and contained the largest amt. of sucrose and the lowest of glucose.  $(NH_4)_2SO_4$  gave the lowest results for purity and sucrose and the highest for glucose. Superphosphate gave results inferior to  $K_2O$  but superior to  $(NH_4)_2SO_4$ . Mustard cake was superior to cyanamide and  $(NH_4)_2SO_4$ , particularly in the latter stages of growth. Cane grown without any fertilizer gave juices which were inferior in quality to those produced with  $K_2O$ , but in all cases they were superior to the juices produced with the other fertilizers. *Adulteration of butter and ghee with animal fat:* The following test was devised for the detection of animal fat in butter. Dissolve 1 g. of dry butter fat in 3 cc. of anhyd.  $Ac_2O$  and add 4 cc. of 93 % EtOH. Maintain the mixt. at  $30^\circ$  for 30 min. when the formation of a ppt. indicates adulteration with animal fat. The test is effective for all cow butters and any buffalo butter from animals not fed on cottonseed. Butters which do not pass this test are subjected to another test in which 1 g. of the fat is dissolved in 4 cc. of anhyd.  $Ac_2O$  and 3 cc. of 93% EtOH is added, the mixt. being maintained at  $30^\circ$  for 30 min. Under these conditions all butters from buffaloes fed on cottonseed are shown to be genuine, whereas the addn. of 10% animal fat, even to cow butter, gives a positive reaction. The first test will detect 10% of added vegetable fat, but the second test will not detect a 50% addn. *Experiments on the curing of tobacco:* Indian varieties of uncured tobacco leaves contain more nicotine and starch than American varieties, and the upper leaves of the plants invariably contain more nicotine and starch than the lower ones. Curing has little effect on the nicotine content of tobacco but causes a marked decrease in starch. Destruction of starch seems to be related to quality, since the best samples of cured leaf have the lowest starch content. *Estimation of the  $p_H$  values of soils by means of the antimony electrode:* Agitation is not necessary in detg. the  $p_H$  of soils by means of the Sb electrode. With the liquid in the quiescent state there exists the relation  $p_H = 20.042\text{obs.} - 0.469$ . Definite reproducible  $p_H$  values can be obtained if the Sb electrode is placed in the moistened soil contained in a glass vessel having a porous bottom so that it can be connected by means of a salt bridge to the reference cell. The values obtained in this way are practically the same as those obtained by the H electrode and are very similar to those given by the ext. obtained after settling a soil emulsion for 24 hrs. *Base exchange and soil acidity:* The results of preliminary expts. support the view that soil acidity is due to an insol. colloidal acid which is assocd. with surface-active H and basic cations. The colloidal acid seems to be tribasic, the acidity of a soil depending on the extent to which this compd. is neutralized by bases.

K. D. JACOB

**Report of the Imperial Agricultural Bacteriologist.** N. V. JOSHI. Agr. Research Inst., Pusa, *Sci. Repts.* 1927-28, 40-55(1928).—*Nitrogen fixation in soils:* Analyses of samples of soil taken monthly to a depth of 1 ft. showed that the total N content is highest in soils fertilized with green manure and superphosphate, followed in order by soils fertilized with superphosphate, farmyard manure and green manure, resp. Positive evidence that *algae* fix a certain amt. of N in soils was obtained in lab. expts. under conditions eliminating the possibility of symbiotic action with bacteria. *Nitrification in soils:* If the nitrifying flora is not active in the soil, the chief loss of N that occurs when large amts. of N are concd. in the soil as a result of spreading the fertilizer on the field is due to volatilization of  $NH_3$  when the temp. is higher than  $28^\circ$ . Very little N is lost at temps. below  $23^\circ$ . Results are given of *nitrification expts. with  $CaCN_2$*  on several types of Indian soils. In general, nitrification of cyanamide was slower than that of  $(NH_4)_2SO_4$ . Nitrification of *artificial farmyard manure* was slower than that of natural farmyard manure. *Refuse from the distn. of mahua flowers*, contg. 2% org. N, also nitrified more slowly than natural farmyard manure. As indicated by  $CO_2$  respiration expts., addn. of  $NaNO_3$  to the soil hastened the decompn. of mahua cake, but it was still inferior in this respect to mustard cake. *Diammonphos* and *Nitrophoska* nitrified as rapidly as  $(NH_4)_2SO_4$  in Pusa soils. *Effect of S and S compds. on nitrification:* When applied in concns. of 0.1 to 0.25% with mustard cake or  $(NH_4)_2SO_4$ , S and  $Na_2S_2O_3$  delayed nitrate accumulation in the soil for about 2 weeks, the effect completely disappearing after this period. In soils contg. 0.1% S from  $Na_2SO_3$  nitrate accumulation was delayed for 2 weeks, but when the concn. was increased to 0.25% the inhibitory effect persisted for over 16 weeks. Data are given on the effect of continued application of

various fertilizers on the N content, nitrifying power, CO<sub>2</sub> production and cellulose-destroying power of soils. Soils fertilized with green manure and superphosphate had the highest N content and the greatest cellulose-destroying power. Nitrifying power and CO<sub>2</sub> production were not affected by the fertilizer applications. *Silage investigations*: Maize silage developed acidity more rapidly and to a greater degree than *juar* silage and also contained a greater no. of bacteria during the first stages. Maize silage contg. a high percentage of H<sub>2</sub>O developed acidity more slowly than that made from maize with a lower H<sub>2</sub>O content. A method was developed for the *manuf. of vinegar* from cane and palm juice, gur, molasses, etc. A concn. of 7% AcOH was obtained in 4 days at 30° by inoculating these materials with *B. aceti*. Cinnamaldehyde and eugenol, in concns. of 1:2000 and 1:500, resp., prevented growth of spoilage organisms in unheated ripe *mango juice*, while in each case the concn. necessary to prevent spoilage was reduced 50% by heating the juice to 100°.

K. D. JACOB

The soils and vegetation of the Troitzk region, Ural Province. V. V. NIKITIN. *Trav. inst. recherches biol. Univ. Perm* (Russia) 2, 109-430(1929).—N. gives a complete picture of the soil formation process in the region, analyses of the parent material, ground waters, water-sol. salt content, mode of salinizing certain areas, the physicochem. characters of the process of salinizing, solonetz and solodi. The geologic formations of the region, and methods of ameliorating the alkali soils are described. An English summary (424-430) is given.

J. S. JOFFE

The nature and origin of the soils of Madagascar. HENRI ERHART. *Compt. rend.* 188, 1561-3(1929).—A detailed discussion with regard to the laterites, marls and clays.

E. F. SNYDER

Reclamation of moss land in Dumfriesshire. JOHN GILLIES. *Scottish J. Agr.* 12, 126-39(1929).—Any form of lime capable of neutralizing soil acidity was effective in moss land reclamation, but no form was more effective than ground limestone. Phosphates gave better results than lime, and phosphates without lime were much more effective than lime without phosphates, combinations of the two being more effective than either alone. Ground mineral phosphates were as effective as the various grades of basic slag. Synthetic silico-phosphates were very effective. The mol. compn. of the phosphates may have an important bearing on their value in the reclamation of moss lands. Potash and sol. N compds. had no visible effect in promoting the growth of grass on this type of land.

K. D. JACOB

Mineral composition of the soil as a factor in soil classification. J. HENDRICK AND G. NEWLANDS. *Proc. 1st Intern. Cong. Soil Sci.* 4, 183-6(1927).—An outline of the process for sepg. the minerals in the fine-sand fraction of soils by means of bromoform is described. The proportions of the various minerals present serve as a means of classification of soils according to origin. Characteristics of the parent rock are retained in cultivated soils.

B. C. A.

Scottish soil types with special reference to North-East Scotland. G. NEWLANDS. *Proc. 1st Intern. Cong. Soil Sci.* 4, 187-92(1927).—The general characteristics of the profiles of Scottish soils are typical of the podsol type. Further subdivision of this type is possible on the basis of org. and moisture contents, texture, and chem. compn.

B. C. A.

Substances removed by the drainage from a Scottish soil. J. HENDRICK AND H. D. WELSH. *Proc. 1st Intern. Cong. Soil. Sci.* 4, 163-71(1927).—The small loss of nitrate from cropped soils even when highly fertilized was noteworthy. The amt. of Na in the drainage water was nearly as great as that of Ca, although the respective proportions of these 2 bases in the total replaceable bases of the soil were 4.5 and 85%. No appreciable amts. of phosphates were found in the drainage even where phosphatic fertilizers were used. The leached sulfate was increased by liming, presumably as a result of stimulated bacterial decompn. of the soil org. matter. In the chalk-free soil examd. considerable amts. of silica appeared in the drainage.

B. C. A.

The washing-out of chloride [added to soils]. H. J. WITTEVEEN. *Landb. Tijdschr.* 40, 528(1928).—In a field expt. in the wet winter of 1926-27, chloride added as heavy applications of 20% potash salts was soon washed out. Chloride was added at the rate of nearly 500 and 600 kg. per hectare, and samples were taken every 4 weeks to a depth of 20 cm. After 2 months only 100-130 kg. of chloride per hectare remained in this depth, and further washing out took place in the following months. It was concluded that by seed time most of the added chloride would be out of reach of all but deep-rooted plants, and thus would not be harmful.

B. C. A.

Relationship between stability of soil structure and its colloid and sand content. A. T. TYULIN. *Rept. Dept. Agr. Chem., Perm* 2, 22(1928).—Stability is related directly to the colloid and inversely to the sand content. Four chernozem and 2 podsol soils

were compared, stability of structure being measured directly by washing samples with a const. pressure of water, and colloid content estimated from adsorption capacity. The product of adsorption capacity and sand content varied as between the 2 types of soil, but was roughly const. within a type. Na acetate treatment increased the amt. of colloid and decreased sand;  $\text{FeSO}_4$  had the opposite effect. B. C. A.

The composition of soil suspensions of various degrees of dispersion in the steppe, solonetz and podsolized types of soil. L. P. BELYAKOVA. *K. D. Glinka Memorial Vol.* (Leningrad Agr. Inst.,) pp. 91–162(1928).—The component particles of the suspensions of various degrees of dispersion resemble the components of the soil with the exception of the  $\text{SiO}_2$  content. The latter decreases with the increase in the degree of dispersion; it has no relation to the  $\text{SiO}_2$  content of the soil. The mineral fractions are almost the same in a solonetz-chestnut, solonetz-chernozem and podsolized soil with the exception of the  $\text{SiO}_2$  content and the compn. of the lowest fraction (particles less than 0.00025 mm.). The amount of humus, hygroscopic moisture and loss on ignition increases with the increase of the degree of dispersion. The  $\text{R}_2\text{O}_3$  content and at times the MnO and MgO increase also with the increase in the degree of dispersion, which indicates that these particles represent the more weathered products. The smallest fractions differ markedly from the coarser fractions, becoming low in  $\text{SiO}_2$  and  $\text{R}_2\text{O}_3$  and high in humus (up to 16%), CaO (up to 15%) and MgO (up to 11%). Apparently there are free hydroxides and vol. salts in the smallest fractions. Suspensions of southern chernozem, horizon A, of various degrees of dispersion are almost alike in their mineral and humus content, except again for the  $\text{SiO}_2$ , which decreases to the advantage of CaO and MgO. The suspensions of a solonetz soil from the B horizon are also alike, not excluding even the  $\text{SiO}_2$ . Only the very lowest fraction (particles less than 0.00025 mm.) contains less  $\text{SiO}_2$  and  $\text{R}_2\text{O}_3$ , more alkali, and has a higher loss on ignition. Suspensions of dark-colored degraded meadow soil are similar to podsolized soils in respect to the humus content and to solonetz soils in respect to the mineral compn. of the last 3 fractions. The humus of southern chernozem disperses but slightly. Suspensions are not composed entirely of hydrous Al silicates, or the so-called "zeolites"; they contain a number of substances not sol. in 10% HCl. The higher the degree of dispersion the more sol. are the substances in HCl. The soly. of suspensions from non-solonetz chernozem is relatively high and almost the same for all fractions. Al, Fe and Ca get into the HCl soln. more than any other constituent. Mg goes into soln. in small quantities or not at all. This indicates that Mg is in a more stable condition. With the increase in the degree of dispersion the amounts of Al and  $\text{SiO}_2$  increase when extd. with KOH. The ratios of  $\text{SiO}_2$  to  $\text{Al}_2\text{O}_3$  definitely show the presence of the hydrates of Al in the suspensions of the chernozem and podsolized soils, primarily in the lowest fraction. J. S. JOFFE

Soil acidity considered from the point of view of base exchange and hydrogen-ion concentration. PATRICK H. GALLAGHER. *J. Dept. Agr. Ireland* 28, 75–106(1929).—This paper is a review and discussion of investigations relating to the relation of base exchange to soil acidity, the measurement of H-ion concn., and the relation of the H-ion concn. of the soil to plant growth and the utilization of fertilizers. A bibliography of 72 references to the literature is appended. K. D. JACOB

Conditions of nitrification [in soil]. J. HENDRICK. *Proc. 1st Intern. Cong. Soil Sci.* 4, 175–82(1927).—Analysis of drainage water from variously fertilized soils indicates that nitrification can take place freely and for long periods in acid, chalk-free soil in spite of increasing acidity resulting from continued use of  $(\text{NH}_4)_2\text{SO}_4$ .  $(\text{NH}_4)_2\text{SO}_4$  is almost completely nitrified when used alone or in conjunction with other fertilizers, even when relatively large applications are made. Mineral fertilizers stimulate the activity of soil bacteria responsible for the decompn. of org. matter from which  $\text{NH}_3$  and ultimately nitrate is produced. The conception that the N of fertilizers may be utilized by soil organisms and stored in an insol. form within their tissues is discredited. No evidence is obtained that N in a gaseous form is lost from soil when excessive amts. of nitrogenous fertilizers are used. B. C. A.

Ammonium salts and calcareous soils. L. DEPARDON. *Ann. sci. agron.* 46, 308–16(1929).—In the application of ammoniacal fertilizers to highly calcareous soils whether or not a loss of N occurs depends upon (1) the water content of the soil, (2) its absorbing power (colloid content), (3) the quantity of fertilizer applied, and (4) depth of covering, if any. In all expts. comparable to field conditions, i.e., applications of  $(\text{NH}_4)_2\text{SO}_4$  up to 1000 kg. per hectare, water content over 2.7%, depth of covering at least 2 cm., no real loss of N was observed. This is explained by the rapid nitrification occurring under the moisture conditions existing at the end of winter and the beginning of spring. K. S. MARKLEY

Small-scale fertilizer experiments. C. M. HUTCHINSON. *Agr. J. India* 24, 21–4

(1929).—Errors in fertilizer plot expts., due to variations in the compn. and properties of the soil, are eliminated by removing and mixing thoroughly the surface soil. A 2-ft. layer of subsoil is next removed and mixed thoroughly. The subsoil and surface soil are then replaced and the area is divided into 4-ft. squares, sepd. by partitions of hard waxed paper. This method combines the desirable features of pot and plot expts. and eliminates many of the undesirable features of both. K. D. JACOB

**Fertilizer requirements of soils.** G. BARBIER. *Ann. sci. agron.* **46**, 292–307 (1929).—Liebig's law of diminishing returns is inexact as a criterion for detg. the soil requirements of fertilizing elements. Mitscherlich's method, widely used in Germany at present, depends upon the value, for a given element, of the "coefficient of efficacy" appearing in the equation of the law of growth of factors. Wiessmann's method of detg. the requirements of assimilable  $K_2O$  and  $P_2O_5$  is based on the use of the particular soil under investigation as the fertilizer for pure sand cultures. Guittonneau's method of detg. the phosphoric acid requirement depends upon the development of *Azotobacter*, which is detd. by a macroscopic technic. Neubauer's method depends upon the amt. of absorption of fertilizing elements by the roots of seedlings kept for 14 to 18 days in a mixt of soil and pure sand, as detd. subsequently by chem. analysis. K. S. MARKLEY

**The use of coal as a fertilizer.** A. D. KISSEL. *Trans. Fuel Conference, World Power Conference, London 1928* **1**, 80–101 (1929).—See C. A. **23**, 2780. A. H. E.

**Manganese deficiency in sand cultures.** L. P. MILLER. *Am. Fertilizer*, **68**, No. 7, 21–2 (1928).—Tomato plants grown in pure quartz sand contg. a nutrient soln. prepd. from high-grade chemicals soon developed a chlorotic condition due to Mn deficiency but quickly responded on the addn. of a small quantity of  $MnSO_4$ . Similar results were also obtained with corn, cabbage, wheat, barley and tobacco. To produce plants showing Mn deficiency is considered to be not much more difficult than to grow plants showing symptoms of N, P or K starvation. W. H. ROSS

**The application of artificial fertilizing means on moor soils.** K. HEITZ. *Künst-dünger u. Leim* **26**, 171–2 (1929).—The application of artificial fertilizing means on moor soils requires a special knowledge of their sp. mode of operation. Only when one considers this and constantly keeps in mind the changes in the moor, can one manage successfully with the aid of artificial fertilizers. E. F. SNYDER

**Concentrated fertilizers for potatoes in Aroostock County.** B. E. BROWN AND F. V. OWEN. *Me. Agr. Expt. Sta., Bull.* **350**, 1–44 (1929).—Field expts. are described. Difficulty experienced in distributing certain exptl. mixts. uniformly, due to poor phys. condition, was overcome by the addn. of a relatively small proportion of cottonseed-meal, or other org. material, to serve as a conditioner. With the use of  $KNO_3$ ,  $NH_4Cl$  and  $(NH_4)_2PO_4$ , no org. conditioner was necessary. C. R. F.

**Fertilizer requirements of the plum lands of the Agenais (France) region.** G. GUITTONNEAU, J. KEILLING AND M. BÉJAMBES. *Ann. sci. agron.* **46**, 255–91 (1929); cf. C. A. **23**, 4007.—A biochemical and microbiological study was made of the plum lands of the Agenais region with particular reference to the factors limiting the soil population such as humidity, aeration, the presence of fertilizing elements, e.g.,  $CaO$ ,  $CaCO_3$ ,  $KCl$ ,  $(NH_4)_2SO_4$ , phosphates, etc. The factor limiting proliferation of *Azotobacter*, in all, except the acid soils of Cardaillac, was found to be a deficiency in assimilable phosphoric acid. The technic and advantages of the *Azotobacter* method of detg. phosphoric acid requirements of soils are outlined. Fifty-seven references are appended. K. S. MARKLEY

**Fertilizer requirements of the cotton plant.** G. CHEVALIER. *Ann. sci. agron.* **46**, 320–30 (1929).—N is rapidly absorbed in the early stages of growth, decreasing with increasing maturity; about 40 kg. of sol. N, equiv. to 200 kg. of  $NH_4NO_3$ , or 250 kg.  $(NH_4)_2SO_4$ , per hectare is required. Phosphoric acid is absorbed rapidly at first and then slowly and continuously to the end of growth. Because of the beneficial action of phosphoric acid on the cotton fibers and of the very calcareous nature of the soil, it is most effective when applied as the superphosphate at the rate of 300 kg. per hectare. The K absorption was high at the beginning of growth, declined toward the flowering stage and increased again toward maturity. In spite of a  $K_2O$  content of the soil of from 3 to 8%, K should be applied at the rate of 50 kg. per hectare because of the insoly. of the naturally occurring form. It should be applied preferably as the sulfate because of the already high content of chlorides in the soil. Lime was not required. Fertilizer applications should be coincident with seeding. K. S. MARKLEY

**Activated phosphate (neutral phosphate) and the determination of the agricultural value of phosphate fertilizers.** GEORGES TRUFFAUT AND BEZSSONOV. *Chimie & industrie Special No.*, 692–7 (Feb., 1929); cf. C. A. **22**, 1846.—"Activated phosphate" is obtained by treating natural  $Ca_3(PO_4)_2$  with an amt. (5%) of  $H_2SO_4$  slightly greater than



that required for the decompn. and neutralization of the mineral impurities (silicates, carbonates, oxides, fluorides), or approx.  $\frac{1}{8}$  the amt. used in the manuf. of superphosphate. T. and B.'s biol. method for detg. the availability of  $P_2O_5$  (C. A. 23, 231) gave results in agreement with those of agricultural tests. The true fertilizing value of a phosphate fertilizer cannot be measured by its soly. in  $H_2O$  or  $NH_4$  citrate soln., or by the ratio of sol. to total  $P_2O_5$ . Though the soly. of activated phosphate is only about 40% that of superphosphate, its agricultural value is as great as that of superphosphate. "Reconstituted phosphate," prepd. by mixing mineral phosphate and superphosphate so as to obtain the same total and sol.  $P_2O_5$  contents as activated phosphate, has a distinctly lower fertilizing value than the activated phosphate. A. PAPINEAU-COUTURE

**A root growth experiment with Hevea.** H. W. ROY BERTRAND. *Trop. Agr.* (Ceylon) 72, 317-22 (1929).—Much greater root development was obtained with rubber trees treated with  $CaCN_2$  in pot expts. than with the same amts. of N derived from  $(NH_4)_2SO_4$ ,  $NaNO_3$ , fish scrap, tankage and other sources. The effect of N in org. ammoniates does not last any longer than that from inorg. salts in Ceylon. The soil temp. ranged from  $75^\circ$  to  $85^\circ$  F. and the rainfall was also high during the expts. A. L. M.

**Report of the Imperial Entomologist.** P. V. ISAAC. Agr. Research Inst., Pusa, *Sci. Repts.* 1927-28, 71-8 (1928).—Exposure to vapors from liquid Hg and Sn-Hg alloys gave very satisfactory control of insects in stored wheat. The germinating power of the treated grain was not affected, and flour made from the wheat was used by a family for 3 years without any deleterious effect on the health. K. D. JACOB

**Analysis of insecticides.** Liquid insecticides non-miscible with water: mixed hydrocarbons, carbon tetrachloride, nitrobenzene, naphthalene, methyl salicylate. MAURICE FRANÇOIS and MISS LAURE SÉGUIN. *Ann. fals.* 22, 226-32; *J. pharm. chim.* [8], 9, 49-58 (1929); cf. C. A. 21, 2355; 22, 3255, 3948. A. PAPINEAU-COUTURE

**The use of carbon dioxide to increase the insecticidal efficiency of fumigants.** R. T. COTTON and H. D. YOUNG. *Proc. Entomol. Soc. Washington* 31, 97-102 (1929); cf. C. A. 23, 441.— $CO_2$  when mixed with gaseous  $(CH_2Cl)_2$ ,  $CH_2ClO_2$ ,  $CS_2$ , chloropicrin and ethylene oxide accelerates the toxic action of these gases upon insects, permitting a reduction in both dosage and exposure time. It also removes or reduces the fire hazard of inflammable fumigants. The use of these mixts. in practical fumigation is discussed. C. H. RICHARDSON

**Studies of substitutes for arsenate of lead as a soil insecticide.** J. WILLIAM LIPP. *J. Econ. Entomol.* 22, 600-1 (1929).—Of 26 inorg. compds. mixed with soil in the amt. of 1500 lb. per acre, only  $Na_2SiF_6$ ,  $BaSiF_6$ ,  $Hg_2O_7$ ,  $HgI_2$  and  $HgCl$  killed the larvae of the Japanese beetle (*Popillia japonica*). The first 3 compds. mentioned did not affect the growth of grasses; the others were not tested for plant tolerance.  $Na_2SiF_6$  tends to harden soil, in some cases preventing the germination of grass seed.  $BaSiF_6$  does not so affect soil and soil treated with it was toxic to the larvae for at least 2 yrs. C. H. R.

**Notes on the ovicidal action of linseed oil.** J. WILLIAM LIPP. *J. Econ. Entomol.* 22, 594 (1929).—Linseed-oil emulsion has the following effect on eggs of the oriental fruit (peach) moth (*Laspeyresia molesta*) and the codling moth (*Carpocapsa pomonella*): (1) Susceptibility of the eggs to the oil varies with their age, incubation time, and concn. of oil in the emulsion; (2) a large no. of eggs pass through a partial development but fail to hatch; (3) the raw oil is more effective than the boiled oil; (4) emulsions made of oil contg. rosin are less effective than those made of oil without rosin. C. H. R.

**A note on the use of dried poison bait against locusts in the Sudan.** HAROLD H. KING. *Bull. Entomol. Research* 20, 99-101 (1929).—A bran-molasses-Na arsenite bait is sun-dried and moistened just before use. C. H. RICHARDSON

**The dangers of sulfating and soaking of seeds.** JAGUENAUD. *Compt. rend. acad. agr. France* 15, 770-1 (1929).—The tests made on wheat with different salts of Cu (phosphate, chloride, sulfate) have given marked variations in germination. Such preps. should be handled with caution. E. F. SNYDER

**The lethal dose of arsenic for the newly hatched codling moth larvae.** RALPH H. SMITH. *J. Econ. Entomol.* 22, 599-600 (1929).—The newly hatched larva of *Carpocapsa pomonella* may ingest 0.096 microg.  $As_2O_3$  by swallowing the apple skin on entering an apple sprayed with 2 lb.  $PbHASO_4$  in 100 gals. water. As the larva only swallows a portion of the apple skin in cutting through the surface, the amt. of  $As_2O_3$  ingested is probably much less, and is estd. as 0.0024-0.096 microg. The first particles swallowed by the larva may pass so rapidly through the body that only a small part of the ingested As is retained. Many larvae probably ingest As by coming in contact with it accidentally. C. H. RICHARDSON

**Investigations in codling control and removal of spray residue from pears.** F. W. PETTEY, ARTHUR SKIBBE and FRANÇOIS DE VILLIERS. Dept. Agr. Union S. Africa,

*Sci. Bull.* 64, 36 pp.(1928).—This investigation was carried out to det. whether the standard practice in spraying pear trees with Pb arsenate for control of the codling moth could be varied in such a manner that satisfactory control of the insect could be obtained without the necessity for treating the pears to remove arsenical spray residues. The results indicate that this is not possible, since in all cases where satisfactory control was obtained it was necessary to treat the pears for spray removal. Addn. of 3% of highly refined mineral oil to Pb arsenate sprays resulted in more effective control of the codling moth but retarded considerably the removal of arsenical residues from Kieffer pears by HCl. Better control was not obtained by adding Ca caseinate spreaders and molasses to the sprays. Bait traps contg. wine and fermenting apple juice were not effective. Pb chromate sprays were not satisfactory and  $\text{Na}_2\text{SiF}_6$  caused severe leaf burning. Most export varieties of pears of smallest export grade, which had received a full Pb arsenate spray program of double-strength sprays, required treatment for at least 2 min in 1% HCl soln., at a temp. not less than 70° F., to reduce the As to well below 0.01 grain per lb., and to remove all visible spray stains. Heavily sprayed Kieffer and Louise Bonne pears from inland localities required submergence for 3 min. in 1% acid for removal of all visible spray residue. Different varieties of pears were found to have different degrees of susceptibility to injury by HCl, the Duchesse, Clairegeau and Forelle being least susceptible, and Bartlett being most susceptible. Pears as a whole are more susceptible to injury by HCl solns. than are apples. Some varieties of pears tolerated 0.017% acid in the rinsing water without injury, while other varieties tolerated as much as 0.034%. The amt. of water required for rinsing acid-treated pears may be reduced as much as 60% by addn. of 1 lb.  $\text{NaHCO}_3$  to 100 gallons, without causing injury to the fruit in storage. Fruit picked and treated for As removal early in the morning is less susceptible to acid injury than fruit picked and treated at midday when the temp. is very high. K. D. JACOB

Laboratory studies in the control of codling-moth larvae on pears. F. W. PETTEY, Dept. Agr. Union S. Africa, *Sci. Bull.* 65, 13 pp.(1928); cf. preceding abstract.—Acid Pb arsenate gave more efficient control of codling moth on pears than was obtained with neutral Pb arsenate. Ca caseinate spreaders increased the efficiency of neutral Pb arsenate sprays, but had no effect on the efficiency of acid Pb arsenate sprays, better results being obtained, however, with the latter. In orchard tests, addn. of molasses to the sprays not only failed to produce better control of the codling moth but caused rusty spots to form on the surface of the fruit. Over half the codling larvae that escaped poisoning by 2 applications of standard Pb arsenate at normal and double concns. plus Ca caseinate spreader entered the lower half of full-grown pears where the spray film was probably thicker than in the upper half. The same was also true in the case of unsprayed pears. About 67% of the larvae that escaped the standard Pb arsenate sprays, contg. no spreader, on single full-grown pears entered between the spray blotches, and the great majority of the remainder entered at the margin of the blotches. K. D. J.

Soil treatment for control of the Japanese beetle. ERNEST N. CORY AND P. D. SANDERS. *J. Econ. Entomol.* 22, 556-61(1929).—A large-scale control operation with  $\text{CS}_2$  emulsion is described. C. H. RICHARDSON

Control measures for cucumber beetles. H. C. HUCKETT. N. Y. State Agr. Expt. Sta., *Tech. Bull.* 148, 82 pp.(1929); cf. C. A. 23, 3535.—Such heavy applications of dust or spray mixts. are necessary to protect seedling cucurbits from the striped cucumber beetle, *Diabrotica vittata*, and the spotted cucumber beetle, *D. duodecimpunctata*, that the development and yield of the plant are affected. Gypsum was less harmful than  $\text{Ca}(\text{OH})_2$  in dust mixts. A mixt. of 1 part Ca arsenate to 15 parts gypsum by wt. gave the best results. The beetles were readily killed by contact with  $\text{Ca}(\text{OH})_2$  but it had relatively little lethal value when applied to the foliage. Moisture rendered dust mixts. innocuous. The use of trap crops to segregate the beetles is described. C. H. RICHARDSON

The Mexican bean beetle, 1927-1928. C. O. EDDY AND W. H. CLARKE. S. C. Agr. Expt. Sta., *Bull.* 258, 41 pp.(1929).—In preliminary expts.  $\text{CaSiF}_6$  gave promising results as a dust or spray for the Mexican bean beetle, *Epilachna corrupta*; pyrethrum soap sprays also were very effective. Spraying and dusting machinery for use in dusting beans are discussed. C. H. RICHARDSON

Investigations on *Heterodera schachtii* in Lancashire and Cheshire. II. The relationship between degree of infestation and hygroscopic moisture, loss on ignition and  $\text{pH}$  value of the soil. A. M. SMITH. *Ann. Appl. Biol.* 16, 340-6(1929).—No correlation was found between hygroscopic soil moisture and loss of the soil on ignition and the degree of infestation with the beet worm, *H. schachtii*. The rate of reproduction is therefore probably not influenced markedly by normal variations in physical

condition of the soil. Some correlation exists between the no. of eelworm cysts and soil  $pH$  when the peat soils are considered. This did not appear to be true of the sandy soils.

C. H. RICHARDSON

**Tea in northeast India.** IV. P. H. CARPENTER. *Agr. J. India* 24, 48-59(1929); cf. C. A. 23, 1203.—The fertilization, control of insect pests and blights, and the processes used in the *prepn. of tea for the market* are discussed. The chem. and biological changes occurring during the manuf. of tea are but incompletely understood. Chem. investigations on the manuf. processes have been confined principally to studies on the changes in tannin content of the leaf. The *tannin content* changes from about 22% in fresh and withered leaves to about 12% in the processed material.

K. D. JACOB

**Report of the imperial mycologist.** W. McRAE. Agr. Research Inst., Pusa, *Sci. Repts.* 1927-28, 56-70(1928).—Fertilization with superphosphate appeared to favor spread of the *wilt disease of rahar* while green manures were unfavorable to it. The results of various expts. relating to the *mosaic disease* of sugar-cane are tabulated.

K. D. JACOB

**Apple spraying experiments in 1926 and 1927.** DONALD FOLSOM AND THEODORE T. AYERS. Me. Agr. Expt. Sta., *Bull.* 348, 145-76(1928).—Leaf burning in Ben Davis and McIntosh varieties was increased by spraying with dry lime-S especially in the late season applications. S dust reduced fruit scab more than leaf scab and caused some undesirable fruit russetting.

C. R. F.

**Apple scab and its control in northern Ireland.** I. ARTHUR E. MUSKETT AND EDMUND TURNER. *J. Ministry Agr. Northern Ireland* 2, 26-42(1929).—Expts. were carried out to det. the value of various fungicides in controlling apple scab caused by *Venturia inaequalis*. The best control was obtained with Bordeaux mixt. contg. sugar or glue. Addn. of Pb arsenate and casein spreaders did not increase the value of the mixt. Lime-S did not give good results but Burgundy mixt. gave good control without causing an appreciable amt. of leaf burn in these particular expts. Bordeaux mixt. was not satisfactory for very late spraying, because it left a thin powdery film on the fruit. For very late spraying lime-S, 1 to 60, should be used.

K. D. JACOB

**Control studies on the plum curculio in Connecticut apple orchards.** PHILIP GARMAN AND M. P. ZAPPE. Conn. Agri. Expt. Sta., *Bull.* 301, 437 pp.(1929).—A study of the life history, habits, parasites and control measures for the plum curculio, *Conotrachelus nemuphar*. Of the stomach poisons tested,  $PbHAsO_4$  was most effective. In lab. expts. capryl alc. was a powerful repellent to the beetle. For orchard control 4 applications of  $PbHAsO_4$  (1.5 lbs. in 50 gals. water) are recommended.

C. H. R.

**Mosaic and its control in other cane-growing countries.** WYNNE SAYER. *Agr. J. India* 24, 25-31(1929).—Methods used in various countries for control of the mosaic disease of sugar-cane are discussed.

K. D. JACOB

**The eggplant blight and fruit rot in Porto Rico.** J. A. B. NOLLA. *J. Dept. Agr. Porto Rico* 13, 35-57(1929).—The causative fungus, *Phomopsis vexans*, was effectively controlled by drenching the soil with 1 to 50  $CH_2O$  at the rate of  $\frac{1}{2}$  gal. per sq. ft. of surface. Neither Bordeaux mixt. (4-4-50) nor chem. seed treatment was entirely reliable as a control measure.

C. R. FELLERS

**The control of ordinary or late blight of the potato in northern Ireland.** ARTHUR E. MUSKETT. *J. Ministry Agr. Northern Ireland* 2, 54-62(1929).—A series of expts. on the control of the ordinary potato blight (*Phytophthora infestans*) showed that the use of dusting powders, as obtainable at present, was neither so efficient nor so economical as ordinary spraying.

K. D. JACOB

**The relation between flag smut infection and manurial treatment.** H. C. FORSTER AND A. J. VASEY. *J. Dept. Agr. Victoria* 27, 321-30(1929).—There was a close relation between the application of lime, in the form of  $CaO$  or basic slag, up to 1000 lbs. per acre and the percentage of flag smut (*Urocystis tritici*) infection on wheat and oats. Application of local farmyard manure also increased the infection, combinations of lime and farmyard manure giving particularly bad results. Application of various amts. of superphosphate had no effect on the percentage of plants affected with the disease.

K. D. JACOB

**Wildfire of tobacco.** I. Studies on overwintering and dissemination of wildfire. E. S. MOORE. Dept. Agr. Union S. Africa, *Sci. Bull.* 54, 5-19(1927). II. Methods of seed disinfection for the control of wildfire in Turkish tobacco. E. S. MOORE AND P. J. NAUDE. *Ibid* 20-3.—The formalin method of seed disinfection is not considered to be responsible for the germination failures occasionally reported in Turkish tobacco seedbeds. In order to prevent deterioration on storage, seed treated with formalin should be washed after treatment. Exposure to 0.5% soln. of Uspulun for 1 hr. or longer did not impair germination of the seed and seemed to give good control of wildfire.

AgNO<sub>3</sub> (1:1000) had no ill effect on germination of the seed when tested immediately after treatment. K. D. JACOB

C determination in soils by means of permanganic anhydride (DeNARDO) 7. The precipitation of CaC<sub>2</sub>O<sub>4</sub> in the presence of Fe, Al, Ti, Mn, Mg and phosphates, with special reference to the determination of total Ca [in soils and soil extracts] (CHAPMAN) 7. Diazonium fluorosulfonates [insecticides] (Brit. pat. 303,527) 25.

EMERSON, PAUL: *Principles of Soil Technology*. New York: The Macmillan Co.  
LYON, T. L., AND BUCKMAN, H. O.: *The Nature and Properties of the Soil*. A College Textbook of Edaphology. Revised ed. New York: The Macmillan Co.

**Fertilizer.** I. G. FARBERIND. A.-G. Brit. 303,916, Sept. 12, 1927. NaNO<sub>3</sub> and KNO<sub>3</sub> are used together (the NaNO<sub>3</sub> being less than 60%, and preferably 20–50% of the mixt.).

**Fertilizer.** I. G. FARBERIND. A.-G. Fr. 657,646, July 18, 1928. The products obtained by heating NH<sub>4</sub>CNS, or its primary heat decompn. products such as thiourea and guanidine thiocyanate, until the cessation of gas liberation, are excellent N fertilizers.

**Fertilizer.** FRIEDRICH L. SCHMIDT. Fr. 658,076, July 25, 1928. A mixed fertilizer contg. phosphoric acid and potash is obtained by decomposing by heat the double bicarbonate of K and Mg (MgCO<sub>3</sub>.KHCO<sub>3</sub>) as aq. emulsion, the soln. of K<sub>2</sub>CO<sub>3</sub> thus obtained being afterwards sepd. from the pptd. MgCO<sub>3</sub> and used for decomposing mineral phosphate, the MgCO<sub>3</sub> being used to reform the double bicarbonate.

**Fertilizers.** RHEINLAND-KUNHEIM VEREIN CHEMISCHER FABRIKEN A.-G. Fr. 34,257, June 24, 1927. Addn. to 598,203. In the production of a fertilizer by heating mixts. of phosphorite and H<sub>2</sub>SiO<sub>3</sub> in the presence of steam and with the addn. of Na<sub>2</sub>SO<sub>4</sub> or NaCl, the amt. of H<sub>2</sub>SiO<sub>3</sub> added is reduced so that 1/2 mol. of H<sub>2</sub>SiO<sub>3</sub> is added for 1 mol of P<sub>2</sub>O<sub>5</sub>. Cf. C. A. 23, 1208.

**Fertilizers.** SOC. CHIM. DE LA GRANDE-PAROISSE, AZOTE & PRODUITS CHIM. Fr. 657,893, Mar. 2, 1927. Salts, which by their manner of manuf. contain a certain amt of volatile NH<sub>4</sub> compds. such as salts formed in the manuf. of NH<sub>4</sub>Cl by the action of NH<sub>3</sub>, CO<sub>2</sub> and NaCl, are treated with SO<sub>2</sub> to form (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> which oxidizes to (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>, and are used as fertilizers.

**Limestone for use as fertilizer.** W. E. CARSON. U. S. 1,721,803, July 23. Moist limestone is mixed with quicklime and the mixt. is ground to a powder, which, with the proportions of ingredients which are used, will not contain sufficient free moisture to form a hard solid cake when subjected to a temp. below freezing.

**Flower pots which decompose in the ground and serve as fertilizing material.** J. J. H. STURMEY. Brit. 303,394, Sept. 26, 1927. A pot may be formed by passing pulped peat into a foraminous mold and compacting and drying the residue. Wood pulp with addn. of Na<sub>2</sub>SO<sub>4</sub> also may be used, and pots formed of wood pulp may be impregnated with fertilizing substances.

**Fertilizer and insecticide.** R. TOYER. Brit. 303,957, Dec. 8, 1927. A mixt. is used comprising soot, lime, sand, sawdust, coal-tar or wood-tar oil and paraffin

**Disinfectant, fungicidal and wood-preserving compositions.** I. G. FARBERIND A.-G., W. BONRATH AND W. SCHEPSS. Brit. 303,932, Oct. 17, 1927. Salts of basic dyes such as the oxalate or ZnCl<sub>2</sub> double salts (e. g., the oxalic salt of malachite green) are mixed with an arsenic or arsenious acid or salt. Various examples are given.

**Spraying agricultural insecticides.** JOHN E. SHEPHERD and EDWIN K. O'BRIEN (to Belle Mead Development Corp.). U. S. 1,723,955, Aug. 6. A blast of steam is liberated into free air and there is introduced into the blast an insecticide including fuel oil or other suitable oily liquid and a dry material such as S or Ca arsenate. An app. is described.

## 16—THE FERMENTATION INDUSTRIES

C. N. FREY

**Preparation of absolute alcohol by the use of lime under pressure.** O. VON KEUSSLER. *Z. Spiritusind.* 52, 147–8(1929); cf. C. A. 23, 2239.—At 4–5 atm. pressure only 1.5 hrs. is required for the reaction. A. SCHULTZ

**Manufacture of absolute alcohol by the alcohol-benzene distillation under pressure.** O. VON KEUSSLER. *Z. Spiritusind.* 52, 36–8(1929); cf. C. A. 23, 234.—By increasing

the pressure of distn. to 10 atm. Merck improved Young's method of manufg. abs. alc. from a min. b. p. mixt. of alc. and benzene. At 10 atm. (b. p. 144°) the amount of water removed from the alc. by the benzene is 2.6 times greater than that at 0 atm. (b. p. 65°). In practice enough benzene is used with benzine to act as a solvent between the aq. alc. and the benzine. At the higher pressure less benzene is required to facilitate the distn.

A. SCHULTZ

**The detection of isopropyl alcohol in spirits with the acid of the Griebel micro-technic.** F. WEISS. *Z. Untersuch. Lebensm.* 57, 45-8(1929).—Oxidize 0.1 cc. of the alc. mixt. with chromic acid. Boil with  $\text{Ag}_2\text{O}$  to remove the  $\text{AcH}$ . Acetone formed from  $\text{Me}_2\text{CHOH}$  is detected by means of *m*-nitrophenylhydrazine by the Griebel micro-cup technic. One % of isopropyl alcohol can be readily detected by this procedure.

C. R. FELLERS

**First chemical phases of hexose decomposition in alcoholic fermentation.** A. J. KLUIJVER AND A. P. STRUIJK. *Wochschr. Brau.* 46, 51-5(1929); cf. *C. A.* 23, 2530.—By increasing the concn. of the yeast macerate a high max. rate of evolution of  $\text{CO}_2$  in cell-free fermentation was brought about during the phosphorylation period with a low ratio of hexose monophosphate to diphosphate. According to the theories of Harden, Henley and Meyerhof the mol. ratio of the increase of  $\text{CO}_2$  during the phosphorylation period to the hexose diphosphate found should be 2:1. The authors' value for this ratio was as high as 11.4. These facts show that Robinsons' hexose monophosphate results from an active hexose monophosphate and that the hexose diphosphate is formed by the combination of 2 mols. of glyceraldehyde monophosphate.

A. SCHULTZ

**Adjustment of acidity of cane-molasses fermentations for maximum alcohol yields.** F. M. HILDEBRANDT. *Ind. Eng. Chem.* 21, 779-81(1929).—A method for obtaining the max. alc. yield from cane molasses by fermentations with the addn. of acid involves the use of the potentiometer and quinhydrone electrode. The max. yield is obtained when sufficient acid is added to prevent the  $p_{\text{H}}$  of the fermentation soln. drifting to the acid side during fermentation.

J. T. WOLF

**Glycerol from molasses.** P. V. GOLOVIN. *Zhur. Sakharnoi Prom.* 1, 22-5(1927).—Equal vols. of molasses and hot water are mixed with turf powder and boiled for one hr. By this operation free volatile org. acids are driven off. The soln. is sterilized and some substances are adsorbed by the turf. Then the soln. is dild. to 10-12° Bé. at 30°, and  $\text{NH}_4$  salts, phosphates and calcium and 5% of yeast on the wt. of sugar in molasses are added. Fermentation is accomplished in 36-48 hrs. in alk. medium in presence of bisulfites of Na and compds. of Ca and Mn. At the end of fermentation the soln. is distd. to eliminate alc. and aldehyde. The remaining liquid mass contains much sulfite, which can be pptd. by  $\text{CaO}$ . The soln. is refiltered and the alk. of the filtrate is neutralized by  $\text{CO}_2$  and  $\text{H}_2\text{SO}_4$ . The crude glycerol is concd. and distd. in a current of superheated steam. Glycerol 20%, alc. 20% (87.5°) and aldehyde 8% were obtained.

V. E. B.

**Benzoic and salicylic acids in alcoholic beverages.** F. DAELS. *Bull. acad. méd. Belg* 1, 28(1928); *Quart. J. Pharm. and Pharmacol.* 2, 83.—The following methods are recommended: 150 g. of sample is shaken with 20 cc. of Pb subacetate soln. (10%) and 5 cc. of soln. of  $\text{NH}_4\text{OH}$  (d. 0.90) and filtered. The filtrate is shaken with 2 g. of  $\text{KHSO}_4$  to remove the excess of Pb and render the soln. acid. After removal of  $\text{PbSO}_4$  by filtration, the soln. is extd. with half its vol. of ether, the ether washed with a little water and evapd. The residue is treated with a ferric salt. A pink color indicates benzoic acid; a violet color indicates salicylic acid or possibly a mixt. of the two acids. The detn. is carried out as above, 100 cc. of the filtrate being used. If both acids are present, the salicylic acid is removed by conversion to picric acid and then to chloropicrin. The residue is treated with 4 to 5 cc. of dil.  $\text{HNO}_3$  and carefully evapd. to dryness, taken up again with 100 cc. of water, 6 g. of bleaching powder added, and warmed on a water-bath for 10 min. The chloropicrin so formed is volatilized. The soln. is filtered, made slightly acid with  $\text{H}_2\text{SO}_4$  and the pptd.  $\text{CaSO}_4$  filtered out. The benzoic acid is extd. with ether and weighed. From the wt. of benzoic acid and the total wt., the salicylic acid can be calcd.

H. L. D.

**Processes for the preparation of sweet ciders.** G. WARCOLLIER AND LE MOAL. *Chimie & industrie, Special No.*, 624-32(Feb., 1929).—There are 2 types of sweet ciders, (a) those obtained by sweetening completely fermented cider by addn. of unfermented apple juice, (b) those which have been kept naturally sweet by incomplete fermentation. The various processes of production of these 2 types are described.

A. P.-C.

**Composition of fusel oils which have been separated as vapor.** B. LAMPE. *Z. Spiritusind.* 52, 190(1929).—A table giving the commercial evaluation of 7 fusel oils and their  $\text{AmOH}$  contents, obtained by fractional distn., shows that the former methods

are misleading. For the same commercial rating the difference in AmOH found by fractional distn. was as high as 20%. A. SCHULTZ

**Determination of starch value of sound and frozen potatoes, with reference to their use for distilling and drying.** B. LAMPE AND W. KILP. *Z. Spiritusind.* 52, 177-8 (1929).—Two samples of frozen potatoes were used, the one apparently sound and the other softened and attacked by bacteria. The starch contents detd. by (1) calcn. from the sp. gr., (2) acid hydrolysis and Fehling's soln., (3) hydrolysis, fermentation and detn of alc. and (4) subtracting 5.8% from the dry matter were, respectively, 16.7, 16.97, 16.82, 16.77% on the sound and 12.0, 23.45, 24.26 and 24.75% on the unsound sample. The applicability of the sp. gr. method for the detn. of starch in unsound potatoes is discussed. A. SCHULTZ

**Modern malting methods.** G. CHABOT. *Wochschr. Brau.* 46, 208-11 (1929).—The optimum  $p_H$  of the steep water is 6-7. With slightly more acid or alk. steep waters the  $p_H$  tends to adjust itself to the above value. Alk. steep water tends to darken the grain. A. SCHULTZ

**Liquefying and saccharifying powers of German malts of the 1928 harvest.** H. LÜERS AND F. WIENINGER. *Wochschr. Brau.* 46, 173-4 (1929). A. SCHULTZ

**Chemical composition of the barleys and malts of 1926 and their worts and beers.** W. WINDISCH, P. KOLBACH AND W. BANHOLZER. *Wochschr. Brau.* 46, 223-8, 235-40 (1929); cf. *C. A.* 22, 2806. A. SCHULTZ

**Determination of tannin.** B. D. HARTONG. *Wochschr. Brau.* 46, 11-15 (1929).—A method is outlined for detg. tannin in beer and wort by titrating the soln. before and after absorbing with casein with 0.01 N  $KMnO_4$ , indigo soln. being used as an indicator. A. SCHULTZ

**Practical experiments on the significance of hop tannins for wort and beer.** H. BILGRAM. *Wochschr. Brau.* 46, 137-41 (1929).—Hop tannins besides improving the flavor of beer ppt. higher albumins and thus produce a clear wort and beer. A hop tannin treatment of pale beers to remove protein material did not prevent these beers from becoming cloudy after pasteurization. A. SCHULTZ

**Hydrogen-ion action in the brewing industry. IV. 2. The effect of the hydrogen-ion concentration on fermentation.** G. HAGUES. *Wochschr. Brau.* 46, 178-82; *J. Inst. Brewing* 35, 51-60 (1929).—The detn. of the reproductive powers of 4 organisms in wort of varying  $p_H$  values has shown that the growth of *Torula* depends upon one enzyme or one group of enzymes whose optimum lies at  $p_H$  5, that the growth of *Sacch. ellipsoideus* and *Sacch. cerevisiae* depends upon two enzymes having optimum  $p_H$  at 4 and 8.5 and besides these two *Pastorianus* yeasts have a third optimum at 6.5. Growing *Pastorianus* I and *Sacch. cerevisiae* in the same wort was harmful to both. A. SCHULTZ

**Improvement of brewing waters of high carbonate content by lactic acid.** V. KOUDELKA. *Wochschr. Brau.* 46, 164-70, 174-8 (1929).—Addn. of lactic acid to hard waters used in brewing improves them more than the lime or  $CaCl_2$ . Lactic acid stimulates protease and phosphatase action but an excess retards diastatic action. A better "break" results in these lactic acid-treated worts. Also the yeast settles better and the beers are paler and have a finer flavor. A. SCHULTZ

**Rapid estimation of nitrogen by Kjeldahl's method.** H. LUNDEN AND J. ELLBORG. *Wochschr. Brau.* 46, 133-7, 147-9 (1929).—Acid digestion of malt, beer, wort, etc., can be completed in 8-12 min. For example, 1-2 g. of malt is digested over a microburner in a 500-cc. flask with 10-20 cc. of 30%  $H_2O_2$ , 0.5 g. copper wire and 10 cc. of a mixt. of 3 vols. concd.  $H_2SO_4$  and 2 vols. 85%  $H_3PO_4$ . After this vigorous action 7 g. of  $K_2SO_4$  is added and the mixt. boiled 5 min. with an ordinary burner. A. SCHULTZ

**The occurrence of sucrase in must and wine.** C. VON DER HEIDE AND H. MANDLEN. *Z. Untersuch. Lebensm.* 57, 13-36 (1929).—A gradual decrease in sp. rotation of sucrose is an indication of the presence of sucrase in wine. Sucrase was detected in grapes, musts and wines. The action of sucrase is particularly marked in new wines and those containing yeast deposits. Probably because of the combined action of acid and EtOH, the action of sucrase in matured wines is only slight and gradually becomes inactive. The life of sucrase depends upon the acid, EtOH and sugar concns. as well as the temp. of storage. After 5 yrs. sucrase is usually inactive. Sucrase is derived from grapes and yeast. It is partly or completely destroyed by heat. C. R. FELLERS

**Identification of volatile acids in wines by fractional distillation.** VIRGILE MIROIR. *Chimie & Industrie* Special No., 614-8 (Feb., 1929).—In wine analysis, detn. of the total volatile acidity in terms of  $H_2SO_4$  is not sufficient, and it is important to have some idea of the nature and relative proportions of the volatile acids. This may be obtained by Duclaux' fractional distn. method. In order to obtain reliable and concordant results, the technic adopted must be followed very closely, and the following is recommended:

After elimination of  $\text{CO}_2$  and  $\text{SO}_2$  place 110 cc. of wine in a small distg. flask provided with a thermometer divided in  $0.1^\circ$  from  $89^\circ$  to  $105^\circ$ , distil 100 cc. in 30 min., collecting the distillate in 10 10-cc. volumetric flasks and observing the time and temp. at the beginning and end of each fraction; titrate each fraction with 0.01 *N* NaOH, and compare the curve with those of formic, acetic, propionic, butyric and valeric acids. Results of a few analyses carried out by this method on wines of known origin are given and discussed. The curves obtained with normally fermented wines are practically identical, irrespective of the compn. and origin of the wines, and lie between the curves of formic acid and AcOH; the curve for soured wines is practically identical with that of AcOH as detd. by Duclaux; the curve for wines attacked by "tourne" is intermediate between those of AcOH and propionic acid.

**Identification of urotropine in wines.** MIRCEA V. IONESCU AND CORNELIU BODEA. *Bull. soc. chim.* 45, 466-8 (1929).—Portions of clear wine, 2-5 cc., and 1-2 vol. of an aq. soln. of dimethyldihydroresorcinol (7%) in presence of urotropine or HCHO show a white, cryst. ppt. of methylenebisdimethylidihydroresorcinol, m.  $184-7^\circ$ . MeCHO reacts similarly. A. PAPINEAU-COUTURE

**Detection of fruit wine in grape wine by use of dibenzalsorbitol.** C. VON DER HEIDE AND K. HENNIG. *Z. Untersuch. Lebensm.* 57, 240-1 (1929).—Werder's method (*C. A.* 23, 4296) using 100 cc. of wine was used. Also in *Z. anal. Chem.* 77, 441-50 (1929). K. H. ENGEL

**Diastatic "casse" of red wines.** VIRGILE MIROIR. *Chimie & industrie Special No.*, 619-23 (Feb., 1929).—Diastatic "casse" is an alteration of wine due to the action of O in presence of enoxidase, the degree to which it proceeds depending on the amt. of enoxidase present. As regards the presence of the latter in wines, it comes practically solely from *Botrytis cinerea*. The disease is proportional to the amt. of enoxidase present and is not contagious. The lack of success of attempts to age wines artificially by treatment with O is attributed to the low oxidizability of wines; as wines contg. enoxidase have a considerable affinity for O, it might be expected that by mixing a certain amt. of it with normal wine, the affinity of the mixt. for O would be such as to permit of artificial aging with O. Preliminary expts. along these lines have given promising results as regards the general appearance (particularly color) and taste of the treated wine, though it did not give the delicate bouquet of naturally aged wines. When the desired degree of oxidation has been obtained, further change may be prevented by pasteurizing at  $80^\circ$  (preferably  $85^\circ$ ). A. PAPINEAU-COUTURE

**Determination of volatile acids in beer.** W. WINDISCH, P. KOLBACH AND E. SCHILD. *Wochschr. Brau.* 46, 245-8, 255-9 (1929).—Vacuum distn. of beer at  $p_H$  3 will liberate all the AcOH and  $\text{HCO}_2\text{H}$  and only a negligible amount of lactic acid. Bottom-fermentation beers made from 12 to 14% worts have a volatile-acid content ranging from 1.71 to 4.17 cc. 0.1 *N* per 100 cc. beer. A. SCHULTZ

**Investigations on the sarcinas of beer, particularly from the standpoint of their viscous properties.** JEAN SATAVA. *Chimie & industrie Special No.*, 633-6 (Feb., 1929). A. PAPINEAU-COUTURE

**Abnormal ester content of kirsch.** G. BONIFAZI AND L. BENVEGNIN. *Mitt. Lebensm. Hyg.* 20, 88-91 (1929).—Although the ester content of alc. beverages is the official analytical test of their quality, it is not always dependable. Kirsch made in 1919, 1921 and 1923, favorable years for the ripening of cherries, showed a very low ester content, but had an excellent flavor. Kirsch made in 1922 and 1924, when the weather was not favorable, had an odor of EtOAc and a higher ester content. A complete analysis, therefore, should include both chem. and organoleptic tests. AMY LEVESCONTE

**Influence of temperature and duration of storage on the fermentative power, cell increase and acid production of top fermentation yeasts.** F. WINDISCH. *Wochschr. Brau.* 46, 31-2 (1929).—Storage of yeast at low temp. was most favorable for subsequent fermentation, increase and acid production. A. SCHULTZ

**Biological quality of the yeast in vat sediments. Practical effect of separating the fermenting wort from these sediments.** F. WINDISCH. *Wochschr. Brau.* 46, 183-7, 197-200 (1929).—The yeast usually removed in the vat sediment shows a greater fermentative power than the yeast in suspension. A. SCHULTZ

**Frozen yeast.** STAIGER AND GLAUBITZ. *Z. Spiritusind.* 52, 116 (1929).—Yeast which was frozen at  $-10^\circ$  to  $-25^\circ$  for 1 to 4 days and subsequently thawed for 24 hrs. at room temperature and  $5^\circ$  showed little change in properties. Its baking and keeping qualities, N content and biol. appearance were almost normal. A. SCHULTZ

**Solid molasses (STAIGER, GLAUBITZ) 28. Determination of the starch value of frozen potatoes (LAMPE) 28.**

SEGHERS, JOZ.: *De fruitwijnen. Bereiding. Ziekten en Behandeling van zieke Wijnen. Champagniseeren. Welten. Tweede uitgave.* Brussels: De Nationale Drukkerij. 114 pp. F. 50.

**Fermentation.** PHILIPPE MALVEZIN. *Fr.* 34,104, June 30, 1927. Addn. to 631,782. Worts, wine, beers, etc., are sterilized by making a culture of the enzyme against which it is desired to protect the liquid, destroying the enzyme and extg. with ether, removing the ether and grinding up with salted water, and adding the vaccine obtained to the wort, etc. The step of destroying the enzyme may be omitted.

**Lactic and acetic acids.** WM. H. PETERSON and EDWIN B. FRED (to Wisconsin Alumni Research Foundation). U. S. 1,723,298, Aug. 6. A special newly discovered microorganism (which is described and which may be obtained from fermenting-plant materials such as silage or sauerkraut) is used for producing lactic and acetic acids by the fermentation of molasses solns. or products derived by the hydrolysis of wood, straw, sawdust, corncobs, corn stover, cottonseed hulls or like materials. Lactic acid is the main product.

**Apparatus for vinegar making.** ELMER W. LOSSING. U. S. 1,722,382, July 30. Various structural details are described, of an app. for carrying out the Schützenbach process.

**Beer and by-products.** E. JALOWETZ and M. HAMBURG. *Brit.* 303,110, Dec. 28, 1927. Malt enzymes, diastases, etc., are obtained as by-products in beer brewing, and the quality of the beer is improved by mashing the malt with water at such temps., below 35°, that the peptonization of the insol. albuminous substances cannot take place and the enzymes are not injured. A soln. contg. enzymes is sepd. and concd.

**Yeast production.** FRED RANSOHOFF (to The Fleischmann Co.). U. S. 1,722,858, July 30. During propagation of yeast in a nutrient soln., with aeration, EtOH is added to the propagating liquid (suitably in a quantity of about 10% by vol. of 25 proof alc.), and a substantial increase in the yield of yeast may thus be obtained, without increasing the time of propagation or adversely affecting the quality of the yeast for baking purposes.

**Yeast manufacture.** JOHN HASLING, JR. (to The Fleischmann Co.). U. S. 1,722,746, July 30. Yeast propagation may be initiated in a dil. yeast-nutrient soln. which is aerated until the seed yeast is increased approx. 50%, whereafter approx. one-third of the propagating liquid may be withdrawn and the yeast sepd. from it; an approx. equal quantity of fresh nutrient soln. is added and the propagation is continued.

**Bakers' yeast.** ERWIN KLEIN (to The Fleischmann Co.). U. S. 1,722,803, July 30. Yeast is propagated in a nutrient medium with aeration until a high yield of "forced" yeast is obtained, the yeast produced is removed, subjected to a purifying treatment and the "forced" yeast is strengthened by propagating it in a second nutrient until it has good baking and keeping qualities; the second nutrient medium is composed principally of ingredients of a relatively easily assimilable character.

## 17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

**Tobacco smoking. II.** A. WINTERSTEIN and E. ARONSON. *Z. Hyg. Infektionskrankh.* 108, 530-53 (1928).—The main current from a cigaret carries about 25% of the nicotine into the mouth, at least 50% passing into the air; from a cigar 60% reaches the mouth. The main current from cigarets of light tobaccos contains markedly less nicotine than that from dark tobaccos. B. C. A.

**Detection of parsley preparations.** L. VAN ITALLIE and A. HARMSMA. *Pharm. Weekblad* 66, 645-7 (1929).—Preps. of parsley fruit are being sold as alleged abortifacients, usually flavored with peppermint or anise and sometimes colored with a green dye. The content of apiol is too small for isolation and identification of this characteristic constituent. Aside from taste and odor a useful test for the recognition of parsley is the prepn. of dibromomyristicin dibromide, m. 130°, by treating an Et<sub>2</sub>O ext. of the steam distillate with Br in AcOH. Myristicin occurs in several other plants; hence its presence is a fair indication rather than conclusive evidence of parsley. A test for parsley oil is the sepn. of the solid glyceride of petroselinic acid, sapon. and identification of the unsatd. acid. In the proprietary preps., however, this glyceride was not present in sufficient amt. to sep. A. W. DOX

**Vinca rosea.** R. C. COWLEY and F. C. BENNETT. *Australasian J. Pharm.* 9, 61



(1928); *Quart. J. Pharm.* 1, 253.—*Vinca rosea*, Linn, N.O. Apocynaceae, is used as a household remedy for diabetes. Various specimens of dried leaves yielded from 0.53 to 0.85% of alkaloidal residue. This gave ppts. with the ordinary alkaloidal reagents and a red coloration with concd.  $\text{HNO}_3$ , and with dil.  $\text{HCl}$  and a crystal of  $\text{KClO}_3$ . By fractional crystn. of the tartrates C. and B. obtained 3 sep. compds. from this residue.

H. L. D.

**Iron and ammonium citrate.** R. C. COWLEY AND F. C. BENNETT. *Australasian J. Pharm.* 9, 170(1928); *Quart. J. Pharm.* 1, 248.—Fe and  $\text{NH}_4$  citrate is not a double citrate of Fe and  $\text{NH}_3$  but a ferricitrate of  $\text{NH}_3$  of indefinite compn. If progressive quantities of  $\text{Fe}_2\text{O}_3$  are dissolved in a definite amt. of citric acid, it is found that the first addns. reduce the amt. of  $\text{NaOH}$  or other alkali required to produce neutrality, but after an amt. of  $\text{Fe}_2\text{O}_3$  equiv. to 1.85 g. to 6.348 g. of citric acid has been dissolved, although further amts. of  $\text{Fe}_2\text{O}_3$  up to a total of 5.58 g. will dissolve, no further reduction in the amt. of  $\text{NaOH}$  required to neutralize the soln. is observed. It is deduced that the further amt. of  $\text{Fe}_2\text{O}_3$  beyond 1.85 g. is in the colloidal condition and that this gives the ppt. caused by the addn. of saline substances to solns. of Fe and  $\text{NH}_4$  citrate. The scales produced by evapg. the neutralized soln. contg. 1.85 g. of  $\text{Fe}_2\text{O}_3$  are green; those contg. larger porportions of Fe are reddish black.

H. L. D.

**Studies on insulin. II and III.** J. BEČKA. *Biol. sp. zvěrolék.* 6, 1–10, 255–60 (1927) Czech, with English summary; *Physiol. Abstracts* 13, 653.—A new method for the prepn. of insulin is described. The glands are ground up with 10%  $\text{FeCl}_3$ , which preserves the insulin content for at least 14 days. The insulin is extd. by 70% methylated spirit at a reaction of  $\text{pH}$  2.0. The final product is a white powder of a value of 10 clinical units in 1 mg. Some expts. for the prepn. of insulin from *Lactuca sativa* had neg. results. An active substance was prepd. from the offal of a sugar factory.

H. L. D.

**Oxidation of adrenaline. I.** The rates of oxidation of commercial solutions. T. VACEK. *Biol. sp. zvěrolék.* 6, 283–90(1927) Czech, with German summary; *Physiol. Abstracts* 13, 662–3; cf. *C. A.* 21, 3065; 22, 1652; 23, 3541.—The rates of oxidation (with  $\text{H}_2\text{O}_2$ ) of different com. adrenaline solns. differ. These rates do not depend upon the  $c_{\text{H}}$  of the solns. Some solns. with a high  $c_{\text{H}}$  oxidize more readily than others with a lower  $c_{\text{H}}$ . **II. The importance of preservatives.** *Ibid* 319–23; *Physiol. Abstracts* 13, 662–3.—The oxidation (with  $\text{H}_2\text{O}_2$ ) of different com. adrenaline solns. depends upon the quality of the solvent and of the different preservative substances. A soln. of pure adrenaline dissolved in  $\text{HCl}$  was oxidized more slowly than a com. soln. of adrenaline at the same  $c_{\text{H}}$ . **III. The importance of some acids of different dissociabilities as solvents of adrenaline.** *Ibid* 347–57; *Physiol. Abstracts* 13, 662–3.—Various “pure” adrenaline substances were dissolved in  $\text{HCl}$ , lactic, acetic and boric acids at a normality of 1, 0.1 and 0.015. The rates of oxidation (with  $\text{H}_2\text{O}_2$ ) of these different solns. have been detd. Different adrenalinols dissolved in the same acid of the same normality were oxidized at various rates. The same adrenaline dissolved in different acids of the same normality also oxidized at different rates. The rate of oxidation does not depend upon the degree of dissociation of the acids. **IV. The photooxidation of commercial solutions and the role of preservatives.** *Ibid* 359–64; *Physiol. Abstracts* 13, 663.—The photooxidation of different com. adrenaline solns. was detd. Oxidation with ultra-violet and visible rays is much more intense than that with visible rays only. Oxidation by visible rays only is, however, nearly as intense as by ultra-violet radiation only.

H. L. D.

**Fixed oil of Caloncoba glauca seeds.** E. PERROT. *Bull. sci. pharmacol.* 35, 260 (1928); *Quart. J. Pharm.* 1, 233.—Since *Oncoba echinata* is not found commonly in the French Cameroons, where leprosy is very prevalent, a common indigenous species, *Oncoba klainii*, or *Caloncoba glauca* A. Chevalier, has been examd. with a view to ascertaining if it can afford a fixed oil suitable to replace chaulmoogra oil in the treatment of that disease. The crushed kernels of the seeds of *Caloncoba glauca* yield to extn. with petr. ether, 30% of pale yellow, semi-solid fat with I value, 86.3,  $a_D^{25} + 60.8^\circ$ . Tested on a lizard weighing 6 g. it developed a stupefying effect in 4 min. From the very high dextrorotation, it is evident that the oil contains a large proportion of acids of the chaulmoogric or hydnocarpic group. The I value is also very near that of *Hydnocarpus anthelmintica* oil. The rapid stupefying action of the fat upon the lizard points to the probable presence of a cyanogenetic glucoside in the kernels. H. L. D.

**On the bottom of the citrate bottle.** WM. J. LOWRY. *Glass Container* 8, No. 9, 16–34(1929); cf. Barnby and Voight, *C. A.* 23, 2783.—Suggested changes in the U.S. P.X formula for citrate of magnesia are: (1) natural oil of lemon should be replaced by the equiv. of terpeneless oil; (2) the  $\text{K}_2\text{CO}_3$  should be reduced to 2 g.; (3) distd.  $\text{H}_2\text{O}$

of room temp. should be specified and (4) the purified talc should be deleted and the formula made for multiples of 1 bottle. To prep. Mg citrate add the citric acid at room temp. to the distd.  $H_2O$ , then gradually the  $MgCO_3$  followed by the terpeneless oil of lemon. Let stand several hrs., filter through thick filter paper and make to vol. minus the allowance for sirup. Sirup should be added just before bottling to decrease danger from mold spoilage. The  $K_2CO_3$  is added without agitation. The bottled citrate is heated at  $74^\circ$  in a water bath for 30-90 min. By following this procedure, sediment formation is entirely prevented.

C. R. FELLERS

Simple tests for stock solutions of quinine and potassium iodide. J. W. D. MEGAW AND HERBERT HAWLEY. *Indian Med. Gaz.* 64, 378-80 (1929).—The concn. of quinine solns. is detd. by phosphotungstic acid as reagent, and that of KI by  $Pb(NO_3)_2$ . The vol. of the ppt. in each instance is compared with that obtained by the employment of standard solns.

FREDERICK G. GERMUTH

Germicides and antiseptics. JAMES F. MALCOLM. *Scottish J. Agr.* 12, 174-85 (1929).—A no. of the more common germicides and antiseptics are discussed with particular reference to the factors affecting their effectiveness.

K. D. JACOB

The determination of ammonia and amide nitrogen in tobacco by the use of permutite. HUBERT B. VICKERY AND GEORGE W. PUCHER. *J. Biol. Chem.* 83, 1-10 (1929); cf. *C. A.* 23, 4019.—The presence of nicotine makes difficult the accurate detn. of  $NH_3$  and amide N in tobacco but it has been found that only a very small amt. of nicotine is taken up by permutite and that it gives no color with Nessler's reagent. In the method described the  $NH_3$  is distd. into acid, the distillate is treated with permutite, the  $NH_3$  liberated by alkali and detd. colorimetrically by Nessler's reagent. The amide N is detd. in a similar manner in the hydrolyzed ext. The method is simple and rapid and can be readily employed in the investigation of other tissues.

A. P. LOTHROP

Comparison of the disinfectants most used by the medical profession. ANDREA BARONE. *Semana méd.* (Buenos Aires) 35, 995-7 (1928).—I in  $H_2O$  soln.,  $C_6H_5OH$ ,  $HgCl_2$ ,  $KMnO_4$ , boric acid, lysol and quinosol are compared. Judged by the germicidal and irritating effect, quinosol is preferable.

A. E. MEYER

Java oil of citronella: necessity of a practical method of analysis. E. TAKENS. *Riechstoffind.* 3, 124-5 (1929); *Chimie et industrie* 21, 1243.—Shake 50 g. of oil for 2 hrs. with 3 vols. of concd.  $NaHSO_4$  soln., contg. a little  $NaOH$ , let stand several hrs., dissolve in 1 l.  $H_2O$ , after sepn. of the oil decant the aq. layer, treat the oil again with 50 cc.  $NaHSO_4$  soln. for 30 min., take up in 400 cc.  $H_2O$ , ext. the combined aq. solns. 3 times with  $Et_2O$ , add the ext. to the residual oil, dehydrate over anhyd.  $Na_2SO_4$ , filter, wash the  $Na_2SO_4$ , evap. the ext. *in vacuo* at about  $40^\circ$  and weigh. If  $a$  = wt. of residue,  $100 - 2a$  = % citronellal. The results obtained in this way on 2 samples were similar to those obtained via Kleber, and were about 3% lower than those via Dupont and Labaune.

A. PAPINEAU-COUTURE

A new method of estimating the potency of digitalis: Pigeon emesis. P. J. HANZLIK. *J. Pharmacol.* 35, 363-91 (1929).—It is proposed to assay digitalis prepn. by detg. the minimum emetic dose (m. em. d.) in pigeons. The method is economical, easy and convenient to use, and the results compare favorably with those obtained by frog and cat methods of assay. M. em. d. causes changes in pulse rate characteristic of digitalis action. The margin of safety in use of the drug can be obtained by detg. the ratio of m. em. d. to m. l. d. It is suggested that from the m. em. d. (pigeon units) there be calcd. the number of pigeon units per g. of prepn. and the strength of the prepn. so expressed

C. RIEGEL

Results with the pigeon-emesis method of estimating the probable therapeutic dose of digitalis. P. J. HANZLIK AND A. B. STOCKTON. *J. Pharmacol.* 35, 393-407 (1929).—Tincture of digitalis, assayed by the pigeon-emesis method, was given to human subjects by mouth, the dose being calcd. from the m. em. d. for pigeons. Slowing of the pulse and reduction in systolic and diastolic blood pressure were observed. The clinical doses agreed well with the m. em. d. detd. in pigeons. It is concluded that the pigeon-emesis method of estimating the potency of digitalis appears to predict the probable therapeutic dose for man.

C. RIEGEL

Elemi oil. SCHIMMEL & Co. *Ber. Schimmel* 1928, 24; *Chem. Zentr.* 1928, II, 1827.—A carana resin from Columbia, which is probably identical with the caranaelemi resin obtained from *Protium Carana* (humb.) L. March, yielded on distn. with steam 15.9% of a light brown oil of turpentine-like odor;  $d_{15}^{20}$  0.9683,  $[\alpha]_D^{20} + 18^\circ 34'$ ,  $n_D^{20}$  1.50448, acid no. 5.0, ester no. 22.4, ester no. after acetylation 42.9, sol. in 8 vols. of 90% alc. The first runnings of the oil (7%, b. p. up to  $175^\circ$ ) contained phellandrene.

G. SCHWOCH

**A rational method for preparing solutions of strychnine salts with the salts of arsenic, phosphoric, glycerophosphoric and methyl- and dimethylarsonic acids.** R. BRAGILOVSKA. *Farm. Zhur.* 1928, 25-30; *Chem. Zentr.* 1928, II, 2381.—In agreement with investigations of Eysseria (*Jahrb. Pharm.* 40, 382(1905)), Demo (*Jahrb. Pharm.* 56, 189(1921)) and others, B. believes that the ppts. occurring in solns. of strychnine salts with the Na salts of arsenic, phosphoric, glycerophosphoric and methyl- and dimethylarsonic acids are due to the alk. reaction of these solns. caused by the hydrolysis of the Na salts. The formation of the ppts., which in all cases could be identified as pure strychnine, is best prevented by addn. of HCl, whose concn. has to be calcd. from the amts. of strychnine and HCl salts present in the solns. Thus the originally alk. reaction becomes almost neutral. The solns. were prepd. by dissolving the strychnine salts in H<sub>2</sub>O contg. HCl and then adding the Na salts dissolved in HCl of the same concn. Thus the following combination, after sterilization at 100°, did not give a ppt.: Strychn. nitr. 0.005; natr. arsenici 0.1; na glycerinophosph. 1.0; Sol. acid. muriat. 0.02 N 10.0.

G. SCHWOCH

**The production of menthol from Ukrainian peppermint oil.** M. EIDERMAN. *Farm. Zhur.* 1928, 35-7; *Chem. Zentr.* 1929, II, 2355.—Several fractions were obtained in the vacuum distn. of peppermint oil at 8-10 mm. Hg and 45-111°. The fraction b. 88-90° contained most of the menthol (80%). The menthol was obtained in a pure state by cooling, sepg. it from the oily mother liquor and recrystallizing it.

G. SCHWOCH

**Australian sandalwood oil.** F. L. GRINBERG. *Farm. Zhur.* 1928, 247-8; *Chem. Zentr.* 1928, II, 821.—G. cites the data given in the literature concerning the chem. and phys. consts. of Australian sandalwood oil (from *Santalum spicatum* and *lanceolatum*) and reports the results of his own investigations for 1 Australian product imported to the Ucraina. Comparison with Indian oil shows that there are no objections to its employment in therapy.

G. SCHWOCH

**The extraction of strychnine in the forensic chemical examination.** N. VALYASHKO AND V. ROSVADOVSKII. *Farm. Zhur.* 1928, 532-4; *Chem. Zentr.* 1929, I, 117.—Strychnine is extd. with CHCl<sub>3</sub> from the soln. made distinctly acid with tartaric acid. The test for strychnine must be carried out directly in the residue on evapn. of the acid CHCl<sub>3</sub> ext. or after purification by dissolving in acidified H<sub>2</sub>O, rendering alk. and extg. with Et<sub>2</sub>O or CHCl<sub>3</sub>. With the extn. according to Gadamer by means of Et<sub>2</sub>O and CHCl<sub>3</sub> from the acid and, later on, alk. soln. and examn. of the ethereal-alk. ext. it is possible that no strychnine is found in material contg. this drug.

G. SCHWOCH

**Absolute flower oils.** W. A. POUCHER. *Chemist and Druggist* 108, 308-9(1928).—A comparison of the enfleurage and volatile solvent products. The latter process of manuf. is now the most frequently used. Regarding the odor evaluation and yield of the abs. oils from jasmine (cf. Cerighelli, *C. A.* 19, 843) and tuberosc, the relative value of the 2 processes is still in doubt. For jasmine flowers, the difference in yield is believed to be nil (cf. v. Soden, *C. A.* 19, 3147; the ratio 5:2 is claimed). P. shows that from the point of view of prices for given strength of odor, there is very little choice between the abs. jasmine oils from both mfg. sources, since about 3 times the cheaper (enfleurage) at approx. 1/3 the price was required to equal the odor strength of the volatile solvent abs. oil.

S. WALDBOTT

**Moscow Endocrinology Institute.** ANON. *Chemist and Druggist* 109, 345(1928).—This Soviet State institution supplies its country with exts. of *orchicrin* (Kravkov) and other preps., e. g., adrenaline, *mascrin*, *antiasthmocrin*, *masmocrin*, *pilucrin*, insulin, thyroxine, ovary hormones and pituitrin. It maintains its own breeding farms, and at Sukhum (Caucasus) is located "the only sub-tropical monkey-breeding farm in the world."

S. WALDBOTT

**Slovakian mud bath.** J. G. F. DRUCE. *Chemist and Druggist* 108, 467(1928).—At Trencsen-Teplicz, a radioactive, inorg. mud, free from bacterial life, accompanies some of the H<sub>2</sub>S-bearing hot springs, and is used with success in cases of rheumatism, gout, etc. Dried at 100-105°, its compn. is: SiO<sub>2</sub> 60.14, Al<sub>2</sub>O<sub>3</sub> 13.96, CaO 9.61, Fe<sub>2</sub>O<sub>3</sub> 6.10, SO<sub>3</sub> 3.12, CO<sub>2</sub> 0.91, MgO 0.80, K<sub>2</sub>O 3.46, Na<sub>2</sub>O 1.85, P<sub>2</sub>O<sub>5</sub> 0.001%. The hot springs (36-42°C.) yielding 9,000,000 l. daily are used medicinally for the same purposes; the water of 1 spring is used for a drinking cure. Its compn. per 10,000 parts is: Na<sub>2</sub>SO<sub>4</sub> 0.779, K<sub>2</sub>SO<sub>4</sub> 0.605, CaSO<sub>4</sub> 12.104, MgSO<sub>4</sub> 5.880, NaCl 1.806, CaCO<sub>3</sub> 3.007, Fe<sub>2</sub>O<sub>3</sub> and Al<sub>2</sub>O<sub>3</sub> 0.012, SiO<sub>2</sub> 0.354, CO<sub>2</sub> (as bicarbonate) 1.323, free CO<sub>2</sub> 2.423, H<sub>2</sub>S 0.022 parts.

S. WALDBOTT

**The chemistry of hair dyes.** H. STANLEY REDGROVE. *Chemist and Druggist* 109, 760-2(1928).—The chem. nature of the substances used as hair dyes, and the mode of formation of the color in the hair are presented. The question of toxicity and effect on the hair is discussed.

S. WALDBOTT

**Modern face powders.** W. A. POUCHER. *Chemist and Druggist* 108, 810-2 (1928).—A discussion of quality requirements of the powder, substances used (e. g., osmo-kaolin, C. A. 18, 1549), effect on the skin and the choice of color and of perfume.

S. WALDBOTT

**Sketches in the history of English medicine. I. Dawn: Celtic and Anglo-Saxon medical and pharmaceutical practice from the 9th to the 13th centuries.** CHARLES SINGER. *Chemist and Druggist* 108, 823-32 (1928). **II. Twilight: The Anglo-Norman period and the advent of the learning of Salerno and the Arabs (13th and 14th centuries).** *Ibid* 110, 795-807 (1929).

S. WALDBOTT

**Emulsio petrolei, Brit. Pharm. Codex.** W. A. KNIGHT. *Pharm. J.* 121, 297 (1928).—Since the use of gum acacia (A) alone produces much smaller oil globules with liquid paraffin (B) than gum tragacanth (C) as used in the Codex, K. recommends first making an emulsion with A, then incorporating B. Half the quantity of A prescribed would be sufficient. The use of 0.15% BzOH is better than that of gum benzoïn as a preservative. In the place of the expensive C, an *emulsio petrolei cum agar agar* is recommended.

S. WALDBOTT

**Antimony in pharmacy and chemistry. I. History and occurrence of the element.** G. MALCOLM DYSON. *Pharm. J.* 121, 397-8 (1928).—The manuf. of Sb from stibnite and the method of freeing it from As are included. **II. The metal and its inorganic compounds.** *Ibid* 520-1.—The compn. of Sb alloys (bearing metals and type metals) is given. The alloy Sn 3, Pb 2, Sb 1 is used in mfg. ship's nails resisting corrosion by sea water. The history and prepn. of inorg. pharmaceutical Sb compds., e. g., Alga-roth and Carthusian powders, and of tartar emetic are reviewed. **III. The organic antimony compounds in therapy.** *Ibid* 596 (1928).—The Sb analogs of arspenamine and arsacetin are useless in the therapy of syphilis. Org. Sb compds., aliphatic and aromatic, are employed in trypanosomiasis, leishmania and schistosomiasis, e. g., tartar emetic (cf. C. A. 17, 3371), "Bayer 205" (cf. C. A. 20, 450, 2702, 2866, 3742; 22, 817, 959), *sulfoform* (Ph<sub>3</sub>Sb:S), stibhenyl (C. A. 14, 2953; 17, 420), *stibosan* (3,4-Cl(AcNH)-C<sub>6</sub>H<sub>3</sub>SbO<sub>2</sub>Na<sub>2</sub>) and luargol (C. A. 12, 830); also cf. C. A. 22, 4648. Sb compds. in conjunction with chaulmoogra oil have been used in leprosy (cf. C. A. 21, 2935). S. W.

**The apothecary and some curious materia medica of the 17th century.** C. T. S. THOMPSON. *Pharm. J.* 121, 474-5, 480; *Chemist and Druggist*, 109, 607-9 (1928).—A lecture on the use of the human skull, blood, brain, fat, urine, gall, etc., and of insects, reptiles, earth (terra sigillata), etc., in the materia medica of that period. However, recent materia medica which uses bone marrow, brain ext., corpus luteum, cobra venom, etc., furnishes many counterparts.

S. WALDBOTT

**Manufacture of lead-selenium preparations.** A. L. TAYLOR AND E. LLOYD. *Pharm. J.* 121, 542-3 (1928); cf. C. A. 20, 2700.—Details are given of the manuf. of a colloidal Pb-Se compd. for intravenous injection in the treatment of cancer. The compd "D<sub>1</sub>" contained 0.4% Pb and 0.04% Se in filtered and sterilized soln. of gum acacia as vehicle. About 0.1% Pb was present as PbSe, 0.3% as Pb(AcO)<sub>2</sub>. An improved new prepn. "D<sub>2</sub>S" (all Pb being present as selenide) is on the market.

S. WALDBOTT

**Everyday problems in pharmacy.** J. H. FRANKLIN. *Pharm. J.* 121, 597-8; *Chemist and Druggist* 109, 673-4 (1928).—In a certain dispensing problem, pptn of salicylic acid from a mixt. of Na salicylate (A), KBr, dil. HBr and H<sub>2</sub>O was avoided by dissolving KBr (11.64 g.), dil. HBr (10.65 cc.) and K citrate (3.88 g.) in H<sub>2</sub>O (150 cc.); then an aq. soln. of A (19.4 g.) was added and the vol. made up with H<sub>2</sub>O to the required 240 cc. No ppt. was formed within a week. The characteristics of *oxymel scillae*, Brit. Pharm., are defined; prolonged heating alters the constituent purified honey, producing a very dark color. *Aromatic spirit of ammonia*, Brit. Pharm., developed a pale straw color in 18 months; if distn. is omitted in its prepn., darkening (mainly caused by the action of the alkali on the essential oil) will probably take place rapidly. The formula for *sirup of citric acid*, Brit. Pharm. Codex, requires revision, on account of the abundant pptn. of inverted sugar soon forming. The difference between the physiol. actions of *red squill*, a rat poison (cf. C. A. 21, 2937) and white squill (contg. glucosides acting on the heart) is pointed out.

S. WALDBOTT

**Nitrogen as a preservative for certain emulsions and sirups.** WILLIAM JOHNSTON. *Pharm. J.* 121, 619 (1928).—The N obtained as a by-product in the manuf. of O from air may be utilized to provide a non-oxidizing atm. in emulsion making, e. g., of cod-liver oil, or for ferrous sirups, ferrum reductum, etc.

S. WALDBOTT

**Homonarceine.** D. B. DORR. *Pharm. J.* 121, 620; *Chemist and Druggist* 109, 802 (1928); cf. C. A. 1, 1083, 2442; 2, 494.—By using EtI in place of MeI in the prepn. of narceine (A) from narcotine, homonarceine (B) may be obtained. B closely resembles A in its general properties. Heated to 98° in the oven, it loses 3 mols. of H<sub>2</sub>O.

Soly. in  $H_2O$  at ordinary temp. is 1:140. The dried *B m.* 169.5° (temp. raised gradually). With  $H_2SO_4$ , *B* dissolves with yellow color which tends to darken; it turns red on warming, deepening to brown. The fully hydrated  $HCl$  salt of *B* probably contains 3 mols. of  $H_2O$ ; soly. in  $H_2O$  is about 1:25. S. WALDBOTT

**Morphine sulfates.** D. B. DORR. *Pharm. J.* 121, 620, 627; *Chemist and Druggist* 109, 802 (1928).—The acid salt  $M.H_2SO_4$  ( $M = C_{17}H_{19}NO_3$ ) is easily sol. in  $H_2O$  (cf. *C. A.* 12, 1235); by repeated crystns. the normal salt  $M_2.H_2SO_4.5H_2O$  (*A*) is formed. When  $M.H_2SO_4$  is recrystd. from  $EtOH$ , titration of the product with 0.1 *N*  $NaOH$  indicates a sesquisulfate of *M*,  $M_{1.5}.H_2SO_4$  (*B*). When *M* is dissolved in a small quantity of  $H_2O$  and the soln. mixed with 0.75 mol.  $H_2SO_4$ , a mass of well-defined crystals, probably *B*, is also formed. Treatment with  $H_2O$  will convert *B* into *A*. The U. S. P. statement that *A* "dried to const. wt. at 130° loses not more than 12% ( $H_2O$ )" needs revision. After *A* contg. 5 mols. of  $H_2O$  was heated on the water bath, 3 mols. of  $H_2O$  was lost, nothing more, however, at 130°. At 150–160° more  $H_2O$  was lost slowly, with decompn. of the salt. S. W.

**Strychnine phosphate.** D. B. DORR. *Pharm. J.* 121, 620, 627; *Chemist and Druggist* 109, 802 (1928).—The salt,  $C_{21}H_{22}N_2O_2.H_3PO_4.2H_2O$ , loses its  $H_2O$  slowly at 100°, more readily at 130°. Soly. in  $H_2O$  is 1:30 at ordinary temp.; (not 1:15). When the salt is prepd. with the aid of  $EtOH$ , the unstable compd.  $(C_{21}H_{22}N_2O_2)_2.H_3PO_4$  is formed;  $H_2O$  decomposes it, pptg. part of the alkaloid. S. WALDBOTT

**Some notes on chamomile.** H. STANLEY REDGROVE. *Pharm. J.* 122, 50–1 (1929).—The botanical differences between the English *Anthemis nobilis* and the German *Matricaria chamomilla* are sketched and explained. The chemistry of the essential oils and of the flower-heads (Power and Browning, *C. A.* 8, 3485; 9, 64) is reviewed. In addn. to the old medicinal uses as a tonic, etc., the dried flower-heads are now much employed in shampoo powders and hair washes, and sometimes in powder form as a hair dye, dependent on its apigenin content, a flavone deriv. S. WALDBOTT

**Arsenic in pharmacy and chemistry.** I. The element, its history and compounds. G. MALCOLM DYSON. *Pharm. J.* 122, 72–3 (1929).—The uses of the metal and its inorg. compds. in pharmacy and industry are pointed out, e. g., of a basic *Ca* arsenate in combating the boll-weevil pest (cf. *C. A.* 14, 3495; 16, 3162; 22, 2024). II. Some forensic aspects of arsenic. *Ibid* 146–8.—Detailed reference is made to famous cases of poisoning by  $As_2O_3$  in the Middle Ages, to the toxic properties of  $AsH_3$ , the detection of arsenic and arsenic eating. III. The organic arsenicals. *Ibid* 199–200, 225–6.—"From a small and apparently unimportant academic observation —(the discovery in 1760 of Cadet's fuming arsenical liquor or acétite oléo-arsénicale)—has sprung an important branch of modern chemotherapy." S. WALDBOTT

**Pharmacies in Czech Silesia.** J. G. F. DRUCE. *Pharm. J.* 122, 92 (1929).—A brief account of old pharmacies, and of medicinal springs in Czech Silesia. S. W.

**The keeping properties of dispensed medicine.** HARRY BODSWORTH. *Pharm. J.* 122, 94–5 (1929).—*B.* refers to periodic, e. g., monthly hospital supplies of medicine to convalescent patients for home use. Deterioration upon careless handling was established in 5 sets of expts., with preps. tending to lose strength (e. g., those contg.  $HCN$ ), to gain strength (e. g.,  $H_2O_2$  caused by evapn. of  $H_2O$ ), preps. liable to develop fungus growths, preps., the ingredients of which interact, and preps. which act on the cork, e. g., tinctures contg.  $NH_3$ . The latter action is avoided by coating the cork with paraffin. When bottles contg. medicine are well corked and kept in a cool dark place, little or no deterioration is noted. S. WALDBOTT

**The copper sulfate-sodium hydroxide test for ephedrine isomers and related compounds.** K. K. CHEN. *J. Am. Pharm. Assoc.* 18, 110–3 (1929).—To 1 cc. of a 1% soln. of the alkaloid add 0.1 cc. of 10%  $CuSO_4$  and 1 cc. of 20%  $NaOH$ . A purplish or deep blue color is produced. If the test reacts positively add 2 cc. of  $Et_2O$  and shake. The color dissolves in  $Et_2O$ . The test applied to 27 aromatic amines, of which 6 were optical isomers of ephedrine, was positive in 22. All that reacted contain an  $OH$  attached to the  $\beta$ -C atom from the amine *N*. The  $Cu$  complexes formed by 16 of the amines are insol. in  $NaOH$ . The  $Cu$  complexes from 13 were sol. in  $Et_2O$ . The test may be used to distinguish the 3 ephedrines from the corresponding pseudo compds. L. E. W.

**The colloidal nature of iron scale salts.** D. LOESER. *J. Am. Pharm. Assoc.* 18, 124–8 (1929).—Several iron salts were prepared in scale form and their solns. dialyzed. It was concluded that the  $Fe K$  tartrate,  $Fe, NH_4$  tartrate and  $Fe$  glycerophosphate are true colloids. Several of the others exist partly in the colloidal state. This accounts for the lessened astringency of such salts. L. E. WARREN

**The ash content of resin of podophyllum.** L. D. HAVENHILL. *J. Am. Pharm. Assoc.* 18, 129–30 (1929).—Fifteen commercial samples of resin of podophyllum were

examd. for ash. Eight gave 0.18–0.45% of ash and five 0.65–0.89%; two were not claimed to be U. S. P. The color varied considerably. The resin can easily be made to contain less than 0.25% ash.  $\text{NaAl}(\text{SO}_4)_2$  used as a precipitant gives yellow resin and is no better than dil.  $\text{HCl}$ . The present U. S. P. limit of 1.5% ash is too high; an upper limit of 0.5% is recommended.

L. E. WARREN

A preliminary report on the composition of sirup of calcium iodide. CATY J. BRADFORD AND H. A. LANGENHAN. *J. Am. Pharm. Assoc.* 18, 135–42 (1929).—Sirup of  $\text{CaI}_2$  was prepd. by 3 formulas and the finished product stored under a variety of conditions. The specimens were assayed from time to time and the keeping qualities noted. The total iodide ranged from 2.80 to 5.89%. Some of the specimens contained free I. The contents of  $\text{FeI}_2$  and  $\text{CaI}_2$  varied greatly.

L. E. WARREN

Tests for  $\text{H}_2\text{O}_2$  solution (BERRY) 7. Chemistry and its relation to medicine (TANNAHILL) 11A. Official inspections. Foods and drugs [spirit of peppermint] (BARTLETT) 12. Oil from *Hydnocarpus anthelmintica* (GEORGI, TEIK) 27. Intermediates [for pharmaceutical compounds] (Brit. pat. 303,901) 25. Preparation of disinfectants from rosin and crude cresols (U. S. pat. 1,722,687) 27. Carboxylic acids [for use as intermediates in manufacture of pharmaceutical compounds] (Brit. 303,389) 25.

HARMS, HERBERT: *Die Reagenzien und Reaktionen des deutschen Arzneibuches*. Berlin: Publication Office of the German Society of Apothecaries. 236 pp. Reviewed in *Am. J. Pharm.* 101, 544 (1929).

Notice sur l'exaltone et d'autres produits à odeur de musc. Geneva: M. NAIEF & CIE. 36 pp. Reviewed in *Chimie & industrie* 21, 1124 (1929).

Pharmaceutical Formulas. Vol. I. 10th ed., entirely revised and rewritten by S. W. WOOLLEY AND G. P. FORRESTER. London, 42 Cannon St.: The Chemist and Druggist. 1146 pp. 152 net. Reviewed in *Pharm. J.* 123, 98 (1929).

THOMS, H.: *Handbuch der praktischen und wissenschaftlichen Pharmazie*. Band V. pp. 753 to 980. Lieferung 27. Berlin: Urban und Schwarzenberg. M 10. Reviewed in *Pharm. J.* 123, 66 (1929).

Synthetic drugs. I. G. FARBERIND. A.-G. Brit. 303,097, June 23, 1927. Alkoxy aminophenols are converted into more basic polyamino derivs. by the introduction of alkylaminoalkyl groups into the OH and  $\text{NH}_2$  groups. An example is given.

Alkylaminoalkylamino compounds (synthetic drugs). I. G. FARBERIND. A.-G. Brit. 302,984, June 23, 1927. The process described in Brit. 274,058 (C. A. 22, 2033) is modified to yield compds. in which the aliphatic side chain is interrupted by O or S atoms or by secondary or tertiary amino groups. Examples are given. Brit. 302,985 specifies the conversion of aminophenols or diamines of the benzene series or their derivs. or substitution products into more strongly basic polyamino derivs. by introducing more than one alkylaminoalkyl group into the same or different amino groups of the benzene nucleus. Examples are given. These products may be used as therapeutic agents in combating blood parasites.

Medicine for bronchial affections. ANATOLE PANALLE (one-third to Sam L. Needle). U. S. 1,723,459, Aug. 6. South Carolina yellow pine tar 4 drams is used with beechwood creosote 1 oz. and  $\text{CS}_2$  8 oz., to form a mixt. which is used by inhalation.

Bismuth camphocarboxylate. MARIUS L. PICON. Fr. 657,694, Jan. 4, 1928. Neutral Bi camphocarboxylate is prepd. by the action of camphocarboxylic acid on anhydrous  $\text{Bi}_2\text{O}_3$  in the presence of a little water, drying the product under vacuum at a temp. below  $100^\circ$ , and afterward treating with an org. solvent such as benzene and removing the benzene with traces of water by distn.

Diethylaminoethyl thiourea and similar compounds (substitutes for ergot). HANS HAHN AND LUDWIG SCHÜTZ (to Winthrop Chemical Co.). U. S. 1,723,696, Aug. 6. Na (6 parts) is dissolved in 60 parts of alc. and 20 parts of thiourea is added. Subsequently 36 parts of diethylaminoethyl chloride is added. The reaction begins at ordinary temp. and is accelerated by warming. The mixt. is poured into water, the oil which seps. is dried and distd. It is a thick oil having most probably the formula:  $\text{NH}:\text{C}(\text{NH}_2)\text{SCH}_2\text{CH}_2\text{N}(\text{Et})_2$ . It  $b_{10}$   $140\text{--}143^\circ$ . With  $\text{HCl}$  it forms a salt which crystallizes from alc. in the shape of white needles sol. in water. The aq. soln. can be used for subcutaneous injections. Other alkylhalogenides can be used, e. g., ethylenebromide as starting materials for producing similar compds.

Hemoxyptic compounds. HANS HAHN AND LUDWIG SCHÜTZ (to Winthrop Chemical Co.). U. S. 1,723,695, Aug. 6. Na (6 parts) is dissolved in 60 parts of alc. and 60

parts of phenylthiodiazolone hydrosulfide is added. Subsequently 40 parts of  $\text{ClCH}_2\text{CH}_2\text{NEt}_3$  is added. The reaction begins at the ordinary temp. and is accelerated by warming. The mixt. is poured into water, the oil which ppts. is sepd., dried and distd. It is probably 5-[ $\beta$ -(diethylamino)ethylmercapto]-3-phenyl-1,3,4-thiodiazol-2(3)-one. With  $\text{HCl}$  it forms a salt which crystallizes from alc. in the shape of white needles sol. in water and m. 207–208°. The aq. soln. can be used for subcutaneous injections. Instead of phenylthiodiazolone hydrosulfide other S-contg. compds. possessing the chem. character of mercaptans and other alkylaminoalkyl halides can be used for producing similar products, which may be used as substitutes for ergot.

**Alkylamino compounds (therapeutics against blood parasites).** I. G. FARBENIND. A.-G. Brit. 303,093, June 23, 1927. The process described in Brit. 274,058 (C. A. 22, 2033) is extended to amines of the benzene series contg. more than 2 amino groups, or is modified to yield products in which a newly introduced alkylamino group is connected to the amino group of an amino hydroxy compd. or polyamine of the benzene series through the medium of a hydroaromatic residue. Examples are given of the prepn. of some of these products and of the production of intermediates for these reactions.

**Hormones.** O. KAMM, T. B. ALDRICH and I. W. GROTE (to Parke, Davis & Co.). Brit. 303,362, Dec. 31, 1927. In purifying and isolating the active principles of various glandular products such as those of exts. of the posterior lobe of the pituitary gland, the material is treated with an org. carboxylic acid such as  $\text{HOAc}$  or propionic or butyric acid, to dissolve the active principles but leave behind most of the contaminating substances, and the soln. formed is then subjected to fractional pptn. as by the addn. of acetone, ether and petr. ether. It is stated that a pressor and an oxytocic hormone may be separately obtained from pituitary ext. Various details are given.

## 18—ACIDS, ALKALIES, SALTS AND SUNDRIES

E. M. SYMMES

**Safety in the manufacture of sulfuric acid by the contact process.** STANLEY H. KERSHAW. *Ind. Eng. Chem.* 21, 762–3(1929).—Recommended practices. T. H. C.

**Chamber process and its regulation.** Y. N. SLAVYANOV. *Zhur. Prikladnoi Khim.* 1, 319–22(1928).—The old method of regulating the  $\text{H}_2\text{SO}_4$  chamber process by temp. differences and by color of the gases is not satisfactory and should be abandoned in favor of control of acidity of escaping gases. V. KALICHEVSKY

**Basic processes of manufacturing alumina.** G. G. URAZOV and Y. E. VILNYANSKII. *Zhur. Prikladnoi Khim.* 1, 271–83(1928).— $\text{Na}_2\text{O} \cdot \text{Al}_2\text{O}_3$  is formed by fusing  $\text{Al}_2\text{O}_3$  and  $\text{Na}_2\text{CO}_3$  at 500–1050°. The presence of  $\text{NaCl}$  has no appreciable effect on the reaction. The reaction rate increases with the increase in the amt. of  $\text{Na}_2\text{CO}_3$  present, but is also dependent on the nature of the raw material. For bauxites fusion with  $\text{Na}_2\text{CO}_3$  for 2 hrs. at 980° is recommended. Quick leaching with water leaves  $\frac{1}{4}$  of the  $\text{Al}_2\text{O}_3$  in an insol. form. Addn. of  $\text{Na}_2\text{CO}_3$  to this water is of no benefit, but addn. of  $\text{NaOH}$  ( $\frac{1}{3}$  of the amt. present in the melt) increases the yield of  $\text{Al}_2\text{O}_3$  by almost 100%. Mol. ratio of  $\text{Na}_2\text{O}$  to  $\text{Al}_2\text{O}_3$  in the soln. is about 1.09–1.48 which is not in accordance with the Goudrian diagram (C. A. 15, 478). V. KALICHEVSKY

**Barium process of manufacturing alumina from bauxites and aluminum silicates rich in silica.** G. G. URAZOV and A. V. CHITAEV. *Zhur. Prikladnoi Khim.* 1, 96–109 (1928); cf. C. A. 14, 1006.—Ba aluminates are formed at higher temps. than those of Na. Fusion at 1220° with  $\text{BaCO}_3$  converts 88–98% of  $\text{Al}_2\text{O}_3$  into water-sol. form, while at 1000° not over 55%  $\text{Al}_2\text{O}_3$  can be extd. In the presence of fluxes such as  $\text{NaCl}$  about 93%  $\text{Al}_2\text{O}_3$  is converted into the water-sol. form at 1000°. Soly. isotherms of the system  $\text{BaO}-\text{Al}_2\text{O}_3-\text{H}_2\text{O}$  were investigated at 60°. Max. soly. corresponds to 348%  $\text{BaO}$  and 1.129%  $\text{Al}_2\text{O}_3$  by wt. ( $\text{Al}_2\text{O}_3:2\text{BaCO}_3$ ). No compds. are formed. Soly. isotherms of the system  $\text{Ba}(\text{OH})_2-\text{NaCl}-\text{H}_2\text{O}$  at 60° show that no compds. are formed and that the highest soly. corresponds to a mixt. of 1.17 mols. of  $\text{BaO}$  and 1 mol. of  $\text{NaCl}$  (the ratio may be even closer to one).  $\text{NaCl}$  increases soly. of  $\text{Ba}(\text{OH})_2$  by 1.52% only. Investigation of the system  $\text{BaO}-\text{Al}_2\text{O}_3-\text{NaCl}-\text{H}_2\text{O}$  at 60° showed that presence of  $\text{NaCl}$  has no effect on soly. By fusing bauxites with  $\text{Na}_2\text{CO}_3$ , more  $\text{Al}_2\text{O}_3$  is converted into a sol. form than by fusing with  $\text{BaCO}_3$ , but the Ba process yields a product with a low  $\text{SiO}_2$  content as compared with the  $\text{Na}_2\text{CO}_3$  process. V. KALICHEVSKY

**Soda-lime process of manufacturing alumina from bauxites and aluminum silicates rich in silica.** G. G. URAZOV, YA. E. VILNYANSKII and YA. V. MORACHEVSKII. *Zhur. Prikladnoi Khim.* 1, 77–96(1928).—In fusing Al silicates with  $\text{Na}_2\text{CO}_3$  the principal

comps. formed are  $\text{Na}_2\text{O} \cdot \text{Al}_2\text{O}_3$  and  $1-1.5\text{Na}_2\text{O} \cdot \text{Al}_2\text{O}_3 \cdot 2-2.5\text{SiO}_2$ . Not more than 1 mol. of  $\text{Na}_2\text{CO}_3$  should be present per mol. of  $\text{Al}_2\text{O}_3$  and per 2 mols. of  $\text{SiO}_2$ ; otherwise considerable  $\text{SiO}_2$  is obtained in water-sol. form. The residue insol. in water has an approx. compn.  $\text{Na}_2\text{O} \cdot \text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$ . Best fusing temp. is  $850-950^\circ$ . When nepheline ( $\text{Na}_2\text{O} \cdot \text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$ ) was fused with  $\text{CaO}$  and the melt leached with water the insol. residue contained all four oxides. The  $\text{Al}_2\text{O}_3$  and  $\text{Na}_2\text{O}$  content of this residue decreases with the increase in the amts. of  $\text{CaO}$  and  $\text{SiO}_2$  present. When clay ( $\text{SiO}_2$  44.25,  $\text{Al}_2\text{O}_3$  38.73,  $\text{Fe}_2\text{O}_3$  0.85,  $\text{TiO}_2$  1.62,  $\text{H}_2\text{O}$  14.44%) was fused with  $\text{Na}_2\text{CO}_3$  and  $\text{CaCO}_3$  more water-sol.  $\text{Na}_2\text{O}$  and  $\text{Al}_2\text{O}_3$  were formed than with nepheline. The insol. residue probably contains  $3\text{CaO} \cdot \text{SiO}_2$ . By leaching the melt with hot  $\text{NaOH}$  soln. more  $\text{Al}_2\text{O}_3$  is extd. but  $\text{SiO}_2$  is also partly dissolved. The soln. of the problem consists in finding conditions under which all of  $\text{Al}_2\text{O}_3$  and no  $\text{SiO}_2$  are extd., but this could not be accomplished.

V. KALICHEVSKY

The estimation and control of acidity in the crystallization of ammonium sulfate. J. A. CRANSTON AND J. STOCKDALE. *J. Roy. Tech. Coll.* (Glasgow) 2, No. 1, 36-9 (1929).— $(\text{NH}_4)_2\text{SO}_4$  crystallizes best from a soln. contg. 2%  $\text{H}_2\text{SO}_4$ . To control automatically the amt. of acid added, an app. is described in which  $\text{SO}_2$  is liberated in the mixing vessel and then passes to an external cond. cell. The resulting increase in cond. is sufficient to operate a relay which regulates the admission of acid into the mixing vessel. Me orange was found to be a satisfactory indicator of acidity of  $(\text{NH}_4)_2\text{SO}_4$  solns. by titration with  $\text{NaOH}$ .

R. H. FERGUSON

Iron carbonyl. HEINRICH PINCESS. *Chem.-Ztg.* 53, 525-6 (1929).—The original Mond and Langer process of making  $\text{Fe}(\text{CO})_5$  was very tedious and gave a yield of about 1%, calcd. upon the  $\text{Fe}$  used. A recent I. G. Farbenindustrie A.-G. process uses  $\text{Fe}$  ore and  $\text{CO}$  from producer gas or water gas, with at least 5%  $\text{H}$  present, with temps. near  $500^\circ$  and pressure near 200 atm. It has not been possible to make the process continuous, but the gas is circulated until its  $\text{CO}$  content is less than 10%. The  $\text{Fe}(\text{CO})_5$  formed may be converted into metallic  $\text{Fe}$  or oxide of great purity, suitable for use as catalyst.

W. C. EBAUGH

Chemical treatment of potassium deposits at Solikamsk. F. F. WOLF AND V. S. YATLOV. *Zhur. Prikladnoi Khim.* 2, 85-90 (1928); cf. *C. A.* 23, 1220.—Deposits contain high-grade sylvanite and can be handled as an ideal  $\text{KCl}-\text{NaCl}-\text{H}_2\text{O}$  system.  $\text{CaSO}_4$  does not give trouble, and the quantity of  $\text{MgCl}_2$  is also small. The flow sheet of the process is given.

V. KALICHEVSKY

Bromine: importance and economic perspectives. PAUL MAQUENNE. *Chimie & industrie* 21, 1305-11 (1929).

A. PAPINEAU-COUTURE

Contribution to the preparation of pure chlorine gas. H. ECKSTEIN. *Chem. Fabrik* 1929, 335. R. WASMUHT. *Ibid* 335-6; cf. *C. A.* 23, 2769.

J. H. MOORE

Mining and treatment of gypsum in South Australia. L. J. WINTON. *Chem. Eng. Mining Rev.* 21, 337-40 (1929).

E. H.

Fermentation of brine water. SHINKICHI AKIMOTO. *Science* (Japan) 3, 148-52 (1928).—Owing to the fact that  $\text{H}_2\text{S}$  is formed in the tank contg. brine, removal of the sulfate ion by means of a culture of sulfate-reducing bacteria in the  $\text{NaCl}$  mfg. industry of Japan was attempted. For this purpose sulfate-reducing bacteria from natural brine water which can live in salty  $\text{H}_2\text{O}$  were inoculated in a brine of  $17^\circ \text{Bé}$ . at  $30^\circ$ . In 2 weeks 30% of the total sulfate could be decompd. by the bacteria.

K. SOMEYA

A study on agar-agar. I. TETSUNOSUKE YANAGAWA. *Repts. Imp. Ind. Research Inst. Osaka, Japan* 10, No. 6 (1929).—A preliminary rept. The historical development of the agar-agar industry in Japan together with the present status, and the effect of 16 inorg. and 11 org. compds. on the viscosity, degree of hydrolysis and degree of gelatinization of agar-agar soln. are discussed.

F. I. NAKAMURA

Preparation of plastics from unsaturated hydrocarbons. L. AUER. *Rev. gén. mat. plastiques* 5, 315, 317 (1929).—See *Fr. pat.* 652,795 (*C. A.* 23, 3804).

A. P.-C.

Notes on *p*-dichlorobenzene and naphthalene as repellents against clothes moth larvae. L. J. BOTTIMER. *J. Econ. Entomol.* 22, 570-3 (1929).—Small amts of  $p\text{-C}_6\text{H}_4\text{Cl}_2$  and  $\text{C}_{10}\text{H}_8$  exposed in a room did not repel larvae of the webbing clothes moth, *Tineola biselliella*.

C. H. RICHARDSON

The control of the tobacco beetle in upholstered furniture. S. MARCOVITCH. *J. Econ. Entomol.* 22, 602 (1929).—The stuffing inside the furniture infested with *Lasioderma serricorne* is treated with a satd. aq. soln. of  $\text{N}_2\text{SiF}_6$ .

C. H. R.

Sodium fluosilicate as a house fly poison. S. MARCOVITCH. *J. Econ. Entomol.* 22, 602 (1929).—A satd. aq. soln. was readily imbibed by *Musca domestica* and it readily killed them.

C. H. R.



**Soap production** [NaOH production from  $\text{Na}_2\text{CO}_3$  and milk of lime] (U. S. pat. 1,722,687) 27.

**DERSEN, HANS AND TIEDT, ERICH:** *Verhalten von Chemikalien bei Bränden*. 2nd ed., revised and enlarged. Munich: Feuerschutzverlag Ph. L. Jung. 43 pp.

**Sulfuric acid.** FRIEDERICK J. CORBETT. Australia 11,475, Jan. 31, 1928. A mixt. of  $\text{SO}_2$ , O and water is heated under pressure in a chamber,  $\text{HNO}_3$  is added and the mixt. agitated. The residual gases are withdrawn and recovered.

**Sulfuric acid.** MARIO C. MANNI. Fr. 34,290, Sept. 13, 1927. Addn. to 623,860. Cooling chambers are put in communication with the Pb chambers of Fr. 623,860 to create a circulation for the hot gases.

**Sulfuric acid.** S. ROBSON, B. LAMBERT and NATIONAL PROCESSES, LTD. Brit. 303,459, Oct. 3, 1927. In prepg.  $\text{H}_2\text{SO}_4$  by use of the contact material described in Brit. 301,853 (C. A. 23, 4306) sulfurous gases obtained by roasting ores, etc., are subjected only to such purification as is necessary to remove dust or suspended matter, as by electrostatic sepn. or filtration.

**Nitric acid.** I. G. FARBERIND. A.-G. Brit. 303,351, Dec. 31, 1927.  $\text{HNO}_3$  is sepd. from solns. contg. other volatile acids such as halogen acids or their salts by reducing the  $\text{HNO}_3$  to N oxides by gaseous reducing agents such as  $\text{SO}_2$ , washing the evolved N oxides with water or alk. solns. and oxidizing them with air or O to form  $\text{HNO}_3$  or nitrates.

**Potassium nitrate and nitric acid.** I. G. FARBERIND A.-G. Brit. 303,355, Dec. 31, 1927. In prepg.  $\text{KNO}_3$  by treating KCl or  $\text{K}_2\text{SO}_4$  (or a mixt. of both) with  $\text{HNO}_3$ , most of the  $\text{KNO}_3$  is sepd., as by cooling to  $-5^\circ$ , and filtering or centrifuging, and the mother liquor is treated to sep. the remaining  $\text{HNO}_3$  as described in Brit. 303,351 (preceding abstract). The mother liquor freed from  $\text{HNO}_3$  is distd. to sep. HCl, leaving a soln. of a K salt formed during the treatment.

**Titanic acid.** I. G. FARBERIND. A.-G. Brit. 303,468, Oct. 4, 1927. White titanic acid which is not discolored by heating to incandescence is pptd. by hydrolysis of Ti solns. in the presence of a sufficient quantity of a weak reducing agent such as  $\text{SO}_2$  or  $\text{Na}_2\text{SO}_3$  (which will not reduce quadrivalent Ti to trivalent Ti) to reduce not only all ferric Fe to the ferrous state but also all other oxidizing agents, other than quadrivalent Ti, present in the soln. Various details of procedure are given. Cf. C. A. 23, 3779.

**Carbon monoxide.** I. G. FARBERIND. A.-G. Fr. 658,108, July 26, 1928. CO is produced by treating coal in a shaft furnace with O, the O being passed in at a speed of at least 35–40 m./sec., and with the addn. of CO or  $\text{CO}_2$  as a cooling gas.

**Apparatus for making solid carbon dioxide.** WALDEMAR HESSLING. Fr. 657,969. July 23, 1928.

**Gases for ammonia synthesis.** EMIL EDWIN. U. S. 1,723,772, Aug. 6. Carbonaceous combustible material such as coal or coke and water vapor are subjected to the action of an elec. high-tension arc to produce a gas consisting essentially of CO and H, and this gas is introduced into a hot gas producer which is supplied with air and water vapor, moisture is added to the gas directly leaving the producer, and a portion of this moist gas is returned to the high-tension arc; the rest of the moist gas is subjected to catalytic action to convert CO and  $\text{H}_2\text{O}$  vapor into H and  $\text{CO}_2$ , the  $\text{CO}_2$  is removed, and the gas is purified.

**High-pressure joint suitable for ammonia-synthesis apparatus, etc.** FRANCIS H. BRAMWELL (to Atmospheric Nitrogen Corp.). U. S. 1,722,623, July 30. Structural features.

**Apparatus adapted for catalytic combustion of ammonia.** HARRY PAULING. U. S. 1,722,339, July 30. Various structural details are described, of an app. adapted for forming nitrous gases.

**Use of ammonia to precipitate metal compounds from solution.** I. G. FARBERIND. A.-G. Brit. 303,366, Dec. 31, 1927. Gaseous or liquid  $\text{NH}_3$  is used (suitably under pressure) for pptn. of NaOH from soln. and its sepn. from a mixed soln. including also  $\text{NaNO}_3$ , for producing and pptg. NaOH from solns. of NaCl, for producing an  $\text{NH}_4$  compd. of  $\text{CaCl}_2$  from  $\text{CaCl}_2$  soln., for pptg.  $\text{CaCl}_2$  from a mixed aq. soln. contg.  $\text{Ca}(\text{NO}_3)_2$  and  $\text{NH}_4\text{Cl}$ , and for various similar reactions.

**Alkali bicarbonates.** A. E. GIBBS (to Pennsylvania Salt Mfg. Co.). Brit. 303,857, Jan. 11, 1928. Cathode liquors of an electrolytic alkali chloride cell are treated with  $\text{CO}_2$  or with flue gases or other suitable gases contg.  $\text{CO}_2$ .

**Alkali metal hydrides.** DEUTSCHE GOLD- & SILBER-SCHNEIDANSTALT VORM. ROESSLER. Fr. 34,192, Sept. 29, 1927. Addn. to 637,794 (C. A. 23, 487). Alkali metal hydrides are prep'd. by submitting the finely divided metal at a high temp. to the action of H under pressure.

**Alkaline earth cyanides.** I. G. FARBENIND. A.-G. Brit. 303,115, Dec. 28, 1927. NaCN and  $\text{Ca}(\text{NO}_3)_2$  are treated with liquid  $\text{NH}_3$ , yielding a soln. of  $\text{NaNO}_3$  and a residue of an  $\text{NH}_3$  compd. of  $\text{Ca}(\text{CN})_2$  from which  $\text{NH}_3$  is driven off by heating to obtain  $\text{Ca}(\text{CN})_2$ . Other alk. earth metal cyanides may be similarly prep'd.

**Fluorides.** A. F. MEYERHOFER. Brit. 303,760, July 28, 1927. Complex fluorides such as Na, K or Ba fluosilicates are decomposed to form a metal fluoride and a volatile fluoride such as that of Si by rapid heating (to avoid sintering) in thin layers in a partial vacuum. Residual fluoride, fluorspar or substances which react with the metal fluoride may be added to the fluosilicate, a rotating or oscillating furnace may be used, and neutral gases or vapor such as air, steam, O, flue gas or producer gas may be used to accelerate the removal of the gaseous fluoride, etc. An app. is described. Cf. C. A. 23, 1478.

**Chromium compounds.** PAUL WEISE (to I. G. Farbenind. A.-G.). U. S. 1,723,536, Aug. 6. An excess of chrome ore is heated with an alk. reagent such as  $\text{Na}_2\text{CO}_3$  and the Cr compds. are leached out of the mass; the residue is then prep'd. for reuse in the process by treatment with an excess of acid such as hot 15° B $\acute{e}$ .  $\text{H}_2\text{SO}_4$ . Cf. C. A. 23, 1381.

**Ammonium and magnesium salts.** REX D. CURLEWIS. Australia 12,403, Mar. 20, 1928. Magnesia with  $\text{MgSO}_4$  and  $(\text{NH}_4)_2\text{CO}_3$  as by-products is manuf'd. by the reaction of magnesite and  $(\text{NH}_4)_2\text{SO}_4$ , sepg. the  $(\text{NH}_4)_2\text{CO}_3$  as a sublimate, leaching out the  $\text{MgSO}_4$ , and drying and calcining the magnesia residue.

**Ammonium nitrate.** CARLO TONIOLO. U. S. 1,721,798, July 23. In prep'g. dry  $\text{NH}_4\text{NO}_3$ , solid  $\text{NH}_4\text{NO}_3$  is dissolved in a concd.  $\text{NH}_4\text{NO}_3$  soln. (by heating at a temp. not exceeding 125°) in sufficient quantity that the latent heat of solidification liberated on solidification will evaporate substantially all the water present. Cf. C. A. 23, 1480.

**Ammonium phosphate.** I. G. FARBENIND. A.-G. Brit. 303,455. Ca phosphates such as raw phosphate or ppt'd. tri-Ca phosphate are decomposed by treatment with acids such as HCl,  $\text{H}_2\text{SO}_4$  or  $\text{HNO}_3$  which form sol. Ca compds. The soln. is neutralized by adding tri-Ca phosphate,  $\text{CaCO}_3$ , milk of lime or the like to obtain a ppt. of mono- and di-Ca phosphate which is sepd. and treated with  $\text{NH}_3$  with or without  $\text{CO}_2$  or with an  $\text{NH}_4$  salt such as the fluoride which yields a sparingly sol. Ca compd. The  $\text{NH}_4$  phosphate soln. thus obtained may be evap'd. to obtain mono- or di- $\text{NH}_4$  phosphate, or, by addn. of  $\text{NH}_3$  in excess, tri- $\text{NH}_4$  phosphate. Cf. C. A. 23, 3546.

**Alumina.** JEAN C. SEAILLES. Fr. 34,239, Aug. 29, 1927. Addn. to 634,430. In the wet treatment of Al ores by alk. earth bases, a mixt. of CaO and BaO is used, the BaO acting as a sort of catalyst, the amt. of CaO being sufficient to ppt. all the  $\text{Al}_2\text{O}_3$  as  $\text{Ca}(\text{AlO}_2)_2$ . Fr. 34,249, Sept. 6, 1927, describes a process in which a mixt. of BaO and CaO or NaOH, or CaO and KOH is used.

**Alumina.** JEAN C. SEAILLES. Fr. 34,231, Aug. 20, 1927. Addn. to 634,430. Al ore and an alk. earth base in the proportion of 3 mols. of base to 1 of  $\text{Al}_2\text{O}_3$  and 1.3 mols. of base to 1 mol. of  $\text{SiO}_2$  are calcined, and the mass obtained is treated with  $\text{Na}_2\text{CO}_3$  soln. to form  $\text{NaAlO}_2$ .

**Alumina.** JEAN C. SEAILLES. Fr. 34,230, Aug. 20, 1927. Addn. to 649,027 (C. A. 23, 2791). The  $\text{NaAlO}_2$  lye of the prior patent is purified by treatment with  $\text{Na}_2\text{S}$  which acts as a reducing agent on any chromates, ferrates, silicates, vanadates, etc., present. An alkali zincate may be added before treatment with  $\text{Na}_2\text{S}$  whereby Ga is carried down and may be recovered.

**Green hydrated chromium oxide.** KURT H. MEYER and HANS KRZIKALIA (to Grasselli Dyestuff Corp.). U. S. 1,723,556. See Can. 283,413 (C. A. 22, 4212).

**Copper sulfate.** HUNGARIA MÚTRAGYA, KÉNSÁV ÉS VÉGYI IPAR RESZVEVÉNYTÁRSASÁG and L. DEUTSCH. Brit. 304,052, Feb. 10, 1928.  $\text{CuSO}_4$  crystals of a size of  $1/8$ -5 mm., with or without addn. of a binding agent such as  $\text{Na}_2\text{SO}_4$ , are molded into briquets under low pressure to facilitate their transport.

**Cyanogen chloride.** I. G. FARBENIND. A.-G. Brit. 303,469, Oct. 4, 1927. See Fr. 642,548 (C. A. 23, 1223).

**Iron carbonyl composition.** MARTIN MÜLLER-CUNRADI and ANNELIESE KOSSUTH (to I. G. Farbenind. A.-G.). U. S. 1,722,076, July 23. A compn. which comprises iron carbonyl together with hydrocarbons such as gasoline is colored with a sol. org. coloring substance such as  $\alpha$ -naphthalene-azo- $\alpha$ -naphthol which serves to stabilize the carbonyl against decompn. by light.

**Iron and nickel carbonyls.** SOC. NATIONALE DE RECHERCHES SUR LE TRAITEMENT DES COMBUSTIBLES. Fr. 34,348, Sept. 21, 1927. Addn. to 607,296. Carbonyls of Fe and Ni are recovered from industrial gases, particularly mixts. of CO and H used for the synthesis of MeOH, by washing with an alc. NaOH soln.

**Ferric oxide and sulfur trioxide from sulfates.** I. G. FARBERIND. A.-G. Brit. 303,808, Jan. 9, 1928. Dehydration and decompn. of Fe sulfates are effected in the presence of a decompn. product of an Fe salt, preferably  $\text{Fe}_2\text{O}_3$ , and a small quantity of an alkali or alk. earth oxide, hydroxide or carbonate also may be present. Drying may be effected in a revolving furnace at 300–400° and decompn. in a calcining furnace at 750–850°, and  $\text{SO}_3$  formed may be completely recovered.

**Potassium manganate.** SOC. CHIM. DES USINES DU RHÔNE. Fr. 34,235, Aug. 26, 1927. See Brit. 296,074 (C. A. 23, 2255).

**Sodium fluoride.** VEREINIGTE ALUMINIUM-WERKE A.-G. Fr. 658,155, July 27, 1928. NaF is made from fluosilicates with temporary formation of  $\text{K}_2\text{SiF}_6$  which is decomposed by alk. K compds. and the KF soln. thus obtained is reacted upon with alk. Na compds. The  $\text{CaF}_2$  resulting from the purification with Ca compds. of the solns. of alk. K compds. contg. KF is treated with  $\text{H}_2\text{SiF}_6$  in the presence of  $\text{SiO}_2$  and KCl, whereby more  $\text{K}_2\text{SiF}_6$  is obtained.

**Sodium hydrogen sulfide.** HARRY P. BASSETT. U. S. 1,722,170, July 23. A mixt. of  $\text{CaSO}_4$ , coal and coke is heated to a reducing temp. to produce coke and a mixt. of Ca compds. including the sulfide, sulfite and oxide; these products are heated under superatm. pressure with a soln. of  $\text{Na}_2\text{SO}_4$  (in less than mol. proportion with respect to the Ca sulfide present) to produce Na sulfide and  $\text{CaSO}_4$ ; the product is then leached and the soln. thus formed is sepd. into 2 parts.  $\text{H}_2\text{SO}_4$  is added to one of the parts to produce  $\text{H}_2\text{S}$  and  $\text{Na}_2\text{SO}_4$  and the  $\text{H}_2\text{S}$  is conducted into the other part to produce NaHS. The intermediate products are reused for continuation of the main process.

**Gels of silica, alumina, etc.** G. C. CONNOLLY and E. B. MILLER (to Silica Gel Corp.). Brit. 303,138, Dec. 30, 1927. Hydrogels of silica, or of oxides of Al, Ti, W, etc., are washed with water heated to 20–80° so that after drying a gel is obtained, the apparent d. of which is less affected than usual by high-temp. reactivation.

**Chlorine.** DAVID A. PRITCHARD and JESSE H. HUBEL (to Canadian Industries, Ltd.). U. S. 1,723,300, Aug. 6. Cl-contg. gas mixts. such as residual gas of liquid Cl plants are brought into contact with liquid aq. refrigerated material such as brine in excess, at a temp. sufficiently low to convert substantially all the Cl directly into Cl hydrate, and the latter is then warmed to vaporize and gasify the Cl. An app. is described.

**Hydrogen from gaseous mixtures.** GEORGE F. JAUBERT (to Soc. Ammonia). U. S. 1,723,425, Aug. 6. Coal gas contg. H is passed in heat exchange relation with cold liquefied constituents of the gas other than H, and the thus-cooled gas is passed in confined streams in heat exchange relation with cold liquefied N, the further-cooled gas is allowed to expand and the expansion is utilized for producing work, and the expanded gas is passed into contact with liquid N under pressure. An app. is described.

**Phosphorus.** ÉDOUARD URBAIN. Fr. 658,184, Dec. 7, 1927. Natural Al phosphates are treated at a high temp. with the addn. of CaO,  $\text{SiO}_2$  and charcoal to form  $\text{Ca}(\text{AlO}_2)_2$  or cement with recovery of P as  $\text{H}_3\text{PO}_4$ .

**Phosphorus from vapors.** MAX MAYER. U. S. 1,721,868, July 23. P-contg. vapors are passed through a tower through which liquid passes countercurrentwise and then passed through an electrostatic separator.

**Phosphorus and fusion cement from natural phosphates.** WLADIMIR KYBER. U. S. 1,723,791, Aug. 6. Natural Ca phosphate, Al phosphate and C are smelted together in such proportions that the dross contains at least 27%  $\text{Al}_2\text{O}_3$ .

**Treating abnormally colored sulfur.** JAMES W. SCHWAB (to Texas Gulf Sulphur Co.). U. S. 1,723,815, Aug. 6. The molten S is treated with finely divided zeolites and then sepd., to remove abnormal coloration.

**Activated carbon.** R. DEFRIS and R. WÄLDER. Brit. 303,669, Feb. 7, 1928. Briquets, carbonized and activated, are made so that there is formed in them a system of macro-capillaries which traverse the material like a system of veins and afford ready admission of gases to the interior of the material. For this purpose, fibrous filaments such as hair, silk or cotton may be incorporated with the materials used and on carbonizing these are burned out and leave suitable channels. Various other details of procedure are also described.

**Active charcoal.** MARCEL CAMBIER and ROBERT CAMBIER. Fr. 657,848, July 20, 1928. Products absorbed by active charcoal are recovered by a circulating fluid in

tubes in contact with the mass or by elec. heating elements buried in the mass, or by passing an elec. current through the mass, the vapors liberated being carried away by a circulating inert gas at atm. or lower pressure.

**Granular carbon.** HOMER H. LOWRY (to Western Electric Co.). U. S. 1,722,055, July 23. Commiunited raw carbonaceous material such as anthracite coal is heated to gradually increasing temps. at such a rate that a homogeneous product of low porosity is produced, and the product is subsequently heated to a higher temp. An app. is described. The product obtained is suitable for use in telephone transmitters.

**Granular desiccant comprising magnesium perchlorate with a carrier such as barium perchlorate.** E. THOMAS. Brit. 303,263, Dec. 9, 1927.

**Catalysts.** I. G. FARBENIND. A.-G. Fr. 34,299, Sept. 21, 1927. Addn. to 631,474. Catalysts composed of metals such as Ni, Co, Cu or their mixts. and suitable particularly for the reduction or hydrogenation of org. compds. are sepd. from aq. or ammoniacal solns. of their salts in the presence of org. bases or acid amides, by treatment with H under pressure, with or without a carrier.

**Catalysts.** SOC. L'AIR LIQUIDE (SOC. ANON. POUR L'ÉTUDE ET L'EXPLOITATION DES PROCÉDÉS GEORGES CLAUDE). Fr. 657,911, Dec. 3, 1927. Catalysts which have been used to free gases from oxides of N are regenerated by washing with an alk. soln., particularly an ammoniacal soln. which may contain alkali or  $\text{NH}_3$  free or as carbonate or hydrosulfide.

**Dehydrogenating catalysts.** SOC. ALSACIENNE DE PRODUITS CHIMIQUES (to J. P. P. Mayor). Brit. 303,347, Dec. 31, 1927. Stabilized hydrated Cu oxides having the compn.  $n\text{CuO} \cdot \text{H}_2\text{O}$  (in which  $n$  is greater than 1) are used as dehydrogenating catalysts. Details of their prepn. are given.

**Urea-formaldehyde products.** EDWARD G. BUDD MANUFACTURING CO. Fr. 657,813, July 19, 1928. Urea is condensed with slightly acid  $\text{CH}_2\text{O}$  at low temps., *e. g.*, 25–50°, the mixt. is distd. under vacuum at a higher temp. but preferably below 100° and thiourea is added either before or after the distn. The mixt. is distd. again at 100–200° and the viscous product may be poured into a mold to cool, and heated again to 70–95° when it becomes tough and insol., or the product from the mold may be ground, mixed with fillers and molded under heat and pressure. Fr. 657,844 describes a process of treating  $\text{CH}_2\text{O}$  with urea and completing the condensation with thiourea and a trace of acid, *e. g.*,  $\text{HCOOH}$ , the final product being distd. under vacuum, with the addn. of more acid just before or after the distn., and molded as desired. Cf. C. A. 23, 2000.

**Solutions or plastic masses from cellulose derivatives, rubber, resins, etc.** W. E. CROOKS and C. D. WALTON (to British Celanese, Ltd.). Brit. 303,152, Dec. 29, 1927. The solids used are pretreated preferably with the vapor of the solvent or liquid subsequently incorporated to make the soln. or plastic mass (which may be dild. with another inert liquid). Various examples and details are given.

**Adhesive containing rubber latex.** ARTHUR BIDDLE (to United Products Corp of America). U. S. 1,722,553, July 30. An adhesive which is suitable for various uses comprises rubber latex, tapioca meal and lime.

**Binder or adhesive containing cellulose esters.** W. PLINATUS (to Compagnie française d'exploitation des procédés Plinatus). Brit. 303,855, Jan. 11, 1928. Dry binding agents such as are described in Brit. 302,324 (C. A. 23, 4308) contg. cellulose esters with high b. p. solvents distributed in them are modified by the addn. of substances resembling the materials to be joined together, *e. g.*, wood meal or sawdust is added for joining wood or leather meal is added for joining leather. Natural or synthetic resins, coloring substances, etc., also may be added.

**Protecting ebonite from the action of light.** BRITISH HARD RUBBER CO., LTD., and P. E. WELLS. Brit. 303,814, Sept. 6, 1927. Ebonite, for "wireless panels" or for other purposes where it is exposed to the light, is coated with a layer of synthetic resin (suitably a phenol-aldehyde or urea resin) to protect it from discoloration due to the light. Coloring substances, etc., may be mixed with the resin.

**Black ash from barytes.** ZOLTAN DE HORVATH (to Eagle Picher Lead Co.). U. S. 1,723,138, Aug. 6. A mixt. of barytes and carbonaceous material is passed through and heated in a rotary kiln and sufficient  $\text{CaCO}_3$  is added to the mixt. to combine with a substantial quantity of the silica present in the barytes.

**Sheeted cork composition.** ENRIQUE VINCKE (to Manufacturas de Corcho S. A.). U. S. 1,722,611, July 30. Cork bark is shaved in planes substantially parallel to the layers of yearly growth to form paper-thin shavings; these are broken up into flakes and the latter are assembled into layers of substantial thickness and subjected to heat

and pressure to cause the flakes to adhere. U. S. 1,722,648 specifies generally similar products reinforced with fine-mesh wire cloth.

**Alkaline cleansing composition with a fluorescent concentration indicator.** LEONARD H. ENGLUND (to Economics Laboratory, Inc.). U. S. reissue 17,383, July 30. See original pat. 1,584,022 (C. A. 20, 2053).

**Detergent composition containing isopropyl alcohol.** EDWARD F. HEYDT (to Petroleum Derivatives Co.). U. S. 1,723,169, Aug. 6. A compn. suitable for use on fabrics, etc., comprises iso-Pr alc., a smaller proportion of tertiary Bu alc. and sufficient water to give the compn. a relatively slow rate of evapn.

**Detergent suitable for removing grease and oil from garage floors.** ALBERT E. PLANK. U. S. 1,723,521, Aug. 6. Wood flour 10 lbs., kerosene 4 qts., crude carbolic acid 4 oz. and oxalic acid 0.5 oz.

**Brake-lining material.** FREDERICK C. STANLEY (to Raybestos Co.). U. S. 1,721,675, July 23. Glycerol and PbO are used for treating material such as brake linings to prevent freezing to brake drums when wet.

**Brake-lining material.** SAMUEL HUGHES (to Raybestos Co.). U. S. 1,721,696, July 23. A wet yarn is passed through powdered C to coat it with the latter and is then woven, satd. with a suitable binder and cured.

**"Friction material."** ALEXANDRE BLUHM (to Soc. anon. française du "Ferodo"). U. S. 1,722,890, July 30. Pure finely divided metallic Pb is incorporated in friction material such as brake linings.

**Stiffening material for boots and shoes.** HORACE M. EATON (to Norman Edmunds). U. S. 1,721,549, July 23. A layer of fibrous material such as felted burlap is impregnated with and united to a sheet of paper by a mixt. which may be formed of celluloid soln., powdered asbestos, plaster of Paris, dextrin and alc. or similar substances.

**Plastic filler for boots and shoes.** I. G. FARBERNIND, A.-G. Brit. 303,451, Jan. 3, 1928. A mixt. of S, zinc white and a vulcanizing accelerator is added to a filling material comprising cork chips, sawdust, leather meal or other solid material and crude rubber soln., shortly before use, so that vulcanization is produced even at room temp. and the filler resists the action of damp and heat. Factis, resins, asphalts, oils, etc., also may be added.

**Resilient flexible sheets suitable for box toes of shoes.** WILLIS A. BOUGHTON (to Bennett Box Co.). U. S. 1,722,968, July 30. A sheet of cloth is impregnated with rosin or similar brittle stiffening material, throughout the sheet, in a continuous body of the material, and the surface portions of the impregnating material are cracked into minute sections on both sides of the cloth. The material may be further superficially coated with rubber.

**Felted water-resistant sheet material.** LESTER KIRSCHBRAUN. U. S. 1,722,431, July 30. A binder such as clay paste, asphalt or tar is added in its adhesive state to an aq. fibrous pulp including cellulosic colloid material such as corn-stalk pulp and dispersion is effected to produce a substantially non-sticky stock which is felted and evapn. of water present then ensues to cause the binder to hold the fibers together by its adhesive action. Cf. C. A. 22, 2650.

**Waterproofed felted sheet material.** LESTER KIRSCHBRAUN. U. S. 1,722,434, July 30. An aq. fibrous stock is mixed with a dispersion contg. asphalt or a similar heat-liquefiable waterproofing material in an aq. medium and the proportions of the materials are so regulated as to produce a sheet incompletely satd. with the waterproofing material but with the latter substantially uniformly distributed in the form of coalesced films about the fibers. The stock is sheeted and dried. An app. is described.

**Composition for treating machine belts, etc.** ROBERT N. BURNETT (one-fourth to A. M. Bowman). U. S. 1,723,328, Aug. 6. Gum arabic 18, castor oil 68 and fish oil 14%.

**Luminous signs.** JOSEPH O. SULLIVAN. U. S. 1,721,534, July 23. A base such as metal, wood, fiber or plaster has a section coated with a mixt. of mica, powdered glass and an "adulterant" such as marble dust or sand and a non-luminous section forming a design, and a section coated with a mixt. of mica and forming a contrasting background for the other sections. The brilliance of the mica is modified by a powder such as blue schmelze.

**Transferring designs to wood.** J. WERNER and F. SCHLOBACH GES. Brit. 303,836, Jan. 10, 1928. In printing wood (as for imitating other woods or tarsia work) by means of transfers, the surface of the wood is smoothed by pressure and heat, provided

with a layer such as zinc white mixed with a siccative and dild. with turpentine and the transfer is applied under great pressure but without heat.

**Bottle-closure pads of fibrous material coated with nitrocellulose.** EWALD GOLTSTEIN and EBERHARD MEYER. U. S. 1,722,909, July 30.

**Pictures in colors on metal surfaces.** G. MANETTI, P. BENAGLIA and M. LUCHSINGER. Brit. 303,419, Jan. 2, 1928. A metal or metallized surface is covered with a thin layer of material such as a lacquer or varnish having a base of nitrocellulose, cellulose, resin or drying oils, and a method of printing with designs in transparent colors is described.

**Radiator sealing composition.** ROSCOE C. MENERAY. U. S. 1,722,437, July 30. A sealing compn. is formed from finely pulverized  $\text{Al } 6\frac{2}{3}\%$ , granulated  $\text{Al } 1\frac{1}{3}\%$ ,  $\text{Na}_2\text{CO}_3$  4,  $\text{NaHCO}_3$   $21\frac{1}{2}\%$  and "rectified flaxseed flour" (contg. oil)  $66\frac{2}{3}\%$  parts.

**Lightning arrester.** NORMAN A. LOUGHEE (to General Elec. Co.). U. S. 1,723,872, Aug. 6. A resistance element is used comprising pellets of  $\text{PbO}_2$  coated with a lower oxide of Pb such as  $\text{PbO}$ . Structural details are described.

**Fire extinguishing solutions.** LOUIS É. NOTTELLE. Fr. 657,938, July 21, 1928.  $\text{NH}_4\text{NO}_2$  is used in fire extinguishing solns. to produce N under the action of the heat, the  $\text{NH}_4\text{NO}_2$  being added to one of the solns. or being obtained by double decomposition between solns. of  $\text{NaNO}_2$  and  $\text{NH}_4$  salts. A foam is produced as the foam from the  $\text{CO}_2$  begins to cease.

## 19—GLASS, CLAY PRODUCTS, REFRACTORIES AND ENAMELED METALS

G. E. BARTON, C. H. KERR

**Glauber's salt as a refining medium for glass melts.** ERICH FELSNER. *Keram Rundschau* 35, 239-40(1927).—Its advantages are stated. H. IMSLEY

**Taylor studies of the technic of analysis of raw materials for glass. III.** DOROTHEA JAPHE. *Sprechsaal* 62, 8-10, 22-5(1929).—Known methods for the detn. of the constituents of  $\text{Na}_2\text{SO}_4$  are considered for the purpose of comparing the accuracy and time required for analysis. The constituents detd. are  $\text{Na}_2\text{SO}_4$ , free acid,  $\text{NaCl}$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{Fe}_2\text{O}_3$ ,  $\text{CaSO}_4$ ,  $\text{MgSO}_4$ ,  $\text{H}_2\text{O}$  and the acid-insol. portion. For an accuracy of  $\pm 0.15$  0.2% (% variation from 100% in summation of all constituents) the shortest time for the analytical procedure was 3 hrs. and 7 min. For an accuracy of  $\pm 0.5$  0.7% the time required was 2 hrs. and 28 min. Cf. C. A. 20, 3217. C. H. LORIG

**Contribution to testing glasses for chemical resistance.** LUDWIG SPRINGER. *Sprechsaal* 62, 187-90, 206-9(1929).—Tests were made on various bottle and plate glasses to det. their resistance to weather,  $\text{H}_2\text{O}$  at  $80^\circ$ , 10% soda soln. at  $80^\circ$  and 5.6% KOH soln. Sulfate glasses in general show the greatest resistability. C. H. LORIG

**The manufacture of glass for electrical incandescent lamps. II.** JOSEF TISCHER. *Sprechsaal* 62, 413-6(1929); cf. C. A. 23, 3551.—Through vaporization and reduction during the melting process, corrections in compn. are necessary either by a second melting or by applying a correction for the loss in the original melt. Chem. analysis is therefore essential. The quant. analysis procedure for a Ba-Pb glass is completely described. The detn. of the oxides  $\text{SiO}_2$ ,  $\text{PbO}$ ,  $\text{BaO}$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{Fe}_2\text{O}_3$  and  $\text{Na}_2\text{O}$  is considered. C. H. LORIG

**Making the glass disk for a 70-inch telescope reflector.** A. N. FINN. *Ind Eng Chem.* 21, 744-50(1929).—Details are given of the procedure followed in making a glass disk 70 in. in diam. and 11 in. thick for use as a reflector in an astronomical telescope. K. D. JACOB

**The permeability of glass to ultra-violet light.** GOTTFRIED ROSE. *Sprechsaal* 62, 314-5, 333-5, 352-5, 375-7(1929).—Permeability is measured with a spectrograph. By comparing the light transmitted through a known medium and through the glass in question, the % absorption of the ultra-violet light of various wave lengths can be detd. In the region of  $300\mu$  to  $280\mu$  the absorption of ultra-violet light in com. glass increases very rapidly. Small addns. of  $\text{Fe}_2\text{O}_3$  in glass increases its absorption. Tervalent Fe is 100 times more effective in absorbing ultra-violet light than is bivalent Fe. On exposure to light for a long time glasses lose a considerable amt. of their ability to pass light of short wave lengths owing to the slow oxidation of the  $\text{FeO}$  to  $\text{Fe}_2\text{O}_3$ . C. H. LORIG

**The trend of the average linear coefficient of expansions between  $25^\circ$  and  $150^\circ$  in the technically useful field of the  $\text{SiO}_2$ - $\text{B}_2\text{O}_3$ - $\text{Na}_2\text{O}$  system.** R. WEINIG and E. ZSCHIM-

**MER.** *Sprechsaal* 62, 93(1929).—A surface which shows the change in the linear coeff. of expansion between 25° and 150° and the compn. is developed by plotting the value of the coeffs. against the Na<sub>2</sub>O and B<sub>2</sub>O<sub>3</sub> content of glasses. C. H. LORIG

**The variation of refractive index of glass at high temperatures.** A. I. STOZAROV. *Trans. Opt. Inst. Leningrad* 4, Part 39(1928); *J. Soc. Glass Tech.* 12A, 381-4(1928).—If a piece of glass is held at any temp. in the critical range, its  $n_D$  approaches a value which corresponds to the equil. state of the glass. The  $n_D$  of glass in a state of equil. was investigated for 6 types of optical glass. In all cases the relationship between the  $n_D$  of glass in a state of equil. and its temp. was a straight line. The rate of variation of  $\Delta$ , the difference between the equil. value and the actual value of the  $n_D$ , are expressed by: (1)  $d\Delta/dt = -\alpha\Delta$ ; (2)  $d\Delta/dt = A\Delta^2$ . The coeffs.  $\alpha$  and  $A$  depend on the temp. according to the equations:  $\log \alpha = -l + k\theta$ ; and  $\log A = -L + K\theta$ , in which  $k$ ,  $K$ ,  $l$  and  $L$  depend only on the type of glass. Expt. shows that equations (1) and (2) give almost equally accurate results; it was possible to obtain trustworthy data for  $\Delta$  only in the range  $10^{-4}$  to  $10^{-3}$ . Adams and Williamson recommended that pieces of glass of different sizes be annealed at different temps. so that the larger the size the lower must be the temp. to which it should be heated and the longer the time at which it must be maintained. This, however, would produce a difference in  $n_D$  between sep. pieces, which can attain in some cases three units in the third decimal place. This difference is too great to be permitted in optical glass; therefore, for this glass, all pieces must be annealed at the same temp. D. E. SHARP

**Stability of glass-furnace parts with special consideration to the refractory materials.** W. GROOTHOFF. *Sprechsaal* 62, 311-3, 331-3(1929). C. H. LORIG

**Innovation and advances in the ceramic industry.** G. HELM. *Z. Ver. deut. Ing.* 73, 985-91(1929). E. H.

**Boiler-furnace refractories.** C. F. HIRSFIELD AND W. A. CARTER. *Fuels and Steam Power (A. S. M. E. Trans.)* 50, No. 23, 115-25(1928).—Brick, tile, wall mortars, plastic compds. and so-called high-temp. cements were studied. A field survey of conditions to which refractories were subjected in different kinds of service was made along with the lab. investigation to det. the chem. and phys. phenomena occurring in boiler-furnace refractories. E. I. S.

**Proprietary air-cooled refractory [furnace] walls.** C. S. GLADDEN. *Trans. Am. Soc. Mech. Eng.*, Advance paper, May 13-6, 1929, 11 pp. E. I. S.

**Refractories service conditions in furnaces burning fuel oil.** R. A. SHERMAN, F. TAYLOR AND H. S. KARCH. *Fuels and Steam Power (A. S. M. E. Trans.)* 50, No. 23, 313-22(1928).—A progress report of committee on boiler-furnace refractories. Slag formed in furnaces was the result of fusion of oil ash. Slag action was probably related to spalling. E. I. S.

**Cupola linings.** L. SCHMID. *Z. ges. Giessereipraxis* 50, 161-4, 197-9(1929).—Properties of refractory materials suitable for cupola linings (fireclay brick, quartz brick, magnesite or dolomite brick) are discussed. E. I. S.

**Enamel sanitary-ware manufacture.** ALICE HAMILTON. *J. Ind. Hyg.* 11, 139-53(1929).—Health hazards are discussed. G. SCHWOCH

**Determination of the coefficient of heat conductivity [of refractory materials, etc.] (VLASOV) 2.** Sealed joints between metal and glass (Brit. pat. 303,348) 1. Electric furnace for producing glass and water glass (Brit. pat. 303,798) 4. Furnace linings (Brit. pat. 303,574) 1.

PINKL, V.: **Manufacture of Hollow Brick and Tile.** Halle (Salle): Wilhelm Knapp. M. 4. Reviewed in *Brick Clay Record* 74, 812; *Clay-Worker* 91, 585; *Ceramic Abstracts* 8, 581(1929).

**Glass making.** SOC. ANON. DES MANUF. DES GLACES ET PRODUITS CHIM. DE SAINT-GOBAIN, CHAUNY ET CREY. Fr. 658,192, Dec. 8, 1927. Method of arresting the flow of glass from the furnace.

**Glass making.** N. V. MIJ. TOT BEHEER EN EXPLOIT VAN OCTROOIEN. Fr. 657,627, July 18, 1928. Method of transporting sheets to the cooling furnace. Cf. C. A. 23, 2262.

**Crucible for drawing plate glass.** GEORGE G. ROBERTS (to Virginia Plate Glass Corp.). U. S. 1,722,445, July 30. Structural features.

**Apparatus for drawing sheet glass.** ARTHUR E. SPINASSE. U. S. 1,722,483, July 30. Structural features.

**Apparatus for effecting circulation of molten glass of a pool.** ERNEST G. NELSON, JR. (to Hartford-Empire Co.). U. S. 1,721,968, July 23. Structural features.

**Apparatus for accumulating and distributing intermittently molten glass.** ADOLF SCHILD. Fr. 658,078, July 25, 1928.

**Apparatus for shaping the edges of glass beakers.** JAMES BAILEY (to Corning Glass Works). U. S. 1,721,983, July 23. Structural features.

**Opal glass.** W. C. TAYLOR (to Corning Glass Works). U. S. 1,721,979, July 23. An acidic batch is used for melting under oxidizing conditions, contg. a metallic element of the even series of the 6th periodic group with an atomic wt. between 95 and 185 (suitably  $\text{MoO}_3$  or  $\text{WO}_3$ ) which serves to produce a dense opal glass of good permanent opacity not burnt out by overheating.

**"Non-splintering" composite glass sheets.** J. H. ROBERTSON. Brit. 303,332, June 25, 1928. Sheets of glass are united to an intervening celluloid sheet or the like after one face of the glass has been treated with a thin coating of casein and then when dry with a soln. of celluloid in  $\text{AmOAc}$  or the like to which pure  $\text{PhOH}$  is added.  $\text{EtOH}$  or  $\text{PrOH}$  may also be used to facilitate union of the sheets under pressure.

**Composite sheets of glass and celluloid.** J. A. WATT. Brit. 303,700, March 30, 1928. Glass sheets of somewhat uneven surfaces are preliminarily ground in contact with each other by use of an abrasive, polished, cleaned and then united in the same relative positions as when the grinding began. Various details are described.

**Kiln of the car-tunnel type for brick, tile, etc.** GEORGE W. DENISON. U. S. 1,721,774, July 23.

**Ceramic material.** I. G. FARBERNIND. A.-G. Fr. 657,651, July 18, 1928. A ceramic material of high thermal cond. has Si as an essential constituent. Thus, mixts. contg. (1) pure finely ground Si 95, and milk of lime 5 parts, (2) ferrosilicon (90%) 50, clay matter 40, feldspar 5, cryolite 5 parts are baked in known manner.

**Ceramic and roofing tiles.** ERNEST A. ETHERIDGE. Australia 12,342, Mar 19, 1928. Tiles having a low wt. and a glazed surface are made by mixing white cement with an aggregate of siliceous clay, aluminous clay, Cornish stone and (or) feldspar, and with or without pulverized slate or pumice; and a glaze is applied consisting of a slip prepd. from the same ingredients together with a frit in very finely powd. condition with  $\text{ZnO}$ , barytes,  $\text{SnO}$  or  $\text{Al}(\text{OH})_3$ . For burnt goods, fusible clay, pulverized pumice and siliceous sharp sand, and (or) magnesite are mixed with any fusible frit and glaze is applied thereto.

**Pottery decoration.** LOVATT & LOVATT, LTD., and A. E. LOVATT. Brit. 303,679, Feb. 20, 1928. Coloring matter crushed to particles of desired size is subjected to an initial firing, mixed with raw or fritted glaze, and the mixt. is applied to ware to be decorated and fired. The preliminary firing of the coloring particles prevents them from dissolving in the glaze.

**Use of dumortierite in batches for making white ware or other ceramic products.** JOSEPH A. JEFFREY and FRANK H. RIDDLE (to Champion Porcelain Co.). U. S. 1,723,174, Aug. 6. Dumortierite is used with feldspar, ball clay and china clay.

**Spark plugs.** HENRY FORD. U. S. 1,723,026, Aug. 6. A formed porcelain is coated with material such as flake graphite adapted initially to form a heat insulator and cushion to protect the porcelain from molten iron and subsequently to form a gas seal between the iron and porcelain, and an iron shell is then cast on to the porcelain.

**Opacifying enamels.** DEUTSCHE GOLD- UND SILBER-SCHNEIDANSTALT VORM. ROESSLER. Brit. 303,061, Dec. 27, 1927.  $\text{ZrO}_2$  which has been heated to above  $1000^\circ$  is used for opacifying. Other compds. of Zr or compds. of Ti or Sb are also stated to be improved by a similar preheating.

## 20—CEMENT AND OTHER BUILDING MATERIALS

J. C. WITT

**The hydraulic index of hydraulic cements.** HENRI LAFUMA. *Rev. matériaux construction trav. publics* 1929, 241-6.—The ratio  $(\text{SiO}_2 + 0.2\text{Al}_2\text{O}_3)/\text{CaO}$  gives the best expression of the hardening tendency of a cement; while the ratio  $(\text{SiO}_2 + \text{Al}_2\text{O}_3)/\text{CaO}$  gives the best index of its chemical resistance. F. O. ANDEREGG

**The determination of the finest portion of cement.** H. W. GONELL. *Tonind.-Ztg.* 53, 1105-7(1929).—Air elutriation will separate to 10 and perhaps to 5 microns. F. O. ANDEREGG

**Composition and properties of the so-called natural cements.** HÄGERMANN.



*Tonind.-Ztg.* 53, 981-5(1929).—Natural cements obtained on the German market and tested according to German specifications are lower in strength than standard cements and are apt to be much less uniform in quality. F. O. ANDEREGG

The storage of portland cement. ANON. *Tonind.-Ztg.* 53, 946-7(1929).—A general review of recent literature. F. O. ANDEREGG

Physico-chemical principles underlying the methods of testing the constancy of volume of portland cement. I. A. ALEKSANDROV. *Zhur. Prikladnoi Khim.* (Leningrad) 2, 303-16(1929).—Changes in the compn. of portland cement on aging are discussed. Exptl. work showed that Faija's method of testing soundness of cement is not sufficiently severe. Heinzl's method and drying at 120° bear no definite relationship to the properties of cement and should be discarded as misleading. Boiling in water results in hydration of the cement and though the process is not exactly the same as encountered in aging under normal conditions, its use can be recommended. Of these methods that of Le Chatelier is the most exact. Drying at 120° followed by steam treatment is very promising, but considerably more work must be done before this method becomes practical. Storage for 28 days under water gives valuable results and cannot be discarded. V. KALICHEVSKY

Fuel control in the cement industry. GEOFFREY MARTIN. *J. Inst. Fuel* 2, 80-6 (1928).—A discussion. LESLIE B. BRAGG

The stereoscopic microscope as an aid in studying concrete deterioration. RICHARD GRÜN. *Tonind.-Ztg.* 53, 1039-41, 1058-60(1929). F. O. ANDEREGG

Water-tight concrete. A. A. BRYUSHKOV AND P. N. SHABLUKIN. *Nefyanoye Khozyaistvo* 16, 561(1929).—Water-tight concrete is prepd. from mortar by the addn. of up to 10-12% by vol. of a mixt. of mineral and fatty oil; and up to 30% of asphalt tar, fuel oil, etc. An excess of this mixt. increases the impermeability of concrete and decreases its strength. This process is covered by the Russian (Soviet) patent No. 4939, Aug. 13, 1929. A. A. BOEHLINGK

Termite control in the Gulf States. THOS. E. SNYDER. *Quart. Bull. State Plant Bd. of Miss.* 9, No. 1, 1-19(1929); cf. *C. A.* 22, 1664.—Non-subterranean species are killed by fumigating framework of buildings with HCN and furniture with CS<sub>2</sub>, by treating infested wood with com. *o*-C<sub>6</sub>H<sub>4</sub>Cl<sub>2</sub> or kerosene emulsion contg. Na arsenate or by forcing dry Paris green with a blower into the nest galleries. All woodwork used in buildings should be impregnated with a standard chem. wood preservative and cut surfaces should be covered with the preservative applied hot. Interior woodwork and furniture should be treated with 0.75-1.5 lb. ZnCl<sub>2</sub> per cu. ft. NaF and chlorinated naphthalene also may be used for this purpose. Wood pulp or fiber products, compn. boards, etc., are protected by the following compds. added in the course of manuf.: crude C<sub>6</sub>H<sub>5</sub>OH, 1 gal. per 1000 sq. ft.; HgCl<sub>2</sub>, 49 oz. per 1000 sq. ft.; CuSO<sub>4</sub>, 113 oz. per 1000 sq. ft.; NaF, Na<sub>2</sub>SiF<sub>6</sub>; Na dinitrophenolate and chlorinated naphthalene. For subterranean or ground-nesting termites the soil should be broken up and treated with NaCN, Ca(CN)<sub>2</sub>, Na arsenite (10% soln.), coal-tar creosote-kerosene mixt., CS<sub>2</sub> emulsion, or *o*-C<sub>6</sub>H<sub>4</sub>Cl<sub>2</sub>. C. H. RICHARDSON

Electric impregnation of copper sulfate solution through Japanese cedar wood. H. MURAOKA. *Researches Electrotechn. Lab., Japan* No. 253, 23 pp.(1929).—The elec. impregnation proceeds best when the liquid moves only electroendosmotically but electrolysis cannot be entirely avoided. By immersing the wood in the electrolyte and insulating one electrode-chamber from the outside liquid except through the wood, electrolysis was avoided to some degree. High temp. of the impregnating liquid gave the best results. The concn. of the soln. must not be too high; M. used a soln. of d. 1.02. The highest quantity of Cu impregnated was 0.0220 g. per cc. of dry wood, and that of SO<sub>4</sub> was 0.034 g. W. OGAWA

Viscosity and adhesiveness of street-tar (HEYDECKE) 21. The crystal structure of tricalcium aluminate (STEELE, DAVY) 6. Hydrated polycalcium aluminates (TRAVERS, SCHNOUTKA) 6. Mining and treatment of gypsum in South Australia (WINTON) 18. Electric furnace for producing cement or phosphates (Brit. pat. 303,798) 4. Rubber facings on various surfaces (Brit. pat. 303,400) 30. Apparatus for centrifugal casting or lining of pipes with cement (Brit. pat. 303,829) 1. Wood-preserving compositions (Brit. pat. 303,932) 15. Cement compositions (Brit. pat. 303,938) 26.

FORESTIER, V.: *Béton armé* (Agenda Dunod). 2nd ed. Paris: Dunod. 360 pp. F. 17. Reviewed in *Chimie & industrie* 21, 447(1929).

PODEVYN, P. A.: *Traité pratique de béton armé*. 2nd ed. Paris: Desforges, Girardot & Cie. 135 pp. F. 18. Reviewed in *Chimie & industrie* 21, 1348(1929).

**Wood Construction.** Principles, Practice, Details; a project of the National Committee on Wood Utilization. Edited by DUDLEY F. HOLTMAN. New York: McGraw-Hill Book Co. 711 pp. \$6. Reviewed in *Mining and Met.* 10, No. 272, p. 22 of advertising section (1929).

**Cement.** N. V. S. KNIBBS. Brit. 303,639, Dec. 16, 1927. A cement of the high alumina type is produced by subjecting a mixt. of lime and bauxite or other highly aluminous material to the action of steam, and then heating to a higher temp. but usually somewhat below the m. p. Proportions and details of procedure are given.

**Cement.** OTTO LELLEP. Fr. 657,785, Mar. 26, 1928. See Brit. 288,192 (C. 1 23, 686).

**Hydraulic cement.** CARL PONTOPPIDAN (to F. L. Smidth & Co.). U. S. 1,722,480, July 30. In producing a rapid-hardening cement, raw materials are mixed in such proportions as to secure in the finished cement an hydraulic modulus of not less than 2.20 and a silica modulus of less than 3.00; the mixt. is ground to such fineness that 95% passes a 200-mesh screen, sintered, and the resulting clinker also is ground so that 95% passes a 200-mesh screen. Cf. C. A. 23, 1489.

**Concrete blocks.** ROBERT R. KENWORTHY. U. S. 1,723,043, Aug. 6. In forming a dense, coherent, non-absorbent concrete, cement is mixed with mineral aggregate of at least 2 sizes and including a fine powder; all the water that is ever used is added initially and the materials are mixed. An outer skin of cement and finer aggregate is formed upon the mass by molding and tamping which confines water to the interior, the interior is permitted to set, and the mass is split to provide a surface resembling stone.

**Casting concrete walls and tubes in situ.** A. T. KNUDSEN and S. D. TÖNNESSEN. Brit. 303,882, Jan. 12, 1928. Glass shutters and cores are used which are left in position until the concrete contracts away from their surfaces. A smooth waterproof surface is thus formed on the concrete.

**Concrete reinforced with metal strips or shreds such as those of old tin cans.** G. WATSON. Brit. 303,406, Oct. 1, 1927.

**Waterproofing concrete surfaces.** EUGENE R. ODEN. U. S. 1,721,861, July 23. The surface of concrete is coated with successive layers of materials such as asphaltic compns. and mixts. and with overlying strips of paper and the materials are subjected to heavy pressure together.

**Pavement comprising inlaid rubber strips, etc.** UNIVERSAL RUBBER PAVIORS, LTD., and L. GAISMAN. Brit. 302,959, Sept. 22, 1927. Structural features.

**Molding sheets of "artificial marble."** C. ZWART and P. ZWART (to J. A. Trouwborst). Brit. 303,831, Jan. 10, 1928. A prepd. viscous mass is molded in a tray of celluloid or formed of Zn with a loose bottom of celluloid or like rustless smooth resilient material. Various details of construction and operation are described.

**Surfacing material for interior walls.** CARLISLE K. ROOS (to U. S. Gypsum Co.) U. S. reissue 17,394, Aug. 6. See original pat. No. 1,606,722 (C. A. 21, 161).

**Plasters and cements.** L. C. SCHILLING. Brit. 303,889, Jan. 13, 1928. In prepg. compns. contg. colloidal solns., emulsions or suspensions of bituminous, resinous, oily or fatty substances with Sorel cement, calcined gypsum or like products which harden by absorbing water, such a proportion of water is used in the mixt. as approx. corresponds to that which will be fixed as water of crystn. in the hardened product.

**Fiber-board manufacture.** OTTO MANTIUS. U. S. 1,723,051, Aug. 6. An app. and details of its operation are described.

**Waterproofing and hardening gypsum building blocks, plaster boards or other porous and fibrous materials.** H. A. AARONSON and CHEMICAL WATERPROOFING CORP. Brit. 303,935, Oct. 20, 1927. The materials are impregnated with a soln. comprising pitch dissolved without heating in a noninflammable solvent such as  $C_2H_5Cl$  or  $C_2H_5Cl_4$ . Turpentine may be used as a diluent, and the treatment is suitable for textile fabrics.

**Dust-preventive composition for use on roads.** R. KARLBERG. Brit. 303,433, Oct. 3, 1927. A 70%  $CaCl_2$  30-70 is used with dried sulfite-cellulose lye 70-30 parts.

**Preserving wood.** WALTER O. SNELLING. U. S. 1,723,384, Aug. 6. Wood or similar porous material is impregnated with "thermolyzed" petroleum material such as heavy Mexican crude oil heated above 400° and under pressures up to 800 lb. per sq. in.

**Preserving wood.** I. G. FARBERNIND. A.-G. Brit. 303,168, Dec. 29, 1927. Wood is preserved against attacks by fungi by treatment with an aq. soln. of a diazo compd. (of which several examples are given) either freshly prepd. or used in the form of  $ZnCl_2$

double salts, naphthalenesulfonates or the like, with or without other preservatives such as NaF or  $\text{HgCl}_2$ . Cf. *C. A.* 23, 4322.

**Wood preservative composition.** LEO P. CURTIN (to Western Union Telegraph Co.). U. S. 1,722,323, July 30. Wood is treated with Cl derivs. of coal-tar acids of higher mol. wt. than the cresols, which are characterized by high toxicity and permanence relative to creosote oil. These Cl derivs. may be used with a diluent such as a heavy petroleum oil.

## 21—FUELS, GAS, TAR AND COKE

A. C. FIELDNER

**The control of fuel in the chemical industry.** ERNEST S. GRUMELL. *J. Inst. Fuel* 2, 73-9(1928).—A discussion of methods

LESLIE B. BRAGG

**Fuel research and fuel economy in Italy.** M. G. LEVI AND C. PADOVANI. *Trans. Fuel Conference, World Power Conference, London, 1928* 1, 192-8(1929).

A. H. E.

**Characteristics and classification of fuels in U. S. S. R.** L. K. RAMZIN. *Trans. Fuel Conference, World Power Conference, London, 1928* 1, 177-91(1929); cf. *C. A.* 23, 950.—A discussion of the properties of Russian fuels based on a table of analyses of 3 firewoods, 1 peat, 10 brown coals, 18 coals, 9 anthracites, 3 oil shales, 2 cokes, 2 charcoals and 1 mazout showing moisture, volatile matter, C, H, N, O, S, ash, heating value, softening temp. of ash, characteristics of coke, weathering properties and tendencies to spontaneous combustion.

ALDEN H. EMERY

**Automatic combustion control.** T. A. PEEBLES. *J. Inst. Fuel* 2, 131-40(1929).—The use of automatic regulating devices, such as Hagan regulators, for the automatic balancing of the loads on a number of boilers and the proper proportioning of air and fuel is carefully discussed.

LESLIE B. BRAGG

**[Mechanism of] combustion processes.** P. SCHLÄFFER AND M. BRUNNER. *Schweiz. Ver. Gas u. Wasserfach. Monats.-Bull.* 9, 161-9(1929).—The slow combustion of hexane was studied at 210° and const. vol. both with and without catalysts. Products of the combustion were identified and detd. from time to time. A proposed mechanism for the reaction assumes first the formation of mol. oxides of hexane, then the decompn. of these mol. oxides both to form unsatd. compds. and  $\text{H}_2\text{O}$ , and also to form normal peroxides. Pyrex glass powder hindered the oxidation; this is explained as due to the decompn. of the mol. oxides into hexane and  $\text{O}_2$ . A trace of  $\text{PhNH}_2$  retarded the combustion to about one-tenth its former rate.

W. A. GALLUP

**Progress in the development of combustion of Victorian brown coal.** STATE ELECTRICITY COMMISSION OF VICTORIA. *Trans. Fuel Conference, World Power Conference 1928* 1, 1-32(1929).—Daily analyses for 1927 showed the following averages for Morwell and Yallourn coal, resp.:  $\text{H}_2\text{O}$  48.5, 63.4; volatile matter 27.3, 19.0; fixed C 22.0, 16.8; ash 2.17, 0.76; C 33.79, 23.74; H 2.38, 1.62; O 12.71, 10.19; N 0.31, 0.2, S 0.14, 0.09; B. t. u. 5736, 3979. Individual samples departed but little from the averages. Designs of boilers to utilize coal of such low heating value and high moisture (large stack losses) are discussed and results of boiler tests showing about 75% net efficiency are given. Tests are discussed on pre-drying (1) in hot flue gases, (2) on an inclined grate in the combustion chamber (feeding the chain grate), (3) externally with steam and (4) by feeding through a drying shaft in the combustion chamber. The latter used with mech. step grates proved most satisfactory.

A. H. E.

**Low-temperature carbonization.** DAVID BROWNLIE. *Gas Age-Record* 63, 753-4, 757-8(1929); cf. *C. A.* 23, 3790, 4322.—A brief general discussion.

L. B. B.

**Low-temperature carbonization.** DAVID BROWNLIE. *Iron Coal Trades Rev.* 118, 493-4(1929).—A review of the low-temp. carbonization developments at British collieries.

LESLIE B. BRAGG

**Low-temperature carbonization in 1928.** S. ROY ILLINGWORTH. *Iron Coal Trades Rev.* 118, 122(1929).

LESLIE B. BRAGG

**Low-temperature carbonization and the gas industry.** DAVID BROWNLIE. *Gas Age-Record* 63, 243-4, 250(1929).—A short discussion of low-temp. carbonization plants now in operation or in process of construction.

LESLIE B. BRAGG

**The Honigmann-Bartling carbonization process.** DAVID BROWNLIE. *Gas Age-Record* 63, 69-70(1929).—The Honigmann-Bartling process for the carbonization of lignite consists chiefly of a revolving horizontal disk of cast iron, placed convex upwards, on which a thin layer of lignite is carbonized. The disk is heated from below by a shallow chamber filled with small pieces of fire brick which are raised almost to incandescence by being fired underneath by a series of gas burners operated with an air blast. The

lignite is fed on to the disk from a hopper and scraped off after one revolution, which takes about one minute. The gas collects beneath a casing and is drawn off at the top. The process is claimed to have a large throughput and may be suitably operated in conjunction with a furnace plant using the carbonized lignite in the pulverized condition.

LESLIE B. BRAGG

**The Sauerbrey process of low-temperature carbonization.** DAVID BROWNLEE *Gas Age-Record* 62, 857-8(1928).—A new mechanically continuous cylindrical rotary retort for use in the low-temp. carbonization of lignite is described in detail. The standard installation consists of 4 retorts carrying sets of thin longitudinal fins slightly bent at the top. The lignite is fed in between these fins at one side and is discharged at the bottom after being carried up and around by the retort. The lignite travels by gravity from one retort to another while the retorts are heated internally and counter-current to the flow of the lignite, the hot gases passing through all four retorts in series.

LESLIE B. BRAGG

**A municipal low-temperature carbonization plant.** JOHN B. C. KERSHAW. *Combustion* 19, 308-10(1928).—The MacLaurin process plant at Glasgow is discussed and some of the financial results obtained by the operation of the plant during the two years ending May 31, 1928, are given.

LESLIE B. BRAGG

**Coal carbonization.** J. HERON. *Iron Coal Trades Rev.* 118, 832-4(1929) — An historical review.

LESLIE B. BRAGG

**Methods of burning Dutch East Indian coals.** D. J. L. CONINCK. *Trans. Fuel Conference, World Power Conference, London, 1928* 1, 102-18(1929).—The coal is a noncoking, long-flame, highly gaseous, very friable and moist Eocene coal. Its compn. varies as follows: fixed C 48-56, volatile matter 34-39, moisture 5.5-8, ash 0.5-7.5, S 0.4-1, C 74.7-79.6, H 5.6-7.3, O 12.6-17.5, N 1.7-15% and heating value 6800-7500 cal. Various methods of firing are discussed. Summary data are given on boiler tests using hand firing, traveling grate and underfeed stokers. Detailed figures on three tests of pulverized fuel firing are given.

ALDEN H. EMERY

**A practical comparative basis for the calorific value of coal.** STANISLAW FELSZ. *Trans. Fuel Conference, World Power Conference, London, 1928* 1, 271-2(1929).—F. defines a hypothetical standard coal as contg. 6320 cal. per kg. This simplifies calcs. if the total heat of steam be assumed to be 632 cal. and the equiv. factor per h. p. hr. be also taken as 632 cal. Examples are given.

ALDEN H. EMERY

**Waste-heat recovery.** FRANK H. PREECE. *Fuel Econ. Rev.* 8, 69-71(1929)

H. C. PARISH

**New method for utilizing soft coal as generator fuel.** JAMES N. PAFF. *Gas Age-Record* 63, 605-6(1929).—Soft coal when used as a water-gas-generator fuel causes a dense smoke during blasting and builds up a central core of dense, partially coked coal, which causes considerable trouble and loss. At the plant of the Peoples Gas Company of Glasboro, N. J., this trouble has been largely overcome by the use of a centrally located, water-cooled steam and air nozzle, which increased the make from 60,000 to 67,000 cu. ft. per hr. and reduced the fuel requirement from 31.0 to 27.0 lb. per 1000 cu. ft. in operating with 100% coal.

LESLIE B. BRAGG

**A study of Post-Carboniferous coals.** EDGAR STANSFIELD. *Trans. Fuel Conference, World Power Conference, London, 1928* 1, 54-61(1929).—Approx. 68% of all estd. U. S. coal reserves and 98% of Canadian are Post-Carboniferous. Post-Carboniferous coals account for over 50% of the world coal reserves. However, North American Post-Carboniferous deposits account for but 3% of world production at the present time. Moisture and fuel ratio increase and fixed C and B. t. u. decrease as one goes further from regions of geologic disturbance. High-moisture coals must be analyzed as soon as possible after sampling as they are unstable and oxidize readily, even in stoppered bottles. Moisture detns. should be made in neutral gas to prevent oxidation. Volatile matter should be detd. by slow coking to avoid sparking. S. recommends exposure of coal for 48 hrs. to rapid current of air of 60% humidity (regulated by exposure to CaCl<sub>2</sub> soln. of 1.3 sp. gr.).

ALDEN H. EMERY

**Korean coals and their utilization.** M. KAMO. *Trans. Fuel Conference, World Power Conference, London, 1928* 1, 119-36(1929).—Analyses of the various grades of Korean coals are given and the results of tests which show that pulverized firing of anthracite and low-temp. distn. of brown coal combined with pulverized firing of the coke are efficient ways for utilizing Korean coals. Yields and analyses of products from the low-temp. carbonization (500°) of 4 brown coals are given.

A. H. F.

**Progress in coal preparation, during 1928.** R. V. WHEELER. *Iron Coal Trades Rev.* 118, 120(1929).

LESLIE B. BRAGG

**Proposals for technical designations of coal characteristics.** GESELLSCHAFT FÜR

**WARMEWIRTSCHAFT, WIEN.** *Trans. Fuel Conference, World Power Conference, London, 1928 1, 46-53(1929).*—In order to make reliable and representative information on the compn. of coals used in Austria available to the consumer, reference tables are being prepd. giving an av. of all data available for the various coals on the market.

**ALDEN H. EMERY**  
**The constitution of coal.** R. V. WHEELER. *Trans. Fuel Conference, World Power Conference, London, 1928 1, 199-213(1929).*—W. reviews the theories of the origin of coal, discusses the coal-forming materials and briefly reviews coal chemistry. To express the compn. and quality of coal it is necessary to know the amounts of hydrocarbons, resins, resistant plant entities and ulmin compds. that it contains and the degree of coalification of the ulmin. Rational analyses on these lines should lead to an ideal scientific classification of coals.

**ALDEN H. EMERY**  
**Sampling and testing of coal.** GESELLSCHAFT FÜR WARMEWIRTSCHAFT, WIEN. *Trans. Fuel Conference, World Power Conference, London, 1928 1, 261-70(1929).*—Sampling methods are similar to those in use in the U. S. Moisture is detd. by the xylene method; heating at 106-110 for 1 hr. was unsatisfactory for oxidizable coals. A coking test is made by heating 1 g. coal in a Pt crucible for 7 min. at 900°. Brown coals are carbonized in Rose crucibles with a gas flame. Loss of wt. = volatile matter. Coke porosity is detd. with special pycnometer-like app. (cf. Lant, C. A. 16, 2400). M. p. of ash in oxidizing atm. is detd. by micropyrometer method; for reducing atm., 15 mm. ash cone is heated in elec. tube furnace filled with any reducing gas. Calorific value is detd. by Berthelot-Mahler process in stainless-steel bomb. For gasification test, 0.2 g. sample is placed in a special tube or 20-50 g. is tested in a Fisher retort (cf. C. A. 14, 3149). Calorific value of gas is detd. in Strache-Löffler caloriscopes (cf. C. A. 22, 1460; 23, 3329). C and H are detd. by combustion; S and N compds. are retained by PbO at 180°. N is detd. by Dumas and Lambris method (cf. C. A. 21, 3115). Combustible S is detd. by absorption in NaBr or ammoniated H<sub>2</sub>O<sub>2</sub> soln. S in ash is extd. by boiling with soda soln. + a little Br for 10 min., acidified with HCl, filtered and S in filtrate detd. with BaCl<sub>2</sub>.

**ALDEN H. EMERY**  
**Determination of volatile matter in coal by low-temperature methods.** R. VON-DRÄCKE. *Trans. Fuel Conference, World Power Conference, London, 1928 1, 273-80(1929).*—The use of a boiling S bath (444°) is suggested for carbonization tests at low temp. The gases are collected and analyzed. V. gives results of studies of the relationship between compn. of fuels and vols. of gas and CO<sub>2</sub> evolved in this test. The approx. compn. and calorific value of the coal can be detd. from this simple assay.

**ALDEN H. EMERY**  
**Sulfur determination in coal.** N. A. NIKOLAI AND H. VOROBYEV. *Izvestiya Teplotekh. Inst. (Trans. Thermo-Tech. Inst. (Russia)) 1929, No. 3, 91-2.*—Coal samples with varying contents of S were analyzed by the Eschka method and then burned in a calorimetric bomb which was filled with O<sub>2</sub> at 20-25 atm. after admitting a few cc. of a 10 caustic soln. to absorb the oxides obtained and to ppt. the Fe. The contents of the bomb were placed in a beaker and the bomb was rinsed 3 times with hot water after the combustion. After the filtration the S was detd. in the same way as by the Eschka method. Pptn. of the BaSO<sub>4</sub> in the filtrate without a preliminary treatment with bromine water produced identical results. This method compared with that of Eschka or the Na<sub>2</sub>O<sub>2</sub> method showed that the material left after the calorimetric detn. can be used for the S detn.

**A. A. BOEHLINGK**  
**A new practical receiver for low-temperature distillation analyses of coal according to Fischer.** OTTO KELLER. *Chem.-Ztg. 53, 517(1929).*—Schaefer's app (C. A. 22, 3110) is applied to coal analysis.

**J. H. MOORE**  
**The distillation of coals from the Moscow basin at low temperatures and in vacuum.** W. WILLIAMS AND P. CHERNOSEMOV. *Izvestiya Teplotekh. Inst. (Trans. Thermo-Tech. Inst. (Russia)) 1927, No. 9, 12-4; Chem. Zentr. 1929, I, 329.*—Various coals were subjected to a 12-hr. distn. at various temps. (320°, 450° and 520°) and at various pressures (1, 0.75 and 0.5 atm.). The light and the heavy fraction increased with reduced pressure and also the paraffin yield from the heavy fraction increased. The oils from the tar had a lower solidification point, but a higher sp. gr.

**G. SCHWOCH**  
**The dry cleaning of coal.** K. C. APPLEYARD. *Trans. Fuel Conference, World Power Conference, London, 1928 1, 416-34(1929); cf. C. A. 22, 311.*—A. gives the general considerations in the dry cleaning of coal, describes the pneumatic cleaning plant at Thorne Colliery and discusses dust collection and its use for powdered fuel.

**ALDEN H. EMERY**  
**The cleaning of coal by froth flotation.** E. EDSER AND P. T. WILLIAMS. *Trans. Fuel Conference, World Power Conference, London, 1928 1, 374-84(1929).*—Since froth

flotation is applicable to coal sizes less than 3 mm. it is a natural complement of gravity methods. Coal particles are collected in the froth and the dirt sinks. To float bony coal, kerosene is added, the amount (about  $\frac{1}{2}$  lb. per ton of coal) depending on the ash required. If ash is to be rigorously excluded, Na silicate is added. Starch (a few oz. per ton of coal) will prevent flotation of fusain. Cresol (about  $\frac{3}{4}$  lb. per ton of coal) is used as a frothing agent. In practice, air bubbles are disseminated through the mass, which flows to a quiescent chamber where a froth contg. the coal forms. The residue goes to a second agitation chamber, then to a second froth-forming compartment, and so on.

ALDEN H. EMERY

**The cleaning of small coal.** W. R. CHAPMAN. *Trans. Fuel Conference, World Power Conference, London, 1928* 1, 359-73(1929); cf. *C. A.* 20, 2240, 2573, 3071, 3555, 21, 812, 1175, 3116, 3265, 4046; 22, 153, 493, 1839, 2254.—The following coal-cleaning processes are briefly described: the Baum jig, the Coppée jig, the Lührig jig, the Humboldt jig, the Rheolaveur washer, the Draper washer, the Chance washer, the Diester-Overstrom table, the H. H. table, froth flotation, pneumatic separators, spiral separators, the Ray process, the Berrisford process, the Dry Coal Cleaning Co.'s process, the Clean Coal Co.'s process ( $\text{CaCl}_2$  float-and-sink) and the Kirkup process. A. H. E.

**Cleaning bituminous coal.** J. R. CAMPBELL. *Trans. Fuel Conference, World Power Conference, London, 1928* 1, 307-27 (1929).—Sec. *C. A.* 22, 3510. A. H. E.

**The dewatering and drying of coal.** R. A. MORT. *Trans. Fuel Conference, World Power Conference, London, 1928*, 1, 341-58(1929).

ALDEN H. EMERY

**Glycerol process for dehydration.** C. H. S. TUPHOLME. *Gas Age-Record* 63, 311-3(1929).—The glycerol process of gas dehydration and the equipment used are described with figures on cost, glycerol requirements, etc. The cost of operation of the process is estd. to be about 0.3 cent per 1000 cu. ft. of gas handled. The first commercial-scale plant has been erected at the Colwyn Bay Gas Works and results of the first few weeks operation are given.

LESLIE B. BRAGG

**The hygroscopic qualities of coal.** R. VONDRÁČEK. *Trans. Fuel Conference, World Power Conference, London, 1928* 1, 281-4(1928).—The drying of coals is not strictly a reversible process, and the humidification of a dry fuel in an atm. of a gradually rising tension of aq. vapor is accompanied by a large time lag. There is no satisfactory method of detg. hygroscopicity. This property is important in the transportation and storage of coal, because of the slacking and oxidation which occur through this phenomenon.

ALDEN H. EMERY

**Methods of control, preparation, handling and storage of coals by the National Railways of Belgium.** H. CHENU. *Trans. Fuel Conference, World Power Conference, London, 1928* 1, 453-74(1929).—Since the Belgian railways purchase about 200 different varieties of coal they must maintain 4 central mixing plants from which, after blending to give the desired characteristics, the coal goes to about 100 points of consumption.

ALDEN H. EMERY

**Coal storage requires special attention to avoid fires.** A. T. WARD. *Iron Trade Rev.* 83, 1499-1500, 1506(1928).—Careful directions are given for the storing of coal so as to avoid spontaneous combustion and methods of inspection and care after storing.

LESLIE B. BRAGG

**The cellulose determination, a fundamental criterion in the differentiation of peat, brown coal and bituminous coal.** R. POTONIE AND W. BENADE. *Braunkohle* 28, 335-40(1929).—Practically no cellulose is found in bituminous coal, and only encrusted cellulose, principally lignocellulose, in brown coal, whereas peat contains also pure cellulose. The pure cellulose is extd. quantitatively by Schweizer's ammoniacal cupric soln., the encrusted cellulose only partially. There is thus a marked difference between peat and brown coal in the quantity extd. The extd. cellulose is pptd. by acids. By trial on a number of specimens, the 3 classes were readily distinguished by this means.

F. S. GRANGER

**Colloidal and chemical properties of peat.** I. I. ZHUKOV', E. A. KREMLEVA AND A. V. TIKHOMIROV. *Zhur. Prikladnoi Khim.* (Leningrad) 2, 257-66(1929).—Samples of peat were examd. by the methods of filtration analysis of Ostwald (*C. A.* 19, 1673) as follows: 30 g. of raw peat were mixed with 50 cc. of water or of a soln. contg. a coagulating agent. After 10 min. the mixt. was transferred to a filter. Readings were taken every min. for the first 3 min. and then every 5 min. Check detns. were in perfect agreement. Filtration proceeds more quickly with peats of higher degree of decompn. Filtration rate increases with the increase in valence of the coagulating agent.  $\text{CaCl}_2$  is a good coagulant, contrary to  $\text{MgCl}_2$ , but when added to peat both salts gave practically identical filtration rates.  $\text{Fe}^{+++}$  and especially  $\text{Fe}^{+++}$  and  $\text{Th}^{IV}$  are very efficient coagulants, colloidal  $\text{Fe}_2\text{O}_3$  being the most efficient. Filtration rate increases with the

increase in concn. of the coagulating agent, but when this concn. is above a certain max. further increase in concn. results in a decrease in the rate of filtration. Heat increases the coagulating rate but with very efficient coagulants this effect is masked.

V. KALICHEVSKY

**The drying of brown coal without breakage.** H. FLEISSNER. *Trans. Fuel Conference, World Power Conference, London, 1928 1, 328-40(1929).*—By heating in an autoclave with steam at 8-10 atm. pressure, the coal is brought to a uniform temp. throughout without evapn. With release of pressure drying proceeds from the center outward and slacking is avoided. During the steaming the lumps contract, preventing reabsorption of  $H_2O$  after drying, and reducing the danger of spontaneous combustion by reducing porosity. The temp. must be high enough to decompose the colloids. One kg. of dried coal gives 2.5 cu. m. of producer gas ( $CO_2$  3.5-4,  $CO$  30-31,  $H_2$  14-15, heavy hydrocarbons 0.2, methane 2% and heating value 1500 cal.) or 0.65-0.75 cu. m. of water gas (3000 cal.).

ALDEN H. EMERY

**Developments in the treatment of lignite.** ANON. *Iron Coal Trades Rev. 118, 821-2, 826(1929).*—The "Cohesite" process for the production of briquets from lignite carbonized in the Lurgi retort and the briquetting plant at Bienfait, Saskatchewan, Canada, are described in some detail.

LESLIE B. BRAGG

**Some considerations regarding the rational utilization of Roumanian lignites.** I. BUIOIU. *Trans. Fuel Conference, World Power Conference, London, 1928 1, 137-50(1929).*—Low-temp. distn. of Roumanian lignites is recommended. The method described recovers 65-80% of the original heating value in the coke. The yield of tar was 6.8-8% and of gas 50-130 cu. m. with a fuel value of 3335-9094 cal. per cu. m.

ALDEN H. EMERY

**Czechoslovakian lignite: its preparation and utilization.** J. FORMÁNEK. *Trans. Fuel Conference, World Power Conference, London, 1928 1, 62-79(1929).*—Statistics are given on world lignite reserves and production. In Bohemian lignite moisture varies from 16.6 to 35.9%, ash from 1.4 to 8.2% and heating value from 6370 to 10,410 B. t. u. Bohemian lignite briquets are not resistant; they slack in the fire or on weathering. Previous to the war, "kaumacite," a lignite char, was prepd. by high-temp. carbonization. The ovens are described. The product analyzed about 79% C, 0.8% H, 0.92% O + N, 1.25% S, 6.5%  $H_2O$ , 12.4% ash and 12,000 B. t. u. It was used in boiler furnaces and for briquets. Tar (3-3.5%) and  $NH_3$  (10% of N content) were recovered. Gas (390-440 B. t. u.) was used for kaumacite-retort heating, for zinc-retort heating and in gas engines. Expts. with low-temp. carbonization are described. Zinc works produce lignite char for use as a reducing agent. The gasification of lignite is important in glass works, metallurgical and chemical plants and towns in the lignite district. Elec. energy for Prague is generated by lignite-raised steam. Pulverized firing is coming into prominence.

ALDEN H. EMERY

**The Seaboard process with the utilization of actifier air.** D. L. JACOBSON. *Gas Age-Record 63, 895-900(1929).*—The actifier air from the Seaboard process which cannot be turned loose into the air on account of its  $H_2S$  content can be disposed of by use in boilers, as the primary air supply to gas producers and during the blow in water-gas machines by synchronizing several machines or by installing an air holder in the line. The  $H_2S$  is burned to  $SO_2$  but does not increase the amt. usually obtained from coal sufficiently to be objectionable, corresponding to an increase of S in the coal of from about 2.0 to 2.3%.

LESLIE B. BRAGG

**Possibilities in synthetic hydrocarbon processes.** W. W. ODELL. *Gas Age-Record 63, 37-41, 48-50(1928).*—The com. and economic possibilities of making hydrocarbons synthetically from water gas are discussed in some detail. Tables of yields and costs are given.

LESLIE B. BRAGG

**Industrial process for obtaining liquid hydrocarbons by simultaneous cracking and hydrogenation.** J. FOHLEN. *Chimie & industrie 21, 1141-8(1929).*—The process consists essentially in cracking the raw material (coal, lignite, shale, tar, etc.) in a suitable app., with addn. of suitable catalyst (chiefly metallic chlorides) if desired, immediately purifying and desulfurizing the hot gases by passing over reduced metals of the same nature as used for the hydrogenation, and finally mixing with  $H_2$  and passing over a catalyst. The purifiers and desulfurizers are practically identical with the catalyst and may be considered as catalysts which are purposely "poisoned" to protect the catalyst proper; they generally work at a somewhat higher temp. (300-250°) than the latter (250-170°). In order to have efficient purification, the nature of the reagents and temp. of reaction must be carefully regulated to avoid reversible reactions such as  $FeS + H_2O \rightleftharpoons FeO + H_2S$ ; 2 purifying chambers are provided, which work alternately and are frequently regenerated by roasting in a current of air or  $O_2$  (with

a final short period of reduction with  $H_2$  or water gas, if desired). Owing to the high yields of low-boiling products, the condensation and recovery of hydrocarbons should preferably be carried out by the methods used for recovering cracked and casinghead gasolines.

A. PAPINEAU-COUTURE

**The Thylox process of liquid purification.** D. L. JACOBSON. *Gas Age-Record* 63, 597-600(1929).—The Thylox liquid purification plant consists essentially of an absorber and a thionizer in which the S is oxidized with air and floated off as a froth to a S slurry tank. A filter is used to recover the S for sale as an agricultural fungicide or as brimstone after melting down. Soda ash soln. is added continuously to the system and Thylox compd. as needed. The process will remove about 98% of the  $H_2S$  and 100% of the HCN at a net cost of 0.91 cent per 1000 cu. ft. of gas.

LESLIE B. BRAGG

**The "Instill" benzene-refining process.** ANON. *Iron Coal Trades Rev.* 117, 719 (1929).—The "Instill" process as used at the Thornhill Collieries, Dewsbury, England, has been found to give an 8 to 10% increase in the benzene yield at about the same cost in a fraction of the time required by the acid process. The process is described in some detail and test results on low-temperature-carbonization spirit at the Mitchell Main Colliery plant are given which show an increase of about 26% in yield.

LESLIE B. BRAGG

**Manufacture of neutral sulfate of ammonia.** O. A. TERNES. *Gas Age-Record* 62, 890, 893(1928).—Methods of manuf. of neutral  $(NH_4)_2SO_4$  are discussed and a method using gaseous  $NH_3$  in air for neutralization and drying is described in detail.

L. B. B.

**The gas industry.** W. J. STONE. *Gas World* 90, 761-5(1929).—The various problems of the gas industry are discussed with suggestions for the operation of a water-gas plant and the production of a satisfactory tar.

J. B. CARPENTER, JR.

**A study of the gas industry.** JAMES JAMIESON. *Gas World* 91, 9-15(1929).—The proper blending of coals gives the product of high-temp. carbonization all the attributes claimed for low-temp. coke. Expts. with an 8-ton coking unit show that the proximate analysis is of little value in choosing a coal and that while throughput was a function of the coal size, moisture and volatile content, a high thermal output in the gas does not follow low quality. Tar yields are affected by the size and coking characteristics of the coal as well as the throughput. The technical possibility is discussed of enriching water gas by the synthesis of methane from CO and  $H_2$  in the presence of Ni catalysts at 265-75°.

J. B. CARPENTER, JR.

**Recent progress in gas engineering.** LESLIE B. BRAGG. *Gas Age-Record* 63, 741-5, 750(1929).

LESLIE B. BRAGG

**Gas dehydration in practical operation.** W. L. SHIVELY. *Gas Age-Record* 63, 445-7, 452(1929).—The gas dehydration plant in operation at the plant of the Grand Rapids Gas Light Co., Grand Rapids, Michigan, which is operating at a total cost of not over 0.75 cent per 1000 cu. ft., is described. The hygroscopic soln. used is a slightly alk. soln. of NaCNS, which is obtained as a by-product from the liquor from liquid purification plants.

LESLIE B. BRAGG

**Dehydration of gas with calcium chloride.** J. S. FERGUSON. *Gas Age-Record* 62, 677-80(1928).—A set of calcns. in connection with the use of  $CaCl_2$  solns. for the dehydration of gas.

LESLIE B. BRAGG

**Experience in gas dehydration at Grand Rapids.** J. E. SPINDLE. *Gas Age-Record* 64, 39-43(1929).—The effects of gas dehydration on drip, frost, water, rust and naphthalene complaints and on the distributing system are carefully considered and discussed. Oil has been used to prevent possible leakage as a result of the drying out of the distributing system; the methods of introduction of this oil are pointed out.

LESLIE B. BRAGG

**Treating waste water from Reading gas plant.** A. F. KUNBERGER. *Gas Age-Record* 63, 9-10(1929).—The app. and methods used by the Consumer's Gas Company of Reading, Pa., to treat waste water, in particular to remove suspended tarry matter, are described in detail. The process is essentially one of the formation of a flocculent ppt. by adding copperas and lime or soda ash, if necessary, followed by settling and filtering.

LESLIE B. BRAGG

**Apparatus for the complete gasification by the Humphrey and Glasgow process.** ANON. *J. usines gaz.* 53, 265-8(1929).—This system is a combination of coal distn. and water-gas manuf. The coal is charged into the top of the retort and distd., producing coal gas. The coke passes to the lower part of the retort, where steam is passed through it to produce water gas, which is drawn off in the center. The two gases are mixed. During blowing the air only passes through the lower part of the retort and out through a carburetor and superheater, as in an ordinary gas works. Tables show



the results obtained in the complete gasification of several different coals. This system gives good results with a wide variety of fuels ranging from gas coals to coke. W. J. M.

**Natural gas.** CLAUDE C. BROWN. *Gas Age-Record* 63, 4-6(1929).—A review of natural-gas production, utilization and methods of conservation, particularly with respect to the California field.

LESLIE B. BRAGG  
**Chemical composition of Polish natural gases and the determination of their calorific value.** I. Chemical composition of Polish natural gases. K. KLING AND L. SUCHOWIAK. *Trans. Fuel Conference, World Power Conference, London, 1928* 1, 821-3 (1929).—See C. A. 22, 4772; 23, 2273. II. Determination of the calorific value of natural gas from the relative density. W. DOMINIK. *Ibid* 823-6.—As natural gas consists almost entirely of paraffin hydrocarbons, the calorific value can be calcd. from the observed density. Heating value can be read directly from a chart which also corrects for contamination with air. III. Determination of the calorific value of natural gas by means of chemical analysis. W. LESNIAŃSKI AND K. KATZ. *Ibid* 826-9.—See C. A. 23, 2552. IV. A comparison of the methods for determining the calorific value of natural gas. J. WÓJCICKI. *Ibid* 829-33.—The calorific value of gas (10-17,000 cal. per l.) was detd. in (1) Junkers and (2) union calorimeters and calcd. by the (3) chem. compn. and (4) density methods. If the values of (1) after correction for unburned gas, etc., are correct, the errors are as follows: (1) without correction 7%, (2) 8%, without correction 29%, (3) 0.98%, (4) 6.9%. The relative time consumed is (1) 3.6, corrected 4.9, (2) 1, (3) 2.75 and (4) 1.5. It is concluded that the method employing chem. analysis is the most satisfactory.

ALDEN H. EMERY  
**Cracking natural gas.** J. A. YUNKER. *Gas Age-Record* 63, 674, 680(1929); cf. C. A. 23, 3793.—Natural gas can be cracked in a water-gas set by using it in place of steam after the blast. A gas contg. 90% H<sub>2</sub> and less than 10% hydrocarbon has been made and 7 lb. of carbon black, suitable for use in rubber tires, has been recovered per 1000 cu. ft. of natural gas processed. About 2.25 cu. ft. of cracked gas may be produced per cu. ft. of natural gas with a consumption of 0.015 lb. of coke. The gas may be used for mixing or for synthetic processes.

LESLIE B. BRAGG  
**Changing from manufactured to natural gas.** GEORGE WEHRLE. *Gas Age-Record* 63, 673, 676(1929).—The change increased the capacity of the distributing system for the delivery of heat units about 2.6 times. By satg. the natural gas with water and oil vapors trouble due to leakage, the drying out of diaphragms and dust in the mains is avoided.

LESLIE B. BRAGG  
**Some manufactured-gas technical developments.** C. J. RAMSBURG. *Gas Age-Record* 63, 205-6, 213-6(1929).—A review of recent developments in liquid purification, dehydration, naphthalene removal, back-run method, automatic operation of water-gas generators, Becker oven and the disposal of phenolic waste liquors. L. B. B.

**Heat loss due to combustibles in flue gas.** G. S. FRING. *Combustion* 19, 251-3 (1928).—An approx. method of detg. the heat loss due to combustibles in the flue gas without making a complete analysis of the gases.

LESLIE B. BRAGG  
**Interpretation of stack-gas analysis.** G. E. SALKVIST. *Blast Furnace & Steel Plant* 17, 1055-7(1929).—A graphic method is described of detg. CO in waste gas from the amt. of CO<sub>2</sub> and O<sub>2</sub> present in the gas and the analysis of the fuel. C. L. READ

**Naphthalene stoppages (in gas mains).** FRITZ SCHUSTER. *Gas Wasserfach* 72, 650-3(1929).—Naphthalene stoppages are avoided by spraying or vaporizing sufficient tetralin into the gas so that naphthalene sepg. out on cooling will be in soln. in the tetralin rather than deposited as a solid. The quantities of tetralin necessary are given and the vaporizing app. is discussed and illustrated.

R. W. RYAN  
**Experience with naphthalene removal.** R. C. DOWNING. *Gas Age-Record* 62, 861-6(1928).—A naphthalene history of the Lowell Gas Light Company, Lowell, Massachusetts from 1915 to date is given. A multiple oil washer, which is giving good results, is described with operating and cost data. The washer decreased the naphthalene content of the gas to an average of 1.3 grains per 100 cu. ft. of gas at an expense of 1/8 cent per 1000 cu. ft. of gas.

LESLIE B. BRAGG  
**Characteristics of low-temperature tar.** M. A. MATTHEWS. *Gas World* 90, 744 (1929).—The chief characteristics of low-temp. tar are discussed with emphasis on the prospects of increased motor-spirit production.

J. B. CARPENTER, JR.  
**Viscosity and adhesiveness of street-tar.** HEYDECKE. *Asphalt u. Teer* 29, 649-51 (1929).—The viscosity and adhesiveness of various tar samples were detd. at various temps. Tars having the same viscosity may have different degrees of adhesiveness.

W. A. GALLUP  
**The Reichmann continuous tar-distillation process.** ERNST WEISE. *Asphalt u. Teer* 29, 620-1(1929).—Four stills are operated in series and maintained at different

temps. The crude tar is introduced into the first still in very finely divided form, the vapors pass off into the condensing system and the residual tar flows to the second still, which is maintained at a higher temp., etc.

**Dehydrating water-gas-tar emulsions.** H. A. KLEINMAN. *Gas Age-Record* 63, 349-50, 353-4(1929).—An app. which has been successfully used at the gas plant of the Peoples Power Co., Moline, Ill., for the dehydration of 100% bituminous coal water gas tar at an expense of about 0.5 cent per gallon of dry tar, consists essentially of an exhaust steam emulsion heater and a separator. The emulsion is heated to about 220° F. in the heater while under a pressure so that no vaporization of the water takes place, and then passes through a set of sprays. After it leaves the sprays the pressure is atm and part of the water vaporizes and is condensed in a jet condenser and the emulsion is broken so that the tar and remaining water will sep. by gravity.

**Acids in peat tar.** G. STADNIKOV AND V. SABAVIN. *Brennstoff-Chem.* 10, 1 (1929).—Carboxylic acids together with phenols are extd. from a sphagnum peat tar with NaOH. The acids are next sepd. from the phenols by treatment with Na<sub>2</sub>CO<sub>3</sub>, esterified and fractionated. From analysis of the esters and of the acids set free therefrom by saponification, together with mol. wt. data, caproic, heptioic and caprylic acids are identified. The presence of unsatd. acids is also indicated. The authors believe that these acids exist as such in the peat and are not formed by destructive dist.

**Coke and by-products in 1927.** F. G. TRYON AND H. L. BENNETT. *Bur Mines, Mineral Resources of the U. S. 1927*, Pt. II, 595-687 (preprint No. 29 published July 3, 1929).

**Recent research on the production and utilization of coke.** W. T. K. BRAUNHOLTZ. *Gas World* 90, Coking Sect. 65-8(1929).—The work of the Northern Coke Research Committee, England, during the past year, is reviewed. The greater part of the paper deals with methods of testing the resistance of foundry coke to breakage in transit. In the detn. of volatile matter in coke, by the usual crucible method, loss of wt. continued to the limit of the test, 28 min., even in an atm. of N, amounting to about double the loss in 7 min. The loss in 7 min. was greater in a silica tube in N than in a crucible in a muffle furnace at the same temp., 950°, without N. Adding benzene in the crucible analysis, to produce an inert atm., gave a still lower value. Analyses of a number of coals showed a distinct tendency for the middle sieve fractions to contain the least ash.

**The part played by the bitumens of the coal in coke-formation.** G. AGDE AND L. VON LYNCKER. *Teer u. Bitumen* 27, 309-11(1929).—Analytical coking and absorption expts. indicate that the reactivity of a coke is decreased by the presence of solid decompn. products of the bitumens of the coal. These decompn. products are derived largely from the solid bitumens of the coal.

**The water content of semi-coke and its exact determination.** M. DOLCH, E. PÖCHMÜLLER AND M. DAVID. *Braunkohle* 28, 429-34(1929).—The usual methods, drying at 108° and distn. with xylene, are not applicable because they do not remove adsorbed moisture. The so-called cryohydric method gives exact results. The sample is boiled several minutes with a known quantity of abs. alc. which takes up all of the moisture. A measured vol. of the alc. is then mixed with an equal vol. of gasoline and the miscibility temp. is detd. exactly. The % H<sub>2</sub>O in the alc. is detd. from a table and from this the % in the coke is calcd.

**The coke-oven industry in 1928.** C. P. FINN. *Iron Coal Trades Rev.* 118, 121 (1929).

**By-product ovens are underfired with blast-furnace gas.** ANON. *Iron Trade Rev.* 84, 644-5(1929).—The results of the first three months of operation when firing Becker cross-regenerative type ovens at the S. Chicago plant of the By-Products Coke Corp. of Chicago with blast-furnace gas indicate the following advantages: more uniform distribution of heat to the walls of the oven; more uniform coke temperature and size as pushed; improvement in the smoothness and ease of operation of the furnaces and greater uniformity in the B. t. u. of the furnace gas.

**Blast-furnace gas on coke ovens.** F. B. THACHER. *Blast Furnace & Steel Plant* 17, 1048-52(1929).—A description of an installation to use blast-furnace gas exclusively to heat 2 batteries of Becker ovens, thus releasing the higher-grade coke-oven gas for other uses.

The estimation and control of acidity in the crystallization of (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> (CRANSTON, STOCKDALE) 18. Gas production from sewage sludge (ZACK, EDWARDS) 14. Pyrogenic decomposition of the perhydrides of fluorene and acenaphthene under H

pressure (ORLOV, BELOPOLSKI) 10. Hydrolysis of naphthenic acids at elevated temperatures and cracking under pressure of H (IPAT'EV, PETROV) 10. Fuel control in forge and rolling mill practice (ARMSTRONG) 9. The use of liquid fuel in open-hearth furnaces (CONWAY) 9. Fuel control on hot blast stoves (FORTUNE) 9. Fuel control in the cement industry (MARTIN) 20. Fuel control in open-hearth practice (BENTLEY) 9. Calculation of the water-gas equilibrium by means of the exact Nernst heat equation (MAURER, BISCHOF) 2. Transformations of fatty acids in the course of geologic periods (STADNIKOV, WEIZMANN) 8. Fuels—alternative or supplementary to gasoline—for use in internal-combustion engines for road vehicles (ORMANDY) 22. Progress of the liquefied petroleum gas industry (OBERFELL) 22. Pipe-line corrosion (LEGG) 9. The place of the complete corrosion survey in industry (HOUGH) 9. Corrosion surveys for distribution systems (HOUGH) 22. Methods of covering or coating pipes to prevent corrosion (MOELLER) 9. Experiences with pipe protection (WARING) 9. Upward-current apparatus for washing and classifying coal (Brit. pat. 303,810) 1. Gases [from coal or coke] for  $\text{NH}_3$  synthesis (U. S. pat. 1,723,772) 18. Gas holder (Brit. pat. 303,471) 1.  $\text{C}_2\text{H}_4$  derivatives (Brit. pat. 303,176) 10. Granular C (U. S. pat. 1,722,055) 18.

**Berichtfolge des Kohlenstaubausschusses des Reichskohlenrates, 18th and 19th April and June, 1929.** Berlin: V. D. I. Verlag. 16 pp. and 12 pp. Each, M. 1. Reviewed in *Mining and Met.* 10, No. 272, p. 20 of advertising section (1929).

**DICKINSON, ERNST: Successful Stoking and Smoke Abatement.** Wakefield, England: Sanderson and Clayton. 53 pp. 2s. Reviewed in *Colliery Guardian* 139, 267 (1929).

**PODBREZNIK, FR.: Les corps humiques dans les charbons et les lignites.** Bordeaux: Imprimerie Cadoret. 46 pp. Reviewed in *Chimie & industrie* 21, 902 (1929).

**WEBER, E.: La combustion et les moteurs.** Paris: G. Gautron. 195 pp. F. 50. Reviewed in *Chimie & industrie* 26, 445 (1929).

**Coking carbonaceous fuel.** EMIL RAFFLOER. U. S. 1,723,807, Aug. 6. An app. is described in which the material is constantly heated as it is progressively moved forward, to effect drying and desulfurization, then compressed in relatively long narrow masses while being constantly heated, and intermittently exposed for the free discharge of gases.

**Hydrogenation.** UNION FINANCIERE COMMERCIALE ET INDUSTRIELLE. Fr. 657,546, Nov. 24, 1927. Fuel such as lignite is reduced to a fine powder and heated under pressure of H or gas contg. H in the presence of a catalyst not capable of forming carbides such as Bi.

**Destructive hydrogenation of coal, etc.** MICHAEL MELAMID. U. S. 1,723,431, Aug. 6. The material is heated with Sn under pressure and at a temp. not substantially exceeding  $600^\circ$  and a current of H is forced into the material during the heating Cf. C. A. 23, 264.

**Hydrocarbon conversion.** I. G. FARBERIND. A-G Brit. 303,761, Sept. 3, 1927. Hydrocarbons of relatively low b. p. are produced from starting materials such as tars, tar oils, mineral and shale oils, products of destructive hydrogenation of carbonaceous materials and mineral oil fractions which are sol. in liquid  $\text{SO}_2$ , by treatment with a gaseous hydrogen halide such as HCl at above  $100^\circ$ , with or without pressure, in the presence of activated metals or alloys such as Al, Cu, Pb, Mg, Fe, Co, Cr, etc., and their alloys. Anhyd. chlorides such as  $\text{AlCl}_3$  also may be used. Several examples are given.

**Apparatus (with a screw retort) for carbonizing coal and similar materials.** FRANK C. GREENE and IRVING F. LAUCKS (to Old Ben Coal Corp.). U. S. 1,723,932, Aug. 6. Structural features.

**Testing coal to be gasified.** RUDOLF GEIPERT. U. S. 1,721,813, July 23. In order to test the gasification properties of coal, a test chamber is heated to a gasification temp. and a definite quantity of coal in brick form is placed in the chamber and gasified. An app. is described.

**Low-temperature distillation of brown coal, peat or similar materials.** KARL W. J. H. JACOBS. U. S. 1,721,997, July 23. Brown coal, peat or like material contg. appreciable quantities of O and capable of evolving tarry material of one character at  $250$ – $350^\circ$  and tarry material of a different character at temps. above  $350^\circ$  is dried by heating in a distg. retort and the temp. is progressively raised to about  $350^\circ$  and the residue is cooled while removing volatilized material from the retort and while the residue still contains most of the substances capable of releasing tar above  $350^\circ$ .

**Screening and washing system for separating lignite from sand and gravel.** JOSEPH W. REID. U. S. 1,723,372, Aug. 6. An app. is described.

**Montan wax.** I. G. FARBENIND. A.-G. Brit. 303,080, Sept. 22, 1927. Montan wax is bleached while warm by an aq. soln. of chromic acid or its salts in the presence of an aq. soln. of an org. acid such as HOAc or benzenesulfonic acid. Details and examples are given. Cf. C. A. 23, 4330.

**Montan wax.** A. RIEBECK'SCHE MONTANWERKE A.-G. and T. HELLTHALER. Brit. 303,036, Aug. 26, 1927. Montan wax, crude or deresinified, fractions extd. by solvents, or the wax alcs. and acids obtained by saponification and acidification, are refined with oxidizing agents such as  $H_2O_2$  or chromic acid or its derivs. in the presence of aq.  $H_2SO_4$ . Diluents or dispersing agents such as silicic acid, clay or  $CCl_4$  may be used to prevent thickening. Various examples and details are given. Cf. C. A. 23, 2558.

**Gas producer.** P. S. HULT (to Morgan Construction Co.). Brit. 303,784, Jan. 9, 1928.

**Gas producers.** POETTER G. M. B. H. Fr. 34,256, May 17, 1927. Addn. to 625,570. App for automatically stirring the fuel.

**Rotary gas producer.** P. B. MORGAN. Brit. 303,554, Oct. 5, 1927.

**Producer-gas boiler.** WM. B. CHAPMAN. U. S. 1,722,495, July 30. U. S. 1,722,496 also relates to a boiler construction.

**Plant for producing mixed coal gas and water gas.** HEINRICH KOPPERS (to Koppers Development Corp.). U. S. 1,723,279, Aug. 6. Various structural features are described. U. S. 1,723,280 relates to app. for producing coke and gas from coal.

**Oil gas.** JOHN E. HACKFORD (to Hakol, Ltd.). U. S. 1,723,418, Aug. 6. A spray stream of hydrocarbon material and air is partially burned (in an app. which is described) to form a combustible gas, and the heat of combustion is utilized for maintaining the combustion initiation region close to the place at which the hydrocarbon and air spray stream commences at a temp. exceeding about  $600^\circ$ .

**Gas holder.** R. WAGNER. Brit. 303,316, April 13, 1928. The joint between an axially movable closure disk and the holder wall is made by a seal of hard solid fat or grease which may consist of an emulsion of soap in mineral oil with or without graphite or kieselguhr. Various structural details are described.

**Waterless gas holder.** H. NIELSEN, B. LAING and J. McCLEARY. Brit. 303,045, Sept. 26, 1927. Structural features are described relating to a gas holder with movable pistons (dividing the holder into upper and lower compartments). The inflammable gas to be stored is held in the lower compartment and an inert gas deficient in O is placed in the upper compartment. Combustion gases from a chimney or stack may be used.

**Column still suitable for ammonia recovery from gas liquor.** WILLIAM H. PAVITT (to Wilputte Coke Oven Corp.). U. S. 1,723,657, Aug. 6. Structural features.

**Extraction of oils, etc.** I. G. FARBENIND. A.-G. Fr. 657,585, July 17, 1928. Oils or volatile substances are extd. from residues from the hydrogenation of certain coals under pressure or from other material by passing the material to be treated in the form of a mud or in a viscous state over surfaces cautiously heated. An app. is described.

**Distilling tars and oils.** GAS LIGHT & COKE CO., W. G. ADAM and F. M. POTTER. Brit. 303,038, Aug. 27, 1927. The material to be distd. is passed through heating coils under pressure, allowed to expand, liquids and vapors produced are sepd. and these passed separately in heat exchanging relation with the initial material. An arrangement of app. is described.

**Separating oil from coke-oven tar.** ANTON WEINDEL (to Zeche Mathias Stinnes) U. S. 1,722,872, July 30. In treating coke-oven tar to obtain lubricating oils without distn. of the main bulk of material, the tar is mixed with a "multiple quantity" of petroleum benzene at ordinary temp., the mixt. is allowed to stand for some time at a temp. below normal room temp., tar oils dissolved in the benzene are sepd. from the sepd. asphalt materials, the benzene is distd. off from the oils, and the oils are then distd. up to a temp. of  $245^\circ$  to remove light oils.

**Coke oven.** H. KOPPERS A.-G. (to F. Totzek). Brit. 303,107, Dec. 28, 1927.

**Coke-oven and gas-plant operation.** S. P. MILLER (to Barrett Co.). Brit. 303,163, Dec. 29, 1927. Valves and valve boxes are provided (in a plant construction which is described) whereby gases are directed into one or the other of different collector mains according to the stage of the distn. "Rich" and "lean" gases are thus collected separately in the mains and are cooled by  $NH_3$  liquor sprays. Tarry oil constituents are sepd. from the gases and the latter are then treated for extn. of  $NH_3$  and light oils. Various other details of operation are also described. Brit. 303,164 specifies a process (which may be carried out in the same plant construction) in which the "rich" gases evolved during an earlier period of the distn. are diverted into a collector main and a low free C tar is sepd. and distd. by the hot gases from a number of ovens. Pitch ob-

tained may be blended with tar or lower m. p. pitch to form low free C-pitch compns. and the distillates are condensed to obtain low-d. oils. Brit. 303,165-6-7 relate to app. for use in generally similar processes.

**Coke-oven battery.** JOSEPH BECKER (to Koppers Co.). U. S. 1,721,763, July 23.

## 22—PETROLEUM, LUBRICANTS, ASPHALT AND WOOD PRODUCTS

W. F. PARAGHER

**Bibliography of petroleum and allied substances 1922 and 1923.** H. BRITTON. Bur. Mines, *Bull.* 290, 667 pp. (1929). E. H.

**Progress in the petroleum industry.** WALTER SAMANS, P. L. GUARIN, T. H. KERR, H. R. PIERCE, C. F. BRAUN AND W. G. HELTZEL. *Petroleum* (A. S. M. E. Trans.) 51, No. 14, 1-8 (1929); cf. C. A. 23, 962. E. H.

**Progress of the liquefied petroleum gas industry.** G. G. OBERFELL. *Gas Age-Record* 63, 137-9, 145-6 (1929).—The properties of liquefied petroleum gas, propanes or butanes, and possible uses in connection with the gas industry are discussed.

LESLIE B. BRAGG

**Thermochemical investigations of petroleum.** Thermochemical transformation of squalene. RYONOSUKE ABE AND GORO SHIBAYASHI. *Bull. Inst. Phys. Chem. Research* (Japan) 8, 496-501 (1929); Abstract Sect. 2, 56-9.—At 185° squalene reacts exothermally, probably because it begins to polymerize. This exothermic reaction increases suddenly at 300°. During cracking, squalene undergoes first a polymerization and then breaks down into smaller volatile mols. The favorable action of  $AlCl_3$  on cracking is attributable to the fact that it helps the first step of the process. ALBERT L. HENNE

**Recent developments in the distillation of petroleum.** S. F. LIRCH AND A. E. DUNSTAN. *Trans. Fuel Conference, World Power Conference, London, 1928* 1, 614-40 (1929); cf. C. A. 22, 863.—A discussion of the modern pipe still and its accessories, fractionation in natural gas gasoline plants, and vacuum distn. of lubricating oils.

ALDEN H. EMERY

**Cracking petroleum oils by means of special metallic catalysts.** M. DARMOIS. *Chimie & Industrie Special No.*, 252-6 (Feb., 1929).—The catalyst used consisted of an inert base (pumice or charcoal) on which was deposited 2-3 g. of Ag per 200 g.; this material was used as cathode in electrolysis for depositing about 50 g. of catalyst per 200 g. of base. The petroleum was passed downward through a vertical glass tube heated by a nichrome coil; the bottom of the tube contained a layer of charcoal over which was placed the catalyst, which in turn was covered with a 2nd layer of charcoal, the upper portion of the tube being empty. The initial decompn. temp. depends on the nature of the catalyst: with Fe and Ni, decompn. is appreciable at 400°; the catalyzing properties of Cu are appreciably improved by using it for some time and then reducing it in a current of  $H_2$ ; this treatment renders it active below 450°. The activity of Ag begins only at about 500°. Decompn. of kerosene gives considerable gas and gasoline (products distg. up to 155°) and very little C (never more than 2% calcd. on the kerosene). As the temp. rises, the amt. of gasoline obtained increases to a max. and then decreases, while the amt. of gas increases continuously. In general the gasoline and gas obtained at low temps. contain  $C_2H_4$  and hydrocarbons contg. 3 or more double bonds, but no  $C_3H_2$ ; as the decompn. temp. increases, this class of hydrocarbons disappears in both the gasoline and the gas, and the proportion of  $C_2H_4$  in the ethylene hydrocarbons increases; at high temps. the gas contains almost pure  $C_2H_4$  in admixt. with  $H_2$  and satd. hydrocarbons, and the gasoline contains an increasingly large proportion of aromatic hydrocarbons, so that  $C_6H_6$  can be obtained from the lower-boiling fractions and naphthalene from the higher-boiling. The compn. of the residual kerosene (boiling above 155°) is changed, the proportion of cyclic hydrocarbons increasing steadily with the no. of times it is catalyzed. Tests on a gasoline of known compn. ( $C_8H_{18}$  +  $C_7H_{16}$  6.7%, dimethylcyclohexane 49.5%, paraffin hydrocarbons 43.8%),  $C_8H_{18}$ ,  $C_7H_{16}$ , cyclohexane, methylcyclohexane and *o*-dimethylcyclohexane showed that the aromatic hydrocarbons are very stable under the conditions of the expts., while the naphthene hydrocarbons gave chiefly  $C_2H_4$  under conditions which produced from the higher petroleum hydrocarbons a large proportion of higher olefins. The methods of analysis used in the investigation are discussed at length.

A. PAPINEAU-COUTURE

**Cracking.** A. N. SAKHANOV AND M. D. TILICH'EV. *Neftyanoe Khozyaistvo* 16,

62-6(1929); cf. C. A. 23, 3658.—An Emba gas oil from Konstantinovskii refinery, having a sp. gr. of 0.872,  $E_{20}$  viscosity 2.23, 109° flash, 0.149 acidity ( $\text{SO}_2$ ), 67% of which distd. over below 350°, was cracked at 450° and 40 atm. for 42-64 min. It produced 28.7-32% of gasoline and the cracked residues represented a high-quality fuel oil. After the gas-oil fractions were recycled 4 times the total yield of gasoline increased to 55% by wt., and gas and loss amounted to 15%. A 2nd Emba gas oil of 0.879 sp. gr., with 46% boiling below 350°, when cracked once at 450° at various pressures and for various periods of time, produced 26.2 to 39.0% gasoline. The total yield after four recycling operations was 58% by wt. with 15% of gas and loss. The C formation was insignificant. The cracked gasoline so obtained was practically free from S and required only very light treatment.

A. A. BOEHLINGK

Higher alcohols from petroleum hydrocarbons. I. STANISLAW PILAT and JOZEF WINKLER. *Przemysl Chem.* 13, 185-95(1929).—The optimum temp. for the formation of olefinic gases which can be converted into secondary alcs. on cracking gas oil in the vapor phase lies between 600° and 670°. In this temp. interval a max. yield of 5 1/2% is obtained, figuring on the basis of the gas oil as the starting material. It has been possible to isolate, though not in a quite pure state, isopropyl, secondary butyl and secondary amyl alcs. The temp. which is most favorable for high alc. yields is also the optimum temp. for the yield of gasoline, which is contrary to scientific and patent literature.

A. C. ZACHLIN

Oil fields of Burma. L. DUDLEY STAMP. *J. Inst. Petroleum Tech.* 15, 300-49 (1929).

E. H.

The oil industry in Japan. K. HASHIMOTO. *Trans. Fuel Conference, World Power Conference, London, 1928* 1, 544-58(1929).—See C. A. 23, 2279.

ALDEN H. EMERY

Oil-field emulsions. LESTER C. UREN. *Natl. Petroleum News* 21, No. 13, 51-7; No. 16, 59-65; No. 20, 61-8; No. 27, 59-66(1929); cf. C. A. 23, 3800. —The handling of oil-field emulsions is discussed from the standpoint of (1) gravity settling, (2) heat treatment, (3) elec. sepn., (4) chem. treatment, (5) centrifugal sepn. and (6) filtration. The phys. properties of crude-petroleum emulsions, theories advanced to explain them, economic aspects of the problem and practical applications of each method for breaking such emulsions are also discussed.

J. L. ESSEX

Kuban crude oils. M. A. BESTUZHEV. *Neftyanoe Khozyaistvo* 15, 339-42(1928). —Heavy Iiskii crude has a sp. gr. of 0.973, a viscosity  $E_{100}$  of 3.42, and low cold test. It contains 1.8% of asphaltenes and 17.2% of resins (adsorbed by silica gel). It has no gasoline fraction and only 3% of kerosene (up to 270°) of sp. gr. 0.876. The lubricating-oil fractions (distd. *in vacuo*) contained 55.7% of lubricating oils and 43.1% of residues. The residue is of high-quality asphaltic character with a sp. gr. of 1.01, softening point (Kraemer-Sarnow) 39°, elongation at 25° < 100° and a penetration of 50. The lubricating oils are aromatic in character. The fuel oil has about 10% each of spindle and solar oil and 35-40% of machine and cylinder oils. Light Iiskii crude oil has a sp. gr. of 0.890. The bore hole 9/9 produces an oil of sp. gr. 0.862 which contains up to 33 7/8% of gasoline (below 200°); the crude from 3/11 has a sp. gr. of 0.904. These crude oils are low in paraffin wax and their f. p. is below -20°. They are naphthene-base oils.

A. A. BOEHLINGK

Bituminous sands of Alberta. II. Separation. K. A. CLARK and S. M. BLAIR. *Alberta Sci. Ind. Research Council Rept.* No. 18, 36 pp.(1929).—A description of the development of the hot-water extn. methods for sepg. the bitumen from the sand. III. Utilization. K. A. CLARK. *Ibid* 33 pp.—The work was undertaken to find an outlet for the bituminous sands of Alberta. Two main uses were found: (a) direct application of the sands to road building to replace road oils and asphalts; and (b) raw material for gasoline manuf. The bitumen may be extd. from the sand and used for road oil, or it may be emulsified and then used for road building. The bitumen may be cracked by the Dubbs process to yield 45-50% of gasoline, which makes it a good source of motor fuel.

J. L. ESSEX

The availability of the Alberta bituminous sands for production of fuel oil. K. A. CLARK. *Trans. Fuel Conference, World Power Conference, London, 1928* 1, 581-4 (1929).—See C. A. 12, 1537; 17, 948; 18, 891, 1563, 1804, 1964, 2232, 3582; 19, 455, 1839; 21, 42, 2861, 3441.

ALDEN H. EMERY

Repressuring. YA. GAVRILOV. *Azerbeidzyanskoe Neftyanoe Khozyaistvo* 1929, No. 2, 85-6.—A review of American and other methods for repressuring oil sands.

A. A. BOEHLINGK

Some facts about pumps and pumping. H. L. KAUFFMAN. *Refiner and Natural Gasoline Mfr.* 8, No. 7, 71-4(1929).—Types of pumps used in the petroleum industry and factors affecting pump capacity and pump efficiency are discussed.

J. L. ESSEX

**Hydrogenation process to be used first in conversion of heavy fuel oil.** PAUL TRUESDELL. *Natl. Petroleum News* 21, No. 28, 27-9(1929). J. L. ESSEX

**Distillation.** B. E. VLASENKO. *Neftyanoe Khozyaistvo* 16, 212-5(1929).—The efficiency of stills can be increased 25-30% by injecting into the vapor line a certain amt. of  $H_2O$  or of an oil fraction identical in b. p. with the vapors passing through the vapor line. A part of the vapors is condensed and a vacuum is thus created which increases the capacity of the still. The remaining vapors are condensed in the condensers. A. A. BOEHLINGK

**Data from air distillation explained.** G. G. BROWN. *Oil and Gas J.* 28, No. 5, 46, 107, 109, 110, 112(1929).—The continuous air distn. app. devised by Sligh for detg. partial volatility of motor fuels directly, and later used by Bridgeman, does not give results const. at varying rates of feed; that is, the results do not represent true equil. conditions. The vaporizing app. now used by Brown is pictured and its operation described. The attempt to extrapolate to zero rate of feed from the results obtained in the vaporization of some fuels with this app. again led to the absurdity that over a certain range the residue was made to appear to become more volatile as more of it was vaporized. Equil. continuous vaporization curves for pressures of 3-740 mm. were calcd. by the aid of Raoult's law from a careful analysis of the fuel. The calcd. curve for 740-mm. pressure was compared with the curve for values of percentage of fuel vaporized, detd. in a vaporizer known to give nearly equil. distn. within the feed range of 6-15 cc. for natural gasoline. At the 10% point the calcd. curve indicated 9% less vaporized than did the exptl. curve. At the 90% point the calcd. curve indicated about 12% more vaporized. From the known deviations of the percentage distd. from the amts. indicated by Raoult's law, the curves calcd. for all pressures were corrected. It was then possible by a method described to calc. corrected equil. vaporization curves, which were found to agree perfectly at the higher temps., where vaporization was nearly complete, with the air-distn. exptl. curves. The agreement, by all tests applied, between results computed and results by air distn. where conditions were those of equil. is evidence that the results computed closely represent equil. distn. A graphical method is described by which the results of equil. air distn. (a continuous distn.) are correlated, with approx. accuracy, with the curves of the A. S. T. M. distn. (a batch process) for natural-gasoline blends EMMA E. CRANDAL

**Rectification columns and fillers.** S. VISHETRAVSKII. *Azerbeidzyanskoe Neftyanoe Khozyaistvo* 1929, No. 3, 56-66.—A crit. review of various American and Russian rectification columns is given. Comparative runs are described and conclusions drawn. A. A. BOEHLINGK

**Improving the performance of rectifying columns and evaporators.** E. MISHKIN. *Azerbeidzyanskoe Neftyanoe Khozyaistvo* 1929, No. 3, 72-4.—The above equipment can be improved by installing a vertical cylinder in the lower part of the rectifying column, immersed in the condensate. Steam injected at the bottom of the cylinder, which is open at both ends, sets the condensate in circulation and carries off gasoline vapors held by the liquid. In another improvement the condensate discharge pipe is attached at the upper level of the condensate and is bent downwardly in U-shape, insuring const. level. The condensate collected in the bend prevents vapors and gases from escaping from the rectifying column with the condensate. A. A. BOEHLINGK

**Refinery research laboratory tied to practical plant operation.** PAUL TRUESDELL. *Natl. Petroleum News* 21, No. 27, 71-2; No. 28, 73-6(1929). J. L. ESSEX

**Oxidation mechanism of the paraffin hydrocarbons.** GUSTAV EGLOFF, R. E. SCHAAD AND C. D. LOWRY, JR. *Ind. Eng. Chem.* 21, 785-91(1929); cf. *C. A.* 23, 3337.—Neither the hydroxylation nor the peroxide theory is in accord with the facts known about the oxidation of paraffin hydrocarbons. The theory of chain reactions has been applied to hydrocarbon oxidation, and the action of suppressors of engine knock identified with that of antioxidants. There are facts which oppose this view. E., S. and I., develop the idea that antioxidants act as knock-suppressors by receiving and dissipating the energy passing along a reaction chain of hydrocarbon mols. only when temp. and pressure conditions in the engine cylinder raise the energy content of the mols. to a crit. point. It is possible that ozone and oxides of nitrogen are formed in the cylinder and from their unstable character act as knock-inducers by activating chains of hydrocarbon mols. EMMA E. CRANDAL

**Recovery of paraffin wax absorbed by fuller's earth.** L. SELSKIL. *Azerbeidzyanskoe Neftyanoe Khozyaistvo* 1929, No. 3, 84-5.—Fuller's earth contg. paraffin wax from treating was freed from paraffin by extg. 3 times with a naphtha b. 90-130° at a temp. of 70-75°. After heating to redness the earth recovered its original absorption power. The paraffin sepd. was of good com. quality and had a m. p. of 52.5-53°. A yield

of about 70%, calcd. on the waste product, was attained after evapg. the naphtha. A hot-H<sub>2</sub>O extn. of paraffin was a failure. Emulsions formed as the result of the emulsifying action of the fine suspended fuller's earth.

A. A. BOEHTLINGK

Properties required of liquid fuels for use in automobile and aircraft engines, and how the oil industry meets these requirements. WA. OSTWALD. *Trans. Fuel Conference, World Power Conference, London 1928* 1, 585-613(1929).

A. H. E.

Fuels—alternative or supplementary to gasoline—for use in internal-combustion engines for road vehicles. I. Liquid fuels. W. R. ORMANDY. *J. Inst. Fuel* 2, 199-204(1929).—A general discussion, covering cracking, high- and low-temp. carbonization, oil shales, alc., hydrogenation and catalytic processes. II. The future possibilities of gas producers and Diesel engines for transport purposes. A. METRAL. *Ibid* 204-220.—The subject is carefully discussed, with the possibilities of the production of sufficient quantities of fish or vegetable oils for use in Diesel engines.

LESLIE B. BRAGG

Comparison of various light motor fuels. D. N. VIRUBOV. *Izvestiya Teplotekhn. Inst. (Trans. Thermo-Tech. Inst. (Russia))* 1928, No. 6, 20-31.—Expts. with various Russian gasolines in a 4-cylinder gasoline-engine with a Zephyr carburetor led to the following conclusions: The volatility of a fuel is of primary importance. It can be detd. by using Gramenetzki's "carburetion number" (*Ibid* p. 12 ff.). "Dumb-bell" gasolines have the disadvantage of heavy ends which form a C deposit on the cylinder head and the valves; the light fraction constitutes a fire hazard. An analysis of Brown's work on "The relation of motor fuel characteristics to engine performance" (Univ. of Mich., 1927) (cf. C. A. 21, 2555) is found to confirm the results obtained by V.

A. A. BOEHTLINGK

Treatment of refinery absorption gasoline by the hypochlorite method. RALPH E. GOODE. *Refiner and Natural Gasoline Mfr.* 8, No. 7, 77-80(1929).—The hypochlorite process is applied for sweetening gasoline absorbed from refinery tail gases.

J. L. ESSEX

Determining gasoline content of (natural) gas. MARTIN SHEPHERD. *Oil and Gas J.* 28, No. 6, 48, 170, 172, 174, 176, 178(1929).—See following abstr.

E. E. C.

The accurate determination of the gasoline content of natural gas and the analytical separation of natural gases by isothermal fractional distillation. MARTIN SHEPHERD. *Bur. Standards J. Research* 2, 1145-99(1929).—S. describes a method for the accurate detn. of gasoline in natural gas. The detn. involves a special sepn. of the natural gas by fractional distn. at low temps. and pressures. A recombination of the resultant fractions is made in such a way that it is possible to det. the max. amt. of hydrocarbon condensate present in the original gas which possesses any given vapor pressure at any given temp. Special forms of app. are used for sepg. the higher-boiling constituents and detg. their liquid vol. to 0.001 ml. App. and procedures are described in detail, analytical results given, and a direct comparison is made with existing field and lab. methods. The analytical sepn. of natural gases and their com. condensates is also discussed.

A. WHITE

Gasoline-kerosene battery. K. KOSTRIN. *Azerbeidjanskoe Neftyanoe Khozjaistvo* 1929, No. 2, 55-71.—A description of the first pipe-still battery installed in Russia is given. A trial run to det. the upper limit of throughput of oil was made to bring out errors in construction, which are described in detail. A complete description of the unit is given, including operation.

A. A. BOEHTLINGK

Flushing. I. KLINGERMAN AND N. BOGOSLOVSKII. *Azerbeidjanskoe Neftyanoe Khozjaistvo* 1929, No. 2, 70-6.—In a gasoline stripping plant the preheated crude oil is sent through a pipe still into an evaporator placed in the flue and heated by flue gases. The hot oil is sprayed over two bell-shaped baffles in succession in this evaporator. The oil collected on the bottom is heated by a steam coil and the vapors thus produced carry the vapors produced on the baffles to the upper part of the evaporator, filled with Raschig rings. The vapors pass through a tower where they are sprayed with hot naphtha and through a second tower sprayed with cold H<sub>2</sub>O. The uncondensed vapors pass finally through two condensers of the usual type.

A. A. B.

Quality and standardization of motor naphtha. A. POPICH. *Vestnik Standartizatsii* 1928, No. 5, 9-13; *Chem. Zentr.* 1929, I, 333.—The properties of Diesel oils important for their valuation are discussed and the Russian plans for standardizing such oils are criticized.

G. SCHWOCH

Normal benzene. L. GUKHMAN AND N. TELESHEV. *Azerbeidjanskoe Neftyanoe Khozjaistvo* 1929, No. 3, 66-7.—A gasoline from Bibi-Eibat crude oil after being treated with H<sub>2</sub>SO<sub>4</sub> was fractionated through a Gadaskin column and the fraction boiling 65-70°, sp. gr. 0.7006, was used for asphaltene pptn. The amt. of asphaltene pptd. found to be very close to the amt. pptd. by Kahlbaum's normal benzene. This



Russian benzine contains more naphthenes than that of Kahlbaum, 30.5% as against 28.3%. A lower cut was therefore used to obtain the same pptn. of asphaltenes, with satisfactory results.

A. A. BOEHLINGK

**Flash-point determination.** ТУРКЕ. *Erdöl u. Teer* 5, 242-3, 258-60(1929).—The standard methods are critically reviewed, with a preference shown for the closed-cup methods.

F. S. GRANGER

**Mixture proportions and combustion processes in oil motors.** P. MEYER. *Z. Ver. deut. Ing.* 73, 824-6(1929).—Employing the analysis of exhaust gases from motors to det. the efficiency of the air-gas mixt. was satisfactory so long as too rich mixts. were not employed, but not otherwise. This stage comes in ordinary motors when the O<sub>2</sub> content of the exhaust gases falls below 3%, and in Diesel engines much earlier. In ordinary gasoline motors, the exhaust gases from rich mixts. contain CO, H<sub>2</sub>, CH<sub>4</sub>, and some C, increasing in amount with the richness of the mixture; with Diesel engines, in which atomized oil is injected into air, free C is found almost exclusively, and not CO, H<sub>2</sub> or CH<sub>4</sub>. In expts. made with a bomb contg. a hydrocarbon fuel evapg. completely at 70°, mixed with air in the proportion 1:15.23, at a pressure of 1.25 atm. abs., gases formed upon explosion under varying conditions did not check with those obtained when the same mixt. was used in a motor. In the latter case free O<sub>2</sub> and CO may even be present at the same time; this may be due to the nonhomogeneity of the exploding gas mixt. Illustrative curves are given.

W. C. EBAUGH

**Paraffin disease.** V. POPEL. *Azerbeidjanskoe Neftyanoe Khojaisitvo* 1929, No. 2, 86 7.—Symptoms of the paraffin disease are described. The disease is probably due to resins dissolved in the paraffin wax and absorbed by the skin. It can be avoided by cleanliness and by the use of a neutral fat, which must be rubbed in before coming in contact with the paraffin.

A. A. BOEHLINGK

**Occupational intoxication by lead tetraethyl.** F. HEIM DE BALSAC, E. AGASSE-LAFONT AND A. FEIL. *Chimie & industrie Special No.*, 740(Feb., 1929).—A brief discussion of the danger of acute or chronic saturnism attending the use of PbEt<sub>4</sub>.

A. PAPINEAU-COUTURE

**Tetraethyl lead, a new source of saturnism.** G. ICHOK. *Presse méd.* 36, 1127-8 (1928).—The physiol. and toxicological actions are described, and treatment with NaHCO<sub>3</sub> or MgO is recommended. The prophylaxis is discussed.

A. E. MEYER

**Iodine numbers of lubricating oils before and after use in automobile engines.** W. F. SEYER AND J. STANLEY ALLEN. *Ind. Eng. Chem.* 21, 793-4(1929).—The I nos. of 61 samples of oil were detd. before and after use in the crankcase of an engine, under carefully controlled conditions. In 54 of the oils, unsatn. was lower after use than before; whether because the unsatd. hydrocarbons were in part oxidized to gases or to sludge was not detd.

EMMA E. CRANDAL

**A new sulfuric-acid test for insulating and lubricating oils.** C. WALTHER. *Erdöl u. Teer* 5, 223-5(1929).—The Graefe NaOH method is unsatisfactory because emulsions form, and the Baum, Baader and other concd. H<sub>2</sub>SO<sub>4</sub> methods are unsatisfactory, because good as well as detrimental constituents are extd. without distinction. The following qual. method is found practicable: 5 cc. of oil, dild. with 5 cc. of normal benzene, is shaken with 5 cc. of 50% (by vol.) H<sub>2</sub>SO<sub>4</sub>. Injurious substances, due to insufficient re-  
mng, oxidation in use, etc., discolor the acid layer and deposit a middle asphaltic layer. the acid layer becomes nut-brown or turbid, or the middle layer exceeds 1 mm. in thickness, the oil is unfit for use in transformers.

F. S. GRANGER

**Oils for turbines.** MAURICE VAN RYSELBERGE. *Bull. fédération ind. chim.* 7, 44-70(1929).—The characteristics of lubricating oils for steam turbines, their firemen's, manuf., method of use and the value of lab. tests as a means of selecting the most suitable are reviewed. The routine tests do not help in the selection. Other tests have been investigated. A shaft is rotated by a motor until a speed of 1400 is reached; but neither the time required for the shaft to come to rest, nor the time reached by the bearing makes satisfactory discrimination. The steam-emulsifying method of the Inst. Petroleum Technologists is better. It has been modified as follows: 40 cc. of oil and 20 cc. of distd. H<sub>2</sub>O are agitated in a 100-cc. Pyrex cylinder by a motor. The vol. of H<sub>2</sub>O sepd. is recorded after each min. This is done at 20°, 40°, 60°, 80°, and the oil with the best demulsifying property at all temps. is selected as the best for steam-turbine lubrication. Sometimes the rate of sepn. is greater at the 80° than at the 20°. This is attributed to the method and degree of refining.

ALBERT L. HENNE

**K. WOLF.** *Petroleum Z.* 25, 95-8(1929).—Lubricating oils are produced by mixing mineral oils, tar, fatty oils or mixt. of mineral, and fatty oils to a glowing

elec. discharge, a. c. of 5000 v. being employed. The process is carried out at about 80° and in a vacuum of 60–70 mm., Al electrodes being used. B. C. A.

**Making "viscozins" from "lube-oil" bottoms.** P. MONTAG. *Azerbejdzhanskoe Neftyanoe Khozyaistvo* 1929, No. 3, 52–5—A mixt. of sp. gr. 0.9203, flash (Brenken) 152°,  $E_{100}$  viscosity 12.81 ( $E_{100}$  2.27), was obtained from 52% by wt. of Balakhany lubricating-oil bottoms, sp. gr. 0.9352, flash 302° and  $E_{100}$  viscosity 11.43, and 48% of a black gas oil, sp. gr. 0.8908, flash 132° and  $E_{100}$  viscosity 1.73. The mixt. was agitated by air for 1 hr. at 25° with 2.5% of 92.5%  $H_2SO_4$ . Part of the sludge was discharged after 4 hrs., and the remaining oil mixt. was agitated for 3 hrs. more with an additional 6% of  $H_2SO_4$ . The sludge was discharged completely after 14 hrs.' settling, without any difficulties. The oil was blown with air and steam at 302° to drive off the S-contg gases and the lower fractions, the final yield being 68% of the mixt. The remaining fraction, which amounts to 58.2% of the original bottoms, had a sp. gr. of 0.9264, flash 300°, viscosity  $E_{100}$  7.0, excise resins 0.0% and Conradson C 3.2%. Another mixt. of sp. gr. 0.9190, flash 152°,  $E_{100}$  viscosity 14.27 ( $E_{100}$  2.40) was prepd. from 62% by wt. of bottoms, sp. gr. 0.9431, flash 313° and  $E_{100}$  viscosity 8.79 and 38% of black gas oil, sp. gr. 0.8857, flash 128° and  $E_{100}$  viscosity 1.61. The same treatment was applied as above but with the temp. maintained at 38–40°; 63.4% of the mixt. was recovered. The final hot-air and steam treatment was applied for various periods of time, yielding viscozins of much higher quality than usual. Comparisons are given in the table

Viskozoin	Flash	Viscosity $E_{100}$	Conradson carbon	Color
No. 5 ordinary	263°	5.98	3.40%	black
No. 5 new method	263°	5.14	2.41%	greenish
No. 7 ordinary	305°	7.47	4.10%	black
No. 7 new method	305°	7.04	2.74%	greenish
No. 10 ordinary	331°	11.09	6.30%	black
No. 10 new method	326°	10.14	4.98%	olive-green

A. A. BOEHLTLING

**Results of tests of aluminum tanks.** L. G. E. BIGNELL. *Oil and Gas J.* 28, No 7, 38, 174–5(1929).—The ability of Al tanks to resist corrosion by the high-S West Texas crude oils, with their high brine content, is being tested by the Aluminum Co. of America in cooperation with the Parkersburg Rig and Reel Co. Two tanks, one constructed entirely of Al, the other of Al for the deck and upper ring but with steel for the bottom and lower ring, have been used for storing oil on the State-Lassiter lease, Crane Co., Tex., since Apr., 1928. Careful examn. after 1 yr. revealed no corrosion except that due to FeS falling to the bottom from steel bolts used to fasten a pressure gage in place, and from a steel gaging well, which was removed after a few months. The tanks are being continued in service, and will be inspected again in the fall of 1929.

EMMA E. CRANDAL

**Purification of ozocerite by means of various adsorbents.** V. SHACHOVZEV. *Neftyanoe Khozyaistvo* 13, 192–9(1927); *Chem. Zentr.* 1928, I, 1480–1.—A series of adsorbents were tested for their ability to decolorize a 2.5% soln. of ozocerite in  $C_6H_6$ . The powder obtained from  $K_4Fe(CN)_6$  and animal waste, when washed with  $H_2O$  and HCl, tested highest.

FRANCIS P. GRIFFITHS

**Varieties of Brazilian wood for the carbonization industry.** FRED. W. FREISE. *Arch. Wärmewirt.* 10, 233–5(1929).—The d., heating value, compressive strength, yield of charcoal, compn. and strength of charcoal, and rate of growth are given for 35 Brazilian woods, identified by their local names. In general, the yield is greater, and the porosity and combustibility are less, than for European charcoals. The exothermic reaction is stronger; hence small retorts have been found more suitable, to avoid overheating.

ERNEST W. THIBLE

**Composition of turpentine from *Pinus silvestris*.** V. KRESTINSKIĬ AND F. SOLODKIĬ. *Zhur. Prikladnoi Khim.* 2, 337–57(1929).—Russian turpentine can be divided into 3 groups: (1) steam-distd. from pitch of leaving trees and characterized by large amts. of pinene present, which makes them valuable raw products for chem. industry, (2) steam-distd. or extd. by solvents, such as  $C_6H_6$ , from wood chips and characterized by the presence of rather large amts. of carene and of alcs. of terpene series, but somewhat deficient in pinene, and (3) fire-distd. and then redistd. with steam. These turpentine are of variable compn. and of poor quality. They are the most common products and are known in Germany as *Kienöl*. Turpentine used in the exptl. work were obtained by distg. wood chips in presence and absence of alkalis. They were sepd. by fractional distn. into 20 fractions and their phys. consts. detd. Turpentine distd. in presence of alkalis contained 43%  $\alpha$ -pinene, 38.5%  $\Delta^3$ -carene, 6.5% ter-

pinolene, 7% alcs. ( $C_{10}H_{17}OH$ ) of unknown structure, 3.5% sesquiterpenes (probably cadinene) and 1.5% residue. Turpentine distd. in absence of alkalies contained 42.5%  $\alpha$ -pinene, 32.5%  $\Delta^2$ -carene, 4% terpinolene, 14% alcs., 3% sesquiterpenes and 4% residue.

V. KALICHEVSKY

**The composition of American spirit of turpentine.** G. DUPONT AND MISS M. BARBAUD. *Bull. inst. pin.* 1929, 155-6.—Analysis of a sample of commercial American spirit of turpentine gave: pinene 61.4, nopinene 33.5, tails 5.1%. Analysis of a sample of spirit of turpentine obtained from slash pine gave:  $\alpha$ -pinene 75.6, nopinene 21.2, tails 3.2%. Analysis of a sample of spirit of turpentine from longleaf pine gave:  $\alpha$ -pinene 64.3,  $\beta$ -pinene 31.8, tails 4.6%.

A. PAPINEAU-COUTURE

**Report on the operation of and work carried out at the Institut du Pin, Bordeaux.** G. DUPONT. *Bull. inst. pin.* 1929, 149-54.—An outline of the organization of the Institut du Pin, with a summary of the work carried out during 1928.

A. P.-C.

Transformations of fatty acids in the course of geologic periods (STADNIKOV, WEIZMANN) 8. Industrial process for obtaining liquid hydrocarbons by simultaneous cracking and hydrogenation (FOHLEN) 21. Plastometric studies of the formation of boundary layers (DE WAELE, LEWIS) 2. Soap production [Manufacture of lubricant and greases] (U. S. pat. 1,722,687) 27. Hydrocarbon conversion (Brit. pat. 303,761) 21. Apparatus for centrifugal purification of oils (U. S. pat. 1,723,329) 1. Apparatus for vacuum distillation of oils (Brit. pat. 303,078) 1. Carboxylic acids produced by oxidation of petroleum hydrocarbons (Brit. pat. 303,560) 29.

AMDURSKY, S. S.: **Handbook of the Petroleum Industry.** Rochester, N. Y.: Taylor Instrument Co. 192 pp. \$5 postpaid. Reviewed in *Instruments* 2, No. 7, p. 21 of advertising section (1929).

PENNIMAN, WILLIAM B. L.: **Lubrication.** New York: The Texas Co. 15 pp.

SKINNER, WALTER E.: **Oil and Petroleum Year Book, 1929.** London: Walter E. Skinner. 308 pp. 8s. 6d. Reviewed in *Mining and Met.* 10, No. 272, p. 18 of advertising section (1929).

**Apparatus for treating emulsified petroleum oils.** GUSTAV EGLOFF (to Universal Oil Products Co.). U. S. 1,722,041, July 23. A still with vertically spaced parallel sections is provided with independently controllable horizontal burners exterior to the still so that heat may be applied to the surface of the oil continuously as the body of the oil in the still decreases and the surface lowers.

**Cracking petroleum oils.** GUSTAV EGLOFF (to Universal Oil Products Co.). U. S. 1,722,042, July 23. Oil is heated to a cracking temp. under pressure as it flows through a pipe coil or the like and thence passes to an enlarged vaporizing chamber in which a somewhat lower super-atm. pressure is maintained. Vapors from the oil are caused to pass through a relatively thin layer of catalytic material such as  $ZnCl_2$  or other suitable metal oxide or chloride supported in the vapor space of the chamber and the pressure distillate is collected. Various details of the app. used are described. U. S. 1,722,043 specifies subjecting a bulk supply of oil to cracking conditions of temp. and pressure, continuously withdrawing portions of unvaporized oil from the bulk supply and dilg. with an oil of lighter gravity, passing the mixed oils through a bed of filtering material such as fuller's earth or bone black and injecting the cleansed oil into the lower portion of the bulk supply of oil being cracked. An app. is described. Cf. *C. A.* 23, 3804.

**Apparatus for distilling petroleum.** FOSTER WHEELER, LTD. Fr. 657,873-4-5, July 20, 1928.

**Heat-exchange apparatus suitable for use in petroleum refining, etc.** JOHN A. POTTER (to Foster Wheeler, Ltd.). U. S. 1,722,109, July 23. Structural features.

**Cracking hydrocarbons.** THOMAS MIDGLEY, JR. (to General Motors Corp.). U. S. 1,721,623, July 23. Cracking is effected by use of a catalyst of the Se type carried on a metal base such as Fe, Ni, Co or Pb. An app. is described. Te and pumice, etc., also may be used.

**Use of alkali metal cyanides and formates to promote cracking of hydrocarbons.** JOHN C. CLANCY. U. S. 1,721,728, July 23.

**Esterified products, etc., from cracked hydrocarbons.** AUGUST P. BJERREGAARD (to Doherty Research Co.). U. S. 1,723,008, Aug. 6. Hydrocarbon material is cracked in vapor phase at substantially atm. pressure, benzene is condensed from the vapors and olefins formed in the gases are esterified. An app. is described.

**Continuous rectification of hydrocarbons.** EMILÉ A. BARBET. U. S. 1,722,322,

July 30. The material to be rectified, that is, hydrocarbons and other liquids of high b. p., is subjected to the indirect action of satd. steam to vaporize a portion of its constituents, residual liquid is subjected to the indirect action of superheated steam to effect further vaporization and vapors from both treatments are brought into intimate contact in a single rectifying column with a reflux of condensates arising from the vapors, and the condensed material is withdrawn as a plurality of sharply defined fractions within different temp. ranges.

**Hydrocarbon oils from products of carbonaceous materials.** I. G. FARBENIND, A.-G. Brit. 302,941, June 20, 1927. Hydrocarbon oils are removed from mixts. of solids and liquids resulting from low-temp. carbonization, destructive hydrogenation, cracking, extn. and other industrial processes of heat treatment of carbonaceous materials, by intimate mixt. with an aq. liquid to which a wetting or emulsifying agent is preferably added. The material is then centrifuged, or treated with elec. or magnetic fields or with emulsion-resolving electrolytes to recover the oil from the aq. mixt. Numerous details and examples are given.

**Cracking hydrocarbon oils.** EUGENE C. HERTHEL (to Sinclair Refining Co.). U. S. 1,721,779, July 23. In a system in which oil is circulated through a heating zone where it is heated to a cracking temp. and thence to a vaporizing zone where vapors of the cracked oil are taken off under super-atm. pressure, vapors from an initial charge of oil are taken off from the vaporizing zone while a higher b. p. oil is circulated and recirculated through the heating zone from and to the vaporizing zone and a raw oil is supplied to the oil circulating through the heating zone until a substantial quantity of cracked oil has been taken off, and then, before the oil circulating through the heating zone becomes satd. with pitch, recirculation of unvaporized oil from the vaporizing zone to the heating zone is stopped while continuing to take off vapors and to circulate raw oil through the heating zone until a further substantial quantity of cracked oil has been taken off. U. S. 1,721,780 relates to app. suitable for use in processes of this character. Cf. C. A. 23, 3569.

**Cracking hydrocarbon oils.** E. C. HERTHEL (to Sinclair Refining Co.) Brit. 303,879, Jan. 12, 1928. Oil is circulated under pressure through a system of heating pipes or the like and a vaporizing drum from which the vapors pass to a dephlegmating tower and thence to a condenser and separator, and the circulation is continued until the concn. of pitch nearly reaches satn. The original circulation is then stopped and fresh oil is supplied while removing pitch-laden oil. An app. is described.

**Cracking hydrocarbon oils.** EDWARD W. ISOM (to Sinclair Refining Co.). U. S. 1,722,147, July 23. A stream of oil is passed once through a heating conduit such as a pipe coil where it is heated to cracking temp. and the hot products are thence discharged directly into a body of oil maintained in a reservoir at cracking temp.; vapors taken off from the reservoir are subjected to a first and second refluxing and fresh relatively refractory oil is passed in indirect heat-exchange relation with the vapors in the first refluxing operation and the oil thus preheated is fed to the reservoir; more refractory oil is similarly used in heat-exchange relation with the vapors in the second refluxing operation and this oil together with reflux condensate from both refluxing stages is forced through the heating conduit. Various details of the app. are described.

**Cracking hydrocarbon oils.** EDWARD W. ISOM (to Sinclair Refining Co.). U. S. 1,722,222, July 23. A stream of oil is passed once through a conduit in which it is heated to cracking temp. and discharged into oil in a reservoir also at cracking temp. An addnl. supply of fresh oil is passed through a reflux condenser in indirect heat exchange relation with vapors generated in the cracking operation to preheat the fresh oil and condense the heavy insufficiently cracked vapors and the fresh oil thus preheated is introduced directly into the body of oil in the reservoir. Uncondensed vapors from the first refluxing are subjected to a second refluxing in direct contact with fresh oil, and the condensate from both refluxing operations together with unvaporized fresh oil from the second refluxing is led to the heating conduit. Unvaporized residual oil is withdrawn from the reservoir. An app. is described. U. S. 1,722,223 specifies maintaining a body of oil at a cracking temp. by circulating oil from the body through heating tubes and back and heating the oil to a cracking temp. in the heating tubes, taking off and refluxing vapors from the oil body, forcing reflux condensate once through a sep. heating conduit in which it is heated to cracking temp., and discharging hot oil products from the heating conduit into the oil circulating from the specified body of oil to the heating tubes. An arrangement of app. is described.

**Refining hydrocarbon oils.** K. Cox and P. J. McDERMOTT. Brit. 303,991, Dec. 8, 1927. Benzene, "petrol," etc., purified by  $\text{Fe}_2(\text{SO}_4)_3$ , are treated with alkali prior to distn. (instead of after distn. as described in Brit. 269,242 (C. A. 22, 1470)).

**Distilling hydrocarbon oils.** WM. W. HOLLAND (to Standard Oil Co. of Ind.). U. S. 1,723,698, Aug. 6. Vapors rising from a distg. body of oil are subjected to partial fractionation and the partially fractionated vapors are passed in indirect heat conductive contact with a current of steam at a temp. of 105–115° further to heat the steam and partially condense the vapors; condensate thus formed is returned to the still in countercurrent to vapors from it, and the heated steam is passed into direct contact with a distg. body of oil. An app. is described.

**Increasing the viscosity of hydrocarbon oils for use in electrical insulation.** CABLON, LTD., and DUSSEK BROS. & Co., LTD. Brit. 303,852, Jan. 11, 1928. A synthetic resin such as coumarone resin is dissolved in the oils, for impregnating paper insulation of cables, etc.

**Cracking oils.** ROBERT T. POLLOCK (to Universal Oil Products Co.). U. S. 1,721,973, July 23. A stream of oil is passed through an enlarged chamber and discharged into a second chamber and the course of oil through the chambers is alternately reversed. Oil is heated when passing through the first chamber by consuming C formed in the chamber during conversion of the oil and is similarly heated in the second chamber. An app. is described.

**Cracking oils.** BLÜMNER CRACK-ANLAGEN A.-G. Fr. 657,949, July 21, 1928. In cracking oils they are given a whirling movement in the heating tubes. Constructional features of the app. are described.

**Drilling oil wells.** ANGLO-PERSIAN OIL Co., LTD. Brit. 303,937, Oct. 22, 1927. A viscous fluid which may comprise water 85 gal., clay 1000 lb. and yellow soap 224 lb. is used for preventing loss of oil or gas in withdrawal of tools from wells. Various details of app. are described.

**Apparatus for "tempering" oil-bearing materials preliminary to oil expression.** FRANK B. ANDERSON (to V. D. Anderson Co.). U. S. 1,723,118, Aug. 6. Structural features.

**Pressure method of working oil sands.** LEO RANNEY (to Standard Oil Development Co.). U. S. 1,722,679, July 30. An oil-expulsive agent such as natural gas is forced into the stratum near an outside surface only, and oil is withdrawn from points only opposite such surface, so that the expulsive agent travels transversely of the stratum. An installation of app. is described.

**Vertical retort for producing liquid hydrocarbons from oil shale.** AUGUST SCHILLING, RICHARD SACHSE, DIMITRI LIAMIN and THEOFIEL CALLAERT. U. S. 1,721,836, July 23. Structural features.

**Increasing the viscosity of mineral oils.** I. G. FARHENIND. A.-G. Brit. 303,776, Sept. 8, 1927. Viscosity is increased by subjecting the oil in liquid phase to high tension elec. treatment with a cs. of a frequency above 500 cycles per sec. but less than 10,000 cycles. Ionizable substances such as alcs., phenols, etc., are preferably excluded. An example is given of a treatment in high vacuum lasting 30 hrs. and applied to a middle fraction of a cracked brown coal-tar oil.

**Catalytic oxidation of mineral oils, etc.** I. G. FARHENIND. A.-G. Brit. 303,268, Dec. 21, 1927. Treatment of mineral oils, residual products sep'd. from oxidized aliphatic hydrocarbons or paraffin with a gaseous oxidizing agent such as air is effected in the presence of a catalyst comprising a comp'd. of a metal with an enolizable org. comp'd., with or without a metal oxide, such as basic Mn acetylacetonate or similar derivs. of Ce, Ni, Co or Zn.

**Dibasic acids and their salts from products of mineral oil oxidation.** JOSEPH H. JAMES. U. S. 1,721,958, July 23. Soaps substantially free from objectionable aldehydic odor are formed from oxygenated acids derived from mineral oil by further oxidation, to form dibasic acids which react with alkalies to form the soaps. Cl may be used as an oxidizing agent and various details and alternative procedures are described. U. S. 1,721,959 relates to the formation of dibasic acids by a further oxidation treatment applied to a mixt. contg. various alcs., aldehydes and oxygenated acids derived by the vapor-phase catalytic oxidation of petroleum oils or similar hydrocarbon materials. Numerous details and examples are given.

**Gasoline from mineral oil.** ARTHUR E. PEW, JR., and HENRY THOMAS (to Sun Oil Co.). U. S. 1,723,368, Aug. 6. A flowing stream of oil such as crude oil is heated to a temp. above the vaporizing temp. of relatively light constituents so that the oil is partly vaporized and the vapors are fractionated in a space heated by oil flowing into it; vapors are removed and residual oil from the fractionating space is passed into a second space or fractionating app. where it is heated by flowing over an extended surface in a thin layer and collected in a pool while the latter is simultaneously heated as is also the thin flowing layer of oil; hot vapors pass in contact with the flowing

thin layer of the oil, and thence pass to a third fractionating app. An arrangement of app. is described. Cf. C. A. 22, 162.

**"Motor spirit."** J. G. DAVIDSON (to Carbide and Carbon Chemicals Corp.) Brit. 303,505, Jan. 6, 1928. Gasoline, kerosene or like fuel is admixed with (suitably 30%) monoethyl benzene or other alkyl benzene in which the alkyl group or groups each have at least 2 C atoms, *e. g.*, propyl, iso-Pr, Bu or mixed derivs., and other "antidetontants" also may be added. The production of the alkylbenzenes may involve treating benzene or an alkylbenzene material with olefins in the presence of  $AlCl_3$ ,  $FeCl_3$  or a similar catalyst, preferably in countercurrent with vigorous agitation and near the b. p. and suitably under pressure.

**Recovering terpene products from gasoline-terpene mixtures.** EBENEZER E. REID (to Hercules Powder Co.). U. S. 1,722,765, July 30. A mixt. such as gasoline used for extg. rosin from chips is treated with liquid  $SO_2$  to dissolve out terpene products.

**Blended "antiknock" motor fuels produced by destructive hydrogenation.** I. G. FARBENIND. A.-G. Brit. 303,894, Jan. 13, 1928. A benzine such as one obtained from brown coal rich in bitumen, and which knocks at too low a compression ratio, is mixed with another benzine, such as one produced from pit coal, to produce an "antiknock" blend. Various details of destructive hydrogenations and blending are given, and it is stated that an antiknock fuel may be obtained directly from brown coal at 500° and 200 atm. in the presence of Al hydrosilicate.

**Automatic water-discharge device for oil tanks.** JOHN H. SMITH. U. S. 1,722,160, July 23. An elec. device serves to operate the discharge valve.

**Removing sediment from oil tanks of ships.** STEPHEN GUARDINO. U. S. 1,722,211, July 23. The deposits are treated *in situ* with a solvent such as kerosene and are heated, these materials are further heated and agitated with water and live steam and the resultant mixt. is removed. An app. is described.

**Dewaxing oils.** LESLIE W. NAYLOR (to Continental Oil Co.). U. S. 1,722,307, July 30. In treating a "long cut residuum" for the sepn. of wax and oil, it is treated with sufficient of a diluent such as naphtha capable of rendering the wax content completely sol. at a low temp., and the wax is pptd. from the sustaining solvent by the action of particles of  $PbO$ .

**Apparatus for sweating paraffin.** D. ARMSTRONG and G. C. G. DOBBIE (to Steel Bros. & Co., Ltd.). Brit. 303,812, July 8, 1927.

**Sweetening paraffin.** E. CANALS. Brit. 302,954, Sept. 21, 1927. Paraffin oil or partly solidified paraffin is sweetened by the addn. of a sweetening agent such as saccharin dissolved in olive oil.

**Effecting combustion of heavy oils in burners.** W. OSTHOFF. Brit. 303,300, March 10, 1928. The oil is first heated to a temp. (which may be 350–450°) not much above its b. p., to effect vaporization, and the vapor is then cooled (suitably to about 50°) by adding air so that an oil mist in air is formed and this is impinged on an incandescent material in the combustion chamber. An app. is described.

**Lampblack from liquid carbonaceous material.** J. L. MAJOR. Brit. 303,632, Dec. 6, 1927. The liquid material used is fed onto a series of trays (in an app. which is described) within a combustion chamber and cascades from tray to tray. Air is admitted through apertures having control plates. Various structural details are described.

**Lubricating oil from petroleum oils.** JOHN B. TERRY and RALPH A. HALLORAN (to Standard Oil Co. of Calif.). U. S. 1,721,719, July 23. Petroleum oil is distd. to asphalt under such reduced pressure as to avoid decompn., and approx. half the asphaltic residue is then destructively distd. to form a brittle residue of non-sticky pitchy character; lubricating oil constituents are then extd. from the pitch with petroleum naphtha.

**Use of magnets to remove magnetic particles from lubricating oils in engine crank cases, etc.** F. R. SIMMS and B. C. JOY. Brit. 303,076, Aug. 25, 1927. An app. is described.

**Insulating oils.** I. G. FARBENIND. A.-G. Fr. 657,804, July 13, 1928. Insulating oils are composed of polyalkyl naphthalenes or their derivs. having a sp. gr. below 1, preferably having a side chain contg. at least 2 C atoms.

**Oil filter.** KENNETH E. FIFE. U. S. 1,723,274, Aug. 6. Structural features.

**Filter for lubricating oil.** ALEXANDER H. ROEHR. U. S. 1,723,374, Aug. 6. Structural features.

**Magazine filter for lubricating oils or other liquids.** FRED W. MANNING and HORACE L. HIRSCHLER (to Stewart-Warner Corp.). U. S. 1,722,808, July 30. Structural features.

**Magazine filter and still suitable for lubricating oil of automobile engines.** FRED

W. MANNING (to Stewart-Warner Corp.). U. S. 1,722,809, July 30. Structural features.

Treated fabric magazine filter for engine lubricating oils. FRED W. MANNING (to Stewart-Warner Corp.). U. S. 1,723,741, Aug. 6. A filter fabric is used which may be treated with cotton fiber, paper pulp, asbestos, kieselguhr, C, fuller's earth or the like.

Oil filter suitable for use on automobile engines. JOHN T. McCUTCHEON. U. S. 1,723,945, Aug. 6. Structural features.

Oil filter suitable for use on automobiles. CHARLES W. MCKINLEY (to A C Spark Plug Co.). U. S. 1,723,054, Aug. 6. Structural features.

Apparatus for purifying the lubricating oil of an internal-combustion engine by heating and rectification. CHARLES E. FELCH-BLAKE. U. S. 1,723,023, Aug. 6. Structural features.

Bag filter suitable for filtering engine oil. CHARLES W. MCKINLEY (to A C Spark Plug Co.). U. S. 1,723,053, Aug. 6. Structural features.

Waterproof coatings. McRAE PAINT PRODUCTS, INC. Fr. 658,095, July 26, 1928. A waterproof coating is made by submitting a mineral asphalt, particularly of the type called "Trinité," to a high temp. (320°) until the light oils are vaporized, then adding a cold petroleum distillate to cool the residue quickly and dissolve it. The residue obtained by heating gilsonite is added and more petroleum distillate until the particles are dissolved. A pigment may be added.

Apparatus for making emulsions such as those of clay and bituminous materials. LESTER KIRSCHBRAUN. U. S. 1,722,433, July 30. Structural features.

Sulfonic acids serving as wetting and emulsifying agents. I. G. FARBERIND. A.-G. Brit. 303,281, Jan. 13, 1928. Various oxidation products of paraffin hydrocarbons are sulfonated.

Wood distillation. MAURICE VITRAC, PAUL MALSALLEZ, ANTOINE J. LABROUCHE and FRANÇOIS BAYLOCC. Fr. 657,685, Dec. 1, 1927. The vapors from wood distn. are condensed and absorbed by passing them through absorbent, spongy or finely divided material. The tars may be first removed by passing the vapors through the heavy products of the distn.

## 23—CELLULOSE AND PAPER

CARLETON E. CURRAN

The adsorptive power of cellulose. STEPHEN R. H. EDGE. *J. Soc. Chem. Ind.* **48**, 118 21T(1929).—The adsorption of acid, alkali and alum by different types of cellulose pulp was studied. Cellulose readily exchanges adsorbed metals or salts for one another when the soln. with which it is in contact changes. Ordinary pulps placed in an acid soln. cause a decrease in the acidity of the soln., and acid-boiled pulps placed in alk. soln. cause a decrease in the alky. The decrease in the acidity is in general nearly equal to the loss of alky. of the ash. In the disappearance of alky. from soln. there is no increase in alky. of the ash, and therefore the alkali is not adsorbed as such. E. postulates that some volatile org. acid in the cellulose is responsible for this effect. Rag pulp (I) contains no appreciable amount of this acid; sulfate pulp (II) contains a small amount thereof; and sulfite pulp (III) contains a considerable amount. Also, after acid treatment, I is readily washed neutral, while II and III remain persistently acid. This indicates that II and III contain org. acidic material normally masked by the alky. of the excess of ash-producing material present. Alum soln. will dissolve out about as much of the alk. ash-producing materials as does  $H_2SO_4$ , with a resulting increase in the ash due to alum adsorbed in exchange.

Properties, analyses and practical tests of cellulose acetates. MAURICE DESCHIEENS. *Chimie & industrie* **21**, 1131-40(1929).

A. PAPINEAU-COUTURE. K. WERNER and H. ENGELMAN. *Z. angew. Chem.* **42**, 438-44(1929).—The properties of cellulose acetate solns., films and threads depend greatly on the acetyl content of the material. Soly. relations with org. liquids are considered in the light of the Hildebrand polar-non-polar theory of the soln. and emphasis is placed on the distribution of acetyl and free hydroxyl groups on the surface of the micelle. The viscosity of cellulose acetate solns. is thought to be detd. by the degree of aggregation of primary particles, which are associated to different degrees in different solvents. To support this view, instances are cited where the viscosity of samples of acetates differed by 50% in  $Me_2CO$  while the viscosity in formic acid did not

change. The sorption of water by cellulose acetate films increases linearly as the acetyl content decreases. The sorption of EtOH reaches a max. at about 50% AcOH content. The film strength was found to be directly proportional to the formic acid viscosity of the dope; and the difference between the wet and dry strength of the film was found to decrease as the AcOH content of the film increased.

**Saponification of cellulose acetates.** D. KRÜGER. *Melliand's Textilber.* 10, 208-11 (1929).—Lab. preps. of cellulose triacetate made from purified Egyptian cotton and from wood pulp showed substantially the same rate of sapon. by *N* NaOH in MeOH as did some com. cellulose acetates contg. over 62% AcOH, manufd. from cotton and from pulp. Apparently chem. compn. is more important in this respect than fine structure. Values of *k* calcd. according to the monomol. reaction equation were not const. A previous swelling of cellulose acetate in 96% EtOH greatly accelerates the sapon. rate.

E. R. CLARK

**Nitrocellulose and its importance in the lacquer and cellulose acetate industry.** H. STADLINGER. *Chem.-Ztg.* 53, 377-8 (1929).—A brief account is given of the general methods of prep. cellulose nitrates of low viscosity.

J. G. McNALLY

**Viscosity of viscose.** I. Type of viscosity change during ripening. G. KITA, S. IWASAKI, S. MASUDA and K. MATSUYAMA. *Kolloid.-Z.* 48, 270-6 (1929).—The viscosity at 30° (a) by the falling-sphere method on 6% viscose soln. and (b) with the Ostwald viscometer on the dil. 2% soln. and the "thread forming" power at 45° of viscose were measured on 10 varieties of cellulose materials. The change of viscosity during ripening as detd. by method (a) agrees with results of Heuser (cf. *C. A.* 20, 2077), drops to min. during the first few days followed by gradual rise; the rate varies with the variety of cellulose and the temp. With method (b) those of high viscosity follow the type observed in (a); those of low viscosity follow the type previously reported by Ostwald, no min. The viscosity of the viscose and the properties of the threads formed from it are closely related to the  $\alpha$ -cellulose content, copper no. and viscosity in cuprammonium soln. The change in viscosity is probably due to 2 opposing effects, a dispersing action and a structure formation. The first is completed during the initial period. This action may explain the variance of the change in viscosity as detd. by the two methods.

E. R. S

**Technical improvements in the Italian rayon industry.** ALBERT SANDER. *Kunstseide* 11, 112-4 (1929).—In the viscose process the coagulating bath decreases and the fixing bath increases in vol., density and acid content. The regeneration of the coagulating bath is very important. The author discusses the foregoing changes and gives two methods of regeneration. In the first method the excess fixing bath (I) is concd., then, after sepn. of  $\text{Na}_2\text{SO}_4$ , added to the coagulating bath (II). In the second method, the Glauber salt is allowed to crystallize out from a portion of I, while another portion of I is mixed with some of the sepd. crystals and then concd., the concd. soln. being added to II. A plant using the latter method is described.

FREDERICK C. HAHN

**Water power in relation to the paper-making industry of Canada.** BRYSNOR CUNNINGHAM. *Water & Water Eng.* 31, 321-4 (1929).

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**Lignin.** I. Chemical and physical investigation of phenol-lignins (WEDEKIND, KATZ) 10. Chemistry of lignin. III. Destructive distillation of lignin from corn cobs (PHILLIPS) 10. Carboxylic acids suitable for use as softening agents in nitrocellulose coating compositions (Brit. pat. 303,560) 29. Coating compositions for making "artificial leather" (Brit. pat. 303,566) 29. Rotary permeable drum apparatus for drying, carbonizing or oxidizing paper (Brit. pat. 303,572) 25.

**The Story of Rayon.** New York: The Viscose Co. 63 pp. 2nd ed.

**Cellulose.** JOAQUIN DE LA ROZA (SENIOR). Fr. 657,770, July 18, 1928. Cellulose is obtained by treating vegetable substances with a dil. soln. of  $\text{H}_2\text{SO}_4$ , storing for some time, washing with water and treating with an alk. soln. under pressure above 100°.

**Cellulose esters.** HEINRICH HEIMANN and ALFONS BAYERL (to I. G. Farbenind. A.-G.). U. S. 1,722,914, July 30. Cellulose (which may be in the form of cotton) is treated with formic acid of about 85% strength, in order to obtain an intermediate product suitable for acetylation, etc.

**Cellulose esters.** I. G. FARBENIND. A.-G. Brit. 303,006, Dec. 24, 1927. Cellulose is first treated with the vapor of  $\text{HNO}_3$  under conditions which preserve the fibrous condition of the material and nitrates or nitroacetates are then produced by further nitration or acetylation of the pretreated material. Various details are given.



**Cellulose esters.** VEREIN FÜR CHEMISCHE INDUSTRIE A.-G. Brit. 303,485, Jan. 5, 1928. Cellulose acetates or other esters are formed in a revolving drum app. having acid-resisting walls and carrying, on its interior, bars or like devices which exert a cutting action on the central portion of the reaction mass.

**Cellulose ester filaments, etc.** HARRY P. BASSETT. U. S. 1,722,171, July 23. Filaments such as those formed of various artificial silk wastes are subjected to the action of a 1% aq. soln. of NaOAc, Na<sub>2</sub>SO<sub>4</sub>, Na sulfide or a similar compd., in order to render them more suitable for use. Soap and NaOH also may be used to produce a crinkled product.

**Molding compositions containing cellulose esters.** C. DREYFUS (to British Celanese, Ltd.). Brit. 303,516, Jan. 6, 1928. Thermoplastic powders consisting of an intimate mixt. of a finely divided cellulose ester or ether with plastifiers and with or without fillers, etc., as described in Brit. 282,723, (C. A. 22, 3988), are molded under heat and pressure (suitably at 50–80° and 300–500 lb. per sq. in.). The product may be variably colored, and may be rendered incombustible by incorporating in the powder org. or inorg. halogen compds. such as NH<sub>4</sub>Br or org. or inorg. phosphates such a triphenyl- or NH<sub>4</sub> phosphate.

**Cellulose derivatives formed with halohydrins of polyalcohols.** LEON LILIENFELD. U. S. 1,722,927, July 30. Products sol. in aq. caustic alkalies, but insol. in water and which are suitable for making films, artificial threads, etc., are prepd. by the action on cellulose (suitably in the form of sulfite cellulose or linters) of  $\alpha$ -monochlorohydrin or other suitable halohydrin of a polyalcohol in the presence of a caustic alkali soln. of less than 50% strength (suitably about 18% strength).

**Esterifying cellulose with formic and acetic acids.** MAURICE CUSIN and PIERRE A. CHEVALET (Cusin to Soc. lyonnaise de soie artificielle). U. S. 1,722,202, July 23. Cellulose such as cotton or wood pulp is treated with a mixt. of formic acid and H<sub>2</sub>SO<sub>4</sub>, and then with a mixt. of HOAc and H<sub>2</sub>SO<sub>4</sub>. The product is a mixed ester suitable for various uses.

**Rotating chambers for acetylation of cellulose.** H. L. BARTHELEMY (to Ruth-Aldo Co.). Brit. 303,099, Dec. 28, 1927. Structural features.

**Cellulose acetate.** WOLFGANG GRUBER (to Alexander Wacker Ges. für Electrochemische Industrie). U.S. 1,723,614, Aug. 6. Acetone-sol cellulose acetate of high viscosity is prepd. by treating acetone-insol. cellulose acetate in soln. with an acid chloride of Zn, Cu or Hg. Cf. C. A. 23, 1267.

**Cellulose acetates, etc.** H. L. BARTHELEMY (to Ruth-Aldo Co.). Brit. 303,098, Dec. 28, 1927. Saponification of primary cellulose acetates or other esters is effected with use of HCl and HF. Aq. HOAc or formic acid may be added to the primary acetylation soln. sufficient to decompose remaining Ac<sub>2</sub>O without producing flocculation, followed by adding to the cooled soln. a further quantity of aq. HOAc or formic acid contg. also such a quantity of HCl and HF that the no. of H ions thus introduced will be equal to or greater than the H ions of the H<sub>2</sub>SO<sub>4</sub> used as catalyst (the quantity of water added being proportioned to equal 5–15% of the org. acids present). Cf. C. A. 22, 3989.

**Cellulose acetates.** H. L. BARTHELEMY (to Ruth-Aldo Co.). Brit. 303,134, Dec. 29, 1927. Cellulose to be acetylated is preliminarily treated with HOAc vapors and a small quantity of a halogen or a halogen halogenide at a temp. not exceeding 65° (preferably 20–40°) and is given a supplementary bleaching. It is thus rendered more reactive to acetylating agents and the presence of residual halogen reduces the quantity of H<sub>2</sub>SO<sub>4</sub> required for the acetylating bath. Brit. 303,135 specifies esterification of cellulose in a succession of acetylating baths, those of the earlier stages of which contain a restricted quantity of anhydride under conditions such that only a small rise in temp. occurs; the reaction in each stage is allowed to proceed until equil. is reached. Various details are given. Brit. 303,136 specifies production of esters such as cellulose acetates or formates by esterifying cellulose in the presence of HF, in aq. or preferably glacial HOAc soln., as a catalyst. Brit. 303,137 relates to an app. for making filaments from solns. of cellulose derivs.

**Cellulose acetate and mixed esters.** C. RUZICKA. Brit. 303,432, Oct. 3, 1927. Cl is passed into a mixt. of glacial HOAc and trichloroacetic acid and the chlorinated acid is used to treat cotton or wood cellulose until it is partially chlorinated and hydrated; HOAc and ZnCl<sub>2</sub> are then added with a solvent such as a further addn. of glacial HOAc. Other acids or mixts. of acids such as HOAc, propionic, butyric or valeric anhydride, etc., may be chlorinated in the presence of trichloroacetic acid and the product used for reaction on cellulose.

**Cellulose acetates and other esters.** E. ORIOLI (to Ruth-Aldo Co.). Brit. 303,491, Jan. 6, 1928. See Can. 286,539 (C. A. 23, 1504). Brit. 303,493 specifies the prepn. of

cellulose sulfates by treating cellulose with  $H_2SO_4$  in the presence of an aliphatic anhydride such as  $Ac_2O$  under such conditions that no appreciable amt. of org. cellulose ester is formed, or at least such that the cellulose sulfate predominates in the product. Various details are given.

**Films, lacquers, plastic compositions, etc., containing nitrocellulose.** I. G. FARBENIND. A.-G. Brit. 302,961, Sept. 22, 1927. Plasticizing agents are used comprising phthalic acid esters in which one COOH group is esterized with the radical of an aromatic or hydroaromatic alc., while the other COOH group is esterized with the radical of an aliphatic or aromatic alc. Examples are given of substances which may be used. Various details are given.

**Treating used alkali solutions such as are obtained in the cellulose and viscose industries.** R. WINTERNITZ. Brit. 303,482, Jan. 4, 1928. Impurities are pptd by adding an alc. such as MeOH or EtOH, and a small quantity of Pb acetate or other suitable Pb salt may be added to remove the color. The filtered soln. is distd. to sep the alc. and treated with quick-lime to regenerate NaOH.

**Viscose "silk," films, etc.** I. G. FARBENIND. A.-G. Brit. 303,514, Jan. 5, 1928. In the manuf. of threads, films, etc., from viscose (which may be unmaturred), a coagulation bath is used contg. a high concn. of acid together with an org. substance of high mol. wt. (suitably one which coagulates albumin) such as Na carbazolesulfonate and the product of reaction of  $CH_2O$  on naphthalenesulfonic acid in quantity substantially to sat. the bath.

**Products such as films and artificial silk from cellulose derivatives.** LEON LILJENFELD. U.S. 1,722,928, July 30. A soln. in an alkali such as NaOH soln. of 1,2-dihydroxypropylcellulose or other suitable hydroxyalkyl deriv., of cellulose sol. in aq. alkalies but insol. in water is shaped into a sheet or film or other desired form and treated (suitably by a coagulating bath) in order to obtain a solid product.

**Artificial films, fibers, etc.** HENRY DREYFUS. Fr. 657,764, July 17, 1928. Films, artificial silk, etc., are made by extruding in air or a coagulating bath a soln. of cellulose acetate or other org. substitution product of cellulose in an aq. or org. soln. of urea, thiourea, guanidine or their alkyl or other simple derivs.

**Artificial silk.** ALLGEMEINE ELEKTRICITÄTS-GES. (to International General Electric Co.). Brit. 303,867, Jan. 11, 1928. Synthetic resins of the glycerol-phthalic anhydride type are used for making artificial silk. Various details are given.

**Artificial silk.** I. G. FARBENIND. A.-G. Brit. 302,956, Sept. 21, 1927. Ammoniacal Cu cellulose solns. for artificial silk production are made by dissolving raw cellulose material, which has been pressed into thin sheets.

**Artificial silk.** I. G. FARBENIND. A.-G. Fr. 34,184, Sept. 27, 1927. Addn to 621,154. Cuprammonium solns. from wood cellulose, straw, etc., and cotton fibers, are spun at a low temp. (20–30°) by increasing the time the thread remains in contact with the precipitant.

**Artificial silk.** J. HUEBNER and K. F. DIEHL. Brit. 303,421, June 28, 1927. To effect a drawing out of the filaments as they pass through the coagulation bath, a bath is used contg. such a high concn. of coagulating agent such as  $H_2SO_4$  as will produce a plasticizing effect on the coagulated filaments, and spinning is conducted at a speed over 60 m. per min. Various details are given.

**Artificial silk.** MELITTA KLEIN. Fr. 34,101, June 24, 1927. Addn to 648,397 (C. A. 23, 3099). The diaphragms extend only across part of the spinning chamber, whereby the movable portion is eliminated.

**Artificial silk.** OSCAR KOHORN & CIE and ALFRED PERL. Fr. 657,601, July 17, 1928. In the manuf. of artificial silk by stretch spinning, any pressure below atm is avoided in the spinning app., and the ptpg. liquid used is heated to a temp. a little higher than the spinning temp. before its introduction into the app.

**Multiple-orifice spinning nozzle for spinning artificial silk by wet or dry processes.** E. ORIOLI (to Ruth-Aldo Co.). Brit. 303,782, Jan. 9, 1928. Structural features

**Spinning nozzle and associated devices for producing artificial silk threads.** EMIL ELSAESSER and HUBERT KEMPF (to American Bemberg Corp.). U. S. 1,721,591, July 23. Structural features.

**Apparatus (with rotating spinning nozzles) for making artificial silk filaments.** U. MANCINI (to Ruth-Aldo Co.). Brit. 302,993, Dec. 26, 1927. Structural features.

**Apparatus for making artificial silk filaments by the dry-spinning method.** M. KLEIN (to Ruth-Aldo Co.). Brit. 303,056, Dec. 27, 1927. Structural features.

**Apparatus (with a special air-heating system) for manufacture of artificial silk by the dry-spinning method.** A. E. GULL. Brit. 303,821, Oct. 5, 1927. Structural features.

**Apparatus for making artificial silk filaments by extrusion into a current of heated air passing in the same direction as the filament.** A. E. GULL. Brit. 303,778, Oct. 5, 1927. Various structural details are described.

**Treating waste sulfite cellulose liquor for further use.** WILHELM MICHAEL and ALBERT PALM (to I. G. Farbenind. A.-G.). U. S. 1,723,800, Aug. 6. Free  $\text{SO}_2$  is expelled, the liquor is heated in a closed vessel to above  $150^\circ\text{C}$  is filtered off, and  $\text{NH}_3$  is expelled by use of a stronger base such as  $\text{Ca}(\text{OH})_2$ . Cf. C. A. 22, 4246.

**Sulfite lyes.** SOC. BARBOU ET CIE. Fr. 34,139, Aug. 4, 1927. Addn. to 642,270 (C. A. 23, 1269). In the recovery of sulfite lyes obtained in the manuf. of cellulose the amt. of  $\text{H}_2\text{SO}_4$  used is reduced by oxidizing the free sulfite in the lye by bubbling air therethrough, or the addn. of  $\text{H}_2\text{SO}_4$  may be avoided by forming  $\text{H}_2\text{SO}_4$  in the lye electrolytically.

**Wood-pulp-grinding plant.** FRIEDRICH GRÖSSLER (to Linke-Hofmann-Werke A.-G. Abteilung Fullnerwerk). U. S. 1,721,863, July 23. Structural features.

**Pulp from wood.** LINN BRADLEY and EDWARD P. MCKEEFE. U. S. 1,722,993, Aug. 6. Wood is subjected to a preliminary partial digestion with an acid cooking liquor contg.  $\text{SO}_2$  and the cooking is completed with a liquor contg. essentially normal alkali metal sulfite.

**Apparatus for screening paper pulp.** HAROLD D. WELLS. U. S. 1,722,874, July 30. Structural features.

**Apparatus for making paper.** LESTER KIRSCHBRAUN. U. S. 1,722,432, July 30. Structural features.

**Paper-making apparatus.** ALONZO ALDRICH. U. S. 1,723,834, Aug. 6. Structural features.

**Paper-making apparatus.** ALONZO ALDRICH (to Beloit Iron Works). U. S. reissue 17,381, July 30. See original pat. 1,595,593 (C. A. 20, 3349).

**Paper-making apparatus.** HERMAN L. KUTTER (one-half to Walter D. Randall). U. S. 1,721,699, July 23. Structural features.

**Paper-making apparatus and method.** WILLIAM H. MILLSPAUGH. U. S. 1,722,503, July 30. Mech. features.

**Apparatus for controlling the moisture content of paper on paper-making machines.** HERBERT L. BONE (to Atlantic Precision Co.). U. S. 1,722,655, July 30.

**Suction press roll for use in paper making.** GEORGE D. KILBERRY (to Downing Mfg. Co.). U. S. 1,723,181, Aug. 6. Structural features.

**Apparatus for screening paper stock.** GEORGE S. WITAM, JR. U. S. 1,722,693, July 30. Structural features.

**Paper manufacture from peat.** CHARLES C. ROTH (to Peat Products Co.). U. S. 1,721,974, July 23. Peat in the natural state is torn into fiber, mixed with about one-third its quantity of a half stuff formed from rag clippings, freed from surplus water, treated with rosin and alum, and formed into sheets. An app. is described.

**Waterproof paper.** LESTER KIRSCHBRAUN. U. S. 1,723,355, Aug. 6. A non-adhesive matrix such as colloidal clay is formed in an aq. vehicle with a waterproof adhesive pitchy binder, the particles of which are sufficiently finely dispersed that they will pass through a wire screen with 40,000 openings per sq. in.; this matrix is mixed with fibrous pulp, and the mixt. is formed into sheets.

**Non-glare writing paper.** WELLINGTON G. REYNOLDS. U. S. 1,721,576, July 23. Calendered paper suitable for use with a pen carries a filler and coloring comprising, together with sulfite stock, auramine double O and soluble blue in small proportions.

**Composition for waterproofing and greasproofing paper.** AARON RUDERMAN. U. S. 1,723,581, Aug. 6. Rubber latex is used with starch in a jelled state,  $\text{Na}_2\text{CO}_3$ , Na polysulfide or other sol. metal polysulfide and  $\text{CH}_2\text{O}$ .

## 25—DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

**Interesting sources of natural dyestuffs.** C. D. MELL. *Textile Colorist* 51, 453-5 (1929); cf. C. A. 23, 1507.—The buttonwood tree, *Conocarpus erecta*, of extreme southern Florida and the tropics, may attain commercial importance as a source of tannin. Anthocyanin occurs in the flowers of *Plumeria*. Alcornoque, *Boudichia virgilioides*, is regarded as one of the important tannin-producing plants of Venezuela. R. K. W. Some considerations on the art of matching to shade. J. MOFFAT. *Dyer, Calico Printer* 62, 14-5, 74-5 (1929). RUBY K. WORNER

**Manufacture of silent fabrics for sound pictures presents new dye problems.** GEORGE RICE. *Textile Colorist* 51, 460-1(1929).—Harshness and stiffness must be avoided.

RUBY K. WORNER

**Improvement in the fixation of indanthrene and other vat dyes by printing.** KOECHLIN BROTHERS AND EUGENE EBERSOL. *Bull. soc. ind. Mulhouse* 95, 221-3(1929).—Sealed Note 2141, Dec. 30, 1911. The novelty of the process consists in that the dye (indanthrene, algol, etc.) is simply thickened, printed on the white fabric, jigged with  $\text{Na}_2\text{CO}_3$  or  $\text{NaOH}$  contg. a reducing agent (preferably rongalite) and finally finished in the usual way by steaming in a Mather-Platt in absence of air and boiling with soap soln. It can be modified by printing after treating the fabric with  $\text{Na}_2\text{CO}_3$  and the reducing agent. The advantages claimed are: it avoids the use of strongly alk. colors; the printed fabric can be allowed to stand indefinitely before jigging with alkali; multi-colored patterns can be printed simultaneously with oxidation dyes, such as aniline black or paramine brown, or with certain steam colors. A no. of formulas are given. **Report.** VICTOR SILBERMANN. *Ibid.* 224.—No anteriority for the process was found. The advantages claimed were substantiated. With certain vat dyes, it was found that the depth of shade varied according as the goods were jigged with the reducing soln before or after printing the color.

A. PAPINEAU-COUTURE

**Detection of indigosols on the fiber.** J. C. LIVINGSTON. *Bull. soc. ind. Mulhouse* 95, 230(1929).—In order to det. whether a given shade has been obtained by vat dyeing or by means of a corresponding indigosol, decolorize with alc. hyposulfite (F. Driessen, *Rev. gén. mat. colorantes* p. 178, June 1908), wash thoroughly, boil in methylene blue (0.25 g. per l.), wash and dry; if the sample is dyed blue, it was originally dyed with an indigosol. The same result is obtained whether the color is developed with  $\text{NaNO}_2$  or by steaming. As it is shown that the reaction cannot be due to the formation of oxycellulose or of hydrocellulose, it must be admitted that the cellulose fixes  $\text{HSO}_3$  as the latter is being liberated.

A. PAPINEAU-COUTURE

**Direct cotton dyes from 2,7-diaminofluorene.** GILBERT T. MORGAN AND H. AINSWORTH HARRISON. *J. Soc. Chem. Ind.* 48, 125-6T(1929).—The soln. of the diazonium salt (I) of 2,7-diaminofluorene and 1-amino-8-naphthol-3,6-disulfonic acid (H-acid) give a dark blue dye which is similar to the corresponding dye from benzidine and H-acid (Chlorazol Blue B) except that it is greener, faster to washing, and less fast to  $\text{H}_2\text{SO}_4$ . I and 1-amino-8-naphthol-2,4-disulfonic acid (2 S-acid) give a blue dye which is redder, inferior in affinity and fastness to washing and alkali, but otherwise similar in fastness to the dianisidine-2 S acid dye (Chlorazol Sky Blue FF).

FREDERICK C. HAHN

**Chromatable dyes on wool.** EMILIO NOELTING. *Bull. soc. ind. Mulhouse* 95, 217-9(1929).—Sealed Note 2367, Jan. 2, 1920. It is generally admitted that, in the chromating of chromotropes, oxidation takes place and the oxidized dye is fixed on the wool simultaneously with the Cr oxide formed, with production of a lake. Attempts to prep. and isolate the hypothetical oxidation product were unsuccessful and led to the conclusion that there is no oxidation, but merely formation of a lake with the Cr oxide produced by reduction of the chromic acid by the wool. This Cr oxide combines to form a complex salt with the chromotrope, and these salts were also prepd; e. g., on heating chromotropes 2R or 2B (obtained by coupling diazotized  $\text{PhNH}_2$  or  $p\text{-NH}_2\text{C}_6\text{H}_4\text{NO}_2$  with chromotropic acid) with Cr fluoride or formate, the soln., which is red at first, turns deep blue and the Cr no longer ppts. with  $\text{Na}_2\text{CO}_3$ ; on dyeing wool in acid bath with these solns., the same blue-black shade is obtained as on treating red chromotrope shades with dichromate, and the bath can be completely exhausted. These complex blue-black dyes are extremely sol. and can be obtained by evapg. their solns to dryness. Chromotropic acid itself can also give complex salts, not only with Cr, but also with Al and Fe; but the latter complexes have not yet been examd. The Cr complexes combine with diazos, so that the complex dyes can thus be obtained directly in a single operation. H acid also gives complexes, but none has as yet been obtained from the corresponding diamino acid. N. considers it probable that the *o*-hydroxy-sulfo compds. should also form complexes, but R acid has so far given neg. results. Chromatable dyes derived from *o*-aminophenols behave similarly to the chromotropes and give complex salts which, in acid bath, give the same shade as the chromated colors after dyeing. **Report.** M. BATTEGAY AND J. LICHTENBERGER. *Ibid.* 219-21.—N.'s results fully confirm the investigations of Rosenhauer (*Z. angew. Chem.* 41, 616(1929)), who succeeded in isolating in cryst. form the lakes obtained by the action of either chromic salts or dichromates, on dyes derived from chromotropic acid.

A. P.-C.

**Adsorption on wool fiber of organic dyes suspended in water.** M. IL'INSKII AND R. BURSTEIN. *Papers Pure and Appl. Chem. Karpov-Inst. (Moscow)* 1928, No. 8, 85-95; *Chem. Zentr.* 1929, I, 698.—Adsorption of indigo on wool fiber in acid soln. increases

with increasing quantities of adsorbed acid. Endosmotic expts. show that the adsorbed H ions reduce the neg. charge of the wool fiber and thus annul the repelling action on the dye particles likewise charged neg. The rapidity of cataphoresis is diminished and the sedimentation is accelerated with increasing concn. of the acid. In order to effect the coagulation on the fiber only it is advisable to have the acid first adsorbed by the fiber and not to acidify the suspension. The presence of methyl orange facilitates the quant. adsorption of the dye. The homogenization of the adsorption layer occurs only in the 2nd phase of the dyeing process.

**The problem of getting a satisfactory white on white woolens.** GEORGE WHITE. *Textile Colorist* 51, 443 (1929).—The loss of whiteness in spots during the hot pressing of some white woolens was traced to the fact that the raw material was made from skin wool which had been subjected to irregular temp. in the sweat box. The trouble was avoided by revamping the steam coil in the sweat chamber.

**The use of decolorizing agents before dyeing.** VALETTE. *T'iba* 7, 503-9 (1929).—Practical operating directions.

**Wool-silk and its treatment before dyeing.** THOMAS F. HUGHES. *Textile Colorist* 51, 437-41 (1929).—Gassing, crabbing, steaming, scouring and bleaching are briefly considered. The properties of wool and silk and their action toward dyestuffs are also discussed with reference to dyeing wool-silk union fabrics.

**Dyeing silk with vegetable colors.** JORRE. *Russa* 4, 549-53, 693, 695, 869, 871 (1929).—Practical operating directions on the dyeing of silk with logwood, with a number of formulas.

**Printing union fabrics containing rayon.** HERMANN KINDERMANN. *Russa* 4, 871, 873 (1929).—A brief discussion of the difficulties of printing such fabrics.

**Dyeing rayon and rayon-cotton mixtures.** H. HOZ. *Melliand Textilber.* 10, 206-8 (1929).—For exptl. purposes a quantity of narrow fabric was woven which had alternate stripes of pale and heavy dyeing viscose rayon. Tested against Chicago Blue 6B for example, this special fabric gave a very pronounced uneven effect. However, a number of com. dyestuffs were found which gave an even effect. As noted by Whittaker, the level-dyeing colors show max. affinity for the fiber at 60-70° rather than at 100°. Lists of current dyes which dye cotton and viscose rayon to the same depth are given as well as of colors which leave the rayon paler than the cotton.

**The uneven dyeing of rayon and the effect of hydrogen-ion concentration in scouring.** CHAS. E. MULLIN. *The Melliand* 1, 608-17 (1929); cf. *C. A.* 23, 2829.—Differences in the depth of shade of exptl. dyeings follow the use of scouring baths of varying  $p_H$  values. It appears that the more alk. scouring baths give rayon which dyes to a deeper shade. However, the temp. of scouring is important in this respect also, although in some cases high temp. led to pale shades and in others to deep shades. The necessity of uniformity and control is clear.

**Theory of dyeing acetate rayon.** HERBERT BRANDENBURGER. *Melliand Textilber.* 10, 215-7 (1929).—Additional exptl. data are given confirmatory of the soln. theory, the development of which is outlined.

**Dyeing of acetate rayon.** HERBERT BRANDENBURGER. *Kunstseide* 11, 98-106, 144-50 (1929).—B. reviews the history, theory, methods of production and properties of acetate rayon, including density, luster, fullness, optical properties and its behavior toward acids, alkali, inorg. salts and org. solvents. The development of the dyeing of acetate rayon is discussed in detail.

**New developments in beam and package dyeing.** ALBERT H. GRIMSHAW. *The Melliand* 1, 565-74 (1929).—Newer machines are illustrated and processes described.

**Researches on dyeing baths.** FRIEDRICH C. JACOBY. *Melliand Textilber.* 10, 121-4 (1929).—Several phys. chem. studies were made of dyeing baths contg. some of the newer dyeing assistants, such as Neomerpin, Tetracarnite, etc. But little measurable effect on viscosity was noted. The drop numbers varied greatly, as did the soly. of the dyestuff. Filtration studies showed remarkably high dispersing power for Tetracarnite and other pyridine derivs. In general, a retarding effect on the rate of dyeing was noted, believed to be beneficial.

**Fastness of dyed fabrics to dry cleaning.** A. S. EICHLIN. *Bur. Standards J. Research* 3, 39-51 (1929).—A number of representative dyestuffs on wool, silk, cotton, rayon and union fabrics were subjected to 2 tests. In the first a moisture-free solvent was used, and in the second the solvent contained 0.1% free moisture and 0.01% alkali. Description of app. is given.

**Fastness to washing of dyed acetate rayon.** HERBERT BRANDENBURGER. *Melliand*

**Textilber.** 10, 227-9(1929).—Since the dyeing of acetate rayon is a soln. process, some bleeding during washing is inevitable. In fact, when dyeings made from the  $H_2O$ -sol. Azetol, Cellite Fast and Setacyl are treated with  $H_2O$  at  $40^\circ$ , diln. is fairly rapid. So tested, the dispersion dyes of the Celliton, Celliton Fast, Cibacet and Duranol series seem more resistant, while the Ionamines are fairly fast. To soap soln., however, the dispersion types show more bleeding than the  $H_2O$ -sol. colors. E. R. CLARK

Fastness to stoving. RICHARD CAMERON. *Textile Colorist* 51, 462(1929).

Study of mercurochrome stains. C. C. HUBBARD. *Natl. Rev.* 5, No. 10, 18(1928). *Expt. Sta. Record* 60, 198.—Tests seemed to show that mercurochrome combines with the dressings and sizing on silks as well as with wool and to indicate the total insoly. of the stain on fabric under certain conditions. Observations suggested that S fumes had something to do with the permanency of the stain. H. L. D

Eruptions caused by dyestuffs derived from *p*-phenylenediamine hydrochloride and diaminophenol. L. BROCO. *Presse méd.* 36, 1115-6(1928).—Some clinical cases are described. For the treatment was used: lanolin 10, sweet almond oil 25 and lime water 25 parts. A. E. MEYER

Effect of temperature and barometric pressure as well as humidity on the moisture content of fibers. W. G. SCHAPOSCHNIKOFF. *The Melliand* 1, 385-8, 517-28(1929)

A new conditioning process for yarns and fabrics. FRED L. BRYANT. *The Melliand* 1, 397-400(1929).—Treating packaged yarns with "Hygrolit" greatly improves their condition and prevents moth or mildew damage. E. R. CLARK

Analytical control of (silk) loading baths. J. BRUYAS. *Russa* 4, 701, 703(1929).—The following detns. are recommended:  $^{60}Be$ ,  $Na_2HPO_4$ ,  $NaH_2PO_4$ ,  $NaCl$ ,  $Sn$ . Total  $PO_4$  can be detd. as  $Mg_3P_2O_7$ , by direct pptn. as  $MgNH_4PO_4$  in the case of fresh baths, and by preliminary pptn. as phosphomolybdate in old baths.  $Na_2HPO_4$  can be detd. by titration with standard  $H_2SO_4$  using methyl orange indicator, correcting (if desired) for the  $NaOH$  produced through hydrolysis of  $Na_2HPO_4$  by titrating a sep. sample with phenolphthalein as indicator.  $NaCl$  can be detd. gravimetrically by pptn. with  $AgNO_3$  in the cold to avoid interference of  $Sn$ . A. PAPINEAU-COUTURE

Processing silk before winding. T. P. SHERIDAN. *Textile World* 76, 223(1929).—The treatment of gum-silk yarn for glove-silk fabrics is described. RUBY K. WORNER  
Cleansing glove-silk fabric. T. P. SHERIDAN. *Textile World* 76, 495(1929).—Practical. RUBY K. WORNER

Differentiation of cuprammonium and viscose rayons. OTTO RÜNZI. *Kunstseide* 11, 158-60(1929).—Cuprammonium rayon (I) is dyed a deep blue and viscose rayon (II) a light blue in a soln. of Pelikantinte 4001. The test may be applied to dyed material after removing the dye with hyposulfite. Optical tests are conducted in doubtful cases. The edges of II cross-sections are notched more than those of I. In transmitted light under the microscope, I resembles clear glass rods, while viscose filaments show streaks and irregularities. FREDERICK C. HAHN

Differentiation of cuprammonium and viscose rayons. W. DISCHREIT. *Kunstseide* 11, 117(1929).—Cuprammonium rayon gives a deeper blue than viscose rayon, when dyed for 5 min. at  $25^\circ$  in a bath contg. 0.25 g. Neolan Blue G and 1.5 g. Neolan Yellow R per l. FREDERICK C. HAHN

Fastness of rayon shades. WILLY ALTEROFF. *Kunstseide* 11, 119-21(1929).—Eighteen types of fastness are discussed in detail. FREDERICK C. HAHN

Rayon cross-sections. E. VIVIANI. *Kunstseide* 11, 111-2(1929).—Cross-sections suitable for photographing are obtained as follows. A cotton thread is drawn through a cork by means of a needle, and then back again, in such manner that a loop is formed at one end. A bundle of rayon filaments is drawn through the loop and then pulled into the cork by pulling the opposite end of the thread. The cork is then cut in thin sections with a sharp knife or razor blade. FREDERICK C. HAHN

The washing and desulfuring of viscose. M. L. BADARELLI. *Russa* 4, 851-5(1929).—A description of the Donagemma system for the washing and desulfuring of viscose threads wound on Al bobbins. A. PAPINEAU-COUTURE

Tests for protective agents to be used on animal fibers. JAMES STAPLE. *Textile Colorist* 51, 473-4(1929).—A review. RUBY K. WORNER

The prospect and goal of artificial wool. DURÉ. *Kunstseide* 11, 114-5(1929).

Rapidly correcting strength of cotton mechanical fabrics for regain. EDWARD R. SCHWARZ. *Textile World* 76, 362-7(1929).—The use of nomographs with Haven's

formula for correcting tensile strengths to any desired condition is described.

**Mercerization of cotton yarn and cloth.** FOSTER PICKLES. *Wool Record* 35, 1605-9, 1685-91(1929).—Some data are given showing the effect of mercerization on regain; a comparison of the strength and elongation of unmercerized, mercerized with tension and mercerized without tension yarns; the effect of the strength of NaOH used on the strength and elongation; the influence of differences in twist on the resultant mercerized yarn; and the effect of storage on the strength and elongation of mercerized and unmercerized yarns. No indication is given of whether the figures are based on one sample or an av.

**Spontaneous development of a pink color on bleached cotton.** CH. CARLOS CASANOVAS Y AMAT. *Tiba* 7, 493, 495(1929).—From a discussion of the results of Weber-Guth (*Bull. soc. ind. Mulhouse*, Nov.-Dec., 1885) and of Pinte (*C. A.* 21, 2066), it is concluded that when improperly bleached cotton contg. pectic derivs is placed in contact with  $\text{PhNH}_2$  vapors, the latter are absorbed with production, by oxidation, of a pink dye, which has not been studied or identified.

**Bleaching without chlorination.** CHARLES SUNDER. *Bull. soc. ind. Mulhouse* 95, 225-9(1929).—Report on Sealed Note 2178, deposited by Albert Dondain, May 21, 1912. According to Richard Müller's D.R.P. 240,037, Cl bleaching can be eliminated by prolonging the NaOH boil and injecting air until the soln. is almost decolorized. Dondain proposes improving the process by substituting nascent O generated electrolytically in the liquor for atm.  $\text{O}_2$ , and claims the process is thus accelerated without using catalysts. In order to do without Cl bleaching, the goods must be perfectly white when they come out of the NaOH; if all the gums, sugars and pectins have been dissolved, they can be oxidized in soln. without attacking the fiber, but if some of them remain on the fiber, they cannot be satisfactorily oxidized without at the same time attacking the fiber. On the other hand, if part of the incrustants remain on the fiber when it comes out of the NaOH liquor, bleaching with acid or  $\text{NaHSO}_3$ , as suggested by Müller, does not give a permanent white. S. concludes that the process cannot give a perfect white, but that it can give a sufficiently good color for many purposes.

A. PAPINEAU-COUTURE

**Benzanthrones (MARTINET, DROBATSCHOFF) 10.** Peptization of dyestuffs by neutral salts (OSTWALD) 2. Waterproofing and hardening fibrous materials (Brit. pat. 303,935) 20. Condensed aromatic sulfonic acids for use as mordants, etc. (U. S. pat. 1,722,924) 29.

**LEHNE, ADOLF:** *Textilchemische Erfindungen.* Lieferung 4. 1 Juli, 1928 bis 31 Dez. 1928. Wittenberg: A. Ziemsen. 86 pp. M. 6.

**ROEHRICH, O.:** *Méthode d'appréciation scientifique et pratique des qualités textiles d'un coton brut.* Paris: L'Édition textile. 56 pp.

**Dyes.** I. B. ANDERSON, R. F. THOMSON, J. THOMAS and SCOTTISH DYES, LTD. Brit. 303,454, June 24, 1927. Isodibenzanthrone and its derivs. are obtained from benzanthrone or its derivs. with free *peri*-positions, or from 2,2'-dibenzanthronyl, by heating with KOH and an alc., at not over about  $130^\circ$  in the presence of xylene,  $\text{C}_6\text{H}_6$ , a halogenated aromatic hydrocarbon such as  $\text{PhCl}$ , kerosene or "petrol." The products (of which examples are given and which may be purified by treating with aniline or other aromatic bases, pyridine,  $\text{H}_2\text{SO}_4$  or hyposulfite) dye cotton from the vat in blue shades, changing to violet on oxidation. The use of EtOH and iso-Pr alc. in the process is suitable.

**Dyes.** I. G. FARBERIND. A.-G. Brit. 303,538, Sept. 6, 1927. The alkali fusion of benzanthrone is effected in the presence of aliphatic aldehydes (other than sugars), their polymers, or sulfite or sulfoxylate derivs. Several examples are given.

**Dyes.** I. G. FARBERIND. A.-G. Brit. 303,838, Jan. 10, 1928. Monoazo dyes giving fast clear blue to violet dyeings are produced in substance or on the fiber by coupling an arylide of 2,3-hydroxynaphthoic acid with a diazotized 1,4-phenylenediamine or a homolog or substitution product, substituted in one amino group by an acetyl group from an aromatic carboxylic acid such as benzoic acid, its homologs or substitution products, naphthoic acid or terephthalic acid. Several examples are given.

**Dyes.** IMPERIAL CHEMICAL INDUSTRIES, LTD., and L. J. ALLCHIN. Brit. 303,234, Nov. 7, 1927. A 3,6-dichlorofluoran is condensed with an *o*-, *m*- or *p*-aminophenol, or a phthalic anhydride is condensed with a di(hydroxyphenyl)amine in which one OH group is in the *m*-position. The basic dyes thus obtained may be sulfonated. Examples are given.

**Azo dyes.** I. G. FARBENIND. A.-G. Brit. 302,965, Sept. 22, 1927. Azo dyes suitable for treatment, in substance or on the fiber either before, during or after the dyeing process, with metal compds. such as those of Cr or Cu are obtained by combining a diazotized 2-aminobenzene-1-carboxylic acid sulfonamide or a deriv. or substitution product with a coupling component. Numerous examples are given.

**Azo dyes.** I. G. FARBENIND. A.-G. Brit. 303,026, Dec. 24, 1927. BzCl or a substitution product is condensed with a secondary disazo dye of the type A-N:N-M-N:N-E or a trisazo dye of the type A-N:N-M-N:N-M'-N:N-E, in which A is a residue of an initial component, M and M' are middle components free from OH groups, and E is an amine coupled in *p*-position to the free amino group. The product is reduced to form an azo dye. When diazotized on the fiber and developed with  $\beta$ -naphthol, 1-phenyl-3-methyl-5-pyrazolone or acetoacetic arylides, brownish shades are produced. Several examples are given.

**Azo dyes.** I. G. FARBENIND. A.-G. Brit. 303,526, Jan. 5, 1928. The process described in Brit. 284,247 (C. A. 22, 4832) is modified by using as diazo components, for coupling in substance or on the fiber with 2,3-hydroxynaphthoic acid, monoarolyated *m*-phenylenediamines contg. alkyl or alkoxy groups in *o*-position to the amino groups. Several examples are given.

**Azo dyes on weighted silk.** RUDOLF KONRAD (to Grasselli Dyestuff Corp.). U. S. 1,723,183, Aug. 6. The weighed silk fiber is impregnated with the alk. soln. of an azo component of substantive character such as the anilide of 2,3-hydroxynaphthoic acid together with a sol. silicate and development is effected with a diazo soln. such as azotized *m*-nitro-*o*-anisidine-HCl.

**Trisazo dyes.** I. G. FARBENIND. A.-G. Brit. 303,424, Sept. 1, 1927. A black trisazo dye is obtained by diazotizing *p*-aminobenzeneazo-2-amino-8-naphthol-6-sulfonic acid obtained by acid coupling, coupling in alk. soln. with 2,8,6-acid, rediazotizing, and coupling with *m*-phenylenediamine. One of the components may carry an addnl. sulfonic group. The dyes have good fastness on cotton and viscose and similar artificial silks (but not on "acetate silk"). Details are given. Cf. C. A. 23, 4081.

**Vat dyes.** I. G. FARBENIND. A.-G. Fr. 34,190, Sept. 29, 1927. Addn. to 642,351 (C. A. 23, 1278). The nitro group of the nitrobenzanthrone referred to in the prior patent and prepd. according to Fr. 6,435 and 349,531, is replaced by an alkoxy group, which compd. is treated with alk. agents as in the prior patent for the production of vat dyes. Cf. C. A. 23, 4082.

**Dyes of the isoviolanthrone series.** I. G. FARBENIND. A.-G. Brit. 303,123, Dec. 28, 1927. Vat dyes are obtained by treating 1,4-dihalo-8-arylnaphthalenes or their substitution products with alk. condensing agents. Several examples are given, various of which form dyes giving reddish blue tints.

**Dyes of the naphthophenazine series.** WILHELM NEELMEIER and THEODOR NOCKEN (to General Aniline Works). U. S. 1,723,199, Aug. 6. Dyes producing red to violet shades on wool from an acid bath are obtained by condensing 3-arylamino-1,8-naphthosultams (such as the 6-sulfonic acids of such compds.) with *p*-nitrosoaminobenzene compds. or by oxidizing together *p*-diamines with the naphthosultam. Several examples are given. The starting material may be substituted by an alkyl group or the like. Cf. C. A. 22, 4833.

**Diazonium fluorosulfonates.** I. G. FARBENIND. A.-G. Brit. 303,527, Jan. 6, 1928. Diazonium fluorosulfonates, which are not sensitive to percussion and friction and may be used in dyeing or as insecticides, are produced by treating a diazonium compd. (such as that from 4-chloro-2-aminotoluene or a similar compd.) with fluorosulfonic acid. Several examples are given.

**Carboxylic acids.** I. G. FARBENIND. A.-G. Brit. 303,389, July 1, 1927. Carboxylic acids suitable for use as intermediates in the manuf. of dyes and pharmaceutical compds. are obtained by heating unsatd. acids such as acrylic acid,  $\alpha$ - or  $\beta$ -chloropropionic acid, maleic acid, cinnamic acid, crotonic acid, or esters, halides or anhydrides of these or similar acids, with hydrocarbons such as anthracene or chrysene or their halogen, alkyl, hydroxy or alkoxy derivs. The product thus obtained from 1-hydroxyanthracene and  $\beta$ -chloropropionic acid when coupled with diazotized *p*-nitroaniline yields an orange-yellow dye.

**Carboxylic acids.** GEORG KALISCHER and HEINZ SCHEYER (to I. G. Farbenind. A.-G.). U. S. 1,721,560, July 23. See Brit. 303,389 (preceding abstract).

**Halogenated dinaphthylidicarboxylic acids.** RICHARD HERZ and WERNER ZERWECK (to General Aniline Works). U. S. 1,723,167, Aug. 6. Dye intermediates which are dinaphthylidicarboxylic acids of the general formula:  $(C_{10}X_4)_2(COOH)_2$ , wherein the X's stand for H atoms, of which one or more may be replaced by a univalent substituent.



ent, are obtained if the diazo compds. of aminonaphthoic acids of the general formula:  $C_{10}X_n(NH_2)COOH$  wherein the X's stand for H atoms, of which one or more may be replaced by a univalent substituent, are treated with a suitable reducing agent, especially with an ammoniacal soln. of cuprous oxide. An example is given of the production of 4,4'-dibromo-1,1'-dinaphthyl-8,8'-dicarboxylic acid, a colorless powder, m. above  $300^\circ$ .

**Dyes and intermediates.** I. G. FARBENIND. A.-G. Brit. 303,095, June 27, 1927. Halogenated *ms*-benzodanthrones and *ms*-naphthodanthrones are prep'd. by direct halogenation under "mild conditions," in a dissolving or suspending medium, and preferably with addn. of halogenation catalysts. The halogenated *ms*-benzodanthrones may be further condensed to *ms*-naphthodanthrones by acid condensing agents or by oxidizing agents in  $H_2SO_4$  soln. *ms*-Benzodanthrones may be converted to halo-*ms*-naphthodanthrones by treatment with halogen under pressure or in the presence of S under oxidizing conditions. Several examples are given. The halogenated *ms*-benzodanthrones dye cotton strong yellow to orange shades from a vat. The halogenated *ms*-naphthodanthrones are mainly useful as intermediates.

**Dyes and intermediates.** I. G. FARBENIND. A.-G. Brit. 303,184, June 27, 1927. Allo-*ms*-naphthodanthrones are obtained from 2,2'-dimethyl-*ms*-benzodanthrones by the action of alk. condensing agents and as a class these products dissolve in strong  $H_2SO_4$  with a green-blue color, give violet to blue vats and dye orange to red shades. Various methods are mentioned of forming their halogen derivs. and various examples are given. *ms*-Anthradanthrones are made by the action of acid condensing agents or of light or oxidizing agents in  $H_2SO_4$  on the allo-*ms*-naphthodanthrones and also from 2,2'-dimethyl-*ms*-naphthodanthrones by the action of alk. condensing agents. Prepn. of their halogen derivs. also is referred to.

**Dyes and intermediates.** I. G. FARBENIND. A.-G. Brit. 303,203, Sept. 30, 1927. Benzanthrone derivs., including dibenzanthronyls and benzanthranyl sulfides, contg. one or more arylsulfamido groups, are prep'd. by the action of arylsulfonylchlorides on the corresponding amino compds., or of arylsulfonamides on the corresponding halogen compds. Several examples are given. Dibenzanthrone and isodibenzanthrone dyes are obtained by alk. condensation of such of the arylsulfonamido compds. as have the 2 and *Bz*-1 positions free, or one only of them occupied by an arylsulfonamido group (which is split off in the course of the reaction), a mercapto, sulfide, thio ether, sulfinic or etherified OH group, or a halogen atom, or by another 2- or *Bz*-1-benzanthronyl nucleus, having its other 2- or *Bz*-1-position free. Several examples of dyes thus produced are given.

**Dyes and intermediates.** I. G. FARBENIND. A.-G. Brit. 303,375, Dec. 30, 1927. Derivs. of the anthracene series are obtained by treating 2- $\alpha$ -naphthoylbenzoic acid or its derivs. with  $AlCl_3$  in the presence or absence of an org. or inorg. melting agent such as NaCl or trichlorobenzene, at temps. of about  $80-130^\circ$ . Several examples are given. The products appear to be derivs. of dihydrobenzanthrone. The products having the *Bz*-1 and 2- positions free are converted into vat dyes by fusing with caustic alkali at  $230-260^\circ$ . The 2- $\alpha$ -naphthoylbenzoic acid deriv. yields a dye giving violet tints on cotton which change to blue on exposure to the air.

**Dye intermediates.** I. G. FARBENIND. A.-G. Brit. 302,964, Sept. 22, 1927. Nitroanthraquinones and their derivs. are reduced by means of hydrogenated bases of the quinoline series, suitably in the presence of a diluent which may be the oxidized product of the hydrogenated quinoline in which case the hydrogenated quinoline is regenerated by catalytic hydrogenation. Various details and examples are given.

**Dye intermediates.** I. G. FARBENIND. A.-G. Brit. 303,901, Jan. 12, 1928. Hydroxycarboxylic acids of carbazole are prep'd. by the action of  $CO_2$  on an alkali compd. of a hydroxycarbazole or on a hydroxycarbazole in the presence of alkali hydroxide or carbonate. The products are suitable for use as intermediates in making dyes or pharmaceutical compds.

**Intermediates for dyes.** IMPERIAL CHEMICAL INDUSTRIES, LTD. Fr. 657,589, July 17, 1928. See Brit. 299,152 (C. A. 23, 3105).

**Dyeing.** SOC. ANON. POUR L'IND. CHIM. A BALE. Brit. 303,179, Dec. 29, 1927. In dyeing cotton, or producing variegated effects on mixed goods of cotton and "acetate silk," etc., fast dyeings are obtained by treatment with naphthols or coupling components having salts stable to steam, drying, steaming and developing with diazo compds. Several examples are given.

**Dyeing with mordant dyes.** SOC. ANON. POUR L'IND. CHIM. A BALE. Brit. 303,384, Dec. 30, 1927. Dyeings fast to rubbing, light, fulling and potting are produced on chrome-mordanted fibers by dyeing with Cr compds. of azo dyes. Several examples are given.

**Dyeing artificial silk.** SILVER SPRINGS BLEACHING & DYEING CO., LTD., and A. J. HALL. Brit. 303,958, Nov. 8, 1927. Yarns and woven or knitted fabrics, etc., having different depths or intensities of color are made by using alkali-treated and untreated regenerated cellulose artificial silks, and dyeing with direct or other dyes. Various details are given.

**Multicolor dyeing of artificial silk skeins, etc., while loosely held by clamping devices.** J. P. CAREY and I. B. HASBROUCK (to Eclipse Textile Devices, Inc.). Brit. 303,892, Jan. 12, 1928. Structural features.

**Dyeing cellulose formate or other similar cellulose esters.** GEORGE H. ELLIS (to Celanese Corp. of America). U. S. 1,723,271, Aug. 6. The material is dyed with an aq. dispersion of a relatively water-insol. coloring material prepd. by pretreating the coloring material with a solubilizing agent comprising Na sulforicinate or other suitable material of oily or fatty character and an auxiliary solvent such as xylene.

**Dyeing cones of yarn with bands of different color by injection of dye solution through grooved needles.** L. B. HASBROUCK (to Eclipse Textile Devices, Inc.). Brit. 303,893, Jan. 12, 1928. An app. is described.

**Printing silk.** CHARLES GALSTER. Fr. 657,966, July 23, 1928. Silk is printed with aniline dyes sol. in water exactly in the manner used in lithography. The aniline dye is dissolved in turpentine oil with the addn. of linseed-oil varnish and is then ready for printing. The silk or material is steeped in a soln. of gum arabic contg. glycerol and is pressed damp on a sheet of paper to which it sticks. When dry it is ready for printing.

**Nitrosamine printing colors.** I. G. FARBENIND. A.-G. Brit. 303,942, Oct. 28, 1927. Nitrosamine printing colors are purified by dissolving in a neutral org. solvent such as acetone, EtOH or MeOH which is an equally good solvent for both components, filtering the soln. and removing the solvent.

**Coloring agent for fabrics.** ANTON PICAREFF (to Anton Picareff Art Studios, Inc.) U. S. 1,722,392, July 30. A compn. suitable for coloring silk or other fabric comprises dyes and a viscous substance such as gum acacia in aq. soln. admixed with glacial HOAc.

**Colored cellulose acetate.** GEORGE H. ELLIS (to Celanese Corp. of America). U. S. 1,723,230, Aug. 6. The fastness to light of material colored with azo or other coloring agents is increased by treatment with diethylaniline-HCl or other simple org. amino compd.

**Dye salt.** I. G. FARBENIND. A.-G. Fr. 657,645, July 18, 1928. The diazonium fluoborate of 5-nitro-2-amino-1-toluene is used as a stable and easily sol. dyeing salt. The shades obtained on cotton by coupling it with arylides of 2,3-hydroxynaphthoic acid are identical with those obtained from freshly prepd. diazo solns. of 5-nitro-2-amino-1-toluene.

**Jigger apparatus for dyeing.** C. S. BEDFORD. Brit. 304,088, May 2, 1928.

**Spot-dyeing clamp.** ARTHUR H. ADAMS (to Herman Epstein). U. S. 1,722,781, July 30. Structural features.

**Skein-dyeing apparatus.** CHARLES E. KIMBALL. U. S. 1,723,624, Aug. 6. Structural features.

**Treating animal and vegetable fibers.** SOC. ANON. POUR L'IND. CHIM. À BAËLE. Fr. 657,974, July 23, 1928. See Erit. 294,890 (C. A. 23, 2001).

**Oil for treating textile fibers.** STANDARD OIL CO. Brit. 303,820, July 6, 1927. A compn. for treating rayon or other textile materials comprises a refined distillate mineral oil of low viscosity, oleic acid, an emulsifying agent such as an alkali metal soap of a (preferably oil-sol.) sulfonic acid obtained by treating a mineral oil with H<sub>2</sub>SO<sub>4</sub> and an "antioxidant" such as  $\beta$ -naphthol or diphenylamine. Cf. C. A. 23, 996.

**Lubricant for use in knitting, spinning or weaving rayon fibers.** STANDARD OIL CO. Brit. 303,841, July 6, 1927. Compns. are used similar to those specified in Brit. 303,820 (preceding abstract).

**Bowling, softening, oiling and finishing of-textile materials.** CHEMISCHE FABRIK, VORM. SANDOZ. Brit. 303,379, Dec. 30, 1927. Preps. stable against lime and acids, suitable for use in these operations, are obtained by mixing fatty acids and aromatic or hydrogenated aromatic sulfonic acids or salts, or amino or hydroxyamino derivs. of such acids, and neutralizing by alkali. Various suitable starting materials for the process are enumerated.

**Apparatus for treating tubular fabrics (on a perforated drum) with drying air and with steam.** M. M. KASANOF. Brit. 303,653, Jan. 10, 1928. Structural features.

**Apparatus for washing, scouring or other treatment of fabrics in long lengths.** MICHAEL F. ROONEY (to Rodney Hunt Machine Co.). U. S. 1,722,482, July 30. Structural features.

**Apparatus for rinsing yarn or fabric in rope form.** GEORGE J. MCGANN (to Slasher Rolls Co.). U. S. 1,722,813, July 30. Structural features.

**Removing stains from fabrics, etc.** T. E. THORPE, F. J. THORPE and P. H. WALLER. Brit. 303,089, Sept. 28, 1927. A compn. suitable for removing stains comprises  $\text{CCl}_4$  and oil of eucalyptus and may also contain other ingredients such as terebene, oleate aniline yellow and oil of cloves.

**Rotary permeable drum apparatus for drying, carbonizing or oxidizing fabrics, paper, cords, etc.** R. GLINKA. Brit. 303,572, Oct. 10 1927. Structural features.

**Loading silk.** R. CLAVEL. Brit. 303,128, Dec. 30, 1927. Natural or artificial silk in hanks, fabric or other form is loaded and dull-lustered by pptg. upon and within the fibers a usual metallic loading salt such as  $\text{SnCl}_4$  or Pb acetate, without washing, acidifying or neutralizing between the steps of the process. Treatment with an alkali phosphate of alk. reaction or with an alk. earth phosphate may precede or follow the pptn. and the silk may also be treated with solns. of alk. earth salts either before or during immersion in the metallic salt bath. Numerous details, modifications and examples of the process are given. Cf. C. A. 23, 2306. Brit. 303,129 describes an app. for similar treatments in successive baths.

**Weighting silk, etc.** HENRY DREYFUS. Fr. 34,391, Nov. 3, 1927. Addn. to 634,165. Threads, films, etc., of cellulose acetate to be weighted with metallic salts are treated with a swelling agent comprising an isothiocyanate, a cyanate or an isocyanate, particularly of the alkali metals or  $\text{NH}_4$ , or comprising one of the following: urea, urethan, thiourea, thiourethan, guanidine or their alkyl or aryl substitution products, or mixts. of these. Cf. C. A. 23, 1267.

**Mixing silk and artificial silk for fabrics.** MEINRAD F. THOMA. U. S. 1,722,829, July 30. Schappe silk is mixed with about twice its quantity of artificial silk, the mixt. is carded and schappe silk fibers are broken while surrounded by the artificial silk fibers, the mixt. is spun, the yarn is woven and the material is dyed in the piece.

**Delustering "acetyl silk," etc.** BLEACHERS' ASSOCIATION, LTD., W. KERSHAW, F. L. BARRETT and R. GAUNT. Brit. 303,286, Jan. 21, 1928. The fabrics are boiled with solns. of soaps or other suitable salts, or are padded with soap, steamed and then embossed. The luster may be locally regenerated.

**Apparatus for washing wool (especially samples).** F. J. COWIE. Brit. 304,050, Feb. 8, 1928. Structural features.

**Felt.** J. L. SOBRINHO. Brit. 303,017, Dec. 23, 1927. Felt is formed of silk, silk residues or artificial silk, alone or mixed with wool or hair or both, with or without the addn. of cotton also.

**Luminescent cloth.** JÉRÔME É. LUCK. Fr. 658,185, Dec. 7, 1927. Cloth is made luminescent by steeping it in a heated bath contg.  $\text{ZnS}$ ,  $\text{AcOAm}$ , clear glue, gelatin, glucose and water.

**Sulfonic acids.** I. G. FARBENIND. A.-G. Brit. 303,917, Sept. 12, 1927. Sulfonic acids suitable for use as *wetting, emulsifying or cleansing agents* are formed from unsatd. aliphatic hydrocarbons or their halogen derivs. or from unsatd. hydroaromatic compds. by treating them with sulfonating agents such as  $\text{H}_2\text{SO}_4$  or  $\text{SO}_3$  or chlorosulfonic acid and at least an equimol. quantity of an org. acid, acid anhydride or acid chloride or of  $\text{H}_3\text{PO}_4$  or of its anhydride or chloride. The treatment may be applied to individual hydrocarbons such as tetrahydrobenzene or propylene, or halogen derivs. such as trichloroethylene, or to hydrocarbon mixts. such as gas oil, "yellow oil" or solar oil.

**Mothproofing wool, fur, etc.** I. G. FARBENIND. A.-G. Brit. 303,092, Sept. 28, 1927. Various compds. are used in which P, As, Sb, Bi or Sn is directly linked to the C atom of one or more org. residues. Numerous details and examples are given. Cf. C. A. 23, 3112.

## 26—PAINTS, VARNISHES AND RESINS

A. H. SABIN

**Investigation of the usefulness of a simple torsion viscometer for testing paints.** W. BRCKS. *Farbe Lack* 1929, 344-5.—There is described a modified Couette or MacMichael viscometer in which the container is rotated. The angle through which the suspended cylinder is rotated is plotted against the speed of rotation of the container. Some typical results are given. G. G. SWARD

**Cadmium-base pigments.** ALBERT HUTIN. *Peintures, pigments, vernis* 6, 837-8 (1929).—There are discussed the qualities of a good pigment for cellulose varnishes. CdS is the best yellow. Lithopones of Cd ( $x\text{CdS} + y\text{BaSO}_4$ ) are now being produced,

but care must be employed in the prepn. in order to obtain the required permanency of shade. Cd yellows mixed with ultra-marine blues give brilliant and very stable greens. The lithopones of Cd are obtained by pptg. a soln. of  $\text{CdSO}_4$  with BaS. Cd thioselenides are employed in the ceramic industry. B. HAMILTON

Methods of analysis and of control in the varnish and paint industry. ANDRÉ MAUROU. *Peintures, pigments, vernis* 6, 830-4, 858-61(1929).—A review. B. H.

Nitrocellulose and its importance in the lacquer industry (STADLINGER) 23. Some properties of acetone-soluble cellulose acetate (WERNER, ENGELMAN) 23. Fossil resin of the Republic of Argentina (CORTELEZZI) 8. Plastometric studies of the formation of boundary layers (DE WAELE, LEWIS) 2. Kauri-resins (HOSKING) 10. *Carthamus tinctorius* oil. Safflower oil (TZUKERVANIK) 27. Soap production [Rosin size manufacture] (U. S. pat. 1,722,687) 27. The saturation capacity of rosin acids (MARGOSCHES, *et al.*) 10.

MARGIVAL, F.: *Encres spéciales*. Paris: Desforges, Girardot & Cie. 180 pp. F. 20. Reviewed in *Bull. soc. ind. Mulhouse* 95, 273; *Chimie & industrie* 21, 443 (1929).

MARGIVAL, F.: *Encres usuelles*. Paris: Desforges, Girardot & Cie. 178 pp. F. 20. Reviewed in *Bull. soc. ind. Mulhouse* 95, 275; *Chimie & industrie* 21, 443(1929).

Oil paint. MATTHEW W. SAUNDERS and JAMES J. HYNES. Australia 12,361, Mar. 19, 1928. To increase the bulk and covering quality of oil paint a soln. of NaCl and (or)  $\text{MgCl}_2$  heated to b. p. is added to the paint, also heated, to produce double decompn. between the salt and the drier of the paint and to liberate an emulsifier.

Paint and cement compositions. C. NITTINGER. Brit. 303,938, Oct. 24, 1927. See Fr. 643,772 (C. A. 23, 1763).

Mixing paint ingredients by forcing them through a fine orifice. R. C. P. WEBSTER (to British Thomson-Houston Co., Ltd.). Brit. 303,380, Dec. 30, 1927. An app is described.

White lead. FRANK T. BAILEY and WILSON AUSTIN. U. S. 1,723,001, Aug. 6. See Brit. 273,287 (C. A. 22, 1862).

Lithopone composition. JAMES E. BOOGE and MARION L. HANAHAN (to Grasselli Chemical Co.). U. S. 1,722,174, July 23. A pigment of good "paint-mixing properties" comprises a light resistant lithopone, to the particles of which adheres a water-sol. dispersing agent comprising a soap, *e. g.*, the  $\text{NH}_4$  soap of sulfonated castor oil.

Ink. B. KALISCHER. Brit. 303,200, Sept. 30, 1927. See Fr. 644,086 (C. A. 23, 1763).

Intaglio-ink composition. GEORGE D. KNIGHT (to Emory Winship). U. S. 1,722,925, July 30. A quick-drying ink for use in intaglio printing of relatively high fluidity and of a degree of homogeneity sufficient to cause it to enter and be retained in the depressions of a hard metal intaglio printing form after wiping the form, and to be withdrawn from the depressions by paper without spreading over or excessively penetrating the paper, consists essentially of a "sirup" of gilsonite and a hydrocarbon distillate intermediate gasoline and kerosene and a pigment.

Varnish. PIETRO ROSSI. Fr. 34,196, Oct. 1, 1927. Addn. to 609,515. A varnish is made by adding zinc white to a mixt. of gum lac and alc.

Lacquers or enamels. BRITISH THOMSON-HOUSTON CO., LTD., H. W. H. WARREN and A. T. WARD. Brit. 303,915, Sept. 5, 1927. A glycerol-phthalic resin, which may be plasticized with oleic acid, is used with lacquers such as those formed with nitrocellulose or other cellulose derivs.

Coating various surfaces with cellulose derivatives, etc. C. DREYFUS (to British Celanese, Ltd.). Brit. 303,898, Jan. 12, 1928. Mixts. are used comprising finely divided org. derivs. of cellulose such as cellulose acetate, cellulose butyrate, or other esters or ethers, and plasticizers, with or without fillers, dyes, pigments and modifying substances. The powders may be prepd. as described in Brit. 282,723 (C. A. 22, 3988) and the coatings may be applied to a wide variety of specified materials and surfaces. Numerous details are given. Cf. C. A. 23, 3098.

Coating composition comprising nitrocellulose and synthetic resins. HARRY M. WEBER (to Ellis-Foster Co.). U. S. 1,722,776, July 30. Nitrocellulose is used with a rosin phthalic glycerol resin sol. in nitrocellulose solvents.

Resinous coating compositions. W. H. MOSS (to British Celanese, Ltd.). Brit. 303,169, Dec. 29, 1927. Resins such as phenol-aldehyde or acetone-phenol resins or

natural resins may be darkened in color by adding dyes or pigments, exposure to suitable actinic rays, addn. of catalysts such as  $\text{HCl}$ ,  $\text{H}_2\text{SO}_4$  or benzoic or salicylic acid during manuf. of the resin, or by addn. of materials such as furfural or  $\text{PhNH}_2$  during prepn. These darkened resins may be mixed with cellulose esters, etc., in prepg. *lacquers* or other compns. Cf. C. A. 23, 3588.

**Coating composition containing rubber.** CHARLES M. STINE and COLE COOLIDGE (to E. I. duPont de Nemours & Co.). U. S. 1,721,930, July 23. In prepg. a compn. suitable for *lacquers*, *varnishes*, etc., rubber is dissolved in a volatile solvent such as  $\text{C}_6\text{H}_6$  or turpentine to form a soln. having a viscosity as high as 2700 sec. (Scott viscometer) and agitated with O until the viscosity has dropped as low as 80 sec. A metal drier may be added. U. S. 1,721,931 (Charles M. Stine to duPont Co.) specifies a compn. contg. at least 10% rubber and having a viscosity not over 80 sec. (Scott), contg. also a drying oil such as bodied Perilla oil, a drier such as Co linoleate, an org. nitro compd., e. g., dinitrobenzene, and benzine or other suitable solvent. Cf. C. A. 22, 1705.

**Coating composition containing rubber.** CHARLES M. STINE and COLE COOLIDGE (to E. I. duPont de Nemours & Co.). U. S. 1,723,632, Aug. 6. A compn. suitable for use on metal, wood, leather, cloth, etc., is prepd. by mixing rubber with a drying oil, a cellulose deriv. such as ethyl cellulose and a substance such as Co linoleate which acts as a mutual catalyst for the curing of the rubber and the drying of the oil. Various examples are given. Cf. C. A. 23, 1528.

**Colored protective finishes on rubber-coated and other fabrics.** W. S. GOCHER and A. N. PARRETT (to E. I. duPont de Nemours & Co.). Brit. 303,368, Dec. 31, 1927. A finish which does not crack or peel after baking is obtained on rubber-coated fabrics and the like by use of a hydrocarbon oil obtained by heating asphalt, petroleum residuum, stearin pitch or other suitable bituminous materials to a temp. such that decompn. occurs and an oil distills off which is usually a brownish fluid. Pigments, solvents, etc., may be added. Various examples and details are given.

**Coating wire with baked insulating enamel.** RICHARD D. JESSUP (to Western Elec. Co.). U. S. 1,722,797, July 30. An app. is described.

**Coating surfaces with bituminous water japan.** WHEELER P. DAVEY (to General Elec. Co.). U. S. 1,723,844, Aug. 6. The electrodeposition of a bituminous water japan contg. a metal alkali soap as the emulsifying agent is improved by adding 1-10%  $\text{NH}_3$  to the japan.

**Resins.** THE NEWPORT Co. Fr. 657,945, July 21, 1928. See Brit. 294,526 (C. A. 23, 2050).

**Composite resin ester.** CARLETON ELLIS. U. S. 1,722,566, July 30. A resinous product of low acid number and capable of blending readily with nitrocellulose is prepd. from rosin, glycerol and phthalic anhydride, by using more rosin than of the other ingredients.

**Phenol-aldehyde resins.** ALLGEMEINE ELEKTRICITÄTS-GES. (to International General Elec. Co.). Brit. 303,905, Jan. 12, 1928. An excess of  $\text{CH}_2\text{O}$  is used with a monohydric or polyhydric phenol and the final stage of reaction is effected under heat and pressure. The resin may be dissolved in glycerol to form a lacquer which may be baked after being applied. Various details are given.

**Artificial resins.** KUNSTHARZFABRIK FRITZ POLLAK G. M. B. H. Fr. 657,794, June 14, 1928. In the manuf. of condensation products of carbamides or their derivs., particularly urea, and aldehydes, particularly  $\text{CH}_2\text{O}$ , the 2 constituents react in acid soln. in the proportion of less than 2 mols. of  $\text{CH}_2\text{O}$  for 1 mol. of urea so that in each phase of the treatment, a relative excess of free  $\text{CH}_2\text{O}$  is present with respect to the amt. of urea momentarily introduced and still uncombined. The addn. of urea is made gradually and the amt. added is reduced as the action proceeds, but is regulated so that in the concn. of acid chosen all the urea has entered into reaction before gelatinization of the mass takes place. The acid treatment may be alternated with neutral or alk. steps, a neutral or alk. step preceding the acid treatment. Cf. C. A. 23, 3589.

**Synthetic resin composition.** THEODORE F. BRADLEY. U. S. 1,722,554, July 30. A compn. which is suitable for hot-press molding comprises a binder of a resinous complex contg. the reaction products of Congo resin, phthalic anhydride and glycerol.

**Synthetic resins.** P. CHESTAKOFF. Brit. 303,022, Dec. 22, 1927. The quality of condensation products from cresol and  $\text{CH}_2\text{O}$  is improved by adding to the liquid dehydrated intermediate product an org. sulfonic acid of high mol. wt. and high dispersive power such as octohydroanthracenesulfonic acid, isopropyl-naphthalenesulfonic acid, sulfo-aromatic fatty acids and the acids obtained by sulfonating mineral oils.

**Synthetic resins.** COMPAGNIE NATIONALE DE MATIÈRES COLORANTES ET MANU-

**FACTURES DE PRODUITS CHIMIQUES DU NORD RÉUNIES ÉTABLISSEMENTS KUHLMANN** Brit. 303,386, Dec. 31, 1927. A polyhydric alc. such as glycerol or glucose is heated together with a polybasic aromatic acid or anhydride such as phthalic anhydride and a natural resin or gum such as colophony, manilla, dammar or Congo. The products are sol. in esters such as Et, Bu, Am and benzyl acetates and Et, Bu and Am phthalates, and are suitable for use alone or with nitrocellulose or cellulose acetate in producing *varnishes or molded articles*. Brit. 303,387 relates to resinous compns obtained by the combination of an aliphatic polyhydric alc. with a mixt. of a polybasic aromatic acid or anhydride and one or more natural resins or gums, which may be condensed with linseed oil or other siccative oil by heating together in an autoclave. The products are suitable for making *insulating varnishes*, etc., which may be baked. Brit. 303,388 relates to synthetic resins obtained by reaction of a resin ester or a mixt. of one or more natural resins or gums with a condensation product of an aliphatic polyhydric alc. such as glycerol and a polybasic acid or anhydride such as phthalic anhydride, or obtained by reaction of a resin ester, already formed or in course of formation, with such an acid or anhydride, with or without a polyhydric alc. Several examples are given, and the products may be further condensed with a siccative oil such as linseed oil. The resultant materials are suitable for use in various mixts. for making *varnishes, lacquers, paints or molded articles*.

**Molding artificial resins.** HEROLD A.-G. Brit. 303,103, Dec. 28, 1927. Thin plates or other articles of artificial resin are formed by hardening the material by heating in the presence of Ni plates or the like inserted into the mass. These may afterward be removed and the spaces filled with material of different color if desired.

**Moldable mixture containing synthetic resin and cellulose ester.** CLARENCE A. NASH (to Bakelite Corp.). U. S. 1,721,742, July 23. A molding mixt. comprises a resin of the urea- $\text{CH}_2\text{O}$  type, a filler such as wood flour and a cellulose ester such as cellulose acetate. Cf. C. A. 23, 1517.

**Linoleum.** G. E. HEYL AND HYCOLITE LIQUID WALLPAPER MFG. CO., LTD. Brit. 303,292, Feb. 7, 1928. Finely disintegrated dry oil-resistant paper or fibrous pulp such as wood pulp is used instead of cork for making linoleum, together with a so-called "mineral lubricant," of which china clay and plaster of Paris are given as examples. Paper used may be preliminarily soaked in varnish or drying oil and dried. Various details are given.

## 27—FATS, FATTY OILS, WAXES AND SOAPS

E. SCHERUBEL

**American reindeer fat.** WALTER F. BAUGHMAN, GEORGE S. JAMIESON AND R. S. MCKINNEY. *Oil and Fat Ind.* 6, No. 8, 11-2(1929).—Five samples of reindeer fat representing the combined fats of kidney, rib, chuck and brisket, rump, buttock and flank, and loin end and short loin gave the following const.: m. p. 45.8-47.4°,  $d_{25}^0$  0.8981-0.8993,  $n_{20}^0$  1.4510, acid value 2-8.6%, sapon. no. 194.3-199.2, unsapon. 0.4%, I no. 33.7-39.4, acetyl no. 5-8, R. M. no. 0-0.3, Polenske no. 0.3-0.5, satd. acids 53.6-59.9%, unsatd. acids 35.2-41.4%, I no. of unsatd. acids 90. The % composition of reindeer fat: olein 36.8, myristin 6.7, palmitin 35.0, stearin 20.5, arachidin 0.7. E. S.

**Microchemical determination of the acetyl value.** F. PREGL AND A. SOLTYS. *Mikrochemie* 7, 1-9(1929).—The substance (3-5 mg.), preferably compressed into a pastille, is introduced into a small pear-shaped flask, the bulb of which is then filled with dry glass beads. The flask is connected by means of a side tube at the top of the bulb to a purifying and drying app. for air, and by means of a side tube in the neck with a U-tube packed with glass beads moistened with a satd. soln. of  $\text{KH}_2\text{PO}_4$  to absorb any  $\text{SO}_2$ . The other limb of the U-tube is connected by a Ag tube and condenser to the absorption flask contg. standard NaOH. The flask is heated in a water bath for 20-40 min. while 1 cc. of a 25% soln. of toluene-*p*-sulfonic acid is introduced by means of a dropping funnel. The flask is then cooled and a slow current of purified air is drawn through it by attaching the side tube of the absorption flask to a vacuum pump capable of exhausting the app. to 15 mm. pressure. After 10 min., 1 cc. of water is allowed to drop into the decompn. flask and the air current continued for another 10 min. without interrupting the suction. The U-tube is then immersed in hot water and the suction continued for a further 10 min. to ensure that all the acetic acid distills into the absorption flask. The soln. in the latter is finally titrated with HCl, in slight excess which is detd. by titration with 0.01 N NaOH. B. C. A.

**Nature, manufacture and general use of stearic acid.** D. F. CRANOR. *Ind. Eng. Chem.* 21, 719-21(1929).—Descriptive. C. C. DAVIS

**The constitution of the glycerides of the fatty oil of Guizotia oleifera.** A. STEIN AND F. ULZER. *Wissenschaftl. Mitt. Osterreich. Heilmittelstelle* 1928, VIII-X; *Chem. Zentr.* 1928, II, 1337.—By bromination of niger seed oil, the fatty oil of *Guizotia oleifera*, which is obtained from ramtilla or niger seed, S. and U. prepd. 2 bromoglycerides. The 1st one is liquid and probably is a triolein bromide, while the other one is solid and represents a mixt. of linoleic acid triglyceride bromide and dilinoleic acid monooleic acid glyceride bromide. G. SCHWOCH

**Chemical investigations on coconuts and oil palm.** C. D. V. GEORGI. *Malayan Agr. J.* 17, 127-39(1929).—The investigation being carried on is the establishment of standards for oil content of Malayan estate copra. The variations of oil on H<sub>2</sub>O-free basis for 17 samples were 62.3 to 66.9%. The prepn. of oil-palm products is described. E. SCHERUBEL

**Olive oil analytical method. II. The use of the ultra-violet ray in the detection of refined in virgin olive oil.** SIDNEY MUSER AND CARL E. WILLOUGHBY. *Oil and Fat Ind.* 6, No. 8, 15-6(1929); cf. *C. A.* 23, 1003.—The purpose of the work was to confirm the work of European labs. The ultra-violet lamp has proved successful in detecting refined in virgin olive oil down to a limit of 5% of the former. It is believed that the chlorophyll content det. the characteristic fluorescence of an oil, and that the bluish violet fluorescence of a refined oil is due to a change in the chlorophyll constituents brought about by the refining process. E. SCHERUBEL

**Piqui-a fruit oils.** C. D. V. GEORGI. *Malayan Agr. J.* 17, 166-70(1929).—Piqui-a fruit is similar to oil-palm fruit; it contains 2 oils, one in the pericarp of the seed and the other in the kernel. The const. of the pericarp oil are:  $d_{20}$  0.8622,  $n_D^{20}$  1.4726, sapon. no. 204.9, I no. 46.6, acidity 1.1% oleic acid, unsapon. 0.7. Fatty acids. Titer 48°, mean mol. wt. 274, I no. 48.5. The const. of the kernel oil are:  $d_{20}$  0.8617,  $n_D^{20}$  1.4726, sapon. no. 202.9, I no. 52, acidity 0.2% oleic acid, unsapon. 1.3. E. SCHERUBEL

**Oil from Hydnocarpus anthelmintica.** C. D. V. GEORGI AND GUNN L. TEIK. *Malayan. Agr. J.* 17, 171-4(1929).—Lack of seed prevented a detailed examn. of the fatty acids but const. found were: Oil  $d_{20}$  0.9429,  $n_D^{20}$  1.4726, sapon. no. 206.4, I no. 81.5, acid no. 1.0,  $\alpha_1$  (CHCl<sub>3</sub> soln.) 49.7°. Fatty acids, titer 39.1°, mean mol. wt. 260.5, neutralization no. 215.3, I no. 84.8,  $\alpha_{2-8}$  (CHCl<sub>3</sub> soln.) + 49.7°. The value of the oil from a medical point of view can only be ascertained when the proportions of the fatty acids present are known. E. SCHERUBEL

**Carthamus tinctorius oil. Safflower oil.** J. TZUKERVANIK. *Acta. Univ. Asiae Med.* 1928, Ser. 6, No. 2, 3-19.—The compn. of safflower is isolinoleic acid 0.05, linoleic acid 39-50, oleic acid 34-37, palmitic acid 5-6, stearic acid 3-4, glycerol radical (C<sub>18</sub>H<sub>37</sub>) 4.6, and unsapon. 0.5-1.0%. The wt. increase of this oil due to oxidation is 5.3-5.6%. The pressed oil may be used for edible purposes and it is also satisfactory for varnish. E. SCHERUBEL

**Fish oils. I. Some properties of commercial pilchard oil.** H. N. BROCKLESBY. *Can. Chem. Met.* 13, 212-4(1929).—Pilchard oil is highly unsatd. and contains 30% of solid acids. The unsatd. acids contain 8.5, 3.8 and 17.9%, resp., of tetra-, tri-, and di-ethylenic acids. The rest of the acids probably are of the mono-ethylenic type. The oil deposits up to 50% of semi-solid glycerides, depending on the temp. It can be bleached and partially sulfonated; and by the use of suitable catalysts it can be made to dry as quickly as boiled linseed oil. Pilchard oil films afford as good protection against H<sub>2</sub>O as linseed oil films. The pptd. semi-solid glycerides have been hydrogenated to a solid white, odorless and tasteless mass. E. SCHERUBEL

**Solvents for waxes.** O. A. PICKETT. *Ind. Eng. Chem.* 21, 767-8(1929).—The following waxes and solvents were used: Beeswax, candelilla, carnauba and montan wax, and V. M. and P. naphtha, turpentine, No. 22 thinner, solvenol, pine oil, sulfonated castor oil and equal parts by wt. of the latter two. Tests were made by weighing the wax and solvent into a 100-cc. Erlenmeyer flask, sealed with a cork contg. a thermometer. The flask was heated until the wax was in soln. and then the point at which the wax began to ppt. on cooling was detd. E. SCHERUBEL

**The polysaccharides as admixtures to soaps.** A. BEYRODT. *Allgem. Öl- u. Fett-Ztg.* 25, 411-3; *Chem. Zentr.* 1928, II, 1505. G. SCHWOCH

The factors in the process of oil formation in plants (IVANOV) 11D. The Bull method for the rapid estimation of the fat content in fish, meat and other animal or vegetable products through extraction (SREBELIEN) 12. The coagulation of Na soap (CIRÓ) 11A. Spray desiccation of soap solutions (Brit. pat. 303,576) 1. Apparatus for

vacuum distillation of oils (Brit. pat. 303,078) 1. [Soaps] from dibasic acids from products of mineral oil oxidation (U. S. pat. 1,721,958) 22. Oil filter (U. S. pat. 1,723,274) 22.

**Extraction of fat from cacao powder or similar extractions.** CLARENCE F. EDDY (to Proscio Oils Corp.). U. S. 1,721,858, July 23. An app. is described in which a solvent such as  $C_6H_6$  is caused to flow upwardly by displacement through a zone in which it is agitated with cacao powder or other material to be extd. and through a second zone where it is permitted to become relatively quiescent so that material in the latter zone acts as a filter for the solvent.

**Extracting fats from animal or vegetable materials.** J. A. S. VAN DEURS. Brit. 303,413, Jan. 2, 1928. The sepn. of fat or oil is assisted by heat, agitation, centrifugal action, etc., and the  $p_H$  may be brought below 5 by adding acid or acid-forming bacteria, in the treatment of materials such as fish liver, copra, olives, or mixts. of fats or oils and other substances such as mineral oils and fuller's earth, fat and hydrogenating catalyst. This treatment promotes the formation of a continuous phase of the oil or fat.

**Wool fat.** I. G. FARBERINDE. A.-G. Brit. 303,890, Jan. 13, 1928. Wool fat is refined by esterifying with an alc. such as MeOH or EtOH in the presence of concd.  $H_2SO_4$  or other suitable inorg. acid. Malodorous substances are thus removed.

**Dry-rendering fatty materials.** W. T. POWLING (to John W. Pittock). U. S. 1,722,015, July 23. In a treatment of material by dry-rendering to produce cracklings which are substantially water-free and which are sepd. by draining from rendered fat, the heated sepd. cracklings are subjected to the action of hot vapor to promote the extn. of their fat content, under pressure and temp. conditions which are substantially inhibitive of condensation of the vapors in the presence of the cracklings. An app. is described.

**Preserving fatty and oily materials.** J. A. S. VAN DEURS. Brit. 303,059, Dec. 27, 1927. Cod livers or other fish livers, herrings or other fish, oleaginous fruits and seeds, etc., are preserved by surrounding them with material having a  $p_H$  of less than 5.

**Fatty acids.** RAYMOND VIDAL. Fr. 33,131, July 23, 1927. Addn. to 633,922. Fats, oils or fatty acids are treated with alkali hypochlorites in the presence of a mineral or org. acid, and the products thus modified are treated with alkali hypochlorites or hypobromites either alone or in the presence of the org. compds. specified in the prior patent. Cf. C. A. 23, 4360.

**Extracting oleaginous grain.** JEAN MOTTE. Fr. 657,687, Dec. 1, 1927. Oleaginous grain is powd. and triturated with water and a solvent for albuminoid material to obtain an emulsion resembling milk, from which insol. substances are removed. The grain should contain sufficient fatty and albuminoid material to give a stable colloidal substance. The emulsion may be sepd. into its constituents in the same way as with milk.

**Pressure-roll apparatus for expressing oil from crushed seeds, etc.** H. NEWALL and CROSFIELD & SONS, LTD. Brit. 303,649, Jan. 5, 1928. Structural features.

**Hydraulic press for extracting oil from seeds or fruit.** DUCHSCHER ET CIE. Brit. 303,498, Jan. 6, 1928. Structural features.

**Apparatus for cooking palm fruits for the extraction of oil.** DUCHSCHER ET CIE. Brit. 303,497, Jan. 6, 1928. Structural features.

**Recovering oil from cottonseed or fish meal or other oleaginous meals.** ROBERT O. BOYKIN (to N. Russell Vail). U. S. 1,721,686, July 23. The meal is freed from moisture sufficiently to render it substantially dry, agitated with  $C_6H_6$  or other suitable water-insol. oil solvent of a sp. gr. not higher than the sp. gr. of the meal, for at least a half hr. and the mixt. is then distributed upon a supporting medium and the soln. of solvent and oil is removed, the meal is washed with fresh solvent and this is sepd. and the oil recovered from the solvent. An app. is described.

**Sulfonated oils.** ERBA A.-G. Fr. 657,799, June 21, 1928. See Brit. 292,574 (C. A. 23, 1520).

**Sulfonated oils.** ERBA A.-G. Fr. 658,094, July 26, 1928. Animal or vegetable fats or fatty acids or hydrocarbons, oils, mineral waxes, etc., are sulfonated in the presence of oxidizing or reducing bleaching agents, and before or after neutralization are given a subsequent bleaching treatment. As bleaching agents, sulfites, hyposulfites, persalts or  $H_2O_2$  may be used. Examples are given. Cf. C. A. 23, 2589.

**Soap production and other chemical reactions.** JACOB W. SPENSLEY. U. S. 1,722,687, July 30. By passing the reacting materials through a mill of the high-speed centrifugal type with intercalating pins mounted on disks, reactions are expedited such as soap manufacture, refining edible oils, manuf. of lubricants and greases, prepn. of



disinfectants from rosin and crude cresols, rosin size manuf., NaOH production from  $\text{Na}_2\text{CO}_3$  and milk of lime, and prepn. of accelerator and compounding mixts. for rubber vulcanization. Numerous details and examples are given and an app. is described.

## 28—SUGAR, STARCH AND GUMS

J. K. DALE

The trend in sugar technology. FR. NOSEK. *Listy Cukrovar* 47, 563-4(1929).

Possible economies in sugar technology. G. PARMA. *Listy Cukrovar* 47, 595 (1929).—Only a portion of the theoretical CaO is added with (0.25-0.30%)  $\text{CaCO}_3$  which yields a firm sediment and decreases the wear of filter cloths. FRANK MARESH

The lowering of the yield in sugar technology and denaturing of sugar. JOSEPH HERNYCH. *Listy Cukrovar* 47, 465-6(1929).—A discussion. FRANK MARESH

Sugar refining season for 1928-29. JAROSLAV MIKOLÁŠEK. *Listy Cukrovar* 47, 479-81(1929).—An av. sample showed: polarization 94.87, moisture 2.21, ash 0.93, org. matter 1.94, sugar according to Clerget = 94.73, CaO 0.020, alky. to phenolphthalein = 0.006, to litmus 0.016, reducing substances 40.1 mg. Cu per 10 g. sample, total N = 0.192. The ash of molasses showed: total  $\text{CO}_3$  = 9.66,  $\text{CaCO}_3$  = 0.72, KCl 0.80,  $\text{K}_2\text{SO}_4$  0.68,  $\text{K}_2\text{CO}_3$  5.74,  $\text{Na}_2\text{CO}_3$  1.47 and  $\text{K}_3\text{PO}_4$  0.25. FRANK MARESH

Amides in sugar refinery products and their relation to the decrease in alkalinity. JIŘÍ VONDRÁK. *Listy Cukrovar* 47, 419-23(1929).—Observations were made on factory juices in 4 mills. At 2 mills in a region of low rainfall a decreasing alky. was observed; at the next 2 the alky. and rainfall were high. Polarization, alky., CaO, total N,  $\text{NH}_3$ , amide N, and N after acid hydrolysis were detd. Diffusion juices from mills in a dry area showed a lower alky and a higher total N (about 50%), than juices from a region of higher rainfall. The amide content was high but alkalinity was low in juices from regions of low rainfall. By hydrolyzing the concn. juices, V. finds that glutamine predominates in juices from beets in the arid area and is present in small amounts in juices from regions of a high rainfall. Asparagine was not found in the hydrolyzates. FRANK MARESH

Indeterminate chemical losses of sugar in refining. M. I. NAKHMANOVICH. *Zhur. Sakharnoi Prom.* 1, 238-46(1927).—Expts. proved that total indeterminate losses are equal to 0.25-0.35%. A rational scheme for the movement of products, lowering of the temp. at certain stations, affination of raw sugars, decrease of amt. of waste water from bone-black filters, etc., will decrease chem. losses in refining. V. E. BAIKOW

Control of losses in the sugar house. AMAURY DOMOULIN. *Bull. assoc. chim. suc. dist.* 46, 218-25(1929).—D. discusses in detail the detn. of losses at various points in the factory and illustrates the calcn. of these losses. The true vol. of the juice from the battery is detd. by multiplying the observed vol. by 0.965 to correct for bubbles in the juice, and making a temp. correction of the vol. to 20° by means of a table given. From the diffusion loss and the av. sugar content of the beets and of the juice, and the true vol. of juice, a good estimate of the amt. of beets worked can be made. Methods for detg. the sol. and total sugar in muds are reviewed. A table is given for recalcul. the sugar content of thin muds to a 50% dry solids basis. Causes for the drop in purity between clarified juice and sirup are reviewed. F. CAMPS-CAMPINS

Microscopic observations on the saturation process. T. BREDT. *Z. Ver. deut. Zuckerind.* 79, 285-315(1929).—Fuchsin-stained photomicrographs are given of 1st satn. juices. Round bodies, slime particles, and crystals of  $\text{CaCO}_3$  are identified. In polarized light some of the round bodies show polarization crosses, while others show a tangled mass of polarization lines: these bodies contain  $\text{CaCO}_3$  crystals. Dry-limed satn. juices gave a similar photomicrograph. Juices with a high content of round bodies filter easily. Classen's observation that dry liming of juice gives a higher initial alky. than the use of milk of lime was confirmed. In both cases during satn., the juice alky.-time curve showed a distinct kink; the point of optimum filterability occurred after different periods of time and at different alkalinities in the two processes. The ability of a juice to settle in a stand glass is in no way connected with the rate of filtration; if the temp. is above 75° a good settling is always obtained but the rate of filtration is indifferently affected. In a factory test, a 1st satn. juice originally treated with 20% satn. juice prior to satn. showed no improved filterability. Slime and jelly particles have been observed in filtered 2nd carbonatation juice which seemed absolutely clear to the eye. It is probable that the addn. of carbonatation juice to the raw juice

prior to satn. helps the settling and gives a better 1st satn. filtered juice. For comparing rate of filtration hot or cold juices may be used provided the different samples are at the same temp. Press cakes have a higher sugar content if  $\text{CH}_3\text{COOH}$  is added beyond the neutral point than if the ordinary  $\text{CH}_3\text{COOH}$  method to neutrality is used; it is assumed that the excess of acid facilitates the diffusion of sugar from the round bodies. The effect of the amt. of  $\text{H}_2\text{O}$  used in digesting the press cake on the polarization of the press cake was studied. It is concluded that along with the process of sugar diffusing from the slime particles (cf. Spengler and Brendel, *C. A.* 23, 3367) there are other phenomena that favor or hinder the detn. of sugar in press cake. Again the rate of diffusion of sugar from the slime particles seems to be greatly retarded at 5%. Various explanations for the formation of the round bodies in the satn. juice are reviewed. F. C.-C.

**The heating of clarified juice under pressure in a juice heater and its proper application.** ERNST THIELEPAPE AND PAUL MEIER. *Z. Ver. deut. Zuckerind.* 79, 316-26 (1929).—The authors' methods for the detn. of the decompn.  $\text{CO}_2$ , carbonate  $\text{CO}_2$ , and bicarbonate  $\text{CO}_2$  are reviewed. The decompn.  $\text{CO}_2$  is formed by the breaking down of org. material accompanying the sucrose. The sugar destroyed is practically nil at 116–120° for the time of heating required in the factory. The greater portion of the  $\text{CO}_2$  is given off at the beginning of the heating. A drop in lime content during heating is explained by the sol. org. lime salts being decompd. and  $\text{CO}_2$  being given off. A table shows the various  $\text{CO}_2$  figures obtained during the 1928 campaign. When the 2nd satn. juices are properly heated the bicarbonate- $\text{CO}_2$  content of the juice should be very small and the decompn.- $\text{CO}_2$  value low. The practical phase of the question is discussed. Pressure heating splits off  $\text{CO}_2$  before the juice reaches the effects; thus the condensate waters from the effects can be used as boiler feed water. Temps of 116–120° further a double decompn. of org. lime salts with alk. carbonate causing  $\text{CaCO}_3$  to sep. In the factory an additional filter was required to remove material from the juice. The heating of the juice may further colloid coagulation. F. C.-C.

**Evaporation of sugar juices in the presence of activated charcoals.** V. SÁZAVSKÝ. *Listy Cukrovar.* 47, 448-9 (1929).—With the exception of some charcoal entering the filtrate, evapn. of sugar juices with the addn. of activated charcoal offered no technological difficulties. FRANK MARESH

**The significance of sampling in sugar analyses.** J. VONDRÁK. *Listy Cukrovar.* 47, 443-8 (1929).—A review. FRANK MARESH

**Diffusion juices from diffusion batteries.** J. SÝKORA. *Listy Cukrovar.* 47, 423-6 (1929).—A technological discussion. FRANK MARESH

**New concepts in diffusion.** KAREL ANDRLÍK. *Listy Cukrovar.* 47, 586-8 (1929). A discussion of colloid concepts in the beet. FRANK MARESH

**Laboratory apparatus for diffusion experiments.** VL. STANĚK. *Listy Cukrovar.* 47, 583-6 (1929).—Š. describes a cutter in which the beets are moved pneumatically over stationary knives. Diffusion cells also are described. FRANK MARESH

**The effect of sediment upon digestion and evaporation of light liquors.** VL. STANĚK AND P. PAVLAS. *Listy Cukrovar.* 47, 427-33 (1929).—The addn. of suspended particles of  $\text{CaCO}_3$  to liquors during digestion and evapn. decreased the amt. of incrustation. The particles of  $\text{CaCO}_3$  formed nuclei upon which other solid particles deposited in preference to the walls of the vessel. Aragonite prepd. by pptg. a Ca salt with  $\text{Na}_2\text{CO}_3$  at b. p. was more effective than the formation of a suspension in the sugar liquor directly. The favorable effect of aragonite was shown in distg.  $\text{H}_2\text{O}$ ; a suspension of 0.01% aragonite altered the compn. of the deposit upon the container; even in water high in  $\text{CaSO}_4$  the sediment was loose, sepd. from the walls spontaneously, and was easily removed by stirring with a rubber-tipped stirring rod. Without the addn. of aragonite a hard adherent crust formed which had to be removed by boiling alternately with  $\text{Na}_2\text{CO}_3$  and dil. acid. The discoloration of beet juices was not considered in this expt. FRANK MARESH

**Denaturing raw sugar.** K. ŠANDERA. *Listy Cukrovar.* 47, 452-6 (1929).—A discussion of methods by which raw sugar may be denatured for human consumption yet remain a food for cattle. Methods for controlling the denaturing process are discussed. FRANK MARESH

**The origin of reducing substances during the heating of an alkaline solution of sucrose and their analytical behavior.** MARIE HERLESOVÁ. *Listy Cukrovar.* 47, 467-72 (1929).—Ten g. of sucrose was dissolved in 50 cc.  $\text{H}_2\text{O}$  and digested with 0.5 g.  $\text{NaOH}$  from 0 to 120 min. The digestion gave rise to decompn. products which reduce Fehling soln., but cannot be invert sugar, for they are not decomposed further in alk. soln. The solns. became deeply colored, but the alky. was not reduced to neu-

trality or acidity. The quantity of reducing substances increased with the time of digestion and attained an equil. after 39 hrs. Only from  $\frac{1}{2}$  to  $\frac{1}{3}$  of the reducing substances are pptd. by Pb acetate, etc. During the refining of sugar, these reducing substances are concd. in the sirups and molasses. They are to be studied further.

FRANK MARESH

**The influence of some nitrogenous substances upon the determination of invert sugar in refinery products.** MARIE HERLESOVÁ. *Listy Cukrovar.* 47, 475-9(1929).—The presence of  $\text{NH}_3$  prevents the pptn. of  $\text{Cu}_2\text{O}$  from Fehling soln. Amides lower the quantity of  $\text{Cu}_2\text{O}$  pptd. and are more effective in this capacity than  $\text{NH}_3$  on a basis of equiv. N content. The decompn. of the amide by alkali is slow and progressive; The purine bases: adenine, guanine, hypoxanthine (in the form of hydrochloride) vernine, xanthine and guanidine were added (in 5 mg.) quantities to 20 mg. of invert sugar, made up to 50 cc., treated with 50 cc. of Fehling soln., boiled 2 min. and titrated. The pptd.  $\text{Cu}_2\text{O}$  was also detd. gravimetrically; the N in the ppt. was detd. All of the above bases caused a decreased pptn. of  $\text{Cu}_2\text{O}$ . Vernine was the most effective, guanidine least. The fraction of N found in the ppt. was: adenine 86%, xanthine 57%, guanine and hypoxanthine 29%, vernine 6% and guanidine 21%. Without invert sugar, blanks showed a N pptn. of 2-6%. The presence of reducing substances is necessary to ppt. Cu-purine compds. All of the purine N is not pptd.; the Cu salts of purine bases are more sol. in the soln. than  $\text{Cu}_2\text{O}$ . Asparagine and glutamine act like purine bases. About  $\frac{1}{4}$  of the purine bases may be adsorbed by activated charcoal, while decompn. products of sucrose in alk. soln. are also removed by this treatment.

FRANK MARESH

**Sugar beet experiments, 1927.** ANON. *J. Dept. Agr. Ireland* 28, 37-66(1929).—The percentages of sugar in a no. of varieties of sugar beets grown for exptl. purposes in Ireland are tabulated.

K. D. JACOB

**The storage of sugar beets.** KAREL ŽERT. *Listy Cukrovar.* 47, 433-4(1929).—Z proposes to increase the capacity of mills by storing beets in large heaps, over refrigerating coils, and maintaining a temp. from ( $1^\circ$  to  $8^\circ$ ) until ready for diffusion.

FRANK MARESH

**Drying of beets and influence upon digestibility.** B. ZIMMERMANN. *Listy Cukrovar.* 47, 436-9(1929).—Beets were sliced and others were hashed and dried in the air. The digestibility of the sliced was from 18.0 to 18.12% higher. The expt. was repeated with beets held at  $0-2^\circ$  and  $5-10^\circ$  during drying, the rate of drying being about  $\frac{1}{2}$  of the normal.

FRANK MARESH

**Effect of the drying of fresh beet cossettes on the content of nitrogenous compounds in the exhausted cossettes.** O. SPENGLER AND W. PAAR. *Z. Ver. deut. Zuckerind.* 1928, 796-800.—A 10 kg. batch of fresh beet slices was divided into 2 equal parts, one of which was dried on trays to a moisture content of 4%, and both were then extd. with hot water in a small battery of 3 glass vessels until the ext. run off contained only 0.4% of solids. The drying of the cossettes was found to have no effect on the amt. of total N or true proteins (precipitable by  $\text{Cu}(\text{OH})_2$  present. Extn. removed 49.8% of the total N and 25.7% of the true proteins from the fresh cossettes, and 42.2% of the total N and only 7.7% of the true proteins from the dried cossettes.

B. C. A.

**Treatment of low-grade beet-sugar products.** V. I. KUZNETZOV. *Zhur. Sakharnoi Prom.* 1, 235-8(1927).—Sugar obtained from the second crystn. (5-6% on wt. of beets) is dissolved in the juice of the second carbonation making  $60^\circ$  Brix and generally treated by one of the 3 following methods: (1) returned to thick juice without treatment; (2) sent to the second carbonation and treated with  $\text{CaO}$  and  $\text{CO}_2$  or (3) mixed with thin or thick sirup and sulfitated. K. made several expts. to det. a convenient method for treatment of this sugar. The remelt ( $16-18^\circ$  Brix) was heated to  $90^\circ$ , limed, defecated and then satd. with  $\text{CO}_2$ . Decrease of color was sufficient, but the purity remained unchanged. In the 3rd method by which the sugar is dissolved in thin sirup to  $60^\circ$  Brix, then heated to  $90^\circ$ , limed to an alky. of 0.06-0.07, sulfitated to an alky. of 0.005, then heated to  $95^\circ$  and filtered, the increase of purity is very slight, but the decrease of the color is 28.3%. Factory expts. verified the lab. results. V. E. B.

**Treatment of low-grade beet products.** G. S. BENIN AND B. F. KRASILSHCHIKOV. *Nauch. Zapiski Sakharnoi Prom.* 8, 73-90(1929).—Expts. were performed to det. the best treatment for remelt and green sirups. Carbonation of the liquors effects little decolorization. Sulfitation of the liquors at  $75^\circ$  gives good results and is advisable. A  $p_{\text{H}}$  of 7.0 for remelts and 6.5 for greens is advisable when liquors are heated at  $75-95^\circ$  during 5-10 hrs. At lower  $p_{\text{H}}$  under the same conditions inversion occurs. At a moderate temp. the  $p_{\text{H}}$  can be lowered to 4.0 without danger of inversion. Decolorization of liquors increases during sulfitation with a drop in  $p_{\text{H}}$ . No increase in surface

## 29—LEATHER AND GLUE

ALLEN ROGERS

**Comparative results of the International Society of Leather Trades Chemists Commission on the international official method of quantitative tannin analysis.** M. BERGMANN, *et al.* *Collegium* 1929, 233-47.—Several steps in the Provisional International Official method (cf. *C. A.* 21, 3139) were investigated. For filling desiccators  $\text{H}_2\text{SO}_4$  and  $\text{P}_2\text{O}_5$  gave approx. the same result for total solids and the wts. did not change overnight; results with  $\text{CaCl}_2$  were 0.5 to 3% high. Evapg. dishes of Ag, steel, half glazed and fully glazed porcelain gave identical results. Extns. of materials were made in the Koch app. to 1 l. and to 2 l. and in the Grasser-Allen app. (*C. A.* 6, 1383). Which method gave more nearly correct results could not be detd. but the 2 latter methods gave more uniform results. Soln. of exts. by the new method was compared with (a) dissolving in 1 l. of boiling  $\text{H}_2\text{O}$ , then heating on the steam bath for 5 min., (b) dissolving in 100 cc. of boiling  $\text{H}_2\text{O}$ , heating on the steam bath 0.5 hr. and then making to 1 l. with boiling  $\text{H}_2\text{O}$ . The new method did not give better results than the others. Moisture (in solid exts.) was the same whether the ext. was moistened with 3 cc. of  $\text{H}_2\text{O}$  before drying or not. Total solubles (total solids) by the Berkefeld candle-filter pump candle-filter tube or paper methods were nearly the same. There was a slight decrease on continued filtration, indicating clogging of the pores in all of the filters. A method proposed by Schmidt is considered promising: 75 cc. of ext. soln. and 1 g. of kaolin are shaken in a closed cylinder, then filtered through an S. & S. 590 folded filter, the filtrate is discarded; this filtration is repeated twice and the third filtrate is saved. Freshly chromed hide powder was compared with 6.25 and 6.5 g. of a ready-chromed powder shaken for 10 and for 15 min. Results with the 2 powders often differed but neither was consistently higher, so a ready-chromed powder should be as serviceable as a freshly chromed one. Changing the quantity of powder or time of shaking had little effect. The filter, old shake and new shake methods for nontannin were compared. The filter method gave the most uniform results. I. D. CLARKE

**Interferometric determination of tannin.** F. ENGLISH. *Collegium* 1929, 109-19. The method for detg. the factor for the instrument and for different tannins is described. This method gives satisfactory results for sol. solids and nontannin and is more rapid than the gravimetric method. I. D. CLARKE

**The determination of insoluble matter in tannin extracts.** C. RIESS. *Collegium* 1929, 103-4.—The method is similar to that of McCandlish and Atkin (*C. A.* 23, 3368). Suction is obtained, not with a pump, but by attaching a 2-mm. tube 1.2 m. long to the stem of the Buchner funnel. I. C. CLARKE

**The tanning properties of dyewood extracts.** H. A. BRECHT. *Collegium* 1929, 186-91.—The similarity in structure and properties of dyewoods and catechol tannins is pointed out. The dye exts. are not used for tanning principally because of the color they impart to the leather and their greater cost. I. D. CLARKE

**The distribution of chromium in one-bath chrome leather.** W. SCHINDLER AND K. KLANFER. *Collegium* 1929, 121-53.—Increasing basicity of the liquor increased the Cr content of both grain and middle splits; below 40% basicity the middle and above 40% the grain split was richer in Cr. Aging was of little importance with 22% basic liquors; with 45% basic liquors it was very important, the grain being richer in Cr with fresh liquors and the middle with aged liquors. The compn., especially pptn. no. and complex-bound  $\text{SO}_4$ , of 45% basic liquors was quite different even when they were prepd. in exactly the same way; the compn. of the leather depended on the compn. of the liquor. The pickle influenced Cr distribution greatly,  $\text{H}_2\text{SO}_4$  affecting principally the grain and formic acid the middle split. Change of Cr concn. (15 to 35 g.  $\text{Cr}_2\text{O}_3$  per l.) had no influence, temp. had considerable influence on Cr distribution. Addn. of soda to the liquor near the end of the tanning period increased the Cr content of the grain greatly but that of the middle very little. I. D. CLARKE

**Coloring leather with nitrocellulose lacquers.** H. ROSE. *Collegium* 1929, 262-4.—To obtain a satisfactory lacquer coating on leather the following points must be observed: the leather must first be dyed to the proper shade; it must be wiped with the diluent to remove fat just before applying the finish; a suitable plasticizer must be added to the lacquer; the spray gun should operate under at least 3 atm. pressure and the compressor should have oil and water separators. Two coats give a better finish but the second coat must be applied while the first is still moist. I. D. CLARKE

**The analysis of artificial leather bates.** II. V. KUBELKA AND J. WAGNER. *Collegium* 1929, 247-62; cf. *C. A.* 23, 1303.—The Kubelka-Wagner method is described in

detail. The following differences between this and the Schneider-Vlcek method are discussed: concn. relations, method of expressing the results, temp. of extg. the bate and influence of ammonium salts. K. and W. do not add a const. quantity of ammonium salts to develop max. activity but consider the salt content as one of the properties of the bate. Diagrams are given of a thermostat, a battery of 10 1-cc. pipets for delivering enzyme soln., water or acetic acid, an automatic pipet for delivering 5 cc. of the casein soln. and a box with light for detecting turbidity in the tubes. I. D. CLARKE

Glue testing. OTTO GERNGROSS. *Collegium* 1929, 119-21, 191-207; cf. C. A. 22, 3315.—See C. A. 23, 1523. I. D. CLARKE

Studies on adsorption and swelling (KUBEKKA, WAGNER) 2.

GRASSER, GEORG: *Handbuch für gerbereichemische Laboratorien*. 3rd ed., revised. Vienna: Verlag von J. Springer. 434 pp. Bound, M. 29.

Depilating carcasses. CHARLES T. WALTER (to Swift & Co.). U. S. 1,721,610, July 23. A mixt. of melted waxy and adhesive substances such as pitch, resin and paraffin is applied and allowed to congeal and then removed with attached hair and extraneous matter.

Tanning. FRANK S. LOW. U. S. 1,723,568, Aug. 6. Anhyd. chromic chloride is used with a metal capable of reducing it such as ferrochrome or Zn. Cf. C. A. 22, 2854.

Tanning. ALLEN ROGERS and ROBERT YUN HUA LEE. U. S. 1,722,594, July 30. Hides are treated with material contg. a simple non-condensed  $\alpha$ -naphthol group in the presence of a labile metal salt such as  $\text{FeCl}_3$  in small proportion.

Tanning. WILLIAM S. SHAW. U. S. 1,722,398, July 30. Hides are treated first with a soln. of relatively low tannin strength and subsequently in a soln. of high tannin strength. The spent soln. from the later stage treatment is treated with a reagent such as a sulfite which converts a portion of the non-tans into tans, and a hide-swelling agent such as lactic acid is added to this soln. and it is then used for the first stage of the treatment.

Condensed aromatic sulfonic acids for use in tanning, as mordants, etc. IAN C. SOMERVILLE (to Rohm & Haas Co.). U. S. 1,722,904, July 30. Use is made of the  $\text{CH}_2\text{O}$  condensation product of iso-Pr naphthalenesulfonic acid or similar compds. in which the radical substituted in the naphthalene is such that the C atom linked to the naphthalene nucleus is further linked to 2 (and 2 only) other C atoms and the fourth linkage is to H. These compds. are tanning agents and may also serve as mordants for certain dyes and as wetting or emulsifying agents or in fat-liquoring.

Dyeing chamois leather. CHEMICAL WORKS, formerly SANDOZ. Brit. 303,523, Jan. 5, 1928. Chamois leather is treated with oxidizing agents and dyed with vat or S dyes, and the dyeings may be finished by an after-treatment in an oxidizing bath such as an alkali dichromate or acidulated nitrite soln. Examples are given.

Belt dressing. ARMAN E. BECKER (to Standard Oil Development Co.). U. S. 1,721,762, July 23. A mineral oil of lubricating grade is used with an oil-sol. "Na sulfonate" and neat's-foot oil. Cf. C. A. 23, 3827.

Agglomerated leather. JOSEPH M. GONNISSEN. Fr. 657,765, July 11, 1928. See Belg. 351,717 (C. A. 23, 2598).

Carboxylic acids (suitable for use as softening agents in nitrocellulose coating compositions) produced by oxidation of petroleum hydrocarbons. ALOX CHEMICAL CORP. Brit. 303,560, Oct. 6, 1927. See Can. 283,892 (C. A. 23, 704).

Coating compositions for making "artificial leather." ALOX CHEMICAL CORP. Brit. 303,566, Oct. 6, 1927. See Can. 283,892 (C. A. 23, 704).

## 30—RUBBER AND ALLIED SUBSTANCES

C. C. DAVIS

The utilization of vulcanized latex (Revultex). L. Sr. *Gummi-Ztg.* 43, 2325-6 (1929).—The chief disadvantages of dried vulcanized latex are its tendency to adsorb water and to swell in org. solvents. After contact with water, films of dried vulcanized latex are easily disintegrated by rubbing. Quant. tests, in which films of Revultex [prepd. 2 mm. thick by drying at 45-50° and then over  $\text{H}_2\text{SO}_4$  to const. wt.] were swelled in water at 16.5-18.0° and the progressive increases in wt. during a period of 640 min.

detd. are described. During the early stages adsorption was relatively rapid, *e. g.*, 6.8% after 90 min., while after 640 min. it was 12.5% and had not reached a max. C. C. DAVIS

**Report on the effect of different dilutions of latex and strengths of coagulant on the plasticity, vulcanizing and mechanical properties of rubber.** ANON. *Trop. Agr. (Ceylon)* 71, 36-9(1928).—Two sets of thin crepe were prepared from latex contg. 15 and 30% dry rubber, with varying proportions of AcOH, HCO<sub>2</sub>H and Na<sub>2</sub>SiF<sub>6</sub>. Plasticity and vulcanization tests were made at the Imperial Inst. 6 mos. later. The results indicate that varying the concn. of the coagulant does not cause variation in plasticity or in vulcanizing and mech. properties. A. L. MEHRING

**Time and temperature-plasticity relations for crude rubber as measured with the Goodrich plastometer.** E. O. DIETERICH. *Ind. Eng. Chem.* 21, 768-70(1929).—Quant data are presented to show the applicability of the Karrer plastometer (*cf. C. A.* 23, 4106) to raw rubber and to uncured rubber mixts., including the relative plasticities at 100° of different types of rubber after different periods of mastication, the relative plasticities of batches of pale crepe of different sizes at 100° after different periods of mastication, and the relative plasticities of masticated smoked sheets at various temps. (the temp. coeff.). C. C. DAVIS

**The stretching and contracting of rubber lamella, the critical slipping temperature and its shifting by admixture.** M. KRÖGER AND WAN-NIEN YAO. *Z. Elektrochem.* 35, 358-62(1929).—It is shown that the unhindered inflation of rubber membranes to an approx. sphere represents a deformation especially favored by slipping. The energy increase in the case of the unhindered expansion of a sphere is as great as in longitudinal expansion. In spite of the difference of the outer deformation, the mol. processes accompanying the deformation are the same. The optical behavior also shows this. A crit. slipping temp. is obtained, which is shifted to a higher temp. by admixt. This gives a quant. measure of the "activity" of the added substance. R. I. RUSH

**Early experiments with stearic acid in rubber compounding.** W. F. RUSSELL. *Ind. Eng. Chem.* 21, 727-9(1929).—See U. S. patent 1,467,197 (*cf. C. A.* 17, 3808, 3809). C. C. DAVIS

**Stearic and oleic acids as rubber-compounding ingredients.** R. P. DINSMORE. *Ind. Eng. Chem.* 21, 722-3(1929).—The expts. which are described show the relative effects of stearic acid and of oleic acid in representative rubber mixts., the influence of stearic acid on chem. and phys. vulcanization, and the different effects obtained with different accelerators. The most important function of stearic acid is to convert ZnO to a form which will react with the accelerator, aside from which it acts as a softener and as a retarder of chem. and phys. vulcanization. C. C. DAVIS

**Effect of stearic acid on various crude rubbers.** E. W. FULLER. *Ind. Eng. Chem.* 21, 723-5(1929).—Since the total acid content of a rubber mixt. has considerable influence on the phys. properties of the cured mixt., uniform quality cannot be obtained by the addn. of a const. porportion of stearic acid, because the stearic acid content of the raw rubber varies. Data show the phys. properties of different types of rubber mixts. contg. rubber with different total acid contents (detd. by the method of Whitby and Evans (*cf. C. A.* 22, 3064), with and without the addn. of stearic acid. The effect depended not only upon the type of rubber, *i. e.*, upon the quantity of stearic acid furnished by the rubber, but also upon the other ingredients, particularly upon the accelerator. There is probably a well-defined state of acidity for each accelerator, and perhaps in turn for each combination of accelerator and other ingredients, which gives the best phys. properties of the resulting vulcanizates. This shows the importance of allowing for the natural acid content of the raw rubber in formulating mixts. which are to contain any desired proportion of stearic acid. C. C. DAVIS

**Stearic acid in lithargy-cured rubber compounds.** J. R. SHEPPARD. *Ind. Eng. Chem.* 21, 732-8(1929).—Expts. on the curing of different rubber mixts. with PbO under various conditions are described, and the quant. results are shown in graphs and tables. Though an org. acid is essential to vulcanization with PbO, smoked sheets usually contain a large enough proportion of natural org. acids for full activation. Rubber mixts. contg. PbO, mercaptobenzothiazole and gas black, of the character of tire treads, showed high tensile strengths over a wide range of cures, whether or not stearic acid was present. C. C. DAVIS

**Effect of stearic acid on reclaimed rubber.** H. A. WINKELMANN AND E. B. BUSENBURG. *Ind. Eng. Chem.* 21, 730-2(1929).—Expts. are described which show the effect of stearic acid (1) in the heating process of the manuf. of reclaimed rubber; (2) as a plasticizing agent during the milling and refining of reclaimed rubber, and (3) on the properties of vulcanized rubber mixts. contg. reclaimed rubber. Stearic acid is far less effective than other softeners in its plasticizing action on vulcanized rubber scrap during

devulcanization (in the alkali process because of its conversion into soap). On the other hand when added to devulcanized rubber on mills previous to the refining operation, it has a very beneficial effect by increasing the plasticity, by improving the tubing and calendering properties of mixts. contg. the reclaimed rubber, by reducing the "nerve" without producing tackiness, by improving molding properties, and by promoting the dispersion of fillers or pigments, thus improving the phys. properties of vulcanizates contg. the reclaim. In rubber mixts. contg. reclaimed rubber, stearic acid improves the vulcanization, diminishes the tendency to "blow" from reversion, and activates the acceleration with mercaptobenzothiazole.

C. C. DAVIS

**Effect of increased quantities of stearic acid on tread abrasions.** C. OLIN NORTH. *Ind. Eng. Chem.* **21**, 725-6 (1929).—The tensile strength and modulus at 300% elongation diminished progressively with increase in stearic acid, but the resistance to abrasion was greatest at 10-15% stearic acid and was greater with 30% stearic acid than with 2% stearic acid. A similar series with paraffin in place of stearic acid gave much the same results, showing that on the Graselli abrasion app. (cf. Williams, *C. A.* **21**, 2573) stearic acid has a lubricating action which renders a direct comparison with service on the road highly misleading.

C. C. DAVIS

**Adsorption of stearic acid by carbon.** J. T. BLAKE. *Ind. Eng. Chem.* **21**, 718-9 (1929).—The theory of pigment reinforcement previously advanced (cf. *C. A.* **22**, 4876) is discussed further from a different point of view. Phys.-chem. calcs. based upon the assumption that the adsorbed mols. are dipoles and are adsorbed with a definite orientation indicate the validity of the theory, and that the dispersing agent is oriented on the surface of the filler particle. The center of the dipole axis is 4.2 Å. U. from the surface of the filler, and since this is only 20% of the length of a stearic acid mol., the  $\text{CO}_2\text{H}$  group is the chief contributor to its dipole moment. The mechanism of the dispersion of fillers other than C black should be essentially the same. The theory explains the importance of fatty acids in the dispersion of pigments like C black in rubber. Discussion. C. R. BOGGS. *Ibid* 719.—A reinforcing pigment which is an elec. non-conductor is needed in the rubber industry for rubber insulation. There is also lacking a lab. test to det. the behavior of a filler or pigment in rubber, and particularly to det. the action of dispersing agents. Deflocculation of a kerosene paste of the substance by dispersing agents does not give comparable results.

C. C. DAVIS

Nature, manufacture and general use of stearic acid (CRANOR) **27**. Cracking natural gas (YUNKER) **21**. A root growth experiment with *Hevea* (BERTRAND) **15**. Adhesive containing rubber latex (U. S. pat. 1,722,553) **18**. Soap production [Preparation of accelerator and compounding mixtures for vulcanization] (U. S. pat. 1,722,687) **27**. Spray desiccation of latex (Brit. pat. 303,576) **1**.

**Rubber.** THE ANODE RUBBER CO. (ENGLAND), LTD. (Robert F. McKay and Wilfred H. Chapman, applicants in England). Fr. 657,611, July 17, 1928. Rubber, etc., sheets or coated or impregnated fabrics are made by obtaining a creamy deposit electrophoretically on a drum, etc., drying and removing. The aq. dispersion used preferably includes a protective colloid such as casein or gelatin in amt. greater than formerly used.

**Rubber.** I. G. FARRENIND. A.-G. Fr. 657,584, July 17, 1928. Rubber is pptd. from its latex by mixing it rapidly with acid, e. g., HCl of such concn. that the  $p_H$  value of the mixt. is less than 2 and preferably less than 1. Substances which lower the surface tension may be added after the acid treatment.

**Treating rubber latex.** AKTIEBOLAGET SEPARATOR. Brit. 303,895, Jan. 13, 1928. The liquid poor in rubber obtained by dividing latex into 2 portions by centrifuging is centrifuged again to remove impurities before coagulating the rubber.

**Electrodeposition of rubber from latex.** S. O. COWPER-COLES. Brit. 303,214, Oct. 3, 1927. An app. is described having a perforated cathode arranged so as to permit any gas generated to escape through the perforations. Various structural details are described. Cf. *C. A.* **23**, 1309.

**Electrodeposition of rubber together with sulfur.** SAMUEL E. SHEPPARD and LEON W. EBERLIN (to American Anode, Inc.). U. S. 1,723,083, Aug. 6. Deposition is effected, from an admixture of a colloidal dispersion of S and an alk. aq. emulsion of unvulcanized rubber, in the form of droplets.

**Electric deposition of rubber.** IMPERIAL CHEMICAL INDUSTRIES, LTD., A. J. HAILWOOD, W. J. S. NAUNTON and A. SHEPHERDSON. Brit. 303,564, Oct. 7, 1927. In elec. deposition of rubber or the like from an aq. emulsion, there is added to the emulsion used an org. compd. adapted to form on oxidation at the anode a vulcanization accelerator.

Na diethyldithiocarbamate, hydroquinone or a dimercaptan may be used. Leuco vat dyes, and other modifying ingredients also may be added.

**Rubber deposition.** DUNLOP RUBBER CO., LTD. and W. H. PAULL. Brit. 303,765, Oct. 7, 1927. Material for shoe soles or heels, tire treads, etc., is formed by electrophoresis or dipping from latex admixed with a viscose or oxycellulose soln., with fillers, vulcanizing agents, etc.

**Rubber deposition.** THE ANODE RUBBER CO. (ENGLAND), LTD. Fr. 657,948, July 21, 1928. In the electrophoretic deposition of rubber or like substances from aq. dispersions, the dispersion is treated in such a way that the particles have a pos charge, after which the deposition is carried out on a support mounted at the cathode.  $H_2SO_4$  or  $AcOH$  may be used, and the H liberated may be fixed by using a cathode having an oxidizing action or by adding oxidizing substances to the dispersion.

**Rubber tubing.** DUNLOP RUBBER CO., LTD., D. F. TWISS and E. A. MURPHY. Brit. 303,546, Oct. 5, 1927. A core is passed (several times if desired) through an aq dispersion of rubber, the coating is dried on the core, and the core may then be sepd from the tubing formed by use of compressed air. Various details are given.

**Mixing machine for treating rubber, etc.** RICHARD C. LEWIS (to Farrel-Birmingham Co.). U. S. 1,721,962, July 23. Structural features.

**Rubber facings on various surfaces.** L. P. F. F. CRESSON. Brit. 303,400, Sept 2, 1927. In applying rubber facings to cement or concrete floors, walls, table tops, etc., an excess of S above that required to form hard rubber is provided either in the base or in the rubber, so that a polysulfide is formed which permeates the interfacial surfaces and firmly unites the rubber to the cement. The cement may be mixed with various fibrous materials and the process is also applicable to materials such as felt or woven fabric impregnated with cement. Various details are given.

**Freeing rubber deposits from water.** DUNLOP RUBBER CO., LTD., E. A. MURPHY and D. F. TWISS. Brit. 303,544, Oct. 5, 1927. Various rubber deposits produced from either natural or artificial dispersions are treated, for removal of water, with a soln. of a salt or mixt. of salts such as  $NaCl$ ,  $NH_4Cl$ ,  $NH_4OAc$ ,  $CaCl_2$ , alums or  $MgSO_4$ , with or without an acid such as  $HOAc$  or mixt. of acids or with fused substances which m below  $100^\circ$  such as  $NaOAc$  or  $Na_2S_2O_3$ , acetamide, or  $NH_4$  acetate or formate. Dehydration is effected by continuous penetrative osmotic action. Insol. or gelatinous thickening agents, etc., may be added to the solns.

**Transparent vulcanized rubber.** DUNLOP RUBBER CO., LTD., D. F. TWISS and E. A. MURPHY. Brit. 303,545, Oct. 5, 1927. Transparent vulcanized rubber is obtained without the use of a Zn activator by forming a deposit by electrophoretic or chem means, or by dipping, spreading, coating, molding or extrusion from natural latex (which may be concd. in various specified ways) with addn. of S and of an "ultra accelerator" such as Zn dialkyldithiocarbamate, Zn piperidine carbothionolate or a Zn alkyl xanthate, with or without various stabilizing and softening agents, etc. The product may be vulcanized in boiling water or in a hot soln. of  $CaCl_2$  or  $NH_4OAc$  used for removing water as described in Brit. 303,544 (cf. preceding abstr.) and is finally treated in a 10% boiling  $NaOH$  soln. to remove free S and accelerator.

**Rubber vulcanization accelerators.** IMPERIAL CHEMICAL INDUSTRIES, LTD, W. J. S. NAUNTON and J. B. PAYMAN. Brit. 303,535, Aug. 31, 1927. Dithiocarbamates and thiuram sulfides of morpholine and its C-substituted derivs. which serve as accelerators are formed by treating morpholine or its C-substituted derivs. with  $CS_2$ . Examples are given of the production of Zn morphyldithiocarbamate, morpholine morphyldithiocarbamate, dimorphylthiuram disulfide, dimorphylthiuram monosulfide and dimorphylthiuram "tetrasulfide."

**Vulcanization accelerators.** AMERICAN CYANAMID CO. Fr. 657,807, July 18, 1928. Vulcanization accelerators are obtained by heating org. compds. contg. O with S and P. The S and P may be combined as  $P_2S_4$ , and the org. compds. may be of the aliphatic or aromatic series, preferably contg. OH groups such as  $BuOH$  or  $AmOH$ . Better results are obtained if a metallic oxide and a N compd. such as guanidine are also added. The reaction products are probably dithiophosphates.

**Vulcanizing and preserving rubber.** J. TEPPEMA (to Goodyear Tire & Rubber Co.). Brit. 303,827, Jan. 10, 1928. Reaction products of mercaptothiazoles with nitroso compds. (such as the reaction products of mercaptobenzothiazole with nitrosodimethyl-aniline or with nitrosonaphthol) are used as vulcanization accelerators and also serve to improve "aging qualities." Cf. C. A. 23, 4376.

**Timing and recording devices, etc., for rubber molding and vulcanizing apparatus.** DUNLOP RUBBER CO., LTD., H. WILLSHAW, W. A. DAVIS and H. SMITH. Brit. 303,075, Aug. 22, 1927. Structural features.



# CHEMICAL ABSTRACTS

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## 1—APPARATUS AND PLANT EQUIPMENT

W. L. BADGER

Chemical apparatus and chemical processes at the 1929 Berlin "Gas and Water" exposition. ALBERT SANDER. *Chem. Fabrik* 1929, 331-3, 343-5. J. H. M.

Review of the development of industrial dust-collecting equipment. OTTO SCHOTT. *Zement* 18, 666-9(1929). H. F. KRIEGE

Methods and apparatus used in the cryogenic laboratory. XXII. A cryostat for temperatures below 1° K. W. H. KEESOM. *Proc. Acad. Sci. Amsterdam* 32, 710-4 (1929). E. H.

Mechanical handling of materials in and about the chemical plant. III. Other types of conveyors and mechanical handling equipment. A. K. BURDITT AND W. F. SCHAPHORST. *Ind. Eng. Chem.* 21, 844-50(1929); cf. *C. A.* 23, 3829. E. H.

A laboratory heater. L. J. N. MOTHERSILL. *Chemist-Analyst* 18, 17(1929).—The conversion of an elec. toaster into a lab. heater is described. W. T. H.

Laboratory generator for making hypochlorite. RALPH E. GOODE. *Chemist Analyst* 18, 18(1929).—Connect 3 Woulfe bottles in series and generate  $\text{Cl}_2$  in the first one by adding concd.  $\text{HCl}$  through a thistle tube to solid  $\text{KMnO}_4$  in the bottle. The evolved  $\text{Cl}_2$  passes into warm water in the second bottle to remove  $\text{HCl}$  and thence to the third bottle contg.  $\text{NaOH}$  soln. The last bottle has a relief valve to control the pressure. W. T. H.

An acid digester. HERMANN YAGODA. *Chemist-Analyst* 18, 18(1929).—A dish of cold water is recommended as a cover for the beaker contg. the heated acid so that the loss by evapn. is reduced to a min. W. T. H.

Handy cork gage. RAYMOND B. WAILES. *Chemist-Analyst* 18, 20(1929).—The use of a string of numbered corks is recommended. W. T. H.

A simple constant-level indicator. C. W. EDDY. *Chemist-Analyst* 18, 20(1929).—A simple arrangement for keeping the water level const. in a water bath is described. W. T. H.

Wash bottles for special purposes. HERMANN YAGODA. *Chemist-Analyst* 18, 21(1929).—A wash bottle head is placed in a test tube. Instead of blowing into the test tube through the usual tubing, a side-arm test tube can be used, connected with the reservoir of wash liquid. By raising or lowering the tube, the wash liquid is forced out or the flow is stopped. W. T. H.

A simple percolator. J. M. D. BROWN. *Chemist-Analyst* 18, 22(1929).—A 20-mesh brass screen is suspended in a beaker and the substance to be treated with solvent is placed on the screen. W. T. H.

Improvement in apparatus for the determination of total fatty acids in soap stock. E. MARTIN. *Chemist-Analyst* 18, 22(1929).—Provide an ordinary stopcock at the bottom of the flask for draining off the water and excess acids when the fatty acids have been liberated from soap stock. W. T. H.

To remove grease from a buret tip. C. J. SCHOLLENBERGER. *Chemist-Analyst* 18, 15-6(1929).—If stopcock lubricant gets into the tip of the buret during a titration and thus dams the flow of liquid, heat the tip somewhat with the flame of a match and let the soln. run quickly into the titrated soln. W. T. H.

Improved differential dilatometer. MAX HAAS AND DENZO UNO. *J. Inst. Metals*, Advance copy, No. 504, 5 pp.(1929).—The accuracy of Chevenard's optical differential-dilatometer has been improved by mounting the app. on a triangular rail, by using one dilatometer tube instead of two, and by replacing the spring that holds the mirror by a magnet coil arrangement. Provision is also made for working in any special atm. and for sketching purposes. M. C. ROGERS

Apparatus for gasometric determinations in technical analysis. J. HÜBSCHER. *Süddeut. Apoth. Ztg.* 68, 447-8(1928). H. L. D.

**New apparatus for electrolytic analysis.** HENRY J. S. SAND. *Analyst* 54, 275-82 (1929).—The designs now submitted are distinct improvements over those previously devised by S. with respect to economy in the use of Pt. The outer electrode surrounds the inner one everywhere except at the bottom, which is to be placed near the bottom of the beaker contg. electrolyte. The stem of the inner electrode revolves inside a quartz glass guide-tube, which forms an integral part of the outer electrode, thus insuring good alignment even when there is but slight clearance between the 2 electrodes. The 2 electrodes can be removed together without danger of a short circuit. Both electrodes are usually mounted on quartz glass frames, or on frames of rubber and glass. A rotating anode is also described, which is designed to be used with a revolving partition consisting of a parchment thimble. The original paper should be consulted regarding further features concerning these excellent and very practical designs. W. T. H.

**Low-pressure gas apparatus for temperatures up to 1000°.** H. R. HEMS. *Gas World* 91, No. 2346; *Ind. Gas Suppl.* 1, No. 10, 9-12(1929).—The design and advantages of 3 types of gas furnace (direct-fired, semi-recuperative and recuperative) are discussed. The direct-fired furnace is satisfactory for the majority of heat treatments requiring temps. up to 1000°. The semi-recuperative type is more economical for long-day or continuous working. The recuperative furnace is generally of more massive construction and will enable maintenance of 900-1000° under varying working conditions more economically than is possible with the other types and will maintain 1500° evenly over comparatively large areas without the introduction of air under pressure. J. B. C. JR.

**An improved stopcock for gas analysis burets.** WARD E. KUENTZEL. *J. Am. Chem. Soc.* 51, 2759-60(1929). E. H.

**Sampler for granular substances.** I BRIL. *Masloboino-Zhirovoe Delo* 1928, No. 7, 4-5. V. KALICHEVSKY

**New apparatus for softening-point determinations.** FISHER SCIENTIFIC CO. *Instruments* 2, 277-8(1929). E. H.

**A continuous circulator for a corrosion test or continuous filter.** J. M. D. BROWN. *Chemist-Analyst* 18, 16-17(1929).—From the side tube of a 2-l. percolator, liquid falls by gravity into a vessel placed below, where, as soon as it reaches a definite height, it is aspirated up into an inverted suction flask from which it falls again into the percolator. The uptake tube should be of 8 mm. inside diam., the air outlet 8 mm., the return tube 5 mm. and the overflow tube 4 mm. for the best results. W. T. H.

**Making stoneware cocks safe.** O. STEGMEYER. *Chem. Fabrik* 1929, 361.—A device is described for reducing the danger of breakage when manipulating cocks J. H. MOORE

**A rugged type of calomel electrode vessel.** L. V. SORG. *Cereal Chemistry* 6, 344-6(1929).—Photograph and drawing show the construction. The vessel is made of 2 pieces of pyrex tubing, one of larger diam. than the other. One end of the larger tubing is drawn down to the size of the smaller tubing and sealed to it. L. H. B.

**Venturi meters and standing wave flumes.** C. C. INGLIS. *Eng. News-Record* 103, 112(1929). R. E. THOMPSON

**A nitrometer without rubber hose for semi-microchemical work.** E. BERL, K. HOFMANN AND R. BREMMANN. *Chem. Fabrik* 1929, 359-60.—Description of the app. and directions for operating, with 6 cuts and a table of results, which are within about 1% of the theoretical. J. H. MOORE

**An electron-tube potentiometer for the determination of  $p_H$  with the glass electrode.** WM. C. STADIE. *J. Biol. Chem.* 83, 477-92(1929).—A null method for the measurement of the e. m. f. of glass electrodes, with an electron-tube potentiometer, is described. The app. is free from electrostatic disturbances, and in measuring e. m. f. through resistance of 20 to 600 megohms its sensitivity is 1 to 4 mm. of deflection per 0.001 v. ARTHUR GROLLMAN

**A two-circle x-ray spectrometer.** W. A. WOOSTER. *Trans. Faraday Soc.* 25, 401-2(1929).—This instrument bears the same relation to the Bragg spectrometer as does the two-circle to the one-circle goniometer. It consists, in addn. to the usual slits and crystal holder, of a small combined ionization chamber and electrometer, mounted on a vertical circle, which in turn is carried on the horizontal circle. A platinized piece of mica replaces the usual gold leaf in the electroscope, whereby the rigid mica acts as a mirror to reflect a light beam and thus largely magnify the movement of the leaf. H. W. WALKER

**Registering spectrometer for the infra-red.** P. LAMBERT AND J. LECOMTE. *Compt. rend.* 189, 156-8(1929).—The spectrometer consists of 2 prisms of rock salt. One is fixed and the other movable around a vertical axis on which is also a mirror and a thermoelec. cell. The rays are made parallel by a concave mirror, pass through the prisms

and are connected by the concave mirror connected with the axis on the thermocouple. The thermocouple is connected with a galvanometer. The sensitive paper on which the movement of the galvanometer is registered is moved by an elec. motor. The axis in the first part of the app. is connected with the motor. E. SCHOTTE

Selecting a viscometer an interesting problem. C. E. FAWKES. *Paint, Oil & Chem. Rev.* 88, No. 8, 12(1929).—A brief review of the principle types of viscometers with 51 references. G. G. SWARD

Capsule for incinerating (organic materials). KÖNIG. *Chem.-Ztg.* 43, 130(1929).—The ordinary small porcelain capsule is provided with an outside flange so as to permit the operator to grip it with the crucible tongs without danger of touching the contents of the capsule. B. C. A.

The Dufton column and its use in preparing anhydrous alcohol. K. PETRÍK. *Chem. Listy* 23, 193–5(1929).—The column consists of a core, closed at both ends, made of Cu with an internal diam. 21 mm., and wound with a Cu spiral wire 6.5 mm. thick. The length of the wave of the helix is 20 mm. The core is inserted into a Cu tube 1400 mm. long, 35 mm. internal diam., which connects the boiler with the dephlegmator. The boiler is 300 mm. in diam. and 300 mm. high and is heated indirectly by steam through Cu tubing—a manometer tube 6–8 mm. internal diam. suffices. The dephlegmator has a diam 100 mm., a height 300 mm. and contains a hose for water. The dephlegmator also contains a screen shaped like a cone upon which anhyd.  $\text{CaCl}_2$  (granulated) may be poured. A glass tube is attached to the 2 nipples protruding from the column. The distg. vapors are condensed. FRANK MARESH

Thermostat. M. MATSUI, S. OGURI, S. KAMBARA AND K. KATO. *J. Soc. Chem. Ind., Japan* 32, 360–467(1929); Suppl. Binding 32, 108B(1929).—Each part of the water thermostat, i. e., bath, elec. heater, thermoregulator, relay, etc., was examd. in detail. A water thermostat covered with a wooden box and constructed carefully worked automatically with an accuracy of  $\pm 0.002^\circ$ . KOBAYASHI

#### Carrying out investigations at high temperatures (COHN) 2.

Cover for laboratory crucible. STAATLICHE PORZELLAN-MANUFAKTUR. Ger. 478,891, Nov. 27, 1926. The cover is dish-shaped with a pair of diametrically opposite notches.

Crucible for analytical use. JOHN D. M. SMITH and WM. J. GEORGE. Ger. 478,890, June 6, 1926. The cover has notches and fits within the crucible.

Thermometer suitable for remote positioning. FRANKLIN W. SPRINGER (to Motometer Co.). U. S. 1,724,528, Aug. 13. Structural features.

Thermometer for measuring the temperatures of flat or curved surfaces. SIEMENS & HALSKE A.-G. Brit. 304,556, June 5, 1928. Structural features.

Viscometer (with coaxial cylinders or disks). F. YACCO SOC. ANON. Brit. 305,242, Feb. 3, 1928. Structural features.

Filters. WILHELM MAUSS. Ger. 478,794, Jan. 18, 1927. A device is described for washing the cakes of a rotary drum filter.

One-piece laboratory suction filter. STAATLICHE PORZELLAN-MANUFAKTUR. (Gerhard Müller, inventor). Ger. 479,489, Feb. 14, 1926.

Laboratory suction filter of adjustable capacity. STAATLICHE PORZELLAN-MANUFAKTUR. (Alfred König and Gerhard Müller, inventors). Ger. 479,488, Jan. 20, 1926.

Filter and thickener. ERNEST J. SWEETLAND (to Oliver United Filters, Inc.). U. S. 1,724,436, Aug. 13. Structural features.

Filter for separating condensate and dirt from compressed air or other fluids. SIDNEY C. PARKER. U. S. 1,725,474, Aug. 20. Structural features.

Sand filter and flushing system for cleaning the filter. BAMAG-MEQUIN A.-G. Brit. 304,967, Feb. 20, 1928. Structural features.

Centrifugal filter suitable for treating continuous filtrations. CHARLES G. HAWLEY (to Centrifix Corp.). U. S. 1,725,712, Aug. 20. Structural features.

Fabric for filtering. VAL. MEHLER SEGELTUCHWEBEREI A.-G. Ger. 478,983, May 1, 1925. A fabric for filtering finely divided materials is prepd. by treating the surface with ammoniacal  $\text{CuO}$ , weak acid and washing with water.

Centrifugal separator. BERGEDORFER EISENWERK A.-G. Ger. 479,259, Aug. 5, 1923.

Centrifugal apparatus for separating solid particles from gases. C. H. CRAGO and A. E. HAMILTON. Brit. 304,952, March 26, 1928. Structural features.

Device for gravity separation of liquids such as benzene and water. W. LINN-MANN. Brit. 304,595, Jan. 21, 1928. A device with a float-controlled outlet is described.

**Pervious table, etc., for separating solid materials.** K. C. APPLEYARD, P. W. BEWICKS, J. F. LAYCOCK, M. R. PORTALL and W. E. MANNERS. Brit. 305,608, Nov. 5, 1927. Structural features.

**Distillation apparatus.** C. W. STRATFORD. Brit. 305,205, Feb. 2, 1928. Liquids to be heated, vaporized or distd. are discharged in jets at high velocity onto the surface of flues heated internally by burners. Various structural details of the app. are described.

**Bubble still or scrubber.** CARL F. BRAUN. U. S. 1,725,052, Aug. 20. Structural features.

**Fractionating ring suitable for use in fractionating or scrubbing columns.** ROBERT H. VAN SCHAAK, JR. U. S. 1,725,429, Aug. 20. Fractionating rings are made of sheet metal or ceramic material in cylindrical form with a diametrical partition extending entirely across the cylinder.

**Drying and distillation head for generators, etc.** FRANKFURTER GAS GES. and ERNST SCHUMACHER. Ger. 479,180, Oct. 22, 1925. Addn. to 455,365.

**Lixiviation apparatus.** W. H. CAMPBELL. Brit. 304,387, Oct. 25, 1927. Structural features.

**Rotary screw stirrer.** THE PFAUDLER CO. Ger. 479,103, Jan. 20, 1928.

**Apparatus (beater) for dispersing amorphous aggregates in liquids.** W. H. WHATMOUGH. Brit. 304,178, Oct. 14, 1927. Structural features.

**Mixing or emulsifying apparatus, especially for viscous liquids.** OTTO J. BUDTZ. Ger. 479,281, Sept. 7, 1928.

**Rotary-vane apparatus for mixing liquids with liquids or solids.** JOHN G. Y. DELMAR-MORGAN. Ger. 479,160, Mar. 31, 1927.

**Evaporator (with steam heating tubes) for treating sugar or salt solutions, etc.** W. RUSIECKI. Brit. 304,670, Jan. 23, 1928.

**Container for pasteurizing apparatus with overflow device.** GEBRÜDER SCHAFFLER. Ger. 478,539, June 10, 1927.

**Multi-chambered apparatus for pasteurizing milk or other liquids.** H. HOLTE. Brit. 304,473, Jan. 21, 1928. Various structural features are described.

**Light-sensitive cells.** A. JOFFE. Brit. 304,132, Jan. 14, 1928. The dielectric used may be formed of: (1) linseed-oil varnish and its oxidation product, or (2) mica and glass or porcelain, or (3) metallic or other conducting or semi-conducting material interleaved with insulating material.

**Light-sensitive cell and relay system for control of apparatus.** L. N. CRITCHON (to Metropolitan-Vickers Electrical Co., Ltd.). Brit. 304,211, Jan. 16, 1928. Elec. features.

**Light measurement by electrolytic action of a light-controlled electric current.** LEWIS R. KOLLER (to General Elec. Co.). U. S. 1,725,651, Aug. 20. An app. is described.

**Shaft furnace.** BRUNO BECK. Ger. 478,838, Nov. 29, 1927. Details of loading are described.

**Shaft furnace.** SÜDDEUTSCHE WAGGONFABRIK G. M. B. H. & Co. KOMM.-GES. Ger. 478,839, July 15, 1927. Details of tapping are given.

**Rotary tube furnace with two or more coaxial cooling drums.** AMME-LUTHER WERKE BRAUNSCHWEIG DER "MIAG" MÜHLENBAU UND INDUSTRIE A.-G. Ger. 479,326, Feb. 1, 1927.

**Soaking-pit furnace.** SAMUEL G. WORTON. U. S. 1,724,058, Aug. 13. Structural features.

**Tunnel furnace.** EESTI PATENDI AKTSIASELT. Brit. 304,238, Jan. 17, 1928. Structural features.

**Coal-dust furnace.** CURT HARTMANN. Ger. 477,960, Mar. 25, 1927. A device for regulating the supply of coal dust is described.

**Coal-dust furnace.** ERNST JÜRGES. Ger. 479,000, Sept. 23, 1924. Details of construction and operation are given.

**Coal-dust burner for regenerative furnaces, etc.** GOTTFRIED KEHREN. Ger. 479,087, Aug. 7, 1926.

**Coal-dust furnace.** KOHLENSCHIEDUNGS-G. M. B. H. Ger. 477,961, Oct. 26, 1924. Details of arrangement are given.

**Fuel-dust furnace with manifold fire tubes.** CARL HOLD. Ger. 478,547, June 17, 1927.

**Gas-fired furnaces.** MAX NUSS. Ger. 479,086, Jan. 20, 1925. A combustion chamber coaxial with the burner is arranged between the burner and the heating space.

**Reversible regenerator for furnaces.** W. DYSSSEN (to Milliken Bros. & Blaw-

Knox, Ltd.). Brit. 304,755, Jan. 26, 1928. Regenerator chambers contain banks of heat-exchanging material of different heat-resisting qualities; at the hotter end sheets of high Cr steel may be used and at the other portions steel with less Cr or ordinary steel. Numerous structural details are described.

A device for automatically regulating the supply of fuel to furnaces. SIEMENS & HALSKE A.-G. (Max Ulrich Büchting, inventor). Ger. 478,957, July 9, 1927.

Loading device for shaft furnace. ERNST KNÖRINGER and KARL WOLSKY. Ger. 478,532, Apr. 22, 1928.

Mechanical furnace-regulating device for steam boilers. SIEMENS-SCHUCKERT-WERKE A.-G. (Ferdinand Köhler, inventor). Ger. 478,548, Nov. 16, 1926.

Furnace cover. BERNHARD VERVOORT. Ger. 478,743, Mar. 29, 1928. Details are given.

An adjustable cover for the fire chamber of furnaces. ALBERT REPPMAN. Ger. 477,986, May 9, 1928. A description is given.

A traveling-grate furnace. WALTHER & CIE. A.-G. Ger. 478,741, Nov. 9, 1926.

A traveling-grate furnace for moist fuel such as peat is described.

Furnace roof construction with cooling fins and pipes for circulating water. JOHN D. MACKENZIE and RICHARD W. SINGER (to American Smelting & Refining Co.). U. S. 1,724,098, Aug. 13. A construction is described suitable for roofs of reverberatory furnaces.

Flue section construction for rotary furnaces. C. P. DEBUCH. Brit. 304,937, Feb. 22, 1928.

Gas burner. THOMAS G. ARROWSMITH. U. S. 1,723,988, Aug. 13.

Gas burner (with automatic igniter). DANTE RASO (one-third each to Angelo Melucci and Constantino Pellegrino). U. S. 1,724,221, Aug. 13.

Gas burner. MILLARD J. ROBERTS (to Roberts-Gordon Appliance Corp.). U. S. 1,725,304, Aug. 20. Structural features.

Gas burner. V. H. RICHARD. Brit. 304,938, Feb. 23, 1928.

Gas burner. ALLGEMEINE ELEKTRICITÄTS-GES. Brit. 304,142, Jan. 13, 1928.

Vapor burners for alcoholic or hydrocarbon fuels, etc. T. LANDI. Brit. 304,651, Jan. 23, 1928. Close-mesh cloth of Al or Al alloy is used as a filter gauze to prevent fouling.

Heat-exchange apparatus. HERBERT HENDERSON and JOHN G. GLASGOW (to Gulf Refining Co.). U. S. 1,724,351, Aug. 13. Structural features.

Heat-exchange apparatus. R. SAMESREUTHER and G. KRANZLEIN. Brit. 305,172, Feb. 1, 1928. Structural features.

Tubular heat-exchange apparatus. E. F. A. D. BECK. Brit. 304,272, Jan. 18, 1928. Structural features.

Tubular heat-exchange apparatus. ANCIENS ÉTABLISSEMENTS M. P. VELUT. Brit. 304,728, Jan. 25, 1928. Structural features.

Tubular heat-exchange apparatus suitable for use as a condenser. FRANK J. SWENSON (to Foster Wheeler Corp.). U. S. 1,725,549, Aug. 20. Structural features.

Tunnel kiln. H. M. ROBERTSON. Brit. 305,025, Jan. 28, 1928.

Annular kiln with chambers connected by inner doors. ALFONS WEYAND. Ger. 478,530, Nov. 23, 1928. Details of arrangement.

Gas-heated drying oven (with means for preheating the combustion air). FRANZ LEICHER, GELDSCHRAUK- & METALLSCHRAUBENFABRIK. Ger. 479,074, Nov. 24, 1927.

Gas-washing tower. H. A. BRASSERT and F. W. BARRETT (to H. A. Brassert & Co.). Brit. 304,753, Jan. 27, 1928. Superposed sections of the tower have successively decreasing diams. Various structural details are described.

Leveling bottle for use with gas-analysis apparatus, etc. CHARLES B. FRANCIS. U. S. 1,724,013, Aug. 13. Structural features.

Apparatus for cooling gases. CHEMISCHE WERKE "LOTHRINGEN" G. M. B. H. (Fritz Rottmann and Fritz Brohmeyer, inventors). Ger. 478,984, June 20, 1925. A double-walled tower for cooling hot gases is described.

Cooling device with multi-stage compressor. ATLAS-WERKE A.-G. Ger. 477,955, Mar. 19, 1927.

A cooling drum for annealing. G. POLYSIUS A.-G. Ger. 478,937, Mar. 12, 1925. A double-walled cooling drum is described, which is constructed so that the heat of the goods cooled is utilized to warm the cooling gas.

Acetylene generator (water to carbide type). MESSER & Co. G. M. B. H. Ger. 479,374, May 8, 1926. Addn. to 465,119.

Apparatus for lighting objects for the ultramicroscope. CHARLES SPIERER. U. S. 1,724,527, Aug. 13.

- Low-water alarm device for boilers, etc.** A. BUTLER and R. BUTLER. Brit 304,476, Jan. 24, 1928. A thermostatic elec. switch operates the alarm.
- Surface condenser.** JOHN F. KIRGAN (to Ingersoll-Rand Co.). U. S. 1,724,138, Aug. 13.
- Surface condenser.** PAUL H. MÜLLER. Ger. 470,478, May 28, 1927.
- Thermostat suitable for use in incubators.** E. L. GODFREY and G. W. WRENT MORE. Brit. 304,619, Oct. 15, 1927. Structural features.
- Thermostat suitable for control of electric circuits.** FLETCHER SCHAUM. U. S. 1,724,425, Aug. 13. Structural features.
- Thermostatic device for electric circuits.** CHARLES H. HODGKINS (to Westinghouse Elec. & Mfg. Co.). U. S. 1,725,518, Aug. 20. Structural features.
- Thermostatic electric switch.** R. P. JACKSON (to Metropolitan-Vickers Electrical Co., Ltd.). Brit. 304,724, Jan. 25, 1928. Structural features.
- Thermostatic temperature-control system for radiator-valve control.** CHARLES L. FORTIER (to Johnson Service Co.). U. S. 1,724,347, Aug. 13. Structural features.
- Thermostatic control system for superheated system.** BRITISH ARCA REGULATORS, LTD., and T. LINDSAY. Brit. 305,564, Nov. 7, 1927.
- Thermostatic valve for controlling oil fuel.** R. MACLAREN. Brit. 304,340, Sept. 21, 1927. Structural features.
- Thermostatic device suitable for carburetor control.** MERL R. WOLFARD (to Charles F. Hopewell and Helen C. Hopewell). U. S. 1,725,607, Aug. 20. Structural features.
- Thermostatically-controlled mixing device for hot and cold water, etc.** ALEXANDER MERDOCH, JR. U. S. 1,724,504, Aug. 13.

## 2—GENERAL AND PHYSICAL CHEMISTRY

FREDERICK L. BROWNE

- Swante Auguste Arrhenius.** J. BABOROVSKY. *Chem. Listy* 21, 469-7(1927).  
A review of the work and theories of Arrhenius. FRANK MARESH
- Richard Lorenz.** W. FRAENKEL. *Z. angew. Chem.* 42, 801-2(1929).—Obituary  
E. H.
- Anthony McGill (1847-1928).** G. E. GRATTAN. *J. Assoc. Official Agr. Chem.* 12, No. 3, ii-iii(Aug. 15, 1929).—An obituary with portrait. A. PAPINEAU-COUTURE
- Paul Schutzenberger.** TENNEY L. DAVIS. *J. Chem. Education* 6, 1403-14 (1929).—Biography with portrait. E. H.
- Louis Stoecklin.** G. F. *Ann. fals.* 22, 324(1929).—An obituary. A. P.-C
- Charles Mayer Wetherill, 1825-1871.** III. EDGAR F. SMITH. *J. Chem. Education* 6, 1461-77(1929); cf. *C. A.* 23, 4111. E. H.
- Chemical Abstracts now covers 1500 periodicals.** E. J. CRANE. *Ind. Eng. Chem., News Ed.* 7, No. 15, 4(1929).—Of the 1500 periodicals covered, the no. and the percent of the whole published in each of the countries of the world are given. Also, the periodicals are classified according to subjects or fields. E. H.
- Aims versus methods in chemistry.** FREDERICK REED. *J. Chem. Education* 6, 1512-6(1929). E. H.
- Supervised study in general chemistry.** A. T. BAWDEN and F. A. JACKSON. *J. Chem. Education* 6, 1517-22(1929). E. H.
- Chemical education in Iowa high schools.** RICHARD A. WORSTELL. *J. Chem. Education* 6, 1503-11(1929). E. H.
- Chemical education in Minnesota.** R. E. KIRK. *J. Chem. Education* 6, 1497-1502(1929). E. H.
- A question of scientific terminology.** A. CLEMENTI. *Boll. soc. ital. biol. sper.* 3, 1269(1928).—C. proposes the Italian term "smorzare" for the English "pufferare" (buffer) or the French "tamponare" (tamponer). PETER MASUCCI
- Activator, promoter or strengthener.** E. PIETSCH. *Z. Elektrochem.* 35, 366-7 (1929).—A contribution to the discussion of terminology suggested by Mittasch (cf. *C. A.* 23, 3133). R. I. RUSH
- Chemical valency considered as an electrostatic phenomenon.** X. A. E. VAN ARKEL and J. H. DE BOER. *Chem. Weekblad* 26, 402-6(1929); cf. *C. A.* 23, 4384. F. DE LEEUW
- Salinity of the water of Chesapeake Bay.** R. C. WELLS, R. K. BAILEY and E. P. HENDERSON. *U. S. Geol. Survey Professional Paper* 154-C, 105-52(1929).—The salinity of

the  $\text{H}_2\text{O}$  of Chesapeake Bay increases toward the mouth and with depth at any one point. The values on the east side of the Bay are higher than on the west. A. H. E.

The decomposition of water by iron hydroxide and the occurrence of hydrogen in potassium salt mines. HUGO DITZ. *Z. Elektrochem.* 35, 392-3(1929).—Attention is called to the fact that the recent work of Schikorr (cf. C. A. 23, 3148, 3149) offers a possible explanation of the presence of  $\text{H}_2$  in the Stassfurt mines. Previous explanations are briefly reviewed.

Excitation of frictional electricity. LOTHAR WOLF. *Ann. Physik* [5], 1, 260-88 (1929).—Frictional electricity arises largely from the transference of metallic ions in soln. in the film of water on the insulator. Friction of an earthed metallic "needle" against a rotating plane surface of specially prepd. shellac results, in the absence of an elec. field, in an equil. between soln. tension and the pressure of dissolved ions. Application of an elec. field sets up a new equil. characterized by a smaller concn. of ions in the film, reversion to the first equil. being possible by reducing the field strength. The sign of the frictional electricity can be reversed by adjusting the field to neutralize the pressure of the ions. Artificially increasing the ionic concn. also reverses the sign. By increasing the surface of contact, the amt. of electricity excited with const. capacity increases to a limiting value. It is also shown that the speed of the moving surface has no influence on the quantity of electricity excited.

Nephelometric and colorimetric measurements with a photoelectric current. E. CUBONI. *Boll. inst. sieroterap. milanese* 1927, No. 6, 3 pp.—The observations are made by means of a photoelectric cell.

Measurements of ozone in the higher atmosphere in 1928. H. BUISSON. *Compt. rend.* 188, 647-8(1929).—Diurnal detns. of  $\text{O}_3$  in the higher atm. during 1927 by the method previously described (C. A. 22, 2690) have confirmed the observations made in 1927, the max. (spring), 3.75 mm., and min. (autumn), 2.25 mm., being slightly less pronounced. The irregular variations are strongest at the beginning and the end of the year and disappear in summer. The measurements are in agreement with those made at Arosa (Switzerland) at 1800 m. and for the period January to October the figures at each station are 0.16 mm. lower than those of 1927.

The determination of the conductivity of electrolytes with an alternating current of low frequency. A. H. W. ATEN AND FRL. L. M. BOERLAGE. *Rec. trav. chim.* 48, 698-710(1929).—Measurements of resistances by an a. c. galvanometer with a frequency of 50 were compared with those made by a telephone circuit with frequencies of 1100 and 2300. With the galvanometer a relative accuracy of 0.01% was attained in the measurement of resistances over 200 ohms. Resistances greater than 10,000 ohms could be measured better with the galvanometer than with the telephone circuit because, at higher frequencies, errors arose from electrostatic capacity which could not be removed in a simple way.

Carrying out investigations at high temperatures. WILLI M. COHN. *Metallwirtschaft* 8, 599-602, 623-30(1929); cf. C. A. 23, 3608.—Furnaces for use at temps. of 1500-3000° are now important. Materials of construction, theories of operation and descriptions of various types involving the use of gaseous liquid and solid fuels, elec. resistance, induction and high-frequency furnaces are given. For obtaining temps. above 3000° arc furnaces of 4 types and cathode-ray furnaces are explained. No materials are available that will remain in the solid condition at atm. pressure above 4000° abs. The use of elec. sparks, one or several explosions of solid or gaseous materials, etc., give such temps., but only for a short interval and cause difficulty in measuring the temps. attained.

Atomic weight of helium. AUG. UPMARK. *Z. Physik* 55, 569-74(1929).—U. calcs. on the basis of his own electrostatic theory of at. structure that He has 3628 electrons and an at. weight of 4.00106. Aston's (C. A. 21, 3543) higher value of 4.00216 is explained as being partially due to neg. He ions.

Numerical regularities in the atomic weights of elements. S. M. LOZANIĆ. *Bull. acad. sci. Bohême*, 1928, (reprint), 9 pp.—Regularities of the type  $a = 2m + b$ , where  $a$  is the at. wt.,  $m$  the at. no. and  $b$  is 0, 1, 2 or 3, appear in the first part of the periodic table. As the at. wt. increases, regularities of the same type appear to persist, with high values for  $b$ . These considerations are regarded as supporting the view that the at. wts. are whole nos. The no. of isotopes possessed by a given element is connected with its place in the table.

The transmutation of elements. K. ŠANDERA. *Chem. Listy* 21, 270-1(1927).—Š. considers 2 sources of error in the transmutation expts.: (1) the difference in evolution of  $\text{He}$  by  $\text{Pd}$  in an atm. of air,  $\text{H}_2$  and  $\text{O}_2$ ; (2) the relative difference in permeability of glass to  $\text{H}_2$ ,  $\text{He}$  and  $\text{Ne}$  at different temps.

FRANK MARSH

The heat capacity of oxygen from 12°K. to its boiling point and its heat of vaporization. The entropy from spectroscopic data. W. F. GIAUQUE AND H. L. JOHNSTON, *J. Am. Chem. Soc.* 51, 2300-21(1929).—The heat capacities of the 3 cryst. forms of solid  $O_2$  and of the liquid have been measured from 11.75°K. to the b. p. The transition temps. and the heats of transition are:  $23.66 \pm 0.10^\circ K.$ ,  $22.42 \pm 0.1$  cal. per mol.;  $43.76 \pm 0.05^\circ K.$ ,  $177.6 \pm 0.5$  cal. per mol. The m. p. was  $54.39 \pm 0.05^\circ K.$ ; the b. p.  $90.13 \pm 0.05^\circ K.$  The heats of fusion and vaporization were  $106.3 \pm 0.3$  and  $1628.8 \pm 1.6$  cal. per mol., resp. The entropy of the gas at  $298.1^\circ K.$  was  $49.03$  cal. per mol. per deg. The method of prepn. of the  $O_2$  is described. J. B. AUSTIN

The formation and decomposition of ozone. E. H. RIESENFELD, *Z. angew. Chem.* 42, 729-34(1929).—A lecture summarizing the theoretical explanations for the formation and decompn. of  $O_3$  by all known methods. The quantum theory, chain-reaction concept, thermodynamics, mass-action laws, activated mols. and free atoms, are called upon to account for the phenomena observed. Bibliography. W. C. F.

Specific resistance and purity of sodium electrolyzed through soda-glass. J. RUD NIELSEN, *Phys. Rev.* 31, 304(1928).—The sp. resistance of solid Na between  $30^\circ$  and  $90^\circ$  was found to be  $4661 \times 10^{-9} \times (1 + 0.00484 t)$ ; and for liquid Na below  $160^\circ$   $9828 \times 10^{-9} \times (1 + 0.00354 (t-100))$ . The measurements were made in a U-shaped capillary tube first filled with Hg and then with Na. H. R. MOORE

Contribution to the chemistry of sulfur. I. The system sulfur-chlorine. MAX TRAUTZ, H. ACKER, L. E. VON BROECKER, A. RICK, A. HOFFMANN, H. KLIPPEL AND O. LOTH, *Z. Elektrochem.* 35, 110-34(1929).—The literature on compds. of S with Cl is summarized. Manometric measurements of the gas phase equil. between S and Cl at  $140^\circ$  and  $250^\circ$  showed at most only traces of reaction involving any compds. other than  $SCl_2$ .  $S_2Cl_2$  combines with dissolved Cl according to a first-order reaction. The combination is catalyzed by higher chlorides. Cl dissolves in liquid  $S_2Cl_2$ , but the reaction is catalyzed by  $SCl_2$ . The mol. heat of soln. is approx. 3.5 cal. The measured heat of formation of  $S_2Cl_2$  from S +  $Cl_2$  is 14.5 cal. The heat of formation of  $SCl_2$  from  $S_2Cl_2$  +  $Cl_2$  is 9-10 cal; that of  $SCl_2$  is estd. as 12-14 cal. The vapor pressures of  $S_2Cl_2$  were measured between  $37^\circ$  and  $137^\circ$ . Frequent sudden reversion to  $SCl_2$  was observed several times at  $100^\circ$  or above. The mol. heat of soln. of S in  $S_2Cl_2$  was between -1.3 and -3 cal. The phase-rule diagram indicates the existence of  $S_2Cl_2$ . The sp. heats, ds. and viscosities of  $S_2Cl_2$  and solns. of S and Cl in  $S_2Cl_2$  are given. R. L. DODGE

The oxidizability of silicon and the allotropic variety of Moissan and Siemens. A. SANFOURCHE, *Compt. rend.* 188, 1672-5(1929).—The reported soly. of Si in HF [cf. *Compt. rend.* 138, 1299(1904)] is explained as due to the oxidation of Si in a fine state of division to  $SiO_2$  or  $Si_2O_3$ , and  $Si_2O_4$ . When Si, crystd. in Ag, or Al or obtained by reduction of  $SiO_2$  by Mg, of 98.4% purity is moistened with HF and evapd. in a Pt dish at  $150^\circ$ , it becomes incandescent in spots just as it becomes dry; these incandescent areas spread;  $SiO_2$  is formed. If a given sample of Si is subjected to this treatment repeatedly (45 times) as much as 98% Si may be oxidized. The colors usually attributed to Si sol. in HF may in reality be due to sub-oxides. E. R. SCHIBRZ

Nitrogenation of manganese. L. DUPARC, P. WENGER AND CH. CIMERMAN, *Helv. Chim. Acta* 12, 806-17(1929).—Nitrogenation of Mn has variously been reported as leading to the nitrides  $Mn_3N_2$ ,  $Mn_2N_2$ ,  $Mn_7N_2$ , or their mixt. The effect of variables was investigated by heating Mn from 3 different sources in a current of  $N_2$  at varying temps. and pressures. The absorption thresholds for different materials were  $500^\circ$  and  $740^\circ$ , resp., these differences being ascribed to varying percentages of the impurities, Si and Al. The absorption of  $N_2$  was a function of the temp. passing through a max. The time factor was unimportant; equil. was reached within 1-2 hrs., there being no formation of satd. crusts. Increase of pressure above 10 atm. caused a continuous rise in absorption curves. The addn. of 10%  $Li_3N$  lowered the absorption threshold to  $360^\circ$ , and caused a decided increase in absorption. K. H. ENGEL

Specific heat of lead at the temperature of liquid helium. W. H. KEESOM AND N. VAN DEN ENDE, *Physik. Z.* 29, 896-7(1929).—The work of Keesom and Andrews (C. A. 21, 2091) has been repeated with an improved technic. For the region  $10-20^\circ$  abs. the earlier data are confirmed. The present work is in agreement with the Debye curve with  $\theta = 88$  even in the region  $3-6.5^\circ$  abs. to which the  $T^3$  law applies, so that discrepancies in the earlier work now disappear. At  $7^\circ$  abs. a marked deviation persists, but since a similar deviation occurs when Bi is studied instead of Pb, the discrepancy may be due to an instrumental defect. B. C. A.

The evaporation of thorium from tungsten. MARY R. ANDREWS, *Phys. Rev.* [2], 33, 454-8(1929).—The rate of evapn. of Th from pure W and from carbonized W



was measured between 2000° and 2500°K. The Th was deposited on these surfaces by evapn. either from thoriated filaments or from metallic Th. Evapn. from both surfaces varied directly with the fraction covered, being more rapid from pure W than from carbonized W. The heat of evapn. from W was calcd. to be 177,000 cal./g. mol. and from carbide 202,000 cal./g. mol.

BERNARD LEWIS

A new chemical theory and its thermodynamic consequences. A. GOSSELIN. *J. chim. phys.* 26, 288-90(1929).—Atoms, groups and mols. can combine by means of polar, steric or mixed forces or valences. Formulas are written for  $\text{NH}_3$ ,  $\text{O}_3$ , etc., and heats of formation calcd.

ARTHUR FLEISCHER

Structure of water molecule. R. SÄNGER AND O. STEIGER. *Helv. Phys. Acta* 1, 369-84(1928); *Science Abstracts* 32A, 193-4.—S. and S. calc. from the dielec. consts. of water vapor that if the mol. of  $\text{H}_2\text{O}$  present the form of an isosceles triangle with the O atom at its apex, the 2 equal angles of the triangle are 58° each, and the two equal sides are each  $1.07 \times 10^{-8}$ . This gives an elec. moment of  $1.34 \times 10^{-18}$ .

H. L. D.

General principles in the consideration of oxidation-reduction reactions, and the question of the existing chemical bond. I. BR. JIRGENSONS. *Z. Elektrochem.* 35, 352-8(1929).—A no. of new principles concerning covalent structure are expounded.

F. E. WALSH

Dielectric constants of benzene, carbon disulfide and carbon tetrachloride, and of dilute solutions of alcohols in these solvents. J. D. STRANATHAN. *Phys. Rev.* 31, 156(1928); cf. *C. A.* 22, 2320.—The temp. variations of the dielec. consts. of the 3 org. compds. were detd. from f. p. to b. p., and also dil. solns. of  $\text{MeOH}$  in  $\text{C}_6\text{H}_6$  and in  $\text{CCl}_4$ , and of  $\text{C}_6\text{H}_{11}\text{OH}$  in  $\text{C}_6\text{H}_6$ . An extrapolation method was used to obtain the elec. moments in the undissoc. state, and the applicability of the Debye theory examd. H. R. M.

Dielectric constants of electrolytic solutions for various concentrations. A. P. CARMAN AND C. C. SCHMIDT. *Phys. Rev.* 31, 157(1928); cf. *C. A.* 22, 534.—The electrometer method, previously developed, was used to measure the dielec. consts. of  $\text{NaCl}$  solns. up to 0.02 *M*, and for solns. of  $\text{KCl}$ ,  $\text{BaCl}_2$  and  $\text{CuSO}_4$  concns. up to 0.01, 0.022 and 0.026 *M*, resp. The dielec. const.—conc. curves show definite minima, and it does not seem that Walden's theory is wholly adequate to explain them. H. R. MOORE

The effect of tension and a longitudinal magnetic field on the thermoelectromotive forces in permalloy. ALPHEUS W. SMITH AND JOY DILLINGER. *Phys. Rev.* 33, 398-402(1929).—Measurements are made on the combined effect of tension and a longitudinal magnetic field on the thermo-e. m. f. in 3 wire specimens of permalloy, of compn. 78, 81 and 84% Ni and the rest Fe. In all cases the magnetic field produces a decrease in the thermo-e. m. f. Annealing at 1000° increases the change of thermo-e. m. f. produced by a longitudinal magnetic field. In an alloy contg. 78% Ni, tension decreases the max. value of the change in thermo-e. m. f. In an alloy contg. 81% Ni the max value of  $\Delta E/E$  is relatively insensitive to tension. In an alloy contg. 84% Ni tension decreases the change in the thermo-e. m. f. at low magnetic fields but increases it for magnetic fields greater than about 10 gauss. In all 3 cases the max. value of  $\Delta E/E$  is relatively insensitive to changes in tension beyond about 10 kg./sq. mm. There is a parallelism between the change in length and the change in thermo-e. m. f. under the combined action of tension and a longitudinal magnetic field. In high Ni permalloys tension decreases the intensity of magnetization for low magnetic fields but increases the magnetostrictive contraction and the change of thermo-e. m. f. In low-Ni alloys tension increases the intensity of magnetization for low magnetic fields but decreases the magnetostrictive expansion and the change of e. m. f. B. L.

Piezoelectric amorphous and crystalline substances in an electric field. A. V. SHUBNIKOV AND B. K. BRUNOVSKI. *Bull. acad. sci. union rép. soviét. social.* 1928, 367-74.—Exptl. results are given which indicate that every dielectric, when placed in an elec. field, owing to orientation of its mols. or other structural units, becomes more or less markedly piezoelec. When such dielec. is subjected to shock, it assumes a state of vibration, that is, of periodic compression and expansion, the result being the establishment of an internal subsidiary elec. field, which changes its direction during the vibration and so alternately strengthens and weakens the original elec. field.

B. C. A.

The Hall effect in nickel-steel alloys. UMBERTO SALERNO. *Rend. accad. sci. (Napoli)* [3], 34, 159-65(1928).—S. studied the Hall effect in pure Ni, in steel and in alloys of Ni steel varying from 8% Ni to 49% Ni and with variation in field intensity from 450 to 12,850 gauss. The same characteristics in Hall effect are shown by Ni steel alloys that are apparent with other ferromagnetic metals. The nature of the secondary electrode influences the phenomenon to some extent. The min. effect is

shown in the 22% alloy and rises to a max. at 36% Ni. The data indicate that an inversion of sign should occur at a compn. of about 80% Ni. L. T. FAIRHALL.

**Crystal structure defects and physical-chemical properties.** ADOLF SMEKAL. *Z. angew. Chem.* 42, 489-94(1929); cf. *C. A.* 20, 683; 21, 1385; 22, 907, 2301; 23, 2862.—S. discusses the properties of solids which may be technically influenced and uninfluenced by mechanical or chem. action. The crystal properties which are uninfluenced are lattice properties. The relation between the properties influenced and crystal structure defects is discussed. All actual crystals contain "loose spaces" and crystals prepd. in different ways have systematically different loose space numbers and also the expected property differences. A theory of the ionic conduction in solids is given. Conclusions for physical-chemical processes such as mixed-crystal formation, disintegration, powder reactions and recrystn. are connected with diffusion processes. Crystal structure defects give rise to active centers of catalytically active surfaces. H. W. W.

**Crystal properties and crystallization conditions.** ADOLF SMEKAL. *Z. Physik* 55, 289-303(1929).—S. distinguishes between two groups of crystal properties: those properties that remain const. and those that change with the change in number of single crystals in the whole crystal mass. The first set are called "lattice properties" as they depend only on the pure crystal and the second set are called "interstitial properties" depending on the number and kind of spaces between the single crystals making up the total actual crystal. NaCl crystals obtained from solns. and from a melt, resp., show differences in their ionic cond. The crystals obtained from a melt show a cond. 1000 times greater than the crystals obtained from solns. Cf. Gingold (*C. A.* 22, 4343) and Joffé and Zechnowitzer (*C. A.* 20, 1553).

**Preferred orientation in tungsten crystals caused by mechanical working.** H. B. DEVORE AND WHEELER P. DAVEY. *Phys. Rev.* 31, 160(1928).—A sheet of rolled W was heated nearly to the m. p., thus causing those crystals which had a preferred orientation to grow at the expense of the fragments of other crystals. Diffraction patterns of the foil revealed a deviation of  $\approx 3^\circ$  from the mean orientation. H. R. MOORE.

**Stretching of copper and  $\alpha$ -brass crystals.** v. GÖLER AND G. SACHS. *Z. Physik* 55, 581-620(1929).—Mech. deformation of Cu and brass crystals is studied as a function of Zn content and crystal orientation. The lattice const. of the alloys as a function of Zn content are given.

**Recrystallization in stretched tin strips.** PAUL BECK. *Z. Physik* 55, 374-7(1929).—The dependence of the no. of recrystn. centers on the degree of deformation is discussed.

**Sudden deformation of crystals under strain.** M. CLASSEN-NEKLUDOVA. *Z. Physik* 55, 555-68(1929).—The mechanism of the plastic deformation of crystals is studied. The deformation occurs in sudden jumps of a few thousandths of a mm. and is accompanied by a uniform noise like the ticking of a watch. The interval between jumps may be a few sec. and the rate of deformation in this interval is zero for the whole crystal.

**The hindrance of crystal growth by electrolytic polarization.** HERBERT BRANDES. *Z. physik. Chem., Abt. A*, 142, 97-112(1929).—The theory is given at length. Expts. with "depolarization-free" electrodes (blank Pt in metallic salt solns.) show that the potential change (brought about by an impressed a. c. of rather high frequency) is directly proportional to the impressed current; thus the cell behaves as a perfect condenser. This is explained on the assumption of a Helmholtz double-layer formed upon the electrode by the migrating ions. Expts. with neutral  $\text{ZnSO}_4$  solns. with cryst. Zn electrodes show a different behavior and it is assumed that the variation from the results with the "depolarization-free" electrodes gives a measure of the degree of polarization. This latter series of expts. was conducted at different temps. ( $8^\circ$  to  $73^\circ$ ) and it is shown that the relationship between velocity of crystal growth (depolarization) and polarization tension depends upon temp.

**Notes on conduction of electricity in crystals.** O. U. VONWILLER. *Proc. 3rd Pan-Pacific Sci. Congr.* 1926, II, 1284-5(Publ. 1928).—Ohm's law appears to hold, and contact resistance varies with direction and magnitude of current for very small currents.

**The axial ratio of alundum as obtained by the Laue spot method.** SHORI TAKANI. Tohoku Imp. Univ. *J. Petrol., Mineral. and Ore Deposits (Japan)*, 1, 71-2(1929).—A small alundum crystal was sectioned parallel to the axial plane and x-rays were directed upon it almost perpendicularly to axial plane. The axial ratio calcd. from the pattern is  $a:b:c = 0.521:1:0.954$ . Kokscharo's value is therefore (0.52854:1:0.95375) more nearly correct than that given by Dana and Haumann (0.52854:1:0.4769).

K. SOMEYA

**Optical and thermal investigation of alundum from Naegi.** SHUKUSUKU KOZU AND JUN'ICHI UEDA. *J. Petrol., Mineral. and Ore Deposits (Japan)* 1, 52-60(1929).—The alundum produced at Naegi, Gifu Prefecture (Japan), was divided into 2 groups, A and B, on the basis of their *ns*, optical axes and double refraction. The internal *ns* of group A are,  $\alpha = 1.6152$   $\beta = 1.6179$ ,  $\gamma = 1.6249$  and are a little smaller than the external *ns*. For the B group the internal indices ( $\alpha = 1.6148$ ,  $\beta = 1.6174$ ,  $\gamma = 1.6244$ ) are a little larger than the external. Values of  $2V$  are, for A,  $62^{\circ}20'8''$  for B,  $63^{\circ}15'$ , from which the content of F and OH can be calcd. From the thermal data the coeffs. for the linear expansion parallel, resp., to the *a*, *b*, *c* axes, are  $l_a = 0.00044635 t + 0.00000025 t^2$ ,  $l_b = 0.00035854 t + 0.00000018 t^2$ ,  $l_c = 0.00059547 t + 0.00000030 t^2$ , (*t* measured from  $20^{\circ}$  as standard). The vol. expansion calcd. from these data is 0.84% at  $500^{\circ}$ , 2.08% at  $1000^{\circ}$ . From the change in wt on heating, it is shown that decompn. is most rapid at  $1250-1300^{\circ}$ . Sometimes fissures are formed on heating the mineral to  $400^{\circ}$ , but the cause is not very clear. It is not due to the escape of volatile matter. The change of the axial ratio on heating was also measured.

K. SOMEYA

**Thermal equilibrium and temperature.** E. WERTHEIMER. *Z. Physik* 55, 395-408 (1929).—The temp. of a gas cannot be defined by kinetic theory but it is necessary to consider the situation from the point of view of the electromagnetic radiation field. Cf. C. A. 19, 3056.

GEORGE GLOCKLER

**The measurement of low pressures.** FRIEDRICH HALLE. *Z. angew. Chem.* 42, 448(1929).—The nature of the light emitted in the field of a Tesla transformer depends on the pressure of the gas in the field. On this principle a manometer can be constructed that is particularly well adapted to the measurement of low pressures in different parts of an enclosed app.

J. G. McNALLY

**Determination of the specific heats of nitrogen and carbon dioxide at elevated temperatures.** MARCEL CHOPIN. *Compt. rend.* 188, 1660-2(1929).—By using a method of temp. measurement previously described (cf. C. A. 22, 3340) values were obtained for *Q*, mol heat, for  $N_2$  and  $CO_2$  at 10 temp. intervals between  $312^{\circ}$  and  $1042^{\circ}$  from which formulas for the mean mol. sp. heat of these gases are derived:  $N_2$  ( $C_p = 6.82 + 0.00058 t$ ) cal.;  $CO_2$  ( $C_p = 8.9 + 0.61 \left(\frac{t}{100}\right)^{0.673}$ ) cal. These values agree

with those of other workers at some temps. At  $500^{\circ}$  the sp. heat of air is practically the same as that of  $N_2$ ; at  $1000^{\circ}$  it is 1% higher.

E. R. SCHIERZ

**The effect of a gas upon the pressure of a vapor.** LEONARD A. SAYCE AND HENRY V. A. BRISCOE. *J. Chem. Soc.* 1929, 1302-7.—Several investigators have shown that the pressure of a satd. vapor in equil. with its liquid is lowered in the presence of an indifferent gas. Campbell (C. A. 9, 2614) has shown that this effect attains a considerable magnitude. C. attributed the low values obtained to adsorption of gas at the liquid-gas interface, a view which implies that in the absence of a liquid a gas should have no effect on the pressure of a vapor. S. and B sought to test the validity of this view. They measured independently both the concn. and the pressure of a vapor in the presence of and in the absence of a gas, using  $CO_2$  as the gas and either ether or pentane for the vapor. The results contradict the view that the diminution of the vapor pressure of a liquid in the presence of a gas can be wholly attributed to the effects of soln. or adsorption of gas in the liquid. The results, although not as consistent as expected, show a definite lowering of the unsatd. vapor pressure in the presence of  $CO_2$ . The effects of adsorption of ether on the flask walls are evident.

L. L. QUILL

**Variation with direction of the capillary constant of smectic substances.** ROBERT GIBRAT. *Compt. rend.* 188, 183-5(1929).—Gauss' theory of capillarity is applied to smectic substances, and expressions are obtained for the capillary const. which indicate the existence of 2 min. values, corresponding with planes passing through the axis and perpendicular to it.

B. C. A.

**Contributions to the study of mesophases (intermediate states of aggregation).**

II. The comparative configurations of a mesophase. H. ZOCHER AND V. BIRSTEIN. *Z. physik. Chem., Abt. A*, 142, 113-25; cf. C. A. 23, 4387.—The arrangement of the axis parallel or vertical to the surface of contact depends on variations of the interfacial surface tension. The surface of ordinary glass treated with acid causes a vertical instead of a parallel arrangement in the case of *p*-azoxyanisole. Alkali reverses the change. The elastic deformability of the mesophases is greater than that of crystals under conditions calling forth neither compressional nor dilatational resistances. In regions of homogeneous orientation, the lines given by the axial directions at each point are divergent or convergent curves for the nematic state; divergent or convergent straight lines for the smectic state. Points of instability exist in both states of aggregation.

III. The aqueous mesophase of arspenamine. *Ibid* 126-38.—The aq. phase of arspenamine is nematic. The suspended droplets are made up of optically negative vol. units. Addn. of an optically active compd. produced the same honeycomb structure with its accompanying strong optical activity, as is found in various other nematic phases. Even without such addition, layers often show such a honeycomb, so that the rotation may be either clockwise or counter-clockwise. I. J. PATTON

Floating mercury on water. N. K. ADAM. *Nature* 123, 413(1929).—Finely divided Hg may float on water, even when the surface tension is reduced to about 46 dynes per cm. by the addn. of a drop of oleic acid. Since the tensions of clean Hg against water differ by more than the surface tension of clean water, it would be impossible for clean Hg to float on clean water. Treatment of the Hg with  $H_2SO_4$  and chromic acid had apparently reduced the Hg-air tension by 100-200 dynes per cm. B. C. A.

Internal friction of binary liquid systems containing allyl mustard oil and dimethyl-, diethyl- and ethyl-aniline. N. A. TRIFONOV AND K. I. SAMARINA. *Bull. inst. recherches biol. Univ. Perm* (Russia) 6, 291-302(1929).—The classification of binary systems into 4 classes as proposed by Dunstan and by Kurnakov is recalled, the 4 classes being: ideal ( $asC_6H_5 + C_7H_8$ ), semi-ideal ( $asMe_2CO + CS_2$ ), irrational (pyridine + AcOH) and rational ( $CSNC_2H_5 + PhNH_2$ ). The internal friction and the density of mixts. of  $CSNC_2H_5$  with  $Me_2NPh$ ,  $Et_2NPh$  and  $EtHNPh$  were detd. at various temps and concns. The system  $CSNC_2H_5$  is nearly ideal: the max. deviation from a straight line is 6%, for a 50% mixt. (internal friction) or 0.5% (sp. gr.). The system  $CSNC_2H_5$  is semi-ideal, the max. deviation being 10% (internal friction) or 1% (sp. gr.). The system  $CSNC_2H_5 + EtHNPh$  is rational: it shows the existence of allylethylthiourea, at 50% concn. The system  $CSNPh + MeHNPh$  is analogous to the precedent, and is now investigated. ALBERT L. HENNE

The electroconductivity of double liquid systems. N. A. TRIFONOV AND S. I. CHERBOV. *Bull. inst. recherches biol. Univ. Perm* (Russia) 6, 247-59, in English 259-60(1929).—The following systems were studied: (1) aniline-AcOH, which gave a max. in the cond. curve for 17 mol. % aniline at 21°; (2) dimethylaniline-allyl mustard oil, having a max. near 20 mol. % amine at 25°; (3) ethyl aniline- $H_2O$ , having a max. at 25 mol. % amine and a smaller one near 60 mol. %, both at 25°; (4)  $Ac_2O-H_2O$ , having max. for 50 and 95 mol. %  $H_2O$  at 25°; (5) pyridine-AcOH, with a max. near 80 mol. % AcOH at 28° and 50°. The max. is always displaced toward the component of smaller mol. wt. and inner friction. E. G. VANDEN BOSCH

The evolution of our present ideas on the nature of salts. N. B. BJERRUM. *Fysisk Tidsskrift* 26, 101(1928).—The Oersted lecture. KRISTIAN HØJENDAL

The solidification of sucrose. Catalyzed by water. A. TIAN. *Compt. rend* 188, 1675-7(1929).—The physico-chem. properties of the solid form of sucrose (I) prepd. from rapidly melted sugar were studied. (Cf. *Bull. soc. chim* [4], 35, 634(1924).) I is vitreous, completely colorless and contains only a few thousandths % of reducing sugars. In a dry atm. it retained its transparency for 5 yrs.; in an ordinary atm. it changes to opaque crystals in 1 day. To verify the hypothesis that a satd. soln. of I is supersatd. with respect to cryst. sugar, the catalytic effect of water on the transformation of vitreous to cryst. I was detd. by (a) gravimetric and (b) calorimetric methods. (a) 9 samples of (I) were placed in atm. of varying vapor pressures controlled by aq. solns. of  $H_2SO_4$  (3-11 mm.) at temp.  $15.9 \pm 0.1^\circ$ . When the pressure exceeded 5 mm. the wt. increased, passed through a max. after 10 hrs. then decreased slowly, the crystals became opaque. In atm. of 3 and 4 mm. the sugar remained transparent and did not change in wt. (7 months). This indicates that the solidification of sugar is catalyzed by moisture due to the fixation of water by the sugar. Fixation is impossible below 4 mm. and temporary below 13 mm. (b) By means of a microcalorimeter (cf. C. A. 18, 1070) the thermal changes were measured which occur when I is placed in an atm. of vapor pressure controlled at 9 mm. (Na phosphate hydrate) There is first absorption of heat (decompn. of hydrate) followed after an hr. by liberation of heat (crystn. of sugar—reformation of hydrate) which reaches a max. in 3 hrs., finally becoming imperceptible. The net quantity of heat liberated represents the heat of solidification of sugar. E. R. SCHIEZ

Absolute calorimetric measurement of electrolytic conductivity for high-frequency currents. E. JUSTI. *Ann. Physik* [5], 2, 65-93(1929).—The theory and exptl. practice of inductive heating by high-frequency currents are discussed. Pb, Hg, brass and solns. of NaCl, KCl, KBr, BaCl<sub>2</sub> and LiCl are treated exptly. WILLIAM E. VAUGHAN

Sedimentation and heat of adsorption. B. IL'IN AND B. ROSANOV. *Z. Physik* 55, 285-8(1929).—The heat of wetting of wood charcoal and glass powders in solns.

of  $\text{CH}_3\text{OH}$  in  $\text{H}_2\text{O}$  of various concns. was studied exptly. as a function of concn. Cf. B. Il'in, C. A. 21, 1577.

**The electrical condition of hot surfaces during the adsorption of gases.** III. A platinum surface at temperatures up to  $850^\circ$ . G. I. FINCH AND J. C. STIMSON. *Proc. Roy. Soc. (London)* A124, 356–65(1929); cf. C. A. 22, 4027.—It is concluded from the results on the elec. charging of Au, Ag and Ni surfaces and of a Pt surface that the "normalizing" of a metal surface involves a rearrangement of the surface atoms by a process related to sintering and Pt does not combine directly and form chem. compds. with  $\text{O}_2$ ,  $\text{H}_2$ ,  $\text{CO}$ ,  $\text{CO}_2$ , A,  $\text{N}_2$  and mixts. of these gases. Some adsorbed gaseous mols. were condensed and formed an electrically neutral layer on the surface and others were held by weak elec. attraction, whereby one bond between the constituent atoms of each mol. was weakened.

**Adsorptive properties of silica gel.** A. P. OKATOV. *Zhur. Prikladnoi Khim.* 2, 21–84(1929).—Adsorptive properties of  $\text{SiO}_2$  gel are independent of the coagulating temp. and of the concn. of  $\text{SiO}_2$  in the sol. At temps. above  $25^\circ$  it is difficult to obtain sols contg. more than 12.5%  $\text{SiO}_2$ . The rate of coagulation increases with the increase in concn. of  $\text{SiO}_2$  and with the increase in temp. Quick coagulation hinders development of the internal structure. Monobasic acids increase the coagulating rate. Solid, semi-solid and liquid phases can be differentiated during coagulation. *Syneresis* is a good measure of the maturity of the gel. Excess of  $\text{NH}_3$  tends to produce gels with a slow adsorption rate, but gels produced by incomplete neutralization with  $\text{NH}_3$  are satisfactory. Internal structure of these gels is independent of their water content provided it does not exceed 80%. Treatment with water improves the rate of adsorption but does not increase the adsorptive capacity of the gels. Adsorptive properties of gels which were not treated with activating solns. are almost independent of the temp. changes during drying and activation. Adsorption of  $\text{C}_6\text{H}_6$ ,  $\text{Et}_2\text{O}$  and  $\text{EtOH}$  vapors by the gel follows the law of Freundlich, but adsorption of  $\text{H}_2\text{O}$  vapor is entirely different. More heat is evolved in adsorption of vapors of org. substances by charcoal than by  $\text{SiO}_2$  gel. Charcoal also liberates 62% more heat than  $\text{SiO}_2$  gel in adsorption of  $\text{Br}_2$ , and 146% more heat in adsorption of  $\text{Cl}_2$ . Of the  $\text{Cl}_2$  adsorbed by charcoal 11% is retained even after heating at  $260\text{--}80^\circ$  in a stream of air. If this  $\text{Cl}_2$  displaces  $\text{H}_2$  which is present in C, only  $1/3$  of the  $\text{H}_2$  is affected. Charcoal poisoned with  $\text{Cl}_2$  loses some of its adsorptive capacity.  $\text{H}_2$  and  $\text{O}_2$  in C are not impurities, but active substances which are indispensable constituents of its colloidal particles.

**Osmosis of liquids.** II. F. A. H. SCHREINEMAKERS. *J. Gen. Physiol.* 12, 555–69 (1929); cf. C. A. 23, 320.—A further consideration of osmosis in which the theoretical osmosis path, exptl. osmosis path, and the path of the membrane are discussed. Examples are given in which water contg.  $\text{Na}_2\text{CO}_3$  and  $\text{NaCl}$  was sepd. from pure water by a membrane of pig bladder. It is shown that the nature of the membrane influences the form of the path of osmosis as calcd. from theoretical considerations. C. H. R.

**Internal pressures in adsorbed films.** P. G. NUTTING. *J. Wash. Acad. Sci.* 19, 295–300(1929).

**The stability of unimolecular films.** I. Conditions of equilibrium. C. G. LYONS AND ERIC K. RIDEAL. *Proc. Roy. Soc. (London)* A124, 322–33(1929).—An examn. of the force-area curves and equil. spreading pressures of unimol. films of palmitic acid on a series of acid and alk. solns. shows that the tendency to spread into the expanded state is increased by an increase in the acidity of the soln. This view is confirmed by the latent heats of spreading on acid and alk. surfaces. The conversion of condensed to expanded films in the case of pentadecylic acid by altering the H-ion concn. has been achieved. II. The mechanism of film expansion. *Ibid* 333–43.—The transition from a solid condensed film to a liquid condensed film and expansion to the vapor state are due to an increasing tilt of the mols. affected by the adhesion of the polar head and hydrocarbon chain for the water and the hydrocarbon chains for one another. The state of liquid condensed films is compared with the smectic state of liquid crystals and the mols. are considered to be freely tilted in this state. An approx. measure of the asymmetry of various head-groups is made from the observed limiting areas. The force-area curves of heptadecylamine are shown to conform with these views. III. Solution in alkaline solution. *Ibid* 344–55.—A study of the rates of soln. of unimol. films of palmitic acid on alk. solns. reveals that over a wide range of alky. a new form of film is stable and this form is believed to consist of a bimol. leaflet. The lower layer of the bimol. film on weakly alk. solns. is less closely packed than the upper layer, the closeness of packing increasing with increased alky. The process of soln. of a unimol. film is given.

H. W. WALKER

**Superficial films and superficial solutions of myristic acid.** FAHNE EMIR. *Compt. rend.* 188, 1667-70(1929).—To verify the hypothesis of Marcelin (cf. C. A. 20, 854) the surface tension produced by films of myristic acid (I) in water and 0.05 N HCl were studied. When the film is produced by dropping a soln. of I in BzH on the surface of water, the surface tension, on standing, asymptotically approaches the value 14 dynes/cm. irrespective of the initial tension or temp. (11-20°). Its rate increases with temp. This value is obtained when I is allowed to spread spontaneously on water at 19°. After some time this value slowly decreases, indicating slight soly. If the film is formed on 0.05 N HCl this decrease will be less marked. The best conditions for measuring the film are on 0.05 N HCl at 19-21°. The surface occupied by the mol. is 26 sq. A. U. The thickness of the film, 16 A. U., is just half that obtained by the x-ray examn. of the solid myristic acid.

E. R. SCHIERZ

**The influence of size, shape and conductivity of microscopically visible particles on cataphoretic mobility.** H. A. ABRAMSON AND L. MICHAELIS. *J. Gen. Physiol.* 12, 587-97(1929).—"The electrophoretic mobility of microscopically visible particles is independent of size, shape and cond. of the particles within the limits of the exptl. error. This is valid for extreme variations in size, shape and cond." The particles used in this study were droplets of a highly refined petroleum oil (Nujol), benzyl alc., castor oil, a paraffin oil and cacao butter in media (alc.-water, sucrose-water mixts. contg. traces of electrolytes) of approx. the same sp. gr. as the oils. C. H. RICHARDSON

**The structure of colloids.** P. P. VON VEIMARN. *Rev. gén. colloïdes* 7, 153-8(1929).—V. expresses his conception of the colloidal states of matter as belonging to 2 main groups: the dispersoidal and the solutoidal states. The first of these is thermodynamically unstable and the second one stable. These 2 states are often distinguished from each other with great difficulty because of the existence of extremely stable dispersoidal systems. This condition is due to the presence of highly solvated compds. on the surface of the colloidal particles. Conclusion: It is not possible to build a theory of stability based upon a single quality of energy, as, e. g., elec. energy. L. B. M

**A method of characterizing colloidal solutions by the state of polarization of their Tyndall light.** R. O. HERZOG AND B. LANGE. *Ber.* 62B, 491-5(1929).—With const. wave length and  $n$ , the polarization angle of Tyndall light is proportional to particle size. With cellulose acetate dissolved in AcOMe, the polarization angle decreased as the soln. aged, indicating a decrease in av. particle size. The change was more marked in dil. solns. (0.08%) than in concd. (2 1/4%). The change in polarization angle on standing is given for solns. of cellulose acetate and nitrate, glycogen, inulin, rubber, polystyrol, gelatin, Congo red and  $V_2O_5$  soln.

J. G. McNALLY

**A collection of references in the field of technical colloids.** XI. The stability and preparation of colloidal solutions. ERICH HEYMANN. *Kolloid-Z.* 48, 195-206(1929).—In the theory of stability of colloidal solns., the work of Tammann, Zsigmondy and others is contrasted with that of von Veimarn. The general theory proposed by A. March is discussed, which leads directly to the dipole nature of most mols. as pictured by Debye. Other factors affecting stability such as viscosity, size of particles, polydispersion, presence of electrolytes, etc., are reviewed. Methods of prepn. of general interest are given for disperse systems. Methods of condensation in the absence of protective colloid are discussed in which the nucleus method and non-aq. sols are included. Condensation in the presence of protective colloids includes reduction, double decompn. and vaporization methods. Some comment is made on purification of sols. Over 100 references are given.

RAYMOND H. LAMBERT

**The autoreduction of sodium silver sulfite.** A. STRIGMANN. *Koll.-id-Z.* 48, 193-4(1929).—When a 2%  $AgNO_3$  soln. is slowly poured into a 10%  $Na_2SO_3$  soln. which is being stirred rapidly the  $NaAgSO_3$  obtained is autoreduced. This action is strongly catalyzed by traces of Cu. The result is obtained with or without excess sulfite present.

RAYMOND H. LAMBERT

**Chemical antagonism of ions. III. Effect of salt mixtures on gelatin activity.** HENRY S. SUMMS. *J. Gen. Physiol.* 12, 511-28(1929); cf. C. A. 23, 4236.—Gelatin solns. were brought to  $p_H$  7.203-7.367 with KOH or NaOH and various concns. of NaCl, KCl and  $MgCl_2$  were added.  $MgCl_2$  and NaCl alone lower the  $p_H$  of Na or K gelatinate. KCl first lowers the  $p_H$  and then with increasing concn. raises it. Mixts. of NaCl and KCl raise the  $p_H$ , then with an increase of either salt lower it and finally the mixt. behaves like KCl alone. Mixts. of  $MgCl_2$  and NaCl raise the  $p_H$  up to 0.1 M  $Na^+$  and lower it up to 0.15 M  $Na^+$ , irrespective of the amt. of  $MgCl_2$ . Higher concns. of NaCl have little effect but increase of  $MgCl_2$  lowers the  $p_H$ . Mixts. of  $MgCl_2$  and KCl behave like those of  $MgCl_2$  and NaCl. Under these conditions the free groups of the dicarboxylic acids and of lysine in the gelatin are practically all ionized. The

arginine group is about 84% ionized whereas the prearginine and histidine groups are essentially non-ionized. The soln. therefore contains 2 ionic species in equil., one with the arginine group ionized the other with it non-ionized. The effect of each salt upon the  $pH$  of the gelatin soln. depends upon the effect of the cation on the activity of the 2 ionic species due to combination. Anomalous effects of cation mixts. may be accounted for if one or both the ionic species fail to combine in the mixt. in proportion to the relative combination in solns. contg. only a single cation. C. H. R.

**Chemical and physical changes in gelatin solutions during hydrolysis.** JOHN H. NORTHROP. *J. Gen. Physiol.* 12, 529-35(1929).—A study of the change in viscosity, and corresponding increase in the carboxyl groups in gelatin solns. showed that marked viscosity changes result from very slight chem. changes. If viscosity is increased by the addn. of acid a greater change in viscosity or vol. of solute is caused by the same % change in no. of carboxyl groups. This change is independent of the gelatin concn. The results support the idea that the high viscosity of gelatin solns. is due to the presence of swollen micelles; a slight chem. hydrolysis may suffice to rupture a micelle and so cause a large change in viscosity. C. H. RICHARDSON

**The swelling of gelatin and the volume of surrounding solution.** JOHN H. NORTHROP AND M. KUNITZ. *J. Gen. Physiol.* 12, 537-42(1929).—The swelling of iso-lec. gelatin added to various vols. of HCl soln. was studied at 5°. Swelling of pure gelatin was detd. by the concn. of the supernatant soln. at equil. and was independent of the vol. of acid; in solns. of unpurified gelatin, swelling is a function of both vol. and the concn. of acid due to the presence of neutral salts. The results are predicted by the Procter-Wilson-Loeb theory for the swelling of gelatin. Cf. *C. A.* 19, 996. C. H. R.

**Colloid chemical reactions between sols of albumin substances and polymeric carbohydrates.** I. WO. OSTWALD AND R. H. HERTEL. *Kolloid-Z.* 47, 258-68(1929).—When a starch and an albumin sol are mixed, 2 physically distinct phases result. A study of the lower "demixed phase (I)" shows that it is either a liquid or a flaky solid consisting mainly of more or less hydrated starch. The vol. of I varies with the concns. of the sols. For const. starch concns. ( $C_s$ ) and varying gelatin concns. ( $C_g$  from 1 to 8%), a max. vol. of I is obtained at intermediate values of  $C_g$ . Four types of starch (maize, rice, wheat and potato) show practically the same effect except that the max. occurs at different  $C_s$ , 1, 2, 3-4 and 5%, resp. With const.  $C_g$  an increasing  $C_s$  (0.25-5%) is always accompanied by an increase of the vol. of I. Maize, rice and wheat starch always form white flakes which become more and more solid with increasing  $C_g$ . Up to 5%  $C_g$  potato starch yields flakes, in higher  $C_g$  large transparent and colorless liquid layers, which in aging undergo a secondary spontaneous "demixture" and form a white paste. With const.  $C_g$  and variable  $C_s$ , flake-like sediments were always obtained. The upper phase (II) is liquid. It becomes more transparent with increase of either  $C_g$  or  $C_s$ . Expts. with agar gave results similar to those obtained with starch, whereas inulin gave only neg. results. J. WIERTELAK

**Coefficient of magnetism and structure of a solution of gelatin.** MAURICE FALLOT. *Compt. rend.* 188, 1498-1500(1929).—Curves showing the relation between the coeff. of magnetization and the dielec. const. of solns. of gelatin of varying concn. (Marinesco, *C. A.* 23, 4393) indicate an increase in both properties from zero concn. to 0.8 g. per 100 cc. At this max., the dielec. const. drops, while the coeff. of magnetization rises more abruptly up to the highest concn. that could be measured. The results suggest the possible existence of 2 forms of gelatin mols., which combine to form 1 mol. at a concn. of 0.8 g. gelatin per 100 cc. N. M. NAYLOR

**Cystine in systems of noble metals protected by gelatin.** A. STEIGMANN. *Kolloid-Z.* 48, 194-5(1929).—When metal sulfite is added to a  $AgNO_3$  soln. in the presence of gelatin, cystine tends to check the reducing action similarly to its effect on NaAg,  $S_2O_8$  and hyposulfite when gelatin is present. Little effect was noted with Hg salt in place of Ag salt. Au showed the effect and by replacing cystine with albumin reduction was nearly stopped.  $NH_3$  speeds up reduction and pyridine slows it down. The color of the dispersed metal is affected by presence of cystine in consequence of its effect on particle growth. A comparison of "Ostwald ripening" of AgBr grains in gelatin soln. with and without cystine present shows that cystine greatly retards ripening. RAYMOND H. LAMBERT

**The dispersion of cellulose in solution.** K. HESS. *Kolloid-Z.* 48, 191-3(1929).—The mass-action formula for the reaction between cellulose and Cu in Schweizer's reagent and the formula for the adsorption isotherm as derived by Baur contain consts. that are fundamentally different. The inconstancy of  $\phi$  (the amt. of Cu adsorbed by 1 mg. mol. of cellulose in 100 cc. soln.) observed by Zeise would lead to the belief that an adsorption formula does not fit. Calcn. on the assumption, that the cuprammon-

ium ion is a tetrahedron and that the dimension of the micelle of cellulose is known leads to an adsorbed layer 4 mols. thick of such ions on the surface of the micelle. Reasoning from results obtained with sugar instead of cellulose would lead the author firmly to believe in the stoichiometrical relation of chem. action rather than an adsorption hypothesis.

RAYMOND H. LAMBERT

Contribution to the theory of vegetable tanning. IV. Phenomena of separation into 2 liquid phases in systems: hydrophil colloid plus water plus polyphenol. H. G. BUNGENBERG DE JONG. *Rec. trav. chim.* 48, 494-503(1929).—It is suggested that the mechanism of dehydration of hydrophil colloids by tannins or simpler phenols is a sepn. of the dispersion medium into 2 liquid phases at the boundary surface of the colloidal particle. When portions of 2.5% gelatin soln. at 42° are treated with equal vols. of resorcinol soln. of increasing concn., the viscosity decreases rapidly to a min., then is const. over a considerable concn. range, and then increases again at higher concns. The effect is most marked at the isoelec. point of gelatin. With the decrease in viscosity, the soln. becomes milky, and eventually the microscopic drops coalesce and settle to form a well-marked layer. It is believed that the sepd. phase is a soln. of resorcinol in H<sub>2</sub>O, surrounding the gelatin particles. The sepd. layer was richer in resorcinol than the upper layer. The same effect was observed with other phenols, including tannin and gelatin, and with colloidal carbohydrates.

H. B. MERRILL

Solution volume. F. WRATSCHKO. *Pharm. Presse* 34, 36, 116-8, 132-4, 256-8, 274-8(1929); cf. C. A. 23, 1553.—“The simplest solns. are those in which the 2 components consist of liquid, org. nonelectrolytes, each chemically inactive with respect to the other, but presenting ideal systems together for the observation of primitive solvent conditions. The following types are differentiated: (a) in which the d. of the soln. is equiv. to the arithmetical mean of the ds. of the resp. components; (b) in which the sp. vol. of the soln. is equiv. to the arithmetical mean of the resp. sp. vols. of the components (isofluid solns., true mixts.); (c) in which the d. and sp. vol. resp. of the soln. are equiv. to the geometric mean of the resp. ds. and sp. vols. of the components (true solns.). The vol. type is characteristic for each soln. pair, and independent of the temp. Among normal solns. type (b) occurs most frequently (true mixt.), much less often type (c) (true soln.), and most rarely type (a).

W. O. E.

The salting out of ethyl acetate. N. SCHLESINGER AND V. KUBASOVA. *Z. physik. Chem., Abt. A*, 142, 25-36(1929).—In order to test the “salting out” theory of Tanmann (cf. C. A. 21, 678, 680) the soly. of neutral EtOAc (*b*<sub>73.8</sub> 76.6-77.1°) in water and 0.1, 0.25, 0.5, 1 *N* NaCl, KBr, KI aq. solns. was detd. at 18 temps. between 15° and 52° by the optical method of Alexeyev. The temp. of formation and disappearance of turbidity did not vary more than 0.1° for any concn. In all cases soly. curves were parabolas with a min. between 50° and 60°. The av. variation of interpolated values from detd. values was 0.47% with a max. of 0.86%. Because of pptn. of I, no detns.

were made for 1 *N* KI solns. The mol. soly. depression  $\lambda$  as well as the const  $\frac{\Delta l}{\Delta c}$  depends on concn. and temp.;  $\frac{\lambda n}{\Delta k} \cdot 10^4$  for the several salts was not const. These

results are not in accord with T's. theory. A preliminary detn. of salting out by use of mixts. of 2 salts indicated additive effects only.

E. R. SCHIERZ

The effect of gases on the color of iodine vapor and the solvent action of various vapors on solid iodine. ROBERT WRIGHT AND THOMAS MCGREGOR. *J. Chem. Soc.* 1929, 1364-7.—Dewar's observation that the color of I<sub>2</sub> vapor was less dense in an evacuated flask than in one contg. air at the same temp. has frequently been cited as an example of the soly. of a solid in a gas under ordinary conditions of temp. and pressure. W. and McG. repeated Dewar's expt by sealing I<sub>2</sub> in a flask, evacuating, heating to 90°, and then allowing air to enter the flask. The I<sub>2</sub> vapor deepened and became more purple with the inrush of air. The expt was repeated with less I<sub>2</sub> than would sat. the space with I<sub>2</sub> vapor at the temp. of the expt., and the same effect was observed. Conclusion: Since no excess solid I was present the effect cannot be attributed to the soly. of I<sub>2</sub> in air. A spectroscopic examn. of the effect was made by photographing the spectrum of the I<sub>2</sub> in the vacuum flask, both an excess of I<sub>2</sub> and an insufficient quantity being used, and also in the presence of air, of N<sub>2</sub>, O<sub>2</sub>, CO<sub>2</sub> and A. An increase of absorption, with the head of the absorption in the green moving to the red, was observed in the presence of the gases. The spectra were identical for all the gases, indicating that the color change is not due to the soly. of the I<sub>2</sub> in the gas used or to a chem. action between the gas and the I<sub>2</sub> vapor, but possibly due to the effect of pressure on the I<sub>2</sub> vapor. The spectra are reproduced. Detn. of the relative volatility of I in air and in a vacuum at 100° showed that it is more volatile in a vacuum, although the results



were not as const. as when air was present. There was no indication of the  $I_2$  being sol. in air. Measurements were carried out to detn. whether  $I_2$  is sol. in the vapors of those solvents in which, as liquids, it is readily sol. Benzene, toluene, alc., ether,  $CCl_4$  and  $CHCl_3$  were used. No const. results could be obtained for these vapors. After prolonged exposure to an air-vapor mixt., the surface of the  $I_2$  frequently became moist, and in some cases all of the  $I_2$  melted. It seemed that the  $I_2$  was absorbing some of the solvent vapor, forming a soln. which would thus have a lower  $I_2$  vapor pressure than pure  $I_2$ , which effect would thus mask any solvent action in the vapor phase.

I. I. QUILL

**Theory of solution of metals and alloys.** M. TZENTNERSHVER. *Z. physik. Chem.*, Abt. A, 141, 297–320 (1929).—A consideration of soln. phenomena from the standpoint of reaction velocity. A primary necessity for comparable results is uniformity of method. For record, results may be reduced to equations of certain reaction orders, or graphic methods used. In the simplest case the reaction may have the mechanism:  $M \rightarrow M^n + n\theta$ ;  $H^+ + \theta \rightarrow H$ ;  $2H \rightarrow H_2$ . This is governed by the diffusion coeff. as shown by the proportionality of its velocity to that of stirring, and its lack of any marked temp. coeff. In the cases such as Al, T. postulates:  $Al + 3Cl^- \rightarrow AlCl_3 + 3\theta$ ;  $3\theta + 3H^+ \rightarrow 3H$ ; with after reactions:  $AlCl_3 \rightarrow Al^{+++} + 3Cl^-$  and  $2H \rightarrow H_2$ . This is chem., being independent of stirring velocity and having a temp. coeff. It reduces to a third-order equation. Cd and Sn show 4th order, attributed to formation of complex ions. Overvoltage and passivity are considered as results of a delay in ion formation and consequent reduction of the soln. pressure ( $p$  in the Nernst equation). These can be lowered by activation (roughening or etching) of surfaces. During the induction period ordinarily observed in metallic soln. self activation is taking place. In metallic mixt. local elements are formed in which the potential of the dissolving metal is pos. and approaches a limit, characteristic of the acid anion. Soln. velocity is proportional to the cond. of the acid and only rarely affected by stirring. The log of the c. d. is proportional to time and follows the temp. coeff. of the cond. of the acid. In alloys, or with metallic coverings applied directly or through pptn. from salt solns., the nobler metal forms a continuous cathode through which the electrolyte diffuses, this diffusion velocity governing the speed of reaction. G. M. E.

**The theoretical evaluation of the entropies of aqueous ions.** WENDELL M. LATIMER AND CHARLES KASPER. *J. Am. Chem. Soc.* 51, 2293–9 (1929).—Calcs. are made which indicate that the entropy of hydration of aq. ions arises largely from the enormous pressures developed about the ion and the resulting decrease in the entropy of the water due to the compression. The entropies of soln. of the halide ions are shown to be in agreement with the estd. electron affinities of these elements. J. B. A.

**The nature of Kucera's anomalies.** P. HERASYMENKO. *Chem. Listy* 23, 121–4 (1929).—The max. of current during electrolytic reduction observed on polarigraphic curves accompany every reducing process including the electrodeposition of metals and various cathode potentials. About 50 reduction reactions have been studied which show a max. of current on the polarity curve; the no. of such reactions is unlimited. All max. of current flow are of the same character; the explanation must be a general one. The accumulation of  $O_2$  at the interface of Hg causes the interfacial tension to rise. Pure Hg has a surface tension of 440 *in vacuo*; in an atm. of  $O_2$ , the tension rises to 504, indicating an adsorption of  $O_2$ . If the rate of reduction is exceeded by the rate of adsorption, the reducing matter in the interface is decreased; the current falls, and the polarization increases.

FRANK MARESH

**Electrochemical reduction of benzoic acid.** FR. FICHTER AND ISRAEL STEIN. *Helv. Chim. Acta* 12, 821–6 (1929).—Baur and Müller (cf. *C. A.* 22, 1894) have reported the electrochem. reduction of  $BzOH$  to 1,3-dihydrobenzoic acid. Older references, apparently at variance, are now confirmed. An 80% yield of benzyl alc. with only traces of hydroaromatic compds. was obtained upon reduction of  $BzOH$  in alc. and concd.  $H_2SO_4$ , with a very pure Pb-cathode and a c. d. of 0.1 amp./sq. cm. Conclusion: Nuclear reduction, as observed by B. and M., was due to the lower c. d., they used, 0.01 amp./sq. cm.

K. H. ENGEL

**The conductivity of ethylmagnesium iodide in ether solns.** N. V. KONDIREV AND A. K. SUSL. *Ber.* 62B, 1856–61 (1929); cf. *C. A.* 19, 2636.— $K$  (= sp. cond.) and  $\lambda$  (= equiv. cond. =  $\phi K$  where  $\phi$  = cc. soln. contg. an equiv. in g. [ $\frac{1}{2}$  EtMgI]) curves were detd. at concns.  $\phi$  = 150 to  $\phi$  = 800 at 0°, 5°, 10°, 15° and 20°. The max. of  $K$  and  $\lambda$  for different temps. varies with concn. Each concn. of EtMgI in  $Et_2O$  corresponds to a different degree of assocn. of the complex between EtMgI and  $Et_2O$ .

A. P. SACHS

**Measurement of the conductance of electrolytes. II. Improvements in the os-**

illator and detector. GRINNELL JONES AND GILES M. BOLLINGER. *J. Am. Chem. Soc.* 51, 2407-16(1929); cf. *C. A.* 22, 1892.—An oscillator to give low voltage and an improved amplifier of vacuum-tube type for use on precision a. c. bridge for elec. cond. are described. G. B. TAYLOR

Some properties of the electromotive forces developed by contact of metals with solutions of various acid and salt concentrations. F. VLKS AND A. UGO. *Compt. rend.* 188, 1550-2(1929).—The e. m. f. of various metals and non-metals in solns. of their salts of varying strength and acidity against the calomel electrode are discussed. The values follow long complex curves. The final value is a function of the acidity and the salinity, and the curves show points of inflection at certain crit. points (equipotential) which when initially imposed yield const. values. The e. m. f. for some metals is more sensitive to changes in acidity and for others more so to changes in salinity. With certain metals at certain acid concns. the soln. appears to be buffered. These points are the equipotential points and may be considered as the isoelec. point of the amphoteric substance. V. F. HARRINGTON

The potentiometric determination of hydrogen ions. J. VELÍŠEK. *Chem. Listy* 22, 97-100(1928).—A theoretical discussion (general). FRANK MARESH

The influence of neutral salts on the  $p_H$  of phosphate buffer mixtures. HOWARD W. ROBINSON. *J. Biol. Chem.* 82, 775-801(1929).—The influence of neutral salts on  $p_H$  was studied throughout the range of the phosphate buffer solns. The effect is predominantly that of the cations and increases in the order  $K < Na < Li$ . It is independent of the total concn. of  $PO_4$  but is a function of the ionic strength. The equation

$p_H = p_K + \log \frac{Na_2HPO_4}{KH_2PO_4} - \frac{1.5\sqrt{\mu}}{1 + 1.5\sqrt{\mu}}$  is valid at 38° for concns. of  $PO_4$  up to

$M/15$ . For  $PO_4$  mixts. contg. neutral salts, the equation may be corrected by adding a term which is a function of the ionic strength of the neutral salt. A graphic method of calcn. is given. ARTHUR GROLLMAN

Limits to the applicability of indicators in simple  $p_H$  determinations. J. EISENBRAND. *Pharm. Zig.* 74, 989-92, 1009-10(1929).—Exptl. evidence indicates that no satisfactory detn. of  $p_H$  is practicable in buffer-free solns. by the aid of color indicators. W. O. E.

Permanence of color standards for  $p_H$  control work. W. A. TAYLOR. *Ind Eng. Chem., News Ed.* 7, 7(1929).—A reply to Schroder (*C. A.* 23, 2853). It is claimed that solns. rather than color standards of glass or color charts give best results, and that such solns. are available with a stability required by the analyst. If protected from light they retain their color for 4 or 5 yrs. W. C. EBAUGH

A method of determining hydrogen-ion concentration by means of the antimony electrode. I. I. SHUKOV AND G. P. AVSEYEVICH. *Z. Elektrochem.* 35, 349-52(1929).—A new method is described for prep. an Sb electrode, consisting of electroplating amalgamated Pt wires in a 25%  $SbCl_3$  soln. in acetone. These electrodes are characterized by permanence of potential and by reproducibility. The relationship between the electrode potential,  $E$ , and the H-ion concn.  $p_H$  is:  $E = 0.009 + 0.053 p_H$ . F. E. W.

The equilibrium  $Fe(NO_3)_3 \cdot KNO_3 \cdot HNO_3 \cdot H_2O$  at 25°. G. MALQUORI. *Atti accad. Lincei* [6], 9, 414-6(1929).—The above system has been studied and the equil. curves are shown; the compd.  $Fe(NO_3)_3 \cdot 2KNO_3 \cdot 4H_2O$  was sepd. from the mother liquors. A. W. CONTIERI

Equilibrium between double sulfates and aqueous solutions of sulfuric acid at various concentrations. II. C. MONTEMARTINI AND L. LOSANA. *L'industria chimica* 4, 107-10(1929); cf. *C. A.* 22, 529.—The systems  $Li_2SO_4 \cdot H_2SO_4 \cdot H_2O$ ,  $Na_2SO_4 \cdot H_2SO_4 \cdot H_2O$  and  $K_2SO_4 \cdot H_2SO_4 \cdot H_2O$  are studied and tables as well as the equil. curves are shown. III. *Ibid* 199-205.—The systems  $MgSO_4 \cdot H_2SO_4 \cdot H_2O$ ,  $MnSO_4 \cdot H_2SO_4 \cdot H_2O$ ,  $NiSO_4 \cdot H_2SO_4 \cdot H_2O$ ,  $CoSO_4 \cdot H_2SO_4 \cdot H_2O$  and  $ZnSO_4 \cdot H_2SO_4 \cdot H_2O$  are studied and complete equil. curves shown. A. W. CONTIERI

The velocity of oxidation of amines by potassium permanganate under various conditions. B. V. TRONOV AND L. S. NIKONOVA. *J. Russ. Phys.-Chem. Soc.* 61, 541-9(1929).—The oxidation of amines presents a more complex problem than that of alcs. and ethers (cf. *C. A.* 22, 3335, 3336, 3627) since N forms a larger variety of compds. than does O and also can exist in several valence states. The course of the oxidation is largely affected by the agent used and the concn. of H ions. The generalizations in the literature concerning the conditions facilitating amine oxidation conflict with one another. In the present investigation were studied triethylamine (I), piperidine (II), pyridine (III),  $\alpha$ -picoline (IV), quinoline (V), isoquinoline (VI) and N-tetrahydroquinoline (VII). The group  $CH_3$  in amines when adjacent to trivalent N reacted very readily

with  $\text{KMnO}_4$  in the presence of alkali. Satd. radicals, e. g., the Me in picoline, when further removed from the N, reacted with more difficulty. Unlike the O compds. studied, the  $\text{CH}_3$  in amines was quite as easily oxidized by  $\text{KMnO}_4$  in absence of alkali. This may be explained by the alk. reaction of the amines themselves. The CH group in pyridine derivative was scarcely attacked by  $\text{KMnO}_4$  alone or with alkali. In this regard exception is taken to the rule of Vorländer, and the case considered analogous to the difficult oxidation of such compds. as PhH by  $\text{CrO}_3$ , where, because of the unsatd. nature of the C atoms, the C—H bond is very stable. Satd. amines oxidized with difficulty in acid environment. It appears to be an exception to this but it may have been impure. In each case these amines oxidized with more difficulty than alcs. contg. the group  $\text{CH}_2$  linked to O. This difference may be explained in 2 ways: either the H attached to N is less mobile making the first phase of the reaction difficult, or the subsequent decompn. proceeds less easily. III in acid soln. is oxidized more easily than I, and much more easily than III in alk. soln. Thus with salt formation the oxidizability increases; this is due perhaps to the role of H attached to N. The present expts. partly confirm this view, since the mobility of this H would increase with an increase in the electronegativity of the remainder of the mol. Varying the acid concn. had little effect on the rate of oxidation. On the other hand the salts of  $\alpha$ -phenyl- and  $\alpha$ -benzylpyridine are more resistant to oxidation. This anomaly could be explained by assuming a kind of ring closure between the mobile H attached to N and a C atom of the ring of the substituent group, in keeping with Lowry's theory of the polarity of the double bond. The oxidation expts. were carried out at 16–18°, either with  $\text{KMnO}_4$  alone, or in the presence of equimol. amts. of NaOH or  $\text{H}_2\text{SO}_4$ . With III, various concns. of  $\text{H}_2\text{SO}_4$  were used ranging from 0.5 to 15 M, and also AcOH 0.5 and 1 M. The amine and  $\text{KMnO}_4$  were taken in equimol. amts.; the concn. of the  $\text{KMnO}_4$  was 0.03 mol. per l. The rate of reaction was measured by titration of unutilized oxidant remaining after various intervals of time. The rates were expressed as relative coeffs., that of III in alk. soln. being taken as unity. With VII titration was impossible because of formation of dark-colored products, although oxidation was very rapid in acid soln., less so under other conditions. The relative rates of oxidation follow: with  $\text{KMnO}_4$  alone; II, 10<sup>6</sup>; III, 4; IV, 21; V,  $6.2 \times 10^3$ ; VI,  $1.5 \times 10^3$ ; with  $\text{KMnO}_4$  and NaOH; I, 10<sup>6</sup>; II,  $2.8 \times 10^5$ ; III, 1; IV, 21; V,  $5.2 \times 10^3$ ; VI,  $9.5 \times 10^3$ ; with  $\text{KMnO}_4$  and  $\text{H}_2\text{SO}_4$ ; I, 3.3; II, 92; III, 74; IV, 126; V,  $1.4 \times 10^4$ ; VI,  $3.8 \times 10^4$ . In the addnl. expts. with III, change in concn. of  $\text{H}_2\text{SO}_4$  had a negligible effect. With III and 0.5 mol. AcOH, the rate is 43; with mol. AcOH, it is 71. The rates of oxidation of the phenyl- and benzylpyridines have not yet been detd.

LEWIS W. BUTZ

Studies on hydrazine; the velocity of the oxidation of hydrazine by ferricyanide. E. C. GILBERT. *Z. physik. Chem.*, Abt. A, 142, 139–50 (1929).—The oxidation was investigated at a temp. of 20° and in a buffer soln. of 0.6 M succinic acid, which has a  $p_H$  of about 6. The reaction gives  $\text{N}_2$ ,  $\text{Fe}(\text{CN})_6^{---}$ , and  $\text{H}_2\text{O}$  and is of the third order between hydrazine, OH ion and ferricyanide (simply of second order between hydrazine and ferricyanide).  $K = 1.72 \times 10^7$  for the third-order reaction. Conclusion:  $\text{N}_2\text{H}_4$ , rather than  $\text{N}_2\text{H}_5^+$  is the reacting material and the first step of the process is  $\text{N}_2\text{H}_4 - e \longrightarrow \text{N}_2\text{H}_3 + \text{H}^+$ .

WILLIAM E. VAUGHAN

Studies of catalysis by the action of subdivided metals. IV. Isotherms of adsorption of hydrogen, ethylene and ethane. B. FORESTI. *Gazz. chim. ital.* 59, 243–58 (1929); cf. *C. A.* 19, 2633.—The isotherms of adsorption of  $\text{H}_2$ ,  $\text{C}_2\text{H}_4$  and  $\text{Me}_2$  by catalytic Ni at 20° were studied. The Ni was first evacuated at 255° and at 21°, and the isotherms were then detd. by a volumetric method which was based on measurements of the quantity of gas adsorbed at different pressures when equil. was reached. The app. was almost the same as that used in detg. the heats of adsorption of various gases on Ni (cf. *C. A.* 18, 1224), with the addn. of a Bourdon manometer. Only  $\text{C}_2\text{H}_4$  conformed to the relation:  $L = K\sqrt{p}$ , when the metal was evacuated at 21°, and when the metal was evacuated at 255°, even  $\text{C}_2\text{H}_4$  followed the law only approx. and within a limited range of pressures. Certain data of Schmidt (cf. *C. A.* 20, 1017; 22, 4332), according to which  $\text{H}_2$  is always adsorbed by Ni in proportion to the square root of the pressure, are corrected. Various cases of adsorption are then discussed from the point of view of the Langmuir theory, the conclusion being reached that the quadratic relation also holds independently for the disson. of the adsorbed gas; in fact non-dissociable gases sometimes follow this quadratic relation. For at. adsorption, the validity of the same relation depends upon the pressure and upon the value of  $\delta$ , the isotherms of which however, have a different form from the form of the exptl. isotherms. The theoretical discussion and the exptl. data together favor the idea of the "heterogeneity" of the sur-

face of the Ni catalyst. Such a surface would be constituted of centers of different values distributed in groups, and the smaller the activity of the centers pertaining to each group, the greater the no. of these groups. At pressures where adsorption isotherms are ordinarily detd., it is possible to obtain curves which obey the quadratic relation without the necessity of assuming that the adsorbed gas is in the at. state. The isotherms for  $C_2H_4$  also show that the quadratic relation is valid for mol. adsorption. The characteristic form of the isotherms for  $H_2$  and Ni indicate to a certain extent the constitution of the adsorbing surface of the metal, for they show that the greater part of the gas is adsorbed at low pressures (not over 50 mm.) with the result that there are 2 branches differently inclined with respect to the ordinates. Curves of the same type can be obtained from the equation:  $\theta = B_1(\delta_{1\mu}/[1 + \delta_{1\mu}]) + B_2(\delta_{2\mu}/[1 + \delta_{2\mu}]) + \dots$ , by assigning to it values of  $\delta_1 = 10^\circ$ ,  $\delta_2 = 10^\circ$ ,  $B_1 = 0.30$ ,  $B_2 = 0.70$ . This is in favor of the heterogeneity of the active surface, with at least 2 types of adsorbing centers distributed so that there are fewer strong ones than weak ones. The form of the isotherms of  $C_2H_4$  and of  $Me_2$  indicates that the bonds established between the gas mols. and Ni catalyst are weaker than those of adsorbed  $H_2$ . As a result  $C_2H_4$  is more readily evolved, and this in turn is in accord with the ease with which  $C_2H_4$  may be hydrogenated in the presence of Ni. The results also show that to obtain data on the adsorption of  $H_2$  by Ni by exptl. detns. of the isotherms, it is necessary to work at the lowest practicable pressures. For simple mol. adsorption on homogeneous or heterogeneous surfaces, the quantity of gas adsorbed is, at low pressures, proportional to these pressures, while the quadratic relation holds for at. adsorption. This should also be true if it is assumed that only a small part of the adsorbed  $H_2$  is dissoed. If the dissoen. is attributed to the more active centers, at low pressures these centers will be covered to the greater degree and therefore will follow the quadratic relation at least to a close approximation. C. C. DAVIS

**Nickel catalyzer. I. Catalyzer prepared from nickel chloride.** TOKISHIGE KUSAMA AND YUKIO UNO. *Bull. Inst. Phys. Chem. Research (Japan)* 8, 461-6(1929); *Abstract sect. 2*, 50-1.—The reason for the fact that a Ni catalyst prepd. from  $NiCl_2$  is generally less active than one prepd. from  $Ni(NO_3)_2$  is discussed. The authors prepd. a basic carbonate from  $NiCl_2$  with  $Na_2CO_3$  and, after washing it thoroughly changed it into an oxide at  $480^\circ$ . The oxide still contained 0.023% Cl. It was reduced in a  $H_2$  current at  $350^\circ$ . The Ni thus prepd. had the same catalytic effect as a batch prepd. from  $Ni(NO_3)_2$  in reducing naphthalene, benzene, phenol and aniline. ALBERT L. HENNE

**Generalized two-dimensional Gibb's statistics.** KULESH CH. KAR AND R. MAZUMDAR. *Z. Physik* 55, 546-54(1929).—Mathematical. GEORGE GLOCKLER

**Ternary systems. VIII. Potassium carbonate, potassium sulfate and water at  $25^\circ$ .** ARTHUR E. HILL AND SAMUEL MOSKOWITZ. *J. Am. Chem. Soc.* 51, 2396-8(1929); cf. C. A. 22, 4336.—The soly. of  $K_2SO_4$ , expressed as g. per 100 g. of satd. soln., at  $25^\circ$  decreases from 10.7 in pure water to 0.03 in satd. solns. of  $K_2CO_3$ . Solid soln. does not occur in the system at  $25^\circ$  to a measurable extent. K. D. JACOB

**A study of the system: sodium bicarbonate-potassium bicarbonate-water.** N. E. OGLESBY. *J. Am. Chem. Soc.* 51, 2352-62(1929).—The ternary system:  $NaHCO_3$ - $KHCO_3$ - $H_2O$  was studied at temps. of  $19.97 \pm 0.01^\circ$ ,  $25 \pm 0.03^\circ$  and  $30.01 \pm 0.04^\circ$  under the fixed condition that the sum of the partial pressures of  $CO_2$  and  $H_2O$  vapor was equal to the atm. pressure. The only solid phases that exist at these temps. are  $NaHCO_3$  and  $KHCO_3$ , the absence of hydrates, solid solns. and double salts being definitely established. The soly. of  $KHCO_3$  at  $20^\circ$ ,  $25^\circ$  and  $30^\circ$  was 33.3, 36.57 and 39.92 g. per 100 g. of water, resp., the values being somewhat higher than the best values previously reported. The values for the soly. of  $NaHCO_3$  checked very closely with the best values previously given in the literature. K. D. JACOB

**Double salt isotherms.** R. M. CAVEN AND WM. JOHNSTON. *J. Roy. Tech. Coll. (Glasgow)* 2, No. 1, 30-5(1929).—The following systems were studied: (1)  $Na_2SO_4$ - $ZnSO_4$ - $H_2O$ , at  $0^\circ$  and  $25^\circ$ ; (2)  $K_2SO_4$ - $CoSO_4$ - $H_2O$ , at  $25^\circ$ ; (3)  $Na_2SO_4$ - $MnSO_4$ - $H_2O$ , at  $0.25$  and  $35^\circ$ . In (1) the double salt  $Na_2SO_4 \cdot ZnSO_4 \cdot 4H_2O$  was found at  $25^\circ$  but not at  $0^\circ$ . In (2) the double salt  $K_2SO_4 \cdot CoSO_4 \cdot 6H_2O$  exists at  $25^\circ$ . In (3) the double salt  $Na_2SO_4 \cdot MnSO_4 \cdot 2H_2O$  occurs at  $25^\circ$  and  $35^\circ$  but not at  $0^\circ$ . Isotherms are plotted for the various double salts. R. H. FERGUSON

**Binary azeotropes. XII.** M. LECAT. *Ann. soc. sci. Bruxelles* 48B, i, 113-26(1928); cf. C. A. 23, 1800.—A further list of binary org. mixts. is given contg. 161 pos. and 11 neg. azeotropes, 27 eutectic mixts., and a large no. of euzotropes. The mixt. of phenetole and isoamyl ether constitutes the first established case of azeotropy in which both the components are oxides. B. C. A.

**Thermic analysis of the system: phenylhydrazine-acetic acid.** N. A. TRIFONOV AND S. I. CHERBOV. *Bull. inst. recherches biol. Univ. Perm (Russia)* 6, 313-8(1929).—The curve m. p. vs. concn. was detd. for the system:  $\text{PhNHNH}_2 + \text{AcOH}$ . The diagram presents one dystectic point at  $61.5^\circ$  for a 50% mol. concn. and 2 eutectic points, at  $15.7^\circ$  for 5% mol. AcOH and at  $-8.8^\circ$  for 85% mol. AcOH. The dystectic point shows the formation of a 1:1 addn. compd. ALBERT L. HENNE

**Decomposition velocity of solids. V. Mercurous carbonate and some metal salt hydrates.** B. BRUŽS. *Z. physik. Chem., Abt. B*, 3, 427-39(1929); cf. *C. A.* 20, 3623.—A curve was drawn and all time elements were reduced to the basis of the time at which the max. velocity was reached. At this point decompn. in  $\text{Hg}_2\text{CO}_3$  had reached 40%. The reaction mechanism was independent of the temp. and pressure. The reaction velocity was proportional to the difference between the internal and external  $\text{CO}_2$  pressure. Equil. in the reaction,  $\text{Hg}_2\text{CO}_3 = \text{Hg}_2\text{O} + \text{CO}_2$ , lies at  $116 \pm 0.5^\circ$ . Efflorescence of the hydrates varied greatly with the condition and area of the surface exposed. Spontaneous procedure of decompn. under const. external conditions is accounted for by local variations in pressure within the crystal lattice. GREGG M. EVANS

**The thermal decomposition of methyl isopropyl di-imide: a homogeneous unimolecular reaction.** The thermal decomposition of hydrazoic acid and methyl azide. HERMAN C. RAMSPERGER. *J. Am. Chem. Soc.* 51, 2134-43(1929); cf. *C. A.* 23, 1877.—The thermal decompn. of  $\text{CH}_3\text{—N=N—C}_3\text{H}_7$  in the range of temp. 250-332° and of pressure 0.0058-13.12 cm. Hg takes place by the main reaction  $\text{CH}_3\text{—N=N—C}_3\text{H}_7 \rightarrow \text{N}_2 + x \text{C}_2\text{H}_6 + y \text{C}_4\text{H}_{10} + z \text{C}_6\text{H}_{14}$  with the probable side reaction  $\text{CH}_3\text{—N=N—C}_3\text{H}_7 = \text{N}_2 + \text{CH}_4 + \text{C}_3\text{H}_6$ . The reaction is homogeneous and first order at high pressures. At pressures below several cm the rate const. falls off. Theory 2 of Rice and the author fits the data if the mol. be assumed to have 33 degrees of freedom. The thermal decompn. of anhyd.  $\text{NH}_3$  takes place at  $290^\circ$  with measurable velocity. Expts. at  $290^\circ$  and 4 cm. pressure show 9-11%  $\text{HN}_3$  to be decompd. in 25 min. The decompn. is catalyzed by the Pyrex walls of the reaction vessel. The thermal decompn. of  $\text{CH}_3\text{N}_3$  was carried out at  $245^\circ$ . The reaction was homogeneous, and of the first order during a given expt., but the rate const. becomes lower at lower initial pressures. E. S. W.

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### 3—SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

S. C. LIND

**The electron permeability of matter.** E. BRÜCHE. *AEG Mitt.* 1929, 478; 10 illus.—A historical review and a brief description of the app. used at the A. E. G. laboratories, Berlin. C. G. F.

**Perturbation theory in quantum mechanics.** A. H. WILSON. *Proc. Roy. Soc.*

(London) A122, 589-98(1929).—It is shown that, although the series of perturbations does not in general converge, yet it usually possesses the same asymptotic character as in the classical theory, and its use can therefore be justified. The investigation is limited to systems possessing only discrete spectra, and the method does not seem adequate to deal with systems with continuous spectra.

B. C. A.

**Determination of crystal potentials by diffraction of high-voltage electrons.** A. G. EMSLIE. *Nature* 123, 977-8(1929).

A. L. HENNE

**The excitation potentials of the mercury atom.** RAMON G. LOYARTE. *Anales soc. cient. Argentina* 107, 498-510(1929).—Several of the excitation potentials found by Franck and Einsporn (*C. A.* 14, 3360) may be obtained by adding the potential of 1.4 or its multiples to the normal series of potentials of Hg. It remains to be detd. whether this potential belongs to the abnormal series or is caused by a very small quantity of impurity in the tube.

R. D. BUMBACHER

**Experiments with rays of atomic hydrogen. I. The technical production of rays of atomic hydrogen, and their effect on a Schumann plate.** HANS KERSCHBAUM. *Ann. Physik* [5], 2, 201-12(1929).—A Woods tube run by d. c. was employed; the new feature was the use of celluloid pierced with fine holes for the 3 parallel slits to define the beam of rays of at. H. On exposing a Schumann plate glass side toward the source, a point image was obtained, but on exposing the emulsion side for the same length of time, an image 4-5 times as large was obtained. It was experimentally proved that blackening of the Schumann plate was due solely to H atoms. The image obtained by exposure of the emulsion side of the plate was due to the H atoms, and was enlarged by a slight scattering of the atom. The fuzzy edges were due to non-circular holes (in the slits) with rough edges. **II. Reflections of hydrogen rays from crystals.** *Ibid* 213-20.—Expts. on the reflection of H atoms of thermal velocity by mica, gypsum and celluloid over 2 angular regions, viz., 45-50°, and 5-10° are reported. The angle of incidence is equal to the angle of reflection, referred to the normal to the crystal. With the thinnest possible films of celluloid and of mica, only irregular scattering in the film was observed. When the gas in the observation chamber was air at a pressure of 0.001 mm. the Schumann plates blackened without the formation of an image of the H atom rays, but when the air was replaced by Ne, a very distinct image of the rays was obtained (save for fuzzy edges) even at a pressure of 0.0014 mm. No explanation of this fact was found.

LOUIS WALDBAUER

**Aggregates of radioactive atoms. II.** JEDRZEJOWSKI. *Compt. rend* 188, 1043-5 (1929). A photographic study of the formation of recoil aggregates in radioactive decompn. under various conditions. Sources prepd. by direct activation in Rn, or by activation *in vacuo* by recoil particles, both from  $\alpha$  and  $\beta$  ray changes, show the existence of at. aggregates, but in sources prepd. by distn., aggregates are absent. Increase of temp. is without influence on aggregation.

W. WEST

**The recoil.** L. WERTENSTEIN. *Compt. rend.* 188, 1045-7(1929); cf. preceding abstr.—A study of the recoil particles of Ra C in the  $\beta$ -ray change of Ra B. The mode of prepn. of the source does not influence the yield; increase in temp. and age of source lowers it. Bi, isotopic with Ra C, is the best receiver for the recoil particles; Al, which is the best substance on which to deposit the source, is the least efficient receiver.

W. WEST

**Radium, with special reference to luminous paint.** A. T. PARSONS. *J. Oil and Colour Chem. Assoc.* 12, 3-25(1929).—A general account of the chem. and radioactive properties and the manipulation of Ra is given, and its applications to medical practice and chem. investigations are indicated. Radioactive luminous paints consist of a phosphorescent substance, e. g., suitably prepd. ZnS, etc., the luminescence of which is excited by radioactive material, e. g., Ra, meso-Th, etc. The manuf. of luminous ZnS is described. Work on the permanence of luminous paint and the recovery of Ra therefrom is summarized.

B. C. A.

**The modification of colloids by the action of the rays from radioactive substances.** J. LOISELEUR. *Compt. rend.* 188, 1570-2(1929).—The rays of Ra and Rn reduce the protective power and cause the flocculation of gelatin and other colloidal solns. Certain salts aid this action.

V. F. HARRINGTON

**Electronic charge e.** R. T. BIRGE. *Nature* 123, 318(1929).—The evaluation of e is discussed.

B. C. A.

**Eddington's hypothesis and the electronic charge.** E. BACKLIN. *Nature* 123, 409-10(1929).—The distribution of individual values of the electronic charge,  $e$ , obtained by Millikan, Wadlund and the author, resp., is examd., and the probable error is estd. It is not possible to decide whether 136 or 137 is the better value for Eddington's relation  $hc/2\pi re^2$  (*C. A.* 23, 1809).

B. C. A.

**Low-voltage sparks as spectroscopic sources.** A. OCCHIALINI. *Atti accad. Lincei* [vi], 8, 339-93(1928). E. J. C.

**Further remarks concerning thermionic "A" and "b," a revision and extension.** EDWIN H. HALL. *Proc. Natl. Acad. Sci.* 15, 504-14(1929).—H. disagrees with the proposal that the thermionic-work function and photoelec.-work function are equal. The equation  $\phi = \phi_0 - (\lambda^1 - \theta)$  is derived, wherein  $\phi$  and  $\phi_0$  are the thermionic and photoelec.-work functions, resp.,  $\lambda^1$  is the energy to ionize an atom in the metal and  $\theta$  a term to account for the thermal energy of the electron after emission. H. insists on the possibility of a variation of the thermionic-work function with temp. even in cases where the corresponding photoelec. term is independent of temp.  $b = \phi/k$  and H. proposes  $b = b_0 - aT$ ,  $b_0$  and  $a$  being const. It is stated that Bridgman is using a definition of work function essentially different from that of H. In cases where the photoelec.-work function varies with temp.,  $I = \epsilon \gamma A_0 T^2 e^{-b_0/T}$  where  $\gamma$ ,  $A_0$  and  $b_0$  are const.  $\phi$  may also be expressed as  $\phi_0 - akT$ ,  $k$  being the Boltzmann const. W. D. V.

**Some applications of electric moments to electronic theories of valence.** CHARLES P. SMYTH. *J. Am. Chem. Soc.* 51, 2380-8(1929).—Electronic moments are used as a test of electronic theories of valence requiring a polar mol. Lack of elec. moments in the paraffins shows no alternating polarity in the chain or inherent dissymmetry in the electron linkages of alkyl radicals. Uniformity of moments of the higher ketones and alkyl halides indicates the same and shows that in these chains no measurable polarity is transmitted through more than 2 atoms. The ethylene double bond has no measurable polarity but may have if different radicals are attached to opposite sides of the bond. The difference in moment between the *cis* and *trans* isomers of acetylene dihalides indicates a lack of rotation about the double bond. Effects commonly attributed to differences of polarity may be due to differences of energy levels of the valence electrons. C. L. READ

**Emission of electrons from metals.** F. ROTHER AND E. MÜNDE. *Physik. Z.* 30, 65-8(1929).—Millikan and Eyring (*C. A.* 20, 1353) found the pulling out of electrons from a thoriated W cathode by intense elec. fields to be independent of temp., and Gossling (*C. A.* 20, 1944) found the temp. effect up to 1700° abs. on electron emission to be negligibly small. Gossling, in contrast to Millikan and Eyring, observed sudden changes in the characteristic curves for the discharge. According to Schottky's theory (*C. A.* 17, 2078), the relation between  $\log i$  ( $i$  being the current) and the root of the voltage gradient  $(v./cm.)^{1/2}$  should be linear; but Millikan and Eyring did not obtain such results. Repetition of the work shows that  $\log i$  is proportional to the sq. root of the field strength rather than to the reciprocal of the field strength (cf. Fowler and Nordheim, *C. A.* 22, 3829). The origin of the exptl. discrepancies is discussed and the validity of Schottky's theory is accepted. B. C. A.

**Influence of the level of origin of the photoelectrons on the distribution in space of their initial directions.** P. AUGER. *Compt. rend.* 188, 447-550(1929); cf. *C. A.* 21, 1591, 23, 1050.—Electrons from the *K*-level behave as if they possess no motion before their photoelec. expulsion, while those from the *L*-level show a considerable supplementary dispersion, appreciable even for low values of this level, which indicates the existence of electronic motion in the atom itself before excitation. B. C. A.

**Technic of the Röntgen methods.** FRITZ KASTNER. *Sprechsaal* 62, 263-4, 294-6, 316-7, 335-8(1929).—Photographs of x-ray app. and parts, with a thorough description of each, and sketches of the set-up for different methods of x-ray analysis are given. C. H. LORIG

**The formation of addition compounds in the crystalline state.** W. KRINGS. *Z. anorg. allgem. Chem.* 181, 298-308(1929).—A theoretical treatment of complex compds. and coordination nos. K. calcs. the energy required for the addn. of 1 mol. of  $NH_3$  to a lattice mol. of the uni-uni salt type as  $4.95 \times 10^{-12}$  ergs on the basis of the charges and potential of the ions. This corresponds to 71,700 cal. mol. The lattice furnishes 38,400 cal., which leaves 33,300 cal. necessary from external sources. 'It is thought that this figure is high. K. theorizes on the meaning of coordination nos. W. E. V.

**Penetrating radiation. II.** J. CLAY. *Proc. Acad. Sci. Amsterdam* 31, 1091-7(1928); cf. *C. A.* 22, 4359.—An accurate detn. of the capacity of the electrometers has shown that the values previously used were incorrect. A redetn. has been made of the residual ionization and of the const. of the penetrating radiation. The origin of the latter is discussed, and its intensity is shown to decrease as the equator is approached. B. C. A.

**The Stark effect of higher atoms and its interpretation according to the quantum theory.** R. LADENBURG. *Physik. Z.* 30, 369-83(1929).—Summary and bibliography. F. R. BICHOWSKY

**Photodichroism and photoanisotropism. III. Quantitative measurements of induced photodichroism.** FRITZ WEIGERT. *Z. physik. Chem., Abt. B*, **4**, 83-112 (1929); cf. *C. A.* **23**, 4146.—W. presents a detailed paper on the phases of induced photodichroism. Various types of plates and emulsions and 8 different filters to isolate portions of the spectrum were employed. The phenomenon is best shown under the stimulation of red light. The measurements are definitely reproducible but are sensitive to even slight variations in exptl. app. and technic. The effects of variation of time of exposure (over a range of from 1 sec. to 4 min.) with time of development (30 sec. to 240 min.), both "physical" and "chemical" developers (metolhydroquinone and iron oxalate) being used, has been fully investigated and it is found that the degree of dichroism is greater with the longer periods of exposure and developing. Influence of period of fixation also was studied. In some cases when a wet plate was exposed to red radiation the dichroism was first neg and then became pos. Blue-green light was effective but red gives the greatest results. The Ag formed may be yellow, vel. low-brown, red-brown, brown, olive-green or black. AgCl shows the most pronounced effects in fixed periods of time of exposure, while AgBr is nearly as sensitive and AgI the least.

WILLIAM E. VAUGHAN

**Elimination of stray radiations in an infra-red spectrometer.** J. LECOMTE. *Compt. rend.* **188**, 622-5(1929).—The proportion  $d$  ( $d < 1$ ) of stray radiation passing into the instrument at each point of the spectrum beyond  $10\mu$  is detd. by the transparent-shutter method, and the gross transmission of the substance is then detd. by the usual opaque-shutter method. The true transmission of the radiation above  $10\mu$  is given by the formula  $T = (T' - d)/(1 - d)$ , where  $T'$  is the gross transmission of the radiation in the presence and absence of the absorbent. The true absorption is given by  $1 - T$ . The variation of  $d$  with wave length is usually a straight line.

B. C. A

**Secondary radiations in light diffused by quartz.** J. CABANNES. *Compt. rend.* **188**, 249-50(1929).—An attempt is made to verify the author's hypothesis that the action of light on a mol. depends on its orientation, by the study of the Daure diffusion spectra and the polarization of the secondary radiations produced by quartz crystals in which the mols. are oriented in a small no. of fixed directions. The Daure spectra always comprise the same radiations, whatever the orientation of the crystal.

B. C. A

**Absorption of the carboxyl group in the short ultra-violet.** H. LEY AND B. ARENDS. *Z. physik. Chem., Abt. B*, **4**, 234-8(1929).—Values of the extinction coeffs. of AcOH, glacial and in aq. soln., of AcOEt and of NaOAc soln. are given from about 2350 to 1850 Å. U. Measurements were made by V. Henri's photographic method, a condensed spark between Ag and W being used as source. The acid and ester, pure or in soln., show an absorption max. at about  $204\mu\mu$ ; the Na salt has no max. here, but continues to absorb the shorter wave lengths with a regular increase of intensity.

W. WEST

**Ultra-violet absorption curves of semiterpene alcohols.** J. SAVARD. *Bull. soc. chim.* **45**, 398-402(1929).—Absorption curves for linalool, geraniol, rhodinol and citronellol (in hexane soln.), have been detd. These support the traditional formulas,  $\text{Me}_2\text{C}:\text{CHCH}_2\text{CH}_2\text{CH}(\text{Me})\text{CH}_2\text{CH}_2\text{OH}$  (I) for rhodinol, and  $\text{CH}_2:\text{C}(\text{Me})\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}(\text{Me})\text{CH}_2\text{CH}_2\text{OH}$  (II) for citronellol. They are not in accord with the conclusions of Grignard, *et al.* (*C. A.* **18**, 659), from ozonization methods, that rhodinol consists of 55% of I and 45% of II, citronellol of 80% of I and 20% of II.

K. H. ENGEL

**Apparatus for strong ultra-violet and infra-red light; photographing with heat rays.** I. PLOTNIKOV. *Z. Elektrochem.* **35**, 434-8(1929).—Three types of app., called the UVR large and small models and luminoscope, for the prepn. of strong ultra-violet and ultra-red light for investigations with the help of excited fluorescence and heat-shadow photographs are described in detail with diagrams. The Görz-Beck carbon arc light, strong sunlight and Mg light are used as light sources. The equipment is adapted for biol., medicinal, photochem., paleontological, archeological and criminological investigations.

H. W. WALKER

**An integrating microphotometer for x-ray crystal analysis.** W. T. ASTHURY. *Trans. Faraday Soc.* **25**, 397-401(1929).—See *C. A.* **23**, 3404.

H. W. WALKER

**The Raman spectrum of some organic and inorganic compounds.** A. PETRIKALIN AND J. HOCHBERG. *Z. physik. Chem., Abt. B*, **4**, 299-311(1929).—The Raman spectrum was detd. for benzonitrile, benzyl chloride, benzotrifluoride, phenol, cyclohexanol, paraldehyde, acetone, acetaldehyde, benzaldehyde, chloral, chloral hydrate, allyl chloride, toluene, Me cyanoacetate,  $\alpha$ -tolunitrile,  $\text{SnCl}_4$  and KCN. For H attached to a double-bonded C, the results agree very closely with previous work (A. Petrikalin, *C. A.* **23**, 3855) giving infra-red wave lengths, 3.25-3.27 $\mu$ . For H attached to a single-bonded C the results vary widely; this is attributed to the effect of other groups in



the mol. The C=N bond gives concordant results, 4.41-4.48 $\mu$ , and the C=O bond, 5.81-6.02 $\mu$ . KCN gave a line at 4.80 $\mu$  and SnCl<sub>4</sub> two widely sepd. doublets.

**Studies of the Raman effect. I. The Raman spectra of organic substances (fatty acids and their esters).** A. DADIEU AND K. W. F. KOHLRAUSCH. *Monatsh.* 52, 220-40; *Sitzb. Akad. Wiss. Wien., Abt. IIa*, 138, 41-61 (1929); cf. following abstr.—The importance of Raman spectra is emphasized, as a means of investigating the mol. Fifteen fatty acids and their esters were investigated. The ultra-red frequencies thus found correspond partially to those found by direct measurement, but certain strong bands in the direct absorption expts. are not found in the Raman spectra.  $\nu = 2940$  is present only when the mol. contains a C-H group;  $\nu = 1700$ , when the C-O group is present;  $\nu = 440$ , always when the O-H group is present, but occasionally when it is not (the authors believe that it depends rather on the presence of a C-H grouping);  $\nu = 1050$  appears in the aromatic series, with  $\nu = 1000$  for benzene, toluene, xylene and monochlorobenzene, but is not present with *p*-xylene. Values between 1000 and 1100 are generally found in the aliphatic series, with the exception of AcOH and Me acetate. The change from acid to ester is not clearly marked; from acid to acid is 7-10, and from ester to ester 12-14. The line-group 840, with values from 760-890, appears in almost all compds. The line-groups 600 and 400 are somehow connected with the group 840. Further investigations are being carried on.

HELEN G. WEIR

I. J. PATTON

**Contribution to the study of the Raman effect.** A. DADIEU AND K. W. F. KOHLRAUSCH. *Physik. Z.* 30, 384-91 (1929)—The Raman frequencies are given for 25 org. compds., aliphatic and aromatic, and briefly discussed with reference to the linkages in the mol. In addn. to the frequency  $\nu' = 3050$ , characteristic of the aromatic CH linkage, the authors claim the frequency  $\nu' = 2940$ , ordinarily present only in aliphatic CH linkages, for benzene. The frequent indefiniteness in the arrangement of the displaced lines is pointed out and more fully discussed in the case of benzene. The unmodified superposition of Raman spectra in mixts. of different compds. is confirmed and applied to the observation of dissolved substances (naphthalene in CCl<sub>4</sub>). Attempts to find any frequency characteristic of the presence of disocin. in a soln. of AcOH in water gave neg. results. The influence of temp. on the intensity of Raman frequencies and the classically scattered exciting lines has been detd. qualitatively.

I. J. PATTON

**Fundamental processes of phosphorescence.** R. TOMASCHIEK. *Apoth. Ztg.* 44, 909-10 (1929).—An address dealing with the phenomena underlying the excitation and emission processes of phosphorescence.

W. O. E.

**A method of measuring luminescent light.** I. PLOTNIKOV. *Z. Elektrochem.* 35, 132-4 (1929).—By means of the polarization colorimeter of KRUSS, a quartz lamp, adjustable liquid filter frame, absorption vessels, black wire gauzes and graduated transparent circle, P. measures quantitatively luminescent light including fluorescence, phosphorescence, chemiluminescence, triboluminescence and luminescent bacteria. The method of interchange eliminates app. errors and in first detg. the "weakening" coeff. of the wire gauzes with a spectrophotometer and with P.'s fluorometer the av. error is less than 0.05%. A diagram of the app. and a trial detn. are given.

H. W. WALKER

**The primary process of light absorption and activation in photochemical reactions.** KALI P. BASU. *J. Phys. Chem.* 33, 1200-3 (1929).—An atom or mol. absorbs part of the quantum of incident effective radiation and is distorted, an electron being removed to a higher quantum orbit. The energy level is raised to initiate chem. action. The remainder of the quantum is scattered by the mol., a part of which is again absorbed by another mol. so that more than one mol. is activated. A photochem. reaction should have a lower energy of activation than the corresponding dark reaction. This explains the diminution of temp. coeff. with increase in frequency and the increase of photochem. efficiency with increase in frequency.

MARY E. LEAR

**Photochemical oxidation with potassium dichromate.** D. S. MORTON. *J. Phys. Chem.* 33, 1135-41 (1929).—In an effort to det. the correctness of Luther and Forbes' conclusions, (cf. *C. A.* 3, 2404) that in the reaction between quinine and K dichromate in a soln. contg. H<sub>2</sub>SO<sub>4</sub> only the light absorbed by the quinine was active, it was found that dichromate solns. are photochemically active for light absorbed. But with increasing acidity, the oxidizing power increases and the apparent action of light decreases. With EtOH, K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> and varying amts. of acid, the light reaction can be made none or all. Method and data are given.

MARY E. LEAR

**Photochemical decomposition of benzaldehyde.** A. DE HEMPTINNE. *Ann. soc.*

*sci. Bruxelles* 48B, 98-100(1928); cf. *C. A.* 23, 4408.—It is concluded that the photolysis of BzH by light of wave lengths less than 2600 Å. U., which was previously observed (*C. A.* 22, 2717), takes place as follows:  $\text{BzH} = \text{C}_6\text{H}_5 + \text{H} + \text{CO}$ , the H then reacting with the Ph group to form  $\text{C}_6\text{H}_6$ . The energy necessary for this decompn. is calcd. to be 115,780 g.-cal., corresponding with light of wave length 2461 Å. U. This is the wave length at which the total absorption band of the BzH spectrum begins. For BzH there is a complete parallelism between the appearance of total absorption and the possibility of photochem. decompn. B. C. A.

**Complementary and critical researches on the subject of dissolved and irradiated cholesterol. Role of an antioxidant.** E. ROUSSEAU. *Compt. rend. soc. biol.* 100, 823 (1929).—Irradiated abs. alc. displaces I from an iodide. The addn. of cholesterol reduces, and the addn. of phloroglucinol prevents this effect. The substance formed in the alc. is thought to be ozone, though no conclusive demonstration of its presence could be made. B. C. BRUNSTETTER

**Ionization and the chemical combination of gases.** A. DE HEMPTINNE *Bull. sci. acad. roy. Belg.* [5], 14, 450-4(1928); *Chem. Zentr.* 1929, I, 16.—Earlier expts were continued on the relation between ionization in a mixt. of  $\text{H}_2$  and  $\text{O}_2$  and chem. reaction under the influence of silent discharges. Very small pressures (about 1 mm. Hg) and d. c. were employed. The decrease in pressure of the static system was measured. The ionization was estd. galvanometrically and the approx. no. of ions present in the discharge was calcd. The comparison of the no. of ions with the no. of mols. obtained by the chem. reaction allows the conclusion that a close relation exists between these 2 factors. The probable explanation of this relation is discussed. The first product in the reaction between  $\text{H}_2$  and  $\text{O}_2$  is  $\text{H}_2\text{O}_2$ . The conditions are still more complicated with the formation of  $\text{NH}_3$  from  $\text{N}_2 + \text{H}_2$  by silent discharge. G. SCHWOCH

**Use of thermionic valve in measurements of ionization currents.** J. A. C. TEGAN *Nature* 124, 91-2(1929). E. H.

**The activation of oxygen by electron impact.** ROBERT H. DALTON. *J. Am. Chem. Soc.* 51, 2366-74(1929).—Crit. potentials of O were studied at pressures of 0.05-0.4 mm. by means of current-potential measurements, and the rate of reaction with solid C. Crit. values were found at 7.9 and 10.6 v. T. H. CHILTON

**Formulas for sensitized photolyses.** EMIL BAUR *Helv. Chim. Acta* 12, 793-806(1929).—Theoretical formulas are developed covering photolyses occurring under different conditions of inhibition, autocatalysis, etc., on the basis of his theory of photosensitization, wherein the catalyzer is assumed to act as an oxidizing and reducing agent. The effect of anodic depolarizers is analyzed from the 3 standpoints of strong, moderate and no inhibition and equations are deduced for these conditions. Desensitization and the stationary state also are considered. Many examples are cited of work which has characteristics and reaction rates which corroborate the equations

WILLIAM E. VAUGHAN

Some modern applications of photography (CLARK) 5. The mineral waters of Rosheim. Analytical and therapeutical study (LEGIN, SCHIRARDIN) 14. A study of thermal springs in the Philippines (FELICIANO) 8. Helium contents and ages of Japanese radioactive minerals from Ishikawa district (KANO, YAMAGUCHI) 8. The distribution of radioactive mineral springs in Japan (NAKAMURA) 8. The distribution of rare chemical elements in the Japanese Islands (KÔZU, WATANABE) 8. Rapid spectroscopic methods for the determination of Ir, Rh and Pd in Pt (GERLACH, SCHWEITZER) 7. Spectroscopic identification of Pb in Au-Cu-Ag alloys (GERLACH, SCHWEITZER) 7. Iodophenolphthalein compounds for x-ray examination (Brit. pat. 304,589) 17.

BOLL, MARCEL: *Matière, électricité, radiations.* 2nd ed. Paris. Dunod 128 pp. F. 7.

CABANNES, J. AND ROCARD, Y.: *La diffusion moléculaire de la lumière.* Paris. Dunod. 326 pp. F. 65.

STORMER, CARL: *De l'espace à l'atome.* Paris: F. Alcan. 160 pp. F. 15

**Röntgen-ray apparatus.** C. H. F. MÜLLER A.-G. *Brit.* 305,044, Jan. 26, 1928. Structural features.

**Device for treating liquids with radium emanation.** EGON ROSENBERG *Ger.* 479,371, Dec. 10, 1927.

**Photosensitive cell.** L. O. GRONDAHL (to Westinghouse Brake & Saxby Signal Co., Ltd.). *Brit.* 304,644, Jan. 23, 1928. Structural features.

**Photomechanical reproduction.** JOHANNES HEIDENHAIN. Ger. 478,777, Aug. 3, 1928. A picture is taken on a layer of substance transparent to Röntgen rays and is reproduced by means of the rays.

#### 4—ELECTROCHEMISTRY

COLIN G. FINK

**Electric steel melting in Europe.** DELTON T. WARY. *Elec. World* 94, 326(1929).—Statistics. C. G. F.

**The changes in concentration of dilute alkali and alkaline-earth amalgams due to the passage of a current.** M. LÉ BLANC AND R. JACKH. *Z. Elektrochem.* 35, 395-409 (1929).—In dil. amalgams (Na 0.154-0.94, Ba 0.349, Li 0.0439, Ca 0.248) changes in Na, K and Ba concns. occur at the anode, and in Li and Ca at the cathode. The change is proportional to the initial concn. and is 4 times greater in bent than in straight glass tubes. The relative changes reach a final value after about 2000 hrs. The changes in concn. are not due to thermoclec. influences. The av. c. d. used was 0.4 A/sq. mm. within a temp. range of 25-75°. R. D. BUMBACHER

**The electrolytic manufacture of hydrogen peroxide.** H. HARTMAN. *Chem. Weekblad* 26, 363-7(1929).—A review. ALFRED HIRSCH

**Studies of overvoltage on metals.** P. SLDERHOLM AND C. BENEDICKS. *Trans. Am. Electrochem. Soc.* 56 (preprint) 14 pp.(1929).—It was empirically established that the regular, half-immersed, H electrode is completely reversible along a straight v.-amp. line, even within the region of O discharge, at least with anodic-currents below 1 milliamp. It has also been found that the same condition prevails when the H electrode is totally immersed; in this case, however, the reversible portion of the v.-amp. curve for the discharge is a very restricted one. A smooth, bright Pt gauze electrode is shown to give the same potential as an electrode of platinized Pt, provided some O has been pptd. on it, the O acting as a depolarizer. In the same manner as overvoltage occurs on the liberation of H, overvoltage also occurs on the discharge of O, and is, in the case studied, about twice as large as that for H. As for H, so also for O, the v.-amp. curves obtained exhibit reversibility, corresponding to the oxygen electrode. In this case H is acting as a depolarizer. The potential difference between the "oxygen electrode" and the "hydrogen electrode" in a given soln. has been found to be 1.48 v. The corresponding value, 1.23 v., given by Nernst, is merely the result of some theoretical considerations. There is, during electrolysis, a complete polar symmetry between the behavior of H and that of O, a fact not properly brought out by earlier experimenters, but a fact which might reasonably be expected. Some theoretical interpretations of the nature of overvoltage are presented. C. G. F.

**Insoluble sulfates and passivity.** LEON McCULLOCH. *Trans. Am. Electrochem. Soc.* 56 (preprint) 4 pp.(1929).—Fe, Ni and Cr have anhyd. sulfates which go into soln. with difficulty. These sulfates may compose the films which cause the passivity of these metals in H<sub>2</sub>SO<sub>4</sub>. Co and Cr anodes dissolve readily because they have easily sol. anodic products. It is suggested that any slowly sol. anode product may be the cause of passivity. C. G. F.

**Effect of current density upon the hardness of electroposited chromium.** ROBERT J. PIERSON. *Trans. Am. Electrochem. Soc.* 56 (preprint) 6 pp.(1929).—With various current densities, from 16 to 109 amp./sq. dm., it is found that Cr has a max. hardness when plated at about 62 amp./sq. dm. The value of this is approx. 43 times as great as that obtained at a normal plating c. d. of 16 amp./sq. dm. as shown by abrasion tests. C. G. F.

**Electroplating of cadmium from cyanide baths.** I. R. WESTBROOK. *Metal Ind.* (London) 35, 83-6, 136(1929).—See C. A. 23, 2664. E. C. M.

**The measurement of  $p_H$  in nickel plating solutions.** W. BLUM AND N. BEKKEDAHL. *Trans. Am. Electrochem. Soc.* 56 (preprint) 27 pp.(1929).—In recent years it has been found that very slight differences in the acidity of Ni plating solns. may affect the character of the deposited Ni. It is therefore the common practice to measure and control the acidity, which is expressed on a scale known as the  $p_H$  scale. In general, this has been done by simple colorimetric methods, which depend upon the color of indicators. Recently, other methods including the use of "the quinhydrone electrode" have come into use. This investigation has shown that while the results with colorimetric methods are sufficiently reproducible to maintain the desired uniformity of the baths, they are numerically somewhat higher than the true value. It is therefore sug-

gested that in future work and publications, when colorimetric methods are used, the results should be corrected to agree with the accepted standard values. C. G. F.

**Oxygen and hydrogen in industry.** W. P. DOBSON AND A. S. L. BARNES. *Trans. Am. Electrochem. Soc.* 56 (preprint) 10 pp.(1929).—The present uses for O and H are reviewed and a no. of the more important new applications that have been suggested in the past are enumerated. It is shown that the com. production of electrolytic O and H is feasible, providing both of the gases are utilized in large quantities. Emphasis is laid on the feasibility of operating oxy-hydrogen cells with off-peak power. Single oxy-hydrogen cells capable of taking 10,000 to 15,000 amp. are now available. C. G. F.

**Oxidation of the depolarizer in preparing standard cells.** W. CECIL GARDINER AND GEO. A. HULETT. *Trans. Am. Electrochem. Soc.* 56 (preprint) 11 pp.(1929).—Cells have been made up in oxidizing and inert atm. by the methods of Vosburgh and Eppley. Any effect of the O of the air on  $\text{HgSO}_4$  in cells set up by the standard method does not appear to be detrimental. Special methods of prepg. cells to prevent oxidation have caused decreasing electromotive forces, showing that care must be taken to expose the depolarizer as little as possible to the hydrolyzing action of  $\text{CdSO}_4$  soln. Cells with a small quantity of  $\text{H}_2\text{SO}_4$  in the electrolyte are very const., and a satd soln of  $\text{CdSO}_4$  in 0.001 N  $\text{H}_2\text{SO}_4$  is recommended. C. G. F.

**Hydrolysis of mercurous sulfate by cadmium sulfate solution in the Weston normal cell.** W. CECIL GARDINER AND GEO. A. HULETT. *Trans. Am. Electrochem. Soc.* 56 (preprint) 17 pp.(1929).—The cathode system of the Weston normal standard cell has been rotated with an excess of neutral  $\text{CdSO}_4$  soln. in an effort to hydrolyze completely the  $\text{Hg}_2\text{SO}_4$ . Analysis of the solid obtained shows that only the outside of the  $\text{Hg}_2\text{SO}_4$  particles hydrolyzes. An exact detn. of the compn. of the final product is therefore impossible under the conditions. The H-ion concn. has been detd. in neutral solns. of  $\text{CdSO}_4$  and in solns. that have been rotated with Hg and  $\text{Hg}_2\text{SO}_4$ . Hydrolysis causes a decrease in  $p_{\text{H}}$  from 4.5 to 4.1. Water brought to equil. with  $\text{Hg}_2\text{SO}_4$  and Hg has a  $p_{\text{H}}$  of about 2.2, but is increased to a  $p_{\text{H}}$  of 4.1 when the soln. is satd. with  $\text{CdSO}_4$ . This soln. is still capable of reacting with  $\text{Hg}_2\text{SO}_4$ . A gain in constancy of the Weston normal cell is obtained by washing the  $\text{Hg}_2\text{SO}_4$  with water that has already been brought to equil. with  $\text{Hg}_2\text{SO}_4$  and Hg. This precaution excludes hydrolyzed salt from the depolarizer, and an electrolyte made by satg. the above soln. with  $\text{CdSO}_4$  provides a reproducible method of obtaining a slightly acid soln. which retards hydrolysis in the Weston normal cell. C. G. F.

**Accumulator acid.** H. S. WILLIAMSON. *Pharm. J.* 121, 618-9(1928).—To avoid the danger in dilg. the strong acid to a required sp. gr., W. recommends the use of 2 stock solns. of  $\text{H}_2\text{SO}_4$ , d. = 1.2 (A) and d. = 1.4 (B). A table of 33 mixts. is given for definite quantities of A and  $\text{H}_2\text{O}$ , and of A and B giving dil. acids varying in d. from 1.125 to 1.300. S. WALDBOFT.

**Electrolytic metal recovery. Present processes and their practical application.** GEORG EGER. *Chem. Fabrik* 1929, 323-4, 333-5, 351-2; *Z. angew. Chem.* 42, 518-22 (1929).—A review. J. H. MOORE.

**Cathodic halogen; the electrolysis of halogenyl amides.** H. R. L. STREIBERT AND E. G. HALLONQUIST. *Trans. Am. Electrochem. Soc.* 56 (preprint) 8 pp.(1929).—Fourteen halogenyl amides or imides were electrolyzed in acetonitrile and pyridine solns. between Ag electrodes. Cathodic Cl was obtained for the first time by electrolyzing chloryl succinimide, dichloryl urea and chloryl phthalimide in a pyridine soln., the Cl going entirely to the cathode. Cathodic Br and I were obtained by the electrolysis of bromyl and iodyl amides. The halogenyl amides behave as electroners; the halogen reacting negatively, on electrolysis, in most solvents but entirely positively in pyridine. An explanation is given for the relative conductance of the aliphatic iodyl amides based on the electron displacement theory. *Iodyl n-butyramide* was prepd. for the first time, and some of its properties were determined. It m.  $97^\circ$ . C. G. F.

**The electrolytic reduction of acetone at a mercury cathode.** CECIL J. HAGGERTY. *Trans. Am. Electrochem. Soc.* 56 (preprint) 4 pp.(1929).—A Hg cathode was used in a weak  $\text{H}_2\text{SO}_4$  soln. contg.  $\frac{1}{8}$  mol. of acetone per l. A pale yellow, oily, mercury diisopropyl was obtained. The catholyte was then distd. and the distillate satd. with  $\text{K}_2\text{CO}_3$ , but only small quantities of isopropyl alc. were obtained. However, the investigation is being continued. C. G. F.

**Electrolytic preparation of 2,4-diaminophenol.** W. E. BRADY AND O. W. BROWN. *Trans. Am. Electrochem. Soc.* 56 (preprint) 13 pp.(1929).—The published work dealing with the electrolytic reduction of 2,4-dinitrophenol is outlined. Reductions of the nitro compd. were conducted in open and closed electrolytic cells. Tabulated results

are included, which show the effect of several variable factors on the current efficiency and material yield. The yield was detd. by diazotization of the amine with standard  $\text{NaNO}_2$  soln. A max. material yield of 94.4% of 2,4-diaminophenol was obtained.

C. G. F.

**New evidence in favor of the peroxide theory of Kolbe's electrosynthesis.** FR. FICHTER. *Trans. Am. Electrochem. Soc.* 56 (preprint) 8 pp.(1929).—Kolbe's electrosynthesis may be duplicated by powerful chem. oxidizing agents like  $\text{F}$ . If  $\text{F}$  or persulfate acts in alk. soln. on a salt of a fatty acid, it is possible to duplicate the electrolytic production of alcs. developed by Hofer and Moest. Chemically prepd. peroxides of a certain mol. wt. are regularly decompd. when heated, and furnish fair yields of synthetic hydrocarbons. At a well-cooled anode  $\text{K}$  caproate is oxidized to the corresponding peroxide and the peracid. When electrolyzed,  $\text{NH}_4$  acetate gives, as a by-product, acetamide, due to the action of  $\text{NH}_3$  on acetyl peroxide. Kolbe's electrosynthesis has to be compared with the formation of persulfates, perphosphates and percarbonates; it differs from them by the particular lability of the first product.

C. G. F.

Carrying out investigations at high temperatures (COHN) 2. Simple methods of potentiometric titration of acids and bases (KAHLENBERG, KRUEGER) 7. Nature of Kučera's anomalies (HERASYMENKO) 2. A turbidimetric method for the determination of the sulfate content of  $\text{Cr}$  plating baths (STOUT, PETCHAFT) 7. The determination of sulfate in chromic acid and in  $\text{Cr}$  plating baths (WILLARD, SCHNEIDEWIND) 7. Apparatus for dehydrating petroleum emulsions by electrical treatment (U. S. pat. 1,724,263) 22.

LAVASSEUR, A.: *L'électrochimie et l'électrometallurgie*. 3rd ed., revised and enlarged. Paris: Dunod. 361 pp., F. 75. Reviewed in *Bull. British Non-Ferrous Metals Research Assoc.* No. 26, 24(1929).

**Electric battery.** E. WOLFF. Brit. 305,009, Jan. 28, 1928. Structural features.

**Electric battery with a copper oxide negative element.** MARTIN L. MARTUS, EDMOND H. BECKER and JAMES G. ROSS. U. S. 1,725,716, Aug. 20. Structural features.

**Electric battery terminals and connections.** EDWARD S. MILLER. U. S. 1,724,214, Aug. 13. Structural features.

**Electrodes for dry cell electric batteries.** CLARENCE N. MERTES (to General Dry Batteries, Inc.). U. S. 1,725,592, Aug. 20. Structural features

**Gas vents for electric batteries.** PRITCHETT & GOLD & E. P. S. Co., LTD., and C. R. D. PRITCHETT. Brit. 305,330, Dec. 16, 1927. Structural features.

**Storage battery.** FURUKAWA DENKI KÔGYÔ KABUSHIKI KAISHA. Brit. 304,231, Jan. 17, 1928. Active material for lead-storage batteries is formed by adding  $\text{Pb}$  oxides such as  $\text{PbO}$  or  $\text{Pb}_2\text{O}_3$  to molten  $\text{Pb}$  and stirring the mixt. or by stirring molten  $\text{Pb}$  alone with free access of air. The product is pulverized and made into a paste with  $\text{H}_2\text{SO}_4$ .

**Storage batteries.** J. BACSA. Brit. 305,680, Aug. 8, 1927. Electrodes of  $\text{Ni}$ ,  $\text{Co}$  or  $\text{Fe}$  are made by first electrolytically depositing the metal on a carrier of sheet metal or wire fabric, using a neutral salt soln., then making the carrier and its deposit the anode in an alk. soln. so that the deposited metal is oxidized, and then reducing the oxidized metal by making it cathode in a neutral salt soln.  $\text{Ni}$  or  $\text{Co}$  pos. electrodes thus prepd. may be used with alk. electrolytes and with neg. electrodes of  $\text{Fe}_2\text{O}_3$  or  $\text{Cd}$ .

**Electric storage batteries.** JULIUS DIAMANT. Ger. 477,977, June 16, 1928. Arrangement of plates is described.

**Electric storage batteries.** ALBERT STRASSER and CARL MÜLLER. Ger. 477,978, Nov. 15, 1925. The cores of the electrodes are made from a  $\text{Pb}$ -alkali metal alloy.

**Storage-battery electrodes comprising compressed lead wool.** K. NISHIMOTO. Brit. 304,190, Jan. 16, 1928.

**Storage battery grid manufacture.** C. A. VANDERVELL & Co., LTD., R. C. PATERSON and P. J. BEDDOUS. Brit. 305,302, Nov. 17, 1927. Mech. features.

**Storage-battery plates.** BENJAMIN HEAP (to Electric Storage Battery Co.). U. S. 1,725,734, Aug. 20. In order to prepare charged neg. pole plates of  $\text{Pb}$  secondary batteries for storage in dry condition, without material loss of capacity, the wet charged plates are dipped into a soln. of gelatin contg.  $\text{CH}_3\text{O}$  and without previous drying; the plates are then dried by heating in a nonoxidizing atm. such as steam, which provides them with an oxidation inhibitor sol. in the electrolyte.

**Storage-battery** jar. CARL J. DUNZWEILER (to Willard Storage Battery Co.). U. S. 1,725,260, Aug. 20. Structural features.

**Galvanic cells.** R. SACHS G. M. B. H. Ger. 478,867, Feb. 10, 1928. Details of forming a complete battery of a number of elements.

**Rectifier for charging storage batteries of low voltage at low charging rates.** CLARENCE W. BALKE (to Fansteel Products Co.). U. S. 1,724,065, Aug. 13. An electrode formed of an alloy of Ta and W is used with another electrode such as Pb and with an electrolyte which may be formed from  $H_2SO_4$ .

**Rectifier for alternating current.** SIEMENS-SCHUCKERTWERKE A.-G. and G. SCHAROWSKY. Brit. 304,579, Nov. 14, 1927. Structural features of a rectifier of the metal-oxide type are described.

**Rectifier for alternating currents.** SIEMENS-SCHUCKERTWERKE A.-G. Brit. 305,171, Feb. 1, 1928. Graphite, preferably in the form of "Aquadag," is applied to the surface of the layer of metal compd. in a dry surface-contact rectifier to provide a low resistance connection between the layer of metal compd. and the metallic conductor. A small proportion of finely divided metal may be added to the graphite compn.

**Electrodes for alternating current rectifiers.** SIEMENS-SCHUCKERTWERKE A. G. Brit. 304,748, Jan. 27, 1928. An electrode for a dry surface-contact rectifier is formed by placing layers of Cu sulfide powder and pulverized Cu in a mold and subjecting to a pressure of several thousand kg. per sq. cm. The counter electrode is made of Al or Mg and the electrodes are assocd. under much less pressure than that used for forming the first-mentioned electrode. Se or Te compds. of a metal may be used instead of sulfide.

**Precipitating electrode (comprising a series of tubes or rods) for electric gas cleaners.** OSKI-A.-G. (Erich Oppen, inventor). Ger. 479,015, Feb. 6, 1926

**Electrical resistances.** A. JOFFE. Brit. 304,131, Jan. 14, 1928. Layers of mica may be interposed between layers of another material such as paraffin or glass. Insulation oxidized at the surface may be used. Linseed-oil varnish may be dried so that the outer surface only is oxidized. Various structural details are described.

**Electric condensers.** E. W. JODREY. Brit. 305,515, Nov. 3, 1927. A dielectric of cellulose ester is used as a coating and sealing medium in making condensers of metal foil and tissue paper.

**Electrolytic cells.** MASCHINENFABRIK OERLIKON. Ger. 478,725, Jan. 17, 1928. A method and device is described for securing the porous diaphragms of electrolytic cells for the decompn. of water.

**Porous products for electrolytic diaphragms, etc.** SIEMENS & HALSKE A. G. Brit. 305,022, Jan. 28, 1928. A silicate (suitably of metals of the alkali or alk earth group or of Al) or other similar acid- and alkali-proof substance is partially set, the mass is ground to a suitable size of grain, and then compressed and molded. Metal oxides or other substances may be added, including such substances as naphthalene, which may be subsequently burnt out to increase the porosity of the product.

**Purification of electrolytic baths.** FRANZ VON WURSTEMBERGER. Ger. 478,770, Dec. 15, 1927. See Swiss 129,293 (C. A. 23, 2667).

**Depositing metals by electrolysis.** SIEMENS & HALSKE A.-G. (Herbert Hom, inventor.). Ger. 478,511, Mar. 7, 1928. Layers of deposited metal having identical phys. properties are obtained by adjusting the active surface of a cathode formed by a series of rods to that of the one-part anode.

**Electrolytic production of heavy metal hydroxides.** ACCUMULATOREN FABRIK A.-G. Brit. 305,092, Jan. 30, 1928. A soln. of a salt of a heavy metal, e. g., a dil. Ni sulfate soln., free from foreign ions, is electrolyzed using an anode of the heavy metal such as Ni or one formed of an inert material coated with a combination of the heavy metal sol. during electrolysis; such a high current d. is used that H instead of the metal is liberated at the cathode, and the hydroxide of the metal is pptd in the soln. Various details are given of the formation of Ni hydroxide.

**Electrolytic production of aluminum.** ALUMINIUM INDUSTRIE A. G. Brit. 305,458, Feb. 4, 1928. Ribbed or grooved anodes are used in a process such as is described in Brit. 265,170 (C. A. 22, 195).

**Ferro-vanadium, etc.** B. D. SAKLATWALLA (to Vanadium Corp. of America) Brit. 305,201, Feb. 2, 1928. Ferro-V contg. 85-95% V is made in an elec furnace by use of Si as reducing agent, or, preferably, by thermo-reduction of high grade  $V_2O_5$  by use of Al. A product is obtained contg. less than 1.25% Si and less than 0.5% C. Cf. C. A. 23, 3655. Brit. 305,202 describes a V alloy contg. about 40-90% V, 3-15% Al 5-30% Si and the remainder principally Fe; or similar alloys may be substantially

free from Fe, and the C present may be less than 0.5%. These alloys may be made by thermo-aluminic reduction of  $V_2O_5$  and may be used for introducing V into molten steel baths in which the Al and Si serve as deoxidizing agents.

**Pickling metal surfaces.** Q. MARINO. Brit. 305,036, Jan. 28, 1928. Iron or steel surfaces are cleaned by anodic treatment in an electrolyte formed by adding  $Na_2SO_4$  or  $K_2SO_4$  to a soln. obtained by treating pulverized Ca phosphate or similar phosphate with  $H_2SO_4$  of 10–20° Bé. Various details of treatment are described.

**Electrolytic desulfonation of anthraquinonesulfonic acids.** ANTHONY J. HARTWOOD (to British Dyestuffs Corp., Ltd.). U. S. 1,724,928, Aug. 20. In the manuf. of oxanthrol derivs. from anthraquinone compds. contg.  $\alpha$ -sulfonic acid groups, reduction and removal of the  $\alpha$ -sulfonic acid groups is effected by electrolytic reduction in alk. soln. An app. is described.

**Apparatus for electrodeposition of metals such as silver, chromium or nickel.** A. POULVEREL. Brit. 305,130, Jan. 31, 1928. Structural features.

**Electrodeposition of metals.** WESTERN ELEC. CO. Brit. 304,354, Oct. 19, 1927. An alloy of uniform compn. throughout is deposited from an electrolyte of such compn. that the cathode potentials of the constituent metals are substantially equal over the operating range of current density; at least one anode is made of the constituent metals. An electrolyte compn. for deposition of an alloy of Ni 79 and Fe 21% is given, with various details of procedure.

**Electrodeposition of cadmium.** A. W. YOUNG and G. STINSON (to C. H. Humphries). Brit. 304,668, Jan. 23, 1928. A Cd plating bath contains a salt such as  $CdSO_4$  together with  $H_2SO_4$  and a "brightening agent" such as animal glue. Cd or graphite anodes may be used. Cf. C. A. 22, 735.

**Electrodeposition of zinc.** Q. MARINO. Brit. 305,035, Jan. 28, 1928. In coating iron, steel or other articles, an electrolyte is used contg.  $ZnSO_4$ , 220–250,  $ZnCl_2$ , 50–60 and  $Al_2(SO_4)_3$ , 20–25 g. per l. Na or K borobenzoate 2–5% may be added to prevent formation of  $ZnO$  at the anode; formation of a smooth and brilliant deposit may be promoted by the addn. of glycerol 2–5% together with 5–10 g. per l. of dextrin or glucose.

**Coating large objects with a chromium layer.** SIEMENS & HALSKE A.-G. (Colin G. Fink, inventor). Ger. 478,769, July 21, 1927. See Fr. 638,238 (C. A. 23, 46).

**Electroplating apparatus of the rotary barrel type.** LANGBEIN-PFANHAUSER-WERKE A.-G. Brit. 305,623, Feb. 8, 1928. Structural features.

**Electric ozonator.** HUGH V. MCPARTLAND (one-half to Oswin C. Moll). U. S. 1,725,661, Aug. 20. Structural features.

**Electric furnace.** D. F. CAMPBELL. Brit. 304,162, Sept. 15, 1927.

**Electric induction furnace.** E. F. NORTHRUP. Brit. 305,620, Sept. 8, 1927. Structural features.

**Coils for high-frequency electric induction furnaces.** G. E. TAYLOR and ELECTRIC FURNACE CO., LTD. Brit. 304,432, Dec. 7, 1927. Structural features.

**Melting chamber for induction furnaces.** R. F. RUSS. Brit. 305,388, March 2, 1928.

**Electric resistance furnace.** L. D. J. TISSEYRE. Brit. 305,631, Feb. 8, 1928. Structural features are described of a furnace suitable for heating high-speed steels up to 1400°, either directly or in an Al or other bath. A refractory crucible is surrounded by a "carbon" or graphite resistance embedded in refractory insulating material.

**Electric resistance furnace.** HERAEUS VACUUMSCHMELZE A.-G. and H. HIEMENZ. Brit. 304,646, Jan. 23, 1928. Structural features.

**Electric resistance furnace.** SIEMENS-SCHUCKERTWERKE A.-G. Brit. 305,470 Feb. 4, 1928. Structural features.

**Electric resistance furnace for heat treatment of metals.** CARL I. HAYES. U. S. 1,724,583, Aug. 13. A stream of combusted gases under pressure is used to form an air-excluding curtain across the furnace opening.

**Electric resistance heaters.** BRITISH THOMSON-HOUSTON CO., LTD., H. W. H. WARREN and R. G. GREEN. Brit. 305,160, Sept. 11, 1928. Heating units of refractory material such as silicon carbide are provided with molded or pressed-on terminal caps which may be formed of a mixt. of graphite 6, "Aquadag" 3, carborundum 1 and waterglass 3 parts, used as a thick aq. paste and baked. Various details are given.

**Muffle and muffle furnace heated by electric resistance heaters.** PHILIP H. P. MONCKTON (to Wm. H. Cross). U. S. 1,724,956, Aug. 20. Structural features.

**Agitating mechanism for materials in electric furnaces.** SOC. ÉLECTRO-MÉTALLURGIQUE DE MONTRICHTER. Brit. 305,569, Feb. 7, 1928.

**Electric immersion heater for heating liquids.** SANTON, LTD., and H. C. SANDERS. Brit. 304,928, April 26, 1928. Structural features.

**Mechanical charging means for electric furnaces.** AKT.-GES. BROWN, BOVERI & CIE. Ger. 479,147, Nov. 24, 1925.

**Effecting chemical reactions with silent electric discharges.** I. G. FARBERINID A.-G. Brit. 304,623, Oct. 20, 1927. In producing various products such as  $H_2O_2$ , the efficiency of the process is stated to be increased by preventing deposition of the products on the walls of the discharge chamber. Mention is made of the production of formic acid,  $CH_3O$  and  $Ac_2O$ .

**Electric discharge tube for treating water or other liquids with ultra-violet rays.** N. V. PHILIPS' GLOEILAMPENFABRIEKEN. Brit. 304,423, Nov. 23, 1927. Structural and elec. features.

**Treating hydrocarbons with electric discharge.** P. H. HULL and IMPERIAL CHEMICAL INDUSTRIES, LTD. Brit. 304,914, Jan. 21, 1928. Gaseous hydrocarbons are passed through an arc discharge between electrodes made from or coated with W, Mo, Os, Ta or their alloys or compds. such as carbides.

**Apparatus for gas purification.** SIEMENS-SCHUCKERTWERKE A.-G. (Otto Körber, inventor). Ger. 478,842, Dec. 19, 1926. An arrangement is described for subjecting the electrodes of an elec. gas filter to a periodic percussion by a suspended hammer.

**Diaphragms for electric endosmose, etc.** SIEMENS & HALSKE A.-G. Brit. 305,020, Jan. 28, 1928. Porous material suitable for use as diaphragms for elec. endosmose is made by stirring acid- and alkali-proof inorg. compds. such as  $BaSO_4$ , Cr oxide or  $Al_2O_3$  in a hardening soln. of a substance such as celluloid or natural asphalt, which is also acid- and alkali-proof, pressing and heating to eliminate the solvent. Greater porosity may be obtained by adding sol. or volatilizable substances.

**Electrophoresis.** SIEMENS-ELEKTRO-OSMOSE GES. Brit. 305,630 Feb. 8, 1928. In the electrophoretic deposition of various substances from dispersions, the dispersion is modified by addn. of suitable colloids or compds. comprising multivalent cations so that particles normally moving to the anode are directed to the cathode. Reversal of rubber latex (suitably after partial removal of  $NH_3$  from com. latex) may be effected with Th nitrate soln. and reversal of a yeast paste is effected by adding a bovine serum.

**Single crystal electromagnetic body.** RICHARD SWINNE (to Siemens & Halske A.-G.). U. S. 1,725,026, Aug. 20. Single crystals of magnetic material such as Fe, Ni and Co are used for cores of electromagnetic relays and other elec. app.

**Electrical ignition for coal-dust burners.** KOHLENSCHIEDUNGS-GES. M B H Ger. 479,432, Mar. 18, 1926.

**Electric thermometer.** DINSHAH P. GHADIALI. U. S. 1,724,469, Aug. 13

**Fusible cut-outs for electric circuits.** R. H. D. BARKLIE. Brit. 305,243, Nov. 1, 1927. A film of metal such as Au, Ag or Cu, so thin as not to be self-supporting, is mounted on an insulating backing such as paper or celluloid. Various alternative methods of manuf. are described. Cf. C. A. 22, 196.

## 5—PHOTOGRAPHY

C. E. K. MEES

**Some modern applications of photography.** W. CLARK. *Brit. J. Phot.* 76, 378-80 (1929).—New applications of photography in industry are reviewed, *i. e.*, the production of talking films and the development of amateur cinematography and its com. and educational uses. The various photographic methods of examn. of paintings of doubtful authenticity, and of charred and illegible documents are briefly mentioned. A discussion follows of medical, industrial and general applications of x-ray photography, with an indication of the possible lines of future developments in this field. A. B.

**New preservative for the photographic industry.** W. LESZYNSKI. *Phot Ind.* 27, 426-7 (1929).—For the prevention of bacterial infection of gelatin soln. and photographic emulsions, a new material, Nipagin, is of value. It is odorless and contains no free acid but is of limited soly. It has a strong germicidal action and apparently no effect on the photographic properties of an emulsion. C. E. MEULENDYKE

**Nature and structure of the photographic image as present in various forms of intensification.** H. D'A. POWER. *Camera Craft* 46, 319-25 (1929).—To reduce graininess, the negative image can be so altered that (1) the av. grain size is smaller; (2) the grains are enlarged at the expense of the interlying clear spaces, and so approximate the conditions of a continuous image; or (3) the interspaces can be colored and so approximate a continuous image. Expts. illustrated with photomicrographs indicate how each condition can be realized. R. A. PURDY



**Effect of environment on photographic sensitivity. II. Effect of certain salts.** S. E. SHEPPARD AND E. P. WIGHTMAN. *Phot. J.* 69, 134-41(1929); cf. *C. A.* 23, 1578.—The action of certain neutral salts on the formation of the latent image has been studied. K citrate has no detectable effect; KCl has a slight effect on developability; KBr has a very considerable depressing effect on the formation of the latent image. Contrary to the behavior with the visible image, acid  $\text{AgNO}_3$  does not accelerate latent image formation, at least with fairly high-speed plates. The results are discussed in terms of the transfer of electrons from bromide ions to Ag ions of the lattice, and it is suggested that the electrostatic field of the adsorbed double layer is a modifying factor of differing importance for visible and latent image formation.

**Function of gelatin in photographic emulsions.** S. E. SHEPPARD. *Phot. J.* 69, 330-6(1929).—The protective colloid action of gelatin in relation to pptn. and reduction of Ag halides is discussed in terms of the chem. constitution of gelatin. It is suggested that imino-( $\text{:NH}$ ) groups of the protein play a direct part by coordination of Ag. The existence of keto-piperazines in gelatin is also considered, and it is suggested that reversible  $p_n$  control of sensitivity might be connected with this.

**Method of increasing the printing speed of dichromated gelatin.** F. J. TRITTON. *Phot. J.* 69, 281-5(1929).—The method of increasing the printing speed of dichromated gelatin by addn. of certain salts to the dichromate bath is discussed. To increase the light sensitivity of any dichromate colloid mixt., it is necessary to know the  $p_n$  of the colloid and then to select a metallic salt, the chromate or hydroxide or which is pptd. at a  $p_n$  slightly greater than that of the colloid. With autotype tissue the best results obtained with the materials so far examd. were with La and Ce salts. The possible applications of this hypersensitizing process are outlined, and formulas and details of procedure are given.

**Variation of the threshold speed of an emulsion according to the developer and conditions of development. III.** E. R. BULLOCK. *Sci. ind. phot.* 9, 24-8(1929); cf. *C. A.* 21, 1067.—But little, if any, influence on the max. threshold speed has been observed on varying (1) the interval between exposing and developing, (2) the interval between prepg. and using the developer, (3) the temp. of the developer, (4) the temp. and (5) the humidity of the sensitive film at the time of exposure. Use of the developer at a lowered temp. shows, however, the effect of a diminution in fog. Some of the ways in which a sensitive film is permanently affected by treatment with  $\text{AgNO}_3$  soln. have been examd. in detail. In general, latent fog is produced, and with this an increase in the max. threshold speed, consistently observed under suitable exptl. conditions, appears to be associated.

**New collodion method.** W. T. WILKINSON. *Penrose's Annual* 30, 134-5(1928).—W. suggests that, if his collodion process with I and Br be used, and the plate washed free from  $\text{AgNO}_3$ , the plate can be color-sensitized and used for 3-color work. After washing, the plate should be immersed in the following preservative: fish glue 100 cc., thiocarbamide 0.5 g. or thiosinamine 0.05 g.,  $\text{H}_2\text{O}$  1 l. Pinaverdol or chlorochrome can be used for the green sensitizer and pinacyanol or erythrochrome for the red.

**Super-sensitizing of autochrome plates.** L. D. TALAMON. *Brit. J. Colour Supp.* 23, 26-8(1929).—Pantochrome is recommended as being simple to use for sensitizing autochromes. Working directions and formulas are given for the use of a sensitizer contg. this dye and ammoniacal  $\text{AgNO}_3$ . The method of washing and drying is described in detail. When used in conjunction with a Lumière S filter, the exposure necessary is cut down to about 0.1 by hypersensitization. After exposure, the plates are desensitized and developed in a metoquinone bath. The keeping qualities of the hypersensitized plates are not good. The lower the proportion of ammoniacal  $\text{AgNO}_3$  in the bath, the better are the keeping qualities of the plates, on the other hand, the sensitizing effect is then less.

**Reversal-like phenomena of the secondary and the tertiary discharge figures impressed on photographic plates.** T. TERADA. *Memoirs Kyoto Coll. Sci.* 11, 355-60(1928).—Two photographic plates were placed in contact with each other on their plain glass sides. Another photographic plate was so supported that the sensitive emulsion was toward the other 2 plates and at a short distance from them. The 3 plates were placed between the 2 electrodes of a discharging condenser, so arranged that the negative pole was in contact with the sensitive side of the first plate. A series of discharge-figures was produced on the 3 photographic plates. These figures are called primary, secondary and tertiary figures. When the spark gap was placed parallel to these plates, Yoshida observed that the primary discharge figures showed reversal-like phenomena. T. discovered that those phenomena also occur in the secondary and in the tertiary discharge figures similarly as in the primary ones.

A. P. H. TRIVELLI

**Practical method of silver recovery from fixing baths.** ANON. *Photographie* 16, 264-5(1929).—Ag is recovered by pptn. with Zn from an exhausted fixing bath slightly acidified with  $H_2SO_4$ . The operations are simple and the Ag is recovered from the sludge by melting.

C. E. CLIFTON

**Cystine in systems of noble metals protected by gelatin (STEIGMANN) 2.**

**Photography.** ROTOGRAVUR, DEUTSCHE TIEFDRUCK-G. M. B. H. (Kurt Wolfsohn, inventor). Ger. 477,965, Sept. 11, 1927. An absorptive cover of cloth, felt or cellulose is impregnated with hygroscopic salts for drying colloid layers such as on photographic plates and films.

**Photography.** AKT.-GES. FÜR FILM-FABRIKATION. Ger. 477,503, Dec. 16, 1927. Photographic copies are produced on both sides of an opaque film coated with Ag salt emulsion.

**Photography.** HEINRICH TAPPESER. Ger. 478,831, Mar. 6, 1928. Addn to 437,240. Colored photographic tracings are prep'd. after the manner of the prior patent wherein the picture is covered, except the part to be colored. This part is then sprayed with coloring matter. The covering material is absorbent.

**Color photography.** SOC. DU FILM EN COULEURS KELLER-DORIAN. Brit. 301,643, Jan. 23, 1928. Optical features.

**Color photography.** WM R. WHITEHORNE. U. S. 1,724,445, Aug. 13. A pair of sensitized surfaces have a common color insensitiveness in one region of the spectrum and a different color insensitiveness in another part of the spectrum.

**Photographic sensitive material.** C. ROEHRICH. Brit. 304,597, Jan. 21, 1928. In impregnating colloid layers with chromate compns., a 10% alc. soln. is used to prevent formation on drying of crystal sediment on the surface of the colloid layer.

**Photographic films.** J. CHAMBERLAIN and H. PERIAM. Brit. 304,632, Oct. 20, 1927. A substratum of ethyl cellulose compn. or the like is used between the celluloid or like support and the light-sensitive layer, and this substratum may carry coloring substances, a multicolor dot screen for color photography, etc.

**Testing photographic plates, etc., spectrographically.** DEUTSCHE VERSUCHSANSTALT FÜR LUFTFAHRT E. V. (Ullrich Schmiescheck, inventor). Ger. 479,392, July 8, 1928. An improved method and app. designed to give const. exptl. conditions are described.

**Photographic emulsions.** I. G. FARBENIND. A.-G. Brit. 305,143, Jan. 31, 1928. An org. compd. which forms a stable Ag salt of a soly. not greater than that of  $AgCl$  is added to a Ag emulsion or one of its constituents. Examples are given.

**Photographic emulsions.** I. G. FARBENIND. A.-G. (Rudolf Robl and Walter Frankenburg, inventors). Ger. 479,275, Nov. 25, 1927. Layers prep'd. from colloidion emulsions are improved by adding to the emulsion, during or after its prep'n., a wetting agent such as a salt of propyl- or butylnaphthalene sulfonic acid. Other usual addns, *e. g.*, sugar, glycerol and protective colloids, may also be made. Examples are given.

**Printing on gelatin films, etc.** I. G. FARBENIND. A.-G. Brit. 304,767, Jan. 27, 1928. Indelible prints are obtained by use of an aq. soln. of a dye contg.  $CH_2O$ ,  $K_2Cr_2O_7$  or other gelatin hardening agent, to which a wetting agent such as Na phenylacetate or saponin also may be added. To protect prints on cinematographic films or the like from dissoln. by liquids such as alc. or  $C_2Cl_6$ , used for cleaning films, a lyophile colloid insol in such liquids may be added to the printing compn.

**Apparatus (with density and temperature controls) for developing photographic films.** M. TANATAR and D. KOKISOFF. Brit. 305,681, Aug. 8, 1927. Structural features.

**Developing photographic diazotypes.** M. RENKER. Brit. 305,104, Jan. 30, 1928. Papers sensitized with diazo-compds. are developed by treatment with an excess of developing liquid, and the excess is immediately removed. The paper may be sensitized with 3-diazocarbazol and developed with an ammoniacal soln. of the Na salt of  $\beta$  naphtholsulfonic acid. An app. is described.

**Superposed photographic images of different planes of sharpness.** L. M. DIETERICH. Brit. 304,703, July 25, 1927. Optical features.

**Pictures in light-sensitive layers.** GUSTAV KÖGEL. U. S. 1,724,666, Aug. 13. Org. light-sensitive compds. such as Na 2,7-anthraquinone disulfonate are incorporated in layers of material such as gelatin and after exposure of the layer to light it is treated with a chromate soln. such as  $K_2Cr_2O_7$ .

**Relief effects in cinematographic images.** L. M. DIETERICH. Brit. 304,711, Nov. 12, 1927. Optical and mech. features.

**Fireproofing cinematographic films.** SOC. INDUSTRIELLE D'APPLICATIONS PHOTOGRAPHIQUES SOC. ANON. Brit. 305,653, Feb. 10, 1928.  $\text{NH}_4\text{Br}$ , alone or with other compds. such as  $(\text{NH}_4)_2\text{SO}_4$ ,  $\text{NH}_4\text{F}$  and  $\text{NH}_4\text{I}$ , is used in the sensitizing bath or added to the film during or after manuf. Cf. C. A. 23, 4155.

**Hardening colloid masses or films.** TECHNICOLOR MOTION PICTURE CORP. Ger. 479,131, Mar. 31, 1928. The hardening of colloid masses or films, particularly gelatin films, is controlled by incorporating with the masses not only a hardening agent, e. g., a dichromate, and an activating agent, e. g., a sol. sulfite, but also a restraining agent, e. g.,  $\text{NH}_4\text{OH}$ . The restraining agent is afterward removed or rendered ineffective.

**Photomechanical processes.** ERICH LOENING. Ger. 478,776, Feb. 28, 1928. A positive print form is prepd. from a halogen-Ag-colloid layer by using the undeveloped part of the layer as the etching base after decompn. of the Ag colloid.

## 6—INORGANIC CHEMISTRY

A. R. MIDDLETON

**The chemistry of lithium. VII. Specific heat, heat of formation, decomposition pressure, and density of lithium halogenide hydrates.** CH. SLONIM and GUSTAV F. HURTTIG. *Z. anorg. allgem. Chem.* 181, 55-64 (1929).—The halogenide hydrates studied were  $\text{LiCl} \cdot \text{H}_2\text{O}$  (I),  $\text{LiBr} \cdot \text{H}_2\text{O}$  (II),  $\text{LiBr} \cdot 2\text{H}_2\text{O}$  (III),  $\text{LiI} \cdot \text{H}_2\text{O}$  (IV),  $\text{LiI} \cdot 2\text{H}_2\text{O}$  (V) and  $\text{LiI} \cdot 3\text{H}_2\text{O}$  (VI). Decompn. pressure ( $p$ ) in mm. is given as follows: for I, between  $37.7$  and  $69.4^\circ$ ,  $p$  runs from 1.18 to 12.68; for II, between  $85^\circ$  and  $100.1^\circ$ ,  $p$  runs from 2.48 to 6.94; for III, between  $23^\circ$  and  $39.94^\circ$ ,  $p$  runs from 0.52 to 2.49; for IV, between  $102^\circ$  and  $131.5^\circ$ ,  $p$  runs from 1.10 to 7.75; for V, between  $70.5^\circ$  and  $78.8^\circ$ ,  $p$  runs from 4.91 to 7.89; for VI, between  $60^\circ$  and  $72^\circ$ ,  $p$  runs from 3.76 to 9.41. The mean sp. heat is given as follows: for LiCl, 0.2852; for I, 0.3898; for LiBr, 0.1435; for II, 0.2152; for LiI, 0.0984; for IV, 0.1555; for V, 0.1934; for VI, 0.2997. Heat of soln. is detd. at  $17^\circ$  except for the chlorides which are detd. at  $19.5^\circ$ . It is as follows in cal.: for LiCl, 8371; for I, 4367; for LiBr, 11511; for II, 5285; for III, 2069; for LiI, 14810; for IV, 6831; for V, 3343; for VI, 254. Density is detd. at  $25^\circ$  in a pycnometer with Hg and a petroleum fraction boiling between  $200^\circ$  and  $220^\circ$ . The following values are obtained: for LiCl, 2.068; for I, 1.73; for LiBr, 3.463; for II, 2.51; for III, 2.20; for LiI, 4.06; for  $\text{LiI} \cdot 0.5\text{H}_2\text{O}$ , 3.50; for IV, 3.13; for V, 2.64; for VI, 2.32. Mol. vol. at  $25^\circ$  is as follows: for LiCl, 20.5; for I, 34.9; LiBr, 25.08; II, 41.8; III, 55.9; LiI, 33.0; IV, 48.5; V, 64.4; VI, 81.0.

**Lithium chlorate and its hydrates.** LEO BERG. *Z. anorg. allgem. Chem.* 181, 131-6 (1929); cf. C. A. 21, 214; 22, 737.—There is a change of phase at  $44^\circ$  in heating or cooling  $\text{LiClO}_3 + \text{H}_2\text{O}$  but none with  $\text{LiClO}_3$ . The microscope shows in heating a mixt. of  $3\text{LiClO}_3 \cdot \text{H}_2\text{O}$  and  $\text{LiClO}_3$  that above  $44^\circ$  only the latter is present. This is presented to show that the  $\gamma$  form of  $\text{LiClO}_3$  of Kraus and Burgess (cf. C. A. 21, 2214) is  $3\text{LiClO}_3 \cdot \text{H}_2\text{O}$ .

**Study of beryllium and its chloride.** J. M. SCHMIDT. *Ann. chim.* [10], 11, 351-446 (1929).—See C. A. 23, 2381.

A. P. SACHS

**Bismuth salts and hypophosphorous and phosphorous acids and their sodium salts.** ORESTE CALCAGNO. *Semana méd.* (Buenos Aires) 35, 1042-70 (1928).—As  $\text{H}_3\text{PO}_3$  and  $\text{H}_3\text{PO}_2$  reduce in heat, an intermediate formation of  $\text{PH}_3$  is supposed. The reactions between  $\text{Bi}(\text{OH})_3$  and  $\text{BiO}(\text{OH})$  and the reducing acids, the intermediate substances as formation of salts between Bi and the acids themselves, the varying effects of the amts. of the reagents, hydrolysis, etc., are discussed and equations given. In the same way, the possibilities of reaction of the Bi and BiO salts of tartaric acid, the double salts with Na, of alk. and acid Bi soln. with  $\text{H}_3\text{PO}_3$  and  $\text{H}_3\text{PO}_2$  are enumerated. In presence of  $\text{HNO}_3$  a previous hydrolysis or treatment with  $\text{AcONa}$  is required.  $\text{Bi}(\text{H}_2\text{PO}_2)_3$  and  $\text{BiOH}_2\text{PO}_2$  are decompd. in the presence of  $\text{H}_2\text{O}$  or O. Equations of the formation of all the possible salts and their structural formula are given.

A. E. MEYER

**Oxygen compounds of rhenium.** J. NODDACK and W. NODDACK. *Z. anorg. allgem. Chem.* 181, 1-37 (1929); cf. C. A. 23, 1833.—None of the Re oxides is as well defined as the disulfide ( $\text{ReS}_2$ ). The oxides are therefore not suitable for at. wt. detn. Re is in group VII in the periodic system and its highest oxide is  $\text{Re}_2\text{O}_7$ . This is prepd. by passing a stream of cold  $\text{O}_2$  over heated solid Re, the oxide being formed as a fine white vapor which is easily condensed. Its d. was not detd. but is probably about 8.4. It is quickly converted by ultra-violet light, by reduced pressure or by heat into  $\text{Re}_2\text{O}_7$ .  $\text{Re}_2\text{O}_7$  has a m. p. of about  $150$ - $155^\circ$ , is easily sol. in  $\text{H}_2\text{O}$ , from which  $\text{Re}_2\text{O}_7$  seps. on

evapn. The aq. soln. is easily reduced, colors Ti and V solns. yellow and decolorizes  $\text{KMnO}_4$ . Anhyd.  $\text{Re}_2\text{O}_7$  is colored violet by  $\text{SO}_2$  gas, as is also its soln. in concd.  $\text{H}_2\text{SO}_4$ , a blue ppt. being formed on long standing. This violet soln. is decolorized again on heating to boiling. After  $\text{H}_2\text{S}$  is passed into an aq. soln. of  $\text{Re}_2\text{O}_7$  for some time, S seps. and on warming a gray-black sulfide.  $\text{Re}_2\text{O}_7$  is prepd. by heating Re metal in  $\text{O}_2$  at a temp. above  $150^\circ$ . It is a bright yellow powder which is easily sublimed, melts at about  $220^\circ$  and has a marked cryst. character. Its d. is about 8.2. It is easily sol. in  $\text{H}_2\text{O}$  and alc., very little sol. in  $\text{Et}_2\text{O}$ . Cond. measurements give values for  $\lambda$  between 366 and 385. An acid is produced on soln. in  $\text{H}_2\text{O}$  according to the equation:  $\text{Re}_2\text{O}_7 + \text{H}_2\text{O} = 2\text{HReO}_4$ . This dissolves hydrates of Al, Zn, Fe as well as metallic Zn or Fe with evolution of  $\text{H}_2$  and is reduced to  $\text{ReO}_2$  by Zn and  $\text{H}_2\text{SO}_4$ .  $\text{Re}_2\text{O}_7$  is reduced to lower oxides by CO or  $\text{SO}_2$ ;  $\text{H}_2$  reduces it at  $300^\circ$  to the dioxide and at  $800^\circ$  to metal. Lower oxides are formed by heating it in a vacuum at  $300^\circ$ . Dry  $\text{Re}_2\text{O}_7$  is converted by dry  $\text{H}_2\text{S}$  into black sulfide. If  $\text{H}_2\text{S}$  is passed into concd.  $\text{HReO}_4$ , a yellow color is produced followed by pptn of the sulfide. If  $\text{NH}_4\text{OH}$  and  $(\text{NH}_4)_2\text{S}_x$  are added to dil.  $\text{HReO}_4$  nothing is pptd., but on acidifying with HCl or  $\text{H}_2\text{SO}_4$  a deep rose color is formed and then the gray-black sulfide is pptd. The reactions of  $\text{HReO}_4$  with various reagents are given in a table. The salts of  $\text{HReO}_4$  are colorless, sol. in  $\text{H}_2\text{O}$  and are more stable than permanganates. *Perrhenates* of non-volatile bases can be ignited in  $\text{O}_2$  without decompn.  $\text{NaReO}_4$  (m. p.  $200^\circ$ ) is sol. to the extent of 250 g. per l., and crystallizes in hexagonal, colorless tables.  $\text{KReO}_4$  (m. p.  $350^\circ$  soly. 12.1 g./l.) crystallizes free of  $\text{H}_2\text{O}$ , gives for  $\lambda$  105 and is reduced to  $\text{ReO}_2$  by  $\text{H}_2$ .  $\text{NH}_4\text{ReO}_4$  (soly. 120 g./l.) is first reduced to  $\text{ReO}_2$  by heating in  $\text{H}_2$  at  $150^\circ$  and finally to metallic Re, which is deposited as a mirror on the walls of the reaction flask.  $\text{AgNO}_3$  gives a white ppt. of  $\text{AgReO}_4$ , sol. in  $\text{H}_2\text{O}$  to the extent of 3.2 g./l., with  $\lambda = 100$ .  $\text{Ba}(\text{ReO}_4)_2$  is sol. in  $\text{H}_2\text{O}$  to the extent of 150 g./l.  $\text{Nd}(\text{ReO}_4)_3$  is prepd. by pptn. of the hydrate with  $\text{NH}_4\text{OH}$  and by reaction between this and  $\text{HReO}_4$ . It crystallizes in rose colored prisms, extremely sol. in  $\text{H}_2\text{O}$ . The trioxide,  $\text{ReO}_3$ , was not isolated, but its salts are analogous to the manganates. Their solns. in  $\text{H}_2\text{O}$  are bright yellow and are not very stable, decomp. as follows:  $3\text{K}_2\text{ReO}_4 + 2\text{H}_2\text{O} = 2\text{KReO}_4 + \text{ReO}_2 + 4\text{KOH}$ . The violet and blue oxides produced by reduction of higher oxides are probably intermediate between  $\text{ReO}_3$  and  $\text{ReO}_2$ , similar to the lower oxides of W and Mo. They are unstable, particularly the violet oxide. On strong reduction of any O compd. of Re the black dioxide,  $\text{ReO}_2$ , is formed. It is quickly oxidized to  $\text{Re}_2\text{O}_7$  in acid soln., but is stable in the presence of alkali.  $\text{ReO}_2$  is easily reduced to metal in the absence of H-O. This reduction is easier than the reduction of the dioxides of Mn, Mo or W, but more difficult than with Os, placing Re between W and Os. The crystal structure of metallic Re is hexagonal as is Os, and it can probably be numbered with the Pt metals. H. S.

Pure aluminum ortho-hydroxide in gelatinous and finely powdered form. P. A. THIESSEN AND K. L. THATER. *Z. anorg. allgem. Chem.* 181, 417-24 (1929).— $\text{AlEt}_2$  was hydrolyzed by adding a dil. soln. in abs. alc. to water and by passing the vapor in dry  $\text{N}_2$  over water. The ppts. so produced were proved to be  $\text{Al}(\text{OH})_3$  by the break in the water vapor pressure-absorption curves at  $17^\circ$ . T. H. CHILTON

Phosphorous trioxide. LUDWIG WOLF AND HERMANN SCHMAGER. *Ber* 62B, 771-86 (1929).—The prepn. of  $\text{P}_2\text{O}_5$  has been considerably improved by carrying the combustion of very pure P at low pressure, in a 75% O + 25% N atm., in a quartz reaction tube, and by cooling the reaction products immediately to  $50^\circ$ . The best yield obtained refers to a gas rate of 30 l. per hr., a pressure of 90 mm and amounts to 49 g.  $\text{P}_2\text{O}_5$  from 50 g. P. The decompn. temp. of  $\text{P}_2\text{O}_5$  decreases rapidly with increasing O pressure. The details of the operations and the app. are extensively described.

ALBERT L. HENNE

The oxidation of carbon monoxide. M. PRETTE AND P. LAFFITTE. *Compt. rend.* 189, 177-9 (1929); cf. C. A. 23, 3810.—A dry mixt. of CO and air is introduced into a container which has been evacuated and heated to a temp. above the ignition temp. The mixt. does not ignite at once but for a few sec. an intense red-violet luminescence is observed. If the temp. is  $50^\circ$  to  $60^\circ$  below the ignition temp. the luminescence lasts for about a min. When suction is applied to the vessel the mixt. ignites with a blue flame. With lower pressure the ignition temp. is lowered. To study the phenomenon quantitatively different mixts. are passed through a heated quartz tube with varying velocity and temp. At the suction end the mixt. is cooled and analyzed. The luminescence observed below the ignition temp. corresponds to a slow oxidation of CO. E. SCHOTTE

Nickel hydride. THEODOR WEICHSSELFELDER AND MAX KOSSODO. *Ber* 62B, 769-71 (1929).— $\text{NiH}_2$  is prepd. by treating anhydrous  $\text{NiCl}_2$  with  $\text{PhMgBr}$  first, then with H. It has been assumed that  $\text{NiPh}_2$  is formed as an intermediate step, and that it decomposes into  $\text{NiH}_2$  and  $\text{C}_6\text{H}_6$  under the influence of H. When the H treatment is

omitted, the hypothetical  $\text{NiPh}_2$  decomposes into Ni and diphenyl, and no benzene is formed. When the H treatment is delayed 4 hrs., 70% of the theoretical quantity of H will be absorbed;  $\text{NiH}_2$  and diphenyl are obtained. If the delay is only 2 hrs.,  $\text{NiH}_2$ ,  $\text{C}_6\text{H}_6$  and diphenyl are obtained. This shows that after about 3 hrs. the decompn. of  $\text{NiPh}_2$  is complete.  $\text{NiH}_2$  has no measurable vapor tension. It plays an important part in the catalytic hydrogenation in the presence of Ni. A suspension of  $\text{NiH}_2$  in  $\text{Et}_2\text{O}$  gives its H completely away to reduce  $\text{C}_2\text{H}_4$ ; the reaction is slow. A suspension in  $\text{EtOH}$  reacts much more rapidly. The presence of  $\text{NiH}_2$  causes a mixt. of  $\text{C}_2\text{H}_4$  and  $\text{H}_2$  to react completely in a very short time. It is concluded that the catalytic power of Ni cannot be referred to the formation of an addition compd. with  $\text{C}_2\text{H}_4$ , nor a surface compd.

ALBERT L. HENNE

**Influence of the temperature on precipitation of nickel carbonate.** M. SERGEEV *Mashoboino-Zhirovoe Delo* 1928, No. 11, 15.—Pptn. of  $\text{NiCO}_3$  from  $\text{NiSO}_4$  soln. is best effected in presence of excess of  $\text{Na}_2\text{CO}_3$  at the b. p. of the mixt. V. KALICHEVSKY

**The reduction of cuprous chloride.** SAILENDRA N. SEN. *Z. anorg. allgem. Chem.* 181, 427-8(1929).—A satd. soln. in  $\text{NH}_4\text{OH}$  of  $\text{CuCl}$  from  $\text{CuO}$ , Cu wire and  $\text{HCl}$ , washed with  $\text{H}_2\text{O}$  and  $\text{NH}_4\text{OH}$ , was prepd. To this was added 1 cc. satd.  $\text{KNaC}_4\text{H}_4\text{O}_6$  soln. and  $\text{HCHO}$  (40%) until a complete green color was reached. The vessel was then immersed in boiling water for 1.5 hrs., when reduction was complete. The Cu was sepd., washed with distd.  $\text{H}_2\text{O}$  and dried. GREGG M. EVANS

**Properties of the chlorides of sulfur. II. Molecular extinction coefficients.** THOMAS M. LOWRY AND GILBERT JESSOP. *J. Chem. Soc.* 1929, 1421-35; cf. C. A. 21, 2230.—The red component of the chlorides of S is  $\text{S}_2\text{Cl}_2$ ; this can be estd. by absorption of light of wave length 5200 or 5400 Å. U., to which the  $\text{S}_2\text{Cl}_2$  and Cl are completely transparent. Colorimetric analysis shows that the liquid  $\text{S}_2\text{Cl}_2$  is dissoed. to the extent of about 16% at atm. temp.  $\text{S}_2\text{Cl}_2$  shows a strong max. of selective absorption in the ultra-violet,  $\log \epsilon = 3.8$  at 2660 Å. U., but cannot be estd. photometrically on account of the absorption of ultra-violet light by the  $\text{S}_2\text{Cl}_2$ .  $\text{S}_2\text{Cl}_4$  is not formed in appreciable quantities in the liquid chlorides of S, which behave as ternary equil. mixts., to which the law of mass action can be applied in accordance with the equation,  $2\text{S}_2\text{Cl}_2 \rightleftharpoons \text{S}_2\text{Cl}_2 + \text{Cl}_2$ . Data are given in tables and curves. C. J. WEST

**The reduction of sodium tungstate with hydrogen.** J. A. M. VAN LIEMPT. *Z. anorg. allgem. Chem.* 181, 425-6(1929).—Total reduction takes place not lower than  $1100^\circ$  and according to the equation  $\text{Na}_2\text{WO}_4 + 3\text{H}_2 = \text{W} + 2\text{NaOH} + 2\text{H}_2\text{O}$  instead of at  $900^\circ$  and according to the equation  $\text{Na}_2\text{WO}_4 + 4\text{H}_2 = 2\text{Na} + \text{W} + 4\text{H}_2\text{O}$ , according to Spitzin (C. A. 20, 156). GREGG M. EVANS

**The action of carbon dioxide under high pressure on metallic iron.** ERNST MÜLLER AND HANS HEINECKA. *Z. anorg. allgem. Chem.* 181, 159-71(1929).—Under 50 atms. of  $\text{CO}_2$  the soly. of Fe in  $\text{H}_2\text{O}$  as  $\text{Fe}(\text{HCO}_3)_2$  is greatly increased. The total soly. increases to  $60^\circ$  and then decreases. At  $30^\circ$  and higher the soly. passes through a max. of  $\text{Fe}(\text{HCO}_3)_2$  and then decreases due to decompn. to  $\text{FeCO}_3$ . At  $60^\circ$  this max. is reached in 2.25 hrs. Fe did not react with  $\text{H}_2\text{O}$  at 50 atms.  $\text{N}_2$ . At  $30^\circ$  the soly. reached is the same with 30, 40 and 50 atms.  $\text{CO}_2$ , the time to reach it varying. The soly. curve resembles that in dil.  $\text{H}_2\text{SO}_4$  and therefore depends on the  $\text{H}^+$  concn. with reaction ceasing at about  $3 \times 10^{-6}$  mol.  $\text{H}^+$  per l. At 50 atms. the disocn. const. to  $\text{H}^+$  and  $\text{HCO}_3^-$  is estd. at 0.25 and the  $\text{H}_2\text{CO}_3$  concn. about 22 times that at 1 atm. F. D. S.

**The systems  $\text{Al}(\text{NO}_3)_3$ - $\text{Fe}(\text{NO}_3)_3$ - $\text{H}_2\text{O}$ , and  $\text{KNO}_3$ - $\text{Fe}(\text{NO}_3)_3$ - $\text{H}_2\text{O}$  at  $0^\circ$  and  $40^\circ$**  G. MALQUORI. *Atti accad. Lincei* 9, 569-72(1929); cf. C. A. 22, 530.—Soly. data and curves are given. A. W. CONTIERI

**System:  $\text{NaNO}_3$ - $\text{Na}_2\text{SO}_4$ - $\text{MgCl}_2$ - $\text{H}_2\text{O}$  in the neighborhood of  $0^\circ$ ,  $10^\circ$ ,  $25^\circ$ ,  $75^\circ$  and  $100^\circ$ .** G. LEIMBACH AND A. PFEIFFENBERGER. *Caliche* 10, 447-68(1929).—A detailed study has been made of the system at  $0^\circ$ ,  $10^\circ$  (and  $25^\circ$ ) and the results have been compared with those of other observers. B. C. A.

**Nickelammine complex salts. III. Nickel, potassium and ammonium hexammine double salts.** E. KOCSSIS. *Magyar Chem. Folyóirat* 34, 213-7(1928); cf. C. A. 23, 788.—Various K and  $\text{NH}_4$  nickelammine double salts were prepd. They all decompose on dissolving in water. In the air, they lose  $\text{NH}_3$  more rapidly than simple salts consisting of the same anions. The nitrate and nitrate-sulfate are the most labile, and salts of Cl and I are the most stable compds. S. S. DE FINÁLY

**Polyhalides. I. Chloroiodous acid:  $\text{HICl}_4 \cdot 4\text{H}_2\text{O}$ .** V. CAGLIOTI. *Atti accad. Lincei* 9, 563-8(1929).—Powd. I added to  $\text{HCl}$  (d. = 1.19), and a current of  $\text{Cl}_2$  passed through until the I was completely dissolved, gave a heavy red-orange soln., which, when immersed in ice, crvstd. almost completely, giving  $\text{HICl}_4 \cdot 4\text{H}_2\text{O}$ . Addn. of concd. solns.

of KCl, CsCl,  $C_2H_5NH_2Cl$ ,  $MgCl_2$  and  $ZnCl_2$  to soln. of the acid causes the corresponding salts to crystallize out. A. W. CONTIERI

**Difluophosphoric acid and formation from it of salts similar to those of perchloric acid.** WILLY LANGE. *Ber.* 62B, 786-92(1929).—The hydrolysis of  $POF_3$  occurs through 2 intermediate steps, *i. e.*,  $F_2PO_2H$  and  $FPO_2H_2$ . If the hydrolysis is carried out in a weakly basic soln., it is possible to isolate these compds. by means of their salts. The formation of the nitron salt gives the best result, but the isolation remains a tedious task. The best method to obtain  $F_2PO_2H$  or its derivs. is to melt 1 mol.  $P_2O_5$  and 3 mols.  $NH_4F$  in a Ni or Cu crucible;  $F_2PO_2NH_4$  is thus formed, which is easily extd. with boiling EtOH and recrystd. from hot  $H_2O$ ; it m.  $213^\circ$ . Dil. solns. of the  $NH_4$  salt treated with a sol. salt of tetramethylammonium, strychnine, brucine, morphine, cocaine or nitron give a cryst. ppt. of the corresponding difluophosphate. In concd. solns., K or Cs difluophosphate can be obtained in a similar way. To obtain other salts the best method is to treat a hot aq. soln. of nitron difluophosphate with a metallic nitrate; nitron nitrate is filtered off and the other salt is obtained by evap. the filtrate *in vacuo*. Difluophosphates are stable, but are hydrolyzed at high temp., specially in the presence of agents causing the formation of insol. compds. Their general behavior is similar to that of the perchlorates, but their cryst. characteristics are not the same. In contradistinction with the easy formation of *o*-toluenediazonium and pyridine perchlorates, the corresponding difluophosphates could not be obtained. A. L. H

**Tartrate cobaltinitrites.** MYKOLA WIKUL. *Z. anorg. allgem. Chem.* 181, 121-30 (1929); cf. *C. A.* 20, 1771; 22, 931.—The formula  $C_4H_4O_6NaCoO_7 \cdot 7K_2NaCo(NO_3)_6 \cdot H_2O$  is justified with  $CoO$  as the central group, on the assumption that the coordination no. is 7. The K reagent ppts.  $C_4H_4O_6Co \cdot 2H_2O$  on standing several months. This dissolves in 33%  $NaNO_2$  readily, if  $H_2O_2$  is added to oxidize  $Co^{++}$  to  $Co^{+++}$ . From soln. of the complex in  $H_2SO_4$ ,  $(CoO)_2SO_4 \cdot NaHSO_4 \cdot 9H_2O$  is pptd. Quant. results could not be obtained in pptn. of Rb as the tartrate cobaltinitrite, and with Cs the errors were large. FOSTER DEE SNELL

**Uranium tetroxide dihydrate.** ARTHUR ROSENHEIM AND HERBERT DAHR. *Z. anorg. allgem. Chem.* 181, 177-82(1929).—The tetroxide pptd. from 10%  $UO_2(NO_3)_2$  or  $(NH_4)_2(UO_2)(C_2O_4)_2$  soln. by 30%  $H_2O_2$  and dried at room temp. corresponds to  $UO_4 \cdot 3H_2O$ . At  $100^\circ$   $UO_4 \cdot 2H_2O$  is obtained. By heating over  $100^\circ$  a pure  $UO_4$  was not obtained. FOSTER DEE SNELL

O and H in industry (DOBSON, BARNES) 4. Contribution to the chemistry of S. I. The system S-Cl (TRAUTZ, *et al.*) 2.

SKALIJS, WILLY: Über einige Doppelverbindungen von Alkali-Carbonaten mit Erdalkali-Carbonaten. Halle: M. Niemeyer. 39 pp. M. 6.

## 7—ANALYTICAL CHEMISTRY

W. T. HALL

**New methods in analytical chemistry. Rapid determination of various elements after precipitation according to the procedures of classic methods.** I. J. DICK. *Z. anal. Chem.* 77, 352-63(1929).—The results are given of 76 expts., all with remarkable concordance, in the rapid detn. of Ni as diacetyldioxime salt, Hg as  $HgS$ , Ag as  $AgCl$ , Pb as  $PbSO_4$ , Ba as  $BaSO_4$ , Ca as  $CaC_2O_4 \cdot H_2O$ , Cl, Br, I and CNS as Ag salts,  $SO_4$  as  $BaSO_4$  and  $C_2O_4$  as  $CaC_2O_4 \cdot H_2O$ . The improvements consist in using König's Prussian porcelain filtering crucibles, washing with alc. and finally with ether and drying in a vacuum at room temp. In many cases a complete analysis can be made in half an hr. W. T. H.

**Solubility effects and quantitative analysis.** ERWIN WENDEHORST. *Z. angew. Chem.* 42, 723-4(1929). L. DEDE. *Ibid* 724.—A polemical discussion concerning the pptn. and ignition of  $CdCO_3$ . Cf. *C. A.* 22, 4079. W. T. H.

**Experimental notes on quantitative emission-spectral analysis.** W. GERLACH AND E. SCHWERTZER. *Z. anal. Chem.* 77, 213-7(1929).—The recent paper by Thurnwald and Hüttig (*C. A.* 23, 2387, 2900) is criticized. It is shown as a result of expts. that with properly constructed electrodes and the proper application of the method of homologous pairs, metal salt solns. can be analyzed spectrally quite independent of the presence of other ions. W. T. H.

**Colorimetry in ultra-violet light with the aid of fluorescent substances.** J. EISEN-

BRAND. *Z. angew. Chem.* **42**, 445-8(1929); cf. *C. A.* **23**, 2119.—If a narrow tube confg. a substance which is fluorescent in ultra-violet light, such as a dil. soln. of quinine sulfate

or invisible if the tested soln. absorbs ultra-violet light. Since this effect is proportional to the concn. of the soln. it is possible to utilize the principle in the examn. of nitrite solns. and alkaloids such as colchicine.

Colorimetric carbon test improved. H. L. CAMPBELL, *Iron Age* **124**, 157-8 (1929).—An improved water bath and a suitable colorimeter can be constructed very easily, as is here described. Full directions are given for carrying out an analysis.

A new volumetric method: mercurimetry. AL. IONESCO-MATHIU *Mon. prod. chim.* **11**, No. 109, 1-6; *Chem. Zentr.* **1928**, II, 920; cf. *C. A.* **22**, 3733, 4203.—The ability of the Hg salts to produce quant. ppts. was used to work out new volumetric methods. The detn. of  $\text{Me}_2\text{CO}$  was carried out in the following manner: the  $\text{Me}_2\text{CO}$  soln. was placed in a 200-cc. flask with reflux condenser and 10 cc.  $\text{H}_2\text{SO}_4$ , 10 cc.  $\text{H}_2\text{SO}_4$  soln. and 100 cc. of  $\text{H}_2\text{O}$  were added. The mixt. was boiled for 20 min. and the  $\text{Me}_2\text{CO}$ -Hg ppt. was filtered after cooling. The ppt. was washed with 200 cc.  $\text{H}_2\text{O}$ , transferred with the aid of  $\text{H}_2\text{O}$  into an Erlenmeyer flask and dissolved by slow heating with 25 cc. of  $\text{HCl-HNO}_3$ . To destroy the N compds. formed, a few drops of 10%  $\text{KMnO}_4$  were added until the red color was permanent. Then 12 drops of 10% Na nitroprusside were added, which caused a ppt. The mixt. was titrated with 0.1 N  $\text{NaCl}$ , until the ppt. disappeared. One cc. of 0.1 N  $\text{NaCl}$  corresponds to 0.0028 g.  $\text{Me}_2\text{CO}$ . The alkaloids, quinine, morphine, strychnine, codeine and cocaine could be detd. by similar methods. Expts. were undertaken to det. the proteins by mercurimetric. G. S.

Note on the significance of sampling for the chemical analysis of metal alloys. ZWICKER. *Chem.-Ztg.* **53**, 546-7(1929).—Considerable variance in the Cu, Sn, Pb and Zn contents of bronze and white bearing metal shows the need of sawing through the entire casting to get a representative sample for chem. analysis.

Stable molybdate solution. C. J. SCHOLLENBERGER *Chemist-Analyst* **18**, 14 (1929).—To 217 cc. of cold water add 115 cc. of concd.  $\text{NH}_4\text{OH}$  and slowly introduce while stirring 80 g. of 85%  $\text{MoO}_3$ , rotating the liquid until complete soln. is obtained. In another bottle put 918 cc. of water and 391 cc. of concd.  $\text{HNO}_3$  and cool. Filter the first soln. and add it slowly, from a separatory funnel, to the second soln., keeping the latter in const. rotary motion. Gradually reduce the rate of adding the molybdate soln. and cool thoroughly before adding the last 30 cc. Dissolve 0.02 g. of  $\text{Na}_2\text{HPO}_4$  in a little water, add to the soln. and mix well. Let stand overnight and filter. It is well to add 4% more of  $\text{HNO}_3$  by vol. (The original directions call for 10 times as much of each reagent.)

The potentiometric standardization of ceric sulfate. KIN'ICHI SOMEYA. *Z. unorg. allgem. Chem.* **181**, 183-8(1929).—Excellent results were obtained in the electrometric titration of  $\text{K}_4\text{Fe}(\text{CN})_6$  with  $\text{Ce}(\text{SO}_4)_2$  in either direction. The method of Willard and Fenwick for standardizing  $\text{Ce}(\text{SO}_4)_2$  with  $\text{KIO}_3$  or  $\text{KI}$  was also found satisfactory.

Experiments on quantitative oxidation with ceric sulfate. A. J. BERRY. *Analyst* **54**, 461-4(1929).—If a  $\text{Ce}(\text{SO}_4)_2$  is standardized in the same way it is used in the analysis, the following procedures give good results: *Titration of ferrocyanides*—Dil. the soln. to make it about 0.01 N, add a few drops of diphenylamine indicator soln. and titrate with 0.1 N  $\text{Ce}(\text{SO}_4)_2$  soln. (25 g.  $\text{Ce}(\text{NO}_3)_3$  heated with concd.  $\text{H}_2\text{SO}_4$  until  $\text{HNO}_3$  is expelled completely and then dild. with cold water). *Titration of tartrates*.—In the titration, one mol. of tartaric acid reacts with 7 mols. of  $\text{Ce}(\text{SO}_4)_2$ . *Titration of thallous salts*.—Take a little  $\text{I}_2$  in  $\text{CHCl}_3$  in a stoppered bottle, add 50 cc. of concd.  $\text{HCl}$  and just sufficient Ce sulfate soln. to decolorize the soln. on shaking. Use this soln. of  $\text{ICl}$  as indicator. Add a measured vol. of  $\text{Ti}_2\text{SO}_4$  soln. and titrate with ceric sulfate until the  $\text{CHCl}_3$  is once more colorless.

Preparation of organic reagents in the analytical laboratory. I. Diphenylcarbazide and diphenylcarbazone. K. H. SLOTTA AND K. R. JACOBI. *Z. anal. Chem.* **77**, 344-8(1929).—(I) Dry 14 g. of powd. urea at  $100^\circ$  and mix with 40 g. of freshly distd. phenylhydrazine in a 250-cc. flask. Heat with an upright tube condenser in an oil bath at  $155^\circ$  for 2.5 hrs. Then take the flask from the bath and 3 min. later add to the golden yellow, oily contents 250 cc. of 96% alc. Pour into a 600-cc. beaker and heat about 15 min. at the b. p. until complete soln. is obtained. After 30 min., cool rapidly with salt and ice, filter with suction and wash twice with ether. Yield = 33 g. of diphenylcarbazide m.  $170^\circ$ . By evapg. the filtrate under diminished pressure

7 g. more of crystals can be obtained. (II) Dissolve 24 g. of diphenylcarbazine by boiling 15 min. with 200 cc. of 95% alc. in a 1. flask. To the hot soln., add at one time 20 g. of powd. KOH while stirring and follow with 20 cc. of 3%  $\text{H}_2\text{O}_2$ . Allow to stand 5 min. and add 250 cc. of 2 *N*  $\text{H}_2\text{SO}_4$  while stirring. Pour the paste into a 3-l. vessel and add 1500 cc. of water to dissolve the  $\text{K}_2\text{SO}_4$ . Cool thoroughly, filter, wash thoroughly with water and dry. Yield 15-17 g. of diphenylcarbazone, decomp. at  $150^\circ$ . (III). Since the desired reagent is the oxidized compd., it is advantageous to prep. it directly instead of in 2 stages as above. Treat as in I until after the boiling with 320 cc. of 96% alc. Transfer to a 3-l. dish and introduce, while stirring, 35 g. of powd. KOH and then, while still stirring, 30 cc. of  $\text{H}_2\text{O}_2$ . Continue as in II. W. T. H.

Note on the breaking down of potassium permanganate in oxidation reactions in which solid manganese oxides are formed. B. REINITZER AND F. HOFFMANN. *Z. anal. Chem.* 77, 407-41(1929).—The oxidation of manganous, chromic and arsenious salts by  $\text{KMnO}_4$  under various conditions was studied to det. what oxides of Mn were obtained in the ppt. The results do not support the primary oxide theory. It appears that  $\text{Mn}_2\text{O}_3$  is often produced by the oxidation of the bivalent Mn and by the reduction of the  $\text{MnO}_4^-$  and that the reaction between  $\text{Mn}^{++}$  and  $\text{MnO}_4^-$  sometimes takes place in 2 stages whereby trivalent Mn is formed and then oxidized to quadrivalent state, but under other conditions the bivalent and 7-valent Mn are at once changed to  $\text{MnO}_2$ . The conclusions were drawn largely from expts. in which a preliminary pptn. was accomplished by adding less than the theoretical vol. of  $\text{KMnO}_4$ , filtering and then titrating the filtrate. W. T. H.

Use of 8-hydroxyquinoline in separations of aluminum. G. E. F. LUNDELL AND H. B. KNOWLES. *Bur. Standards J. Research* 3, 91-6(1929).—Oxine will cause complete pptn. of Al and sepn. from  $\text{PO}_4$ ,  $\text{AsO}_4$ , F and  $\text{BO}_3$  anions in ammoniacal solns. If Ta, Nb, Ti or Mo is present,  $\text{H}_2\text{O}_2$  must be added. With  $\text{UO}_2$  compds., a good sepn. is made if  $(\text{NH}_4)_2\text{CO}_3$  is added instead of  $\text{NH}_4\text{OH}$  and the sepn. of Al from Be can be accomplished in dil.  $\text{AcOH}$  solns. In the analysis of Fe-V alloy, however, only 12.1% Al was obtained with a sample contg. 12.5%. W. T. H.

Use of aluminum for the detection of arsenic. ELMER B. SVENSON. *Chemist-Analyst* 18, 5(1929).—Al can be used in place of Zn in the Marsh test with HCl as acid. With  $\text{H}_2\text{SO}_4$  it is necessary to activate the Al by immersing it in a slightly acid Cu or Hg salt to give it a light coating. The metal is free from As. W. T. H.

Notes on the determination of arsenic by the Marsh-Berzelius method. ALBERT T. W. COLLEY AND HAROLD C. LOCKWOOD. *J. Soc. Chem. Ind.* 48, 226T(1929) — Zn mirrors can be eliminated by using 5 *N* HCl, instead of more concd. acid and 20 cc. of water with 20 g. of Zn. A tight plug of cotton wool and a small plug of  $\text{Pb}(\text{OAc})_2$  wool can replace the usual  $\text{CaCl}_2$  drying tube, but should be filled freshly in each expt. A small piece of hardened, thin, sheet brass, wedged into position 0.25 in. from the heated portion and in contact with wet lint, serves to cool the tube and aid in obtaining uniform mirrors. W. T. H.

The determination of small quantities of beryllium in rocks. B. E. DIXON. *Analyst* 54, 268-74(1929).—If an HCl soln. of  $\text{TiCl}_4$  and  $\text{BeCl}_2$  (5-10 mg. of  $\text{TiO}_2$ , 5-40 mg. of  $\text{BeO}$  in 250 cc.) is heated to boiling, neutralized with  $\text{NH}_4\text{OH}$  until a turbid appearance is obtained and then treated with 1-1.5 g. of *p*-chloroaniline, all of the Ti and no Be will be pptd. by boiling 3 min. In 15 expts. the max. error was 0.5 mg. of  $\text{TiO}_2$ . To apply this new method for sepg. Be from Ti to rock analysis, take the twice pptd. Fe-Al-Ti-Be, etc., hydroxide ppt. (obtained with  $\text{NH}_4\text{OH}$  and  $\text{NH}_4\text{Cl}$  in the usual way), fuse it with  $\text{Na}_2\text{CO}_3$  and leach with water. The residue will contain the Be and Ti. Dissolve in HCl and sep. the bulk of the Ti from the Be by the  $\text{NaHCO}_3$  treatment recommended by Parsons and Barnes. Then, in view of the heavy Na salt content, ppt. with  $\text{NH}_4\text{OH}$ . Dissolve the ppt. in HCl and carry out the chloroaniline pptn. Filter and ppt.  $\text{Be}(\text{OH})_2$  with  $\text{NH}_4\text{OH}$ . In this way excellent results were obtained in the analysis of a synthetic mixt. of about 25 mg. each of  $\text{Fe}_2\text{O}_3$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{TiO}_2$  and  $\text{BeO}$ . W. T. H.

Determination of minute quantities of bismuth. A. PORTNOV AND V. SKVORZOV. *Farm. Zhur.* 1928, 534-9; *Chem. Zentr.* 1929, 1, 114.—The colorimetric method is recommended for the detn. of minute quantities of Bi. The org. substances are destroyed, the resulting product is dissolved in HCl and the excess of HCl is evapd. on the water bath. The  $\text{BiCl}_3$  formed is converted into  $\text{K}_2\text{BiI}_6 \cdot 4\text{H}_2\text{O}$  and the Bi detd. colorimetrically. The best way of removing the free  $\text{I}_2$  formed during the conversion of  $\text{BiCl}_3$  into  $\text{K}_2\text{BiI}_6 \cdot 4\text{H}_2\text{O}$  is by shaking the mixt. with  $\text{CHCl}_3$ . Addn. of glycerol to the soln. of  $\text{K}_2\text{BiI}_6 \cdot 4\text{H}_2\text{O}$  inhibits to a large degree the sepn. of free  $\text{I}_2$ , because the dissocn. is retarded. An excess of acid has to be avoided in making the  $\text{K}_2\text{BiI}_6 \cdot 4\text{H}_2\text{O}$



soln. The soln. has to be protected against light. The destruction of the org. substances according to Fresenius and Babo as recommended by several authors (Authenrieth and Meyer, *C. A.* 19, 2216) is believed by P. and S. to be too complicated. The most practical way is to destroy the compd. by igniting it. The sensitiveness of this method is given as 0.0025 mg. in 1 cc.

A new and rapid method for determining cadmium. G. SPACU AND G. SUCIU. *Z. anal. Chem.* 77, 340-3(1929). See *C. A.* 23, 3184.

Gravimetric method for the determination of chromium in steel. WM. F. POND. *Chemist Analyst* 18, 11(1929).—Heat 0.5-1.5 g. of steel with 25 cc. of 6 *N* HCl, add 5 cc. of 6 *N* HNO<sub>3</sub> and 1 cc. of 6 *N* H<sub>2</sub>SO<sub>4</sub>. Reduce the vol. to 10 cc., add 100 cc. of hot water and heat a few min. Cool and add Na<sub>2</sub>O<sub>2</sub> very cautiously, using about 2 g. in excess. Heat 30 min. just below boiling. Filter, wash with hot water, boil the filtrate 30 min., make acid with AcOH and ppt. as PbCrO<sub>4</sub> with Pb(OAc)<sub>2</sub> soln.

The determination of cobalt in driers, japans, alloys, etc. OSCAR HEIM. *Analyst* 54, 464-5(1929).—See *C. A.* 23, 4161.

Potassium cyanate as a reagent for the detection of cobalt. B. J. F. DORRINGTON AND A. M. WARD. *Analyst* 54, 327-32(1929).—If a satd. soln. of KCNO is substituted for NH<sub>4</sub>CNS in the Vogel test for Co, an equally-intense blue color is obtained which is not so seriously interfered with by the presence of Fe, because this element can be pptd. by boiling the soln. and then the Co test will be obtained by adding more reagent.

A new sensitive color reaction of copper. S. G. CLARKE AND B. JONES. *Analyst* 54, 333-4(1929).—To the faintly acid, chloride-free Cu soln., add 1 g. of (NH<sub>4</sub>)<sub>2</sub>S<sub>2</sub>O<sub>8</sub>, 1 cc. of satd. soln. of diacetyldioxime in alc., 0.5 cc. of 0.5% AgNO<sub>3</sub> and 2 cc. of 10% aq. pyridine. Compare the reddish violet color with that similarly produced with known amts. of Cu. 0.1 mg. of Cu is the max. which should be detd. and 1 part of Cu in 10 million of water can be detected. Other oxidizing agents can replace the persulfate.

The determination of copper and nitrite in solutions of cuprammonium hydroxide. E. BUTTERWORTH AND H. A. ELKIN. *J. Soc. Chem. Ind.* 48, 127-8T(1929).—Ten cc. cuprammonium soln. (I) is acidified with dil. H<sub>2</sub>SO<sub>4</sub>, boiled 5 min. (to remove nitrous fumes), cooled, made slightly alk. with ammonia, acidified with AcOH and the Cu is detd. in the usual manner with KI and Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub>. The nitrite is detd. as follows: 10 cc. I is run into a Lunge nitrometer, treated with 20 cc. dil. H<sub>2</sub>SO<sub>4</sub> (25% by vol.), and, after a few min., with 10 cc. concd. H<sub>2</sub>SO<sub>4</sub>, and the nitrous acid is detd. in the usual way.

Presidential address—method in the gold bullion assay. ROBERT LAW. *Proc. Soc. Chem. Ind. Victoria* 28, 130-46(1929).—Details are given concerning the elementary operations involved in assay work.

Potentiometric determination of gold and platinum with stannous chloride. ERICH MULLER AND RUDOLF BENNEWITZ. *Z. anorg. allgem. Chem.* 179, 113-24(1929).—0.0004 *M* solns. of H<sub>2</sub>AuCl<sub>4</sub> and H<sub>2</sub>PtCl<sub>6</sub> were prepd. by dissolving the metals in aqua regia and expelling the HNO<sub>3</sub> by repeated evapn. with HCl. The metals were detd. potentiometrically with 0.04 *N* SnCl<sub>2</sub> soln. in an atm. of N<sub>2</sub>. The titration curve for Au in solns. contg. excess Cl<sub>2</sub> shows 2 breaks, the first corresponding to the reduction of excess Cl<sub>2</sub> and the second to the reduction of AuCl<sub>4</sub><sup>-</sup> by Sn<sup>2+</sup>. In the detn. of Pt, the excess Cl<sub>2</sub> was titrated at 18°, and the PtCl<sub>6</sub><sup>2-</sup> was reduced to Pt at 75°. By using KBrO<sub>3</sub> as the oxidant and conducting the entire titration at 75° results were obtained which were 7% too high. Either of the metals may be detd. at lower concns. but when both are together there is no end point until both Au and Pt are reduced to metal.

Rapid spectroscopic methods for the determination of iridium, rhodium and palladium in platinum. WALTHER GERLACH AND EUGEN SCHWEITZER. *Z. anorg. allgem. Chem.* 181, 103-10(1929); cf. *C. A.* 21, 3172, 3851.—In examn. of the emission spectrum of an alloy in which a substance Z has been added to a base substance G, that part of the field is sought where with a definite compn. of G + a%Z, a pair of lines is found (one from each element) having equal intensity. This is called a *homologous pair*, and where a no. of these pairs can be found covering a sufficient range of concn. of Z in G, a good quant. method is available for detn. of Z. These pairs can be detected simply by using a magnifying glass, photometric methods being unnecessary. With Rh in Pt sufficient lines are found to cover 0.5, 0.6, 0.8, 1.0, 1.1, 1.2, 1.4, 1.5, 2.5, 3.0, 4.0, 5.0 and 7.5% Rh; with Ir in Pt 0.3, 1.56, 1.64, 2.0, 5.0, 6.0, 7.0 and about

10.0% Ir. In the case of Pd, analytical samples were not available, but suitable lines were found at 3609.6 and 3634.7 A. U.

**Spectroscopic identification of lead in gold-copper-silver alloys.** VII. WALTHER GERLACH AND EUGEN SCHWEITZER. *Z. anorg. allgem. Chem.* **181**, 101-2(1929); cf. C. A. **22**, 3112.—Pb can be identified spectroscopically in an alloy contg. Au + 10% Cu + 10% Ag + 0.09% Pb by using a large glass spectrograph, the dispersion of which is about 13 A. U. per mm. in the vicinity of wave length 4060. The Pb line at 4057.8 is sharp and easily distinguished even with only 0.005% Pb. It is very improbable that elements which show lines in this vicinity would be present in sufficient quantity to interfere.

**Non-sulfide lead determinations.** H. K. HANSEN. *Chemist-Analyst* **18**, 10-11 (1929).—To det. Pb in sulfates, oxides and carbonates, treat 2.5-5 g. of very fine sample with 20 cc. of concd.  $\text{NH}_4\text{OAc}$  soln. contg. 5 cc. of excess  $\text{AcOH}$ . Simmer 5 min., filter and to the filtrate add 1-2 cc. of satd.  $\text{Na}_2\text{S}$  soln. Boil, filter and wash with cold water. Treat the ppt. with  $\text{HNO}_3$  and  $\text{KClO}_3$ , and fume with 5-7 cc. of  $\text{H}_2\text{SO}_4$ . Continue as usual. Another procedure is given in which the  $\text{H}_2\text{SO}_4$  is added directly to the first filtrate. To det. Zn in an ore, decomp. with  $\text{HNO}_3$ , fume with  $\text{H}_2\text{SO}_4$  and  $\text{HCl}$  and treat the fumed soln. with 15-20 ml. of water, a large spoonful of  $\text{NH}_4\text{Cl}$  and 5 cc. of  $\text{HCl}$ . Boil, make ammoniacal, add a pinch of  $\text{NH}_4$  persulfate, boil, filter and continue in the usual manner. Another procedure when no sulfide is present, is to dissolve in 25 cc. of water and 5 cc.  $\text{AcOH}$ , boil, filter, add  $\text{Br}_2$  and 5 cc. of  $\text{HCl}$ , boil off  $\text{Br}_2$ , add a spoonful of  $\text{NH}_4\text{Cl}$  and continue as above. To det. Fe, dissolve pptd.  $\text{Fe}(\text{OH})_3$  in 2.5 N  $\text{HCl}$ , reduce with a small spoonful of test Pb, filter, wash by 3 decantations with 50-cc. portions of cold water and titrate with  $\text{K}_2\text{Cr}_2\text{O}_7$ , diphenylamine being used as indicator.

**The determination of manganese by the Volhard method.** F. J. WATSON. *Chem. Eng. Mining Rev.* **21**, 352-3(1929).—The expt. was tried of adding an excess of  $\text{KMnO}_4$  in the Volhard titration and titrating the excess with  $\text{Na}_2\text{S}_2\text{O}_4$ , assuming it to be oxidized to  $\text{SO}_4^{--}$  but since more than the anticipated vol. of thiosulfate was required for 10 cc. of 0.1 N  $\text{KMnO}_4$  soln., the conclusion is drawn that this method is applicable only when the excess of  $\text{KMnO}_4$  is small. In running a Volhard titration when the approx. position of the end point is unknown, it is well to reserve a part of the soln. and add it to the main soln. after the end point has been over-run. Another method is to prep. a  $\text{MnSO}_4$  soln. as follows: Take 500 cc. of 0.1 N  $\text{KMnO}_4$ , make acid with  $\text{H}_2\text{SO}_4$  and reduce with  $\text{H}_2\text{O}_2$ . Boil with an excess of  $\text{ZnO}$  and make up to 1 l. Add 3 cc. to the titrated soln. (= 1 cc. of  $\text{KMnO}_4$ ) and get a new end point.

**Volumetric determination of manganese as manganous salt by a new method.** RUDOLF LANG AND FRANZ KURTZ. *Z. anorg. allgem. Chem.* **161**, 111-20(1929).—The method depends on the induced oxidation of  $\text{Mn}^{++}$  to  $\text{Mn}^{+++}$  by means of dichromate-arsenite mixt. and titration of the  $\text{Mn}^{+++}$  with  $\text{FeSO}_4$ -diphenylamine. Make the  $\text{Mn}^{++}$  soln., contg. not more than 0.2 g. Mn, slightly alk. with  $\text{Na}_2\text{CO}_3$ , add 5-10 cc. of  $\text{HF}$  and 5-10 cc. of sirupy  $\text{H}_3\text{PO}_4$ . Then add 45 cc. of 1.5%  $\text{K}_2\text{Cr}_2\text{O}_7$  soln. and 50 cc. of arsenite soln. (15 g.  $\text{As}_2\text{O}_3$  and 10 g.  $\text{Na}_2\text{CO}_3$  per l.). After 2-3 min., add 3 drops of 1% diphenylamine soln. and titrate with  $\text{FeSO}_4$  soln. (28 g. copperas and 10 cc.  $\text{H}_2\text{SO}_4$  per l.) until the color of the soln. changes from dark blue to grass green. To det. Mn in Mn-steel, dissolve 4.981 g. of metal in 60 cc. of 6 N  $\text{HCl}$  and boil the resulting soln. for 5 min. with some 3%  $\text{H}_2\text{O}_2$ . Dil. to 200 cc., mix and use 40 cc. for the Mn titration, neutralizing with  $\text{Na}_2\text{CO}_3$  until an abundant pptn. of  $\text{Fe}(\text{OH})_3$  takes place and then adding the reagents as described above. The titration can be repeated if desired. Hg solns., considerable  $\text{NH}_4$  salt, Al, Ca and other elements which form insol. fluorides, interfere, by causing adsorption of  $\text{Mn}^{++}$ , thus preventing its oxidation to  $\text{Mn}^{+++}$ .

**A new, rapid method for determining mercury.** G. SPACU AND G. SUCIU. *Z. anal. Chem.* **77**, 334-40(1929). See C. A. **23**, 3184.

**The volumetric determination of mercury.** H. B. DUNNICLIFF AND H. D. SURI. *Analyst* **54**, 405-10(1929).—A bibliography with notes on previous volumetric methods is given. The following method using  $\text{SnCl}_2$  is recommended: Mix a measured vol. of standard  $\text{SnCl}_2$  soln. with an equal vol. of 25% Na tartrate in a graduated cylinder through which  $\text{CO}_2$  is passing. Neutralize with the calcd. amt. of  $\text{NaHCO}_3$  and dil. to 80-90 cc. Stir and standardize by the Fe-alum- $\text{TiCl}_3$  method. Do the same thing with  $\text{HgCl}_2$  added but filter into a buret in an atm. of  $\text{CO}_2$  after dilg. the mixt. to 80-85 cc. Add 10 cc. of the filtrate to an excess of standard Fe-alum soln. which has been heated on the water bath and contains an excess of  $\text{HCl}$ . Titrate the excess Fe with  $\text{TiCl}_3$  soln. which is standardized daily. The  $\text{HgCl}_2$  soln. should be 0.025-0.125 N,

more than enough  $\text{SnCl}_2$  soln. added to reduce the  $\text{HgCl}_2$  to metal and air must be excluded as indicated above. For filtering, 2 layers of  $\text{BaSO}_4$  paper and some asbestos are recommended. Instead of  $\text{Fe}$  alum and  $\text{TiCl}_3$  solns.,  $\text{I}_2$  and  $\text{Na}_2\text{S}_2\text{O}_3$  can be used equally well.

**Mercury poisoning and its chemical detection.** FRIEDERICH AND BUHR. *Süddeut. Apoth.-Ztg.* **68**, 702-3 (1928); *Chem. Zentr.* **1928**, II, 2739.—In cases of  $\text{Hg}$  poisoning the chem. detection in the excreta was carried out in the following way. A  $\text{Cl}$  current was passed in 1000 cc. of urine and the urine evapd. to about 150 cc., with  $\text{Cl}$  passing steadily through the fluid. The excess of  $\text{Cl}$  was removed by means of  $\text{CO}_2$  passed through the fluid in a slow current. Then the liquid was filtered in the cold. A few drops of  $\text{CuSO}_4$  soln. (German Pharmacopeia 6) was added, the mixt. was slightly acidified with  $\text{HCl}$  and pptd. with  $\text{H}_2\text{S}$ . The centrifugized ppt. was suspended in  $\text{H}_2\text{O}$  and dissolved with  $\text{Cl}$ .  $\text{CO}_2$  was passed through and the dil. soln. was again treated with  $\text{H}_2\text{S}$ . The ppt. formed was once more treated with  $\text{Cl}$  and  $\text{CO}_2$  as described above. The soln. was filtered and finely powdered  $(\text{NH}_4)_2\text{C}_2\text{O}_4$  was added until the  $\text{CuC}_2\text{O}_4$  first pptd. dissolved again.  $\text{Hg}$  was then pptd. by introduction of a  $\text{Cu}$  wire into the blue soln. The  $\text{Hg}$  was identified as the iodide. The  $\text{HgI}_2$  was dissolved by passing  $\text{Cl}$  into the aq. suspension. The excess of  $\text{Cl}$  was removed and the soln. electrolyzed after addn. of  $(\text{NH}_4)_2\text{C}_2\text{O}_4$  and  $(\text{CO}_2\text{H})_2$ . The quantity of  $\text{Hg}$  present was calcd. from the wt. of the cathode. The method proved to be very exact.

G. SCHWOCH  
**Determination of small quantities of potassium in the presence of considerable sodium salt by a direct, gasvolumetric method.** GERHART JANDER AND HERMANN FABER. *Z. anorg. allgem. Chem.* **181**, 189-92 (1929).—Directions are given for modifying the method so that 1 mg. of  $\text{K}$  can be detd. in the presence of 1.0 g. of  $\text{Na}$  salt.  $\text{K}_2\text{Na}_3[\text{Co}(\text{NO}_2)_6]_2$  is pptd., the ppt. is filtered and decompd. with  $\text{FeSO}_4$  and the resulting  $\text{NO}$  measured in an azotometer. The results are very accurate. W. T. H.

**Note on the determination of silicon.** THEODOR HECZKO. *Z. anal. Chem.* **77**, 327-8 (1929).—In volatilizing  $\text{SiF}_4$  with  $\text{HF}$  and  $\text{H}_2\text{SO}_4$ , time can be saved if filter paper is put into the crucible to absorb the liquid. It is then easier to evap. to dryness.

W. T. H.  
**Microchemical detection of silver as sulfate.** O. HACKL. *Mikrochemie* **6**, 106-7 (1928); *Chem. Zentr.* **1928**, II, 923.—The crystals obtained on adding  $\text{H}_2\text{SO}_4$  of various concns. or solid  $(\text{NH}_4)_2\text{SO}_4$  are described. The limit of sensitiveness is 0.001 mg. per cc.

G. SCHWOCH  
**Investigations into the analytical chemistry of tantalum, columbium and their mineral associates.** XIV. A new method for the separation of small quantities of tantalum from columbium and from titanium. W. R. SCHOELLER. *Analyst* **54**, 320-6 (1929); cf. *C. A.* **23**, 55.—Tartaric acid hydrolysis on a small scale is a good pptn. reaction of the earth acids; a fraction of a mg. is recovered from a bulk of 2 cc. by boiling with 1 cc. of  $\text{HNO}_3$  and at the same time a good sepn. from  $\text{Ti}$  is obtained. A concn. of 0.1-1.0 mg. of  $\text{M}_2\text{O}_3$  should be chosen. This reaction is the final stage of the new procedure. When a soln. contg. oxalates of  $\text{Ti}$  and  $\text{NH}_4$  with a small quantity of oxalo-earth acids is treated with an excess of  $\text{Na}$  salicylate, the characteristic, orange color of the salicylic- $\text{Ti}$  complex is obtained. If, now, the oxalate ion is removed by addn. of  $\text{CaCl}_2$ , the bulky oxalate ppt. carries down the earth acids while the  $\text{Ti}$  complex remains unaffected. Since, however, this pptn. of rare earths is not quite quant., it is necessary to recover  $\text{Ti}$  from the filtrate and repeat the treatment. The oxalate ppts. can then be dissolved in  $\text{HCl}$ , the oxalate destroyed with  $\text{KMnO}_4$ , and the earth acids pptd. as tannin complexes. Then the ignited ppts. can be submitted to the tartaric acid hydrolysis described above. The entire procedure is as follows: Fuse 0.2-0.3 g. of the mixed oxides with 2 g. of  $\text{KHSO}_4$  in a silica crucible and treat the melt with 250 cc. of a hot soln. of 2 g.  $(\text{NH}_4)_2\text{C}_2\text{O}_4$ . To the boiling soln. add 5 g. of  $\text{Na}$  salicylate dissolved in hot water and 20%  $\text{CaCl}_2$  soln., in small portions, until all oxalate is pptd. Allow to settle 5 min. on the steam bath and make sure that the pptn. was complete. Filter while hot, using suction. Wash with hot 2%  $\text{Na}$  oxalate soln. until the washings are colorless. Dissolve the ppt. in 40-50 cc. of 6  $N$   $\text{HCl}$ , heat to boiling and add  $\text{KMnO}_4$  cautiously. When the oxalate is decompd. and the soln. is clear, dil. to 300-350 cc. with boiling water, add 1 g. of recently dissolved tannin, boil 10 min. and allow the resulting ppt. to settle on the steam bath. Filter, wash with 2%  $\text{NH}_4\text{Cl}$  soln. contg. a little tannin and ignite the ppt. ( $\text{TP}_1$ ) in a porcelain crucible. Evap. the previous salicylate filtrate to about 150 cc., add 40 g. of  $\text{NH}_4\text{Cl}$  (forming a copious yellow ppt.) and let stand overnight. This causes the nearly complete pptn. of  $\text{Ti}$  as yellow crystals. Filter and wash with satd.  $\text{NH}_4\text{Cl}$  soln. Boil the mother

liquid from this last ppt. with 5 g. of  $\text{NH}_4\text{OAc}$  and 0.5 g. tannin. Filter off the ppt. and wash with 2%  $\text{NH}_4\text{Cl}$ -tannin soln. Ignite and fuse with a little  $\text{KHSO}_4$ . Dissolve the melt in a hot soln. of 2 g.  $(\text{NH}_4)_2\text{C}_2\text{O}_4$  and rinse the liquid into the beaker contg. the yellow Ti crystals. On being heated they dissolve, leaving a white ppt. of  $\text{CaC}_2\text{O}_4$ , which should not be removed at this stage. Add 5 g. of Na salicylate, dil. to 250 cc. and ppt. the boiling soln. with  $\text{CaCl}_2$  as in the first part of this procedure, obtaining, as before, an ignited tannin ppt. ( $TP_2$ ). Fuse the  $TP_1$  ppt. with 0.25 g. of  $\text{KHSO}_4$  and carry out the tartaric acid hydrolysis as described above, but filtering before adding the  $\text{HNO}_3$  if there is any siliceous residue. Unite any siliceous residue after ignition, with  $TP_1$ . Treat with HF and  $\text{H}_2\text{SO}_4$ , fuse with a fragment of  $\text{K}_2\text{S}_2\text{O}_7$ , dissolve in about 1 cc. of tartaric acid soln. and add to the above soln. of  $TP_1$ . Boil with  $\text{HNO}_3$  as described above, filter, ignite and weigh. Fuse with  $\text{KHSO}_4$  and correct for any Ti present by the  $\text{H}_2\text{O}_2$  test. The errors in this procedure are consistently neg., a few mg. of rare earth oxide escaping detection. XV. A new method for the separation of tantalum and columbium from titanium and zirconium (1: qualitative). W. R. SCHOELLER. *Analyst* 54, 453-60(1929).—To sep. Ta and Cb from Ti and Zr, fuse 0.1-0.2 g. of the mixed oxides with 2-3 g. of  $\text{KHSO}_4$  in a silica crucible. Make the melt solidify in a thin layer around the sides of the crucible. To the contents add a part of a soln. of 1 g. tannin in 100 cc. of 1.8 N  $\text{H}_2\text{SO}_4$  and heat gently with a moving flame until the melt disintegrates into small detached fragments. By this treatment, the molecularly dispersed sulfates of K, Ti and Zr are able to diffuse through the meshes of the tannin colloid whereas the larger aggregates of  $\text{Ta}_2\text{O}_5$  and  $\text{Cb}_2\text{O}_5$  are entangled and coagulated by the colloid as soon as they are formed by disintegration of the melt. This prevents the Ti and Zr from forming complex compds. with the Ta and Cb. Transfer the contents of the crucible to a 400-cc. beaker and rinse the crucible with the rest of the 100 cc. of tannin soln. referred to above. Heat to boiling and allow to stand on a hot plate, or water bath, until the ppt. has coagulated (about 15 min.). To detect Ti and Zr, add 5 cc. of concd.  $\text{H}_2\text{SO}_4$  and evap. till the liquid darkens and foams. Then clarify by adding small portions of concd.  $\text{HNO}_3$ , finally evapg. to dense fumes, adding more  $\text{HNO}_3$  if necessary. Cool, add 50 cc. of cold water and test for Ti with  $\text{H}_2\text{O}_2$  and Zr with  $(\text{NH}_4)_2\text{HPO}_4$ . Wash the ppt. of earth acids and tannin with 2%  $\text{H}_2\text{SO}_4$  contg. a little tannin, ignite and fuse with  $\text{KHSO}_4$ . Dissolve the melt in a hot concd. soln. of tartaric acid. Dil. to 20 cc. for each 0.01 g. of oxide and treat while boiling with 0.2 of its vol. of concd.  $\text{HNO}_3$ ; a white flocculent ppt. is pos. proof of the identity of the earth acids. Fuse with  $\text{KHSO}_4$  again and identify Ta and Cb by the method of Powell and Schoeller (*C. A.* 20, 721). Three reagents are suitable for differentiating between Ta and Cb: (1) Tannin in oxalate soln. gives a yellow ppt. with Ta and a red ppt. with Cb. (2) Zn dust in  $\text{H}_3\text{PO}_4$  soln. gives no coloration with Ta and a dark coloration with Cb. (3) KF in HF soln. gives a cryst. ppt. with Ta and no ppt. with Cb. The results obtained in the quant. anal. of 13 artificial mixts. show that the above qual. sepn. can probably be adapted to quant. work. W. T. H.

The determination of tin by rapid electrolysis. J. ŠVÉDA AND R. UZEL. *Collection Czechoslov. Chem. Comm.* 1, 203-22(1929).—The rapid electrolytic detn. of Sn from neutral stannous oxalate solns. gives good results although the deposits are powdery. In acid oxalate solns. the results are likely to vary and in stannic solns. good results cannot be obtained either in acid or alk. solns. On the other hand, Sn of either valence can be deposited rapidly from an acid oxalate soln. in the presence of  $\text{NH}_4\text{OH}$ . Solns. of  $\text{NH}_4$  thiosalts gave fairly good results in the presence of  $\text{Na}_2\text{SO}_3$  and  $\text{NH}_4$  salts but solns. of Na thiosalt were not so good. Sn can be deposited from HCl soln. in the presence of  $\text{NH}_4\text{OH}$  as depolarizer. Over 100 electrolytic analyses were made in connection with the above conclusions, mostly in testing known procedures. W. T. H.

A rapid method for determining vanadium in unalloyed and in alloyed steels. KARL RIES. *Chem.-Ztg.* 53, 527(1929).—Dissolve 1-2 g. of metal in dil.  $\text{H}_2\text{SO}_4$ , adding 10 cc. of  $\text{H}_3\text{PO}_4$  if W is present. Oxidize with  $\text{HNO}_3$  and evap. to fumes. Cool, add water and reduce V with  $\text{FeSO}_4$ . Decomp. the excess of  $\text{FeSO}_4$  with a little  $(\text{NH}_4)_2\text{S}_2\text{O}_8$  and titrate the cold soln. with  $\text{KMnO}_4$  until an end point will last 1-2 min. If much Cr or W is present, correct for the color effect. W. T. H.

Detection of small quantities of vanadium. JULIUS MEYER. *Chem.-Ztg.* 53, 366(1929).—Fölsner (*C. A.* 23, 3185) was unable to get sensitive color tests for V with  $\text{H}_2\text{O}_2$  and this was undoubtedly because he did not use proper concns. of  $\text{H}_2\text{SO}_4$  and  $\text{H}_2\text{O}_2$ . To test for  $\text{H}_2\text{VO}_4$  it is best to make the soln. contain 15-20%  $\text{H}_2\text{SO}_4$ , wait a moment and then add 1 drop of 3%  $\text{H}_2\text{O}_2$ . W. T. H.

Determination of gases in metals and in particular the determination of oxygen in

**iron and steel by the hot extraction method.** HANS DIERGARTEN. *Arch. Eisenhüttenw.* 2, 813-28(1929).—This paper contains valuable information with respect to the detn. of gases in metals in graphite crucibles heated in a vacuum. To decrease the cost of app., several new furnaces were constructed to replace the expensive high-frequency furnace. The attempt was made to utilize crucibles of special oxidic materials but the results were not satisfactory. Improved methods were worked out for introducing pieces of metal in a vacuum. Expts. showed that CO is not absorbed appreciably in a high-frequency furnace, and not more than 5% in a C-spiral furnace. N<sub>2</sub> is recovered completely. The recovery of H<sub>2</sub> is perfect in the high-frequency furnace but only 50% is recovered in the C-spiral furnace. Fe or steel samples contg. 0.7% Mn gave too low O values because of CO absorption by the Mn volatilized but expts. to det. the seriousness of this error are not yet finished. Numerous results are given of O detns. in various materials showing the applicability of the hot extn. method.

W. T. H.

**Methods of determination of sulfur.** R. P. HUDSON. *Blast Furnace & Steel Plant* 17, 873-6(1929).—The well-known methods for detg. S in Fe and steel are explained in detail.

W. T. H.

**Rapid method for dissolving high-chromium steels for the determination of sulfur.** B. S. EVANS. *Analyst* 54, 286-7(1929).—In the detn. of S by the gravimetric, oxidation method, some difficulty is encountered in dissolving stainless steel samples. This can be overcome by using HCl alone in such a way that the escaping gases are passed into aqua regia so that all H<sub>2</sub>S is oxidized to H<sub>2</sub>SO<sub>4</sub>. A flask with ground-glass connection to a tapped funnel and to an exit tube is shown and directions are given in detail for dissolving the sample in HCl and finally causing the aqua regia to be drawn back into the flask by alternately heating and chilling the contents.

W. T. H.

**The assumed influence of copper on the determination of sulfur in iron and steel.** H. PINSL. *Die Giesserei* 16, 453-8(1929).—It has been stated that the presence of Cu in Fe metals causes low results in the usual evolution method for the detn. of S, probably with the idea that insol. CuS is present in the metal. The study of polished specimens shows, however, that CuS is present in the alloyed metal as CuS only when the Mn content is low and that, moreover, the CuS is then present in such small particles that it is decompd. by concd. HCl, which is used in German practice for the detn. of S by the evolution method. Comparative tests by 3 different methods show that the evolution method, using 12 N HCl, gives correct results when any likely quantity of Cu is present in the various kinds of Fe and steel, provided the sample is not heated too quickly so that too much HCl is distd. off before the samples are sufficiently attacked. With respect to whether the Cu is appreciably dissolved by the treatment with concd. HCl in the evolution method, expts. show that all the Cu in steel, with even 0.88% of Cu, dissolves in concd. HCl but with cast Fe, a small part of S remains in the residue. This should be taken into consideration if the Cu is to be detd. after the evolution S detn. The soln. should be treated with H<sub>2</sub>S without filtering off the residue and the resulting ppt. and residue should be treated with HNO<sub>3</sub> to dissolve the CuS and a second pptn. made with H<sub>2</sub>S before the Cu is finally detd. as CuO.

W. T. H.

**The significance of the inner-complex salts in the analytical chemistry of metals.** O. SCHMITZ-DUMONT. *Metallwirtschaft* 7, 281-5(1929).—An interesting theoretical discussion, based on the valence theory of Werner, of important analytical reactions with org. substances such as diacetyldioxime, o-hydroxyquinoline, pyridine, alizarin, glyocoll, tetrahydroxyanthraquinone, α-nitroso-β-naphthol, dicyandiamidine, isonitrosophenylhydroxylamine, furildioxime, cyclohexanedioxime, etc.

W. T. H.

**Reactions of the metals of the hydrogen sulfide group.** ALEXANDRE SERGUEEFF. *Ann. chim. anal. chim. appl.* 11, 161-5(1929).—It is recommended to place some metal filings in a sachet of cigaret paper for carrying out sensitive displacement tests. To detect Cd.—Use Zn filings in the sachet and have the soln. nearly neutral, using some KCN if Cu is present. If a thin deposit of Cd is obtained, place the sachet and the deposit in a soln. of SnCl<sub>2</sub>; the immediate pptn. of Sn proves the deposit to be Cd. Tin solns. give characteristic crystals when treated with Ag. Zn ppts. Sn easily but in an acid soln. the H<sub>2</sub> is likely to cause the ppt. to fall off so that Cd is a better test. In the presence of Sb, the nature of the metallic deposit is changed. Pb solns. give good deposits with Zn or Cd. This, and the fact that a concd. soln. of Sn in KOH serves to ppt. only Pb, Bi and Sb will often help to identify Pb. Zn gives a dark deposit with Cu solns. except in the presence of KCN. Bi(NO<sub>3</sub>)<sub>3</sub> solns. do not give a ppt. with Cu but a soln. of KBiI<sub>4</sub> gives a ppt. of Bi with Cu and this serves to distinguish Bi from all other metals except As, Sb and Sn. A sensitive test for Bi is described in which crystals of Sn on 10 mg. of Cd are first obtained; the excess SnCl<sub>2</sub> soln. is

removed so as to expose the crystals above the residual liquid in a small test tube, and then the Bi soln. is added: the Sn crystals become darkened. Sb behaves like Bi with Zn, Sn, etc. To detect Ag, add to the  $\text{HNO}_3$  soln. an excess of  $\text{NH}_4\text{OH}$ , heat and filter. Heat with Sb or Bi. All these tests and other replacement reactions are described in detail.

**Analysis of aluminum alloys.** HENRY GIBB. *Ind. Chemist* 5, 286-8(1929).—Methods are given in detail for the detn. of Si, Cu, Sn, Zn, Mn, Cr, Pb, Fe, Ca, Mg and Ni. The methods are well chosen and are suitable for use in a lab. attached to a small foundry.

**Determination of oxidic inclusions in iron and steel by the analysis of the residue left after heating the metal in chlorine.** ROLAND WASMUHT AND PAUL OBERHOFFER. *Arch. Eisenhüttenw.* 2, 829-42(1929).—The effect of heating various oxides in pure  $\text{Cl}_2$  at various temps. was studied with the oxides alone and with other substances present. To get an idea of the amt. of  $\text{FeO}$  in a sample of Fe alloy it is recommended to heat at  $350^\circ$  and then det. the quantity of trivalent Fe in the residue, assuming, as the results of the expt. indicate, that all of the  $\text{FeO}$  has been oxidized but no O lost. In the presence of phosphide and sulfide, however, there is a very noticeable loss of O. Oxide of Mn behaves similarly: there is an oxidation but little if any loss of O in the absence of P and S.  $\text{Al}_2\text{O}_3$  and  $\text{SiO}_2$ , on the other hand, are obtained best by heating the sample in dry  $\text{Cl}_2$  at  $500$ – $600^\circ$ . The C present serves to make the reactions with  $\text{Cl}_2$  take place more readily. The app. used is described in detail and considerable painstaking work is discussed.

**Application of thermomagnetic analysis to the study of the oxides and minerals of iron.** J. HUGGETT. *Ann. chim.* [10], 11, 447-510(1929); cf. C. A. 22, 1934.—Anomalies were found in the systems  $\text{Fe}_2\text{O}_3$ - $\text{Fe}_3\text{O}_4$ ,  $\text{Fe}_3\text{O}_4$ - $\text{FeO}$  and  $\text{FeO}$ -Fe. Malaguti's oxide (I), the magnetic oxide obtained by calcining the ferruginous deposits left by mineral waters, liberates heat on conversion to the ordinary form of  $\text{Fe}_2\text{O}_3$ . The transition occurs at  $300$ – $800^\circ$  depending on the stability of (I) which in turn varies inversely as the purity of the material from which it was obtained. Goethite ( $\text{FeO} \cdot \text{H}_2\text{O}$ ) and its variety lepidocrocite on dehydration gives (I). (I) is also an essential constituent of rust.

**The determination of total and available lime.** N. SHILKIN. *Chem. Eng. Mining Rev.* 21, 354-5(1929).—Some work carried out with well-known methods is outlined very briefly.

**Determination of the purity of "yellow potash" and "yellow soda" by titration with zinc sulfate solution.** FARB-SALZ GESELLSCHAFT M. B. H. *Chem.-Ztg.* 53, 390(1929).—The terms "yellow potash" and "yellow soda" refer to the alkali salts of ferrocyanic acid which are best analyzed by titration with  $\text{ZnSO}_4$  soln. The procedure recommended is the following: Dissolve 28.76 g. of  $\text{ZnSO}_4$  in water and dil. to 1 l. Dissolve 10 g. of pure  $\text{K}_4\text{Fe}(\text{CN})_6$  in water and dil. to exactly 500 cc. Take 50 cc. of the latter soln., add 100 cc. of water and 10 cc. of 0.1 N  $\text{H}_2\text{SO}_4$  and titrate with the Zn soln. at  $20^\circ$  until a drop of the soln. placed on filter paper, and then after 30 seconds allowed to come in contact with a spreading drop of 15% ferric alum soln. in the paper, will show no Prussian blue color. In carrying out this test, give time for the soln. to spread out and not let the ferric alum soln. come in contact with the  $\text{K}_4\text{Zn}[\text{Fe}(\text{CN})_6]$  ppt. Titrate a soln. of the sample in the same way. To det. water in ferrocyanides dry in an oven at  $125^\circ$  to const. wt.

**The analysis of fluorspar.** G. E. F. LUNDELL AND J. I. HOFFMAN. *Bur. Standards J. Research* 2, 671-83(1929).—The procedures found best for the detn. of  $\text{CO}_2$ ,  $\text{SiO}_2$ ,  $\text{CaF}_2$ , S, Ba, Pb and Zn are described. Det.  $\text{CO}_2$  by treating with acid and absorbing the dried, escaping gas in ascarite or heat the sample in a combustion tube if it is known that no org. matter is present. To det.  $\text{SiO}_2$ , treat 1 g. of sample with 3 cc. of a mixt. of 20 cc.  $\text{Br}_2$  and 80 cc.  $\text{AcOH}$ . Digest 10 min. on the steam bath, add 10 cc. of water and 10 cc. of satd. 20%  $\text{KBr}$  soln. (which has been satd. with  $\text{Br}_2$ ) and digest 40 min. Finally add 5 ml. of 50%  $\text{NH}_4\text{OAc}$  and digest 10 min. Add paper pulp, filter and wash with hot water. Dry, ignite, weigh and det. the loss in wt. by treatment with HF and  $\text{H}_2\text{SO}_4$ . To det.  $\text{CaF}_2$ , digest 0.5 g. of sample with 15 cc. of 10%  $\text{AcOH}$  in a Pt crucible on the steam bath for 30 min. Filter and wash thoroughly with hot water. Dry and ignite the residue at a dull red heat. Treat with HF and either  $\text{H}_2\text{SO}_4$  or  $\text{HClO}_4$  to remove  $\text{SiO}_2$ . Dissolve the residue in 150 cc. of 0.6 N  $\text{HCl}$  and, if there is any residue of  $\text{BaSO}_4$ ,  $\text{PbSO}_4$  or undecompd.  $\text{CaF}_2$ , filter it off and weigh it. Pass  $\text{H}_2\text{S}$  into the clear filtrate, add  $\text{NH}_4\text{OH}$ , filter and wash with a soln. contg. 5 cc. of  $\text{NH}_4\text{OH}$  and 10 g.  $\text{NH}_4\text{Cl}$  per l. and satd. with  $\text{H}_2\text{S}$ . Filter, remove  $\text{H}_2\text{S}$  by making acid, boiling, and adding  $\text{KBr}$ - $\text{Br}$  soln. and ppt. the Ca as  $\text{CaC}_2\text{O}_4$ , weighing as  $\text{CaO}$  or titrating with

**KMnO<sub>4</sub>.** Almost equally good results can be obtained by removing the SiO<sub>2</sub> with HF and HClO<sub>4</sub>, repeating the evapn., heating the residue with a little HCl, adding 3-5 ml. of HClO<sub>4</sub> and again evapg. to dryness. Filter if necessary, make alk. to methyl red by adding NH<sub>4</sub>OH, add oxalic acid to acid reaction, with 10 ml. of 10% oxalic acid in excess and 50 cc. of 4% (NH<sub>4</sub>)<sub>2</sub>C<sub>2</sub>O<sub>4</sub> soln., finally titrating the CaC<sub>2</sub>O<sub>4</sub> ppt. with KMnO<sub>4</sub>. *To det. S*, fuse 1 g. of sample with 10 g. K<sub>2</sub>CO<sub>3</sub> and 0.5 g. KNO<sub>3</sub> in an elec. muffle or over an alc. or petroleum ether flame. Continue as in the Fresenius method for detg. S in pyrite. *To det. Ba*, remove SiO<sub>2</sub> by treatment with HF, HNO<sub>3</sub> and HClO<sub>4</sub>, evapg. to dryness, adding more HClO<sub>4</sub> and repeating the evapn. If an insol. residue remains, filter, wash with warm water, ignite at as low a temp. as possible, and treat with HF and H<sub>2</sub>SO<sub>4</sub>. Evap. to dryness and fuse the residue with Na<sub>2</sub>CO<sub>3</sub>. Leach out all Na salts with hot water, dissolve the insol. residue in HCl and ppt. BaSO<sub>4</sub> in the usual manner. Test the ppt. for PbSO<sub>4</sub> by treating with NH<sub>4</sub>OAc soln., adding a drop of HCl and H<sub>2</sub>S until satd. Ignite and weigh as PbSO<sub>4</sub>, allowing for this wt. in both the Ba and Pb detns. *To det. Pb*, pass H<sub>2</sub>S into the filtrate from the BaSO<sub>4</sub> pptn., add NH<sub>4</sub>Cl-(NH<sub>4</sub>)<sub>2</sub>S soln., filter and discard the filtrate. Dissolve the sulfide ppt. in hot, dil. HNO<sub>3</sub> and det. the Pb as PbSO<sub>4</sub> in the usual way. *To det. Zn*, boil the filtrate from the above pptn. of PbS, make 0.01 N in H<sub>2</sub>SO<sub>4</sub> and sat. with H<sub>2</sub>S. Filter, ignite and weigh as ZnO. (If Fe or Al is present it is necessary to remove them first.)

W. T. H.

**Iodometry of a mixture of sulfide, sulfite and thiosulfate.** ROBERT WOLLAK *Z. anal. Chem.* 77, 401-6(1929).—An improved procedure is: To a part of the soln. add an excess of 0.1 N I<sub>2</sub> soln. and titrate the excess with Na<sub>2</sub>S<sub>2</sub>O<sub>4</sub>. The I<sub>2</sub> consumption corresponds to the sum of the S in the 3 states. To another portion add 15 cc. of 10% Zn(OAc)<sub>2</sub> soln. and dil. with water to about 150 cc. Then, without filtering, add 5 cc. of 35-40% HCHO soln. and make acid with 20 cc. of 10% AcOH. Add an excess of standard I<sub>2</sub> soln. and titrate the excess with Na<sub>2</sub>S<sub>2</sub>O<sub>4</sub>. The I<sub>2</sub> consumption now corresponds to the sulfide and thiosulfate. Take a third part of the original soln. and add it slowly to a dil. soln. of I<sub>2</sub> and H<sub>2</sub>SO<sub>4</sub> and titrate the excess with approx. 0.1 N sulfite soln., using starch as indicator. Then make alk. to methyl red by adding 0.1 N NH<sub>4</sub>OH, add 7 cc. of 10% KCN and allow the mixt. to stand 10-15 min. Add 25-50 cc. of 9 N H<sub>2</sub>SO<sub>4</sub> and titrate with I<sub>2</sub> to the first permanent blue color. The I<sub>2</sub> consumption in this last titration corresponds to 0.5 of the original thiosulfate content. Under the above conditions, the following reaction takes place:  $3\text{KCN} + \text{Na}_2\text{S}_2\text{O}_3 + \text{H}_2\text{O} \rightarrow \text{Na}_2\text{S}_2\text{O}_3 + \text{K}_2\text{SO}_4 + \text{KCNS} + 2\text{HCN}$ .

W. T. H.

**Detection and determination of carbon disulfide in the air.** E. SELIVOUNOFF. *Ann. chim. anal. chim. appl.* 11, 133-5(1929).—To det. less than 0.01 mg. per l. of CS<sub>2</sub> in air the following method has been used: Pass the gas at 10 l. per hr. through 2 bottles of 10% aq. KOH or NaOH, one with 2.5% H<sub>2</sub>SO<sub>4</sub> and then through 2 bottles contg. 5% KOH in alc. The first 2 wash bottles serve to remove H<sub>2</sub>S, SO<sub>2</sub>, CO<sub>2</sub> and HCN, the H<sub>2</sub>SO<sub>4</sub> removes NH<sub>3</sub> and other bases, but the CS<sub>2</sub> is absorbed by the KOH in alc. to form K xanthate. Evap. the soln. at 80° to half its vol., neutralize exactly to phenolphthalein with dil. AcOH, treat with 0.5-1 cc. 0.5 1% soln. of guaiac resin in alc. and titrate with 0.002 N CuSO<sub>4</sub> soln.; 1 cc. of the reagent = 0.011 mg. of CS<sub>2</sub>. One mol. CS<sub>2</sub> = 1 mol. CuSO<sub>4</sub> in the presence of the resin.

W. T. H.

**Some analytical applications of sodium hyposulfite.** (Antimony, bismuth, lead, cadmium.) B. S. EVANS. *Analyst* 54, 395-405(1929).—*To det. Sb in Cu alloys rich in Sb*.—Proceed as follows: Dissolve 1 g. of alloy in 15 cc. HCl, 5 cc. HNO<sub>3</sub>, 20 cc. of water and 20 cc. of 50% citric acid soln. and make the resulting soln. slightly ammoniacal. To a satd. soln. of KCN, add aq. Br until a drop removed gives no violet color with Na<sub>2</sub>FeNO(CN)<sub>5</sub> and add the resulting soln. to the ammoniacal soln. of the alloy, until the blue color is discharged and 20 cc. in excess. Heat to the b. p. Add 50 cc. of 20% NH<sub>4</sub>Cl and 7 g. of Na<sub>2</sub>S<sub>2</sub>O<sub>4</sub>. Heat just to the b. p. and allow to stand on the steam bath 1 hr. to ppt. all Sb, add 2 g. more of Na<sub>2</sub>S<sub>2</sub>O<sub>4</sub> and cool under running water. Filter with paper pulp and wash with a cold soln. of 4 g. NH<sub>4</sub>Cl and 2 g. Na<sub>2</sub>S<sub>2</sub>O<sub>4</sub> in 400 cc. of water. Dissolve the Sb in 6 N HCl and Br and filter off the paper pulp, washing with 6 N HCl. Det. the Sb by the KBrO<sub>3</sub> method of Gyory (*Z. anal. Chem.* 32, 415(1893)). *To det. small quantities of Bi in Sn-Zn alloys*.—Dissolve 5 g. of alloy in 50 cc. of 7 N HCl, adding 5 cc. of HNO<sub>3</sub> after the first violent action is over. Then add 15 g. of tartaric acid and 5 cc. of 0.1 N arsenite soln. (to get a filterable ppt.). Make the soln. alk. with NH<sub>4</sub>OH, add 5 g. of NH<sub>4</sub>Cl and 40 cc. of satd. KCN soln. which has been treated with Br to remove sulfide. Next add 7 g. of Na<sub>2</sub>S<sub>2</sub>O<sub>4</sub> and treat as above to ppt. the Sb. Reheating of the filtrate will in this case always produce further pptn. which will, however, be As in this case. Filter and wash the Bi ppt. as prescribed

for Sb. Dissolve the Bi in Br-HCl, dil., fume with  $\text{H}_2\text{SO}_4$ , clear with  $\text{HNO}_3$ , fume again and det. the Bi colorimetrically by the iodide method. *To det. small quantities of Sb in Pb alloys.*—Dissolve 20 g. of metal in 100 cc. of 6 N  $\text{HNO}_3$  and 5-g. tartaric acid. Dissolve the  $\text{Pb}(\text{NO}_3)_2$  that crystallizes out in hot water, add 80 cc. of 9 N  $\text{H}_2\text{SO}_4$ , filter off the  $\text{PbSO}_4$  ppt. and wash with 2%  $\text{H}_2\text{SO}_4$ . Make the filtrate ammoniacal and continue as in the detn. of Sb in Cu alloys. *To sep. Cd from Bi and Pb.*—Dissolve the sample in  $\text{HNO}_3$  and remove the greater part of Pb as  $\text{PbSO}_4$  as just described, add 10 cc. of 50% citric acid, make alk. with  $\text{NH}_4\text{OH}$ , add about 1 g. of KCN in a soln. freed from sulfide and 7 g. of  $\text{Na}_2\text{S}_2\text{O}_4$ . Heat on the steam bath to  $60^\circ$ , remove and let stand 15–30 min. and then filter to ppt. Sb and Bi. Sat. the filtrate with  $\text{H}_2\text{S}$  and weigh the ppt. as  $\text{CdSO}_4$  after treatment with  $\text{H}_2\text{SO}_4$  and  $\text{HNO}_3$ . *To sep. Cd from Sb.*—The above treatment serves to ppt. enough Sb provided sufficient Bi and Pb are present, so that the residual Sb will not ppt. with  $\text{CdS}$ . *For the detn. of Cd in Pb-base alloys.*—It is well to avoid the  $\text{PbSO}_4$  pptn. Excellent results were obtained by a procedure like that given above using the following quantities of reagents: 5 g. alloy, 50 cc. of 50% citric acid, 50 cc. 6 N  $\text{HNO}_3$ ,  $\text{NH}_4\text{OH}$  till neutral and then 20 cc. of 7.5 N  $\text{NH}_4\text{OH}$ , 10 cc. of satd. KCN soln., 10 g.  $\text{Na}_2\text{S}_2\text{O}_4$ , heating at  $60^\circ$ , 10 cc. of 7.5 N  $\text{NH}_4\text{OH}$  satd. with  $\text{H}_2\text{S}$ . W T H.

A dilution method for the colorimetric determination of  $p_{\text{H}}$  in colored solutions. F. C. THOMPSON AND W. R. ATKIN. *J. Intern. Soc. Leather Trades' Chem* 13, 297, 9 (1929).—Prep. a series of dilns. proceeding in powers of 2. Det.  $p_{\text{H}}$  value of all dilns. that are not too highly colored, using the usual colorimetric method with comparator. Plot the  $p_{\text{H}}$  values found against log to any base of the diln. The points lie on a straight line. Extrapolate to zero diln. The correctness of this method is demonstrated theoretically and by data obtained with dild. tan liquors, for which the  $p_{\text{H}}$  values obtained by extrapolation checked those obtained electrometrically within about 0.05  $p_{\text{H}}$  unit. H. B. MERRILL.

A sensitive reaction of cuprous ion. OTOZO FUNAKOSHI. *Mem. Coll. Sci. Kyoto Imp. Univ. A* 12, 155–7 (1929).—Feigl has shown that *p*-dimethylaminobenzylidene rhodanine is a sensitive precipitant for Ag, giving a reddish violet ppt. with 1 part Ag in 5 million of water. If, instead of the acetone soln. used by F., a 0.03% soln. in alc. is used as reagent, the rhodanine compd. will give a reddish violet ppt. with  $\text{Cu}^+$  at about the same diln. in neutral or slightly acid solns. Colors are obtained with concd. solns. of  $\text{Cu}^{++}$  but the products are much more sol. in water. W T H.

A rapid method of qualitative analysis. 1. Some specific and special tests for common cations and anions. GREGOIRE GUTZEIT. *Helv. Chim. Acta* 12, 713, 40 (1929).—Characteristic tests are given for: *Silver* with  $\text{K}_2\text{CrO}_4$ ,  $\text{Na}_2\text{HAsO}_4$ ,  $\text{NH}_4$  dithiocarbamate and dihydroxynaphthalene disulfonic acid (chromotropic acid). *Lead*— $\text{NH}_4\text{SAC}$ , tetramethyl-*p*-diamino-*p*-diphenylmethane, benzidine, diphenylthiocarbazon and  $\text{SnCl}_2$  with KI. *Mercury*—diphenylcarbazine, tincture of nutgalls,  $\text{SnCl}_2$  and aniline, Zn purpurate,  $\text{K}_2\text{Co}(\text{CNS})_4$  and Cu-Zn. *Bismuth*—cinchonine nitrate and KI, quinine sulfate, dil.  $\text{H}_2\text{SO}_4$  and KI, pyrogallol,  $\text{Na}_2\text{SnO}_2$ ,  $\text{NH}_4$  tetracetvl. *Copper*—Denigès' HBr reagent, formaldoxime, *n*-aminocaproic acid, benzidine-HCl, benzidine acetate, tincture of guaiac and KCN, 1,2-diaminoanthraquinone-3 sulfonic acid, xanthogen amide, NaOH, amyl alc. and  $\text{CS}_2$ , benzoine oxime in alc. soln. in the presence of tartaric acid, pyrimidine thiocyanate. *Cadmium*—thiosinamine and NaOH, bromobrucine reagent, pyridine iodide, diphenylcarbazidethiocyanate, diphenylthiocarbazon. *Arsenic*— $\text{AgNO}_3$ , 8-hydroxyquinoline,  $\text{NH}_4\text{VO}_3$  followed by strychnine sulfate, diazobenzene chloride in acid soln. *Antimony*— $\text{Na}_2\text{S}_2\text{O}_3$ , phosphomolybdic acid, pyrogallol, pyrocatechol, tetraethylrhodamine, indene and anthracene. *Tin*—cacotheline, sulfomolybdic acid,  $\text{AuCl}_3$ . *Iron*— $\text{K}_4\text{Fe}(\text{CN})_6$ , KCNS, tannin, tincture of nutgalls, pyrocatecholic acid, 2,4-dinitroresorcinol, alloxanic reagent, chromotropic acid, 1,2,5-thiosalicilic acid. *Chromium*—chromic salts are oxidized by  $\text{NaBrO}$ ,  $\text{KMnO}_4$  and  $\text{Na}_2\text{CO}_3$ ,  $\text{KClO}_3$ ,  $\text{H}_2\text{O}_2$  in alk. soln., perborates in alk. soln. Chromates give characteristic reactions with yellow alizarin acid G, diphenylcarbazine, orcein,  $\alpha$ -naphthylamine, dinitrate of 1,8-dihydroxynaphthalene-3,6-disulfonic acid, chrome-red-acidol, alizarine VI B. A. S. F. Bayer. *Manganese*— $\text{NaBrO}$ ,  $\text{KIO}_4$ , tetramethyldiaminodiphenylmethane, benzidine acetate, tetralline. *Nickel*—diacetyl-di-oxime, 1,2-diaminoanthraquinone-3-sulfonic acid, dicyandiamidine sulfate, ovalene, diuraminoxime, benzildioxime. *Cobalt*— $\alpha$ -nitroso- $\beta$ -naphthol,  $\beta$ -nitroso- $\alpha$ -naphthol, nitroso- $\beta$ -naphthol-3,6-disulfonate of Na, diaminoanthraquinonesulfonic acid, naphtheneic acid, resorcinol, KCNS,  $\text{Na}_2\text{S}_2\text{O}_4$ , phenylthiohydantoic acid, pyrimidone thio-cyanate in concd. HCl. *Zinc*—pyridine bisulfite, urobilin,  $\text{KHg}(\text{SCN})_3$ , K pyridine iodide, antipyrine thiocyanate, pyrimidone thiocyanate. *Aluminum*—alizarin, tinc-



ture of orcanette, aurine tricarboxylic acid. *Barium*—Na rhodizonate, triquinol, tetrahydroxyquinone, lokaonic acid. *Strontium*—Na rhodizonate, tetrahydroxyquinone. *Calcium*—aniline, phenol and  $\text{NH}_4\text{OH}$ , thiodiphenylcarbazide. *Magnesium*— $\text{NaIO}$ , 1,2,5,8-tetrahydroxyanthraquinone, dihydrothio-*p*-toluidinesulfonic acid, diphenyl carbazide. *Potassium*— $\text{K}_2\text{PtCl}_6$ , Na Bi thiosulfate, lokaonic acid. *Sodium*—dihydroxytartaric acid, K Bi Cs nitrite,  $\text{Mg UO}_2$  acetate. *Ammonium*— $\text{HCHO}$ , hematoxylin, *p*-nitrodiazobenzene, Nessler's reagent. Besides the foregoing tests for cations, the behavior of tincture of campeche, antipyrine thiocyanate, pyrimidone thiocyanate, thiodiphenylcarbazide, diphenylthiocarbazon, diphenylcarbazide,  $\text{NH}_4$  dithiocarbamate, quinalizarin in alk. soln. are described with the various cations. The following tests for the following anions are described. *Fluorine*—pernambuco paper, methemoglobin. *Chlorine*—phenolaniline, aniline, toluidine and  $\text{AcOH}$ , urotropine acetate, diphenylamine sulfate, tetramethyl-*p*-diaminodiphenylamine,  $\text{Cu}(\text{NO}_3)_2$  paper,  $\text{CuSO}_4$ . *Bromine*—acetate of fluorescein, reduced fuchsin,  $\text{CuSO}_4$ . *Iodine*—starch paste,  $\text{PdCl}_2$ ,  $\text{TiNO}_3$ . *Hydrogen sulfide*—tartar emetic paper,  $\text{Na}_2\text{NOFe}(\text{CN})_5$ , dimethyl-*p*-phenylenediamine sulfate, nitrobenzene. *Thiosulfate*— $\text{SbCl}_5$ ,  $\text{FeCl}_3$  paper.  $\text{H}_2\text{SO}_4$ —aniline- $\text{Cd}(\text{NO}_3)_2$  reagent,  $\text{ZnNOFe}(\text{CN})_5$ , oxazine dyes.  $\text{H}_2\text{SO}_4$ —Ba rhodizonate,  $\text{Hg}(\text{NO}_3)_2$  in 1%  $\text{HNO}_3$ .  $\text{HNO}_2$ —metaphenylene diamine, antipyrine,  $\text{ZnCl}_2$  starch and  $\text{ZnI}_2$  sulfanilic-naphthylamine, diamino-2,4-hydroxy-6-pyrimidine hydrochloride, benzidine- $\beta$ -naphthol, safranin T.  $\text{HNO}_3$ —salts of cinchonamine, quinetol, acetate of diphenylendanioldihydrotriazole, nitron and  $\text{HCH}_2\text{O}$ , dimonohydroxyphenanthrylamine, brucine, 1,5-dihydroxyanthraquinone,  $\alpha$ -dinaphthodimethylamine.  $\text{H}_3\text{PO}_4$ —stannous thiomolybdate,  $\text{UO}_2(\text{OAc})_2$ , benzidine molybdate.  $\text{H}_3\text{BO}_3$ —turmeric paper, turmeric-oxalic acid paper.  $\text{H}_2\text{SiO}_4$ —stannous molybdate, alanine tincture,  $\text{NH}_4$  salt of aurintricarboxylic acid,  $\text{NH}_4$  molybdate- $\text{KNO}_3$ . *HCN*—Na pierate paper, guaiacol- $\text{CuSO}_4$ , hydroceruligone. *Complex cyanides*— $\text{FeCl}_3$ ,  $\text{MoO}_3$ ,  $\text{FeSO}_4$ . *Oxalic and tartaric acids*—resorcinol,  $\text{NH}_4\text{VO}_3$ . W. T. H.

**Simple methods of potentiometric titration of acids and bases.** LOUIS KAHLLENBERG AND ALBERT C. KRUEGER. *Trans. Am. Electrochem. Soc.* 56 (preprint) 10 pp. (1929).—Expts. in potentiometric titrations are recorded, demonstrating that the calomel electrode may be dispensed with. The potential between 2 suitable electrodes, dipped into a dil. acid soln., was measured by means of a potentiometer as the titration proceeded. By simple trial a pair of electrodes, which was most suitable for the purpose in hand, was selected. When tungsten was used as one of the electrodes a large no. of other metals served very well as the other electrode. Equil. is reached most rapidly with the couples W-Cu; W-Ni; W-Si; and W-Co. With these, and a no. of other couples, an actual change in polarity was observed at the neutral point. C. G. F.

**New test for boric acid and borates.** A. SCOTT DODD. *Analyst* 54, 282-5 (1929).—The test with methyl red or Sofnol Indicator No. 1 and mannitol is very satisfactory.  $\text{NaOH}$  is added until the soln. is barely alk. to the above indicator and 0.5 g. of mannitol is added. On shaking a reddish pink coloration is obtained. W. T. H.

**Quantitative analysis of phosphoric acid. IV. Gravimetric and volumetric determination as ammonium phosphomolybdate.** MASAYOSHI ISHIBASHI. *Mem. Coll. Sci. Kyoto Imp. Univ.* A 12, 135-53 (1929).—The conclusions drawn are based on some 150 expts. of which the results are given. The solns. used in these expts. were: 0.1% soln. of pure  $(\text{NH}_4)_2\text{HPO}_4$ , 3.5% soln. of pure  $(\text{NH}_4)_6\text{Mo}_7\text{O}_{21}\cdot 4\text{H}_2\text{O}$ , 5 *N*  $\text{NH}_4\text{NO}_3$ , 5 *N*  $\text{HNO}_3$  and 0.4 *N*  $\text{HNO}_3$ . The best gravimetric results were obtained as follows: To a neutral soln. of 6-70 mg.  $\text{P}_2\text{O}_5$  add about twice the theoretical requirement of  $(\text{NH}_4)_6\text{Mo}_7\text{O}_{21}$  soln., making the total vol. about 60 cc. Add 20 cc. of 5 *N*  $\text{NH}_4\text{NO}_3$  and 20 cc. of 5 *N*  $\text{HNO}_3$ . Heat for 5 min. at 50-60° in a water bath with occasional stirring. Filter through a quartz filtering crucible and wash promptly with 0.4 *N*  $\text{HNO}_3$  until the washings give no test for Mo. Place the filtering crucible on glass wool in a larger porcelain crucible, heat gradually for 10 min. and then at 250-300° to const. wt. Cool in a desiccator over  $\text{P}_2\text{O}_5$  or  $\text{CaCl}_2$ . 0.5  $\text{H}_2\text{O}$  and weigh quickly. The ppt. contains 3.78%  $\text{P}_2\text{O}_5$  and corresponds to the formula  $(\text{NH}_4)_3\text{Mo}_{12}\text{PO}_4$ . In this form it is very hygroscopic. If the ppt. is washed with  $\text{HNO}_3$  as above and dried over  $\text{CaCl}_2$  2 $\text{H}_2\text{O}$  it contains 3.60% of  $\text{P}_2\text{O}_5$  and has the compn.  $(\text{NH}_4)_3\text{Mo}_{12}\text{PO}_4\cdot\text{HNO}_3\cdot 2\text{H}_2\text{O}$ . The alkalimetric titration method, after washing with 1%  $\text{KNO}_3$  instead of 0.4 *N*  $\text{HNO}_3$ , gave results which agreed with those obtained gravimetrically. W. T. H.

**The determination of sulfate in chromic acid and in chromium plating baths.** H. H. WILLARD AND RICHARD SCHNEIDEWIND. *Trans. Am. Electrochem. Soc.* 56 (preprint) 13 pp. (1929).—To make an accurate sulfate detn in chromic acid, the latter must be reduced to a chromic salt. In this soln. the Cr is present as a complex ion,

contg. some sulfate which is not pptd. by Ba except on standing for a long time, and sometimes not at all. By heating with AcOH a more stable complex is formed, contg. acetate, and the sulfate being now in the ionic form is rapidly pptd. As a rapid control method for plating baths, a measurement of the turbidity produced by the  $\text{BaSO}_4$  is satisfactory. Instead of measuring the depth of liquid required to extinguish the light, as in the Parr Sulfur Photometer, it has been found more accurate to maintain a fixed depth of liquid and vary the strength of the light, measuring the voltage across its terminals or the resistance in series with it. C. G. F.

A turbidimetric method for the determination of the sulfate content of chromium plating baths. LAWRENCE E. STOUT AND A. W. PETCHAFT. *Trans. Am. Electrochem. Soc.* 56 (preprint) 10 pp.(1929).—A new and rapid method for the detn. of sulfates in Cr plating baths is presented. The Parr Sulfur Photometer can be used if  $\text{SrCl}_2$  be substituted for  $\text{BaCl}_2$ , and if the funnel of the instrument be made of glass throughout, so that no rubber comes in contact with the solns. of  $\text{CrO}_3$ . The accuracy of the method described is at least comparable to any heretofore used, and is much more rapid and convenient, requiring neither chem. balance nor complicated gravimetric procedure. C. G. F.

The analysis of organic mixtures. ERWIN BENESCH. *Chem.-Ztg.* 53, 566 7 (1929).—If the nature of the substances present is known and it is only necessary to det. the quantities present, all that is necessary is to make as many analyses as there are substances present, or one less analysis if the weight of the original material is known. Thus with a mixt. of 2 org. substances, the amt. of each can be calcd. from the wts of  $\text{H}_2\text{O}$  and of  $\text{CO}_2$  obtained by combustion and if 3 substances are present in the mixt. the original wt., the  $\text{CO}_2$  and  $\text{H}_2\text{O}$  values are sufficient. The simple algebraic computation is outlined. W. T. H.

Note on the destruction of organic matter for the analysis of the constituents of the ash. EMILE CHERBULIEZ. *Helv. Chim. Acta* 12, 818-9(1929).—It is recommended to heat with  $\text{H}_2\text{SO}_4$ ,  $\text{HClO}_4$  and finally some fuming  $\text{HNO}_3$ . W. T. H.

Iodine determination in organic compounds which readily split off iodine. E. I. VAN ITALLIE. *Pharm. Weekblad* 66, 629-32(1929).—Antiseptics and pharmaceuticals which contain I, like  $\text{CHI}_3$ , iodoic, yatren, euphoren, aristol, etc., are readily decomposed by mineral acids with liberation of  $\text{I}_2$ . The  $\text{I}_2$  may be distd. from the sample (10-200 mg.) with 8-10 cc.  $\text{H}_2\text{SO}_4$  in a retort, the neck of which dips into a soln. of NaOH. The NaOH is then dild. to 100 cc., a 25-cc. aliquot acidified with dil.  $\text{H}_2\text{SO}_4$ , boiled with NaOCl, cooled, treated with KI and the liberated  $\text{I}_2$  titrated with 0.1 N  $\text{Na}_2\text{S}_2\text{O}_3$ . Or, the  $\text{I}_2$  in the distillate may be detd. gravimetrically as AgI. The method gave satisfactory values with a no. of I-contg. compds. A. W. DOX.

A specific color test for isobutyl alcohol. ARTUR KUTZLNIGG. *Z. anal. Chem.* 77, 349-52(1929).—To a 1% soln. of  $\text{Na}_3\text{Fe}(\text{CN})_6$  add the liquid to be tested and heat to boiling. If isobutyl alc. is present the aq. layer will be light brown to orange in color. The test is given also, and somewhat more conveniently, with  $\text{Na}_3\text{Fe}(\text{CN})_6 \cdot \text{H}_2\text{O}$  or  $\text{Na}_3\text{Fe}(\text{CN})_6 \cdot 2\text{NH}_3$ ; the latter is easily prepd. from  $\text{Na}_2\text{NOFe}(\text{CN})_6$  by treating with twice its wt. of  $\text{NH}_3$  and allowing to stand 48 hrs. W. T. H.

Determination of glycerol and ethylene glycol in radiator compounds. ALFRED KUNDERT. *Chemist Analyst* 18, 5(1929).—A mixt. of water, glycerol and ethylene glycol can be sepd. by a single distn., as there are nearly  $100^\circ$  difference between the b. ps. W. T. H.

Determination and separation of formaldehyde and acetaldehyde by means of methone. D. VORLÄNDER WITH CURT IHLE AND HANS VOLKHOIZ. *Z. anal. Chem.* 77, 321-7(1929).—The behavior of these aldehydes toward methone,  $\text{C}_5\text{H}_{12}\text{O}_2$ , can be utilized for their detection and detn. Each gives cryst. compds. which can be dried in a vacuum and weighed; the methylene compd. can be dried at  $90-95^\circ$  to const. wt. The  $\text{HCHO}$  compd. is monobasic toward NaOH but the ethylidene compd. is dibasic. Several analytical methods have been devised and tested. (I) Heat the aldehydes and an excess of methone for 12 hrs. at  $50^\circ$  and allow to stand 12-16 hrs. at room temp. Filter, wash with cold water and weigh or dissolve the unweighed, washed ppt. in EtOH and titrate at  $65-70^\circ$  with NaOH using phenolphthalein as indicator. (II) Use a carefully measured quantity of methone, ppt. as in (I) and titrate the excess methone in the filtrate. (III) With  $\text{HCHO}$  alone, the analysis can be effected without filtering off the ppt., by dissolving it in warm EtOH and titrating with NaOH at room temp. By combining with  $\text{HCHO}$ , methone loses  $1/2$  of its acid property so that the  $\text{HCHO}$  is known from the loss in acidity. A titrated methone soln. or weighed, powd. methone can be used. Four methods are given for the sepn. of the 2 aldehydes. (1) Treat the vacuum-dried methone compds. with 4-5 times as much glacial AcOH and heat

6-7 hrs. in boiling water. Filter after standing 12 hrs. in the cold. Rinse the ppt. into a small flask and treat with cold, dil.  $\text{Na}_2\text{CO}_3$  soln., d. 1.095. The  $\text{HCHO}$  compd. dissolves in the soda soln. and can be reprecipitated by adding  $\text{AcOH}$  or  $\text{HCl}$  till acid to methyl orange; the  $\text{AcH}$  compd., on the other hand, is changed to its anhydride by treatment with  $\text{AcOH}$  and is then insol. in  $\text{Na}_2\text{CO}_3$  soln. (2) Treat the mixt. of aldehydes in aq. soln. with a weighed or titrated amt. of methone; after 15 hrs. dissolve the ppt. with  $\text{EtOH}$  and titrate at  $65-70^\circ$  with  $\text{NaOH}$ . This method gives the  $\text{HCHO}$  alone. (3) Weigh the mixt. of the 2 condensation products and titrate the excess of methone. (4) Ppt. both aldehydes with methone as in (1) and shake the soln. and ppt. in a machine after adding  $1/15$  of the solns. vol. of 50%  $\text{H}_2\text{SO}_4$ . Filter, wash with cold water and treat with cold soda soln. This dissolves the  $\text{HCHO}$  compd. alone and the  $\text{AcH}$ -methone compd. remains as undissolved anhydride. From the soda soln., ppt. the  $\text{HCHO}$ -methone compd. by careful neutralization, and weigh both of the insol. products. This procedure gives excellent results if allowance is made for a loss of 1 mg. of the  $\text{HCHO}$  compd. and of 8 mg. of the  $\text{AcH}$  compd. for each 100 cc. of soln. or wash water.

W. T. H.

The preparation of alcoholic caustic potash solution and the reaction with caustic potash for aldehydes present in chloroform. N. VALYASHKO. *Farm. Zhur.* 1928, 34 5; *Chem. Zentr.* 1929, I, 457.—Malfatti's method is recommended (*C. A.* 6, 200) for making the alc.  $\text{KOH}$  soln. used for the detn. of the acid no. and of the sapon. no., because with this method the soln. does not become yellow or brown. The required amt. of  $\text{KOH}$  is ground with an equal or slightly larger amt. of  $\text{CaO}$ , with addn. of a little  $\text{EtOH}$ . With the aid of  $\text{EtOH}$  the paste obtained is transferred into a flask and the rest of the  $\text{EtOH}$  required is added. The mixt. is shaken until all the  $\text{KOH}$  is dissolved. The soln. is carefully decanted or filtered. The soln. thus obtained remains perfectly colorless for 1 year even in presence of air and does not change its titer. According to Malfatti the oxidation and the turning brown of the alc.  $\text{KOH}$  soln. is caused by colloidal or finely suspended particles of metals, especially of  $\text{Fe}$  or  $\text{Cu}$ , originating from containers used in the manuf. On account of Malfatti's expts. V. and other Russian authors doubt the value of the  $\text{KOH}$  test for aldehydes in  $\text{CHCl}_3$ . V. believes that the turning yellow of the  $\text{KOH}$  pieces in  $\text{CHCl}_3$  is caused by the oxidation of the  $\text{EtOH}$  absorbed by  $\text{KOH}$ , with min. traces of metals as catalysts. Thus the reaction is not specific for aldehydes but is also given by alcs. According to Rosenfeld and other Russian authors samples of  $\text{CHCl}_3$  contg.  $\text{EtOH}$  gave a yellow color with the purest  $\text{KOH}$  even in cases where no aldehyde could be detected with Nessler's reagent.

G. SCHWOCH

Refractometric determination of formic acid in the presence of acetic acid. J. BULIR. *Chem. Listy* 23, 25-6(1929); cf. *C. A.* 15, 353.—Objections raised against this method by Štiastny are shown to be unfounded, fairly accurate results (0.2 g. of formic acid per 100 cc.) being attained provided that no substances other than the above acids and water are present in the soln.

B. C. A.

The titration end point in the determination of tartaric acid by the Goldenberg method. D. ALFRED UHL. *Z. anal. Chem.* 77, 328-34(1929).—In the Goldenberg method, the end point is usually a spot test on litmus paper. Better results will be obtained if an electrometric end point is obtained with quinhydrone or if the litmus paper is standardized so that the end point will be obtained at  $p_{\text{H}}$  7-8.

W. T. H.

The titration of acetic anhydride in mixtures of ethyl alcohol or methanol and water. J. F. M. CAUDRI. *Rec. trav. chim.* 48, 778-92(1929).—Lumière and Barbier (*Bull. soc. chim.* 35, 625(1906)) found that  $\text{Ac}_2\text{O}$  cannot be titrated with alkali in aq. alc., the exptl. figures being always too low and approaching the theoretical value more and more, the more  $\text{EtOH}$  is added before the titration. It is now found that in this titration  $\text{AcOEt}$  is formed which may be distd. off after the titration; the amt. of alkali used up for the titration and the amt. necessary for the sapon. of the  $\text{AcOEt}$  together correspond to the quantity of  $\text{Ac}_2\text{O}$ . Thus the reaction between  $\text{Ac}_2\text{O}$  and dil. aq. alc. alkali is most simply represented as 2 simultaneous reactions, viz., the action of  $\text{Ac}_2\text{O}$  with  $\text{NaOH}$  and with  $\text{NaOEt}$ . In analogy with the theory of Wegscheider (*C. A.* 13, 2474) on aq. alc.  $\text{Na}$  alkylate solns., developed by C. previously (*C. A.* 23, 3393), it follows that  $x/y = k_{\text{H}}(1-\beta)/k_{\text{A}}\beta$ , when  $x$  and  $y$  are the quantity of  $\text{Ac}_2\text{O}$  reacting with  $\text{NaOH}$  and  $\text{NaOEt}$ ,  $\beta$  is the proportion of the total quantity of  $\text{Na}$  present as alcoholate, and  $k_{\text{H}}$  and  $k_{\text{A}}$  are the consts. for alk. hydrolysis and alcoholysis. The ratio  $x/y$  is dependent on the initial concn. of the base but independent on the concn. of the  $\text{Ac}_2\text{O}$ , given a definite temp. and a given concn. of the  $\text{EtOH}$  and this was confirmed experimentally. The lower the temp., the greater the amt. of  $\text{Ac}_2\text{O}$  that had reacted with the formation of  $\text{AcOEt}$ ; e. g., under comparable conditions at  $0^\circ$ , 57%;

at 7°, 53%; and at 25°, 41.8%. With increasing concn. of the EtOH in the EtOH-water mixt. the % of  $\text{Ac}_2\text{O}$  that reacts with the ethylate increases: in 10% EtOH, 26%; in 20% EtOH, 41.8%; in 30% EtOH, 54%; in 50% EtOH, 68%; and in 75% EtOH, 81%; whereas the theoretical value was obtained when an abs. alc. soln. of  $\text{Ac}_2\text{O}$  reacts with an abs. alc. soln. of  $\text{NaOEt}$ . In mixts. of MeOH and water the following % of the  $\text{Ac}_2\text{O}$  had been converted into  $\text{AcOMe}$  at 25°: in 2 1/2% MeOH, 44%; in 5% MeOH, 60%; in 10% MeOH, 76%; in 15% MeOH, 82%; in 20% MeOH, 85%; in 50% MeOH, 92%; and in 75% MeOH, 97%. From these figures it follows that  $\text{NaOMe}$  and  $\text{NaOEt}$  are much more reactive toward  $\text{Ac}_2\text{O}$  than  $\text{NaOH}$ . It was to be expected now that acid chlorides would behave like acid anhydrides on neutralization with alkali in mixts. of alcohols and water. This was confirmed experimentally for  $\text{BzCl}$ , and the same holds for the neutralization in acetone where an ester-like compd. is formed by means of the enolic form of the acetone. On treating  $\text{BzCl}$  in acetone with half the theoretical amt. of  $\text{NaOH}$ ,  $\text{Bz}_2\text{O}$  was obtained by the von Pechmann reaction in homogeneous soln. (cf. Wedekind, *Ber.* 34, 2070(1901)). Finally it was shown that  $\text{Ac}_2\text{O}$  may be titrated potentiometrically with standardized  $\text{NH}_3$ , in water-EtOH mixts.

Colorimetric method for determining small quantities of aniline. V. I. MINAEV, K. O. SVETLYAKOV AND S. S. FROLOV. *Kunstseide* 11, 241-3(1929).—See C 4 22, 3602.

The alkaloid test for tannins. CHRISTINA MARY FEAR. *Analyst* 54, 316-20 (1929).—Expts. described indicate that the only alkaloids giving appreciable ppts. with tannin solns. are brucine, caffeine, cinchonine, cinchonides, quinine and strychnine. It, moreover, seems probable that the phenomenon described as pptn. is one of interaction, either phys. or chem., of alkaloid and tannin and is not caused by pptn. of unchanged alkaloid hydrochlorides through supersatn. The assumption, so frequently made, that alkaloids are general reagents for the tannins is evidently not entirely true.

Microchemical method for determining semicarbazones and its application to the analysis of ketones. RALPH P. HOBSON. *J. Chem. Soc.* 1929, 1384-5.—The semicarbazone was hydrolyzed with a soln. contg. 15%  $\text{HCl}$  and 5%  $\text{HgCl}_2$  by boiling under reflux for 7-8 hrs., and the  $\text{NH}_3$  detd. by Pregl's modified micro-Kjeldahl method:  $\text{H}_2\text{NCONHNH}_2 + \text{H}_2\text{O} = \text{NH}_3 + \text{CO}_2 + \text{N}_2\text{H}_4$ ;  $\text{N}_2\text{H}_4 + 2\text{HgCl}_2 = \text{N}_2 + 2\text{H}_2 + 4\text{HCl}$ ; the  $\text{N}_2\text{H}_4$  must be destroyed, as the ketone released or org. impurities, if present, may cause a partial reduction to  $\text{NH}_3$ . One of the 3 N atoms appears as  $\text{NH}_3$ . This method affords a means for the detn. of ketones, provided they can be converted quantitatively into their semicarbazones when present only in small amts.; the semicarbazones do not need to be purified but the excess  $\text{H}_2\text{NCONHNH}_2$  must be removed by pptn. of the semicarbazone with  $\text{H}_2\text{O}$  or by evapn. to dryness and extg. the  $\text{H}_2\text{NCONHNH}_2$  with  $\text{H}_2\text{O}$  or by extg. with  $\text{Et}_2\text{O}$  and then shaking out the  $\text{H}_2\text{NCONHNH}_2$  with  $\text{H}_2\text{O}$ .

C. J. WEST

Detection of isopropyl alcohol in the presence of acetone (MEYER) 17. Colorimetric estimation of glucuronic acid (OGATA, YAMANOUCHI) 11B.

DUBRISAY, R.: Applications de la mesure des tensions superficielles à l'analyse chimique. Paris: Dunod. 54 pp. F. 15.

## 8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY AND J. F. SCHAIRER

Rapid identification of grains of platinum, palladium, platiniridium and iridosmium by pyrognostic reaction. AD. BRALY. *Bull. soc. franç. minéral.* 49, 141 2(1926).—Pt is infusible before a blowpipe, and alloys with Pb, the alloy scorifying to a gray spongy mass. Pd is infusible, and on heating to dull red in a blowpipe is oxidized on surface to indigo blue; it alloys with Pb, Au, Ag, Pt. Platiniridium is infusible before a blowpipe, and does not alloy with Pb. Iridosmium is infusible, does not alloy with Pb, and on heating strongly in an oxidizing flame gives off vapors of osmic oxide.

B. E. TIFFANY

Determination of indices of refraction of becquerelite, curite, kasolite, fourmarierite, parsonsite, dumontite and ianthinite. VALÉRIE BILLIET. *Bull. soc. franç. minéral.* 49, 136-40(1926).—Eleven new U minerals have been discovered in the Kasolo, (Ka-

tanga) mine. These have high  $n_s$  so that a series of mixts. of piperine-iodides and of S-Se was used, at 100°. Tables of the  $n_s$  of these mixts. are given. B. E. TIFFANY

Some covellite-chalcocite relationships. ALAN M. BATEMAN. *Econ. Geol.* 24, 424-39(1929); cf. C. A. 11, 3202.—From a study of the behavior of intergrowths of covellite and chalcocite on heating, B. concludes that covellite enters into solid soln. in chalcocite to the extent of 30-40% at 75-150°, but that chalcocite does not dissolve in covellite to any appreciable extent. ELLIOTT J. ROBERTS

Marcasite in the contact metamorphic ore deposits of the Twin Buttes district, Pima County, Ariz. BENJ. N. WEBBER. *Econ. Geol.* 24, 301-10(1929).—Marcasite occurs as a concentric structure around pyrite in a deposit of intensely metamorphic character. The deposit shows no action of supergene solns. ELLIOTT J. ROBERTS

Blue rock-salt. CORNELIO DOELTER. *Monatsh.* 52, 241-52(1929).—A review of the occurrence of blue rock-salt in minerals and a discussion of the possible causes of the color, e. g., mineral pigments, radiations and org. matter. G. B. TAYLOR

The existence of agate and of Iceland spar in the archipelago of Kerguelen. EDGAR AUBERT DE LA RÜE. *Compt. rend.* 188, 1421-2(1929).—A great part of the archipelago consists of basaltic coulées. All of the agates are found with the basalts. The interiors of some are occupied by geodes of quartz, or rarely of amethyst. Large deposits of Iceland spar of perfect clearness occur on the Kerguelen islands, in veins in the decomposed basalt. While other eruptive rocks are represented, only the basalts enclose mineral deposits of practical interest. The numerous beds of lignite in the north of the islands are also found among the basalt coulées. A. J. MONACK

The identity and genesis of lodestone magnetite. W. H. NEWHOUSE. *Econ. Geol.* 24, 62-7(1929).—From the study of a large no. of specimens of lodestone, N. concludes that lodestone is generally formed from oxidized magnetite (ferromagnetic ferric oxide). ELLIOTT J. ROBERTS

Spinel of the type  $M_2^{++} M_2^{+++}O_4$ . G. NATTA AND L. PASSERINI. *Atti accad. Lincei* 9, 557-63(1929).— $Mg_2SnO_4$  and  $Co_2SnO_4$ , prepd. by pptg. with alkali from a soln. contg. 1 mol.  $SnCl_4$  to 2  $MgCl_2$  and  $CoCl_2$ , resp., and calcining the dried ppt at 900°, were studied with the aid of x-rays.  $Co_2SnO_4$  crystallizes in the cubic system, the unit contg. 8 mols. with  $a = 8.605 \pm 0.005$  A. U. The  $d_{calc.} = 6.307$ ,  $d_{obs.} = 6.108$ .  $Mg_2SnO_4$  is isomorphous with the above;  $a = 8.580 \pm 0.007$  A. U.,  $d_{calc.} = 4.864$ ,  $d_{obs.} = 4.738$ . Both are, therefore, true spinels. A. W. CONTIERI

The isomorphous mixtures in the calcite group. G. BILBIN. *Mem. soc. Russe Mineralogie* [2], 56, 3-36; *Chem. Zentr.* 1928, II, 975.—With their content of  $CaCO_3$ ,  $MgCO_3$ ,  $FeCO_3$  and  $MnCO_3$ , as the basis, 397 analyses of minerals of the calcite group are arranged into a tetrahedron. G. SCHWOCH

X-ray study of symmetry and twins of dolomite. L. GARRABOS. *Bull. soc. franç. minéral.* 49, 110-27(1926).—A study of dolomite twins by etching in dil. HCl and by x-rays. Diagrams are given of probable arrangement of the atoms in the space lattice. B. E. TIFFANY

Phosgenite of Monteponi. F. RODOLICO. *Atti accad. Lincei* [5], 8, 171-4(1928).—Twinned crystals of phosgenite,  $d = 6.05$ , are described, in one of which numerous regular pits occurred. These pits were square in shape with edges parallel to the angles between the planes (001) and (111), and were formed by the facets of a very obtuse bipyramid sometimes truncated and terminating in a square. Analysis gave: PbO 81.73, Cl 13.06,  $CO_2$  7.91, Ag 0.01, less O for Cl 2.99%. B. C. A.

The optical properties of synthetic anorthite and the results compared with those given by different methods of determining the plagioclases. L. DUPARC AND M. GYSIN. *Bull. soc. franç. minéral.* 49, 63-76(1926).—A petrographic study of sections of 2 melts of the theoretical compn. of anorthite. B. E. TIFFANY

Mangan-titan-pyroxene from Shisaka-jima. HOKOTO SATO. *Proc. 3rd Pan-Pacific Sci. Congr.* 1926, I, 803-4(1928).—This mineral is probably a product of contact action of schistose granite. It is brownish black, fine-granular, with sp. gr. = 3.495, closely assoc. with hercynite and apatite. The pure compd. is pink, with cleavage prismatic, also slight on (010) and (100); optical plane (010), biaxial,  $+2E = 29^\circ$ . The variable extinction suggests the monoclinic system; max. extinction angle is  $43^\circ$ . Pleochroism is distinct,  $a$  pink,  $b$  colorless,  $c$  pink.  $\alpha_D = 1.694$ ,  $\gamma_D = 1.710$ . Analyses were doubtful because of hercynite contamination. E. M. SYMMES

Gen vite, a new mineral. L. DUPARC AND M. GYSIN. *Bull. soc. franç. minéral.* 50, 41-6(1927).—A mineral from Morocco is described and the name genevite is proposed. It is tetragonal, with  $a$  = 10.0,  $c$  = 10.0,  $d = 3.16$ ,  $\rho = 4.0$ . Analysis gave:  $SiO_2$  37.11,  $Al_2O_3$  16.19,  $Fe_2O_3$  3.05,  $FeO$

2.53, MnO tr., CaO 33.67, MgO 2.17, K<sub>2</sub>O 0.66, Na<sub>2</sub>O 0.46, H<sub>2</sub>O 2.70, loss on ignition 1.01%. The mineral is optically —,  $n_g = 1.707$ ,  $n_p = 1.698$ . B. E. TIFFANY

Phenacite from San Miguel di Piracicaba, Minas Geraes, Brazil. V. ROSICKY. *Bull. soc. franç. minéral.* 50, 47-55(1927).—A crystallographic study. B. E. T.

The datolite of Toggiano. EMANUELE GRILL. *Mem. accad. Lincei* [6], 3, 84-105 (1928); *Chem. Zentr.* 1929, I, 373.—The forms of the datolite of Toggiano are described in detail. It has the compn.: SiO<sub>2</sub> 37.48, CaO 34.40, MgO 0.38, Fe<sub>2</sub>O<sub>3</sub> + Al<sub>2</sub>O<sub>3</sub> 0.68, B<sub>2</sub>O<sub>3</sub> 21.81, H<sub>2</sub>O 5.25%; d. = 2.994; F was not found. A large part of the B<sub>2</sub>O<sub>3</sub> is lost with the ordinary method of detg. the H<sub>2</sub>O by drying, the loss being 7.6% in 32.5 hrs. at 700° and 7.56 in 40 hrs. at 900°. With the temp. sufficiently high (in the muffle furnace) all B<sub>2</sub>O<sub>3</sub> volatilizes in 132 hrs. G. SCHWACH

Sorption of gas by minerals. I. Heulandite and chabazite. JITSUSABURO SAMESHIMA. *Bull. Chem. Soc. Japan* 4, No. 4, 96-103(1929).—The sorptive capacities of the minerals, dehydrated at 350° for CO<sub>2</sub>, C<sub>2</sub>H<sub>4</sub> and NH<sub>3</sub> were detd. at 25° and approx. one atm. Heulandite sorbed only NH<sub>3</sub> appreciably, 137.6 cc. (N. T. P.) in 1340 min., and after expulsion of the NH<sub>3</sub> at 300°, 138.3 cc. in 60 min. On exposure to NH<sub>3</sub>, the dehydrated crystals expanded, became chalky and, when heated, were reduced to a powder. The mol. ratio of NH<sub>3</sub> taken up to H<sub>2</sub>O lost was nearly unity. In 30 min. chabazite sorbed 117.4 and 209.3 cc. of CO<sub>2</sub> and NH<sub>3</sub>, resp., and in 90 min. 50.3 cc. of C<sub>2</sub>H<sub>4</sub>. These values increased slowly with time. W. L. HILL

Heulandite from Monastir. GIULIA MARTINEZ. *Atti accad. Lincei* 9, 128-33 (1929).—Both the natural heulandite as well as a recrystd. product have been exam'd, the compns. being: natural, SiO<sub>2</sub> 47.77, TiO<sub>2</sub> 0.57, Al<sub>2</sub>O<sub>3</sub> 19.01, Fe<sub>2</sub>O<sub>3</sub> 8.88, FeO 2.00, MnO 0.01, MgO 4.23, CaO 8.70, Na<sub>2</sub>O 3.00, K<sub>2</sub>O 1.59, H<sub>2</sub>O 3.97, sum 99.72%; recrystd., SiO<sub>2</sub> 57.40, Al<sub>2</sub>O<sub>3</sub> 17.10, CaO 7.80, H<sub>2</sub>O 17.67, sum 99.77%. Crystallographic measurements are also given. A. W. CONTIERI

Laumontite of Toggiano. P. GALLITELLI. *Atti accad. Lincei* [6], 8, 82-7(1928).—Two types of laumontite occur assocd. with the datolite of Toggiano, the one of a rather fibrous structure, with a pearly luster, the other granular and whitish. Goniometric analyses have been made of these 2 varieties, which contain, resp.: SiO<sub>2</sub> 50.78, 51.43, Al<sub>2</sub>O<sub>3</sub> 21.09, 22.30; BeO 0.47, 0.40; CaO 12.13, 12.47; H<sub>2</sub>O 15.34, 13.74%. When heated, laumontite loses water continuously, but there is some evidence of an arrest point between 250° and 300°, leading to the conclusion that there is probably some difference in the nature of the water lost below 300° and that given up at higher temps. B. C. A.

Investigations on the chemical composition of chlorites. J. ORCEL. *Bull. soc. franç. minéral.* 50, 75-456(1927).—A comprehensive treatise including a review of previous work, methods of analysis, analyses of sheridanite, leuchtenbergite, ripidolite, aphrosiderite, bavalite, thuringite, clinocllore, kotschubeite, etc. The chlorites are classified into 9 groups on the basis of these analyses. A bibliography is given. B. E. TIFFANY

Sepiolite deposit in Salinelles, Gard. H. LONGCHAMON AND F. MOURGUES. *Bull. soc. franç. minéral.* 50, 66-74(1927).—L. and M. describe the deposit and suggest that it may have been formed by pptn. from a colloidal suspension of the mineral in fresh water, upon the entrance of salt water. The present contamination by lime and silica is due to water circulating in from the limestone above. The excess silica found now may be due to CO<sub>2</sub> in the water attacking the mineral. B. E. TIFFANY

Some minerals containing the rarer elements. D. SATO. *Proc. 3rd Pan Pacific Sci. Congr.* 1926, I, 865-6(1928); cf. C. A. 20, 3409.—The occurrence of allanite, monazite, xenotime, fergusonite, samarskite, columbite, hagatalite, naegite and oymalite is shown. E. M. SYMMES

Japanese minerals containing the rarer elements. MASAOKI HOSHINA. *Proc. 3rd Pan-Pacific Sci. Congr.* 1926, I, 867-8(1928). E. M. SYMMES

Chemical investigation of Japanese minerals containing the rare elements. Y. SHIBATA. *Proc. 3rd Pan-Pacific Sci. Congr.* 1926, I, 852-65(1928). E. M. SYMMES

Anglesite from Tsumeb, Otavi (S. W. Africa). V. ROSICKY. *Bull. soc. franç. minéral.* 49, 160-3(1926).—Measurements of the angles of a series of crystals are given. B. E. TIFFANY

Notes on the meteorite from the Pampa del Infierno. ENRIQUE HERRERO DUCLOUX. *Anales soc. cient. Argentina* 107, 491-7(1929).—The specimen weighed 896 g.; sp. gr. = 3.407. The stone belongs to the type *franchfortosa*, not heretofore found in Argentina. Analysis gave: SiO<sub>2</sub> 38.860, P<sub>2</sub>O<sub>5</sub> 0.327, Fe<sub>2</sub>O<sub>3</sub> 0.102, FeO 19.765, MnO 0.620, SnO<sub>2</sub> 0.031, Al<sub>2</sub>O<sub>3</sub> 11.947, CaO 2.700, MgO 20.051, K<sub>2</sub>O 0.071, Na<sub>2</sub>O 0.572,

S 3.034,  $\text{Cr}_2\text{O}_3$  0.601, Fe 2.916, Ni 0.387, Co 0.085,  $\text{Cr}_2\text{O}_3\cdot\text{FeO}$  0.045; P 0.015%;  $\text{TiO}_2$ , NiO, CoO traces.

**Notes on the mineralogy of Brazil.** JORGE PALMIRO DE ARAUJO FERRAZ. *Bull. soc. franç. minéral.* 50, 6-41 (1927).—An annotated list of minerals of Brazil, edited by A. ROCCATI from papers left by Ferraz. Analyses are included of: acgirite, albertite, albite, andalusite, anthosiderite, apatite, asbestos, atopite, azurite, baddeleyite, barite, bauxite, Bi, chalcopyrite, chalmersite, chromite, columbite, derbylite, euxenite, ferrazite, garnets, comprising almandite, andradite, grossularite and pyrope, gorceixite, goyazite, graphite and gypsum.

**Solvent effects of certain organic acids upon oxides of iron.** NORMAN J. HARRAR. *Econ. Geol.* 24, 50-61 (1929).—Samples of  $\text{FeO}$ ,  $\text{Fe}_2\text{O}_3$  and limonite were shaken with 500 cc. portions of 0.1 N solns. of formic, acetic, propionic, oxalic, malonic, succinic, lactic, tartaric, citric, benzoic, salicylic and sulfuric acids and portions of the solns. analyzed after 40 and 60 day periods.  $\text{FeO}$  dissolved most readily, limonite a little less so, and the  $\text{Fe}_2\text{O}_3$  much more difficultly. A definite relation existed between the ionization constants of the acids and the amts. of Fe dissolved. The hydroxy acids dissolved abnormal quantities of Fe and underwent striking color changes.

**Solution, transportation and precipitation of iron and silica.** E. S. MOORE AND J. E. MAYNARD. *Econ. Geol.* 24, 272-303, 365-402, 506-27 (1929).—M. and M. made a very detailed lab. study of the following points: the amt. of  $\text{Fe}_2\text{O}_3$  and  $\text{SiO}_2$  in natural waters; the agents by which these substances were taken into soln.; the final chem. state of the  $\text{Fe}_2\text{O}_3$  and  $\text{SiO}_2$  in the soln. permitting transportation; the manner of pptn. of the  $\text{SiO}_2$  and  $\text{Fe}_2\text{O}_3$  to form the characteristically banded ppts., and the agents which brought about this pptn.

**The origin of some iron ores and serpentine in the Dutch East Indies.** W. F. GISOLF. *Proc. 3rd Pan-Pacific Sci. Congr.* 1926, II, 1729-32 (1928).  
**Formation of Japanese gold ores.** CHOZO IWASAKI. *Proc. 3rd Pan-Pacific Sci. Congr.* 1926, II, 1737-8 (1928).

**Zoning in Michigan copper deposits and its significance.** I. T. M. BRODERICK. *Econ. Geol.* 24, 149-62 (1929).—In most of the mines the As-Cu ratio increases with depth; in general, the lower the lode stratigraphically in the series, the higher the As-Cu ratio at the outcrop. In the lowest member, the As-Cu ratio increases with depth to approx. 0.56% and then rapidly declines with greater depth. The total variation of the ratio in the different beds is 0.0003-0.56%. The As is probably present chiefly as Cu arsenides, perhaps somewhat in solid soln. in the Cu. II. *Ibid* 311-26.—The deeper zones contain Cu arsenides and chalcocite, and the  $\text{Fe}_2\text{O}_3$  of the original rock has been reduced to  $\text{FeO}$ , now present in the form of silicates. The intermediate zones contain smaller quantities of arsenides and sulfides and the  $\text{Fe}_2\text{O}_3$  has been reduced and removed. The shallow zones contain practically no arsenides or sulfides and there has been little reduction or removal of  $\text{Fe}_2\text{O}_3$ .

**The copper deposits of Michigan.** B. S. BUTLER AND W. S. BURBANK WITH T. M. BRODERICK, L. C. GRATON, C. D. HOHL, CHAS. PALACHE, M. J. SCHOLZ, ALFRED WANDKE AND R. C. WELLS. U. S. Geol. Survey, *Professional Paper* 144, 233 pp. (1929).—This paper is a detailed description of the geology of the Mich. Cu region. Statistics on Cu production and dividends by companies, lodes and mines from 1845 to 1925 are given. The genesis of the deposits is discussed. Conclusion: Ascending ore solns. were pptd. by oxidation. The underlying Duluth gabbro is probably the source of the Cu. Geophys. methods are discussed in their application to the exploration of these deposits. Detailed descriptions of the lodes and fissures are given and an extensive bibliography is included.

**Ore deposits of the Kune copper mine.** KOZABURO MAKINO. *Proc. 3rd Pan-Pacific Sci. Congr.* 1926, II, 1738 (1928).

**Ore deposits of the Iimori copper mine.** KOZABURO MAKINO. *Proc. 3rd Pan-Pacific Sci. Congr.* 1926, II, 1738-9 (1928).

**Ore deposits of the Ashio copper mine.** TOSHIO KISHI. *Proc. 3rd Pan-Pacific Sci. Congr.* 1926, II, 1739 (1928).

**The geologic age of the ore deposit of the Tsuchikura mine, with special reference to the late Palaeozoic mineralization in Japan.** KAMEKI KINOSHITA. *Proc. 3rd Pan-Pacific Sci. Congr.* 1926, II, 1732-4 (1928).

**Geology of Hyder and vicinity, southeastern Alaska—with a reconnaissance of Chickamin River.** A. F. BUDDINGTON. U. S. Geol. Survey *Bull.* 807, 121 pp. (1929).—The minerals found are: (1) native elements (Au and Ag), (2) sulfides (galena, pyrite, pyrrhotite, sphalerite, chalcopyrite, molybdenite, chalmersite, covellite, marcasite),

(3) sulfo-salts (tetrahedrite, freibergite, arsenopyrite, proustite), (4) sulfates (barite, anglesite), (5) oxides (quartz, magnetite, specularite, limonite), (6) carbonates (calcite, ankerite, malachite, azurite), (7) tungstate (scheelite). A. J. MONACK

**Platinum and black sand in Washington.** J. T. PARDEE. U. S. Geol. Survey *Bull.* 805-A, 1-15(1929).—A total of about  $7\frac{1}{2}$  oz. of Pt has been reported from the state of Wash. Most of this came from the beach south of Cape Flattery; the remainder from a short course along the south fork of Lewis River near Moulton. At both places the Pt was obtained as a by-product of placer mining of Au. A discussion of black sands is given, including a list of minerals other than quartz, and a table showing mineral compns. of 50 samples of black sand. A. J. MONACK

**The chromite-bearing ultrabasic deposits of Singhbhum.** C. MAHADEVAN. *Econ. Geol.* 24, 195-205(1929).—The deposits contain ore analyzing 44-53%  $\text{Cr}_2\text{O}_3$ . Production in 1926 amounted to 1623 tons. ELLIOTT J. ROBERTS

**Chromite deposits in the Philippines.** V. ELICANO. *Proc. 3rd Pan-Pacific Sci. Congr.* 1926, II, 1753-4(1928). E. M. SYMMES

**Mineral resources of the Russian Far East.** P. I. POLEVOI. *Proc. 3rd Pan-Pacific Sci. Congr.* 1926, II, 1754-7(1928); cf. C. A. 19, 2010. E. M. SYMMES

**Mineral resources of South Manchuria.** HANZO MURAKAMI. *Proc. 3rd Pan-Pacific Sci. Congr.* 1926, II, 1763-4(1928). E. M. SYMMES

**Mineral resources of the Japanese Empire.** NOBUYASU KANEHARA. *Proc. 3rd Pan-Pacific Sci. Congr.* 1926, II, 1765(1928). E. M. SYMMES

**Geologic age of gypsum deposits in Japan.** KAMEKI KINOSHITA. *Proc. 3rd Pan-Pacific Sci. Congr.* 1926, II, 1734-6(1928). E. M. SYMMES

**Strontium from a domestic standpoint.** R. M. SANTMYERS. *Bur. Mines Econ. Paper* 4, 19 pp.(1929).—S. discusses the U. S. Sr industry, including domestic and foreign deposits, imports, uses, methods of manuf. and tests. ALDEN H. EMERY

**Barite in the jurassic and cretaceous deposits of the Tschuvaschki Republic.** L. M. MIROPOLSKI. *Bull. acad. sci. union rep. soviet. social.* 1928, 425-41.—The different forms of barite, which appear in these deposits both as concretion and as sep. crystals of varying habit, are described. B. C. A.

**The pyrophyllite deposits of North Carolina (with a more detailed account of the geology of the Deep River region).** JASPER L. STUCKEY. North Carolina Dept. of Conservation and Development, *Bull.* 37, 62 pp(1928).—The pyrophyllite bodies occur in acid rocks in oval or lenticular deposits formed along lines of shearing due to folding. The chief minerals are pyrophyllite, quartz, pyrite, chloritoid and sericite, the minor minerals include feldspar, Fe oxides, epidote, zircon, titanite, rutile, zeolites and apatite. The deposits are formed by metasomatic replacement in the order: (1) silicification of tuffs and breccias, (2) development of (a) pyrite, (b) chloritoid in those bodies near the Fe breccia, (c) pyrophyllite by replacement of silicified tuff and (d) sericite. The pyrophyllite is closely assoc. with some of the old Au mines, formation of both being probably due to hot solns. The material is used in making roofing paper, cotton cordage, textiles, rubber, soap, pipe covering, pottery and porcelain, asbestos, paint, toilet preps., bleaching compds., crayons and pencils and sheet asphalt. Waste in production has been huge because only ore pure enough to use without treatment has been used. ALDEN H. EMERY

**Deposits of vermiculite and other minerals in the Rainy Creek District near Libby, Montana.** J. T. PARDEE and E. S. LARSEN. U. S. Geol. Survey *Bull.* 805-B, 1-28(1929).—The deposits occur in an easily accessible area about 7 mi. N.E. of Libby, Mont. About  $\frac{2}{3}$  of the stock consists of a coarse-grained pyroxenite that ranges from nearly unmixt pyroxene to nearly unmixt biotite or vermiculite (alteration product) and usually contains 7-10% of F-rich apatite. About 0.12%  $\text{V}_2\text{O}_5$  is also present. The remainder of the stock is coarse-grained syenite and altered nepheline syenite. The vermiculite is being developed commercially. A fibrous amphibole also occurs as a spur north of Kearney Creek and a small quantity has been mined for expl. purposes. Quartz, chalcopyrite, galena, sphalerite, fluorite, strontianite, celestite, aegirite and aegirite-diopside occur in veins in the pyroxenite mass. Some of the aegirites contain 3-4% of  $\text{V}_2\text{O}_5$ . A. J. MONACK

**A unique feldspar deposit near DeKalb Junction, N. Y.** B. M. SHAUB. *Econ. Geol.* 24, 68-89(1929).—The feldspar-quartz deposit, contg. tremolite, phlogopite, titanite, diopside, serpentine and talc, was probably formed by the hydrothermal replacement of the quartz-diopside and dolomite country rocks. E. J. R.

**The diamond deposits on the coast of Little Namaqualand.** PERCY A. WAGNER and HANS MERENSKY. *Trans. Geol. Soc. S. Africa* 31, 1-41(1928).—A description of the diamond deposits on the southwest coast of Africa with a discussion of the possible



origins of the diamonds (cf. *Proc. Geol. Soc. S. Africa* 31, 25(1928)). This region is compared with the diamond deposits of Brazil.

**Upland diamond deposits, Diamantina district, Minas Geraes, Brazil.** DJALMA GUIMARAES. *Econ. Geol.* 24, 444-7(1929).—G. corrects some statements of Thomson (*C. A.* 23, 4425) regarding the geology of the region and points out that the breccia was not originally a basic intrusion but either neutral or acidic since the contained minerals (quartz, rutile, etc.) are more characteristic of a neutral or acid rock.

**Northward extension of the Sheridan coal field—Big Horn and Rosebud counties, Montana.** A. A. BAKER. U. S. Geol. Survey *Bull.* 806-B, 15-67(1929).—The following are treated: geography (land features, drainage and water supply, timber, settlement, routes of travel); geology (stratigraphy, structure, physiography); coal (distribution and correlation of the coal beds, phys. properties, chem. properties, burning of the coal beds, fossil wood, mining, details by townships). It is possible that more complete exploration will show that the present est. of 38,500,000,000 short tons of coal in the field is too low.

**Igneous metamorphism of coal beds.** GEO. C. MCFARLANE. *Econ. Geol.* 24, 1-14(1929).—The change from low-rank bituminous to anthracite is accomplished at temps. ranging from 160° to 350°. Sp. gr., fixed C, volatile matter and H<sub>2</sub>O absorbed detns. for coals heated at different temps. are given. A Colo. coal within 1 ft. of a basalt sill had been heated to approx. 1000° by the intrusive mass.

**New theories regarding the formation of petroleum.** A. WEINFELD. *Intern. Z. Bohrtech. Erdölbergbau u. Geol.* 37, 83-9, 93-6(1929).—Discussion of genetic connection between salt deposits and petroleum in porous sands. W. is entirely opposed to the idea of migration of oil from its mother rock and therefore assumes that the greater part of oil found in porous beds is primary in character.

**Oil-bearing rocks of the Waiapu Subdivision (New Zealand).** M. ONGLEY AND E. O. MACPHERSON. *Proc. 3rd Pan-Pacific Sci. Congr.* 1926, II, 1594(1928).

**Petroleum in Taranaki (New Zealand).** I. I. GRANGE. *Proc. 3rd Pan-Pacific Sci. Congr.* 1926, II, 1595(1928).

**The Echigo oil fields (Japan).** TSUNENAKA IKI. *Proc. 3rd Pan-Pacific Sci. Congr.* 1926, II, 1596-7(1928).

**The diatom theory of the origin of petroleum in California.** JUN-ICHI TAKAHASHI. *Proc. 3rd Pan-Pacific Sci. Congr.* 1926, II, 1613-4(1928); cf. *C. A.* 22, 2727.

**Further studies of volcano gases.** A. L. DAY. *Proc. 3rd Pan-Pacific Sci. Congr.* 1926, I, 710(1928).—Gas reactions can contribute heat and reduce viscosities of lava and the flow temp. The mechanism of gas explosions and reasons for periodicity are shown. Water is the most important volatile ingredient in magmas and the most important factor in lava movement and explosions.

**Extrusives and ejectamenta of some Philippine volcanoes.** A. D. ALVIR. *Proc. 3rd Pan-Pacific Sci. Congr.* 1926, I, 758-60(1928).

**Steam as immediate cause of the last eruptions of Taal and Bulusan volcanoes.** MIGUEL SADERRA MASÓ. *Proc. 3rd Pan-Pacific Sci. Congr.* 1926, I, 761-7(1928).

**Distribution of volcanic rocks in Japan, with subordinate notes on the Korean rocks.** S. KÔZU AND M. WATANABE. *Proc. 3rd Pan-Pacific Sci. Congr.* 1926, I, 770-80(1928).

**Some alkali rocks occurring in Korea.** S. KÔZU AND K. SETO. *Proc. 3rd Pan-Pacific Sci. Congr.* 1926, I, 781(1928).

**Concretions in water-laid tuff in the Philippine Islands.** JOSÉ M. FELICIANO. *Proc. 3rd Pan-Pacific Sci. Congr.* 1926, II, 1863-6(1928).

**Water-laid volcanic rocks of early upper Cretaceous age in southwestern Arkansas, southeastern Oklahoma and northeastern Texas.** CLARENCE S. ROSS, HUGH D. MISER AND LLOYD W. STEPHENSON. U. S. Geol. Survey, *Professional Paper* 154F, 175-202(1929).—Tuffaceous material of Cretaceous age occurs in an east-west belt about 150 miles long lying near the northern margin of the Gulf Coastal Plain in Texas, Okla. and Ark. It was deposited for the most part in shallow H<sub>2</sub>O under the influence of strong currents and is mixed in various proportions with detrital material derived from the Paleozoic rocks on the north. Intense alteration has formed many clay beds, chiefly bentonite. The commonest rock is in the form of rounded lithic grains about 0.5-1.0 mm. in diam. The volcanic vents are probably located in Howard, Pike and Sevier Cos., Ark.

ALDEN H. EMERY

**Contact metamorphism of the Ellsworth schist near Blue Hill, Me.** J. L. GILLSON AND R. M. WILLIAMS. *Econ. Geol.* **24**, 182-94(1929).—Analyses of unmetamorphosed and contact-metamorphosed Ellsworth schist are given. The pyrite-chalcopyrite deposits were formed from solns. migrating from a nearby granite. E. J. R.

**Chemical and mineralogical composition of red and green eocene schistous clay of the Eastern Carpathians.** A. GAWEL. *Bull. acad. polonaise* **1928A**, 523-37.—Chem analyses are recorded of the portion of slate clay sol. in HCl and these are expressed by the general formula  $4\text{SiO}_2(\text{Al}_2\text{O}_3 + \text{Fe}_2\text{O}_3)(\text{FeO}, \text{MgO}, \text{CaO}, \text{K}_2\text{O}, \text{Na}_2\text{O})$ . The red clay is characterized by the absence of combined  $\text{Fe}_2\text{O}_3$  but contains free  $\text{Fe}_2\text{O}_3$ , to which the color is due, while in the green clay the Fe oxide is combined with silica. B. C. A.

**The characteristics of "terra rossa" from the vicinity of Rome.** B. FILOSOFOV. *K. D. Glinka Memorial vol.* (Leningrad Agr. Inst.) 191-207(1928).—F. presents data on the chem. and mineralogical compn. of 3 samples of native rock and the corresponding weathered materials, which give rise to "terra rossa" in the vicinity of Rome. The analyses of one specimen of native rock and weathered material are: hygroscopic moisture 1.17, 8.7;  $\text{SiO}_2$  47.53, 43.2;  $\text{Al}_2\text{O}_3$  14.85, 19.46; FeO 5.32, 7.21; MnO 0.27, 0.13; MgO 8.18, 9.08; CaO 12.66, 11.74;  $\text{K}_2\text{O}$  5.59, 0.51;  $\text{Na}_2\text{O}$  2.15, 1.41;  $\text{CO}_2$  0.00, 0.01;  $\text{H}_2\text{O}$  1.28, 4.42; org. substance 0.0, 0.55%. From the analyses presented F. concludes that the weathering in the region of the Mediterranean is similar to that of laterization in the tropics. The presence of free Al hydroxides is another indication of the similarity. According to F., the intensity of the red color is detd. by the presence of Ca, but its presence is not a necessary attribute of the formation of "terra rossa" J. S. JOFFE

**A study of thermal springs in the Philippines.** JOSÉ M. FELICIANO. *Proc. 3rd Pan-Pacific Sci. Congr.* **1926**, I, 804-11(1928).—Very few thermal springs are radioactive, but the cold springs are slightly so, an anomaly which may be due to the fact that heat is derived mostly from volcanic rock. Underground waters absorb emanations from radioactive rock irrespective of temp.; magmatic diluted with vadose waters probably represent most of those in volcanic regions. Recent intrusions and extrusions are less radioactive than older ones. E. M. SYMMES

**The distribution of radioactive mineral springs in Japan.** SAEMON TARO NAKA MURA. *Proc. 3rd Pan-Pacific Sci. Congr.* **1926**, I, 814-7(1928). E. M. SYMMES

**The distribution of rare chemical elements in the Japanese Islands.** S. KÖZU AND M. WATANABE. *Proc. 3rd Pan-Pacific Sci. Congr.* **1926**, I, 839-52(1928).—Rare earths and rare acid earths are found mostly in the outer zone of northeast Japan and the inner zone of southwest Japan, with Li, Be, W, Mo, Th and U. Radioactive minerals are found in the inner zone of northeast Japan, but in them no radioactive element has been detected chemically. Pt, Ir and Os are most abundant in Hokkaido. Gases contg. He are widely distributed, the max. He content being 0.2%. E. M. SYMMES

**Helium contents and ages of Japanese radioactive minerals from Ishikawa district.** Y. KANO AND B. YAMAGUCHI. *Bull. Chem. Soc. Japan* **3**, 244-52(1928). The minerals xenotime, samarskite, monazite and ishikawaite (cf. *C. A.* **17**, 252) have been examd. for their He content with the following results: 1 g. of the minerals heated to 1000° yields, resp., 0.025, 1.42, 0.246 and 1.77 cc. of He. The U, Th and Pb contents of ishikawaite were detd. Calcs. based on the He and Pb contents give values, resp., for the age of this mineral as 72.3 and 127 million years. The ages of the samarskite and the monazite are calcd. as 81.2 and 73.9 million years. These 3 minerals from Ishikawa belong to the same geological age, either Jurassic or Cretaceous. B. C. A.

**Determination of the helium content of some Japanese minerals.** II. JIRO SASAKI. *Bull. Chem. Soc. Japan* **4**, No. 5, 111-2(1929); cf. *C. A.* **21**, 1610.—The He content in cc. per g. of the minerals studied was: conglomerate of samarskite and columbite 0.20, naegite 0.028, 2 samples each of ilmenite and sphene 0.00044, none and 0.0054, none, resp., rutile 0.0000053. One specimen of sphene was feebly radioactive, the rutile and ilmenite were not. W. L. HILL

**HINTZE, CARL: Handbuch der Mineralogie. Band I. Lfg. 29. Elemente, Sulfide, Oxyde, Haloide, Carbonate, Sulfate, Borate, Phosphate.** Edited by Gottlob Linck. Pp. 3831-3990. Berlin: W. de Gruyter & Co. M. 15.

**FERNÁNDEZ NAVARRO, LUCAS: El mundo de los minerales.** 2nd ed. Madrid España-Calpe, S. A. 94 pp. Ptas. 1.75.

## 9—METALLURGY AND METALLOGRAPHY

D. J. DEMOREST, R. H. ABORN

**A method for the sizing of ore by elutriation.** JOHN GROSS, S. R. ZIMMERLEY AND ALAN PROBERT. *Bur. Mines, Repts. of Investigations* No. 2951, 8 pp.(1929).—Elutriation was adopted as probably giving better results than sedimentation for sizing materials finer than 200 mesh. Illustrations of an elutriator are shown and its operation is discussed. The method may be used for the sepn. of sized minerals to det. metallurgical recovery, as well as for the detn. of surface in the calcn. of grinding efficiencies. H. C. PARISH

**The relation of table feed preparation to table efficiency.** A. W. FAHRENWALD AND W. F. MECKEL. *Bur. Mines, Repts. of Investigations* No. 2949, 15 pp.(1929).—In general, the work of the table of the reciprocating type of gravity concentrator grows better as the difference in size between concn and tailing material becomes greater. A difference in sp. gr. between concn. and tailing material has the greatest effect on table concn. Conditions are most favorable to concn. when the concn. grains are smaller, heavier and more nearly spherical than the tailing grains. H. C. P.

**Reducing and oxidizing agents and lime consumption in flotation pulp.** LEONARD KLEIN, C. R. KING, T. F. MITCHELL, O. E. YOUNG, F. H. MILLER, L. M. BARKER AND OLIVER C. RALSTON. *Am. Inst. Mining Met. Eng., Tech. Publication* No. 224, 17 pp.(1929).—O is always dissolved in pyritic flotation pulps made alk. with CaO in the presence of air, in amts. depending on the extent of aëration. Sol. sulfides and thiosulfates are present as a result of the action of CaO and air on powd. sulfide minerals. CaO is consumed by interaction with sulfide and gang minerals, probably by adsorption on all surfaces, by reaction with oxidation products, by CO<sub>2</sub> from the air and by reaction with constituents of the water used. H. C. PARISH

**High-zinc slags in Australia.** PHILIP S. MORSE. *Am. Inst. Min. Met. Eng., Tech. Publication* No. 222, 14 pp.(1929).—Australian Pb blast-furnaces make slags high in ZnO, often 20% or more. This is possible when roasting is carried to the point where no mat is made; S on the charge must be below 4% or Zn mush will form. The Zn remains in the slag probably in the form of spinels, such as ZnO.Fe<sub>2</sub>O<sub>3</sub> and ZnO.Al<sub>2</sub>O<sub>3</sub>, together with some dissolved sulfide. A. BUTTS

**Diffusion of iron oxide from slag to metal in the open-hearth process.** C. H. HERTY, JR. *Am. Inst. Mining Met. Eng., Tech. Publication* No. 229, 18 pp.(1929).—The fundamental principles governing the diffusion of FeO from slag to metal in the open-hearth steel process are discussed and different diffusion coeffs. are calcd. from furnace data. DOWNS SCHAAP

**The value of pyritic ores as sources of iron ore.** ARTHUR J. CADDICK. *Mining Mag.* 41, 22-4(1929).—Results are given of a study of compns. of com. Fe ores in comparison with residues from pyritic ore after a treatment of roasting, chloridization and leaching. It is indicated that pyritic ore contg. 39% S, 37% Fe and 14% SiO<sub>2</sub> will yield a residue profitable for Fe smelting; but if the SiO<sub>2</sub> exceeds 14%, preliminary concn. will be necessary. A. BUTTS

**Iron-ore sinter.** G. M. SCHWARTZ. *Am. Inst. Mining Met. Eng., Tech. Publication* No. 227, 30 pp.(1929).—The fundamental reactions that take place in the sintering of Fe ores were studied by detg. the nature of the resulting minerals. Microscopic studies were made of the polished surfaces of 9 com. Fe ore sinters and 18 exptl. sinters produced under varying conditions. DOWNS SCHAAP

**Leaching manganese from the siliceous iron ores of Minnesota.** CARL ZAPFFE. *Eng. Mining J.* 127, 1039-40; 128, 14-9(1929).—The ore is crushed to pass 65 mesh, and roasted in a reducing atm. of producer or blast-furnace gas at 400°, reducing MnO<sub>2</sub> to MnO and Fe<sub>2</sub>O<sub>3</sub> to Fe<sub>3</sub>O<sub>4</sub> with a little FeO. It is then leached with (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>, in which MnO and FeO are sol and Fe<sub>3</sub>O<sub>4</sub> is insol. NH<sub>3</sub> gas is liberated, and on bringing this in contact with the soln. of MnSO<sub>4</sub> in a standard NH<sub>3</sub> tower, Mn(OH)<sub>2</sub> is pptd. This is converted to stable MnO.OH by treatment with air. The ppt. is washed, dried and sintered. A pilot mill gave 92% recovery of the Mn in the ore. In leaching there must be a large excess of (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>. The residue contg. Fe<sub>3</sub>O<sub>4</sub> is treated by magnetic concn., and a recovery of 70% of the original Fe is made. The exptl. development of this process, called the Bradley process, together with details of app. and essential controlling conditions, are outlined and a flow-sheet is given. A sinter contg. 64% Mn, 7% Fe, 2% SiO<sub>2</sub>, and practically free from P and S, is made. This is ideal for ferro-Mn. The process is applicable to all low-grade Mn ores and is especially valuable in sepg. high SiO<sub>2</sub>. A. BUTTS

The development of the "chlorine process" of extraction of platinum metals from ores. R. A. COOPER AND F. W. WATSON. *J. Chem. Met. Min. Soc. S. Africa* 29, 220-30(1929).—Various methods of concn. and leaching with various solvents were tried on ore from the Waterberg district, Transvaal. Only cyanide and Cl gas gave encouragement. Application of Cl was tried in various ways, and finally 80% extn. was obtained by heating the ore to 550° in a glass combustion tube and passing moist Cl through, then leaching with acidified H<sub>2</sub>O. Addn. of 1% NaCl increased extn. to 90%. A revolving steel tube of large capacity gave good results on original ore and tailings, but the costs were too high for low-grade material, and on concentrates results were poor. Similar treatment using a stationary rectangular muffle, however, was successful unless coarse Pt was present. In this case, electrolytic amalgamation (cf. C. A. 23, 3194) was used, followed by chlorination of the tailings, yielding 90% extn. On norite, ore flotation was the only successful method of concn. By this 87% of the Pt was obtained in 5% of the ore, but the previous method could not ext. the Pt from this conc. because of the Pt existing as a solid soln. or submicroscopic dispersion within base-metal sulfides in the ore. A slight modification in roasting, with elimination of the NaCl, then resulted in successful chlorination and leaching without amalgamation. From the soln. obtained Pt is pptd. with Zn dust. Cu must be pptd. before pptn. of the Pt, slow pptn. with pulverized limestone being found best. Ni remains after the Pt is pptd. and is then pptd. separately. Thus, 80% of the Cu and Ni in the ore is recovered besides the Pt. The final product carries 52% Pt and 15 Pd. A com. plant has been built and is treating flotation concentrates from sulfide norite carrying 25-30 dwt. Pt per ton. A BUTTS

The new Sulman-Picard process for tin extraction. A. S. FITZPATRICK. *Chem. Eng. Mining Rev.* 21, 331-2(1929).—The Sn is 1st converted to sulfide by one of two methods. In the one the finely ground ore or concentrate is briquetted with pyrite and sometimes charcoal, or reduction may be accomplished by passing coal gas or producer gas over the dried porous briquet. In the other method pyrite is heated in a furnace compartment separately from the mixt. of finely ground ore and a reducing agent. S from the pyrite combines with the Sn to form the sulfide. The Sn concentrate mixt. is next allowed to cool away from air. The mass is leached with a soln. of NH<sub>4</sub> polysulfide, then distd. and calcined with charcoal to SnO<sub>2</sub>. A sulfide of the required soly. is formed at 750-850°. Temp. control is very important. It is considered possible to collect sulfides of As and Sb separately. No details of the furnace to be used in this process are yet available. H. C. PARISH

Developing an efficient and economical gold-ore treatment process. ALGERNON DELMAR. *Eng. Mining J.* 128, 208-10(1929).—Three slightly siliceous limestone ores were treated: (A) a low-grade ore contg. native Hg, the  $-1/4$ -mesh portion contg. 80% of the Au; (B) the  $+1/2$ -mesh portion contg. 81% of the Au; and (C) ore wherein the Au was evenly distributed. The ore A could not be treated by amalgamation as the native Hg did not coalesce with the Hg in the traps. Wet grinding and cyaniding did not give good recovery. Screening and cyaniding the  $-1/4$ -mesh material gave a satisfactory recovery. Ore B was wet screened and the  $+1/2$ -mesh material was ground to  $-1/4$  mesh, amalgamated and cyanided. Ore C was ground to  $-30$  mesh, amalgamated and cyanided. C. L. READ

The extraction of gold from sea waters. A. GLAZUNOV. *Chem. Listy* 23, 188-93, 215-22(1929); cf. C. A. 23, 3847.—Solns. contg. 5-50 mg. Au per ton (metric) were concd. to 260 mg./ton by passing through containers filled with pyrites or Cu<sub>2</sub>S. Grains of pyrites 1-1.5 cm. av. diam. were most useful and a water flow of 5-10 mm. per sec. (2-4 l. per hr. per sq. cm.) through a layer of pyrites 20 cm. deep was used. From 25 to 40% of the Au in soln. was recovered. With sea water the concn. of Au deposited was not proportional to the water passed through the filters. The action of sea water constituents (grasses and weeds) dissolved the pyrites to form a spongy layer. By changing the filter mass so that the pyrites remained unattacked, the process was successful. The waters at Ile d'Ouessant contain 1 mg. Au per metric ton; by adsorption 0.20-0.25 mg. per ton was recovered. FRANK MARESH

Gold and silver in 1927. J. P. DUNLOP. *Bur. Mines, Mineral Resources of U. S. 1927*, Pt. I, 599-636(preprint No. 23, published Aug. 1, 1929). E. H.

Gold, silver, copper, lead and zinc in Colorado in 1927. CHAS. W. HENDERSON. *Bur. Mines, Mineral Resources of U. S. 1927*, Pt. I, 527-72(preprint No. 21, published July 17, 1929). E. H.

Gold, silver, copper, lead and zinc in Nevada in 1927. C. N. GERRY. *Bur. Mines, Mineral Resources of U. S. 1927*, Pt. I, 509-24(preprint No. 20, published July 18, 1929). E. H.

**Lead in 1927.** LEWIS A. SMITH. *Bur. Mines, Mineral Resources of U. S. 1927*, Pt. I, 341-72 (preprint No. 15, published April 8, 1929). E. H.

**Present-day smelting practice at Rio Tinto.** H. R. PORRS. *Bull. Inst. Mining Met.* 1929, No. 299, 1-10; *Metal Ind.* (London) 35, 200-3 (1929).—Copper metallurgy is described. E. H.

**Distribution of copper in the slag and mat from pyritic smelting.** B. PENTEGOV. *Proc. 3rd Pan-Pacific Sci. Congr.* 1926, II, 1760-2 (Publ. 1928). E. M. SYMMES

**Physico-chemical air investigations in the manufacturing rooms of the copper foundry "Krassny Fakel."** S. BRUJEVIC. *Zentr. ges. Hyg.* 18, 702 (1928); *Wasser u. Abwasser* 25, 287.—Results showed the presence of 39.3 mg. of metals per cc. of air in the founding or casting room and 2.3-9.0 mg. per cc. in the molding and forming rooms. The elec. condition of the air points to a very high ionization. ZnO is negatively charged. C. R. F.

**A note on making steel in a basic-lined converter from Indian pig iron at Mysore Iron & Steel Works.** PREM N. MATHUR. *J. Indian Chem. Soc.* 6, 353-5 (1929).—Molten Indian Fe contg. 0.12-0.40% P is blown in a basic-lined converter by a process differing from the standard method mainly in that no afterblow is required.

**Heat economy in the steel industry.** SABURO UNNO. *J. Fuel Soc. Japan* 8, 760-73 (1929); English Abstract, *Ibid* 79-81.—U. measured the thermal efficiency of 6 heating furnaces in the Yawata Steel Works. The furnace temp. was measured by Holbarn-Kurlbaum photometric pyrometer where the temp. was highest and by a thermocouple of basic metal and by a Hg thermometer where the temps. were medium and low. The heat lost through the furnace walls and the amt. carried away with the discharge were calcd. The thermal efficiency can be increased by means of heat insulation and by the utilization of waste heat. The results of the expts. are illustrated by curves and drawings. F. I. NAKAMURA

**A new development in wrought iron manufacture.** JAMES ASTON. *Am. Inst. Mining Met. Eng., Tech. Publication No. 228*, 12 pp. (1929).—The inventor of a process for making wrought Fe without hand puddling describes the operations in a pilot plant producing 200 tons daily. He also explains the physicochem. principles involved.

**Byers new process for wrought iron.** JAMES ASTON. *Iron Age* 124, 341-4 (1929).—See preceding abstr. DOWNS SCHAAP

**Experimental data on the equilibrium of the system: iron oxide-carbon in molten iron.** A. B. KINZEL AND J. J. EGAN. *Am. Inst. Mining Met. Eng., Tech. Publication No. 230*, 9 pp. (1929).—An exptl. method is described for obtaining the FeO-C equil. const. at steel-melting temps. A figure for the FeO-C product of  $5 \times 10^{-4}$  is given as the wt.-concn. equil const. at 1550° and 1 atm. DOWNS SCHAAP

**Some cupola troubles.** W. H. BLEEKE. *Foundry Trade J.* 41, 115-6 (1929). E. H.

**The viscosity (of metals).** J. COURNOT. *Rev. métal.* 26, 326-8 (1929); cf. C. A. 20, 568; 21, 1090, 2454; 22, 375, 2543.—Results of measurements on Al and on duralumin show that the practical viscosity limit increases with the diam. of the wire.

**A new hardness tester.** J. POMEY AND P. VOULET. *Rev. métal.* 26, 238-47 (1929).—With this instrument, as with the Brinell, hardness is defined as the ratio of the load to the area of mark, which is made by a very small diamond cone, the angle of which has been selected to give a hardness value identical with the Brinell hardness. A. PAFINEAU-COUTURE

**Chemical action in relation to fatigue in metals.** B. P. HAIGH. *Inst. Chem. Eng.*, March 20, 1929, 15 pp.—Endurance and fatigue limits are affected by chem. action on the surface, even by water or air, and even if no visible corrosion occurs. Practical illustrations are given, and these conclusions were confirmed by lab. tests on specimens moistened with various reagents. It was proved that this "conjoint action" accelerated fatigue, irrespective of corrosion. Expts. carried out in America on the reduction of the fatigue limit of alloy steels by fresh or salt water are described. Results were found not to vary with the size of the specimen. Solns. were not more active than was water in affecting the fatigue limit; some, e. g., Na dichromate, are beneficial. Tests at higher temps. suggest that air in soln. in water may be of importance. The coating with grease, etc., of a specimen tested in air greatly increases the fatigue limit. B. C. A.

**Tensile strength and hardness of metals.** O. SCHWARZ. *Z. Ver. deut. Ing.* 73, 792-7 (1929).—Although for nonferrous metals (Al and its alloys excluded) a linear

relation between Brinell hardness and tensile strength does not exist, the expression  $K_z = 0.36 H_B$  for practical purposes is sufficiently accurate for all metals (where  $K_z$  = tensile strength, and  $H_B$  = Brinell hardness).

Heat-treating aircraft parts. HORACE C. KNERR. *Iron Age* 124, 519-24 (1929).

C. H. LORIG

E. H.

Heat-treating aluminum alloys. ROBERT J. ANDERSON. *Iron Age* 124, 514-6 (1929).

E. H.

Heat treatment of high-tensile aluminum alloys. A. R. PAGE. *Chem. News* 130, 102-4 (1929).

E. H.

A new macroscopical metallographic reagent. GEORGES D'HUART. *Rev. métal.* 26, 300-6 (1929).—The compn. of the new reagent is: distd.  $H_2O$  100 cc., concd.  $HCl$  100 cc., crystd. chromic acid 40 g., anhyd.  $NiCl_2$  16 g.; dissolve the  $NiCl_2$  in the  $HCl$  soln., with slight heating, cool and add the chromic acid. The time required for etching varies from a few sec. to a max. of 1 min. With less than the indicated amt. of  $CrO_3$ , there is an intense evolution of  $H_2$ , while a greater proportion causes surface oxidation with deposition of a brownish yellow film of oxide. The reagent does not keep because of oxidation of  $HCl$ , and the  $HCl-NiCl_2$  and  $CrO_3-H_2O$  solns. may be stored separately and mixed just before using. The etched piece is most conveniently photographed under a thin layer of  $H_2O$ , and all oxidation can be prevented by using a dil., slightly acid  $ZnCl_2$  soln. instead of  $H_2O$ . If the etched piece is to be dried, wash with  $H_2O$ , immediately immerse in  $ZnCl_2$  soln., let stand for some time (not specified), rinse in alc., dry in a current of warm air, and apply a soln. of dammar gum in benzine. When they are exceptionally strongly pronounced, lines of slippage in mild steel, which has been strained beyond the elastic limit, are revealed by the reagent; but with the following modified formula lines of medium, or even slight, intensity, can be readily revealed.  $H_2O$  100 cc.,  $HCl$  140 cc.,  $CrO_3$  40 g.,  $NiCl_2$  16 g., crystd.  $CuCl_2$  8 g. Formation of a deposit of  $Cu$  can be prevented by washing with a 120%  $HCl$  soln. (probably a misprint for 12%) until all the  $Cu$  has been removed, before washing with  $H_2O$ . If the lines do not stand out sufficiently, because the background is too dark, the latter may be cleared by treating for some time with concd.  $NH_4OH$ . Photomicrographs are given and discussed, showing the practical applications of the reagent and its advantages over the Heyn, LeChatelier and Oberhoffer reagents.

A. PAPINEAU-COUTURE

On the road to pure iron and some of its indicated properties. T. D. YLSEN. *Trans. Am. Electrochem. Soc.* 56 (preprint) 8 pp. (1929).—The purity of  $Fe$  has been gradually increased, until now one can readily produce it with an  $Fe$  content greater than 99.95%. The remaining 0.05% consists partly of interstitial elements, such as  $C$ ,  $P$ , etc., and partly of substitution elements, such as  $Al$ ,  $Si$ , etc. Of these 2 classes of impurities the interstitial elements have by far the greater effect on the phys. properties, and are very difficult to remove simultaneously. By careful prepn., using electrolytic  $Fe$  with a small quantity of  $C$  as deoxidizer, and vacuum furnaces, samples have been obtained with greatly improved magnetic properties, indicating that pure  $Fe$  may have a hysteresis loss approaching zero, and an exceedingly high permeability.

C. G. F.

A year's progress in steel treating. H. F. MOORE. *Iron Age* 124, 517-8 (1929).

E. H.

Hardening steel with nitrogen. V. O. HOMERBERG. *Iron Age* 123, 1562-5, 1759-61 (1929).—Steels contg. varying amts. of  $C$  with approx. 1 to 1.25%  $Al$ , 1 to 5%  $Cr$  and 0.20%  $Mo$  show max. surface hardness when exposed to  $NH_3$  gas at  $510^\circ$  under definite conditions. The process (Fry process) of case-hardening steels is called "nitriding." Equipment required for nitriding is discussed. If decarburization takes place before nitriding, the case will lend itself to chipping and flaking.  $Ni$  plating to a depth of 0.0005 in. or coating with  $Sn$  or solder protects the surfaces not to be hardened. The surface hardness is retained at high temps. and is equiv. to 1000 Brinell. Nitrided steels are resistant to atm.,  $H_2O$ , and salt  $H_2O$  corrosion.

C. H. LORIG

X-ray investigation of the structure of tempered carbon steel. G. KURDJUMOV. *Z. Physik* 55, 187-98 (1929).—A steel sample contg. 1.44%  $C$  was studied by the Debye-Scherrer powder method. The changes in property of hardened steel on annealing in the temp. range of  $100-150^\circ$  depend upon the destruction of the tetragonal form, which tends to go into the cubical lattice. The second change is due to the decomposition of austenite and the third change is connected with the formation of the mixt. of  $\alpha$  iron and cementite. These three changes have been found previously by a study of thermal expansion and elec. cond. Cf. G. Kurdjumov and E. Kaminskii, *C. A.* 23, 3198.

GEORGE GLOCKLER

Continuous bending experiments on steels. E. HOUDREMONT AND R. MAILANDER

**Krupp. Monatsh.** 10, 39-49(1929).—The results of 170 exptl. series of steels of varying compn. confirm the known relations between the fatigue strength, elastic limit and tensile strength. The fatigue strength increases more slowly than the tensile strength and much more slowly than the elastic limit with increased cold deformation.

**Response of steels at elevated temperatures.** W. H. HATFIELD. *J. West Scot. Iron Steel Inst.* 36, 60-71(1929).—Time-yield tests at elevated temps. indicate that for a mild steel contg. C 0.25%, Mn 0.53%, Si 0.11% and Ni 0.13%, the max. safe load for a continued period is 7.7 tons per sq. in. at 400°, and about 4 tons per sq. in. at 500°. For 3% Ni steel these values are about 10.5 and 5 tons per sq. in. respectively.

**Resistance to oxidation at elevated temps.** is studied with a few steels, the following gain in wt., expressed as mg. per sq. cm. of surface, being obtained by exposing the samples for 6 hrs. at 540° to steam formed from H<sub>2</sub>O contg. 5 cc. of O<sub>2</sub> per l. The results follow: 0.25% C, steel 0.62; high tensile alloy steel 0.73; 14% Cr stainless steel 0.24; 18% Cr, 8% Ni, rustless steel 0.01. Tensile tests at 800° show that Ni-Cr-W heat-resisting steels give values 20-25 tons per sq. in.

**Heat-resistant steels.** E. HOUDREMONT AND V. EHMCKE. *Krupp. Monatsh.* 10, 79-94(1929).—A review.

**The influence of size of section on the strength of gray cast iron.** J. G. PEARCE. *Foundry Trade J.* 41, 101-2, 104, 106(1929).

**Tensile strength and fracture of rolled strips of molybdenum.** TAKEO FUJIWARA. *Mem. Coll. Sci. Kyoto Imp. Univ. A* 12, 165-78(1929).—The tensile strengths of rolled strips of Mo, especially in reference to the direction of rolling, were detd. with a tensile testing machine, and their fractures examined by means of photomicrographs and x-rays.

**The effect of mixing small quantities of cobalt with brass.** DAIDZI IITSUKA. *Mem. Coll. Sci. Kyoto Imp. Univ. A* 12, 179-98(1929).—Cu and Co are not completely sol in the molten state; instead, they form 2 liquid layers, the soly. limits at a temp. a little higher than 1110° being 3.5% Co on the Cu side, and probably 8% Cu on the Co side. By using this modified diagram of the Cu-Co system, the author's diagram of the Cu-Zn system and Lewkonja's diagram of the Zn-Co system together with data on thermal analyses and microstructures of ternary compns., a corner of the ternary equil. diagram where Cu varies from 50-100%, Zn varies from 0-50% and Co varies from 0-10% was established.  $\beta$  brass is improved in all its mech. properties by addn. of Co, while  $\alpha$  brass is improved in strength but not in elongation. 60-40 brass with 3.4% Co is more resistant to sea water than simple brass.

**Resistance of zinc to indentation.** J. N. FRIEND AND W. E. THORNECROFT. *J. Inst. Metals*, Advance copy, March, 1929, 6 pp.—A machine by which the effect of varying load, duration of application and temp. on the deformation of soft metals can be detd., consists essentially of a steel bar supported on a fulcrum at one end and carrying a collar on the underside of which is affixed a hard steel cone (45°). The cone rests on a small block of the metal to be tested, which is contained in a marble trough with two glass sides, filled with liquid paraffin and heated electrically. With rolled 99.9% Zn under const. load  $L$ , at const. temp., the depth of indentation,  $D$ , varied with the time  $t$  according to the equation  $D = Kt^m$ , where  $K$  represents the depth of indentation when  $L$  acts for unit time.  $K$  varied with temp. and load,  $m$  with temp. only. A break in a smooth curve was indicated at about 160°, interesting in view of the supposed allotropic change of Zn at 160-180°.

**The electrical conductivity, corrosion and age-hardening of cadmium-zinc alloys.** G. GRUBE AND ARTHUR BURKHARDT. *Z. Metallkunde* 21, 231-4(1929).—The elec. cond. of Cd-Zn alloys at various temps. shows that Zn dissolves Cd in solid soln. to the extent of 3.7% at 263°, 3.08% at 226°, 2.06% at 212° and 0.92% at 142°, and that Cd dissolves Zn in solid soln. to the extent of 4.3% at 263°, 2.97% at 180° and 2.08% at 150°. The corrosion of these alloys for 24 hrs. in  $N$  NaOH at 25°, 2  $N$  NaOH at 35° and 3  $N$  NaOH at 30° was investigated. The loss of Zn was least and nearly zero between 0% Zn and 17.4% Zn (the eutectic compn.) but took a sudden jump at this compn., then falling off in intermediate compns. but rising to a second max. at about 82% Zn, then gradually falling off to that of pure Zn. The effect of time on corrosion by 2.9  $N$  NaOH at 45° was studied. For 3- and 6-hr. periods the corrosion curve was similar to the preceding except the second max. occurred at 77% Zn. Test pieces

were made up of 98% Zn and 2% Cd, rolled, quenched in water from 300°, and measured for tensile strength, elongation and Brinell hardness after aging. At 20° and at 70° pure Zn showed no change with this treatment. In 15 days the tensile strength rose from 14.3 kg./sq. mm. to 19.2 kg./sq. mm. and up to 8 weeks appeared to remain const. at this temp.; the elongation in 15 days increased from 5.7 to 11.4%; the Brinell hardness number (2.5/187.5/60) increased from 57.2 to 65.4 in 4 days and then fell slightly to 64.4 at the end of 15 days.

**Crystal faces developed by etching metallic crystals of aluminum and zinc.** BUN-TARO FUJITA. *Mem. Coll. Sci. Kyoto Imp. Univ. A* 12, 159-63(1929).—When the surface of a single crystal of a metal is etched by some reagent, its surface shines brightly in several directions. This seems to be caused by the reflection of light at many small and regularly arranged facets of the crystal, which are developed by etching. The crystallographic indices of Al and Zn crystals were detd. by means of an optical goniometer and x-ray analysis.

**Thermoelectric tests for aluminum-manganese and other alloys.** CYRIL S. TAYLOR AND JUNIUS D. EDWARDS. *Trans. Am. Electrochem. Soc.* 56, (preprint) 4 pp. (1929).—One % of Mn added to Al has a marked effect upon the thermoelec. properties of the metal. The high thermoelec. potential of the couple: alloy (Al + 1% Mn) vs. pure Al, forms the basis of a new sensitive instrument for distinguishing between pure Al and the Al-Mn alloy. The instrument is also applicable for testing Mg base alloys, contg. Al, against pure Mg; the galvanometer deflection is roughly proportional to the percentage of Al present.

**Preparation of aluminum alloys for microscopic examination.** HEINZ CHOLANT. *Z. Metallkunde* 21, 197-9(1929).—The use of  $\text{NH}_4$  alum during the polishing of Al alloys prevents the formation of a hazy surface. An alc. soln. of iron nitrate, acid with  $\text{HNO}_3$ , is recommended for the etching of  $\text{CuAl}_2$ , which it colors brown, leaving  $\text{NiAl}_3$  and  $\text{FeAl}_3$  uncolored. The technic of polishing and etching used by other workers is discussed. It is recommended that Al alloys be ground with emery paper with a layer of paraffin, polished with alc. and "Geolin" with the addn. of  $\text{NH}_4$  alum, etched for  $\text{CuAl}_2$  with alc. iron nitrate soln. and etched for iron compds. with  $\text{H}_2\text{SO}_4$ .

**The age-hardening of an aluminum alloy as revealed by x-ray diffraction.** FRHR. VON GÖLER AND G. SACHS. *Metallwirtschaft* 8, 671-80(1929).—Alloy pieces contg. Cu 5.05, Si 0.26, Fe 0.27 and Mg 0.03% were quenched from 525°. The tensile strength, elongation and reduction in area were detd. on pieces which had been aged at room temp. up to 80 hrs. and on others which had been "artificially aged" in steps of 50° up to 400° for 24-hr. periods and for 1/2-hr. periods. X-ray diffraction methods were applied to the change in Al lattice size resulting from the exclusion of Cu from supersatd. soln. (C. A. 19, 1213). The cube edge length  $a_0$  changed from 4.040 Å U. for pure Al to 4.030 Å U. for the quenched 5% Cu alloy. Single crystals of the 5% Cu alloy were prepd. and after given the heat treatments described above were photographed by the rotating crystal method. With aging temps. up to 220° for 1/2 hr. anneal  $a_0$  remains const., but above this temp.  $a_0$  increases suddenly, indicating pptn. of  $\text{CuAl}_2$ . The interference spots remain sharp up to 200° (1/2 hr. anneal) but are diffuse above this temp., again becoming sharp at 300°, indicating an inhomogeneous pptn. of  $\text{CuAl}_2$  and perhaps some lattice distortion. Pptn. is complete at 350° as indicated by the sharpness of the interference spots. New interference rings, originating in pptd.  $\text{CuAl}_2$ , appear at 300° (1/2 hr.). The mech. properties of similarly heat-treated single crystals were studied. The data indicate a distortion accompanying the second discontinuity in mech. properties originating in the pptn. of  $\text{CuAl}_2$  but indicate neither the pptn. of  $\text{CuAl}_2$  nor distortion of the lattice for the first discontinuity. Conclusion: The chief agent in age-hardening of this 5% Cu alloy is not the pptn. of  $\text{CuAl}_2$  but a change which proceeds within the Cu-Al solid soln. prior to but distinct from the pptn. itself, and may be pictured as a preparative process, probably an agglomeration of mols. of the compd.  $\text{CuAl}_2$  still, however, held in solid soln.

**Silver contents of specimens of ancient and medieval lead.** J. N. FRIEND AND W. E. THORNEYCROFT. *J. Inst. Metals*, Advance copy, March, 1929, 12 pp.—Detns. of the Ag content of 20 specimens of ancient, Roman and medieval Pb showed that pre-Roman Pb was not desilverized, although considerable variation occurred in their Ag content, a variation which occurred in medieval samples, some of which, however, were really of Roman origin. Spartan votive figurines (700-500 B. C.) contained 0.0568% Ag.

**Cadmium coating.** GIULIANO MONTELUCCI. *Rev. métal.* 26, 340(1929); cf.



de Lattre, C. A. 23, 806.—M. claims priority for the use of the Cd-Zn eutectic for Cd coating.

**The corrosion rate of ferro-nickel alloys.** COLIN G. FINK AND CLAUDE M. DE-CROLY. *Trans. Am. Electrochem. Soc.* 56 (preprint) 34 pp.(1929).—In the chem. engineering industry there has been an increasing demand for special alloys resistant to various chem. reagents. The authors record tests made on com. alloys of the Fe-Ni series, using the intermittent corrosion test, as this more nearly approaches actual service conditions. Specifications laid down by the Am. Soc. for Testing Materials were followed as closely as possible. Results in general indicate that the rate of corrosion in  $H_2SO_4$  increases at first very rapidly with the concn. of the acid, reaches a max., then decreases again, reaching a min., and usually increases again to reach a second max. The addn. of small percentages of Cr to the alloy, e. g., up to about 4%, does not materially alter the general trend of the Ni-Fe curves. However, higher percentages, such as one finds in nichrome, with 12.5% Cr, tend to eliminate the first sharp rise in the corrosion rate. Nor is there in these high Cr alloys a distinct min. to be detected. On the other hand, other alloys quite distinct in compn. from the ferro-Ni alloys, such as the com. Cu alloy Barberite, composed of Cu with a little Ni, Sn and Si, give the same type of corrosion rate curve as the Fe-Ni alloys. The addn. of  $CrO_3$  to the  $H_2SO_4$  does not render the surface of the Ni-Fe alloys passive, but, on the contrary, accelerates the corrosion. Contact potential measurements, made with the different samples of Fe-Ni alloys, show a relation between voltage and acid concn. somewhat similar to the corrosion rate relation, but in other respects are more or less distinct, indicating that the rate of corrosion is primarily dependent upon the rate of oxidation by the O dissolved in the  $H_2SO_4$ , and not by the rate of ionization of the metal.

C. G. F.

**Accelerated corrosion tests for coatings of the iron phosphate type.** E. M. BAKER, A. J. HERZIG AND R. M. PARKE. *Trans. Am. Electrochem. Soc.* 56 (preprint) 9 pp. (1929).—Coatings of the Fe phosphate type, often used in place of certain electroplated coatings, were produced on mild steel from solns. contg. various concns. of Fe phosphate and phosphoric acid. The salt spray test and intermittent immersion tests in distd. water and 0.01 N  $H_2SO_4$  were suitable for evaluating the quality of the coatings. Intermittent immersion tests in 5 and 20% NaCl solns. were unsuitable. Substantially all the Fe in the soln. is in the Fe state after the bath has been in operation. Some observations are presented on the effect of bath compn. on the quality of coating, and on the optimum bath compn. for best quality.

C. G. F.

**Corrosiveness of soils with respect to iron and steel.** Preliminary studies. H. D. HOLLER. *Ind. Eng. Chem.* 21, 750-5(1929).—A method of estg. soil corrosion based on the relation of salt content, acidity and corrosiveness of soil to rainfall is suggested. The corrosiveness of soils as indicated by the initial losses of buried specimens in humid areas of the U. S. has been correlated with their acidity. A relation exists between the ability of a soil to react on Fe with liberation of  $H_2$  and its total acidity as indicated by titration. The corrosiveness of a soil in humid regions may possibly be indicated by its total acidity or by its action on Fe with evaluation of  $H_2$ .

E. F. SNYDER

**Some aspects of corrosion in cast iron main pipes.** J. R. BRADSHAW. *Gas J.* 186, 593-6(1929).—Eight samples of cast iron pipes of varying sizes, ages and surroundings, some gas pipes and some water pipes, were studied for corrosion effects. The outside corrosion consisted essentially of  $FeO$ , etc., typical of electrolytic soil action. With the exception of a gas main over 75 years old, the internal deposits were essentially brown hydrated ferric oxide with various amts. of  $FeO$ , the former pipe showing much org. matter. Pipe buried in firm clay stands up much longer than in a mixt. of clay and ashes or wet clay. A standard and unvarying quality of Fe of high d. should last almost indefinitely.

J. B. CARPENTER, JR.

**The corrosion of light and ultra-light metals and alloys.** R. CAZAUD. *Rev. métal.* 26, 209-20, 259-86, 307-25, 367-77(1929).—A summary of the work carried out and results obtained to date under the direction of the sub-comm. on light and ultra-light alloys of the permanent comm. on aeronautical investigations, with bibliography of 60 references. **Methods for testing the corrosion of light alloys and metals in wet media.** X. WACHÉ AND G. CHAUDRON. *Ibid* 209-13.—Corrosion of Al and duralumin by  $H_2O_2$  soln., both in presence and absence of NaCl, was studied, the technic adopted being as follows: clean with 000 glass paper, weigh, after treatment with the corroding soln. collect the easily detachable  $Al_2O_3$  on a tared filter, and dry 36 hrs. at  $50^\circ$  side by side with the test sample to which adheres the remainder of the  $Al_2O_3$ . Within limits of 1.5-4%, the concn. of  $H_2O_2$  (without addn. of NaCl) has no appreciable effect on the rate of oxidation of Al as cast. Addn. of NaCl facilitates oxidation of Al, and

the rate of attack does not remain as const. over the  $H_2O_2$  concn. range of 1.5-4%, which is attributed to the fact that NaCl reduces the adhesion of the  $Al(OH)_3$  film to the metal, thus affording the O easier access to the metal. A 1%  $H_2O_2$  soln. has very little effect on duralumin, even at the end of 3 weeks, but corrodes Al to a considerable extent; on addn. of 1% NaCl the rate of attack of duralumin becomes greater than that of Al, but the reaction on duralumin is practically complete at the end of 2 hrs. The following explanation is put forward: the addn. of other metals (principally Cu) to Al in duralumin increases its resistance to oxidation by the non-conducting  $H_2O_2$ , but on addn. of NaCl, which is an electrolyte, electrochem. phenomena come into play, because of phys. and chem. differences in the surface of the metal, and facilitate oxidation. After heating 3 hrs. at  $480^\circ$  and quenching in cold water, there was no appreciable change in the rate of oxidation of either Al or duralumin; subsequent annealing for 88 hrs. at  $220^\circ$  did not cause any appreciable change in the rate of corrosion of Al, and slightly increased that of duralumin. Addn. of Mg reduces the corrodibility of Al by  $H_2O_2 + NaCl$ , while Si and Cu increase it. It was previously shown (C. A. 22, 3616) that the electrochem. theory applies in the case of the soln. of Al and its alloys in acids, and the mechanism of oxidation by  $NaCl + H_2O_2$  appears to be similar. The parallelism between the two, however, holds only as regards the rate of soln. per unit area, detd. after the end of the induction period (in the case of soln. in acids), and the loss of metal caused by attack of  $H_2O_2 + NaCl$ . Application of solution electromotive forces to the study of light alloys. AUBERT AND PROT. *Ibid* 214-7.—The purposes of the investigation were to find what coated metals would corrode least in case the coating were damaged, and to devise a method for differentiating alloys and detg. their resistance to corrosion by sea water. The results, which are given very briefly, indicate that the only metal suitable for protecting Al against sea water is Zn, while for duralumin Cd might also possibly be used. The detn. of soln. potential does not appear to furnish a convenient or satisfactory method of differentiating between different Al alloys, at least by the method used by A. and P. The corrosion of aluminum alloys. QUILLARD AND BASCOM. *Ibid* 217-20.—The results obtained so far would indicate that the corrodibility of an Al alloy can be detd. rapidly as a function of its chem. activity toward  $HgCl_2$  and of its soln. potential before and after chem. treatment; but the conditions of such a test have not yet been definitely ascertained. Study of the corrodibility of magnesium and ultra-light alloys. A. PORTEVIN AND E. PRETET. *Ibid* 259-72; cf. C. A. 21, 3338.—A more detailed account of the investigation. Value of radiometallographic methods for detecting fissures and internal defects in the metal of light alloys. JEAN COURNOT AND ALBERT ROUX. *Ibid* 272-4. Micrographic study of the corrosion of a few light alloys by sea water. R. CAZAUD. *Ibid* 274-81.—The resistance of light alloys to corrosion by sea water can easily be estd. by photographing before treatment and after immersion for 6, 24 and 72 hrs. in sea water; and it is considered that the classification which is thus obtained quite rapidly cannot differ appreciably from that obtained from tests of longer duration. As regards the effects of addn. of other elements to Al, Si and Mn have a distinctly beneficial effect and Mg has a harmful effect on the resistance to corrosion. Annealed duralumin is appreciably more corrodible than heat-treated duralumin, and the constituent elements seem to be attacked to a less extent than the solid soln. of Al. Effect of occluded gases on the solution of aluminum-copper alloys in hydrochloric acid. R. CAZAUD AND A. PETIT. *Ibid* 281-5.—The rate of evolution of  $H_2$  per unit area, at given temp. and concn., was used to characterize the soly. of the metal. Different alloys differ especially during the 1st stage of attack which Chaudron and Waché call the "induction period"; but 2 alloys having different rates of attack at the start may have the same rate at a subsequent stage, and C and P. define the attackability by the curve of vol. of  $H_2$  as a function of time. The rate of soln. increases with the fineness of the structure of the alloy. Dil HCl dissolves only the Al leaving the Cu in the form of a spongy mass having the same dimensions as the original metal. After a fusion in high vacuum, which eliminates the occluded gases, the corrodibility of the metal is always lowered. pH measurements applied to the study of corrosion of light alloys by sea water. ABEL PETIT. *Ibid* 285-6.—The investigation was carried out to det. the variation produced in the pH value of sea water by immersion of light alloys, with a view to classifying the alloys, if possible. The area of the test pieces had but little effect on the pH of the soln. The order of classification of a no. of alloys varies with the time of immersion. The expts. did not give any indication as to which of the constituent elements of the alloys increases or decreases their corrodibility. The method would seem to permit of differentiating between the samples; but under the limits of accuracy of the technic followed the

natural heterogeneity of the samples and the formation of a thin film of cold-hardened metal during polishing apparently produce greater variations than the constituents of the alloys. Method for rapidly estimating the permeability and adherence of varnishes used for the protection of light alloys. AUBERT AND G. DIXMIER. *Ibid* 307-8.—See Dixmier, C. A. 22, 4842. Protection of aluminum by coating in salt solutions. AUBERT AND G. DIXMIER. *Ibid* 309-10.—Each test piece was cleaned by washing successively with benzine, alc. and  $\text{H}_2\text{O}$ , dried on soft paper, and finally immersed in the reagent. They were then subjected to corrosion tests in sea water, and the degree of corrosion was judged from the appearance of the sample. Conclusions: (1) Salts, particularly  $\text{NH}_3$  salts, afford no protection, only  $\text{Na}_2\text{SO}_3$  possibly giving some protection, and only at  $100^\circ$ . (2) Water under pressure affords but poor protection. (3)  $\text{KHCrO}_4$ ,  $\text{Na}_2\text{CrO}_4$ ,  $\text{K}_2\text{Cr}_2\text{O}_7$ ,  $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$ ,  $\text{KMnO}_4$ , Na vanadate, Na tungstate and Na molybdate in alk. ( $\text{Na}_2\text{CO}_3$  or  $(\text{NH}_4)_2\text{CO}_3$ ) soln. all give adherent coatings affording good protection, which could be greatly improved by the concurrent use of an oil or varnish. (4) No difference was observed due to differences in the degree of polishing. Protection of light alloys by tars. AUBERT AND A. PIGNOT. *Ibid* 310-2.—The properties required of a satisfactory varnish for light alloys are enumerated. The following gave satisfactory results: pitch (volatile 52-7%, m. p. (Kraemer) 68-75°) 65, PhOH 5, crude benzine (distd. 100-80°) 30; pitch 65,  $\text{C}_6\text{H}_5\text{N}$  5, crude benzine 30; pitch 65, light anthracene oil 10, crude benzine 25% by wt. A no. of varnishes with coumarone resin base were also studied, but were found unsatisfactory. Protection of light and ultra-light metals and alloys against corrosion by sea water by electroplating. JEAN COURNOT AND JEAN BARY. *Ibid* 312-8; cf. C. A. 21, 708; 22, 753.—The previously published report is reproduced in somewhat more detailed form. Cementation of light and ultra-light alloys in order to protect them against corrosion by sea water. JEAN COURNOT AND EUGÈNE PEROT. *Ibid* 318-25, 367-74; cf. C. A. 21, 1246, 2651, 2867.—A more detailed account of the investigation. Protection of aluminum and light alloys against corrosion by sea water by means of electrolytic cadmium plating. J. COURNOT. *Ibid* 374-6; cf. C. A. 22, 753.—Satisfactory coating could not be obtained with  $\text{CdSO}_4$  in  $\text{H}_2\text{SO}_4$ . Best results for coating Al and duralumin were obtained with a bath contg:  $\text{CdCO}_3$  11.6 g., KCN 35 g., Na phosphate 5 g.,  $\text{K}_4\text{Fe}(\text{CN})_6$  7.5 g., gelatin 2.5 g. per l., 0.5-0.7 amp. per sq. dm. and 3-5 v. The coatings obtained under these conditions did not fail in bending and stamping tests until the supporting metal cracked, and corrosion tests in sea water gave entirely satisfactory results. Excellent results were also obtained by applying a light Cd coating, followed by Cr-plating at 13-17 amp. per sq. dm., under 4-5 v., at exactly  $50^\circ$ , in a bath contg: chromic acid (free from  $\text{H}_2\text{SO}_4$ ) 250 g.,  $\text{Cr}_2(\text{SO}_4)_3$  5 g., crystd.  $\text{Na}_2\text{CO}_3$  14 g., boric acid 3 g. per l.

A. PAPINEAU-COUTURE

A simple apparatus for the immediate and direct reading off of the corrosion of metals, the formation of incrustations, as well as the oxidizing power of solutions (Tödt's Oxydimeter). LUDWIG KÖHLER. *Chem.-Ztg.* 53, 567(1929).—Cf. C. A. 23, 588, 1859, 2410. J. H. MOORE

The determination of Co in alloys, etc. (HEIM) 7. Wood producer gas for the treatment of Ag ores (VAN HOEK) 21. Industrial gas in the United States—growth and trends (LOBELL *et al.*) 21. The dry grinding of calcite tailings from the Kingdon Pb mine Galletta, Ontario (CARNOCHAN, *et al.*) 18. The Hall effect in Ni-steel alloys (SALERNO) 2. Annealing (Ger. pat. 478,990) 13. A cooling drum for annealing (Ger. pat. 478,937) 1.

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Ore treatment. EDUARD BENDER and BENDER & FRÄMES G. M. B. H. Ger.

478,643, Jan. 13, 1927. A lattice for Cowper's app. or regenerative chambers is described.

**Treatment of ores.** PETER TROTZIG. Ger. 477,950, Feb. 20, 1927. Slime from heavy ores is subjected to an elec. current to produce a foamy mass.

**Device for sorting and grading ores, coal and coke.** WM. ROSS. Ger. 478,721, Jan. 27, 1927.

**Separating ore constituents by passage through an alternating magnetic field.** J. A. SEEDÉ (to British Thomson-Houston Co., Ltd.). Brit. 305,102, Jan. 30, 1928.

**Apparatus for sorting mineral pulps hydraulically.** THOMAS G. MARTYN. U. S. 1,724,100, Aug. 13. Structural features.

**Rotary cylindrical apparatus for wet concentration of ore constituents.** A. R. BROWN and J. I. YEATS. Brit. 304,508, March 12, 1928. Structural features.

**Vertical retort apparatus (and mode of working) for reducing iron, copper or nickel ores.** F. L. DUFFIELD. Brit. 304,174, Oct. 10, 1927. Structural features.

**Treating tin-bearing ores, etc.** W. WITTER, M. LISSAUER, H. LISSAUER and B. GRIESMANN (trading as M. Lissauer et Cie). Brit. 304,829, Oct. 27, 1927. Sn ores and other Sn-bearing materials are mixed with a reducing material such as C and heated in stages from 200° to 800° to remove As, Sb, Pb and Bi successively by volatilization without affecting the Sn. Zn also may be partly removed in a similar manner. Cu and Ag may be sepd. by use of NaCl in a subsequent treatment. A rotary furnace may be used, and various details are given.

**Recovering or purifying light metals.** I. G. FARBENIND. A.-G. (Adolf Beck, inventor). Ger. 479,481, Jan. 16, 1926. See U. S. 1,661,526 (C. A. 22, 1322).

**Tin recovery from scrap.** LES PETITS FILS DE F. DE WENDEL ET CIE. Brit. 304,639, Jan. 25, 1928. Residues, sweepings, etc., from the manuf. of tin-plate are treated with hot alk. solns. such as NaOH and Na<sub>2</sub>CO<sub>3</sub> together. An app. is described.

**Apparatus for sooting molds.** HERMANN MÜLLER. Ger. 477,988, May 15, 1928. A radial nozzle device for sooting molds is described.

**Molds for casting plated ingots.** S. H. CARBIS (to Aluminium, Ltd.). Brit. 304,752, Jan. 27, 1928. Structural features.

**Ingot molds.** M. BLAGÉ and SOC. ANON. DES FORGES DE VIREAUX-MOLHAIN. Brit. 304,302, Jan. 20, 1928. Structural features.

**Aluminum castings.** EUGEN STRASSER (to Max Dietiker). U. S. 1,724,624, Aug. 13. Molds are formed of a mixt. of molding sand and finely divided Cu ore.

**Alloy-surface castings.** ROGER WILLIAMS (to Electro Metallurgical Co.). U. S. 1,725,039, Aug. 20. Alloys are formed on the surface of castings formed mainly from iron or steel by casting the metal in molds which are coated with metal particles contg. Cr such as ferro-Cr together with woven org. material and a material such as NaF, which is capable of inhibiting the formation of oxides and of promoting the uniformity of the coating.

**Castings with a chromium alloyed surface.** WALTER M. MITCHELL (to Electro Metallurgical Co.). U. S. 1,724,299, Aug. 13. Base metal castings contg. Cr 5-15% throughout and which may be otherwise composed mainly of Fe and Ni are provided with a Cr alloy surface contg. over 25% Cr, which avoids cracking and warping. Cf. C. A. 22, 3387.

**Die-casting apparatus.** WALTER O. WILL and ERIC CARLSON (to Stewart Die Casting Corp.). U. S. 1,724,331, Aug. 13. Structural features.

**Die-casting apparatus.** DAVID J. CONANT (to Westinghouse Elec. & Mfg. Co.) U. S. 1,724,395, Aug. 13. Structural features.

**Die-casting machine.** INTERNATIONAL DE LAVAUD MFG. CORP. Ger. 478,887, Oct. 25, 1927.

**Die-casting mold.** CONRAD VAUGHAN and F. H. ADAMS (1926), LTD. Ger. 477,992, Oct. 21, 1927. Details are given.

**Nitrogenized steel dies for stamping metals.** P. F. M. AUBERT, A. J. P. DUVAL and H. A. M. DUVAL (trading as Aubert et Duval Frères). Brit. 305,539, Feb. 6, 1928. Various details of prepreg. nitrogenized dies are given.

**Rolling strip metal.** BELL TELEPHONE LABORATORIES, INC. Brit. 304,849, Oct. 31, 1927. Strips of metal such as the Fe-Ni alloy "Permalloy" for continuous inductive loading of a. c. conductors are made by preforming wire to strip form and then accurately sizing the strip by cold-rolling. An app. is described.

**Blast-furnace operation.** VULCAN-FEUERUNG A.-G. Brit. 304,887, Dec. 16, 1927. Water is supplied to the smelting zone of blast or cupola furnaces by spraying it so close to the furnace tuyères that the water enters in liquid form. A nozzle construction is described. Cf. C. A. 23, 811.

**Blast-furnace charging apparatus.** A. E. HANDY (to Waygood-Otis, Ltd.). Brit. 304,772, Jan. 28, 1928. Structural features.

**Cupola furnace.** MAX FELDER. Ger. 478,849, May 23, 1926. The furnace has an adjacent hot hearth for the refining and superheating of the molten metal.

**Smelting furnace.** CLEMENT H. MACE. U. S. 1,724,490, Aug. 13. Various details of blast furnace tuyère construction, etc., are described.

**Reverberatory smelting furnace.** HENRY L. CHARLES. U. S. 1,724,340, Aug. 13. Structural features.

**Construction and operation of regenerative open-hearth furnaces used in steel making.** GEORGE H. ISLEY (to Morgan Construction Co.). U. S. 1,724,656, Aug. 13.

**Continuous furnace for annealing and heat-treating metals.** ARTHUR T. KATHNER. U. S. reissue 17,413, Aug. 20. See original pat. No. 1,669,902 (C. A. 22, 2351).

**Continuous open-ended furnace for annealing and heat treating metals.** ARTHUR T. KATHNER. U. S. 1,725,398, Aug. 20. Structural features.

**Spongy iron.** HÖGANÄS-BILLESOLMS AKTIEBOLAG. Ger. 478,563, Dec. 3, 1927. Spongy Fe is prep'd. from pressed ore mixed with C and Ca compds. contg. S by heating without admitting air or gas. Cf. C. A. 23, 1863.

**Cementing iron and steel.** CARL LUTZ. Ger. 479,402, Oct. 29, 1926. Finely divided tobacco waste or tobacco dust is used as the source of C. It may be mixed with small amts. of carbonaceous substances such as wood charcoal.

**Rust-proofing iron and steel.** W. H. COLE. Brit. 305,386, Feb. 28, 1928. In a process such as is described in Brit. 289,906 (C. A. 23, 811), a soln. is used which is prep'd from Fe oxide 25, ZnO 15, Cr oxide 1 and Al 1 part, separately dissolved in  $H_3PO_4$ , the solns. being then mixed and further treated with  $K_2Cr_2O_7$ ,  $K_2CrO_4$ ,  $NH_4$  phosphate or naphthalene. Cf. C. A. 23, 3894.

**Heat-treating steel.** H. HANEMANN. Brit. 304,196, Jan. 16, 1928. Steel pieces are first heated for a long time to 20–50° below the crit. points and then heated quickly and uniformly throughout (suitably by direct resistance heating or by eddy currents) beyond the crit. points, and allowed to cool.

**"High-speed" steels.** STAHLWERK BECKER A.-G. Brit. 305,105, Dec. 30, 1926. In high-speed steels contg. Co, the C content is increased, above 0.6%, by 0.04% for each 1% of Co. Cf. C. A. 22, 3877.

**Refining nickel and its alloys.** BELL TELEPHONE LABORATORIES, INC. Brit. 304,371, Oct. 20, 1927. Ni or alloys formed mainly of Ni, while molten, are treated with V, Ta or Nb in small proportions and V may be followed by a small quantity of Mg. Various details are given.

**Bearing alloy containing copper and lead, etc.** ALBERT H. ACKERMAN (to Ackermite Co.). U. S. 1,724,896, Aug. 20. A bearing metal is formed from Cu and Pb combined while molten with S, Sb sulfide, As sulfides and As oxide.

**Bearing metals containing lead and other metals.** E. ABEL. Brit. 304,548, May 18, 1928. Pb is used with less than 1% Rb or Cs or both and also Na; other elements also may be present such as alkali metals, alk. earth metals, Al, Be, Cd, Co, Cu, Ni, Bi, Zn, Sn, Sb, As, P, S, Se and Si.

**Brazing alloy.** ANDREW E. AVERRETT (to General Elec. Co.). U. S. 1,724,818, Aug. 13. An alloy suitable for use as a substitute for ordinary silver solder comprises Cu about 54, Zn about 36 and Ag about 10%. Cf. C. A. 23, 2146.

**Aluminum-silicon alloys.** A. PHILLIPS, E. BARON and METROPOLITAN-VICKERS ELECTRICAL CO., LTD. Brit. 305,311, Nov. 24, 1927. Al-Si alloys contg. 5–15% Si are obtained in the modified condition by heating the molten alloy with anhyd.  $Na_2CO_3$  or other alkali metal carbonate or bicarbonate.

**Aluminum-silicon alloys.** SOC. D'ÉLECTROCHIMIE D'ÉLECTROMÉTALLURGIE ET DES ACIERIES ÉLECTRIQUES D'UGINE. Brit. 305,640, Feb. 8, 1928. Crude Al-Si alloys, which may be elec. furnace products contg. over 67% Al and contg. also impurities such as Fe, C and Ti, are submitted to liquation (suitably at about 575°) for producing a more refined alloy contg. a higher proportion of Al and a solid residue contg. a greater proportion of Si together with most of the impurities. The material may be preliminarily heat-treated to increase the size of the Si crystals. Cf. C. A. 23, 4183.

**Copper-aluminum alloys plated with gold alloys.** VICTOR D. DAVIGNON (to General Plate Co.). U. S. 1,725,445, Aug. 20. Various details are given of the manuf. of plated products.

**Iron-chromium-nickel alloys.** F. KRUPP A.-G. Brit. 305,654, Feb. 9, 1928. In alloys such as those which contain Cr 18–25 and Ni 7–12%, together with Fe, the quantity of other constituents such as C is so det'd. that the alloys retain an austenitic

structure when heated to 600–900°. The C may be less than 0.07%, and other elements such as Mo and Cu may be present.

**Iron alloys.** T. D. KELLY. Brit. 304,893, Dec. 23, 1927. A base alloy of Fe contg. Si or Mn (with or without C and which may also contain 0.2–2.0% of V, Mo or W) is mixed in a non-oxidizing atm. with alloys contg. Cr, Ni and Cu (or Cr and Ni or Cr and Cu) 5–20 parts each together with C-free Fe 60–80 parts, to form finished alloys contg. 2–20% Si or Mn or both. Melting may be effected in an elec. furnace or by use of powdered fuel substantially free from S and burnt by hot air or gases under pressure. Al, Mg, powdered C, ferro-Si or ferro-Mn may be used as deoxidants.

**Magnesium and its alloys.** I. G. FARBENIND. A.-G. Brit. 305,197, Feb. 2, 1928. The resistance to corrosion of Mg and its alloys is improved by treating them for an hr. or more with a boiling aq. soln. of a bichromate (suitably after a preliminary treatment with dil. HNO<sub>3</sub>).

**Protecting magnesium or its alloys from corrosion.** METALLGES. A.-G. (formerly Metallbank und Metallurgische Ges. A.-G.). Brit. 305,544, Feb. 6, 1928. Pure Al or an Al alloy such as an Al-Si alloy is used for coating Mg or Mg alloys.

**Steel alloys.** H. J. SCHIFFLER. Brit. 304,303, Jan. 19, 1928. Steels resistant to scaling up to 800° contain Al 1–4% with or without addn. of other metals such as Mn, Cr, W, Mo, Ti and V. They may be annealed at 750–950° and quenched, with or without reheating to 500–750°. Steel alloys contg. Cr or both Cr and Ni and higher proportions of Al also are mentioned.

**Heat-resistant steel alloy.** OESTERREICHISCHE SCHMIDTSTAHLWERKE A.-G. Brit. 305,047, Jan. 28, 1928. Steel alloys are formed contg. up to 25% Al, about 0.8–2.0% C and up to 6% Si, with or without up to 10% Cu and up to 25% Cr. Ni may be used instead of part or all of the Cu.

**Zinc alloys.** W. M. PEIRCE and E. A. ANDERSON (to New Jersey Zinc Co.). Brit. 305,651, Feb. 9, 1928. See U. S. 1,716,599 (C. A. 23, 3657).

**Heat-treatment of steel bars.** GEORGE LANGFORD (to McKenna Process Co. of Ill.). U. S. 1,724,031, Aug. 13. After heating to approx. its hardening temp., the temp. of the bar is slowly lowered to the crit. point for the steel, and the bar is afterward slowly cooled in order to effect oil tempering.

**Salt bath for heat-treating metals.** ARTHUR E. BELLIS. U. S. 1,724,551, Aug. 13. A salt bath comprising KCl 79 and anhyd. Na borate 20 parts is used. U. S. 1,724,552 specifies the use of B<sub>2</sub>O<sub>3</sub> as an oxide solvent in salt baths for heat-treating metals.

**Hardening metal articles by nitrogenization.** P. F. M. AUBERT, A. J. P. DUVAL and H. A. M. DUVAL (trading as Aubert et Duval Frères). Brit. 304,783, Jan. 26, 1928. Articles of steel or cast iron and which contain one or more of the elements Al, Si, Mn, Ni, Cr, Mo, W, V, Ti and Zr are nitrogenized in their marginal layers sufficiently to impart resistance to the action of corroding agents, and only for such a time that the condition of the nitrogenizing agents is not altered. Cf. C. A. 23, 800.

**Case-hardening.** DEUTSCHE GOLD-UND SILBER-SCHNEIDANSTALT VORM ROESSLER. Brit. 304,209, Jan. 16, 1928. Articles of iron or steel are hardened in a molten bath of salts such as chlorides admixed with finely divided C such as charcoal, with or without caustic alkalis, carbonates, cyanides, cyanamides, etc., preferably at 900–950°.

**Protecting metal surfaces.** VEREINIGTE STAHLWERKE A.-G. (Arthur Boeddeker, inventor). Ger. 478,902, May 8, 1927. App. for coating metal objects with a protective film of condensed oil vapor is described.

**Carbonizing the surface of metals.** H. M. ELSEY (to Westinghouse Elec. & Mfg. Co.). Brit. 305,465, Feb. 4, 1928. Metals such as Ni, W and Ni alloys, which may be used in electron tubes, are first superficially oxidized and then heated to 700–1000° in a hydrocarbon gas (which may be dild. with N, A or He) to effect reduction and carbonization.

**Carbonizing the surface of metals.** C. B. ÜPP and L. SUTHERLIN (to Westinghouse Elec. & Mfg. Co.). Brit. 305,467, Feb. 4, 1928. Metal such as Ni, Mo, W or a Ni alloy, which may be used in electron tubes, is passed through a tube through which is passed also a hydrocarbon gas such as C<sub>2</sub>H<sub>2</sub>, CH<sub>4</sub>, C<sub>2</sub>H<sub>4</sub>, petroleum ether or natural gas, and heated electrically or by gas burners.

**Treating aluminum surfaces to prevent corrosion.** B. JIROTKA. Brit. 305,149, Oct. 28, 1927. Al or Al alloys are treated with HNO<sub>3</sub> of a strength of at least 25% for 15–60 min. Different colored effects may be obtained by adding to the acid small quantities of salts of Cr, Cu, Co, Ni, Zn or other suitable metals, and an alkali chromate may be added to increase the oxidizing action. In some cases, the Al article while immersed in the acid is connected with a C electrode so as to form a closed circuit. After the treatment the metal may be coated, e. g., with a varnish, paint, celluloid or resin.

**Coating surfaces with osmium.** N.-V. PHILIPS' GLOEILAMPENFABRIEKEN. Brit. 304,580, Oct. 31, 1927. A wire or rod of W, Mo, Ni or C, or other article to be coated with Os is heated in an atm. contg. one or more volatile carbonyl halogen compds. of Os, preferably the chloride.

**Coating surfaces with rhodium, iridium and ruthenium.** N. V. PHILIPS' GLOEILAMPENFABRIEKEN. Brit. 304,396, Oct. 31, 1927. The articles to be coated (which may be metallic or non-metallic) are heated in an atm. contg. one or more volatile compds. of the coating metal such as the carbonyl chlorides.

**Apparatus for cleaning and degreasing metal objects.** ALEXANDER WACKER GES. FÜR ELECTROCHEMISCHE INDUSTRIE G. M. B. H. (Georg Wolff, inventor). Ger. 479,389, Sept. 21, 1927.

**Welding.** TH. GOLDSCHMIDT A.-G. (Fritz Wust, inventor) Ger. 478,544, Sept. 3, 1925. Iron cuttings are made into bundles, heated to welding temp. electrically, and subjected to pressing, hammering or rolling.

**Welding aluminum-plated sheet iron ware.** F. JORDAN Brit. 304,170, Oct. 15, 1927. Al-plated sheet iron parts are welded together autogenously by elec resistance pressure electrodes so as to convert the Al into oxide, which melts together with the iron to complete the weld.

**Rosin-core solder.** PERRY C. RIPLEY (to Kester Solder Co.). U. S. 1,724,680, Aug. 13. A permanently plastic rosin-contg. material fills and seals a solder tube.

## 10—ORGANIC CHEMISTRY

CHAS. A. ROUILLER AND CLARENCE J. WEST

**Waxes and boghead coals as mother substances of petroleum.** IV. N. D. ZELINSKII AND K. P. LAVROVSKI. *Ber.* 62B, 1264-6 (1929); cf. *C. A.* 22, 2920.—Beeswax heated with 30% of  $\text{AlCl}_3$  began to decomp. at  $120^\circ$  and yielded 80% of liquid and solid products from which was isolated a substance volatile with steam, b.  $70\text{--}300^\circ$ , consisting chiefly of paraffin hydrocarbons; the portion non-volatile with steam yielded on extn with  $\text{Et}_2\text{O}$  liquid paraffins, b.  $90\text{--}250^\circ$ , and solid paraffins, m.  $59^\circ$ , mol. wt (Rast) 317, and m.  $70\text{--}1^\circ$ , mol. wt. 426. From 300 g of a boghead coal heated under 10 mm. with 30%  $\text{AlCl}_3$  was obtained 107 g. condensate, most of which solidified. The hydrocarbons volatile with steam b.  $90\text{--}210^\circ$  and reacted with  $\text{KMnO}_4$ ; on hydrogenation with Pt-charcoal they gave a light naphtha oil in which cycloparaffin hydrocarbons predominated. The portion of the condensate not volatile with steam consisted chiefly of a paraffin m.  $63\text{--}4^\circ$ , mol. wt. 380. There is no doubt that the tar, so rich in unsatd. compds., obtained by the dry distn. of Siberian boghead coals differs materially in its chem. nature from that obtained by decomp. such a boghead coal with  $\text{AlCl}_3$ . C. A. R.

**The gradual combustion of hydrocarbons.** STANISLAS LANDA. *Paliva a topeni* 11, 1-4 (1929); cf. *C. A.* 22, 1948.—I. The oxidation of paraffin yielded propionic, formic, acetic, capric and caproic aldehydes, MeOH and EtOH,  $\text{Et}_2\text{CO}$  and  $\text{MeCOEt}$ . The yield of low alcs and ketones was large; higher alcs could not be found. This suggests that paraffin contains branched C chains besides the *n*-chain. II. Triacontane  $\text{Me}(\text{CH}_2)_{28}\text{Me}$  was prepd. by the electrolysis of alc. K palmitate and from a Japanese wax. The reaction proceeds thus:  $2\text{C}_{15}\text{H}_{31}\text{COO} \longrightarrow \text{C}_{30}\text{H}_{62} + 2\text{CO}_2$ . The product settles out on the surface as an oil. It was washed with alc. KOH,  $\text{H}_2\text{O}$ , and rectified *in vacuo*. After redistn., it had the appearance of paraffin; it crvstl. from  $\text{C}_6\text{H}_6$  in large plates, m.  $66^\circ$ . The gradual combustion occurred from  $290\text{--}310^\circ$ . At  $330^\circ$  the triacontane burned with a flame. At  $300^\circ$  very little cracking occurs without catalysts. The evolved gases were collected and showed  $\text{CO}_2$  0.49%, unsatd. hydrocarbons 0.47%,  $\text{O}_2$  16.63%, H 0.00%, CO 1.65%,  $\text{CH}_4$  and homologs 0.00%, N 80.76%. The sol. products contained no fraction b. below  $100^\circ$ . The soln. had an aldehyde odor, colored Schiff's reagent, reduced  $\text{NH}_3\text{-AgNO}_3$ , and did not give the  $\text{CHI}_3$  reaction. AcH was not present, EtOH was absent (even the test was negative); MeOH could not be detected either as MeI or by its reaction with salicylic or  $\text{H}_2\text{SO}_4$ . HCHO was demonstrated by Hehners', Marquis', etc., reactions. After burning 200 g. triacontane, 73 cc. 1 *N* NaOH was necessary to neutralize the acids present. The acid which was identified was  $\text{HCO}_2\text{H}$ ; neither AcOH nor  $\text{EtCO}_2\text{H}$  could be demonstrated. The oil residue constituted 50–60% of the original triacontane; it was redistd. at 14 mm. Hg into 5 fractions: 1, b.  $0\text{--}100^\circ$ ,  $d_{10}$  0.879, 9% of total; 2, b.  $100\text{--}150^\circ$ ,  $d$  0.881, 14% of total; 3, b.  $150\text{--}200^\circ$ , 7%; 4, b.  $200\text{--}250^\circ$ , 14%; 5, residue b. above  $250^\circ$ , 56% of the

total. The acids in fractions 3 and 4 formed soap with alkalis. Fraction 1 was satd. with  $\text{Na}_2\text{SO}_4$  and filtered off; all of the soln. combined with the  $\text{Na}_2\text{SO}_4$ . The freed aldehydes were identified as caproic and heptylic. The semicarbazone of caproic aldehyde m.  $104-6^\circ$ . The acids in the residue were shown to be butyric and valeric. The main products of oxidation were aldehydes, and from them acids were formed. Ketones and alcs. do not form unless side chains are present. The splitting of the triacontane mol. occurs in several places for aldehydes of odd and even nos of C atoms result. The gradual combustion of petroleum oils may be used analytically; those oils lacking paraffin, after a gradual oxidation, fail to give an aldehyde test (Schiff reagent); those oils contg. paraffin give a positive test.

Correction. The nitration of methane- and ethanesulfonyl-*p*-phenetidines. FREDERIC REVERDIN. *Helv. Chim. Acta* 12, 786(1929).—A few detailed corrections to R.'s paper are given (cf. *C. A.* 23, 2704).

Polymerization of ethylene by electric discharge. Synthesis of butene and hexene. GEORGES MIGNONAC and RENÉ VANIER DE SAINT-AUNAY. *Compt. rend.* 189, 1068 (1929); cf. *C. A.* 23, 3437.— $\text{C}_2\text{H}_4$  was continuously circulated through a high-frequency discharge at  $0-10^\circ$  and then through a condenser at  $-60^\circ$ , collecting 90-5% of the  $\text{C}_2\text{H}_4$  as polymers. The product was fractionated and identified by  $\text{O}_3$  oxidation as 1-butene (I) and 1-hexene (II). Lowering the temp. of the condenser to  $-80^\circ$  and circulating the gas more rapidly gave a product which was essentially I; at higher condenser temps., the yield of II was increased, showing that 2 consecutive reactions were taking place, i. e.,  $2\text{C}_2\text{H}_4 \rightarrow \text{C}_4\text{H}_8$  and  $\text{C}_4\text{H}_8 + \text{C}_2\text{H}_4 \rightarrow \text{C}_6\text{H}_{12}$ .

The action of a zinc-copper couple on methylene iodide. GUV EMSCHWILLER. *Compt. rend.* 188, 1555-7(1929); cf. *C. A.* 21, 563.— $\text{CH}_2\text{I}_2$  (I) in anhyd.  $\text{Et}_2\text{O}$  is attacked by Zn-Cu, giving  $\text{C}_2\text{H}_4$  and  $\text{ICH}_2\text{ZnI}$  (40% yield) which with  $\text{I}_2$  yields I and  $\text{ZnI}_2$ , with  $\text{H}_2\text{O}$ ,  $\text{MeI}$ ; with  $\text{O}_3$ ,  $\text{CH}_2\text{O}$  and  $\text{ZnI}_2$ ; with heat,  $\text{C}_2\text{H}_4$ . Some  $\text{CH}_2(\text{ZnI})_2$  is also obtained which with  $\text{H}_2\text{O}$  yields  $\text{C}_2\text{H}_4$  and  $\text{Zn}(\text{OH})_2$ .

Synthetic alcohols. Manufacture of synthetic ethyl and methyl alcohol by the mining company of Béthune. PAUL DAMM. *Mon. prod. chim.* 11, No. 114, 15; *Chem. Zentr.* 1928, II, 2208.—A report on the synthetic manuf. of EtOH and MeOH from coke-oven gases. The gases consist chiefly of H,  $\text{CH}_4$ ,  $\text{C}_2\text{H}_4$ , CO and N. H is sep'd. by liquefaction of the rest of the gases.  $\text{C}_2\text{H}_4$ ,  $\text{CH}_4$  and CO can be sep'd. by the same method.  $\text{C}_2\text{H}_4$  is converted into EtOH by means of  $\text{H}_2\text{SO}_4$ . A suitable mixt. of H, CO and N serves for the synthesis of MeOH according to the equation:  $\text{CO} + 2\text{H}_2 = \text{CH}_3\text{O}$ . For this reaction a catalyst is used whose compn. is kept secret.  $\text{NH}_3$  is synthesized from the remaining mixt. of H and N. It is still more advantageous to make MeOH from water gas. MeOH should have a promising future because it is an excellent motor fuel.

Preparation of *dl*-citronellol. JEAN DOEUVRE. *Bull. soc. chim.* 45, 403 12(1929), cf. *C. A.* 23, 4187.—Treatment of 2-methyl-2,6-heptenol with  $\text{PBr}_3$  gave a mixt. (I) contg. 22% of 2-methyl-6-bromo-1-heptene and 76% of 2-methyl-6-bromo-2-heptene. Treating 41 g. of I with 5.2 g. of Mg and a trace of  $\text{I}_2$  in 60 cc. of  $\text{Et}_2\text{O}$  gave an organo-magnesium compd. which was added to an equiv. quantity of  $\text{ClCH}_2\text{CH}_2\text{OMgBr}$  (obtained from  $\text{ClCH}_2\text{CH}_2\text{OH}$  (II) and  $\text{EtMgBr}$ );  $\text{Et}_2\text{O}$  was evap'd. from this product, which was then heated for 30 min. in a  $\text{H}_2\text{O}$  bath, hydrolyzed with ice  $\text{H}_2\text{O}$  and  $\text{HOAc}$  and finally fractionated giving: (a) b.  $115-20^\circ$ , 2-methyl-2-heptene (III) and 2-methyl-1-heptene (IV) which gave 2-methyldibromoheptane,  $b_{15}$   $108-10^\circ$ , with  $\text{Br}_2$  in  $\text{CCl}_4$ , (b) b.  $120-30^\circ$  contg. II; (c)  $b_{15}$   $115-7^\circ$ , 5 g. of *dl*-citronellol (V),  $d_4^{20}$  0.863,  $n_D^{20}$  1.4588 (allophanate, m.  $105-6^\circ$ ); and (d)  $b_1$  over  $117^\circ$ , 8-10 g. of polymers. Treatment with  $\text{O}_3$  indicated that V was 25% of the  $\alpha$ -form (2,6-dimethyl-1,8-octenol) and 76% of the  $\beta$ -form (the 2,8-octenol), the isomer ratio being the same as in the starting material I. Treating the Mg deriv. obtained from 38 g. of I with an excess of ethylene oxide in the cold, adding 100 cc. of PhH, evap'd. off the  $\text{Et}_2\text{O}$  and refluxing at the b. p. of PhH for 40 min. gave 4 g. of V after hydrolyzing and fractionating. Treatment of the Mg

deriv. of neopentene and 40% of a mixt.,  $b_{15}$   $100-0^\circ$  (cor.),  $d_4^{20}$  0.809,  $n_D^{20}$  1.4021,  $n_D^{25}$  1.384, contg. 2,6-dimethyl-2,7-heptenol and 2,6-dimethyl-1,7-heptenol.  $b_{15}$   $99-100^\circ$ , in  $\text{CCl}_4$ , this latter mixt. gave 45% of the corresponding 7-bromoheptene,  $b_{15}$   $108-10^\circ$ ,  $d_4^{15}$  1.123,  $n_D^{15}$  1.4749, which was allowed to react with Mg and then with VI under  $\text{H}_2$ , producing a mixt. which was fractionated to give 2,6-dimethyl-2-heptene and 2,6-dimethyl-1-heptene, b.  $142-3^\circ$ ,  $d_4^{14}$  0.768,  $n_D^{14}$  1.4321, and V. In the course of this and



previous work (*loc. cit.*) V and *d*-citronellol have been prepd. by a no. of methods, in each case the product apparently being identical with the 1-*rhodinol* of Barbier and Rouveault (see Grignard and D., *C. A.* 22, 3879, 4104). The conclusion is drawn that the product of B. and B. is a mixt. of the  $\alpha$ - and  $\beta$ -isomers of citronellol. A. S. C.

**Diisopropyl sulfate and dipropyl sulfate.** R. LEVAILLANT. *Compt. rend.* 188, 261-3 (1929).—Contrary to previous reports, the neutral iso-Pr sulfate (I) can easily be prepd. in 30% yields by the reaction between  $\text{Me}_3\text{CHOH}$  and  $\text{SO}_2\text{Cl}_2$  in half its wt. of  $\text{CCl}_4$ , the reaction being kept very well cooled. Purification is accomplished by distn. under 3-4 mm. at less than  $90^\circ$  and the resulting ester is quite stable at ordinary temps.,  $b_p$  78- $80^\circ$ ,  $n_D^{17}$  1.409,  $d_4^{20}$  1.118,  $d_4^{17}$  1.101, mol. refraction 40.91 (theory, 40.98). Both I and normal  $\text{Pr}_2\text{SO}_4$  react with  $\text{PhONa}$  to give the appropriate ethers in yields of 47 and 66%, resp.  $\text{Me}_3\text{CHOPh}$ ,  $n_D^{17}$  1.4983,  $d_4^{20}$  0.959,  $d_4^{17}$  0.943, mol. refraction 42.32 (theory 42.24).  $\text{ProPh}$ ,  $b_p$  81°,  $n_D^{14}$  1.503,  $d_4^{20}$  0.969,  $d_4^{14}$  0.955, mol. refraction 42.13 (theory 42.24). Normal  $\text{Pr}_2\text{SO}_4$  ( $b_p$  82°,  $d_4^{20}$  1.042,  $d_4^{16}$  1.026,  $n_D^{16}$  1.426) is oxidized by  $\text{KMnO}_4$  to the sulfate,  $b_{\text{about } 2.5}$  87- $9^\circ$ ,  $n_D^{18}$  1.414,  $d_4^{17}$  1.12. C. H. PRET

**Preparation of free halogenated aliphatic amines.** M. DE MONTMOLLIN AND J. ZOLLIKER. *Helv. Chim. Acta* 12, 610-6 (1929).—The following general method yields the salts of  $\beta$ -haloalkylamines: (1)  $\text{EtOCHClCH}_2\text{Cl}$

(2)  $\text{EtOCHRCH}_2\text{Cl} + \text{satd. alc. NH}_3 \xrightarrow{160-80^\circ} \text{EtOCHRCH}_2\text{NH}_2$  (plus secondary and tertiary amines). (3)  $\text{EtOCHRCH}_2\text{NH}_2 + \text{satd. aq. HCl} \xrightarrow{150^\circ} \text{RCHClCH}_2\text{NH}_2 \cdot \text{HCl}$ .  $\gamma$ -Haloalkylamines are prepd. as follows: (4)  $\text{RCH(ORCH}_2\text{CN} \xrightarrow{\text{reduce}} \text{RCH(ORCH}_2\text{CH}_2\text{CH}_2\text{NH}_2$ . (5) Hydrolyze as in (3). The following new

compds. are described:  $\beta$ -chlorobutylamine picrate, yellow, m.  $124^\circ$ ; *N*-[ $\beta$ -chlorobutyl]-benzamide, m.  $69^\circ$ ; di-[ $\beta$ -bromobutyl]amine-HBr;  $\gamma$ -ethoxybutylamine, b.  $142-3^\circ$ ;  $\gamma$ -methoxybutylamine, b.  $128-30^\circ$  (picrate, yellow, m.  $110-2^\circ$ ; phenylthiourea, m.  $84^\circ$ );  $\gamma$ -propoxybutylamine, b.  $160^\circ$  (picrate, yellow, m.  $101^\circ$ ; phenylthiourea, m.  $67^\circ$ );  $\gamma$ -bromobutylamine picrate, yellow or orange, m.  $152^\circ$ . All previous work described in the literature indicates that the free halogenated amines immediately condense to ring compds. By the following procedure, de M. and Z. obtained the free amines pure enough to analyze. The salt was dissolved in water and treated with the theoretical amt of  $\text{Na}_2\text{CO}_3$ . The pptd. oil was distd. *in vacuo* and immediately analyzed. In a few hrs. at room temp. or very quickly at  $120-30^\circ$ , condensation to ring compds. resulted. The  $\beta$ -compds. are more stable than the  $\gamma$ -, and the Cl derivs. more stable than Br compds. They prepd.  $\beta$ -chlorobutylamine,  $b_p$   $50^\circ$ ; di-[ $\beta$ -chlorobutyl]amine,  $b_p$   $91^\circ$ ;  $\gamma$ -bromobutylamine,  $b_p$   $57^\circ$ . M. A. DAHLEN

**Decomposition of quaternary ammonium and sulfonium hydroxides.** IV. JULIUS v BRAUN, WILHELM TRUFFERT AND KARL WEISSBACH. *Ann.* 472, 121-42 (1929); *et C. A.* 18, 1835.—The work of Hanhart and Ingold (*C. A.* 21, 2660) is discussed. The influence of  $\text{CO}_2$  taken up from the air during the evapn. of the aq. soln. on the decompn. of quaternary  $\text{NH}_4$  bases is shown by the following figures (the 1st figures are the % of unsatd. compd. without and with  $\text{CO}_2$ ; the last 2 figures the % of satd. tert. base under the same conditions):  $\text{BuNMe}_3\text{OH}$ , 77, 23, 10, 50;  $\text{C}_{10}\text{H}_{21}\text{NMe}_3\text{OH}$ , 62, 25, 30, 72;  $\text{C}_{12}\text{H}_{25}\text{NMe}_3\text{OH}$ , 82, 15.5, 18, 84.5;  $\text{C}_8\text{H}_{19}\text{NMe}_3\text{OH}$ , 82, 65, —, about 20. *Docosyl bromide*,  $b_p$   $225^\circ$ , m.  $44^\circ$ ;  $\text{Me}_3\text{N}$  gives nearly quant. *docosyltrimethylammonium bromide*. The decompn. products are  $\Delta^1$ -docosylene,  $b_p$   $174-8^\circ$ , m.  $41^\circ$  and *docosyldimethylamine*,  $b_p$   $190^\circ$ , m.  $41^\circ$ ; HCl salt, m.  $180^\circ$ ; picrate, m.  $84^\circ$ . The influence of adding 3-4 vols. of  $\text{C}_2\text{H}_5(\text{OH})_2$  on the decompn. is shown in the following figures (again the figures refer to the unsatd. compd. when the base is heated alone and with  $\text{C}_2\text{H}_5(\text{OH})_2$  and the satd. tert. base under the same conditions):  $\text{C}_7\text{H}_{19}\text{NMe}_3\text{OH}$ , 77, 16.5, 10, 69;  $\text{C}_{10}\text{H}_{21}\text{NMe}_3\text{OH}$ , 62, 14, 30, 76;  $\text{C}_8\text{H}_{19}\text{NMe}_3\text{OH}$ , 82, 32, —, 49. The ratio of hydrocarbon to base upon dry distn. of  $\text{C}_7\text{H}_{19}\text{NMe}_3\text{OH}$  (77:12) is practically the same as when the base is distd. with KOH (81:12); the corresponding figures for  $\text{C}_{10}\text{H}_{21}\text{NMe}_3\text{OH}$  are 62:30 and 79:13. In dil. alkali, the % of base split increases with increasing concn. of the alkali but the ratio of hydrocarbon to base is unchanged, 10:17. *Hexyldithiourethan*, m.  $50^\circ$ ; with KOH this gives  $\text{C}_6\text{H}_{13}\text{SH}$ , transformed by MeI and MeONa into *hexyl Me sulfide* (I),  $b_p$   $61-2^\circ$ , and with more MeI into *hexyldimethylsulfonium iodide*, m.  $68^\circ$ . The hydroxide, distd. with  $\text{C}_2\text{H}_5(\text{OH})_2$ , gives 7.2%  $\text{C}_6\text{H}_{12}$  and 85.5% I; distd. with 50% KOH at the ordinary pressure, there results 19%  $\text{C}_6\text{H}_{12}$  and 77.5% I. *Decyldithiourethan*, m.  $76^\circ$  (80% yield); the mercaptan  $b_p$   $114-5^\circ$ ;

*decyl Me sulfide* (II),  $b_{13}$  125°; *decyldimethylsulfonium iodide*, very hygroscopic. The base, on distn., yields 21.5%  $C_{10}H_{20}$  and 68.5% II; distd. with  $C_2H_5(OH)_2$ , there results 3%  $C_{10}H_{20}$  and 94% II; with 50% KOH, 27%  $C_{10}H_{20}$  and 64% II. *Phenylethyl methyl sulfide*,  $b_{13}$  111°; *phenylethyldimethylsulfonium iodide*, m. 130° (decompn.); decompn. of the base gives styrene. *Decylselenomercaptan*,  $b_{13}$  128-9°; *decyl Me selenide*,  $b_{14}$  137-8°; with MeI there results only  $Me_2SeI$ . C. J. WEST

**Methyltin derivatives.** I. Introduction. II. Action of zinc on trimethyltin bromide. III. Trimethyltin phenolate. IV. Decamethylstannobutane. CHARLES A. KRAUS AND ARTHUR M. NEAL. *J. Am. Chem. Soc.* 51, 2403-7(1929); cf. C. A. 19, 2928, 3250.—The action of Zn on  $Me_3SnBr$  in  $H_2O$  was studied. The chief product of reduction was  $Me_3Sn$ , some  $Me_3SnOH$  and metallic Sn also being formed. *Trimethylstannyl phenolate*,  $PhOSnMe_3$ , was prepd. by the action of  $Me_3SnBr$  (1 mol.) on  $PhONa$  (1 mol.),  $b_8$  109°,  $b$  223-4° (uncor.) with slight decompn. *Decamethylstannobutane*,  $Me_{10}Sn_4$ , was prepd. from  $(NaMe_3Sn)_2$  (1 mol.) and  $Me_3SnBr$  (2 mols.); mol. wt. found, 610, 627 (calcd. 625). H. W. LEAHY

**Lead tetramethyl and the use of alkyl magnesium chlorides for the preparation of organometallic compounds.** ERICH KRAUSE. *Ber.* 62B, 1877-8(1929).—K. recommends alkylmagnesium bromide and chloride instead of iodide. The Mg must be very finely distributed.  $PbMe_4$  is prepd. very pure with  $MeMgCl$  and is very explosive. A. E. BEITLICH

**Isomeric trithioacetaldehydes.** ERNEST V. BELL, GEORGE MACDONALD BENNETT AND FREDERICK G. MANN. *J. Chem. Soc.* 1929, 1462-5.—The  $\gamma$ -isomer (I) of  $MeHC(SCHMe)_2S$  (cf. Mann and Pope, C. A. 17, 2558), in spite of the fact that it has a definite m. p. when crystd. from various solvents or sublimed, is a mixt. of the  $\alpha$ - (II) and  $\beta$ -isomers(III), contg. 40% of the latter. The m. p. of  $PhOH$  already satd. with I is no further depressed by the addn. of II and III successively. The m. ps. of series of mixts. of I with II and III are all consistent with I being a mixt. of the compn. stated. The m.-p. curve of II and III is given, and is similar to that of Suyver (*Rec. trav. chim.* 24, 377(1905)) but the m. ps. are 4° higher. II, monoclinic,  $a:b:c = 0.6907:1:0.8009$ ,  $\beta$  114° 44'. III, orthorhombic prisms,  $a:b:c = 0.9217:1:1$ . Crystn. of I from  $EtOH$  gives mixt. of II and III; slow crystn. from  $Me_2CO$  gives crystals of II, while from  $C_6H_6$  crystals of III could be isolated. Since II and III differ only slightly in their solubilities in 8 solvents examd. by S. and as the joint soly. curves of 2 substances in a solvent are closely related to the m.-p. curve of their mixts., it is intelligible that the proportions of these 2 stereoisomers dissolved at the invariant point should be the same as that in their eutectic mixt. The position of the invariant point on the soly. curve must be practically independent of the individual solvent and of the temp. (over the range involved). C. J. WEST

**$\alpha$ -Bromo- and hydroxyaldehydes.** IV.  $\alpha$ -Hydroxybutyraldehyde,  $\alpha$ -hydroxyisobutyraldehyde, glycolaldehyde. RUDOLF DWORZAK AND JENNY PIERRI. *Monatsh.* 52, 141-50(1929); cf. C. A. 23, 2151.—Bromination of parabutyraldehyde at 10 to -5° and addn. of  $EtOH$  give about 35% crude  $EtCHBrCH(OEt)_2$ ,  $b_{12}$  76-81°, which, boiled with 3 parts  $H_2O$  for 3 hrs., gives  $\alpha$ -hydroxybutyraldehyde,  $b_{14}$  70-80°, solidifies after about 2 weeks; 1 g.  $CuO$  corresponds to 0.5851 g. aldehyde; the osazone could not be crystd.; *p*-nitrophenylhydrazones, orange-yellow, m. 135°; *p*-nitrophenyl-osazone, dark red, m. 227°. Paraisobutyraldehyde, on bromination and alcoholysis, gives about 25% of the acetal,  $b_{11}$  79-81°, and also a compd.  $C_{12}H_{18}OBr_2$ ,  $b_{11}$  140-50°, m. 85.5° (mol. wt. too low for this formula: found, 400; calcd., 658). Hydrolysis gives  $\alpha$ -hydroxyisobutyraldehyde, whose *p*-nitrophenylhydrazones is orange. Details are given of the prepn of  $HOCH_2CHO$  from  $BrCH_2CH(OEt)_2$ , which possesses no advantage over other methods. C. J. WEST

**Ketonic transformation of aldehydes at high temperatures.** S. DAN LOV. *J. Russ. Phys.-Chem. Soc.* 61, 723-5(1929); *Ibid.* 51, 109(1919); 57, 347(1925); 59, 196, 210(1927); C. A. 21, 571.—D. undertook studies of the pyrogenous isomerization of aldehydes to ketones under the influence of catalysts with a view to interpreting similar reactions in the destructive distn. of wood, two products of which are here treated.  $CMe_3CHO$  was quant. converted to  $Me_2CHCOMe$ ,  $b$  93-4°, at 350° with  $Al_2(SO_4)_3$  as a catalyst.  $CPh_3CHO$  was converted to triphenylethanone, m. 136°, by heating at 25 mm. to 320-40° with  $Al_2(SO_4)_3$ . C. B.

**Cyclic acetals.** II. RUDOLF DWORZAK AND KARL HERRMANN. *Monatsh.* 52, 83-106(1929); cf. C. A. 23, 1615.—Four methods were employed in the prepn. of the acetals: I, satn. of a cooled mixt. of mol. amts. of the components; II, shaking at room temp., the ketone, contg. 1% by wt. of  $HCl$ , being in excess, with  $Na_2SO_4$  to take up the  $H_2O$ ; III, with 0.25-0.5%  $H_2SO_4$  as catalyst; IV, heating mol. amts. of the compo-

nents with 40%  $\text{H}_2\text{SO}_4$  at  $100^\circ$ ; the yields were approx. the same with each method.  $\text{C}_2\text{H}_4(\text{OH})_2$  (V) does not react with  $m\text{-MeC}_6\text{H}_4\text{CHO}$  or  $p\text{-MeOC}_6\text{H}_4\text{CHO}$ ;  $\text{CH}_2(\text{CH}_2\text{OH})_2$  (VI) does not react with  $\text{Me}_2\text{CO}$  or  $\text{MeEtCO}$ . V and  $\text{Me}_2\text{CO}$  give 7.6% (II) or 8% (IV) of  $(\text{CH}_3\text{O})_2\text{CMe}_2$ ,  $b_{760}$   $91.5\text{--}2^\circ$ .  $\text{C}_2\text{H}_5(\text{OH})_2$  (VII) and  $\text{Me}_2\text{CO}$  give 77% (II) or 74% (III) of acetoneglycerol,  $b_{11}$   $82.5^\circ$ . V and  $\text{MeEtCO}$  give 15% (II) of methyl ethylketone ethyleneglycol,  $b_{11}$   $113.5^\circ$ . VII and  $\text{MeEtCO}$  give 60% of methyl ethylketone glycerol,  $b_{11}$   $89^\circ$ . V and  $\text{Pr}_2\text{CO}$  give 30% (III) of dipropylketone ethyleneglycol,  $b_{760}$   $172.5\text{--}4^\circ$ . VI and  $\text{Pr}_2\text{CO}$  give 0% (III), 1.2–2.7% (IV) of dipropylketone ethyleneglycol,  $b_{760}$   $187^\circ$ . VII and  $\text{Pr}_2\text{CO}$  give 10% (III) of dipropylketone glycerol,  $b_{11}$   $160^\circ$ . V and  $\text{BzH}$  give 28% (IV) of  $(\text{CH}_3\text{O})_2\text{CHPh}$ ,  $b_{11}$   $223\text{--}5^\circ$ ; VI and  $\text{BzH}$  give 32% (I), 38.5% (IV) of  $\text{CH}_2(\text{CH}_3\text{O})_2\text{CHPh}$ ,  $b_{11}$   $124\text{--}5^\circ$ ; VII and  $\text{BzH}$  give 52% (I or IV) of benzaldehyde glycerol,  $b_{11}$   $157^\circ$ ,  $m.$   $10\text{--}5^\circ$ , which may be a mixt. of the 2 possible isomers.  $m\text{-MeC}_6\text{H}_4\text{CHO}$  and VI give 24.7% (IV) of  $m\text{-tolylaldehydetrimethyleneglycol}$ ,  $b_{12}$   $140^\circ$ ; VII gives 6.1% of  $m\text{-tolylaldehydeglycerol}$ ,  $b_{11}$   $158^\circ$ . Anisaldehydetrimethyleneglycol, 29.9% yield (IV),  $b_{11}$   $164\text{--}5^\circ$ ; the glycerol deriv.,  $b_{10}$   $164^\circ$ , 13% yield (IV). C. J. WEST

Action of columbium and tantalum pentachlorides on organic compounds. III. H. FUNK AND K. NIEDERLÄNDER. *Ber.* 62B, 1688–91 (1929).—Studies of the reaction of  $\text{CbCl}_5$  and  $\text{TaCl}_5$  with glacial  $\text{AcOH}$ ,  $\text{MeOH}$  and  $\text{EtOH}$  were carried out. A soln. of  $\text{TaCl}_5$  in  $\text{AcOH}$  evapd. *in vacuo* yields  $\text{TaCl}(\text{AcO})_4$  (I) and sometimes  $\text{TaCl}(\text{AcO})_4 \cdot 4\text{AcOH}$  (very unstable). Two mols. of I give when heated for 2 hrs. *in vacuo* at  $80\text{--}90^\circ$   $(\text{AcO})_2\text{Ta}(\text{O})\text{OTa}(\text{O})(\text{AcO})\text{Cl}$  (II).  $\text{CbCl}_5$  yields when boiled with  $\text{AcOH}$  a white ppt. corresponding in compn. to II.  $\text{TaCl}_5$  gives with  $\text{MeOH}$   $(\text{MeO})_3\text{TaCl}_2$  and with  $\text{EtOH}$   $\text{Et}_3\text{TaCl}_2$ . A. E. BEITZCH

Catalytic transfer of hydrogen between organic compounds. SHIRO AKABORI AND TAZO SUZUKI. *Proc. Imp. Acad. (Japan)* 5, 255–6 (1929).—Tetralin and Pd black reduce cinnamic acid, oleic acid, eugenol and coumarin to hydrocinnamic acid, stearic acid, hydroeugenol and hydrocoumarin in satisfactory yields, the 1st 3 at  $115\text{--}20^\circ$ , the last in boiling PhMe.  $\text{BzCl}$  is only slightly attacked, giving a small quantity of  $\text{BzH}$ . Tetrahydroquinoline and maleic acid in boiling  $\text{H}_2\text{O}$  with Pd black give quant.  $(\text{CH}_2\text{CO}_2\text{H})_2$ ; no reaction occurs with  $\text{CH}_2(\text{CO}_2\text{H})_2$ , showing that for the dehydrogenation of tetrahydroquinoline at  $100^\circ$  there must be both the H activator and H acceptor. Piperidine is not dehydrogenated by maleic acid and Pd in boiling  $\text{H}_2\text{O}$ , but safrrole and Pd at  $175^\circ$  give 88% of pyridine. Tetrahydroisoquinoline gives a good yield of isoquinoline at  $149^\circ$  with anethole and Pd but tetrahydropapaverine is not dehydrogenated under these conditions. Nicotine (4.9 g.) and anethole with Pd black at  $150\text{--}2^\circ$  give 0.4 g. nicotine. C. J. WEST

Constitution of linolic acid. ROBERT D. HAWORTH. *J. Chem. Soc.* 1929, 1456–61.—According to the literature, at least 2 linolic acids (I) are known, one from poppy seed oil, assumed by Goldsobel (*C. A.* 5, 1281) to be octadeca- $\Delta^9,10,12,13$ -dienoic acid (II) and a second from soy-bean oil and rice-bran oil, assumed by Takahashi (*C. A.* 15, 2273) to be the 9:10,14:15-isomer. The structures of these 2 acids have been reinvestigated. The tetra-Br acids obtained from poppy seed oil was identical with that obtained from soy-bean oil and the identity of the 2 specimens was confirmed by comparing the Me esters of the tetra-Br acids. The Me linolates, obtained by reducing the Br acids were identical in b. p., and hexoic, azelaic and  $(\text{CO}_2\text{H})_2$  were isolated, in yields approx. 80% of those calcd. from II, after the ester derived from either oil had been oxidized with  $\text{KMnO}_4$  in cold  $\text{Me}_2\text{CO}$ . In a few expts. the presence of  $\text{CH}_2(\text{CO}_2\text{H})_2$  was detected but the majority of this acid was converted into  $(\text{CO}_2\text{H})_2$  and a control expt. showed that  $\text{CH}_2(\text{CO}_2\text{H})_2$  was slowly oxidized to  $(\text{CO}_2\text{H})_2$  under the conditions employed in the oxidation of Me linolate. These oxidation expts. indicate that I from poppy seed oil or soy-bean oil has the formula II and this has been confirmed by oxidation with  $\text{KMnO}_4$  in dil. alk. soln. The sativic acid, from either source, was the same, and on oxidation with ice-cold  $\text{KMnO}_4$  in alk. soln. gave suberic, valeric and oxalic acids, together with smaller quantities of azelaic and hexoic acid. When the oxidation was carried out in hot alk. soln., the products were hexoic and azelaic acids and a smaller quantity of suberic acid. The yield of oxidation products would suggest that I is almost entirely composed of II although the presence of geometrical isomers is not excluded. Details are given in the exptl. section. C. J. WEST

Chemical constitution of clupanodonic acid. MITSUMARU TSUJIMOTO. *Bull. Chem. Soc. Japan* 3, 299–307 (1928).—The isolation of nearly pure clupanodonic acid is reported. The fatty acids of a Japanese sardine oil were treated by the Li salt-acetone method and the highly unsatd. acids so obtained were changed to Me esters and fractionated under 5-mm. pressure. The fraction b.  $217\text{--}26^\circ$  was taken as the Me ester of

clupanodonic acid. It was saponified and the accompanying small quantity of unsaponifiable matter removed. The finally oxidized acids were sep'd. by means of petroleum ether. The acid thus obtained had the following properties:  $d_4^{16}$  0.9410, neutralization value 170.7; I no. 3388.8,  $n_D^{16}$  1.5057; calcd. for  $C_{22}H_{34}O_8$ ; neutralization value 169.8, I no. 384.3. A study of the constitution of this acid follows. The ozonide prepd. from the acid was decompd. with water and the volatile and nonvolatile decompn. products were exam'd. The results of several expts. show that no conjugated double bonds and no triple bonds are present. Evidence is given showing that the mol. consists of the following at. groups: (1)  $MeCH_2CH=$ , (2)  $=CHCH_2CH=$ , (3)  $=CH(CH_2)_2CH=$ , (4)  $=CH(CH_2)_2CO_2H$ . As to the arrangement of these groups no definite data have yet been obtained. Indications point to 2 possible formulas which are given. These formulas have been proposed provisionally. The decompn. of the Am ester ozonide of this acid was studied to confirm the position of the ethylenic linkage nearest to the  $CO_2H$  group. Evidence is given which indicates that the ethylenic linkage nearest the  $CO_2H$  in the mol. is situated between the 4,5-C atoms counting from the  $CO_2H$  group.

E. S. WALLIS

Interpretation of the rearrangements of pinacols and tertiary amino alcohols from the electron theory of valency. MASAO MIGITA. *Bull. Chem. Soc. Japan* 3, 308 16 (1928).—A theoretical paper. Exptl. evidence taken from the chem. literature is cited to show that the theory of "affinity requirement" of Meerwein and others cannot foretell the products of semipinacolin deamination of tertiary amino alcs. except those of the type  $R_2C(OH)CHR'NH_2$ . An interpretation of all rearrangements similar to the pinacolin transformation is given in terms of the modern electron theory developed by Lapworth and Kermack. This interpretation has the following advantages. (1) The products of rearrangements of pinacols and tertiary amino alcs. are reliably predicted by one and the same reasoning. (2) It can also be explained why tertiary amino alcs. generally behave abnormally toward  $HNO_3$ , whereas in certain cases normal displacement of the amino group takes place. The theory as outlined has certain fundamental contradictory facts: (1) The problem of steric hindrance is unsolved. (2) The rearrangements of alkyltrimethylpinacols offer a strong objection to this interpretation, for they give ketones,  $MeCOCRMe_2$  by the migration of the more positive group. (3) When  $H_2NCHPhCET_2OH$  is treated with  $HNO_3$ , the main product is the corresponding glycol, while according to the above theory in the case of  $H_2NCHPhC(CH_2Ph)_2OH$  the normal displacement of the amino group should take place at least as easily as in the former case, since benzyl is more positive than Et, it should migrate more difficultly to the positively polarized  $\beta$ -C atom. But the actual products disprove this prediction, for it gives the glycol only as a by-product.

E. S. WALLIS

Configuration of pentaerythritol. III. J. BÖESEKEN AND B. B. C. FELIX. *Ber* 62B, 1310-6 (1929); cf. *C. A.* 23, 99.—In spite of the fact pointed out by Kenner (*C. A.* 23, 1616) and by Sementsov (*C. A.* 23, 4445) that in a pyramidal arrangement an asym configuration is possible, B. and F. hold fast to the opinion that as long as no *cis trans*-isomeric acetals of pentaerythritol (I) have been isolated, resolution into optical antipodes is decisive evidence of the tetrahedral configuration. In continuation of their investigation they have resolved the basic acetal, bis[aminoacetaldehyde]pentaerythritol (II), studied the camphor acetals of I and resolved [pyruvic acid dimethylol]-*p*-methylcyclohexane (III),  $MeCH \begin{array}{c} \diagup CH_2CH_2 \diagdown \\ \diagdown CH_2CH_2 \diagup \end{array} C \begin{array}{c} \diagup CH_2O \diagdown \\ \diagdown CH_2O \diagup \end{array} CMeCO_2H$ .  $H_2NCH_2CH(OEt)_2$

g. from 200 g.  $BrCH_2CH(OEt)_2$  and liquid  $NH_3$  at  $105^\circ$  (80 atm.),  $b_{760}$   $163.4^\circ$ ; refluxed with I and HCl in abs. alc. it yields II, m.  $124^\circ$ , resolved by means of malic acid into the *l*-base,  $[\alpha]_D^{20} -2.04^\circ$  (9.3 g. in 100 cc.  $CHCl_3$ ), m.  $60-70^\circ$ , and the *d*-base,  $[\alpha]_D^{20} 4.03^\circ$  (8.3 g. in 100 cc.  $CHCl_3$ ). The *l*-base in  $H_2O$  (5.9 g. in 100 cc.) showed  $[\alpha]_D^{20} -0.43^\circ$ , changing to  $[\alpha]_D 0.01^\circ$  on neutralization with AcOH; the *d*-base (4.64 g. in 100 cc.)  $[\alpha]_D^{20} 0.95^\circ$ , changing to  $[\alpha]_D -0.05^\circ$  on neutralization; no racemization occurred, for liberation of the bases gave products showing the original rotations in  $CHCl_3$ . Di-camphor acetal of I, from camphor acetal and I refluxed in abs. alc. with HCl, m.  $156^\circ$ ,  $[\alpha]_D^{20} -29.3^\circ$  (1 g. in 20 cc.  $CHCl_3$ ); monocamphor acetal, obtained along with the preceding compd., m.  $135^\circ$ ,  $[\alpha]_D^{20} -18.6^\circ$  ( $CHCl_3$ ); no isomers of these acetals were obtained. 4,4-Dimethylol-1-methylcyclohexane,  $b_D 105^\circ$ , m.  $45^\circ$ , was obtained in 35% yield by reducing 200 g. *p*-cresol with Ni and H (100-50 atm.) at  $150-60^\circ$ , treating the resulting 4-methylcyclohexanol (275 g.) with 0.5 mol.  $PBr_3$  below  $10^\circ$ , converting

the bromide (330 g.) into the Mg compd., condensing this with  $\text{HC}(\text{OEt})_3$  to *p*-methyl-hexahydrobenzaldehyde di-Et acetal (34% yield), hydrolyzing the acetal with 5 N HCl and treating the bisulfite compd. of the aldehyde with HCHO and KOH in cold aq. alc. *Ei* ester of III, from  $\text{AcCO}_2\text{H}$  refluxed in abs. alc. with HCl, then treated with  $\text{C}_6\text{H}_6$ , freed of the  $\text{H}_2\text{O}$ -EtOH- $\text{C}_6\text{H}_6$  by slow distn. and refluxed in abs. alc. with the dimethylol and HCl, *b*<sub>10</sub> 82-9°, *d*<sub>20</sub> 1.049, *n*<sub>D</sub><sup>20</sup> 1.4638. Free III, viscous liquid, resolved through the gelatinous quinine salt into an acid with  $[\alpha]_D^{20}$  4.85° (8.1 g. in 100 cc.  $\text{CHCl}_3$ ) and an acid with  $[\alpha]_D^{20}$  -2.84° ( $\text{CHCl}_3$ , 12.5%). After some weeks the *dl* and the active acids partially crystd.; all the crystals, however, were inactive and m. 111°; resolution of the cryst. acids gave fractions with  $[\alpha]_D^{20}$  10.5° ( $\text{CHCl}_3$ , *c* 5.87) and -8.5° (*c* 6.65).

C. A. R.

**Preparation of tertiary  $\alpha$ -hydroxy acids.** R. HEILMANN. *Bull. soc. chim* **45**, 412 (1929).—A general method has been suggested for the prepn. of  $\alpha$ -HO acids of the type  $\text{RC}(\text{OH})\text{R}'\text{CO}_2\text{H}$  by the oxidation of  $\alpha$ -HO ketones,  $\text{RC}(\text{OH})\text{R}'\text{COMe}$  (obtained by the hydrolysis of  $\text{RC}(\text{OH})\text{R}'\text{C}(\text{CH}_3)_2$  with alk. hypochlorites or hypobromites with the elimination of  $\text{CHCl}_3$  or  $\text{CHBr}_3$ ). In this manner 4-heptanone was converted into 3-propyl- $\Delta^1$ -3-hexinol, then to 3-propyl-3-hydroxy-2-hexanone and finally oxidized to dipropylhydroxyacetic acid, m. 80°, *Me* ester, *b*<sub>10</sub> 83-4°. 1,1,1-Trimethyl-2-propanone was converted to  $\alpha$ -tert-butyl-lactic acid, m. 141°, sublimes 130° at 14 mm., through the intermediates 3-tert-butyl- $\Delta^1$ -3-butanol and 3-tert-butyl-3-hydroxy-2-butanone; and also 2-pentanone gave 3-methyl- $\Delta^1$ -3-hexinol, 3-methyl-3-hydroxy-2-hexanone and finally 70% of  $\alpha$ -propyl-lactic acid, *b*<sub>10</sub> 127-8°, *Me* ester, *b*<sub>15</sub> 65-6°; *Ei* ester, *b*<sub>9</sub> 68°.

A. S. CARTER

**Preparation of glycerides of amino fatty acids.** WEIZMANN AND L. HASKELBERG. *Compt. rend.* **189**, 104-6 (1929).—3-Chloro-1,2-propanediol was heated for 1 hr. in a  $\text{H}_2\text{O}$  bath with the Na salt of glycine (I); the product was dissolved in MeOH (cold), filtered and pptd. with  $\text{Et}_2\text{O}$  giving 20-30% of  $\alpha$ -monoglycyl glyceride, m. 160-70°, decomp. at 250°. In the same manner, alanine (II) gave  $\alpha$ -monolanyl glyceride, m. 219°. I or II with  $\alpha,\beta$ -distearyl or -dipalmityl glyceride gave the following mixed glycerides:  $\alpha'$ -glycyl- $\alpha,\beta$ -istearyl, m. 170°;  $\alpha'$ -glycyl- $\alpha,\beta$ -dipalmityl, m. 215°;  $\alpha'$ -alanyl- $\alpha,\beta$ -distearyl, m. 233°;  $\beta'$ -alanyl- $\alpha,\beta$ -dipalmityl, m. 216°; also  $\alpha'$ -dl-leucyl- $\alpha,\beta$ -distearyl (m. 150°) and  $\alpha'$ -dl-leucyl- $\alpha,\beta$ -dipalmityl glyceride (m. 219°) were prepd by the same method.

A. S. CARTER

**$\gamma,\gamma$ -Dimethylpimelic acid.** GUST. KOMPFA *Ber* **62B**, 1371-2 (1929).— $\gamma,\gamma$ -Dimethylpiperidine-HCl shaken with  $\text{BzCl}$  and a slight excess of alkali yields *N*-benzoyl- $\gamma,\gamma$ -dimethylpiperidine, *b*<sub>10</sub> 174-7°, *d*<sub>4</sub><sup>16</sup> 1.0511, *n*<sub>D</sub><sup>16</sup> 1.54534, converted by heating with  $\text{PCl}_5$  into PhCN and  $\gamma,\gamma$ -dimethylpentamethylene dichloride (yield, 30%). *b*<sub>8</sub> 58-9°, *d*<sub>4</sub><sup>15</sup> 1.0917, *n*<sub>D</sub><sup>15</sup> 1.48990. The crude mixt. of the dichloride and PhCN boiled in aq. alc. with KCN gives 80% of the dicyanide, m. 123°, which is hydrolyzed by HCl (d. 1.19) at 120° to  $\gamma,\gamma$ -dimethylpimelic acid (85% yield), m. 83°; dianilide, m. 165°; diimide, m. 176°.

C. A. R.

**Stereochemistry of the glutacnic acids.** I. R. MALACHOWSKI. *Ber* **62B**, 1323-6 (1929).—The failure, up to the present, to isolate more than 1 form (m. 138°) (I) of glutacnic acid has given rise to theoretical speculations involving anomalous bonds in this group of acids, but M. has now found that a 2nd form (II) of I does exist and can be prepd. in essentially the same way as *cis*-aconitic acid (*C. A.* **23**, 1878); glutacnic anhydride is decompd. with cold  $\text{H}_2\text{O}$  but the II must be removed as quickly as possible from the solvent as it is exceedingly unstable in  $\text{H}_2\text{O}$ . In solid form and in  $\text{Et}_2\text{O}$  it can be kept for weeks but when fused and in  $\text{H}_2\text{O}$  it rapidly rearranges into I. Unlike I, II, which from its method of formation may be assumed to be the *cis*-form, is readily converted back into the anhydride with  $\text{Ac}_2\text{O}$  (almost quantitatively at 40°). At 0° the dissocn. consts. of I and II are  $1.74 \times 10^{-4}$  and  $1.43 \times 10^{-4}$ , resp. In  $\text{M}/64$  soln. at 0° the mol. cond. of I remains const. at 23.79  $\pm$  0.02, while that of II increases from 21.85 at a rate corresponding to 15, 36, 59 and 74% rearrangement in 1, 3, 5 and 7 days, resp.; at 15-20° there is 40% rearrangement in 16 hrs. II m. 136-6.5° (cor.); an equimol. mixt. with I m. 111-4°. II gives no color with  $\text{FeCl}_3$  and immediately decolorizes  $\text{KMnO}_4$ .

C. A. R.

**Dehydration of malic acid.** II. AMANDUS HAHN, W. HAARMANN AND F. FISCH-BACH. *Z. Biol.* **88**, 586-93 (1929); cf. *C. A.* **22**, 3420.—The phenylhydrazone of pyro-racemic acid is obtained from muscle in much greater quantity when neutralized malic acid is present together with methylene blue and semicarbazide than when it is absent. Oxalacetic acid is the first product in the dehydration of malic acid. F. K.

**Substituted, optically active asparagines. I.** O. LUTZ. *Ber.* 62B, 1879-84 (1929).— $\text{I-NH}_2\text{COCH}_2\text{CHBrCO}_2\text{H}$  (I) and aromatic amines yield substituted *d*-asparagines. Thus, 10 g. of I in 150 cc.  $\text{H}_2\text{O}$  and 15 g. *p*- $\text{MeC}_6\text{H}_4\text{NH}_2$  in 50 cc. MeOH on standing, deposit cryst. *l-p*-toluidinosuccinic acid monoamide m.  $100-1^\circ$ , in 60-70% yield. Similarly were prepd., with poorer yields, the following succinic acid monoamides: *d-o*-toluidino, m.  $164-6^\circ$ ; *d-o*-anisidino, m.  $153-4^\circ$ ; *d-m*-phenetidino, m.  $149-51^\circ$ ; *d-p*-phenetidino, m.  $139-40^\circ$ ; *d-1,2,4*-xylydino, m.  $145-6^\circ$ ; and *d-1,2,5*-xylydino, m.  $138-9^\circ$ . These compds. showed *d*-rotation in NaOH soln., which gradually changed sign with increasing addns. of HCl. K. H. ENGEL

**Photochemical and oxidative degradation of carbonyls.** HANS REIHLEN, A. GRUHL AND G. V. HESSLING. *Ann.* 472, 268-87 (1929).— $\text{Fe}(\text{CO})_5$  (5 cc.) and 25 cc EtSH at  $38^\circ$  in the light of a Hg lamp react according to the equation  $2\text{Fe}(\text{CO})_5 + 2\text{EtSH} = [\text{Fe}(\text{C}_2\text{O}_3)\text{SEt}]_2 + 4\text{CO} + \text{H}_2$ ; the mercaptocarbonyl m.  $75.5^\circ$ . The principal difficulty of the reaction is overheating; by working at  $3-5^\circ$ , the same products are formed, but the ratio of CO:H is 9.2:1 instead of 4:1, and the mercaptocarbonyl is not pure.  $\text{Fe}(\text{CO})_5$  and  $\text{Ac}_2\text{CH}_2$ , similarly treated at  $130^\circ$  for 6-8 hrs., give 45% ferric acetylacetonate, a small amt. of an  $\text{Me}_2\text{CO}$ -insol. product,  $\text{Fe}_3\text{C}_{20}\text{H}_{24}\text{O}_{12}$ , yellow, and a 2nd product,  $\text{FeC}_{14}\text{H}_{14}\text{O}_6$ , colorless but quickly turning black in the air; the gases consisted of CO and  $\text{H}_2$ .  $\text{Ni}(\text{CO})_4$  and  $\text{AcCl}$  in petroleum ether (b.  $40-50^\circ$ ), heated at  $50-5^\circ$  for 13 hrs. in the Hg light, react according to the equation  $\text{Ni}(\text{CO})_4 + 2\text{AcCl} = 4\text{CO} + \text{NiCl}_2 + \text{Ac}_2$ , the  $\text{NiCl}_2$  reacting with  $\text{Ac}_2$  to give  $\text{NiCl}_2\text{Ac}_2$ ; in the presence of  $\text{O}_2$  at about  $10^\circ$  there results  $\text{AcOH}$  and  $\text{Ac}_2\text{O}$ ,  $\text{NiCl}_2$ , CO and  $\text{CO}_2$ . Unsuccessful attempts to reduce  $\text{Fe}(\text{CO})_5$  and  $\text{Ni}(\text{CO})_4$  are reported. C. J. WEST

**A characteristic reaction of primary *aci*-nitro compounds.** HEINRICH WIELAND AND ZENJIRO KITASATO. *Ber.* 62B, 1250-3 (1929).—In investigations on the polymeric fulminic acids, in attempting to benzoylate in  $\text{C}_6\text{H}_5\text{N}$  metacyanilic acid (I), which contains a primary  $\text{NO}_2$  group, the product was unexpectedly found to contain Cl. Methazonic acid,  $\text{HC}(\text{:NOH})\text{CH:N}(\text{:O})\text{OH}$  (II), and  $\text{PhCH:N}(\text{:O})\text{OH}$  (III) behaved in the same way, while secondary *aci*-nitro compds. are apparently benzoylated normally. The compds. obtained from II and III were *dibenzoylchloroglyoxime*,  $\text{HC}(\text{:NOBz})\text{C}(\text{:NOBz})\text{Cl}$  (IV), and *benzoylbenzohydroxamyl chloride*,  $\text{PhC}(\text{:NOBz})\text{Cl}$  (V), resp., probably formed by addn. of  $\text{BzCl}$  to the  $\text{RCH:N}(\text{:O})\text{OH}$  and subsequent cleavage of  $\text{H}_2\text{O}$  from the resulting  $\text{RCH[N(Obz)OH]Cl}$ . Without  $\text{C}_6\text{H}_5\text{N}$ , III does not react with  $\text{BzCl}$ . IV and V are also formed from the acid-stable form of  $\text{HC}(\text{:NOH})\text{CCl:NOH}$  (VI) and from  $\text{PhCCl:NOH}$ , resp., with  $\text{BzCl}$  in  $\text{C}_6\text{H}_5\text{N}$ ; the alkali-stable isomer of VI yields an isomer (VII) of IV. IV, from II and  $\text{BzCl}$  in  $\text{C}_6\text{H}_5\text{N}$  at  $15^\circ$ , m.  $165^\circ$ , loses both its Cl and Bz to cold alc. KOH. VII, m.  $165^\circ$  but depresses the m p of IV to  $140^\circ$ . V, m.  $109^\circ$ . C. A. R

**The hydrazide of the 9,10-dihydroxystearic acid and the symmetric bisdihydroxyheptadecylurea.** C. BERNSTEIN AND F. ULLER. *Wissenschaftl. Mitt. Österreich. Heilmittelstelle* 1928, XI-XIV; *Chem. Zentr.* 1928, II, 1317. *Dihydroxystearic acid hydrazide*,  $\text{Me}(\text{CH}_2)_7\text{CH}(\text{OH})\text{CH}(\text{OH})(\text{CH}_2)_7\text{CONHNH}_2$  (I) (from dihydroxystearic acid ester and  $\text{H}_2\text{NNH}_2 \cdot \text{H}_2\text{O}$ ), m.  $164^\circ$ , insol. in  $\text{H}_2\text{O}$  and petroleum ether, almost insol. in EtOH; *HCl salt*,  $\text{C}_{18}\text{H}_{35}\text{O}_3\text{N}_2\text{Cl}$  (II), m.  $194-5^\circ$  (decompn.), slightly sol. in EtOH, insol. in  $\text{H}_2\text{O}$  and  $\text{Et}_2\text{O}$ . *Benzaldihydroxystearic acid hydrazide*,  $\text{Me}(\text{CH}_2)_7\text{CH}(\text{OH})\text{CH}(\text{OH})(\text{CH}_2)_7\text{CONHN:CHPh}$  (from I and  $\text{BzH}$ ), m.  $143-4^\circ$ , sparingly sol. in EtOH, insol. in  $\text{H}_2\text{O}$ . *Piperonaldihydroxystearic acid hydrazide* (from I and piperonal), m.  $153.5-4.5^\circ$ . *sym-sec-Dihydroxystearic acid dihydrazide*,  $\text{Me}(\text{CH}_2)_7\text{CH}(\text{OH})\text{CH}(\text{OH})(\text{CH}_2)_7\text{CONHNHCO}(\text{CH}_2)_7\text{CH}(\text{OH})\text{CH}(\text{OH})(\text{CH}_2)_7\text{Me}$  (from I with I in alc.), m.  $202-4^\circ$ , almost insol. in all org. solvents. *Dihydroxystearic acid azide*  $\text{Me}(\text{CH}_2)_7\text{CH}(\text{OH})\text{CH}(\text{OH})(\text{CH}_2)_7\text{CON}_3$  (III) (from II and  $\text{N}_2\text{O}_5$ ), m.  $168-73^\circ$ . *sym Bis[dihydroxyheptadecyl]urea*,  $\text{OC[NH}(\text{CH}_2)_7\text{CHOHCHOH}(\text{CH}_2)_7\text{Me}]_2$  (from III by boiling with  $\text{H}_2\text{O}$ , m.  $187^\circ$ , slightly sol. in EtOH, AcOH and  $\text{Et}_2\text{O}$ , insol. in petroleum ether. G. S

**The optical properties of some amino acids. II. Arginine and histidine.** GEORGE L. KEENAN. *J. Biol. Chem.* 83, 137-8 (1929); cf. C. A. 19, 1128.—Optical data on cryst. arginine and histidine are presented to supplement data already published on other cryst. amino acids. Arginine, crystd. from  $\text{H}_2\text{O}$ , dihydrate,  $n_D^{25} 1.528$ ,  $n_D^{20} 1.549$ ,  $n_D^{15} 1.579$ ; crystd. from 66% alc.,  $n_D^{25} 1.548$ ,  $n_D^{20} 1.562$ ,  $n_D^{15} 1.610$ . Histidine, crystd. from  $\text{H}_2\text{O}$ ,  $n_D^{25} 1.520$ ,  $n_D$  indeterminate,  $n_D^{15} 1.610$ . A. P. LOTHROP

**Rearrangement reactions in the carbohydrate group. I. New derivatives of monoacetoneglucose.** KARL JOSEPHSON. *Ann.* 472, 217-29 (1929).—3-Acetyldiacetone glucose (5 g.) in 10 cc. AcOH, to which 3 cc.  $\text{H}_2\text{O}$  is added after soln., allowed to stand 3-4 days and then concd. at  $30-5^\circ$  in vacuo, gives 62% 3-acetyl-1,2-isopropylidene-glucose  $< 1,4 >$  (I), m.  $125-6^\circ$ ,  $[\alpha]_D^{20}$  (yellow)  $-20.1^\circ$  (0.1593 g made up to 5 cc. in  $\text{H}_2\text{O}$ );

the structure is shown by transforming it into the diacetone deriv. with  $\text{Me}_2\text{CO}$  and  $\text{CuSO}_4$ ; very dil. alkali causes rearrangement into the 6-Ac deriv., m. 144–6° (Fischer and Noth, *C. A.* 12, 2558). I is rather stable at  $p_{\text{H}}$  about 4; in 1%  $\text{Na}_2\text{HPO}_4$  ( $p_{\text{H}}$  about 9) the rearrangement is practically complete in 5 min.; data are given for the rate of rearrangement at  $p_{\text{H}}$  5.81, 6.75 and 7.10,  $k$  being 1.1, 9.6 and  $19.5 \times 10^{-3}$  and the ratio  $k/\text{OH}$  being 2.0, 2.0 and  $1.8 \times 10^5$ . I and  $\text{Ph}_3\text{CCl}$  in  $\text{C}_6\text{H}_5\text{N}$  give the 6-trityl deriv., sinters 55°,  $[\alpha]_{\text{D}}^{20} -16^\circ$  (0.1573 g. made up to 5 cc. in  $\text{CHCl}_3$ );  $\text{Ac}_2\text{O}$  gives the 3,5-di-Ac deriv., sinters about 64° and then melts gradually,  $[\alpha]_{\text{D}}^{20} 5^\circ$  (0.1071 g. made up to 5 cc. in  $\text{CHCl}_3$ ).

C. J. WEST

**Triphenylmethyl ethers of several di- and trisaccharides. Constitution of maltose, saccharose and raffinose.** KARL JOSEPHSON. *Ann.* 472, 230–40 (1929).—Helferich and Koester (*C. A.* 18, 2873) have shown that the primary HO groups in poly-HO compds. are much more easily etherified with  $\text{Ph}_3\text{CCl}$  than the sec. groups. It is now shown that the no. of trityl groups introduced into maltose (I), saccharose (II) and raffinose (III) in  $\text{C}_6\text{H}_5\text{N}$  corresponds to the no. of primary HO groups to be expected according to Haworth's formulation. I (3.5 g.) in 60 cc.  $\text{C}_6\text{H}_5\text{N}$  and 8.4 g.  $\text{Ph}_3\text{CCl}$ , allowed to stand 40 hrs. at room temp., give 6-tritylglucoside  $< 1,5 >$  -6-tritylglucose  $< 1,5 >$  (ditritylmaltose), m. 137–9° (all m. ps. cor.),  $[\alpha]_{\text{D}}^{23} 78^\circ$  (0.0627 g. made up to 5 cc.  $\text{EtOH}$ ), shows no mutarotation, reduces Fehling soln. and yields a hexa-Ac deriv., m. 116–9°,  $[\alpha]_{\text{D}}^{20} 91^\circ$  (0.0823 g. made up to 5 cc. in  $\text{CHCl}_3$ ), and gives with  $\text{HBr}$   $\text{Ph}_3\text{CBr}$ . 6-Tritylglucoside-  $< 1,5 >$  -1,6-ditritylfructoside  $< 2,5 >$  (tritritylsaccharose), from 3.4 g. II and 8.4 g.  $\text{Ph}_3\text{CCl}$  in 50 cc.  $\text{C}_6\text{H}_5\text{N}$  in 10 g. yield, m. 127–9°,  $[\alpha]_{\text{D}}^{23} 44.3^\circ$  (0.0790 g. made up to 5 cc. in  $\text{EtOH}$ ); penta-Ac deriv., m. 125–6°,  $[\alpha]_{\text{D}}^{23} 57^\circ$  (0.0716 g. made up to 5 cc. in  $\text{CHCl}_3$ ). 6-Tritylgalactoside-  $< 1,5 >$  -glucoside-  $< 1,5 >$  -1,6-ditritylfructoside  $< 2,5 >$  (tritylraffinose), m. about 130° (1.3 g. from 0.7 g. III and 1.6 g.  $\text{Ph}_3\text{CCl}$ ),  $[\alpha]_{\text{D}}^{23} 79^\circ$  (0.0254 g. made up to 5 cc. in  $\text{EtOH}$ ); octa-Ac deriv., m. 123–5° (not cor.),  $[\alpha]_{\text{D}}^{20} 66^\circ$  (0.0757 g. made up to 5 cc. in  $\text{CHCl}_3$ ).

C. J. WEST

**Chemistry of starch.** H. PRINGSHEIM AND COLLABORATORS. XXII. Amylose and amylopectin. ARNOLD STEINGROEVER. *Ber.* 62B, 1352–9 (1929); cf. *C. A.* 23, 376.—An amylose completely sol. in cold  $\text{H}_2\text{O}$  and molecularly dispersed in this solvent can be obtained by subjecting the triacetate to a previous disaggregating treatment, either by heating in a bomb tube with 10 parts  $\text{C}_{10}\text{H}_8$  for 0.5 hr. at 260–70° or by refluxing it 24 hrs. in  $\text{CHCl}_3$  in the presence of 0.2% of  $\text{PhSO}_3\text{H}$ . If the product is hydrolyzed in the usual way with alc. KOH and very cautiously dehydrated with alc. and ether there is obtained an amyloosan showing the same sp. rotation as the original amylose, having no reducing power and giving the blue color with I. It is readily sol. in  $\text{H}_2\text{O}$  at room temp. and the soln. seems to be stable on standing although on freezing the solute gradually seps. out. In f.-p. detns. the f. p. of the soln. rises continuously after each detn. so that the lowest value (about 600) found can only be considered as the upper limit of the real mol. wt. The ash content of these preps. is always less than 0.5% and cannot account for the lowering of the f. p., which thus indicates a dispersion of the solute into particles of a mol. order of magnitude (corresponding to about 4- $(\text{C}_6\text{H}_{10}\text{O}_5)$  at the beginning); in 0.001 *M*  $\text{NaSCN}$ , which is a specially good disperser, no further diminution in particle size was observed. The 2 preps. do not raise the b. p. of pure water; in fact, they lower it several hundredths of a degree. Difficulties are also encountered with the Barger-Rast method. Measurements at high temps. were abandoned because the blanks even were not sufficiently reproducible. At room temp. a long time must be taken and yet it cannot be unlimited because of re-assocn. and for the same reason the concn. must be kept low. The values obtained correspond to about 2- $(\text{C}_6\text{H}_{10}\text{O}_5)$ . Longer refluxing with  $\text{PhSO}_3\text{H}$  does not improve the soly. of the product and seems to bring about a rearrangement similar to that with cellulose acetate. Amylopectin, prepd. according to Ling and Nanji, was acetylated, while still moist with  $\text{Et}_2\text{O}$ , with  $\text{Ac}_2\text{O}$  and  $\text{C}_6\text{H}_5\text{N}$  by shaking 3–4 days in the incubator; the resulting stiff jelly was decompd. with much ice, the ppt. ground to a powder with  $\text{H}_2\text{O}$ , dehydrated with alc., extd. with boiling  $\text{AcOEt}$  (which removes a substance with the soly. properties of an amylose acetate), taken up in  $\text{CHCl}_3$ , centrifuged and pptd. with  $\text{Et}_2\text{O}$ ; the amylopectin triacetate so obtained slowly dissolves in  $\text{CHCl}_3$  and  $\text{AcOH}$  in the course of several days at room temp., but even 1% solns. are so viscous and turbid that polarimetric measurements cannot be made;  $\text{H}_3\text{PO}_4$  can be detected qualitatively after decompn. of the org. matter. It has hitherto not been possible to break down the acetate with  $\text{PhSO}_3\text{H}$  without extensive rearrangement and decrease in the rotation; after refluxing 3–4 days and sapong. the product which seps. from the

$\text{CHCl}_3$ , there was obtained a substance with a rotation of  $165^\circ$ , having no reducing power, forming a red color with I and giving in freezing water values intermediate between those corresponding to  $2(\text{C}_6\text{H}_{10}\text{O}_5)$  and  $3(\text{C}_6\text{H}_{10}\text{O}_5)$ . If the boiling with  $\text{Ph}\cdot\text{SO}_3\text{H}$  in  $\text{CHCl}_3$  is done in the presence of much  $\text{Ac}_2\text{O}$ , no  $\text{AcOH}$  is split off; the product remains in soln. after boiling 4 days and alc. ppts. a substance having all the properties of amylose acetate. Starch pptd. from starch paste with alc. and dehydrated with alc. and ether can likewise be acetylated in  $\text{C}_6\text{H}_5\text{N}$  at incubator temp., yielding an acetate contg.  $\text{H}_3\text{PO}_4$ , swelling in  $\text{CHCl}_3$ ,  $\text{AcOH}$  and  $\text{Me}_2\text{CO}$  and dispersing in the last 2 solvents after several days to homogeneous but highly viscous and turbid solns. even at 1-2% concns. C. A. R.

A new series of depolymerization products of starch. AMÉ PICTET AND HANS VOGEL. *Helv. Chim. Acta* 12, 700-13(1929).—Previously reported degradation products of starch are not true structural units of starch, as they show neither a color with I nor a tendency to polymerize. *Isotrihexosan* (I) shows both of these properties. Dry potato starch, heated with 3 parts dry glycerol in an oil bath at  $220^\circ$ , dissolves gradually, and after 3 hrs. begins to show a violet color with  $\text{I}_2$ . After 2 hrs. more, the mixt. is cooled, 10 parts abs. alc. added, and the ppt. washed again with alc. and purified by soln. in  $\text{H}_2\text{O}$  and repptn. with alc.; 72% of I results, a white cryst. powder,  $(\text{C}_6\text{H}_{10}\text{O}_5)_3$ , mol. wt. in  $\text{H}_2\text{O}$ , 472 (calcd. 486), turns yellow toward  $235^\circ$ ,  $[\alpha]_D^{20} 2^\circ$  (decompn.),  $[\alpha]_D^{166.4-6.7^\circ}$  in  $\text{H}_2\text{O}$ , does not reduce Fehling soln., or neutral  $\text{KMnO}_4$ , is not attacked by emulsin. Malt diastase changes I to *dextrinose* (II) (synonym for *isomaltose* from starch, to avoid confusion with Fischer's isomaltose from glucose), and hot dil.  $\text{HCl}$  gives glucose. Heated with 6 parts  $\text{Ac}_2\text{O}$  and 3 parts  $\text{C}_6\text{H}_5\text{N}$ , I gives a *nonacetate*, m.  $156^\circ$ , decomps. about  $200^\circ$ , mol. wt. in  $\text{AcOH}$ , 878 (calcd. 864),  $[\alpha]_D^{154.8^\circ}$  in  $\text{CHCl}_3$ ; cold  $\text{NaOMe}$  in alc. regenerates I. When I is dissolved in cold concd.  $\text{HCl}$  and the latter allowed to evap. *in vacuo*, a new *trisaccharide*, *isotrihexose*, results, decomps.  $155-60^\circ$ , mol. wt. in  $\text{H}_2\text{O}$ , 543 (calcd. 504),  $[\alpha]_D^{102.1^\circ}$  in  $\text{H}_2\text{O}$ , reduces hot Fehling soln. and gives no color with  $\text{I}_2$ ; the very sol. osazone m.  $169-71^\circ$ . Dil.  $\text{HCl}$  hydrolyzes I to II, crystals with  $1\text{H}_2\text{O}$  from 80% alc., m.  $67-8^\circ$  (dry; *hydrate*, m.  $91-6^\circ$ ), mol. wt. in  $\text{H}_2\text{O}$ , 338 (calcd., 360),  $[\alpha]_D^{141.6^\circ}$  in  $\text{H}_2\text{O}$ ; osazone, m.  $167^\circ$  (the osazone from II contg. 17% maltose, m.  $154^\circ$ ; previous preps. of II probably contained maltose). Acetylation of II gives maltose octaacetate. When I is heated more severely ( $240^\circ$ ) with glycerol, it is further depolymerized to *dextrinosan* (III), which can also be obtained from starch directly, best with the addn. of a little  $\text{H}_2\text{C}_2\text{O}_4$ ; III,  $(\text{C}_6\text{H}_8\text{O}_5)_3$ , m.  $185-6^\circ$  (decompn.), mol. wt. in  $\text{H}_2\text{O}$ , 305-41 (calcd. 324),  $[\alpha]_D^{150.3^\circ}$  in  $\text{H}_2\text{O}$ ; best purified by regeneration from its *hexaacetate*, m.  $140-3^\circ$ , mol. wt. in  $\text{C}_6\text{H}_5\text{N}$ , 559 (calcd. 576),  $[\alpha]_D^{145.5^\circ}$  in  $\text{CHCl}_3$ . Hydration of III with cold concd.  $\text{HCl}$  gives II; but dehydration of II by heating 1 hr. at  $175^\circ$  and 12 mm. gives an *anhydride* isomeric with III, amorphous, m.  $130-40^\circ$ , and assumed to contain an ethylene oxide group, since it regenerates II on boiling in  $\text{H}_2\text{O}$ . In concd. soln. in  $\text{H}_2\text{O}$ , I forms (in 12-24 hrs.) a ppt. of a *polymer*, *isopolyhexosan* (IV); light does not affect the change, which is inhibited by various salts. IV forms rather starch-like grains which show birefringence, softens  $235^\circ$  and decomps.  $245^\circ$ ; boiling with  $\text{H}_2\text{O}$  reforms I, and hydrolysis with  $\text{HCl}$  gives only glucose. Acetylation of IV gives  $(\text{C}_6\text{H}_7\text{O}_5\text{Ac})_{12}$ ,  $[\alpha]_D^{177.4^\circ}$  in  $\text{CHCl}_3$ , mol. wt. in  $\text{C}_6\text{H}_5\text{N}$ , 3325, 3411 (calcd. 3456). B. H. NICOLET

Glycerides of chaulmoogra oil. A. RÖMER AND H. ENGEL. *Z. Untersuch. Lebensm.* 57, 113-47(1929).—The oil was hardened at  $170-200^\circ$  in the presence of a 0.1% mixt. of Pd and kieselguhr (1%). It was optically inactive and m.  $28^\circ$ . With the results of many fractional crystns. from acetone and  $\text{Et}_2\text{O}$  at  $0^\circ$ , graphs showing m. p. and wt. of the fractions were constructed. *Dihydrochaulmoogrodihydrohynocarpin*, m.  $307^\circ$ , made up 79% of the hardened oil. There was 13% of *dihydrohynocarpodihydrochaulmoogrin*, m.  $42.2^\circ$ , and also traces of a slightly sol. glyceride, possibly *tripalmitin*. Sapon., acid and I values as well as fractional pptn. of the fatty acids with  $\text{Mg}(\text{OAc})_2$  checked the above findings. Natural chaulmoogra oil contains the corresponding unsatd. glycerides *chaulmoogrodihydrohynocarpin* and *hynocarpodichaulmoogrin* in corresponding proportions while the fatty acids of the hardened oil have the compn. 40% dihydrochaulmoogric acid and 59% dihydrohynocarpic acid (*C. A.* 15, 728). Dihydrochaulmoogric and dihydrohynocarpic acids are 3-4 times more sol. in  $\text{EtOH}$  than stearic and palmitic acids. Tridihydrochaulmoogrin, m.  $51^\circ$ , was synthesized by the action of the Pb salt of dihydrochaulmoogric acid on tribromohydrin in the presence of xylene at  $170-80^\circ$  for 10 hrs. Analogously tridihydrohynocarpin, m.  $39.2^\circ$ , didihydrochaulmoogrin, m.  $60.7^\circ$ , trilaurin and trimyristin were prepd. C. R. F.

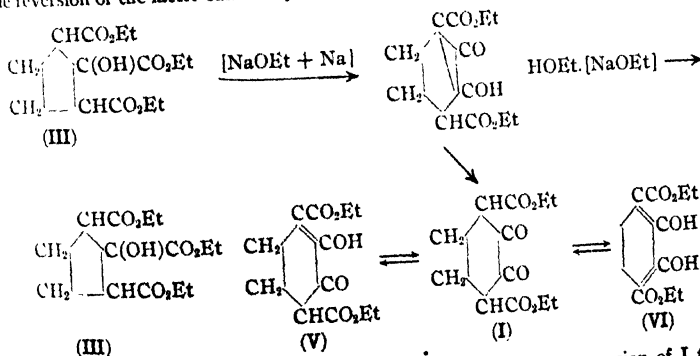
Some esters of 1,3- and 1,4-cyclohexanediol (resorcitol and quinitol). L. PAL-



FRAY AND B. ROTHSTEIN. *Compt. rend.* 189, 188-9 (1929); cf. C. A. 22, 2370, 4462, 4482.—*trans*-1,4-Cyclohexanediol (I) with EtCOCl and C<sub>6</sub>H<sub>5</sub>N in CHCl<sub>3</sub> gave the *trans*-dipropionate (II), m. 75.5-6.0°. From com. 1,4-cyclohexanediol (III), the product was essentially II but also some *cis*-form, m. 39.5-40°, was found. I reacted with iso-BuCOCl giving the *divaleryl*, but in this case as with III, the product was a mixt. of the 2 isomers,  $d_4^{22}$  0.9867,  $n_D^{22}$  1.4477, which could not be sepd. The *cis*-form of I reacted with PhCH:CHCOCl to give both the *trans*- and *cis*-dibenzoylates, m. 189° and 122°, resp. A phthalate could not be prepd. 1,3-Cyclohexanediol gave the following esters: *diacetate*,  $b_p$  130.5-1.5°,  $d_4^{25}$  1.0790,  $n_D^{25}$  1.4494; *dipropionate*,  $b_p$  154°,  $d_4^{26}$  1.0355,  $n_D^{26}$  1.4478; *diisovalerate*,  $b_p$  159-60,  $d_4^{27}$  0.9806,  $n_D^{27}$  1.4458; *diphenylacetate*,  $b_p$  215-7°,  $d_4^{24}$  1.1235,  $n_D^{24}$  1.5390; *dibenzoate*, *trans*, m. 122.5°, *cis*, m. 65.5°; *di-p-nitrobenzoate*, *trans*, m. 176.5°, *cis*, m. 154-4.5°; and the mixed Et oxalate ester, C<sub>12</sub>H<sub>10</sub>(OCO.CO<sub>2</sub>Et)<sub>2</sub>,  $b_p$  187°,  $d_4^{23}$  1.1988,  $n_D^{23}$  1.4604. The *cis*- and *trans*-forms of the diol were successfully isolated through the dibenzoate. Reaction of 1,3-di[chloromethoxy]cyclohexane with RMgX gave the following bis-ethers: 1,3-di[propoxycyclohexane],  $b_p$  113°,  $d_4^{22}$  0.9006,  $n_D^{22}$  1.4430; 1,3-di[phenylmethoxycyclohexane],  $b_p$  205-7°,  $d_4^{26}$  1.0739,  $n_D^{25}$  1.5440; and 1,3-di[2-methoxypropoxycyclohexane], 1,3-C<sub>6</sub>H<sub>10</sub>[OCH<sub>2</sub>CH<sub>2</sub>(OMe)Me]<sub>2</sub>,  $b_p$  160-2°,  $d_4^{23}$  0.9006,  $n_D^{23}$  1.4489.

A. S. CARTER

The action of sodium alcoholate on diethyl 2,3-cyclohexanedione-1,4-dicarboxylate. LUDIA S. DEBUSENKO. *Acta Univ. Asiae Med* 1928, Ser. 6, No. 1, 3-16.—These investigations, dealing with the action of NaOEt on di-Et 2,3-cyclohexanedione-1,4-dicarboxylate (I), were concerned with explaining the mechanism of the formation of tri-Et cyclopentenetricarboxylate (II) in the condensation of adipic acid esters with (CO<sub>2</sub>Et)<sub>2</sub> under the influence of metallic Na. The presence of the diketone group —CO—CO— in I leaves open the possibility that it is first transformed into alc. under —C(OH)(CO<sub>2</sub>Et), in the same way as with benzil, whereby tri-Et cyclopentanoltetricarboxylate (III) is formed, from which II is further formed under the existing reaction conditions with loss of water. A fundamental study of these reactions was carried out. With an excess of alc., I is converted into tri-Et 2-hydroxycyclopentane-1,2,3-tricarboxylate (III) under the influence of NaOEt. III reverts to I in the absence of alc. under the influence of NaOEt and metallic Na. In the condensation of adipic acid esters with oxalic acid esters, besides I, II and III, previously identified, only Et oxaladipate (IV) can be found. These compds., thus obtained, leave the original question unanswered, i. e., as to whether II is to be considered as a product of the ring closure of IV or a transformation product of I. From best evidence it seems that III is formed as a primary transformation product of IV, which, under the reaction conditions (presence of excess of metallic Na and dry NaOEt), either splits off water and thus forms II or, in case alc. is split off, yields I. The mechanism of the conversion of III to I and the reversion of the latter can be represented by the following scheme:



V and VI are mono-enolic and di-enolic tautomers, resp. The conversion of I to III in an alc.-contg. medium under the influence of NaOEt and the reverse process under the influence of metallic Na and NaOEt in the complete absence of alc., makes probable the hypothesis that the conversions —CO.CO— + HOC<sub>2</sub>H<sub>5</sub>  $\rightleftharpoons$  >C(OH)CO<sub>2</sub>Et constitutes a reversible process.

R. P. WALTON

**Chaulmoogrylamino phenols and chaulmoogrylbenzylamine.** IRÈNE DE SANTOS AND AUGUSTUS P. WEST. *Phillipine J. Sci.* **38**, 445-9(1929); cf. *C. A.* **23**, 3540.—Four new derivs. of chaulmoogric acid were prep'd. by heating the amide with the appropriate Cl deriv. in the presence of NaOAc and Cu powder: *o*-hydroxyanilide, m. 104.9-5.9°; *m*-hydroxyanilide, m. 105.9-8.0°; *p*-hydroxyanilide, m. 97.8-101.9°; benzylamide, m. 92.7-5.8°. The yields were 5-22%. BEN H. NICOLET

**Diethyl 1-cyclohexanone-2,6-dicarboxylate.** The mechanism of the reducing action of zinc upon halogen derivatives. M. I. USHAKOV. *J. Russ. Phys.-Chem. Soc.* **61**, 795-802(1929).—*Di-Et 1-cyclohexanone-2,6-dicarboxylate* (I) was prep'd. by condensation of  $\text{CH}_2[\text{CH}_2\text{CH}(\text{CO}_2\text{Et})_2]_2$  (II) (Meerwein and Schürmann, *C. A.* **7**, 3475):  $\text{I} \rightarrow \text{II} + \text{CO}(\text{OEt})_2$ , when 1 mol. each of II and metallic Na in 650 cc. abs. alc. were heated 3 hrs. on a water bath, the alc. and  $\text{CO}(\text{OEt})_2$  distd. off, the residue fractionated *in vacuo*, cooled with ice and decomp'd. with 20%  $\text{H}_2\text{SO}_4$ ; the 2nd fraction contg. most of the I,  $b_D^{20}$  165-5.5°; yield 36%. *1-Phenylpyrazolone* of I, was obtained in 90% yield on heating 1 hr. in a water bath an equimol. amt. of I and  $\text{PhNHNH}_2$ , the product crystd. from  $\text{Et}_2\text{O}$  and recrystd. from a mixt. of alc. and  $\text{Et}_2\text{O}$ , m. 151-2°, white powder, insol. in  $\text{H}_2\text{O}$ . The cyclohexanone,  $\text{CH}_2 \cdot (\text{CH}_2)_4 \cdot \text{CH}_2 \cdot \text{CO}$ , from I was prep'd. on heating

at 230-40° for 1 hr. equal vols. of I and  $\text{H}_2\text{O}$  (Meerwein and Schürmann, *loc. cit.*); the semicarbazone m. 166°. The bromination of I gives  $\text{EtO}_2\text{CCBr} \cdot (\text{CH}_2)_4 \cdot \text{CBr}(\text{CO}_2\text{Et}) \cdot \text{CO}$

(III) when 21 g. I in 100 cc.  $\text{Et}_2\text{O}$  with powd. marble is cooled with ice and slowly mixed with 28 g. Br, the product washed with  $\text{H}_2\text{O}$ , then with 2 *N* NaOH and 10%  $\text{H}_2\text{SO}_4$ ; on drying it forms a heavy yellow liquid easily decomp'd. on distn. The action of Zn dust on III. Twenty-nine g. of III in 30 cc. PhMe are mixed with 14 g. Zn dust and heated on a water bath; after the turbulent reaction has subsided, the heating is continued for 2 hrs., forming two layers over some Zn; the mixt. is treated with  $\text{H}_2\text{O}$ , the ZnO formed is dissolved with 10%  $\text{H}_2\text{SO}_4$ , the PhMe layer removed, dried with calcined  $\text{MnSO}_4$ , filtered and distd. *in vacuo*, giving 8.5 g. of a liquid  $b_D^{20}$  140-75°, which gives violet color with  $\text{FeCl}_3$ , the Cu salt, the *N*-phenylpyrazolone, m. 150-2°, show that this fraction contains 70% of I. CHAS. BLANC

**Chemistry of the three-carbon system. XXI. Some cycloheptane compounds.** WILFRED E. HUGH, GEO. A. R. KON AND THOMAS MITCHELL. *J. Chem. Soc.* **1929**, 1435-40.—Cycloheptylideneacetic acid on treatment with alkali passes into an equimixt. from which about 25% of the unchanged acid could be recovered (Kon and May, *C. A.* **21**, 3187); with I, instead of May's extrapolation method (*C. A.* **22**, 370) this value is confirmed (26%  $\alpha, \beta$ -isomer) but subsequent expts. with the pure  $\beta, \gamma$ -acid suggest that this value may be 2-3% low.  $\Delta^1$ -Cycloheptenylacetic acid,  $b_D^{20}$  153°,  $b_D^{25}$  107,  $d_4^{25}$  1.01155,  $n_D^{20}$  1.48820; Et ester,  $b_D^{20}$  104-7°,  $d_4^{25}$  0.97172,  $n_D^{20}$  1.44680; chloride,  $b_D^{20}$  100-4°; anilide, m. 79-80°. Cycloheptylideneacetone, from the  $\alpha, \beta$ -acid,  $b_D^{20}$  96°,  $d_4^{25}$  0.94852,  $n_D^{20}$  1.49518; semicarbazone, m. 172-3°; cycloheptenylacetone,  $b_D^{20}$  95°,  $d_4^{25}$  0.93558,  $n_D^{20}$  1.47595; semicarbazone, m. 128-9°. The equilibration of the 2 ketones is difficult because equil. is reached after 5 min. treatment with  $\text{EtONa}$ , the av. figure is 65% of the  $\alpha, \beta$ -ketone. The mobility of the acid system,  $(k_1 + k_2) \times 10^4$ , is 0.66; for the ketone system,  $(k_1 + k_2) \times 10^4$ , is greater than 3500. The work shows that the mobility and the point of equil. of ketones cannot be simply correlated with those of the corresponding acids. C. J. WEST

**The action of hydrohalic acids upon acetylene glycols.** YU. ZALKIND AND A. KRUGLOV. *J. Russ. Phys.-Chem. Soc.* **61**, 803-14(1929).—The action of HBr on acetylene glycols may produce 2 derivs., a dibromide,  $\text{R}_2\text{C}:\text{CBrCBr}:\text{CR}_2$  and an oxybromide,  $\text{RR}'\text{C}:\text{CBr}:\text{CH}:\text{CRR}'\text{O}$  (*J. Russ. Phys.-Chem. Soc.* **58**, 1039, 1052; **56**,

283). The glycols with aromatic radicals react either with HBr or HI in both directions. Tetraphenylbutenediol (I), however, reacts with HI differently (Salkind and Krugov, *Ber.* **61**, 2306), giving the oxyiodide, but instead of the expected diiodides, which seem to be unstable, there are formed hydrocarbons:  $\text{C}_{22}\text{H}_{20}$ , m. 235° and 204-5°, and  $\text{C}_{24}\text{H}_{22}$ , m. 201-2°. The oxyiodide, 2,2,5,5-tetraphenyl-3-iododihydrofuran,  $(\text{C}_6\text{H}_5)_2\text{C}:\text{CH}:\text{CI}:\text{C}(\text{C}_6\text{H}_5)_2\text{O}$  (II), could only be obtained when using very dil. HI and heating

on a boiling water bath, whereby the hydrocarbon,  $\text{C}_{22}\text{H}_{20}$ , m. 235°, is also formed; the mixt. is poured in cold  $\text{H}_2\text{O}$  the solid is filtered off, washed, dried, extd. with ligroin, filtered hot, from which is crystd. II contg. some hydrocarbon; this is dissolved again in a mixt. of acetone and ligroin, whereby on cooling the hydrocarbon is pptd., filtered,

and after partial evapn. of the solvent is pptd. The pure **II** m. 139–40° (yield 60–70%), colorless prisms, readily sol. in org. solvents. *1,1,4,4-Tetraphenyl-1,2,3-butatriene*,  $(C_6H_5)_2C:C:C(C_6H_5)_2$  (**III**), m. 235°, is obtained in 80–85% yield, when **I** is treated with a more concd. soln. in AcOH at 0°; when working at 5–15° the **III** is contaminated with the hydrocarbon, m. 204–5°. **III** was also prepd. with a satd. soln. of HI in AcOH and **II**. In all the cases the reaction product was poured in cold H<sub>2</sub>O, the solid filtered off and crystd. from a mixt. of C<sub>6</sub>H<sub>6</sub> and C<sub>6</sub>H<sub>5</sub>CH<sub>3</sub>, and then from AcOEt, yellow prisms, sol. in PhMe, CHCl<sub>3</sub>, poorly sol. in petroleum ether and Et<sub>2</sub>O (Rast, *Ber.* **55**, 1051 (1922); Brand, *Ber.* **54**, 1987, 2020; *J. Chem. Soc.* **57**, 1537; *Ann.* **279**, 379). *1,10,10-Triphenylbenzofulvene* is obtained in 60–80% yield when 1 g. **I** with 5–10 cc. dil. HI and 0.5 g. **I** is heated in a boiling water bath for 1–2 hrs., the product poured into cold H<sub>2</sub>O, filtered and crystd. from AcOEt, orange crystals, m. 205–6°, easily sol. in C<sub>6</sub>H<sub>6</sub>, C<sub>6</sub>H<sub>5</sub>CH<sub>3</sub>, CHCl<sub>3</sub>, less sol. in AcOH, ligroin, acetone and alc. *1,1,4,4-Tetraphenyl-1,3-butadiene*,  $(C_6H_5)_2C:CHCH:C(C_6H_5)_2$ , is prepd. when 1 g. **III** is heated in a water bath for 3 hrs. with 8 cc. HI and 1 g. P; on diln. with H<sub>2</sub>O the solid product is filtered off and crystd., first from C<sub>6</sub>H<sub>6</sub> and then from a mixt. of acetone and alc., colorless needles, m. 192–3°.

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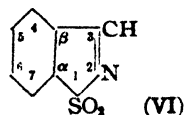
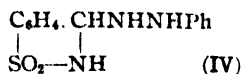
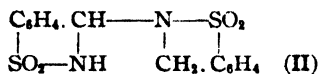
**Relation between quinone hydrazones and *p*-hydroxyazo compounds.** VI. *p*-Quinone dihydrazones from *p*-hydroxyazo compounds. W. BORSCHKE, W. MÜLLER AND C. A. BODENSTEIN. *Ann.* **472**, 201–16 (1929); cf. *C. A.* **21**, 68. In the following it is shown that true hydroxyazo compds. of the type 4-hydroxyazobenzene react under definite conditions with primary hydrazines to form *p*-quinone dihydrazones, thus giving chem. proof, previously lacking, that 4-hydroxyazo compds. are capable of quinone tautomerism. *p*-Anisylsemicarbazide, m. 184°, from  $p\text{-MeOC}_6\text{H}_4\text{NHNH}_2$  and KCNO, is oxidized in AcOH by CrO<sub>3</sub> to 4-methoxyphenylazoformamide (**I**), orange-red, m. 157° (decompn.) (90% yield); with H<sub>2</sub>NNHCONH<sub>2</sub>·HCl in MeOH the latter gives quinone disemicarbazone, yellow, m. 251° (decompn.); similarly, 2,4-(O<sub>2</sub>N)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>NHNH<sub>2</sub> (**II**) gives the semicarbazone 2,4-dinitrophenylhydrazine (**III**), dark brown, m. 242° (decompn.), and 4,2-NC(O<sub>2</sub>N)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>NHNH<sub>2</sub>, the semicarbazone 4-cyano-2-nitrophenylhydrazine, black-brown, decomp. 240° (70% yield). **I** and *p*-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>NHNH<sub>2</sub> give 4-methoxyphenylhydrazoformamide; i. e., the hydrazine acts as a reducing rather than as a substituting agent. 4-Phenoxyphenylsemicarbazide, m. 159°; 4-phenoxyphenylazoformamide, orange-red, m. 165°; neither this nor the 4-Br deriv. reacts with 4-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>NHNH<sub>2</sub>, except to be reduced. Thus, the ethers of the oxyazo compds. do not condense with primary hydrazines in the presence of HCl to form quinone dihydrazones. 2,4,6-(O<sub>2</sub>N)<sub>3</sub>C<sub>6</sub>H<sub>2</sub>N·NC<sub>6</sub>H<sub>4</sub>OH and **II** give *p*-quinone 2,4,6-trinitrophenylhydrazine 2,4-dinitrophenylhydrazine, dark brownish red, m. 204–6°. *p*-Quinone bis[2,4-dinitrophenylhydrazine], dark red, m. 267–8° (decompn.), results in 1.1 g. yield from 1.44 g. 2,4-(O<sub>2</sub>N)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>N·NC<sub>6</sub>H<sub>4</sub>OH (**IV**), and **II**, in 0.7 g. yield from 0.54 g. O·C<sub>6</sub>H<sub>4</sub>O and **II**, by heating **IV** with 2 N HCl for 2 hrs., from 2,4-dinitrophenylazoanisole, m. 177–8°, and **II** by heating 0.5 day, and from *O*-Bz deriv. of **IV**, red-brown, m. 164°, and **II** with MeOH·HCl. **IV** and H<sub>2</sub>NNHCONH<sub>2</sub>·HCl give **III**. 4-Hydroxyphenylazoformanilide and **II** in MeOH·HCl or **IV** and PhNHNHCONH<sub>2</sub>·HCl give quinone phenyl-1-semicarbazone 2,4-dinitrophenylhydrazine, dark red, decomp. 248–50°. **IV** and 2-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>NHNH<sub>2</sub> or 2-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>N·NC<sub>6</sub>H<sub>4</sub>OH-4 and **II** give quinone 2-nitrophenylhydrazine 2,4-dinitrophenylhydrazine, black-brown, m. 236–8° (decompn.). 2,4-(O<sub>2</sub>N)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>N·NC<sub>6</sub>H<sub>4</sub>(OH)Me-4,2 and **II** give toluquinone bis[2,4-dinitrophenylhydrazine], grayish black, m. 269°, while 2-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>NHNH<sub>2</sub> gives toluquinone 2-[2-dinitrophenylhydrazine] 5-[2,4-dinitrophenylhydrazine], dark brown, m. 246–7° (decompn.). Thymoquinone 6-[2-nitrophenylhydrazine] 3-[2,4-dinitrophenylhydrazine], black, m. 258–60°. Quinone 2,4-dinitrophenylhydrazine 3-nitrophenylhydrazine, brown, m. 223–5°, from 3-nitrobenzenesulphonic acid, light yellow, m. 146–7°. The 4-nitrophenylhydrazine deriv., black, m. 215° (decompn.). 4-Hydroxyazobenzene-2'-carboxylic acid, brown, m. 206–7°; *Me* ether, yellow, m. 170–2° (*Me* ester, red, m. 105–6°); either acid and **II** give quinone 2-carboxyphenylhydrazine 2,4-dinitrophenylhydrazine, deep violet, m. 226–8°. **IV** does not react with BzNHNH<sub>2</sub>, PhNHNH<sub>2</sub>, or NH<sub>2</sub>OH. C. J. W.

**Derivatives of 2,4-dichlorophenylhydrazine, 2,4,6-trichlorophenylhydrazine and 2-chloro-4-nitrophenylhydrazine with aldehydes and ketones, especially the sugars.** E. VOTOČEK AND L. RYS. *Collection Czechoslov. Chem. Comm.* **1**, 346–51 (1929); cf. *C. A.* **18**, 50; **19**, 44; **20**, 1794. The hydrazones of the above 3 compds. (**I**, **II** and **III**, resp.) with COMe<sub>2</sub>, BzH, salicyl aldehyde, arabinose, rhamnose, glucose, galactose and fructose, also the osazones of the sugars have been prepd. The **II** and **III** hydrazones of COMe<sub>2</sub> sep. easily from dil. solns., and m. 58° and 121.5°, resp. So do the **I** and **II** hydrazones of fructose, m. 120° and 155°, resp. **I** was prepd. (cf. *C. A.* **23**, 1400).

For II 60 g. of 2,4,6-Cl<sub>3</sub>C<sub>6</sub>H<sub>3</sub>NH<sub>2</sub> in concd. H<sub>2</sub>SO<sub>4</sub> was added to 500 g. concd. HCl, cooled, 24 g. concd. NaNO<sub>2</sub> soln. added and the excess destroyed with urea, the mixt. added to 150 g. of SnCl<sub>2</sub> in HCl, the double salt recrystd. from hot H<sub>2</sub>O, dried, decompd. with Na<sub>2</sub>CO<sub>3</sub>, recrystd. from C<sub>6</sub>H<sub>6</sub> and EtOH. Yield 55%, white crystals, m. 143°. For III 100 g. of 2,4-Cl(O<sub>2</sub>N)C<sub>6</sub>H<sub>3</sub>NH<sub>2</sub> in concd. H<sub>2</sub>SO<sub>4</sub> was added to 500 g. concd. HCl, cooled, 50 g. NaNO<sub>2</sub> in H<sub>2</sub>O added and the mixt. added to 260 g. SnCl<sub>2</sub> in concd. HCl. Recrystallize as before. Sn was remove by H<sub>2</sub>S. An equal vol. of HCl was added and satd. with HCl gas, filtered, decompd. with NaOAc and recrystallized from EtOH; yellow, m. 144°.

V. F. HARRINGTON

**Aromatic sulfonamides.** J. AND P. KOETSCHET. *Helv. Chim. Acta*, 12, 669 (1929).—Sulfonamides contg. the groups —CH<sub>2</sub>OH or —CHO cannot be made from the acids by the usual methods. Dakin (C. A. 11, 3276) obtained *p*-OHCC<sub>6</sub>H<sub>4</sub>SO<sub>2</sub>NH<sub>2</sub> (I) by the action of chloramine-T and glucose. It is now found that in the presence of acid (and hence of dichloroamine) I is formed without glucose, and may be sepd either as the phenylimide or phenylhydrazone. The *p*-nitrophenylhydrazone of I, yellow needles, m. 256–7°; the *α*-naphthylhydrazone, m. 254–5°. Methylation of I with Me<sub>2</sub>SO<sub>4</sub> (gradual addn. of alkali) formed *p*-sulfonmethylamidobenzaldehyde, m. 119–9.5°; phenylhydrazone, m. 163–4°; and *p*-sulfondimethylamidobenzaldehyde, m. 134–7°; phenylhydrazone, m. 170–1°. By the Cannizzaro reaction, I gave *p*-sulfonamidobenzyl alc., m. 119–20°, and H<sub>2</sub>NSO<sub>2</sub>C<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>H. "Chloramine-TO" (prepn from *o*-MeC<sub>6</sub>H<sub>4</sub>SO<sub>2</sub>NH<sub>2</sub> described in detail) boiled and agitated by steam in 10 parts of 2.5% AcOH, gave the anhydrobenzylalcohol-*o*-sulfimide of *o*-sulfamidopseudobenzaldehyde (II), m. 141–2° and some saccharin (III). With hydrazines, II gave the phenylhydrazone (IV) (authors' name; see formula), red-brown, m. 110°, the *p*-nitrophenylhydrazone, yellow needles, m. about 250°, and the *α*-naphthylhydrazone, m. 206–8°, of *o*-sulfamidopseudobenzaldehyde (V). A new nomenclature is proposed in which these compds are



H derivs. of *S*-dioxo-*α,β*-benzisothiazole (VI). IV would then become *S*-dioxo-2,3-dihydro-3-phenylhydrazino-*α,β*-benzisothiazole. Boiling dil. HCl does not affect II, but SO<sub>2</sub> gives 1 mol. of anhydro-*o*-sulfamidobenzyl alc. (VII), m. 112.5–3°, and the soln. seems to contain V, although the isolated product is apparently a polymer of V, amorphous, m. above 250°. Methylation of II with Me<sub>2</sub>SO<sub>4</sub> gives 3 products: *N*-Me deriv. of II, m. 262–3°; *N*-Me deriv. of VII, m. 122–3°; and an aldehyde, *N*-Me deriv. of V, which with PhN<sub>2</sub>H<sub>2</sub> gives the *N*-Me deriv. of IV, m. 153–4°. In the prepn. of II, there is also formed a small quantity of the "bitter substance," *o*-toluenesulfonyl deriv. of *S*-dioxo-3-amino-*α,β*-benzisothiazole, m. 255° (Herzog, C. A. 20, 3450; Klages, C. A. 21, 2888) which accompanies III in its technical manuf. By modifying the conditions for the action of Cl<sub>2</sub> on *o*-MeC<sub>6</sub>H<sub>4</sub>SO<sub>2</sub>NH<sub>2</sub> this can be obtained in double the yield previously possible. When III is boiled 1.5 hrs. with 6 parts of PhNH<sub>2</sub> and the excess PhNH<sub>2</sub> distd. off up to 250°, pseudosaccharin anilide (*S*-dioxo-3-anilino-*α,β*-benzisothiazole), m. 313–5°, is obtained in much improved yield. A table gives the "system nos." (cf. Beilstein, 4th ed.) of the compds. described.

B. H. NICOLET

***o*-Aminobenzenesulfonic acid (orthanilic acid).** HANS EDUARD PIERZ DAVID WITH EMIL SCHLITTLER AND HANS WALDMANN. *Helv. Chim. Acta* 12, 663 (1929).—A no. of methods for the prepn. of *o*-H<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>SO<sub>2</sub>H (I) were studied. Directions are given for the nitration of PhSO<sub>3</sub>H and sepn. of the isomers as Fe<sup>+</sup> salts; after reduction, 23% of I was obtained. Sulfonation of PhNH<sub>2</sub> with ClSO<sub>3</sub>H in C<sub>2</sub>H<sub>5</sub>Cl (cf. D. R. P. 392,460) was not satisfactory. *o*-ClC<sub>6</sub>H<sub>4</sub>NO<sub>2</sub> boiled 8 hrs. with Na<sub>2</sub>S<sub>2</sub> in alc. gave 72–75% (*o*-NO<sub>2</sub>C<sub>6</sub>H<sub>4</sub>S<sub>2</sub>), 100 g. of which in 600 cc. concd. HCl and 50 cc. concd. HNO<sub>3</sub> gave with Cl<sub>2</sub> *o*-NO<sub>2</sub>C<sub>6</sub>H<sub>4</sub>SO<sub>2</sub>Cl (II), m. 67°, in 80% yield. Hydrolysis with Na<sub>2</sub>CO<sub>3</sub> and reduction with Fe gave 92% I (microphotographs are given of crystal forms of the isomers of I, and of the stable and unstable forms of I). With NH<sub>4</sub>OH II gave the amide (90%), reduced by Fe to *o*-H<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>SO<sub>2</sub>NH<sub>2</sub> (III) (70%). With HCl and C<sub>6</sub>H<sub>5</sub>ONO in alc., III gave C<sub>6</sub>H<sub>5</sub>— NH (IV), white needles pptd. by Et<sub>2</sub>O, be-

H<sub>2</sub>ONO in alc., III gave C<sub>6</sub>H<sub>5</sub>— NH (IV), white needles pptd. by Et<sub>2</sub>O, be-

haves on heating like gun-cotton, and has a very sweet taste, recalling saccharin, to which it is closely related. Various azo dyes from IV were very similar to corresponding dyes from  $p\text{-H}_2\text{NC}_6\text{H}_4\text{NHAc}$ .

**The reaction between phenol and lead subacetate (Goulard's extract).** E. A. LUM. *Pharm. J.* 122, 149–50, 251, 321 (1929); G. S. GIBSON, *Ibid* 192–3; J. E. DRIVER, *Ibid* 251; E. MATTHEWS, *Ibid* 297.—With Medley (*C. A.* 20, 3777), L. considers the ppt. to be  $\text{Pb}(\text{OPh})_2$ ; a large portion of ionized Pb is in neutral soln. G. and M. previously (*C. A.* 22, 1965) found for the ppt. the compn.  $\text{Pb}(\text{OPh})_2 \cdot \text{Pb}(\text{OH})(\text{OAc})$  (I). This formula L. accepts, also the following equation given by M.:  $3\text{Pb}(\text{OH})(\text{OAc}) + 2\text{PhOH} = \text{I} + \text{Pb}(\text{OAc})_2 + 2\text{H}_2\text{O}$ .

**The preparation of aromatic ethers by the catalytic action of alkali bisulfates.** JEAN B. SENDERENS. *Compt. rend.* 188, 1073–6 (1929).—Heating  $\text{PhCH}_2\text{OH}$  to 145–50° in the presence of  $\text{KHSO}_4$  or  $\text{NaHSO}_4$  gives  $(\text{PhCH}_2)_2\text{O}$ . Similarly,  $(\text{PhCH}_2\text{CH}_2)_2\text{O}$  was prepd. from  $\text{PhCH}_2\text{CH}_2\text{OH}$ . Mixts. of alcs. under the foregoing conditions give corresponding mixed ethers.

**Some substances derived from the anhydrocatechol tetramethyl ether.** WILSON BAKER. *J. Chem. Soc.* 1929, 1593–1604.—Anhydrocatechol tetra-Me ether (I) contains the same C skeleton as the natural isoflavones and from the point of view of genetic relationships it was of importance to attempt to oxidize the  $\text{CH}_2$  group in this compd. to a CO group with the object of producing 5,7,3',4'-tetramethoxyisoflavone. It was considered doubtful whether such a relationship between the catechols and the isoflavones really exists in nature, since the isoflavone corresponding to the catechols is unknown and no catechols are known to occur which correspond to any of the known isoflavones. I, m. 133–4°, gives a bright orange soln. in concd.  $\text{H}_2\text{SO}_4$ ; in AcOH and a few drops of concd.  $\text{HNO}_3$  the orange-yellow color rapidly develops a greenish tint and then more slowly becomes a dull slate-blue. I yields no recognizable products either by fusion with KOH, toward which it is remarkably stable, or by oxidation with  $\text{CrO}_3$  in AcOH. It does not react with aromatic aldehydes or NO compds. Definite results were obtained only on oxidizing with  $\text{KMnO}_4$  and  $\text{CrO}_3$ .  $\text{KMnO}_4$  in  $\text{Me}_2\text{CO}$  at 12–22° gives about 12% of 5,7,3',4'-tetramethoxy-3-phenylcoumarin (II), very pale yellow, m. 177°, and about 8% of a basic substance converted by HCl into 5,7,3',4'-tetramethoxyisoflavylum chloride (III). The solns. of II are all very pale yellow; that in EtOH exhibits a bluish green, in  $\text{C}_6\text{H}_6$  and  $\text{Me}_2\text{CO}$  a fine blue and in  $\text{CHCl}_3$  a strong greenish blue fluorescence. II does not give an oxonium salt on warming with concd. HCl. Demethylation gives the corresponding tetra-HO deriv., yellow, m. 337° (decompn.); the concd.  $\text{H}_2\text{SO}_4$  soln. is yellow and exhibits a very weak green fluorescence. A suspension in air-free  $\text{H}_2\text{O}$ , treated with a drop of 1% NaOH, yields a bright yellow soln. which, when shaken rapidly, darkens and becomes dull reddish brown.  $\text{FeCl}_3$  in EtOH gives a greenish yellow color, changing with excess through dull yellowish brown to red-brown. Phloroglucinaldehyde and Na homoveratrate, boiled with  $\text{Ac}_2\text{O}$  for 24 hrs., give the di-Ac deriv., pale yellow, m. 151°, of 5,7-dihydroxy-3',4'-dimethoxy-3-phenylcoumarin, yellow, m. 327° (decompn.); methylation gives II, thus establishing its constitution. III, bright red, m. 128–9° (decompn.); the same product was obtained from the bromide (Pratt and Robinson, *C. A.* 19, 2341). The oxidation of I with  $\text{KMnO}_4$  in  $\text{C}_6\text{H}_5\text{N}$  gives about 25% of II and only a trace of III. Oxidation of I with  $\text{CrO}_3$  in  $\text{C}_6\text{H}_5\text{N}$  gives about 4% of the 2 products. Oxidation of the pseudo-base of III gives only a trace of II and a minute amt. of an acid, probably 2,4,6-HO(MeO)- $\text{C}_6\text{H}_2\text{CO}_2\text{H}$ ; the stability of this base towards oxidation excludes the possibility of its being regarded as an intermediate in the oxidation of I to II. This leads B. to the opinion that the isoflavones are not derived from catechol-like substances. Freudenberg, Carrara and Cohn (*C. A.* 20, 405) have described a reddish violet HCl salt of I, which, however, is identical with III. The analogous HCl salt of anhydroepicatechol tetra Me ether (F., Fikentscher and Wenner, *C. A.* 19, 2041) is shown to be identical with tetramethyluteolinidin chloride (Pratt, Robinson and Williams, *C. A.* 18, 986). This crystals from hot 8% HCl on cooling and satg. with HCl as the compd.  $\text{C}_{19}\text{H}_{16}\text{O}_8 \cdot \text{Cl} \cdot \text{HCl} \cdot 2\text{H}_2\text{O}$ , orange-red needles with greenish yellow reflex.

**Substitution in resorcinol derivatives.** II. Bromo derivatives of  $\beta$ -resorcyraldehyde and their orientation. MYSORE GURU SRINIVASA RAO, COLLURAYANA SRIKANTIA AND MYSORE SESHA IVENGAR. *J. Chem. Soc.* 1929, 1578–81; cf. *C. A.* 19, 1701.—2,4-HO(MeO) $\text{C}_6\text{H}_2\text{CHO}$  (I) (3 g.) in 15 cc.  $\text{HCO}_2\text{H}$  and 15 g. AcONa, treated with 1 cc. Br in 15 cc.  $\text{HCO}_2\text{H}$ , gives quant. the 5-Br deriv., m. 120–1° (larger amts. give 75% yields);  $\text{FeCl}_3$  gives a dark violet color; oxime, m. 148–9°; phenylhydrazone, m. 177–8°. The same compd. results by reduction of the 5- $\text{NO}_2$  deriv. and applying the Sandmeyer reaction. Excess Br or the action of the calcd. amt. of Br upon I in AcOH and AcONa

gives the *3,5-di-Br deriv.*, m. 97–8°; FeCl<sub>3</sub> gives a violet color; *oxime*, m. 215°; *phenylhydrazine*, m. 131–2°. Nitration gives 2,6,4,3-Br<sub>2</sub>(O<sub>2</sub>N)(HO)C<sub>6</sub>HOMe, m. 127–8° whose Me ether, m. 81°, was prepd. by Jackson and Fiske (*Am. Chem. J.* 30, 53 (1903)). Bromination of other derivs. of 2,4-(HO)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>CHO gives 5-Br derivs., showing that the MeO and EtO groups are powerfully *p*-directive.

C. J. WEST

An easy conversion of hydroxyhydroquinone trimethyl ether derivatives into quinone compds. TIBOR SZÉKI. *Ber.* 62B, 1373–8 (1929).—A no. of trimethoxyphenylphthalides in AcOH with a little concd. HNO<sub>3</sub> yield quinones with extraordinary ease, even in the cold, the two MeO groups in the *p*-position to each other being oxidized. 3-[2',4',5'-Trimethoxyphenyl]meconin (I) (6.7–7 g. from 4.5 g. opianic acid, 1,2,4-C<sub>6</sub>H<sub>3</sub>(OMe)<sub>3</sub> and H<sub>2</sub>SO<sub>4</sub>), m. 115–9°, sol. in concd. H<sub>2</sub>SO<sub>4</sub> with deep cherry-red color. *Me-4,5,8',4',5',2',4',5'-octamethoxytriiphenylmethane-6-carboxylate*, similarly obtained from Me opianate, m. 143°, sol. in H<sub>2</sub>SO<sub>4</sub> with dark red color. 4-Nitro deriv. (II) of I, from nitroopianic acid (65% yield), lemon-yellow, m. 184°, sol. in H<sub>2</sub>SO<sub>4</sub> with reddish yellow color changing on heating to green and then violet. 2-Methoxy-5-meconylbenzoquinone (III), from 2 g. I in 8 cc. cold AcOH slowly treated with 1 cc. of a mixt. of equal vols. of AcOH and HNO<sub>3</sub> (d. 1.48), shrinks 202–4°, m. around 220°. I slowly added to HNO<sub>3</sub> (d. 1.48) at –60° gives 2-methoxy-5-[4'-nitromeconyl]benzoquinone, lemon-yellow, m. 199–200° (decompn.), sol. in concd. H<sub>2</sub>SO<sub>4</sub> with yellowish red color changing to green and then deep blue on heating, also obtained by oxidizing II in the same way. 2-Methoxy-5-phthalidylbenzoquinone, prepd. like III, brick-red, m. 152–4°, also obtained with fuming HNO<sub>3</sub> but as lemon-yellow crystals which begin to reddens 160° and m. 170–80° to a semi-fluid mass. 2-Methoxy-5-[diphenylbenzoylmethyl]benzoquinone, orange-yellow, m. 181°. 2-Methoxy-5-[α,α-diphenylethyl]benzoquinone, cinnabar-red, m. 198°. 2-Methoxy-5-[α,β-diphenylisopropyl]benzoquinone, crimson, m. 183–4°. 2-Methoxy-5-meconylhydroquinone, from III in AcOH with SO<sub>2</sub>, m. 210° sol. in alkalis with yellowish red color; diacetate, m. 153°. 2-Methoxy-5-phthalidylhydroquinone, m. 204°; diacetate, m. 178°.

C. A. R.

Nitrosation of phenols. VI. Further study of the nitrosation of *m*-chlorophenol. HERBERT HODGSON AND ARNOLD KERSHAW. *J. Chem. Soc.* 1929, 1553–7; cf. C. A. 22, 1966.—The 2 alleged forms of 3-chlorobenzoquinone 4-oxime (I), stable towards acid and alkali, resp. (C. A. 18, 235) are impure specimens of 1 form, the reddish color of the acid stable specimen being due to traces of decompn. products formed during the drastic acid treatment. The conversion of 3,4-Cl(ON)C<sub>6</sub>H<sub>3</sub>OH (II) into I by acid and alkali is readily explained by current electronic theories (formulas given). II, m. 133°, exposure in EtOH to ultra-violet light transforms it into resinous products. 3-Chloro-4-nitrosoanisole, from the 4-NH<sub>2</sub> deriv., bright green, m. 60°. I, very pale greenish yellow, m. 184° (decompn.), gives in dil. aq. NaOH and Na<sub>2</sub>CO<sub>3</sub> red solns. which become green on diln. I or II with BzCl in Na<sub>2</sub>CO<sub>3</sub> gives the benzoate, golden brown, m. 189.5°; Me<sub>2</sub>SO<sub>4</sub> gives the Me ether, pale yellow, m. 113°. *p*-Benzoquinone dioxime 4-Me ether, m. 115°.

C. J. WEST

Reaction between magnesium phenyl bromide and phenyl glycidate. D. R. BOYD AND G. J. C. VINEALL. *J. Chem. Soc.* 1929, 1622.—Ph glycidate and PhMgBr give 75% of *γ*-phenoxy-*α*-phenylisopropyl alc. (I), m. 92.5°; if the reaction product is not heated before decompn. with H<sub>2</sub>O, an oil, b<sub>p</sub> 165°, probably *α*-bromo-*γ*-phenoxyisopropyl alc., is obtained. I reacts with PCl<sub>5</sub> to give an ester of H<sub>3</sub>PO<sub>4</sub> sol. in NH<sub>4</sub>OH.

C. J. WEST

Conjugated double bonds. VIII. RICHARD KUHN AND ALFRED WINTERSTEIN. *Helv. Chim. Acta* 12, 493–8 (1929); cf. C. A. 23, 2698.—BzH and MeCH:CHCHO give PhCH:CHCH:CHCHO, b<sub>p</sub> 160–2°, in 10% yield. Diphenylhexatriene and alkali metal give a bluish black addn. compd. which is decompd. by water giving PhCH<sub>2</sub>CH:CHCH:CHCH<sub>2</sub>Ph. Diphenyloctatetraene and Li give a similar addn. compd., but several days is required for the reaction.

FREDERICK C. HAHN

2,4-Dinitrobenzaldehyde as a reagent. GEORGE MACDONALD BENNETT AND WALTER L. C. PRATT. *J. Chem. Soc.* 1929, 1465–8; cf. C. A. 22, 3663.—An improved method for the prepn. of 2,4-(O<sub>2</sub>N)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>CHO is given. The following 2,4-dinitrobenzylidene derivs were prepd.: *m*-chloroaniline, orange, m. 137°; 3,5-dibromoaniline, Cu-red, m. 181°; *p*-iodoaniline, yellow, m. 163°; *p*-aminophenol, yellow, m. 158°; *p*-aminoacetanilide, yellow, m. 199°; 6-aminoquinoline, pale yellow, m. 206°; bis derivs.; *o*-phenylenediamine, red brown, m. 158°; 3,4-lolylenediamine, brown, m. 153.5°; 4,4'-diaminodiphenylamine, purple with green reflex, m. 263° (decompn.). *α*-Picoline yields *α*-dinitrostyrylpyridine, yellow, m. 159°. 2,6-Dimethylquinoline (I) gives 2-[2,4-dinitrostyryl]-6-methylquinoline (II), yellow, m. 163.5°; heating in Ac<sub>2</sub>O with excess of the reagent gives tetranitro-2,4-distyrylquinoline, deep yellow, m. 270° (decompn.).

The di- and tri-Cl derivs. of I react rapidly to give the 5,8-di-Cl and the 5,6,8-tri-Cl derivs. of II, orange, m. 198.5°, and bright yellow, m. 225.5°, resp. 2,4,6-Trimethylquinoline yields 2-[2,4-dinitrostyryl]-4,6-dimethylquinoline, yellow, m. 195°. 2-Methylbenzimidazole yields 2-dinitrostyrylbenzimidazole, orange-yellow, m. 215°.  $p\text{-O}_2\text{NC}_6\text{H}_4\text{CH}_2\text{CN}$  gives 2,4,4'-trinitro- $\alpha$ -cyanostilbene, pale brown, m. 149° C. J. WEST

Systematic investigation of polymorphism of organic compounds. C. WEYGAND. *Ann.* 472, 143-79 (1929); cf. C. A. 23, 3683, 3685.—A discussion under the headings: specific seeding action with polymorphic forms in the chalcone series; relation between structural isomerism (tautomerism) and polymorphism; systematic relation between the polymorphic forms of chalcones,  $\beta$ -hydroxychalcones  $\alpha$ -bromochalcones and  $\beta$ -ethoxychalcones. The original should be consulted for the details of the various polymorphic forms observed. C. J. WEST

Action of diazomethane on piperonal. II. ERICH MOSETTIG. *Ber.* 62B, 1271-8 (1929); cf. C. A. 22, 4512.—It was shown in the earlier paper that piperonal (I) with  $\text{CH}_2\text{N}_2$  under certain conditions gives only to a very minor extent the expected aceto-piperone (II), the chief products being piperonylacetone (III) and a substance (IV) which has now been identified as isosafrole oxide (V). Chlorohydrin of V, from IV in cold petroleum ether with dry HCl, m. 47-8.5° 2-Piperidino-1-[3',4'-methylenedioxyphenyl]-3-propanol or 3,1,2-isomer, from V, piperidine and  $\text{H}_2\text{O}$  in sealed tubes at 100°, m. 42-4°, isolated as the HCl salt, m. 165-7°; *picrate*, light yellow, m. 178-80°; *chloroplatinate*, has no sharp m. p. 2-Dimethylamino-1-[3',4'-methylenedioxyphenyl]-3-propanol or 3,1,2-isomer, similarly obtained with aq.  $\text{NHMe}_3$ , oil; *picrate*, dark yellow, m. 164-5°; HCl salt, quickly deliquesces in the air. By using larger amts. than before in the reaction between I and  $\text{CH}_2\text{N}_2$ , there were obtained from a IV which had been purified by fractionation and steam distn. the above derivs. of V. C. A. R.

Spectrochemistry of  $\alpha$ -diketones and ethylene oxides. K. V. AUWERS (WITH F. BERGMANN). *Ber.* 62B, 1317-9 (1929).—Moureu has shown that diketones of the type of benzylmethylglyoxal (I) and benzylphenylglyoxal (II) exist in 2 forms mutually interconvertible under the influence of alkalis. To the lower-melting, yellow isomers he assigned the true diketone structure and to the higher-melting, colorless isomers the keto-enol structure,  $\text{PhCH:C(OH)COR}$ . Although the chem. evidence he gives is convincing it did not seem superfluous to amplify and confirm it spectrochemically; the true diketones should show only moderate, the keto-enols very high exaltations. II did not prove well adapted to spectrochem. investigation because the enol form, on account of its high m. p., had to be measured at 90-100° and at this temp. in contact with the glass of the cup and prism it changed so rapidly into its isomer that the lines being measured traveled across the field of vision with relatively high velocity. A few rough measurements showed, however, that its exaltations are high. The diketonic I,  $d_4^{16}$  1.0919,  $n$  1.52767, 1.53404 for  $\alpha$  and He at 15.8°,  $n_{\text{He}}^{20}$  1.4322,  $E\Sigma$  0.74, 0.83 for  $\alpha$  and D. Keto-enol form,  $d_4^{78.4}$  1.0756,  $n$  1.58698, 1.59953 for  $\alpha$  and He at 78.4°,  $E\Sigma$  3.17, 3.50. Benzalacetone oxide,  $d_4^{66}$  1.0733,  $n$  1.51529, 1.52016, 1.53196 for  $\alpha$ , He and  $\beta$  at 66.0°,  $E\Sigma$  1.00, 1.04, 28% for  $\alpha$ , D and  $\beta$ - $\alpha$ . The diketone and keto-enol forms can therefore be sharply differentiated from each other but not the diketone from the oxide. Arndt and Eistert have recently shown by chem. means that Schlotterbeck's "trichloroacetone" is really the oxide  $\text{CCl}_3\text{CH}_2\text{CH}_2\text{O}$ . Its optical consts.

are:  $d_4^{19}$  1.4962,  $d_4^{20}$  1.495,  $n$  1.47310, 1.47729, 1.48235, 1.48786 for  $\alpha$ , He,  $\beta$  and  $\gamma$  at 19.0°,  $n_{\text{He}}^{20}$  1.4768,  $E\Sigma$  (calcd. for the ketone) -0.15, -0.12, -4%, -5% (calcd. for the oxide) 0.19, 0.23, 4%; 3% for  $\alpha$ , D,  $\beta$ - $\alpha$  and  $\gamma$ - $\alpha$ . To decide as between the ketone and oxide forms it was necessary to det. whether accumulation of Cl atoms on a C increases or lowers the optical consts. For this purpose was chosen chloral, for which the oxide form is excluded. Its consts. are:  $d_4^{21.4}$  1.5059,  $d_4^{20}$  1.508,  $n$  1.44988, 1.45412, 1.45964, 1.46544 at 21.4°,  $E\Sigma$  0.26, 0.31, 9, 8%. This leaves no doubt that the Schlotterbeck compd. is the oxide. C. A. R.

The velocity of oxidation of the acids of the benzene series with potassium permanganate in alkaline medium. B. V. TRONOV AND A. A. GRIGOR'YEV. *J. Russ. Phys.-Chem. Soc.* 61, 653-65 (1929).—T. and G. carried out the oxidation of the Na salts of mono- and di- $\text{CO}_2\text{H}$  and  $\text{SO}_3\text{H}$  acids of  $\text{C}_6\text{H}_6$ ,  $\text{C}_{10}\text{H}_8$  and furfuran, with and without a substitution group, or the  $\text{CO}_2\text{H}$  group in the side chain, using 0.1 N or 1 N soln. of the acids and an equimol. amt. of NaOH, to which was added 5.5%  $\text{KMnO}_4$  in the proportion of 1 mol. of  $\text{KMnO}_4$  to 10 mols. of the acid. The results are shown in tables,

to which are appended tentative conclusions: all substituents, whether in the *p*-, *o*- or *m*-position, accelerate the oxidation of  $\text{BzOH}$ ; even the  $\text{NO}_2$ , which retards further nitration, acts favorably; the substituents  $\text{Cl}$ ,  $\text{Br}$ ,  $\text{NO}_2$ ,  $\text{CO}_2\text{H}$  and  $\text{OMe}$  accelerate the oxidation from 2 to 100 times, while  $\text{OH}$  and  $\text{NH}_2$  hundreds of thousand times. Nothing definite can be said regarding the isomeric position of the substituents. In the  $\text{HO}$  and  $\text{NH}_2$  acids the *m*-isomer seems to oxidize more readily. The  $\text{NO}_2$  acts more rapidly in the *p*-position to the  $\text{CO}_2\text{H}$  group, while in the di- $\text{CO}_2\text{H}$  acids the *p*-acid is oxidized 10 times slower than the other isomers.  $\text{PhSO}_3\text{H}$  is oxidized 10 times faster than  $\text{BzOH}$ . The satd. side chains are oxidized much more rapidly than the ring. The position of the  $\text{CO}_2\text{H}$  group, either in the ring ( $\text{MeC}_6\text{H}_4\text{CO}_2\text{H}$ ) or in the side chain ( $\text{PhCH}_2\text{CO}_2\text{H}$  and  $\text{PhCH}_2\text{CH}_2\text{CO}_2\text{H}$ ) have very little influence on the speed of oxidation. Unsatd. chains (cinnamic acid and its derivs.) are oxidized a thousand times more easily. The furfuran ring (in pyromucic acid) is less resistant to oxidation than the  $\text{C}_6\text{H}_5$  ring.

CHAS. BLANC

**Influence of ethyl ether and of dimethylpyrone on the availability of hydrogen chloride in alcoholic solution.** VIVIAN E. S. MITCHELL and JAMES R. PARTINGTON. *J. Chem. Soc.* 1929, 1562-8.—The rate of esterification of  $\text{PhCH}_2\text{CO}_2\text{H}$  in dry  $\text{EtOH}$ , under the influence of  $\text{HCl}$ , is accelerated by the addn. of small quantities of dry  $\text{Et}_2\text{O}$  and retarded by the addn. of small quantities of  $\text{H}_2\text{O}$  or dimethylpyrone (I). The effect with I is analogous to that with  $\text{H}_2\text{O}$  if the former is regarded as dibasic. Thus, on the assumption that the catalytic acceleration is due to hydron, and retardation to combination with such ion, a mol. of  $\text{H}_2\text{O}$  unites with 1 mol. of hydron and a mol. of I with 2. The slight accelerating influence of dry  $\text{Et}_2\text{O}$  is possibly due to a solvent effect, and it is probable that  $\text{Et}_2\text{O}$  does not, under these conditions, behave as a base. Other possibly basic substances, such as  $\text{Me}_2\text{O}$  and  $\text{Me}_2\text{CO}$  and in  $\text{MeOH}$  solns., will be studied.

C. J. WEST

**Isomeric monohydroxyphenylalanines. I. New synthesis of the *o*- and *m*-isomers and a comparison of their properties with those of tyrosine.** WM. P. DICKINSON and PHILIP G. MARSHALL. *J. Chem. Soc.* 1929, 1495-8.—Condensation of glycine anhydride (I) and *o*- $\text{HOC}_6\text{H}_4\text{CHO}$  with  $\text{AcONa}$  and  $\text{Ac}_2\text{O}$  by heating 9 hrs. at  $125^\circ$  and 2 hrs. at  $135^\circ$  gives 15.8% of 2,5-diketo-3,6-di-*o*-acetoxybenzylidenepiperazine, m.  $272^\circ$ , gives an orange-yellow color with concd.  $\text{H}_2\text{SO}_4$ ; the poor yield is due to the formation of coumarin as a by-product. Condensation of I and *o*- $\text{MeC}_6\text{H}_4\text{CHO}$  by heating with  $\text{AcONa}$  and  $\text{Ac}_2\text{O}$  12-15 hrs. at  $140^\circ$  gives 46.6% of the corresponding *o*- $\text{MeO}$  deriv., m.  $268^\circ$ , which also gives an orange-yellow color in concd.  $\text{H}_2\text{SO}_4$ . Reduction with  $\text{HI}$  and red P gives *o*-hydroxyphenylalanine (II), m.  $249-50^\circ$  as reported by Blum (C. A. 3, 204). The *m*-acetoxy deriv., pale yellow, m.  $272^\circ$  (90% yield), is similarly reduced to *m*-hydroxyphenylalanine (III), m.  $275^\circ$  (B. gives  $279-80^\circ$ ). Folin and Ciocalteu's modified Millon test (C. A. 21, 3210) gives with II a much less orange shade than with tyrosine (IV), the intensity being approx. 35% of that produced by IV; III gives a shade identical with that given by IV, the intensity being 60% that of IV. With Folin's  $\text{PhOH}$  reagent, the results were: IV, 100%; II, 126.5%; III, 123.5%; tryptophan, 84.7%; cystine, glycine, phenylalanine or alanine gave no color with reagent.

C. J. WEST

**Phenylserines.** OESTERLIN. *Metallborse* 19, 1237-8(1929).—Prolonged (2-3 weeks) action of  $\text{NH}_3$  on  $\text{PhCH(OH)CHBrCO}_2\text{H}$  gave phenylisoserine (I), m.  $230-2^\circ$ , wrongly described by Forster and Rao (C. A. 20, 3450) as *cis*-phenylserine; *p*-toluenesulfonyl deriv., m.  $189^\circ$ . Similarly,  $\text{MeNH}_2$  and  $\text{Me}_2\text{NH}$  (in dil. alc., or even in dry  $\text{C}_6\text{H}_6$ ) gave resp. the *N*-*Me*, m.  $272^\circ$  (decompn.), and *N*-di-*Me* derivs. m.  $143^\circ$ , of I. Phenylglycidic acid (II) and  $\text{NH}_3$  also gave I; the Et ester of II yielded phenylisoserine amide, hexagonal prisms, m.  $200^\circ$ ; and with  $\text{MeNH}_2$ , *N*-methylphenylisoserine methylamide, m.  $153^\circ$ . Hydrolysis of III with 2.5%  $\text{Ba(OH)}_2$  gave I and a less sol. isomeric phenylisoserine (IV), m.  $270-80^\circ$ . The structures of I and IV were proved by oxidation of each with  $\text{KMnO}_4$  in 0.5 *N*  $\text{H}_2\text{SO}_4$ , with isolation of  $\text{PhCH(NH}_2\text{)CO}_2\text{H}$  (as the *p*- $\text{MeC}_6\text{H}_4\text{SO}_3$  deriv.). The 2 phenylserines, on the other hand, gave by this method  $\text{PhCHO}$  and  $\text{NH}_3$ .

BEN H. NICOLET

**Intranuclear migration of the mercuric group in benzene derivatives. I. Mercuric derivatives of sulfosalicylic acid and the reaction mechanism.** I. K. ISHIIHARA. *J. Pharm. Soc. Japan* 49, 579-608(1929).—A historical review on the synthesis of org.  $\text{Hg}^+$  derivs. is given. Aq. sulfosalicylic acid (I) and  $\text{HgO}$  at  $15^\circ$  gave  $\text{HOHgSO}_3\text{C}_6\text{H}_4\text{(OH)CO}_2\text{H}$  (II) which on heating at  $150-60^\circ$  loses 1 mol. of  $\text{H}_2\text{O}$ . II (226 g.) in  $\text{H}_2\text{O}$  (1250 cc.) and I (375 g.) treated on the water bath for 2 hrs. gave  $(\text{HO})\text{C}_6\text{H}_4(\text{CO}_2\text{H})\text{SO}_3\text{HgSO}_3(\text{CO}_2\text{H})\text{C}_6\text{H}_4\text{OH}$  (III) (yield, 196 g.) which on heating gave 4,3-HO(HO<sub>2</sub>C)- $\text{C}_6\text{H}_4\text{SO}_3\text{R}$  (IV) ( $\text{R} = 2,3,5\text{-HO(HO}_2\text{C)(HO}_2\text{S)C}_6\text{H}_3\text{Hg-}$ ). II is sol. in  $\text{HCl}$  and  $\text{KOH}$ ,



but insol. in org. solvents. Aq. IV changes to I and 3-hydroxymercuric-5-sulfo-2-hydroxybenzoic acid (V) which loses  $H_2O$  and forms  $HOHgC_6H_3(CO_2H).SO_3.O$  (VI). V

forms Na, Ba and aniline salts. Aq. V treated with HCl and evapd. to dryness *in vacuo* gave 3-chloromercuric-5-sulfo-2-hydroxybenzoic acid (VII) which on heating decomps. into V,  $HgCl_2$  and I. VII and  $PhNH_2$ . HCl gave the aniline salt. V in alc. and  $H_2S$  dried with  $CaCl_2$  gave  $[2,3,5-HO(HO_2C)(RO_2S)C_6H_2Hg]_2S$  (VIII), which on heating at  $120-30^\circ$  loses  $EtOH + 5 H_2O$ . Aq. V at  $5-10^\circ$  treated with KI gave 3,3'-mercuri-bis[5-sulfo-2-hydroxybenzoic acid mono-K salt] (IX), which on heating with KI decomps. into  $HOC_6H_3(SO_3K)CO_2K$  and  $HgI_2$ . IX on heating with  $H_2S$  at  $150-60^\circ$  changes into  $HOC_6H_3(SO_3K)CO_2H.2H_2O$ . Two mols. of V and 1 mol. of  $BaI_2$  on heating gave the Ba salt.

F. I. NAKAMURA

Mixed glycerides of salicylic acid. III. W. HUMNICKI AND (MLLE.) J. LUNKIEWICZ. *Bull. soc. chim.* 45, 422-8(1929); cf. C. A. 23, 3913.—Na salts of fatty acids were prepd. by adding a calcd. quantity of NaOEt to the acid in alc., heating for 30 min., filtering and drying the pptd. salt. Ag salts were prepd. by adding an equiv. quantity of  $NH_4OH$  and  $AgNO_3$  to the acids in alc., filtering and drying at  $50^\circ$  *in vacuo*. Heating 1,3-dichloro-2-propanol salicylate at  $138-40^\circ$  for 8 hrs. with the suitable Ag salt gave the following mixed esters of  $\beta$ -glycerol salicylate which were purified by vacuum distn.:  $\alpha,\alpha'$ -diisovalerate,  $b_{12}$   $237-8^\circ$ ;  $\alpha,\alpha'$ -dicaproate,  $b_{12}$   $256-7^\circ$ ;  $\alpha,\alpha'$ -dilaurate, m.  $52-3^\circ$  (purified by crystn.);  $\alpha,\alpha'$ -dimyristate, m.  $55-7^\circ$  (purified by crystn.);  $\alpha,\alpha'$ -dioleate, oily liquid. Heating 1 mol. of 1,3-dichloro-2-propanol acetate with 24 g. of  $HOC_6H_4CO_2Na$  for 6 hrs. at  $127-30^\circ$  gave glycerol  $\alpha,\alpha'$ -disalicylate  $\beta$ -acetate, m.  $96-7^\circ$ . In the same manner, the suitable esters of dichloropropanol gave the following mixed esters of glycerol  $\alpha,\alpha'$ -disalicylate:  $\beta$ -isovalerate, m.  $52-3^\circ$ ;  $\beta$ -caproate,  $b_{12}$   $268-70^\circ$ ;  $\beta$ -laurate, oil,  $d_{20}$  1.118,  $n_D^{20}$  1.507;  $\beta$ -myristate, m.  $34-5^\circ$ ;  $\beta$ -stearate, m.  $42-4^\circ$ . Heating 3-chloro-1,2-propanediol with  $HOC_6H_4COCl$ , extg. with  $Et_2O$  and recrystg. from EtOH gave 3-chloro-1,2-propanediol disalicylate, m.  $82-3^\circ$ .

A. S. CARTER

Previously undescribed form of tyrosine crystals. JAMES C. ANDREWS. *J. Biol. Chem.* 83, 353-5(1929).—By neutralization of a soln. of the HCl salt, tyrosine was obtained in the form of blunt prisms, resembling aspartic acid.

A. G.

Reduction of semicarbazones of  $\alpha$ -ketonic acids. Semicarbazides substituted in the 1-position by acids. J. BOUGAULT AND (MLLE.) L. POPOVICI. *Compt. rend.* 189, 186-8(1929).—Reduction of phenylglyoxylic acid semicarbazone (I) with Na-Hg gave  $\alpha$ -semicarbazidophenylacetic acid (II),  $PhCH(CO_2H)NHNHCONH_2$ , m.  $208^\circ$ ; phenylpyruvic acid semicarbazone (III) gave  $\alpha$ -semicarbazido- $\beta$ -phenylpropionic acid (IV),  $PhCH_2CH(CO_2H)NHNHCONH_2$ , m.  $164^\circ$ , by the same treatment. II and IV were insol. in  $H_2O$  and EtOH, slightly sol. in  $Et_2O$ , MeAc and PhH; they are amphoteric, but essentially acid;  $K_2HgI_4$  (Nessler's soln.) had no effect on I or III but oxidized II and IV; similarly a soln. of II or IV in excess  $Na_2CO_3$  was oxidized by  $I_2$  to the semicarbazone of  $BzH$  or  $PhCH_2CO$ , resp., decarboxylation taking place.

A. S. C.

Synthesis of the esters of  $\beta$ -benzyl- $\alpha,\gamma$ -dicyanoglutaconic acid. YOSHIYUKI URUSHIBARA. *Bull. Chem. Soc. (Japan)* 3, 316-20(1928).—Di-Et  $\beta$ -benzyl- $\alpha,\gamma$ -dicyanoglutaconate (I),  $EtO_2C(CN)C:C(CH_2Ph)CH(CN)CO_2Et$  was prepd. by the condensation of ethyl  $\alpha$ -cyano- $\beta$ -ethoxy- $\gamma$ -phenylcrotonate,  $EtOC(CH_2Ph):C(CN)CO_2Et$  and Na Etcyanoacetate. The method of condensation and of prepn. of the compds. used is completely described. A cryst. substance, m.  $131^\circ$ , was proved to be di-Et  $\beta$ -benzylcyanocarbamylglutaconate,  $NH_2COC(CO_2Et):C(CH_2Ph)CH(CN)(CO_2Et)$  and not I. An oily substance which afterwards changed into a cryst. monohydrate was thought to be the ester desired. In a similar manner the Me Et esters were prepd. The final product was the monohydrate of Me Et  $\beta$ -benzyl- $\alpha,\gamma$ -dicyanoglutaconate,  $H_2NCO(EtO_2C)C:C(CH_2Ph)CH(CN)CO_2Me$ , m.  $115^\circ$ . By starting from Me  $\alpha$ -cyano- $\beta$ -ethoxy- $\gamma$ -phenylcrotonate a specimen of Me Et  $\beta$ -benzylcyanocarbamylglutaconate,  $MeO_2CC(CN):C(CH_2Ph)CH(CONH_2)CO_2Et$  was obtained, m. about  $115^\circ$ . Expts. indicate that the 2 specimens may be identical. However U. makes the suggestion only with reserve.

E. S. W.

Some outstanding advances in the chemistry of the terpenes during the last decade.

THOMAS H. DURRANS. *Perfumery Essential Oil Record* 20, Special No., 278-9(1929).

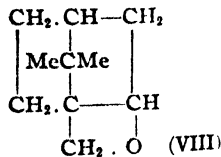
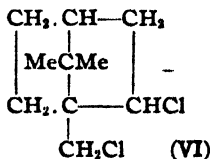
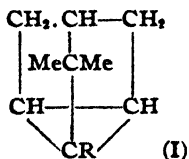
E. H.

Configuration determinations in the terpene series. III. JULIUS V. BRAUN, HUGO KRÖPER AND WILHELM REINHARDT. *Ber.* 62B, 1301-7(1929); cf. C. A. 23, 420G.—In the transformations into each other of individual members of the terpene series, both open and cyclic, the replacement of the  $NH_2$  group by HO plays an important role. The usual method of effecting such a replacement (treatment of the primary

base with  $\text{HNO}_3$ ) is quite unreliable in establishing relationships in structure and configuration, as the reaction may often be accompanied by intramol. rearrangements or yield mixts. of products. More reliable, from the structural point of view, is the treatment of the Bz deriv.,  $\text{RNHBz}$ , of the amine with  $\text{PCl}_5$  (or  $\text{PBr}_5$ ), which gives a mixt. of PhCN and a halide,  $\text{RCl}$  or  $\text{RBr}$ , easily converted into the alc. ROH. Only in the case of active  $\text{H}_2\text{NCH}_2\text{C}^*\text{HMeCH}_2\text{CH}_2\text{NH}_2$ , however, had it been proven that the reaction is effected without any configurational change about the asym.  $\text{C}^*$  atom, and it has accordingly been tried out with 2 more bases, the open *dihydromenthonylamine* (I) and the cyclic *dihydrocamphylamine* (II). Both bases are readily decompd. by  $\text{PCl}_5$  after benzylation and that the asym. C atom is not affected was shown by converting the resulting chlorides (III and IV) into the iodides (V and VI) and condensing these with  $\text{NMe}_3$  to the quaternary salts (VII and VIII), which proved to be identical with compds. obtained directly by exhaustive methylation of I and II. I,  $b_{15}$   $85^\circ$ , eagerly absorbs  $\text{CO}_2$  from the air, was obtained with H and Pd-charcoal in water from menthonylamine-HCl as the HCl salt, m.  $123-4^\circ$ ,  $[\alpha]_D^{16}$   $5.74^\circ$  ( $\text{H}_2\text{O}$ , 19.83%); Bz deriv.,  $b_{0.3}$   $201-2^\circ$ . *Dihydromenthonyl chloride* (III) (yield, about 40%),  $b_{10}$   $85-7^\circ$ ,  $d_4^{12}$   $0.8752$ ,  $[\alpha]_D^{12}$   $-2.56^\circ$ . *Iodide* (V),  $b_{10}$   $108-12^\circ$ ,  $d_4^{14}$   $1.1533$ ,  $[\alpha]_D^{14}$   $-9.69^\circ$ . *Trimethylammonium iodide* (VII), m.  $236^\circ$ ,  $[\alpha]_D^{18}$   $4.35^\circ$  (alc., 14.33%). II, from dihydro- $\alpha$ -campholenic nitrile with Na and alc. or with Ni and H under 25 atm. in decalin at  $150^\circ$ ,  $b_{13}$   $88^\circ$ ; HCl salt, m.  $255^\circ$  (decompn.); picrate, m.  $197^\circ$ ; phenyllithiurea, m.  $116^\circ$ ; Bz deriv.,  $b_{0.2}$   $190^\circ$ ,  $[\alpha]_D^{22}$   $26.37^\circ$  (alc., 12.45%). *Dihydrocamphyl chloride* (IV) (yield, somewhat more than 50%),  $b_{13}$   $88^\circ$ ,  $d_4^{25}$   $0.9983$ ,  $[\alpha]_D^{25}$   $46.65^\circ$ . *Iodide* (VI),  $b_{13}$   $115-20^\circ$ ,  $d_4^{20}$   $1.0051$ ,  $[\alpha]_D^{20}$   $44.72^\circ$ . *Trimethylammonium iodide* (VIII), m.  $277-8^\circ$ ,  $[\alpha]_D^{20}$   $23.74^\circ$  ( $\text{H}_2\text{O}$ , 1.93%). C. A. R.

**Norpinic acid.** C. W. SHOPPEE AND J. L. SIMONSEN. *Chemistry and Industry* 48, 730-1 (1929).—The constitution of norpinic acid was confirmed synthetically as follows. The *trans*-norpinic acid prepd. by Kerr (C. A. 23, 1398) was converted into the *cis*-norpinic anhydride (I) by treatment with  $\text{Ac}_2\text{O}$  at  $220^\circ$ , and was found to be identical in all respects (m. p.  $135^\circ$ ) with that described by Perkin and Simonsen. Digestion of I with water gives *cis*-norpinic acid, m.  $173-5^\circ$  both alone and in admixt. with some of the acid prepd. from  $\alpha$ -pinene. FREDERICK C. HAHN

**Tricyclene series.** GUST. KOMPPA. *Ber.* 62B, 1366-70 (1929).—The correctness of the tricyclic (I, R =  $\text{CO}_2\text{H}$ ) rather than Bredt and May's tetracyclic formulation for tricyclenic acid (II) (Jagelki's "dehydrocamphenylic acid") has been established by reducing II to the corresponding hydrocarbon, tricyclene (III). The Et ester of II was reduced with Na and alc. to *tricyclenol* (IV) (I, R =  $\text{CH}_2\text{OH}$ ), converted by cautious treatment with  $\text{PCl}_5$  into *tricyclenyl chloride* (V) and again reduced with Na and alc. to III. The results of this work also show that while I and teresantalic acid and their derivs. have very nearly the same m. ps. the 2 acids are not identical. IV with HCl gives a dichloride,  $\beta,\omega$ -*dichlorocamphane* (VI), which with Na and alc. yields III; boiled in aq. alc. with  $\text{Ag}_2\text{O}$ , VI is partially converted into the *glycol* (VII) but forms chiefly an oil volatile with steam which reacts with neither  $\text{NH}_2\text{CONHNH}_2$  nor  $\text{PhNCO}$  and is probably the inner ether (VIII) of VII. IV (70-80% yield), m.  $110-1^\circ$ ; urethan, m.  $86^\circ$ . V (86% yield),  $b_8$   $75-6^\circ$ ,  $d_4^{20}$   $1.0348$ ,  $n_D^{20}$   $1.49336$ . III,  $b_8$   $40^\circ$ ,  $b_{15}$   $152-3^\circ$ , m.  $62-4^\circ$ ; along with it is formed some *Et tricyclenyl ether*,  $b_8$   $74-5^\circ$ ,  $b_{15}$   $174-5^\circ$ . VI (89% from IV in cold abs.  $\text{Et}_2\text{O}$  satd. with HCl), m.  $53-5^\circ$ .  $\beta,\omega$ -*Dihydroxycamphane* (VII), thick oil. VIII,  $b_8$   $80-3^\circ$ . C. A. R.



**Fenchene series. II. A homologous isofenchene.** GUST. KOMPPA. *Ann.* 472, 179-84 (1929); cf. C. A. 23, 3693.—Isofenchone and  $\text{MeMgI}$  give about 50% of *methylisofenchol*,  $b_{10}$   $82^\circ$ , m.  $47^\circ$ ; dehydration of this with  $\text{K}_2\text{SO}_4$  at  $155-60^\circ$  gives *methylfenchene*,  $b_{10}$   $160-2^\circ$ ,  $d_4^{20}$   $0.85205$ ,  $n_D^{20}$   $1.46261$ . The action of  $\text{O}_3$  gives an aldehyde and a ketone acid, further oxidized by  $\text{NaBrO}$  to *dl-cis*-fenchocamphoric acid. In other words, no Wagner rearrangement has taken place. C. J. WEST

Some new pairs of stereoisomeric trisubstituted glycols. ALEX. MCKENZIE, E. M. LUIS, M. TIEFFENAU AND P. WEILL. *Bull. soc. chim.* **45**, 414-22(1929); cf. *C. A.* **22**, 585.—It has been found that the C:O in RCH(OH)COR' is unsym. and upon reaction with R''MgX the product, RCH(OH)C(OH)R'R'', possesses 2 forms depending upon whether R' or R'' is the radical last introduced. To distinguish, the form in which the radical last introduced possesses the higher mol. wt. is called the  $\alpha$ -form and the  $\beta$ -form is that isomer in which the R of lower mol. wt. is the last to be introduced.  $\alpha$ -*p*-Methoxyphenylglycolamide (I) was treated with 8 mols. of EtMgBr in 8 l. of Et<sub>2</sub>O with warming and agitation for 3 hrs. The Et<sub>2</sub>O soln. after hydrolysis with H<sub>2</sub>O was fractionated, giving 48% of 1-*p*-methoxyphenyl-1-hydroxy-3-butanone (II), *b*<sub>D</sub> 175°, *d*. 1.11, *n*<sub>D</sub> 1.531; semicarbazone, m. 220-2°; oxime in 2 forms, one crystd. from a mixt. of PhH and ligroin, m. 128°, the other from Et<sub>2</sub>O and ligroin and then from EtOH and ligroin, m. 88-9°. One mol. of II was treated with 5 mols. of PhMgBr and heated for 2 hrs., giving after hydrolysis with dil. H<sub>2</sub>SO<sub>4</sub> and steam distn. to remove Ph<sub>2</sub>, a product which was crystd. from PhH and ligroin followed by EtOH and ligroin to yield 30% of the  $\alpha$ -form of 1-*p*-methoxyphenyl-2-phenyl-1,2-butanediol (III), m. 90°. As before, 1 mol. of I and 5 mols. of PhMgBr gave 25% of *p*-methoxyphenylbenzoylcarbinol (IV), m. 100-1°; semicarbazone, m. 206°; oxime, m. 132°, which was not distd. but purified by crystn. from EtOH and Et<sub>2</sub>O followed by a CHCl<sub>3</sub>-ligroin mixt. Treating IV with EtMgBr gave 25% of the  $\beta$ -isomer of III, m. 112-3°. Similarly II gave the  $\alpha$ -form of 1-*p*-methoxyphenyl-2-ethyl-1,2-hexanediol (V), m. 74°, when treated with BuMgBr; with 4 mols. of BuMgBr, I gave 1-*p*-methoxyphenyl-1-hydroxy-2-hexanone, *b*<sub>D</sub> 204-8°, which was treated with EtMgBr giving the  $\beta$ -form of V, m. 65.5-65°. *dl*-Benzoin with *p*-MeOC<sub>6</sub>H<sub>4</sub>MgBr gave the  $\alpha$ -form of 2-*p*-methoxyphenyl-1,2-diphenyl-1,2-ethanediol (VI), m. 203-4°, which was dehydrated at 50° with H<sub>2</sub>SO<sub>4</sub>, giving a 1-*p*-methoxyphenyl-1,2-diphenylethanone (VII), m. 85-6°. KCN (24 g.) was dissolved in 184 cc. of H<sub>2</sub>O and 232 cc. of EtOH, to which was added 80 g. of BzH and 104 g. of *p*-MeOC<sub>6</sub>H<sub>4</sub>CHO. After heating for 80 min. the mixt. was cooled, the oil was sepd. and slowly crystd. (cold), giving after recrystn. from EtOH, 76 g. of phenyl-*p*-methoxybenzoylcarbinol (VIII), m. 105.5-6.5, semicarbazone, m. 185-6°; phenylhydrazone, m. 149-50.5; oxime, m. 136-8°. Oxidation of VIII with CuSO<sub>4</sub> in C<sub>6</sub>H<sub>5</sub>N and H<sub>2</sub>O for 10 hrs. gave 4.5 g. of 4-methoxybenzil, m. 62-3°. With PhMgBr, 1 mol. of VIII gave 8 g. of the  $\beta$ -isomer of VI, m. 155-6°. Dehydration of this isomer with H<sub>2</sub>SO<sub>4</sub> gave a product identical with VII, m. 85-6°.

A. S. CARTER

The nitration of 4-methylbenzophenone and 2,4-dimethylbenzophenone. LOUIS CHARDONNENS. *Helv. Chim. Acta* **12**, 649-62(1929).—The conditions for nitration of 4-methyl- and 2,4-dimethylbenzophenone are described in detail, methods being given for introducing 1 to 4 nitro groups. The following benzophenone derivs. are described: 3-nitro-4-methyl, m. 129-130°; 3-amino-4-methyl, yellow, m. 107.5°; 3,3'-dinitro-4-methyl, m. 133.5-134°; 3,3'-diamino-4-methyl, yellow, m. 130°; 3,5-dinitro-4-methyl, m. 108.5-109°; 3,5,3'-trinitro-4-methyl, yellow, m. 171°; 3,5-dinitro, yellow, m. 131°; 3,5,3'-dinitro-4-methyl, yellow, m. 135.5-136°; 3,5,3',5'-tetranitro-4-methyl, yellow, m. 196-198°; 2,4-dimethyl-5-nitro, yellow, m. 62-3°; 5-amino-2,4-dimethyl, yellow, m. 103.5-4°; 2,4-dimethyl-3-nitro, m. 79.5-80°; 3-amino-2,4-dimethyl, yellow, m. 84°; 2,4-dimethyl-5,3'-dinitro, m. 144.5°; 2,4-dimethyl-3,5-dinitro, m. 111-2°; 2,4-dimethyl-3,5,3'-trinitro, m. 139-140°; 2,4-dimethyl-3',5'-dinitro, yellow, m. 110°; 2,4-dimethyl-3,5,3',5'-tetranitro, yellow prisms, m. 187-8°.

M. A. DAHLEN

Thermal and hydrolytic decomposition of basic and phenolic diphenylmethane derivatives and synthesis of optically active aromatic compounds. JULIUS V. BRAUN, ERNST ANTON, WERNER HAENSEL AND GEORG WERNER. *Ann.* **472**, 1-89(1929).—Cyclohexanone (50 g.), 95 g. PhNH<sub>2</sub>, 88 cc. concd. HCl and 13 cc. EtOH, warmed 4 days on the H<sub>2</sub>O bath, give 53 g. PhNH<sub>2</sub>, 1.5 g. cyclohexenylaniline (I) and 70 g. diaminodiphenylcyclohexane (II); if the condensation is continued for 12 days, there result 35 g. PhNH<sub>2</sub>, 2.3 g. I and 99 g. II, pale yellow, *b*<sub>D</sub> 175°; HCl salt, m. 228°; picrate, m. 170°; Ac compd., m. 152°; Bz compd., m. 177°; phenylthiourea, m. 144°; benzal compd., m. 82°. Reduction gives *p*-cyclohexenylaniline, m. 45°; warming I with PhNH<sub>2</sub> in HCl or better with PhNH<sub>2</sub>.HCl gives II. II, *b*<sub>D</sub> 248°, m. 114°; HCl salt, m. 235°; Ac compd., m. 266°; diphenylthiourea, m. 163°. Warming 114 g. II, 78 cc. concd. HCl and 11 cc. EtOH 12 days at 100° gives 5 g. PhNH<sub>2</sub>, 8 g. I and 96 g. II. A slight decompn. of II takes place upon heating at 305°; a little HCl, H<sub>2</sub>SO<sub>4</sub>, HBr or ZnCl<sub>2</sub> causes a more marked decompn.; H<sub>3</sub>PO<sub>4</sub> or Cl<sub>3</sub>CCO<sub>2</sub>H has no action. PhNHMe (107 g.) and cyclohexanone (50 g.), heated 12 days as above, give 123 g. 1,1-di[methylamino]diphenylcyclohexane, *b*<sub>D</sub> 250-2°, m. 124° (HCl salt, m. 220°; picrate, m. 105°; di-Ac deriv., m. 185°; diphenylthiourea, m. 165°) and 3.5 g. *N*-methylcyclohexenylaniline,

$b_{14}$  184° (*HCl* salt, m. 212°; *picrate*, m. 114°; *Ac* deriv., m. 85°; *N-NO* compd., m. 89°)  $\text{PhNMe}_2$  (123 g.) and 50 g. cyclohexanone give 125 g. *di*[*dimethylamino*]diphenylcyclohexane,  $b_{12}$  282–3°, m. 164° (*HCl* salt, m. 180°; *picrate*, m. 148°; *dimethiodide*, m. 178°) and 4.5 g. cyclohexenyldimethylaniline (III),  $b_{14}$  190°, m. 56° (*HCl* salt, m. 195°; *picrate*, m. 162°; *methiodide*, m. 190°). 1,1-Amino[*dimethylamino*]diphenylcyclohexane, light yellow,  $b_{0,1}$  250–5°, m. 101° (*HCl* salt, m. 195°; *Ac* deriv., m. 115°); distn with a couple drops of dil. *HCl* gives  $\text{PhNMe}_2$  and I. 1,1-Dimethylaminophenyl[*diethylaminophenyl*]cyclohexane,  $b_{0,1}$  260–5°, m. 108° (*HCl* salt, m. 141–2°, strongly hygroscopic). Condensation with  $\alpha\text{-C}_{10}\text{H}_7\text{NH}_2$  is slow, the yield being only 13% after 90 hrs.; the compd.,  $\text{C}_{24}\text{H}_{28}\text{N}_2$ ,  $b_{0,1}$  270–80°, m. 152°. III in fuming *HBr* gives the compd.  $\text{C}_{14}\text{H}_{20}\text{NBr}$ , m. 95° (20% yield) (*picrate*, m. 152°). Cyclohexanone (20 g.) and 50 g. tetrahydroquinoline give 5 g. 6-cyclohexenyldimethylaminocyclohexane,  $b_{0,1}$  163–5° (*HCl* salt, m. 120°; *picrate*, m. 90°) and 30 g. 1,1-di[tetrahydroquinolyl]cyclohexane,  $b_{0,1}$  265–7°, m. 114° (*di-NO* compd., m. 85°; *di-Bz* deriv., m. 154°; *diphenylthiourea*, m. 92°). *m*- $\text{MeC}_6\text{H}_4\text{NH}_2$  gives only a few % of 3-methyl-4,6-dicyclohexenyldimethylaniline, yellow oil,  $b_{12}$  230–5° (*picrate*, m. 176–7°); *p*- $\text{MeC}_6\text{H}_4\text{NH}_2$  (110 g.) gives 9 g. of 4-methyl-2,6-dicyclohexenyldimethylaniline,  $b_{12}$  228°, m. 60° (*picrate*, m. 192°; *Bz* compd., m. 69°). *p*-Cyclohexylaniline (30 g.) gives about 1 g. of the compd.  $\text{C}_{24}\text{H}_{28}\text{N}$ ,  $b_{12}$  260–5°. 3-Methylcyclohexanone (IV) (50 g.) and 83 g.  $\text{PhNH}_2$  after 12 days at 100° give 42 g.  $\text{PhNH}_2$ , 24 g. methylcyclohexenyldimethylaniline (V),  $b_{14}$  187–90° (*Ac* deriv., m. 127°; *Bz* deriv., m. 178°; *phenylthiourea*, m. 143°), and 38 g. 1,1-diaminodiphenyl-3-methylcyclohexane (VI),  $b_{14}$  285–90° (*HCl* salt, m. 214°; *diphenylthiourea*, m. 127°); 40 g.  $\text{PhNH}_2$  and 80 g. IV, 12 days at 100°, give 14 g.  $\text{PhNH}_2$ , 27 g. V and 74 g. VI.  $\text{PhNMe}_2$  (100 g.) and 100 g. IV give 28 g. methylcyclohexenyldimethylaniline,  $b_{14}$  194–6°, m. 38° (*picrate*, m. 162°; *methiodide*, m. 159°), and 11 g. 1,1-tetramethyldiaminodiphenyl-3-methylcyclohexane,  $b_{12}$  295°, m. 109° (*picrate*, orange, m. 164°; *dimethiodide*, m. 186°). *o*-Methylcyclohexanone condenses more slowly than IV and yields probably 2-methylcyclohexenyldimethylaniline,  $b_{14}$  160° (*chloroplatinate*, m. 211–2°). Cyclopentanone (20 g.) and 86 g.  $\text{PhNMe}_2$  heated with concd. *HCl* 10 hrs. at 150° give 20 g. cyclopentenylidimethylaniline (VII),  $b_{12}$  160°, m. 10° (*HCl* salt, m. 170°; *picrate*, m. 129°; *methiodide*, decomps. 180°), and 12 g. 1,1-tetramethyldiaminodiphenylcyclopentane, m. 128° (*HCl* salt, m. 213°; *picrate*, m. 181; *dimethiodide*, decomps. 195°). VII is reduced by Na and *EtOH* to *p*-cyclopentenylidimethylaniline,  $b_{12}$  156° (*HCl* salt, m. 175°; *picrate*, m. 134°; *methiodide*, m. 179°). In the reaction product of  $\text{PhNH}_2$  and  $\text{Me}_2\text{CO}$  (Homolka, Ger. Pat. 399,141), in addn. to  $\text{Me}_2\text{C}(\text{C}_6\text{H}_4\text{NH}_2)_2$ , there may be observed a small fraction (about 1%) consisting of isopropenyldimethylaniline (VIII), b. 125–30° (pressure not given), which may be obtained in better yields by heating  $\text{Me}_2\text{C}(\text{C}_6\text{H}_4\text{NH}_2)_2$  with a few drops of dil. *HCl* and  $\text{H}_2\text{SO}_4$  *in vacuo*; the distillate consists of  $\text{PhNH}_2$  and VIII in the ratio of about 2:1. VIII yields a *HCl* salt, m. 230–5°; a *picrate*, m. 180°; the *Ac* deriv., m. 110–1°, the *phenylthiourea*, m. 137°. VIII, freshly prepd., has  $d_4^{20}$  1.0320 and is a mobile liquid, on standing 40 hrs. there results a dimer or bisisopropenyldimethylaniline (IX), m. 173° (*HCl* salt, m. 228°; *picrate*, m. 172°; *di-Ac* deriv., m. 205°; *phenylthiourea*, m. 117°; these compds. could not be obtained from the corresponding derivs. of VIII). IX is unsatd towards  $\text{KMnO}_4$  and the *Ac* deriv. is catalytically reduced; the dihydro deriv., m. 121°, sapon. gives the bisisopropenyldimethylaniline (X),  $b_{0,1}$  205–10°, m. 50–2° (*diphenylthiourea*, m. 178°; *picrate*, m. 213°; *HCl* salt, m. 275°). X, through the diazo reaction, yields the phenol,  $\text{C}_{18}\text{H}_{22}\text{O}$ , m. 106–7° (*Bz* deriv., m. 117°; *Ac* deriv.,  $b_{1,1}$  192°).  $\text{Me}_2\text{CO}$  and  $\text{PhNHMe}$ , heated 10 hrs. at 150° with *HCl*, give 50% of 2,2-dimethylaminodiphenylpropane,  $b_{12}$  190°, m. 138° (*HCl* salt, m. 218°; *Ac* deriv., m. 139°; *diphenylthiourea*, m. 170°); distn with a little acid gives equal parts of  $\text{PhNHMe}$  and *N*-methyl-*p*-isopropenyldimethylaniline,  $b_{14}$  123–5° (*HCl* salt, oily; *picrate*, m. 147°); d. 0.9675, changes only to 1.0067 after heating 20 hrs. on the  $\text{H}_2\text{O}$  bath, indicating only slight polymerization.  $\text{Me}_2\text{C}(\text{C}_6\text{H}_4\text{NMe}_2)_2$  gives *N*-dimethylisopropenyldimethylaniline,  $b_{14}$  120–2°, m. 74° (*HCl* salt, m. 122°; *picrate*, m. 96°); this also shows little tendency to polymerization.  $\text{Me}_2\text{CO}$  and *m*- $\text{MeC}_6\text{H}_4\text{NH}_2$  give about 9% of 3-methyl-4-isopropenyldimethylaniline (XI),  $b_{12}$  150–5° (*HCl* salt, m. 217°; *picrate*, m. 224°; *Ac* compd., oily), reduced to 3-methyl-4-isopropenyldimethylaniline,  $b_{12}$  141–5° (*HCl* salt, m. 211°) and 3% of 3-methyl-4,6-diisopropenyldimethylaniline,  $b_{12}$  225–30° (*HCl* salt, m. 218°; *picrate*, m. 205°). XI, warmed 16 hrs. at 100°, shows about 10% polymerization. 2,2-Diaminodiphenylbutane,  $b_{12}$  210° (20% yield); distd. with a little *HCl* or  $\text{H}_2\text{SO}_4$ , there results about 40% of *p*-isobutenyldimethylaniline,  $b_{14}$  140–5°,  $d_4^{19}$  0.9899 (*HCl* salt, m. 238°; *picrate*, m. 196°; *phenylthiourea*, m. 131°; *Ac* deriv., m. 121°); after standing 4 days and warming 24 hrs. at 100° 75% is recovered unchanged while the rest is obtained as a dark red hard glass. 2,2-Dimethylaminodiphenylbutane,  $b_{14}$

240°, m. 98° (*diphenyllithiurea*, m. 142°; *di-Ac deriv.*, m. 121°); *p-isobutenylmethyl-aniline*,  $b_{14}$  145–50°. 2,2-Tetramethyldiaminodiphenylbutane,  $b_{0.8}$  210–2° (*HCl salt*, m. 125°; *picrate*, m. 80–90°; *methiodide*, m. 202°); *p-isobutenyldimethylaniline*,  $b_{14}$  138–42°,  $d_4^{20}$  0.9561; (*picrate*, m. 125°; *dimethiodide*, m. 175°); polymerization is scarcely noticeable. MeBuCO and PhNMe<sub>2</sub> give 5% *p-isohexenyldimethylaniline*,  $b_{12}$  160–2° (*methiodide*, m. 175°), and 15% 2,2-tetramethyldiaminodiphenylhexane,  $b_4$  230–4° (*dimethiodide*, m. 196°). PhAc and PhNMe<sub>2</sub> give 20% of tetramethyldiaminotriphenylethane, m. 134° (*dimethiodide*, m. 188°), and 7–8% of *p-α-phenylvinyl*dimethylaniline,  $b_{18}$  208–11°,  $d_{20}$  1.0409 (*HCl salt*, m. 144°; *methiodide*, m. 170°). Condensation of PhNH<sub>2</sub> and PrCHO gives only 2-propyl-3-ethylquinoline; PrCHO and PhNMe<sub>2</sub> with 20% HCl and a little EtOH show about 30% condensation after 5 days at 100°; the principal product is 1,1-tetramethyldiaminodiphenylbutane,  $b_{0.8}$  225–7°; distd. with a little H<sub>2</sub>SO<sub>4</sub> *in vacuo* there results 30% of a mixt. of PhNMe<sub>2</sub> and *p-butenyldimethylaniline*, the latter,  $b_{12}$  140–2°,  $d_4^{15}$  0.9395 (*picrate*, reddish yellow, m. 99–100°); it shows little tendency to polymerize, even on heating at 100° for 24 hrs.; warming with PhNH<sub>2</sub>·HCl for 30 hrs. gives about 50% of 1,1-aminophenyl[methylaminophenyl]butane,  $b_{0.2}$  205–10°. In comparison with PrCHO, BzH and PhNMe<sub>2</sub> are almost completely condensed in 24 hrs.; *p*-Me<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>CHO is completely condensed in 24 hrs. and *p*-NO<sub>2</sub>C<sub>6</sub>H<sub>4</sub>CHO in about 18 hrs. In acid soln. 1 mol. of an aromatic aldehyde and 1 mol. of an aromatic aniline first condense to a very active product closely related but not identical with the basic hydrol. Condensation of 2 mols PhOH and 1 mol. cyclohexanone, using  $\frac{1}{2}$  of the wt. of the latter of concd. HCl, at 36° gives, after 60 hrs., a 65% yield, consisting of 1,1-dihydroxydiphenylcyclohexane (XII) (*di-Me ether*,  $b_{16}$  260–3°, m. 82°; *di-Ac deriv.*, m. 122°) (cf. Schmidlin and Lang, *C. A.* 5, 487), and a small amt. of *o*-cyclohexyldicyclohexanone. Distn. of XII at the ordinary pressure gives PhOH, cyclohexenylphenol (XIII), m. 123° (*Me ether*,  $b_{14}$  155°, m. 35°; *Ac deriv.*, m. 52°), and *p*-cyclohexylphenol (XIV), m. 131° (*Me ether*, m. 58°; *Ac deriv.*,  $b_{18}$  170°, m. 35°). XIII adds Br to the double bond before substitution occurs and this reaction may be used to det. the amt. of XIII present in the mixt. with XIV. Warming XIII with concd. HCl gives about 50% of XIV, while the other half is a resinous mass, similar to that obtained by the distn. of XII. Heating XII with Ni and H at 230–50° gives cyclohexanol, *p*-cyclohexylcyclohexanol (Schrauth and Görg, *C. A.* 18, 388) (*Ac deriv.*,  $b_{18}$  158–60°), and a partial reduction product of XII, C<sub>18</sub>H<sub>26</sub>O<sub>2</sub>,  $b_{13}$  260–70°. Cyclohexanone and *m*-MeC<sub>6</sub>H<sub>4</sub>OH, after 14 days, condense to the extent of 40%; cyclohexenylcresol,  $b_{12}$  175°; *p*-cyclohexyl-*m*-cresol, thick oil. *o*-Methylcyclohexanone and PhOH give methylcyclohexenylphenol,  $b_{12}$  173–5°, and the diphenylmethane compd., C<sub>19</sub>H<sub>22</sub>O<sub>2</sub>,  $b_{12}$  280°, m. 135–7°. Cyclopentanone and PhOH give 1,1-dihydroxydiphenylcyclopentane,  $b_{12}$  270°, m. 155–6° (*Me ether*,  $b_{12}$  240–5°, m. 115°; *Ac deriv.*, m. 79°); heating with 3 parts concd. HCl 3 hrs. at 100° gives PhOH and *p*-cyclopentylphenol,  $b_{12}$  155°, m. 63–5° (*Me ether*,  $b_{12}$  143°; *Ac deriv.*,  $b_{12}$  150–2°); distn. of the diphenol at the ordinary pressure gives cyclopentenylphenol, m. 148–50° (*Me ether*, m. 90°; *Ac deriv.*, m. 72°). 4-Cyclopentylcyclohexanol,  $b_{12}$  135°, m. 43–50° (*phenylurethan*, m. 115–45°); this is a mixt. of 2 stereoisomers. Oxidation gives 4-cyclopentylcyclohexanone,  $b_{12}$  125°,  $n_D^{18}$  1.4860,  $d_4^{18}$  0.9714 (*semicarbazone*, m. 195–7°). Me<sub>2</sub>CO and PhOH give after 60 hrs. practically quant. Me<sub>2</sub>C(C<sub>6</sub>H<sub>4</sub>OH)<sub>2</sub>,  $b_{13}$  250–2°; distn. at the ordinary pressure gives a small amt. of *p*-isopropylphenol,  $b_{12}$  112–5°, m. 61°; the action of 3 parts of concd. HCl for 20 hrs. at 100° gives a dimer, C<sub>18</sub>H<sub>20</sub>O<sub>2</sub>,  $b_{14}$  255–6°, m. 181°, which is stable towards HCl at 125°; the *di-Me ether*, m. 115°, is stable towards catalytic reduction or Na and EtOH; *di-Ac deriv.*, m. 165°. Catalytic reduction (Ni) gives a mixt. of cyclohexanol, *p*-isopropylcyclohexanol, *di-4-hydroxycyclohexyldimethylmethane*,  $b_{14}$  230–4° (*diketone*, m. 158–60°; *semicarbazone*, m. 222°), and *p*-hydroxyphenyl-4-hydroxycyclohexyldimethylmethane (XV),  $b_{12}$  244–8° (*di-Ac deriv.*,  $b_{18}$  234–7°; *mono-Me ether*,  $b_1$  170–5°). The last 2 compds. are probably mixts. of stereoisomers. Oxidation of XV with CrO<sub>3</sub> gives the ketone,  $b_{15}$  205–10° (*semicarbazone*, m. 184°). Oxidation of XV with KMnO<sub>4</sub> gives the substituted adipic acid, MeOC<sub>6</sub>H<sub>4</sub>Me<sub>2</sub>CCH(CH<sub>2</sub>CO<sub>2</sub>H)CH<sub>2</sub>CH<sub>2</sub>CO<sub>2</sub>H, m. 116° (45% yield). Me<sub>2</sub>CO and *m*-MeC<sub>6</sub>H<sub>4</sub>OH give the diphenol,  $b_{12}$  230–5°. MeEtCO and PhOH give a diphenol,  $b_{12}$  250–3°, which, on distn. at ordinary pressures, gives, as 1 product, *p*-isobutenylphenol, m. 86° (*Ac deriv.*,  $b_{18}$  148°). Catalytic reduction with Ni at 200° gives the compd., C<sub>10</sub>H<sub>20</sub>O, an isomer of menthol,  $b_{10}$  128°, oxidized to the ketone, C<sub>10</sub>H<sub>18</sub>O,  $b_{12}$  104–6° (*semicarbazone*, m. 190°). EtCHO and PhOH give EtCH(C<sub>6</sub>H<sub>4</sub>OH)<sub>2</sub>,  $b_{18}$  250°, which, distd. at atm. pressure, gives *p*-propenylphenol, m. 89–91°; heating the latter 1 hr. at its b. p. gives a reddish oil, about half of which is *p*-PrC<sub>6</sub>H<sub>4</sub>OH. PrCHO gives 1,1-dihydroxydiphenyl-

butane (XVI),  $b_{12}$  270°, which on distn. gives *p*-butylphenol,  $b_{12}$  138–41° (*Ac deriv.*,  $b_{12}$  138–41°). Catalytic reduction of XVI at 220° gives the compd.  $C_{14}H_{24}O_2$ ,  $b_{12}$  235–40° (*di-Ac deriv.*,  $b_{12}$  230–4°), and 4-butylcyclohexanol,  $b_{12}$  120–2°,  $d_4^{20}$  0.9106,  $n_D^{15}$  1.4691, which yields 2 phenylurethans, m. 124° and 42°, sepd. by crystn. from MeOH; oxidation ( $CrO_3$ ) gives *p*-butylcyclohexanone, m. 101–2° (*semicarbazone*, m. 175°).  $PrCHO$  and *m*- $MeC_6H_4OH$  give butenylcresol,  $b_{12}$  150° (*Me ether*,  $b_{12}$  130–3°; *Ac deriv.*,  $b_{12}$  140°) and 1,1-dihydroxydi-*m*-tolylbutane,  $b_{12}$  250° (*di-Ac deriv.*,  $b_{12}$  230–5°); heating 8 hrs. with 3 parts concd. HCl at 120–5° gives 3-methyl-4-butylphenol,  $b_{14}$  140–5°. Catalytic reduction of  $MeCH(C_6H_5)_2$  gives a mixt. of the compd.  $C_{14}H_{26}O_2$ ,  $b_{12}$  240° (*mono-Me ether*,  $b_{0.2}$  175–8°), and the compd.  $C_{14}H_{26}O_2$ , m. 140–6° (a mixt. of isomers) (*mono-Me ether*,  $b_{0.2}$  175–8°), oxidized to the ketone,  $C_{14}H_{22}O_2$ ,  $b_{12}$  225–30°, m. 55–6° (*semicarbazone*, m. 215–7°). Camphor (100 g.), 120 g.  $PhNH_2$  and 150 cc. 20% HCl, heated 14 days at 100°, give about 1 g. of the compd.  $C_{16}H_{21}N$ ,  $b_{0.2}$  140°,  $[\alpha]_D^{14}$  9.49° (0.2090 g. in 2.2990 g. EtOH). Similarly 43 g. menthone, 88 g.  $PhNMe_2$  and 80 cc. concd. HCl, heated 10 hrs. at 180°, give 2.5 g. of the compd.  $C_{18}H_{27}N$ ,  $b_{12}$  195–205°,  $[\alpha]_D^{15}$  13° (10% in  $CHCl_3$ ). *d*-3-Methylcyclopentanone and  $PhNMe_2$ , heated several days at 100° in HCl soln., give about 4% of 3-methylpentenyldimethylaniline, m. 64°, which shows scarcely any optical activity, and about the same yield of tetramethyldiaminodiphenyl-3-methylcyclopentane, m. 95°,  $[\alpha]_D^{21}$  22.50° ( $CHCl_3$ ). *d*-3-Methylcyclohexanone (XVII) and  $PhOH$ , condensed in the usual manner, give 56% of the diphenol,  $C_{18}H_{22}O_2$ ,  $b_2$  235–6°, m. 153–5°,  $[\alpha]_D^{20}$  –18.74° (EtOH); heating 4 hrs. at 100° with concd. HCl gives *p*-methylcyclohexylphenol,  $b_{14}$  170°, m. 60–75°,  $[\alpha]_D^{20}$  –6.94° ( $C_6H_6$ ), identical with that obtained by fractional distn. of the product obtained by heating 3 hrs. at 100°. XVII and  $PhNH_2$  give the same products as the inactive compd. except that they are optically active; the diamine has  $[\alpha]_D^{23}$  –11.78° ( $CHCl_3$ ), the unsatd. amine  $[\alpha]_D^{20}$  54.21° (EtOH), 57.02° ( $CHCl_3$ ); a carefully prepd. sample of the diamine,  $b_{0.1}$  240–3°, has  $[\alpha]_D^{18}$  –16.21° ( $CHCl_3$ ). Methylcyclohexylaniline, m. 146°,  $[\alpha]_D^{17}$  –4.78° (EtOH); methylcyclohexylphenol, m. 60°,  $[\alpha]_D^{20}$  –6.9° ( $C_6H_6$ ). Methylcyclohexenylmethylylaniline,  $b_{12}$  192–5°, m. 33°,  $[\alpha]_D^{18}$  47.63° ( $CHCl_3$ ) (*HCl salt*, m. 180°); 1,1-dimethylaminophenyl-3-methylcyclohexane,  $b_{12}$  260–5°,  $[\alpha]_D^{23}$  –15.26° ( $CHCl_3$ ) (*HCl salt*, m. 185°); bisphenylthiourea, m. 105°. The corresponding dimethylaniline derivs. have  $[\alpha]_D^{23}$  46.69° and –20.94° 3-Methylcyclohexylbenzene (XVIII),  $b_{14}$  123–4°,  $[\alpha]_D^{20}$  –5.26° (cf. Kursanov, *C. A.* 1, 2093). *p*-Methylcyclohexylbromobenzene, in 60% yield from the diazo compd. and  $CuBr$ ,  $b_{14}$  165–7°,  $d_4^{18}$  1.2100,  $[\alpha]_D^{18}$  –2.23°; the diazo compd. and  $CuCN$  give the nitrile,  $b_{14}$  166–8°,  $d_4^{13}$  1.0058,  $[\alpha]_D^{28}$  –1.62°. Reduction of the diazo compd. with  $SnCl_2$  gives 50% of *p*-3-methylcyclohexylphenylhydrazine, m. 84–5°,  $[\alpha]_D^{20}$  –4.99° (EtOH), relatively unstable (*HCl salt*, m. 210°; *semicarbazide*, m. 217–8°; *thiosemicarbazide*, m. 175°). XVIII and  $AcCl$  with  $AlCl_3$  give 85% of *p*-methylcyclohexylacetophenone,  $b_{14}$  182–5°,  $d_4^{21}$  0.9986,  $[\alpha]_D^{21}$  –3° (*semicarbazone*, m. 211°). Methylcyclohexenylmethylylaniline, m. 33°, yields a yellow *NO compd.*, m. 50°, reduced to the hydrazine, m. 34°  $[\alpha]_D^{16}$  39.12° (EtOH) (*thiosemicarbazide*, m. 181°);  $HCHO$  gives a *hydrazine*, m. 121°, and  $BzH$  a *hydrazone*, m. 108°.

C. J. WEST

Isomerism in 9-fluorene derivatives? A. KIEGL. *Ber.* 62B, 1327–35 (1929). All of the 7 cases of supposed stereoisomerism of 9-fluorene derivs. which had been reported up to 1925 were later shown to be incorrect. K. in his work on fluorene derivs. nevertheless kept the possibility of such an isomerism in view and with E. Thoma carefully investigated the reduction of fluorenone with Zn dust and  $AcOH$ . Along with fluorene alc., m. 156°, were obtained not inconsiderable amts. of fluorenopinalcol and a little 9-acetoxyfluorene, difluorenyl ether and diphenylenepheneanthrone but no traces of an isomeric fluorene alc. A careful repetition of the work of Schlenk and Bergmann on the prepn. of stereoisomeric fluorene derivs. (*C. A.* 22, 4495) gave entirely neg. results. Na fluorene and  $CO_2$  gave only technical ( $\alpha$ )-fluorene-9-carboxylic acid, m. 221–3° (slight gas evolution), and none of S. and B.'s ( $\beta$ )-acid, m. 232°; the Na fluorene was prepd. both by their method from  $Ph_3CNa$  and fluorene and from 9-methoxyfluorene, m. 43.5° (made from carefully purified 9-chlorofluorene), and Na powder. Again, the acid obtained from fluorenone di-Me acetal with Na and  $CO_2$  decompd. 184° (S. and B. state it m. 172–3°) and proved to be identical with the 9-methoxyfluorene-9-carboxylic acid obtained by Klinger from the 9-Cl acid. The supposed new benzohydrylfluorene, m. 187°, obtained by S. and B. from 9-chlorofluorene and  $Ph_3CHNa$ .

was sepd. by fractional crystn. into the known benzohydrylfluorene, m. 217°, ( $\text{CHPh}$ )<sub>2</sub>, m. 209°, and a little difluorenyl, m. 240°. Finally, S. and B. claim to have obtained from 9,9-dichlorofluorene and  $\text{Ph}_2\text{CNa}$ , diphenylenediphenylethylene oxide (I), m. 228°, diphenylenediphenylethylene (II), m. 225°, and an isomer (III), m. 213°, of II. III, however, is an isomorphous mixt. of I and II; an equal amt. of II lowers its m. p. only a few degrees, I raises its m. p.; fractionation from  $\text{C}_6\text{H}_6$  gives I or II, depending on which component is present in excess; with  $\text{AcCl}$  it gives II and phenylbenzoylfluorene, a product which can have been formed only from I; a hot  $\text{C}_6\text{H}_6$  soln. of approx. equal amts. of I and II gives on cooling crystals which differ from the supposed III only in being colorless.

C. A. R.

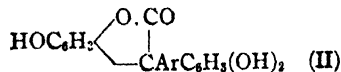
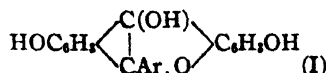
**New derivatives of 2-hydroxyfluorene.** CELESTINO RUÍZ. *Anales asocn. quim. Argentina* 16, 170-86(1928).—From fluorene 2-nitrofluorene was prepd., reduced by Sn to 2-aminofluorene, and diazotized and decomd. into 2-hydroxyfluorene with 20-60% yields, with resin formation. By modifying the Diels and Schlenk method (*Ber.* 34, 1759) fluorenol was prepd. in 80% yield. Mononitration of hydroxyfluorene by the Raiford and Colber method (*C. A.* 19, 1858) gave 1- or 3-nitro-2-hydroxyfluorene, which was reduced by  $\text{NaHSO}_3$  to 1- or 3-amino-2-hydroxyfluorene. The latter was oxidized to phthalic acid, showing that both  $\text{NH}_2$  and  $\text{NO}_2$  were originally in the same nucleus as the OH. By the action of  $p\text{-MeC}_6\text{H}_4\text{SO}_2\text{Cl}$  2- $p$ -toluenesulfonylhydroxyfluorene was obtained, whose main nitration product is 7-nitro-2-hydroxyfluorene, which can also be prepd. by diazotization of 2-amino-7-nitrofluorene, showing the constitution. By reduction with  $\text{Al-Hg}$  7-amino-2-hydroxyfluorene is obtained. Denitration by the Banús and Thomas method (*C. A.* 17, 2574) does not give 1,3-dinitrohydroxyfluorene, but phthalic acid. 1,3,7-Trinitro-2-hydroxyfluorene was not identified. Combining 2-hydroxyfluorene with  $\text{PhN}_2\text{Cl}$  gives benzene-1- or 3-hydroxyfluorene, showing that coupling is in the  $o$ -position. No nitroso deriv. of 2-hydroxyfluorene was obtained, only small quantities of 1- or 3-nitro-2-hydroxyfluorene. These derivs. all resemble those of  $\text{Ph}_2$ , sustaining previous hypotheses that fluorene acts like ( $o\text{-MeC}_6\text{H}_4$ )<sub>2</sub> and not like dibenzocyclopentadiene.

E. M. SYMMES

**The effects of orientation in the diphenyl and fluorene series.** CELESTINO RUÍZ. *Anales asocn. quim. Argentina* 16, 187-96(1928).— $\text{Ph}_2$  and fluorene follow the laws of orientation observed in the  $\text{C}_6\text{H}_5$  nucleus, but are always found in a nucleus which is little stable, depending upon the nature of the substituent. By energetic action there is possible the formation of a double conjugate system between equiv. positions 4 and 4' for  $\text{Ph}_2$  and 2 and 7 for fluorene.

E. M. SYMMES

**Synthesis of phenol ketones according to Hoesch.** W. BORSCHIE. II. Condensation of arylglyoxylic nitriles with phthloroglucinol. W. BORSCHIE, C. WALTER AND J. NIEMANN. *Ber.* 62B, 1360-6(1929); cf. *C. A.* 20, 2323.—It had been shown that the substances obtained by Marsh and Stephen by treating arylglyoxylic nitriles with resorcinol according to Hoesch and hydrolyzing the product are not "superoxide forms of dihydroxydibenzils,"  $\text{ArC}_6\text{H}_3\text{O}_4$ , but compds. of the compn.  $\text{ArC}_6\text{H}_3\text{O}_5$  (formed from 1 mol. of the nitrile and 2 of  $\text{C}_6\text{H}_3(\text{OH})_2$ ) for which the structure I was tentatively proposed. As, however, all three HO groups are methylated in the same way by  $\text{CH}_3\text{N}_2$ , preference is now given to the structure II. Repetition of M. and S.'s work with phthloroglucinol (III) showed that the reaction proceeds in the same way, as shown



by analysis not only of the final products of hydrolysis but also of the intermediate imino lactones,  $(\text{HO})_3\text{C}_6\text{H}_3\text{C}(\text{C}(\text{NH})\text{O.C}_6\text{H}_3(\text{OH})_2) \quad (\text{IV})$ . 1,4,6,2',4',6'-Hexa-

hydroxytriphenylacetic iminolactone,  $\text{C}_{26}\text{H}_{18}\text{O}_8\text{N}$  (IV,  $\text{Ar} = \text{Ph}$ ), crystals with  $\text{H}_2\text{O}$  from 20%  $\text{MeOH}$ , m. 286-7°, from  $\text{BzCN}$  and III in  $\text{Et}_2\text{O}$  satd. with  $\text{HCl}$ ;  $\text{HCl}$  salt, m. 215-2° (decompn.); penta-Ac deriv., from the IV and  $\text{Ac}_2\text{O}$  on the  $\text{H}_2\text{O}$  bath, prisms with 2 mols.  $\text{H}_2\text{O}$  drying with porcelain-like turbidity and m. 178-81°. 4''-MeO analog, from  $p\text{-MeOC}_6\text{H}_4\text{COCN}$  and III, m. 259-60°, contains 1 mol.  $\text{H}_2\text{O}$  after drying over  $\text{CaCl}_2$ , is easily sol. in hot dil. mineral acids.  $p\text{-ClC}_6\text{H}_4\text{COCN}$ , b.p. 117-8°, m. 40-1°, was obtained in 4.5-g. yield by digesting with 5 N  $\text{HCl}$  the 4-dimethylaminoanil, red, m. 146-7°, which is in turn obtained in 8-g. yield from 5 g.  $\text{ClC}_6\text{H}_4\text{CH}_2\text{CN}$  and  $p\text{-ONC}_6\text{H}_4\text{NMe}_2$  in boiling  $\text{MeOH}$  cautiously treated with  $\text{NaOH}$ . 4''-Cl iminolactone (IV,  $\text{Ar} =$

convert the aldoximes,  $\text{XC}_6\text{H}_4\text{COCH:NHOH}$ , of 4-chloro- or 4-bromophenylglyoxal into the corresponding benzoyl cyanides with  $\text{Ac}_2\text{O}$  or  $\text{SOCl}_2$ , they undergo a "Beckmann rearrangement of the 2nd kind," as they do also on heating alone, and decompn. into  $\text{HCN}$  and 4- $\text{XC}_6\text{H}_4\text{CO}_2\text{H}$ . C. A. R.

**Bivalency of carbon. II.** The displacement of chlorine from desyl chloride, Benzoin diethyl acetal. ALLAN M. WARD. *J. Chem. Soc.* 1929, 1541-53; cf. *C. A.* 22, 70.—In EtOH or dil. EtOH at 25°,  $\text{BzPhCHCl}$  (I) is stable but the addn. of NaOH or NaOEt to the soln. brings about a very rapid displacement of Cl, the reaction being complete for 0.1 *N* alkali in less than 1 hr. The velocity coeffs. calcd. on the basis of a bimol. reaction are in good agreement when the concns. of the reactants are approx. 0.1 *M* but for 0.2 *N* NaOH or NaOEt they are less regular and often show a considerable drift; these variations may be due to side reactions or to inaccuracy in measurements owing to the rapidity of the reaction. The magnitude of *k* also diminishes with increasing concns. of alkali. The difference in the mechanism of the reaction in this case from those previously studied finds further support on the basis of the products obtained from I and alkali. When the final reaction mixt. was added to dil. HCl the product was benzoin (II); no evidence was obtained for the formation of the Et ether. The formation of II only would appear to indicate that the Cl of I was displaced entirely by the HO group in EtOH by the agency of EtONa. The intermediate product is the *di-Et acetal* (III) of II, rapidly decompd. by dil. HCl to II. Quant. detns. (Ziesel) showed that 78% of III is formed at 15° in EtOH-EtOH, 74% in EtOH-NaOH and 54% in 10% aq. EtOH-NaOH. III, m. 68°, monoclinic, *a*:*b*:*c* = 1.099:1:1.010,  $\beta$  94°7' (other crystallographic data are given). C. J. WEST.

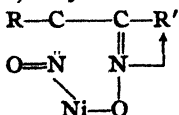
**The specific action of the oxime group on metal salts. III.** The complex chemical behavior of stereoisomeric oximes. W. HIEBER AND F. LEUTERT. *Ber.* 62B, 1830-46(1929); cf. *C. A.* 22, 3104, 3105.—The structures of both metal salts and oximes (especially their steric configuration) play a role in their combination. Halides of Co, Ni and Cu display the greatest tendency to combine with oximes. Coordination of the metal is always on the oxime N, regularly lying in a position opposite to that previously occupied by the hydroxyl (cf. *C. A.* 21, 3901). With aromatic oximes this is not always the case, since *syn*-Ph ( $\beta$ ) oximes rearrange under the influence of metal

salts to the *syn*-H ( $\alpha$ ) form. *E. g.*  $\uparrow$   $\begin{array}{c} \text{C}_6\text{H}_5 \text{ CH} \\ \parallel \\ \text{-NOH} \end{array}$  yields  $\left( \begin{array}{c} \text{C}_6\text{H}_5 \text{ CH} \\ \parallel \\ \text{HON} \cdots \end{array} \right)_{2 \text{ or } 4} \text{MX}_2$ . With ar

matic  $\alpha$ -diketone oximes, metal salts yield an inner complex,  $\begin{array}{c} \text{R}-\text{C}-\text{C}-\text{R}' \\ \parallel \quad \parallel \\ \text{HON} \quad \text{N}-\text{OH} \end{array} \text{ (I),}$

which in some cases may lose HX, yielding a complex-salt,  $\begin{array}{c} \text{MX}_2 \\ \text{R}-\text{C}=\text{N}-\text{OH} \\ | \\ \text{R}'\text{C}=\text{N}=\text{O} \end{array}$ . M

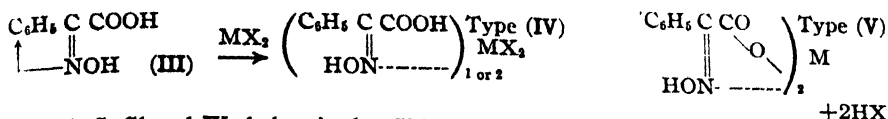
(II). Where the oxime N is unreactive (*viz.*, corresponding to the  $\beta$ -oxime), the complex is not formed.  $\text{Cu}(\text{OAc})_2$  and  $\alpha$ -benzildioxime, heated in alc. aq.  $\text{NH}_4\text{OH}$  yield dark brown *Cu- $\alpha$ -phenyl-dioxime* (type II). Treating an ether suspension with HCl gas yields *Cu chloride- $\alpha$ -benzil-dioxime* (type I) and free dioxime. The compd. of type I is obtained directly when  $\text{CuCl}$  replaces the  $\text{Cu}(\text{OAc})_2$  in the reaction. *Ni- $\alpha$ -benzil-dioxime* (type II) is much more stable and can be converted to the inner complex (type I) only under abs. anhyd. conditions. *Ni* salts and  $\gamma$ -benzil-dioxime in  $\text{NH}_4\text{OH}$  yield



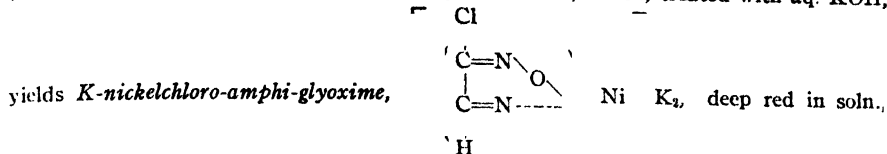
, the oxime acting as a dibasic acid. The formula is supported by

the yellow color of the compd., in contrast to the deep red *Ni* inner salt of the  $\alpha$ -dioxime, where metal is bound to oxime N only.  $\text{CuCl}$  produces a rearrangement of  $\gamma$ -benzil-dioxime into the  $\alpha$ -dioxime, and yields the identical inner-complex noted above. The oxime of phenylglyoxylic acid [prepd. according to Meyer, *Ber.* 21, 1314 (1888)] yields the  $\alpha$ -form (III), which is converted into the  $\beta$  form (IV) by treating an ether soln. with HCl gas. Metal salts do not add to III directly, but produce ( $\text{Cu}' > \text{Co}$ ) a slow rearrangement of III into IV, then forming an inner complex which may lose HX to give an inner salt (V)





Anhyd. CuCl and IV shaken in dry CHCl<sub>3</sub> suspension for 70 hrs., evapd. and washed with ether, yield *Cu chloride-β-phenylglyoxylic acid oxime* (type IV), which may be isolated, but loses HCl easily to give the inner complex-salt *Cu-di-[β-phenylglyoxylic acid oxime]* (type V). CoCl<sub>2</sub> and IV in alc. yield the inner complex *Co β-phenylglyoxylic acid oxime* (type IV), which spontaneously loses HCl, yielding *Co di-[β-phenylglyoxylic acid oxime]* (type V). With *chloro-anti-glyoxime*, Ni(OAc)<sub>2</sub> gives a red-brown inner complex salt, as with other *anti-dioximes*. Ni(OAc)<sub>2</sub> with *chloro-amphi-glyoxime* yields an amorphous product with varying Ni content, which, treated with aq. KOH,



the color being destroyed by the addn. of acid, and reappearing in alk. soln. Salts of the heavy metals added to the aq. soln. give colors varying from yellow to brown. With NiCl<sub>2</sub> the same product is obtained as in the original reaction between Ni(OAc)<sub>2</sub> and the oxime. The existence of the nickel-bischloro-*amphi-glyoxime* anion is also shown by cond. measurements of the aq. soln. of the K salt. T. H. RIDER

Elimination of amino groups from tertiary amino alcohols. VII. Migration of hydrocarbon radicals in derivatives of optically active desylamine. ALEX. MCKENZIE AND ARTHUR K. MILLS. *Ber.* 62B, 1784-94(1929); cf. C. A. 23, 1892.—*l*-Desylamine-HCl (I) and MeMgI gave *l*-1,2-diphenyl-2-amino-1-methylethanol, m. 73-4°. HNO<sub>2</sub> changed this compd. to Ph<sub>2</sub>CHCOMe, in a semipinacolin deamination, migration in this case being strictly limited to the Ph group. α-C<sub>10</sub>H<sub>7</sub>MgI and I gave *l*-1,2-diphenyl-2-amino-1-α-naphthylethanol, m. 177-8°. This, with HNO<sub>2</sub>, yielded predominantly the inactive diphenylacetone and very little *l*-PhCOCH(C<sub>10</sub>H<sub>7</sub>)Ph. *p*-MeO-C<sub>6</sub>H<sub>4</sub>MgBr and *d*-desylamine gave *d*-1,2-diphenyl-2-amino-1-anisylethanol, m. 146-7°, which, with HNO<sub>2</sub>, yielded MeOC<sub>6</sub>H<sub>4</sub>COCHPh<sub>2</sub>, and very little *d*-PhCOCHPhC<sub>6</sub>H<sub>4</sub>OMe. The Ph group in these instances showed a greater tendency to migrate than either the Me, α-C<sub>10</sub>H<sub>7</sub>, or anisyl group. Quite similar reactions are cited, which show the opposite tendency. K. H. ENGEL

Isomerism of derivatives of 2-phenylnaphthylene-1,3-diamine. MARY S. LESSLIE AND EUSTACE E. TURNER. *J. Chem. Soc.* 1929, 1512-7.—In considering the existence of the 2 isomeric forms of *N,N'*-dimethyl-2-phenylnaphthylene-1,3-diamine (Lees and Thorpe, C. A. 2, 125) L. and T. consider the possibility of the diamine (I) reacting in the tautomeric form (II) and review the reactions in favor of such a view. Since



II contains an asym. C atom, it should be capable of optical resolution; this has been accomplished. Using *d*-camphorsulfonic acid, there is obtained *d*-I *di-d*-camphorsulfonate, [α]<sub>5461</sub><sup>20</sup> 40.5°; *d*-I, m. 109-11°, [α]<sub>5461</sub><sup>20</sup> 14.8 (EtOH, c 0.5070). *l*-I *di-l*-camphorsulfonate, [α]<sub>5461</sub><sup>20</sup> -40.7°. C. J. WEST

Reactions of a mixture of ethyl ether, acetyl bromide and naphthol. HAROLD L. BASSETT AND KATHERINE F. TAYLOR. *J. Chem. Soc.* 1929, 1568-78.—Starting with 1 mol. each of Et<sub>2</sub>O (I), AcBr (II) and α- or β-C<sub>10</sub>H<sub>7</sub>OH (III), and allowing the reaction to proceed at 25°, the final distribution of the Ac and Br actually recovered was: α-III: III acetate, 0%; AcOEt, 33; EtBr, 98; AcOH, 53; β-III: III acetate, 15%; AcOEt, 45; EtBr, 100; AcOH, 26. Because of the difficulty of analysis, the values are only approx. Consideration of these figures lead to the following series of reactions: III + II = III.II; III.II = C<sub>10</sub>H<sub>7</sub>OAc + HBr; 2HBr + I = 2EtBr + H<sub>2</sub>O; C<sub>10</sub>H<sub>7</sub>OAc + H<sub>2</sub>O = III + AcOH; 2AcOH + I = 2AcOEt + H<sub>2</sub>O. Although there must be some overlapping, it is considered that these 5 reactions are, in the main, consecutive and that the order in which they are written also represents the order of their velocities,

the 1st being the most rapid. The changes taking place are such that no equil. is ever reached. The various reactions are discussed. The exptl. part gives in detail the methods of detn. of the various components

C. J. WEST

**Conjugated systems. Factors which disturb the valence field. V. Action of substances with reactive methylene on carbindogenides.** M. V. IONESCU AND A. GEORGESCU. *Bull. soc. chim.* 45, 428-35(1929); cf. C. A. 21, 3362; 22, 1353. —*o*-Chlorobenzylideneindandione (I), (also the *m*- and *p*-Cl isomers), in alc., and in the presence of piperidine as a catalyst, adds to malonic ester, yielding, exclusively, colorless  $\text{CO}_2\text{C}_6\text{H}_4\text{CO}_2\text{CHCH}(\text{C}_6\text{H}_4\text{Cl})\text{CH}(\text{CO}_2\text{Et})_2$ . The more strongly reactive dimethyl-

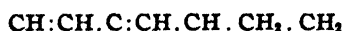
dihydroresorcinol yields *o*-chlorobenzylidenebisdimethyldihydroresorcinol, m. 203.5°; furthermore, *o*-chlorobenzylideneindandioneindone (II), m. 288° (*m*-Cl isomer, m. 265-7° (decompn.); *p*-Cl isomer, m. 275° (decompn.)); and also truxenequinone (III) in small amts. Similarly, phenylmethylpyrazolone and I, besides small amts of II and III, yields mostly *o*-chlorobenzylidenebisphenylmethylpyrazolone, m. 229-31° (*m*-Cl isomer, m. 206-7°; *p*-Cl isomer, m. 208°).

K. H. ENGEL

**Oxidation of anthracene with nitric oxide.** M. IL'INSKII AND B. MAKOROV. *Z. Farbenind.* 20, 244-5(1929); cf. C. A. 22, 3888; 23, 4214. —In the oxidation of crude anthracene (I) with NO, carbazole (II) and phenanthrene (III) as well as I are oxidized, while with  $\text{CrO}_3$  I is oxidized first. Crude I causes more anthraquinone (IV) to remain in the mother liquor. Sulfonation and reduction methods applied to crude II contg. large quantities of II and III do not result in pure IV.

F. C. H.

**Catalytic reduction under pressure in the presence of nickel salts. XIII.  $\alpha$ - and  $\beta$ -hydroxy- and amino derivatives of anthracene.** JULIUS V. BRAUN AND OTTO BAYER. *Ann.* 472, 90-121(1929); cf. C. A. 22, 1586. —Reduction of  $\alpha$ -anthrol with EtOH and 6-7 atoms Na gives 75% of dihydroanthrol (I), b<sub>18</sub> 216-20°, m. 100° (Ac deriv., m. 84°, as found by Pleus, *Ber.* 35, 2926(1902)). There also results an amorphous, dark colored product, which is not a reduction product but a transformation product of anthrol, which also results when the anthrol is heated in N under pressure. Tetrahydroanthracene ketone (II), on reduction, yields a viscous oil, b<sub>17</sub> 205-13° from which no definite product could be isolated; heating II to boiling for a few min. lowers the m. p. from 96° to 87-90° and crystn. from EtOH gives  $\text{C}_{14}\text{H}_{10}$ ;  $\text{KMnO}_4$  oxidation gives *o*- $\text{C}_6\text{H}_4(\text{CO}_2\text{H})_2$  but no trace of 2,3- $\text{C}_{10}\text{H}_6(\text{CO}_2\text{H})_2$ . The phenylhydrazone of II, yellow, m. 116°, yields with dil.  $\text{H}_2\text{SO}_4$ , but more smoothly with concd. HCl, the hydrocarbazole deriv. (III), m. 245°, easily dehydrogenated by heating to boiling, by heating in  $\text{PhNO}_2$  or by distn. with PbO or with 2-3% Cu powder to carbazole (IV), yellow, m. 325°, sol. in concd.  $\text{H}_2\text{SO}_4$  with a deep blue color, and oxidized by  $\text{CrO}_3$  in AcOH to an *o*-quinone (V), brown, does not m. 360°, giving with Zn dust and alkali a brown vat. Reduction of I in 30% decalin soln. at 210° gives a mixt. of tetrahydroanthrol, m. 109-10° (phenylurethan, m. 153-4°), which is easily oxidized; on standing in MeOH with  $\text{H}_2\text{NNHCONH}_2$ , there results the semicarbazone of II, m. 250°, II and  $\alpha$ -octahydroanthracene ketone. Complete hydrogenation of  $\alpha$ -anthrol gives octahydroanthracene  $\beta$ -Anthrol (VI), m. 255° (Liebermann, *Ann.* 212, 50(1882) gives 200°). *meso*-Dihydro- $\beta$ -anthrol (VII), obtained by Bamberger and Hoffmann (*Ber.* 26, 3069(1883)) from VI with Na and EtOH, is much more easily obtained (60% yield) from  $\beta$ -hydroxyanthrone with excess Na and AmOH and also in 60% yield from  $\beta$ -hydroxyanthraquinone, Zn dust and 20% NaOH. Reduction of VI with 2 atoms H at 200° gives VII, *ac*-tetrahydro- $\beta$ -anthrol (VIII), m. 148° (Ac deriv., m. 75-6°; phenylurethan, m.



NH-C<sub>6</sub>H<sub>5</sub> (III)



NH-C<sub>6</sub>H<sub>5</sub> (IV)



NH.C<sub>6</sub>H<sub>5</sub> (V)

150°; picrate, orange, m. 142°), and about 3% of *ac*- $\beta$ -tetrahydroanthracene ketone, m. 148-50° (semicarbazone, m. 250°). VIII is not oxidized by  $\text{CrO}_3$  to the ketone but to *o*- $\text{C}_6\text{H}_4(\text{CO}_2\text{H})_2$ . VIII is stable when heated to boiling for several hrs.; heating with  $\text{ZnCl}_2$  causes a complete resinification of the material. The phenylurethan, however,

when heated in the dry state yields  $\text{CO}_2$ ,  $\text{EtOH}$ ,  $\text{PhNH}_2$ ,  $\text{PhNCO}$  and 1,2-dihydroanthracene (1,2-diacene), m.  $150^\circ$  (picrate, brick red, m.  $115^\circ$ ; dibromide, m.  $102^\circ$ ). VII can be reduced in 2 steps to *ac*-octahydro- $\beta$ -anthrol, m.  $122^\circ$  (phenylurethan, m.  $183^\circ$ ), which can not be oxidized to the ketone. Dry distn. of the phenylurethan gives hexahydroanthracene, m.  $70^\circ$ . Reduction of  $\alpha$ -aminoanthraquinone with Zn in  $\text{NH}_4\text{OH}$  gives 80–5% of dihydro- $\alpha$ -anthramine, m.  $85^\circ$  (Dienel, *Ber.* 38, 2862(1905) gives 60–70%), which on distn. gives 80% of  $\alpha$ -anthramine (IX), m.  $127^\circ$ . Boiling with  $\text{AcOH}$  gives  $\alpha$ , $\alpha$ -dianthramine, yellow, m.  $252^\circ$ . The *Ac* deriv. of IX, m.  $212^\circ$  (D. gives  $198^\circ$ ). Reduction of IX in 25% decalin soln. at  $200^\circ$  gives octahydroanthramine,  $b_{14}$   $188$ – $93^\circ$  (picrate, sinters  $220^\circ$ , decomp.  $255^\circ$ ; *Ac* deriv., m.  $185^\circ$ ), and the tetrahydro m.  $170^\circ$ . *ac*-Tetrahydro- $\beta$ -anthramine, pale green, m.  $154^\circ$  (picrate, golden yellow, decomp.  $215^\circ$ ; *Ac* deriv., m.  $159$ – $60^\circ$ ; phenylthiourea, m.  $127^\circ$ ; aminoazo compd., red, m.  $174^\circ$ ); this compd. is very stable and is scarcely changed by heating with 10%  $\text{KOH}$  at  $160^\circ$ . Octahydro deriv., m.  $69$ – $70^\circ$  (picrate, m.  $245^\circ$ ; *Ac* deriv., m.  $165^\circ$ ).

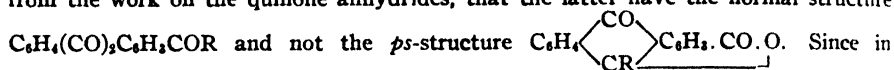
C. J. WEST

Certain 3,9-halodibenzoyl derivatives of perylene. New synthesis of isoviolanthrone. V. V. SHARVIN AND L. Z. SOBOLOVSKII. *J. Russ. Phys.-Chem. Soc.* 61, 789–94 (1929).—3,9-Di-*o*-chlorobenzoylperylene (I), obtained in 85% yield when 1 part of perylene, 1.4 parts of *o*- $\text{ClC}_6\text{H}_4\text{COCl}$  and 1.2 parts of anhyd.  $\text{AlCl}_3$  were introduced into 30 parts of  $\text{CS}_2$ , allowed to stand for 12 hrs., then heated 3 hrs. in a water bath, the  $\text{CS}_2$  was expelled, the residue treated with ice, the red ppt. worked up and then treated with hot alc. and  $\text{PhMe}$  to remove impurities; the crude I was recrystd. from a mixt. of  $\text{PhNO}_2$  and  $\text{C}_6\text{H}_5\text{Me}_2$ , red needles, do not melt up to  $320^\circ$ , readily sol. in  $\text{PhNO}_2$ ,  $\text{PhNH}_2$ , less sol. in  $\text{C}_6\text{H}_5\text{Me}_2$ . 3,9-Di-*o*-bromobenzoylperylene and 3,9-di-*o*-iodobenzoylperylene are prepd. from perylene and the corresponding *o*-bromo- and *o*-iodobenzoyl chlorides as described above, after recrystn. the 1st compd. forms red and the 2nd one brick-red needles, sol. and melt similarly to I. Isoviolanthrone (II) was prepd. from I by 2 methods. (1) One part of I was powdered with 5 parts of anhyd.  $\text{AlCl}_3$  and heated within a flask sealed with a  $\text{CaCl}_2$  tube in a glycerol bath to  $100^\circ$ , then in the course of 2 hrs. to  $170^\circ$ , where it was maintained for an addnl. 2 hrs.; after cooling the mass was worked up with ice and hot  $\text{HCl}$ , the black ppt. dissolved in concd.  $\text{H}_2\text{SO}_4$ , the soln. poured drop by drop into  $\text{H}_2\text{O}$ , the deep violet ppt. reduced with  $\text{NaOH}$  and hyposulfite at  $60^\circ$  and air was blown through the soln. until complete pptn. of the vat dye II. (2) One part of I was powdered with 6 parts of  $\text{NaOH}$ , the mixt. heated 30 min. while stirring in boiling quinoline, then allowed to stand for 24 hrs., the ppt. worked up with dil.  $\text{HCl}$ , washed with  $\text{H}_2\text{O}$  and alc., the resulting violet-black powder washed with weak alkali, which exts. a substance with green fluorescence; the II was treated with  $\text{NaOH}$  and hyposulfite and then oxidized with air as described above.

CHAS. BLANC

Anthrahydroquinol- $\alpha$ -carboxylic lactones. ROLAND SCHOLL AND FRITZ KENNER (WITH OSKAR BÖTTGER, SIGFRID HASS AND H. KURT MEYER) *Ber.* 62B, 1278–95 (1929); cf. *C. A.* 23, 2710.—In addn. to the 2 methods described in the earlier papers (treatment of anthrahydroquinol- $\alpha$ -carboxylic acids with  $\text{Ac}_2\text{O}$  and of anthraquinone- $\alpha$ -carboxylic anhydrides with  $\text{Na}_2\text{S}_2\text{O}_4$  alone or in the presence of dil.  $\text{NH}_4\text{OH}$  or  $\text{AcOH}$ ), anthrahydroquinol-1-carboxylic lactone (I) and its 2-Me deriv. (II) have been prepd. by the following methods: (1) Short heating of the anthraquinone acids with Zn dust and  $\text{AcOH}$  in the presence of  $\text{Ac}_2\text{O}$ . (2) Reduction of the esters of the quinone acids with acid or alk. reducing agents. The aryl esters are readily reduced by  $\text{Na}_2\text{S}_2\text{O}_4$  or Zn dust and  $\text{NH}_4\text{OH}$ , best by Zn dust and boiling  $\text{AcOH}$ . Of the alkyl esters, only those of the 2,1- $\text{C}_6\text{H}_4(\text{CO})_2\text{C}_6\text{H}_4\text{MeCO}_2\text{H}$  (III) react in this way; those of the unmetlylated  $\text{C}_6\text{H}_4(\text{CO})_2\text{C}_6\text{H}_4\text{CO}_2\text{H}$  (IV) are converted exclusively into the hydroquinol acid. (3) From the acid chlorides with  $\text{Na}_2\text{S}_2\text{O}_4$  and  $\text{NaOH}$ . (4) From the acid amides with  $\text{Na}_2\text{S}_2\text{O}_4$  and very dil.  $\text{NaOH}$  or  $\text{AcOH}$ . The methods involving alkalies or  $\text{NH}_4\text{OH}$  are not practical as the alk. solns. of the lactones are very unstable and sensitive to the air. The lactones, themselves red, dissolve easily in aq.  $\text{NH}_4\text{OH}$ , less readily in  $\text{NaOH}$  and  $\text{Na}_2\text{CO}_3$ , with vivid pure blue color and are reprecip. red by acids, including  $\text{CO}_2$ ; in the blue alk. solns. they change more or less rapidly, by addn. of  $\text{H}_2\text{O}$ , into the red anthrahydroquinolcarboxylates; in the  $\text{NH}_4\text{OH}$  solns. into the anthrahydroquinolcarboxamides. In  $\text{C}_6\text{H}_5\text{N}$ , I dissolves with its own red color and on cooling seps. from a hot concd. soln. as a red homopolar compd.  $\text{III} \cdot \text{C}_6\text{H}_5\text{N}$ , but if  $\text{H}_2\text{O}$  is added to the red soln., it becomes deep blue with formation of the heteropolar true pyridinium salt which is dissoed. back into the red form by heat or much  $\text{C}_6\text{H}_5\text{N}$ . The lactones are sensitive to air in alk., acid or neutral soln., especially in  $\text{C}_6\text{H}_6$  or xylene in the

light. Typical oxidizing agents ( $\text{PbO}_2$ ,  $\text{FeCl}_3$ ,  $\text{K}_2\text{Fe}(\text{CN})_6$ ,  $\text{Br}$ ,  $\text{KMnO}_4$ ) oxidize them more or less rapidly at room temp.; for practical purposes hot  $\text{PhNO}_2$  is best. **II** in all cases gave chiefly 2,2'-dimethyl-9,9'-dihydroxy-9,9'-bianthranyl-1,1'-dicarboxylic dilactone (**V**). The oxidation with  $\text{KMnO}_4$  in  $\text{Me}_2\text{CO}$ - $\text{AcOH}$  and with  $\text{Br}$  in  $\text{C}_6\text{H}_5\text{N}$  is instantaneous and quant. and may be used to titrate the lactones. **V** is also formed from the acid chloride of **III** in  $\text{C}_6\text{H}_6$  with finely divided  $\text{Ag}$  or  $\text{PhNMe}_2$ . Concd.  $\text{H}_2\text{SO}_4$  decomps. **V** into **III**.  $\text{Zn}$  dust and  $\text{AcOH}$ ,  $\text{Na}_2\text{S}_2\text{O}_4$  and  $\text{NH}_4\text{OH}$  very slowly, reduce **V** to the monomeric **II**. Aq. and especially alc. alkalis dissociate **V** with formation of an olive-green soln. contg. the salts of the anthraquinone and the anthrahydroquinol acids apparently in quinhydrone-like combination. Probably the primary process is a radical dissocn. into an anthroxyl with univalent  $\text{O}$ . Exposure of **V** in  $\text{AcOH}$  to ultra-violet light and heating in certain org. solvents apparently also brings about a similar dissocn. **I**, brown-red, decolorizes above  $175^\circ$  and begins to sublime. *Ph* ester of **IV**, m.  $213^\circ$ . 10-Acetate of **I**, from **IV** and  $\text{Zn}$  dust in boiling  $\text{Ac}_2\text{O}$ , m.  $196^\circ$ . *Me* ester of **III**, light yellow, m.  $178-9^\circ$ ; *Et* ester, m.  $144^\circ$ ; *Ph* ester, pale yellow, m.  $218-9^\circ$  (2-methylpyridazonanthrone, from the *Ph* ester and  $\text{N}_2\text{H}_4 \cdot \text{H}_2\text{O}$  in boiling  $\text{C}_6\text{H}_6$ , yellow, m.  $332^\circ$ ); *p*-bromophenyl ester, yellowish, m.  $226^\circ$ . 2-Methylanthrahydroquinol-1-carboxylic acid is pptd. as a yellow jelly from the alk.  $\text{Na}_2\text{S}_2\text{O}_4$  vat of **III**. The lactone (**II**), red, becomes lighter about  $235^\circ$ , m. around  $265^\circ$  (decompn.). Amide of **III**, from **II** allowed to stand in  $\text{NH}_4\text{OH}$  and then shaken with air, or from the chloride of **III** in  $\text{C}_6\text{H}_6$  with  $\text{NH}_3$ , begins to sinter  $255^\circ$ , darkens  $260^\circ$ , decomps. completely at higher temps. Acetate of **II**, orange, m.  $238^\circ$ . 2,2'-Di-Me homolog of **V**, turns brown on rapid heating about  $270^\circ$ , m. around  $290^\circ$  (decompn.). It had been concluded, from the work on the quinone anhydrides, that the latter have the normal structure



the reduction of the free quinone acid (**III**) to **II** the intermediate hydroquinol acid has been isolated and the amide is repptd. unchanged by air from its alk. vat, it is concluded that the free anthraquinonecarboxylic acids and their amides likewise have the normal structure, and the same is shown for the esters in the following abstr.

C. A. R.

The nature of the anthraquinone- $\alpha$ -carboxylic esters. ROLAND SCHOLL AND JOACHIM DONAT. *Ber.* 62B, 1295-1301(1929).—The synthesis of the esters of anthraquinone- (**I**) and 2-methylanthraquinone-1-carboxylic acid (**II**) was effected or attempted by the following methods: (1) from the acid with an alc. and  $\text{HCl}$  or  $\text{H}_2\text{SO}_4$ ; (2) from the acid chloride with an alc. or phenol; (3) from the  $\text{Ag}$  salt and an alkyl iodide; (4) by oxidation of esters of 2-methylanthracene-1-carboxylic acid (**III**). **I** is readily esterified by alcs. with  $\text{HCl}$  or  $\text{H}_2\text{SO}_4$  but **II** is not. The chlorides were prepd with both  $\text{PCl}_5$  and  $\text{SOCl}_2$ ; no indication that, as with  $o\text{-BzC}_6\text{H}_4\text{CO}_2\text{H}$  and analogous acids, isomeric chlorides and esters were formed was obtained. The esters of **I** prepd by methods 1, 2 and 3 and those of **II** prepd. by methods 2, 3 and 4 were identical, and it is concluded that the esters of the 2 acids have the normal structure (cf. preceding abstr.). *Ca* salt of **I**. Chloride, yellow, from **I** heated with  $\text{SOCl}_2$  until dissolved, or from 8 g. **I** refluxed 3 hrs. with 8.5 g.  $\text{PCl}_5$  in 15 cc.  $\text{C}_6\text{H}_6$ ; boiled a short time with only a little more than 0.5 part  $\text{PCl}_5$  in *m*-xylene, **I** gives the yellow anhydride, m.  $206^\circ$ , instead of the chloride. **III** (with LOTHAR WANKA), from **II** refluxed with  $\text{Zn}$  dust in concd.  $\text{NH}_4\text{OH}$ , pale yellow, m.  $212.5^\circ$ ; chloride; *Et* ester, vivid yellow, m.  $87-90^\circ$ ; *Ph* ester, pale yellow, m.  $137-40^\circ$ .

C. A. R.

Constitution of hydroxymethylanthraquinone. **II**. Synthesis of 1-methyl-3-hydroxyanthraquinone and 2-methyl-4-hydroxyanthraquinone. S. KEIMATSU, I. HIRAMO AND T. TANABE. *J. Pharm. Soc. Japan* 49, 531-41(1929); cf. C. A. 23, 4214.—Chloromethylbenzoylbenzoic acid, the condensation product of  $o\text{-C}_6\text{H}_4(\text{CO})_2\text{O}$  and  $m\text{-ClC}_6\text{H}_4\text{Me}$ , may have the structures: 1-methyl-3-chloroanthraquinone or 2-methyl-4'-chloroanthraquinone, and by substituting  $\text{OH}$  for  $\text{Cl}$  it is possible to have 2-hydroxymethylanthraquinones. Only 2'-methyl-4'-hydroxyanthraquinone is reported in the literature. Condensation of  $o\text{-C}_6\text{H}_4(\text{CO})_2\text{O}$  (15 g.) with  $m\text{-ClC}_6\text{H}_4\text{Me}$  (50 g.), with  $\text{AlCl}_3$  (30 g.), gave 2'-methyl-4'-chlorobenzoylbenzoic acid (**I**), (yield 16.5 g.),  $\text{AcOH}$ -insol., m.  $110-1^\circ$ , and 2'-chloro-4'-methylbenzoylbenzoic acid (**II**), (yield 5.5 g.),  $\text{AcOH}$ -sol., m.  $86-7^\circ$ . **I** (12 g.) treated in 20% fuming  $\text{H}_2\text{SO}_4$  (120 g.) (cf. C. A. 23, 3466) gave 1-methyl-3-chloro-9,10-anthraquinone (**III**), m.  $191^\circ$  (yield 8.3 g.). **III** (2.6 g.) treated with  $\text{NaOMe}$  at  $150-70^\circ$  gave 1-methyl-3-methoxy-9,10-anthraquinone (**IV**), m.  $128-9^\circ$  (yield 2.2 g.). **IV** (1.5 g.) treated with  $\text{Br}$  in glacial  $\text{AcOH}$  gave 1-methyl-3-hydroxy-9,10-anthraquinone, a new compd., m.  $285^\circ$  (yield 1.0 g.), *Ac* deriv.,

151–2° **III** (2.5 g.) treated with Br at 160–70° gave 1-*ω*-dibromomethyl-3-chloro-9,10-anthraquinone (**V**), decomps. 252–3° (yield 3.7 g.). **V** (3 g.) treated with concd. H<sub>2</sub>SO<sub>4</sub> (16 cc.) and fuming H<sub>2</sub>SO<sub>4</sub> gave 3-chloro-9,10-anthraquinone-1-aldehyde (**VI**), decomps. 257° (yield 1.7 g.). Oxidation of the aldehyde radical of **VI** gave 2-chloro-9,10-anthraquinone, m. 200–3° (yield 0.4 g.). This is in harmony with 2-chloroanthraquinone, derived from anthraquinone-2-sulfonic acid, the Cl atom taking the β-position. **II** (7 g.) treated with 20% fuming H<sub>2</sub>SO<sub>4</sub> gave 4-chloro-2-methyl-9,10-anthraquinone (**VIII**), m. 187–8° (yield 4.5 g.). **VIII** (2.6 g.) treated with NaOMe gave 4-methoxy-2-methylanthraquinone (**IX**), m. 142–3° (yield 2.3 g.). **I** (1.5 g.) treated with Br gave 4-hydroxy-2-methylanthraquinone (**X**), m. 178° (yield, 1.4 g.). Ac deriv. of **X**, m. 152–3°. **VIII** (2 g.) treated with Br gave 2-*ω*-dibromomethyl-4-chloroanthraquinone (**XI**), decomps. 223–4° (yield 2.9 g.). **XI** (3 g.) treated as **V** gave 4-chloroanthraquinone-1-aldehyde (**XII**), decomps. 209–10°. Oxidation of the aldehyde radical of **XII** gave 4-chloroanthraquinonecarboxylic acid (**XIII**), decomps. 256–7°. **XIII** treated as **VII** gave α-chloroanthraquinone, m. 162°. This is in harmony with 1-chloroanthraquinone, deriv. of 1-aminoanthraquinone. It is certain that the Cl atom is located at the α-position.

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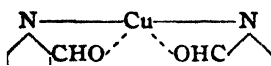
**Migration of the acyl group in partly acylated phenolic compounds. II. Synthesis of anthragallol 1,2- and 1,3-dimethyl ethers.** ARTHUR G. PERKIN and CHARLES WM. H. STORV. *J. Chem. Soc.* 1929, 1399–1421; cf. C. A. 22, 1354 —Anthragallol 2-Me ether (1.5 g.), ground to a paste with 8 cc. Ac<sub>2</sub>O and treated with 1 g. AcOK, gives 1.5 g. of the 3-Ac deriv., orange, m. 167–9.5°; 1.5 g. of the 3-Ac deriv. with CH<sub>2</sub>N<sub>2</sub> gives a mixt. of 0.7 g. of 3-acetylanthragallol 1,2-di-Me ether, bright yellow, m. 177–9° (identical with the Ac deriv. of the 1,2-di-Me ether which occurs in Chay roots) and about 15% of the 1,2,3-tri-Me ether, m. 167–9° (the yield of the latter varied with the concn of the CH<sub>2</sub>N<sub>2</sub>). 2,3-Diacetylanthragallol and BzCl in CHCl<sub>3</sub> and C<sub>6</sub>H<sub>5</sub>N give a mixt. of the 2-benzoyl-3-acetyl deriv. (**I**), golden yellow, m. 203–6°, and probably the 3-benzoyl-2-acetyl deriv. (**II**), yellow, m. 189–90°; hydrolysis of either product gives 2-benzoylanthragallol (**III**), orange, m. 241–3°. Acetylation of **III** with boiling Ac<sub>2</sub>O and C<sub>6</sub>H<sub>5</sub>N gives the tri-Ac deriv.: adding Ac<sub>2</sub>O to **III** in ice-cold C<sub>6</sub>H<sub>5</sub>N gives the 1,3-di-Ac deriv. (**IV**), m. 211–3°; partial acetylation of **III** in Ac<sub>2</sub>O contg. a trace of AcOK gives **I**; complete acetylation gives **IV**. **II**, fully acetylated, also gives a di-Ac deriv., m. 203–5°, but not identical with **I**. Methylation (CH<sub>2</sub>N<sub>2</sub>) of **III** gives approx. 60% of 1-benzoylanthragallol 2,3-di-Me ether, pale greenish yellow, m. 216–8° (sapon. with boiling 1% MeOH-KOH gives anthragallol 2,3-di-Me ether), 15.5% of 2-benzoylanthragallol 1,3-di-Me ether and 13% of 3-benzoylanthragallol 1,2-di-Me ether, the last 2 being identified after hydrolysis of the anthragallol ethers. Anthragallol 3-Me ether (**V**), m. 242–3° (Ac deriv., m. 204–6°), is identical with the product obtained by the action of CH<sub>2</sub>N<sub>2</sub> on 2,3-diacetylanthragallol. **V** and BzCl in CHCl<sub>3</sub>-C<sub>6</sub>H<sub>5</sub>N give the 2-Bz deriv., orange, m. 221–3°, which gives with CH<sub>2</sub>N<sub>2</sub> about 80% of 1-benzoylanthragallol 2,3-di-Me ether, greenish yellow, m. 216–8° and about 16% of 2-benzoylanthragallol 1,3-di-Me ether. Acetylation of **V** gives 2-benzoylacetylanthragallol Me ethers, pale yellow, m. 195–6° and deep yellow, m. 214–7°. 2-Acetylanthragallol, m. 219–20°, on methylation gives a mixt. of 69% of 1-acetylanthragallol 2,3-di-Me ether, about 15% of the 1,3-di-Me ether and some 1,2-di-Me ether. 1,3-Diacetylanthragallol 2-Me ether in Me<sub>2</sub>CO with excess of NH<sub>3</sub> gives 1-acetylanthragallol 2-Me ether, yellow, m. 205–8°; methylation of this gave the 2,3-di-Me ether, m. 168–70°. Triacetylpuropur-oxanthin with concd. NH<sub>4</sub>OH in boiling Me<sub>2</sub>CO gives 1-acetylpuropur-oxanthin, pale orange-yellow, m. 231–5°; in partly cooled Me<sub>2</sub>CO the 1,3-diacetylpuropurin, orange-yellow, m. 203–5°, results from triacetylpuropurin. 3-Nitroalizarin in KOH with Me<sub>2</sub>SO<sub>4</sub> gives the di-Me ether, yellow, m. 168–71°, reduced by Na<sub>2</sub>S to the 3-NH<sub>2</sub> deriv., red, m. 203–5° (Ac deriv., m. 237–40°). 2,3-Ditoluene-*p*-sulfonylanthragallol (**VI**), yellow, m. 196–8° (Ac deriv., m. 212–5°); with CH<sub>2</sub>N<sub>2</sub> it gives anthragallol 1-Me ether, deep yellow, m. 248–50° (di-Ac deriv., pale greenish yellow, m. 165–6°); Ba(OH)<sub>2</sub> gives a green ppt.; Pb(OAc)<sub>2</sub>, a red ppt. **VI** and excess of 1% MeOH-KOH give monitoluene-*p*-sulfonylanthragallol 1-Me ether, yellow, m. 289–91°; methylation gives the 1,3-di-Me ether (?), m. 175–7°; sapon. of the crystals and mother liquor gives, resp., the 1,3- and 1,2-di-Me ethers. 2-Ethylcarbonato-1-acetylalizarin, pale greenish yellow, m. 177–9°, results on acetylation in the cold; in a warm soln., the EtCO<sub>2</sub> group is replaced by Ac. The action of CH<sub>2</sub>N<sub>2</sub> on 2,3-diethylcarbonatoanthragallol gives 80% of 1,3-diethylcarbonatoanthragallol 2-Me ether (cf. C. A. 22, 1354) and 2% of a compd., probably the 2,3-diethylcarbonato 1-Me ether. 2-Ethylcarbonatoalizarin, reduced with SnCl<sub>4</sub> in AcOH-HCl, gives 2-ethylcarbonato-1-hydroxyanthrone (**VII**),

$C_{17}H_{14}O_6$ , pale yellow, m.  $130-3^\circ$ , yielding with  $Ac_2O$  in cold  $C_6H_5N$  2-ethylcarbonato-1,9-diacetoxyanthranol, m.  $177-80^\circ$ . The methylation of VII is also described, although pure products were not isolated. 3,4-Dihydroxyanthranol and  $CH_3N_2$  give 4,4'-dihydroxy-3,3'-dimethoxydianthrone, m.  $290-2^\circ$ . 5,6-Dihydroxy-1-benzylidenecoumaran-2-one (VIII) gives a ditoluene-*p*-sulfonyl deriv. (IX), m.  $178-80^\circ$ . Two monotoluene-*p*-sulfonyl derivs. were obtained, yellow, m.  $217-9^\circ$ , and greenish yellow, m.  $237-40^\circ$ ; Ac derivs. m.  $177-8^\circ$  and  $145-6^\circ$ , resp. Sapon. of IX with EtOH-KOH in the cold gives X. VIII also yields a diethylcarbonato deriv., pale yellow, m.  $104-7^\circ$ , and a mono deriv., yellow, m.  $177-80^\circ$ ; acetylation of the latter gives the di-Ac deriv. The original should be consulted for the theoretical discussion of these various reactions.

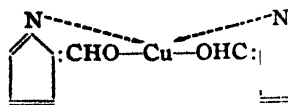
C. J. WEST  
**1-Methyl-2-furfurylcyclopropane.** N. KIZHNER. *J. Russ. Phys.-Chem. Soc.* 61, 781-8(1929); cf. *C. A.* 6, 2915.—1-Methyl-2-furfurylcyclopropane (I) is prepd from 3-methyl-5-furfurylpyrazoline (II), which is obtained when 25 g. furfuralacetone in 50 cc. alc. is mixed with 15 cc. 90%  $N_2H_4 \cdot H_2O$ , the alc. and the excess of hydrazine are expelled at  $110^\circ$ , the distn. is continued at reduced pressure, the residue is dissolved in  $Et_2O$ , dried with KOH, the  $Et_2O$  evapd., and distd. under reduced pressure; it is a heavy, almost colorless liquid, easily oxidized in the air with green color,  $b_{748} 127.8^\circ$ , sol. in  $H_2O$ ,  $d_{40}^{20} 1.1507$ . II is converted to I when into a flask having a reflux condenser and contg. 1 g. KOH and 0.5 g. pieces of platinized porous porcelain are introduced drop by drop 5 g. II; the reacting mixt. begins at once to boil and I distils over; when completed it is washed with  $H_2O$ , steam distd. and dried with  $CaCl_2$ , yield 75%, after boiling over metallic Na, it  $b_{748} 144.2^\circ$  and  $b_{748} 145.2^\circ$ ; it is colorless liquid giving a furfuran gr en reaction with a pine splinter, is easily oxidized in the air with yellow color, absorbs 4 atoms of Br, forming  $C_8H_{10}OBr_4$ , which method can be used for titration of I; by oxidation with  $KMnO_4$  is obtained probably 2-methylcyclopropane-1-carboxylic acid.

CHAS. BLANC  
**Inner complex-salts of pyrrole derivatives.** B. FEMMERT, K. DIEHL and F. GOLLWITZER. *Ber.* 62B, 1733-8(1929); cf. *C. A.* 22, 425.—Pyridylpyrrole-nickel (I)  $NiK_2$

( $R = \begin{bmatrix} \text{NC}_5H_7 \\ \diagup \quad \diagdown \\ \text{NC}_5H_7 \end{bmatrix}$ ), is obtained by slowly adding 1 g. NiO to a gently boiling soln. of 1 g. pyridylpyrrole (II) in 2 g.  $C_{10}H_8$ , cooling, extg. with  $CHCl_3$ , filtering and pptg. I by addn. of petroleum ether. Evapn. *in vacuo* of a soln. of I in a mixt. of 4 parts PhH and 5 parts ligroin yields red-brown needles, m.  $165^\circ$ . I is decompd. by acids, not by abs. alc. NaOH. Pyridylpyrrole-aluminum (III),  $AlR_3$  is obtained by boiling 1 g. II, 0.5 g. Al dust in 2 g.  $C_{10}H_8$  for 10 min. Extd. with anhyd. PhH, filtered, III was pptd. by addn. with shaking of 3 vols. petroleum ether. Purified by repptn. from PhH with ligroin, and dried over  $CaCl_2$ , it m.  $310^\circ$  approx. The crystals are orange gold in transmitted light and blue in reflected light. Pyridylpyrrole-cadmium (IV),  $CdR_2$ , obtained in like manner to III, with 0.5 g. CdO, very finely pulverized. The cooled reaction mixt. washed with PhH left green crystals of IV, mixed with unreacted oxide.  $\alpha$ -Pyrrolealdehyde (V) was prepd. according to Bamberger and Djerdjan (*Ber.* 33, 536(1900)). Mol. wt. detns. showed the keto form to predominate over the dimol enol form in  $H_2O$ .  $FeCl_3$  gave no color reaction.  $\alpha$ -Pyrrolealdehyde-copper, obtained



(VI)



(VII)

by heating a soln. of V with an excess of pptd. CuO in xylene. Slow evapn. under reduced pressure yields dark green crystals. Formula VI is favored.  $\alpha$ -Pyrrolealdehydimide (VIII) was prepd. by warming V with 33% aq.  $MeNH_2$  until the soln. was a clear yellow. Cooling ppts. VIII, m.  $57^\circ$ . Freshly prepd. VIII heated with pptd. CuO

in xylene yields  $\alpha$ -pyrrolealdehydimide-copper (IX),  $CuR'_2$  ( $R' = \begin{bmatrix} \text{NMe:CH} \\ \diagup \quad \diagdown \\ \text{N} - C_4H_7 \end{bmatrix}$ ).

m.  $163-5^\circ$  (from xylene or PhH-ligroin). IX is unchanged by abs. alc. KOH, but is decompd. by HCl.  $\alpha$ -Pyrrolealdehydimide-cobalt (X),  $CoR'_2$ , obtained by heating  $Co_2O_3$  and V in anisole, the solvent removed *in vacuo*, yields an addn. product of X and anisole. Recrystd. from PhH or xylene, it loses anisole and yields X, m.  $250.2^\circ$ . X is unaffected by alc. KOH, and is slowly attacked by HCl.

T. H. RIDER

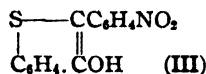
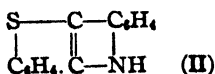
**New metallic derivatives of thiophene.** II. Thallium, silicon, bismuth, tel-

lurium and mixed tin and lead thiényls. ERICH KRAUSE AND GERHARD RENWANZ. *Ber.* 62B, 1710-6(1929); cf. C. A. 22, 76.—To 25 g. thiophene in 125 cc. cold AcOH (10°) was added 16 cc. Br in 250 cc. AcOH. The oil was pptd. with H<sub>2</sub>O, extd. with Et<sub>2</sub>O and distd., b<sub>m</sub> 42-46°; yield 27 g.  $\alpha$ -bromothiophene (I). A series of thiényl-metallic compds. were prepd. with this starting material. Ten g. I, 1.5 g. Mg and 5.7 g. TiCl<sub>3</sub> in Et<sub>2</sub>O yield a gray ppt.; recrystd. from abs. alc. boiled 6 min. in alc. NaBr and recrystd. from abs. alc. it forms white needles of *di- $\alpha$ -thienylthallic bromide*, (C<sub>4</sub>H<sub>3</sub>S)<sub>2</sub>TlBr, m. 270°. Ten g. iodothiophene (II), 1.5 g. Mg and 0.8 g. SiCl<sub>4</sub> in Et<sub>2</sub>O yield *tetra- $\alpha$ -thienylsilicon*, (C<sub>4</sub>H<sub>3</sub>S)<sub>4</sub>Si, extd. with C<sub>6</sub>H<sub>6</sub>, recrystd. from abs. alc., m. 133.5° (cor., 135.5°). Twenty g. II, 3 g. Mg, 6 g. BiCl<sub>3</sub> and 130 cc. Et<sub>2</sub>O give after recrystn. with C<sub>6</sub>H<sub>6</sub> 1 g. *tri- $\alpha$ -thienylbismuth*, (C<sub>4</sub>H<sub>3</sub>S)<sub>3</sub>Bi, m. 135.5° (cor., 137.5°). Eight g. TeBr<sub>2</sub>, 16.3 g. I, 2.5 g. Mg and 100 cc. Et<sub>2</sub>O yield after extn *di- $\alpha$ -thienyltellurium dibromide* (III), (C<sub>4</sub>H<sub>3</sub>S)<sub>2</sub>TeBr<sub>2</sub>, m. 190.5° (cor., 195°), b. 220° (decompn.). III was reduced in SnCl<sub>2</sub> soln. to *di- $\alpha$ -thienyltellurium* (IV). IV in Et<sub>2</sub>O and Cl in CCl<sub>4</sub> give *di- $\alpha$ -thienyltellurium dichloride*, m. 185.5° (cor., 189.5°) decomp. 250°. IV yields with I in Et<sub>2</sub>O, *di- $\alpha$ -thienyltellurium diiodide*, m. 125° (cor., 126.5°). In a similar manner were prepd. *tri- $\alpha$ -thienyltellurium bromide*, (C<sub>4</sub>H<sub>3</sub>S)<sub>3</sub>TeBr, m. 244.5° (cor., 253°); *triphenyl- $\alpha$ -thienyllin*, (C<sub>6</sub>H<sub>5</sub>)<sub>3</sub>SnC<sub>4</sub>H<sub>3</sub>S, m. 201.5° (cor., 206°); and *triphenyl- $\alpha$ -thienyllead*, (C<sub>6</sub>H<sub>5</sub>)<sub>3</sub>PbC<sub>4</sub>H<sub>3</sub>S, m. 203.5° (cor., 208°), decomp. 305°. A. E. B.

Course of the indole synthesis according to Emil Fischer. P. W. NEBER, GERTRUD KNÖLLER, K. HERBST AND A. TRISSLER. *Ann.* 471, 113 45(1929).—In an attempt to decide between the mechanism proposed by Robinson and Robinson (C. A. 18, 2161), which assumes an *o*-benzidine rearrangement, and that by N. (Chem.-Ztg. 1925, 709), which assumes the formation of a tetrahydrocinnoline deriv. it is concluded that neither view can explain all the exptl. facts. (PhCH<sub>2</sub>)<sub>2</sub>CO and MePhNNH<sub>2</sub> in AcOH at room temp. give *1-methyl-2-benzyl-3-phenylindole*, straw-yellow, m. 129-30°; Et-PhNNH<sub>2</sub> gives the *1-Et homolog*, pale yellow, m. 106°; PhCH<sub>2</sub>NPhNH<sub>2</sub> gives *1,2-dibenzyl-3-phenylindole*, m. 138°. *Isonitrosodibenzyl ketone* (I), m. 116°; with Me-PhNNH<sub>2</sub> this gives *1-methyl-2-benzyl-3-phenylindole oxime*, deep yellow, m. 195°; *1-Et homolog*, m. 150°. PhCH<sub>2</sub>C(=NOH)COCH<sub>2</sub>Ph and PhNNH<sub>2</sub> in EtOH give the phenylhydrazone of I, m. 185° and with NH<sub>2</sub>OH, HCl and Na<sub>2</sub>CO<sub>3</sub>,  $\alpha,\beta$ -*diisonitroso- $\alpha,\gamma$ -diphenylpropane*, m. 213°. (PhCH<sub>2</sub>)<sub>2</sub>CO and Ph<sub>2</sub>NNH<sub>2</sub> give the diphenylhydrazone, yellow, m. 71-2°, giving with EtOH-HCl *1,3-diphenyl-2-benzylindole*, m. 124°. *o*-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>CH<sub>2</sub>COCO<sub>2</sub>H yields a *methylphenylhydrazone* (II), yellow, m. 110° (decompn.), which gives with EtOH-HCl *1-methyl-3-[*o*-nitrophenyl]indole-2-carboxylic acid* (III), yellow, m. 226° and a *diphenylhydrazone* (IV), m. 125°, crystg. with 1 mol EtOH, and giving with EtOH-HCl *1-phenyl-3-[*o*-nitrophenyl]indole-2-carboxylic acid*, pale yellow, m. 220°; PhCH<sub>2</sub>NPhNH<sub>2</sub> gives after several days *1-benzyl-3-[*o*-nitrophenyl]indole-2-carboxylic acid*, m. 186°. Starting with *o*-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>CH<sub>2</sub>COCO<sub>2</sub>Et there result the *Et esters* of II, pale yellow, m. 99° of III, light yellow, m. 107°, and of IV, m. 107°. Dihydro-3-hydroxycinnoline and BzCl in C<sub>6</sub>H<sub>5</sub>N give a *di-Bz deriv.*, m. 167°. 3-Hydroxycinnoline is reduced by HI and red P to oxindole. (PhCH<sub>2</sub>)<sub>2</sub>CO and 2,5-Me<sub>2</sub>-C<sub>6</sub>H<sub>3</sub>NHNH<sub>2</sub> give the *2,5-dimethylphenylhydrazone*, m. 105°; with EtOH-HCl this gives *2-benzyl-3-phenyl-4,7-dimethylindole*, m. 139°. Formyl[2,5-dimethylphenyl]hydrazine, from 2,5-Me<sub>2</sub>-C<sub>6</sub>H<sub>3</sub>NHNH<sub>2</sub> and 50% HCO<sub>2</sub>H, with Me<sub>2</sub>SO<sub>4</sub> and 45% NaOH give  $\alpha,\beta$ -*dimethyl- $\beta$ -formyl[2,5-dimethylphenyl]hydrazine*, light yellow, b<sub>m</sub> 172-4°; with EtOH and concd. HCl by boiling for 6 hrs., there results *2,5-dimethylphenyl- $\alpha,\beta$ -dimethylhydrazone*, yellow, b<sub>m</sub> 106-8°; the corresponding *hydrazone* of (PhCH<sub>2</sub>)<sub>2</sub>CO, m. 86° and 104° (stereoisomers?), both of which, with EtOH-HCl, yield *1-methyl-2-benzyl-3-phenyl-4,7-dimethylindole*, m. 108°. AcCO<sub>2</sub>H yields a *2,5-dimethylphenylhydrazone*, m. 172° (decompn.), which gives with EtOH a substance of low m. p. not investigated; the *2,5-dimethylphenylhydrazone* of *o*-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>CH<sub>2</sub>COCO<sub>2</sub>H, honey-yellow, m. 156°, also gives a similar low-melting substance. *Et Ph ketone diphenylhydrazone*, pale yellow, m. 83°, gives with EtOH-HCl *1,2-diphenyl-3-methylindole*, m. 116°. *iso-Pr Ph ketone diphenylhydrazone* (V), yellow, m. 72°, with EtOH-HCl gives *1,2-diphenyl-3,3-dimethylindolin-2-ol* (VI), m. 156° (decompn.), isolated as the *chloride* (VII), m. 196° (decompn.); *perchlorate*, m. 209° (decompn.). Me<sub>2</sub>CHCOPh and Ph<sub>2</sub>NNH<sub>2</sub>, allowed to stand several days in AcOH, give *o-anilinophenylisobutyrophenone* (?) (VIII), m. 96-8°, which also results from V in EtOH-AcOH, and a little VI; with HCl it gives VII. VI and NaNO<sub>2</sub> in AcOH give the *N-NO deriv.*, straw-yellow, m. 115° (decompn.), which, warmed with MePhNNH<sub>2</sub>, gives VIII, while warming with EtOH at 40-50° gives the *C-NO deriv.*, emerald-green, m. 146° (decompn.). VII and MeOK give the *O-Me ether* of VI, m. 118°. Reduction of VI with Zn and AcOH gives *1,2-diphenyl-3,3-dimethyl-2,3-dihydroindole*, m. 104°. PhN:NCMeCHCO<sub>2</sub>Et and Et<sub>2</sub>O-HCl give a mixt. of 1-

[*o*- and *p*-chlorophenyl]-3-methylpyrazolone, m. 165°; the pure *o*-deriv., pale yellow, m. 201°.  $\text{AcCO}_2\text{H}$  gives a *methyl-4-nitrophenylhydrazone*, deep yellow, m. 150° (decompn.) on nitration of the hydrazone; reduction with Zn and HCl, followed by the action of  $\text{BzCl}$ , gives *N,N'*-dibenzoyl-*N*-methyl-*p*-phenylenediamine, m. 165°. 4-Nitro-2-aminostilbene and  $\text{Me}_2\text{SO}_4$  give 44% of the *mono-Me deriv.* (IX), dark carmine-red m. 172°, and the *di-Me deriv.*, yellow, m. 75°. IX yields a *N-NO deriv.*, yellow, m. 175°, which gives with Br in  $\text{CHCl}_3$   $\alpha$ -[2-methylamino-4-nitro-5-nitrosophenyl]- $\beta$ -phenyl- $\alpha,\beta$ -dibromoethane-HBr, m. 274°; soln. in hot EtOH transforms this into 1-methyl-2-phenyl-5-nitroso-6-nitroindole, yellow, m. 170°. 4-Hydroxycinnoline is reduced by P and HI to the *tetrahydro deriv.*, yellow, m. 220° (decompn.). Reduction of 4-phenylcinnoline with Zn and  $\text{NH}_4\text{OH}$  gives the *dihydro deriv.*, m. 115–6°. Heating 4-phenylcinnoline or its dihydro deriv. with amalgamated Zn and HCl gives 3-phenylindole. Catalytic reduction of the dihydro deriv. gives the *tetrahydro deriv.*, m. 83°; *HCl salt*, m. 201°; *picrate*, yellow, m. 128°. *o*-Aminophenylacetamide, m. 93°, crystg. with 1 mol.  $\text{H}_2\text{O}$ , results by reducing the  $\text{NO}_2$  compd.; *Ac deriv.*, m. 130°; the diazo compd. gives the  $\beta$ -naphtholazo deriv., blood-red, m. 252°.  $\alpha$ -2,5-Dichlorophenyl- $\beta$ -formylhydrazine, m. 222° (91% yield);  $\text{Me}_2\text{SO}_4$  gives the  $\alpha$ -Me deriv., m. 112°, which gives with HCl and EtOH  $\alpha,\alpha,2,5$ -dichlorophenylmethylhydrazine,  $b_{11}$  142–8°; *HCl salt*, m. 183°; *Ac deriv.*, m. 134°.  $\alpha,\alpha$ -Diphenylmethyl- $\beta$ -formylhydrazine, m. 68°. C. J. W.

**Formation of thionaphthindole.** ERNEST W. McCLELLAND. *J. Chem. Soc.* 1929, 1588–93.—2-Keto-1,2-dihydrobenzothiazole and  $\text{Ac}_2\text{O}$  under ordinary conditions yield the *N*-Ac deriv. (M. and Longwell, C. A. 18, 676) but when heated with  $\text{Ac}_2\text{O}$  and  $\text{AcOK}$  at 120° for 10 min. there results 1-acetyl-2-methylene-1,2-dihydrobenzothiazole (I), m. 168–70°. Hydrolysis of I gives 3-hydroxy-1-thionaphthene and  $\text{NH}_3$ . In  $\text{CHCl}_3$ , I absorbs Br, yielding after 21 hrs. the *Br deriv.*, m. 201–2°. In the purification of I steam distn. gives a yellow, volatile oil, from which alkali exts. 2-acetyl-3-hydroxy-1-thionaphthene; the residue is assumed to be *o*-thiolacetophenone, since it yields the requisite semicarbazone, m. 235° (decompn.), and with  $\text{PhNHNH}_2$  gives *thionaphthindole* (II), m. 252–3°; concd.  $\text{H}_2\text{SO}_4$  gives an intense blue color with II and isatin and a red color with phenanthraquinone; II is not affected by boiling concd. HCl and is not readily reduced; concd.  $\text{HNO}_3$  gives an intense yellow color and concd.  $\text{H}_2\text{SO}_4$  gives a yellow color. *N*-Ac deriv., m. 160–1°. The structure of II was confirmed by its synthesis from *o*- $\text{HSC}_6\text{H}_4\text{CO}_2\text{H}$ , through the *o*-nitrobenzyl ester to the thionaphthene (III), which was reduced to II, and also by the synthesis from *o*- $\text{H}_2\text{NC}_6\text{H}_4\text{Ac}$ , which was diazotized, treated with Et K xanthate, boiled with EtOH-KOH, reduced with Zn and condensed with  $\text{PhNHNH}_2$ .



C. J. WEST

**Further investigation of the relative firmness of union of organic radicals.** K. V. AUWERS AND F. BERGMANN. *Ann.* 472, 287–314 (1929).—Oettinger (*Diss. Jena*, 1894) showed that 3,4,4,5-tetramethylpyrazole (I) adds and splits off MeI, giving the 1,3,4,5-deriv. The effect of other alkyl halides is now studied; in general the quaternary salts are decompd. by heating to their m. p., the alkyl halide distd. off and the product distd. *in vacuo*, the resulting products being sepd. as picrates; instead of giving the % of each product formed, the % of Me split off from the C atom and of the alkyl from the N atom are given, the group bound to the N atom being given: Et, 74, 26; Pr, 89, 11; iso-Pr, 100, 0; allyl, 35, 65;  $\text{PhCH}_3$ , 33.5, 66.5. The following quaternary salts of I were prepd.: *EtI*, m. 167°; *PrI*, m. 142–2.5°; *iso-PrI*, m. 157–8.5°; *allyl iodide*, m. 165°;  $\text{PhCH}_2\text{I}$ , m. 132–3°. For comparison the following 1-derivs. of 3,1,5-trimethylpyrazole were prepd.: *Et*, by heating 6 hrs. at 110–20°, b. 192–3° (*picrate*, m. 156–7°; all picrates are more or less intense yellow); *Pr*,  $b_{11}$  94–5° (*picrate*, m. 107–7.5°); *iso-Pr*,  $b_{11}$  89–91° (*picrate*, m. 137–8.5°); *allyl*,  $b_{11}$  94–6° (*picrate*, m. 119–20°);  $\text{PhCH}_3$ ,  $b_{11}$  163° (*picrate*, m. 148–8.5°). In order to study the relative effect of the Me and Et groups, there was studied 3,5-dimethyl-4,4-diethylpyrazole (II),  $b_{11}$  131–3°, m. 52–3° when first crystd. from  $\text{Et}_2\text{O}$ , changing to 72–3.5° after 1 day in a desiccator. The % of C-Et and N-alkyl split off were as follows (radical bound to N given): Me, 79, 21; Pr, 100, 0; iso-Pr, 100, 0; allyl, 90, 10;  $\text{PhCH}_3$ , 75.5, 24.5. *Picrate* of II, m. 193°; quaternary salts: *MeI*, m. 186°; *PrI*, m. 106–12°; *iso-PrI*, m. 161.5–2°; *allyl iodide*, m. 123.5–5°;  $\text{PhCH}_2\text{I}$ , m. 148.5–9°. 3,5-Dimethyl-4-ethylpyrazole,  $b_{11}$  133–5°, m. 53.5–4.5°; *picrate*, m. 211–2°; 1-Me deriv.,  $b_{11}$  84–6° (*HCl salt*, m. 114.5–5°; *picrate*, m. 134.5–5.5°); 1-Et deriv.,  $b_{11}$  86–9° (*picrate*, m. 108–9°);

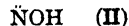


*1-Pr deriv.*,  $b_{12}$  98–100° (*picrate*, m. 116.5–7°); *1-iso-Pr deriv.*,  $b_{12}$  90–2° (*picrate*,  $n$  112.5–3.5°); *1-allyl deriv.*,  $b_{12}$  100–3° (*picrate*, m. 75–6°); *1-benzyl deriv.*,  $b_{12}$  162–4 (*picrate*, m. 126–7.5°). The effect of temp. upon the rearrangement was studied with

which, on heating, yields *1-methyl-4-ethyl-3,5-diphenylpyrazole*, m. 80–2° (*picrate*, yellow, m. 138–9°); allyl iodide and  $\text{PhCH}_2\text{I}$  do not yield definite products. *4-Ethyl-3,5-diphenylpyrazole (III)*, m. 167° (a *picrate* could not be prepd. by the usual methods); *3,5-diphenylpyrazole picrate*, m. 161–3°. *1,4-Diethyl-3,5-diphenylpyrazole*, m. 63–4° (*picrate*, m. 122.5–3.5°). *1-Benzyl deriv. of III*, m. 83–3.5° (*picrate*, m. 111.5–2.5°). *Thiopyrine-pseudo-propyl iodide*, m. 138.5–9.5°; *butyl iodide*, m. 95–6°. *1-Phenyl-3-methyl-5-iodopyrazole-PrI*, m. 225–6°. Heating caused splitting off of the following % of *N-R* and *S-R* from salts contg.: *S-Et* and *N-Me*, 28, 13 (2 expts.), 72, 87; *S-Pr*, *N-Me*, 45, 55; *S-Bu*, *N-Me*, 55, 45; *S-allyl*, *N-Me*, 10.5, 89.5; *S-Me*, *N-Et*, 89, 94 (2 expts.), 11, 6; *S-Me*, *N-allyl*, 87, 13. *4-Methylantipyryne*,  $d_4^{99.2} n$  1.55411, 1.56064, 1.57744 at 99.2° for  $\alpha$ ,  $\text{He}$ ,  $\beta$  (same order for the following); homoantipyryne,  $d_4^{99.7} n$  1.0692,  $n$  1.54945, 1.55566, 1.57182 at 99.7°; 1-phenyl-2,3,4-trimethylpyrazol-5-one,  $d_4^{99.7} n$  1.52460, 1.54070, 1.56000. 1-phenyl-3-methyl-5-methoxypyrazole,  $d_4^{21.6} n$  1.1147,  $n$  1.56909, 1.57533, 1.69131 at 21.6°; 1-phenyl-3-methyl-5-methylthiopyrazole,  $d_4^{21.0} n$  1.1464,  $n$  1.60195, 1.60875, 1.62597.

C. J. WEST

**Oximes of unsaturated ketones (preliminary communication).** K. v. AUWERS. *Ber.* 62B, 1320–3 (1929).—Stockhausen and Gattermann obtained with alk.  $\text{NH}_2\text{OH}$  from the condensation products of  $\text{PhCH}:\text{CHCOCl}$  with anisole and phenetole alkali-insol. isoxazolines. Their results have been confirmed (with M. SEYFRIED) and it has also been found that with  $\text{NH}_2\text{OH} \cdot \text{HCl}$  are obtained alkali-sol. compds. with an oxime character. From analogy, it would be natural to assume that the isoxazolines are derived from unstable *syn*-oximes (I) and that the alkali-sol. oximes are the *anti*-compds. (II), but of the latter the *phenetole deriv.*, m. 134–40°, smoothly gives  $\text{PhCH}:\text{CHCONHC}_6\text{H}_4\text{OEt}$  by the Beckmann rearrangement. To avoid conflict with the Meisenheimer conception of the rearrangement it would have to be assumed that the oxime has the *syn*-form or rearranges into it before undergoing the Beckmann reaction.  $\text{PhCH}:\text{CBrCOPh}$  with alk.  $\text{NH}_2\text{OH}$  yields 3,5-diphenylisoxazole and with  $\text{NH}_2\text{OH} \cdot \text{HCl}$  a Br-contg. *oxime*, m. 151°, which slowly rearranges into the isoxazole in alk. soln. According to Meisenheimer, a *m*-alkyl group drives the HO of the  $:\text{NOH}$  group away from the  $\text{C}_6\text{H}_5$  nucleus; in conformity with this, the condensation product of  $\text{PhCH}:\text{CHCOCl}$  with *p*-xylene was found (with H. RISS) to give only an alkali-insol. compd. with either alk. or acid  $\text{NH}_2\text{OH}$ .



C. A. R.

**Formation and stability of the 2-thio-1,2-dihydrobenzisothiazoles.** ERNEST W. McCLELLAND, LEONARD A. WARREN and JANE H. JACKSON. *J. Chem. Soc.* 1929, 1582–8.—M. and Longwell (*C. A.* 18, 676) have shown that while 2-dithiobenzoyl (I) reacts with  $\text{NH}_3$  to give 2-keto-1,2-dihydrobenzisothiazole, primary amines give disulfides and not cyclic compds. It is now shown that the substitution of S for O in the system increases the stability of the S-N link towards reducing agents. I and  $\text{P}_2\text{S}_5$  in  $\text{C}_6\text{H}_5\text{Me}_2$  give 2,3-dithiosulfindene (II), m. 94–5°; with  $\text{MeNH}_2$  in EtOH there results 2-thio-1-methyl-1,2-dihydrobenzisothiazole (III), yellow, m. 138–9°, feebly basic, and sparingly sol. in 2 *N* HCl; *1-Et deriv.*, m. 62–3°; *1-benzyl deriv.*, m. 122–3°; *1-Ph deriv.*, m. 77°. The action of  $\text{H}_2\text{S}$  on these derivs. gives II, indicating that the reaction is reversible. They are not affected by  $\text{SO}_2$ . Oxidation of III in AcOH with  $\text{H}_2\text{O}_2$  gives *N-methyl-o-benzoic sulfinide*, m. 131°; the other derivs. behaved similarly, giving the corresponding deriv. of the sulfinide, which may also be obtained by oxidizing the 2,2'-dithiobenzamides obtained by the action of the amine on I or its chloride. 2,2'-Dithiobenzamide with  $\text{P}_2\text{O}_5$  in  $\text{C}_6\text{H}_5\text{Me}_2$  gives 2,2'-dithiobenzonitrile, reduced by  $\text{H}_2\text{S}$  to II. Attempts to prep. 2-thio-1,2-dihydrobenzisothiazole have not been successful.

C. J. WEST

**Constituents of the bark of the peach tree.** J. SHINODA and S. UYEDA. *J. Pharm. Soc. Japan* 49, 575–8 (1929).—The study of flavanone in nature was previously reported

(cf. C. A. 22, 1592, 2946; 23, 4210). S. and U. extd. from the bark of the peach tree with MeOH a phenolic substance (I), m. 248°, which does not depress the m. p. of naringenin. Alc. I gives a pos. reaction with FeCl<sub>3</sub> and H<sub>2</sub>SO<sub>4</sub> similar to the naringenin reaction. Ac deriv., m. 194-5°, does not depress the m. p. of tetraacetylnaringenin (C. A. 23, 2956). Oxime of I, m. 233°, does not depress the m. p. of naringenin oxime (m. 231°). A paraffin-like substance, m. 280-3°, was also obtained. This gives the flavanone reaction but its phytosterol reaction is negative. This is probably triacontane or pentatriacontane (cf. Tutin, *Proc. Am. Pharm. Ass.* 54, 352, 1906). F. I. N.

Combination of methyl-, dimethyl-, trimethylamine, ethylenediamine and choline with flavianic acid. H. SIEVERS AND E. MÜLLER. *Z. Biol.* 89, 37-40(1929).

Flavinate	Ratio base: acid	N content	Soly. in 100 g. at 18° alc.	water	Decompn. temp
Methylamine	1:1	12.7	0.28	3.42	265-8
Dimethylamine	1:1	11.70	0.51	7.54	230-5
Trimethylamine	1:1	11.26	0.85	12.14	217-23
Ethylenediamine	1:2	12.21	0.04	0.16	265-7
Choline	1:1	10.07	0.50	30.36	

FRANCES KRASNOW

The naphthophenoxanthones. A. PIERONI. *Atti accad. Lincei* 9, 420-4(1929). A preliminary paper discussing the known naphthophenoxanthones and outlining work which P. proposes to undertake concerning their constitution. A. W. CONTIERI

Isoflavone group. V. New general method applicable to the synthesis of derivatives of 7-hydroxyisoflavone. WILSON BAKER, ALFRED POLLARD and ROBERT ROBINSON. *J. Chem. Soc.* 1929, 1468-73; cf. C. A. 23, 2180.—m-MeOC<sub>6</sub>H<sub>4</sub>OH and Ph-COCH<sub>2</sub>Br in Me<sub>2</sub>CO and aq. NaOH, heated on the H<sub>2</sub>O bath for 15 min., give 6:6'-O of ω-methoxyphenoxycetophenone (I), m. 85-6°; H<sub>2</sub>SO<sub>4</sub> gives an orange soln with a green fluorescence, from which H<sub>2</sub>O ppts. a compd., probably 6-methoxy-3-phenylcoumarone. I and KCN with 30% H<sub>2</sub>SO<sub>4</sub> give almost quant. α-m-methoxyphenoxymethylmandelonitrile (II), m. 84-5.5°, which regenerates I on boiling with dil. EtOH and which is saponid. to a mixt. of α-m-methoxyphenoxymethylmandelic acid (III), m. 95-7° (apparently forming an unstable hydrate, m. 74-6°), and its amide, m. 122-3°, the Me ester m. 48-9°. Numerous expts. on the dehydration of III did not result in the production of γ-pyrone derivs. and the action of 80% H<sub>2</sub>SO<sub>4</sub> at 60° on the Me ester gave a poor yield of 7-methoxy-3-phenylcoumarin, m. 124°. II undergoes cyclization to a ketimine-HCl with ZnCl<sub>2</sub> and HCl in Et<sub>2</sub>O, which is hydrolyzed to 3-hydroxy-7-methoxyisoflavanone (IV), m. 133-5°. Reduction of IV with Na-Hg in MeOH gives 3,4-dihydroxy-7-methoxyisoflavane, m. 153°, giving in concd. H<sub>2</sub>SO<sub>4</sub> a yellow soln with a deep green fluorescence. 7-Methoxy-2-styrylisoflavone is oxidized by KMnO<sub>4</sub> in dil. C<sub>6</sub>H<sub>5</sub>N to 7-methoxyisoflavone-2-carboxylic acid, m. 241° (decompn.), which gives a pale yellow H<sub>2</sub>SO<sub>4</sub> soln.; on heating to 250° for 5 min., there results 7-methoxyisoflavone, also obtained from IV in cold concd. H<sub>2</sub>SO<sub>4</sub> after standing 30 min.

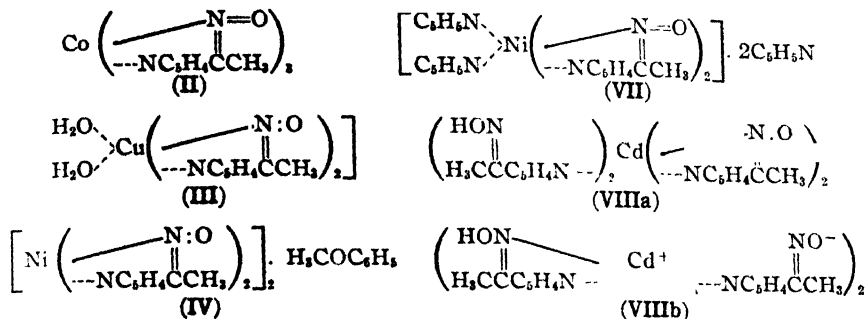
C. J. WEST

Synthesis of hexahydro-β-collidine. M. DE MONTMOLLIN AND M. MARTINET. *Helv. Chim. Acta* 12, 604-9(1929).—Com. PrOH was converted to EtCHO by catalytic oxidation, the aldehyde treated with aq. K<sub>2</sub>CO<sub>3</sub> to yield the aldol and this reduced with Al-Hg to 2-methylpentane-1,3-diol (I). These 3 reactions were carried out with large amts. of material with good yields. I with PBr<sub>3</sub> gave 2-methyl-1,3-dibromopentane (II), b<sub>12</sub> 80-2°, and a bromohydrin (III) of undetd. structure, b<sub>12</sub> 86-94°. II reacted with KCN in 80% EtOH, forming 2-methylpentane-1,3-dinitrile (IV), b<sub>12</sub> 189-93°. IV reduced with Na and EtOH gave 2-ethyl-3-methylpentamethylenediamine (V), b<sub>12</sub> 100-3°. V converted to the HCl salt and dry-distd. formed 2-ethyl-3-methylpiperidine ("hexahydro-β-collidine") (VI), b<sub>12</sub> 63-5°.

M. A. DAHLEN

Inner complex-salts of methyl α-pyridyl ketoximes. B. EMMERT AND K. DIEHL. *Ber.* 62B, 1738-42(1929).—Inner complex-salts of Ph-α-pyridyl ketoximes are described by Chugaev (cf. *Ber.* 39, 3382(1906)). Me α-pyridyl ketoxime (I), due to its ability to form complex-salts, is regarded as the syn-Me form (cf. Pfeiffer and Richarz, C. A. 22, 1291). The compds. prepd. by E. and D. from I form rather stable complexes with additional mols. of solvent, etc. An exception is Me pyridyl ketoxime cobalt (II), obtained by refluxing Co(OH)<sub>2</sub> with aq. I. The reaction mixt. is filtered and evapd. on a water bath, the excess of I removed by extr. with hot ligroin and the residue recrystd. from pyridine yields crystals, decomp. 275-80°. The water soln. of II is stable toward acid and alkali. In the following complexes, E. and D. attribute the coordination of solvent mols., etc., to the metal atom where feasible, elsewhere to

the mol. as a whole. *Me pyridyl ketoxime-copper* +  $2H_2O$  (III), obtained by boiling I in  $H_2O$  with  $CuO$  or powd.  $Cu$ , filtering and cooling, recrystg the ppt. from water. *2 Me pyridyl ketoxime-nickel* + 1 anisole (IV), obtained by refluxing I with  $NiO$  in anisole, and pptg. by removing the anisole *in vacuo*. Heating with water removes anisole and the colored aq. soln. so obtained is stable toward alkali, but is decolorized by dil. acid. *Me pyridyl ketoxime-zinc* +  $ZnO$  (V) and *Me pyridyl ketoxime zinc* +  $H_2O$  (VI) (in which  $ZnO$  and  $H_2O$  are coordinated by the whole mol. as in IV) are obtained by heating I and  $ZnO$  with a small quantity of water for 1–2 hrs. The reaction mixt. is filtered warm and evapd. at  $60^\circ$ . Light yellow crystals of V ppt. On continuing the pptn. dark yellow crystals of VI ppt. Both V and VI decomp. when heated in dil. aq. soln. *Me pyridyl ketoxime-nickel* + 4 pyridine (VII), obtained as was IV, using pyridine as the solvent instead of anisole. *Me pyridyl ketoxime-cadmium* + 2 *Me pyridyl ketoxime* (VIII), pptd. by addn. of  $CdSO_4$  in  $NH_4OH$  to I in warm dil. alc., decomp.  $250^\circ$  (from alc. or hot water). VIII in alc. is attacked slowly by  $KOH$ , rapidly by acids. Of the possible formulas VIIIa and VIIIb, the former is favored since the compd. is more easily sol. in org. solvents than in water.



T. H. RIDER

Natural rotation of polarized light by optically active bases. III. Rotation, refraction and volume of organic bases in solution. WOLFGANG LEITHE. *Monatsh.* 52, 151–62 (1929); cf. *C. A.* 23, 3451.—Data are given for  $n$  and  $d$  for pipercoline and its  $HCl$  salt, cyclohexane,  $PhCH_2CH_2NH_2$  and its  $HCl$  salt,  $PhEt$ , tetrahydroquinoline and its  $HCl$  salt and  $\alpha$ -methylindoline and its  $HCl$  salt in several of the following solvents:  $H_2O$ ,  $EtOH$ ,  $MeOH$ ,  $C_6H_6$ ,  $CCl_4$ ,  $CHCl_3$ ,  $AcOH$ , pyridine, piperidine,  $AcOEt$ ,  $C_2H_5Cl$  and  $Me_2CO$ .

C. J. WEST

A complex (polynuclear) ring system. B. EMMERT AND FR. MEIXNER. *Ber.* 62B, 1731–3 (1929).—*Di[benzaldipiperidyl]* (I),  $H_5C_6HC \left( \begin{array}{c} NH_2C_6H_4C_6H_5N \\ NH_2C_6H_4C_6H_5N \end{array} \right) CHC_6H_5$ , is obtained by treating 8 g.  $\gamma$ - $\gamma'$  dipiperidyl (II) with 5 g. freshly distd.  $BzH$  in 35 cc. hot abs. alc. Crystals contg. 1 mol. alc. ppt. on cooling in ice water. Warmed to  $80^\circ$  *in vacuo*, over  $P_2O_5$ , they m.  $189^\circ$ . The formula given for I is supported by mol. wt. detns. Boiled with water, I is unchanged, whereas boiling with dil.  $HCl$  splits I into its components.  $HCHO$  with II in water yields an amorphous product  $(C_{11}H_{20}N_2)_x$ , which decomp. on treatment with hot dil.  $HCl$ .  $MeI$ ,  $EtCl$  and  $COCl_2$  with II yield amorphous products of undetd. constitution. *Di[p-hydroxybenzaldehyde]dipiperidyl*,  $HOC_6H_4CH(OH)NH_2C_6H_4NCH(OH)C_6H_4OH$ , is obtained by refluxing 10 g. II with 6 g.  $p$ - $HOC_6H_4CHO$  in 70 cc. abs. alc. for 1 hr. On concg. and cooling the cryst. product, recrystd. from alc., m.  $153^\circ$ .

T. H. RIDER

Phenolic bases from angostura bark. Synthesis of galipolin. ERNST SPÄTH AND GEORG PAPAIOANOU. *Monatsh.* 52, 129–40 (1929).—Extn. of angostura bark with  $EtOH$  for 8 days and working up the alkali-sol. portion gives galipolin [2-( $\beta$ -3',4'-dimethoxyphenyl)ethyl-4-hydroxyquinoline] (I), m.  $193^\circ$ , which gives galipin on methylation (*C. A.* 19, 520). Since there was not sufficient material to prove the constitution by oxidation, the compd. was synthesized, as well as the other 2 possible isomers. 2-Methyl-4-methoxyquinoline and vanillin condense with  $ZnCl_2$  after heating 6 hrs. at  $108$ – $10^\circ$  to give 2-[ $\beta$ -4'-hydroxy-3'-methoxyphenylethylene]-4-methoxyquinoline, m.  $210$ – $1^\circ$ ; acids give deep orange salts; catalytic reduction gives the corresponding ethyl compd., m.  $186$ – $7^\circ$ . Similarly 2-methyl-4-methoxyquinoline gives 2-[ $\beta$ -3'-hydroxy-4'-methoxyphenylethylene]-4-methoxyquinoline, m.  $267$ – $8^\circ$ ; the  $HCl$  salt is orange-

yellow; reduction gives the *ethyl compd.*, m. 147–8°. 2-Methyl-4-chloroquinoline and 3,4-(MeO)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>CHO, heated with ZnCl<sub>2</sub>, 1.25 hrs. at 120° give 2-[β-3',4'-dimethoxy-phenyl]ethylene-4-chloroquinoline, yellow, m. 144–5°; EtOH-HCl gives an orange HCl salt; heating with PhCH<sub>2</sub>OH and Na at 100° for 18 hrs. gives the 4-benzyl ether, m. 138–9°; catalytic reduction and hydrolysis gives I. 2-Methyl-4-hydroxyquinoline m. 241–2° (Conrad and Limpach, *Ber.* 20, 947(1887) give 230–1°); 2-methyl-4-chloroquinoline m. 25–6° (C. and L. give 42–3°, which may be the m. p. of a hydrate); heating with MeONa at 150–5° splits off the MeO group from 2-methyl-4-methoxyquinoline, giving the 4-HO deriv.

**Action of phosphoric oxide on β-anilinobutyral.** FREDERICK A. MASON. *J. Chem. Soc.* 1929, 1560–2; cf. *C. A.* 19, 2343; 20, 2330.—Further study of the action of P<sub>2</sub>O<sub>5</sub> on β-anilinobutyral shows that the only products are quinajdine and PhNH<sub>2</sub>. Attempts to condense β-chlorobutyral with *p*-MeC<sub>6</sub>H<sub>4</sub>SO<sub>2</sub>NHPh failed.

**Substances of the phenarsazine type containing the acenaphthene nucleus.** CHARLES S. GIBSON AND JOHN D. A. JOHNSON. *J. Chem. Soc.* 1929, 1621–2.—3-Amino-acenaphthene, *o*-BrC<sub>6</sub>H<sub>4</sub>AsO<sub>2</sub>H<sub>2</sub>, K<sub>2</sub>CO<sub>3</sub>, AmOH and a trace of Cu give 17.5% of *o*-[3-acenaphthylamino]phenylarsonic acid, decomp. 180–1°, purified through the NH<sub>4</sub> salt. Reduction with SO<sub>2</sub> in a hot mixt. of EtOH, concd. HCl and a trace of I gives 7-chloro-1,2,7-dihydroisoacenaphthabenzarsazine, orange-red, m. 241° (decompn.); 7-Br deriv., deep orange-red, m. 244–6° (decompn.). Oxidation of the Cl compd. does not appear to proceed smoothly.

**1,3,5-Dithiazine (formothialdine).** T. G. LEVI. *Atti accad. Lincei* 9, 424 7 (1929).—This product is obtained when a cold soln. of CH<sub>2</sub>O is treated with S, or, preferably, (NH<sub>4</sub>)<sub>2</sub>S, as a tarry product which solidifies after several hrs. The trithioformaldehyde, (CH<sub>2</sub>S)<sub>3</sub>, formed at the same time is decanted off. The reaction is 3CH<sub>2</sub>O + 2H<sub>2</sub>S + NH<sub>3</sub> = NH(CH<sub>2</sub>S)<sub>2</sub>CH<sub>2</sub> + 3H<sub>2</sub>O. The reaction will not take place with urotropine and H<sub>2</sub>S, as the former is a ring structure already. The impure product may be purified by prolonged extrn. (70–80 hrs.) in a Knöfler extractor with CS<sub>2</sub>. It cannot be purified by recrystn. as it is very slightly sol. in all solvents and at 70° it decomps. Heated in a current of CO<sub>2</sub> at 100°, CS<sub>2</sub> is liberated, while at 150° H<sub>2</sub>S, NH<sub>3</sub>, and CS<sub>2</sub> are liberated. Added to aq. AgNO<sub>3</sub> soln. Ag<sub>2</sub>S is pptd. Heated with concd. HCl it is decompd. to (CH<sub>2</sub>S)<sub>3</sub> and NH<sub>4</sub>Cl.

**10-Chloro-5,10-dihydrophenarsazine and its derivatives.** X. The 1- and (or) 3-methyl derivatives. The condensation of arsenious chloride and phenyl-*m*-tolylamine. CHARLES S. GIBSON AND JOHN D. A. JOHNSON. *J. Chem. Soc.* 1929, 1473–6; cf. *C. A.* 23, 4473.—Razuvaev (*C. A.* 23, 4474) has recently prepd. 10-chloro-1-(or 3)-methyl-5,10-dihydrophenarsazine (I) from AsCl<sub>3</sub> and *m*-MeC<sub>6</sub>H<sub>4</sub>NHPh, and gives the m. p. as 195–6°. Since both the 1- and 3-Me derivs. have been synthesized (*C. A.* 23, 3446) and shown to be indistinguishable isomers or the same substance, m. 215–6.5°, it seemed desirable to det. whether R.'s compd. was isomeric with these substances. It is shown to be the same, the low m. p. probably being due to impure *m*-MeC<sub>6</sub>H<sub>4</sub>NHPh. *m*-MeC<sub>6</sub>H<sub>4</sub>N:CPhCl and PhOH condense with EtONa to give *N*-*m*-tolylbenziminophenyl ether (II), m. 60°; similarly PhN:CPhCl and *m*-MeC<sub>6</sub>H<sub>4</sub>OH give *N*-phenylbenziminophenyl ether (III), m. 65°; heating either II or III at 280–300° for 2 hrs. gives phenyl-*m*-tolylamine benzoate, m. 104–6°, hydrolyzed to *m*-MeC<sub>6</sub>H<sub>4</sub>NHPh, b<sub>17</sub> 183 4°, m. 27.5°. Condensation with AsCl<sub>3</sub> under conditions previously described gives I, m. 215–6°.

**Synthesis of lobelia alkaloids.** G. SCHEUING AND L. WINTERHALDER. *Ann* 473, 126–36(1929).—2,6-Distyrylpyridine tetrabromide (Shaw, *C. A.* 19, 518), shaken with 2 *N* EtOH-KOH in C<sub>6</sub>H<sub>6</sub>, gives 2,6-di-β-phenylethynylpyridine (I), m. 137–8°. Heating I with H<sub>2</sub>SO<sub>4</sub> (1:1) 10 min. gives 2,6-diphenacylpyridine (II), yellow, m. 92° (sulfate, m. 197°; HCl salt, decomp. 223°); catalytic reduction (Pt oxide-BaSO<sub>4</sub>) gives 2,6-di[β-hydroxy-β-phenethyl]pyridine, oily, whose HCl salt m. 219° (decompn.). further reduced during 8 hrs. to norlobelanidine (III), the yield of HCl salt being about 50%. Norlobelanine is reduced by PtO<sub>2</sub> and H to *dl*-norlobeline, m. 104°, further reduction giving III. I and *p*-MeC<sub>6</sub>H<sub>4</sub>SO<sub>2</sub>Me give 90% of a quaternary salt, m. 168°; H<sub>2</sub>SO<sub>4</sub> gives the corresponding salt of II, m. 224°; reduction gives lobelanidine (absorption of 5 mols. H<sub>2</sub>) or lobelanine (absorption of 3 mols.). Reduction of α-phenacylpyridine (4 mols. H<sub>2</sub>) gives phenyl-α-pipecolylcarbinol, b<sub>4</sub> 165°, m. 85°.

**Synthetical experiments on the aporphine alkaloids.** VI. Isothebaine. Attempted syntheses of 3,4,5-trimethoxyaporphine. ROBERT K. CALLOW, JOHN M. GULLAND AND ROBERT D. HAWORTH. *J. Chem. Soc.* 1929, 1444–56; cf. *C. A.* 23,

3473.—Klee (C. A. 9, 298) was probably correct in classifying isothebaine as an aporphine alkaloid but on the other hand the location of the O atoms in positions 3, 4 and 5 was based on more slender evidence. Because of the difficulty of securing isothebaine, an attempt was made to synthesize 3,4,5-trimethoxyaporphine in order to com-

parisons with those of thebaine. *2'-nitro-3',4'-dimethoxyphenylaceto-β-4-methoxyphenylethylamide*, m. 97.5–8.0° (crystals with 1 mol. C<sub>6</sub>H<sub>6</sub>, m. 76–88°); this was not converted into basic material by the action in cold CHCl<sub>3</sub> of PCl<sub>5</sub>, P<sub>2</sub>O<sub>5</sub>, a mixt. of PCl<sub>5</sub> and P<sub>2</sub>O<sub>5</sub>, FeCl<sub>3</sub>, FeCl<sub>2</sub> and PCl<sub>5</sub> or AlCl<sub>3</sub> and PCl<sub>5</sub>. The action of PCl<sub>5</sub> in cold CHCl<sub>3</sub>, a mixt. of P<sub>2</sub>O<sub>5</sub> and POCl<sub>3</sub> or best P<sub>2</sub>O<sub>5</sub> and PCl<sub>5</sub> in boiling C<sub>6</sub>H<sub>6</sub> or PhMe for 15–30 min. gives a small amt. of *2'-nitro-3',4'-dimethoxyphenyl-β-4-methoxyphenylethylamino* acetylene, pale yellow, m. 143.5–4°. This indicates that the facile closure of the isoquinoline ring is dependent on the presence of a strongly *p*-directive group in the *p*-position to that at which condensation is to take place. An attempt was then made to introduce an NH<sub>2</sub> group in position 3 of I. I is not nitrated in concd. HNO<sub>3</sub> in the cold; I is not attacked by an AcOH soln. of fuming HNO<sub>3</sub> and CO(NH<sub>2</sub>)<sub>2</sub>. HNO<sub>3</sub> until the temp. is raised to 50–75°, when 4,3,5-HO(O<sub>2</sub>N)<sub>2</sub>-C<sub>6</sub>H<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>NH<sub>2</sub> is formed; in concd. H<sub>2</sub>SO<sub>4</sub> HNO<sub>3</sub> gives *β-3-nitro-4-methoxyphenylethylamine-5-sulfonic acid*, crystg. with 1 mol. H<sub>2</sub>O, dimorphous (plates and needles), darkens 290° but does not m. 310°; fuming HNO<sub>3</sub> in a freezing mixt. gives *β-3,5-dinitro-4-methoxyphenylethylamine nitrate*, pale yellow, m. 161° (decompn.); the free base could not be obtained, demethylation taking place at the same time as the hydrolytic disocn. Nitration of *p*-MeOC<sub>6</sub>H<sub>4</sub>CH<sub>2</sub>CH<sub>2</sub>CO<sub>2</sub>H with HNO<sub>3</sub> (d 1.4) yields a mixt. of the *3-NO<sub>2</sub> deriv.* (II), pale yellow, m. 128–30.5°, and the *3,5-di-NO<sub>2</sub> deriv.*, m. 136.9° (NaOH soln. is red; hot H<sub>2</sub>O gives an orange soln. turned yellow by a few drops of dil. H<sub>2</sub>SO<sub>4</sub>). II with SOCl<sub>2</sub>, followed by concd. NH<sub>4</sub>OH, gives the *amide*, pale yellow, m. 126.5–7°, which is converted by the Hofmann reaction into *β-3-nitro-4-methoxyphenylethylamine* (III), oily (*HCl* salt, yellow, m. 231–2°; Bz deriv., yellow, m. 129–30°, becoming red in the light); in 1 expt., when too little alkali was used, a compd., C<sub>20</sub>H<sub>22</sub>O<sub>7</sub>N<sub>4</sub>, m. 137–8°, was obtained. Reduction of III with SnCl<sub>2</sub> and HCl gives the *NH<sub>2</sub> deriv.*, analyzed as the *di-HCl salt*, m. 253–4° (decompn.), which gives with 2,3,4-O<sub>2</sub>N(MeO)<sub>2</sub>C<sub>6</sub>H<sub>2</sub>CH<sub>2</sub>COCl *2'-nitro-3',4'-dimethoxyphenylaceto-β-3-[2'-nitro-3',4'-dimethoxyphenylacetamido]-4-methoxyphenylethylamide*, m. 158–9°. The action of PCl<sub>5</sub> in CHCl<sub>3</sub>, followed by hydrolysis, gives *2'-nitro-3',4'-dimethoxyphenyl-β-3-amino-1-methoxy-β-phenylethylamino* acetylene, yellow, m. 169.5–70° (*picrate*, yellowish brown, m. 194–5° (decompn.)). Other methods of attack will be employed to solve the question of the constitution of isothebaine.

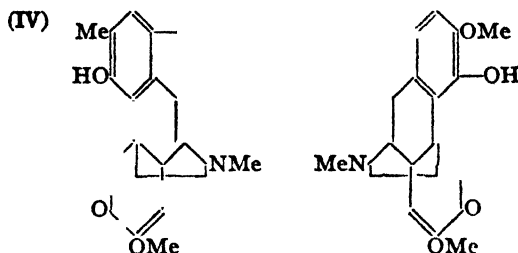
C. J. WEST

**Constitution of sinomenine.** I. E. OCHIAI. *J. Pharm. Soc. Japan* 49, 556–65 (1929); Abstract sect. 49, 91–3.—In a previous publication (C. A. 22, 4531) O. reported that the Clemmensen reduction of sinomenine gave *deshydroxytetrahydrosinomenine* and showed that it is an optical antipode of *dihydrothebaine* (I) (Speyer and Siebert, C. A. 15, 3975) and also that the Clemmensen reduction of *dihydrothebaine* gives I. It was further shown (*Ibid* No. 538) that the OMe group which is situated at C<sub>7</sub> of the sinomenine nucleus, *i. e.*, in the *β*-position to the >C—O, can be easily replaced by H. Recently Goto (*J. Agr. Chem. Soc.* 5, No. 53(1929)) confirmed the work of O. on the constitution of sinomenine, except that they did not agree on the position of the double bond. G. suggested that sinomenine is an *α,β*-unsatd. ketone. Clemmensen reduction of *dihydrooxycodone* gave C<sub>15</sub>H<sub>21</sub>NO<sub>3</sub> (II), m. 138–9°, [α]<sub>D</sub><sup>25</sup> —58.15°, insol. in KOH, and gives a negative result with FeCl<sub>3</sub>. II has 10Me and 2OH groups. O. named this *dihydro-ox-14-thebaine* (Gulland and Robinson, C. A. 17, 2584). Similarly Clemmensen reduction of *dihydrocodone* gave III, m. 150–1°, which does not depress the m. p. of the I of Speyer and Siebert. Na-Hg reduction of *dihydrocodone* gave a phenolic substance which does not depress the m. p. of *dihydrothebaine* prepd. from *dihydrothebaine*. O. also prepd. *β-tetrahydrodesoxycodone* (IV) (Freund, *J. prakt. Chem.* [2], 101, 29(1920)) and studied its properties. O. claims that I, IV and *deshydroxytetrahydrocodone* (Mannig, Löwenheim, *Arch. Pharm.* 258, 299) are identical substances. Catalytic reduction of *thebaine* gave *β-dihydrothebaine*, an isomer of *thebaine* and *dihydrothebaine* (Schöpf, C. A. 22, 430). O. previously reported that *dihydrothebaine* is an antipode of *7-methoxydihydrothebaine* and also showed that sinomenine is an antipode of *7-methoxythebaine*. O. thinks that the term "euthethebaine" for *thebaine* (according to Goto sinomenine is an optical isomer of *7-methoxy-euthethebaine*) should be discontinued.

F. I. NAKAMURA

**Bimolecular alkaloids.** I. On bisinomenine and *ψ*-bisinomenine. KAKUJI

GOTO AND HIDRO SUZUKI. *Bull. Chem. Soc. Japan* 4, 107-11(1929).—The oxidation with mild oxidizing agents ( $\text{AuCl}_3$ ,  $\text{AgNO}_3$ ,  $\text{K}_2\text{FeCN}_6$ ,  $\text{KMnO}_4$ ,  $\text{FeCl}_3$  and  $\text{H}_2\text{O}_2$ ) of sinomenine (I) gives 2 bimol. alkaloids, bisinomenine (II) and  $\psi$ -bisinomenine (III) which differ in the following characteristics: m. p. free base of II,  $222^\circ$ , of III,  $227^\circ$ ; decompn. m. p. free base II,  $245^\circ$ , of III,  $227^\circ$ ; crystal form II hexagonal plates, of III needles; m. p. HCl salt of II  $> 290^\circ$ , of III  $> 290^\circ$ ; soly. HCl salt of II 0.6%, of III  $\infty$ ; decompn. p. methiodide of II  $263^\circ$ , of III  $268^\circ$ ; m. p. oxime of II  $265^\circ$ , of III  $290^\circ$ ; m. p. semicarbazone of II  $> 290^\circ$ , of III  $> 290^\circ$ ;  $[\alpha]_D^{25}$  II  $149.98^\circ$ ,  $[\alpha]_D^{25}$  III  $-127.03^\circ$ . The acetolysis of both substances gives the same tetrabisinomenol, the derivs. of which are identical with those from bisinomenol obtained by boiling I with 66% KOH. II and III can readily be sepd. by recrystn. of the HCl salts which shows that they are not enantiomorphous. The strong diazo reaction of I is greatly diminished in these products. The diazo reaction is similarly diminished in bromosinomenine, which on oxidation does not give II and III. From these facts it may be assumed with some certainty that the linking of the two I mols. takes place in the position 2, opposite to the free phenolic hydroxyl, which gives the formula IV for these alkaloids. II occurs in nature accompanying I. III has not been isolated so far from *sinomenium acutum*.



F. J. G. DE LEEUW

**Lobelia alkaloids. III. Constitution of the lobelia alkaloids.** HEINRICH WIELAND AND OTTO DRAGENDORFF. *Ann.* 473, 83-101(1929); cf. C. A. 19, 2827. Oxidation of lobelanidine,  $\text{C}_{22}\text{H}_{29}\text{O}_2\text{N}$ , or lobeline,  $\text{C}_{22}\text{H}_{29}\text{O}_2\text{N}$ , with  $\text{CrO}_3$  in AcOH gives lobelanine (I,  $\text{C}_{27}\text{H}_{35}\text{O}_2\text{N}$ ). I and  $\text{PhNHNH}_2$  give an addn. compd.,  $\text{C}_{34}\text{H}_{45}\text{O}_2\text{N}$ , light yellow, m.  $187^\circ$  (decompn.). I and  $\text{H}_2\text{O}_2$  in AcOH give, after 2 days, lobelanine N-oxide, m.  $84-6^\circ$  (HCl salt, m.  $169^\circ$ ), reduced by  $\text{SO}_2$  to I. Distn. of I.HCl with Zn dust gives PhAc. I yields a dioxime, m.  $209^\circ$ , which, by means of the Beckmann rearrangement ( $\text{SOCl}_2$  in  $\text{CHCl}_3$ ), gives the dianilide, m.  $218-9^\circ$  (decompn.), of lobeline acid,  $\text{C}_{10}\text{H}_{17}\text{O}_4\text{N}$ , m.  $225-8^\circ$  (decompn.). (Au salt). I, oxidized with  $\text{CrO}_3$  in 33%  $\text{H}_2\text{SO}_4$ , yields scopolinic acid. I and MeI yield a difficultly soluble quaternary iodide, whose base is unstable and splits off  $\text{Me}_3\text{N}$  on treatment with  $\text{Ag}_2\text{O}$ ; extn. with HCl gives unchanged I (up to 50%) and a small amt. of a compd.,  $\text{C}_{22}\text{H}_{29}\text{NO}_3$ , m.  $164^\circ$  (HCl salt, m.  $236^\circ$  (decompn.)). The neutral portion is strongly unsatd. and on catalytic reduction in EtOH gives 1,7-dibenzoylheptane (II), m.  $56-7^\circ$  (Etaise, *Ann. chim.* 9, 391 (1896)); oxidation with  $\text{CrO}_3$  in AcOH gives  $\omega$ -benzoylheptylic acid, m.  $84-5^\circ$ . Reduction of the neutral part in AcOH gives 1,9-diphenyl-1,9-dihydroxynonane, b.  $210-20^\circ$  (in vacuo, pressure not given), oxidized to II. Thus I is  $\alpha, \alpha'$ -diphenacyl-N-methylpiperidine. In lobeline 1 of the CO groups is reduced to CHOH and in lobelanidine, both are reduced. IV. Synthesis of lobelia alkaloids. H. WIELAND AND IRMGARD DRISHAUS. *Ibid.* 102-18.—Reduction of benzallutidine by Na and EtOH gives the 2 stereoisomeric nor-bases, the  $\alpha, \alpha'$ -diphenylethylpiperidine, the HCl salts of which m.  $195^\circ$  (meso-norlobelan-HCl; HI salt, m.  $187^\circ$ ), and  $162-5^\circ$  (HI salt, m.  $187-9^\circ$ ), which is probably the trans-lobelan; the methiodides m.  $234^\circ$  and  $217-9^\circ$ , resp. Condensation of 188 g.  $\text{CH}_3(\text{CH}_2\text{CO}_2\text{Et})_2$  with 480 g. PhAc ( $\text{NaNH}_2$  in  $\text{EtO}_2$ ) gives 55-60 g. 6-benzoyl- $\delta$ -ketocaproic acid (I), m.  $130^\circ$  (Me ester, m.  $43^\circ$ ), both of which give a deep red  $\text{FeCl}_3$  reaction, and 25-30 g. 1,7-dibenzoylhepta-2,6-dione (II), m.  $72^\circ$ , which gives an intensely red  $\text{FeCl}_3$  reaction. Further reaction of I with PhAc gives II. Two by-products of II were a compd.  $\text{C}_{19}\text{H}_{21}\text{N}$  or  $\text{C}_{19}\text{H}_{19}\text{N}$ , m.  $64.5^\circ$  (picrate, yellow, m.  $185^\circ$ ), and a compd.  $\text{C}_{21}\text{H}_{23}\text{O}$ , m.  $135^\circ$ . Condensation of II with dry  $\text{NH}_3$  at  $100^\circ$  gives 30% of  $\alpha, \alpha'$ -diphenacylidene-piperidine, deep yellow, m.  $237^\circ$  (tetrabromide, m.  $183^\circ$ , catalytically reduced (H and Pt oxide) to  $\alpha$ -, m.  $148^\circ$ , and  $\beta$ -lobelanidine (III), m.  $173^\circ$  together with the compd.  $\text{C}_{22}\text{H}_{29}\text{O}_2\text{N}$ , m.  $125^\circ$ . Reduction of  $\beta$ -III with amalgamated Al in moist  $\text{Et}_2\text{O}$  gives a mixt. of norlobelanidine, m.  $120^\circ$  (HCl salt, m.  $244^\circ$ ), and an oily base, oxidized by  $\text{CrO}_3$  to norlobelanine (IV), m.  $120^\circ$  (HCl salt, m.  $195^\circ$ ).  $\alpha$ -III,

similarly reduced and then oxidized, gives IV. V. Several bases accompanying lobeline and the reciprocal relations of the lobelia alkaloids. H. WIELAND, WALTER KOSCHARA AND ELISABETH DANE. *Ibid* 118-26.—The mother liquor from *l*-lobeline yields a small amt. of *di*-lobeline (I), m. 110° (*HCl* salt, m. 170°; *nitrate*, decomps. 159-60°); oxidation with  $\text{CrO}_3$  gives lobelanine, m. 96-7°. I was previously termed lobelidine. Isolobelanine is now termed norlobelanine (II), which yields a *Bz* deriv., m. 125-6°. Reduction of II gives norlobelanidine (III), m. 120°, which is also isolated from the mixt. with lobelanidine (IV) (obtained from the lobelia alkaloids) by extg. the latter with boiling abs. EtOH (the *nitrate* m. 179-80°; the *iodide* m. 211°). Methylation of III with  $p\text{-MeC}_6\text{H}_4\text{SO}_3\text{Me}$  gives IV. Oxidation of III with  $\text{CrO}_3$  in AcOH gives II, while oxidation of IV with  $\text{KMnO}_4$  in 0.1 *N*  $\text{H}_2\text{SO}_4$  gives I. I may be resolved by tartaric acid, giving *l*-lobeline.

C. J. WEST  
Quaternary bases of *Berberis vulgaris*. ERNST SPATH AND NIKOLAUS POLGAR. *Monatsh.* 52, 117-28(1929).—A systematic investigation of the bases of *Berberis vulgaris* is reported, for the details of which the original should be consulted. Tertiary bases, which were not sepd., accounted for 3.9% of the dried plant material. The quaternary bases were sepd. into the non-phenolic and phenolic bases. The former (9.4%) consisted almost entirely of berberine, with about 1/4% of palmatine, which has previously not been isolated, and a trace of a base not of the berberine type. The phenolic bases (2.03%) were reduced to the tert. tetrahydro bases; the principal component was tetrahydrojatrorrhizine, with some tetrahydrocolumbamine and tetrahydroberberrubine. Simple basic building units, such as homopiperonylamine and homoveratrylamine, could not be isolated.

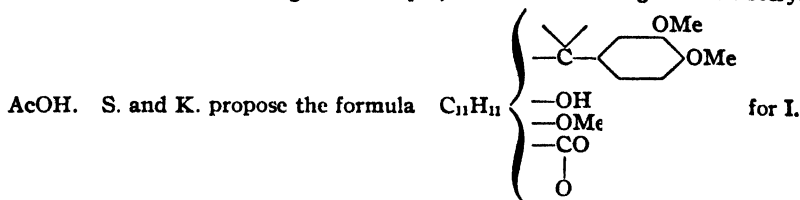
C. J. WEST  
Strychnos alkaloids. XLIX. Oxidation with potassium permanganate of the compounds  $\text{C}_{19}\text{H}_{27}\text{O}_5\text{N}_2$  and  $\text{C}_{19}\text{H}_{25}\text{ON}_2$  obtained from Hanssen's acid. HERMANN LEUCHS AND ALFRED HOFFMANN. *Ber.* 62B, 1253-61(1929), cf. *C. A.* 23, 3230.—Oxidation with  $\text{KMnO}_4$  in  $\text{Me}_2\text{CO}$  of brucine to brucinonic acid leaves unchanged the  $\text{C}_6\text{H}_5$  nucleus carrying the  $\text{MeO}$  group, whereas in the degradation through cathodine to Hanssen's acid,  $\text{C}_{19}\text{H}_{25}\text{ON}_2$  (I), this ring is destroyed. It was of importance, therefore, to obtain, if possible, definite compds. from I or its transformation products by attacking it with  $\text{KMnO}_4$  at the same points of the mol. as in brucine. This has been successfully effected, not with I itself but with the acid  $\text{C}_{19}\text{H}_{25}\text{O}_6\text{N}_2$  (II), obtained by oxidizing I with Br to the acid  $\text{C}_{19}\text{H}_{25}\text{O}_8\text{N}_2$  (III) and then treating III with HgO. In faintly alk. soln. II almost instantly decolorizes  $\text{KMnO}_4$  (up to about 4 atoms O), yielding  $(\text{CO}_2\text{H})_2$  and an acid  $\text{C}_{17}\text{H}_{19}\text{O}_8\text{N}_2 \cdot \text{H}_2\text{O}$  (IV) which contains a  $\text{C}=\text{O}$  and 1 free  $\text{CO}_2\text{H}$  group, and one  $\text{CO}_2\text{H}$  group neutralized by the basic N. IV is also obtained directly from III but only in 25% yield and with a large consumption of  $\text{KMnO}_4$ . IV is quite stable to  $\text{KMnO}_4$  at 0° and is not oxidized at 100° by either Br-HBr or HgO in  $\text{H}_2\text{O}$ . With boiling AcOH it yields a yellow dianhydride,  $\text{C}_{17}\text{H}_{14}\text{O}_8\text{N}_2$  (V), which regenerates IV with  $\text{H}_2\text{O}$ . IV loses its  $\text{H}_2\text{O}$  of crystn. only at 150-70°, becomes brownish about 300°, is easily sol. in *N* HCl,  $\text{HNO}_3$  or  $\text{KHCO}_3$ ; *HCl* salt, prisms and needles with  $2\text{H}_2\text{O}$ , sinters 250-90°; *oxime*; *semicarbazone*, crystals with  $2\text{H}_2\text{O}$ , easily sol. in *N*  $\text{KHCO}_3$ , quite sol. in *N* NaOAc and 5 *N* HCl, sol. in hot *N* HBr; *di*-Me ester, prisms with  $1\text{H}_2\text{O}$ . V, prisms with 1AcOH which it loses *in vacuo* at 130°.

C. A. R.  
Isomerism and catalytic decomposition of sandaraco-pimaric acid. F. BALÁŠ AND J. BRZÁK. *Collection Czechoslov. Chem. Comm.* 1, 352-9(1929); cf. *C. A.* 23, 4224.—Boiling in various solvents and even distn. does not isomerize this acid. At 240° in  $\text{CO}_2$  an isomer, m. 153-4°, results. At 310° in  $\text{CO}_2$  a compd.  $\text{C}_{19}\text{H}_{28}\text{O}_6$ , b<sub>2</sub> 195°, results by loss of  $\text{CO}_2$ . 4.5 g. of the acid in 100 cc. of AcOH with 70 cc. (0.5 g.) of colloidal Pt soln. at 60° under 0.1 atm. of  $\text{H}_2$  yields a dihydrogenated acid, m. 180°. The properties of the various isomeric sandaraco-pimaric acids are reviewed.

V. F. H.  
Constituents of the seeds of *Arctium lappa* L. I. J. SHINODA AND M. KAWAGOEY. *J. Pharm. Soc. Japan* 49, 565-75(1929).—S. and K. extd. from the seeds of *Arctium lappa* L. (700 g.) with ether (750 cc.) I, m. 99-102° (yield 15.0-21.5%) which does not depress the m. p. of arctigenin. The ether ext. residue gave II, m. 111-2°;  $[\alpha]_D^{25}$  -38.8° (in alc.) (yield 18-20%). II is probably arctiin, reduces Fehling and  $\text{NH}_3 \cdot \text{AgNO}_3$  soln. Catalytic reduction and methylation of II gave neg. results. Hydrolysis of II gave the *alcohols* arctigenin (yield 64%).  $\text{C}_{20}\text{H}_{30}\text{O}_6 + \text{H}_2\text{O} = \text{C}_{22}\text{H}_{32}\text{O}_6 +$

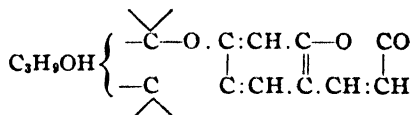
of II, which does not depress the m. p. of veratric acid (m. 110-111°). Hydrolysis of II gave III, m. 194°, and  $\text{HCO}_2\text{H}$ (?). III does not depress the m. p. of protocatechuic acid. I gives bromoarctigenin (IV), m. 194-5°. Oxidation of IV with  $\text{KMnO}_4$ ,

gave a compd., m. 182-4°, which does not depress the m. p. of 6-bromoveratric acid (m. 183-4°). Methylation of I with  $\text{Me}_2\text{SO}_4$  gave methylarctigenin (V), m. 125-7°. Nitration of V gave a nitro deriv., m. 204-6°. Reduction of II gave I. Acetylation of I by the usual method gave a compd., m. 52-60°. Alc. I treated in KOH and acidified with either AcOH or HCl gave a compd., m. 117-8° which gives I on recrystn. in dil.



F. I. N.

**Constitution of nonadekin, a new glucoside from *Peucedanum decursivum* Maxim.**  
**II. JUNZO ARIMA.** *Bull. Chem. Soc. Japan* 4, 113-9 (1929).—The similarity of nonadekin with the coumarin series described in Part I (*C. A.* 23, 2445) was proven further. Nonadekin absorbs 1 mol.  $\text{Br}_2$  and forms a mono-Br deriv., m. 230-1°, which gives with alc. KOH nodakilic acid, m. 214-5°, a monobasic acid,  $\text{C}_{10}\text{H}_8\text{O}_6$ , which has no lactonic or phenol HO group, and contains one O more than nonadekin. This is similar to the formation of coumaric acid from coumarin. Oxidation with  $\text{CrO}_3$  of nonadekin gives a monobasic phenolcarboxylic acid  $\text{C}_{10}\text{H}_8\text{O}_6$ , m. 244-6°. This acid has one lactonic group, colors violet with  $\text{FeCl}_3$  and gives a di-Me deriv., m. 165-6°. This acid was proven to be identical with a hydroxycoumarincarboxylic acid synthesized from  $\beta$ -resorcylic acid and malic acid according to the method of Pechmann. This acid gives on heating under evolution of  $\text{CO}_2$  the 7-hydroxycoumarin (umbelliferone, m. 230-1°). From the facts it is concluded that the formula for nonadekin is:



F. J. G. DE LEEUW

**Several rearrangements of ergosterol peroxide.** A. WINDAUS, W. BERGMANN AND A. LÜTTRINGHAUS. *Ann.* 472, 195-201 (1929).—Distn. of 0.5 g. ergosterol peroxide (I) at 0.0007 mm. and 180-215° (bath temp.) gives 15% of a compd.,  $\text{C}_{27}\text{H}_{44}\text{O}_3$  (II),  $[\alpha]_D^{17}$  55.5°, which contains 1HO and 1CO group; the third O is probably oxidic in character. Titration with  $\text{BzO}_2\text{H}$  indicates 1 double bond and gives a monoxide,  $\text{C}_{27}\text{H}_{44}\text{O}_4$ , m. 218°,  $[\alpha]_D^{17}$  94.6°. MeMgI indicates 1 active H. II yields an *Ac* deriv., m. 168-9°,  $[\alpha]_D^{17}$  41°; an *oxime*, m. 260° (decompn); and with MeMgI the *tert. alc.*,  $\text{C}_{28}\text{H}_{46}\text{O}_3$ , m. 190°; catalytic reduction gives the *dihydro deriv.*, m. 152-3°,  $[\alpha]_D^{20}$  94.6°, whose *Ac* deriv., m. 161°,  $[\alpha]_D^{17}$  74.6°. I with Zn and alkali gives a triol (W. and Linsert, *C. A.* 22, 4534) (correct rotation,  $[\alpha]_D^{20}$  -13.7°), also obtained with Al-Hg; reduction with EtOH and Na gives dihydroergosterol, while catalytic reduction (Pd + H) gives a *diol*,  $\text{C}_{27}\text{H}_{46}\text{O}_2$ , m. 234°,  $[\alpha]_D^{20}$  14.7°;  $\text{Ac}_2\text{O}$  gives a *monoacetate*, m. 227°,  $[\alpha]_D^{18}$  14.7°; complete catalytic reduction (Pt + H for 8 hrs. at 70°) gives *allo- $\alpha$ -ergosterol*, also obtained from I.

**Rearrangement of ergosterol.** A. WINDAUS AND E. AUHAGEN. *Ann.* 472, 185-94 (1929).—Ergosterol (I) in the absence of air gives with ultra-violet light isomeric alcs, which are not pptd. by digitonin (II). Some of these have been prepd. by chem. methods and will be compared with those obtained by photochem. methods. I (5 g) and 0.9 g. finely divided Ni, heated in  $\text{CO}_2$  3.5 hrs. at 225°, give 0.5 g. *ergostadienone* (III),  $\text{C}_{27}\text{H}_{44}\text{O}$ , yellow, m. 182-3°,  $[\alpha]_D^{19}$  2°; the Liebermann-Burchard test with  $\text{Ac}_2\text{O}$  and concd.  $\text{H}_2\text{SO}_4$  gives red, blue and then green colors;  $\text{AsCl}_3$  and  $\text{SbCl}_3$  give no color; *oxime*, decomp. 240-50°; reduction with Na and EtOH gives dihydroergosterol (IV) while catalytic reduction gives *allo- $\alpha$ -ergosterol*. Besides III there results 80% of a red oil, which contains some III and other compds., and also *u-ergostadienone*, which was not obtained pure but was reduced to *u-ergostadienol*,  $\text{C}_{27}\text{H}_{44}\text{O}$ , m. 170°,  $[\alpha]_D^{17}$  42°; *Ac* deriv., m. 128°,  $[\alpha]_D^{18}$  58°. Catalytic reduction gives *u-ergostanol*,  $\text{C}_{27}\text{H}_{46}\text{O}$ , m. 184°,  $[\alpha]_D^{18}$  34°; *Ac* deriv., m. 96°,  $[\alpha]_D^{17}$  39°; this is not pptd. by II. Heating dehydroergosterol (V) with Ni gives *ergostatrienone D* (VI), m. 199-200°,  $[\alpha]_D^{20}$  50°; *oxime*,



decomps. 245°. Reduction with Na and EtOH gives *ergostatrienol D* (VII), m. 165–6°,  $[\alpha]_D^{20}$  22°; *Ac deriv.*, m. 171°,  $[\alpha]_D^{17}$  17.5°. VII also results by heating 5 g. V in 250 cc EtOH with 10 g. Hg(OAc)<sub>2</sub> and 5 cc. AcOH 45 min. The mother liquor of VI contains *u-ergostatrienone*, m. 130–1°,  $[\alpha]_D^{19}$  53°; *oxime* reduction with Na and EtOH gives *u-ergostatrienol*, C<sub>27</sub>H<sub>46</sub>O, m. 154°,  $[\alpha]_D^{16}$  88°, is not pptd. by II; *Ac deriv.*, m. 151°,  $[\alpha]_D^{17}$  103°; catalytic reduction gives the *Ac deriv.*, m. 96° (see above).

C. J. WEST

The relation of organic chemistry to biology (BARGER) 11A. The Dufton column and its use in preparing anhydrous alcohol (PETRIK) 1. Cathodic halogen; the electrolysis of halogenyl amides (STREIGHT, HALLONQUIST) 4. New evidence in favor of the peroxide theory of Kolbe's electrosynthesis (FICHTER) 4. The thermal decomposition of methyl isopropyl di-imide: a homogeneous unimolecular reaction. The thermal decomposition of hydrazoic acid and methyl azide (RAMSPERGER) 2. The velocity of oxidation of amines by KMnO<sub>4</sub> under various conditions (TRONOV, NIKONOVA) 2. Amyl acetate from aviation gasoline (DOBRYANSKII, GUREVICH) 22. Ultra-violet absorption curves of semi-terpene alcohols (SAVARD) 3. Hydrocarbon derivatives containing O or S (Brit. pat. 305,603) 21.

CLARK, ALBERT H.: *Organic Chemistry: For Students of Pharmacy and Medicine*. New York: D. Van Nostrand Co., Inc. 446 pp. \$3.50. Reviewed in *Chemicals* 32, No 9, 6(1929).

MEYER, V. AND JACOBSON, P.: *Lehrbuch der organischen Chemie*. Berlin and Leipzig: W. de Gruyter & Co. 216 pp. \$3.50. Reviewed in *Eastman Kodak Co. Abstract Bull.* 15, 441(1929).

RICHTER, VICTOR VON: *Richter-Anschütz Chemie der Kohlenstoffverbindungen; oder, Organische Chemie*. Leipzig: Akad. Verlag. m. b. H.

Catalysts for hydrogenation and dehydrogenation of organic compounds. HOLZ-VERKOHLLUNGS-INDUSTRIE A.-G. Brit. 305,198, Feb. 2, 1928. A soln. of a sol. compd. of the catalyst such as Cu formate is applied to a carrier such as granulated magnesia which acts as a precipitant for the soln. A mixed soln. of Cu and Mn nitrates may be applied to granular lime, and Ni nitrate may be applied to magnesia. The impregnated carrier is dried and may be reduced in H.

Catalysts for reduction and hydrogenation of organic nitrogen compounds. A. O. JAEGER (to Selden Co.). Brit. 304,640, Jan 23, 1928. In reducing PhNO<sub>2</sub> to PhNH<sub>2</sub>, forming piperidine from pyridine, and effecting various generally similar reactions, catalysts are used which are formed of zeolites or non-siliceous base-exchange materials with which catalytically active components are assoc. either combined in an exchangeable or non-exchangeable form or in phys. admixt. or assocd. with diluents or in the form of anions forming salt-like compds. Numerous examples, modifications and details are given.

Organic bases. I. G. FARBENIND. A.-G. (Otto Nicodemus, inventor). Ger. 479,351, Jan. 6, 1927. See Brit. 283,163 (C. A. 22, 3892).

Esters. STANDARD OIL DEVELOPMENT CO. Brit. 305,308, Nov. 21, 1927. Esters, such as those of secondary alcs., *e. g.*, of iso-Bu alc. and Pr Me carbinol, are made in the presence of a solvent for the ester (such as a white petroleum oil, b 300°) which is capable of sepg. it from the reaction mixt. The ester is then sepd. from the solvent by distn.

Ketonic acid esters. A. WACKER GES. FÜR ELEKTROCHEMISCHE INDUSTRIE GES. Brit 304,118, Jan. 14, 1928. See Fr. 654,413 (C. A. 23, 3714).

Esters of orthosilicic acid. MARTIN MÜLLER-CUNRADI and GRETE LECHNER (to I. G. Farbenind. A.-G.). U. S. 1,725,620, Aug. 20. SiCl<sub>4</sub> is treated with EtOH or other alc. in the presence of an inert diluent such as benzene.

Halogenated alcohols. JÜRGEN CALLSEN (to Winthrop Chemical Co.). U. S. 1,725,054, Aug. 20. In forming halogenated alcs., *e. g.*, tribromoethyl alc., a halogenated aldehyde such as bromal, dissolved in a secondary alc. such as iso-Pr alc., is heated with an Al alcoholate, in the presence of H.

Alcoholates. A. WACKER GES. FÜR ELEKTROCHEMISCHE INDUSTRIE GES. Brit. 304,585, Jan. 21, 1928. Alcoholates are prepd. from alcs. contg. more than 3 C atoms in the mol. by boiling the alc. with a metal hydroxide, *e. g.*, Bu alc. is boiled with NaOH in a distn. app. Mention is made also of the prepn. of metallic derivs of cyclic alcs. such as benzyl alc. and cyclohexanol.

**Alkylene phenols.** SCHERING-KAHLBAUM A.-G. Brit. 304,727, Jan. 25, 1928. See Fr. 657,122 (C. A. 23, 4229).

**Disubstituted guanidines.** I. G. FARBENIND. A.-G. Brit. 304,360, Oct. 19, 1927. Disubstituted guanidines are made by treating a cyanogen halide with a primary org. base in the presence of a salt of such a base. An example is given.

**Thioureas.** CARL N. HAND and CLARENCE E. SMITH (to Rubber Service Laboratories Co.). U. S. 1,724,580, Aug. 13. In making a thiourea such as diphenylthiourea, reaction between a primary aromatic amine such as aniline and  $\text{CS}_2$  is effected at a temp. of 46–46.2°, vapors and gaseous by-products are removed from the reaction zone, the vapors are condensed and the condensate is returned to the reacting materials for revaporization to remove a further quantity of gaseous by-products. An arrangement of app. is described.

**Xanthates.** THOMAS W. BARTRAM and WM. C. WELTMAN (to Rubber Service Laboratories Co.). U. S. 1,724,549, Aug. 13. Compns. such as Na ethyl xanthate are stabilized by adding a basic metallic compd. such as lime.

***ar*-Tetrahydronaphthylamines.** LEOPOLD CASSELLA & Co., G. M. B. H. (Felix Klingemann, Ernst Korten, Wilhelm Lommel and Theodor Goost, inventors). Ger. 479,401, Oct. 11, 1925. *ar*-Tetrahydronaphthylamines are prepd. by hydrogenation of acylated naphthylamines and sapon. the products to obtain the free base. Examples are given.

**Alkali metal salts of nitrosamines of halogenated and methyl-substituted anilines.** ARTHUR ZITSCHER and WILHELM SEIDENFADEN (to General Aniline Works). U. S. 1,724,062, Aug. 13. The *K* salt of the nitrosamine of 4-chloro-*o*-toluidine, probably 4,2-ClMeC<sub>6</sub>H<sub>3</sub>NKNO, is obtained from the *syn*-diazotate of 4,2-ClMeC<sub>6</sub>H<sub>3</sub>NH<sub>2</sub> prepd. at lower temp. and run, with stirring, into KOH soln. at about 115°. In the same manner at a temp. of conversion of about 110° is formed the *K* salt of the nitrosamine of 5-chloro-*o*-toluidine. Similar derivs. are prepd. from 3,4-dichloro-*o*-toluidine and 3,5-dichloro-1-amino-2,4-xylene at about 120°, 5-bromo-*o*-toluidinenitrosamine, 2-chloro-5-bromo-*p*-toluidine, 6-chloro-*m*-toluidine, 4,5-dichloro-*o*-toluidine, 2,5-dichloro-*p*-toluidine, 2,3-dichloro-*p*-toluidine and 3-chloro-*o*-toluidine.

**Alkylaminoanthraquinone derivatives.** BRITISH DYESTUFFS CORP., LTD. Ger. 478,739, Dec. 8, 1927. These derivs. are prepd. by heating 1,4-dialkylaminoanthraquinone with highly concd.  $\text{H}_2\text{SO}_4$  to temps. over 150° in presence or absence of  $\text{H}_3\text{BO}_3$ . An example is given.

**Anthraquinone derivatives.** I. G. FARBENIND. A.-G. Brit. 304,436, Dec. 9, 1927.  $\text{H}_2\text{SO}_4$ -ester salts of nitroanthraquinols are formed by treating a nitroanthraquinone with a metal such as Cu powder in the presence of a tertiary base such as pyridine and  $\text{SO}_3$ , halogen sulfonic acids or alkylsulfuric halides. When treated with acid oxidizing agents, the esters regenerate the nitroanthraquinones; non-oxidizing acids cause a reaction with formation of a mixt. of nitro- and amino-anthraquinone. Examples are given.

**Anthraquinone derivatives.** I. G. FARBENIND. A.-G. (Max A. Kunz and Erich Berthold, inventors). Ger. 479,350, Aug. 13, 1926. Isoxazoles of the anthraquinone series are prepd. by heating an *o*-nitromethylanthraquinone with anhyd.  $\text{AlCl}_3$  to 150–200°. The reaction can be applied to 3-nitro-2-methylanthraquinone and its nuclear substitution products as well as to 1-nitro-2-methylanthraquinone and its nuclear substitution products, and is thus an improvement on the method of Ger. 360,422 (using fuming  $\text{H}_2\text{SO}_4$ ), which is applicable to 1-nitro-2-methylanthraquinones only. Examples are given. Anthraquinone-2,3-isoxazole is a yellow-brown powder insol. in the usual org. solvents but sol. in pyridine; it cannot be melted without decompn. Cf. C. A. 23, 4349–50.

**2-Aminoanthraquinone-3-carboxylic acid.** I. G. FARBENIND. A.-G. (Max A. Kunz and Erich Berthold, inventors). Ger. 479,355, Sept. 1, 1926. 2-Aminoanthraquinone-3-carboxylic acid is prepd. by sapon. anthraquinone-2,3-isoxazole. The prepn. of the initial material is described in Ger. 479,350 (preceding abstract). Examples are given.

**Benzanthrone derivatives.** I. G. FARBENIND. A.-G. (Hugo Wolff, inventor). Ger. 479,286, Jan. 15, 1927. Addn. to 459,366. See Brit. 291,131 (C. A. 23, 1138).

**Benanthrone derivatives.** I. G. FARBENIND. A.-G. (Paul Nawiasky, Eduard Holzapfel and Otto Braunsdorf, inventors). Ger. 479,230, May 21, 1925. Yellow thio ethers of benzanthrone, useful as pigments or as intermediates for dyes, are prepd. by condensing halobenzantrones with mercaptans, other than benzanthranyl mercaptans. The examples describe the prepn. of (1) the *Bs*-1- and *Bs*-2-thio-*p*-tolyl ethers, m. 218–222° and 170–171°, resp., (2) the *Bs*-1-thioethyl ether, m. 116–118°,

(3) the *Bs*-1-thio- $\alpha$ -anthraquinonyl ether, m. 368–370°. Cf. Brit. 256,059 (C. A. 21, 2907).

**Pyrazoleanthrone derivatives.** I. G. FARBENIND. A.-G. (Paul Nawiasky, Arthur Krause, and Alfred Holl, inventors). Ger. 479,284, Dec. 15, 1926. Addn. to 454,760. According to Ger. 454,760 *N*-alkyl derivs. are prepd. from pyrazoleanthrone by treating it, in the presence of an acid condensing agent, with alkyl sulfates or sulfonates or with mixts. of EtOH and H<sub>2</sub>SO<sub>4</sub>. This method is now modified by omitting the acid condensing agent, and preferably substituting therefor an acid-binding agent. Other alkylating agents, *e. g.*, alkyl halides, may then be used.

**Pyridine derivatives.** IWAN OSTROMISLENSKII (to Pyridium Corp.). U. S. 1,724,305, Aug. 13. Phenyldiazoamino- $\alpha$ -monoaminopyridine-HCl and similar compds. are obtained by reaction of phenyl diazonium salts with  $\alpha,\alpha$ -diaminopyridines in a slightly acidified aq. medium. When boiled with aniline the hydrochlorides of the diazoamido compds. are transformed, quantitatively, to the corresponding azoamido compd. Analogous diazo compds. are easily obtained under the same conditions by coupling  $\alpha,\alpha$ -diaminopyridine with the diazotized homologs and analogs of aniline, such as diazotized toluidines, phenetidine, anisidine, etc. Analogous with the first and simplest member of the homolog series, the hydrochlorides of all these salts of diazoamido compds. are easily converted to the corresponding azoamido compds. under similar conditions, for example, prolonged boiling of the substances in distd. water, aniline, or the like. The base and its hydrochlorides occur in fine crystals in different shades of brown and yellow-brown, or reddish orange.

**Triazine derivatives.** F. MERCK CHEMISCHE FABRIK (Otto Diels, inventor). Ger. 479,349, Dec. 5, 1926. A monoacylurea and -thiourea treated with CH<sub>2</sub>O in concd. H<sub>2</sub>SO<sub>4</sub> soln. at a low temp. and the product sapond. give, resp., CH<sub>3</sub>(NHCONH<sub>2</sub>)<sub>2</sub> and CH<sub>2</sub>(NHCSNH<sub>2</sub>)<sub>2</sub>, m. 252°. These compds. with strong mineral acids form, resp., 2,4-diketohexahydro-*s*-triazine, m. 245°, and 2,4-dithiohexahydro-*s*-triazine, m. 230° (decompn.), which forms Cu, Ag and Hg salts. The triazine derivs. are of *therapeutic value*.

**Stable diazo compounds.** I. G. FARBENIND. A.-G. Brit. 305,498, Oct. 28, 1927. Stable diazo compds. derived from *p*-aminoazo compds. contg. no sulfonic or carboxylic groups but contg. an alkoxy aralkoxy or aryloxy group in *o*-position to the amino group are obtained in solid form by adding an alkali halide, H<sub>2</sub>SO<sub>4</sub> or a sulfate (or both), a heavy metal salt or an aryl sulfonate to the diazo soln. Numerous examples are given.

**Substituted ammonium compounds.** LEOPOLD CASSELLA & Co. G. M. B. H. (Georg Kalischer and Karl Keller, inventors). Ger. 479,476, July 16, 1925. Substituted NH<sub>4</sub> compds. are prepd. by the action of an equimol. proportion of an alkyl sulfate or sulfonate on a dialkylarylamine substituted with halogen in the *o*-position or in the *o*- and *p*-positions. The components may react directly or in the presence of an org. solvent. The products are useful as *alkylating agents*.

**Acids, alcohols and hydrocarbons from waxes.** I. G. FARBENIND. A.-G. Brit. 304,150, Jan. 14, 1928. Beeswax, montan wax, wool fat and the like are sepd. into the corresponding hydrocarbons, acids, and alcs., by saponifying, atomizing the product to convert it into a dry powder, extg. with solvents and acidifying the soaps. Various details are given.

**Acetic and formic acids.** I. G. FARBENIND. A.-G. Brit. 305,594, Feb. 7, 1928. Acetic and formic acids are sepd. by adding a liquid such as C<sub>2</sub>HCl<sub>3</sub> which is miscible with HOAc but not with formic acid and distg.

**Acetic acid.** IMPERIAL CHEMICAL INDUSTRIES, LTD., S. W. ROWELL and H. S. HIRST. Brit. 304,350, Oct. 18, 1927. In a continuous process of producing HOAc, a current of HOAc and a catalyst, such as small proportions of Mn and Co acetates, is fed down through a tower which may be filled with Raschig rings of Al and acetaldehyde vapor and air or O are supplied at the bottom of the tower. Various details of app., temps. of operation, etc., are described.

**Acetic acid.** H. SUIDA. Brit. 303,494, Jan. 5, 1928. HOAc is extd. from its aq. solns. by a mixt. of a base such as quinoline and its homologs, dimethylaniline and the like, which is not readily acetylated, and a hydrocarbon material such as anthracene oil, "heavy oil," paraffin oil, spindle oil, hydrogenated naphthalene, solvent naphtha, gas oil, solar oil, heavy benzine, oil from the destructive hydrogenation of coal or pentachloroethane; all ingredients of the solvent should b. above 150° to facilitate sepn. of the HOAc from the ext. Brit. 303,495 specifies the use of similar extg. substances for recovery of HOAc vapor from gaseous mixts. Cf. C. A. 23, 4230.

**Citric acid.** GIUSEPPE BOSURGI and PAUL STUKART. Ger. 477,844, July 29, 1926. Citric acid is extd. from the pulp of lemon presses by diffusion.

**Maleic acid.** C. H. BOEHRINGER SOHN. (Fritz Zumstein, inventor). Ger. 478,726, Feb. 17, 1927. Maleic acid or anhydride is prepd. by the catalytic treatment of vaporized compds. of the furfuran series with O. The catalyzers may be acidic oxides or metal salts. Thus, crude furfural, obtained by heating corncobs or oat husks with dil.  $H_2SO_4$  under pressure, is atomized with pure O and led over Zn vanadate on granulated Al heated to 300–350°. The actual yield is 30% of the theoretical. Starting with pyromucic acid, 50–60% of the theoretical yield is obtained. Molybdic and dehydromucic acids are mentioned as starting materials in other examples.

**3-Amino-2-naphthoic acid.** SOC. ANON. POUR L'IND. CHIM. A BAËLE. Ger. 479,227, Mar. 16, 1926. See Brit. 250,598 (C. A. 21, 1127).

**4-Alkoxybenzene-1-carboxy-amino-2-thioglycolic acids.** ERWIN HOFFA, RUDOLF BRUNE and JENS MÜLLER (to General Aniline Works). U. S. 1,725,080, Aug. 20. A 4-alkoxy-1-cyanobenzene-2-thioglycolic acid is treated for a period of not substantially longer than 18 hrs. with not more than about 5 times the quantity of 90%  $H_2SO_4$ .

**2-Naphthol-3-carboxylic acid.** PAUL DIETERLE (to National Aniline & Chemical Co.). U. S. 1,725,394, Aug. 20. A dry alkali metal salt of  $\beta$ -naphthol is subjected to the action of  $CO_2$  at a temp. ranging from about 120° to 285°, under atm. pressure.

**Aliphatic anhydrides.** BRITISH CELANESE, LTD., H. DREYFUS and C. I. HANEY. Brit. 304,156, July 15, 1927.  $Ac_2O$  and other aliphatic anhydrides are produced by mixing the acid, as a spray or vapor, with an inert gas such as steam (which may be superheated), N or H heated to a sufficient temp. (suitably about 600–1200°). The acid is preferably preheated to 150–300°. Numerous details and modifications of procedure and an app. are described.

**Acetic anhydride, etc.** H. DREYFUS. Brit. 305,147, July 30, 1927.  $Ac_2O$  or other aliphatic anhydrides are formed by passing the vapor of the corresponding acids through a heated reaction zone formed of or lined with reducible metals or their alloys such as Cu, Ni, Fe, Co and bronze; metals, the acetates of which yield HIOAc on heating, such as Ni or Cu, are especially suitable. H, coal gas, producer gas, CO or similar reducing gas is passed through the app. continuously or intermittently during or before the passage of the acid vapor. A temp. of 500–700° is preferred and dil. acid may be used. Various details are given. Cf. C. A. 23, 850.

**Acetaldehyde and acetic acid.** I. G. FARBENIND. A.-G. Brit. 304,855, Nov. 2, 1927. Acetaldehyde and HOAc are formed by passing a mixt. of  $CH_4$  with H and O or substances yielding O over catalysts having both oxidizing and hydrating properties. Acetaldehyde is produced at 40–180° especially with Hg or V compds. as catalysts (the O not being in excess unless the acetaldehyde is to be further oxidized to form HOAc). For direct production of HOAc, more O is used and salts of Sn, Ag or Hg (especially, such as contain V in the acid radical) may be used as catalysts with or without other substances. Various details and examples are given. Cf. C. A. 23, 1910.

**Butyraldehyde and butyl alcohol by hydrogenation of crotonic aldehyde.** HIRAM C. HOLDEN (to Carbide and Carbon Chemicals Corp.). U. S. 1,724,761, Aug. 13. Hydrogenation is effected without use of steam and without formation of any serious quantities of undesired products of high b. p., by treating crotonic aldehyde (in the presence of a Ni catalyst) with H at a temp. below 140° until most of the crotonic aldehyde has been converted to satd. compds. contg. the propyl group; and then treating the product with H at a higher temp. to produce Bu alc.; both said treatments with H being carried out in the presence of less water than is necessary effectively to prevent the formation of undesired high-boiling substances during subsequent distn. of the reaction product; making up the necessary amt. of water by suitable addn. after the hydrogenation; and then distg. the reaction product.

**Separating isobutyl alcohol and isoamyl alcohol or other liquids by distillation.** SOC. ANON. DES DISTILLERIES DES DEUX-SEVRES. Brit. 305,528, Feb. 6, 1928. In effecting distn. sepns. of liquids contained in aq. mixts. such as a liquid A which is insol., or but slightly sol. in water and another liquid B miscible or not with water but more volatile than A, the mixt. of A and B is preliminarily dehydrated in continuous manner in a dehydration column by the ordinary azeotropic method. An app. and various details of procedure are described.

**Hexahydroaniline.** I. G. FARBENIND. A.-G. Brit. 305,507, Nov. 5, 1927. See Can. 283,752 (C. A. 22, 4540).

**Dichloro-*p*-toluidines.** I. G. FARBENIND. A.-G. (Wilhelm Schumacher and Karl Seib, inventors). Ger. 479,492, Mar. 31, 1926. 2-Chloro-4-acetamido-1-methylbenzene

is chlorinated in aq. AcOH at a low temp. 2,5-Dichloro-4-acetamido-1-methylbenzene seps., while 2,3-dichloro-4-acetamido-1-methylbenzene can be pptd. from the mother liquor by diln. Each of these compds. yields the corresponding dichloro-*p*-toluidine on sapon.

**Purifying anthracene.** A. O. JAEGER (to Selden Co.). Brit. 304,179, Jan. 16, 1928. See U. S. 1,693,713 (C. A. 23, 851).

**Hydrogenating naphthalene.** TECHNICAL RESEARCH WORKS, LTD., and E. J. LUSH. Brit. 304,403, Nov. 4, 1927. Tetrahydronaphthalene in pure form is obtained by hydrogenating naphthalene in the vapor phase under conditions precluding any condensation. A Ni catalyst is used as described in Brit. 203,218 (C. A. 18, 502).

**Nitrosafrole.** FIRMA E. MERCK (Max Oberlin, inventor). Ger. 478,844, May 7, 1925. In the prepn. of 6-nitrosafrole by treating a soln. of safrole in glacial AcOH with HNO<sub>3</sub>, an amt. of conc. H<sub>2</sub>SO<sub>4</sub> not exceeding 25% of the vol. of the safrole is present.

**Crotyl bromide.** KURT MEISENBURG (to Winthrop Chemical Co.). U. S. 1,725,156, Aug. 20. 1,3-Butadiene is reacted on with HBr.

**Choline monoborate.** VEREINIGTE CHEMISCHE WERKE A.-G. Ger. 479,016, July 9, 1927. Choline monoborate is prepd. by dissolving between 1 and 3 mols. of H<sub>3</sub>BO<sub>3</sub> in an aq. soln. of 1 mol. of the base, concg. the soln. in vacuo, dissolving in EtOH, and pptg. the salt with acetone, Et<sub>2</sub>O, AcOEt, C<sub>6</sub>H<sub>6</sub>, or other diluent in which the salt is insol. Alternatively, the acid and the base may be brought to reaction in alc. soln. and the salt pptd. with acetone, etc. Choline monoborate is a white microcryst. compd. which crystallizes with 1 mol. H<sub>2</sub>O. It is alk. to litmus and m. above 300°.

**Condensation products of aldehydes and amines.** THE GRASELLI CHEMICAL Co. Ger. 478,948, Mar. 8, 1926. One mol. of a primary or secondary amine is allowed to react with 2 or more, preferably 3 to 7, mols. of a satd. or unsatd. aldehyde in the presence of an acid and with or without heating. A table of amines, aldehydes, acid catalyzers, proportions and products is given.

## 11—BIOLOGICAL CHEMISTRY

PAUL E. HOWE

### A—GENERAL

FRANK P. UNDERHILL

**The enzymic activity of mummy muscle, 3000 years old. (Precipitin reaction glucolysis, respiration enzyme.)** E. SEHRT. *Arch. expil. Path. Pharmacol.* 143, 35-45 (1929).—Mummy muscle gives the precipitin reaction. It acts like fresh ox muscle, in cooperation with pancreas tissue, in producing glucolysis, and it gives a pos. oxidase reaction.

**Diastatic conversion of uric acid to allantoinic acid.** R. FOSSE, A. BRUNEL AND R. DE GRAEVE. *Compt. rend.* 189, 213-5 (1929); cf. C. A. 23, 2450, 3875, 4495.—Juices of many plants have been found capable of converting uric acid (I) to allantoinic acid (II). This fermentation is especially active in the juice of legumes (e. g., *Soya hispida*, *Phaseolus multiflorus*, *P. lunatus*, *P. vulgaris*, *Melilotus alba*, etc.); it is the work of two enzymes, one an oxidase producing allantoin (III) from I and the second hydrolyzing III to II.

A. S. CARTER

**Examinations of the amylase of potato.** J. BURGER. *Magyar Chem. Folyóirat* 34, 120-8, 135-40, 150-4 (1928).—The optimum pH for hydrolyzing starch of potato amylase is 7.0. Salts show an activating influence in the following order: cations: Na → K → NH<sub>4</sub>; anions: SO<sub>4</sub> → Cl → Br → F → NO<sub>3</sub>. Optimum diln. is 1:5. Optimum time of autolysis is 20 hrs. Optimum pH of autolysis is 7.0. The activating influence of salts at autolysis: K → Na → NH<sub>4</sub>; F → Cl → SO<sub>4</sub> → NO<sub>3</sub> → Br. Conc. of amylase is increased on storing; that is zymogen changes to amylase. The original pH of potato is 5.8-5.9 after harvest and reaches the value of 6.3-6.4 after 2-3 weeks; this remains const. Potato amylase is very similar to animal amylases; therefore no distinction should be made between enzymes of animals and those of plants. S. S. DE FINÁLY

**The 100th anniversary of Edward Pflüger's birth.** R. ROSEMAN, BLEIBTREU, A. BETHE AND F. RUNKEL. *Arch.-Ges. Physiol.* (Pflüger's) 222, 548-74 (1929).

ARTHUR GROLLMAN

**Hermann Wieland.** J. SCHÜLLER. *Deut. med. Wochschr.* 55, 1059 (1929).—An obituary.

ARTHUR GROLLMAN

The structure and composition of hemosiderin. SHERBURNE F. COOK. *J. Biol. Chem.* 82, 595-609(1929).—Hemosiderin is shown to consist of org. granules impregnated with some colloidal form of  $\text{Fe}(\text{OH})_3$ . The granules may be obtained, free from tissue, by alk. digestion, and the  $\text{Fe}(\text{OH})_3$  extd. and observed *in vitro*. ARTHUR GROLLMAN

Studies on the combination between certain basic dyes and proteins. L. M. C. RAWLINS AND CARL L. A. SCHMIDT. *J. Biol. Chem.* 82, 709-16(1929).—Casein, fibrin, gelatin and edestin were titrated with methylene blue and safranin Y and the first 3 dyes mentioned also titrated with induline Scarlet. The results indicate that the union between protein and dye occurs in stoichiometric proportions. ARTHUR GROLLMAN

Hydrolysis of the *d*-glucosides of *d*- and *l*-methyl-*n*-hexylcarbinol with emulsin. STOTHERD MITCHELL. *J. Biol. Chem.* 82, 727-30(1929).—*d*-Methyl-*n*-hexylcarbinyl-*d*-glucose was hydrolyzed by emulsin 8.4 times as rapidly as the *l*-modification. ARTHUR GROLLMAN

A study of the action of trypsin on casein. H. W. VAHLTEICH. *J. Biol. Chem.* 82, 737-49(1929).—Tryptic hydrolysis of casein was studied by following the progress of production of amino N, proteose N and the transformation of casein N into products of digestion at varying temps. and for several concns. of enzyme. ARTHUR GROLLMAN

The structure of insulin and its relation to the enzymes and catalysts. ERHARD GLASER AND GEORG HALPERN. *Wiener med. Wochschr.* 79, 363(1929).—A review with 42 references to the literature. ARTHUR GROLLMAN

Polysaccharides. XXXIX. The enzymic degradation of chitin and chitosan. 1. P. KARRER AND A. HOPMANN. *Helv. Chim. Acta* 12, 616-37(1929); cf. *C. A.* 22, 2055.—Finely powd. chitin (I) (from lobster shell) is attacked slowly by snail liquid. The attack is strongly increased, as with cellulose, by pptg. I from cold  $\text{HCl}$ . The chitin-splitting enzyme is called *chitinase*. It acts best in weakly acid soln.,  $p_H$  5.2 (maintained by phosphate buffer). The enzyme hydrolysis at the start nearly follows the rule of Schütz, that is the split substrata mass is proportional to  $\sqrt{\text{time}}$ . Doubling the enzyme mass results in 1.3-1.5 fold increase in action. *N*-acetylglucosamine (II) is produced in 50% yield in pure cryst. form. Glucosamine (III) is present only in traces. Chitosan, prepd. by treating I with concd. alkali, is attacked quickly by the enzyme, the optimum acidity being  $p_H$  4.4-4.5. The reaction closely follows Schütz's rule. Doubling the enzyme mass gives 1.7 fold increase in hydrolysis. The product does not contain II or III, but is a mixt. of compds. that forms a colorless, amorphous hydrochloride which was sepd. into 2 fractions by extn. with hot alc., a sol. fraction, mol. wt. 540 and an insol. fraction, mol. wt. 630-657. FREDERICK C. HAHN

Distribution of reducing substances between plasma and corpuscles; a comparison of various blood-sugar methods. FREDA K. HERBERT AND JUDA GROEN. *Biochem. J.* 23, 339-51(1929).—With different methods, widely varying results are obtained for the distribution of "sugar" between plasma and corpuscles. The authors suggest that the discrepancies are due to the presence of a non-glucose reducing substance in the corpuscles, which is present in tungstic filtrates, and is either absent in Fe and Zn filtrates, or present in them in smaller quantity. BENJAMIN HARROW

Isolation of a carbohydrate derivative from serum proteins. CLAUDE RIMINGTON. *Biochem. J.* 23, 430-43(1929).—The substance isolated has the compn.  $\text{C}_{13}\text{H}_{20}\text{O}_{10}\text{N}$ ; it shows no reducing properties and no measurable optical activity. The constituent sugars are glucosamine and mannose. BENJAMIN HARROW

Activation of certain oxidase preparations. CAECILIA E. M. PUGH. *Biochem. J.* 23, 456-71(1929).—The authors have confirmed the finding of Bach and Chodat on the apparent activation by peroxidases of a constituent of the *Lactarius* fungi separable from it by 40% alc. This is probably due to an autoxidizable substance. The action of tyrosinase on tyrosine and on *p*-cresol is shown to be autocatalytic. B. H.

The nature of the sugar residue in the hexosemonophosphoric acid of muscle. JOHN PRYDE AND EDWARD T. WATERS. *Biochem. J.* 23, 573-82(1929).—The hexose-phosphoric acid of normal muscle press-juice from rabbit, goat and donkey is a mono-phosphoric acid. The diphosphoric acid, identical with that of yeast fermentation, is only obtained when the fermentative resynthesis using  $\text{NaF}$  is employed. The carbohydrate residue of muscle hexosemonophosphoric acid consists of 90% aldose, identified as *d*-glucose, and 10% ketose. BENJAMIN HARROW

The relation of organic chemistry to biology. GEORGE BARGER. *Chemistry and Industry* 48, 751-7(1929). E. H.

Oxidation-reduction potential of protoplasm. ROBERT CHAMBERS. *Bull. Natl. Research Council* 69, 48-50(1929).—The most reliable  $p_H$  values for living protoplasm, as detd. by microinjection of indicators, are: ameba 17-19, eggs of starfish and sea urchins

21-22. If the egg cells are placed under anaerobic conditions, the level of  $r_H$  drops to a value corresponding to those found by Cannan, Clark and Cohen (C. A. 20, 2779).

Permeability and bioelectrical phenomena. W. J. V. OSTERHOUT. *Bull. Natl. Research Council* 69, 170-228(1929).—A review. W. D. LANGLEY

Viscosity of protoplasm. WM. SEIFRIZ. *Bull. Natl. Research Council* 69, 229-61 (1929).—A review with a bibliography of 142 references. W. D. LANGLEY

X-ray examination of insulin, edestin and hemoglobins. WM. H. GEORGE. *Proc. Leeds Phil. Lit. Soc. Sci.*, Sect. I, Pt. 9, 412-5(1929).—No crystal diffraction effects due to insulin, edestin or hemoglobins of sheep or horse blood were found in powder photographs with soft x-rays (Cu or Fe, K  $\alpha$ ). Laue photographs of methemoglobin were probably due to foreign matter. MARY E. LEAR

Autolysis and phosphagen. G. FALCO AND V. SIRACUSA. *Boll. soc. ital. biol. sper.* 4, 409-10(1929).—During autolysis, the increase in amino acids and phosphoric acid ran parallel but the phosphagen disappeared rather slowly. PETER MASUCCI

Studies in the qualitative reaction of proteins. II. Action of salts in the acetic acid-sodium chloride test. SUN OGATA. *Hokkaido J. Med.* 6, 148-60(1928); cf. C. A. 23, 1147, 1799.—In the AcOH-NaCl test of proteins, the quantity of the NaCl required to cause the pptn. of protein is different with different  $p_H$  values of the soln. Since this fact is attributed to the disson. of proteins. O. tested the similar pptn. reaction caused by other salts, with a soln. of gelatin, to which has been added HCl and  $(NH_4)_2SO_4$ . The quantity of  $(NH_4)_2SO_4$  necessary for pptn. becomes const. when the concn. of HCl is 0.07 N ( $p_H$  2.69). The influence of added salt appears to affect the state of disson. of proteins, and the quantity of acids necessary to cause pptn. by salts is supposed to make the disson. of the protein complete. When  $Na_2HPO_4$  is used, HCl of any concn. fails to ppt. the protein, the pptn. being effected only by the combined use of  $Na_2HPO_4$  and NaCl. In this case the phosphate acts to furnish the H ion and keep the  $p_H$  value of the medium above a certain value. When  $K_4Fe(CN)_6$  is used, part of the salt appears to affect the H ion of the soln. IV. Anion series. *Ibid* 567-76.—O. first examd. the ease of pptn. caused by KCl solns. of various concns. of the serum of a healthy horse from the mixt. contg. it and  $1/6$  of its vol. of  $NH_4Cl$ , finding, as mentioned in earlier work, that the degree of ease of the pptn. is in the reverse order of the lyotrope series, and that with glue, only a few K salts are capable of causing pptn., although the order of the series is the same. In order to exam. the effect of a small quantity of H ions formed by adding ferrocyanide, citrate or tartrate ions to the acid soln. of the serum and  $NH_4Cl$ , the mode of pptn. of the colloid caused by the addn. of the above ions was observed. The glue is pptd. only when the soln. contains HCl of a concn. greater than 0.00125 N and when the HCl is increased, the quantity of ferrocyanide necessary for the glue pptn. becomes larger, the  $p_H$  value of the supernatant clear soln. being always kept at 3.8. Comparing this result with the  $p_H$  curve of the AcONa-HCl soln., O. concludes that the action of ferrocyanide consists in giving the soln. a definite  $p_H$  value. The elec. conductivities of KCl,  $K_4Fe(CN)_6$  and HCl, and some mixts. contg. them, were measured, from which result the disson. const. of the ferrocyanic acid is concluded to lie at  $10^{-4}$ - $10^{-5}$ . The effect of the presence of EtOH upon the pptn. caused by various chlorides and AcOH was also observed; the concn. of the salts necessary to cause pptn. cannot be interpreted as due to the action of the salts upon EtOH. K. SOMEYA

The hydrogen-ion concentration of sea water off the coast of Southern California. E. G. MOBERG. *Proc. 3rd Pan-Pacific Sci. Congr.* 1926, I, 221-8(Publ., 1928).—The  $p_H$  of sea water depends upon the interrelation between alk. salts and  $CO_2$ . Since the amt. of alk. salts is relatively const., changes in  $p_H$  are due chiefly to fluctuations in amt. of  $CO_2$ , so that the  $p_H$  of sea water may be used as an index of  $CO_2$  present. These factors may be influenced by metabolic activity of organisms, by decay of org. materials, by changes in temp. of water or atm. and by changes in  $CO_2$  content of the atm. E. M. SYMMES

The phosphate, silica and fixed nitrogen content of sea water. E. G. MOBERG. *Proc. 3rd Pan-Pacific Sci. Congr.* 1926, I, 229-32(Publ., 1928).—Rapid, sensitive colorimetric methods have been adopted for the study of chem. substances in sea water. E. M. SYMMES

The action of peroxidase on glycerophosphates. J. RAE. *Pharm. J.* 122, 354 (1929).—A current of air was passed through a 5% soln. of Na glycerophosphate (A) for 2 hrs.; no increase was noted in the 0.05% of mineral phosphate (B) it originally contained. Then soln. A was left in contact with (a) 10% N NaOH, (b) 10%  $NH_4SO_4$ , (c) 1% dextrose and (d) 40% cane sugar for 6 months in each case and the quantity of B formed was detd. by the Lizius method (C. A. 15, 3893). With a and c, no increase in B

took place; *b* gave an increase of 0.5%; *d* gave an increase of 0.6%. Much stronger effects were obtained by addn. of solns. of peroxidases. Ten % addn. of an aq. filtered 10% raw potato ext. to *A*, when kept for 2 months (a little  $\text{CHCl}_3$  added for preservation), showed 2.4% increase of *B*. Addn. of 10% mucilage of acacia (*C*) showed even 5% increase after only 14 days; however, with *C* sterilized by 5 hrs. heating at  $110^\circ$ , there was still 1.9% increase of *B* after 2 months. The oxidizing enzymes in cudbear and certain other colorants may be responsible for pptn. often noted in compd. sirup of glycerophosphates.

S. WALDBOTT

Starch, amylase and amylolysis (COLIN) 16. Vital processes and technical methods (WILLSTÄTTER) 13. Dehydration of malic acid (HAHN, *et al.*) 10. Complementary and critical researches on the subject of dissolved and irradiated cholesterol. Role of an antioxidant (ROUSSEAU) 3.

DUBOULOZ, PIERRE: *Les phénomènes de membrane. Essai théorique, avec application à l'étude de la tension artérielle.* Paris: Gaston Doin et Cie. 91 pp. F. 15.

Enzymes. KALLE & Co. A.-G. (Hans Altgelt, inventor). Ger. 479,285, July 4, 1924. See Brit. 251,405 (*C. A.* 21, 1282).

Urease. HENKEL & Cie G. M. B. H. Ger. 478,947, Sept. 16, 1926. A dry, stable, slightly sol. light colored prepn. of urease is obtained from the aq. ext. of soy beans, or other vegetable matter contg. urease, by treating the ext. with a soln. of an alkali salt, such as  $\text{Na}_3\text{PO}_4$ ,  $\text{Na}_2\text{BO}_3$ ,  $\text{Na}_2\text{SO}_4$ , Na citrate, Na lactate,  $\text{AcONa}$ , a mixt. of these, and atomizing in a current of dry air or gas. Cf. *C. A.* 22, 2639.

## B—METHODS AND APPARATUS

STANLEY R. BENEDICT

Staining of glial cells. R. ALTSCHUL. *Atti accad. Lincei* 8, [6], 594-5(1928).—By mordanting nervous tissue with a soln. contg. 2 cc. of HBr and 2 g. of  $\text{NH}_4\text{Br}$  to 100 cc. of water, staining with either methyl violet or Victoria blue, and differentiating with xylene-aniline oil, the glial cells are revealed more certainly and more simply than by Weigert's process.

B. C. A.

Determination of the carbohydrates in animal organs and in blood by characteristic color reactions. I. Color reactions of the carbohydrates and their use in the microchemical determination of different sugars in dilute solution. Z. DISCHE. *Mikrochemie* 7, 33-68(1929).—The soln. (1 vol.) is mixed with 0.1 vol. of 10%  $\alpha$ -naphthol soln. and 8 vols. of concd.  $\text{H}_2\text{SO}_4$  without cooling—a brown color indicates glucuronic acid and a red color glycolaldehyde or a sugar. In the latter case a further portion of the soln. (1 vol.) is heated with 9 vols. of a mixt. of 8 vols. of concd.  $\text{H}_2\text{SO}_4$  and 1 vol. of water for 3 min. in a water-bath, cooled, and treated with 0.2 cc. of a 5%  $\alpha$ -naphthol soln.—a brown color develops in 10 min. if glycolaldehyde or a triose is present and a red color in other cases. If a red color is obtained, a third portion of the original soln. (2 vols.) is heated for 30 min. in a water-bath with 4 vols. of a mixt. of 100 vols. of concd.,  $\text{HCl}$ , 80 vols. of glacial acetic acid, and 20 vols. of a 10% alc. soln. of diphenylamine; pentoses give a brown, hexoses a blue and carbohydrates or thymonucleic acid a violet-red color. To distinguish between glycolaldehyde and trioses the soln. (1 vol.) is mixed with 0.1 vol. of a 10%  $\alpha$ -naphthol soln. and 4 vols. of concd.  $\text{H}_2\text{SO}_4$  without cooling; glycolaldehyde gives a greenish blue and the trioses give a red color. The presence of the latter may be confirmed by mixing 1 vol. of the sugar soln. with 4 vols. of  $\text{H}_2\text{SO}_4$ , cooling, and adding 0.1 vol. of a 10%  $\alpha$ -naphthol soln.; a green color indicates trioses. If the hexose test is pos. 1 vol. of the original soln. is mixed with 0.1 cc. of a 2% alc. soln. of  $\alpha$ -naphthol and 9 vols. of 75 vol.-%  $\text{H}_2\text{SO}_4$ ; a blue color indicates levulose or hexosediphosphoric acid and a red color aldoses. On diln. with water the red soln. becomes colorless and a red ppt. is formed, but the blue soln. is stable. The aldoses are differentiated by repeating the diphenylamine test previously mentioned but heating only for 1.5 min.; galactose produces a violet, mannose a brown and dextrose a blue soln. To distinguish levulose from hexosediphosphoric acid the diphenylamine test is repeated with only a 3-min. heating; the acid gives a violet and levulose a brown color. All the above tests serve to detect the respective compds. when they are present alone in a soln., but it is possible to use the tests for the approx. detn. of levulose, mannose and galactose in the presence of dextrose by indirect analysis.

B. C. A.

Loeffler's methylene-blue. H. J. CONN. *Stain Tech.* 4, 27(1929).—An alc. soln. of methylene blue dild. with  $\text{H}_2\text{O}$  is recommended instead of the standard Loeffler formula.

B. C. A.



**Differentiation of safranine in cytology.** RACHEL HAYNES. *Stain Tech.* 4, 27-8 (1929).—An acid dye such as light green S F yellowish is preferable to HCl for the differentiation of safranine. B. C. A.

**Estimation of sugar and residual nitrogen in the blood.** HANS MELCHER. *Pharm. Zentralhalle* 44, 883-5(1929).—In connection with the discussion of methods for detg. sugar and residual N in the blood, certain practical suggestions are offered and several types of app. illustrated, the use of which is calcd. to simplify the technic usually followed. W. O. E.

**Practical methods for the most important quantitative investigation of blood and urine.** W. BRANDRUP. *Pharm. Ztg.* 74, 961-4(1929).—In the present paper concise practical methods are given for use in the apothecary in the quant. examn. of urine, blood and blood serum, such examn. to be carried out in collaboration with the local physician. W. O. E.

**Detection of acetone-producing substances in the urine.** B. SCHWENKE. *Pharm. Ztg.* 74, 992-4(1929).—The principal substances producing  $\text{Me}_2\text{CO}$  are  $\beta$ -hydroxybutyric acid and acetoacetic acid. An exptl. study of certain methods available for their detection tends to substantiate the findings of Lorber, Fischer and Horkheimer, that Na nitroprusside tests are insufficient for the detection of  $\text{Me}_2\text{CO}$ , but are chiefly useful in detecting acetoacetic acid. In testing for substances yielding  $\text{Me}_2\text{CO}$  the Lieben  $\text{CHI}_3$  reaction should be applied in addn. to the nitroprusside test. If a pos. reaction is obtained, the presence of  $\text{Me}_2\text{CO}$  is assured. The presence of acetoacetic acid should be confirmed by application of the Liplawsky test. W. O. E.

**Staining fats with natural dyes.** A. HADJIOLOFF. *Bull. histol. appl.* 5, 183(1929); *Stain Tech.* 4, 94-5.—Tests were made of the pigments of the carrot, tomato, pepper, orange, pumpkin, beet, red cabbage, cherry and grape as fat stains. The exts. were made by extg. the dried fruits or vegetables in 85% EtOH and allowing them to stand for several days at 37°; this soln. is twice filtered and used for staining fat in adipose tissues. Tomato, pepper and pumpkin gave the best results, being similar to Sudan. Carrot was fair but beets, red cabbage, cherries and grapes gave no fat staining. C. R. FELLERS

**The chromosome and nuclear structure in the living cell and in the fixed cell.** P. MARTENS. *Bull. histol. appl.* 5, 229-52(1928); *Stain Tech.* 4, 95.—The resting nucleus of the living cell appears to be made up of a reticular filamentous structure, with granular embedding at the intersections of the network. A method of studying nuclear structure is by observation during the process of fixation especially with Benda's fluid. The only result of fixation is that visibility of the existing structure is accentuated. No new structure is created by the process. C. R. FELLERS

**A new method of staining fats.** G. DOLFINI. *Bull. histol. appl.* 6, 137(1929); *Stain Tech.* 4, 94.—The method of Galesesco and Bratiano (*Stain Tech.* 4, 52; cf. C. A. 23, 1295) using an alc. ext. of carrots is inferior to fat staining with Sudan and it is useless in identification of different kinds of fat. C. R. FELLERS

**Progress in stain standardization. Safranine.** H. J. CONN. *Stain Tech.* 4, 65-9 (1929); cf. C. A. 23, 403.—Safranine, which has proved satisfactory for cytological staining, is normally also well adapted for bacteriol. or histological staining. The spectrophotometric curve for safranine O has its absorption max. at about 515  $\mu$ . A great variation in speed of staining among different batches of safranine was noted. This variation was not due to differences in ash content but is attributed to other impurities. A dye content of 90% is about the best that can be hoped for in the case of any dye, and even this degree of purity represents an expense that may be perhaps seldom justified. C. R. FELLERS

**Stain solubilities. IV.** W. C. HOLMES. *Stain Tech.* 4, 73-4(1929); cf. C. A. 22, 1170.—Soly. data ( $\text{H}_2\text{O}$  and EtOH) for 28 dyes are expressed as g. of anhyd. dye per 100 cc. of satd. soln. at 26°. Many of the values recorded have reference to the solubilities of various salts of fluorescein and of its halogenated derivs. Salts of erythrosin are less sol. than the corresponding salts of eosin, but salts of phloxin are more sol. than eosin. Salts of rose bengal are more sol. than those of erythrosin. Soly. is decreased by substitution within resorcinol residues of the dye and is decreased more by I than by Br. Substitution in the phthalic anhydride residue increases soly. The solubilities of Na, Mg, Ca and Ba salts of these dyes were found to decrease in the above order. C. R. FELLERS

**The mechanism of staining. The case for the physical theories.** W. C. HOLMES. *Stain Tech.* 4, 75-80(1929).—The chemistry, soln. and adsorption theories of dyeing are discussed. It is held that adsorption is the principal factor in color retention. Adsorption is affected by the chem. nature of the adsorbing and adsorbed substances, and is also influenced by such phys. factors as the surface area (and probably the density) of the

adsorbing medium and the size of the adsorbed particle. Among the reasons given for accepting the adsorption theory of staining are that wool, silk, and animal fiber are amphoteric and in all probability adsorb dyes. Bacteria are not considered to differ in essential particulars from these substances. Metachromasy and differentiation are considered in this connection.

C. R. FELLERS

Smear method for the study of chromosomes. J. M. WEBBER. *Univ. Calif. Pub. in Botany* 14, 345-52 (1929); *Stain Tech.* 4, 96.—Fixing and staining techniques for matured chromosomes, cytokinesis and tetrad cells are described.

C. R. FELLERS

A preliminary note on a color reaction for "693" and its application in the estimation of that compound in the urine. T. C. BOYD AND A. C. ROY. *Indian Med. Gaz.* 64, 382 (1929).—Upon diazotizing diethylamine *p*-aminophenyl stibinate with dil. HCl and HNO<sub>3</sub> soln., and coupling this with  $\alpha$ -naphthol in alk. soln., a fine red color is produced, and the depth of this color is proportional to the concn. of the Sb compd. present.

FREDERICK G. GERMUTH

The methods of Bang for the determination of fatty substances in the blood. W. RADSMÅ. *Geneeskund. Tijdschr. Nederland-Indie* 69, 479-91 (1929).—A critical discussion with a description in detail of Bang's methods as used by R. on samples of blood, including some slight modifications which he recommends to get more accurate results.

J. C. JURRIJENS

Iodine in water, food and urine. H. W. CLARK AND GEORGE O. ADAMS. *Am. J. Pub. Health* 19, 898-900 (1929).—*Detn. of I<sub>2</sub> in urine*: Evap. 2.5-4 l. of urine with 10 g. NaOH to consistency of a thick sirup; transfer to a small iron pan; add 20 g. more of NaOH; heat slowly until fumes cease to come off. Grind the resulting black clinker in a lab. hand mill and let stand overnight in a beaker with about 200 cc. of alc. Decant through a filter, wash the residue by decantation several times with alc.; finally place the residue upon a filter and thoroughly wash with alc. again. Distill off a large part of the alc. of the filtrate; evap. the residue nearly to dryness with 3 g. NaOH in a nickel dish; heat the dish slowly until the org. matter extd. is broken up, the volatile portion driven off and the remainder present as free C. Dissolve, filter, evap. to a small vol. and add 1-2 drops of approx. 0.1 N H<sub>3</sub>AsO<sub>3</sub>. Acidify with H<sub>2</sub>SO<sub>4</sub>, transfer to a separatory funnel and add a few drops of strong H<sub>2</sub>SO<sub>4</sub>, transfer to a separatory funnel and add a few drops of strong H<sub>2</sub>SO<sub>4</sub> satd. with NaNO<sub>2</sub>. Ext. I<sub>2</sub> with purified CCl<sub>4</sub> and det. amt. present by comparison with a standard soln. of I<sub>2</sub> in CCl<sub>4</sub> in a Duboscq colorimeter. This procedure gave check results on duplicate samples and showed an av. recovery of 75% of known amts. of KI added to urine.

J. A. KENNEDY

The use of iodized rape-seed oil (capiodol) for röntgenographic exploration. CHARLES H. FRAZIER. *Ann. Surgery* 89, 801-12 (1929).—The iodized oils have a definite use in the röntgenographic exploration of some of the internal organs. Iodized rape-seed oil (capiodol) has proven a highly satisfactory prepn. It is well tolerated by all types of tissues studied.

FRANCES KRASNOW

The Carpenter form of the Haldane gas-analysis apparatus. Changes made in the apparatus and details regarding its use. THORNE M. CARPENTER, EDWARD L. FOX AND ARTHUR F. SEREQUE. *J. Biol. Chem.* 83, 211-30 (1929); cf. *C. A.* 17, 3685; 20, 3709.—"A description is given of changes in the compensating system of a gas-analysis app. for outdoor and respiratory-chamber air, together with the method of adjustment for adequate compensation, of a modified pipet for K pyrogallate, of an alteration in the combustion unit for CH<sub>4</sub>, of a short method of calibrating the measuring buret, and of an arrangement for operating the motor. Remarks are included on the use of the app. with special reference to dead space in sampling, H<sub>2</sub>O in buret, sp. gr. of KOH soln. and prepn. and storage of K pyrogallate, suitable size of tube for compressed air used for stirring in water jacket, variable at. pressure, and tests for tightness and adequate compensation."

A. P. LOTHROP

The importance of oxidation-reduction processes in biology and the knowledge of the  $r_H$ . RENÉ WOLFF. *Presse méd.* 36, 1225-6 (1928).—A general discussion of oxidation-reduction systems is given, the significance and importance of  $r_H$ , the influence of buffers and the  $p_H$  are explained, and a list of indicators is given.

A. E. MEYER

Colorimetric estimation of glucuronic acid. I. A. OGATA AND T. YAMANOUCHI. *J. Pharm. Soc. Japan* 49, 541-56 (1929).—Colorimetric estn. of glucuronic acid was previously reported by Tollens (*C. A.* 3, 2709). O. and Y.'s method is simple and applicable, especially for the estn. of a very small quantity in aq. soln. The standard soln. was prepd. with mentholglucuronic acid (1 cc. = 1 mg. glucuronic acid), and naphthoresorcinol soln. freshly prepd. from 1,3-dihydroxynaphthalene-2-carboxylic acid was used as reagent. To liberate glucuronic acid from complex glucuronic acid it was boiled with HCl just before estn. Under proper conditions (concn. of HCl, temp. and time of

heating, etc.) colorimetric estn. is best done when the sample soln. contains about 0.5 mg. glucuronic acid in 5 cc. The presence of NaCl does not interfere, but excess H and sugar in aq. soln. influence the final reaction. This is under investigation now.

F. I. NAKAMURA

The Strzyzowski reaction for blood. P. V. OUSTINOFF. *Ann. méd. légale criminol. police sci.* 9, 477-82(1929).—The 2 chief drawbacks of Strzyzowski's reagent are that it does not keep more than 24 hrs., and HI is none too convenient to procure. They have been overcome by substituting  $\text{HIO}_3$  for HI, and the following formulas give good results: (1)  $\text{AcOH}$  1 cc., 25% gum arabic soln. 1 cc., 1%  $\text{HIO}_3$  soln. 3-5 drops; (2)  $\text{AcOH}$  1 cc., 25% gum arabic soln. 1 cc., alc. 1 cc., 1%  $\text{HIO}_3$  3-5 drops; (3)  $\text{AcOH}$  1 cc.,  $\text{H}_2\text{O}$  1 cc., 1%  $\text{HIO}_3$  3-5 drops. The crystals obtained are identical with those obtained with Strzyzowski's original reagent. Addn. of gum arabic facilitates the production of the crystals; it also stabilizes the original reagent for about 2-3 weeks. A. P.-C.

Uric acid and its detection in blood and urine. FISCHER. *Süddeut. Apoth.-Ztg.* 68, 448-50(1928); *Chem. Zentr.* 1928, II, 1468; cf. C. A. 22, 100.—Occurrence and formation of uric acid in the human body are discussed and more detailed information is given concerning the degradation of the nucleoproteins. Hopkins' method as modified by Folin and Shaffer is described for the detn. of uric acid in the urine. For detg. the blood uric acid F. cites Flatow's titrimetric method, which is based on the principle that in the protein-free blood serum the uric acid is oxidized to allantoin by means of  $\text{K}_3\text{Fe}(\text{CN})_6$ . The quantity of  $\text{K}_3\text{Fe}(\text{CN})_6$  used is estd. by titrating back with Na indigosulfate. The blue indigo soln. is rendered yellow or colorless by  $\text{K}_3\text{Fe}(\text{CN})_6$ . G. S.

Respiratory tests for determining the rate of oxygen metabolism. ALBERT SCHNEIDER. *J. Am. Pharm. Assoc.* 18, 105(1929). L. E. WARREN

A simple spectroscopic measure of tissue metabolism. ALBERT SCHNEIDER. *J. Am. Pharm. Assoc.* 18, 106(1929). L. E. WARREN

HADEN, RUSSELL L.: *Clinical Laboratory Methods*. St. Louis: C. V. Mosby. 317 pp. \$5.

LUCK, JAMES M.: *Quantitative Analysis of Blood, Urine and Milk*. Stanford Univ., Calif.: Stanford Univ. Press. 204 pp. \$2.

## C—BACTERIOLOGY

CHARLES B. MORREY

Serum-egg-tellurite medium for culture and demonstration of *B. diphtheriae*. M. PERGOLA. *Boll. ist. sieroterap. milanese* 7, 585-98(1928); *Stain Tech.* 4, 96.—A technic is described by which the Babes-Ernst polar or metachromatic granules are black to dark blue while the bacterial bodies are light blue. C. R. FELLERS

A note on the Gram stain. ALEXANDER ZEISSIG. *Stain Tech.* 4, 91-2(1929).—A modification of the Gram stain in which I-EtOH is substituted for 95% EtOH as a decolorizing agent is particularly useful in staining Gram-neg. organisms in tissues and also for smears. C. R. FELLERS

In vitro studies of the nature of Besredka antivirus. H. ALDERSHOFF. *Centr. Bakt. Parasitenk.*, I Abt., 112, 273-81(1929).—The growth-inhibiting factor of Besredka antivirus is non-sp. It is not the result of bacterial growth as filtered bouillon has the same inhibiting effect. The strength is proportional to the no. of filtrations. No difference was found between this factor in inoculated and uninoculated bouillon; it is thermostable in both cases. The inhibition seems to be due to changes in the proteins of the bouillon. JOHN T. MYERS

The nature of antivirus. B. G. MATVEYEVSKII. *Centr. Bakt. Parasitenk.*, I Abt., 112, 464-9(1929).—Staphylococci and streptococci will grow in Besredka filtrates after the addn. of carbohydrates or meat infusion, but not of peptone or ascites. Dln. with isotonic NaCl soln. decreases the inhibitory power, but restoration of the original pH increases it. The important factor in such growth inhibition is the exhaustion of some dynamic food factor. JOHN T. MYERS

Two-part dish for cultivating bacteria with exclusion of oxygen. M. WAFIK ZAHER. *Ger.* 479,304, July 14, 1926.

## D—BOTANY

THOMAS G. PHILLIPS

L-Asparagine in the fresh flowers of *Ulex europæus*. M. BRIDEL. *Bull. soc. chim. biol.* 10, 1378-9(1928).—L-Asparagine (7.7 g. from 25 kg. of fresh flowers) is obtained from the mother liquor from the prepn. of ulexoside (C. A. 21, 937). B. C. A.

The  $p_H$  of the cell sap of flowers. B. H. BUXTON AND F. V. DARBISHIRE. *J. Roy. Hort. Soc.* 54, 203-13 (1929).—Colorimetric detns. have been made of the variation with time of the  $p_H$  of aq. solns. of dried petals from various flowers. B. C. A.

Assimilation of nutrients by the rice plant. D. L. SAHASRABUDDHE. Dept. Agr. Bombay, *Bull.* 154, 17 pp. (1928).—During the seedling stage of the rice plant the percentages of  $Et_2O$  ext., albuminoids, N,  $K_2O$  and  $P_2O_5$  decrease with age, while sol. carbohydrates and woody fiber increase, and  $CaO$  remains fairly const. The % of water decreases slightly. After the seedlings are transplanted the % of water continues to decrease and there is a sudden drop at the time of full ripening. The percentages of  $Et_2O$  ext. and albuminoids continue to decrease while the sol. carbohydrates increase and the woody fiber remains fairly const. N and  $P_2O_5$  decrease while  $K_2O$  and  $CaO$  remain fairly const. The rice plant continues to assimilate its constituents up to the full ripening period and does not stop when the flowering period begins. When the plant comes to flowering, its powers of assimilation are increased and max. assimilation occurs at the "milk" stage. In fertilizing rice with  $(NH_4)_2SO_4$  the fertilizer should be applied in 3 doses—namely, at the time of transplanting, just before flowering and just before the "milk" stage. The rice crop removes an av. of 28 lb. N, 20 lb.  $P_2O_5$ , 60 lb.  $K_2O$  and 28 lb.  $CaO$  per acre. K. D. JACOB

An apple disease occurring in the Elgin district. C. J. HOPKINS. Dept. Agr. Union S. Africa, *Sci. Bull.* 61, 17 pp. (1927).—The disease is confined to the bark of apple trees and appears to be the same as that described by Rose (*Phytopathology* 7, (1917); cf. C. A. 13, 857) and Rhoads (*Phytopathology* 14, (1924)). The organism grows on nutrient agar, glycerol agar, gelatin and bouillon cultures, at acidities varying from -10 to +20 on Fuller's scale. It produces a slight amt. of  $NH_3$  when grown on nutrient broth, but does not reduce nitrates. A trace of indole was produced in peptone water in 10 days. No strains of the organism produced acid or gas in solns. of the common sugars, but one strain produced acid in galactose and mannose and one produced acid in arabinose soln. The disease was best controlled by treating the affected parts of the tree with aq. solns. of  $ZnCl_2$  (1:100) contg. a few drops of  $HCl$ . K. D. J.

Regulation of the reaction of an external solution by plants. D. A. SABININ AND E. G. MININA. *Bull. inst. recherches biol. univ. Perm* (Russia) 6, No. 4, 165-90 (English 190-2) (1928).—The theory that plants having pronounced ability to assimilate  $Ca_3(PO_4)_2$  come to equil. with the nutrient soln. at more acid reactions was tested and not confirmed. The assumption that the difference in compn. of root secretions may account for the different assimilating power was also tested. Plants which assimilate  $Ca_3(PO_4)_2$  readily secrete more org. acids at the zone of  $p_H$  equil. than the non-assimilating plants. H. R. KRAYBILL

Physiological meaning of guttation. V. S. SHARDAKOV. *Bull. inst. recherches biol. univ. Perm* (Russia) 6, No. 4, 193-207 (In English 207-8) (1928).—The concn. of ions in the sap from hydathodes is directly dependent upon the salt concn. of the substratum and changes with time. The decline in concn. of bleeding sap with the distance it moves through the tissue indicates a role of guttation in plant nutrition. A marked increase in the concn. of bleeding sap after removal of hydathodes indicates an absorption of ions from the bleeding sap when it passes through the tissues. H. R. KRAYBILL

Assimilation of phosphoric acid by barley in a water solution. O. TUEVA. *Bull. inst. recherches biol. univ. Perm* (Russia) 6, No. 6, 261-75 (In English 275-6) (1929).—Barley plants of pure line were grown in Knop's soln. with different amts. of phosphate. With high concn. of phosphate absorption of phosphate occurred to the end of the vegetative period and the migration of phosphate from vegetative to reproductive organs did not occur. With temporary restriction of quantity of phosphate, P migrated from vegetative to reproductive organs. The quantity of P absorbed up to 5 weeks is enough for normal development of plants. A further supply of P reduces yield of crop. H. R. KRAYBILL

Inorganic combinations of nitrogen in the sap of plants. I. E. BIKOV. *Bull. inst. recherches biol. univ. Perm* (Russia) 6, No. 6, 277-90 (In English 290) (1929).—The quantity of nitrate in corn decreases when transferred to a soln. free of nitrate or to  $H_2O$ . The quantity of ammonia N and nitrate in the sap of corn grown in solns. of  $NH_4$ , nitrate and nitrite salts resembles that when grown in soil. Nitrite is transformed into other forms more rapidly and nitrate less rapidly than the other forms of mineral N. H. R. KRAYBILL

Antagonistic action of calcium and magnesium ions upon seeded peas. FR. BOLŠLOVSKÝ. *Zeměd. Archiv.* 9, 493 (1928); *Listy Cukrovar. Rozhledy* 47, 6.—The legumes absorb the most Ca of all seeded plants. Peas absorb Ca during the whole vegetative period; immediately after sprouting Ca is necessary; the quantity consumed

increases and becomes maximal during the formation of stalks and leaves; after the formation of the nodules, the consumption of Ca decreases. During the early development of peas, the absorption of Mg is low. After the formation of the nodules, the consumption of Mg increases and becomes greater than the intake of Ca at this stage. It is necessary to have a ratio  $\text{Ca/Mg} = \frac{2}{1}$  for in this combination the assimilation of  $\text{P}_2\text{O}_5$  is greater than when Ca is in excess. Further expts. showed that Ca and Mg are replaceable; peas without Ca tended to replace the Ca with Mg, which is an antagonist, according to the percentage in ash analysis. Physiologically Ca and Mg cannot be replaced. The peas tend to replace a nutritive element by a related antagonist when the element is deficient. An excess of antagonistic elements reacts unfavorably. The peas withstand an excessive quantity of Ca and Mg, but during a deficiency of either one, an excess of Ca or Mg has a detrimental effect upon the growth of peas. A lack of Mg effects to a large measure the yield of pea grains—it lowers the yield more than a lack of Ca. The detrimental effects of Ca and Mg are compensatory when both are present, and it is only when both elements are present that their physiological functions are effective and a good yield of peas is assured under normal conditions. F. M.

The influence of humidity upon sugar concentration in the nectar of various plants. O. W. PARK. *J. Econ. Entomol.* 22, 504-44(1929); cf. *C. A.* 23, 1180.—The sugar concn. of flower nectar varies inversely with the relative humidity of the air, the relation being much closer in some types of flowers than in others. Sugar concn. of nectar was detd. with an Abbé refractometer. Bibliography. C. H. RICHARDSON

Damage to oats by salt constituents of the soil. R. SCHERPE. *Arbb. biol. Reichsanst. Land- u. Forstwirtschaft.* 16, 169-96; *Chem. Zentr.* 1928, II, 1223.—In order to eliminate absorption by the roots, the expts. with  $\text{Na}_2\text{CO}_3$ ,  $\text{K}_2\text{CO}_3$ ,  $\text{CaH}_2(\text{CO}_3)_2$ ,  $\text{NaCl}$ ,  $\text{KCl}$  and  $\text{MgSO}_4$  were conducted on oat stalks without roots. The salts caused discoloration (which was probably due to formation of anthocyanin) with subsequent withering and drying up. Alkali carbonates and  $\text{MgSO}_4$  augmented the transpiration considerably. Weak concns. aided the growth of the roots.  $\text{CaH}_2(\text{CO}_3)_2$  in equal concn. caused more harm than did alkali bicarbonate. In all cases there was a rapid accumulation of salt in the leaves. G. SCHWOCH

Effect of freezing on the catalase activity of apple fruits. D. B. CARRICK. *Cornell Agr. Expt. Sta. Mem.* 122, 18 pp.(1929).—The vascular tissues of the McIntosh apple gave an increased catalase activity when tested immediately after 3, 6 and 9 hrs. of freezing at an air temp. of  $7.5^\circ$ . The vascular tissue had a greater catalase activity than the parenchyma. However, the catalase in both these tissues was greatly reduced after 20 hrs. of freezing. Four days after freezing the catalase in both the pulp and the vascular tissues was somewhat higher in the 6 and 12 hrs. exposures than in the controls, but lower in the 3 and 9 hrs. treatments. After 20 hrs. of freezing the activity was almost extinct in each instance. Detns. on the vascular tissue of other McIntosh fruits 20 hrs. after freezing showed a decrease in catalase activity in the 3, 6 and 9 hrs. treatments. The catalase measurements on the vascular tissue of Baldwin fruits were generally unsatisfactory. Immediately after freezing the 6 and 24 hrs. treatments and possibly the 9 hrs. exposure, showed a slight gain in catalase activity. The 3 hrs. exposure gave results similar to those in the normal fruit. Three days after freezing, the 6 and 9 hrs. freezing induced a slight increase of catalase in the tissue of the Baldwin fruits, while the apples frozen for 3 and for 24 hrs. did not vary from the control. Seven days after freezing, the Baldwin fruits in the 3 and 6 hrs. treatments gained slightly in catalase activity; the tissue frozen for 9 hrs. was somewhat retarded; and the fruits in the 12 and 24 hrs. exposures were similar to the control. J. J. SKINNER

Chemical composition of marine plankton. E. G. MOBERG. *Proc. 3rd Pan-Pacific Sci. Cong.* 1926, I, 233-6(Publ. 1928).—Biochem. microchem. methods of detg. protein and fat avoid many difficulties. E. M. SYMMES

Insectivorous plants. GORDON PERKINS. *Pharm. J.* 122, 74-6(1929).—An address is given on the environment and the insect-devouring mechanism of British species of *Drosera* (Sun-dew), *Pinguicula* (butterwort) and *Utricularia* (bladderwort), and foreign species of *Nepenthes* (pitcher plant) and *Sarracenia* (side-saddle plant). In *Drosera*, the glandular tentacles exude a glairy matter contg. a weak acid and an enzyme converting the proteins of the captured insect's body into peptones which are absorbed by the leaf. In *Pinguicula*, the enzyme secreted is capable of digesting even cartilage. In *Nepenthes* (Ceylon), the pitchers are partly filled with  $\text{H}_2\text{O}$  contg. malic acid, a little citric acid,  $\text{KCl}$  and salts of Na, Ca and Mg; it usually swarms with bacteria which cause decompn. of the body of the drowned insect; the sol. products are absorbed. S. W.

The crystal habit and form of calcium oxalate as a species characteristic. P. JACCARD AND A. FREY. *Naturforsch. Ges. Zurich (Festschrift Hans Schinz)* 73, 127-61

(1928).—In the bulb scales of onions (*Allium* species) Ca oxalate crystallizes both as the monohydrate and the trihydrate, and in forms which are characteristic of the species. Ten types are recognized: (a) the trihydrate in various forms of prisms and bi-pyramids (*A. cepa*, *sativum*, *ursinum*, *shoenoprasum*, *oleraceum*); (b) special groupings of trihydrate crystals (*A. sphaerocephalum*); (c) the mono- and trihydrate appearing together (*A. montanum*, *ursinum*); (d) the monohydrate alone in the form of crystal sand (*A. globosum*); (e) no crystals of Ca oxalate (*A. victorialis*). J. J. WILLAMAN

Studies on the growth of root hairs in solutions. The  $p_H$  molar-rate relation for *Brassica oleracea* in calcium sulfate. WANDA K. FARR. *Proc. Nat. Acad. Sci.* 15, 464-70(1929); cf. *C. A.* 22, 1793, 3904.—A study of the rate of elongation of root hairs of *Brassica oleracea* has been made in solns. of  $CaSO_4$  in concn. from 0.000448 to 0.0140 *M*. Each salt concn. was studied over the  $p_H$  range from 2.5 to 12.0. The results are presented in 3-dimensional models. The typical curve was trimodal, with 2 maxima on the alk. and 1 on the acid side. In consideration of the simple nature of the solution, growth was very rapid. These results being compared with those previously, the growth effect of the anions is  $OH > SO_4 > Cl_2 > NO_3$ , with the Ca cation const. J. J. WILLAMAN

The nature of the carbohydrate found in the Jerusalem artichoke (THAYSAN, *et al.*) 12. Oil content of sunflower seeds and factors controlling it (USPENSKII) 27. Constituents of the bark of the peach tree (SHINODA, UYEDA) 10.

## E—NUTRITION

PHILIP B. HAWK

Vitamins. L. SCOTTI FOGLIENI. *Arch. fisiol.* 26, 83-153(1928).—In absence of air, vitamins A, B and C withstand exposure to 120-134° without loss of activity. Vitamin-B consists of 2 components which separately have only a small and transient action; one gives Folin's reaction, is non-volatile and has no effect on yeast growth, while the other gives Folin's reaction, is largely volatile between 120° and 134° and stimulates the development of yeast. Similarly, vitamin C appears to consist of 2 substances; one is non-volatile, gives Bezssonoff's test and alone has a healing effect on acute, but not chronic, scurvy, while the other is volatile, fails to respond to Bezssonoff's test and has no antiscorbutic action. In both cases the substances together exert a strong effect. When a soln. contg. vitamin C is made slightly alk. with NaOH and heated, the vitamin is rapidly inactivated. B. C. A.

Experimental black tongue and the black-tongue preventive in yeast. J. GOLDBERGER, G. A. WHEELER, R. D. LILLIE AND L. M. ROGERS. *U. S. Public Health Repts.* 43, 657-94(1928).—Expts. indicate that black tongue in dogs is due to a dietary deficiency capable of correction by a preventive present in yeast. This preventive, which can be distinguished from the antineuritic factor, shows considerable heat resistance, and is probably identical with the anti-pellagra vitamin. B. C. A.

Fructosuria. P. A. HEERES AND HERMAN VOS. *Arch. Internal Med.* 44, 47-64 (1929).—Observations on a case of fructosuria are reported in detail. Fructosuria disappeared at once if food free from fructose was eaten. Administration of fructose led to rise in blood sugar due almost entirely to increase in fructose. About 14% of the amt. of fructose given was excreted in the urine, regardless of the size of the dose or whether the dose was divided. The results by mouth and intravenously were the same. The fructosuria caused by rectal administration was more severe. When given in combination with other sugars more fructose was excreted. The metabolism of dextrose, galactose, maltose and mannose was not disturbed. Sorbose when fed was excreted in large quantities. Ingestion of fructose caused no change in respiratory quotient. Insulin had no effect on fructosuria. J. B. BROWN

Vitamin-D and iso-ergosterol. A. VAN WIJK AND E. H. REERINK. *Nature* 122, 648(1928).—Absorption spectra of ergosterol and iso-ergosterol were studied. The former has two types of absorption bands, connected with different parts of the mol. By irradiation with formation of vitamin D the first system makes way for the characteristic band of iso-ergosterol, suggesting that the corresponding part of the mol. undergoes the same change in constitution by irradiation as by chem. transformation. Vitamin D and iso-ergosterol behave similarly. J. B. BROWN

The effect on digestion and assimilation of including bananas in the mixed diet of some children over five years of age. ALAN BROWN AND ANGELIA M. COURTNEY. *Can. Med. Assoc. J.* 21, 37-42(1929).—The chief effects noted on a diet contg. bananas, compared with one without this ingredient, were a somewhat smaller output of urine and a greater output of feces (but never diarrhea), and a distinctly more alk. urine (suggesting that the banana may be of value for addn. to diets in acidic conditions). A. T. C.

The carbon: nitrogen (C/N) ratio in the urine of rats deprived of one or both factors of the vitamin B complex. STANISLAUS K. KON. *J. Nutrition* 1, 467-73 (1929).—Thirty-six female rats were used. The animals, which were kept on a diet deficient in the heat-stable component of the vitamin-B complex, show an increased C/N ratio in the urine as compared with individual controls receiving equiv. amts. of a complete diet. The difference is less marked for animals deprived of the whole vitamin-B complex and is negligible in rats receiving autoclaved yeast. The hypothesis is entertained that the heat-stable factor is in some way linked with the metabolic processes of the body. It is not apparent that this is the case with the heat-labile moiety of the vitamin-B complex. The nature of the metabolic disorder following withdrawal of the vitamin-B complex is unknown but the carbonaceous bodies excreted in the urine do not appear to belong to the class of intermediate products of carbohydrate breakdown. The literature is fully reviewed. C. R. FELLERS

The measurement of the basal heat production of pigeons. I. Instrumental technic. FRANCIS G. BENEDICT AND OSCAR RIDDLE. *J. Nutrition* 1, 475-95(1929).—Various types of app. are described in sufficient detail to permit duplication. A bibliography of 44 references is given. II. Physiological technic. *Ibid* 497-536.—The app. and technic are described. Prolonged fasting results in a distinct increase of the metabolism in both the pigeon and the dove. Immature but full-grown doves and pigeons have somewhat higher rates of heat production than birds at older ages, probably a true age effect. Further expts. using the technic and app. here described are being conducted. C. R. F.

Vitamin requirements of nursing young. VII. The production of uncomplicated vitamin B deficiency in the nursing young of the albino rat. BARNETT SURE AND MARGARET E. SMITH. *J. Nutrition* 1, 537-40(1929); *C. A.* 23, 1159, 3491.—A biol. technic is described. A ration furnishing as much as 10% autoclaved yeast must contain sufficient undestroyed vitamin B to keep the nurslings that partake of the maternal diet at maintenance for a considerable length of time. The technic is varied to produce the various desired phases of the avitaminosis in nursing young in order to study the biochem. changes in the blood and tissues. The pathological lesions of uncomplicated avitaminosis are severe hemorrhages in the vertebral column, hypertrophy of the heart, particularly the right auricle, liver atrophy and capillary congestion. All the animals showed either progressive hypoglycemia or an accentuated form in the premortal state. Constipation was present. The liver showed a marked reduction in glycogen content. Anhydremia, assocd. with disturbance in hematopoietic function, has also been found in polyneuritic nursing young. C. R. FELLERS

What place have aluminum, copper, manganese and zinc in normal nutrition? MARY S. ROSE. *J. Nutrition* 1, 541-54(1929).—A review bringing our knowledge of the role of metals in nutrition up to date. C. R. FELLERS

The effect of drying and of sulfur dioxide upon the antiscorbutic property of fruits. AGNES F. MORGAN AND ANNA FIELD. *J. Biol. Chem.* 82, 579-86(1929).—Sulfured peach products retained their full antiscorbutic vitamin content while unsulfured, sun-dried or dehydrated peaches lost their vitamin C. ARTHUR GROLLMAN

Further progress towards the isolation of the antineuritic vitamin (vitamin B) from brewers' yeast. ATHERTON SEIDELL. *J. Biol. Chem.* 82, 633-40(1929).—The antineuritic concentrate previously prepd. was further purified by benzoylation in alk. soln. and extn. with  $\text{CHCl}_3$ . Doses contg. 0.15 mg of N protected pigeons against loss in wt. ARTHUR GROLLMAN

Vitamin D and fecal reaction. A. L. BACHARACH AND H. JEPHCOTT. *J. Biol. Chem.* 82, 751-8(1929).—The assay of vitamin D, based on an examn. of the fecal  $\text{pH}$  of rats on a rachitogenic diet, was found to be useful, provided certain exptl. conditions were observed. ARTHUR GROLLMAN

Sparing action of fat on the antineuritic vitamin B. HERBERT M. EVANS AND SAMUEL LEPKOVSKY. *J. Biol. Chem.* 83, 269-87(1929); cf. *C. A.* 23, 422.—Natural fats have a sparing action on the antineuritic vitamin B. ARTHUR GROLLMAN

A note on the creatine-creatinine excretion during fasting. SERGIUS MORGULIS. *J. Biol. Chem.* 83, 299-310(1929).—The "creatinine-creatinine crossing" is not necessarily a *pre mortem* phenomenon but is rather a peculiarity of the fasting metabolism. The creatinine coeff. is very const. even during a long fast and is not materially different from that found during feeding. The expts. indicate the synthesis of creatine during inanition and its retention during refeeding following a long fast. ARTHUR GROLLMAN

The effect of  $\text{pH}$  control in the autoclaving of yeast with respect to the vitamin B factors. ROBERT R. WILLIAMS, ROBERT E. WATERMAN AND SAMUEL GURIN. *J. Biol. Chem.* 83, 321-30(1929).—The  $\text{pH}$  of yeast is a factor in detg. the efficiency of the de-

struction of the B<sub>1</sub> factor by autoclaving. A vitamin-B<sub>1</sub>-free autoclaved yeast could not be obtained without great loss of vitamin B<sub>2</sub>. Alkaline autoclaving destroys a very large part of the B<sub>2</sub> factor.

ARTHUR GROLLMAN

The effect of avitaminosis on hematopoietic function. I. Vitamin A deficiency. BARNETT SURE, M. C. KIK AND DOROTHY J. WALKER. *J. Biol. Chem.* 83, 375-85 (1929).—In the ophthalmic stage of vitamin-A deficiency, the blood picture is affected by anhydremia. In the preophthalmic stage there is a suggestion of an anemia. II. Vitamin B deficiency. *Ibid* 387-400.—Vitamin-B deficiency leads to a loss of serum proteins, marked hematopoietic disturbances, slight edema and anhydremia. III. Vitamin E deficiency. *Ibid* 401-8.—Vitamin E has no influence on hematopoietic function of females during the period of resorption of the fetus.

ARTHUR GROLLMAN

Comparison of biological and colorimetric assays for vitamin A as applied to fish oils. EARL R. NORRIS AND IRVIN S. DANIELSON. *J. Biol. Chem.* 83, 469-75 (1929).—The blue color produced by fish oil and SbCl<sub>3</sub> is not proportional to the amt. of oil used. The authors claim that the color test checks within reasonable limits with the biol. assay.

ARTHUR GROLLMAN

The vitamin-C content of commercially pasteurized milk. Antiscorbutic potency of raw cow milk and the effects of heating. MASATARO MIURA. *Bull. Inst. Phys. Chem. Research (Japan)* 8, 502-5 (1929); *Abstract sect. 2*, 59.—Autoclaved milk, as used in scorbutic basal rations, contains vitamin C, sometimes in non-negligible quantities. Feeding expts. show that 40 cc. of milk so treated supplies about one-half of the daily antiscorbutic requirement for guinea pigs. Commercially pasteurized milk contains vitamin C in larger amts. than does autoclaved milk. Raw milk contains still more of that vitamin.

ALBERT L. HENNE

Effects of the temperature of water applied for the infusion of Japanese green tea, upon its antiscorbutic potency. MASATARO MIURA. *Bull. Inst. Phys. Chem. Research (Japan)* 8, 506-9 (1929); *Abstract sect. 2*, 59-61.—Infusions of Japanese green tea were made with water at various temps. The infusions were forcibly fed to guinea pigs, with a little sugar and pasteurized milk. Brewing the tea at 70-5° for 5 min. destroyed about 74% of its antiscorbutic properties. The properties of infusions made at higher temps. varied greatly, depending on their treatment before feeding. If the infusion was used immediately, it showed about 33% of the antiscorbutic properties present in the tea. A method of making infusions is proposed by which the antiscorbutic properties are not lost after standing at room temp. for 2 hrs.

ALBERT L. HENNE

Report of the physiological chemist. A. VISWANATHA IYER. *Agr. Research Inst., Pusa, Bull. Sci. Repts.* 1927-28, 124-31 (1928).—The effect of the type of food on the excretion of hippuric acid and urea by cattle was investigated.

K. D. JACOB

The effect of summer grazing on the composition of milk. R. O. DAVIES AND A. J. PUGH. *Welsh J. Agr.* 5, 109-16 (1929).—When cows are on a high level of nutrition immediately before grass and are turned to a sparse pasture of poor quality there is a diminution in fat secretion, while the concn. of casein and inorg. P remains const. When the animals are on a low level of nutrition before grazing and are given enough pasture of good quality, an increase in fat secretion takes place, accompanied by a rise in casein and inorg. P concn. The investigations are being continued to obtain sufficient exptl. data to define the relationship which exists between the change in total amt. of fat secretion and the change in the P contg. compds. at the commencement of summer grazing.

K. D. JACOB

The therapy of rickets. ETHEL BROWNING. *Am. Med.* 35, 377-80 (1929).—General discussion centered about vitamin D, irradiated ergosterol, ultra-violet radiation and hypervitaminosis.

FRANCES KRASNOW

The behavior of nucleoprotamine and its components in animal metabolism. HANS HENSCHEL. *Z. Biol.* 88, 594-603 (1929).—The ratio of the N:P in the dog is dependent on the ratio of these substances contained in the diet. The nucleic acid of herring sperm has a greater influence on the N/P<sub>2</sub>O<sub>5</sub> quotient than the protamine. The P<sub>2</sub>O<sub>5</sub>:uric acid is const., approaching 1:1 entirely independent of the diet. This is especially significant in the dog since most of the uric acid is metabolized to allantoin.

FRANCES KRASNOW

Purine metabolism. II. The effect of the ingestion of glycine on the excretion of endogenous uric acid. A. A. CHRISTMAN AND E. C. MOSIER. *J. Biol. Chem.* 83, 11-9 (1929); cf. *C. A.* 22, 459.—The ingestion of glycine by a fasting man is followed by an increased hourly excretion of uric acid. It begins during the 1st hr. and continues for the following 2 hrs. The concn. of amino acids in the urine immediately following the ingestion of 10 g. of glycine is 5-6 times that for the control periods. The method of Benedict and Franke for the direct detn. of uric acid gives much too low results for urines



contg. high concns. of amino acids and the failure of Zwarenstein (*C. A.* 22, 2598) to obtain pos. results under similar exptl. conditions was probably due to the use of this method. The results confirm those of Lewis, Dunn and Doisy (*C. A.* 12, 2352).

A. P. LOTHROP

**Chemical investigations of embryonic metabolism. III. A study of the nitrogen distribution in the developing hen's egg by the modified Van Slyke procedure.** H. O. CALVERY. *J. Biol. Chem.* 83, 231-41(1929); cf. *C. A.*, 22, 2970.—“A complete study has been made of the N distribution in the developing hen's egg (from white Leghorn hens on a const. diet) throughout the entire incubation period of 21 days. The large no. of eggs used (5 each day) and the study of the daily changes that occur throughout the whole period make this a much more extensive series of data than any previously reported. There are no distinct changes in the acid melanin, amide or cystine N. In the fraction pptd. by phosphotungstic acid there is a small increase in the total amino and non-amino N. There is a decrease of 3% in the total N of the filtrate, but the most decided change that occurs is the increase in the non-amino N of the filtrate from about 2% to a value above 6%, with a corresponding decrease in the amino N. The arginine N presents an interesting curve with a fall in the middle and a much more evident rise at the end of the incubation period. The data show a tendency for the histidine N to decrease, but the daily fluctuations are such that no definite conclusion is justified. There is a slight increase indicated for lysine N. It should be emphasized that the changes in arginine, histidine and lysine represented by the data obtained by this method may not be an indication of the actual changes which occur. It should be kept in mind that the material from the whole egg obtained by the procedure described is not pure protein and may contain many interfering substances which would be pptd. by phosphotungstic acid. A further investigation of this fraction will be reported later.” A bibliography of 34 references is included.

A. P. LOTHROP

**Iron in nutrition. VIII. The ineffectiveness of high doses of iron in curing anemia in the rat.** J. WADDELL, H. STEENBOCK AND E. B. HART. *J. Biol. Chem.* 83, 243-50(1929); cf. *C. A.* 22, 3199.—“A pure Fe salt, namely,  $\text{FeCl}_3$ , when fed at very high levels did not serve to correct the anemia induced in young rats by a milk diet. So-called pure Fe salts prepd. from standard Fe wire, when fed at sufficiently high levels, did cure this anemia unless they were freed from traces of Cu by treatment with  $\text{H}_2\text{S}$ . These results may serve in some measure to explain the many and conflicting reports in the literature with regard to the effect of Fe in curing or preventing various exptl. and clinical anemias.” **IX. Further proof that the anemia produced on diets of whole milk and iron is due to a deficiency of copper.** J. WADDELL, H. STEENBOCK, C. A. ELVEHJEM AND E. B. HART. *Ibid* 251-60.—“The supplementing of a basal diet of whole milk and Fe with several liver preps., with  $\text{H}_2\text{S}$  fractions of the acid exts. of the ashes of 2 of them, and with Cu as a soln. of  $\text{CuSO}_4$ , all on the same levels of Cu intake, has shown that all serve equally well to cure the nutritional anemia produced by the basal diet. This is additional and convincing proof that the deficiency of this basal diet is inorg. in nature and that this inorg. deficiency is Cu only.”

A. P. LOTHROP

**The relation of rate of growth in infants to diet.** AMY L. DANIELS, MARY K. HUTTON, GENEVIEVE STEARNS AND LUCEA M. HEJINIAN. *Am. J. Diseases Children* 37, 1177-86(1929).—Infants receiving diets of modified cow milk and cod-liver oil show a greater gain in wt. and eliminate larger amts. of urinary creatinine than infants receiving the same diet without cod-liver oil. The accepted standards of growth for infants may be too low.

E. R. MAIN

**Comparative studies of meat extracts and vitamin-containing yeast extracts with special reference to their biochemical, bacteriological and serological behavior.** F. REMY. *Arch. Hyg.* 101, 27-38(1929).—The meat exts. examd. showed no vitamin-B potency; that of the yeast exts. was high. The yeast exts. contained more org. P, lecithin P and tryptophan, but less org. S than the meat exts. The addn. of either prepn. to an ordinary agar medium permitted the growth of strains of *Streptococcus viridans* and meningococcus, but appeared to inhibit the growth of strains of gonococcus, influenza bacillus and pneumococcus. The yeast protein appeared to be denatured during the prepn. of the ext., since its antigenic properties were lost. The color reaction of Jendrassik for testing for the presence of vitamin B appeared to be non-specific.

E. R. MAIN

**The action of irradiated ergosterol (Vigantol) and the relation of the changes produced to arteriosclerosis.** HELENE HERZENBERG. *Beitr. path. Anat.* 82, 27-56(1929).—The administration of large quantities of irradiated ergosterol to rats results in the production of a necrosis in the smooth and transversely striated musculature and a deposition of Ca salts in the necrotic areas, in the heart muscle and in the elastic muscle

fibers. The changes appear to have no similarity to those occurring in arteriosclerosis.

E. R. MAIN

**Nutritional anemia in infancy. A deficiency disease.** LEWIS W. HILL. *New Engl. J. Med.* 201, 261-5(1929).—The nutritional anemia observed in infants between the ages of 6 months and 2 yrs. appears to be caused by a dietary deficiency of Fe and the pigments essential to the synthesis of hemoglobin. An increase in the hemoglobin content of the blood of anemic infants is produced most rapidly by the addn. of both Fe and liver to the diet, although either Fe or liver alone may sometimes be effective.

E. R. MAIN

**Studies on the metabolic action of lecithin and cholesterol.** ALFONSO CRUTO. *Biochim. terap. sper.* 16, 175-88(1929).—A comparison was made of the variations produced in the metabolism of rabbits by injections of 5% emulsions of lecithin and of 5% lecithin plus 4% cholesterol esters (oleate and palmitate). The injection of lecithin alone diminished considerably the amt. of glycogen in the liver and muscles. The addn. of cholesterol esters to the lecithin decreased still further the amt. of glycogen but increased markedly the wt. of the animals. The liver of the animals which had been injected with lecithin and cholesterol esters showed a decrease in neutral fats. Conclusion: Cholesterol retards the catabolic functions of lecithin without diminishing its anabolic action. Data are also given showing the variations produced in the lipid content of the blood, spleen and suprarenals.

PETER MASUCCI

**The action of lecithin and cholesterol esters on protein metabolism.** VITTORIO PIOVANO. *Biochim. terap. sper.* 16, 189-95(1929).—The injection into rabbits over a period of 33 days of lecithin alone (2.5 g.) produced an increase in the elimination of creatinine and a decrease in the elimination of urea. The injection of the same amt. of lecithin plus 2 g. cholesterol esters produced exactly the opposite effect. It seems, therefore, that lecithin alone accelerates both the catabolic and anabolic action but that the addn. of cholesterol shifts the equil. by increasing the anabolic and diminishing the catabolic action.

PETER MASUCCI

**The value of gluteins and other fractions of wheat flour on the growth of albino rats.** A. GALAMINI. *Boll. soc. ital. biol. sper.* 4, 386-8(1929).—Rats fed exclusively with wheat flour and vitamins did not show a normal growth. The lack of growth is attributed to the insufficient nutritive value of the food administered.

PETER MASUCCI

**The feeding of albino rats with bread crust and crumbs and with wheat and corn proteins.** A. GALAMINI. *Boll. soc. ital. biol. sper.* 4, 389-91(1929).

P. M.

**The biological control and standardization of substances containing vitamins.** E. LÉSNÉ AND ROBERT CLÉMENT. *Presse méd.* 36, 1254-6(1928).—The physiol. unit of a vitamin is the daily dose sufficient to protect an animal of standard weight if kept on a prescribed diet. The methods for vitamin A, B, C and D are given.

A. E. M.

**Some new publications concerning the precautions required as to the proper dosage of irradiated ergosterol.** J. MOUZON. *Presse méd.* 36, 1546-50(1928).

A. E. MEYER

**The actual situation of the vitamin problem.** PH. PAGNIEZ. *Presse méd.* 36, 1582-4(1928).

A. E. MEYER

**The utilization value of different classes of bread.** HUGO SALOMON. *Semana méd.* (Buenos Aires) 35, 602-4(1928).—Young rats develop better on a diet with black bread, than with white. This is due not only to the higher food value, but to the fact that they eat more of it.

A. E. MEYER

**Artificial infant feeding and the milk problem.** MARIANO ETCHEGARAY. *Semana méd.* (Buenos Aires) 35, 1070-2(1928).—A criticism concerning the special conditions in Argentine.

A. E. MEYER

**Barlow's disease caused by dried condensed milk.** M. ACUÑA AND J. M. MACERA. *Semana méd.* (Buenos Aires) 36, 187-90(1929).—Scurvy is produced by exclusive feeding for 3-6 months with dried milk.

A. E. MEYER

**The so-called specific dynamic action of foodstuffs.** G. MANSFELD AND Z. HORN. *Biochem. Z.* 209, 34-54(1929); cf. *C. A.* 22, 2965.—In unicellular organisms dextrose, unlike protein, increases oxidation only to a limited degree, and the effect of dextrose and protein is a summation of both effects on the rate of metabolism.

S. MORGULIS

**Observations on epiphyses and liver extracts of rats fed on carotinoids.** BETH V. EULER, HANS V. EULER AND P. KARRER. *Biochem. Z.* 209, 240-5(1929).—Normal growth obtained in rats even in the absence of vitamin D if the diet contains 0.03 mg. carotin per day. Furthermore, even with a sufficient amt. of vitamin D the calcification was found rather defective unless carotin was also present in the diet. The presence of carotin or carotinoid was demonstrated in the liver exts. provided the rats received no less than 0.03 mg. daily.

S. MORGULIS

The Metchnikof theory and the influence of diet on intestinal flora, impregnation, abortion and blood picture of the white rat. I. Introduction. The properties of the intestinal contents, especially feces, with a mixed diet. MART SCHIEBLICH. *Centr. Bakt. Parasitenk.*, I Abt., 112, 188-205(1929). II. The influence of a marked preponderance of vegetables and carbohydrates in the diet on the intestinal flora of the white rat. *Ibid* 206-30.—On a diet with a slight excess of vegetable over animal matter, the fecal flora was chiefly a mixt. of lactic acid bacilli, lactic acid streptococci, and members of the colon group. There was little anaerobic putrefaction. The addn. of a large amt. of lactose markedly increased the no. of lactic acid bacilli but not the streptococci. Also the anaerobe, *B. bifidus*, appeared in noticeable nos. There was no putrefaction. Dextrose, levulose, maltose and starch did not make this change in flora, nor did dextrin, which is contrary to the findings of some others. III. The nature of the intestinal contents on an animal diet. *Ibid* 497-505. IV. The importance of intestinal spirochetes and a consideration of the types of flora which vary from the normal. *Ibid* 505-7.—On a pure animal diet, protein-splitting processes predominate, brought about largely by aerobes rather than by putrefactive anaerobes. The no. of spirochetes in the feces is not an index of intestinal putrefaction. JOHN T. MYERS

Phosphorus metabolism. II. The role of the spleen in phosphorus metabolism. A. Y. KHARIT. *Ark. Biol. Nauk* 28, 145-7(1928); *Chem. Zentr.* 1928, II, 1897; cf. C. A. 22, 4599.—The blood flowing out of the spleen contains more inorg. P than does the blood flowing in. An increase or decrease of P in the blood does not alter this relation. It must be assumed that complex org. P compds. are dissoc. in the spleen, thus causing free inorg. P to enter the blood circulation. III. Action of adrenaline on phosphorus metabolism. *Ibid* 149-54; *Chem. Zentr.* 1928, II, 1897.—Adrenaline introduced subcutaneously causes a 28-30% reduction of inorg. P. Glucose and insulin introduced during the hypophosphatemia produced by adrenaline do not cause further diminution of the P content of the blood. K. assumes that the inorg. P of the blood consists of 2 parts, only one of which is able to react with the carbohydrates. A certain quant. relation must exist between these 2 parts. G. SCHWOCH

A technical study of the maintenance and fattening of lambs and their utilization of a ration of alfalfa hay and corn. H. H. MITCHELL, W. G. KAMMLADE AND T. S. HAMILTON. *Univ. Illinois Agr. Expt. Sta. Bull.* 314, 31-60(1928).—The digestibility of a ration consisting of equal parts by wt. of alfalfa hay and shelled corn was investigated at 2 levels of feeding. E. F. SNYDER

A new method of investigating nutrition. TADASU SAIKI. *Proc. 3rd Pan-Pacific Sci. Congr.* 1926, II, 2619-20(Publ. 1928).—There are included in the tests, the food requirements of Japanese, the utilization of rice, the relationship between vitamin B and the catalase content in rice, the production of carcinoma, and the formation of urinary and biliary calculi, on a diet deficient in vitamin A. E. M. SYMMES

Value of calcium salts in poultry feeding. W. AUTON. *Gardeners' Chronicle* 83, 399(1928); *Pharm. J.* 121, 159(1928).—By feeding crushed limestone (8.7 g. per hen per day) or rock gypsum (6.3 g.), egg production was distinctly increased. As large quantities of these Ca salts pass through the birds unchanged, the value of poultry manure as a substitute for guano might be important. Cf. Lapp, C. A. 22, 126. S. WALDBOTT

Recent research on the vitamins. KATHARINE H. COWARD. *Pharm. J.* 121, 572-5, 579-80; *Chemist and Druggist* 109, 733-4(1928); cf. Carr, C. A. 21, 762.—A comprehensive survey of recent advances in the study of the vitamins, with 35 recent references. S. WALDBOTT

Factors influencing calcium balance. Influence of potential alkalinity on the utilization of supplementary calcium lactate in young rachitic rats. VERSA V. COLE, JOHN H. SPEER AND FREDERICK W. HEYL. *J. Am. Pharm. Assoc.* 18, 107-10(1929).—Rickets was induced in young rats by Steenbock's diet for 21 days. The animals were then placed on basal diets A or B for 21 days. A contained 0.021% Ca, 0.029% P and 0.12% Mg. B is the starch-case in diet (casein 18, yeast 2, NaCl mixt. 1, starch 79). Two sets of tests were carried on with Diet A to test the mineral retention on an acidotic and an alk. ration. The alk. was produced by 500 mg. Na citrate per day to the ration. The controls received none. Base-forming or neutral diets are more favorable to Ca retention than acidotic diets. They favor Mg, and probably P retention. Incomplete alkalization produces better mineral retention than the acidotic diets. Na citrate is a better source of alk. than a mixt. of Na and K citrates. Cf. C. A. 23, 4502. L. E. WARREN

Physiological action of carotin. Kōzō KAWAKAMI AND RYANG-HA KIMM. *Proc. Imp. Acad. (Japan)* 5, 213-5(1929).—Euler, Euler and Hellström (C. A. 23, 1941) have recently shown that when 0.005 mg. pure carotin was given daily, together with irradi-

ated ergosterol, the avitaminosis rats, previously fed on a diet deficient in vitamins A and D, were completely cured and resumed growth at a normal rate. The present paper confirms these results. The min. daily dose required for a cure lies between 0.03 and 0.05 mg. of carotin. C. J. WHEAT

**The toxic action of milk and other substances exposed to ultra-violet irradiation.** P. REYHER AND E. WALKHOFF. *Munch med. Wochschr.* 75, 1071-3(1928).—Mice and guinea pigs were fed a normal diet and various substances which had been pretreated with ultra-violet rays. The substances included raw cow milk, a dry milk, an egg yolk prepn., plasmon and ergosterol. All the animals showed pathol. changes of different types, degrees and duration. Nitrite-free raw milk contained nitrites after ultra-violet irradiation. R. C. WILLSON

Utilization of microorganisms as human food (TAKATA) 12. Deodorization of cod-liver oil by silent discharge (IWAMOTO) 27. The deterioration of iodized salt (NICHOLS) 18. Complementary and critical researches on the subject of dissolved and irradiated cholesterol. Role of an antioxidant (ROUSSEAU) 3.

ROSEWARNE, D. D.: **The Science of Nutrition Simplified.** London: H. Kimp-ton. 314 pp. 6s. 6d., net. Reviewed in *Pharm. J.* 123, 146(1929).

## F—PHYSIOLOGY

E. K. MARSHALL, JR.

**Variations in monocytic response to peroxidase test.** F. A. MCJUNKIN. *Proc. Soc. Exptl. Biol. Med.* 26, 55-7(1928).—Rabbit monocytes neg. to the peroxidase test may acquire a pos. reaction when cultured on smears of dry human blood. Since rabbit monocytes in tissue cultures may, by phagocytosis, acquire a peroxidase content it seems possible that the mononuclear phagocytes of human blood may get their peroxidase granules by the same process. C. V. BAILEY

**Some experiments on reducing reaction of cerebrospinal fluid.** ROGER S. HUBBARD. *Proc. Soc. Exptl. Biol. Med.* 26, 78-9(1928).—Benedict's copper method for blood sugar was applied to specimens of cerebrospinal fluid; the results were about 3 mg. % lower than published results of the application of the method of Folin and Wu. It seems probable that the non-glucose reducing compds. which cause marked differences in the sugar values in whole blood and plasma do not enter the spinal fluid in appreciable amts. The different results obtained when these methods are applied to blood are supposed to be due to compds. which reduce "uric acid reagents" in acid solns but which are not pptd. by silver lactate. These compds. were not found in the spinal fluids. The reducing material in the cerebrospinal fluid other than carbohydrate is present in concns. of about 1 mg. % expressed as glucose. C. V. BAILEY

**Fate of blood sugar during glucolysis.** ICHIRO KATAYAMA AND TERESA GARCIA. *Proc. Soc. Exptl. Biol. Med.* 26, 122-4(1928).—The sugar of shed blood gradually decreases on standing without bacterial contamination. The loss is accounted for by the formation of a corresponding amount of lactic acid. C. V. BAILEY

**Effect of changes in ion concentration of blood upon reflex time.** W. F. WENNER AND A. B. TAYLOR. *Proc. Soc. Exptl. Biol. Med.* 26, 188-9(1928).—Patellar tendon reflex time of dogs is markedly reduced following acid, and to a less degree following alkali, administration. C. V. BAILEY

**Influence of mechanical factors on "basal" gastric secretion.** ROBERT K. S. LIM AND HSIANG-CH'UAN HOU. *Proc. Soc. Exptl. Biol. Med.* 26, 270-1(1929).—In dogs with autotransplanted gastric pouches, the feeding of 100-300 g. of broken bones with a cereal gruel in the evening causes a marked gastric hypersecretion the following morning and at this time the pyloric antrum invariably contains pieces of broken bone. This secretory phenomenon may be the result of a purely mech. factor acting upon the pyloric humoral mechanism. C. V. BAILEY

**Tissue lactates and blood lactates as affected by muscular exercise.** E. G. MARTIN, J. FIELD, 2nd AND V. E. HALL. *Proc. Soc. Exptl. Biol. Med.* 26, 292-3(1929); cf. following abstr.—Lactates accumulate in muscles during periods of exercise; they diffuse into the blood and are taken up by non-exercised muscles during the same period. In resting periods all the muscles dispose of their lactate accumulations. The partition coeff. for lactates between blood and tissue is not the same in the dog as has been assumed by Hill, Long and Lupton for man. Arterial pressure is a significant factor in the disposition of lactates formed during exercise. C. V. BAILEY

**Metabolism following anoxemia. I. Oxygen consumption and blood lactates after experimentally induced exercise.** E. G. MARTIN, J. FIELD AND V. E. HALL. *Am.*

*J. Physiol.* **88**, 407–19(1929); cf. preceding abstr.—Artificial exercise was induced in anesthetized dogs by the rhythmic tetanization of the spinal cord. The excess  $O_2$  consumption following such exercise was not detd. by the amt. of lactate disappearing from the body concurrently.

J. F. LYMAN

**The demethoxylation of lignin in the animal body.** MAX PHILLIPS, HERMAN WEIHE, D. B. JONES AND F. A. CSONKA. *Proc. Soc. Exptl. Biol. Med.* **26**, 320–1(1929).—The Kirpal and Bühn modification of the Zeisel method was used for the estn. of the  $OCH_3$  group which is present in lignin. A dog fed lignin "liberated" over 15% of the methoxyl initially present in the lignin; with a cow, 37% loss was observed. Demethoxylation of lignin takes place in the stomach and this is not the result of bacterial action but probably due to an enzyme in the gastric juice. When lignin was fed in doses larger than 2 g. per kg., toxic symptoms assocd. with impaired renal function developed.

C. V. BAILEY

**The male hormone.** CASIMIR FUNK AND BENJAMIN HARROW. *Proc. Soc. Exptl. Biol. Med.* **26**, 325–6(1929).—Castration was successfully performed on 30 cocks about 2 months of age. Urine from young men was extd. with alcohol, filtered and evapd.; the resulting ext. was injected daily into the castrated cocks and the length of comb measured each week. In every instance injections caused an increase, and cessation caused shrinkage in the size of the comb. Six of the castrated animals received daily urinary injections for 2 weeks; the ext. was from the urine of men 70–80 years of age. The combs decrease 9% in size.

C. V. BAILEY

**Changes in lactic acid and glucose in the blood on passage through organs.** H. E. HIMWICH, Y. D. KOSKOFF AND L. H. NAHUM. *Proc. Soc. Exptl. Biol. Med.* **25**, 347–9(1928).—The main source of lactic acid is the muscle. The organ chiefly concerned in its removal is the liver. Since all organs, excepting the liver, remove glucose from the blood and the liver adds glucose there seems to be a carbohydrate cycle between muscle and liver, muscles sending lactic acid through the blood to the liver and the liver returning glucose to the muscles.

C. V. BAILEY

**The mechanism of glucose absorption from the intestinal tract.** CARL F. CORI, GERTY T. CORI AND HILDA L. GOLTZ. *Proc. Soc. Exptl. Biol. Med.* **26**, 433–6(1929).—The rate of absorption of glucose is uninfluenced, within wide limits, by the amt. of sugar present in the intestine. The authors defend the findings of Cori and refute the criticisms of Pierce, Osgood and Polansky.

C. V. BAILEY

**Tissue respiration and endocrine function. III. Influence of thyroidectomy on tissue respiration.** J. A. DYE AND G. H. MAUGHAN. *Proc. Soc. Exptl. Biol. Med.* **26**, 439–41(1929); cf. *C. A.* **22**, 3688–9.—Skeletal muscle of cretin pups, 7 months after thyroidectomy, show a diminution of 25 to 60% in their power to consume atm. O.

C. V. BAILEY

**The chemistry of the estrus-producing hormone.** CASIMIR FUNK. *Proc. Soc. Exptl. Biol. Med.* **26**, 568–9(1929).—Estrin is very sparingly sol. even in hot water; most of the hormone occurs in the free state in the ovary, placenta or urine. Sapon. is not necessary. It forms salts with strong alkalies which are fairly well sol. in ether, and also forms sol Na, K,  $NH_4$  and Ba salts. Making use of these properties estrin fractions weighing 0.01 mg. per rat unit are easily obtained. Such preps. show an acidity equiv. to 43.2 cc. of 0.1 N NaOH soln. per 100 mg. of substance. The similarity in chem. behavior of estrin and phenols does not render further purification easy. It is very difficult to sep. the hormone from phenolphthalein which is often present in urine following its use as a laxative. Aq. solns. of estrin appear to be slightly less active than solns. of equal strength in oil; this may be due to a more rapid elimination of the aq. ext.

C. V. B.

**Blood catalase.** H. BISCHOFF. *Arch. Kinderheilk.* **82**, 189–98(1927).—The catalase content of the blood of children does not differ greatly from that of adults, but varies according to the point of extn. of the sample. The value is unchanged in infection or irradiation.

B. C. A.

**Is there an iodine value of the blood dependent on the thyroid gland?** F. BLUM. *Schweiz. med. Wochschr.* **57**, No. 34, 14 pp.(1927).—The thyroid gland does not pass I into the blood. Fellenberg's method for the detn. of I is not suitable for blood.

B. C. A.

**The reducing power (blood sugar) of filtrates from the blood of the rabbit.** ERNEST L. SCOTT. *Arch. Internal Med.* **43**, 393–412(1929).—Rabbit blood obtained from a vein of the ear and tested by the method of Shaffer and Hartmann gave a mean reducing power of 123 mg. per 100 cc. in a series of 1625 observations. The amt. seemed to be independent of age, wt., sex, time of year when housed in lab. and time of day. A short

period of inanition caused a slight drop in blood sugar in the rabbit and the rat.

**Pancreatic function. IV. The humorneural regulation of the gastric, pancreatic and biliary secretions.** SEIZABURO OKADA, KWANICHI KURAMOCCHI, TOSHIO TSUKAHARA AND TATSUO OGINOUE. *Arch. Internal Med.* 43, 446-71(1929); cf. *C. A.* 23, 4258.—Injection of insulin when accompanied by hypoglycemia provokes gastric pancreatic and biliary secretion. This effect is produced even in cases of achlorhydria. Injection of glucose or of atropine prevents the insulin effect on secretion. Adrenaline and ephedrine inhibit the secretions. This paper is largely physiol. and includes an extended bibliography of the physiology of these secretions. J. B. BROWN

**Estrus hormone in bile.** M. A. GSELL-BUSSE. *Arch. expil. Path. Pharmacol.* 139, 328-40(1929); cf. *C. A.* 22, 4161.—The estrogenic action of preps. of taurocholic acid or its Na salt is due to an impurity. Neutral ethereal exts. of fresh bile contained the following amts. of estrogenic substance in rat units per l.; ox bile, 80-200; human bile, 35-600. An ext. of 0.5 kg. of fresh liver tested neg. for estrus hormone. Meconium gave the highest yield of hormone obtained (6000 rat units per kg.). B. C. B.

**The metabolism of muscle in activity.** J.-K. PARNAS. *Compt. rend. soc. biol.* 101, No. 23, 37-70(1929).—A review, accompanied by an extensive bibliography.

**The oxidation-reduction potential of mammalian cells.** E. AUBEL AND R. WURMSER. *Compt. rend. soc. biol.* 101, 880-1(1929).—Nile blue, methylene blue and 2,6-dibromophenol indophenol were intravenously injected in doses of 0.15 g. per kg. into rabbits and dogs. After 5 min. the animals were killed and the tissues examd. at once. The results are summarized as follows: Spleen, pancreas, intestine, stomach— $r_H$  16-20; muscle and kidney— $r_H$  14-16; gray matter of the brain, liver— $r_H$  about 9. B. C. B.

**Water content of blood at rest, walking and during running.** U. CASSINIS AND L. BRACALONI. *Atti accad. Lincei* [6], 9, 355-8(1929).—The  $H_2O$  in blood is about 78-79.8%. In walking there is a slight change in different individuals, the change varying from + 0.10 to -2.11%; in running, the loss is greater, i. e., from 0.39% up to as high as 2.15% for every 600 km. There is no definite relation between the two.

**Studies on the acidosis of young athletes after running over various distances.** HARALD A. SALVESEN. *Norsk Mag. Laegevidenskap.* 89, 121-30(1928).—The acidosis produced after 100-, 400-, 1500- and 10,000- m. runs is investigated. The acidosis is most pronounced after 1500 m. where the lowering of the alkali reserve may amount to 30 vol. %. ARNE DROGSETTI

**Normal calcium impregnation of aortic wall.** P. P. RAVAUULT. *Bull. hist. appl. physiol. et path.* 5, 40-8(1928); *Physiol. Abstracts* 13, 615; cf. *C. A.* 22, 620.—Fragments from 25 aortas were examd. by the usual staining methods and also by micro-incineration, the sections in the latter case being examd. by lateral illumination. The media coat appeared well impregnated with Ca salts, the other coats contg. relatively little; the Ca impregnation was most dense at the origin of collateral vessels. The suggestion is made that this deposition of Ca material is produced by the delay of circulation of nutritive fluids in this coat, due chiefly to the thick elastic lamina present. H. L. D.

**Chemical study on the marine mammals. I. The adrenal of the whale. Adrenaline.** MAKOTO YAMAGAWA AND SHOMATSU NISHIMURA. *J. Imp. Fish. Inst. (Tokyo)* 22 (2), 22-3(1926); *Biol. Abstracts* 2, 1038-9.—Although the adrenal gland in the whale contains a smaller percentage of adrenaline than that of the ox, the gland weighs 30 times as much. Material which may have been pure adrenaline was prepd. III. **The pancreas of the whale insulin.** MAKOTO YAMAGAWA AND NOBUTOMO NAKAMURA. *Ibid* 26-8; *Biol. Abstracts* 2, 1039.—Insulin prepd. from pancreas of the whale was of low potency because of autolysis during the 5-6 hrs. between capture and dissection. H. L. D.

**The regulation of carbohydrate metabolism. V. The synergistic action of lactose on insulin.** ALEXANDER PARTOS AND FRANZ ŠVEC. *Arch. ges. Physiol. (Pflüger's)* 222, 287-92(1929). ARTHUR GROLLMAN

**Carbon dioxide and the regulation of respiration.** HANS WINTERSTEIN. *Arch. ges. Physiol. (Pflüger's)* 222, 411-4(1929). ARTHUR GROLLMAN

**Clinical and experimental observations with the ovarian hormone "folliculin."** S. JOSEPH AND I. RASCHKES. *Deut. med. Wochschr.* 55, 1044-6(1929). A. G.

**The action of spleen extracts on the blood picture, particularly in hyperglobulia vera.** NIPPERDEY. *Deut. med. Wochschr.* 55, 1085-6(1929). ARTHUR GROLLMAN

**The problem of blood sugar.** JOSEPH C. BOCK. *Wiener med. Wochschr.* 79, 43-7

(1929).—A review of the methods used for detg. blood sugar and blood sugar curves obtained under different conditions. ARTHUR GROLLMAN

Recent chemical advances in the realm of the hormones. H. K. BARRENSCHEEN. *Wiener med. Wochschr.* 79, 75-7; 110-4(1929). ARTHUR GROLLMAN

New findings in the field of the physiological chemistry of digestion. OTTO FÜRTH. *Wiener med. Wochschr.* 79, 299-304(1929). ARTHUR GROLLMAN

Studies in the metabolism of tissues growing in vitro. III. Cyanic acid as a possible precursor of the ammonia and urea formed by embryo kidney tissue. BARBARA E. HOLMES AND ELSIE WATCHORN. *Biochem. J.* 23, 199-205(1929); cf. *C. A.* 22, 1183.—Cyanic acid in the presence of embryo kidney tissue is broken down to ammonia and urea, and the tissue catalyzes the reaction. *l*-Hydantoinacetic acid, the result of a possible reaction between *l*-aspartic acid and cyanic acid, is also broken down by embryonic tissue, yielding urea and ammonia. BENJAMIN HARROW

Clinical significance of the water of metabolism in children. HYMAN GOLDSTEIN. *Arch. Pediatrics* 46, 371-81(1929).—A study of the factors governing retention and loss of water in metabolism, and of the consequences of changes from the normal water equil. JOSEPH S. HEPBURN

Reid Hunt reaction and pregnancy. H. EUFINGER, H. WIESBADER AND L. FOC-SANEANU. *Arch. Gynäkol.* 136, 12-8(1929).—The resistance of the white mouse to acetonitrile is markedly increased by previous subcutaneous injections of serum from a pregnant woman. The gradual increase in the Reid Hunt reaction grows more marked as pregnancy advances, reaches its max. during labor and rapidly returns to normal in the puerperium. Serum was also used from patients suffering from the toxicoses of pregnancy. In cases of hyperemesis the serum had about the same effect as normal serum. Serum from eclamptic patients increased the acetonitrile resistance more than normal serum. The blood from the umbilical cord increased the acetonitrile resistance only slightly or not at all. The Reid Hunt reaction was first carried out with thyroid preps. and seems to offer a clinical method for detecting hyperthyroidism. It is probable, but not proved, that the reaction with serum from a pregnant woman is due to the hyperfunction of the thyroid during pregnancy. HARRIET F. HOLMES

Studies in comparative hematology. III. Marsupialia. ERIC PONDER, J. FRANKLIN YEAGER AND H. A. CHARIPPER. *Quart. J. Exptl. Physiol.* 19, 273-83(1929); cf. *C. A.* 23, 1961.—Morphology of the leucocytes is similar to that of the leucocytes in man. 8000 is the av. figure for the leucocyte count. The mean diam. of the red cells in genus *Macropus* is 8.6 $\mu$ ; in the wombat, 7.2 $\mu$  and in the opossum 9.2 $\mu$ . There is a very high hemoglobin content in genus *Macropus*. The red cell count is 8,000,000. The resistance to hypotonic saline is either the same or a little less than that of the cells of man; resistance to saponin and Na taurocholate varies considerably. F. K.

Origin and destination of the cellular fats. JULES AMAR. *Compt. rend.* 188, 1626-8(1929).—Fats form in the body as a reserve of least effort of the cell, or a secretion of degradation or inactivity in the cytoplasm. A simple hydrolysis of albumin forms triolein in the absence of oxygen. When the cell is in repose, glycogen is not needed, and fats form as an economic fuel and source of glycogen. Pathology shows that diseases which impede oxidation favor the formation of fat. AMY LEVESCONTE

Spectrographic analysis of the ash of blood and of organs. PAUL DUTOIT AND CHRISTIAN ZBINDEN. *Compt. rend.* 188, 1628-9(1929).—The arc spectra of the ash of blood always show Ag, Al, Ca, Cu, Fe, K, Mg, Mn, Na, P, Si, Ti and Zn. The Ag is in sufficient amt. for a detn. Other elements sometimes found are Co, Cr, Ge, Pb, Ni, Sn and Sr. When the albumins are coagulated by heat Ag, Ca, Cu, Mn, Ni, Pb, Sn and Zn are concd. while Al and Ti are diminished. Studies on the ash of organs and of tumors indicate a concn. of Ni, Co and Pb in the pancreas of Sn in the suprarenal capsules and of Zn in the liver and kidney. Ag and Cu seem to disappear in tumors. A. LÉV.

The respiratory quotient. HENRY B. RICHARDSON. *Physiol. Rev.* 9, 61-125(1929).—Review with extensive bibliography. E. R. LONG

Phosphocreatine. CYRUS H. FISKE AND YELLAPRAGADA SUBBAROW. *J. Biol. Chem.* 81, 629-79(1929); cf. *C. A.* 22, 1184.—Phosphocreatine can be obtained from protein-free muscle filtrates as a cryst. Ca salt which is a mixt. of the secondary and tertiary salts and is convertible into the pure secondary salt,  $C_4H_9O_5N_3PCa \cdot 4H_2O$ . Practically the theoretical amt. of creatine can be obtained by hydrolysis of this salt which indicates that phosphocreatine is probably  $(OH)_2OPNH(C:NH)NMeCH_2CO_2H$ . The amt. of the Ca salt obtained represents only 70% of the labile P present in the protein-free filtrate but this is all phosphocreatine, for the 30% loss in the succeeding steps of the isolation occurs also in control expts. with known amts. of the pure substance. "The labile P compd. in the protein-free filtrate hence contains nothing but creatine and

$\text{H}_3\text{PO}_4$ , and the physiol. significance of the physicochem. properties of phosphocreatine is nil without knowledge of this fact. The 2nd acid disson. const. of phosphocreatine, detd. by the titration of 0.005 *M* solns. of the secondary Ca salt, is  $2.6 \times 10^{-4}$ . Since the method of intravital staining with indicators has shown that the interior of the muscle fiber is distinctly acid and since the labile P of muscle has now been shown to be phosphocreatine itself (and not some substance of which it is a decompn. product), it follows that the hydrolysis of this substance during muscular contraction is accompanied by the liberation of a large amt. of base and consequently functions as a mechanism for neutralizing acid. The rate of hydrolysis of phosphocreatine by acid in a mixt. of the primary and secondary salts is proportional to the mol. fraction of the primary salt. In other words, the primary salt is hydrolyzed by  $\text{H}_2\text{O}$ ; the secondary salt is not. Analytical data are presented showing the compn. of normal resting cat muscle, as well as the hydrolysis of phosphocreatine during contraction and after shutting off the circulation and its resynthesis during recovery. Hydrolysis has been demonstrated also after the intravenous injection of lactic acid and of KCl. Intravenous injection of creatine (alone or mixed with  $\text{Na}_2\text{HPO}_4$ ) does not increase the concn. of phosphocreatine in muscle. It has so far been impossible to show conclusively that the contraction of one set of muscles induces the hydrolysis of phosphocreatine elsewhere in the body." Methods are given for the detn. of phosphocreatine (and inorg. phosphate) in muscle. One is a direct colorimetric method which gives accurate results only when properly controlled with known solns. The other method is based on the preliminary sepn. of the inorg. phosphate by means of Ca and is more reliable, particularly when the tissue contains only a small amt. of the substance.

A. P. LOTHROP

Is copper a constituent of the hemoglobin molecule? The distribution of copper in blood. C. A. ELVEHJEM, H. STEENBOCK AND E. B. HART. *J. Biol. Chem.* **83**, 21-5 (1929).—"If the mol. wt. of hemoglobin is accepted as 16,700 or 66,800 as recently reported by Svedberg and Fahraeus, then the hemoglobin of rat blood does not contain Cu as part of its mol. The Cu content of horse blood is approx. 0.05 mg. of Cu per 100 cc. of blood. The corpuscle fraction of blood, whether prepd. by centrifuging oxalated blood or defibrinated blood, contains the largest portion of the Cu." A. P. L.

The effect of diet on the copper content of milk. C. A. ELVEHJEM, H. STEENBOCK AND E. B. HART. *J. Biol. Chem.* **83**, 27-34 (1929).—The milk from cows on a normal ration contains about 0.15 mg. of Cu per l. and this amt. cannot be increased by feeding sufficient  $\text{CuSO}_4$  to increase the Cu content of the ration 5-fold. There were very slight differences in the Cu content of samples of milk collected from 13 herds located in different states. Increasing the Cu content of the ration 5- to 10-fold did not increase the Cu content of goat milk, which contains about the same quantity of Cu as cow milk.

A. P. LOTHROP

The effect of whole skeletal muscle on blood sugar *in vitro*. MELVILLE SAHYUN AND CARL L. ALSBERG. *J. Biol. Chem.* **83**, 129-36 (1929).—When normal skeletal muscle is incubated with blood the decrease in blood sugar at the end of the 3rd hr. is as small as when blood is incubated alone. On the other hand, when deglycogenated muscle (from adrenaized animals) is used there is a marked drop whether or not insulin has been added. Deglycogenated muscle, therefore, has the power of utilizing glucose *in vitro* but whether the glucose that disappears is burned or changed into glycogen it is not possible to state.

A. P. LOTHROP

The equation expressing the excretion of a diuretic and its relation to diffusion processes. II. E. J. CONWAY. *Am. J. Physiol.* **88**, 1-28 (1929); cf. *C. A.* **20**, 3464.---Various formulas have been derived for urinary secretion from the fundamental diffusion relation, viz.: output of tubules into unit vol. of glomerular fluid =  $\sqrt{t} \times$  the diffusion head  $\times K$ . The diffusion-secretion formula, viz.,  $\sqrt{1/t} (C_u - C_B) = K$  applies to glucose, urea and with slight modification to NaCl and at high blood values to  $\text{Na}_2\text{SO}_4$ .  $\sqrt{1/t \times D} \times (C_u - C_B) / (C_{\text{max.}} - C_B) = K$ . This expression holds for all substances when the plasma concn. exceeds a certain value.  $C_u$  and  $C_B$  are the concns. of urine and plasma,  $t$  is the time of unit vol. of urine,  $D$  is the diffusion coeff. and  $C_{\text{max.}}$  the highest value of  $C_u$  as  $V$  or  $1/t$  is indefinitely diminished. III. E. J. CONWAY AND F. KANE. *Ibid* 29-51.—The diffusion-secretion theory of urinary secretion states that in the excretion of NaCl and  $\text{H}_2\text{O}$ , for example, the direction and rate of NaCl diffusion alone are influenced by the concn. of plasma NaCl; no water is absorbed in the tubules. The glomerulus is the site for control of  $\text{H}_2\text{O}$  output. The Cl threshold is defined as the highest value of  $C_B$  (the plasma concn.) at which  $C_u$  (the urine concn.) is  $< C_B$  for all rates of urine flow. The threshold for the rabbit is 0.574. The injection of glucose had no effect on the Cl threshold; but sulfate or urea in saline caused a marked increase.



The chloride absorption equation developed in this paper is  $(C_B - C_u)/C_B = \sqrt{tK} \times \sqrt{T - C_B}$ .  $T$  = the Cl threshold,  $t$  = time of unit vol. of urine. The theory advanced is in harmony with the main pertinent facts of renal physiology and is capable of explaining them by relations based on simple diffusion processes and a vital state of the kidney cells which can be adequately represented as to time and concn. relations by a simple physical parallel, *i. e.*, the diffusion of I from  $\text{CHCl}_3$  into KI solns. J. F. L.

The physiology of animals surviving complete exclusion of sympathetic nerve impulses. W. B. CANNON, H. F. NEWTON, E. M. BRIGHT, V. MENKIN AND R. M. MOORE. *Am. J. Physiol.* 89, 84-107(1929).—After the removal of the sympathetic nervous system, *i. e.*, the two chains of ganglia, from the stellate to the pelvic, in cats, good health was maintained for many months. Additional removal of one adrenal and the destruction of the medulla of the other demonstrated that the chromophil tissue is of no vital importance. After removal of the sympathetic system emotional excitement caused no erection of hairs, no consistent increase of blood sugar, no polycythemia, no relative increase in mononuclear cells and no marked rise in arterial blood pressure. The sympathetic system seems to be of physiological value in critical emergencies but is not essential to life under protected conditions. J. F. LYMAN

Nerve metabolism. V. Phosphates. R. W. GERARD AND J. WALLEN. *Am. J. Physiol.* 89, 108-19(1929).—Rest in  $\text{O}_2$  resulted in a slight increase of acid-stable phosphate in the sciatic nerve at the expense of the inorg. acid-labile phosphate. Rest in  $\text{N}_2$  caused a partial breakdown of both the acid-labile and acid-stable phosphates and rest in  $\text{O}_2$  restored the original condition. Total sol. phosphate tended to increase in nerves kept in  $\text{O}_2$  and still more when kept in  $\text{N}_2$  or stimulated. Tetanization in  $\text{O}_2$  caused the same changes as asphyxia but to a less extent. J. F. LYMAN

Physiological variations in the cardiac output of man. II. Changes in the cardiac output, metabolism, blood pressure and pulse rate of man following ingestion of fluids. ARTHUR GROLLMAN. *Am. J. Physiol.* 89, 157-63(1929).—After the ingestion of 1000 to 1500 cc. water by man the cardiac output rose in some cases 26%, usually about 10%. The respiratory metabolism was increased about 8% by the ingestion of large vols. of  $\text{H}_2\text{O}$ , but Locke's soln. or 1% NaCl soln. had no such effect. J. F. LYMAN

The hydrogen-ion concentration of the reproductive organs of the white leghorn chicken. G. D. BUCKNER AND J. H. MARTIN. *Am. J. Physiol.* 89, 164-9(1929).—The  $p_{\text{H}}$  of the funnel portion and of the upper and lower parts of the albumin-secreting section of the oviduct varied from 6.3 to 6.6 in hens that were laying and not laying. The  $p_{\text{H}}$  of the mucosa of the isthmus, uterus and vagina in hens actively laying was between 5.6 and 5.9; in hens that were not laying the range was 6.2 to 6.6. Semen had a  $p_{\text{H}}$  of 7.3. J. F. LYMAN

The role of the liver and other abdominal viscera in the destruction of adrenaline in the body. J. MARKOWITZ AND F. C. MANN. *Am. J. Physiol.* 89, 176-81(1929).—Adrenaline destruction occurred all over the body and not in any particular organ. J. F. LYMAN

The physiology of the pancreas. IV. The elimination of dyes in the external secretion of the pancreas. L. A. CRANDALL, E. OLDBERG AND A. C. IVY. *Am. J. Physiol.* 89, 223-9(1929); cf. *C. A.* 21, 3947.—Of 90 dyes tested 10 were eliminated in the pancreatic juice following their intravenous injection. Among those eliminated there appears to be no common physical or chem. relationship. No dye was eliminated in sufficient amt. to be of practical value as a pancreatic functional test. J. F. LYMAN

The regulation of respiration. XXXI. The effect of hemorrhage, reinjection and low alveolar oxygen on the reflex activity of the cord. A. W. WINKLER. *Am. J. Physiol.* 89, 243-52(1929).—The activities of the respiratory muscles and of the lower spinal arcs studied, in the majority of cases, varied in the same direction following hemorrhage, reinjection and low alveolar  $\text{O}_2$  tension followed by readministration of room air. J. F. LYMAN

The renal threshold for chloride in man. R. S. AITKEN. *J. Physiol.* 67, 199-210 (1929).—The plasma Cl was reduced in 2 men by the ingestion of a diet very low in Cl over a period of 7 days together with forced sweating. The concn of Cl in plasma and urine was measured at intervals over a wide range of plasma Cl concns. At plasma NaCl concns. above 0.585% there was a large increase in excretion for a small increase in plasma concn. Below about 0.555% of plasma NaCl there was a steady rate of excretion at about 5 mg. per hr. down at least to 0.537% of plasma NaCl. The renal threshold for Cl is not a definite point but simply a region in which the relation of renal excretion to plasma concn. changes rapidly. It is suggested that the idea of a renal threshold for Cl be abandoned. J. F. LYMAN

The action of extract of pituitary on the blood sugar after pancreatectomy. C. G. IMRIE. *J. Physiol.* 67, 264-9(1929).—In a dog whose pancreas had been removed and which was maintained in a healthy state by injections of insulin and a diet contg. raw pancreas, pituitrin produced a rise in blood sugar as long as there was glycogen present in the liver. Liver glycogen and not muscle glycogen seems to be the source of the extra glucose in the hyperglucemia caused by ext. of the pituitary. J. F. LYMAN

Adsorption of hemoglobin by muscle tissue. M. N. J. DIRKEN. *J. Physiol.* 67, 282-7(1929).—Minced muscle can be completely decolorized by washing it with Ringer fluid or with 1% NaCl soln. After removing the salt from the extd. muscle by washing with H<sub>2</sub>O, the tissue is colored intensely red if shaken up with H<sub>2</sub>O to which a little blood has been added. This color in the tissue can be removed with 1% NaCl but not with H<sub>2</sub>O. Conditions of concn. of hemoglobin, temp., salt concn. and  $p_H$  under which coloring and decolorization take place are reported. The phenomenon is thought to be due to adsorption. Muscle hemoglobin of the living tissue seems to be in soln. rather than adsorbed. For the detn. of muscle hemoglobin extn. should be made with a salt soln., rather than with H<sub>2</sub>O. J. F. LYMAN

Water evaporated during work. J. A. CAMPBELL. *Proc. Physiol. Soc., J. Physiol.* 67, x(1929).—At temps. of 10°, 15° and 20° during exercise there was no H<sub>2</sub>O lost by the skin in some tests. At 25° the H<sub>2</sub>O loss from the lungs was very much less than that from the skin. J. F. LYMAN

A central chemical control of the heart rate. R. J. S. McDOWALL. *Proc. Physiol. Soc., J. Physiol.* 67, xxi(1929).—Asphyxia of the cerebral centers in a chloralose cat, provided sensory stimulation is absent, caused marked acceleration of the heart. This result must be due to the chem. effect of asphyxia on the sympathetic system. J. F. LYMAN

The antidiuretic action of the separated principles of the posterior lobe of the pituitary. A. HEMINGWAY AND J. M. PETERSON. *Proc. Physiol. Soc., J. Physiol.* 67, xxiv(1929).—Both vasopressin and oxytocin had a prolonged antidiuretic action, the action of vasopressin being more powerful. Accompanying the antidiuretic action, there was an increase in the Cl concn. of the urine and often an increase in the total excretion of Cl per unit of time. J. F. LYMAN

Studies upon the glycogen in the nerve cells of the central nervous system of mammals. IV. The changes in glycogen distribution after the injection of insulin. V. The postmortal changes of the glycogen distribution in the central nervous system. HYOSAKU TANAKA. *Sei-i-kwai Med. J.* 48, No. 3, 1-17, Abstract sect., 1-2(1929).—The injection of insulin caused a marked diminution in the glycogen in the nuclei of the floor of the fourth ventricle as well as in those of the cerebral peduncle, the cerebral cortex, the optic thalamus, the corpus striatum and in the Purkinje cells and nerve cells of the nucleus of the cerebrum. Insulin did not produce a marked diminution of glycogen in the nerve cells in the gray substance of the spinal cord. Only a slight diminution was effected in the nerve cells of the intervertebral ganglia. No change in the glycogen content of the anterior lobe of the hypophysis or of the epithelium of the choroid plexus could be found. Insulin injection caused marked changes in the nerve cells of the motor centers of the lower medulla oblongata and in the gray matter and ganglion cells of the spinal cord. The injection of glucose after insulin produces a return to the normal picture except in the case of the spinal cord. After this return to normal no cells were found in which the vol. was not normal, the form irregular or the number of Nissl bodies not appreciable. V. The postmortal changes of the glycogen distribution in the central nervous system. *Ibid* 18-26, Abstract sect., 2-3.—After death the glycogen of the ganglion cells of the central nervous system diminished in the course of time until it disappeared. That of the cerebral cortex disappeared first. Glycogen remained longest in parts of nuclei of the fifth and seventh nerves and in the nucleus of the third nerve and in the red nucleus. In general the glycogen is held better by the large cells whose form is not readily altered. In others it shows a gray diffuse color after about 12 hrs. It remains chiefly in cells of quite definite structure and low in glycogen in contrast to cells of disorganized structure even though they were previously rich in glycogen. VI. *Ibid* 27-40, Abstract sect., 3-4(1929).—Glycogen is found in all ganglion cells and its form falls into three or four classes. It attains a max. value at the time of birth of guinea pigs, decreases to the 16th day and then rises suddenly to a normal at the end of a month. Glycogen is recognized in only a few cells of rabbits or guinea pigs after they have been dead 6-12 hrs. This glycogen is more resistant than that of the liver cells of the same animals. During fasting the glycogen present in the central nervous system of rabbits and guinea pigs is first lost extracellularly and then reduced intracellularly. Its decrease is much less than in the livers of the same animals. The glycogen of guinea pigs and

rabbits is diminished in insulin hypoglycemia. At the same time the cells shrink, become stained deeply with hematoxylin and the Nissl bodies are disturbed. Soon after glucose injection these disturbed conditions within the cells disappear. This glycogen is attacked slightly by organic acids and readily by strong ones. It shows the same reactions as liver glycogen. This glycogen is attacked by the enzymes that digest carbohydrates but not by proteases. Ganglion cells show glycogen after immersion in a 6% fructose soln. and become very rich in a 24% glycogen soln. Preps. stained by the author's method show the Nissl bodies very plainly but only the glycogen is stained with carmine. The substance in these cells termed "glycogen" by the author must be true glycogen judged from both its microchemical and biological properties. C. M. McC.

**Respiration in atmospheres of high oxygen content.** BOUNHIOL. *Compt. rend.* 188, 1340-2(1929).—Guinea pigs survived only two to three days in an atm. composed of 80% O<sub>2</sub>, and only 16 hrs. in 85-90% O<sub>2</sub>. The total N content of the blood decreased from 1.6% in the normal animal to about 1% at the time of death. The urea content increased from 0.4% to 0.59%. J. G. McNALLY

**A contribution to the knowledge of hypo- and hyperglucemic substances present in the blood of the dog.** E. MORACCI. *Boll. soc. ital. biol. sper.* 4, 329-31(1929).—An ordinary mixed diet was given to 2 dogs. Two hrs. after the meal, samples of blood were taken from which it was possible to ext. a substance capable of lowering the blood sugar of a rabbit. From blood taken during a digesting period, that is, feeding the animals after a fast of 72 hrs., a substance was extd. which had both hypo- and hyper-glucemic properties. These results confirm those of G. Martino. PETER MASUCCI

**The presence of phosphagen in the gastric muscles of certain birds.** G. ZANGHI. *Boll. soc. ital. biol. sper.* 4, 332-3(1929).—Phosphagen was found in the gastric muscles of the chicken, rooster and sparrow. The presence of phosphagen in the stomach muscles of the ox, dog or rabbit was doubtful; the min. quantity found came within the exptl. error of the detn. PETER MASUCCI

**Hormones and vitamins.** CAMILLE SOULA. *Presse méd.* 36, 1234-6(1928).—A general critical discussion is given. A. E. MEYER

**The scientific basis of cortical suprarenal opotherapy.** J. MOUZON. *Presse méd.* 36, 1379-81(1928).—The cortical suprarenal hormone is antagonistic to the adrenaline concerning its action on the blood pressure. It reactivates the fatigued muscle. The adrenaline in the ext. can be destroyed by oxidation of the alk. soln.—Prepn.: grind the gland with sand, ext. hot with 0.2 N HCl and adjust the extg. liquid to pH 4.1. Filter, ppt. with NaCl, dissolve in alc. of 70°, filter, ppt. with 5 vols. of AmOH. Dissolve the ppt. in EtOH of 80°, dry in *vacuo* and repeat the dissolving and drying. It is a white powder, sol. in alc. and dil. acids, insol. in H<sub>2</sub>O, dil. alkali, Et<sub>2</sub>O and CHCl<sub>3</sub>. It contains 24% Cl. The free substance contains N 13.3, C 43, H 5.1, O 37.3 and S 1.3%. A. E. MEYER

**The pancreas, glucemia and adrenaline in blood coagulation.** D. ESTEBAN S. TURCATTI. *Rev. sudamericana endocrinol., inmunol., quimioterap.* 12, 389-95(1929).—The pancreas secretion and sugar content in the blood do not have a definite influence on the coagulation of the blood. Adrenaline produces an increased coagulability by causing contraction of the spleen. A. E. MEYER

**Inorganic phosphorus in the blood of the newborn.** S. I. BETTINOTTI. *Semana méd.* (Buenos Aires) 35, 562-3(1928).—The average is 5.5 mg. per 100 cc. of serum. No difference in reference to sex, weight or age was observed. A. E. MEYER

**The sexual cycle of the rat and the endocrine factors.** E. B. DEL CASTILLO. *Semana méd.* (Buenos Aires) 36, 1530-57(1929); cf. C. A. 23, 887.—A complete study is given of the sexual functions of the rat, the relation between ovary and the other glands, the influence of folliculin and its chem. and physiol. qualities. A. E. MEYER

**Is fibrinogen present in natural plasma in free or combined state?** E. HEKMA. *Biochem. Z.* 209, 90-102(1929).—The view is maintained that fibrinogen in natural plasma is in a free state. S. MORGULIS

**The possibility of the existence of fibrinogen complexes together with free fibrinogen in plasma fluids.** E. HEKMA. *Biochem. Z.* 209, 128-33(1929).—Under certain artificial conditions independent, inactive fibrinogen complexes are formed in plasmatic fluids, the remainder of the plasma still contg. fibrinogen so that both free and combined fibrinogen may coexist. S. MORGULIS

**The behavior of carbohydrates in perfusion experiments on muscles of limb preparations.** A. BORNSTEIN AND HANS VÖLKER. *Biochem. Z.* 209, 102-18(1929).—The blood sugar of a dog limb perfused with dog blood tends to diminish. To maintain this sugar level const. it is necessary to supply continuously 0.225 g. glucose per kg. per hr. or 0.250 g. of fructose. The addn. of lactic acid or alc. always exerts a small but definite

sugar-sparing influence and helps in maintaining the sugar level const. If, in addn. to a continuous administration of 0.250 g. glucose, sufficient in itself to raise the sugar level, insulin is used in the perfusion there is a marked drop in the blood sugar, and the insulin produces quant. the same effect as it does in the intact animal. The glycogen and total carbohydrate content of the muscles show no const. relation to the amt. of added sugar, although with a continuous supply of glucose to maintain the blood sugar level the muscle glycogen at the end of 1½ to 2 hrs. actually increases. If a similar expt. is made with the addn. of insulin, the glycogen diminishes. The amt. of glucose necessary to maintain the blood sugar level is 50% greater than can be anticipated from the O<sub>2</sub> consumption of the extremity, so that part of the sugar must be deposited in the limb as reserve material (either carbohydrate or fat).

S. MORGULIS

**The behavior and action of indigestible materials (keratin, kaolin) in the mammalian organism.** ANNA GOLDFEDER. *Biochem. Z.* 209, 154-71(1929).—Keratin acts as an entirely indifferent material. The indigestibility of keratin was deduced from a number of observations on the insol. N and S of the feces and other matters. No mechanical effect of the keratin was noted and the coeff. of the ratio of body length to intestine length in control and exptl. mice showed only minimal variations. Neither keratin in a proportion of 50-60% nor kaolin in a proportion of 80%, although these indigestible materials fill the intestinal tract, has any effect upon the organism of the mouse.

S. MORGULIS

**Respiratory metabolism of eviscerated dogs.** A. BORNSTEIN. *Biochem. Z.* 209, 172-80(1929).—Upon removing the abdominal viscera from fasting dogs the respiratory metabolism falls, on the av., 40-45%. The respiratory quotient gradually rises, but stays between 0.8 and 0.9. The lung ventilation is too great in comparison with the lowered respiratory metabolism, so that the high respiratory quotient is really due largely to overventilation, the true quotient for the combustion of material being much lower. The intravenous administration of glucose in amts. greater than the caloric requirement of the animal causes a permanent rise in the respiratory quotient. Carbohydrate and fat play, therefore, the same role in the metabolism of eviscerated animals as in that of normal animals.

S. MORGULIS

**The inorganic phosphate content of arterial and venous blood.** AUGUST HOFF. *Biochem. Z.* 209, 195-9(1929).—Simultaneous detns. of inorg. P in arterial and venous dog blood show that the latter contains a somewhat higher concn. of P.

S. M.

**Studies on the physiology of glands. CXVIII. The influence of the liver on the secretion of urine.** LEON ASHER AND HANS MEIER. *Biochem. Z.* 209, 200-17(1929).—A method is described for a frog prepn. in which the heart itself serves as the motor to propel blood exclusively through the kidney, so that this is similar to Starling's heart-lung-kidney prepn. If the blood is circulated through the heart and kidney, then through the heart, liver and kidney, a much more pronounced diuresis was obtained in the latter case. The possibility that either urea or sugar is the cause of the increased diuresis was carefully excluded, since even the presence of a very small portion of liver, exptly. completely isolated, is able to induce the diuresis. It is concluded, therefore, that the liver must act humorally in regulating the kidney activity.

S. MORGULIS

**The protein metabolism of organs of animals living under reduced pressure.** H. ANGELESCU. *Biochem. Z.* 209, 236-9(1929).—The protein catabolism of spleen, heart, liver and muscle proceeds further under the influence of O<sub>2</sub> want than normally. The total N was 2-7% less, while the total non-protein N was 9% greater in heart or muscle, and 100% higher in spleen and liver under the greatest reduction of pressure. The alteration first appears in the spleen, then liver and in heart or muscle only under condition of extreme reduction of atmospheric pressure.

S. MORGULIS

**Experimental studies on blood ammonia.** SUGIZO KARAZAWA. *J. Biochem. (Japan)* 10, 389-94(1929).—The highest NH<sub>3</sub> content in dogs is found in the blood of the kidney vein, then in the inferior vena cava, while the blood from the aorta and of the neck arteries contains much less NH<sub>3</sub>.

S. MORGULIS

**Studies on the behavior of cholesterol within the animal body. II. The content of free and ester cholesterol in various tissues of normal rabbits.** JINYE ONIZAWA. *J. Biochem. (Japan)* 10, 409-11(1929); cf. *C. A.* 23, 1658.—The free cholesterol content of many tissues is almost const. Even in a few tissues with great variability the free cholesterol varies very much less than the esters, with the exception of the adrenal gland. The cholesterol esters of normal organs are subject to considerable variation. However, some tissues are invariably rich and others almost lacking in cholesterol esters. Then adrenal glands contain more than 5%; spleen, liver and kidney more than 0.5%; skin, testicles, diaphragm and brain more than 0.01%; while lung and heart contain less than 0.01%. The variations in both free and ester cholesterol are especially great in blood

plasma. Furthermore the cholesterol content is greater in the fall and winter than in the spring and summer. III. The influence of various autonomous nervous poisons on the content of cholesterol in each organ and tissue. *Ibid* 413-24.—Only drugs acting upon the sympathetic nerve have a marked effect on the free cholesterol content of tissues. Adrenaline raises the free cholesterol in nearly all tissues, this effect being completely annulled by previous treatment with ergotoxin, although ergotoxin injected alone tends to increase the tissue-free cholesterol. This is attributed to the fact that ergotoxin has an excitatory effect upon the sympathetic only for 90 min., producing paralysis later. It is pointed out that in these expts. the adrenaline was injected 3 hrs. after the ergotoxin, when its paralyzing effect has already been evoked so that the adrenaline action was completely suppressed. IV. The role of thyroid gland in the content of cholesterol in each organ and tissue. *Ibid* 425-34.—Extirpation of the thyroid gland has only a slight effect on the free cholesterol content of tissue. The cholesterol ester content also remains unchanged except in the adrenals and in the blood plasma where it increases noticeably. S. MORGULIS

Allantoin in dog bile. SHIGEO YOSHIMURA. *J. Biochem. (Japan)* 10, 435-42(1929).—Under usual conditions the uric acid content of the bile in dogs is 0.55% of the urinary uric acid, and even when uric acid is given either intravenously or *per os* it only increases to 2.3 and 1.3%, resp. However, allantoin is found in the bile in large amt. (18.9 mg. %, or in the av. the daily elimination is 14.3 mg.). The administration of uric acid causes a great increase in the bile allantoin, and the elimination may even reach 98.2 mg. per day. Following P poisoning the allantoin excretion both in the urine and bile diminishes to about half. S. MORGULIS

The fate of hippuric acid in the chicken organism. MASAO TAKAHASHI. *J. Biochem. (Japan)* 10, 457-61(1929).—Hippuric acid fed to chicken can be recovered to the extent of 90% in the excreta while 10% is found in the form of benzoic acid. The hydrolysis takes place more effectively in the kidney than in the liver or muscle. Benzoic acid was also found when the kidney was perfused with blood contg. hippuric acid. S. M.

Biochemical studies on the auriculoventricular junctional system of the heart. I. The glycogen content. KAGEYU YAMAZAKI. *J. Biochem. (Japan)* 10, 481-90(1929).—The glycogen content of the Tawara bundle of the horse and ox heart was detd. quantitatively. It was greater than the glycogen content of the heart muscle. S. MORGULIS

Physiological ontogeny. A. Chicken embryos. XIV. The hydrogen-ion concentration of the blood of chicken embryos as a function of time. A. E. COHN AND A. E. MIRSKY. *J. Gen. Physiol.* 12, 463-8(1929); cf. *C. A.* 22, 1799.—The H-ion concn. of the blood of chicken embryos 8-20 days old was studied by means of glass electrodes. At the beginning of this period the blood is acid ( $p_H$  6.92), at the end of the period alk. ( $p_H$  7.30). This initial reaction is probably characteristic of rapidly growing tissues. As the curve of change of  $p_H$  under these conditions resembles the curve of  $O_2$  consumption under similar conditions, it is suggested that the changes in  $p_H$  may indicate change in metabolism. C. H. RICHARDSON

Ethyl alcohol in urine and its significance. SEI OTANI. *Chiba J. Med. (Japan)* 6, 1715-43(1928).—The urine of healthy nurses, 16-27 yrs. old, who have never drunk, contains 0.01701-0.00559 vol. per mille (mean of 42 cases 0.01114 vol. per mille) of EtOH, while it is not found in the feces. Reference to the literature indicates that 2 cc. of EtOH is formed in the human body in 24 hrs. In many kinds of illness no remarkable change in EtOH formation is observable. In liver diseases the production greatly increases, the max. sometimes attaining 0.02898 vol. per mille (av. 0.01452 per mille). In tuberculosis there is also an increase due to the imperfect excretion from the lungs and not to the increase in the production within the body, as is the case in some liver diseases. In diabetes and other kidney diseases there is also an increase. K. SOMEYA

Gastric lipase in healthy babies fed with mother's milk. KUMATARO GONDO. *Nagasaki J. Med.* 6, 681-95(1928).—The gastric lipase was measured by the Rona-Michaelis method with 10 babies 45 days to 1 year old. G. took into consideration the fact that the human milk has a marked lipase action while cow milk has not. After giving milk the lipase action increases with the lapse of time, but the individual variation is fairly large. In 3 hrs. after giving milk the action is invariably intense and the individual variation is also small. K. SOMEYA

The nitrogen content of the bile and its relation to the nitrogen content of urine. SHIGEO YOSHIMURA. *Nagasaki J. Med.* 6, 740-75(1928).—Although there is a marked fluctuation of the bile taken from the bile bladder of a dog by means of a fistula, the approx. av. is: residual N 8.45 mg. (accumulated in 1 day), 32.44% of which is urea, 25.35% allantoin, 6.7% amino N, 4.37%  $NH_3$  N, 0.88% creatinine N, 0.28% uric acid N. Comparing these quantities with those excreted in the urine, Y. found in urine urea 0.9%,

$\text{NH}_3\text{N}$  10%, uric acid 0.55%, allantoin 2.40%,  $\text{NH}_3\text{N}$  8.10% and total creatinine N 2.-20%. Urea and uric acid given perorally go into the bile. In P poisoning, urea and allantoin in the bile decrease while  $\text{NH}_3$  and uric acid increase. There is no remarkable change in the residual N (70.9 mg. accumulated in 1 day); it corresponds to 1.5% of the total N.

K. SOMBYA

**Influence of pyruvic acid and acetaldehyde upon the iodic acid value of the blood serum of hungry animals.** TEISHI SUGITA. *Osaka J. Med.* 28, 151-64 (1929).—When 5 g. of  $\text{AcH}$  is given per kg. of the wt. of a dove or a dog to which no food has been given for 8 days and whose serum iodic acid value has become markedly high, the iodic acid value of the blood increases more in 1-2 hrs. and then gradually decreases. With 2.5 g. for every kg. there is no initial rise but a decrease from the outset. When pyruvic acid is given the same phenomenon can be made to take place more rapidly.  $\text{AcH}$  in such a quantity as causes no narcotic action has no influence, from which S. concludes that although the intermediate product of the sugar metabolism can accelerate the complete combustion of the product of the incomplete combustion which has been accumulated in the blood, its accelerating action is inferior to that of sugar, while such a lower oxidation product as  $\text{AcH}$  has no accelerating action.

K. SOMBYA

**Metabolism of nerves.** W. O. FENN. *Medicine* 7, 433 (1928).—A review.

H. G. WELLS

**Comparison of the manner of excretion of neutral red and phenol red by the frog kidney.** JEAN OLIVER AND ESHREF SHEVKY. *J. Exptl. Med.* 50, 15-29 (1929).—Phenol red is excreted chiefly by the perfused frog kidney through the glomerulus, while neutral red is excreted through the tubules. Some slight excretion of each of these dyes by the converse mechanism is possible, although there is no evidence in the expts. that necessitates such a conclusion. The importance of methods leading to the production of a normal vol. of urine by the perfused kidney is emphasized.

C. J. WEST

**Cause of the change in the urinary constituents due to the partial closure of the ureter.** JURO KAWASOE. *Proc. Imp. Acad. (Japan)* 5, 257-9 (1929).—When the Tamura method is applied to the Japanese toad, the amt. of  $\text{SO}_4$  excreted from the tubules is comparatively small, regardless of whether  $\text{SO}_4$  had been injected into the animal or not; but the relative concn. of  $\text{SO}_4$  was higher in the urine excreted under pressure. In a moist condition, when the glomerular circulation was retarded and was of a pulsatory nature, the total amt. of each urinary constituent was diminished considerably; the diminution of Cl was larger than that of  $\text{H}_2\text{O}$  while  $\text{SO}_4$  diminished less than the latter. When the glomerular circulation was not much impaired and of a non-pulsatory nature, the total amt. of each constituent did not diminish as much; in this case  $\text{SO}_4$  diminished slightly less than  $\text{H}_2\text{O}$ , while Cl was considerably larger than that of the other 2. In an arid condition, the diminution of  $\text{H}_2\text{O}$  was definitely higher than that of  $\text{SO}_4$ . Thus the cause of the changes in the urinary constituents, when excreted against a higher pressure, is to be attributed to the changes in glomerular circulation, resulting in the diminution of the sp. physiol. filtration of the glomeruli.

C. J. WEST

**Blood cholesterol: after fasting and after cholesterol ingestion.** G. W. PUCHER AND G. E. SLV. *Bull. Buffalo Gen. Hosp.* 7, 10-4 (1929).—The blood cholesterol of the same individual even under controlled conditions varies from day to day to almost as great an extent as that of different individuals. In 4 of 6 expts. there was a small rise in blood cholesterol after the administration of cholesterol. Cream alone does not increase the blood cholesterol but cream and cholesterol have an effect similar to that of pure cholesterol.

R. C. WILLSON

**Amylase concentration in normal urine.** WALTER BREM MAYER AND HAROLD FINKELSTEIN. *Bull. Johns Hopkins Hosp.* 45, 105-7 (1929).—Detns. in the same individual, apparently normal, over a period of 2 months varied from 0.8 to 8.8 units (amylase) per cc. urine. The daily variation in the same individual was 1.4-5.7 units. Amylase concn. in 24-hr. specimens from another subject varied from 7.4 to 12.3 units. There was no deterioration in amylase concn. when specimens were kept overnight at 4° with and without toluene.

R. C. WILLSON

**Influence of thymus on cholesterol metabolism in early childhood.** G. A. PIANA. *Clin. pediatrica* 11, 217-28 (1929); *J. Am. Med. Assoc.* 93, 243.—After the thymus gland was removed from young animals, the cholesterol content of the blood increased from  $\frac{1}{4}$  to  $\frac{1}{2}$  in the first 24 hrs., and in the surviving animals subsequently returned to normal. The extirpation of the thymus results in an increased production of adrenaline, which in turn produces an increase of cholesterol mobilized from the tissues and the suprarenal cortex. It appears that the removal of the thymus checks the normal processes of cholesterol destruction.

R. C. WILLSON

**Hormone of anterior lobe of pituitary (Prolan).** B. ZONDEK. *Zentr. Gynäkol.* 53,

834-48(1929); *J. Am. Med. Assoc.* 93, 247.—Prolan is modified at 60° and is quickly destroyed by strong acid or alkali. It is dialyzable, sol. in H<sub>2</sub>O, insol. in ether and is pptd. by alc. and acetone. Given to mature female rabbits it produces marked congestion and hypertrophy of all the organs of reproduction. In young male rabbits it causes an increased growth of the genital apparatus.

R. C. WILLSON

LAZAREV, PETROVIČ: *Physikalisch-chemische Theorie der Tätigkeit der Nervenzentren*. Halle: M. Niemeyer. 11 pp. M. 1.20.

## G—PATHOLOGY

H. GIDEON WELLS

Significance of cholesterol in the formation of gall-stones. S. HANSEN. *Acta Chir. Scand.* 67, 483-542(1927).—A critical discussion.

B. C. A.

Protein and energy economy in pancreatic diabetes of dogs. E. ENDERLEN, H. GLATZEL AND PÜ. *Arch. expl. Path. Pharm.* 139, 20-31(1929).—Fever-free, non-infected, depancreatized dogs showed on the av. the following increases: protein metabolism 45%, (28-66%); basal metabolism 12% (3-28%). Respiratory quotients showed no significant deviations from normal.

B. C. A.

The effect of  $p_H$  on the bactericidal power of blood. L. BOEZ. *Compt. rend. soc. biol.* 101, 848-50(1929).—Rabbit blood was adjusted to different H-ion concns. from  $p_H$  5 to 9, then was treated with suspensions of *B. proteus*, *B. dysenteriae* Shiga, *B. typhosus*, *B. paratyphosus* B, *B. anthracis*, *V. cholerae* and *Streptococcus*. After exposures from 1 min. to 8 hrs., bacterial counts were made. B. found that the bactericidal power of whole blood and of plasma is a function of the H-ion concn., the critical zone being approx.  $p_H$  7.20 to  $p_H$  7.40. Above this range, bacteriolysis is great; below it, bacteriolysis is suppressed or prevented.

B. C. BRUNSTETTER

Carotinemia and diabetes. I. M. RABINOWITCH. *Can. Med. Assoc. J.* 18, 527-30(1928).—Of 1014 diabetics 59 showed xanthosis. Since most of the patients were practically on the same diet, diet seemed to be not the only factor. The proportion of insulin patients was high, as was also the incidence of cardio-vascular disease. Insulin-edema was present in 4 cases, hyperglucemia difficult to control with insulin in 11 and raised renal threshold for sugar in 3. Hypercholesterolemia was a marked feature, although this is not easily interpretable. R. considers that xanthosis in diabetes is of clinical importance and suggests an unfavorable prognosis. He believes that a test for it should form part of the routine management of the diabetic. For this test to 3 cc. of plasma add sufficient plaster of Paris to make a paste, and to the paste add 3 cc. of 95% EtOH. Shake for a few min. Then add 3 cc. of petroleum ether (b. 30-50°). Shake 10 min. and then centrifuge. Carotin remains in the upper layer. Remove this to a clean dry test tube. Prep. standards by dissolving oleic acid in petroleum ether. A 10% soln. (giving a color corresponding to the max. amt. of pigment found in the blood of more than 100 normal individuals) is taken as equiv. to 1 unit of pigment. Make up a series of such solns. and compare with the unknown. Diabetics may show up to 5 units.

A. T. CAMERON

The importance of the protein-relations in the diagnostic study of cerebrospinal fluid. V. KAFKA AND K. SAMSON. *Deut. med. Wochschr.* 55, 1122-4(1929).

ARTHUR GROLLMAN

The effect of hydrogen-ion concentration on saponin hemolysis. MEYER BODANSKY. *J. Biol. Chem.* 82, 567-77(1929).—The effect of  $p_H$  and inorg. acids and bases on the saponin hemolysis of dog and human erythrocytes was detd. The resistance of the cells increases with increasing  $p_H$ , reaching a max. at  $p_H$  10.

ARTHUR GROLLMAN

Biochemical findings in a rare case of acute yellow atrophy of the liver. With particular reference to the origin of urea in the body. I. M. RABINOWITCH. *J. Biol. Chem.* 83, 333-5(1929).—In acute yellow atrophy with kidney involvement and anuria, no urea was found in the blood. The other findings did not deviate greatly from the normal except for an hypoglucemia and a very high amino acid N (216 mg. per 100 cc.) in the blood.

ARTHUR GROLLMAN

Studies of serum electrolytes. IV. The chloride and nitrogen balances, and weight changes in pneumonia. F. W. SUNDERMAN. *J. Clin. Investigation* 7, 313-32(1929); V. Urinary electrolyte excretion in pneumonia. J. HAROLD AUSTIN AND F. W. SUNDERMAN. *Ibid* 333-7(1929).

ARTHUR GROLLMAN

Metabolism of chloride and total fixed base in pneumonia and the relation to salt and water retention. T. S. WILDER AND T. G. H. DRAKE. *J. Clin. Investigation* 7, 353-64(1929).

ARTHUR GROLLMAN

Lecithin and streptococcal hemolysin. J. GORDON AND F. R. STANSFIELD.

*Brit. J. Exptl. Path.* 10, 191-3(1929).—Lecithin added to cultures of hemolytic streptococci neutralizes the hemolytic activity. Treatment with ligroin does not remove or destroy hemolysin. The hemolytic activity of streptococcal cultures cannot be restored by treatment with a lecithin solvent (ligroin) after it has once been destroyed by addn. of lecithin.

HARRIET F. HOLMES

**Hypersecretion (gastro-succorhea or Reichmann's disease).** HERBERT J. PATERSON. *Am. Med.* 35, 261-4(1929).—Discussion.

FRANCES KRASNOW

**Blood sugar in trypanosome infections.** P. REGENDANZ. *Arch. Schiffs-Tropen Hyg.* 33, 242-51(1929).—Rats infected with trypanosomes show low sugar only during last stages. Infections of monkeys with *T. rhodesiense* are accompanied by blood-sugar decreases which are independent of the no. of the parasites. In such cases adrena-line administration brings the blood sugar back to normal. The liver is rich in glycogen.

FRANCES KRASNOW

**The occurrence of reducing substances in the stomach contents during gastritis.** NORBERT HENNING. *Arch. Verdauungs-Krankh.* 44, 311-5(1928).—In 35 of 50 gastric-ulcer cases there was no reduction of methylene blue by the contents of the fasting stomach. A rapid decoloration of the dye was obtained in only 5 cases suffering from carcinoma. After administration of coffee (1 case treated with methylene blue), the contents withdrawn at 10 min. intervals were colorless. This is probably brought about by the bacteria present.

FRANCES KRASNOW

**Physicochemical properties of normal and pathological organisms. Application to the tumor problem.** F. VLÈS AND A. DE COULON. *Bull. Natl. Research Council* 69, 262-93(1929); cf. *C. A.* 23, 3509.—A review.

W. D. LANGLEY

**The action of heat on the agglutinins of blood group I.** V. SIRACUSA. *Boll. soc. ital. biol. sper.* 4, 410-2(1929).—The agglutinins  $\alpha$  and  $\beta$  of group I serums are attenuated or completely destroyed if exposed for  $\frac{1}{4}$ ,  $\frac{1}{2}$  or 1 hr. at 60°. If both agglutinins are not destroyed, the one which originally was more active remains.

PETER MASUCCI

**Blood cholesterol studies in cancer. IV. With special reference to other lipid partitions.** WALTER L. MATTICK AND KENNETH W. BUCHWALD. *J. Cancer Research* 13, 157-66(1929); cf. *C. A.* 23, 196.—The partitioning of total fatty acids, lecithin and cholesterol was detd. in the whole blood and plasma of 21 unselected cancer patients and 10 healthy controls while in a post-absorptive state. Values for the corpuscles were calcd. from the data obtained. Results in both the cancerous and control group are tabulated for each of these fractions in whole blood, plasma and corpuscles together with the cell vol. in each case. It would seem that definite normal values are yet to be established and methods standardized in order to furnish a more satisfactory basis for comparison of results of different investigators. This work demonstrates the tendency in cancer to a hypercholesterolemia in the plasma with little change in the corpuscles. Lecithin values fail to show significant changes except for slight lower values in the plasma. Total fatty acids show the most marked changes, being especially higher than normal values in the plasma, with a less but similar tendency in the corpuscles. Thus it would appear in cancer that either fat absorption is increased or the utilization decreased with resulting accumulation of total fatty acids and fats especially in the plasma.

H. G. WELLS

**Factors influencing the precipitation of colloidal lead.** HELEN Q. WOODWARD. *J. Cancer Research* 13, 173-9(1929).—The coagulation of Bredig Pb sols is hastened greatly by rise in temp. Up to 37° it is retarded by the addn. of the strong reducing agents HCHO and glucose, and hastened by H<sub>2</sub>O<sub>2</sub>. HCHO and glucose, when added to Bredig Pb sols, react with part of the colloidal Pb to form sol. compds.

H. G. W.

**Enzyme studies on hemolysis. II. Purification experiments on an amboceptor of hemolysis.** H. v. EULER AND EDWARD BRUNIUS. *Arkiv Kemi, Mineral. Geol.* 10B, 1-6(1929); cf. *C. A.* 23, 2996, 3272.—By using goat blood corpuscles in dogs for the production of amboceptor, and with guinea-pig serum for complement, purification of the amboceptor was attempted by various methods. Pptn. by half-satd. (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> increased its activity 6-fold; this followed by adsorption on colloidal Fe(OH)<sub>3</sub> increased it 15-fold; both of these treatments, followed by adsorption on Al(OH)<sub>3</sub>, increased it 25-fold; repetition of the Fe(OH)<sub>3</sub> treatment increased it 30-fold.

J. J. W.

## H—PHARMACOLOGY

A. N. RICHARDS

**Excretion of bismuth from the human organism.** W. ENGELHARDT. *Arch. Dermatol. Syphilis* 156, 1-42(1928).—Considerable quantities of Bi are excreted in



the feces and urine during treatment of syphilis by Bi preps. Up to 50% is so excreted, most rapid excretion taking place after intravenous injection. Oil suspension are irregularly excreted. B. C. A.

[Physiological] action of sulfur. L. PINCUSSEN AND E. GORNITZKAJA. *Z. klin. Med.* 108, 369-77(1928).—After application of S the sugar, diastase and catalase of the blood are unchanged, but the tributyrin esterase is diminished. B. C. A.

The influence of ergotamine on blood-sugar concentration. L. RIGØ AND L. VESZELSZKY. *Arch. expul. Path. Pharmacol.* 139, 10-3(1929).—See C. A. 23, 2487.

B. C. BRUNSTETTER

The effect of ovarian extracts on the  $p_H$  of the blood. E. IMPARATO. *Compt. rend. soc. biol.* 100, 165-6(1929).—Subcutaneous injections of exts. of the corpus luteum (I) or of follicles (II) or of the entire ovary (III) into rabbits did not affect blood  $p_H$  or alk. reserve except in the case of III, where a decrease from 54.2 to 45.9 was noted. Intravenous injection of I (1.0 cc.) caused an av. drop in  $p_H$  from 7.52 to 7.49, and in alk. reserve from 50.4 to 41.5 (1 hr. after injection). The alk. reserve only was changed after the intravenous injection of II, increasing from 50.3 to 57.2. Intravenous injection of III caused an increased in  $p_H$  (7.50 to 7.54) but a decrease in alk. reserve (59.1 to 50.8).

B. C. BRUNSTETTER

A case of extensive atrophy of the subcutaneous fat following injections of insulin. I. M. RABINOWITZ. *Can. Med. Assoc. J.* 21, 67-8(1929).—A case report, with photographs.

A. T. CAMERON

The use of vitamins A and D and sodium iodide in the pre-operative treatment of Graves' disease. ROY H. FRASER AND A. T. CAMERON. *Can. Med. Assoc. J.* 21, 153-5(1929); cf. Adamson and Cameron. *C. A.* 23, 197.—A combination of vitamins A and D and NaI produces the same beneficial effect as "vitiodum" and as Lugol's solution in the pre-operative treatment of Graves' disease. The vitamins alone appear to be without action.

A. T. CAMERON

The effects of iodine treatment, with and without vitamins, on the basal metabolic rate in exophthalmic goiter. I. M. RABINOWITZ. *Can. Med. Assoc. J.* 21, 156-60(1929).—Analyses of thyroids from normal (autopsy) material and from hyperthyroid patients (tissue removed at operation) showed that the latter are not deficient in I, the amt. present frequently exceeding the normal av. This suggests that lack of I cannot be the only factor responsible for the clinical signs of exophthalmic goiter, in spite of the fact that administration of I (Lugol's soln.) leads to improvement. These and other observations led R. to test the effect of a mixt. of vitamins A and D and iodized jeccoleic acid ("vitiodum") on 12 cases of Graves' disease. The rate of decrease of the basal metabolic rate, as compared with that in 12 similar patients on Lugol's soln., was somewhat greater. It is considered that administration of large amts. of A and D influences the course of exophthalmic goiter, and the various possibilities of the mechanism of the action are discussed.

A. T. CAMERON

A new anesthetic gas: cyclopropane. G. H. W. LUCAS AND V. E. HENDERSON. *Can. Med. Assoc. J.* 21, 173-5(1929).—Expts. on cats and rabbits suggest that cyclopropane is a highly potent anesthetic, 10 to 12% producing deep surgical anesthesia in cats.

A. T. CAMERON

The cardiac hormone. XII. Pharmacological investigations of the cardiac hormone. L. HABERLANDT. *Arch. ges. Physiol. (Pflüger's)* 222, 259-70(1929); cf. C. A. 23, 3504.

ARTHUR GROLLMAN

The vasomotor and secretory reactions of the salivary glands to acetylcholine. P. ANOCHIN AND A. ANOCHINA-IVANOVA. *Arch. ges. Physiol. (Pflüger's)* 222, 478-92(1929).

ARTHUR GROLLMAN

The blood-sugar after the administration of opiates. ARNOLD HIRSCH. *Deut. med. Wochschr.* 55, 1129(1929).

ARTHUR GROLLMAN

Calcium and magnesium relations in the animal. W. P. ELMSLIE AND H. STEENBOCK. *J. Biol. Chem.* 82, 611-32(1929).—Mg administered in large doses to rats did not affect Ca assimilation, the digestive tract being capable of excluding any excess of Mg.

ARTHUR GROLLMAN

Studies on creatine. I. The effect of creatine on the blood sugar. Robert M. HILL AND INEZ H. MATTISON. *J. Biol. Chem.* 82, 679-85(1929).—Creatine administered subcutaneously or *per os* reduces the blood sugar of dogs. Given with glucose, it diminishes the rise in blood sugar. Creatine is apparently non-toxic. II. The effect of creatine administration upon rabbits. W. A. PEABODY AND ROBERT M. HILL. *Ibid* 687-92.—Creatine caused no liver injury, as tested by the glycine method, and in only 1 case did it cause urea retention. The hypoglucemia observed in dogs did not occur in rabbits after creatine administration.

ARTHUR GROLLMAN

The prevention of the tetany of parathyroidectomized dogs. III. Ammonium chloride. ISIDOR GREENWALD. *J. Biol. Chem.* 82, 717-25(1929); cf. *C. A.* 23, 3970.—Administration of  $\text{NH}_4\text{Cl}$  relieved or prevented tetany. There was an increased excretion of P, Na and K. The  $[\text{Ca}^{++}]$  of the blood was sometimes increased while that of the inorg. P was diminished.

ARTHUR GROLLMAN

The action of sodium chloride, ammonium chloride and sodium bicarbonate on the total acid-base balance of a case of chronic nephritis with edema. FULLER ALBRIGHT and WALTER BAUER. *J. Clin. Investigation* 7, 465-86(1929).

A. G.

The effect of potassium salt upon the hyperglucemia. TSURUKICHI HIRAMATSU. *Sei-i-kwai Med. J.* 48, 105-12, Abstract sect. 4(1929).

E. H.

Radium in malignancy. JOSEPH MUIR. *Am. Med.* 35, 404-17(1929).—General discussion centered about the beneficial action of radium.

FRANCES KRASNOW

Effect of iodine and thyroid feeding on the thyroid gland. CHARLES H. FRAZIER and W. BLAIR MOSSER. *Ann. Surgery* 89, 849-56(1929).—Ingestion of I increases the amount of colloid in the gland. Colloid retention compresses the cell lining of the acini. Prolonged I administration may produce a stage of exhaustion in the thyroid of the normal dog. This may be followed by a state of partial recovery. Such administration to human beings with hyperthyroidism produces a similar effect. The effect of desiccated thyroid on the gland is not the same as that of I.

F. K.

Experience with tryparsamide in sleeping sickness. MARK LAUTERBURG. *Arch. Schiffs-Tropen Hyg.* 33, 251-6(1929).—Tryparsamide was beneficial in 66% of the very advanced cases of African sleeping sickness. In infections with *Trypanosome rhodesiense*, this drug does not effect any relief.

FRANCES KRASNOW

Experience with plasmochin. E. STERN. *Arch. Schiffs-Tropen-Hyg.* 33, 273-6(1929).—Plasmochin is very valuable in tropical and subtropical practice. It plays the same role as quinine in being a cure but is more agreeable.

FRANCES KRASNOW

The action of rivanol, yatren and emetine on the intestine. OTTO GESSNER. *Arch. Schiffs-Tropen-Hyg.* 33, 277-81(1929).—Rivanol was slightly toxic (1:20,000); it effected an increase in tone (1:1000) and irreparable contraction in diln. of 1:100. Emetin had a similar effect. Influence was already noticed at a concn. of 1:10<sup>7</sup>, in guinea pigs, 1:10<sup>8</sup> in rats. Yatren showed stimulation in concns. to 1:100. Greater concn. produced injury.

FRANCES KRASNOW

Plasmochin and plasmochin compound in treatment of malaria. MARK FREEMAN. *J. Trop. Med.* 32, 165-9(1929).—These drugs have a specific action on the different malaria parasites. They have a tendency to cause methemoglobinuria and methemoglobinemia. There is an individual limit to plasmochin tolerance.

F. K.

The influence of morphine and like substances on the skin sensory qualities, together with a contribution on morphinism. PAUL HOFER. *Z. Biol.* 89, 21-36(1929).—In all cases there is an acute action of morphine and pantopon on the pain and pressure sense. If the same dose (0.006-0.01 g.) is repeated for several days, the pain sense is finally no longer influenced and greater doses must be used. Warmth and cold are not affected. Like results were obtained with dikodid and eukodal.

FRANCES KRASNOW

Paraldehyde poisoning. ST. BAU. *Deut. Z. ges. gericht. Med.* 13, 337-52(1929).—Chronic paraldehyde poisoning produces effects similar to chronic alcoholism.

F. K.

A case of vernal poisoning. A. SCHRÖDER. *Deut. Z. ges. gericht. Med.* 13, 353-7(1929).—Death was caused by the thrombosis of the sinus longitudinalis.

F. K.

Mercury poisoning. R. N. V. PODROUŽEK. *Chem. Listy* 22, 529-31(1929).—Hg poisoning is more hazardous than Pb; the poisoning remains concealed, and characteristic symptoms are manifested only in later stages of the intoxication. Less than a mg. of Hg vapor per cu. m. of air is considered dangerous. This concn. may be produced by open manometers, gas pipets, tensiometers, Hg cups and contacts used in lab. Symptoms and diagnoses are discussed.

FRANK MARESH

Pharmacological studies on japaconitine A and japaconitine B. R. BENIGNI. *Boll. soc. ital. biol. sper.* 4, 399-400(1929).—When injected intravenously into warm-blooded animals in doses of 0.009 mg. per kg. body wt., both drugs modify the intensity and frequency of respiration. Doses 10 times as large stop the heart and respiration. In cold-blooded animals (frogs) the symptomology is mostly peripheral. On the isolated heart of the frog, japaconitine A in a diln. of 1:20,000,000 produces effects which are characteristic of aconitine in general, while japaconitine B has a specific action in a diln. of 1:5,000,000 to 1:1,000,000. On the isolated mammalian heart, doses of 0.1 to 0.5 mg. are very toxic—the action being mostly systolic. The m. l. d. of both drugs is between 0.06 and 0.05 mg. per kg. body wt. for warm-blooded animals and 0.44 mg. per kg. body wt. for frogs.

PETER MASUCCI

The influence of histamine hydrochloride on the number of leucocytes. G. RUGGERI. *Boll. soc. ital. biol. sper.* 4, 415-7(1929).—Histamine produced a definite leucocytosis; in certain animals this was preceded by a leucopenia analogous to that caused by the ingestion of HCl.

PETER MASUCCI

Studies on the isolated uterus: the action of glucose. MARIANO MESSINI. *Boll. soc. ital. biol. sper.* 4, 421-3(1929).

PETER MASUCCI

Studies on the isolated uterus: the action of tri-sodium citrate. M. MESSINI. *Boll. soc. ital. biol. sper.* 4, 418-21(1929).

PETER MASUCCI

Pharmacological studies on certain derivatives of pyrrole. V. The antithermic and antipyretic action of pyrrole and of pyrrolalkyl ketones. ANGELO RABBENO. *Boll. soc. ital. biol. sper.* 4, 429-32(1929); cf. *C. A.* 23, 3978.—The general action and toxicity of pyrrole and its derivs. are described. The min. antithermic dose of pyrrole is 0.5 millimol. The lowering of the temp. is slight and transitory. With a dose of 1-2 millimol. the lowering is more intense and persists for hrs. With lethal doses, if death is rapid, the fall in temp. is continuous and precipitous; if death is delayed for a few hrs., the intense hypothermy may be followed by a transitory rise to normal temp. In rabbits rendered hyperpyretic by intravenous injection of a mixed vaccine, the fever is either checked or abolished. The derivs. of pyrrole have the same antithermic and antipyretic action in doses which do not produce narcosis. With acetylpyrrole the antithermic action prevails over the narcotic; with 0.004 g.-mol. the lowering of temp. is  $-2.4^{\circ}$ . The min. antithermic dose of the Ac deriv. is 0.0013 g.-mol. per kg.; of the benzoylpyrrole 0.00029 g.-mol. The propylpyrrole acts on the temp. and also causes narcosis; butylpyrrole produces only a lowering of temp. The pyrrole derivs. have the property of breaking up or abolishing the pyrexia in rabbits injected with a mixed vaccine and their activity is comparable to acetanilide, pyramidone and acetylsalicylic acid.

PETER MASUCCI

The action of cocaine hydrochloride on the nerve trunk. Comparison of the action on the sensory fibers and that on the motor fibers. JEAN RÉGNIER. *Bull. sci. pharmacol.* 36, 401-7(1929).—In different fibers of different nerves, the chronaxie decreases considerably at first, when increasing doses of cocaine are given; further doses produce a comparatively small decrease. All the curves differ only by a const.

A. E. MEYER

The action of the derivatives of phenylquinoline on the liver. J. MOUZON. *Presse méd.* 36, 1256-7(1928).

A. E. MEYER

The cholesterol esters in antibacterial therapy. JUAN A. SÁNCHEZ. *Semana méd.* (Buenos Aires) 35, 443-5(1928).—Free cholesterol is worthless in subcutaneous application. The palmitate and oleate are recommended.

A. E. MEYER

The therapeutic use of cholesterol esters. JUAN R. GOYENA. *Semana méd.* (Buenos Aires) 35, 882-7(1928).—A case of successful use against pleurisy is reported.

A. E. MEYER

Chlorine in the regulation of the acid-base equilibrium in blood. JUAN R. GOYENA. *Semana méd.* (Buenos Aires) 35, 1162-5(1928).—Intravenous injections of NaCl soln. reduce the alk. reserve in the plasma; the Cl content is higher. The ingestion of NaCl increases the alk. reserve; the Cl content remained unchanged.

A. E. MEYER

Acute poisoning caused by a tincture for shoe dyeing. LUIS E. ALCAYAGA AND A. BERCOVICH. *Semana méd.* (Buenos Aires) 36, 642-8(1929).—A soln. of an aniline dye in 75% alc. absorbed from wet shoes caused bluish color over the whole body and blue vision (cyanopsia) but no important subjective symptoms. A general review of dye poisoning is given.

A. E. MEYER

The treatment of pulmonary tuberculosis with metals in very small doses by the method of Walbum. GUMERSINDO SAYAGO AND ALBERTO MARSAL. *Semana méd.* (Buenos Aires) 36, 648-51(1929).—The catalytic action of certain metals, as Au, Cd, Al, etc., stimulates the formation of antitoxins.

A. E. MEYER

Pharmacodynamics of the colloids, rare earths and radioactive substances. SIMON LIBEDINSKY. *Semana méd.* (Buenos Aires) 36, 748-56(1929).—Colloidal Ag produces leucocytosis; it is fixed in the liver producing an increase of the destructive power of the liver secretions against streptococcus and pyocyanus toxin. The agglutination and the opsonic index are increased. Se and colloidal metals have a favorable influence on the enzymes and the globular stability. They affect leucocytosis and elimination of uric acid. Metals of the Ce group produce a slight increase of the red, and an enormous increase of the white corpuscles without any bodily disorder. Radioactive substances are deposited in the bones and the bone marrow and to a lower extent in the spleen and the liver. Rn has a special affinity to the suprarenal gland. The affinity to the tissues is in direct relation to their content in nucleinic P. An elective affinity exists to

embryonal and cancer cells. In cancer treated with Ra the nuclear P decreases. The radioactive substances are fixed in the protoplasm by the elec. charges of the colloidal particles. The effects of small doses are: stabilization of the globulins, hyperleucocytosis, polyglobulia and stimulation of the secretion of adrenaline and uric acid. High doses produce destruction of the hematopoietic organs, decrease of the red and white cells, of the blood pressure and its coagulability, injuries in the liver lungs, bone marrow and kidneys. Rn is eliminated by the lungs; the other substances by the urine, saliva and through the intestine. The therapeutic results in cancer, anemia and leucemia are incomplete; in gout they are satisfactory. Also in *Rev. farm.* (Buenos Aires) [2], 2, 350-69(1929).

A. E. MEYER

**Therapeutics with metal salts in pulmonary tuberculosis.** N. LUNDE. *Semana méd.* (Buenos Aires) 36, 771-5(1929).—The use of Mn, Be, Cd and sanocrysin and their effect is reported.

A. E. MEYER

**The mechanism of morphine habituation.** ROBERT A. HATCHER AND HARRY GOLD. *J. Pharmacol.* 35, 257-79(1929).—Morphine was found in the blood of normal or habituated animals in traces only when exsanguination was begun after an interval of more than 5 min. from the time of injection. The amt. of morphine found in tissues was variable, although skeletal muscles and kidneys contained it in greatest amt. There appeared to be no essential differences between the amt. in tissues of normal and of habituated animals. The liver of habituated animals, when perfused with fluid contg. morphine sulfate, had no greater power to destroy morphine than the liver of normal animals so perfused. Different animals showed great individual variations in the amt. of morphine excreted in the urine and in the rate of excretion. No evidence was found that the organs or tissues of habituated animals have a greater capacity for destroying morphine than those of normal animals.

C. RIEGEL

**Concerning the antipyretic properties of benzyl benzoate.** DAVID I. MACHT AND HARRIET P. LEACH. *J. Pharmacol.* 35, 281-90(1929).—Aq. suspensions of benzyl benzoate administered to normal rabbits by stomach tube did not cause fall in body temp. When given to rabbits whose temp. was above normal because of infection, peptone injections or injections of hay infusion, the lowering of temp. was marked. Much less effect was noted after the fever produced by injections of cocaine, atropine,  $\beta$ -tetrahydronaphthylamine, caffeine or after heat puncture. Perfusion of frog lower extremities or of a rabbit ear, with fluid contg. benzyl benzoate, caused vasodilatation. It is concluded that benzyl benzoate has no marked depressant or narcotic action on the brain, but produces fall in temp. because of a greater dissipation of heat through dilatation of blood vessels.

C. RIEGEL

**The action of adrenaline on the respiratory center, with remarks upon the treatment of severe respiratory depression.** CARL F. SCHMIDT. *J. Pharmacol.* 35, 297-311(1929).—Production of apnea following injection of adrenaline is due to increase in cerebral blood flow because: (1) if the brain of a cat is perfused via the vertebral arteries, the addn. of adrenaline causes marked rise in systemic pressure but perfusion pressure is not raised and respiration is only slightly depressed, whereas, when the carotids are opened, typical adrenaline apnea occurs; (2) when const. blood flow through cerebral vessels is maintained, adrenaline does not produce apnea. Evidence is presented against the theory that adrenaline apnea is the result of direct cerebral depression, or of acute anemia of the respiratory center. Reflex inhibition is thought to be a factor. Adrenaline may stimulate respiration when it is markedly depressed, as after morphine. This is attributed to improvement in oxygen supply to the center through augmented blood supply.

C. RIEGEL

**A comparative study of new ether derivatives of barbituric acid.** FRANK P. UNDERHILL AND OSCAR R. JOHNSON. *J. Pharmacol.* 35, 441-8(1929).—The effect of the following compds. administered to white mice was studied: (1) ethyl(benzyloxymethyl)-barbituric acid, (2) ethyl(ethoxymethyl)barbituric acid, (3) ethyl(butoxymethyl)-barbituric acid, (4) ethyl(methoxymethyl)barbituric acid, (5) ethyl(propoxymethyl)-barbituric acid, (6) ethyl(isobutoxymethyl)barbituric acid. Nos. 2, 3 and 5 produced no narcosis. Nos. 1, 4 and 6 produced narcosis, but with 4 and 6 paralysis of the hind legs resulted also. No. 1 approached barbital most closely. The m. c. d. was 150 mg. per kg.; the m. t. d. 200 mg. per kg., and the m. l. d. dose 225 mg. per kg. For barbital, these doses were, respectively, 200 mg., 350 mg. and 400 mg. per kg. C. R.

**The influence of some salts on the secretory capacity of the gastric glands.** I. RAZENKOV. *Russ. physiol. J.* 9, 75-86(1926); *Chem. Zentr.* 1929, I, 257-8.—Distd.  $H_2O$  and 0.025 N solns. of NaF, NaCl,  $Na_2CO_3$ ,  $Na_2HPO_4$ ,  $NaH_2PO_4$  and  $Na_2SO_4$  were introduced into the stomach of a dog with an "isolated small ventricle." NaCl produces a smaller, NaF a greater, secretion of gastric juice than does  $H_2O$ . With the salt

concn. doubled ( $\text{Na}_2\text{CO}_3$ ,  $\text{Na}_2\text{SO}_4$  and  $\text{NaF}$ ) the secretion is increased from 2.8 to 3.7, from 3.6 to 4.6 and from 6.2 to 12.1, resp. K salts inhibit the secretion almost completely.  $\text{Na}_2\text{SO}_4$  produces secretion of mucus only. Anions as well as cations are of influence on the activity of the stomach; univalent anions cause secretion of gastric juice, while bivalent anions cause secretion of mucus. G. SCHWOCH

Quantity of cholesterol in the rabbit given lecithin. C. KAMEDA. *Osaka J. Med.* 28, 35-66(1929).—When 0.5-1 g. per day of lecithin is given mixed with the ordinary vegetable food of the rabbit, there appeared an increase in wt. of the animal, the increase reaching a max. in 20-30 days, and then decreased afterward. When the same substance is subcutaneously injected, the quantity of cholesterol in blood also increases, the increase apparently reaching a max. in 6-9 hrs. K. SOMEYA

Influence of insulin upon the formation of hippuric acid. SHINZO SAKATA. *Osaka Med. Coll. Osaka J. Med.* 28, 189-94(1929).—When insulin is injected into a rabbit fed with ordinary vegetable food, it slightly increases the excretion of hippuric acid. K. SOMEYA

Fluctuation of the cholesterol content due to the vegetable stimuli. III. C. KAMEDA. *Osaka Med. Coll. Osaka J. Med.* 28, 335-50(1929).—When 20-50 mg. of choline is injected subcutaneously into a rabbit, the amt. of cholesterol in the blood generally decreases, the decrease being the more marked the larger the quantity injected. With 0.2-0.5 mg. of atropine sulfate, the corresponding decrease is slight. When choline chloride and adrenaline, or pilocarpine and insulin is used in combination, the actions of both of the injected substances appear independently. K. S.

The modalities of the action of cocaine. L. HALLION. *Rev. prat. biol.* 21, 321-31 (1928).—The physiol. effects of cocaine are discussed in detail, showing that its action is exerted upon all living matter; however, with less and less differentiated animals and plants, one finds that the quant. sensibility toward cocaine is gradually decreasing, while in qual. respects its action gradually reverses itself in such a manner that the paralyzing action becomes more and more predominant over the stimulating action. G. TOENNIES \*

Dermatological use of titanium oxide. B. L. MEREDITH and W. G. CHRISTIANSEN. *J. Am. Pharm. Assoc.* 18, 607-8(1929).—A specimen of  $\text{TiO}_2$  was found to be free from foreign metals except traces of the Sn group. Ointments were prepd. with paraffin and white petrolatum as bases. The ointments had no greater antiseptic value than the vaseline control. Scarified areas were treated with  $\text{TiO}_2$  ointment,  $\text{ZnO}$  ointment and  $\text{TiO}_2$ . The areas healed more rapidly than the untreated controls. The ointments were more effective than the powder. No irritation resulted when  $\text{TiO}_2$  was applied to the skin of normal rabbits for 15 days. L. E. WARREN

The mineral waters of Rosheim. Analytical and therapeutical study (LEGIN, SCHIRARDIN) 14. The peroxidase activity of mineral waters; the numerical measurement of this activity (MOUGNOT) 14. Activity of mineral springs (HARPUDE) 14. Chaulmoogrylamino phenols and chaulmoogrylbenzylamine (DE SANTOS, WEST) 10.

## I—ZOÖLOGY

R. A. GORTNER

Histochemistry of the insect skeleton. W. KÜHNELT. *Zoöl. Anz.* 75, 111-3 (1928). B. C. A.

Oxidation-reduction potential in larvae of *Galleria mellonella*. E. AUBEL and ROBERT LEVY. *Compt. rend. soc. biol.* 101, 756-7(1929).—Larvae injected with the following dyes, then stored in  $\text{N}_2$ , decolorized at a rate inversely proportional to the  $r_H$  of the dye: cresyl blue, 20 min.; methylene blue, 25 min.; Nile blue, 45 min.; cresyl violet, 60 min. There was no decolorization of Janus green or neutral red. Larvae decolorized in  $\text{N}$  recolored instantly in air. The  $r_H$  of the blood and tissues of larvae in  $\text{N}$  is about 7. Larvae injected with the above dyes did not decolorize in air, but when injected with 2,6-dibromophenolindophenol, the dye was reduced almost instantly. Partial reduction in air occurred after the injection of 1-naphthol-2-sulfonate-indophenol. The  $r_H$  of the blood and tissues of larvae under normal conditions is about 20. B. C. BRUNSTETTER

Pigment of *Arbacia* egg as an indicator of intracellular  $p_H$ . FRED VLAS and EDMOND VELLINGER. *Bull. inst. océanograph* 513, 1-16(1928); *Biol. Abstracts* 2, 891(1928).—The egg of *Arbacia* contains a pigment which in alc. ext., or in mashed eggs, presents spectral variations correlated with  $p_H$  which can serve as an indicator; this pigment is orange, with a band at  $\lambda 495 \text{ m}\mu$  below  $p_H$  4; yellow with 2 bands ( $\lambda 485$  and  $518$ ) above  $p_H$  6; violet with 3 bands ( $\lambda 495$ ,  $515$ ,  $548$ ) between  $p_H$  4 and 6. The microspectra

of the entire egg show that its pigment corresponds to an intermediate stage between 5.2 and 5.9; a microspectrophotometric examn. of the egg bears out these data. There exist, therefore, in the egg of *Arbacia* certain points of which the physicochemical equilibria may be equiv. to a  $p_H$  of  $5.5 \pm 0.3$ .  
H. L. D.

Chemical study on the sperm of the marine animal. I. MAKOTO YAMAGAWA, HIDE Nobu MIKAWA AND TETSUO TOMIYAMA. *J. Imp. Fish. Inst. (Tokyo)* 22, (2) 30-1 (1926); *Biol. Abstracts* 2, 975.—Analyses are given for the cystine and tryptophan content of the milt of 13 varieties of fish identified by Japanese names. The arginine, histidine and lysine values are also given for 4 more varieties. II. The nucleic acid in bonito testis. MAKOTO YAMAGAWA AND TAKESHI ITO. *Ibid* 32-3; *Biol. Abstracts* 2, 975. III. The sperm of the sardine, *Amblygaster immaculatus*. MAKOTO YAMAGAWA AND BUNJI IBUKA. *Ibid* 33-4; *Biol. Abstracts* 2, 975.—The compd.  $C_{40}H_{54}N_{11}O_6 \cdot 2HCl + PtCl_4$  was prepd. from the sperm of *A. immaculatus*. The authors propose name "Amblygine" for the related protamine. A new histone ( $C_4H_{10}N_3SO_3$ ) and a new nucleic acid ( $C_{48}H_{88}N_{11}P_4O_{10}$ ) are also described.  
H. L. D.

The inorganic composition of the body fluids of the Chelonia. HOMER W. SMITH. *J. Biol. Chem.* 82, 651-61 (1929).—The perivisceral and pericardial fluids of turtles are alk. secretions whose  $[HCO_3^-]$  may be 2 or 3 times that of the blood plasma. Analyses of the Na, K, Ca, Mg, Cl,  $SO_4$ ,  $PO_4$ , total base, total anions and  $p_H$  of these fluids as well as of the bile, of several species of turtles, are given.  
ARTHUR GROLLMAN

The blood chemistry of two species of rattlesnakes, *Crotalus atrox* and *Crotalus oregonus*. JAMES M. LUCK AND LEONARDE KEELER. *J. Biol. Chem.* 82, 703-7 (1929).—The bloods of rattlesnakes contained only traces of urea; amino acids and inorg. P were present in greater quantities than in mammalian blood; reducing sugar and cholesterol were low; and  $[Cl^-]$  was high. The non-protein N, creatine, creatinine and lipid P values were of the same order of magnitude as those in mammalian blood.  
ARTHUR GROLLMAN

The influence of hemocyanin on the distribution of chloride between sea water and the blood of *Limulus polyphemus*. GILES W. THOMAS. *J. Biol. Chem.* 83, 71-7 (1929).—The concn. of chloride in the serum of *Limulus polyphemus* is 0.953 times the concn. of chlorides in sea water estd. on the basis of the total vol. of soln. and 0.981 times estd. on the basis of the  $H_2O$  in serum and sea water. The Donnan equil. due to hemocyanin of the serum will account theoretically for a considerable part of the difference in concn.  
A. P. LOTHROP

Urea content of frog muscle. JÓSEF HELLER. *Biochem. Z.* 209, 74-8 (1929).—Expts. show that the muscle urea does not take part in the traumatic  $NH_3$  production. *R. temporaria* has a much higher urea content in the muscle than *R. esculenta* (av. 29.2 and 7.2 mg. %, resp.).  
S. MORGULIS

Studies on the chemical embryology of reptiles. VIII. Behavior of ovomucoid and choline in the development of the sea turtle egg. MASAJI TOMITA AND MASAO TAKAHASHI. *J. Biochem. (Japan)* 10, 443-9 (1929); cf. *C. A.* 23, 3515.—The ovomucoid constitutes quantitatively the largest component of the org. matter of the egg. In the fresh egg the ratio to total org. matter was found 1:3.1, but diminishes to 1:6.1 at 15 days of incubation but increases again at later stages. The results of elementary analyses of the ovomucoid obtained at different stages show certain differences in compn. The free choline is very small in quantity as compared with the total, which diminishes greatly at the end of 45 days of incubation.  
S. MORGULIS

The behavior of the hexone and purine basis which are present in the free state during incubation of the chick egg. MASAO TAKAHASHI. *J. Biochem. (Japan)* 10, 451-5 (1929).—Purine bases are produced during the incubation of the chick egg. The free histidine content of the egg is only about 0.1 mg. but it increases during incubation to 0.38 mg. The arginine is found in much larger amt. (1 mg.) and likewise increases during the incubation. Free lysine is present in the amt. of 6 mg. and increases much more rapidly during the late stages of the development, reaching a max. after 19 days, when its content is 27.4 mg.  
S. MORGULIS

The bionomics of some tree-hole mosquitoes. MARY V. F. BEATTIE. *Bull. Entomol. Research* 20, 45-58 (1929).—In studying the bionomics of mosquitoes which live in the water in rot-holes of beech trees, the water was subjected to physical and chem. analysis including temp.,  $p_H$ , dissolved  $O_2$ ,  $NH_3$ , N, albumoid N, total org. N, total volatile and fixed solids. Larvae of *Anopheles plumbeus* were found in rot-hole water at all times of the year. Total org. N is believed to be an important factor in the life in the rot-hole; it probably aids the female mosquito in her choice of a place for oviposition. The relation of the microorganisms in the water to the nutrition of the larvae is discussed.  
C. H. RICHARDSON

The respiratory exchange of the honey bee. G. H. VANSSELL. *J. Econ. Entomol.* 22, 517-8(1929).—A short description of expts. on the moisture and  $\text{CO}_2$  discharged from a bee hive. The av. hourly output during the winter was:  $\text{H}_2\text{O}$  1.3 mg.,  $\text{CO}_2$  17.6 mg. During the summer when nectar was being brought into the hive by the bees the resp. hourly figures were: 30.8 mg. and 25.2 mg. av. There was a direct correlation between loss in wt. in winter, temp. of the bee cluster and production of  $\text{CO}_2$ . Frequently, in winter, the amt. of moisture in the hive air was less than that in the outside air, indicating that the bees or the stores (honey, etc.) were absorbing moisture. C. H. R.

Metabolic activity and duration of life. I. Influence of temperature on longevity in *Daphnia magna*. J. W. MCARTHUR AND W. H. T. BAILLIE. *J. Exptl. Zool.* 53, 221-42(1929).—Longevity of this crustacean varied inversely with the temp. between  $8^\circ$  and  $28^\circ$ , the temp. coeff. ( $Q_{10}$ ) being 2.12. The duration of life for males was lengthened  $\frac{1}{3}$  more than that of females by a temp. decrease from  $28^\circ$  to  $8^\circ$  and their  $Q_{10}$  values were 15% greater. The effects of sex and temp. upon longevity suggest that av. duration of life is regulated chiefly by metabolic rates. II. Metabolic rates and their relation to longevity in *Daphnia magna*. *Ibid* 243-68.—Heart rate and susceptibility to KCN in *D. magna* more than doubled with a temp. increase from  $8^\circ$  to  $18^\circ$  and nearly doubled with a further  $10^\circ$  increase. Velocity of aging and velocities of metabolic processes were changed in the same direction and nearly the same degree by changes in temp. The more intense catabolism of males was shown by more rapid heart rate, greater  $\text{CO}_2$  output, greater susceptibility to chem. agents and greater sensitivity to changes in temp. The length of life multiplied by heart rate is approx. a const. "It is not time as such, but the tempo of its life that best measures the rate of aging of an organism." C. H. RICHARDSON

The regulation of adult body size in the protozoan Colpoda. EDWARD F. ADOLPH. *J. Exptl. Zool.* 53, 269-311(1929).—Longer life in *Colpoda* is slightly correlated with larger body size; size of parent was highly correlated with size of offspring. Temp., change of temp., quality and quantity of food and  $\text{O}_2$  tension modified av. size and fission rate.  $\text{O}_2$  consumption was measured. Other biol. data are given. C. H. R.

Oxygen consumption of isolated frog skin under the influence of solutions. EDWARD F. ADOLPH. *J. Exptl. Zool.* 53, 313-25(1929).—Fresh skin from *Rana pipiens* gave an av.  $\text{O}_2$  consumption of 133 cu. mm. per g. (wet wt.) per hr. at  $20^\circ$ . A slight but regular decrease in  $\text{O}_2$  consumption accompanied a decrease in  $\text{O}_2$  tension. The reversible influence of various concns. of NaCl was very small. Rate of  $\text{O}_2$  consumption and rate of passage of water through the skin are not closely related. Effects of time of isolation of the skin, temp. and of various salt solns. are described. C. H. R.

Studies on chemical changes during the life cycle of the tent caterpillar (*Mala-cosoma americana* Fab.) IV. Glycogen. WILHELM RUDOLFS. *J. N. Y. Entomol. Soc.* 37, 17-23(1929); cf. C. A. 23, 441.—The glycogen content of the eastern tent caterpillar changes during the life cycle, the greatest change occurring when the larva is actively feeding. During the transformation of egg to larva the changes in glycogen content are unimportant. Glycogen disappears during the pupal stage, indicating that it plays an important role. Glycogen was present in the leucocytes, muscles, fat glands (bodies) and eggs. C. H. RICHARDSON

Some facts relative to the effect of high-frequency radio waves on insect activity. THOMAS J. HEADLEE AND ROBERT C. BURDETTE. *J. N. Y. Entomol. Soc.* 37, 59-64 (1928).—Various species of insects are killed by exposure to high-frequency waves of 24 meters, 12 million cycles per sec. and 1.75 amp. The lethal effect is due to the development of an internal fatal temp. Nervous reaction increases the rate of producing this lethal temp., the more specialized the nervous tissue the greater is the increase in speed of reaction. 32 compds. and mixts., including carbohydrates, fats, oils, fatty acids, waxes, cholesterol, lecithin, proteins, chitin, charcoal, silica and quartz, all of which are more or less characteristic of living tissues, were subjected to the same high-frequency waves and all showed ability to increase in internal heat. Cholesterol which is characteristic of nervous tissue possessed this ability in marked degree. C. H. R.

## 12—FOODS

F. C. BLANCK AND H. A. LEPPEL

Address of the President (American Association of Cereal Chemists). C. E. MANGELS. *Cereal Chemistry* 6, 334-8(1929).—A historical review of the development of the Assocn., its activities and outlook for the future. L. H. BAILEY

History of food laws. T. G. JOYCE. *Food Manuf.* 2, 315(1928).

J. A. K.

Utilization of microorganisms as human food. R. TAKATA. *J. Soc. Chem. Ind. Japan* 32, 497-510, 544-57(1929); Suppl. Binding 32, 155-8B, 169-72B(1929).—T. investigated the nutritive value of *Aspergillus oryzae*. The dried mycelium of *Aspergillus oryzae*, cultivated on a synthetic medium contg. dextrin,  $(\text{NH}_4)_2\text{SO}_4$ , etc., contains about 38% of protein. When used as the sole source of protein for albino rats, the protein showed certain deficiencies. The digestibility of the dried mold was high enough for the feeding of albino rats. The dried mold is rich in vitamin B (both the growth-promoting and the antineuritic), but does not contain vitamins A and C; the latter is also absent from the expressed juice of the fresh mycelium. Analysis of the dried mold gave:  $\text{H}_2\text{O}$  7.43, protein 34.61, fat 1.81, fiber 7.51% and non-N extractives 40.54%; the ash consisted of  $\text{Na}_2\text{O}$  11.21,  $\text{K}_2\text{O}$  28.16,  $\text{MgO}$  3.88,  $\text{CaO}$  1.95,  $\text{Fe}_2\text{O}_3$  1.65,  $\text{SO}_3$  0.11,  $\text{Cl}$  0.07 and  $\text{P}_2\text{O}_5$  48.55%. From 2 kg. of the dried material the following N bases were isolated:  $\text{NH}_3$  (4.5 g. as chloride), adenine (0.4 g. as picrate), hypoxanthine (0.07 g. as nitrate), histidine (0.05 g. as picrate), betaine (0.1 g. as chloride and 0.15 g. as chloroplatinate) and stachydrine (0.03 g. as chloride). Y. TOMODA

The production of pressed foods from dried beets and molasses. E. SAILLARD. *Suppl. Circ. Hebd.* No. 2081(1929); *Listy Cukrovar. Rozhledy* 47, 36.—A mixt. contg. dried beet slices 75% and molasses 25% is pressed into briquets at a pressure of 120-150 atms. The briquets are hard to break, and after soaking in  $\text{H}_2\text{O}$  they fall apart quite easily and yield a good cattle food. They keep indefinitely when stored dry and save in transportation costs. The measurement of rations is exact and very simple. F. M.

The detection of prohibited vegetable and coal-tar colors in foodstuffs. J. R. NICHOLLS. *Analyst* 54, 335(1929).—Two of the supplementary tests, Nos. 16 and 17, (*C. A.* 22, 120) have proved fallacious. W. T. H.

Improvement of flour. M. VUK AND P. SPANYÁR. *Z. Untersuch. Lebensm.* 56, 292-308(1928).—The effects on the baking qualities of flour of addn. of wheat germ, sugar, dextrin,  $\text{KBrO}_3$ ,  $\text{NH}_4$  persulfate, Na borate, "novadelox" and of treatment with N peroxide and "gologas" (Cl contg. 0.5% of nitrosyl chloride) were studied. Wheat germ improves the baking qualities, but cannot be used because of its effect on color and taste of the bread. Sugar or, to a smaller extent, dextrin is beneficial, but addn. of the above salts gave no definite improvement. Novadelox resulted in improved texture and bleaching, N peroxide in bleaching only, but gologas had a very favorable effect, especially on bread vol. and texture. Gologas is a flour improver rather than a maturing agent, as flour matured by aging can be further improved thereby. Its action appears to be due to the production of acidic protein substances in the flour. B. C. A.

Semi-microchemical method for the determination of gluten in flour. A. C. RÖRTINGER. *Mikrochem.* 7, 106-9(1929); cf. following abstr.—The flour (1 g.) is moistened with two drops of water in a bag of suitable material and, after 30 min., the paste is kneaded until no further starch is removed. The small ball of moist gluten obtained is removed from the bag and dried in an evacuated tube immersed in a water-bath. The wt. of dried material obtained multiplied by 3 gives approx. the wt. of moist gluten obtained in the usual test using 30-40 g. of flour. B. C. A.

Semi-microchemical method for the determination of the gluten content in flour. A. RÖRTINGER AND K. WÖDICH. *Z. ges. Getreidewesen* 15, 140-3; *Chem. Zentr.* 1928, II, 949; cf. preceding abstr.—A device is described, which makes it possible to wash 1 kg. of flour with the same accuracy as in the macrochem. process. The app. is manufd. by Mühlenchemie Ltd., Frankfurt a. M. The mean factor 2.95 was found for changing the dry gluten to wet gluten. G. SCHWOCH

Difficulties in improving Czechoslovakian flours. KAREL KŘTINSKY. *Chem. Listy* 23, 104-7(1929).—Using Cl with  $\text{NOCl}$  or alone is difficult because of the large variety of wheats grown and non-uniformity of the lots entering the mills. A large no. of detns. is necessary for each lot to apply the correct bleach. The supply comes from varied and small peasant holdings and cannot be assumed to have a const. compn. F. M.

The determination of carotin in flour. CHARLES C. FERRARI AND C. H. BAILEY. *Cereal Chemistry* 6, 347-71(1929); cf. *C. A.* 23, 3754.—The tentative method of the A.O.A.C. for detg. the gasoline color value of flour was found unsatisfactory when the ext. was used for spectrophotometric examn., as it was never possible to prep. an ext. entirely free from suspended matter. Filter paper did not remove all of the suspended matter and adsorbed some of the carotin. An unglazed porcelain filter removed the suspended matter but also adsorbed some of the carotin. The most satisfactory results were obtained by using aluminum thimbles having the right porosity and then following a special procedure which is given in detail. A capillary siphon procedure of obtaining the ext. is also described. Results by this method compare favorably with those of the



alundum thimble filtration. The carotin content is given on the moisture-free basis in parts per million as follows: patent flour 4.10, clear flour 4.20, shorts 3.55, bran 6.30 and whole wheat 4.40. It is shown that the coloring matter in bran is unlike the carotin in flour. In straight grade of flours milled from 11 varieties of Canadian wheats the carotin content ranged from 1.94 to 3.40 parts per million. In examg. the various mill streams from the Minnesota State testing mill the first break flour had the lowest carotin content 1.20 parts per million and the fifth break flour the highest 3.15 p. p. m. and the straight grade flour had 2.43 p. p. m. of carotin.

L. H. BAILEY

Report of the Committee on Methods of Testing Cake and Biscuit Flours. MARY M. BROOKE, *et al.* *Cereal Chemistry* 6, 312-20(1929).

L. H. BAILEY

Report of the Committee on Standardization of Experimental Baking Test. C. G. HARREL, *et al.* *Cereal Chemistry* 6, 249-310(1929).—Consideration was given to the Standard Baking Test and its modifications; to a report card for reporting the results of baking, and to reference photographs showing internal characteristics of the loaf; to yeast testing; to ovens; dough thermometers; fermentation bowls; baking pans and loaf-measuring app.

L. H. BAILEY

Change of acidity during storing in bread. L. KARÁCSONYI. *Magyar Chem. Folyóirat* 35, 22-5(1929).—Dctn. of H-ion concn. in bread by means of the electrometric method has shown that acidity does not increase in bread during storing. It shows, on the contrary, a diminishing tendency, which is greater with rye bread and darker wheat bread than with white wheat bread.

S. S. DE FINÁLY

Fermentation in bread making. G. GEUNIS. *Bull. assoc. élèves inst. sup. fermentations Gand* 30, 149-58, 202-13(1929).—Addn. of alc. to  $H_2O$  used in extg. flour appreciably lowers the  $p_H$  value of the ext. and brings it to a point more favorable to fermentation; on the other hand this ext. undergoes an almost abs. buffering at a  $p_H$  value of about 7.0, which is much higher than the optimum for fermentation (5.0). Fermentation lowers the  $p_H$  value, but the variation is not large and depends to a considerable extent on the strain of yeast used; moreover, fermentation considerably increases the buffering. Baking of the fermented dough appreciably lowers the  $p_H$  value, and the exts. are properly and uniformly buffered. Addn. of  $KH_2PO_4$  to the water used in prepg. the dough considerably lowers the  $p_H$  values of the exts. of both the dough and the bread, reducing it below the optimum of 5.0; the bread is very light and of low sp. gr. Addn. of a mixt. of  $KH_2PO_4$  and of  $K_2HPO_4$  does not reduce the  $p_H$  of either the dough or the bread, but stabilizes the  $p_H$  value almost completely; the bread obtained is light, but its sp. gr. is higher than when only  $KH_2PO_4$  is added. Generally speaking, the exts. are better buffered in the alk. than in the acid zone. Addn. of salts still further increases the buffering of the exts. Addn. of  $CaSO_4$  to the water used in prepg. the dough gives well-buffered exts. and bread with a high sp. gr. Addn. of  $NH_4Cl$  and of  $MgCl_2$  gives well-buffered bread exts., but very heavy bread with high sp. gr.; and  $NaCl$  gives well-buffered bread exts., but breads with excessively high sp. gr. Conclusion: It would be advantageous to add a mixt. of  $KH_2PO_4$  and  $K_2HPO_4$  in suitable proportions to obtain a  $p_H$  value of about 5.0 in the fermented dough, which is the optimum value for bread fermentation, and which would give a lighter bread. A. PAPINEAU-COUTURE

Loaf volume as produced by different flours under prolonged fermentation. ROWLAND J. CLARK. *Cereal Chemistry*, 6, 338-44(1929).

L. H. BAILEY

Influence of the age of a milk on the result of pasteurization. A. WOLFF. *Milch. Zentr.* 11, 233-8(1927).—Cultures on gelatin and agar-agar were made of samples of fresh milk and of the same milks after sterilizing by heating for  $1\frac{1}{2}$  hr. at 62-63°, followed by rapid cooling, and a comparison was made of the total no. and of the relative proportions of the different kinds of bacteria in the fresh and sterilized milks. Similar tests were made on the milk after keeping for periods varying from 2 to 8 hrs. at temps. from 8° to 30°. The results show that the no. of bacteria surviving pasteurization, as well as the percentage of these calcd. on the total no. present in the unpasteurized milk, are greater for the milks which have been kept for a time than for those which were sterilized at once. In practice, it is therefore preferable to sterilize a milk as early as possible and then to keep it cool, rather than to keep it in cold storage and sterilize later.

B. C. A.

The refraction of milks low in solids-not-fat. G. D. ELDON AND J. R. STUBBS. *Analyst* 54, 318-20(1929).—In the examn. of 2850 samples of milk, in nearly every case a low solids-not-fat corresponded to a low refraction value. This means either that the low solids-not-fat is invariably due to watering or that milks naturally low in these solids do not give a normal refraction of 38 or more. In all, some 8000 samples have now been examd. to show that a milk, which has not soured, will have a low refraction if it has a low solids-not-fat.

W. T. H.

Dyes as an indication of adulteration in butter. D. HENVILLE AND W. M. PAULLEY. *Analyst* 54, 413(1929).—All samples of butter and margarine passing through a London lab. are tested for prohibited coloring matter. From 97 to 98% of the margarines contain a dye which is extd. with  $\text{NH}_4\text{OH}$  while 94–95% of butter samples do not give the test and even then the color is slight. To carry out the test, shake 10 ml. of fat with 10 ml. of petroleum ether and 10 ml. of 3%  $\text{NH}_3$  soln. The test is described as "not definite but helpful."

W. T. H.

The general principles of cheese making. L. J. LORD. *Food Manuf.* 3, 443–5, 463, 477–80(1928). Some further consideration of the ripening period of cheese. *Ibid* 507–8.

J. A. KENNEDY

Some scientific aspects of packaging and quick-freezing perishable flesh products.

III. Sanitary measures in a fish dressing plant. CLARENCE BIRDSEYE. *Ind. Eng. Chem.* 21, 854–7(1929); cf. *C. A.* 23, 3278.

E. H.

Spoilage of preserved meats. E. W. LEWIS. *Food Manuf.* 3, 425–6, 487–8, 490(1928).

J. A. KENNEDY

Fat removal from chocolate sirup and sweet chocolate. R. O. BROOKS. *Chemist Analyst* 18, 8(1929).—To 26 g. of sirup add water to make 100 cc. and Pb subacetate to 110 cc. Add 30 cc. of ether, stopper, shake and filter. Use 25 or 50 cc. for the polarimetric detn. of sucrose and lactose. Take 13–26 g. of solid chocolate, add water to 105 cc. and continue as above. This method does not provide for the removal of ether as in the official detn.

W. T. H.

The Kreis reaction as a method for the detection of incipient rancidity in cacao butter. T. H. COOKE. *Analyst* 54, 411–3(1929).—The Kreis tests consists in shaking the fat with strong  $\text{HCl}$  and a 1% ethereal soln. of phloroglucinol. A rancid fat will give a red or pink color, the depth of color being proportional to the degree of rancidity, because of the presence of aldehydes and ketones in the rancid product. Studies with many samples showed that the test is of little value as it does not give any evidence of incipient rancidity as good as the taste and odor of the fat.

W. T. H.

Some observations on the Fiehe test (for the detection of commercial invert sugar in honey). C. A. GREENLEAF AND C. A. BROWNE. *J. Assoc. Official Agr. Chem.* 12, 319–23(1929).—As compared with the aniline acetate test and the A. O. A. C. resorcinol test, the Fiehe test for com. invert sugar in honey is more sensitive but more difficult of interpretation. Moderate heating of honey is not likely to cause it to give pos. reactions for com. invert sugar. The destructive effect of heat is increased by high acidity, and a highly acid honey subjected to a high temp. might give pos. reactions, especially with the Fiehe test. A more efficient modification of the colorimetric resorcinol test has been developed by Nelson. Cf. following abstr.

A. PAPINEAU-COUTURE

Modification of the Fiehe test for the detection of artificial invert sugar in honey. E. K. NELSON. *J. Assoc. Official Agr. Chem.* 12, 323–4(1929); cf. preceding abstr.—The following procedure is recommended: dissolve 2 g. of honey in 10 cc.  $\text{H}_2\text{O}$ , ext. the soln. rapidly with  $\text{Et}_2\text{O}$  in a Palkin-Watkins extractor for 30 min., conc. the  $\text{Et}_2\text{O}$  to about 5 cc., transfer to a test tube, add 2 cc. of resorcinol reagent, freshly prepd by dissolving 0.2 g. resorcinol in 20 cc. concd.  $\text{HCl}$ , and shake the mixt. immediately; note the color at the end of 5 min. Pure honey gives an extremely faint pink color; honey contg. 10% artificial invert sugar gives a deep pink, and honey contg. 20% artificial invert sugar gives a dark red color.

A. PAPINEAU-COUTURE

Furfural and diastase in heated honey. L. H. LAMPITT, E. B. HUGHES AND H. S. ROOKE. *Analyst* 54, 381–95(1929).—The most sensitive and satisfactory test for hydroxymethylfurfural and for furfuraldehyde in honey proved to be the following: Dissolve 20 g. of honey in 20 cc. of water, ext. with 40 cc. of ether and evap. at room temp. Dissolve the residue in 10 cc. of ether and use 2 cc. for the Fiehe test as follows: Add an equal vol. of 1% resorcinol in concd.  $\text{HCl}$ . If the test is pos. a pink color is obtained at once; this rapidly darkens and after 20 min. there is a deep cherry-red color at the junction of the acid and ether. The resorcinol reagent must be fresh. Take the remainder of the ether ext., evap. at room temp. in a porcelain dish and to the residue add 2 cc. of freshly made soln. of 1 cc. of redistd. aniline in 4 cc. of  $\text{AcOH}$ . A pink to orange color appears in 15 min. if furfuraldehyde is present. When both of these tests are pos., it can be assumed that com. invert sugar is present in the honey. Pos. tests are obtained with 5% of this sugar. Heated honey may give these tests but only when the heating has accomplished a marked deterioration of flavor. Storage of heated honey did not cause the formation of furfural in 8 months. A method was developed for detg. the diastatic activity of honey and the method showed that heating honey causes a considerable loss in diastatic activity although the full significance of this fact is not yet clear.

W. T. H.

**Difference between unripe honey and artificially watered honey under the refractometer.** J. SITTA. *Magyar Chem. Folyóirat* 35, 10-4(1929).—Adulteration of honey with water lowers the refractive index considerably. The detn. of refractive index as a method to prove adulteration of honey with water still needs many statistical data to make final conclusions. S. S. DE FINÁLY

**The influence of the sugar inversion on the gel formation.** K. FIEDLER. *Konserven-Ind.* 15, 405-7, 427-8; *Chem. Zentr.* 1928, II, 1831.—F. investigated how much the pectin employed in the jelly and jam manuf. loses in efficiency by the process of sugar inversion. He further investigated whether pectin as a gelatinizing agent is destroyed by the process of boiling or inversion. The expts. showed that the inversion of cane sugar inhibits the gelatinization and even is able to prevent it altogether. The pectin remains in the goods as an active gelatinizing agent; on account of the sugar inversion, however, it is not able to function. G. SCHWOCH

**The preservation of fruit for the jam manufacturer.** F. HIRST. *Food Manuf.* 4, 224-5(1929).—H. describes briefly the more important methods used in preservation as well as the principles involved in so far as they apply to fruit. J. A. KENNEDY

**The feasibility of standardizing jam products.** J. W. BLACK. *Food Manuf.* 4, 227-9, 232(1929). J. A. KENNEDY

**Vanilla flavoring extract and practical methods of its manufacture.** I. Growth and selection of the beans. E. J. KESSLER. *Glass Packer* 1929, 325-7.—Descriptive. Data of practical value to users of vanilla beans are given. C. R. F.

**Bananas, banana flour, bananin and its value.** W. PEYER. *Apoth. Ztg.* 44, 872-3 (1929).—With fresh bananas (peeled), dried bananas and banana flour, the following values were obtained: moisture 75.0, 24.2, 13.9; dry substance 25.0, 75.8, 86.1; mineral constituents 0.91, 2.4, 1.8; fat (petr. ether ext.) —, 0.4, 0.44; total sugar 18.0, 58.1, 3.5; N substance 1.1, 3.1, 3.2; calories in 100 g. 80, 295, 320; comparative cost in pf. for 100 g. 28.9, 20, 13-14, resp. These values are compared with corresponding ones for oranges, and apples (fresh and dried). Bananin is a com. product consisting of banana flour, milk powder, cocoa and sugar. W. O. E.

**The nature of the carbohydrates found in the Jerusalem artichoke.** AAGE C. THAYSAU, WM. E. BAKES AND BRIAN M. GREEN. *Biochem. J.* 23, 444-55(1929).—The autumn-gathered tubers and the unripe pith of the Jerusalem artichoke contain a carbohydrate apparently identical with inulin. This carbohydrate is displaced by more sol. carbohydrates in the spring. BENJAMIN HARROW

**Fraud in the alimentary casein trade.** MARC FOUASSIER. *Ann. fals.* 22, 362-4 (1929).—Polemical with Porcher and Brigando (*C. A.* 23, 3545). A. P.-C.

**Modern processing in pea canning.** The new Wisbeck plant. S. W. SMEDLEY. *Food. Manuf.* 4, 222-3(1929). J. A. KENNEDY

**Technical preparation of caffeine-free coffee.** F. IHLOW. *Chem.-Ztg.* 53, 629-30 (1929).—A review. E. H.

**Determination of sulfur dioxide in apple musts and in ciders.** G. WARCOLLIER AND LE MOAL. *Ann. fals.* 22, 333-40(1929).—With high SO<sub>2</sub> contents (200-1000 mg. per l.) the Ripper method always gives lower results than the Haas method. This is shown to be due to oxidation of SO<sub>2</sub> to SO<sub>3</sub> in alk. soln. in presence of tannin, and not merely to a more or less stable combination of SO<sub>2</sub> with the tannin. The Haas method gives correct results; but the Ripper method gives approx. the same results provided the time of treatment with NaOH does not exceed 5 min. With low SO<sub>2</sub> contents (150-200 mg. per l.) the Ripper method gives results 30-5 mg. higher than the Haas method. A. PAPINEAU-COUTURE

**The acidification of green fodder rich in protein with particular regard to the hydrochloric acid process.** KLAUS VOLBEHR. *Landw. Vers. Sta.* 108, 115-46(1929).—The application of HCl for the preservation of green fodder rich in protein was verified. It is necessary, at least in the beginning of the preservation, not to exceed a pH value of 2. A pH value of 4 represents the upper limit at which unspoiled fodder is to be expected. The decompn. of the pure protein was all the greater, the greater the protein content of the plant, the smaller the HCl addn. and the longer the duration of the expts. It amounted to 4.6-71%. Losses in total N in general did not occur or were only slight. A preservation with a 5% NaCl addn. produced an excellent silage. The decrease in pure protein was in this case about as large as with the application of HCl. E. F. S.

**Feeding investigations with the biologically prepared feeding stuff "Bovita" on dairy cows in pasture and in stables.** W. GÖRTERS. *Fortschr. Landw.* 4, 265-70 (1929).—From bacteriol. and chem. tests on the milk produced it is concluded that "Bovita" improves the quality of milk. Similar effects, but to a less degree, were obtained through feeding wheat bran. LAWRENCE P. MILLER

Rice husks in bran and sharps. A. J. AMOS. *Analyst* 54, 332-3(1929).—Rice husks are light brown in color; the outer surfaces are dull; the inner surfaces are shiny; their stiff and hard nature can be detected by scraping the outer surface with a needle. Boil a little of a suspected sample with a mixt. of 5 parts chloral hydrate and 2 parts water and exam. a drop of the liquid under the microscope. Rice husks consist of 4 layers of tissue with characteristic cells in the outer epidermis having a sinuous form.

W. T. H.

Rice "pula" and its chemical composition. L. BORASIO. *Giorn. risicoltura* 19, 58-61(1929); cf. *C. A.* 22, 2415.—Analyses of "pula" (meal from the first and second pearling machines) and of "farinaccio" (meal from the third and fourth pearling machines) showed  $H_2O$  11.50, 11.80; ash 9.40, 4.90; ash insol. in  $HCl$  1.30, 0.35; crude cellulose 10.60, 2.80; crude protein 13.70, 11.70; fats 14.50, 9.80 and non-nitrogenous exts. 40.30, 59.00%. Analyses are also given of "pula" mixed with "lolla" (rice husks). "Pula" may contain 5.36%  $P_2O_5$ , of which 4.70% is phytinic and 0.038% lecithinic. "Pula" is used for the extn. of its fat, for the prepn. of organo-phosphatic compds. (especially phytin) and as a cattle food when mixed with "lolla." ALBERT R. MERZ

Oil from the seeds of *Erucastrum elongatum* (BELYAEV) 27. The farm as a consumer of chemicals (MACDOWELL) 15. Effect of freezing on the catalase activity of apple fruits (CARRICK) 11D. Industrial gas in the United States—growth and trends—food (LOBELL, *et al.*) 21. Determination of shell in pressed cakes (BELYAEV) 27. The deterioration of iodized salt (NICHOLAS) 18. Value of Ca salts in poultry feeding (AUTON) 11E. Multi-chambered apparatus for pasteurizing milk or other liquids (Brit. pat. 304,473) 1. Apparatus for [enclosing and preserving various food products] (Brit. pat. 304,168) 25. Emulsifying margarine, chocolate pulp, tallow or other fatty materials (Brit. pat. 304,256) 27. Foodstuff containers of fibrous material (U. S. pat. 1,724,778) 23. Pasteurizing beer or other liquids without loss of dissolved gases (U. S. pat. 1,724,291) 16. Container for pasteurizing apparatus (Ger. pat. 478,539) 1.

CALLOW, A. BARBARA: *Food and Health*. London: Oxford Univ. Press. 2s. 6d. Reviewed in *Food Manuf.* 2, 308(1929).

TAYLOR, MRS. D. D. COTTINGTON, AND GARbutt, P. L.: *Food Wisdom*. London: Sir Isaac Pitman and Sons. Reviewed in *Food Manuf.* 2, 308(1929).

Preserving foods. A. G. M. STABBACK and STABAVITE SYNDICATE, LTD. Brit. 304,253, July 18, 1927. Foods such as fruit, eggs, poultry or meat are directly coated with, or wrapped in, paper, cloth or the like treated with a mixt. of gum tragacanth or other gum which swells in contact with water without becoming sticky, together with glycerol, with or without a bisulfite or an alkali nitrate or other preservative.

Preserving food in closed receptacles. SUTAX, LTD., and J. W. SUTCLIFFE. Brit. 304,389, Oct. 27, 1927. Receptacles of glass, metal, cardboard or other materials, filled with food and like products, and hermetically sealed, have their closure ends heat treated to sterilize the closing cap and the air space beneath it.

Destroying insect pests in foods or other materials. ADOLF M. KOBIOLEKE. U. S. 1,725,650, Aug. 20. The material is placed in an air-tight kiln from which the air is then withdrawn by suction;  $CO$  is then supplied to the kiln until atm. pressure is attained, the  $CO$  is withdrawn by suction, and a fumigating gas such as  $CS_2$  vapor which has not been in contact with the air is supplied to the kiln, subsequently this is withdrawn by a vacuum pump, and the vacuum is afterward suddenly released by admitting air to the kiln. An app. is described.

Special dough for bread or biscuits, etc. F. PASSEK and H. BOLLMANN. Brit. 305,217, Feb. 3, 1928. Cereal flour is used with added gluten and an admixture of albumin-rich meals such as soy-bean or cottonseed meals. Various details of prepg. the dough are given.

Condensation system for recovery of alcohol from the vapors evolved in baking bread. N. DE NACROTZKY. Brit. 305,223, Feb. 2, 1928. An app. is described.

Baking powders. L. WEIL. Brit. 304,230, Jan. 17, 1928. With baking powders the acid constituent of which is an acid alkali phosphate or acid alkali pyrophosphate, salts such as  $CaCl_2$ ,  $Ca$  tartrate,  $CaCO_3$ , with pyrotartaric acid or  $Ca$  in combination with casein are added to obtain an acid end reaction corresponding to that obtainable with yeast. Cf. *C. A.* 23, 4512.

Receptacles for milk and other foods. K. RICHTER. Brit. 305,114, Oct. 20, 1927. Milk bottles and the like are made of wholly or partially glazed Al silicates; such re-

ceptacles may be sterilized by heating to  $500^{\circ}$ , and are stated to be permeable to air and to cool the contents by allowing evapn.

**Cheese.** MAX CLAASZ. Ger. 478,552, April 15, 1925. Emmenthal cheese is coated with soft cheese by melting with neutral  $\text{Na}_2\text{HPO}_4$  to temps. below  $100^{\circ}$ ; the necessary amt. of  $\text{H}_3\text{PO}_4$  or  $\text{Na}_2\text{CO}_3$  is added to keep the mixt. neutral.

**Preserving egg contents.** JOSEPH FOUSEK. U. S. 1,724,078, Aug. 13. Equal wts. of broken eggs and sugar are mixed at a temp. of about  $62^{\circ}$  until the mixt. is of smooth sirupy consistency.

**Preserving egg yolks.** H. BELHOMMET. Brit. 304,902, Jan. 10, 1928. Yolks to be preserved by drying are preliminarily treated with 4% of sugar or other suitable water-sol. substance which will enable the dried yolks to be reconstituted by addn. of water.

**Preserving fish.** H. K. T. LANGVA. Brit. 304,868, Nov. 16, 1927. Split, salted and dried fish is protected from damage by the "split-fish mite" by placing it in a closed chamber from which the air is exhausted (but which may contain N or  $\text{CO}_2$ ) and leaving it for several days, after which it is stored and transported in the usual way.

**Coating granular sugar with chocolate, etc.** EDWARD A. ZEBULSKY (one-half each to Hyla F. Maynes and Emma C. Maynes). U. S. 1,725,608, Aug. 20. Granular material to be coated is introduced into an air current carrying the coating material and the material thus coated is further carried by the air current until the coating has dried or hardened. An app. is described.

**Cacao.** T. ZELLER. Brit. 304,181, Jan. 16, 1928. In the prepn. of fresh cacao beans, the usual fermentation is interrupted at the termination of the alc. fermentation and before the beginning of the acetic fermentation, by heating (preferably at  $55\text{--}65^{\circ}$  for 24 hrs. to complete the decompn. and loosening of the mucous covering). An app. is described.

**Fermenting cacao beans.** B. MÜLLER. Brit. 305,236, Feb. 2, 1928. Beans freed from the pods are placed in receptacles having ventilating devices and of such size that overheating is avoided, and remain quiescent until completion of the fermentation. Alc. fermentation is allowed to proceed to conclusion but formation of  $\text{HOAc}$  is avoided. After the fermentation in boxes, the beans are subjected to a drying operation for complete destruction of the bean tissue, removal of bitter flavor and completion of the brown coloration. An app. is described.

**Controlling the sulfur dioxide content of dried fruit.** FRANCIS J. PROWSE, RAYMOND D. ROBINSON, ERNEST M. HALL and CHARLES F. FLEMING (to Calif. Packing Corp.). U. S. 1,724,514, Aug. 13. Previously sulfured dried fruits are subjected to the action of heated air after moistening, to remove  $\text{SO}_2$  from the fruit to the desired extent. An app. is described.

**Yeast for use as food for animals.** SELBI SOC. D'EXPLOITATION DE LICENCES DE BREVETS INDUSTRIELS. Brit. 304,314, Jan. 19, 1928. Vinasses from molasses distilleries, sugar or yeast factories are used either alone or with molasses or other suitable vegetable-carbohydrate material for production of yeast for animal food. Superphosphate,  $(\text{NH}_4)_2\text{SO}_4$  and Na phosphate may be added, and the yeast produced may be sepd. and dried.

### 13—GENERAL INDUSTRIAL CHEMISTRY

HARLAN S. MINER

**Chemical industries in Slovakia.** JAR. HOŠEK. *Chem. Listy* 23, 317–22(1929).—A review. FRANK MARESH

**Czechoslovakian chemical industries in 1928.** OTAKAR WEBER. *Chem. Listy* 23, 257–61, 295–9(1929).—A review. FRANK MARESH

**The chemical industry of Subcarpathian Russia (Czechoslovakia).** JAR. HOŠEK. *Chem. Listy* 23, 172–5(1929).—A review of 1928 productions. FRANK MARESH

**Sixty-fifth Annual Report on alkali, etc., works in England and Wales.** T. LEWIS BAILEY. *Ann. Rept. Alkali, etc., Works Proc. for 1928*, 3–26(1929).—Operations at registered works have been conducted, in general, in a satisfactory manner. Details of operation of the Alkali, etc., Works Regulation Act 1906 and the Alkali, etc., Works Order 1928 cover the following works: alkali and Cu (wet process), cement, smelting,  $\text{H}_2\text{SO}_4$ , chem. manure, gas liquor sulfate and chloride of  $\text{NH}_4$ ,  $\text{HCl}$ , sulfide, As,  $\text{CS}_2$ , paraffin oil, tar, benzene, pyridine, Br and  $\text{HF}$ . In connection with  $\text{NH}_4$  plant effluent disposal the following points deserve attention: (1) Devil-liquor, contg. most of the phenol, can be evapd. by direct heating in a hot chimney, evapd. by direct heating if the vapor

can be taken to a steam boiler chimney, or some may be removed at producer fires; (2) steps can be taken to maintain a properly regulated flow of spent liquor from the works; and (3) as complete sepn. as possible of liquor from tar should always be effected at once. In tar handling, it must be recognized that (1) the introduction of even a small amount of water at any depth beneath the surface of hot tar is dangerous, and (2) tar heated initially to 150° can be distd. by air blowing without external heat—a fact to be borne in mind where blending is effected by air blowing. A section of the appendix gives an outline of the progress on the analysis and constitution of ammoniacal and spent liquors, particularly in regard to the difference between actual  $O_2$  absorption and the sum of the effects due to the known constituents. The different figures represent: 10–20% of the total  $O_2$  absorbed by horizontal retort liquors; 30–50% by vertical retorts, and up to 60% by liquors derived from the low-temp. carbonization of coal.

W. H. BOYNTON

**Alkali, etc., works in Scotland. Report for the Year 1928.** J. W. YOUNG. *Ann. Rept. Alkali, etc., Works Proc. for 1928*, 27–31(1929); cf. C. A. 22, 3470.—Inspection was made of 142 registered works operating 285 scheduled processes. Public complaints were more frequent than usual, but remedial steps were prompt. Inspection covered alkali,  $H_2SO_4$ , chem. fertilizer,  $HNO_3$ ,  $(NH_4)_2SO_4$  or  $NH_4Cl$  and gas liquor, tar and Zn works.

W. H. BOYNTON

**Vital processes and technical methods.** RICHARD WILLSTÄTTER. *Osterr. Chem. Ztg.* 32, 107–12(1929).—A lecture covering present day theories and applications of catalysts, both org. and inorg. Ideal technical processes are those the raw materials of which are acted upon by energy in the presence of catalysts yielding a max. of the desired products and a min. of by-products. The reduction of Fe oxides in a blast furnace is therefore a wasteful process compared with the reduction of  $CO_2$  and the formation of carbohydrates by plant cells.

W. C. BAUGH

**Chemistry goes to sea.** I. A. C. PURDY. *Marine News*, April, 1929, 2 pp. II. May, 1929, 1 p.—A short review of some problems confronting chem. experts in the detn. of damages occurring to ship cargoes, and of the hazards involved in the transportation of petroleum products.

ALBERT L. HENNE

**Distillation and rectification of complex mixtures. III. Continuous distillation with a single column; intermittent distillation.** L. GAY. *Chimie & industrie* 22, 3–18(1929); cf. C. A. 20, 1288, 2214; 22, 286.—A general graphical study of the continuous and intermittent distn. of complex mixts. with a single rectifying column.

A. PAPINEAU-COUTURE

**Evaporation at low temperatures.** VL. STANEK. *Chem. Listy* 23, 316–7(1929).—A 10-l. metallic drum rotates upon hollow trunnions, connected to sources of vapors or liquids by a pipe line. A fine capillary tube enters the liquid in the drum by following the axis of rotation. The drum is sepd. into sections by a metallic net adjusted so that the vapors travel a long path and 5–7 kg. anhyd.  $CaCl_2$  is suspended from it. A vacuum of 3–5 mm. is maintained by an oil vacuum pump. At 10–15° in 1–1½ hrs. about 1½ l. is evapd. off. Evapn. may be also carried out at 0° at a slower rate. The  $CaCl_2$  in the drum is regenerated in 2–3 hrs. by passing hot gases (150–200°) through the drum. Very unstable substances have been evapd. by this method without their decompn. or formation of coloring matter.

FRANK MARESH

**Vapor purification.** R. W. ANDREWS. *Southern and Southwestern Ry. Club Proc.*, May, 1929, 31–54.—A. describes the harmful action of unpurified vapors on different types of machinery and recommends an app. called the Tracyfier for the removal of the dirt.

ALFRED HIRSCH

**Chemical lead and plant involving its use.** W. HENRY IBBOTSON. *Ind. Chemist* 5, 267–8(1929).—Tests and specifications for Pb intended for use in chem. industry are given.

E. G. R. ARDAGH

**The method of operation of sodium peroxide respiration apparatus. I. Serial experiments with sodium peroxide respiration apparatus.** G. STAMPE AND E. HORN. *Z. angew. Chem.* 42, 776–9(1929).—Respiration app. of the Dräger type, depending upon the liberation of  $O_2$  from peroxides, shows variations in operation, and the following expts. are reported: (1) What are the variations in time for an expt., i. e., for  $O_2$  to fall below 15%, for  $CO_2$  to rise above 3%, or for the expt. to stop for physiol. reasons? With a charge of "Proxylit" (950 g.) in a Dräger cartridge one subject required 64, and the other, 58 min. (av.). (2) Catalysts distributed over the active material caused the  $O_2$  to come off more quickly, but otherwise rendered the action more uncertain. (3) Partial drying of the cartridge contents through  $CaCl_2$  showed a better regulation in liberation of  $O_2$ . (4) Cartridges filled to the usual height (about 22 cm.) showed optimum efficiency. (5) Proxylit of 2%  $H_2O$  was too slow in action; that of 8% content acted

quickly, but soon became impervious. The usual form with 6%  $H_2O$  is best, provided the material is not more than 2 to 6 months old.

How heat transmission affects fluid friction in pipes. C. S. KEEVIL AND W. H. MCADAMS. *Chem. Met. Eng.* 36, 464-7 (1929).

Ammonia compared with other refrigerants. W. F. SCHAPHORST. *Ind. Eng. Chem., News Ed.* 7, No. 16, 8 (1929).—A table is given showing the no. of lbs. of the various common refrigerants required to absorb 100 heat units.

Tests on paper cables (insulation). RAYMOND D. SHERMAN. *Elec. World* 94, 277-81 (1929).

Asphalt emulsion has many uses in the chemical plant (KIRSCHBRAUN) 22.

American Standards Year Book, 1929. New York American Standards Assocn. 88 pp. Reviewed in *Am. Dyestuff Reporter* 18, 570 (1929).

BALCKE, HANS: *Die Abwärmtechnik*. Vol. III. (Special Fields for Waste-Heat Utilization.) Munich and Berlin: R. Oldenbourg. 242 pp. Bound, M. 13.50. Reviewed in *Eng. Progress* 10, 190 (1929).

HERMANSEN, A.: *Industrial Furnace Technique*. London: Ernest Benn, Ltd. 25s., net.

Transferring heat from one gas body to another. FRANZ POLLITZER. U. S. 1,724,513, Aug. 13. A compressed gas such as  $C_2H_4$  to be liquefied is caused to ascend through a descending shower of cool liquid in a cooling chamber, the gas is expanded further to cool it, and the gas is then caused to ascend through a descending shower of a warm liquid in a second chamber. An arrangement of app. is described.

Liquefaction of gases. "LENO" GES. FÜR ENERGIEVERWERTUNG M. B. H. (Rudolf F. Mewes and Karl Rudolf Eduard Mewes, inventors). Ger. 478,862, June 11, 1922. A method and app. are described for liquefying by sudden expansion such gas mixts. as air.

Separating gaseous mixtures by liquefaction. SOC. L'AIR LIQUIDE, SOC. ANON. POUR L'ÉTUDE ET L'EXPLOITATION DES PROCÉDÉS GEORGES CLAUDE. Ger. 479,331, July 4, 1925. See Brit. 238,174 (C. A. 20, 1732).

Filtering gases and liquids. DEUTSCHE GASGLÜHLICHT-AUER-GES. M. B. H. Ger. 479,159, Jan. 29, 1925. The gas or liquid is supplied intermittently to a mass of porous filtering material, the free space of which corresponds to the amt. of gas or liquid supplied at one time. The method is best effected with 2 or more filters to be used in turn, and is particularly intended for purifying air for respiration.

Testing liquids; controlling chemical processes. CHRISTIAN HÜLSMEYER. Ger. 467,547, Dec. 10, 1924. Liquids are tested by measuring their elec. cond. before and after subjection to the action of a reagent. The measurements are made simultaneously and are recorded by a measuring instrument acting differentially. Thus, water may be passed through a series of vessels contg. steel wool, marble and permutite, and from the change in cond. observed after each treatment, deductions as to the condition of the water may be made. The measuring instrument may be arranged to actuate means for controlling the reaction, e. g., it may actuate the means supplying the reagents.

Concentrating solutions. NIKODEM CARO and ALBERT R. FRANK. Ger. 477,898, Sept. 1, 1927. A method and app. for removing water from, for example, dil. acids by concd.  $H_2SO_4$  vapor is described.

Separating alcoholic or other mixtures by distillation. SOC. ANON. DES DISTILLERIES DES DEUX-SEVRES. Brit. 304,756, Jan. 26, 1928. In treating alc. worts, mixts. of  $EtOAc$ , alc. and water or other seps. of liquids miscible with water from liquids which are insol. or only slightly sol. in water, the mixt. to be sepd. is fed into a distn. column and a current of water is sprayed into the upper part. The mixt. is fed into the middle of the column as a vapor and the water is preheated to the temp. of the azeotropic mixt. which is formed by the water and the insol. or slightly sol. liquid. The base of the column is heated and the vapors of the azeotropic mixt., which escape at the upper part of the column, are condensed to obtain a liquid which seps. into 2 layers, one of which is sepd. and the other returned to the column.

Crystallizing salts. I. G. FARBENIND. A.-G. Brit. 304,872, Nov. 24, 1927. Crystals of uniformly coarse grain are obtained by allowing a hot satd. soln. of a salt to cool while passing cooling currents of gas or vapor upwardly through the soln. at such a rate that only the coarse crystals fall to the bottom while the surplus crystal nuclei are carried away by the gas stream. An app. is described.  $NH_4HCO_3$  soln. may be formed by blowing a current of  $CO_2$  and  $NH_3$  into a 16% soln. of  $NH_3$ .

Dry distillation or other heat treatments of pulverulent materials. TROCKNUNGS-

**VERSCHWELUNGS- UND VERGASUNGS-GES.** Brit. 305,231, Feb. 2, 1928. The material treated is held against the heating surfaces by electrostatic action, in app. such as traveling hearth or rotary annular plate furnaces.

**Catalytic reactions with suspended catalysts.** SILICA GEL CORP. Brit. 304,269, July 12, 1927. In reactions such as  $\text{SO}_2$  or  $\text{NH}_3$  production, hydrogenation of oils, etc., a pulverized catalyst (such as silica gel which may carry Pt, Fe and Cu or Ni, according to the reaction to be effected) is mixed with the gas and carried through the reaction space, then sepd., revived and reused. The gas need not be freed from contact poisons as these will be taken up by the catalyst and removed from it in the revivification. An app. and numerous details are described.

**Heating and cooling system for catalytic converters of the layer type.** A. O. JAEGER (to Selden Co.). Brit. 305,636, Oct. 27, 1926. Means are provided for vaporizing liquid or solid substances so as to effect a substantially uniform cooling through any cross section of the catalyst. Various structural details are described.

**Heating apparatus by steam.** H. R. MINOR (to General Carbonic Co.). Brit. 305,577, Feb. 7, 1928. In heating app. for vulcanizing rubber, effecting distns., etc., the heating chamber is first supplied with an inert gas such as  $\text{CO}_2$  at a controlled pressure and then with steam at a fixed higher pressure and the temp. is controlled by varying the pressure of the inert gas and thus varying the partial pressure of the steam. Various details are given.

**Heating coal, charcoal, silica gel or other materials to effect drying, heating, cooling or distillation.** J. S. MORGAN. Brit. 305,106, July 28, 1927. The material is mixed with metallic shot of suitable temp. to effect the desired heating or cooling and the shot is then sepd. An app. is described.

**Temperature-control system for enameling apparatus.** BELL TELEPHONE LABORATORIES, INC. Brit. 305,611, Nov. 8, 1927. The temp. in the combustion chamber of an enameling app. (suitable for coating wire) is controlled in accord with the hardness of the baked enamel.

**Coating wire with enamel, etc.** BELL TELEPHONE LABORATORIES, INC. Brit. 305,084, Oct. 28, 1927. Hardening of coatings such as enamel on wire is effected solely by heat obtained by combustion of ingredients of the coating compn. An app. is described.

**Deoxidizing the atmospheres of transformers or other devices.** CLARENCE J. RODMAN (to Westinghouse Elec. & Mfg Co.). U. S. 1,725,160, Aug. 20. A deoxidizing agent such as is described in U. S. 1,557,092 (C. A. 20, 465) is used in the device and means are provided for heating the deoxidizing agent in order to render it highly active. Structural features are described.

**Deposition of aqueous dispersions.** THE ANODE RUBBER CO., LTD. Fr. 657,404, June 23, 1928. An agglomeration of org. material dispersed in water is obtained on molds of solid material, which enters into chem. reaction with the elements of the dispersion and is consequently consumed during the formation of the agglomerated product. The mold may be made of a sol. salt of a metal and may be dipped into an aq. dispersion of rubber slightly alk. with  $\text{NH}_3$ , or of a metal such as Zn; the dispersion contg.  $(\text{NH}_4)_2\text{S}$ .

**Annealing.** "GAFAG" GASFEUERUNGS-GES., WENTZEL & CIE. Ger. 478,990, Jan. 15, 1924. A method of operating a gas-heated annealing furnace by pre-heating gas and air in an Fe recuperator is described.

**Refrigerating apparatus.** O. LIESEGANG. Brit. 305,626, Feb. 8, 1928. Ice is made in the refrigerator by passing  $\text{CO}_2$  through water. Various structural details are described.

**Continuously acting refrigerator.** SIEMENS-SCHUCKERTWERKE A.-G. (Edmund Altenkirch, inventor). Ger. 478,657, Oct. 13, 1927.

**Refrigerating apparatus of the continuous-cycle absorption type.** SIEMENS-SCHUCKERTWERKE A.-G. Brit. 304,762, Jan. 26, 1928. Structural features.

**Absorption refrigerating machine.** PLATEN-MUNTERS REFRIGERATING SYSTEM AKTIEBOLAG. Ger. 479,420, Feb. 9, 1927.

**Refrigerating apparatus of the absorption type.** CLARENCE O. PETTERSSON. U. S. 1,724,219, Aug. 13. Structural features.

**Refrigerating system of the absorption type.** SIEMENS-SCHUCKERTWERKE A.-G. Brit. 304,122, Jan. 14, 1928. Structural features.

**Refrigerating system of the absorption type.** STUART OTTO and LAWRENCE BRUEHL (to Gas Refrigeration Corp.). U. S. 1,725,205, Aug. 20. Structural features.

**Refrigerating apparatus of the continuous absorption type.** GUIDO MAIURI and RAOUL F. BOSSINI. U. S. 1,725,658, Aug. 20.



**Refrigerating apparatus of the compression type.** JOHN A. GRIER. U. S. 1,724,-874, Aug. 13. Structural features.

**Refrigerating apparatus of the compression type.** CLARK ORR (to General Elec. Co.). U. S. 1,725,472, Aug. 20. Structural features.

**Multiple-installation refrigerating system of the compression type.** WELLING F. THATCHER (to Servel, Inc.). U. S. 1,724,233, Aug. 13. Structural features.

**Rotating refrigerating machine.** AKT.-GES. BROWN, BOVERI & CIE. Ger. 479,498, Mar. 20, 1927.

**Refrigerator with alternating hot and cold periods.** LUDWIG HIRSCH. Ger. 478,642, Mar. 19, 1924.

**Thermostatic control for refrigerating systems.** DALLAS D. PARSHALL (to The Jack Frost Co.). U. S. 1,725,415, Aug. 20. Structural features.

**Stopping leaks in refrigerating systems.** THOMAS J. LITTLE, JR. U. S. 1,724,944, Aug. 20. A soln. of a natural or synthetic gum in alc. or other suitable solvent having a freezing point below the lowest temp. in the refrigerating system is circulated through the system to stop leaks. The use of bakelite and pyroxylin is mentioned.

**Generating oxygen for use in respirators.** INHABAD-GES. Brit. 304,292, Jan. 18, 1928. O is generated by heating compds. such as perborates, persulfates, perchlorates, chlorates, permanganates, bichromates, plumbates, or alkali or alk. earth peroxides. An app. is described.

**Closed-circuit respirators.** INHABAD-GES. Brit. 304,248, Jan. 17, 1928. O is supplied by substances which yield it when heated, such as perborates, persulfates, perchlorates, chlorates, permanganates, bichromates, plumbates or alk. earth peroxides, which may be formed into briquets. Various structural details are described.

**Heat insulation.** BRUNO F. BALDUF (to U. S. Gypsum Co.). U. S. 1,723,989, Aug. 13. A dry fluffy insulating material suitable for use in walls, etc., comprises shredded paper and comminuted plaster and may be produced by utilizing gypsum board factory waste.

**Electrical insulation.** HAROLD H. BROWN. U. S. 1,725,335, Aug. 20. The fiber of leaves of plants of the Bromelia family such as caroa is used for paper wrappings for wires, etc.

**Insulating wire for electric conductors.** SIEMENS-SCHUCKERTWERKE A.-G. Brit. 304,192, Jan. 16, 1928. The insulating material is applied in vaporized state, preferably *in vacuo*, in one or more coats, and is deposited by condensation.

**Electric cable coverings.** E. S. ALI-COHEN. Brit. 304,493, Dec. 13, 1928. A cable core, after insulation such as "Karetnja" has been applied, and while still somewhat heated, is drawn through a fine powder of metal or other cond. material such as C black.

## 14—WATER, SEWAGE AND SANITATION

EDWARD BARTOW

**Quality of the surface waters of North Carolina.** E. E. RANDOLPH. *J. Elisha Mitchell Sci. Soc.* 44, 70-4(1928).—Complete industrial analyses were made of about 200 samples of surface H<sub>2</sub>O collected from all the large streams of the state. The av. amts. of dissolved solids in the samples from the mountain, piedmont and coast plain sections were 25, 55 and 60 p. p. m. The waters of the entire state are slightly alk. and unusually soft. The av. Ca content is 4-6 p. p. m. and Mg content 1-3 p. p. m. They contain very little Fe.

**Iodine in North Carolina public water supplies.** J. W. PERRY. *J. Elisha Mitchell Sci. Soc.* 44, 87-9(1928).—The av. I content of the public H<sub>2</sub>O supplies of 10 cities, including most of the large ones of the state, was 1.73 p. p. b.

**The ground water of Nishinomiya and its environs.** ATSUSHI MATSUBARA. *Proc. 3rd Pan-Pacific Sci. Congr.* 1926, I, 817-37(Publ. 1928).

**The mineral waters of Rosheim. Analytical and therapeutical study.** L. LEGIN AND SCHIRARDIN. *Strasbourg méd.* 88, 277-93(1928); *Wasser u. Abwasser* 25, 293.—The water is neutral in reaction, weakly radioactive and contains large quantities of Mg, Ca and Li. The waters are particularly effective in kidney, bile, gall bladder and diabetic ailments.

**Activity of mineral springs (Wiesbaden).** K. HARPUDER. *Z. wiss. Bäderkunde* 3, 293-7(1929); *Wasser u. Abwasser* 25, 293.—Catalase, peroxidase and oxidase reactions were strong and usually went hand in hand with high heavy metal oxides and insol. hydroxides.

The peroxidase activity of mineral waters; the pumerical measurement of this activity. A. MOUGROT. *Progrès méd.* 56, 733-8(1928); *Wasser u. Abwasser* 25, 294.—The decompn. of  $H_2O_2$  is effected by Vichy and some other mineral waters. Aeration causes a loss in activity but boiling recovers it. A numerical scale is used in classifying waters as to their activity.

Analysis of mineral springs in the Upper Chechnya (Caucasus). A. P. POPOV AND V. A. KARNITZKII. *Zhur. Prikladnoi Khim.* 1, 291-9(1928).—Chem. analysis of 12 mineral springs is given.

The carbon dioxide content of the Reinerz thermal springs. W. GOETSCH. *Z. wiss. Bäderkunde* 3, 320-3(1929); *Wasser u. Abwasser* 25, 294.—The  $CO_2$  content, temp., barometric height and degree of  $CO_2$  satn. were detd. on numerous samples.

Standard methods of water analysis. Progress report of sub-committee No. 8 on standardization of water analysis. [Tentative method for determination of dissolved oxygen in boiler feedwater.] HAROLD FARMER. *Fuels and Steam Power* (A. S. M. E. Trans.) 51, No. 12, 90-3(1929); cf. C. A. 22, 2630.—A tentative method for trial and criticism by the various industries is presented.  $MnCl_2$  is used instead of  $MnSO_4$ . The chem. reactions involved are given. There are 4 photographs showing the app. and steps in the operation. Sufficient construction details are shown for making the cooling coil whereby water supplied in excess of 125° F. and above atm. pressure may be cooled to room temp.

Influence of organic matter and its removal in the determination of iron in water. G. NACHTIGALL AND M. BAYER. *Arch. Hyg.* 100, 35-9(1928); *Wasser u. Abwasser* 25, 305.—In the thiocyanate method of Fe detn. in water, a clear soln. and Fe in the tervalent condition are necessary. In clear waters, Br,  $H_2O_2$  and  $KClO_3$  are all satisfactory oxidizers, but the latter is preferred in waters contg. much org. matter. The use of 1-5 drops of  $H_2O_2$  in the reaction was favorable but larger quantities decompd. the thiocyanate pigment.

Chlorophenol tastes and odors in water supplies of Ohio River cities. H. W. STREETER. *Am. J. Pub. Health* 19, 929-34(1929).—Discussion of disposal of phenol wastes by Waring (cf. C. A. 23, 4518).

A study of the taste that develops when water containing phenol is treated with chlorine. F. DIÉNERT AND F. WANDENBULCKE. *Ann. hyg. publ. ind. sociale* 1929, 298-301; *Rev. hyg. méd. prev.* 51, 489-92(1929).—In water contg. phenol in concns. higher than  $10^{-10}$ , Cl produces a taste like  $CHI_3$  that is attributed to the formation of an oxychlorophenol. Quant. expts. on both spring water and Seine water show that with increasing amts. of Cl the degree of taste increases to a max. and then decreases until no taste is present. The less phenol there is present, however, the higher is the Cl concn. necessary to reach the max. of taste, so that the intensity of taste is a function of the concn. of the Cl as well as of the phenol. The taste always disappears gradually in course of time; the slower the taste disappears, the stronger the taste was originally. If the free Cl is destroyed by hyposulfite the taste disappears much sooner than without this treatment. However, even if hyposulfite is added before the Cl some taste will appear and the safest way of preventing the formation of the unpleasant taste is destruction of the phenol by means of permanganate. When phenol does not get into the water until after the Cl and hyposulfite treatments no taste will form. These treatments, therefore, are effective and unobjectionable when, as is frequently the case, the only source of phenol is the tar material of the pipe system through which the water circulates after leaving the plant. On the pure compds. *o* and *p*-chlorophenol and trichlorophenol the observation was made that the gradual disappearance of the  $CHI_3$  taste is due to the decompn. of the Cl compds. *o*-PhCl gives the strongest and most persistent taste.

Antiliton. M. S. MILEANT. *Ukrainskii Khim. Zhur.* 4, No. 1, Tech. Pt., 23-9(1929).—A boiler compd. named antiliton contains 20% of solids and 12% of tannins. When a sample of water having 8° of temporary hardness and 16° of permanent hardness was treated with this compd. and evapd. at 5 kg. of pressure, a copious fluffy ppt. resulted, while in a control expt. hard scale was produced on the walls of the vessel.

Bacteriological examination of water. A. GUILLERD. *Ref. Zentr. ges. Hyg.* 17, 4(1928); *Wasser u. Abwasser* 25, 68.—The French, Belgian, English, German and American methods are described. Especial significance is attached to *B. coli* and fecal tests, to the differentiation of human and animal strains of coli and the number of coli colonies and the interpretation of results.

Supplementing the Gersbach fecal titer for the certain determination of bacteria in water. R. KOPP. *Zentr. Bakt.* 1927, II, 267-71; *Wasser u. Abwasser* 25, 69.—The

Gersbach fecal titer test after 24 hrs.' use was considered sufficient for *B. coli* without confirmatory tests. After 48 hrs. the test is not as good. For exact work it is necessary to confirm coli with dextrose fermentation at 45°.

F. P. GRIFFITHS

**Sewage treatment in Europe.** A few snapshots from an engineer's collection. SAMUEL A. GREELEY. *Sewage Works J.* 1, 228-30(1928).—A discussion. E. HURWITZ

**A chemical study of the sewage of the city of Prague.** J. HAMÁČKOVÁ. *Chem. Listy* 23, 98-104, 162-7, 185-8, 251-6, 277-83, 305-9(1929).—H. made weekly analyses at the city sewage plant in Bubeneč throughout the year 1927 for  $\text{HNO}_3$ ,  $\text{HNO}_2$ , Cl,  $\text{NH}_3$ , org. N,  $\text{H}_2\text{S}$ , alky. and org. matter by the action of  $\text{KMnO}_4$  upon samples after 4 hrs. and after 5 days of incubation. From graphs for the year, the sediment and sol. matter vary between wide ranges. The mineral content shows slight variations.  $\text{H}_2\text{S}$  appears very irregularly. The addn. of Cl to the sewage has no effect upon sedimentation, i. e., pptg. the colloids; a large dose (20 mg. per l.) bleaches the soln. Lime water ppts. the colloids and increases the sediment. The solns. are much decolorized by the addns. of  $\text{CaO}$ . An addn. of 200 mg.  $\text{Al}_2\text{O}_3$  per l. removes 92% of the suspended matter and leaves clear solns. The addn. of 100 mg.  $\text{SO}_2$  per l. increases the sediment measured in the lab., but no visible pptn. of the colloids occurs; the solns. are slightly bleached. The sediment shows  $\text{P}_2\text{O}_5$  2.26%,  $\text{K}_2\text{O}$  0.16%, N 3.01% on a dry basis; this compn. is the same as that found in 1910, 1914 and 1916. After settling in basins for 2 months, the  $\text{H}_2\text{O}$  content of the sediment dropped from 90 to 70%. The fresh sediment was used in various compost mixts. Tables of the mixts. and analyses are given. The gas from the sediment contained 41%  $\text{CO}_2$  and 59%  $\text{CH}_4$ . The effect of the sedimentation plant upon the river water was studied. Complete tables and graphs are given.

FRANK MARESH

**Operation of trickling filters.** E. SHERMAN CHASE. *Sewage Works J.* 1, 223-7 (1929).—Successful operation of trickling filters calls for thorough preliminary treatment for removal of suspended solids, fresh sewage, good distribution over the filter, clean nozzles, proper filter media, freedom from excessive pooling, and faithful, intelligent personnel.

E. HURWITZ

**The operation of Imhoff tanks.** H. M. BEAUMONT. *Sewage Works J.* 1, 211-7 (1929).—Possible causes of foaming of Imhoff tanks and measures taken to prevent or overcome foaming at the Philadelphia plant are discussed.

E. HURWITZ

**Separate sludge digestion studies.** ANTHONY J. FISCHER. *Sewage Works J.* 1, 236-41(1929); cf. *C. A.* 23, 1707.—Lab. research showed that the best and most economical digestion is secured when (1) the tank temp. is kept at about 80° F; (2) the amt. of fresh ripe sludge is equal to 20 times the weight of raw sludge added daily on the dry solids basis; (3) the  $p_H$  is kept between 7.3 and 7.6; (4) the raw sludge is added in the freshest possible condition and has a solid concn. of about 15%; (5) provision is made for mixing or stirring. Plant scale operations cited bear out these facts. E. H.

**Hydrogen-ion control in the digestion of sewage sludge on a practical scale.** FRANK BACHMAN. *Sewage Works J.* 1, 218-22(1929).—Answers to a questionnaire reveal that in nearly all cases liming was beneficial to digestion. Adjustment of  $p_H$  was generally practiced but varied among the operators from 6.4-6.8 to 7.2-8.4. The value of  $p_H$  adjustment to control foaming is indefinite.

E. HURWITZ

**Sludge and sludge disposal.** C. A. EMERSON, JR. *Sewage Works J.* 1, 231-5 (1929).—A brief discussion.

E. HURWITZ

**The Nidus (Nest) Rack, a modern development of the Travis Colloider.** A. M. BUSWELL AND E. L. PEARSON. *Sewage Works J.* 1, 187-95(1929).—The racks differ from the original Travis Colloider in that (1) more contact surface is afforded, (2) provision is made for removal of the pptd. material and (3) aerobic conditions are maintained in the tank. Expts. show that when ratio of contact surface to vol. of sewage is 20:1, 30% of the colloidal org. matter is removed. The efficiency of this process over plain sedimentation is given as 20 to 50%. Notes on the construction of the Nidus racks and veneer mats and ests. of costs are given.

E. HURWITZ

**Mechanical aerator at Des Plaines River Treatment Works.** M. B. TARK. *Sewage Works J.* 1, 206-10(1929).—Aeration was accomplished by a ribbon conveyor pitched both ways to give approx. the same spiral motion as the Manchester tank. Results of 6 months of operation indicate that a stable effluent was obtained with a 6 hr. detention period and a power consumption of 20 h. p. per million gallons.

E. HURWITZ

**Effect of industrial wastes on sewerage systems.** GEORGE S. RUSSELL. *Sewage Works J.* 1, 242-3(1929).—Wastes which affect sewerage systems by increasing the load on the plant or by causing disintegration and lessening of capacity of sewer systems should either be excluded from the system by ordinance or should receive preliminary treatment at the factory, sufficient to remove causes for objection.

E. HURWITZ

**Smokes and dusts of the big cities.** H. CARRION. *Rev. prat. biol.* **22**, 135-41 (1929).—A general discussion of the causes of and remedies for the pollution of the city atm. A characteristic analysis of dust collected during one month (February) on the terrace of the Palais Royal in Paris is given: C 2.659 g. hydrocarbons 1.824 g.,  $\text{H}_2\text{SO}_4$  2.432 g., Cl 0.253 g.,  $\text{NH}_3$  0.021 g. each per sq. m. G. TOENNIES

**Bacteriological investigation into the state of pollution of the Clyde at Port Glasgow, Greenock and Gourock.** D. ELLIS. *J. Roy. Tech. Coll. (Glasgow)* **2**, 129-42 (1929).—The study of pollution of the River Clyde showed, in general, that the swift running tide in the channel effectively scoured and purified the deeper waters. The quiet, shallow, shore waters were but little affected by the tide and contained numerous saprophytic organisms such as *Cladothrix*, *S-bacteria*, *Beggiatoa* and *Eumycetous* fungi. Black mud contg.  $\text{H}_2\text{S}$  underlaid the shore waters while white sand was found in the deeper waters. No corrective measures are considered. C. R. F.

**Some biochemical relationships in a polluted stream.** H. HEUKELEKIAN. *U. S. Pub. Health Repts.* **44**, 1544-55 (1929).—A survey of the Raritan River extending over a yr. shows pollution. The process of self-purification is evidenced by (a) the reduction of the nos. of *B. coli* and pollutional forms of plankton by a dam, (b) the lowering of O satn. (due to bacterial activities), and (c) the zone of max. pollution moving farther upstream in summer. Diln. with sea  $\text{H}_2\text{O}$  is a major factor in the improvement of the river below New Brunswick. The zone of max. diln. and the zone of bacterial reduction coincide. The max. amt. of Cl present is below the toxic limit of *B. coli*, and therefore, probably, is not a factor in the bacterial reduction at the point of max. diln. There is a direct relationship between the nos. of bacteria, biochem. O demand and the  $\text{NH}_3$  nitrogen. As long as the river is not overloaded nitrification is not impaired. But a heavy pollution, causing a large depletion of O, causes a decrease in  $\text{NO}_3$ . Of the tests employed in the survey the following gave an accurate picture of pollution with domestic sewage: (a) bacteria—*B. coli* and total nos., (b) biochem. O demand, (c)  $\text{NH}_3$  nitrogen, and (d)  $\text{NO}_3$  and  $\text{NO}_2$  nitrogen. J. A. KENNEDY

**Current malaria studies, with special reference to control measures.** I. J. WILLIAMS, JR. *U. S. Pub. Health Repts.* **44**, 2001-4 (1929). J. A. KENNEDY

**Paris green as an anopheline larvicide.** S. N. SUR AND HARIPADA SARKAR. *Indian Med. Gaz.* **64**, 376-8 (1929).—The advantages of cupric aceto-arsenite as a larvicide are stressed, and its effect upon anopheline larvae was discussed. F. G. G.

**The disposal of oil-field brines (a preliminary study).** LUDWIG SCHMIDT AND JOHN M. DEVINE. *Bur. Mines, Repts. of Investigations* No. 2945, 17 pp. (1929).—The successful use of ponds for evapn. in the district studied is limited to properties producing very small quantities of brine; however, ponds are of great value for temporary storage of brine. Plants for recovering the common salts from oil-field brines are uneconomical except in special cases. Further investigation of the brines produced with petroleum may disclose that the rarer salts can be economically obtained. The diversion of oil-field brines into selected streams offers possibilities. Detailed surveys covering all seasons of the year should be made of the various streams. A complete analysis to insure absence of poisonous salts should be made of all brines that are to be allowed to enter streams. The delivery of brine from a field to the selected stream can be accomplished by pipe lines, or a small tributary stream, if available, could be set aside for that purpose, providing fresh  $\text{H}_2\text{O}$  can otherwise be supplied to those obtaining their  $\text{H}_2\text{O}$  for human or stock consumption from the tributary stream. The disposal of oil-field brines by returning them to a subsurface formation appears to be feasible in isolated instances. Great care must be used in attempting this method. Not only is there danger that the  $\text{H}_2\text{O}$  will migrate to fresh-water sands and pollute a potable  $\text{H}_2\text{O}$  supply but also there is an ever-present possibility that this  $\text{H}_2\text{O}$  may endanger present or future oil production. Also in *Petroleum Times* **22**, 207-8 (1929). J. A. KENNEDY

**Disposal of phenol wastes from by-product coke plants.** F. W. SPERR, JR. *Am. J. Pub. Health* **19**, 901-7 (1929).—All phenol-bearing wastes, with the exception of  $\text{NH}_3$  still waste, may be handled by installing suitable recirculating and intercepting systems so that no phenol from these sources need reach any public water supply. The cheapest and most satisfactory for  $\text{NH}_3$  still waste disposal consists in mixing the waste with ordinary city sewage, provided a sufficient amt. of sewage is available. In cities having no sewage disposal systems simple mixt. with raw sewage will suffice to a certain extent, provided sufficient diln. or time of contact can be had. In these cases, it would be well to consider the installation of a sewage aeration system, as this would greatly facilitate the destruction of phenol. In cities using the activated sludge system of sewage disposal, a vol. of still waste equiv. to 50 parts of phenol per million parts of sewage can be treated with certainty, and it is probable that a much larger proportion can be safely

treated. In cities equipped with Imhoff tank systems of sewage disposal,  $\text{NH}_3$  still waste properly clarified can be added either to the raw sewage or to the tank effluent, and if the effluent is suitably aerated, the phenols will be destroyed. There is not sufficient data as to the proportion of still waste that can be handled in this way, but it is probable that a proportion of 1 part still waste to 10 parts sewage may be safely handled. Where the required amt. of sewage is not available, the  $\text{NH}_3$  liquor should be treated for the removal of the bulk of the phenols; this treatment should be followed, if necessary, by mixing the still waste, with its small remaining phenol content, with sewage, or treating it on bacterial filters. In most cases, the removal of the bulk of the phenol from the  $\text{NH}_3$  liquor will be sufficient without further treatment of the still waste. The disposal of  $\text{NH}_3$  still waste by using it for coke quenching is available as an emergency method except for plants producing domestic coke, but although it offers adequate protection to  $\text{H}_2\text{O}$  supplies, it is unsatisfactory for many technical reasons and will doubtless be superseded by other methods.

J. A. KENNEDY

Venturi meters and standing wave flumes (INGLIS) 1.

KELLER, HERMANN: *Wassergewinnung in heissen Ländern*. Berlin: W. Ernst & Sohn. 172 pp. M. 16.

KOPACZEWSKI: *Physico-chimie des eaux minérales*. Paris: Gauthier-Villars & Cie. 62 pp. F. 18.

Tank for purifying water by sedimentation. JOHN CARPITA. U. S. 1,724,693, Aug. 13. Structural features.

Filtering and softening water. GEORGE W. PRATHER. U. S. 1,724,679, Aug. 13. In forming a filtering and water-softening material, a mineral such as a natural zeolite-like material is mixed with a non-acid sol. alkali metal compd. such as a hot 10% salt soln.; the mixt. is baked at a temp. sufficiently high to liquefy the alkali metal compd. and cause it to permeate the material and to form a product hard enough to resist the powdering action of water; the material is then washed free from excess salt.

Apparatus for softening water by adding chemical reagents. STUART A. WIER (to Tridex Corp.). U. S. 1,725,236, Aug. 20. Structural features of an app. in which a float valve controls the supply of treating liquid.

Apparatus for softening water by the action of base-exchange materials. CHARLES A. STICKNEY (to Stickney Hydraulic Co.). U. S. 1,725,110, Aug. 20. Structural features.

Purifying waste waters. METALLGES. A.-G. (formerly Metallbank und Metallurgische Ges. A.-G.). Brit. 305,657, Feb. 9, 1928. Waste waters such as those from coking plants or cellulose or other factories are treated with active C or other suitable adsorbent; adsorbed constituents are subsequently recovered by use of a solvent such as  $\text{C}_6\text{H}_6$ ,  $\text{CS}_2$  or mixts. of  $\text{C}_6\text{H}_6$  with alc. or acetone. Phenol may be thus recovered from waters contg. it.

Sludge-settling tank, etc. M. PRÜSS. Brit. 304,735, Jan. 25, 1928. Structural features.

Treating sewage sludge for fertilizer or other purposes. G. H. HADFIELD. Brit. 305,346, Dec. 29, 1927. Ash from boilers or house refuse is mixed with sewage sludge cake as discharged from a filter-press; quicklime or portland cement also may be added.

Shaft furnace for garbage destruction. CARL C. ILVING. U. S. 1,724,352, Aug. 13.

## 15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER

The soil reaction profile. E. A. NORTON AND R. H. BRAY. *J. Am. Soc. Agron.* 21, 834-44 (1929).—Early in the process of soil formation, the  $p_{\text{H}}$  of the  $A_2$  horizon of the soils in Illinois becomes 5.7, which seems to be a position of equil. between the accumulation of bases from the decay of org. matter and the loss of bases by leaching. This  $p_{\text{H}}$  is maintained as long as the soil is able to support a good vegetative growth. The highest acidity which might be expected in the muck soils of this region under present environment is a  $p_{\text{H}}$  of about 4.8. Soils developed on rolling well-drained topography were more acid throughout the profile than those developed on flat topography under poorly drained conditions. A significant difference was observed in the amt. of leaching in 2 profiles of the same soil type differing only in the length of time they had been

subjected to weathering. The  $p_H$  of the Slick Spot profiles shows a good correlation with the texture, structure and consistence characteristics as observed in the field and with replaceable Na as detd. in the lab. The reaction profile is a relatively stable soil character, and can be considered as an aid to the sepn. of soil types. E. F. S.

**The nature of acidity of mineral soils.** SHIGERU OSUGI. *Proc. 3rd Pan-Pacific Sci. Congr.* 1926, II, 1960-71 (Publ. 1928).—Mineral acid soils invert cane sugar to a high degree; this is due not to the presence of large amts. of any sol. acid in the soil, but to the surface action of soil particles, as proved by expts. with soil ext. Although the  $p_H$  of the water ext. of the soil is not enough to explain the inverting action, the higher the proportion of soil to water the higher the  $p_H$  of the ext. The ext. from the clay portion of the soil has a higher  $p_H$  than that from the coarser parts. A higher  $p_H$  exists in the adsorbed water film of the soil. Existence of an insol. acid substance in acid soil is proved by changes in cond. of  $NH_4OH$  after contact with the soil. The substance causing soil to invert cane sugar is closely related to the colloidal substance in the soil. E. M. SYMMES

**Studies on the decomposition of genge (*Astragalus sinicus*) in the soil and its relation to the growth of paddy rice.** ISENOSUKE ONODERA. *Proc. 3rd Pan-Pacific Sci. Congr.* 1926, II, 1973-88 (Publ. 1928).—When a large amt. of genge is used as green manure in certain soils it retards growth of paddy rice, not because of the presence of free org. acids but because of the  $CH_4$ ,  $CO_2$ , etc., formed, which displace the necessary O in the soil. E. M. SYMMES

**The role of a cellulose fermenter in soil fertility.** ARAO ITANO. *Proc. 3rd Pan-Pacific Sci. Congr.* 1926, II, 1989-93 (Publ. 1928).—The thermophilic cellular fermenter acts vigorously on cellulose during composting. A specially built zymotic chamber aids in producing desirable compost from waste in a short time without the aid of cattle. This may be used on a large scale to dispose of city or farm waste. Human excreta can be used with comparative safety because the high temp. produced in the process destroys most of the pathogenic organisms. E. M. SYMMES

**The maximum amount of combined nitrogen that can be absorbed by soils from the atmosphere.** TSUNEJIRO IMASEKI. *Proc. 3rd Pan-Pacific Sci. Congr.* 1926, II, 1994-6 (Publ. 1928).—By using a 5%  $H_2SO_4$  soln. to absorb  $NH_3$ , and a 5%  $K_2CO_3$  soln. to absorb  $HNO_3$  and  $HNO_2$ , it was found that at Nishigahara about 22.6 kg. per hectare of combined N may be absorbed. E. M. SYMMES

**Relation between the phosphatic requirement and the phosphatic content of soil for paddy rice.** MICHI IMAI. *Proc. 3rd Pan-Pacific Sci. Congr.* 1926, II, 1996-8 (Publ. 1928).—The ratio  $Al_2O_3 + Fe_2O_3 : P_2O_5$  in a soil sol. in concd. HCl may be used to indicate its phosphatic requirement. The P content in a soil sol. in 0.2 N HCl also gives reliable information. E. M. SYMMES

**Several observations on the soils with a close gley horizon.** A. A. ZAVALISHIN. *Memorial Vol. to K. D. Glinka*, Leningrad Agricultural Inst. pp. 45-90 (1928).—Several soil profile cuts are described. (1) Peat or mud-marshy soil which lies immediately below a vegetative surface layer horizon; (2) podzolized-gley soil, where the profile has the typical podzol morphological characters. The gley horizon appears as a light gray, or gray with a slightly bluish, sandy or clay parent material. The gley horizons have no structure, are more or less compact, plastic and smeary. A suspension of the soil material from the gley horizon is stable and it is highly dispersed. The consecutive stages of the gley process are: At first there is formed a more or less compact, cemented, dark-brown horizon; the next step is a yellowish green loose gley, rich in sol. org. substances and ferrous iron. In the third stage a light-gray bluish gley is formed. In K the humus content in the gley is small; its soly. increases with the advance of the gleying process. The reaction of the gley horizon becomes more alk. with its depth, the  $p_H$  varying from 6.0 to 7.5. The gley horizon is poor in exchangeable Ca due to the decompn. of the complex by the ground waters. There is some exchangeable Mg equal in amount to Ca. The horizons above the gley horizon contain appreciable exchangeable Ca and Mg; upon treating the gley horizon with 0.05 N HCl appreciable amounts of  $SiO_2$  (av. 0.25%) are extd.  $Al_2O_3$  is found in the B and gley horizons. The specific property of the gley is the presence of ferrous iron. In general the compn. of the gley horizon differs but little from the parent material. The dynamics of the formation of the marshy condition is discussed. In gley soils the marshy condition is caused by the ground waters in distinction of the marshy soils produced by the imperviousness to the surface waters whereby a surface marsh is formed. J. S. JOFFE

**Measurement of suction forces in soil.** C. F. SHAW. *Soil Science* 27, 111-5 (1929). E. J. C.

The determination of the number of microbes in arable soils. A. J. J. VAN DE VELDE AND ALFRED VERBELEN. *Naturw. Tijdschr.* 11, 108-14(1929).—The  $pH$  and the no. of microbes of 30 different Belgian soils have been detd. In order to do the microbe counting without difficulty, the sample of soil is shaken with sterilized milk, and the counting is then done in the milk by the Skar method: flocculation of the dye is thus prevented. In order to stop the multiplication of the soil microbes during the shaking with milk, 1 cc. of 40% formol is added per 1 l. of milk. Very consistent results have been obtained.

Soil alkali as a scientific problem in Pacific regions. FRANKLIN S. HARRIS. *Proc. 3rd Pan-Pacific Sci. Congr.* 1926, II, 1923-32(Publ. 1928).—A review. E. M. S.

Determination of the fineness of marl. E. P. DEATRICK AND C. DORMAN. *Soil Science* 27, 121-2(1929).

Chernozem and forest loam. M. A. EGOROV AND M. M. STRELNIKOVA. *Ukrain-skii Khim. Zhurnal* 4, No. 1, Tech. Pt., 65-82(1929).—Of the 2 soils located under similar climatic conditions the loam is more productive, and in order to det. the cause both soils were subjected to various analyses and treatments. The chernozem contains more of the particles of the size 0.05 to 0.25 mm.; it contains more N,  $P_2O_5$ , CaO and humus; and in it  $Al_2O_3$ , CaO and, in part,  $Fe_2O_3$  move faster as shown from data on a 10% HCl ext. Treatment of the soil with  $NH_4Cl$  soln. dissolves the Ca ion; in the presence of Ca ion there is little org. matter,  $P_2O_5$  or  $Fe_2O_3$  in soln. Treatment with  $(NH_4)_2CO_3$  or  $(NH_4)_2C_2O_4$  seps. the Ca from soln.; in this case the org. matter, the  $P_2O_5$  and the  $Fe_2O_3$  appear in soln. In this respect both soils behave alike. Loam decomposes cellulose faster than chernozem and is more efficient in decomp.  $H_2O_2$ . More org. matter goes in soln. from chernozem upon treating the soils with  $Na_3PO_4$ . The loam soil contains more "crenic and aprocronic acids" of humus. Reversion of phosphates goes on faster in a chernozem soil. Treating the soils with  $Na_2CO_3$  and  $NaHCO_3$  gave the same results as treating with the phosphates of Na. In the loam the elements of fertility—N and P—are more active and move faster, while the chernozem contains more of the so-called preserving elements like Ca,  $Fe_2O_3$  and  $P_2O_5$ , which in turn hold the org. matter.

Distribution of volcanic ash loams in Japan proper and their characteristics and agricultural value. TOYOTARO SEKI. *Proc. 3rd Pan-Pacific Sci. Congr.* 1926, II, 1936-41(Publ. 1928).—To promote the productivity of ash loams attention should be given to the application of sol. phosphate after addn. of lime, addn. of K salts to ash loams deficient in K, and application of leguminous green manure to those deficient in org. substances. Land supposed to be infertile can be raised to moderate productivity.

Volcanic ashes in Hokkaido and their agricultural value. KOJI MIYAKE. *Proc. 3rd Pan-Pacific Sci. Congr.* 1926, II, 1941-54(Publ. 1928).—Volcanic ash soils are not naturally fertile. Improvement in water conditions makes them fertile and use of large amts. of fertilizers is more profitable. Selection of crops is necessary. E. M. S.

The new fertilizers. W. S. LANDIS. *Am. Fertilizer* 70, No. 12, 31-3, 55-6, 58, 60, 62(1929).—A review and discussion of the scientific basis for modern fertilizer practice and of the problems to be encountered in the use of the synthetic fertilizer salts.

Developments in fertilizer production. HARRY A. CURTIS. *Am. Fertilizer* 71, No. 1, 54, 56, 58, 60(1929).—A review with special reference to new developments in the synthetic  $NH_3$  industry.

Changes in fertilizer manufacture. H. R. SMALLEY. *Am. Fertilizer* 70, No. 7, 33, 55-6, 58(1929).—A discussion of the present tendency in fertilizer manuf. towards increasing the plant food content of fertilizer mixts. and the use of inorg. materials from chem. sources.

High analysis phosphates. F. L. LARISON. *Am. Fertilizer* 70, No. 13, 54-63(1929).—A review of the present method of producing treble superphosphate in the western field with a discussion of the economic advantages attending the use of high-grade phosphates.

Chemistry and economics of superphosphate. K. D. JACOB. *Am. Fertilizer* 70, No. 13, 48-54(1929).—Superphosphate is discussed with respect to its present economic aspects, future prospects, chem. compn. and the technical aspects of the industry. The reactions involved in the neutralization of the free acids in superphosphate are outlined and statistics are given on the possible production of F compds. as by-products in the superphosphate industry.

By-products of furnace-made phosphoric acid. K. D. JACOB AND D. S. REYNOLDS. *Am. Fertilizer* 70, No. 6, 19-23(1929).—An outline is given of a no. of processes that are

in use or have been proposed for the direct or indirect production of by-products in the manuf. of  $\text{H}_3\text{PO}_4$  by the volatilization method. The by-products listed include such materials as H, fused cement, CO, ferrophos, F compds.,  $\text{K}_2\text{O}$  salts, active C and slag wool. Several of the processes seem to offer interesting possibilities and their possible economic value is discussed in connection with the production of  $\text{H}_3\text{PO}_4$  for use in fertilizers.

W. H. ROSS

**Certain experiments for the utilization of natural aluminum phosphate on the Pacific Coast.** YOSHISABURO KIDA. *Proc. 3rd Pan-Pacific Sci. Congr.* 1926, II, 1999-2000 (Publ. 1928).—(1) Al phosphate was decompd. by  $\text{H}_2\text{SO}_4$ , extd. by alc. or acetone, and  $\text{NH}_3$  blown into the sepd. solvent to combine with the phosphoric acid, sepg.  $\text{NH}_4$  phosphate. (2) Al phosphate was decomposed by  $\text{H}_2\text{SO}_4$ , mixed with an equiv. sulfate to form alum, which was sepd. and lime or  $\text{Ca}_3(\text{PO}_4)_2$  added to convert to monocalcium phosphate. (3) Al phosphate was treated with hot  $\text{NaOH}$  soln., decanted, and Na phosphate formed at 80% yield. From the waste, alumina was prepd. (4) Finely ground Al phosphate was mixed with a small amt. of warm, dil.  $\text{NaOH}$  and allowed to stand. Fertilizers made as above were almost equiv. to superphosphate.

R. M. SYMMES

**An analysis of the effects of potash fertilizers on apple trees at East Malling.** N. H. GRUBB. *J. Pomology Hort. Sci.* 7, 32-58 (1928).—The application of  $\text{K}_2\text{SO}_4$  to a number of varieties of apple trees largely prevented leaf scorch, increased the quantity and size of fruit and promoted more vigorous growth. No consistent tendency towards more highly colored fruit was observed but in some cases the reverse was shown, probably due to denser foliage where K was applied.

A. L. MEHRING

**The effects of fertilizer treatments on the chemical composition of gooseberry bushes.** I. Effects on dry matter, ash and ash constituents of leaves and stems of terminal shoots and of fruits, and on total nitrogen of fruits. T. WALLACE. *J. Pomology Hort. Sci.* 7, 130-45 (1928); cf. *C. A.* 22, 839.—Deficiency of K is clearly shown in the compn. of the ash of leaves, stems and berries, especially of the first two. Low amts. of  $\text{K}_2\text{O}$  are accompanied by high values for  $\text{CaO}$ ,  $\text{MgO}$ ,  $\text{Na}_2\text{O}$  and  $\text{P}_2\text{O}_5$ . The moisture content is low in leaves and stem and ash is low in stems and berries where K is deficient. When K was applied, deficiency of P was reflected in low  $\text{P}_2\text{O}_5$  in the ash and deficiency of N in the total N detns. When K was not applied, its influence masked other results. The ash of material from plots treated with fertilizer was low in  $\text{P}_2\text{O}_5$ .

A. L. MEHRING

**The influence of increasing amounts of calcium sulfite and calcium sulfate on the germination and the young development of grain plants.** K. SCHARER and W. SCHROPP. *Landw. Vers. Sta.* 108, 217-51 (1929).—The action of  $\text{CaSO}_3$  on quaternary loam soils shows with wheat, rye and barley injury of no kind on germination and no decrease of the yield in green wt.; with the smaller amts. a small increase in yield is obtained. With oats a slight depression in yield was produced by the increasing amts. of  $\text{CaSO}_3$ , likewise a slight arresting of germination. The expts. with  $\text{CaSO}_4$  on the quaternary loam show a tendency toward a decrease in yield for the different amts. of  $\text{CaSO}_4$ . The decline in yield was the most distinct with the high amts. of  $\text{CaSO}_4$  on winter rye, winter barley and oats, the least on winter wheat. The small amts. produced changeable influences. On low moor soils  $\text{CaSO}_3$  and  $\text{CaSO}_4$  had, with all crops, an unfavorable influence on the yield and green wt. On low-terraced gravelly soil both  $\text{CaSO}_3$  and  $\text{CaSO}_4$  diminished yields of all cultivated plants. If one considers the  $p_{\text{H}}$  values of the individual soils with different fertilizing and different crops, a uniform picture is not obtained. With the low moor soils the differences in the reaction nos. are mostly small and for the most part lie within the limits of exptl. error. With the low-terraced soils finally the differences are the slightest and lie entirely within the limits of exptl. error.

E. F. SNYDER

**Increasing the protein content of pasture grasses by frequent light applications of nitrogen.** C. R. ENLOW and J. M. COLEMAN. *J. Am. Soc. Agron.* 21, 845-53 (1929). The protein content of the grasses mowed frequently averaged much higher than when the grasses were cut only at the end of the growing season. This held true on both fertilized and unfertilized areas. The protein content of pasture grass in a grazed condition can be increased and maintained at a somewhat higher level than ordinary by frequent light applications of a N fertilizer. The pasture grasses used in this expt. gave much higher forage yields from the N applications as shown by yield records obtained and as indicated from results obtained in the pasture expt. Rainfall (rather than available soil N) is a limiting factor in forage production, as the ratio between the total N content of the grass and the lb. of forage produced is flexible. E. F. S.

Chemical and microbiological principles underlying the transformation of organic



**matter in stable manure in the soil.** SELMAN A. WAKSMAN AND ROBERT A. DIEHM. *J. Am. Soc. Agron.* **21**, 795-809(1929).—The digestion of the complex org. materials in feeds involves a diminution of sugars, starches, fats, pentosans and celluloses and an increase of the lignins. The N is excreted by the animal partly in a sol. form, as urea and  $(\text{NH}_4)_2\text{CO}_3$  and partly in a complex org. form. In the decompn. of manure, the pentosans and celluloses are reduced much more rapidly than the total org. matter, while the lignins are decompd. less rapidly; hence there is a rapid reduction of the polysaccharides and an accumulation of the lignins. Only the sol. N undergoes rapid nitrification in the soil. Both forms of org. N, namely, that present originally in the manure and that synthesized by the microorganisms in the composting of the manure, become only slowly available. The role of microorganisms in the transformation of manure can be summarized under the processes of decompn. and synthesis, both of which take place side by side. E. F. S.

**Fermentation of soy-bean meal.** K. SHIMO AND T. HARADA. *J. Soc. Chem. Ind. Japan* **32**, 125-30(1929); Suppl. Binding **32**, 40-2B(1929).—Soy-bean meal was mixed with 30% of water and allowed to ferment in an incubator at 37°. At an early stage of fermentation the meal became more and more acid, reaching the max. acidity; its acidity then gradually fell, finally to an alk. reaction at the end of the fermentation. Unless the fermentation was stopped just when the fermenting meal showed neutrality, there would be a large loss of N as  $\text{NH}_3$ . Fats and carbohydrates are largely destroyed by fermentation whereas the total N, proteins, fibrous matter and ashes do not decrease, when the fermentation was stopped at the right time. The amide N increased markedly while the monoamino N greatly decreased and humin- and diamino-N decreased to a less extent. These facts indicate that the fermented meal when used as fertilizer should be more easily utilizable by plants than the unfermented. Y. T.

**Weight of plant tops and roots.** CLAUSEN. *Fortschr. Landw.* **4**, 277-80(1929).—The relative wt. of roots and tops is influenced by the kind of soil and the fertilization. The addn. of N increases the wt. of tops to a greater degree than that of roots.

LAWRENCE P. MILLER

**The farm as a consumer of chemicals.** C. H. MACDOWELL. *Am. Fertilizer* **70**, No. 12, 19-20, 52(1929).—The consumption of chemicals on the farm is discussed with special reference to their use in fertilizers, insecticides, sprays and mineral feeds.

W. H. ROSS

**Organic insecticides.** F. J. RUSSELL. *Chemist and Druggist* **108**, 427(1928).—A review chiefly on some recently introduced insecticides (*C. A.* **19**, 1750; **20**, 2556, 3769).

S. WALDBOTT

**The effect of copper carbonate on covered smut, *Ustilago hordei*, of hull-less barley.** R. H. PORTER. *Proc. 3rd Pan-Pacific Sci. Congr.* **1926**, II, 2098-2102(Publ. 1928).— $\text{CuCO}_3$ , dry and liquid Tillantin, dry and liquid  $\text{CuSO}_4$  and hot and cold  $\text{HCHO}$  all practically eliminated smut from infected barley seed and produced a clean crop.

E. M. SYMMES

**Seed disinfectants for the control of kernel smut of foxtail millet.** R. H. PORTER. *Proc. 3rd. Pan-Pacific Sci. Congr.* **1926**, II, 2103-7(Publ. 1928).—Dry Tillantin, cold  $\text{HCHO}$ , dry Uspulun and  $\text{CuCO}_3$  reduced smut to below 5% and increased the yield 3.1-4.6 bushels per acre.

E. M. SYMMES

**Exterminators for beet parasites.** B. TESI. *L'industria saccarifera ital.* **22**, 1(1929); *Listy Cukrovar. Rozhledy* **47**, 26.—The following prepn. were effective especially against cockchafer: (1) tobacco dust 40%, flowers of S 30%, finely ground naphthalene 30%; (2) tobacco dust 50%, dried "šama" 50%; (3) fine naphthalene 50%, dried "šama" 50%. Because of high costs, only the latter prepn. was used. Several applications were given during the summer. Solns. were more effective than dry powders, but their cost prevents a wide use. A successful prepn. was: soap 2.5 kg., cresol 1 kg.,  $\text{H}_2\text{O}$  6 l.; the mixt. is stirred till well dissolved, and then diluted to 9 l.

FRANK MARESH

**The ecology of growing beets and its relation to plant diseases.** V. STEHLIK AND FR. NEUWIRTH. *Listy Cukrovar. Rozhledy* **47**, 639-44(1929); cf. *C. A.* **23**, 1665.—The peeling of beet seeds is not effective. The main source of infection does not lie in the seed but is *Rythium de Baryanum* which attacks the growing plant. *Rythium de Baryanum* is found in blighty soils and is not carried by seeds; the treatment of seeds with germicides is useless in this case. The main causes of blight are due to soil deficiencies. The peeling of beets improved their germination and sprouting (primarily for seeds with thick shells). For ordinary com. seeds this improvement is small. FRANK MARESH

**Studies of the spring scarabee.** FLACHS. *Z. angew. Entomologie* **14**, 514(1929); *Listy Cukrovar. Rozhledy* **47**, 38.—The larvae are able to avoid poisoned baits; petro-

leum,  $\text{CS}_2$ ,  $\text{C}_6\text{H}_6$ ,  $\text{CCl}_4$ , phenols, cresols, gas plant solns. and CN mixts. kill insects and the larvae directly in lab. expts.; their practical use is very restricted. The larvae are able to live for a few days submerged in  $\text{H}_2\text{O}$ ; flooding the helds is ineffective. Drought and sunlight were very destructive to the larvae; rolling the fields 3-4 times was detrimental to the larvae. Larvae were indifferent to soil rich or deficient in Ca, or an acid or alk. one. They sought soils with the highest moisture content. K salts and manure water contg. 1-2%  $\text{FeSO}_4$  or  $\text{Ca}(\text{NO}_3)_2$  removed larvae from the upper soil layer. Powd.  $\text{FeSO}_4$  was equally effective.

FRANK MARESH

The Cu content of drug extracts resulting from insecticide sprays (JANICSEK) 17. Losses in Florida land pebble phosphate (LAWRENCE) 18. International aspects of the phosphate rock industry (GRACE) 18. Oil content of sunflower seeds and factors controlling it (USPENSKII) 27. Phosphate progress (BURROWS) 18. Value of Ca salts in poultry feeding (AUTON) 11E. Treating sewage sludge for fertilizer (Brit. pat. 305,346) 14.

BEAR, FIRMAN E.: *Theory and Practice in the Use of Fertilizers*. London: Chapman & Hall. 348 pp. 20s., net.

RENDU, A.: *Fertilité de la terre et engrais chimiques*. PARIS: Garnier frères. 192 pp. F. 8.

**Fertilizers.** SOC. L'AIR LIQUIDE, SOC. ANON. POUR L'ÉTUDE ET L'EXPLOITATION DES PROCÉDÉS G. CLAUDE AND E. URBAIN. Brit. 305,132, Jan. 31, 1928. A mixt. of  $\text{KCl}$  and  $\text{NH}_4\text{Cl}$  which may be formed as described in Brit. 210,399 is treated, at temps. up to  $260^\circ$ , with  $\text{H}_3\text{PO}_4$  in such proportion that for each atom of the total alkali contents of the mixt. there is present more than 1 (suitably 2) atoms of P, and the product is then treated, at about  $150^\circ$ , with  $\text{NH}_3$  until at least one-third of the H of the  $\text{H}_3\text{PO}_4$  used has been replaced.

**Artificial fertilizer.** NILS K. E. MALMSTEN. Ger. 477,954, Oct. 24, 1922. A device for powdering and mixing artificial fertilizer is described.

**Superphosphate.** CHEMISCHE INDUSTRIE A.-G. and H. MEYER. Brit. 304,697, Jan. 24, 1928. Superphosphate is stored until its  $\text{CaSO}_4$  content has sepd as  $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$  and then dried at a temp. below that at which the water-sol. phosphate is rendered water-insol. A single drying may reduce the water content to 5-6%.

**Insecticides.** CALIFORNIA FRUIT GROWERS' EXCHANGE. Ger. 479,192, Sept. 17, 1926. Comps. to be sprayed on plants and comprising an aq. emulsion of an oil or other insecticide are prepd. with the use of pectin or a pectic substance as the emulsifying agent.

**Liquid insecticide containing an effective ingredient of the Derris species.** SANKICHI TAKEI (to Zaidan Hojin Rikagaku Kenkyujo). U. S. 1,724,626, Aug. 13. Raw material such as *Derris* root is extracted with a volatile org. solvent for the effective ingredient, such as with ether or gasoline, the ext. is mixed with lard and chrysalic oil or other suitable anhyd. alkali-free org. preservative for the ingredient, the solvent is evapd. from the mixt. and the resulting product is mixed with an org. colloidal material in an aq. medium, e. g., with soap and water.

**Seed-separating and germination-stimulating solution.** H. R. WARREN (to Warrenteed Seed Co.). Brit. 304,649, Jan. 23, 1928. See U. S. 1,708,435 (C. A. 23, 2541).

## 16—THE FERMENTATION INDUSTRIES

C. N. FREY

**Lactic fermentation.** P. SIMONART. *Bull. trimestr. assoc. élèves école sup. brasserie univ. Louvain* 29, 75-81 (1929).—An address. A. PAFINEAU-COUTURE

**Evolution of the Saladin system in pneumatic malting.** ANTH. VISEZ. *Bull. trimestr. assoc. élèves école sup. brasserie univ. Louvain* 29, 70-4 (1929).—The evolution of the system is outlined. A. PAFINEAU-COUTURE

**Controlling the drying of malt.** V. CIHAK. *Kvas*, Jan. 16, 1929; *Brasserie & malterie* 19, 73-7 (1929).—An address. A. PAFINEAU-COUTURE

**Analyses of 1928 malts.** J. DE CLERCK. *Bull. trimestr. assoc. élèves école sup. brasserie univ. Louvain* 29, 67-70 (1929).—Analyses of 129 malts of the 1928 crop confirmed the conclusions drawn from analyses of malts from the 1927 crops (C. A. 22, 3258). A. PAFINEAU-COUTURE

**Starch, amylase and amylolysis.** H. COLIN. *Bull. trimestr. assoc. élèves école sup. brasserie univ. Louvain* 29, 49-60(1929).—A crit. review. A. PAPINEAU-COUTURE

**Use of metal filtering surfaces instead of wort filters.** J. RAUX. *Brasserie & malterie* 19, 53-61, 69-73, 86-92, 97-101(1929); cf. *C. A.* 22, 1431.—Tests with a wire cloth having a rep weave showed that it could be used instead of textile filtering cloth without appreciable modification in the working conditions of the filter, that a finer flour must be used (which results in a higher degree of extn. in mashing), and that filtration is as rapid as with a coarse textile cloth and more rapid than with a fine cloth. Preliminary tests with slotted metal plates indicated that they are not as advantageous as the wire cloth filters. A. PAPINEAU-COUTURE

**General effect of very cold temperature on the chemical composition of wine.** ASTRUC AND CASTEL. *Ann. fals.* 22, 272-5(1929).—A brief discussion of the effects on the compn. of wine of the exceptionally cold weather experienced in Southern France during the winter of 1928-29, more particularly from the standpoint of the interpretation of the results of analysis in judging of the genuineness of the wine. A.P.-C.

**Wines of Gard and of Ardèche from the 1928 vintage.** AUBOUV. *Ann. fals.* 22, 278-87(1929).—Analyses of 84 wines of Gard and 28 of Ardèche are tabulated and briefly commented. A. PAPINEAU-COUTURE

**The use of alkali sulfites in wine making.** J. HENRI FABRE AND E. BRÉMOND. *Ann. fals.* 22, 262-71(1929).—After a brief discussion of the French regulations as regards the use of free SO<sub>2</sub>, bisulfites and NH<sub>4</sub> phosphates in wine making, it is shown that NH<sub>4</sub> sulfite has no unfavorable effect either on the yeast or on the quality of the finished wine, and that sol. phosphates added to the wine must pass entirely into the finished wine and do not seem to be utilized by the yeast during fermentation. A. PAPINEAU-COUTURE

**The use of potassium ferrocyanide in wine making.** E. COUERRÉ. *Ann. fals.* 22, 354-62(1929).—Polemical with Musso (*C. A.* 23, 2530), defending the use of K<sub>4</sub>Fe(CN)<sub>6</sub>. A. PAPINEAU-COUTURE

**Contribution to the study of raisin wine.** L. CHAUVEAU AND A. VASSEUR. *Ann. fals.* 22, 340-51(1929).—A review of the rather meager literature on the subject, together with a very detailed analysis and description of the phys. and organoleptic characteristics of a sample prepd. in the lab. A. PAPINEAU-COUTURE

**A new method of estimating the acids of wine.** G. BONIFAZI. *Mitt. Lebensm. Hyg.* 20, 122-47(1929).—A comprehensive review of the methods for detg. fruit acids is presented. Lactic, tartaric, malic and succinic acids are detd. from the same sample. Acetic acid is detd. by distn. in the usual way with a sep. sample. C. R. F.

**Determination of alcohol in wines by chromic oxidation.** LUCIEN SEMICHON AND MICHEL FLANZY. *Ann. chim. anal. chim. appl.* 11, 195-9(1929).—See *C. A.* 23, 3537. W. T. H.

**Detection of cider and other fruit juices in wine.** J. WERDER. *Ann. fals.* 22, 260-1(1929).—See *C. A.* 23, 4296. A. PAPINEAU-COUTURE

**Conversion of dibenzalsorbite into hexaacetylsorbite.** C. ZACH. *Ann. fals.* 22, 261-2(1929).—See *C. A.* 23, 4296. A. PAPINEAU-COUTURE

**"Lambic" beers.** ALBERT VOSSEN. *Bull. assoc. élèves inst. sup. fermentation Gand* 30, 192-201(1929).—An address discussing the precautions to be taken to obtain good lambics. A. PAPINEAU-COUTURE

**Container for pasteurizing apparatus** (Ger. pat. 478,539) 1. **Fermenting cacao beans** (Brit. pat. 305,236) 12. **Separating alcoholic mixtures by distillation** (Brit. pat. 304,756) 13.

FABRE, J. HENRI: *Traité encyclopédique des vins: procédés modernes de vinification*. Vol. I. 4th ed. Paris: Dujardin frères. F. 40. Reviewed in *Ann. fals.* 22, 370(1929).

FEHR, J. H., AND NORRENBERG, HEINRICH: *Likörfabrikation auf kaltem Wege*. 4th ed., revised. Eberswalde: R Müller. 94 pp. M. 2.80.

HESSE, ALBERT: *Die Technologie der Fermente*. 1 Halbband. *Enzymatische Technologie der Gärungsindustrien*. Leipzig: Georg Thieme. 357 pp. M. 36. Reviewed in *Cereal Chemistry* 6, 372; *Ind. Eng. Chem.* 21, 889(1929).

**Simultaneous production of carbonic acid, alcohol and lactic acid.** PAUL LINDER. Ger. 478,558, Aug. 17, 1927. CO<sub>2</sub>, alc. and lactic acid are produced simultaneously from cane sugar, glucose, fructose or mixts. by fermentation with the bacteria from the American aloe at 25-35°.

**Butyl and isopropyl alcohols.** ALEXANDER IZSAK (to Eastern Alcohol Corp.). U. S. 1,725,083, Aug. 20. BuOH and iso-Pr alc. are obtained by the fermentation of carbohydrate material such as molasses by the action of a bacillus which is described and which is obtained by saccharifying the starches of barley malt and incubating the maltose.

**Fusel oil by fermentation.** FRANK A. McDERMOTT (to Eastern Alcohol Corp.). U. S. 1,725,084, Aug. 20. An acid molasses or other carbohydrate-protein mash is sterilized, cooled to optimum temp. (suitably about 30°), inoculated with a culture of *Willia anomala*, cultures of regular distillery yeast are added to the medium and it is aerated and permitted to ferment.

**Glycerol by fermentation.** FRANK A. McDERMOTT (to E. I. Du Pont de Nemours & Co.). U. S. 1,725,363, Aug. 20. During the fermentation of materials such as molasses solns., by the action of yeast, for glycerol production, relatively small vols. of concd. soln. of mash materials are added in successive portions.

**Apparatus for distilling alcoholic liquors.** MICHAEL KONTER. U. S. 1,725,528, Aug. 20. Structural features.

**Mash tub and rotary stirrer.** A. ROLZ. Brit. 304,182, Jan. 16, 1928.

**Stabilizing cereal beverages.** HERMAN HEUSER (to U. S. Process Corp.). U. S. 1,724,021, Aug. 13. Fermented cereal beverages of legal alc. content are treated with catechu tannic acid in at least sufficient quantity to ppt. the readily precipitable protein compds.

**Drying hops.** L. WEBER. Brit. 305,076, Oct. 27, 1927. Hops are drawn by suction into a space between perforate grids in a still and are dried, prior to extraction with air or alcoholized air, at a temp. of about 32° or somewhat lower and preferably under less than atm. pressure. An app. is described.

**Oils and resins from hops.** L. WEBER. Brit. 305,066, Oct. 27, 1927. Hops are dried (preferably at a temp. of not higher than 32° and at a pressure below atm. pressure); the dried hops are treated with water vapor at less than atm. pressure and the vapor and assocd. oil are condensed; the material is dried by warm or alcoholized air, treated with 96% alc. to ext. resins, alc. is recovered by circulating warm air through the hops and the latter are then treated with warm water to ext. residual oil, resin and alc. An app. is described, including a still with jacketed ends for cooling or heating purposes.

**Yeast.** LEWELLYN J. HOWELLS. U. S. 1,725,583, Aug. 20. A quantity of yeast-fermentable wort is divided into 2 sep. parts and each part is separately washed to produce 2 sep. worts "A" and "B," "A" having a high ratio of yeast-fermentable carbohydrate to yeast-assimilable N, and "B" having a low ratio of yeast-fermentable carbohydrate to yeast-assimilable N; yeast propagation is conducted in "B" and such quantities of "A" are added as are just sufficient to supply the yeast-fermentable carbohydrate required to maintain unrestricted growth; intense aeration is maintained during the propagation, which is conducted at a temp. of about 30°.

**Pasteurizing beer or other liquids without loss of dissolved gases.** FREDERIK LASSEN (to Aktieselskabet de Forenede Bryggerier). U. S. 1,724,291, Aug. 13. Pasteurization in a confined space is followed by cooling under pressure to effect re-dissolving of liberated gases. An app. is described.

**Yeast.** EJNAR A. MEYER (to The Fleischmann Co.). U. S. 1,724,952, Aug. 20. In an aeration process of yeast production extending over some time, yeast propagation is initiated with aeration in a soln. comprizing molasses, propagation is continued for a period in excess of 10 hrs., a portion of the yeast-contg. liquid is withdrawn, and to the remainder there is added at least an equiv. quantity of an ext. of cereal material, and the propagation with aeration is continued. Cf. C. A. 22, 3485.

**Ergosterol from yeast.** ROBERT GRIESSBACH and OTTO AMBROS (to Winthrop Chemical Co.). U. S. 1,724,706, Aug. 13. Yeast is first subjected to autolysis and ergosterol is then extd. to obtain a larger yield than is obtained without the preliminary autolysis.

**Antiseptic, from beer yeast, suitable for use in autolyzing operations.** MAURICE KAHN, ELIANE LEBRETON and GEORGES SCHAEFFER (to Soc. française des produits alimentaires azotes). U. S. 1,724,027, Aug. 13. The yeast is autolyzed for 3-20 days at a temp. of 36-44°, without addn. of an antiseptic, the mass is agitated, autolyzate is sepd. from non-liquid substances, and an antiseptic substance is obtained from the autolyzate.

## 17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

**Glycerophosphates and inositolphosphates.** G. LOCATELLI. *Boll. chim. farm.* **66**, 737-8(1927).—Ca Mg inositolphosphate,  $C_6H_8O_{24}P_4Ca_3Mg_3$ , is contained in the husk of cereals to the extent of about 8%, and is easily extd. by dil. acid; for pharmaceutical purposes it can advantageously replace Ca glycerophosphate. B. C. A.

**Evaluation of folia belladonnae.** E. I. VAN ITALLIE. *Pharm. Weekblad* **66**, 657-60 (1929).—Slight modifications in technic are described which make it possible to det. the alkaloid in a 10-g. sample of dried leaves instead of the 15-g. sample specified in the Dutch Pharm. A. W. DOX

**History of pharmacy in old Roumania.** JULIUS ORIENT. *Pharm. Post* **62**, 351-6 (1929). W. O. E.

**Macrochemical and microchemical methods for evaluation of caffeine in drugs.** GYULA V. MIKÓ. *Pharm. Monatsh.* **10**, 133-7(1929).—A critical review of the methods at present in common use, in connection with an exptl. study of a shortened macrochem. method based on the U. S. Pharm. procedure, but using only 2-g. samples (of tea) and a far shorter period for extn. (5 min. digestion in aq. media and 5 min. treatment with  $CHCl_3$ ). The caffeine values obtained were quite satisfactory. A microchem. procedure involving 0.5 g. samples and extn. as in the macrochem. method was developed, the crude caffeine being thereupon treated with  $H_2SO_4$ , and the resulting acid soln. examd. refractometrically. The results obtained in a series of samples are presented in tabulated form. Recourse should be had to the original for the rather involved details of the procedures studied. W. O. E.

**Chemistry and pharmacology of digitalis.** II. RUNNE. *Pharm. Zentralhalle* **70**, 453-60, 469-75(1929).—An address giving a review of our present knowledge of the essential ingredients of *Digitalis purpurea* L. W. O. E.

**Evaluation of cresol-rosin soap solutions.** GREGOR KOGAN. *Pharm. Zentralhalle* **70**, 488-90(1929).—An account of the examn. of certain "kreolins" of Russian and foreign manuf. from the standpoint of the Russian Pharm. W. O. E.

**Use of gold, silver, copper, iron, tin and sulfur in ancient therapy.** F. KAISER. *Pharm. Zentralhalle* **70**, 490-1(1929).—Certain observations are made on the early use of these elements in disease. W. O. E.

**Yeast products used in the manufacture of drugs.** F. GRAF. *Pharm. Ztg.* **74**, 946-9(1929).—A discussion of the use of yeast and its exts. (Zyma brand) in large-scale production of pills, the formulas of which (some 30) are given. W. O. E.

**Pine-needle extracts and pine-needle bath extracts.** C. A. ROJAHN. *Pharm. Ztg.* **74**, 978-80(1929).—A compilation of results obtained in the examn. of some 22 samples. W. O. E.

**Practical pharmacy. Barium sulfate containing barium carbonate and other "non-toxic" mixtures.** HERMANN KUNZ-KRAUSE. *Apoth. Ztg.* **44**, 924-6, 937-9(1929).—A discussion of the problems presented in the examn. and control of substances like  $BaSO_4$  (+  $BaCO_3$ ), K tartrate (+ K Sb tartrate),  $MgSO_4$  (+  $ZnSO_4$ ),  $PhNHAc$  (+  $H_3BO_3$ ), etc., notably when made to develop fluorescence. W. O. E.

**The alkaloid content of some plants.** M. STULNIKOV. *Ber. Saratower Naturforscherges.* (Russia) **2**, 8-14; *Chem. Zentr.* **1928**, I, 1294.—*Atropa belladonna* contained 0.38-0.75% in the leaves, 0.29-0.35% in the roots and 0.86% in the seeds. The normal mature leaves contained more than the tender, immature ones. The leaves of *Datura stramonium* contained 0.32%, and the seeds 0.38% atropine. The leaves and seeds of *Hyoscyamus niger* had 0.17 and 0.34% atropine, resp. *H. alba* had 0.35% of atropine in the leaves. All the plants examd. were obtained near Saratov. C. R. F.

**Extractum filicis maris.** Z. CSIPKE. *Magyar Gyógy Társaság Értesítője* **5**, 143-60 (1929).—Active components of this drug are the so-called "crude filicine," filicic acid and filmaron. The rhizome of filix mas contains about 6% fatty oil, acting as solvent to the above active components. In making an ext., this oil should always be extd. The odor of the ext. is due to the presence of about 0.04-0.06% ethereal oils. Rhizoma filicis maris should always be examd. as its content of crude filicin varies considerably, i. e., from 0.81 to 4.50%. S. S. DE FINÁLY

**Growing and production of Rheum in Szeged.** S. TUKATS. *Magyar Gyógy. Társaság Értesítője* **5**, 161-71(1929).—*Rheum palmatum* L. was grown at Szeged in different soils. Detns. were made of exts., ash, free and bound anthraquinone, emodin and chrysophanic acid. *Rheum* rhizomes of Szeged contain 26.4% less anthraquinone than Chinese rhizomes. The anthraquinone content of the roots is about 4.4%.

Anthraquinones of the roots consist for the most part of emodin. The roots proved to be more valuable than the rhizomes. The production of *Rheum* in Hungary is recommended.

S. S. DE FINÁLY

Evaluation of rhizoma and radix rhei. S. TUKATS. *Magyar Gyógy. Társaság. Értesítője* 5, 172-80(1929).—Anthranols are oxidized to anthraquinone by  $H_2O_2$ . The glucosides are hydrolyzed with alc. HCl, and the aglucones extd. with  $CHCl_3$ . This treating should be repeated. The  $CHCl_3$  ext. is evapd. and the dry matter boiled with benzene-gasoline mixt. (2:1). The benzene-gasoline ext. is shaken out with 5% KOH. To this alk. soln. a gasoline- $CHCl_3$  mixt. is added, the mixt. is acidified with HCl and shaken out in a separatory funnel. The gasoline- $CHCl_3$  mixt. is washed with acid water, evapd. and weighed as anthraquinone.

S. S. DE FINÁLY

Some notes on digitalis G. FRITZ. *Magyar Gyógy. Társaság. Értesítője* 5, 205-17 (1929).—There are given a summary of the history of digitalis in medical science and a critical review of methods of evaluation, especially that of the German D. A. B. 6.

S. S. DE FINÁLY

Value of formaldehyde and its preparations as antiseptics. V. ANDRISKA. *Magyar Gyógy. Társaság. Értesítője* 5, 242-56(1929).—Various antiseptics were compared with 0.1%  $HgCl_2$  soln. "New-lysoform" was the best of those examd. Its chem. compn. is not known. It contains  $CH_2O$ , active Cl and Cr compds. Liquor formaldehydi saponatus is next in value.

S. S. DE FINÁLY

Assay of digitalis. A. STASIAK AND B. ZBORAV. *Magyar Gyógy. Társaság. Értesítője* 5, 257-72(1929).—Since the sensitivity to digitalis of sinus parts of frog heart may change, the sinus method should be used only in comparison with a standard prepn. The g-strophanthin proposed by Mansfeld and Horn as a standard is abandoned; a standard powder of digitalis leaves is found more useful with the sinus method. The relative values shown by the sinus method are very near to the values yielded by other biol. methods.

S. S. DE FINÁLY

The copper content of drug extracts resulting from insecticide sprays. M. JANICSEK. *Magyar Gyógy. Társaság. Értesítője* 5, 317-22(1929).—A spray of 2% Bordeaux soln. and 1% Burgundy mixt. was used. Samples of plants were taken after 2, 16 and 30 days. Cu was detd. electrolytically in the 10%  $H_2SO_4$  ext. of the plant ash. By another method the dry plant powder was boiled with dil.  $HNO_3$ , evapd., concd.  $H_2SO_4$  added and the mixt. diluted. Cu was calcd to  $CuSO_4 \cdot 5H_2O$ . The Cu content of *Melissa officinalis* amounted to about 2%, that of *Mentha crispa* about 0.5%. Plants contain much Cu even after a month with ample rains. These Cu compds. are not dissolved by water and could be removed by filtering. As plant exts. are usually not filtered, toxic Cu compds. can thus get into the soln.

S. S. DE FINÁLY

The detoxification of chloroform. H. FÜHNER. *Deut. med. Wochschr.* 55, 1331 2 (1929).

ARTHUR GROLLMAN

Report of the essential oil sub-committee to the standing committee on uniformity of analytical methods. JOHN ALLAN, et al. *Analyst* 54, 335-8(1929).—Notes with respect to f.-p. and m.-p. detns., a description with cut of a standard, distg. app. and sp. directions for *oléo de rose* are given.

W. T. H.

Method for differentiating and determining the value of rhubarb, based on fluorescence. MAREU. *Ann. chim. anal. chim. appl.* 11, 165-8(1929).—A method of examg. rhubarb samples with ultra-violet light filtered through a Wood's screen is described. All the true types of Chinese rhubarb (*Rheum officinale*, *R. emodi*, *R. tanguticum*) give a velvety, brown fluorescence. *Rheum rhaponticum*, *R. undulatum*, *R. compactum* and *R. ribes* give violet fluorescence. These latter constitute the so-called *rhubarbs of Austria, England and France* but it may be said that when a rhubarb powder or tincture shows a violet fluorescence it should be rejected as not being the official drug. Such a variety has recently been sold cheaply in France as *Asiatic rhubarb*. W. T. H.

Detection and identification of primary phenylethyl alcohol in essential oils and in mixtures of perfumes. SEBASTIEN SABETAY. *Ann. chim. anal. chim. appl.* 11, 193-5 (1929).—Take the fraction (210-230°) contg. the alc. and add 1-1.5 mol. of anhyd. KOH per mol. of alc. and distil slowly and carefully. This converts the alc. into styrolene, recognizable by its odor. Shake the distillate with ether, and add  $Br_2$  in ether to form dibromostyrolene which m. 72°.

W. T. H.

Rapid method for actual quinine determination. GUSTAVE A. STICHT. *Chemist Analyst* 18, 6-7(1929).—Quinine can be sepd. from many other alkaloids by pptn. as the acid quinine citrate. Detailed directions are given for detg. quinine in cinchona bark.

W. T. H.

Detection of isopropyl alcohol in the presence of acetone. WALTER MEYER. *Chem.-Ztg.* 53, 410-1(1929).—Cf. C. A. 23, 2246.—There is some danger of isopropyl

alc. being used in cosmetics and pharmaceutical preps. Its detn. is usually accomplished by the Peyer method of oxidizing the distillate of the liquid in question with dichromate and  $\text{H}_2\text{SO}_4$  under a reflux condenser and detg. the resulting acetone by the Lagal, Déniges or Ellram method. It has generally been conceded that the method is useless if acetone is already present and most com. isopropyl alc. contains some acetone. Since, however acetone b.  $56-8^\circ$ , MeOH at  $65-67^\circ$  and isopropyl alc. at  $82^\circ$ , the problem of sepg. is not difficult. Take 50 g. of sample and distil carefully. Collect the first 5 cc. and test by the well-known methods for MeOH and acetone. Then, in a well-cooled Erlenmeyer flask, collect the next 20 cc. of distillate. Use the residue in the distg. flask for the pyridine test after acidifying and distg. some more. Take the 20 cc. and mix well, using half for each of the following tests: to one portion, add  $\text{H}_2\text{SO}_4$  and  $\text{K}_2\text{Cr}_2\text{O}_7$  and subject the oxidation product to the usual detn. If the oxidized part shows a stronger color in the acetone test than the unoxidized portion, then acetone and isopropyl alc. are both present. The difference in color or of the degree of turbidity with  $\text{HgSO}_4$  will, with practice, give a good idea of the relative amts. When acetone or isopropyl alc. is present, obviously the tables used for detg. EtOH will give erroneous results. W. T. H.

**Industrial uses of essential oils, their isolates and allied synthetics.** ANON. *Perfumery and Essential Oil Record* 20, 292-300(1929). E. H.

**Researches on the acids of tobacco.** A. SHMUK. State Inst. for Tobacco Investigations (Russia), *Bull.* 50, 1-10(1929).—The org. acids from tobacco were extd. with 3% HCl, made alk. with  $\text{NH}_4\text{OH}$  and acidified with AcOH, Ca acetate was added and the soln. heated on the water bath for 2-3 hrs. The Ca ppt. obtained was filtered, washed and dissolved in 10%  $\text{H}_2\text{SO}_4$ . The soln. was extd. with ether, the latter distd. off and a cryst. ppt. of  $\text{H}_2\text{C}_2\text{O}_4$  obtained. To the residue 1.5 l. of EtOH, made up to 2% chloric acid was added, and heated on a water bath for 20 hrs. The EtOH was driven off and the residue extd. with ether. This was fractionated by vacuum distn. The presence of malic, succinic, fumaric, acetic and formic acids was demonstrated. Other acids were obtained but their identity could not be established. J. S. JOFFE

**The acids of tobacco as a means of determining the quality of tobacco and its products.** M. PYATNITZKII. State Inst. for Tobacco Investigations (Russia), *Bull.* 51, 1-11(1929).—Tobacco (0.25 g.) moistened with 0.25 cc. 40%  $\text{H}_2\text{SO}_4$  was ground with pumice (about 0.75 g.) in a porcelain mortar. The contents were transferred into a 250-cc. glass-stoppered flask, 100 cc. of moisture-free ether was added, shaken and allowed to stand overnight. 25 cc. or 50 cc. of the ext. was pipetted off, transferred into a flask connected with a Liebig cooler and the ether distd. off at  $60^\circ$ .  $\text{H}_2\text{O}$  (15-20 cc.) was added to the residue and titrated with 0.025 N NaOH with phenolphthalein as an indicator. A subtraction of the alkali used in a blank gave the alkali used by the acids extd. The poorer grades of tobacco contain more org. acids. J. S. JOFFE

**Relation of bulk density, size, and color of mustard seeds to their oil content.** V. MILASHEVSKII. *Maslobaino-Zhirovoe Delo* 1928, No. 9, 10-2.—Exptl. work was done with *Brassica juncea* var *lutea* Bl. Bulk density of mustard seeds is not a measure of their oil content. Large seeds yield oil and cake of higher quality than small seeds. Presence of unripe seeds affects the quality of oil and cake. V. KALICHEVSKY

**The colorimetric determination of the strophanthins.** ALBERT LEULIER AND HENRI GRIFFON. *Bull. sci. pharmacol.* 36, 408-14(1929).—Strophanthins from *Strophanthus kombé* and *S. hispidus* give the reaction of Liebermann: mix a trace of the substance with 2 cc.  $\text{Ac}_2\text{O}$ , 2 cc.  $\text{CHCl}_3$  and 2 drops  $\text{H}_2\text{SO}_4$ . A green color is developed after  $\frac{1}{2}$  hr. Hydrolyze the glucoside previously by heating to  $80^\circ$  with 1%  $\text{H}_2\text{SO}_4$ . Ouabain gives a yellow color turning into orange; it should not be hydrolyzed. For amts. of 1-2 mg. this method can be used for colorimetric detn. Differences of 10-20% may occur. For tinctures, evap. 20 cc., dissolve in 18 cc.  $\text{H}_2\text{O}$  and 2 cc. Courtonne's liquid. Filter and add 1.5 g.  $\text{Na}_2\text{SO}_4$ . Filter again. Take 10 cc. and add 10 cc. dil.  $\text{H}_2\text{SO}_4$  (1:10), heat to  $80^\circ$  for 45 min. Shake out first with 5 cc.  $\text{CHCl}_3$  and twice with 2.5 cc. Use 2 cc. of the  $\text{CHCl}_3$  soln. and compare after 30 min. Strophanthin gives Pettenkofer's furfurole reaction. A. E. MEYER

**Detection of  $\alpha$ -bromoisovalerylurea.** R. SAKAI. *J. Pharm. Soc. Japan* 48, 1114-8(1928).—Soly. of  $\alpha$ -bromoisovalerylurea (I) was studied by Meyer's and Reinboldt's methods (*Ber.* 8, 999 and Houben, *Die Methoden der organischen Chemie.* 1, 787, resp.). I is most sol. in  $\text{Me}_2\text{CO}$  and alc., but insol. in petr. ether. It is nonvolatile. I gives characteristic reactions with Mandelin, Nessler and  $\text{KMnO}_4$  solns., but does not react with  $\text{AgNO}_3$  soln. In order to est. I in animals, rabbits and dogs were fed with the food contg. I and they were killed the next day. The estn. shows that most of I was distributed in stomach, intestine, blood and urine. I is stable in dead body

and it can be detected after 2 months in summer and 3 in winter. Liebig's method of estn. (*Ber.* 38, 1163) was employed throughout the expts. F. I. NAKAMURA

**Report on the analysis of drugs.** ARTHUR E. PAUL. *J. Assoc. Official Agr. Chem.* 12, 255-61(1929); cf. *C. A.* 22, 3955.—A brief discussion of the reports of the associate referees on various drugs (see following abstrs.). A. PAPINEAU-COUTURE

**Report on (the determination of) alcohol in drugs.** E. M. BAILEY. *J. Assoc. Official Agr. Chem.* 12, 261-4(1929); cf. Howard, *C. A.* 22, 3955.—Collaborative colorimetric detns. of small quantities of MeOH (1.0-2.5%) in the presence of EtOH gave very satisfactory results. A. PAPINEAU-COUTURE

**Report on (the determination of) chloroform and carbon tetrachloride.** W. F. KUNKE. *J. Assoc. Official Agr. Chem.* 12, 264-76(1929); cf. *C. A.* 22, 3956.—Any quant. method for the sepn. of  $\text{CHCl}_3$  in mixts. by distn. is considered to give inaccurate results, and a new method without distn. was developed. If the sample is a prepn. like  $\text{CHCl}_3$  Liniment, U. S. P. X, almost the same procedure is used as for  $\text{CHCl}_3$ ; if the  $\text{CHCl}_3$  mixt. is sirupy, like compd. sirup of white pine, N. F., the reaction mixt., after sapon. of the  $\text{CHCl}_3$ , is evapd. and the residue charred before detg. the chloride. Weighing of  $\text{CHCl}_3$  or  $\text{CCl}_4$ , or their mixts., directly under the reagent in a 60-70 cc. pressure bottle is a simple, satisfactory and accurate procedure. Pressure and heat are required for complete sapon. of  $\text{CHCl}_3$  and  $\text{CCl}_4$ . Non-aq. alc. KOH is a more active sapon. reagent than alc. KOH contg. 30%  $\text{H}_2\text{O}$  by vol.  $\text{CHCl}_3$  and  $\text{CCl}_4$  cannot be completely sapond. by alc. KOH (either aq. or non-aq.) at room temp. within a reasonable length of time. Shaking  $\text{CHCl}_3$  or  $\text{CCl}_4$  with the reagent is not necessary; in case foreign material is present, as would be the case when  $\text{CHCl}_3$  or  $\text{CCl}_4$  is detd. in a mixt., gentle swirling of the mixt. with the reagent is advisable. Addnl. alc. to insure complete soln. of either  $\text{CHCl}_3$  or  $\text{CCl}_4$  is not necessary. Cooling of the sapon. reagent- $\text{CHCl}_3$  mixt. materially reduces the rate of sapon.  $\text{CHCl}_3$  is more readily sapond. than  $\text{CCl}_4$  by alc. KOH. KOH is considerably more sol. than NaOH in MeOH.  $\text{CHCl}_3$  contg. 0.5% alc. by wt. does not deteriorate when kept in an amber glass bottle, closed with a cork stopper and stored in a cupboard at room temp. for 2 yr. A. P.-C.

**Report on (the analysis of) laxatives and bitter tonics.** E. O. EATON. *J. Assoc. Official Agr. Chem.* 12, 276-8(1929).—In the method proposed (which is described in detail) for *cascara prepns.* an attempt is made to liberate the acidic principles combined as salts, to ext. by  $\text{CHCl}_3$ , with a min. of heat, from a soln. of low H-ion concn. both the free and salt-occurring hydroxyanthraquinones, and to sep. the possibly non-therapeutic substances from those thought to be therapeutically active. In the second portion of the method the use of a mineral acid in essential concn., aided by heat, hydrolyzes the glucoside present; it also reacts with any resinous-like substances present to liberate  $\text{CHCl}_3$ -sol. substances. Treatment with Caro's reagent shows the resinous substances to be of hydroxyanthraquinone origin. The procedure employed removes the acidic hydroxyanthraquinones, as liberated, from further contact with the more concd. mineral acid, which under certain conditions appears to induce the destruction of the anthraquinones. The method is considered encouraging, the variation of results among collaborators being believed to be largely a matter of interpretation, as they check closely. A. PAPINEAU-COUTURE

**Report on (the analysis of) mercurials.** R. S. ROE. *J. Assoc. Official Agr. Chem.* 12, 280-2(1929); cf. *C. A.* 22, 3957.—The modified U. S. P. I method previously tentatively adopted for the detn. of  $\text{Hg}_2\text{Cl}_2$  in tablets gave very good collaborative results for  $\text{Hg}_2\text{I}_2$  tablets. The use of an asbestos mat on a Caldwell crucible, with a precaution to use a few drops of alumina cream when necessary, is an improvement over the use of filter paper. A. PAPINEAU-COUTURE

**Report on microchemical methods for alkaloids.** C. K. GLYCART. *J. Assoc. Official Agr. Chem.* 12, 282-4(1929); cf. *C. A.* 22, 3957.—Collaborative work showed the reliability of microchem. tests for the identification of quinine, quinidine, cinchonine and cinchonidine. A. PAPINEAU-COUTURE

**Report on (the determination of) santonin.** H. M. BURLAGE. *J. Assoc. Official Agr. Chem.* 12, 284-8(1929).—Collaborative results by the German Pharm., Hagar, Kropat and modified Eder-Schneider methods were disappointing, which is attributed to the impracticability and inaccuracy of the existing methods. A. P.-C.

**Report on (the analysis of) ephedra.** A. E. PAUL and C. K. GLYCART. *J. Assoc. Official Agr. Chem.* 12, 290-4(1929).—The method tried out was as follows: to 10 g. of ephedra in fine powder in an Erlenmeyer flask add exactly 100 cc. of a 3:1  $\text{Et}_2\text{O}$ - $\text{CHCl}_3$  mixt., shake, let stand at least 5 min., add 5 cc. of 10%  $\text{NH}_4\text{OH}$  and 0.5 g. anhyd.  $\text{Na}_2\text{CO}_3$ , shake intermittently for 2 hrs., let macerate 4 hrs., decant or filter rapidly a



50-cc. aliquot, ext. with 15, 10 and 10 cc. dild.  $\text{H}_2\text{SO}_4$ , neutralize with concd.  $\text{NH}_4\text{OH}$ , add about 5 g. anhyd.  $\text{Na}_2\text{CO}_3$ , ext. with 35, 30, 25, 20 and 15 cc.  $\text{Et}_2\text{O}$  and titrate by 1 of the 2 following procedures: (1) evap. the  $\text{Et}_2\text{O}$  on a steam bath with the aid of a fan to about 5 cc., finish evapn. at room temp., dissolve the alkaloids in 2 cc. neutral alc. dild. with about 40 cc.  $\text{CO}_2$ -free water, titrate with 0.02  $N$   $\text{H}_2\text{SO}_4$  in presence of bromothymol blue, comparing with a standard adjusted to a  $p_{\text{H}}$  value of 6.0; (2) evap. the  $\text{Et}_2\text{O}$  to 5 cc. as above, add the indicator and a measured excess of 0.02  $N$   $\text{H}_2\text{SO}_4$ , warm to dissolve the alkaloid and evap. the  $\text{Et}_2\text{O}$ , titrate the excess acid with 0.02  $N$  alkali. 1 cc. 0.02  $N$  acid = 0.0033 g. ephedrine alkaloids. A collaborative test showed that the method is readily workable and that the results are within acceptable limits of accuracy considering the marked chem. properties of the alkaloid ephedrine.

A. PAPINEAU-COUTURE

**Report on (the determination of) pilocarpine in tablets.** T. F. PAPPE. *J. Assoc. Official Agr. Chem.* 12, 294-6(1929).—In the absence of other alkaloids, pilocarpine can be satisfactorily detd. in simple tablet masses by dissolving in  $\text{H}_2\text{O}$ , adding slight excess  $\text{NH}_4\text{OH}$ , extd. with  $\text{CHCl}_3$ , evapg. the solvent to 5 cc., adding a measured excess of 0.02  $N$   $\text{H}_2\text{SO}_4$ , evapg. the remainder of the  $\text{CHCl}_3$  and titrating the excess of acid. 1 cc. 0.02  $N$  acid = 0.004893 g. of  $\text{C}_{11}\text{H}_{16}\text{O}_2\text{N}_2 \cdot \text{HCl}$ . Methyl red is preferable to bromophenol blue as indicator.

A. PAPINEAU-COUTURE

**Report on (the determination of) thymol.** LESLIE HART. *J. Assoc. Official Agr. Chem.* 12, 296-300(1929).—In Messinger and Vortmann's I method for the detn. of thymol (*Ber.* 23, 2753 (1890)) comparatively slight variations in the quantity of alkali and of I used in excess of that required by theory (4 I per mol. of thymol) gave wide differences in the results; in the Koppeschaar Br method (*Z. anal. Chem.* 15, 233(1876)) the quantity of Br soln. present in excess of that required for the formation of dibromothymol and the time allowed before titrating the excess Br materially affects the results. Two volumetric methods were subjected to collaborative study, both based on the reaction that occurs when nascent Br, furnished by a standard bromide-bromate soln., reacts with thymol in the presence of hot, strong  $\text{HCl}$  according to the reaction  $\text{C}_6\text{H}_5\text{CH}_2\text{CH}(\text{CH}_3)_2\text{OH} + 4\text{Br} = \text{C}_6\text{HBr}_2\text{CH}_2\text{CH}(\text{CH}_3)_2\text{OH} + 2\text{HBr}$ ; in method A the end point is observed by destruction of the red color of methyl orange indicator by slight excess of Br; method B was carried out by back titration, the starch-I end point being used. If method B is used independently of method A, the preliminary titration in hot soln. with 0.1  $N$  Br and methyl orange as an indicator should be made, so as to regulate the quantity of excess Br for the back titration, and the  $\text{Na}_2\text{S}_2\text{O}_4$  titration should be carried out immediately after the addn. of the Br soln. Both methods gave concordant results, well within 1% of theoretical; but A is considered to be inherently the better as it eliminates the effect of excess Br and the consequent time factor.

A. PAPINEAU-COUTURE

**Report on (the determination of) menthol.** F. L. ELLIOTT. *J. Assoc. Official Agr. Chem.* 12, 300 2(1929).—The U. S. P. method for menthol, slightly modified, gave fairly satisfactory collaborative results; but difficulty was apparently experienced in removing the whole of the  $\text{Ac}_2\text{O}$  from the acetylated oil.

A. PAPINEAU-COUTURE

**Report on (the determination of) ascaridole in) chenopodium oil.** E. K. NELSON. *J. Assoc. Official Agr. Chem.* 12, 303-4(1929).—Paget's contention (*C. A.* 20, 2722) that the present U. S. P. method, while useful in the assay of authentic oils of chenopodium, may give misleading results with adulterated oils, was confirmed.

A. P.-C.

**Report on (the analysis of) sabadilla.** F. C. SYKOVICH. *J. Assoc. Official Agr. Chem.* 12, 305-8(1929).—A method (described in detail), which is essentially the U. S. P. X type process A for alkaloidal assays, was studied collaboratively and yielded consistent results.

A. PAPINEAU-COUTURE

**The identification of atropine with Wagner's reagent.** CHARLES C. FULTON. *J. Assoc. Official Agr. Chem.* 12, 312-7(1929).—Atropine gives at least 4 different types of useful crystals with Wagner's reagent, depending on the relative proportions of atropine, I and KI in the test drop: (1) small, red-brown rods, (2) small, yellow plates, (3) bicolored ppt., yellow and dark-red crystals, (4) orange-red, hexagonal, elongated plates, the most characteristic and usually the most numerous form, also dark-red, diamond-shaped or triangular grains and a smaller no. of yellow cubes. The crystals generally increase in size in the order given, but all are small and usually require high power for their microscopic examn. An increase in the proportion of atropine changes the crystals from one type to another in the order given, as does an increase in the proportion of KI. A reagent may be prepd. to obtain a particular crystal type in atropine solns. of suitable concn. between 1:500 and 1:5000; when 1 g. I and 100 cc.  $\text{H}_2\text{O}$  are used, these reagents required KI as follows: (1) 2.75, (2) 8, (3) 35, (4) 50 g. Reagent

(1) is best used with solns. of 1:5000 to 1:50,000 concn.; (2) with 1:800 to 1:5000; (3) with 1:650 to 1:2000 and (4) with 1:200 to 1:800. Care should be taken not to make the test on a soln. too concd. for good results with the reagent used. Reagents that have the highest I:KI ratio are the most sensitive. With reagent (1) characteristic crystals can be obtained from a 1:200,000 atropine soln. Even reagent (4) is sufficiently sensitive to atropine to be used on a fragment of a 0.01-grain tablet dissolved in a drop of water. Atropine can be identified beyond any doubt by means of the different types of crystals described.

A. PAPINEAU-COUTURE

**The assay of jalap.** L. E. WARREN. *J. Assoc. Official Agr. Chem.* 12, 324-32 (1929).—Six methods for the assay of jalap were studied. The U. S. P. X and the Jenkins methods (C. A. 8, 3218) gave high results and were discarded. The methods of the Dutch, French and German Pharmacopeias are "aliquot-part" procedures, and therefore they were rejected. The Dale method (C. A. 22, 2032) requires total extn. and therefore it is accurate, but is tedious in execution. A modification of the U. S. P. X extn. process combined with the method of the French Pharm. for the washing and purification of the extd. resin was devised and is described in detail. It is more expeditious than the published procedures and gives equally good results.

A. P.-C.

**Absolute (flower) extracts obtained by means of volatile solvents.** D'AURIBEAU. *Parfumerie moderne* 22, 397-413 (1929).—In French, English and Spanish.—A brief discussion of the merits of abs. concrete exts. over steam-distd. oils and synthetic products.

A. PAPINEAU-COUTURE

**Toilet soap perfumes.** ARTHUR I. EWINSON. *Parfumerie moderne* 22, 431-7, 479-87 (1929).—A brief review of the chemism of the reactions which do or can take place between a neutral soap and the various radicals present in natural essential oils and synthetic perfumes.

A. PAPINEAU-COUTURE

**Analysis of liquor cresoli saponatus.** HANS KAISER. *Süddeut. Apoth.-Ztg.* 68, 626-7 (1928); *Chem. Zentr.* 1928, II, 2047.—The proposed simple method is based on the direct distn. of liquor cresoli saponatus from a fractionating flask at up to 205-6° into a tube graduated into cc./10, which is the direct receiver. The aq. portion mixed with a small part of the cresol distils between 100° and 125°. Then the temp. suddenly rises to 195-200°, at which temp., with a good prepn., only small amts. distil, thus indicating that PhOH (b. p. 178-82°) and *o*-MeC<sub>6</sub>H<sub>4</sub>OH (b. 188°) are only present in traces. The other cresols present distil almost quant. at 205-6°. The mixt. should not be heated above 210°. The no. of cc. of the total distillate is read in the graduated tube. The cresol layer seps. after the salting out. By deducting its quantity in cc. from the total distillate the water content can be calcd. The water content should not amount to more than 10-13 cc. and the cresol layer should amount to at least 44-45 cc. (per 100 cc. of liquor cresoli saponatus). For the detn. of the hydrocarbons 5 cc. of the oily distillate is shaken with 50 cc. of 8% NaOH and 5 cc. petr. ether. The increase in vol. of the petr. ether due to the hydrocarbons should not amount to more than 0.25 cc. The cresols are distd. off and the hot portion contg. the soap is transferred from the tared fractionating flask into a tared dish and weighed. The total fatty acids may be detd. in the known amt. of the soap residue, *e. g.*, this may be done with the aid of the "Standard methods of the fat industries."

G. SCHWOCH

**The cultivation and production of medicinal plants in Japan.** TARUO KARIYONE. *Proc. 3rd Pan-Pacific Sci. Congr.* 1926, II, 2169-70 (Publ. 1928).—E. M. SYMMES

**Madagascar cloves.** V. H. KIRKMAN. *Chemist and Druggist* 109, 527 (1928).—Notes on the cultivation of cloves and the distn. of oil from cloves, leaves and stems in 1928; cf. *Bull. Imperial Inst.* 26, 323 (1928). Zanzibar Clove Industry in 1927. ANON. *Ibid* 110, 103-4 (1929).

S. WALDBOTT

**Essential oils from Kenya Colony.** GEORGE FERGUSON AND ERNEST J. PARRY. *Chemist and Druggist* 108, 604 (1928).—"Mawah oil" distd. from "geranium" (12 tons in 1928) had an odor intermediate between that of geranium and that of palmarosa oils;  $d_{15.5}$  0.894, optical rotation  $-16.7^\circ$ ,  $n_D^{20}$  1.4690, total alcs. (as geraniol) 71%, citronellol 20%, esters (as geranyl tiglate) 12.5%. *Vetiveri* oil of high-grade odor had  $d_{15.5}$  0.9923,  $n_D^{20}$  1.5237, acid no. 10.2, ester no. 4.6, alcs. (as vetiverol) 50%. The plants grow at 7000 feet altitude, and the climatic conditions are similar to those in Java. *True geranium oil*, of typical high grade, was distd. from plants imported from Grasse in 1925, yield about 0.1%  $d_{15.5}$  0.892,  $n_D^{20}$  1.4649, optical rotation  $-9^\circ 40'$ , esters (as geranyl tiglate) 30.7%.

S. WALDBOTT

**The preparation of ampoules.** H. A. HURLSTONE. *Chemist and Druggist* 108, 813-4 (1928).—A general review of the manuf. and filling of ampoules. Three types of filling app. are illustrated and described. W. A. N. MARKWELL. *Ibid* 109, 65 (1928).

—Addnl. precautions are given as to cleaning the glass before filling, and sterilization of the finished ampoules. S. WALDBOTT

**Assay of belladonna and hyoscyamus leaves.** W. A. N. MARKWELL AND L. J. WALKER. *Chemist and Druggist* 109, 525-6(1928).—Discrepancies exist in official and other methods of assay, as the volatile bases are not always included in the results. Thus, e. g., the assay processes of the Brit. Pharm. for leaves and preps. of leaves of belladonna, on which the assay of henbane is based, do not give comparable results, because in the assay of the preps., heating of the extd. alkaloids on the water bath for 30 min. is directed, which is omitted in the assay of the leaves. On assaying *Hyoscyamus niger* leaves, no volatile bases were noted; with *H. muticus*, a slight loss upon heat occurred; with *Japanese henbane*, a dark brown sample having an odor of  $\text{NH}_3$ , over 50% of the alkaloids present escaped upon heating. No loss resulted from heating atropine and hyoscyamine on a water bath for 30 min., nor from washing the final  $\text{CHCl}_3$  solns. with  $\text{H}_2\text{O}$ . In titrating back the acid solns. of the alkaloids, the borax method of Rasmussen and Christensen (C. A. 21, 215) was used. S. W.

**Menthol from Mexico.** E. M. HOLMES. *Chemist and Druggist* 109, 649(1928); 110, 203(1929).—The plants *Calamintha macrostema*, Benth. or *tabaquillo* (A) and *Hedeoma piperita*, Benth. or *tabaquillo oloroso* (B) are possible sources of com. menthol. Dried specimens from the Kew Herbarium are photographed, and the plants are described in detail. The fresh plant of A yields 0.1-0.3% of essential oil, B 0.3-0.5% contg. 2-3% of menthol. S. WALDBOTT

**Citral in lemon oil.** G. FERGUSON AND E. J. PARRY. *Chemist and Druggist* 109, 762(1928).—With fresh unoxidized lemon oils, results of detn. of citral by the cold process (A) (Bennett and Salamon, C. A. 22, 1825) and the hot process (B) (Brit. Pharm.) are nearly identical; oxidized samples show differences of 0.3 to 0.5%. A seems to indicate pure citral only, while in B, the hot alkali may restore aldehydes or ketones in the oxidized oil, which then will react with  $\text{NH}_2\text{OH}$ , as if no alteration had taken place. S. WALDBOTT

**The varying characters of certain galenicals.** J. H. FRANKLIN. *Chemist and Druggist* 110, 11-2(1929); cf. C. A. 23, 4534.—A protest against the prepn. of "Brit. Pharm." tinctures from solid alc. exts. since the resulting products are not of Brit. Pharm. character. The variable colors of certain tinctures (belladonna, digitalis and henbane) are caused by the use of foreign or old faded English leaves. Variation in the color of compd. tincture of lavender may be caused by slight deficiency of EtOH content, affecting the  $\text{H}_2\text{O}$ -insol. color of the constituting red sanders wood. Contact with metals, Fe, Zn or Cu, also affects the color of this tincture, and of compd. tincture of cardamoms (cf. C. A. 17, 3749). Finally color variations in liquid exts. of ergot and of licorice are discussed. S. WALDBOTT

**Materia medica and pharmacy.** WILLIAM WHITLA. *Chemist and Druggist* 110, 19-21(1929).—A review of the progress of pharmacy in Great Britain since the 1st pharmacopoeia, 1618; with personal reminiscences, and portrait of W. S. W.

**The citral value of lemon oil.** ERNEST J. PARRY. *Chemist and Druggist* 110, 360(1929).—A protest against certifying to citral content on the basis of arbitrary methods of detn. Since the  $\text{NH}_2\text{OH}$  method of Brit. Pharm. is universally accepted, it should alone be recognized in com. testing; the  $\text{PhNHNH}_2$  method gives higher, but faulty results. S. WALDBOTT

**A further note on mercury ointment.** G. G. HAMMOND. *Chemist and Druggist* 110, 594(1929); cf. Franklin, C. A. 23, 480.—The previous conclusions are fully confirmed. The ointments recommended by F. for inclusion into the new Brit. Pharm. are not adversely affected by severe frosty weather. S. WALDBOTT

**The new remedies of 1928.** THOMAS STEPHENSON. *Pharm. J.* 122, 116-8(1929).—Progress in the prepn. of liver exts. in the treatment of pernicious anemia (cf. C. A. 22, 1186, 2012; 23, 195) is reviewed, also the use of salts of *o*-iodobenzoic acid in arthritis (C. A. 22, 1396); *arthrytin* is the  $\text{NH}_4$  salt. Other new remedies discussed are: *Salyrgan*, a mercurial diuretic (C. A. 22, 1394), also called *neptal* or "440-B" (France) and *mersalyl* (U. S.); *synthalin*, and *glukhorment* (C. A. 22, 2004, 2970), *ephetonine* (C. A. 22, 4656) and a new *synthetic ephedrine substitute* (phenylaminoethanol sulfate) (C. A. 23, 239) prepd. in U. S. in 1915. Miscellaneous remedies referred to are: *Ca gluconate* (Calcium-Sandoz) (C. A. 23, 2534), *cardiazole* (C. A. 22, 2789), *parosan* contg. As, an antispasmodic, *sandoptal*, a hypnotic (C. A. 22, 1397), and *staniform*,  $\text{SnMe}_2$ , used in ointment form (2%) or as a dusting powder (5%) in local inflammation. S. W.

**Alkaline citrates and acetylsalicylic acid in mixtures.** THOMAS WILSON. *Pharm. J.* 122, 196-7, 204; *Chemist and Druggist* 110, 266-7(1929); THOMAS STEPHENSON. *Pharm. J.* 122, 251(1929).—A prescription soln. contg.  $\text{HO}_2\text{CC}_6\text{H}_4\text{OAc}$  (A) 3, K citrate

(B) 6 drachms, H<sub>2</sub>O to make 6 ounces, remained clear for 12 hrs.; then a ppt. of large crystals was formed within 12 hrs. Later, re-soln. took place. Soly. expts. showed that a ratio of A:B:H<sub>2</sub>O, 2:4:6 cold-prepd., or 2.5:5:6 prepd. with gentle heat, will result in a permanent soln. In more concd. solns., complete hydrolysis will take place with time, e. g., 50% in 4 days (C. A. 16, 1486). In the unaltered soln., the therapeutic effect of A seems to be enhanced by the mixt. with B. (S.). The chem. nature of the cryst. ppt. formed on standing was not detd. Na citrate is only half as sol. as B, but the soln. of A in it also kept clear for 12 hrs.; the ppt. subsequently forming was more abundant than with B. S. H. Stroud (*Australasian J. pharm.* 5, 827, 833(1924)) states that a cryst. ppt. is formed in certain concns. of soln. of A in B, and the same substance is pptd. when an alc. soln. of A is mixed with sufficient alc. KOH to neutralize half of the acid. Its mol. formula is C<sub>18</sub>H<sub>16</sub>O<sub>8</sub>K, m. 170.5°. It is probably *acetyl-salicylyloxoniumacetylsalicylate*. S. WALDBOTT

**Acetylsalicylic acid; decomposition in aqueous solution of sodium salt.** D. B. DORT. *Pharm. J.* 122, 302, 311-3; *Chemist and Druggist* 110, 395-6(1929).—"Soln. of acetylsalicylic acid (A) may be effected by addn. of NaHCO<sub>3</sub>, but as the resulting soln. is merely a mixt. of Na acetate and Na salicylate, this method is not admissible" (*Prescriber*, quoted by Stephenson, cf. preceding abstr.). D., on treating A with a soln. of Na<sub>2</sub>CO<sub>3</sub>.10H<sub>2</sub>O or of NaHCO<sub>3</sub>, then neutralizing with HCl, extg. with Et<sub>2</sub>O-CHCl<sub>3</sub> and evapg., effected a *quant.* recovery of pure A, m. 137° (Wood, 137-138°; Brit. Pharm. 135-136°); with FeCl<sub>3</sub> no trace of salicylic acid (B) was noted. When the soln. was allowed to stand for 2 hrs., 3.5% of A was hydrolyzed, and a distinct trace of B was observed. **Supplementary note.** *Pharm. J.* 122, 355.—After 4 hrs. standing, 5.27% B was formed; after 24 hrs. 14.14% B was formed. If the soln. is used within a short time, the degree of decompn. is quite negligible. S. WALDBOTT

**Diffusion of arsenious oxide in combination with iron pill.** EDWARD ARTHUR. *Pharm. J.* 122, 197, 204-5; *Chemist and Druggist* 110, 267-8(1929).—The query arose: Can homogeneous distribution of 2.1 mg. of As<sub>2</sub>O<sub>3</sub> in the mass of 12 iron pills of 3.84 g. total wt. be proved by detg. the As content of each pill? As the detn. of such traces of As<sub>2</sub>O<sub>3</sub> seemed futile, detn. of the same quantity of MnCO<sub>3</sub> was substituted, the Mn in each pill being detd. colorimetrically after oxidation by the persulfate method. Results, although not very sharp, indicated that there was little or no variation in the Mn content of the different pills. S. WALDBOTT

**What is adhesive plaster?** ISABELLA A. PURDIE. *Pharm. J.* 122, 198, 205; *Chemist and Druggist* 110, 268(1929).—The lack of uniformity in the compn. and make-up of official adhesive plaster in the Brit. Pharm., the U. S. P. and the English Drug Tariff is pointed out. S. WALDBOTT

**Enzymes in pharmaceutical preparations.** HENRY DRYERRE. *Pharm. J.* 122, 279-82; *Chemist and Druggist* 110, 172-3(1929).—An address on the nature of enzymes and their functions in digestion, with special reference to pepsin and liquor pancreatis of the Brit. Pharm. S. WALDBOTT

**Variation in the contents of active principles in tablets and gelatin capsules made on a manufacturing scale.** P. C. *Schweiz. Apoth. Ztg.* 66, 489-91(1928).—Tables published by the official Swedish Pharmaceutical Control Lab. show considerable pos. or neg. deviations from the declared quantity of active principle present. Cf. C. A. 22, 4203. S. WALDBOTT

**The effect of methods of cultivation upon the contents of active principles in medicinal plants.** K. BOSCHART. *Schweiz. Apoth. Ztg.* 66, 649-52, 661-4(1928).—See C. A. 22, 1651. S. WALDBOTT

Light Bi carbonate (STICKINGS, COUPLAND) 18. I determination in organic compounds which readily split off I (VAN ITALLIE) 7. The action of peroxidase on glycerophosphates (RAE) 11A. Technical and medicinal petrolatums from Grozny mixed-base fuel oil (TARASOV) 22. The reaction between phenol and Pb subacetate (Gould's extract) (LUM) 10. Preparing petrolatums (CHERNOZHUKOV) 22. Condensation products of the benzodiazine [intermediates for manufacture of pharmaceutical products] (U. S. pat. 1,724,086) 25. [Therapeutic] triazine derivatives (Ger. pat. 479,349) 10.

CROLAS, F., AND MOREAU, B. **Précis de pharmacie chimique.** 6th ed., revised by A. Leulier. Paris: N. Maloine. 897 pp. F. 65.

**Medicinal preparations.** SOC. ANON. POUR L'IND. CHIM. A BALG. Ger. 479,332, Dec. 9, 1924. See Brit. 244,055 (C. A. 21, 158).

**Therapeutic composition comprising iron and yeast.** MATRO GES. Brit. 304,895, Dec. 24, 1927. See U. S. pat. No. 1,710,584 (C. A. 23, 2786).

**Therapeutic products from hemoglobin compounds.** SCHERING-KAHLBAUM A.-G. Brit. 304,731, Jan. 25, 1928. Compds. of hemoglobins with heavy metals of 2 or more stages of oxidation, such as Fe-porphyrin compds., are reduced by an agent such as hyposulfite or cysteine, and then combined with bases such as arginine, histamine or nicotine. The products may be adsorbed on an org. or inorg. carrier such as starch, animal charcoal or silica.

**Synthetic drugs (acridine derivatives).** I. G. FARBENIND. A.-G. Brit. 304,280, Jan. 18, 1928. The process described in Brit. 283,510 (C. A. 22, 4205) in which nitro-9-aminoacridine derivs. are obtained by condensing a nitro-9-chloro- or 9-alkoxyacridine with a base contg. at least 2 N atoms of which one is a primary one is modified by condensing first with an amino acid or an ester or nitrile thereof and then converting the nitroacridylamino acid thus obtained into a basic amide by means of a primary or secondary amine which also contains at least one tertiary basic N atom. The products are strong *bactericides*. Examples are given. Cf. C. A. 23, 4536.

**Chlorinized and ozonized topical remedy.** BRUCE E. CLARKE. U. S. 1,724,562. Aug. 13. A compn. suitable for supplying Cl and ozone for inhalation comprises a vehicle such as olive oil or petrolatum together with Cl and a gas such as ozone capable of producing nascent O. An arrangement of app. for prepg. the product is described.

**Anesthetic compounds.** ROGER ADAMS and OTIS A. BARNES (to Abbott Laboratories). U. S. 1,724,248, Aug. 13. Details are given of the production of  $\beta$ -( $\beta$ -carbomethoxypiperidyl)ethyl *p*-aminobenzoate-HCl and  $\gamma$ -( $\beta$ -carbomethoxypiperidyl)-propyl *p*-aminobenzoate-HCl, *m.* about 197° and about 207°, resp.

**Alkali metal tetra-bismuth tartrates.** D. H. SEARLE & Co. Brit. 304,956, April 2, 1928. Compds. such as (COOBiO.CHOBiO.CHOBiO.COOBiO)NaOH are obtained by adding Bi hydroxide to a soln. of alkali metal tartrate, contg. excess alkali metal hydroxide, without heating, and shaking the mixt. until no more Bi hydroxide dissolves. The products may be used therapeutically, *e. g.*, as *anti-syphilitics*, and are stated to be less toxic than other known alkali bismuth tartrates.

**Iodophenolphthalein compounds for x-ray examination.** E. F. ILLZEY (to National Aniline & Chemical Co.). Brit. 304,589, Jan. 21, 1928. Monoalkali metal salts of tetraiodophenolphthalein are prepd. in colloidal form for administration to a patient prior to gall-bladder examn. by Röntgen rays. Various details of mixts. for administration of these compds. are given.

**Amines.** OSCAR HINSBERG. Ger. 478,949, Dec. 21, 1926. Addn. to 360,607. Mono- and dihydroxyarylcboxylic acid ethanolamines or the corresponding bisarylethylamines and their derivs. are prepd. by the action of aminoacetal or its *N*-alkyl derivs. on mono- or dihydroxycarboxylic acids in the presence of HClO<sub>4</sub>. Examples are given. The products are *used in therapy*.

**Amino fatty acid derivatives.** VLADIMIR M. RODIONOW. Ger. 479,228, Sept. 17, 1926.  $\beta$ -Aryl- $\beta$ -amino fatty acids and their *N*-alkyl derivs. are prepd. by treating an equimol. mixt. of an aromatic aldehyde and malonic acid with an alc. soln. of NH<sub>3</sub> or of a primary or secondary aliphatic amine. The reaction is carefully controlled so that only 1 COOH group is split off. The reaction product is dissolved in water and acidified to ppt. the cinnamic acid always obtained as a by-product, and the hydrochloride of the  $\beta$ -aryl- $\beta$ -amino fatty acid is then crystd. out from the filtrate. Examples described the prepn. of the hydrochlorides of  $\beta$ -piperonyl- $\beta$ -aminopropionic acid, *m.* 232–234°,  $\beta$ -phenyl- $\beta$ -aminopropionic acid, *m.* 216–217°,  $\beta$ -piperonyl- $\beta$ - $\beta$ -methylaminopropionic acid, *m.* 207–207.5°,  $\beta$ -*m*-nitrophenyl- $\beta$ -aminopropionic acid, *m.* 202–204°, and  $\beta$ -phenyl- $\beta$ -dimethylaminopropionic acid (*m. p.* not stated). The products are *intermediates for drugs*.

**Phenol aminoalkyl ethers.** I. G. FARBENIND. A.-G. Brit. 304,732, Jan. 25, 1928. In forming *therapeutic products* such as the monoethylaminoethyl ether of 6-allyl-2-methoxy-1-phenol, a phenol contg. an unsatd. group in *o*-position to the OH group (but which is not a deriv. of an *N*-acetylaminophenol) is treated with an alkylene dihalide in the presence of an alk. agent and the resulting halogen compd. is then combined with a monoalkylamine. Cf. C. A. 23, 669.

**4-Methyl-2-phenoxyquinoline-4'-carboxylic acid.** I. G. FARBENIND. A.-G. Brit. 305,589, Feb. 7, 1928. This compd., a *therapeutic substance*, is made by heating 2-chloroquinoline with the Me ester of *p*-hydroxybenzoic acid in PhNO<sub>2</sub>, boiling the product with NaOH and acidifying.

**Urethans of  $\alpha$ -phenylcinchoninic acid.** R. WOLFFENSTEIN. Brit. 304,655, Jan. 23, 1928. These compds. (which are *therapeutic agents*) are prepd. by treating  $\alpha$ -

phenylcinchoninic acid chloride with a urethan or by reaction of  $\alpha$ -phenylcinchoninic acid amide with a chlorocarbonic ester. Examples are given of the prepn. of the ethyl- and methyl-urethans.

**Tannates.** LABORATORIUM REUMELLA ADOLF BOAS. Ger. 479,229, April 7, 1926. Tannates of Cu, Zn and Mg are prepd. by adding an aq. soln. of tannin to a soln. of the metal hydroxide in an excess of  $\text{NH}_4\text{OH}$  and an  $\text{NH}_4$  salt. The tannate ppts. and is sepd. off. The products are intended for *therapeutic use*.

**Diaminoisopropanol derivatives.** I. G. FARBENIND. A.-G. (Heinrich Jensch, inventor). Ger. 479,354, Aug. 14, 1926. Products of the formula  $\text{H}_2\text{NCH}_2\text{CH}(\text{OH})\text{CH}_2\text{N}-$ , where N— is tertiary, are prepd. (1) by treating 3-halo-2-hydroxypropylphthalimide with secondary bases and splitting off the phthalic acid residue or (2) by treating 3-halo-2-hydroxypropylamine with secondary bases. Examples are given describing the prepn. of some of these compds. and also their hydrochlorides. The products are useful as *drugs* and *intermediates for drugs*. Cf. C. A. 22, 2171.

**Dipyridylamine derivatives.** SCHERING-KAHLBAUM A.-G. (Max Dohrn and Paul Diedrich, inventors). Ger. 479,282, Nov. 5, 1925. Addn. to 406,207. Ger. 406,207 describes the manuf. of a condensation product, now identified as 2,2'-dipyridylamine, by treating 2-aminopyridine or its salts with  $\text{COCl}_2$ . This method is now extended to nuclear substitution products of 2-aminopyridine. Examples are given. The products are *drugs* or *intermediates for drugs*.

**Halogen derivatives of dihydrocodeinone.** C. H. BOEHRINGER SOHN (Clemens Schöpf, inventor). Ger. 479,104, July 21, 1925. Cl and Br derivs. are prepd. from dihydrocodeinone or its salts by treatment in aq. soln. or in acid solvents with chlorinating or brominating agents, the halogen entering the  $\text{C}_6\text{H}_5$  nucleus. Examples are given. Bromodihydrocodeinone m. 205-207° and forms a hydrobromide m. 215-217°; chlorodihydrocodeinone m. 177-178°. The products are useful as *drugs* or as *intermediates for drugs*.

**Basic phenol alkyl ethers.** HANS HAHN (to Winthrop Chemical Co.). U. S. 1,725,136, Aug. 20. Compds. of the probable general formula,  $4,2,6\text{-R}(\text{XO})_2\text{C}_6\text{H}_2\text{OYNZ}_2$ , where X represents an alkyl group, Y an alkylene group, Z, *Hor* alkyl, at least one Z being alkyl, and R represents an unsatd. aliphatic radical, are obtained by causing a compd. of the general formula  $\text{HIYNZ}_2$ , where HI represents halogen, to react upon a compd. of the general formula  $4,2,6\text{-R}(\text{XO})_2\text{C}_6\text{H}_2\text{OH}$ . The products are mostly liquids possessing a basic odor and form neutral salts with acids which salts retain the therapeutic properties of the products and are sol. in water. They are substitutes for *secale cornutum*.  $4,2,6\text{-C}_3\text{H}_7(\text{MeO})_2\text{C}_6\text{H}_2\text{OCH}_2\text{CH}_2\text{NEt}_2$ , a yellow oil, b. 146-151°.

**Cardio-active substance from bulbous scillae.** WALTER KREIS (to Chemische Fabrik vorm Sandoz). U. S. 1,725,652, Aug. 20. Aq. squill material is exhaustively extd. with org. solvents not miscible with water such as  $\text{EtOAc}$  in the presence of a sufficient quantity of easily water-sol. salts such as Na phosphate to facilitate the extrn.

**Hormones.** I. G. FARBENIND. A.-G. Brit. 305,475, Feb. 4, 1928. Active substances are obtained from the fresh or dried hypophysis or from its sep. lobes by hydrolysis by use of an alkali or an acid, under such conditions of time and temp. as avoid decompn. of the active substances. Albumin degradation products are pptd. by neutralizing the hydrolyzing agent or adjusting the  $\text{pH}$  of the soln. Numerous details are given. Cf. C. A. 23, 2252.

**Immunizing preparations from carcinoma, etc.** W. SCHMIDT and W. SCHMIDT SERUMWERK A.-G. Brit. 304,155, July 11, 1927. Microorganisms causing malignant tumors, such as carcinoma, are cultivated, either *in vitro* or *in vivo*, in symbiosis with mold fungi such as *Mucor racemosus* or *Mucor mucedo* and vaccines and immunizing preps. are obtained from the cultivated organisms. Numerous details are given.

**Surgical dressing.** E. BLANK. Brit. 304,393, Oct. 28, 1927. A pad of dressing material to be treated with a liquid, e. g.,  $\text{CHCl}_3$ , is secured to a backing of larger area comprising a foil of a cellulose salt or ester, e. g., nitrocellulose, which is not sol. in the treating liquid.

**Improving various natural and synthetic perfumery ingredients by hydrogenation.** I. G. FARBENIND. A.-G. Brit. 305,555, Oct. 29, 1927. "Subsidiary odors" are destroyed by selective hydrogenation of impurities present in resins, balsams, essential oils or synthetic products such as ionone or methyl ionone.

**Cosmetic preparations.** TOKUJIRO HASHIMOTO. Ger. 478,745, April 24, 1925. Vegetable gelatin and  $\text{H}_2\text{BO}_3$  are mixed under pressure and a mixt. of  $(\text{CH}_3)_4\text{N}_4$  and  $\text{BzONa}$  or  $\text{BzOLi}$  is added. Lanolin may also be added. Cf. C. A. 22, 2440.

**Disinfectants.** SCHERING-KAHLBAUM A.-C. Brit. 305,229, Feb. 3, 1928. The

double compd. of urea and *m*-cresol (the production of which is described in Brit. 297,083, C. A. 23, 2449) is incorporated with a neutral or disinfecting powder such as talcum, kieselguhr or boric acid.

**Reduction of the nicotine content of tobacco.** THÉOPHILE SCHLOESING. Ger. 479,095, Aug. 5, 1924. The nicotine content of tobacco is reduced, without destroying the aroma, by treating the tobacco at atm. pressure with a stream of a mixt. of steam and  $\text{NH}_3$ , the compn. of which is maintained const. throughout the process.

## 18—ACIDS, ALKALIES, SALTS AND SUNDRIES

R. M. SYMMES

**The phosphoric acid industry in its relation to the manufacture of activated charcoal.** EDOUARD URBAIN. *Bull. soc. ind. Mulhouse* 95, 325-43 (1929).—An address dealing with the general principles of the absorption of vapors by activated charcoal and with the effects of impurities in activated and decolorizing charcoals, showing how attempts to prevent introduction of impurities through  $\text{H}_3\text{PO}_4$  (used in the prepn. of charcoal by the Urbain process) led to the development of a process for the production of very pure  $\text{H}_3\text{PO}_4$ , with production of pure K metaphosphate as a by-product. A. P.-C.

**The manufacture of ammonia by direct synthesis.** III. N. F. YUSHKEVICH. *J. Chem. Ind. (Russia)* 5, 353-64 (1928); *Chem. Zentr.* 1928, II, 2180.—A summary is given of some investigations carried out during the last few years by Larson, Almquist, Crittenden and others on the effect of temp., pressure and velocity of current on the quantity of  $\text{NH}_3$  formed from a mixt. of  $\text{N}_2$  and  $\text{H}_2$ . Other expts. were concerned with mode of action of catalysts and influence of their compn., and with influence of activators and catalyzer poisons ( $\text{O}_2$ ) on the efficiency on these catalysts. G. S.

**The utilization of natural gases for the ammonia process.** H. LIANDER. *Trans. Faraday Soc.* 25, 462-72 (1929).—Possible reactions of  $\text{CH}_4$  with  $\text{O}_2$ ,  $\text{H}_2\text{O}$  and  $\text{CO}_2$  were calcd. from the Nernst heat theorem. Expts. were made by heating  $\text{CH}_4$  and  $\text{O}_2$ , with and without Ni catalysts, to 550-850°. With no catalyst the products are  $\text{CO}_2$  and  $\text{H}_2\text{O}$ ; with catalyst  $\text{H}_2$ , CO and  $\text{CO}_2$ . Conclusion: Natural gas, air and steam passed over a suitable catalyst at 1000° would yield gas that could be used as a source of  $\text{H}_2$  and  $\text{N}_2$  for  $\text{NH}_3$  synthesis. G. B. TAYLOR

**Light bismuth carbonate.** R. W. F. STICKINGS AND H. C. COUPLAND. *Chemist and Druggist* 108, 605 (1928); cf. C. A. 20, 95, 800.—Formation of the light carbonate takes place at the expense of purity;  $\text{Na}_2\text{CO}_3$  is held by adsorption, and is replaced by  $\text{CaCO}_3$  when the salt is washed with tap water. The Brit. Pharm. permits a max. of 1.06%  $\text{Na}_2\text{CO}_3$  and 0.40%  $\text{HNO}_3$ ;  $\text{CaCO}_3$  is excluded. S. and C. succeeded in removing the adsorbed alkali while preserving the lightness of the salts and adhering nitrates were reduced to 0.08%  $\text{HNO}_3$ . Details are not given. S. WALDBOTT

**The deterioration of iodized salt.** M. STARR NICHOLS. *Am. J. Pub. Health* 19, 923-5 (1929).—The results show considerable loss during the first period (about 9 months) of storage and a corresponding decrease thereafter. No definite relationship was established between added antihardeners and keeping qualities. The 2nd period of storage covered about 35 months. J. A. KENNEDY

**Sodium silicate.** ALBERT DEBECQ. *Bull. fédération ind. chim. Belg.* 8, 255-7 (1929).—This is a general article to emphasize the growing importance of sodium silicate in the industry. ALBERT L. HENNE

**The dry grinding of calcite tailings from the Kingdon lead mine, Galetta, Ontario.** R. K. CARNOCHAN. Investigations in Ore Dressing and Metallurgy, Canada Dept. of Mines, Mines Branch, *Rept. No. 695*, 123-4 (1929).—Elimination of iron from sand samples. *Ibid* 124-5.—The concentration of a garnet rock from Langlade, Quebec. *Ibid* 125-9.—The rock consisted of garnet crystals in a gang of quartz, hornblende, pyroxene and black mica. A flow sheet is given for a process which produces about 28% of the rock in an 80% garnet concentrate. The drying of epsom salts. *Ibid* 129-30.—The possibility of removing economically the 51% of  $\text{H}_2\text{O}$  from epsom salts to save freight was investigated. A gas-fired rotary drier with a screw feeder and a scraper at the top produced a product contg. 10%  $\text{H}_2\text{O}$ . The flotation of graphite tailings from Dominion Mine, Buckingham, Quebec. *Ibid* 130-1.—A tailing contg. 2.55% C in impure flakes was floated, but because of the impurities the concn. was not satisfactory. The wet milling of asbestos rock from Danville, Quebec. *Ibid* 131-4.—Typical coarse fiber asbestos rock was tested by a wet-concn. process. The rock was ground in a Hardinge mill with as much  $\text{H}_2\text{O}$  as possible to float the fiber

out of the mill as soon as freed. The balls were large in order to crack rather than to grind the rock. The mill discharge was screened on  $1/32$ -in. round-holed sieve, the oversize being the product and the undersized raw material being used for further treatment, which is outlined. The elimination of iron from sandstone from East Templeton, Quebec. *Ibid* 134-6.—The stone consisted of rounded quartz particles smaller than 10 mesh with pyrite between the grains. The  $\text{Fe}_2\text{O}_3$  content was 0.15-0.3%. Roasting and magnetic sepn. reduced the Fe content below 0.07%, the limit for glass sand. Tabling reduced the Fe but not sufficiently.

ALDEN H. EMERY

**Fluorspar and cryolite in 1928.** HUBERT W. DAVIS. Bur. Mines. *Mineral Resources of U. S.* 1928, Pt. II, 13-30 (preprint No. 2, published July 12, 1929). E. H.

**Phosphate progress.** JOHN T. BURROWS. *Am. Fertilizer* 70, No. 13, 40-2(1929). — A review is given of recent developments in the mining, washing, drying and grinding of phosphate rock. Brief reference is made to the successful application of a new flotation process for sepgg. finely divided phosphate from its assocd. siliceous material.

W. H. ROSS

**International aspects of the phosphate rock industry.** MORGAN H. GRACE. *Am. Fertilizer* 70, No. 13, 45-7(1929).—A statistical review of the production and consumption of phosphate rock in different countries throughout the world. W. H. R.

**Losses in Florida land-pebble phosphate.** H. M. LAWRENCE. *Am. Fertilizer* 70, No. 11, 42, 44, 54, 57-8(1929).—A study was made of the debris bank sands now accumulating in the land-pebble phosphate district of Florida. The greater portion of the phosphate discarded by the washers is in the finer sizes below 16 to 24 mesh. These fractions analyze considerably less than 31%  $\text{P}_2\text{O}_5$ . Recovery of the phosphate in these sizes is not possible by simple washing methods. A portion of the material now rejected by the washing plants is coarser than 16 to 20 mesh and contains upwards of 31%  $\text{P}_2\text{O}_5$ . The relation of the phosphate so lost to the present washer production is discussed. Methods and estd. costs for reclaiming the comm. fractions are considered.

W. H. ROSS

**Phosphate resources of the Philippine Islands.** V. ELICANO. *Proc. 3rd Pan-Pacific Sci. Congr.* 1926, II, 1740-3(Publ. 1928). E. M. SYMMES

**Sulfur resources of the Philippine Islands.** LEOPOLDO A. FAUSTINO. *Proc. 3rd Pan-Pacific Sci. Congr.* 1926, II, 1744-5(Publ. 1928). E. M. SYMMES

**The industrial production of hydrogen.** FERD. MORAVEC. *Chem. Listy* 23, 168-72 (1929).—Eight of the processes in use at the present time are reviewed. F. M.

**Activation of charcoal by steam.** P. P. KOSAKEVICH and N. A. ISMAILOV. *Kolloid-Z.* 48, 241-6(1929).—When charcoal is activated by steam the activity increases continuously with time between 700° and 800°. At 800° 28% activation is obtained. Lowering of the rate at which steam is passed over charcoal decreases the activity and increases the yield. At 850° the activation reaches a max. after 15 min.; at 900° in half the time. Activation and graphitization are concurrent. The velocity of the latter increases very rapidly between 800° and 850°.  $\text{EtNH}_2$  and phenol are adsorbed equally well. The normal ash constituents of charcoal have a negligible influence on the activity.

FRANK URBAN

**A suggested method for the utilization of seaweed.** T. DILLON and E. F. LAVELLE. *Econ. Proc. Roy. Dublin Soc.* 2, 407-13(1928).—Kelp cannot be dried and burned in winter, but if collected then and stored in a tub decompn. occurs. After 17 weeks 31 kg. of kelp gave a clarified ext. contg. total solids 1373, ash 684, 121.5. Of the original solids 29% had disappeared. Distn. of the ext. with  $\text{H}_2\text{SO}_4$  gave  $\text{AcOH}$  and other acids not identified.

E. M. SYMMES

**Japanese agar-agar.** U. S. Commerce Rept. *Chemist and Druggist* 108, 668 (1928).—The primitive but effective methods of prepg. agar-agar, both in mfg. and home production, are described.

S. WALDBOTT

**Modern washing and cleansing materials.** AUGUST NOLL. *Seide* 34, 166-9 (1929).—The newer types of washing and cleansing materials are discussed. Trade names, composition, properties, etc., are covered.

H. W. STIEGLER

By-products of furnace-made  $\text{H}_3\text{PO}_4$  (JACOB, REYNOLDS) 15. Developments in fertilizer production (CURTIS) 15.  $\text{H}_2\text{O}_2$ (Brit. pat. 305,472) 25. Gas purification (Brit. pat. 304,345) 21. Evaporator for treating sugar or salt solutions, etc. (Brit. pat. 304,670) 1.

**Les réserves mondiales en phosphates.** Vols. I and II. Issued by 14th International Geological Congress. In 4 languages: French, Spanish, English and Ger-



man. Madrid: Graficas reunidas, S. A. 890 pp. Reviewed in *Eng. Mining J.* **128**, 24(1929).

**Volatile acids.** HERMANN FRISCHER. Ger. 479,212, Aug. 10, 1920. Addn. to 421,319. Ger. 421,319 describes an app. for the manuf. of HCl and Na<sub>2</sub>SO<sub>4</sub> from NaCl and H<sub>2</sub>SO<sub>4</sub> comprising a heated drum fitted with stirrers and contg. balls or the like which are lifted and dropped by the rotation of the drum or of the stirrers. This app. is now applied to the decompn. of salts of other volatile acids, such as formates, acetates and fluorides.

**Nitric acid by oxidation of ammonia.** FRANS G. LILJENROTH. U. S. 1,725,462, Aug. 20. A gas mixt. consisting essentially of NH<sub>3</sub>, O, NO and steam is continuously supplied to a series of NH<sub>3</sub>-oxidation furnaces; a portion of the gas mixt. formed is drawn off and condensed to HNO<sub>3</sub>; the remainder is cooled without condensing the NO and the cooled gases are utilized to dil. freshly supplied NH<sub>3</sub> and O. An arrangement of app. is described.

**Sulfuric acid.** MANSFIELD A.-G. FÜR BERGBAU UND HÜTTENBETRIEB and R. BORCHERS. Brit. 304,688, Jan. 24, 1928. Iron, steel or Fe alloys are used instead of lead in construction of app. for H<sub>2</sub>SO<sub>4</sub> manuf., especially that used in the "intensive" system. Various details are described.

**Sulfuric acid.** METALLGES. A.-G. (formerly Metallbank und Metallurgische Ges. A.-G.). Brit. 304,308, Jan. 19, 1928. The rate of oxidation of SO<sub>2</sub> in the presence of N oxides is increased by rapidly whirling the mixt. of gases while avoiding sepn. of liquid particles. Various details and alternative procedures are described.

**Titanic acid.** METALLGESELLSCHAFT A.-G. (Erich Stahl, inventor). Ger. 478,740, Jan. 17, 1928. H<sub>2</sub>TiO<sub>3</sub> or its salts are extd. from titaniferous materials, especially the so called "red slime," by treating with SO<sub>2</sub>. The SO<sub>2</sub> may be supplied by roasting pyrites.

**Purifying carbon dioxide.** I. G. FARBENIND. A.-G. (Oskar Jonas and Philipp Balz, inventors). Ger. 479,490, Mar. 21, 1928. CO<sub>2</sub> obtained by the action of Na<sub>2</sub>CO<sub>3</sub> on HNO<sub>3</sub> is freed from oxides of N by mixing it with sufficient H to convert the oxides of N to NH<sub>3</sub> and passing the mixt. over a Pt or Pd catalyst heated to at least 70°. The NH<sub>3</sub> is washed out from the product and the CO<sub>2</sub> is liquefied. The CO<sub>2</sub> is sufficiently pure for use in the manuf. of mineral waters.

**Apparatus for producing solid carbon dioxide from the liquid.** E. DUBOIS. Brit. 304,958, April 3, 1928. Structural features.

**Ammonia synthesis, etc.** SOC. L'AIR LIQUIDE, SOC. ANON. POUR L'ÉTUDE ET L'EXPLOITATION DES PROCÉDÉS G. CLAUDE. Brit. 305,534, Feb. 6, 1928. A catalytic system as described in Brit. 268,721, (C. A. 22, 1444) is modified by heating the gas after passage through the jacket of the app. and before entry to the reaction chamber.

**Purifying gases for ammonia synthesis.** NORSK HYDRO-ELEKTRISK KVAELSTOFKATIESELSKAB. Ger. 479,474, Jan. 25, 1927. See Brit. 266,689 (C. A. 22, 669).

**Purifying ammonia liquors, etc.** H. W. ROBINSON and D. W. PARKES. Brit. 305,494, Aug. 5, 1927. The liquor is treated with a reagent such as Pb salts to ppt. catechols, after a preliminary purification by distn. or acid treatment depending on the character of the liquor, and recovery of catechols from the ppt. Various details and modifications of the process are described. Cf. C. A. 22, 862.

**Apparatus for liquefying ammonia.** WALTER HAMLIN KNISKERN. Ger. 478,540, Aug. 30, 1924. App. for liquefying synthetic NH<sub>3</sub> gas from mixts. by the cooling action of a volatile liquid is described.

**Crystallizing salts from brine.** GEORGE B. BURNHAM (to Burnham Chemical Co.). U. S. 1,724,558, Aug. 13. In heating brine, it is caused to flow beneath a salt crust subject to the action of the sun.

**Earth metal halides.** F. KRUPP GRUSONWERK A.-G. Brit. 304,135, Jan. 14, 1928. A rotary tubular furnace is used for producing halogen or double halogen compds. of earth metals such as Al compds. by treatment of raw materials mixed with fuel with halogen-contg. substances such as CaCl<sub>2</sub>, fluorides or free halogens. The halogen compds. formed are volatilized and condensed.

**Colloidal metal hydroxides.** RICHARD LORENZ and HEINRICH HEINZ. Ger. 478,994, July 23, 1924. Colloidal metal hydroxides are prepd. by pptn. from solns. of the metal salt and alkali in the presence of an albuminous protective colloid such as size, gelatin or casein, dissolving the ppt. in caustic alkali or alkali carbonate soln. and evapng. Cu, Ag and Pb hydroxides are mentioned in the examples.

**Alkali cyanides.** STRICKSTOFFWERKE G. M. B. H. (H. Heinrich Franck and Hugo

Heimann, inventors.) Ger. 478,946, Jan. 11, 1925. Addn. to 417,018. Alkali cyanides are prepd. by treating a mixt. of  $\text{Ca}(\text{CN})_2$  and alkali carbonate between  $500^\circ$  and  $700^\circ$  with a mixt. of H and CO. The reaction gives a 90% yield.

**Alkali silicate.** NATHANIEL M. ELIAS. U. S. 1,724,185, Aug. 13. An alkali silicate such as that of Na is heated in the form of a glassy solid to  $200$ – $500^\circ$ , and coated, in the form of a foam-like mass with a waterproofing substance such as paraffin. The material may be used as a *heat- and sound-insulation*.

**Alkali sulfates.** FERDINAND STEIN. Ger. 478,988, Oct. 21, 1924. Addn. to 453,118. A variation in the method of the com. prepn. of  $\text{NH}_4$  and alkali sulfates or double salts thereof described in 453,118 consists in treating the starting material with alkali chloride before treating with  $\text{CO}_2$ . Thus, gypsum is treated with an aq. soln. of  $\text{NH}_3$  and NaCl. The liquid is heated and  $\text{CO}_2$  led in. The product  $\text{NH}_4\text{NaSO}_4 \cdot 2\text{H}_2\text{O}$  is obtained by crystn.

**Reduction of alkaline earth sulfates.** SALZWERK HEILBRONN A.-G., THEODOR LICHTENBERGER and KONRAD FLOR. Ger. 479,346, Sept. 26, 1925. Addn. to 478,310. The method of Ger. 478,310 (C. A. 23, 4305) is modified by adding  $\text{MgCl}_2$  to the melt before or after the reduction with coke. A copious evolution of  $\text{H}_2\text{S}$ , which is collected or worked up, is so obtained, while  $\text{MgO}$  is produced in the melt and is sep'd. therefrom by decantation. The residue comprising alkali and alk. earth chlorides may be used again. The process may be accelerated by passing steam into the melt.

**Reduction of alkaline earth sulfates.** SALZWERK HEILBRONN A.-G., THEODOR LICHTENBERGER and KONRAD FLOR. Ger. 479,347, Dec. 22, 1925. Addn. to 478,310. The method of Ger. 478,310 (C. A. 23, 4305) is modified by using other suitable alkali or alk. earth salts instead of NaCl. Salts or mixts. of salts which liberate acid when the melt is treated with steam are preferred. Alkali sulfates and alkali and alk. earth fluorides are mentioned as suitable salts. Cf. preceding abstract.

**Sulfides from sulfur.** I. G. FARBEIND. A.-G. (Paul Koppe and Paul Herold, inventors). Ger. 478,986, July 21, 1926.  $\text{H}_2\text{S}$  and other sulfides are prepd. from S or S-yielding compds. such as polysulfides and thiosulfates by the action of H, etc., under pressure and at high temps. The H may be replaced by CO,  $\text{CH}_2\text{Cl}_2$  or formates. A catalyzer may also be used. Examples are given.

**Double fluorides.** I. G. FARBEIND. A.-G. (Julius Soll and Robert Bilsinger, inventors). Ger. 479,400, Sept. 9, 1922. Addn. to 443,007 and 461,136. According to Ger. 443,007 and 461,136, double compds. of  $\text{AlF}_3$  with alkali fluorides are manuf'd. from an impure soln. of an Al salt such as is obtained by treating clay with acid. The soln. is treated with an alkali salt and HF, the latter being added in an amt. less than that theoretically necessary, in order to avoid contamination of the product with Fe. It is now found that any desired amt. of HF can be used, without contaminating the product with Fe, if the Fe in the soln. is first reduced to the ferrous state.

**"Semimechanical" phosphate den.** DARBY L. BAKER. U. S. 1,725,604, Aug. 20. Various structural features are described.

**Alumina, etc.** N. J. GAREAU. Brit. 305,599, Aug. 3, 1927. Calcined clay briquets are passed downwardly through a tower with water, countercurrent to gases from a furnace carrying S oxides and N oxides.  $\text{H}_2\text{SO}_4$  formed reacts with the clay and forms Al sulfate and the silica is dehydrated. The briquets are lixiviated with water contg.  $\text{H}_2\text{SO}_4$  to form a soln. of Al sulfate and this is dried and calcined to form a product of the compn.  $\text{Al}_2\text{O}_3 \cdot \text{SO}_3$ . This is ground with NaCl and coal and heated to about  $300^\circ$  and treated with steam to produce HCl and further heated to redness to produce Na sulfide. The briquets are also utilized to form Na aluminate from which alumina is produced. An app. is described. Cf. C. A. 23, 674.

**Aluminum oxide.** G. A. BLANC. Brit. 304,289, Jan. 18, 1928. Alumina is obtained in granular form by decomposing the hydrated chloride or nitrate in an app. in which the material is not subjected to friction, shock, pressure or other mech. stresses during its decompn. Muffle or rotary furnaces may be used.

**Aluminum chloride.** I. G. FARBEIND. A.-G. Brit. 305,578, Feb. 7, 1928. Production of anhyd.  $\text{AlCl}_3$  from raw materials such as clay, contg. both alumina and silica, in the presence of a reducing agent such as C (which may be in the form of brown coal) or CO is carried out with Cl charged with  $\text{SiCl}_4$  vapor in such quantity that no simultaneous formation of  $\text{SiCl}_4$  from the silica present can take place. Various details are given. Cf. C. A. 23, 938.

**Ammonium chloride crystals.** JOSEPH W. MOORE and WILFRID G. POLACK (to Imperial Chemical Industries, Ltd.). U. S. 1,725,292, Aug. 20. See C. A. 22, 3497.

**Ammonium nitrate.** APPAREILS ET ÉVAPORATEURS KESTNER. Brit. 305,121, Jan. 31, 1928. In effecting neutralization of  $\text{HNO}_3$  by  $\text{NH}_3$ , excessive heating is prevented

by carrying out the reaction in the presence of excess  $\text{NH}_4\text{NO}_3$ ; the soln. is kept at a temp. below  $35^\circ$ . A circulating system including a tower and cooler is described.

**Cobalt carbonyl.** BADISCHE ANILIN & SODA-FABRIK. Fr. 33,951, Aug. 1, 1927. Addn. to 607,134. In the prepn. of Co carbonyl by the action of CO on Co under pressure, the carbonyl is sepd. from the reaction gases by cooling before expansion.

**Iron carbonyl.** MARTIN MÜLLER-CUNRADI (to I. G. Farbenind. A.-G.) U. S. 1,725,619, Aug. 20. CO is passed under pressure, downwardly, through a vertical reaction vessel contg. coarse grained iron. Cf. C. A. 23, 4540.

**Chromic hydroxide.** I. G. FARBEIND. A.-G. Brit. 305,588, Feb. 7, 1928. Chromium green and alkali or alk. earth metal formates are simultaneously formed by reduction in soln., with CO or gases contg. it, of an alkali or alk. earth chromate (suitably at  $150\text{--}350^\circ$  under pressure).

**Phosphorus oxides.** GEWERKSCHAFT DER STEINKOHLENZECHHE MONT CENIS. Ger. 478,843, June 16, 1926. Oxides of P, particularly  $\text{P}_2\text{O}_5$ , are condensed by contact with steam at high temps., forming a cloud of the corresponding acid.

**Separation of sodium and potassium hydroxides.** SOC. ANON. POUR L'IND. CHIM. A BALE. Ger. 477,952, Apr. 25, 1925. KOH and NaOH in lye mixts. are sepd. by cong. at  $40\text{--}100^\circ$ , when the KOH crystals sep., and then diluting and cooling, when the NaOH separates out. Thus, a lye mixt. is evapd. at  $60^\circ$  in a crystn. drum until the deposit of crystals ceases. These are practically pure KOH. They are sepd. and the liquor is diluted and cooled. NaOH crystals then deposited contain 8–10% KOH. These can be redissolved and the process repeated.

**Sodium hydrosulfide, nitrite and nitrate.** FRIEDRICH JOST. Ger. 479,475, Aug. 25, 1926.  $\text{Na}_2\text{S}$  is treated with not more than an equimol. amt. of nitrous gases, whereby a mixt. of NaHS,  $\text{NaNO}_2$  and  $\text{NaNO}_3$  is obtained. Suitably, the gases ascend a tower against a stream of  $\text{Na}_2\text{S}$  soln. and the salts are sepd. from the product by crystn.

**Granulating sodium sulfide, etc.** RHENANIA-KUNHEIM VEREIN CHEMISCHER FABRIKEN A.-G. (to Kali-Chemie A.-G.). Brit. 305,645, Feb. 10, 1928. See Ger. 476,218 (C. A. 23, 3781).

**Continuous preparation of sodium sulfate.** WALDEMAR RECHA. Ger. 478,987, Oct. 4, 1924. A process for the continuous prepn. of water-free  $\text{Na}_2\text{SO}_4$  from Glauber's salt consists in heating the salt to over  $32.40^\circ$  in the trough of a rotary filter and leading the filtered-off anhyd.  $\text{Na}_2\text{SO}_4$  into a drying drum.

**Stannic chloride, etc.** J. GORIANY (to G. A. Favre). Brit. 304,282, Jan. 18, 1928. Material such as alloys contg. Sn are treated while molten and suitably at a temp. of  $900^\circ$ , with Cl, with or without pressure. Volatilized chlorides such as those of Fe, Al and Sb are fractionally condensed before the  $\text{SnCl}_4$  is condensed. Unvolatilized chlorides such as those of Pb and Cu are run off from the surface of the melt. Materials contg. Ag, Au, Mo and Ni may also be treated and an app. is described.

**Titanium sulfates.** I. G. FARBEIND. A.-G. (Friedrich Raspe and Paul Weise, inventors). Ger. 479,491, Apr. 4, 1928. Solid water-sol. titanyl and titanate sulfates are prepd. from concd. solns. by evapg. the solns. in finely divided form, e. g., by spraying into heated air, preferably after addn. of a binding or solidifying agent. Suitable solidifying agents are porous substances such as kieselguhr,  $\text{TiO}_2$  or  $\text{BaSO}_4$ , water-sol. org. substances such as starch, anhyd. inorg. salts capable of taking up water of crystn., or oxides forming water-sol. sulfates. Examples are given. Cf. Brit. 309,047.

**Borax refining.** CHARLES F. RITCHIE and WM. A. GALE (to American Potash & Chemical Corp.). U. S. 1,724,420, Aug. 13. Liquors (such as Searles Lake brine) contg. borates together with phosphates are treated with reagents such as  $\text{H}_2\text{SO}_4$  to reduce the  $p_H$  to increase substantially the soly. of the phosphates and thus facilitate the crystn. of the borax substantially free from phosphates.

**Water glass.** KALI-CHEMIE A.-G. and HANS BRENEK. Ger. 477,974, Feb. 20, 1924. Rock contg. alkali and alumina is subjected to smelting or sintering and the smelt treated with acid after chilling. The resulting  $\text{H}_2\text{SiO}_3$  is dissolved in NaOH.

**Oxygen.** DEUTSCHE GOLD-UND SILBER-SCHNEIDANSTALT VORM. ROESSLER. Brit. 305,101, Jan. 30, 1928. The process described in Brit. 280,554 (C. A. 22, 3244) is modified by using a larger quantity of water for hydration of the alkali metal peroxides or their mixts. (10–15% water being suitably employed). The hydration may be followed by milling and the preps. may be stabilized by heating. Various details and modifications are described.

**Colloidal sulfur.** I. G. FARBEIND. A.-G. Brit. 304,498, Feb. 20, 1928. See Ger. 472,913 (C. A. 23, 3059).

**Gas strong in sulfur dioxide.** GEORGE A. RICHTER (to Brown Co.). U. S. 1,724,421, Aug. 13. Sulfur-burner gases are passed through a confined space in contact

with a surface material such as spiral brick filling and with water so that the water progressively absorbs  $\text{SO}_2$  and the gas becomes progressively weaker in  $\text{SO}_2$ ; the acidulated water is heated and passed through a confined space in contact with inert surface material such as spiral brick filling; gases from the first treatment are passed in contact with the acidulated water countercurrent-wise to take up  $\text{SO}_2$  from the water and to produce a gas rich in  $\text{SO}_2$  and suitable for making an acid cooking liquor.

**Carbon.** I. G. FARBENIND. A.-G. Brit. 304,791, Jan. 26, 1928. In producing finely divided C by catalytic decompn. of CO or gases contg. it, metals of the 8th group of the periodic system, such as Fe, Ni or Co, in a "carefully reduced" and finely divided form, are used as catalysts. Temps. of 350–450° (or of 250–350°, if the activity of the catalyst is increased by adding  $\text{Al}_2\text{O}_3$  or MgO) are suitable and by adding hydrocarbons such as  $\text{CH}_4$ , a C of increased activity and deep black luster is obtained (without necessary participation of the hydrocarbons in the reaction). Various details are given Cf. C. A. 23, 488.

**Active carbon.** FIRMA E. MERCK (Hermann Wieters, inventor). Ger. 478,945, June 24, 1926. Active C is prepd. by carbonizing sulfonic acids or sulfonates of all kinds, except ligninsulfonic acid, or their mixts. with such substances as molasses, cellulose, wood or straw, at high temps. with a protective alkali such as KOH.

**Finely divided carbon of high purity.** ANTON LEDERER. U. S. 1,725,359, Aug. 20, 1928. The vapor of  $\text{CS}_2$  or other suitable simple volatile compd. of C with an element of an atomic wt. of 32 or higher is passed into a heated zone where it is heated to at least 700°; C is collected on plates in a cooler zone.

**Porous clay product for carrying catalysts, filtering agents, etc.** COMPAGNIE INTERNATIONALE POUR LA FABRICATION DES ESSENCES ET PETROLES. Brit. 304,654, Jan. 23, 1928. Clay is mixed with a combustible substance such as sawdust and a binder such as mazut (naphtha residue), and the material is then baked to eliminate the sawdust. The mixt. may be molded into short hollow cylinders and baked successively in a reducing and in an oxidizing flame.

**Condensation products from acrylic acid, etc.** RÖHM & HAAS A.-G. Brit. 304,681, Jan. 24, 1928. Acrylic acid or its derivs. or mixts. contg. them are subjected to the action of O or of an oxidizing agent such as org. peroxides; heat, pressure and org. solvents such as acetone may be used.

**Molding resinous condensation products.** GILBERT MOMBACH. U. S. 1,724,501, Aug. 13, 1928. A plastic material such as plaster of Paris contg. Zn or other suitable heat-conductive metal powder is used for making a die and counterdie about a model of the article to be molded; the resinous condensation product to be molded is inserted within the dies thus formed and is subjected to a pressure of several tons per sq. in. The method is suitable for use in making artificial dentures.

**Colored molded products from blood.** FELIX HOMBERG and MAX LANDECKER (to American Nuplax Corp.). U. S. 1,724,088, Aug. 13, 1928. A water-sol. blood powder is mixed with a basic color lake prepd. with the so-called basic aniline dyes; the mixt. is pressed into shape while heated, and the color of the lake is then developed by immersing the formed body in a  $\text{CH}_2\text{O}$  soln., which develops the color on the surface and into the interior as far as the  $\text{CH}_2\text{O}$  soln. penetrates.

**Protein-containing adhesives.** GLENN DAVIDSON (to I. F. LAUCKS, INC.). U. S. 1,724,695, Aug. 13, 1928. The dispersability of vegetable protein-contg. material such as soy-bean cake in aq. alk. media is increased by subdividing the material, after the greater portion of the natural oil has been removed, to such an extent that 95% of the particles is smaller than a screen opening of 0.074 mm.

**Adhesives for uniting parts of shoes.** BRITISH UNITED SHOE MACHINERY CO., LTD., F. RICKS and R. A. LINEHAM. Brit. 304,823, Oct. 27, 1927. Rubber latex and glue are used together. Various details of prepn. and use of the compn. are given.

**Elastic composition.** W. T. GALBRAITH and A. E. MILLS. Brit. 305,249, Feb. 29, 1928. Paper or synthetic, natural or reclaimed rubber 50, heated vegetable oil 50, "synothin" 5, gluten 20, glue 20, gum such as arabin or cerasin 40, asbestos 5 and casein 2 lb., admixed with waterglass 3 qt., are immersed in  $\text{H}_2\text{SO}_4$  or paraffin, washed with ammonia, digested with  $\text{NH}_4\text{Cl}$  and alc. and dried, and may be further treated with S fumes and shellac. Washing with alc., acetone and water makes the product transparent, and addn. of a small proportion of tannic acid stabilizes its elasticity.

**Putty.** GEBRÜDERS KRAMER. Ger. 479,084, Feb. 8, 1927. A putty for the windows of forcing frames, etc., is prepd. by mixing a soln. of bitumen in a volatile solvent such as benzine with a lubricant such as petroleum jelly and a mineral filler such as chalk or  $\text{Al}_2\text{O}_3$ . The putty is repulsive to birds.

**Annular kiln for burning lime or tile ware.** EDMUND JEENICKE. Ger. 478,631, Sept. 14, 1927. Details are given. Cf. C. A. 23, 2541.

**Cleansing composition.** IRA W. LANHAM. U. S. 1,724,289, Aug. 13. A compn. suitable for cleaning clothes or woodwork, etc., is formed of soap 18–28 lb.,  $\text{Na}_2\text{CO}_3$  5–9 lb., borax 5–12 lb., a "mild abrasive" such as fuller's earth 2–8 lb. and "double-strength ammonia" 4 oz. to 1 qt.

**Cleaning and polishing composition for use on glassware, metals or other materials.** ROBERT BATES. U. S. 1,725,245, Aug. 20. Three gills of a soln. in water of the gum of chicken-grape vine (*Vitis cordifolia*) of a sp. gr. of 1.0006 at 20° is used with neutral soap 5 oz., salt 1 teaspoonful and  $\text{NaHCO}_3$  1 teaspoonful.

**Composition for cleaning and polishing varnished surfaces, etc.** A. F. WOODWARD. Brit. 305,384, March 29, 1928. Whiting 1 lb. or similar mild abrasive is mixed with copal or similar varnish  $\frac{1}{2}$  pint; "methylated spirit" and paraffin oil 1 pint each are added, as is also a soln. of borax 1 oz. in water 1 pint.

**Impregnated mops and polishing cloths.** E. A. VIAL. Brit. 305,078, Sept. 26, 1927. The material is impregnated with paraffin oil, which may be emulsified with an equal quantity of MeOH, and is further treated with a detergent mixt. such as "Bon-Ami" 25, "Old Dutch Cleanser" 50 and powdered Na hyposulfite 25%, and afterward treated also with fine dental pumice.

**Dust preventing.** HERMANN KRÜGER, WACHSMELZE (Theodor Schoenheit, inventor). Ger. 478,677, Dec. 30, 1927. A dust-preventing preservative for wood or linoleum floors consists of wool fat (95%), perfume and dye (5%).

**Composition for cleaning cylinders of internal combustion engines.** J. W. MELLORES. Brit. 304,923, Feb. 2, 1928. Naphthalene 1–7 oz. and  $\text{Na}_2\text{CO}_3$  0.5–3.5 oz. are used with "petrol" 1 qt., with or without addn. of 1% of "Castrol."

**Detergents.** E. N. QUANCE and L. C. BURCHELL. Brit. 305,273, June 29, 1928. Compds. especially suitable for cleaning the inside of enameled ovens are formed of dispersions of "com." NaOH and finely divided Fe oxide in water or other suitable liquid or pasty vehicle.

**Ornamental surfaces imitating worked metals.** SOC. LUMIFER. Brit. 305,591, Feb. 7, 1928. A compn. of plaster of Paris, glue and metallic oxide such as Pb oxide is applied to wood, cardboard or other material, and finished with a varnish in imitation of metals such as iron, Ag or bronze.

**Imitating marble or other surfaces.** OXFORD VARNISH CORP. Brit. 304,509, March 12, 1928. See U. S. 1,682,067 (C. A. 22, 3971).

**Reproducing designs of material such as wood or marble.** O. A. BERIAU. Brit. 304,524, April 10, 1928. The softer portions of the surface of a material such as wood or marble are etched out of a slab or cylinder of the material and the surface thus prepd. is used as a relief or intaglio printing-surface for direct or offset printing. HCl or  $\text{HNO}_3$  may be used for etching marble and the high portions then rolled up with a resist, and the operations repeated to secure the desired depth of etching.  $\text{H}_2\text{SO}_4$  or  $\text{NH}_3$  soln. may be used for treating wood, followed by treatment with water to expand the harder portions of the surface. The surface is polished and glossed with beeswax.

**Etching printing surfaces.** BEKK & KAULEN CHEMISCHE FABRIK GES. Brit. 304,685, Jan. 24, 1928. Intaglio, planographic or other printing plates are coated with a mixt. of Fe chloride and  $\text{HNO}_3$ . A soln. of I in KI may be used as an addnl. ingredient to clean the metal and to increase its capacity for taking fatty colors. The plates may be prepd. for etching either photographically or by use of a varnish resist.

**Composite sheet material.** H. C. ROHLFS (to British Thomson-Houston Co., Ltd.). Brit. 305,671, Feb. 9, 1928. Sheets such as paper, cotton or linen are cemented together by coating them with a condensation product such as glycerol phthalate or the like in the "B-stage," pressing the coated sheets together under a pressure of at least 1000 lb. per sq. in. at a temp. of 125–40° and thus converting the resin into the "C-stage."

**Sheet material for boxes, etc.** L. RADO. Brit. 305,571, Feb. 7, 1928. Cellulose foil is coated on one side with a metal foil such as Al and on the other side with a cellulose varnish or the like.

**Composite sheet material for making boxes, cartons, etc.** L. RADO. Brit. 305,098, Jan. 30, 1928. Pasteboard is coated with a pellicle of cellulose hydrate, cellulose acetate or the like, which is coated with a water-repellant material such as celluloid and which may be pasted to a thin sheet of paper before being attached to the pasteboard.

**Shoe-stiffening material.** HENRY P. SHOPNECK. U. S. 1,725,598, Aug. 20. A felted material of the water-laid type is formed of a short fibrous pulp mixed with longer fibers, and is impregnated with celluloid.

**Projection screen.** J. E. PALLEMAERTS. Brit. 304,875, May 18, 1928. A base is coated on the back with lead paint and convex lenses are secured to the front by adhesive.

**Projection screens.** J. E. PALLEMAERTS. Brit. 304,913, Jan. 21, 1928. A base material is coated on the back with lead paint and glass pyramids are secured to the front by adhesive.

**Projection screens of tracing cloth treated with paraffin.** SIEMENS-SCHUCKERT-WERKE A.-G. Brit. 304,656, Jan. 23, 1928. Paraffin oil may be used with the paraffin.

**Whalebone bristles for brushes.** GIMMY & DIEPOLD GES. Brit. 305,484, Feb. 4, 1928. To prevent absorption of moisture, whalebone bristles are treated with a varnish, which may be formed by introducing pinic acid resin, silvinic acid and colophony into MeOH and adding vesuvium, or which may comprise MeOH and ruby shellac.

**Brake-shoe filling and lining composition.** JACOB LAEUFER. U. S. 1,724,718, Aug. 13. Finely divided fibrous material such as sawdust or ground straw is used with hydraulic cement, a heat-resisting agent composed of asbestos and a Na compd. such as Na benzoate, blood and casein.

**Vermin-destroying compositions.** I. G. FARBERNIND, A.-G. (Karl Marx and Karl Brodersen, inventors). Ger. 479,409, Dec 22, 1922. Addn. to 430,712. According to Ger. 430,712, water-insol., vermin-destroying compns. are prepd. in a readily dispersible form by pptg. them from suitable solns. together with the org. acids obtainable from fossil fuels by oxidation, etc. This method is now modified by treating the products with alk. reagents, whereby water-sol. products are obtained. Thus, the insol. products may be dissolved in alkali and the solns. evapd., or the necessary amt. of alkali may be added during the process of Ger. 430,712, or the insol. products may be mixed with solid alkali. Examples are given. Cf. C. A. 23, 1730.

## 19—GLASS, CLAY PRODUCTS, REFRACTORIES AND ENAMELED METALS

G. E. BARTON, C. H. KERR

**Economic problems of glass technology.** OTAKAR WEBER. *Chem. Listy* 23, 146 8 (1929).—A discussion.

FRANK MARESH

**The shrinking of glass threads on heating.** IKUTARO SAWAI AND YOSHIHIRO UEDA. *Z. anorg. allgem. Chem.* 180, 287-303 (1929).—Glass threads of the compn 75.00 SiO<sub>2</sub>, 2.83 R<sub>2</sub>O, 6.43 CaO and 15.40% Na<sub>2</sub>O and varying in diam. from 0.316 to 0.031 mm. were heated at various temps. and under various loads. From observations of the rate of elongation or shrinking, viscosity and surface tension could be calcd. by the formula  $-\ln(l_0/l) = [l/(\pi r_m^2 \lambda)] [2\pi r_m \alpha - (m + (M_0/2))]$ , where  $l_0$  is the original length,  $l$  the final length,  $t$  the time,  $r_m$  the mean radius of the thread,  $\lambda$  the coeff. of viscous traction (cf. F. L. TROUTON, *Proc. Roy. Soc.* 77, 426 (1906)),  $\alpha$  the surface tension,  $M$  the weight of the thread and  $m$  the load on the thread. The surface tension varied from about 15 mg./mm. at 600° to about 11 at 800° and  $\lambda$  from  $1.5 \times 10^6$  to  $7.4 \times 10^2$ .

A. C. HIGGINS

**The rational analysis of clays.** A. F. FIOLETOVA. *Keram. Rundschau* 35, 187-9 (1927).—Ignite the clay at about 550° to const. wt., treat the ignited sample (about 0.75 g.) with 50 cc. of 10% HCl over a steam bath in a closed vessel for 10 hrs., filter, wash and treat the residue with 50 cc. of 10% Na<sub>2</sub>CO<sub>3</sub> soln. in a covered Pt vessel over a steam bath for 1/2 hr. The ignition loss is considered as combined H<sub>2</sub>O and is calcd. to kaolin. K<sub>2</sub>O taken into soln. in HCl is calcd. to muscovite mica. The rest of the K<sub>2</sub>O (known from a complete chem. analysis) is calcd. to K feldspar. The difference between SiO<sub>2</sub> found by anal. and SiO<sub>2</sub> required to satisfy H<sub>2</sub>O for kaolin, K<sub>2</sub>O for muscovite mica and K<sub>2</sub>O for feldspar is considered as quartz. Results of control treatments of quartz, muscovite mica and feldspar with HCl and Na<sub>2</sub>CO<sub>3</sub> solns. are given.

H. INSLEY

**Brick and tile clays from the Sudan.** ANON. *Bull. Imp. Inst.* 27, 161-9 (1929).—The results are given of brick and tile-making tests carried out on 11 samples of clays from Sudan.

A. PAPINEAU-COUTURE

**X-ray study of the zonal structure of silica brick from the roof of a basic open-hearth furnace.** G. L. CLARK AND H. V. ANDERSON. *Ind. Eng. Chem.* 21, 781-5 (1929).—The presence of both quartz and cristobalite in unused, burned silica brick was definitely established by means of x-ray studies. After service in an open-hearth furnace silica brick still retained the quartz formation, although there is a greater

tendency toward the cristobalite state in the hotter zones than in the cooler zones.

K. D. JACOB

**Electric selection of kaolin.** SACHIO SAITO. *Bull. Elec. Research Inst., Communications Dept.* (Japan) 220, 1-15(1928).—S. made a suspension of kaolin in an electrolytic soln. and tried to sep. and collect by cataphoresis the kaolin of different dispersities. Korean kaolin was taken and NaOH used as an electrolyte. The charge on the particle depends upon the quantity of the electrolyte in the suspension and the size of the particle, the best condition of the charge being obtained when 10-40% of kaolin is contained in 0.01-0.02 *N* NaOH. The quantity of kaolin collected by the same quantity of electricity depends upon the concn. of the mud and the current density, the current efficiency increasing with the concn. of the mud and decreasing with the current density. A current density of 10-60 ma./sq. cm. was used. With a. c. superposed on d. c. the efficiency increases markedly. Temp. variations between 15° and 30° do not change efficiency. Some expts. on a semi-industrial scale are described.

K. SOMBYA

**Heat requirement and heat distribution in a periodic or a single chambered ceramic oven.** CARL LÖRER. *Sprechsaal* 62, 76-8(1929).

C. H. LORIG

**Rapid methods of analysis in the ceramic industry.** K. PFEFFERKORN. *Sprechsaal* 62, 1-4(1929).—Rapid methods for detg. loss by ignition, loss by evapn.,  $\text{Al}_2\text{O}_3$ ,  $\text{Al}_2\text{O}_3$  and  $\text{Fe}_2\text{O}_3$ , total  $\text{SiO}_2$  and alkalies of ceramic materials are thoroughly described.  $\text{Al}_2\text{O}_3$  is detd. by titrating with 20%  $\text{Na}_2\text{S}_2\text{O}_4$  a weakly acid soln. contg. the sample to which an excess of a mixt. of equal parts of 25% KI and satd. KIO<sub>3</sub> has been added. The  $\text{Al}(\text{OH})_3$  quickly settles and is readily filtered, ignited and weighed.  $\text{Fe}_2\text{O}_3$  and  $\text{Al}_2\text{O}_3$  are detd. by electroanalysis;  $\text{SiO}_2$  is detd. by means of an ultra-filtration method, and the alkalies are detd. by Hildebrand's method, using a Hg cathode and titrating the hydroxide formed.

C. H. LORIG

**The determination of the water solubility of solid material of ceramic earths and products.** OTAKAR KALLAUNER. *Sprechsaal* 62, 19-21, 35-7, 53-6(1929).—The existing qual. and quant. methods of detg. the sol. material of ceramic earths and products are considered from a theoretical as well as from a practical standpoint. Quant. methods which require the sedimentation of suspended particles are time consuming and give, as a rule, high values. Sedimentation is accelerated by addns. of electrolytes, but in this case clear liquids are obtained only after a long time. Methods which provide for the filtration of the soln. through Puhall or Berkefeld ceramic filters give quick and accurate results.

C. H. LORIG

**Causes of fissure formation in pressed porcelain.** C. DORNEDDEN. *Sprechsaal* 62, 409-13(1929).

C. H. LORIG

**The effect on colored melts of additions of zinc oxide, rutile and fluorspar.** ANON. *Keram. Rundschau* 35, 253-5(1927).—To 4 basic glazes, the comps. of which are given, was added 2% of  $\text{CuO}$ ,  $\text{Cr}_2\text{O}_3$ ,  $\text{Fe}_2\text{O}_3$ ,  $\text{CoO}$ ,  $\text{MnO}_2$  or  $\text{Ni}_2\text{O}_3$ . To a second series of the same compn. and with the same coloring oxides was added 2%  $\text{ZnO}$ , to a 3rd 2%  $\text{TiO}_2$  and to a 4th 4% fluorspar. The glazes were applied to an earthenware biscuit and fired under oxidizing conditions. The colors and appearance of the 96 samples thus obtained are described.

H. INSLEY

**The solubility of refractory soda-lime-silicate glazes in hot water as a function of the chemical composition.** W. MÖLLER AND E. ZSCHIMMER. *Sprechsaal* 62, 38-9, 57-60, 78-82, 94-5, 115-6, 133-4, 150-4(1929).—Fifteen melts from the system  $\text{Na}_2\text{O}-\text{CaO}-\text{SiO}_2$  were prepd. and their solubilities in  $\text{H}_2\text{O}$  at 98° detd. Three series of glazes of 5, 10, and 15%  $\text{CaO}$  and varying amts. of  $\text{Na}_2\text{O}$  were used in the expt. Threads of the melt of about 1 mm. diam. were cut into 12 cm. lengths, their ends rounded in a Bunsen burner and the surface area was detd. by measurement. Bundles of 30 to 40 pieces were immersed in  $\text{H}_2\text{O}$  for 3 periods each of 3 hrs'. duration. The  $\text{Na}_2\text{O}$  dissolved was expressed in mg. per 1000 mg.  $\text{Na}_2\text{O}$  per 100 sq. cm. surface. Increasing  $\text{Na}_2\text{O}$  content with const.  $\text{CaO}$  materially increases the soly. of the glaze. The soly. decreases with an increase of  $\text{CaO}$  from 5 to 10%, but with high  $\text{Na}_2\text{O}$  content, the soly. is greater for glazes of 15%  $\text{CaO}$  content than for glazes of 10%  $\text{CaO}$  content. The effect of 1%  $\text{Al}_2\text{O}_3$  on its soly. was detd. for several series of  $\text{Na}_2\text{O}-\text{CaO}-\text{SiO}_2$  glazes.

C. H. LORIG

**Methods of investigating the resistance of refractory silica and grog to the attack of slags or glass fluxes.** OSKAR LECHER. *Sprechsaal* 62, 3(0-2)(1929).—Small cubes of 6 samples of grog were made and burnt at Seger cones 10, 12 and 14. The absorption of  $\text{H}_2\text{O}$  and the slag attack, as a rule, decrease with increased burning temp. Chem. compn., especially the  $\text{Al}_2\text{O}_3$  content, is of little value in judging the resistance of grog to slag and flux attack. As long as the material is refractory, its m. p. has little

influence on the resistance to attack. A mathematical relation between the slag attack,  $H_2O$  absorption and burning temp. is not possible. C. H. LORIG

**Coöperative tests on the determination of reversible and permanent thermal expansion of refractories.** W. MIEHR. *Tonind.-Ztg.* 53, 871 (1929).—Samples of standard brick were sent to four different laboratories employing somewhat different methods. Silica, quartzite and flint clay brick were used. There was very little deviation in the results for the reversible thermal expansion. In the detn. of permanent linear change at  $1400^\circ$  and  $1500^\circ$  the results were very erratic with high results ten times the low results. R. F. FERGUSON

**The use of antimony-bearing opacifiers in the enamel industry.** H. HAUPT AND G. POPP. *Keram. Rundschau* 35, 221-3 (1927).—Expts. are described in which 2 opacifiers contg. Sb (trade names "Leukonin" and "Timonox") were treated with boiling solns. of tartaric acid, AcOH and hard  $H_2O$  to det. the amts. of quinquevalent and of tervalent Sb dissolved. The quantities of tervalent Sb dissolved from enameled vessels using "Leukonin" are too small to be dangerous to health while the amts. of tervalent Sb dissolved from enameled vessels using "Timonox" are so great that such vessels are unsafe. H. INSLEY

Carrying out investigations at high temperatures (COHN) 2. Industrial gas in the United States—growth and trends [ceramics] (LOBELL, *et al.*) 21. A cooling drum for annealing (Ger. pat. 478,937) 1. Annealing (Ger. pat 478,990) 13. Annular kiln for burning tile ware (Ger. pat 478,631) 18.

**Schleifindustrie-Kalender, 1929.** Edited by BERNHARD KLEINSCHMIDT. Düsseldorf: Verlag des Schleifindustrie-Kalenders. 345 pp. Bound, M. 4 50. Reviewed in *Eng. Progress* 10, 224 (1929).

**Glass.** SIEMENS-SCHUCKERTWERKE A.-G. (Karl Donat, inventor). Ger. 478,746, Oct. 18, 1925. A method is described for fusing glass or quartz with metals by the aid of a device delivering a hot reducing or indifferent gas current.

**Apparatus for feeding mold charges of molten glass.** KARL E. PEILER (to Hartford-Empire Co.). U. S. 1,724,678, Aug. 13.

**Method of drawing hollow glass bodies from the molten mass.** LEONHARD BOCK (Ger. 478,583, Feb. 20, 1926).

**Apparatus for drawing sheet glass.** A. BOUFFIOUX Brit. 305,575 6, Feb. 7, 1928. Structural features

**Heat-exchange roll suitable for making plate glass.** CLAUD MOXLEY (to Pittsburgh Plate Glass Co.). U. S. 1,724,676, Aug. 13. Structural features

**Drum for glass working.** SOC. ANON. DES ATELIERS DE CONSTRUCTION ET FONDERIES DE JEUMONT (Anciens établissements Th. Haut). Ger. 478,888, April 20, 1926. Details are given.

**Glass tubing.** P. A. FAVRE. Brit. 304,664, Jan. 23, 1928. Mech. features

**Endless conveyor for glass-annealing leers, etc.** CANNING TOWN GLASS WORKS, LTD., and J. J. PARNABY. Brit. 304,381, April 18, 1928. Structural features.

**Uniting metals to glass.** RUDOLF ENGELS (to C. H. F. Muller Rontgen-Rohren-fabrik). U. S. 1,724,465, Aug. 13. Metals such as Fe, Cu or Mo which are to be fused to glass are preliminarily coated with a lacquer contg. Al and heated to form a thin Al layer on the other metal or the latter may be otherwise coated with Al.

**Porous glass filter.** JENAER GLASWERK SCHOTT & GEN. Ger. 478,560, July 18, 1926.

**Sealing the edges of composite glass sheets, etc.** J. A. WATT. Brit. 305,404, March 30, 1928. A compn. of Pb oxide and glycerol is used.

**Composite sheets of glass and celluloid, etc.** J. A. WATT. Brit. 304,530, May 2, 1928. The surface of glass which is to be joined to celluloid or the like is preliminarily roughened by treatment with dil. HCl or a similarly acting soln. or by sand blasting or like treatment to provide a better bond for the adhesive used to join the materials (which may be an acetone soln. of nitrocellulose). A solvent such as AmOAc and a transparent oil also may be applied to the surfaces to be joined to remove air bubbles and facilitate uniting of the materials. Cf. C. A. 23, 4546.

**Nonsplintering sheets of glass and cellulose derivatives.** GEORGE E. HEYL. U. S. 1,725,454, Aug. 20. The assembled materials are treated with liquid and subjected to suction in a fluid-tight bag to remove gas bubbles before pressing the sheets together.

**Silvering and beveling small mirrors.** BERT F. KELLY. U. S. 1,724,204, Aug. 13.



The edges of silvered sheets of glass are waterproofed (suitably by waterproof paint) and the edges, with the silver thus protected, are then ground to the desired bevel.

**Glass-like opaque material.** PETRUS M. COCHIUS (to N.-V. Glasfabriek "Leerdam," voorheen Jeckel, Mijnsen & Co.). U. S. 1,724,747, Aug. 13. Shaped products such as vases or building blocks are formed from a partially melted batch contg. an excess of sand, before the sand is wholly dissolved in the fusion mass.

**Rolling mill for purifying and opening clay, loam, etc.** CHRISTIAN GIELOW. U. S. 1,725,630, Aug. 20. Structural features.

**Circular multi-chamber kiln suitable for baking bricks or ceramic ware.** OTTO BUSCH. U. S. 1,724,392, Aug. 13. Structural features.

**Tunnel kiln for firing ceramic ware in successive zones of different temperatures.** ARTHUR S. WATTS. U. S. 1,724,238, Aug. 13. Structural features.

**Drier for ceramic wares.** HALVER R. STRAIGHT (to Ethel H. Straight). U. S. 1,724,325, Aug. 13. Structural features.

**Drying ceramic goods.** OSWALD HELLER. Ger. 479,414, June 18, 1925. The goods are heated by a circulating current of hot, damp air until they have attained a suitable temp., and the moisture in the circulating air current is then condensed. App. is described.

**Ceramics.** AUGUST LIEDTKE. Ger. 478,714, May 6, 1928. In the manuf. of earthenware objects, a cooling current of air and steam is blown into the kiln.

**Coloring tiles with use of special composite stencils.** GEORGE W. KRICK. U. S. 1,724,206, Aug. 13.

**Building up fused silica articles by fusing pulverulent silica to preformed masses.** PIERRE H. C. LA BURTHE (to Soc. "Quartz et Silice"). U. S. 1,724,844, Aug. 13. Details are described of a procedure adapted for building up tubes, insulators, etc.

**Fused silica beams.** ROBERT W. CLARK and LESLIE SAMPLE (to Thermal Syndicate, Ltd.). U. S. 1,724,793, Aug. 13. Mech. features of working fused silica ingots are described as is also an app. for this purpose.

**Refractory material.** J. I. BRONN. Brit. 304,492, Feb. 10, 1928. Chromite is used with a binder of the aluminous cement known as "fused cement."

**Refractory material.** KARL F. PEILER (to Hartford-Empire Co.). U. S. 1,724,886, Aug. 13. In making refractory grog suitable for use in making glass-tank blocks, etc., powdered refractory clay contg. only sufficient moisture to serve as a binder is compacted in a mold and the compacted material is fired and ground.

**Refractory retorts.** N.-V. ELECTROCHEMISCHE INDUSTRIE. Brit. 304,694, Jan. 24, 1928. Retorts for treating corrosive mixts. such as oxygenic salts with C and halogens are lined with or made from insol. halides such as  $\text{CaF}_2$  and  $\text{AgCl}$ .

**Heat-insulating refractory materials.** METALLGES. A.-G. Brit. 304,729, Jan. 25, 1928. Mg orthosilicate is used, either as a synthetic product or as a natural product such as olivine, peredolite or dunnite. The material may be used in the form of grains, with a binder and with combustible or other gas-forming materials to increase the porosity of the product.

## 20—CEMENT AND OTHER BUILDING MATERIALS

J. C. WITT

**The fuel question in the cement industry.** O. V. MORCH. *Trans. Fuel Conference, World Power Conference, London, 1928* 2, 898-918(1929).—Efficiency of cement burning figured as the ratio of the theoretical heat needs and actual consumption is about 22%. Because of the use of waste-heat boilers, clinker coolers, etc., efficiency is actually about 67%. From 75 to 140 kw. hrs. of power per metric ton of cement are required. About 25 million tons of fuel (coal, coke, lignite, peat and oil) are used annually in cement plants.

**Manganese in cement clinker, with a discussion of the question of the constitution of cements.** A. GUTTMANN and F. GILLE. *Zement* 18, 500-6, 537-41, 570-4(1929).—In portland cement clinker Mn usually occurs as  $\text{Mn}_2\text{O}_3$  though in cements poor in  $\text{Al}_2\text{O}_3$  it may exist as  $\text{MnO}_2$  also. The soundness of clinker contg. up to 3.3%  $\text{Mn}_2\text{O}_3$  has been proved in practice.  $\text{Mn}_2\text{O}_3$  may be used to add to or replace  $\text{Fe}_2\text{O}_3$  in clinker to secure the high early strengths of special cements. In normal high-Ca clinker  $\text{Mn}_2\text{O}_3$  appears in the heavy, dark-colored constituents in combinations not fully known.

H. F. KRIEGER

**Strength relationships of cements of different binding power.** H. BURCHARTZ. *Zement* 18, 662-6, 693-7(1929).—The cements studied were a normal portland, a high-

early-strength and a special cement. The amt. of  $H_2O$ , kind and amt. of aggregate and the type of curing affected each variety of cement differently. Likewise, the relative values between compressive, tensile and transverse strengths changed. The use of a well-graded sand for cement testing would be better than the standard sand since it approaches more nearly the conditions in practice.

H. F. KRIEGER

**Cement strength and water-cement ratio.** V. PÄHRNER. *Zement* 18, 468-72 (1929).—When the logarithms of the compressive strengths were plotted as ordinates and the  $H_2O$ /cement ratios as abscissas, the lines joining the values at various ages were straight and converging at a point on the ordinate axis. The position of this point was the same for any one cement even with sands of different gradation. Each cement had its own slope though no marked differences were noted.

H. F. KRIEGER

**Lime compounds formed with the constituents of clay during the progressive heating of cement raw meal.** HANS LORENZ AND HANS KÜHL. *Zement* 18, 604-11 (1929).—

Three raw batches covering the usual range in variation of  $CaO$  and of  $SiO_2$  were heated at  $50^\circ$  stages from  $800^\circ$  to  $1500^\circ$ . The formation of lime and its combinations with  $SiO_2$  and  $R_2O_3$  were followed by the methods of White and of Emley. About half of the lime had combined by the time the last  $CO_2$  was expelled from the batch. The compds. poor in lime form first. The  $2CaO \cdot SiO_2$  is formed between  $1000^\circ$  and  $1250^\circ$ . The development of a sintering melt at about  $1250^\circ$  furthers the formation of more complex compds. *Alite* appears to be a solid soln. of  $3CaO \cdot SiO_2$  and  $2CaO \cdot Al_2O_3$  while *celite* consists of  $2CaO \cdot Al_2O_3$  and  $2CaO \cdot Fe_2O_3$ .

H. F. KRIEGER

**Waterglass powder as a cement admixture.** RICHARD GRÜN. *Zement* 18, 192-4 (1929).—Addns. of 5% powd. water glass both in the slowly set. and the quickly set. forms decreased the strength, water-tightness and the resistance to salt and dil. acid soln. in the portland cement mortars observed.

H. F. KRIEGER

**Graphic determination of all practical combinations of more than two raw materials in the preparation of hydraulic cements.** F. W. MEIER. *Zement* 18, 691-3 (1929).—See C. A. 23, 2263.

H. F. KRIEGER

**Graphic determination of the raw material components for portland cement manufacture.** HESS. *Zement* 18, 227-30 (1929).—The use of the tetrahedral system in the graphic calcn. of desired compns. from four components is discussed.

H. F. K

**"Best" composition of portland cement clinker.** ERNST JÄNECKE. *Zement* 18, 288-92 (1929).—Only slight changes have been made in the compn. of portland cement since 1910 in spite of the vast amount of information gained since that time. J. concludes that the "best" compn. is approx. 63.7  $CaO$ , 21.3  $SiO_2$ , 8.0  $Al_2O_3$ , 2  $Fe_2O_3$ , and 5% of other constituents.

H. F. KRIEGER

**Determination of silica in technical portland cement raw mixes with the aid of ultra-filtration.** H. MINDERMAN. *Zement* 18, 124-8 (1929).—The method of Hart (cf. C. A. 21, 3260) is applied to cements and raw mixes by special prepn. of the sample. After grinding the sample is formed into slender rods. These are heated to  $1300^\circ$  to insure the complete conversion of the  $SiO_2$  into silicates decomposable by acids. After cooling and regrinding the 1-g. portions are treated as follows: add 1 cc.  $H_2O$  to the sample in a small beaker, then 3-5 cc.  $HCl$  (sp. gr. 1.19) and mix thoroughly with a glass rod. Warm on the sand bath to break down the gel. Cool, bring up to 50 cc with  $H_2O$  and stir until all lumps are broken. Filter through an ultra-fine filter, washing with hot dil.  $HCl$  and  $H_2O$ . By allowing 45 min. for the filtration the whole detn., including the  $CaO$ ,  $Fe_2O_3$  and  $Al_2O_3$ , can be completed in 3.5 hrs.

H. F. KRIEGER

**Influence of sugar on the setting and hardening of portland cement.** H. W. GONELL. *Zement* 18, 372-6, 437-41, 472-4 (1929).—The normal order of crystal growths and gel formation attending the setting of cement is disrupted by the presence of sugar in the mixing  $H_2O$ . Greater gel formation occurs, giving the specimens much greater vol. changes with variable moisture contents, with the attending physical stresses within the mortar. The normal crvstn. is delayed months in some cases by the solns.  $Ca$  saccharate could not be identified as a constituent in the treated mortars.

H. F. K.

**Bauxite cements.** WALTER OBST. *Zement* 18, 98-9 (1929).—The subject is discussed generally.

H. F. KRIEGER

**Action of chemically active solutions on cement and mortar.** E. PROBST AND KARL E. DORSCH. *Zement* 18, 292-6, 338-42 (1929).—Six kinds of cements and 2 sands were used to make up the test briquets. After 7 days' curing 10 specimens of each kind were immersed in a satd. soln. of  $CaSO_4$ , and 15% solns. of  $Na_2SO_4$ ,  $(NH_4)_2SO_4$ ,  $MgCl_2$  and sugar. The resistance of a high-early-strength cement was least and of an aluminous cement the greatest in the series. Briquets of Rhine River sand (graded) showed less disruption than did those of standard briquet sand. After one year's immersion in the solns. of sugar,  $CaSO_4$  and  $MgCl_2$  practically, all the specimens were intact. The

CaO held in soln. in  $\beta$ -2CaO.SiO<sub>2</sub> is liberated during the hydration process. This CaO is most readily attacked by the salt solns. The development of CaSO<sub>4</sub> crystals was noted in every case where disruption of the test pieces occurred. It was possible to follow the CaSO<sub>4</sub> reaction chemically both in the increased SO<sub>4</sub> content of the specimens and in the alky. produced in the immersing soln. The reduction in tensile strength followed closely the degree of disintegration produced. H. F. KRIEGE

Relation between cement content and curing period in attaining desired concrete strengths. A. GESSNER. *Zement* 18, 129-31(1929).—The cement content in kg. per cu. m. loose aggregates to give desired compressive strengths at 3, 7, 21 and 42 days can be predetd. by the formula  $Z = A/\sqrt[3]{T}$ , where  $T$  is the age in days and  $A$  is a const. depending on the type and gradation of aggregates, water/cement ratio, etc. H. F. KRIEGE

The suitability and economy of a cement kiln. HARRY STEHMANN. *Zement* 18, 256-9(1929). H. F. KRIEGE

Water permeability of paper sacks. CURT PRÜSSING. *Zement* 18, 568-9(1929).—The penetration of moisture through sack paper can be followed by the decrease in fineness of cement contained therein. Also the time required by heated cement to make a phenolphthalein soln. become red through paper is a good index to the permeability of the paper to H<sub>2</sub>O. Colored paper is more pervious than is plain paper. H. F. KRIEGE

Humus and alkalinity. W. DE SHÄRENGRAD. *Zement* 18, 298-9(1929).—In general, cements high in their content of H<sub>2</sub>O-sol. alky. seemed best able to withstand the effect of humus in mortar sands. H. F. KRIEGE

Gypsum or anhydrite as set retarder. A. DAHLGREN. *Zement* 18, 411(1929).—Anhydrite is not a satisfactory substitute for gypsum. H. F. KRIEGE

Gypsum or anhydrite as a set retarder. F. KILLIG. *Zement* 18, 259-60(1929).—The substitution of anhydrite for gypsum was not successful when trials were made on a commercial scale. H. F. KRIEGE

Improved asphalt treatment for concrete piles in sea water. G. F. NICHOLSON. *Eng. News-Record* 103, 95-6(1929).—A brief description of an improved method of asphalt treatment for concrete piles developed by the Los Angeles Harbor Dept. A very dense concrete is obtained by the use of pneumatic hammers on the sides of the forms during pouring. The piles are heated, subjected to vacuum and impregnated with hot asphalt under pressure of 250-300 lb. per sq. in. R. E. THOMPSON

Comparison of the changes in mortar due to drying and rewetting with similar reactions of crystallized zeolites. LEOPOLD JESSER. *Zement* 18, 158-65(1929).—The processes of hardening and vol. change of cement with variable H<sub>2</sub>O content are discussed as colloidal phenomena. Vapor-pressure curves were found to agree well with those of some zeolites, especially heulandite. H. F. KRIEGE

Testing and judging asphalt emulsions for highways. HUGO NOVÁK. *Paliva a Topení* 11, 4-11(1929).—Asphalts made by the cold process have been successful in lab. tests, but the application of the cold process for building use has not begun. The emulsions have been used for repair work primarily and for penetrating macadam. The tests which have been carried out in routine work are: moisture, stability of the emulsion, size and uniformity of the dispersed oil particle, speed of coagulation, adhesiveness, penetrating qualities, org. addn. products and phys. properties of the emulsified resins. FRANK MARESH

Testing of parquet asphalt. HUGO NOVÁK. *Paliva a Topení* 11, 17-20(1929).—Parquet asphalt is a mixt. of resin with finely ground mineral matter, chiefly limestone, which is used as a base for parquet floors in residences. These floors cannot be laid directly upon cement floors but have to be sepd. by the asphalt. An excess of resin is to be avoided; an ideal quantity would just fill all of the air spaces between the ground mineral; this vol. may be computed from the sp. gr. The amt. of resin should not exceed this ideal quantity by more than 10-12%. The m. p. of the mixt. should not be below 50°. An asphalt beam is suspended between 2 supports, and the amt. of deflection is measured for increments of temp. and plotted. A good grade shows no deflection below 35° and a complete bend does not occur below 45°. The deflection test is very simple to make and gives the best criterion by which a suitable asphalt for parquet work may be recognized. FRANK MARESH

Zinc metaarsenite, a (proposed) new American wood preservative. KARL H. WOLMAN AND HANS PFUG. *Ind. Eng. Chem.* 21, 705-7(1929).—The authors investigated the claims of Curtin, *et al.*, with reference to Zn metaarsenite as a wood preservative (*C. A.* 22, 857-8) and were unable to substantiate the claim that the resulting

compd. left in the wood was wholly insol.  $\text{Zn}(\text{AsO}_2)_2$ . Hot and cold water leaching tests of wood treated both in their lab. and by the Curtin-Howe Corp. in U. S. A. showed that the greater part of the compds. remaining in the wood were sol., the results differing little from those obtained with wood treated with sol. Zn and As salts separately. Evapn. of the preservative soln. at room temp. showed that the AcOH concn. increased to the end.  $\text{Zn}(\text{AsO}_2)_2$  was not pptd. even approx. quantitatively; arsenic acid formed which is difficult to sep. by washing. Toxicity test with purified  $\text{Zn}(\text{AsO}_2)_2$  showed no inhibition to growth of *Fomes annosus* even up to 1.0% concn. Reply. LEO P. CURTIN. *Ibid* 707-9.—W. and P. in their tests did not take into account the humidity of the air nor of the water content of the wood before treatment, factors which materially affect the AcOH evapn. and the efficiency of the reaction resulting in the pptn. of  $\text{Zn}(\text{AsO}_2)_2$ . Their failure to get inhibition to *Fomes annosus* even at 1% concn. was no doubt due to not obtaining the proper degree of dispersion of the  $\text{Zn}(\text{AsO}_2)_2$  in the agar gel. An analysis of commercially treated, kiln-dried lumber showed that 50% of the Zn had been changed to  $\text{Zn}(\text{AsO}_2)_2$ . That the reaction will continue with water absorption was shown by adding dry  $\text{As}_2\text{O}_3$  and Zn acetate to water. After 1 month 76% of the Zn was changed to  $\text{Zn}(\text{AsO}_2)_2$ . The soly. of  $\text{Zn}(\text{AsO}_2)_2$  was 25 p. p. m. Even after long soaking in water, crystals of  $\text{Zn}(\text{AsO}_2)_2$  can be seen covering the cell walls of the treated wood fibers. After an exposure of 1 yr. in the Panama Canal Zone "Z-M-A"-treated wood showed neither decay nor termite attack. ALFRED L. KAMMERER

Effect of distillation conditions on the consistence of road tars (CONDURP, SPIERS)  
21. The gasification of fuels by liquid slag producers (DESSEMOND) 21. Cement and bore-hole waters (DEMETYEV) 22. Aqueous medium for cements (Brit. pat 304,355) 26.

**Handbuch für Eisenbeton. Band I. Geschichtliche Entwicklung, Versuche, Theorie.** Lfg. 1. 4th ed., revised. Edited by FRITZ EDLER v. EMPERGER. Berlin: W. Ernst & Sohn. 96 pp. M. 6.80.

**Meddelelser fra Vejlaboratoriet. Nr. 1. Emulsionsbeton** 32 pp. Kr. 1. Nr. 2. **Gebalit.** Copenhagen: Gad. 26 pp. Kr. 1.

**Cement.** RENÉ DECOLLAND. Ger. 479,007, Feb. 10, 1924. See Brit. 211,197 (C. A. 18, 1892).

**Cement.** THOMAS RIGBY. Ger. 478,632, July 24, 1925. A method of mfg cement by spraying wet, crude cement into the chamber of a rotary furnace through a belt of furnace gas is described.

**Cement.** L. PERRIN and B. TUSCHER (to Soc pour l'exploitation des procédés Petrus). Brit. 305,170, Feb. 1, 1928. Finely ground pozzolana or blast-furnace scoria 60-80, portland cement 5-27 and lime 2-22% are mixed to form a cement.  $\text{Na}_2\text{CO}_3$ ,  $\text{K}_2\text{SO}_4$  or  $\text{BaCl}_2$  may be added to adjust the compn. of the pozzolana and "plaster" 1-10% may be added to control the setting.

**Sorel cement composition.** HIRAM S. LUKENS (to Solidon Products, Inc.) U. S. 1,724,945, Aug. 20. Sand and "silex" or other aggregate is mixed with a binder of the Sorel cement type and an emulsion of a material such as an oil is added to and cracked in the cement mixt. (suitably by the action of the  $\text{MgCl}_2$  present).

**Device for preventing the baking-on of cement during burning in a shaft furnace.** LUDWIG SAUER. Ger. 478,531, June 6, 1926.

**Lining cement pipes with bituminous material.** B. E. MONTEUX and P. L. DUK-AND. Brit. 304,288, Jan. 18, 1928. Mech. features.

**Porous concrete.** G. RICHTER. Brit. 305,415, April 25, 1928. Al powder activated by heating with  $\text{HgCl}_2$  so as to decompose water readily is used in concrete mixts. to give porosity.

**Bituminous concrete.** "PRODOR" FABRIQUE DE PRODUITS ORGANIQUES S. A. and MARCEL LEVY. Ger. 479,219, Feb. 13, 1923. See U. S. 1,699,705 (C. A. 23, 1240).

**Special heating and mixing system for preparing bituminous concrete for paving, etc.** WM. H. STANSBURY. U. S. 1,724,687, Aug. 13. An app. and various details of operation are described.

**Bituminous paving compositions, etc.** N. V. KONINKLIJKE STEARINE KAARSEN-FABRIEK GOUDA. Brit. 304,114, Jan. 14, 1928. Mineral aggregate is first treated with linseed oil, petroleum, a petroleum residuum or similar fatty or mineral oil, resin oil, oily acid or similar fatty acid or a solvent such as alc. or xylene, and then treated with a bituminous emulsion.

**Bituminous compositions for roads.** AMESITE ASPHALT CO. OF AMERICA. Brit. 304,226, Oct. 14, 1927. Crushed limestone or other suitable mineral aggregate is coated

with a bitumen-liquefier such as kerosene, naphtha or gasoline, contg. a partly neutralized oil-sol. org. acid such as oleic acid or sulfonated oil partly neutralized with  $\text{NH}_3$ , and the cold aggregate is treated with a heated, normally solid binder such as asphalt, and with lime. Various details are given.

**Gypsum wallboard.** SEWELL L. AVERY, JR., and MORRIS H. BASQUIN (to U. S. Gypsum Co.). U. S. 1,725,243, Aug. 20. In restoring the bond of paper surfacing to a partially calcined or burned gypsum board core layer at its marginal edges, warm boards assembled in piles have their margins moistened to sat. them and to rehydrate the plaster of Paris, and excess moisture is evapd. by the heat retained in the material.

**Multi-ply felted waterproof material.** LESTER KIRSCHBRAUN. U. S. 1,725,645, Aug. 20. Plies of fiber of different characters carry a coalesced film of bituminous material such as asphalt contg. also an emulsifying agent, e. g., clay, extending through each ply, and are united and simultaneously felted during the forming operation. U. S. 1,725,646 specifies a floor-covering material of similar character with an outer ply substantially free from pitchy satg. material but satd. with china-wood oil or other suitable oily material and provided with coloring material and with a design. U. S. 1,725,647 relates to generally similar products made of felted fibrous material which has been treated while in an aq. dispersion with a waterproofing binder such as asphalt which forms a continuous film coating on the fibers.

**Preserving wood.** HANS NEUBAUER. Ger. 479,270, Feb. 20, 1924. Concrete or cement is prepd. with a germicidal aq. soln. and applied in a thin layer to the wood.

**Immunizing wood, grain or other materials against fungi.** I. G. FARBENIND. A.-G. Brit. 304,741, Jan. 25, 1928. The materials are treated with As compds. of dihydroxy-benzenes such as pyrocatechol arsenoxide, pyrogallol As chloride and the corresponding compds. of pyrocatecholcarboxylic acid and pyrogallolsulfonic acid. The prepn. of various of these compds. is described.

## 21—FUELS, GAS, TAR AND COKE

A. C. FIELDNER

Points of importance for an economical comparison of the value of the heat unit in gaseous and solid fuels. HR. ELVERS. *Trans. Fuel Conference, World Power Conference, London, 1928* 2, 81-99 (1929).—The most important factor in any use of fuel is not its calorific value or the quantity of heat required for any process, but the intensity of the heat, or heat d., which is the net calorific value divided by the vol. of waste gases. The flame temp. depends on the speed of combustion, which in turn is dependent on the properties of the different fuels and also on the furnace and burner construction. This rate is much higher for gaseous than solid fuels.  $\text{H}_2$  gives an intense heat because of high speed of combustion and high sp. heat of  $\text{H}_2\text{O}$  vapor from its combustion. A gas with high CO content gives an even heat distribution in the furnace because of slow flame propagation and low sp. heat of the resulting  $\text{CO}_2$ . Temp. is more closely controllable and furnace efficiency is usually higher with gaseous than solid fuels. Other factors are also considered.

ALDEN H. EMERY

The use of gross and net calorific values for the purpose of guarantee tests. N. F. NISSEN. *Trans. Fuel Conference, World Power Conference, London, 1928* 2, 69-80 (1929).—Power plant efficiencies when calcd. on gross and net heating value are compared.

ALDEN H. EMERY

New methods for fuel analysis. BUNTE. *Trans. Fuel Conference, World Power Conference, London, 1928* 2, 467-81 (in German), 481-93 (in English) (1929).—B. believes the ordinary methods of coal analysis do not give enough data. He suggests several addnl. detns. which should be made. Ash m.-p. curves are detd. by heating a cylindrical test piece at a uniform rate in a reducing atm. in an elec. furnace. The subsidence of the sample is graphically recorded by a graphite rod in contact with the upper surface of the sample (cf. C. A. 22, 1457). The results are consistent within 5-8° and provide information not given by cones (cf. C. A. 13, 370; *Gas J.* 1913, 1160; *Glückauf* 1925, 179), rods (cf. C. A. 17, 2947, 3085; 19, 884) or the micropyrometer method (cf. C. A. 7, 1430; *Bur. Standards, Scientific Paper* 198).  $\text{H}_2\text{O}$  should be detd. by the xylene method (cf. C. A. 8, 1656) to avoid loss of bitumen and danger of oxidation. Coke vol. should be detd. by Lessing's swelling test (cf. *J. Gas Lighting* 118, 815, 855) which B. regards as more practical than other tests (cf. C. A. 15, 2172; 16, 2400; *Stahl u. Eisen* 1920, 1278). Kattwinkel's method of detg. coking power (cf. C. A. 20, 1510, 3344) is recommended. Heat of carbonization should be detd. (cf. C. A. 23,

1457, 3035). The coking constituents of coal should be isolated either by extrn. (cf. C. A. 11, 1739; 14, 1424; 16, 622; 21, 2780; *Fuel* 1927, 532) or by sepn. of vitrain, clarain, durain and fusain by sp. gr. (cf. C. A. 22, 3761; 23, 3791). For gas coals, the gas yield and its calorific value can be detd. by Geipert's method (cf. C. A. 21, 106, 813) which will also give data on tar and coke yields. The results are more reproducible than those by Bauer's method (cf. *J. Gasbeleuchtung* 1913, 389). Low-temp. distn. tests should be made (cf. C. A. 14, 3149). The reactivity of carbonized fuels is important. B. favors Koppers method for its detn. (cf. C. A. 19, 2122).

ALDEN H. EMERY

The detection and determination of sulfur in fuels. ŠTANISLAV LANDA. *Chem. Listy* 23, 287(1929).—An aq. soln. of ammoniacal  $\text{AgNO}_3$  detects sulfides, mercaptans and thio acids but is not specific for thiophene in benzene. The Heusler-Engler method gave good results in petroleum but is not satisfactory for detg S in  $\text{C}_6\text{H}_6$ . Soot deposits formed even in great dilns. with  $\text{C}_2\text{H}_5\text{OH}$ . The Lomax modification gave accurate results. The method was shortened by a titrimetric detn.

FRANK MARESH

The testing of gaseous fuels. I. Contribution on technical gas analysis. H. LÖFFLER. *Trans. Fuel Conference, World Power Conference, London, 1928* 2, 284-7 (1929).—App. planned to be simple and inexpensive is described. Strache's "Siccus" is used to det.  $\text{CO}_2$  by which absorption of  $\text{CO}_2$  from a known vol. of air is registered on a manometer calibrated in %. Temp. is measured with a "Thermoscope." The "Gasoscope" is used to locate leaks. It is a small cell, one side of which is a porous diaphragm and the other a metal diaphragm attached to an indicating device. Calorific value is detd. with a "Caloriscope." (Cf. C. A. 22, 1460; 23, 3329.) II. Review of the methods employed for investigation of fuels, firing and gas lighting in the Technical High School, Vienna. W. J. MÜLLER. *Ibid* 288-90.—For works' tests, Bunte and Orsat app. are used; for lab. tests, Hempel's app. is preferred. Absorption pipets used with the Orsat are constructed on Friedrich's spiral principle. The usual absorbents are used—KOH for  $\text{CO}_2$ ,  $\text{Br}_2$  for hydrocarbons (or  $\text{H}_2\text{SO}_4$  in Hempel and Orsat), pyrogallol for  $\text{O}_2$  and ammoniacal  $\text{CuCl}$  for CO. H,  $\text{CH}_4$  and N are detd by fractional combustion (explosion methods give incorrect results).

ALDEN H. EMERY

Domestic fuels other than anthracite. I. Processed coals. F. G. TRVON. *Trans. Fuel Conference, World Power Conference, London, 1928* 2, 319-35(1929).—The briquetting of anthracite culm and bituminous screenings is important only in certain sections of the U. S. Low-temp. carbonization in the U. S. is still insignificant in amt. The quantity of high-temp. coke sold for domestic uses is increasing. Gas heating is expanding. The av. value of by-product coke and its by-products from 1913 to 1926, the gross value of several by-products per ton of coke produced, and the price trends of solid fuels are shown graphically. II. Domestic heating from coals below the rank of anthracite. F. M. SHORE. *Ibid* 335-8.—A brief discussion of the occurrence and properties of the different ranks of fuels below anthracite is given. III. Heating with oil. E. B. SWANSON. *Ibid* 338-47.—In 1927, 26,350,000 bbls. or 5.3% of the fuel-oil production, was used for heating, 43% in the north Atlantic states, 38% in the central states, 17% on the Pacific Coast and the balance in the south Atlantic region. A brief history of the introduction of oil heating and the mechanics of the process are given.

ALDEN H. EMERY

Utilization of liquid fuels for the generation of steam. A. L. P. MARK-WARDLAW. *Trans. Fuel Conference, World Power Conference, London, 1928* 2, 668-91(1929).—M.-W. considers the use of oil for marine fuel. Oil for this purpose should have a flash point of more than 175°F., or 200°F. with low-viscosity oils; less than 0.75% S, 0.5%  $\text{H}_2\text{O}$ , 0.05% acid; viscosity less than 1000 sec. at 32°F. (for ships without heater tanks), 1000 sec. at 70°F. (for ships with heaters); and be free from solid impurities. Methods of burning are discussed.

ALDEN H. EMERY

Alcohol fuels for use in internal-combustion engines. J. C. KING and A. B. MANNING. *J. Inst. Petroleum Tech.* 15, 350-68(1929).—Efficiency with the use of alc. alone as a fuel for internal-combustion engines would require much higher compression ratios than engines are now designed to have. Studies were for this reason undertaken to det. the miscibility of alc. with other fuels. The other fuels chosen for test included representative gasolines and light distillates from coal distn. From test-tube tests the soly. of the gasolines in 95% alc. at  $-10^\circ$  to  $13^\circ$  ranged from very low for Mexican naphtha to very high for gasoline from Borneo oil. Not more than 41% of  $\text{C}_6\text{H}_6$  would combine in stable mixt. with alc. at  $-10^\circ$ ; but any probable com. mixt. would be stable at  $-15^\circ$ . The possible ternary mixts. contg. 50% of alc. and the balance gasoline and  $\text{C}_6\text{H}_6$  are given. Mixts. contg. 50% of  $\text{C}_6\text{H}_6$  were stable in any combination with the other 2 fuels at  $5^\circ$  so far as the  $\text{C}_6\text{H}_6$  was concerned but not as regards the sepn.

of  $H_2O$  from the alc. if the percentage of  $H_2O$  became high. No ternary mixt. contg. 50% of gasoline was practicable. From engine tests it was seen that blended fuels composed of alc.,  $C_2H_6$  and gasoline can be used successfully and efficiently in the present internal-combustion engine merely by enlarging the carburetor jets. Gasoline-alc. mixts. cannot be so used because of the limited and uneconomical mixt. strengths over which smooth running is possible. Thermal efficiency with the blended fuels is not very different from that obtained with gasoline.

EMMA E. CRANDAL

The gasification of fuels by liquid slag producers. A. DESSEMOND. *Trans. Fuel Conference, World Power Conference, London, 1928* 2, 506-17(1929).—A slagging gas producer is fed with a mixt. of shale or screenings and coke-breeze, high in ash, plus limestone and a certain amt. of scrap cast iron. It produces 180-270,000 cu. m. of gas, 60 tons of ingots and 40 tons of slag per 24 hrs. The gas analyzes  $CO_2$  3-4,  $CO$  28-31,  $H_2$  3-5,  $CH_4$  1.5-2.5,  $N_2$  55-60% and heating value 1150-1200 cal./cu. m. The granulated slag, dried by waste heat to 0.5% moisture, is used in making cement. A. H. E.

The bearing of high- and low-temperature carbonization and synthetic fuel processes on Canada's fuel problems. B. F. HAANEL. *Trans. Fuel Conference, World Power Conference, London, 1928* 2, 1-26(1929).—H. discusses Canada's fuel situation with her consuming centers remote from production; the present requirements and how they are met, including the production of coal gas, carbureted water gas, vaporized oil gas, acetylene, coke-oven gas, natural gas and refinery still gas; the production, importation and refining of crude petroleum, gasoline, etc.; and the conditions necessary for the establishment of high- and low-temp. carbonization plants. The profitable operation of plants for low-temp. carbonization depends on a market for the coke residue and the primary tar oils. The compn. of the latter is shown by tables of analyses. Results of the high- and low-temp. carbonization of 6 Canadian coals are compared, the data including analyses of coal and coke; yields of coke, tar,  $NH_3$  and gas; sp. gr. of tar fractions; and heating value of coke and gas. Low-temp. carbonization data are given for hardwood, peat, lignite, sub-bituminous coal and bituminous coal.

ALDEN H. EMERY

The fundamental aspects of combustion. W. A. BONE, G. I. FINCH and D. T. A. TOWNEND. *Trans. Fuel Conference, World Power Conference, London, 1928* 2, 143-85(1929); cf. *C. A.* 21, 2058.—Hea's of combustion, combustion temp. as affected by dissoen. and sp. heats and radiation from flames are discussed. The combustion of C, CO and hydrocarbons is considered (cf. *C. A.* 20, 2414). In the combustion of C there are 3 steps, a "fixation" of O at the C surface, the evolution of oxides of C, and the adjustment of mobile equil. in the reversible system  $2CO \rightleftharpoons C + CO_2$  in consonance with the temp. Presence of steam is not essential to ignition and explosion of  $CO-O_2$  mixts. When undried CO burns, both direct and indirect oxidations proceed simultaneously and independently. The presence of  $H_2$  and steam favors the indirect oxidation. The slow oxidation of hydrocarbons involves successive hydroxylation stages with evolution of heat accompanied by the decompn. of unstable hydroxylated mols. into simpler products which may undergo further oxidation in the same manner (cf. *C. A.* 22, 4236). In flames similar reactions occur. Ignition temps., limits of inflammability, propagation of flame, explosions in closed vessels and the problem of "knock" in gasoline engines are discussed. A homogeneous explosive mixt. of gas and air in proper proportion for complete combustion burns without flame in contact with a granular incandescent solid by a system devised by Bone and McCourt (cf. *C. A.* 21, 522, 1745). Such a system accelerates combustion, concentrates the heat, gives perfect combustion with a min. of air, produces high temp. without regeneration, and gives rapid transmission of heat (on account of a large amt. of radiant heat). Steam-raising efficiencies as high as 92-93% of the net calorific value of the gas have been obtained.

ALDEN H. EMERY

Coal in 1926. F. G. TRYON, O. E. KIESSLING and L. MANN. *Bur. Mines, Mineral Resources of U. S.* 1926, Pt. II, 419-585(preprint No. 29, published Nov. 15, 1928).

E. H.

Chemical constitution and technical quality of Far Eastern coal deposits. B. PENTEGOV. *Proc. 3rd Pan-Pacific Sci. Congr.* 1926, II, 1758-9(Publ. 1928). E. M. S.

Composition of coal. H. ISHIBASHI. *J. Fuel Soc. Japan* 8, 801-13(1929).—A review of methods of studying the compn. of coal. F. I. NAKAMURA

Determination of total sulfur in coal. O. HACKL. *Chem.-Ztg.* 52, 933-4(1928).—In view of the low results given by the Eschka method, especially with coals very rich in S, due to (a) loss of S during the heating up process and (b) incomplete oxidation, the following method is suggested: 1 g. of finely powd. coal, after drying at  $100^\circ$ , is mixed in an Fe crucible with 8 g. of a mixt. of equal parts of Na carbonate and  $KMnO_4$ .

and the whole covered with a further 2-3 g. of the mixt. The crucible is very carefully heated to redness and maintained there for  $\frac{1}{2}$  hr. After cooling, the crucible contents are extd. with 100-150 cc. of hot water, contg. a small quantity of Na carbonate, until free from sulfate. The filtrate is then pptd. with  $\text{BaCl}_2$  after making slightly acid with  $\text{HCl}$ . With coals very rich in S only  $\frac{1}{2}$  g. of coal is taken. B. C. A.

An accurate and rapid method for determining the total sulfur in coal. O. HACKL. *Chem.-Ztg.* 53, 366(1929); F. HUNDESHAGEN. *Ibid.*—Replying to a criticism of Hundeshagen (*Chem.-Ztg.* 52, 1018) Hackl cites considerable literature concerning the manner of carrying out the Eschka method and Hundeshagen repeats his criticism, which Hackl grants, that the latter did not carry out his procedure in precisely the way in which the former recommended. Cf. preceding abstr. W. T. H.

The plasticity of coal: its measurement and its value in the selection of coals for carbonization. J. A. JACKSON. *Gas J.* 186, 863-5(1929).—J. made expts. in specially designed app. M. p. and plastic range are characteristic of the coal. Standard conditions, particularly as regards rate of heating, must be used for comparable results. Oxidation, if carried sufficiently far, renders coal infusible. Partial oxidation by exposure to air does not appear to affect the m. p. but does reduce the plastic range and the expansion. Coals of low plasticity range and small expansion are easily carbonized in vertical retorts, those of high plasticity range and expansion being more suitable for coke ovens. Three stages in the coking of coal are: preliminary period of water elimination, plastic period of fusion, rapid decompn. and solidification, final period of shrinkage of mass, and elimination of gases contg. increasing amounts of H. Also in *Gas World* 90, 715(1929). J. B. CARPENTER, JR.

Coal resources of the Philippine Islands. LEOPOLDO A. FAUSTINO. *Proc. 3rd Pan-Pacific Sci. Congr.* 1926, II, 1748-52(Publ. 1928). B. M. SYMMES

Coal carbonization in Japan. YOSHIKIYO OSHIMA. *Trans. Fuel Conference, World Power Conference, London, 1928* 2, 426-36(1929).—O. gives a brief history of the coke industry in Japan, discusses the reactivity of 3 coke samples, and shows the availability of low-temp. tar as fuel oil. ALDEN H. EMERY

Progress report on low-temperature carbonization projects in the United States. ANON. *Proc. Am. Gas Assoc.* 1928, 1200-11. E. H.

Progress report on low-temperature carbonization projects in Europe. ANON. *Proc. Am. Gas Assoc.* 1928, 1211-6. E. H.

The present state and significance of the distillation of coal at low temperatures. R. VONDRÁČEK. *Chem. Listy* 23, 283-7, 310-2(1929).—Most of the tars are liberated below  $450^\circ$  in brown coal and below  $500^\circ$  in black coal. The gases are removed as rapidly as possible and contact with heated walls is reduced to maintain the original compn. of the gases. A contact with heated walls brings about pyrogenic changes. Raising the temp. very gradually, a long distn. period and a decreased pressure were not effective in improving the process. FRANK MARESH

Development and condition of the (low-temperature) coal-distillation industry in Germany. R. HEINZE. *Chem. Fabrik* 1929, 249-53, 288 90, 287 8, 306 9, 315 8, 345-7, 352-5.—An illustrated review. J. H. MOORE

Bussey Coal Distillation Company, Ltd. ANON. *Ind. Chemist* 5, 327-31(1929). E. H.

Hydrogenation of Eocene coal. J. VARGA. *Chem. Folyóirat* 34, 65-76(1928).—A dried and pulverized Hungarian Eocene coal of Tata was hydrogenated without addition of tar.  $\text{Fe}_2\text{O}_3$  (15%) was mixed with the coal both to catalyze the hydrogenation and to produce gases free of  $\text{H}_2\text{S}$  and oil low in S (0.22-0.28%). There was obtained a yield of 16.8-57.9% on the pure coal of an oil of d. 1.002-1.066. Best oil production was attained by heating for 1 minute only. Relative quantity of H, temp. and time of heating influenced both the quantity and the quality of the oil. The largest oil yield (57.9%) was obtained from 300 g. coal at 100 atm. and  $470^\circ$ . S. S. DE FINÁLY

Low-volatile coals. E. K. REGAN. *Power Eng.* (London) 24, 276-7, E. I. S. No. 29-22694(1929).—R. discusses the advantages of sized low-volatile coal with special reference to smoke prevention and efficiency. H. C. PARISH

Low-grade coal for blast-furnace coke. TSURUO NODA AND TAIZO KURODA. *Trans. Fuel Conference, World Power Conference, London, 1928* 2, 1131-50(1929).—Japanese coals are of low grade, producing a porous, friable coke. Low or medium volatile coal is usually mixed with high volatile coal, which reduces the porosity but increases the strength. About 12% ash in the coal after washing (resulting in 18% ash coke) is the most economical. Rapid coking seems to be most profitable. Froth flotation is being used to recover coal from slurry. The developments in blast-furnace design (enlargement in hearth, increase in bosh angle, etc.) have caused an enormous



increase in pig-iron production per unit vol. of furnace. Analyses of 5 Japanese, 4 Chinese and 1 Russian coals carbonized in Japan show the following ranges in compn.: ash 5.44-20.54, volatile matter 17.52-50.36, fixed C 42.11-67.85, S 0.143-3.92, N 0.59-1.63, C 62.73-75.64, H 3.79-5.5, O 6.42-15.54 and heating value 5942-7290 cal. Analyses of various coal mixts. usually charged show a rather const. compn.: ash 10.2-11.49, volatile matter 31.1-32.74, fixed C 51.92-56.44, S 0.52-0.73 and N 0.92-1.18. Results of washing tests are given.

ALDEN H. EMERY

**Methods for making preparations from fossil coals and bituminous shales for the purpose of their examination by microscope.** M. ZALESKII. *Izvestiya teplotekh. Inst* 1926, No. 10, 58-61; *Chem. Zentr.* 1929, I, 333.—Two methods are described. Bituminous coals and anthracites are treated with MeOH shellac soln. and dried. One side is polished with Carborundum, washed and dried. The polished side is glued to the slide by means of Canada balsam, which may be mixed with copal, if necessary. Then the other side is polished with Carborundum and finally with PbO. According to a 2nd method the coals or slates are first treated with 70% alc. KOH or NaOH, then with HF or PhOH. The coals become so soft that they can be easily cut on the microtome. The softened coal is enclosed in celloidin and is cut therein. G. S.

**Use of the Berthelot-Mahler calorimeter.** V. KOSTJEJEV. *Arhiv. Hem. Fum.* 3, 27-9 (1929).—Powd. fuels such as coke, coal, and charcoal may, when not compressible into tablets, be burned in starch capsules, the heat of combustion of which is about 3600 g.-cal./g. A supply of these capsules may be kept in hermetically closed jars.

B. C. A.

**Modern methods for the production and utilization of coal and lignite briquets.** CH. BERTHELOT. *Trans. Fuel Conference, World Power Conference, London, 1928* 2, 518-38 (1929).—Improvements have recently been made in the technic of briquetting by introduction of new methods of feeding presses, alterations in briquet shapes, improvements in fine coal drying and better agglomerating agents. B. describes the carbonization of briquets.

ALDEN H. EMERY

**Drying of lump brown coal.** HERBERT KLINGER. *Arch. Warmewirt.* 10, 265-70 (1929).—In the Fleissner process (C. A. 23, 4553) the coal is dried by high-pressure steam. Part of the water driven out is not evapd, but flows out when the colloid structure is broken. The only gas evolved is a trace of CO<sub>2</sub>. The process is not so successful with weathered coal. One kg. of steam will remove about 1.5 kg. of water.

ERNEST W. THIELE

**Statistics on the economics of the ammonia situation.** ANON. *Proc. Am. Gas Assoc.* 1928, 1145-53.

E. H.

**The gas industry as a source of domestic and industrial energy.** F. W. GOODE-NOUGH. *Trans. Fuel Conference, World Power Conference, London, 1928* 2, 186-92 (1929).—By carbonization about 115 therms per ton of coal are made available as gas, chem. by-products and elec. energy from the combustion of the residual coke, as compared with less than 60 therms from the direct combustion of the same coal. A. H. E.

**The production of gas and the recovery of other products by carbonization in the Vienna Municipal gasworks.** F. MENZEL. *Trans. Fuel Conference, World Power Conference, London, 1928* 2, 310-7 (1929).—Descriptive.

ALDEN H. EMERY

**The manufacture of gas from oil.** J. KEWLEY. *Trans. Fuel Conference, World Power Conference, London, 1928* 2, 437-9 (1929).—K. describes the manuf. of oil gas for enriching or for use in place of coal gas and the Pintsch, Mansfield, Hakol-Zwicky, Dayton and Goldsbrough processes.

ALDEN H. EMERY

**Removing sulfur from gases, and recovery of the sulfur.** GERHARD LORENZEN. *Z. angew. Chem.* 42, 768-73 (1929).—A lecture covering recent progress in extg. S from gas, with special reference to the Petit process, i. e., absorption in alk. carbonate and subsequent liberation of H<sub>2</sub>S by CO<sub>2</sub>; the bicarbonate formed is decomposed by heating and both CO<sub>2</sub> and alk. carbonate are re-used.

W. C. EBAUGH

**The properties of gases defining their combustion.** W. BERTELSMANN and F. SCHUSTER. *Trans. Fuel Conference, World Power Conference, London, 1928* 2, 291-309 (1929).—A presentation of data (mostly tabular) on calorific values of 8 important gaseous fuels, their air requirements for combustion, the vol. and compn. of their combustion products, flame temps., ignition temps., and rate of ignition. A. H. E.

**Determination of the specific gravity of gas with the Bunsen-Schilling apparatus.** L. ZIPPERER. *Gas Wasserfach* 72, 690-2 (1929).—The errors in gas density measurement with the Bunsen-Schilling app. due to moisture in the gas are calcd. and found to be normally less than the exptl. error in such detns. Changes in design of the app. to permit more accurate readings are suggested. These are: constricting the inner

glass cylinder at the calibration marks and the use of a pointer instead of the usual etched ring.

R. W. RYAN

A systematic classification of technical gases. GESELLSCHAFT FÜR WÄRMES-  
WIRTSCHAFT, WIEN. *Trans. Fuel Conference, World Power Conference, London, 1928 2*,  
269-73(1929).—A table is given classifying and giving data on gases under the follow-  
ing headings: source (from solid or liquid combustibles, natural gas or non-combustible),  
process, general nature of gas, particular nature of gas ( $H_2O$ , producer, blast-furnace,  
etc.), calorific value, and remarks on methods of production. ALDEN H. EMERY

Atmospheric-pressure burners for natural gas. T. NIEMCZYŃSKI. *Trans.*  
*Fuel Conference, World Power Conference, London, 1928 2*, 1122-30(1929).—The fac-  
tors influencing the behavior of air-pressure gas burners are discussed and formulas  
developed. The effects of the dimensions on the firing rate, the air feed and the ve-  
locity of flow of the mixt. from the burner are considered. The agreement between  
the plotted curves and exptl. results is good. ALDEN H. EMERY

Estimation of heat losses when employing natural gas as boiler fuel. WIKTOR  
WIŚNIEWSKI. *Trans. Fuel Conference, World Power Conference, London, 1928 2*, 705-  
11(1929).—W. discusses equations for measuring heat losses in flue gases. A. H. E.

Contents of nitrogen in natural gas. O. HACKL. *Neftyanoe Khozyaistvo* 16,  
274(1929); *Intern. Z. Bohrtech.* 1928, 65.—The N content of natural gas was found in  
some cases to be as high as 99.9%. The presence of elementary N is explained by de-  
compn. of nitric compds. The Dumas method gave quant. results, the Kjeldahl  
method is not recommended. A. A. BOEHLINGK

Gas from brown coal. FRITZ FRANK. *Z. angew. Chem.* 42, 773 6(1929).—  
Elaborate arrangements of app. for the study of coal distn. under most varying con-  
ditions are described, and the nature of investigations undertaken is explained. That  
the ash contains finely divided materials active as catalysts is pointed out, thus lead-  
ing to the formation of different types of compds. with alterations of pressure and temp.

W. C. EBAUGH

Coke-oven gas. (Detection and determination of nitric oxide and nitrogen peroxide  
in coke-oven gas.) P. SCHUFTAN. *Z. angew. Chem.* 42, 757-60(1929).—In s.p.g. coke-  
oven gas into its components by the Linde (low temp.) process oxides of N were found.  
It appears that NO gets into the coke-oven gas from bench (producer) gas when the  
vacuum is high, and that in the presence of  $O_2$  this oxidizes to  $NO_2$ . The compressed  
gas, freed from  $H_2S$ , is treated with *m*-phenylenediamine in AcOH soln., and the  $NO_2$   
detd. colorimetrically with an accuracy of 0.01-0.05 part per million. With a modifica-  
tion of the above method NO in coke-oven gas was oxidized to  $NO_2$  by adding 30-50%  
 $O_2$ , and then found in amts. from 1 to 30 parts per million. Correction curves and  
results are appended. W. C. EBAUGH

Separating coke-oven gases into their individual components and utilizing them.  
J. BRONN. *Z. angew. Chem.* 42, 760-8(1929).—Recent demands for substances con-  
tained in coke-oven gas have led to the application of the Linde process for sepg. the  
components and yielding them in a pure condition for the trade. A lay-out of the  
Concordia Bergbau A. G. at Oberhausen is described in detail, with analyses of raw  
gases, intermediate and finished products and the fundamental theories of sepn. in-  
volved. One cu. m. of raw gas contains 485 l.  $H_2$ , 240 l.  $CH_4$ , 120 l.  $N_2$ , 70 l. CO, 20 l.  
CO<sub>2</sub>, 20 l.  $H_2O$  (vapor), 11 l.  $C_2H_6$ , 11 l.  $C_3H_8$  and homologs, 10 l.  $C_4H_{10}$  and homologs,  
10 l.  $O_2$ , 0.5 l.  $C_4H_8$  (vapor) and 0.3 l.  $C_2H_2$ . The liquefaction method of treatment  
gives far more accurate results than any form of analytical procedure, since it seps.  
with certainty even small amts. of a given component; its "sample" is a billion-fold  
larger than that used for analysis. Hydrocarbons with 2 or more C atoms liquify  
above  $-103^\circ$ ; then comes an interval of  $60^\circ$ , and between  $-161^\circ$  and  $-191^\circ$  lie the  
liquefying points of  $CH_4$ , CO and  $N_2$ ; another interval of  $60^\circ$  is followed by the lique-  
fying temp. of  $H_2$ ,  $-252^\circ$ . When the partial pressure of each gas concerned is con-  
sidered it makes the conditions for sepn. even more favorable, especially if compres-  
sions of 10 atms. or more are used. W. C. EBAUGH

The utilization of coke-oven gas by the gas industry. T. P. RIDLEY. *Trans.*  
*Fuel Conference, World Power Conference, London, 1928 2*, 193-211(1929); cf. C. A.  
22, 4773.—To meet the needs of the gas industr., the supply of coke-oven gas must  
be (1) const. as to agreed calorific value, purity and pressure, (2) adequate in amt. and  
not subject to failure and (3) economical in price. The extent to which such gas can  
be absorbed by the gas industry is considered. Tables are given showing the amt.  
of coke-oven gas purchased by 25 English companies from 1920 to 1927, the gas sold  
by the 740 gas undertakings in Great Britain in 1928, and the estd. surplus gas at coke  
ovens. ALDEN H. EMERY

**Report of subcommittee on equipment used in water-gas manufacture.** H. B. YOUNG, *et al.* *Proc. Am. Gas. Assoc.* 1928, 1304-37. E. H.

**Wood-producer gas for the treatment of silver ores.** A. VAN HOEK. *Trans. Fuel Conference, World Power Conference, London, 1928* 2, 919-26(1929).—The Ag ore at Tambang Sawah, Sumatra, is heated in a reducing atm. and then cyanided. Gas produced from wood in 2 down-draft producers is used as fuel and reducing agent. Normal production is 90,000 cu. ft. per hr., heating value 115 B. t. u., av. compn. CO<sub>2</sub> 14-19, CO 6-10, O<sub>2</sub> 0.2-1, H<sub>2</sub> 16-24, CH<sub>4</sub> 2-4 and N<sub>2</sub> 50-55%. Av. daily fuel consumption is 60 cu. m. wood and 6 cu. m. of charcoal. About 55% of the calorific value of the fuel is recovered in the gas. Costs are 0.66 cents per cu. m. of gas. A. H. E.

**Production and utilization of producer gas in industry.** W. M. B. CHAPMAN. *Trans. Fuel Conference, World Power Conference, London, 1928* 2, 1335-54(1929). A. H. E.

**The development of the illuminating gas industry considered from the chemical standpoint.** W. BERTELSMANN. *Z. angew. Chem.* 42, 753-7(1929).—A résumé.

W. C. EBAUGH

**Removal of carbon monoxide from illuminating gas.** HARALD KEMMER. *Gas Wasserfach* 72, 744-51(1929).—Although an insignificant no. of deaths are due to unintentional poisoning with illuminating gas, as compared to other causes of accidental death, the feasibility of removing CO from coal or coke-oven gas by (1) absorption, (2) catalytic processes or (3) fractional condensation, has been studied. CO may be absorbed by acid or alk. Cu<sub>2</sub>Cl<sub>2</sub>, which can be regenerated by heating under a vacuum. High pressures are required for complete removal of CO by this method. An analysis of the cost indicated that this would be about 3.91 pf. per cu. m. of gas (25¢ per M cu. ft.). The sp. gr. and B. t. u. of the gas are altered, but can be restored by adding inert gas. CO may also be absorbed by alkalies, giving formates, but there is but little market for these in Germany. Catalytic processes may be used, such as the hydrogenation of the CO by passing the gas over a catalyst, preferably one composed of active C impregnated with Ni contg. about 18% ThO<sub>2</sub>, which has an optimum temp. of 180-190°. A CO-H<sub>2</sub> ratio of 1:5 is required for quant. conversion to CH<sub>4</sub>. The active C-Ni catalyzer is relatively inert to contact poisons, but on an industrial scale these must be removed by fractional condensation, increasing the cost. This process is too expensive for practical purposes, and the finished gas also requires the addn. of a CO<sub>2</sub>-H<sub>2</sub> mixt. to restore its heating value and sp. gr. to the original values. For this reason K. suggests the oxidation of CO to CO<sub>2</sub> by passing the gas, with steam, over a catalyst such as Fe activated with Cr oxide. The remaining traces of CO are removed by the methanation process previously described, giving a gas with a density and heating value approximating the original gas more than other processes. The final process, that of liquefaction and fractionation, is well known. If the CO is used for heating purposes, a cost of 1.97 pf. per cu. m. of gas (about 12.5¢ per M cu. ft.) may be realized. The cost of the catalytic process would probably be somewhat higher, but no data are available for estg. this. In any case the cost of removing CO from gas is too high to make the process commercially feasible.

R. W. RYAN

**Industrial gas in the United States—growth and trends.** I. Economics of industrial fuel utilization. HENRY O. LOBELL. *Trans. Fuel Conference, World Power Conference, London, 1928* 2, 1181-9(1929).—The value of gas now used as industrial fuel in the U. S. is approx. 1/4 the total value of all industrial fuel. About 25% of the gas sold is for industrial uses. The advantages of gas over other fuels for this purpose are discussed. II. The trend of industrial gas utilization. **Steam generation.** H. W. BROOKS AND GEO. ORROK. *Ibid* 1189-92.—More than 50% of U. S. blast-furnace gas is used in steam raising, producing about 6 billion kw. hrs. annually at 60-70% efficiency. Natural gas used in central stations generates 3 billion kw. hrs. and in other industries an equal amt. The blast-furnace gas is equiv. to about 18 million tons of coal and the natural gas to about 45 million, a total of about 10% of the yearly coal production of the U. S. **The steel plant.** C. W. BERGHORN. *Ibid* 1192-7.—The total amt. of open-hearth steel ingots and castings made in 1926 by an important steel company was produced in the following proportions by the different fuels: producer gas 40.6, tar 10.6, coke-oven gas 3.8, fuel oil 2.7, natural gas 2.7, coke-oven gas and natural gas 13.1, coke-oven gas, tar and fuel oil 3.9, coke-oven gas and tar 16.2, coke-oven gas, natural gas, tar and fuel oil 6.2 and tar and fuel oil 0.2. **Heat treatment of ferrous metals.** N. T. SELLMAN. *Ibid* 1197-9.—The inherent qualities of gas as a fuel can be fully realized in all heat-treating operations. **Heat treatment of non-ferrous metals.** A. M. APMANN. *Ibid* 1199-1203.—Various uses of non-ferrous metals are reviewed and the application of gas heat to their production is discussed. **Food products.** H. O. ANDREW. *Ibid* 1204-5.—About 10% of the total mfd. gas is used in in-

dustrial coking, which is 80% performed by gas. **Ceramics.** HENRY L. READ. *Ibid* 1206-9.—A discussion. **Miscellaneous uses.** J. B. NEALEY. *Ibid* 1209-11. **III. Growth and future trends.** J. P. LEINROTH. *Ibid* 1211-7.—Statistics are given for the consumption of mfd., natural, coke-oven and blast-furnace gas for 1919-27. **Appendix.** *Ibid* 1218-1318.—Pictures and descriptive matter are given which show industrial uses of gas. ALDEN H. EMERY

**Secondary reactions in oxide purification (of gas).** G. W. ANDERSON. *Gas World* 91, 54-5(1929).—Imperfect removal of  $H_2S$  may be due to mech. defects, process defects, chem. reactions and bacterial action. Mech. defects include leaky valves, "channelling," etc. Removal of oil and tar from the gas entering the purifiers and frequent removal of sulfide sludge will prevent contamination of the oxide. A temp. between  $70^\circ$  and  $80^\circ F.$  is necessary for rapid absorption of  $H_2S$  but not sufficient to cause the formation of  $FeS$  and  $FeS_{n+1}$  or the decompn. of org. S compds. yielding  $H_2S$ . Excess alkyl. must be avoided as alkalis, alk. earths and  $NH_3$  also react with  $CS_2$ . The use of bog ore or pitch-pine sawdust will prevent or inhibit  $H_2S$  formation due to bacterial action.  $CuSO_4$  in 1:6000 concn. is a satisfactory bactericide. J. B. C., JR.

**Considerations for the preliminary survey of the theoretically correct gas plant.** FRANK W. STEERE. *Proc. Am. Gas Assoc.* 1928, 991-1027. E. H.

**The material and construction of inflammable gas appliances.** MATAKE KUROKAWA. *J. Soc. Chem. Ind. Japan* 32, 481-8(1929); Suppl. Building 32, 149-52B (1929).—K. investigated the effects of d. and compn. of gas on the rate of flow of gas at the burner orifice, the ratio of air and gas in the gas mixt. just before combustion and the radiant energy emitted. These effects and the speed of propagation of flame and the range of inflammability of gas-air mixt. det. the suitability of gas for a given gas burner to obtain good efficiency. K. also investigated the influence of the quality of radiants used in gas stoves on the amt. of radiant energy emitted, and found that the radiants coated with Pd, Pt, Cu, Fe and oxides of U emitted more radiant energy than those without coating. K. proposed the coating of U oxide most suitable for this purpose because it is not very expensive and so durable that only 1% decrease of radiant energy was observed after a continuous working of 500 hrs. S. OKA

**The principles of flame radiation.** T. LINDMARK. *Trans. Fuel Conference, World Power Conference, London, 1928* 2, 766-70(1929).—Transmission of heat is by convection, gas radiation and flame radiation, of which the latter is the most important. It is made up of chem. radiation and of radiation from min. C particles. With pulverized coal the flame is increased since the particles increase in vol. in burning (up to 8 times) and a porous core of coke remains. ALDEN H. EMERY

**Pressure regulation for high-pressure holders.** E. H. ENANDER. *Proc. Am. Gas Assoc.* 1928, 1473-9. E. H.

**Purification of tar and tar oils.** J. DE KÁRPÁTI. *Chem. Rundschau Mitteleuropa u. Balkan* 6, 11-4, 21-4(1929).—EtOH and MeOH do not dissolve tar or tar oils, but dissolve their impurities. Concd. EtOH dissolves more phenol but the soln. is less pure than when dil. EtOH is used. Forty % EtOH dissolves considerable quantities of phenols under pressure of 4-4.5 atm. and at  $128-130^\circ$ . The  $H_2O$ -alc. phase and the pptd. phenol phase can be sep'd after sedimentation. By simple distn 94% alc. can be sep'd. from the refined oils and 87% alc. from the phenols. The practical loss of alc. is about 0.1-0.2% of the crude oils. Phenols ppt. from the alc. soln. on slow cooling in the order of their acidity, beginning with PhOH. The quantity of extd. phenols depends on the temp. of extn.; their purity depends on the concn. of the alc. The purification of 1 kg. oil requires about 400 cal.; older methods required about 1500-2000 cal. S. S. DE FINÁLY

**Tar and bitumen from the colloid-chemical viewpoint.** H. GROHN. *Teer u. Bitumen* 27, 345-9(1929)—A review. W. A. GALLUP

**Effect of distillation conditions on the consistency of road tars.** C. O. CONDRUP AND H. M. SPIERS. *Gas J.* 186, 856(1929).—There is considerable flexibility in the prepn. of road tars by straight distn. since, with a still in which the time of contact is short, a tar of predtd. consistency may be obtained either by topping off a definite proportion and cooling the residue tar slowly, or by topping off a much larger proportion and cooling the residue tar quickly. Topping to the extent of an extra 4% calcd. on the wt. of the tar gives rise to at least a three- or four-fold increase in the consistency. Increase in primary consistency takes place very slowly below  $150^\circ$ . J. B. C., JR.

**The development of the coking industry.** E. LANGROGNE. *Trans. Fuel Conference, World Power Conference, London, 1928* 2, 494-505(1929).—The quality of coke from blended coals can be improved by compression of the charge, higher temps. and reduction of carbonizing time. High volatile coals are now being blended with

semi-coke from low-temp. carbonization. Improvements have been made in the charging, handling and conveying of coal and coke, methods of heating and fuel economy.

**Economics of coke manufacture in the coking industry.** M. MACKENZIE. *Trans. Fuel Conference, World Power Conference, London, 1928* 2, 108-19(1929); cf. C. A. 23, 264.

**The by-product coke oven as a source of industrial and domestic energy.** C. P. FINN AND R. RAY. *Trans. Fuel Conference, World Power Conference, London, 1928* 2, 100-7(1929).—Uses of coke, coke-oven gas, tar, benzene and  $\text{NH}_3$  are briefly discussed.

**Coke-oven practice and developments in bulk carbonization.** W. H. BLAUVELT. *Trans. Fuel Conference, World Power Conference, London, 1928* 2, 412-25(1929).—B. gives a description of the American coke industry. He includes an extensive statistical summary of the coke industry in 1926, including the by-products.

**Coke screening.** W. S. EDWARDS. *Trans. Fuel Conference, World Power Conference, London, 1928* 2, 229-44(1929).—A general discussion.

**Coke quenching and cooling.** W. COLQUHOUN. *Trans. Fuel Conference, World Power Conference, London, 1928* 2, 120-42(1929).—C. discusses and compares coke quenching with  $\text{H}_2\text{O}$  (wharf, car, tank and remote) and dry (Sulzer app.). He regards the latter as highly preferable because of the const. C and  $\text{H}_2\text{O}$  content which can be maintained, the larger size of coke obtained, lack of corrosion, lower costs of transportation, more regular furnace operation and the large amt. of steam raised as a by-product.

**Use of coke dust in boiler firing.** FR. REUTER. *Gas Wasserfach* 72, 692-5(1929).—Coke dust may be successfully fired as powd. fuel in a boiler burning coke breeze on a travelling grate. Exptl. data and a description of the boiler are given.

**The determination of mineral matter in coke.** K. HRADSKÝ. *Paliva a Topení* 11, 30-2(32-3, French)(1929).—In the incineration of coke the ash gains wt. by the oxidation of Fe  $\rightarrow$  FeO and  $\text{Fe}_2\text{O}_3$  and FeS  $\rightarrow$   $\text{FeSO}_4$  and loses wt. by decompn. of  $\text{CO}_2$ , volatilization of chlorides and decompn. of pyrites. The true mineral content can be detd. from the following schem: mineral matter  $\rightarrow$  (ash + CaO + FeS + FeO +  $\text{Fe}_2\text{O}_3$  +  $\text{SO}_3$ ) in the coke  $\rightarrow$  (CaO + CaS + FeS + FeO +  $\text{Fe}_2\text{O}_3$  +  $\text{SO}_3$ ) in the ash. The analysis is long and involved. The compn. of S in ash depends upon the oxidation of S to  $\text{SO}_4$ . Cokes with a small quantity of S leave an ash free of  $\text{SO}_4$  unless S is present as  $\text{SO}_4$  in the coke; high S in coke leaves an ash rich in  $\text{SO}_4$ . The sulfides in such cokes can be treated with an acid, the  $\text{H}_2\text{S}$  is evolved, and the S in the ash is reduced. The org. sulfides are not the source of  $\text{SO}_4$  in the ash in combination with metals. The increase in basicity does not increase the bound basic sulfate. By adding  $\text{CaCO}_3$  or CaO to the coke, the S in the ash was the same as when this addn. was omitted. By decompn. with HCl, the sulfur as sulfide is evolved and not converted to a sulfate and only the  $\text{SO}_4$  already present is detd. The procedure is: Coke (0.5-1.0 g.) in a porcelain boat is treated in an atm. of  $\text{CO}_2$  with 3-5 cc. dil. AcOH and after drying the coke is ashed at 700-800°. The ashing may be carried out in a porcelain or a glass tube in an atm. of air or O; with O the time for ashing is 30 min. toward the end; the boat is withdrawn and the contents are stirred with a wire and heated again until completely ashed. The ash is reduced with H (dry) from a Kipp flask at 700-800° and is cooled in a H atm. It is advisable to treat the ash again with AcOH (few drops), dry and reduce with H at 700-800°. The ash is weighed immediately. The total time for the detn. is 1½ hrs. With coke rich in FeS the error as compared with the abs. analysis was 0.20%; with coke with small quantities of S, the agreement was 0.04-0.05%. The Fe in coke occurs as elementary Fe or as FeS; the quantity of other compds. is small. The formed oxides of Fe are reduced to metallic Fe by H.

F. M.

Synthetic alcohols. Manufacture of synthetic ethanol and methanol by the mining company of Bethune (DAMM) 10. Disposal of phenol wastes from by-product coke plants (SPERR) 14. The fuel question in the cement industry (MORCH) 20. Northward extension of the Sheridan coal field—Big Horn and Rosebud counties, Montana (BAKER) 8. The cracking process—a universal source of motor fuel (EGLORF) 22. Mineral and tar oils (Brit. pat. 305,553) 22. Device for sorting and grading coal and coke (Ger. pat. 478,721) 9. Cracking coal-distillation products (Brit. pat. 304,316) 22. Heating coal and charcoal to effect drying, heating, cooling or distillation (Brit. pat. 305,106) 13. Acids, alcohols and hydrocarbons from waxes (Brit. pat. 304,150) 10.

HINZ, FRITZ: Über wärmetechnische Vorgänge der Kohlenstaubfeuerung unter besonderer Berücksichtigung ihrer Verwendung für Lokomotivkessel. Berlin: J. Springer. 76 pp. M. 7.50. Reviewed in *Eng. Progress* 10, 190(1929).

ROSIN, P. AND FEHLING, R.: Das It-Diagramm der Verbrennung. Berlin. V. D. I. Verlag. 32 pp.

**Fuel.** LESTER KIRSCHBRAUN. U. S. 1,725,198, Aug. 20. Comminuted coal is mixed with an emulsion contg. an argilliferous emulsifying agent and bituminous material and the emulsion is then broken down (suitably by removal of water) to cause the adhesive agent to form with the coal an agglomerated mass suitable for making briquets.

**Composition fuel.** H. NIELSEN and B. LAING. Brit. 304,812, Oct. 26, 1927. Granular or powdered material such as coal or coke is caused to fall in a finely divided stream through a chamber in contra-flow to an atomized stream of a liquid coating or impregnating material such as heated pitch. The temp. at the lower part of the treating chamber is preferably such as to revaporize surplus liquid. Various details of app. and procedure are described.

**Agglomerating carbonaceous materials.** J. S. MORGAN. Brit. 305,051, July 29, 1927. Coke and the vapor of a high b. p. oil may be introduced into a rapidly revolving cylinder in which the materials are subjected to centrifugal force and may be removed continuously or intermittently and broken up. Various modifications of procedure also are described among which is the use of binders which polymerize or condense such as phenolic substances sprayed in an atm. contg.  $\text{CH}_2\text{O}$ , or a soln. of pitch.

**Hydrocarbon derivatives containing oxygen or sulfur.** I. G. FARBENIND. A.-G. Brit. 305,603, Oct. 6, 1927. Difficultly condensible hydrocarbon mixts., especially those of low mol. wt. up to  $\text{C}_6\text{H}_{12}$  which may be obtained by the destructive hydrogenation of carbonaceous materials, are treated with gases contg. O or S such as  $\text{CO}_2$ , steam, air or  $\text{H}_2\text{S}$ , at temps. of 500–800° and preferably in the presence of catalysts such as  $\text{MnO}_2$ , V, Mo or Cr oxides, Mn sulfide, alumina, active C or silica, elements and compds. of groups 1 and 2 of the periodic system or their mixts. with or without use of pressure. Among the compds. which may be obtained are HOAc and its homologs, ketones, acetaldehyde, alcohols, butadiene, butylene, propylene, thiophene, etc. Details are given Cf. C. A. 23, 3796.

**Destructive hydrogenation.** I. G. FARBENIND. A.-G. Brit. 304,343, Oct. 17, 1927. In effecting destructive hydrogenation of coals, tars, oils, etc., or low-temp. carbonization of coal, in the presence of gases, the gases and vapors are maintained at a higher rate of flow in the reaction space than they would have by being merely passed through the reaction chamber, e. g., by setting up a pulsating or oscillating movement of the gases by the action of a piston (in an app. which is described).

**Destructive hydrogenation.** R. T. HASLAM and R. P. RUSSEL (to Standard Oil Development Co.). Brit. 304,301, Jan. 19, 1928. Carbonaceous materials such as oils or coal suspensions are converted into hydrocarbons of low b. p. by intimate contact with H at high temps and pressures in a reaction zone to which a portion of the treated material is returned after being withdrawn and reheated. Catalysts such as metal oxides are preferably used. An arrangement of app. is described.

**Destructive hydrogenation, etc.** I. G. FARBENIND. A.-G. Brit. 304,404, Nov. 5, 1927. Oils are recovered from the oil-bearing residues of the destructive hydrogenation of coal, tars or mineral oils or the residues from the extrn. of coal under pressure by benzene. These residues are mixed with coal dust, sawdust or the like, and oils from the residues are obtained mixed with the oils from the powdered fuels and are suitable as a "pasting medium" for destructive hydrogenation. Coke ash or clinker may be added catalytically to promote the formation of low b. p. hydrocarbons or to loosen the starting material. Cf. C. A. 23, 4050.

**Hydrogenation of coal, etc.** I. G. FARBENIND. A.-G. Fr. 34,048, Sept. 13, 1927. Addn. to 617,504. Gases contg. hydrocarbons are partially decomposed by  $\text{CO}_2$  with or without steam or gases other than O. and used for the hydrogenation of coal, tars, mineral oils, etc. Thus a gas contg. 30–40%  $\text{CH}_4$  obtained by treating coal, tars or mineral oils with H at a high temp. and under pressure is mixed with  $\text{CO}_2$  and passed through a heated vertical furnace contg. a Ni catalyst. The resulting gas contains CO 31.4, H 66.2,  $\text{CO}_2$  1.1 and N 1.3%. The CO content of this may be converted by steam to H and  $\text{CO}_2$  before use for hydrogenating.

**Sifting and washing device for coal and other fuel.** HEAD, WRIGHTSON & Co., LTD., ROBERT S. BENSON and HENRY CLARK. Ger. 478,943, July 8, 1928. Addn. to 422,594.

**Drying or destructive distillation apparatus.** LUDWIG HONIGMANN. Ger. 469,503,

Apr. 5, 1927. Addn. to 466,925. The app. of Ger. 466,925 (C. A. 23, 3131) is modified by securing the conductive plates directly to the drum, which is rotated. Cf. Ger. 472,032 (C. A. 23, 3832).

**Apparatus for withdrawal of smoke and fumes from intermittent carbonizing-apparatus.** N. J. BOWATER, A. H. LYMN AND CHAMBER OVENS, LTD. Brit. 304,859, Nov. 7, 1927. Structural features.

**Oven and associated apparatus for carbonized briquets.** W. E. TRENT (to Trent Process Corp.). Brit. 304,284, Jan. 18, 1928. Structural features.

**Binder suitable for use with fuels in making briquets, etc.** STANLEY W. CARPENTER and GERALD N. WHITE (to Pulp Binders Development Co., Ltd.). U. S. 1,724,393, Aug. 13. Soft vegetable tissue such as grass is subjected to the action of a natural aerobic fermentation agent until fully rotted (the material being moistened during the fermentation) and the mass, contg. the fermentation products other than gases, is treated with 1-5% of an alkali such as  $\text{Na}_2\text{CO}_3$  to produce a structureless slime having strong agglomerative properties.

**Briquetting porous materials.** JULIEN PETITPAS. Ger. 479,157, Nov. 10, 1925. Materials such as sawdust, shavings, charcoal and coal are briquetted by means of a mixt. of a binder and a gel, the mixt. being ground with the material so that the particles of the latter become surrounded by the gel. The gel may be prepd. from albuminous, cellulosic or starchy material, vegetable mucilages, etc. Numerous details are given. Cf. C. A. 20, 1313, and Brit. 242,605 (C. A. 20, 3786).

**Apparatus for removing oil and fat from the hot chamber of a steam-heated coal-drying device.** LOTHAR WOLF AND KARL KUNZE. Ger. 478,637, July 1, 1927.

**Method of and means for cooling and after-drying dried lignite.** GOTTHILF SEITZ. Ger. 479,158, Sept. 15, 1926.

**Metallurgical carbon.** CARBONISATION SOC. GÉNÉRALE D'EXPLOITATION DES CARBONES. Brit. 304,676, Jan. 24, 1928. The process of producing metallurgical C described in Brit. 288,551 (C. A. 23, 676-7) is modified by starting with coked or uncoked lignite, peat or other carbonaceous material; this is crushed to small pieces, treated with a bath of  $\text{NaOH}$  or  $\text{KOH}$  to remove S, and distd. to drive off tars, and the dried treated mass has incorporated with it a nitrate or borate of Na, K, Ca, Ba, Sr, etc., proportionate to the S and P content of the material to be treated. The S content is converted into sulfate which is washed out. Distn. may be effected in a stream of N and water vapor to remove tarry substances without coking.

**Treating peat preparatory to expression of water.** A. TEN BOSCH. Brit. 304,329, Jan. 19, 1928. Elec. osmosis may be used to break down the colloidal condition of the peat surface by passing a c. between electrodes inserted in the material. Acid treatment of the perforated peat may be used for the same purpose, and the peat may be squeezed between steam-heated perforating plungers of a heated press.

**Montan wax.** I. G. FARBENIND. A.-G. Brit. 305,552, Sept. 5, 1927. Crude or deresinified montan wax is bleached and largely hydrolyzed by treatment at 100-130° with a compd. of high-valent Cr such as  $\text{CrO}_3$  and with at least 5 times its quantity of a 30-70% inorg. acid soln. such as  $\text{H}_2\text{SO}_4$  and  $\text{H}_3\text{PO}_4$ . Various details are given.

**Gasifying bituminous coal.** JOHN M. RUSHY (to U. G. I. Contracting Co.). U. S. 1,725,739, Aug. 20. In effecting complete gasification in a single vessel, a descending fuel bed is maintained with uncarbonized coal at its top and with a supporting layer of coke at its bottom; the coke layer is air-blasted upwardly to establish a bottom hot zone across the entire horizontal area of the coke, and a second air-blast is used to establish a second and upper hot zone in the coke immediately supporting the uncarbonized coal; the blast gas is excluded from the uncarbonized coal; and blue water gas is then generated by steam-blasting the coke at the lower hot zone; the blue water gas thus formed is forced upwardly through the upper hot zone where it is highly heated and is then passed upwardly through the superposed coal to effect its carbonization. An app. is described.

**Rich gas from bituminous fuel.** METALLGES. A.-G. Brit. 304,760, Jan. 26, 1928. The fuel is distd. and the residue is gasified with a gas mixt. contg. O and such a high proportion of steam that most of the C in the fuel is converted into  $\text{CO}_2$  and the H content of the resulting gas exceeds the CO content.  $\text{CO}_2$  is removed from the gas before use. The O used may be sprayed with hot water used for cooling the rich gas, or steam for further use in the process may be generated from this cooling water in a vacuum app. and superheated by the semi-coke.

**Gas manufacture.** KARL KOLLER. Ger. 479,030, Sept. 1, 1925. The gasification of caking fuels takes place in a rotary-grate producer having a rotary distn. retort in the producer shaft, the retort being traversed by the producer gases. The improve-

ment consists in operating the plant, in accordance with observations of the temp. in the upper part of the producer shaft, so that the distn. process is completed in the distn. retort. For instance, the rate of rotation of the grate may be varied.

**Gas producer.** HARRY F. SMITH (to Gas Research Co.). U. S. 1,724,525, Aug. 13.

**Gas producer (for heating steam generators, etc.).** T. R. WOLLASTON. Brit. 305,288, Nov. 8, 1927.

**Gas producer.** BAMAG-MEQUIN A.-G. Ger. 479,028, Dec. 2, 1925. In a plant in which coal is distd. and the coke is used for the manuf. of water gas, means is provided for introducing a cooling gas at the bottom of the distn. portion to avoid too high a temp. in the tar separator to which the mixed gases are passed.

**Gas producer.** FRANKFURTER GASGES. and ERNST SCHUMACHER. Ger. 479,029, Jan. 3, 1925. Plant for the manuf. of carbureted water gas is described comprising a gas-producer shaft with means for introducing steam and oil vapor at an intermediate point.

**Gas producer.** NICOLA LENGERSDORFF. Ger. 479,031, Feb. 21, 1926. A fuel distn. chamber coaxially superposed on the gas-producer shaft is heated both internally and externally.

**Gas producer (with improved rotating grate).** GES. FÜR INDUSTRIE-OFFENBAU M. B. H. Ger. 479,033, Apr. 16, 1922.

**Gas producer (with means for upper heating).** NICOLA LENGERSDORFF. Ger. 479,032, Nov. 11, 1924.

**Revolving grate construction for gas producers.** GASTON DIENNE (to Soc. anon. les ateliers mechaniques). U. S. 1,724,461, Aug. 13.

**Gas-producing and oil-recovery plant construction and operation.** F. L. DUFFIELD. Brit. 305,253, Nov. 1, 1927. Pulverized fuel is preheated in air to 200-250° to prevent the particles from sticking together on further heating, and is then distd. in the presence of a combustible gas and is gasified by partial combustion in air and steam. Volatiles from the distn. zone are recovered by condensation and the hot gases are passed through heat exchangers for preheating the air, gas and steam used. Various details of construction are described.

**Apparatus for feeding fuel to gas generators.** THOMAS F. HOLDEN (one third each to Robert D. Weaver and Calvin Vos). U. S. 1,724,402, Aug. 13. Various structural details of a portable sealed magazine-feeding device are described.

**Gas retort.** HEINRICH KOPPERS (to Koppers Development Corp.). U. S. 1,725,148-9, Aug. 20.

**Treating fuel gases.** C. COOPER, D. M. HENSHAW and W. C. HOLMES & Co. Brit. 304,333, July 15, 1927. Crude fuel gas is dehydrated, purified and cooled by contact with concd. solns. of salts such as  $\text{NH}_4$  salts, which absorb water without correspondingly taking up free  $\text{NH}_3$ . An arrangement of app. is described.

**Gas purification.** IMPERIAL CHEMICAL INDUSTRIES, LTD., K. GORDON and J. HUGHES. Brit. 304,345, Oct. 17, 1927. Coal-distn. gases are washed with water and scrubbed with oil to remove tar,  $\text{NH}_3$  and  $\text{C}_2\text{H}_4$  and the clean gas is compressed to, preferably, 250 atm.  $\text{CO}_2$ ,  $\text{H}_2\text{S}$  and S compds. are removed by ammonia liquor and the gas is then treated in a tower with an ammoniacal cuprous salt to effect absorption of CO and  $\text{C}_2\text{H}_4$  and other unsatd. hydrocarbons. The gas is then washed with a high b. p. solvent such as kerosene to remove most of the  $\text{CH}_4$  as described in Brit. 293,138 (C. A. 23, 1479), and, after addn. of gases to adjust the ratio of H to N to 3:1, the mixt is used for  $\text{NH}_3$  synthesis. Numerous details and auxiliary treatments are described.

**Gas purification.** O. W. LUSBY (to W. J. Huff). Brit. 305,026, Jan. 28, 1928.  $\text{H}_2\text{S}$  and org. S compds. are removed from combustible gases by passage at a high temp. (suitably about 450°) over metals or metal compds. such as combinations of Cu, Ag, Fe, Ni, Co, Pb, Sn and Sb or their oxides with metals (or their oxides) of the sixth and seventh groups of the periodic system. Examples are given of the use of Cu with a smaller proportion of Cr or U or both, and various details of prep. the purifying materials are given.

**Revivifying materials used in gas purification.** METALLGES. A.-G. Brit. 304,239, Jan. 17, 1928. Revivification of catalytic or other purifying materials is effected before the material is fully spent. An arrangement of app. is described in which gas purifying material may be revivified with air or O.

**Desulfurizing gas.** ROBERT M. CRAWFORD. U. S. 1,724,909, Aug. 20. The gas is washed with a soln. contg. an alkali metal carbonate obtained from the decomposition of phenolates.

**Catalysts for removing sulfur compounds from gases.** O. W. LUSBY. Brit. 305,027, Jan. 28, 1928. Catalysts are used consisting of metals of the sixth group or



their oxides or hydroxides together with metals of the first to fifth groups or of the eighth group or their oxides or hydroxides; *e. g.*, U may be used with Ce, Cu or Sb; Cr with Ce, Cu or Th; and W or Mo with metals of other groups. A temp. of 200–600° may be used.

**Coal-gas purification.** GEWERKSCHAFT M. STINNES. Brit. 305,545, Feb. 6, 1928. The gas is bubbled through naphthalene oil, tar oil or steam-volatile portions of washing oil at about 100°, cooled to about 0° to effect drying, and the condensed solvent is reused, preferably after sepn. of naphthalene by cooling or distn.

**Purifying coal gas.** GEWERKSCHAFT MATHIAS STINNES. Brit. 304,145, Jan. 14, 1928. After a usual preliminary purification, coal gas is charged with vapors of an oil which is an absorbent of naphthalene and is then cooled to effect condensation of the vapors as a rain which washes the naphthalene out of the gas. Other details also are described.

**Coal-gas plant.** C. OTTO & Co. G. M. B. H. Ger. 477,915, May 3, 1928. App. for utilizing the heat of the distd. gas in a coking furnace for heating water is described.

**Apparatus for saturating coal gas with vapor of xylene or for similar purposes.** R. MEZGER. Brit. 305,089, Jan. 30, 1928.

**Water gas.** BAMAG-MEQUIN A.-G. and O. HELLER. Brit. 304,139, Jan. 12, 1928. An app. is described in which powdered fuel is brought into contact with superheated steam and the heat of the gases generated is recovered for use in the process.

**Water gas.** HUMPHREYS & GLASGOW, LTD. Ger. 478,742, Oct. 9, 1925. A plant for producing carbureted water gas is described.

**Liquefaction system for separation of constituents of complex gaseous mixtures such as water gas, coke-oven gas, etc.** GEORGES CLAUDE (to La societe l'air liquide, Soc. anon. pour l'etude et l'exploitation des procédés Georges Claude). U. S. 1,724,004, Aug. 13.

**Dip-pipes for gas plants.** GAS LIGHT & COKE CO., W. J. B. LEECH, S. HAY and A. E. BURTON. Brit. 304,266, Oct. 18, 1927. Various structural features are described.

**Method for regulating furnaces.** SIEMENS-SCHUCKERTWERKE A.-G. (Wilhelm Gumz, inventor). Ger. 478,955, Nov. 5, 1927. A method of regulating the furnace of a steam plant by adding O to the blast gas is described.

**Device for registering simultaneously both the benzene and gas obtained in a benzene-extracting plant.** RHEIN. ARMATUREN UND MASCHINENFABRIK UND EISENGIESSEREI ALBERT SEMPELL. Ger. 478,686, July 12, 1925. Details are given.

**Distilling oils, tars or other carbonaceous liquids.** A. L. RISPLER. Brit. 305,263, Nov. 3, 1927. The material is passed through a rotary still contg. iron balls or similar crushing material which powders the residue and assists in distn. Steam may be used to facilitate the distn. Various details of the app. used are described.

**Recovering tars from aqueous emulsions.** RUSSELL R. RIPLEY and SIGMUND C. SCHWARZ. U. S. 1,724,222, Aug. 13. A relatively small proportion of a demulsifying agent such as NaOH is added to the emulsion and the mixt. is rapidly heated to the b. p. under atm. pressure; the heating is then continued at a higher temp. under increasing pressure, while preventing vaporization, but without heating to cause substantial cracking of the tar; water coalescence is effected and the tar is sepd. by gravity. An app. is described.

**Coking.** C. OTTO & Co. G. M. B. H. Ger. 478,860, Jan. 1, 1928. A method is described for operating a group of regenerative coke furnaces for varying the heating of the gases. Cf. C. A. 23, 1498.

**Coking.** METALLGESELLSCHAFT A.-G. Ger. 478,982, May 26, 1925. A method is described for producing gas, semi-coke and by-products from bituminous fuel by using O or gases rich in O.

**Vertical coke-oven battery.** J. VAN ACKEREN (to Koppers Co.). Brit. 304,743, Jan. 26, 1928.

## 22—PETROLEUM, LUBRICANTS, ASPHALT AND WOOD PRODUCTS

W. F. PARAGHER

**Petroleum resources of the Philippine Islands.** LEOPOLDO A. FAUSTINO. *Proc. 3rd. Pan-Pacific Sci. Congr.* 1926, II, 1745–8 (Publ. 1928). E. M. SYMMES

**Chemical reactions involved in the refining of petroleum.** S. F. BIRCH and W. S. NORRIS. *Trans. Fuel Conference, World Power Conference, London, 1928* 1, 641–68

(1929).—Washing with soda,  $\text{Na}_2\text{S}$  and  $\text{Na}_2\text{CO}_3$ , the plumbite process, PbS refining, the hypochlorite process, acid washing, cuprammonium sulfate,  $\text{SO}_2$  (Edeleanu process), the Frasch process, anhyd.  $\text{AlCl}_3$  and  $\text{ZnCl}_2$ , bauxite,  $\text{SiO}_2$  gel, fuller's earth and floridin are discussed and the use of each is outlined.

ALDEN H. EMERY

**The composition and chemical properties of Russian oils.** J. ELIN. *Trans. Fuel Conference, World Power Conference, London, 1928* 1, 669-79 (1929).—The oils from the Baku-Grozny field (97% of the total Russian production) are mixed-base oils with low content of S (less than a few tenths of 1%), slight acidity (max. of 0.22 g. per 100 cc. of petroleum), few unsatd. hydrocarbons, extremely low % of aromatic hydrocarbons, and high content of gummy substances. They contain less gasoline than American oils (6.5-17%, final b.  $170^\circ$ , 30% below  $100^\circ$ ).

ALDEN H. EMERY

**Flow of oil through sands.** A. D. ARKHANGELSKII AND M. A. ZHIRKEVICH. *Neftyanoe Khozyaistvo* 16, 163-73 (1929).—A thorough lab. investigation of the extn. of oil from various sands, sand-kaolin mixts. as well as oil sands being used. shows that coarse-grain sand absorbs smaller quantities of crude oil than sand of fine grain. The addn. of 10% kaolin improves by 50% the absorptive properties for oil. Similar oil sands from various fields behave quite similarly. The following conditions exist in the extn. of oil from sands by salt  $\text{H}_2\text{O}$ : (1) The oil flows from the sand; (2) oil and water flow in small quantities, each separately, at certain intervals, (3) water comes off intermingled with a few drops of oil, sometimes with oil layers. The highest recovery of oil was attained when displacing it from sand with a 1% soln. of  $\text{Na}_2\text{CO}_3$ ; blowing with air gave decidedly unsatisfactory results. Not more than 50% of oil can be recovered commercially from sand.

A. A. BOEHLINGK

**Shale and the production of oil from shale.** H. H. HILL. *Trans. Fuel Conference, World Power Conference, London, 1928* 1, 753-62 (1929).—Oil shale is found in Colo., Utah., Ky., Ind., Calif., Wyo., Mont., Nev. and Ore.; it yields 1-90 gals. of oil per ton of shale. Shale oil contains more unsatd. hydrocarbons, less gasoline, more wax and a higher % of N than crude petroleum. The crude oil has a heating value of 18,400 B. t. u. per lb. The Bureau of Mines exptl. plant is described. Oil produced from a Pumpherson retort and oil from an N-T-U retort have the following characteristics, resp.: sp. gr. 0.89, 0.92; A. P. I. gravity  $27.5^\circ$ ,  $22.3^\circ$ ; S 0.66, 0.85%; pour point  $55^\circ\text{F}$ .,  $75^\circ\text{F}$ .; Saybolt viscosity at  $70^\circ\text{F}$ ., 65 sec., solid; at  $100^\circ\text{F}$ ., 47 sec., 112 sec.; gasoline and naphtha 15.9, 8.5; gas oil 30.1, 32.1; nonviscous lubricating distillate 17.1, 10.7; medium—, 8.7; viscous—, 11.3; residuum 10.9, 36.9; C residue of residuum 7.1, 7.1; C residue of crude 0.8, 2.6%

ALDEN H. EMERY

**Investigations in distilling processes of Swedish oil shales.** B. HOLMBERG. *Trans. Fuel Conference, World Power Conference, London, 1928* 1, 680-92 (1929).—A large no. of expts. were made to ascertain the influence on thermal decompn. of rate of heating, final temp., and the size of shale particles. The shale has an approx. compn. of moisture 1.5, C 23, H 2.5, S 6, N 0.5 and ash 67%. The org. compds. in the shale are bituminous and humic substances, the former giving on heating a gas rich in hydrocarbons and  $\text{H}_2\text{S}$ , together with a large amt. of oil, and the latter a gas rich in  $\text{H}_2$  but no oil. The hydrocarbons in the shale oil are a definite class of substances intermediate between the terpenes and the benzene hydrocarbons plus small quantities of satd. aliphatic and purely aromatic hydrocarbons. Considerable amts. of org. S compds. are also present. Results are given of a detailed examn. of a shale oil contg. C 86, H 10, S 2 and phenols 0.2% and with  $d_4^{25}$  0.97, viscosity (Engler) at  $20^\circ$  4.34, at  $50^\circ$  1.75, flashpoint  $21^\circ$  and heating value 10,100 kg. cal. When distd. it gave the following fractions: up to  $150^\circ$  5.3,  $150-200^\circ$  9.9,  $200-300^\circ$  27.4,  $300-365^\circ$  21.0, residue 32.9 and loss 3.5%. The compds. of the aviation gasoline (b. up to  $90^\circ$ ), light shale gasoline (b.  $90-150^\circ$ ), heavy shale gasoline (b.  $150-200^\circ$ ) and shale gas oil (b.  $200-300^\circ$ ) are carefully considered.

ALDEN H. EMERY

**Sakhalin crude oil from Katangli.** S. S. NAMEYKIN AND L. N. ABAKUMOVSKAYA. *Neftyanoe Khozyaistvo* 16, 527-9 (1929).—Three samples of the above oil had the following characteristics: sp. gr. 0.943;  $E_{50}$  viscosity 6.7; excise resins 34%; flash (Martens-Pensky)  $102-126^\circ$ ; cold test below  $-20^\circ$  and S (Eschka) 0.42-0.44%. The Engler distn. gave: initial b. p.  $225^\circ$ , 3-4.5% below  $250^\circ$ , 8-9% below  $275^\circ$ , 19-20% below  $300^\circ$ . A vacuum (20 mm.) distn. of the bottoms gave the following cuts:

144- $204^\circ$  17.53% by weight, 0.8925 sp. gr.,  $E_{50}$  viscosity, 1.14  
204- $250^\circ$  17.71% by weight, 0.9168 sp. gr.,  $E_{50}$  viscosity, 1.70  
250- $322^\circ$  24.26% by weight, 0.9485 sp. gr.,  $E_{50}$  viscosity, 10.62  
Bottoms, 31.11% by weight.

The cuts have a cold test below  $-29^\circ$ . These crude oils do not contain any gasoline

and only the heavier part of the kerosene fraction. They are crude lubricating oils.

**Specific-heat determination of crude oil products at elevated temperatures.** V. I. TRKHOMIROV AND V. P. ZHUSE. *Neftyanoe Khozyaistvo* 16, 74-9(1929).—A calorimeter was placed in a container supplied with liquid of constant boiling point, the hot vapor of which surrounded the calorimeter. An accurately weighed amt. of oil was placed in a Cu vessel, stirred by a helical glass stirrer and heated by an elec. resistance wire. The temp. was measured with a Pt resistance wire. The sp. heat of kerosene distillate was found for the range 26.84° to 144.10° to be 0.4418-0.5936; that for gas oil of sp. gr. 0.8649 from 29.67° to 204.00° to be 0.434-0.6293; that for gas oil of sp. gr. 0.8845 from 24.41° to 196.32° to be 0.4226-0.6367; and that for gas oil of sp. gr. 0.8916 from 24.13° to 221.94° to be 0.4307-0.6603. Complete tables as well as a drawing of the app. are given.

**Bumping of hot crude-oil products containing water.** A. O. YURKOV. *Neftyanoe Khozyaistvo* 16, 362-3(1929).—The bumping of hot crude-oil products in the presence of H<sub>2</sub>O is due to the superheating of the H<sub>2</sub>O phase below the oil. This superheating depends on the wt. of the oil column and its viscosity; it is also influenced by weak soap solns. Superheating can be avoided by the creation of an evapg. surface inside the H<sub>2</sub>O itself; e. g., by introducing porous material that occludes air. A theoretical explanation of this phenomenon is given.

**Carbon monoxide the main factor in crude oil synthesis.** I. M. GARFINKEL. *Neftyanoe Khozyaistvo* 15, 556-8(1928).—A review of various synthetic crude-oil processes.

**Rectification of gaseous products from crude oil cracked in the vapor phase.** M. B. MARKOVICH. *Neftyanoe Khozyaistvo* 16, 67-73(1929).—In the "Blau Gas" process crude oil is cracked in Pintsch retorts in the presence of permanent gases. The cracked gasoline obtained has a sp. gr. of 0.725 and absorbs up to 60% by vol. of gas; it has an av. of 2% C<sub>3</sub>H<sub>6</sub>, 19% C<sub>4</sub>H<sub>8</sub>, some divinyl and butanes, 28% hydrocarbons with 5 C atoms (up to 90% of unsatd. hydrocarbons), 22% hydrocarbons with 6 C atoms (contg. not less than 85% unsatd. hydrocarbons), 17% C<sub>6</sub>H<sub>6</sub> and 12% higher polymers. The gases held by this gasoline are composed of 25% of iso-C<sub>4</sub>H<sub>8</sub> and vapors of higher unsatd. hydrocarbons, 22% divinyl, 45% C<sub>3</sub>H<sub>6</sub> + *n*-butylenes, 4% C<sub>2</sub>H<sub>4</sub> and 2% satd. hydrocarbons. The permanent gases contain 24% unsatd. hydrocarbons, 52% satd. hydrocarbons and 24% H<sub>2</sub> (all by vol.). The Blau gas contained 53.6% unsatd. hydrocarbons, 42.7% satd. hydrocarbons and 3.7 H<sub>2</sub>. It was liquefied and sepd. from the permanent gases.

**Recent advances in cracking.** A. E. DUNSTAN AND R. PITKETHLY. *Fuel Conference, World Power Conference, London, 1928* 1, 693-718(1929); cf. *C. A.* 23, 1498, 3799.—After a general review of cracking, the following processes are described (with sketches): Cross, Dubbs, Holmes-Manley, Jenkins, Tube and Tank, McAfee, Blümner, Bergius, Gyro, Knox and Leamon.

**Cracking.** A. N. SAKHANOV AND M. D. TILICH'EV. *Neftyanoe Khozyaistvo* 16, 223-9(1929); cf. *C. A.* 23, 4559.—When cracking Grozny mixed-base fuel oil at 425° for a short period (about 33 min.) the amt. of gasoline and kerosene formed is not changed materially with increase of pressure up to 40 atm. The production of gas increases and that of heavier distillate decreases with increased pressure. By heavy cracking of Surakhany fuel oil (425° for about 94 min.) approx. 4% more gasoline is obtained at a pressure of 10 atm. than at 20 to 80 atm. When Baku gas oil is cracked at 450° for about 50 min., 2% more gasoline is obtained at 10 atm. than at higher pressures. Grozny paraffin wax with a m. p. of 57° when cracked at 450° for about 65 min. gave a const. yield of gasoline independent of the pressure. The yield of kerosene decreased rapidly between pressures of 10 and 20 atm., but remained stationary at higher pressures. The following totals of fractions boiling below 300° were obtained at the pressures named: 10 atm., 73.7%, 20 atm., 62.5%, 30 atm., 65.4%, 40 atm., 61.3%. The I nos. of cracked gasolines decreased rapidly with the increase in pressure. The aniline points changed in the reverse manner. Cracked gasolines after the removal of unsatd. and aromatic hydrocarbons with 98% H<sub>2</sub>SO<sub>4</sub> gave a lower aniline point in cases where according to the I nos. considerable decrease in unsatd. compds. had been effected. In other cases the aniline point remained more or less stable regardless of the decreasing I no. This indicates that the amt. of naphthenes did not change. Therefore the unsatd. hydrocarbons in gasolines are only partly converted into naphthenes by increasing the pressure. The remainder are evidently transformed into polymerization products. **Recycling.**—Grozny mixed-base gas oil of 0.833 sp. gr. was cracked once, the cracked gasoline taken off and the residue recycled. In the 2 following recycling operations only the gas-oil fraction

was used. The total yield of gasoline, which declined gradually with each recycling, amounted to 55.2% on the original charging stock. Emba gas oil of sp. gr. 0.872 and  $E_{20}$  viscosity 2.23 produced 47.5% gasoline after recycling the gas oil fractions 6 times. The sp. gr. of the distillate increased gradually to 1.135 after the 6th recycling. The duration of cracking had to be increased for both oils for each recycling from 30 up to 95 min. for the Grozny gas oil and from 42 to 160 min. for Emba gas oil. All yields are given in percentage by wt. The proportion of gases formed increases with each recycling operation. The first cracking gave 40–150 l. per kg. gasoline; the 6th recycling produced 1500 l. per kg. gasoline. The sp. gr. of the crude oil products, decreasing after the first cracking, increases in the later operations, which indicates the prevalence of condensation processes in the latter. In the mild first cracking of straight-run products paraffins are broken up and the side chains attached to the aromatic and hydroaromatic hydrocarbons are split off, giving comparatively little gas and practically no coke. In heavier cracking or recycling decompn. of the newly formed simpler aromatic and hydroaromatic hydrocarbons takes place simultaneously with that of the original oils, so that the first ones become dehydrogenated. This reaction is accompanied by the splitting off of side chains at a much lower rate. The high gas yields are, therefore, due to the liberation of  $H_2$  and to the formation of higher hydrocarbons from the sepd. side chains. The accumulation of aromatic hydrocarbons causes the coke formation, which takes place in the condensation processes following. The amt. of unsatd. hydrocarbons decreases with each recycling of gas oil. That of aromatics increases rapidly, finally reaching 100% of the last charge, after the 6th recycling operation. This is proved by the aniline points (below  $-17^\circ$ ). The cracked kerosene fractions when chilled to  $-25^\circ$  solidify into a solid mass consisting evidently for the most part of lower naphthalene homologs. It appears that only 3 recycling operations are justified when working for high yields of gasoline; the 4th, 5th and 6th recycling are of more value for the production of aromatic compds. for other purposes. An independent cracking of gas oil collected from the several recycling operations is recommended, because with increase in the no. of the recycling operations higher cracking temp. and longer period of cracking are required for each following cracking. This could not be effected when using fresh stock with the addn. of the recycled product and the result is lower yields of cracked gasoline.

A. A. BOEHLING

**The cracking process—a universal source of motor fuel.** GUSTAV EGLOFF. *Trans. Fuel Conference, World Power Conference, London, 1928* 1, 763–820(1929); cf. C. A. 23, 963, 1499, 3330, 3335, 3568, 3793.—A comprehensive paper giving in tabular form the results of cracking petroleum oils, coal tars, shale oils, bituminous tars and asphalts, wood tars, vegetable oils, fish oils and peat oils. Data are given for 56 countries on crude-oil production, motor vehicle registration, population per motor vehicle, gasoline consumption, gasoline and kerosene prices and price of fuel oil at the nearest port. Other tabular data given and discussed include crude-oil resources; results of residual oil cracking of 8 typical oils; results of cracking and coking in one operation for 5 oils, summary of cracking results on 20 representative stocks (including sp. gr., yields of different products, pressure and temp.); chem. analyses of 6 cracked motor fuels and comparison with straight-run fuels; properties of furnace or Diesel oil from cracking 8 typical oils; comparison of 5 charging stocks with residual oils from their cracking; yields of gasoline and coke from cracking 3 crude oils, 20 topped crude oils, 29 fuel oils and 15 gas oils; analyses of 11 cokes from cracking; compn. of gas from cracking 21 oils; coal production and resources (by countries); oil shale and shale oil resources; etc.

ALDEN H. EMERY

**New cracking equipment.** ANON. *Azerbejdanskoe Neftyanoe Khozyaistvo* 1929, No. 5, 101.—The Vickers Company intends to improve its cracking equipment in Grozny and Baku by the following modification: The fuel oil is moderately heated in the first coil whereby the gas-oil fraction and a part of the lubricating-oil cut are distd.; a second coil, which is the cracking coil, cracks the bottoms together with the gas-oil fraction, which was also sent through the rectification column for the cracked gasoline. This is the first installation of its kind which is to be built by Vickers. A. A. B.

**Cracking-coil thermal calculations.** S. OBYADCHIKOV. *Neftyanoe Khozyaistvo* 16, 357–61(1929).—By using Sakhanov (Sachanen) and Tilich'ev's data "Cracking in the Liquid Phase," Moscow, 1928 (Russian), the amt. of heat required to crack a given oil at a given temp. for a predtd. yield of gasoline is calcd. The amt. of heat absorbed by the cracking reaction per m. of tube (velocity 1 m./sec.) is expressed by the

$$500G_2 P_{400} 2^{\frac{t-400}{10}}$$

equation:  $Q_{\text{req.}} = \frac{500G_2 P_{400} 2^{\frac{t-400}{10}}}{100}$ , where  $G_2$  is the wt. of stock sent through the

tubes;  $P_{400}$  percentage of cracked gasoline formed at  $400^\circ$  during the passage through one m. of tube;  $t$  the temp. of the liquid in this section of the tube.  $Q_{\text{reac}}$  is plotted against  $P_{400}$  as a function of the velocity of the flow of the liquid in the tubes in m./sec. for 1 sq. cm. of the useful tube surface. The mean temp., etc., difference, can be detd. by using these data and the method of subdividing the temp. curve into  $10^\circ$  sections. In a typical example the formation of 2.6% gasoline on stock subjected to cracking is calcd. When the oil is heated above  $400\text{--}420^\circ$  a much greater quantity of heat is required to effect cracking than in the ordinary stills. This is attained by the increase of the heating surface. Lower heating temps. require larger tubes; higher temps. require smaller tubes.

A. A. BOEHLINGK

The Voltol oil treating process. A. G. ZAKHARENKO. *Neftyanoe Khozyaistvo* 16, 544-7(1929).—A description of the Voltol process and a bibliography are given.

A. A. BOEHLINGK

Treating of light-oil distillates. S. F. BIRCH AND W. S. NORRIS. *Oil and Gas J.* 28, No. 8, 46, 162, 164, 166, 168(1929).—The action of  $\text{H}_2\text{SO}_4$  in removing S compds. from light-oil distillates and in preventing gum formation is described. The special refining uses of cuprammonium sulfate,  $\text{SO}_2$ ,  $\text{CuO}$ ,  $\text{AlCl}_3$ , bauxite, alumina gel, fuller's earth and floridin are stated.

EMMA E. CRANDAL

Improving yields with old stills. YU. AND N. BOGOSLOVSKII. *Azerbeidzanskoe Neftyanoe Khozyaistvo* 1928, No. 10, 49-55.—The throughput of an old gasoline or kerosene stripping battery can be increased 50% and better fractionation obtained either by replacing the first shell still with a tube still connected to a crude oil preheater or by atomizing crude oil preheated by a fuel oil heat exchanger into the first shell still. Similar improvements are recommended for the kerosene distg. unit. Bubble towers must also be provided to insure sharp sepn. of cuts.

A. A. BOEHLINGK

Vacuum distillation of the typical Baku fuel oils. V. GURVICH AND B. KAMINER. *Azerbeidzanskoe Neftyanoe Khozyaistvo* 1929, No. 5, 64-70.—Paraffin-base Surakhany, naphthene-base Balakhany, Sabunchi and Ramany lubricating oil, asphalt-base Binagady and heavy Balakhany and the mixed-base light Bibi-Eibat crudes were stripped of fractions below  $300^\circ$  and vacuum-distd. on a lab. scale at 2.5 mm.  $\pm 0.5$ -mm. abs. pressure. The fuel oil was heated below  $340\text{--}350^\circ$ , corresponding to vapor temps. of about  $300^\circ$  to avoid cracking. The fractions below  $140^\circ$ ,  $140\text{--}180^\circ$ ,  $180\text{--}220^\circ$ ,  $220\text{--}260^\circ$  and  $260\text{--}300^\circ$  were sepd. into gas-oil, solar-oil, spindle-oil, machine-oil and cylinder-oil cuts, making an av., very close for all the oils, of 68% of the fuel oil used. Spindle oil, etc., from a naphthene-base crude required a higher distn. temp. than corresponding fractions from asphalt-base crudes. Practically the same amt. of heat was required for the complete distn. of fuel oils independent of their origin. From 12 to 20% of asphalts suitable for road work could be recovered from the bottoms. A high vacuum is recommended when working for high-quality lubricating oils. Very complete distn. data are given.

A. A. BOEHLINGK

Fluidity of mixed-base fuel oil. N. I. CHERNOZHUKOV. *Izvestiya Teplotekhn. Inst.* 1927, No. 4, 28-32.—The viscosity of mixed-base fuel oil at low temp. was detd. in an app. consisting of a brass container immersed in a thermostat and having a glass discharge tube 300 mm. long and 12 mm. in diam. attached on the side near the bottom. This tube was closed and opened by a plug operated from the inside. The fuel oil was first heated to  $100^\circ$ , chilled, heated again, charged hot into the viscometer and stirred until the thermostat temp. was reached. The time required to discharge 200 cc. was read. Since the movement of the fluid through the tube is such as to come under Poiseuille's law, it may be accepted that the ratio of the abs. viscosity of the material under test at a certain temp. to that at another temp. is equal to the ratio of the 2 times of discharge. The difference in viscosity due to the diminishing pressure of the oil column can be disregarded. This assumption corresponds very closely with the practical results obtained. The following conclusions are based upon the results obtained with Grozny mixed-base fuel oil "V": The viscosity of fuel oil stirred in the viscometer depends on the preliminary heat treatment. Treatment that gave the max. pour point gave also the max. viscosity. The viscosity of heat-treated fuel oil stirred in the viscometer as it approaches the thermostat temp. increases with the fall of temp. considerably faster than that of a fuel oil which was not previously heat-treated. The pour point of a fuel oil which was previously heat-treated from  $40^\circ$  to  $70^\circ$  is between  $17^\circ$  and  $18^\circ$  and its viscosity approaches infinity at  $15^\circ$ , whereas lower and higher heat treatments produce a pour point below  $15^\circ$  and a low viscosity at  $15^\circ$ . The viscosity is also low at  $10^\circ$  for a fuel oil heat-treated at  $20^\circ$  and lower. The freezing curve of a stirred fuel oil indicates its fluidity.

A. A. BOEHLINGK

Fluidity determinations. L. A. SELSKII. *Neftyanoe Khozyaistvo* 16, 552-3

(1929).—Fluidity of Grozny mixed-base crude oil and its products by the Prussian Railroad Method was 15 mm. at 5° for the non-heat-treated and 9 mm. for the oil which was previously heat-treated to 50°. The fluidity of fuel oil at 27° was 9 mm. and 5 mm., resp. At 29° it was 20 mm. and 13 mm., resp. The fluidity of Diesel fuel at -10° and -19° was below zero for heat-treated and non-heat-treated oils in spite of the fact that the Diesel oil had a sp. gr. of 0.862 and that of the crude oil was 0.854. This is due to the absence of paraffin wax in the crude. This method is of primary importance when calcg. oil transmission through pipe lines.

A. A. BOEHTLINGK

Standards for Diesel fuel. N. I. CHERNOZHUKOV. *Izvestiya Teplotekh. Inst.* 1927, No. 9, 78-87.—The Russian standard for Diesel fuel accepted by the Commission for Diesel fuels are as follows: sp. gr. at 15°, 0.855-0.900; flash pt. recommended, 65-110° by Martens-Pensky and limits tolerated, 45-120°; H<sub>2</sub>O not over 1%; mech. admixtures not over 0.3%; S not over 0.5%; recommended limit 0.05% toleration not over 0.10%; acidity (mineral acid) 0.0%; viscosity E<sub>80</sub> not over 5; pour test not over 5°; coke formation not over 2% Conradson, toleration not over 3% Conradson; fractional compn. (Engler distn.) not more than 15% over below 250° and not less than 40% over between 250 and 350°; permissible residue above 350° not more than 45%.

Standards for Gt. Britain, United States, Italy, Roumania and Germany are also given.

A. A. BOEHTLINGK

Cylinder oils from heavy bottoms. L. GUKHMAN. *Azerbeidzyanskoe Neftyanoe Khozyaistvo* 1929, No. 5, 70-2.—When acid-treating heavy lubricating oil bottoms at a temp. of 25-35°, excessive polymerization is avoided by dilg. with gasoil and the polymerization products formed remain mostly in the acid sludge. Light diluents such as gasoline or kerosene dissolve more of the acid sludge and are therefore not recommended. Thus, when Binagady heavy bottoms of 0.979 sp. gr., 280° flash (Brenken), dild. with a dark gas oil of 0.881 sp. gr. and E<sub>80</sub> viscosity 1.63 in the proportion 1:1, giving a product of 0.9296 sp. gr. and E<sub>100</sub> viscosity 2.00, are treated at 20-23° with 15% (3% + 12%) of 92.5% H<sub>2</sub>SO<sub>4</sub> calcd. on the bottoms, 36% of the mixt. acid is acid sludge. After distg. off 55.8% from the sepd. oil layer a heavy greenish oil of E<sub>100</sub> viscosity 7.55 and flash (Brenken) 263° is obtained, which in its properties is close to "Viskozin 7" except for the flash, which is 300° for the latter. The comparatively high viscosity is due to the asphaltic character of this oil product. To obtain a better cylinder stock the bottoms were dild. with gas oil in the proportion 3:2 and treated with 20% (3% + 17%) of a 97.5% H<sub>2</sub>SO<sub>4</sub>. The loss amounted to 51%. When 45.9% of light fractions was distd. off, the concentrate was of a greenish color, sp. gr. 0.9402, E<sub>100</sub> viscosity 5.92, flash 260°, excise resins 32%, C 2.8% and pour test 0°. It amounted to 46% of the bottoms. When only 36.6% of concentrate was left it had the following properties: color greenish, sp. gr. 0.9433, E<sub>100</sub> viscosity 8.02, flash 298°, excise resins 38%, C 3.4% and pour test 6°. When heavy bottoms from Bibi-Eibat crude, sp. gr. 0.959 and 292° flash, were dild. with gas oil 1:1, a mixt. of 0.921 sp. gr. and 214° flash was obtained, which after treatment with 20% (3% + 17%) of a 96% H<sub>2</sub>SO<sub>4</sub> produced a conc. of the following properties depending on the amt. of light fractions taken off: sp. gr. 0.9261-0.9301, E<sub>100</sub> viscosity 4.87-7.35, flash 254-298°, excise resins 22-20%, C 2.7-3.3% and pour test 8-12°. The yield of the concentrate varies between 57.8 and 39.2% of the original bottoms. These oils, while not free from excise resins, are still of superior quality and are the equal of foreign cylinder stocks. With a lower pour test than "Viskozin 5" and flash and viscosity up to the standard, they are suitable for compounding automobile oils. The acid sludge obtained in treating after dissolving in the "solvent," washing out the acid with H<sub>2</sub>O, distg. off the solvent and blowing the org. part of the sludge with air, produced asphalts with the following properties: from the Binagady acid-sludge mixt., softening point Kraemer-Sarnow 41° and 43°, penetration 35-27, ductility above 110; from Bibi-Eibat mixture softening point 45°, penetration 43 and ductility above 100.

A. A. BOEHTLINGK

Utilization of acid sludge from lubricating-oil bottoms. S. N. OBRVADCHIKOV. *Neftyanoe Khozyaistvo* 16, 80-2(1929).—Fifty% of Grozny lubricating-oil acid sludge can be converted into an oil-sol. product suitable for fuel by first sepg. the H<sub>2</sub>SO<sub>4</sub>, partly from the sludge by settling, neutralizing the remaining acid and the sulfonic acids with lime and extg. the oil-sol. part with gasoline at 50-80°. From 17 to 20% of lime, calcd. on the acid sludge, was required. Another method, i. e., conversion of acid sludge into a solid pulverizable product, consists in blowing the acid sludge with air 15 min. at 185-218°, whereby a solid and very brittle product with a softening point of 113° is obtained. The yield is 73%. This product can be used as pulverized fuel or it can be added in any proportion to a fuel to be pulverized.

A. A. BOEHTLINGK

Synthetic gasoline. FERD. MORAVEC. *Chem. Listy* 23, 288(1929).—Synthetic

gasoline is mixed with  $\text{CH}_3\text{OH}$  and a small quantity of  $\text{Fe}(\text{CO})_5$ ; it withstands a high compression and is not self-igniting at high pressures. The antidetonating property is conferred by the  $\text{Fe}(\text{CO})_5$ .

FRANK MARESH

**Gaging and sampling natural gasoline.** P. W. HILL, A. C. LYLES AND P. S. MAGRUDER. *Oil and Gas J.* 28, No. 7, 105-6, 110, 114(1929)

HENNA E. CRANDAL

**Antiknock gasoline by cracking various products at atmospheric pressure.** V. F. GERR. *Neftyanoe Khozyaistvo* 15, 343-51(1928).—The following products were cracked on the lab. scale and at atm. pressure: (1) a mixt. contg. mainly di- and trimethyl benzene and ethyl benzene, (2) the same with Cu turnings as catalyst, (3) Surakhany fuel oil, (4) Baku kerosene distillate, (5) naphthalene fooms, (6) green oil, (7) Surakhany crude oil, (8) gasoline of 0.7736 sp. gr., (9) paraffin wax m.  $60^\circ$ , (10) cracked kerosene ( $150-300^\circ$ ), (11) black gas oil of sp. gr. 0.8705, (12) toluene (grade No. 1). Nos. 4, 7 and 11 were also cracked on the mfg. scale, 3 and 11 in Kvitko's cracking still. No. 1 produced good results when a fraction b.  $122-200^\circ$  and contg. benzenes with 2 or more side chains was used. Toluene was more resistant and formed C on cracking. No. 2 produced more tar than No. 1, forming coke in small plates. No. 6 gave a low yield when recycled. Nos. 3 and 7 behaved similarly to kerosene distillate. No. 9 gave a low yield, explained by the splitting of ozocerite-like hydrocarbons, which form easily cracked paraffin and unsatd. hydrocarbons. No. 10 gave slightly lower yields than normal kerosene; the unsatd. hydrocarbons were readily converted into aromatic compds. Pintsch, Pickering and Krussel app. were used for large-scale production of aromatic compds. The temp. range  $670-700^\circ$  gave the highest yields of aromatic compds, provided the charging rate of oils was kept within certain limits. The gasolines obtained were of high-antiknock quality, contg. up to 25% of aromatic hydrocarbons. About 3 times more gas was obtained in the course of this process than when cracking under super-atm. pressure.

A. A. BOEHTLINGK

**Amyl acetate from aviation gasoline.** A. DOBRYANSKII AND E. GUREVICH. *Neftyanoe Khozyaistvo* 15, 532-59(1928).—The  $\text{C}_5\text{H}_{12}$  cut (about 20%) was sepd from Krasnodar aviation gasoline by an elaborate fractionating app. and redistd. between  $31^\circ$  and  $38^\circ$ , yielding 11.5-12.5% (on the gasoline used) of a product of mol. wt. 69-70.5 and sp. gr. 0.6332. It was then chlorinated in the gas phase in artificial light. The highest yield (35%) of the monochloride, sp. gr. 0.790-0.800, was obtained by heating to  $60-70^\circ$ . Wet Cl increases the formation of polychlorides. The reaction is then exothermic and is accompanied by explosion and sepg. of C. Up to 56-59 parts of monochloride can be obtained from 100 parts of  $\text{C}_5\text{H}_{12}$ . Chlorination of  $\text{C}_5\text{H}_{12}$  in the liquid phase and in the presence of activated C produced only 20% of monochloride. The monochloropentane was esterified with dry Na acetate by heating to  $230^\circ$  in sealed tubes for 4-8 hrs. Yield, about 90% of crude Am. acetate.

A. A. BOEHTLINGK

**Exploitation of a new kerosene battery of the regenerative type (Konstantinovskii refinery).** V. B. PARKHOMENKO. *Neftyanoe Khozyaistvo* 16, 365-76(1929).—Various minor changes were made in the equipment without noticeable improvement in the operation. A detailed description of the plant was given by Zadolin (C. A. 21, 3735).

A. A. BOEHTLINGK

**Action of sulfuric acid on gas from cracked kerosene.** V. F. GERR AND M. M. TIKHOMIROVA. *Neftyanoe Khozyaistvo* 16, 411-4(1929).—Gas from cracking kerosene containing 33.6% of heavy hydrocarbons, 17.4%  $\text{H}_2$  and 49%  $\text{CH}_4$  was led at varying rates (from 9 to 22 min. per 1350 l. of gas), which do not affect the reaction quant., through  $\text{H}_2\text{SO}_4$  in 3 Tishchenko gas-washing bottles cooled in ice water. The gas after this treatment contained 24% of heavy hydrocarbons, 20% of  $\text{H}_2$  and 56% of  $\text{CH}_4$ , the  $\text{H}_2$  to  $\text{CH}_4$  ratio remaining unchanged, while that of  $\text{CH}_4 + \text{H}_2$  to heavy hydrocarbons indicated a lower proportion of the latter after treatment, as the result of the polymerizing action of the  $\text{H}_2\text{SO}_4$ . The  $\text{H}_2\text{SO}_4$  gained 0.3 g. in wt. for each l. of gas conducted through. An oil layer was formed on the acid amounting to 0.0476 g. per l. of gas and having the following characteristics: sulfur 0.03%,  $\text{O}_2$  no. 1.077, I no. 4.3, ash 0.19%, composed mostly of NaCl and  $\text{CaCl}_2$ ,  $E_{20}$  viscosity 2.68, cold test below  $-20^\circ$ , initial b. p.  $135^\circ$ ,  $n$  1.473 and mol. wt. 243. The elementary compn. was C 85.68%,  $\text{H}_2$  13.76%. Technical  $\text{H}_2\text{SO}_4$  recovered from acid sludge was more active than C. P. acid. The oil layer was distd. at a vacuum of 2 mm. and sepd. into 12 fractions. The residue of 15% was composed of 82.9% C and 10.3%  $\text{H}_2$  and formed a film when dried. The  $128.6-158.5^\circ$  fraction (2 mm. abs. pressure) crystd. immediately after distn. The  $68.5-98.5^\circ$  and the  $98.5-128.5^\circ$  fractions also produced crystals after cooling to  $5^\circ$ . The  $99-130^\circ$  fraction (2 mm. abs. pressure) yielded odorless crystals m.  $73-74^\circ$ , d. 0.8626, C 87.96%,  $\text{H}_2$  11.77%, mol. wt. 196 and the empirical formula  $\text{C}_{14}\text{H}_{24}$ . Crystals obtained from the  $115-154^\circ$  cut (2 mm. abs. pressure) m.  $213^\circ$ , elementary compn. C 86.04%,  $\text{H}_2$

11.4%, and a mol. wt. of 289. The 115–206° fraction (2 mm. abs. pressure) is a viscous oil of the character of lubricating oils.

A. A. BOEHLINGK

**Preparing petrolatums.** N. I. CHERNOZHUKOV. *Neftyanoe Khozyaistvo* 16, 240–1(1929).—Low-viscosity petrolatums are prepd. from distillates by a freezing out of the higher m. p. wax, followed by a sepn. whereby the low-melting paraffin becomes more concd. in the distillate. High-viscosity petrolatums can be obtained by dissolving paraffin bottoms in naphtha, freezing out high-melting paraffins, sepg. them and concg. the low-melting paraffins by cold. To obtain a medicinal petrolatum, only the high-melting paraffins must be removed, leaving 25% of paraffin in the petrolatum.

A. A. BOEHLINGK

**Technical and medicinal petrolatums from Grozny mixed-base fuel oil.** B. K. TARASOV. *Neftyanoe Khozyaistvo* 16, 236–9(1929).—Fuel oil (69% from crude oil), of sp. gr. 0.892–0.898,  $E_{50}$  viscosity 3.4–4.0, pour point 28°, was treated with 5% com.  $H_2SO_4$  and neutralized while hot with a strong soln. of water glass. Allowed to settle and filtered through silica gel, it yielded 75% of "green oil" of 0.878 sp. gr.,  $E_{50}$  viscosity 2.49 and  $E_{60}$  viscosity 1.94. It was steam-distd. and 50, 40 and 30% cuts from the fuel oil were investigated. Medicinal petrolatums were prepd. by dissolving technical petrolatums in gasoline (initial b. p. 80–110°) in the proportion 1:4, treating twice with 10% fuming  $H_2SO_4$ , sepg. from the sludge, neutralizing the soln., washing, drying and treating with fuller's earth (5–20% portions). This gave a yield of 60–65% calcd. on technical petrolatum. Medicinal petrolatums from technical petrolatums. The 1st acid treatment (of fuel oils) does not affect the qualities of the final product, the medicinal petrolatum, appreciably. The 2nd acid treatment (of the technical petrolatum) yields a very satisfactory medicinal petrolatum when 20% of com.  $H_2SO_4$  is used instead of fuming acid. Russian petrolatums are higher in sp. gr. (0.866) than American (0.832). They contain not more than 18.9% of paraffin wax as against about 30% in American, the m. p. of the latter being lower, 56–69.5° against 58.5–62°.

A. A. BOEHLINGK

**Oxygen numbers of asphaltenes and resins in crude oils.** S. S. NAMETKIN AND V. G. PUTZILLO. *Neftyanoe Khozyaistvo* 16, 230–5(1929).—The discrepancies in the coeff. of unsatn. detd. by the I and the O numbers, particularly in the heavier oil fractions, are due to asphaltenes, which are absent in gasoline but are contained in crude oils and in the heavier fractions. Perbenzoic acid reacts with the resins and asphaltenes but I does not. The S compds., which are present in small quantities in the oil, do not affect the results appreciably.

A. A. BOEHLINGK

**Asphalt tar from Grozny mixed-base crude oil.** A. I. VORONOV AND V. S. TVERTZIN. *Neftyanoe Khozyaistvo* 16, 242–6(1929).—Heavy residues from Grozny mixed-base fuel oil of sp. gr. 0.964,  $E_{100}$  viscosity 6.80, flash (Cleveland) 250°, drop test (Ubbelohde) 45°, solidification point (Jolde-Sakhanov) 45°, asphaltenes 4.8%, resins 10.5% and oil 83%, were agitated with steam superheated to about 320° and heated to 350–375°. Asphalt of high elasticity and sp. gr. 1.003 at 20° was obtained when a limited amt. of oil was distd. off. Lower and higher sp. gravities indicated an inferior asphalt. Its m. p. was 40°; it contained about 20% of resins and 60% of oil; the penetration test decreased from 85 to 70.5 after heating; the losses amounted to 0.08% (which is below the A.S.T.M. standard). The following products were recovered by steam distn.: 4% paraffin wax m. 72° and 6% m. 62°; 63% of oil with a pour test of 21.5°,  $E_{60}$  viscosity 5.82; 10% of vaseline m. 35°; and an abs. viscosity at 60° of 0.3289. The oil with high pour test can be used as a cracking stock.

A. A. BOEHLINGK

**Preparing varnish asphalt from Emba lubricating-oil acid sludge.** N. N. KARSKII AND S. V. KAPATZINSKII. *Neftyanoe Khozyaistvo* 16, 548–51(1929).—Up to 60% of an asphalt suitable for varnish was obtained by blowing a mixt. of 2 parts acid sludge from Emba lubricating oil, 1 part of turpentine and 1 part of needle-wood tar at 280–300° for 18–20 hrs. The turpentine vapors were condensed and the sulfurous acid was absorbed in a tower sprayed with water. The yield of asphalt depends greatly upon the size of the fraction of turpentine boiling close to 180°.

A. A. BOEHLINGK

**Asphalt emulsion has many-uses in the chemical plant.** LESTER KIRSCHBRAUN. *Chem. & Met. Eng.* 36, 477–9(1929).

E. H.

**Determination of paraffin hydrocarbons in commercial benzene and motor fuel.** WAWRZINICK. *Chem.-Ztg.* 53, 557(1929).—Polemical against Heilingötter (*C. A.* 23, 2287). Reply. R. HEILINGÖTTER. *Ibid* 557.

E. M. SYMMES

**Thermal decomposition of paraffin wax in the presence and in the absence of hydrogen under high pressure.** H. I. WATERMAN, T. W. TE NUYL AND J. N. J. PERQUIN. *J. Inst. Petroleum Tech.* 15, 369–71(1929).—Paraffin wax was subjected to berginization and to cracking. The portion of the products boiling above 150° was fractionally distd. in cathodic vacuum. The vapors were cooled by liquid air and the condensate was col-



lected in 10° fractions. The aniline point of the fractions from the berginized oil was about 20° higher than that of the fractions from the cracked oil. The  $\eta$  and sp. gr. of the cracked products were higher and the Br no. was much higher. Substitution was more marked in the cracked oils. These facts indicate the more unsatd. and more cyclic character of the cracked products. A comparison of the common phys. consts. of the normal satd. aliphatic hydrocarbons from  $C_9H_{20}$  to  $C_{16}H_{34}$  with those of the oils produced by berginizing shows much similarity, though the latter probably contain a small percentage of unsatd. compds. The differences noted in previous work upon the gasoline fraction between berginizing and cracking products are still more apparent in the higher fractions.

EMMA E. CRANDAL

**Exploitation of the Grozny paraffin wax plant.** A. ABLOVATZKII. *Neftyanoe Khozyaistvo* 16, 530-43 (1929); cf. C. A. 23, 2561.—The process of obtaining paraffin wax from Grozny fuel oil comprises the following operations: (1) distn. of fuel oil, (2) redistn. of cuts contg. paraffin wax, (3) settling of the distillate, (4) refrigeration, (5) crystn., (6) filtration, (7) repeated pressing of slack wax, (8) treatment of slack wax, (9) sweating, (10) bleaching and (11) packing. The fuel oil contg. paraffin wax is steam distd. in a battery of 14 shell stills, each still having 4 dephlegmators. The first 6 stills deliver cuts below 0.870 sp. gr., which are combined and do not need redistn. Cuts from the 2nd part of the battery must be redistd., leaving a petrolatum-like residue. A wax of very fine cryst. structure or of colloidal character is obtained from the machine-oil fraction, which is very difficult to handle. Up to 44% of paraffin distillate was recovered from the fuel oil and 21.82% of gas- and spindle-oil fractions was lost in the recovery of the paraffin-wax as the result of faulty equipment. This can be eliminated by the use of pipe stills now in the process of construction and of better fractionating equipment. Gas oil contg. paraffin from other stills was added to the fuel oil to improve the paraffin yield. The paraffin distillate should be free from  $H_2O$  or emulsifying agents. The crystn. temp. is kept within  $-2^\circ$  to  $+2^\circ$ . A pressure of 32 atm. produces plates of a higher wax content than lower pressures. The temp. to be used during the process depends on the character of the slack wax. Thin cakes are higher in wax than thick ones, the latter being as a rule obtained through less compression. Various lubricating oil fractions could be sepd. from repeatedly pressed slack wax. Impurities contained in slack wax are removed either through treatment with  $H_2SO_4$  (up to 4-5%) at 70-75°, followed by neutralization and washing, or by treatment with live steam, the sludge being withdrawn from the bottom. A final treatment with fuming  $H_2SO_4$ , followed by neutralization and fuller's earth treatment, produces a good com. wax, which is shipped in plates or in shavings packed in barrels.

A. A. BOEHTLINGK

**Cement and bore-hole waters.** G. DEMETIEV. *Azerbaidzhanskoe Neftyanoe Khozyaistvo* 1928, No. 8/9, 38-46.—An addn. of 4 to 7% of "Konset," which consists of 78.10% of  $CaO$  and sol. compds., 5.65% of fatty acids, 2.58% of  $NH_3$ , 10.07% of  $Mg$  silicate and 3% of volatile compds., improved the setting qualities of a poor-setting cement. This mixt. increased the accelerating action of bore-hole  $H_2O$  upon setting by 15 to 50%. As compared with pure  $H_2O$ , the bore-hole  $N_2O$  accelerated the setting of cement in the presence of this mixt. 60 to 200% when naphthenic acids were absent. The chlorides always present in bore-hole waters are probably the accelerators.

A. A. BOEHTLINGK

**Turpentine oil from larch turpentine.** SCHIMMEL & Co. *Ber. Schimmel* 1928, 101; *Chem. Zentr.* 1928, II, 1827.—Larch turpentine (*Larix decidua* Miller) yielded 14.6% oil with steam distn. The oil had the following properties:  $d_{15}^0$  0.8661,  $[\alpha]_D^{20} = -9^\circ 32'$ ,  $n_D^{20} = 1.47220$ , acid no. 0, ester no. 7.5, sol. in about 5 vols. of 90% alc. with a slight turbidity. A larch turpentine oil from Tirol had the following consts.:  $d_{15}^0$  0.8637,  $[\alpha]_D^{20} = -12^\circ 3'$ ,  $n_D^{20} = 1.46717$ , acid no. 0, ester no. 1.9, sol. in about 6 vols. of 90% alc. with a slight turbidity; the odor is more pronounced than with ordinary turpentine.

G. SCHWOCH

The detection and determination of S in fuels (LANDA) 21. Tar and bitumen from the colloid-chemical viewpoint (GROHN) 21. Alcohol fuels for use in internal-combustion engines (KING, MANNING) 21. Chemistry goes to sea (PURDY) 13. Domestic fuels other than anthracite. I. Processed coals (TRYON) 21. The disposal of oil-field brines (SCHMIDT, DEVINE) 14. Waxes and boghead coals as mother substances of petroleum. IV. (ZELINSKII, LAVROVSKI) 10. Oil-bearing rocks of the Waiapu Subdivision (New Zealand) (ONGLEY, MACPHERSON) 8. Petroleum in Taranaki (New Zealand) (GRANGE) 8. Distilling oils (Brit. pat. 305,263) 21. Destructive hydrogenation (Brit. pats. 304,301 and 304,343) 21. Destructive hydrogenation, etc. (Brit. pat. 304,404) 21. Hydrogenation of coal, etc. (Ir. pat. 34,048) 21.

**Cracking petroleum oils.** MILON J. TRUMBLE. U. S. 1,724,982, Aug. 20. Successive portions of a device such as a metal rotor are moved through a heating chamber where they are heated by a flame and then through an oil-heating and vaporizing chamber where the same portions of the device heated by flame contact come into contact with the oil under treatment. Various details of this and assocd. app. are described. Cf. C. A. 23, 968.

**Treating petroleum distillates with sulfuric acid, etc.** JOHN C. CLARK, WIRT D. RIAL and JOHN R. MCCONNELL (to Pan American Petroleum Co.). U. S. 1,725,611, Aug. 20. After treating a distillate with  $H_2SO_4$  and sepg. from the acid sludge, the sepd. oil is treated with a pitch such as petroleum pitch in order to sep. "peppery sludge" remaining in the oil. U. S. 1,725,612 specifies the use of a coal-tar pitch as a pptg. agent for the same purpose.

**Apparatus for dehydrating petroleum emulsions by electrical treatment.** WM. O. EDDY. U. S. 1,724,263, Aug. 13. Structural features.

**Fractional distillation of hydrocarbons.** LESTER W. SNELL. U. S. 1,725,219, Aug. 20. In order to obtain fractional liquid products having desired end b. p., predetd. vapor temps. are maintained at each end of one of the condensing zones from which liquid products are withdrawn, by cooling the withdrawn liquid products, discharging portions of one of the cooled liquid products into the vapors entering the last-mentioned zone and discharging portions of another of the cooled liquid products into the vapors leaving the last-mentioned zone, and varying the flow of these portions in accord with prevailing temps. of the vapors into which they are discharged, so as to predet. the initial and end point of the product condensed in this zone. An arrangement of app. is described.

**Conversion of hydrocarbon oils.** LOUIS J. WALSH (to Standard Oil Development Co.). U. S. 1,725,434, Aug. 20. In effecting withdrawal of converted hydrocarbon material from a reaction drum (in an app. which is described), tarry material which settles during the conversion is withdrawn from near the bottom of the drum and is combined as a single stream with vapors which are withdrawn from near the top of the drum; this stream is subjected to a reduction of pressure.

**Cracking hydrocarbon oils.** GEORGE W. GRAY (to Texas Co.). U. S. 1,724,760, Aug. 13. Oil is subjected to a cracking temp and pressure in a pressure zone, fractions of high b. p. are condensed from the resulting vapors, and the condensate while still hot is subjected to increased cracking temp. and pressure. Simultaneously, another body of oil is distd., evolved vapors are sepd. according to their b. ps. and the condensate thus formed is commingled with the oil in one of the pressure zones. An arrangement of app. is described. Cf. C. A. 23, 509.

**Catalytic cracking of hydrocarbon vapors.** SILICA GEL CORP. Brit. 304,251, July 12, 1927. A finely divided absorbent silica or similar gel (preferably contg. an active catalytic material such as Fe oxide) is mixed with the gas and carried through the reaction chamber in suspension, and then sepd., revived and reused. An app. is described.

**Treating cracked hydrocarbon products containing sulfur compounds.** GUSTAV EGLOFF and JACQUE C. MORRELL (to Universal Oil Products Co.). U. S. 1,725,068, Aug. 20. The oil is agitated in the presence of  $CuSO_4$  in  $H_2SO_4$  soln. in order to remove S compds.

**Purifying hydrocarbon-oil distillates.** IMPERIAL OIL, LTD. Brit. 305,108, Aug. 30, 1927. Vapors such as those of naphtha or gasoline produced by cracking processes are passed in countercurrent to a stream of liquid carrying a finely divided adsorbent or absorbent such as clay at such a temp. that the desired vapors pass on after contact and momentary condensation on the clay (which may carry a substance such as a metal oxide or sulfide, of Cu, Pb or Fe to reduce the S content of the oil). An app. is described.

**Revivifying spent decolorizing clay from hydrocarbon-oil refining.** WM. M. STRATFORD (to Texas Co.). U. S. 1,724,531, Aug. 13. The material is treated with a solvent such as gasoline at a temp. above the normal b. p. of the latter and under sufficient pressure to maintain the solvent in substantially liquid condition. Cf. C. A. 23, 2820.

**Mineral and tar oils.** I. G. FARBENIND. A.-G. Brit. 305,553, Oct. 5, 1927. Lubricating and insulating oils are obtained from coal tars, mineral oils and other carbonaceous materials by extracting or destructively hydrogenating the solid materials or cracking or destructively hydrogenating the liquids, and exposing the liquid products or their fractions, in coherent liquid phase, to the action of high-tension and preferably high-frequency elec. currents. An example is given of the treatment of brown coal and its products.

**Stabilizing clay-treated mineral oils.** GEORGE F. OLSEN (to General Petroleum

Corp. of Calif.). U. S. 1,724,510, Aug. 13. In order to remove deleterious volatile substances from lubricating oils which have been heated with clay and sepd. from the clay while hot, the sepd. oil, while still hot, is atomized by the action of a non-oxidizing fluid such as steam to promote vaporization of the volatile substances. An arrangement of app. is described.

**Cracking mineral oils.** RICHARD W. HANNA (to Standard Oil Co. of Calif.). U. S. 1,724,476, Aug. 13. The oil is heated under pressure to a temp. sufficient to form vapors, vapors and liquid oil are sepd., the pressure is separately raised on both the liquid oil and the vapors; they are recombined and subjected to pyrogenetic decompn. together. An app. is described.

**Cracking oils.** N. E. LOOMIS (to Standard Oil Development Co.). Brit. 304,798, Jan. 27, 1928. An app. is described in which oils are cracked in an installation of the oil and drum type, the cracked material is withdrawn and mixed with uncracked oil, and sepd. from tar and fractionated.

**Cracking oils.** J. C. CLANCY. Brit. 304,421, Nov. 21, 1927. Low b. p. oils are obtained from those of higher b. p. by distn. in contact with NaCN or other suitable cyanide or cyanate in molten form. Hydrogenation of the vapors is effected by  $\text{NH}_3$  formed during the reaction;  $\text{NH}_3$  and other hydrogenating gases may also be admitted from an extraneous source. Metallic catalysts such as Fe, Ni or Cu may be added. The cyanide is regenerated by heating it with the carbonaceous residues and an alkali carbonate, hydroxide or formate in the presence of nitrogenous gases. An app. is described. Cf. C. A. 22, 683, 3288.

**Cracking oils or coal-distillation products.** L. TOCCO. Brit. 304,316, Jan. 20, 1928. Vapors from oil distn. or from destructive distn. of coal, etc., are converted into low b. p. hydrocarbons suitable for fuel for internal combustion engines by freeing them from sulfurous compds. and then passing them over catalysts and fractionating the products in a series of condensers, the temp. of which is controlled by molten metal or salt baths. Incondensable gases formed are purified, treated by high tension discharges, and then passed over the surface of the condensate obtained from the first fractionation. An arrangement of app. is described.

**Cracking and hydrogenating oils.** E. M. CLARK (to Standard Oil Development Co.). Brit. 304,796, Jan. 26, 1928. A system of app. is described in which oil is heated under a pressure of at least 50 atm. in the presence of H, vapors and liquids produced are continuously withdrawn, and the liquids are continuously distd. in a plurality of distn. zones. Brit. 304,797 relates to a process in which a fraction is distd. from the oil under low pressure, the residual oil is hydrogenated under high pressure and the hydrogenated product is returned to the distn. zone.

**Apparatus for hydrogenating and cracking oils from shale, etc.** MILON J. TRUMBLE. U. S. 1,725,320, Aug. 20. A hydrogenator delivers directly to an "equil. chamber" below it, which has an outlet for lighter fractions, and provision is made for recirculation of the heavier fractions through the hydrogenator and "equil. chamber" independent of the supply of fresh material. Various details of construction are described.

**Auxiliary oil-circulating system for cooling the coils of oil-cracking apparatus.** GUSTAV EGLOFF and HARRY P. BENNER (to Universal Oil Products Co.). U. S. 1,725,067, Aug. 20.

**Pressure-relief system for use on oil stills, etc.** HOWARD G. HILL (to Texas Co.). U. S. 1,725,455, Aug. 20. Structural features.

**Recovery of oils and naphthenic acids from distillation residues.** HUMBLE OIL & REFINING Co. Brit. 304,926, Feb. 6, 1928. The residues obtained when lubricating stocks contg. naphthenic acids are redistd. with NaOH or the like, preferably while hot, are floated on gently moving water and the upper layer of oil which forms is sepd. from the lower layer of naphthenate soln. An app. is described.

**Tank and baffle system for separating oil and gas.** MILLARD F. WATERS (to Smith Separator Co.). U. S. 1,724,537, Aug. 13.

**Separating paraffin or like material from associated oil.** JOHAN F. P. SCHÖNFELD (one-half to N.-V. De Bataafsche Petroleum Maatschappij). U. S. 1,724,731, Aug. 13. Fractional solidification of the atomized material is effected in a cooling atm. An app. is described. U. S. 1,724,732 relates to the use of a cooling atm. contg. a fog of water particles in similar seps.

**Centrifugal filter and clarifier for gasoline, etc.** PETER J. CHAPPELLE. U. S. 1,725,618, Aug. 20. Structural features are described.

**Apparatus for catalytic production of "motor spirit" by use of molten lead.** M. BALS (to W. Huesy). Brit. 305,033, Jan. 28, 1928. An app. with vertical reaction tubes

is described, which is suitable for passing a mixt. of alc. and kerosene through molten Pb as described in Brit. 267,530 (C. A. 22, 1229).

**Tetraalkyl lead compositions.** WILLIAM S. CALCOTT and ALFRED E. PARMELEE (to E. I. Du Pont de Nemours & Co.). U. S. 1,724,640, Aug. 13. An aliphatic base such as dimethylamine is used with compns. such as those contg.  $\text{Et}_4\text{Pb}$  and  $\text{C}_2\text{H}_5\text{Br}_2$  in order to stabilize the compn.

**Lubricant.** J. D. RIEDEL-E. DE HAËN A.-G. Ger. 478,767, Dec. 16, 1927. A colloidal soln. of graphite in oil is employed as a lubricant.

**Lubricants containing water.** MORITZ J. HEITMANN. U. S. 1,724,653, Aug. 13. A gas such as steam, air, H, N or O is passed under pressure into a body of lubricating oil finely to divide or break up the oil; water is then added to form an emulsion of the desired compn. and the supply of gas is continued to effect a stable emulsification. An app. is described.

**Lubricant for use in tungsten wire drawing.** CHARLES V. IREDELL (to Westinghouse Lamp Co.). U. S. 1,724,134, Aug. 13. See Can. 286,472 (C. A. 23, 1502).

**Filter for lubricating oil, etc.** RENÉ AUDUBERT. U. S. 1,723,997, Aug. 13. Structural features of filters containing capillary material such as wick-like fabric.

**Distilling device (heated by the engine exhaust) for refining lubricating oil used in internal combustion engines.** WALTER B. CLIFFORD (to Clifford Corp.). U. S. 1,725,392, Aug. 20. Various structural features are described.

**Bituminous emulsion.** LESTER KIRSCHBRAUN. U. S. 1,725,648, Aug. 20. An aq dispersion comprises bitumen-pitch particles as the dispersed phase and water as the continuous phase and contains in the external phase alc. in quantity not over 1.5% and small quantities of a deflocculating electrolyte. The quantities of alc. and electrolyte are insufficient to prevent freezing of the dispersion at temps. substantially below  $0^\circ$  but prevent damage by freezing when it does occur.

## 23—CELLULOSE AND PAPER

CARLETON E. CURRAN

**Studies on esterification of cellulose and cellulose esters. III. Effect of nitration temperature upon the properties of cellulose nitrate.** KATSUMOTO ATSUKI AND MASANORI ISHIWATA. *J. Soc. Chem. Ind. Japan*, Suppl. Binding 31, 268-9B (1928); cf. C. A. 22, 4792.—As the nitration temp. rises, the viscosity of the cellulose nitrate soln. decreases rapidly at first until the temp. reaches  $35^\circ$ , then slowly, and when the temp. rises to  $55^\circ$  it decreases rapidly. The tensile strength of the film decreases with the rise of temp., but the elongation increases with the rise of temp. of nitration until the latter reaches  $35^\circ$ , and then decreases with further rise of temp. The N content does not alter until the temp. rises higher than about  $55^\circ$ ; it then begins to decrease. A. and I. explained these relations with colloidal depolymerization and chem. decompn. of the cellulose mols.

**Cellulose ethers (alkylated celluloses).** E. BERL AND H. SCHUPP. *Cellulose Chemie* 10, 41-59 (1929).—A review is given of the literature on the methods of methylation and ethylation of cellulose. Denham and Woodhouse (C. A. 8, 243; 9, 203; 11, 1953; 15, 1693) have shown that cellulose (linters) can be methylated by treating a 15% NaOH soln. of cotton cellulose with  $\text{Me}_2\text{SO}_4$  at room temp. B. and S. carried out 28 successive methylations according to this method, obtaining Me, di-Me and tri-Me derivs. after 1, 5 and 25 methylations, resp. (17.39, 33.23 and 43.91% OMe, resp.). The soly. of these products in cold  $\text{H}_2\text{O}$  and  $\text{Cu-NH}_4\text{OH}$  decreases with increase in OMe content and *vice versa* for the usual org solvents. Alkali-sol. cellulose (regenerated from 75%  $\text{H}_2\text{SO}_4$  soln.) was methylated (I) and ethylated (II), the resp. alkyl sulfate being used under various conditions of temp., concn. and time. The products purified by dialysis contained (I) 19.17-30.71% OMe and (II) 18.2-40.84% OEt. (I) proceeds well at room temp. but (II) requires an initial temp. of  $50^\circ$  for reaction to start. Mono-methylcellulose is sol. in  $\text{H}_2\text{O}$  while the di-Me deriv. is insol. The reverse is true of alc. soly. Ethylations (6) using  $\text{C}_2\text{H}_5\text{Cl}$  and NaOH yielded derivs. of varying compn. and properties, according to the temp. of reaction, heating period, presence of  $\text{H}_2\text{O}$  and concn. of  $\text{C}_2\text{H}_5\text{Cl}$ . The viscosities of the products in  $\text{CHCl}_3$  soln. vary. The original must be consulted for the soly. of the several products. By using a high concn. of  $\text{C}_2\text{H}_5\text{Cl}$  or repeated treatment at  $100$ - $115^\circ$  triethylcellulose is finally obtained. It is sol. in  $\text{CHCl}_3$ ,  $\text{C}_2\text{H}_5\text{Cl}_2$ ,  $\text{C}_6\text{H}_6$  and  $\text{AcOH}$ . Continued ethylation of  $\text{H}_2\text{O}$ -sol. ethylcellulose (18.2% OEt) with  $\text{C}_2\text{H}_5\text{Cl}$  and NaOH at  $80^\circ$  increases OEt content to 38.85%; the product is

insol. in  $H_2O$ , but sol. in alc. Denham and Woodhouse dimethylcellulose can be ethylated with  $C_2H_5Cl$  and  $NaOH$  at  $90-100^\circ$ . Cellulose cannot be ethylated in the presence of  $C_2H_5N$  or  $Mg(OH)_2$  by the  $C_2H_5Cl$  method. Dialkylcellulose is stable in hot  $NaOH$  soln. Solns. of cellulose ethers in water, alc. or  $CHCl_3$  showed no optical activity.

C. W. SONDERN

The viscosity of nitrocellulose solutions. III. OTTO MERZ. *Farben-Ztg.* 34, 2566-70(1929); cf. *C. A.* 22, 2269.—The viscosities of solns. contg. 60 parts BuOAc (85%)  $(20 - x)$  alc. and  $(20 + x)$  "C" nitrocellulose were detd. on a modified Engler app. and found to be in substantial agreement with the equation,  $t_g = 67 \times 1.57 (p/2 - 10)$ , where  $t_g$  = time in sec. for 50 cc. to flow through a 5 mm. orifice and  $p$  = % of dry nitrocellulose in soln. The no., 67, is the const. for the app. and 1.57 is the const. for the system, BuOAc (85%), alc.  $(20 - x)$ , nitrocellulose  $(20 + x)$ . The corresponding equation for the "Wasag" falling ball method is  $t_w = 8.7 \times 1.57 (p/2 - 10)$ . The viscosities of solns. of BuOAc 40, alc. plus water 20 and nitrocellulose 20 were proportional to the amt. of water within the range 0 to 4%.

G. G. SWARD

The effect of thinners on the viscosity of nitrocellulose solutions. B. M. PAM. *J. Soc. Chem. Ind.* 48, 223-6T(1929).—Irrespective of the order of addn. of solvents or non-solvents to nitrocellulose, the viscosity of the resulting soln. is the same for a definite proportion of ingredients, provided sufficient time and agitation are allowed. The reduction of viscosity on the addn. is not directly proportional to the percentage of thinner added, but rather to the log. of that value.

FREDERICK C. HAHN

Cellulose octa-acetate. N. SENDA AND Y. UYEDA. *Cellulose Ind.* 5, 29-32 (1929).—The effects of various factors such as time, the amt. of  $Ac_2O$ , etc., on the acetylation of cellulose from a tissue paper of moisture content 5.35% and ash content 0.31% have been studied. In the acetylation the removal of water- and alc.-sol. substances from the gelatinous product formed by pouring the acetylated cellulose into water is important. For the same material under controlled conditions of treatment the highest yield of the octa-acetate is given when 20 g. of  $Ac_2O$  is used for treatment of 5 g. of tissue paper in the presence of  $H_2SO_4$ ; this yield, however, is only 37.5% of the theoretical. For the treatment of different materials under standard conditions the highest yields are given by cotton wadding and tissue paper (27.8% of the theoretical) and the lowest by straw cellulose (9.7%) and sulfite pulp (11.5%).

B. C. A.

The action of the caustic soda solution upon cellulose. II. The nitration of the mercerized cotton wool. KATSUMOTO ATSUKI AND KICHIRO SHIMOVAMA. *J. Soc. Chem. Ind. Japan* 31, 1104-9(1928); Suppl. Binding 31, 261B(1928).—The viscosity of nitrate of  $NaOH$ -treated cellulose decreases with increasing concn. of  $NaOH$  up to 20%, more rapidly than the rate of increase of concn., if the duration of treatment is limited to a few hrs. When the concn. of  $NaOH$  soln. was more than 40% the viscosity of the product is higher than that of the product from the untreated cellulose. If treated for a long time with  $NaOH$  in air, the viscosity of the product decreases with the duration; the tensile strength and elongation of the film increase with the duration at first, but decrease on further treatment. The treatment with alkali soln. has no effect upon the N content of the product, as long as no appreciable oxidation of cellulose occurs, but the velocity of the nitration is greater than that of untreated cellulose.

S. OKA

Studies on viscose. XV. Increase of rigidity of the filament by means of mere rubbing at spinning. RIKIMATSU TOMIHISA. *J. Soc. Chem. Ind. Japan* 31, 429-33(1928); Suppl. Binding 31, 100-1B(1928); cf. *C. A.* 23, 3084.—By rubbing the filament at spinning, the rigidity of the filament was greatly increased without increasing the denier. Too much rubbing will break the filament.

S. OKA

Removal of dyes from cellulose acetate rayon. SCHEURER, LAUTH & CIE AND L. DISERENS. *Bull. soc. ind. Mulhouse* 95, 349-52(1929); Sealed Note 2662, June 23, 1926.—Addn. of  $Ca(CNS)_2$ , as recommended by the Brit. Dyestuffs Corp., does not give perfectly satisfactory whites. These can be obtained by printing with Na sulfoxylate to which is added a  $C_6H_5$  deriv. contg. 1 or more OH groups, e. g., resorcinol or aromatic or aliphatic acids contg. an alc. group, e. g., lactic or glycolic acids, which do not react with the reducing agent. PhOH should not be used because it exerts too strong a solvent action on the fiber. Dyes which are destroyed by reduction are unaffected by hyposulfite NF alone when fixed on acetate rayon, but are very deeply degraded by the action of colored removing pastes consisting of basic dyes dissolved in resorcinol, hyposulfite NF and tannin. Addn. of anthraquinone or its derivs. is practically without effect, showing that the effect is not due to a catalytic action of the basic dye similar to that produced by setopaline, patent blue or nitroalizarin in the removal of naphthylamine bordeaux. A large no. of the Duranol, Ionamine, Acetonine and Setacyl dyes can be removed by addn. of 5-10% resorcinol. The function of the latter is considered to be partly a cellu-

lose acetate solvent; but that cannot be its sole function as solvents such as  $\text{Me}_2\text{CO}$  and  $\text{PhOH}$  do not give a good white. It is considered highly probable that resorcinol reacts with the cellulose acetate in a manner similar to  $\text{Ac}_2\text{O}$  and phenols. Report. ANDRÉ WOLFF. *Ibid* 352-4.—Addn. of resorcinol undoubtedly gives a better white and with a larger no. of dyes than  $\text{Ca}(\text{CNS})_2$ , but the fiber is seriously impaired, unless the amt. of resorcinol is reduced to about 20 g. per kg. of color, and the results are then no better than those obtained with  $\text{Ca}(\text{CNS})_2$ . A. PAFINEAU-COUTURE

Cellulose ether rayon. SLAVKO. *Russa* 4, 1003, 1005(1929).—A brief outline of the prepn. of Et and Me celluloses and of their possibilities as textiles. A. P.-C.

Cuprammonia rayon. WILHELM A. DYES. *Kunstseide* 11, 47-52, 90-8(1929).—A review of the literature and patents in connection with the manuf. of this type of rayon. FREDERICK C. HAHN

Corrosion-resisting steels in the rayon industry. Their response to sulfuric acid. J. H. G. MONYPENNY. *Rayon Record* 2, 489-91, 631-5(1929). A. K. J.

Paper and cellulose industries in 1928. JOSEF SATOPLÉ. *Chem. Listy* 23, 265-9 (1929).—A discussion. FRANK MARESH

Cogon and rice straw as raw material for paper manufacture. F. D. REYES AND A. O. CRUZ. *Philippine J. Sci.* 38, 367-76(1929).—Cogon grass and rice straw are available in com. quantities as pulp sources. The latter has the advantage of being a waste by-product. The rice straw required  $\frac{1}{3}$  less  $\text{NaOH}$  to yield a more easily bleached pulp than the cogon grass. The cellulose contents of cogon and rice straw were 50 and 42%, resp., but the pulp yield from rice straw was 15% higher than that from cogon because of the milder digestion used. The paper made from cogon had a higher tensile strength than that from rice straw. F. A. SIMMONDS

Qualitative method for the determination of paraffin in paper. FRANK R. FILZ. *Chemist-Analyst* 18, 4(1929).—Digest the sample in  $\text{CHCl}_3$ , which dissolves the paraffin, and add an excess of  $\text{EtOH}$  to the evapd. soln. which ppts. paraffin. W. T. H.

Dull artificial silk (NEVELY) 25. Tests on paper cables [insulation] (SHERMAN) 13. Water permeability of paper sacks (PRÜSSING) 20. The determination of Cu and nitrite in solutions of cuprammonium hydroxide (BUTTERWORTH, ELKIN) 7. Gas strong in  $\text{SO}_2$  [for making an acid cooking liquor] (U. S. pat. 1,724,421) 18.

BIAGOSCH, HEINRICH: *Lexikon der Papierbearbeitung. Band 2. Arbeitsverfahren. Lfg. 3. Bog. 9-12. Begazen-Einfasser. Pp. 129-2. Berlin: Verlag d. Papier-Ztg. C. Hofmann.*

Cellulose esters. H. T. CLARKE and C. J. MALM (to Kodak, Ltd.). Brit. 304,278, Jan. 18, 1928. Cellulose aceto-esters contg. higher acyl groups are made by treating a partly deacetylated cellulose acetate (suitably an acetone-sol. cellulose acetate contg. 34.5-37.5% acetyl) with anhydrides such as stearic, propionic, butyric, valeric, heptylic, lauric, myristic, palmitic, cyclohexanecarboxylic, crotonic, cinnamic, hydrocinnamic, undecylenic, *o*-methoxybenzoic and benzoic anhydrides, or with the corresponding or similar acids in the presence of halogen-substituted anhydrides, and suitably in the presence also of chloroacetic acid and a catalyst such as Mg perchlorate. The products are suitable for making films. Brit. 304,279 relates to the production of various cellulose esters contg. halogen-substituted fatty acid groups and gives numerous details regarding the manuf. of such products. Cf. C. A. 23, 980.

Cellulose esters. I. G. FARBERIND. A.-G. Brit. 305,674, Feb. 9, 1928. Chloroacetic acid is used as a diluent at a temp. below  $50^\circ$  in effecting the acylation of cellulose such as cotton with  $\text{HOAc}$  or other carboxylic acid in the presence of a catalyst. Various details are given. Cf. C. A. 23, 4570.

Esters of cellulose, starch, etc. I. G. FARBERIND. A.-G. Brit. 305,661, Feb. 10, 1928. Higher aliphatic acid and cyclocarboxylic acid esters of cellulose, starch and the like sol. in org. solvents, are obtained in a single operation by permitting the reaction between the halide of the acid and the carbohydrate to take place with rise of temp. and heating if necessary. The products are suitable for making threads, films, lacquers, insulating compns., plastic masses, etc. Various details are given.

Cellulose ester compositions, etc. I. G. FARBERIND. A.-G. Brit. 304,814, Oct. 26, 1927. Colored cellulose deriv. compns. such as are described in Brit. 247,288 (C. A. 21, 649) are incorporated with water-repelling substances such as natural or artificial resins, waxes or oils, to produce compns. which may be dissolved in solvents in which the coloring matter is insol. to form coatings for leather or paper, etc., or lacquers, priming or filling compns. Various details and examples are given.

Plastic compositions containing cellulose esters. W. PLINATUS (to Compagnie française d'exploitation des procédés Plinatus). Brit. 305,238, Feb. 2, 1928. "Semi-moist" cellulose esters such as nitrocellulose or cellulose acetate, of low viscosity, are mixed with solid solvents or gelatinizing agents of high b. p. in the absence of volatile org. solvents. Cellulose esters of greater viscosity also may be added. Examples are given.

Composite sheets containing cellulosic derivatives. WOLFF & Co. and R. WEINGAND. Brit. 304,722, Jan. 25, 1928. Layers of material which swell in water such as cellulose, regenerated cellulose or cellulose ether are joined with layers of material such as celluloid which is resistant to water (suitably by use of an agglutinant also resistant to water).

Decorating sheet material of cellulose esters or ethers. SOC. CHIMIQUE DES USINES DU RHONE. Brit. 305,189, Feb. 3, 1928. See Fr. 648,152 (C. A. 23, 2793).

Cellulose acetates. H. L. BARTHELEMY (to Ruth-Aldo Co.). Brit. 305,096, Jan. 30, 1928. Acetylation is effected by spraying into the app. used a series of 5 acetylation mixts. each composed of glacial HOAc,  $\text{Ac}_2\text{O}$  and  $\text{H}_2\text{SO}_4$ , with the addn. of chromic acid and Br to the first and second mixt., resp., and the acetate is saponified by a 2-stage-process comprising addn. of aq. HOAc to destroy the surplus  $\text{Ac}_2\text{O}$  followed by aq. HOAc contg. HCl and HF, and the acetate is then pptd. by a dil.  $\text{NaHCO}_3$  soln., washed with water and dried. Various pretreatments of the cellulose used (including oxidation) may be employed as described in previously issued British patent specifications, several of which are referred to. Cf. C. A. 23, 4571.

Cellulose acetate, etc. I. G. FARBENIND. A.-G. Brit. 305,601, Sept. 5, 1927. Cellulose, such as cotton which is to be used for the production of cellulose acetate, is preliminarily treated with formic acid of at least 80% strength until it contains 4–10% chemically combined formic acid. Cf. C. A. 23, 4342.

Nitrocellulose solutions. W. J. JENKINS and IMPERIAL CHEMICAL INDUSTRIES, Ltd. Brit. 305,148, Aug. 26, 1927. Nitrocellulose solns. such as those contg. "petrol" or "benzol hydrocarbons" or other diluents of low flash point, and with or without other ingredients such as resins, plasticizers, pigments and drying oils, are formed with a content of  $\text{CCl}_4$  8% or less.

Apparatus for treating cellulose fibers with acetic acid and anhydride, aromatic sulfochlorides, etc. COMPAGNIE NATIONALE DE MATIÈRES COLORANTES ET MANUFACTURES DE PRODUITS CHIMIQUES DU NORD RÉUNIES ÉTABLISSEMENTS KUHLMANN. Brit. 304,227, Jan. 17, 1928.

Foodstuff containers of fibrous material. JOHN D. RUE, SIDNEY D. WELLS and FRANCIS G. RAWLING. U. S. 1,724,778, Aug. 13. A fibrous material free from objectionable odor under cold-storage conditions is made from cereal straw by mildly cooking it until it is softened, but not pulped, into ultimate fibers, with a soln. formed solely of water,  $\text{Na}_2\text{CO}_3$  and  $\text{Na}_2\text{SO}_3$ .

Seamless tubes from cellulose solutions. WOLFF & Co. and R. WEINGAND. Brit. 304,717, Jan. 25, 1928. An app. and various mech. details of treatment are described.

Forming seamless tubes from cellulose solutions by extrusion and coagulation. WOLFF & Co. and R. WEINGAND. Brit. 304,754, Jan. 26, 1928. An app. is described.

Playing cards. CELLON-WERKE A. EICHENGRÜN (to S. Klausner). Brit. 304,276, Jan. 18, 1928. Opaque, washable playing cards are formed of celluloid-like cellulose ester or ether or ester-ether compns. contg. as fillers mixts. of zinc white, lithopone or the like together with other pigments of higher sp. gr. such as titanium white, etc.

Apparatus for making transparent films of cuprammonium cellulose or viscose solutions. C. RUZICKA. Brit. 304,374, Oct. 21, 1927. Mech. features.

Artificial fibers. I. G. FARBENIND. A.-G. (Emil Hubert, Otto Leuchs and Ludwig Lock, inventors.) Ger. 479,003, July 21, 1923. In order to render cellulose acetate solns. capable of stretch spinning in salt baths, there is added to the spinning soln. a compd. which is extd. by the bath more slowly than the solvent. Thus, to an acetone soln. which is to be spun into a bath of concd.  $\text{CaCl}_2$  soln. there may be added  $\text{AcOEt}$ ,  $\text{PhNH}_2$ , pyridine,  $\text{ClC}_2\text{H}_4\text{OH}$  or  $\text{C}_6\text{H}_6$  with  $\text{EtOH}$  or chlorobenzene. Again, to an  $\text{AcOH}$  soln. to be spun into a bath of concd.  $\text{AcONa}$  soln. there may be added  $\text{ClC}_2\text{H}_4\text{OH}$  or  $\text{C}_6\text{H}_5\text{Cl}$ . Examples are given. Cf. C. A. 23, 4070.

Artificial fibers, films, etc. MELITTA KLEIN. Ger. 474,236, June 30, 1923. Artificial fibers, films, etc., are prepd. from the flour or meal obtainable from certain aroid plants such as the snake palm (*Amorphophallus rivieri*). An aq. colloidal soln. of the meal is prepd., suitably with the aid of a small addn. of acid or alkali, and this is then spun or extruded into a pptg. bath, e. g., a warm bisulfate bath, in the usual way. Solns.

of cellulose may be mixed with the soln. of the meal. An antiseptic may be added also.

**Artificial fibers, films, etc., from viscose.** N. V. NEDERLANDSCHE KUNSTZIJDE-FABRIEK. Ger. 479,149, Mar. 6, 1925. An addn. of 1% or so of a salt of Ni and (or) a salt of Co is made to pptg. baths of the kind comprising  $\text{H}_2\text{SO}_4$  with or without  $\text{Na}_2\text{SO}_4$ ,  $\text{MgSO}_4$  or  $(\text{NH}_4)_2\text{SO}_4$ . The products have an enhanced affinity for dyes.

**Films from viscose.** KALLE & Co. A.-G. Ger. 479,246, Oct. 14, 1924. Films are prepd. from comparatively ripe viscose such that the salt point is less than 3. Transparent and uniform products are so obtained.

**Films, etc., from viscose, etc.** WOLFF & Co., EMIL CZAPEK and RICHARD WEINGAND. Ger. 479,004, Sept. 14, 1926. See Brit. 277,309 (C. A. 22, 2472).

**"Viscose silk."** I. G. FARBENIND. A.-G. Brit. 304,244, Jan. 17, 1928. The process described in Brit. 303,514 (C. A. 23, 4572) is modified by employing a bath contg. a low percentage of inorg. electrolytes and a high percentage of added org. substance so that the bath is maintained satd. with the org. substance. The condensation product of naphthalenesulfonic acid and  $\text{CH}_2\text{O}$  or Na carbazolesulfonate may be used in a coagulation bath contg. 9-12%  $\text{H}_2\text{SO}_4$ .

**Apparatus for spinning artificial silk.** A. E. GULL. Brit. 304,890, Dec. 20, 1927. Structural features.

**Spinning device for artificial fibers.** RUTHALDO Co., INC. Ger. 478,579, Mar. 13, 1927. Details are given.

**Funnel-shaped spinning device for artificial fibers.** FRITZ TSCHIRCH. Ger. 478,928, Apr. 14, 1926.

**Rotating nozzles for artificial-silk manufacture.** O. SINDL. Brit. 305,280, Nov. 28, 1927. Structural features.

**Multi-nozzle cells for "dry spinning" of artificial silk.** BRITISH CELANESE, LTD., H. DREYFUS, E. KINSELLA, J. BOWER and W. I. TAYLOR. Brit. 304, 674, Oct. 24, 1927. Such cells as described in Brit. 300,998 (C. A. 23, 4072) may be made with up to 100 or more nozzles to avoid the necessity of partitioning the "meters" of the spinning plant into comparatively small cells.

**Artificial silk.** JAMES A. SINGMASTER. U. S. 1,725,742, Aug. 20. In order to produce artificial silk filaments of good opacity and covering power, a soln. to be spun has incorporated with it a small quantity of inorg. pigment-like material such as C black or  $\text{BaSO}_4$  such as will not materially impair the continuity of the filaments formed from the soln. by use of small orifices.

**Artificial silk.** COMPAGNIE DE PRODUITS CHIMIQUES ET ÉLECTROMÉTALLURGIQUES ALAIS, FROGES ET CAMARGUE. Brit. 305,468, Feb. 4, 1928. Artificial silk is made from condensation products of urea or its derivs and (or) cyanamide or its derivs. with  $\text{CH}_2\text{O}$ ; the viscous condensation products are extruded into an acid coagulating bath. Numerous details and examples are given.

**Artificial silk.** M. DUPUY (to Soc. D. O.). Brit. 305,622, Feb. 8, 1928. Artificial silk is rendered more elastic and its twist is fixed by immersion before twisting in a bath formed of white soap 300 g., olive oil 2 centiliters, 66° Bé.  $\text{H}_2\text{SO}_4$  0.5 centiliters, 36° Bé NaOH 1.5 centiliters and water 100 liters, at a temp. of 40-50°.

**Absorption chest for a paper or cellulose drying machine.** JOSEF HROCH. Ger. 478,612, Jan. 11, 1928. Details are given.

**Drying pulpy material.** ALBERT SCHLOSS. Ger. 478,855, Mar. 13, 1926. Pulpy wet goods are subjected to a kneading process and dried in two stages.

**Pulp board from corn-stalk material.** J. J. HINDE. Brit. 304,171, July 14, 1927. An app. is described.

**Hydraulic paper- and pulp-rolling machine.** WILLY SCHEU. Ger. 478,903, Sept. 15, 1926. Details are described.

**Paper manufacture.** MOISEY M. SEREBRIANOI. U. S. 1,724,522, Aug. 13. Paper and paperboard are made by a process similar to that used in rubber manuf. by drawing the pulp between hot and cold rolls until the desired thickness and d. are obtained.

**Paper-making apparatus.** ALVIN W. SMITH. U. S. 1,725,108, Aug. 20. Structural features.

**Paper-making apparatus.** HAINDL'SCHE PAPIERFABRIKEN GES. Brit. 304,671, Jan. 23, 1928.

**Paper-making apparatus.** SIEMENS-SCHUCKERTWERKE A.-G. Brit. 305,668, Feb. 10, 1928. Mech. features.

**Apparatus for applying waterproofing materials to sheets such as paper.** LESTER KIRSCHBAUM and CHESTER R. MACDONALD (MacDonald to Flintkote Co.). U. S. 1,724,137, Aug. 13. Structural features.



Coloring, sizing, impregnating or other treatments of paper. I. G. FARBERNIND. A.-G. Brit. 305,122, Jan. 31, 1928. An elastic surface such as rubber is used on rollers of app. such as described in Brit. 293,000 (C. A. 23, 1507).

Ornamental paper. JOHN MACLAURIN. U. S. 1,724,672, Aug. 13. Paper is coated with a soln. of mannitol, allowed to dry and the drying is controlled by a hydroscopic agent such as glycerol and gum tragacanth which is used in the soln., so that the greater part of the coating will be converted into flake-like crystals.

## 24—EXPLOSIVES AND EXPLOSIONS

CHARLES E. MUNROE

Charles E. Munroe. H. BRUNSWIG. *Z. ges. Schiess-Sprengstoffw.* 24, 121-4 (1929).—A review of the accomplishments of M. in chemistry and in the development of explosives, written in honor of his 80th birthday, May 24, 1929. C. G. STORM

53rd annual report H. M. Inspectors of Explosives for the year 1928. T. H. CROZIER, R. A. THOMAS, H. E. WATTS AND G. HARCOURT GIBBS. *Home Office Rept.*, June, 1929, 51 pp.—There is covered the usual field for explosives, petroleum,  $\text{CaC}_2$  and  $\text{C}_2\text{H}_2$  with records of a large no. of accidents in each field. In tests of Al, though the different samples varied widely in size of grain and some were protected by oil or vaseline, no difference could be detected in mixts. of these aluminums with  $\text{KClO}_3$  in sensitiveness to shock, or shock and friction combined but their effectiveness as ingredients of fireworks varied widely. A mixt. of  $\text{KClO}_3$  + Al + orpiment was exploded by friction of the broomstick on soft wood. Wet TNT was found to be sensitive to detonation and its transportation as a non-explosive forbidden. In making dyes the explosiveness of intermediates should be ascertained and proper precautions taken. 4,6-Dinitrophenoldiazo oxide was found a very sensitive and violent explosive. The burning of a girl's legs in an accident was attributed to her having worn stockings of artificial silk.

CHARLES E. MUNROE

The factory accidents of the chemist. LEYMAN. *Chem. Fabrik* 1929, 360-1.—Notes on explosive compds. Cf. C. A. 23, 1186. J. H. MOORE

Liquid oxygen involves an explosion hazard. ANON. *Eng. Mining J.* 128, 162-3 (1929).—An accidental explosion of LOX occurred in a mine at Chuquicamata, Chile, early in July, 1929, through which 11 men were killed. The cause of the accident is unknown but during the investigation while search was being made for "stray currents" it developed that in loading the boreholes the explosive charge acquired a static charge whose potential at the top and bottom of the explosive charge differed by a v., thus making a spark possible. A previous accident was due to an LOX cartridge being stuck in the hole and an attempt made to free it with a Cu spear dislodged rock from the walls of the hole so as to form a spark by friction.

CHARLES E. MUNROE

Explosibility of atmospheres behind stoppings. H. F. COWARD. *Iron Coal Trades Rev.* 118, 432, 468-70(1929).—See C. A. 23, 3345. LESLIE B. BRAGG

The technic of measuring coal dust. C. FÖRDERREUTHER. *Rauch Staub* 19, 1-12(1929); *Wasser Abwasser* 26, 29.—The methods of detg. dust content, humidity and inflammability of coal-mine galleries are discussed. C. R. F.

Comparative tests of the initiating ability of lead azide and mercury fulminate detonators. BÉLA CSERNÉCZKY. *Z. ges. Schiess-Sprengstoffw.* 24, 169-71(1929).—Specially loaded detonators (blasting caps) were tested by a modification of Wöhler's method (C. A. 21, 3744) in which the material to be detonated was compressed picric acid (instead of TNT) impregnated with 2-8% of paraffin oil. The explosive was pressed at 1500 kg./sq. cm. to d. 1.55 in 50 g. charges 38 mm. in diam. The explosive effect of the charges was detd. by the Pb block compression method of Hess. Tetryl was more effective than TNT as a base charge in compound detonators, while mixts. of  $\text{PbN}_3$  and Pb styphnate were more effective than  $\text{Hg}(\text{ONC})_3$  as the priming charge. The Pb styphnate increases the inflammability of the  $\text{PbN}_3$ . When the cavity in the pressed charge was provided with a metal lining in which the detonator was placed, simulating conditions under which detonators are used in ammunition, results were less consistent. The metal surrounding the detonator appeared to reduce its efficiency. After exposure to moist atm. for 7 to 21 days all tetryl and TNT detonators with 0.6 g. priming charge of  $\text{Hg}(\text{ONC})_3$  or its mixts. with  $\text{KClO}_3$  failed to function, whereas similar detonators with 0.3-0.4 g. priming charge of the  $\text{PbN}_3$  mixt. still functioned after 58 days of such exposure. C. G. STORM

Pentaerythritol tetranitrate and its nitroglycerin mixture "penthrinit" as a shell

filler. ALFRED STETTbacher. *Chem.-Ztg.* 53, 533-4, 554-6(1920); cf. C. A. 23, 516. E. M. SYMONS

Combustion and explosion processes. F. HABER. *Z. angew. Chem.* 42, 745-51 (1929).—Rutherford's concept of an atom and Planck's ideas concerning quanta to the processes of combustion result in new explanations of the mechanism involved. In the Bunsen flame there is an inner cone (about 0.1 mm. thick) of constant explosions, requiring only a few ten-thousandths of a second for gas to pass through it. The assumption that it was much hotter than other parts of the flame was not proved by expt. But its spectrum showed 3 groups of bands, due to OH, CH and CC (Swan spectrum), resp., which exist temporarily in the flame. Studies on radiation and cond. of flames from hydrocarbons support the theory that the number of ions and free atoms in the flame is high. Flames of different origins have very different conditions in the inner zones, depending upon whether CC or CH groups are present. The existence of free H is definitely established; by employing walls, dust or antiknock preps. to cause the free H atoms to combine with one another the course of combustion is regulated. That ortho-H and para-H occur in varying proportions in H at different temps. also has a bearing upon the course of the combustion. It has been established, too, that  $C_2H_4$ ,  $C_2H_2$  and  $C_2H$ , all yield the radical CC as an intermediate substance, that long aliphatic chains break down into members of low mol. wts. during combustion, and that  $C_6H_6$  likewise yields  $C_2H_2$ . Explanations for these facts are offered in terms of modern theories. W. C. EBAUGH

The role of electricity carriers during the explosion of combustible gases mixed with air. F. HABER. *Sitzb. preuss. Akad. Wiss.* 1929, 162-70.—On the basis of expts. carried out by himself in collaboration with Sasaki and Quasebarth, H. discusses the extinction of explosion flames by passage through charged condensers, and states that the cond. in the explosion zone is to be assigned chiefly to the presence of CC-, or eventually CH-radicals. The source of the energy required to bring about splitting into charged parts lies in the impact of the primary particles formed during the combustion stage. ALBERT L. HENNE

Report of Commission of Inquiry into the Holborn explosions and fires. Secy. of State for the Home Dept., *Pamphlet* 47, 1929.—This catastrophe which occurred in London, Dec. 20-21, 1928, through which a large section of the streets was blown up, was due to mixts. of coal gas and air accumulated in the Post Office duct. The continuous ventilation of underground ducts and cavities is recommended. The rept. is accompanied by many sketches, photographs and tables. CHARLES E. MUNROE

Explosive shells. O. MATTER. *Brit.* 303,975, Nov. 25, 1927. A shell is charged with compressed TNT or the like and provided with a cap contg. highly compressed pentaerythritoltetranitrate, tetranitromethylaniline or the like with a superposed igniting charge of strongly compressed Pb azide or other suitable heavy metal azide. Small caliber shells may have caps contg. merely compressed azide. Cf. C. A. 23, 517.

Blasting detonators and fuses. W. ESCHBACH. *Brit.* 304,144, Jan. 14, 1928. Pb azide in a Cu container is protected from moisture and  $CO_2$  by inserting an elec. igniter into the mouth of the container and applying a cast seal.

Gun cartridges. J. D. PEDERSEN. *Brit.* 304,948, March 20, 1928. The exterior of metal cartridges is coated with a protective and lubricating coating preferably formed of ceresin applied in soln. in  $CCl_4$ .

Cartridge wads. C. A. BURGHARDT (to Textile Fabrics Corp.). *Brit.* 304,714, Jan. 25, 1928. Wads are formed with the fibers perpendicular to the plane of the wad, to facilitate lateral expansion of the wad and good sealing effect for the gases under pressure.

Gas bomb suitable for discharge from aircraft. ARCHIE F. NAIR and ROBERT A. NAIR. U. S. 1,723,804, Aug. 6. Structural features.

Projectile for bombing practice from aircraft. F. MARIE (to État-Français). *Brit.* 304,318, Jan. 19, 1928. Structural details are given of a projectile adapted to eject a cloud of colored powder such as red ochre on impact with the ground.

Hexamethylenetetramine dinitrate. MAX ELBE. *Ger.* 479,226, Jan. 23, 1927. The dinitrate of  $(CH_2)_6N_4$  is prepd. directly by passing  $CH_2O$  into a concd. aq. or alc. soln. of  $NH_3$  and treating the product with the calcd. amt. of  $HNO_3$ , which may contain some  $H_2SO_4$ . Alternatively, a solid polymer of  $CH_2O$  may be dissolved in the  $NH_3$  soln. and the acid then added. The product is desired for use in the manuf. of an explosive compd., tentatively considered to be 1,3,5-trinitrohexahydro-s-triazine.

## 25—DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

The analysis of dyestuffs, yesterday and to-day. H. E. FIERZ-DAVID. *J. Soc. Dyers Colourists* 45, 133-40(1929).—At the present time methods exist which permit the identification of any dyestuff which has once been properly described. Methods for newly developed types of dyes are not generally available but are kept unpublished by manufacturers who are unwilling to give the necessary data. Valuable examples and methods of approach are given. H. W. STIEGLER

The increasing importance of vat colors, and some methods of application. PHILLIP H. STORT. *Proc. Am. Assoc. Textile Chem. Colorists* 1929, 261-71; *Am. Dyestuff Repr.* 43, 463-73(1929).—The development of the vat dye industry and methods of dyeing and printing cotton, rayon and silk are described. Thorough reduction is important. A classification of certain vat dyes as to dyeing temp. and speed of exhaust is given. Variations in fastness of vat colors are discussed. E. W. CLARK

Dibenzodithiazinequinone, a class of vat dyestuffs. II. Derivatives. RINOSUKE SHIBATA, SHUTARO TESHIMA AND YASUYUKI ASAGI. *Tech. Repts. Tohoku Imp. Univ.* 8, 279-95(1929); cf. C. A. 22, 2842.—The dichloro and the dibromo derivs. are prepd. by condensation of  $p\text{-Cl}_2\text{C}_6\text{H}_4\text{NH}_2$  (II) with itself or bromoaniline, resp. and treating as previously described. These dyes decomp. above  $360^\circ$  and impart blue shades. Dibenzodithiazinequinone (I) with  $\text{Br}_2$  is probably both brominated and oxidized to the sulfonyl deriv. 3,6-Dichloro-2,5-diphenetinedio- $p$ -quinone, decomp. at  $263^\circ$ , is obtained in 56% yield by condensing II with  $p\text{-H}_2\text{NC}_6\text{H}_4\text{OEt}$ . This with alc.  $\text{Na}_2\text{S}$  yields a mercaptan which with  $\text{PhNO}_2$  gives a 40% yield of the diethoxy deriv., which with  $\text{HBr}$  yields 10% of the dihydroxy deriv. (III) and with  $\text{HNO}_3$  45% of the sulfonyl deriv. III has also probably been prepd. from 2,5-di-( $p$ -hydroxyanilino)-3,6-dimercaptoquinone, which is prepd. either from 2,5-di-( $p$ -hydroxyanilino)-3,6-dichloroquinone or its acetate, which are prepd. by condensing II with  $p\text{-H}_2\text{NC}_6\text{H}_4\text{OH}$  or  $\text{MeCOOC}_6\text{H}_4\text{NH}_2$ , resp. All these give blue colors from a  $\text{NaHSO}_4$  vat. The dinaphtho deriv. is prepd. directly in 88% yield by treatment of the condensation product of  $\beta\text{-C}_{10}\text{H}_7\text{NH}_2$  and II with a  $\text{Na}_2\text{Sx}$  soln. This deriv. colors fibers green, yields with  $\text{HNO}_3$  the disulfonyl and gives a violet Cu salt. I can be crystd. from  $\text{H}_2\text{SO}_4$  by exposure to  $\text{H}_2\text{O}$  vapor. V. F. HARRINGTON

The utilization of some by-products from intermediates in the aniline dye industry. G. V. KOGAN. *J. Chem. Ind. (Russia)* 4, 761(1927); *Chem. Zentr.* 1928, I, 1332-3.— $\text{Fe}_2\text{O}_3$  is present in most of the aniline waste liquors.  $p$ -Nitroaniline waste contains approx. 28-29% of  $\text{H}_2\text{SO}_4$ . By concg. this  $\text{H}_2\text{SO}_4$  and mixing with Fe chips,  $\text{FeSO}_4$  may be manufactured. In the reduction of nitrobenzene to hydrazobenzene with Zn in an alk. soln.,  $\text{ZnSO}_4$  or  $\text{ZnCl}_2$  is obtained. The Zn may be pptd. as basic carbonate and ignited to form ZnO. The ZnO may then be converted into  $\text{ZnCrO}_4$ . C. R. F.

Colloid chemistry and dyeing. I. KARIN SCHULZE. *Seide* 34, 169-73(1929).—An exposition of colloid chem. principles applied to textile fibers. H. W. STIEGLER

Dyeing methods for rayon. GEORG RUDOLPH. *Kunstseide* 11, 244-6(1929).—A general article. FREDERICK C. HAHN

Dyeing possibilities of acetate rayon alone and in mixed fabrics. GEORG RUDOLPH. *Kunstseide* 11, 261-4(1929).—General discussion. FREDERICK C. HAHN

The boiling of rayon in dyeing. GEORG RUDOLPH. *Kunstseide* 11, 278-9(1929). FREDERICK C. HAHN

Dyeing of mixed shades in rayon fabrics. GEORG RUDOLPH. *Kunstseide* 11, 23-4(1929). FREDERICK C. HAHN

Uneven colors on rayon. GEORG RUDOLPH. *Kunstseide* 11, 61-3(1929).—A discussion of dyeing conditions for avoiding uneven colors. FREDERICK C. HAHN

Dye absorption power of mercerized cellulose. N. UERB. *Z. Farbenind.* 20, 247-50(1929).—U. has endeavored to find chem. methods for distinguishing between mercerized (I) and unmercerized (II) cotton. The absorption of different dyes was studied. I absorbs a much greater quantity of dye than does II. F. C. H.

Lake formation and cotton dyeing. EMIL BAUR AND H. SCHNYDER. *Z. Elektrochem.* 35, 254-63(1929).—An attempt is made to place the question of chem. combination between fiber and dye on a more general basis. The exptl. evidence is based on the distribution of dye between adsorbing material and soln. After theoretical discussion, detailed exptl. evidence is presented in the form of curves and tables. The data cover  $\beta$ -naphthol and picric acid; pptd. alumina, Al-tannin, Cr-tannin, Cu-tannin, Sb-tannin mordants; cotton, immunized and mercerized cotton. Acid, basic and direct dyes were used. After studying a wide range of concns., the conclusion is reached that

the distribution of acid and basic dyes between dye bath and such materials as mordants and various types of cellulose fibers is governed essentially by chem. change.

H. W. STIEGLER  
Printing sulfur dyes without blackening the rolls. PIERRE HOLM. *Bull. soc. ind. Mulhouse* 95, 354-7(1929).—Sealed Note 1960, Dec. 27, 1905.  $As_2O_3$  is added to the color paste. The  $As_2S_3$  formed dissolves in the alkali, giving Na thioarsenite which, in presence of a slight excess of  $As_2O_3$  and NaOH, does not attack the Cu rolls. The paste should not be too strongly reducing, as the  $As_2S_3$  would be again liberated and would darken the rolls. A no. of formulas are given. Report. ANDRÉ WOLFF. *Ibid* 358-9.—The results claimed were confirmed. No anteriority was found. The toxicity of  $As_2O_3$  militates against the industrial application of the process, especially as there are now available dyes which are faster and easier to use than the S dyes. A. P.-C.

Aging in a print works. CARLETON C. ADAMS. *Am. Dyestuff Repr.* 43, 483-8, 508-11(1929).—A. describes the development of the ager, present ager practice and classes of colors handled. Of the many factors affecting the reactions which take place on the cloth during aging, the temp. of the steam is considered the most important with the factors of time, flow and moisture coming next. The use of a copious supply of satd. steam is recommended. Various methods of introducing moisture to the steam, which is important in the aging of vat colors, are mentioned. E. W. CLARK

Report of the Sub-Committee on Light Fastness. III. The fading of dyed textiles in daylight and in carbon arc light. WM. H. CADY AND WM. D. APPEL. *Proc. Am. Assoc. Textile Chem. Colorists* 1929, 217-56; *Am. Dyestuff Repr.* 18, 407-46.—Twelve hundred fifty-two specially prepd. dyeings on cotton, wool, silk and weighed silk were exposed to daylight in several different ways and to the light from a glass-enclosed C arc. Three hundred eighty-one different coloring matters were used. Details are given concerning the samples used, the method of exposure, the method of studying results, the results of exposure and miscellaneous observations. Results prove that the "standard sun test" of the Am. Assoc. of Textile Chemists and Colorists gives reproducible results with reference to the relative fading of dyes in the series; that the presence or absence of a glass cover over dyeings exposed to the sun has a marked effect on the fading in only 4% of the samples; and that marked divergences take place in fading, depending on the method of exposure to sunlight. Fading in the arc light is different in quality in many instances from that in the "standard sun test." T. G. HAWLEY, JR.

Preliminary report on investigations of the fastness of dyed textiles to light and washing. P. W. CUNLIFFE. *J. Soc. Dyers Colourists* 45, 215-7(1929).—A brief description is given of the results of fastness tests on wool, silk, cotton, linen, rayon and mixed fabrics, and the conditions under which they were carried on. Increased humidity generally caused more rapid fading of dyed fabrics exposed to light. Some of the methods of measuring color changes are briefly discussed and an opinion is expressed as to their relative values. T. G. HAWLEY, JR.

Notes on the effect of light on colored fabric. III. EVA HIBBERT. *J. Soc. Dyers Colourists* 45, 204-5(1929); cf. C. A. 23, 280.—Calico, wool and cellulose acetate silk were impregnated with 1,2,4-trihydroxyanthraquinone (Purpurin). After 60 hrs.' exposure to the Fade-O-Meter, a substance was extd. with  $CCl_4$  which was thought to be a mixt. of phthalic acid and phthalic anhydride. References are given to earlier work in which Purpurin has been oxidized to phthalic and oxalic acids. Impregnation with phthalic acid and phthalic anhydride, followed by exposure to the Fade-O-Meter and extn. with alc. and  $CCl_4$ , increases the affinity of calico for methylene blue. T. G. HAWLEY, JR.

Effect of light during the bleaching of some colored cellulose materials by hypochlorites. F. SCHOLEFIELD AND C. K. PATEL. *J. Soc. Dyers Colourists* 45, 175-8(1929).—If cellulose materials dyed with certain vat yellows and oranges and satd. with hypochlorite or  $H_2O_2$  solns. are exposed to light, tendering takes place, except with Indanthrene Yellow G. H. F. LEUPOLD

How much should a dyer know about wool? GEORGE RICE. *Am. Dyestuff Repr.* 43, 489-92, 502-3(1929).—Practical. H. H. MOSHER

The manufacture of staple fiber. ARTHUR FATH. *Rayon Record* 2, 537-41(1929). ARTHUR K. JOHNSON

The rotting of textiles by microorganisms. I. A laboratory test. G. O. SEARLE. *J. Textile Inst.* 20, 162-74T(1929).—The loss of strength caused by fungi and bacteria attacking textiles, more particularly heavy canvases and tent ducks, is discussed. The chief matters for investigation are the nature of the intrinsic mildew-resistant qualities of various cloths in the loom state and the proportionate effects of microbial, tendering and light tendering on textiles exposed to weathering, so as to discover the relative im-

portance of antiseptics, waterproofing and lightproofing in producing max. resistance. To compare the resistance of cloths to fungi and bacteria, strips of a size suitable for a Goodbrand cloth-testing machine are bound round filter candles which have been covered first with a thin layer of soil. The samples are kept in an incubator and the strips are tested for strength at periodic intervals. Results of several trials of heavy linen ducks are given. No appreciable difference was found between the resistance of a cotton duck and a linen duck tested by this method over a period of 6 weeks. The viscosity in cuprammonium of cloths tendered by microorganisms is the same as that of normal cellulose, and this is suggested as a basis for distinguishing between microbiol decay and light tendering, since the latter causes a considerable drop in the viscosity values.

S. B. FOSTER

The preliminary examination of raw silk before scouring and loading. KARL GUTOWSKY. *Kunstseide* 11, 24-5(1929).—Raw silk is made softer and more workable by treatment with glycerol, olive oil, soap or other textile oils before weaving and knitting. The treatment results in 10-30% increase in wt., which must be taken into account to obtain satisfactory loading and subsequent processing.

F. C. H.

The action of alkalies and other swelling agents on viscose silk (Courtauld's A quality). A. J. HALL. *J. Soc. Dyers Colourists* 45, 171-5(1929).—Viscose silk suffers much loss of luster, shrinkage in length, strength, softness of handle and elasticity when immersed in soln. of NaOH (12-70° Tw.) and afterward washed in cold water. The deleterious effect of such treatment comes when washing with plain water, since the use of aq. solns. of certain org. or inorg. substances permits the silk to retain its original properties. The effect of KOH is practically harmless above 0° and it decreases with increased temp. It is possible to mercerize cotton goods contg. viscose silk with KOH without the slightest deleterious effect on the viscose silk.

A. K. JOHNSON

Denier measurement—the microscopic method. J. M. PRESTON. *Rayon Record* 2, 543(1929).—Herzog's method measures the areas of the filament cross sections by square-ruled standardized eyepiece micrometer. The product of the mean value for a single filament, the no. of filaments in yarn, the sp. gr. of rayon and the correction factor 0.93 are the denier size of yarn. The sp. gr. and area per denier for acetate rayon are 1.26 and  $85 \times 10^{-8}$  sq. mm., resp.; for viscose, cuprammonium and nitron rayon 1.52 and  $71 \times 10^{-8}$  sq. mm.

ARTHUR K. JOHNSON

Dull artificial silk. FRANZ NEVELY. *Seide* 34, 173-5(1929).—A survey is made of patent literature on the production of artificial silk having less luster. Two general methods are given: the introduction of finely dispersed materials in the fiber during spinning; changing the fiber surface during after-treatments.

H. W. STIEGLER

Delustering rayon. WALTER OBST. *Kunstseide* 11, 279-80(1929).—A discussion of patents in this connection.

FREDERICK C. HAHN

Creping wool muslin. CAMILLE FAVRE. *Bull. soc. ind. Mulhouse* 95, 359-60(1929); cf. C. A. 16, 3001; 20, 827. Sealed Note 2284, Oct. 8, 1913.—When a large no. of pieces are creped simultaneously by the process of Sealed Note 2266, the results are somewhat uneven, and best results are obtained by treating each piece separately for about 20 min. The crepe may be reserved by printing the wool muslin with 40° Bé. water glass, drying and then treating with acid. By dissolving a direct dye in the water glass, a colored reserve is obtained. Report. ADOLPHE WOLF. *Ibid* 360.—The claims of F. were confirmed. Similar results can be obtained by printing with a soln. of albumin or of sericose, but not with British gum and BaCl<sub>2</sub>.

A. PAPINEAU-COUTURE

The sulfur content of wool. II. Distribution of sulfur along the fiber, variation with color and the effect of exposure to ultra-violet light. J. BARRITT AND A. T. KING. *J. Textile Inst.* 20, 151-8T(1929); cf. C. A. 21, 178.—In a majority of the samples examd. the highest percentage of S was found to be toward the tips. This distribution was not affected by a typical S-contg. dip. Weathering causes a diminution of S in the most exposed parts of the fiber. White wool has a higher S content than black. Cleaned samples exposed for 80-100 hrs. to the light from a quartz lamp lost from 3.7 to 5.0% of their S content. If irradiation was followed by treatment with 0.001 N NaOH, this loss was more than doubled. Microscopic examn. showed that the scales were raised up and some completely removed. It is suggested that these scales possess a higher S content than the cortex; hence a decrease in the number of scales would explain in part the loss of Sn on irradiation. This paper contains an addendum in which the authors criticize similar studies by H. R. Marston who reported (cf. C. A. 23, 2997) no inherent variation in S content. The biol. significance of variable S in wool is discussed, and the belief advanced that this property is due to variations in the incorporation of the cystine nucleus under the action of *glutathione*. III. Effects of chemical processing on sulfur content. *Ibid* 159-61T.—Certain com. processes such as scouring,

liming and chlorination as conducted by the authors have little effect on the total S content. With respect to scouring with  $\text{Na}_2\text{CO}_3$  and alk. soaps, this conclusion contradicts that of Marston.

S. B. FOSTER

The influence of laundering on some cotton and linen fabrics. MARION GRIFFITH, THELMA SPRAGUE, VERA BERG WITH RACHEL EDGAR. *Iowa State Coll. J. Sci.* 3, 215-25(1929).—Eleven fabrics were tested for thickness, weight, inorg. content, dry breaking strength and wet breaking strength after 100 washings, 150 washings and 200 washing. Dry breaking strength was measured at 7 intervals in a 100-hr. exposure to steam at  $120^\circ$ .

F. E. BROWN

The use of dispersing media to prevent precipitation by means of hard water. F. MÜNZ. *Z. angew. Chem.* 42, 734-6(1929).—Soap itself acts as a protective colloid to hold material in suspension, and therefore when textiles are washed in hard water and rinsed even in soft water there may be a deposition of flocculated substances during the rinsing. "Intrasol," a (German) proprietary product made by treating certain oils with acids, is very efficient in preventing such deposition, and is therefore recommended for use with hard water.

W. C. EBAUGH

Report of the Sub-Committee on Waterproof Standards. ANON. *Proc. Am. Assoc. Textile Chemists and Colorists* 1929, 281-3; *Am. Dyestuff Repr.* 18, 523-5 (1929).—An app. has been developed for hydrostatic pressure tests. Fabrics showing a resistance of 17 cm. are called showerproof, a resistance of 50 cm., rain resisting. A resistance of 50 cm. for 1 hr. is accepted as waterproof. The size of drops, their rate of fall and the amt. falling from 1 min. to 24 hrs. is being investigated, as is the relation of hydrostatic pressure to conditions during rainfall of various degrees. The impermeability of fabrics to air at various pressures is being studied by the comm. with the idea of measuring the fabric's resistance during very high wind pressure. STEPHEN K. FORD

Modern washing and cleansing materials (NOLL) 18. Synthetic agents [for weight-imp silk] (Brit. pat. 305,013) 29. Benzanthrone derivatives [intermediates] (Ger. pat. 479,230) 10.

MANGET, CH.: *Tableaux synoptiques pour l'examen des tissus et l'analyse des fibres textiles*. Paris: Dunod. 80 pp. F. 5.

WOODHOUSE, T. AND KILGOUR, P.: *Spinning, Weaving and Finishing of Flax and Jute*. London: Sir Isaac Pitman & Sons, Ltd. 206 pp. 10s. 6d., net. Reviewed in *J. Textile Inst.* 20, P138(1929).

Dye. A. ZINKE (to F. Bensa). Brit. 305,136, Jan. 31, 1928. A vat dye giving heliotrope shades on cotton is made by chlorinating  $\beta$ -dinaphthol in boiling glacial HOAc and treating the product with concd. or fuming  $\text{H}_2\text{SO}_4$ .

Dyes. L. CASSELLA & Co. Brit. 304,613, Jan. 21, 1928. Halogen derivs. of anthranthrone are prepd. by treating an aq. soln. of an anthranthrone-sulfonic acid with a halogenating agent, to replace the sulfonic acid group by halogen. Products are obtained which dye cotton from the vat orange shades.

Dyes. I. G. FARBENIND. A.-G. Brit. 304,263, Oct. 18, 1927. 1,2-Benzanthraquinone-3,4-dicarboxylic acid, anhydrides, imides and imidazoles are prepd. by acid condensation of 1,8-naphthalic-4-benzoyl-*o*-carboxylic acid and its derivs. (suitably by use of  $\text{H}_2\text{SO}_4$ , with or without  $\text{H}_3\text{BO}_3$ , at  $160$ - $200^\circ$ ). Examples are given including an imidazole which is an orange vat dye. 1,8-Naphthalic anhydride-4-benzoyl-*o*-carboxylic acids are pred. by oxidation of 5-acenaphthoylbenzene-*o*-carboxylic acids, and the product thus formed yields the corresponding imides and imidazole by reaction of  $\text{NH}_3$ , methylamine, arylamines or *o*-phenylenediamine. 5-Acenaphthoyl-3',6'-dichlorobenzene-*o*-carboxylic acid is obtained from acenaphthene and 3,6-dichlorophthalic anhydride by use of  $\text{AlCl}_3$  in  $\text{CS}_2$ .

Dyes. I. G. FARBENIND. A.-G. Brit. 304,326, Jan. 20, 1928. Bluish red azo dyes are formed in substance or on the fiber by coupling with an arylide of 2,3-hydroxynaphthoic acid a diazotized monoaroyl-*m*-phenylenediamine having in the *o*-position to the amino groups a halogen atom and a methyl or alkyl group or 2 halogen atoms. The amino H atom of the aroylamino group may be replaced by an alkyl or aralkyl group. Several examples are given.

Dyes. I. G. FARBENIND. A.-G. Brit. 304,794, Jan. 26, 1928. An active  $\alpha$ -deriv. of 5,6-benzo-7-chloro-3-hydroxy-1-thionaphthene is condensed, in a solvent such as glacial HOAc, with 4,5-benzo-3-hydroxy-1-thionaphthene or an active  $\alpha$ -deriv. of the latter is condensed with 5,6-benzo-7-chloro-3-hydroxy-1-thionaphthene. Dyes are thus obtained which give current tints on cotton.

**Dyes.** I. G. FARBENIND. A.-G. Brit. 304,804, Sept. 22, 1927. Dyes are formed by treating naphthazarine with monomethylamine or other suitable aliphatic amines, preferably in a closed vessel and in the presence of boric acid or condensing a reducing action such as Zn dust or  $\text{SnCl}_2$ , at a temp. not exceeding  $100^\circ$ ; the products are sepd. from the small quantity of vat dyes which are simultaneously formed (and which are less sol.) by extn. with an org. solvent. The products are suitable for dyeing cellulose esters and ethers such as "acetate silk." Examples are given.

**Dyes.** I. G. FARBENIND. A.-G. Brit. 305,082, Oct. 26, 1927. Anthraquinone vat dyes are formed by the action of  $\text{H}_2\text{SO}_4$  at a relatively low temp. (suitably about  $15\text{--}20^\circ$ ) on a 1,1'- or 2,1'-dianthraquinonylamine contg. at least one acridone ring in the 3(CO)-4 (NH)-position, and also contg. at least one acylamino group, with or without other substituents. The products may be oxidized with  $\text{HNO}_3$ . Dyes are obtained which produce olive-brown and gray shades on cotton. Examples are given.

**Dyes.** I. G. FARBENIND. A.-G. Brit. 305,174, Feb. 1, 1928. Monoazo dyes dyeing wool orange and yellow shades fast to fulling and to light are made by coupling a diazotized amine of the benzene series, such as diazotized 4-aminoacetylaniline or diazotized 2,4,6-trichloroaniline, with a sulfonic acid of 2-phenylindole or a substitution product.

**Dyes.** I. G. FARBENIND. A.-G. Brit. 305,487, Feb. 3, 1928. Azo dyes are made by use as components of compds. at least one of which contains a heterocyclic structure of the general formula  $(A.R_1)_x.R_2(B)_y$ , in which A represents nitro groups or reduction groups such as azoxy or azo or the amino group or its acylation products,  $R_1$  represents a carbocyclic ring,  $R_2$  represents a heterocyclic ring joined to  $R_1$  by a C to C linkage, x and y are 1 or 2 and B represents a halogen atom or a residue introduced in place of a halogen atom combined with  $R_2$  through a N, O or S atom. Various dyes are formed capable of use as acid wool, mordant or direct cotton dyes or cotton dyes for subsequent treatment. A very large number of examples are given.

**Dyes.** I. G. FARBENIND. A.-G. Brit. 305,488, Feb. 3, 1928. Phthaloylphenanthridones and their derivs. and substitution products are obtained by treating phenanthridone or a deriv. or substitution product with phthalic anhydride or a deriv. in the presence of a condensing agent such as  $\text{AlCl}_3$ . Yellow dyes or intermediates for dye manif. are thus obtained.

**Dyes.** I. G. FARBENIND. A.-G. Brit. 305,489, Feb. 3, 1928. Dyes and intermediates of the anthanthrone series are formed by treating a halogenated anthanthrone such as 2,7-dibromoanthanthrone with S or a S-yielding agent. A dye producing reddish violet shades on cotton may be thus formed.

**Dyes.** I. G. FARBENIND. A.-G. Brit. 305,592, Feb. 7, 1928. Indigo dyes are formed from 1-amino-3,6-dimethyl-4-halogen benzene or 1-amino-2-carboxy-3,6-dimethyl-4-halogen benzene by caustic alkali fusion of the Na amide of the corresponding phenylglycine, by condensation of the phenylglycine- $\alpha$ -carboxylic acid by use of  $\text{Ac}_2\text{O}$ , or by the phenylaminomalonic acid ester method. Various details and modifications of procedure are described.

**Dyes.** J. R. GEIGY AKT. GES. Brit. 305,648, Feb. 9, 1928. *o*-Hydroxynitroso dyes are made by nitrosating an aminonaphthol or a deriv. in which the amino group has been replaced by an alkylammonium group or by a group of the general formula  $\text{NH}\cdot\text{CO}\cdot\text{CH}_2\cdot\text{N}(\text{X})\cdot\text{B}$ , in which B is a basic residue such as pyridine or a dialkylamine, and X is an acid radical. The acid salts of the dyes and their heavy metal compds. are sol. in water and can be used directly on wool or silk, or by means of tanning mordants on vegetable fibers. Silk is dyed brown-yellow by the Cu compd. of nitrosated pyridacetyl-2,7-aminonaphthol. Other examples also are given. Cf. C. A. 23, 4347.

**Dyes.** ALFRED PONGRATZ (to Felice Bensa). U. S. 1,725,596, Aug. 20. Diacetyl dichloroperylene or other suitable halogen substituent of alkylperylene diketones having each of the 2 aliphatic acetyl groups and a halogen atom in peri position is heated with a metal cyanide such as Cu cyanide in the presence of an org. solvent such as quinoline and the product of the reaction is sepd. from the solvent and the metal constituent of the cyanide is removed (suitably by use of aq.  $\text{NH}_3$ ). The product dyes cotton red which changes to reddish violet on exposure to the air. Cf. C. A. 23, 990.

**Azo dyes.** COMPAGNIE NATIONALE DE MATIÈRES COLORANTES ET MANUFACTURES DE PRODUITS CHIMIQUES DU NORD RÉUNIES ÉTABLISSEMENTS KUELMANN. Brit. 304,298, Jan. 19, 1928. Azo dyes of mordant character capable of being converted into sol. Cr compds. are obtained by coupling diazotized *o*-aminophenols or *o*-aminonaphthols or their substitution products with pyrazoles derived from aminoarylsulfamides. Numerous examples are given.

**Azo dyes.** KARL HEUSNER and MAX SIMON (to General Aniline Works). U. S.

1,725,076 Aug. 20. By coupling diazo compds., such as those derived from aniline or the like, with  $\alpha$ -naphthylsulfaminic sulfonic acid compds., dyes are obtained which give orange to yellow shades on wool.

**Azo dye.** I. G. FARBENIND. A.-G. (Georg Kalischer and Richard Gast, inventors). Ger. 477,913, May 22, 1927. Basic azo dyes sol. in water are prepd. by heating unsulfonated azo dyes contg. one or more thiazole groups in the mol. with alkylating agents in the presence of an org. solvent. Examples are given.

**Azo dye.** I. G. FARBENIND. A.-G. (Winfrid Hentrich and Max Hardtmann, inventors). Ger. 477,914, July 17, 1926. Tetrakisazo dyes are prepd. by diazotizing aminodisazo dyes of the type  $R_1$ -azo- $R_2$ -azo- $R_3$ -NH<sub>2</sub>, (where  $R_1$  = an amine,  $R_2$  = a further diazotable middle component of the naphthalene series and  $R_3$  = a deriv. of  $\alpha$ -naphthylamine coupled to the amino group in the *p*-position and contg. a substituted or free OH group), coupling with derivs. of 2-amino-5-hydroxynaphthalene-7-sulfonic acid, diazotizing again and coupling with methyl-ketol, its analogs or substitution products, pyrazolone, derivs. of  $\beta$ -ketoninaldehyde, 1,3-dihydroxyquinoline, sulfazone or salicylic acid. Examples are given. Cf. C. A. 23, 4347-8.

**Azo dyes.** I. G. FARBENIND. A.-G. (Leopold Laska and Arthur Zitscher, inventors). Ger. 479,345, Sept. 6, 1927. Azo dyes fast to light are produced on the fiber by impregnating the goods with a bis-(2',3'-hydroxynaphthoyl)-arylene-1,4-diamine having substituents in the 2- and 5-positions, and then coupling with a diazo, tetrazo or diazoazo compd. Many examples are given. Cf. Brit. 311,194.

**Azo dyes from rubber derivatives.** HARRY L. FISHER (to B. F. Goodrich Co.). U. S. 1,724,270, Aug. 13. Rubber di(hydroxyphenyl), which may be prepd. by reaction between rubber bromide and PhOH, is coupled in alk. soln. with diazotized aromatic amines such as the diazo compds. of sulfanilic acid, aniline or benzidine. Dyes are obtained which give brown to orange shades on wool, fast to washing and to sunlight.

**Red azo dyes formed by combining aromatic diazo compounds with 2,3-hydroxynaphthoyl-2-amino-3-naphthol ethers.** LEOPOLD LASKA and ARTHUR ZITSCHER (to General Aniline Works). U. S. 1,725,087, Aug. 20. Numerous examples are given of dyes suitable for production of lakes and which give red shades of good fastness on vegetable fiber.

**Monoazo dyes.** I. G. FARBENIND. A.-G. Brit. 304,744, Jan. 26, 1928. Monoazo dyes of good fastness to Cl and to kier-boiling are formed in substance or on the fiber by coupling with arylides of 2,3-hydroxynaphthoic acid diazo compds. of amines of the general formula 1,2,3,4,5-C<sub>6</sub>HMeHlgR(NH<sub>2</sub>)R, in which Hlg is halogen, one R is H and the other is halogen and in which one of the halogens is not Cl and preferably is Br. Several examples are given of dyes giving various red colors. Cf. C. A. 23, 2301.

**Orange to brown disazo dyes.** HENRY JORDAN (to E. I. Du Pont de Nemours & Co.). U. S. 1,724,660, Aug. 13. Various dyes are formed by coupling diazo compds. not having a sulfo or carboxy group with an aminobenzoylaminobenzoyl-2-amino-5-naphthol-7-sulfonic acid, diazotizing the resulting monoazo compd. and combining it with a sulfo or carboxylarylpyrazolone compd. or a sulfo or carboxyl indole compd. As first components there may be used, for instance, aniline, *o*-, *m*- or *p*-toluidine, xyldine, *o*- or *p*-anisidine, chloroaniline,  $\alpha$ - or  $\beta$ -naphthylamine, etc. U. S. 1,724,663 relates to dyes obtained by coupling a diazo compd. of the benzene or naphthalene series without a free hydroxyl or amino group to an amino compd. of the benzene or naphthalene series contg. only one free amino group and no OH group, and having a free *p*-position to the amino group, diazotizing the aminoazo compd. and coupling it again to an amino compd. of the benzene or naphthalene series contg. only one free amino group and no OH group, and having a free *p*-position to the amino group, then condensing the aminodisazo compd. with nitrobenzoyl chloride, reducing the nitrobenzoyl compd., and finally condensing the resulting aminobenzoyl compd. with an aliphatic or aromatic acid chloride or anhydride not contg. a free OH or amino group. Several examples are given.

**Vat dye.** LEOPOLD CASSELLA & CO. G. M. B. H. (Richard Herz and Werner Zerweck, inventors). Ger. 478,738, Nov. 14, 1926. Addn. to 458,568. An orange vat dye is prepd. by the successive action of Cl and Br on anthanthrone. The order of the halogenation may be reversed. Examples are given.

**Vat dyes.** I. G. FARBENIND. A.-G. Brit. 305,679, Feb. 10, 1928. Anthraquinone vat dyes are formed by the action of an acid condensing agent such as H<sub>2</sub>SO<sub>4</sub> on a benz-anthranylaminoanthraquinone contg. at least one aroylamino group in the anthraquinone nucleus. Examples are given of dyes producing yellowish brown shades on cotton.

**Vat dyes.** I. G. FARBENIND. A.-G. (Karl Schirmacher, Wilhelm Schaich and Arthur Wolfram, inventors). Ger. 476,811, June 25, 1926. Addn. to 470,809. The



method of Ger. 470,809 (C. A. 23, 2043) is modified by conducting the oxidation throughout under moderately acid conditions. The same final products are obtained as before, and these are now identified as anthraquinoneazines. Examples are given.

**Vat dyes.** I. G. FARBENIND. A.-G. (Paul Nawiasky and Julius Müller, inventors). Ger. 479,027, May 11, 1927. Addn. to 478,047. Brown vat dyes resembling those prep'd. according to Ger. 478,047 (C. A. 23, 4348) are prep'd. by treating directly with alk. reagents the nitrobenzanthrone prep'd. according to Brit. 12,518(1906), example 2. According to the example, the nitrobenzanthrone is treated with alc. KOH at 120°. The product may be purified by treatment with oxidizing agents.

**Vat dyes.** SOC. ANON. POUR. L'IND. CHIM. A BAËLE. Brit. 304,245, Jan. 17, 1928. Dibenzanthronyl sulfonic acids are alkali-fused to form vat dyes which, on alkylation form vat dyes dyeing gray shades and similar to the products formed as described in Brit. 279,479 (C. A. 22, 2845). Examples are given.

**Violet to blue sulfur dyes from dihydroindoleindophenolic compounds.** FRITZ BALLAUF (to General Aniline Works). U. S. 1,725,046, Aug. 20. A dihydroindoleindophenolic comp'd. which in form of its leuco deriv. has most probably the formula  $p\text{-HOC}_6\text{H}_4\text{NHR}_1\text{HR}_2\text{CHR}_3\text{CHR}_4$ , where R stands for H, an alkyl, aryl or aralkyl group

and  $R_1$  stands for a benzene nucleus which may be substituted by an alkyl, aryl, aralkyl, halogen or other univalent group, such as 2-phenyldihydroindole-5-*p*-leucoindophenol, is submitted to a polysulfide fusion (suitably an alc. fusion with  $\text{Na}_2\text{S}_4$  at about 170°). Dyes of good fastness to light and boiling are thus obtained.

**Dyes.** I. G. FARBENIND. A.-G. Brit. 305,140, Jan. 31, 1928. *o*-Cyanarylsulfocyanogen compds. (as described in Brit. 306,575 (following abstract)) are first submitted to acid hydrolysis and are then condensed with chloroacetic acid in alk. soln. to give *o*-cyanarylthioglycolic acids, for the prepn. of dyes of the thioindigo series. Various details and examples are given.

**Dye intermediates.** I. G. FARBENIND. A.-G. Brit. 306,575, Nov. 18, 1927. An *o*-aminoarylthiocyano comp'd. in which the position *p*- to the amino group is occupied or forms part of a further ring (and which may be prep'd. (as described in Brit. 257,619 (C. A. 21, 3057) and Brit. 303,813 (C. A. 23, 4482)) is diazotized and subjected to Sandmeyer's reaction in order to replace the amino group by a cyano group. The thiocyanogen group is then saponified with alkali and the resulting mercapto group is coupled with chloroacetic acid in order to produce an *o*-cyanarylthioglycolic acid. Several examples are given.

**Dyes and intermediates.** I. G. FARBENIND. A.-G. (Georg Kränzlein and Fritz Roemer, inventors). Ger. 479,163, Jan. 26, 1926. 1-Amino-4-diazoanthraquinone-sulfonic acids are prep'd. by subjecting 1,4-diaminoanthraquinone-2-sulfonic acid or 1,4-diaminoanthraquinone-2,6- or 2,7-disulfonic acid to the usual diazotization process. Neither quinoneimide derivs. nor bisdiazogen compds. are produced. New dyes of the alizarine direct blue A class can be prep'd. from the diazosulfonic acids by replacing the diazo group with halogen and treating the product with arylamines. Examples of the diazotization process are given.

**Dye intermediates.** I. GUBELMANN, R. J. GOODRICH and E. T. HOWELL (to Newport Co.). Brit. 305,536, Feb. 6, 1928. Benzanthrone or a benzanthrone deriv. is obtained in a pure state from crude reaction masses such as are produced by condensing an anthranol with glycerol in the presence of  $\text{H}_2\text{SO}_4$ , by treating the mass with a solvent such as  $\text{C}_6\text{H}_6$  and its homologs, which has a selective solvent action on the benzanthrone or deriv.

**Dye intermediates.** I. G. FARBENIND. A.-G. Brit. 304,439, Dec. 15, 1927. 2,3-Aminonaphthol and its derivs. are obtained when an *O*-arylsulfonic ester of 2,3-hydroxynaphthalenecarboxamide or a nuclear substitution product is subjected to Hofmann's reaction and the *O*-arylsulfonyl-2,3-aminonaphthol or nuclear substitution product thus formed is hydrolyzed. Several examples are given. Brit. 304,441 relates to the production of naphthol ether carboxyamides by alkylation of hydroxynaphthalene carboxyamides, and to their conversion into the corresponding aminonaphthol ethers by Hofmann's reaction. Examples are given.

**Dye intermediates.** I. G. FARBENIND. A.-G. Brit. 305,593, Feb. 7, 1928. (*o*-Aminoaroyl)-benzoic acids and their inner ring anhydrides are prep'd. from specified phthalic acid arylimides by heating with a Cl-contg. acid condensing agent such as  $\text{AlCl}_3$ ,  $\text{ZnCl}_2$  or  $\text{HCl}$ . Various details and examples are given.

**Anthracene derivatives.** I. G. FARBENIND. A.-G. (Georg Kalischer and Heinrich Salkowski, inventors). Ger. 479,357, Nov. 12, 1926. A product useful as an *intermediate for dyes* is prep'd. by heating  $\text{C}_{14}\text{H}_{10}$  with S at 200–250° and extg. the desired

product from the melt with an alkali sulfide soln. The extrn. with alkali sulfide soln. seps. the desired product from the dyes which, as described in Ger. 186,990 (C. A. 2, 600), are formed at the same time. The product is believed to be a mixt. of compds.

**Benzanthrone derivatives.** I. G. FARBENIND. A.-G. (Georg Kalischer and Heinz Scheyer, inventors). Ger. 479,231, Sept. 5, 1926. Dye intermediates are prepd. by heating benzanthrone to a high temp. with aromatic hydroxy compds. (which may contain other substituents in the nucleus) in the presence of caustic alkali. An excess of caustic alkali is avoided.

**Benzanthrone derivatives.** I. G. FARBENIND. A.-G. (Eduard Holzapfel, Otto Braunsdorf and Hans Lange, inventors). Ger. 479,356, Aug. 3, 1926. *Intermediates for dyes* are prepd. by condensing a halobenzanthronyl sulfide, disulfide or mercaptan, or derivs. thereof, with compds. having a reactive H atom, particularly with  $\text{NH}_3$ , aliphatic or aromatic amines, phenols or mercaptans. Examples describe the prepn. of aminobenzanthronyl sulfide, m. above  $340^\circ$ , propylaminobenzanthronyl sulfide, bisphenoxybenzanthronyl sulfide, bis-*p*-thiocresylbenzanthronyl sulfide, phenoxy-*Bz*-1-benzanthronyl methyl sulfide, m.  $163\text{--}165^\circ$ , amino-*Bz*-1-benzanthronyl methyl sulfide, m.  $275\text{--}278^\circ$ , 1'-anthraquinonylamino-*Bz*-1-benzanthronyl-*p*-tolyl sulfide, m. about  $330^\circ$  and 1-anthraquinonylamino-*Bz*-1-benzanthronyl sulfide. Cf. Brit. 249,891 (C. A. 21, 1016) and 261,757 (C. A. 21, 3751).

**Bisaminoarylanthrone and bisaminoarylanthracenes.** KARL SCHIRMACHER, BERTHOLD STEIN and KONRAD STENGER (to General Aniline Works). U. S. 1,724,045, Aug. 13. These compds. are formed by heating an anthraquinone or substitution deriv. with a salt of an aromatic amine such as  $\text{PhNH}_2\text{--HCl}$  or *o*-toluidine- $\text{HCl}$  and may be used as *dye intermediates*. Various examples and details of procedure are given. Bisaminophenylanthrone, m.  $298^\circ$ , bis-*o*-aminotolylanthrone, m.  $255^\circ$  and bisaminophenyl-*l*-aminoanthrone decomposes on melting.

**6,6'-Dichloroisodibenzanthrone.** ARTHUR LÜTTRINGHAUS and HUGO WOLFF (to General Aniline Works). U. S. 1,725,590, Aug. 20. This compd. is made by reaction of Na anilide on 6,6'-dichlorobenzanthrone in aniline at  $100\text{--}118^\circ$  in a current of N and dyes cotton violet-blue. Other similar compds. also are described.

**Condensation products of the benzodiazine series.** WINFRID HENTRICH, MAX HARDTMANN and RUDOLF KNOCH (to General Aniline Works). U. S. 1,724,086, Aug. 13. Quinazolines, monohalogenated in a diazine nucleus and wherein the diazine nucleus may be further substituted by a hydrocarbon residue and the benzene nucleus by any substituent, are caused to react with one mol. of such compds. which possess one or more reactive H atoms attached to a N, a S atom which is attached to a C atom with one valency or an O atom in such a manner that halide is split off. The products may be used as *intermediate products in the manuf. of dyes or pharmaceutical products*.

**Metal compounds of dyes.** I. G. FARBENIND. A.-G. (Hans Krzikalla and Werner Müller, inventors). Ger. 479,373, June 16, 1926. See Brit. 272,908 (C. A. 22, 1859).

**Dyeing with vat dyes.** DURAND & HUGUENIN SOC. ANON. Ger. 479,487, Jan. 25, 1927. Addn. to 418,487. According to Ger. 418,487, the fiber is impregnated with an ester salt of a leuco vat dye and the color is then developed by oxidation. This method is now simplified by impregnating the fiber with a bath contg. the ester salt and an oxidizing agent, with or without salts such as  $\text{Na}_2\text{SO}_4$  and a protective colloid, acidifying the bath and warming to develop the color. Examples are given.

**Dyeing with vat dyes.** I. G. FARBENIND. A.-G. Brit. 305,230, Feb. 2, 1928. In dyeing piece goods, an agent promoting bleeding or running is applied in the padding process, to assist penetration of the dye. Various emulsions of fats and oils or of their free acids or water-sol. derivs. such as Turkey-red oils and cellulose derivs. such as an alkali salt of carboxymethylcellulose capable of forming neutral or alk. colloidal solns. in water may be used.

**Dyeing mixed fabrics.** I. G. FARBENIND. A.-G. Brit. 305,269, Nov. 4, 1927. A sulfonated natural resin such as colophony sulfonic acid is employed as a reserve for wool or silk in dyeing mixed fabrics in acid or neutral baths. Several examples are given, and the prepn. of colophony sulfonic acid is described.

**Dyeing vegetable fibers.** JULIUS RATH (to General Aniline Works). U. S. 1,724,108, Aug. 13. Mixts. of S dyes with "ice colors" are produced on the fiber. U. S. 1,724,109 specifies a process of dyeing with S dyes and azo dye components which are developed with diazo compds. Several examples are given.

**Dyeing material containing wool.** I. G. FARBENIND. A.-G. Brit. 304,742, Jan. 25, 1928. In dyeing material contg. wool with substantive dyes, the wool is reserved by use of sol. salts of sulfonic acids produced by condensing a natural resin with an aralkyl-halide or a deriv. and sulfonating, or by condensing one or more natural resins with a

phenol and then treating with an aralkyl halide or deriv. followed by sulfonation. Examples are given.

**Dyeing cellulose esters and ethers, etc.** I. G. FARBENIND. A.-G. Brit. 304,739, Jan. 25, 1928. "Acetate silk" and like products are dyed deep greenish yellow tints by treatment with compds. such as that obtained by interaction of the anhydride of 4-amino-1,8-naphthalic acid with  $\text{NH}_3$  or a suitable amine or similar compds. Cf. C. A. 23, 2305

**Dyeing cellulose esters and ethers.** I. G. FARBENIND. A.-G. (Paul Nawiasky, inventor). Ger. 479,225, June 9, 1926. Fast red to blue shades are produced on cellulose esters and ethers by dyeing with ethers of 1,4-diamino-2-hydroxyanthraquinone or its *N*-substituted derivs.

**Dyeing cellulose acetate.** BRITISH CELANESE, LTD., G. H. ELLIS and H. C. OLPIN. Brit. 305,560, Nov. 7, 1927. Examples of nitro compds. which can be used are given. Various dispersing methods (which are specified) may be used in applying these compds. to materials formed from or contg. cellulose acetate. Brit. 305,566 relates to the use of similar compds. for the same purpose. Cf. C. A. 23, 3110.

**Dyeing cellulose acetate.** BRITISH DYESTUFFS CORP., LTD., R. S. HORSFALL, L. G. LAWRIE and J. A. R. HENDERSON. Ger. 479,224, Apr. 23, 1926. See Brit. 257,654 (C. A. 21, 3134).

**Dyeing acetate silk.** I. G. FARBENIND. A.-G. (Gustav Reddelien and Georg Matzdorf, inventors). Ger. 479,343, July 25, 1926. See U. S. 1,673,301 (C. A. 22, 2846).

**Spot dyeing yarn in cones.** WARD N. GERE (to Eclipse Textile Devices, Inc.). U. S. 1,724,015, Aug. 13. In order to color portions of a yarn cone, a coloring liquid is projected from the interior outwardly to the exterior of the cone while the cone is revolved at sufficient speed to assist the passage of the coloring liquid by centrifugal force. An app. is described.

**Printing fabrics.** I. G. FARBENIND. A.-G. Brit. 305,476, Feb. 2, 1928. Color printing is effected by padding the fabric with an aniline-black liquor, drying, printing with a paste contg.  $\text{ZnO}$ , a large excess of caustic alkali, and a coupling component free from sulfonic and carboxylic groups, steaming and developing with a diazo soln. Numerous examples and details are given.

**Printing fabrics with vat dyes.** I. G. FARBENIND. A.-G. Brit. 304,787, Jan. 26, 1928. The material is first printed with a dye thickened with a soln. of a cellulose ester or ether, and is subsequently treated with a reducing agent and an alkali and steamed without previous drying. A hyposulfite with addn. of a wetting agent is a suitable reducing agent. Details are given.

**Perforated dyeing spindles for use with yarn "cheeses."** J. BRANDWOOD and T. BRANDWOOD. Brit. 304,800, July 28, 1927. Structural features.

**Leather-like surface on dyed textile materials.** GOTTHARDT A. SALLMANN. U. S. 1,725,675, Aug. 20. Pressure rolls of soft rubber are used for assisting in giving fabrics a suitable leather-like appearance by treatment of the material in dry condition.

**Mordants and wetting agents.** ORANIENBURGER CHEMISCHE FABRIK A.-G. Brit. 304,608, Jan. 19, 1928. Products which are mordants for basic dyes, upon vegetable materials and chrome leather, are obtained by the action of strong condensing and sulfonating agents upon fats, fatty acids, resins or fat-like substances, the high b. p. distn. products of petroleum, brown-coal tar or other bituminous material or upon mixts. of such materials with compds. capable of being condensed with them under the conditions of sulfonation. Various details are given, with examples employing as starting materials: wool fat and peanut oil fatty acid, naphthalene and the fatty acids of peanut oil and soy oil, castor oil and  $\text{Ac}_2\text{O}$ , a mineral oil and a mineral oil together with iso- $\text{PROH}$ .

**Retting fibers.** C. LIENARD-FIEVET. Brit. 304,602, Jan. 20, 1928. In the prepn. of fibers having a wooley feel from fibrous plants of the Malvaceae family, such as *Sida rhombifolia*, the sorted and moistened plants are steeped in 1%  $\text{Na}_2\text{CO}_3$  soln. followed by an alk. soln. of vegetable oil dissolved in "tetrachloride (Tetrapol)" in order to dissolve out the pectic substances. The material is then washed, drained, treated for  $1\frac{1}{2}$ -2 hrs. at ordinary temp. with a soln. of 35° Bé.  $\text{NaOH}$  to which 1 g. monopol soap per l. has been added, drained, rinsed and bleached with sulfurous gases. Brit. 304,606 relates to the use of yarns of such fiber, mixed with wool, etc., and which may be treated with natural or sulfonated oils.

**Insect-proofing textile materials, etc.** HAROLD MAXWELL-LEFROY (to Graesser Monsanto Chemical Works, Ltd.). U. S. 1,725,656, Aug. 20. Trichloronaphthalene or other suitable polyhalogenated naphthalene is used as an impregnating agent in insuffi-

cient quantity substantially to alter the phys. and mech. properties of the material treated.

**Waterproofing textile and other materials.** C. J. MORETON and PRUFIX, LTD. Brit. 305,493, Aug. 5, 1927. Gum tragacanth or a similar gum is used with soap, an animal, vegetable or mineral waxy substance and ammonia, in conjunction with metal salts such as those of Ti, Zn or Al. Various details and examples are given.

**Yarn-sizing apparatus of the "bobbin-to-bobbin" type.** WM. B. CROMPTON. U. S. 1,724,397, Aug. 13. Structural features.

**Yarn-conditioning apparatus (for treating yarn with steam).** FREDERICK E. STRUVE (to Textile Machine Works). U. S. 1,724,230, Aug. 13. Structural features.

**Mercerizing fabrics and yarns.** N.-V. J. A. CARP'S GARENFABRIEKEN. Brit. 305,664, Feb. 10, 1928. The wetting power of NaOH mercerizing lye is increased by adding a phenol such as cresol and an alc. such as benzyl alc.

**Mercerizing cotton or similar fabrics.** I. G. FARBEIND. A.-G. Brit. 305,509, Sept. 6, 1927. A mixt. of an org. sulfonic acid with the product obtained by the interaction of  $H_2SO_4$  upon oleic or ricinoleic acid is added to the mercerizing bath or used for pretreating the fabric. Alcs. or other org. solvents also may be added to increase the wetting power of the mercerizing bath. Various examples are given.

**Coating fabrics with rubber.** ANODE RUBBER CO., LTD. Brit. 304,157, Aug. 10, 1927. Materials to be coated or impregnated are subjected to a preliminary wetting with the same or a similar dispersion as that used for the impregnation or coating. Various compounding and modifying ingredients such as synthetic rubber, casein or artificial resins may be added, and various details and modification of procedure are described.

**Coating fabrics with natural or artificial rubber dispersions.** C. MACINTOSH & Co., LTD., S. A. BRAZIER and J. D. CAMPBELL. Brit. 305,264, Nov. 4, 1927. After application of the coating material, the fabric is passed in festoons through a drying chamber, further coating is applied and the material passed through another drying chamber, in a continuous operation. An arrangement of app. is described.

**Mixed linen and cotton fabric.** NORBERT VOHS. U. S. 1,724,628, Aug. 13. Features of weaving are specified.

**Apparatus for impregnating cotton-wrapping cloth, etc., with viscose or like solutions.** A. H. KILNER. Brit. 304,168, Oct. 15, 1927. The fabric is immersed in the soln. and then passed through a fine slit to force the soln. into the material. Various structural details are described. Brit. 304,341 relates to the use of similar material for *enclosing and preserving various food products*.

**Washing wool or other textile fibers, leather, feathers, etc.** H. T. BÖHME A.-G. Brit. 304,719, Jan. 25, 1928. In using oxidizing agents such as peroxides or reducing agents such as sulfurous acid or hyposulfite, hypogenated phenols such as hexahydro-cresol or aromatic or hydroaromatic oxy-compds. are added as protective agents; they may also enhance the cleaning effect. Further addns. such as soaps, Turkey-red oil or the hydrogenation products of higher sulfo acids are also preferably used.

**Centrifugal apparatus for treating wool-washing water.** J. THOMSON and C. A. THOMSON. Brit. 304,718, Jan. 25, 1928. Fat, water and dirt are separately discharged from the app. described.

**Finishing textile materials containing cellulose organic esters.** C. DREYFUS (to British Celanese, Ltd.). Brit. 304,596, Jan. 21, 1928. Yarns, threads, fabrics, garments, etc., comprising esters such as cellulose acetate, alone or with other fibers such as silk, cotton or linen, are treated with an alk. soln. of OH-ion concn. sufficient partially to saponify the cellulose ester. The permissible ironing temp. is thus raised.  $Na_2PO_4$  or an alkali metal hydroxide, carbonate or silicate may be used for the treatment.

**Artificial fibrous cellulosic material.** LEON HILLENFELD. U. S. 1,724,670, Aug. 13. Material comprising cellulose or cellulose hydrate is treated with a caustic alkali soln. contg. not more than 5% NaOH or equiv., and the material is stretched during at least a part of the treatment, in order to strengthen the material, e. g., "viscose silk."

**Treating cellulosic fabrics.** TOOTAL BROADHURST LEE CO., LTD., R. P. FOULDS and J. T. MARSH. Brit. 304,900, Jan. 9, 1928. Cellulosic fabrics have little or no tendency to crease or crumple after successive treatment with a mercerizing liquid and then, while in wet swollen condition, with a synthetic resin or components capable of forming such a resin such as  $PhOH$ ,  $CH_3O$  and  $K_2CO_3$  which are caused to react on the material.

**Apparatus for treating artificial silk on spools with liquids for bleaching or dyeing, etc.** MASCHINENFABRIK SCHWEITER A.-G. Brit. 304,310, Jan. 19, 1928.

**Centrifugal boxes for treating artificial silk with liquids.** COURTAULDS, LTD.,

E. HAZELBY and E. A. MORTON. Brit. 305,279, Nov. 7, 1927. Structural features. Treating artificial filaments with liquids. I. G. FARBENIND. A.-G. Brit. 304,667, Jan. 23, 1928. Mech. features.

Treating artificial silk with liquids on perforated tubes and drums. M. SCHOENFELD. Brit. 304,197, Jan. 16, 1928. Mech. features. Brit. 304,203 relates to spools for use in similar treatments.

Mat and luster effects on yarns or fabrics comprising viscose in the sulfur state. FRED SCHOLEFIELD and NORMAN DENNER (to Burgess Ledward & Co., Ltd.). U. S. 1,724,375, Aug. 13. A printing paste contg.  $\text{Na}_2\text{SO}_3$  and a dye is applied locally to parts of the material. Several examples are given.

Device for washing artificial silk fibers. SPINNSTOFFWERK GLAUCHAU A.-G. Ger. 478,580, Jan. 22, 1927. Details are given.

Rubber-lined vat and associated apparatus for washing or other treatments of fibrous material wound on bobbins. WALTER ALTHOFF. U. S. 1,725,045, Aug. 20. Structural features.

Degreasing, opening up, and bleaching animal and vegetable fibers. A. UHLMANN (to Aktis Patent-Verwertungs-Ges.). Brit. 304,295, Jan. 18, 1928. The material is placed in water in a glass or ceramic vessel contg. a metal plate and resting on or surrounded by a coil through which currents of 3000–5000 v. and up to 3,000,000 periods may be passed. *Soaps, oils and fats may be obtained as by-products.*

Hydrogen peroxide. N.-V. ELECTROCHEMISCHE INDUSTRIE. Brit. 305,472, Feb. 4, 1928.  $\text{H}_2\text{O}_2$  (which may be in alk. soln.) and solns. of  $\text{Na}_2\text{O}_2$  or Na perborate are stabilized by addn. of protein substances such as gelatin, glue, casein, keratin, glutenin, gliadin or albumin, which may be dissolved by alkali. The stabilized solns. may be used for bleaching or in the prepn. of compds. such as alk. earth peroxides, diacyl peroxides or perborates.

Bleaching fibers, pelts, skins, material for making hats, etc. H. GOLDARBEITER. Brit. 304,680, Jan. 24, 1928. Bleaching is effected by an alk. oxidizing process in which a catalyzer such as Co nitrate or Ni sulfate, and a bleaching agent such as  $\text{H}_2\text{O}_2$ , act successively. The materials may be subsequently treated with a reducing bleaching soln., and may be finally washed with dil. oxalic acid soln. Cf. C. A. 23, 1760.

## 26—PAINTS, VARNISHES AND RESINS

A. H. SABIN

Paint vehicles containing olive oil. ERNST TAUBER. *Farben-Ztg.* 34, 2460–1 (1929).—After 14–21 years the yellowing of white paints contg. olive oil was inversely proportional to the percent of olive oil. Softness and tackiness were directly proportional to the percent of olive oil.

Determination of chromate in paints. EDWARD J. DAVIS. *Chemist Analyst* 18, 8(192).—See C. A. 23, 2839. G. G. SWARD W. T. H.

Coloring power of white pigments and its connection with covering power. F. MUNK. *Z. angew. Chem.* 42, 737–8(1929).—In the hands of a skilled operator detns. of coloring power may be made with an accuracy of  $\pm 2\%$ , but much time and care are required; otherwise, errors of 30% or more may be made. Coloring power is not proportional to covering power, and it is doubtful if even accurate detns. of the former can be taken as approx. values for the latter. Expts. with titanium white, lithopone, zinc white and various mixed pigments are reported. W. C. EBAUGH

Pigment form. F. KLUMPP. *Farben-Ztg.* 34, 2612–4(1929); cf. C. A. 22, 3790; 23, 4086.—A study of oil absorption data leads to the conclusion that there are 3 classes of pigment particles, *vis.*, primary, secondary formed by cohesion of crystals during growth and secondary formed by primary particles cemented together with the mother liquor. The larger pore space of a mass made up of secondary particles is the sum of the space between the primary particles composing the secondary particles and the space between the secondary particles themselves. Thus, if the secondary particles of a pigment be reduced to primary ones, the oil absorption will be lowered by an amt. corresponding to the space between the secondary particles. G. G. SWARD

The chromates of lead. J. STEWART REMINGTON. *Ind. Chemist* 5, 292–4(1929).—Methods are given for making different shades of Pb chromate, also for the analysis of chromes. A no. of complete analyses of different varieties of litharge are tabulated. R.'s experience on the color fastness of chromes is given. E. G. R. ARDAGH

Colloid chemistry of coatings. RAPHAEL ED. LIESEGANG. *Farben-Ztg.* 34,

2460(1929).—The sepn. of a paint film into a pigment and a vehicle layer has often been noted. With a magnetic pigment the magnitude of the forces involved might be detd. by measuring the magnetic field necessary to overcome the sepn. Pores in coatings may sometimes be closed by treatment in a medium in which the coating swells. To det. permeability of films to  $H_2O$ , first coat the panel with a mixt. of 50 g. gelatin, 350 cc. warm  $H_2O$  and 400 cc. latex. When dry, apply the material to be tested. The primer of gelatin and latex turns white upon absorption of  $H_2O$ . G. G. SWARD

**The problem of the drying (determination of drying time) of paints and varnishes.** HANS WOLFF AND W. TOELDT. *Farben-Ztg.* 34, 2293-5(1929).—The original spreading-drop test soln. (cf. *C. A.* 23, 4086) spreads irregularly on paint films. However, satisfactory results are obtained if the soln. be diluted with an equal amt. of benzene. The dust-free drying time is 20% longer than the min. spreading time, i. e., at the dust-free stage the film is 12° dry if the dryness at min. spreading be taken as 10°. The max. increase in weight often occurs at 12° of dryness. Spreading-drop graphs should aid in the differentiation of materials which have the same final drying times but not the same intermediate rates. G. G. SWARD

**Oil absorption and particle size.** HANS WAGNER AND HANS PFANNER. *Farben-Ztg.* 34, 2513-4(1929).—The authors are unable wholly to confirm Klumpp's statement (*C. A.* 23, 4086) that the oil absorption of a pigment is decreased by a preliminary grinding. Data on several pigments confirmed Klumpp's statement only in those cases in which the pigment was already very finely divided, in which cases microscopic examn. showed the formation of secondary particles. Wherever grinding resulted in the production of smaller particles, the oil absorption was increased. G. G. SWARD

**Contribution to the theory of drying oils.** B. TYUTYUNNIKOV. *Masloboiino-Zhirovoe Delo* 1928, No. 10, 35-41; No. 11, 28-32; No. 12, 26-32.—Decrease in vol. of the oil on drying is due to coagulation of the colloidal soln. of the oxidation products of the glycerides of fatty acids. Oxidation and coagulation processes are of auto catalytic nature. Physical properties of the oily film are greatly affected by the presence of foreign substances such as driers. V. KALICHEVSKY

**The drying of oils.** R. S. MORRELL AND S. MARKS. *J. Oil & Colour. Chem. Assoc.* 12, 183-205(1929).—Recent theories of the drying of oils are discussed and the conclusion is reached that oxidation is followed by polymerization and gelation. Pure  $\beta$ -eleostearin was oxidized in the solid state and in soln. in  $C_6H_6$  and in  $CCl_4$ . The results of oxidation in the solid state were not satisfactory. Oxidation in soln. resulted in an insol. gel (I) and a sol. portion (II). I is a monoperoxydihydroxy- $\beta$ -eleostearic glyceride, while II contains a petroleum ether insol. form (F) and a sol. form (E), in which the hydroxyl groups of I have passed into the keto form and in which the peroxy group has disappeared. I yields a polymerized methyl ester (A), insol. in petroleum ether, and a simple methoxy methyl ester (C), sol. in petroleum ether. II yields corresponding products (G) and (H). The mol. wt. of A is 1107 (calcd. 1068) indicating that the oxidized gel was intramolecularly polymerized. The formation of C destroyed the polymerization, indicating that polymerization is assocd. with the hydroxyl groups. In all of the compds. mentioned, the I value indicates one remaining double bond. Sapon. nos. of I, A and C were high (over 300), indicating disruption of the mol. during sapon. I is insol. in  $C_6H_6$ ,  $CCl_4$ , EtOAc and  $Me_2CO$ . It is slowly sol. in valeraldehyde, which fact may account for the gradual softening in some cases of drying-oil films. When fresh it is sol. in glacial AcOH. On heating, it decomposes with formation of valeraldehyde. Piperidine unites with the gel to form a soln. which may be diluted with  $H_2O$ ,  $C_6H_6$  or alc. The union with piperidine decomposes with evolution of piperidine and formation of valeraldehyde. G. G. SWARD

**Drying of drying oils in an atmosphere of carbon dioxide.** N. BELYAEV. *Masloboiino-Zhirovoe Delo* 1928, No. 12, 33-4.—Linseed and hempseed oils dry in an atm. of  $CO_2$ . V. KALICHEVSKY

**Decolorization of hempseed oil for manufacturing a colorless drying oil.** A. LAPTEV. *Masloboiino-Zhirovoe Delo* 1928, No. 8, 3-5.—Blowing of the oil with a heavy blast of air for several hrs. at 125-170° is recommended. V. KALICHEVSKY

**The properties of varnishes containing natural and synthetic copals.** HANS WOLFF AND G. ZEIDLER. *Farben-Ztg.* 34, 2458-9(1929).—Short and long oil varnishes were prepd. from congo, kauri, Albertol 111L and Albertol 117R. Floor enamels were also prepd. The varnishes were subjected to an accelerated test and a sand abrasion test, while the enamels were tested for gloss, pencil hardness, sand abrasion, water resistance and a bending test. In the above tests, the products contg. congo ranked first 3 times, kauri 3 and 111L, 4. Congo ranked last 3 times, kauri 3 and 111L once. Similar tests on varnished maple panels using varnishes contg. 111L, or ester gum, compared

with a com. copal and a com. tung oil varnish were conducted. In general, the Albertol varnish was as good or better than the copal and much better than the ester gum varnish.

G. G. SWARD

**Detection of benzene in varnishes.** EDWARD H. JACKSON. *Chemist Analyst* 18, 15(1929).—Distil 200 cc., using a Hempel still head. The benzene will all distil between 65° and 100°. Wash this fraction with 4 vols. of water. To 8 cc. of concd.  $H_2SO_4$  in a 100-cc. beaker add slowly 7 cc. of concd.  $HNO_3$ , keeping the mixt. chilled by ice water. When at 25°, add 5 cc. of the fraction to be tested and allow to stand 15 min. at 25°. Cool and wash the resulting nitrobenzene in a small separatory funnel with a little water. Dissolve 0.5 cc. of the nitrated sample in 25 cc. of EtOH, add 15 cc. of concd. HCl and 2 g. of 20-mesh Zn. Boil 10 min. to reduce the nitrobenzene to aniline. Dil. with 2 vols. of water and set free aniline by adding 30% NaOH in slight excess. Filter and to 5 cc. of the clear filtrate, add 15 cc. of water and 10 cc. of a freshly prepd., satd. soln. of bleaching powder. Filter if necessary. If aniline is present, a red to purple color is formed; otherwise the NaClO soln. is yellow. This test for benzene is delicate and toluene does not interfere.

W. T. H.

**Chemical methods of thickening oils and their use by the lacquer industry.** K. DORN and I. BURDIN. *Masloboino-Zhirovoe Delo* 1928, No. 7, 29-31.— $S_2Cl_2$  is an effective agent for thickening linseed oil, which is thus rendered satisfactory for use by the lacquer industry.

V. KALICHEVSKY

**Clarification of nitrocellulose lacquers.** FRITZ KOLKE. *Farben-Ztg.* 34, 2045-8 (1929); cf. C. A. 23, 997.—Clarification by centrifuging does not give an optically clear product but the results are satisfactory and it is quicker than pressing or settling. Centrifuges operating at 5000-6000 r. p. m. are now safe. For exceedingly viscous lacquers slight warming is advantageous.

G. G. SWARD

**Influence of plasticizers on the viscosity and light sensitivity of nitrocellulose lacquers.** HANS WOLFF and B. ROSEN. *Farben-Ztg.* 34, 2564-6(1929).—The plasticizers, dibutylphthalate, tricresyl phosphate, sipalin AOM and sipalin MOM, were added in varying amts. to BuOAc solns. of nitrocellulose. The following detns. were then made: diln. ratios with toluene and with benzine, viscosity of solns. contg. the max. amt. of non-solvent, max. amts. of benzine which permitted the solns. to dry clear, and max. amts. which permitted the solns. to dry without orange peel effect. Addn. of any of these plasticizers increased the yellowing of films exposed to ultra-violet light, the effect being greatest with tricresyl phosphate, next with dibutylphthalate, next with sipalin MOM and least with sipalin AOM. In general, the diln. ratios were greater with toluene than with benzine; the viscosities were reduced most with sipalin MOM, least with sipalin AOM.

G. G. SWARD

**Rapid drying finishes for wood surfaces.** F. W. HOPKINS. *Am. Paint & Varnish Mfrs.' Assoc. Circ.* 343, 61-4(Feb., 1929).—H. ests. that of all surfaces requiring protective or decorative coatings, wood surfaces constitute 68% and metal 32%. Nitrocellulose lacquers are being used successfully on but 14% of the wood surfaces. The claim is made that rapid drying finishes not contg. nitrocellulose have been developed for use on wood surfaces that heretofore could not be successfully coated with any lacquer.

G. G. SWARD

Oil from the seeds of *Erucastrum elongatum* (semi-drying oil) (BELYAEV) 27. The determination of Co in driers, japans, etc. (HEIM) 7. Preparing varnish asphalt from Emba lubricating-oil acid sludge (KARSKII, KAPATZINSKII) 22. Radium, with special reference to luminous paint (PARSONS) 3. Benzanthrone derivatives [pigments] (Ger. pat. 479,230) 10. Coating wire with enamel, etc. (Brit. pat. 305,084) 13. Temperature-control system for enameling apparatus (Brit. pat. 305,611) 13. Cellulose ester compositions [lacquers, priming or filling compositions] (Brit. pat. 304,814) 23.

**Solvents, Cotton Solutions and Plasticizers, including specifications, technical data and general information for the lacquer manufacturer.** New York: U. S. Industrial Chemical Co., Inc. 48 pp.

**Paint.** HUGO REINHARD. Fr. 656,984, July 4, 1928. By- or waste-products in paint manuf. are emulsified or ground up with oils ordinarily used for paints, then sepd. by drying or sifting or both, giving a product of higher quality than the starting material.

**Paint suitable for use on sheet materials containing rubber.** P. SCHROEDT and D. J. BURKE. Brit. 304,334, July 16, 1927. A gum resin such as wax-free shellac or a dammar resin is dissolved in a low-viscosity soln. of nitrocellulose or cellulose acetate in a high b. p. solvent such as Et lactate or Et benzoate; the resulting soln. is mixed

with a colloidal soln. of a pigment in a non-drying oil such as castor oil or a liquid plasticizer such as tricresyl phosphate, and thinners may be added such as toluene, xylene and AmOH. AmOH may be used as a solvent for the gum resin before admixt. with the cellulose deriv.

**Aqueous medium for paints and cements.** A. G. RODWELL, W. ROPER and A. J. C. HART. Brit. 304,355, Oct. 19, 1927. Na silicate and  $\text{NaNO}_3$  are used together with water in stated proportions, with various pigments, for coating cements or concretes, or as a binder with fireclay, etc.

**Incorporating paint ingredients.** KRAUSEWERK A.-G. Brit. 305,452, Feb. 4, 1928. See Fr. 653,517 (C. A. 23, 3820).

**Chromium oxide.** I. G. FARBERIND. A.-G. Brit. 304,809, Oct. 24, 1927. Green hydrated Cr oxides for use as pigments or for other purposes are formed by heating chromic acid or its salts with water and reducing agents (other than  $\text{SO}_2$ ) such as H, hydrocarbons, CO, formates, glycerol or  $\text{Na}_2\text{S}_2\text{O}_3$  under a pressure not exceeding 150 atm. (suitably by treating a soln. of K chromate with H or a mixt. of H with CO at  $270^\circ$  under 110 atm. pressure). Cf. C. A. 23, 4306.

**Coating compositions containing drying oils, etc.** J. SCHEIBER (to Chemische Fabriken J. Wiernik & Co. A.-G. and Bakelite Ges.). Brit. 304,761, Jan. 26, 1928. The process described in Brit. 299,024 (C. A. 23, 3113) is modified by adding to the paints, etc., themselves deoxidizing materials in an initially inert form but which become active by the action of substances such as acid degradation products or water produced in the completed film. Phenolates of Pb, Zn, Ba, Mg or other metals may be used, e. g., the Pb salt of  $\alpha$ -naphthol may be used in linseed oil varnish. Amines such as diphenylamine or benzylamine may be rendered temporarily inert by employing readily hydrolyzable compds. with metal salts such as the double compds. with  $\text{ZnCl}_2$ ; in such case, water formed serves as the activator.

**Modifying drying oils.** JAMES E. BOOGE and COLE COOLIDGE (to E. I. Du Pont de Nemours & Co.). U. S. 1,725,561, Aug. 20. In order to improve paint-forming drying oils such as linseed and soy-bean oil, the oil is heated in N at a moderate temp. (suitably about  $200^\circ$ ) and blown with air or other O-contg. gas at a temp. lower than that used for the heat treatment.

**Rustproofing metal surfaces.** I. G. FARBERIND. A.-G. Brit. 305,218, Feb. 2, 1928. The surface is treated with a soln. of a cellulose ester, the acid residue of which forms with the metal a compd. insol. in water, such as esters of higher aliphatic acids such as stearic or lauric acid, in a solvent such as xylene or  $\text{C}_6\text{H}_6$ . Various pigments may be added, as may also salts such as Cu naphthenate, Cu oleate, ferric laurate or ferric resinate, and the layer may be further covered with lacquer, varnish or oil.

**Ink.** GEORGE D. KNIGHT (to Emory Winship). U. S. 1,725,649, Aug. 20. A quick drying ink for use in intaglio printing, of relatively high fluidity and sufficient homogeneity to cause it to enter and to be retained in the depressions of a hard metal intaglio printing form after wiping, and which does not excessively spread or penetrate the paper used, comprises gilsonite 22, a hydrocarbon solvent such as "M and P" thinner 51, water 22 and glue about 5 parts.

**Printing ink.** GEORGE D. KNIGHT (to Emory Winship). U. S. 1,724,603, Aug. 13. Casein, borax, carbolic acid,  $\text{CH}_3\text{O}$ , oil of citronella, glycerol and coloring matter are used in intaglio inks suitable for printing etchings or engravings.

**Ink for use for safety purposes on deeds, checks, etc.** E. BAYLE, H. GEORGE and A. MACHE. Brit. 305,028, Jan. 28, 1928. An ink is used the color of which is readily changed by various reagents. A violet, blue or red ink is prepd. by mixing together in varying proportions the chlorozincic deriv. of the bromoethylate of hexamethyl- and pentamethylmonoethyl-*p*-rosaniline, the Na salt of *o*-toluidine diazo-bi-1-naphthylamine 4-sulfonic acid,  $\text{NaH}_2\text{PO}_4$ , soda, glycerol and a thin printing-ink varnish. This ink undergoes a variety of stated color changes with different specified reagents.

**Varnish solvents.** J. G. DAVIDSON (to Carbide & Carbon Chemicals Corp.). Brit. 304,759, Jan. 27, 1928. Nitrocellulose and natural or synthetic resins are used with mixed solvents comprising an ethyl benzene or like alkyl benzene and a good solvent for nitrocellulose such as glycol mono-ethyl ether or BuOAc.

**Coatings for the fabric of airship gas containers.** K. HUERTLE (to Goodyear-Zeppelin Corp.). Brit. 304,775, Jan. 27, 1928. Solns. or varnishes contg. synthetic resins such as "bakelite" are used with softeners such as castor oil, tricresyl phosphate or triphenyl phosphate and thinners such as acetone, etc.

**Lacquers.** I. G. FARBERIND. A.-G. (Ludwig Lock and Emil Hubert, inventors). Ger. 479,083, Aug. 27, 1925. Lacquers giving mat effects are prepd. by dissolving a plastic mass comprising a cellulose ether and a high-boiling hydrocarbon, fat or oil in a



mixt. of liquids of which one is a solvent for both the cellulose ether and the hydrocarbon, etc., while the other is a solvent for the cellulose ether only. According to the example, a compn. comprising ethyl cellulose and a condensation product of  $C_{10}H_8$  with xylyl chloride is dissolved in a mixt. of  $C_6H_6$  and EtOH.

**Depositing japan-forming materials from emulsions.** HARRY CHISLET (to General Elec. Co.). U. S. 1,724,826, Aug. 13. A film of an electrolyte such as KOH or NaOH or NaCl is deposited on the surface of an article under treatment, and the coated surface is immersed in an aq. emulsion of japan-forming materials for a sufficient time to cause deposition of a portion of the materials as an adherent layer; the article is then removed and baked.

**Artificial resins.** F. SCHMIDT. Brit. 304,648, Jan. 23, 1928. Condensation products of phenols and aldehydes, which are still liquid while hot, are hardened by treatment with as small a quantity as possible of acid or an acid-reacting substance.

**Synthetic resins.** BAKELITE GES. Brit. 305,237, Feb. 3, 1928. Phenol-aldehyde resins (which may be mixed with fillers, other synthetic or natural resins, dyes, etc.), are hardened and deodorized by use of metal compds. such as Ca, Mg, Fe and Zn oxides, hydroxides or salts with acids such as fatty, oleic and resin acids, *e. g.*, Ca stearate or Zn oleate. Various details are given.

**Synthetic resins.** BAKELITE GES. Brit. 305,211, Feb. 3, 1928. In forming shaped articles, urea or a urea deriv., a solid polymerized aldehyde such as paraformaldehyde, and fillers such as lithopone and paper pulp are mixed, and the mixt. may be pressed cold and then heated to 100–120°, or may be hot pressed. Various natural or artificial resins may be added as may also other ingredients such as PhOH, *p*-toluene sulfonamide, gypsum, cements, dyes, etc.

**Synthetic resins.** H. L. Bender (to Bakelite Corp.). Brit. 304,659, Nov. 11, 1926. A phenol 2, aniline (or a homolog) 1 and  $CH_2O$  more than 2 mol. proportions are heated together (suitably in the presence of  $(CH_2)_6N_4$ ,  $Na_2CO_3$  or  $Ca(OH)_2$ ) and the aniline is expelled from the condensation product (suitably by distn. under reduced pressure).

**Synthetic resins.** I. G. FARBENIND. A.-G. Brit. 305,043, Jan. 28, 1928. Vinyl ester resins are freed from unpolymerized ester by heating to about 80–100° in water or water vapor so that the volatile material in the resin is replaced by water; the water is then removed by heating *in vacuo* at about 100° or by cooling, comminuting and subjecting to a vacuum. Various details are given.

**Synthetic resins.** I. G. FARBENIND. A.-G. (Adolf Steindorff and Gerhard Balle, inventors). Ger. 479,161, Jan. 14, 1922. Resinous products, which become insol. and infusible on heating, are prep'd. by combining (1) a permanently sol. and fusible condensation product from a phenol or a naphthol and aldol or crotonaldehyde with (2) a resin of the PhOH- $CH_2O$  type. The 2 components may be fused together or brought together in a solvent, or one can be added in the process of prepg. the other.

**Linoleum.** E. CLAXTON (to Armstrong Cork Co.). Brit. 305,656, Feb. 9, 1928. Linoleum cement contg. little unoxidized oil is made by heating a drying or semi-drying oil (such as linseed, menhaden, fish, tung or soy bean) in the presence of O and material delaying coagulation (such as rosin, gum kauri, ester gum, abietic acid, pimaric acid and neutral esters of rosin). Various details are given.

## 27—FATS, FATTY OILS, WAXES AND SOAPS

E. SCHERUBEL

**The differential halogen absorptions of oils and fats.** J. W. CROXFORD. *Analyst* 54, 445–53 (1929).—The Cl, Br and I absorbed by the following oils and fats were det'd: tung oil and eleostearic acid, linseed oil, rubber seed oil, soy-bean oil, coconut oil, maize oil, olive oil, almond oil, whale oil, cod-liver oil, castor oil and ricinoleic acid, peanut oil, fatty acids from peanut oil, oleic acid, fatty acids from parsley seeds, crotonic acid, tiglic acid, maleic acid, fumaric acid, cinnamic acid, cinnamyl alc., croton oil and the fatty acids from croton oil. From the mass of results here presented, it is claimed that the Br vapor method for detg. the degree of unsatn. compares favorably with the Wijs method, is more rapid and often more complete. Castor oil and ricinoleic acid, however, absorb considerably more Cl or Br than corresponds to the I value of the Wijs method, probably because of the halogen being substituted for H as well as absorbed at double bonds. It is suggested that the difference between the values obtained by 1 hr's. absorption by the Wijs and Br-vapor methods may help to indicate the position of the unsatd. bond in the fatty acids of the oleic series. The expts. with substances not oils or

fats showed, in general, that the Cl-vapor and Br-vapor methods gave results agreeing closely with the theory except with maleic and fumaric acids which were very inert under this treatment. Results obtained with Br in AcOH were unsatisfactory probably because of the formation of bromohydrins during absorption. With croton oil, 2 hrs. digestion by the Wijs method gave the value 109.1 whereas 14 days and 100% excess gave the value 123.4 while Margosches got the value 117.1-117.7. The Br vapor after 7 hrs. gave a value like that obtained by M.

W. T. H.  
**Terrestrial animal oils and fats from a few birds.** III. S. UENO AND KUZŌ. *J. Soc. Chem. Ind. Japan* 32, 312-9(1929); Suppl. Binding 32, 94-7B(1929).—The properties are given of (A) Japanese black bear fat from *Ursus torquatus* Schinz., var *Japonicus* Schleg., (B) Japanese weasel fat from *Putorius itatsi* Pallas, (C) "Mami-tanuki" fat from *Canis procyonoides* Schleg., (D) painted snipe fat from *Rostratula capensis* (Linn.), (E) common quail fat from *Coturnix communis*, Bonn, (F) feathered-toed scops owl fat from *Scops semitorques* (Temm. and Schl.), (G) ural owl fat from *Strix uralensis*, Pallas.

	A	B	C	D	E	F	G
$d_{4}^{100}$	0.8618	0.8770	0.8524	0.8638	0.8587	0.8640	0.8633
m. p.	30.0°	36.5°	19.0°	31.0°	27.0°	30.5°	29.6°
sapon. value	197.2	213.1	194.6	194.0	195.4	198.5	198.6
unsaponifiable matter	0.3%				1.2%	0.3%	0.4%
$n_D^{40}$	1.4591	1.4609	1.4621	1.4601	1.4600	1.4616	1.4616
acid value	2.9	19.6	0.8		3.2	2.2	2.0
(Wijs) I value	62.8	52.2	107.2	66.4	73.8	80.5	84.6

Bird fats contained highly unsatd. fatty acids. The fats from *Scops semitorques* (Temm. and Schl.) and *Strix* gave ether-insol. bromide. The unsaponifiable matter from "Mami-tanuki" fat is a fragrant light yellow liquid, most likely to consist of hydrocarbons.

M. NAKAMURA

**Thiocyanogen number of fatty oil and its uses.** WASABURO KIMURA. *J. Soc. Chem. Ind. Japan* 32, 451-61(1929); Suppl. Binding 32, 138-41B(1929). I. Preparation of pure thiocyanogen solution and determination of thiocyanogen number.—A pure soln. of  $(CNS)_2$  is obtainable by decomp.  $Pb(CNS)_2$  in AcOH by  $Br_2$  (in  $CCl_4$  and AcOH) and filtering off the  $PbBr_2$ . For the detn. of the  $(CNS)_2$  number, an excess of 50% of soln. and duration of 24 hrs. were suitable.  $(CN)_2$  numbers of 32 different kinds (16 animal, 16 vegetable oils) of fatty oils were detd. and tabulated, and the difference between them and the I value was discussed. II. Selective action of free thiocyanogen on unsaturated fatty acids.—The actions of  $(CNS)_2$  on Me oleate, elaidic acid, Me linoleate and Me linolenate were studied. One mol. of  $(CNS)_2$  is taken up by oleic, elaidic and linoleic acids, while linolenic acid takes up between 1 and 2 mols.; this suggests the existence of some isomers which have different  $(CNS)_2$  nos.

KOSAKA

**Determination of iodine number by the rapid method of Margosches.** S. YUSHKEVICH. *Masloboino-Zhirovoe Delo* 1928, No. 9, 22-6, No. 10, 31-5; cf. *C. A.* 18, 2436, 3484; 19, 741, 904, 1503; 20, 302, 1914.—Results obtained by the method of Margosches are in good agreement with those obtained by the method of Hübl and of Hanus. At least 65% excess of  $I_2$  must be present. Periodine numbers are analytically important.

V. KALICHEVSKY

**Improvement of methods of estimation of impurities in crude camphor.** II. Determination of iodine values of camphor and camphor oil. YAMADA AND TERUJI KOSHITAKA. *J. Soc. Chem. Ind. Japan* 31, 574-83(1928); Suppl. Binding 31, 141-2B(1928).—Four methods of detg. the I value were tested concerning the influence of concn. and amt. of reagent, time of reaction and temp. The methods were: (1) Hübl's method, (2) Wijs' method, (3) a method with AcOH soln. of Br and (4) Rosenmund's method. In methods (1) and (2), the I values depended much upon the above conditions, while by methods (3) and (4), fairly const. I values were gained in a short time. The most satisfactory results were gained when method (3) or (4) was used with sufficient excess Br at 20°.

S. OKA

**Relation between the titer and the coefficient of refraction of oils.** A. MARKMAN AND M. SERGEV. *Masloboino-Zhirovoe Delo* 1928, No. 7, 27-9.—No relation was found, hence hydrogenation cannot be controlled by observing changes in refraction coeff. of oils.

V. KALICHEVSKY

**Standards in oil manufacture.** S. IVANOV. *Vestnik Standardizatsii* 1928, No. 3, 20-2; *Chem. Zentr.* 1928, II, 2417.—I. demonstrated by the example of linseed oil and its

I no., which varies with the climate, that creation of international standards for vegetable oils is not possible in all cases. The oils of tropical plants (palm oil, almond oil, etc.), which mainly contain satd. fatty acids and fatty acids with 1 double bond, possess uniform properties on account of their formation in a climate, which is everywhere uniform. However, the properties of oils contg. 2 or 3 double bonds depend on the location in which these oils originated. Therefore the oils mentioned first may be brought under an international norm, but for the other oils, each producing country has to work out its own standards corresponding to its climate.

Steam kettles in oil factories. P. TERSIKH. *Masloboino-Zhirovoe Delo* 1928, No. 6, 6-7.—A continuous system of kettles for heating oil-bearing seeds is described.

Optical methods for the rapid examination of oil. C. VAURABOURG. *Ann. chim. anal. chim. appl.* 11, 129-32(1929); cf. *C. A.* 23, 2052.—Methods are discussed, app. shown and some typical values given.

Effect of pressure on the yield of oil. A. MARKMAN AND V. BOCHKO. *Masloboino-Zhirovoe Delo* 1928, No. 8, 19-23.—The amt. of oil lost in the cake is an exponential function of the pressure.

Determination of shell in pressed cakes. N. BELYAEV. *Masloboino-Zhirovoe Delo* 1928, No. 5, 13.—Ten g. of pressed sunflower cake is boiled under reflux with a 3% NaOH soln. for 6-7 hrs. on a water bath. The sediment (shell) is washed by decantation and dried to const. wt.

Effect of temperature on the hydrogenation process. A. MARKMAN AND V. VASIL'EV. *Masloboino-Zhirovoe Delo* 1928, No. 8, 23-4.—Absorption of H by sunflower oil in the presence of Ni reaches a max. at 250-270°. Above this temp. dehydrogenation and decompn. of the oil take place.

Catalyst for hydrogenating oils. A. MOSHKIN. *Masloboino-Zhirovoe Delo* 1928, No. 10, 16-7.—S is less poisonous to Ni catalyst than As. In regenerating Ni must be cooled in the atm. of H<sub>2</sub> or CO<sub>2</sub> as contacting of hot Ni with air affects its catalytic properties.

Influence of air on the activity of catalysts used in hydrogenating oils. A. BAG. *Masloboino-Zhirovoe Delo* 1928, No. 5, 6.—Reactivated Ni does not lose its activity when kept in contact with air for one month, provided it is treated with CO<sub>2</sub> directly after exposure to H<sub>2</sub>.

The utilization of the exhausted catalysts. S. KAZARNOVSKII. *Masloboino-Zhirovoe Delo* 1928, No. 1, 12-4; *Chem. Zentr.* 1928, II, 2417.—K. gives a survey of some methods for the regeneration of Ni from Ni catalysts freed from oil by means of extn. or sapon.

Hydrogenation of linseed oil. V. VASIL'EV. *Masloboino-Zhirovoe Delo* 1928, No. 7, 9-11.—Slightly deteriorated linseed oil absorbs more H<sub>2</sub> than can be accounted for by the decrease in I no. This is explained by reduction of hydroxyl groups formed during the oxidation process.

Oil content of sunflower seeds and factors controlling it. N. USPENSKII. *Masloboino-Zhirovoe Delo* 1928, No. 6, 31-40.—Oil content of sunflower seeds decreases with the increase in N content of the soil beyond a certain limit which is required for max. growth of leaves. Other factors such as humidity of the soil, etc., must not be below the same limit. The influence of weather is important. Oil-bearing properties are hereditary but attempts to increase the oil content of the plants beyond a certain limit may lead to reverse results.

Oil from the seeds of *Erucastrum elongatum*. N. BELYAEV. *Masloboino-Zhirovoe Delo* 1928, No. 8, 26-8.—The oil is used as food by the population of the Samara and adjacent districts in the time of famine. It has brown color, pungent odor and bitter disagreeable taste. The oil has d<sub>4</sub><sup>15</sup>—0.9321; it freezes at —24°, thickens at 17°, b. 200-210° and decomposes at 230°. It is sol. in Et<sub>2</sub>O, CHCl<sub>3</sub> and probably in all common solvents. Its acid no. is 4.52, I no. 116.3, sapon. no. 176.02, glycerol content 9.35%, av. mol. wt. 318.03. It is a semi-drying oil and can be used by the industry.

Studies on soy-bean oil. IV. Changes during the formation of polymerized and air-blown oils. K. HASHI. *J. Soc. Chem. Ind. Japan* 32, 415-22(1929); Suppl. Binding 32, 121-6B(1929); cf. *C. A.* 22, 1864.—Soy-bean oil was heated 30 hrs. at 290° in H<sub>2</sub>; the coagulated substance sepd. quickly and disappeared on further heating. The  $\eta$ , sp. gr., viscosity, acid value and mol. wt. increased and the I value decreased. The product of the above heating was distd. at 10 mm. at 250°, and the properties of the distillate and residue were examd. During the polymerization process, solid and liquid fatty acids sepd. and unstable liquid fatty acids decompd. further and hydrocarbon formed. When about 10% was distd. off from the polymerized oil, the residue was

easily changed into gel when heated at 290°; this gel formation may be prevented by addn. of rape-seed oil. Heating in the presence of dry  $\text{AlCl}_3$  decreases the I value and increases the acid value to a certain degree. They then became nearly const. The viscosity of  $\text{AlCl}_3$ -contg. oil increased rapidly during heating, but that of oil sepd. from  $\text{AlCl}_3$  with  $\text{HCl}$  is nearly unchanged, which facts show, according to H., the necessity of a small quantity of  $\text{H}_2\text{O}$  for catalytic action of  $\text{AlCl}_3$ . By blowing air into the oil at above 210°, changes of characteristic values of oil were observed in quite analogous directions as in the case of heating in  $\text{H}_2$ . N. KAMEYAMA

**Alkaline refining of castor oil.** M. BAUMAN. *Masloboino-Zhirovoe Delo* 1928, No. 7, 12-4.—Emulsions formed in refining castor oil with  $\text{NaOH}$  soln. are avoided by dilg. the oil with benzene, which is later distd. off from the refined oil. 15° Bé.  $\text{NaOH}$  soln. is used, and agitation is continued for about 30 min. while the temp. rises to 50°. The oil is settled and washed with warm water until neutral. V. KALICHEVSKY

**Control of the roll setting in a crushing mill.** V. LAZDIN. *Masloboino-Zhirovoe Delo* 1928, No. 6, 3-6.—Proper crushing of seeds is shown to be important to insure high yield of oil. V. KALICHEVSKY

**Japanese fish oils, rock-fish oil and sand-eel oils.** M. HIROSE and T. SHIMOMURA. Tokyo Imp. Ind. Laboratory. *J. Soc. Chem. Ind. Japan* 32, 569-74; Suppl. Binding, 32, 176-8B(1929).—H. and S. gave characteristic values of fish oils produced in 1927-1928, including oils of sardine, herring, plaice, salmon and trout. The properties of 2 samples of oils of rock-fish (*Sebastes macrochir*) and sand-eel (*Ammodytes personatus*) were, resp.: I value Wijs 130.0, 139.4, 167.3; sapon. value 188.2, 187.6, 184.6; acid value 3.8, 1.2, 11.6;  $n_D^{20}$  1.4710, 1.4714, 1.4750;  $d_4^{20}$  0.9228, 0.9228, 0.9300; unsaponifiable matter 1.98, 1.77%, —. M. NAKAMURA

**Deodorization of cod-liver oil by silent discharge.** Y. IWAMOTO. *J. Soc. Chem. Ind. Japan* 32, 308-12(1929); Suppl. Binding 32, 93-4B(1929).—Cod-liver oil was subjected to the action of a silent discharge in  $\text{H}_2$  and  $\text{N}_2$  under normal pressure. The sp. gr. and  $n$  increased, while the I value decreased. In  $\text{H}_2$ , the oil was perfectly deodorized after 3 or 1.5 hrs. treatment, the applied elec. pressure being 1000 and 2000 v., resp. I. confirmed by animal test that vitamin A had not been destroyed during the process and that the oil retained its original nutritive value. M. NAKAMURA

**Sulfonated oils. III. Hydrolysis of ricinoleic acid sulfuric ester and its sodium salt.** K. WINOKUTI and K. NISHIZAWA. *J. Soc. Chem. Ind. Japan* 32, 141-4(1929); Suppl. Binding 32, 47-8B(1929).—Ricinoleic acid sulfuric ester is quite stable in aq. soln. towards the action of acid at ordinary temp. (25°), partially decomposed at somewhat elevated temp. and completely at 100° under certain conditions. The time of heating at 100° necessary for the complete decompn. of the ester was detd. at several concns. of  $\text{HCl}$ . At room temp. the ester is sepd. from the soln. by concd.  $\text{HCl}$ , but the ester is quite stable at least within 24 hrs. under such a condition. Alkali exerts at least no action on the ester (Na salt) at ordinary temp. (25°) either in aq. or alc. soln., but at higher temp. (say 100°) it decomposes the ester; the velocity of decompn. is small and depends on the concn. of alkali and the nature of solvents. IV. Preparation of sodium sulforicinoleate and its isolation from commercial products. *Ibid* 145-7; 48-9B.—The ethereal soln. of ricinoleic acid sulfuric ester obtained by Grün's process is washed and then neutralized with  $\text{NaOH}$  soln. The ester can be obtained by the reaction of ricinoleic acid and concd.  $\text{H}_2\text{SO}_4$  at room temp., but the yield is less than that by the chlorosulfonic acid process. The crystals of the ester salt are orthorhombic, prismatic or rather lath-shape and optically active, the axial plane being at right angles to the crystallographic elongation, but its axial angle not being so large. M. NAKAMURA

**Proposed standard method for the analysis of so-called 72% soaps.** ANON. *Ann. fals.* 22, 325-33(1929).—The method proposed by the Chambre Syndicale des Fabricants de Savons à Marseille is described in detail. A. PAPINEAU-COUTURE

**Chlorinated herring oil and its soap.** M. HIROSE and T. SHIMOMURA. *J. Soc. Chem. Ind. Japan* 32, 233-6(1929); Suppl. Binding 32, 71-2B(1929).—The properties of the chlorinated herring oil obtained by passing dry  $\text{Cl}$  through refined herring oil at 18-20° were examd. The fishy smell is eliminated by chlorination; an irritating gas ( $\text{HCl}$ ) is evolved at room temp. Chlorination does not have a remarkable effect on the drop no. of the soap. The lather of soap of the chlorinated oil is very thin and transparent and vanishes rapidly. K soap of chlorinated oil exposed in the air for a long period gave an offensive odor and became dark brown. Chlorinated oil is not suitable for soap stock. M. NAKAMURA

**Soap from polymerized fish oil.** M. HIROSE. *J. Soc. Chem. Ind. Japan* 32, 381-4(1929); Suppl. Binding 32, 115-6B(1929).—The oil was polymerized by heating

in a current of  $\text{CO}_2$ , and the drop nos. of a Na-soap soln. of polymerized herring oil were measured by means of a Hillyer's stalagmometer, the kerosene of "Chester" brand b. 150–200° being used as the medium oil. The drop no. decreased as the polymerization proceeded at the beginning, but after a certain period it began to increase to a max. and then decreased again. The max. drop no. was, however, smaller than that of the soap from the original oil. The lathering power measured with a Stiepel's flask modified by H. showed that the soap of polymerized oil was less than that of the original soap. The lathering vol. decreased in the first stage of polymerization, then increased remarkably and exceeded that of the soap from the original oil and then decreased again. Conclusion: The degree of polymerization of this oil most suited for soap manuf. corresponds to an I value of 80; the soap produced had no disagreeable smell and no apparent change after long keeping.

M. NAKAMURA

**Soap from castor oil.** N. PANTYUKHOV. *Masloboino-Zhirovoe Delo* 1928, No. 7, 11–2; cf. C. A. 22, 3794.—Greatest difficulties are encountered in the salting-out process. The curd soap from castor oil is easily sol. in alkali and salt solns. It is hard and has an appearance of a good soap, but is easily sol. in water, contains large quantities of salts, and does not lather well.

V. KALICHEVSKY

**Cold method of manufacturing soaps in presence of catalysts.** D. ZABRAMNII AND I. ITZKOVICH. *Masloboino-Zhirovoe Delo* 1928, No. 10, 18–21.—Cottonseed oil yields a soft soap by the usual method of manuf. in Middle Asia where hydrogenated oils are not available. It is recommended to use the cold process with  $\alpha$ - or  $\beta$ -naphtholsulfonic acid as catalyst. To prevent discoloration of the soap not over 0.1–0.2% of catalyst should be used. Soap of high quality is obtained but glycerol is lost in the process.

V. K.

**Studies on soap solution.** VII. Adsorption of soaps on charcoal. JIRO MIKUMO. *J. Soc. Chem. Ind. Japan* 32, 574–6(1929); Suppl. Binding 32, 178–80B(1929); cf. C. A. 23, 3118.—The adsorption of single K soaps (laurate, myristate, palmitate, stearate and oleate) in abs. alc. soln. on animal charcoal (Merck's "extra pure" purified with EtOH and Et<sub>2</sub>O) was measured. For single soaps Freundlich's adsorption isotherm holds below the concn. of aggregate formation, and Traube's rule is also applicable. In binary mixed soaps, the higher soap is always predominant on the adsorption layer, displacing the lower soap to a certain extent.

S. OKA

**Committee on oils, fats and waxes.** II. Limitations of present methods used in the analysis of oils and fats in the leather industry (BURTON, ROBERTSHAW) 29. Fermentation of soy-bean meal (SHIMO, HARADA) 15. Glycerides of chaulmoogra oil (BÖMER, ENGEL) 10. The cracking process—a universal source of motor fuel (EGLOFF) 22. Acids, alcohols and hydrocarbons from waxes (Brit. pat. 304,150) 10. Degreasing, etc., of animal and vegetable fibers [with soaps, oils and fats as by-products] (Brit. pat. 304,295) 25.

RENAUD-SIVAN: *L'industrie des corps gras dans la région de Marseille*. Paris: Dunod. 140 pp. F. 20.

**Wool fat.** REGINALD O. HERZOG and HEINRICH OESTERMANN. Ger. 477,959, Mar. 9, 1923. A sulfonated product of wool fat is obtained by sepg. the wax-like and liquid constituents in the known way and sulfonating them separately.

**Sulfonated wool fat.** I G. FARBENIND. A.-G. Brit. 305,597, Feb. 7, 1928. In prepg. water-sol. products of high emulsifying power, from the fatty acids of wool fat, these acids are treated with O or with a gas contg. O, at a high temp., with or without a catalyst such as Co resinate, which effects volatilization of substances of low mol. wt. and decreases the acid value of the mixt. The product obtained by sulfonating the fatty acids and pptg. by Na<sub>2</sub>SO<sub>4</sub> soln. is treated with BuOH and soda lye which effects sepn. of an upper layer of the purified product. This may be used to stabilize easily pptd. solns. such as those of 2,3-hydroxynaphthoic acid arylides.

**Emulsifying margarine, chocolate pulp, tallow or other fatty materials.** V. A. T. FAURSKOV. Brit. 304,256, Oct. 12, 1927. The material is subjected to the action of rollers revolving in opposite directions, in an app. which is described.

**Phosphatides—sterols.** CHEMISCHE FABRIK PROMONTA G. M. B. H. Ger. 479,353, Aug. 8, 1926. Addn. to 463,531. According to Ger. 463,531, fats or suitable exts. of fats are run in a thin stream into hot EtOH denatured with crude MeOH and, after sepg. the fatty residue, the alc. soln. is evapd. and the phosphatides and sterols are sepd. from the evapd. product with acetone. This method is now modified by using aq. or abs. EtOH or MeOH for the initial extn. step. Examples are given.

Apparatus for heating oil-bearing seeds, etc., prior to pressing. FRIED. KRUPP GRUSONWERK A.-G. Ger. 472,211, Oct. 18, 1925. See Brit. 259,939 (C. A. 21, 3477).

Cooking cotton seeds or other oil-bearing seeds preparatory to oil extraction. JOSEPH DAVIDSON (to Davidson-Kennedy Co.). U. S. 1,724,073, Aug. 13. Steam having a temp. above 200° is passed directly through the material and the excess steam and moisture are drawn off. An app. is described.

Aqueous emulsions or solutions of tall oil. HEIN & COMP. Ger. 479,085, June 10, 1925. The dispersion is effected, in the presence of a soap, with  $\text{PhNH}_2$  or its homologs, with or without a naphthol. An example is given.

Tall oil products. OEL- UND FETT-CHEMIE G. M. B. H. Ger. 477,829, Dec. 5, 1926. Products valuable in commerce are made from tall oil by fractioning *in vacuo* at a pressure below 8 mm.

## 28—SUGAR, STARCH AND GUMS

J. K. DALE

Titrimetric determination of invert sugar. G. D'ORAZI. *L'ind. saccharifera ital.* 21, 502(1928); *Listy Cukrovar. Rozhledy* 47, 27.—During the boiling of Fehling soln. with invert sugar and  $\text{NH}_4\text{OH}$ , the  $\text{Cu}_2\text{O}$  is not redissolved. The soln. becomes clear and colorless as all of the bivalent Cu is reduced to the univalent. The detn. is carried out by adding  $\text{NH}_4\text{OH}$  to a standardized Fehling soln., and while boiling, adding a soln. of invert sugar from a buret until decolorization occurs. Sucrose has an insignificant effect upon the reduction.

FRANK MARESH

The continual filtration following the first saturation. E. SAILLARD. *Suppl. Circ. Hebdm.* No. 2079(1929); *Listy Cukrovar. Rozhledy* 47, 31.—S. describes a filtering plant consisting of a concentrator and a rotating filter which has 0.1 the capacity of the plant. Details of the process are given.

FRANK MARESH

Methods for the determination of injurious nitrogen in beets. B. A. RUBIN. *Zhur. Sakharnoi Prom.* 2, 83-8(1928).—The method of Friedl (C. A. 5, 3179), modified by Herzfeld (Z. Ver. deut. Zuckerind. 70, 307), cannot be accepted for exact detn. of injurious N in beets. Even in beets which contain a very high % of it the exptl. error of Friedl's method reaches 4%, which cannot be compared with Kjeldahl's much superior precision method. It is not possible to apply a correction, as errors are variable. Comparative tables are shown.

V. E. BAIKOW

Changes in beets during storage. I. E. DUSHKII AND P. G. GALABUTSKII. *Zhur. Sakharnoi Prom.* 2, 213-28(1928).

V. E. BAIKOW

Regeneration of Norit. S. S. KUTZEV AND M. R. KOTLYARENKO. *Zhur. Sakharnoi Prom.* 2, 236-8(1928).—The decolorizing power of used Norit cannot be raised by chem. treatment to more than 65.68% of the original. Further treatment gives a decrease in decolorizing power and an increase in ash. Exhausted Norit after 50 days of use contained 17.5% of ash and 2.03% of mineral oils. The sample treated 8 times with 2% soln. of NaOH and 2% HCl still contained some oil and 9.7% of ash. The decolorizing power increased only from 52.55 to 55.6% of the original. After extn. of the oils by ether and after washing 6 times with 2% NaOH and once with 2% HCl the decolorizing power increased to 69.16%, while the ash decreased to 6.4%; a trace of oils was left. Norit regenerated in the factory and submitted in the lab. to thermal treatment in a current of  $\text{CO}_2$ , then washed once with 2% NaOH and 2% HCl contained no longer any trace of oil, the decolorizing power increased to 88.43% and the ash decreased to 3.2%. In bone char an increasing amt. of oil decreases the decolorizing power.

V. E. BAIKOW

The chemical constitution of gums. I. The nature of gum arabic and the biochemical classification of the gums. ARTHUR G. NORMAN. *Biochem. J.* 23, 524-35 (1929).—Gum arabic is not a substance of definite empirical formula, but in its general compn. there is a nucleus-acid consisting of galactose, and a uronic acid, probably galacturonic acid, to which is linked arabinose by glucoside linkages. There is no essential difference in structure between gums and hemicelluloses. BENJAMIN HARROW

Exterminators for beet parasites (Tesi) 15. Starch, amylase and amylolysis (COLIN) 16. The ecology of growing beets and its relation to plant diseases (STREHLIK, NEUWIRTH) 15. The production of pressed foods from dried beets and molasses (SAILLARD) 12. A new series of depolymerization products of starch (PICTET, VOGL) 10. Evaporator for treating sugar solutions (Brit. pat. 304,670) 1.

**Purifying raw sugar juices.** HERMAN SCHREIBER. U. S. 1,724,376, Aug. 13. The juice is heated at a temp. somewhat below the b. p. until no further sepn. of non-sugars occurs, lime is added to the sepd. juice to adjust the  $p_H$  and the limed juice is heated until a clear liquid is produced.

**Sugar-crystallizing apparatus.** BERNARD H. VARNAU and TRUMAN B. WAYNE. U. S. 1,724,627, Aug. 13.

**Starch.** HENKEL & CIE. G. M. B. H. (Max Jacobi, inventor). Ger. 478,538, July 2, 1925. Starch for use with cold water is prepd. by grinding with KOH, water and alc. or acetone, drying and regrounding.

**Starch preparations.** HENKEL & CIE. G. M. B. H. (Guido Hedrich, inventor). Ger. 479,143, Aug. 18, 1926. See Brit. 276,340 (C. A. 22, 2482).

## 29—LEATHER AND GLUE

ALLEN ROGERS

**Work of the German research laboratory for the leather industry in Freiberg during 1928.** JOHANNES PAESSLER. *Ledertech. Rundschau* 21, 37-9, 53-7, 64-7, 75-8, 87-9 (1929).—Summary of analyses made during 1928.

**A study of enzymes in the leather industry.** PAUL I. SMITH. *Ind. Chemist* 5, 311-2, 323 (1929).—A review. I. D. CLARKE

**Committee on oils, fats and waxes [of the I. S. L. T. C.] II. Limitations of present methods used in the analysis of oils and fats in the leather industry.** D. BURTON AND G. F. ROBERTSHAW. *J. Intern. Soc. Leather Trades Chem.* 13, 285-97 (1929); cf. C. A. 23, 1764.—A discussion. E. H. H. B. MERRILL

**The significance of the  $p_H$  value in leather manufacture.** M. AUERBACH. *Leder- tech. Rundschau* 21, 93-7 (1929).—A general discussion. I. D. CLARKE

**Fat liquors with special consideration of preparations containing lecithin.** ANON. *Leder- tech. Rundschau* 21, 105-9 (1929).—Vegetable lecithin (*Leder- tech. Rundschau* 1928, 23) is an excellent material for use in fat liquors. I. D. CLARKE

**The principles of fat liquoring.** OSWALD STADLER. *Leder- tech. Rundschau* 21, 69-74, 83-7 (1929).—A discussion from the practical viewpoint of parts of a monograph by Wilh. Schindler (cf. C. A. 23, 2846). I. D. CLARKE

**Acidity of vegetable-tanned leathers.** W. R. ATKIN AND F. C. THOMPSON. *J. Intern. Soc. Leather Trades Chem.* 13, 300-9 (1929).—Vegetable-tanned leather probably still contains some free  $NH_2$  groups, and may, therefore, be treated as a protein jelly like collagen or gelatin. The  $p_H$  value of any external soln. in contact with such a jelly is lower than that of the melted jelly, but the difference disappears if the external soln. is made about 0.1 *N* in KCl or other salt. Weigh 3 different quantities of leather increasing by powers of 2 or of 3 (e. g., 1, 3 and 9 g.). Digest each sample for 24 hrs. with exactly 100 cc. of 0.1 *N* KCl, filter and det.  $p_H$  value of the ext. by any convenient method. Plot  $p_H$  value of each soln. against  $\log_{10}$  of the diln. of the  $H_2O$  in the leather (e. g., for 1 g. of leather contg. 14%  $H_2O$ , diln. is  $100.14 \div 0.14 = 716$ ). Extrapolate to zero diln. The resulting figure is the  $p_H$  value of the acid soln. in the original leather, and is called the "acid figure." Acid figures are compared with % mineral acid by the Procter-Searle method. For leathers tanned with ordinary vegetable tanning materials, the 2 detns. give concordant results. In general, when % mineral acid  $\geq 0.5$ , acid figure  $\leq 2.5$ . For leathers tanned with syntans or other substances containing sulfonic groups, the % mineral acid found by the Procter-Searle method is generally high, but the acid figures indicate low acid in such leathers, which is in accordance with the facts. H. B. MERRILL

**The evaluation of cold-soluble quebracho extracts.** M. AUERBACH. *Leder- tech. Rundschau* 21, 118-22 (1929).—An untreated settled, cold-sol. quebracho ext. was compared with a sulfated ext. The former gave better weight and penetration in tanning and less ash and soluble matter in the leather.

**Tanning materials and their estimation.** [Effect of tanning agents on properties of gelatin and hide.] G. GRASSER and SUN TAU. *J. Am. Leather Chem. Assoc.* 24, 406-27 (1929).—Strips of gelatin and of hide were treated with (a) metalloids (I, Br, S), (b) metal salts, (c) metallic dichromates, (d) coal-tar dyestuffs, (e) vegetable tanning materials, and (f) ultra-violet light. The change in m. p. of gelatin and increase in shrinking temp. and hrs. required for complete hydrolysis of hide upon boiling were detd. Some tanning agents have a much greater relative effect upon gelatin than upon hide, and *vice versa*. Results of several hundred tests are tabulated. H. B. M.

**Gelatin.** KATHLEEN PEARSON AND PAUL I. SMITH. *Food Manuf.* 2, 232-4, 287-9; 3, 427-30 (1928).—The properties, applications, technical valuation of the various grades of gelatin and a simple description of its manuf. are given. J. A. KENNEDY

**The water-resisting property of glue and casein glue.** I. TSURUO ARAKI AND TASUKE MATSUNO. *J. Soc. Chem. Ind. Japan* 32, 591-5 (1929); Suppl. Binding 32, 183-4B (1929).—This property was measured by the time of failure under const. load in water of test pieces bound together by glue. With test joints made with casein glue, fairly concordant results were obtained for various specimens of casein. With test joints made with glue, widely varying results were obtained according to the kind of glues. Glues of higher  $p_H$  values generally have inferior water-resisting property with the exception of bone glue. Good glues are more water-resistant than the com. casein glues. II. *Ibid* 32, 595-600 (1929); Suppl. Binding 32, 184B (1929).—The water-resisting properties of glues are improved by treatment with paraformaldehyde together with oxalic acid; those of casein glues are improved by mixing them with a little Cu salt. In a water bath at 45° the test joints failed much sooner than at 20°. To test the brittleness of the casein glues, the glued test pieces were examd. by a high-speed vibration testing machine for 40 hrs., after which the shearing strength of the glued portion was tested, but the decrease of the strength was not noticed. S. OKA

Contribution to the theory of vegetable tanning (BUNGENBERG DE JONG) 2. Cellulose ester compositions [for coating leather] (Brit. pat. 304,814) 23.

**Preparing skins such as those of crocodilians for tanning.** RODOLPHE A. GERMAIN. U. S. 1,725,629, Aug. 20. In order to decalcify skins with calcareous formations without detaching the latter, the skin is macerated in a 2-10% soln. of an acid, which dissolves the calcareous matter and neutral salts in sufficient quantity to give a soln. of mol. tension high enough to oppose swelling and attack of the fiber; the skin is moved about, with care, in the soln., and is afterward washed and neutralized.

**Treating hides and skins with flowing liquors for depilating, cleansing, tanning, etc.** MATTHEW M. MERRITT (to United Shoe Machinery Corp.). U. S. 1,724,954, Aug. 20. A liquor is caused to flow rapidly past both sides of hides or skins in stretched condition; the used liquor is mixed with stronger liquor to restore its strength and is reused with the stronger liquor. An app. is described.

**Drench for treating hides.** I. G. FARBENIND. A.-G. Brit. 304,214, Jan. 16, 1928. A drench is prepd. by the action of bacteria such as those of the mesenteric group on albuminous and fatty substances such as defibrinated blood and refuse from meat and fish. A dry product may be formed by drying the liquid on kieselguhr, animal charcoal, sawdust, etc.

**Treating hides and skins preparatory to tanning.** I. G. FARBENIND. A.-G. Brit. 304,204, Jan. 18, 1928. Hides and skins after being limed and unhaird are drenched with materials such as those prepd. as described in Brit. 304,214 (preceding abstract). A salt such as  $AlCl_3$  may be used to facilitate the deliming process.

**Treating hides and skins before tanning.** SOC. INDUSTRIELLE DES APPLICATIONS CHIMIQUES SOC. ANON. Brit. 305,126, Jan. 31, 1928. Depilation is effected by treatment with purified Na sulfide or thioarsenite to which, for fatty hides, a small quantity of soda soln. may be added. Desulfurizing agents such as Al acetate may be used to prevent subsequent deterioration of the hides. Cf. C. A. 23, 2066.

**Tanning agents.** LEOPOLD POLLAK. Ger. 479,162, Mar. 4, 1925. Tanning agents are prepd. by treating sulfite cellulose lye with aromatic hydroxy or sulfo compds. in the presence of a mineral acid or  $S_2Cl_2$  and in the absence (as far as possible) of water, the reaction being conducted under energetic conditions until no free hydroxy or sulfo compd. remains. The products may be purified by treatment with Zn, Al, Mg or Fe. Examples are given.

**Synthetic tanning agents.** I. G. FARBENIND. A.-G. Brit. 304,454, Jan. 9, 1928. Water-sol. synthetic tanning agents are obtained by condensing phenol alcs. (which may also contain alkylated hydroxyl groups or carboxylic groups) with resorcinol at a temp. below 50°, preferably in the presence of an acid or alk. condensing agent. Examples are given both of this process and of the prepn. of the phenol alcs. used.

**Synthetic tanning agents.** J. R. GEIGY AKT.-GES. Brit. 305,013, Jan. 28, 1928. Condensation products of sulfonated phenols with urea and  $CH_3O$ , which are sol. in alkalies and suitable for use as tanning agents and also for *weighting silk*, are produced by sulfonating a phenol and then adding urea or a substance yielding urea, and  $CH_3O$



or a  $\text{CH}_2\text{O}$  substitution product, or adding to the sulfonated phenol the condensation product of urea and  $\text{CH}_2\text{O}$ . Several examples are given.

**Tanning with iron compounds.** E. G. STIASNY and B. JALOWZER. Brit. 305,562, Nov. 7, 1927. Complex compds. of Fe are used, such as those obtained by treating a  $\text{FeCl}_3$  soln. with  $\text{Na}_2\text{CO}_3$  and Na lactate, or by treating a soln. of  $\text{FeSO}_4$  acidified with  $\text{H}_2\text{SO}_4$  with K chromate and Na lactate. Various other reacting materials suitable also for producing complex compds. include compds. of acetic, oxalic, malonic, butyric and nitric acids or naphthalene or anthracenesulfonic acids. Glucose or molasses also may be added. Cf. C. A. 23, 543.

**Plastic composition suitable for making imitation leather, etc.** MOISEY M. SEREBRIANOI. U. S. 1,724,523, Aug. 13. Leather scrap is soaked and heated in water, turpentine is added and the material is formed into sheets by compression.

**Glue.** WILHELM LEIBROCK and AUGUST KLEE. Ger. 477,783, Dec. 25, 1925. Strong glues are made by heating finely divided albuminous substances with water in the presence of such materials as  $\text{NaOH}$ ,  $\text{Na}_2\text{CO}_3$ ,  $\text{NH}_4\text{OH}$ ,  $\text{Na}_2\text{B}_4\text{O}_7$  or  $\text{Ca}(\text{OH})_2$ .

### 30—RUBBER AND ALLIED SUBSTANCES

C. C. DAVIS

**Jelutong.** C. D. V. GEORGI. *Malayan Agr. J.* 17, 101-17(1929).—Since Fe compds. have been shown to induce the oxidation of jelutong (cf. C. A. 23, 546) and since jelutong can, during its prepn., be easily contaminated with Fe, expts. were carried out to det. at what stage Fe has the greatest influence. The expts. with Cu and Mn compds. were repeated, the reputed tendency of Kedah jelutong to oxidize was investigated further, and the behavior of creped jelutong in storage was detd. In the new expts. various proportions of aq.  $(\text{NH}_4)_2\text{Fe}_2(\text{SO}_4)_3$  were added to the latex, the latter was then coagulated with  $\text{H}_2\text{SO}_4$ , let stand 4 days, squeezed and left without further treatment or refined with boiling water. The results show that very small proportions of sol. Fe salts induce rapid oxidation, without the growth of mold, even 1 part of sol. Fe in 20,000 parts of latex causing complete oxidation after 3 months, in which case only 60% of the Fe originally added was found in the oxidized product. Jelutong refined with boiling water did not oxidize nearly so rapidly (because of the smaller Fe content of the corresponding samples), though here too oxidation was well advanced after 4 months. Treatment with boiling water also increased the toughness. The same general results were obtained with  $\text{FeCl}_3$ , with  $\text{AcOH}$  as coagulant. When jelutong latex contg. Fe salts was coagulated by boiling, the product was also susceptible to oxidation in much the same way, even after refining with boiling water. Expts. with rusty coagulating app. showed that wherever spots of rust existed in the jelutong, oxidation ensued. When  $\text{Fe}_2\text{O}_3$  was mixed with latex before coagulation with  $\text{H}_2\text{SO}_4$  or coagulation by boiling, black mold developed, but there was no oxidation. There was no oxidation of jelutong prepd. by soaking the coagulum in water contg.  $\text{Fe}(\text{OH})_3$  (1-40 parts of Fe per 100,000 parts of water) and refining with boiling water after 4 days. Contact of the surface of refined jelutong with aq.  $\text{FeCl}_3$ ,  $(\text{NH}_4)_2\text{Fe}_2(\text{SO}_4)_3$ , and  $\text{Fe}(\text{OH})_3$  and rusty nails caused little or no oxidation. Addn. of  $\text{CuSO}_4$  (1 part of Cu per 2500-10,000 parts of latex) and coagulation with  $\text{AcOH}$  yielded products, which, whether or not they were refined with boiling water, showed no signs of oxidation. Similar treatment, except for coagulation with boiling  $\text{AcOH}$ , yielded products which with the higher proportions of  $\text{CuSO}_4$  were completely oxidized after 4 months. Similarly,  $\text{MnCl}_2$  and  $\text{MnSO}_4$  (1 part of Mn per 1000-4000 parts of latex) yielded products which did not oxidize, and which showed no abnormal growth of mold. The higher proportions of Mn tended to retard coagulation. In general, the res. lts agree with those of the earlier expts. (*loc. cit.*). Fe is the most dangerous metal of those tested, but it is objectionable only if in sol. form in the latex. An investigation of Kedah jelutong showed no evidence in support of the view that this jelutong is particularly prone to oxidation. Expts. also show that creped jelutong has no greater tendency to oxidize than the corresponding uncreped product. C. C. D.

**Microscopic investigations on the occurrence of resins in Hevea latex.** A. FRIG-WYSSLING. *Arch. Rubbercultuur* 13, 371-91(1929). (In English 392-412.)—A systematic study of latexes of different origins led to the discovery that there are present among the rubber particles a hitherto unsuspected kind of globule which has the same appearance as the rubber particles but which consists of resin. These colorless globules of resin carry the yellow pigment of latex, and it was because of this that they were first detected in latex from trees which yielded a yellow latex. They occur not only in the

latex of *Hevea brasiliensis*, but also in that of *H. guianensis*, *H. collina* and *H. spruceana*, in the latter in relatively great quantities. Their dimensions are about the same as those of the rubber particles. They refract light somewhat more; they are viscous and of a butter-like consistency; and they cohere far better than rubber particles. Unlike rubber particles they can be stained by fat coloring dyes, and unlike rubber particles they are sol. in EtOH, AcMe and AcOH. They contain several components, including various esters of fatty acids and at times the yellow pigment. They are unaffected by  $\text{NH}_3$ ,  $\text{Na}_2\text{CO}_3$ ,  $\text{Na}_2\text{SO}_3$ ,  $\text{NaHSO}_3$  and  $\text{Na}_2\text{S}_2\text{O}_3$ , but are liquefied by 40% aq.  $\text{HCHO}$ . No peroxidase is present. They reduce 1% osmic acid and  $\text{AgNO}_3$ , and are oxidized by  $\text{HNO}_3$  and by  $\text{KMnO}_4$ . Though the yellow pigment is absorbed in the resin there is no quant. relation between the resin content and the pigment content of the latex. If pigment formation is abundant, yellow latex results, whereas with only a slight tendency to form pigment the latex is white. Colorless resin globules also occur in branches and in very young latex next to the cambium, and in general, the formation of resin globules in latex is just as characteristic of the rubber tree as the formation of rubber particles.

C. C. DAVIS

Latices of *Euphorbia tirucalli*, *E. candelabro* and *E. abyssinica*. E. DE'CONNO, S. CAPALBI AND L. FRUITIER. *Ann. chim. applicata* 18, 540-9(1929).—All plants of the *Euphorbia* family contain some latex. The varieties found in *Tirucalli*, *Candelabro* and *Abyssinica* have been investigated. They contain, resp.,  $\text{H}_2\text{O}$  46.8, 30.05, 49.6%; gums 7.25, 8.3, 8.44%; insol. residue 10.1, 9.8, 2.02%. All also contain traces of fatty substances.

A. W. CONTIERI

The swelling of rubber. P. STAMBERGER AND C. M. BLOW. *Nature* 124, 13 (1929).—Expts. on the diminution of the vapor pressure of solvents in rubber jellies and on swelling pressures show that the vapor pressure of jellies is a const. at a given concn. of rubber, regardless of the kind of rubber and the extent to which it has been masticated (cf. S., C. A. 22, 2078). However, after mastication swelling is unlimited and up to 30% concn. a viscous liquid is obtained, which shows that the solvent is not bound by surface adsorption. The relative vapor-pressure-concn. curve differs from that calcd. by Raoult's laws, the curve bending sharply at 20-30% concn. toward the vapor-pressure axis, which suggests that the phenomenon is more complicated than ordinary soln. Though no difference was found between the vapor pressure of "liquid" jelly from masticated rubber and solid jelly from untreated rubber, the swelling pressures were far different, showing that the swelling of a structureless rubber differs greatly from that of a rubber with a well-defined structure, though both show the same diminution of vapor pressure. It is impossible, therefore, to calc. the swelling pressure from the vapor-pressure diminution on a thermodynamical basis. The expts. show that the forces which cause imbibition of solvent by jelly are not uniform, a "structure factor" taking a part when the solvent is in liquid form.

C. C. DAVIS

The influence of the amount of the surplus liquid on the swelling maximum of rubber jellies. C. M. BLOW AND P. STAMBERGER. *Rec. trav. chim.* 48, 681-94(1929); cf. C. A. 22, 4314; 23, 3144.—Rubber jellies in PhMe, petroleum ether or  $\text{C}_6\text{H}_6$  show an increasing swelling max. with an increase in the initial vol. of liquid present, up to a point beyond which a greater vol. of liquid causes no greater swelling max. The variations are due to the rubber diffusing into the solvent during the process of swelling to different extents when different proportions of liquid are present. The effect of a higher temp. during swelling is to increase the swelling max. The proportion of rubber in a gel was detd. by drying the gel and weighing. It was found that the concn. of rubber in the unabsorbed liquid was greater, the less the proportion of pure liquid present initially. The jelly swells less, the higher the concn. of rubber in the final liquid. Nearly the same final state was observed when rubber was swollen in solvents initially contg. varying proportions of rubber, and when jellies swollen to a max. were transferred to solns. contg. varying proportions of rubber. Variations in the swelling max. due to change in the concn. of the rubber in the unabsorbed liquid, can be explained qual. on the assumption of an osmotic phenomenon.

CORNELIA T. SNELL

Cold vulcanization [of rubber] (Parkes' process). P. BOURCOIS. *Bull. fédération ind. chim. Belg.* 8, 3-8(1929).—The method of vulcanization of rubber by immersion in a soln. of  $\text{S}_2\text{Cl}_2$  is reviewed, with especial reference to certain practical details and difficulties. The vulcanizing effect is attributed to nascent S formed from the  $\text{S}_2\text{Cl}_2$  by the action of natural moisture in the rubber.

B. C. A.

Topochemical reactions with racked rubber. F. KIRCHMOP. *Kautschuk* 5, 9-13 (1929).—When immersed in  $\text{H}_2\text{SO}_4$  (d. 1.8) for 4 months, thin strips of smoked sheet rubber which had been racked to 600% darkened and lost their power of contraction in warm water. A fibrous structure was, however, still evident both from visual examn.

and by the production of a distinct point diagram with x-rays. Treatment of similarly raked rubber with Br water also yielded a product with a superficially fibrous character, but x-rays revealed no sign of any structure, even the amorphous ring being absent. Apparently bromination causes a complete structural disturbance both in the amorphous component and in the crystallites, whereas with  $H_2SO_4$  the action appears to be confined chiefly to the amorphous phase.

C. C. DAVIS

The problem of vulcanization without sulfur. LEO ECK. *Gummi-Ztg.* 43, 2481-2 (1929).—A discussion of present knowledge, with particular reference to the work of Ostromislenskii (cf. following abstr.). For vulcanization without S to be successful economically: (1) the new process must be no longer nor more difficult than that with S; (2) the phys. properties of the vulcanizates, including their aging, must be at least as good as those of the corresponding vulcanizates with S; (3) the vulcanizing agent must be innocuous; and (4) if the vulcanizing agent gives no better results than does S, it must be cheaper. The fulfillment of these conditions by  $1,3,5-C_6H_3(NO_2)_3$  is open to question.

C. C. DAVIS

Vulcanization without the use of sulfur. IVAN OSTROMISLENSKII. *India Rubber World* 80, No. 3, 55-61 (1929).—Because of contradictory results obtained by other investigators on the vulcanization of rubber with  $1,3,5-C_6H_3(NO_2)_3$ , and to furnish quant. data on the methods and results obtained by O. (which were not published in complete form in the original papers of O.), the earlier expts. are reviewed and discussed and quant. data not heretofore published are given. The commonest error in using  $1,3,5-C_6H_3(NO_2)_3$  is to use too much. Over 3% should never be used, and 2% is better (based on the wt. of rubber). All mixts. should contain an agent to protect the vulcanizates against aging, e. g., relatively large proportions of oxides (PbO, ZnO, etc.) or 0.3-1.0% of aromatic amine. Rubber mixts. vulcanized with  $1,3,5-C_6H_3(NO_2)_3$  often have phys. properties superior to the corresponding mixts. with S. The aging in particular is better with the  $1,3,5-C_6H_3(NO_2)_3$  vulcanizates. A sample 13 yrs. old has shown little or no change in phys. properties. With suitable accessory ingredients, rubber mixts. can be vulcanized at 50-100° with  $1,3,5-C_6H_3(NO_2)_3$ . With the latter, overcuring is minimized, e. g., a mixt. of rubber 100,  $1,3,5-C_6H_3(NO_2)_3$  2,  $PhNH_2$  1, ZnO 150, has almost the same phys. properties whether cured for 20 min. or for 2 hrs. at 141°. Carborundum, Si and certain other uncommon ingredients accelerate the action of  $1,3,5-C_6H_3(NO_2)_3$  and impart peculiar phys. properties to the vulcanizates. Deterioration through contact with Cu or by acids is slower in vulcanizates cured with  $1,3,5-C_6H_3(NO_2)_3$  than in those cured with S. Metallic oxides, sulfides, selenides and tellurides, C black, lamp black, amorphous C, graphite, Si, SiC, red P, Al, talc, ultramarine and other substances accelerate the action of  $1,3,5-C_6H_3(NO_2)_3$ , whereas amorphous B is not an accelerator. C black, whether it is or is not satd. with air, accelerates in the same way, so it does not act as an O carrier. With a chem. and a phys. accelerator together, e. g., with a metallic oxide and C black, the effect is additive. The character of the ZnO governs to a great extent its accelerating power. Thus a mixt. of rubber 100,  $1,3,5-C_6H_3(NO_2)_3$  2, ZnO 150, cures in 20-25 min. at 141° with "Kadox", ZnO, whereas with ordinary ZnO the cure is 160 min. at 141°. C black is also an excellent accelerator with  $1,3-C_6H_4(NO_2)_2$ . With PbO and C black, 0.25-0.5% of  $1,3,5-C_6H_3(NO_2)_3$  (based on the wt. of rubber) is the min. required for satisfactory vulcanization. The presence of S (0.3-8.0%) or of ordinary accelerators does not influence the rate of vulcanization with  $1,3,5-C_6H_3(NO_2)_3$ . With 2-8% S (there is a discrepancy between these values and those above—ABSTRACTOR) or with a large proportion of aliphatic or aromatic amine, the rate of vulcanization with  $NO_2$  compds. is retarded and the phys. properties of the vulcanizates are impaired. Aromatic amines, S, metallic sulfides and above all  $Sb_2S_3$ , certain S dyes and tannic acid protect  $1,3,5-C_6H_3(NO_2)_3$  vulcanizates from oxidation and other changes occurring on storage in the open air. The proportion of these protective substances should be limited to 0.3-1.0%. A few representative factory rubber mixts. cured with  $1,3,5-C_6H_3(NO_2)_3$  had superior phys. properties for the particular uses to the corresponding mixts. cured with S.

C. C. DAVIS

Deposition of aqueous dispersions [of rubber] (Fr. pat. 657,404) 13. Coating fabrics with rubber (Brit. pat. 304,157) 25. Coating fabrics with natural or artificial rubber dispersions (Brit. pat. 305,264) 25. Heating apparatus [for vulcanizing rubber] by steam (Brit. pat. 305,577) 13. Electrophoresis [reversal of rubber latex] (Brit. pat. 305,630) 4.

Centrifugal concentration of latex. AKTIEBOLAGET SEPARATOR. Brit. 304,686, Jan. 24, 1928. Liquid to be treated is supplied from a tank of uniform cross section

in which the surface is protected from the air by a float which prevents evapn. of  $\text{NH}_3$  or other preservative. Various other app. details are described.

Composition from rubber latex and casein. WM. W. CHRISTMAS. U. S. 1,724,906, Aug. 20. Casein is dissolved in a strong  $\text{NH}_3$  soln. heated to about 70–90°, mixed with raw rubber latex, and the resulting compn. is dried and vulcanized.

Rubber. ERNST ROHLIN. Ger. 478,590, Aug. 23, 1925. A dipping app. for the prepn. of rubber goods and for the recovery of the solvent is described.

Preserving rubber. A. M. CLIFFORD (to Goodyear Tire & Rubber Co.). Brit. 305,195, Feb. 2, 1928. Aryl hydroxides such as hydroquinone and amines such as aniline are caused to react in the absence of solvents (suitably by heating with  $\text{CaCl}_2$ ) to form compds. which improve the "aging qualities" of rubber. Cf. C. A. 23, 4376.

Preserving rubber. A. M. CLIFFORD (to Goodyear Tire & Rubber Co.). Brit. 305,572, Feb. 7, 1928. The "aging qualities" of rubber are improved by adding aromatic nitrosoamines such as the nitroso derivs. of phenyl- $\beta$ -naphthylamine,  $\beta$ , $\beta$ -dinaphthylamine or the like.

Preserving rubber. A. M. CLIFFORD (to Goodyear Tire & Rubber Co.). Brit. 305,647, Feb. 9, 1928. See U. S. 1,717,093 (C. A. 23, 3828).

Retarding deterioration of rubber. WM. S. CALCOTT, WM. A. DOUGLAS and OLIVER M. HAYDEN (to E. I. Du Pont de Nemours & Co.). U. S. 1,725,564, Aug. 20. In order to retard deterioration by the action of oxidation and heat, there is incorporated with rubber 2 or more substances such as *m*-toluylenediamine and phenyl- $\alpha$ -naphthylamine, one of which primarily retards deterioration by action of heat and the other of which primarily retards deterioration by the action of O.

Rubber pastes. I. G. FARBERIND. A.-G. Brit. 305,490, Feb. 3, 1928. A paste which can be homogeneously mixed with fillers, vulcanizing agents, etc., is prepd. from natural or synthetic latexes or the like by treatment with a water-sol. cellulose ether such as the methyl ether or a soln. of the ether, heating to form a ppt. and sepgg. the ppt. from the water. Various details are given.

Extrusion method for making rubber inner tire tubes. HERMAN T. KRAFT (to Goodyear Tire & Rubber Co.). U. S. 1,724,354, Aug. 13. An app. and various details of procedure are described.

Forming rubber tire tubes by extrusion. DUNLOP RUBBER CO., LTD., and F. FELLOWES. Brit. 305,152, Oct. 31, 1927. Mech. features.

Forming seamless rubber tires, etc., by deposition on the surface of a hollow mold. J. TOWNLEY. Brit. 304,633, Oct. 21, 1927. Mech. features.

Cleaning rubber molds. G. G. ANDREWS (to Goodyear Tire & Rubber Co.). Brit. 305,531, Feb. 6, 1928. Alk. solns. are used under heat and pressure, e. g.,  $\text{NaOH}$ ,  $\text{KOH}$  or  $\text{Na}$  sulfide may be used under a steam pressure of about 80 lb. per sq. in. An app. is described.

Coloring rubber and similar materials. IMPERIAL CHEMICAL INDUSTRIES, LTD., A. J. HAILWOOD, W. J. S. NAUNTON and A. SHEPHERDSON. Brit. 304,376, Oct. 21, 1927. Materials such as rubber, balata or gutta-percha are colored by incorporating with them a pigment consisting of a vat dye and a finely divided substratum substantially insol. in water. Various details and examples are given.

Synthetic rubber. I. G. FARBERIND. A.-G. Brit. 304,207, Jan. 16, 1928. Coagulation of a synthetic latex such as may be formed from isoprene and  $\text{Na}$  oleate soln. is effected by cooling to below 0°, and after thawing the coagulum is sepd. from the aq. emulsifying and polymerizing agent. Unpolymerized diolefin present is removed by heating or reduced pressure, use of a gas current or by rolling the coagulum. Several examples are given. Cf. C. A. 23, 2324.

Synthetic rubber compositions. I. G. FARBERIND. A.-G. Brit. 304,612, Jan. 20, 1928. Sheets or other forms of material for use in the same manner as linoleum, celluloid, horn, etc., are made from synthetic rubber (such as that from isoprene) with an artificial or natural resin or other plastic material and org. or inorg. fillers or both. Fac-tis, natural rubber, cellulose esters or ethers, dyes, etc., may be included in various compns.

Rubber vulcanization accelerators. SIDNEY M. CADWELL (to Naugatuck Chemical Co.). U. S. 1,724,180, Aug. 13. Polynitrophenylbenzothiazyl sulfides (and corresponding chlorophenyl compds.), details of the production of which are given, are accelerators of the vulcanization of rubber. They all have antioxidant properties and improve the aging of rubber, and particularly is this true of the 2,4-dinitrophenylbenzothiazyl sulfide. The 2,4,6-trinitrophenylbenzothiazyl sulfide, which may be also called picrylbenzothiazyl sulfide, has the property of improving the flexing of a rubber compd.

# CHEMICAL ABSTRACTS

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No. 20

## 1—APPARATUS AND PLANT EQUIPMENT

W. L. BADGER

Time of reaction and apparatus construction. W. ALLNER. *Chem. App.* 16, 117(1929).—A. discusses the influence of the time factor and the velocity of reaction on the size of equipment. Examples showing the effects are given. A table gives the time of combustion for a no. of common fuels. M. C. ROGERS

A laboratory ozonizer. ALBERT L. HENNE. *J. Am. Chem. Soc.* 51, 2676-7(1929).—The app. of Smith (cf. *C. A.* 19, 2427) has been modified to eliminate the use of Hg electrodes and litharge joints. The new app. has the same yields of O<sub>3</sub> but is less expensive and more easily built. ALBERT L. HENNE

Late developments in continuous filtering machines for sludges. K. W. GEISLER. *Eng. Progress* 10, 36-9(1929); cf. *C. A.* 22, 3807. E. I. S.

Some modern apparatus for the artificial drying of chemical products. K. RENGW. *Chem.-Ztg.* 53, 496-7(1929).—Different types of mech. drying app. built by the Benno Schilde Machinery Co., Hersfeld, Germany, are described. G. H. VON FUCHS

New desiccator and insets. KURT THORMANN. *Chem. Fabrik* 1929, 392.—The porcelain supports touch the crucible at 3 points only. Cf. *C. A.* 23, 3377. J. H. MOORE

An all-glass evaporator. D. F. OTHMER. *Ind. Eng. Chem.* 21, 876-7(1929).—Details of construction and operation of an app. for evapn. of corrosive solns. and of delicate solns. under vacuum. J. H. MOORE

A mercury displacement volumeter. COLIN G. JACKSON. *J. Sci. Instruments* 6, 261-2(1929). E. J. C.

Simple method of distillation under greatly reduced pressure. B. STEMPEL. *Arch. Pharm.* 267, 484-6(1929).—A very compact distg. app. is described and illustrated, a set-up reminiscent of the original Anschütz arrangement of flasks, with suitable connections with manometer, drying tube, pump, notably for distn. in an atm. of H or CO<sub>2</sub>. W. O. E.

Apparatus for the automatic stopping of distillations. G. RANKOFF. *Chem. Fabrik* 1929, 401.—An improvement of R.'s app., *C. A.* 22, 892. J. H. MOORE

A new automatic apparatus for the determination of water by distillation. J. PRITZKER AND ROB. JUNGKUNZ. *Chem.-Ztg.* 53, 603(1929).—The app. described in *C. A.* 21, 719 is improved to use with substances both lighter and heavier than H<sub>2</sub>O. J. H. MOORE

A new integrating microphotometer for x-ray crystal reflections. I, II. W. T. ASTBURY. *J. Sci. Instruments* 6, 192-6, 209-13(1929). E. H.

An improved adjusting device for thermoregulators. FRITZ FRIEDRICH. *Chem.-Ztg.* 53, 480(1929).—The escaping of min. particles of Hg through the threads of the adjusting screw is prevented by the use of a ground-in piston. G. H. VON FUCHS

A new rapid counterflow mixer. O. SCHWENNINGER. *Eng. Progress* 10, 52-4(1929).—This machine consists of a revolving mixing tub and two rotary agitators. Uniform and rapid mixing of material is assured by appropriate location of agitator centers. E. I. S.

Portable detector developed for many combustible gases. J. K. MABBS AND W. B. ROWLAND. *Chem. Met. Eng.* 36, 490-2(1929).—Description of an app. which depends on the increased elec. resistance of a hot filament when the temp. is further raised by the combustion of a gas on its surface. The app. is not suitable for detecting mixts. of air with H<sub>2</sub>, C<sub>2</sub>H<sub>2</sub>, or CS<sub>2</sub>. J. H. MOORE

A modified Pirani vacuum gage. THOS. DEVRIES. *J. Optical Soc. Am.* 18, 333-5(1929).—A modified Pirani vacuum gage can be made by assembling 4 C or W bulbs in a Wheatstone bridge arrangement, and connecting to the vacuum line those which are in the opposite arms of the bridge. The other 2 bulbs serve as balancing resistances, together with a dial-decade box in series with one of these bulbs to balance

the bridge. This arrangement is a simple set-up for controlling low pressures or for detecting slight changes.

FRANK V. JOHNSON, JR.

Some vacuum recording gages. K. C. D. HICKMAN. *J. Optical Soc. Am.* 18, 305-31(1929).—There has been no satisfactory vacuum gage for recording between the limits 5 mm. and 0.01 mm. A differential Hg manometer is described which covers this range satisfactorily. The same principle has been extended to construct a moving dial instrument. These gages yield a nearly linear deflection with pressure and their use is extended to obtain abs. measurements of pressure. Certain org. liquids are recommended for lubricating the Hg meniscus. A no. of other gages and their limitations are described.

FRANK V. JOHNSON, JR.

A pressure-controlled McLeod gage. NEWTON UNDERWOOD. *J. Optical Soc. Am.* 19, 78(1929).

E. J. C.

A new apparatus for collecting and measuring gas. B. KUNISCH. *Chem. Fabrik* 1929, 372-3.

J. H. MOORE

A voltage regulator for gas discharge x-ray tubes. F. E. HAWORTH. *J. Optical Soc. Am.* 19, 79-80(1929).

E. J. C.

A spherical high-pressure ionization chamber. JAMES W. BROXON. *J. Optical Soc. Am.* 18, 403-4(1929).—Details are given for the construction of an ionization chamber to withstand pressures of 2500 lb. per sq. in. and suitable for studies of the natural ionization in gases at high pressures.

H. R. MOORE

[Apparatus for] determination of isotherms at high pressures. A. MICHELS AND R. O. GIBSON. *Ann. Physik* [4], 87, 850-76(1928).—A new app. for detg. isotherms at high pressures is fully described. In particular, the isotherms of Ne between 0° and 100° at 20-500 atm. are detd. The accuracy is estd. to be not greater than 1 in 2000.

B. C. A.

Determination of the size of rotary vacuum pumps of multiple-cell construction. M. LACKMANN. *Chem. Fabrik* 1929, 371-2, 380-1.—Practical formulas are given for calcg. capacities and the mean working grade during progressive evacuation to a detd. pressure.

J. H. MOORE

"Small gas muffle." M. MIELDS. *Chem. Fabrik* 1929, 392.—Cf. Horst, C. A. 23, 8378.

J. H. MOORE

Water, oil and sludge separator for compressed-air systems. M. BEYER. *Apparatebau* 41, 121(1929).—The compressed air undergoes purification in 3 stages: (1) Packed metal turnings remove small dust particles and other like materials. (2) Passing through a conical metal sieve it is cooled and dehumidified. (3) It next strikes against a metal plate and undergoes a change of direction, which insures thorough mixing.

M. C. ROGERS

The working of aluminum. H. KRAUSE. *Apparatebau* 41, 133(1929).—K discusses the factors to be considered.

M. C. ROGERS

The use of stoneware. FELIX SINGER. *Chem. App.* 16, 130(1929); cf. C. A. 23, 1312.—S. discusses the use of stoneware in the chem. industry.

M. C. ROGERS

Sublimation. MARTIN STRUBIN. *Chem. App.* 16, 139(1929).—S. discusses the fundamental principles of sublimation and their relation to the design of app. used for sublimation.

M. C. ROGERS

Measuring the specific heats of metallurgically important materials with the aid of 2 new types of calorimeters (ROTH, BERTRAM) 2. Practical guides for gas-analytical investigations (NEUMANN, STRÄHUBER) 7. Determination of H and CH<sub>4</sub> in the Orsat apparatus (BAHR) 7.

Filter. CHARLES H. LOEW (to Loew Filter Co.). U. S. 1,726,035, Aug. 27.

Filter. SIEMENS & HALSKE A.-G. (Nikolaus Schönfeldt and Reinhold Reichmann, inventors). Ger. 481,178, Apr. 20, 1927. See Fr. 653,033 (C. A. 23, 3603).

Drum filters. MASCHINENFABRIK BUCKAU R. WOLF A.-G. Ger. 480,894, Jan. 18, 1925. Details.

Filter for air, etc. A. JORDAHL. Brit. 306,348, June 15, 1928. Structural features are described of a filter preferably formed of knitted metal fabric and which may be coated with a viscous material.

Filter for gases. H. S. POCHIN and C. H. W. CHELTNAM. Brit. 305,693, Nov. 4, 1927. Structural features.

Filter for clarifying furnace flue gases for purposes of analysis. A. LUMB and L. LUMB. Brit. 305,874, April 10, 1928. Structural features of a filter are described, the lower half of which is filled with broken coke and the upper half with asbestos fiber

**Combined settling and filtering apparatus.** C. PICCARDO. Brit. 305,976, Feb. 13, 1928. Structural features.

**A concentrating device for a filter-press washing machine.** VULKAN-WERKE A.-G. FÜR BRAUEREIBEDARF. Ger. 480,300, Nov. 6, 1926.

**Drying apparatus.** EMIL WEISS. Ger. 479,898, Jan. 9, 1927. Details of the trough and hot gases.

**Vacuum drying apparatus.** OGDEN MINTON. Ger. 479,573, Mar. 25, 1927. Details.

**Vacuum drying apparatus with a rotary or oscillating drum.** A. E. JONSSON. Brit. 306,088, Feb. 15, 1928. Structural features.

**Cleaning device for rotary vacuum driers.** AUGUSTINUS E. JONSSON. Ger. 480,574, Nov. 24, 1927. Corresponds to Brit. 288,341.

**Vacuum container.** ROBERT LUBOWSKI. Ger. 480,021, Sept. 6, 1925. A hollow body made of materials which resist chemicals is exhausted by coating its interior with a substance which will form a stable solid compd. with the gaseous contents.

**Rotary spray disk for drying apparatus.** J. A. REAVELL. Brit. 306,009, Oct. 14, 1927. Structural features.

**Traveling-belt apparatus for drying moist solid materials.** VERNOR S. HENRY, ARTHUR WRIGHT and FRANK W. YOUNG (to Filtration Engineers, Inc.). U. S. 1,726,511, Aug. 27. Structural features.

**Device for drying grass and grain.** HEINRICH SUTER-EGGENBERGER. Swiss 132,237, May 1, 1928.

**Apparatus for drying hides, skins, enamel plates and other objects in sheet form.** ALAN W. RANDALL. Ger. 480,571, Nov. 23, 1928. Corresponds to Brit. 314,738.

**Crucible holder.** JOHANN ARNST. Ger. 481,072, Mar. 16, 1927. The holder has three adjustable arms.

**Photoelectric photometer.** CLAYTON H. SHARP, CARL KINSLEY and EDGAR D. DOYLE. U. S. 1,726,318, Aug. 27. Structural, optical and electrical features are described.

**Microscope.** R. WINKEL G. M. B. H. Ger. 467,150, Jan. 8, 1927.

**Pasteurizing apparatus.** GEBRÜDER SCHÄFFLER MASCHINENFABRIK. Ger. 480,028, June 21, 1927. Addn. to 478,539 (C. A. 23, 4600). An improvement in the water circulation of the container for the flasks is described.

**Reaction vessel.** FELD & VORSTMAN G. M. B. H. Ger. 481,320, May 15, 1928. The vessel has corrugated walls and is made of Fe with a lining of chem.-resisting metal such as Sn or Cu.

**Containers lined with rubber and similar chemical-proof coatings.** GUMMIWERK ERNST KNIEPERT. Ger. 481,283, July 23, 1925.

**Catalytic apparatus.** A. O. JAEGER (to Selden Co.). Brit. 306,442, Feb. 20, 1928. In a catalytic converter cooled by the reaction gas, all or a portion of the partly reacted gases issuing from the converter are recirculated (preferably after removal of reaction products and addn. of more reacting gases). Various details of app. and procedure are described applicable to processes such as  $\text{NH}_3$  synthesis,  $\text{SO}_2$  oxidation,  $\text{NH}_3$  oxidation, org. oxidation, reduction, dehydrogenations, polymerizations, condensations, etc Cf. C. A. 22, 4015.

**Catalytic apparatus for gas reactions.** A. O. JAEGER (to Selden Co.). Brit. 306,519, Feb. 23, 1928. A converter having a plurality of catalyst chambers immersed in a bath of normally non-boiling liquid is provided with temp. regulating elements such as rods or tubes of metal immersed in the bath so as to prevent undue rise in temp. either locally or generally. The app. is suitable for org. oxidations, reductions, hydrogenations, dehydrations, decompositions, condensations, polymerizations,  $\text{NH}_3$  synthesis and oxidation and  $\text{SO}_2$  production. Various structural details are described. Cf. C. A. 23, 3831.

**Emulsifying or mixing apparatus.** C. S. H. SNOW. Brit. 305,711, Nov. 10, 1927. Structural features.

**Apparatus for stirring and mixing fluids.** FRANZ MEYER. Ger. 481,319, Oct. 14, 1927. Details.

**Homogenizing mill of the rotating disk type.** W. EPPENBACH. Brit. 306,502, Nov. 22, 1927. Various structural features are described.

**Measuring device for liquids such as benzene.** "BREVO" A.-G. FÜR EXPLOSIONS-UND FEUERSCHUTZ. Swiss 131,783, Apr. 10, 1923.

**Apparatus for delivering measured quantities of coloring substances or other powdered or granular substances.** GUSTAV HAAS (to General Aniline Works). U. S. 1,725,913, Aug. 27. Structural features.

- Apparatus for working up coal and ores. ERNEST HODEIGE. Ger. 480,481, Oct. 22, 1924. Details are given.
- Apparatus for determining the viscosity of liquids. MARIO MICHELS and BORN & STUCKI. Swiss 130,930, Apr. 4, 1928.
- Vacuum meter. MASCHINENFABRIK OERLIKON. Swiss 131,844, May 24, 1928.
- Molding machine. BADISCHE MASCHINENFABRIK UND EISENGIESSEREI VORM. G. SEBOLD UND SEBOLD & NEFF. Ger. 480,118, Oct. 9, 1926. Details.
- Molding machines. CLIFTON D. PETTIS. Ger. 479,630 and 479,631, Jan. 16, 1925. Details of construction are given.
- Double molding machine. PHILIPP KREUZER. Ger. 479,624, Nov. 10, 1926. Details of construction are described.
- Surface condenser with a rotating internal cooling drum. KALIINDUSTRIE A.-G. Brit. 306,106, Feb. 17, 1928. Structural features.
- Gas-purification plant. METALLGES. A.-G. (Kurt von Eberhard, inventor). Ger. 480,600, Oct. 22, 1927. Small particles deposited on the electrodes of gas purifiers are removed by magnetically operated scrapers.
- Tray for gas purifiers. JULIUS SCHMITT. Ger. 480,613, June 19, 1928.
- Apparatus for removing constituents of gas mixtures. ADOLF MESSER. Ger. 479,984, Apr. 4, 1928. App. for removing constituents of gas mixts. by solidification is described.
- Gas washer with vertical baffle plates. PNEUMATIC CONVEYANCE & EXTRACTION, LTD., and W. A. SMITH. Brit. 306,058, Nov. 14, 1927. Structural features.
- Centrifugal gas-washing machine. HAROLD NIELSEN. Ger. 479,765, July 11, 1924.
- Apparatus for cooling gas-washing oil. C. OTTO & Co., G. M. B. H. Ger. 479,954, Mar. 29, 1925. Details are given.
- Recording gas calorimeter. CHARLES V. BOYS. U. S. 1,726,140, Aug. 27. Structural features.
- Pressure vessel for difficultly liquifiable gases. GES. FÜR INDUSTRIEGASVERTUNG M. B. H. Ger. 479,985, Dec. 28, 1926. Details are given.
- Acetylene generator. CLARA D. KILLIAN (to H. C. S. Samuels). U. S. 1,726,029, Aug. 27. Structural features.
- Acetylene generator. AUTOGEN ENDRESS A.-G. Swiss 131,769, Oct. 19, 1927. The  $\text{CaC}_2$  container and water tower are relatively displaced so as to ensure a sudden and continuous contact between the  $\text{CaC}_2$  and the water.
- Carbide-charging device for acetylene generator (carbide to water type). JACOB KNAPPICH. Ger. 480,347, Jan. 14, 1927.
- Furnace. CHARLES CHAPPUIS. Swiss 131,542, Mar. 16, 1927. Details are given.
- Furnace. INTERNATIONAL ENGINEERING CORP. Ger. 479,869, Jan. 13, 1926. Details of cooling tubes.
- Furnace. ROLFS KOHLEN-OXYD-VERBRENNER G. M. B. H. Ger. 479,618, Feb. 19, 1928. The blast air is pre-heated by passing it through canals in the furnace wall.
- Rotary furnace. KLÖCKNER-WERKE A.-G. Ger. 481,012, Apr. 8, 1927. Details.
- Rotary plate furnace. TROCKNUNGS-, VERSCHWELUNGS- UND VERGASUNGS-G. M. B. H. Ger. 479,730, Jan. 16, 1927. Details of unloading are described.
- Regenerative furnace. FRIEDRICH SIEMENS A.-G. Ger. 481,332, Feb. 25, 1928.
- Regenerative furnace. KARL WOLINSKI. Ger. 481,132, Dec. 24, 1926.
- Regenerative furnace plant. C. OTTO & COMP. G. M. B. H. Ger. 479,614, June 27, 1928. A device for keeping down the pressure in the gas tubes is described.
- Crucible furnace. HANS KOCH. Ger. 481,035, Apr. 24, 1927. The furnace has a jacket comprising two semi-cylindrical hinged halves.
- Annular kiln for crucibles. AUGUST HUNECKE. Ger. 481,057, Feb. 12, 1928. Details of removing smoke are given.
- Chamber furnace for the production of dry air. EGON DREVES. Ger. 480,618, Dec. 18, 1924. Details are given.
- Traveling-grate furnace for granular coal. ALLGEMEINE ELEKTRICITÄTS GES. (Nius Hilgers, inventor). Ger. 481,554, Sept. 27, 1927.
- Coal-dust furnace. CAMILLE DUQUENNE. Ger. 481,142, Oct. 7, 1925. Constructional details.
- Coal-dust furnace. BERG & Co. GES. FÜR INDUSTRIE-OFFENBAU UND FEUERUNGS-BEDARF M. B. H. Ger. 481,246, Aug. 29, 1926. Details of the fire chamber are described.



**Coal-dust furnace.** WILFRED R. WOOD. Ger. 480,578, May 9, 1926. Details of arrangement of the hearth and water tubes are described.

**Furnace for peat.** L. & C. STEINMÜLLER ROHRENDAMPFKESSEL- UND MASCHINENFABRIK. Ger. 480,346, Nov. 28, 1926. Details of the fire chamber are given.

**Gas furnace.** EUGEN BURG. Ger. 480,227, Feb. 23, 1927. Details of burner are given.

**Gas furnace.** DEUTSCHE WÄRME-AUSNUTZUNG G. M. B. H. "DEWAG." Ger. 479,615, May 5, 1927. Details of construction are given.

**Gas furnace.** G. KROMSCHRÖDER A.-G. Ger. 480,086, Jan. 26, 1926. Details of the gas-mixing app.

**Gas furnaces.** JOSEF H. REINEKE. Ger. 481,352, Nov. 25, 1924. A device is described for regulating the gas mixt.

**Gas-fired furnaces.** MAX NUSS. Ger. 479,867, Sept. 4, 1925. Addn. to 479,086 (C. A. 23, 4600).

**Gas burner.** C. H. KEMPTON and W. BISSELL. Brit. 305,786, Jan. 7, 1928. Structural features.

**Gas burner.** F. S. SCOTT. Brit. 305,795, Jan. 23, 1928. Structural features.

**Liquid-fuel burner with pressure and atomizing devices.** BARTHÉLÉMY TERRY. Ger. 479,613, May 19, 1925.

**Oil furnace.** HEINRICH DINNER. Swiss 132,183, Jan. 21, 1928.

**Furnace operated optionally by oil, gas or fuel dust.** KOHLENSCHIEDUNGS-GES. M. B. H. Ger. 479,963, Dec. 18, 1924. Details of construction are described.

**Furnace plant for producing superheated steam and distillate from impure water.** AKT.-GES. BROWN, BOVERI & CO. Swiss 132,230, Dec. 22, 1927. Addn. to 123,207. Details of arrangement are given.

**Annealing furnace.** SIEMENS-SCHUCKERTWERKE A.-G. Ger. 479,852, Sept. 3, 1925. A furnace for tubes and rods is described.

**Annealing furnace.** SIEMENS-SCHUCKERTWERKE A.-G. (Johann Schnepf, inventor). Ger. 480,038, Aug. 15, 1926. A furnace for rods and tubes is described.

**Annealing kiln.** AKT.-GES. BROWN, BOVERI & CO. Swiss 131,865, Jan. 5, 1928. Details of loading are described.

**Continuously-acting melting furnace for glass or metals.** RUDOLF SCHNEIDER. Ger. 480,619, Sept. 5, 1924. Details of the circulation of hot gases in the furnace structure are described.

**Enameling furnace.** ALLGEMEINE ELEKTRICITÄTS-GES. (Gerhard Schumann, inventor). Ger. 480,718, Mar. 22, 1927.

**Fire chamber for enameling furnace.** ALLGEMEINE ELEKTRICITÄTS-GES. Ger. 480,719, Oct. 26, 1927.

**Device for consuming the smoke in a furnace plant.** ADOLPH MESSMER. Swiss 131,985, Feb. 17, 1928.

**Delivering device for shaft furnaces, condensers and generators.** ARNO ANDREAS. Ger. 481,058, Mar. 23, 1928.

**Furnace-charging device.** THE STANDARD STOKER CO., INC. Ger. 481,333, Sept. 21, 1926.

**Air-heating plant in furnace waste-gas canal.** ELEKTROWERKE A.-G. Ger. 479,619, Oct. 11, 1927.

**Delivering device for a shaft furnace.** KARL BERGFELD. Ger. 480,764, May 16, 1926. Structural details.

**Device for cooling furnaces.** DEUTSCHE BABCOCK & WILCOX DAMPFKESSEL-WERKE A.-G. Ger. 480,876, Feb. 25, 1928.

**Automatic loading device for a rotary wheel-grate furnace.** SIEMENS-SCHUCKERTWERKE A.-G. (Wilhelm Gumz, inventor). Ger. 479,995, May 4, 1926.

**Machine for molding furnace doors.** KOMMANDIT-GES. EISENHÜTTEN & EMAILIERWERK PAULINENHÜTTE EDMUND GLÄSER. Ger. 480,779, Oct. 13, 1928. Addn. to 405,144. Details are described.

**Temperature-alarm device.** H. SCHLAICH. Brit. 305,985, Feb. 13, 1928.

**Thermostatic control device for incubators.** EUGENE C. HENRION. U. S. 1,725,799, Aug. 27. Structural features.

**Thermostatic electric switch.** B. R. WINGFIELD and B. T. WINGFIELD. Brit. 305,749, Dec. 5, 1927. Structural features.

**High-temperature thermostat.** SIEMENS-SCHUCKERTWERKE A.-G. Ger. 481,455, Sept. 7, 1926.

## 2—GENERAL AND PHYSICAL CHEMISTRY

FREDERICK L. BROWNE

**The name Berzelius. The 150th anniversary of Jöns Jakob Berzelius.** J. SVEN-  
NUNG. *Chem.-Ztg.* 53, 669 (1929). E. J. C.

**Richard Newman Brackett.** B. B. ROSS. *Ind. Eng. Chem.* 21, 885-6 (1929).—  
Biography with portrait. E. H.

**The 125th anniversary of August Bragg.** ANON. *Apparaturbau* 41, 148 (1929).—  
A biography. M. C. ROGERS

**One hundred years of chemistry in the Stuttgart Technical College.** E. SAUER.  
*Chem. App.* 16, 93-6 (1929).—A discussion of the development of the college.  
M. C. ROGERS

**Use of word "anaëric" proposed.** FRANK WILEN. *Ind. Eng. Chem., News Ed.* 7,  
No. 17, 8 (1929).—This word is proposed to express the adjectival and adverbial notion  
of mere freedom from, or performance in the absence of, free oxygen. E. J. C.

**Secondary science education.** CHAS. G. FRASER. *Can. Chem. Met.* 13, 245-8  
(1929).—The problems confronting the science teacher, and the increasing relative  
importance of the sciences in industry and every-day life are pointed out. W. H. B.

**The origin of the term "gas."** ERNST DARMSTAEDTER. *Chem.-Ztg.* 53, 565-6  
(1929).—It is suggested that Von Helmholtz coined "gas," not from the Greek "chaos"  
but from the Middle High German "gasesen" or "gesen" (to ferment, to foam).

AUSTIN M. PATTERSON

**Ortho, meta, para. I. History of the introduction of the prefixes into chemical  
nomenclature.** LEONARD DOBBIN. *Chemist and Druggist* 109, 643 (1928).—The term  
"ortho" (phosphates) was first used in 1859 by Odling, following Breithaupt's naming  
of "orthoclase" in mineralogy. "Para" (tartaric acid) was introduced "with more  
ceremony" by Berzelius in 1830, "meta" (phosphoric acid) by Graham in 1833. **II.**  
**Benzene and some of its derivatives.** *Ibid* 643-4.—This history of its discovery and  
synthesis is given; also of the discovery of  $\text{BzOH}$ ,  $\text{PhNH}_2$ ,  $\text{PhNO}_2$ ,  $\text{PhOH}$  and  $\text{PhMe}$ .  
Loschmidt (1861) contrasted a "condensed"  $\text{C}_6\text{H}_6$  group with the more open chain  
 $\text{C}_6\text{H}_4$ , and constructed graphic formulas for 121 aryl compds. **III. Kekulé; the con-  
stitution of aromatic substances.** *Ibid* 110, 38 (1929).—History of the benzene ring of  
K., 1866. **IV. Position isomerism; early views and difficulties.** *Ibid* 164.—Körner  
(1866) introduced *o*, *m* and *p*, into the special nomenclature of the benzene isomerides,  
but actual place relations were often uncertain, causing confusion, e. g. with  $\text{C}_6\text{H}_4(\text{OH})_2$ .  
**V. Position isomerism; the problems solved.** *Ibid* 225-6.—The successive steps in  
proving the location of *o*, *m* and *p*, positions are outlined, and the methods of Körner  
(1867) and Griess (1874) for detg. these positions are explained in detail. S. W.

**Bunsen flames of unusual structure.** FRANCIS A. SMITH AND S. F. PICKERING.  
*Bur. Standards J. Research* 3, 65-74 (1929)—A mixt. of air or  $\text{O}_2$  with a combustible  
gas is forced through a cylindrical burner tube, and the flame is observed in secondary  
air. Complex structures noticed in acetylene-air mixts. include the intersection of 2  
zones, 4 distinct light zones and a hollow dark core extending upward from the tip  
of the primary zone. When secondary air is excluded, the primary zones of some  
hydrocarbon-air flames become polyhedral. Photographs of flames are presented.  
J. O. C.

**Laboratory methods for the purification of metallic mercury.** EDGAR NEWBERY.  
*Ind. Chemist* 5, 289-91 (1929).—Filtration methods, treatment with various reagents,  
distn. methods and the "mercurous perchlorate" electrolytic method are described.  
Three illustrations are included. E. G. R. ARDAGH

**Tellurium thermoelements.** B. LANGE AND W. HELLER. *Physik. Z.* 30, 419-25  
(1929).—The authors, using Henning's method, were able to prep. Te-Pt thermo-  
couples which gave very exact temp. measurements from  $-75^\circ$  to  $+90^\circ$ . The thermal  
e. m. f. in this region was practically const. It increases linearly for Te from  $0^\circ$  to  $40^\circ$   
and is practically linear up to  $400^\circ$ . For the Te used in capillaries a temp. coeff. of  
0.00325 was found for the range  $20-40^\circ$ , which permits of its use as a resistance ther-  
mometer for a smaller temp. interval. LOUIS WALDBAUER

**Comparison of colors: errors and illusions.** RENÉ TOUSSAINT. *Chimie & in-  
dustrie* 21, 924-30 (1929).—A brief discussion of the difficulties inherent to matching of  
colors, and of the use and advantages of the photocolormeter for this purpose.

A. PAPINEAU-COUTURE

**The standardization of colors.** WILHELM OSTWALD. *Z. angew. Chem.* 42, 437-9

(1929).—A discussion of the classifications of others and that of O. Cf. *C. A.* 16, 1903

Iron and antiquity. T. A. RICKARD. *J. Iron Steel Inst.*, Advance copy, No. 9, Oct. 1929, 20 pp. J. G. McNALLY, E. J. C.

Surface oxidation of aluminum, tungsten and molybdenum. LEONARD C. BANISTER. *Metal Ind.* (London) 35, 27-8, 30(1929); cf. *C. A.* 23, 2086. C. L. READ

The atomic weight of arsenic. HANS KREPELKA. *Nature* 123, 944 (1929).—The internationally accepted at. wt of As is 74.96. The British sub-committee has proposed 74.934, based on the mass spectrograms of Aston. K. detd. the ratio  $\text{AsCl}_3:3\text{Ag}$  and obtained  $\text{As} = 74.937$ , in remarkable accord with the physical detns. of Aston. The measurement of the  $\text{AsBr}_3:\text{Ag}$  ratio is under way. ALBERT L. HENNE

The pseudo-components of hydrogen. A. SMITS. *Physik. Z.* 30, 425-7(1929).—The proof of the existence of para and ortho  $\text{H}_2$  is hailed as a proof of the principles on which the theory of allotropy is based. Further proofs of this nature are predicted. LOUIS WALDBAUER

Heat of dissociation of oxygen. GERHARD HERZBERG. *Z. physik. Chem.*, Abt. B, 4, 223-6(1929).—The spectroscopic value of the heat of dissoen. of normal  $\text{O}_2$  hitherto given, namely 7 volts, rests on the assumption that the mol. dissociates under the influence of light into 2 normal atoms. This transition is incompatible with the selection rules of the new theory; dissoen. must yield a normal  $^3P$  and an excited metastable  $^1D$  atom. Since the exciting energy of the  $^1D$  atom is between 1 and 2 volts, the value of the heat of dissoen. of  $\text{O}_2$  into normal atoms must lie between 5 and 6 volts. W. W.

The ability of silicon to oxidize and its solubility in hydrofluoric acid. CH. BEDEL. *Compt. rend.* 189, 180-2(1929); cf. *C. A.* 23, 4604 —B. repeated the expts. of Sanfouche without success. Si cannot be oxidized at  $150^\circ$  (cf. *C. A.* 21, 1582). E. S.

Investigations of the active forces between atoms and molecules. DANIEL AVDALIAN. *Ukrainskii Khim Zhurnal* 4, No. 1, Sci. Pt. 95-8(1929).—In the first of a series of articles A. analyzes the Lindeman equation:  $D \equiv KT_s/V^{2/3}$ , where  $T_s$  is the m. p. in the abs. scale and  $V^{2/3}$  is the square of the distance between the atomic centers at the m. p. To study the periodicity of  $D$  a curve was constructed in which the abscissas represent the at. nos. and the ordinates  $T_s/V^{2/3}$ . The minima differentiate the periods: the smallest is H-He, followed by 2 small ones, Li-Ne and Na-A; then 2 large periods with 18 elements K-Kr and Rb-Xe and finally a period with 32 elements Cs-Rd and 87-U. It is pointed out that the distribution of the maxima coincides with the even-number groups in the periodic system, with one exception: some maxima (beginning with C) decrease in value, while others (beginning with O) increase. The decreasing maxima differentiate the electropos. and electroneg. elements and coincide with the elements of the 4th group. The increasing maxima come into the 6th group and coincide with the elements the properties of which are characteristically electroneg. The min. at Mn occupies a special position; it reflects a subgroup in the 7th group (Mn, 73 and 75). It is thus logical to suppose that the elements 73 and 75 are also to be found on the minima, but their abs. value is lower than that of Mn. J. S. JOFFE

The boiling point elevation of acetone solutions as related to the interionic attraction theory. A. L. ROBINSON. *J. Phys. Chem.* 33, 1193-9(1929).—B. p. measurements of acetone solns. of NaI,  $\text{CoCl}_2$  and  $\text{La}(\text{NO}_3)_3$  were made, in the concn. range 0.001-0.3 M. Both anhyd. and hydrated salts were used. For the 3 valence types of salts the results are in accord with the interionic attraction theory of Debye and Hückel. The results obtained with hydrated salts indicate that definite ionic hydrates do not exist. H. W. LEAHY

The electronic interpretation of oxidation and reduction. WM. ALBERT NOYES. *J. Am. Chem. Soc.* 51, 2391-6(1929).—Oxidations are of 3 types: (1) transfer of an electron from one atom to another, (2) addn. of a pos. hydroxyl group,  $\text{H}:\ddot{\text{O}}^+$ , to an unshared pair of electrons in either a negative ion or an elec. neutral mol. (in the latter case a H ion seps. and a semipolar union is formed) and (3) sepn. of a semipolar O atom in an elec. neutral condition followed by its union with an unshared pair of electrons. The O atom may either remain in the semipolar condition in the new compd. or may take up a H ion and form an OH group. C. L. READ

The volume of molecules. W. HERZ. *Z. Elektrochem.* 35, 457-8(1929).—Data on 69 org. compds. are compiled to show that a proportionality exists between the values for  $b_K$  of van der Waals' equation calcd. from crit. data and for the mol. refraction, quantities which are directly related to the sp. vol. of mols. For  $1/3$  of the known cases the quotients lie between 3 and 5. Low quotient values appear for low-boiling or assoc. substances. H. W. WALKER

The heats of dissociation of the molecules CH, NH, OH and HF. DONALD S. VILLARS. *J. Am. Chem. Soc.* 51, 2374-7(1929).—Band spectra data were interpolated by Mecke's method and the heats of dissociation of the molecules, CH, NH, OH and HF were calculated to be, resp., 82.0, 108.3, 138.0 and 172 kilocal. C. L. READ

Diamagnetism and space charge distribution of atoms and ions. EDMUND C. STONER. *Proc. Leeds Phil. Lit. Soc. (Sci. Sect.)* 1, Pt. X, 484-90(1929).—From the space charge distribution values of Hartree (*C. A.* 22, 1269) and Brindley and James (*C. A.* 23, 2864) the diamagnetic susceptibilities are calculated for He 1.90;  $\text{Li}^+$  0.70;  $\text{Na}^+$  5.47;  $\text{K}^+$  17.61;  $\text{Rb}^+$  30.12;  $\text{Cl}^-$  40.39. For He the values agree within 1% and for the positive ions they agree very well with the experimental values of Ikenmeyer (*C. A.* 23, 3136), Joos (*C. A.* 18, 618; 20, 1026) and Wills and Hector (*C. A.* 18, 1232). This indicates that the space charge distribution in ions in solution does not differ widely from that calculated for the free ion. The calculated value for  $\text{Cl}^-$  ion is much greater than that determined experimentally. This indicates that the charge distribution in the ion in solution is considerably more diffuse than that calculated for the free ion. If the whole of the charge of the Cl ion were concentrated within the radius 1.57 Å, i.e., half the distance between centers of K and Cl ions in crystalline KCl, the calculated diamagnetism would be of the order of that observed. This discrepancy may be due to the difficulty in calculating "self-consistent field" for a negative ion. E. R. SCHIERZ

Molecular polarization of symmetrical, but non-rigid molecules. GERHARD JUNG AND ARTHUR SCHLEDE. *Z. physik. Chem., Abt. B.* 4, 207-16(1929).—For a molecular model consisting of 2 atoms or groups placed symmetrically with respect to a third, and capable of displacement perpendicular to the line joining them to the third, it is shown that a dipole moment may be induced by the measuring field, in virtue of a displacement of the movable atoms or group. This displacement is influenced by temperature, the higher the temperature, the greater the length of the movable arm of the molecule; an increase in temperature causes a diminution of the molecular polarization. This effect, which is given by the equation  $P_{\text{non-rigid}} = a' - b/T$ , can be distinguished from the temperature influence on the polarization of unsymmetrical rigid molecules, which is given by the Debye equation  $P_{\text{rigid}} = a + (b/T)$ . The significance of these considerations with regard to the experimentally observed moments of C compounds of the type  $\text{CR}_4$  is pointed out. W. W.

The additive nature of molecular dipole moments. A. EUCKEN AND L. MEYER. *Physik. Z.* 30, 397-402(1929).—The extent of the validity of the dipole-additivity rule is shown, a recalculation of molecular dipole moments having been made on the basis of the moments, not of individual groups, but of individual linkages. This gives important information as to the orientation of the resulting moments. On the basis of the stereochemical rotation of individual groups a hitherto unobserved case of a rotational polarization is shown, which causes the apparent moment of many  $\text{Ca}_4$  compounds. I. J. PATTON

The dipole moment as a characteristic group property. KRISTIAN HØJENDAHL. *Physik. Z.* 30, 391-97(1929); cf. *C. A.* 23, 2333.—Dipole moments were calculated from the dielectric constants of vapors and the values found to be constant for monosubstituted homologous compounds. Each polar group is thus characterized by a constant "group moment," which may be considered as a vector. Dipole moments were calculated from the dielectric constant and  $n$  of 24 aromatic compounds in  $\text{C}_6\text{H}_6$  solution and were compared with the moment obtained from the geometrical sum of the group moments. The classical plane  $\text{C}_6\text{H}_6$  formula is supported by these investigations. Agreement was obtained between calculated and experimental moments for dinitro-, chloronitro- and bromonitro-benzene, dinitronaphthalene and nitrotoluene. In the case of nitroaniline, the groups cause considerable mutual deformation. Deviations were found in the case of anisole and of nitroanisole, explained by the fact that the 2 O<sub>2</sub> bonds are not in a straight line. Three types of substituent groups are distinguished. (1) Those which have the positive pole on the outside, (2) those which have the negative pole on the outside, (3) those in which the group moment lies diagonally across the group. These form a transitional type. NO<sub>2</sub>, Cl and Br belong to one, CH<sub>3</sub> and NH<sub>2</sub> to the other of the 2 first types, but it cannot be determined which is positive and which is negative. I. J. PATTON

Magnetic researches on sorbed gases. JOSEPH AHARONI AND FRANZ SIMON. *Z. physik. Chem., Abt. B.* 4, 175-89(1929); cf. *C. A.* 23, 1550.—A simple, accurate null method for measuring magnetic susceptibility is described which does not involve a knowledge of the field strength and which is suitable for work at low temperatures. This method is used in measuring the susceptibilities of the systems chabasite-O<sub>2</sub>, charcoal-O<sub>2</sub>, and Pd-H<sub>2</sub> at various gas concentrations and temperatures. Measurements were also made on a series of NH<sub>3</sub> halides and on the oxides of Mn. The susceptibility of O<sub>2</sub> absorbed by chabasite is less than that of the free gas and shows discontinuities corresponding to integral molecular proportions. The C-O<sub>2</sub> system gives similar results. For the Pd-H<sub>2</sub> system the result

seem to indicate the presence of the weakly paramagnetic compd.  $\text{Pd}_2\text{H}_2$ .  $\text{H}_2$  in amts. less than this ratio is bound adsorptively.

W. W. STIFLER

The paramagnetic properties of the rare earths. B. CABRERA AND A. DUPERRIER. *Compt. rend.* 188, 1640–2(1929).—All the compds. of the rare earths which were tested were found to follow the Curie-Weiss law approx. Salts of Gd, Tb, Dy, Ho and Er were found to follow this law rigorously and the no. of Weiss magnetons were approx. 39, 48, 52, 52 and 47, resp. Salts of Nd and Eu followed more accurately a modification of the Curie-Weiss law which can be written  $(\chi + k)(T + \Delta) = C$ , where  $k$  is a const. for any given compd. The no. of magnetons corresponding to Nd and Eu seem to be approx. 17 and 18, resp. The paramagnetism of Sm salts is weak and possibly const. Salts of Pr, Tu and Yb, which have been considered to obey the Curie-Weiss law, satisfy more accurately the modified law. The introduction of the new const.,  $k$ , permits a latitude of 3 or 4 tenths in the no. of magnetons. Tables are given for the various compds. studied in which the values of  $k$  are so chosen as to make the no. of magnetons most nearly integral. This const.,  $k$ , represents a susceptibility, independent of the temp., which is paramagnetic for elements in the neighborhood of Sm and diamagnetic for Tu and Yb. Perhaps it may be due to a deformation of the atom.

W. W. STIFLER

Magnetic susceptibilities of some inorganic and organic electronic isomers. S. S. BHATNAGAR AND SHAM LAL LUTHER. *J. Indian Chem. Soc.* 6, 303–7(1929).—Measurements on a no. of electronic isomers, such as NaBr and SrO, and aminobenzoic acid and nitrotoluene, indicate that the mol. susceptibilities,  $\chi_m$ , and the mean radius of the mol.,  $r_1$ , are connected by the relation  $\chi_m = -2.85 \times 10^{10} k r_1^2$ , where  $k$  is a const. for each group of isomers. Two tables are given, showing the mean values of  $k$ ,  $r_1$  as computed from Bragg's data,  $\chi_m$  as found by expt. and  $\chi_m$  as calcd. by this equation, for 16 groups of isomers varying from at. no. 28 to at. no. 96. The values of  $k$  tend to increase with the no. of atoms in the mol. For groups of isomers having the same no. of atoms in the mol., the values of  $k$  increase with the atomic nos. of the groups. In the case of groups of isomers having the same at. no., the values of  $k$  increase with the no. of atoms.

W. W. S.

The dipole moment of antimony trichloride. OTTO WERNER. *Z. anorg. allgem. Chem.* 181, 154–8.—The mol. dipole moment  $\mu$  for  $\text{SbCl}_3$  is  $3.64 \times 10^{18}$ . This is larger than the value of  $0.4 \times 10^{18}$  for  $\text{SbI}_3$ . The more strongly positive character of the I atom is given as the explanation for the difference. This value for  $\text{SbCl}_3$  is also discussed from the point of view of the measurements for the series HCl, HBr, HI and  $\text{NH}_3$ ,  $\text{PH}_3$ ,  $\text{AsH}_3$ .

L. L. QUILL

Dipole moment of symmetrical trinitrobenzene. ADOLF PARTS. *Z. physik. Chem., Abt. B*, 4, 227–33(1929); cf. *C. A.* 22, 1528.—The dielec. const. of solns. of symmetrical trinitrobenzene in  $\text{C}_6\text{H}_6$  were measured to 1 unit in the 4th decimal by means of an oscillator at frequency  $10^4$ . The concn. ranged from a mol. fraction of trinitrobenzene to 0.0389, and the temp. from  $10^\circ$  to  $50^\circ$ . Within this range the total polarization is independent of concn. and temp. to within the limits of exptl. error; the dipole moment, therefore, cannot be calcd. directly. Subtraction of the electronic polarization 40 cc. as estd. from optical data by Williams and also by P., from the total polarization leaves 14 cc. for atomic and dipole polarization. If atomic polarization is absent, this corresponds to a dipole moment of  $0.8 \times 10^{-18}$ , which agrees with Williams' second value (*C. A.* 23, 559).

W. WEST

Dielectric constants of benzene solutions of oximes and ketones. The dipole moment of *o*-methylbenzaloxime, of acetophenone and of benzophenone. O. HASSEL AND E. NAESHAGEN. *Z. physik. Chem., Abt. B*, 4, 217–22.—The dielec. const. of  $\text{C}_6\text{H}_6$  is scarcely increased by addn. of the stable modification of benzaloxime or of acetoxime; since the oximes, which in single mols. must have a large dipole moment, are strongly assocd. in  $\text{C}_6\text{H}_6$ , it appears that even in small concn. the assocn. is so great as to obliterate the dipole moment. *anti-O*-Methylbenzaloxime in  $\text{C}_6\text{H}_6$ , which is slightly assocd., has a dipole moment of  $0.86 \times 10^{-18}$  e. s. u. In contrast to the observation that aliphatic ketones have the same moment of  $2.74 \times 10^{-18}$  e. s. u., it was found that acetophenone had a moment of  $2.94 \times 10^{-18}$ , and benzophenone,  $3.13 \times 10^{-18}$ , against  $2.72 \times 10^{-18}$  for acetone.

W. WEST

Microscopic study of electric double refraction in liquids. MATSUNOSUKE IWATAKE. *Tech. Repts. Tohoku Imp. Univ.* 8, No. 3, 121–32(1929).—Elec. double refraction in  $\text{PhNO}_2$  (I), *o*- $\text{MeC}_6\text{H}_4\text{NO}_2$  (II),  $\text{C}_6\text{H}_5\text{N}$  (III) and  $\text{CS}_2$  (IV) is studied. By increasing the potential above 6000 v. per mm. I and II, between crossed Nicols, show a bright layer at the anode; II shows a layer at the cathode which disappears, then reappears at the anode; III shows uniform brightness. Further increase produces a

color fringe. With Nicols not exactly crossed, at high intensity, the color fringe fills the field; rotation of the analyzer decreases the color. At  $45^\circ$  the field is uniform and at  $90^\circ$  the fringe reappears with complementary colors. These results suggest non-uniformity and are easily explained in the same way as the chromatic polarization of uniaxial crystals. IV does not show this anomaly. Eighteen photomicrographs, 50 references and a description of the app. are given. V. F. HARRINGTON

**The effect of iron on the magnetic susceptibility of aluminum.** RALPH B. MASON. *Trans. Am. Electrochem. Soc.* 56 (preprint) 8 pp.(1929).—Values published to date on the magnetic susceptibility of Al have not been considered trustworthy, because of the presence of Fe and other impurities. Accordingly, the magnetic properties of the purest Al obtainable today (99.97% Al) were investigated and compared with those of com. grades of Al and various alloys. It was found that pure Al is paramagnetic. Furthermore, the paramagnetic property of Al is only very slightly increased by the presence of Fe up to 8%, because the Fe occurs as an intermetallic compd. Upon etching the surface of the sample with NaOH soln., the Fe-Al compd. is broken up, and the liberated Fe in the surface film produces a marked increase in magnetic susceptibility. The magnetic method described is useful in the *approx. estn. of the Fe content of Al*, but is not recommended for the accurate detn. of small percentages of Fe in Al. C. G. F.

**Magnetostriction of diamagnetic substances in strong magnetic fields.** P. KAPITZA. *Nature* 124, 53(1929).—Atomic, as distinguished from classical magnetostriction is due to the action of the magnetic field on the binding forces between the atoms. A single crystal of Bi contracted when its trigonal axis was perpendicular to a very powerful field, but when its axis was parallel to the field an expansion of approx. the same amount was observed. This explains why with an extruded Bi rod only the classical magnetostriction was observed. The fields used were of the order of 300 kilogausses and were maintained for approx.  $\frac{1}{160}$  sec. The possible bearing of these results on the theory of homopolar bonds is discussed. W. W. STIFLER

**Behavior of various organic vapors under high-tension oscillatory discharges.** H. HIEDEMANN. *Ann. Physik* [5], 2, 221-32(1929).—The  $H_2$  diffused through a glowing Pd tube into a high-frequency silent discharge tube was tested for purity; it was then tested by carburetting the  $H_2$  flame with various org. vapors, but was found uncontaminated. Previous work had shown that old Pd tubes sometimes become permeable to org. vapors, leading to the formation of a brown deposit on the walls of the discharge tube; the deposit was found to be a mixt. of C and a small amt. of a highly polymerized hydrocarbon. The phenomena taking place when  $Et_2O$ ,  $EtOH$ ,  $Me_2CO$ , glacial  $AcOH$ ,  $CHCl_3$ ,  $CCl_4$  and  $PhH$  vapors were subjected to a silent discharge are described.  $PhH$  was found to give a product similar to the brown deposit previously noted; it consisted of C, and biphenyl, biphenylene and their polymers. The type of elec. discharge seems to have no influence on the nature of the products. LOUIS WALDBAUER

**Magnetic and crystallographic researches: Hydrated ferric oxide.** WERNER H. ALBRECHT. *Ber.* 62B, 1475-82(1929).—Of the 2 hydrated oxides of trivalent Fe occurring in nature, both represented chemically by the formula  $Fe_2O_3 \cdot H_2O$ , although differing in cryst. form, only one has heretofore been prepd. synthetically. A now gives full details for the prepn. of 2 hydrates,  $\alpha$ - and  $\gamma$ -, which are shown by chem. analysis, x-ray photographs and magnetic measurements to be identical with the minerals gothite and lepidocrocite, resp. The  $\alpha$ -hydrate is prepd. by oxidizing a dil. aq. soln. of  $Fe(HCO_3)_2$ . Three different methods of oxidation are outlined and tests on the different products are described which prove them to be identical. One sample, prepd. in March, 1928, contained 12.3%  $H_2O$  and had a magnetic susceptibility =  $36.47 \times 10^{-6}$ . After being stored 10 months in a stoppered flask its susceptibility was practically unaltered, although it had absorbed moisture from the air so that it now contained 19.4%  $H_2O$ . Upon dehydration in a stream of dry air at  $100^\circ$ , its  $H_2O$  content was reduced to 10.62%, corresponding accurately to the formula  $Fe_2O_3 \cdot H_2O$ , and this value remained const. until the temp. was raised. Continued heating at successively higher temps. up to  $260^\circ$  reduced the  $H_2O$  to 2.21%, and complete dehydration was obtained by heating for 4 hrs. at  $600^\circ$ . It then had a susceptibility =  $23.10 \times 10^{-6}$  and x-ray photographs showed the lines of the  $\alpha$ -oxide. The hydrate when first prepd. had a susceptibility =  $48.10 \times 10^{-6}$ . Heating for some time at  $100^\circ$  produced so great an increase in susceptibility that it could not be measured by the magnetic balance. After heating for 3 hrs. at  $250^\circ$  it contained only 1.75%  $H_2O$  and was strongly ferromagnetic. The x-ray photographs showed the broadened lines of the  $\gamma$ -oxide. Complete dehydration at  $600^\circ$  reduced the susceptibility to  $25.6 \times 10^{-6}$  and the x-ray interference pattern now corresponded to that of the  $\alpha$ -oxide. These results are not altogether in agreement with those of Herroun and Wilson on lepidocrocite (cf. C. A. 23, 3136)

X-ray analysis by A. of samples supplied by Herroun shows that the discrepancies are due to the small amts. of Mn present in the natural minerals, as noted by H. and W. The application of Haber's theory of "aggregation" and "arrangement" velocities to the synthetic prepn. of these hydrates is pointed out. It is also suggested that the production of the  $\alpha$ - or the  $\gamma$ -hydrate is detd. primarily by the H-ion concn. In both the natural and the synthetic hydrates the  $\alpha$ -form is the more stable, and both are eventually converted into the  $\alpha$ -oxide when dehydrated at sufficiently high temps. Excellent reproductions of a no. of the x-ray photographs of the different preps. are given.

W. W. STIFLER

**The magnetic anisotropy of naphthalene crystals.** S. BHAGAVANTAM. *Proc. Roy. Soc. (London)* A124, 545-54(1929).— $C_{10}H_8$ , carefully freed from Fe was recrystallized from alc. The magnetic susceptibilities along the three axes by direct detn. and by null method were  $-700$ ,  $-420$  and  $-1540 \times 10^{-7}$ . Indices of refraction for  $NaD$  were found to be:  $b$  axis 1.775,  $c$  axis 1.932 and for axis perpendicular to  $b$  and  $c$  1.442. Two magnetic axes coincide with the crystallographic axes  $b$  and  $c$ , while the third is perpendicular. The data indicate an orientation of molecules in the  $bc$  plane, rather than the  $ac$  plane as suggested by Bragg. The max. axis of the magnetic ellipsoid coincides with the min. axis of the optical ellipsoid. This leads to a simple explanation of the strong positive birefringence of aromatic liquids in a magnetic field.

ARTHUR FLEISCHER

**X-ray structure and magnetic properties of single crystals of Heusler alloy.** H. H. POTTER. *Proc. Phys. Soc. (London)* 41, 135-42(1929).—By use of single-crystal rotation method, Heusler alloy has been found to crystallize as a body-centered cube with lattice const. 2.95 Å. U. The Al atoms are distributed so as to lie on a face-centered cube of lattice const. 5.9 Å. U. Directional magnetic properties are found to be identical with those of Ni, which has a face-centered cubic structure. It is suggested that this may be interpreted as indicating that the Mn atoms (the positions of which cannot be detd. by x-ray analysis) also lie in a face-centered cubic lattice.

B. C. A.

**Röntgenographic study of the crystalline state of iron.** ROBERT BACH. *Helv. Phys. Acta* 2, 95-114(1929).—The crystal lattice of iron is investigated between  $700^\circ$  and  $1400^\circ$ . A discontinuity of the cell dimensions has been observed between  $750^\circ$  and  $850^\circ$ , corresponding to the transition of the  $\alpha$  into the  $\beta$  modification. The structure of  $\alpha$ ,  $\beta$  and  $\delta$  iron is represented by a body-centered cube.  $\gamma$  iron is face-centered. As the curve of dilatation of  $\beta$  iron on extrapolation meets the curve of the  $\delta$  modification, it is assumed that these modifications are identical.

EGON BRETSCHER

**Allotropy and the determination of densities by means of x-rays.** N. H. KOLKMEIJER. *Trans. Faraday Soc.* 25, 392-7(1929).—Ds. detd. by the x-ray method show smaller discrepancies than those obtained by the pycnometer. In both cases these variations are due to exptl. error, to "physical impurity" or coexistent allotropic modifications and to mixed crystals. The necessity for detg. const. on chemically and physically pure substances is emphasized. K. describes his special use of the spectrographic and powder methods and attributes greater accuracy to the former. A precision camera to improve the powder method and to eliminate certain sources of error which are enumerated is being constructed.

H. W. WALKER

**The crystal structure of bismuth fluoride.** O. HASSEL and SIGURD NILSSEN. *Z. anorg. allgem. Chem.* 181, 172-6(1929).— $BiF_3$ , prepd. (I) by the interaction of  $Bi(NO_3)_3$  and KF and (II) from  $Bi(NO_3)_3$ ,  $Bi_2O_3$  suspended in 40% KOH soln.,  $Cl_2$  and HF and purified to the theoretical compn., was analyzed by the Debye x-ray powder method using the  $K\alpha$  rays from Ni and Fe.  $BiF_3$  is face-centered cubic with 4  $BiF_3$  mols. in the unit cell and has a density of 8.75 as compared with 8.3-8.4 by the pycnometer method. The planes of the Bi and F atoms are given together with tables of data and a comparison with  $PbF_2$ .

H. W. WALKER

**An examination of the microcrystals of calcium carbonate in molluscan shells by means of x-rays.** III. JINZO TSUTSUMI. *Mem. Coll. Sci. Kyoto Imp. Univ.* A12, 199-202(1929); cf. C. A. 23, 2083.—By testing the shells of more than 60 species of Japanese molluscs by means of the x-ray method, it is proved that there are various fibrous arrangements of the microcrystals of  $CaCO_3$  in the molluscan shells. In the porcelaneous and the nacreous layers of the shells the  $CaCO_3$  is in the form of aragonite, while in the prismatic layer it is usually in the form of calcite but sometimes in the form of aragonite. The axis of the fibrous arrangement is always in a direction nearly perpendicular to the outer surface of the shell, and coincides with the principal axis of calcite or the orthorhombic C axis of aragonite, resp.

C. H. LORIG

**Determination of the length of the cube edge of potassium bromoplatinate.** M. MATHIEU. *Compt. rend.* 188, 1611-2(1929).—X-ray powder photographs of this

compd. and of  $K_2[PtCl_6]$  give the relation between the 2 cube edges as  $a_{Br}/a_{Cl} = 1.07$ , which gives the cube edge of  $K_2[PtBr_6]$  as  $10.35 \pm 0.05$ . From Groth's density the no. of mols. per unit cube (4) accords with this value.

GREGG M. EVANS

The lattice constants and the space groups of barium carbonate and strontium carbonate. THOMAS A. WILSON. *Phys. Rev.* 31, 305(1928).—Precision x-ray photographs were taken of Merck's  $BaCO_3$  and  $SrCO_3$  by the powder method with Mo K radiation. The crystallographic dimensions are given.

H. R. MOORE

The dependence of the number of crystallization centers on the temperature. G. TAMMANN. *Z. anorg. allgem. Chem.* 181, 408-16(1929).—This is a theoretical study dealing with the probability of the formation of sep. crystals depending on the energies involved and the temps.

HELEN G. WEIR

Factors governing the growth of zinc crystals by the Czochralski-Gomperz method. E. P. T. TYNDALL. *Phys. Rev.* 31, 313(1928).—It has been shown that the production of Zn crystals of any desired orientation can be insured by controlling the temp. gradient existing in the column of liquid Zn between the crystal and the surface of the molten metal.

H. R. MOORE

The chemistry of crystalline forms of aggregation. Investigation of basic copper compounds. TOA LABANUKROM. *Kolloidchem. Beihefte* 29, 80-121(1929).—Introductory remarks and method of investigation are given by V. KOHLSCHÜTTER. The purpose is to obtain a material suitable for studying the relationship between definite factors and conditions of formation and individual forms and forms of aggregation. The basic compds. of the following Cu salts were studied:  $CuSO_4$ ,  $Cu(NO_3)_2$ ,  $CuCl_2$ ,  $CuBr_2$ ,  $Cu(ClO_4)_2$ ,  $Cu(BrO_3)_2$ ,  $Cu(IO_3)_2$ ,  $Cu(NO_2)_2$ ,  $Cu_2S_2O_6$  and  $CuCO_3$ . Methods of prepn. (chiefly the slow hydrolytic cleaving of the normal salt) are given. Morphologically well-defined forms are obtained and described crystallographically and optically. Plates of the various cryst. forms are included. The mode of formation of the individual crystals and their type of assocn to aggregates in the case of different compds. presenting similar relations from the standpoint of crystallography and chem. constitution are decidedly different. This must be due chiefly to the properties of the compds. themselves and the kind of material and conditions concerned in the formation. The topochem. reactions of the basic Cu salts are also investigated. Remarkable individual differences are shown with respect to the type as well as the form and properties of the decompn products. These observations on the basic Cu salts show that the typical aggregation forms of cryst. substances, if not simply a result of the chem. and crystallographic structure of their individuals, are connected with their chem. nature by an ordered, complex or indirect relation.

R. I. RUSH

Mesophases (intermediate states of aggregation). IV. Some further cases of aqueous mesophases. H. ZOCHER AND V. BIRSTEIN. *Z. physik. Chem., Abt. A*, 142, 177-85(1929).—Of the soaps, only K and Na oleates form mesophases (smectic). Stearates and palmitates sep. in cryst. form from aq. soln. Na naphthenate, in aq. soln., also forms a smectic mesophase, which explains the jelly formation on the addn. of amyl alc. to the concd. aq. soln. Cetyl xanthate, in concd. aq. soln., forms at higher temps., a smectic phase with anomalous dispersion of the double refraction. The nematic phase formed by bromophenanthrenesulfonic acid in moderate concns. shows neg. double refraction and forms drops with optically pos. radii. Com. lecithin shows an aq. smectic phase, but the pure synthetic lecithin does not. The diffuse double refraction often found is attributable to gels or sols with anisotropic colloid particles. V. Influence of electric and magnetic fields. *Ibid.* 186-94.—The dielec. anisotropy of nematic substances is neg. for symmetrical mol. formulas, pos. for unsymmetrical formulas, in the cases hitherto studied. Nematic systems of the cholesterol type are orientated by the elec. field and their optical activity is diminished. Smectic compds. are also influenced by a field of sufficient strength. Their dielec. anisotropy seems to be neg. in every case investigated, even when the corresponding nematic phase is pos. The magnetic anisotropy appears always to be neg.

I. J. PATTON

Hydrocyanic acid. II. Determination of the densities of gaseous and liquid hydrocyanic acid, and some thermodynamic calculations. HEIMA SINOSAKI AND RYOSABURO HARA. *Tech. Repts. Tohoku Imp. Univ.* 8, No. 3, 19-64(1929).—The vapor d. was measured with an accuracy of  $1/1000$  to  $1/100$  at temps. from  $0^\circ$  to  $190^\circ$  and pressures of 100 to 830 mm. At  $0^\circ$ ,  $30^\circ$  and  $60^\circ$  the relation  $PV/WT = R - bP - cP^2$  holds and at  $100^\circ$  and  $189^\circ$   $PV/WT = R - bP$ .  $W$  is the wt. of the gas;  $(\log b)^2 = -2.6393 + 0.010449T$  and  $-\log c = -4.4533 + 0.029123T$ . Keyes' equation expresses the assoc. to 1 part per 1000. For the liquid,  $V_1 = V_0(1 + 0.002002t + 6.175t^2)$  holds to 2 parts per 150,000. The heat of vaporization and sublimation, the fugacity,  $C_p/C_v$ ,  $C_p - C_v$ ,  $(\partial H/\partial P)_T$ , and  $(\partial E/\partial V)_T$ , were calcd.

V. F. HARRINGTON



**Removal of dissolved gases from liquids by vacuum sublimation.** JAMES H. HIBBEN. *Bur. Standards J. Research* 3, 97-104(1929).—A method of removing and collecting dissolved gases from liquids is described. The principle of vacuum sublimation is applied to prepare gas-free liquids without appreciable loss of either liquid or dissolved gas. J. O. COLLINS

**A general method of measuring the partial pressures of mercury at room temperatures.** L. L. HIRST AND A. R. OLSON. *J. Am. Chem. Soc.* 51, 2398-2403(1929).—Hg resonance radiation was allowed to fall through absorption cells on reaction cells contg. mixts. of 93% H<sub>2</sub> and 7% C<sub>2</sub>H<sub>2</sub>, satd. with Hg vapor. These were connected to opposite sides of a differential pressure gage (cf. *C. A.* 23, 4377). From the time required to produce a given pressure change with pure Hg vapor in the absorption cells, and the free-energy equation for Hg, the vapor pressures of Hg at various temps. were calcd. The activities of Tl amalgams were calcd. by substituting them for Hg in one of the absorption cells. GREGG M. EVANS

**Osmotic vapor pressure.** II. F. A. H. SCHREINEMAKERS. *Proc. Acad. Sci. Amsterdam* 32, 392-400(1929); cf. *C. A.* 23, 3847.—Systems with volatile components are discussed. A substance *S* runs congruently through a membrane, when it diffuses from greater toward smaller O. S. V. P., and incongruently from smaller toward greater pressure. O. S. V. P. is the value of its own osmotic vapor pressure. E. SCHOTTÉ

**The dependence of surface tension and heat of vaporization on density and temperature up to the critical temperature.** W. HERZ. *Z. anorg. allgem. Chem.* 181, 280-4(1929).—A criticism of van Laar's treatment of work and data cited in the latter's article (cf. *C. A.* 23, 3622). W. E. VAUGHAN

**Diffusion of gases through metals.** V. LOMBARD. *Rev. métal.* 26, 343-50(1929); cf. *C. A.* 22, 4024; 23, 2338.—Description of app. and technic, and summary of results. A. PAPINEAU-COUTURE

**Rectification.** A. TREGUBOV. *Azerbejdjanskoe Neftyanoe Khozjaistvo* 1929, No. 4, 73-81.—A mathematical analysis of the process of rectification of a binary mixt. A. A. BORHTLINGK

**Liquid substances.** N. BĂRBULESCU. *Bul. stiintei fizice pure aplicate* 29, 22-8 (1928).—Relations between d. of liquids and d. of the elements thereof, with deductions as to d. of elements when in compds. E. M. SYMMES

**The shapes of drops and the determination of surface tension.** B. B. FREUD AND W. D. HARKINS. *J. Phys. Chem.* 33, 1217-34(1929).—The drop-wt. method for detg. surface tension is concerned with at least 3 drops: the hanging, the detaching and the detached. The profile of the hanging drop can be calcd. in terms of surface tension, diam. of tip, height of liquid column above the tip and d. of liquid. This is done by the expansion of Taylor's theorem and the interpretation of the graphs which result from plotting the data. If the head of a liquid above a tip is const. there is only one stable drop as measured by the length of the drop. There is also a crit. length of the drop greater than the length of the stable drop which corresponds to a max. vol. If a drop is smaller than the stable drop it grows until the stable drop is formed. If the drop is larger than the stable drop and shorter than the crit. length it will shrink to the stable form. If the drop is longer than the crit. length it will increase in size as a detaching drop and lose a part of itself as a detached drop. The ideal drop of Harkins and Brown is the max. drop which is stable on a tip where  $r/a$  is very small. The theory of the detaching drop and the detached drop have not been worked out without the use of guesses. The guess, that the drop breaks in such a way that the length of the profile between the curve of max. vol. and the point of inflection is bisected, is suggested and agrees with exptl. data as well as any assumption yet made. It is certain that the neck of the detaching drop is broken into several small drops. Calcs., curves, drawings of drops and 5 plates of photographs taken with a motion-picture camera are reproduced. F. E. BROWN

**Surface tension and associated phenomena.** N. E. DORSEY. *Natl. Research Council Bull.* 69, 56-118(1929).—A review of recent theory of surface tension and of methods of measuring it. W. D. LANGLEY

**Rheology.** II. The nature of plastic flow and its relation to fluid flow. EUGENE C. BINGHAM. *J. Chem. Education* 6, 1206-14(1929); cf. *C. A.* 23, 4119.—An outline of methods of measurement, with quant. definitions of *shortness*, *tackiness*, *elasticity*, etc. Photographic demonstrations are given of various types of flow and *slippage*. EUGENE C. BINGHAM

**Viscosity.** JOHN H. NORTHPROP. *Natl. Research Council Bull.* 69, 142-5(1929).—The various math. equations correlating viscosity with other properties of solns. are reviewed. W. D. LANGLEY

**Viscosity of different soap solutions.** BRUNO WALTHER. *Allgem. Öl- u. Fett-Ztg.* 25, 448-50; *Chem. Zentr.* 1928, II, 1633.—The time of outflow of aq. soap solns. (0.3% expressed as fatty acids) was detd. in the Engler viscometer; the Na and K soaps used were prepd. from fats of known compn. and were analyzed as exactly as possible. The time of outflow for H<sub>2</sub>O at 20° was 50.8 sec., while with the soap soln. the values found varied between 52 and 56.2 sec.; for K soaps the values were in most instances a little higher than for the corresponding Na soaps. The Na soaps from tallow and lard with 240.3 and 66.6 were exceptions. At 50° the solns. showed values between 47.2 and 50.8. Further expts. were made at 30° and at 40°. It is attempted to correlate the detn. of viscosity of the soaps with their value for washing purpose. G. S.

**Experiments in viscometry.** BANDTE. *Erdöl u. Teer* 5, 387-9(1929).—Oils were heated 28 days at 115-20° in O<sub>2</sub> and 50 hrs. at 200° in H<sub>2</sub> and the effect on their viscosities was detd. Exception is taken to the opinion of Rowell and Finlayson (*C. A.* 22, 3770) that changes in the viscosity of oils after heating may be due to "temp.-hysteresis." It is argued that these effects are caused chiefly by oxidation. W. A. G.

**The viscosity of sodium chloride, calcium chloride, and magnesium chloride solutions and its dependence on the temperature and concentration.** H. STAKELBECK AND R. PLANK. *Z. ges. Kälte-Ind* 36, 105-12, 133-5(1929).—The abs. viscosities of Na, Ca and Mg chloride solns. over the whole concn. range and from 20° to -25° were detd. exptly. by the Lawaczek fall method. The results are tabulated and graphed and compared with the data of other experimenters. F. D. ROSSINI

**The viscosity of binary systems containing guaiacol as one component.** N. A. PUSHIN AND T. PINTNER. *Z. physik. Chem., Abt. A*, 142, 211-26(1929).—The densities and viscosities at 30° of mixts. of guaiacol with benzene, toluene, acetone, methylaniline, dimethylaniline, phenylhydrazine, quinoline, pyridine, aniline and *o*-toluidine, were detd. with the Ostwald viscometer, by using the formula  $\eta = 0.008019 \frac{dt}{t_{H_2O}}$  in which  $d$  is density,  $t$  the time of efflux, and  $t_{H_2O}$  the time of efflux for H<sub>2</sub>O. The first 5 pairs show no evidence of compd. formation and the authors regard the shape of the viscosity curves as evidence of dissoen. The last 5 pairs give undeniable evidence of compd. formation, there being a max. in each of the curves of viscosity vs. mol. concn. However the max. usually does not occur in the mixt. which corresponds with the chem. compd. indicated by the m p. curve. EUGENE C BINGHAM

**Meaning and measurement of plasticity.** E. KARRER. *Ind. Eng. Chem.* 21, 770-3(1929).—The principles of plasticity in general and of the new plastometer of K. (cf. *C. A.* 23, 4106) in particular are discussed critically. Plasticity may be defined as the susceptibility to and the retentivity of deformation. A substance has unit plasticity when it undergoes a quant. defined deformation under a force of 1 kg. per sq. cm. acting for 1 sec. and the deformation is retained permanently. These definitions are then developed mathematically and their application to the new plastometer are shown. C. C. DAVIS

**The general laws of plastification.** OTTO MANFRED AND J. OBRIST. *Rev. gén. mat. plastiques* 5, 195-203, 251-7(1929); cf. *C. A.* 22, 4674.—A general discussion of the laws governing plastification of org. and inorg. plastics and of metals. In the light of numerical data by other investigators, it is shown that the laws enunciated in previous publications (*C. A.* 21, 2535, 2991; 22, 173) are of general application as regards the functional dependence between the degree of plastification of the raw materials and the phys. properties of the finished product. It is also shown that the products obtained in the molded plastics industry, which subsequently are shaped by the plastic method, receive in practically every case their final conformation in accordance with an operating principle of general application, viz., the "principle of conformation by assemblage." A. PAPINEAU-COUTURE

**The specific resistance of cupric sulfide and its temperature coefficient.** KURT FISCHBECK AND OSKAR DORNER. *Z. anorg. allgem. Chem.* 181, 372-8(1929).—A Cu wire spiral was converted to CuS by immersing in boiling S until its resistance became const. and its resistance was then measured at several temps. Three wires gave values for the resistivity at 0° of 36.76, 41.60 and 42.33 microhm-cm. (Cu = 1.7); and for the temp. coeff. 0.0037, 0.0037 and 0.0036, resp. T. H. CHILTON

**The electrical conductivity, the thermal expansion, and the hardness of magnesium-zinc alloys.** G. GRUBE AND A. BURKHARDT. *Z. Elektrochem.* 35, 315-32(1929).—Systematic measurements of the elec. cond. and thermal expansion from room temp. to the beginning of melting were made on Mg-Zn alloys in order completely to investigate the equil. diagram by means other than thermal analyses. Hardness tests were made on the alloys. The alloys were prepd. from Mg of 99.93% purity, and Zn of 99.99% purity. The specimens were tempered for many hrs. at 300 = 3° and

cooled very slowly to insure homogeneity and equil. conditions. The elec. cond. tests were carried out in an atm. of pure  $H_2$  with a Thomson double bridge and a sensitive galvanometer. The sp. resistance and sp. cond. of the alloys for each  $10^\circ$  rise in temp. are tabulated. Isothermal cond. lines show distinct maxima at compns. represented by the compds.  $MgZn_2$  and  $MgZn_8$ . An equil. diagram constructed from elec. cond. data agrees with the diagram of Chadwick with the exception of 2 additional transformation lines. One line appears at  $260 \pm 10^\circ$  for alloys between 3.5 and 65 wt. % Zn; the other appears at  $371^\circ$  for alloys between 68 and 83 wt. % Zn. Thermal expansion measurements of the alloys by the dilatometer method confirmed the results of the elec. cond. tests. Brinell hardness numbers when plotted against compn. of the alloys gave a curve with two minima at the compn. of the compds.  $MgZn_2$  and  $MgZn_8$ .

C. H. LORIG

**The problem of the metallic state.** J. D. BERNAL. *Trans. Faraday Soc.* **25**, 367–79(1929).—Substances in the metallic state are classified as metallic ionic, metallic homopolar, and truly metallic substances, depending on the predominating ionic, homopolar or metallic forces binding them together. The distinguishing properties of true metals such as close-packed structure, constancy of at. vol., dissolving power and elec. and thermal cond. are discussed and tables of compiled data given together with those of compds. and solid solns. A hypothesis for *super-cond.* is put forward wherein the super-conductive state is conceived as one of absolute purity and undistorted lattice. An explanation in terms of homopolar binding is given for certain diamagnetic metallic compds. which follow the Hume-Rothery rules. The chief empirical characteristics of the metallic bond are described and their possible theoretical meaning discussed.

H. W. WALKER

**Density measurements at high temperatures. IX. The density of molten gold and molten gold-copper and silver-copper alloys.** W. KRAUSE AND F. SAUERWALD. *Z. anorg. allgem. Chem.* **181**, 347–52(1929); cf. *C. A.* **20**, 3148.—The ds. were detd. by the method previously discussed. For the binary alloys Au-Cu and Ag-Cu the vol. additivity-concn. curves for the liquid state are straight lines while the sp. vol.-temp. curves are very nearly straight. The tables give the data:

Au-Cu(Parts Au per 1000)				
$^\circ C.$	1000 d.	757.7 d.	510.5 d.	0 d.
18	19.21	14.96	12.16	8.92
900	18.32	14.01	11.42	8.47
1000	18.23	13.46	10.98	8.41
1100	17.24	13.33	10.86	7.96
1200	17.12	13.21	10.73	7.81
1300	17.00	.....	10.61	....

Ag-Cu (% Cu)				
	81	55.7	28.1	0
800	....	...	8.98	...
900	....	8.62	8.88	...
1000	8.31	8.48	8.79	9.2
1100	8.16	8.34	8.68	9.17
1200	8.00	8.21	8.59	9.07

ARTHUR FLEISCHER

**The surface tension of molten metals and alloys. III. The surface tension of gold, zinc, gold-copper, silver-copper and iron alloys.** W. KRAUSE AND F. SAUERWALD (with investigations of M. MICHALKE). *Z. anorg. allgem. Chem.* **181**, 353–71(1929); cf. *C. A.* **20**, 3110.—The values for  $\sigma$  found were higher in all cases than those recorded in the literature. For alloys of Ag and Cu  $\sigma$  decreases linearly up to 64% Cu, above which  $\sigma$  increases linearly with temp.

% Ag	Temp.	$\sigma$	$\frac{d\sigma}{dt}$
100	995	923 dynes per cm.	—0.13
71.9	800	962	—0.12
44.3	911	1042	—0.07
18.0	1008	1092	+0.18

In the Au-Cu alloys a max. is found in  $\sigma$ -temp. curves, with the max. displaced to higher temps. with increasing Cu content.

Parts Au	Temp.	$\sigma$	Temp.	Max. $\sigma$	Temp.	$\sigma$	$\frac{d\sigma}{dt}$
1000	1120	1128	....	....	....	....	-0.10
810	1135	1036	1210	1098	1315	1095	....
757.7	1135	1071	1240	1122	1305	1110	....
510	1075	1032	....	....	....	....	+0.52
0	1140	1120	....	....	....	....	+0.66

The difficulty in the Cu-Au series is the closeness of the values of  $\sigma$  of the pure metals. The Cu-rich alloys have linear  $\sigma$ -temp. curves. For Zn oxidation was excluded by a special app.

Temp.	$\sigma$	$\frac{d\sigma}{dt}$
510	785	-0.19

The measurements were made from 510-640°. The Fe alloys show a great difference in  $\sigma$ .

% C	% Mn	% Si	% P	Temp.	$\sigma$	$\frac{d\sigma}{dt}$
3.32	0.56	2.76	0.49	1225	826	+0.80
3.52	2.1	0.65	1.6	1150	1054	+0.34
1.4	0.29	1.27	7.44	1245	957	+1.4

The capillaries were checked wherever possible before and after detns. The Fe alloys show positive temp. coeffs. The heats of vaporization cannot be calcd. from  $\sigma$  data of metals with the exception of Hg. The temp. coeffs. for Au, Ag and Zn do not fulfil the Eötvös rule.

ARTHUR FLEISCHER

The electrokinetic potential of gold in very dilute solutions of electrolytes. P. A. THIESSEN AND J. HEUMANN. *Z. anorg. allgem. Chem.* 181, 379-84(1929).—The displacement of a freely suspended fine Au wire under the influence of a potential applied through the soln. was taken as a measure of the electrokinetic potential or mobility. With solns. of LiCl, KCl, CsCl and K<sub>2</sub>SO<sub>4</sub>, ranging from 10<sup>-3</sup> N to 10<sup>-4</sup> N, the values passed through a max. at about 10<sup>-7</sup> N. The effect is explained on the basis of Debye's double layer.

T. H. CHILTON

The adsorption of sulfur dioxide by platinized asbestos. D. O. SHIELS. *J. Phys. Chem.* 33, 1167-74(1929).—Measurements are given of the adsorption of SO<sub>2</sub> by platinized asbestos in absence of air at 25° and up to 40-mm. pressure. The adsorption is reversible and the isotherm is represented by Langmuir's equation  $q = abp/(1 + ap)$ .

S. LENHER

The adsorption of sulfur dioxide by platinum black. D. O. SHIELS. *J. Phys. Chem.* 33, 1175-83(1929).—The adsorption of SO<sub>2</sub> by Pt black is measured at 25° from 0.0 to 175-mm. pressure. The process is irreversible, 84 vols. of gas at normal temp. and pressure being adsorbed per vol. of Pt, of which 54 vols were retained after desorbing at 250°. Possible causes of irreversibility are discussed.

S. LENHER

The sorption of water vapor by activated charcoals. II. Isothermals in presence of air. A. J. ALLMAND, R. CHAPLIN AND D. O. SHIELS. *J. Phys. Chem.* 33, 1151-60(1929); cf. *C. A.* 22, 1510.—Sorption isotherms of H<sub>2</sub>O vapor in the presence of air on activated C were obtained by a flow method. The very marked hysteresis found between the sorption and desorption values at various partial pressures of H<sub>2</sub>O vapor agrees with previous work. The shapes of the sorption isotherms depend upon the temp. at which the C samples were outgassed. Activated coconut and pinewood C but not activated birchwood C yielded sorption isotherms that approached definite maxima with increasing partial pressures of H<sub>2</sub>O vapor. III. Isothermals in presence of nitrogen. A. J. ALLMAND AND P. G. T. HAND. *Ibid* 1161-6.—Sorption measurements of moisture on activated C in the presence of N<sub>2</sub> agree well in most respects with those made in the presence of air. However, sorption isotherms obtained from coconut C outgassed at 800°C. in N<sub>2</sub> approached no max. with increasing partial pressures of H<sub>2</sub>O vapor, whereas those obtained from samples outgassed in air reached such maxima. O<sub>2</sub> has no retarding effect on the rate of sorption of H<sub>2</sub>O vapor by the C samples.

P. H. EMMETT

Influence of ammonia on the adsorption of copper and nickel salts. M. GELOSO AND M. L. S. LÉVY. *Compt. rend.* 189, 175-7(1929).—To a clear soln. contg., in the presence of (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>, Cu or Ni sulfate and NH<sub>4</sub>OH in different concns., a known quantity of Fe alum is added. After 3 hrs. standing at 22° the ppt. is filtered off and analyzed. The concn. of the NH<sub>4</sub>OH has a considerable influence on the adsorption

of the salts.  $\text{NH}_4\text{OH}$  does not seem to be adsorbed. The  $\text{NH}_4\text{OH}$  may help to change the  $p_{\text{H}}$  of the medium or it forms complex compds. of which part, after hydrolysis, is adsorbed.

E. SCHOTTE

**Membrane equilibria and selective absorption.** NORMAN C. WRIGHT. *Biochem. J.* 23, 352-7(1929); cf. *J. Agr. Sci.* 16, 640(1926).—The unequal distribution of inorg. salts on either side of the membrane can be explained if the degree of dissociation of the protein salt and the establishment of a Donnan equil. are taken into account.

BENJAMIN HARROW

**Résumé of investigations on membrane equilibria and membrane potentials.** F. G. DONNAN. *Natl. Research Council Bull.* 69, 51-5(1929).—A review and bibliography of 45 papers.

W. D. LANGLEY

**Molecular sieve membranes.** LEONOR MICHAELIS. *Natl. Research Council Bull.* 69, 119-41(1929); cf. *C. A.* 23, 1035.—The p. d. between 0.1 and 0.01 *N* solns. of  $\text{KCl}$  sep'd. by a membrane is called the "characteristic concn. potential" of the membrane, or  $\text{CoP}$ . Similarly, the p. d. between 0.1 *N* solns. of different electrolytes is called the "characteristic chem. potential," or  $\text{ChP}$ . For the best membranes,  $\text{CoP}$  amts. to about 50 mv. This is close to the value calcd. from Nernst's (Gibbs') formula for p. ds. arising from diffusion gradients. For the best membranes,  $\text{ChP}$  between  $\text{KCl}$  and  $\text{NaCl}$  is also about 50 mv., the  $\text{NaCl}$  soln. being positive. On arranging different chem. chains, each being constructed from 2 sets of univalent cations, so that each cation is positive with respect to any preceding cation, the series is  $\text{H}^+$ ,  $\text{Rb}^+$ ,  $\text{K}^+$ ,  $\text{NH}_4^+$ ,  $\text{Na}^+$ ,  $\text{Li}^+$ .

W. D. LANGLEY

**The polarization of membranes by metallic foils.** J. LOISELEUR. *Compt. rend.* 189, 170-1(1929).—An animal membrane dividing a conductive soln. becomes polarized when an insulated metallic foil is brought into one of the divisions. The polarization increases when the foil is brought nearer to the membrane and is max. when the foil touches the membrane. The time of polarization is short and depends upon the nature of the electrolyte and the metal of the foil. A freshly polished foil gives the best results. The value of the polarization decreases with increasing concn. of the electrolyte. The polarization of the membrane changes the ionic equil. between the 2 parts of the liquid. The observed effect could have its origin in biol. phenomena connected with the presence of metals. The polarizing of the membrane and the new ionic distribution results in a modification of the cellular condition of the membrane.

E. SCHOTTE

**The significance of colloid chemistry in chemical research.** V. PODROUŽEK. (*Chem. Listy* 22, 106-8(1928)).—The study of dispersion systems has added new concepts to the dispersion of ions.

FRANK MARSH

**Influence of light on some colloids.** SHEILA ROY. *J. Indian Chem. Soc.* 6, 431-40(1929).—Sols of  $\text{Sn}(\text{OH})_4$ ,  $\text{Al}(\text{OH})_3$ ,  $\text{Th}(\text{OH})_4$  and  $\text{HgS}$  become unstable toward uni- and bivalent ions on exposure to light. Sols of:  $\text{As}_2\text{S}_3$ ,  $\text{Sb}_2\text{S}_3$ , uranium ferrocyanide and  $\text{Cu}_2\text{Fe}(\text{CN})_6$  are stabilized toward uni- and bivalent electrolytes by short exposures to light but become unstable on long exposure. Long exposures of sols of  $\text{Sb}_2\text{S}_3$ ,  $\text{HgS}$  and uranium ferrocyanide to light produce coagulation without the addn. of an electrolyte. Sols exposed to light have a higher cond. than those kept in the dark. F. E. B.

**The role of dielectric constant, polarization and dipole moment in colloidal systems.**

IV. **The swelling of acetylcellulose in single organic liquids.** ICHIRO SAKURADA. *Kolloid.-Z.* 48, 277-83(1929).—The soly. and swelling of an acetylcellulose (I) ( $\text{HOAc}$  combined 53.4, free 0.024; moisture 0.36%), dried over  $\text{H}_2\text{SO}_4$ , was observed in  $\text{CHCl}_3$ ,  $\text{EtOAc}$ ,  $\text{PhNO}_2$ ,  $\text{MeOH}$ ,  $\text{EtOH}$ ,  $\text{PrOH}$ ,  $\text{BuOH}$ ,  $\text{Et}_2\text{O}$ , isobutyl and isoamyl alc.,  $\text{PhCl}$ ,  $\text{PhH}$ ,  $\text{PhMe}$ ,  $\text{CCl}_4$  and  $\text{CS}_2$  at room temp. by (a) a volumetric method (measuring the vol. of sediment remaining at equil. when 1 g. I is in contact with 20 cc. of liquid); (b) a gravimetric method (increase in weight of 100 g. of I). Equil. is usually attained in 1-2 weeks; only  $\text{CHCl}_3$  requires longer; the liquids are listed in the decreasing order of activity; the last 4 have no swelling action. All liquids having solvent or swelling action have high d. c. (4.3-57.0) and dipole moment. All homopolar or slightly dipolar liquids have neither solvent nor swelling action. The relation of mol. vol. ( $V$ ) and mol. polarization ( $P_{\text{em}}/V^2$ ) or dipole moment ( $\mu/V$ ) plays an important role in detg. the solvent or swelling action of a liquid. For solvents the ratio is high ( $\mu/V = 17-36$ ); non-solvents low; swelling action intermediate ( $\mu/V > 12$ ). If assocn. is taken into account the  $P_{\text{em}}/V^2$  for alcs. falls in the non-solvent group (7.3-2.9). In homologous series of alcs. the degree of swelling decreases with increase in no. of C. Iso alcs. swell less than normal ones.

E. R. SCHIERZ

**The surface properties of soap solutions.** WALTER C. PRESTON AND A. S. RICHARDSON. *J. Phys. Chem.* 33, 1142-50(1929).—Measurements of surface tension, surface viscosity and foaming power were made on 0.1% solns. of 3 typical com. soaps. The

results show that there is no simple relation between these properties. It is concluded that unknown factors besides surface tension and surface viscosity det. the foaming power of soap solns. The effect of age on the solns. when exposed to air is to decrease the foaming power, while there is no effect on the surface tension and a variable effect on surface viscosity depending on the soap. Aging the solns. in closed vessels produced no significant variations in the properties measured.

R. H. FERGUSON

**Preparation of pure silicic acid solution by means of electrodialysis. I. Electrodialysis.** SHUMPEI OKA. *J. Soc. Chem. Ind. Japan* 31, 1281-9(1928); Suppl. binding 31, 306-7B.—See C. A. 23, 2088. **II. Some properties of silicic acid obtained.** *Ibid* 1289-95; Suppl. binding 307-8B.—Some of chem. and phys. properties of silicic acid solns. obtained by means of electrodialysis are reported. As the soln. aged, its sp. viscosity increased gradually, and sp. cond. decreased slowly, indicating the polymerization of silicic acid particles in the soln. But no coagulation occurred during 8-13 months' storing. The mol. wt. was detd. with a soln. 6 months after the prepn. by means of f.-p. depression, and found to be 9150 assuming silicic acid to exist as entirely undissocd. mols. such as  $(\text{SiO}_2)_n$ .

S. KONDO

**Physico-chemical properties of Japanese acid clay. II. The heat of wetting by water of Japanese acid clay, fuller's earth and Florida earth.** KYUHEI KOBAYASHI AND KEN-ICHI YAMAMOTO. *J. Soc. Chem. Ind. Japan* 31, 434-8(1928).—The heat of wetting by  $\text{H}_2\text{O}$  of Japanese acid clays, fuller's earth, Florida earth, kaolin and animal charcoal was detd. by an elec. calorimeter after U. Fischer. The results obtained in cal. per g. are: fuller's earth 21.03, Florida earth 16.75, Japanese acid clay (from Itoigawa) 12.51, Japanese acid clay (from Odo) 11.14, kaolin (Gairome), 58.4, animal C (Merck) 5.72. The previous report stated that Japanese acid clay is composed of much smaller particles than other clays. Their radii are now calcd. to be between  $1 \times 10^{-6}$  and  $2 \times 10^{-6}$  cm. Parks showed by special expts. that the heat of wetting is proportional to the area of the boundary surface. The authors consider that the heat of wetting by  $\text{H}_2\text{O}$  of Japanese acid clay is due to its large surface area. **III. The heat of polymerization of turpentine oil,  $\alpha$ -pinene by Japanese acid clay, fuller's earth and Florida earth.** *Ibid* 438-44.—The heats of polymerization of turpentine oil and of  $\alpha$ -pinene with Japanese acid clay, fuller's earth, Florida earth,  $\text{SiO}_2$  gel, kaolin and animal C were detd. by an elec. calorimeter. The results in cal./g. follow, the first figure being for turpentine oil and the second for  $\alpha$ -pinene: Japanese acid clay (Itoigawa no. 1) 1623.6, 2055.8, ditto (no. 2) 807.7, 2154.2, ditto (no. 3) 418.6, 1894.1, Japanese clay (Odo) 60.2, 38.8; Florida earth 48.8, (not detd.); kaolin (Gairome) 19.0, (not detd.);  $\text{SiO}_2$  gel 27.4, 28.8, animal C (Merck) 21.3, (not detd.).

S. KONDO

**The synthesis of a substance having properties analogous to the Japanese acid clay. I. NAOTO KAMEYAMA AND SHUMPEI OKA.** *J. Soc. Chem. Ind. Japan* 31, 1125-33 (1928); Suppl. binding 31, 269-71B.—According to Kobayashi, Japanese acid clay contains 49.90-68.42%  $\text{SiO}_2$  and 9.83-20.86%  $\text{Al}_2\text{O}_3$ . As minor constituents, it has  $\text{Fe}_2\text{O}_3$ ,  $\text{CaO}$ ,  $\text{MgO}$  and alkalis; the molecular ratio of  $\text{SiO}_2$  to all basic constituents calcd. as  $\text{Al}_2\text{O}_3$  is 6:1. Several kinds of  $\text{SiO}_2$  gel were prepd. by drying a pure soln. of  $\text{H}_2\text{SiO}_4$ , made from recrystd.  $\text{Na}_2\text{SiO}_3$  by means of electrodialysis, under different conditions. The products showed almost all properties of the acid clay, i. e., (1) turned blue litmus paper red, (2) set acid free from neutral  $\text{KCl}$  soln., (3) inverted cane sugar, (4) took up methyl violet from its aq. soln. But one property was lacking, namely oxidizing power toward aq. soln. of benzidine base. It has also been ascertained that addition of  $\text{Al}_2\text{O}_3$  strengthens the acidic properties. **II.** *Ibid* 32, 328-43(1929); Suppl. binding 32, 99-101B.—The authors reported in another paper that the blue coloration of the Japanese acid clay by benzidine is mainly due to the presence of some oxidizing agent in the clay. Mn was found in all 3 samples of the acid clay from different localities. Moreover, the comparison showed that the sample contg. most Mn showed the most intense coloration.  $\text{SiO}_2$  gel contg.  $\text{Al}_2\text{O}_3$  as much as 1 mol. per 6 mols.  $\text{SiO}_2$  and 0.1%  $\text{MnO}_2$  was prepd. This powdery product had all properties of the Japanese acid clay. A small addn. of  $\text{NaOH}$  to the constituents of the artificial clay improves the decolorizing property toward methyl violet and also the coloration property of the benzidine test.

S. KONDO

**Clay and water.** H. SALMANG. *Kolloid-Z.* 48, 377-80(1929).—A review covering the last 6 years.

E. C. M.

**Crystallization phenomena of dye salts.** HANS WAGNER. *Kolloid-Z.* 48, 248-52 (1929).—Pigment Scarlet 3B was flocculated by  $\text{NaCl}$ ,  $\text{BaCl}_2$ ,  $\text{CaCl}_2$  and the coagula were studied microscopically and polariscopically.

FRANK URBAN

**The process of coagulation in smokes.** H. S. PATTERSON, R. WHYTIAW-GRAV AND W. CAWOOD. *Proc. Roy. Soc. (London)* A124, 502-22(1929); cf. C. A. 21, 843.—

Although the equation  $\sigma = \sigma_0 + Kt$ , where  $\sigma$  = vol. of smoke at time  $t$  and  $\sigma_0$  is the initial particulate vol. (by extrapolation), fits the data for smokes,  $K$  varies within wide limits even when conditions are carefully reproduced. The method of counting was improved by making the app. perfectly rigid, decreasing the dead space on the exit side of the cell, and perfecting the finish of the bore of the rotating tap to interrupt the stream sharply. By keeping the counting chamber moist the particles were brightened and the small  $\text{NH}_4\text{Cl}$  particles previously invisible in dil. smokes could be counted so that the curvature in the data disappeared. The results were also improved by detg. the actual wt. concn. of the cloud by absorption of the  $\text{NH}_4\text{Cl}$  and treatment with Nessler reagent. The wt. concn. was always less than the amt. actually volatilized. An equation for coagulation is derived theoretically. Unblown smokes show good agreement but blown smokes because of greater heterogeneity do not agree. A. F.

**The structure and electrification of smoke particles.** H. S. PATTERSON, R. WHYTE-LAW-GRAY and W. CAWOOD. *Proc. Roy. Soc. (London)* **A124**, 523-32(1929); cf. preceding abstract.— $\text{CdO}$ ,  $\text{MgO}$ ,  $\text{Ag}$  and  $\text{Au}$  clouds were prepared by arc discharge, while  $\text{As}_2\text{O}_3$ ,  $\text{HgCl}_2$  and some org. compd. smokes were prep'd by volatilization.  $\text{CdO}$  smokes are composed of chains  $10^{-3}$  cm. long with particles of  $10^{-6}$  cm. radius. The other arc discharge smokes are similar in structure.  $\text{As}_2\text{O}_3$  and  $\text{HgCl}_2$  smokes show a slight degree of aggregation. Fluorescein forms non-crystalline spheres; salol forms super-cooled liquid droplets. Azonaphthols form super-cooled spherical droplets which develop cryst. hair-like tails. Smokes from violent chem. reactions such as  $\text{Mg}$  ribbon and  $\text{O}_2$  give a high percentage of electrified particles, while volatilized smokes such as  $\text{NH}_4\text{Cl}$  smokes show a slight initial electrification with gradual increase on standing.

ARTHUR FLEISCHER

**The precipitation rule for emulsions on the basis of sulfonated oils.** WILHELM SCHINDLER. *Kolloid-Z* **48**, 254-70(1929).—Using technical products S. studied the emulsification of a light-colored, heavy mineral oil, d. 0.91 (I) with  $\text{H}_2\text{O}$  in the presence of sulfonated fish oils (II), (III) and castor oils (IV), (V), (VI). Analyses of the oils for total fat, total sulfate, org. combined,  $\text{SO}_3$  and inorg. combined  $\text{SO}_3$  gave for (II) 73.8, 4.75, 4.345, 0.405; (III) 69.8, 3.86, 3.62, 0.24; (IV) 61, 5.1, 4.7, 0.4; (V) 63.0, 7.45, 6.96, 0.49; (VI) 34.7, 3.12, 2.90, 0.22%. The emulsifying agent was stirred with the mineral oil to a creamy consistency; then  $\text{H}_2\text{O}$  was added to make the vol. 100 cc.; no attempt to homogenize was made. From const. quantities of (I) with increasing quantities of (II) an emulsion stable for 14 days was obtained at optimum concn. (I) 5 g (II) 5 g. If less (II) were used dispersion was poor; if more, coagulation resulted. Adding  $N$   $\text{NaOH}$  to produce  $p_H$  7.1-11.1 gave emulsions stable for 8 days with no optimum (cf. *C. A.* **20**, 302). (III) has less emulsifying power than (II), nor does it cause coagulation in slight excess of optimum. Using increasing quantities of mixts. of (I) and (II) or (III) made up to def. vol. with  $\text{H}_2\text{O}$  optimum were obtained which varied with nature and proportion of the emulsifying agent. (IV) to (VI) were not as good for emulsifying (I) as the fish oils; there was no relation between org. combined sulfate and emulsifying power; addn. of small amts. of oleic acid enhanced the emulsifying power and produced a max. in the case of (VI) only. The fact is emphasized that the value of a substance as an emulsifying agent depends on the method of producing the emulsion and specifically on the substance to be emulsified. E. R. S.

**Coagulation of colloidal titanic hydroxide.** SUBODH KUMAR MAJUMDAR. *J. Indian Chem. Soc.* **6**, 357-60(1929).— $\text{TiO}_2$  hydrosol behaves as a typical positively charged hydrosol.  $\text{MeOH}$  and  $\text{EtOH}$  sensitize this sol. toward the majority of coagulating agents but such sp. effects occur as stabilization against  $\text{K}_4\text{Fe}(\text{CN})_6$  by higher concns. of  $\text{MeOH}$  and sensitization by all concns. of  $\text{EtOH}$ . Aging the sol increases its stability against coagulation by electrolytes. F. E. BROWN

**Coagulation of gelatin sols in alcohol-water mixtures.** S. GHOSH, S. N. BANERJEE and N. R. DHAR. *J. Indian Chem. Soc.* **6**, 321-31(1929).—A positively charged gelatin sol in alc.- $\text{H}_2\text{O}$  mixts. is stabilized by diln. against coagulation by  $\text{KCl}$ ,  $\text{HCl}$  and  $\text{MgCl}_2$ . This sol cannot be coagulated by  $\text{BaCl}_2$  and  $\text{Al}(\text{NO}_3)_3$ . Ionic antagonism is developed when coagulation is produced by mixts. of  $\text{KCl}$  and  $\text{MgSO}_4$ ,  $\text{MgCl}_2$  and  $\text{K}_2\text{SO}_4$ ,  $\text{HCl}$  and  $\text{K}_2\text{SO}_4$ , and  $\text{HCl}$  and  $\text{KCl}$ . The sol. shows positive acclimatization when coagulated by  $\text{KCl}$ ,  $\text{HCl}$  and  $\text{MgCl}_2$ . A negatively charged gelatin sol in alc.- $\text{H}_2\text{O}$  mixts. is stabilized by diln. against coagulation by  $\text{K}_2\text{SO}_4$ ,  $\text{K}_4\text{Fe}(\text{CN})_6$  and  $\text{KOH}$ . Ionic antagonism is observed when this sol is coagulated by mixts. of  $\text{K}_2\text{SO}_4$  and  $\text{MgCl}_2$ .  $\text{KOH}$  stabilizes the sol, when it is being coagulated by  $\text{KCl}$ . Positive acclimatization is developed when the coagulant is  $\text{K}_2\text{SO}_4$  or  $\text{KOH}$ . Marked negative acclimatization is developed when the coagulant is  $\text{HCl}$ ,  $\text{BaCl}_2$ ,  $\text{MgCl}_2$  or  $\text{Al}(\text{NO}_3)_3$ . Positively charged gelatin

sol can adsorb cations and negatively charged gelatin can adsorb anions but gelatin adsorbs more of a cation than of an anion.

F E BROWN

**Absorption of water by gelatin. III. The sulfate system.** WINIFRED B. PLEASS, *Biochem. J.* 23, 358-72(1929); cf. *C. A.* 23, 18.—From a physico-chem. point of view,  $\text{HNO}_3$ ,  $\text{HCl}$ ,  $\text{H}_2\text{SO}_4$ , and their corresponding salts are similar in many respects, but the  $\text{SO}_4$  ion is differentiated by its bivalent character.  $\text{H}_2\text{SO}_4$  is not ionized to so great an extent, and has a great affinity for water. Max. swelling of gelatin occurs in a soln. of  $\text{H}_2\text{SO}_4$  at  $p_{\text{H}}$  3.0.  $\text{Na}_2\text{SO}_4$  in concns up to 0.5 *M* in the presence of  $\text{H}_2\text{SO}_4$  suppresses the osmotic swelling of gelatin due to the acid. At greater concns of the salt the gelatin coagulates.

BENJAMIN HARROW

**Intensity of Tyndall cone in agar gels as a function of hydration.** EMIL HATSCHKE, *Kolloid-Z.* 48, 246-8(1929).—Increasing intensity of Tyndall cone in cooling agar sols cannot be due to hydration alone.

FRANK URBAN

**Changes in the viscosity and hydrogen-ion concentration of some inorganic substances during the process of jelly formation.** SATYA PRAKASH AND N. R. DHAR, *J. Indian Chem. Soc.* 6, 391-409(1929).—Viscosity and  $p_{\text{H}}$  measurements were made on sols of  $\text{Fe}(\text{OH})_3$ ,  $\text{Cr}(\text{OH})_3$ ,  $\text{Al}(\text{OH})_3$ ,  $\text{Sn}(\text{OH})_4$ ,  $\text{HgO}$ , mercurisulfosalicylic acid,  $\text{FeAsO}_4$ ,  $\text{FePO}_4$ ,  $\text{Fe}_3(\text{MoO}_4)_3$ ,  $\text{CrAsO}_4$ ,  $\text{Sn}(\text{WO}_4)_2$ ,  $\text{Sn}(\text{MoO}_4)_2$ , ferric borate,  $\text{Th}_3(\text{PO}_4)_4$ ,  $\text{Th}(\text{MoO}_4)_2$ , and  $\text{Th}_3(\text{AsO}_4)_4$  during gelation. There are 3 stages in the viscosity changes: (1) very little change, (2) a regular exponential change with time, (3) a rapid increase in viscosity ending in the formation of a jelly. (1) Coincides with the change from true soln. to colloid, (2) with the partial neutralization of the charges on the micelles and their hydration, (3) with the formation of the jelly. During gelation the concn. of H ion falls  $50 \pm 20\%$  of the original value. The firmness of jellies is directly proportional to their transparency. Transparency depends on hydration, which in turn depends on slow neutralization of charges on the colloidal particles. Slow neutralization permits high hydration before coagulation occurs. Excess of electrolytes even in a clear jelly promotes agglomeration and consequent synecresis.

F E BROWN

**Germanate gels of the alkaline earths.** JOHN H. MÜLLER AND CHARLES E. GULEZIAN, *J. Am. Chem. Soc.* 51, 2029-42(1929).—The neutralization of dil. germanic acid by  $\text{Ca}(\text{OH})_2$  produces a highly dispersed colloidal Ca germanate. The water present appears to be simply trapped; nearly all of it can be removed by pressure or suction filtration. Gelation at max. diln. occurs when acid and base are combined in the ratio 4  $\text{CaO} : 3\text{GeO}_2$ . The water of the hydrogel may be replaced by other liquids such as  $\text{MeOH}$ ,  $\text{EtOH}$  or acetone, which in turn may be replaced by ether or  $\text{C}_6\text{H}_6$ . These non-aq. dispersoids are permanent if protected from evapn. Sr germanate dispersoids are similar to Ca but gels are not obtained at dilns. comparable to those used in the case of Ca. Ba germanate is distinctly cryst. and appreciably sol. in water.

R I RUSH

**The problem of solubility changes.** L. J. WEBER, *Z. anorg. allgem. Chem.* 181, 385-94(1929).—If a salt raises the surface tension of  $\text{H}_2\text{O}$  it decreases the solv. of a non-conductor dissolved in the salt soln.; if the salt decreases the surface tension of  $\text{H}_2\text{O}$  it increases the solv. of the nonconductor. The exptl. results on  $\text{Li}_2\text{CO}_3$  and  $\text{K}_2\text{SO}_4$  solns in the presence of various capillary-active compds. verify the statement. A large number of references are given.

ARTHUR FLEISCHER

**The determination of the solubility of slightly soluble liquids in water and the solubilities of the dichloroethanes and -propanes.** PAUL GROSS, *J. Am. Chem. Soc.* 51, 2362-6(1929).—Solubilities are detd. by analyzing satd. solns by means of a liquid interferometer, for which a scale is calibrated with known concns of the liquid. Solubilities at 25° so detd. are, in g. per 100 g.  $\text{H}_2\text{O}$ : 1,1-dichloroethane, 0.506; 1,2-dichloroethane, 0.865; 1,2-dichloropropane, 0.280; 1,3-dichloropropane, 0.273;  $\text{CCl}_4$ , 0.077.

T H. CHILTON

**The solubility of arsenic trisulfide and arsenic pentasulfide.** ROBERT HÖLTJE, *Z. anorg. allgem. Chem.* 181, 395-407(1929).—The solubilities of  $\text{As}_2\text{S}_3$  and  $\text{As}_2\text{S}_5$  were appreciable in pure water at 0°, decreased with slight amt. of  $\text{H}_2\text{S}$  and then increased again with increase in  $\text{H}_2\text{S}$  concn. In the presence of  $\text{HCl}$ ,  $\text{H}_2\text{S}$  has no effect on the soly. In the presence of  $\text{HCl}$ ,  $\text{As}_2\text{S}_3$  is pptd. quant. from soln. when a slight excess of  $\text{H}_2\text{S}$  is present. The soly. of the sulfides in pure water is explained by hydrolysis to compds. like  $\text{H}_2\text{AsO}_4\text{S}_3$ .

ARTHUR FLEISCHER

**Solubility of calcium hydroxide.** L. B. MILLER AND J. C. WITT, *J. Phys. Chem.* 32, 285-9(1929).—The  $\text{Ca}(\text{OH})_2$  was prepd. by hydrating  $\text{CaO}$  obtained by igniting Iceland spar. The soly., expressed as g.  $\text{CaO}$  per 1000 cc. of satd. soln. at 30°, was 1.198. Gravimetric and elec. cond. methods were employed.

E. J. C.

**The solubility of sodium and potassium hydroxides in methanol and ethyl alcohol.**



A. G. MURRAY. *J. Assoc. Official Agr. Chem.* 12, 309(1929).—NaOH and KOH in excess were placed in bottles of EtOH and MeOH and allowed to stand with occasional shaking at room temp. (about 28°) for about 3 weeks. Ordinary lab. reagents were used. The soly. in g per 100 ml. and the d. of the satd. soln. were found, resp., 29.0 and 1.04 for KOH in EtOH, 40.3 and 1.14 for KOH in MeOH, 13.6 and 0.93 for NaOH in EtOH, 23.9 and 1.01 for NaOH in MeOH.

The miscibility of phenol with aqueous salt solutions. G. CLAXTON AND H. M. DAWSON. *Proc. Leeds Phil Lit. Soc. Sci. Sect. 1*, 416–20(1929).—The measured solubilities in phenol–water–salt systems are closely represented by the formula:  $\log S = \log S_0 - km$ . ( $m$  = mol. concn.;  $k$  = const. ( $S_0$  values smaller than that from expts using pure water as solvent show that salts in dil. soln. do not behave in accordance with the exponential formula. These deviations may be connected with interionic forces. The salting out effects by concd. salt soln. are in agreement with the Debye-Hückel requirements.

MARY E. LEAR

Equilibrium between alcohols and salts. II. GRAHAM C. GIBSON, JOHN O'LEARY DRISCOLL AND WM. J. JONES. *J. Chem. Soc.* 1929, 1440–3; cf. *C. A.* 22, 2099.—Solubilities of  $MgSO_4$ ,  $ZnSO_4$ ,  $CdSO_4$ ,  $Th(SO_4)_2$ ,  $MnSO_4$ ,  $CoSO_4$ , and  $NiSO_4$  in MeOH at 15°, 25°, 35°, 45° and 55° are reported.  $Na_2SO_4$ ,  $K_2SO_4$ ,  $(NH_4)_2SO_4$ ,  $Ag_2SO_4$ ,  $CaSO_4$ ,  $SrSO_4$ , and  $Al_2(SO_4)_3$  all have solubilities less than 0.0001 g. per g. MeOH at 25°,  $BaSO_4$  and  $PbSO_4$  less than 0.00001. The amt. of salt dissolved increases at first, then attains a max. value and subsequently falls as the sparingly sol. basic salt is being formed. Alcoholation is always subsequent to the attainment of the max. The compn. of the solid phases in equil. with the resp. satd. solns. between 15° and 55° and the dissoen. pressures of the alcoholates at 12°, 16° and 20° are given for  $MgSO_4 \cdot 3.5MeOH$ ,  $ZnSO_4 \cdot 2.5MeOH$  and  $ZnSO_4 \cdot MeOH$ . Between 15° and 55°, Cd, Th, Mn, Co and Ni sulfates exist in equil. with their resp. satd. solns. as the non-alcoholated salts. In no case was a transition pt. observed. The solubilities of Mg, Zn, Cd, Mn, Co and Ni sulfates in EtOH are reported at 15°, 25°, 35°, 45° and 55°; Ca, Sr, Ba and Pb sulfates in EtOH at 25° have solubilities of less than 0.00009; the solid phase in contact with the satd. soln. is the non-alcoholated normal salt.  $Th(SO_4)_2$  and  $CoSO_4$  (anhydrous) extd. with MeOH (Soxhlet) for 100 hrs., showed no trace of basic decompn.,  $ZnSO_4$  gave a ratio of basic to normal sulfate of 0.0019; with  $CuSO_4$  basic decompn. was complete. One vol. 100%  $H_2SO_4$  added to 6 vols. well-cooled abs. MeOH gave with Fe ferrous sulfate hemisulfate methyl alcoholate, olive green; Mg gives  $MgSO_4 \cdot 3.5MeOH$ , and Zn,  $ZnSO_4 \cdot MeOH$ . C. J. W.

Influence of different salts on the solution of pure aluminum in hydrochloric acid. J. CALVET. *Compt. rend.* 189, 183–6(1929), cf. *C. A.* 22, 1317; 23, 3431.—The effect of small amts. of chlorides on the action of HCl on pure Al was detd. The results of different series of expts. are tabulated. Most of the 14 metals in 0.5 N HCl have little influence, except Pt and Ni. At the end of 6 days the action of 0.004 mg. Pt is comparable to 0.608 mg. Au 0.312 mg. Cu produces the same effect after 14 days. In 2.5 N HCl with small amts. of  $HgCl_2$ , the attack is discontinuous and irregular. In the presence of 20 mg.  $HgCl_2$ , the reaction started only after 1.5 hrs. The velocity increases rapidly and after 25 min. a value is obtained 60 times higher than with pure HCl.

E. SCHOTTE

The rate of solution of lead. L. AUBER. *Magyar Chem. Folyóirat* 34, 62–4, 77–83(1929).—Gróh detd. the quantity of Pb dissolved from the activity of amalgamated Pb over which aq.  $Pb(NO_3)_2$  activated with  $Th(NO_3)_4$  was flowing. The radioactive  $Pb(NO_3)_2$  soln. was replaced in these expts. by  $Cu(NO_3)_2$ . The rate of solution was found to be influenced by the concn. of Cu ion in case of relatively small Cu concn. but by Pb concn. in the amalgam in case of relatively large Cu ion concn. Thus a relatively concd.  $Cu(NO_3)_2$  soln. should be used for detg. the max. of rate of solution. The result was  $11.4 \times 10^{-4}$  g.  $cm^{-2}$   $sec^{-1}$  calcd. for satd. Pb amalgam, agreeing with the data of Gróh (*C. A.* 22, 11). This method can also be used in other cases by applying the soln. of a metal of similar solution tension instead of radioactive solns.

S. S. DE FINÁLY

Diffusion coefficients of gases in water and their temperature dependence. G. TAMMANN AND VITUS JESSEN. *Z. anorg. allgem. Chem.* 179, 125–44(1929).—The rates of diffusion of gases into de-gassed 1 to 3% agar in  $H_2O$  solns. were detd. Columns of solns. 10 cm. in length and 156 sq. cm. in cross section were used. The diffusion coeff.,  $k$ , is given by the equation  $k = \pi v^2 / 4a^2 q^2 t$ , where  $v$  is the vol. of gas absorbed,  $a$  is the Bunsen absorption coeff.,  $q$  is the area of the cross section of the column of liquid and  $t$  is the time. Expts. with  $CO_2$  gave no appreciable differences in the values of  $k$  for liquid columns of 4 and 10 cm. in length. Expts. with  $CO_2$ ,  $C_2H_2$ , and  $H_2$  showed no effect of concn. from 1 to 3% of agar on the values of  $k$ . The temps., values of  $a$

used in the calcs. and the resulting coeffs. in  $\text{cm.}^3/\text{day}$  are, resp.:  $\text{CO}_2$  0.0°, 1.713, 0.83; 10.0°, 1.194, 1.06; 17.5°, 0.942, 1.25; 25.0°, 0.759, 1.50; 30.0°, 0.665, 1.51— $\text{C}_2\text{H}_2$  0.0°, 1.73, 0.95; 10.0°, 1.31, 1.30; 17.5°, 1.09, 1.46; 30.0°, 0.84, 1.89— $\text{H}_2$  10.0°, 0.0196, 2.42; 17.5°, 0.0185, 2.93; 25.0°, 0.0175, 3.53; 30.0°, 0.0170, 3.88— $\text{N}_2$  1.0°, 0.0230, 0.98; 10.0°, 0.0190, 1.16; 17.5°, 0.0166, 1.40; 25.0°, 0.0149, 1.56; 30.0°, 0.0140, 1.73— $\text{O}_2$  1.0°, 0.0476, 1.06; 10.0°, 0.0380, 1.57; 17.5°, 0.0325, 2.12; 25.0°, 0.0284, 3.06. The values of  $k$  for  $\text{CO}_2$ ,  $\text{C}_2\text{H}_2$ ,  $\text{H}_2$  and  $\text{N}_2$  increase linearly with the temp. The values for  $\text{O}_2$  increase more rapidly.

J. E. SNYDER

**Thermal diffusion at low temperatures.** T. L. IBBS, K. E. GREW AND A. A. HIRST. *Proc. Phys. Soc. London* 41, 456-75(1929).

E. J. C.

**Measurements on the lowering of the freezing point of dilute solutions of mixtures of two electrolytes.** RAGNVALD WESØE. *Physik. Z.* 30, 412-9(1929).—Lowerings of the f. p. were detd. on dil. aq. solns. of equimol. mixts. of  $\text{KNO}_3$ ,  $\text{K}_2\text{SO}_4$ ,  $\text{MgSO}_4$ ,  $\text{Ca}(\text{NO}_3)_2$ , using the salts in pairs. From these data the exptl osmotic coeffs. were calcd. and these compared with those calcd. by means of the Debye-Hückel theory. The exptl. values were in fair agreement with the calcd. ones.

L. W.

**Studies in the region of concentrated solutions.** V. P. SHISHOKIN. *Z. anorg. allgem. Chem.* 181, 137-53.—A study of the Schröder formula  $\log S = -Q(T_m - T)/4.58 T_m T$ . ( $S$  is the concn. of the crystd. component;  $Q$ , its heat content,  $T_m$ , its abs. m. p.; and  $T$ , the abs. temp. of the beginning of crystn. of the mixt.  $4.58 = 2.3 R$ .) Three series of binary systems are considered: (1) Allylphenylthiourea as solvent, the 2nd component one of a series of 21 org. substances such as  $p\text{-C}_6\text{H}_4\text{Br}$ ,  $o\text{-C}_6\text{H}_4\text{NO}_2\text{NH}_2$ ,  $m\text{-C}_6\text{H}_4\text{NO}_2\text{NH}_2$ ,  $\text{C}_6\text{H}_5\text{NO}_2$ ,  $\text{EtOH}$ ,  $\text{MeOH}$ ,  $\text{CCl}_3\text{COOH}$ ,  $\text{CH}_3\text{COOH}$ ,  $o\text{-MeC}_6\text{H}_4\text{NH}_2$ , etc., (2)  $p\text{-C}_6\text{H}_4\text{Br}_2$  as solvent, the 2nd component one of six org. substances, (3) acetanilide as solvent, the 2nd component one of five org. substances. M. p. diagrams for all series are obtained, by plotting  $\log S$  against  $1/T$ . It is pointed out that the individual branches of the m.-p. diagrams conform to the equation  $S = Ke^{-\alpha/T}$ , a simplified form of the Schröder formula ( $K$  and  $\alpha$  are consts.), when the heat content  $Q$ , as calcd. by the Schröder formula does not vary to any great extent from the actual heat of fusion of the crystg. component. It is also concluded that the individual branches of the m.-p. diagrams formed between one substance and a series of other substances conforms to the equation  $S = Ke^{-\alpha/T}$  only when the m.-p. curves of the pure components conform to the same equation. Conversely, if the m.-p. curve of any component of a binary system does not fulfil the equation, neither will the branches of the m.-p. diagram of the binary system. For example, the m.-p. curves for  $\text{C}_6\text{H}_6$  and  $\text{C}_6\text{H}_5\text{NO}_2$ , as well as the individual branches of the diagram for the system  $\text{C}_6\text{H}_6\text{—C}_6\text{H}_5\text{NO}_2$ , agree with the equation. The variation of the value for  $Q$  as calcd. by the Schröder formula from that of the actual heat of fusion of the pure substance is explained by assuming chem. action between the components when the mixt. is melted. The heat capacities of allylphenylthiourea and acetanilide were detd. Several examples of systems not in accordance with the equation  $S = Ke^{-\alpha/T}$  are discussed.

L. L. QUILL

**The existence of monocalcium aluminate in solution.** A. TRAVERS AND SCHNOUTKA. *Compt. rend.* 189, 182-3(1929).—A soln. of any Al salt treated with lime water gives 3 distinct phases. (1) A ppt. of gelatinous Al hydroxide. The reaction is quant. with 3CaO per  $\text{Al}_2\text{O}_3$ . (2) On addn. of a 4th mol. CaO the ppt. disappears. It is impossible to crystallize the hydrated mono-Ca aluminate. Decompn. will take place on evapn. (3) Excess  $\text{Ca}(\text{OH})_2$  gives crystals, the shape of which changes with the  $p_H$ . The impossibility of concentrating solns. of  $\text{Al}_2\text{O}_3\text{—CaO}$  without decompn. is due to the insoly. of polycalcium aluminates. The latter are formed by the action of Ca, liberated by hydrolysis, on the monocalcium aluminate.

E. SCHOTTE

**The transport number of water in a 0.1 N hydrobromic acid solution.** J. BABOROVSKÝ AND A. WAGNER. *Chem. Listy* 23, 97-8(1929); cf. *C. A.* 22, 1517.—By the method of Baborovský, the transport no. of  $\text{H}_2\text{O}$  in 0.1 N solns. of HBr is detd. as 0.860; the exact transport no. of the cation  $(1 - N) = 0.867$ . The influence of parchment membranes has not been considered in the above detns.; the detns. have not been checked without membranes. In 0.1 N solns. of HCl, the introduction of a membrane increased the transport no. of the electrolyte. The transport of HBr by 96,490 coulombs was detd. with and without membranes.

	Anode	Cathode
With membranes	70.0	70.3 g.
Without ..	63.1	65.1

FRANK MARESH

The electrical conductivities of ammonia-water mixtures, between 26 and 82 per cent ammonia and from  $-30^{\circ}$  to  $+30^{\circ}$ . M. DEKAY THOMPSON AND R. B. ATKINSON. *Trans. Am. Electrochem. Soc.* 56 (preprint) 11 pp. (1929).—These measurements were originally suggested as a means of analyzing refrigerating mixts. of water and  $\text{NH}_4\text{OH}$  by detns. of elec. cond. and temp. in the circulating system. The results show that above  $15^{\circ}$ , in the absence of impurities, the compns. of mixts. up to 50%  $\text{NH}_3$  could be detd. to 0.5% or better. As the temp. falls the cond. changes less and less with the compn., so that at  $-30^{\circ}$  mixts. contg. more than 32%  $\text{NH}_3$  could not be analyzed by this means. The conductivities of mixts. above 50%  $\text{NH}_3$  at  $-30^{\circ}$  are about the same as that of the pure  $\text{NH}_3$  here used. C. G. F.

Dissociation constants of organic acids. I. The primary dissociation constants of some alkylmalonic acids. ARTHUR ISRAEL VOGEL. *J. Chem. Soc.* 1929, 1476–87.—This work was undertaken to study the influence of substituents and of unsatn and the effect of ring closure. Details are given of the prepn. of the acids and their Na salts and the measurement of resistance (bridge assembly, cond. cells, detn. of cell consts., prepn. of solns., cond. measurements, solvent correction). The following values for  $\mu_0$  and  $K_1 \times 10^4$  are reported for  $\text{CH}_2(\text{CO}_2\text{H})_2$  (I) and its alkyl derivs.: (I) 407.9, 14.10; Me (II), 404.2, 7.99; Et (III), 398.3, 10.30; Me<sub>2</sub> (IV), 398.4, 6.57; MeEt (V), 397.3, 13.94; Et<sub>2</sub> (VI), 396.85, 63.9; EtPr (VII), 392.2, 73.7; Pr<sub>2</sub> (VIII), 389.65, 90(?). For the di-Na salts there are reported  $\mu_0$ ,  $L_x$ —(ionic cond. at infinite diln. of the neutral anion),  $b$  and  $n$  ( $\mu_0 = \mu + bC^n$ ): I, 220.55, 117.7, 2071, 0.8387; II, 213.1, 110.3, 961, 0.6551; III, 201.3, 98.5, 2643, 0.9271; IV, 201.5, 98.7, 2978, 0.9085; V, 199.3, 96.5, 1115, 0.7080; VI, 198.4, 95.6, 1416, 0.8185; VII, 189.1, 86.3, 1424, 0.7619; VIII, 184.0, 81.2, 1170, 0.7917. The effect of successively substituting Me groups for the 2 H atoms of I is a lowering of the dissocn. const., whereas the substitution of larger groups causes an increase. The diminution of  $K_1$  with decrease of concn. is an outstanding feature of the results. II. The primary dissociation constants of some cyclic 1,1-dicarboxylic acids. *Ibid* 1487–94.—Methods of prepn. of the acids are reported.  $K_0$  and  $K_1$  are given for the following 1,1-di- $\text{CO}_2\text{H}$  acids: cyclopropane (I), 402.5, about  $1.4 \times 10^{-2}$ ; cyclobutane (II), 397.0,  $6.96 \times 10^{-4}$ ; cyclopentane (III), 395.95,  $5.47 \times 10^{-4}$ ; cyclohexane (IV), 394.2,  $3.14 \times 10^{-4}$ . Na salts ( $K_0$ ,  $L_x$ —,  $b$  and  $n$  as above): I, 209.6, 106.8, 1105, 0.7151; II, 198.75, 95.95, 1498, 0.7924; III, 196.65, 93.8, 1127, 0.7521; IV, 193.1, 90.3, 805, 0.6870. There seems at present no apparent relation between the primary dissocn. consts. of these four acids and those of IV, V, VI and VII the open-chain compds. from which they may be regarded as derived. C. J. WEST

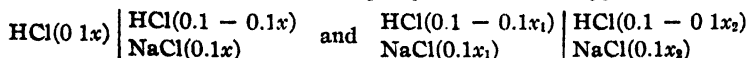
Interionic forces and the ionization of weak electrolytes. H. M. DAWSON. *Proc. Leeds Phil. Lit. Soc. (Sci. Sect.)* 1, 491–6 (1929).—By using the results of work published elsewhere (cf. *C. A.* 21, 2834; 22, 4333; 23, 1337) it is shown that the catalytic effect of salt-free acid solns. is due solely to the concn. of the H-ion. The agreement of observed and calcd. velocity consts (assuming  $K$ , ionization const., remains const., i. e., elec. field effect negligibly small) is evidence for the view that the interionic forces of salt-free solns. are very small in comparison with those which would correspond with the Debye-Hückel theory and the ionic strength hypothesis of Lewis and Randall. In the presence of salts the catalytic activity of H-ion as measured by the catalytic const.  $k_a$  varies with the nature and concn. of the salt. The ionization const.  $K$  increases with increasing quantities of inert salt to a max. then decreases. It can be closely represented by  $K_x/K_0 = 10^{m\sqrt{a-nx}}$ ;  $K_0$  = ionization const. of acid in salt-free soln.,  $K_x$  its value in soln. contg.  $x$  mol salt/l;  $m$  and  $n$  are consts. which are but slightly affected by the nature of the acid, but vary when the NaCl used usually is replaced by other salts. The interionic forces which det. the value of the ratio in solns. of low ionic strength are much smaller than those suggested by the D.-H. theory. The ionic strength hypothesis is not applicable when the H-ions are involved in the elec. field effect. The consistency of the results obtained with different salts, acids and reactions justifies the use of the catalytic method for the study of interionic forces. E. R. SCHIERZ

The frequency dependence of the electrical conductance of solutions of strong electrolytes. HANS FALKENHAGEN AND JOHN W. WILLIAMS. *J. Phys. Chem.* 33, 1121–34 (1929).—The elec. conductance of dil. solns. as a consequence of the existence of a finite time of relaxation possessed by the ionic atm. of each ion is reviewed (cf. *C. A.* 22, 2705, 3573) and extended by a math. discussion based on tables, graphs and formulas. The reason why a dispersion of the elec. cond. must exist is shown. The factors influencing that dispersion are: concn. (which is inversely proportional to the times of relaxation), mobilities of the ions, dielec. const., valence and temp. (at higher temps.,

smaller wave lengths go with the same values of the ratio of the conductances). The magnitude of the dependence on the frequency is recognized when the difference between the mol. cond. for the frequency  $\omega$  and that for zero is compared to the mol. conductance at infinite diln. The max. dispersion effect would be of the order of 2%.

M. E. L.

**Potential differences across the boundaries between solutions of mixed univalent chlorides.** EDGAR R. SMITH. *Bur. Standards J. Research* 2, 1137-43(1929).—Potential differences were measured across liquid junctions of the types:



using a flowing junction and Ag-AgCl electrodes. There was no evidence of complex formation, and the detns. gave reproducible values for the liquid-junction potentials which can be accurately computed from the formula  $E = RT/F \ln [(1 - N_{\text{Na}}) - x_2(N_{\text{H}} - N_{\text{Na}})] / [(1 - N_{\text{Na}}) - x_1(N_{\text{H}} - N_{\text{Na}})]$ , where  $x_1$  and  $x_2$  represent the molal proportions of NaCl to the total electrolyte concn., and  $N_{\text{Na}}$  and  $N_{\text{H}}$  are the cation transference nos. in solns. of the pure electrolytes at the same concn. as the total concn. of the mixt.

H. STOERTZ

**Potential of an inert electrode in a solution of acetaldehyde.** LOUIS RAPKINE. *Compt. rend.* 189, 171-3(1929).—When a Pt electrode is brought into a soln. contg. a substance the oxidation of which is irreversible, a definite potential may be observed. The potential is dependent upon the kinetic equil. between the velocity of the formation and that of the disappearance of the active substance on the electrode. The curve given represents the limiting potential as a function of the  $p_{\text{H}}$  at 40° for a concn. of 2% acetaldehyde. The soln. contains a phosphate buffer. The curve is linear till about a  $p_{\text{H}} = 10$ ; then there is an inflection to the electroneg. region. Near the  $p_{\text{H}} = 12$  the curve reaches the value of the limiting potential of glucose (cf. C. A. 22, 3343). This and the bending of the curve at the  $p_{\text{H}} = 10$  seems to indicate that in a very alk. medium a more and more intensive condensation of aldehyde into sugars takes place. The irreversibility of the potential is proved in different ways. E. S.

**The cell ammonia-oxygen.** C. MARIE AND C. HAENNY. *Compt. rend.* 189, 149-50(1929).—The e. m. f. of the chain air- Pt- Pyrex glass- Pt-  $\text{NH}_3$  was measured. The system becomes a conductor at about 480°. The e. m. f. varies with the temp., from 1.090 at 510° to 0.951 at 790°. The values are in accordance with that of the reaction in which  $\text{NH}_3$  is oxidized to  $\text{N}_2$ .

E. SCHOTTE

**Electromotive behavior of single zinc crystals.** M. STRAUMANIS. *Nature* 124, 56(1929).—No difference could be observed in the potentials of different, artificially prepd. planes of single Zn crystals against a neutral  $\text{ZnSO}_4$  soln. This contradicts reports by Anderson (C. A. 23, 1792). The potential varied with the concn. of the electrolyte and with the previous mech. treatment of the surface, etching, etc. Similar results were obtained with single crystals of Zn-Cd alloys contg. up to 0.2% Cd.

W. W. STIFLER

**The theory of passivity.** ROBERT MÜLLER. *Z. Elektrochem.* 35, 459-60(1929).—Theories of passivity are reviewed and a combination of the  $\text{H}_2$  and  $\text{O}_2$  theory with allotropic change in the metal is advanced as an explanation of passivity. R. D. B.

**The passivity of metals.** I. N. STRANSKI AND Z. C. MUTAFTSCHIEW. *Z. Elektrochem.* 35, 393-5(1929).—Soln. of a crystal can be retarded merely by hampering the soln. of a few ions or mols. situated on its surfaces and edges. Cf. C. A. 22, 4289.

R. D. BUMBACHER

**The rate of absorption of carbon dioxide by calcium cyanamide solution and the product found therein.** YOGORO KATO AND SHIGEN FUJINO. *J. Soc. Chem. Ind Japan* 32, 332-7(1929); Suppl. Binding 32, 99B(1929).—The rate of absorption was found to be proportional to the partial pressure of  $\text{CO}_2$ , to the initial concn. of the soln. and also to the final concn. of Ca. The presence of an undissocd. compd. having the compn.  $\text{Ca}(\text{CN})_2 \cdot \text{CO}_2$  in the soln. was proved by means of cryoscopic and cond. methods.

S. OKA

**Influence of nonelectrolytes on the speed of ionic reaction.** E. HATZ. *Magyar Chem. Folyóirat* 34, 141-4, 154-60, 177-9(1928).—The influence of nonelectrolytes on the speed of reaction between  $\text{S}_2\text{O}_8$  and I ions was studied in the presence of neutral salts. It was found that MeOH, EtOH and glycerol diminish the speed; carbamide and saccharose, on the contrary, increase it. The connection between the total ionic concn. and the retarding action of EtOH and MeOH was detd.

S. S. de FINÁLY

**The classification of induced reactions.** WILDER D. BANCROFT. *J. Phys. Chem.*

33, 1185-92(1929).—The classification given is based on the induction factor detd. at the end of reaction. All of the induced reactions are arranged in 3 groups: (a) the acceptor I reacts with a lower stage of the actor II, (b) I reacts with a reaction product of the inductor III, (c) II reacts with a reaction product of III and I. Consecutive reactions are classed under induced reactions.

**New view of autoxidations.** NICHOLAS A. MILAS. *J. Phys. Chem.* 33, 1204-16 (1929).—The new interpretation of autoxidations is a compromise of the widely different views held by various investigators.

**Influence of neutral salts on the oxidation velocities by permanganate.** B. V. TRONOV AND A. A. LUKANIN. *J. Russ. Phys.-Chem. Soc.* 61, 727-34(1929).—Permanganate solns. contain mols. of the non-dissocd. salt as well as the ions of the metal and of  $\text{MnO}_4^-$ . In oxidation with permanganate solns., the metal ions take no part, whereas  $\text{MnO}_4^-$  and the non-dissocd. mols. combine with electrons of the substance which is being oxidized. Theoretically a neutral substance is apt, more easily, to acquire a neg. charge than a substance which is already negatively charged, and a positively charged substance combines with electrons more easily than a neutral substance. Again, electrons are more easily lost by a negatively charged body than by a neutral or positively charged body. It follows that a permanganate mol. is apt to acquire electrons (thus acting as an oxidizer) with greater facility than  $\text{MnO}_4^-$ . These theoretical considerations are confirmed by the fact that solns. of alk. nitrates are very weak oxidizers on account of their being completely dissocd., whereas nitrates of Cu, Fe, and Pb and  $\text{HNO}_3$ , which are less dissocd., have a more powerful oxidizing effect. To verify the theory for permanganates, a series of expts. was made to follow the changes in oxidizing capacity at various stages of dissocn. The concns. remaining the same, the variations of the degree of dissocn. were effected by adding neutral salts which had a common ion with the permanganate; KCl, NaCl,  $\text{KNO}_3$ ,  $\text{NaNCl}_3$ ,  $\text{KClO}_4$ ,  $\text{K}_2\text{SO}_4$ , and  $\text{Na}_2\text{CO}_3$  were thus used for this purpose. EtOH was the substance to be oxidized, and the reactions were carried out in alk. soln. Most of the measurements were made at 16.8-18°. The reactions were followed only till 20% of the oxidizer was used up; this corresponds to the first stage of permanganate reduction, whereby the 7-valent Mn is transformed into the 6-valent Mn. Conclusions: (1) All the neutral inorg. salts actually accelerate the reaction between  $\text{KMnO}_4$  and EtOH in presence of KOH, the increase of the reaction velocity being almost proportional to the concns. of the added salts. (2) The nature of the cation of the neutral salt ( $\text{K}^+$  or  $\text{Na}^+$ ) has no noticeable influence on the velocity. (3) The nature of the anion has little influence in the case of univalent strong acids, but the salts of  $\text{H}_2\text{SO}_4$  accelerate the oxidation to a considerably less extent, and carbonates, as well as free caustic, even retard it. (4) Changes in permanganate concns. within the limits of 0.0001 to 0.0004 M have practically no influence on the reaction velocity. (5) The temp. coeff. of the reaction (from 16.8 to 26.8°) calcd. for the same % active O consumed noticeably increases with the addn. of KCl, and still more with the addn. of  $\text{K}_2\text{SO}_4$ ; the ratio of reaction velocities is, for  $\text{K}_2\text{SO}_4$  and KCl, equal to 0.7 at 16.8°, and is more than 1 at 26.8°. Thus, as a whole, theoretical considerations are exptly. confirmed, with the exception of the retarding influence of  $\text{Na}_2\text{CO}_3$ . The latter, as well as the exceptional action of  $\text{K}_2\text{SO}_4$ , is explained by the formation of elec. fields around the ions, in conformance with the theory of Brönsted developed by Christiansen (*C. A.* 19, 2157; 20, 324). B. N.

**The action of hydrochloric acid on alcohol.** VI. Velocity coefficient. S. KILPI. *Z. physik. Chem.*, Aht A, 142, 195-210(1929).—Velocity measurements were made on  $\text{H}_2\text{O}$ -alc. mixts. contg. 25 and 50% of alc., at 96.5° and 110°, and on mixts. contg. 65 and 80% alc., at 96.5°. Equations for the reaction-velocity coeffs. were derived, taking into account changes in the velocity-coeff.  $C_1$  of the action of HCl on alc. If  $N_a < 0.5$ ,  $C_1$  can be taken as const. for purposes of integration.  $C_1^{(0)}$ , the velocity-coeff. at infinite diln., and the corres.  $C_1^{(0)}/[\text{C}_2\text{H}_5\text{OH}]$  increase rapidly with increasing alc. content.  $C_1^{(0)}/[\text{C}_2\text{H}_5\text{OH}]$  was compared with the corresponding electrically measured activity of HCl in various  $\text{H}_2\text{O}$ -alc. mixts. The same relation between the reaction velocity and the electrically measured activity of HCl, which was observed on varying the concn. of the electrolyte in the same  $\text{H}_2\text{O}$ -alc. mixt., seems to be present when the compn. of the  $\text{H}_2\text{O}$ -alc. mixt. is varied.

**Oxidation of sodium sulfite by air in the presence of ferrous hydroxide, and a theory of negative induced reaction.** S. MIYAMOTO. *Sci. Papers Inst. Phys. Chem. Research* (Tokyo) 11, 81-92(1929).—The oxidation velocity of  $\text{Na}_2\text{SO}_3$  in the presence of  $\text{Fe}(\text{OH})_2$  with a flow of air equal to 7.78 l./hr. and at 20°, decreases rapidly with time and proves the reaction to be a negative induced reaction of the second kind or

one in which the active states of the mols. of the reacting substances of the secondary reaction can transfer to the mols. of the reaction products. The oxidation velocity of  $\text{Na}_2\text{SO}_3$  in the presence of  $\text{Fe}(\text{OH})_3$  is very low, showing that the decrease of the oxidation velocity of  $\text{Na}_2\text{SO}_3$  in the mixt. is due to the formation of  $\text{Fe}(\text{OH})_3$ .  $\text{Na}_2\text{SO}_4$  has no appreciable effect on the oxidation velocity of  $\text{Na}_2\text{SO}_3$ . H. STOERTZ

A study of the catalysis by silver of the union of hydrogen and oxygen. D. L. CHAPMAN AND W. K. HALL. *Proc. Roy. Soc. (London)*, A124, 478-93(1929); cf. C. A. 19, 1082.—The elec. resistance method of Hughes and Bevan (cf. C. A. 22, 716) for the detn. of the presence of an oxide film was applied to Ag. Metallic Ag wire which has been heated in  $\text{H}_2$  forms an oxide film at room temp. This film is more active than Ag which has an oxide film formed at higher temp. A Ag wire becomes coated with the oxide film in a mixt. of  $\text{H}_2$  and  $\text{O}_2$ . The activity of the low temp. film decreases with increase in temp. by reason of the conversion from an unstable configuration of atoms to a more stable one. The mechanism of catalysis by Ag is due to alternate oxidation and reduction at the Ag surface. ARTHUR FLEISCHER

An enquiry into the catalytic activity of molten tin. The relative efficiencies of tin and its oxides as catalysts for the reduction of nitrobenzene vapor. GWYN WILLIAMS. *Trans. Faraday Soc.* 25, 446-51(1929).—As catalysts for vapor-phase reduction to  $\text{PhNH}_2$  by  $\text{H}_2$  at  $310^\circ$  tin oxides are effective but molten tin is not. G. B. TAYLOR

Gibbs' theorem applied to heterogeneous equilibria. V. POLARA. *Atti accad. Lincei* [6], 8, 500-5(1928).—Mathematical. H. L. D.

Absorption of hydrogen in calcium and its alloys. G. KASSNER AND B. STEMPEL. *Z. anorg. allgem. Chem.* 181, 83-94(1929).—At  $250^\circ$ , finely rasped Ca metal rapidly takes up  $\text{H}_2$  to form the hydride  $\text{CaH}_2$ . As the temp. is raised the reaction becomes less rapid, but at  $500^\circ$  Ca is quantitatively converted into  $\text{CaH}_2$  in 2-3 hrs.; at about  $800^\circ$  the velocity of the reaction is very great. Measurements of the disson pressure of the hydride prep'd at  $250^\circ$  give a vapor-pressure curve, the equation of which between  $755^\circ$  and  $920^\circ$  is approx given by  $\log p = -3.475 + 0.005322 T$ . The vapor pressure is considerably higher than values given by other authors and corresponds to the equil.  $2\text{CaH} \rightleftharpoons 2\text{CaH} + \text{H}_2$ . Previously given values are probably represented by  $2\text{CaH} \rightleftharpoons 2\text{Ca} + \text{H}_2$ . Calcn. of the heat content of  $\text{CaH}_2$  between  $755^\circ$  and  $920^\circ$  by van't Hoff's formula gives 24.8-31.5 cal., and by Nernst's formula 22.6 cal. These values are in good agreement with calorimetric detns. The hydride can be prep'd in the form of white hexagonal prisms. A grouping of metal hydrides into salt-like, metallic and gaseous is made on the basis of the potential series. H. STOERTZ

Determination of transition point by the viscosity method. M. MATSUI AND S. OGURI. *J. Soc. Chem. Ind. (Japan)* 32, 43-8(1929); Suppl. Binding 32, 16B(1929).—By means of a modified Hartshorne viscometer, the viscosity of sat'd. solns. was measured at several temps. and the transition temps. of the following reactions were detd.: (1)  $\text{Na}_2\text{HPO}_4 \cdot 12\text{H}_2\text{O} \rightleftharpoons \text{Na}_2\text{HPO}_4 \cdot 7\text{H}_2\text{O} + 5\text{H}_2\text{O}$ . (2)  $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O} \rightleftharpoons \text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$ . (3)  $\text{NiSO}_4 \cdot 7\text{H}_2\text{O} \rightleftharpoons \text{NiSO}_4 \cdot 6\text{H}_2\text{O} + \text{H}_2\text{O}$ . The transition points obtained graphically were: (1)  $35.6^\circ$ , (2)  $32.5^\circ$ , (3)  $31.8^\circ$ . The following were obtained mathematically as the intersection of two curves of viscosity which were assumed to be parabolas. (1)  $32.88^\circ$ , (2)  $32.46^\circ$ , (3)  $31.36^\circ$ . SHIRO OKA

Melting-point curves of a few hydrated salts. G. TAMMANN. *Z. anorg. allgem. Chem.* 179, 186-92(1929).—Fusion pressures for  $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$  were detd by pressing the salt in a steel cylinder at const. temp. At the following temps. the pressures in kg./sq. cm. are, resp.,  $8.0^\circ$ , 7730;  $12.5^\circ$ , 7480;  $14.0^\circ$ , 6656;  $18.0^\circ$ , 6320. By increasing the temp. at const. pressure, the values obtained were  $19.1^\circ$ , 6415;  $22.8^\circ$ , 5810;  $23.6^\circ$ , 5360;  $10.8^\circ$ , 7120. These data give a continuous  $p$ - $t$  curve, the m. p. decreasing with increasing pressure. Data were obtained for  $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$ , by using Hg in transmitting the pressure. The m. ps. and pressures in kg./sq. cm. are, resp.,  $128^\circ$ , 1082;  $139^\circ$ , 2066;  $148^\circ$ , 2826. The  $p$ - $t$  diagram is a straight line, the m. p. increasing with increasing pressure. Geller's data (C. A. 19, 951) for the above and other hydrates give  $p$ - $t$  curves with distinct minima. The method consisted of imbedding a crystal of the salt in clay and heating under pressure. Using the latter method, T. verified G.'s results for  $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$  and accordingly considers G.'s method and resulting data to be incorrect. J. E. SNYDER

Melting-point diagram of cryolite-barium fluoride. NAOTO KAMEYAMA AND EIICHI MASUDA. *J. Soc. Chem. Ind. (Japan)* 31, 1134(1928); Suppl. Binding 32, 271B(1928).—The cryolite used contained 24.30%  $\text{Al}_2\text{O}_3$  and 0.04% matter insol. in  $\text{H}_2\text{SO}_4$  and HCl.  $\text{BaF}_2$  was prep'd. by double decompn. of  $\text{BaCl}_2$  and NaF, and the purified product contained 0.19% NaF and 99.48%  $\text{BaF}_2$ . The NaF used was purified by pptg. contaminating sulfate with benzidine chloride. Cooling curves show a eutectic

point at 835°, the eutectic mixt. being composed of  $\text{BaF}_2$ , 62.5% by wt. No compd. was found.

BaF <sub>2</sub> in the mixt. by weight	Beginning of freezing	Eutectic point
0	1014°	.....
20	982	819.5
40	931	830
55	877	837
61	844	834
64	840	835
67.5	856	835
70	875	833
77.5	944	828
85	1025	820
100	1324	.....

N. KAMEYAMA

A determination of the temperature prevailing at the solid-liquid phase boundary during crystallization from undercooled melts. HERBERT POLLATSCHKE. *Z. physik. Chem., Abt. A.*, **142**, 289-300(1929).—Direct measurements on *salol* show that Tamman's assumption that the solid-liquid interface attains the melting temp. of the substance during crystn. from undercooled melts is not correct.

J. B. AUSTIN

The system: water and hexamethylenetetramine. V. EVRARD. *Naturw. Tijdschr.* **11**, 99-107(1929).—The soly. diagram of hexamethylenetetramine has been exptly. detd. by measuring the  $n$  of the solns., and by Kjeldahl N detns. Below are listed the temps. and the urotropine concns. in % wt. of soln.: line AB(ice line): -0.56, -0.90, -1.80, -4.00, -5.70, -8.00, 8.30, -9.00°; 3.71, 5.80, 10.5, 19.8, 23.0, 27.6, 28.8, 29.8%. Line BC(soly. of the hydrate): -6.0, -5.0, 0.0, 7.0, 9.2, 10.8, 12.0, 13.0; 30.5, 30.8, 34.8, 40.5, 42.0, 43.3, 45.0, 46.8%. Line CM(metastable solns.): -4.0, -1.0, 7.0°; 47.3, 47.2, 47.0%. Line CDE: 13.0, 16.0, 20.0, 30.0, 40.0, 49.0, 65.0, 85.0, 95.0, 100.0, 110.0, 115.0, 130.0, 145.0, 150.0, 165.0°; 46.8, 46.5, 46.5, 46.3, 46.2, 46.0, 45.7, 45.6, 46.0, 46.3, 36.8, 47.4, 48.6, 50.0, 51.0, 52.5%. The refractive indexes of solns. contg. from 1 to 10 g. hexamethylenetetramine per 100 cc. soln are: 1.33493, 1.33659, 1.33831, 1.33999, 1.34162, 1.34331, 1.34507, 1.34683, 1.34851 and 1.35021, resp.

ALBERT L. HENNE

Liquid ammonia and sodium nitrate. NAOTO KAMEYAMA AND SAKAE YAGI. *J. Soc. Chem. Ind. (Japan)*, **31**, 1141(1928); Suppl. Binding **31**, 272B(1928).—The vapor tension of  $\text{NH}_3$  over the soln. of  $\text{NaNO}_3$  in liquid  $\text{NH}_3$  was measured at various concns. The presence of solid  $\text{NaNO}_3$  besides the satd. soln. makes the system univariant. The pressure of  $\text{NH}_3$  in mm. Hg at which the system is univariant are, resp., 325, 400, 500, 600, 760, 800, 1000, 1200 at the temps in °C -35.0, -30.7, -26.0, -22.1, -16.7, -15.6, -10.3 and -6.3. The absorbed heat during the isothermal evapn. of  $\text{NH}_3$  from the satd. soln., leaving  $\text{NaNO}_3$  as solid, was calcd. from  $dP/dT$  and was found to be about 5.4 kg.-cal./g.-mol.  $\text{NH}_3$  at -20°. The heat of soln. of  $\text{NaNO}_3$  in the satd. soln. is small.

S. OKA

Examination of a system containing three liquid phases. T. SZAFFKA. *Magyar Chem. Folyóirat* **34**, 145-9(1928).—Weszelszky found during the radiological examn. of silt from the baths *Ilévis* and *Budapest-Császár-fürdő*, that a soln. prepd. during the work yielded a system with 3 liquid phases when shaken with  $\text{Et}_2\text{O}$ . Analysis showed that the soln. contained  $\text{CaCl}_2$ ,  $\text{AlCl}_3$  and  $\text{NH}_4\text{Cl}$  and  $\text{HCl}$ . The  $\text{CaCl}_2$  caused the formation of 3 phases. Two series of expts. were made to det. the concn. of  $\text{HCl}$  and  $\text{CaCl}_2$  at which 3 phases form.

S. S. DE FINÁLY

Density of calcium hydroxide and the role of that material in the shrinkage of portland cement. P. JOYE AND P. DEMONT. *J. chim. phys.* **26**, 317-8(1929).—There has been considerable disagreement about the d. of  $\text{Ca(OH)}_2$ . The d. should be greater than that of  $\text{CaCO}_3$  to accord with the fact that the vol. of portland cement after setting is less than that of the cement before setting. J. and D. found the d. of  $\text{CaCO}_3$  to be 2.702, while that of  $\text{Ca(OH)}_2$  was found to be 2.239. The  $\text{CaCO}_3$  was placed in a weighed crucible and transformed into the oxide by heating at 1100° for one hr. The oxide was placed in a desiccator contg.  $\text{KOH}$ . The loss of  $\text{CO}_2$  agreed with that calcd. The hydration of the oxide occurred under a bell jar by contact with satd.  $\text{H}_2\text{O}$  vapor. The reaction required 24 hrs and there was no loss by swelling of the material. The crucible was placed under a bell jar in the presence of  $\text{P}_2\text{O}_5$  until const. wt. was attained. The d. of  $\text{Ca(OH)}_2$  thus prepd. was detd. in a pycnometer with  $\text{C}_6\text{H}_6$  as the filling liquid. The value found agrees with that of Lamv [*Ann. chim. phys.* **114**,

172-5(1878)]. It is evident that  $\text{Ca}(\text{OH})_2$  plays a part in the diminution of vol. of portland cement.

A. J. MONACK

**Specific heat, heat of formation and decomposition pressure of strontium halide hydrates.** GUSTAV F. HÜTTIG AND CH. SLONIM. *Z. anorg. allgem. Chem.* 181, 65-77(1929).—Dehydration at const. pressure indicated the following hydrates:  $\text{SrCl}_2 \cdot \text{H}_2\text{O}$  (I),  $\text{SrCl}_2 \cdot 2\text{H}_2\text{O}$  (II),  $\text{SrCl}_2 \cdot 6\text{H}_2\text{O}$  (III),  $\text{SrBr}_2 \cdot \text{H}_2\text{O}$  (IV),  $\text{SrBr}_2 \cdot 6\text{H}_2\text{O}$  (V),  $\text{SrI}_2 \cdot \text{H}_2\text{O}$  (VI),  $\text{SrI}_2 \cdot 2\text{H}_2\text{O}$  (VII),  $\text{SrI}_2 \cdot 6\text{H}_2\text{O}$  (VIII). Vapor-pressure curves are given in tables. Mean sp. heat is given as follows: for  $\text{SrCl}_2$ , 0.1201; for I, 0.1626; II, 0.1967;  $\text{SrBr}_2$ , 0.0773; IV, 0.1090; V, 0.2308;  $\text{SrI}_2$ , 0.0574; VI, 0.0792; VII, 0.1036; VIII, 0.1888. Heat of soln. in cal. is as follows: for  $\text{SrCl}_2$ , 11,441; for I, 6017; II, 2569; III, —7441;  $\text{SrBr}_2$ , 16,248; IV, 8862; V, —7106;  $\text{SrI}_2$ , 20,660; VI, 12,407; VII, 10,174; VIII, —4729. Density is detd. at 25° and is as follows: for  $\text{SrCl}_2$ , 2.953; III, 1.931;  $\text{SrBr}_2$ , 4.175; V, 2.386;  $\text{SrI}_2$ , 4.437; VIII, 2.672. The following mol. heat values were obtained:  $\text{SrCl}_2$ , 19.04; I, 28.70; II, 38.26;  $\text{SrBr}_2$ , 19.13; IV, 28.95; V, 82.03;  $\text{SrI}_2$ , 19.60; VI, 28.48; VII, 39.12; VIII, 84.87. H. STÖRRTZ

**Heat of solidification and solution of sucrose.** A. TIAN. *Compt. rend.* 189, 164-7(1929); cf. C. A. 23, 4608.—The heat of soln. of undercooled sugar is pos. In dissolving simultaneously in the proper proportions undercooled and cryst. sugar a thermic effect = 0 can be obtained.  $\alpha Q_s + Q_1 = 0$ ,  $Q_s$  and  $Q_1$  are the mol. heats of soln. The mol. heat of solidification is then  $X = Q_1 - Q_s = -(\alpha + 1)Q_s$ . For  $\alpha$  the value 3.474 was found with a microcalorimeter (cf. C. A. 18, 1070). At 17° for the heat of soln. of 1 g.-mol. of the sugar in 5 l.  $\text{H}_2\text{O}$  the value —1027 was obtained. The values calcd. for  $X$  and  $Q_1$  are, resp., 4595 and 3548. The two soly. curves of the 2 varieties of sugar should meet in a point most probably the m. p. of sugar. E. S.

**The heat of solution at the saturation point of a few hydrates. Direct method.** J. PÉRREU. *Compt. rend.* 189, 167-9(1929).—The heat of soln. of the hydrates was detd. at 11-12° by adding to the solns. of the salt increasing amts. till near the satn. point. The extrapolated values are —13.54 for  $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$ , —21.845 for  $\text{Na}_2\text{HPO}_4 \cdot 12\text{H}_2\text{O}$ , —16.83 for  $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$ , —4.73 for  $\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$  and —2.44 for  $\text{CuSO}_4$ . The solubilities of the salts were, resp., 49, 11.5, 25, 41.5 and 32 g. per 100 g.  $\text{H}_2\text{O}$ . E. S.

**Measuring the specific heats of metallurgically important materials through a large range of temperature with the aid of two new types of calorimeters.** W. A. ROTH AND W. W. BERTRAM. *Z. Elektrochem.* 35, 297-308(1929).—The buffer calorimeter, using paraffin oil as a heat-absorbing liquid, is capable of measuring av. sp. heats up to 900°. The all-metal calorimeter consists of a cylindrical Al block 14 cm. high and 13 cm. diam. with a hole 10 cm. deep and  $1\frac{1}{2}$  to 2 cm. diam. in its center. Thirty-seven thermocouples are inserted in the bottom of the block through 4 concentric rows of holes. When there are no changes (transformations or melting) the measured av. sp. heats fall on smooth, generally slowly rising curves. The equations derived from detd. av. sp. heat values are as follows:  $\beta$ -quartz (20-900°) =  $0.1794 + 0.001645(t-20^\circ) - 0.000000850(t-20^\circ)^2$ ; amorphous  $\text{SiO}_2$  (20-900°) =  $0.1782 - 0.000104(t-20^\circ) - 0.000000403(t-20^\circ)^2$ ; cryst quartz glass (20-900°) =  $0.1782 - 0.0001231(t-20^\circ) - 0.0000004937(t-20^\circ)^2$ ;  $\text{CaO}$  (99.94%)(20-900°) =  $0.1823 + 0.000087(t-20^\circ) - 0.000000366(t-20^\circ)^2$ ;  $\text{CaSiO}_3$  (20-900°) =  $0.1749 + 0.0001107(t-20^\circ) - 0.000000705(t-20^\circ)^2$ ; cryolite (12.81% Al, 30.02% Na, 53.45% F, 0.27%  $\text{SiO}_2$ , 0.04%  $\text{Fe}_2\text{O}_3$ , 0.85%  $\text{H}_2\text{O}$ )( $\alpha$  form)(20-565°) =  $0.2251 + 0.0001977(t-20^\circ) - 0.000001086(t-20^\circ)^2$ ; cryolite ( $\beta$  form)(565° m. p.) =  $0.2359 + 0.0001977(565-20^\circ) - 0.000001086(565-20^\circ)^2 + 0.000100(t-565^\circ)$ ;  $\text{NaCl}$  (20-800°) =  $0.2006 + 0.00007024(t-20^\circ) - 0.000000375(t-20^\circ)^2$ ;  $\text{Fe}$  (0.055% C, 0.023% S, 0.18% P, 0.39% Mn, 0% Si)( $\alpha$  form)(20-720°) =  $0.1060 + 0.00006003(t-20^\circ)$ ; hematite (1.19%  $\text{SiO}_2$ , 0.08%  $\text{H}_2\text{O}$ )(20-700°) =  $0.1514 + 0.0001239(t-20^\circ) - 0.000000577(t-20^\circ)^2$ ; magnetite (67.24%  $\text{Fe}_2\text{O}_3$ , 30.31%  $\text{FeO}$ , 1.31%  $\text{FeSiO}_3$ , 0.15%  $\text{CaSiO}_3$ , 0.94%  $\text{SiO}_2$ )(20-800°) =  $0.1487 + 0.000148(t-20^\circ) - 0.000000725(t-20^\circ)^2$ ; fayalite (97.84%  $\text{Fe}_2\text{SiO}_4$ , 0.54%  $\text{Fe}_3\text{O}_4$ , 0.50%  $\text{Al}_2\text{O}_3$ , 0.23%  $\text{MgO}$ , 0.64%  $\text{SiO}_2$ )(0-700°) =  $0.1447 + 0.0001407(t-20^\circ) - 0.000000700(t-20^\circ)^2$ . The values of av. sp. heats for  $\alpha$  quartz as detd. are 0.1911 at 96°, 0.2325 at 455° and 0.2330 at 503°. The heat of fusion for cryolite was detd. as 16.64 kg. cal./mol., and for  $\text{NaCl}$  as 7.41 kg. cal./mol. The heat of transformation from  $\alpha$  to  $\beta$  cryolite was detd. as 1.24 kg. cal./mol., and from  $\alpha$  to  $\beta$  Fe as 0.324 kg. cal./gr.-atom. C. H. LORIG

**The thermolysis of solid salts (Ludwig-Soret phenomenon).** H. REINHOLD. *Z. physik. Chem., Abt. A*, 141, 137-40(1929).—Mixed crystals of  $\text{CuI}$  and  $\text{AgI}$ , 25 and 75 mol. %, resp., show a concn. change of about 15 mol. % when subjected to a temp. difference of 100° from 200° to 300°. Also in *Z. Elektrochem.* 35, 627-31(1929).

F. D. ROSSINI



**Thermal data on organic compounds. V. A revision of the entropies and free energies of nineteen organic compounds.** GEORGE S. PARKS, KENNETH K. KELLEY AND HUGH M. HUFFMAN. *J. Am. Chem. Soc.* 51, 1969-73(1929); cf. *C. A.* 19, 1085, 2903; 20, 2444; 21, 693.—Values given in previous papers are revised so that the "accuracy . . . is now almost entirely limited by the accuracy of the heats of combustion involved."

**Thermodynamic studies of chemical change. II. Thermodynamic study of lead monoxide.** FUSAO ISHIKAWA AND EIICHI SHIBATA. *Science Repts. Tohoku Imp. Univ.* 1st Ser. 18, 109-19(1929). (In English.)—In the abstract from the Japanese of this paper (*C. A.* 22, 2101) the entropy should be given as 18.89 units, the dissocn. pressure as  $1.52 \times 10^{-66}$  atms.

M. A. DAHLEN

F. R. BICHOWSKY

Refractive index of Na vapor and width of D in absorption (KORFF) 3.

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### 3—SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

S. C. LIND

**Quantum laws and the uncertainty principle of Heisenberg.** G. N. LEWIS AND J. E. MAYER. *Proc. Natl. Acad. Sci.* 15, 127-39(1929).—Mathematical. H. L. D.

**Some modern developments of wave mechanics and their bearing on the understanding of crystal structure.** P. P. EWALD. *Trans. Faraday Soc.* 25, 402-9(1929).—The principles of at. structure and at. forces, which include the Schrodinger picture of the atom, Pauli's exclusion principle and electron spin, and the principle of energy shift by resonance and London-Heitler's application to exchange energy are reviewed and applied to the problems of chem. action and of crystal structure. H. W. WALKER

**A constant permitting a new classification of the atoms.** GEORGES FOURNIER. *Compt. rend.* 188, 1553-5(1929).—Neither  $N$ , the at. no. nor  $A$ , the at. wt., defines an atom.  $U = (3/4)(A - N)$  docs. From this it follows that  $A - N$  is the no. of nuclear electrons;  $A - 2N$ , the excess nuclear electrons on the periphery (Harkins' isotope no.);  $A/4$ , the " $\alpha$ -capacity," the loss of  $\alpha$ -particles in radioactive transformation; and  $(A/2) - N$ , the " $\beta$ -capacity."  $U$ , the "filiation capacity," is the sum of the last two. V. F. H.

**The relative masses of the proton, electron and the helium nucleus.** ENOS E. WITMER. *Nature* 124, 180-1(1929).—Through several equations  $e$  is proportional to the square root of mass. Further, the ratio between the proton and electron masses  $\rho = M/m$  is a pure no., which according to quantum considerations should be integral.  $\sqrt{\rho} = \sqrt{1847} = 43$  approx.  $= 1^2 + 2^2 + 2^2 + 3^2 + 3^2 + 4^2$ . Multiplying the right-

hand term by 2 gives the length of the successive periods of the periodic table. The relation between the mass of the He nucleus and that of the proton is also the square of an integer, 2. W. suggests that the He nucleus may be also an ultimate particle in which the identities of the protons and electrons have been lost. GREGG M. EVANS

**Some problems of cosmical physics, solved and unsolved.** LORD RAYLEIGH. *Science* 70, 77-84(1929).—An address. R. discusses the problems of the unknown lines in the nebular spectra, the green and red lines in the aurora, and their possible significance. Freeman's proposal of attributing the green line to argon is criticized. The excitation of these spectra is considered and the possibility of reproduction in the lab. Other points discussed are dark patches in nebulae, luminosity of comets (R. criticizes Zantra's view of this matter), metastable states of atoms, and elements of at. no. above 92. R. seems opposed to the proposal of the latter by Jeans as being the source of stellar energy. WILLIAM E. VAUGHAN

**The two quantum excited states of the hydrogen molecule.** E. C. KEMBLE AND C. ZENER. *Phys. Rev.* 33, 512-37(1929).—There are 16 possible wave functions for a pair of interacting H atoms which dissociate adiabatically into a normal H atom and a two quantum H atom. These wave functions give rise to 8 distinct *S* states and 4 distinct *P* states (the latter are degenerate in the fixed-nuclei problem). Those states may be divided into 4 groups of 3 according to the symmetry of the wave functions with respect to (a) an interchange of electron coordinates and (b) reflection in the plane which forms the perpendicular bisector of the internuclear axis. The principles of selection for transitions between these various types of electronic states are formulated. A first-order perturbation-theory computation of the potential energy curves for the *P* states shows that 2 of them have the form requisite for the formation of stable molecules. These 2 may be identified, resp., with the *C* state (upper level for Werner bands) and the  $2^3P$  state reported by Richardson. The agreement between the computed curves and the empirical data is fair. The computation shows that in the excited states of H the union of valence electrons to form sym. pairs is not the essential feature of mol. formation as London's (*C. A.* 22, 1531; 23, 758) original valence theory supposed. The rule that mol. formation is contingent on the removal of degeneracy from the wave functions of the interacting atoms seems to have a greater range of applicability than London's rule. The authors believe, however, that the latter is undoubtedly correct for a great variety of cases. BERNARD LEWIS

**Mean square angular momentum and diamagnetism of the normal hydrogen molecule.** J. H. VAN VLECK AND AMELIA FRANK. *Proc. Natl. Acad. Sci.* 15, 539-41(1929).—The nuclear field is not of central character in the H mol. since the 2 nuclei act as sep. attracting centers and there thus exists a torque upon the 2 electrons. The mean square electronic angular momentum is theoretically derived by using as the wave equation  $\psi = A(e^{-b(p_1 + q_1)} + e^{-b(p_2 + q_2)})$ . The treatment gives  $\overline{P^2} = 0.394 (h^2/4\pi^2)$ , somewhat less than half the square of a Bohr unit. The Pauli formula for diamagnetism is corrected by addn. of a second term for the summation over the various excited states. Calcn. gives  $-4.20 \times 10^{-6}$  as the diamagnetic susceptibility. WILLIAM E. VAUGHAN

**$\sigma$ -Type doubling and electron spin in the spectra of diatomic molecules.** J. H. VAN VLECK. *Phys. Rev.* 33, 467-506(1929).—The distortion due to mol. rotation causes the width of a spin multiplet to depend on *j*, and tends to uncouple the spin axis from quantization relative to the axis of figure, thus bringing about a gradual passage from Hund's case (a) to (b). Another rotational effect is "sigma-type doubling" of spectral lines due to removal of the degeneracy associated with the equality in energy of left- and right-handed axial rotations in stationary molecules. The paper treats these 2 effects, especially in their interrelation. V. first calculates the *perturbing matrix elements* due to the components of angular momentum perpendicular to the figure axis. Neglect of the relatively small sigma-doubling yields identically the formulas for the rotational distortion of spin multiplets which Hill and Van Vleck (*C. A.* 23, 34) obtained by a different method. Singlet *P* states should exhibit a sigma-doubling proportional to  $j(j+1)$  and *D* states ordinarily a negligible doubling. In doublet *P* states the spin profoundly modifies the sigma-doubling. In Hund's case (b) both spin components should exhibit equal doublings proportional to  $j_k(j_k+1)$  but in case (a) the  $P_{1/2}$  sigma-doubling should be negligible, but the  $P_{3/2}$  fairly large and proportional to  $j + 1/2$ . Formulas are developed for the sigma-doublet width which apply throughout the range between (a) and (b). The pronounced doubling of the  $P_{1/2}$  component in case (a) is due to a rather complicated superposition of the rotational distortion on the magnetic coupling between the components of spin and orbital angular momentum which are perpendicular to the axis of figure. A similar superposition explains the so-called "rho-type doubling" in doublet *S* states whereby levels like  $j_k$  but unlike  $j$  differ by small quantities proportional to  $j_k$ .

$1/2$ . In triplet  $P$  states for case (b) all 3 components should have equal doublings proportional to  $j_k(j_k + 1)$  but in (a) the  $P_0$  and  $P_1$  doublings should be, resp., independent of  $j$  and proportional to  $j(j + 1)$ , while  $P_2$  is negligible. A summary and comparison with exptl. data taken from a paper by Mulliken (see next abstr.) are given. There is a striking agreement between theory and expt. on the type of variation with  $j$  in the various multiplet components in case (a). The theoretical orders of abs. magnitude are also confirmed.

BERNARD LEWIS

**Electronic states and band spectrum structure in diatomic molecules. VIII. Some empirical relations in  $\sigma$ -type doubling.** ROBERT S. MULLIKEN. *Phys. Rev.* 33, 507–11(1929); cf. *C. A.* 23, 769. —Some of the empirical relations which exist in  $\sigma$ -type doubling are summarized. In particular, the magnitudes of the doublet intervals as a function of  $j$ , and in relation to  $\Delta E/B$  are considered. The observed relations, though very varied, are consistently in agreement with theoretical work of Van Vleck (preceding abstract). Van Vleck's work shows definitely that the  $^3P$  levels involved in the second positive  $N_2$  bands are both normal (not inverted).

BERNARD LEWIS

**The distribution of charge in the carbon atom.** G. W. BRINDLEY. *Proc. Leeds Phil. Lit. Soc. Sci. Sect.* 1, 402–11(1929). —In connection with the question of asymmetry of the  $C$  atom values of  $U(r)$ , radial density of charge for spherical distribution at a distance  $r$  from the nucleus, in electrons per atomic unit are calcd. for the free  $C$  atom (diamond) from the values for electrons 1, 2, and 2<sub>2</sub>. Comparison of total charge distribution for the atom with its radius shows considerable overlapping of the atoms. The  $F$  curve does not agree well with the exptl. curve of Ponte (cf. *C. A.* 21, 1058) most noticeably for large values of  $\sin \theta$ . This disagreement can hardly be due to distortion of the  $K$  or  $L$  electrons. Spectra between  $\sin \theta = 0.10$  and  $0.30$  will be most important in such investigations.

MARY E. LEAR

**An isotope of carbon, mass 13.** ARTHUR S. KING AND RAYMOND T. BIRGE. *Nature* 124, 127(1929). —A faint band about 7.5  $\mu$  U. to the red of the band  $\lambda$  4737 on plates where the latter band is strong, is attributed to an isotope of  $C$  of mass 13. Six individual lines within the band have been measured. Further evidence of the carbon isotope, mass 13. RAYMOND T. BIRGE. *Ibid.* 182–3. —Bands in Hopfield's absorption spectrogram of  $CO$  corresponding to  $C^{13}O^{16}$  have been identified. These were wide enough to have included a band  $C^{13}O^{18}$ , but sepn. was impossible. In King's furnace (emission) spectrogram of the  $\lambda$  3883  $CN$  band identification has been made of  $C^{13}N^{14}$  bands which are outside the limits of error for  $C^{12}N^{15}$  or  $C^{12}N^{16}$ . No other isotopic lines are observable, indicating the absence of  $N$  isotopes.

GREGG M. EVANS

**Note on structure of atomic nuclei.** M. F. SOONAWALA. Maharaja's Coll., Jaipur. *Indian J. Physics* 3, 489–92(1929). —A table and notes representing the formation of at. nuclei by synthesis from protons, electrons and rare-gas nuclei. W. E. V.

**Temperature coefficient of radioactive disintegration.** OSCAR KNEFLER. *Proc. Natl. Acad. Sci.* 15, 593–5(1929). —Assuming that an  $\alpha$ -particle assumes harmonic oscillations within the nucleus,  $R$  calcs. that the difference in energy of the "discrete" state of the  $\alpha$ -particle within the nucleus and of the next higher state is  $1.6 \times 10^{-7}$  ergs. By use of the Boltzmann expression the probability of the second state is found to be  $e^{-2} \times 10^5$ . The total rate of decompn. is of the order  $10^{20} \times e^{-2} \times 10^5$  per atom per sec. at  $5000^\circ$ . Conclusion: A single level is responsible for ordinary radioactive decompn. up to temps. of  $5000^\circ$ ; therefore no temp. coeff. is to be expected. This level is supposed to be very sharp. Similar reasoning may be applied to  $\beta$ -particle disintegrations.

WILLIAM F. VAUGHAN

**Thorium emanation.** JAN SĚBOR. *Chem. Listy* 22, 521–6(1928). —Expts. with  $Th(NO_3)_4$  solns indicate that the course of decompn. is a function of the accumulation time. As the accumulation time increases, the half-period time decreases. S. considers this to be due to an increased ionization caused by the deposits of the  $Tn$  during its accumulation.

FRANK MARESH

**Scattering of  $\alpha$ -rays by helium atoms.** WILLY HARDMEIER. *Helv. Phys. Acta* 1, 193–207(1928). —Theoretical. The scattering of  $\alpha$ -rays is calcd., by assuming that the nucleus as well as the  $\alpha$ -particle are polarizable. The results do not completely agree with the exptl. results of Rutherford and Chadwick. The polarizability of the  $He$  nucleus gives as vol  $1.6 \times 10^{-36} \text{ cm}^3$ .

EGON BRETSCHER

**Electronic charge  $e$ .** J. H. J. POOLE. *Nature* 123, 530(1929). —The possibility that a new value of  $\pi$  should be used in obtaining the value of  $hc/2\pi e^2$  is suggested (cf. Birge. *C. A.* 23, 4618; Bäcklin, *C. A.* 23, 4118).

B. C. A.

**Diffusion of cathode rays, of 100 volts velocity, in gaseous media.** O. HOLTZMANN. *Ann. Physik* 86, 214–40(1928). —True reflection of electrons (i. e., large angle deflection from the original line of travel) is found to occur in  $H$ ,  $N$ ,  $He$ ,  $Ne$  and  $A$ . An electron

suffering such reflection undergoes no loss in velocity. The true reflection masks the diffusion so that it was possible only in the case of N to det. the value of the "turbidity factor" in the absorption equation.

B. C. A.

**Equivalent heights of the atmospheric ionized regions in England and America.** E. V. APPLETON. *Nature* 123, 445(1929).

H. L. D.

**Ionization through electronic collision.** ARTUR VON HIPPEL. *Ann. physik* [4], 87, 1035-87(1928).—A theoretical discussion is given of the ionization of atoms by electronic collision on the basis of classical theory. An ionization function representing the probability of ionization taking place through a collision is deduced. Under certain limiting conditions this function for a single at. electron shows a max. at a collision-electron speed corresponding with double the ionization potential of the atom. Former exptl. methods are critically discussed and a new one is described. A stream of electrons of homogeneous velocity hits perpendicularly a stream of atoms; the ions formed are carried on with the stream of atoms and are sepd. from the non-ionized atoms by passage through a mass spectrograph. The deflected ray of ions is then collected on a suitable ion collector. Hg vapor has been examd. afresh by this method, and the existence of a max. of ionization yield for an electronic speed in the neighborhood of double the ionization voltage of Hg is demonstrated. The measured collision yield, however, at this max. is 8.3% compared with that predicted of 15%. A short description is given of a high-frequency method suitable for the qual. study of collision ionization and also for expts. with streams of ions.

B. C. A.

**The scattering of fast electrons by atomic nuclei.** N. F. MOTT. *Proc. Roy. Soc. (London)* A124, 425-42(1929).—Mathematical.

GREGG M. EVANS

**Metal analysis with electron waves.** E. RUPP. *Metallwirtschaft* 8, 446-8(1929), cf. C. A. 22, 3094.—Adopting the hypothesis that light waves possess corpuscular properties and corpuscles have wave properties and applying DeBroglie's quant. expression which equates the impulse of a body to the impulse of a wave and gives a wave length to an electron beam corresponding to the voltage, R. analyzes metal crystal surfaces with an electron stream. The electrons, produced at a hot wire in a high vacuum, impinge on a metal surface at a known angle and velocity and are reflected into a collecting tube. The layer of crystal particles of max. bending effect is given by the equation:  $V(1 - \sin^2 \alpha) = (150 n^2 / 4d^2) - E_0$ , where  $V$  is the volt-velocity of the electrons,  $E_0$  the inner lattice potential of the metal under analysis,  $d$  the interplanar crystal distance,  $\alpha$  the reflection angle and  $n$  a whole no. Cu, Ag and Au have been analyzed. The electron rays may be passed through a thin layer of many crystals and patterns resembling x-ray figures obtained on a photographic plate. The sp. crystal faces can be calcd. from the concentric reflection rings of the pattern.

H. W. WALKER

**A crucial experiment on the diffraction of electrons.** F. DACOS. *Bull. acad. roy. Belg* 15, 452-60(1929).—Using a slit formed between 2 beveled steel plates clamped in a V, D. has succeeded in obtaining electron diffraction similar to that obtained from crystals. Photographic plates, photometric curves and a diagram of the app. are reproduced.

GREGG M. EVANS

**The rate of formation of negative ions by electron attachment.** AUSTIN M. CRAVATH. *Phys. Rev.* 33, 605-13(1929).—By a new method the fraction  $h$  of the collisions between electrons and mols. which result in the attachment of the electron to form a negative ion has been measured in air and  $O_2$  as a function of the av. electron energy, the gas pressure and the moisture content. In  $O_2$   $h$  had a min. at 0.9 v. av. electron energy, and increased with either increase or decrease of the energy from this value. In air  $h$  increased as the av. electron energy was reduced below 0.9 v. The abs. value was about 0.4 of that predicted from the value in  $O_2$  by assuming simple additivity, but this difference is possible within the limits or error. The variation with electron energy and the order of magnitude of  $h$  are in agreement with Bailey's (C. A. 20, 11) results for air. On the other hand, a rapid increase in  $h$  with increase in pressure at const. electron energy was found at low energy, while Bailey's results show no variation with pressure. In  $H_2O$   $h$  is of the same order of magnitude as in  $O_2$  but in mixts. of  $H_2O$  and  $O_2$   $h$  is much larger than in either alone, showing that here the attachment process is complex. Evidence was found for the detachment of electrons from negative ions in  $O_2$  at very high fields.

BERNARD LEWIS

**Emission from oxide-coated filaments: a process phenomenon.** VERNON C. MACNABB. *J. Optical Soc. Am.* 19, 33-41(1929).—The different methods of producing oxide filaments of Ba and Sr differ only in degree. The fundamental underlying action of all methods is that the filament, to become emissive, must undergo a gaseous bombardment which presumably causes a breaking down of the higher oxides or compounds like the carbonates, to the lower oxides or the pure metal; and conversely the breaking

down must be caused by or accompanied by a gaseous discharge in order to produce an active filament. The gas most suitable for this action is best obtained from the filament, and is best produced from a carbonate that has not been reduced until put into a vacuum; the gas then liberated and used is probably  $\text{CO}_2$ . The baked-on coating acts merely as a mechanical bond. The core may be of a variety of material.

LOUIS WALDBAUER

**Dependence of electron emission from metals upon field strengths and temperatures.** ROBERT A. MILLIKAN AND CHARLES C. LAURITSEN. *Phys. Rev.* 33, 598-604 (1929).—The paper contains reasons for believing that field currents are independent of temp. only up to about  $100^\circ\text{K}$ . and that at that temp. the energy of thermal agitation begins to assist the fields appreciably in causing the escape of electrons through metals. The precise form of function describing this dependence is not accurately determinable exptly., but the form originally suggested by the authors fits the observed facts known thus far satisfactorily, no better, however than does the theoretical form suggested by Houston (*C. A.* 23, 4138).

BERNARD LEWIS

**Angular scattering of electrons in helium, neon, hydrogen and nitrogen.** G. P. HARNWELL. *Phys. Rev.* 33, 559-71 (1929); cf. *C. A.* 22, 3829.—An attempt was made to investigate in a qual. way the angular distribution of electrons scattered by a gas (He, Ne,  $\text{H}_2$  and  $\text{N}_2$  were used). The energy of the primary electron beam varied from 75 to 300 equiv. v. Those electrons which were scattered elastically were deflected in general through only a few degrees. In He fewer than  $1/1000$  of the 200-v. electrons were scattered through  $15^\circ$ . Electrons which had sustained an exciting collision were scattered through slightly larger angles. Evidence of electrons which had suffered 2 inelastic collisions was obtained; these were distributed through still larger angles. A general tendency for slower electrons to be scattered through larger angles was observable.

BERNARD LEWIS

**The motion of ions in constant fields.** LEIGH PAGE. *Phys. Rev.* 33, 553-8 (1929).—It is shown that the effect of a const. elec. or gravitational force  $F$  on ions passing through a const. magnetic field  $H$  is to cause the circular or helical ion paths to advance in a direction at right angles to both  $F$  and  $H$  with the const. velocity  $u = c[F \times H]/eH^2$ . Ions paths relative to a rotating earth are discussed on the assumption that the earth's field is purely magnetic relative to the inertial system of the center of the earth. The essential features of the theory are shown to be unaltered if the const. mass of the classical theory is replaced by the variable mass of the relativity theory.

BERNARD LEWIS

**Problem of the ionized hydrogen molecule.** C. Y. CHAO. *Proc. Natl. Acad. Sci.* 15, 558-65 (1929).—Mathematical; on the basis of the wave equation for  $\text{H}_2^+$ :  $(\partial^2\psi/\partial x^2) + (\partial^2\psi/\partial y^2) + (\partial^2\psi/\partial z^2) + (8\pi^2 m_e c^2/h^2)[E + (e^2/r_A) + (e^2/r_B)]\psi = 0$ . W. E. V.

**Luminous discharges in gas at low pressures.** HANS PETTERSSON. *Nature* 123, 978-9 (1929).—If the Lecher circuit previously employed for generating a luminous discharge in electrodeless tubes by elec. oscillations of high frequency (cf. *C. A.* 23, 2657) is exchanged for short coils, the luminosity is greatly increased. It is thus possible to make the discharge pass through narrow quartz capillaries and to realize a source of light suitable for spectrography with a min. quantity of the gas under examn. The luminosity is very intense with inert gases, especially with Ne. CO and  $\text{CO}_2$  are rapidly disso. by the oscillating discharge; this prevents the sepn. of their spectra by the flow method. CO excited when passing through a narrow capillary at the rate of 5 m. per second gives a deposit of C. Hydrocarbons from tap grease do the same. The deposit cannot be removed unless by passing O for a long time. If the discharge is made to pass through a tube contaminated in this manner, the O produced by disintegration of the quartz is largely converted into oxides of C which emit the white light erroneously ascribed to ozonized O in the previous communication. The red fluorescence of glass or quartz excited by the oscillation is probably due to excited mols. or ions of O, as is demonstrated by deflecting with a horse-shoe magnet the egg-shaped luminosity which is formed between the electrodes in a discharge tube of wider diameter contg. pure O at low pressure. With other gases, quartz fluoresces in the deep blue or violet, sometimes in the green, whereas the red fluorescence, corresponding to a band near  $620\mu\mu$ , is only observed with O at low pressure.

ALBERT L. HENNE

**Experimental studies on form and structure of sparks.** VI. Long sparks in organic vapors. T. TERADA, U. NAKAYA AND R. YAMAMOTO. *Sci. Papers Inst. Phys. Chem. Research (Tokyo)* 10, 271-90 (1929).—In general, halogen compds. require less than 0.5% added to air to transform zig-zag sparks to the smooth three-part type, Cl being most effective, I next, with little effect from Br up to 2.3%.  $\text{C}_2\text{H}_4$  produced a spark similar to a small-capacity spark in air, but alcs.,  $\text{Et}_2\text{O}$ , and  $\text{Me}_2\text{CO}$  have little effect.

The authors suggest that the formation of the smooth pos. or neg. part of a long spark is brought about by the formation of a pilot brush, which may be connected with the generation of soft x-rays at the electrode. Branches or gaps may be caused by local combustion.

GREGG M. EVANS

**The emission of anodic rays of sodium and chromium.** A. POIROT. *Compt. rend.* 189, 150-1(1929).—With pure  $\text{Na}_2\text{Cr}_2\text{O}_7$  the emission of the anodic rays is regular and stable. The emission starts suddenly below the m. p. of the salt. The anode is surrounded by a yellowish glimmer. The bundle of rays, conveniently directed, is faintly yellow. There is also an intense yellow spot on the cathode where it is hit by the anodic rays. The spectrum of the light from the cathode is formed by the arc spectra of Na and Cr. That of the light of the anode and between the anode and cathode shows the more intensive lines of Cr. No rays relative to O were observed.

E. SCHOTTE

**Effects of a crystallographic transformation on the photoelectric and thermionic emission from cobalt.** ALVIN B. CARDWELL. *Proc. Natl. Acad. Sci.* 15, 544-51 (1929).—A Co strip, hung inside a Mo receiving cylinder, the whole being encased in Pyrex, was thoroughly outgassed for 210 hrs. The thermionic and photoelec currents were measured by use of a Compton electrometer. Consistent results depended upon the completeness of outgassing. The temp. of the filament was detd. by use of an optical pyrometer and a Hg-quartz lamp served as illuminator. The heating current was gradually raised and the corresponding photoelec currents were measured; it was found that the sensitivity of undercooled Co (in face-centered cubic form) is greater than that of ordinary Co (in hexagonal close-packed). At higher temps. the 2 curves coincide. With decreasing temp., the trend of the curve is to a max. not reached on the increasing-temp. curve, followed by a drop to near coincidence. The max thermionic current was about  $1/10$  as strong as the max. photoelec. The curves are similar to those obtained for the photoelec. current. It is concluded that the thermionic work function is less for cubic Co than for hexagonal.

WILLIAM E. VAUGHAN

**The uranyl oxalate method of daylight photometry and its photoelectric standardization.** W. R. G. ATKINS AND H. H. POOLE. *Sci. Proc. Roy. Dublin Soc.* 19, 321-39 (1929).

E. J. C.

**Spectrophotometry in the ultra-violet.** F. H. GAGE. *J. Sci. Instruments* 6, 256-8(1929).—A simple app. is described for detg. the absorption of ultra-violet light by solids.

E. J. C.

**Longitudinal magnetic action upon bundles of slow electrons (concentration and periodic expansion).** JEAN THIBAUD. *J. phys. radium* 10, 161-76(1929).—See C. A. 23, 3156.

E. H.

**New x-ray effect.** C. V. RAMAN AND P. KRISHNAMURTI. *Nature* 124, 53 4 (1929).—The diffraction photographs obtained when the K radiation of Cu is scattered by graphite show a notable amt. of scattered radiation surrounding the primary beam, terminating abruptly at the first diffraction ring, and reappearing with smaller intensity between the first and second rings. The effect becomes more noticeable with increasing fineness of the graphite powder. This result is correlated with the fact that the diamagnetic susceptibility of graphite is several times greater than that of C in other forms, and it is suggested that the scattering may be due to the mobile electrons which give graphite its elec. cond.

W. W. STIFLER

**Energy measurement of x-rays.** FRIEDRICH VIERHEILER. *Contrib. estudio ciencias fis. mat. La Plata* 4, 185-96; *Chem Zentr.* 1928, 11, 126; cf C. A. 22, 2713.

C. R. FELLERS

**Measurement of absolute intensity of x-rays.** MAX STEENBECK. *Ann. Physik* [4], 87, 811-49(1928).—A method is described for the detn. of the abs. no. of quanta which pass in unit time through the area of cross-section of a beam of x-rays. The no. of quanta absorbed over a given track are counted as ions the rays being made to pass perpendicular to the lines of force of a homogeneous elec. field, and the resulting ions counted by means of a Geiger counter. It is necessary to ascertain the fraction of ions registered by the counter. The ionizing power of a monochromatic ray was measured and its intensity obtained in this way. For the formation of ionic doublets the necessary energies for Cu-K $\alpha$  and Cr-K $\alpha$  are practically the same, and are in agreement with other detns. The possible errors in the method are discussed.

B. C. A.

**Production and absorption of soft x-rays and secondary electrons.** ERIK RUBENBERG. *Proc. Roy. Soc. (London)* A121, 421-32(1928); cf C. A. 23, 29.—The work of several investigators is considered, and it has been calcd. that the no. of photoelectrons produced in a solid conductor by soft x-rays is of the same order of magnitude as the no. produced in gases by the same radiation. Also the no. of primary electrons inside the conductor is about 10 times the no. escaping from the surface. In the case of the pro

duction of secondary by primary electrons, it is suggested that the apparent loss in efficiency may be accounted for (1) by the absorption of slow electrons by the body in which they are produced, (2) by collisions which reduce the energy of the escaping electron and (3) by the fact that there may be slow electrons, the energy of which is not sufficient to overcome the surface field. Conclusion: All the energy of the bombarding electrons can be converted into that of secondary electrons within the target. The source of the secondary electrons has been considered and it is concluded that on the whole the evidence points to their origin as being the free electrons initially present in the conductor.

B. C. A.

**The intensity, sharpness and reproducibility of Debye-Scherrer lines.** H. MÖLLER AND A. REIS. *Trans. Faraday Soc.* 25, 386(1929).—The intensity distribution of each spectral line is dependent upon and deduced from the conditions of the expt. Two essentials are (1) a strictly parallel beam and (2) a detn. of whether the size of the line is limited by the size of the focal spot image or the aperture of the screen. The conditions for highest intensity and sharpest lines which are reproducible for all angles of diffraction have been worked out

H. W. WALKER

**The determination of particle size by the use of x-rays.** H. MARK. *Trans. Faraday Soc.* 25, 387-9(1929).—Equations for particle size detn. agreeing with expts. for the case of (1) parallel radiation and non-absorbing material and (2) a divergent x-ray beam and a transparent substance are discussed. A correction factor for absorbing substances is given. The difficulties of applying the distribution law of particle size are considered and favor is given the sym. law of the Gauss type rather than the Maxwellian distribution. A study of natural cellulose for knowledge of particle-size distribution is suggested.

H. W. WALKER

**Lattice determination in polycrystalline aggregates.** K. WEISSENBERG. *Trans. Faraday Soc.* 25, 391-2(1929).—Two methods for detg. the x-ray structure of org. compds. of high mol. wt. existing in polycryst. form have been worked out. In (1) a growth or deformation structure is obtained in which only a few distinct crystallite orientations occur in statistical preponderance and in (2) the interferences of the planes with the greatest spacing are strengthened by making the prepn. as long as possible (1 to 1.5 cm.) in the direction of the beam

H. W. WALKER

**X-ray absorption limits and the distribution of electrons round the atom.** B. B. RAY. *Indian J. Phys.* 3, 477-88(1929).—Kossel's view that the absorption edges or fine structure may be due to removal of electrons from inner to outer levels is treated and is considered to be a general phenomenon and not confined to atoms where a fine structure is observed. It is shown by examples that, in general, for similar compds. of different elements the sepn. of the *K* edge in the elementary atoms from that of the *K* edge in the compds. is approx. the same. Absorption and emission data are utilized to lend support to the Saha scheme in preference to that of Main-Smith and Stoner.

W. E. V.

**Nature of interference lines in x-ray diagrams of many crystalline materials.** I. H. MÖLLER AND A. REIS. *Z. physik. Chem.*, Aht A., 139, 425-38(1928).—The influence exerted by the nature of the cross-section of the powder rod on the interference lines obtained in x-ray photographs taken by the Debye-Scherrer method is examd. mathematically assuming that a parallel primary radiation is used. The shape, dimensions and absorption of the rod are considered and results are given for 3 different shapes—flat slab, wedge and cylinder. Weakening of intensity of the lines through increase in the coarseness of the particles is considered. II. *Ibid.*, Aht. B., 2, 317-39.—The relation of the effective width of the focus of the primary radiation and the variation of intensity across it to the character of the lines obtained in the Debye-Scherrer method of x-ray investigation, using non-parallel radiation, has been examd. theoretically. The various arrangements to secure sharpness and accuracy are described.

B. C. A.

**Diffraction of x-rays by two-dimensional crystal lattice.** W. L. BRAGG. *Nature* 124, 125(1929).—It is not necessary to postulate a 2-dimensional lattice to account for the arrangement of spots described by Linnik (*C. A.* 23, 4138) for mica. A rocking of the crystal  $6.5^\circ$  in every direction will bring other planes into position so that an equiv. effect is produced.

GREGG M. EVANS

**Scattering of x-rays by gases.** I. GERHARD HERZOG. *Helv. Phys. Acta* 2, 169-216(1929).—A new method to det. the scattering function is described. A finite beam of x-rays is used, a photographic plate being placed at a certain angle  $\varphi$  in the field covered with the scattered radiation. From the distribution of intensity on the plate, the scattering function for any angle  $\alpha$  may be obtained by differentiation with respect to  $\alpha$ . Argon has been studied, by means of  $\text{Cu}_\alpha$  radiation. The scattering function decreases monotonously with increasing scattering angle. II. *Ibid.* 217-56.—The scattering power of air,  $\text{H}_2$ , CO,  $\text{N}_2$ ,  $\text{C}_2\text{H}_2$ ,  $\text{C}_2\text{H}_4$ , A,  $\text{N}_2\text{O}$  and  $\text{CO}_2$  has been measured for various wave lengths at

a right angle to the incident beam. The method used was this of J. A. Crowther; 2 scattering chambers (one with air as standard) are irradiated with x-rays from the same tube; 2 ionization chambers are attached to the scattering chambers and connected to an Edelmann electrometer; the pressure in the scattering chambers is regulated so that zero position of the electrometer is obtained. The scattering coeff. increases with increasing wave length of the incident beam; mols with the same no. of electrons have different scattering coeffs.; the additivity rule of Crowther does not hold.

EGON BRETSCHER

**X-ray spectrography of alloys.** H. WEISS. *Bull. soc. chim.* [4], 43, 697-711 (1928).—A lecture.

H. L. D.

**A hot-cathode x-ray tube for use in spectroscopy.** C. J. SMITH. *J. Sci. Instruments* 6, 251-3 (1929).

E. J. C.

**Domain of the atom of bismuth in its crystal.** H. PERLITZ. *Sitzb. Naturforsch.-Ges. Univ. Tartu* 35, 113-20 (1928).—Theoretical. In cryst. Bi every atom has 6 neighbors in 2 triplets. The decrease of vol. at fusion suggests that the domains of atoms cannot intersect. From the distribution of the shared electrons it is inferred that the electrons of the outer completed shell, consisting of 2 sub-shells, occur in pairs, and that diams. of the inner and outer sub shells are equal to the shorter and longer inter-atomic distances and form the boundaries of  $\text{Bi}^+$  and  $\text{Bi}^{--}$ , resp. A distribution of electrons of the outer shell in vertices of 2 regular tetrahedra is indicated. The observed and calcd. rise of cond. at fusion are in good agreement, if it is assumed that the non-shared electrons in the crystal carry the elec. current, and that the shared electrons are liberated on melting.

B. C. A.

**Total reflection of x-rays from nickel films. II.** HIRAM W. EDWARDS. *Phys. Rev.* 33, 463-6 (1929).—The total reflection of x-rays ( $\lambda = 0.707 \text{ \AA. U.}$ ) is obtained from a series of thin Ni films of thickness varying from zero to  $2.05 \times 10^{-8} \text{ cm.}$  The films were sputtered upon thick Pt which was, in turn, sputtered upon a glass support. The crit. angle for each film was measured. The values of the crit. angle varied from 0.0040 radians (that of bare Pt) to 0.0034 radians. With the exception of an increase in the crit. angle (max. value of 0.0043 radians) for the thinnest films, the crit. angle decreased logarithmically with increasing thickness of the Ni film. The value obtained from the thickest film agrees with that calcd. by the Lorentz dispersion formula. These results together with those reported earlier (*C. A.* 23, 2099) seem to prove conclusively that the phenomenon of total reflection is not a purely surface phenomenon but is one which requires a layer of metal of definite thickness for the particular reflecting matter and wave length of radiation used. An explanation of the variation of the crit. angle with the thickness of the metal films is given. This is based upon the assumption that the contribution to the intensity of the reflected ray made by the deepest electrons will be effective only when the total length of the path of the radiation in the metal is not too great. The max. effective depth is that which reduces the intensity of the emerging radiation by absorption to a value less than that which may be detected in the reflected beam.

BERNARD LEWIS

**Soft x-ray levels of iron, cobalt, nickel and copper.** O. W. RICHARDSON and F. C. CHALKLIN. *Proc. Roy. Soc. (London)* A121, 218-36 (1928); cf. *C. A.* 22, 2712.—In a previous investigation of the excitation of soft x-rays from Fe, Co, N and Cu by the photoelec. method (*loc. cit.*), a considerable no. of discontinuities which had been detected were attributed to transitions from provisional  $X_1$  and  $X_2$  levels and a series of Rydberg terms. An attempt has now been made to arrange the remaining discontinuities which have been observed into the same scheme. Experimentally observed breaks are attributed to transitions from levels denoted by  $X_1$  and  $X_2$  to the  $b/n^2$  terms, so that there are now 4 initial states from which jumps can be made to the "b" series of terms. The values in v. of all the L and X levels for the 4 metals are tabulated, and the values of the square roots are plotted as a Moseley diagram against at. no. The L levels fall accurately on a straight line, in agreement with the view that this level is unaffected by the external atom-building. The  $X_1$ ,  $X_2$  and  $X_3$  levels are practically the same for each element, the slight variations shown being common to all these levels. The  $X_0$  level shows a variation very similar to the shape of the Moseley diagrams of the L and M levels when they are being completed. This may explain the constancy of the  $X_1$ ,  $X_2$  and  $X_3$  levels. If the no. of electrons in the  $X_0$  level increases by unity from element to element with increasing at. no., the approx. constancy of the factor  $b$  for all the virtual orbit levels  $b/n^2$  would be accounted for. Some of the soft x-ray level differences show a marked agreement with corresponding x-ray emission transitions. The value of the const.  $b$  corresponds in each case with an effective nuclear charge of 13.2e-13.2e. The case for the inclusion of Cu in the suggested scheme is not so definite as that for the other



metals. The  $L_{II}, III \rightarrow X_2$  transition and the  $X \rightarrow X$  transitions are absent, and other important differences are found. It was at first considered that the  $X$  levels were identical with the  $M$  levels, but evidence has since been obtained that the systems of levels here described are only parts of much larger systems, so that any assocn. between the  $X$  and  $M$  levels now appears to be highly improbable.

**Boundary of the solar chromosphere.** W. H. McCREA. *Nature* 123, 527-8(1929); cf. *C. A.* 23, 3626. B. C. A.

**Structure of the solar chromosphere.** L. D'AZAMBUJA. *Compt. rend.* 188, 773-5 (1929).—The granular structure of the monochromatic solar spectrographs has been examd. by simultaneous photography of the 2 couples of lines Ca 4227—Fe 4384 and Ca 4227—Fe 4202, but no appreciable difference in the form and distribution of the grains was detected, and the difference between the heights of the two Fe rays (1200 and 700 km., resp.) is apparently too small to affect them. A similar granulation was observed for the  $H_\alpha$  ray, which occurs at a higher level. B. C. A.

**Measurement of the strength of sunlight.** J. EWART MOSS AND ARTHUR W. KNAPP. *Analyst* 54, 334-5(1929).—A discussion of the precautions to be taken to det. the quantities of ultra-violet radiations by chem. tests. W. T. H.

**The possibility of observing an emission spectrum of the calcium substratum in the galaxy.** YNGVE ÖHMAN. *Nature*, 124, 179-80(1929).—Ö. concludes that because of interstellar Ca the forbidden doublet  $1s-1s$  may be present in emission in the spectrum of the night sky, but the  $H$  and  $K$  lines are not to be expected. GREGG M. EVANS

**Spectrography at the temperature of liquid air.** G. BECK. *Deut. Z. ges. gericht. Med.* 12, 1-4(1928).—A tube for the spectrographic examn. of alkaloid soln. at  $-180^\circ$  to  $-200^\circ$  is described, and the eutectics of mixts. of ether, Pr alc., pentane, methylocyclohexane and decahydronaphthalene have been examd. in order to select a suitable solvent. B. C. A.

**Spectral relation between certain isoelectronic systems and sequences.** I. Ca I, Sc II, Ti III, V IV and Cr V. H. E. WHITE. *Phys. Rev.* 33, 538-46(1929).—The neutral atoms of V and Cr contain 5 valence electrons,  $3d^4s^2$  and 6 valence electrons,  $3d^4s$ , resp. The removal of 3 electrons,  $3d^4s^2$ , from V and 4 electrons,  $3d^4s$ , from Cr yields 2 isoelectronic systems, V IV and Cr V, the lowest energy levels of which arise from the 2 remaining electrons,  $3d^2$ . The spectra from these 2 systems should resemble very closely the spectra of neutral Ca, singly ionized Sc and doubly ionized Ti. Extrapolation from the already known data of Ca I, Sc II and Ti III to V IV and Cr V have led to the identification of some 30 energy levels in both triply ionized V and quadruply ionized Cr. The strongest lines in these spectra arise from combinations between  $^2P$ ,  $^3D$ ,  $^3F$ ,  $^1P$ ,  $^1D$ ,  $^1F$  ( $3d4p$ ) and  $^3D$ ,  $^1D$  ( $3d4s$ ) and  $^1S$ ,  $^3P$ ,  $^1D$ ,  $^3F$ ,  $^1G$  ( $3d^2$ ). Following the irregular doublet law, the radiated frequencies resulting from transitions between the terms arising from  $3d4p$  and  $3d4s$  as well as from transitions between the terms arising from  $3d4d$  and  $3d4p$  in going from element to element are displaced to higher and higher frequencies by very nearly a const.-frequency interval. The combination of ordinary energy level diagrams with a Moseley diagram brings out interesting relations between the isoelectronic systems K I, Ca II, Sc III, Ti IV, V V and the isoelectronic systems Ca I, Sc II, Ti III, V IV and Cr V. The Moseley diagram and the irregular doublet law serve to det. the approx. positions of the various singlet and triplet levels as well as the approx. location in the spectrum of the radiated frequencies. The triplet term seps. follow fairly well the Landé interval rule. In general, Hund's rule is valid for low-lying terms in each spectrum; the  $^1D_2$  term arising from the electronic configuration  $3d4p$  lies deeper than the triplet terms. The ionization potentials, that is, the voltages necessary to remove the  $3d$  electron from the normal state  $^3F_4$  ( $3d^2$ ) of V IV and Cr V to the normal state  $^3D_3$  ( $3d$ ) of the once-more ionized atoms, are detd. at about 48.3 v. and 72.8 v., resp. BERNARD LEWIS

**Spectra of phosphorus and arsenic in the far ultra-violet.** Multiplets of As IV and As V. PAUL QUENEY. *Compt. rend.* 189, 158-9(1929).—For As IV and As V a table of the multiplets is given. E. SCHOTTE

**Abnormal broadening of spectral lines.** ALFRED W. PORTER. *Trans. Faraday Soc.* 25, 389-91(1929).—The causes for broadening of the spectral lines are discussed with emphasis given to the character of the illumination. Equations are given for the diffracted vibration and intensity which take into account a common phase difference between 2 illumination beams and values dependent upon the monochromator. H. W. WALKER

**Asymmetry in the radiation from the hydrogen atom in the electric field.** J. STARK. *Nature* 124, 125-6(1929).—There are emitted along the axis of the field, those components of the lines  $H_\alpha$ ,  $H_\beta$ ,  $H_\gamma$  and  $H_\delta$ , which appear electrically normally vi-

brating to the axis of the field when the axis of vision is normal to the axis of the field. Components displaced toward the red are emitted more intensely in the direction of the field; those displaced toward the violet are emitted more intensely in the direction opposite the field. This asymmetry is incompatible with the Bohr-Epstein-Kramers theory and the Sommerfeld theorem.

GREGG M. EVANS

**Refractive index of sodium vapor and width of D in absorption.** S. A. KORFF. *Phys. Rev.* 33, 584-8(1929).—Continuing the study by Stewart and Korff (*C. A.* 23, 767) of the  $n$  of Na vapor near the D lines, more accurate measurements are obtained. The variation of  $n$  is found to agree with the classical formula, within exptl. errors. Similarly, the relation of dispersion to the width of the D lines in absorption, measured visually, is found to agree with classical prediction. By these optical methods a value of the "radius" of the electron can be found. It is of the order  $10^{-13}$  cm. To det. a more exact value further study with a densitometer is necessary.

B. L.

**Variation in the intensities of mercury spectrum lines with pressure of the vapor.** JOHN G. FRAYNE AND CAROL G. MONTGOMERY. *Phys. Rev.* 33, 549-52(1929).—The relative intensities of spectrum lines of Hg vapor in the d. c. arc and at a pressure  $10^{-3}$  mm. in a high-frequency electrodeless discharge have been measured for wave lengths between  $\lambda 7000$  and  $\lambda 3000$ . There is a decided increase in intensity, relative to the triplet line  $\lambda 5460$ , of the singlet members in the low-pressure discharge, the sharp series showing the greatest increases. The relative intensity increases rapidly with ascending members of the series. Five new lines in the sharp singlet series were observed. Combination singlets appeared strong in the red in the low-pressure discharge. The first members of the triplet series do not show much change but the higher members show an increasing intensity at low pressure. Combination lines also show decided increase in the low-pressure discharge.

BERNARD LEWIS

**The spark spectrum of nickel (Ni II).** R. J. LANG. *Phys. Rev.* 33, 547-8(1929).—Twenty-six lines resulting from intercombinations between the low terms  $d^9\ ^2D_{3,1}$  and 11 more terms of the  $d^9p$  configuration  $b^1S'$ ,  $b^4P$ ,  $b^4D'$ ;  $c^2S'$ ,  $c^2P$ ,  $c^2D'$ ;  $b^2P$ ,  $b^2D'$ ,  $b^2F$ ;  $c^2F$ ;  $b^2G'$  have been classified. These lines lie between  $\lambda 1537$  A. U. and  $\lambda 1250$  A. U.

BERNARD LEWIS

**Wave lengths and atomic levels in the spectrum of the vacuum iron arc.** KEVIN BURNS AND FRANCIS M. WALTERS, JR. *Pub. Allegheny Observatory, Univ. Pittsburgh* 6, 159-211(1929).—Wave lengths of about 600 lines of Fe I, between 2800 A. U. and 8800 A. U. emitted by an arc *in vacuo*, have been measured by interference methods with a median accuracy of one part in 5,000,000. No wave lengths furnished the standards of reference. These new wave lengths have been used to calc. accurate values of the Fe I terms, which in turn have been employed to check the observations, on the basis of the combination principle, and to compute the wave lengths of about 1200 additional Fe I lines between 2100 A. U. and 9000 A. U. This work thus supplies a long-felt need for wave-length standards in the near ultra-violet. The observed and computed wave lengths and also the terms of Fe I are presented in detail in the tables.

C. C. KIESS

**An ultra-violet lead oxide band system.** SIDNEY BLOOMENTHAL. *Science* 69, 676-7(1929).—When Pb is excited in an arc or flame a system of bands is emitted with heads at 3209.2 A. U. (2,0), 3264.4 A. U. (1,0), 3320.7 A. U. (0,0), 3341.8 A. U. (1,1), 3401.9 A. U. (0,1), 3485.7 A. U. (0,2) and 3594.2 A. U. (1,4) the quantum nos. assigned being in ( ). These bands are attributed to PbO. This is supported by the fact that the isotope effect of 0.033 A. U. calcd. from the formula for the PbO system agrees with the value 0.037 A. U. found by direct measurement of the bands obtained first by using  $Pb_{206}$  and then  $Pb_{208}$ , 207, 206 in the light source.

C. C. KIESS

**Infra-red spectra.** ROBERT ROBERTSON. *Proc. Roy. Inst. Great Britain* (preprint), March 1, 1929, 7 pp; *Trans. Faraday Soc.*, Advance proof, 1929, Sec. III(c) No. 1, 6 pp.—An address.

C. C. KIESS

**Further investigations of the spectrum of ionized nitrogen (N II).** I. J. FREEMAN. *Proc. Roy. Soc. (London)*, A124, 654-67(1929).—The analysis of N II previously given (*C. A.* 21, 2224) is here extended to include the quintet-system terms which arise by adding  $s$ ,  $p$  and  $d$  electrons, resp., to the term  $^4P$  of N III. It is not possible to assign abs. values to these terms because the inter-system combinations have not yet been found. In addn. to these terms 2 new triplet terms,  $^3P$  and  $^3F$ , coming from the  $^4p$  and  $^4d$  electrons have been found. Altogether the new terms lead to classification of 75 more N II lines.

C. C. KIESS

**The structure of the high-pressure carbon bands and the Swan system.** R. C. JOHNSON AND R. K. ASUNDI. *Proc. Roy. Soc. (London)* A124, 668-88(1929).—New observations, with high dispersion, have been made of the "high-pressure" C bands, emitted by a discharge tube contg. CO at 20- to 40-mm. pressure and having at least 1

electrode of C. In addn. to the bands already known, 4 new and relatively faint ones in the ultra-violet have been found and 2 new ones in the deep red. These bands belong to a single progression given by the formula  $\nu = 29212 - (1627n'' - 11.7n'^2)$ , where  $n''$  is the vibrational quantum no. This progression shows a close relationship with the bands of the Swan system and it is apparent that the two-band systems have a common final electronic state which is the normal state of the  $C_2$  mol. A detailed study of the fine structure of the high-pressure bands (0.4), (0.5), (0.8) and (0.9) shows that they consist of  $P$  and  $R$  branches only and represent an electronic transition  $^3P \rightarrow ^1P$ . Application of the methods of Hund and Mulliken to the interpretation of data derived from the fine-structure analysis leads to the view that the structure of the  $C_2$  mol. in the initial state of the high-pressure bands is such as to produce a normal  $^3P$  level, whereas the ground state of the mol. gives an inverted  $^3P$  level. C. C. KIESS

The thermal excitation of atoms in the reversing layer of the sun. ALBRECHT UNSOLD. *Astrophys. J.* 69, 322-9(1929).—The method previously described (*C. A.* 22, 1277) is applied to det., from photometric measurements of the contours of a Fraunhofer line, the no. of atoms,  $N$ , in a particular state of excitation which lie above 1 sq. cm. of the photosphere, multiplied by  $f$ , the "oscillatory power" of the spectrum line corresponding to the excited state. The data thus obtained from  $Ca^+$  and  $Ba^+$  lines representing corresponding term combinations show that, for excitation potentials up to 1.7 v., Boltzmann's relation holds for the no. of atoms in a given stage of excitation or ionization for a state of thermal equil. C. C. KIESS

The spectrum of B. D. + 11° 4673. PAUL W. MERRILL. *Astrophys. J.* 69, 330-78 (1929).—In addn. to absorption lines the spectrum of the star B. D. + 11° 4673 contains the emission lines of H, He, Fe II, Al II, Al III, N II, Si I, Si II, Si III, Ti II, Cr II, Mg II, C II and Sc II. Of the Fe II lines some occur which represent not only the forbidden transitions between the low metastable states but also transitions for which  $\Delta j = 2$ . The bright lines are variable both in position and in intensity. At. phenomena thus occur in the star which it is as yet impossible to produce in the lab. C. C. KIESS

The absorption spectra of halogens and inter-halogen compounds in solution in carbon tetrachloride. A. F. GILLAM AND R. A. MORTON. *Proc. Roy. Soc. (London)* A124, 604-16(1929).—The absorption spectra of solns. in  $CCl_4$  of Cl, Br and I were measured spectrophotometrically to det. not only the absorption curves of the halogens but also of the compds. ICl, IBr, BrCl and of the less stable trichlorides and tribromides. The results obtained are presented in the tables and are shown by graphs. At the dilns. necessary to permit measurement of the absorption, dissocn. of the compds. occurred to some extent, barely detectable with ICl, small with IBr, but pronounced with BrCl. Solns. contg. halogens in the proportions necessary for the formation of the trichlorides or tribromides contained the monohalide and free halogen only. C. C. K.

The arc spectrum of chlorine and its structure. C. C. KIESS AND T. L. DEBRUIN. *Bur. Standards J. Research* 2, 1117-36(1929).—More than 200 wave lengths between 4000 Å. U. in the violet and 9900 Å. U. in the infra-red have been measured in the hitherto almost unknown arc spectrum of Cl. The light source was an uncondensed discharge in a Geissler tube contg. the gas at low pressure. Sixty-two percent of these lines, together with those observed by Turner in the Schumann region (*C. A.* 20, 2613), have been classified as members of the doublet- and quartet-series systems. Nine sets of series-forming terms, arising from  $^3P$  of the Cl ion, have been found. From them the distance between  $^3P_2$ , the base term of the neutral atom, and  $^3P_2$ , the lowest term of  $Cl^+$ , is found to be  $104991\text{ cm}^{-1}$ . This gives 12.96 v. as the ionization potential of neutral Cl. C. C. KIESS

Fine structure of the magnetic spectrum of  $\alpha$ -rays. S. ROSENBLUM. *Compt. rend* 188, 1549-50(1929).—The fine structure found for the  $\alpha$ -rays of Th C (*C. A.* 23, 4132) has not been found for Ra A, Ra C' and Th C' when studied by the same method. C. C. KIESS

The spectrum of carbon. DATTATRAYA SHRIDHAR JOG. *Indian J. Physics* 3, 451-61(1929); cf. *C. A.* 23, 2884.—New ultra-violet wave lengths of C between 1930 Å. U. and 2930 Å. U. have been observed in an arc excited with a heavy current. A few of these lines, together with some in the Schumann region observed by others, have been classified as members of the singlet and triplet systems and as inter-system combinations. C. C. KIESS

New bands in the spectrum of oxide of lanthanum. GIORGIO PICCARDI. *Nature* 124, 129(1929).—By a simple arrangement of the O-H flame P. was able to vaporize the oxide completely. The spectrum was photographed with a quartz spectrograph between  $\lambda 7000$  and  $\lambda 2400$  and shows groups of bands at  $\lambda\lambda 6540, 6154, 5866, 5600, 5380, 5178 (5058), 4582, 4543, 4531, 4418, 4372, 4357, 3708, 3671, 3620, 3612, 3566$ . The

groups between  $\lambda 6540$  and  $\lambda 5058$  are composed of double-headed bands, the sepn. of the heads decreasing with the wave length.

GREGG M. EVANS

**Band spectra of mercury, cadmium and zinc halides.** K. WIELAND. *Helv. Phys. Acta* 2, 46-64(1929).—Photographs of the band spectra of the chlorides, bromides and iodides of Zn, Cd and Hg in the region from 7000 Å. U. to 2000 Å. U. are obtained. In the ultra-violet region sharp edges are observed. Some of these follow the rule of Deslandres (mols. with 2 atoms). The isotope effect is observed for  $\text{HgCl}^{18}$  and  $\text{HgCl}^{17}$ ,  $\text{HgBr}^{79}$  and  $\text{HgBr}^{81}$ .

EGON BRETSCHER

**Optical studies on the mercury atom.** MARCEL SCHEIN. *Helv. Phys. Acta* 2, Supplement 1-114(1929); cf. *C. A.* 22, 1541.—(1) *The hyperfine structure of line 2536.7 Å. U. of Hg* is studied. Light from a Hg-resonance lamp (Wood) is allowed to fall on a second one which is placed in a magnetic field (up to 18,000 gauss); the light scattered at right angles to the incident beam of the second lamp shows periodic changes in intensity with increasing strength of field. A max. of intensity is obtained when the wavelength shift, due to the magnetic field, corresponds to the difference of wave length of the lines of the fine structure (Resonanzkurvenmethode). The intensity of the light is detd. by means of a photoelec. cell, whose sensitivity is increased by using a valve amplifier. Line 2536.7 Å. U. consists of 5 lines, placed at a distance of about 0.01 Å. U. from each other (agreement with Wood); analogous results were obtained by studying the absorption instead of emission. No Paschen-Back effect could be found. The *intensity distribution* of line 2537 Å. U. is compared with the calcd. value (based on the Doppler effect); the agreement is only qual. (2) *The Stark effect of the Hg-resonance line* is measured by further refinement of the resonance curve method; a change of  $7.65 \times 10^{-6}$  Å. U. of wave length can be detected; the shift of wave length of the resonance line amounts to  $5.4 \times 10^{-4}$  Å. U. in a field of  $10^5$  v./cm. Expts. with crossed and parallel magnetic and elec. fields combined are described, for details see original. (3) *Doppler effect and thermal velocity of Hg atoms.* The above outlined method is applied to det. the distribution of the mol. velocity. There is approx. agreement with idealized calcn.

EGON BRETSCHER

**Infra-red investigations of molecular structure. I. Apparatus and technic.** C. P. SNOW AND A. M. TAYLOR. *Proc. Roy. Soc. (London)* A124, 442-52(1929).—A rock-salt prism is used to segregate a frequency band of less than one octave. This band is then analyzed by means of a grating. With this app., evidence of fine structure in the CO 4.66 $\mu$  band has been obtained. Very exact details are given. II. *The molecule of nitric oxide.* C. P. SNOW, F. I. G. RAWLINS AND E. K. RIDEAL. *Ibid* 453-64. The vibration-rotation band spectrum of NO is shown to be a fundamental, with its center at 1882.9  $\text{cm}^{-1}$ ,  $n' = \frac{1}{2}$ , with the fine structure consisting of *P*, *Q* and *R* branches with at least 42 rotation bands in each of the *P* and *R* branches. No overtone ( $n' = \frac{3}{2}$ ) was found. The mol. consts. derived from the sepn. of the fine-structure bands ( $3.35 \text{ cm}^{-1}$ ) correspond almost exactly with those obtained from electronic band spectral data.

GREGG M. EVANS

**A new ultra-violet band spectrum of hydrogen chloride.** BROOKS A. BRICE AND F. A. JENKINS. *Nature* 123, 944(1929).—Photographs have been taken of an extended band system in the region  $\lambda 2830$ -3966 from a low-pressure discharge in pure HCl gas with Pt electrodes. The bands are degraded toward long wave lengths, and have the characteristic widely spaced structure always observed in hydride spectra. A discharge in H gives the same band system if a small amt. of AgCl or CuCl is fused on the electrodes but not if AgBr is used. There is thus strong evidence that this spectrum is due to HCl. The emitter is probably the singly charged HCl ion. Because of the unusual intensity distribution, it has not been possible to reach an assignment of vibrational quantum nos. and thus to det. the electronic frequency. The bands occur in pairs of const. sepn., indicating that a doublet electronic level is involved. The 2 components of a pair have about equal intensities. The wave nos. of the band heads may be represented by  $\nu = \frac{28446}{27778} \left\{ + 1561 p - 30.3 p^2 - 2573 n, \text{ observed values of } (p,n) \text{ being } (-1,0)?, (0,1), (3,1)?, (0,0), (1,0), (2,0), (3,0), (4,0), (5,0). \right.$  The pair (0,0) at  $\lambda 3514, 3598$  is the strongest, and the 5 succeeding pairs have regularly decreasing intensity. They apparently form a progression with a common vibrational quantum no. in the lower state.

ALBERT L. HENNE

**The ultra-violet absorption spectra of *o*-, *m*- and *p*-cresols.** JEAN SAVARD. *Compt. rend.* 188, 782-3(1929).—The vapor spectra of *o*-, *m*- and *p*-cresols present the same differences as shown in the dihalogen derivs. by Henri and Errera. The electronic energy decreases as one passes from *o*, to *m*, to *p*. The *o* and *m* have 2 states of activa-

tion but the  $p$  has only one. A formula is given for the absorption spectra and data are included on the 3 cresols, phenol, toluene and benzene. WALLACE R. BRODE

The absorption spectra of rubrene and of its derivatives. ANTOINE WILLEMART. *Compt. rend.* 188, 988–90 (1929).—Rubrene and its di-Me and dibenzo derivs. present a similar absorption spectrum with 3 sharp bands at 4650, 4950 and 5300 Å. U.

Absorption spectrum of liquid benzene: a criticism of a paper bearing this title by Barnes and Fulweiler. JOSEPH W. ELLIS. *Phys. Rev.* 33, 625–6 (1929).—It is shown that the assumption of Barnes and Fulweiler (*C. A.* 23, 769) of a const. amplitude of vibration for all stationary states of an anharmonic oscillator is theoretically unsound. It is also pointed out that the precision of these authors' measurements on 4 bands in the visible and near infra-red absorption spectra of liquid benzene cannot be used as a test for the superiority of the new wave mechanics over the classical quantum theory. Reply. JAMES BARNES. *Ibid* 627. WALLACE R. BRODE

Spectrophotometric study of micas. T. YOSHIMURA. *Suppl. Sci. Papers Inst. Phys. Chem. Research (Tokyo)* 11, No. 11, 1–4 (1929).—Tables of extinction coeffs. and certain other optical properties for some Japanese micas are given. The Lambert law does not hold for mica flakes. Since no characteristic bands appear which might be due to absorbing mols. it is concluded that the color is due to colloidal particles. G. M. E. BERNARD LEWIS

Some experiments on the Raman effect of liquids. R. BÄR. *Helv. Phys. Acta* 2, 154–6 (1929).—A lecture. The original method of Raman and the modification of Wood are combined in order to be able to use polarized light and to insert filters. A 100-cm. long and 3-cm. wide tube, contg. the liquid to be investigated is closed at one end with a glass window. Through  $\frac{1}{2}$  of this window the liquid is irradiated. The modified radiation leaving the tube through the other half of the window is deflected by a mirror placed at  $45^\circ$  to the axis of the tube and is led to the spectroscope. No new effects have been detected; the continuous ground usually found on Raman spectrograms is shown to be due to fluorescence. EGON BRETSCHER

The Raman spectra of sulfuric acid and the sulfates. S. K. MUKHERJEE AND P. N. SENGUPTA. *Indian J. Physics* 3, 503–5 (1929).— $\text{MgSO}_4$ ,  $\text{Na}_2\text{SO}_4$  and  $\text{CuSO}_4$ , when excited by the Hg lines 4358 Å. U. and 4046 Å. U., give scattered lines of wave lengths 4552 Å. U. and 4213 Å. U., resp. These correspond to an infra-red absorption band at  $10.2\mu$ , whereas the observed infra-red absorption of sulfates is at  $9.2\mu$ . For  $\text{H}_2\text{SO}_4$  5 scattered lines were observed, corresponding to infra-red absorption bands at  $4.68\mu$ ,  $11.01\mu$ ,  $17.9\mu$  and  $18.4\mu$ . Observed bands of  $\text{H}_2\text{SO}_4$  lie at  $8.6\mu$ ,  $9.55\mu$ ,  $10.4\mu$  and  $11.35\mu$ . The  $4.68$  and  $9.55$  bands are regarded as harmonics of the fundamental at  $18\mu$ . C. C. KIESS

The spectrum of trebly ionized thallium (Tl IV). P. PATTABHIRAMIAH. *Indian J. Physics* 3, 523–9 (1929).—The application of the regular doublet law to the spectra Au II and Hg III has led to the analysis of Tl IV, trebly ionized Tl being isoelectronic with singly ionized Au and doubly ionized Hg. The classified lines lie between 1030 Å. U. and 2026 Å. U. in the far ultra-violet and represent combinations of  $P$ ,  $D$  and  $F$  terms of the singlet and triplet systems. C. C. KIESS

Series spectrum of Se IV. P. PATTABHIRAMIAH AND A. S. RAO. *Indian J. Physics* 3, 531–5 (1929).—A table of classified lines is presented representing combinations between the doublet terms of Se IV. Trebly ionized Se is isoelectronic with neutral Ga, singly ionized Ge and doubly ionized As. A comparison is made of the common spectral structures of these 4 similar at systems. C. C. KIESS

Chemiluminescence of aminophthalic hydrazide. HERBERT O. ALBRECHT. *Z. physik. Chem.* 135, 321–30 (1928).—The strong chemiluminescence observed when 3-aminophthalic hydrazide and its diacetyl deriv. are oxidized in alk. soln. has been investigated. Most oxidizing agents which may be used in alk. soln. are active, especially hypochlorites and ferricyanides. The action of  $\text{H}_2\text{O}_2$  alone is feeble, but the max. effect is obtained with a mixt. of  $\text{H}_2\text{O}_2$  and hypochlorite or ferricyanide. The luminescence is visible even at concns. of  $10^{-8} M$ . Of the various cyclohydrazides and hydrazine derivs. investigated, only those related in some manner to phthalic acid exhibit this highly developed luminescence. B. C. A.

Theory of sensitized fluorescence. A. CARELLI. *Atti accad. Lincei* [vi], 8, 495–500 (1928).—A mathematical treatment based on wave mechanics. H. G.

Technic of fluorescence analysis. MAX HAITINGER AND VIKTOR REICH. *Chem. Fabrik* 1929, 379–80.—Description of an app. which permits ultra-violet rays to fall only vertically on the surface of liquids, the concns. of which are measured by the depth of penetration of the rays. Cf. *C. A.* 20, 3827; 22, 2291. J. H. MOORE

Fluorescence and infra-red absorption. V. POSEPAL. *Compt. rend.* 189, 159–61 (1929); cf. *C. A.* 23, 2659.—A general theory is developed from the earlier findings.

Applied to Na an exptl. verification is obtained for the formulas of Haber and Liebermann for the infra-red absorption. E. SCHOTTE

**The cause of the after-glow of calcium tungstate.** ARTHUR SCHLEEDÉ AND TIEN HUAN TSAO. *Ber.* 62B, 763-8(1929).—Ca tungstate has been prepd. from  $\text{WO}_3$  and from  $\text{NH}_4$  tungstate and  $\text{CaCl}_2$ . In every case investigated, the after-glow could be referred to the presence of traces of As. Recrystn. is the best method of purification. ALBERT L. HENNE

**The phosphorescence of beryllium sulfide and a device for the analysis of luminescence specially suitable for weakly luminous preparations.** ERICH TIEDE AND FRIEDA GOLDSCHMIDT. *Ber.* 62B, 758-62(1929).—Be sulfide has been prepd. by treating the chloride with pure  $\text{H}_2\text{S}$  at  $900^\circ$ . The chloride had been obtained in a very pure state from the oxide, cane sugar C and Cl or HCl, and resublimed several times. The phosphors prepd. with that material exhibited no phosphorescence even after a strong irradiation with an Fe arc. Traces of Sb or Bi caused the appearance of a weak yellowish or purple phosphorescence. Traces of other elements were without effect. Phosphors have also been prepd. with a Be sulfide batch obtained by heating the metal with S vapors in a H current at  $1000$ – $1300^\circ$ ; they exhibited a weak blue phosphorescence, even without addn. of NaCl or traces of metals. The phosphorescence was attributed to traces of Fe which were present in the metallic Be used as starting point. Further addns. of Fe did not modify the phosphorescence and this is in good agreement that only traces of a metal are required to exhalt the phosphorescence. Addns. of Sb or Bi were rendered impossible by the fact that those elements distil off at the temp. used to prep. the phosphors. Details are given of a simple app. which was used very successfully to study the weak phosphorescence of small quantities of materials. ALBERT L. HENNE

**Chemical studies of synthetic galena as a radio detector. I. Metallographical observation of the synthetic crystals.** WAKASABURO OGAWA. *J. Soc. Chem. Ind. (Japan)* 31, 476-80(1928); Suppl. Binding 31, 115-6B(1928).—Synthetic galena contg. some  $\text{Ag}_2\text{S}$  is a good radio detector. Such crystals contain Ag particles, which are seen as white brilliant spots on the polished and etched surface under the microscope. The content of Ag particles increases with the increasing content of  $\text{Ag}_2\text{S}$  in the crystal up to 10%, and then decreases. The sensitivity of the synthetic galena increases with the increasing content of  $\text{Ag}_2\text{S}$  up to 10% and then decreases. From this parallelism, the Ag particles are supposed to play an important role in the detector action. **II. Activation of galena by metallic silver and its compounds.** *Ibid* 481-6; 116-8B. Sensitive galena is obtainable by incorporating a suitable amt. of Ag in galena (1) by heating a mixt. of Ag and PbS, (2) by fusing a mixt. of PbS with an easily reducible Ag compd. such as nitrate, oxide, etc., (3) by heating PbS crystals imbedded in Ag powder or easily reducible Ag compd. to a temp. below the m. p. of Ag, say  $500^\circ$ , (4) by heating during 2 hrs. at  $800^\circ$  Ag-plated galena (by immersion in 0.1 N  $\text{AgNO}_3$ ), (5) by heating a mixt. of powd. galena with Ag powder or easily reducible Ag compd. compressed in a mold at its sintering temp. ( $700$ – $800^\circ$ ) for 1-2 hrs., or (6) by heating a molded mixt. of powd. galena with  $\text{AgNO}_3$  soln. at its sintering temp. for 2 hrs. **III. Activation of galena by various elements and compounds.** *Ibid* 486-90; 118-20B. S activates galena when treated at high temp., say  $800^\circ$ . Tl compds. are also effective. The salts of all the alkali metals, Fe, Al, Zr and many rare earth compds. have a remarkable effect. Ba, Hg, Zn, Th, As, Sb, Cr, Mo, U and Mn salts appear to have some activating effect. Anions seem to have no important effect except halogens which are decidedly injurious. **IV-VI.** *Ibid* 553-69; 135-40B. **IV. Rectifying properties of synthetic galena.**—The d. c. characteristic curves for the synthetic galena of various Ag contents are given. The contact pressure between Pt needle and synthetic galena must be small, in a certain limit, to get a good sensitivity. Although a heavier contact increases the current in the rectifying direction (from crystal to needle), it also increases the current in the opposite direction, resulting in a decreased rectification. The current in the rectifying direction for a given voltage was smaller in a more sensitive crystal, which shows that the improvement of sensitivity by Ag is not caused by an increase of current in the rectifying direction, but must be due to a decrease of current in the opposite direction. **V. Direction of the rectified current.**—The direction of rectification is primarily detd. by the chem. compns. of substances which constitute the contact part. O. obtained the following series, of which, if any 2 crystals are coupled, the rectified current will flow from the former in the order to the latter in the order: Argentiferous galena, Carborundum A, Si, Te, Ni, bornite, chalcopryrite, pyrite, Carborundum B, zincite. The order may be modified by impurities and by a phys. change of surface. **VI. Electrical conductivity.**—The sp. resistance ( $x$ ) at  $t^\circ$  between  $20^\circ$  and  $150^\circ$  for galena contg. various amts. of Ag was measured, and exptl. formulas of the form  $x = a(1 + bt)$ ,  $a$  and  $b$  being consts., were

made. VII-IX. *Ibid* 711-27; 169-74B. VII. Thermoelectrical properties.—The thermoelec. e. m. fs. of synthetic galena as well as other minerals commonly used as detectors were measured against Cu between 0° and 25°. E. m. fs. in  $\mu$ v. were 13,000 for Fe pyrite A, 12,850 Si, 10,000 bornite, 6650 Te, —1000 smaltite, —5400 pyrite C, —5700 galena IV, —6500 for galena III, 5250 synthetic galena contg. 7.5% Ag<sub>2</sub>S, —8500 Fe pyrite B, —10,500 for chalcopyrite, —16,000 zincite, —34,500 molybdenite at the hot junction. The pos. sign denotes that current flows from Cu into mineral at the hot junction. One mineral cut in two, and the two parts brought into contact with each other showed a thermoelec. power which depended on their form at the contact. VIII. A theory of crystal detector.—The rectification by a crystal detector is caused by difference of electron affinity, and is due to the difference between nos. of electrons emitted from each electrode. A good detector must have 3 important properties, namely, proper degree of contact, a large difference of electron emission, between the two substances, and proper elec. resistance to minimize metallic conduction through the contact point, but not so much as to retard the conduction in the materials in contact themselves. IX. A confirmation of the theory.—By using vacuum tube with two electrodes, not in direct contact, of such metals and crystals as are used in the detector, a c. was rectified at ordinary temp. by cold electron emission. From the direction of the rectified current, O. obtained for the increasing electron emissibility in the following order: Most sensitive natural galena, synthetic galena (5% Ag), Si, Pt, Ag, synthetic galena (2.5% Ag), Cu, Sn, CuO, Sb, German silver, Bi, brass, Pb, Cd, Fe pyrite, Al, Mg. Synthetic galena activated by impregnating with LiNO<sub>3</sub>, Na<sub>2</sub>SO<sub>4</sub>, TiNO<sub>3</sub>, FeSO<sub>4</sub>, Ba(NO<sub>3</sub>)<sub>2</sub> and Zr(NO<sub>3</sub>)<sub>2</sub> were nobler than Ag, and these impregnated with Cu(NO<sub>3</sub>)<sub>2</sub>, Sb and As comp., and Ca(NO<sub>3</sub>)<sub>2</sub> were between Cu and Fe. S. OKA

Analysis by x-ray spectroscopy (EDDY, *et al.*) 7. Influence of radioactivity of water on the biological and biochemical action of the cells of lower and higher organisms (STOKLASA) 14. The heats of dissociation of the molecules CH, NH, OH and HF (VILLARS) 2. The electronic interpretation of oxidation and reduction (NOYES) 2. The photographic effect produced by sterols after exposure to ultra-violet rays (CLUZET, KOFMAN) 11A. The photochemical activity of various sterols and the nature of their action (HUGOUNENQ, COUTURE) 11A. A spherical high-pressure ionization chamber (BROXON) 1. Radiation in connection with essential oils and perfumery chemicals (MORTON) 17. Hg-vapor lamp for producing ultra-violet rays for treating food, etc. (Brit. pat. 305,758) 4. Electric heater and ultra-violet ray apparatus combined (Brit. pat. 305,788) 4. Chemical effects of semi-corona discharge in gaseous hydrocarbons (LIND, GLOCKLER) 10. Comparative stability of isomers in relation to their absorption spectra [aromatic allyl and isallyl derivatives] (RAMART-LUCAS, AMAGAT) 10. Comparative stability of isomers in relation to their absorption spectra [dehydration of glycols, isomerization of oxides of ethylene] (RAMART-LUCAS, SALMON-LEGAGNEUR) 10.

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Emanation apparatus for radium. LEONHARD BLUMER. Swiss 132,328, Mar. 20, 1928.

#### 4—ELECTROCHEMISTRY

COLIN G. FINK

How electricity does things. Fifth Faraday lecture. LLEWELYN B. ATKINSON. *J. Inst. Elec. Eng.* (London) 67, 937-46(1929).—Historical. C. G. F.

The development of the electrochemical industries. ANON. *J. four élec.* 38, 257-9(1929).—A review with particular reference to developments in Germany. C. G. F.

Electrometallurgy in Sweden. OTAKAR WEBER. *Chem. Listy* 22, 101-5(1928).—Two elec. furnaces are described: (1) steel furnace and (2) furnace for melting cast iron. Detailed diagrams are included. FRANK MARRESH

Muscle Shoals relative to conservation (ammonia). FARLEY G. CLARK. *Trans.*

*Am. Electrochem. Soc.* 56 (preprint) 6 pp.(1929).—The Muscle Shoals plant is practically idle today. As a power site it is as yet unimportant. The 8 installed elec. generators will deliver 215,000 kw. at full head, and probably 70,000 kw. at extreme low water. Based on government data the cost of the first 80,000 kw., primary power, will be around \$50 per kw. yr. To compete with synthetic  $\text{NH}_3$  plants elsewhere the primary power cost will have to be about \$25 per kw. yr. It appears practical to utilize surplus or secondary power, free of cost, for the electrolytic generation of  $\text{H}_2$  and to supply this gas to a synthetic  $\text{NH}_3$  plant. A continuous plant of a private company would thus produce  $\text{NH}_3$  at \$97.83 per ton of fixed N, and an intermittent plant at \$83.67 per ton, assuming \$25 per kw. yr. for primary and no charge for secondary power. With govt. costs for capital, the secondary power plant could deliver  $\text{NH}_3$  at \$59.23 instead of \$83.67 per ton of fixed N. C. G. F.

**Electrothermal manufacture of ferro-silicon-manganese.** K. TH. KÜRTEN. *Zentr. Hütten- u. Walzwerke* 32, 281-3; *Chem. Zentr.* 1928, II, 1028; cf. C. A. 23, 3428.—The compn. of Fe-Si-Mn varies within wide limits. The following alloys are the most usual ones: Mn %, 48-52, 60-65, 70-75, 80-85; Si %, 20-25, 25, 23, 10-15. The C content varies between 0.5 and 1%. The P content should not exceed 0.1% and the S content 0.05%. With a Si content of over 25%, decompn. phenomena occur unless the alloys are very poor in P. Fe-Si-Mn alloys are manufd. in the elec. furnace by reduction of the natural Mn silicate, rhodonite ( $\text{MnSiO}_3$ ) or by reduction of oxidized manganese ores with addn. of  $\text{SiO}_2$  in form of quartz, etc. The Mn yield is higher than with the manuf. of ferro-manganese. A voltage of 35-55 v. and a c. d. of 2-4 amp. per sq. cm. are used. Practical examples are given including the compn. of furnace charges, yields, etc. G. SCHWOCH

**Economies of firing stained glass electrically.** P. N. RUGG. *Elec. World* 94, 377-8(1929).—A 15-kw 220-v. box type elec. furnace permits firing of 1.9 sq. ft. (0.177 sq. m.) of glass per kw. hr. with improved quality and a min. of rejects. The hearth area is 12 in.  $\times$  24 in. (0.305 m.  $\times$  0.61 m.) and a door opening of 11 in. (0.28 m.). The max. temp. used is 649° for this work. A second chamber at one side of the kiln preheats the glass to about 315° before charging into the kiln. Annealing is done in an adjoining cooling chamber, which is equipped with ten 500-w. strip heaters operating on 220 v. Five of these strip heaters are in the preheating section and 5 in the cooling section. Five snap switches afford easy adjustment of chamber temps. W. H. B.

**Lead alloys for anodes in electrolytic production of zinc of high purity.** U. C. TANTON, A. G. TAYLOR AND H. P. EHRLINGER. *Am. Inst. Mining Met. Eng., Tech. Pub.* No. 221, 12 pp.(1929).—A research purporting to overcome the difficulties encountered in the use of pure Pb anodes. These include: disintegration under electrolysis; part of the Pb goes to the cathode, lowering the purity of the deposited Zn and decreasing the  $\text{H}_2$  overvoltage; the remainder of the Pb from the disintegration of the anode goes into the  $\text{MnO}_2$ , rendering it unsalable as a by-product; the plain Pb anodes tend to bend and buckle during electrolysis, because of intercryst. oxidation. Elements tried alloyed with Pb were: As, Sb, Ba, Bi, Ca, Ce, Cu, Hg, Ag, Th and Sn. The Pb-Ag series contg. no free Ag, *i. e.*, at or below the eutectic of 2.6% Ag, proved so much superior to the other alloys tried that results are confined in this paper to an alloy contg. 1% Ag and 99% Pb. Results comparing pure Pb and this alloy as anode, and with different electrode spacing and with various addn. agents, are given. Finally, 2 lb. (0.917 kg.)  $\text{SiO}_2$  and 2 lb. gum arabic were used as addn. agent continuously in the plant. Over a month's operation, terminal voltage and current efficiency were 3.37 and 91.5, resp., and the Pb in the Zn was 0.004%. Among a no. of ternary alloys contg. Pb-Ag and another element some advantage was found in Pb-Ag-As and Pb-Ag-Sn combinations. The Pb-Ag-Sn anodes give exceptionally smooth deposits, while the Pb-Ag-As anodes put very little Pb in the Zn and in the  $\text{MnO}_2$ . The large plant has produced Zn of 99.994% purity. The properties of this metal are surprisingly different from those of ordinary high-grade Zn; it is very malleable and can be rolled indefinitely without annealing and beaten into extremely thin sheets like gold leaf. It can be drawn, stamped and extruded to a severity beyond the range of com. Zn metal. It is almost unaffected by  $\text{H}_2\text{SO}_4$  and but slowly by HCl, and has great resistance to atm. oxidation. A brief discussion is included. W. H. BOYNTON

**Progress in the realm of zinc electrolysis with special reference to Tainton's method.** GEORG EGER. *Metall u. Erz.* 46, 373-83(1929).—An address. Development of  $\text{ZnSO}_4$  electrolysis on a com. basis, a discussion of Tainton's method and a description of a large Tainton installation at Kellogg, Idaho. H. STORRY

**The electrolysis of molten zinc chloride.** RICHARD THRELFALL. *J. Soc. Chem. Ind.* 48, 210-23T(1929).—An account of extended work on  $\text{ZnCl}_2$  during the period



1903-15. The sources of Zn were ash from galvanizing tanks, and pickle liquor which consists mostly of  $\text{FeCl}_2$ . Means of removing Fe and other impurities before electrolysis are pointed out. The Fe is removed as  $\text{Fe}(\text{OH})_3$  and is furnace to yield pigment iron.  $\text{ZnCl}_2$  has a brightening effect on the color of Fe oxide, due to the fraction of  $\text{ZnCl}_2$  adsorbed by the coagulated  $\text{Fe}(\text{OH})_3$ . Chlorination of pickle liquor was carried out in towers packed and unpacked, or by passing it through an earthenware fan where it is beaten with Cl.  $\text{HCl}$  gas is necessary to effect complete removal of water from  $\text{ZnCl}_2$ . The means of removing Pb and Cd are noted. Types of cells used for electrolysis are described and illustrated. The behavior of a 6-pole high amperage cell and that of an 8-pole multiplate cell are compared. The arrangement of graphite electrodes in a single element of a multiplate cell and the structure of the graphite electrodes showing corrugations on the cathode face are illustrated, along with types of cells employed, also of the plan of automatic gas draught control for the Cl recovery. This Cl is used for the production of  $\text{CCl}_4$ .

W. H. BOYNTON

**Electrolysis of metallic oxides dissolved in fused boric acid and in fused borates (tungsten, molybdenum, zinc).** LUCIEN ANDRIEUX. Masson et Cie, Paris, France, *Thesis*, 1929.—A. found that in the electrolysis of borax, Na metal is the primary product. This Na thus liberated reacts with the  $\text{B}_2\text{O}_3$ , resulting in amorphous B at the cathode. Thus, the electrolysis of a metal borate is a means of liberating the metal of this borate. The electrolysis of K and Li borate likewise produces B. Electrolysis of borates of the alk. earths results in a product composed of amorphous B and boride of the alk. earth metal. The borates of Ce and Mn produce borides of these 2 metals. Mg borate results in a very pure B. This reaction was studied in detail. The addn. of  $\text{MgF}_2$  facilitates the reaction. A graphite crucible was used and the charge consisted of  $\text{B}_2\text{O}_3$ ,  $\text{MgO}$  and  $\text{MgF}_2$ . The method is much better than the older method of Moissan. The electrolysis of tetraborate of Ca results in a mixed product of B and boride of Ca. With Mg there is a tendency to form pyroborates. These borates gather around the cathode in the shape of a solid, cryst. ball surrounded by the bath, which is perfectly fluid at  $1000^\circ$ . This is a new and curious phenomenon. To obtain the boride of a metal A. electrolyzes a mixt. of borate and of fluoride of the metal. In this way 17 borides have been prepd., 10 of which are new:  $\text{CaB}_6$ ,  $\text{SrB}_6$ ,  $\text{BaB}_6$ ,  $\text{ThB}_6$ ,  $\text{ZrB}_6$ ,  $\text{Cr}_3\text{B}_2$ ,  $\text{MnB}$ , and the new borates  $\text{CeB}_6$ ,  $\text{LaB}_6$ ,  $\text{NdB}_6$ ,  $\text{GdB}_6$ ,  $\text{YB}_6$ ,  $\text{ErB}_6$ ,  $\text{YbB}_6$ ,  $\text{TiB}_2$ ,  $\text{VB}_2$ ,  $\text{UB}_4$ . Among the metals produced are Zn, W and Mo. Zn can be obtained by the electrolysis of the oxide of Zn dissolved in a bath of  $\text{B}_2\text{O}_3$  or of borates to which have been added fluorides or other salts to lower the fusing temp. of the bath. W and Mo can be obtained by dissolving the trioxide of the metal in the bath of borate and fluoride with an addn. of oxide of Zn.

C. G. F.

**Electrode potentials of copper anodes and copper cathodes.** EDWARD F. KERN AND ROBERT W. ROWEN. *Trans. Am. Electrochem. Soc.* 56 (preprint) 13 pp. (1929).—The electrode potentials of Cu anodes and cathodes were detd., as well as the effect upon the electrode potentials by varying the temp. and the compn. of the electrolyte, by the compn. and phys. character of the anodes, and by the addns. to the electrolyte of glue and sulfite-waste residue in the proportions usually added to Cu refining electrolytes. The static potentials of Cu anodes and cathodes were practically identical in the same cells, whereas the dynamic potentials and the polarization potentials varied, and were dependent upon circulation and temp. of the electrolyte, upon compn. and phys. condition of the electrodes, and upon the presence of glue and of sulfite-waste residue, in the amt. usually added to Cu refining electrolytes. A comparison of the results obtained by the use of the Haring polarization and resistivity cell, by means of a satd. calomel half-cell and a  $\text{Hg}_2\text{SO}_4$  half-cell, showed that the most satisfactory results were obtained by the satd. calomel half-cell in connection with a potentiometer. Agitation or circulation of the electrolyte caused a decrease in anode polarization, and a greater decrease in cathode polarization. The amt. of free  $\text{H}_2\text{SO}_4$  in the electrolyte did not have an appreciable effect upon either the anode or the cathode polarization. The effect of increase of temp. of the electrolyte was to decrease slightly anode polarization and to decrease greatly cathode polarization. The impurities in the anode caused an increase in anode polarization; the larger the amt., the higher the anode polarization. The phys. condition of the anode had some effect upon the anode potentials, the rolled anode having a higher static potential than cast anodes. The addn. of glue to the electrolyte had scarcely any effect upon the anode static potential. It decreased the dynamic potential, causing an increase in anode polarization. Presence of glue in the electrolyte slightly decreased cathode static potential, greatly decreased cathode dynamic potential, causing a corresponding increase in the cathode polarization, which was higher with increase in the temp. of the electrolyte. Addition of sulfite-waste residue ("goulac," "lignin

sulfite," etc.), to the electrolyte slightly increased anode polarization, and caused a considerable decrease in cathode polarization after the current had passed through the electrolyte for a few min. At a higher temp. of the electrolyte the presence of sulfite-waste residue caused a decrease in cathode polarization. The combined effect of glue and sulfite-waste residue in the electrolyte was additive, the increase in cathode polarization being due to the effect of the glue. C. G. F.

**Some chromium plating experiments.** CHESTER M. ALTER AND FRANK C. MATHERS. *Trans. Am. Electrochem. Soc.* 56 (preprint) 6 pp. (1929).—The authors find that Cr deposits more easily upon Cu or Fe than upon Pt or graphite. It is thought that this may, in some measure, account for the early controversy concerning whether or not Cr could be deposited from  $\text{CrO}_3$  solns. Those who used Cu cathodes had a much better chance of success than those who used Pt cathodes. Co salts in the  $\text{CrO}_3$  bath prevent the deposition of Cr. Periodic reversal of the current, whereby the cathode is made anode for only a small proportion of the time, prevents the deposition of Cr. Stirring the bath or momentarily lifting the cathode out of the bath reduces or prevents the deposition of Cr. Silica gel in the bath in sufficient quantities to prevent convection currents does not improve the throwing power nor increase the yield in Cr deposition. Cu, Ni, Fe and various other metals in the form of chromates were without effect upon the deposition of Cr. These metals were not deposited with the Cr unless they were added in large amts., and in no cases were the deposits satisfactory where another metal was deposited with Cr. Current efficiencies were increased by the use of a porous diaphragm, but the color of the deposits was poor when a porous cup was used. C. G. F.

**The preparation of articles for chromium plating.** W. L. PINNER. *Metal Cleaning and Finishing* 1, No. 3, 249-52 (1929). E. I. S.

**Direct electrolytic preparation of ammonium permanganate.** GASTON RAPIN. *Compt. rend.* 188, 1547-8 (1929).—Expts. are described which prove that  $\text{NH}_4\text{MnO}_4$  can be prepd. by direct electrolysis starting from silico-manganese. Because of poor cond. of ammoniacal solns. used the results are only of theoretical value. Addn. of  $\text{NH}_4\text{Cl}$  to ammoniacal soln. does not increase cond. sufficiently to increase formation of  $\text{MnO}_4$ . M. McMAHON

**Crystalline mercurous sulfate and the Weston normal standard cell.** DONALD B. SUMMERS AND W. CECIL GARDINER. *Trans. Am. Electrochem. Soc.* 56 (preprint) 18 pp. (1929).—Methods of prepg. cryst.  $\text{Hg}_2\text{SO}_4$  by oxidation, reduction and recrystn. are described. A table showing the sizes of crystals obtained by the different methods and photographs of some typical crystals are given. Cryst.  $\text{Hg}_2\text{SO}_4$  of large grain size is shown to give a high initial value, and a steady decrease of the e. m. f. of the Weston normal cell. The results obtained are explained by assuming that large crystals of  $\text{Hg}_2\text{SO}_4$  favor an increased rate of hydrolysis of the  $\text{Hg}_2\text{SO}_4$  by the  $\text{CdSO}_4$  soln. C. G. F.

**Hysteresis in standard cells.** WENDELL S. NIEDERHAUSER AND GEO. A. HULETT. *J. Am. Chem. Soc.* 51, 2345-51 (1929).—A study of the sep. electrodes of the Cd cell showed considerable hysteresis if the temp. was raised to  $35^\circ$  for as little as 3 min. No hysteresis was observed in cathode half-cells in which the electrolyte was a soln. satd. with  $\text{Hg}_2\text{SO}_4$  and  $\text{CdSO}_4$  at  $25^\circ$ , but which contained no solid  $\text{Hg}_2\text{SO}_4$ . A new theory, based upon the rate of establishment of satn. equil. between the soln. and the solid salts present, is suggested to explain hysteresis. New cells show high initial e. m. f. values, due at least in part to overloading in construction, which do not become normal until after a month or so. Cells constructed in such manner as to hold the temp. below  $25^\circ$  reach normal e. m. f. within a few hrs. H. STÖERTZ

**Polarization in standard cells.** WENDELL S. NIEDERHAUSER AND GEO. A. HULETT. *J. Am. Chem. Soc.* 51, 2327-44 (1929).—A study of the polarization of the individual limbs of the satd., unsatd. and acid Cd cells, and of the Zn cell at very low currents. Most of the polarization is found in the Hg limbs; the presence of acid diminishes the magnitude of polarization; no noticeable change in the resistance of a cell accompanies polarization. The apparent recovery from polarization, which occurs in the Hg limbs of cells during the passage of current, is attributed to an increase in the rates of soln. and of crystn. at the surface of the  $\text{Hg}_2\text{SO}_4$  crystals. H. STÖERTZ

**Life of dry cells. I. Rate of discharge and the life.** NAOTO KAMEYAMA. *J. Soc. Chem. Ind. Japan* 32, 461 (1929); Suppl. Binding 32, 142-4B (1929).—If  $\omega_0$  is taken as the theoret. amt. of active material to be consumed per amp. hr. supplied by a dry cell,  $W$  the quantity of the active material originally present in the cell and  $B$  that still remaining active at the end of the life ( $T$ ) then the following relation should hold for the const. discharge current (1 amp.): (1)  $W-B = (\omega_0/\bar{\varphi}) \times IT$ , where  $\bar{\varphi}$

represents the av. efficiency of utilization of the active material for the whole period of the life.  $\bar{\varphi}$  is less when the discharge rate  $I/W$  is greater, and the effect becomes more pronounced when the rate becomes greater. K. assumed the following relation: (2)  $\bar{\varphi} = \text{const.}/(I/W)^n$ , where  $n$  varies with the discharge rate ( $I/W$ ), but in the limited range of the rate, it may be taken approx. const. "B"-batteries of wireless service.—As the discharge rate is usually small, K. considered  $n = 0$  and derived the following equation from (1) and (2) for const.  $I$ :  $T = A(W-B)$ ;  $A$  and  $B$  are const. Calcd. value of this relation between  $T$  and  $W$  was compared with the result of the discharge tests through a const. resistance (10,000  $\Omega$  for 45-v. batteries), the cut-off voltage being 1.13 v. per cell. Six cells of a manufacturer were in series, ( $T$  in hr.,  $W$  in g.),  $T = 15.55 (W-3.6)$ , 24 cells of other manufacturers were in series  $T = 11.1 (W-10)$ . The cell having a larger value of  $A$  and a smaller value of  $B$  is superior to that having smaller  $A$  and larger  $B$ . K. discussed the relation of electrode area, vol. of active materials, etc., to the const.  $A$  or  $B$ . "A"-batteries of wireless service.—The cut-off voltage is much lower than with "B"-batteries. Consequently  $B$  can be negligible compared with  $W$ . This gives the following from equations (1) and (2):  $T(I/W)^{n+1} = \text{const.}$  Validity of this relation was exam'd. by the results of the discharge test of 54 cells of 20 kinds made by 4 makers of Japan, with the largest  $W$  1020 g. and the smallest 218 g.; the discharge currents 65, 125, 180 and 250 milliamp. gave  $T(I/W)^{1.5} = 25.4$ , cut-off voltage being 0.90 v. Thus, these cells had a const.  $n = 0.5$ . II. Discharge mechanism of grains of active material. *Ibid* 469-75, Suppl. Binding 144-5B(1920).—As  $\text{MnO}_2$  is in grain form, the reaction must occur at the interface of the grain and the soln., and the reacting zone of the grain must recede into the interior of the grain as the discharge proceeds. To supply a const. current per grain, the receding velocity of the reaction zone must be greater and greater as the discharge proceeds, because the area of the reacting zone becomes less and less in the interior of the grain. Finally, a limit will be reached beyond which the receding velocity cannot be greater, and the grain begins to fail to supply the const. current. But the grain may still be able to supply another const. current, which is less than the previous one, because the small current does not require so large a receding velocity as the larger current does. Thus, the limiting receding velocity is a function of the discharge rate per grain. When the limit is reached, the grain as a whole is dead as active material, although there is still some  $\text{MnO}_2$  remaining active in the interior of the grain. Thus the utilization of  $\text{MnO}_2$ -grain is not always complete. On the basis of the above idea of the receding velocity of reaction zone in a grain and the rate of discharge per grain, K. tried to work out a quant. relation between the efficiency of utilization of active material and the discharge rate, the active material of a dry cell having been considered as the assemblage of reacting grains.

S. OKA

The electromotive force of the dry cell. SEIZI KANEKO. *J. Soc. Chem. Ind. Japan* 32, 120-5(1929); Suppl. Binding 32, 37B(1929).—The e. m. f. of the following equations was calcd. from known thermodynamical data: (1)  $\text{Zn} + 2\text{MnO}_2 + 2\text{NH}_4\text{Cl} = \text{Zn}(\text{NH}_4)_2\text{Cl}_2 + \text{Mn}_2\text{O}_3 + \text{H}_2\text{O}$ . (2)  $2\text{Zn} + 4\text{NH}_4\text{Cl} + 3\text{MnO}_2 = 2\text{Zn}(\text{NH}_4)_2\text{Cl}_2 + \text{Mn}_2\text{O}_3 + 2\text{H}_2\text{O}$ . (3)  $\text{Zn} + \text{MnO}_2 + 2\text{NH}_4\text{Cl} = \text{Zn}(\text{NH}_4)_2\text{Cl}_2 + \text{MnO} + \text{H}_2\text{O}$ . (4)  $\text{Zn} + \frac{1}{2}\text{O}_2 + 2\text{NH}_4\text{Cl} = \text{Zn}(\text{NH}_4)_2\text{Cl}_2 + \text{H}_2\text{O}$ . The values (1) 1.605 v., (2) 1.367 v., (3) 1.160 v. and (4) 1.720 v. were obtained. Since the e. m. f. of a dry cell actually measured was 1.63 v., K. concluded that the reaction in the cell is (1).

S. OKA

The fundamental chemical reaction of the lead accumulator. NAOTO KAMEYAMA. *J. Soc. Chem. Ind. Japan* 31, 689-94(1928); Suppl. Binding 31, 163B(1928).—The standard free energy change of the following chem. reaction was calcd. with the following results:  $\text{Pb}(s) + 2\text{H}_2\text{SO}_4(\text{aq. soln.}) + \text{PbO}_2(s) \longrightarrow 2\text{PbSO}_4(s) + 2\text{H}_2\text{O}(l)$ ,  $\Delta F_{298}^\circ = -93,416$  cal., equiv. to  $E^\circ = 2.0243$  v. Of the data of free energy of formation used for the calcn., the following first 3 values were taken from the literature: (1)  $\text{H}_2$ , S (rhomb.),  $2\text{O}_2 \longrightarrow 2\text{H}^+, \text{SO}_4^{--}$ ,  $\Delta F_{298}^\circ = -176,500$  cal. (2)  $\text{Pb}$ ,  $\text{O}_2 \longrightarrow \text{PbO}_2(s)$ ,  $-52,367$ . (3)  $\text{H}_2$ ,  $\frac{1}{2}\text{O}_2 \longrightarrow \text{H}_2\text{O}$  (1),  $-56,560$ . (4)  $\text{Pb}$ , S (rhomb.),  $2\text{O}_2 \longrightarrow \text{PbSO}_4$ ,  $-192,828$ . The fourth value was calcd. from (1) and (5)  $\text{Pb}$ ,  $2\text{H}^+ \longrightarrow \text{Pb}^{++}$ ,  $\text{H}_2$ ,  $\Delta F_{298}^\circ = -5630$  taking the soly. of  $\text{PbSO}_4$  to be  $1.45 \cdot 10^{-4}$  mol/l. (Boettger) at  $24.95^\circ$ . The above value of  $F^\circ$  coincides within 0.3% with the exptl. value, 2.0184 v. (*C. A.* 22, 2718) found by K.

S. OKA

Electrolysis in gels. I. P. HAPPEL, R. E. LIESEGANG AND O. MASTBAUM. *Kolloid-Z.* 48, 80-2(1929).—Electrolysis took place in a layer of 10% gelatin on glass plates. Pt wires served as electrodes. The potential was 15-25 v. In some cases, the current completely inhibited normal diffusion. The direction of the lines of flow was found to be significant. *Ibid* 252-4.—Gelatin does not merely act as a substrate during elec-

trolisis, but reacts as an ampholyte. The swelling conditions of gelatin, electroosmose and the electrolytic water transport according to Remy are superimposed upon this. This study should throw more light on conditions within sepg. membranes. F. U.

**Electrolytic reduction of aldehydes. V. Cinnamaldehyde.** G. SHIMA. *Mem. Coll. Sci. Kyoto Imp. Univ.* A12, 69-72(1929); cf. C. A. 23, 2371.—The best yield (72%) of  $\gamma$ -phenylpropyl alc. from cinnamaldehyde by electrolytic reduction was obtained by using a Hg cathode and adding the aldehyde slowly to a cathode soln. contg. satd.  $\text{NaHCO}_3$  soln. (50 cc.) and alc. (70 cc.) at 20-22°, with a c. d. of 6 amp./100 sq. cm. The results of varying the conditions are tabulated. In alc. ethyl acetate soln. the max. yield was 50%. **VI. Complete reduction of the carbonyl group.** *Ibid* 73-80.—The use of a Zn amalgam cathode gives better results than Cd (Schepss, C. A. 8, 93) in the complete electrolytic reduction of the aldehyde-group to methyl. The best yields of *p*-tolyl methyl ether from anisaldehyde (68%), and of *o*-cresol from salicylaldehyde (66%), were obtained by using a cathode soln. contg. 60%  $\text{H}_2\text{SO}_4$  (60 cc.) and alc. (20 cc.) at 35-40° with a c. d. of 72 amp./100 sq. cm. The best yields of *p*-cresol from *p*-hydroxybenzaldehyde (58%), and of cresol from vanillin (75%), were obtained under the same conditions, but in the absence of alc. The best yield of 3,4-methylenedioxytoluene from piperonal (55%) was obtained under the same conditions in a mixt. of 60%  $\text{H}_2\text{SO}_4$  (50 cc.) and alc. (30 cc.). The results of varying the conditions are tabulated. The effect of the presence of alc. is discussed. Müller's theory (C. A. 17, 1621) does not account for the different behavior of aldehydes and additive products. B. C. A.

**Production of tetrachloroquinone, trichloroquinone and *s*-trichloroaniline by electrolysis of aniline.** J. ERDELYI. *Magyar Chem. Folyóirat* 34, 180-4(1928).—Aniline may be chlorinated by electrolysis. The higher the HCl concn., the smaller is the value of oxidation. Tetrachloroquinone can be produced in 10% HCl soln., trichloroquinone in 20% HCl, *s*-trichloroaniline in solns. contg. more HCl. Tetrachloroquinone is formed if the soln. gets warmed to 30-40° during electrolysis. Trichloroquinone, on the contrary, requires cooling down to 5-15°. The current density in all cases was about 0.1 amp./sq. dm. S. S. DE FINÁLY

**The electrochemical oxidation of toluene.** R. W. MITCHELL. *Trans. Am. Electrochem. Soc.* 56 (preprint) 16 pp.(1929).—The direct oxidation of hydrocarbons at an anode has long been an attractive possibility. The oxidation of toluene to benzaldehyde or benzoic acid is interesting, and has been attempted in this investigation. Previous workers have almost always sought to carry on their oxidation in an electrolyte contg. a large proportion of some water-miscible org. solvent as acetone, ether or glacial acetic acid to bring toluene into soln. A few have recommended the electrolytic prepn. of an inorg. oxidizing agent, to be subsequently used in a chem. oxidation and then regenerated electrolytically; this latter is, however, not an electrochem. oxidation of toluene. M. describes the employment of other means than these in attempts to oxidize toluene electrolytically. Expts. on "batch" versus continuous process of operation show the latter theoretically and practically superior. A process which continually removes emulsified toluene from an electrolytic cell, which is forming  $\text{Mn}_2(\text{SO}_4)_3$  or  $\text{H}_2\text{CrO}_4$ , and which exts. oxidation products from the toluene, and returns the toluene to the cell, gives the most efficient method for oxidizing toluene by electrochem. means to benzaldehyde and benzoic acid, resp. C. G. F.

**The electrolytic preparation of iodoform without platinum.** ANT. VYSKOČIL. *Chem. Listy* 23, 212-5, 249-51(1929).—In the electrolytic prepn. of iodoform from EtOH, the Pt anode may be replaced by graphite in the form of long slender rods; on drying, the CHI<sub>3</sub> had a slightly gray color. Steel rods plated with Cr gave pure CHI<sub>3</sub>, but the Cr was dissolved off too rapidly; the soln. about the anode was colored yellow red ( $\text{Cr}_2\text{O}_7$ ), the remaining soln. was yellow ( $\text{CrO}_4$ ). Ni, Cu and Ag were unsatisfactory. Nichrome was too resistant; alloys of Cu and Ag did not function well. "Nike lin" Ni (26%, Cu 54%, Zn 20%), Ni bronze (Ni 20%, Cu 80%) and (Ni 25%, Cu 75%) and constantan (Ni 50%, Cu 50%) were tried; Nikelin was the least satisfactory. Ni-bronze the most satisfactory. The soln. was clear, the anode was not attacked, and a loss in wt. was not perceptible if the soln. was kept slightly alk. with  $\text{Na}_2\text{CO}_3$ , which functions better than NaOH. With NaOH a greater soln. of the anode occurred. An excess of I has a favorable effect upon the formation of CHI<sub>3</sub> and prevents the formation of an excess OH and  $\text{HCO}_3$  ions, which have a tendency to corrode the anode. The OH ions present function as depolarizers and remove the freed I from the vicinity of the anode. For cathodes, plates of Ni, Cu or Nikelin were used. FRANK MARESH

**Gaseous combustion in electric discharges. III. Cathodic combustion of dry carbonic oxide detonating gas.** G. I. FINCH AND D. L. HODGE. *Proc. Roy. Soc.*

(London) A124, 303-17(1929); cf. C. A. 22, 860.—A d. c. elec. discharge can be passed through a mixt. of dry CO and O<sub>2</sub> in such a manner that combustion is confined to the cathode zone over a considerable range of pressure, gap width and current, and is proportional to the current. Cathodes of freely sputtering metals cause more vigorous combustion. The phenomenon is regarded as ionic, with sputtered metal-gas complexes as an intermediate stage.

GREGG M. EVANS

**Dielectric loss in electrolyte solutions in high-frequency fields.** WILLIAM T. RICHARDS and ALFRED LOOMIS. *Proc. Natl. Acad. Sci.* 15, 587-93(1929).—The heating of electrolyte solns. in condenser containers by short electrostatic waves of from 14 to 1000 m. wave length has been measured for 0.5-0.0005 M NaCl, 0.816-0.026 M Pb(C<sub>2</sub>H<sub>3</sub>O<sub>2</sub>)<sub>2</sub> and 0.079-0.0016 M HgCl<sub>2</sub>. The results were reproducible within 5%. The equation  $\Delta T \approx A'kw/(B' + Dk^2)$  is given as approximating the exptl. results and is derived from theory.  $\Delta T$  is temp. increase,  $k$  sp. cond.,  $\omega$  frequency,  $A'$ ,  $B'$  and  $D$  are consts. The application to *physiol. behavior in high frequency fields* is suggested.

WILLIAM E. VAUGHAN

**High ohm resistors (carborundum). A new method of testing them.** G. LEIT-HÄUSER. *Elek. Nachr. Tech.* 6, 335-8(1929).—L. uses high-frequency currents to test the resistors: slight imperfections are easily revealed. They are applicable to resistors of 100,000 ohms and higher.

C. G. F.

**The Rectox rectifier (copper oxide). Its application to industrial control.** D. SANTINI and I. R. SMITH. *Elec. J.* 26, 416-20(1929).—The Rectox (Cu oxide) rectifier is rugged, dry (completely metallic), has no moving parts and operates noiselessly. It produces almost a perfect rectified wave form with very little reverse current, and operates electronically. Full-wave connections are made with great facility permitting direct operation from a line of any no. of phases without intermediate transformers. It has high thermal capacity, minimizing dangers of great overload. Units may be connected in series or in parallel. Temp. control is essential in the application of this rectifier because both the useful and the high-resistance characteristics vary with temp., decreasing with a rise in temp. Provision must be made for the change in rectifier resistance which occurs in use. Means for this provision are outlined. Radio has furnished the application of Rectox, but advantages claimed for elevator applications are: ready connection for any no. of phases and use on any com. frequency without intervening transformers; easily and cheaply mounted behind the control panel without complicating the wiring or taking up excessive space; easy maintenance and rugged construction; and automatic protection against phase failure or polyphase circuits. Several illustrations and charts are shown.

W. H. BOYNTON

**The pressure produced on blowing electric fuse links and striking electric arcs in closed vessels.** G. ALLSOP. *Safety Mines Research Board* (London), Paper No. 52, 19 pp.(1929).

E. J. C.

**The lightning arrester and factors affecting its performance and application.** H. M. TOWNE. *Gen. Elec. Rev.* 32, 428-36(1929); cf. C. A. 23, 4148.—The voltage conditions of systems in which arresters are used and their influence on operation are outlined. Curves are plotted for the practical application of arresters showing relationship of discharge path resistance to surge impedance and the service performance under various conditions.

M. MCMAHON

**The testing of transformers.** G. CAMILLI. *Gen. Elec. Rev.* 32, 497(1929).

C. G. F.

**Hydrogen—a successor to air.** C. J. FECHHEIMER. *Elec. J.* 26, 405-7(1929).—Large elec. generators can be rated a quarter more when cooled with H<sub>2</sub> instead of air, as indicated by phys. data and exptl. tests. Tables show the cooling qualities of various gases in comparison with those of air and a comparison of air and H<sub>2</sub> for cooling. The desirable properties of a cooling medium in order of importance are: (1) high thermal cond.; (2) low d.; (3) high sp. heat; (4) freedom from damage by corona to the insulation; and (5) it must not support combustion. The advantages obtained by the use of H<sub>2</sub> are summarized as: (1) higher efficiency due largely to decrease in windage; (2) decreased size of the machine; (3) reduction in fire hazard; (4) freedom from injury from corona; (5) cleanliness, as all joints are tightly sealed, and the small leakage is outward due to pos. internal pressure; (6) greater certainty in calcn. of temps. as the thermal drops through stagnant gas pockets are greatly reduced and (7) greater freedom from local high temps.

W. H. BOYNTON

**Recent research developments.** C. E. SKINNER. *Elec. News Eng.* 38, 35-8 (1929).—Review of certain lines of research at the Westinghouse labs.

C. G. F.

**The A E G Laboratory for high-voltage research.** J. BIERMANN. *Elektrotech. Maschinenbau* 47, 697-705, 22 illus.(1929).

C. G. F.

**Fundamental methods in incandescent lamps. Filaments manufacture.** V. DUSCHNITZ. *Elektrotech. Z.* 50, 1049-53(1929).—Development of Coolidge and Pintsch methods in com. manuf. of W filaments from beginning until present time. E. I. S.

Potential differences across the boundaries between solutions of mixed univalent chlorides (SMITH) 2. The prevention of ionization in impregnated paper dielectrics (BROWN, SPORING) 13. Iron powder [for cores of electrical apparatus] (Brit. pat. 306,215) 9.

GÜNTHERSCHULZE, A.: *Elektrische Gleichrichter und Ventile*. Berlin: J. Springer. 330 pp. M. 29. Reviewed in *Phys. Rev.* 34, 820(1929).

**Electric batteries.** OLDHAM & SON, LTD., and W. D. WILDE. Brit. 305,724, Nov. 10, 1927. Structural features.

**Electric storage battery.** E. THOMAS & WILLIAMS, LTD., and J. BOWEN. Brit. 306,312, April 2, 1928. Structural features.

**Storage battery.** CHARLES D. GALLOWAY. U. S. 1,725,905, Aug. 27. Structural features.

**Storage battery.** H. F. JOEL. Brit. 305,738, Sept. 21, 1928. The electrodes are covered with a winding of coir to hold the active material in place and a jelly-like electrolyte may be used. Other structural features are described.

**Galvanic cells.** BATTERIEN- UND ELEMENTE-FABRIK SYSTEM ZEILER A.-G. Ger. 479,734, Sept. 9, 1928. The cells are soaked in a soln. of chloride of alk. earth metal and filled with the usual sal ammoniac electrolyte mixt.; cf. C. A. 23, 1576.

**Depolarizing element for a galvanic cell.** NATIONAL CARBON CO., INC. Ger. 479,733, June 5, 1928.

**Accumulators.** GOTTFRIED HAGEN A.-G. Ger. 479,735, Dec. 9, 1928. Details of plates are described.

**Accumulators.** MORITZ KUGEL. Ger. 480,149, Nov. 7, 1926. A Pb-plate accumulator has an electrolyte consisting of a mixt. of dil.  $\text{H}_2\text{SO}_4$  and  $\text{H}_3\text{PO}_4$ . The electrolyte must be free from alkali and  $\text{NH}_4$  salts. Cf. C. A. 23, 1064.

**Accumulators.** ADOLFO POUCHAIN. Swiss 132,418, April 28, 1928. Details of the construction of the neg. electrode.

**Tube for removing acid from accumulators.** ACCUMULATOREN-FABRIK A.-G. (Gustav Ewert, inventor). Ger. 479,596, Oct. 4, 1928.

**Method of determining the charging conditions of lead accumulators.** JOHANN PROSZT and ALEXANDER BIHARI. Ger. 479,990, Apr. 12, 1927. Details are given.

**Electric discharge devices.** M. O. VALVE CO., LTD., A. L. REIMANN and J. W. RYDE. Brit. 306,281, Feb. 20, 1928. Cathodes are coated with one or more alk. earth oxides to which about 5% metallic Th is added (suitably by dipping a support of Pt-Rh alloy in a pasty mixt. of Ba and Sr carbonates and Th, drying and heating to decompose the carbonates). La may be used instead of Th, and Pt, Ni or W may be used instead of the Pt-Rh alloy.

**Electric discharge tube.** GUSTAV L. HERTZ (to N.-V. Philips' Gloeilampenfabriek). U. S. 1,726,107, Aug. 27. See Ger. 473,141 (C. A. 23, 2668).

**Electrodeposition of iron.** E. KELSEN. Brit. 306,151, Feb. 16, 1928. An electrolyte used comprises an Fe salt such as  $\text{FeCl}_2$  together with 2 or more salts such as  $\text{CaCl}_2$  and  $\text{KCl}$ , the combined wt. of which exceeds that wt. of one salt only which would produce satn. Several examples are given.

**Electroplating apparatus.** OSCAR L. MAAG (to Timken Roller Bearing Co.). U. S. 1,725,877, Aug. 27. Structural features.

**Electroplating apparatus of the barrel type.** WM. J. O'NEILL (to Elmer J. Merch). U. S. 1,726,308, Aug. 27. Structural features.

**Electrolysis.** MAX BOLLIGER. Swiss 131,828, May 19, 1928. An app. with a moving anode for rapid deposition of metal is described.

**Electrolyzing solution of sodium chloride and sodium carbonate.** HERSCHEL C. PARKER. U. S. 1,726,236, Aug. 27. A soln. contg.  $\text{NaCl}$  and  $\text{Na}_2\text{CO}_3$  is subjected to electrolysis, using an iron anode, so that Fe hydroxide and  $\text{NaHCO}_3$  are formed; these compds. are sepd. from soln. (suitably by gravity). An app. is described.

**Purification of nickel electrolytic baths.** FRANZ VON WURSTENBERGER. Swiss 131,827, Apr. 12, 1928. Ni baths are cleared of foreign metals, especially Cu, by the interpolation of a different current at intervals in the electrolysis.

**Electrolytic gas producer.** MASCHINENFABRIK OERLIKON. Swiss 132,298, Mar. 22, 1928. Details are given.

**Apparatus for the electrolytic decomposition of water.** MACHINENFABRIK OERLIKON. Swiss 132,486, July 5, 1928. Addn. to 118,711. The construction of the electrodes is described.

**Electrolytic renewal of the coverings of copper-coated rollers.** LOUIS SIMÉANT and HERMANN KUPPEL. Ger. 480,420, May 18, 1926. The Cu coatings of rotary printing-machine rollers are renewed by a process in which the rollers form the cathodes in a bath consisting of water 78,  $\text{CuSO}_4$  18 and  $\text{H}_2\text{SO}_4$  4%, through which a current of 3 v. 0.4–0.5 amps. is passed at 17–18°.

**Stirring apparatus for molten electrolytes.** FRANZ ELLINGER. Ger. 479,746, Mar. 15, 1927.

**Device for feeding the electrolyte to a cell in which electrolytic decomposition is effected under pressure.** HANS NIEDERREITHER. Ger. 480,430, May 5, 1925. Details of construction and arrangement are described.

**Electrometallurgy.** ALUMINIUM-INDUSTRIE-A.-G. Ger. 480,549, Nov. 23, 1926. Pure Al is obtained from crude Al or alloys by using these as the anode in an electrolytic bath of molten halides of Al and alkali- or alk. earth metals with a m. p. below that of the electrodes.

**Pure aluminum.** ALUMINIUM-INDUSTRIE-A.-G. Swiss 131,405, Jan. 24, 1927. Pure Al is prepd. electrolytically from aluminiferous metals by the employment of an Fe-Si anode contg. at least one atom of Si to each Fe atom.

**Purifying aluminum oxide.** SVEN E. SIEURIN and ALFRED S. EDLUND. U. S. 1,726,001, Aug. 27. Purifying of materials such as bauxite is effected by melting in an elec. furnace with such a proportion of reducing material such as C that there is a deficiency of reducing material during the melting; after melting is completed, addnl. carbonaceous reducing material such as C is added in excess of that required to reduce all impurities.

**Fluorine.** PAUL M. A. LEBEAU and AUGUSTIN A. L. J. DAMIENS. Ger. 476,732, Dec. 7, 1926. F is prepd. by the electrolysis of alkali fluorides m. 0–150° with an anode of Fe, Ni or Co or an alloy of these metals. The cathode may be made of Cu, Fe, Ni or an alloy.

**Acetylene and hydrocyanic acid.** I. G. FARBENIND A.-G. Brit. 306,008, Oct. 13, 1927. Treatment of coke-oven gas, coal gas or similar gases in an elec. arc to obtain  $\text{C}_2\text{H}_2$  (together with HCN if N or N compds. are present) is improved by converting CO present into innocuous compds. as by catalytic conversion into  $\text{CH}_4$  or decompn. with steam previous to the arc treatment. The fresh gases are preheated by gases from the arc furnace. Cf. C. A. 23, 3635.

**Gas purification.** "EINTRACHT" BRAUNKOHLENWERKE UND BRIKETTFABRIKEN A.-G. Ger. 480,895, Dec. 2, 1924. The gas is distributed over the whole area of a shaft in which dust is pptd. electrically.

**Purification of gases.** METALLGESELLSCHAFT A.-G. Ger. 481,128, April 18, 1920. A method of cleaning the dust-collecting bands of an electric gas-purification app. is described.

**Electric gas-purifying plant with dust-removing channels.** OSKI A.-G. Ger. 180,801, Aug. 17, 1924.

**Device for cleaning the electrodes of a gas purifier.** WITKOWITZER BERGBAU- UND EISENHÜTTEN-GEWERKSCHAFT and GEORG RASCHKA. Ger. 467,040, July 8, 1927.

**Electric induction furnace.** P. E. BUNET and ACIERIES DE GENNEVILLIERS. Brit. 306,144, Feb. 17, 1928. Structural features.

**Electric induction furnace.** E. F. RUSS. Brit. 306,172, Nov. 15, 1927. Structural features.

**Electric induction furnace for melting light metals such as aluminum, etc.** HIRSCH KUPFER-UND MESSINGWERKE A.-G. Brit. 305,952, Feb. 11, 1928. Structural and elec. features.

**Electric resistance heater.** J. KATUNSKY. Brit. 305,799, Jan. 24, 1928. A resistance wire is wound on a core of a calcined mixt. of ground emery, feldspar and waterglass, and is surrounded by an outer layer of a similar calcined mixt.

**Resistance-heated muffle furnace for heat treating steel or other metal articles.** V. SORREL and L. A. LAFONT (to Infra Soc. Anon.). Brit. 306,446, Feb. 20, 1928. A magnetic field holds the articles until sufficiently heated and they are then discharged into a tempering bath. Cf. C. A. 23, 2668.

**Electric furnace for metal founding.** SIEMENS-SCHUCKERTWERKE A.-G. Ger. 480,203, Dec. 31, 1927. The mounting of the crucible is described.

**Electric annealing furnace.** HERAUS-VACUUMSCHMELZE A.-G. and WILHELM ROHN. Ger. 480,891, Dec. 16, 1924. Details of construction are given.

**Electric annealing and hardening furnace.** ALLGEMEINE ELEKTRICITÄTS-GES. (Ferdinand Brieger, inventor). Ger. 480,768, April 22, 1927. The heating chamber is suspended in a salt bath.

**Gas-tight connection for an electric annealing furnace.** A.-G. BROWN, BOVERI & CIE. Swiss 131,457, April 17, 1928.

**Annealing.** ALLGEMEINE ELEKTRICITÄTS-GES. Ger. 480,432, July 27, 1926. An article to be annealed or hardened in an electrically heated salt-bath kiln is heated to the required temp. by radiation from the salt bath.

**Electric water heater.** A. W. NEWLAND and J. SABEL. Brit. 305,713, Nov. 11, 1927. Structural features.

**Electrical apparatus for treating metal surfaces to prevent corrosion.** LUDWIG ERENYI. Swiss 132,326, Dec. 7, 1926.

**An agent for the reduction of metals.** GOTTHARDWERKE A.-G. FÜR ELEKTRO-CHEMISCHE IND. and ARTURO PAOLONI. Swiss 131,627, Aug. 26, 1927. An agent for the reduction of metal compds. is prepd. from crude alumina by smelting electrolytically with quartz in such quantities that the product is an alloy contg. Al 40-60, Si 30-50, Fe 2-15 and Ti 1-3%.

**An apparatus for condensing vapor.** RICHARD BLASBERG. Ger. 480,860, Jan. 26, 1928. An app. is described for condensing the vapor from high temp. electrolytic processes, such as nickeling.

**Electric gas-condensing device.** CARL BAUMANN. Swiss 131,666, Mar. 16, 1928.

**Thermal cut-out for electric circuits.** CLARENCE D. PLATT (to Trumbull Electric Mfg. Co.). U. S. 1,726,503, Aug. 27. Structural features.

**Mercury-vapor lamp for producing ultra-violet rays for treating foods, etc.** C. A. COOPER. Brit. 305,758, Dec. 9, 1927. Structural features.

**Electric heater and ultra-violet ray apparatus combined.** L. G. HAWKINS & Co., LTD., and L. G. HAWKINS. Brit. 305,788, Jan. 12, 1928. Structural features.

**Light rays for therapeutic purposes, for promoting plant growth, etc.** SIEMENS & HALSKE A.-G. Brit. 306,112, Feb. 16, 1928. In app. such as that described in Brit. 296,724 (C. A. 23, 2378-9) a metal vapor lamp is used, preferably with a quartz envelope. Metals which may be thus used in lamps include K, Na, Ca, Mg, Ti, Zr, La, Zn, Cd, Hg, Co and Ni, and alloys of these and other metals such as an alloy of Al 3 and Ag 7 parts.

## 5—PHOTOGRAPHY

C. E. K. MEES

**Methods of analysis of photographic emulsion.** SHIRO MATSUMAYE. *J. Soc. Chem. Ind. Japan* 32, 99-106(1929); Suppl. Binding 32, 34B(1929).—After several trials, Clark's method was found best with slight modifications. Ext. the dry plate with KCN soln., boil the ext. with Zn for 1 hr., decomp. the cyanide with HCl and expel HCN with a stream of CO<sub>2</sub>. Filter the reduced Ag ppt., dissolve it in HNO<sub>3</sub> and titrate the soln. with AmCNS soln.; the result gives the total Ag. Add 5% of Ba(NO<sub>3</sub>)<sub>2</sub> to the filtrate and titrate the soln. electrometrically with AgNO<sub>3</sub>; this is a test for I, Br and Cl. From this, AgI, AgBr, free (adsorbed) Br and Cl (if present) can be calcd. It is also a test for sulfate (perhaps in the form of alum); it gives a white ppt. with Ba(NO<sub>3</sub>)<sub>2</sub>.  
S. OKA

**Analysis of the commercial photographic emulsion.** SHIRO MATSUMAYE. *J. Soc. Chem. Ind. Japan* 32, 106-11(1929); Suppl. Binding 32, 35B(1929).—Emulsions of 13 kinds of com. photographic plates were analyzed (cf. preceding abstr.). The results were tabulated and discussed as follows: comparison of analyses of plates of the same emulsion no., comparison of the emulsion of the same name or similar name, relation between the total Ag and the emulsion concn., the total Ag and AgI content, the speed and AgI content, the sol. bromide and chloride, the presence of Cr and sulfate, fluctuation of the weight of glass plate.  
S. OKA

**The metallic silver content of photographic emulsions.** FRITZ WEIGERT and FRANZ LÜHR. *Z. Elektrochem.* 35, 209(1929).—The authors take up the defense of their method (cf. C. A. 22, 548) against the criticisms of Kieser (C. A. 23, 1829, 2894, 3175) and state that K.'s own method is not reliable.  
ALBERT L. HENNE

**Photographic sensitivity. I. Effect of heat on sensitivity curve of photographic plates.** O. MASARI. *Mem. Coll. Sci. Kyoto Imp. Univ.* A12, 1-12(1929); cf. C. A. 19, 1103; 23, 4415; Kellner, C. A. 20, 1763.—The effect of a preliminary heating for 1 hr. at 80° on the sensitivity of photographic plates to light of various wave lengths has



been investigated. With panchromatic and other slow plates, the sensitivity, as measured by the inertia, is increased for all wave lengths, the effect near a max. point on the sensitivity-wave-length curve being greater on the side corresponding with longer wave lengths, i. e., the max. point is shifted toward the red. The sensitivity of fast plates shows the same shift, but is usually diminished by heating. With all plates and for all wave lengths the contrast is increased by heating, and for panchromatic and orthochromatic plates the increase is greatest for long wave lengths. Plates which have been heated gradually regain their normal sensitivity on keeping at the ordinary temp. Drying the plate has very little effect on its sensitivity. **II. Sensitivity of photographic plates at various temperatures.** *Ibid* 13-22.—The relation between the temp. of preliminary heating,  $t$ , and the inertia and contrast,  $\gamma$ , for a given plate and a given wave length has also been investigated. The inertia varies most between about 30° and 70°, while  $\gamma$  and  $t$  are connected by the empirical expression  $\gamma = e^{a t^{1/2} + b}$ , where  $a$  and  $b$  are consts. depending on the wave length of the light to which the plate is exposed, on the time of development and on the properties of the emulsion. If  $D_m$  is the max. d. at 0°,  $E$  the length of exposure and  $D$  the d. of the developed plate, it is further found empirically that  $D = D_m e^{a t^{1/2}} \{1 - e^{-(b t^{1/2} + c) E}\}$ , where  $b$  and  $c$  are consts. of the same nature as  $a$ ,  $b$ , being neg. for some rapid plates and pos. for other plates. This formula is valid from 10° to 80°. B. C. A.

**Color photography.** K. WAHL. Brit. 306,026, Feb. 14, 1928. Transparent color positives are made by coating the support on both sides with a non-Ag sensitizing material and exposing one side to a negative and the other side to a positive from the negative, printing being in register (a light-absorbing intermediate layer being provided). Each side is then colored separately.

**Color photography.** O. E. WHEELER. Brit. 305,775, Dec. 28, 1927. Low-relief color-record images in uncolored gelatin on celluloid or similar supports are produced from bromide color-record prints by the "carbo" chem. contact process, and are used to produce a tri-color paper picture or transparency by dye-impression printing (in which pinatype dyes may be used).

**Color photography.** SOC. ANON. SPLENDICOLOR and L. J. B. DIDIER. Brit. 306,328, April 25, 1928. Tri-color photographs are produced on a film sensitized on one side as with a Ag gelatino-bromide layer and coated on the other side with a layer of plain gelatin, by printing on the sensitized side a positive image from a negative made with an orange-red filter and toning this image blue, sensitizing the gelatin layers on both sides with alk. bichromate and printing thereon, simultaneously from opposite sides, images from positives made from color-record negatives produced, resp., with blue-violet and green filters, washing and drying; the 2 images printed in the bichromated gelatin are then colored by moistening and applying strips of paper coated with gelatin layers contg., resp., yellow and green dyes of the pinatype class capable of being absorbed by unhardened but not by hardened gelatin. Brit. 306,329 relates to an optical system for color photography.

**Photographic chromated colloid process.** C. ROEHRICH. Brit. 306,027, Feb. 14, 1928. The sensitive layers are moistened after printing and are then exposed again to light before development.

**Photographic diazotype processes.** KALLE & Co. A.-G. Brit. 306,408, Feb. 16, 1928. Diazotype sensitive layers contg. an azo coupling component and which may be developed with alk. gases, as described in Brit. 234,818 (C. A. 20, 716), are stabilized by the addn. of S compds. such as thiourea, thiosinamine, thiocarbamic acid and its derivs., thioglycolic acids and colloidal S. Various examples are given. Cf. C. A. 23, 4154

**Photographic developing.** ERVIN BURG. Ger. 480,352, Jan. 27, 1927. See Brit. 284,253 (C. A. 22, 4395).

**Fixing and washing photographic materials.** SCHERING-KAHLBAUM A.-G. (Wolfgang M. Schultz, inventor). Ger. 480,884, Sept. 2, 1928. Photographic materials are fixed and washed in baths undergoing electrolysis. The materials may be arranged between the electrodes, or the electrolysis may occur at a part of the bath remote from the materials. Thus, fixing may be effected in baths through which current at 1 v. is passed to effect sepn. of Ag, while during washing d. c. or a. c. at 220 v. or so may be passed so as to decomp. the fixing bath residues. The materials may be spread on the surface of a hollow perforated rotary drum, and various ways of leading in the current are described.

**Photographic emulsions.** I. G. FARBENIND. A.-G. (Walter Frankenburger and Georg K. Rössler, inventors). Ger. 470,619, Aug. 20, 1927. The sensitiveness of

photographic emulsions contg.  $(\text{COO})_2\text{Hg}$  or its complex ammine compds. as the active ingredient is enhanced by means of a suitable inorg. salt or org. dye. Suitable salts are those of Hg, Ag, Tl, Au and Pt, and suitable dyes are eosin and erythrosin. These sensitizing agents may be added to the emulsion or produced therein. Thus, in using the emulsions in the prepn. of printing-out papers, the rate of direct darkening may be increased by adding  $\text{HgI}_2$  and a small amt. of  $\text{AgNO}_3$  to the emulsion. Again, in using the emulsions in developing processes, the production and developing of the latent image may be promoted by adding  $\text{HgI}_2$  and a small amt. of  $\text{AgI}$  to the emulsion. Tannin or the like may also be added for toning. Cf. Brit. 307,716.

**Silver halide photographic emulsions.** JOSEF REITSTÖTTER (to Agfa Ansco Corp.). U. S. 1,725,934, Aug. 27. Light-sensitive Ag halide photographic emulsions are prepd. in the presence of a thiazole compd., such as thiazole yellow, which serves to give increased speed.

**Light-sensitive layers.** I. G. FARBENIND. A.-G. (John Eggert, Richard Schmidt and Bruno Wendt, inventors). Ger. 480,729, July 18, 1928. Light-sensitive layers are prepd. from one or more org. compds. capable of being transformed into stereoisomers under the action of light. A catalyst promoting the transformation may be present, e. g., a halogen or a compd. splitting off halogen under the action of light, such as  $\text{Hg-Br}_2$ ,  $\text{C}_6\text{H}_5\text{Br}_4$  or  $\omega$ -bromoacetophenone. The layers may be exposed in a camera or under a negative, and the development or fixing may involve the removal of one isomer or the elimination of the catalyst or the conversion of one isomer into a suitable deriv. Examples are given.

## 6--INORGANIC CHEMISTRY

A. R. MIDDLETON

Some recent advances in inorganic chemistry. WARREN C. JOHNSON. *Chem. Bull.* **16**, 233-6, 256(1929). E. J. C.

**Ruthenium.** H. REMY. *Z. angew. Chem.* **42**, 289-90, 291(1929). H. GALL. *Ibid.* 290-1; cf. *C. A.* **23**, 50, 1580.—Polemical. A discussion of the valency of Ru in the blue chloride soln. and in solns. obtained by treating the tetroxide with HCl (cf. Remy and Luhrs, *C. A.* **23**, 1580.) B. C. A.

**A new type of rare-earth salt.** G. A. BARBIERI. *Atti accad. Lincei* **9**, 906-9(1929).—It has been found possible to prep. argentocyanides as well as aurocyanides of the tervalent elements of the Ce group of the type  $\text{M}^{+++}[\text{Ag}(\text{CN})_2]_3$  and  $\text{M}^{+++}[\text{Au}(\text{CN})_2]_3$ . Attempts to prep. similar compds. of tervalent Al, Cr, Fe were failures. Prepn. of  $\text{Ce}[\text{Ag}(\text{CN})_2]_3 \cdot 3\text{H}_2\text{O}$ : to 10 cc. of a neutral soln. of  $\text{Ce}(\text{NO}_3)_3$  contg. about 1 g. Ce, a soln. of 10 g.  $\text{KAg}(\text{CN})_2$  in 50 cc. of cold  $\text{H}_2\text{O}$  is added slowly without stirring. In a few min. the soln. becomes turbid and a cryst. powder ppts. Rubbing the sides of the beaker assists the deposition, and after about 2 hrs. it is collected on a suction filter. In a similar manner  $\text{La}[\text{Ag}(\text{CN})_2]_3 \cdot 3\text{H}_2\text{O}$ ,  $\text{Nd}[\text{Ag}(\text{CN})_2]_3 \cdot 3\text{H}_2\text{O}$ ,  $[\text{Co}(\text{NH}_3)_6][\text{Ag}(\text{CN})_2]_3$ ,  $\text{Ce}[\text{Au}(\text{CN})_2]_3 \cdot 3\text{H}_2\text{O}$ ,  $\text{La}[\text{Au}(\text{CN})_2]_3 \cdot 3\text{H}_2\text{O}$  and  $[\text{Co}(\text{NH}_3)_6][\text{Au}(\text{CN})_2]_3$  were prepd. A. W. CONTIERI

**Addition of ammonia to lead nitrate and lead sulfate.** W. KRINGS. *Z. anorg. allgem. Chem.* **181**, 309-36(1929); cf. *C. A.* **23**, 4619.—A survey of the additive power of Pb salts for  $\text{NH}_3$  would indicate that Werner's concept of max. coordination no. is not generally applicable. It seems to hold only for those complexes existing as free groups in soln. Pressure-compn. and pressure-temp. studies of the systems  $\text{Pb}(\text{NO}_3)_2 \cdot \text{NH}_3$  and  $\text{PbSO}_4 \cdot \text{NH}_3$  revealed the existence of a monammonate, triammonate (m.  $115^\circ$ ) and hexammonate of  $\text{Pb}(\text{NO}_3)_2$ , and a di- and tetrammonate of  $\text{PbSO}_4$ . Density detns. of the ammonious salts as well as of the ammonates were made to det. the expansion of the crystal lattice as a result of the addn. of  $\text{NH}_3$ . These results, with the sp. vols., etc., are tabulated. A special pycnometer is described, which may be employed with substances exhibiting a high vapor pressure. L. F. AUDRIETH

**The action of chlorine on iron oxides.** WALTHER KANGRO and RUDOLF FÜGGE. *Z. Elektrochem.* **35**, 189-94(1929).—Contrary to the common belief, Cl is capable of reacting with Fe oxides but only at high temps. At  $700^\circ$  the reaction is noticeable with pptd.  $\text{Fe}_2\text{O}_3$ , and at  $900^\circ$  it becomes very vigorous. The various natural oxides are generally less susceptible, but they are slightly affected at  $700^\circ$ . At  $1000^\circ$  they are totally decompd. The possibility of replacing C by Cl in the extn. of Fe from its ores is discussed. ALBERT L. HENNE

**The reactivity of iodine cyanide in different organic solvents.** ERWIN CHARLGAFF. *J. Am. Chem. Soc.* **51**, 1999-2002(1929).—In a previous paper (cf. *C. A.* **22**, 3816, (4083))

it was shown that the Ag salt of saccharin reacts with I in certain solvents to give an addn. compd., in others to ppt. AgI. However, ICN fails to react with the same salt, indicating that ICN is a "heteropolar compd." and does not function in this case as a "mixed halogen" as claimed by Ephraim (cf. C. A. 16, 2277; 17, 940; 20, 2962; 22, 553).

M. A. DAHLEN

**The decomposition of alkaline carbonate in boiling aqueous solution. II.** B. L. VANZETTI AND A. OLIVERIO. *Gazz. chim. ital.* 59, 288-300(1929); cf. C. A. 23, 4157.—An extension and elaboration of the previous article. A discussion of the nature of the equilibria, which are established in aq. solns. of alk. carbonates between the liquid phase and the supernatant gaseous phase, leads to deductions which indicate the possibility of a decompn. to a marked extent of the carbonates as a result of the application of heat (boiling solns.), when the supernatant gaseous phase is maintained free of CO<sub>2</sub>. Expts show that at various concns. of Na<sub>2</sub>CO<sub>3</sub>, viz., 0.2-0.4 N, up to 74% was decompd. into NaOH in about 6 days, and with 0.2 N K<sub>2</sub>CO<sub>3</sub> up to 65% was decompd. in 5-7 days. The decompn. occurred in a current of inert gas in the same way that it did in air or in a current of steam. The decompn. was, however, inappreciable when the boiling was carried out *in vacuo*, because of the relatively low temp. at which the solns. boiled and the consequently smaller hydrolytic decompn. The character of the receptacle in which the reaction was carried out had little influence on the course of the reactions. Under the conditions studied in the expts. the decompn. followed a very simple law, viz., that the proportion of carbonate decompd. was proportional to the square root of the time. **III. The manner in which lithium carbonate decomposes in boiling aqueous solution.** B. L. VANZETTI AND A. OLIVERIO. *Ibid* 300-4.—Li<sub>2</sub>CO<sub>3</sub> decompn. in boiling water in the same way that Na<sub>2</sub>CO<sub>3</sub> and K<sub>2</sub>CO<sub>3</sub> do, only more slowly. By maintaining the gaseous phase free of CO<sub>2</sub>, 71% of the Li<sub>2</sub>CO<sub>3</sub> in a 0.27 N soln. decompd. in about 10 days, which is about the same decompn. occurring with 0.4 N Na<sub>2</sub>CO<sub>3</sub>. With Li<sub>2</sub>CO<sub>3</sub>, too, the decompn. was proportional to the square root of the time. The decompn. is moreover continuous and does not reach an equil. between Li<sub>2</sub>CO<sub>3</sub> and LiOH, provided that the supernatant gaseous medium is maintained perfectly free of CO<sub>2</sub>.

C. C. DAVIS

**The thiosulfate process of iodine separation.** J. J. DEUGARTE. *Caliche* 11, 49-51 (1929).—The method of Smith (cf. *Caliche* 8, 515(1927)) admits of different final amts. of H<sub>2</sub>SO<sub>4</sub> from the iodate reaction. This is not strictly proportional to the initial acidity but with given conditions is dependent also on the rate of adding acid. This affects the time and yield. Rise in temp. tends to cause excessive I in the foam rather than in the ppt.

J. HOWARD FLINT

**Ternary system: water-sodium nitrate-potassium perchlorate from 0° to 100°.** E. CORNEC AND A. NEUMEISTER. *Caliche* 10, 488-91(1929).—At const. temp. NaNO<sub>3</sub> raises KClO<sub>4</sub> soly., increasingly so with temp. rise. A cyclic method of purifying these 2 salts by evapg. and cooling from their mixt. is outlined. Equimolar quantities of NaClO<sub>4</sub> and KNO<sub>3</sub> show double decompn.

J. HOWARD FLINT

**Quaternary system: water-sodium nitrate-sodium chloride-potassium perchlorate from 0° to 100°.** E. CORNEC AND A. NEUMEISTER. *Caliche* 10, 494-99(1929).—From curves presented it is observed that cooling a satd. soln. of these 3 salts crystallizes NaNO<sub>3</sub> and KClO<sub>4</sub>; adding water to maintain NaNO<sub>3</sub> in soln. permits obtaining pure KClO<sub>4</sub>. From a soln. not satd. with respect to KClO<sub>4</sub>, pure NaNO<sub>3</sub> may be crystd. by cooling. A cyclic sepn. is outlined.

J. HOWARD FLINT

**Quaternary system: sodium nitrate-sodium sulfate-magnesium chloride-water from 0° to 100°.** G. LEIMBACH AND A. PFEIFFENBERGER. *Caliche* 11, 61-85(1929).—A reprint to correct unspecified errors in C. A. 23, 4633 presenting a review of data from the literature.

J. HOWARD FLINT

**Monofluorophosphoric acid and the similarity between its salts and the sulfates.** WILLY LANGE. *Ber.* 62B, 793-801(1929).—The hydrolysis of M'PO<sub>3</sub>F<sub>2</sub> in a dil. KOH soln. gives K<sub>2</sub>PO<sub>3</sub>F; if a large excess of AgNO<sub>3</sub> is then added, a cryst. ppt. of Ag<sub>2</sub>PO<sub>3</sub>F is obtained. The monofluorophosphate of any other metal can be prepd. from this Ag salt by double decompn. The alk. salts are neutral toward phenolphthalein, but basic to methyl orange: this property permits the titration of a mixt. of PO<sub>4</sub>H<sub>3</sub> and FPO<sub>4</sub>H<sub>2</sub>. The PO<sub>3</sub>F ion is similar to the SO<sub>4</sub> ion. The solubilities of some of the salts in mol./l. are: CaPO<sub>3</sub>F.2H<sub>2</sub>O,  $6.3 \times 10^{-2}$ ; SrPO<sub>3</sub>F.H<sub>2</sub>O,  $5.5 \times 10^{-2}$ ; BaPO<sub>3</sub>F,  $6 \times 10^{-4}$ ; Ag<sub>2</sub>PO<sub>3</sub>F,  $5.93 \times 10^{-2}$ ; PbPO<sub>3</sub>F,  $3.2 \times 10^{-4}$ ; Hg<sub>2</sub>PO<sub>3</sub>F,  $5 \times 10^{-4}$ . The La salt is sol. at room temp. in a dil. AcOH soln. but ppts. at higher temp. (NH<sub>4</sub>)<sub>2</sub>PO<sub>3</sub>F is most conveniently prepd. by fusion of 1 mol. P<sub>2</sub>O<sub>5</sub> and 3 mols. NH<sub>4</sub>F. A. L. H.

**Molybdates and tungstates. Binary systems:** Li<sub>2</sub>MoO<sub>4</sub>-MoO<sub>3</sub>, Na<sub>2</sub>MoO<sub>4</sub>-MoO<sub>3</sub>, K<sub>2</sub>MoO<sub>4</sub>-MoO<sub>3</sub>, Li<sub>2</sub>WO<sub>4</sub>-WO<sub>3</sub>, Na<sub>2</sub>WO<sub>4</sub>-WO<sub>3</sub>, K<sub>2</sub>WO<sub>4</sub>-WO<sub>3</sub>, Li<sub>2</sub>MoO<sub>4</sub>-Na<sub>2</sub>MoO<sub>4</sub>,

$\text{Li}_2\text{WO}_4$ - $\text{Na}_2\text{WO}_4$ ,  $\text{Li}_2\text{MoO}_4$ - $\text{K}_2\text{MoO}_4$ . FRITZ HOERMANN. *Z. anorg. allgem. Chem.* 177, 145-86(1928).—The simple molybdate and tungstate of Li sep. from aq. soln. and from fusions as anhyd. trigonal crystals, whereas the K salts, which are also anhyd., crystallize in the monoclinic system; the dihydrated Na salts form rhombic-bipyramidal crystals. Thermal analysis of the systems,  $\text{Li}_2\text{MoO}_4$ - $\text{MoO}_3$  and  $\text{Na}_2\text{MoO}_4$ - $\text{MoO}_3$ , indicates the existence of di-, tri- and tetramolybdates; with K the trimolybdate alone is formed. The salts,  $\text{Li}_2\text{O} \cdot 2\text{MoO}_3$ ,  $\text{Na}_2\text{O} \cdot 2\text{MoO}_3$  and  $\text{K}_2\text{O} \cdot 3\text{MoO}_3$ , crystallize in the rhombic system. The rhombic ditungstates of Li and Na melt without decompn., and are probably isomorphous with the corresponding molybdates; K ditungstate does not appear to exist. Tetratungstates of Li and Na, and tri- and tetratungstates of K exist. The following m. ps. have been detd.:  $\text{Li}_2\text{O} \cdot \text{MoO}_3$  705°,  $\text{Li}_2\text{O} \cdot 2\text{MoO}_3$  (532°),  $\text{Li}_2\text{O} \cdot 3\text{MoO}_3$  (549°),  $\text{Li}_2\text{O} \cdot 4\text{MoO}_3$  (568°),  $\text{Na}_2\text{O} \cdot \text{MoO}_3$  687°,  $\text{Na}_2\text{O} \cdot 2\text{MoO}_3$  612°,  $\text{Na}_2\text{O} \cdot 3\text{MoO}_3$  (528°),  $\text{Na}_2\text{O} \cdot 4\text{MoO}_3$  (515°),  $\text{K}_2\text{O} \cdot \text{MoO}_3$  926°,  $\text{K}_2\text{O} \cdot 3\text{MoO}_3$  571°,  $\text{Li}_2\text{O} \cdot \text{WO}_3$  742°,  $\text{Li}_2\text{O} \cdot 2\text{WO}_3$  745°,  $\text{Li}_2\text{O} \cdot 4\text{WO}_3$  (800°),  $\text{Na}_2\text{O} \cdot \text{WO}_3$  700°,  $\text{Na}_2\text{O} \cdot 2\text{WO}_3$  738°,  $\text{Na}_2\text{O} \cdot 4\text{WO}_3$  (784°),  $\text{K}_2\text{O} \cdot \text{WO}_3$  921°,  $\text{K}_2\text{O} \cdot 3\text{WO}_3$  (660°),  $\text{K}_2\text{O} \cdot 4\text{WO}_3$  (930°),  $\text{Li}_2\text{MoO}_4 \cdot 3\text{Na}_2\text{MoO}_4$  (484°),  $\text{Li}_2\text{WO}_4 \cdot 3\text{Na}_2\text{WO}_4$  (511°). Figures in parentheses are incongruent m. ps. B. C. A.

**Chromic ethylates. Preparation and properties.** P. A. THIESSEN AND B. KANDELAKY. *Z. anorg. allgem. Chem.* 181, 285-94(1929).—Chromic chloride tetraethylalcoholate,  $\text{CrCl}_3 \cdot 4\text{C}_2\text{H}_5\text{OH}$ , is obtained in the form of ditetragonal bipyramidal crystals ( $A:C=1:0.7744$ ) by the action of dry HCl upon Cr under abs. EtOH. Drying at 50° in a vacuum yields the trialcoholate,  $\text{CrCl}_3 \cdot 3\text{C}_2\text{H}_5\text{OH}$ . The action of Na upon  $\text{CrCl}_3$  in abs. EtOH results in the formation of *chromic ethylate triethylalcoholate* (I),  $\text{Cr}(\text{OC}_2\text{H}_5)_3 \cdot 3\text{C}_2\text{H}_5\text{OH}$ . Concn. of the mother liquor, or treatment of  $\text{CrCl}_3$  in abs. EtOH with  $\text{NaOC}_2\text{H}_5$  followed by evapn., yields green amorphous *chromic ethylate* (II),  $\text{Cr}(\text{OC}_2\text{H}_5)_3$ . Both I and II are rapidly attacked by moisture and may be used in the prepn. of pure hydrous chromic oxides. L. F. AUDRIETH

**Chromic *p*-toluenesulfonate.** GUSTAV JANTSCH AND K. MECKENSTOCK. *Monatsh.* 52, 169-84(1929).—Evapn. at room temp. of concd. solns. of (*p*- $\text{MeC}_6\text{H}_4\text{SO}_3$ )<sub>2</sub>Cr (I) gives grey-green crystals of hydrates varying between I + 8H<sub>2</sub>O and I + 12H<sub>2</sub>O. Crystn. below 12° gives a blue-violet salt contg. probably 16H<sub>2</sub>O. Hydrolysis in the crystal water at temps. as low as 50° interferes with an accurate analysis. The hydrate I + 16H<sub>2</sub>O is stable between -0.5 and +12°. The hydrate I + 9H<sub>2</sub>O, which at 10 mm. Hg is stable up to 61°, was obtained by dehydrating I + 16H<sub>2</sub>O at 10° or the crystals I + 8H<sub>2</sub>O to I + 12H<sub>2</sub>O at 30° over H<sub>2</sub>SO<sub>4</sub> of definite vapor pressure. By further dehydration of I + 16H<sub>2</sub>O or I + 9H<sub>2</sub>O over concd. H<sub>2</sub>SO<sub>4</sub>, a green hydrate I + 4H<sub>2</sub>O was obtained. Its deep green aq. soln. soon turns blue-violet, while solns in EtOH or Me<sub>2</sub>CO remain green; the tetrahydrate seems to form, by addn. of H<sub>2</sub>O, the blue-violet complex ion  $[\text{Cr}(\text{OH})_2]^{+++}$ . Solns. of I + 16H<sub>2</sub>O are blue, those of I + 9H<sub>2</sub>O are blue-violet. Both turn green on heating. Attempts to obtain corresponding acido-aquo-salts by concn. of the green soln. at 76° yielded only I + 10H<sub>2</sub>O and concn. at 100° gave a green sirup that did not crystallize. The presence of acido-aquo ions could be proved by electrolytic transference expts. and it was shown on soln. of the mixed hydrate (8-10H<sub>2</sub>O) that, while below 60° only aquo chromic complexes migrate to the cathode, above 65° acido-aquochromic complexes are present. G. T.

**Dipyridine iodostannate.** A. G. DIMITRIOU. *Praktika* 2, 496(1927).—The compd ( $\text{C}_5\text{H}_5\text{N}$ )<sub>2</sub>SnI<sub>4</sub>, orange-red, is obtained by interaction of the components in anhyd. light petroleum. B. C. A.

**Complex derivatives of triazinetricarboxylic acid.** PAUL PASCAL AND RENÉ LÉCUR. *Compt. rend.* 189, 49-51(1929).— $[\text{C}_3\text{N}_3(\text{CO}_2)_3]^{---} = 1$ . When 1K<sub>3</sub> is treated with a heavy metal, a ppt. is generally formed which is sol. in an excess of 1K<sub>3</sub>. The metal forms a part of a complex ion. The compn. of the complex formed may be one of 3 types according to the conditions employed. The first type is obtained when the addn. of the heavy metal salt is stopped at the point when the ppt. is no longer dissolved. A colored ppt. is obtained after some time and has a compn., of which the following are examples:  $[\text{Fe}^{+++}]_2\text{Fe}^{+++}\text{K} \cdot 24\text{H}_2\text{O}$ ,  $[\text{Mn}^{+++}]_2\text{Mn}^{+++}\text{K}_2 \cdot 6\text{H}_2\text{O}$ ,  $[\text{Cr}^{+++}]_2\text{Cr}^{+++}\text{K}_2 \cdot 40\text{H}_2\text{O}$ ,  $[\text{Co}^{+++}]_2\text{Co}^{+++}\text{K}_3 \cdot 24\text{H}_2\text{O}$  (2),  $[\text{Fe}^{+++}]_2\text{Fe}^{+++}\text{K}_3 \cdot 3[\text{Fe}^{+++}]_2\text{K}_2 \cdot 40\text{H}_2\text{O}$ . The compd. 2 is obtained from the Co<sup>++</sup> complex by treatment with H<sub>2</sub>O<sub>2</sub>. Formation of the Co<sup>++</sup> and Ni<sup>++</sup> complexes,  $[\text{Co}^{++}]_2\text{Co}^{++}\text{K}_4 \cdot 8\text{H}_2\text{O}$  (3) and  $[\text{Ni}^{++}]_2\text{Ni}^{++}\text{K}_2 \cdot \text{H}_2\text{O}$ , is preceded by the pptn. of the compds. of the second type. These compds. are generally formed when the heavy metal salt is added in excess, under which conditions all of the K is replaced. Examples of this type are  $[\text{Fe}^{+++}]_2\text{Fe}^{+++} \cdot 24\text{H}_2\text{O}$ ,  $[\text{Co}^{+++}]_2\text{Co}^{+++} \cdot 9\text{H}_2\text{O}$  (4) and  $[\text{Ni}^{+++}]_2\text{Ni}^{+++} \cdot 4\text{H}_2\text{O}$ . Cr and Mn salts give complexes of the first type only. The third type is obtained when the alkali salt is in excess and is pptd.

from soln. by addn. of 95% alc.  $[Fe^{++1}_2]K_4$  and  $[Fe^{+++1}_2]K_3 \cdot 20H_2O$  are examples,  $Co^{++}$  salts under the same conditions give the tan compds. 4 and 3 successively. The former then undergoes mol. isomerism for the color of the soln. turns red and a red compd. ppts. out. This compd. has the same compn. as 4 but besides the  $C_6N_2$  group it contains the oxalate and  $NH_4$  groups. It is formed from 4 by internal hydrolysis and has the compn.  $[Co^{++1}_2][Co^{+++1}_2 \cdot 9(Co(C_2O_4)_2)(NH_4)_2]$ . The hydrolysis takes place at the expense of the  $H_2O$  of crstn. and ceases as soon as this has all reacted. J. M. L.

**The oxygen addition product obtained by treatment of tetramethylammonium hydroxide with ozone.** WILHELM TRAUBE AND FRITZ KUHBIER. *Ber.* 62B, 809-20 (1929).— $Me_4NOH$  treated with  $O_3$  gives a red compd., analogous to the "hydroxoxides" obtained by treating  $KOH$ ,  $RbOH$  or  $CsOH$  with  $O_3$ . The hydroxide of  $Me_4NOH$  is much more stable than those of the alk. metals: the formula,  $(Me_4NOH)_2O_3$ , is proposed to represent it. When the alk. hydroxides are decompd. by  $H_2O$ , they liberate exactly the amt. of  $O$  picked up for their formation. With  $Me_4NOH$ , only about one half of the  $O$  is recovered as such: during the decompn. by  $H_2O$ ,  $H_2O_2$  is formed.  $CO_2$  and  $HCO_2H$  can be detected as  $NH_4$  salts: it is not evident whether that oxidation occurs during the  $O_3$  absorption period or during the  $H_2O$  decompn. stage. A. L. H.

Magnetic and crystallographic researches: Hydrated  $Fe_2O_3$  (ALBRECHT) 2.

## 7—ANALYTICAL CHEMISTRY

W. T. HALL

**Applications of recent analytical interest.** J. J. FOX. *J. Oil and Color Chem. Assoc.* 12, 38-45(1929).—F. briefly reviews and recommends the use of 8-hydroxyquinoline and pyridine-thiocyanate reagents and the potentiometric titration methods in quant. analysis. Examples of interest in *paint analysis* are given. G. G. SWARD

**Practical guides for gas-analytical investigations.** G. NEUMANN AND F. STRÄHUBER. *Arch. Eisenhüttenw.* 2, 557-74(1929).—The adjustment, manipulation and sources of error of the Orsat app. are discussed. App. for exact gas analysis is described and also automatic measuring app. The taking of samples and evaluation of results are also considered. W. T. H.

**The effect of shaking on various reactions of precipitation.** GUSTAV THANHEISER AND PETER DICKENS. *Arch. Eisenhüttenw.* 2, 575-81(1929).—With chemically pure salts and the customary procedures, it was found that Ba, S, Ca and Mg could be pptd. completely as  $BaSO_4$ ,  $CaC_2O_4$  and  $MgNH_4PO_4$  by 10-min. shaking, but, contrary to general opinion, the shaking of a molybdate ppt. in the detn. of P accomplishes nothing more than 10-min. standing will do. W. T. H.

**Analysis by x-ray spectroscopy.** C. F. EDDY, T. H. LABY AND A. H. TURNER. *Proc. Roy. Soc. (London)* A124, 249-68(1929).—In spectral analyses with x-rays an element is usually identified by its 4 K-series lines or by at least 6 of its L-series lines. With very small quantities of an element in a mixt. some of these lines may be undiscernible. As compared with other methods of spectral analysis, x-ray spectra have the following advantages: (1) the no. of lines is small; (2) Moseley's law simplifies the identification of a line; (3) a min. potential is required to excite a group of lines, so the 2nd or higher order lines can be excluded. In this paper the technic of constructing the x-ray tube and spectrometer and the identification of the lines are described. Results show that the method is capable of detecting as little as 0.0003 of an impurity in a metal. Seven samples of Zn were examd., one of which was spectroscopically pure and the others were of compn. known by analysis or synthesis. W. T. H.

**New method for the determination of chlorine and sulfur in sulfur monoxide.** HIDEMARO ENDO. *J. Soc. Chem. Ind. Japan* 32, 422-30(1929); Suppl. Binding 32, 126B(1929).—For the detn. of Cl, 10 cc. of soln. is taken and 20 cc. of glacial AcOH acid, 50 cc. of 1%  $NaNO_2$  soln., 20 cc. of 10%  $CuSO_4$  soln. together with 50 cc. of water are added; the whole is heated for  $\frac{1}{2}$ -1 hr. to expel  $CS_2$ .  $CuS$  ppt. is filtered off and the filtrate is acidified with 2 or 3 drops of concd.  $HNO_3$  and boiled;  $AgNO_3$  is then added and Cl is estd. as  $AgCl$ . For the detn. of S, 10 cc. of sample soln. is taken, to which 60 cc. of glacial AcOH and 5 cc. of concd.  $HNO_3$  are added. After 15 min. it is heated on a water bath for one hour, 5 cc. of  $Br_2$  is then added to the soln. and 300 cc. of hot water is added in small quantities at a time, the whole is evapd. to dryness and  $BaSO_4$  is pptd. in the usual way. FUZIBAYASHI

**Notes on the determination of hydrogen and methane in the Orsat apparatus.** HERBERT A. BAHR. *Arch. Eisenhüttenw.* 2, 495-502(1929).—Orsat app., such as is used today in many labs. with the glowing wire pipets, gives unreliable results because of oxidizability of the electrodes and the use of unsuitable confining liquids. If a satd. soln. of NaCl is used as confining liquid and Au, or protected Hg, used as electrodes, satisfactory results can be obtained. A const., slight neg. error in the  $\text{CH}_4$  detn. indicates that when the combustion is accomplished by means of a glowing Pt wire, some oxidation product other than  $\text{CO}_2$  is formed, possibly  $\text{HCHO}$  or  $\text{HCO}$ . Two new modifications of the Orsat app. are shown, which are designed especially to overcome the errors encountered. W. T. H.

**Determination of available oxygen by the Bunsen method.** THOMAS W. PARKER AND PERCY L. ROBINSON. *J. Chem. Soc.* 1929, 1106-7.—An app. is described in which the danger of the liquid from the receiver sucking back into the distg. flask is obviated and it is not necessary to transfer the  $\text{KI}_2$  soln. to another vessel for titration. The results obtained in the analysis of  $\text{K}_2\text{Cr}_2\text{O}_7$  by the Bunsen iodometric method were distinctly better with the new app. and procedure. W. T. H.

**Volumetric method for the determination of potassium with  $\text{Na}_2\text{PbCo}(\text{NO}_2)_6$ .** V. I. TOVARNITZKII AND P. S. SERGEENKO. *Zhurnal Sakharnoi Promyshlennosti* 2, 228-36(1928).—K can be detd. by the following method without ptg. other bases except  $\text{NH}_4$ , with a max. error of 1-2%. To 50 cc. of the soln. to be tested and contg. 10-20 mg. of K, add 2-4 cc. of  $\text{Na}_2\text{PbCo}(\text{NO}_2)_6$  reagent. Stir for 20 min. to get complete pptn. Add  $\text{BaSO}_4$  till the ppt. changes from orange to a light yellow color. Filter through filter paper and wash with 200-250 cc. of  $\text{H}_2\text{O}$ . Wash the ppt. from the filter into the first beaker, then add 50 cc. 0.1 N  $\text{KMnO}_4$  and 20 cc. of  $\text{H}_2\text{SO}_4$  (1:3) and make up to 300-400 cc. Heat the beaker on a water bath at  $100^\circ$  for 30 min. After heating add to the beaker 0.1 N  $\text{Na}_2\text{C}_2\text{O}_4$  and titrate back with 0.1 N  $\text{KMnO}_4$ . Calc. the results by the formula  $x = [(a + c) - b] \times 0.0006521$ , where  $a$  = cc. of  $\text{KMnO}_4$  used for oxidation,  $b$  = cc. of  $\text{Na}_2\text{C}_2\text{O}_4$ ,  $c$  = cc. of  $\text{KMnO}_4$  used for titration; 0.0006521 is the factor. Reagents required are: 0.1 N  $\text{KMnO}_4$ ; 0.1 N  $\text{Na}_2\text{C}_2\text{O}_4$ ;  $\text{H}_2\text{SO}_4$  (1:3),  $\text{BaSO}_4$  suspended in water. The  $\text{Na}_2\text{PbCo}(\text{NO}_2)_6$  can be obtained by mixing 22 g. of  $\text{NaNO}_2$ , 3 g. of  $\text{Co}(\text{NO}_3)_2$  and 5 g. of  $\text{Pb}(\text{NO}_3)_2$ , crushed and dissolved in a little hot  $\text{H}_2\text{O}$ . Then wash into a graduate cylinder, make up to 80 cc. and add 5 cc. of  $\text{AcOH}$ . When the pptn. is complete, filter the soln. and keep the absolutely clear filtrate in dark glass bottles. V. E. BAIKOW

**Smith's method for the determination of arsenic.** YU. D. GNESIN. *Farm. Zhur* 1928, 442-4.—Correction of journal reference (*C. A.* 23, 4161). E. J. C.

**A study of the accuracy of the Gutzeit method for arsenic.** J. R. NELLER. *J. Assoc. Official Agr. Chem.* 12, 332-41(1929).—The accuracy of the Gutzeit test was studied with Pb arsenate solns. obtained by dipping sprayed apples in boiling 10%  $\text{HCl}$  and with Pb arsenate powder. Variations in averages obtained when aliquots of the same size were used ranged from 4.5 to 13.4%. The av. probable error in % of the mean of all possible pairs obtainable in the various groups of 8-11 detns. each was 6.6%. An evolution and absorption temp. of  $18-20^\circ$  was equally as accurate as a temp. of  $30-3^\circ$ . The addn. of  $\text{SnCl}_2$  either before or after heating the soln. with  $\text{KI}$  did not affect the results; if  $\text{H}_2\text{SO}_4$  is present it is advisable to add the  $\text{SnCl}_2$  at the time of cooling to avoid the possibility of forming  $\text{SO}_2$ . A convenient method of prepg. the sensitized strips is described and several precautions are listed with reference to the technique of the method. A. PAFINEAU-COUTURE

**Note on the colorimetry of bismuth.** FRICK AND ENGERMANN. *Chem.-Ztg.* 53, 505-7(1929).—By dissolving black  $\text{BiI}_3$  in  $\text{KI}$  a yellow soln. of  $\text{KBiI}_4$  is obtained and the color is proportional to the Bi content. The method of carrying out the colorimetric test and the necessary app. are described. W. T. H.

**Reaction restriction and reaction acceleration in analytical procedures.** P. FUCHS. *Z. angew. Chem.* 42, 704(1929); F. FEIGL. *Ibid.*—The formation of complex fluosilicates and fluoaluminates in analytical procedures is discussed somewhat polemically with respect to priority. W. T. H.

**The determination of trivalent and bivalent cobalt in cobalt compounds.** V. CUVELIER. *Natuurw. Tijdschr.* 11, 123-30(1929).—Total Co is titrated by a modification of the Willard method (use of diphenylamine as inside indicator instead of  $\text{K}_3\text{Fe}(\text{CN})_6$  as outside indicator). To titrate trivalent Co, the mineral is dissolved directly in titrated  $\text{SnCl}_4$ , in a  $\text{CO}_2$  atm. and the above procedure is then applied. Bivalent Co is computed by difference of the results thus obtained. So-called "Heterogenite from Katanga (Belgian Congo)" has been analyzed: it is not true Heterogenite, but

a colloidal mineral whose chem. compn. is  $3\text{Co}_3\text{O}_4 \cdot 2\text{CuO} \cdot 10\text{H}_2\text{O}$  and whose  $n$  is 1.85.

**The determination of ash.** C. WEKER. *Gaz. Cukrow*, 36, 134 (1929); *Listy Cukrovar Roshledy* 47, 29.—The app. and method are described. Ash was detd. by cond. method and compared with carbonate ash detd. by heating with  $\text{H}_2\text{SO}_4$ . The cond. method for ash detn. gives a rapid result, and the differences in the results obtained by the 2 methods were very small. Electrolysis of the soln. and polarization at the electrodes can be ignored for the time the current flow is very short. Scrupulous cleanliness of the cells is necessary, otherwise differences in the cond. and ignition detns. occur.

FRANK MARESH

**Report on (the determination of) bromides (in the presence of) chlorides.** H. WALES. *J. Assoc. Official Agr. Chem.* 12, 302-3 (1929).—The Winkler method (C. A. 10, 867) gave 99.43-100.83% of theoretical results.

A. PAPINEAU-COUTURE

**Qualitative analysis of a mixture of ferrocyanide, ferricyanide and thiocyanate.** PARES CHANDRA BANERJEE. *J. Indian Chem. Soc.* 6, 259-62 (1929).—Treat the neutral soln. with  $\text{Ce}(\text{NO}_3)_3$  soln. (instead of  $\text{Th}(\text{NO}_3)_4$  as recommended by Browning and Palmer) to ppt.  $\text{KCeFe}(\text{CN})_6$ . Wash the ppt. with cold water, decomp. with  $\text{NaOH}$  soln., make the filtrate acid and test with  $\text{FeCl}_3$  soln. To the filtrate from the original Ce pptn. add  $\text{Ni}(\text{NO}_3)_2$  to ppt.  $\text{Ni}_2(\text{Fe}(\text{CN})_6)_3 \cdot 18\text{H}_2\text{O}$ . Filter and treat the filtrate in the acid and  $\text{FeSO}_4$  soln. Finally, in the filtrate from the Ni ppt., test for  $\text{CNS}^-$  with ferric salt.

W. T. H.

**Quantitative analysis of phosphoric acid. I. Determination as magnesium pyrophosphate.** M. ISHIRASHI. *Mem. Coll. Sci. Kyoto Imp. Univ.* A12, 23-38 (1929); cf. C. A. 23, 4645.—In the gravimetric detn. of phosphate by pptn. as  $\text{MgNH}_4\text{PO}_4$ , the magnesia mixt. should be adjusted to a  $p_n$  of 5-6. The mol. ratio of  $\text{NH}_4\text{Cl}$  to  $\text{MgCl}_2$  should be 5-15:1, and the ratio of  $\text{MgCl}_2$  to  $\text{P}_2\text{O}_5$  1.3-10.5:1. If the  $p_n$  of the phosphate soln. is 4.4-8.3, and the pptn. is effected below  $35^\circ$ , the ppt. will settle satisfactorily in 30 min.  $\text{AcONa}$ ,  $\text{KCl}$  and  $\text{NH}_4$  and  $\text{Na}$  sulfates interfere. **II. Gravimetric and volumetric methods.** *Ibid* 39-47.—The spontaneous oxidation of manganous  $\text{NH}_4$  phosphate in alk. soln. may be prevented by addn. of hydroxylamine, so that it becomes possible to det. phosphate by pptn. as the double phosphate and weighing as pyrophosphate after ignition. Excess of a soln. contg.  $\text{NH}_4\text{Cl}$  and  $\text{MnCl}_2$  in the mol. ratio of 75-125:1 and a little hydroxylamine-HCl are added to the phosphate soln., which must be not too dil. and of such acidity that only a very slight ppt. results. The soln. is then heated nearly at the b. p., pptd. by addn. of  $\text{NH}_3$  and filtered after 2 hrs.  $\text{NH}_4$  citrate, tartrate and oxalate interfere, and, if  $\text{NH}_4$  molybdate is present, it is necessary to ppt. from a strongly ammoniacal soln., then dissolve in acid and reppt. The double phosphate may also be dissolved in acid and titrated with permanganate at  $80-90^\circ$ , the end point being reached when the color of the soln. does not change for 2-3 min.; 2 g. of  $\text{AcONa}$  must be added for each 10 cc. of 0.1  $N$ -permanganate. **Determination as zinc ammonium phosphate. III.** *Ibid* 49-56.—Phosphate may also be detd. by pptg. as  $\text{ZnNH}_4\text{PO}_4$ , igniting and weighing as pyrophosphate. Excess of a soln. contg.  $\text{NH}_4\text{Cl}$  and  $\text{MgCl}_2$  in the mol. ratio of 50-100:1, and 2.0-3.6  $N$  in respect of the former chloride, is added to the phosphate soln., the acidity of the mixt. being so regulated that very little pptn. occurs. The soln. is then heated nearly at the b. p., and  $\text{NH}_3$  slowly added until pptn. is complete, the  $p_n$  being kept at 5-6.5 during this process.  $\text{NH}_4$  molybdate interferes. Instead of the ppt. being ignited, it may be converted into  $\text{Zn}$  oxalate by treatment with oxalic acid and titrated with permanganate.

B. C. A.

**Analysis of a mixture of water, nitric acid and sulfuric acid by thermometric titration.** T. SOMIYA. *Chem. News* 137, 14 (1928).—Addn. of fuming  $\text{H}_2\text{SO}_4$  to a mixt. of water,  $\text{HNO}_3$  and  $\text{H}_2\text{SO}_4$  results in a well-defined temp. max. when the water is converted into  $\text{H}_2\text{SO}_4$  and the  $\text{HNO}_3$  into  $\text{OH} \cdot \text{SO}_3 \cdot \text{ONO}_2$ . Further addn. of the fuming acid gives a less well-marked temp. max. when the  $\text{HNO}_3$  is converted into  $(\text{SO}_3)_2\text{N}_2\text{O}_6$ .

B. C. A.

**Determination of polysulfide sulfur and nitrogenous substances in commercial sodium sulfide.** KOTARO SHIMO AND YUTAKA MAKITA. *J. Soc. Chem. Ind. Japan* 32, 123-5 (1929); Suppl. Binding 32, 32B (1929).—Polysulfide S is first converted into thiosulfate by boiling the sample with a small excess of  $\text{Na}_2\text{SO}_4$  and  $\text{MgCl}_2$  soln. in an atm. of  $\text{CO}_2$ . When the sulfite-thiosulfate mixt. thus obtained is treated with  $\text{I}_2$  soln., the former is oxidized to sulfate and the latter to tetrathionate. By treating the mixt. with  $\text{Al}$  and  $\text{HCl}$ , the tetrathionate alone is reduced to  $\text{H}_2\text{S}$ , which is absorbed in  $\text{I}_2$  soln.; thus, thiosulfate can be estd. The value of thiosulfate (A) thus obtained is the sum of the original thiosulfate and that which corresponds to the polysulfide S.

The true amt. of thiosulfate in the original sample (B) can be detd. by the usual method, and then polysulfide S. can be calcd. from the difference (A-B). Y. and U. found that nitrogenous substances are present mainly as ammoniacal nitrogen and thiocyanate. They estd. the former by distg. the sample with MgO and the latter by the iodometric method.

FUZIBAYASHI

**The determination of silicon in ferrosilicon and other ferrous alloys.** A. STADELER. *Arch. Eisenhüttenw.* 2, 425-37(1929).—The results tabulated in this paper represent a great deal of work on the identical sample in 11 different chem. labs. It is the most thorough investigation ever made on the detn. of Si in alloys contg. 11-97% Si and deserves study by all chemists having to do with such work. Samples contg. up to 15% Si present little difficulty because they are easily decompd. by acids. The most satisfactory method for these alloys appears to be the following: Treat 1 g. of the sample with 25 cc. of Br-HCl (500 cc. concd. HCl, 500 cc. of water and 100 cc. of Br<sub>2</sub>). Heat until decompn. is complete, evap. to dryness and bake 1 hr. at 130°. Take up the residue in 10-15 cc. of concd. HCl. Dil. and filter. Evap. the filtrate, except the washings, to dryness and recover the small quantity of SiO<sub>2</sub> that escaped pptn. the first time. Treat the SiO<sub>2</sub> with HF and H<sub>2</sub>SO<sub>4</sub> as usual. The following rapid method gives nearly as good results: Treat 1 g. of material with 40 cc. of concd. HCl at a moderate temp. and allow to stand overnight. Dil., filter and weigh the ppt. without correcting for impurities. With 15% of Si in the alloy, the impurities in the ppt. counterbalance the wt. of SiO<sub>2</sub> in soln. With materials higher in Si, it is necessary to use a fusion method but the expts. show that Na<sub>2</sub>CO<sub>3</sub> itself can serve for the oxidation of both Fe and Si. All the chemists engaged in this cooperative investigation agreed that the following procedure was the most satisfactory: Fuse 0.5 g. of sample with 6 times as much of a mixt. of 2Na<sub>2</sub>KCO<sub>3</sub>:1Na<sub>2</sub>O<sub>2</sub> in a Ni or Fe crucible, heating gradually at first and only using a common burner. Cool, ext. the melt with water and carefully acidify with HCl. Evap. to dryness and heat 1 hr. at 130°. Take up the residue in a little concd. HCl, filter and evap. the filtrate to dryness again to recover residual SiO<sub>2</sub>, running a blank on all reagents. Treat with HF and H<sub>2</sub>SO<sub>4</sub> as usual. The same method proved satisfactory with material very rich in Si, although it seemed best to heat first with KNaCO<sub>3</sub> and add the Na<sub>2</sub>O<sub>2</sub> later. Expts. with direct treatment of the sample with HF and H<sub>2</sub>SO<sub>4</sub> gave results which were not entirely satisfactory although fair results were obtained with high materials when it was assumed that 0.7 of the wt. of residue represented the corresponding wt. of original material.

W. T. H.

**The analysis of sodium sulfide, sulfite and bisulfite.** M. AUERBACH. *Lederlech. Rundschau* 21, 83(1929).—Comments on note by Paessler (*C. A.* 23, 3187). I. D. C.

**Analysis of a mixture of acetic acid, acetic anhydride and sulfuric acid and the acetylation bath of cellulose by thermometric titration.** TAKAYUKI SOMIYA. *J. Soc. Chem. Ind. Japan* 32, 490-5(1929); Suppl. Binding 32, 153-4B; cf. *C. A.* 23, 2907.—When acid mixts. were titrated thermometrically with standard C<sub>6</sub>H<sub>5</sub>NH<sub>2</sub> soln. in the presence of pyridine, the end point corresponding to the sum of Ac<sub>2</sub>O and acetylsulfuric acid was obtained, but it was not sharp, because there was a further rise of temp. even after the end point. When a mixt. contg. Ac<sub>2</sub>O and sulfoacetic acid was titrated with C<sub>6</sub>H<sub>5</sub>NH<sub>2</sub>, without adding pyridine, the end point corresponding to the sum of the 2 components was gained, but was not accurate enough. When an excess of the standard C<sub>6</sub>H<sub>5</sub>NH<sub>2</sub> soln. was added first to the acid mixt. and then the excess of C<sub>6</sub>H<sub>5</sub>NH<sub>2</sub> was thermometrically titrated with Ac<sub>2</sub>O soln. in the presence of pyridine, a sharp end point was obtained and the sum of Ac<sub>2</sub>O and acetylsulfuric acid could be detd. with accuracy.

S. OKA

**Application of the iodometric method to the estimation of small amounts of aldoses.** MORNA MACLEOD AND ROBERT ROBISON. *Biochem. J.* 23, 517-23(1929).—Satisfactory results are obtained by using 3-4 times the theoretical quantity of I with Na<sub>2</sub>CO<sub>3</sub> as the alkali, and allowing the oxidation to proceed during 30 min. at 21°. B. H.

**Determination of invert sugar in sucrose solution with the titrimetric reduction method.** IV. Influence of calcium salts on the reduction. JOHN A. A. GABREELS AND A. L. VAN SCHERPENBERG. *Chem. Weekblad* 26, 394-8(1929); cf. *C. A.* 19, 1835.—Ca salts have a large influence on the reducing power of sucrose on alk. Cu solns. and may even stop the same when the sucrose concn. is low. With higher concns. the influence is less and increase of reducing action is found. The detn. of invert sugar in sucrose solns. contg. 3.46 g. tartrate per 50 cc. is not influenced by Ca salts. The "acid adsorption" of the glassware used is mostly due to a permutite action of the glass.

E. SCHORR

**Graphical method for calculating the composition of a saccharin mixture containing sucrose, dextrose and levulose.** J. DUMAQUIÉ. *Ann. fals.* 22, 352-3(1929).—



A graphical method is described in detail, and it is claimed that the error is negligible as compared with those inherent to polarimetric readings and sugar detns. by Fehling's soln.

A. PAPINEAU-COUTURE

The reducing power of polybasic alcohols on alkaline solutions of potassium mercuric iodide. PAUL FLEURY AND JEAN MARQUE. *Compt. rend.* 188, 1686-8(1929).—The reducing action of aldehydes and monoses on alk. solns. of  $K_2HgI_4$  is shared by polybasic alcs. as mannitol (I), dulcitol (II), erythritol, inositol, glycerol and glycol (III), and to a smaller extent, inversely proportional to the mol. wt., by di-, tri-, tetra- and even polysaccharides. Among the acid alcs., gluconic acid is 50% as powerful as I, while glycolic, lactic, malic, saccharic, mucic and salicylic acids are 0.5-3% as effective. Dibasic acids as tartaric and citric acids do not exhibit this property. Heat has to be applied in all cases. The reaction may be used as a means of *detg. polybasic alcs.* The mixt. is added to 7.5 cc. of a soln. contg. 108 g. of  $HgCl_2$  and 288 g. of KI per l. and 10 cc. of NaOH soln. contg. 300 g. per l., to make a total vol. of 35 cc. It is heated for 45 min. on the  $H_2O$  bath, acidified with  $H_2SO_4$ , an excess of standard I soln. is added, and the excess detd. with  $Na_2S_2O_3$ . About 1 g. of pptd.  $BaSO_4$  is added during the reduction to agglomerate the Hg. For 1-15 mg. of alc. the amt. of I fixed is linearly proportional to the amt. of alc. and is 7.33 cc. of 0.1 N for 10 mg. of I. The procedure has been applied successfully to I, II and III. A mixt. of I and glucose (IV) may be detd. approx. in spite of a previous finding that the reaction is specific for IV. In this case the alky. was 30 times as weak as that used by F. and M., who found that I in a mixt. with IV is attacked when it is present in a ratio of more than 4:1. For sucrose the ratio must be greater than 20:1. The reducing action of  $\alpha$ -glycerophosphoric acid is more marked than that of the  $\beta$ -compd., showing the greater activity of the secondary OH group in comparison with the primary one. I. M. LEVINE

Detection of benzene with dracorubin. BERGER. *Zentr. Gewerbehyg. u. Unfallverhüt.* 15, 227-8(1928).—The dye "dracorubin," which is sol. in benzene but not in benzenes, is used in the form of test-paper. B. C. A.

Report on (the determination of) ether. H. M. JOSLIN. *J. Assoc. Official Agr. Chem.* 12, 288-9(1929); cf. Spencer, C. A. 22, 4410.—As it may not always be convenient to heat the alc. vapor absorption tube in a const.-temp. bath at 50°, the acid concn. in the tube was increased from 9 N to 12 N  $H_2SO_4$ ; in addn., iodometric methods were used to det. the excess  $K_2Cr_2O_7$  remaining after oxidation of the  $Et_2O$ . 97.7-102.1% recovery was obtained with known wts. of anhyd.  $Et_2O$ , and 94.8-98.9% with  $H_2O$ -alc.- $Et_2O$  solns. of known concns. A. PAPINEAU-COUTURE

Determination of 2-phenyl-4-quinolinecarboxylic acid in the presence of salicylic acid, acetylsalicylic acid and hexamethylenetetramine. E. SCHULEK AND G. VASTAGH. *Magyar. Gyóg. Társaság Értesítője* 5, 218-25(1929).—The material should be dissolved in 5% NaOH; 50%  $H_2SO_4$  is added to the soln. until a ppt. is formed. The ppt. is transferred to a Gooch filter or better to a crucible with porous glass bottom. The filter is washed out 3 times with water, the soln. made alk. and concd. to 20 cc. The cooled soln. is treated with  $H_2SO_4$  as before and the same treatment repeated. The ppt. produced now with addn. of  $H_2SO_4$  consists almost of pure salicylic acid. The filter contg. this ppt. is treated 5 times with 5 cc. warm, satd. phenylquinolinecarboxylic acid soln. to remove salicylic acid. The last traces of the latter are washed out with cold satd. phenylquinolinecarboxylic acid. The ppt. is dried at 1200°. The results agree very well with calcd. values. One part phenylquinolinecarboxylic acid is dissolved by 199 parts  $H_2O$  of 100° temp. and by 15,000 parts  $H_2O$  of 20°. S. S. DE FINALLY

A reaction of resorcinol and a new colored indicator. LIGOR BEY AND M. FAILLER-BIN. *Compt. rend.* 188, 1679-81(1929).—The blue substance (I) obtained when  $NH_3$  is added to an aq. soln. of resorcinol in the presence of cations such as  $Cd^{++}$ ,  $Zn^{++}$ ,  $Cu^{++}$ ,  $Pb^{++}$  and  $Sn^{++}$  is not formed in an atm. of  $N$ . Oxidation is necessary and this process is catalyzed by the cations. A second colored substance (II), combined with the cation, is formed when no  $NH_3$  is added. This is red in acid soln. and green in a soln. of  $pH$  9.18. When  $NH_4OH$  is added to this, it is transformed irreversibly into I, which is blue in alk. and red in acid medium. The color changes between  $pH$  4.3 and 5.9, within which interval the color is violet. Both I and II may be isolated from their aq. soln. by extn. with AmOH. I. M. LEVINE

Following up the inversion danger (BRUHNS) 28. The effect of Fe on the magnetic susceptibility of Al (MASON) 2. Determination of some medicinal products by the mercurimetric method (IONESCO-MATTU, POPESCU) 17. The HCN question. XXV. Detection of substances capable of uniting with HCN in hydrocyanic distillates (ROSENTHALER) 17. Smelting in the lead blast furnace (OLDRIGHT, MILLER) 9.

FULTON, C. H., AND CHARWOOD, W. J.: *Manual of Fire Assaying*. 3rd. ed., revised. New York: McGraw-Hill Book Co. 268 pp. \$3.

## 8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY AND J. F. SCHAIRER

**New occurrences of germanium. II. The occurrence of germanium in silicate minerals.** JACOB PAPISH. *Econ. Geol.* 24, 470-80(1929); cf. *C. A.* 23, 4423.—A large no. of silicate minerals showed the presence of small quantities of Ge on spectroscopic examn., but no Ge was indicated in 5 quartz and 2 opal specimens, although part of these came from localities in which Ge-bearing silicate minerals were found

ELLIOTT J. ROBERTS

**Etching tests and x-ray examination of some manganese minerals.** WILLIAM V. SMITTHRINGALE. *Econ. Geol.* 24, 481-505(1929).—Etching tests and measurements of x-ray powder photographs are given for manganite, pyrolusite, hausmannite, braunite, bementite, psilomelane and wad. Analyses are given of the first 3 minerals. E. J. R.

**The absorption of a dialogite crystal.** PIERRE LEROUX. *Compt. rend.* 189, 162-3 (1929).—In dialogite ( $MnCO_3$ ) the light absorption is greater in the direction perpendicular to the optic axis. The pleochroism is most marked in the ultra-violet, the difference for  $\lambda 3655$  being 4 times greater than for D. E. SCHOTTE

**Natrolite from Viagrande, Etna.** S. DI FRANCO. *Atti accad. Lincei* [6], 9, 657-68 (1929).—Natrolite crystals having the approx. compn.  $Na_2O$  16.43,  $Al_2O_3$  27.02,  $SiO_2$  46.93,  $H_2O$  9.58%, corresponding to the formula  $Na_2Al_2Si_3O_{10} + 2 H_2O$ , have been found

A. W. CONTIERI

**Further examination of pseudophite from Borostyánkő.** G. VAVRINECZ. *Magyar Chem. Folyóirat* 34, 149-50(1928); cf. *C. A.* 22, 4416.—Another pseudophite was analyzed giving  $SiO_2$  33.04,  $Al_2O_3$  17.72,  $Fe_2O_3$  0.66,  $MgO$  32.07,  $FeO$  3.00,  $CaO$  0.67,  $H_2O$  13.40, sum 100.56%. Hardness was 2.5; sp. gr. 2.67. This compn. does not agree with the formula of pure orthochlorites, and the mineral consists of serpentine, amesite and another compd.,  $H_4MgAl_2SiO_8$ , differing from amesite in 1 mol.  $MgO$ . S. S. DE F.

**Analyses of minerals from Recsk.** G. VAVRINECZ. *Magyar Chem. Folyóirat* 35, 4-9(1929).—Chalcanthite, melanterite, pisanite, halotrichite and brochantite were analyzed, the last 2 minerals being new to the locality. S. S. DE FINÁLY

**The Sheritt Gordon copper-zinc deposit, northern Manitoba.** E. L. BRUCE. *Econ. Geol.* 24, 457-69(1929).—The ore, carrying approx. 3% each of Zn and Cu, was probably formed by contact metamorphic reactions between ore-bearing solns. high in Fe and the original minerals of a bed of gneiss. ELLIOTT J. ROBERTS

**The formation of cupriferous "black earths" in the Niari basin, French Congo.** RENÉ BURKHARDT. *Arch. sci. phys. nat.* [5], 11, 59-82(1929).—The mineralization of the entire region is discussed, and chem. equations are given for the formation of the several minerals found. The primary mineral, supposedly chalcopryite, has been decomposed by waters rising through the anticlinal fissures in limestone to be arrested by the sandstone layer on top, and slowly transformed into the present ores. The black earth is found in pockets, sometimes 20 m. thick and 100 to 200 m. in extent, between the sandstone and limestone, often in the latter but never in the former. It is a very complex material, the uppermost layers being richest in ore; d. = 1-2; it yields a very fine powder when dry. Its compn. is:  $SiO_2$  68.72, Pb 0.84, Zn traces, Cu 4.92 (chrysocolla, malachite, diopside and chalcocite in the order of their frequency), S 0.37,  $MnO_2$  4.46,  $Mn_2O_3$  0.23,  $Fe_2O_3$  4.46,  $Al_2O_3$  1.81,  $CaO$  4.96,  $MgO$  2.66%. II *Ibid* 163-83(1929).—Complete analyses are given, showing the variations in compn. (1) with the deposits, (2) with the layers, and (3) with the compact nature of the earths. According to the hypothesis formulated, the "black earths" are the residue from the dissoln. of limestones, usually dolomitic and very siliceous, by surface waters charged principally with  $CO_2$  and silicic acids. Analyses of samples of "black earths" and adjacent limestone, resp., gave: insol. in aqua regia 65.5, 5.74; Pb 0.42, trace; Zn trace, none; Cu 2.94, 0.65;  $MnO_2$  7.00, 1.93;  $Fe_2O_3$  5.2, 2.64;  $Al_2O_3$  traces;  $CaO$  6.63, 32.11.  $MgO$  3.21, 13.27; S 0.01, 0.02%. W. L. HILL

**Comparison of the conditions of occurrence of bituminous coal and petroleum.** E. MCKENZIE TAYLOR. *J. Inst. Petroleum Tech.* 15, 372-84(1929).—The shales forming the roofs of bituminous coal seams are identical in character with those which form the cap rocks of oil sands. Both contain Na clay, capable of being hydrolyzed in fresh  $H_2O$ . It is a generally accepted theory that coal was formed by the decompn. of land

plants. The lignocellulose of those plants is the most probable source of the solid coal substance. No remains of land vegetation are found in or about petroleum deposits. An explanation of the *origin of petroleum*, which takes account of these facts, is that petroleum is the result of the deposition and decompn. of marine flora and fauna in shallow deltaic or estuarine waters.

**Genesis of Japanese acid clay.** KYUHEI KOBAYASHI and KENICHI YAMAMOTO. *J. Soc. Chem. Ind. Japan* 32, 564-8(1929); Suppl. Binding 32, 174-5B(1929); cf. *C. A.* 22, 2250.—The Japanese acid clay is a decompn. product of Na feldspar and Na silicates. The decompn. was accelerated by ascending gases, such as  $\text{CO}_2$ ,  $\text{SO}_2$ ,  $\text{H}_2\text{S}$  and  $\text{H}_2\text{O}$ , and boiling water during post volcanic action, the feldspar being essentially transformed into a gel of hydrated Al silicate. The presence of  $\text{Fe}_2\text{O}_3$ ,  $\text{CaO}$ ,  $\text{MgO}$ , etc., may be partly due to accidental contamination and partly to adsorbing activity of acid clay. It is suggested that a part of this Al silicate and  $\text{SiO}_2$  flowed in while in a state of colloidal soln., which became coagulated into the deposits. S OKA

**The bauxite industry of northern South America.** L. LITCHFIELD, Jr. *Eng. Mining J.* 128, 242-8, 346-9(1929). E. H.

Magnetic and crystallographic researches: Hydrated  $\text{Fe}_2\text{O}_3$  (ALBRECHT) 2. Mosses and their subsoil (GYÖRFFY) 11D. The question of the soil-indicating mosses (BOROS) 11D. The determination of trivalent and bivalent Co in Co compounds (CUVELIER) 7.

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## 9--METALLURGY AND METALLOGRAPHY

D. J. DEMOREST, R. H. ABORN

**The treatment of ore from the Sunny South Lease, Jimble Bar, Murchison Goldfield.** W. G. CLARKE AND B. H. MOORE. *West Australia School Mines Bull.* No. 4, 23-6(1929).—Report on tests by combinations of amalgamation and cyanidation.

E. I. S.

**The treatment of ore from Waterloo Gold Mine, Holden's Find.** W. G. CLARKE AND B. H. MOORE. *West Australia School of Mines Bull.* No. 4, 6-11(1929).—Report on extn. tests by amalgamation and concn., by cyanidation of Wilfley table residues and by flotation with or without other treatments. The ore is white quartz with galena, chalcopryite, pyrite, cerussite and traces of Cu carbonates.

E. I. S.

**The treatment of oxidized and sulfide ores from the Emu North Mine, Reedy's Mararoa Leases, Cue.** W. G. CLARKE AND B. H. MOORE. *West. Australia School of Mines Bull.* No. 4, 44 9(1929).—Agitation with cyanide soln. gave good extn. with low cyanide consumption. Cyanidation of sulfide should be preceded by amalgamation. Pulp from mixed ore filters more readily than does oxidized alone and yields high extn. Incomplete data are given on flotation treatment.

E. I. S.

**The treatment of "mill tailings" from the Sand Queen-Gladsome Gold Mine, Comet Vale.** W. G. CLARKE AND B. H. MOORE. *West. Australia School of Mines Bull.* No. 4, 27-33(1929).—Tests showed varying conditions of treatment to have practically no effect on extn. of gold, which was considered satisfactory, being over 90%.

E. I. S.

**The treatment of pyrrhotitic apatite from the Coolgardie Bores.** W. G. CLARKE AND B. H. MOORE. *West. Australia School of Mines Bull.* No. 4, 12-4(1929).—Report on tests of ore by different combinations of amalgamation, flotation and cyanidation.

E. I. S.

**The importance of preliminary ore analyses by means of the stereoscopic binocular microscope.** A. E. DRUCKER. *State College of Wash. Eng. Bull.* No. 28, 19 pp.(1929).

E. I. S.

**Investigations on the relations between adsorption, wetting and flotation.** W. LUYKEN AND E. BIERBRAUER. *Metall u. Erz* 26, 197-202(1929).—In working out a method for winning apatite from Swedish slime waste by the application of a Na palmistate flotation process, the authors find the usual relations of adsorption influence, wetting and flotability to hold for this material.

L. T. FAIRHALL

**Flotative recovery of apatite.** W. LUYKEN AND E. BIERBRAUER. *Metall u. Erz* 26, 202-3(1929).—See *C. A.* 23, 2398

L. T. FAIRHALL

**Organization of the Korsokpay Copper Flotation Plant.** V. I. TRUSHLEVICH. *Gorniy J.* (Moscow) 105, 113-36(1929).—A description of the newly organized plant located on property formerly belonging to Athassar Copper Co., Ltd., in Turkestan and a review of special studies made to test the applicability of the flotation process to the treatment of Jezcazgan ores. E. I. S.

**The treatment of concentrates from the Brilliant Gold Mine, Gnow's Nest, Yalgoo Goldfield.** W. G. CLARKE AND B. H. MOORE. *West. Australia School of Mines Bull.* No. 4, 15-8(1929).—Complete treatment with amalgamation, concn. and cyanidation gave extn. of over 98% Au and 88% of Ag content. E. I. S.

**The treatment of concentrates from Ives Reward Mine.** W. G. CLARKE AND B. H. MOORE. *West. Australia School of Mines Bull.* No. 4, 19-22(1929).—Roasting, fine grinding, amalgamation and cyanidation of roasted concentrates yielded best extn. but the roasting furnace was not considered as warranted. The use of CNBr offered no advantages. Suggestions are made as to fine grinding. E. I. S.

**Analyses and methods of concentrating tungsten ores of the Gumbey Mines in Ural.** M. ORTIN. *Gorniy J.* (Moscow) 105, 272-8(1929).—Physical analysis of scheelite contg. 13.26% W. The concn. process makes use of Humboldt concentrators. E. I. S.

**Technical control methods used in the concentration of tin and tungsten ores.** RUDOLF WEBERS. *Metall u. Erz* 26, 325-31(1929).—The enrichment of a Sn + WO<sub>3</sub> concentrate may be rapidly detd. by measuring its d., provided the percentage Sn + WO<sub>3</sub> is above 25%. Small quantities of Sn are detd. by reduction of the ore in porcelain boats with H<sub>2</sub> at 575°-600°. The Sn is leached out with warm HCl (sp. gr. 1.12), the leachings being dild. with water to throw out Cu and Sb, reduced with ferrum reductum, pptd. with H<sub>2</sub>S and roasted and weighed as SnO<sub>2</sub>. WO<sub>3</sub> is detd. by distn. of a complex chloride in the presence of CCl<sub>4</sub>. This complex, dissolved in water, throws out WO<sub>3</sub>, which may be dried and weighed. HANS C. DUUS

**Present practice in tin smelting, also researches on carbon reduction.** J. B. JOHNSON. *Metallbörse* 17, 2584, 2694-5(1927); *Chem. Zentr.* 1928, I, 2985-6.—In the Straits Settlement Sn mines, the Sn concentrate is smelted with high-C metals. American and English practices are briefly outlined. C. R. FELLERS

**Notes on lead mining and smelting in West Yorkshire.** A. R. RAISTRICK. *Trans. Newcomen Soc.* (London) 7, 81-96(1926-7).—Historical notes. E. I. S.

**Smelting in the lead blast furnace. I. A method for approximating the form of the lead in slag and other products of the lead blast furnace.** G. L. OLDRIGHT AND VIRGIL MILLER. *Bur. Mines, Repts. of Investigations* No. 2954, 8 pp.(1929).—Dissolve 0.5-5 g. sample in 25 cc. NH<sub>3</sub> acetate, dil. to 100 cc., boil 10 min., filter and wash. The filtrate contains Pb as oxide, sulfate or basic sulfate. Add 10-20 cc. 10% soln. AgNO<sub>3</sub> to residue, treat 1 hr. cold, filter and wash. The filtrate contains the metallic Pb. Add to the residue 25-50 cc. of a satd. soln. of NaCl contg. 60 g. FeCl<sub>3</sub>·6H<sub>2</sub>O per l., treat at 25-28° for 12 hrs., filter and wash. The filtrate contains the Pb present as sulfides, the residue the Pb silicates. The filtrates are analyzed for Pb and the mineral percentages calcd. II. **The gases from the top of the lead blast furnace.** *Ibid.* No. 2957, 18 pp.—Very little S is removed from the charge in furnace gases. Top gas (if undiluted with air) is of sufficient calorific value to be used as a fuel. Its CO content differs little from that of Fe blast-furnace gas. Variations of temp. and compn. of top gases are similar to those that would occur in a gas producer having a variable height of combustion zone. Highest top temps. accompany the highest CO<sub>2</sub>. "Hot top" is caused by the combustion zone rising too high in the charge. Analyses of 150 samples of gas from 21 position at the top of a Pb blast furnace are given. ALDEN H. EMERY

**How is the basic steel smelting furnace to be rated against the acid?** E. PIWOWARSKY. *Die Giesserei* 16, 685-93(1929).—A lecture in which the reactions and phys. chem. equil. occurring in the steel smelting furnace are derived from the latest publications on the constitution of slags, and critically discussed. J. BALOZIAN

**Coordination between blast furnaces, coke ovens and Martin furnaces in a metallurgical works.** CH. BERTHELOT. *Trans. Fuel Conference, World Power Conference, London* 1928, III, 1420-56(1929).—If blast-furnace gas be used for elec. power generation, for heating Cowper stoves and coke ovens and if coke-oven gas be used for heating Martin furnaces, soaking pits and rolling mills, there will be 26% coke-oven gas and 8.2% blast-furnace gas as surplus. By such management 35 cwt. of coal (26% volatile) will make 1 ton of steel and give a surplus of 261 kw. hr. and a quantity of by-products after supplying all necessary power to the works. ALDEN H. EMERY

**Temperature measurements on Siemens-Martin furnaces.** ALFRED SCHACHT. *Arch. Eisenhüttenw.* 3, 7-13(1929).—The gas, waste gas and air temps. in the crown of

Siemens-Martin furnaces, fired with (I) mixed and generator gas and with (II) pure generator gas, are detd. with a new type of *flow pyrometer*. In this a Pt-Pt/Rh thermocouple, protected by a close-fitting Freiburger pyrometer tube, is placed inside a larger one of sillite; the hot gases flowing between the 2 and are pumped out. Comparative measurements with a thermoelement and an optical pyrometer are in practical agreement with one another. The temp. of waste gases in the drawing off head does not exceed  $1610^{\circ}$ , further decreasing  $100-200^{\circ}$  on the way to the chamber. The air temp. in the flue is  $120^{\circ}$  lower and the waste gas  $50^{\circ}$  higher than is obtained with the optical pyrometer. The mixed gas temp. in the gas flue over the scaffold is  $1100^{\circ}$  in the furnace fired with I and  $1080^{\circ}$  in the other, the air temps. in the rising air flues being  $1200^{\circ}$  and  $1300^{\circ}$ , resp. Calcs. show that from the flues over the scaffold to the chambers the temp. decrease ( $103^{\circ}$ ) is due to conduction through the walls ( $57^{\circ}$ ) and leakage of contaminated air ( $46^{\circ}$ ). Measurements of the bath temp. with the thermoelement in I is  $1640^{\circ}$  and with the optical pyrometer  $1660^{\circ}$ , while in II they are  $1530^{\circ}$  and  $1610^{\circ}$ , resp. J. BALOZIAN

**The relationships between output and hearth measurements of blast furnaces.** GEORG RICHENBERG. *Arch. Eisenhüttenw.* 3, 1-5(1929).—From figures of 173 German blast furnaces (in operation) the truest measure of the output is obtained. The blast-furnace performance may best be regarded as the amt. of C gasified in a given time before the tuyères, the latter being 80% for 168 furnaces. Neither the hearth diam. nor its area is a true measure of the probable output of a blast furnace; in the former case the output increases with the diam., while in the latter the output decreases with increase in the hearth breadth. Up to a diam. of 3.50 m the output of a blast furnace is apparently directly proportional to the hearth area, while from thereon it is proportional to the diam., the depth of the combustion zone diminishing 1.75 m. J. BALOZIAN

**Different kinds of explosions in cupola practice. Causes and measures of prevention.** ALBERT LÖBNER. *Die Giesserei* 16, 557-9(1929).—Explosions from explosive materials in the charge are generally of a simple nature and of little consequence. Explosive gas mixts. may form in the wind box during the lighting of the cupola and when the blast is momentarily shut off during its operation. The action of  $\text{SO}_2$  and  $\text{H}_2$  gases in the forehearth during the desulfurizing process may result in an explosion. Moisture in the forehearth lining, slag buggy or bottom of cupola is a source for dangerous explosions. C. H. LORIG

**Copper converter practice.** ARTHUR J. CADDICK. *Metal Ind.* (London) 35, 51-3 (1929).—Data representing 121 converter blows and the treatment of 3903 tons of mat are given showing the relation of grade of mat (Cu content) to general converter practice, amt. of flux, amt. of cold material added, slag produced, air compressor and converter times, amts of air used and required, and process losses for mat contg. 22-45% Cu. Data are given for another series of mat contg. 12, 14 and 20% Cu showing the relation of the grade of the mat to the time required to blow to the white metal stage. C. L. R.

**Microscopic composition and structure of basic slag after different heat treatments and their relation to the citric acid solubility.** H. SCHNEIDERHÖHN. *Stahl u. Eisen* 49, 345-52(1929).—See C. A. 23, 2679. E. H.

**Determination of the iron loss from the cupola slag.** EMIL KNOPPICK. *Die Giesserei* 16, 321-3(1929).—The  $\text{FeO}$  content of the slag alone does not det. the Fe losses in the cupola. The quantity of slag and the  $\text{FeO}$  content of the coke ash, limestone and cupola lining must be known to calc. Fe losses. C. H. LORIG

**Comparative properties of wrought iron made by hand-puddling and by the Aston process.** H. S. RAWDON AND O. A. KNIGHT. *Metals and Alloys* 1, 46-56(1929).—The "Aston" process (C. A. 20, 3728; *Am. Iron and Steel Institute, Yearbook*, 15, 117 (1925)) consists of melting pig Fe in a cupola, refining the molten metal in a Bessemer converter, producing slag of the proper compn by itself in an open-hearth furnace, and mechanically disintegrating the Fe and incorporating the slag with it by pouring the molten Fe into the molten slag. The remainder of the process is similar to the hand-puddling process. A résumé of the process is given and the essential operations are shown by photographs. The following tables of data are included: results of chem. analysis of metal at different stages of the process, chem. analysis of slag used, d. of wrought Fe in various stages of working, tensile properties of wrought Fe in the muck bar state, tensile properties of 1 in. wrought Fe pipe as detd. on full-size specimens, tensile properties of wrought Fe in the form of pipe skelp, tensile properties of 1 in. wrought Fe pipe detd. on longitudinal strips machined from the pipe, torsional properties of 1 in. wrought Fe pipe, results of chem. analysis of the three types of pipe used, chem. compns. of slags, results of flattening tests of 1 in. wrought Fe pipe, av. corrosion losses of wrought Fe pipe in accelerated lab. tests, 3 months duration. The following graphs are given: stress-strain curves of wrought Fe in the muck bar condition tested in tension,

stress-strain curves of wrought Fe in the form of pipe skelp tested in tension, corrosion of 1 in. wrought Fe pipe, comparison of the tensile properties of wrought Fe pipe with specification values. Photomicrographs show the structure of the Fe during various stages of manuf. Conclusions: The chem. compn. of the Fe made by the new process agreed closely with that of the hand-puddled (HP) Fe. The C content was consistently lower in the new-process (AP) Fe and more uniform. Metallographic examn. showed the entire absence of C streaks in the (AP) Fe. The S content of the (AP) Fe was slightly higher than that of the (HP) Fe. The densities of the (AP) Fe and the HP product were practically identical, that of the former being slightly higher. No marked differences in mech. properties were found in the 2 irons, in pipe form, as shown by tension, torsion and flattening tests. The (AP) Fe showed a slightly lower tensile strength accompanied by higher ductility. A slight difference in corrosion resistance as shown by accelerated lab. tests was in favor of the (HP) Fe. The difference was less than that due to the different methods used. The structural features of (AP) Fe were similar to those of all wrought irons. The important reactions entering into the manuf. of wrought Fe by the 2 processes seem to be fundamentally the same. The (AP) Fe does not seem to be inferior to (HP) Fe with respect to welding, galvanizing and machining. A. J. M.

**Summarized data of zinc production.** ELMER W. PEHRSON AND THE COMMON METALS DIVISION. Bur. of Mines. *Econ. Paper* 2, 47 pp.(1929).—Shows the relation of production in the United States to that of the world. E. J. C.

**The reduction of zinc ferrite.** V TAFEL AND H GROSSE. *Metall u. Erz* 26, 354-7 (1929).—At 1050° Zn ferrite is reduced by charcoal as rapidly as ZnO, but below this temp. somewhat more slowly. Reduction may also be brought about by metallic Fe but ZnO is the more easily reduced. The addn. of CaO to ferrite promotes the reduction very markedly. HANS C. DIUS

**Beryllium.** MENAHEM MERLUB-SOBEI. *Metals and Alloys* 1, 69-70(1929).—A review. A. J. MONACK

**The production and uses of beryllium.** KURT ILLIG. *Chem. Age* (London), Monthly Met. Sect. 21, 17-8(1929); cf. C. A. 23, 801. E. J. C.

**Utilization of metal scraps.** CONSTANTIN REDZICH. *Apparatebau* 41, 138(1929).—The economic importance of the utilization of metal scraps is stressed and practical suggestions are made. M. C. ROGERS

**Sodium sulfide fusions.** H. FINCKE. *Metallbörse* 17, 2637-8; *Chem. Zentr* 1928, 1, 481.—The behavior of PbS, ZnS, Cu<sub>2</sub>S, FeS and NiS<sub>2</sub> when fused with Na<sub>2</sub>S was investigated. PbS dissolved but ZnS did not. A mixt. of ZnS + PbS set at the bottom of the fused Na<sub>2</sub>S without complete soln. Metallic Cu or Pb was not obtained by fusion of the sulfides with Na<sub>2</sub>S. Somewhat better results were obtained by fusion of Cu<sub>2</sub>S and PbS with Na<sub>2</sub>SO<sub>4</sub> and charcoal. Similarly the Orford process, fusion with Na<sub>2</sub>SO<sub>4</sub> + C gave a better sepn. of Ni and Cu from their sulfides than when fused with Na<sub>2</sub>S alone. The sepn. of Cu<sub>2</sub>S-PbS in Pb-mat cannot be accomplished by Na<sub>2</sub>S fusion because of the FeS which is also present. C. R. F.

**Molding sand testing, theory and practice.** FRANZ ROLL. *Die Giesserei* 16, 393-401(1929).—Permeability of sand depends on the character of the grain, H<sub>2</sub>O content, compactness, bond material and the condition of the mold. For given conditions there is an optimum H<sub>2</sub>O content at which molding sand has the highest permeability. Air has a different permeability no. than CO<sub>2</sub> and CO. CO<sub>2</sub> passes through sand more readily than air. Addns. of coke or coal dust can increase or decrease the permeability of sand. Its strength increases with the H<sub>2</sub>O content, compactness and the amt. of clay bond until some optimum value for each is reached. On drying sand its ability to absorb dyes decreases as the temp. of drying rises. The strength of sand and its dye absorption properties are closely related. In general, the strength of sand increases with decreased porosity. The thermal cond. of sand increases rapidly with the H<sub>2</sub>O content. Sand contg. 10% H<sub>2</sub>O is 10 times more conductive than dry sand. Compactness of sand influences the heat capacity and thermal cond. Molding sand should not lose more than 6% of wt. when ignited for 4 hrs. at 500°. C. H. LORIG

**Melting and casting magnesium.** W. E. WARNER. *Metal Ind.* (London) 35, 203(1929). E. J. C.

**Eutectic cast iron.** BERNHARD OSANN. *Die Giesserei* 16, 565-7(1929).—The question of the formation of eutectic cast iron is considered from a theoretical standpoint. Fletcher's formula for C content of eutectic cast iron,  $C = 4.3 - 0.286 Si - 0.387 P + 0.018 (Mn - 1.8 S)$  gives values that are high. At no time will this calcd. value be below 3.43% C. In cast iron there are 6 components which det. the eutectic compn. of the Fe. Analysis made of the liquid removed from partially solidified cast

Fe gave the compn. of the eutectic alloy as C 3.00, Si 0.80, Mn 0.30, P 0.26 and S 0.07%.

**Molding of iron plates for gas and chemical tanks.** J. H. EASTHAM. *Foundry* 57, 801-2(1929). E. J. C.

**Steel-melting practice for large ingots and high-grade castings.** W. H. WHITE. *Fuels Furnaces* 7, 1389-92(1929). E. J. C.

**Effect of molten bronze on steel.** I. T. HOOK. *Welding Eng.* 14, No. 7, 53-6 (1929).—Molten high-strength bronze applied to steel which is free from stresses will not penetrate or cause cracks. E. I. S.

**Manufacture of wire bars from secondary copper.** W. A. SCHEUCH AND J. WALTER SCOTT. *Am. Inst. Mining Met. Eng., Tech. Pub.* No. 246, 16 pp.(1929). E. J. C.

**The patentability of alloys.** H. SCHACK. *Z. Metallkunde* 21, 246(1929).—A comprehensive analysis with discussion. ROBERT F. MEHL

**X-ray metallography in 1929.** II. GEORGE L. CLARK. *Metals and Alloys* 1, 57-68(1929); cf. *C. A.* 23, 4429.—A well-illustrated review. A. J. MONACK

**Examination of alloys by x-rays.** LÁSZLÓ TOKODY. *Technika* (Budapest) 10, 95-101(1929).—The theory of structure of crystals is summarized. The Debye-Scherrer method is described as the most efficient one for the analysis of alloys by x-rays. The results of x-ray analyses of various alloys are presented and, finally, a theoretical explanation of particular details in the data is given. S. S. DE FINÁLY

**X-ray studies on alloys.** A. F. WESTGREN AND G. PHRAGMÉN. *Trans. Faraday Soc.* 25, 379-85(1929); cf. *C. A.* 23, 587.—Structural similarity of intermetallic phases is connected with the concn. of valency electrons. The ratio of valency electrons to atoms is about 3/2 for several binary alloys of Cu, Ag and Au with other metals. In the cases of the 3/2 ratio the structure is body-centered cubic or that of  $\beta$ -manganese. The terms solid chemical compd. and solid soln. are discussed and a short account of the change of the av. vol. of the atoms in alloys with varying compn. is given. W. H. W.

**X-ray investigation of wire.** F. C. ELDER. *Wire* 4, No. 7, 236(1929).—Expts. with studies of crystn in low-C specimens promise possibilities of wider application for test purposes. E. I. S.

**A metallurgical specimen holder for use on an ordinary microscope stage.** E. E. JELLEY. *J. Sci. Instruments* 6, 266-7(1929). E. J. C.

**A study of the Ikeda accelerated test for determining endurance limit.** H. F. MOORE AND SEIICHI KONZO. *Metals and Alloys* 1, 70(1929).—Data are given to show that results obtained by the accelerated test compare favorably with those obtained by the long-time test. A. J. MONACK

**Rise of the break in the tensile strength curve of metals due to strain and aging.** GALIBOURG. *Compt. rend.* 188, 993-5(1929).—The curves representing the variation of the rise for extra-soft steel as a function of time are hyperbolas of the form  $x = ay/(b - y)$ , where  $x$  is the time of aging,  $y$  the difference between the final load of the first strain and the load corresponding with the break in the second strain curve, and  $a, b$  are consts. The rate of rise increases with the temp, the temps. of aging between the first and second strains being 12.5-14.5°, 50-53° and 175-180°. Pure Ni aged at 175-180° also showed the phenomenon. B. C. A.

**The correlation of fatigue and overstress.** J. H. SMITH, C. A. CONNOR AND F. H. ARMSTRONG. *J. Iron Steel Inst., Advance copy* No. 10, Oct., 1929, 29 pp. E. J. C.

**Nitride and cyanide hardening of vacuum cleaner parts.** R. G. ROSHONG. *Fuels Furnaces* 7, 1393-6, 1408(1929). E. J. C.

**Effect of service on the endurance properties of rail steels.** JOHN R. FREEMAN, JR., AND HAIG N. SOLAKIAN. *Bur. Standards J. Research* 3, 205-46(1929). E. J. C.

**The elastic properties of light metals.** H. SIEGLERSCHMIDT. *Metallwirtschaft* 8, 843-6(1929). E. J. C.

**Tarnishing the non-ferrous metals and alloys.** B. JEFFS. *Black and White* 2, No. 2, 9-10(1929).—Study of corrosion of different metals shows that products of corrosion may be divided into the following classes which are discussed: films which accelerate corrosion, films which neither accelerate nor retard corrosion but allow corrosion to proceed at a uniform rate and films which retard corrosion. E. I. S.

**Bimetallic thermometric elements.** W. ROHN. *Z. Metallkunde* 21, 259-65 (1929).—The choice of a proper bimetallic strip depends upon whether the strip is to be used to give temp. readings over a range of temps or to maintain a const. predetd. temp. For the first purpose the choice of the less expansive alloy is made difficult by the fact that the usual com. alloys (Ni-Fe) do not expand linearly with temp. to high temps. For a temp range up to 120° invar is recommended, up to 230° a 40% Ni-Fe alloy, up to 340° a 42% Ni-Fe alloy, up to 440° a 46% Ni-Fe alloy. Ni-Fe alloys cannot

be used at higher temps. since their thermal expansion becomes greater than that of the element usually chosen for the more expansive alloy. Constantan and Monel metal are better than Al, Cu or Pb for the high-expansion alloy. Ni-Fe alloys lower in Ni (22-27%) can be used for the high expansion alloy but show irregularities due to transitions at higher temps. These may be wholly suppressed by the addn. of 5% Mo. Such an alloy has an expansion greater than that of Cu. Expansion curves are given for a large no. of com. alloys. A combination of an alloy of 27% Ni (Fe-Ni) plus 5% Mo with an alloy of 42% Ni (Fe-Ni) can be used up to 550°. For a high elec. cond. an age-hardened Cu-Be alloy with invar is theoretically desirable but difficult to prepare and, in general, other combinations are more useful, especially Ni-invar. Some notes on the prepn. of bimetallic strips are given. Metals are always used in a hard-rolled condition in order to get the highest possible elastic limit. Slow and repeated heating up to 30-50° above the temp. of use is recommended as a preliminary aging. Mechanical requirements of thickness and length are discussed as well as methods of measuring the desired properties.

ROBERT F. MEHL

**Influence of heat treatment below the  $A_1$  point on the properties of technical iron.** W. KÖSTER. *Arch. Eisenhüttenw.* 2, 503-22(1928-9).—The solid soly. of cementite in  $\alpha$ -iron increases with rising temp. between 600° and the  $A_1$  point, so that steels with less than 0.9% C age-harden after quenching from above 600°, the max. effect being obtained with 0.09-0.1% C aged at room temp. In this case the yield point increases by 60%, the tensile strength by 55% and the hardness by 65%, whereas the elongation decreases by 50% and the reduction in area by 10%. The decompn. of the supersatd. solid. soln. begins to be appreciable in 1 hr. at 50°, and is completed at 200-250°; the pptd. carbide particles first sep. as black points throughout the grains, but with rising temp. they migrate to the grain boundaries. The coercivity increases slightly with increase of quenching temp. below  $A_1$ , but the remanence undergoes a marked decrease; on aging or annealing the quenched steel the values for these properties return more or less rapidly to the normal.

B. C. A.

**Molybdenum steels and their use in permanent magnets.** A. F. STOGOV AND V. S. MESKIN. *Arch. Eisenhüttenw.* 2, 595-600(1928-9).—Steel with 0.9-1% C and 2-2.5% Mo has considerably better magnetic properties than the usual W and C magnet steels, but the decrease in the magnetic moment by aging is approx. the same. The highest values for the remanence and coercivity are obtained by quenching in water from 800°; a slightly lower temp. gives much lower values for these properties, whereas a slightly higher temp. has little effect. Complete dissoln. of the Mo carbide into solid soln. does not occur below 1100°; at 800° the alloy has a granular pearlitic structure.

B. C. A.

**Study of stainless steels. II.** YOSHIHIRO KAWAKAMI. *Iron and Steel* (Japan) 14, 996-1059(1928); cf. *C. A.* 23, 2139.—K. carried out the tensile strength and impact tests of various kinds of quenched and quench-tempered stainless steels, finding that the tensile strength is a max. in W-contg. steel, while the impact resistance is max. in steels contg. Cr and more than 5% of Ni. At -60° the impact resistance decreases to a value less than  $\frac{1}{3}$  of the value at ordinary temp., the decrease being less when Ni, Si or Cu is contained in addn. to Cr. In the range 300-800° the tensile strength is max. in steels contg. more than 5% Ni and less than 3% Si. The min. temp. coeff. of expansion is shown in steels contg. Cr and a small quantity of C or W. The resistance to oxidation at 900° is high in steels contg. much Si or in those contg. Cr and more than 5% Ni. Steels contg. much Cr and less than 10% Ni are hardest to machine. An alloy contg. Ni 20%, Zn 30%, Ag 3%, Cu 46% is best for soldering. Steels contg. a small quantity of Cr are most easily gas welded.

K. SOMEYA

**The recrystallization of electrolytic copper after hot-rolling.** W. TAFEL. *Z. Metallkunde* 21, 265-7(1929).—It was previously shown that the recrystn. of Fe after hot-rolling is somewhat different than that after hot forging, probably because of different states of inner strain induced in the two processes (*C. A.* 23, 1853). Cu shows similar deviations. The grain size at deformations less than the critical and also at deformations greater than the critical is somewhat greater in the case of hot-rolling. The peak in the curve of grain growth vs. reduction is somewhat displaced toward higher deformations. These deviations of the hot-rolling curve from the hot-forging curve are thought to originate in the seizing action of the rolls, which introduces a drawing effect, making the recorded reductions in height somewhat too great for the amount of strain introduced in the metal.

ROBERT F. MEHL

**Solubility of gases in pure aluminum and in an aluminum alloy.** W. CLAUS. *Z. Metallkunde* 21, 268-70(1929).—The claim made by Czochralski (*C. A.* 16, 3862) that Al and Al alloys must be heated above 900° before porosity, owing to gas soly., occurs in



the cast alloy is contrary to foundry experience. C.'s expts. were repeated with pure Al and with an alloy of 8% Cu, 92% Al. Samples (250 g. each) were heated and gassed 30 min. at temps. of 700° and 800°, resp. for each gas. For pure Al, C.'s results are confirmed with N<sub>2</sub>, O<sub>2</sub>, CO, CO<sub>2</sub>, SO<sub>2</sub>, but not for H<sub>2</sub> and illuminating gas, in which soly. sets in at low temps. CH<sub>4</sub> and C<sub>2</sub>H<sub>4</sub> are slightly sol. at 800°. The 8% Cu alloy was more active than pure Al in dissolving the gases H<sub>2</sub>, illuminating gas, CH<sub>4</sub>, C<sub>2</sub>H<sub>4</sub> and water vapor. The results are tabulated in detail. Photomicrographs show inclusions and porosity. It is recommended that Al and Al alloys not be heated above 800° in manuf., that the furnace atm. be kept away from the melt, and that products of combustion of the fuel contain as little water vapor as possible. The usual porosity in com. Al alloys is probably caused by the decompn. products of water vapor. ROBERT F. MEHL

**Pouring height should be low in casting aluminum alloys.** DOUGLAS B. HOBBS. *Foundry* 57, 753-6 (1929).

**Regulated control in heat-treating aluminum-alloy castings.** ANON. *Am. Mach.* 71, No. 10, 403 (1929).—The method used by the Aluminum Company of America to heat-treat and test castings of Al alloys under nearly automatic conditions is illustrated.

**98 percent aluminum bars and ingots for remelting purposes, for rolling slabs and Billets.** ANON. *Brit. Eng. Standards Assoc.* (London) No. 359, 9 pp. (June, 1929).—Specifications cover quality of material, manuf. and provision of samples for analysis.

**99 percent aluminum notched bars and ingots.** ANON. *Brit. Eng. Standards Assoc.* (London) No. 360, 6 pp. (June, 1929).—Specifications cover quality of material, manuf. and provision of samples for analysis.

**Work on beryllium and its alloys.** H. W. GILLETT. *Metals and Alloys* 1, 71-2 (1929).—The properties of Be and Be alloys are reviewed.

**The possible use of beryllium in aircraft construction.** H. W. GILLETT. *Trans. Am. Electrochem. Soc.* 56 (preprint) 4 pp. (1929).—The phys. properties of Be are briefly reviewed. An outstanding property is the high modulus of elasticity, which is nearly 3 times that of Mg. Be is more abundant in the earth's crust than either Pb or Zn. The future development and application of the metal are discussed at length, and it is concluded that Be will some day be an important factor in aircraft construction.

**Lime process for coating aluminum.** LEON McCULLOCH. *Trans. Am. Electrochem. Soc.* 56 (preprint) 3 pp. (1929).—A dead-white coating can be given articles of Al by boiling them with 10 g. of unslaked lime and 10 g. of CaSO<sub>4</sub> per l. of water. Each day a fresh addition of lime and CaSO<sub>4</sub> should be made, as it is suspected that the bath deteriorates in some way on aging. The temp. should be kept at about 100°. The bath should be gently stirred to prevent settling. The coatings are extremely fine-grained, very adherent and do not separate from the metal on bending. A chemical analysis of the coating upon Al foil showed Al<sub>2</sub>O<sub>3</sub> 54.5, CaO 5.75, SO<sub>3</sub> 10.7, water expelled at 300° 29.0%.

**Hair line cracks on the surface of plates (metallic).** FRICH A. MATEYKA. *Metals and Alloys* 1, 80-1 (1929).—See C. A. 23, 3647.

**The heat resistance of aluminized steel and cast iron.** W. ZIMM. *Arch. Wärme-ert.* 10, 275-8 (1929).—In the aluminizing process Al is sprayed on, and the piece afterward heated away from air. Since the piece is not bedded in Al when heated, the alloy formed may be made to contain less than 25% Al. Above 1100° the process affords no protection. Cast iron is less evenly protected, as the Al will not diffuse through graphite; the finer the grain, the better the results. Tests for 4 months at 500-700° showed the coating to be of value in all cases, though the protection is not abs.

**Rept. of Committee A-5 on corrosion of iron and steel.** J. H. GIBBONEY, et al. *Proc. Am. Soc. Testing Materials* 1929 (preprint) No. 12.—Data of continuations of atm. and submerged corrosion tests of Comm. A-5 are presented without conclusions as to the relative corrodibilities of the various metals tested.

**Some methods of preventing pipe corrosion.** FR. BESIG. *Korrosion u. Metall-schutz* 5, 99-110 (1929).—A review of the modern methods for prevention of corrosion of underground pipes with special reference to corrosion by electrolysis.

**A critical study of the A.S.T.M. corrosion data on uncoated commercial iron and steel sheets.** V. V. KENDALL AND E. S. TAYLORSON. *Proc. Am. Soc. Testing Materials* 1929 (preprint) No. 37, 16 pp.—From the data of Committee A-5 on corrosion of Fe and steel it is concluded that Cu-bearing steel is more resistant to corrosion than ordinary steel in the atm. P combined with Cu in the steel is beneficial in Pittsburgh

atm., while Mn and S to the extent investigated have no marked effect either way. None of the elements studied seems to have any effect on submerged corrosion.

B. E. ROETHLI

**Effect of corrosion, accompanied by stress, on the tensile properties of sheet duralumin.** H. S. RAWDON. *Proc. Am. Soc. Testing Materials* 1929 (preprint) No. 42.—Full-sized tension specimens were corroded in a NaCl-H<sub>2</sub>O<sub>2</sub> soln. Al-coated duralumin sheet maintained its initial properties unimpaired under static tension for 60 days when loaded to 20,000 lb. per sq. in. and for 40 days when loaded to 31,000 lb. per sq. in., while the unprotected alloy suffered a marked depreciation in tensile properties after a few days. Al-coated duralumin was found far superior to the uncoated alloy when subjected to cyclic stress; it could be stressed much more severely than the alloy alone and even then the number of cycles to cause failure is considerably greater.

B. E. R.

**Atmospheric corrosion of metals—3rd report to the Atmospheric Corrosion Research Committee.** J. C. HUDSON. *Trans. Faraday Soc.* 25, 177-252 (1929).—Of 16 non-ferrous metals and alloys, most were but slightly subject to atm. corrosion. Changes in appearance might influence the use of one or the other if used for decorative purposes. No definite conclusions are presented regarding the rate of corrosion vs. time. However, it is believed that there is a direct proportionality between the two. Films of corrosion products may limit further corrosion, depending upon the solv and chem compn. of the resulting film, e. g., arsenical Cu is more resistant than high-cond Cu. Samples fully exposed to the atm. show higher rates than those under Stevenson screens. The changes in tensile strength and in elec. resistance agree closely except for brass indicating the absence of pitting or intercryst. corrosion. There is considerable difference between wt. loss, the wt. increment and the resistance tests. The discrepancies are attributed to wind shelter, to penetration of the metal at cryst. boundaries in wt.-loss tests and to local action due to H<sub>2</sub>O droplets. Dezinification of brass causes appreciable losses in strength (more for 60/40 brass than for 70/30 brass). The indices of corrodibility outdoors for rural, suburban, urban, marine and industrial atms. are, resp., 1.0, 1.6, 2.8, 2.1 and 2.3 with 1, 2.1, 5.8, 2.2 and 2.8 when under Stevenson screens. The corrosion rates in continuous tests show a decrease with time over the periods investigated. Cu, Cd-Cu, As-Cu, Sn-bronze and Al-bronze gave the lowest increments in wt., probably due to the formation of insol corrosion products. Evidence is given to show the existence of critical humidities for the various metals all being below satn. except for Al and Cu. Ni is liable to attack without much loss in tensile strength in atms. high in S compds. Resistance methods consistently give higher results than wt.-loss tests, because wt.-loss measurements are necessarily minimum value. Also in *Metal Ind.* (London) 34, 631-4; 35, 14-6, 35-7, 79-82 (1929).

B. E. ROETHLI

**The mechanism of oxidation processes. XVI. The corroding of iron.** HEINRICH WIELAND AND WILHELM FRANKE. *Ann.* 469, 257-308 (1929); cf. *C. A.* 23, 2196.—Fe amalgam shaken with H<sub>2</sub>O and air liberated H<sub>2</sub>O<sub>2</sub> in measurable quantities; the H<sub>2</sub>O<sub>2</sub> was detd. colorimetrically in acidulated Ti<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub>. The quantity of H<sub>2</sub>O<sub>2</sub> liberated increased with increasing alky. The Fe is oxidized to Fe<sup>++</sup> and subsequently to Fe<sup>+++</sup>. HCN decreases the rate of decompn. With Fe (ferrum reduction) powder the isolation of H<sub>2</sub>O<sub>2</sub> is rendered more difficult because of its increased rate of catalytic decompn. Alkali is necessary to slow the rate of decompn. so as to enable the isolation of H<sub>2</sub>O<sub>2</sub>. Cooling increases the possibility of isolation. KCN does not appreciably lower the rate of decompn. The quantity of O<sub>2</sub> used up by Fe powder is increased by decreasing the  $p_H$  whereas the reaction Fe<sup>++</sup> to Fe<sup>+++</sup> is not affected appreciably. It is therefore concluded that the latter reaction is brought about by H<sub>2</sub>O<sub>2</sub> and not by O<sub>2</sub>. Complex formation affects the O<sub>2</sub> consumption in various ways. Neutral salts, amino acids (leucine, glycocoll, alanine and asparagine) increased the rate of O<sub>2</sub> consumption of Fe powder, whereas no appreciable effect was noted in case of Fe amalgam. Expts. with salts of noble metals altered the O<sub>2</sub> consumption not by the deposition of metal but by altering the Fe<sup>++</sup> concn. in the soln, further expts. on salts of Fe<sup>++</sup> confirming these observations. Passivating agents [(K<sub>3</sub>Fe(CN)<sub>6</sub>), K<sub>2</sub>CrO<sub>4</sub>, KMnO<sub>4</sub>] decrease the auto oxidation of Fe powder but have no appreciable effect upon Fe amalgam. For Fe powder the rate of consumption of O<sub>2</sub> decreases with time, while for Fe amalgam the rate remains uniform, thus indicating the passivating of the Fe powder and the const. activity of the Fe in the amalgam. Similar results are obtained with H<sub>2</sub>O<sub>2</sub>. Depolarizers such as quinone, methylene blue, diethyl peroxide and dithiodiglyc. l'c acid affect Fe powder in a manner similar to O<sub>2</sub>. The H<sub>2</sub>O<sub>2</sub> formed is used up (1) by catalytic decompn., (2) in oxidation of Fe to Fe<sup>++</sup> and (3) in oxidation of Fe<sup>++</sup> to Fe<sup>+++</sup>. The increase in O<sub>2</sub> consumption in the presence of neutral salts is attributed to increased elec. cond., and the effect of  $p_H$  to changes in the potential of the cell Fe | Fe<sup>++</sup> | H | H<sup>+</sup>.

The effects of HCN and amino acids are believed to be due to possible complex ion formations. The differences in behavior of Fe powder and Fe amalgam in passivating agents are attributed to the nature of particle distribution, *i. e.*, the Fe particles in the amalgam do not have the surface available for passivation, while in the powder the surfaces are always exposed to the passivating medium.

**Investigations on the corrosion of metals in automotive vehicles by fuels and mixtures thereof.** K. R. DIETRICH. *Korrosion Metallschutz* 5, 110-4(1929).—Samples of Fe, Cu, Zn, galvanized Fe, brasses and Fe plated with Ni, Sn or Pb were immersed in various liquids in use as motor fuels, such as benzine, benzene, light oil, alc., abs. alc. and monopolin. Fe was attacked by all the liquids to form an oxide or sulfide. Zn and Cu were attacked by hydrocarbons contg. S. Hard Al was attacked by the alc.-benzine mixtures but not by any of the liquids alone. Lautal was attacked by the hydrocarbons contg. S, somewhat by alc. and not at all by benzine-alc. mixtures. Fe plated with Ni or Sn was unattacked. Pb-coated Fe was unattacked only by abs. alc. Galvanized Fe was attacked by hydrocarbons contg. S. Brasses and bronzes were unattacked. Increasing the pressure on the liquid and the temp. of the corroding medium increased the corrosion rate about 50-fold.

**Corrosion of metals under cyclic stress.** D. J. McADAM, JR. *Proc. Am. Soc. Testing Materials* 1929 (preprint) No. 40, 54 pp.; cf. C. A. 23, 2410.—A discussion of the effect of stress, time and no. of cycles on corrosion in Severn river H<sub>2</sub>O and fresh H<sub>2</sub>O. The metals investigated were steels, duralumin, Monel metal and stainless Fe. The net effect of cyclic stress on corrosion is shown graphically by "net damage" diagrams. The net damage diagrams indicate that for the metals investigated the stress-time cycle relationship is exponential in character. The relationship for ordinary steels in both waters can be represented by practically the same diagram. Stress cycles, however small, increase the corrosion rate of ordinary steels and duralumin. There is apparently no limiting stress below which the effect of cyclic stress decreases suddenly. It is not known whether there is such a limiting stress for Monel metal or stainless Fe.

**Welding in the chemical and process industries.** A. G. WIKOFF. *J. Am. Welding Soc.* 8, 78-88(1929).—Various ways are presented in which chem. plants can utilize welded construction and apply oxy-acetylene welding and cutting processes advantageously.

**Welding of copper and high copper alloys.** I. T. HOOK. *J. Am. Welding Soc.* 8, 113-29(1929).

**Aluminum welding in an industrial plant.** A. McMILLAN. *Acetylene J.* 31, No. 1, 15-7(1929).—Description of methods of welding Al cans developed in plant of Shawinigan Chemicals, Ltd.

**Autogenous welding of Monel metal.** A. BOUTTE. *Z. Schweisstech.* 19, No. 2, 33-8(1929).—(In German and French.)

**Autogenous welding of Monel metal.** R. MESLIER. *Rev. soudure autogène* 21, 1756-7(1929).

The theory of passivity (MÜLLER) 2. The passivity of metals (STRANSKI, MUTAFTSCHIEW) 2. The use of fuels in tunnel kilns (RICE) 21. The automatic formation of a protective film from cold water in Fe pipes (TILLMANS, *et al.*) 14. Synopsis of waste purification from coke plants and related industries (REICH) 14. Measuring the specific heats of metallurgically important materials (ROTH, BERTRAM) 1. The problem of the metallic state (BERNAL) 2. The electrical conductivity, the thermal expansion and the hardness of Mg-Zn alloys (GRUBE, BURKHARDT) 2. Annealing kiln (Swiss pat. 131,865) 1. Continuously-acting melting furnace for metals (Ger. pat. 480,619) 1. Annealing furnace (Ger. pats. 479,852 and 480,038) 1. Bricks and stones from Cu slag (Ger. pat. 479,895) 20. Apparatus for working up ores (Ger. pat. 480,481) 1.

KELLER, A., AND BOHACEK, K. A.: *Beizen von Eisen und Stahl mit sparbeize Adacid*. Halle (Salle)-Trotha: Rostschutz G. m. b. H. 31 pp.

MÜNZER, GUSTAV: *Das Platin. Gewinnung, Handel, Verwendg.* Leipzig: W. Diebener. 136 pp. M. 6.75.

NIESE, HANS AND KRÖKEL, HEINRICH: *Das autogene Schweiß- und Schneidverfahren*. 4th ed., revised and enlarged. Berlin: W. de Gruyter & Co. 141 pp. Linen, M. 1.50.

**Ore dressing.** THOMAS G. MARTYN. Ger. 479,672, Apr. 17, 1926. A method of sepg. the solid parts from the sludge is described.

**Ore-classifying apparatus.** FRANCIS B. McCONVILLE. U. S. 1,728,404, Aug. 27. Structural features.

**Working up ores by bubbling air into a suspension of slime.** ERZ- UND KOHLE-FLOTATION G. M. B. H. Ger. 480,425, Nov. 17, 1926. Details.

**Working up complex ores.** FRIEDRICH KRUPP GRUSONWERKE A.-G. Ger. 481,211, Aug. 8, 1925. Complex ores and similar metallic materials contg. metals easily volatilized mixed with those difficult to volatilize are worked up by first heating with reducing agents to remove the readily volatile metals, and then heating more strongly with chlorides to volatilize the other metals. The condensed metals are then sepd. from each other.

**Purifying aluminiferous ores.** U. B. VOISIN. Brit. 306,094, Feb. 15, 1928. Bauxite or like material contg. Fe is treated with gaseous HCl at 150–500° to volatilize the Fe as FeCl<sub>3</sub>. Effluent gases may be washed with H<sub>2</sub>SO<sub>4</sub> to recover Fe as sulfate, and regenerate HCl. Cl may be used with the HCl if any of the Fe is in the ferrous state. The ore may be preliminarily roasted.

**Machine for disintegrating and refining friable aluminiferous ores.** ILSEDER HÜTTE. Ger. 479,774, Dec. 15, 1925.

**Treating chromium ores.** I. G. FARBENIND. A.-G. Brit. 305,712, Nov. 10, 1927. Cr ores are given a preliminary "opening up" treatment, as by heating and quenching in water or by melting with 5% or more of an alk. reagent in a non-oxidizing atm. and are then treated (preferably at temps. of 500–650°) with HCl or Cl or both, with or without use of reducing agents. Treatment with Cl in the presence of charcoal followed by lixiviation with dil. HCl leaves Cr oxide free from Fe; treatment with HCl in the presence of a reducing agent leaves a residue of pure chromic chloride; treatment with mixed HCl and Cl or with HCl alone without a reducing agent leaves a residue of Cr oxide. Cf. C. A. 23, 590.

**Treating iron ores.** E. W. WESCOTT (to Comstock & Wescott, Inc.). Brit. 306,107, Feb. 16, 1928. Fe ores such as sulfide ores are chlorinated at about 375° to form FeCl<sub>3</sub> and after diluent gases are removed from the system further chlorination to form FeCl<sub>3</sub> is effected. The FeCl<sub>3</sub> may be treated with hot air at 700–800° to form Fe<sub>2</sub>O<sub>3</sub> and Cl. A small quantity of producer gas may be added catalytically to coarsen the oxide formed. Various details of operation and use of Cl in a cyclic process are described.

**Treating oxidized lead ores.** NIELS C. CHRISTENSEN. U. S. 1,726,258, Aug. 27. PbCO<sub>3</sub> ore or the like is lixiviated with a concd. NaCl brine contg. FeCl<sub>3</sub> to dissolve the Pb as chloride, the soln. is sepd. from ore residue and is electrolyzed with an iron anode to ppt. substantially two-thirds of the dissolved Pb and form FeCl<sub>2</sub> in the soln.; the soln. is thereafter electrolyzed with an insol. anode to ppt. approx. one-third of the Pb in soln. and the FeCl<sub>2</sub> is converted into FeCl<sub>3</sub> by electrolytic action and the FeCl<sub>3</sub> is used for treating a further quantity of ore. An app. is described.

**Treating tin-bearing materials.** P. ROBINSON (to D. Guggenheim, M. Guggenheim, S. R. Guggenheim, S. Guggenheim, J. K. MacGowan and E. A. C. Smith (trading as Guggenheim Bros.)). Brit. 306,108, Feb. 16, 1928. Crude Sn-bearing material is subjected to a preliminary purification treatment which may comprise treatment with acid and then successively leaching with NaCl and NaOH solns. and reduction is afterward effected in the presence of a carbonaceous reducing agent and a mixt. of alkali and alk. earth fluxes (preferably lime and soda with the lime in excess). Numerous details and auxiliary treatments are described.

**Agglomerating granular tin ores.** PAUL HAEDRICH and OTTO KIPPE (to Metallges. A.-G.). U. S. 1,726,066, Aug. 27. Mixts. formed from granular Sn ore and highly dispersed Sn oxide are pressed into pieces.

**Tin ores.** WILHELM WITTER and M. LISSAUER & CIE. Ger. 481,394, Sept. 1, 1925. See Brit. 304,829 (C. A. 23, 4664).

**Treating zinc ores.** S. ROBSON. Brit. 306,569, Oct. 24, 1927. In producing a porous sintered zinc oxide from ZnS ores, concentrates and like materials, the material is mixed with a coarse granular or nodular material (such as a crushed product from a previous blast-roasting operation, crushed pumice, slag or zinc retort residue) to ensure such porosity in the charge that air can readily be drawn through it, and the charge is subjected to blast-roasting with substantial exclusion of air other than that which is drawn through the charge itself, to produce a gas sufficiently rich in S that it may be used in the *manuf. of H<sub>2</sub>SO<sub>4</sub>*.

**Mercury from ore.** ITALO CAVALLI. Ger. 480,713, Sept. 21, 1927. See Fr 641,178 (C. A. 23, 1105).

**Zinc sulfate from ores.** FRIEDRICH JOHANNSEN (to Fried. Krupp Grusonwerk A.-G.). U. S. 1,725,865, Aug. 27. Sulfidic ore contg. Zn is subjected to an initial oxi-

dizing roast to eliminate part of the S content as  $\text{SO}_2$ ; the resulting Zn-contg. product is then subjected to a combined roasting and distg. treatment in the presence of an alk. earth metal compd. to liberate a Zn-contg. distn. product, and  $\text{SO}_2$ -contg. gases from the oxidizing roasting treatment are caused to react with the Zn-contg. distn. product, to produce  $\text{ZnSO}_4$ . An app. is described.

**Distilling zinc and other volatile metals.** H. E. COLEY. Brit. 306,425, Sept. 14, 1927. Zn and other volatile metal vapors are condensed by passing them directly from the reducing chamber into a condensing chamber where they ascend through a finely divided spray of water or other suitable liquid. The liquid with assocd. metal may be passed to a filter press. An app. is described.

**Platinum concentrates.** S. C. SMITH. Brit. 306,566, Oct. 21, 1927. In obtaining Pt concentrates from ores also contg. Ni, Cu and Fe, a sulfide mat is first produced, desulfurization is effected by roasting with or without first bessermerizing, the roasted mat is reduced to produce a metal sponge, with or without a previous leaching with acid to ext. Cu, Ni and Co, the sponge is treated with dil. acid to dissolve Ni and Fe and leave the Pt group metals, generally admixed with Cu. Various methods of reduction are specified.

**Chemical metal working.** ALADAR PACZ. Ger. 480,720, Dec. 2, 1926. Metal consisting wholly or chiefly of Al is given an irregular speckled coating by treating with an aq. soln. contg. a fluosilicate, a salt of Co or Ni and an alkali metal salt. A catalyzer such as a Mo compd. may be present.

**Metal founding.** CARL REIN. Ger. 480,831, May 7, 1927. A tilting trough for pouring molten metal, especially Fe, into molds, is described.

**Pump for molten metals.** G. WESTOVER and LANSTON MONOTYPE CORP., LTD. Brit. 306,339, May 9, 1928. Structural features.

**Water-cooled ingot mold.** JOHANN HOLTHAUS. Ger. 479,629, Feb. 22, 1927. Details of construction are described.

**Steel-pouring device for an ingot mold.** DANIEL LARNER. Ger. 479,627, Dec. 18, 1925.

**Molding metals.** LEO SZILARD. Ger. 476,812, Jan. 20, 1926. The metals are poured into the molds by elec. means.

**Molding metals.** PIEL & ADEY G. M. B. H. Ger. 480,900, May 23, 1923. Small castings of alloys contg. more than 50% Cu, such as brass, German silver and bronze, and difficult to melt, are produced in an ingot mold.

**Apparatus for molding metals.** EDWARD HARMES (to New Process Multi-Castings Co.). U. S. 1,726,022 3-4-5, Aug. 27. Structural features.

**Metal molding machine.** WILHELM KURZE. Ger. 480,311, July 7, 1927.

**Molding die-casting machine tubes in thin-walled ingot molds.** HEINRICH BURCHARTZ. Ger. 481,334, Apr. 10, 1927.

**Die-casting machine.** JOSEF POLAK. Ger. 479,632, Nov. 6, 1926. Details are described.

**Die-casting machine.** HALBERGERHÜTTE G. M. B. H. Ger. 480,204, Oct. 5, 1926. Details of pouring and filling.

**Die-casting machines.** HEINRICH PROJAHN. Ger. 480,993, Feb. 22, 1927. The improvement of the tubes, e. g., by coating with enamel, is described.

**Centrifugal casting of pipe.** WM. H. MORGAN, SR. (to Wm. H. Morgan, Jr.). U. S. 1,726,160, Aug. 27. Mech. features.

**Casting and rolling copper.** W. F. EPPENSTEINER and H. M. GREEN (to United States Metals Refining Co.). Brit. 305,998, Feb. 13, 1928. Ingots of Cu or other easily oxidized metal or alloy, for rolling into sheets or strips, are cast on end in cooled molds with but slight taper or no taper and then passed through rolls with the oxidized face in advance. An arrangement of app. and various details of procedure are described.

**Smelting iron alloys.** C. BRACKELSBURG. Brit. 306,141, Feb. 16, 1928. Smelting is effected in a rotary furnace by use of pulverulent fuel, and oxidation of the metal and absorption of gases are prevented by covering the molten charge with a layer of slag. Lime may be added to the charge and a slightly reducing atm. may be maintained in the furnace. An app. is described.

**Refining antimonial lead.** BRUCE W. GONSER and CALVIN W. HAFFREY (to American Smelting and Refining Co.). U. S. 1,726,346, Aug. 27. In order to recover Sb present in large proportion in Pb it is rapidly heated to a relatively high temp. and the bath is alternately subjected to oxidizing and reducing conditions so that volatile Sb oxides pass off as a fume and non-volatile oxides which form a scum on the surface are reduced to volatile oxides. Cf. C. A. 23, 86.

**Metallurgical furnace.** XAVIER DE SPIRLAT. Ger. 480,127, Apr. 17, 1927.

**Apparatus for use as a gas-producer ore-roasting furnace or for making bleaching powder, etc.** H. M. RIDGE. Brit. 305,883, May 1, 1928. Material treated is supported on a bed of inert granular material through which treating gas is introduced. Various structural details are described.

**Furnace suitable for heating ingots.** GEORGE NAISMITH and DONALD M. NAISMITH. U. S. 1,725,879, Aug. 27. Structural features.

**Oil-fired cupola furnace.** PETER MARX. Ger. 469,704, Nov. 15, 1927 and 477,241, Dec. 4, 1927. Details of construction are given.

**Rotary drum furnace.** WILHELM BUESS. Ger. 480,856, July 17, 1926. A cylindrical rotary drum furnace for refining metals and alloys is heated by gas or oil and can rotate through 360°.

**Smelting furnace.** FREIER GRUNDER EISEN- UND METALLWERKE G. M. B. H. Ger. 480,087, June 19, 1925. Details are given of the arrangement for sepg. and collecting the molten metal and the molten slag.

**Smelting furnace.** KARL SCHMIDT. Ger. 480,617, Sept. 22, 1927. A smelting furnace is mounted on an inclined axis to rotate through 360°.

**Tube furnace for treating ores.** MARCEL LAVOYE. Ger. 481,228, Aug. 11, 1926. The tube rotates and has a spiral internal flange. The app. is specially suitable for treating Al ores.

**Furnace for smelting tin ores.** W. J. CAYZER (to Cayzer Tin Smelting Co. (Proprietary), Ltd.). Brit. 306,445, Feb. 20, 1928. A reducing chamber with a dished hearth contains a bed of material such as spongy iron for filtering the molten tin. The furnace is heated electrically or by combustion of liquid or powdered fuel. In starting the furnace, powdered coke is used as the filtering material and during working this is replaced by spongy iron reduced from hematite or magnetite fed to the furnace or from impurities in the Sn ore. The furnace is operated with an atm. contg. at least 60% CO and at a temp. of about 950°. Various structural details are described.

**Oil burner for metal-smelting hearth.** ROBERT BÜHRER. Ger. 480,973, Nov. 2, 1927. Details.

**Air delivery system for blast furnaces.** JOHN C. HAYES, JR. (to Freyn Engineering Co.). U. S. 1,726,298, Aug. 27.

**Iron powder.** I. G. FARBENIND. A.-G. Brit. 306,215, Dec. 2, 1927. Pure Fe powder suitable for use in making cores of transformers or other elec. app. is made by treating Fe powder (which may have been produced from Fe carbonyl) at not over about 500° with a reducing gas, free from C, such as H, or an inert gas such as N until the C content is not over 0.5%, and subsequently heating to over 500° but below the m. p. in an inert atm., and grinding.

**Direct reduction of iron in a rotary furnace.** J. W. HORNSEY. Brit. 306,561, Aug. 18, 1927. Ore is passed through a rotary preheater and delivered to a rotary reducing chamber in which combustion is maintained under such conditions that the charge is kept from detrimental contact with the combustion air. An app. and various details of procedure are described.

**Strong machinable cast iron.** FRITZ GREINER. U. S. 1,726,433, Aug. 27. In treating molten cast iron having a content of (C plus Si) greater than 4%, to cause the metal upon solidification to contain the major part of the C in fine graphitic form, the (C plus Si) content is regulated in accord with the temp. from 4% for a temp. of 1400° to 6% for a temp. of 1700°.

**Magnetic testing system for detecting flaws in steel wire ropes, rails or other products.** T. F. WALL. Brit. 306,232, Dec. 20, 1927.

**Surface treatment of metals.** MARCEL FOURMENT. U. S. 1,726,431, Aug. 27. Articles such as bars, wires or tubes are highly heated superficially by the action of high frequency induction currents while in contact with coating material such as Zn or Al.

**Uniting metals.** PAUL HAESSLER. Ger. 481,363, May 9, 1926. Metals are joined by tinning and spraying with Al or Al alloy.

**Metallic pots for use in carburizing metals, etc.** F. K. LLANDGRAF and E. S. FITZSIMMONS (to Flannery Bolt Co.). Brit. 306,346, March 27, 1928. See U. S. 1,709,729 (C. A. 23, 2691).

**Heat treating conductors loaded with magnetic alloys.** G. W. ELMEN (to Electrical Research Products, Inc.). Brit. 306,543, Feb. 24, 1928. A coil of the conductor, on a reel of heat-resisting material, is heated and cooled in an annealing pot within an elec. furnace. The magnetic alloys may contain Ni 9-81, Co 5-80 and Fe 9-50% with or without up to about 10% of Mo or Cr. The material may be slowly heated to about 900°, maintained at this temp. for an hr. and then slowly cooled or it may be heated preliminarily to 800-900° by passing through a furnace as a continuous length, cooled

and reheated in the pot to 400–450°, or it may be heated to considerably above 450°, cooled to about 450° and either kept at 400–450° for several hrs. or very slowly cooled through the 450–400° range.

**Heat treating copper conductors.** V. E. LEGG (to Electrical Research Products, Inc.). Brit. 306,541, Feb. 24, 1928. A loaded or unloaded Cu conductor is heated in coiled form in an inert or rarefied atm. in a closed vessel to a temp. at which in the presence of reducing gases it would become brittle, and is then slowly cooled. An app. is described.

**Annealing.** ADALBERT BESTA. Ger. 479,851, Mar. 1, 1925. A method and a furnace filled with inert gas for annealing metals are described.

**Annealing metal strip in continuous lengths.** HIRSCH KUPFER- UND MESSINGWERKE A.-G. Brit. 305,951, Feb. 11, 1928. In passing through an annealing furnace, the material is exposed first to the highest annealing temp. and then to continuously decreasing temp. (which may be automatically controlled by a pyrometer).

**Metal sheets or strips.** O. JUNKER and O. JUNKER GES. Brit. 305,884, May 12, 1928. Sheets or strips such as those of Cu and its alloys are made by peeling off a surface layer from a metal block or ingot, with a cutting tool, at a temp. at which the metal assumes a plastic state. A temp. of 780–800° is suitable with an alloy contg. Cu 63 and Zn 37%. An app. is described.

**Utilizing light metal scrap.** HENRY CHAMBERLAIN. U. S. 1,725,780, Aug. 27. Scrap sheet metal such as tin-can scrap is intimately mixed with finely divided C, the mixt. is pressed cold to form bales, the bales are heated to about 1200° and while heated are subjected to high pressure to form solid bodies of metal.

**Degreasing metal objects.** GEBRÜDER FESSLER. Ger. 480,389, June 2, 1928. The degreasing agent, e. g.,  $C_2H_5Cl$ , is contained in a vessel with a layer of liquid such as water over it to protect it from contact with air.

**Degreasing metal objects.** EDUARD HAAS. Ger. 480,990, Feb. 1, 1928. Layers of grease or oil are removed from metal objects such as machine parts by a current of solvent. The app. is described.

**Alloys.** TH. GOLDSCHMIDT A.-G. Ger. 479,528, Dec. 10, 1922. An Al alloy with good casting qualities contains Ce 3–12 and Cu 2–20%, or Ce 2–12 and Si 1–8%.

**Alloys.** FRIEDRICH KRUPP A.-G. (Karl Schröter, inventor). Ger. 481,212, Dec. 13, 1925. Tools are made from hard metal alloys prepd. by sintering and contg. WC, Co and Ni or Fe. The alloy is heated to 700–1100°, sintered and molded as closely to the desired final form as possible. They are then sintered at higher temps. and ground. Cf. C. A. 23, 1103.

**Alloys.** ZINNWERKE WILHELMSBURG G. M. B. H. Ger. 479,661, Nov. 13, 1925. Converter dust contg. oxides of Zn, Sn, Pb and Cu is worked up by smelting with alkali. Thus dust contg. 25% Sn, 18% Pb and 30% Zn is mixed with 25% NaOH and 30% C and heated in a reverberatory furnace. The Zn is rapidly liberated and removed. After some hours, a Pb-Sn alloy almost entirely free from Zn is produced.

**Alloys for tools.** W. MÜLLER and KARL PRINZ ZU LÖWENSTEIN. Brit. 305,942, Feb. 11, 1928. A hard alloy for tools contains Fe 10–55% together with W, Cr and Co in about the proportions of 8:2:1 and preferably 1–4% C. Part of the W may be replaced by Mo and the Co by Ni, and there may be added up to a total of 4% of other elements such as Si, B, Zr, Ti, N, V, Be, Ce and Mn.

**Soot blower of special alloy.** H. G. C. FAIRWEATHER. Brit. 306,360, July 17, 1928. Ni or an alloy of Ni 96 and Mn 4% may be used.

**Alloy containing iron, nickel, etc.** NOAK V. HYBINETTE. U. S. 1,726,489, Aug. 27. Alloys which are suitable for cooking utensils, etc. contain at least 2.5 times as much Fe as Ni and contain also Cr, W and Mo in substantial quantity not exceeding about 8% in the aggregate.

**Nickel-iron alloy.** HEINRICH LANZ A.-G. Ger. 480,284, Dec. 2, 1923. Gray pig iron contg. at least 3% C and 1% Si is improved by replacing the Si wholly or in part by Ni. The Ni-Fe alloy so formed should contain 0.85% combined C.

**Iron-nickel-beryllium alloys.** SIEMENS & HALSKER A.-G. Brit. 306,035, Feb. 14, 1928. Alloys are formed contg. Fe, at least 0.1% Ni and 0.1–12.0% Be and may contain up to about 25% of other elements such as Cr, W, Mo, V, Mn, Cu, O, Si and P. They may be quenched from 800° to 1200° and artificially matured by reheating at 300–700°. Cf. C. A. 23, 564.

**Corrosion-resistant iron alloys.** H. L. MILLER. Brit. 306,320, April 13, 1928. Alloys are formed contg. at least 95% Fe together with Cu 0.2–2.0%, Mo up to 0.2%, Mn 0.2–1.0%, Si up to 0.5% and not more than 0.04% each of S and P, and traces of Al. Details for manuf. of the alloy are given.

**Aluminum alloys.** WILHELM SANDER (to Th. Goldschmidt A.-G.). U. S. 1,726,194, Aug. 27. See Fr. 647,407 (C. A. 23, 2414).

**Apparatus for leading off the acid vapor in etching and pickling plant.** FERDINAND BÄUML. Ger. 481,161, Apr. 22, 1928. Addn. to 426,205. Details of arrangement are given.

**Coating finely divided particles of magnetic metal or other hard material with softer material such as zinc.** WM. S. BUTTLES (to Western Elec. Co.). U. S. 1,726,340, Aug. 27. The particles are caused to travel a serpentine path in contact with surfaces of the coating material. An app. is described.

**Coating and coloring metals.** ALADAR PACZ. Ger. 480,995, Apr. 17, 1927. See Brit. 302,943 (C. A. 23, 4436).

**Metal coatings.** LAMBERT KOCHS. Ger. 480,991, Apr. 20, 1928. An app. for coating metal objects such as bolts and nails by plunging them into a bath of molten metal is described.

**Nickeling.** CHEMISCHES LABORATORIUM "CITY." Ger. 479,662, Oct. 15, 1925. A reagent for wet-nickeling metals, especially Cu and brass, is obtained by mixing Ni salt, Zn dust, a small quantity of Sn or Fe and an amt. of strong mineral acid equal to 50% of the wt. of the metal salt-Zn dust mixt.

**Galvanizing.** STAHLWERKE BRÜNINGHAUS A.-G. Ger. 479,554, Dec. 6, 1927. Excess of Zn after coating metal objects by immersion in molten Zn is removed by plunging them into a bath of molten salt such as KCl, NaCl or CaCl<sub>2</sub>.

**Galvanizing apparatus.** RICHARD BLASBERG. Ger. 480,754, Nov. 17, 1927.

**Apparatus for galvanizing sheet metal by immersion.** FRED W. BROWN. U. S. 1,726,336, Aug. 27. Structural features.

**Attaching handles to aluminum vessels.** J. H. WILSON and I. W. WOOD (to Aluminium, Ltd.). Brit. 306,455, Feb. 20, 1928. Cast Al base alloy handles contg. at least 7% (and preferably about 15%) Si are secured to wrought or Al alloy vessels by elec. spot-welding.

**Welding and heating metals by an electric arc struck in an oxy-hydrogen flame.** I. G. FARBENIND. A.-G. Brit. 305,999, Feb. 13, 1928.

**Apparatus utilizing liquid gases by vaporization and compression for welding or cutting metals, etc.** GES. FÜR INDUSTRIEGASVERWERTUNG. Brit. 306,130, Feb. 16, 1928.

**Welding and cutting burner.** AUTOGEN ENDRESS A.-G. Swiss 131,690, Feb. 6, 1928.

## 10—ORGANIC CHEMISTRY

CHAS. A. ROUILLER AND CLARENCE J. WEST

**A century of organic chemistry; 1828-1928.** H. GILLIG. *Pharm. Berichte* No. 6; *Schweiz. Apoth. Ztg.* 66, 625-8(1928).—The synthesis of org. substances since Wöhler led away from the concept of a vital force creating these. The modern trend is a return to the study of living force.

**A theory of optical activity in a homogeneous medium.** R. DE MALLEMANN. *Compt. rend.* 188, 705-7(1929).—A résumé of a mathematical theory. W. R. BRODE.

**Chemical effects of semi-corona discharge in gaseous hydrocarbons.** S. C. LIND AND GEORGE GLOCKLER. *J. Am. Chem. Soc.* 51, 2811-22(1929); cf. C. A. 22, 2353. Like C<sub>2</sub>H<sub>6</sub>, the other lower hydrocarbons, CH<sub>4</sub>, C<sub>2</sub>H<sub>4</sub>, C<sub>2</sub>H<sub>2</sub> and C<sub>2</sub>H<sub>6</sub>, condense to liquid and solid hydrocarbons in semi-corona discharge (central Al rod in a Pyrex glass cylinder). The condensation of saturates is brought about by the elimination of H and some CH<sub>4</sub> as under  $\alpha$ -radiation. In series gas flow through a no. of discharge tubes, the amt. of liquid condensate increases in successive tubes. If the rate of flow be so slow that depletion of reactant becomes considerable, then a max. of liquid yield is attained in an intermediate tube. The liquid products obtained from different hydrocarbons or in different tubes from the same hydrocarbon are similar in phys. properties, when obtained at the same trap temp. The liquid products are very complex. Fractionation was not attempted in the present work. Solid hydrocarbons are obtained in slight quantity in the Siemens tube, in larger quantity equal to that of liquid in the corona tubes. The solid is gummy or resinous, inert toward solvents and chem. reagents, except strong oxidizing agents. In corona discharge a small quantity of free C is deposited on the metal electrode in tree-like formation. A close correlation of  $n$ , mol. wt., d., color and viscosity characterizes all the liquid products. Increase in all these properties is inversely proportional to the yield, for which a simple explanation is given.

C. J. WEST



**Preparation of acetylene derivatives from epidibromohydrin.** LESPIREAU AND WIEGMANN. *Compt. rend.* 188, 998-1000(1929).—A study was made of the effect of removing HBr from epidibromohydrin, and the effect of a Grignard reagent. The following new compds. were reported:  $\text{EtCBr}:\text{CHEt}$ ,  $b_p$  34°,  $d^{20}$  1.197,  $n$  1.459;  $\text{EtCBr}:\text{CHBrEt}$ ,  $b_p$  105-6°,  $d^{20}$  1.9434,  $n$  1.5508;  $\text{EtCBr}:\text{CBrEt}$ ,  $b_p$  60-1°,  $d^{20}$  1.6128,  $n$  1.514;  $\text{EtC}:\text{CEt}$ ,  $m.$  -51°,  $b_{770}$  79-80°;  $\text{CH}:\text{CCHMeEt}$ ,  $m.$  65-70°,  $b.$  77°.

WALLACE R. BRODE

**Reactivity of atoms and groups in organic compounds. IX. Vapor pressures, densities and refractive indices of certain binary mixtures.** SPENCER W. PRENTISS. *J. Am. Chem. Soc.* 51, 2825-32(1929); cf. *C. A.* 23, 143.—The vapor pressures of several binary mixts. of  $\text{PhNO}_2$ ,  $\text{Me}_2\text{CO}$ ,  $\text{BuOH}$  and  $\text{C}_6\text{H}_6$  with  $\text{C}_6\text{H}_5\text{N}$  and with  $\text{EtI}$ , have been measured at 20° by a static method. The  $d.$  of similar mixts. of  $\text{PhNO}_2$ ,  $\text{Me}_2\text{CO}$ , *tert*- $\text{BuOH}$  and  $\text{C}_6\text{H}_6$  with  $\text{C}_6\text{H}_5\text{N}$  and of  $\text{PhNO}_2$  and  $\text{C}_6\text{H}_6$  with  $\text{EtI}$  and the  $n$  of mixts. of  $\text{PhNO}_2$  and  $\text{C}_6\text{H}_6$  with  $\text{C}_6\text{H}_5\text{N}$  and with  $\text{EtI}$ , have been measured at 25°. For the reaction between  $\text{C}_6\text{H}_5\text{N}$  and  $\text{EtI}$  an attempt has been made to show that the adjuvance of the solvent, reported in a previous paper, would bear some relation to the deviation, from ideal soln. laws, of vapor pressures,  $d.$  or  $n$  of binary mixts. of the solvent with each reactant. No such correlation, however, has been observed. C. J. WEST

**The configurational relationship of 2-methyl-6-heptanol to lactic acid.** With a note on the effect of unsaturation on optical activity. P. A. LEVENE AND H. L. HALLER. *J. Biol. Chem.* 83, 177-83(1929).—*d*-2-Methyl-6-heptanol has been correlated with lactic acid by the following reactions: *d*-2-methyl- $\Delta^2$ -6-heptenol  $\rightarrow$  *l*-4-hydroxypentanol  $\rightarrow$  *d*-4-hydroxyvaleric acid  $\rightarrow$  *d*-lactic acid and *d*-2-methyl- $\Delta^2$ -6-heptenol  $\rightarrow$  *d*-2-methyl-6-heptanol. Exaltation of the rotation by a double bond is produced when it is situated between C atoms 3 and 4 from the asym. C atom. It had been previously accepted that the effect was generally an exaltation of the rotation of the parent satd. substance. "The general conclusion from the work to date is that the optical rotation of a substance is the resultant of the simultaneous action of several factors, of which 3 have been definitely pointed out: the resp. masses of the radicals attached to the asym. C atom, the polarity of the groups, and the distances of the polar groups from the asym. C atom." A. P. LOTHROP

**Interaction of alkyl sulfides and salts of mercury.** W. F. FARAGHER, J. C. MORRELL AND S. COMAY. *J. Am. Chem. Soc.* 51, 2774-81(1929).—The action of alkyl sulfides on  $\text{Hg}^+$  salts is a conversion of the salt into  $\text{Hg}$  and the corresponding  $\text{Hg}^{++}$  salt and the formation of an addn. compd. of the sulfides with the  $\text{Hg}^{++}$  salt. In some cases the reaction takes place only in the presence of  $\text{H}_2\text{O}$ . Except for  $\text{Me}_2\text{S}$ , the alkyl sulfides have no action on  $\text{HgCl}$ .  $\text{Et}_2\text{S}$  and  $\text{HgCl}_2$  in equimol. proportions in  $\text{EtOH}$  give the compd.  $\text{Et}_2\text{S}:\text{HgCl}_2$ ,  $m.$  76.5-7°, if crystd. from  $\text{EtOH}$ ; excess  $\text{HgCl}_2$  in  $\text{EtOH}$  gives the compd.  $\text{Et}_2\text{S}:\text{2HgCl}_2$ ,  $m.$  119-9.5°; crystn. of  $\text{Et}_2\text{S}:\text{HgCl}_2$  from  $\text{Et}_2\text{O}$  or  $\text{Me}_2\text{CO}$  gives a mixt. of the 2 compds. and several crystns. from  $\text{Me}_2\text{CO}$  or  $\text{C}_6\text{H}_6$  gives  $\text{Et}_2\text{S}:\text{2HgCl}_2$ ; crystn. of  $\text{Et}_2\text{S}:\text{2HgCl}_2$  from  $\text{EtOH}$  effected no conversion.  $\text{Pr}_2\text{S}$  and  $\text{HgCl}_2$ , using an excess of either reagent, give the compd.  $\text{Pr}_2\text{S}:\text{HgCl}_2$ ,  $m.$  87.5-8°, if crystd. from  $\text{EtOH}$ ; crystn. from  $\text{C}_6\text{H}_6$  gives the compd.  $\text{Pr}_2\text{S}:\text{2HgCl}_2$ ,  $m.$  121-2°, reconverted to  $\text{Pr}_2\text{S}:\text{HgCl}_2$  on crystn. from  $\text{EtOH}$ . *iso*- $\text{Bu}_2\text{S}$  in  $\text{EtOH}$  gives the compd. *iso*- $\text{Bu}_2\text{S}:\text{HgCl}_2$ ,  $m.$  116°, converted by crystn. from  $\text{C}_6\text{H}_6$  to *iso*- $\text{Bu}_2\text{S}:\text{2HgCl}_2$ ,  $m.$  131°, and reconverted by crystn. from  $\text{EtOH}$ .  $\text{Bu}_2\text{S}$  (1 mol.) and 3 mols.  $\text{HgCl}_2$  in  $\text{EtOH}$  or  $\text{H}_2\text{O}$  give the compd.  $\text{Bu}_2\text{S}:\text{2HgCl}_2$ ,  $m.$  112-3°; in  $\text{H}_2\text{O}$ , mol. proportions of the reagents give a liquid, from which  $\text{Et}_2\text{O}$  ppts.  $\text{Bu}_2\text{S}:\text{2HgCl}_2$ , leaving  $(\text{Bu}_2\text{S})_2:\text{HgCl}_2$  in soln. *iso*- $\text{Am}_2\text{S}$  behaves similarly, giving the compds. *iso*- $\text{Am}_2\text{S}:\text{2HgCl}_2$  and (*iso*- $\text{Am}_2\text{S}$ ) $_2:\text{HgCl}_2$ .  $\text{Me}_2\text{S}$  gives the compd.  $2\text{Me}_2\text{S}:\text{3HgCl}_2$ ,  $m.$  151°, which may be a mixt. or mol. compd. of  $\text{Me}_2\text{S}:\text{HgCl}_2$  and  $\text{Me}_2\text{S}:\text{2HgCl}_2$ . C. J. WEST

**True mixed organo-magnesium carbonates.** D. IVANOV. *Compt. rend.* 189, 51-3(1929).—The compds. ordinarily known as organo-magnesium carbonates have the structure  $\text{RC}(\text{O})\text{OMgX}$  but the name should really be applied to compds. with the structure  $\text{ROC}(\text{O})\text{OMgX}$ . These may be prepd. by the oxidation of the Grignard reagent with mol.  $\text{O}_2$  at 0° in a closed tube and then treatment with  $\text{CO}_2$  under the same conditions. The true organo-magnesium carbonates of the following alkyl halides have been prepd.: *EtBr*, *PrBr*, *iso-PrBr*, *BuCl*, *BuBr*, *iso-BuBr*, *iso-AmBr*, *PhCH<sub>2</sub>Cl* and *cyclohexyl bromide*. The compds. derived from the primary halides are solids, the others, pastes. They are hydrolyzed by  $\text{H}_2\text{O}$  to give the corresponding alcs. but when a mineral acid is used both  $\text{CO}_2$  and the alc. are obtained. J. M. LEVINE

--- -- BRAUN AND ERNST

isomeric nonylaldehyde, is due to the branching of the chain has been tested with another pair of isomers. Hexahydrofarnesyl bromide reacts only slowly with NMe<sub>3</sub> in C<sub>6</sub>H<sub>6</sub> at 100° to form the quaternary bromide (50% yield after 17 hrs.) which is so hygroscopic that it instantly deliquesces in the air. Treated with Ag<sub>2</sub>O and distd. from 4 mols. alkali it yields an oil consisting of 20% *hexahydrofarnesylidimethylamine*, b<sub>10</sub> 155-7°, and 80% *hexahydrofarnesene*, b<sub>11</sub> 117-20°, d<sub>4</sub><sup>15</sup> 0.7797, n<sub>D</sub><sup>15</sup> 1.4398, which, on ozonization and decompn. of the ozonide with H<sub>2</sub>O and Zn dust, yields about 60% of 2,6,10-trimethylundecylaldehyde (*norhexahydrofarnesal*) (I), b<sub>9</sub> 133-5°, d<sub>4</sub><sup>12</sup> 0.8452, n<sub>D</sub><sup>12</sup> 1.4440; when freshly distd. it has an unusually pleasant, strong, refreshing, flower-like odor which becomes weaker and weaker on standing, the aldehyde at the same time becoming more dense (d. after 44 hrs., 0.8589). The aldehyde readily colors fuchsin-SO<sub>2</sub>; *semicarbazone*, m. 235-7°. *Hexahydrofarnesal*, obtained in 20-30% yield from hexahydrofarnesol in 2.5 parts cold AcOH slowly treated with the calcd. amt of CrO<sub>3</sub>, b<sub>11</sub> 145-7°; *semicarbazone*, m. 248-50°. Its odor is quite pleasant but not as refreshing and flowery as that of I. Myristaldehyde, the straight-chain isomer of I, has a very faint odor which, on account of its fatty tinge, is not very pleasant.

C. A. R.

**Synthesis of formaldehyde by catalytic oxidation of methyl alcohol.** HIROAKI KADOWAKI AND MASAMORI YAMADA. *Repts. Imp. Ind. Research Inst. Osaka, Japan* 10, No. 7(1929) —By using a modified app. and Ag wire gauze (99.7% pure, B. W. G. No. 33) as catalyst K. and Y. repeated the catalytic oxidation of MeOH to CH<sub>2</sub>O with special emphasis on the velocity of the reacting gas, ratio of reacting O and MeOH, initial temp., method of prepn. of the catalyst, and effect of water vapor, oxides of N and N on the reaction. The MeOH was 99.3% pure, d<sub>15</sub><sup>15</sup> 0.7987. The unoxidized MeOH and CH<sub>2</sub>O were analyzed by the usual method (Williams, *J. Am. Chem. Soc.* 27, 596(1905), and Blank and Finkenbeiner, *Ber.* 39, 1226(1906), resp.). The results of expts. are illustrated by 7 curves. The best yield was obtained under the following conditions: The amt. of air used is about 1.2-1.7 l. per min. when the diameter of the rolled Ag catalyst is about 1.5 cm. and the amt. of O in the air is about 0.38-0.48 g. per 1 g. MeOH. The initial temp. should be at 175-300°, the high initial temp. reduces the yield except when the catalyst has small holes. Cooling of the catalyst by air reduces the CH<sub>2</sub>O yield, but it also decreases the waste about 5%. The ideal length of catalyst is about 2-6 cm. The presence of water vapor (5% of MeOH) does not influence the final product. The presence of oxides of N (0.2-0.3% of MeOH) increases the yield, the highest yield being 78.9%. The presence of N (20-100% of the air) also increases the yield, the highest yield being 79.3%. In most cases the reaction time was 30 min. Catalytic oxidation of AcH to CH<sub>3</sub>CO, with Ag and Cu wire gauze as catalyst, gave a 15 and 20% yield, resp.

F. I. NAKAMURA

**Organic molecular compounds with coordination centers. II. The coordination numbers of alkyl esters of fatty acids in the choleic acids.** HEINRICH RHEINBOLDT, OTTO KONIG AND REINHARD OTTEN. *Ann.* 473, 249-59(1929); cf. C. A. 21, 1127. For the purpose of detg. coordination nos. the following esters were prepd.: *HCO<sub>2</sub>H*: dodecyl, b<sub>15</sub> 145-6°; tetradecyl, b<sub>17</sub> 166°; hexadecyl, b<sub>17</sub> 188°; *EtCO<sub>2</sub>H*: dodecyl, b<sub>16</sub> 166-8°; hexadecyl, b<sub>18</sub> 211-2°; *PrCO<sub>2</sub>H*: dodecyl, b<sub>18</sub> 177-8°; hexyl heptanoate, b<sub>15</sub> 137°; *heptyl pelargonate*, b<sub>16</sub> 210°; *octyl pelargonate*, b<sub>21</sub> 183°; *nonyl decaate*, b<sub>20</sub> 210.5-1.5°; *C<sub>12</sub>H<sub>24</sub>O<sub>2</sub>*: *Pr*, b<sub>18</sub> 155-6°; *Bu*, b<sub>18</sub> 180°; *hexyl*, b<sub>18</sub> 199°; *octyl*, b<sub>17</sub> 204-5°; *C<sub>14</sub>H<sub>28</sub>O<sub>2</sub>*: *Bu*, b<sub>18</sub> 195°; *hexyl*, b<sub>17</sub> 215°; *tetradecyl*, m. 43°; *hexadecyl*, m. 47°. The following mol. compds. with *desoxycholic acid* were prepd. by crystg. the 2 components from a little abs. EtOH and the compn. detd. by titration with alkali; the m. p. and coordination no. is given in each case. *Formates*: *hexyl*, m. 167.5°, 4; *heptyl*, m. 168-9°, 4; *octyl*, m. 170.5-1°, 6; *dodecyl*, m. 179°, 6; *tetradecyl*, m. 185°, 8; *hexadecyl*, m. 187.5°, 8. *Acetates*: *Me*, m. about 145° (decompn.), 3; *Et*, m. 140-5° (decompn.), 3; *Pr*, m. 142-6° (decompn.), 4; *hexyl*, m. 168-9°, 4; *heptyl*, m. 169°, 4; *octyl*, m. 172-3°, 6; *dodecyl*, m. 180.5°, 6; *tetradecyl*, m. 185.5-6°, 8; *hexadecyl*, m. 189°, 8. *Propionates*: *Me*, m. 144-8° (decompn.), 3; *Et*, m. 145-9° (decompn.), 4; *heptyl*, m. 170-1°, 4; *octyl*, m. 173.5-4.5°, 6; *dodecyl*, m. 182°, 6; *hexadecyl*, m. 187°, 8. *Butyrates*: *Me*, m. about 148-52° (decompn.), 4; *octyl*, m. 176-6.5°, 6; *dodecyl*, m. 183.5°, 6; *hexadecyl*, m. 189°, 8. *Valerates*: *Bu*, m. 169-70°, 6; *octyl*, m. 176-7°, 6. *Capronates*: *Am*, m. 173.5°, 6; *octyl*, m. 181-1.5°, 6. *Heptanoates*: *Me*, m. 169-70°, 4; *hexyl*, m. 177-7.5°, 6; *octyl*, m. 182°, 6. *Caprylates*: *Me*, m. 169-70°, 4; *heptyl*, m. 180.5-1°, 6; *octyl*, m. 181-1.5°, 6. *Pelargonates*: *Me*, m. 174-5°, 6; *heptyl*, m. 182.5-3°, 6; *octyl*, m. 185°, 8. *Nonyl caprate*, m. 186.5-7°, 8. *Laurates*: *Me*, m. 180°, 6; *Et*, m. 182°, 6; *Pr*, m. 183.5-4°, 6; *Bu*, m. 184-4.5°, 6; *hexyl*, m. 185.5°, 6; *octyl*, m. 186°, 6.

**Myristates:** *Me*, m. 181.5–2°, 6; *Et*, m. 183.5°, 6; *Bu*, m. 186°, 6; *hexyl*, m. 188°, 6; *tetradecyl*, m. 194.5–5.5°, 8; *hexadecyl*, m. 197–8°, 8. *Me pentadecylate*, m. 184.5–5°, 8. *Apocholic acid* and *hexadecyl acetate*, m. 187–8°, 8. *Octyl alc.* and *desoxycholic acid*, m. 169.5–70°, 6; with *tetradecyl alc.*, m. 183.5–4.5°, 8. Various relationships between coördination no. and structure are discussed.

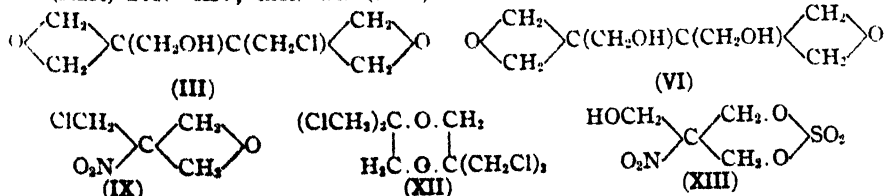
C. J. WEST

**Diethyl pentasulfides.** G. R. LEVI AND A. BARONI. *Atti accad. Lincei* [6], 9, 772–8 (1929).— $\text{Et}_2\text{S}_5$  was prepd. by heating 7 g.  $\text{S}_2\text{Cl}_2$  in 5 parts of  $\text{CS}_2$  together with 10 g.  $\text{EtSH}$  also in 5 parts of  $\text{CS}_2$ , and 2 parts  $\text{S}$ , in a closed tube in a water bath, at 150°, and at 200°, 150° giving the optimum yield. Two isomers result,  $b_{25}$  119° and 130°, resp. The structures of the 2 pentasulfides are considered to be  $\text{EtS}(\text{:S:S:S:})\text{SEt}$

and  $\text{EtS}(\text{S—S})\text{SEt}$  by analogy with the tetrasulfide whose structure is  $\text{EtS}(\text{:S:})\text{S}(\text{:S:})\text{SEt}$ ; because of its prepn.  $\text{Et}_2\text{S}_2 + \text{S}_2$ , and since there is only 1 tetrasulfide known. The above structure explains the presence of 2 pentasulfides, while the other possible formula  $\text{Et}_2\text{S:S}(\text{S})\text{S}$  would only explain one pentasulfide. The consts. for the pentasulfide  $b_{25}$  119° are  $d_{16}$  1.1687,  $n_D^{25}$  1.60269; the isomer  $b_{25}$  130° has not been studied as yet.

A. W. CONTIERI

**Cleavage of the nitro group from tertiary nitro compounds. I. Derivatives of "nitroisobutylglycerol."** HANS KLEINFELLER. *Ber.* 62B, 1582–90 (1929); cf. Möller, *Diss. Kiel* 1927.—In attempting to convert *trichloronitroisobutane* (1,3-dichloro-2-chloromethyl-2-nitropropane),  $\text{O}_2\text{NC}(\text{CH}_2\text{Cl})_3$  (I), obtained from Henry's nitroisobutylglycerol,  $\text{O}_2\text{NC}(\text{CH}_2\text{OH})_3$  (II), with  $\text{PCl}_5$ , back into II it was found that no reaction occurs with  $\text{Ag}_2\text{O}$ , but when I is gently warmed with alc. KOH, 3.5 mols. of the KOH are used up, the  $\text{NO}_2$  group is split off as  $\text{KNO}_2$ , then 2 mols.  $\text{H}_2\text{O}$  are also eliminated and there is obtained the *compd.* III. The ease with which the  $\text{NO}_2$  group is split off led to trying the reaction on II itself, its tribenzoate (IV) and its dibenzoate (V); 4, 3 and 1 mols., resp., of KOH were used up, and  $\text{KNO}_2$  was formed in each case but only with V could a homogeneous org. *product* (VI) be isolated. Even in the chlorination of II with  $\text{PCl}_5$ , the  $\text{NO}_2$  is in part split off; along with I,  $\text{O}_2\text{NC}(\text{CH}_2\text{Cl})_2\text{CH}_2\text{OH}$  (VII), the phosphate (VIII) of VII and a *compd.* (IX) formed by loss of HCl from VII, are obtained the N-free unsatd. *compd.*  $\text{ClCH}:\text{C}(\text{CH}_2\text{Cl})_2$  (X), and its HCl addn. *product* (XI) which, from the laws of halogen acid addn., probably has the structure  $\text{Cl}_2\text{CHCH}(\text{CH}_2\text{Cl})_2$ . Bromination with  $\text{PBr}_5$  gives entirely analogous products, although the analogs of VII and IX were not obtained. VIII on heating gives  $\text{NO}$ ,  $\text{CO}_2$ , HCl and a *compd.* which most probably is a *dioxan* (XII). In the reaction between II and  $\text{SOCl}_2$  there are obtained a *sulfite* (XIII) and an *isomer* (XIV), m. 180°, of II forming a tribenzoate identical with IV; XIV is also obtained with  $\text{SO}_2\text{Cl}_2$  or  $\text{PCl}_5$ ; on standing for weeks it changes back into II. I, m. 104°, mol. wt. (Rast) 215; yield, 25 g. from 60 g. II. 2-Nitro-3-chloro-2-chloromethyl-1-propanol (VII), sep'd. from IX, X and XI by *distn.* *in vacuo*, m. 127°. 3-Nitro-3-chloromethyltrimethylene oxide (IX),  $b_{25}$  45–6°. 1,3-Dichloro-2-chloromethyl-1-propene (X),  $b_{25}$  62–4° (see following abstr.). 1,1,3-Trichloro-2-chloromethylpropane (XI),  $b_{25}$  77–80°. VIII cannot be *crystd.* or *distd.* and was purified by repeated soln. from alc., *extrn.* with  $\text{Et}_2\text{O}$  and finally drying *in vacuo* at 80° over  $\text{P}_2\text{O}_5$ . *Br analog* of I, m. 85°; of X,  $b_{25}$  105–7°, very irritating to the eyes, of XI,  $b_{25}$  133–6°, also very irritating to the eyes. With  $\text{Al-Hg}$  in alc. on the  $\text{H}_2\text{O}$  bath 3 g. I gives 2 g. of the 2-hydroxylamino *deriv.*, m. 81°, while with  $\text{SnCl}_2$  and boiling alc. HCl is obtained the 2-amino *compd.* as the HCl salt, m. 245–6° (decompn.). *Dibenzoyl-2-nitro-2-methylolpropane-1,3-diol* (V), obtained as a by-product in the prepn. of IV, cream-colored, sandy, *cryst. powder*, m. 122–4°. III,  $b_{12}$  80° (yield, about 60%), mol. wt. in freezing  $\text{C}_6\text{H}_6$  180. VI,  $b_{25}$  108–12°. VII,  $b_{25}$  60–1°. XIII, m. 104°, mol. wt. (Rast) 210. XIV, mol. wt. (Rast) 164. II. Action of sodium amalgam on



derivatives of "nitroisobutylglycerol." HANS KLEINFELLER (IN PART WITH ALFRED KIRSCH AND FRANZ ECKERT). *Ibid* 1590–7.— $\text{O}_2\text{NC}(\text{CH}_2\text{Cl})_3$  (I) and  $\text{O}_2\text{NC}(\text{CH}_2\text{Br})_3$  (II) do not react at all with  $\text{Ag}$ ,  $\text{Cu}$  or  $\text{Zn}$  at different temps. with or without a solvent. With  $\text{Na}$  in  $\text{Et}_2\text{O}$  under pressure the reaction mixt. tars completely. Boiling in  $\text{C}_6\text{H}_6$ .

PhMe or xylene with Na, K or Na-Hg gives the inorg. halide and large amts. of amorphous substances but the org. products can be isolated only incompletely and with great losses because of their unfavorable b. ps. and their enormous volatility with the vapors of the solvents; in the absence of solvents explosions generally occur. The reaction can, however, be successfully carried out by intimately mixing the finely powd. substance (about 5 g.) and 50 g. of 4.5% Na-Hg and starting the reaction, if necessary, by cautiously heating the mixt. at some point with a small flame; the reaction temp. is about 200°. I gives more than 70% of a mixt. of  $\text{ClCH}_2\text{C}(\text{CH}_2\text{Cl})_2$  (III) (see preceding abstr.) and 3-chloro-2-chloromethyl-1-propene,  $\text{CH}_2\text{C}(\text{CH}_2\text{Cl})_2$  (IV), b<sub>10</sub> 30–1°, mol. wt. in freezing  $\text{C}_6\text{H}_6$  119. Addn. of Br to these compds. gives 1,3-dichloro-1,2-dibromo-2-chloromethylpropane, b<sub>10</sub> 140°, and the 3-chloro-1,2-dibromo compd., b<sub>10</sub> 115°, while with Cl are obtained the 1,1,2,3-tetra- and 1,2,3-tri-Cl derivs., b<sub>12</sub> 99–101° and b<sub>8</sub> 87°, resp. With H and Pt sponge in alc. both III and IV yield 3-chloro-2-chloromethylpropane, b<sub>10</sub> 45°.  $\text{O}_2\text{NC}(\text{CH}_2\text{Cl})_2\text{CH}_2\text{OH}$  and  $\text{ClCH}_2\text{C}(\text{NO}_2)_2\text{CH}_2\text{O.C}_2\text{H}_5$  with

Na-Hg yield 3-chloromethylenetrimethylene oxide, b<sub>760</sub> 63–6°, and 3-methylenetrimethylene oxide, b<sub>760</sub> 35–40°. II and Na-Hg yield 2,5-bis(bromomethyl)1,5-hexadiene, b<sub>8</sub> 140–3° (slight decompn.), mol. wt. in freezing  $\text{C}_6\text{H}_6$  249,  $\text{BrCH}_2\text{C}(\text{CH}_2\text{Br})_2$  (see preceding abstr.) and 3-bromo-2-bromomethyl-1-propene, b<sub>8</sub> 70–2°. The 3 compds. with Br yield 1,2,5,6-tetrabromo-2,5-bis(bromomethyl)hexane, m. 115°, 1,1,2,3-tetrabromo-2-bromomethylpropane, b<sub>8</sub> 185–90° (slight decompn.), and 1,2,3-tribromo-2-bromomethylpropane, b<sub>8</sub> 143–5°.  $\text{O}_2\text{NC}(\text{CH}_2\text{OBz})_2$  and Na-Hg yield  $\text{Ph}_2\text{C}(\text{OBz})_2$ , dibenzoyl-2,5-dimethylol-1,5-hexadiene (V), yellow, b<sub>8</sub> 220°, mol. wt. (Rast-Carlsohn) 300, and benzoyl-2-methyl-1-propen-3-ol, yellow, b<sub>50</sub> 120°, mol. wt. 148. Dibenzoyl-1,2,5,6-tetrabromo-2,5-bismethylolhexane, from V and Br, decomp. completely on distn. in vacuo. C. A. R.

Separation of glycerides. VI–IX. BUNSUKE SUZUKI. *Proc. Imp. Acad. (Japan)* 5, 265–8(1929); cf. C. A. 22, 2549.—With the method previously described linseed oil gave bromides of linoleodiolein (I), solidifying at 5°, 3° and –2°, resp., of stearolinoleolein, –4° and of stearolinolenodolein, –7°. Soybean oil: bromides of oleodilinenin, solidifying at 6°, 5° and 3°, resp., and of I, 3°. Whale oil: bromides of steardioömarin, solidifying at 1°; stearolinoleozoömarin, –3°; stearolinolenozoömarin, –6°;  $\text{C}_{18}\text{H}_{33}\text{O}_2(\text{C}_{22}\text{H}_{41}\text{O})_2$ , –4° and palmitostearidonogadolein, –3°; the acid  $\text{C}_{22}\text{H}_{42}\text{O}_2$  could not be identified. Herring oil: bromides of gadoleo- $\text{C}_{22}\text{H}_{42}\text{O}$ -linolenin, m. 104°; zoömarostearidonarichidonin, 148°; zoömaroarachidonoclipanodonin, m. 150° (decompn.); zoömaro- $\text{C}_{22}\text{H}_{42}\text{O}$ -stearidonin, m. 150°; gadoleodiarachidonin, m. 180°; linoleodigadolein, m. 6°; linoleodizoömarin (II), m. 2°;  $(\text{C}_{22}\text{H}_{41}\text{O})_2$ -gadolein, m. 5°;  $(\text{C}_{22}\text{H}_{41}\text{O})_2\text{C}_2\text{H}_5\text{O}_2$ , m. –2°; stearolinolenozoömarin, m. –8°. The acid  $\text{C}_{22}\text{H}_{42}\text{O}_2$  will be discussed below. Cod oil: Bromides of zoömarolinolenoclipanodonin, m. 131°; zoömarolinoleoarachidonin, m. 255° (decompn.); II, m. 2°; linolenodizoömarin, m. –2° and –5°; steardionodizoömarin, m. –4°;  $(\text{C}_{22}\text{H}_{41}\text{O})_2$ -stearin, m. –7°. Sardine oil: Bromides of  $(\text{C}_{22}\text{H}_{42}\text{O})_2$ -arachidonin, m. 85°; zoömaro- $\text{C}_{22}\text{H}_{42}\text{O}$ -stearidonin, m. 120°;  $(\text{C}_{18}\text{H}_{33}\text{O})_2$ -arachidonin, m. 110°; steardiono- $\text{C}_{18}\text{H}_{33}\text{O}$ -zoömarin, m. 135°; triarachidonin, m. 205° (decompn.); triolein, m. 6°; linoleodigadolein, m. 2°;  $(\text{C}_{22}\text{H}_{41}\text{O})_2$ olein, m. –2°; stearolinoleolein, m. –5° and 6°;  $(\text{C}_{22}\text{H}_{41}\text{O})_2$ -arachidonin, m. –3°. The acid  $\text{C}_{18}\text{H}_{33}\text{O}_2$  is new and will be discussed below. X–XIV. *Ibid* 269–71.—Sandeel (*Ammodytes personatus*) oil: bromides of  $(\text{C}_{18}\text{H}_{33}\text{O})_2$ -clipanodonin, m. 124°;  $(\text{C}_{18}\text{H}_{33}\text{O})_2$ -arachidonin, m. 126°; linoleo- $\text{C}_{18}\text{H}_{33}\text{O}$ -arachidonin, m. 153°; arachidonoclipanodonin, m. 230°; linoleodizoömarin (I),  $(\text{C}_{22}\text{H}_{41}\text{O})_2$ -clipanodonin, diarachidoömarin, dioleoömarin, palmitozoömarin,  $(\text{C}_{22}\text{H}_{41}\text{O})_2\text{C}_2\text{H}_5\text{O}_2$ . Oil of *Theragra chalcogramma*: bromides of diclipanodonoarachidonin, m. 95°; steardionodclipanodonin, m. 125°; diclipanodonolinolenin, m. 165° (decompn.); triarachidonin (II), m. 205° (decompn.); arachidonodizoömarin; zoömarolinoleostearin. Cuttle fish oil: Bromides of  $(\text{C}_{18}\text{H}_{33}\text{O})_2\text{C}_2\text{H}_5\text{O}_2$ , m. 74°;  $(\text{C}_{18}\text{H}_{33}\text{O})_2$ -linolenin, m. 81°;  $(\text{C}_{18}\text{H}_{33}\text{O})_2$ -distearidonin, m. 125°; II, I and trizoömarin (III). Red salmon oil: bromides of linolenolinolenoarachidonin, m. 103°; linolenodiarachidonin, m. 115°; I, III and  $(\text{C}_{22}\text{H}_{41}\text{O})_2\text{C}_2\text{H}_5\text{O}_2$ . Shark liver oil: Bromides of arachidonodclipanodonin, m. 110°; clipanodonodiarachidonin, m. 140°; clipanodonoarachidonin; inolenin, m. 117°. II, III, digadoleolinolenin, triolein, dizoömarolinolenin and palmitodiolein. XV. Two new fatty acids obtained from fish oils. B. SUZUKI AND YOSHIKUNI YOKOYAMA. *Ibid* 272–3.—Sardine oil, on bromination and fractionation, gives in the  $\text{Et}_2\text{O}$  and  $\text{Me}_2\text{CO}$  fractions a glyceride contg. the acid  $\text{C}_{18}\text{H}_{33}\text{O}_2$ , whose octa-Br deriv. m. 96°. Removal of the Br and reduction gives behenic acid, m. 78°. The  $\text{C}_6\text{H}_6$ -sol. portion of the bromo-glycerides yields the acid  $\text{C}_{18}\text{H}_{33}\text{O}_2$ , whose octa-Br deriv. m. 104–5°; the satd. acid is stearic acid. C. J. WEST

The direct synthesis of optically active compounds and an explanation of the origin of the first optically active compound. HENRY GILMAN. *Iowa State Coll. J. Sci.* 3, 227-30(1929).—The application of the statistical theory of probability shows that there could be fortuitous expts. in which an excess of a *d*-acidic compd. might be formed. Segregation and reaction with a *dl*-base would start a cycle which would produce additional active mols.

F. E. BROWN

The reaction between nitrous acid and certain amino acids and related compounds at 45°. CARL L. A. SCHMIDT. *J. Biol. Chem.* 82, 587-94(1929).—Glycocoll, glycylglycine, cystine, cysteine, tryptophan, arginine and an unsatd. oxyindole deriv. yielded more N than could be accounted for on the basis of their free amino groups. Other substances reacted normally.

ARTHUR GROLLMAN

Preparation of *d*-gluconic and galactonic acids. M. HÖNIG AND W. RUZICZKA. *Ber.* 62B, 1434-6(1929); cf. Kiliani, *C. A.* 23, 3665.—H. and R. have also devised a method of prep. these acids in which the use of Ag or Pb compds. to remove the halogen is completely avoided. The glucose or galactose is oxidized either with Ba(OBr)<sub>2</sub> in the presence of a permanent slight excess of Ba(OH)<sub>2</sub> or with bleaching powder in the presence of an excess of Ca(OH)<sub>2</sub> at room temp. in direct sunlight or the light of a Hanauer anal. quartz lamp. The smaller the concn. of the sugar and of the alkali, the more homogeneous is the reaction; the best results were obtained with a 1% sugar soln., exactly 0.1 *N* hypobromite or hypochlorite (1 equiv. of O) and the calcd. amt. of 0.1 *N* Ba(OH)<sub>2</sub> or Ca(OH)<sub>2</sub> required to neutralize the resulting acid oxidation products. Usually the alkali is used up before the end of the oxidation and small amts. of Ba(OH)<sub>2</sub> must be added from time to time to keep the soln. permanently alk. The oxidation requires 30-45 min.; the soln. is then satd. boiling-hot with CO<sub>2</sub>, filtered, concd. *in vacuo*, treated with the calcd. amt. of dil. H<sub>2</sub>SO<sub>4</sub> (as detd. by a Ba analysis of a sample), filtered from the BaSO<sub>4</sub>, neutralized with CaCO<sub>3</sub>, filtered, evapd. *in vacuo* to a sirup and dropped into abs. alc., the pptd. Ca salt being repeatedly pptd. from a little H<sub>2</sub>O in the same way until it is free of Br. The yield of crude Ca gluconate is 85.3%. Galactonic acid is prepd. in the same way. Oxidation in the light of the quartz lamp requires 35 min. and the yield of crude Ca salt is 79.8%. The prepn. with Ca(OCI)<sub>2</sub> is even simpler, as the need of removing the Ba as BaSO<sub>4</sub> is avoided. Glucose after 3 hrs. oxidation gave 61.3% of crude Ca gluconate, galactose after 3.5 hrs. 58.13% of Ca galactonate. The gluconic acid can also be prepared from com. pure starch sirup.

C. A. R.

Chemistry of the associating lactolides: transformations of the aldols. MAX BERGMANN, ARTHUR MIEKELEY AND ERNST VON LIPPMANN. *Ber.* 62B, 1467-74(1929).—Like that of ordinary aldol the lactol acetate (I) of  $\beta$ -lactaldehyde is monomeric in gas form but in solvents associates to a dimer. The tendency to associate is accompanied by a pronounced tendency to rearrange, which often leads to unexpected products. Thus, on catalytic hydrogenation it does not simply exchange its OAc group for H but 2 mols. react with loss of only one OAc group and formation of 2-[ $\beta$ -acetoxyethyl]-1,3-dioxan (II),  $\text{AcOCH}_2\text{CH}_2\text{CH}(\text{O} \cdot \text{CH}_2 \cdot \text{CH}_2 \cdot \text{CH}_2 \cdot \text{O})$ . Removal of the

Ac group with alkali gives the hydroxyethyl compd. (III), which does not reduce Fehling soln., alk. hypoiodite or NH<sub>4</sub>-AgNO<sub>3</sub>, regenerates II on acetylation and yields a *mono-Me ether* (IV), which with boiling 2 *N* H<sub>2</sub>SO<sub>4</sub> yields MeOH, CH<sub>3</sub>:CHCHO and CH<sub>2</sub>:(CH<sub>2</sub>OH)<sub>2</sub>. CH<sub>3</sub>:CHCHO and CH<sub>2</sub>:(CH<sub>2</sub>OH)<sub>2</sub>, treated at 0° with HCl gas give 3-[ $\beta$ -chloroethyl]-1,3-dioxan (V), which with *N*/3 NaOH yields a compd. identical with III. This tendency to react as a double mol. is also exhibited by aldol cycloacetate (VI).  $\beta$ -Hydroxypropionaldehyde lactol acetate (I),  $\text{O} \cdot \text{CHMe} \cdot \text{CH}_2 \cdot \text{CHOAc}$  or

(6-7 g. from 10 g.  $\beta$ -lactaldehyde and Ac<sub>2</sub>O in C<sub>6</sub>H<sub>6</sub>N),

*b*<sub>0</sub>, 122-3°,  $n_D^{20}$  1.4490,  $d_4^{20}$  1.1795, mol. wt. in freezing AcOH, 232, in vapor form (at 180°) 137. II, obtained in about 53% yield from I in AcOH with H and Pd sponge, *b*<sub>12</sub> 115-8°,  $n_D^{20}$  1.4415,  $d_4^{20}$  1.0998, mol. wt. in freezing AcOH 169, in vapor form (at 180°) 292-330. III (3.3-3.5 g. from 5 g. II), *b*<sub>0</sub> 102-3°,  $n_D^{20}$  1.4566,  $d_4^{20}$  1.1057, mol. wt. in freezing AcOH 151, in H<sub>2</sub>O 120, in vapor form (at 180°) 251, does not react with PhNHNH<sub>2</sub> and reduces Fehling soln. only after acid hydrolysis. IV, from III boiled with MeI and Ag<sub>2</sub>O, *b*<sub>0</sub> 70-2°,  $n_D^{20}$  1.4334, mol. wt. in vapor form (at 180°) 313. V (20 g. from 20 cc. CH<sub>3</sub>:CHCHO), *b*<sub>0</sub> 74-5°,  $n_D^{20}$  1.4542, mol. wt. in vapor form (at

100°) 329. 2-[ $\beta$ -Acetoxypropyl]-4-methyl-1,3-dioxan (6.9 g. from 15 g. VI),  $b_{15}$  114-6°,  $n_D^{20}$  1.4347, does not react with  $NH_4OH$  or  $PhNHNH_2$ , is not oxidized by alk. hypoiodite, cannot be further acetylated and reduces Fehling soln. only after acid hydrolysis, mol. wt. in vapor form (at 180°) 423; it is also obtained in about the same yield when VI in gas form at 200° under 22 mm. is slowly passed with H over Pd-asbestos. Hydroxypropyl compd.,  $b_{15}$  100°, does not reduce alk. hypoiodite, gives on acid hydrolysis  $CH_3:CHCHO$  and 1,3-butanediol,  $b_{15}$  108-9°,  $n_D^{19}$  1.4418. C. A. R.

Isomeric  $\alpha,\beta$ -diphenylglutaric acids. S. AVERY AND W. D. MACLAY. *J. Am. Chem. Soc.* 51, 2833-9(1929).—The work previously published on the higher-melting acid (I), in so far as this paper relates to it, is confirmed in all essential points. The lower-melting acid (II) has been prep'd. in a pure condition by different methods, its cryst. habit noted and the m. p. found to be 208-10° (cor.). A mixt. of the 2 acids may be sep'd. by fractional crystn. I is transformed into the anhydride of II by heating with  $AcCl$  at 140° for 4 hrs.; it m. 126.5° and gives II with boiling  $H_2O$ . The Me ester, m. 143°, the Et ester, m. 93.3°, and the acid, m. 226-8°, belong to what is termed the higher-melting series; the Me ester, m. 87°, the Et ester, m. 76°, and the acid, m. 208-10°, belong to the lower-melting series. The CN and mono- $NH_2$  derivs., the imide, m. 225-9°, and the anilic acid, m. 201-2°, also appear to be members of the lower-melting series. The members of the higher-melting series might be termed "trans" or "fumaroid" compds., while those of the lower-melting series would be designated as "cis" or "maleinoid" forms, although these terms help to classify rather than to explain this and similar cases of stereoisomerism. Resolution of I by means of brucine gives *d*-I, m. 224-6°,  $[\alpha]_D^{20}$  58.7° (1 g. in 25 cc.  $Me_2CO$ ), and the *l*-I, m. slightly lower,  $[\alpha]_D^{20}$  -58.0°. Resolution of II gives a *d*-II, m. 202°,  $[\alpha]_D^{20}$  140.6° (0.2188 g. in 25 cc.  $Me_2CO$ ), and the *l*-II, m. 202°,  $[\alpha]_D^{20}$  -140°. The names proposed for I and its *d*- and *l*-forms are: *ad,bl-ad,bl-d*-, *ad,bl-* and *al,bl-d*-diphenylglutaric acids, for II, *al bl-ad,bl-d*-, *ad,bl-d*- and *al bl-d*-diphenylglutaric acids. C. J. WEST

New esters of thiocynoacetic acid. A. LAKNER. *Chem. Folyóirat* 34, 129-35 (1928).—Some thiocynoacetic esters can be used very well to produce thiazole derivs. Until now only some lower alc esters had been produced. Now the hexyl, heptyl, octyl, nonyl, phenol, resorcinol, pyrocatechol, hydroquinone, thymol, guaiacol, carvacrol, naphthol, benzyl, phenylethyl, phenylpropyl esters, further its Me salicylate and Me anthranilate esters have been produced and their phys. data det'd.

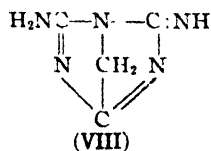
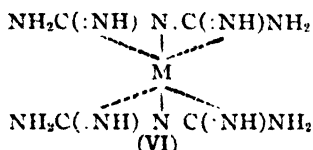
S. S. DE FINAIV

A note on the specific rotatory power of *d*-arginine. ANDREW HUNTER. *J. Biol. Chem.* 82, 731-6(1929).—The sp. rotatory power of *d*-arginine,  $\alpha_D^{20}$ , in the presence of an excess of  $HCl$  is at least 26.54°, the corresponding value for the  $HCl$  salt is 21.94°. Treated with  $HNO_3$ , arginine gives off 25% of its total N in 5 min. at room temp. and 30% more in 3 hrs.

ARTHUR GROLLMAN

Biguanides. I. Constitution of the heavy metal-complex compounds of biguanide. K. H. SLOTTA AND R. TSCHESCHE. *Ber.* 62B, 1390 8(1929).—It was previously shown for  $MeNHCONHC(:NH)NH_2$  and is now shown for [methylguanyl]urea,  $NH_2CONHC(:NH)NHMe$  (II), that these substances can no longer form complex compds., so that the presence of the unsubstituted  $NH_2$  group in guanylurea (III) is necessary for complex formation. It was desired to learn what influence alkylation of the middle N atom would have but when methylcarbethoxycyanamide (IV),  $NCNMeCO_2Et$ , was treated under mild conditions with  $NH_3$  the  $CO_2Et$  was split off with formation of  $MeNHCN$  which at once polymerized to trimethylmelamine. Contrary to the view of Chugaev that the metal complexes of II and of biguanide (V) have the same structure are the following facts: if V is singly or doubly substituted in positions 1 or 1 and 5, its ability to form complexes is not at all affected; derivs. substituted in positions 1 and 2 form no typical, difficultly sol. complexes although the color of the soln. changes to violet and no metal hydroxide is pptd.; substitution in positions 1, 2 and 3 completely prevents complex formation. These facts point definitely to the structure VI for the complexes of V, the 3-H atom being replaced by the metal. To test this view it was hoped that 3-methylbiguanide might be prep'd. by adding  $NH_3$  to Madelung and Kern's methylidicyanamide but their product proved to be a polymer (VII) and all efforts to obtain the monomer failed. That the 3-H atom is reactive, however, was shown by treating V with  $ClCH_2CO_2Et$  which gave a small amt. of a substance undoubtedly formed by primary reaction of the ester with the middle N atom with simultaneous splitting off of  $H_2O$  and  $EtOH$  and formation of the triazine VIII. The chief product, however, was biguanide-5-acetic acid  $HCl$  salt (IX). 1,1-Dimethylbiguanide gave

about equal parts of the *di-Me* derivs. (X and XI) of VIII and IX. The 1-derivs. of V were prepd. by addn. of amines to cyanoguanidine (XII) either in the presence of Cu ions in H<sub>2</sub>O (Herth method) or by fusing the amine salts with the XII. Aromatic derivs. were obtained by boiling the XII with the amine-HCl in H<sub>2</sub>O. 1,5-Disubstituted derivs. were prepd. by heating the Cu salt of dicyandiamide (XIII) with amines in H<sub>2</sub>O or fusing its Na salt with the amine-HCl. The 1,2-derivs. were prepd. by alkylating guanyllalkylthiouras with EtBr and treating the resulting S-Et derivs. with primary and secondary amines. 1,2,3-Triphenylbiguanide (XIV) was obtained from PhN:C(NHPh)<sub>2</sub> and NCNH<sub>2</sub>; attempts to extend the reaction to other aliphatic and aromatic guanidines failed. Sulfate of II (0.4 g. from 3 g. NH<sub>2</sub>CONHCN heated at 100° with alc. MeNH<sub>2</sub>, followed by pptn. of the product from EtOH with concd. H<sub>2</sub>SO<sub>4</sub>), m. 228-30° (slight gas evolution). IV (11 g. from 20 g. NCNNaCO<sub>2</sub>Et and Me<sub>2</sub>SO<sub>4</sub> in H<sub>2</sub>O), b<sub>s</sub> 100°. Biguanide acid sulfates: 1,5-Di-Me (6 g. from 8 g. of the Na salt of XIII and MeNH<sub>2</sub> HCl heated to 130°), decomp. 200°, isolated through the red Cu complex; 1,5-diallyl, viscous mass; 1,1,5,5-tetra-Me (6.5 g. from 8 g. of the Cu salt of XIII and aq. NHMe<sub>2</sub> at 120°), sinters 133-5°, decomp. 142°. *N*-Methyl-S-ethylguanyllthiurea-HBr (XV) (15 g. from 10 g. MeNHCSNHC(:NH)NH<sub>2</sub> and EtBr in boiling alc.), m. 173-5° (incipient decompn.). 1,2-Dimethylbiguanide-HBr (3.2 g. from 6 g. XV with aq. MeNH<sub>2</sub> on the H<sub>2</sub>O bath), decomp. 240-5°. 1,1,2-Tri-Me homolog (4 g. from 6 g. XV with NMe<sub>2</sub>), m. 185-90°. XIV (2.6 g. from 7 g. PhN:C(NHPh)<sub>2</sub> in C<sub>6</sub>H<sub>6</sub> and NCNH<sub>2</sub> in Et<sub>2</sub>O), decomp. 118-20°. VII, sinters 290° m. 235-8°. mol. wt. in PhOH 199. V from the sulfate boiled with NaOH.



(14.5 g.), m. 176° (darkening). II. Blood-sugar-lowering action of biguanides. *Ibid* 1398 1405.—In order to retain the blood-sugar-lowering action in biguanides, only 1 of the NH<sub>2</sub> groups can be substituted. In the Me, Et, Pr, iso-Bu, iso-Am series, the 1st member is the most effective and the same is true of the allyl, crotyl, isoamylenyl and isohexenyl series, as also of the 1,1-dialkyl series; the di-Et deriv. is wholly without action. Introduction of aromatic residues (Ph, MeOC<sub>6</sub>H<sub>4</sub>) or of CH<sub>2</sub>CO<sub>2</sub>H does not increase the activity. The 1-β-hydroxyethyl- and 1-β-mercaptoethylbiguanides and the ethylene-, hexamethylene- and decamethylenedibiguanides were inactive. The blood-sugar-lowering action is therefore limited to the 1st member of each series and is most pronounced in the 1,1-di-Me deriv., only the allyl deriv. having approx. the same activity; 0.1 g., subcutaneously, of each of these lowers the blood sugar of a middle-sized rabbit to the convulsive level, and they are effective by mouth. Glucose will restore the normal blood sugar level but adrenaline will not overcome the convulsions. Biguanide sulfates: 1-Pr (4 g. from 6 g. PrNH<sub>2</sub> and NCNHC(:NH)NH<sub>2</sub> with CuSO<sub>4</sub> in H<sub>2</sub>O at 100°), m. 193-6°. 1-iso-Am, m. 168-70°. 1,1-Dimethylbiguanide-HCl (140 g. from 100 g. Me<sub>2</sub>NH<sub>2</sub>·HCl), m. 235°. 1,1-Diethylbiguanide-H<sub>2</sub>SO<sub>4</sub> (6 g. from 14 g. Et<sub>2</sub>NH<sub>2</sub>·HCl), decomp. 202°. 1,1-Diallylbiguanide-HCl (2.5 g. from 5 g. (C<sub>3</sub>H<sub>5</sub>)<sub>2</sub>NH<sub>2</sub>·HCl), very hygroscopic, gradually m. 100-10°. 1-Crotylbiguanide sulfate, m. 165-8°, is obtained in 2.5 g. yield from 3.5 g. C<sub>4</sub>H<sub>7</sub>NH<sub>2</sub>·HCl which in turn is obtained with boiling Ba(OH)<sub>2</sub> from 7 g. *N*-crotylphthalimide, m. 76°, b<sub>12</sub> 178-80° (12 g. from 20 g. C<sub>4</sub>H<sub>7</sub>-Br and C<sub>6</sub>H<sub>5</sub>(CO)<sub>2</sub>NK in xylene at 180°). 1-Isoamyl-ethylbiguanide sulfate (3.0 g. from 5 g. C<sub>5</sub>H<sub>11</sub>NH<sub>2</sub>·HCl), m. 153-4°. Hexenylbiguanide sulfate (12 g. from 20 g. of the amine-HCl), decomp. 226°. 1-*p*-Methoxyphenylbiguanide-HCl (15 g. from 12 g. MeOC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub>·HCl), m. 235°. Guanyllthiurea carbonate (I) was obtained in 90-100 g. yield from three 40-g. portions of NCNHC(:NH)NH<sub>2</sub> in H<sub>2</sub>O satd. at 0° with H<sub>2</sub>S, heated 10 hrs. at 70-80° and again alternately satd. with H<sub>2</sub>S and heated 7 times more and finally filtered and satd. at 0° with CO<sub>2</sub>. Guanyll-S-ethylthiurea-HBr (II) (50 g. from 100 g. I with EtBr on the H<sub>2</sub>O bath), decomp. 166°. 1-β-Hydroxyethylbiguanide sulfate (2.6 g. from 3 g. HOCH<sub>2</sub>CH<sub>2</sub>NH<sub>2</sub> and II in H<sub>2</sub>O), decomp. 148°, isolated as the Cu salt. 1-β-Mercaptoethyl acid sulfate (1 g.

from 10 g.  $\text{HSCH}_2\text{CH}_2\text{NH}_2 \cdot \text{HCl}$ ), decomps.  $201^\circ$ . *Ethylenedibiguanide sulfate* (1 g. from 2 g.  $(\text{CH}_2\text{NH}_2)_2$  with II in  $\text{H}_2\text{O}$ ), decomps.  $300^\circ$ . *Hexamethylenedibiguanide acid sulfate* (3 g. from 12 g.  $\text{H}_2\text{N}(\text{CH}_2)_6\text{NH}_2$ ), sinters  $195^\circ$ , decomps.  $205\text{--}10^\circ$ . *Decamethylenedibiguanide sulfate* (15 g. from 22 g. of the diamine), m.  $115^\circ$ , decomps.  $122^\circ$ . The hexamethylenediamine-HCl, m.  $248^\circ$ , was obtained (by W. HILTNER) in 45% yield from adipic dinitrile with Na and alc., and *decamethylenediamine-HCl* (by J. KOLLWITZ) in 60% yield from sebacic dinitrile. C. A. R.

**Crystalline tetraacetyl- $\alpha$ -glucose.** HANS H. SCHLUBACH AND IRENE WOLF (WITH P. STADLER). *Ber.* 62B, 1507-9(1929); cf. C. A. 22, 4106.—When  $\beta$ -acetochloroglucose (I) in  $\text{Et}_2\text{O}$  is shaken with  $\text{Ag}_2\text{CO}_3$  with addn. of a little  $\text{H}_2\text{O}$  at intervals the Cl is so slowly replaced by HO that the *tetraacetyl- $\alpha$ -glucose* (II), formed primarily, isomerizes to an equil. mixt. from which no cryst. product can be isolated. By using 10 cc. of the purest  $\text{Me}_2\text{CO}$ , freshly distd. after standing for months over  $\text{CaCl}_2$ , and 0.1 cc.  $\text{H}_2\text{O}$  and shaking 1.5 hrs. with 4 g. dry  $\text{Ag}_2\text{CO}_3$ , 1.1 g. cryst. II can be obtained from 5 g. I. II seps. from  $\text{Et}_2\text{O}$  in needles, m.  $107\text{--}8^\circ$ , mol. wt. in camphor 330,  $[\alpha]_D^{20}$   $138.9^\circ$  ( $\text{CHCl}_3$ ,  $c$  0.8964),  $139.4^\circ$  (96% alc.,  $c$  0.746) changing to  $83.1^\circ$  in 14 days (instantly on addn. of a drop of  $\text{NH}_4\text{OH}$ ). C. A. R.

**Sulfur sugars and their derivatives. XIV.  $\alpha$ -Glucothiose.** WILHELM SCHNEIDER AND HERBERT LEONHARDT. *Ber.* 62B, 1384-9(1929); cf. C. A. 22, 4108.—By using larger amts. of Na  $\beta$ -glucothiosate S. and L. have now been able to obtain the  $\alpha$ -pentaacetylglucothiose (I) in pure form; this on sapon. with NaOMe yielded the cryst. Na  $\alpha$ -glucothiose,  $\text{C}_6\text{H}_{11}\text{O}_5\text{SNa} \cdot 2\text{H}_2\text{O}$  (II). The rotation of the free glucothiose was detd. by adding an equiv. of mineral acid to the  $\text{H}_2\text{O}$  soln. of II; if the acid was present in slight excess the rotation fell in about 5 days to a const. value somewhat higher than that reached from the  $\beta$ -glucothiose side, possibly because of the presence in the  $\alpha$ -salt of a small amt. of the  $\alpha$ , $\alpha$ -diglucosyl disulfide produced by oxidation by the air. The Na salts of the 2 thioglucoses in faintly acidified soln. are smoothly and quantitatively oxidized to the disulfides by I. Below are the values for  $[\alpha]_D$  at about  $20^\circ$  for the  $\alpha$ - and  $\beta$ -derivs., resp., in  $\text{H}_2\text{O}$  (except the pentaacetates which were measured in  $(\text{CHCl}_3)_2$ ): Na salt 141.8°, 15.5°; glucothiose ion 183.8°, 20.2°; free thiose, initial, 212.8°, 16.5°; free thiose, final, 76.8°, 58.4°; pentaacetate 132.4°, 10.0°; disulfide 530.8°,  $-149.3^\circ$ . I (2.5 g. from 120 g.  $\beta$ -salt worked up in 15 g. portions), m.  $128\text{--}9^\circ$ . II, sinters on rapid heating at  $100^\circ$ , m.  $129\text{--}30^\circ$  (decompn.); the anhyd salt becomes yellow at  $130^\circ$  and m.  $155^\circ$  (decompn.). The Na content can be detd. by titration with Me orange but towards phenolphthalein the thiose behaves as a weak acid. In  $\text{H}_2\text{O}$  the salt is quite stable if the air is excluded. C. A. R.

**Relations between rotatory power and structure in the sugar group. XX. Two isomeric crystalline compounds of  $d$ -mannose with calcium chloride.** J. K. DALE. *J. Am. Chem. Soc.* 51, 2788-95(1929); cf. Hudson and Isbell, C. A. 23, 3901.— $\beta$ -Mannose (20 g.) and 32 g.  $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$  in 28 cc.  $\text{H}_2\text{O}$ , on standing at room temp. give 28 g. crude *mannose- $\text{CaCl}_2 \cdot 4\text{H}_2\text{O}$*  (I), m.  $101\text{--}2^\circ$  (cor.) after crystn. from  $\text{H}_2\text{O}$ ; the  $\text{H}_2\text{O}$  is lost at  $100^\circ$  after 19 hrs.; this may also be obtained from vegetable ivory through the mannose sirup, 100 g. ivory giving 114 g. I. I shows an unusual course of mutarotation and an initial sp. rotation (about  $-30^\circ$  or for the mannose constituent,  $-60^\circ$  in  $\text{H}_2\text{O}$ ); in MeOH the rate of change is slower and at  $20^\circ$  and  $5^\circ$  the initial sp. rotations are  $-34^\circ$  and  $-33^\circ$  or for the mannose constituent,  $-68.6^\circ$  and  $-60.5^\circ$ , with a final equil. value of  $4.4^\circ$  which indicates that the sugar constituent of the double compd. is a new form of mannose. The extrapolated initial rotation given above shows a value for the mannose portion in good agreement with that previously called by Hudson for a  $\beta$ -mannose of a 1,5-ring structure. Evapn. of I in EtOH on the  $\text{H}_2\text{O}$  bath gives the compd.  *$\beta$ -mannose- $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$*  (II), m.  $150\text{--}00^\circ$  (cor.); this may also be obtained directly from vegetable ivory or  $\beta$ -mannose. The final sp. rotation,  $6.73^\circ$ , and the extrapolated initial sp. rotation,  $-9.0^\circ$ , indicate that this is a compd. of  $\beta$ -mannose. II on acetylation gives 60% of the  $\beta$ -pentaacetate; I gives a sirupy gum, from which only a few crystals of the acetate sepd. The prepn. and study of compds. of the sugars with salts appear to offer a promising method for the discovery of new cryst. forms of the sugars. C. J. WEST.

**Trityl ethers of mannose. A new tetraacetylmannose.** BURCKHARDT HELFERICH AND JOSEPH F. LEBTE. *Ber.* 62B, 1549-54(1929).—Application of the "trityl" method to mannose for the prepn. of a tetra-Ac deriv. led to results entirely analogous to those obtained with glucose.  *$\beta$ - $d$ -Mannose 6-trityl ether* (I) (1.2 g. from 5 g.  $d$ -mannose in  $\text{C}_6\text{H}_5\text{N}$  at  $0^\circ$  with 1 mol.  $\text{Ph}_3\text{CCl}$ ), hydrated crystals, melts quite indefinitely even when anhyd. (begins to sinter about  $140^\circ$ , m. clear  $160\text{--}70^\circ$ ),  $[\alpha]_D^{17} -2.0^\circ$  ( $\text{CHCl}_3$ ).



$[\alpha]_D^{10}$   $-3.7^\circ$  ( $C_6H_5N$ ), slowly but strongly reduces hot Fehling soln., gives in  $C_6H_5N$  with  $Ac_2O$  a mixt. of the  $\alpha$ - and  $\beta$ -tetraacetyl derivs., better prepd. without isolating the free I:  $\beta$ -compd. (II) (21% from anhyd. mannose in abs.  $C_6H_5N$  allowed to stand 36 hrs. at room temp. with 1 mol.  $Ph_3CCl$ , then 1 hr. at  $0^\circ$  and 24 hrs. at room temp. with  $Ac_2O$ , dropped into much  $H_2O$ , washed repeatedly by decantation, dried in the air and recrystd. from hot alc. + 1% petroleum ether), m.  $204-6^\circ$ ,  $[\alpha]_D^{23}$   $-2.6^\circ$  ( $CHCl_3$ ); concn. of the mother liquors yields 20.5% of the  $\alpha$ -compd., m.  $130.5-1.5^\circ$  (an apparently isomorphous form, m.  $123-4^\circ$ , was also obtained),  $[\alpha]_D^{23}$   $73.4^\circ$ . 1,2,3,4-Tetraacetyl- $\beta$ -D-mannose (III), from II in cold  $AcOH$  with  $HBr-AcOH$ , m.  $135.5-6.5^\circ$  (cor.),  $[\alpha]_D^{20}$   $-22.5^\circ$  ( $CHCl_3$ ), shows no mutarotation, dissolves to the extent of about 2% in  $H_2O$ , the rotation of the soln. (kept in ordinary glass) changing in the course of several days from  $-15^\circ$  through a max. ( $-40^\circ$  to  $-45^\circ$ ) back to a final value of  $-13^\circ$ ; with  $Ac_2O$  in  $C_6H_5N$  it gives 20% of pentaacetyl-D-mannose, m.  $116^\circ$ ,  $[\alpha]_D^{22}$   $-24.1^\circ$  ( $CHCl_3$ ); with  $POCl_3$  in  $C_6H_5N$  at  $-20^\circ$  it gives tetraacetyl- $\beta$ -D-mannose-6-chlorohydrin, m.  $142-3^\circ$ ,  $[\alpha]_D^{12}$   $-7.6^\circ$  ( $CHCl_3$ ), slowly but strongly reduces hot Fehling soln., loses its Cl only slowly with  $AgNO_3$  and concd.  $HNO_3$  at  $95^\circ$ . Di[tetraacetyl- $\beta$ -D-mannose-6] sulfite, prepd. from III in the same way that diacetone-mannose 1-chlorohydrin was obtained from diacetone-mannose (C. A. 23, 107) and thus indicating that in III it is the 6- and not the 1-HO group which is free, m.  $173-5^\circ$ ,  $[\alpha]_D^{12}$   $-33.1^\circ$  ( $CHCl_3$ ). C. A. R.

**Shifting of the solution equilibrium between  $n$ - and  $h$ -galactose.** HANS H. SCHLUBACH and VILMA PROCHOWNICK. *Ber.* 62B, 1502-7(1929).—By a combination of the optical and isolation methods, S. and P. have shown that the equil. between the different forms of galactose in  $C_6H_5N$  is shifted in favor of the  $h$ -form by increase in temp. If the equil. soln. is heated the rotation changes from  $[\alpha]_D$   $55^\circ$  at  $20^\circ$  to  $32^\circ$  at  $90^\circ$  and acetylation at various temps. and isolation of the  $\beta$ -pentaacetyl- $h$ -galactose (I) shows that the content of  $h$ -sugar increases proportionately with the temp. Riiber and Minnaas calcd., from a study of the mutarotation of galactose, that a 10% soln. in  $H_2O$  at equil. at  $20^\circ$  contained 6.6, 27.4 and 66.0% of the  $\alpha$ - $n$ -,  $\alpha$ - $\beta$ - $h$ - and  $\beta$ - $n$ -forms, resp., while S. and P. find in cold  $C_6H_5N$  about 10, — and 71% and in boiling  $C_6H_5N$  —, 23.4 and 41.6% of the  $\alpha$ - $n$ -,  $\beta$ - $h$ - and  $\beta$ - $n$ -forms, resp. These are min. values, as the I can never be quantitatively isolated from the sirups and the content of the individual components cannot be calcd. from the rotation of the residual sirup since there are 4 possible components (it is quite certain that the  $\beta$ - $h$ -galactose is in equil. with the  $\alpha$ -form). As the result of this work, I has become a readily available substance; it can be obtained in more than 20% yield within 2 days. C. A. R.

**Some organic acids of sugar-cane molasses.** E. K. NELSON. *J. Am. Chem. Soc.* 51, 2808-10(1929).—The acids of molasses were found to be  $HCO_2H$ , about 0.1%;  $AcOH$ , 0.2%; acetic acid, 0.8%; lactic acid, 0.05%, and small quantities of malic and citric acids. Citric acid has not been previously reported as a constituent of sugar cane molasses. C. J. WEST

**Synthesis of sucrose.** AMÉ PICTET and HANS VOGEL. *Ber.* 62B, 1418-22(1929).—In view of the difficulty experienced by Zemplén and Gerecs in attempting to repeat the synthesis of sucrose (C. A. 23, 4195), P. and V. describe their method in greater detail than in their 1st paper. C. A. R.

**Strange course of the solubility of calcium hydroxide in sucrose solutions of low concentration.** PAUL FUCHS. *Ber.* 62B, 1535-8(1929).—When varying amts. (0-25 cc.) of 10% sucrose soln. were made up to 25 cc. with  $H_2O$ , treated with 50 cc. of  $N$   $NaOH$ , then with 25 cc. of somewhat more than 2  $N$   $CaCl_2$ , allowed to stand 5 min. with frequent shaking and filtered and the  $Ca(OH)_2$  remaining in soln. was titrated with  $N$   $HCl$  and methyl orange, the following relation between the sucrose concn. and amt. of dissolved  $Ca(OH)_2$  (both expressed in g./100 cc. filtrate) was found: 0.00, 0.304; 0.10, 0.452; 0.20, 0.545; 0.30, 0.671; 0.40, 0.785; 0.50, 0.871; 0.60, 0.913; 0.70, 0.943; 0.90, 0.926; 1.20, 0.911; 1.40, 0.893; 1.50, 0.882; 1.60, 0.900; 1.70, 0.904; 2.10, 1.193; 2.50, 1.559. At sucrose concns. of 0.00 to 0.70 and of 1.50 to 2.50 the dissolved  $Ca(OH)_2$  increases with the sucrose concn. and between these points the curve obtained by plotting the sucrose concn. against the dissolved  $Ca(OH)_2$  can be used for the analysis of sucrose solns., but the intermediate section of the curve passes through both a max. and a min.: the max. and min. correspond each to 2 different sucrose concns. and points between the max. and min. to 3 different concns. The type of the curve recalls the pressure-vol. curve calcd. from the van der Waals equation for non-ideal gases slightly below the critical temp. and it would be interesting to det. whether it undergoes the same changes in form as the pressure-vol. curve when the

temp. is changed. The cause of the peculiar course of the  $\text{Ca}(\text{OH})_2$  soly. curve may be purely chem., however. Thus, while the curve shows that 1.75 g sucrose/100 cc. holds as much  $\text{Ca}(\text{OH})_2$  in soln. as 0.75 g., when to 17.5 cc. of the 10% sucrose soln. + 7.5 cc.  $\text{H}_2\text{O}$  + 50 cc.  $N$   $\text{NaOH}$  the  $\text{CaCl}_2$  was rapidly added with shaking from a buret the pptd.  $\text{Ca}(\text{OH})_2$  at first immediately redissolved and only after 18.0 cc. of the  $\text{CaCl}_2$  had been added was a permanent ppt. formed quite suddenly; on the other hand, with 7.5 cc. sucrose soln. and 17.5 cc.  $\text{H}_2\text{O}$  a permanent turbidity appeared with less than 1 cc.  $\text{CaCl}_2$  soln.

C. A. R.

**Chemistry of high molecular organic substances.** K. H. MEYER. *Z. angew. Chem.* **42**, 76-7 (1929).—A reply to Staudinger (*C. A.* **23**, 2155). In dispersion of highly polymerized substances groups or parts of the chains of indefinite size are present. The assocn. of mol. groups as micelles in soap is not exceptional as Staudinger asserts but similar to the behavior of tannin in water, substantive dyes, higher hydrocarbons, and fatty acids in phenol, lower fatty acids in water. Staudinger's views have been anticipated by Póányi and by Herzog. Later views of H. (*C. A.* **19**, 3179) are indorsed.

B. C. A.

**Constitution of sinistrin.** HANS H. SCHLUBACH AND WERNER FLÖRSHEIM. *Ber.* **62B**, 1491-3 (1929).—The belief that the synthetic difructose anhydride thought to be the basic substance of inulin (*C. A.* **23**, 1393) occurs in nature has been verified by a study of Schmiedeberg's sinistrin from *Scilla maritima*. By extn. of the fresh bulbs with cold  $\text{H}_2\text{O}$ , pptn. of the dissolved protein and fractional pptn with alc. there are obtained in good yields 2 sugars: sinistrin A, more easily sol. in alc.,  $[\alpha]_D^{20} -25.3^\circ$  ( $\text{H}_2\text{O}$ ,  $c$  1.2080), mol. wt. 305-10, and sinistrin B,  $[\alpha]_D^{20} -30.6^\circ$  ( $\text{H}_2\text{O}$ ,  $c$  1.1640), mol. wt. 670. With  $\text{Me}_2\text{SO}$ , the A compd. takes up 3 Me groups to each fructose anhydride unit with formation of a substance (I) whose mol. wt. corresponds to a product consisting of about 10 trimethylfructose anhydride units and in its other properties resembling methylated inulin in many respects. Cleavage with  $(\text{CO}_2\text{H})_2$  readily yields a 3,4,6-trimethylfructose  $< 2.5 >$  identical with that obtained by Haworth and Learner from inulin and by S. and Elsner from their synthetic hexamethyldifructose anhydride. Sinistrin A is therefore di-*h*-fructose anhydride, probably identical with that obtained from the synthetic di-*h* fructose and from the difructose anhydride prepd. by Vogel and Pictet from inulin by heating with glycerol. Sinistrin B is supposed to be the analogous tetra-*h*-fructose anhydride. I, mol. wt. 2020,  $[\alpha]_D^{20} -41.5^\circ$  ( $\text{CHCl}_3$ ,  $c$  0.9496).

C. A. R.

**Nature of inulin.** HANS H. SCHLUBACH AND HORST ELSNER. *Ber.* **62B**, 1493 (1929); cf. preceding abstr.—If all the known substances having the compn. of a hexose anhydride,  $(\text{C}_6\text{H}_{10}\text{O}_5)_x$ , and a weak *l*-rotation and yielding chiefly fructose on hydrolysis are arranged in the order of decreasing soly. in  $\text{H}_2\text{O}$  (fructose anhydride, difructose anhydride, sinistrin A,  $\beta$ -levulin,  $\beta$ -levulan, sinistrin B, levulin, triticin, graminin, inulenin, inuloid, pseudoinulin inulin), their mol. wts. increase and their rotations decrease (become more strongly negative) in the same order. Assuming that the basic substance of all these compds. is the same, *viz.*, fructose anhydride  $< 1.2 >$   $< 2.5 >$  (I), as has been proved for the 1st and last members and is rendered very probable for the middle members by their occurrence and properties, this would seem to be a polymeric homologous series like Staudinger's polyhydroxymethylenes. In order to simplify the nomenclature of these compds. and to bring out their relationship to each other it is proposed to call I *levan*. Sinistrin A would then be *dilevan*, sinistrin B *tetralevan*, inulin a mixt. of *polylevans*. As indicated by numerous reports in the literature and shown by further examples in the present paper, in prep. inulin the results of fractionation are greatly influenced by the stage of polymerization of the raw material and this in turn varies greatly not only with the plant species from which the raw material is obtained but also with the time of the year when the plant is worked up; before the beginning of the period of vegetation the more easily sol. lower polylevans increase at the expense of the higher polymers and in the fall the latter predominate. Inulin may be built up in 2 ways: dilevan (*h*-difructose anhydride  $< 1.2' >$   $< 2.1' >$ ) associates to structures of high mol. wt., or there is formed a chain of *h*-fructose residues joined alternately through an O bridge between the 2nd C atom of 1 residue and the 1st C atom of the next residue. The abundant, in part contradictory, evidence for and against each view does not make it possible to det. which is correct. Nor is this picture of the make-up of inulin complete. Numerous investigators have pointed out that inulin always contains small and varying amts. of ash, chiefly phosphoric and silicic acids, the interpretation of the significance of which encounters the same difficulties as in the case of starch. Moreover, Tanret concluded, from the lower

ing of the rotation of inulin on acid hydrolysis, that it contains 1 glucose to every 12 fructose residues and actually isolated cryst. glucose from pseudoinulin, although Bourquelot and Bridel were unable to detect glucose, with emulsin in MeOH, in inulin hydrolyzed with *Aspergillus niger*. S. and E. have now shown its presence in 3 ways: (1) triacetylulinin cautiously hydrolyzed with AcBr·AcOH·HBr, debrominated with Ag<sub>2</sub>CO<sub>3</sub> and acetylated with Ac<sub>2</sub>O·H<sub>2</sub>SO<sub>4</sub> gave α-pentaacetylglucose; (2) the same product was obtained directly from triacetylulinin with Ac<sub>2</sub>O·H<sub>2</sub>SO<sub>4</sub>; (3) the reducing power of inulin hydrolyzed with very dil. H<sub>2</sub>SO<sub>4</sub> (0.05 N) was detd. according to Willstätter-Schudel and compared with the total reducing value according to Bertrand; the results indicated an aldose content of about 8%, in good agreement with Tanret ( $1/13 = 7.7\%$ ). This does not prove, of course, that glucose is present preformed in inulin, as part of the *h* fructose may rearrange into glucose at the moment it is set free, although a similar expt. with sucrose gave no evidence of such a rearrangement. Staudinger found that in the β-polyhydroxymethylenes the end HO group is esterified by H<sub>2</sub>SO<sub>4</sub> and in the γ-comps. it is etherified by alc.; it is possible that in inulin the end HO group of the fructose chain is combined with a glucose residue through the reducing group of the latter.

C. A. R.

**Cyclopropane derivatives.** N. VAN KEERSBILCK. *Bull. soc. chim. Belg.* 38, 205–11 (1929).—Several cyclopropane derivs. and compds. obtained therefrom by opening of the cyclopropane ring have been prepd. by known methods in sufficient quantities to render a thorough purification possible. Me<sub>2</sub>C:CHCH:CH<sub>2</sub>, *b*<sub>769</sub> 76.0–.5°, *d*<sub>4</sub><sup>20</sup> 0.71814, *n*<sub>D</sub><sup>20</sup> 1.44838, *n*<sub>D</sub><sup>20</sup> 1.45317, *n*<sub>B</sub><sup>20</sup> 1.46975. Me<sub>2</sub>C(OH)CH:CHMe, *b*<sub>757</sub> 121.6–2.0°, *d*<sub>4</sub><sup>20</sup> 0.83432, *n*<sub>D</sub><sup>20</sup> 1.4268, *n*<sub>D</sub><sup>20</sup> 1.42946, *n*<sub>B</sub><sup>20</sup> 1.43593, *n*<sub>γ</sub><sup>20</sup> 1.44137. CH<sub>2</sub>:CMeCH:CHMe *b*. 75.6–6.0°, *d*<sub>4</sub><sup>20</sup> 0.71896, *n*<sub>D</sub><sup>20</sup> 1.44223, *n*<sub>D</sub><sup>20</sup> 1.44655, *n*<sub>B</sub><sup>20</sup> 1.45814, *n*<sub>γ</sub><sup>20</sup> 1.46850. CH<sub>2</sub>:C

C(Me)CH:CH<sub>2</sub>:CH<sub>2</sub>, *b*<sub>761</sub> 69.5–70.0°, *d*<sub>4</sub><sup>20</sup> 0.74999, *n*<sub>D</sub><sup>20</sup> 1.42064, *n*<sub>D</sub><sup>20</sup> 1.42524, *n*<sub>B</sub><sup>20</sup> 1.43206,

(i) CH<sub>2</sub>:CH<sub>2</sub>:CH<sub>2</sub>:CMe<sub>3</sub>, *b*<sub>720</sub> 92–3°, *d*<sub>4</sub><sup>20</sup> 0.8335. MeCH:CEtCH:CH<sub>2</sub>:CH<sub>2</sub>, *b*<sub>762.6</sub> 127.5–8.0°, *d*<sub>4</sub><sup>20</sup> 0.79150, *n*<sub>D</sub><sup>20</sup> 1.44159, *n*<sub>D</sub><sup>20</sup> 1.44454, *n*<sub>B</sub><sup>20</sup> 1.45156. The dehydration of

EtCHMeCH:CH<sub>2</sub>:CH<sub>2</sub> gives 2 products, A, *b*. 103.5–3.8°, *d*<sub>4</sub><sup>20</sup> 0.7772, *n*<sub>D</sub><sup>20</sup> 1.43569, *n*<sub>D</sub><sup>20</sup> 1.43901, *n*<sub>B</sub><sup>20</sup> 1.44730, *n*<sub>γ</sub><sup>20</sup> 1.45416, and B, *b*. 105.5–6.0°, *d*<sub>4</sub><sup>20</sup> 0.7804, *n*<sub>D</sub><sup>20</sup> 1.43861,

*n*<sub>D</sub><sup>20</sup> 1.44253, *n*<sub>B</sub><sup>20</sup> 1.44926, *n*<sub>γ</sub><sup>20</sup> 1.45515: these products could be CH<sub>2</sub>:CEtCH:CH<sub>2</sub>:CH<sub>2</sub>

and MeCH:CMeCH:CH<sub>2</sub>:CH<sub>2</sub>.

ALBERT L. HENNE

**Conversion of the naphthenic acids into naphthenes.** GUST. KOMPPA (with O. ROUTALA AND J. M. KANERVA). *Ber.* 62B, 1562–70 (1929).—A no. of yrs. ago K. undertook to convert naphthenic acids by modern mild methods of reduction into their corresponding hydrocarbons in order to det. whether these acids are really CO<sub>2</sub>H derivs. of naphthenes present in the same petroleum. Large quantities of the crude acids from Baku petroleum were accordingly freed of neutral impurities and converted into the Me esters, the tedious fractionation of which had just been finished when Zelinskii's paper on the same subject appeared (*C. A.* 18, 2148). As, however, he did not obtain undecanaphthenic acid (I) in pure form, K. investigated those fractions (*b* 227–45°) of his Me esters which should contain the I. Most careful fractionation of the Me esters gave no homogeneous product nor even "main fractions," and while sapon. and fractionation of the free acids *in vacuo* gave a main fraction *b*<sub>3</sub> 147–8°, this proved to be a const. boiling mixt. of decanaphthenic acid and I from which no cryst. amide, anilide or toluidide could be obtained. Fractionation of the chlorides finally yielded a homogeneous product from which the pure Me and Et esters of I and I itself were obtained. Reduction of the Et ester by the Bouveault-Blanc method gave undecanaphthenol (II), converted through the chloride (III) into an undecanaphthene (IV) which was undoubtedly identical with the hendecanaphthene isolated, although apparently not in as pure form, by Markovnikov and Oglobin from Baku naphtha. Chloride of I, *b*<sub>3</sub> 106.5–8°. Et ester, *b*<sub>733</sub> 247–8.5°, *d*<sub>4</sub><sup>20</sup> 0.92356, *n* 1.44818, 1.44579, 1.45369, 1.45801 for D, α, β and γ at 20°, *E*<sub>S</sub> –0.075, –0.081, –0.079, –0.107, –1.0650, –4.920% for D, α, β, γ, β-α and γ-α, resp. Me ester, *b*<sub>733</sub> 236–7°, *d*<sub>4</sub><sup>20</sup> 0.93528, *n* 1.44984, 1.44758, 1.45535, 1.45983, *E*<sub>S</sub> –0.081, –0.081, –0.087, –0.106, –2.0750, –5.040%. I, *b*<sub>733</sub> 271–2°, *d*<sub>4</sub><sup>20</sup> 0.9707, *n* 1.46237, 1.46021, 1.46820, 1.47292,

$EE = -0.069, -0.058, -0.069, -0.082, -2.270, -4.57\%$ . II, b.  $236.5-7.5^\circ$ ,  $d_4^{20}$  0.90245,  $n$  1.46469, 1.46245, 1.47063, 1.47527,  $EE = -0.128, -0.124, -0.121, -0.138, -0.7680, -2.990\%$ ; *cinnamate*, prepd. with  $PhCH:CHCOCl$ , b.  $219-20^\circ$ ,  $d_4^{20}$  1.00222,  $n$  1.53728, 1.53248, 1.55329 for D,  $\alpha$  and  $\beta$  at  $20^\circ$ ,  $EE$  1.218, 1.160, 1.575, 71.24% for D,  $\alpha$ ,  $\beta$  and  $\beta$ - $\alpha$ , resp. III, from II and  $POCl_3 \cdot PCl_5$ , b.  $74-8^\circ$ ,  $d_4^{20}$  0.89318. IV, from III in alc. with Na, b.  $183.5-4.5^\circ$ ,  $d_4^{20}$  0.81284,  $n$  1.44834, 1.44597, 1.45431, 1.45940,  $EE$  0.009, 0.002, 0.029, 0.051, 5.290, 4.62% (M. and O.'s product b.  $180-5^\circ$ ,  $d_0$  0.8119).  
C. A. R.

The action of cyclohexane and its derivatives on organic compounds in the presence of aluminum chloride. DANIEL BODROUX. *Ann. chim.* [10], 11, 511-82 (1929).—The dehydration of cyclohexanol with  $H_3PO_4$  yields *cyclohexene* (I), b.  $83-4^\circ$ ,  $d_{21}$  0.809,  $n_D^{20}$  1.445; mol. refractivity 26.97. B. has found it more convenient to use I than its halogen derivs. in the prepn. of condensation products with aromatic hydrocarbons. I,  $AlCl_3$  (II) and the hydrocarbon are reacted at room temp., using  $CS_2$  to complete soln. when necessary. I, II and benzene yield 70% of crude *cyclohexylbenzene* (III), b.  $238-40^\circ$ ,  $d_{16}$  0.947,  $n_D^{16}$  1.528, mol. refractivity 52.07, and *1,2-diphenylcyclohexane* (IV), m.  $169-70^\circ$  (from alc.-PhH). B. regards IV as having been formed by the rearrangement of *cyclohexylbiphenyl*, resulting in turn from the dehydrogenation of the by-product *phenyldicyclohexane*. I, II and toluene yield 62% of a mixt. of *o*- and *p*-*cyclohexyltoluene* (V), b.  $255-61^\circ$ ,  $d_{16}$  0.935,  $n_D^{16}$  1.527, mol. refractivity 57.07. I, II and *p*-xylene yield 33% of *2-cyclohexyl-1,4-dimethylbenzene*, b.  $261-3^\circ$ ,  $d_{16}$  0.936,  $n_D^{16}$  1.529, mol. refractivity 61.94, and *dicyclohexyldimethylbenzene*, m.  $156-7^\circ$  (from alc.-PhH). I, II and *m*-xylene yield 56% of *5-cyclohexyl-1,3-dimethylbenzene* (VI), b.  $266-8^\circ$ ,  $d_{16}$  0.931,  $n_D^{16}$  1.525, mol. refractivity 61.83. VI was identified by the prepn. of *2,4,6-trinitro-5-cyclohexyl-1,3-dimethylbenzene*, m.  $117-8^\circ$ . I, II and mesitylene yield 21% of *2-cyclohexyl-1,3,5-trimethylbenzene* (VII), b.  $283-4^\circ$ ,  $d_0$  0.946,  $n_D^0$  1.535, mol. refractivity 66.33. I, II and cymene yield a mixt. of the 2 isomers of *cyclohexyl-1-methyl-4-isopropylbenzene* (VIII), b.  $279-85^\circ$ ,  $d_{24}$  0.916,  $n_D^{24}$  1.517, mol. refractivity 71.34, and *methylidicyclohexylbenzene* (IX), b.  $210-20^\circ$ . B. regards the formation of IX to have been due to the formation of *dicyclohexylcymene*, with the subsequent removal of the iso-Pr group by the action of II. I, II and  $Ph_2$  yield *cyclohexylbiphenyl*, m.  $75-6^\circ$  (from alc.), a liquid isomeric mixt. of *cyclohexylbiphenyl* which partially solidifies at  $0^\circ$  (combined yields 54%), b.  $238-40^\circ$ ,  $d_{27}$  1.017,  $d_{14}$  1.028,  $n_D^{27}$  1.5915,  $n_D^{14}$  1.598, mol. refractivity 78.40, and *dicyclohexylbiphenyl*, m.  $205-6^\circ$ . I, II and  $CH_2Ph_2$  yield 27% of *cyclohexyldiphenylmethane*, b.  $252-7^\circ$ ,  $d_{20}$  1.005,  $d_8$  1.029,  $n_D^{20}$  1.571,  $n_D^8$  1.587, mol. refractivity 81.69, and *p-benzylbiphenyl*, m.  $85^\circ$  (from alc.), resulting from the dehydrogenation of *p-cyclohexyldiphenylmethane*. I, II and *bi-benzyl* yield a solid *cyclohexylbibenzyl*, m.  $68-9^\circ$  (from alc.) and a liquid isomeric mixt. of *cyclohexylbibenzyl*, which partially solidifies at  $0^\circ$ , b.  $240-4^\circ$ ,  $d_{10}$  0.994,  $d_{21}$  0.992,  $n_D^{10}$  1.564,  $n_D^{24}$  1.561, mol. refractivity 86.27. B. calls attention to the fact that in the liquid products, the disparity between the calcd. mol. refract. and that found decreases as successive  $-CH_2-$  groups are interposed between the Ph groups. This is in accord with the findings of others on similar compds. I, II and  $C_{10}H_8$  yield 19% of a liquid isomeric mixt. of *cyclohexylnaphthalene* (X), which partially solidifies at  $0^\circ$ , b.  $341-7^\circ$ ,  $d_{17}$  1.025,  $d_{20}$  1.021,  $n_D^{17}$  1.603,  $n_D^{20}$  1.597, mol. refractivity 70.29, a solid *p-cyclohexylnaphthalene* (XI), m.  $31^\circ$  (by evapn. of a MeOH soln.), and *dicyclohexylnaphthalene*, m.  $151-2^\circ$ . XI may be obtained in 29.5% yield by a modified procedure. XI yields a *picrate*, m.  $100-1^\circ$  (from alc.), oxidized with  $HNO_3$  to  $\beta$ - $C_{10}H_7CO_2H(?)$ , m.  $181-2^\circ$ , and, dehydrogenated by heating to  $230^\circ$  with pulverized  $S$  to  $\beta$ - $C_{10}H_7Ph$ , m.  $101-2^\circ$ . I, II and tetrahydronaphthalene yield *cyclohexyltetrahydronaphthalene* (XII), b.  $329-35^\circ$ ,  $d_{16}$  0.991,  $d_{20}$  0.9855,  $n_D^{16}$  1.553,  $n_D^{20}$  1.5498, mol. refractivity 69.13. XII, considered by B. to be an isomeric mixt., on dehydrogenation yields only a small quantity of  $\beta$ - $C_{10}H_7Ph$ . The cyclohexyl radical is attached to the unsatd. ring, since there is no action between I, II and cyclohexane or decahydronaphthalene at room temp. B. calls attention to the fact that the disparity between the calcd. mol. refractivity and that found is greater in X than in XII, which is in accord with the disparities found for  $C_{10}H_8$  and tetrahydronaphthalene. Bodroux (*Thesis, Paris, 1898*) has shown that all H atoms and all secondary or tertiary side chains are replaced by Br in the presence of  $AlBr_3$ . On bromination, III yields  $C_6Br_6$ , V yields  $MeC_6Br_5$ , VII yields

tribromomesitylene, and X and XI yield hexabromonaphthalene. I does not react with guaiacol, and gives a resinous product with  $\alpha$ -naphthol. I, II and phenol yield cyclohexyl chloride,  $b_{758}$  143–4°,  $d_{25}$  0.999,  $n_D^{25}$  1.466, mol. refractivity 32.84, 12% of *p*-cyclohexyl ether,  $b_{758}$  247–9°,  $d_{25}$  0.999,  $n_D^{25}$  1.527, mol. refractivity 54.16, 4% of *p*-cyclohexylphenol (XIII), m. 130–1°, and 15% of *o*-cyclohexylphenol (XIV), m. 56–7°. XIV on alkylation yields 82.7% of methyl *o*-cyclohexylphenolate (XV),  $b_{749}$  267–8.5°,  $d_{18}$  1.007,  $n_D^{18}$  1.5365, mol. refractivity 58.89, or 88% of ethyl *o*-cyclohexylphenolate,  $b_{756}$  276–8°,  $d_{21}$  0.976,  $n_D^{21}$  1.5223, mol. refractivity 63.78, or 88% of propyl *o*-cyclohexylphenolate,  $b_{758}$  292–4.5°,  $d_{21}$  0.966,  $n_D^{21}$  1.5198, mol. refractivity 68.58, or 79.5% of butyl *o*-cyclohexylphenolate,  $b_{758}$  305–7°,  $d_{23}$  0.955,  $n_D^{23}$  1.5137, mol. refractivity 73.12. XIII on alkylation yields 62.7% of methyl *p*-cyclohexylphenolate (XVI), m. 57–8° (from dil. alc.), or 92% of ethyl *p*-cyclohexylphenolate, m. 41–2° (from dil. MeOH), or 87% of propyl *p*-cyclohexylphenolate, m. 36° (from dil. MeOH), of 92% of butyl *p*-cyclohexylphenolate, m. 29° (from dil. MeOH). I, II and anisole yield XVI and XV. I, II and carvacrol yield 12.9% of carvacrol cyclohexyl ether,  $b_{758}$  305–10°,  $d_{16}$  0.966,  $n_D^{16}$  1.5215, mol. refractivity 73.19, and 18% of an isomeric mixt. of cyclohexylcarvacrol,  $b_{762}$  315–25°. The actions of 1-methyl- $\Delta^3$ -cyclohexene (XVII), menthene (XVIII), and 1-phenyl- $\Delta^1$ -cyclohexene (XIX) on aromatic hydrocarbons in the presence of II, were studied in a similar manner. XVII, prepd. by the dehydration of 1-methylcyclohexan-4-ol in 90% yield,  $b_{762}$  104–5°,  $d_{17}$  0.804,  $n_D^{17}$  1.422, mol. refractivity 31.58, vapor d. 3.35. XVII, II and benzene yield 12.2% of dimethyldicyclohexylbenzene,  $b_{20}$  230–5°,  $d_{22}$  0.962,  $n_D^{22}$  0.533, mol. refractivity 87.10 and 33% of an isomeric mixt. of methylcyclohexylbenzene (XX),  $b_{764}$  247–51°,  $d_{21}$  0.918,  $n_D^{21}$  1.512, mol. refractivity 56.85. XX on bromination yields  $\text{MeC}_6\text{Br}_5$  (from the cyclohexyl radical) and  $\text{C}_6\text{Br}_6$ . XVII, II and *p*-xylene yield 19% of an isomeric mixt. of methylcyclohexyl-*p*-xylene,  $b_{756}$  275–85°,  $d_{24}$  0.927,  $n_D^{24}$  1.522, mol. refractivity 66.48. XVII, II and  $\text{CH}_2\text{Ph}_2$  yield an isomeric mixt. of methylcyclohexyldiphenylmethane,  $b_{20}$  238–48°,  $d_{23}$  1.01,  $n_D^{23}$  1.574, mol. refractivity 86.26. XVIII is obtained by the dehydration of menthol in 92% yield,  $b_{758}$  165–7°,  $d_{18}$  0.807,  $n_D^{18}$  1.451, mol. refractivity 46.08, vapor d. 4.87. XVIII, II and benzene yield 22% of an isomeric mixt. of menthyl benzene,  $b_{90}$  194–210°,  $d_{24}$  0.9145,  $n_D^{24}$  1.5008, mol. refractivity 70.35. XIX, prepd. according to Brazidec (Bull. Soc. Chem. [4], 17, 101), with II and benzene yields diphenylcyclohexane (?),  $b_{20}$  267–300°. The analysis is correct, but the mol. wt. detd. in PhH, and the b. p. are both much too high.

T. H. RIDER

**Comparative stability of isomers in relation to their absorption spectra (aromatic allyl and isoallyl derivatives).** MME. RAMART-LUCAS AND MLLÉ. AMAGAT. *Compt. rend.* 188, 638–40 (1929); cf. C. A. 22, 2717.—A study of stable isomeric formation by means of absorption spectra data. The isoallylphenyl derivs. have a band nearer the visible than the normal allyl derivs. Allyl derivs. are converted by heating into the isoallyl derivs:  $\gamma$ -Phenylpropanol gives, on dehydration, allylbenzene at low temp. and isoallylbenzene at higher temps. New compds. prepd. include: 3-anisylpropanol,  $b_{15}$  160°, m. 26°; phenylurethan, m. 67°; 3-piperonylpropanol,  $b_{13}$  180°; phenylurethan, m. 97°.

WALLACE R. BRODE

**Comparative stability of isomers in relation to their absorption spectra (dehydration of glycols, isomerization of oxides of ethylene).** MME. RAMART-LUCAS AND F. SALMON-LEGAGNEUR. *Compt. rend.* 188, 1301–3; cf. preceding abstr.—A study was made of the absorption spectra of isomeric diphenyldimethylethylene glycols. When heated they dehydrate and undergo a pinacol-pinacolin rearrangement, forming compounds with absorption bands near the visible, provided CO or  $\text{CO}_2$  are not split out.  $\text{Ph}_2\text{C}(\text{OH})\text{C}(\text{OH})\text{Me}_2$  gives with  $\text{Ac}_2\text{O}$  and traces of  $\text{H}_2\text{SO}_4$   $\text{Me}_2\text{CPhCOPh}$ , and with concd.  $\text{H}_2\text{SO}_4$  1,1- $\text{Ph}_2\text{CMeCOMe}$ .  $\text{PhMeCH}(\text{OH})\text{CH}(\text{OH})\text{MePh}$  yields with either of the above reagents,  $\text{Ph}_2\text{CMeCOMe}$ .

WALLACE R. BRODE

**Preparation of symmetrical trichloroaniline and of tetrachloroquinone from aniline in hydrochloric acid solution.** J. ERDELYI. *Magyar Chem. Folyóirat* 35, 15–6 (1929); *Chimie & industrie* 22, 87.—Prepn. of sym.  $\text{C}_6\text{H}_2\text{Cl}_3\text{NH}_2$  by direct chlorination is rendered difficult by formation of resins and coloring matter, which was avoided by working in concd. HCl, as follows: dissolve 5 g.  $\text{PhNH}_2$  in 100 cc. concd. HCl, pass  $\text{Cl}_2$  gas until diln. with  $\text{H}_2\text{O}$  no longer produces turbidity, filter and dil. with 5–6 vols.  $\text{H}_2\text{O}$ . The ppt., recrystd. from alc., m. 76.5°. Yield 1 g. Tetrachloroquinone, which has already been prepd. by oxidation of  $\text{PhNH}_2$  in HCl by means of  $\text{KClO}_3$ ,  $\text{Na}_2\text{Cr}_2\text{O}_7$

and *aqua regia*, can also be prepd. by means of other oxidizing agents, but only in HCl. 1 g. PhNH<sub>2</sub> in 100 cc. of 20% HCl was treated at boiling temp. with (a) solid MnO<sub>2</sub>, (b) solid KMnO<sub>4</sub>, (c) NaOCl soln., (d) Cl + ClO<sub>2</sub> (prepd. from KClO<sub>3</sub> + H<sub>2</sub>SO<sub>4</sub> (not HCl)), (e) Cl + O<sub>2</sub>; after cooling all the solns. turned yellow and deposited a brown powder or yellow scales which, after drying, subliming and recrystg. from AcOH m. (a) 280°, (b) 284°, (c) 287°, (d) 288.5°. Expts. in 20% H<sub>2</sub>SO<sub>4</sub>, HNO<sub>3</sub> and NaCl soln. were unsuccessful.

A. PAPINEAU-COUTURE

**Catalytic reduction of nitro compounds.** M. BUSCH AND KARL SCHULZ. *Ber.* 62B, 1458-66(1929).—Palladinized CaCO<sub>3</sub> (1%) was used as the catalyst and N<sub>2</sub>H<sub>4</sub> as the source of H. The reductions were generally carried out in boiling 5% alc. KOH, 0.5 of the catalyst being added at the beginning and the rest in 2-3 portions during the operation. The amt. of catalyst quite materially affects both the qual. and the quant. course of the reaction. The nature of the solvent has a marked influence, the reduction being far more energetic in MeOH than in EtOH. Thus, while PhNO<sub>2</sub> in EtOH under certain conditions gives Ph<sub>2</sub>N<sub>2</sub>O almost exclusively, in MeOH under the same conditions is obtained PhN:NPh. This effect of the solvent evidently is related to the dielec. const., for EtOH properly dild. with H<sub>2</sub>O behaves like MeOH. Nitro compds tending to tautomerize into pseudo acids are much more readily and extensively reduced, generally directly to the amine *o*- and *p*-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>OH yielded the aminophenols without increasing the amt. of catalyst, as did also the *m*-compd. in MeOH. Of the nitrosulfonic acids, the *m*-compd. yielded the amino acid almost exclusively. Similarly, *o*- and *p*-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub> gave the phenylenediamines, as did the *m*-compd. in MeOH, while in EtOH it gave the azoxy compd. Under the same conditions Ph<sub>2</sub>N<sub>2</sub>O is almost quant., PhN:NPh about 50% reduced to PhNHNHPh, while the latter is almost unclanged. In the nitrotoluenes the position of the Me group materially influences the degree of hydrogenation which increases in the order *o* → *m* → *p*, the 3 isomers giving in alc. azoxy-, azo- and a mixt. of azo- and hydrazotoluene, resp. In MeOH *o*-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>Me gives *o*-toluidine in excellent yield, the *m*-compd. a mixt. of hydrazotoluene and toluidine, and the *p*-isomer azo- and hydrazotoluene and toluidine. In the halonitrobenzenes the nitro group is first attacked; the formation of azoxy derivs. is greatly repressed (only with *p*-BrC<sub>6</sub>H<sub>4</sub>NO<sub>2</sub> was (BrC<sub>6</sub>H<sub>4</sub>)<sub>2</sub>N<sub>2</sub>O obtained as chief product, because of its slight soly. in alc.); in EtOH the azo compds. predominate while in MeOH haloanilines and even PhNH<sub>2</sub> itself are also formed; the latter was the chief product with *o*-BrC<sub>6</sub>H<sub>4</sub>NO<sub>2</sub>.

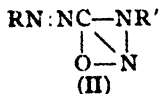
C. A. R.

**Amine oxidation. XII. Hydrazyls:  $\alpha,\alpha$ -diaryl- $\beta$ -benzoylhydrazyls.** STEFAN GOLDSCHMIDT AND JOS. BADER. *Ann.* 473, 137-62(1929); cf. *C. A.* 21, 3052— $\alpha,\alpha$ -Diphenyl- $\beta$ -acylhydrazyls are a class of radicals with bivalent N (cf. G., *C. A.* 18, 2139); in soln. they are in equil. with their dimol tetrazans. Unsym. diarylhydrazines being difficult of prepn.,  $\alpha,\alpha$ -diaryl- $\beta$ -acylhydrazines were prepd. by the Tafel-Gattermann reaction (*Ber.* 25, 413, 1075), which consists in the action of Cu(OAc)<sub>2</sub> or CuCl<sub>2</sub> on sym. acylphenylhydrazines. The reaction is explained by the following series of reactions.  $Ar_1NHNHCOR \rightarrow (Cu^{++})Ar_1N:NCOR \rightarrow$  (hydrolysis)  $RCO_2H + Ar_1N:NH \rightarrow$  (oxidation)  $ArN:NX \rightarrow (Ar_1NHNHBz) Ar_2N(N-NAr_1)NHBz \rightarrow (Cu) Ar_1Ar_2NNHBz$ . Among the proofs of this series of reactions are: In the prepn. of (*p*-BrC<sub>6</sub>H<sub>4</sub>)<sub>2</sub>NNHBz with CuCl<sub>2</sub> there is formed a considerable amt. of *p*-BrC<sub>6</sub>H<sub>4</sub>Cl; addn. of a diazonium salt or an arylhydrazine salt (which yields a diazonium salt with Cu<sup>++</sup>) increases the yield; hydrazines, with Ar<sub>1</sub> and Ar<sub>2</sub> in the same mol may be obtained from Ar<sub>1</sub>NHNHBz and Ar<sub>2</sub>NHNH<sub>2</sub>, HCl or from Ar<sub>2</sub>NHNHBz and Ar<sub>1</sub>NHNH<sub>2</sub>. HCl. *p*-BrC<sub>6</sub>H<sub>4</sub>NNHBz (5 g.) in 100 cc. EtOH with 10-15 g. Cu(OAc)<sub>2</sub> gives 20-30% of  $\alpha,\alpha'$ -di-*p*-bromophenyl- $\beta$ -benzoylhydrazine (I), m. 235°;  $\alpha,\alpha'$ -di-*p*-nitrophenyl deriv. (II), deep yellow, m. 276°;  $\alpha,\alpha'$ -di-*p*-anisyl deriv. (III), m. 228° (from  $\alpha$ -*p*-anisyl- $\beta$ -benzoylhydrazine (IV), m. 139-40°);  $\alpha$ -phenyl- $\alpha'$ -*p*-bromophenyl deriv. (V), m. 198-9°, prepd. in the 2 ways given above;  $\alpha$ -phenyl- $\alpha'$ -*p*-anisyl deriv. (VI), very sensitive to oxidation, especially in soln.;  $\alpha$ -phenyl- $\alpha'$ -*p*-tolyl deriv. (VII), m. 171-2°;  $\alpha$ -phenyl- $\alpha'$ -*p*-nitrophenyl deriv. (VIII), light yellow, m. 172-3°. These hydrazines are oxidized by K<sub>2</sub>Fe(CN)<sub>6</sub> or PbO<sub>2</sub> in alk. soln. to hydrazyls which, except in the case of III (which is exclusively monomol. in soln.) are in equil. with the dimol tetrazans; the equil. can be detd. by titration with C<sub>6</sub>H<sub>5</sub>(OH)<sub>2</sub> or (PhNH)<sub>2</sub>. The follg. values were found for *K*: II in CHCl<sub>3</sub> at 0°,  $6 \times 10^{-7}$ ; VIII in CHCl<sub>3</sub> at -18.5°,  $8.3 \times 10^{-8}$ ; I in PhMe at -18.6°,  $1.45 \times 10^{-8}$ ; V in PhMe at -18.5°,  $3.3 \times 10^{-8}$ ; Ph<sub>2</sub>NNHBz in PhMe at -18.1°,  $1.15 \times 10^{-8}$ ; VII in PhMe at -18.5°,  $4.3 \times 10^{-8}$ ; (*p*-MeC<sub>6</sub>H<sub>4</sub>)<sub>2</sub>NNHBz in PhMe at -18.5°,  $1.7 \times 10^{-8}$ ; VI in Me<sub>2</sub>CO at -18.6°,  $3.5 \times 10^{-8}$ . These values are correct within  $\pm 5\%$ . Values are also given for the disson. energy in cal. calcd. from the formula  $U = 4.571 (\log K_2 - \log K_1) T_1 T_2 / T_2 - T_1$  for

the N-N linkage in the tetrazans; it varies from 7000 to 18,000; the solvent has a considerable influence; e. g., tetraphenyldibenzoyltetrazan gave the following values: PhMe, 9800-10,500; Me<sub>2</sub>CO, 7700-8200; CHCl<sub>3</sub>, 5200-5900; Et<sub>2</sub>O, 9100-10,100. It appears that with an increase in the dissocn. const. there is a decrease of the heat of dissocn.

C. J. WEST

**A new group of hydrazomethylenes.** M. BUSCH AND WALTER SCHMIDT (WITH PAUL BOHRISCH AND OTTO LUSCH). *Ber.* 62B, 1449-57 (1929).—The properties of the dark red compd C<sub>12</sub>H<sub>10</sub>ON<sub>4</sub> obtained from PhNHNHCSNHPH (I) and HNO<sub>3</sub>, for which the "isotetrazolone" structure formerly assigned to it is not in harmony with its intense color, agree best with the structure II (R = R' = Ph) of a 1-phenylazo-2-phenyl-1,3-endoxyhydrazomethylene. On very mild reduction it gives NH<sub>3</sub>, PhN NCONH<sub>2</sub> and PhNHNHCONHPh (III); while (NH<sub>4</sub>)<sub>2</sub>S thus gives III, however, H<sub>2</sub>S and NH<sub>4</sub>SH give I. Hydrolysis with mineral acids gives PhN:NCONHPh and N<sub>2</sub>, not N<sub>2</sub>O as might have been expected; the cleavage is quite a complicated process, as indicated by the formation of considerable amts of resinous products. The 1-phenylazo-1,3-endoxyhydrazomethylene (IV), obtained from PhNHNHCSNH<sub>2</sub>, is a yellow, unstable, amphoteric substance, which can be isolated as either the K or the HCl salt, both colorless. In alc. soln. the II rearrange into colorless, non-basic isomers to which are assigned the structure of 1,4-dialkyl-3,5-endoxytetrazoles (V). The new ring system is very stable. The di-Ph compd. (VI) is not attacked by concd HCl up to 220° but above that temp. seems to decomp. instantaneously, the sealed tube being generally shattered. On cautious heating in a test tube the VI distills as a colorless oil which solidifies but on superheating it decomps. explosively with evolution of flames. Nascent H attacks it with difficulty; long boiling with Zn and HCl finally results in rupture of the ring with formation of NH<sub>3</sub>, PhNH<sub>2</sub>, NH<sub>2</sub>CONHPh and small amts. of PhNHNH<sub>2</sub>. Neither IV nor the II in which R' is an aliphyl radical undergo the rearrangement into the V. When the lemon-yellow HCl salt of II (R = R' = Ph) is recrystd from EtOH Et<sub>2</sub>O it seps. in colorless needles of the mono-HCl salt immediately decompd. by H<sub>2</sub>O into the red base. VI, m. 156°, shows faint violet-blue fluorescence in Et<sub>2</sub>O, mol. wt. in PhOH 236. 1-Phenylazo-2-*vic-m-xyl*yl-1,3-endoxyhydrazomethylene, orange, m. 101°; tetrazole (V), m. 174°. 1-*vic-m-xyl*ylazo-2-phenyl-1,3-endoxyhydrazomethylene, orange-red, m. 191-2°, changes in Et<sub>2</sub>O-AcOH into *vic-m-xyl*ylazocarboxanilide, brown-red, m. 124.5°; tetrazole, m. 122-3°. IV, m. 60-2°; HCl salt, m. 189-90°; B<sub>2</sub> deriv., m. 166°; K salt, begins to turn brown 110°, m. 185-90° (decompn.). The following additional II and V, resp., were prepd. (1st substituent = R, 2nd = R'): *p*-tolylphenyl, blood-red, m. 127° (salts, lemon-yellow), m. 158°; *o*-tolylphenyl, garnet-red, m. 99°, m. 117°; *di-o*-tolyl, dark brown-red, m. 62°, m. 128°; phenyl- $\alpha$ -naphthyl, red-brown, m. 125°, faintly yellowish, m. 160°;  $\alpha$ -naphthylphenyl, red, m. 90° (HCl salt, ochre-yellow), m. 177-8°; phenyl- $\beta$ -naphthyl, red-brown, m. 89-90°, yellowish, m. 213-4°; phenyl-ethyl, light yellow, m. 45° (HCl salt, colorless), —; phenylallyl, lemon-yellow, m. 43° (HCl salt), —; *p*-tolylallyl, greenish yellow, m. 59° (HCl salt), —.



C. A. R.

**The action of phenylhydrazine on the aromatic dithio acids.** HENRI WUYTS. *Bull. soc. chim. Belg.* 38, 195-204 (1929).—H<sub>2</sub>NNHPh (I) is allowed to react with acids of the RCS<sub>2</sub>H type: in general a salt is formed first, which evolves H<sub>2</sub>S to yield a thiohydrazide, RCSNHNHPh, which eliminates S to yield a hydrazone, RCH:NNHPh. Dithiobenzoic (II), dithio-*o*-toluic (III), dithio-*p*-toluic (IV) and dithio- $\alpha$ -naphthoic (V) acids have been prepd. from the suitable Grignard derivs. and CS<sub>2</sub>. II and I give a salt only below -30°: at room temp., H<sub>2</sub>S is evolved: at 85° the transformation into the hydrazone is complete. III and I give a salt at room temp.: the latter heated at 80° gives a mixt. of *o*-MeC<sub>6</sub>H<sub>4</sub>CSNHNHPh, m. 116-8°, sol. in alkali, little sol. in Et<sub>2</sub>O, and *o*-MeC<sub>6</sub>H<sub>4</sub>CH:NNHPh, m. 105-6°. IV and I give a salt only at low temp., at higher temps., a mixt. of thiohydrazide (not purified sufficiently) and *p*-MeC<sub>6</sub>H<sub>4</sub>CH:NNHPh, m. 110-2° is obtained. V and I give a salt which m. (decompn.) about 100°.  $\alpha$ -C<sub>10</sub>H<sub>7</sub>CSNHNHPh m. 150-2°;  $\alpha$ -C<sub>10</sub>H<sub>7</sub>CH:NNHPh m. 79.5-80°.

ALBERT L. HENNE

**Organic compounds of arsenic. VI. Electrolytic reduction of some arylarsonic acids.** K. MATSUYAMA AND H. NAKATA. *Mem. Coll. Sci. Kyoto Imp. Univ.* A12,

63-8(1929); cf. C. A. 22, 1337.—Electrolytic reduction by the method previously described but using Pt, Ni and Cu cathodes did not affect the  $\text{AsO}_3\text{H}_2$  group. 4,3- $\text{HO}(\text{O}_2\text{N})\text{C}_6\text{H}_3\text{AsO}_3\text{H}_2$  yielded 3,3'-azoxy-4,4'-dihydroxyphenyl-1,1'-diarsonic acid, darkens 210°, decomps. without melting, and 4,3- $\text{HO}(\text{H}_2\text{N})\text{C}_6\text{H}_3\text{AsO}_3\text{H}_2$ , with only traces of the arsine. 3,4- $\text{O}_2\text{N}(\text{H}_2\text{N})\text{C}_6\text{H}_3\text{AsO}_3\text{H}_2$  with a Cu cathode yielded 3,4- $(\text{H}_2\text{N})_2\text{C}_6\text{H}_3\text{AsO}_3\text{H}_2$ , darkens 140°, m. 158° (decompn.). Further investigation of the effect of varying concns. of HCl was made. With a Hg cathode  $p\text{-H}_2\text{NC}_6\text{H}_4\text{AsO}_3\text{H}_2$  yielded  $p\text{-ClH}_2\text{NC}_6\text{H}_4\text{AsH}_2$  (cf. Fichter and Elkind, C. A. 10, 1038) or  $(\text{ClH}_2\text{NC}_6\text{H}_4\text{As})_2$ , according as the concn. of acid was above or below 8 N.  $p\text{-HOC}_6\text{H}_4\text{AsO}_3\text{H}_2$  yielded  $p\text{-HOC}_6\text{H}_4\text{AsH}_2$  or  $(p\text{-HOC}_6\text{H}_4\text{As})_2$  at concns. below or above 4 N, resp. B. C. A.

**Possible interchange of radicals on heating a mixture of an R'X and an RMgX compound.** HENRY GILMAN AND HAROLD L. JONES. *J. Am. Chem. Soc.* 51, 2840-3 (1929).—In connection with rate studies, series of mixts. contg. an R'X and an RMgX compd. have been heated to det. whether there is an interchange of radicals. No such interchange was observed with the systems: PhBr and  $\text{PhCH}_2\text{MgCl}$ ,  $\text{PhCH}_2\text{Cl}$  and  $\text{PhMgBr}$ , PhBr and  $\text{Ph}_2\text{CMgCl}$ ,  $\text{Ph}_2\text{CCl}$  and  $\text{PhCH}_2\text{MgCl}$  and  $\text{Ph}_2\text{CCl}$  and  $\text{PhMgBr}$ .  $\text{Ph}_2\text{CCl}$  and  $\text{PhMgBr}$  give 47% of  $p\text{-PhC}_6\text{H}_4\text{CHPh}_2$ , m. 111-2°. C. J. W.

**Acyl derivatives of *o*-aminophenol.** V. R. E. NELSON AND H. S. ROTHROCK. *J. Am. Chem. Soc.* 51, 2761-4(1929); cf. C. A. 22, 1339.—A study is reported of the diacyl derivs. of  $o\text{-H}_2\text{NC}_6\text{H}_4\text{OH}$ , using the Bz group against a series of carbalkoxy groups. The carbalkoxy group is able in most cases to displace the Bz group from the N. When, however, there is a large difference in the wts. of the 2 groups, as in the case of  $\text{CO}_2\text{Me}$  and Bz groups, the Bz group is able to displace the lighter group completely, though the reverse takes place when the next heavier group ( $\text{CO}_2\text{Et}$ ) is used. No evidence of differences in the action of normal and iso-acyl groups when used against the Bz group is observed with *n*- and iso- $\text{CO}_2\text{Bu}$  groups and with *n*- and iso- $\text{COBu}$  groups. *o*-Valerylaminophenol, m. 79° (90% yield); isovaleryl deriv., m. 100.5-2°; *Me o*-hydroxycarbamate, m. 122-3°. *o*-Carbobotoxyaminophenyl benzoate, m. 62.5° (63% yield); isocarbobotoxy deriv., m. 85.5-5.8° (60%); valeryl deriv., m. 73-4° (45%); isovaleryl deriv., m. 96-7.5° (29%); *o*-benzoylaminophenylmethyl carbonate, m. 128° (78%); *o*-benzoylaminophenyl valerate, m. 103.5-4.5° (36%); the isovalerate, m. 113.5-7° (35%).

C. J. WEST

**Action of nitrosodimethylaniline on apiole.** A. QUILICO AND M. FRERÏ. *Gazz. chim. ital.* 59, 273-9(1929).—In a further attempt to explain the mechanism of the reaction between aromatic NO bases and unsatd. aliphatic compds. (cf. Q., C. A. 23, 378), the reaction between  $\text{ONC}_6\text{H}_4\text{NMe}_2$  (I) and apiole (II) was investigated. II was of particular interest because, unlike other allyl derivs., it does not form a nitron with PhNO. The reaction between I and II is very slow, and even at 80-90° the yield of cryst. substances is even lower than with safrole. In the present case the cryst. portion is a mixt. of compds. which can best be sepd. by their differing soly. in EtOH. The first of these is obtained, by repeated crystns. from EtOH, in the form of minute yellow crystals which m. 90-100° and which behave like a Schiff base. It dissolves readily in acids, giving intense red solns. from which there seps. almost immediately by hydrolysis a grayish white substance, while in the filtrate is dimethyl-*p*-phenylenediamine. The grayish compd. contains no N, reduces alk.  $\text{KMnO}_4$ , and has all the properties of an aldehyde. Except for a small difference in the m. p. (140°) all indications point to its being identical with the aldehyde, m. 137°, which was obtained by Alessandri (cf. C. A. 20, 1067) from II and PhNO, and to which he justifiably assigned the formula  $(\text{MeO})_2(\text{CH}_2\text{O})_2\text{C}_6\text{HCH:CHCHO}$ , i. e., apioleacrylic aldehyde. It combines readily with  $p\text{-O}_2\text{NC}_6\text{H}_4\text{HNHNH}_2$  in AcOH, yielding a phenylhydrazone,  $(\text{MeO})_2(\text{CH}_2\text{O})_2\text{C}_6\text{HCH:CHCH:NNHC}_6\text{H}_4\text{NO}_2$ , bright red, m. 268°. Boiled with alc.  $\text{NH}_4\text{OH}$ , the Schiff base forms an oxime,  $(\text{MeO})_2(\text{CH}_2\text{O})_2\text{C}_6\text{HCH:CHCH:NOH}$ , m. 166°. The oxime of Alessandri (*loc. cit.*) m. 172°, and probably the 2 oximes are stereoisomeric. It is also probable in view of this latter reaction that the Schiff base has the constitution;  $(\text{MeO})_2(\text{CH}_2\text{O})_2\text{C}_6\text{HCH:CHCH:NC}_6\text{H}_4\text{NMe}_2$ , which is furthermore in conformity with the results obtained with safrole. A peculiarity of the compd. is its great sensitivity to acids, which easily decomp. it into its constituent parts, contrary to the usual behavior of Schiff bases of the type  $\text{RCH:CHCH:NR}$ , which often give cryst. salts with acids. The part only slightly sol. in EtOH in the original reaction is a mixt. of azo- and azoxydimethylaniline, the sepn. of which is very difficult (cf. Ber. 30, 2946 (1897)). Even after repeated crystns. from xylene, microscopic examn. shows the product to be a mixt. of the brown azo and the yellow azoxy compd. Addn. of a drop of dil.  $\text{H}_2\text{SO}_4$  dissolves the brown azo compd. to an intense red soln., leaving the azoxy compd., while AcOH dissolves the former to a green soln. The formation of the azoxy



compd. makes it very probable that the mechanism of the reaction with I is the same as with PhNO. The azo and azoxy compds. have been obtained simultaneously in many reactions where NO<sub>2</sub> compds. have been reduced in an alk. medium (cf. Bamberger, *Ber.* 33, 3624(1900); *C. A.* 20, 2153; Bigiavi, *Rend. accad. Lincei* VIII, Series 6, 167(1928)), the reaction probably being the Cannizzaro reaction, thus:

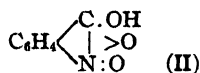
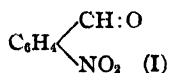
$\text{RNHOH} \rightarrow \text{RNH}_2 \rightarrow \text{RNO} \rightarrow \text{RN:NR} + \text{H}_2\text{O}$ . Repeating the expt. with safrole, it was found that the formation of the azo compd. is facilitated by high temps.

C. C. DAVIS

A characteristic color reaction of quinone on the atomic grouping  $\text{E}^{(-)}\text{CCH}_2\text{C}^{(-)}\text{E}$ . W. KESTING. *Ber.* 62B, 1422-4(1929); cf. *C. A.* 23, 387.—The formation of intensely colored compds. from  $\text{CH}_2(\text{CN})_2$  with *p*-benzoquinone,  $\alpha$ - and  $\beta$ -naphthoquinone and their derivs. is a special case of a very characteristic color reaction of these quinones with compds. contg. the at. grouping  $\text{EC}^{(-)}\text{CH}_2\text{C}^{(-)}\text{E}$  (E = plurivalent element). When a trace each of such a compd. and of 1 of the quinones in a suitable solvent (e. g., alc.) is treated with a few drops of NH<sub>4</sub>OH or alkali and shaken the whole soln. instantly becomes an intense blue, the color varying somewhat with the quinone used but being independent of the substance reacting with the quinone. The reactive grouping must be present in an open chain. Fluorene and Ph<sub>2</sub>CH<sub>2</sub> do not give the reaction, nor do indene and phloroglucinol (the latter gives an orange-red color, probably produced by a reaction of a different kind). The reaction takes place only if the solvent is a substance capable of exhibiting basic properties (H<sub>2</sub>O, alc., glycerol, C<sub>6</sub>H<sub>5</sub>N, Me<sub>3</sub>NH, NH<sub>4</sub>OH, alkali) and in such a solvent (or an indifferent solvent contg. enough of a basic substance) the reaction occurs only when the  $p_H$  is above a definite value, varying for the different substances. Thus  $\text{CH}_2(\text{CN})_2$  and  $\text{NCCH}_2\text{CO}_2\text{Et}$  react with *p*-benzoquinone and  $\alpha$ -naphthoquinone in H<sub>2</sub>O or alc. but  $\text{AcCH}_2\text{CO}_2\text{Et}$  and  $\text{CH}_2(\text{CO}_2\text{Et})_2$  react only after addn. of small amts. of NH<sub>4</sub>OH or an alkali. Anthraquinone and its derivs., phenanthrenequinone and anthradiquinone do not give the reaction. Positive results have been obtained with all the substances contg. the reactive group thus far tested ( $\text{BzCH}_2\text{CO}_2\text{Et}$ ,  $\text{NCCH}_2\text{CONH}_2$ ,  $\text{CH}_2\text{Ac}$ ,  $\text{BzCH}_2\text{Ac}$ , in addn. to those mentioned above).

C. A. R.

Does *o*-nitrobenzaldehyde exist in two tautomeric forms? I. YA. POSTOVSKII. *J. Russ. Phys.-Chem. Soc.* 61, 719-22(1929).—According to Tanasescu (*C. A.* 21, 533; 22, 951) *o*-nitrobenzaldehyde presents itself in the 2 tautomeric forms (I) and (II) which are in equil., but Arndt (*C. A.* 21, 1640, 2897; 22, 2932; 23, 90) contested the existence of this tautomerism. As very valid arguments were presented in favor of both theories, P. undertook to investigate the matter by using Sugden's method of parachor detn. The formula  $P = M/D \cdot \gamma^{1/4}$  was applied, and the d., surface tension and capillary const. of pure *o*-nitrobenzaldehyde were detd. By calcul., the parachor corresponding to formula I is 312.2, that of formula II is 294.0. The exptl. results obtained in the temp. interval of 50–100° show parachor values of from 307.69 to 308.70, which evidently correspond to formula I. Thus the tautomerism does not take place, except perhaps to a very insignificant extent, between 50° and 100°. This, however, does not exclude the possibility of tautomerism in solns., e. g., in chem. reactions.



BERNARD NELSON

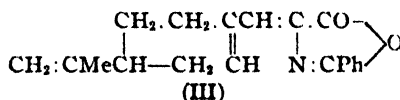
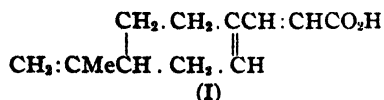
Stereochemical research in the benzalacetophenone series:  $\alpha$ -bromo- $\beta$ -alkoxybenzalacetophenones. Ethylenic isomerism and polymorphism. CHARLES DUFRAISSE AND ALFRED GILLET. *Ann. chim.* 11, 5-21(1929).—Heating  $\text{PhCOCHBrC(OMe)}_2\text{Ph}$  at 220–40° removes a mol. of MeOH and gives  $\alpha$ -bromo- $\beta$ -methoxybenzalacetophenone in the form of a mixt. of isomers: A, m. 102°, and B, m. 72°. The latter is dimorphous and can be obtained in the forms B<sub>a</sub>, m. 64–5°, and B<sub>g</sub>, m. 71–2°. A is very sensitive to the action of heat and acids and is transformed to B by them. Partial transformation of A to B takes place under the influence of direct or diffused sunlight, elec. light or the Hg arc.  $\alpha$ -Bromo- $\beta$ -ethoxybenzalacetophenone was obtained in 3 cryst. forms:  $\alpha$ , m. 65°,  $\beta$ , m. 73° and  $\gamma$ , m. 76°. Attempts to transform this compd. into isomers similar to the MeO deriv. were unsuccessful, although a new compd., m. 84–5°, was obtained but not in sufficient amt. for analysis.  $\alpha$ -Bromo- $\beta$ -propoxybenzalacetophenone, m. 50–1°, was prepd. by a similar method in only 1 form.

R. C. ROBERTS

Condensations of piperonal with various pinacolins. E. PACE. *Atti acad. Lincei*

[6], 9, 778-82(1929).—The prepn. of various pinacolins by the reaction of Mg alkyls on  $\text{Ac}_2\text{O}$  was described (cf. *C. A.* 23, 1615). Piperonal has been condensed with  $\text{Me-COCMe}_2$  by dissolving these in 50 cc. EtOH, adding 50 cc. 6%  $\text{Na}_2\text{CO}_3$ . A yellow oil seps. when 50 cc.  $\text{H}_2\text{O}$  is added. Recrystd. from  $\text{Et}_2\text{O}$  and EtOH piperonal-methyl *tert*-Bu ketone. seps. in birefracting, biaxial needles, m.  $98^\circ$ , d. 1.0765. Similarly prepd., piperonalethyl *tert*-amyl ketone, m.  $106^\circ$ , d. 1.08830. Piperonalpropyl  $\alpha,\alpha$ -dimethylbutyl ketone, m.  $117^\circ$ , d. 1.0928. A. W. CONTIERI

Some derivatives of perillaldehyde. B. RUTOVSKII AND A. KOROLEV. *Trans. sci. chem.-pharm. Inst.* (Moscow) 1928, 153-6; *Chem. Zentr.* 1928, 11, 2355.—The prepn. of some derivs. of perillaldehyde (I) is described. *Perillaacrylic acid* (II) is obtained by condensation according to Perkin (*Ber.* 10, 68) and Knoevenagel (*Ber.* 31, 2602). The Me, Et and iso-Am esters were prepd. The Et ester was also obtained according to Erdmann and Claisen (*Ber.* 23, 976) by action of  $\text{AcOEt}$  on I in presence of Na. *Perillydeneacetone*, *diperillydeneacetone* and *perillydeneacrolein* were obtained by condensation of I with  $\text{Me}_2\text{CO}$  and  $\text{AcH}$  in presence of 10% NaOH soln. *2-Phenyl-4-perillydeneoxazolone* (III) (by heating on the water bath of equimol. amts. of I and  $\text{BzNHCH}_2\text{CO}_2\text{H}$  in presence of water-free  $\text{AcONa}$  in  $\text{Ac}_2\text{O}$ ), m.  $137-8^\circ$  (yield 65-70%), golden yellow crystals with a silky luster from  $\text{AcOH}$ , slightly sol. in EtOH,  $\text{Et}_2\text{O}$ , PhH and petroleum ether.



G. SCHWOCH

X-ray investigations of optically active compounds. I. A proof of molecular asymmetry in optically active phenylaminoacetic acid. GEORGE L. CLARK AND G. ROBERT YOHE. *J. Am. Chem. Soc.* 51, 2796-2807(1929).—An x-ray examn. by the rotation and powder diffraction methods has been made of the *d*-, *l*- and *dl*-forms of  $\text{Ph-CH}_2\text{NH}_2\text{CO}_2\text{H}$ . The power of the rotation method is shown by the fact that a straightforward crystal structure analysis was possible although no crystallographic or optical data were available. The *d*- and *l*-forms are shown to crystallize in the orthorhombic system, upon Bravais lattice  $\Gamma_0$ , space group  $\text{C}_{2v}^2$ . The unit cell contg. 4 mols. has the dimensions  $a = 15.2$ ,  $b = 5.05$ ,  $c = 9.66$  A. U. The vol. of this cell is  $742$  A.  $\text{U}^3$ . The d. of the crystals is 1.30. The fact that the space group  $\text{C}_{2v}^2$  admits of no mol symmetry confirms the classical theories of van't Hoff and Le Bel connecting mol asymmetry with optical activity. It has not been found possible to distinguish between the *d*- and *l*-forms by means of x-ray diffraction methods. The crystal form of the *dl*-modification differs from that of the optically active forms. C. J. WEST

Anodic behavior of substituted acetic acids. I. Diphenylacetic acid. H. KATAGISHI, Y. GINBAYASHI AND M. MATSUI. *Mem. Coll. Sci. Kyoto Imp. Univ.* 12A, 57-62(1929).—On electrolysis between Pt electrodes of a soln of  $\text{Ph}_2\text{CHCO}_2\text{K}$  of concn not less than about 35% and acidified with  $\text{H}_2\text{SO}_4$  or  $\text{HCl}$ ,  $\text{Ph}_2\text{CHOH}$  and a little  $\text{Ph}_2\text{CHCO}_2\text{CHPh}$  are formed with evolution of  $\text{CO}_2$ . Pb catalyzes the formation of alc., but not of ester. If an a. c. is employed, the total yield and also the relative amt. of ester are increased. B. C. A.

Ring tension and radical formation. III. G. WITTIG AND M. LEO. *Ber.* 62B, 1405-10(1929); cf. *C. A.* 23, 133.—The object of these studies is to introduce 2 radical centers as adjacent members in ring systems in order, on the one hand, to det. the attraction from member to member in strained rings and, on the other, to investigate the dissocn. tendency of the ethane union. For this purpose have been prepd. biradicals of the type  $\text{Ph}_3\text{CC}_6\text{H}_4(\text{CH}_2)_n\text{C}_6\text{H}_4\text{CPh}_2$ . In those hitherto prepd.  $n$  was 1 or 2. The

prepn. of the trimethylene homologs met with insuperable difficulties; all attempts to obtain  $\text{CH}_2(\text{CH}_2\text{C}_6\text{H}_4\text{Bz})_2$  by introducing 2 Bz radicals into  $\text{CH}_2(\text{CH}_2\text{Ph})_2$  failed. Bromination of *p*- $\text{BzC}_6\text{H}_4\text{Me}$  gave a product (I), m.  $112^\circ$ , while Bourcet obtained a compd., m.  $96.6^\circ$ . Since I on oxidation gave *p*- $\text{BzC}_6\text{H}_4\text{CO}_2\text{H}$ , the Br could not have been on the nucleus and this is probably another case of dimorphism, often observed in the  $\text{Ph}_3\text{CO}$  series. With  $\text{CNNa}(\text{CO}_2\text{Et})_2$  I smoothly yielded *di-Et bis*[*p*-benzoylbenzyl]-malonate (II), sepg. in 2 dimorphous forms, depending on the conditions of crystn. Sapon. and decarboxylation of II gave resinous products and it was therefore treated with  $\text{PhMgBr}$ ; from the product was isolated, under the proper conditions, a crystal glycol [ $\text{Ph}_2\text{C}(\text{OH})\text{C}_6\text{H}_4\text{CH}_2\text{C}(\text{CO}_2\text{R})_2$ ] (III) forming in  $\text{Et}_2\text{O}$  with  $\text{HCl}$  a sol. dichloride

(IV). Dehalogenation in the usual way with "Naturkupper C" under N yielded a light brown soln. whose color did not in the least resemble that of the radicals previously prepd. The tetramethylene biradical (V) was prepd. with no particular difficulty.  $\alpha,\delta$ -Bis[*p*-benzoylphenyl]butane (VI) was smoothly obtained by the Friedel-Crafts method from  $(\text{CH}_2\text{CH}_2\text{Ph})_2$  and  $\text{BzCl}$  and converted into the corresponding glycol (VII) and dichloride (VIII). Dehalogenation of VIII gave a V, forming yellow solns. with greenish fluorescence, which obeyed Beer's law. The observations made on the 4 homologous biradicals show, on the whole, that in the 1st two the position of the (very broad) absorption band corresponds to monomeric  $(\text{PhC}_6\text{H}_4)_2\text{C}$  while in the last two it corresponds to the moderately dissociating  $(\text{CPh}_3)_2$ . This distinction is also brought out in models; intramol. union of the free radical-ends is impossible in the mono- and dimethylene compds. but in biradicals with a longer methylene bridge the ring tension permits of such a union. *p*-Benzoylbenzyl bromide (I), from *p*- $\text{PhCOC}_6\text{H}_4\text{Me}$  at  $150^\circ$  and 1 mol.  $\text{Br}_2$ , m.  $112^\circ$ . II (25 g. from 40 g. I), needles, m.  $103\text{--}4^\circ$ , or leaflets, m.  $108\text{--}9^\circ$ ; on long standing under the solvent the needles change into the leaflets, and from a satd. soln. either form can be obtained by seeding. Di-Et bis[*p*-(diphenylhydroxymethyl)benzyl]malonate (III) (2.6 g. from 10 g. II), m.  $173.5\text{--}4.5^\circ$ , sol in concd.  $\text{H}_2\text{SO}_4$  with deep orange color. VI, m.  $150^\circ$ ; yield, 50%.  $\alpha,\delta$ -Bis[*p*-(diphenylhydroxymethyl)phenyl]butane (VII) (1.6 g. from 2 g. VI), m.  $140\text{--}5^\circ$ . VIII, m.  $159\text{--}61^\circ$ , sol. in hot AcOH with a greenish yellow color which disappears on cooling.  $\alpha,\delta$ -Bis[*p*-(diphenylmethyl)phenyl]butane (V), mol. wt. in freezing  $\text{C}_6\text{H}_6$  1209 (indicating assocn. between the mols. of the V); shaking the  $\text{C}_6\text{H}_6$  soln. with O and evapg. the solvent leaves a yellow solid, m.  $150\text{--}60^\circ$ , contg. 92.1% C and 7.4% H. C. A. R.

**Composition of asarone oil.** I. GERÖ. *Chem. Folyóirat* 34, 103–12, 115–20 (1928).—Asarone oil was prepd. from the roots of *Asarum europaeum* by distn. with steam. Five fractions were made at 20 mm. pressure. The fraction b.  $144\text{--}50^\circ$  consists chiefly of a compd.  $\text{C}_{11}\text{H}_{16}\text{O}$ , the O being bound as an ether. The fraction b.  $155\text{--}63^\circ$  is probably a mixt. of a sesquiterpene with a sesquiterpene alc. Other fractions contain asarylaldehyde, asarone, a compd. with compn. of diasarone, but with another structure.

S. S. DE FINÁLY

#### Mercuration of aurin and attempts to mercurate some other triphenylmethane dyes.

FRANK C. WHITMORE AND G. J. LBUCK. *J. Am. Chem. Soc.* 51, 2782–4 (1929).—Pararosaniline acetate (5 g.) and 2 g.  $\text{Hg}(\text{OAc})_2$  in 500 cc.  $\text{H}_2\text{O}$  contg. 1 cc. AcOH, refluxed 3 hrs., 3 g.  $\text{Hg}(\text{OAc})_2$  added and the mixt. refluxed for 5 hrs., give triacetoxymercuripararosaniline acetate, dark brown, sparingly sol. in  $\text{H}_2\text{O}$ ; NaI gives NaHgI, NaOH and the free base. The base of malachite green gives a small yield of a diacetoxymercuri compd.; no org. Hg deriv. was obtained with crystal violet or *N*-phenylmethyl violet. Aurin (48 g.), 58 g. 90%  $\text{Hg}(\text{OAc})_2$ , 240 g. AcOH and 760 cc. 90% AcOEt, refluxed 6 hrs., give 83 g. (91%) of the acetoxymercuri deriv. (I), red powder; using 19.3 g. aurin, 6 g.  $\text{Hg}(\text{OAc})_2$ , 300 cc. 95% EtOH and 12 cc. AcOH, there results the diacetoxymercuri deriv., bright red; 14.5 g. aurin, 32 g.  $\text{Hg}(\text{OAc})_2$ , 300 cc. 95% EtOH, 50 cc.  $\text{H}_2\text{O}$  and 15 cc. AcOH give 22 g. of the triacetoxymercuri compd. (II), black. Heating I with EtOH for 48 hrs. gives II, but the product is dark red, not black. II and NaCl give the trichloromercuri compd., also obtained by heating I with NaCl in EtOH for 3 days. C. J. WEST

**Mercurated terephthalic acid.** FRANK C. WHITMORE AND LLOYD L. ISENHOUR. *J. Am. Chem. Soc.* 51, 2785–7 (1929).—*p*- $\text{C}_6\text{H}_4(\text{CO}_2\text{H})_2$  (34 g.) and 44.7 g.  $\text{Hg}(\text{OAc})_2$  in NaOH and AcONa, refluxed 240 hrs., give 102 g. of material, which was extd. with concd.  $\text{NH}_4\text{OH}$  and  $\text{H}_2\text{O}$  (2:1), the ext. pptd. with AcOH, the ppt. taken up in hot satd.  $\text{Na}_2\text{CO}_3$ , pptd. with  $\text{CO}_2$ , again extd. with satd. (20%) AcONa and  $\text{H}_2\text{O}$  (1:2) and pptd. with AcOH, giving 18 g. of anhydro-2-hydroxymercuriterephthalate (I); with  $\text{PCl}_5$  in  $\text{CHCl}_3$  this yields an acid chloride (II) which gives with BuOH 70% of di-Bu 2-chloromercuriterephthalate, readily crystd. from EtOH or BuOH and affording a convenient method of purification. II and dry  $\text{NH}_3$  in  $\text{CHCl}_3$  give 90% of 2-chloromercuriterephthalate;  $\text{PhNH}_2$  gives the anilide, brown, amorphous, does not m.  $300^\circ$ . I and Br in NaBr give 2,1,4- $\text{BrC}_6\text{H}_3(\text{CO}_2\text{H})_2$ , m.  $299^\circ$ . I is also obtained by heating 40 g. *p*- $\text{C}_6\text{H}_4(\text{CO}_2\text{Et})_2$ , 57.5 g.  $\text{Hg}(\text{OAc})_2$  and 2 cc. AcOH at  $117^\circ$  for 70 hrs. The purification of the mercurated BzOH is also described. The salts of I are only slightly less hydrolyzed than those of the mercurated BzOH. C. J. WEST

**A peculiar case of "pinacolin" rearrangement.** HANS KLEINFELLER AND FRANZ ECKERT. *Ber.* 62B, 1598–1600 (1929).— $\text{Bz}_2$  and  $(\text{BrMgC})_2$  in cold  $\text{CHCl}_3$  give 1,2,5,6-tetraphenyl-3-hexin-2,5-diol-1,6-dione [ $\text{BzCPh}(\text{OH})\text{C}(\text{Ph})_2$ ], m.  $154^\circ$ , quantitatively decompd. by hot aq. NaOH into BzOH and  $[\text{PhCH}(\text{OH})\text{C}(\text{Ph})_2]$ , m.  $145^\circ$ , which, when refluxed with satd. alc. HCl, loses  $\text{H}_2\text{O}$  and undergoes a "pinacolin" rearrangement.

yielding 1,2,2,6-tetraphenyl-3-hexin-1,5,6-trione,  $\text{PhCOCPh}_2\text{C}:\text{CCOCOPh}$ , yellow, m.  $213^\circ$ , mol. wt. (Rast-Carlsohn) 412; trioxime, m.  $237^\circ$ . C. A. R.

**Oxidation of benzoin to diketones with iodine.** BEN B. CORSON AND ROBERT W. McALLISTER. *J. Am. Chem. Soc.* 51, 2822-5(1929).—Various analogs of benzil can be prepd. by I oxidation of alk. solns. of the corresponding benzoin. A mechanism involving stilbene diolate is suggested. Benzoin (21 g.) in 500 cc. MeOH and 7.5 g. Na in 100 cc. MeOH, heated to  $50^\circ$  for 0.5 hr. and stirred while compressed air is passed through, give 2 g. benzil and 12 g. BzOH; in N atm., however, 90-5% yields of benzil were obtained. Furoin gives 80% of furil; substitution of Br for I causes a drop in yield of 20-30%; in this reduction the MeONa should be barely in excess. The frequently described delicate color test with alc. alkali is shown to be applicable to certain benzoin but not to others. The procedure suggested is to add to a 10 cc. test tube 1 cc. of MeONa (4 g. Na in 50 cc. MeOH), then 0.1 cc. satd. benzil soln. and then from 0.02 to 1 cc. of the MeOH soln. of benzoin to be tested. With this a pos. color test is given by 0.0002 g. of benzoin and a weak test with 0.0001 g. The color test can be applied to furoin and benzofuroin; piperoin or anisooin give no color with MeONa. Simple sugars are similar to benzoin but levulose does not respond to the color test, nor does butyoin. This test is much more sensitive than the Fehling test for benzoin. It is suggested that the color is indicative of tervalent C. C. J. WEST

**$\alpha$ -Chloronaphthalene.** IV. The chlorination of naphthalene in solution. P. FERRERO AND M. FEILMANN. *Helv. Chim. Acta* 12, 583-603(1929); cf. C. A. 23, 1896.—The optimum conditions found for the chlorination of  $\text{C}_{10}\text{H}_8$  (I) in soln. were 256 g. I, 0.5% I, 450 g.  $\text{PhCl}$ ,  $126-8^\circ$ , and sufficient Cl to give an increase in wt. of 66-8 g. The yield of  $\alpha\text{-C}_{10}\text{H}_7\text{Cl}$  is 81% on I used, 92% on I consumed. 6-7% polychlorides is formed. The use of  $\text{CCl}_4$  as an inert solvent gives more unreacted I and higher chlorides. A no. of inert solvents were tried. The nature of the solvent directly influences the reaction, and the results depend on the relative affinities of the solvent and I for Cl. The lower the proportion of solvent, the more nearly results approach those obtained without a solvent. Large increases in inert solvent favor chlorination of the solvent. FREDERICK C. HAHN

**The octalin from the tertiary decalol.** S. S. NAMETKIN AND E. GLAGOLEVA. *Ber.* 62B, 1570-3(1929).—See C. A. 23, 4465. C. A. R.

**The limiting concentration of sulfuric acid necessary for sulfonation (of hydrocarbons); actual means of maintaining it.** ANON. *Rev. gén. mat. color.* 33, 177-83 (1929).—Work of different investigators is reviewed. References are given. Limiting values for the mono-, di- and trisulfonation of  $\text{C}_{10}\text{H}_8$  are given for different temps. Equations are given by means of which the amt. of acid required for a sulfonation may be calcd., if this limiting value is known for the compd. in question. Details of sepg. a  $\text{SO}_3\text{H}$  acid from a reaction mixt. are given. Details of sulfonation by means of  $\text{SO}_3$  in  $\text{CHCl}_3$  are given. The concn. of aq.  $\text{H}_2\text{SO}_4$  in a sulfonation mixt. below the theoretical is lowered sometimes by labile combination of  $\text{SO}_3$  with the hydrocarbon as well as by the water formed in the reaction. T. G. HAWLEY, JR.

**Anthrahydroquinone-1,5-dicarboxylic dilactones.** ROLAND SCHOLL AND LOTHAR WANKA (with HERBERT HÄHLE AND WALTER LEONHARDT). *Ber.* 62B, 1424-33(1929); cf. C. A. 23, 4695.—Anthraquinone-1,5-dicarboxylic acid (I) and, insofar as they have been tested, its 4,8-disubstituted derivs. yield the hydroquinone dilactones with Cu and concd.  $\text{H}_2\text{SO}_4$  so readily that this is the best method of obtaining these dilactones. The latter are red cryst. compds. very stable toward aq. alkalis but hydrolyzed with relative ease by hot alc. alkalis. The hydrolysis proceeds by stages, yielding first the blue alk. solns., sensitive to air, of the lactone carboxylic acids, which in the free state are red, and then the red alk. solns., also sensitive to air, of the di- $\text{CO}_2\text{H}$  acids. The lactone acids are also obtained when the quinonedicarboxylic acids are treated with Cu and  $\text{H}_2\text{SO}_4$  a shorter time than is necessary for their conversion into the hydroquinone dilactones. Anthrahydroquinone-1,5-dicarboxylic dilactone (II) is obtained in 2.4 g. yield (crude product) from 2.5 g. I in 25 cc.  $\text{H}_2\text{SO}_4$  stirred 20 min. with 2.5 g. Cu powder. 4,8-Dichloro-1,5-bisacetylaminanthraquinone, from 1,5-AcNHC<sub>6</sub>H<sub>4</sub>(CO)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>NHAc in AcOH-Ac<sub>2</sub>O-NaOAc at  $80^\circ$  with Cl, yellow, does not m.  $300^\circ$ , hydrolyzed by moderately concd.  $\text{H}_2\text{SO}_4$  at  $100^\circ$  into the 1,5-diamino compd., red, m.  $305^\circ$ ; 60 g. of this gives by the Sandmeyer method 45 g. (crude) 1,5-dinitrile, silvery leaves (pale brown in transmitted light) from  $\text{PhNO}_2$ , does not m.  $360^\circ$ , sol. in the higher-boiling solvents with yellow to red-brown color, forms a green alk.  $\text{Na}_2\text{S}_2\text{O}_4$  vat. 1,5-Dicarboxylic acid (III) (9 g. crude product from 15 g. crude dinitrile boiled with  $\text{H}_2\text{SO}_4$ ), yellow needles with AcOH of crystn., weather readily, decomp. about  $250^\circ$ ; di-Et ester, obtained through the chloride (prepd. with  $\text{SOCl}_2$ ) (21 g. from 20 g. of the acid), m.  $154^\circ$ .

**Hydroquinone dilactone** (3.2 g. (crude) from 4.8 g. of the quinone acid), dark red, insol. in aq. NaOH. **4,8-Di-PhO deriv.** of I, (12.5 g. (crude) from 15 g. of III with PhOH and powd. KOH at 140–50°), dark yellow, begins to decomp. 273°, forms a red alk.  $\text{Na}_2\text{S}_2\text{O}_4$  vat. **Dichloride** (11.5 g. from 12.5 g. of the crude acid with  $\text{PCl}_5$  in boiling  $\text{C}_6\text{H}_6$ ). **4,8-Bis-*p*-nitrophenoxy deriv.** of I (0.1 g. from 0.1 g. of the di-PhO acid dissolved in boiling concd.  $\text{HNO}_3$ ), m. 325–6° (decompn.) sol. in  $\text{NH}_4\text{OH}$  with yellow, in NaOH with orange-red color. The di-PhO acid refluxed with Zn dust in concd.  $\text{NH}_4\text{OH}$  yields **4,8-diphenoxanthracene-1,5-dicarboxylic acid**, yellow, m. 344–5°, sol. with yellow color in concd.  $\text{H}_2\text{SO}_4$  and converted at 70–80° into a colorless  $\text{SO}_3\text{H}$  acid. **4,8-Bis-*p*-tolylloxy deriv.** of I, (0.25 g. from 0.5 g. of III with *p*-cresol and powd. KOH at 100°), orange-yellow, darkens 280°, blackens about 317°, sol. in  $\text{H}_2\text{SO}_4$  with brown-red color changing (with formation of a  $\text{SO}_3\text{H}$  acid) to dark green at 40–50°, forms a red alk.  $\text{Na}_2\text{S}_2\text{O}_4$  vat. **4,8-Di-PhO deriv.** of II (0.15 g. from 0.3 g. of the quinone acid), brown-red needles with Cu luster. **4,8-Di-PhO deriv.** of III (0.15 g. from 0.3 g. of the quinone acid), brown-red needles with Cu luster.

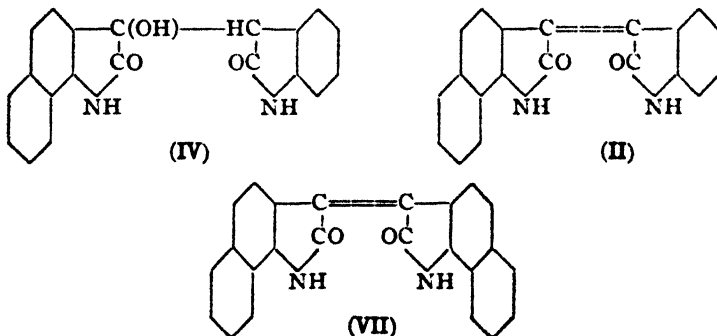
**4,8-Bis-*p*-tolylmercapto deriv.** of I (2.5 g. from 1.8 g. of III), orange-yellow, m. 308°, decomp. 310°, sol. in  $\text{H}_2\text{SO}_4$  with blue color; **deriv.** of II (0.5 g. from 1 g. of the quinone acid), dark red. **4,8-Di-PhNH deriv.** of I, dark violet needles with metallic luster, m. 320° (effervescence), sol. in cold  $\text{NH}_4\text{OH}$  but in alkalis only on heating (with blue-red color), in  $\text{H}_2\text{SO}_4$  almost without color. the soln. becoming blue at 80°; with  $\text{NaOH-Na}_2\text{S}_2\text{O}_4$  it forms a yellow-red vat sensitive to air, with  $\text{NH}_4\text{OH-Na}_2\text{S}_2\text{O}_4$  a yellow vat quite stable to air. III splits off  $\text{CO}_2$  when heated with  $\text{PhNH}_2$  and the above di-PhNH acid must therefore be prepd. through its *di-Et ester* (obtained by boiling the ester of III with  $\text{PhNH}_2$ ), violet. **4,8-Di-PhNH deriv.** of II (0.9 g. (crude) from 1 g. of the quinone acid), red leaves with Cu luster, m. 348°, sol. in  $\text{H}_2\text{SO}_4$  with red color changing to blue at 100°. **4,8-Di-*p*-toluidino deriv.** of I, dark violet needles with Cu luster, m. 312–3° (decompn.), sol. in  $\text{H}_2\text{SO}_4$  with pale blue-green color changing to dark blue at 70–80°; the acid is prepd. through its *di-Et ester*, m. 248°. **Deriv.** of II, dark violet crystals with metallic luster. C. A. R.

**Benzanthrone.** ARTHUR LÖTTRINGHAUS AND HEINRICH NERESHEIMER. *Ann.* **473**, 259–89 (1929).—No suitable explanation has been advanced for the formation of benzanthrone (I) discovered by Bally (*Ber.* **38**, 194 (1905); *C. A.* **5**, 3248); the following expts were undertaken to supply this; the original should be consulted for the discussion and formulas proposed for intermediate products. **Bz-1-Bz-1'-dibenzanthronyl** (II), dark yellow, m. 412–4°, concd.  $\text{H}_2\text{SO}_4$  gives a carmine red soln with an intense brick-red fluorescence. Heating 10 g. II with 50 g. KOH and 50 cc. MeOH at 115–20° for 2 hrs. gives dibenzanthrone (III). I (75 g.), added to a melt prepd. from 300 g. KOH and 180 g. EtOH at 95–100° and heated several hrs. at 100–5°, gives a small quantity of the 2-HO deriv. of I, a phenolic impurity (removed by heating the mixt. with *p*-MeC<sub>6</sub>H<sub>4</sub>SO<sub>3</sub>Me in C<sub>6</sub>H<sub>5</sub>Cl<sub>3</sub> and Na<sub>2</sub>CO<sub>3</sub> at 195°) and 80% of 2,2'-dibenzanthronyl (IV), light yellow, m. 320–1°, the concd.  $\text{H}_2\text{SO}_4$  soln. is red, without fluorescence. The formation of this compound depends upon the alc. used; with iso-PrOH, it takes place at 10–5°, with an optimum temp. of 30–5°; with EtOH, 70–5°; with MeOH, about 85°. With  $\text{PhNHNa}$  and  $\text{PhNH}_2$  at 40–5°, the yield is about 50%; the by-product in this case appears to be the *anilino deriv.* of I, brown needles with bluish metallic luster, m. 215°, since with 50% KOH at 250° it gives the 2-HO deriv. of I. The 6-Me deriv. of I (10 g.) and KOH in MeOH, heated 5 hrs. at 100–5°, give 6.5 g. of the 6,6'-*di-Me deriv.* of IV, greenish yellow, m. 357–8°; the concd.  $\text{H}_2\text{SO}_4$  soln. is brick-red without fluorescence. Similarly, the 6-Cl deriv. of I gives the 6,6'-*di-Cl deriv.* of IV, yellow, m. 407–8°. IV (25 g.), added to a melt of 250 g. KOH and 20 g. AcONa at 240° and heated 2 hrs. at 245–50°, gives nearly quant. III; the ring closure can also be carried out with 80%  $\text{H}_2\text{SO}_4$  contg. a little Hg salt at 200° but the product contains S compds. Heating the 6,6'-Me<sub>2</sub> deriv. with the KOH melt at 230° for 2 hrs. gives quant. the 6,6'-*di-Me deriv.* of III, which differs from III in that it is less sol. in high-boiling org. solvents and that it dyes cotton a deeper blue. The 6,6'-Cl<sub>2</sub> deriv., heated with 80%  $\text{H}_2\text{SO}_4$  and a little HgSO<sub>4</sub> at 190°, gives the 6,6'-*di-Cl deriv.* of III, dark blue needles; the concd.  $\text{H}_2\text{SO}_4$  soln. is bluish violet, the dye bath is reddish violet; the boiling  $\text{PhNO}_2$  soln. is bluish red with a red fluorescence. The 2-NH<sub>2</sub> deriv. of I, through the diazo reaction, gives 82% of 2-chlorobenzanthrone (V), yellow, m. 204–5°, sublimes at 1–2 mm. and 240–60°; the concd.  $\text{H}_2\text{SO}_4$  soln. is golden yellow without fluorescence. Stirring an equimol. mixt. of 23 g. I and 26.5 g. V with a soln. of 7 g. Na in 450 g.  $\text{PhNH}_2$  at 11–2° for 2 hrs. gives 50% of IV; if the V is omitted, only traces of IV are formed. A mixt.

of V and the 6-Me deriv. of I, treated in the same way, gives 32% of the 6-Me deriv. of IV, golden yellow, m. 329–30°, which is very similar to IV in properties. In the same way V and the 6-Cl deriv. of I give the 6-Cl deriv. of IV, m. 313–4°. 2,6-Dichloroanthraquinone (139 g.), 4100 g. 98%  $\text{H}_2\text{SO}_4$ , 415 g.  $\text{H}_2\text{O}$  (added at 130–5°), 75 g. Cu bronze and 75 g.  $\text{C}_6\text{H}_5(\text{OH})_3$ , heated 0.5 hr. at 130–5°, give 66% of 2,6-dichlorobenzanthrone (VI), yellow, m. 234°; with I and PhNHK it gives the 6-Cl deriv. of IV. The 6-Me deriv. of IV with KOH at 240–50° gives the 6-Me deriv. of III, whose soly. is between that of III and its 6,6-Me<sub>2</sub> deriv. The relative yields of III and isodibenzanthrone (VII) obtained from I with KOH and MeOH, EtOH or iso-PrOH are shown for temps. of 100–220° in the form of curves; the 2 products may be sepd. by the difference in soly. of the hydrogenated compds.; dihydro-VII is practically insol. in 4% NaOH. Bz-1-Chlorobenzanthrone (VIII) and I in PhNHNa and PhNH<sub>2</sub> give 46% of 2-Bz-1'-dibenzanthronyl (IX), pale yellowish green, m. 331–2° I (100 g.) and 66 g.  $\text{HNO}_3$  (87%) in 850 g.  $\text{PhNO}_2$  give 83 g. Bz-1-nitrobenzanthrone, yellow, m. 244–5°; reduction with Na<sub>2</sub>S gives the  $\text{NH}_2$  deriv., reddish brown, m. 239–40°, transformed, through the diazo reaction, to the F deriv. (X), yellow, m. 194–5° (63% yield); with I and PhNHNa this gives IX in about the same yield as the Cl deriv. VIII and the 6-Me deriv. of I with PhNHNa give 50% of the 6-Me deriv. of IX, yellowish brown, m. 371–2°, while VIII and the 6-Cl deriv. of I give the 6-Cl deriv. of IX, pale yellow, m. 375–6°, IX and KOH-EtOH at 130° give quantitatively VII; the yield with PhNHNa is nearly as good. In the same way, the 6-Me deriv. of IX gives the 6-Me deriv. of VII; the 6-Cl deriv. was also prepd. in this manner; these 2 resemble VII. X (49.6 g.) added to 11.4 g. Na in 400 g.  $\text{PhNH}_2$  at –5° (N atm.) and stirred 3–4 hrs. at 0–2° gives 36% of Bz-1-fluoro-2-Bz-1'-dibenzanthronyl, golden yellow, m. 350–2°; alc. KOH at 110–25° gives VII quantitatively.

C. J. WEST

The naphthoisoindigotins. A. WAHL AND J. LOBECK. *Compt. rend.* 188, 1683–5 (1929); cf. C. A. 4, 1296.—The reactions leading to the formation of isoindigotin (I) and its derivs. are applied in the  $\text{C}_{10}\text{H}_7$  series.  $\alpha$ -Naphthoisoindigotin (II) may be obtained directly by condensation of oxindole and  $\alpha$ -naphthoisatin (III) in the presence of a HCl-HOAc mixt. or with the intermediate formation of mononaphthoisatin (IV) when  $\text{NH}_3$  or  $\text{C}_6\text{H}_5\text{N}$  is used as condensing agent (C. A. 18, 1296). Reduction of III with Zn and HOAc yields the leuco base, the Ac deriv. of which m. above 300°.

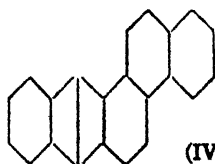


When II is heated with an excess of  $\text{H}_2\text{SO}_4$ , the disulfonic acid (V) is formed. This acid yields cryst. Na, K, Ba, Ca and Ag salts.  $\beta$ -Naphthoisoindigotin and its derivs. are formed in an analogous manner. Treatment of III with  $\text{H}_2\text{S}$  yields dinaphthodithioisatin (VI) (C. A. 19, 1862) which decomps. when heated in boiling  $\text{C}_6\text{H}_5\text{N}$ , NaOH,  $\text{NH}_4\text{OH}$  or  $\text{Na}_2\text{CO}_3$ , to dinaphthoisoindigotin (VII) and naphthoxindole; the benzylidene deriv. m. 241°. Although VI has the expected chem. properties its mol. contains 3 atoms of S instead of 2, perhaps due to impurity. Treatment of VII with  $\text{H}_2\text{SO}_4$  yields the disulfonic acid (VIII). The di- $\text{SO}_3\text{H}$  acid of I dyes wool bright orange but the color is easily removed by washing. The dyeing color of V is dark violet and is somewhat resistant to washing, while VIII dyes dark blue and is quite fast. There is, thus, an increase in both shade and fastness with increase in complexity of structure.

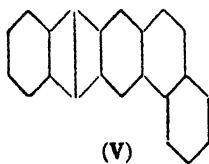
I. M. LEVINE

Polynuclear aromatic hydrocarbons and their derivatives. IV. Naphthophenanthrenes and their quinones. E. CLAR. *Ber.* 62B, 1574–82 (1929); cf. C. A. 23, 3915.—It was shown in the 1st paper that  $\alpha$ - $\text{MeC}_6\text{H}_4\text{COCl}$  and phenanthrene give a mixt. of  $\alpha$ -toluylphenanthrenes consisting chiefly of  $\alpha$ -tolyl 9-phenanthryl ketone (I). By

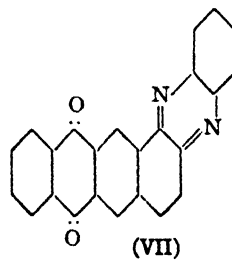
condensation with loss of  $H_2O$  the ketone mixt. gives a mixt. of hydrocarbons, the main component of which is 1,2,3,4-dibenzanthrene (II), undoubtedly formed from I. Next to the most reactive 9,10-positions in phenanthrene, the 2-position, in the *p*-position to the diphenyl union, is the one which the  $MeC_6H_4CO$  group is most likely to enter in the Friedel-Crafts reaction, forming *o*-tolyl 2-phenanthryl ketone (III) which on condensation could, theoretically, yield both [naphtho-2',3':1,2-phenanthrene] (IV) and [naphtho-2',3':2,3-phenanthrene] (V). The latter reaction seems little probable in view of the results obtained in the condensation of di-*o*-toluylbenzenes, which showed that the formation of angular hydrocarbons is always favored. The V actually found in the hydrocarbon mixt. is probably produced, not from III but from *o*-tolyl 3-phenanthryl ketone (VI). The V was not isolated in pure form from the hydrocarbon mixt. itself but its presence was shown by the formation of a pure 1,2-benzo[anthraquinono-2',3':3,4-phenazine] (VII) identical with a product obtained in another way. 2-Methyl-3- $\alpha$ -naphthoyl-5,6,7,8-tetrahydronaphthulene (VIII) and the 3- $\beta$ -isomer (IX), readily obtained from 2-methyl-5,6,7,8-tetrahydronaphthalene with  $\alpha$ - and  $\beta$ - $C_{10}H_7COCl$ , both yield pure V, with loss of  $H_2O$  and H, when heated with reduced Cu. Traces of impurities, not detectable by analysis, depress the m. ps of the naphthophenanthrenes extraordinarily; sometimes 20 recrystns. are required to obtain a max. m. p.; the faintly yellow II, previously described, when repeatedly purified through the picrate became almost colorless and the m. p. was raised from 196–7° to 205°. Unlike II, IV and V react only with a very large excess of picric acid, forming very unstable brown-red picrates which immediately decomp. when the excess of picric acid is washed away with  $C_6H_6$ . With the amt. of  $CrO_3$  theoretically required for the formation of the diquinones, IV and V give mixts of the mono- and diquinones; that both are produced from the same hydrocarbon is shown by the fact that oxidation of the hydrocarbon obtained by reducing the monoquinone again gives a mixt. of mono- and diquinones and that the mono- can be further oxidized to the diquinones. With an excess of  $CrO_3$  the IV and V can be oxidized directly to the diquinones. If the hydrocarbon distillate prepd. as described in the 1st paper is crystd. from xylene there is obtained 10 g. of a cryst. product consisting chiefly of IV with some V; 20 recrystns. gives pure IV, very faintly greenish yellow leaves, m. 293–4° (sealed capillary), sol. in concd.  $H_2SO_4$  with red color changing through red-violet and violet-blue to blue-green. 1,2-Phthalyl-



(IV)



(V)



(VII)

phenanthrene from the hydrocarbon fraction m. 275–80° with  $CrO_3$  in boiling AcOH, yellow, m. 269–70°, sol. in concd.  $H_2SO_4$  with blue color changing to brown, forms a red vat in alk.  $Na_2S_2O_4$ . At the same time is formed 1,2-phthalylphenanthrenequinone (X), golden yellow, m. 355°, sol. in  $H_2SO_4$  with brownish orange-red color, gives in boiling  $C_6H_5N$  with excess of  $N_2H_4 \cdot H_2O$  the dark leuco deriv. of the azine; the latter, obtained by recrystg the leuco compd from  $PhNO_2$ , seps. in light brown needles, do not m. 375°, sol. in  $H_2SO_4$  with red-violet color, form a dark green vat. With  $o$ - $C_6H_4$  ( $NH_2$ ) in boiling AcOH, X gives 1,2-benzo[anthraquinono-2',1':3,4-phenazine], faintly yellow, m. 350°, sol. in  $H_2SO_4$  with light brown color, forms a blood-red vat, sublimes at about 300° in *vacuo* in  $CO_2$  in moss-green needles. VIII, m. 142–3°, b<sub>12</sub> 265°, sol. in  $H_2SO_4$  with orange-yellow color, IX, m. 103–4°. V, yellow, m. 263–4°, sol. in  $H_2SO_4$  with violet-red color changing through dirty brown to olive-green, shows strong yellow luminescence in the anal. quartz lamp, forms solns. with green fluorescence, is oxidized by  $CrO_3$  in AcOH to 2,3-phthalylphenanthrene, faintly yellow, m. 272–3°, sol. in  $H_2SO_4$  with blue color changing to red on moderate diln., forms a red-brown vat, and 2,3-phthalylphenanthrenequinone (XI), orange-yellow, m. 318°, sublimes about 300°, sol. in  $H_2SO_4$  with orange-red color, forms a brown-yellow vat, forms in hot AcOH with a little  $PhNHNH_2$  a brown-red quinoxaline, m. about 375° (gas evolution), sol. in  $H_2SO_4$  with dirty green-brown color. VII, from XI in boiling AcOH with  $o$ - $C_6H_4$ -

( $\text{NH}_3$ )<sub>2</sub>, faintly yellow, m.  $373^\circ$ , sol. in  $\text{H}_2\text{SO}_4$  with light brown color, sublimes about  $300^\circ$  *in vacuo* in golden yellow needles. C. A. R.

**Carotenoids. II. Determination of the degree of saturation of polyenes by means of iodine chloride and perbenzoic acid.** RUDOLF PUMMERER, LUDWIG REBMANN AND WILHELM REINDEL. *Ber.* 62B, 1411-8 (1929); cf. C. A. 22, 2950.—In connection with the exact detn. of the no. and nature of the double bonds in rubber and gutta-percha, the authors have studied the applicability of the Wijs CII method to various systems. As already reported the consumption of CII by carotene reaches a const. value of 11.3-11.4 mols. in 20 hrs. In lycopin 12 of the double bonds react in 20 hrs., the 13th only in 5-6 days and only if at least a 2.8-fold excess of the reagent is used; further increase in the excess of reagent or time of reaction has no effect, the max. value reached after 10 days being 13.14. When the reaction is complete the excess of CII can be titrated in the usual way without difficulty, no liberation of CII or of I from the addn. product taking place. With  $\text{BzO}_2\text{H}$  only 12 double bonds react. With xanthophyll 9.7, 10.3 and 11.0 double bonds react in 1, 3 and 7 days, resp. Isoprene again gives incorrect results if at least twice the calcd. amt. of reagent is not used; with a 2-fold excess 1.94 and 1.97 double bonds react in 1 and 14 days, resp. With  $\text{BzO}_2\text{H}$  at  $0^\circ$  it takes up only 1 atom of O. Bixin consumes 6 mols. CII and takes up 6 atoms O with  $\text{BzO}_2\text{H}$ .  $\omega,\omega'$ -Diphenyloctatetraene adds 3.6 mols. CII and with  $\text{BzO}_2\text{H}$  takes up 3.2-3.3 atoms of O. *dl*- and *d*-Limonene take up 2.2-2.3 mols. CII and with  $\text{BzO}_2\text{H}$  about 1.6 atoms of O. In general, in aliphatic hydrocarbons, even with long conjugated chains, the no. of double bonds can be detd. with a large excess of CII allowed to react a long time but not with  $\text{BzO}_2\text{H}$  at  $0^\circ$ . Measurements (by GÜNTHER SCHEIBE) of the absorption of carotene, xanthophyll and lycopin gave very similar curves. The main band of xanthophyll (2 max. with  $\log k = 5.2$  and  $5.1$ ) shows somewhat stronger extinction than that of carotene (5.0); the secondary band ( $\log k = 4.3$ ) is almost identical in both compds. In xanthophyll the absorption is shifted about  $5\text{m}\mu$  toward the ultra-violet. In lycopin the extinction of the main and secondary bands is somewhat stronger than in carotene and shifted toward the longer wave lengths; measurements farther in the ultra-violet revealed a 3rd band. C. A. R.

**Sterols in yeast.** HEINRICH WIELAND AND MITIZO ASANO. *Ann.* 473, 300-13 (1929).—A sterol mixt. (150 g.) from the mother liquors of the prepn. of ergosterol (I) from yeast is benzoylated in 450 cc. pure  $\text{C}_6\text{H}_5\text{N}$  with 150 cc.  $\text{BzCl}$ , giving 170 g. of a mixt., which crystd. from 1.5 l.  $\text{AcOEt}$  gives 54 g. of a fraction (II), sinters  $135^\circ$ , m.  $155^\circ$ , and on concn. to one-half of the vol., a 2nd fraction (III) of 50 g., m.  $136^\circ$ . II on recrystn. from  $\text{AcOEt}$  gives 42 g. I benzoate (IV) and III gives 17 g. IV. All the mother liquors from IV, concd. to one-half, give 34 g. of a fraction (V), m.  $110-36^\circ$ , and on evapn. to dryness, 22 g. of a final fraction (VI), m.  $90-100^\circ$ . Repeated crystn. of VI from  $\text{Me}_2\text{CO}$  finally gives the benzoate, m.  $126-8^\circ$ , clears  $138^\circ$ ,  $[\alpha]_D^{23} 36.4^\circ$  (0.1085 g. in 5 cc.  $\text{CHCl}_3$ ), of zymosterol,  $\text{C}_{27}\text{H}_{44}\text{O}$  (cf. Maclean, C. A. 22, 1985), m.  $108-10^\circ$ ,  $[\alpha]_D 47.3^\circ$ ; Ac deriv., m.  $104-6^\circ$ ,  $[\alpha]_D^{24} 33.5^\circ$ . Crystn. of V from  $\text{Me}_2\text{CO}$ ,  $\text{MeEtCO}$  and finally dioxan gives the benzoate, m.  $144-6^\circ$ ,  $[\alpha]_D^{25} 34.7^\circ$  (0.085 g. in 5 cc.  $\text{CHCl}_3$ ), of fecosterol,  $\text{C}_{27}\text{H}_{44}\text{O}$  (VII), m.  $161-3^\circ$ ,  $[\alpha]_D^{25} 42.1^\circ$  (0.1152 g. in 5 cc.  $\text{CHCl}_3$ ); Ac deriv., m.  $159-61^\circ$ . The  $\text{Me}_2\text{CO}$  mother liquor of VII, repeatedly recrystd. from  $\text{Me}_2\text{CO}$ , gives the benzoate, m.  $130-1^\circ$ ,  $[\alpha]_D^{24} 37.0^\circ$  (0.1146 g. in 5 cc.  $\text{CHCl}_3$ ), of ascosterol,  $\text{C}_{27}\text{H}_{44}\text{O}$ , m.  $141-2^\circ$ ,  $[\alpha]_D^{20} 45.0^\circ$  (0.0253 g. in 2 cc.  $\text{CHCl}_3$ ). Recrystn. of II and III from  $\text{AcOEt}$  gives IV and also the benzoate, m.  $173-5^\circ$ ,  $[\alpha]_D^{24} -50.6^\circ$  (0.1254 g. in 5 cc.  $\text{CHCl}_3$ ), of neosterol,  $\text{C}_{27}\text{H}_{44}\text{O}$ , m.  $164-5^\circ$ ,  $[\alpha]_D^{24} -105.0^\circ$  (0.0943 g. in 5 cc.  $\text{CHCl}_3$ ); Ac deriv. m.  $173-4^\circ$ . The color reactions of these compds. are given for Salkowski's reagent ( $\text{CHCl}_3 + \text{H}_2\text{SO}_4$ ), Tortelli-Jaffe's reagent ( $\text{Br-CHCl}_3\text{-AcOH}$ ), Liebermann-Burchard reagent ( $\text{Ac}_2\text{O} + \text{H}_2\text{SO}_4$ ) and Rosenheim's reagent ( $\text{Cl}_3\text{CCO}_2\text{H}$ ). Ergosterol and neosterol and fecosterol and ascosterol cannot be distinguished from each other by these color reactions. C. J. WEST

The dipole moment as a characteristic group property (HØJENDAHLE) 2. Ortho, meta, para (history) (DOBBIN) 2. Production of tetrachloroquinone, trichloroquinone and *s*-trichloroaniline by electrolysis of aniline (ERDÉLYI) 4. Thermal data on organic compounds. V. A revision of the entropies and free energies of 19 organic compounds (PARKS, *et al.*) 2. Dissociation constants of organic acids (VOGEL) 2. Studies on sugars. III. Galactose from *Gelidium pacificum* Okam (UYEDA) 11D. Presence of pyridine bases in the tar oil from Russian bituminous shales (DODONOV, SOSHESTVENSKAYA) 22. Chromic *p*-toluenesulfonate (JANTSCH, MECKENSTOCK) 6. Electrolytic reduction of



aldehydes (SHIMA) 4. Lignin and cellulose (FREUDENBERG, *et al.*) 23. Lignin (HERZOG, *et al.*) 23. Gas mixtures [extraction of volatile organic substances] (Ger. pat. 479,825) 13.

**Conversion of hydrocarbons with aluminium chloride.** I. G. FARBENIND. A.-G. Brit. 306,437, Oct. 20, 1927. Hydrocarbons sol. in liquid  $\text{SO}_2$  and liquid at ordinary temps. are converted into hydrocarbons of lower b. p. range (up to  $200^\circ$ ) and with a high content of benzene and toluene, by treatment with anhyd.  $\text{AlCl}_3$ , preferably at temps. above  $100^\circ$  and while stirring and passing an inert gas such as  $\text{N}_2$  or  $\text{HCl}$ , through the mixt., with or without increase in pressure. Metallic Al and  $\text{HCl}$  may be used conjointly.

**Catalytic reduction of organic compounds.** A. O. JAEGER (to Selden Co.). Brit. 306,471, Feb. 21, 1928. Catalysts such as those described in Brit. 304,640 (C. A. 23, 4709) are used for the reduction of oxides of C or org. compds. contg. O such as ketones, aldehydes, acids, esters, alcs. or ethers, etc. Oxides of C may be reduced to  $\text{CH}_2\text{O}$ ,  $\text{MeOH}$  or  $\text{CH}_4$ , or, in the presence of alk. stabilizers which cause condensation, to higher alcs., ketones, acids such as propionic and butyric acids and hydrocarbons of a petroleum character. Ketones may be reduced to secondary alcs. and aldehydes to primary alcs. Various other reductions also are described and the reducing gas may be  $\text{H}$  or various hydrocarbons, etc.

**Catalytic production of alcohols, etc.** SOC. L'AIR LIQUIDE, SOC. ANON. POUR L'ÉTUDE ET L'EXPLOITATION DES PROCÉDÉS G. CLAUDE. Brit. 306,512, Feb. 22, 1928. In the catalytic production of oxygenated org. compds. such as alcs., an inert gas such as  $\text{N}$  or an excess of  $\text{H}$  is introduced into the gas mixt. before reaction, and with a gas mixt. of suitable compn. the production of  $\text{NH}_3$  may be combined with that of oxygenated org. compds. An example is given of the production of  $\text{MeOH}$  and  $\text{NH}_3$  from a mixt. of  $\text{CO}$ ,  $\text{N}$  and  $\text{H}$ . An arrangement of app. is described.

**Hydroaromatic amines.** I. G. FARBENIND. A.-G. Brit. 306,414, Feb. 18, 1928. A phenol or hydrogenated phenol such as  $\text{PhOH}$  or cyclohexanol is treated with  $\text{NH}_3$  or an amine such as  $\text{PhNH}_2$  in the presence of  $\text{H}$  and a hydrogenation catalyst such as  $\text{Ni}$ .

**N-Methylsulfites of secondary alkylarylamines.** I. G. FARBENIND. A.-G. (Max Boskmühl and Adolf Schwarz, inventors). Ger. 476,663, July 1, 1922. Addn. to 421,505. N-Methylsulfites of secondary alkylarylamines are prepd. by acting on the amine with  $\text{HCHO}$  and bisulfite. Thus, N-phenyl-2,3-dimethyl-5-pyrazolone-4-ethylaminomethylsulfite is prepd. by the action of  $\text{HCHO}$  and  $\text{NaHSO}_3$  on 1-phenyl-2,3-dimethyl-4-ethylamino-5-pyrazolone. Other examples are given. Cf. C. A. 23, 3715.

**Complex compounds of aromatic p-diamines with sulfur dioxide.** RICHARD WOLFFSTEIN (to I. G. Farbenind. A.-G.). U. S. 1,726,252, Aug. 27. An aromatic p-diamine such as p-tylenediamine or p-phenylenediamine is treated with  $\text{SO}_2$  while excluding water, to form a compd. which is stable in the air.

**Hydroxyalkylamines.** I. G. FARBENIND. A.-G. Brit. 306,563, Aug. 24, 1927. See Fr. 650,574 (C. A. 23, 3232).

**$\alpha$ -Anthraquinonyl ketones.** GEORG KRÄNZLEIN, HEINRICH VOLLMANN and KARL WILKE (to General Aniline Works). U. S. 1,725,927, Aug. 27. By causing chromic acid to act in glacial acetic acid soln. at an elevated temp. upon a benzanthrone in which at least one of the H atoms in the Bz-1 and Bz-2 positions is substituted by a radical of the group including alkyl, aryl, acyl, aroyl, nitrile and carboxyl, the Bz-ring is split up and  $\alpha$ -anthraquinonyl ketones are formed. In this manner there is obtainable by the oxidation of, for instance, Bz-1-phenylbenzanthrone the 1-benzoyl-anthraquinone, by the oxidation of Bz-1-benzanthronylbenzanthrone (Bz-1-Bz-1'-dibenzanthronyl) the hitherto unknown benzil of the anthraquinone series (diphthaloylbenzil) and by the oxidation of Bz-1-hydroxy-Bz-2-phenylbenzanthrone the mono-phthaloylbenzil which is also not yet known. Furthermore, by a moderate oxidation of the Bz-1-methylbenzanthrone the hitherto unknown 1-acetylanthraquinone is obtained. Numerous details and examples are given.

**Ethers of 2-amino-4-nitro-1-hydroxybenzene.** CHEM. FABRIK VORM. SANDOZ. Ger. 479,831, Dec. 20, 1925. Hydroxyalkyl ethers of 2-amino-4-nitro-1-hydroxybenzene are prepd. by treating 2,4-dinitrophenoxyethanol or -propanediol with alkali sulfides or polysulfides. An example is given.

**Alkylisopropylenephenols and alkylcoumaranes.** CHEMISCH FABRIK AUF ACTIEN VORM. E. SCHERING and H. JORDAN. Brit. 306,051, Aug. 15, 1927. These compds. are obtained by the thermal decompn. of condensation products prepd. from m- and

*p*-cresol and aliphatic ketones, as described in Brit. 273,684 (C. A. 22, 1982) in the presence of catalytic material contg. a metal hydrogenation catalyst, a metal phenolate, a porous material such as fuller's earth, diatomite or silica gel, or a metal hydrogenation catalyst carried on porous material, or mixts. of such catalytic materials. Various details and examples are given.

***N*-Substituted cyanoformylides.** DEUTSCHE GOLD-UND SILBER-SCHNEIDAN-STALT VORM. ROESSLER. Brit. 306,450, Feb. 20, 1928. Compds. of the general formula  $\text{ArRN}-\text{COCN}$  in which Ar represents a substituted or unsubstituted aromatic residue and R a substituted or unsubstituted aromatic or aliphatic residue which may be connected to the former residue, are prepd. from the corresponding formic acid chlorides by treatment, in pyridine, with HCN at ordinary or higher temps. Examples describe the conversion of *N*-methyl- and ethylanilidocarbonyl chlorides to the corresponding nitriles and the use also of various other starting materials.

**Indoles.** I. G. FARBENIND. A.-G. Ger. 479,283, Nov. 11, 1926. See Brit. 303,467 (C. A. 23, 4484).

**Lactones.** SOC. ANON. M. NAEF ET CIE. Brit. 306,352, June 26, 1928. See Fr. 657,971 (C. A. 23, 4483).

**Acenaphthene derivatives.** G. T. MORGAN and H. A. HARRISON. Brit. 305,754, Dec. 8, 1927. 2-Nitroacenaphthene is made by nitrating acenaphthene under anhyd. conditions and sepg. the product from the mother liquor (which contains 4-nitroacenaphthene). Anhyd. diacetylorthonitric acid may be used as nitrating agent. 2-Aminoacenaphthene is obtained by reducing 2-nitroacenaphthene (suitably with Na hydrosulfite). Cf. C. A. 23, 1353.

**Thiazole derivatives of 1,4-naphthoquinone.** WILHELM HERZBERG and GERHARD HOPPE (to General Aniline Works). U. S. 1,726,265, Aug. 27.  $\beta,\beta$ -Naphthothiazole-3,8-diones may be obtained by condensing 2-amino-3-mercapto-1,4 naphthoquinone with an aldehyde. The yellow thiazole derivs. are sol. in concn.  $\text{H}_2\text{SO}_4$  with a yellowish color. They yield with  $\text{Na}_2\text{S}_2\text{O}_4$  in the presence of a strong alk. agent a vat, from which cotton is dyed yellow tints.

**Aromatic polynitroamino compounds.** WILLIAM H. BENTLEY and WILLIAM BLYTHE & Co. Ger. 480,343, Nov. 12, 1926. See Brit. 263,552 (C. A. 22, 92).

**Aliphatic acids.** I. G. FARBENIND. A.-G. Brit. 306,097, Feb. 15, 1928. Concn. of acids such as propionic, butyric and isobutyric acids is effected by distg. them with halogenated hydrocarbons, such as  $\text{C}_2\text{H}_2\text{Cl}_2$ ,  $\text{C}_2\text{HCl}_3$  or  $\text{CHCl}_3$  (the added liquid being suitably returned to the still until the water has been removed, after which the halogen compd. is sepd. from the concd. acid by distn.). Cf. C. A. 23, 605.

**Haloalkylarylcarboxylic acids.** HENRI C. J. H. GELISSEN. Ger. 480,362, Apr. 28, 1925. Haloalkylarylcarboxylic acids with the halogen in the alkyl group are prepd. by treating substituted or non-substituted aromatic peroxides with halogenated aliphatic hydrocarbons. Thus, benzoyl peroxide is heated in a reflex condenser with  $\text{CCl}_4$  to give trichloro-*p*-toluic acid. Other examples are given.

**Concentrating acetic acid and similar acids.** HOLZVERKOHLE-INDUSTRIE A.-G. Brit. 306,105, Feb. 16, 1928. In effecting concn. of acids by forming acid salts and then heating these salts, salt mixts. are used which are wholly or in part molten during the subsequent heating stage. Alkali metals or alk. earth metal acetates or other aliphatic acid salts such as butyrates corresponding to the acid being concd. are suitable. Various details are given. Cf. C. A. 23, 4230.

**Barbituric acid derivative.** LES ÉTABLISSEMENTS POULENC FRÈRES. Ger. 481,129, Feb. 3, 1922. The condensation of esters of butylethylmalonic or butylethylcyanoacetic acid such as ethyl butylethylmalonate with urea produces butylethylbarbituric acid, m. 127-128°.

**Barbituric acid and pyrazolone derivative.** CHEM. FAB. VORM. SANDOZ. SWISS 131,927, Dec. 3, 1927. Mol. equivs. of a salt of isobutylallylbarbituric acid and a salt of 1-phenyl-2,3-dimethyl-4-dimethylamino-5-pyrazolone are allowed to combine. The product m. 87-89°.

**A colorless fused product from barbituric acid and pyrazolone derivatives.** SCHERING KAHLEBAUM A.-G. Ger. 481,392, July 17, 1925. Dialkylbarbituric acid and 4-dimethylamino-1-phenyl-2,3-dimethyl-5-pyrazolone are melted in mol. proportions and allowed to cool in an atm. of indifferent gas to prevent oxidation.

**Compounds of dialkyl- and arylalkylbarbituric acid.** F. HOFFMANN-LA ROCHE & Co. A.-G. Ger. 479,669, May 23, 1925. A dialkyl- or arylalkylbarbituric acid and 1-phenyl-2,3-dimethyl-5-pyrazolone are melted in mol. proportions or mixed in a suitable solvent with excess of the acid. Thus, isopropylallylbarbituric acid and 1-phenyl-2,3-dimethyl-5-pyrazolone are dissolved in 92% alc. On cooling an addn

product contg. 1 mol. of each, m.  $94^{\circ}$ , is obtained. Other examples are given. Cf. C. A. 23, 2989.

**Compounds of yohimboic acid.** F. HOFFMANN-LA-ROCHE & Co. A.-G. Swiss 132,448, Feb. 8, 1928. The acid is subjected to the action of alkylating agents. In the example, the acid is boiled with allyl alc., giving the allyl ester.

**Acenaphthene carboxylic acid.** I. G. FARBENIND. A.-G. (Wilhelm Eckert, inventor). Ger. 479,916, July 25, 1928. See Brit. 274,894 (C. A. 22, 2170-1).

**Quinolinecarboxylic acids.** SCHERING-KAHLBAUM A.-G. (Max Dohrn and Albrecht Thiele, inventors). Ger. 481,179, April 1, 1927. Halogen substituted quinoline-carboxylic acids are prepd. by the action of aliphatic keto acids or their esters on halogen substituted isatin. Thus, acetoacetic ester is added to an alk. soln. of 5,7-dibromo-isatin to produce 6,8-dibromo-2-methylquinoline-3,4-dicarboxylic acid, m.  $207-208^{\circ}$ . Other examples mention 6-iodo-2-methylquinoline-3,4-dicarboxylic acid, m.  $235-237^{\circ}$ , and 6,8-dibromoquinoline-2,4-dicarboxylic acid, m.  $258-260^{\circ}$ .

**Sulfonic acids.** I. G. FARBENIND. A.-G. Brit. 306,052, Sept. 14, 1927. Sulfonic acids are prepd. from unsatd. aliphatic or hydroaromatic hydrocarbons or their substitution products by treating them (1) with sulfonating agents in the presence of such compds. as form with the sulfonating agents addn. products of the oxonium, ammonium or sulfonium type, or (2) with esters of chlorosulfonic acid. In "(1)," compds. such as  $\text{Et}_2\text{S}$ , ethyl ether,  $\text{EtOAc}$ ,  $\text{MeOAc}$ , diethylene oxide or pyridine (or substances furnishing such compds.) may be used. Various examples and details are given. Cf. C. A. 23, 4581.

**Sulfonic acids.** I. G. FARBENIND. A.-G. (Karl Dachlauer and Emil Thiel, inventors). Ger. 478,332, April 8, 1926. Addn. to 476,906 (C. A. 23, 3716). Aromatic sulfonic acids are prepd. by the action of  $\text{MeOH}$  or  $\text{EtOH}$  and chlorosulfonic acid or fuming  $\text{H}_2\text{SO}_4$  on aromatic hydrocarbons. Examples are given.

**Aniline.** JOSEPH W. BRITTON and WM. H. WILLIAMS (to Dow Chemical Co.). U. S. 1,726,170, Aug. 27. Reaction between a monohalogenated benzene such as  $\text{PhCl}$  and aq.  $\text{NH}_3$  is effected in the presence of a cuprous compd. such as  $\text{Cu}_2\text{O}$  or  $\text{Cu}_2\text{Cl}_2$  and the aniline oil formed is sepd. from assocd. aq. soln. of Cu compds. and the latter are causticized and the ppt. thus produced is used in further conduct of the first step of the process. U. S. 1,726,171-2-3 describe similar processes of making various arylamines such as aniline, toluidine, naphthylamine or aminoanthraquinone.

**Acetylene.** AKT.-GES. FÜR STICKSTOFFDÜNGER. Brit. 306,042, Feb. 14, 1928. The quantity of water added to carbide is restricted to that necessary to keep the temp. in the generator below  $100^{\circ}$  while producing a substantially dry  $\text{Ca}(\text{OH})_2$ . The carbide is kept in motion and the water may be supplied as a finely divided spray or as steam mixed with  $\text{C}_2\text{H}_2$ . An app. is described.

**Isobutyl alcohol.** I. G. FARBENIND. A.-G. (Martin Luther and Rudolf Wietzel, inventors). Ger. 479,829, Dec. 25, 1923. Isobutyl alcohol is prepd. by the catalytic hydrogenation of a mixt. of  $\text{CO}_2$ ,  $\text{MeOH}$  and O-contg. org. compds. and fractionating the product. Thus, a mixt. of  $\text{CO}_2$ ,  $\text{MeOH}$  and O is hydrogenated under pressure by the aid of a contact mass of Cr, Mo or W. The product is dissolved in alkali to remove unchanged  $\text{MeOH}$ . The rest of the  $\text{MeOH}$  is removed by adding  $\text{HCOOH}$  and distg. off the  $\text{HCOOMe}$ . The fraction of the distillate between  $80^{\circ}$  and  $125^{\circ}$  is 75% isobutyl alcohol. Other examples are given.

**Vinyl alcohol.** CONSORTIUM FÜR ELEKTROCHEMISCHE INDUSTRIE G. M. B. H. (Wolf-ram Haehnel and Willy O. Herrmann, inventors). Ger. 480,866, July 20, 1924. Derivs. of polymerized vinyl alc. are prepd. directly from the polymerized alc. Thus, polymerized vinyl acetate is prepd. by heating a soln. of the polymerized alc. in  $(\text{Ac})_2\text{O}$  with dry  $\text{AcONa}$ . An elastic mass of partially butylated polymerized vinyl alc. is obtained by heating the alc. with butyric acid. Other examples are given.

**Liquefaction of tribromoethylalcohol.** I. G. FARBENIND. A.-G. (Karl Schranz and Siegfried Jaeger, inventors). Ger. 479,520, Dec. 17, 1927.  $\text{CBr}_3\text{CH}_2\text{OH}$  is liquified by treating it with  $\text{AmOH}$ . Cf. C. A. 23, 1217.

**Phenylpropanolmethylamine.** I. G. FARBENIND. A.-G. (Friedrich Stolz, inventor). Ger. 481,436, May 31, 1927. Phenylpropanolmethylamine is prepd. by diazotizing *p*-aminophenylpropanolmethylamine with 1 mol. of nitrite in acid soln. and reducing the product.

**Dipthaloylbenzoin.** I. G. FARBENIND. A.-G. (Berthold Stein, inventor). Ger. 481,291, Dec. 24, 1925. Dipthaloylbenzoin is prepd. by treating a soln. of  $\alpha$ -methyl-anthraquinone or its derivs. and substitution products, in conc.  $\text{H}_2\text{SO}_4$ , with oxidizing agents such as  $\text{MnO}_2$  or  $\text{PbO}_2$ , at temps. over  $60^{\circ}$ .

**Bornyl and isobornyl acetates.** L. SCHMIDT. Brit. 306,385, Feb. 18, 1928. Pinene

is heated to the b. p. with a mixt. of 3 mol. proportions of  $\text{Ac}_2\text{O}$  and 1 mol. proportion of  $\text{H}_3\text{BO}_3$  or smaller proportion of the  $\text{Ac}_2\text{O}$  and  $\text{H}_3\text{BO}_3$  may be used with subsequent addn. of glacial  $\text{HOAc}$ . Brit. 306,387 specifies removal of B compds. from similar reaction mixts. when the ester content is constant and adding small quantities of an org. or inorg. acid as catalyst.  $\text{H}_3\text{PO}_4$ ,  $\text{HNO}_3$ ,  $\text{H}_2\text{SO}_4$ ,  $\text{HCl}$  or oxalic, benzenesulfonic, or toluenesulfonic acids may be used. Addnl. heating at relatively low temps. produces an ester content increase of 15-20%.

**2-Mercaptobenzothiazoles.** I. G. FARBENIND. A.-G. Brit. 306,492, Feb. 21, 1928. o-Nitrochlorobenzene or a homolog, analog, or substitution product is heated with an alkali metal hydrosulfide,  $\text{NH}_4\text{HS}$  or an alk. earth metal hydrosulfide, the reaction mixt. is cooled,  $\text{CS}_2$  is added, and the mixt. is reheated. The hydrosulfide used may be mixed with the corresponding sulfide and the process is carried out in the presence of water or an inert solvent such as alc. or a mixt. of these, and almost quantitative yields are obtained. Several examples are given.

**2,3-Diaminoanthraquinone.** SOC. ANON. POUR L'IND. CHIM. À BÂLE. Ger. 480,848, June 22, 1922. To prepare 2,3-diaminoanthraquinone, 2-amino-3-bromoanthraquinone is heated to 175-180° in an autoclave under pressure with 28%  $\text{NH}_3$  soln. in the presence of a catalyzer such as  $\text{CuSO}_4$  salt.

**Triacetonepinacone.** I. G. FARBENIND. A.-G. (Richard Leopold, inventor). Ger. 480,034, June 23, 1925. Triacetonepinacone and 2,6-dimethylheptane-2,4,6-triol are obtained by dissolving triacetonedialcohol in water, satg. with  $\text{CO}_2$  and treating with Na-amalgam. The amalgam is added gradually so that the soln. is never alk. The pinacone deriv. which seps. is filtered off washed and dried. The triol is obtained from the filtrate by adding  $\text{KOH}$ .

**Proline and similar compounds.** JOSEPH KAPFHAMMER. Ger. 479,731, Apr. 25, 1926. Proline, hydroxyproline and similar nitrogenous compds. are obtained from animal and vegetable exts. by hydrolyzing and adding ammoniumdiamminechromium cyanide. The ppt. is dissolved in water or alc. and heavy metal salt soln. added to ppt the complex Cr compds. formed. The proline is obtained from the filtrate by evapn. Examples are given.

**1-Phenyl-2,3-dimethyl-4-dimethylamino-5-pyrazolone.** I. G. FARBENIND. A.-G. Ger. 479,348, Dec. 20, 1927. Addn. to 469,285. 1-Phenyl-2,3-dimethyl-4-dimethylamino-5-pyrazolone is prepd. by treating an acidified aq. suspension of 1-phenyl-2,3-dimethyl-4-nitroso-5-pyrazolone with  $\text{HCHO}$  or its polymers, and  $\text{H}_2$  in presence of a Pt or Ni catalyzer, under high pressure.

## 11—BIOLOGICAL CHEMISTRY

PAUL E. HOWE

### A—GENERAL

FRANK P. UNDERHILL

**Denaturation of proteins. VII. Denaturation versus coagulation.** H. WU. *Chinese J. Physiol.* 3, 1-6(1929).—After flocculation, denatured egg-albumin differs from coagulated egg-albumin in its soly. in acids, alkalis, or in concd. carbamide soln. Denatured egg-albumin differs from the native protein in not being coagulated by alc. or by shaking. Therefore, probably, denaturation is not a step in the coagulation of protein but the essential step in denaturation is hydrolytic fission, while in coagulation it is mol. condensation. **VIII. Effect of denaturation and coagulation on acid- and base-binding power of proteins.** H. WU AND T. T. CHEN. *Ibid* 7-27.—A soln. of denatured egg-albumin contg. sufficient acid to be on the acid side of the isoelec. point has a  $pH$  greater than a soln. of the native protein contg. the same quantity of acid. Similarly a soln. of denatured egg-albumin contg. alkali has a lower  $pH$  than a soln. of native protein contg. the same quantity of alkali. Similar results are obtained with serum-globulin and hemoglobin. The greater buffering action of denatured as compared with native protein may be due to hydrolytic fission during denaturation. Coagulated protein has less buffering action than native protein. This may be due to mol. condensation during coagulation, but other possible explanations are given. **IX. Liberation of non-protein substances on denaturation and coagulation of proteins.** *Ibid* 75-9.—Highly purified egg-albumin was heated at 100° for 15 min. with various quantities of acid or alkali. The cooled and neutralized solns. were filtered from protein which had been coagulated or denatured and flocculated. Any conalbumin pptd. by further heating for 15 min.

was removed by filtration. The filtrates were tested by the phenol reagent and  $\text{Na}_2\text{CO}_3$ ; at the isoelec. point there was no liberation of chromogenic substances on heating, but on either side of this point there is some liberation, much more on the alk. than on the acid side. B. C. A.

**Action of  $p_{\text{H}}$  on striated muscles.** S. GOLDBERGER. *Atti accad. Lincei* 9, 812-6 (1929).—Isolated, striated muscles of frog were used. These were held in Ringer soln. and the  $p_{\text{H}}$  was varied by adding either 0.1 N HCl or 0.1 N NaOH, the  $p_{\text{H}}$  value being detd. by means of the Hellige colorimeter. A current was then passed through the muscle and min. and max. excitability as well as the height of the contraction measured. For  $p_{\text{H}}$  5.8-9.0 the max. contraction is the same even after 120 min.; for  $p_{\text{H}}$  = 4.7-3.2 it drops to less than 0.5 in 120 min. A. W. CONTIERI

**Alkaline reserve of sea water.** R. MARGARIA. *Atti accad. Lincei* 9, 816-20 (1929).—To study the effect of injection of sea water in animals, its alk. reserve has been measured by measuring the amt. of  $\text{CO}_2$  it will absorb under various pressures of  $\text{CO}_2$ . The amts. vary from 6.52 (cc.  $\text{CO}_2$ /100 cc. water) at a pressure of 0.774 mm. of  $\text{CO}_2$  to 13.3 at a pressure of 51.6 mm. of  $\text{CO}_2$ , or  $p_{\text{H}}$  varies from 7.5 to 6.2; i.e., absorption of  $\text{CO}_2$  from the animals blood is a negligible factor when studying the effect of injections of sea water in animals. A. W. CONTIERI

**Chemical constitution and musk odor.** MARSTON T. BOGERT. *Am. Perfumer* 24, 235-8, 357-8 (1929).—A discussion of the mol. structure and synthesis of substances possessing the musk odor, in connection with the chem. constitution and odor of the higher cyclanones. W. O. E.

**Investigations in the blood group.** W. PFANNENSTIEL. *Arch. Pharm.* 267, 489-502 (1929).—An address. W. O. E.

**Liberation of iodine from iodides by solutions in oil of cholesterol and ergosterol irradiated by sunlight.** ÉMILE ROUSSEAU. *Compt. rend.* 189, 37-9 (1929).—Solns. of cholesterol (I) and ergosterol (II) in (live oil (0.5%) were very carefully prepd. to exclude air and other oxidizing agents. Solns. of iodides were added and the mixts. placed in quartz tubes and exposed to sunlight. I was liberated in an amt. proportional to the time exposed. The oxidizing ability of II was 1.5 times as great as that of I and 10 times as great when exposed to sunlight as when irradiated by rays from a Hg arc light—3650 Å. U. or mixt. of 3650, 3341 and 3132 Å. U. I. M. LEVINE

**Oxidizing action of sunlight on a solution of zymosterol in oil.** ÉMILE ROUSSEAU. *Compt. rend.* 189, 173-4 (1929); cf. preceding abstr.—The procedure of irradiating sterols by sunlight and measuring the effectiveness by the amt. of  $\text{I}_2$  liberated from a KI soln. mixed with it is applied to an olive oil soln. of zymosterol. This sterol is about 50% as effective as the cholesterol used which may contain some of the powerful ergosterol. I. M. LEVINE

**The photographic effect produced by sterols after exposure to ultra-violet rays.** J. CLUZET AND KOFMAN. *Compt. rend.* 189, 45-7 (1929).—Sterols, when irradiated by ultra-violet rays, affect a photographic film. Theoretically, this effect may be produced by rays emitted by the irradiated substance or by gases formed as a result of the irradiation. The expts. of C and K. support the latter idea. The wave length of the rays absorbed by the sterols are 2800-3000 Å. U. According to Stokes law the wave length of emitted light should be greater than that absorbed, yet sheets of quartz or cellophane which are transparent to light of 2302 and 2805 Å. U. prevent the passage of these rays, for when these substances are interposed between the sterol and the film the latter is unaffected even after 12 days. The activity is also decreased or lost after exposure to a temp. of 80° or to infra-red rays. On the other hand the photographic activity may be brought about by exposure to x-rays with a penetration equiv. to a 20 cm. spark or to the rays from 10 mg. of  $\text{RaBr}_2$ . I. M. LEVINE

**The photochemical activity of various sterols and the nature of their action.** L. HUGOUNENQ AND E. COUTURE. *Compt. rend.* 189, 47-9 (1929); cf. C. A. 23, 2728.—When exposed to diffused light the sterols in cod-liver oil (1) cholesterol (Bombyx) and beer yeast affect a photographic plate. The former loses its activity when placed in complete darkness for 2 months. The following sterols become active when exposed to sunlight for a month under a thin sheet of cellophane: those present in ox blood, in the fatty substance from the human brain and powd. ergot of rye. Sunlight intensifies the activity of 1. Among the sterols inactive after exposure to sunlight are those present in ox brain, egg, herring and bile calculi. When subjected to the action of a Hg vapor lamp for 0.5 hr. at a distance of 60 cm. the results were similar. Only 1 showed the same activity when the photographic plate was placed 3 mm.-6 cm. from the sterol. The activity is accelerated when the substance is heated to 40° in the presence of an oxidizing

agent as  $\text{MnBO}_2$ . A sheet of transparent quartz prevents the activity. Indole and skatole upon exposure to sunlight acquire photochem. activity as do the sterols, besides becoming resinified. That the action of sunlight or other radiation is chem. is shown by the fact that the sterols become yellow and there is evolved at ordinary temp. a volatile, heavy substance which reduces ammoniacal  $\text{AgNO}_3$  and which reacts positively to Schiff's reagent, signifying the presence of an aldehyde. Active  $\text{O}_2$  is also present since  $\text{I}$  is liberated from a soln. of  $\text{KI}$  acidified with 15%  $\text{H}_2\text{SO}_4$ .  $\text{H}_2\text{O}_2$  has never been detected. It is believed that some sterols form ozonides due to the presence of double bonds.

I. M. LEVINE

**Oxidation-reduction systems of biological significance. IV. Comparative study of the complexes of cysteine with metals of the iron group.** L. MICHAELIS AND E. S. GUZMAN BARRON. *J. Biol. Chem.* 83, 191-210(1929); cf. *C. A.* 23, 2729.—At  $\text{pH}$  7 to 8  $\text{Ni}$  gives a Bordeaux red complex with cysteine both in the presence and absence of  $\text{O}_2$ . A slightly olive-green cobaltous complex is obtained in the absence of  $\text{O}_2$  but the color is pink if there is a large excess of cysteine. The cobaltous complex is rapidly oxidized by air, org. dyes, or  $\text{K}_3\text{Fe}(\text{CN})_6$  to a brown complex in which the ratio of  $\text{Co}$  to cysteine is 1:3, and the amt. of  $\text{O}_2$  consumed is 0.5 mol. The amt. of  $\text{K}_3\text{Fe}(\text{CN})_6$  or phenolindophenol reduced by cobaltous cysteine is equiv. to the  $\text{O}_2$  consumption. The course of the potential shows 2 distinct steps of oxidation when cobaltous cysteine is titrated with  $\text{K}_3\text{Fe}(\text{CN})_6$ . The potential of pure cobaltous cysteine at  $\text{pH}$  7.5 practically matches that of the  $\text{H}$  electrode for the same  $\text{pH}$ . Cobaltous cysteine is one of the most powerful reductants at  $\text{pH}$  7.5 to 8. It gives a brown complex with cystine in the absence of  $\text{O}_2$ .  $\text{Co}$  and  $\text{Ni}$  are no catalysts for the oxidation of cysteine. The violet  $\text{Fe}$  complex of cysteine at  $\text{pH}$  7 to 8 corresponds to the oxidized form of the  $\text{Co}$  complex but is different insofar as it is labile, leading to the formation of cystine and making  $\text{Fe}$  a catalyst. The study of the  $\text{Co}$  complex is important because the end product of its oxidation is a compd. which is analogous to an intermediary compd. in the case of  $\text{Fe}$  and will permit the study of the intermediary state in the  $\text{Fe}$  catalysis.

A. P. LOTHIROP

**Purine substances and uric acid. I.** I. DAMAS. *Bull. sci. pharmacol.* 34, 282-96 (1927).—A survey of the purine compds and the chemistry of uric acid is given. Different methods of detn. of uric acid are described. The quickest method is that of Ronchèse, that of Kayser and Le Breton permits the detn. of both uric acid and xanthinic compds. **II.** *Ibid* 35, 111-23(1928).—The method of Ducung employs a soln. composed of equal parts of a 0.228% soln. of  $\text{CuSO}_4$  and an other one contg. 2.5%  $\text{Na}_2\text{S}_2\text{O}_8$  and 2.5% of Seignette's salt. One cc. corresponds to 1 mg. uric acid. In a soln. of uric acid exact results are obtained, but in normal urines, the results are exactly 50% higher. It is supposed, that in urines, 2 mols. of uric acid are combined with 1 mol. of a hypothetical substance that reacts with one  $\text{Cu}$ . In urines contg. urates, the uric acid is not present in that form. The methods of Folin and Wu, Grigaut, Guillaumin and Laudat for the detn. of uric acid in blood are described.

A. E. MEYER

**Contribution to the study of the purification of pepsin by application of its physico-chemical properties.** JACQUES PLÉ. *Rev. gen. colloides* 7, 193-201(1929).—The methods used have been described by Fuld and Levison (*C. A.* 2, 1156) and by Plé (*Doctorate Thesis, Univ. of Paris*, p. 26). Results obtained for the action of acetone on pepsin were: (1) In every case the wt. of ppt. obtained is slightly lower than the wt. of pepsin taken, because of a slight soln. of the pepsin ext. or of a component of that ext. in the acetone liquid. (2) At a  $\text{pH}$  of 1.03 the ppt. obtained is insol. and completely inactive, as if the acetone in very acid media causes an irreversible coagulation of colloidal pepsin. (3) At  $\text{pH}$  2.5, in the neighborhood of the isoelec. point of pepsin, the activity in pepsin units (the wt. of each ppt. multiplied by the French Pharm. no.,  $T$ , of the pepsin, the latter value being the wt. in g. of dried pork fibrin hydrolyzed by 1 g. of pepsin under defined conditions of time, acidity and temp.) is const. even at the end of 48 hrs. contact with acetone. (4) At  $\text{pH}$  3.6 and 4.7 there is a gradual decrease in activity; at  $\text{pH}$  5.4 the decrease is rapid for about 8 hrs., then gradual, then more rapid after 20 hrs. (5) At  $\text{pH}$  6 the activity is decreased 50% at the end of 1 hr. of acetone contact, while at  $\text{pH}$  7 the diminution in the same time attains 90%. (6) At  $\text{pH}$  2.5 the curve for the wts. of ppts. obtained shows a noticeable flexure between acetonic percentages of 50-70%; at 90% the wt. of pptd. pepsin is nearly equal to the original wt. taken. (7) The relation between acetonic percentage and pepsin units shows a rapid increase in the latter between percentages of 60 and 75%. (8) To obtain sol. ppts. it was necessary to cause the acetonic ppts. at  $-18^\circ$ . The ppts. obtained at  $+18^\circ$  were barely sol. (9) The flexure of the curve at 60% shows that there is a coeff. of partition between the ppt. and the remaining liquid. (10) The value of  $T$  (see above) for the original pepsin was 1000 and after treatment the value of  $T$  at 70-75% acetone was 1700. (11) The best

yield is obtained with an acetonic percentage of 75 (yield in pepsin units was 463) where the theoretical yield is 500 pepsin units. The flocculation should take place at  $p_H$  2.5. The results of the action of alc. on pepsin were: (1) The pepsin is best pptd. at a  $p_H$  of 2.5. (2) The values of  $T$  are, especially at  $p_H$  2.5, higher than the  $T$  values of the pepsin used initially. The pepsin units are relatively low with respect to the same procedure with acetone. (3) There is not complete inactivity between the alc. and pepsin in very acid media. (4) The wts. of pepsin ppts. obtained by the addn. of abs. alc. are lower than the wts. obtained with acetone. (5) At a temp. of  $18^\circ$  the ppts. are nearly all insol. and show proteolytic activities much lower than the acetonic ppts. (6) If the temp. is lowered to  $-18^\circ$ , the alc. ppts. dissolve readily and the proteolytic activity exceeds 2000 for a pepsin whose initial  $T$  value was 1000. (7) Acetone is preferable as a flocculating liquid for the purification of pepsin since the wts. of the ppts. formed are about twice as great as with alc. pptn. The results of Fenger and Andrew (C. A. 21, 2706) are confirmed. The results obtained by P. are illustrated graphically. The following method is proposed by P. for the purification of a pepsin of  $T = 1000$ . Dissolve 1 g. of pepsin, at  $18^\circ$ , in 6 cc. of distd.  $H_2O$ , add 1.2 cc. of  $N HCl$ ; add sufficient distd.  $H_2O$  to make the total vol. equal to 10 cc. The  $p_H$  of the soln. is 2.5. Add 30 cc. of pure anhyd. rectified acetone; centrifuge the mixt., decant the supernatant liquid, dry the pepsin in a vacuum. Its  $T$  value will be increased at least  $3/4$  of its initial value, the yield being about 55%  
A. J. MONACK

**Black pigments of adrenaline and natural melanins.** G. GALLERANI. *Arch. ital. biol.* 80, 1-8(1928).—Hydroxytyrosine obtained from plants has not been demonstrated in animal tissues just as the dopa-oxidase has not yet been isolated. Neither have the black granules of dopa been obtained from cellular elements which commonly give rise to melanins. The pigmentation of the skin is due to pyrrole compds. Exts. of melanotic tumors blacken pyrrole and pyrrole blackens these tumors both *in vivo* and *in vitro*. The enzymes from melanotic tumors do not alter tyrosine but do affect *p*-hydroxyphenylethylamine. Melanogen obtained by Eppinger from melanosarcoma patients produces reactions in the urine which are similar to those following the administration of pyrrole derivs. Following administration of dopa the urines give alcatonic reactions due to phenol but not pyrrole compds., and furthermore do not show the spectrophotometric peculiarities of melanuria. Upon injection of hydroxytyrosine into rabbits the urines show a much greater absorption than normally in the region of least refrangibility of the spectrum and lesser absorption in the region of greater refrangibility. On the contrary, after the injection of pyrroles, quinone-pyrrole black or of adrenaline treated with  $Cl$ -water and exposed to ultra-violet radiation the spectrophotometric findings are just the reverse. Adrenaline oxidizes very readily, especially in alk. medium and thus loses its sympathico-mimetic action. In Addison's disease it is supposed that there is a preponderance of the pigment over the unoxidized adrenaline.  
S. MORGULIS

**Studies on the behavior of amylase in the presence of crude starch.** GIULIO RAFAELI. *Arch. ital. biol.* 80, 161-6(1928).—The electrolyte  $NaCl$  is necessary for the fixation of salivary amylase by crude starch.  $Ca$  is not indispensable for the fixation.  
S. MORGULIS

**Enzyme reaction.** MARIO CAPOCACCIA. *Arch. ital. biol.* 80, 196-205(1928).—Pos. results with the serum enzyme reaction are described in a great variety of exptl. and chemical conditions provided the ninhydrin test is performed with the antigen which had undergone preliminary digestion with pepsin- $HCl$  to the albumose stage. Similar pos. results were obtained even when tissues previously fixed with formaldehyde were employed.  
S. MORGULIS

**Chemical characterization of the serum proteins.** H. K. BARRENSCHEEN and LUISE MESSINER. *Biochem. Z.* 209, 251-62(1929).—Careful treatment of serum proteins with  $H_3PO_4$ , according to Rimington's method shows that the globulins take up much more of the acid than the albumins. Similar results are obtained when the serum proteins are methylated according to the Kossel-Edlbacher procedure, but the results by the methoxy method are much higher. The methylimide values for globulins, except the pseudoglobulins, are considerably lower than those for the albumins. Proteins methylated with dimethyl sulfate can also be phosphorylated. The combination with the  $H_3PO_4$  is assigned a significance on the assumption that it takes place with the free  $OH$  groups of the oxy-amino acids which can thus be detd. in the protein mol.  
S. MORGULIS

**Studies on the increase of lichenase and cellulase.** V. A note on the enzymes of barley malt of Pringsheim. GEORG OTTO. *Biochem. Z.* 209, 276-89(1929).—Ways are described for increasing the activity of lichenase and cellulase. S. MORGULIS

**The influence of hydrogen-ion concentration on the salt flocculation of serum**

proteins. II. D. v. KLOBUSITZKY. *Biochem. Z.* 209, 304-11(1929); cf. C. A. 19, 3277.—The flocculation of serum albumin and serum globulin purified by electrodialysis was studied with satd. NaCl solns. at different  $p_H$  values. Unlike the whole serum, these serum proteins flocculate only below the isoelec. point. Pseudoglobulin mixed with euglobulin is stable at the isoelec. point. The flocculating effect of NaCl is closely dependent on the H-ion concn. The results speak against the dehydration hypothesis.

S. MORGULIS

Studies on the decomposition of gelatin by acetic anhydride. Isolation of acetylated compounds from partially dehydrated polypeptides. IV. The decomposition of proteins and of their derivatives. A. FODOR AND CHASUVA EPSTEIN. *Biochem. Z.* 210, 24-41(1929); cf. C. A. 22, 431, 23, 618.—The tripeptide deriv. resulting spontaneously from the action of  $Ac_2O$  on gelatin or gelatin peptone is a dehydrated glycypropyl-alanine or glycyhydroxypropylalanine. Upon splitting off the glyccoll prolyl- or hydroxypropylalanine results.

S. MORGULIS

The combination of curare with certain proteins and dyestuffs and the dependence of this process upon the  $p_H$ . V. M. KARASSIK, ANNA PETRUNKINA AND MICHAEL PETRUNKIN. *Biochem. Z.* 210, 70-5(1929).—Gelatin and brain proteins having a high  $p_H$  combine with curare. They become colored and poisonous while the curare soln. itself loses much of its toxicity and color. If the protein has a low  $p_H$  it remains colorless and innocuous, while the curare soln. retains its golden-yellow color and toxicity. The ability of Congo red to detoxicate curare is due, at least partly, to the  $SO_3$  groups. This property is also shared by other dyes of the same group, by germanin and to a much smaller degree also by the non-colloidal naphthionic acid.

S. MORGULIS

The hemolytic action of some decomposition products of lecithin, lecithides and phosphatides. I. Products of intermediate hydrolysis. HUGO MAGISTRIS. *Biochem. Z.* 210, 85-119(1929).—Through the action of cobra venom and bee poison products of intermediary hydrolysis were obtained from egg lecithin as well as from various lecithides and phosphatides of plant and animal origin, and these were investigated from the standpoint of their hemolytic effect. Lysolecithin and lysocephalin were obtained from egg lecithin and sepd. The former crystallizes from hot pyridine in fine needles which are very hygroscopic. It is easily sol. in  $CHCl_3$ , glacial acetic acid, pyridine, MeOH and EtOH but is insol. in ether, petr. ether or acetone. In  $H_2O$  it swells strongly and finally dissolves. Analyses show that it is a choline ester of palmityl glycerolphosphoric acid. It exerts a hemolytic action up to a diln. of 1:26400. The lysocephalin can be obtained as flat, transparent and non-hygroscopic needles from hot  $CHCl_3$ . It is not easily sol. in pyridine or glacial acetic acid while in ether, acetone and petr. ether it is insol. It m.  $212.6^\circ$ . It is hard to prep. in pure condition and it seems probable that freed from lysolecithin it has no hemolytic action. Lytic products were also prepd from various animal lecithides. Cephalin from the brain was acted upon by cobra venom. The resulting lysocephalin was not very pure and its hemolytic effect disappeared in a diln. 1:2000. A small quantity of lysolecithin was obtained as by-product and this exerted a much stronger hemolytic action. The suggestion is made that only such split products of lipid having choline in the mol. have a hemolytic effect, while the slight action of those products contg. the amino-ethyl alc. group depends only on contamination with the former. Lysosphingomyelin prepd from brain sphingomyelin with poison obtained from bees has a very slight hemolytic action. In this case only lignoceric acid but no cerebronic acid nor base is set free by the enzyme. Cobra venom hydrolyzes pancreatic lecithin to lysolecithin which is still active hemolytically in a diln. of 1:7200; from horse brain lecithin a product is formed active in a diln. of 1:6100. Lecithin from the testes yielded lysolecithin with bee poison which could not be easily crystd. but was hemolytically active in a diln. of 1:7700. All these preps. of lysolecithin were considerably less effective than that made from the egg yolk lecithin. This lower activity is attributed to protein and carbohydrate impurities. The prepn. of hemolysins from native phosphatides obtained by dialyzing vegetable material (peas) against distd.  $H_2O$  was also undertaken, but these were very weak in action because of much contamination. Lysolecithin was prepd. from a variety of plant lecithides (MeOH-benzene extn. of oat seeds, Möystad and soy beans. All show very slight hemolytic action. Radiation of egg lecithin with ultra-violet, which causes the splitting off of choline, considerably reduces the hemolytic action of the lysolecithin prepd. Likewise, lysolecithin subjected to ultra-violet radiation loses much of its hemolytic action. The formation of lysolecithin in the hydrolysis of lecithin by the enzymes of venoms is not merely due to a splitting off of a fatty acid radical but to an actual rearrangement of the mol. It is suggested that the free OH of the choline group combines with the OH of the glycerol mol. which becomes free upon the splitting off of the fatty acid.

S. MORGULIS



**The mechanism of action of muscle-phosphatase, cozymase and of insulin.** J. BODNÁR AND BÉLA TANKÓ. *Biochem. Z.* 210, 143-74(1929).—Muscle powder obtained from pigeon breast muscle causes phosphorylation in the mixt.  $\text{Na}_2\text{HPO}_4 + \text{NaF} + \text{glycogen} + \text{muscle powder}$ . The amt. of  $\text{H}_3\text{PO}_4$  esterified by the muscle powder increases greatly with the phosphate concn.; 0.25 g. muscle powder esterifies at most 11.42 mg.  $\text{P}_2\text{O}_5$ . Juice obtained by boiling muscles has no effect on action of the muscle powder, from which it is concluded that the latter contains the max. amt. of cozymase. Muscle powder washed at room temp. with water loses very much of its  $\text{H}_3\text{PO}_4$ -esterifying capacity because of the loss of cozymase since the esterifying power can once again be appreciably raised by the addn. of boiled muscle juice. However, the loss of esterifying powder must partly also be due to the injury of the phosphatase itself. The boiled juice from yeast can likewise restore the lost esterification power of the dry muscle powder so that cozymase from both animal and vegetable sources acts similarly. Washing the muscle powder at  $0^\circ$  removes the cozymase but has a much less striking influence upon the phosphatase itself. The  $\text{H}_3\text{PO}_4$ -esterifying capacity of muscle powder is well preserved and even after 5 weeks only 20% is lost. On the contrary, the  $\text{H}_3\text{PO}_4$ -esterifying power of muscle pulp disappears very rapidly. Insulin has no effect on the  $\text{H}_3\text{PO}_4$ -esterifying activity of either fresh or dry muscle pulp muscle powder. It exerts no noticeable action even on cozymase-free muscle powder, the occasional increase of the phosphatase activity being attributed to the high phosphate content of the insulin.

S. MORGULIS

**The effect of trypsin on conjugated bile acids.** A. VON BEZNÁK. *Biochem. Z.* 210, 261-4(1929).—Trypsin does not split the glycocholic or taurocholic acids. They can therefore form combinations with fatty acids in the intestine preliminary to their absorption in the intestine.

S. MORGULIS

**Combination of conjugated bile acids with fatty acids and its significance for the resorption of fat.** II. Solubility and diffusibility. F. VERZÁR AND A. KÚTHY. *Biochem. Z.* 210, 265-80(1929); cf. *C. A.* 23, 3261.—The soln. of fatty acids in bile acids depends upon the formation of mol. and later of colloidal complexes. This has been demonstrated by nephelometric studies which showed that when the concn. of the bile acids exceeds a certain limit the fatty acids no longer give a clear soln. but form a turbid emulsion. This is much clearer and more stable than an ordinary fatty acid emulsion but nevertheless consists of large aggregates. Diffusion expts. at different concns. and  $p_{\text{H}}$  values show that actually in the more concd. solns. less of the fatty acids are diffusible. Fatty acids in combination with bile acids diffuse though more slowly than the bile acids alone. However, neither neutral fat nor fatty acids alone are diffusible. Similar results are obtained by ultrafiltration expts. The solns. are pptd. by cations and by positively charged colloids. It was possible to prep. 0.25% aq. solns. of oleic, stearic or palmitic acids together with bile acids in which, even at a  $p_{\text{H}}$  6.25, the fatty acids were largely diffusible. The significance of this fact for the intestinal absorption of fat is discussed. III. Surface tension. *Ibid* 281-5.—Changes in surface tension at different  $p_{\text{H}}$  values corroborate the finding that in neutral or slightly acid medium water-sol. complexes are formed from fatty acids and bile acids. These are characterized by low tension.

S. MORGULIS

**Malt amylase.** VI. Adsorption of amylase by blood charcoal and kaolin at different  $p_{\text{H}}$  values as manifested by the dextrin- and sugar-forming capacity. TH. SABALITSCHKA AND R. WEIDLICH. *Biochem. Z.* 210, 414-33(1929); cf. *C. A.* 23, 3242.—Blood charcoal adsorbs amylase poorly at  $p_{\text{H}}$  6.0-6.2 but much better at  $p_{\text{H}}$  3.2. Kaolin adsorbs amylase more effectively, and increases from  $p_{\text{H}}$  6.2 to 4.5 but decreases somewhat at  $p_{\text{H}}$  3.0. At  $p_{\text{H}}$  4.5 Merck's diastase is completely adsorbed by a four-fold quantity of kaolin. When adsorption is carried out at  $p_{\text{H}}$  6.2-4.5 and the enzymic activity is tested at the opt.  $p_{\text{H}}$  no change is observed in the dextrin and sugar-forming capacity, but this is injured when the adsorption is made at  $p_{\text{H}}$  4.0, and still more at  $p_{\text{H}}$  3.0, the dextrin-forming capacity suffering much more than the sugar-forming. If the adsorption is at  $p_{\text{H}}$  2.8 both amylase effects are practically destroyed.

S. MORGULIS

**Lactic acid formation from sucrose under pressure.** H. WOLFF. *Biochem. Z.* 210, 458-65(1929).—Sucrose treated under pressure with  $\text{CaO}$  yielded 73% of lactic acid; under similar conditions invert sugar yielded only 38%. The formation of formic acid was in the reverse order.

S. MORGULIS

**Further evidence of the desmolytic production of methylglyoxal by yeast.** CARL NEUBERG AND MARIA KOBEL. *Biochem. Z.* 210, 466-88(1929); cf. *C. A.* 23, 1427.

S. MORGULIS

**Influence of the production of fats upon the constitution of proteins.** TETSUTARO TADOKORO. *Sapporo J. Forestry and Agr.* 19, 199-204(1927).—Fats found in plants and

animals are formed chiefly from carbohydrates. The reductive deamination of proteins will form fatty acids. Since this reductive deaminating action is considered to be induced in animal and vegetable bodies, the fat-producing action of the plants and animals will have a great bearing upon the constitution of proteins found in them. When the isoelec. point of the protein shifts from the acid to the alk. region the sp. rotation increases and the fat content decreases. In rice the species that is rich in fat is also rich in albumin and globulin, while the oryzenin, which is the chief protein of rice, is more acidic in the species low in fat and protein. In the species with great fat-producing action the free amidic radical in the protein decreases, because the amino-acid addition reaction is not sufficient to meet the production of fat. Both in plants and animals the fat-producing action is greater in female than in male. K. SOMEYA

Light rays for therapeutic purposes (Brit. pat. 306,112) 4.

Cleavage products of albumin. SWIGEL POSTERNAK and THEODOR POSTERNAK. Swiss 132,234, Mar. 31, 1926. Addn. to 125,830. A Ca compd. of a P-contg. cleavage product of albumin is obtained by digesting egg yolk with pepsin in presence of a mineral acid, neutralizing with the salt of an org. acid, filtering and subjecting to a tryptic digestion in a weak alk. medium. The product is weakly acidified, and the filtrate treated with a heavy metal salt, producing cleavage products of albumin contg. P and Fe. These are treated with a Na salt, dissolved in alc., distd. in alc. and treated with a Ca compd.

## B—METHODS AND APPARATUS

STANLEY R. BENEDICT

pH of blood. GYULA HOLLÓ AND ISTVAN WEISS. *Bull. soc. chim. biol.* 10, 1372-5(1928).—A reply to criticisms by Bigwood (*C. A.* 22, 2182) of the author's method for the detn. of the pH of blood. B. C. A.

pH of blood. E. J. BIGWOOD. *Bull. soc. chim. biol.* 10, 1376-7(1928); cf. *C. A.* 22, 457.—While no objection is made to the method of Holló and Weiss (preceding abstr.) it is doubtful whether their method is more accurate than those of Cullen and Hastings B. C. A.

Graph for urine analysis. J. DÉCADE. *Bull. soc. chim. biol.* 10, 1343-4(1928).—In the graph described the acidity and normal total N, carbamide, uric acid,  $P_2O_5$  and NaCl contents are multiplied by a suitable factor so that each possesses an equal numerical value. Thus, when analyses of pathol. and normal urine are compared graphically, the deviations from the normal may be easily read. B. C. A.

Microchemical determination of sodium in biological liquids and tissues. P. GRABAR. *Bull. soc. chim. biol.* 11, 58-64(1929).—After oxidation of the org. matter by treatment with hot  $HNO_3$  in a silica flask, phosphates are removed from the residue as ferric phosphate and the Na is detd. by a modification of the U method of Blanchetière (*C. A.* 17, 3006). The av. error is within 1%. B. C. A.

Validity of determinations of "immediately reducing blood sugars." I. Determination of blood sugars. G. FONTÈS AND L. THIVOLLE. *Bull. soc. chim. biol.* 11, 146-51(1929).—A discussion of previously published work (*C. A.* 22, 2177, 2588). The addn. of yeast to plasma or to blood, stabilized with oxalic acid, results in complete elimination of the reducing sugars. II. Total amount of fermentable sugar of the blood. *Ibid* 152-8.—Deproteinization of laked blood or of blood plasma with tungstic acid affords a filtrate which contains only fermentable sugars; if  $Hg(NO_3)_2$  or  $Zn(OH)_2$  is used, a varying proportion of the sugar is found to be unfermentable. It is suggested that the two last-named reagents displace reducing, unfermentable substances from the proteins. III. Absence of influence of disulfides and thiol compounds on sugar determinations by the phosphomolybdic acid and potassium permanganate method. *Ibid* 159-67.—Although in some circumstances large amts. of S compds. interfere in the detns. of sugars by the phosphomolybdic acid and  $KMnO_4$  method (*C. A.* 21, 2712) the amts. present in blood exert no detectable influence. B. C. A.

Titrimetric microchemical estimation of phosphorus in serum and in cerebrospinal fluid. KURT SAMSON. *Klin. Wochschr.* 8, 1029-30(1929).—See *C. A.* 23, 3943.

MILTON HANKE

Apparatus in current use in bacteriological laboratories. ALFREDO SORDELLI. *Anales asocn. quim. Argentina* 16, 234-46(1928).—A study of thermostats. E. M. S.

## C—BACTERIOLOGY

CHARLES B. MORREY

**Factors affecting the growth of surface colonies of bacteria.** P. K. BATES. *Abst. Thesis Mass. Inst. Tech.* No. 3, 39-40(1929).—The area of a bacterial colony on an agar surface increases at a rate characteristic of each species. Growth is greater in a humid than in a dry atm., and in a neutral than in an acid medium, and is inhibited by a lack of O. The character of the colonies varies with the concn. of the agar gel and with the temp.; at 25°, growth is slower than at 37°, but much larger colonies are formed.

B. C. A.

**Formation of citric and oxalic acids by *Aspergillus niger*.** S. KOSTYCHEV AND V. CHESNOKOV. *Planta, Abt. E Z. wiss. Biol.* 4, 181-200(1927).—Formation of citric acid is favored by acidity, and of oxalic acid by alkalinity, of the medium. In young cultures citric acid is not formed so long as N is utilized from the nutrient soln. Citric acid is considered to be necessary for the synthesis of amino acids

B. C. A.

**The effect of tin on *B. tuberculosis* in vitro.** NUNO DOS SANTOS. *Compt. rend. soc. biol.* 101, 383-4(1929).—SnCl<sub>2</sub> added to peptone cultures in dilns. of 1:5000 to 1:50,000 had no effect on colony development, morphology or staining reactions of *B. tuberculosis* (human).

B. C. BRUNSTETTER

**The antiseptic value of sulfur dioxide.** FRANCISCO L. P. MONTEIRO. *Compt. rend. soc. biol.* 101, 387-8(1929).—Of the pathogenic organisms tested under exptl. conditions simulating practical disinfection methods, *B. anthracis* and *B. dysenteriae* Shiga proved resistant.

B. C. BRUNSTETTER

**Culture media containing the growth factors for microorganisms.** ANDRÉ L. SERGENT. *Rev. hyg. méd. prév.* 51, 467-72(1929).—Numerous formulas of media are given, some without and some contg. growth-promoting exts. from bacteria, mushrooms, fungi, vegetables, meat and plant substances.

C. R. FELLERS

**The bactericidal action of human milk.** F. SCHLAEPI. *Schweiz. Z. Gesundheitspflege* 8, 373-506(1928); *Rev. hyg. méd. prév.* 51, 545-6.—Very detailed expts. definitely proved the bactericidal property of human milk. At 10-13°, the action lasted for 60 hrs.; at 17-23°, the action was less marked; at 30-37°, no bactericidal action was noted. Staphylococci and *B. coli* were used in the tests. Fresh and preserved milk had nearly equal bactericidal values.

C. R. F.

**Detailed differentiation of bacteria by means of a mixture of acid and basic dyes at different pH values.** ALEXANDER V. TOLSTOUHOV. *Stain Tech.* 4, 81-9(1929).—A mixt. of methylene blue and eosin Y can be used for satisfactory differential staining of bacteria at or above pH 3. Below pH 3, the eosin Y stains bacteria only a very pale pink, i. e., the eosin is present as undissolved color acid, and for this reason not enough eosin is in soln. to stain bacteria. The substitution of acid fuchsin for eosin Y improved the staining at low pH values (to 0.8). The polar bodies of the colon group consist of more alk protein than the body of the bacteria itself. On the contrary, the polar bodies of *B. diphtheriae* are more acid than the bacterial bodies. The differentiation of bacteria by the Gram stain depends chiefly on the varying stability of the compd. formed (Gram-pos. or Gram-neg. bacteria plus gentian violet and I) in the presence of such org. solvents as EtOH and acetone.

C. R. FELLERS

**The influence of carbon monoxide on infection.** L. KANDIBA. *Zentr. ges. Hyg.* 18, 710(1928); *Wasser Abwasser* 25, 285.—Cats, white mice and rats were infected with streptococci and staphylococci and injected with tetanus toxin and exposed to varying concns. of CO. Results showed a definite lowering of resistance with increased CO poisoning in the animals.

C. R. FELLERS

**A chemical study of type III pneumococci.** ARTHUR STULL. *J. Biol. Chem.* 82, 641-50(1929).—N, P, S, Cl, ash and volatile matter were detd. in virulent type III pneumococci dried at 55°. The sol. specific substance isolated from the culture medium after removal of the pneumococci was shown to be related to the latter bacteria. Ten fractions, one of which was the sol. specific carbohydrate, were sepd. from the dried bacteria. When tested by the precipitin reaction, only the sol. specific carbohydrate showed specific pptn.

ARTHUR GROLLMAN

**The metabolism of diphtheria bacilli and of the diphtheroids.** F. SILBERSTEIN AND F. RAPPAPORT. *Wiener med. Wochschr.* 79, 460-1(1929).—The O consumption and CO<sub>2</sub> production of the diphtheria bacillus, the pseudo-diphtheroid bacillus and the xerosis bacillus were detd. The results vary with the different bacterial species.

A. G.

**Note on anaerobiosis and the use of alkaline solutions of pyrogallol.** HUGH NIZOL. *Biochem. J.* 23, 324-6(1929).—Even such a weakly alk. soln. of pyrogallol as the modification of Rockwell's soln. (see Stitt's Practical Bacteriology, 83(1927)) used

in this work is capable of evolving CO when the soln. is used as an absorbent of oxygen.

BENJAMIN HARROW

Some enzymes in *B. coli communis* which act on fumaric acid. BARNET WOOLF. *Biochem. J.* 23, 472-82(1929).—Considerable quantities of fumarase are present in *B. coli communis*. The three reversible changes involving fumaric acid—those to succinic, malic and aspartic acids—are catalyzed by distinct enzymes. BENJAMIN HARROW

Symbiosis among lactic microbes. HENRIETTE LANDAU. *Natuurw. Tijdschr.* 11, 115-7(1929).—*Oidium lactis* has practically no influence on the lactic bacteria; its presence in milk has no effect on the souring time.

ALBERT L. HENNE

Urea solutions. Culture media for microbes. A. J. J. VANDEVELDE. *Natuurw. Tijdschr.* 11, 118-22(1929).—Heating to 100° causes a partial hydrolysis of  $\text{CO}(\text{NH}_2)_2$ ; the no. of OH ions, after sterilization, is markedly increased. Heating at 120° has a much stronger effect.

ALBERT L. HENNE

Trypanocidal action of some derivatives of anil and styryl quinoline. C. H. BROWN-ING, J. B. COHEN, S. ELLINGWORTH AND R. GULBRANSEN. *Proc. Roy. Soc. (London)* B105, 99-111(1929).—Use was made of mice and 3 strains of *T. brucei*. Trypanocidal action apparently depended upon the presence in each of the nuclei of basic groups or acylamino groups; the action was most marked when one nucleus contained a free basic group, the other nucleus an acylamino group; this was especially true of the styryl series. The anil quinolines had but little trypanocidal action as a rule, while the styryl quinolines usually were far more effective. When 2(*p*-acetylamino styryl)-6-acetylaminoquinoline methochloride was administered to rabbits, it rapidly imparted its characteristic color to the urine, and was recovered from the urine with retention of its trypanocidal action; hence it was excreted, in part at least, in an active form in the urine. The prepn. of a no. of these compds. is described.

JOSEPH S. HEPBURN

Tetanus. VIII. The positive limit of oxidation-reduction potential required for the germination of spores of *B. tetani* in vitro. P. FILDES. *Brit. J. Exptl. Path.* 10, 151-75(1929); cf. *C. A.* 22, 442.—On exclusion of air, culture media develop a reducing intensity which can be measured by Clark's indicators of oxidation-reduction potential. The rapidity and extent of this change depend upon the constitution of the medium and upon  $p_H$ . The period required for the germination of spores of *B. tetani* (lag) in a suitable medium at 38° depends mainly on the time required for this medium to reach a suitable reducing intensity. Within limits,  $p_H$  does not affect the lag of *B. tetani* except through its effect upon the reducing intensity of the medium. The greater the reducing intensity of the medium the shorter the lag and, conversely, the slighter the reducing intensity the longer the lag, until a zone of reducing intensity is reached at which germination is not observed to occur at all. This zone may be measured and expressed in terms of oxidation-reduction potential. At each  $p_H$  it approximates to the zone of complete reduction of thionin, i. e., at  $p_H$  7.0 it approximates to oxidation-reduction potential + 0.01 v. If spores are placed under conditions in which the oxidation-reduction potential is more pos. than this, they do not germinate. IX. The oxidation-reduction potential of the subcutaneous tissue fluid of the guinea pig; its effect on infection. *Ibid* 197-204.—The oxidation-reduction potential of the subcutaneous tissue fluids and of the peritoneal fluid of the normal guinea pig is more pos. than the oxidation-reduction potential required for germination of spores of *B. tetani* and to this fact chiefly is ascribed the failure of tetanus spores to germinate when inoculated into these animals. The germination of spores which takes place naturally in tetanus or which is experimentally induced is due to the production in the tissues of an adequately neg. oxidation-reduction potential. The main conclusions relating to *B. tetani* may be applied in principle to all anaerobic organisms and it is possible that the oxidation-reduction potential enters into some of the pathologic relations of strictly aerobic organisms.

HARRIET F. HOLMES

The oxygen requirements of *B. pestis* and *Pasteurella* strains. H. SCHÜTZE AND M. A. HASSANEIN. *Brit. J. Exptl. Path.* 10, 204-9(1929).—A difficulty in initiating the growth of plague and *Pasteurella* cells lying widely scattered on agar plates has been observed and regarded as due to the O sensitivity of those organisms. This difficulty can be overcome by the addition to the culture medium of such substances as blood,  $\text{Na}_2\text{SO}_4$ , or sterilized broth culture of a variety of bacteria or by placing the plates under anaerobic conditions. It is suggested that the substances just mentioned act as reducing agents and that the substances contained in broth cultures of these particular bacteria are enzymic in nature, as they are rapidly destroyed under anaerobic conditions between 70° and 80°.

HARRIET F. HOLMES

Observations upon electric charge in certain bacteriologic problems. H. C. BROWN AND J. C. BROOM. *Brit. J. Exptl. Path.* 10, 219-25(1929).—A simple modification of the Northrop microcataphoresis cell is described. Its construction is such that it can be

**Cataphoretic behavior of rough and smooth variants of the typhoid-paratyphoid group** was studied. In a series of several hundred observations the migration rate of the rough variant in a total concn. of Th nitrate of the order  $10^{-3.5}$  N is considerably greater than that of the corresponding smooth form under the same conditions. The thrombocytolytic or adhesion reaction may be correlated with the enhanced toxic action of negatively charged colloids in presence of immune serum. It is possible that the use of negatively charged colloids would offer the possibility of a more definite test for the presence of antibodies in trypanosomiasis, spirochetosis or *Leishmania tropica* infections than the adhesion reaction in its present form.

HARRIET F. HOLMES

**The antibacterial action of cultures of a *Penicillium*, with special reference to their use in the isolation of *B. influenzae*.** A. FLEMING. *Brit. J. Exptl. Path.* 10, 226-36 (1929).—A certain type of *Penicillium* produces in ordinary nutrient broth a powerful antibacterial substance. The active agent is readily filtrable and the name "penicillin" has been given to filtrates of broth cultures of the mold. Penicillin loses most of its power after 10-14 days at room temp. but can be preserved longer by neutralization. The active agent is not destroyed by boiling for a few min. but in alk. soln. boiling for 1 hr. markedly reduces the power. Autoclaving for 20 min. at  $115^{\circ}$  practically destroys it. It is sol. in alc. but insol. in ether or  $\text{CHCl}_3$ . The action is very marked on the pyogenic cocci and the diphtheria group of bacilli. Many bacteria are quite insensitive, e.g., the coli-typhoid group, the influenza bacillus group and the enterococcus. The isolation of Pfeiffer's bacillus of influenza is very easy when penicillin is used. Penicillin is non-toxic to animals in enormous doses and is non-irritant. It is suggested that it may be an efficient antiseptic for application to, or injection into, areas infected with penicillin-sensitive microbes.

HARRIET F. HOLMES

**Some aspects of intestinal bacteriology in relation to health.** LEO F. RETTGER. *Am. J. Pub. Health* 19, 771-6 (1929).—The relationship of *B. acidophilus* to dental caries is also discussed briefly.

J. A. KENNEDY

**Antigenic and metabolic studies of *Bacillus typhosus*.** CORNELIA M. DOWNS. *Univ. of Kansas Sci. Bull.* 16, 5-89 (1926).—Part I deals with a study of the antigenic differences exhibited by 32 strains of *B. typhosus* and the relation of such antigenic differences to any cultural peculiarities present. Part II deals with the effect of H-ion concn. on the metabolism of these same strains, their dextrose metabolism and viability, and the correlation of these reactions with their antigenic characters. There is a bibliography of 162 references.

J. A. KENNEDY

**Studies on *Bacillus pyocyaneus*.** NOBLE P. SHERWOOD, T. L. JOHNSON AND IDA RADOTINCKY. *Univ. of Kansas Sci. Bull.* 16, 91-9 (1926).—Practically all strains of *B. pyocyaneus* have the ability to utilize dextrose although alk. products may obscure this phenomenon. They were consistently neg. in mannitol, arabinose and dulcitol, and pos. in saccharose. The authors' results as well as those of DeBord (cf. *C. A.* 17, 1656) and Downs (cf. preceding abstr.) emphasize the limitations of H-ion detns. as an indication of sugar utilization. The Fildes strain was the only one of the 22 strains studied that showed acid production in litmus lactose broth. It also produced the max. H-ion concn. in fresh meat infusion dextrose broth, reaching a  $p_H$  of 5.0 in 2 weeks. Six of the strains showed an acid reaction after 2 weeks. The remaining 16 strains developed  $p_H$  values ranging from 7.0 to 8.0 at the end of 14 days. The initial reaction was  $p_H$  7.0. These results might not hold if the initial H-ion concn. was decidedly different. Animal charcoal added to dextrose broth apparently adsorbs the pigments. All strains produced indole. Eleven strains blackened Pb acetate. Only one strain reduced  $\text{NO}_3$ . All strains produced HCN, as did also a strain of *B. fluorescens liquefaciens*. Efforts to produce high-titred immune sera were not very successful; a titer of 1-5000 was the max. obtained. Cross agglutination expts. gave irregular results. A bibliography of 19 references is appended.

J. A. KENNEDY

**The bactericidal effect produced by the growth of intestinal bacilli in peptone water containing glucose and other sugars.** MACKENZIE DOUGLAS. *J. Trop. Med.* 32, 101-5 (1929).—If glucose-peptone water is inoculated with *B. coli communis*, left to incubate until the soln. is sterile and then reinoculated, the organism still lives 4 to 5 days. Repetition of this procedure several times causes death in less and less time until finally 10 cc. of the fluid will kill a full agar slant. This bactericidal action is practically specific. Expts. were made also with *B. typhosus*, *B. paratyphosus* A and B, *B. ceylonensis* A, *B. dysenteriae* Shiga, Flexner and Y, *B. proteus* 19. FRANCIS KRASNOW

***Proteus ammoniae*.** THOMAS B. MAGATH. *J. Infectious Diseases* 43, 181-3 (1928).—An organism capable of quickly transforming urea into  $\text{NH}_3$  and believed to be the etiologic agent in incrustated cystitis was studied as to its fermentative abilities for the

purpose of properly classifying it. From the results it is suggested that if the characteristics of the genus *Proteus* be modified so as to include occasional organisms that ferment sucrose, which this organism does, the *B. proteus ammoniae* can be placed in the proteus group. JULIAN H. LEWIS

**Replacement of potassium by other elements in culture media.** C. H. BOISSEVAIN. *J. Infectious Diseases* 43, 194-9(1928).—K or Rb, in a minimal concn. of 0.001% KCl or 0.002% RbCl, is necessary for the growth of acid-fast bacteria on a modified Long synthetic medium. No other metals can be substituted. Continuous exposure to x-rays for 168 hrs. does not kill smegma bacilli and does not favor their growth. Among the Gram-positive organisms, only a soil bacillus not previously described grew freely on the synthetic medium; it needed the same amt. of K as the acid-fast bacteria. Among the Gram-negative organisms examd., *B. coli* and *B. paratyphosus* B grew freely on the synthetic medium; they did not need K. JULIAN H. LEWIS

**Method of staining flagella.** EMIL WEISS. *J. Infectious Diseases* 43, 228-31 (1928).—AcOH is added to young cultures to make a concn. of 5%; a drop of this suspension is allowed to dry untouched; stain first with a basic dye and then an acid dye. Useful contrastive stains were satd. gentian or crystal violet and acid green; Loeffler's methylene blue or aq. thionine blue and acid fuchsin; brilliant green and acid fuchsin or acid violet; carbolfuchsin and acid green. This method is also useful for the demonstration of degenerated or phagocytosed bacteria. JULIAN H. LEWIS

**Studies on the metabolism of the abortus-melitensis group. IV. Effect of various concentrations of carbon dioxide.** JAMES G. McALPINE AND CHARLES A. SLANETZ. *J. Infectious Diseases* 43, 232-40(1928); cf. C. A. 22, 4565.—Bovine strains of *B. abortus*, acclimated to aerobic conditions, are markedly stimulated in growth by 5 to 10% CO<sub>2</sub>. This amt. of CO<sub>2</sub> had a more or less inhibitory action on porcine and human strains of *B. abortus*. The difference in the two types of reactions is not due to changes in pH concn. Total exclusion of CO<sub>2</sub> makes all members of the abortus-melitensis group inert and unable to proliferate. JULIAN H. LEWIS

**Chemical and bacterial inhibition of gas formation in bacterial cultures.** MITSUTERU ISHIKAWA. *J. Infectious Diseases* 43, 311-20(1928).—Subcarbonate, subgallate and subnitrate of Bi, Bi(NO<sub>3</sub>)<sub>3</sub>, NH<sub>4</sub> benzoate, Na benzoate, K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>, KClO<sub>3</sub>, NH<sub>4</sub>NO<sub>3</sub>, NaNO<sub>3</sub>, NaF, NaIO<sub>3</sub> and Na salicylate definitely suppress the formation of gas, not only from carbohydrates by single cultures of gas-producing bacilli and 3 types of associative cultures (a gas-forming with an acid-producing organism, an aerogenous bacillus with a proteolytic organism, and gas-forming and acid-producing organisms with a proteolytic bacterium), but also from NaCHO<sub>2</sub> by pure cultures of aerogenous bacteria. The inhibitory effect of the paratyphoid bacillus on gas production of the colon bacillus appears to depend, partly at least, on a deficiency of proper nitrogenous substance apparently resulting from the metabolic activity of the paratyphoid bacillus. JULIAN H. LEWIS

**Influence of iodide on bacterial decomposition of nitrogenous substances.** MITSUTERU ISHIKAWA. *J. Infectious Diseases* 43, 321-6(1928).—KI and KIO<sub>3</sub> exert an inhibitory effect on the formation of NH<sub>3</sub> by cultures of proteolytic organisms and on the production of amino acids by the proteolytic bacteria-free enzyme. In this effect, KI has practically no demonstrable selective action; different bacteria are affected almost equally by the presence of the iodide. The liberation of NH<sub>3</sub> from urea by urea-splitting bacteria, cultured or washed, is decreased under the influence of KI, apparently through an inhibitory effect on the activity of the enzymes. JULIAN H. LEWIS

**Comparison of glycerol and brilliant green bile for treatment of feces for isolation of typhoid organisms.** LEON C. HAVENS AND CATHERINE RIDGWAY. *J. Infectious Diseases* 43, 345-8(1928).—About 10 times as many typhoid bacilli must be present for pos. results when 30% glycerol is used as an enrichment medium as when brilliant green bile is used. The organisms disappear rapidly in glycerol while there is only a slight decrease in their no. after 48 hrs. when brilliant green is used. JULIAN H. LEWIS

**Brilliant green enrichment methods in the examination of feces for organisms of the enteric group.** RUTH GILBERT AND MARION COLEMAN. *J. Infectious Diseases* 44, 21-6(1929).—The superiority claimed by Havens (cf. preceding abstract) for brilliant green bile enrichment media over 30% glycerol is not confirmed. JULIAN H. LEWIS

**Production of histamine, tyramine, bronchospastic and arteriospastic substances in blood broth by pure cultures of microorganisms.** KARL K. KOEHLER, MILTON THEO. HANKE AND MARY S. SHEPPARD. *J. Infectious Diseases* 43, 363-77(1929).—Of 223 microorganisms of the American Type Culture Collection, histamine was produced from histidine only by a few strains of the colontyphoid group. Tyrosine was converted into tyramine by a few streptococci. The faculty for producing very active

but unidentified arteriospastic and bronchospastic substances is highly developed in the colontyphoid group, while members of other groups produce them only occasionally.

**The metabolism of *Leishmania tropica*.** A. J. SALLE AND CARL L. A. SCHMIDT. *J. Infectious Diseases* 43, 378-84(1928).—The analytic data indicate that the metabolism of *Leishmania tropica* does not differ essentially from that of many bacteria. J. H. L. LEWIS

**The proteus hemolysin.** JOHN F. NORTON, ELIZABETH VERDER AND CATHERINE RIDGWAY. *J. Infectious Diseases* 43, 458-60(1928).—The production of an agent which is lytic for red blood cells is characteristic of the proteus group of bacteria. The agent is heat labile, is formed during the first few hrs. of growth in a culture. The agent is destroyed by phenol disinfectants, is absorbed by a Berkefeld N filter and is neutralized by both homologous and heterologous antisera.

**The use of pectin in fermentation tests.** ELIZABETH MCCOY AND W. H. PETERSON. *J. Infectious Diseases* 43, 475-9(1928).—Pectin used for fermentation tests must be carefully purified to free it of adherent carbohydrate. Organisms that cause retting under natural conditions may not ferment pectin in the lab. when pure cultures are used.

**A hemolytic substance in pneumococcus culture broth.** G. M. SICKLES AND J. M. COFFEY. *J. Infectious Diseases* 43, 490-5(1928).—Young cultures of various strains of pneumococci grown on different kinds of media produce a substance which has a lytic action on red blood cells. This hemolytic substance is absorbed from the culture broth by sheep red cells, guinea-pig leucocytes, animal charcoal and alumina. It is thermolabile and is destroyed by heating for 1/2 hr. at 55°. Its activity is lessened by standing at cold room temp. and, in a shorter time, at 37°. Normal horse serum has an inhibitory action on the hemolytic power while pneumococcus immune serum has a much more marked effect.

**Studies on botulinus toxin. V. Influence of nitrogenous and lipid compounds on the potency of botulinus toxin.** E. WAGNER SOMMER AND H. SOMMER. *J. Infectious Diseases* 43, 496-506(1928).—Botulinus toxin incubated at 37° in neutral salt soln. rapidly deteriorates in 24 hrs. to 90-99% of its original potency. The deterioration is retarded in acid and accelerated in alk. media. The addn. of serum causes an immediate increase in toxicity which may show a further rise on incubation. Witte's peptone acts similarly but to a lesser degree. Diln. in a 25% aminoid soln. greatly stabilizes the toxin. Lecithin slightly increases the initial titer of the toxin. No effect was observed with Na stearate and Na oleate. Na ricinoleate caused rapid though not immediate inactivation of the poison.

**A poison produced by *Bacterium enteritidis* and *Bacterium aertrycke* which is active in mice when given by mouth.** SARAH E. BRANHAM, LUCILLE ROBEY AND LOIS A. DAY. *J. Infectious Diseases* 43, 507-15(1928).—Boiled or autoclaved broth cultures or Berkefeld filtrates of broth cultures of paratyphoid bacteria killed 40-100% of the mice fed with these preps. The feeding of autolyzed, boiled or autoclaved suspensions of the washed bacteria had little, if any, effect. The extremely long incubation period of this toxic action differentiates it from the violent acute toxic symptoms observed in man after eating foods contg. these bacteria.

**Extracellular production of toxin by *Clostridium botulinum* type B.** C. N. STARK, J. M. SHERMAN AND PAULINE STARK. *J. Infectious Diseases* 43, 565(1928).—Bacteria-free filtrates of type B *Cl. botulinum* showed a marked increase in toxin content when they are allowed to act on sterile unskimmed milk. This is believed to be the result of the action of the enzymes of the organisms on the casein of milk. Glucose inhibition of extracellular toxin-producing enzymes of *Cl. botulinum*. *Ibid* 566-8.—The extracellular enzymes of *Cl. botulinum* responsible for the extracellular formation of toxin are not produced as readily in the presence of glucose as in its absence. Toxin produced in glucose broth is more stable than that formed in media without carbohydrate. Destruction of diphtheria toxin by bacteria. *Ibid* 569-70.—*B. coli*, *B. cereus*, *B. vulgaricus*, *Pseudomonas pyocyaneus* and *Cl. sporogenes* have the power to destroy diphtheria toxin when grown in its presence.

**Acid agglutination optimum in the *Brucella* group.** F. E. ECKER AND M. SIMON. *J. Infectious Diseases* 44, 62-4(1929).—The acid agglutination optimums of 4 strains of *Br. melitensis* and *abortus* were identical.

**The action of bacteria on fat. I. Relative merits of various differential plating media for lipase-producing organisms.** ROY H. TURNER. *J. Infectious Diseases* 44, 126-33(1929).—Five groups of differential plating media for lipase-producing bacteria were compared for sharpness of differentiation, sensitivity, inhibition of bacterial growth and tendency to give false reactions. Those media which depended on gross disintegra-

tion of tallow or globules of cottonseed oil emulsion for differentiation were found to lack sharpness of differentiation, to be low in sensitivity, but did not inhibit growth of organisms studied and gave no false reactions. The development of clear zones may be greatly facilitated by using fats made up of short-chain fatty acids or by adding bile to the medium. Those media which depend on H-ion indicators for differentiation were found lacking in sensitivity, probably because of the little effect which the higher fatty acids have on  $p_H$ , and they gave false positive reactions in the presence of fermentable carbohydrates. The Nile blue sulfate medium gave remarkable sharpness of differentiation and high degree of sensitivity, but inhibited the growth of certain organisms. The meaning and mechanism of fading zones are discussed; they do not seem to indicate the formation of lipase. II. A microscopic study of emulsion of oil in an agar medium. *Ibid* 134-41.—The course of events during the action of a strain of lipolytic bacteria on the globules of fat in a thin layer of agar medium contg. Nile blue sulfate, observed microscopically and photomicrographically, are described as follows: A globule of oil, well removed from a bacterial colony, becomes blue in consequence of the staining of unsatd. fatty acids, oleic and linoleic, split by diffusible lipase. Part of the fatty acids are converted into soaps. There is a diffusion into the agar surrounding the globule of blue staining material, probably mixts. of these same fatty acids and their sol. soaps. If near the colony, this material quickly becomes decolorized and disappears; if further away, this happens slowly. Marked shrinkage of the globule occurs; it usually takes a crescentic shape, probably due to surface activity of the remaining lipid material, which no longer fills the cavity in the agar. Shrinkage of some globules is accompanied by protrusion of a bundle of doubly refractile crystals of the solid fatty acids or their derivs. Crystals formed in the agar well removed from visible globules of oil are probably derived from lipid material which existed in soln. or colloidal suspension.

JULIAN H. LEWIS

An improved technic for the comparison of antiseptics by yeast fermentation. SARAH E. BRANHAM. *J. Infectious Diseases* 44, 142-9(1929).—A simple device for quantitatively collecting  $CO_2$  produced by fermenting yeast is described and used to compare the relative action of antiseptics on the fermentation by yeast.

JULIAN H. LEWIS

Studies in bacterial metabolism. LXXXVII. The significance of certain reactions induced by resting bacteria. ARTHUR I. KENDALL AND MITSUTERU ISHIKAWA. *J. Infectious Diseases* 44, 282-91(1929); cf. *C. A.* 22, 4621.—The reduction of methylene blue by "resting bacteria" in the presence of certain carbohydrates is precisely paralleled by the fermentation of these same carbohydrates in cultural media inoculated with identical strains of proliferating bacteria. It is inferred that resting bacteria, therefore, initiate changes in substrates which they, as proliferating bacteria, would subsequently use for their energy requirements. The initial changes thus induced in substrates are not assocd with the proliferation of the organisms; they occur under conditions of time, temp and environment which preclude growth. The substrate, thus initially altered, is conceived of as in a state peculiarly adapted to rapid utilization for energy. The high degree of specificity of this preliminary change in various carbohydrates resides in the hereditary chem. architecture of the microbial protoplasm. It seems to be manifested at the surface of the microbe. The reactions induced by "resting bacteria" will not ordinarily supplant cultural reactions; the technic is more complex and cumbersome.

JULIAN H. LEWIS

The chemistry of the lipoids of tubercle bacilli. III. Preparation and properties of phthioic acid. R. J. ANDERSON. *J. Biol. Chem.* 83, 169-75(1929); cf. *C. A.* 21, 3923 —Phthioic acid is sepd. from the fatty acids obtained on hydrolyzing the phosphatide from the human type of tubercle bacilli as follows: The mixed acids are converted into Pb soaps which are extd. with  $Et_2O$ ; decompn. of the  $Et_2O$ -sol. Pb soaps yields liquid acids contg. oleic and phthioic acids; catalytic reduction converts the oleic into stearic acid, the Pb salt of which is insol. in  $Et_2O$ ; decompn. of the  $Et_2O$ -sol. Pb salt of phthioic acid with dil. HCl yields free phthioic acid. Yield of phthioic acid = 22.8% of the phosphatide taken;  $[\alpha]_D^{20}$  in alc. soln. is about 1.5 to 1.6°. The compn. and mol. wt. indicate that phthioic acid must contain at least 20 C atoms. It is a colorless oil which is miscible in all proportions with alc. and other org. solvents but insol. in  $H_2O$ . It possesses marked biol. properties, its intraperitoneal injection stimulating the proliferation of monocytes and epitheloid cells and causing the formation of massive tuberculous-like tissue and it is evident that the active principle of the phosphatide is assocd. with this new fatty acid and is always isolated with this fraction. A. P. L.

A quick transformation of hexosediphosphate into lactate under the influence of the typical lactic acid-forming *Delbrücki* bacilli. ALEXANDER TYCHOWSKI AND MARIA KOBEL. *Biochem. Z.* 209, 134-41(1929).—Hexosediphosphate is fermented to



lactate by a genuine lactic acid-forming organism with a practically 100% yield as is also the case with a non-phosphated sugar.

S. MORGULIS

**The biochemical properties of *Bacillus Frish* and other capsulated bacilli.** B. ELBERT. *Centr. Bakt. Parasitenk.*, I Abt., 112, 178-87(1929).—This is a detailed study of the acid- and gas-forming powers of the capsulated Friedländer group of bacilli. The Frish bacillus as a rule forms no gas from carbohydrates, does not attack lactose and produces acid but no gas from most polysaccharides and alcs. It does not attack Na tartrate, citrate, mucinate or amygdalin.

JOHN T. MYERS

**Comparison of the activity of heat- and yaten-killed dysentery bacillus vaccine.** ELISE GRASSMÜCK. *Centr. Bakt. Parasitenk.*, I Abt., 112, 232-43(1929).—Heat-killed vaccine and that killed by 0.25 to 2.0% yaten solns. had equal agglutinogenic power. Killing with yaten is simpler. The possibility of a non-sp. protective effect of yaten has not been studied.

JOHN T. MYERS

**Enrichment methods for the cultivation of typhoid, and paratyphoid bacilli from feces.** III. The sodium tetrathionate medium of Leon Miller. K. L. PESCH AND FRIEDRICH KORTENHAUS. *Centr. Bakt. Parasitenk.*, I Abt., 112, 397-400(1929).—It is the best enrichment medium known for these organisms in feces.

JOHN T. MYERS

**The causes of the weakening influence of glycerol on disinfecting agents.** GÜNTHER LODGE. *Centr. Bakt. Parasitenk.*, I Abt., 112, 401-11(1929).—Glycerol weakens disinfectants by decreasing the degree of disocn. In the case of phenol, glycerol ethers are formed. Lipoid soly. in glycerol may be a factor but it is not yet understood.

JOHN T. MYERS

**The influence of iron on the pigmentation of acid-fast bacteria.** GUILFORD B. REED AND CHRISTINE E. RICE. *J. Bact.* 17, 407-11(1929).—Yellow, brown or red pigmentation of acid-fast bacteria is related to the presence of Fe in the culture media. If citrate is present, Fe will not ppt., probably because of the formation of complex ions, if the  $pH$  is not greater than 8.0 and pigmentation results. Above  $pH$  8.0 the Fe is pptd. and no pigmentation occurs.

JOHN T. MYERS

**The germicidal action of halogen derivatives of phenol and resorcinol and its impairment by organic matter.** EMIL KLARMANN, VLADIMIR A. SHTERNOV AND JOHN VON WOWERN. *J. Bact.* 17, 423-42(1929).—Expts. on the disinfectant action of phenol, resorcinol and their halogen derivs. indicate a distinct relationship between constitution of the derivs. and impairment of disinfectant action by org. matter. The minute amts. of org. matter in the original culture will produce considerable impairment with certain derivs. It is assumed that additive compds. between the mols. of the disinfecting agent and certain free reactive groups in the org. matter or the protoplasm are formed, thus rendering the disinfectant less active, the degree of impairment being proportional to the stability of such additive compds.

JOHN T. MYERS

**Studies on carbon dioxide.** IV. The influence of gaseous environment on growth and toxin production of *C. diphtheriae*. WAYNE N. PLASTRIDGE AND LEO F. RETTGER. *J. Bact.* 18, 1-41(1929).—Aeration of broth cultures of *C. diphtheriae* with atms. contg. 3 to 10% of  $CO_2$  and 5 to 50% O caused increased growth and toxin production. Aeration with ordinary air or  $CO_2$ -free air contg. 10 to 50% O resulted in marked irregularity of growth and toxin production. The higher the O content of the atms. passed over the cultures the greater the irregularity in toxin content. The rate of destruction of toxin once formed was inversely proportional to the O tension in the culture flask. The optimum O content of the atm. for toxin production was 15 to 20%, and the  $CO_2$  5 to 10%. Under these conditions there was max. toxin production and no deterioration on prolonged incubation. The  $NH_3$  content of all cultures showed a sharp increase during the period of max. growth. In cultures aerated with ordinary air or  $CO_2$ -free air, this was followed by a gradual decline, while with increased  $CO_2$  tension there was a continuous increase for a 20-day period. The amino N increase in cultures grown in broth prep'd. from Difco-Bacto peptone was much less marked than in broth with Difco-proteose peptone, probably because the former had a dearth of protein derivs. capable of being split into amino acids by the peptolytic enzymes of *C. diphtheriae*. The proteose fractions of peptones are necessary for toxin production for other reasons than as a buffer. Increased  $CO_2$  tension prevents the usual destruction of bacterial cells after the period of max. growth.

JOHN T. MYERS

**Sodium chloride media for the separation of Gram-positive cocci from Gram-negative bacilli.** JUSTINA H. HILL AND EDWIN C. WHITE. *J. Bact.* 18, 43-57(1929).—Agar with a NaCl concn. of 2 to 20% and a  $pH$  of 6.0 exerts a marked inhibitory action on the growth of bacilli of the typhoid, paratyphoid, dysentery and colon groups, some species of *Proteus*, diphtheroids, *Pseudomonas* and anthrax. Gram-positive cocci

tolerated 20% NaCl well. A similar bacteriostasis occurs in salt broths but to a lesser extent.

A continuous method of culturing bacteria for chemical study. JOHN T. MYERS. *J. Bact.* 18, 59-67(1929).

Lactic acid bacilli in eugenic and non-eugenic media. CARLOS A. SAGASTUME AND JORGE GASCON. *Rev. facultad cienc. quim.* (Univ. La Plata) 5, Pt. 2, 99-109(1929).—A strain of lactic acid bacilli of the uric acid group, isolated by S. and G. from the human intestine, was found to lose its coagulating and acid-forming activity, and to change its microscopic appearance after successive transplantations in a medium of sterilized milk (I). Gorini (no ref.) reported such a case in which the activity was restored by inoculating milk with a broth culture, or by growing in a medium of I contg. a small amount of corrective, such as broth, blood, etc. S. and G. repeated the findings of Gorini, and tested various amino acids, glycosamine and peptone as correctives for the non-eugenic I. They found that broth ( $1/2$ ), tryptophan ( $1/1000$ ) and peptone ( $1/1000$ ) all increased the speed of coagulation and of acid formation, as well as the multiplication. They found that bacteria of their strain, which had lost its activity after transplantation in I, were short, articulated and granular, while after growth in a eugenic medium they were long, fine and homogeneous. They conclude that tryptophan, especially, is necessary for the cultivation of their strain, and point out the relationship between tryptophan and the natural products, skatole and indole.

Comparative bacteriological examination of American and Moravian barley. V. BERMANN AND H. WERTHEIM. *Wochschr. Brau.* 45, 564-5(1928).—The microorganisms that were found in the American barley and not in the Moravian were an anaerobic, gas- and spore-forming bacterium, an aerobic non-spore-forming bacterium and a mold of the *Mucor* type.

Biology of *Sarcina*. J. FUCHS. *Wochschr. Brau.* 46, 203-8, 213-5(1929).—Incomplete saccharification of the mash resulting in the weakening and partial autolysis of the yeast aids the development of *Sarcina*. The use of a barley rich in sol. proteins furnishes a good growing medium. There is no evidence of parasitism of *Sarcina* on, or symbiosis with, yeast.

Production of kojic acid from pentoses by *Aspergillus oryzae*. FREDERICK CHALLENGER, LOUIS KLEIN AND THOMAS K. WALKER. *J. Chem. Soc.* 1929, 1498-1505.—The following yields of kojic acid were obtained by the action of *A. oryzae* on pentoses: arabinose, 8 days, 2.5 g. per 100 g. sugar; 7 days, 1.4 g.; xylose, 7 days, 5.0 g.; 16 days, 2.1 g.; 8 days, 3.8 g.; glucose, 7 days, 3.8 g. No growth took place on pyromeconic acid, dimethylpyrone or Na comenat. Glucuronic acid supported growth but no comenic acid, kojic acid or hydroxypyrene derivs. could be detected. K H adipate soln. shows a fair growth but tests for kojic and citric acids were neg. up to the 16th day.

Role of carbohydrates in biological oxidations and reductions. Experiments with pneumococcus. RENÉ DUBOS. *J. Exptl. Med.* 50, 143-60(1929).—The reducing power of plain broth cultures of pneumococcus is largely dependent upon the presence of certain metabolites in the medium at the time when the reduction test is performed. The washed cells of pneumococcus are able to reduce the various indicators of oxidation-reduction potentials in the presence of glucose. The relative velocity of reduction of these indicators is detd. by the no. of cells used in the test the concn. of the dyes and their position in the oxidation-reduction scale. Oxidized thiol compds. (glutathione, cystine, oxidized thioglycolic acid) are likewise rapidly reduced by glucose in the presence of the washed cells of pneumococcus. This pneumococcus-glucose system is able to form peroxide under aerobic conditions. The power of washed cells of pneumococcus to reduce methylene blue in the presence of glucose is dependent on at least 2 constituents, one of which can be readily removed from the cell by washing. Sugar-free meat infusion will function instead of it. The other is inactivated more slowly by the process of washing and is destroyed by 10 min. heating at 55°. The inter-reaction between the glucose and the cell seems to result in a fundamental reaction in which 1 mol. of glucose becomes able to reduce rapidly 1 mol. of methylene blue. The significance of these observations is considered in relation to the nature and mechanism of the "activation" of metabolites, the prepn. of synthetic media, the phenomena of growth and the meaning of the expression "reducing power of a bacterial culture."

Germicidal action of hydroxy soaps. ARNOLD H. EGGERTH. *J. Exptl. Med.* 50, 299-313(1929).—The  $\alpha$ -HO soaps exhibit a high germicidal action toward certain organisms. As with other soaps, this action increases with mol. wt. to a max., then diminishes. The  $p_n$  affects the germicidal action as it does in other soaps. With the  $\alpha$ -hydroxy myristate and -palmitate, *Staphylococcus aureus* gives 2 distinct zones of germicidal

action at  $pH$  7.5. The effect of the HO group in satd. soaps is to increase the selective germicidal action, while in an unsatd. soap it diminishes it. Soaps offer a means of sepg. mixts. of organisms by selective germicidal action.

C. J. WEST

Methylene blue and bromocresol purple in differentiating bacteria of the colon-aerogenes group (DOMINICK, LAUTER) 14.

## D—BOTANY

THOMAS G. PHILLIPS

Determination of the nitrogen fixation by legumes by means of the nitrogen-base ratio. ALFRED STORCK AND AUGUST RIPPEL. *Z. Pflanzenernähr. Düngung u. Bodenk.* 13A, 158-9(1929).—In a preliminary study, the authors seem to have established a relationship between the N utilized by a legume and the bases absorbed by the legume at different stages of growth.

R. M. BARNETTE

Provision of the oat plant with nitrogen and mineral nutrients as correlated with the number of crown roots. TH. CHIRIKOV. *Z. Pflanzenernähr., Düngung u. Bodenk.* 13A, 201-4(1929).—Analyses of the oat plant without crown roots, with 1-3 crown roots, 4-6 crown roots, etc., showed that the no. of crown roots det. the degree with which the plant is provided with N and mineral constituents. The plant is more completely supplied with these nutrients with the larger no. of crown roots.

R. M. BARNETTE

Influence of potassium upon the formation of fiber cell walls in fiber plants. FRIEDRICH TOBLER. *Z. Pflanzenernähr. Düngung u. Bodenk.* 13A, 208-13(1929).—The addn. of K is noticed most in the surface layers of the cell wall. With K addn. there was a swelling of the cell walls, a greater capacity to hold water and an increase in the thickness of the walls. This can be easily noted by microscopic anatomical studies. K gave a smoother surface, better spinning property and closer, more compact fiber. The K has an indirect effect in overcoming the undesirable effects of N on the fiber. The action is not directly correlated with increased K in the fiber but rather with an indirect effect in the increase in water, and the effect on the growth and structure of the cells and bundles. Flax, hemp, ramie and other fibers were anatomically examd.

R. M. BARNETTE

The desiccation and cold resistance of plants. E. V. BOBKOV AND R. A. POPOVA. *Z. Pflanzenernähr. Düngung u. Bodenk.* 14A, 24-37(1929).—By using the dilatometer method, the content of combined water was estd. for several varieties of winter wheat which had different degrees of cold resistance. From the detn., it was shown that winter rye and cold resistant winter wheat varieties have a higher content of combined water in the water-contg. tissues than non-resistant varieties.

R. M. BARNETTE

Physiological function of magnesium in plants. I. CANALS. *Bull. soc. chim. biol.* 11, 14-45(1929); cf. *C. A.* 23, 3003. —Crude preps. of invertase from brewers' yeast show a rough proportionality between their activity and their Mg content. Invertase pptd. from aq. soln. with alc. shows a low activity which is increased to a value below that of the original material by the addn. of  $MgSO_4$ . Activity is lower in the same sample at higher  $pH$  values. Electrolysis of aq. solns. of invertase, whether contg. sucrose or not, results in a partial migration of the Mg to the cathode; dialyzed invertase shows little variation in Mg content when subjected to electrolysis. From these results it is concluded that the invertase mol. contains Mg in a non-ionic form. When pea seeds are allowed to germinate and grow in solns. of appropriate salts, much less growth is observed if Mg is absent. If Ca ions are absent or if solns. of  $MgSO_4$  alone are used, Mg salts exert a toxic action. In these expts. and also in the growth of maize and lupins, Mg solns. show an appreciable effect at 0.001%, an optimum effect at 0.05%, and a toxic effect at 0.1%. Mg salts also possess a marked influence on the growth of *Saccharomyces kephir* and *Bacillus caucasicus*.

B. C. A.

Fixation of chondriosomes of the vegetable cell. M. MASCRÉ. *Compt. rend.* 188, 811-3(1929); cf. *C. A.* 22, 612.—While the chondriosomes of *Elodea canadensis* are dissolved by treatment with AcOH, a sufficient preliminary treatment with  $CH_2O$  inhibits the destruction.

B. C. A.

Coloration of living vegetable cells by neutral-red. GUILLIERMOND. *Compt. rend.* 188, 813-5(1929).—Concd. solns. of neutral-red cause a flocculation of the colloids of the vacuoles of yeast cells and coloration of the vacuole without death of the cell.

B. C. A.

Iodine liberator from Laminaria. H. D. KAY. *Nature* 123, 317(1929).—The liberation of I from KI by an acidified ext. of *Laminaria fronds* (Dillon, *C. A.* 23, 2465) might be due to the presence of iodate.

B. C. A.

Absorption of nutrients by the onion. M. KOZTOWSKA. *Roczn. Nauk Roln.* 20,

15-24(1928).—Two phases in the life of the onion are differentiated: that of absorption of mineral substances, and that of the transference of nutrient materials from the tops into the bulbs.

B. C. A.

**The immediate effect of change of light on the rate of photosynthesis.** TSI-TUNG LI. *Ann. Botany* 43, 787-801(1929).—*Ceratophyllum*, *Myriophyllum* and *Polamogelon* were used as exptl. plants and the rate of photosynthesis was detd. by counting the no. of bubbles given off by the submerged plant in unit time. Light of varying intensity was obtained by altering the distance between light source and plant material and the Wallace colored glass filters were employed to give variously colored lights. Change from white light to red, green or blue produces an immediate cessation of photosynthetic activity followed after 1-4 min. by increase to a rate which is const. for that particular light; return to white is followed by rapid return to a rate equaling or exceeding the normal for white light. The initial effect of progressively decreasing the intensity of the light was a decrease in photosynthetic rate lasting less than 1 min., followed by establishment of a new rate const. for the particular intensity. When the light was altered in color but gave the same amt. of available energy the rate of photosynthesis showed no change. There is initial inhibition upon changing from light of high available energy to light of lower available energy; initial acceleration occurs when the direction of the change is reversed. The results support the Warburg-Baly theory of surface action in photosynthesis. The splitting off of O may be a secondary reaction controlled by an enzyme and not a part of the primary photochem. reaction, and the degree of correlation between the 2 reactions may vary in different plants.

JOSEPH S. CALDWELL

**Studies on sugars. III. Galactose from *Gelidium pacificum* Okam.** YOSHISUKE UYEDA. *J. Soc. Chem. Ind. Japan* 32, 568-9(1929); Suppl. Binding 32, 175-6B(1929).—The av. compn. of sea weed "Tengusa" (*Gelidium pacificum*, Okam) was moisture 15.31, ash 3.35, galactose 18.52 and galactan 12.53%. From this material, 5% of galactose was obtained in crystal form, by first hydrolyzing with 5%  $H_2SO_4$  for 20 hrs., neutralizing with  $BaCO_3$ , filtering, evapg. the filtrate under reduced pressure, and purifying the soln. with alc. and evapg.

FUJIBAYASHI

**The chemical nature of allergens. III. Pollen of *Alopecurus*.** L. FARMER LOEB. *Klin. Wochschr.* 8, 926-7(1929); cf. *C. A.* 23, 677. If  $C_2H_5OH$  is added to an aq. ext. of the pollen of *Alopecurus* (to which certain hay fever patients give a reaction), a ppt is formed that contains all of the active substance. This ppt. loses its activity when it is subjected to proteolytic digestion. The active substance is either a protein, or is combined with a protein or is active only when it is combined with a protein.

M. H.

**Seed fats of the Umbelliferae. II. The seed fats of some cultivated species.** BRIAN C. CHRISTIAN AND THOMAS P. HILDITCH. *Biochem. J.* 23, 327-38(1929); cf. *C. A.* 22, 2766.—In 7 examples of umbellate seed fats, petroselinic acid (6<sup>6</sup>-octadecenoic acid) is present in all cases; varying quantities of palmitic, oleic and linoleic acids are also present.

BENJAMIN HARROW

**Carrageen (*Chondrus crispus*). IV. The hydrolysis of carrageen mucilage.** PAUL HAAS AND BARBARA RUSSELL-WELLS. *Biochem. J.* 23, 425-9(1929); cf. *C. A.* 16, 2710.—Mild hydrolysis of carrageen does not give rise to free sugars, but 2 ethereal sulfates are produced which can be sepd. by dialysis. Glucose is present in carrageen mucilage.

BENJAMIN HARROW

**Effect of partial decay on the alkali solubility of wood.** WM. G. CAMPBELL AND JAMES BOOTH. *Biochem. J.* 23, 566-72(1929).—The similarity of the effect on wood between acid hydrolysis and fungal decay of the brown rot type is so close as to warrant the conclusion that the latter type may be regarded as an acid hydrolysis.

B. H.

**Irreversible injury and carbon dioxide production from cells of *Nitella flexilis*.** P. A. DAVIES. *Bot. Gaz.* 87, 660-4(1929).—The rate of  $CO_2$  produced from the cells drops below the normal at the time when irreversible injury occurs. Cf. Haas, *C. A.* 13, 2903.

BENJAMIN HARROW

**New apparatus for the study of carbon dioxide assimilation, respiration, stomatal aperture and light intensity.** P. BOYSEN-JENSEN. *Planta, Abt. E. wiss. Biol.* 6, 456-72(1928).—An app. for the detn. of  $CO_2$  used during photosynthesis is described in detail. A known vol. of air is drawn through the system by means of  $H_2O$  flowing at a given rate from one 5 l. bottle to another. The difference in amt. of  $CO_2$  remaining in an air stream passed over leaves and one not passed over leaves is detd. by absorption with  $Ba(OH)_2$  and titration with  $HCl$ . The description of addnl. app. and methods are: Respiration is detd. by absorption of  $CO_2$  with  $Ba(OH)_2$  in a closed cylinder ( $10 \times 4$  cm.), the leaves resting on a perforated plate above the soln. Size of stomatal aperture is detd. by the pressure (cm. of Hg) necessary to infiltrate with  $H_2O$  leaves which have been

exhausted of air. Light intensity is detd. by means of Rhodamine B-paper for the red-yellow end of the spectrum which is regarded as most important in  $\text{CO}_2$  assimilation (blue end must be screened out).

**Process of formation of ethereal oil in the coriander plant.** A. E. HITCHCOCK. *Masloboino-Zhirovoe Delo* 1928, No. 12, 34-6.—Ethereal oil is formed by a series of reduction processes within the plant. This is complicated by secondary processes such as complex rearrangements in the course of formation of secondary alcs. from aldehydes, etherification of these alcs., and their dehydration with formation of cyclic hydrocarbons.

**New hypotheses concerning the action of potash in plant growth.** A. BRUNO. *Rev. vit.* 69, 60-2(1928).—B. suggests that  $\text{K}_2\text{O}$  may influence plant growth and especially carbohydrate formation as a result of a photoelec. effect originating in the radioactivity of K. The energy required in chlorophyll formation is supposed to be derived in part at least as the result of bombardment of K by solar rays and subsequent  $\beta$ -particle emission.

**The determination of manganese in plant materials by the periodate method.** JEHL DAVIDSON AND RUTH G. CAPEN. *J. Assoc. Official Agr. Chem.* 12, 310-1(1929).—In the  $\text{KIO}_4$  method for Mn in plant materials, the soln. must be free from reducing agents; the principal reducing agent in solns. of ashed plant materials is HCl, which is troublesome to eliminate completely. Practically the same results were obtained by dissolving the ashed material in  $\text{HNO}_3$ ,  $\text{H}_2\text{SO}_4$  or  $\text{H}_3\text{PO}_4$  instead of HCl; the differences in the results obtained were within the limits of exptl. error, but, if anything, better than with HCl.  $\text{H}_3\text{PO}_4$  proved the most suitable, as it developed the  $\text{KMnO}_4$  color in the shortest time;  $\text{H}_2\text{SO}_4$  was next in order, and  $\text{HNO}_3$  last. Addn. of  $\text{Fe}(\text{NO}_3)_3$  to the standard  $\text{KMnO}_4$  soln. is unnecessary in plant materials, but the addn. of  $\text{KIO}_4$  acts as an excellent preservative. The solns. should be guarded against alc. vapors and other volatile reducing substances.

**Chemical composition of Alaskan lichens.** G. C. SPENCER AND O. F. KRUMBOLTZ. *J. Assoc. Official Agr. Chem.* 12, 317-9(1929).—After a brief description of the biol. nature of lichens, a table of analytical results of 21 samples of Alaskan lichens is presented together with a bibliography of 4 references of non-grassy range feeds.

**The relationship of soil type to the calcium and magnesium content of green bean stems and leaves and their expressed juice.** J. F. FONDER. *Soil Science* 27, 415-32(1929).—The effect of crop growth upon the Ca and Mg content of the soil solns. and upon the  $p_{\text{H}}$  value of the soils was observed, and the relationships between these characteristics of the soils and the Ca and Mg content of the plants. Widely different amts. of Ca and Mg were found present in the various soil solns. before plant growth began but they were greatly reduced by the growing plants and were almost equal at the end of the growth period. The soil solns. with the highest concns. of Ca and Mg at the beginning of the growth period generally maintained a higher concn. during the growing period. No relationship appeared to exist between the Ca and Mg content of the soil solns. and either the  $p_{\text{H}}$  value or the texture of the soils. Marked variations were found in the amts. of Ca and Mg present in the green tissue and in the juice of both stems and leaves of bean plants grown on the different soil types. Greater increases in the Ca and Mg contents of the tissue and juice of stems and leaves generally occurred in early growth and near maturity than during the intermediate stages of growth. A decided correlation appeared to exist between the Cu content of the tissue and juice of both stem and leaves and that of the soil soln. A high Ca content in the soil soln. was associated with a high Ca content in the plants when the soils were of similar texture.

**Variations in the calcium and magnesium contents of pea plants on different soil types.** J. F. FONDER. *Soil Science* 28, 15-26(1929).—A study was made of the influence of the growth of field peas on the Ca and Mg contents of the soil solns., the reaction of the soil and on variations in the Ca and Mg content of pea stems and leaves and in their juice when obtained from plants grown on different soil types. Growing pea plants greatly reduced the amts. of Ca and Mg present in the different soil solns. They also tended to decrease the acidity of strongly acid soils and to increase that of alk. or nearly neutral soils. The Ca and Mg content varied greatly in the pea plants grown on the different soil types. On soils of similar texture and reaction, the amt. of Ca present in the pea plant varied directly with the amt. present in the soil soln. The Mg content

Mg increased in the tissue and juice of pea leaves. Greater amts. of Ca than of Mg were always present in the tissue and in the juice of pea stems and leaves. The Ca and Mg

content was higher in slowly growing plants than in those making a rapid growth.

**Acidity changes in stored legume seeds.** J. K. WILSON. *J. Am. Soc. Agron.* 21, 815-7(1929).—Seeds of different species of legumes, ranging from fresh seed to seeds 10 yr. old, were tested for acidity. In most cases there was a marked change in reaction. Usually older seeds of a given legume have a more acid reaction than fresh seeds.

J. J. SKINNER

**A study of the relations between chloroplast pigments and dry weights of tops in dent corn.** H. B. SPRAGUE AND J. W. SHIVE. *Plant Physiology* 4, 165-92(1929).—A close correlation appears to exist between the total quantity of chlorophyll contained in the leaves of the various strains of maize and their dry wt. of tops at successive harvests. Correlations also between total carotin content and dry wt., and between total xanthophyll content and dry wt. are close enough to be significant.

WALTER THOMAS

**Mosses and their subsoil.** ISTVÁN GYÖRFFY. *Földtani Közöny* 54, 45-56 (Hungarian), 166-73(German)(1925).—Mosses are of interest to geologists in 2 ways, as indicators of the chem. nature of rocks and as rock-formers. While many mosses are indifferent, some are largely restricted to substrata contg. certain elements. Thus *Mielichhoferia nitida* requires Fe and Cu; *Aloina stellata* indicates clay; and considerable numbers are Ca- or Si-loving. Reports of lime-loving mosses, as of other plants, on non-calcareous rocks such as granite are largely or wholly due to errors in identification of the rock. Supposed granites may contain much Ca-feldspar, amphibole, etc. Mosses are important in the deposition of travertine and limestone in running waters. They usually ext. CO<sub>2</sub> from the water, whereupon the CaCO<sub>3</sub> is pptd.

E. T. WHERRY

**The question of the soil-indicating mosses.** ÁDÁM BOROS. *Földtani Közöny* 55, 239-41 (Hungarian), 387-8 (German)(1926); cf. preceding abstract.—Mosses can be used as indicators only of the substratum in which they are rooted, and this may be quite different in character from the underlying rock, or even from the subsoil into which the roots of other plants extend. Differences in the moss-cover of 2 rocks may be due to phys. rather than chem. causes, as for instance, if one rock breaks up on weathering into flakes and the other into blocks. To call a plant Si-loving is certainly erroneous, because the Si in a rock does not act chemically on the plant.

E. T. WHERRY

**Fiber plants of the Crotalaria family (Ross) 25.** Course of the growth and the absorption of nutrients by the cotton plant (KUDRIN) 15. New method for determination of small quantities of nitrate in soils and plants (BLOM, TRESCHOW) 15. Vitamins and other constituents of citrus oils and related products (WILLMOTT) 17. Light rays for promoting plant growth (Brit. pat. 306,112) 4.

## E—NUTRITION

PHILIP B. HAWK

**Increase of hepatic proteins with a diet rich in proteins.** C. GAUTIER. *Bull. soc. chim. biol.* 11, 168-77(1929).—The expts. on frogs (*C. A.* 22, 2592) are repeated with the addnl. detn. of the liver-proteins by pptn. with 20% trichloroacetic acid. While the percentage protein content falls, the total amt. of protein increases 2-4 times in the animals receiving cheese.

B. C. A.

**Urinary elimination of ammonia in relation to different nitrogenous diets.** M. POLONOVSKI AND P. BOULANGER. *Bull. soc. chim. biol.* 11, 211-32(1929).—The ratio of ammoniacal N to total N of the urine appears to possess no relation to the N content of the diet. The constant of Hasselbalch (*C. A.* 10, 1760) possesses an approx. inverse relation to the  $pH$  of the urine.

B. C. A.

**Causes of alimentary hyperglucemia in carbohydrate feeding and deprivation.** F. SCHELLONG AND H. KRAMER. *Klin. Wochschr.* 7, 1726-9(1928).

B. C. A.

**Utilization of sulfur by animals.** H. R. MARSTON AND T. B. ROBERTSON. *Australia Inst. Sci. Ind. Bull.* 39, 5-51(1928).—A review of the literature dealing with S metabolism, compiled with the object of laying a foundation for research into the problem of the economic importance of S in wool production.

B. C. A.

**The toxicity of irradiated ergosterol preparations.** ARTHUR SCHREUNERT AND MARTIN SCHIEBLICH. *Klin. Wochschr.* 8, 983-4(1929).—The toxicity and the antirachitic properties of three irradiated ergosterol preps. have been quant. compared. The two effects are approx. parallel, indicating that the antirachitic mol. is also the toxic mol.

MILTON HANKE

**The milk of irradiated mothers.** H. HIRSCH-KAUFFMANN AND C. WIENER. *Klin. Wochschr.* 8, 984-5(1929).—Irradiation of the mother increases the quantity of milk

produced but does not produce a determinable difference in the chem. compn. of the milk. The vitamin C and D contents are definitely increased by irradiation. M. H.

**The specific dynamic action of liver.** R. NOTHAAS AND J. MULZER. *Klin. Wochschr.* 8, 1065-6(1929).—The specific dynamic action of liver is approx. identical with that of meat. An attempt is made to explain why Mark (C. A. 23, 1438) found liver to have very little specific dynamic action.

**Effect on vitamin B<sub>2</sub> of treatment with nitrous acid.** H. CHICK. *Biochem. J.* 23, 514-6(1929).—Vitamin B<sub>2</sub> is not destroyed by HNO<sub>2</sub>. BENJAMIN HARROW

**The antirachitic action of certain cholesterol lipides of the Bourgogne snail (*Helix pomatia*).** G. MOURIQUAND AND A. LEULIER. *Compt. rend.* 188, 1701-2(1929).—The cholesterol lipides of the *Helix pomatia* were studied for antirachitic activity because of the great Ca content of its blood and the ease with which it repairs its shell. The ingestion of one drop of a 0.1% soln. of a mixt. of cholesterol and lipides after irradiation cured a rachitic rat while 5 drops of nonirradiated material had no effect; neither did irradiated nor nonirradiated cholesterol. The lipides are not toxic and, thus, may be used therapeutically.

**The determination of the value of vitamin D preparations.** I. ARTHUR SCHEUNERT AND MARTIN SCHIEBLICH. *Biochem. Z.* 209, 290-303(1929).—See C. A. 23, 2743.

**The metabolism of sulfur. XVI. Dietary factors in relation to the chemical composition of the hair of the young white rat.** HOWARD D. LIGHTBODY AND HOWARD B. LEWIS. *J. Biol. Chem.* 82, 663-71(1929); cf. C. A. 23, 3957.—The cystine and S contents of the hair varied with the content of these substances in the diet and with the age of the rats. The cystine requirements for body-growth take precedence over the requirements for hair production.

Vitamins and other constituents of citrus oils and related products (WILLIMOTT) 17.

**KNAUR, HANS: Ergebnisse der Lipidstoffwechselforschung mit besonderer Berücksichtigung der Verhältnisse im Kindesalter.** Berlin: S. Karger. 164 pp. M. 7. Reviewed in *J. Am. Med. Assoc.* 93, 792(1929).

**SCHUEUNERT, ARTUR: The Vitamin Content of German Fruits and Vegetables. I. Fruits and Vegetables (in German).** Berlin: J. Springer. 37 pp. M. 2.40. Reviewed in *Nahrungsmittel-Industrie* 8, 622(1929).

## F—PHYSIOLOGY

E. K. MARSHALL, JR.

**Urinary elimination of ammonia and nitrogen. Some urinary constants. II.** E. RAFFLIN. *Bull. soc. chim. biol.* 11, 178-88(1929).—Chiefly polemical against Polonovski and Boulanger (C. A. 22, 2972). An account of the variation of the consts. with a no. of pathol. conditions is given. III. *Ibid* 189-97.—The effect of NaHCO<sub>3</sub>, NaCl, CaCl<sub>2</sub> and H<sub>2</sub>SO<sub>4</sub> on the urinary constants (C. A. 22, 3920) is studied. The substances cause a fall, little effect, an increase and little effect, resp., in the ratio ammoniacal N/total N. IV. *Ibid* 198-210.—A discussion of the effects of a no. of pathol. conditions on the urinary constants.

**Mathematical relationships of urinary characteristics.** L. LEMATTE AND E. KAHANE. *Bull. soc. chim. biol.* 11, 233-41(1929).—A discussion of the constants of Rafflin and Hasselbalch (cf. preceding abstr.).

**Seasonal influence on the respiratory combustion of the dog.** F. MAIGNON AND A. PAINVIN. *Compt. rend.* 188, 573-5(1929).—The amt. of O used in respiration by a fasting dog shows maxima in the spring and the autumn; on a meat diet the effect is similar but less pronounced.

**Caries investigations. A. Biochemistry of mixed human saliva. I. Dextrose content.** D. ENTIN AND A. A. SCHMIDT. *Deut. Monatschr. Zahnheilkunde* 1928, 177-88; *Chem. Zentr.* 1928, I, 2955; cf. C. A. 23, 3255.

**The question of the origin of urinary ammonia.** STANLEY R. BENEDICT AND THOMAS P. NASH, JR. *J. Biol. Chem.* 82, 673-8(1929).—Conclusions: Urinary NH<sub>3</sub> is of renal origin. Urea is probably its precursor. NH<sub>3</sub> plays no part in the neutralization of acids in the blood. "Satisfactory evidence is lacking that NH<sub>3</sub> is utilized for the intracellular neutralization of acids."

**The excretion of lead in urine.** HORACE MILLET. *J. Biol. Chem.* 83, 265-8(1929).—The excretion of Pb in the urine was detd. electrometrically. Cancer patients who had received injections of colloidal Pb<sub>2</sub>(PO<sub>4</sub>)<sub>2</sub> and those not treated with Pb showed

the same rate of excretion of Pb. There is a definite normal excretion of Pb in urine.

ARTHUR GROLLMAN

A previously undetected constituent of blood. E. W. ROCKWOOD, R. G. TURNER AND J. J. PFIFFNER. *J. Biol. Chem.* **83**, 289-97(1929).—After the acid hydrolysis of the blood of man, dog and rabbit, there is a previously undetected substance, reducing arsenophosphotungstic acid, which is provisionally named *substance Z*. It is also present in the muscle, kidney and liver of the dog and rabbit.

ARTHUR GROLLMAN

Endogenous uric acid and hematopoiesis. JOSEPH KRAFKA, JR. *J. Biol. Chem.* **83**, 409-14(1929).—During the hematopoietic activity following hemorrhage, there was a great increase in the excretion of uric acid by the Dalmatian coach hound.

ARTHUR GROLLMAN

The storage of manganese and copper in the animal body and its influence on hemoglobin building. R. W. TITUS AND J. S. HUGHES. *J. Biol. Chem.* **83**, 463-7 (1929).—Mn and Cu are stored in the body when added to the ration of rats and are effective in the utilization of Fe in hemoglobin building.

ARTHUR GROLLMAN

Composition of bone. VI. Effect of massive doses of irradiated ergosterol. BENJAMIN KRAMER, M. J. SHEAR AND MARGARET R. MCKENZIE. *J. Biol. Chem.* **82**, 555-7(1929).—The residual Ca:P ratio of the bones of rats was not affected by massive doses of irradiated ergosterol or by feeding cod-liver oil. Cf. *C. A.* **22**, 4328.

ARTHUR GROLLMAN

Fat excretion. VI. Excretion by Thiry-Vella fistulas. ROBERT W. ANGEVINE. *J. Biol. Chem.* **82**, 559-65(1929).—A considerable amt. of fatty material was formed and excreted through the intestinal loops of a Thiry-Vella fistula. The amt. excreted was independent of the diet.

ARTHUR GROLLMAN

Growth in infants from the standpoint of physical measurements and nitrogen metabolism. I. Creatinine. AMY L. DANIELS AND LUCEA M. HEJNIAN. *Am. J. Diseases Children* **37**, 1128-34(1929).—The phys. development of an infant may be more accurately measured by the increase in the amt. of creatinine excreted per cm of the body length than by the amt. excreted per kg. of the body wt. E. R. MAIN

The composition of growth in infancy. I. A premature infant. BENGT HAMILTON AND MARGARET MORIARTY. *Am. J. Diseases Children* **37**, 1169-76(1929).—The compn of the growth of a premature infant was studied by a detn. of the retentions of Ca, P, Na, K, Cl and N per kg. of gain in wt. The gain in wt. appeared to contain more Ca and P, but less Na, K, Cl and N than does the body at birth. It is suggested that there was a progressive loss of lime salts from the bones, an increase in the body fluids and a change in either the compn. or the relative mass of the cellular tissues. E. R. M.

Chemical investigations on the nature of the intraocular fluids. II. Magnesium, sodium and chlorine in the blood serum and in the aqueous and vitreous humor of the eye of the ox. EUGEN TRON. *Arch. Ophthalmol.* **118**, 713-22(1927); *Chem. Zentr.* **1928**, II, 1894; cf. *C. A.* **22**, 2954.—The vitreous humor in the ox contains Cl 0.44, Na 0.335 and Mg 0.001%. The same values were found for the aq. humor. The Na content equals that of serum, while the Cl value is 20% higher and the Mg value 33% lower than the resp. values in serum. III. Inorganic sulfur and phosphorus in the intraocular fluids and the blood serum of the ox. The intraocular fluids as the ultra-filtrate of the blood. *Ibid* **119**, 659-79; *Chem. Zentr.* **1928**, II, 1894.—The av. content of inorg. P in ox serum is 0.047 mg. and that of S is 0.027 mg. per cc. Aq. humor contains 0.028 mg. of inorg. P and 0.012 mg. S, while vitreous humor contains 0.01 mg. P and 0.014 mg. S per cc. The distribution of the ions in blood and intraocular fluid is discussed with regard to the Donnan equil. Since the diffusibility is not definitely known for Ca, sulfate and phosphate, a final decision cannot be made. It is highly probable, however, that the intraocular fluid is an ultra-filtrate of the serum, which view is supported by the fact that no ionic exchange occurs on dialyzing serum against intraocular fluid.

G. SCHWOCH

The liver glycogen content of different animals in the embryonic and newly born stages. II. The liver glycogen in the newly born stages. ICHIRO MARUYAMA. *Okayama-Igakkai-Zasshi* **39**, 1133-72; *Chem. Zentr.* **1928**, II, 1794.—The liver glycogen in newly born mammals is low and is sometimes absent directly after the birth. There exist great individual variations and also differences according to the species of animals. Hunger is not the cause of the glycogen loss. Administration of glucose directly after birth is without effect.

G. SCHWOCH



## H—PHARMACOLOGY

A. N. RICHARDS

**Adsorption of dyes by the serum in lead poisoning.** A. SEITZ. *Klin. Wochschr.* 7, 1234-5(1928).—Inhibition by serum of the diffusion of dyes is less marked in Pb poisoning.

..... (strongly absorbed), adrenaline, strophanthin, or pilocarpine (absorbed with difficulty) is inhibited by adsorption from the nutrient soln. or from the tissue by the above substances, in order of decreasing effect. Animal charcoal is more effective.

**Influence of ergotamine on the blood sugar of animals and man.** M. BUFANO AND A. MASINI. *Riforma med.* 43, No. 38, 21 pp.(1927).—Administration of ergotamine causes a fall in the blood sugar which is ascribed to diminished glycogenolysis in the liver.

**Influence of substances of the pilocarpine group on the gaseous exchanges of animals.** A. M. PREOBRAZHENSKII. *Russ. J. Physiol.* 12, 45-58(1929).—The excretion of CO<sub>2</sub> and water and the absorption of O in the rabbit are increased as a result of the injection of pilocarpine in doses from 1 mg. per kg. body weight. In large doses (10 mg. per kg.), this general increase is maintained, but the O absorption does not increase proportionately to the increased excretion of water and CO<sub>2</sub>. Arecoline in doses of 0.1-1 mg. gives results similar to those obtained with pilocarpine, but the general increase of all components with increasing dosage is more proportionately interrelated. With both drugs the excretion of water is the most marked. Physostigmine in doses of 0.1-1 mg. causes an increased excretion of CO<sub>2</sub> but the excretion of water and the absorption of O decrease.

**Connection between sodium chloride elimination and insulin administration in diabetes.** M. TINKER AND A. SAIDENBERG. *Russ. Klin.* 8, 223-35(1927).—In diabetes there is NaCl insufficiency, but retention of NaCl in the tissues is prevented by polyuria; excess of administered salt is retained, but the smaller the concn. of sugar in the urine, the greater is the NaCl concn. On administration of insulin the diminished urinary excretion of sugar is paralleled by an increase in the NaCl concn., but the water retention leads to NaCl retention in the tissues. The NaCl concn. in the blood is increased.

**Effect of hydrazine, hydroxylamine and aminoguanidine on the excretion of uric acid.** N. NIELSEN AND G. E. WIDMARK. *Upsala Läkarefor. Förh.* [2], 33, 327-33 (1927).—The uric acid excreted by normal rats was 7-8 mg. per kg. per day; the administration of hydrazine, hydroxylamine or aminoguanidine did not cause increased elimination of uric acid.

**The physiological and pharmacological relations of  $p_H$  to the heart.** T. KOMIYAMA. *Arch. exptl. Path. Pharmacol.* 139, 100-19(1929).—Acids and alkalis affect the heart reversibly or irreversibly according to their concn. The reversible effect involves only the contraction process. As acidity increases, contractility decreases until at  $p_H$  6 (in nutrient soln.) the heart comes to diastolic rest. An increase in alkali increases contractility. The heart is irreversibly contracted at  $p_H$  5, but complete recovery is possible after exposure to  $p_H$  12.0; 0.025 N NaOH causes irreversible contraction. The concn. of H or OH ions exerts its influence as regards its reversible effects on the cell membrane. The effect of  $p_H$  in combination with various neutral salts and with neurotropic bases is studied.

**Experiments on nerve-muscle preparations of frogs. The increase of toxicity of hydroquinone by the promotion of its oxidation (a contribution to the toxicology of aromatic compounds).** RICHARD LABES. *Arch. exptl. Path. Pharmacol.* 139, 120-8 (1929).—Conditions which favor the oxidation of hydroquinone (in solns. of 1:10,000) at the same time accelerate the injury to nerves of isolated nerve-muscle preps. At the same time or shortly after, the nerve and muscle are discolored.

**The pharmacology of the ester of brominated valeric acid.** ERICH RATH. *Arch. exptl. Path. Pharmacol.* 142, 162-5(1929).—The substitution of a Br atom in the acid half of isovalerylamlene hydrate resulted in much stronger hypnotic action (tested on fish and mice) than substitution in the alc. half.

**The cholagog action of sodium naphthoate and sodium hydroxynaphthoate.** ETIENNE CHABROL, R. CHARONNAT, M. MAXIMIN, J. PORIN AND M. E. PIETTRE. *Compt. rend. soc. biol.* 101, 254-6(1929).—In order to learn whether cinchopen deprived of N and a phenyl radical loses its cholagog property. Na naphthoate and Na hydroxynaphthoate

were injected intravenously in 1.1 g. doses into dogs with biliary fistulas. The flow of bile was more than doubled for 3-5 hrs. after injection. Replacement of the carboxyl radical of  $\alpha$ -naphthoic acid by the sulfonic acid radical resulted in a loss of cholagog action. The carboxyl radical is not the only factor for BzOH is also inactive.

B. C. BRUNSTETTER

The concentration of urea and ammonium salts, as affected by pilocarpine, in human saliva. Role of the salivary glands in the maintenance of the alkaline reserve. R. VLADESCO and MARIN POPESCO. *Compt. rend. soc. biol.* 101, 306-8(1929).—Injections of pilocarpine (0.006-0.010 g.) into humans decreased the concn. of urea and ammonia N in the saliva and increased the concn. of urea in the blood. V. and P. believe the salivary glands change urea into  $\text{NH}_3$  and consider them as important as the kidneys in maintaining the alkali reserve.

B. C. BRUNSTETTER

Physiological action of strontium. M. COMEL. *Atti accad. Lincei* 9, 663-5 (1929).—Sr hexahydroxypropionate injected intramuscularly in fowl produces, after about 15 injections, symptoms analogous to intoxication. The fowls eat voraciously, though losing weight as well as strength; the nervous system is affected till convulsions occur. Hunger increases, although the strength fails. Autopsy shows lesions only in the liver and heart; sometimes there is subcutaneous edema. Vitamin D seems to attenuate the symptoms of poisoning by Sr.

A. W. CONTIERI

Treatment of the epidemic Parkinsonian forms of encephalitis with glucose injections of sodium salicylate. A. LEQUIN. *Bull. gén. théor.* 179, 225(1928); *Quart. J. Pharm. and Pharmacol.* 2, 154.—L. advocates the daily injection, intravenously, for 12 consecutive days, of 20 cc. of 10% glucose-contg. soln. of Na salicylate. It is stated that the treatment is perfectly tolerated. Three courses are thus given, sepd by a 10 days' interval. L. asserts the method to be absolutely harmless. There is no general reaction such as shock. Locally venous obliterations need not be feared if the Na salicylate is pure, if the puncture is made into the vein, and if a glucose soln. not exceeding in strength 10% of Na salicylate is employed. The treatment may be prolonged, and it may be useful to employ some therapeutic adjuncts, such as stramonium.

H. L. D.

Toxic character of *Scrophularia nodosa* L. LUDWIG KROEBER. *Apoth. Ztg.* 44, 909(1929).

W. O. E.

Gold salts in the treatment of tuberculosis. A. LUMIÈRE AND A. GELIBERT. *L'Avenir médical* 1928, 165; *Rev. hyg. méd. prév.* 51, 534.—In general, favorable results were obtained.

C. R. F.

The treatment of human trypanosomiasis by "tryponarsyl." G. LEDENTU AND M. VAUCEL. *Bull. Soc. Path. Exot.* 22, 875-83(1928); *Rev. hyg. méd. prév.* 51, 531.—Tryponarsyl is similar in compn. to the American tryparsamide. In 25 cases under treatment during the first period of the disease, 4 were successful; the blood remained sterile for 5 months. In the second period of the disease, 13 cases were treated; 9 were treated successfully, 1 was relieved and 3 were failures. The tryponarsyl was administered intravenously at weekly intervals, dose 0.035-0.09 g. per kg. of body wt. Tryponarsyl is considered as effective as tryparsamide.

C. R. F.

Asphyxia due to oxygen want. K. KÖTSCHAU. *Arch. ges. Physiol.* (Pflüger's) 222, 510-5(1929).—Factors other than the O tension are concerned in asphyxial change when isolated tissues are oxygenated.

ARTHUR GROLLMAN

The effect of an experimental alkalosis on human metabolism. O. WUTH. *Klin. Wochschr.* 8, 969(1929).—The administration of 50 g.  $\text{NaHCO}_3$  to a healthy human subject leads to marked, generalized alkalosis and an increase in the metabolic rate from -3 to +14.

MILTON HANKE

The influence of thallium on lipid metabolism and on the tissues. A. BUSCHKE AND ANDREAS MÄRKUS. *Klin. Wochschr.* 8, 1122-3(1929).—Administration of Tl to rats leads to a decrease in the lipid content of the suprarenals, and of the skin. Other changes are described, but they have been described before. The action of Tl is reversible. A repair process begins promptly after the administration of the Tl salts is discontinued. The lipoids reappear in the skin and in the suprarenals; the alopecia disappears and the testicles assume a normal histological appearance. MILTON HANKE

Studies in carbohydrate metabolism. IV. Action of hydroxymethylglyoxal upon normal and hypoglycemic animals. WM. O. KERMACK, CHARLES G. LAMBIE AND ROBERT H. SLATER. *Biochem. J.* 23, 410-15(1929).—The lethal dose of monomeric hydroxymethylglyoxal (A) is 0.06 g., which is about 4 times the lethal dose of the unheated material. Depolymerization, therefore, considerably reduces the toxicity of (A). The depolymerized substance when administered in sublethal doses does not appear to cause the appearance of symptoms similar to those of insulin hypoglycemia.

**V. Effect of administration of dextrose and of dihydroxyacetone upon the glycogen content of muscle in depancreatized cats.** *Ibid* 416-21.—No evidence could be obtained that muscle glycogen was more readily formed from dihydroxyacetone than from dextrose in presence of the liver.

**Preliminary report on the toxicity of the fruit of *Melia azedarach* (Syringa berries).** BENJAMIN HARROW, D. G. STEYN AND M. RINDL. *Trans. Roy. Soc. S. Africa* 17, 295-308(1929).—The fruit of *Melia azedarach* Linn., commonly known as the China Berry, was given by use of stomach tubes to rabbits, dogs, sheep, goats and pigs. In all cases the fruit proved to be toxic. The symptoms produced were paralysis and narcosis. Death occurred through asphyxia. The poison was readily extd. by  $\text{Et}_2\text{O}$  and  $\text{CHCl}_3$ , and was thermostable. It seemed not to be an alkaloid, albumin or glucoside. Feeding of small quantities of tannic acid with the fruit had an inhibitory effect upon its activity, although the poison seemed not to have been pptd.

**The distribution of arsenic in the organism after intravenous injections of arsenious acid.** AMBROGIO MANTEGAZZA. *Biochim. terap. sper* 16, 153-9(1929).— $\text{As}_2\text{O}_3$  was injected intravenously into rabbits in amts. which killed the animals in  $\frac{1}{2}$  to one hr. after the injection. The organs were immediately analyzed for As by the Marsh method. The As administered was distributed as follows: muscles 16.66-17.94, liver 9.18-10.19, kidneys 1.83-3.12%, in the other organs (lungs, heart, spleen, brain, digestive tract and bones) less than 1%.

**Studies on the action of adrenaline, calcium and potassium on the isolated stomach of the frog.** E. CANTEL. *Boll. soc. ital. biol. sper.* 4, 348-9(1929).—Adrenaline 1:5,000,000 causes a diminution in the rhythmic activity of the stomach. In larger doses, 1:1,000,000, it causes arrest and diminution of the tone.  $\text{CaCl}_2$  and  $\text{KCl}$  increase in a varying degree the tone of the muscle depending on the condition of the tone itself, the more depressed the greater the efficiency. To obtain appreciable results a concn of the salts 0.6:1000 is required. If the salts are introduced immediately after the adrenaline, at a concn. of 0.9:1000, they suppress the action of adrenaline; if introduced before the adrenaline they arrest only the rhythmic contractions but not the diminution of the tone.

**The action of the anterior, posterior and whole extract of hypophysis on the  $pH$  of the blood.** E. IMPARATO. *Boll. soc. ital. biol. sper.* 4, 350 2(1929).—The subcutaneous injection of anterior lobe ext. produces an increase in alk. which becomes greater with increasing doses. The posterior lobe ext. produces an increase in acidity, less marked if injected subcutaneously, very marked if injected intravenously. The diminution in alk. reserve is more marked the greater the dose. An ext. of the whole hypophysis has no influence on the  $pH$  nor on the alk. reserve. With the posterior lobe ext. the diminution in  $pH$  is more marked  $\frac{1}{2}$  hr. after the injection; then it gradually rises until it reaches normal within 2 hrs.

**Studies on phlorhizin. II. The action of phlorhizin on the automatic contractions of the stomach.** P. S. ISRAEL. *Boll. soc. ital. biol. sper.* 4, 376-8(1929).—The immersion of the stomach in a soln. of phlorhizin in Ringer soln. (0.075%) immediately produces a marked diminution in the frequency and the height of contractions followed by a noticeable diminution of the tone. By washing out the phlorhizin with Ringer soln. the phenomenon is reversible except that after 15-20 min. the contractions were double or triple the original.

**The paralyzing action of magnesium and lithium.** MICHELE MITOLO. *Boll. soc. ital. biol. sper.* 4, 378-80(1929).—Mg is a poison which paralyzes the spinal cord, it causes a central depression only when it acts selectively on the sensory centers of the posterior horn (dorsal side) while it is inert for the motor center of the anterior horn (ventral side). Li is also a poison which paralyzes the spinal cord and has the same central seat of action as Mg, but similar to Ca, it has an intensity of action stronger than Mg.

**The treatment of typhoid fever with barium chloride.** K. ROUTKEVITCH. *Presse méd.* 36, 1046-8(1928).—Typhoid fever was successfully treated with  $\text{BaCl}_2$  in doses of 0.5 g. 3 times daily for 6-7 days. This treatment was repeated when 3-5 days had elapsed. R. cannot explain the mode of action of the  $\text{BaCl}_2$ .

**The treatment of diabetes insipidus by the nasal application of powdered posterior pituitary body.** ANDRÉ AND LUCIE CHOAY. *Presse méd.* 36, 1155-6(1928). A. E. MEYER.

**The use of organic phosphorus in therapy of children.** M. LA FERLA. *Semana méd.* (Buenos Aires) 36, 658-9(1929).—Three cases of rickets were successfully treated with a compd. (tonophosphan) contg. P and C in direct linkage.

**Relation between poisoning and the urine or serum amylase. I. The amylase of a normal urine or serum.** KISHI KAWAGUCHI. *Kyoto J. Med.* 25, 711-36(1928).—

K. measured the quantity and the fluctuation of the amylase in rabbit's urine and serum. Fresh rabbit urine is mostly transparent and acid in character. When the total quantity of urine is accumulated for a day it is usually neutral, d. 1.008-1.016. The amylase variation is parallel to that of the d., and the amylase value of a rabbit measured after making the sp. gr. 1.010 by diln. or concn. is almost const. throughout the year, the value being  $d_{30}^{38} = 16$ . It is only slightly affected by the variation of the serum amylase value. Hence K. compared the results of measurements taken by making the sp. gr. of the urine 1.010 by diln. The amylase in a turbid urine is removed by its adsorption on the suspended substance. No change in the amylase value is observed up to the point of the putrefaction of the urine or serum. The value is also unaffected by the addn. of a small quantity of xylene. **II. Relation between corrosive poisoning and the urine or serum amylase.** *Ibid* 737-63.—The amylase value of the urine of the rabbit affected by the poisoning with  $HgCl_2$ ,  $K_2Cr_2O_7$  and  $(CO_2H)_2$  decreases, while that of the serum amylase first decreases and then increases. In both cases the peroral poisoning causes a more gradual change, while the subcutaneous poisoning causes a very rapid change in the value. **III. The relation between serum poisoning and the amylase of the urine or serum amylase.** *Ibid* 844-58.—The CO poisoning first shows a slight decrease and then an increase, the increase being especially remarkable in a somewhat acute poisoning. The serum amylase value shows a similar change, but in acute poisoning it only shows a temporary increase. In acute  $KClO_3$  poisoning there is a marked decrease of the urine amylase and a slight decrease in the serum amylase. K. S.

**Toxicity of phenolphthalein.** DEVRIENT. *Therap. Berichte* 1928, No. 7; *Schweiz. Apoth. Ztg.* 66, 367-8(1928); cf. C. A. 16, 967; 17, 827.—Disturbances of kidney and liver functions are recorded. S WALDBOTT

## 12—FOODS

F. C. BLANCK AND H. A. LEPPER

**Chemistry of foods in 1928.** AD. STEINRUCK. *Fortschrittsber. Chem.-Ztg.* 53, 69-99(1929).—A review with bibliography. E. J. C.

**Recent advances in the low-temperature preservation of foodstuffs.** T. MORAN. *J. Soc. Chem. Ind.* 48, 245-51T(1929). E. J. C.

**A method for determining the soundness of grain.** K. MOHS. *Z. ges. Getreidek.* 15, 85-90; *Chem. Zentr.* 1928, II, 299-300.—The % of wheat kernels germinating in 48 hrs. at 15-18° was detd. For American wheat this was 90-95%, and for hard wheat 70-80%. The observation of Jago (1895) that wheat flour hinders the fermentation of beer yeast was confirmed. The toxicity was detd. by measuring the decrease in  $H_2CO_3$  given off by a certain quantity of yeast. Musty-smelling and bitter tasting flour was much more toxic than acid flour. The detn. of the kind of bacteria present is especially important. FRANCIS P. GRIFFITHS

**A study of the basic, bromate and blend baking formulas as means for determining wheat quality with particular reference to low-grade wheat of the crop of 1928.** R. K. LARMOUR AND A. G. MACLEOD. *Sci. Agr.* 10, 1-22(1929); cf. C. A. 23, 2505.—With frosted and unfrosted samples as well as various grades of wheat, the basic formula gave erroneous values with experimentally milled flours because frequently high-grade wheat flour failed to show its true value by this method. The results, when used in conjunction with those obtained by the action of 0.001%  $KBrO_3$ , are useful in revealing the direction and magnitude of response attributable to the bromate. This response is indicative of the quality of the flour under consideration. By the baking procedure commonly used, wheat of the lower grades, i. e., 4, 5 and 6, gives values equal to or superior to wheat of the high grades. Samples of grades 5 and 6 give av. lower flour yields with higher ash and darker color than the higher grades of wheat. A study of the capacity of the flour to "stand up" in a blend with very weak flour, taken as a measure of strength of wheat, showed (1) feed wheat is of little value; (2) grade 6 wheat averages very poor; (3) grade 5 is much superior to grade 6 but inferior to grade 4, which is in turn comparable in strength to that of the higher grades. Response of flours to the bromate formula gave fairly reliable data for predicting the behavior of the flour when baked in a blend. Results by the basic formula bear no relation to the behavior of the flour by the bromate or blend formulas, and for this reason the basic formula alone is regarded as unreliable for detg. the strength or quality of wheat. C. R. FELLERS

**Acetone-soluble substances in rye.** EIJI TAKAHASHI AND KIYOSHI SHIRAHAMA. *Sapporo J. Forestry and Agr.* 19, 105-23(1927).—Both the 60% acetone ext. [AC] and

the alc. ext. [AL] of rye give positive biuret, xanthoproteic, Millon, glyoxylic acid, concd.  $H_2SO_4$  and concd. HCl reactions, the reaction being more rapid in [AC] than in [AL]. The N, S and amidic N contents are the same in both, while the free amino acid content is greater in [AC] than in [AL]. There is a difference in the colloidal properties of the two, perhaps owing to the fact that  $Me_2CO$  acts as a more intense peptizer than EtOH, and the change in the colloidal structure causes the difference in the chem. reaction in the secondary manner. Thus, the more rapid color reaction of [AC] and the greater content in the free amidic N is due to the fact that the dispersity of [AC] is greater and hence the sp. surface area is larger with the consequent increase in the reaction velocity. Globulin, [AC], [AL] and glutelin were sepd. from rye; the surface-tension curves were constructed for the case when 0.01 N HCl soln. was added dropwise into their 0.02 N NaOH solns. Comparison of these curves with those for the mixt. of the proteins indicates that [AC] and [AL] are the same protein. K. SOMEYA

**Action of chlorine on wheat flour in treatment with gologas.** M. VUK AND A. GÖMÖRY. *Z. Untersuch. Lebensm.* 57, 177-91(1929).—Definite compds. are not formed with Cl and starch and no harmful influence on the flour could be detected. The Cl changes the balance between the gliadin and glutelin so that it becomes difficult to obtain the gluten by washing with water. The proportions of various amino acids in the gliadin and glutelin of untreated, chlorinated and over-chlorinated flours, resp., were detd. The greatest increases were in the quantities of amide N and glutamic acid, and to a lesser degree of aspartic acid and arginine. The  $H_2O$ -sol. N increased after chlorination. Glutamic and aspartic acids, in the form of glutamine and asparagine, are so united to other amides, mono- or di-amino substances that they are set free on treatment of flour with gologas and become sol. as free amino acids or their hydrochlorides. The Cl forms addn. products with the unsatd. glycerides of flour fat. Carotin is bleached by conversion to  $H_2O$ -sol. dicarotin. C. R. FELLERS

**Efficiency of pasteurization as a means of killing tubercle bacilli in milk.** SCHARR AND LENTZ. *Z. Fleisch-Milchhyg.* 37, 202-5; *U. S. Pub. Health Eng. Abstracts* E-856c, 32(1929).—Thirty min heating of milk at a temp. of 60-63° does not suffice to kill all tubercle bacilli. C. R. FELLERS

**The influence of the foot-and-mouth disease on the weight of cows and on the chemical composition of the milk.** JULIUS KARKLIN. *Fortschritte Landw.* 4, 476-8 (1929).—From analyses of the milk from 4 cows it was found that during the disease there is a decrease in sp. gr. and casein content, and an increase in fat, albumin and ash. The *n* of the butter fat is increased and the Reichert-Meißl no. decreased. L. P. M.

**Electrical conductivity of milk. I. Detection of abnormal milk from diseased cows.** J. KRENN. *Z. Untersuch. Lebensm.* 57, 148-77(1929).—Detn. of elec. cond. of milk is shown to be of great utility in the detection of milk from cows with diseased udders. Such milk has invariably a higher elec. cond. than normal milk because of its slightly higher NaCl content. C. R. FELLERS

**The significance of alkalis in milk.** F. E. NOTTBOHM. *Volksernährung* 3, 68; *Chem. Zentr.* 1928, 1, 2217.—The  $K_2O$  content of milk ash is approx. 25% and lies midway between the  $CaO$  and  $P_2O_5$  contents. Milk ash contains about 4% of  $Na_2O$ . In 100 cc. of normal milk there was approx. 27 mg. of  $Na_2O$  and 181 mg. of  $K_2O$ . The quotient  $K_2O/Na_2O$  is an excellent indication of neutralized milk. C. R. FELLERS

**Value of optical examination for the detection of watered milk.** KESAJI YOSHIOKA. *J. Pub. Health Assocn. Japan* 5, No. 4, 4-10(1929); *U. S. Pub. Health Eng. Abstracts* E-880b, 36.—The use of the *n* together with sp. gr. and fat detn. is recommended. A long series of tests shows low *n*s together with the other phys. and chem. data usually taken on milk samples, give addnl. weight to the probability of added water. C. R. F.

**Influence of neutral salts upon the alcohol coagulation of fresh milk.** KENTARO MITAMURA. *Sapporo J. Forestry and Agr.* 19, 1-36(1927).—Neutral salts in concns. 0.001 N to N increase the sensitivity of fresh milk to coagulation by alc. The sensitivity is greatest at concns. of 0.5-0.7 N with univalent and bivalent ions. The influence increases with valency of the cation. When the milk is dialyzed through a collodion membrane, the sensitivity to alc. coagulation becomes very weak, probably because of removal of milk-sol. salts. The  $pH$  of fresh milk (6.59-7.00) has no relation to the sensitivity towards coagulation by EtOH. The alc. coagulation which takes place when the fresh milk contg. a definite quantity of univalent, bivalent or polyvalent cations is mixed with solns. of univalent cations of various concns. is proportional to the total salt concn. M. concludes that the coagulation does not occur when the salts contained are in a certain equil., but occurs when this equil. is disturbed. K. SOMEYA

**Chlorine index of goat milk. Systems of rapid analysis.** J. M. CLAVERA AND D. GUEVARA POZO. *Anal. soc. españ. fís. quím.* (Sec. Téc.) 2, 14-22(1929).—The detn.

of the Cl index (g. Cl/l.) of goat milk by a rapid method (Weiss, C. A. 15, 3339; Siroc and Joret, C. A. 12, 1786) is recommended for control of its purity. Four quickly detd. values, which, with goat milk in Granada and Andalusia, are normally as follows:  $d_{4}^{20}$  1.029-1.032, fat 32-55 g. per l., ash 6.5-8.5 g. per l., Cl 0.9-1.25 g. per l., then suffice for the estn. of its quality, and the type of adulteration practiced, e. g., simple addn. of water or addn. of water, sucrose and salt may be readily diagnosed. B. C. A.

**The butter aroma.** C. B. VAN NIEL, A. J. KLUYVER AND H. G. DEX. *Biochem. Z.* 210, 234-51(1929).—Evidence is presented to show that characteristic aroma of butter is due to the presence of diacetylmethylcarbinol. S. MORGULIS

**Examination and evaluation of crayfish soups.** E. BAIER AND H. BARSCH. *Z. Untersuch. Lebensm.* 57, 224-34(1929).—Microscopic and organoleptic tests are described. Methods for the detection of artificial coloring matter in crayfish soups are described, involving extn. of the pigment with alc. and testing its affinity for wool, its reaction with concd.  $H_2SO_4$  and its behavior in ultra-violet light, in which solns. of the natural coloring matter show fluorescence and those of synthetic dyes do not. C. R. FELLERS

**Advances in the field of synthetic sweetening agents and related compounds in 1927 and 1928.** WALTHER HERZOG. *Fortschrittsber. Chem.-Ztg.* 53, 99-100(1929).—A review with bibliography. E. J. C.

**Honey ash.** F. E. NOTTBOHM. *Arch. Bienenkunde* 8, 32-52 sep.; *Chem. Zentr.* 1928, II, 115.—The ash of blossom and honeydew honey contains, resp.,  $K_2O$  30.50-50.78, 52.59-57.16;  $Na_2O$  5.54-10.03, 3.16-4.31;  $CaO$  2.12-8.00, 0.52-1.30;  $MgO$  1.50-2.17, 0.71-2.31;  $P_2O_5$  1.65-12.50, 6.64-9.51. C. R. FELLERS

**New use for Sterculia gum or Indian tragacanth.** W. PEYER, W. LIEBISCH AND K. ROSENTHAL. *Apoth. Ztg.* 44, 978-9(1929).—The use of this gum in the manuf. of ice cream is noted and its stiffening effects are compared with those of other com. gums (tragacanth, acacia, gelatin). W. O. E.

**Retardation of the ripening of pears by exclusion of oxygen.** F. KIDD AND C. WEST. *Nature* 123, 315-6(1929).—When pears are preserved in an atm. of  $N$  the macroscopic changes of "ripening" are almost completely inhibited. With shorter time of exposure, however, ripening subsequently takes place in air, the rate of ripening being a function of the concn. of  $O$  and of that of  $CO_2$  over a considerable range. B. C. A.

**Effect of fumigation by hydrogen cyanide on fresh fruits and vegetables.** P. BUTTENBERG. *Z. Untersuch. Lebensm.* 57, 204-11(1929).—HCN, 0.5% by vol., showed no effect on grapes, plums, shallots or onions; the effect on parsley and tomatoes is doubtful. Early potatoes do not stand the treatment but winter potatoes are more resistant. The germ layer may be destroyed if the winter potatoes are sprouted. HCN-fumigated potatoes sometimes show an injury similar to frost damage. Fresh Swedish turnips are less resistant to HCN than wintered turnips. Bananas, pears, apples, lemons, oranges, quinces, cucumbers, cabbage, carrots, radishes, lettuce, rhubarb, beets, turnips, celery, spinach and comfrey are more or less damaged. The injury may not appear for several weeks; hence, freshly fumigated fruits or vegetables may be consumed early. C. R. FELLERS

**Cacao beans and cocoa products.** VI. H. FINCKE. *Z. Untersuch. Lebensm.* 56, 312-34(1929); cf. C. A. 23, 2223.—In view of the specifications drawn up by the Verbande Dett. Schokolade-Fabrikanten, calcs. relative to the compn. of chocolate preps. are carefully checked. Addn. of coffee to chocolate does not necessitate modification of methods or calcs. The effect of fermentation on appearance, taste, odor and chem. compn. of cacao was studied. The fat of immature beans does not differ from that of riper beans. Fermentation does not affect the fat. It is probable that the theobromine in cacao exists partly free and partly in loose combination with tannin, from which it can be liberated by moistening the material with addn. of  $MgO$  as well as by treatment with dil.  $H_2SO_4$ . Certain Accra cacao butters possess unusually high unsatd. fatty acids of low m. p., probably oleic acid. C. R. FELLERS

**Loss of iodine and other inorganic substances from spinach in the usual cooking process.** A. MIERMEISTER. *Z. Untersuch. Lebensm.* 57, 235-9(1929).—In cooking 2 kg. of spinach in 3 l. of boiling water, a loss of 44% of the total mineral matter was found. The cooking water contained 15.8 g. of  $NaCl$ . The spinach was washed in distd. water after the cooking water had been poured off. On analyzing this loss, 50% was due to  $K_2O$  (57% of the total present). The cooked and washed spinach contained a considerable excess of inorg. bases over acids. One hundred g. of fresh spinach contained 0.044 mg. of  $I$ , of which 0.0035 mg. was lost in cooking. The  $I$  is organically combined and largely insol. Analytical methods are described. C. R. FELLERS

**Form and weight changes in potato tubers during storage.** GREISENROGER AND

NEUDECKER. *Fortschritte Landw.* 4, 473-6(1929).—Loss in wt. may reach 25% in 3 months at 25°. The amt. of loss is not correlated with size or shape of the tuber or condition of the skin.

**Rapid determination of the oil content of paprika.** J. DÖMÖTÖR. *Z. Untersuch. Lebensm.* 57, 239-40(1929).—A 2.5 g. sample is shaken for 60 min. with 40-60 cc. of Et<sub>2</sub>O. The solvent is decanted through 3 filter papers which have been previously wetted with Et<sub>2</sub>O. The filtrate is passed through the filters twice, both filters and residue being well washed with Et<sub>2</sub>O. The clear filtrate is carefully transferred to a tared flask, the Et<sub>2</sub>O evapd., the oil dried at 105° and weighed. The total time consumed for the detn. is approx. 4 hrs.

**The digestibility and food value of "vitamin fodder" when fed to calves.** H. EDIN. *Kgl. Landbruks-Akad. Handl. Tid.* 68, 164-83(1929).—The prepn. tested had the following compn.: dry substance 97.1%, which contained ash 2.8, crude protein 10.1, fats 68.1 and carbohydrates 16.0%. The fat consisted of 90.0% soy oil and 10.0% cod-liver oil. The feeding tests were made on calves, and the results indicated that the product was a poor substitute for milk.

**Press- and extraction-processes in the treatment of sunflower seed (for feeding-stuff).** ISTVÁN WEISER AND A. ZAITSCHEK. *Fortschritte Landw.* 3, 926(1928).—In expts. with sheep fed with the residue from the solvent-extn. of sunflower seed, the digestibility of protein and fat appeared satisfactory, but the crude fiber and N-free ext. not only showed poor digestibility itself, but markedly reduced the digestibility of hay mixed with it. The starch value of this residue was 35, the figure being higher if the proportion of husk was reduced during manuf. With goats the press-cake from sunflower seed gave much greater live-weight increase than the solvent-extd. material. For the production of a satisfactory feeding material the removal of husks followed by pressure-extn. is necessary.

**Beet-leaf drying (dried sugar-beet leaves as fodder).** O. EISENER. *Deut. Zucker-Ind.* 54, 493(1929).

**The feeding value of silage made from reed.** ARTHUR ZAITSCHEK. *Fortschritte Landw.* 4, 392-4(1929).—The digestibility of reed silage, using sheep as test animals, was detd. Results of analyses for various org. acids in the silage are given. L. P. M.

**The calcium and phosphorus content of some Quebec hays.** R. HOLCOMB. *Sci. Agr.* 10, 28-34(1929).—The Ca content of 9 timothy hays grown in Quebec ranged from 0.04 to 0.205%. Four clover hays varied from 0.950 to 1.227% Ca. The P content of 6 timothy samples varied from 0.08 to 0.17%, and the P content of 4 clover hays from 0.134 to 0.193%. The A. O. A. C. method for P proved unsatisfactory because of the large amt. of org. matter to be destroyed. The Mg(NO<sub>3</sub>)<sub>2</sub> fusion method was the only practicable one. Evapn. to dryness with HNO<sub>3</sub> or a HNO<sub>3</sub>-HCl mixt. resulted in a gummy mass of org. oxidation products. These gummy substances tended to foam over with resulting loss of the sample. The addn. of KClO<sub>4</sub> did not aid. A convenient and cheap const.-temp. bath is described.

**The combating of Equisetum palustre and methods of destroying its poison.** GERLACH. *Fortschritte Landw.* 4, 377-9(1929).—A meadow grass contg. 7-13% of E. palustre was quite toxic to cows. Silage made from this grass was still poisonous.

LAWRENCE P. MILLER

**Chemical composition of Alaskan lichens (SPENCER, KRUMBOLTZ) 11D.** Effect of various preparations on the growth of bakers' and brewers' yeasts (WILLIAMS, *et al.*) 16. Device for drying grass and grain (Swiss pat. 132,237) 1. Hg-vapor lamp for producing ultra-violet rays for treating foods (Brit. pat. 305,758) 4. Pasteurizing apparatus (Ger. pat. 480,028) 1.

HASELHOFF, E., AND BLANCK, H.: *Lehrbuch der Agrikulturchemie*. IV. Futtermittellehre. Berlin: Verlag von Gebrüder Borntraeger. 216 pp. Cf. C. A. 22, 3482.

KASTEN, HENNIG: *Abhandlungen d. Instituts f. Tierzucht u. Molkereiwesen an d. Universität Leipzig*. H. 20. Vergleichende Fütterungsversuche mit Albovin M und dem Ölkuchenmischfutter Agricola I. Krit. Untersuchungen über die Verfahren zum Nachweis von Milchverfälschn. Leipzig and Hannover: M. & H. Schaper im Komm. 101 pp. M. 6.

**Food products from nut kernels.** ELAM G. HESS (to Pecano Mfg. Co.). U. S. 1,725,801, Aug. 27. Minute flake-like particles of substantially uniform thickness are

sepd. from kernels of nuts and the particles are allowed to fall through the atm. into a loose mass.

**Bread.** D. FRAME. Brit. 305,845, March 7, 1928. Yeast is stimulated and grown in an emulsion of milk, egg yolk, malt ext. and treacle for about 15 min. and then mixed with meal, butter and salt to form a dough which is subdivided, proved for about 15 min. at 30° and then baked at about 200°. Fruit and vegetables may be added.

**Apparatus for cutting bread loaves for testing purposes.** ROBERT L. CORBY. U. S. 1,725,781, Aug. 27.

**Sterilizing milk, etc.** ROBERT RAFN. Ger. 480,452, Nov. 30, 1923. In sterilizing milk and other liquids in closed vessels practically full of the liquid, the vessels are rotated in a hot bath and the direction of rotation is changed suddenly at intervals.

**Milk-serum preparation (inoculated with lactic acid bacteria) for use in making bread, cakes and biscuits.** N. M. KRONBERG. Brit. 306,374, June 29, 1928. See U. S. 1,721,867 (C. A. 23, 4513).

**Preserving food, especially eggs.** HENRY EVERAERT. Ger. 480,250, April 26, 1924. The eggs, etc., are placed in autoclaves in a chamber cooled to 0°, and the air is withdrawn from the autoclaves, which are then put into communication with a vessel contg. a mixt. of CO<sub>2</sub> and N at superatm. pressure. Cf. Brit. 222,487 (C. A. 19, 1018).

**Preserving egg material.** A. DONNER. Brit. 306,013, Nov. 10, 1927. Egg yolks or whites are treated with about 1% of lactic or acetic acid or a mixt. of these acids, and a small proportion of an oil such as mustard oil also may be added; the product is sealed in a non-metallic container. NaCl also may be added.

**Preserving liquid egg material.** A. K. EPSTEIN. Brit. 305,844, March 6, 1928. In preserving egg material consisting mainly of yolk by freezing, a neutral edible salt, such as NaCl 2-10%, is added, sufficient to produce in the thawed product a viscosity greater than that of the untreated material when thawed. Na<sub>3</sub>PO<sub>4</sub> or NaNO<sub>3</sub> may be used and the quantity of salt is increased according to the proportion of egg white present.

**Curing and preserving meat.** M. M. HERIOT. Brit. 305,972, Nov. 11, 1927. Meat such as bacon and ham is treated with a preservative liquid *in vacuo*. Various details of app. and procedure are described. Cf. C. A. 23, 3031.

**Sterilizing and preserving fruit juices.** LEMMIE R. CLEVELAND (to National Academy of Sciences). U. S. 1,725,959, Aug. 27. Juices are clarified and treated with O under pressure for a sufficient time to inhibit growth of bacteria.

**Insipissated sugar fruits.** BERTHOLD GERNHARDT. U. S. 1,726,482, Aug. 27. Fruits are stewed with water in a closed vessel and treated in the same vessel, under high pressure of CO<sub>2</sub>, with a sugar soln. (produced by dissolving sugar in cold water and contg. 66% sugar).

**Paste rich in nutrient salts.** ELISE ROSENBAUM. Swiss 132,017, Nov. 7, 1927. A paste rich in nutrient salts is prepd. by leaving bran in contact with water until fermentation sets in, washing out the liquid and adding milk and malt ext. to the residue.

**Cattle feed.** HERAND ROBINSON (to Piercy Co.). U. S. 1,725,969, Aug. 27. See Can. 284,079 (C. A. 23, 562).

### 13—GENERAL INDUSTRIAL CHEMISTRY

HARLAN S. MINER

**The present and future state of our natural energetic resources.** F. M. JAEGER. *Mech. Eng.* 51, 675-8(1929). E. J. C.

**The cost of a modern chemical factory.** W. F. SCHAPHORST. *Ind. Eng. Chem., News Ed.* 7, No. 17, 1(1929). E. J. C.

**Chemical marketing methods.** CHARLES C. CONCANNON. *Chem. Markets* 25, 271-3(1929). E. J. C.

**How scientific research contributes to the welfare of labor.** ARTHUR D. LITTLE. *Chem. Markets* 25, 261-4(1929). E. J. C.

**Chemicals in aviation.** DONALD M. LIDDELL. *Chem. Markets* 25, 249-50(1929). E. J. C.

**Absorption of solvent vapors.** A. ALEŠ. *Chem. Listy* 23, 1-5(1929).—A review of methods used in industry for the recovery of volatile solvents. B. C. A.

**Separation of alcohols and phenols from oil mixtures.** H. SCHMIDT. *Chem.-Ztg.* 52, 898(1928).—The oil is heated at 80-100° under slightly reduced pressure with the theoretical quantity of boric acid to produce the borate B(OR)<sub>3</sub>. When no further



water distills over, the temp. is raised and the unchanged oil distd. under low pressure. The residual borate is then hydrolyzed with NaOH and the liberated alc. or phenol is recovered by distn. in steam. The method affords a rapid means of sepg. primary, secondary and tertiary alcs. from admixt. with one another; sufficient boric acid is first added to combine with the primary alc., and the unchanged mixt. of secondary and tertiary alcs. is distd. off under low pressure, treated with just sufficient boric acid to combine with the secondary alcs. and the process repeated.

**Measurement of fluids in pipe lines.** I. H. ESCHER. *Commonwealth Eng.* 17, 7-10(1929). B. C. A.

**Supersaturation in steam and its influence upon some problems of steam engineering.** C. F. POWELL. *Engineering* 127, 711-3, 779-80(1929). E. J. C.

**Commercial properties of bakelized asbestos.** ANON. *Electrician* 103, 161 (1929).—Chem. and phys. tests carried out on bakelized asbestos of Continental and English manuf. give results on which the following specification requirements are based: asbestos content between 45 and 65%; roughened and moistened surface shall just color red litmus paper; matter sol. in alc. not over 6%; no corrosion when taken to 25°F. in contact with polished Cu and after 3 hrs. removed to satd. atm. and allowed to remain there at atm. temp. for 12 hrs.; heat loss—max. of 2' for sheets up to 1/8" thick; should resist 330°F. for 12 hrs.; gain in water should not exceed 2' for sheets up to 1/8" thick.

**The resistance to flow of air at bends and in straight airways.** W. R. COOKE AND I. C. F. STATHAM. *Colliery Guardian* 138, 2295-7, 2403 6(1929). E. J. C.

**Aerosols—clouds, dust, fog and smoke.** WILLIS J. BRAY. *J. Chem. Education* 6, 1486-96(1929). The term aerosols is applied to disperse systems in which air is the dispersion medium. B. reviews the general properties of such systems and discusses their relation to dust explosions and the application of aerosols in warfare. L. F. A.

**A method for the rapid determination of dust in air.** I. C. McNAIR AND J. F. HIRST. *J. Soc. Chem. Ind.* 48, 127T(1929).—The method often employed for the detn. of dust in air consists of aspirating the air through a dried filter paper in a tared dust bottle and weighing the dust retained. The drying before and after sampling is lengthy and the results are likely to be erroneous. A new method is outlined, which is not only accurate, but which is extremely rapid.

**Chemical and physical properties of chemical warfare materials.** E. ENGEL. *Z. ges. Schuss-Sprengstoffe* 23, 321-5, 365-7, 402-7, 438-42(1928).—A summary is given of the phys. properties on which the effective utilization of chem. warfare materials depends. The data given for some of the more important include h. p., sp. wt. and vol., coeff. of expansion, vapor pressure, volatility and heat of evapn. The physics of cloud and fog formation is discussed, and a short account is given of the absorption of toxic vapors by activated charcoal.

**The prevention of ionization in impregnated paper dielectrics.** S. G. BROWN AND P. A. SPORING. *J. Inst. Elec. Eng.* (London) 67, 968-76, 985-6, 990-1(1929).—See C. A. 23, 3032.

**Some notes on thermal insulation.** E. A. COAD-PRYOR. *Brit. Clayworker* 38, 179-81(1929).—There are many forms of insulating material on the market varying considerably in mech. strength, in thermal cond. and in the max. temp. at which they can be used. The basis of most insulating materials intended for use at comparatively high temps. is some form of highly porous silica, usually a diatomaceous earth. A different type of insulating material is made from fireclay, the high porosity being obtained by mixing with the fireclay a carbonaceous material which burns out during firing. By judicious insulation it is possible to reduce the heat lost through furnace walls by 60 to 70%. This does not imply that the fuel consumption in the furnace will be reduced by anything like this amt. It is often overlooked that the application of insulation should go hand in hand with a considerable modification in the design of furnaces, regenerators, etc., to suit the new temp. equilibria which are set up.

**Electrical insulating papers for the manufacture of power cables.** T. N. RILEY AND T. R. SCOTT. *J. Inst. Elec. Eng.* (London) 67, 946 67(1929).—See C. A. 23, 3032.

**Discussion.** *J. Inst. Elec. Eng.* (London) 67, 977-85(1929). Reply. *Ibid* 986-90.

W. H. BOYNTON

**Welding in the chemical and process industries (WIKOFF) 9.** [Compositions for use in coating, impregnating or molding] from cashew-nut oil (U. S. pat. 1,725,793) 26.

**SCHNACK, EMIL: Festigkeitslehre auf Grund der Anschauung.** Leipzig and Berlin: B. G. Teubner. 134 pp.

**Table of Common Hazardous Chemicals.** Prepd. by Committee on Hazardous Chemicals and Explosives of the American Chemical Society and the National Fire Protection Assocn. Boston, 60 Batterymarch St.: The Natl. Fire Protection Assocn. 12 pp. \$0.15. Reviewed in *J. Chem. Education* 6, 1603(1929).

**Gas purification.** BERNHARD SÄGBARTH. Ger. 481,075, Oct. 12, 1926. Dust is removed from gases by a centrifugal device.

**Filtering suction gas.** E. F. J. WARNANT. Brit. 305,932, Feb. 11, 1928. The gas is passed through a very fine gauze cylinder of Ni, Ni-Cr, copro-Ni or the like. Various structural details are described.

**Compressed gases.** MERCER G. FARRAR (to Carbide & Carbon Chemicals Corp.). U. S. 1,726,018, Aug. 27. Formation of congealed condensate in the exit pipe of a holder contg.  $C_2H_2$  mixts. or other compressed gas is prevented by introducing into the holder a small proportion of a volatile substance freely sol. in water, e. g., MeOH.

**Compressed gases from liquid gases such as liquid air.** GRS. FÜR INDUSTRIEGASVERWERTUNG. Brit. 305,974, Nov. 24, 1926. Evolved gases not required for use are absorbed by gels cooled to the b. p. of the gas and the absorbed gas is recovered by subsequently heating the gel.

**Method of and means for charging pressure vessels with liquefied gas.** GRS. FÜR INDUSTRIEGASVERWERTUNG M. B. H. Ger. 480,816, Apr. 8, 1927.

**Drying air or other gases with silica gel.** GRS. FÜR INDUSTRIEGASVERWERTUNG. Brit. 305,975, Dec. 1, 1926.

**Gas mixtures.** I. G. FARBENIND. A.-G. (Curt Schönberg and Gerhard von der Bruck, inventors). Ger. 479,825, Dec. 4, 1925. Volatile org. substances are extd. from gas mixts. by washing with an oil such as liquid or dissolved triarylphosphate, e. g., tricresylphosphate.

**Measuring constituents in gas mixtures by the psychrometer method.** SIEMENS & HALSKE A.-G. Ger. 479,723, Apr. 18, 1924.

**Separation of mixed fluids.** FRIEDRICH BARTLING and FRANZ LAWACZECK. Ger. 480,213, Jan. 1, 1927. The mixt is circulated in an app. which separates the constituents by utilizing their different velocities of flow.

**Recovery of solvents.** RUDOLF OERTEL. Ger. 480,747, April 29, 1924. Volatile solvents are recovered by evapg. them in an air current to form a mixt. with a min. explosion point and a higher sp. heat than air.

**Sulfonating oils.** HERMANN BOLLMANN and BRUNO REWALD. Ger. 480,157, Dec. 25, 1927. Oils, preferably freed from constituents which solidify at low temps., are provided with an addn. of animal or vegetable phosphate before being sulfonated by concd.  $H_2SO_4$  in the usual way.

**System for drying substances while carried by heated gas currents.** N. TESTRUET, G. GRAM, O. SÖDERLUND and TECHNO-CHEMICAL LABORATORIES, LTD. Brit. 306,200, Nov. 21, 1927. An app. is described.

**Forming thin films from various materials by flotation of the surface on metallic mercury.** A. JOFFE. Brit. 306,078, Feb. 15, 1928. The formation of films for insulating, acoustic purposes, etc., is described.

**Wetting and emulsifying agents.** I. G. FARBENIND. A.-G. Brit. 806,116, Feb. 17, 1928. Triethanolamine or other amines which contain several org. radicals with OH groups are condensed with org. carboxylic, sulfonic or sulfonated carboxylic acids of high mol. wt. such as stearic acid. Various examples and details are given.

**Sterilizing by use of metals and metal compounds.** G. A. KRAUSE. Brit. 306,547, Feb. 24, 1928. Oligodynamically active metals such as Ag, Cu, Au, Ir, Tl and Sb or active compds. such as AgCl or alloys of the metals, for use in sterilizing liquids, are deposited with the application of heat on carriers such as ceramic materials, highly porous clay, silica gel, activated C, kieselguhr, asbestos, quartz sand, glass wool and metals such as iron, Al and Cu. Numerous details and examples are given. Cf. C. A. 23, 1702.

**Compressing soft powders, especially soap.** FRITZ KILIAN. Ger. 480,700, Aug. 11, 1927. The powders are compressed in molds and the pressure is maintained for a period of time and is then gradually released. Shaped products are so obtained in one operation. A press is described.

**Method of removing frost from cold-exchangers.** AUTOGEN-GASACCUMULATOR KRÜGL & HANSMANN G. M. B. H. Ger. 480,815, Dec. 20, 1927.

**Refrigerating.** CHICAGO PNEUMATIC TOOL CO. Ger. 478,658, Mar. 25, 1927. Addn. to 473,414 (C. A. 23, 3034).

**Refrigerating apparatus.** PLATEN-MUNTERS. REFRIGERATING SYSTEM AKTIE BOLAG. Ger. 479,670, Oct. 10, 1926. Details of the heat-absorbing system.

**Refrigerating machine.** RUDOLF WEIDMANN. Swiss 131,905, April 18, 1928. Details of construction are given.

**Refrigerating plant.** AKT.-GES. MASCHINENFABRIK ESCHER WYSS & CIE. Swiss 132,117, April 26, 1928. Details of arrangement.

**Refrigerating process.** CHICAGO PNEUMATIC TOOL CO. Ger. 480,867, Feb. 24, 1926. See U. S. 1,619,196 (C. A. 21, 1320-1).

**Refrigerating system.** SAMUEL C. CARNEY (to Shell Petroleum Corp.). U. S. 1,726,341, Aug. 27. In cooling a mixt. of hydrocarbon fluid such as is used in refrigerating, carrying entrained water vapor, a brine soln. is injected to lower the freezing point of the mixt., the mixt. is passed through a zone below the normal freezing point of water, and the hydrocarbon product is then sepd. from the soln.; the degree of concn. of the latter is raised to expel the dilg. water vapor which it carries and the soln. is returned to the system for recirculation. An arrangement of app. is described.

**Refrigerating apparatus of the continuous absorption type.** SIEMENS-SCHUCKERTWERKE A.-G. Brit. 306,506, Feb. 22, 1928. Structural feature.

**Absorption refrigerating machine.** SIEMENS-SCHUCKERTWERKE A.-G. (Edmund Altenkirch, inventor). Ger. 480,036, Feb. 23, 1928.

**Absorption refrigerating machines.** OSKAR KLEINDIENST. Ger. 480,604, Aug. 3, 1926. A method of and means for removing water from the evaporators are described.

**Refrigerating system of the compression type.** RANSOM W. DAVENPORT (to Chicago Pneumatic Tool Co.). U. S. 1,726,178, Aug. 27.

**Refrigerating apparatus of the compression type.** DELOS P. HEATH. U. S. 1,726,519, Aug. 27. Structural features.

**Regulating device for refrigerators.** OSCAR SIMMEN. Swiss 132,417, Feb. 10, 1928.

**Thermostatic device for controlling the flow of ammonia or other substances through refrigerating apparatus, etc.** HENRY A. HOESCHEN (to Baker Ice Machine Co.). U. S. 1,726,068, Aug. 27.

**Operation of a small refrigerator by cooling agent and dry gas.** CARL BAUMANN. Swiss 131,667, Mar. 16, 1928.

**Coating wires.** SIEMENS-SCHUCKERTWERKE A.-G. Brit. 306,122, Feb. 16, 1928. The process described in Brit. 304,192 (C. A. 23, 4757) is modified by causing the insulating material to be applied to the wire in the form of overlapping layers (suitably by nozzles, as the wire and nozzle are rotated at high speed with respect to each other). An app. is described. A plurality of nozzles may supply different insulating materials.

**Electric insulation.** J. A. CRABTREE and J. R. DOLPHIN. Brit. 306,249, Jan. 12, 1928. Dies used in molding insulators carry shields of refractory material such as asbestos, which may be pretreated with dil. HCl and may be impregnated with substances which, when heated, form a phenolic resin.

**Electrical conductor insulation.** JOHN H. WHITE (to Western Elec. Co.). U. S. 1,725,773, Aug. 27. Conductors such as telephone switchboard cables are provided with a non-waterproof insulating material such as cotton, which retains its insulating qualities under conditions where it is always warmer than the dew-point of the surrounding air; they are impregnated with a solid ester material such as cellulose acetate dissolved in acetone or other suitable solvent and free from electrolytic materials.

**Insulators from wood.** SIEMENS-SCHUCKERTWERKE A.-G. (Walther Estorff, inventor). Ger. 479,905, May 27, 1924. Before being soaked with paraffin, shellac, resin or linseed oil, the wood is soaked in electrolytic salt soln., dried and washed.

## 14—WATER, SEWAGE AND SANITATION

EDWARD BARTOW

**Supplementary water supply for Kingsport, Tenn.** H. F. WIEDEMAN. *Eng. News-Record* 103, 219-20(1929).—The original supply of Kingsport is impounded in a 175-million gal. reservoir, 6 miles from the city, which gives a static head of 622 ft. on the distribution system. Objectionable color and turbidity necessitated the construction of a filter plant, which was located directly below the storage dam. Following shortage of water in 1925 and 1926, an addnl. supply was developed from the South Fork of the Holston River, utilizing the head of the gravity supply for pumping. The old filter plant was abandoned and a new one constructed for treating both supplies.

consisting of an aerator, gravity mixing chamber, coagulation basin providing 8-hr. detention period, two 1-million gal. per day rapid sand filters and a 0.4-million gal. clear well. R. E. THOMPSON

**Sixty-second annual report of the Commissioners of Water Works in the City of Erie, Pa., for the year ending December 31, 1928.** 95 pp.—This report consists chiefly of extensive tabulations regarding financing, operation, etc., together with a brief description of the works. The estd. population served was 120,000 and the av. per capita consumption 191.4 gal. per day. The cost of supplying water, including collection, purification, pumping and depreciation, was \$21.553 per million gal. The av. no. of gal. pumped per lb. of coal was 310. The av. amts. of alum and hypochlorite used were 0.229 grains per gal. and 3.4 lb. per million gal., resp. Wash water averaged 1.58%. Of 302 one-cc. samples of raw water examd., 107 contained *B. coli*, while of 596 ten-cc. samples of treated water none contained the colon bacillus. R. E. T.

**The experimental filtration plant of Chicago, Illinois.** JOHN R. BAYLIS. *Munc. News and Water Works* 76, 89-95(1929).—A very complete exptl. filtration plant which was constructed to det. the cheapest and most efficient treatment for Chicago is described. The plant includes chem. soln. tanks, a dry-feed machine, mixing basins, settling basins, 12 filters, 2 clear water reservoirs, a wash water tank, wash water pumps, chlorinating machines, CO<sub>2</sub>-generating plant and labs. Two of the filters have surface areas of 100 sq. ft. each and the others each have 10 sq. ft. of surface area. The exptl. work includes filtration without chem. treatment, chem. treatment, removal of tastes and odors and chlorination. Pieces of lab. app. which have played an important part in these expts. and are not common to water labs. include a stirring machine and a lab. sand filter. The work so far has shown that the major problem is to handle the micro-organisms so as to produce practical filter runs. Some coagulant other than alum will have to be used part of the time. Filter rates greater than 125 million gallons per acre per day may also be used. C. C. RUCHHOFF

**Significance and methods for determination of filter-plant turbidities.** JOHN R. BAYLIS. *Munc. News and Water Works* 76, 156-9(1929); cf. *C. J.* 23, 4286. —Three instruments that were developed for measuring and controlling turbidity removal to a residual turbidity of 0.2 p. p. m. are described. The first is a submarine light which is placed near the bottom of the clear water reservoir under 6 ft. or more of water. This will show turbidities of 0.2 p. p. m. The floe detector described is installed on filter operating tables and is used to det. when flocculated material is passing the filter and washing is required. The turbidimeter which is illustrated is used for reading the low fine turbidities of 0.1-0.2 p. p. m. which are obtained when the water is slightly under treated. A recommended procedure for practice is to det. the total turbidity with the special turbidimeter and the floe turbidity with the floe detector. The fine turbidity is the difference between the total and the floe turbidity. An arbitrary limit of 0.2 fine and 0.05 floe turbidity is suggested. When the floe turbidity exceeds 0.05 the filters should be washed more often and when the fine turbidity exceeds 0.2 the coagulant should be increased. C. C. RUCHHOFF

**Effect of percolating water on concrete dams.** N. A. BOWERS. *Eng. News Record* 103, 212-3(1929).—Conclusions formed from observations on a no. of dams along the Pacific Slope are given and discussed. Leaching of Ca compds. and the resulting deterioration of the concrete are prevalent. The seepage water is in some cases supersatd. with salts dissolved from the concrete. In one dam a deposit of CaCO<sub>3</sub> 14 in. thick was found on the stairway of the inspection gallery. Percolation usually occurs at the joints between successive pours. A standard permeability test is urgently needed. Strength tests are not a reliable indication of permeability. R. E. T.

**Incrustations on wells and their chemical removal.** J. WIEGAND. *Gas u. Wasserfack* 72, 741-4(1929).—The brass or Cu screens on deep well pipes frequently become clogged with Cu sulfide formed by the H<sub>2</sub>S contained in the water, nearly closing the mesh. Treatment with HCl by the method given removes this material and restores the efficiency of the well. Al is the only metal which can be used to coat the screen to prevent this action. Other causes of well failure are given. R. W. RYAN

**Making surface water potable.** PERMIEN. *Gas u. Wasserfack* 72, 718-25, 751-4(1929).—Rapid sand filters are recommended, and these are described and numerous illustrations and sketches given, together with a discussion. Chlorination usually follows rapid filtration. R. W. RYAN

**Two laws for the purification of potable water.** N. MALISHEVSKII. *Gesundh. Ing.* 52, 569-71(1929).—Streeter has shown that a mathematical relation exists between the bacterial count in raw water "*R*" and filtered water "*E*," in the form of the equation  $E = (R)^n$ , where *C* and *n* are consts., characteristics of a given water work.

supply. Also, it has been shown that double application of a given water treatment gives better results than the corresponding treatment given in one application.

WAYNE L. DENMAN

**Purification of water supply in a country town.** A. GORDON GUTTERIDGE AND J. H. VARCOE. *Commonwealth Eng.* 16, 432-5(1929).—A report on the establishment of H<sub>2</sub>O purification for Shepparton, Victoria. The filter plant recommended for adoption is of the rapid sand type, comprising a mixing and aeration channel, a sedimentation basin of 78,000 gal. capacity, 4 filter beds of a total area of 450 sq. ft. and a clear H<sub>2</sub>O basin of 12,750 gal. capacity. Provision is made for extension of the plant to an additional 50% capacity, for addn. of coagulating chemical and for inclusion of a chlorination app.

J. A. KENNEDY

**Purification and sterilization of water by high chlorination.** RUDOLF ADLER. *Gas u. Wasserfach* 72, 675-8(1928).—Larger amts. of Cl than necessary to destroy bacteria will result in completely sterile water and the removal of organic Fe and Mn. The water should be filtered after chlorination. Excess Cl may then be removed by passing the water over active charcoal which converts the Cl to HCl. From time to time the charcoal must be washed with water contg. Na<sub>2</sub>CO<sub>3</sub> to remove org. materials from the surface, after which the excess of Na<sub>2</sub>CO<sub>3</sub> is destroyed by treating with CaCl<sub>2</sub>, forming CaCO<sub>3</sub>, which serves to neutralize the HCl formed from the free Cl. The C also removes phenols and the resulting water is very satisfactory.

R. W. RYAN

**Oligodynamic water purification by means of catalytic silver.** G. A. KRAUSE. *Gesundh. Ing.* 52, 500-5(1929).—Activated Ag (Katadyn) kills all known pathogens. Finely divided Ag is activated by metals below it in the electromotive series such as Pd and Au. Sterilization is effected by passing the water over Katadyn.

W. I. D.

**Some examples and precepts of water conditioning.** R. E. HALL. *Ind. Eng. Chem.* 21, 824-9(1929).—The use of a stable radical in place of the carbonate radical permits control by maintenance of a definite min. of alky., thus minimizing the requisite sulfate concn. It is essential that some substance other than CaSO<sub>4</sub> be the solid phase within the boiler. The treatment given a water cannot be arrived at by fixed rules but varies with the water. For some waters direct conditioning suffices while with other waters pretreatment by means of zeolite or lime soda softeners is necessary. O<sub>2</sub> and CO<sub>2</sub> are the gases usually eliminated from a water. At times, other gases such as NH<sub>3</sub> must be removed. NH<sub>3</sub> is best removed by means of Cl<sub>2</sub>. The analysis of a number of interesting deposits is given. One of them is unusual in that it contains 28.5% Na<sub>2</sub>SO<sub>4</sub> with but little CaSO<sub>4</sub> present. The addn. of anti-foaming material is successful if enough is used but when the amt. used drops below the allowable min. serious trouble results.

WAYNE L. DENMAN

**Sterilization of drinking water supplies in the state of Washington.** H. W. NIGHTINGALE. *The Thermometer. Wash. State Dept. Health* 2, No. 2, 3; *U. S. Pub. Health Eng. Abstracts* E-880a, 97. See C. A. 23, 3764.

C. R. FELLERS

**The removal of troublesome substances from drinking water by means of active and inactive charcoal.** K. W. JOTTEN, FR. SARTORIUS AND W. OTTEMEYER. *Gesundh. Ing.* 52, 529-34, 546-50(1929).—Chlorination is necessary in order to obtain a safe drinking water. In addn., the removal of taste, turbidity, etc., is essential. Charcoal is well adapted for the latter. Three kinds of carbon, wood charcoal, coke and ZnCl<sub>2</sub> activated A. K. T. charcoal of the I. G. Farbenindustrie, were found to absorb Cl, the coke being the poorest and the A. K. T. charcoal the best. Regeneration of the satd. adsorptive material is slight in the case of the simple wood charcoal and only imperfect with coke while with the A. K. T. charcoal it takes place to a considerable degree. The removal of phenol or rather chlorophenol in concns. of 1.100.000 to 1.1.000.000 is very much more difficult than dechlorination. Wood charcoal and coke even with very small grains and long retention showed very little action. The active charcoal is much better. The rate of flow for a chlorophenol soln. of 1.100.000 concn. with 50 g. of charcoal is 12 min. per l.

WAYNE L. DENMAN

**Preammoniation at Springfield, Illinois.** CHARLES H. SPAULDING. *J. Am. Water Works Assoc.* 21, 1085-40(1929).—The addn. of NH<sub>3</sub> in advance of Cl in water purification not only eliminates tastes and odors but increases the efficiency of chlorination. When lime is used or where the pH is high, this efficiency is reduced. Full details of this specific case are given.

D. K. FRENCH

**The influence of temperature upon the chlorine in water.** G. W. SCHMIDT. *Arch. Hyg.* 101, 290-6(1929).—The ability of distd. water, tap water, solns. of org. substances and sewage to bind Cl increases with the temp. at which the detn. is made. E. R. M.

**Nitrates in drainage water.** F. T. PERITURIN. *Trans. Inst. Fertilizers* 1927, No. 45, 65-103; *Wasser u. Abwasser* 26, 122(1929).—The amt. of nitrate washed out of soils

depends upon soil moisture and fertilizer treatment. The greatest losses of  $P_2O_5$ , Ca and nitrates resulted from the use of stable manure. C. R. FELLERS

**Softening municipal water supplies by zeolite.** J. T. CAMPBELL AND D. E. DAVIS. *J. Am. Water Works Assoc.* 21, 1035-53(1929).—An unusually complete survey of 2 installations near Pittsburgh for softening Ohio River water. As a zero hardness is not desired, the units are allowed to operate beyond their point of exhaustion. The treatment was found to be cheaper than the use of lime and soda-ash, and more satisfactory. D. K. FRENCH

**Sampling boiler water for testing and guidance of treatment.** S. C. PAGE. *Universal Eng.* 50, No. 1, 25-7(1929).—A simple layout makes it possible to make competent test of boiler fluid. E. I. S.

**Zeolite-deconcentrator combination for boiler water purification.** ELWOOD W. SCARRITT. *Ind. Eng. Chem.* 21, 821-3(1929).—In this method of feed water treatment, the NaOH and  $Na_2CO_3$ , produced in the boiler from zeolite softening, was used for softening raw feed water. Enough zeolite-softened water was used to ppt. the hardness and to maintain a NaOH content of 200-250 p. p. m. The sludge is removed by sedimentation in the deconcentrator. In this way, the 2 chief defects of zeolite softening, accumulation of sol. Na salts and the concn. of NaOH, are prevented. Furthermore, the reduction in NaCl consumption, reduction in blow down with its saving in fuel, and the maintenance of a correct sulfate-alky. ratio without the use of  $H_2SO_4$ , acid salts or  $Na_2SO_4$  makes the method effective in reducing operating expenses. WAYNE L. DENMAN

**Recent developments in boiler-feed water treatment.** SHEPPARD T. POWELL. *J. Am. Water Works Assoc.* 21, 1063-6(1929).—Progress in steam engineering has brought new problems. Many important investigations are now being carried on regarding foaming, corrosion and the mechanism of scale deposition. The problems of non-condensable gases and acid steam, as well as the possible disocn. of steam, are raised. D. K. FRENCH

**Silicic acid in boiler-feed water.** K. BRAUNGARD. *Wärme* 52, 277-80(1929).—General discussion. C. R. FELLERS

**Chemical proportioning of internal feed-water treatment.** E. M. PARTRIDGE. *Ind. Eng. Chem.* 21, 819-21(1929).—Two systems of internal treatment are used. In the first an excess of chemicals ( $Na_2CO_3$ ,  $Na_3PO_4$ , etc.) is used while in the second the added chemicals are insufficient completely to ppt the hardness. Org. material is relied on to keep the carbonate hardness in soln. or in suspension long enough to allow it to mix with the sulfate scale, softening it and causing it to decompose under boiler conditions. The org. material is usually tannin. As commonly used by railroads this process is called wayside treating. WAYNE L. DENMAN

**Prevention of pitting in locomotive boilers by exclusion of dissolved oxygen from feedwater.** C. H. KOVL. *J. Am. Water Works Assoc.* 21, 1013-23(1929); cf. C. A. 22, 3474.—In the discussion there was described a device, used in European locomotives and not difficult to install, which had been very successful in removing gases, thus reducing corrosion and scale deposition, as well as the tendency to foam. D. K. F.

**Ultramicroscopic studies of colloids in water.** C. H. CHRISTMAN. *J. Am. Water Works Assoc.* 21, 1076-80(1929).—This is a preliminary report on work involving colloidal color and suspended matter and its removal with coagulants. At the present time our knowledge is uncertain. An ultramicroscope is used and the effect of a positive elec. force on negatively charged colloids is observed. The colloidal theory is outlined as related to this investigation. D. K. FRENCH

**The bacteriological and chemical standards employed in water analysis.** W. JAMES WILSON. *J. State Med.* 37, 439-43(1929). J. A. KENNEDY

**Influence of radioactivity of water on the biological and biochemical action of the cells of lower and higher organisms.** J. STOKLASA. *Strahlentherapie* 20, 324-32(1928); *Wasser u. Abwasser* 26, 31-2.—A great increase in the richness of the flora and fauna occurs in moderately acid radioactive waters contg. at least 10 mg. of  $O_2$  per l. An accelerated development of green algae and N-assimilating bacteria occurs not only in water, but in radioactive soils and rocks as well. S. recommends baths in radioactive water contg. sufficient amts. of  $O_2$  for accelerating enzyme activity in humans. Living cells have a selective adsorption capacity for rays of the several radioactive elements. C. R. F

**Methylene blue and bromocresol purple in differentiating bacteria of the colon-aerogenes group.** JOHN F. DOMINICK AND CARL J. LAUTER. *J. Am. Water Works Assoc.* 21, 1067-75(1929).—With Standard Method lactose broth as much as 3 days may elapse before definite knowledge of the quality of a water is gained. By using

certain dilns. of methylene blue and bromocresol purple, definite results can be obtained in 24 hrs. and in many cases in as short a time as 12 hrs. Considerable data are given.

**The Cladotrix dichotoma and allied organisms as a cause of an "indeterminate" taste in chlorinated water.** B. A. ADAMS. *Water and Water Eng* 31, 327-9(1929).—The presence or past presence of *Cladotrix dichotoma*, or of certain streptothrix, may give rise to a mold-like taste in  $H_2O$ . The taste is due to volatile products given off by these organisms. Chlorination, especially with small doses, accentuates the taste and may even produce one when none is detected in the untreated  $H_2O$ . None of the chemicals usually employed in  $H_2O$  treatment is completely effective in preventing or removing this taste.

D. K. FRENCH

J. A. KENNEDY

**The automatic formation of a protective film from cold water in iron pipes.** II. Some investigations of the iron rust-lime coating. J. TILLMANS, P. HIRSCH AND K. SCHILLING. *Gas u. Wasserfach* 72, 689(1929); cf. C. A. 23, 1973.—A method of detg. the lime content of the coating is given, which involves soln. by boiling with 10%  $AcOH$ , filtration if necessary, the addn. of an excess of  $NH_4$  oxalate to the boiling soln., followed by centrifuging in calibrated tubes, from which the percentage of Ca may be estd. or more accurate detns. made in the usual way with 0.01 N  $KMnO_4$  after washing by decantation. The formation of the rust layer hinders electrolysis by increasing the resistance between the metal and the soln. The  $CaCO_3$  crystals in the coating may be observed under the microscope by using polarized light. III. Determination of the "rust protection hindering" excess carbon dioxide. *Ibid* 689-90.—The method of Luhrig of passing air through the soln. (cf. C. A. 21, 2158) is inaccurate. The  $CO_2$  content at which the water became aggressive was detd. by aerating to a greater or less extent several samples and detg. the content of free and combined  $CO_2$  and the loss or gain of combined  $CO_2$  when contacted with marble. This amt. naturally varied with different waters and examples are given.

R. W. RVAN

**The pollution of the sea bottom by the Schussen River and the possibility of its estimation by observation of protozoan forms.** A. WETZEL. *Internat. Rev. ges. Hydrobiol. Hydrographie* 19, 217-60(1928); *Wasser u. Abwasser* 26, 31.—By sampling waters at the mouth of rivers and examg. the types and character of the protozoan fauna, a good indication of the extent of sewage pollution may be obtained.

C. R. F.

**Pollution of the Lahn River in Marburg.** KAPPELLER. *Arch. Hyg. Bakt.* 101, 81-94(1929); *Wasser u. Abwasser* 26, 22.—The  $O_2$  demand and  $O_2$  content of water are good indications of sewage pollution. Other important tests are total bacteria per cc., and detn. of  $NH_3$ .

C. R. F.

**The contamination of a well which feeds into the Savona water system lines, with ammonia and nitrites from an industrial establishment.** CANALIS, et al. *Jg. moderna* 21, 161-8(1928); *Wasser u. Abwasser* 25, 276.—The well which had delivered water of excellent quality for 27 yrs. suddenly became contaminated with tar,  $NH_3$  and nitrites from effluent of a nearby newly built mfg. plant. Recommendation: A protective zone of 100 m. in diam. around wells should be kept free from polluting agencies.

C. R. F.

**Calculations for laying out a sewage system.** G. INHÜSEN. *Der Städt. Tiefbau* 6, 90-3(1929); *Wasser u. Abwasser* 26, 20.—Particular emphasis is laid on the laying of mains and pipe network.

C. R. F.

**A new sewer-cleaning apparatus.** FR. GERLACH. *Der Städt. Tiefbau* 6, 97-8(1929); *Wasser u. Abwasser* 26, 21.—The app. consists of a brush provided with axially arranged rinsing tubes or openings. The app. is effective in cleaning out slime and sand with a min. of rinse water.

C. R. F.

**Sewage works operation at Worcester, Mass.** I. Grit chambers and bar screens. ROY S. LANPHEAR. *Eng. News-Record* 103, 124-6(1929); cf. C. A. 22, 3249.—The sewage works of Worcester, which have a capacity of 28 million gallons daily, consist of a 2-compartment grit chamber, a 2-bar screen with 2-in. openings, 12 double Imhoff tanks, 4 pairs of dosing tanks, 13.56 acres of trickling filters, 4 final settling basins and a 23-acre sludge-drying area. The sewage flow averaged 23.79 million gallons per day in 1928. The grit chambers and bar screens and their operation during 1928 are discussed. The material removed by the grit chambers averaged 4.05 cu. ft. per million gallons and the cleaning cost was \$.75 per cu. yd. of material removed. The screenings are disposed of by burying. Screen operation cost was \$.216 per million gallons. II. Imhoff tanks and sludge-drying beds. *Ibid* 180-3.—The Imhoff tanks provide a detention period of 2.1 hrs. at rated capacity, actual detention in 1928 being 2.5 hrs. Sedimentation capacity is equiv. to 1.34 and the sludge compartments 2.54 cu. ft. per capita. Grease is skimmed from the tanks, discharged on to waste land and burned. In 1928,

17.4 million gallons of sludge was produced contg. 6.21% of dry solids. The sludge storage period is 8-12 weeks. The  $p_H$  value of the fresh sludge is below 7; alk. fermentation raises the  $p_H$  during digestion to 7 and 7.2. The area available for sludge drying is equiv. to 4.9 sq. ft. per capita. The cost of Imhoff tank operation in 1928 was \$1.73 per million gallons. III. Dosing tanks, sprinkling filters and settling tanks. *Ibid* 222-4.—The rate of sprinkling filter operation is usually under 3 million gallons per acre per day. The filtering medium is crushed stone, 10 ft. in depth. Continuous operation give the best results. The detention period in the final settling tanks is 1.4 hrs. The cost of operating the sprinkling filters in 1928 was \$0.85 per million gallons and the settling tanks \$1.29. The total plant operating cost was \$6.56 per million gallons or 26¢ per capita contributing. Perfect stability of the Blackstone River, into which the effluent is discharged, has prevailed since 1927. R. F. THOMPSON

Economical utilization of the sedimentation chamber of a two-storied treatment to plant. LEINER. *Gesundh. Ing.* 52, 601-7(1929).—Criticism of an article by Preuss (*C. A.* 22, 2019; 23, 2776), also comment by F. G. Kloiber of New York. W. L. D.

The estimation of the phosphate ion in relation to contamination of sewage, river water and swimming-pool water. E. REMY. *Arch. Hyg.* 101, 366-8(1929).—The concn. of phosphate ion in sewage, river water and swimming-pool water does not indicate the degree of their contamination. E. R. MAIN

Gas production of the treatment plant at Stuttgart based on results from two years' operation. MATER AND SOHLER. *Gesundh. Ing.* 52, 497-500(1929).—The yield of gas per capita per year is 3 cu. m. The av. compn. is:  $CO_2$  25.4, O 0.9,  $CH_4$  49.5,  $H_2$  9.1, N 14.1 and  $H_2S$  0.02% and the av. heating value is 7500 8000 cal.  $H_2S$  is removed by iron oxide. After purification, the gas is mixed with the city gas. The gross yearly revenue is 70,000 M. and the net profit, after depreciation and interest on invested capital has been deducted, is 34,000 M. WAYNE L. DENMAN

The significance of atmospheric polarization in the estimation of degree of purity of air. CHR. JENSEN. *Zentr. ges. Hyg.* 18, 674(1928), *Wasser u. Abwasser* 25, 288.—A general survey with no definite conclusions. C. R. F.

The detection and determination of urea in water and its decomposition by bacteria and chlorine. A study of the chlorination of swimming-pool water. HANS WETTE. *Arch. Hyg.* 101, 222-33(1929).—The amt. of urea present gives no definite indication of the degree of contamination of the water of swimming pools, but may be used to approximate the degree of purification realized during the process of chlorination. The urea may be removed either through the action of free Cl or through the action of bacteria. E. R. MAIN

Paints for the pool. C. P. McCORD. *Hygiene* 6, 485-6(1928); *J. Am. Water Works Assoc.* 21, 846(1929).—Care should be taken in selecting paints for the swimming pool, as some absorb Cl readily. D. K. FRENCH

Qualitative and quantitative investigations on industrial wastes in Ivanovo-Vosnesensk. A. LEVIN. *Gig. i. Epidem.* (Russia) 7, 18-24(1928) (French summary); *Wasser u. Abwasser* 26, 24.—The wastes from cotton bleaching, dyeing, spinning and weaving plants contg. only twice their vol of river water are considered. Pptn by lime gave best results in the purification expts. Results were judged by the decrease in oxidizability of the effluent. C. R. F.

The treatment of waste from beet-sugar plants. M. GEVMEYER. *Gesundh. Ing.* 52, 443-6(1929).—The waste from such a plant is very high in org. matter. Much of this may be removed by means of mech. clarifiers and separators. This applies especially to the washing water, etc. The cooling water is used for the beet washing. Chlorination tends to prevent the exhaustion of dissolved O in streams into which the waste flows. WAYNE L. DENMAN

The effect of sugar factory waste water on streams. MATSCHKY. *Zentr. Zucker ind.* 37, 520-2(1929).—The slight differences in the O content of the water above and below the factory indicate little, if any, harmful effects. J. F. LEBTE

The waste from paper mills in Pommern. MÖLLER. *Fischereizeitung Neudamm* 31, 623(1928); *Wasser u. Abwasser* 26, 31.—Paper mill, brewery and sugar refinery wastes are thought responsible for much of the damage to fish in Pommern. C. R. F.

Synopsis of waste purification from coke plants and related industries. A REICH. *Der Stadt. Tiefbau* 1929, 59-63; *Wasser u. Abwasser* 26, 25-6.—The ore wash water from blast furnaces contains fine dust particles and dirt which are pptd. in a settling tank, the water being used again. The cooling water contains gas and carried-over flue dust, and is purified for re-use in 2 or more shallow aerating basins. The blast furnace waste waters contain, besides much dust, such poisonous substances as  $CN$ . The water is conducted to a pit or tank in which hang full sacks of  $FeSO_4$ . Neutraliza-



tion is effected by NaOH addn. followed by slight acidification by  $H_2SO_4$ . Sometimes the wastes are purified by the addn. of milk of lime by the use of a patented process (Steuer system). Coke plant waste water contains sol. gases and coke particles; the latter are pptd. in settling tanks. Phenols may be extd. with  $C_6H_6$  and the phenol recovered by neutralization with NaOH or by distn. Another method of reclaiming phenol is to treat the water with an excess of  $NH_3$  and heat to  $98^\circ$  to form ammonium phenolate, which is decompd. by NaOH. Still a third method of purification is the biol. method whereby phenol in dil. concns. serves as a suitable medium for bacterial growth. An Emscher filter or aeration chamber treated with activated sludge is recommended for carrying on the treatment.

C. R. F.

The phenol waste liquor problem (PRÜSS) 21.

**The Purification of Swimming Bath Water.** Revised and enlarged ed. London: The Paterson Engineering Co., Ltd. Reviewed in *Chem. News* 139, 120(1929).

**Apparatus for softening water.** JEAN SCHNEEBELI. Swiss 132,327, Mar. 1, 1928. The app. has a device at the bottom for collecting the Ca ppt.

**Apparatus for softening water by reagents in solution.** WILSON L. McLAUGHLIN and HERROLD L. McLAUGHLIN (to A. J. Miller). U. S. 1,726,082, Aug. 27. Structural features.

**Apparatus for softening water by use of treating solutions.** WILSON L. McLAUGHLIN and HERROLD McLAUGHLIN. U. S. 1,726,083, Aug. 27. Structural features.

**Apparatus for aerating water.** IGINIO PRONIO. Swiss 132,039, Mar. 3, 1928. App. for satg. water with  $CO_2$  is described.

**Purifying feedwater.** E. BRUCHHAUS. Brit. 305,848, March 9, 1928. The water is preheated by steam and vapor from a second heater, treated with reagents, then heated up to steam temp. in the second heater with fresh steam, and filtered. An app. is described.

**Apparatus for deaerating boiler-feed water by spraying it in a vacuum chamber.** G & J WEIR, LTD., and J SIM. Brit. 306,257, Jan. 21, 1928.

**Treating feedwater for boilers, condensers, etc.** DONALD W. KENT. U. S. 1,725,925, Aug. 27. The water is subjected to the action of a stream of gas such as H or N to replace O dissolved in the water with a gas inert in respect to formation of scale and contg. H, and the stream of gas used is recirculated for treatment of addnl. supplies of water. O is removed from the circulating stream by combustion with H, and fresh supplies of gas are added to make up for the loss by combustion and solu. An app. is described.

**Preventing incrustation in boilers.** A. HEINRICH. Brit. 306,145, Feb. 17, 1928. The boiler is connected to earth and the upper part of the boiler is connected to metallic points projecting into the air or to an aerial wire preferably extending parallel to power wires in the neighborhood.

**Waste-water purification plant.** WILHELM WURL. Ger 479,711, July 13, 1926. Details.

**Purifying sewage.** F. A. DALLYN. Brit. 305,717, Nov. 11, 1927. Sewage or the like is treated with a floe (such as hydrates of Fe and Al) which will absorb molecular O to effect the adsorption of foreign substances, coagulation of certain substances and oxidation and dispersion of org. matter. O and Cl also may be added.

## 15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER

**The ultimate natural structure of soils.** GEORGE J. BOUYOUCOS. *Soil Science* 28, 27-37(1929).—When soils in the natural dry state are placed in an excess of  $H_2O$  they disintegrate into particles of various sizes. Shaking vigorously does not decrease the size of these particles. The size into which the granules slake naturally seems to be stable and in equil., and a large amt. of force is required to reduce this size. The hydrometer method will measure the size of these particles, constituting the ultimate natural structure of soils.

A. L. MEHRING

**Influence of different nitrogen carriers on the structure of soils.** H. LATHER. *Z. Pflanzenernähr. u. Düngung* 12A, 227-51(1928).—The detrimental influence of  $NaNO_3$  on the soil by increasing the degree of dispersion was noted in short-time expts.

The action of  $\text{Ca}(\text{NO}_3)_2$  was not definitely detd. though in the presence of carbonate its desirable pptg. or flocculating action no doubt was manifested.  $(\text{NH}_4)_2\text{SO}_4$ , in the short period of observation and in the presence of carbonates, evidently formed  $(\text{NH}_4)_2\text{CO}_3$  which deflocculated the soil colloids. Subsequent oxidation of the  $\text{NH}_4$  salt to  $\text{HNO}_3$  resulted in flocculation of the finer particles. R. M. BARNETTE

A new physicochemical theory on the formation of humus, muck and oil. The role and interpretation of the biological factors in the process. JAN ŻÓŁCŃSKI. *Roczniki Nauk Rolniczych. I. Lesnych* 16, Sep. 48 pp.(1927); *Chem. Zentr.* 1928, I, 2443.—The biol. theory of humus formation is held untenable. Certain org. compds. formed under the influence of light, optically active rays from water and cyclic aromatic compds., behave like oxidases and peroxidases and decompose the N compds. C. R. F.

The distribution of the main soil types in Roumania. ROBERT MAYER. *Ernähr. Pflanze* 25, 324-7(1929). LAWRENCE P. MILLER

The vertical distribution of soil bases and acidity in some Illinois soils. HERBERT A. LUNT. *Soil Science* 28, 137-76(1929).—Soils from 8 widely sepd. sections of Illinois, representing as many soil types, were sampled by 3- or 4- in. strata and were subjected to the following tests and detns.: H-ion concn., Comber KCNS test, buffer action, Hutchinson-MacLennan and Hopkins Ca-requirement tests, total and exchangeable Ca and Mg.  $\text{NH}_4$  acetate soln. was found most suitable for replacement of Ca and Mg. In all cases the  $p_H$  values increased with depth, the increase being greatest in the Joliet soil whose subsoil is highly calcareous and least in the soils from the Mt. Morris and Oquawka fields. The Comber test agrees closely with the  $p_H$  values. The Oquawka sand was the most poorly buffered, whereas the Urbana, Joliet and Mt. Morris soils possess the greatest buffer capacity. The Hutchinson-MacLennan Ca-requirement data compare favorably with electrometric titration with  $\text{Ca}(\text{OH})_2$  to a  $p_H$  of approx. 7.0. Only in the southern soils does the Ca requirement as measured by the Hutchinson-MacLennan test increase with depth. These soils are characterized by a comparatively high total acidity, of which a very large proportion is exchangeable acidity and a small part is hydrolytic acidity. The  $p_H$  values vary with the total Ca content, with the exception of the Black clay loam at Hartsburg. This soil is immature and its Ca has not been leached out of the surface as it has in the older soils. In most instances the total Mg content in the surface horizon is approx. equal in amt. to the Ca in that horizon, but in the subsoils Mg has accumulated to a greater extent. The curves for exchangeable Ca and Mg follow those for total Ca and Mg. In the upper layers exchangeable Ca and Mg constitute a much greater portion of the total in the soils from Joliet, Mt. Morris, Urbana and Hartsburg than is the case of the Oquawka sand and the 3 southern Ill. soils. This is believed to be due to the greater age, higher rain fall and milder winters in the southern part. Applications of limestone reduced the H-ion concn. and increased the total and exchangeable Ca content of the surface layer in every case. In only the Oquawka sand was the influence of these applications observed below the A horizon. This influence was detected more readily by the  $p_H$  detn. than by any other. Natural soil variations were greater than any measurable influence of fertilizer applications. The correlation coeff. of crop yields with total and exchangeable Ca and with acidity in the A horizon is very high in the southern soils, but low in the northern soils. The H-ion concn. of the A<sub>1</sub> horizon of the southern fields and of 3 of the 5 northern fields was approx. identical although crop yields are considerably greater in the northern fields. It is believed that  $p_H$  value is not a primary factor in crop production so far as direct effect on crop growth is concerned. In the soils from Ewing, Toledo and Unionville, the chief chem. factors which limit crop growth are probably the presence of exchangeable acidity and the low percentage of exchangeable bases. In the Oquawka sand an insufficient amt. of available Ca appears to limit crop yields. In the other soils studied, none of the factors studied can be considered as limiting. 32 references are appended. A. L. MEHRING

Bavarian soils formed by the weathering of chalk. H. NIKLAS, R. PÜRCKHAUER AND H. POSCHENRIEDER. *Z. Pflanzenernähr., Düngung u. Bodenk.* 13A, 39-53(1929).—A brief description of the soils is given. The acidity or alk. of the soils described is not individual to the different soil groups, but they may be roughly divided into the acid tripoli soils and the neutral to alk., lime-contg. soils of the chalk sandstones (greensand, etc.). The P requirements of the chalk soils are for the most part very great. K is evidently present in sufficient quantities, apparently furnished by the greensand. A need for org. matter for increasing the water-holding capacity and other phys. properties of these soils is great. Fertilizer expts. point to the need of P. R. M. B.

Reaction and nutrient condition of some soil weathered from basalt in "Oberhessen." L. SCHMITT. *Z. Pflanzenernähr., Düngung u. Bodenk.* 13A, 242-52(1929) -

The soils weathered from basalt can easily exhibit an "exchange acidity," despite the large percentage of lime in the original rock. The content in available lime is not significantly higher (by the Meyer method) than that formed from rocks low in lime content. About 70% of these soils are low in  $P_2O_5$  while about 48% have a deficiency in potash. While it is usually conceded that basalt gives a nutritively fertile soil, still from the weathering under the "Oberhessen" conditions a soil is obtained which from field and Neubauer tests as well as reaction studies needs the application of lime,  $K_2O$  and  $P_2O_5$ .

R. M. BARNETTE

**Weathering of sandstone, limestone and basalt in the "red earth" area.** ADOLF REIFENBERG. *Z. Pflanzenernähr., Düngung u. Bodenk.* 13A, 53-66(1929).—The climate of the Mediterranean Sea area of Palestine is characterized by a winter rainy period with a summer dry period. The rain factor lies between 30 and 50. The original formations giving rise to the soils of Palestine are: (1) limestone, (2) basalt, (3) sandstone with relatively high  $CaO$  content. The soils formed show an alk. reaction caused by the large content of  $CaO$ , low content of humus and the presence of alkali carbonates. The soils are for the most part high in content of salts of the alk. earths and alkalies which remain in the soil upon the evapn. of the water brought to the surface by capillarity. A low content of humus caused by the high  $CaO$  content and acid conditions in the summer is a characteristic of the area. The small quantities of adsorptively satd. coagulated humus cannot have a protective action on the iron oxide sols. The humid conditions in the winter combined with the relatively high temps. bring about an energetic hydrolysis and soln. of the rock components. The soils show an increase in the sesquioxides and  $SiO_2$  in comparison with the original rocks. On the other hand, the alk. earths are washed out for the most part during the rainy months, while during the arid season there is a vertical movement upward. The movement of water gives rise to an *eluvial* horizon underneath and a *illuvial* horizon above. The low content in humus with a more or less high content of Fe causes the often-encountered light red color of the soils. A theory for the formation of the soils in the part of Palestine having the Mediterranean climate is given. The soils are briefly described: (1) "Red Earths" occur as typical soils in general only on limestone under the typical Mediterranean climate. They show a large increase of sesquioxides and  $SiO_2$  over the original lime rock. Their content in salts, alkalies and alk. earths is relatively high. Their red color is a result of a high Fe content and a low humus content. They have an alk. reaction and loamy feel. The colloidal  $SiO_2$  appears to play an important role as a protective colloid. (2) "Red Sands" result from lime-sandstone in much the same manner as "red earths." The individual soil particles are covered with a layer of some Fe compds. which indicates that the Fe must have previously been brought into soln. They are sandy soils with low adsorptive capacity and with a low content of alkalies, alk. earths and plant nutrients. They contain magnetic Fe concretions. (3) "Chocolate Brown Basalt soils" develop in much the same manner as the "red earths," with quite similar properties. Color is variable because of the content of  $FeO$  and different stages of its oxidation to  $Fe_2O_3$ .

R. M. BARNETTE

**A new method for the conservation of soil profiles.** K. SCHLACHT. *Z. Pflanzenernähr., Düngung u. Bodenk.* 13A, 426-31(1929).—By the use of a conserving medium which is a colorless condensation product of urea and formaldehyde, S. is able to conserve soil profiles for future study and comparison. The method which is described offers a quick and convenient method of collecting and comparing a no. of profiles. An addnl. advantage is the ease of transportation and low weight of the profiles thus taken. The condensation product penetrates wet soil readily.

R. M. BARNETTE

**The iodine question and agriculture.** W. GAUS AND R. GRIESSBACH. *Z. Pflanzenernähr., Düngung u. Bodenk.* 13A, 321-425(1929).—An extensive review of the literature concerning the distribution of I in nature and the significance of I to plants and animals together with an account of the expts. carried out by the I. G. Farbenindustrie Akt. at their expt. stations and in coöperation with other agencies. Conclusions: A stimulation and increased yield resulting from applications of small quantities of I as impurities in fertilizer salts cannot be expected from results to date. An improved quality of the plants cannot be established with certainty by application of I compds. in small quantities, apparently because of a sufficiency of the I in the soil, rain water, etc. Applications of I compds. in large amts. are distinctly detrimental as most halogens are. The question of deficiencies of I for plants and animals in localized areas does not appear important for Germany, and thus continued small addns. of I in fertilizer salts or as amendments to fertilizers does not appear to be important. The view that cultivated soils which have been in culture for hundreds of years are deficient in I does not appear to cause deficiencies of I in the agriculturally important plants grown on

these soils. The cultivated soils, with a high content of inorg. and org. adsorption materials, show an enrichment in I which is supplied from the atm. and rain water. The role of I in the plant is little understood and the necessity of I to plant growth is by no means experimentally detd. On the other hand, I appears necessary for man and for animals. Its presence is closely assocd. with the proper functioning of the thyroid gland, which secretes the I-contg. thyroxine. The question of the I relationship to goiter is still unsolved, though some relationship appears to exist. The suggestion that soils deficient in I be fertilized with I salts is not a soln. of the problem as often such soils do not give an enrichment of I in the plant. The I is for the most part present in the stems and leaves of plants, while in general, the fruit, seed and tubers of plants are eaten. These plant parts contain smaller quantities of I. It has been observed that I in org. combinations is more effective in treating goiter than inorg. forms. It appears that there is little basis for considering I or I-contg. fertilizer salts as agriculturally important for their I content.

R. M. BARNETTE

**Unsaturated soils.** NIL P. REMEZOV. *Z. Pflanzenernähr., Düngung u. Bodenk* 13A, 228-42(1929).—A review of the methods for detg. the lime requirements of acid soils in which the conclusion is reached that no one method is satisfactory and that a no. of factors, such as the fineness of the liming material, the plant to be cultivated, etc., must be weighed before practical recommendations from any of the numerous methods are of much value. The empirical field method seems best suited to give practical results. An extensive bibliography is given.

R. M. BARNETTE

**Degree of lime and potash saturation of soils.** A. GEHRING. *Z. Pflanzenernähr., Düngung u. Bodenk.* 13A, 1-17(1929).—The comparison of the Hissink and Gedroiz methods for detg. the replaceable CaO in a soil showed that the 2 methods gave comparable results with either 12.5 g. or 25 g. of soil. However, the Gehring-Wehrmann method for detg. the amt. of lime necessary to sat. a soil gave a higher adsorption of CaO when 12.5 g. of soil was used than when 25 g. was used. This difference is attributed to the increased amts. of  $\text{CaCO}_3$  formed when the larger amts. of soil (previously treated with CaO and  $\text{CO}_2$  passed through the suspension) are leached with NaCl, the Na ion replacing the Ca ion of the soil and the Ca forming  $\text{CaCO}_3$  which is more difficultly sol. The proportion of  $\text{Ca(OH)}_2$  soln. to soil had very little influence on the max. adsorption of CaO by the soil as long as sufficient  $\text{Ca(OH)}_2$  was used actually to sat. the soil. An alc. soln. of  $\text{Na}_2\text{SO}_4$  was a very satisfactory method of detg. the replaceable CaO of a soil as compared with the Hissink method. Fifty cc. of a  $\text{Na}_2\text{SO}_4$  soln. of known concn. plus 50 cc. of alc. were added to 10 g. of soil and the suspension was allowed to stand overnight. After filtration the sulfate remaining in soln. was detd. and the difference between the original sulfate content and content after contact with the soil which represented the sulfate which combined to form the insol.  $\text{CaSO}_4$  was used to calc. the CaO replaced. The degree of satn. in K agreed fairly satisfactorily with the response of crops to potash fertilization in the field.

R. M. BARNETTE

**Further investigations on the significance of the degree of saturation in potash for indicating the potash needs of soils.** A. GEHRING AND O. WEHRMANN. *Z. Pflanzenernähr., Düngung u. Bodenk.* 13A, 18-28(1929).—From the degree of satn. in K<sub>2</sub>O, the total degree of satn. in CaO and K, the relationship between the Neubauer detd. K and the degree of satn. in K, the authors believe they have found a method for indicating the K needs of a soil. No definite conclusions are drawn.

R. M. BARNETTE

**Acidity of mineral soils.** S. GOV, P. MÜLLER AND O. ROOS. *Z. Pflanzenernähr., Düngung u. Bodenk.* 13A, 66-91(1929).—The  $p_H$  value in KCl, the  $p_H$  value in water, the total acidity titrated to a  $p_H$  point of 7.7 and the easily activated soil acidity detd. by titration of a KCl suspension to a  $p_H$  value of 5 gives the total adsorption of a soil the total acidity of which includes the easily activated acidity (the "exchange acidity"), the difficultly activated acidity ("hydrolytic acidity"), the temporary acid condition ( $p_H$  in water), the greatest degree of acidity ( $p_H$  in KCl), the buffer value for the total acidity expressed as mg. NaOH which is necessary for the neutralization of 1 mg. H ion, the buffer value for the easily activated acidity ("exchange acidity") and the buffer value of the difficultly activated acidity detd. between  $p_H$  5 and 7.7 and for soils without "exchange acidity" between the lowest  $p_H$  point and 7.7.

R. M. BARNETTE

**Do soil samples become more acid upon drying?** B. AARNIO. *Z. Pflanzenernähr., Düngung u. Bodenk.* 14A, 37-9(1929).—From a series of measurements of the H-ion concns. of aq. suspensions of fresh and dried soils, A. maintains that drying increases the H-ion concn. of soil suspensions.

R. M. BARNETTE

**The alleged increase of the acidity of soil samples upon drying.** WIDAR BRENNER. *Z. Pflanzenernähr., Düngung u. Bodenk.* 14A, 39-42(1929); cf. C. A. 22, 4695.—The results of Aarnio (preceding abstr.) are explained upon the basis that the drying of the

soil samples was carried out in a closed thermostat where the gases could easily be absorbed by the soils. B. fails to find any significant effect of drying upon the  $pH$  value of soil suspensions.

**Acid content and lime requirement of our cultivated soils.** R. M. BARNETTE, R. BALKS AND MARIA BACH. *Z. Pflanzenernähr., Düngung u. Bodenk.* 13A, 93-118 (1929).—Detns. of the various forms of acidity and the degree of satn. in bases of a series of cultivated soils in comparison with the practical application of lime showed that the detns. were of only limited value in recommending the application of lime to be made, and that the tests in the field must be carried out sometimes 2-3 years before satisfactory results may be obtained. Physiologically alk. fertilizers are only partially effective in very acid soils in overcoming the undesirable effects of the excessively acid condition. In soils of low to medium org.-matter content (1 to 9%) with an increase in the degree of acidity there is a corresponding tendency of the "exchange acidity" to approach the "hydrolytic acidity." In soils with more than 9% org. matter the "hydrolytic acidity" was greatly in excess of the "exchange acidity." In mineral soils without org. matter the "exchange acidity" and the "hydrolytic acidity" were the same. With light sandy soils the total adsorptive capacity of the soil cannot be reached without detrimental effects on plant growth.

**Determination of the lime requirement of acid soils on the basis of laboratory and vegetation experiments.** A. KAUFMANN. *Z. Pflanzenernähr. Düngung* 12A, 156-75 (1928).—The chem. methods of detg. the lime requirements as given by D. J. Hissink, by A. Gehring, by K. K. Gedroiz and by E. W. Bobko and D. L. Askinasi showed no agreement in lime requirement values when used for 5 acid soils. The "exchange acidity," within certain limits, must be taken into consideration in the culture of both barley and oats, especially on light soils. The lime applications calcd. from the Daikuhara method or from the titration curves were not sufficient to bring about the highest yields in most cases. The quantities of lime calcd. from the A. Gehring method were sufficient to give max. yields. An increase of 55% in the application of lime as detd. by the D. J. Hissink titration method gave small increases. A decrease in the yield with 3, 6 and 9 times the amt. of lime as calcd. from the titration curves—was noted for only 1 soil (a loamy sand). Tests of the acidity at the end of the vegetation expts. showed that the lime requirements detd. by the Daikuhara and electrolytic titration methods were not sufficient completely to neutralize the soils. The neutral point was obtained by quantities of lime 3 times the amts. detd. by the titration curves. R. M. BARNETTE

**The comparative acid tolerance of some southern legumes.** G. JANSSEN. *Soil Science* 27, 469-92 (1929). The best growth of most legumes was produced at a soil reaction of  $pH$  6.0-6.8. When NaOH was used to change the reaction it destroyed the phys. properties of the soil but some plants, particularly sweet clover, seemed to grow better when NaOH was used to change the reaction than when  $Ca(OH)_2$  was used under similar H ion concns. This was particularly true when the soil was brought to a  $pH$  of 7.2 and 7.4. The following range of acid tolerance was noted among legumes when grown on soil, ranging from high to low acidity: seredella subterranean clover, vetch, bur clover, Austrian field pea, soy bean, Canadian field pea, crimson clover, Hubam clover and biennial white sweet clover. The results of the comparative legumes tested on sand cultures show the following gradient of tolerance of low to high acidity: red clover, vetch, seredella, California bur clover, spotted bur clover and velvet bean.

J. J. SKINNER

**Chemical soil analyses and molecular proportions.** K. UTESCHER. *Z. Pflanzenernähr., Düngung u. Bodenk.* 13A, 265-74 (1929), cf. C. A. 22, 4696.—A comparison of the method used at the Geol. Landes-Anstalt (heating 1 hr. on sand bath with 100 cc. of 1.15 sp. gr. HCl) with the method by the Int. Soc. of Soil Scientists (heating under reflux condenser with 10 times as much HCl, b.  $110^\circ$ ), on soils from Scotland. Results of the mol. proportions calcd. from the sol. Fe, Al,  $SiO_2$  and bases showed that the 2 methods gave the same results with the humid soils from Scotland as long as the soils did not contain easily decompd. silicates such as greensand, which have at the same time not been significantly weathered. The Geol. Landes-Anstalt method using a concd. HCl ext. can give valuable information regarding the weathered silicate complex which cannot be obtained with weaker reagents.

R. M. BARNETTE

**The gravimetric method for the determination of carbonates in the soil.** NORMAN A. CLARK AND EMERSON R. COLLINS. *Soil Science* 27, 407-14 (1929).—The gravimetric method for detg. soil carbonates has been improved by using ascarite and either dehydrite or  $P_2O_5$  as absorbents, by stirring instead of shaking and by using 1 to 10 HCl at room temp. At  $50^\circ$  the amt. of  $CO_2$  given off is slightly increased. Nineteen references are given.

A. L. MEHRING

**New method for determination of small quantities of nitrate in soils and plants.** JACOB BLOM AND CECIL TRESCHOW. *Z. Pflanzenernähr., Düngung u. Bodenk.* 13A, 159-90(1929).—The method is based upon the nitrating of 2,4-xyleneol, the distn. of the *o*-nitroxyleneols formed with steam and the colorimetric detn. of the nitroxyleneols in the distillate after the addn. of NaOH. About 0.05 mg. NO<sub>3</sub> may be detd. with an accuracy of 2%. Org. matter is destroyed before nitrating, by heating with permanganate and H<sub>2</sub>SO<sub>4</sub>. HNO<sub>3</sub> is not changed by this process and NH<sub>4</sub> salts are not oxidized while amino acids are split only very slightly with the formation of nitrates. The xyleneol method was used successfully in hundreds of plant and soil analyses with good results. R. M. BARNETTE

**Detection and determination of chlorate ion in soils.** F. MACH AND R. HERRMANN. *Z. Pflanzenernähr. Düngung* 12A, 189-98(1928).—The use of NaClO<sub>3</sub> for the destruction of weeds and undesirable vegetation has given rise to the question of possible effects of the chlorate ion on plant growth and the detn. of the chlorate ion in the soil. The authors describe expts. on the detection and detn. of the chlorate ion in soil. For the former, the authors use the I reaction. 200 g. soil is shaken with 500 cc. of distd. water. The filtrate is used. To 1 cc. of the filtrate of the soil ext. in a glass-stoppered flask, 25 cc. of distd. water, 25 cc. of HCl (sp. gr. 1.19) and 1 g. KBr are added and the flask is shaken several times. After 5 min. about 1 g. KI is added. Free I is liberated which imparts a yellow color; it may be detected in very small quantities with the aid of a starch soln. As another method, the authors added 2 cc. of 0.02 N AgNO<sub>3</sub> to 25 cc. of soil soln. (filtrate from 100 g. soil and 250 cc. water) and back titrated with 0.02 N KCNS. To the same quantity of soil soln., 5 cc. of 5-6% H<sub>2</sub>SO<sub>4</sub> is added and the mixt. placed on the water bath for 20-30 min., and then heated over an open flame until the H<sub>2</sub>SO<sub>4</sub> is expelled; after cooling and the addn. of HNO<sub>3</sub>, 2 cc. 0.02 N AgNO<sub>3</sub> is added and titrated back with 0.02 N KCNS. If the AgNO<sub>3</sub> is used to the extent of 0.30 cc. in the detn. after reduction, then the chlorate ion is present. For detn., the authors recommend AgNO<sub>3</sub>-KCNS titrations before and after reduction. The detrimental influence of chlorate ion on the germination of rye plants was established. R. M. BARNETTE

**Detection and significance of manganese dioxide in the soil.** W. O. ROBINSON. *Soil Science* 27, 335-50(1929).—The presence of a small quantity of MnO<sub>2</sub> in the soil causes the soil to decomp. H<sub>2</sub>O<sub>2</sub> so vigorously that the presence of MnO<sub>2</sub> in the soil can be established by the H<sub>2</sub>O<sub>2</sub> test. The test is not recommended for a detn. of MnO, on account of probable differences to be found in the size of the MnO particles in different soils. MnO<sub>2</sub> does not occur in the clay or colloidal fractions of soil. It occurs in the sands, but to a greater extent in the silt fraction. The detn. of the total Mn in the silts and sands is an approx. detn. of the MnO<sub>2</sub> in the whole soil. Concretionary and other deposits of MnO<sub>2</sub> in the soil are apparently formed through the agency of CaCO<sub>3</sub>. The presence of MnO<sub>2</sub> in the surface layers of soil is characteristic of certain soil series. These soils are characterized by a peculiar and unmistakable chocolate-brown color. J. J. SKINNER

**The practical routine procedure for the mechanical analyses of soils.** P. KÖTTGEN AND H. HEUSER. *Z. Pflanzenernähr., Düngung u. Bodenk.* 13A, 137-58(1929).—A practical method is given for carrying out the routine mech. analyses of the soil utilizing the pipet method. A horizontal tip to the pipet is recommended for the withdrawal of the suspension in the mech. analyses. A special cylinder with a horizontal offset is described. Glycerol is used as the dispersing medium for coarse particles. R. M. B

**The value of nitrification tests on soils representing extreme contrasts in physical and chemical properties.** W. V. HALVERSEN. *Soil Science* 26, 221-31(1928).—Consistent parallelisms of variations in nitrifying power are shown on heavy, well-buffered soils when the incubation period is 4 weeks. Very sandy soils of low org. content yield less consistent results and an incubation period of 2 weeks is preferable. Furthermore, less nitrogenous material should be added. (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> is recommended as a source of N. M. S. ANDERSON

**Composition of natural organic materials and their decomposition in the soil.** IV. The nature and rapidity of decomposition of the various organic complexes in different plant materials, under aerobic conditions. FLORENCE G. TENNEY AND SELMAN A. WAKSMAN. *Soil Science* 28, 55-84(1929).—The decompn. of corn stalks, rye straw, oak leaves and alfalfa plants was studied under aerobic and optimum moisture conditions at 25-7°. The nature and rapidity of decompn. vary with the chem. compn. of the material. Sugars, celluloses, hemicelluloses, fats and proteins decompose readily but lignins tend to accumulate. Under aerobic conditions, however, the total lignin content is reduced decidedly. The decompn. of org. matter contg. only 0.2-1.7% total

N is accompanied by an abs. increase in the crude protein content. This is due to syntheses by the organisms which decompose cellulose. The pentosans decay rapidly at first but tend to accumulate toward the end. The addition of sol. inorg. N salt hastens the decompn. of celluloses and hemicelluloses. The residues after 12-14 months possess all the properties of soil org. matter. This humus is composed chiefly of lignins, modified lignin complexes, proteins, hemicelluloses, a small amt. of cellulose and other org. compds. but is not in a state of equilibrium. The rate of change constantly decreases until it approaches that of the soil humus. Sixteen references are appended.

A. L. MEHRING

**The chemical composition of Florida Everglades peat soils, with special reference to their inorganic constituents.** HARALD E. HAMMAR. *Soil Science* 28, 1-11(1929).—Twenty-four representative soils from the Florida Everglades were analyzed, which are classified according to the native vegetation growing on them, namely, saw grass, elderberry and custard apple. The custard-apple and saw-grass soils represent 2 chemically distinct types, the former being a true muck, and the latter a true peat. The custard-apple soils are sedimentary in nature, and the saw-grass accumulative. The elderberry soil is not so distinct from this class.

for the custard-apple and saw-grass soils was 3.814 and 5.208%, resp., whereas the MgO content was 0.0881 and 0.0102%. The reaction of the custard-apple soil was acid, whereas elderberry and saw-grass soils were slightly acid to neutral. The acidity decreased upon increase in depth, whereas the Ca and Mg probably increased. The custard-apple and saw-grass soils contained 44.52 and 86.37 org. matter and 12.25 and 16.47% hygroscopic  $H_2O$ . The custard-apple soils have a higher natural fertility than the saw-grass soils, but the latter are rendered productive by the use of Cu and Mn salts. The poor fertility of the saw-grass soil is not due to the absence of the usual fertilizer constituents, N, P and K.

J. J. SKINNER

**"Coefficient of wilting" and other moisture values of soils.** P. I. ANDRIANOV. *Z. Pflanzenernähr. Düngung* 12A, 145-56(1928).—The different quantities of water held by the soil (corresponding to any particular method of evaluation) are related to one another in a regular manner. This conformity to a law shows that: (a) The quantity of the water held by the soil and detn. by any method is a characteristic of the soil, and the soil has a definite place among other soils. (b) The proportion of the quantities of water unequally held by the soil is less as the actual quantities of water increase.

R. M. BARNETTE

**Root development and soil moisture.** JOHN P. CONRAD AND F. J. VIEHMEYER. *Hilgardia* 4, 113-34(1923).—The root development of grain-sorghum plants in relation to soil moisture was studied. The use of the *moisture equiv.* for the reduction of moisture contents to a common basis is suggested. Variations in soil texture that are not interpreted by moisture equivs. may be great enough to make the results unreliable unless many samples are taken for the condition investigated. Moisture under rows of grain-sorghum plants is extd. in successive zones, and the extn. is progressive whenever no material addns. of moisture occur during the growing season. A correlation exists between the amt. of roots and the extent to which the soil has been dried by root activity. If the soil is wet at the beginning of the growing season to the full depth to which roots of plants would normally penetrate, subsequent addns. of water by rain or irrigation can have but little influence on the extent of the root system developed. A bibliography of 22 references is appended.

C. R. F.

**Daily and seasonal air and soil temperatures at Davis, California.** ALFRED SMITH. *Hilgardia* 4, 77-112(1923).—The installation of *elec. resistance thermometers* for detg. soil temps. at different depths is described. The surface 4 in. of a loam soil under black paper mulch was very much more moist than unmulched soil. A careful study of soil temps. and moistures is necessary for a proper interpretation of soil chem. and biol. data.

C. R. F.

**The influence of replaceable bases on the soil solution formation in mineralized soils.** F. MENCHIKOVSKY AND S. RAVIKOVITCH. *Soil Science* 27, 49-68(1929).—The exchangeable bases of 3 Palestine soil profiles are studied. A study of the distribution of the various cations shows Ca to be relatively higher near the surface and to decrease relatively with depth, while the proportion of Na is higher in the lower horizons than near the surface. The distribution of cations in aq. exts. shows a relationship between the exchangeable and  $H_2O$ -sol. bases. Variations in the proportions of soil and  $H_2O$  from 1-1 to 15-100 gives negligible variation in the proportions of the various bases.

Sol. phosphate and sulfate ions are absent in most cases. The bicarbonate and silicate ions extd. by  $H_2O$  increase with diln. Cations are distributed in the same percentage in all exts. In highly mineralized soils the compn. of the soil soln. is correlated with the exchangeable base in the soil colloidal complex, and to a certain degree these reflect the character of this complex.

M. S. ANDERSON

**Changes in the nitrate and sulfate content of the soil solution under orchard conditions.** E. L. PROEBSTING. *Hilgardia* 4, 57-78(1929).—With field plots at Davis, Calif., fruit trees and cereals influenced the soil soln. differently. Under trees, the nitrate content steadily increases during the growing season. This is contrary to the findings under cereals. Alfalfa behaved like cereals rather than trees, though the growing season corresponds more closely to that of trees. With the exception of alfalfa, nitrification exceeds utilization throughout the summer months. Soils depleted in chloride and nitrate ions are usually high in sulfates. The peach series of soils were higher in sulfates and lower in nitrates than the pear plots. It is possible that the bicarbonate relationship may explain the above findings. Considerable fluctuation was found in the concn. of all ions except  $H$ -ion concn., which was almost const. at  $pH$  7.0-7.2 in the top 3 ft. and 7.4-7.8 in the 3-6 ft. samples. The phosphate varied from 50 to 120 p. p. m. and nitrate from 130 to 500 p. p. m. of soil soln.

C. R. F.

**Soil reaction and growth of meadow plants.** KARL E. LANDGRAF. *Z. Pflanzenernähr., Düngung u. Bodenk.* 13A, 213-28(1929).— $H_2SO_4$  and  $NaOH$  were used to alter the acidity and alk. of the soil for studies with meadow plants in pots.  $H_2SO_4$  and  $NaOH$  increased the citric-acid-sol. N. The  $H_2SO_4$  lowered while  $NaOH$  increased the citric-acid-sol.  $P_2O_5$ .  $K_2O$  soly. was slightly decreased by both acid and alkali while the Ca was not significantly changed. The water capacity and the hygroscopicity increased under the influence of acid between  $pH$  4.4 and 4.7 and then decreased.  $NaOH$  also increased the water-holding capacity and hygroscopicity. *Festuca pratensis* showed (from a one-year test) 2 optimum growth points at  $pH$  4 and 7. The growth factors such as sol. nutrients seemed to influence the max. growth at these points. The optimum reaction range of the cell sap of *Festuca pratensis* lies between  $pH$  5.95 and 6.25. A large application of lime to a neutral to alk. soil was less effective in changing the  $pH$  of the cell sap than a smaller application. A physiologically alk. nutrient increased the  $pH$  value of the cell sap about 0.3 units. No relationship between the  $pH$  value of the soil and that of the cell sap could be ascertained. The reaction of the cell sap was dependent upon the pressure of definite ions in the nutrient medium. An extensive bibliography is given.

B. M. BARNETTE

**The absorption of phosphate from soil and solution cultures.** L. J. H. TEAKLE. *Plant Physiology* 4, 213-32(1929).—The absorption of the phosphate by wheat plants was studied in soil cultures and in flowing soln. cultures. In solns. contg. between 1.0 p. p. m. phosphate and 50 p. p. m. phosphate vigorous growth and tillering and high absorption of phosphate occurred; whereas small growth and reduced tillering and low absorption of phosphate took place between 0.05 p. p. m. phosphate and 0.1 p. p. m. phosphate. If a region of direct proportionality exists between absorption of phosphate and concn. of soil or culture soln., T. suggests that it will be between 0.1 p. p. m. phosphate and 1.0 p. p. m. phosphate—the range commonly occurring in soil solns. In the displaced soln. of the neutral and highly buffered soils studied, the concn. of the phosphate in the soil soln. was dependent on the nature of the solid phase rather than on the compn. of the soil soln. The compn. and buffer qualities of the expressed sap were reflected by the total absorption of phosphate. Phosphate was effective in buffering against alkali, but the concn. of phosphate has no observable effect against acid. An excess of base in the expressed sap suggested the presence of an org. anion.

W. T.

**Liming as factor in the mobilization of phosphoric acid in the podsol soils.** D. I. ASKINAZI AND S. S. YARUSOV. *Z. Pflanzenernähr., Düngung u. Bodenk.* 13A, 294-5 (1929).—See C. A. 23, 3533.

R. M. BARNETTE

**Is sulfur a limiting factor of crop production in some Utah soils?** J. E. GRAVES AND W. GARDNER. *Soil Science* 27, 445-57(1929).—An analysis of the Cache Valley soils shows that they contain from 252 to 1764 lb. of S per acre-foot of 3,600,000 lb. The av. S content of the soil analyzed was 903 lb. per acre-ft. Analyses of the water of 45 streams, which are used for irrigation purposes, showed them to carry from 3 to 676 lb. of S per acre-ft. of water. Six streams carried over 200 lb. and 34 streams carried less than 100 lb. Consequently, the quantity of S carried to the soil by irrigation water is often appreciable. The waters used on the soils of Cache Valley contain only small quantities of S. The pptn. was collected in 10 different localities in the valley. The av. annual quantity of S brought to the soil over a period of 4 years at



9 of the 10 stations varied from 6.4 to 12.1 lb., with an av. of 9.5 lb. The pptn. collected near the college campus had an av. annual S content of 32.7 lb. S-carrying salts increase the bacterial activities of the soil. This is especially pronounced in the case of N fixation. This may be due either to the direct action of the S as a food, to the microorganisms, or to an indirect action upon insol. nutrients. The conclusion is reached that S may become a limiting factor of crop production in some Cache Valley soils. The time required for this to manifest itself in diminished crop returns will vary with the soil, the specific irrigation water used and the crop grown upon the soil.

J. J. SKINNER

**Biochemical studies on the biological activity of sandy forest soils of the Hungarian plain.** D. FEHÉR AND R. BOKOR. *Biochem. Z.* **209**, 471-88 (1929).—Sandy forest soils are very favorable from the point of view of the C nutrition, the advantage probably being due to greater air capacity and more favorable  $O_2$  circulation. The bacterial flora is less numerous in the sandy soil but the numerical inferiority is compensated by the more intensive vital activity. The N metabolism shows certain essential variations. The total N content of sandy forest soil is less but the activity of nitrifying bacteria is much better because of the good conditions for aeration. As a result, sandy soil is considerably richer in nitrate N. The nitrifying bacteria are also numerically much more numerous than in the non-sandy forest soils. Furthermore, the water-sol. nitrogenous compds. are much more rapidly washed into sandy than loamy soils. The  $pH$  of the sandy soil is nearer the neutrality point which also contributes greatly to the intense bacterial activity.

S. MORGULIS

**Conduction of heat by sands.** FRANZ ROLL. *Z. Pflanzenernähr. Düngung* **12A**, 199-204 (1928). The conduction of heat by sands depends for the most part upon the degree of packing, the moisture content, as well as the particle size and temp. Formulas for the conduction of heat are given.

R. M. BARNETTE

**Statistical collections from the laboratory for soil investigation of the sugar factory of Greifsborg, Pomerania.** A. H. ERDENBRECHER. *Deut. Zuckerind.* **54**, 523-9 (1929).—E. summarizes the soil investigation of 1925-28, referring especially to N-fixing bacteria, CaO,  $P_2O_5$ ,  $K_2O$ ,  $pH$  and acid consumption. Methods are described, limits of accuracy of methods are stated, tables and curves given.

J. F. LEETE

**Does frost exert a "solubilizing" effect on the phosphate and potash of soils?** O. ENGELS. *Fortschritte Landw.* **3**, 96 (1928).—Exam. by Neubauer's method of soils frozen once, and repeatedly, showed little or no increase in root-sol. phosphate or K as a result.

B. C. A.

**An efficient soil tube jack.** C. A. TAYLOR AND HARRY F. BLANEY. *Soil Science* **27**, 351-3 (1929).—An instrument is described, which is valuable for obtaining sub-soil samples.

A. L. MEHRING

**Comparative investigations and experiments with different methods for determining the nutrient requirements of soils in phosphate and potash.** EUGEN BECKER. *Z. Pflanzenernähr., Düngung u. Bodenk.* **13A**, 274-93 (1929).—If proper regard is given to the degree of alk. of a soil, the Sigmund method using dil.  $HNO_3$  and adjusting the soil to a more or less const. reaction gives satisfactory agreement with the 1% citric acid method and the Neubauer method for detg. the soly. of  $P_2O_5$  and  $K_2O$  in soils. An extensive bibliography is given.

R. M. BARNETTE

**Soil reaction experiments with mustard and oats in connection with nutrient-requirement trials.** I. HELLER. *Z. Pflanzenernähr., Düngung u. Bodenk.* **8B**, 37-40 (1929). The importance of detg. of the effect of soil reaction, lime content and lime requirement on the growth of individual crops as a necessary complement to fertilizer-requirement expts. is emphasized.

B. C. A.

**Examination of the "effect factors" of the three principal nutrients of cultivated plants and of the determination of the nutrient content of soils according to Mitscherlich.** M. NOACK. *Kuhn-Arch.* **19**, 412-553 (1928). Numerous trials are recorded designed to exam. the alleged constancy of the "effect factors" as applied to different plants and to different forms of fertilizers. In many cases the nature of the fertilizer and the kind of crop did not markedly affect the "effect factors." There were, however, notable exceptions in which different crops indicated different contents of assimilable N and P in identical soils. The Mitscherlich "effect factor" for K in the presence of Na varied considerably.

B. C. A.

**Influence of nutrients on the value of bast-fiber plants (flax and nettle).** I. H. FABIAN. *Faserforschung* **7**, 1-56 (1928).—Lack or excess of K, N or P is unfavorable for the production of fiber. Diminution of fiber yield occasioned by N can be to a certain extent compensated by means of K. The most favorable fertilization for the pro-

duction of fiber is that which best stimulates growth, but does not afford the max. production of stem. B. C. A.

**Course of the growth and the absorption of nutrients by the cotton plant.** S. A. KUDRIN. *Z. Pflanzenernähr., Düngung u. Bodenk.* 13A, 91-3(1929).—The cotton plant was studied as to the fresh wt. of material produced, air-dried wt. of material produced, abs. dry wt. of material produced and chem. compn. at 5 stages of growth: (1) with the formation of the third leaf, (2) bud formation, (3) bloom stages, (4) the beginning of ripening, (5) the first harvest. The chem. studies showed a decrease of the relative amts. of N and ash constituents with increasing age. The largest amts. of N and  $P_2O_5$  were found in the blooms and seeds while the largest amts. of Ca and Mg were found in the leaves and stems. With increasing plant growth the N and ash constituents migrate from the vegetative organs to the generative. In the last stage of development investigated (the first harvest stage),  $\frac{2}{3}$  of the total N and  $P_2O_5$  compds. of the cotton plant were in the generative organs while the larger part of the Ca remained in the vegetative organs. The Mg in this stage was more or less equally divided in both classes of organs. Between the bud formation and bloom formation stages, the cotton plant absorbed the largest amts. of nutrients from the soil. During this time an increased absorption of Ca and N compared with  $P_2O_5$  and Mg occurred. The cotton plant has a high requirement for nutrients, but it so happens that the large quantities of these nutrients are not removed with the harvest of the cotton but are returned to the soil.

R. M. BARNETTE

**Nitrates in soil and plant as indexes of the nitrogen needs of a growing crop.** B. E. GILBERT AND J. B. SMITH. *Soil Science* 27, 459-68(1929).—The curves for soil and plant soln. nitrates in connection with 1928 crops of cabbage, tomatoes, celery and beets are given and attention is drawn to the influences of side-dressings of sol. N fertilizer upon these curves. Nitrate concns. both in soil and in plant solns. were maintained above previously designated suboptimum concns. throughout the greater part of the season and yields were uniformly greater than with lower N fertilization. Conclusion: Chem. and cultural methods should be used concurrently to secure a complete picture of N needs of crops. J. J. SKINNER

**Soil respiration and fertility.** E. H. REINAU. *Festschr. Stoklasa* 1928, 305-18.—The intensity of the assimilation of  $CO_2$  by green leaves from the air immediately surrounding them is such that practically the whole of the  $CO_2$  produced within the soil can be absorbed. The interchange of layers of air at the soil surface with higher layers is small. Hence the view is propounded that  $CO_2$  production in soils must control crop yields. B. C. A.

**Observations upon methods of cultivation.** J. F. RAVAT. *Rev. vil.* 69, 235-41 (1928).—The anomalous fact that unfertilized fields often produce higher crop yields than fertilized ones is explained upon the hypothesis that plants derive their essential food constituents primarily from disintegrated soil microorganisms. The microorganisms are supposed to be able to attack and utilize for their own nutrition the mineral constituents present in the soil but which are not directly assimilable by the plant. The beneficial effect obtained by the application of fertilizers is due to the increased no. and activity of the soil microorganisms rather than to any direct assimilation on the part of the plant. This is especially true where the applied fertilizing elements are available for only a short period of time compared to the life of the plant. R. believes the same beneficial effect may be obtained by the practice of methods of cultivation which tend to produce an environment more favorable to the soil microorganisms. K. S. MARKLEY

**Swedish fertilizer trials in 1927.** G. SUNDELIN, C. LARSON AND E. MANELL. *Medd. Centralanstalt försöksväsendet jordbruks.* No. 340; *Jordbruksavdel.* No. 69, 1.—Summaries of the results of numerous field trials are recorded and classified according to crop, soil type and reaction. B. C. A.

**Cold- and hot-fermented manure.** GERLACH AND SEIDEL. *Z. Pflanzenernähr., Düngung u. Bodenk.* 8B, 15-37(1929).—Published literature is critically reviewed. Hot-fermented manure has rather less dry wt. and total N but more water-sol. N than cold-fermented manure. The work of Krantz and Löhnis and Ruschmann on the fermentation process was not confirmed. The decompn. in soil of hot-fermented manure was slightly slower than with the cold-fermented product, and crop yields were rather lower. B. C. A.

**Hot fermentation of manure and weeds.** C. FRUWIRTH. *Fortschrille Landw.* 3, 832(1928).—The vitality of seeds surviving the hot-fermentation process for manure was examd. Daily addns. of weeds and manure were made to the stack in a concrete pit and seed samples inserted in fine-meshed packets. A small no. of seed germinated

after the "cold" fermentation of the ordinary yard manure, but in the hot-fermentation process none survived. Similar results were obtained with undigested seed entering the stack with the manure.

The action of the complete fertilizer "Nitrophoska" in comparison with other fertilizer combinations, according to newer and in part special investigations on this problem. O. ENGELS. *Fortschritte Landw.* 4, 418-21(1929).—Review. L. P. M.

The fertilizing action of several potash salts alone and as mixtures. H. LIESEGANG. *Z. Pflanzenernähr., Düngung u. Bodenk.* 14A, 62-5(1929).—KCl,  $K_2SO_4$ , and  $KNO_3$  were used alone and in combinations of 2 of the 3 salts as sources of K in sand cultures. There were no significant differences in plant yields except for a detrimental effect of relatively large applications of KCl. The earlier results of Hellriegel, whose studies showed a superiority of a combination of 2 of the salts over a single salt, were not substantiated under the conditions of the expt.

Fertilizer requirement of the onion. M. GÓRSKI AND M. KOZTOWSKA. *Rocz. Nauk. Rolnicz* 20, 1-14(1928).—The onion reacts chiefly to fertilization with K, that to N and phosphate being very small. Rye, oats and potatoes react chiefly to N; only potatoes reacted to K. The large K requirement of the onion is due to its small ability to utilize soil K.

The availability of nitrogenous fertilizers to rice. R. P. BARTHOLOMEW. *Soil Science* 28, 85-99(1929).—The efficiency of the following N compds. for rice compared to  $(NH_4)_2SO_4$  as 100 were, Leunasalpeter 96, a mixt. of cottonseed meal and  $(NH_4)_2SO_4$  96, urea 92,  $NaNO_3$  85.9, blood meal 87,  $NH_4$  phosphate 84.5, Ca cyanamide 69.5, a mixt. of cottonseed meal and  $NaNO_3$  66, cottonseed meal 61.5 and  $Ca(NO_3)_2$  59. Under proper conditions the first 6 seem well adapted for the production of rice.  $NH_4$  compds. such as  $(NH_4)_2SO_4$  and  $NH_4$  phosphate are more suitable, as rice seems to be affected less by the changes they produce and there is the probability that less N may be lost by denitrification. Physiologically basic fertilizers are not desirable as rice grows best under acid conditions. The production of nitrites due to denitrification was spasmodic and only in several cases were they found in quantities larger than several mg. per jar. Nitrites were found in jars which had received no nitrate N. The results do not support the contention that the production of nitrites from nitrates is the cause for the failure of nitrates to produce good yields of rice. N was lost, presumably as elemental N, from all forms of N whether it was in the  $NH_4$ , nitrate or org. form, but smaller quantities lost were from the  $NH_4$  compds.

Contribution to the question of the relative effectiveness of sodium nitrate, calcium nitrate, and Chile saltpeter. HUPPERT. *Fortschritte Landw.* 4, 452-7(1929).—From a large no. of tests it is concluded that these salts are equal in value as nitrogenous fertilizers.

The significance of ammonium citrate solubility for Thomas meal and Rhenania phosphate. A. WILHELMJ, H. KARST AND S. GERICKE. *Z. Pflanzenernähr., Düngung u. Bodenk.* 14A, 42-61(1929).—From vegetation expts., it appeared that the  $NH_4$  citrate soly. of Thomas meal and Rhenania phosphate has no relationship to their action on plant growth, in that the yields were not correlated with the  $NH_4$  citrate sol.  $P_2O_5$ . The citric acid soly. of Thomas meal and Rhenania phosphate gave a better correlation with the results of the vegetation expts. As the  $NH_4$  citrate sol.  $P_2O_5$  of both phosphates has no significance, the superiority of Rhenania phosphate over Thomas meal because of the higher content of  $NH_4$  citrate sol.  $P_2O_5$  in the former cannot be admitted. A superiority of the Rhenania phosphate over Thomas meal could not be detd. in the vegetation expts.

Fertilizer constituent test: phosphoric acid gives profitable increased yields on lowlands at Barcolod-Murcia Millsite. H. ATHERTON LEE, MARIANO G. MEDALLA, BASILIO DESEMBRANA AND PEDRO SENGSON. *Sugar News* 10, 260-3(1929).—In past years N was the only fertilizer constituent which gave increased yields in Negros cane fields. Recently, however,  $P_2O_5$  gave increased yields in the uplands. Plot tests in the lowlands of the Barcolod-Murcia district showed an increase in yield from the use of  $P_2O_5$ .

Laboratory methods for determining the form in which phosphate fertilizers should be applied to different soils. L. VON KREYBIG. *Z. Pflanzenernähr. Düngung* 12A, 176-88(1928).—A general discussion of the possible influences of the acidity or alk. of soil upon the soly. of superphosphate and rock phosphates, with a short discussion of the bacteriol methods for detg. the phosphate needs of a soil. R. M. B.

Sulfur and rock phosphate. A. KALUSHKII. *Z. Pflanzenernähr. Düngung* 12A, 217-26(1928).—By the application of S with rock phosphate, the  $P_2O_5$  of the rock phosphate is made available to plants. In sand cultures with millet, the best results were

obtained with equal amts. of S and rock phosphate, in which case the utilization coeff. of the  $P_2O_5$  of rock phosphate is the same as that of  $CaHPO_4$ . The proportions of rock phosphate and S may be broader and change with the soil type. The rock phosphate S fertilization has, in comparison with the  $CaHPO_4$ , an especially favorable influence on the yield of grain in its relationship to the weight of the entire plant. S not only may be applied with advantage with rock phosphate but also may be used alone on these soils which have a relatively large content of difficultly sol. P compds. or as a means of increasing the soly. of the  $P_2O_5$ . R. M. BARNETTE

**Active lime in basic slag and so-called disintegrated phosphates.** CH. BRIOUX AND EDO. JOUIS. *Compt. rend.* 189, 117-9 (1929).—Two g. of slag or disintegrated phosphate was mixed dry with lots of 1 kg. of acid soil, of known  $p_H$  and lime requirement, then the moisture content was brought to 20% and the  $p_H$  of the different lots detd. by the  $H_2$  electrode after 24 hrs., 2 days, 8 days, etc. From satn. curves there was calcd., according to the different  $p_H$  values, the corresponding amts. of active lime coming from the fertilizer used. For a soil of rather strong acidity, the variations in  $p_H$  observed 3 hrs. after mixing the fertilizer and soil correspond to amts. of active lime varying from 12 to 19%, which is very much higher than the quantity of free lime existing in the fertilizer. The silicates and silicophosphates of lime existing in the slag and the disintegrated phosphate decomp. rapidly in an acid soil in liberating the active lime. Their decompn. appears terminated for the soil considered, at the end of 8 days; after 3 weeks there is a reacidification. The amt. of active lime in the slag exceeds 30%. In an acid soil the decompn. of the silicates and silicophosphates of lime is hastened and distinctly favored by the proper acidity of the soil. E. F. SNYDER

**Action of silica.** O. LEMMERMANN. *Z. Pflanzenernähr., Düngung u. Bodenk.* 13A, 28-39 (1929).—A general review of the action of  $SiO_2$  on the growth of plants, particularly with reference to P fertilization. R. M. BARNETTE

**The tolerance limit of seedlings for aluminum and iron and the antagonism of calcium.** JOHN R. SKEEN. *Soil Science* 27, 69-80 (1929).—There is much evidence that when calcns. are made on a molar basis the toxicity of heavy metals is greater to plants than the toxicity of an equiv. amt. of free acid. The limits of tolerance of *Lupinus albus* and *Phaseolus vulgaris nanus* for Al and Fe and the antagonistic action of Ca to these elements are studied. At temps. from 17° to 21° in the same interval of time 0.35 p. p. m. Fe is toxic and lethal to *Phaseolus*, while 1.15 p. p. m. is lethal to lupins (cf. *C. A.* 23, 4495). *Phaseolus* just survives a concn. of 0.00003 M HCl while the same plant just survives an Fe concn. of 0.000004 M. The presence of Ca greatly reduces the toxicity of both Al and Fe. M. S. ANDERSON

**Investigations on chlorosis of fruit trees. II. The composition of leaves, bark and wood of current season's shoots in cases of lime-induced chlorosis.** T. WALLACE. *J. Pomology Hort. Sci.* 7, 172-83 (1928); cf. *C. A.* 21, 3218.—In Ca-induced chlorosis of apples, pears, plums and raspberries, affected leaves and bark show a higher percentage of ash in dry matter and less Ca and more K in the ash than do comparable healthy material. The ash of the wood of new chlorotic shoots was also higher than that from healthy shoots, but the Ca-K proportions were not materially altered in the ash. Green leaves show no consistent difference from chlorotic in Fe content, although the bark and wood of the latter usually contain more Fe. III. A chlorosis of plums due to potassium deficiency. *Ibid.* 184-98.—A certain type of chlorosis of plum trees develops under soil conditions conducive to leaf scorch in apples, gooseberry and other fruit trees and is believed to be due to K deficiency. Chlorotic foliage contains less ash and a low proportion of K but high proportions of Fe, Ca, Mg and K in the ash. The results in chlorosis due to K deficiency are exactly opposite to those when the chlorosis is due to excess of Ca in the soil. A. L. MEHRING

**Sugar beet parasites in 1927-8.** F. J. RAMBOUSEK. *Listy Cukrovar.* 47, 713-20 (1929); cf. *C. A.* 23, 290.—The occurrence and effects, and in some cases methods of combating, numerous insects and fungi are reported. FRANK MARESH

**Phosphate rock and superphosphate (GRAY) 18. Variations in the Ca and Mg contents of pea plants on different soil types (PONDER) 11D. The relationship of soil type to the Ca and Mg content of green bean stems and leaves and their expressed juice (PONDER) 11D. Alkali metal nitrates and Ca phosphate [with mixed fertilizer production] (Brit. pat. 306,048) 18.**

**Fertilizer.** SIEMENS & HALSKE A.-G. (Georg Eriwein, inventor). Ger. 479,832. Jan. 10, 1925. A fertilizer contg.  $COCl_2$  is produced by the combined action of  $CO$ , Cl and  $NH_3$ .

**Fertilizer.** R. E. SLADE and IMPERIAL CHEMICAL INDUSTRIES, LTD. Brit. 305,760, Dec. 13, 1927. A granular fertilizer is made by mixing a strong soln. or melt of  $\text{NH}_4\text{NO}_3$  with  $\text{CaCO}_3$  obtained as a by-product in the manuf. of  $(\text{NH}_4)_2\text{SO}_4$  from  $\text{CaSO}_4$  and  $(\text{NH}_4)_2\text{CO}_3$ . The mixt. is evapd. to dryness *in vacuo* at 50–100°.

**Fertilizers.** STOCKHOLMS SUPERFOSFAT FABRIKS AKTIEBOLAG. Brit. 306,103, Feb. 15, 1928. Two fertilizers, one consisting of Ca phosphate sol. in citric acid and the other of a mixt. or double salt of the compn.  $(\text{NH}_4)_2\text{SO}_4 \cdot 2\text{NH}_4\text{NO}_3$  and which may contain K phosphate, are prepd. from raw phosphate or phosphate-contg. materials by treatment with a mixt. of  $\text{H}_2\text{SO}_4$  and  $\text{HNO}_3$  followed by treatment with  $(\text{NH}_4)_2\text{CO}_3$  or  $\text{NH}_3$  and  $\text{CO}_2$ . Various details and modifications of procedure are described. Cf. C. A. 23, 4011.

**Storing sodium nitrate or other hygroscopic crystalline substances.** A. C. SCOTT. Brit. 305,721, Nov. 11, 1927.  $\text{NaNO}_3$  for use as fertilizer, or other materials are prevented from caking by admixture with a finely divided inert insol. silicate of laminated or fibrous structure such as asbestos, talc or mica.

**Fungicides.** I. G. FARBENIND. A.-G. (Karl Brodersen and Werner Ekt, inventors). Ger. 480,858, Nov. 23, 1923. Fungicides for use with plants or seeds comprise a highly dispersed heavy metal compd. and a halogen deriv. of humic acid. Thus, the product obtained by treating chlorinated lignite with  $\text{HNO}_3$  may be dissolved in excess of  $\text{Na}_2\text{CO}_3$ , treated with  $\text{CuSO}_4$  until a feeble alky. remains, and the mixt. evapd.

**Disinfectants and fungicides.** I. G. FARBENIND. A.-G. Brit. 305,943, Feb. 9, 1928. In prepg. a disinfecting, fungicidal or wood-preserving compn., a mercurized aliphatic hydrocarbon, unsubstituted or having an inactive substituent, such as Et mercuric bromide, is used as an active ingredient and fillers and wetting agents, etc., may be mixed with it.

**Composition for use on fruit trees, etc., to combat pests such as insects.** MARK B. PATTERSON (to Calif. Fruit Growers Exchange). U. S. 1,726,364, Aug. 27. A mineral oil compn. is dispersed in an emulsifying medium contg. pectin and water.

**Plant preservation.** SACCHARIN-FABRIK A.-G. VORM. FAHLBERG, LIST & CO. Ger. 469,202, Oct. 28, 1923. Animal and vegetable pests in the subcutaneous layers of plants are destroyed by application of Hg salts of aromatic or heterocyclic bases in powder or emulsion form. Examples are given.

**Vine wash.** MARIE VINCENT-RENTSCH. Swiss 131,744, Nov. 19, 1928. A wash for destroying vermin on vines is prepd. by digesting tobacco with garlic bulbs and adding mineral oil to the digest.

**Composition for destroying wood-worms.** PAUL LIPPKE. Ger. 480,001, Sept. 7, 1926. The compn. is prepd. in paste form and comprises (1) a mixt. of oils (neat's foot oil or linseed oil or a mineral oil with juniper oil), (2) a mixt. of suitable org. substances ( $\text{CCl}_4$  with  $\text{C}_2\text{H}_2\text{Cl}_4$  or *p*-dichlorobenzene, petroleum,  $\text{C}_{10}\text{H}_8$ , or naphthol) and (3) a mixt. of waxes (ceresin with montan wax). A resin,  $\text{PhNO}_2$ , and a coloring addn. agent may be included. An example is given.

**Cauterizing seed goods.** ALEXIS C. WOLF and WILHELM LANG. Ger. 479,750, Oct. 7, 1922. The cauterizing soln. contains a mixt. of at least 2 metallic or metalloid cyanides. Hg, Pb, Fe, As, Al, Cr and Mg cyanides are mentioned in examples. Disinfectants such as  $\text{PhOH}$ , pyridine and  $\text{K}_2\text{MnO}_4$  may be added.

## 16 THE FERMENTATION INDUSTRIES

C. N. FREY

**Influence of certain metals on acetous fermentation.** M. ROSENBLATT and M. MORDKOWITSCH. *Deut. Essigind.* 33, 281–2 (1929).—The accelerating and retarding effect of certain metals, notably Ni, Co, Fe and Mn, on acetous fermentation has been studied. The optimum concn. for these metals appears to be  $\frac{1}{100000}$ %. W. O. E.

**The development of the saccharification of cellulose and the production of wood spirits.** H. BAUSCH. *Z. angew. Chem.* 42, 790–1 (1929).—Early published work, industrial production and two recent patents are reviewed. The theoretical yield of EtOH is about 35 l. per 100 kg. of wood. The best yield yet obtained is 25 l. by the Prodor Co. on a small exptl. scale.

**Microchemical determination of alcohol and extract in saké.** Y. TOMIYASU. *J. Soc. Chem. Ind. Japan* 32, 288–94 (1929); Suppl. Binding 32, 85–7B (1929).

TOMODA

**Heat radiation from vinegar generators.** H. WÜSTENFELD and H. KREIPE.

*Deut. Essigind.* 33, 253-6(1929).—The heat radiated by vinegar generators of varying size and form of wood and stoneware was measured electrically. It amounted at a temp. difference of  $15^{\circ}$  between a normal thermometer and the interior to 4630 heat units over a 24-hr. period in the normal types of wood, to 7800 heat units on the av. in stoneware generators of similar size, to 5550 heat units in a "Moselfuder" and to 8600 heat units in a larger wooden generator (1.50 m. diam. and 2.40 m. high). From the values thus detd. the transmission value  $K$  was calcd. for each expt. In point of alc. formation this important heat radiation is dependent primarily on the material involved (wood or stoneware) and the thickness of wall. The results obtained have been tabulated.

W. O. E.

**Present status of oenological research.** L. SEMICHON. *Rev. vit.* 69, 309-13, 329-33, 348-50, 405-11(1928).—A review of the previous accomplishments and present status of oenological research in France, especially with respect to legal and regulatory improvements, oenotechnic, microbiology, physiology and chemistry involved in the production of grapes and the manuf. of wines.

K. S. MARKLEY

**The nitrogen question [in brewing].** J. H. OLIVER. *J. Inst. Brewing* 35, 191-200 (1929).—The amt. of sol. nitrogenous compds. in a wort made by mashing malt at approx.  $67^{\circ}$  increases as the concn. of the mash becomes greater and as the diastatic activity of the malt becomes higher. The N content of the wort is also augmented by the acidification of the mash, but the results under conditions of thick mashing, such as brewery mashers, are not so marked as with the  $10\%$  lab. mash (thin mashing), since the increased concn. of the salts and proteins of the thicker mashers exerts a greater buffering effect. The maltose content of the wort tends to be similarly influenced by the concn. of the malt mashers.

B. C. A.

**Studies on the significance of the hydrogen-ion concentration in distillery processes.**

III. W. DIEHAIR AND K. SICHERT. *Biochem. Z.* 210, 286-95(1929); cf. *C. A.* 23, 1985.—A  $pH$  3.9 is most favorable in the prepn. of the yeast fermentation mass, so that the added acid must be adjusted accordingly.

S. MORGULIS

**An investigation of cane molasses distillery slop, with special reference to certain organic acids.** E. K. NELSON AND C. A. GREENLEAF. *Ind. Eng. Chem.* 21, 857-9 (1929).—The slop had the following analysis: solids [in vacuo at  $100^{\circ}$ ] 51.22%, ash 12.65,  $CaO$  1.78,  $MgO$  0.47,  $Fe_2O_3$  and  $Al_2O_3$  0.15,  $Na_2O$  0.38,  $K_2O$  5,  $Mn_2O_3$  0.015,  $SiO_2$  0.10,  $P_2O_5$  0.21,  $SO_3$  0.37,  $Cl$  2.17,  $N$  1.43, ammonia  $N$  0.06, amino  $N$  0.3, pentoses 1.11, reducing substances 4.63. The volatile acids were acetic 0.9%, formic 0.3. The non volatile acids were succinic 0.5%, tricarballic about 1%, lactic 3, a small quantity of aconitic and a trace of citric. 0.6% glycerol was extd. Attempts to identify carbohydrates by means of  $C_6H_5NHNH_2$ , acetylation and pptn. with ammoniacal  $Cu$  were not successful.

C. N. FREY

**Mash distillation apparatus.** R. HUEBNER. *Apparatchau* 41, 124(1929).

M. C. ROGERS

**Preliminary heating of grapes used in fermentation of Burgundy wines.** I. FERRÉ. *Rev. vit.* 69, 5-11, 21-9(1928).—The incoming, whole grapes are heated to, and maintained at, a temp. of  $80^{\circ}$  for 4 to 5 min. by means of a portion of the must, which is preheated to a temp. of  $95^{\circ}$  to  $100^{\circ}$ . The must, after its use as a heat exchange medium, is returned to a heating reservoir and the grapes are mechanically removed and allowed to cool prior to pressing. Chem. analysis as well as color, bouquet and mellowness indicate that the wine made from grapes thus treated is superior to wine from untreated grapes.

K. S. MARKLEY

**Phosphates in wine-making.** H. ASTRAC. *Rev. vit.* 69, 165-70(1928).— $N$  and  $P$ , which are essential nutrients of the yeast during fermentation, are supplied as  $(NH_4)_2H_2PO_4$ , which in soln. and in conjunction with the added  $SO_2$  gas or bisulfites forms the triammonium salt.  $(NH_4)_2HPO_4$ , although now actually manufactured in Germany, is too unstable to be handled commercially.  $(NH_4)_2HPO_4$ , although available, is not used primarily because the wine-maker is ignorant of its existence and of its superior value and because it is more profitable for the chem. houses to supply the mono-salt. A. maintains that the wine-maker should be educated to specify the di-salt, which the chem. houses are willing to supply, if there is a sufficient demand for it.

K. S. M.

**The use of phosphates in wine making.** LUCIEN SEMICHON. *Rev. vit.* 69, 101-4 (1928).—S. discusses the use of  $NH_4$  phosphate either alone or mixed with sulfurous solns. in the making of wine, with particular reference to its effect upon the acidity, colloid and pectin content of the wine, yeast nutrition, zymase activity and intermediate products of the fermentation process.

K. S. MARKLEY

**Wine distillates and brandies.** E. RUFFIN. *Z. Untersuch. Lebensm.* 57, 243-4 (1929).—On theoretical considerations based on the law of Guldberg and Waage,

unadulterated wine brandy may contain much less than 100 mg. of ester in 100 cc. of alc. This is contrary to the findings of Büttner and Miermeister (*C. A.* 23, 2241). The necessity for tasting tests in evaluating these products is emphasized. C. R. F.

**Examination and evaluation of wine distillates and wine brandies.** H. WÜSTENFELD AND C. LUCKOW. *Z. Untersuch. Lebensm.* 57, 242-3 (1929).—Contrary to the findings of Büttner and Miermeister (*C. A.* 23, 2241), the necessity of tasting tests in evaluation of still wines and their distn. products is emphasized and the fixing of min. values is considered undesirable. The value of analytical data is admitted in conjunction with tasting tests on the individual fractions obtained by rectification. C. R. F.

**Sterilization of wine.** A. HUBERT. *Rev. vit.* 69, 333-6 (1928).—A discussion of the value of pasteurization, filtration and centrifuging as a preventative of "sickness" in wines made from grapes which have suffered from mildew, scale insect and hail injury. K. S. MARKLEY

**Metals in connection with wort and beer.** C. G. MATTHEWS. *J. Inst. Brewing* 35, 181-8 (1929).—The use of an Fe yeast press may introduce iron into the barm ale and give rise to an astringency. This tends to produce later an iron haze and an undesirable color when the barm ale is added to the brew in the fermentation vessel. Zn or galvanized containers dissolve in appreciable amt. and produce an unpleasant metallic effect on the palate. Cu can be safely used for mashing vessels, but may be corroded by fermenting worts with a consequent reduction in the amt. of yeast reproduction. The corrosion is more intense when the metal is scoured than when it is simply mopped over and allowed to form a natural film of oxide or sulfide. Cu, especially when of high purity, may become pitted at points where particles of foreign substances are situated, and which det. small galvanic cells. Cu alloys, such as gun-metal, are less subject to this action. Al of 99% purity is superior and is hardly attacked by fermenting wort, but is corroded by prolonged contact with water. Al vessels should, therefore, be kept dry if they have to remain empty for any length of time. Sn, which is seldom pure, is affected by drastic methods of cleansing and is likely to produce hazes. Stainless steel, Monel metal and, to a smaller extent, pure Ni appear suitable for all types of brewing vessels, but are relatively dear compared with Cu and Al. Although there is a tendency for a protective coating to form, pure Pb piping is attacked by beer. Pb alloys contg. 15% Sn are much more resistant. B. C. A.

**Studies on yeast fermentation under high gas pressures.** R. LIESKE AND E. HOFMANN. *Biochem. Z.* 210, 448-57 (1929).—At room temp. yeast fermentation ceases when the pressure of the formed CO<sub>2</sub> reaches 38-40 atm. At that point 1 mol. CO<sub>2</sub> per l. has been formed and about 40 g. alc. It is suggested that the inhibition of the fermentation is due to an accumulation of CO<sub>2</sub> and alc. If the yeast fermentation is allowed to proceed at an initial pressure of 90 atm. there is no effect observed, and even under 1000 atm. the fermentative process proceeds normally to about 50%. S. M.

**Effect of various preparations on the growth of bakers' and brewers' yeasts.** ROGER J. WILLIAMS, MARION E. WARNER AND RICHARD R. ROEHM. *J. Am. Chem. Soc.* 51, 2764-73 (1929). Six strains of yeasts (3 bakers' and 3 brewers') all showed a very marked stimulation of growth when varying quantities of yeast exts. were added to anaerated synthetic medium. All the yeasts failed to show an "optimum" concn. of yeast ext. either when an 18-hr or a 48-hr growth period was used. In every case when toxic materials were not present the largest crops were obtained when the most ext. was added. It appeared that a short growth period (18 hrs.) in most of the strains studied is much more easily adapted than a 48-hr. period for quant. studies on yeast nutrients, as in case of the latter, a very small dosage of active material may produce an inordinately large and irregular increase in the yeast crop. In spite of the uniformities noted above, each of the several different strains of yeast (so-called *Saccharomyces cerevisiae*) reacts more or less distinctively toward different "bios" preps., indicating possible deep-seated differences in the metabolic processes. The results show that the most concd. fraction (adsorbable by fuller's earth<sup>b</sup>) in conjunction with the unadsorbed residue stimulates 2 of the yeasts markedly, 0.00005 mg. effecting yeast no. 578, and has a varying though definite effect on the others. The same prepn. has little effect on 1 or 2 of the yeasts tested and uniformly has little effect on any yeast unless the "unadsorbed residue" is also present. The dosage indicated above is much smaller than that used by any other investigator. The effect of "α-bios" and "β-bios" and that of inositol on the 6 yeasts tested are of a lesser order and involve the presence of relatively large amounts of the substances, indicating that such activities as these preps. possess may be due to occluded or adsorbed impurities. C. J. WAST

The waste from [breweries] in Pommern (MÖLLER) 14. A method for determining the soundness of grain (MOHS) 12. Biology of *Sarcina* (FUCHS) 11C. Comparative bacteriological examination of American and Mahren barley (BERMANN, WERTHEIM) 11C. Pasteurizing apparatus (Ger. pat 480,028) 1.

**Fermentation.** ALFONS KRZYKAWSKI. Ger. 471,793, Nov. 1, 1927. Preps. are obtained from animal organs such as the heart and liver by fermenting with yeast.

**Refining alcoholic liquids containing wort and perfume.** I. G. FARBENIND. A.-G. (Eugen Bernhard and Albert Meyer-Küster, inventors). Ger. 479,728, Oct. 13, 1925. The liquids are subjected to the action of rapidly moving surfaces.

**Butyl acetonic fermentation of carbohydrates.** M. C. WHEELER and C. DEL. GOODALE (to Commercial Solvents Corp.). Brit. 306,138, Feb. 17, 1928. Fermentation is effected in a continuous manner in a series of connected fermenters while adding fresh mash to the first and removing fermented mash from the last fermenter of the series and transferring partially fermented mash from each preceding into the next succeeding fermenter. Various details of procedure are described.

**Gluconic acid.** HORACE T. HERRICK and ORVILLE E. MAY (to Government and People of U. S. A.). U. S. 1,726,067, Aug. 27. An aq. suspension or soln. of carbohydrate material such as starch, glucose or sucrose is inoculated with spores and mycelium of fungi such as *P. citrinum*, *P. divaricatum* and *P. luteum purpurogenum* for gluconic acid production.

**Yeast.** ALFRED POLLAK. Ger. 480,076, April 12, 1922. See U. S. 1,877,520 (C. A. 22, 3259).

## 17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

**Extracts of medicinal plants in pharmaceutical preparations.** F. DI STEFANS. *Ann. chim. anal. chim. appl.* 19, 107-9 (1929).—In many drugs where an ext. is called for the pulverize drug may be used. To det. whether this has been the case, has been difficult in most cases. However, the ext. contains only the active principle, whereas the drug itself contains the cellulose-bearing cellular structure, which can thus be used as an indication of the use of the pulverized drug. The cellulose was detd. by J. König's (*Chemie der Menschlichen Nahrungs und Genussmittel*, Vol. III, part 1, p. 453 (C. A. 14, 2040)) method. The content of cellulose of several common drugs is given. The technic followed is: Treat 3-4 g. of the substance with sulfolglycerol reagent (pure glycerol contg. 20 g. concd.  $H_2SO_4$  per l. and allow to digest in a Kjeldahl flask  $1\frac{1}{2}$  hr. Then cool to about 90° and add 100 cc. boiling  $H_2O$ , and filter through an alundum crucible, wash the residue with  $EtOH$  and  $Et_2O$ , then dry, place in a crucible and add 4-5 cc. of Schweizer's reagent, draw off the liquid after 5 min. by means of a suction filter and wash the residue with  $H_2O$ . Place the filtrate in a test tube and add dil.  $H_2SO_4$ . A flocculent ppt. indicates the presence of cellulose in the original drug. A. W. CONTIERI

**A dictionary of essential oils.** ANON. *Perfumery Essential Oil Record* 20, 322-32 (1929). E. J. C

**Assay of citronella.** FRANCIS D. DODGE. *Am. Perfumer* 24, 11 2 (1929). A method accurate enough for most technical purposes is the following: Into the usual cassia flask contg. 5 cc. sulfite soln. (about 33%) introduce 10 cc. of the sample (lava oil) contg. 30-40% aldehyde, shake well, then add 2 to 5 cc. 10% bisulfite soln. (free from  $SO_2$ ). Again shake thoroughly until the mixt. becomes soapy and shows a persistent froth. When this point is reached continue the addn. of bisulfite until 50-60 cc. have been used. The mixt. now contains the aldehyde addn. compd. partly as ppt. in a soapy soln. The ppt. gradually dissolves on standing and yields a nearly clear soln. with a supernatant layer of oil. When the soapiness no longer persists, fill the flask with bisulfite soln. Standing overnight or gentle heat will clarify the oil. For oils contg. more than 50% aldehyde more bisulfite will be required. For oils likely to be low in aldehyde, as the Ceylon product, the exptl. error is likely to be greater, in which case titration with phenylhydrazine may be more satisfactory. W. O. E

**Tinctura quillajae.** K. A. KARSMARK and L. KOPLER. *Arch. Pharm.* 267, 424-3 (1929).—Tinctures prepd. with spiritus dil. or tenuis contain about 5 times as much saponin as those made with concd. spirit. Tinctures made with spiritus tenuis less sediment than those with dil. spirit. For the prepn. of liquor carbonis detergens a tincture with dil. spirit is preferable. W. O. E



**Polarimetric drug investigations.** E. SCHROFF. *Süddeutsche Apoth. Ztg.* 69, 496-7, 504-6(1929).—A discussion of the reasons why estn. of the optical activity of drugs should be carried out wherever possible in the apothecary's lab. W. O. E.

**Decomposition of pharmaceutically important alkaloids in aqueous solution, especially on sterilization: solanaceous alkaloids, yohimbine, hydrastine and hydrastinine.** R. DIETZEL, F. SCHLEMMER AND R. FISCHER. *Arch. Pharm.* 267, 468-84 (1929).—Examn. of the spectra of atropine, hyoscyamine and scopolamine immediately after soln. in  $H_2O$  (concns. of 1, 0.1 and 0.001%) and after 1 hr. sterilization in steam, and comparison therewith of the spectra of tropic acid and of tropine show that the character of such spectra is detd. largely through the tropic acid and that such changes as were observed are apparently due to this acid. It was not, however, possible from the methods followed to det. the exact nature of the changes. Similar treatment of yohimbine, hydrastine and hydrastinine showed marked decompn. in the 2 former alkaloids, while hydrastinine proved to be a relatively stable substance. The results are graphically represented. W. O. E.

**Radiation in connection with essential oils and perfumery chemicals.** R. A. MORTON. *Perfumery Essential Oil Record* 20, 258-67(1929).—The importance of radiation to chemistry in general and to essential oils and perfume chemicals in particular is discussed. In this connection recent work on the photochem. production of vanillin from isoeugenol and eugenol is considered along with the photochemistry of certain essential oils, notably of wintergreen, almond, clove, pimento, thyme, cinnamon and cassia, celery, coriander, mustard, sage, sassafras and lemon. A bibliography of absorption spectra is appended. W. O. E.

**Vitamins and other constituents of citrus oils and related products.** STANLEY G. WILLIMOTT. *Perfumery Essential Oil Record* 20, 270-5(1929).—An exptl. study with comments on earlier work on the microscopic characters, origin of the constituents of citrus fruits, changes in acidity during ripening, vitamins of citrus products, European work, pigments and vitamin A, factors affecting vitamins in citrus fruits, citrus seed oils and other by-products. A bibliography is appended. W. O. E.

**Transparent emulsions of some essential oils.** WILLET F. WHITMORE AND RICHARD E. LINEHAN. *Ind. Eng. Chem.* 21, 878-80(1929).—Transparent emulsions can be prepd. by equalizing the refractive indices of the 2 phases at the same temp. Gelatin is the most efficient of the peptonizing agents examd., while gum arabic ranks 2nd; agar-agar and tragacanth proved unsatisfactory. The problem of graining may be solved by employing a mixt. of 2 pts. invert sugar and 1 pt. sucrose instead of straight invert sugar in the dispersion medium. The colloid mill is indispensable in the prepn. of the dispersion. W. O. E.

**Experatol.** W. WAGNER. *Pharm. Ztg.* 74, 1038(1929).—An aq. soln. of formalin 1, potash alum 8 and pine needle ext. 10%.

**Nicotine in tobacco.** A. HEIDUSCHKA AND F. MUTH. *Pharm. Zentralhalle* 70, 517-20(1929); cf. *C. A.* 22, 2800. Addnl. data are presented showing the amts. of nicotine in the smoke of a great variety of tobaccos, cigars and cigars. W. O. E.

**Succus juniperi inspissatus.** H. VALENTIN. *Pharm. Ztg.* 74, 1049-53(1929).—A large no. of com. and otherwise specially prepd. exts. have been examd. and the results obtained tabulated. W. O. E.

**Evaluation of aluminum acetate via the D. A.-B. 6.** H. LEPKE. *Pharm. Ztg.* 74, 1036-7(1929).—The examn. of a sample recently submitted is described. W. O. E.

**Evaluation of aluminum acetate via D. A.-B. 6.** FREITAG. *Pharm. Ztg.* 74, 1079-80(1929).—A commentary on the recent paper by H. Lepke (preceding abstract). W. O. E.

**Practical pharmacy. Impurities in aqua destillata.** HERMANN KUNZ-KRAUSE. *Apoth. Ztg.* 44, 1046(1929). A case is cited of an accidental contamination ( $PbSO_4$ ) of distd. water intended for soln. of KI. W. O. E.

**Tinctura hemostyptica, D. Ap.-V. 4.** WALTER MEYER. *Pharm. Ztg.* 74, 1037 (1929); cf. *C. A.* 23, 608. This ergot prepn. sponsored by the Ger. Pharm. Assoc. was found to possess little or no activity. W. O. E.

**Tinctura hemostyptica.** W. DENSEL. *Pharm. Ztg.* 74, 1021-2(1929).—A discussion of the prepn. as originally developed by Densel during the period of 1880-90. It is shown to be different from that sponsored by the Ger. Pharm. Assoc. and to which reference was made by W. Meyer (preceding abstract). W. O. E.

**Mercury salve.** RICHARD HOLDERMANN. *Pharm. Ztg.* 74, 1097(1929).—A procedure is outlined for prepg. this medicament variously termed: unguentum hydrargyri cinereum precipitatum and precipitated gray mercury salve. The pptn. of the Hg is best effected by treatment of  $HgCl_2$  in intimate suspension in vaseline oil, with alkaline

formalin. After washing the ppt. it is incorporated with the base, a mixt. of paraffin, vaseline and wool fat. W. O. E.

**Tablet manufacture.** F. GRAF. *Pharm. Ztg.* 74, 1066-7(1929).—A commentary on certain operations in the manuf. of medicated tablets. W. O. E.

**Production of sulfur oil.** F. CHERNITZUS. *Pharm. Zentralhalle* 70, 501-2(1929).—The manuf. of sulfur oil (distn. of the shale, refining and sulfonation of the distillates) of the ichthyol type is described. W. O. E.

**Detection of diethyl phthalate in spirit.** HENRYK SZANCER. *Pharm. Zentralhalle* 70, 502-3(1929).—A modified form of the Utz method is employed. Thus, a few drops of the brown reaction mixt. ( $\text{H}_2\text{SO}_4$  + sample + resorcinol) are added to about 500 cc. distd.  $\text{H}_2\text{O}$ , well mixed therewith, then treated with a few drops of official  $\text{NH}_4\text{OH}$  soln., whereupon the upper layer of liquid begins to fluoresce if diethyl phthalate is present. W. O. E.

**New method for the identification of true pine-needle extract, as also the calculation of the quantities of gas in bath preparations.** H. UHLMANN. *Süddeutsche Apoth. Ztg.* 69, 483(1929).—Dil. 1 drop of the sample in question in a test tube until just colorless and add a few drops of strong KOH or  $\text{NH}_4\text{OH}$  soln., whereupon the upper layer of a true ext. acquires a greenish brown color, which persists throughout the entire liquid on shaking. In further examn. prep. an exact 10% soln. of the ext., then shake 5 cc. thereof with a like amt. of  $\text{Et}_2\text{O}$ , and add 90% alc. (about 4-5 cc.) until the liquid seps. into 2 layers. On the addn. of a few drops of  $\text{NH}_3$  soln., the ethereal layer will (depending on the purity of the ext.) become dark to light green. Bark ext. colors brown, pure sulfite lye scarcely brown or not at all. Reasons for the appearance of this reaction are withheld for the avowed protection of honest manufcs. For the calcn. of gas quantities, a typical case (perborate) is given in detail. W. O. E.

**Pine-needle extract and pine-needle bath extracts.** P. BOHRISCH. *Pharm. Ztg.* 74, 1078-9(1929); cf. C. A. 23, 2245.—A discussion, notably in reference to the recent article of like title by Rojahn (C. A. 23, 4769) Appended thereto is a reply by Rojahn. W. O. E.

**Estimation of cinchophen in admixture with salicylic acid, acetylsalicylic acid and hexamethylenetetramine.** E. SCHULEK AND G. VASTAGH. *Pharm. Zentralhalle* 70, 533-7(1929).—The method of sepn. is based on the difference in soly. of cinchophen and salicylic acid (and aspirin, resp.) in water. The technic being somewhat involved, reference should be had to the original for a clear understanding of the various steps followed in effecting soln. and sepn. of the 2 acids involved, leading to the estn. of cinchophen. W. O. E.

**New salve base.** A. KARSTEN. *Pharm. Presse* 34, 365 6(1929).—The patented product in question called "Iegin" is a neutral ester closely related to the natural fats. It is wax-like, m.  $57^\circ$  and yields with 10 vols. of  $\text{H}_2\text{O}$  at  $70^\circ$  an immediate inseparable emulsion, stable even at the temp. of boiling  $\text{H}_2\text{O}$ . It is miscible with fats, oils, glycerol, aces., mucilage,  $\text{CH}_2\text{O}$ ,  $\text{TiO}_2$ , S, tar, alkali, etc., but not with electrolytes as NaCl, borax, salicylic acid, etc. It is recommended as a base for cold creams. W. O. E.

**Galénicals, their preparation, sophistication and value.** W. PEYER. *Süddeutsche Apoth. Ztg.* 69, 487-9, 493-5, 501-4(1929).—An address. W. O. E.

**Evaluation of pepsin and pepsin wine.** G. BÜMMING. *Apoth. Ztg.* 44, 904-6(1929).—A critical review of the official Ger. methods of standardization and evaluation, with some suggestions for their improvement. W. O. E.

**Different methods for the evaluation of pepsin.** W. BRANDRUP. *Apoth. Ztg.* 44, 993(1929).—Certain methods are discussed with particular reference to their suitability for the apothecary lab. Among those recommended for this purpose are (1) formal titration *via* Sørensen; (2) alkalimetric titration in alc. soln. *via* Willstätter and Waldschmidt-Leitz; (3) estn. of amino N *via* van Slyke; (4) Kjeldahl method combined with either one of the preceding. W. O. E.

**New medicaments and pharmaceutical specialties during the second quarter of 1929.** F. ZERNIK. *Süddeutsche Apoth. Ztg.* 69, 509-11(1929); cf. C. A. 23, 4297. A commentary. W. O. E.

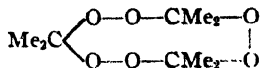
**Isobutyric acid esters in perfumes.** ALFONS M. BURGER. *Riechstoffind.* 3, 16-8. *Chem. Zentr.* 1928, I, 2498.—Many fruit odors are due to isobutyric acid esters. The esters are widely used in the perfume industry. No new data are presented. C. R. F.

**Lavender.** ALBERT ELLMER. *Riechstoffind.* 3, 43-4, 56-7, 69-70, 82-3, 92-4. *Chem. Zentr.* 1928, I, 3005.—The manuf., properties and uses of lavender oil are outlined. Most of the oil originates in France, Spain, Italy and England. The oil is obtained by extn. with petroleum ether followed by steam distn. The usual yield



ein) as the indicator, until the violet soln. becomes colorless. One cc.  $N H_2SO_4 = 0.054$  g.  $Al(OH)(OAc)_3$ .

**An incompatibility of hydrogen peroxide.** M. SCHOOPS AND M. BOHRT. *Bull. acad. roy. méd. Belg.* [5], 9, 254-6 (1929).—On mixing one part of  $Me_2CO$  with 3 parts perhydrol (30%  $H_2O_2$ ) contg. 0.2%  $H_2SO_4$ , a white cryst. product is formed, which, under slight friction, violently detonates. It is insol. in  $H_2O$ , sol. in org. solvents; in dil.  $H_2SO_4$  it liberates I from KI; heated with dil. acids it disengages  $Me_2CO$ ; m. p. 92-7°. The authors believe it to be the triacetone cycloperoxide (*Ber.* 28, 2265 (1895)):



they warn against the danger thus presented by the mixt. of  $Me_2CO$  and acid  $H_2O_2$ .

**L. Braemer.** J. E. GEROCK; F. JADIN. *J. pharm. Alsace Lorraine* 55, 297-314 (1928).—Biography, with portrait, and list of publications; transactions anent B.'s retirement from the faculty of pharmacy, Strasbourg.

**Emile Reeb, 1843-1928.** J. E. GEROCK. *J. pharm. Alsace Lorraine* 56, 15-26 (1929).—Obituary, with portrait, and list of publications.

**Professor Louis Gautier (1878-1928)** Strasbourg. ANON. *J. pharm. Alsace Lorraine* 56, 26 (1929).—Brief obituary.

**A new molybdenum compound, the phospho-ceruleomolybdic conjugate of Denigès.** G. DENIGÈS. *Pharm. Acta Helv.* 3, 52-6 (1928).—Reply to Verda (*C. A.* 22, 2121). Results of new expts. with very many inorg. and org. reducing agents confirm D.'s original contention. V.'s failure to obtain an  $Et_2O$ -sol. blue compd. *A* in all cases is ascribed to his use of  $HNO_3$  instead of  $HCl$  or  $H_2SO_4$ . Reply. A. VERDA. *Ibid.* 56-9.—Admitting the merit of D.'s discovery, V. believes the conclusions to be too general. Formation of *A* depends on certain conditions of medium, acidity, absence of certain salts, e. g., of Hg, and the choice of reducing agent. Thus, the intensely blue color obtained with a not too concd.  $HNO_3$  soln. of Na phosphomolybdate by means of Zn dust is not sol. in  $Et_2O$ , while the same soln. reduced with Sn, Al or Cu yields *A*. The instability of *A* does not seem to depend so much on phenomena of oxidation as on those of hydration.

**The evaluation of rhubarb.** A. TSCHIRCH AND PAUL SCHMITZ. *Pharm. Acta Helv.* 3, 88-92 (1928).—The chem. evaluation of rhubarb giving comparable results is based on the detn. of (a) free anthraquinones (*A*), (b) total *A*, (c) *A* plus anthranols (anthrone). To det. *a*, leave air-dried powd. rhubarb in contact with slight excess of 0.1 *N* KOH for 24 hrs., and after diln. with  $CO_2$ -free  $H_2O$  titrate back with 0.1 *N* HCl, the drug color being the indicator changes from red to yellowish pink. To det. *b*, saponify the rhubarb by gently boiling for 1 min. with slight excess of 0.1 *N* KOH after 1 hr., titrate back with 0.1 *N* HCl. To det. *c*, add to powd. rhubarb perhydrol of known acidity; after 30 min. add 0.1 *N* KOH in slight excess, allow the corked vessel to stand for 23 hrs., add  $H_2O$ , boil for 1 min. and after 30 min. titrate back to light yellow. The limits suggested for *a*, *b* and *c* in terms of chrysophanic acid,  $C_{15}H_{10}O_6$ , are (a) 3.7-5.7%, (b) 4.23-8.56%, (c) 6.34-9.94%. These methods applied to 21 samples of rhizomes and roots of *Rheum palmatum* and *R. tanguticum* cultivated in Switzerland (cf. *C. A.* 18, 1365) and to 12 recent and 6 old samples of Chinese rhubarb for comparison gave the following av. results: Swiss: *a* 4.45, *b* 5.42, *c* 8.23%; Chinese, recent: 3.95, 5.83, 8.02%; old: 3.21, 4.69 and 7.29%. These results and the favorable physiol. test prove that rhubarb transplanted from Tibet-China and cultivated in Swiss valleys has an activity equal to that of the Chinese drug.

**Precipitation of carbohydrates and glucosides by alkaloidal precipitants.** J. ROSENTHALER. *Pharm. Acta Helv.* 3, 93-6 (1928).—The behavior of starches (0.4% paste), dextrin (10%), glycogen (0.5%), inulin (1, 10%), sugars, gum arabic (10%), tragacanth (0.5%), agar (0.25%), mucilages of Irish moss, flaxseed, marshmallow, squill, etc., toward  $HBr-Br$  (resp. 25-10%) (*B*), tannin (1%) (*T*), silicotungstic acid (10%) (*S*) and phosphomolybdic acid (*P*) is recorded. No ppts. are produced with inulin and sugars. Starches ppt. with *B*, *P* and *S* and become turbid with *T*; dextrin clouds with *T* at once, slowly with *B*, ppts. with *S*; agar faintly clouds with *T*, strongly with *B* and ppts. with *P* and *S*; flaxseed is pptd. with *T* and *S*, not pptd. with *B* and *P*. Of glucosides, arbutin, Me arbutin, salicin, coniferin and esculin, loganin, amygdalin and linamarin gave no ppts. A 5% aloin soln. was pptd. by *P* and *S*. The complex glucosides, e. g., convallamarin, digitalin, gitalin, strophanthin (Merck), are pptd. by *T*, *P* and *S*; purest *Gypsophila* saponin is pptd. by *P* and *S*, not by *T* or *R*.

With starches, a chem. explanation of the cause of pptn. is possibly the basic character of the bridging O in their mol., especially when the relative no. of "acid" OH groups in the mol. is diminished by polymerization, as in maltose anhydride (Karrer, C. A. 16, 1748).

**A peppermint oil from Canton Ticino.** L. ROSENTHALER. *Pharm. Acta Helv.* 3, 101-3(1928).—A sample from Capolago, of excellent quality in odor and tastes, met the Pharm. Helv. IV requirements, except that the menthol content was 47.8% instead of 50%. R. suggests that the future Pharm. Helv. omit the color tests for this oil, and instead adopt a value for  $[\alpha]_D^{20}$ ; this oil showed  $-22.42^\circ$ ; the Ger. Pharm. requires  $-20^\circ$  to  $-34^\circ$ . R. hopes that the menthol content can be raised to 50% by cultivation; if not, the Pharm. Helv. should adopt a min. standard of 47.5% so as not to exclude an excellent native oil from use in Swiss pharmacy.

**Pharmaceutical notes from Canton Ticino.** HARTMANN-RORDORF. *Schweiz. Apoth. Ztg.* 66, 513-7(1928).—A report on plantations of peppermint (cf. Rosenthaler, preceding abstr.), atropa belladonna, datura metel, etc., grown at Capolago, the local Expt. Sta. cooperating. An account is also given of the near-by mines of *ichthyl slate* and its local mfg. treatment. Cf. C. A. 19, 3556.

**Experiences with vioform and vioform gauzes in the Swiss army.** J. THOMANN. *Pharm. Acta Helv.* 3, 112-7(1928).—Vioform (cf. C. A. 8, 987, 2218; 21, 2050) has been successfully used in place of CHI<sub>3</sub> in the Swiss army since 1904, and is official in Pharm. Helv. Examn. of 5 old samples of vioform gauze (1904-1915) showed on drying at 103° 4.5-5.0% H<sub>2</sub>O and a vioform content of 4.60-4.80% (required 4.5-5.5%). All the samples had kept their sterile quality. To det. vioform in gauze, exhaust 2-3 g gauze in a Soxhlet app. with 0.5 N alc. KOH. dil. with 4 times the vol. of H<sub>2</sub>O and carefully neutralize with HNO<sub>3</sub>; added drop by drop; collect the pptd. vioform on a tared filter, dry at 90° and weigh. A list of 17 references is given.

**Galenic preparations of gentian root.** CH. BÉGUIN. *Pharm. Acta Helv.* 3, 117-22, 123-8(1928); cf. *Ibid.* 2, 196-206(1927) and C. A. 22, 1439.—A preliminary report on large-scale cooperative expts (cf. C. A. 22, 1215; *Pharm. Acta Helv.* 2, 227-8(1927)). In detg. whether stabilization was successful, the presence of (H<sub>2</sub>O-sol.) *gentiopicric acid* (A) in the exts. was testd. for by decompn. with emulsin by applying to the resulting (H<sub>2</sub>O-insol., EtOH-sol.) white, crystd. *gentiogenol* (B) the color test with H<sub>2</sub>SO<sub>4</sub> (C. A. 5, 3877). The blue color is not obtained with the brown, amorphous B resulting from acid hydrolysis of A. The test was strongly pos. in all exts. prepd. with boiling EtOH from *fresh roots*; it was neg. after pulping the root; pulping thus leads to a rapid, total destruction of A. Expts. with dried roots treated with boiling EtOH showed that roots dried rapidly (at 50-60°) gave a pos. test; those dried slowly (30-40°) gave a feeble or neg. reaction. Strangely, the whole root stabilized with alc. vapors no longer contained A, but when the root was cut transversely before stabilizing, the test was feebly pos. Suggestions for adoption and testing of stabilized exts. of Gentian in Pharm. Helv. are submitted. A list of 27 references is appended.

**Second international European Congress in Budapest on cultivation of medicinal plants.** H. FLÖCK. *Pharm. Acta Helv.* 3, 130-4(1928).—A report, including the mfg. treatment for paprika; also reference to extn. of *opium alkaloids direct from the whole, fresh poppy plant* by suitable solvents and subsequent purification. Details are thus far unknown.

**New method of extraction of ergot of rye.** H. GOLAZ. *Pharm. Acta Helv.* 3, 135-40(1928).—From defatted ergot successively ext. first the alkaloidal bases with Et<sub>2</sub>O (after treatment with NH<sub>4</sub>OH), then the amino bases; after titration both are converted into tartrates. Their combination will yield either a *fluid ext.* making a clear 1:1 mixt. with alc. or H<sub>2</sub>O (1 cc. of fluid ext. contg. 0.001 g. of total bases, equiv. to 1 g. defatted ergot) suitable for ingestion or injection; or a *dry ext.* (1 g. contg. 0.01 g. bases); or a *soln. of alkaloidal tartrates* may be prepd. (1 cc. contg. 0.001 g. alkaloids). The processes of extn. are given in minute detail. To insure completeness of extn. of the alkaloids, the ergotoxine color test is applied (cf. C. A. 21, 3710); similarly in extg. the amino bases, a *color scale* is used prepd. by dissolving, resp., 0.2, 0.4, 0.6, 0.8 and 1 mg. of the tartrate of synthetic *p*-(OH)C<sub>6</sub>H<sub>4</sub>CH<sub>2</sub>CH<sub>2</sub>NH<sub>2</sub> in 5 cc. H<sub>2</sub>O, adding 15 drops of Millon's reagent and boiling for 15 seconds. The amino bases are extd. with soln. of tartaric acid in 10% alc.; then the inert coloring matters and acid resins that are partly toxic are pptd. with 95% EtOH. The biol. acidity of the fluid ext. is adjusted to  $p_H = 4.5$  to about 4.8. The clinical tests of these preps. at Lausanne were very satisfactory, proving also that the synergic action of alkaloids and titrated amines, accompanied by mineral substances, etc., is not entirely analogous to the activity of an isolated alkaloidal salt.

**The oxidizing enzymes of gum arabic.** A. TSCHIRCH AND H. FLÜCK. *Pharm. Acta Helv.* 3, 140-6(1928).—The reagents best adapted for qual. and approx. quant. tests for oxidase and peroxidase in gum arabic are: (A) a 5% abs. alc. ext. of *guaiac wood*, (B) a 1% aq. soln. of *p*-phenylenediamine and (C) a 1% alc. benzidine soln. To 5 cc. of a 1% aq. gum soln. add 0.2 cc. of 3%  $H_2O_2$  (omitted in tests for oxidases), then the reagent (A 0.1 cc., or B and C 0.2 cc.); at the end of 10 min. observe the color, which is blue in A, violet to dull cherry-red with B, sky-blue and greenish blue lasting 10 min. with C, then changing to dull violet and grayish green. The results of the examn. of 10 samples are tabulated; intensities (marked by multiple +) are based on the weakest color in any series examd. The peroxidase reactions are faster and stronger than those of oxidase. A differentiates oxidase from peroxidase but poorly; C is not very sensitive towards oxidase, but is sensitive to peroxidase. B is sensitive and differentiates well between these enzymes, but as it colors  $H_2O$  red within 10 min., a blank test is necessary. C undergoes no autoxidation within 10 min. For pharmacopeial use, benzidine or guaiac, in the concns. stated, is recommended. To destroy the enzymes in the gum so as to render it inactive in pharmaceutical mixts., 2 methods are given: (a) Boil the mucilage for 10 min. to 1 hr., then evap.; the solid gives no test with C or A. (b) Pour 1:5 mucilage into 5 vols. of boiling 90% EtOH, then boil for 10 min. Sep. the finely divided gum by centrifuging. It is also neg. to C and A. S WALDBOTT

**Inactivation of the oxidizing enzymes of gum arabic.** H. FLÜCK. *Pharm. Acta Helv.* 4, 58-62(1929); cf. preceding abstr.—With a mucilage of gum inactivated by the 2 methods given, a brown coloration with benzidine was formed in 2 hrs. This color was not caused by oxidation; the gum so inactivated failed to oxidize morphine, as oxydimorphine (Bourquelot, 1903) could not be identified in the liquid sepd. by centrifuging from the few flocks formed. Heating dry gum to 120° (Tschirch) does not completely inactivate it. Viscosity of the mucilage is diminished by boiling the soln.; pptn. with boiling alc., or dry heat at 120° does not affect the viscosity. Addns. are made to the list of drugs attacked by the oxidases of gum arabic (Bourquelot, 1904). A 1 + 10 aq. soln. of gum is mixed with 3 cc. of 1% solns. to be examd.; the test was pos. when discoloration or clouding took place (starting on top.). Pos. tests were obtained with strychnine- $HNO_3$ , hydrastine-HCl, atropine- $H_2SO_4$ , morphine-HCl, codeine-phosphate, ethylmorphine-HCl, diacetylmorphine-HCl, cocaine-HCl, hyoscyamine- $H_2SO_4$ , digitalin, digitoxin and digitalin Merck. Neg. tests were given by caffeine and its citrate, theobromine, theophylline, quinine- $H_2SO_4$ , quinine-HCl, digitonin Merck and digitaligenin Cloetta. As to the min. quantity of  $H_2O$  at which the oxidases of gum arabic are still active, it was found that pill masses contg. 2%  $H_2O$  still show the test with benzidine. S. WALDBOTT

**Contributions to the pharmacchemistry of asafetida.** P. CASPARIS AND M. RAU-MANN. *Pharm. Acta Helv.* 3, 148-50, 163-82(1928).—The primary resin constituent of asafetida is the very unstable, colorless *ferulic ester of asaresinol* (16.57% of the drug). To obtain it, a method similar to that for prepg. ammoniacum (C. A. 22, 2437) was used, modified on account of the presence also of free *ferulic acid* (13.57%). The ester (A) is sol. in  $Et_2O$ , and is readily sapond., e. g., by a 5%  $Na_2CO_3$  soln. in the cold or by a 1% NaOH soln., yielding amorphous *asaresinol* (B) (11.57%), which is insol. in  $Et_2O$ , insol. in  $Na_2CO_3$ , but sol. in NaOH, showing it to be phenolic. A was found stable, however, toward  $(NH_4)_2CO_3$ , which enabled its sepn. from the free acid in  $Et_2O$  soln. B is sensitive to light and air and is the sole constituent of the drug to which its color changes are due. No formula is assigned to it, as it could not be crystd. nor any cryst. compd. be prepd. from it. Although B gives the phloroglucinol-HCl test, it is not coniferyl alc. (cf. C. A. 21, 183), since on oxidation it yields only traces of vanillin. This substance is absent in the fresh drug. The latter also contains 31% of gum insol. in acetone, and 1% of a grayish substance insol. in  $Et_2O$ . Neutral resins (*resene*) and essential oil (Semmler, 1891; 6.7%, Polasek, 1897) constitute 50.1% of the drug. A cryst. *asaresene* A,  $C_{20}H_{32}O_4$ , m. 172°, obtained by fractional pptn. of  $Et_2O$  solns. with ligroin, and cryst. *hydroasaresene* B,  $C_{20}H_{34}O_4$ , m. 155°, obtained by catalytic H addn. under pressure at ordinary temp., were isolated from resene in small quantities. S. W.

**Detection of sterculia gum (Indian tragacanth) in powdered tragacanth.** A. TSCHIRCH AND H. FLÜCK. *Pharm. Acta Helv.* 3, 151-3(1928); cf. Fuller, C. A. 6, 1339. Peyer, C. A. 19, 376 and *Apoth. Ztg.* 40, No. 53(1925).—Since detn. of the acid no (13.4-21.3 for sterculia gum, 2-4 for gum tragacanth) fails to detect less than 15% of admixt., a peroxidase test (cf. Rosenthaler, C. A. 18, 2943; 19, 702) is used by means of which 10% admixt. can be detected with certainty. To 20 cc. of a freshly and cold prepd. 1% soln. of tragacanth add 0.5 cc.  $H_2O_2$  and 0.5 cc. of a 1% alc. benzidine soln. and shake vigorously. Within 15 min., numerous blue flakelets appear if sterculia gum

is present; examn. of 15 samples of pure tragacanth in the same concn. showed at most only 2 flakelets within 15 min.

S. WALDBOTT

**Stabilized cola seeds, and fluidextracts of the stabilized drug.** K. SIEGFRIED. *Pharm. Acta Helv.* 3, 153-4 (1928).—Unstabilized powd. cola (Pharm. Helv. IV) contains 0.6-1% free caffeine; powd. cola seeds stabilized by 15 min. exposure to vapors of hot alc. are pink colored or almost white and contain only 0.05-0.2% free caffeine, which explains the difference in physiol. action between the two. The compn. of the stabilized powder is permanent. The fluidext. of dried unstabilized seed contained 0.2% free caffeine, which increased to 0.3%, but after months was 0.2% again because recombination with tannin had taken place. Fluidext. of stabilized cola had 0.1-0.2% free caffeine and remained unchanged for months. Hence, with fluidexts., differentiation between stabilized and unstabilized seeds used is difficult, although a decided difference in taste exists. Fluidext. prepd. from an Africa-dried cola contained about 1% free caffeine, but this content was permanent because the tannin had become partly insol. through excessive heat in drying.

S. WALDBOTT

**Salves and a new salve base.** H. GFELLER. *Pharm. Acta Helv.* 3, 154-63 (1928).—Historical review and discussion of requirements of a good salve base. *Astra fat* (A) (cf. *C. A.* 18, 2970) is a white, soft, hydrogenated peanut oil in which the I no. due to unsatd. acids is reduced from 95 to about 63. Its manuf. is described in detail. Consts.: fat 100%, H<sub>2</sub>O 0; refraction no. 52.7, sapon. no. 189.8 (1923), Reichert-Meissl no. 0.3, Polenske no. 0.9, I no. 66.6, acid no. 0.3 (0.2), m 39.0°. The fat is odorless, foams with H<sub>2</sub>O and does not become rancid as fast as hog fat (B) or cold cream (C). Salves contg. 10% KI were made with A, B and C; that with A was yellow at once, but the I content remained const. Those with B and C were white, but soon changed color. Addn. of 0.2% of Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub> in each case caused A to remain white for 2 yrs., B and C to turn faintly yellow in 24 hrs., brown-red in 2 yrs. Testing fats A, B and C for rancidity (Tschirch and Barben, *C. A.* 18, 2970) after steam distn., A after 1 yr. showed no aldehydic reduction, faint reduction after 2 yrs.; B and C reduced faintly in 24 hrs., and 30 days, resp., and strongly after 1 yr. Clinical supporting results in dermatology are adduced, and literature of 11 references is appended.

S. WALDBOTT

**Is astra fat a suitable substitute for adeps suillus, Pharm. Helv. IV?** R. MAEDER. *Pharm. Acta Helv.* 4, 56-8 (1929), cf. preceding abstr. —In view of the appearance and keeping qualities of 10 ointments, opodeldoc, etc., of Pharm. Helv. prepd. with astra fat in place of hog lard, the question is answered in the affirmative.

S. WALDBOTT

**Arbutin.** III. L. ROSENTHALER. *Pharm. Acta Helv.* 4, 55-6 (1929); cf. *C. A.* 22, 1824. —Arbutin from 2 samples of leaves of *Arctostaphylos uva ursi* collected in Switzerland at altitudes of 1970 m. and 550 m. contained, resp., 30.9 and 31.3% Me arbutin. This again confirms the contrast in the compn. of Tyrol and Swiss-grown leaves to those growing in Spain and European Northern countries.

S. WALDBOTT

**The hydrocyanic acid question.** XXV. Detection of substances capable of uniting with hydrocyanic acid in hydrocyanic distillates. L. ROSENTHALER. *Pharm. Acta Helv.* 4, 62-3 (1929); cf. *C. A.* 22, 2438. —Distil off the HCN as usual, collect in well-cooled water; dissolve any insol. matter in EtOH and fill up to a definite vol. Then 2 methods are open: (1) Allow to stand for at least 24 hrs. In half the vol. det. total HCN by the Liebig-Denigès method; in the other half det. free HCN by the Volhard method. If combining substances, e. g., BzH, are not present, the 2 results will be identical. (2) In half the vol. det. free HCN at once, in the other half not earlier than after 24 hrs. In the presence of combining substances, the titration value is diminished. By both methods it is shown that the seeds of *Schleicheria trijuga* do not yield a distillate contg. any substance combining with its HCN. The distillate of samples of bitter almonds is titrated in parallel, as a contrasting example.

S. WALDBOTT

**Yeast as a medicament.** WALTER FISCHER. Thesis, Bern, 1927; *Schweiz. Apoth. Ztg.* 66, 343-4 (1928).—Historical notes on the medicinal uses of yeast are given. Yeast had a clinical effect on staphylo and streptomycosis in 80-90% of the cases treated. *In vitro*, no retardation by yeast in the growth of colon bacilli, staphylococci and streptococci could be proved. In cases of clinical treatment where vitamin content is essential, yeast should be administered in as fresh a state as possible; with the main clinical indications for the use of yeast, the state of life of the yeast cell is not essential for therapeutic efficiency.

S. WALDBOTT

**Introduction of biological assay of digitalis into the pharmacopeias.** M. TIFFENBAU. *Int. Pharm. Fed.; Schweiz. Apoth. Ztg.* 66, 465 (1928).—An address, with discussion. T. holds the biol. assay indispensable, a view not shared by Wasicky, who prefers chem. and phys. methods. T. considers the limit of moisture adopted for the

leaf (3%) too rigid, while admitting that 7-8% noted in com. samples render these unstable.

S. WALDBOTT

**The assay of medicinal mildly acting drugs.** WASICKY. *Schweiz. Apoth. Ztg.* 66, 466-9(1928).—Practical tests should be introduced, e. g., for saponin-bearing drugs, e. g., Kobert's hemolytic method (cf. C. A. 22, 478) or a foam test; for mucilage-yielding drugs, viscosity detns.; for bitter substances, tests depending on their chem. nature, e. g., for glucosides, the Bourquelot test; for lactones, lactone titration; for such drugs as *Herba absinthii* or *lignum quassiae*, tasting the bitterness of a dild. ext., with quinine as a standard.

S. WALDBOTT

**Note on recent studies of digitalis.** G. CONCI. *Officina. Schweiz. Apoth. Ztg.* 66, 470-3(1928). (In Italian).—The work of Meulenhoff (cf. C. A. 23, 2533) is reviewed. *Stabilization* of digitalis leaves by means of hot vapors of EtOH caused a notable increase of their activity. A summary is also given of the chapter on digitalis in R. Rapp's *Wissenschaftliche Pharmasie in Rezeptur und Defectur*, Berlin, 1927. S. WALDBOTT

**Action of disinfectants containing formaldehyde compared with that of cresol soap solution.** THOMANN. *Schweiz. Apoth. Ztg.* 66, 491-2(1928).—Exptl. results by Piorowski (*Z. Desinfekt. Gesundh.* 20, No. 9(1928)) on *ipsiform* (liquid K soap with about 15% HCHO and 30% soap) compared with *lysiform* and *liquor cresoli saponatus* (Germ. Pharm.) are recorded. Disinfectants contg. HCHO have an undoubted superiority, e. g., in anthrax (cf. Mueller, C. A. 18, 2788); but P.'s results again confirm the superiority of cresol soap soln. in disinfecting practice.

S. WALDBOTT

**Active principles and "ballast" substances of vegetable drugs.** L. KOFLER. *Schweiz. Apoth. Ztg.* 67, 73-5(1929).—Cinchona bark, rhubarb and opium are given as examples to show that the use of active principles sepd. from ballast is sometimes justified by a special medicinal objective; other objectives may, however, require the use of the whole drug. Often, as with astringent drugs, "ballast" substances are very important. Thus, e. g., tormentilla root contg. 20% tannin is used as an internal astringent. The tannin is liberated very gradually from its firm natural combination with ballast substances, while proprietary products such as tannigen tend to hydrolyze on mere keeping. Saponins often proclaimed as ballast seem to promote resorption of drugs and food (e. g., C. A. 21, 449). K. reports on expts. of fattening hogs by the aid of saponin (C. A. 22, 997). As a rule, a vegetable drug or its pharmacopeial prepn surpasses the corresponding specialty "freed from ballast."

S. WALDBOTT

Bayberry fat, and its optical activity (WALLRABE) 27. Refining alcoholic liquids containing wort and perfume (Ger. pat. 479,728) 16.

CRAVERI, C.: *Les essences naturelles* (extraction, caractères, emplois). Translated from the Italian by H. Tatu. Paris: Dunod. 602 pp. F. 70; bound, F. 80.

POLLAK, JAKOB: *Handbuch der biologischen Arbeitsmethoden*. Edited by EMIL ABDERHALDEN. Abt. 4. Angewandte chem. u. physikal. Methoden. Tl. 7c. Untersuchungs- und Forschungsmethoden der Methoden. H. 2. *Makrochemische Untersuchungsmethoden der Pharmazie*. (Lieferung 298). Berlin and Vienna: Urban & Schwarzenberg. pp. 193 to 871. M. 35.

*Die Riechstoffe und ihre Derivate*. Vol. I. Aldehyde der aliphatischen Reihe. Edited by ALFRED WAGNER. Vienna: A. Hartleben's Verlag. 404 pp. Unbound, M. 25.

**Derivatives of barbituric acid.** CHEM. FABRIK VORM. SANDOZ. Swiss 131,517 and 131,518, Nov. 11, 1927. Addns. to 122,692. Two new derivs. of isobutyl- $\alpha$ -propyl barbituric acid are prepd. by treating the acid with 1-phenyl-2,3-dimethyl-4-dimethylamino-5-pyrazolone (131,517) or with 1-phenyl-2,3-dimethyl-5-pyrazolone (131,518) in mol. proportions. The products melt at 107-108° and 93-94°, resp., and are used as *hypnotics*.

**Isobutyl- $\alpha$ -propylbarbituric acid.** CHEM. FAB. VORM. SANDOZ. Swiss 132,149, Nov. 29, 1927. This acid is prepd. by condensing isobutyl- $\alpha$ -propyldialkylmalonic ester with urea. The diethyl ester is mentioned in the example. The new acid m. 169-170° and is a powerful *hypnotic*.

**Derivative of benzoic acid.** F. HOFFMANN-LA ROCHE & Co. A.-G. Swiss 131,520, May 17, 1927. Addn. to 127,649. The compd. 2-hydroxy-5- $\beta$ -phenylethylbenzoic acid is prepd. by treating the Na salt of *p*- $\beta$ -phenylethylphenol with CO<sub>2</sub>. The compd. m. 156° and is used as a *disinfectant*.

**Quinoline carboxylic acid derivatives.** SOC. ANON. POUR L'IND. CHIM. A. BALB.



Swiss 131,926, July 15, 1927. A basic deriv. of a substituted quinolinecarboxylic acid is prep'd. by the action of an acid deriv. of 2-ethoxy-4-quinolinecarboxylic acid on diethylaminoethanol. The 2-ethoxy-4-quinolinecarboxylic acid diethylaminoethanol ester, formed b. 134–136° at 0.02 mm., is used in therapy.

**Thiazole derivatives.** I. G. FARBENIND. A.-G. Brit. 306,558, Feb. 23, 1928. 2-Mercaptoarylenethiazoles are prep'd. from arylenethiazthionium compds. of the general formula  $R.N.S(X).S$ , in which R is an arylene group (which may or may not be

substituted) and X is Cl or OH, by heating with an alkali and a salt of a thiocarboxylic acid. The products may be used for pharmaceutical purposes, as dye intermediates, or as rubber vulcanization accelerators.

**Glucosides.** F. HOFFMANN-LA ROCHE & Co. A.-G. Ger. 480,410, Feb. 14, 1926. A glucoside is obtained from the herb *Adonis vernalis* L. by treating the ext. with  $(AcO)_2Pb$ , mixing with an absorption agent such as C or fuller's earth, drying, extg. with, for example,  $CHCl_3$ , and pptg. the glucoside by addn. of petroleum ether. Cf. C. A. 23, 483.

**Lupinine.** KALLE & Co. A.-G. (Erich Bartholomäus and Otto Schaumann, inventors). Ger. 481,285, Aug. 19, 1923. Addn. to 386,936. Halogen derivs. are prep'd. from lupinine by the action thereon of hydrohalides at temps. below 150°.

**Theobromine.** KNOLL A.-G. (Eugen Bernhard and Hans Prillwitz, inventors). Ger. 479,715, Aug. 14, 1924. Theobromine is prep'd. from natural products by pulverizing, treating with water and alk.-earth metal hydroxides or  $Mg(OH)_2$ , filtering, concg. and pptg. with  $CO_2$ , and treating with acid. Thus, cocoa husks are stirred with chalk and water, and filtered. The filtrate is concd. to  $\frac{1}{6}$  its vol. and  $CO_2$  led in. The ppt. is treated with dil. HCl and the theobromine remains undissolved.

**Vitamins.** K. HELHOLT. Brit. 305,929, Feb. 11, 1928. Vitamins are transferred from one oil to another by adding to the first oil an unsaponifiable, edible non-volatile oil such as paraffin oil to protect the vitamins and to ext. them from the soap, which is subsequently formed by treating the oil with an alkali (suitably with KOH in N at a temp. not exceeding 90°, with cod-liver oil), the vitamins being extd. with the added oil by use of a solvent such as acetone, and added to another oil such as peanut oil.

**Vitamin-bearing oils from fish livers.** FERDINAND W. NITARDY (to E. R. Squibb & Sons). U. S. 1,725,964, Aug. 27. Livers such as those of the cod are cooked at a temp. not exceeding 100° while under sub atm. pressure until the livers are disintegrated and the oil is freed from them; an inert gas such as N or  $CO_2$  is introduced above the mass to break the vacuum and exclude air, the mass is cooled while permitting it to sep. into strata, and the upper layer of oil is decanted and stored under an inert gas. An arrangement of app. is described.

**Stabilizing and reducing the viscosity of emulsions of lecithin.** CHEM. FAB. GRÜNAU LANDSHOFF & MEYER A.-G. Ger. 480,616, Jan. 29, 1928. Addn. to 470,954. The method of Ger. 470,954 (C. A. 23, 1995) is modified by using simple or complex salts of the heavy metals or of the rare earths in place of the salts specified therein. Thus, the emulsions may be treated with  $CeCl_3$  0.06 and NaCl 0.04%, or with  $Na_2Fe(CN)_6$  0.08%.

**Magnetic surgical probe of special cobalt steel.** RALPH C. HARTSOUGH (to West-ern Elec. Co.). U. S. 1,726,349, Aug. 27.

**Plaster of Paris surgical bandage.** GUSTAVE S. MATHEY (to Johnson & Johnson). U. S. 1,726,403, Aug. 27. See Brit. 282,243 (C. A. 22, 3747).

**Thickening cosmetics and lubricants with montan wax bleached by oxidation.** I. G. FARBENIND. A.-G. Brit. 305,955, Sept. 12, 1927.

**Disinfectant.** LLOYD E. HARRIMAN. Swiss 132,148, Aug. 2, 1927. A disinfectant comprises the oil obtained by the treatment of lanolin with ultra-violet rays 116.96, NaCl 4.32, AgI or iodobenzenesulfonic acid 7.85 and  $BiO.NO_3$  350.87 parts.

**Disinfecting agent.** OTTO GERNGROSS and KURT RÜLKE. Ger. 476,992, June 28, 1924. A disinfecting agent contains thiocyanates, HCHO and cresol.

## 18—ACIDS, ALKALIES, SALTS AND SUNDRIES

E. M. SYMMES

**The chamber process.** XVII. Analytical study on Glover tower function. M. MATSUI AND T. SAKAMAKI. J. Soc. Chem. Ind. Japan 32, 476–81 (1929).—At several places in a Glover tower, gas temp., acid temps., acid concns. and nitrosities of

acid were measured. The acid concn. was a min. at a midheight of the tower; the acid concn. of any height can be expressed as the third order function of height. With these data, the denitration and cooling of acid in the tower are discussed. R. K.

**Parabolic reinforced concrete sheds for storage of salts.** J. VERDEVEN. *Bull. tech. assoc. ing. sortis école polytech. Bruxelles* 25, No. 2, 59-67(1929).—Description of several such sheds built in France, England and Belgium, having spans up to 27 m. and holding from 12,000 to 30,000 tons. E. I. S.

**High-temperature technic and new fluorides.** O. RUFF. *Z. angew. Chem.* 42, 807-10(1929).—Vapor pressure diagrams of Fe, Co and Ni are shown, based on actual detns. in C-tube furnaces improved by the use of double, water-cooled walls. The many reactions of the refractory oxides with W and other low-volatility metals, e. g.,  $W + 3 CaO = WO_3 + 3 Ca$ , caused renewed interest in this field. X-ray analysis was used. The main cause of cracks in pure zircon vessels above  $1000^\circ$  was found to be reversible conversion of monoclinic  $ZrO_2$  to the more dense, tetragonal form, which could be avoided by adding foreign oxides, such as  $MgO$ , to form a cubic lattice at  $1700^\circ$ , which is stable to sharp temp. changes. X-ray diagrams of the system  $ZrO_2$ - $CaO$  are shown. Heating chambers for  $3000^\circ$  have been built.  $NF_3$  was made by electrolysis of  $(NH_4)HF_2$ ;  $NO_2F$  from  $NO_2$  and  $F_2$ .  $NO_2F$  b.  $-70^\circ$  instead of  $-63^\circ$  given in the literature. Liquid and gaseous  $NF_3$  is colorless, slightly sol. in  $H_2O$ , inert to  $NaOH$  solns., and its mixts. with  $H_2$  and  $NH_3$  explode violently.  $NF_3$  and  $H_2O$  vapor is not dangerous, and on ignition forms  $N_2O_5$ ,  $HF$  and a white ppt. of  $SiO_2$ . Mixts. of Cl and F are explosive but can burn through a nozzle with a yellow flame; app. of Cu are used instead of glass because  $4ClF + SiO_2 = 2Cl_2O + SiF_4$ . The heat of formation of  $ClF$  is  $+22$  cal.; that of  $HF$  by calcn.  $+64.8 = 1$  cal.  $ClF$  ignites cotton instantly and burns Al more rapidly than does F. In addn. to  $RhF$ , there is  $RhF_4$  or  $RhF_5$ . Black  $PdF_4$  takes fire in  $H_2$ . Light brown  $CoF_3$  gives up 1 F atom readily to most substances, e. g., warming a mixt. of  $CoF_3$  and Si causes the mass to glow, and is therefore useful in preparative chemistry. E. M. SYMMES

**A new sulfur-fluorine compound, sulfur tetrafluoride (preliminary communication).** JOSEPH FISCHER and WERNER JAENCKNER. *Z. angew. Chem.* 42, 810-1(1929).—A mixt. of  $CoF_3$  and S decomposes at room temp. with a disagreeable odor. Slight heating or use of large quantities in closed app. causes explosion and deflagration. Diln. with fluorspar avoids danger. The gas evolved is condensed in app. cooled by liquid air. The equation is mainly  $4CoF_3 + S = 4CoF_2 + SF_4$ .  $SF_4$  is colorless and distills between  $-120^\circ$  and  $-90^\circ$ ; mol. wt. = 107. Analysis is made by passing it into a mixt. of  $NaOH$  and  $H_2O_2$  solns., forming  $Na_2SO_4$  and  $HaF$ , pptg. F as  $CaF_2$  and  $SO_4$  as  $BaSO_4$ . At  $-40^\circ$  and atm. pressure  $SF_4$  condenses to a water-white, mobile liquid, which at  $-124^\circ$  (1.3 mm.) forms colorless crystals. Its vapor pressure is given by the equation  $\log p = -1132/T + 7.746$ . Pure  $SF_4$  does not attack dry glass but attacks Hg.  $H_2O$  decomposes  $SF_4$  to a clear soln. Paraffin oil, rubber and S have no effect. E. M. SYMMES

**Fluorspar and its uses.** E. L. BROKENSHERE. *Mining Met.* 10, 425-8(1929).

**Phosphate rock and superphosphate.** A. N. GRAY. *Chem. Trade J.* 85, 215-7(1929).

**Recovery of bromine from sea water.** CHAS. M. A. STINE. *Ind. Eng. Chem.* 21, 434-42(1929).—A description of the plant equipment of the S. S. Ethyl for the recovery of Br from sea water and of the first sea voyage for this purpose. Sea water was chlorinated and treated with dil. aniline sulfate, resulting in the formation of cryst. tribromoaniline, which was sepd. in filter presses. The estd. cost of the essential materials, based on a yield of 70% and a Br content of sea water of 68 p. p. m., is \$0.177 per lb. of Br. L. T. FAIRHALL

**Extraction of iodine from Black Sea algae.** S. KOMARECKYJ. *Chem. Listy* 23, 5-7(1929).—The yield of I from algae is 24-41% less when air is freely admitted during combustion than when the supply is restricted. A mixt. of various Black Sea algae contained 0.0859-0.172% of I, or 0.138-0.338% of the ash remaining after combustion. The corresponding figures for *Cystosira* are 0.095 and 0.146% of I, and for *Phyllophora* 0.645 and 1.01%. B. C. A.

**Nitrogen fixation. Development of the industry in Holland.** ANON. *Chem. Trade J.* 85, 176-7(1929).

**The production of sulfur from pyrites by sublimation or volatilization.** ARTHUR J. CADDICK. *Mining Mag.* 40, 220-1(1929).—Methods are classified into those aiming to recover 1 atom of S and those aiming to recover all the S. Various processes are outlined and patents cited. A. BUTTS

**Activated charcoal as a catalyst (the phosgene industry).** M. JACQUÉ AND L. JACQUÉ. *Chimie & Industrie* 22, 19-25(1929); cf. C. A. 22, 1573.—A description of its manuf.

**Progress in carbon-black manufacture.** H. L. KAUFFMAN. *Oil Weekly* 54, No. 8, 31-2, 71(1929).  
E. I. S.

**A popular lesson on the chemistry of aktivin.** RICHARD FEIBELMANN. *Am. Dyestuff Repr.* 43, 453-5(1929).—The unique position of aktivin as a bleaching agent and starch solubilizer is explained by the structure of the aktivin mol. All Cl atoms bound to O are available and those bound to N exhibit varying degrees of availability, depending upon other radicals with which N is connected. In aktivin this group is  $C_6H_4CH_2SO_2$ .

**Chromium-plated molds for bakelite parts.** C. R. GIVEN. *Machy.* (N. Y.) 35, 889-90(1929).  
H. H. MOSHER  
E. I. S.

**The benzidine color reaction of Japanese acid clay.** NAOTO KAMEYAMA AND SHUMPEI OKA. *J. Soc. Chem. Ind. Japan* 32, 294-301(1929); Suppl. Binding 32, 87-9B(1929).—The color reaction of Japanese acid clay towards  $NH_2C_6H_4C_6H_4NH_2$  was tried in complete absence of air. There are 2 different reactions in the so-called oxidase-like reaction of Japanese acid clay as usually tested by the aq. soln. of benzidine base with access of air. The first main and quick reaction is oxidation due to certain oxidizing agents present in the clay and therefore can be reproduced in the  $O_2$ -free atm. The second minor and slow reaction is the catalytic oxidation due to the atm.  $O_2$  in the presence of the clay.  
S. OKA

**The color reaction of the Japanese acid clay upon carotin.** KYUHEI KOBAYASHI AND KENICHI YAMAMOTO. *J. Soc. Chem. Ind. Japan*, Suppl. Binding 32, 182-3B(1929).—Japanese acid clay adsorbs carotin from its orange soln. and turns it into blue or green. The order of the strength of color reaction of various acid clays upon carotin is just parallel to that of color reaction of acid clays upon liver oil. As a solvent for carotin,  $C_6H_6$ ,  $CCl_4$  and petroleum ether are suitable, but EtOH and  $Et_2O$  give poor results. An analogous color reaction is also produced with anhyd.  $ZnCl_2$ ,  $AlCl_3$  and concd.  $H_3PO_4$ . The acid clay dried 2 hrs at  $100^\circ$  showed the most intense reaction.  
S. OKA

**The Poupin system of caliche treatment.** H. GERLACH, WARNECKE AND F. BLANCKENHORN. *Caliche* 10, 534-56; 11, 5-29(1929).—In this system, with the false bottom of the Shanks leaching tanks raised and the heating coils placed below the bottom, and each tank capable of individual treatment, steam rises through the charge while the liquor is concd. Proper sequences of downward washes follow. For the particular plant where the expts. were conducted the calens. of factors are shown in extensive tables.  
J. HOWARD FLINT

**Physico-chemical properties of Japanese acid clay (KOBAYASHI, YAMAMOTO) 2.**  
**Non-metallic construction materials for the acid industry (WÄSSER) 20.** Apparatus for making bleaching powder, etc. (Brit. pat. 305,883) 9. Treating Zn ores [gas for use in manufacture of  $H_2SO_4$ ] (Brit. pat. 306,569) 9. Emulsions for detergents or sheep dips (Brit. pat. 305,742) 20. Catalytic production of alcohols, etc. [of  $NH_3$ ] (Brit. pat. 306,512) 10.

**Hydrocyanic acid.** I. G. FARBENIND. A-G. Brit. 305,860, March 23, 1928. Alkali metal cyanides are decomposed with an excess of  $NaHCO_3$  in the presence of water at temps. up to  $50^\circ$ .

**Hydrocyanic acid.** T. EWAN AND IMPERIAL CHEMICAL INDUSTRIES, LTD. Brit. 305,816, Feb. 10, 1928. Alumina, zirconia or thoria for use as a catalyst for dehydrating formamide vapor to produce HCN is submitted to heat treatment at a temp. above  $1000^\circ$  to reduce the activity of the oxide. Com. alundum may be used.

**Molybdic and tungstic acids.** METALLWERK PLANSEE G. M. B. H. Ger. 480,287, Apr. 27, 1926.  $H_2MoO_4$  and  $H_2WO_4$  are prepd. directly from the ores by smelting, evapg. and condensing. The ore is completely desulfurized before smelting and the temp. during smelting is so high that the acids are vaporized.

**Concentrating nitric acid.** HERMANN FRISCHER. Ger. 479,668, Dec. 7, 1926. See Brit. 281,891 (C. A. 22, 3744).

**Phosphoric acid.** JULIUS KERSTEN. Ger. 479,827, July 20, 1926.  $H_3PO_4$  is prepd. by heating powd.  $Ca_3(PO_4)_2$  or phosphorite to dull red heat and passing there-  
over HCl.

**Phosphoric acid.** KARL MÜLLER. Ger. 479,767, Aug. 27, 1926.  $H_3PO_4$  is prepd. from phosphates such as natural phosphate contg.  $Ca_3(PO_4)_2$ ,  $CaCO_3$ ,  $MgCO_3$ , and

$\text{CaF}_2$  by heating with flux and pitch or lignite to 1300–1550°. Air is blown in during the heating giving  $\text{P}_2\text{O}_5$ , which is condensed by water.

**Phosphoric acid and hydrogen.** I. G. FARBENIND. A.-G. Ger. 480,961, Dec. 4, 1925. P vapor and steam at 650° are led over active C. The product is cooled to 110° to condense the phosphoric acids formed. The residue consists of steam and H and is led over an Fe-Cr contact agent at 550° with steam-satd. CO. The  $\text{CO}_2$  produced is removed from the product, leaving H. Cf. C. A. 23, 4303.

**Contact process for sulfuric acid and anhydride.** VEREIN FÜR CHEMISCHE UND METALLURGISCHE PRODUKTION. Ger. 479,080, May 6, 1927. The production of  $\text{SO}_2$  and  $\text{H}_2\text{SO}_4$  from  $\text{SO}_2$  and O or gases contg. O, by contact agents, and the app. necessary are described.

**Concentrating sulfuric acid.** WALTER H. SIMONSON and OTTO MANTIUS. U. S. 1,726,321, Aug. 27. In concentrating  $\text{H}_2\text{SO}_4$  under vacuum, a flowing liquid heating medium such as oil is used out of direct contact with the acid and at a temp. varied from time to time suitably to insure vaporization of water from the acid under the conditions prevailing at different stages of the process. An app. is described.

**Containers for acids.** GEORG WECK. Ger. 480,529, Nov. 15, 1928. Containers with a high resistance to  $\text{H}_2\text{SO}_4$  and HCl are made from an alloy contg. 10–30% NiSb<sub>2</sub>, 0–20% Ni and the rest Cu.

**Carbon dioxide.** RHEINISCHE-WESTFALISCHE KALKWERKE. Ger. 480,342, Feb. 8, 1927. Pure  $\text{CO}_2$  is prepd. from furnace and generator waste gases rich in  $\text{CO}_2$  by passing the gas into a soln. of Mg salts to form  $\text{MgCO}_3$ , which is then dried and heated to evolve pure  $\text{CO}_2$ .

**Apparatus for recovering the gaseous carbon dioxide escaping from stored solid carbon dioxide.** WALDEMAR HESSLING. Swiss 128,810, Mar. 15, 1928. Details are given.

**Ammonia.** FIRMA CARL STILL. Ger. 479,002, Jan. 20, 1924 and 479,693, April 11, 1924. Addns. to 469,003 (C. A. 23, 1253).  $\text{NH}_3$  and  $\text{NH}_4$  compds. are obtained from such gas mixts. as those from the distn. of coal by passing the gases through a cooler at a temp. just above the dew point of the  $\text{NH}_3$  and  $\text{NH}_4$  compds. A stream of water may be allowed to trickle through filling material in the cooling tower to absorb the  $\text{NH}_3$  and  $\text{NH}_4$  compds.

**Synthetic ammonia.** AMMONIA CASALE S. A. Ger. 479,714, Aug. 5, 1924. Synthetic  $\text{NH}_3$  is prepd. from gas rich in N and H under pressure by aid of a contact agent. The app. is indicated.

**Ammonia synthesis.** A. HURTER. Brit. 305,753, Dec. 7, 1927. A catalyst for  $\text{NH}_3$  synthesis consists of a double compd. of Fe with cyanogen and alkali, alk. earth or other earth metal together with  $\text{ZrO}_2$  or other Zr compd. Details of prepn of the catalyst are given.

**Apparatus for ammonia synthesis or other exothermic gas reactions.** I. G. FARBENIND. A.-G. Brit. 306,054, Sept. 15, 1927. The reaction chamber is cooled by the incoming mixt. or other cooling fluid which flows in a sinuous course around the walls. Various structural details are described.

**Catalytic oxidation of ammonia.** C. W. DAVIS (to E. I. Du Pont de Nemours & Co.). Brit. 306,382, Feb. 18, 1928. See U. S. 1,706,055 (C. A. 23, 2254).

**Alkali nitrates.** I. G. FARBENIND. A.-G. (Wilhelm Wild and Christoph Beck, inventors). Ger. 480,906, July 9, 1926. See U. S. 1,609,643 (C. A. 23, 1222).

**Alkali metal nitrates and calcium phosphate.** P. JOST. Brit. 306,046, Feb. 14, 1928. Chlorides such as NaCl are treated with  $\text{H}_3\text{PO}_4$  to produce alkali metal phosphates and the latter are treated with  $\text{Ca(NO}_3)_2$  to form alkali metal nitrate and Ca phosphate. Excess  $\text{Ca(NO}_3)_2$  may be used for producing a mixed fertilizer. Various details, modifications and auxiliary procedures are described.

**Aluminum salt solution.** I. G. FARBENIND. A.-G. (Friedrich Horner, inventor). Ger. 479,902, Nov. 16, 1924. An Al salt soln. is mfd. from pure alumina by treatment with  $\text{NH}_4\text{OH}$  or  $(\text{NH}_4)_2\text{CO}_3$  or a mixt. of these. The Al gel obtained is filtered off, evapd. and redissolved.

**Chlorides.** I. G. FARBENIND. A.-G. (Karl Staib, inventor). Ger. 480,079, Mar. 7, 1926. Oxides are converted into water-free chlorides by the simultaneous action of Cl and a reducing agent. The oxide is finely divided and heated in a coal-dust furnace in a current of CO and Cl.

**Cyanides.** DESSAUER ZUCKER-RAFFINERIE G. M. B. H. Ger. 479,845, Jan. 5, 1926. Cyanides are prepd. by the action of HCN on molten formates, e. g.,  $\text{HCOONa}$  is melted and HCN led thereover, producing pure NaCN. The HCN may be mixed with inert gases.

**Alkali cyanides from calcium cyanamide.** STICKSTOFFWERKE G. M. B. H. (H. Heinrich Franck and Hugo Heimann, inventors). Ger. 480,905, Jan. 11, 1925. Alkali cyanides are prepd. from "lime-nitrogen" or  $\text{CaCN}_2$  by heating with alkali carbonate to 450–700° and treating the molten mass with CO free from H. The reaction may take place under pressure. Cf. C. A. 23, 4781.

**Decomposition of crude calcium cyanamide.** ALBERT F. MEYERHOFER. Swiss 131,957, Jul. 1, 1926. Addn. to 123,925.  $\text{CaCN}_2$  is broken down to give  $\text{NH}_3$  and  $\text{Na}_2\text{CO}_3$  by heating with NaF in the presence of water. The NaF is recovered by heating the  $\text{CaF}_2$  formed during the reaction with NaCl,  $\text{SiF}_4$  and acid.

**Calcium-alkali phosphates.** A. MESSERSCHMITT. Brit. 306,086, Feb. 15, 1928. In sintering together raw phosphates or phosphate mixts., an alkali sulfate and a strong reducing agent such as C or Fe pyrites, as described in Brit. 300,961 (C. A. 23, 4027), the reducing agent consists at least partly of Ca sulfide which facilitates elimination of S from the reaction mixt. Extraction residues of the Leblanc soda process or like materials may be used.

**Oxysalt compositions such as calcium oxychloride.** CHARLES CATLETT. U. S. 1,726,472, Aug. 27. An oxide or hydrated oxide and a salt, e. g.,  $\text{Ca}(\text{OH})_2$  and  $\text{CaCl}_2$ , are mixed with a relatively small quantity of oleaginous material such as cottonseed oil under reacting conditions, and the resulting reaction mass is finely divided.

**Alumina.** ELEKTIZITÄTWERK LONZA. Swiss 131,590, Aug. 4, 1927. Molten alumina is finely divided by spraying it under pressure into the path of a strong current of atomized water. Cf. C. A. 23, 3057.

**Alumina.** I. G. FARBENIND. A.-G. (Heinrich Specketer, inventor). Ger. 479,768, Oct. 14, 1924. Fe-free alumina is obtained from clay by treating with HCl, reducing the  $\text{FeCl}_3$  to  $\text{FeCl}_2$ , evapg. the soln. of Fe and Al chlorides and decomposing the  $\text{AlCl}_3$  thermally. The  $\text{FeCl}_2$  is then extd.

**Alumina from bauxite, etc.** U. B. VOISIN. Brit. 306,095, Feb. 15, 1928. A mixt. of finely pulverized bauxite or similar aluminiferous material and pulverized fluorspar is heated with concd.  $\text{H}_2\text{SO}_4$ , silica present is evolved as  $\text{SiF}_4$  and may be converted into  $\text{H}_2\text{SiF}_6$  with water. Mixed Al and Fe sulfates formed are dissolved in water, the soln. is treated with  $\text{CaCl}_2$  to form chlorides and Fe and Al hydroxides are pptd. from the chlorides with lime. The mixed hydroxides may be treated with soda lye to form Na aluminate, from which, after sepg. Fe hydroxide,  $\text{Al}_2\text{O}_3$  may be pptd. with  $\text{CO}_2$ .

**Ammonium phosphate.** I. G. FARBENIND. A.-G. (Robert Griessbach and Walther Sommer, inventors). Ger. 480,198, Feb. 12, 1927. Crude phosphate is treated with an acid forming a readily sol. Ca salt, particularly with HCl, and the soln. is partly neutralized and then treated with Fe or a compd. of Fe so as to ppt.  $\text{FePO}_4$ . The ppt. is suspended in water and treated with  $\text{NH}_3$ , or with  $\text{NH}_4\text{OH}$  and  $\text{CO}_2$ , or with a salt of  $\text{NH}_4$ , capable of pptg. Fe by double decompn.; the soln. of  $(\text{NH}_4)_2\text{PO}_4$  so obtained is worked up.

**Hydrated chromic chloride.** I. G. FARBENIND. A.-G. Brit. 306,305, March 23, 1928. Hydrated chromic chloride is obtained from the anhyd. salt by effecting soln. in approx. only sufficient water to produce the hydrated salt in the presence of a reducing agent such as chromous chloride,  $\text{SnCl}_2$ , Fe, Cr, Zn, Sn or Al. The hot soln. is filtered and allowed to cool and solidify. Cf. C. A. 22, 1658.

**Copper sulfate.** HÜTTENWERKE TEMPELHOF A. MEYER. Ger. 481,391, Jan. 14, 1926. Waste metal from alloys of Cu with Sn, Pb and Sb is melted with S to form a sulfide mixt., which is then roasted in air. The mixt. of  $\text{CuO}$ ,  $\text{Cu}_2\text{O}$  and  $\text{CuSO}_4$  so formed is washed out with  $\text{H}_2\text{SO}_4$ , giving a soln. of  $\text{CuSO}_4$ .

**Lead chloride solutions.** H. W. ROBINSON and D. W. PARKES. Brit. 305,827, Feb. 17, 1928. Pb chloride and an alkali acetate are heated to about 80° in water and a small quantity of an acid such as  $\text{HNO}_3$ , HOAc, HCl, citric acid,  $\text{H}_2\text{SO}_4$  or tartaric acid is added. Solns. are obtained contg. up to 35% of Pb chloride, which remain clear at temps. above about 50°.

**Sodium sulfide.** KALI-CHEMIE A.-G. (Friedrich Ruisberg and Paul Schmid, inventors). Ger. 479,766, Nov. 29, 1927. Addn. to 424,193.  $\text{Na}_2\text{S}$  and similar chemicals are made up into predetd. shapes and amts. by molding.

**Sodium hyposulfite.** VEREIN FÜR CHEMISCHE UND METALLURGISCHE PRODUKTION. Ger. 480,431, Apr. 11, 1926. The size of the crystals of  $\text{Na}_2\text{S}_2\text{O}_4$  is increased by dissolving finely divided dry crystals in an amt. of solvent such as NaCl, insufficient for complete soln., and recrystallizing. The larger crystals are more stable to moist air.

**Zinc oxide.** "SACHTLEBEN" AKT.-GES. FÜR BERGBAU UND CHEMISCHE INDUSTRIE and MAX HERDER. Ger. 481,284, Jan. 27, 1927.  $\text{ZnO}$  is prepd. from lye contg. Zn by treating with a carbonate, bicarbonate, oxide or hydroxide of an alkali metal or alk. earth metal such as milk of lime or soda, and subjecting the ppt., washed free

from  $\text{CaCl}_2$  or  $\text{NaCl}$  and suspended in water at  $70-80^\circ$ , to the action of  $\text{CO}_2$ . The filtered mass is dried and heated to  $300-400^\circ$ , producing  $\text{ZnO}$ .

**Beryllium.** WILHELM KROLL. Ger. 480,128, Sept. 29, 1926. Metallic Be is prepd. by the decompn. of molten Be-alkali double fluorides by an alk. earth metal, Mg or Li at temp. above  $1000^\circ$ . In the example, Mg is added to molten  $\text{MgF}_2\text{BeF}_2$  at  $1300^\circ$ . Pure Be is produced.

**Phosphorus.** I. G. FARBENIND. A.-G. Ger. 480,513, Feb. 27, 1926. P is sepd. from gases with which it is mixed by allowing rapidly moving drops of liquid such as water, soln. or molten P to impinge on the P mist formed by bringing the gaseous mixt. to the dew point.

**Activated carbon.** I. G. FARBENIND. A.-G. Brit. 306,490, Feb. 21, 1928. Dis-integrated wood is soaked for a long time or boiled in a soln. of  $\text{ZnCl}_2$ ,  $\text{H}_3\text{PO}_4$  or other activating agent and then dried and ignited (suitably after a further impregnation with the activating agent). Various details are given.

**Active carbon.** VEREIN FÜR CHEMISCHE UND METALLURGISCHE PRODUKTION. Ger. 479,828, Feb. 4, 1928. See Brit. 285,386 (C. A. 22, 4738).

**Plastic composition.** I. G. FARBENIND. A.-G. (Karl Daimler, inventor). Ger. 479,965, Jan. 21, 1927. Plastic masses are obtained by treating castor oil with maleic acid or anhydride. Steeping, solvent or filling agents may be added. Examples are given.

**Plastic compositions.** HANS KAPPELER. Swiss 131,597, July 14, 1927. A plastic mass is prepd. by the action of urea on furfural.

**Plastic compositions.** E. THOMAS. Brit. 305,973, Nov. 11, 1927. Fibrous material such as asbestos in a freely flowing aq. pulp is mixed with a small quantity of an oily substance such as wood oil immiscible with water, which uniformly coats the fiber; the fiber is then sepd. from the water and molded into sheets or other forms by the action of heat and pressure. Numerous details and modifications are described.

**Adhesive.** MAX LANDECKER (to American Nuplax Corp.). U. S. 1,725,805, Aug. 27. A neutral casein soln. suitable for use as an adhesive is prepd. by dissolving casein in an aq. soln. of urea.  $\text{CH}_2\text{O}$  also may be added.

**Water-resistant adhesive.** CHARLES N. CONE, GLENN DAVIDSON and IRVING F. LAUCKS (to I. F. Laucks Inc.) U. S. 1,726,510, Aug. 27. Protein-contg. material from soy beans is used with a halogen substitution product of paraffin hydrocarbons such as  $\text{CCl}_4$ .

**Molding compositions.** HERMANN BURMEISTER. Ger. 480,832, July 23, 1924. Shaped articles are obtained in one operation by hot-pressing (1) a dry compn. prepd. by mixing a filler in the cold with a polyhydric phenol, e. g., resorcinol, and a solid polymerized aldehyde, e. g., paraformaldehyde, or (2) a compn. comprising a filler and a semi-condensate prepd. from the phenol and the aldehyde at ordinary temp., or (3) a compn. obtained by fusing the filler with the reagents separately or mixed. Examples are given. Cf. Brit. 275,678 (C. A. 22, 2445).

**Casein compositions.** R. ARNOT. Brit. 306,168, Nov. 12, 1927. Casein itself or material such as soy-bean meal, horse chestnuts or lupin seeds is hydrolyzed (for prep. adhesive or food products) by heating with water and an alkali carbonate or bicarbonate or an alk. earth oxide or magnesia or an org. base such as urea under pressure and at a temp. not exceeding  $135^\circ$  (suitably about  $115-125^\circ$ ). Several examples are given, some of which include use of preservatives or addns. such as rubber latex, fillers, natural gums and resins and varnishes.

**Molding casein and the like.** PFENNING-SCHUMACHER-WERKE G. M. B. H. Ger. 480,090, April. 9, 1926. The products obtained by hot-pressing powd. casein and the like are improved by allowing the pressed products to cool under a higher pressure than was applied during the pressing.

**Condensation products of phenols and formaldehyde.** SOCIÉTÉ DES VERRERIES DE FOLEMBRAY. Ger. 481,207, July 4, 1922. Plastic masses sol. in acetone and alc., and kneadable in the cold, are prepd. by condensing phenols with  $\text{HCHO}$ , using chlorides of alk. earth metals as catalyzers.

**Phenol-aldehyde condensation products.** I. S. MELLANOFF (to Kemikal, Inc.) Brit. 306,522, Feb. 23, 1928. Plastic compns. are prepd. by the interaction of an alk. soln. from peat, a phenolic compd. and an aldehyde. Reaction starts at room temp. and may be completed by heating. Fillers, etc., may be added.

**Artificial fibers.** FIRMA HEINRICH SCHMUCK. Ger. 479,795, Mar. 17, 1927. Artificial fibers consist of a fiber core with a thin transparent coating of cellulose. The core may be first coated with a thin layer of metal.

**Porous compositions.** H. BECKMANN. Brit. 306,129, Feb. 17, 1928. Porous

materials for filters, etc., are made by binding together permeable or impermeable fibrous, granular or powdered substances by porous vulcanized rubber. Numerous examples are given.

**Composition for removing carbon deposits from engine cylinders.** CARROLL A. HOCHWALT (to General Motors Research Corp). U. S. 1,726,437, Aug. 27. Furfuraldehyde, alc. and  $C_6H_6$  are used together.

**Shaft furnace for burning lime and dolomite.** WALTHER WITSCEL. Ger. 481,473, Dec. 14, 1927. Details.

**Vertical kiln for burning limestone.** WM. D. MOUNT and IRVING WARNER. U. S. 1,725,763, Aug. 27. Structural features.

**Cleansing painted cloth and wood.** ADOLF ENGEL. Swiss 131,823, Sept. 30, 1927. A cleansing agent for painted cloth or wood consists of aq.  $NH_4OH$ ,  $(COOH)_2$ , KOH,  $AcOAm$ , alc. soft soap, water and  $AcOH$ .

**Composite sheet materials for book covers and other uses.** L. RADO. Brit. 306,225, Aug. 31, 1927. A base of paper, cloth, leather, rubber or other material is covered on one or both sides with metal foil upon which is a coating of cellulose hydrate foil, which in turn carries a coating of celluloid or like material.

**Sheet material for panels of airplanes, etc.** BRITISH CELANESE, LTD., and W. A. WIRZ. Brit. 305,694, Nov. 8, 1927. Perforated sheet metal plates are placed between sheets of cellulose acetate compn. or similar material which may be subjected to heat and pressure so that it penetrates the perforations of the metal. Various details and modifications are described.

**Artificial threads, films, etc., from animal protein solutions.** HEBERLEIN & Co. A.-G. Brit. 306,464, Feb. 20, 1928. Protein materials such as horn shavings, skin, waste wool or waste silk are subjected to a swelling operation (as with hot water and salicylic acid) and to a simultaneous or subsequent treatment with phenol or its homologs or derivs. until soln. is effected. Various details are given.

**Diaphragms for gramophones or other acoustic instruments.** W. A. HALDEN. Brit. 306,193, Oct. 21, 1927. Metallic gauze, perforated plates or interlaced strips are coated with celluloid, ebonite or wax with which may be admixed fine particles of wood or other solid substances.

**Transparent material for plant shelters, etc.** I. G. FARBERNIND. A.-G. Brit. 306,242, Jan. 2, 1928. A network of org. material such as wool, yarn or webbing carries transparent or translucent artificial resins such as condensation products of urea with formaldehyde and casein or cellulose ethers, etc.

**Cleaning printing presses.** FIRMA OTTO C. STRECKER. Ger. 479,983, Dec. 21, 1928. The rubber parts of printing presses are cleaned by a mixt. of castor oil and one or more aldehydes.

**Printing plates and matrices.** EDWARD S. HOLE. U. S. 1,726,151, Aug. 27. A sheet of plastic material such as paper pulp is impregnated with a phenolic condensation product in moist and water sol. state and contg. Cr oxides, chromates or dichromates; the sheet is dried and is subjected to heat and pressure in contact with an original to effect hardening of the phenolic condensation product and to convert it into the water-insol. state.

**Cleaning linotype matrices.** WILLIAM DUNKLIN. U. S. 1,725,785, Aug. 27. Brass matrices are immersed in a soln. contg. Cr trioxide 3.5 and water 95-97%.

**Vermin-destroying composition.** CHEM. FAB. H. STOLTZENBERG HAMBURG. (Wilhelm Gump, inventor). Ger. 480,349, Mar. 28, 1924. HCN adsorbed in purified silica gel is used.

## 19 GLASS, CLAY PRODUCTS, REFRACTORIES AND ENAMELED METALS

J. E. BARTON, C. H. KERR

**Modern glass-forming machinery.** ANON. *Engineering* 128, 27-9, 91-2, 153-5 277-8, 304-5 (1929). E. H.

**Opal covering glasses.** G. KÖRRN. *Keram. Rundschau* 35, 601-3, 620-1 (1927).—Methods of covering transparent blown glass articles with white or colored opal glasses are described and batch compns. for the clear and opal glasses are given. H. INSLLEY.

**The properties and applications of "vita" glass.** F. E. LAMPLUGH. *Pottery Gazette* 54, 1120-3 (1929).—The special properties of "vita" glass, its use, transmission of health-giving rays, present installations and cost are reviewed. R. A. HEINDL.

Electrically conductive antimony mirrors on glass. STANDISH MILLER. *J. Optical Soc. Am.* 19, 101-2(1929). E. J. C.

An example of disintegration of a silica brick in a glass-melting furnace. M. A. BESBORODOW. *Keram. Rundschau* 35, 515-6(1927).—A silica brick which had been in contact with a clay brick in the wall of a used glass-melting furnace had a sponge-like incrustation with drops depending from it. Analyses were made of the unaffected silica brick, the clay brick, the incrustation and the drops. Conclusion: The incrustation as well as the drops were caused by the clay and the silica and alkalis from the furnace atm. melting to form a glass having approx. the compn. of feldspar. It is not advisable to have clay blocks and silica blocks in contact in the upper walls or crowns of glass-melting furnaces. H. INSLEY

The operation of modern shaft kilns. HÄGERMANN. *Tonind.-Ztg.* 53, 1269-71 (1929).—A review, including recent pats. F. O. ANDERHOGG

Contributions to the ceramics of highly refractory materials. III. The system zirconia-thoria. OTTO RUFF, FRITZ EBERT AND HANS WOITINKE. *Z. anorg. allgem. Chem.* 180, 252-6(1929); cf. *C. A.* 23, 3396.—There is no reaction between  $\text{ThO}_2$  and  $\text{ZrO}_2$  up to  $2400^\circ$ . After heating to  $2600^\circ$ , 1:1 mol. mixts. gave x-ray evidence of 2 new mixed crystals. These were cubical and had  $a = 5.32$  and  $5.51$ .  $\text{ThO}_2$  can just be melted by the oxyacetylene flame. Its m. p. is estd. at  $3050^\circ$  and it is the most refractory material known. M.-p. data indicate a continuous series of mixed crystals from  $\text{ZrO}_2$  to  $\text{ThO}_2$  while x-ray diagrams of the cooled melts show 2 series. Hence a sepn. into 2 different mixed crystals must take place shortly below the m. p. No lower oxide of Th formed by thermal decompn. or reduction was found. A. C. H.

Refractories service conditions in furnaces burning anthracite on traveling grate stokers. R. A. SHERMAN, EDMUND TAYLOR AND H. S. KARCH. *Trans. Am. Soc. Mech. Eng.* 51, 183-96(1929); cf. *C. A.* 23, 4545.—Data obtained under actual operating conditions are presented on the service conditions which govern the life of refractories in furnaces. Temp., compn. and velocity of furnace gas, temp. of refractories and amt. and compns. of the solids carried in the furnace gas were investigated. The nature of the slag action was studied. The investigation disclosed no reason why, with the proper design of furnace to obviate the extremely high temps and high content of reducing gas, the burning of anthracite of the sizes smaller than brickwheat No. 3 should be accompanied by more difficulty with refractories than the burning of the larger steam sizes. A. WHITE

Procedure for the determination of the permeability of refractory materials to gases. A. KANZ. *Arch. Eisenhüttenw.* 2, 843-9(1929).—App. and procedure are described and results are given on a large no. of materials. A. WHITE

Pickling steel for vitreous enameling. F. G. JAEGER. *Metal Cleaning and Finishing* 1, No. 3, 299-302(1929). E. I. S.

Non-metallic construction materials for the acid industry (WAESER) 20. The use of fuels in tunnel kilns (RICE) 21. Clay and water (SALMANG) 2. Economics of firing stained glass electrically (RUGG) 4. Refractories for gas retorts (HARVEY) 21. Continuously acting melting furnace for glass (Ger. pat. 480,619) 1. Annealing kiln (Swiss pat. 131,865) 1. Gelatin and glue [binder for making "splinterless glass"] (Brit. pat. 306,439) 29. Enameling furnace (Ger. pat. 480,718) 1. Apparatus for drying enamel plates (Ger. pat. 480,571) 1.

SEARLE, ALFRED B.: *An Encyclopedia of the Ceramic Industries*. 3 Volumes. London: Ernest Benn, Ltd. 1200 pp. £ 9: 9s the set plus postage.

Glass. N. V. MIJ. TOT BEHEER EN EXPLOIT. VAN OCTROOIEN. Ger. 478,582, April 8, 1928. A method and app. for rolling and cooling glass plates are described.

Glass. LUDWIG GLASER. Ger. 479,930, Mar. 19, 1926. A process of mfg. glass objects is described.

Glass. KURT KUNZEL. Ger. 481,364, Feb. 11, 1925. Glass is melted in a shaft furnace through which the melting flame is projected under pressure.

Manufacture of glass. LUDWIG HOCHSTEIN. Ger. 480,753, Mar. 19, 1925. A glass is made by melting together  $\text{SiO}_2$ ,  $\text{B}_2\text{O}_3$ ,  $\text{Al}_2\text{O}_3$  and  $\text{ZrO}_2$  in such amts. that the finished glass contains them in the proportions 80-85, 16-12, 2-1.5 and 2-1.5%, resp., with no alkali.

Glass-blowing machine. LYNCH GLASS MACHINERY CO. Ger. 480,780, April 16, 1920.



**Glass-blowing machines.** GLASFABRIKATIONS-AUTOMATEN-G. M. B. H. Ger. 479,928, July 23, 1926, and 479,929, Nov. 19, 1926. Details are described.

**Glass thread manufacture.** GOULD STORAGE BATTERY CO. Brit. 306,332, April 26, 1928. An app. is described.

**Rolling molten glass.** HERZOGENRATHER GLASWERK BICHEROUX & CIE G. M. B. H. Ger. 481,365, Nov. 7, 1926. Details.

**Drawing sheet glass.** WM. A. MORTON. U. S. 1,726,114, Aug. 27. Stretching and setting of the glass is effected in a zone under super-atm. pressure.

**Plate and sheet glass production.** COMPAGNIES REUNIES DES GLACES ET VERRES SPECIAUX DE NORD DE LA FRANCE. Brit. 306,441, Feb. 20, 1928. Glass is melted and refined in a pot furnace, poured into a small tank or regulating furnace, and then flows through a slot to a rolling app.

**Process for drawing plate glass.** WILHELMINE BRAUER. Ger. 480,620, July 16, 1926. Details of the method and app. are given.

**Uniting sheets of glass and celluloid.** J. H. ROBERTSON. Brit. 306,351, June 25, 1928. The glass is first coated with a cement consisting of a gelatinous silicate in a hot soln. of gelatin with or without K Cr alum, or of albumin or casein, dried and joined with a sheet of celluloid softened with an acid such as propionic acid and the sheets are pressed together in a bath such as PrOH. Various details and modifications of procedure are described.

**Uniting glass sheets with celluloid, etc.** P. H. HEAD. Brit. 306,279, Feb. 13, 1928. The united sheets are sealed at the edges by heating the intermediate sheet with a wire or by treatment with acid or NaOH or phenol. The action of NaOH may be stopped by application of diacetone alc. When dry, the edges are coated with lacquer or varnish.

**Uniting glass or other sheet materials with cellulose derivatives.** C. DREYFUS (to British Celanese, Ltd.) Brit. 305,992, Feb. 13, 1928. Cellulose derivs., such as cellulose acetate, are used in finely powdered form with plasticizers, fillers, dyes, etc., under heat and pressure. Numerous details and examples are given.

**Composite sheets pervious to ultra-violet rays.** C. DREYFUS (to British Celanese, Ltd.) Brit. 306,397, Feb. 18, 1928. Sheets of material such as pure quartz glass are united with intermediate sheets of a cellulose ester or other compn (or by use of similar powdered material) under the action of heat and pressure.

**Tunnel kiln for cooling glass ware.** HARTFORD-EMPIRE CO. Ger. 481,366, Mar. 18, 1924 and 481,367, Mar. 24, 1926. Details of construction are given.

**Tunnel kiln for firing objects made from carbon-slag.** WILHELM HOFFMEYER. Ger. 480,479, June 8, 1927. Details of the circulation of the hot gases are given.

**Annular or zig-zag kiln for firing earthenware.** BORNKESSEL & CO. M. B. H. Ger. 481,397, Aug. 11, 1925. Details of construction and arrangement are given.

**Drying plant for ceramic goods.** OSWALD HELLER. Ger. 480,276, Oct. 30, 1925. Addn. to 479,414 (C. A. 23, 1789)

**Drying plant for pottery, etc.** BORNKESSEL & CO. M. B. H. Ger. 480,526, July 31, 1925.

**Ceramic compositions.** HERMANN MEHNER. Ger. 472,653, July 14, 1923. A method of making porous stone from clay by high-pressure steam treatment is described.

**Ceramic compositions.** LIPSA CHEMISCHE FABRIK A.-G. Ger. 481,214, Mar. 16, 1926. Heat insulating coverings are made from granular basic  $MgCO_3$ .

**Ceramic compositions.** QUARTZ & SILICE SOC. ANON. Ger. 481,472, Nov. 3, 1926. See Brit. 263,765 (C. A. 22, 148)

**Ceramic compositions.** SCHUMACHER'SCHE FABRIK G. M. B. H. Ger. 481,387, May 28, 1925. Porous molded bodies for diffusion or filtering purposes, which are non-conductors of electricity, are prep'd by mixing granular material such as quartz, glass, asbestos or glass wool with a plastic binding material m. below  $400^\circ$ , such as S or asphalt.

**Ceramic compositions.** STERCHAMOLWERKE G. M. B. H. Ger. 480,586, Oct. 21, 1925. Porous fire bricks are made by mixing the clay with material which is swollen by water, e. g., cork dust, before molding, and burning it out after molding.

**Refractory materials.** R. L. FRINK. Brit. 306,216, Aug. 29, 1927. In forming refractory products by the union of materials such as sillimanite, bauxite, andalusite, etc., with bonding materials such as silica, oxides and chlorides of the alk. or rare earths such as Zr, Ce and Th are added to effect a cementing action prior to heating. Numerous details and examples are given. Cf. C. A. 23, 1732.

**Enamel.** DRUSCHKE GASGLÜHLICHT AVER-GES. Brit. 306,019, Feb. 14, 1928. An opaquing medium suitable for use in enameling metal is made by fusing Zr silicate

with about an equimol. proportion of oxide of Ca, Ba, Sr, Mg or Zn together with a small quantity of a flux.

## 20—CEMENT AND OTHER BUILDING MATERIALS

J. C. WITT

The four-component system, cement-sand-large aggregate-water. G. KATHREIN. *Tonind.-Ztg.* 53, 1122-5(1929).—A tetrahedral figure and certain projections thereof are useful for indicating various properties of different concretes. F. O. A.

A simple sedimentation apparatus. HANS KÜHL AND WOLFGANG GRAF CZERIN. *Tonind.-Ztg.* 53, 1247-50(1929).—When a suspension of cement in abs. alc. is introduced into the upper part of a tube contg. alc. only, the difference in sp. gr. causes the suspension to spurt down into the alc. This is overcome by heating coils placed at intervals along the tube, the temp. being maintained so that a 10° differential occurs along the tube. Then alc. in the topmost section is heated 20° hotter as is also a suspension of a little cement in alc. The latter is introduced in the top of the tube by a simple metallic dump arrangement. When the largest particles approach the bottom, the alc. is allowed to flow out through a capillary tube at a rate of 100 drops per min. and caught in 4 fractions. The sepn. is accurate above 25 microns for 3 fractions, but the 4th fraction ranging from 25 to 15 microns is not so reliable. F. O. A.

Constitution of hydrated portland cement. G. ASSARSSON AND N. SUNDIUS. *Sveriges Geol. Undersökning*, Series C, No. 357, 9 pp.(1929).—Clinker grains remaining in cement can readily be determined microscopically and are found to consist mainly of disilicate, with some trisilicate but mostly as larger fragments; the hydrolyzing process during the hardening of cement is explained. E. I. S.

The action of calcium chloride on portland cement. I. C. R. PLATZMANN. *Chem.-Ztg.* 53, 477-8(1929).—Addn. of  $\text{CaCl}_2$  to the mixing water results in quicker hardening, higher early strength and less shrinkage. Compression strength is increased while tensile strength is unchanged at first and later on slightly decreased. Opt. concn. is a 4%  $\text{CaCl}_2$  soln. The beneficial action of  $\text{CaCl}_2$  seems to be due to the prevention of cracking and hair checking due to its hygroscopic nature. It was not decided whether or not the ultimate action of  $\text{CaCl}_2$  would be detrimental because of a possible chipping action later on. II. *Ibid* 494-6.— $\text{CaCl}_2$  increases the setting temp. proportional to the amt. used. According to Killig this may be explained by assuming a more intensive crystal formation due to the greater soly. of  $\text{CaO}$  in  $\text{CaCl}_2$  soln. This results in quicker hardening and also makes low-temp. concrete work possible. The action of  $\text{CaCl}_2$  varies with different cements. No final conclusion can be drawn yet as to the advisability of using  $\text{CaCl}_2$  in concrete work. G. H. VON FUCHS

Fatigue in concrete. D. D. EWING. *Elec. Ry. J.* 73, 829-30(1929).—Concrete loses strength when subjected to repeated stresses. The properties of concrete are affected by age, moisture and other conditions which make fatigue testing a rather tedious and expensive matter. The probable endurance limit for bond strength is about 60% of the bond strength as detd. by the static test. Present knowledge of the effect of repeated loads on concrete is summarized. W. H. BOYNTON

Tar-bitumen mixtures for surfaces (of streets). B. VON LEMBERKE. *Erdöl u. Teer* 22, 409; *Teer u. Bitumen* 27, 413(1929).—Mixts. of 70-75% tar and 25-30% bitumen are recommended. A. W. FRANCIS

Non-metallic construction materials for the acid industry. BRUNO WAESER. *Korrosion* 3, 29-30, 46-7(1928); 4, 1-3, 21-2, 33-4(1929).—A general review of the org. materials, natural and artificial stones, cements, minerals, glasses. A table shows the phys. properties of quartz, porcelain and glasses, with improvements from 1921 to 1926. Patent and literature references are given. J. H. MOORE

Absorption of wood preservatives. J. D. MACLEAN. *Eng. News-Record* 102, 176-9(1929).—M. points out that present practice of basing specifications for preservative treatment on the net retention of impregnating material per cu. ft. of wood does not make provision for the widely different ratios of surface area to vol. of timbers of different dimensions and the ratio of end to side penetration. Retention per cu. ft. is a satisfactory unit for sapwood, which is completely penetrated, but not for heartwood, which cannot be fully penetrated even by the most effective methods of treatment. Tabulated data are given showing that with the same vol. absorption the depth of penetration in timbers of different sizes may vary several hundred percent. A method is suggested for detg. within reasonable limits the proportional vol. absorption required

for timbers of various dimensions to obtain treatment equiv. to that of a given timber taken as a standard, and the values so obtained are tabulated. R. E. THOMPSON

"Waste" heat recovery in the Japanese cement industry (KASAI) 21. Density of  $\text{Ca}(\text{OH})_2$  and the role of that material in the shrinkage of portland cement (JOYE, DEMONT) 2. Solubility of  $\text{Ca}(\text{OH})_2$  (MILLER, WITT) 2. Copal oil and copal condensation oil [as wood preservatives] (GREMPE) 26. The operation of modern shaft kilns (HAEGERMANN) 19. Effect of percolating water on concrete dams (BOWERS) 14. Parabolic reinforced concrete sheds for storage of salts (VERDEYEN) 18. [Wood preserving composition] (Brit. pat. 305,943) 15.

**Cement.** PERRIN & TUSCHER. Swiss 120,818, Feb. 1, 1928. A cement contains slag 60–80, lime 2–22, and portland cement 7–27%.

**Method of impregnating cement blocks with coal tar or pitch by pressure.** "DIANA" BAU- & ISOLIERPLATTEN A.-G. Swiss 131,761, Feb. 2, 1928.

**Device for aerating wet cement.** GEORGE B. HINTON. Swiss 131,757, Feb. 27, 1928 and 131,759, Apr. 4, 1928

**Device for aerating cement paste.** GEORGE B. HINTON. Swiss 131,541, Feb. 27, 1928.

**Cooling shaft for a rotary furnace for burning cement.** KLÖCKNER-WERKE A.-G. Ger. 480,525, May 11, 1926 Addn to 464,761

**Porous concrete.** N. E. BROANDER (to K. P. Billner). Brit. 306,444, Feb. 20, 1928. Gases are injected or generated in a plastic mix of pulverized pozzolanic material, portland cement or lime, water and aggregate such as slag, cinders, sand and crushed stone. Al powder is preferably mixed with the compn. but soap solns., yeast, etc., may be used. Cf. C. A. 22, 1454.

**Lime and cement mortars containing blood serum, etc.** A. GENAIRON. Brit. 306,038, Feb. 14, 1928

**Bricks and stones from copper slag.** SUKESAKU JOSHIMOTO, TORATARO OKUMURA and SEISHICHIRO NAKAMURA. Ger. 479,895, Aug. 27, 1926. Bricks and stones are made from the molten slag of a Cu smelting plant by pouring into a mold and sprinkling with powd. S, Fe, mica and bran. The bricks may then be cooled in straw ash.

**Emulsions for use on roads or for detergents or sheep dips.** R. LISTER ET CIE. Brit. 305,742, Nov. 26, 1927. Bituminous, coal-tar or oil derivs. are emulsified with soap and amylaceous water and the mixt. is heated to about 96°. Various examples and details are given.

**Cellular building material.** G. M. THOMSON. Brit. 305,806, Jan. 31, 1928. A foam, the d. of which is regulated in accord with the cell size desired in the finished product, is mixed with a slurry of quick-setting cementitious material such as calcined gypsum and water, in such manner as to prevent occlusion of addnl. atm. air.

**Heat and sound insulating material for building construction.** C. A. UPSON (to Upson Co.). Brit. 306,559/60, Feb. 23, 1928. Structural features.

**Composition for coating walls, ironwork, roofing, etc.** R. F. BANKS. Brit. 306,256, Jan. 21, 1928. Cement, Na silicate,  $\text{BaCl}_2$  and water are used together, with or without acid K oxalate.

**Plastic compositions from benzyl cellulose.** H. BÖRNSTEIN AND N.-V. NEDERLANDSCHE LINOLEUMFABRIEK. Brit. 306,140, Feb. 17, 1928. In forming floor or wall coverings or the like, benzyl cellulose is plasticized by gelatinizing agents such as tri-cresylphosphate and mixed with fillers, coloring materials, linoxyn, etc., and may be applied to jute or other fabric.

**Bleaching wood.** I. G. FARBENIND. A.-G. (Helmuth Korte, inventor). Ger. 479,801, Aug. 11, 1927. The wood is washed with hot alkali, and bleached with  $\text{HClO}_4$  and  $\text{H}_2\text{O}_2$ .

**Preservation of wood.** I. G. FARBENIND. A.-G. (Hans Finkelstein and Oskar Loehr, inventors). Ger. 481,184, Jan. 8, 1928. The wood is preserved by impregnation with soln. contg. compds. of org. nitro compds. with org. bases. Preferably compds. of nitrated phenols with hydroxyalkyl amines are used. An example is given. Cf. C. A. 23, 4548.

**Wood preserving.** GRUBENHOLZIMPRAGNIERUNG-G. M. B. H. Ger. 480,205, Feb. 21, 1926. A wood preserving and hardening agent consists of a mixt. of  $\text{NaF}$  and  $\text{Na}_2\text{SiF}_6$ . Other insecticide and fungicide may be added together with fireproofing agents.

**Impregnating wood.** KARL BURLA. Ger. 481,534, May 6, 1925. The wood is

subjected to a vacuum and impregnated with a strong soln. of  $\text{HgCl}_2$ . The app. is described.

Device for impregnating wood. FRIEDRICH MOLL. Ger. 479,770, Jan. 1, 1927.

## 21—FUELS, GAS, TAR AND COKE

A. C. FIELDNER

The training of fuel engineers in Austria. W. J. MÜLLER. *Trans. Fuel Conference, World Power Conference, London, 1928 3*, 1277-81(1929). A. H. E.

Organizations for the promotion of fuel and heat economy in German industry. F. ZUR NEDDEN. *Trans. Fuel Conference, World Power Conference, London, 1928 3*, 1291-1304(1929). ALDEN H. EMERY

Organizations concerned with the efficient use of fuel in industry. E. C. EVANS. *Trans. Fuel Conference, World Power Conference, London, 1928 3*, 1305-46(1929).—E. gives a list and a statement of the objects of 93 organizations concerned with efficient fuel utilization in 14 countries. ALDEN H. EMERY

General problems of fuel utilization. M. I. LAPIROFF-SCOBLO. *Trans. Fuel Conference, World Power Conference, London, 1928 3*, 1347-70(1929).—A general survey of the training of fuel technicians and the organizations concerned with fuel utilization in Russia. ALDEN H. EMERY

"Waste" heat recovery in the Japanese cement industry. S. KASAI. *Trans. Fuel Conference, World Power Conference, London, 1928 3*, 901-8(1929).—Descriptive. ALDEN H. EMERY

Evaluation of fuels used for aviation in Germany. E. RACKWITZ AND A. VON PHILIPPOVICH. *Trans. Fuel Conference, World Power Conference, London, 1928 3*, 610-25(1929).—The compression ratio of German airplane engines lies between 1:5.5 and 1:6.3 and suitable fuels are hard to find. Properties to be met include: aniline point below  $52^\circ$  for pure gasoline and  $58^\circ$  for gasoline-benzene mixts., less than 2% unsaturates, sp. gr. more than 0.710, withstand  $-30^\circ$  temp., non-corrosive, non-gumming (no diolefins allowed), less than 0.3% S, calorific value more than 8500 cal. per kg., and boils as follows: 1st drop  $50-60^\circ$ , 10% to  $70^\circ$ , 60% to  $100^\circ$ , 80% to  $120^\circ$ , 96% to  $130^\circ$ , dry  $140^\circ$ , or for gasoline for gasoline-benzene mixts. 1st drop  $50-60^\circ$ , 10% to  $75^\circ$ , 60% to  $110^\circ$ , 80% to  $130^\circ$ , 96% to  $150^\circ$  and dry  $160^\circ$ . A. H. E.

Improving the combustibility of fuel. JOHN ROBERTS. *Eng. & Finance* 21, 79-80 (1929).—By prepg. suitable blends of coking and non-coking coals and shortening the coking period the Woodall-Duckham Co. has succeeded in producing a free burning, smokeless, high-temp. coke contg. about 4% volatile matter. L. B. B.

Pulverized fuel in marine work. H. W. BROOKS. *Trans. Fuel Conference, World Power Conference, London, 1928 3*, 506-41(1929). Marine boiler practice demands release of 60,000-80,000 B. t. u. per cu. ft. per hr. Expts. toward obtaining this capacity in pulverized-fuel-fired boilers are described in detail. It is necessary to secure (1) extra fine pulverization (75% through 300 mesh), (2) high flame turbulence, and (3) even distribution of the coal stream among burners. ALDEN H. EMERY

Progress of pulverized-fuel burning for steam boilers in Japan. SHUICHI YAMAUCHI. *Trans. Fuel Conference, World Power Conference, London, 1928 3*, 385-400(1929).—Typical Japanese pulverized-fuel-burning installations are described. ALDEN H. EMERY

Pulverized-fuel firing. F. H. ROSENCRANTS. *Trans. Fuel Conference, World Power Conference, London, 1928 3*, 323-61(1929).—An excellent general discussion. ALDEN H. EMERY

The use of fuels in tunnel kilns. W. E. RICE. *The Clay Worker* 92, 28-34(1929) cf. C. A. 22, 308.—R. deals with the use of fuels in continuous-heating furnaces of the railroad car tunnel type, which furnaces at present provide the most efficient means of heat-treating such materials as metallurgical products, steel sheets, C electrodes, brick, tile, pottery, etc. He first takes up the various fuels, gas, oil and coal, following which he deals with the movements of the gases in the various zones of the kiln, and finally with the confinement of products of combustion in muffles when accurate control of atm. is required as in many high-grade metallurgical and ceramic products. R. A. HEINDL

The use of ethyl alcohol as a motor fuel. E. HUBENDICK. *Trans. Fuel Conference, World Power Conference, London, 1928 3*, 724-48(1929).—Up to 25% EtOH can be mixed with gasoline without materially affecting its properties as a motor fuel. With

greater amts., intake air must be preheated (100–150°), the float must be adjusted for the different sp. gravities, and the size of the carburetor jet must be increased in inverse proportion to the thermal value of the alc. fuel and the gasoline per unit vol. The miscibility of the system and the effect of air humidity are discussed. A. H. E.

**Examination of alcohol motor fuels.** K. R. DIETRICH AND H. JEGLINSKI. *Chem.-Ztg.* 53, 177–8, 198–9 (1929).—The most usual diluents for alc. fuels are benzine, benzene and ether; the alcs. are removed by treatment with water. The residue after this washing is benzene if it has  $d_{15}$  0.87–0.88, while if it is lower a more detailed inspection is necessary, and this may conveniently take the form of the Dietrich or Formánek color test (*cf. C. A.* 22, 2826). The presence of alcs. is more certainly detected by the use of  $\text{CaCl}_2$  soln. or by the addn. of a dye which is sol. only in alcs.;  $\text{EtOH}$  is identified by Schiff's reagent. Ether or acetone is sepd. from a large vol. by careful fractionation, and if acetone is present the aq. ext. of the distillate will give a red or violet coloration, on the addn. of Na nitroprusside. Detns. are carried out along the same lines, and a crit. review of the methods available is given. B. C. A.

**The fusibility of the ashes of some fuels from U. S. S. R. according to the data of the Chemical Laboratory of the Institute for Thermotechnic.** N. UVAROV AND V. UVAROV. *Izvestiya teplotekh. Inst.* 1926, No. 8, 26–37; *Chem. Zentr.* 1929, I, 334.

**Laboratory examination of the ashes of solid mineral fuels regarding their fusibility.** O. NEFEDVEVA AND V. UVAROV. *Izvestiya teplotekh. Inst.* 1927, No. 10, 37–50; *Chem. Zentr.* 1929, I, 334.—Cones similar to the Seger cones were made from the ash under examn. by grinding the powd. ash with a few drops of water. If necessary, some dextrin was added. The cones were heated in refractory crucibles. The temp. at which deformation begins, the softening temp. and the fusing temp. (at which the cone deliquesces) were observed. The detns. were carried out in an atm. of the products obtained by complete combustion ( $\text{CO}_2 + \text{H}_2\text{O}$ ) or in a half-reducing atm. (a mixt. of equal vols. of  $\text{CO} + \text{H}_2 + \text{CH}_4 + \text{C}_2\text{H}_4$  and  $\text{CO}_2 + \text{H}_2\text{O}$ ). The results of the examn. of the ashes of different fuels are compiled in tables. G. SCHWOCH

**Some chemical aspects of power production from mineral fuels.** J. T. WARD. *Chemistry and Industry* 48, 547–51 (1929).—Increased efficiency in fuel utilization and conservation is an industrial necessity. The present power generation methods are limited in scope. A few ways are suggested in which efficiency of power might possibly be increased and some of the more important chem. problems involved in their soln. are pointed out. FRANK V. JOHNSON, JR.

**Transmission over various distances of energy in the form of coal, coke, oil, gas and electricity.** E. W. SMITH. *Trans. Fuel Conference, World Power Conference, London, 1928* 3, 828–30 (1929).—English costs per therm of the above fuels are calcd. for transmission over various distances and at various loads. There is a limiting distance beyond which transportation of fuel is cheaper than the transmission of gas or electricity. ALDEN H. EMERY

**Industrial heating by solid, liquid and gaseous fuels.** ROBT. HADFIELD AND R. J. SARJANT. *Trans. Fuel Conference, World Power Conference, London, 1928* 2, 1003–35 (1929).—Gaseous and liquid fuels are more adaptable and occasionally discount the lower thermal cost of solid fuel. The iron and steel industry is the largest English consumer of coal for industrial heating, using in 1927 over 13 million tons to produce pig iron and about 12 million tons for steel and other purposes. The fuel requirements of different processes are (in cwt. per ton): soaking pits 1.5–4, reheating furnaces—heavy 1.75–5, reheating furnaces—light 2–10, forge furnaces—heavy 3–8, forge furnaces—light 2–10, plate mill 4 (approx.), sheet mill (av.) 7.2, etc. There is considerable scope for the direct use of solid fuel by further development of mech. stokers and other means of burning solid fuel (such as pulverizing). Metallic recuperators of heat-resisting alloy operating at high temps. are practicable and valuable aids to fuel economy. In an investigation of air regenerators, the coeff. of heat exchange per unit of surface area was shown to increase as the path of the heated gas was ascended. This suggests that the checker work should be built as near the furnace ports as possible. The rate of heating was shown to have a marked influence on the relative storage of heat in unlagged firebrick walls as compared with external surface losses. A. H. E.

**The function of the combustion chamber of a powdered fuel-fired boiler installation.** W. LULORA. *Trans. Fuel Conference, World Power Conference, London, 1928* 3, 362–84 (1929).—The proper design of the combustion chamber of a powd.-fuel boiler is thoroughly discussed, beginning with fundamental principles.

the limiting size of a boiler according to the percentage of  $\text{CO}_2$  in the flue gas at  $1200^\circ$  in the combustion chamber.

ALDEN H. EMERY

**Theoretical considerations on the question of preheated air in the cupola.** E. PIWOWARSKY AND R. VOGEL. *Die Giesserei* 16, 147-53 (1929).—The authors advance some criticisms of former studies on the combustibility of fuels. They studied the mechanism of the reaction  $\text{C} + \text{O}_2 = \text{CO}_2$  in the region of small reaction velocities (low temps.). Charcoal, heating coke, petroleum coke and graphite at various temps. were in contact with 1.5 to 9.0 l./hr. of  $\text{CO}_2$ -free air. The calcd. reaction const. for given temps. can be detd. by means of the formula for reactions of the first order. In studying the reaction  $\text{CO}_2 + \text{C} = 2\text{CO}$  with graphite at a temp. of  $910^\circ$  to  $1010^\circ$ , and a gas consisting of 79 vol. %  $\text{N}_2$  and 21 vol. %  $\text{CO}_2$ , the value for the reaction const. can be detd. by the formula for reactions of the second order. Conclusion: The reaction  $\text{C} + \text{O}_2 = \text{CO}_2$  is of the first order, while the reaction  $\text{CO}_2 + \text{C} = 2\text{CO}$  is of the second order. A study was made to det. the effect of air velocity on cooling a bed of hot coke. In the region of low temps. the amt. of heat developed per unit time is less than the heat removed by the cold air entering. Cubes of heating coke and petroleum coke 40 mm. on edge were heated to  $850^\circ$  in a small column furnace. Various amts. of cold air were passed through the hot coke, and temps. of the outgoing gas taken every 5 sec. Petroleum coke could not be blown cold. Heating coke began to cool for air vols. of 2 cu. m./min. Great differences in combustibility exist between cokes. By an economic preheating of air the velocity of the reaction  $\text{C} + \text{O}_2 = \text{CO}_2$  will increase and the cooling action of the inblown air in and above the tuyère zone of the cupola will lessen, bringing about the following advantages: the amt. of coke burned per unit time will increase by the introduction of more air per sq. m. of furnace cross section; the melting performance will increase; Fe and slag temps. will be raised; heat loss through radiation will lessen with a corresponding saving in coke; thermal efficiency will increase; melting zone will be lowered, and desulfurization will increase.

C. H. LORIG

**Analysis of coal for export.** ANON. *Colliery Guardian* 139, 801-3, 900-2 (1929).—Methods adopted by the Brit. Engineering Standards Assoc. are outlined. E. J. C.

**The assay of coal for carbonization purposes. II. Results of experiences with the Gray-King method.** J. G. KING, C. TASKER AND L. J. EDGCOMBE. Dept. Sci. Ind. Research, Fuel Research Div., *Tech. Paper* No. 21; *Gas World* 90, 697-9 (1929).—The latest improved design of the Gray-King app. (*C. A.* 15, 1390) is described. The considerations which have led to it, the modifications desirable with strongly swelling coals and the information obtainable by its use are discussed. F. S. GRANGER

**Some chemical aspects of coal carbonization.** S. ROY ILLINGWORTH. *Gas World* 90, No. 2339, Coking Sect. 18-20 (1929).—Sevler's classification of coals, the components of coal by extn., and H content are discussed with reference to coking qualities. For a given C content, available H is some measure of cementing and swelling properties, since the  $\gamma$  constituent of coal is richest in H. It was found by extn. after various heating stages that the material factors of coke formation—namely, the ulmins and the  $\beta$  and  $\gamma$  constituents, are all destroyed below  $500^\circ$ , so that the nature of the coke is detd. by the behavior of the coal below this temp. The relative decompn. temps. of the  $\beta$  and  $\gamma$  constituents responsible, resp., for bubble formation and the plastic stage, are an important factor. Factors and effects related to the rate of heat penetration and economic questions relating to tar also are discussed. F. S. GRANGER

**Electrical conductivity of coal during carbonization. I. Low-temperature carbonization.** SADAŌ IKI. *J. Soc. Chem. Ind. (Japan)* 32, 367-75 (1929); Suppl. Binding 32, 11-2B (1929).—Anthracite has some cond. at ordinary temp., which begins to increase at  $300^\circ$  and rapidly increases from  $400^\circ$ . Bituminous coal, brown coal and sawdust have practically no cond. at ordinary temp.; their conductivities begin to increase slowly at  $400^\circ$  and rapidly from  $500^\circ$ . A very moist brown coal shows a large transitory cond. at  $100$ - $200^\circ$ . The temp. at which the rapid rise of elec. cond. begins is a little higher than the softening temp. of coal, and nearly coincides with the temp. at which the coal begins to evolve gases and to swell. The cond. during cooling depends upon the properties of cokes produced; the higher the temp. attained, the larger is the cond. This cond. measurement can be used for the detn. of the decompn. temp. for the examn. of coke produced and for the investigation of the progress of carbonization. **II. High-temperature carbonization.** *Ibid* 375-80, 112-3B.—During high-temp. carbonization of coal, the elec. cond. increases in 2 stages, at  $400$ - $500^\circ$  and at  $700$ - $800^\circ$ . The former corresponds to the temp. at which coal begin to decomp. and evolve gas and tar; the latter corresponds to the temp. at which the tar decomposes and binds the coke mass together. The change of elec. cond. of the coke produced depends greatly upon the temp. of coking; the higher the temp. of coking, the

lower the temp. at which the cond. becomes apparent. The temp. coeff. of cond. depends on the coking temp.; the higher the temp., the smaller the coeff. When coal is heated for a long time at const. temp., the cond. increases; at temps. below 600°, the rate of increase is very small, and above 700°, very large. S. OKA

**The Bussey process of low-temperature carbonization.** DAVID BROWNLIE. *Gas Age-Record* 64, 141-2, 148, 150(1929).—A large plant of 14 standard retorts with a total calcd. throughput of 600-700 tons of bituminous coal per 24 hrs. has just been completed at Glenboig, Scotland. A description of the retorts with dimensions is given and the results of operation of exptl. retorts in the United States are discussed.

**The Pehrson process for the low-temperature carbonization of coal.** W. R. CHAPMAN. *J. Soc. Chem. Ind.* 48, 189-94T(1929).—The essential principle of this process involves the use of a rotary dryer or preheater for the first stage in which the coal is heated up to a crit. temp., and a retort in which the carbonization is completed. Cuts and diagrams are included. LESLIE B. BRAGG

**Status of low-temperature carbonization in Europe.** B. F. HAANEL. *Gas World* 91, 119-22(1929); *Gas Age-Record* 64, 203-6, 214(1929).—The usual objective of low-temp. carbonization is to produce the largest quantity of solid residue and tar oils without the formation of gas. The solid residue may be intended for domestic or industrial fuel. At present the tar oils must generally be credited as fuel or gas oils. A brief description is given of the types of retorts and processes used in 11 European plants showing promise of com. success. H. L. OLIN

**Low-temperature and high-temperature carbonization.** H. NIELSEN. *Gas Eng.* 46, 137(1929).—Comparison between low- and high-temperature methods shows no marked demarcation. J. B. CARPENTER, JR.

**Coal blending in carbonizing practice.** H. S. MADDEN. *Gas Eng.* 46, 83-4(1929).—Blending practice is considered to offer a field of development in the use of cheap non-coking coals with those of strongly pronounced coking qualities. E. I. S.

**Low-temperature distillation of low-grade fuels, especially lignites.** MAX TOLTZ. *Trans. Am. Soc. Mech. Eng.* 51, 209-11(1929); cf. *C. A.* 23, 500.—The utilization of low-grade fuels by low-temperature carbonization is discussed. A WHITE

**A large-scale laboratory apparatus for the low-temperature carbonization assay of coals.** N. SIMPKIN, C. G. WOOD, A. DAWE AND W. GIBSON. *J. Soc. Chem. Ind.* 48, 183-9T(1929). The app. consists of an elec. furnace, retort, air-cooled condenser, Woulff bottle, by-pass, spiral condensers, U-tube, tar-fog filter, NH<sub>3</sub> tower, light-oil absorption tower, meter guard tube, gas meter, gas holder and manometers. Cuts and diagrams are included in the description. H. L. OLIN

**Carbonizing Illinois coal.** S. W. PARR. *J. Western Soc. Eng.* 34, 458-71(1929).—See *C. A.* 23, 3557. H. L. O.

**Distribution of ash in the Merrimac coal seam.** F. H. FISH AND J. A. ADDLESTONE. *Va. Polytech. Inst. Bull.* 22, No. 10, 3-18(1929). E. I. S.

**Specific gravity of Alabama coals.** B. W. GANDRUD AND S. A. BRITTON. *Alabama State Mine Expt. Sta., Bull.* No. 2, 57 pp (1928).—Samples of Alabama coal were taken from 19 mines of the Warrior and Cahaba fields. These coals on analysis had d. 1.26-1.37%, ash 2-15%, moisture 2-4.5%. Ordinarily the sp. gr. increases uniformly with the percentage of ash, the discrepancies observed may be due to change in the character of the ash-forming material, to variation in the volatile-matter content, or to their combined effect. In those cases where the seams consist of benches of coal sepd. by partings of shale, etc., of high ash content, crushing will be necessary to eliminate the ash-forming impurities, and the resulting finer sizes of coal will furnish the most difficult problem in effecting improvements in the washing of Alabama coal. B. C. A.

**The coals of Nottinghamshire and Derbyshire.** J. W. WHITAKER. *Iron Coal Trades Rev.* 119, 39-40, 79-80(1929).—Several methods of classification of coals are discussed. The classification and uses of the various seams of Nottinghamshire and Derbyshire, England, coals are then taken up in detail. The effect of moisture, ash and S on the value of coals and the utility of the above-mentioned coals for gasification and hydrogenation are further considered. LESLIE B. BRAGG

**The action of chlorine on coal.** A. MARSH, A. McCULLOCH AND E. PARRISH. *J. Soc. Chem. Ind.* 48, 167-74T(1929).—Gaseous Cl reacts vigorously with coal with evolution of heat, the amt. of which may serve as an index to the tendency of the coal to spontaneous heating in storage. At temps. below 550° the Cl is given off quantitatively as HCl. H. L. OLIN

**The coking of coal.** M. BARASH. *J. Soc. Chem. Ind.* 48, 174-83T(1929).—The effects of various thermal and chem. treatments of coals with respect to coking or

agglutinating values were studied. Cl, among the oxidizing agents, was found to be especially destructive to the coking agents. An extensive review of the literature is appended. Also in *Blast Furnace Steel Plant* 17, 1358-62(1929). H. L. OLIN

The combustion of anthracite culms and brown coals in pulverized form. L. K. RAMZIN. *Trans. Fuel Conference, World Power Conference, London, 1928* 3, 438-58 (1929).—Grinding culm to 85% through 200 mesh and using a moderate rate of combustion increased efficiency of furnaces to 90.6%. Radiation losses were 3%. The coeff. of excess air behind the boiler was 1.36 and losses through incomplete combustion were 2.1% (10.5% previously). A table gives full data including heat balances on tests with 7 culms, 2 brown coals and 2 oil shales. An extensive tabulation shows the results of low-grade fuel combustion in different furnaces. Conclusion: (1) the lower the content of volatiles in the combustible matter and the higher the ash content, the more difficult it becomes to obtain high-combustion efficiency on mech. stokers (pulverized firing of such fuels is recommended) and (2) costs of drying and crushing so greatly reduce net efficiency of powd. fuel firing that high-grade coals could probably be stoker-fired most economically. ALDEN H. EMERY

The history and recent developments of pulverized coal for fuel. W. W. DULMAGE. *Natl. Eng.* 33, 309-12(1929). E. I. S.

Powdered coal for steam purposes. HENRY KREISINGER AND MARTIN FRISCH. *Trans. Fuel Conference, World Power Conference, London, 1928* 3, 459-505(1929).—A general discussion of the burning of powd. fuel and the equipment needed to secure max. efficiency. ALDEN H. EMERY

Some selected topics in the field of pulverized coal research in Germany FÖRDER-REUTHER. *Trans. Fuel Conference, World Power Conference, London, 1928* 3, 275-322(1929).—The following subjects are discussed: methods of chem. and phys. analysis of powd. fuel, hygroscopic property of fine coal, m. p. of coal ash, bulk measurement, ignition temp., temp. of spontaneous combustion, velocity of combustion, measurement of particle size, grinding characteristics, costs of drying and prepg. coal dust, transportation of powd. coal, type of furnaces to be used, special applications of powd. fuel, safety in use, etc. ALDEN H. EMERY

The reliability of the Eschka method for the determination of sulfur in solid fuels. K. STROCKFISCH. *Mitt. Lab. preuss. Geol. Landesanstalt* 1928, No. 7, sep. 10 pp.; *Chem. Zentr.* 1928, I, 2557.—In coals of high and low S content, S found that sulfide-S from pyrites was completely recovered, but from pyrrhotite, only after prolonged heating. The S of sulfates is readily recovered. Long heating is necessary to set free org. S. The procedure makes use of 1 g. of the pulverized sample mixed in a porcelain crucible with 3 g. of the Eschka mixt. and overlaid with 1 g. of the mixt. The crucible is slowly heated for 1 hr. with the tip of the flame merely touching the base of the crucible. A triple burner is used for an addnl. hr. An asbestos pad is fitted around the crucible to protect the contents from S in the gas. After cooling, the residue is well extd. with 150 cc. of H<sub>2</sub>O and 20 cc. of 3% H<sub>2</sub>O<sub>2</sub>, boiled for 10 min. and filtered. The filtrate is acidified with HCl and pptd. with BaCl<sub>2</sub> in the usual way. C. R. FELLERS

Rate of burning of individual particles of solid fuel. H. K. GRIFFIN, J. R. ADAMS AND DAVID F. SMITH. *Ind. Eng. Chem.* 21, 808-15(1929).—Pulverized bituminous (gas) coal, semicoke, beehive coke and activated charcoal were tested as to time required for burning by dropping through a vertical furnace electrically heated and provided with windows for making photographic records. Coal and semicoke particles required longer time for burning at higher temps. than at lower. The neg. temp. coeff. was much smaller for the fuels very low in volatile matter. Explanations are suggested. Charcoal particles were much longer in burning than coal, wt. for wt. Also in *Blast Furnace Steel Plant* 17, 1368-73(1929). EMMA E. CRANDAL

Evaluation of bituminous coal for gas works on basis of analyses. ROBERT MEZGER *Gas u. Wasserfach* 72, 770-6(1929).—Methods of comparing the relative value of various coals are discussed, and a method is recommended which is based on the cost of producing 100,000 calories of unpurified gas. R. W. RYAN

Behavior of bituminous coals in the water-gas generator. E. S. PETTYJOHN *Gas Age-Record* 64, 237-40(1929).—A summary of an investigation conducted by the Dept. of Eng. Research of the Univ. of Michigan. The test results of 7 different coals are given. Operating conditions, as detd. by the size of the coal, the quantity of fines, the coking properties, ash content and the ash fusion temp., are most important. LESLIE B. BRAGG

Tests of bituminous caking coal in a large low-pressure heating boiler. P. NICHO-LLA, C. E. AUGUSTINE AND B. A. LANDRY. *Bur. Mines, Rept. of Investigations, No. 2943*, 8 pp.(1929); *Fuel Econ. Ind. Products* 1929, 545-7.—Continuation of tests pre-



vously reported (C. A. 23, 1242) but with various modifications. A furnace equipped with tuyeres for secondary air produced an improvement in the smoke condition, but did not eliminate it. Boiler and furnace efficiency was only 1.0% higher. T. P. K.

**Texas plant burns lignite.** E. T. KECK. *Coal Age* 34, 429(1929).—In the plant of the Texas Power and Light Co. pulverized lignite has proved economical. The boilers are 18,756-sq. ft. Babcock and Wilcox type with interdeck superheaters. The steam pressure of 425-lb. gage; the main turbines are 20,000-kw., 14-stage, 1800-r. p. m., single-cylinder, General Electric units for steam pressure and temp. of 375-lb. gage and 700°.

**Drying of lignites according to the Fleissner system.** P. ROSIN. *Braunkohle* 28, 649-58(1929).

**Pulverized fuel firing at the Mydlovary Power Station of the South Bohemian Electricity Works at Budějovice.** FR. WIESNER. *Trans. Fuel Conference, World Power Conference, London, 1928* 3, 259-74(1929).—Mydlovary lignite, the poorest fuel in Czechoslovakia, contains 50-60% H<sub>2</sub>O and only about 1600 cal. per kg. It cannot be successfully fired on grates. The powd.-fuel installation using this fuel is thoroughly described; 4 boilers, each of 500 sq. m. heating surface, produce 100,000 kg. of steam per hr. and operate at 84% efficiency. Ash is removed hydraulically. Power consumption of the coal-dust-prepn. units and costs of construction are discussed.

**Fusain.** JOSEPH D. DAVIS. *Mining Congress J.* 1929, 197-200; *Bur. Mines, Circ.* 6115, 10 pp.(1929).—The literature on fusain is reviewed and an extensive bibliography is given. The occurrence of fusain and its recognition in coal by streak tests and microscopical exams. are described. Fusain may make up 1-5% of a coal bed. The different theories as to the origin of fusain and the difficulties arising in sepp. it from the other coal substances are stated. The phys. properties of fusain, its fibrous needle-like structure, sp. gr. 1.53 to 1.98, and ease of ignition are given, also the chem. properties and a table of distn. data. Chem. analyses for 21 samples of fusain and of the coals from which it is obtained are tabulated. The practical significance of fusain in coal is discussed; it has no coking power and relatively thin sheets of fusain may reduce the strength of a large proportion of the sized lumps of coke as marketed. Fusain rapidly absorbs O at low temps. and so may possibly increase the tendency of coal to ignite spontaneously. Fusain is the black smudgy material found on lumps of coal; it dries quickly and increases the dustiness of coal.

**Microscopical examination of fine-coal-cleaning products by the methods of relief-polishing.** ERICH STACH AND F. L. KÜHLWEIN. *Glückauf* 64, 841-5(1928).—The products obtained in the cleaning of fine coal have been examd. microscopically by embedding the material in Schneiderhohn's resin mixt. (Venetian turpentine 1, dammar resin 3, shellac 2 pts.), which is then cast into small blocks, ground and relief-polished. The characteristic appearance of the different constituents, vitrain, durain, fusain and shale, is illustrated by photomicrographs. They can be recognized at once and their resp. amts. detd.

**The phenol waste liquor problem.** MAX PRUSS. *Gas u. Wasserfach* 72, 791-801(1929); *Gas J.* 187, 404 7. The phenol content of waste liquor from coke-oven plants in the Emscher region of Germany is so great as seriously to affect fish life and the taste of the drinking water, when chlorinated, and has been especially damaging to the Rhine. Biological methods of purification were studied by the Emscher Commission and a new biological filter was devised that required a diln. of the raw liquor with only 1 vol. of water or treated effluent. This method destroys practically all of the phenol and thiocyanates, but is too expensive for the Emscher. A method of extg. the phenol (Pott-Hilgenstock) from the liquor with about 50% of benzene (based on liquor vol.) was then developed but the cost of recovery by distn. was excessive, so the phenol was recovered from the benzene ext. by treating with NaOH soln. For a large coke plant, the cost of producing crude phenol was about 5¢ per lb., or slightly less than the German selling price. The Am. Koppers Co. hot gas process is also reviewed, but the capital cost was higher than that for the Pott-Hilgenstock process. It was also noted that other constituents of the liquor were nearly as harmful as the phenols. Active C can also be used to remove phenols but the recovery of the phenols by steam distn. causes rapid disintegration of the C. Benzene extn. can be used to remove phenol from the C at least 100 times, but doubt was expressed as to the value of such an involved process.

**Naphthalene recovery and purification.** OTTO KREBS. *Teer u. Bitumen* 27, 254-8(1929).—A review and discussion of industrial practice.

**Study of the desulfurizing of ammonia liquors.** YVAN QUERRT. *J. usines gaz* 53,

373-86(1929).—A brief survey of previous work followed by a description of expts. where the  $H_2S$  of the  $NH_3$  liquor was oxidized to sulfate by air. Various salts were used as catalysts.  $NiSO_4$  was best. Co, Fe and Cu were of some value. Cr, Mn, Sn, Zn and Al had no activity. Activation of the catalyst by an elec. current, either a. c. or d. c., greatly increased the efficiency of oxidation, particularly with Fe and Mn. Com.-scale equipment with Fe electrodes and Fe catalyst is described. W. J. M.

Notes on refining benzenes by treatment with sulfuric acid. W. H. HOFFERT. *Gas Eng.* 46, 161-3(1929).—The 6th report of the Benzole Research Committee for 1928 is divided into 4 parts: (1) resin forming in benzenes, (2) comparative absorptive efficiencies of wash oils for  $C_6H_6$  recovery, (3) reduction of sp. gr. and vol. to  $60^\circ F$  and (4) notes on refining benzenes by treatment with  $H_2SO_4$ . E. I. S.

Calculation of thermal capacity of combustible gases. W. C. BUELL, JR. *Fuels and Furnaces* 7, 1049-52(1929).—A discussion of the construction and use of curves for a simplified calcn. of thermal capacity of combustible gases. T. P. KELLER

Operating costs for continuous heating with gas. KAISER. *Gas u. Wasserfach* 72, 725-8(1929).—A comparison of operating costs for continuous heating with gas with other fuels and central heating. R. W. RYAN

Interpretation of stack-gas analysis. II. G. E. SALKVIST. *Blust Furnace and Steel Plant* 17, 1226-9(1929); cf. C. A. 23, 4555.—The method of detg. the efficiency of combustion from analysis of fuel and stack gas. C. L. READ

Proper flue-gas conduits for gas fires. GÜLICH. *Gas u. Wasserfach* 72, 761 6(1929).—Gas fires and gas-using equipment are blamed for many accidents really due to defective flues or chimneys. Illustrations and examples of faulty installations are given. R. W. RYAN

Elimination of sulfur compounds from flue gases. J. ARTHUR REAVELL. *Chem. Age* (London) 21, 103(1929).—Washing flue gases in a chamber which reduces their velocity to below that in the flues, with ample supplies of water furnished by non-plugging, rotary sprayers will remove 90-95% of the S compds. Records show years of operation at 97.5% removal. Unless eliminators are used entrained water is carried out the stack. E. M. SYMMES

Gas oil value and supply. HUGH E. FERGUSON. *Gas Age-Record* 64, 235-6, 241-4(1929).—Specifications and proposed standard grades of carbureting oils are discussed. LESLIE B. BRAGG

Observations during the control and working of horizontal retorts. G. PERCIVAL. *Gas Eng.* 46, 89-92(1929).—Details of retort arrangement and operation at the plant of H. M. Fuel Research Station, East Greenwich, Eng. E. I. S.

British make practical test of MacLaurin process. A. C. BLACKALL. *Eng. & Finance* 21, 84-5, 96(1929).—A short description of the MacLaurin retort and a partial report of a test on a retort at the Dalmarneok Gasworks of the Glasgow Corp. carried out by the Dept. of Scientific and Industrial Research. LESLIE B. BRAGG

Refractories for gas retorts. FRED A. HARVEY. *Am. Refractories Inst., Tech. Bull.* No. 29, 14 pp(1929).—An analysis of the service requirements of coal gas bench refractories by means of the "Utility of Refractories" chart. M. A. EDDY

Gas producers. F. E. LEAHY. *Iron and Steel Eng.* 6, 451-2(1929).—The status of gas-producer development is outlined and a description is given of the producer in operation for 2 years in the seamless tube dept. of the Youngstown Sheet and Tube Co. For high rates of gasification, selection of proper coal is very important. E. I. S.

Reactions in the gas producer. W. P. RYAN. *Fuels and Furnaces* 7, 1037-8(1929).—A detailed discussion of the reactions occurring in a gas producer, with particular reference to air-steam ratio and fuel-bed thickness. T. P. K.

Suction gas producers for motor vehicles. J. AUCLAIR. *Trans. Fuel Conference, World Power Conference, London, 1928* 2, 854-77(1929).—An engine designed for gasoline will lose more than 30% of its h. p. efficiency when adapted for gaseous fuels. The price of fuel must be 40% that of gasoline to make competition possible. Progress in gas generation has led to great simplification by eliminating steam injection and air preheating. Producers for burning charcoal with downward combustion and fabric gas filtration are being used. The difficulties of combustion in the producer under max., min. and zero output of the engine are discussed together with the phys. nature and condition of the combustible and the qualities of a standard synthetic fuel. ALDEN H. EMERY

The purification of brown-coal tar of alcoholic substances and the recovery of Frosol in the patented continuous alcohol wash. OTTO KREBS. *Teer u. Binnman* 27, 273-7(1929).—Great economy has been effected, in certain plants, by using alc., instead of caustic soda, for the removal of creosote from the paraffin oil fraction. The alc.

ext. contains also the resinous and other unsatd. substances and so is a new material to which the trade name Fresol has been given. It has proved a valuable article of commerce, covering completely the cost of the process as a method of tar purification. The app. and process are described and discussed.

**Tar and bitumen from the colloid-chemical viewpoint.** H. GROHN. *Teer u. Bitumen* 27, 365-8(1929); cf. C. A. 23, 4800.—A review.

**Separation of tar from producer gas.** R. W. MILLER. *Blast Furnace and Steel Plant* 17, 1172-3(1929).—Description of methods employed abroad for the cleaning of gas to eliminate the burning out of gas mains and to recover the tar products.

**Coke research.** R. A. MOTT. *Colliery Guardian* 138, 2505-8(1929).—Work of the Midland Coke Research Comm. shows a rational basis for the use of the *shatter test* to assess the hardness of different cokes by the use of the 2 in., 1½ in. and 1 in. shatter indices.

**Constitution of low-temperature tar.** *Repts. Imp. Fuel Research Inst. Japan* No. 7, 54 pp.(1929).—This rept. includes 4 papers: **Constitution of gas benzene obtained from low-temperature gas.** YOSHISADA BAN. See C. A. 22, 4231. **Constitution of neutral oil in low-temperature tar.** K. KURIHARA. Neutral oil was fractionated into 2 parts: (I) distd. up to 200° and (II) above 200°. I contains toluene, *o*-, *m*- and *p*-xylenes and a substance resembling 1,3-dimethyl-5-ethylbenzene. II contains naphthalene,  $\alpha$ -methyl-naphthalene, dimethylnaphthalene, anthracene, and methylanthracene. **Action of sulfuric acid on neutral oil of low-temperature tar.** K. KURIHARA.—H<sub>2</sub>SO<sub>4</sub> (concn. is up to 90%) acts upon unsatd. compds; it acts upon aromatic compds as it increases its concn. and its action is almost completed at 95% concn. **New method of low-temperature tar distillation.** ISAMI ARAKAWA.—Two special methods of distn of low-temp. tar are described: (I) acid clay is added to low-temp. tar to decomp. unsatd. compds. and (II) low-temp. tar is treated with dil. H<sub>2</sub>SO<sub>4</sub> and a metal such as Zn is added to sat. unsatd. compds. Distn of low-temp. tar by the above methods gave better yield and better quality.

**Recent research on the production and utilization of coke.** II. W. T. K. BRAUNHOLTZ. *Gas World* 91, Coking Sect. 78-83(1929); cf. C. A. 23, 4556.—Expts. are made in full-scale ovens of various types and with various coals showing the influence of various carbonization conditions on the coke as indicated by shatter tests, sp. gr. and porosities. The conditions covered are method of charging, width of oven, carbonizing time, position of coke in oven, "soaking" in oven after completed carbonization and blending of Durham coking coals with anthracite duff. The data are insufficient for general conclusions. Other articles included are comparisons of cokes made from identical coals in tins and full-size oven charges, behavior of different cokes in full-size cupolas, and lab. combustibility tests. From the last it is concluded that an increase in FeO<sub>2</sub> materially increases the rate of consumption of the coke under a given air blast, and tends simultaneously to lower the temp. produced in the combustion zone. Removal of Fe and alkalis from coke by acid extn. markedly diminishes its rate of consumption in the lab. combustibility app. Less total ash in coke, from a given coal, washed to different degrees of cleanness, tends to reduce the rate of C consumption under the test conditions, probably because of the smaller proportion of catalytic material. Decreasing the size of the coke results in an increase in the temp. of the combustion zone and an increased C consumption. Also, the max. temp. in the combustion zone is obtained lower in the fuel bed with small coke than with large.

**The reactivity of coke.** Extracts from Fuel Research Board Tech. Paper No. 22. I. H. JONES, J. G. KING and F. S. SINNATT. *Gas World* 91, Coking Sect. 84-7(1929).—CO<sub>2</sub> reactivity tests were made on a large variety of metallurgical cokes for the purpose of ascertaining whether any relationship exists between the reactivity of a coke and its behavior in the blast furnace. A broad correlation is found with the phys. strength, as indicated by the shatter test, which, however, cannot be extended to particular cases. Data are also given on the influence of carbonization conditions and inorg. constituents.

**The economy of various methods of coke-oven heating.** ERNST WEISE. *Z. oesterr. Ver. Gas Wasserfach.* 60, 142-50(1929).—See C. A. 23, 2019.

**The design of the modern coke-oven.** G. E. FOXWELL. *Gas Eng.* 46, 143-5(1929).—Review of development and general tendencies in coke-oven design indicates increase in capacity of ovens, adoption of ovens operating with small pressure differences, and general adoption of combination ovens.

**Studies on coke and charcoal.** YOSHIKIYO OSHIMA AND YOSHITANI FUKUDA. *J. Soc. Chem. Ind. Japan* 31, 1222-43(1928); Suppl. Binding 31, 288-90B(1928).—

O. and F. proposed to classify porosity into total porosity, open-pore porosity and closed-pore porosity. The total porosity is given from true and apparent specific gravities; open porosity is given by an air expansion porosimeter designed by O. and F.; closed porosity is given by the difference of the two. The results obtained with several kinds of coke show the amt. of closed pore is small (2-5%), while the open-pore vol. is usually between 40 and 70%, which is evidence of a remarkable continuity of porous structure. Assuming that the coke pores are the remnants of the path of gaseous products during carbonization and consist of a bundle of capillary tubes, O. and F. derived an equation of flow of liquid in the capillary bundle. The coke pores practically met the theoretical requirements. The effect of structure on the reactivity of coke toward  $\text{CO}_2$  was studied. The high-temp. coke showed considerable increase of reactivity by pulverizing, which may be due to the increase of the edges and corners of the min. C particles and consequently to the development of the unsatd. valency force of C atoms and mois. situated at the corners and edges. The low-temp coke, which consisted chiefly of so-called amorphous C, displays no such increase in reactivity by pulverizing. Therefore, the microstructure of coke is more important to the reactivity than macrostructure. The structure of charcoal was examd. by photomicrography. The distribution of the pores of charcoal is just the same as that of original wood, and the cracks or fissures correspond to the pith ray of the original wood. The max. temp. of carbonization exerts a determinative influence upon the starting temp. of reaction of coke and charcoal. Powder methods of x-ray analysis showed that the modification of C of charcoal called "Sirozumi" (high-temp. charcoal) was very much like that of high-temp. coke. This "Sirozumi" is much more reactive than coke. This suggested structure plays an important part in the reactivity. S OKA

Synopsis of waste purification from coke plants and related industries (REICH) 14. Coordination between blast furnaces, coke ovens and Martin furnaces in a metallurgical works (BERTHELOT) 9. Gas production of the treatment plant at Stuttgart (MATER, SOHLER) 14. Time of reaction and apparatus construction [combustion time of common fuels] (ALLNER) 1. Refractories service conditions in furnaces burning anthracite on traveling grate stokers (SHERMAN, *et al*) 19. Determination of the permeability of refractory materials to gases (KANZ) 19. Apparatus for use as a gas-producer ore-roasting furnace (Brit. pat. 305,883) 9. Apparatus for working up coal (Ger. pat. 480,481) 1.

WYNNE, THOMAS N.: **Facts on Indiana Coal.** Indianapolis: W. K. Stewart Co

**Powdered fuel.** WALTHER & CIE A.-G., WILHELM OTTE and MAX BIRKNER. Ger. 480,855, April 27, 1924. Addn. to 443,111. Powd. fuel is prepd. from distd coal by milling. The app. is described. Cf. C A 23, 2020.

**Machine for pulverizing and delivering solid fuel.** SOC ANON. POUR L'UTILISATION DES COMBUSTIBLES. Ger. 479,585, Feb. 16, 1924. Details of construction are given.

**Apparatus for mixing liquid fuels.** PAUL NEUNDORF. Ger. 480,323, Aug. 25, 1927. App. for mixing liquid fuels in desired proportions is described.

**Briquetting fuel.** KOMMANDITGES EMANUEL FRIEDLAENDER & Co. Ger. 479,824, Nov. 28, 1926. A binding medium for fuel briquets is made from burned chalk and  $\text{Mg SO}_4$  soln.

**Fuel containers.** RENÉ COURTIN. Ger. 479,887, June 11, 1927. Fuel containers, especially for aircraft, are given a protective coating of a mixt. of glycerol and carbohydrate such as glucose.

**Destructive hydrogenation.** C. H. LANDER, F. S. SINNATT and J. G. KING. Brit. 306,564, Sept. 17, 1927. Prior to destructive hydrogenation, coal is treated to remove part of its content of fusain or durain, as by crushing and sepg. the fines, and hand picking. The caking properties of the coal may be modified by a preliminary hydrogenation as described in Brit. 301,720 (C. A. 23, 4328), by preheating in the absence of air to 100-350°, by heating in the presence of air, O, steam, hydrocarbons or inert gases under pressure to 300°, by exposure to air or O for long periods or by treating with various oxidizing reagents.

**Distilling solid carbonaceous materials.** D. M. RAMSAY. Brit. 306,714, Nov. 11, 1927. Materials such as coal, shale, lignite or peat are distd. by contact with superheated steam and under a constant vacuum in an app. provided with feeding and discharge elevators in water-sealed barometric ducts. Various details of the app are described.

**Distilling solid carbonaceous materials in oil.** H. A. HUMPHREY AND IMPERIAL

**CHEMICAL INDUSTRIES, LTD.** Brit. 305,744, Nov. 30, 1927. Solid carbonaceous material is distd. in oil by causing the comminuted material to move through a body of oil so as to be subjected to progressively increasing temps. Superheated steam, H or a gas contg. H may be introduced at the hottest part of the oil so as to increase the yield of oil and to agitate the charge. Various details of app. and operation are described.

**Increasing furnace-plant combustion.** WILHELM BALLUFF. Ger. 481,495, Nov. 17, 1928. Atomized ozonized water is blown into the fire chamber.

**Agglomerates of coal or other fuels.** L. LIAIS. Brit. 306,085, Feb. 15, 1928. The powdered fuel is heated to 125–45° and poured as falling sheets which come into contact with falling sheets or jets of liquid pitch or the like to form a mixt. which may be led to a press. An arrangement of app. is described.

**Apparatus for washing coal.** P. WOLF. Brit. 306,169, Nov. 14, 1927. Structural features.

**Apparatus for washing coal.** R. NORGATE. Brit. 306,170, Nov. 14, 1927. Structural features.

**Centrifugal apparatus for drying coal mud.** ALFRED KITTNAR. Ger. 479,674, Feb. 4, 1928.

**Removing oil and fat impurities from a steam-heated coal-drying app.** LOTHAR WOLF and KARL KUNZE. Ger. 480,408, Feb. 11, 1928. Addn. to 478,637 (C. A. 23, 4803).

**Stand-pipe construction, etc., for retort coal distillation and gas-making apparatus.** WILLIAM M. CARR and THOMAS J. ASHLEY. U. S. 1,726,058, Aug. 27.

**Phenol.** EUGEN KARPATI and M. GEORG HÜBSCH. Swiss 132,312, Oct. 31, 1927. PhOH is obtained from the distn. products of coal by mixing them with a PhOH solvent which has been diluted with water, subjecting the whole to a high pressure at 100°, allowing to settle into two layers, and tapping off the aq. PhOH layer.

**Peat.** WILHELM CLEMENS. Ger. 479,953, July 6, 1926. The water-content of peat is diminished by adding an electrolyte to the diggings.

**Lignite briquets.** DEUTSCHE ERDÖL A.-G. Ger. 480,282, July 5, 1927. Addn. to 475,844. Lignite briquets are cooled by air currents and spraying with water.

**Cooler for lignite.** "EINTRACHT," BRAUNKOHLENWERKE UND BRIKETTFABRIKEN. Ger. 480,960, Oct. 5, 1928.

**Drier, especially for lignite (comprising plates and rotary stirrers).** DEUTSCHE ERDÖL A.-G. (Hermann Langewald, inventor). Ger. 480,147, Nov. 10, 1927.

**Gas.** OTTO MISCH. Ger. 480,751, July 17, 1925. A gasification process is described in which bituminous fuel is distd. in the upper half of a column partly by the sensible heat of water gas generated in the lower half of the column and partly by the heat derived from the combustion of some of the water gas in a heating chamber surrounding the column. The improvement consists in supplying compressed air to the heating chamber so that a temp. of above 700° is attained in the upper half of the column. Tar or oil may be sprayed in at the hottest part of the column to enrich the distn. products.

**Gas.** SOUTH METROPOLITAN GAS CO., E. V. EVANS and H. STANIER. Brit. 306,435, Nov. 19, 1927. Hydrocarbon vapors from low-temp. distn. of coal are heated with H to produce gases of high calorific value and hydrocarbons of lower b. p. than the original hydrocarbons. Water gas (or gas obtained by the high-temp. distn. of the coke obtained, with or without steaming, mixed with a gas contg. H) is passed through coal heated to 600–650° and the mixt. of gases and vapors is passed to a cracking chamber, which may contain a catalyst, heated to about 750°, without intermediate cooling, and the treated gases are thence passed through a condenser, scrubber and purifying box. An arrangement of app. is described. Cf. C. A. 22, 313.

**Purification of gas mixtures.** METALLGESELLSCHAFT A.-G. (Friedrich P. Kerschbaum, inventor). Ger. 481,127, June 29, 1923. Gas mixts. are purified by the adsorption of one or more constituents by a solid adsorption agent. Thus a mixt. of the gases from the distn. of coal is passed over active C to remove the light oil vapor.

**Removing soot from gases.** C. DANTSIZEN (to British Thomson-Houston Co., Ltd.). Brit. 306,043, Feb. 14, 1928. A current of water is used for removing soot from gases, the soot is sepd. from the water by flotation, and the water is used again. Atomized oil is also supplied, in an arrangement of app. which is described.

**Gas-producer operation.** C. CARPENTER and SOUTH METROPOLITAN GAS CO. Brit. 305,764, Dec. 10, 1927. Waste of fuel during clinkering is minimized by reducing the temp. of the fuel bed by means of a current of gas which is either inert or acts endothermically on the fuel. Structural features of a producer are described.

**Gas producer and furnace construction.** DRAKES, LTD. and J. W. DRAKE. Brit. 305,695, Nov. 9, 1927.

**Gas producer with rotary fire chamber.** GES. FÜR INDUSTRIE-OFFENBAU M. B. H. Ger. 480,612, Jan. 23, 1926. Addn. to 479,033 (C. A. 23, 4804). Details.

**Gas-producing furnace.** EDUARD RIEPE. Ger. 481,267, Sept. 15, 1927. Details of construction are given.

**Gas-producing plant.** PAUL DVORKOVITZ. Ger. 481,174, Aug. 21, 1924. Plant for producing gas from finely divided carbon, coke or C-contg. material and steam is described.

**Plant for producing fuel gas and vapor.** SIEMENS-SCHUCKERTWERKE A.-G. (Wilhelm Gunz, inventor). Ger. 480,522, Feb. 17, 1927. Details of arrangement are described.

**Plant for making power gas from steam, air and fuel.** RAPHAEL MALBAY. Ger. 479,868, Oct. 23, 1924. Details of arrangement.

**Plant for the production of gas from coal dust.** GÉZA SZIKLA and ARTHUR ROZINEK. Ger. 479,793, July 10, 1926. Addn. to 452,015. Details of arrangement are given.

**Gases rich in ethylene from tar oils.** HERMANN SUIDA (to I. G. Farbenind. A.-G.). U. S. 1,726,048, Aug. 27. Tar oils of high b. p. are subjected to destructive distn. in the presence of steam at 800–900°.

**Water gas.** RICHARD NÜBLING and ROBERT MEZGER. Ger. 480,489, Nov. 11, 1926. An app. for producing water gas, comprises one or more towers filled with heated coal through which steam is blown.

**Water gas from pulverized fuel.** BAMAGMEGUIN A.-G. and O. HELLER. Brit. 306,143, Feb. 17, 1928. Details of construction and operation of a producer are described.

**Carbureted water-gas apparatus.** ROBERT M. SEARLE. U. S. 1,726,317, Aug. 27. Structural features.

**Apparatus for automatic control of water-gas plants.** W. A. BARR (to Western Gas Construction Co.). Brit. 306,537, Feb. 23, 1928. Numerous structural features are described.

**Liquid seals for gas holders.** MASCHINENFABRIK AUGSBURG-NÜRNBERG A.-G. Brit. 306,310, March 31, 1928. Felt sheets dip into the liquid in the seal. Various structural features are described.

**Distilling tarry materials.** S. P. MILLER (to Barrett Co.). Brit. 306,003, Feb. 15, 1928. Gases from the uptake pipes of a plurality of coal-distn. ovens or retorts are collected and passed at high temp. through a common collecting main through which thin tar is continuously circulated from a storage tank, to effect partial distn. of the tar. An arrangement of app. and various details of procedure are described. Cf. C. A. 23, 2278.

**Destructive distillation of tar sands or carbonaceous materials.** H. NIELSEN and B. LAING. Brit. 306,429, Oct. 19, 1927. Oil vapors evolved are subjected to fractional condensation in sep. scrubbers at successively lower temps. by a liquid medium. The scrubbers contain disks rotating in opposite directions; various other structural details and details of procedure are described.

**Tar heater.** CASPAR TOPHINKE. Ger. 480,226, Apr. 13, 1926.

**Hard low-temperature coke.** E. ROSER. Brit. 306,092, Feb. 15, 1928. The dry fuel such as dust coal or slime coal is mixed with wet bituminous fuel, pressed and distd. at about 600–700°, forming large pieces of high volatile content.

**Coking plant.** C. OTTO & Co. G. M. B. H. Ger. 480,746, Feb. 5, 1925. A method of regulating the height of the gas collecting part of a multiple-oven coking plant is described.

**Loading device for a coke oven.** C. OTTO & Co. G. M. B. H. Ger. 480,763, Sept. 30, 1926.

**Coke oven.** MAX KELTING. U. S. 1,726,494, Aug. 27.

**Ascension pipe, main and valve construction for coke-oven plants.** LOUIS WILPUTTE (to Wilputte Coke-Oven Corp.). U. S. 1,726,092, Aug. 27. A jet device is provided for supplying washing liquor to the cut-off valve.

**Device for dry-cooling coke.** FIRMA HEINRICH KOPPERS. Ger. 479,579, Dec. 11, 1923. The coke is shot into a stepped cooling tower with tubes for the cooling gas in the steps.

**Drum for dry-cooling coke.** J. POMLJO A.-G. Ger. 479,729, July 25, 1926. Details of construction are given.

**Device for automatically quenching glowing coals.** C. OTTO & Co. G. M. B. H. Ger. 480,429, May 18, 1927. Details of arrangement are given.

**Coke quenching.** KARL SASSENHOFF. Ger. 480,865, Feb. 8, 1927.

## 22—PETROLEUM, LUBRICANTS, ASPHALT AND WOOD PRODUCTS

W. F. FARAGHER

**Thermochemical investigations of petroleum.** II and III. RYONOSUKE ABE. *J. Soc. Chem. Ind. Japan* 32, 152-7(1929); Suppl. Binding 32, 54B(1929).—The heating curve of petroleum was taken under atm. pressure by means of an improved app., the difference of temp. of the sample and the neutral substance showing whether there is an exothermic or endothermic reaction. With the oil, Socony Service No. 4, exothermic changes were observed at about 50°, 220°, 375° and 440°, and endothermic reactions at about 128°, 307° and 405°. I value,  $n$  and sp. gr. of distillates and residue were measured. The exothermic point at 220° corresponds to a thermochemical change, probably a polymerization. At 300° the exothermic thermal decompn. commenced and became rapid at about 400°. The decompn. products consisted mainly of light oil and higher unsatd. hydrocarbons. The former distd. V. **Thermal change of liquid paraffin.** *Ibid* 217-9; 63B—The heating curve was taken. At about 180° a slow exothermic reaction begins, probably a polymerization of unsatd. hydrocarbons. From 300°, cracking becomes rapid. R. K.

**Synthesis of petroleum hydrocarbons from hydrogen and carbon monoxide at ordinary pressure.** KIUCHI KOBAYASHI AND KENICHI YAMAMOTO. *J. Soc. Chem. Ind. Japan* 32, 54(1929); Suppl. Binding 32, 23B(1929).—Expts. are described in which petroleum hydrocarbons were obtained by passing a mixt. of 3 vols. of  $H_2$  and 2 vols. of CO over a catalyst consisting of Co, Cu and Mn at about 300° under atm. pressure. S. OKA

**Scientific and technical study of oil sources in Austria.** JOSEF PRELEUTNER AND J. FLEISCHMANN. *Montan. Rundschau* 20, 661-76(1929).—A general article.

**Standardization of crude oil products in Russia.** M. M. DAVIDOV. *Neftyanoe Khozyaistvo* 16, 377-87(1929).—Standards accepted on Dec. 1, 1928 by the Committee on Standardization of the Supreme Economic Council are given for spindle oils, machine oils, cylinder oils and gasolines. A. A. BOEHLINGK

**Cause of failures in sulfur determinations in mineral oils.** H. D. WATERMAN AND M. J. VAN TUSSEN BROEK. *Erdöl u. Teer* 23, 424-5(1929).—Polemic against Fischer and Hess (*C. A.* 23, 2281). Cf. *C. A.* 22, 2528. A. W. FRANCIS

**Presence of pyridine bases in the tar oil from Russian bituminous shales.** JAKOB DODONOV AND EKATERINA SOSHESTVENSKAIA. *Ber.* 62B, 1348-52(1929).—It had been found that the tar oil from the Russian bituminous shales from the Kashpirsky mines in the middle Volga region consists chiefly of thiophene and its derivs., with only very small quantities of  $C_6H_6$  and PhMe. In order to identify any other possible heterocyclic substances, chiefly pyridine bases, large quantities of the oil were first roughly fractionated and the fractions below 250° were treated separately with  $H_2SO_4$  and the bases liberated from the acid soln. as usual with KOH; the yield of crude product was somewhat more than 1% of the original oil. By repeated fractionation and pptn. as the Hg-Cl<sub>2</sub> compds., pyridine,  $\alpha$ - and  $\beta$ -picoline, and 2,4-, 2,5- and 2,6-lutidine were identified with certainty. C. A. R.

**Anthracene from oil tar.** I. BESPOLOV. *Azerbejdjanskoe Neftyanoe Khozyaistvo* 1929, No. 5, 72-8.—Crude oil tar was stripped of fractions boiling below 280° and the remaining pitch further distd. until crystals appeared in the condenser. The fraction distd. was repeatedly refractionated, the final temp. being 370°. Up to 0.6% of anthracene was obtained by the pyrogenetic decompn. of a tar of 1.062 sp. gr. which had a fraction of 30.8% distg. below, and 40.2% above, 300°. Anthracene crystd. out partly at room temp., partly at -10°. Repeated refractionation produced more anthracene with each repetition, but the amt. of pure anthracene obtained through freezing and recrystn. from toluene and a light-oil cut (120-150°) decreased in proportion. An 80% pure anthracene was finally obtained from the xylene fraction of the light oil. The green anthracene oils obtained besides anthracene meet part of the expense and make the process com.; the yield of anthracene depends greatly upon the method of running the coking retorts, which also produce coke for electrotechnical purposes. A. A. B.

**Shale—some new reactions.** F. J. POPHAM. *Ind. Chemist* 5, 269-72(1929).—A discussion of the character of the org. matter in oil shale is followed by a detailed account of expts. carried out on Estonian shale. The ground shale was heated under pressure with various reagents in an autoclave of 3 l. capacity. Conclusions: The org. matter

in the shale can be decompd. to liquid hydrocarbons by heat and pressure, giving a higher yield of low-b.-p. hydrocarbons than by ordinary retorting. Similar treatment with superheated steam in the absence of catalysts is ineffective. The presence of  $H_2$  is a distinct advantage. The presence of a cracking oil (largely assisted by the inorg. matter in the shale) is a distinct advantage. For this purpose the heavier portions of the oil produced by the process can be advantageously used. The shale should be heated as rapidly as possible (preferably ground in a liquid medium). The products should be removed rapidly from the reaction, or if this is not possible, the retarding effect of superheated steam may be utilized to advantage.

E. G. R. ARDAGH

**The crystal form of paraffin.** YOSHIO TANAKA. *Repts. Imp. Fuel Research Inst. Japan* No. 8 (1929).—The samples (crude and purified) were dissolved in org. solvents and the effect of concn. of paraffin, velocity of cooling, and viscosity on crystal formation studied. The fundamental form of the paraffin crystal is a rhombic plate, having angles of 110 and 70°. The plate and the needle form are interchangeable. The plate crystal is formed at low viscosity while high viscosity favors the needle crystal. The presence of isoparaffin and pitch-like materials disturbs the crystn. of paraffin from low-temp. tar. The velocity of the growth of the crystal nucleus can be expressed by the equation

$$V = \frac{L}{\eta}(c - 1),$$
 where  $L$  is a constant depending upon the amt. of impurity, rate of cooling, and the method of stirring,  $\eta$  the abs. viscosity of the medium,  $c$  the concn. of paraffin at the time of crystn., and  $l$  the soly.

F. I. NAKAMURA

**The influence of cylinder design on pinking.** G. B. MAXWELL AND R. V. WHEELER. *J. Inst. Petroleum Tech.* 15, 415-27(1929).

E. J. C.

**Weighing gasoline samples for combustion in the oxygen bomb.** L. R. RAYMOND. *Chemist Analyst* 18, 7(1929).—The use of gelatin capsules is advocated.

W. T. H.

**Gasoline engines and their fuels.** H. R. RICARDO AND O. THORNYCROFT. *Trans. Fuel Conference, World Power Conference, London 1928*, III, 602-84(1929).—A discussion of engine efficiency and power, factors limiting compression ratios, and detonation characteristics of fuels.

ALDEN H. EMERY

**Effect of antiknock materials on the condenser discharge spark energy required to ignite the mixture of air with the vapor of ethyl ether.** YUZABURO NAGAI. *J. Soc. Chem. Ind. Japan* 31, 503-7(1928); Suppl. Binding 31, 123-4B(1928); cf. *C. A.* 23, 1500.—N. investigated the effect of  $Et_3Se$ ,  $Me_4Pb$  and  $Me_4Sn$  on the spark energy required to ignite a mixt. of 4.25% of  $Et_2O$  and 95.75% of air by a condenser discharge. The min. igniting capacity at the condenser at 100 v. increased with increasing content of antiknock materials, e. g., 2.0 microfarads in the absence of antiknock material, 3.1 in the presence of 1% of  $Me_4Sn$  and 4.0 in the presence of 1.5% of  $Me_4Sn$ .

S. OKA

**The use of heavy oils in internal-combustion engines.** E. HUBENDICK. *Trans. Fuel Conference, World Power Conference, London 1928*, III, 749-62(1929).—H. gives detailed data on a test using heavy oil in an internal-combustion engine.

A. H. E.

**Fuel oil for heavy-oil engines.** HAROLD MOORE. *Trans. Fuel Conference, World Power Conference, London 1928*, III, 685-99(1929).—The suitability of various oils for use in present-day internal-combustion engines and the relation of lab. analysis to the practical problem are discussed.

ALDEN H. EMERY

**Discharge-stability tests on insulating oils.** W. ZIMMERMANN. *Petroleum Z.* 24, 1213-30(1928).—Tests have been carried out on the oils by means of the Siemens Schukert-Werke app., which differs from previously described app. in that a fixed potential difference with a variable electrode gap is used. By including a circuit-breaker in the low-tension circuit of the 110-220/30,000 v. transformer, immediate cessation of the discharge is effected following each individual test, thus protecting both the oil and the electrodes; otherwise, a prolonged discharge after the breakdown potential gradient is reached causes a lowering of the discharge stability ("breakdown voltage"). Individual figures for the discharge stability obtained from successive discharges using the same sample of oil show great variation. The min. value is usually given by one of the earlier of a series of discharges, often by the first, but may be given by even the tenth. When the first discharge gives the lowest value, the result is not necessarily due to incomplete cleansing of the electrodes. The min. value may vary by as much as 50% below the mean of a series of detns.; it is questionable whether such a mean value alone characterizes an oil. Exchange of moisture between the oil sample and the atm. has a great influence on the discharge stability. Careful sampling of the oil is necessary since different samples of oil from the same consignment show great variation in discharge stability. Used oils may be brought up to their original insulating value by refining by means of floridin alone or with acid.

B. C. A.



The determination of the total sulfur in transformer oil. MASAKICHI MIZUTA. *J. Soc. Chem. Ind. Japan* 32, 320-5(1929); Suppl. Binding 32, 97B(1929).—Five methods commonly recommended were compared. M. recommended 2 methods as satisfactory; namely, the Waters methods (*C. A.* 15, 594) and the method of oxidizing the oil in a calorimeter bomb. The Eschka method gave somewhat low results. The method of oxidizing with  $\text{NH}_4\text{NO}_3$  and MgO and of oxidizing with fuming  $\text{HNO}_3$  and MgO gave too low results.

Synchronous converter lubrication. F. W. BRAUND. *Elec. Ry. J.* 73, 854(1929).—The installation of automatic control has introduced the necessity of employment of an oil with a minimum viscosity change between  $-18^\circ$  and  $71^\circ$ . The oil chosen is a treated product contg. a portion of edible tallow, and functioning in extreme temps. with a viscosity change of but 2%. A table shows: room temp., bearing temp. with ordinary oil, and with the treated oil. Differences in bearing temp. favoring the latter oil are  $8-15^\circ$ .

Measurement of the lubricating property of oil in bearings. V. VIEWEG and J. KLUGE. *Arch. Eisenhüttenw.* 2, 805-11(1929).

Spanish essence of turpentine from *Pinus halepensis* (Aleppo pine). MARIANO T. LACRUZ. *Bull. inst. pin.* 1929, 97-9(In Spanish).—Spanish essence of turpentine from *Pinus halepensis* has the same characteristics as that obtained from the same tree in other Mediterranean regions, and contains almost wholly *d*- $\alpha$ -pinene. E. M. S.

Spanish essence of turpentine from *Pinus pinea* (pignon pine). MARIANO T. LACRUZ. *Bull. inst. pin.* 1929, 99-101(In Spanish).—Redn. of characteristics of essence of turpentine from *Pinus pinea* shows that in the heads of distn. there is a constituent of lower rotary power than limonene, namely pinene, to the extent of 16%. It is probable that previous results obtained by the Institut du Pin were not on pure materials. E. M. SYMMES

Production of S oil (CHEMNITIUS) 17. Tar-bitumen mixtures for surfaces of streets (VON LEMBERKE) 20. Experiments in viscometry (BANDTE) 2. Comparison of the conditions of occurrence of bituminous coal and petroleum (TAYLOR) 8. Decolorizing oils (Ger. pat. 480,345) 27. Sulfonating oils (Ger. pat. 480,157) 13.

FILHOL, J., AND BIIHOREAU, CH. *Le pétrole*. Paris: Editions pittoresques. 208 pp. F. 30.

SCHWARZ, ROBERT. *Petroleum Vademecum*. International Petroleum Tables. 6th ed. enlarged. Berlin and Vienna: Verlag für Fachliteratur. 564 pp. \$5.

Apparatus for sampling crude-oil products. YA. I. PELEVIN. Russ. 2271, Aug. 17, 1925.

Treating emulsified hydrocarbon oils. ELMER H. PAYNE and SAMUEL A. MONTGOMERY (to Standard Oil Co. of Ind.) U. S. 1,726,309, Aug. 27. Sepn. of emulsified oils is effected by treatment with a spent  $\text{NaOH}$  soln. previously used in oil refinery operations for washing hydrocarbon oils or oil refinery gases and heating (suitably at a temp. of about  $65^\circ$ ) until stratification occurs. U. S. 1,726,310 specifies similar use of a spent alk. soln. derived from the neutralization of sour oils.

Destructive hydrogenation of oils. H. TERRISSE and L. DUFOUR. Brit. 305,981, Feb. 13, 1928. Oils such as gas oil, lamp oil, schist oil or brown-coal tar are converted into gasoline by heating at  $200-500^\circ$  under a pressure of 5-40 kg. per sq. cm. in the presence of  $\text{FeCl}_3$  and gases such as  $\text{H}$  or water gas. Desulfurization of the oils is simultaneously effected. Various details are given.

Cracking. E. K. KVITKO, V. S. KVITKO and K. S. SEMENOVA. Russ. 211, Nov. 15, 1924. Gasoline and other crude-oil products are obtained by preheating the raw material by hot residues and hot gasoline vapors, in special heat exchangers and finally in a special preheater, and passing it into tubular dephlegmators mounted on the domes of stills where it is cracked.

Apparatus for treating hydrocarbon oils with aluminum chloride and distilling them. GEORGE D. WHITE (to Texas Co.). U. S. 1,726,280, Aug. 27.

Refining oil and oil products. B. TICHININ. Russ. 31, Nov. 28, 1921. Crude oil and its products are treated cold with  $\text{S}_2\text{Cl}_2$ ; heavy oils are dild. with gasoline, etc., and these are then evapd. The sludge, which settles on the bottom, is sep'd. as usual and the oil washed to remove the dissolved impurities.

Purification of lubricating oil. THE DE LAVAL SEPARATOR CO. Ger. 479,866, Sept. 1, 1925. Oil from a machine is circulated back through a cooling app. in which it is brought to at least  $27^\circ$  to ppt. dissolved matter

**Distilling lubricating oils.** SUN OIL CO. Brit. 305,846, March 7, 1928. Lubricating oils of low C content, low org. acidity, good color and demulsibility, and high flash and fire tests are obtained by distg. lubricating stock from an asphalt-base oil, in a system closed against O, passing the stock through a series of vaporizers in which it is distributed over extended surfaces and brought into heat exchange with Hg vapors under conditions avoiding cracking and to obtain progressively higher b. p. fractions, and sep. distillates are subjected to reflux condensation and vacuum treatment to remove odor-producing gases. An app. is described.

**Apparatus for removing impurities from used lubricating oils by evaporation and filtration.** JOHN C. BRIEL. U. S. 1,725,845, Aug. 27. Structural features.

**Bituminous emulsions.** J. A. MONTGOMERIE. Brit. 305,716, Nov. 11, 1927. An aq. emulsion of artificial material of petroleum derivation such as Mexican asphalt is treated with a small quantity of Na laurate or similar salt to improve the wetting, spreading and penetrating power of the emulsion. Cf. C. A. 23, 4061.

**Acetate liquors from wood carbonization.** EDUARD LÖW (to Verein für chemische Industrie A.-G.). U. S. 1,726,401, Aug. 27. Gases from wood distn., contg. varying quantities of HOAc vapor, are divided into 2 streams; one stream is passed through hot liquid contg. a neutralizing agent such as Ca(OH)<sub>2</sub> in an absorption plant, and the other stream is passed through a condensation plant for recovering pyroligneous acid and the latter is used for keeping constant the acetate concn. in the absorption plant. App. is described.

## 23 CELLULOSE AND PAPER

CARLETON E. CURRAN

**The acetolysis of cotton cellulose.** CLAYTON C. SPENCER. *Cellulosechemie* 10, 61-73(1929).—In a study of the influence of temp., duration of acetolysis and H<sub>2</sub>SO<sub>4</sub> content of the reaction mixt. upon the yield of cellobiose octa-acetate (I) S. obtained a max. yield (46.5%) by treating 2 g. of cotton (98.6%  $\alpha$ -cellulose) with 2 cc. H<sub>2</sub>SO<sub>4</sub> and 8 cc. Ac<sub>2</sub>O and heating at 50.4° for 14 days. The products on 2 crystals from hot alc. varied in m. p. 227.5-8° and  $[\alpha]_D$  41-41.8. Curves and tables show the effect of the variations in the exptl. conditions upon the yield. Using the method in which Hess and Friese (cf. C. A. 21, 174) claim yields of 50% (of theoretical) of (I) S. records only 37% and under certain conditions he obtained a considerable quantity of glucose penta-acetate not reported by H. and F. C. W. SONDERM.

**Lignin and cellulose. X. The aromatic nature of lignin.** KARL FREUDENBERG, WALTER BELZ AND CHRISTIAN NIEMANN. *Ber.* 62B, 1554-61(1929); cf. C. A. 23, 3342.—The object of this work was to det. whether and to what extent the C<sub>6</sub>H<sub>5</sub> ring is present in lignin and whether its MeO group belongs to an aromatic or aliphatic system. A lignin prepd. from pine-wood meal by alternate treatment with boiling 1% H<sub>2</sub>SO<sub>4</sub> and Cu(O-NH<sub>2</sub>)<sub>2</sub> was used. Its MeO content was 17%, that of detectable methylenedioxy groups (HCHO) up to 1.4%. The lignin (1 g.) was allowed to stand at exactly 18° with 2 g. Br in 100 cc. of 10% HBr, and after 2, 24 and 48 hrs. was filtered in a closed app. under pressure and the Br was titrated back iodometrically. None of the lignin dissolved and special expts. showed that HBr alone does not act on it. The filtered solid was carefully washed, dried at 65° under 1-mm. pressure and analyzed. Parallel expts. were run on methyl lignin (I), dehydrodivanillin (II), polymerized coniferyl alc. (III), 5-bromovanillic acid (IV) and methylcellulose (V); the II and III remained practically unchanged. When the results with the other 3 compds. and lignin are plotted with the length of reaction of the Br as abscissas and with the loss in Me (in mols.), the amt. of Br (in atoms taken up by the substance and the total amt. of Br used up, resp., as ordinates, there are obtained in all cases curves entirely similar to each other in form (a steep rise within the first 2 hrs. followed by a negligible or very much slower rise during the next 46 hrs. and differing only in their height above the axis of abscissas. The picture, as a whole, is as follows: The main reaction is a substitution, RHH + Br<sub>2</sub> = RHBr + HBr, followed more slowly by a further substitution, RHBr + Br<sub>2</sub> = RBr<sub>2</sub> + HBr. The amt. of Br taken up by the substance, however, is less than 0.5 of the total Br used up; this is undoubtedly due to the initial side reaction which results in the loss of Me; it competes at first with the substitution reaction and rapidly comes to a standstill as soon as the first substitution reaction ends. It is very probable that the loss of MeO is connected with a quinone formation. The reactivity of the 4 compds. increases in the order I  $\rightarrow$  lignin  $\rightarrow$  III  $\rightarrow$  IV. With HI (d. 1.7) the following percentages of the MeO content of various substances are split off at 90° (unless otherwise stated) in the no. of min. given in

parentheses: lignin 56 (30), 93 (300); bromolignin 30 (20); I, 88 (45 at 100°); III, 70 (20); V, 92 (20); vanillin 60 (20), 74 (18 at 100°), 96 (48 at 100°); 3-methylglucose 96 (20); 6-methylgalactose 100 (20). These results indicate that the 17% of MeO in insolated lignin is present in a system of the vanillin type. After subtracting the identified O-contg. groups there remains for the basic hydrocarbon the formula  $(CH_{1.4})_x$ ; this also, as well as the high  $n$  (about 1.61) of lignin, speaks for the aromatic nature of lignin.

**Lignin. II. (Preliminary communication.)** R. O. HERZOG AND ARMIN HILLMER (with ERWIN PAERSCH AND ERICH HELLRIEGEL). *Ber.* 62B, 1600-2 (1929); cf. *C. A.* 21, 1407; preceding abstr.—Attention was called in the 1st paper to the similarity in the ultra-violet absorption spectra of lignin and of compds with coniferyl residues. In the uniting in nature of the structural units of lignin, atm. O may be assumed to play a material role and this is also probably true of the change (polymerization) which coniferyl alc. readily undergoes. In order to have as clear an example as possible of such changes the action of mol. O on isoeugenol (I) was studied. If a current of air or O is passed through I, best at a high temp., the viscosity increases, and from the ether soln. of the product petroleum ether ppts. a substance (II) different from vanillin, dehydrodivanillin, diisoeugenol and dehydrodiisoeugenol; although it was not obtained in cryst. form it could be purified to such an extent by repeated pptn. that its compn. could be detd. with some certainty (C 69.69, H 6.58, MeO 18.03-18.07%, mol. wt. in freezing PhOH 300.3-305.8);  $Ac_2O-H_2SO_4$  gave an *acetate* (also not cryst.) with C 67.78, H 6.00, MeO 15.17-15.21, Ac 21.82-22.07%. These results indicate that 2 mols. I combine with addn. of O. II in  $Et_2O$ , in cold or hot  $AcOH$  is not reduced by II and Pt black. The absorption curve in the ultra-violet has the typical form of the curves for I, coniferyl alc. and lignin (max at 273, min. at 257  $m\mu$ ). In solns. of equal % concn. of the (monomeric) I and (dimeric) II the depths of layers showing equal extinction are approx. as 1:2. The simplest interpretation is that in the combination of the 2 mols. of I one optically active (propenyl) group becomes inactivated (chemically satd.); the non-reducibility of the other "end" propenyl group is connected with the addn. of O to the complex. By specially mild treatment of rye straw (extrn. of the powd. and purified straw with 2% NaOH in MeOH at room temp. in the absence of light and air) and electro dialysis there was prepd. a lignin sol not only in alkali but also (colloidally) in  $H_2O$ ; its ultra-violet absorption spectrum was of entirely the same type as that of other lignin preps.; in neutral aq. soln. the max. and min. were shifted towards the red as compared with those of ligninsulfonic acids; the mol. wt. in resorcinol was very small (about 2 coniferyl residues); attempted reduction with Pt black as catalyst gave negative results.

**Study of the beating of nitrocellulose.** M. JUPEAU. *Mém. poudres* 23, 183-97 (1928).—A 350 g. Pb sphere supported by a thin steel wire was immersed in a nitrocellulose slurry in a beater of the Hollander type. The angle from the vertical, which the wire makes during the beating, is used in a viscosity formula, from which fineness curves are plotted. The curves vary with nitrocelluloses of different viscosities, because of variations in the rate at which they are reduced in fineness. The influence of size of charge and consistency is studied in relation to h. p. consumption.

**Wood. IV. Chemical composition of pulp woods from North Korea.** Y. UYEDA AND T. MORITA. *Cellulose Ind. (Tokyo)* 4, 233-4 (1928); cf. *C. A.* 22, 3775.—Analyses are given of "Ezomatsu" (*Picea jezoensis*), "Tōshirabe" (*Abies nephrolepsis*) and "Chōsenimomi" (*Abies holophylla*). These woods have a total cellulose content (by chlorination) of 50-51% on the wt. of air-dry wood (10% moisture), 90% of which is  $\alpha$ -cellulose.

**The thermal decomposition of the wood pulp from deciduous trees.** K. KOROTKOV. *Weiss-russ. staatl. Landwirtschaftsakademie* 1927, 3 pp. separate; *Chem. Zentr.* 1928, II, 34.—The lignin is obtained from wood pulp by sep. treatments with 1% HCl or 72%  $H_2SO_4$ . The former method gave higher yields of lignin. By dry distn. in a glass-lined retort at 360°, yields of MeOH as high as 50-65% were obtained. In addn. to about 0.5%  $AcOH$ , 100% increased yield of charcoal was obtained over what would normally be expected from the original wood. More MeOH was secured from lignin prepd. by decompn. with HCl rather than by  $H_2SO_4$ .

**Viscose. IV. The analysis of viscose.** I. FUKUSHIMA, Y. TAKEMATSU AND I. WATANABE. *Cellulose Ind. (Tokyo)* 3, 214-9; in English, 25; *Chem. Zentr.* 1928, II, 509.—Besides the detn. of NaOH,  $Na_2CO_3$ ,  $Na_2S$  and Na xanthogenate in ripened viscose,  $Na_2CS_3$  may be estd. in the presence of other alk. substances according to the reaction:  $Na_2CS_3 + I_2 = 2NaI + CS_2 + S$ . The methods outlined preclude the detn. of the variations in viscose during the ripening process.

**Viscose. XXII. Viscosity of viscose.** G. KITA, S. IWASAKI, T. NAKASHIMA,

S. MASUDA AND K. MATSUYAMA. *Cellulose Ind.* (Tokyo) 5, 59-71(1929); cf. *C. A.* 23, 4064, 4570.—It is generally acknowledged that the viscosity of viscose soln. falls during the first stages of ripening, reaches a min., rises very slowly, and, shortly before coagulation, suddenly rises quickly. The ripening process was studied for different cellulose materials by means of the Ostwald viscometer and falling-sphere methods, and the fiber-forming capacity of the viscose was also measured. The change of viscosity as found by the falling-sphere method is always the same, whereas that found by means of the Ostwald viscometer varies with the kind of cellulose used. The change in the fiber-forming capacity follows the viscosity as measured by the former method, and Schuster's theory (*C. A.* 20, 2077) as to the fall of viscosity during ripening is not upheld; it is thought more likely to be due to the increased dispersion produced by the soln. of the cellulose xanthate. Conclusion: The change of viscosity is due to 2 factors, viz., to dispersion and structure formation; the former effect is completed during the first days of ripening. This would explain the differences obtained when the viscosity is measured in the above 2 ways. Measurements of the viscosity of viscose under a range of pressures in the Ostwald viscometer have been carried out, and the results may be tolerably well expressed by means of the Ostwald equation. Results of fiber thickness measurements for different pressures also show good agreement with this equation. It is deduced that fiber thickness is not directly proportional to the pressure—which is actually the case. B. C. A.

The Erkensator. B. KOLB. *Chem. App.* 16, 107(1929).—A new purification centrifuge for the paper industry is described. It does not use a sieve.

M. C. ROGERS

Electrical insulating papers for the manufacture of power cables (RILEY, SCOTT) 13. The development of the saccharification of cellulose and the production of wood spirits (BAUSCH) 16. The waste from paper mills in Pommern (MÖLLER) 14. Uniting rubber and cellulose derivatives (Brit. pat. 305,745) 30. Apparatus for dyeing, mordanting or other treatments of paper (Brit. pat. 305,901) 25.

AVRAM, M. H.: *The Rayon Industry*. 2nd ed., revised and enlarged. New York D. Van Nostrand Co., Inc. 800 pp. \$12.

BOSSO, AMEDEO: *La fabbricazione della cellulosa al cloro in Italia e sue applicazioni industriali*. Turin: C. Accame. 43 pp.

STADLINGER, HERMANN: *Das Kunstseiden-Taschenbuch*. Ein praktisches Nachschlagebuch für Hersteller, Verarbeiter, Kaufleute, Volkswirtschaftler und Wissenschaftler. Berlin: Finanz-Verlag G. m. b. H. 254 pp.

WALTON, ROBERT P.: *Causes and Prevention of Deterioration in Book Materials*. New York: Public Library. 30 pp. \$0.15, post free. Reviewed in *J. Intern. Soc. Leather Trades' Chem.* 13, 534(1929).

Cellulosic fiber. SOC. ANON. PAPETERIES NAVARRE. Brit. 306,072, Feb. 15, 1927. In obtaining cellulose from wood, straw, etc., the material is heated in a series of heaters, charged with and emptied of cellulose in turn, and the lye, such as soda, is systematically circulated at the required temp. so that the material in the most advanced heating stages receives the fresh lye while the raw material is treated with lye which has passed through the previous heaters. Soda-wood cellulose or straw cellulose of good light color is thus obtained.

Improving cellulosic materials such as jute or cotton. LEON DE WOLF. U. S. 1,726,142, Aug. 27. The material is subjected in a crude state to the action of a soln. of NaOH and phenol to sep. it from foreign substances and to transform it into a finished product suitable for manufacturing.

Cellulose halogen carboxylates. I. G. FARBENIND. A.-G. Brit. 306,132, Feb. 17, 1928. Cellulose carboxylates such as cellulose triacetate are dissolved or suspended in an indifferent medium such as  $C_2H_5Cl$ , and treated with a chlorinating agent such as  $PCl_5$  to replace all the H atoms of the acid radical of the cellulose carboxylate with Cl. The products have increased stability toward hydrolytic agents and increased solv. Various details of procedure are given.

Cellulose ethers. I. G. FARBENIND. A.-G. Brit. 305,946, Feb. 10, 1928. Alkyl ethers of cellulose contg. 1.5-2.5 alkyl groups per mol. of cellulose are rendered resistant to the action of water by employing in the alkylation 2 mols. of an alkylating agent such as benzyl chloride for every 10-30 mols. of the alkylating agent such as  $EtCl$ . An alc.- $C_6H_5$ -sol. product is thus obtained from pasteboard pretreated with a 60% NaOH soln. and ripened.

**Cellulose ethers.** A. WACKER GES. FÜR ELEKTROCHEMISCHE INDUSTRIE GES. Brit. 306,125, Feb. 17, 1928. Cellulose ethers insol. in the usual simple solvents are obtained by treating alkali cellulose with alkyl halide in the presence of water, but in the absence of any added salt, e. g., soda cellulose 100 and water 400 parts may be treated with an excess of EtCl. The products are sol. in mixed solvents such as  $C_6H_6$ -alc. and  $C_6H_5Cl$ -alc. and may be used for making films, threads, etc.

**Cellulose esters and ether-esters.** I. G. FARBENIND. A.-G. Brit. 305,946, Feb. 11, 1928. The processes for prepg. cellulose higher aliphatic acid esters described in Brit. 283,181 (C. A. 22, 3988) and Brit. 297,766 (C. A. 23, 2822) are modified by (a) using mixts. of different halides of the higher aliphatic acids; (b) adding the esterifying agent in stages, different acid halides being used if desired in successive stages, and (c) substituting for the halide of the higher aliphatic acid, wholly or in part, a halide of a cyclic substituted aliphatic acid or of an alicyclic carboxylic acid. Numerous details and examples are given. Cf. C. A. 23, 4818.

**Reducing the viscosity of cellulose esters.** BORIS N. LOUGOVOY (to Ellis-Foster Co.). U. S. 1,726,357, Aug. 27. A cellulose ester such as a nitrocellulose, the viscosity of which is to be reduced, is dissolved in acetone or other solvent of high dispersing power; sepn. of the ester is then effected by gradual dilm. of the soln. with a mixt. of the solvent and a non-solvent such as water, which is miscible with the solvent.

**Cellulose acetate.** L. M. BURGHART (to U. S. Industrial Alcohol Co.). Brit. 306,531, Feb. 24, 1928. An acetylating medium such as  $Ac_2O$  or  $AcCl$  is caused to react on cellulose (preferably below  $30^\circ$ , suitably at  $17-18^\circ$ ) in a reaction medium of liquid  $SO_2$  with or without glacial  $HOAc$ , and with use of catalysts or condensing agents such as  $H_2SO_4$ ,  $ZnCl_2$ ,  $H_3PO_4$ , or  $Me_2SO_4$ . Various details of the acetylation and after-hydration process are described.

**Filaments, etc., from viscose.** "BORVISK" CO. M. B. H. Ger. 480,478, Oct. 16, 1919. Filaments and other products are prepd. from fresh viscose while using a pptg. bath comprising a salt soln. of at least  $20^\circ$  Bé. to which sufficient acid to prevent development of alky. has been added, the length of travel of the filaments, etc., through the bath being at least 20 cm. Cf. Brit. 116,268 (C. A. 13, 74).

**Filaments, films, etc., from viscose.** LAMBERTUS A. VAN BERGEN. Ger. 480,519, May 7, 1924. Products of improved elasticity are obtained by using an acid pptg. bath contg. a salt of a bivalent metal ( $MgSO_4$ ), together with a small quantity of a Zn salt ( $ZnSO_4$ ).

**Device for the production of air- or light-silk.** DEUTSCHE ZELLSTOFF-TEXTILWERKE G. M. B. H. Ger. 479,794, Mar. 7, 1926. Addn. to 467,241 (C. A. 23, 705). The viscose is passed through sieve-like electrodes on its way to the spinning nozzle to form the necessary small bubbles.

**Apparatus for spinning or winding artificial silk.** ALFRED SCHÖTZ. Ger. 480,348, Apr. 14, 1927.

**Apparatus for making artificial filaments by dry-spinning.** VEREINIGTE GLANZSTOFF-FABRIKEN A.-G. (Konrad Hoffmann, inventor). Ger. 480,752, Mar. 13, 1925. See Brit. 249,141 (C. A. 21, 1011).

**Regulating the amount of lime in sulfite lye.** METALLGESELLSCHAFT A. G. Ger. 480,672, July 15, 1926. Addn. to 437,531. The amt. of lime in the lye from the manuf. of cellulose sulfite is detd. by the temp. of the irrigating tower, which is regulated by the passage of waste gas brought to the required low temps. by a refrigerator.

**Spent cellulose sulfite lye.** I. G. FARBENIND. A.-G. (Hans Wesche and Karl Brodersen, inventors). Ger. 480,898, Jan. 1, 1925. Addn. to 419,224. A non-deliquescent powder is obtained from spent cellulose sulfite lye by treating it with amines, phenols, aromatic sulfonic acids or aldehydes in the presence of a small quantity of acid before evapg. The reaction is stopped before compds. insol. in water are formed. Examples are given.

**Treating waste alkali lyes.** I. G. FARBENIND. A.-G. Brit. 305,931, Feb. 11, 1928. Waste alkali lyes contg. org. substances such as are obtained in making artificial silk are treated with Cl at about ordinary temp. Org. substances are oxidized to  $CO_2$ , which escapes, and a soln. of alkali hypochloride remains.

**Wood pulp.** WILLIAM D. MOUNT. U. S. 1,725,818, Aug. 27. See Brit. 269,256 (C. A. 22, 1474).

**Apparatus for mechanically preparing pulp and rags for paper manufacture.** GERHARD ANDREWS. Ger. 481,423, June 12, 1926.

**Cellulosic material for paper manufacture.** CARL LEVST (one-half to Arthur H. Lyman). U. S. 1,726,078, Aug. 27. Finely disintegrated bamboo is boiled with quick-

lime to form a pulp, washed and pressed into coherent form, dried and treated with soda lye. Various details are given.

**Paper manufacture.** KRISTIAN HOLTER and OLAF QVILLER. Ger. 480,643, Apr. 27, 1926. In pressing the water out of cellulose sulfite, salts (e. g., NaCl) are added to the pressing pad to increase its efficiency.

**Paper manufacture.** CHARLES MÜLLER. Ger. 481,048, Mar. 10, 1927. Details of removing water by suction are described.

**Paper-making apparatus.** PAPYRUS A.-G. and C. BÜCHNER. Brit. 306,022, Feb. 14, 1928. Structural features.

**Steam-heated drying cylinders for paper-making machines.** LINKE-HOFFMANN-BUSCH-WERKE A.-G. Ger. 480,134, Aug. 9, 1927.

**Slice for paper-making apparatus.** PHILLIP J. LAMOUREUX. U. S. 1,726,440, Aug. 27.

**Apparatus for seasoning and "rectifying" paper stock.** GEORGE E. POGGEL (to Advance Mfg. Co.). U. S. 1,725,764, Aug. 27. Structural features.

**Parchment paper.** I. G. FARBENIND. A.-G. (Rudolf Richter, inventor). Ger. 481,123, Feb. 12, 1925. Parchment paper is prepd. from pressed crude paper by couching with a layer of ordinary paper with a squamous surface, or by couching with a layer of flaky paper material.

## 24—EXPLOSIVES AND EXPLOSIONS

CHARLES E. MUNROE

**A photographic investigation of flame movements in carbonic oxide-oxygen explosions.** WM. A. BONE AND REGINALD P. FRASER. *Trans. Roy. Soc. (London)*, A228, 197-234 (1929).—A study has been made of the initiation and development of flame when a mixt. of CO and O in combining proportions is exploded at atm. pressure under varying conditions such as dryness, source and intensity of ignition, and under the influence of superimposed shock waves up to and including detonation. A new high-speed photographic machine, which is described in detail, was specially designed for the work. From the first group of expts. it was found that progressive and intensive drying of the  $2\text{CO} + \text{O}_2$  mixt. over  $\text{P}_2\text{O}_5$  greatly lowered the flame velocity and hindered combustion, although after very intensive drying the medium could still be ignited and the flame maintained in and slowly propagated through it, extinction occurring only when the flame reached a region where the medium had become diluted with the product of combustion. The hindering effect of intensive drying could be overcome by imposing a strong elec. field upon the medium. A second group of expts. detd. the effects of varying types and intensities of ignition on the flame movements through a moist  $2\text{CO} + \text{O}_2$  mixt. With very feeble sources of ignition, such as a glowing wire or a condenser discharge of small capacity, there was a definite induction period between the imparting of the igniting energy and the appearance of flame; and with condenser discharges the general flame speed and combustion were not greatly accelerated even by great increases in the intensity of the spark; and the duration of combustion was prolonged in cases where violent oscillations, originating in the spark discharge, were set up in the burning medium. In the third group of expts. it was found that under the influence of successive shock waves superimposed on it, at suitably timed intervals, the uniform velocity of the initial flame movement can be increased in successive stages, each of uniform type, until the flame-front is traveling at a velocity comparable with that of the shock waves; and that uniform flame movements at still higher velocities may occur in what is provisionally called the "predetonation" stage of the explosion, during which detonation may be initiated in a region of the medium a little ahead of the advancing flame in cases where such region is under the influence of shock waves. The rate of detonation, while uniform in any one expt., may vary from 1900 to 2200 m. per sec. Some of the photographs on which the study is based are reproduced. C. C. KRESS

**High explosives.** ARTHUR LAMOTTE. *Chem. Met. Eng.* 36, 460 3 (1929).—An account of their development with the view of securing greater safety, and efficiency through specialization. The factors which govern the production of an explosive for a specific use are enumerated and it is stated that a manufacturer may make 12 different types of dynamite, each type being in 10 different grades or "strengths" and each grade in 14 different sizes.

**Effect of storage at 50° on powder B and nitroglycerin powders.** M. DESMARCEUX. *Mem. poudres* 23, 230-5 (1928).—Test of Powder B and of French, German and Italian powders contg. ethyl centralite and nitroglycerin showed that the greatest loss and the

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most rapid rate of loss accompanied the powders which contained the highest ratio of solvent to nitrocellulose.

**Vacuum heating of nitroglycerin powders.** M. MARQUEVROL. *Mem. poudres* 23, 178-82(1928).—Curves are plotted for the gas evolution of nitroglycerin powders heated in a vacuum at 50° for periods up to 1800 days, in comparison with straight diphenylamine powders.

**Study of different stabilizers.** M. MARQUEVROL. *Mem. poudres* 23, 158-77 (1928).—*Smokeless powder* samples contg. up to 10%  $(C_6H_5)_2NH$  were heated at 110°, 100°, 75°, 60° and 40° in open and in closed containers for periods extending up to 4083 days. At intervals the nitrocellulose was pptd. from the samples, extd. with  $CHCl_3$  and the N detd. in a nitrometer. The results show that  $(C_6H_5)_2NH$  attacks the powders at 75° and 60° but only feebly at 40°, with the production of *nitrosodiphenylamine* which itself acts as a stabilizer. In addn. strongly colored secondary reaction products are formed. Powders stabilized with varying amts. of nitrosodiphenylamine were superior to powders contg. the same amt. of  $(C_6H_5)_2NH$  with regard to the amt. of denitration of the nitrocellulose. There was no indication that nitrosodiphenylamine destroys unstable products in nitrocellulose during the manuf. of powder. The speed of denitration and the instability of the powders increase sharply at the moment when the products of decompn. react on the powder. Nitrosodiphenylamine immediately fixes these products in a stable form and as distinguished from  $(C_6H_5)_2NH$  it remains intimately mixed because of its faculty for gelatinizing nitrocellulose. The result is that small quantities of nitrous products which normally give rise to decompn. of the nitrocellulose are more rapidly fixed and held by the nitrosodiphenylamine than by the other stabilizers. It has been generally considered that nitrocellulose is an essentially unstable substance which has at any definite temp. a regular speed of decompn. which cannot be retarded. The role of stabilizer is to maintain the speed of decompn. within reasonable limits and prevent the decompn. from accelerating too rapidly by reason of a reaction under pressure, between the nitro cotton and the products of decompn. However, these tests indicate that nitrocellulose is in itself a very stable substance and it loses this property only when its own products of decompn. react partially or totally upon it. This happens when pulverent nitrocellulose is heated alone, even in an open vessel. It likewise happens when the nitrocellulose is heated with a stabilizer which forms with the nitrous products an unstable compd. or with a stabilizer which is imperfectly mixed with the nitrocellulose. There are 2 phenomena which merge here and studies made up to the present do not distinguish between these 2 conditions: denitration proper of the nitrocellulose and denitration under the more or less attenuated action of its own decompn. products. These 2 processes are indistinguishable if the tests are run at a temp. at which the stabilizer forms an unstable product with nitrous fumes. The results also show what deceptive results are obtained when different stabilizers are compared at the same temp. The stabilizing properties of nitrosodiphenylamine do not appear when the heat tests are conducted at 110°. This indicates that it is decompd. at this temp. The denitration of powders contg. 10% of this material is slight at 75° and still less at 60°. It appears that reliable tests can be obtained only by using 2 temps., so that at these temps. the stabilizer will not decompose, nor will the product formed from the stabilizer and nitrous products. Further studies showed that although carbazole is not as efficient as nitrosodiphenylamine at the same temp. and same percentage, because of its less intimate combination with the nitrocellulose, it has less direct action on nitrocellulose at high temps. and therefore a larger percentage of it may be used with safety. Studies with amyl alc., diphenylbenzidine, nitronaphthalene and naphthalene at 75°, showed the diphenylbenzidine to be superior to nitrosodiphenylamine and much superior to  $(C_6H_5)_2NH$ . Many charts and table accompany the article.

A. J. PHILLIPS

**Laboratory and field tests of the Martienssen permissible-type methane detector.** A. B. HOOKER, W. J. FENN AND R. D. CURRIE. *Bur. Mines, Repts. of Investigations* No. 2919, 10 pp.(1929).—This is a detailed rept. of the various tests to which the detector was submitted with results and an illustrated description of the device which measures the  $CH_4$  content of an atm. with reasonable precision. It is of no value in the detection and detn. of  $CO_2$ .

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**Combustion at high pressures.** L. C. LICHTY. *Trans. Am. Soc. Mech. Eng.* 51, 37-44(1929).—Const. vol. combustion of H air mixts, ranging from  $1H_2 + 0.85$  air to  $1H_2 + 6.5$  air, under pressure was investigated. Photographic records were obtained from which were detd. the effects of compn. of the mixt. on max. pressure, on time of the pressure rise, on rate of flame propagation, on heat loss during pressure rise and the effect of surface-vol. relationships on max. pressure.

A. WHITE

**New method for extinguishing of pulverized-lignite fires.** J. HAUSEN. *Wärme*

52, 504-6(1929).—Erkalen, produced by I. G. Farbenindustrie, when dissolved in water, greatly increases efficiency of extinction by water. Practical application of the process is described. E. I. S.

Coal-dust explosions in mines—causes, effects, and recommendations for prevention. GEORGE S. RICE. *Bur. Mines, Tech. Paper 448*, 24 pp.(1929).—The section on phenomena observed in coal mine explosions is particularly new and valuable.

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Different kinds of explosions in cupola practice, causes and measures of prevention (LÖBNER) 9.

Explosives. A. C. SCOTT. *Brit.* 305,722, Nov. 11, 1927. A charge of O-carrying salts for subsequent impregnation with combustible liquid mixts. to form explosives is admixed with asbestos or similar insol. silicate such as mica which assists in preventing exudation of the liquid when it is added. Examples are given.

Porous material for storage of acetylene or other explosive gases. EDMUND STREIL (to American Gasaccumulator Co.). U. S. 1,726,323, Aug. 27. A suitable porous org. material is treated with a soln. of Cu chloride in a quantity short of satn. and then treated with a soln. of  $\text{FeSO}_4$ .

## 25—DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

X-ray investigation of dyed cellulose. The theory of dyeing. FRITZ BION. *Helv. Phys. Acta* 1, 165-85(1928).—It is intended to decide by means of x-rays if the particles of a dye or metal pptd. on a fiber are deposited at random orientation, or if compd. formation with the fiber or adsorption takes place. Au, Ag, Se and Te are to a great extent deposited as unoriented crystals; Hg is present in the liquid state; I gives rise to an amorphous ring and it seems to be adsorbed; org. dyes do not give sharp lines, though in some cases of acid dyes the salts of lead were pptd. on the fiber in order to increase the intensity of scattering; it is therefore most probable, that they are adsorbed. From the breadth of the lines on the x-ray pattern it is concluded that coagulation takes place during the process of dyeing; this effect can be obtained if the fiber is previously treated with hot salt solns.

EGON BRETSCHER

The chemical and allied industries. III. The dyestuffs industry. REX FURNESS. *Chemistry & Industry* 48, 827-31(1929); cf. *C. A.* 23, 1475.—A review. E. J. C.

Production of printed effects with combinations of anthraquinone and indigoid vat dyes. R. HALLER. *Melliand Textilber.* 9, 924-6(1928).—Printed effects of excellent fastness may be obtained by printing anthraquinoid vat dyes on grounds prepd. with indigoid dyes, of the Ciba series for example. The ground is prepd. in the usual manner, and printed with the desired anthraquinoid color (e. g., Cibacolor Blue GCDN) made up with Rongalit CL,  $\text{FeSO}_4$ ,  $\text{SnCl}_2$  and glycerol. The fabric is then steamed and next passed rapidly through hot concd.  $\text{NaOH}$  soln., squeezed, rinsed and soured. White discharges may be made with Leucotrop W.

E. R. CLARK

Adipic acid and its derivatives for use in the textile industry. WALTER OBST. *The Melliand* 1, 442-3(1929).—Adipic acid, which has lately been made commercially available in Germany, is less expensive than tartaric acid and by being non-poisonous is preferable to oxalic acid in certain uses. The various esters and alkyl derivs. show a wide range of phys. properties and are being introduced to the textile trade under the name, "Sipalin." One ester may be a good substitute for camphor.

E. R. CLARK

The influence of hypochlorite solutions with and without stabilizers on the strength of textile fabrics. BRUNO WALTHER. *Spinner u. Weber* 1928, 14; *Chem. Zentr.* 1928, II, 1151.—Expts. were conducted on the strength of fabrics as influenced by hypochlorite solns. without stabilizers or in presence of alkali silicates, borax, or  $\text{Na}_2\text{PO}_4$ . Cl bleaching is a very good method of bleaching. The danger lying in faulty application also exists in other bleaching processes.

G. SCHWOCH

Fiber plants of the *Crotolaria* family. J. H. H. ROSS. *Faserforschung* 8, 36-44 (1929).—Of some 250 sorts of fiber plants of the *Crotolaria* family, *Sunn hemp* is the best known and most important. The deterioration upon immersion or storage in damp places of articles made from this fiber is distinctly slow. It is also noteworthy that the moisture content (11%) of this fiber after exposure to satd. air is low. Many botanical, agricultural and technological notes are given.

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**Vistra fiber.** A. HARTGEN. *Melliand Textilber.* 10, 220-2(1929). *The Melliand* 1, 776-8(1929).—Vistra fiber is specially spun viscose rayon of 1.2-1.5 denier single filament size, cut to lengths suitable for spinning on cotton systems. The yarns have unique heat-retaining and absorbent properties as compared with the common continuous-filament rayons making them very suitable for underwear. The subdued luster is valuable for diverse effects. Samples are affixed.

**Swelling of plant fibers in cuprammonia solution.** HERBERT MÜLLER. *Faserforschung* 7, 205-91(1929).—A previous effort to assemble and reconcile the extensive literature on this subject was reported by Dischendorfer (*C. A.* 17, 3417). The Sorau Inst. has continued this work, and the present report outlines recommended methods and gives detailed illustrated descriptions of the behavior of all the common fibers. Extensive bibliography.

**Heat required for retting flax in closed vats.** W. KLUBOW. *Faserforschung* 8, 18-36(1929).—The data presented are on the operation of a com. rettery operated throughout the year in Russia. The tanks are of steel plates with little insulation set on concrete bases. No mech. agitation is provided and the heat is supplied electrically. The temp. is maintained at 28-35° and while the end point is detd. by hand tests, the av. time requirement is 108 hrs. Using 72 kg. straw to 950 kg. H<sub>2</sub>O, 70-80 kw. hrs. is considered sufficient. At least 65% of the heat needed to maintain the temp. is generated by the fermentation.

**Making duplex fabrics.** WALTER M. MÜNZINGER. *Melliand Textilber.* 10, 301-2(1929).—"Revertex," a latex concentrate contg. about 75% total solids, is suitable for making waterproof 2-ply fabrics. It may be applied from aq. dispersion to one or both the fabrics and vulcanized by hot calendering. A suitable mixt. contains 50 kg. Revertex, 15 kg. mineral color, 4 kg. lithopone, 0.8 kg. S, 0.08 kg. "Vulcazit 774" (an accelerator suited to low-temp. vulcanization) and 0.8 kg. Nekal BX.

**Avivage of rayon.** J. F. STÖCKER. *Melliand Textilber.* 10, 302-4(1929).—S. recommends Viscosil S, an oil emulsion used at high diln., for removing the brittle feel and harsh luster of rayon.

**Finishing machinery for rayon.** R. GÜNTHER. *Melliand Textilber.* 10, 304-8(1929).—Line drawings illustrate several calendering devices

**Influence of nutrients on the value of bast-fiber plants (FABIAN) 15.** Crystallization phenomena of dye salts (WAGNER) 2. The naphthoisindigotins (WAHL, LOBECK) 10. Thiazole derivatives of 1,4-naphthoquinone [dye] (U. S. pat. 1,726,265) 10. Thiazole derivatives [dye intermediates] (Brit. pat. 306,558) 17.

BRASS, KURT. *Praktikum der Färberei und Druckerei.* 2nd ed., revised. Berlin: J. Springer. 104 pp. Paper, M. 5.25. Reviewed in *Chem. Trade J.* 85, 174(1929).

**The Flax, Hemp and Jute Year Book.** Belfast, 25 Donegall St. H. R. Carter. 5s. net. Reviewed in *J. Textile Inst.* 20, P 150(1929).

**Dyes.** R. S. BARNES, J. E. G. HARRIS, J. THOMAS and SCOTTISH DYES, LTD. Brit. 306,573, Nov. 17, 1927. Anthraquinonecarboxylic acids contg. an arylamino substituent in the *o*-position to the COOH group are treated with a tertiary base-SO<sub>3</sub> compd. in the presence of a metal such as Cu and of an excess of the tertiary base. The products (which may be esters of anthrahydroquinonecarboxylic acids contg. an *o*-aryl substituent) are converted into anthraquinoneacridones by working up with alkali and treating with acid oxidizing agents. The products obtained by alkali treatment also may be applied to animal, vegetable or artificial fibers by dyeing, padding or printing processes and converted into anthraquinoneacridones on the fiber by treating with an acid oxidizing agent in dil. soln. Several examples are given.

**Dyes.** BRITISH ALIZARINE CO., LTD., and P. BEGHIN. Brit. 306,434, Nov. 17, 1927. Pyranthrone or its substitution products such as dichloro- or dibromo-pyranthrone, in soln. or suspension in an org. liquid such as PhNO<sub>2</sub> or nitrotoluene, are treated with SO<sub>2</sub>Cl<sub>2</sub> at 140-205°. The products dye cotton from a vat green, changed to brown by after-treatment with oxidizing agents.

**Dyes.** J. R. GRIGY AKT.-GES. Brit. 306,447, Feb. 20, 1928. Azo dyes contg. either resorcinol or its derivs., 1-methyl-2-amino-4-hydroxybenzene,  $\alpha$ -naphthol or 1,5-dihydroxynaphthalene as components are treated with an oxidizing agent such as air or MnO<sub>2</sub> in the presence of NH<sub>3</sub>. The resulting products (which are still azo dyes) are suitable for dyeing leather but not for wool or silk. Several examples are given. Brit. 306,448 specifies disazo dyes for mordant dyeing made by coupling a diazotized amino-

sulfonic acid of the benzene or naphthalene series with  $\alpha$ -naphthylamine or its 6- or 7-sulfonic acid, rediazotizing the aminoazo compd. thus formed and coupling with an aromatic *o*-hydroxycarboxylic acid. Cr compds. of the dyes may be used for printing. Several examples are given. Cf. C. A. 23, 4827.

**Azo dyes.** FRITZ HESS (to General Aniline Works). U. S. 1,726,266, Aug. 27. Dyes made by coupling the diazo compd. of a safranin, advantageously in an acetic soln., with a compd. contg. a substituted malonyl group dye silk and cotton mordanted with tannic acid valuable shades. A no. of salts of these dyes are distinguished by their excellent copying power and are, therefore, particularly suitable for the manuf. of copying materials, such as *copying pencils, copying inks, copying printing-pastes, typewriter-ribbons* and the like. Cf. C. A. 23, 4827.

**Azo dyes.** I. G. FARBENIND. A.-G. Brit. 306,415, Feb. 18, 1928. Monoazo dyes are made in substance or on the fiber by coupling a diazo compd. of the benzene series such as 5-nitro-2-amino-1-methoxybenzene or 4-chloro-2-toluidine with a 2,3-hydroxynaphthyl-4'-alkyloxy-1'-naphthylamine.

**Azo dye.** I. G. FARBENIND. A.-G. (Hans Heyna, Werner Kirst, Herbert Kracker and Karl Moldaenke, inventors). Ger. 479,925, Mar. 22, 1927. The diazo compds. of dihalo-3-amino-1-toluene are coupled with compds. such as arylamides of 2,3-hydroxynaphthoic acid and  $\beta$ -ketocarboxylic acids, which act on vegetable fibers. Lists of baths and developing baths are given.

**Azo dye.** I. G. FARBENIND. A.-G. (Karl Dobmaier, inventor). Ger. 479,926, Aug. 20, 1927. Diazo compds. of sulfonic, carboxylic or sulfocarboxylic acids of amino- or aminohydroxybenzene or naphthalene contg. a middle component with a free amino group, are condensed with  $O_2NC_6H_4COCl$  or its derivs. The acid can be reduced and again condensed with  $O_2NC_6H_4COCl$  further reduced, diazotized, and coupled with aminophenyl-methylpyrazolone or its derivs. The disazo dye resulting can be further diazotized in the fibers of the material and combined with coupling components. Examples are given.

**Azo dyes.** I. G. FARBENIND. A.-G. (Hermann Wagner, Erwin Hoffa, Ernst Runne and Erwin Thoma, inventors). Ger. 480,826, July 10, 1926. Azo dyes giving fast red shades on cotton are prepd. by coupling the diazo compds. from 1,3-dimethyl-4-amino-6-halobenzene or 1,3-dimethyl-4-amino-2,6-dihalobenzene with arylamides of 2,3-hydroxynaphthoic acid. Coupling may be effected in substance or on the fiber. Examples are given. The 1,3-dimethyl-4-amino-2,6-dihalobenzenes are new compds. and may be prepd. by halogenating *asym.-m* xyldine in  $H_2SO_4$ .

**Azo dye.** SOC. ANON. POUR L'IND. CHIM. A BALE. Swiss 131,727, May 7, 1927. Addn. to 128,228 (C. A. 23, 2300). An azo dye compd. contg. both Cr and S is prepd. by treating the Cr compd. of the dye from diazotized 1,2-aminonaphthol 4-sulfonic acid and  $\alpha$ -naphthol, with a sulfurizing agent, such as polysulfide, in the presence of EtOH and *m*-nitrobenzenesulfonic acid. The dye colors cotton in wash- and light-fast green-blue tones in  $Na_2S$  baths.

**Azo dye.** SOC. ANON. POUR L'IND. CHIM. A BALE. Swiss 131,818, Oct. 31, 1927. A trisazo dye is prepd. by diazotizing the disazo dye obtained by coupling monoazobenzene with a mixt. of 1,6- and 1,7-aminonaphthalenesulfonic acid, further diazotizing and coupling with the same mixt., diazotizing and coupling with 1-amino-5-hydroxynaphthalene-7-sulfonic acid in an alk. medium. The new dye is a black powder which colors cotton green-gray.

**Azo dyes containing chromium.** I. G. FARBENIND. A.-G. (Hans Krzikalla, inventor). Ger. 480,827, Feb. 13, 1927. Azo dyes giving fast red- to blue-violet shades on wool are prepd. by the action of trivalent Cr on the monoazo dyes obtainable from 4-chloro-2-aminophenol and naphtholmonosulfonic acids. Examples are given. Cf. C. A. 23, 716.

**Chromium compounds of azo dyes.** SOC. ANON. POUR L'IND. CHIM. A BALE. Ger. 480,225, Feb. 23, 1926. See Brit. 260,830 (C. A. 21, 3468).

**Chromium compounds of azo dyes.** SOC. ANON. POUR L'IND. CHIM. A BALE. Swiss 131,502 to 131,504, Aug. 19, 1927. Addns to 128,006 (C. A. 23, 2042). A chromium azo dye is prepd. by treating the dyes from diazotized 5-nitro-2-amino-1-phenol, and 2-(3'-amino)-benzoylamino-5-hydroxynaphthalene-7-sulfonic acid (131,502) or 2-acetyl-amino-5-hydroxynaphthalene-7-sulfonic acid (131,503), or 2-(3'-nitro)-phenyl-amino-5-hydroxynaphthalene (131,504), with Cr-yielding reagents. The dyes color cotton in fast green-blue tones. Cf. C. A. 23, 3814.

**Vat dyes.** I. G. FARBENIND. A.-G. (Georg Kalischer, Heinrich Salkowski and Fritz Frister, inventors). Ger. 480,377, Oct. 2, 1926. Vat dyes of uncertain constitution but contg. Cl and S are prepd. by treating  $C_{14}H_{18}$  or its derivs. or substitution products contg. Cl and (or) S with  $S_2Cl_2$  in the presence of a catalyst such as I,  $FeCl_3$ ,  $AlCl_3$ .

**Sb or SbCl<sub>5</sub>.** An indifferent solvent or diluent may be present. The process may be conducted by treating C<sub>14</sub>H<sub>10</sub>, etc., with Cl at a high temp. in the presence of an excess of S. The reaction proceeds in stages and the intermediate products may sometimes be isolated. The final product prepd. from C<sub>14</sub>H<sub>10</sub> itself is identical with that prepd. according to Ger. 247,416 (C. A. 6, 2542). Examples are given.

**Vat dyes.** I. G. FARBENIND. A.-G. (Max A. Kunz, Erich Berthold and Eduard Gofferjé, inventors). Ger. 480,917, Aug. 29, 1926. Vat dyes are prepd. by the action of N<sub>2</sub>H<sub>4</sub> or its salts on 2-aminoanthraquinone-3-aldehyde or its derivs. or materials giving rise thereto, such as anthraquinone-2,3-isoxazole. The product from 2-aminoanthraquinone-3-aldehyde itself gives orange shades on cotton. Examples are given.

**Vat dyes.** SOC. ANON. POUR L'IND. CHIM. À BAËLE. Ger. 480,487, Jan. 22, 1928. Addn. to 465,988. Vat dyes giving blue shades fast to water are prepd. by chlorinating certain violanthrone derivs. at a temp. above 80° in the presence of a diluent not miscible with water. The violanthrone derivs. treated are the halogen derivs. dyeing in shades not fast to water, with the exception of such halogen derivs. as are prepd. in the presence of HClSO<sub>3</sub> or by means of halogen carriers such as FeCl<sub>3</sub> or SbCl<sub>5</sub>. Examples are given.

**Vat dye.** SOC. ANON. POUR L'IND. CHIM. À BAËLE. Swiss 131,729, Jan. 17, 1928. Addn. to 125,480. A new vat dye is obtained by sulfonating Bz-1, Bz-1'-dibenzanthrone with 12% fuming H<sub>2</sub>SO<sub>4</sub>, melting with caustic alkali and methylating. It colors cotton a fast gray in a red-violet bath.

**Sulfur dyes.** I. G. FARBENIND. A.-G. (Erwin Kramer, Ludwig Zeh and Bernhard Bollweg, inventors). Ger. 478,351, July 9, 1927. Addn. to 477,698 (C. A. 23, 4347). Binaphthalene dioxide is treated with S halide such as S<sub>2</sub>Cl<sub>2</sub> with or without diluent and the mixt. warmed to 80–120° when it solidifies to an orange-yellow mass. The mass is then heated to 250–260° to complete the formation of the dye. S may be added during the heating. The dye gives a red Na<sub>2</sub>S soln. and dyes cotton violet-brown. Examples mention SCl<sub>2</sub> as the halide. Cf. C. A. 23, 3815.

**Brown dyes.** M. CHILIKIN. Russ. 335, June 6, 1922. A mixt. of naphthenic acids is fused with NaOH and S in the presence of Cu or Zn salts or without the addition of the latter before the mixt. becomes dry.

**Dye preparations.** I. G. FARBENIND. A.-G. Brit. 305,787, Jan. 11, 1928. The process described in Brit. 303,942 (C. A. 23, 4580) in which nitrosamine printing colors are purified by use of org. solvents is modified by dissolving an azo component and a nitrosamine of an aromatic amine separately in small quantities of water with the addn. of a sufficient quantity of alkali, filtering the sp. solns. and mixing them at such a concn. that no dye formation occurs. Several examples are given.

**Dyes and intermediates.** BRITISH DYESTUFFS CORP., LTD., ARNOLD SHEPHERDSON and ANTHONY JAMES HAILWOOD. Ger. 480,541, May 3, 1927. See Brit. 278,102 (C. A. 22, 2668) or Fr. 634,686 (C. A. 22, 3995).

**Dye intermediates.** I. G. FARBENIND. A.-G. Brit. 305,763, Dec. 16, 1927. Hydroxydiaryl ketones are made by treating an *o*-hydroxyaryl carboxylic acid halide with an aromatic hydrocarbon, which may contain a non reactive substituent, in the presence of acid condensing agents such as AlCl<sub>3</sub>. Examples are given.

**Coal-tar intermediate.** SOC. ANON. POUR L'IND. CHIM. À BAËLE. Swiss 131,494, Oct. 22, 1927. Addn. to 103,430. A new coal-tar dye intermediate product is prepd. by the action of 1 mol. CNCl and 1 mol. 1,8-aminonaphthol-3,6-disulfonic acid on 1 mol. dehydrothiolumidinesulfonic acid. The product is a yellow powder which readily attacks cotton fibers and facilitates dyeing by azo compds.

**Substitution products of isoviolanthrone.** SOC. ANON. POUR L'IND. CHIM. À BAËLE. Ger. 479,611, Dec. 17, 1925. Chloro substitution products of violanthrone are obtained by removing part of the Cl from the polychloro leuco compd. by reduction in alk. soln. and then oxidizing. The oxidation may take place in the fibers of the material to be dyed. Thus, dichloroisoviolanthrone is suspended in warm NaOH, and NaHSO<sub>3</sub> added. An intense blue dye contg. 1 atom of Cl is produced.

**Dyeing.** CHEMISCHER FABRIK VORM. SANDOZ. Ger. 479,595, Nov. 19, 1927. See Brit. 300,662 (C. A. 23, 4082).

**Dyeing.** DURAND & HUGUENIN SOC. ANON. Ger. 479,678, Nov. 30, 1926. Addn. to 418,487. A process for fast dyeing and printing consists in developing the color of an ester of a leuco dye by oxidation with steam and an acid which does not decompose the slop-soln. or printing paste. Examples give suitable mixts.

**Dyeing.** I. G. FARBENIND. A.-G. (J. Nüsslein, inventor). Ger. 479,915. In dyeing by the oxidation of aromatic amines, a highly dispersed prepn. of the amine in water is used.

**Dyeing.** SOC. ANON. POUR L'IND. CHIM. À BAËLE. Ger. 479,713, July 8, 1923.

Addn. to 393,701. Fast color tones are produced in fibers by soaking them in diazotized 4-chloro-2-aminobenzene-1-phenyl ether and treating with arylides of 2,3-hydroxynaphthoic acid. Examples are given.

**Dyeing cellulose ester or other silk.** I. G. FARBENIND. A.-G. (Winfrid Hentrich, Max Hardtmann and Rudolf Knoche, inventors). Ger. 480,904, Feb. 3, 1927. See Brit. 284,652 (C. A. 22, 4834).

**Dyeing viscose materials.** I. G. FARBENIND. A.-G. Brit. 306,153, Feb. 17, 1928. Uniform dyeings are produced by use of dyes obtained by either (a) coupling tetrazotized *m*- or *p*-azoxyaniline or a substitution product with a component or, (b) coupling diazotized *m*- or *p*-nitroaniline or a substitution product with a component and treating the monoazo dye with an alk. reducing agent to obtain a disazoazoxy or trisazo product. Several examples are given. Cf. C. A. 23, 4351.

**Bleaching and dyeing.** G. F. LLOYD (to Spectrum Dyes Proprietary, Ltd.). Brit. 305,922, Feb. 11, 1928. Dyed fabrics are subjected to the action of slowly acting stripping solns. (such as may be prepd. by treating  $\text{NaHSO}_3$  with Zn) to regulate the final color produced. Numerous details are given.

**Apparatus for the local dyeing, especially stripe dyeing, of hanks.** JULIUS LEVY. Ger. 480,958, Aug. 1, 1925, and 480,959, Aug. 11, 1927.

**Apparatus for dyeing textiles.** I. G. FARBENIND. A.-G. Ger. 479,914, Nov. 28, 1926. Addn. to 368,734, App. for treating textiles with developing dyes is described.

**Air-drying machine for textiles.** GEBRÜDER SÜCKER. Ger. 479,764, May 27, 1925.

**Machine for impregnating and dyeing fabrics.** MASCHINENFABRIK BENNINGER A.-G. Swiss 131,956, Feb. 21, 1928. Details are given.

**Apparatus for dyeing long pieces of fabric on both sides.** FRANTISEK RUDOLF. Swiss 131,568, Jan. 4, 1928. Details are given.

**Dyeing apparatus for treating textile materials in lengths.** C. P. COLE. Brit. 306,462, Feb. 20, 1928. Structural features.

**Automatic reversing device for dyeing apparatus.** MASCHINENFABRIK BENNINGER A.-G. Brit. 306,484, Feb. 21, 1928. Mech. features.

**Apparatus (with rollers having rubber strips on their surface) for dyeing, mordanting or other treatments of paper or textile fabrics.** C. S. BEDFORD. Brit. 305,901, June 27, 1928. Structural features.

**Printing fabrics containing cellulose acetate or similar materials.** C. DREYFUS (to British Celanese, Ltd.). Brit. 306,534, Feb. 23, 1928. In printing fabrics contg. cellulose org. esters or ethers, substances for preventing delustering (or to effect relustering when delustered) are incorporated with the printing pastes. Examples are given of substances which may be used.

**Cloth printing dyes.** I. G. FARBENIND. A.-G. (Max A. Kunz and Friedrich Feller, inventors). Ger. 479,976, May 24, 1927. Alkali-fixed dye preps. used in cloth printing consist of dyes mixed with vegetable mucilage. The alkali coagulates the mucilage in the fibers. Cf. C. A. 23, 3107.

**Cloth printing.** I. G. FARBENIND. A.-G. (Alfred Fischesser, inventor). Ger. 479,977, Oct. 27, 1927. In printing fabrics with basic dyes from tannin substitution products, prepd. as in 390,931, the tannin compd. is removed by oxidation and the dyeing completed. Two lists of components of suitable finishing solns. are given.

**"Shading" artificial silk.** SOC. POUR LA FABRICATION DE LA SOIE "RHODIASETA." Ger. 480,899, Aug. 29, 1925. The application of a fugitive color to dry-spun threads of cellulose esters or ethers, for the purpose of distinguishing threads of different nature, is effected in the course of production of the threads, i. e., on the filaments before union into threads and inside or outside the spinning cell, or on the threads before or during reeling. Various ways of applying the color are described. Cf. Brit. 251,580 (C. A. 21, 1362).

**Apparatus for washing, desulfurizing, decoppering, dyeing or other treatments of artificial silk on bobbins.** C. LANDESKROENER. Brit. 305,980, Feb. 13, 1928. Structural features.

**Singeing device for textile fibers.** GEORG ERNE. Swiss 131,570, Feb. 25, 1928.

**Wadding from flax fibers.** SOC. DES TEXTILES ROANNAIS. Brit. 305,709, Nov. 10, 1927. Raw or retted flax fibers are treated to produce hydrophilous wadding by subjecting them to a hot bath contg.  $\text{NaOH}$ ,  $\text{Na}_2\text{CO}_3$ , soap and lime, rinsing in water, treating with a soln. of  $\text{Na}_2\text{S}_2\text{O}_4$ , rinsing, drying, subjecting to a bath contg.  $\text{H}_2\text{SO}_4$ , bleaching with chlorosone, rinsing and further treating with a bath contg.  $\text{H}_2\text{SO}_4$ ,  $\text{Na}_2\text{S}_2\text{O}_4$  and  $\text{HNO}_3$ .

**Apparatus for loading silk fabrics.** MASCHINENFABRIK TILLM. GERBER SÖHNE & GEHR. WANKLEBEN. Ger. 480,937, Apr. 5, 1925.

**Degumming silk.** BRITISH CELANESE, LTD., and G. H. ELLIS. Brit. 306,067, Nov. 15, 1927. Degumming of natural silk, alone or assocd. with other materials, is effected by use of an alk. liquor of a  $pH$  not exceeding 10.5. The process (details of which are described) is especially suitable for treating silk which is assocd. with cellulose acetate or the like. Cf. C. A. 22, 317.

**Composite yarns with a cotton core covered with artificial silk.** O. RASCH. Brit. 306,007, Oct. 10, 1927. Mech. features of manuf. are described. The finish of the material may be improved by treatment with a soln. of soap, oil and a fat solvent, e. g., with Marseilles soap, olive oil and  $CCl_4$ .

**Artificial silk.** S. I. VLES and D. VAN DER WANT. Brit. 306,050, Aug. 10, 1927. Adherence of filaments constituting a thread is prevented by treating them with a substance which acts as a solvent or swelling agent especially at temps. slightly  $\pm$  working temp. Various details of compns., procedure and app. are described.

**Apparatus for introducing an artificial silk filament into a rarified space.** GEORG FRANK. Ger. 480,829, Dec. 24, 1927.

**Centrifugal apparatus for the wet treatment of artificial silk on the spools.** I. G. FARBENIND. A.-G. (Alfred Friederich inventor). Ger. 479,621, May 4, 1924, addn. to 456,190.

**Delustering "viscose silk.** C. TERRELL. Brit. 305,828, Feb. 17, 1928. An insol., uncolored, opaque ppt. is produced on the material by impregnating it with an aq. soln. of a salt such as  $BaCl_2$  and then treating it with a pptg. agent such as  $(NH_4)_2SO_4$  or  $(NH_4)_2CO_3$ . Examples are given of various other treating substances which react similarly.

**Treating mixed fibers containing cellulose derivatives.** CAMILLE DREYFUS, ROBERT G. DORT and HERBERT PLATT (to Celanese Corp. of America). U. S. 1,725,857, Aug. 27. Fabrics contg. both vegetable fibers such as cotton and org. derivs. of cellulose such as cellulose acetate or propionate are subjected to the action of a carbonizing soln., e. g.,  $AlCl_3$  or  $HCl$ , to render the vegetable fibers removable.  $Na_2SO_4$  or other delustering preventive also is used.

**Artificial threads of cellulose derivatives.** CHARLES F. RYLEY, CHARLES W. PALMER and SIDNEY A. WELCH (to Celanese Corp. of America). U. S. 1,725,829, Aug. 27. In the dry-spinning and winding of threads such as those formed from cellulose acetate the threads are treated with paraffin oil, oleic acid, olive oil or other suitable lubricating dressing, which facilitates the winding.

**Apparatus for treating yarn or rove with liquids.** M. WADDELL and H. C. WATSON. Brit. 306,206, Nov. 25, 1927. Structural features.

**Detergent mixtures.** A. R. JENNINGS. Brit. 306,119, Feb. 17, 1928. Compns. for removing stains from delicate fabrics comprise a finely powdered material such as talc, chalk or pyrophyllite and a softening or loosening agent such as liquid soap or oils of turpentine, cedar, camphor, pine, rosemary or eucalyptus. Water may be added to form a paste.

**Mothproofing wool, fur, hair, etc.** I. G. FARBENIND A.-G. (Wilhelm Lommel, Heinrich Münzel, Winfrid Hentrich and Max Hardtmann, inventors). Ger. 480,180, Mar. 16, 1920. The goods are treated with esters of  $H_3PO_4$ . A 2% soln. of diphenyl *o*-cresyl phosphate or a 1% alc. soln. of tri-*o*-chlorophenyl phosphate is suitable.

## 26 -PAINTS, VARNISHES AND RESINS

A. H. SABIN

**Causes of paint failures on sidewalls.** OTTO R. HARTWIG. Am. Paint & Varnish Mfrs. Assoc., Circ. 355, 742-808 (1929).—A study of 1500 cases of paint failure on exterior sidewalls revealed moisture to be the cause in 75-80% of the cases. The presence of moisture was usually due to one or more of the following circumstances: wet lumber, careless or improper carpentry, damp basements or painting too soon after a rain. Photographs of typical cases of failure, improper and proper installation of flashing, means for drying buildings during construction, locating the places where rain water has entered, etc., are given. G. G. SWARD

**Oxidation and weathering of linseed oil paints.** D'ANS. Z. angew. Chem. 41, 1193-7 (1928).—The effect on the oxidation of linseed oil of light and moisture is discussed. The swelling of linseed oil and paint films exposed to moisture, which varies with different pigments, is recommended as a delicate criterion in the evaluation of

paints. It is pointed out that, under favorable conditions of warmth and moisture, paint films, especially if recently applied, are susceptible to attack by molds (*Penicillium*, *Aspergillus*) which may cause rapid and extensive deterioration. The development of molds appears to be hindered by the presence of ZnO and certain colored pigments: the possibility of attack by molds should not be neglected when assessing weathering tests.

B. C. A.

**Testing paints.** A. V. BLOM. *Z. angew. Chem.* **41**, 1178-81(1928).—For testing the strength of paint films, strips of iron of known tensile strength are painted on one side and then pulled in the usual tensile machine until microscopic cracks begin to appear in the paint film. With freshly painted strips this happens at or near the breaking point of the iron; after the paint has aged somewhat, fracture occurs during the region of plastic flow of the iron, but with very old and brittle films it may occur as soon as the elastic limit is exceeded. The shape and position of the fissures in the paint film after the test provide an indication of the state of preservation of the paint, and, by observing whether the first cracks appear along the Lüder-Hartmann flow lines or whether they are evenly distributed over the surface of the strip, conclusions may be drawn as to the intensity of adherence of aged paint films. The value of the method in testing red lead paint is described; after aging for 12 days at 80° the elongation of films of ordinary red lead paint decreased from 27 to 16.5%, and that of films of highly dispersed red lead paint from 14.7 to 0.2%. The latter therefore harden and become watertight sooner than the former, and the permanent elongation of 0.2% suffices for paint films on iron as it exceeds the usual limit of proportionality of the metal.

B. C. A.

**Comparative investigations on the toxicity of basic lead sulfate and of white lead.** K. B. LEHMAN. *Arch. Hyg.* **101**, 197-204(1929).—White lead and the basic Pb sulfate of commerce are equally poisonous to cats and rabbits when administered under similar conditions.

E. R. MAIN

**Comparative investigations on the toxicity of basic lead sulfate and basic lead carbonate.** F. KOELSCH, E. LEDERER AND R. KOELSCH. *Arch. Hyg.* **101**, 234-56(1929).—The com. product,  $2\text{PbSO}_4 \cdot \text{PbO}$ , sold as a non-poisonous substitute for white lead, appears to be equally as toxic as the latter to guinea pigs and rabbits, either upon inhalation or oral administration.

E. R. MAIN

**A comprehensive theory of the drying process and of the heat polymerization of fatty oils.** B. SCHEIFELE. *Z. angew. Chem.* **42**, 787-90(1929); cf. *C. A.* **22**, 3053.—The drying of an oil depends on the no. and position of the double bonds in the fatty acid radical. Conjugated double bonds greatly increase the rate of drying or polymerization. The behaviors of china wood, linseed and poppyseed oils are explained on this basis. Objection has been made that butadiene should be at least as good a drying oil as china wood oil since it contains conjugated double bonds. S. replies that butadiene does polymerize to rubber-like substances but the mol. is too small to be classed with the ordinary drying oils.

A. C. HIGGINS

**Composition of Chinese wood oil (tung oil).** A. STEGER AND J. VAN LOON. *J. Soc. Chem. Ind.* **47**, 361-3T(1928).—The authors give an account of the preliminary analysis of a typical wood oil, which they believe to consist principally of the glyceride of an isomeride of linolenic acid. Practically only fatty acids with an 18 C straight chain are present; the satd. fatty acids appear to consist of a mixt. of 75% of palmitic and 25% of stearic acids.

B. C. A.

**Copal oil and copal condensation oil.** P. MAX GREMPE. *Teer u. Bitumen* **27**, 383(1929).—A new by-product from the lacquer industry, copal condensation oil, is described. It is suitable for use in wood preservatives, linoleum finishes, etc.

W. A. GALLUP

**Turpentine. Type A.** ANON. *Brit. Eng. Standards Assoc.* (London), No. 290, 8 pp (June, 1929).—Specifications cover description, sp. gr., distn., residue, n, polymerization, flash point, sampling and size of sample.

R. I. S.

**Physical properties of shellac solutions.** I. M. RANGASWAMI AND M. VENUGOPALAN. *Indian Lac Assoc. for Research Bull.* **1928**, No. 1, 14 pp.—The variation of viscosity with concn. of shellac solns. in various alc. solvents was detd. "Solvent-power nos." of the solns., using water and light petroleum as non-solvents, are plotted against concn. and against viscosity, it being demonstrated that both solvent power and viscosity must be correlated in rating a solvent. Wood naphtha is shown to exhibit peculiar behavior, a second peak in the solvent power occurring at about 30% concn., such peak being absent with the other solvents.

B. C. A.

**The world's recent progress in synthetic resins.** ALADIN. *Plastics* **5**, 258-60, 326-8, 449-51, 507-9(1929).

E. J. C.

Applications of recent [paint] analytical interest (Fox) 7. Enameling furnace (Ger. pat. 480,718) 1.

BAUER, K. H.: *Monographien aus dem Gebiete der Fett-Chemie*. Vol. XI. *Die trocknenden Öle*. Stuttgart: Wissenschaftliche Verlag m. b. H. 354 pp. M. 27. Reviewed in *Chemistry & Industry* 48, 816(1929).

**Color indicator for pigment.** MAX ASCHER & Co. G. M. B. H. Ger. 479,721, Jan. 8, 1926. A color indicator for paint which is color-sensitive to heat, for use on automobiles, comprises a mixt. of  $\text{HgI}_2$  and  $\text{CuI}_2$  or  $\text{AgI}$  with varnish or  $\text{HCHO-PhOH}$  condensation products.

**Treating copper salts of naphthenic acids.** M. POTOLOVSKII. Russ. 30, May 14, 1923. Cu salts of naphthenic acids obtained by any of the known methods are treated with superheated steam, hot air or other gas heated to  $250^\circ$ . A green paint pigment of high quality is obtained.

**Varnish and paint oils.** J. SCHEIBER. Brit. 306,452, Feb. 20, 1928. Ricinoleic acid or the mixt. of fatty acids obtained from castor oil are subjected to prolonged heating (suitably *in vacuo*) to effect splitting off of water which leads to an isomeric linolic acid with conjugated double bonds which is then esterified with glycerol or other polyhydric alc. Excess glycerol may be used and a supplementary esterification effected with rosin, copal or the like. Brit. 306,453 specifies subjecting mixts. of fatty acids from good drying oils such as wood oil, linseed oil or perilla oil and those from semi-drying or non-drying oils to a common esterification with glycerol or other polyhydric alc. (and also if desired to a further esterification with colophony or copal or the like if an excess of glycerol is used).

**Varnish.** GEORG FEY & Co. Swiss 132,318, Feb. 12, 1927. Nitrocellulose varnish is caused to dry with a mat surface by adding vegetable oil. Thus, a varnish contg. pyroxylin,  $\text{AcOBu}$ ,  $\text{BuOH}$ ,  $\text{C}_{12}\text{H}_{26}$ , alc., softening material and resin is given a mat drying surface by addn. of wood oil.

**Cellulose nitrate solutions.** W. J. JENKINS and IMPERIAL CHEMICAL INDUSTRIES, LTD. Brit. 305,960, Oct. 12, 1927. Solns. of nitrocellulose suitable for use as *lacquers* or *enamels* are prepd. with a Me, Et, Pr or iso-Pr ether of a lactic acid ester (such as may be made by treating  $\alpha$ -chloro- or  $\alpha$ -bromo-propionic acid esters with the corresponding Na alcoholate) with or without other solvents, plasticizers, etc.

**Metal-coating japan.** WHEELER P. DAVEY (to General Electric Co.). U. S. 1,726,473, Aug. 27. A japan comprises water as a dispersion medium with a disperse phase including bituminous material, a drying oil and rubber having in the aggregate a d. less than that of water and a finely divided solid such as clay or lampblack having a d. greater than that of water, so that the disperse phase as an entirety has a d. approx. the same as water.

**Resinous compositions.** CHEM. FAB. KURT ALBERT G. M. B. H. Ger. 480,488, Apr. 27, 1921. Addn. to 440,003. According to Ger. 440,003, fresh natural acid resins are improved by combining them under the action of heat with resins prepd. from  $\text{PhOH}$ , or its homologs and  $\text{CH}_2\text{O}$ , the combined product being then neutralized or esterified in a known way. This method is now modified by using resins prepd. by condensing  $\text{PhOH}$ , etc., with other aldehydes such as  $\text{AcH}$  or with ketones or mixts. of ketones with aldehydes. Cf. Brit. 259,030 (C. A. 21, 3276).

**Resin from cashew-nut oil.** MORTIMER T. HARVEY (to Harvel Corp.). U. S. 1,725,791, Aug. 27. Cashew-nut shell liquid and  $\text{CH}_2\text{O}$  are caused to react by heating in the presence of an acid catalyst such as  $\text{HCl}$ . U. S. 1,725,792 specifies a reaction product of cashew-nut shell oil with an oxidizing agent and an acid such as  $\text{MnO}_2$  and  $\text{HNO}_3$ . The product is an *elec. insulator*. U. S. 1,725,793 specifies the production of compns. for use in *coatings, impregnating or for molding*, by heating cashew-nut shell oil with  $\text{CuCO}_3$  or other O-contg. metalliferous drying agent. U. S. 1,725,794 specifies heating cashew-nut shell oil in a Cu kettle to remove the non-drying characteristic of the oil. U. S. 1,725,795 specifies bringing  $\text{CH}_2\text{O}$  and cashew-nut shell oil together in the presence of gasoline or other suitable solvent for the initial reaction product which is formed, under acid conditions, to produce a product which dissolves as it is formed and which may be used on paper, etc., for *insulating*. U. S. 1,725,796 relates to a modified cashew-nut shell liquid,  $\text{CH}_2\text{O}$  and a drier together in a common solvent. Cf. C. A. 23, 3998.

**Vinyl ester resins.** HOWARD W. MATHESON and FREDERICK W. SKIRROW (to Canadian Electro Products Co., Ltd.). U. S. 1,725,362, Aug. 20. Gummy or resinous

products with plastic rubbery consistency are formed by reaction of a compd. contg. an  $C_2H_4$  linkage such as vinyl acetate with  $AcH$  or other satd. aliphatic aldehyde.

**Synthetic resins.** IMPERIAL CHEMICAL INDUSTRIES, LTD., R. HILL and E. E. WALKER. Brit. 305,965, Nov. 11, 1927. A polybasic acid or its anhydride such as phthalic anhydride is condensed with a plurality of alcs. at least one of which is di- or polyhydric (products of low-acid value and high soly. being obtained if a mono- or dihydric alc. is used). Numerous details and examples are given.

**Synthetic resins.** I. G. FARBENIND. A.-G. Brit. 306,501, Nov. 22, 1927. See Fr. 644,015 (C. A. 23, 1764).

## 27—FATS, FATTY OILS, WAXES AND SOAPS

E. SCHERUBEL

The qualitative test for fats and their components with special regard to micro-chemical methods. ANNELIESE NIETHAMMER. *Biochem. Z.* 209, 447-57 (1929).—The use of Sudan III, sapon., solidification types and sublimation in the identification of fats is discussed. S. MORGULIS

**Bayberry fat and its optical activity.** G. WALLRABE. *Arch. Pharm.* 267, 405-12 (1929).—The fat obtained from the fresh berries by extr. with petr. ether and the essential oil therefrom (by distn. with steam) yielded the following consts., resp.: acid no. 5.31, 6.06; sapon no. 210.85, 219.6; I no. 67.94, 65.7; apparent Ac no. 15.27, —; unsaponifiable —, 5.00%;  $H_2O$ -insol. fatty acids —, 84.69%;  $[\alpha]_D^{15}$  11.21, 8.429°. Sepn. of the  $H_2O$ -insol. fatty acids *via* Twitchell gave 58.5% liquid and 37.5% solid fatty acids. The av. mol. wt. of the solid acids (m. 38.5-39°) was 228.7, while that of the liquid acids was 306. The liquid fatty acids contain oleic and linoleic acids. The high av. mol. wt. of the liquid acids leads to the conclusion that they contain another constituent; this is confirmed by the formation of a rubber-like substance on brominating the mixt. The unsaponifiable portion contains, as other workers have found, phytosterol, melissyl alc. laurane and considerable liquid constituents. That the optical activity of bayberry fat must be profoundly influenced by the presence of "bayberry camphor" is indicated by manipulating the fat with very cold alc. (final refrigeration to -50°), and repeated isolation of the accompanying glycerides with alc., whereupon the alc. soln. gave on evapn. a dark yellow, bayberry-odorous oil ( $[\alpha]_D^{15}$  45.68°), which on long standing yielded colorless cryst. masses ( $[\alpha]_D^{15}$  137.65°). This substance crystg. in 1.5-cm. needles has the formula  $C_{22}H_{36}O_4$ , and is the main source of optical activity in the fat. W. O. E.

**Cacao butter.** DAVID W. HORN AND ARTHUR OSOL. *Am. J. Pharm.* 101, 601-11 (1929).—A report of comparative tests upon com. samples of cacao butter, cacao butter olein, cacao butter stearin and cacao butter from "Dutched" nibs. Although these 4 products are different, the differences lie within the range of exptl. error in the detns. of sp. gr. of sapon. no., of unsaponifiable residue and of liquid fatty acid by the Pb salt-ether method. The results are for cacao butter  $d_{15}^{20}$  0.8572, sapon no. 194.66 unsapon. matter 0.76%; for olein  $d_{15}^{20}$  0.8572, sapon. no. 194.63, unsapon. matter 0.90%, liquid fatty acids 36.9; for stearin  $d_{15}^{20}$  0.8574, sapon no. 193.67 unsapon. matter 0.93%, liquid fatty acid 37.8; Dutched cacao butter  $d_{15}^{20}$  0.8576, sapon no. 194.52 unsapon. matter 0.90. The differences lie not far outside the range of exptl. error in the detns. of  $n$  and of surface tension at 40° and of viscosity (Stormer) at 80°. The results are for pure cacao butter  $n_D^{40}$  1.4572, surface tension (in dynes per cm.) 35.5, viscosity (sec. required for 100 revolutions at 80°) 21.8; for com. olein of cacao butter  $n_D^{40}$  1.4579, surface tension 35.2, viscosity 22.7; for com. stearin of cacao butter  $n_D^{40}$  1.4580, surface tension 34.9, viscosity 22.0; for Dutched cacao butter  $n_D^{40}$  1.4578, surface tension 35.7, viscosity 21.1. Distinct indications of differences are brought out in the detns. of I no. (Hanus), of m. p. (Wiley) and of "transition point" and possibly also of acidity (stated as mg. of KOH required to neutralize the acid in 1 g. of fat). The 4 products were subjected to a study as follows: The melted fat was placed in a Dewar test tube, which was held firmly in the center of a bath of water and ice. The fat was stirred constantly with a thermometer and when its temp. had fallen to 33° or thereabout, the readings of the thermometer every min. were written down. The results were then plotted, the temp. vertically and the time horizontally. In general the form of the resulting graph is that of the root-sign of algebra  $\sqrt{\quad}$ . The liquids gradually cool until they are undercooled as much as 5° to 10°; finally crystn. sets in accompanied by a gradual rise in temp. This rise continues



to a max., which max. is maintained quite exactly to within  $0.1^\circ$  for a period (in these expts.) of 8–20 min. This temp. is called the "transition point" of the product. The results are for cacao butter I no. 37.73, m. p.  $33.2^\circ$ , "transition point"  $29.3^\circ$ , acidity 2.4; for olein I no. 41.02, m. p.  $31.0^\circ$ , "transition point"  $27.8^\circ$ , acidity 3.31; for stearin I no. 38.69, m. p.  $34.6^\circ$ , "transition point"  $28.9^\circ$ , acidity 2.60; for Dutched cacao butter I no. 37.02, m. p.  $33.3^\circ$ , "transition point"  $30.0^\circ$ , acidity 2.81.

W. G. GAESSLER

**Indirect analysis of three-component systems, particularly of fatty acid mixtures.** K. TAUFEL AND M. RUSCH. *Z. Untersuch. Lebensm.* 57, 216–24 (1929).—Triangular coordinates are used for the indirect analysis of 3-component systems. Examples are: (1) mixts. of oleic, linoleic and erucic acids of known I and neutralization nos.; (2) mixts. of  $(\text{NH}_4)_2\text{CO}_3$ ,  $\text{NH}_4\text{HCO}_3$  and  $\text{NH}_4\text{CO}_2\text{NH}_2$  of known  $\text{CO}_2$  and  $\text{NH}_3$  contents. The method is also applicable to a mixt. of linoleic, linolenic and oleic acids inasmuch as the iso-I and iso-neutralization values are parallel.

C. R. F.

**The highly unsaturated acids of sardine oil. I. A new acid  $\text{C}_{18}\text{H}_{32}\text{O}_2$  and the highly unsaturated  $\text{C}_{18}$  acids.** YOSHIYUKI TOYAMA AND TOMOTARO TSUCHIYA. *Bull. Chem. Soc. Japan* 4, 83–91 (1929); cf. *C. A.* 23, 2586.—Japanese sardine oil was treated by the Na-soap-acetone method (*C. A.* 19, 3606) and crude highly unsatd. acids were obtained from the acetone-sol. Na soaps. On vacuum distn. of the Me esters the part boiling up to  $215^\circ$  at 15 mm. was brominated. The  $\text{Et}_2\text{O}$ -insol. part of the bromides was sepd. by  $\text{C}_6\text{H}_6$  into 2 parts: sol. at  $40^\circ$  and insol. on boiling. The debromination product of the part sol. at  $40^\circ$  was distd. at 15 mm. The part b.  $180$ – $215^\circ$  was redistd. Sapon. of fraction I,  $b_{18}$   $180$ – $90^\circ$ , yielded the free acid, a yellow liquid of  $d_4^{20}$  0.9324,  $d_4^{20}$  0.9288,  $n_D^{15}$  1.4876,  $n_D^{20}$  1.4855, neutralization no. 221.6, sapon. no. 222.6, 1 no. (Rosenmund and Kuhnemann) 298.5, (Wijs) 310.7; bromide insol. in  $\text{Et}_2\text{O}$ , hexabromohiragonic acid: yield 50.80%, m. p.  $190^\circ$ , 66.10% Br. Hydrogenation produced palmitic acid. The new acid,  $\text{C}_{18}\text{H}_{32}\text{O}_2$ , was named *hiragonic acid*. The Me ester fraction yields methyl-hexabromohiragonate of 64.95% Br. and m. p.  $180^\circ$ . Similar treatment of fraction II showed that it contains mainly the ester of acid,  $\text{C}_{18}\text{H}_{32}\text{O}_2$ , with acids of lower and higher unsatn. present. The bromides insol. in boiling  $\text{C}_6\text{H}_6$  furnished, by debromination and vacuum distn., fraction I  $b_{18}$   $200$ – $15^\circ$  and fraction II  $b_{18}$   $215$ – $30^\circ$ . After redistn. of fraction I the fraction  $b_{18}$   $205$ – $15^\circ$  yielded, after sapon., the free acid of  $d_4^{25}$  0.9332,  $d_4^{20}$  0.9298,  $n_D^{15}$  1.4942,  $n_D^{20}$  1.4921, neutralization no. 202.5, sapon. no. 206.4, 1 no. (R. and K.) 327.8, (W.) 340.8; bromide insol. in  $\text{Et}_2\text{O}$ : yield 53.82%, m. p. about  $220^\circ$ , 69.67% Br. Hydrogenation produced stearic acid.

G. TOERNIES

**Iodine number and its relation to the source and age of olive oil.** E. DE CONNO AND D. RAGO. *Ann. chim. applicata* 19, 98–107 (1929).—Detns. of  $I_2$  no. on olive oils from Sorrento, Lucca and Bari show some variation. However, this variation is not much greater than the variation due to the age of the oil, i. e., an oil of  $I_2$  value of 103.4 in 2 yrs. decreases to 99.0. Therefore, the age as well as the source of an oil must be considered in detg. its  $I_2$  value.

A. W. CONTIERI

**The extraction of olive oil by the Acapulco process.** J. BONNET. *Rev. vit.* 69, 69–77 (1928).—The novelty of the process consists in the use of a device for sepg. the stones from the pulp prior to extrn. of the oil, and upon the use of a mech. extractor which results in a high yield of oil from the pulp. The first object is accomplished by means of a rotating shaft provided with blades which beat the pulp through holes bored in the surface of a stationary Fe cylinder. The oil is sepd. from the pulp by a process of mech. kneading carried out in a semi-cylindrical app. fitted with a very fine Ni screen at its lower end through which the oil drains during the maceration of the pulp. By this method of treatment the oil contained in the endocarp of the seeds, in the seeds themselves and in the pulp adhering to the stones is lost but part of this loss is counterbalanced by the quality and the increased yield of oil from the pulp itself. The most important loss is that of the pulp itself which is converted into a slime of no economic value. A comparison of the Acapulco and pressure processes, especially as regards yields and compn. of the oil, rate of operation and economics involved, is given.

K. S. M.

**The oil of silk-worm chrysalides.** E. DE CONNO AND A. QUARTO. *Ann. chim. applicata* 19, 91–7 (1929).—As chrysalides give a yield of over 20% oil, on extrn., which can be readily solidified by hydrogenation, this oil has been studied and some of its properties have been detd. as follows: m. p.  $11$ – $18^\circ$ , sp. gr. 0.927, acid no. 45.55, sapon. no. 194.2,  $I_2$  no. 134, volatile acid 1.3%.

A. W. CONTIERI

**Viscosity of soap solutions.** B. WALKER. *Allgem. Oel- u. Fett-Ztg.* 25, 448–50 (1928).—The viscosity of 0.3% (of fatty acid) soap solns at  $20^\circ$  was 52–56.2 sec. (water at  $20^\circ$ , 50.8 sec.). Generally, K soaps gave higher values than Na soaps, tallow and lard excepted. Values for  $30^\circ$ ,  $40^\circ$  and  $50^\circ$  are recorded.

B. C. A.

Viscosity of different soap solutions (WALTHER) 2. Separation of glycerides (SUZUKI) 10. Compressing soap (Ger. pat. 480,700) 13. Sulfonating oils (Ger. pat. 480,157) 13.

**Hardening fats, fatty acids, waxes, etc.** I. G. FARBENIND. A.-G. Brit. 306,053, Sept. 15, 1927. A small proportion of montan wax that has been bleached by oxidation (suitably by chromic acid or by electrolytic treatment) is added to materials such as stearin, tallow, paraffin, ozocerite, ceresin or beeswax.

**Decolorizing oils.** HERMANN BOLLMANN. Ger. 480,345, Jan. 7, 1925. Fatty or mineral oils are treated with decolorizing earths by a continuous method in which the oil and the earth are fed in predetd. proportions to a mixer in such a way that fresh oil meets fresh earth, the mixt. being continuously withdrawn. App is described.

**Decolorizing and refining crude cottonseed oil.** WALTER S. BAYLIS (to Filtrol Co. of Calif.). U. S. 1,725,895, Aug. 27. The oil is heated to a temp. not exceeding 43°, intimately mixed with water, and the water and assocd. substances are removed from the oil, the latter is brought into intimate contact with activated clay, and then sepd. from the clay.

**Soy-bean oil.** J. D. RIEDEL-K. DE HAËN. A.-G. Ger. 474,543, Aug. 29, 1923. Addn. to 464,554. The waste products of soy-bean oil production are extd. with alc. and then with acetone to obtain the oil, lecithin, phosphatide and mucin therein.

**Phosphatide emulsions.** HERMANN BOLLMANN. Ger. 480,480, Oct. 7, 1925. An oil emulsion of phosphatides such as from soy beans, is purified by removing most of the oil and distg. under reduced pressure (60°) to remove water and substances which impart an unpleasant taste.

**Extracting oils from fish livers.** MANUFACTURE DE MACHINES AUXILIAIRES POUR L'ELECTRICITE ET L'INDUSTRIE. Brit. 306,020, Feb. 14, 1928. An arrangement of app is described suitable for disintegrating the material in the presence of hot water and sepg. the oil by centrifuging.

**Plastic compositions.** JEAN BAER. Swiss 132,325, Nov. 8, 1927. Wax-like bodies are prepd. by the action of  $C_2H_4Cl_2$  on  $(NH_4)_2S$  soln. The product has a higher m. p. than beeswax or carnauba wax.

**Soap.** KARL LÖFFL. Ger. 479,908, Nov. 28, 1925. In the sapon. of fats under pressure for making soap, the empty portion of the sapon vessel is cleared of air and gas so that only vapors of readily condensable liquids remain. An example is given.

**Soap.** HANS SCHNYDER. Swiss 132,321, Nov. 11, 1927. Dry soap is prepd by kneading soft soap with calcined soda in the warm until not more than 7 mols. of water of crystn. remain to each mol. of  $Na_2CO_3$ , cooling and pulverizing.

**Apparatus for cutting soap flakes.** ERNST FLAMMER and I. CHRISTIAN KELLER. Ger. 480,675, May 10, 1925.

## 28 SUGAR, STARCH AND GUMS

J. K. DALE

**The economy of the German sugar industry.** P. RIEFER. *Deut. Zuckerind.* 54, 538-42(1929). J. F. LERTE

**Utilization of exhaust heat in sugar factories.** K. SCHIEDL. *Centr. Zuckerind.* 37, 577-80(1929).—A discussion with calcns. J. F. LERTE

**Special lubricants in the sugar industry.** ERNST W. STEINITZ. *Centr. Zuckerind.* 37, 683-4, 703-4(1929). J. F. LERTE

**Sugar in the "reform-houses" (natural food stores).** ROSSÉN. *Deut. Zuckerind.* 54, 494(1929).—R. presents data showing several "patent" sugars selling at high prices to consist of 82-96% sucrose and 0.5-1% invert sugar with varying amts. of other ingredients such as whitening, starch and grain germs. J. F. LERTE

**Raw sugar and affination.** E. PELTZ. *Deut. Zuckerind.* 54, 542-3(1929). J. F. L.

**The valuation of raw sugar.** O. SPENGLER. *Deut. Zuckerind.* 54, 537-8(1929).—S. discusses the successful use of the shorter method (Spengler and Brendel, C. A. 22, 4859) and their longer method (C. A. 22, 1870) in practice, and recommends, as a result of some 8000 detns., certain changes in procedure and the adoption of the methods for factory control. J. F. LERTE

**Determination of ash of some Philippine raw sugars by the electrical conductivity method.** V. G. LAVA and F. G. ISAAC. *Sugar News* 10, 186-9(1929).—This is an adaptation of the work of Zerban and Sattler (C. A. 21, 2394). For 11 samples of sugar representing 8 Philippine Sugar centrals, L. and I. found that: (1) at 28° the value

of the *c*-ratio calcd. by the method of least squares is 1511 (Zerban's and Sattler's value is 1566.5); (2) in some cases there is an appreciable difference between chem. ash and cond. ash, which is explained by assuming that the value of the ash is different in different centrals and at different seasons; (3) the sample from the sugar mill of the Univ. of the Philippines which has low extn. gave an abnormally high *c*-ratio. V. G. L.

**The significance of sampling for chemical analysis.** JOSEF HAMOUS. *Listy Cukrovar.* 47, 645-6 (1929).—Correct sampling does not account for losses due to caramelization of the heated sugar solns. Liquid entering one chamber from another is superheated for that chamber. Such losses may be as high as 0.2%. Caramelization may be detd. by measuring the color produced during boiling. FRANK MARESH

**The preparation of sugar from carob by alcoholic extractions.** G. ODDO. *L'ind. sacc. ital.* 21, 460 (1928); *Listy Cukrovar. Rozhledy* 47, 36; cf. C. A. 22, 4861.—The fruit contains 20-34% sucrose and 10-20% reducing sugars. Extn. with H<sub>2</sub>O lead to sirups which did not cryst. Alc. ext. gave sirups which crystd. after 10-15 days standing yielding 16.4-21.6% of raw sugar figured on the fruit. The mother liquor contained 2-3% sucrose and reducing sugars. Carob is a very stable fruit and could be worked throughout the whole year in small plants. Dried beets extd. with MeOH and EtOH yielded sirups which crystd. readily. FRANK MARESH

**Cercospora of sugar beets.** E. SAILLARD. *Revue de Path. Végétale et d'Entomologie Agricole* 10, 292 (1928); *Listy Cukrovar. Rozhledy* 47, 38.—Beets diseased with cercospora give highly impure and colored sugar liquors, a low percentage of sugar, large amide and NH<sub>3</sub> content, require the addn. of Na<sub>2</sub>CO<sub>3</sub>, and yield an excess of molasses. Soaking seeds in germicides was ineffective. Spraying the greens with CuSO<sub>4</sub> soln. every 8-10 days was effective but spraying with dry CuSO<sub>4</sub> was better. F. M.

**French growing experiments with 14 beet varieties.** E. SAILLARD. *Circ. hebdom.* 10, III (1929); *Listy Cukrovar. Rozhledy* 47, 33.—Varieties of beets, 7 domestic and 7 foreign, were grown on exptl. plots in 11 localities. The data on the best varieties is tabulated.

Variety	Yield of beets g per ha	Sugar content, %	Yield of sugar g. per ha.
Zapotil	314.2	18.24	57.3
Kleinwanzleben Z	311.5	18.18	56.6
Vilmorin B	305.9	18.12	55.4
Dippe W I	303.3	18.27	55.4

FRANK MARESH

**New experiments on the effect of breaking the greens upon the yield and quality of sugar beets.** JAROSLAV SOUČEK AND JOSEF SUK. *Listy Cukrovar.* 47, 599-601 (1929).

FRANK MARESH

**Drying sugar beets and extracting the sugar by means of diffusion.** N. L. KARAVAEV AND A. P. PALKIN. *Acta Univ. Asiae Med.* Sci. 6 No. 3, 3-12 (1928); cf. C. A. 23, 299.—With the climatic conditions existing in Middle Asia, sugar beets may be dried in the sun until the middle of October. Dried sugar-beet cuttings with a moisture content of 8-10% can be preserved indefinitely without spoiling. The extn. of sugar from dried-beet cuttings is as good as with raw beets. The purity quotient of the diffusion and satn. liquors from dried beets is not, in general, lower than that from raw beets. The quantity of lime for the defecation of the diffusion liquors from dried beets is considerably lower than that for raw beets. R. P. WALTON

**Treatment of beet juices with sodium carbonate, and the juice alkalinity.** V. STANEK. *Z. Zuckerind. Tschoslovak. Rep.* 53, 173-7 (1929).—Na<sub>2</sub>CO<sub>3</sub> added for the reduction of the Ca content of juices during their clarification should be introduced before the first carbonation, e. g., to the juice in the measuring tanks. If triple carbonation is applied, the alkali should be mixed with the second carbonation juice before turning on the gas, the colloidal CaCO<sub>3</sub> formed being thus entrained by the carbonation scums. In practice, it is found that the quantity of Na<sub>2</sub>CO<sub>3</sub> added should be somewhat more than the equiv. of the Ca present, otherwise, the desired final alk. will not be realized. B. C. A.

**The coloring of beet juices during evaporation.** E. SAILLARD. *Suppl. Circ. hebdom.* No. 2000 (1929); *Listy Cukrovar. Rozhledy* 47, 36.—Observations were made on the changes of color during evapn. of liquors treated with SO<sub>2</sub>. A few runs were made on liquors which had not been so treated. The increased color was slight, from 100 to 108. FRANK MARESH

**Evolution of carbon dioxide in the boiling of thin [beet] juices.** I. E. THIELFAPE AND P. MEIER. *Z. Ver. deut. Zucker-Ind.* 78, 385-92 (1928).—The CO<sub>2</sub> evolved in the boiling of thin juices is not derived entirely from bicarbonates; other decompn.

processes occur to some extent. Juices boiled under pressure at  $116^{\circ}$  evolve during the first hr., a definite amt. of  $\text{CO}_2$ , which does not appreciably increase during the second hr., and the amt. of sugar decomposed is negligible. At  $124^{\circ}$ , however, considerable decompn. of sugar occurs and  $\text{CO}_2$  is evolved as long as boiling is continued. At both temps. the juices, originally alk., become slightly acid in time. B. C. A.

Lime content (of sugar beet liquors) and the addition of soda. C. TSCHASKALIK. *Centr. Zuckerind.* 37, 523-4(1929).—A discussion. J. F. LESTY

Frothing of [sugar] juice during carbonation in the beet-sugar factory. V. STANEK AND J. VONDRÁK. *Z. Zuckerind. tchosllovak. Rep.* 53, 81-98(1928).—See C. A. 23, 2059. B. C. A.

Decolorizing cane and beet sugar juices with sulfur dioxide and activated charcoal. G. MEZZADROLI AND E. VARETON. *L'ind. sacc. ital.* 21, 552(1928); *Listy Cukrovar. Rozhledy* 47, 30.—Treating with  $\text{SO}_2$  in the cold causes no inversion; at  $80^{\circ}$  no inversion occurs as long as the free acidity is less than the org. acid acidity of the juices. Treatment with norite in the cold or warm causes no inversion at a pH 4-5.2; the acidity of the soln. is decreased due to an adsorption of the acids by norite. Treatment with  $\text{SO}_2$  and norite does not produce an inversion even at  $85^{\circ}$  for norite adsorbs the excess  $\text{SO}_2$ .  $\text{SO}_2$  decolorized the liquor, lowered the viscosity and permitted evapn. to proceed without bumping or foaming. Norite decolorized the liquor, adsorbed colloids and lowered the viscosity. Treatment with  $\text{SO}_2$  followed by norite gave better clarification. Lowering in viscosity was greater than with either treatment alone. Surface tension was increased, no foaming occurred, and, after the addn. of norite, the original alky. was restored so that the consumption of  $\text{CaO}$  was not increased. The decolorization was permanent and remained so after the soln. was made alk.; this is not true for treatment with  $\text{SO}_2$  alone. Treatment in dil. soln. followed by a concn. to  $60^{\circ}$  B $\acute{e}$ . gave better results than when solns. were concd., treated with  $\text{SO}_2$  and followed with a norite treatment. The expts. were carried out with beet and cane molasses, sirups and liquors from various processes. FRANK MARESH

Comparative examination of "Norite" and "Carboraffin" in sugar refining. K. REICH AND G. VAVRINECK. *Z. Zuckerind. tchosllovak. Rep.* 53, 285-9(1929).—Analytical figures observed for "Norite Supra 3X" and "Carboraffin" were, resp., loss of wt. at  $150^{\circ}$ , 12.73, 11.10; ash 6.50, 2.98; water-sol. ash 2.27, 1.57%; reaction, alk., neutral;  $\text{Fe}_2\text{O}_3$ , 0.60, 0.34%. Inverting effect was observed by heating 2 g. of each carbon with 100 cc. of a 50% soln. of sugar for  $\frac{1}{2}$  hr. at  $90^{\circ}$ , and detg. the Cu reduced from 50 cc. of Fehling's soln., the figures found being 30.9 and 58.6 mg. (blank 26.0 mg.) To charge a Danek filter of 13 sq. m. surface, the wt. of the 2 carbons to give the same thickness of layer was 30 and 20 kg. After a factory run lasting 49 hrs. using such filters, the color removed by the 2 media was, resp., 29.9 and 39.4%. Boiling the used carbon for 1 hr. with water showed only a slight revivification with the "Norite," but re-stored the "Carboraffin" to 50% of its original decolorizing power. B. C. A.

Advances in the control of saturation. K. SOLOS. *Deut. Zuckerind.* 54, 540-51(1929).—A review. J. F. LESTY

Experiments on diffusion. W. SZYMANSKI. *Gaz. Cukrowc.* 64, 311(1929); *Listy Cukrovar. Rozhledy* 47, 30.—Observations on diffusion in the cell were made by packing beets into sacks of a coarse weave of 1 kg. capacity and distributing them throughout the diffusion cells. Before blowing the cell, the sacks were withdrawn and analyzed. The least diffusion occurred at the surface opposite to the  $\text{H}_2\text{O}$  intake. F. M.

Innovation in diffusion batteries. HERMANN GUTHERZ. *Centr. Zuckerind.* 37, 522-3(1929).—G. describes a new type of relief sieve with slits which, placed inside the customary round-hole sieve, increases the efficiency of the battery, especially when small beets are handled. J. F. LESTY

Determination of sugar content at receiving and diffusion time and its significance in determining the losses. KAREL HERZBERG. *Listy Cukrovar.* 47, 644-5(1929). The change in sugar content was  $18.08-17.80 = 0.28\%$  at Mironovka. H. found a difference of  $0.20\%$  in 1927-8. It is not correct to take the wt. of beets and subtract  $1.5\%$  for adhering  $\text{H}_2\text{O}$  as advised by Kryž when losses are computed. F. M.

Scale formation in evaporators. K. FEUERLEIN. *Centr. Zuckerind.* 37, 630(1929).—F. describes, with analyses, deposits in evaporators at 4 beet sugar factories. J. F. LESTY

Freeing the heating surface of evaporators of deposits. H. A. SCHLOSSER. *Deut. Zuckerind.* 54, 545-8(1929).—S. discusses the problem and recommends, especially when much  $\text{SiO}_2$  is present, boiling 1 hr. with 1% solns. of  $\text{HCl}$ ,  $\text{NH}_4\text{Cl}$  and  $\text{NaOH}$ , resp. Changing the order of treatment leads to poorer results. Examples are given of analysis and treatment. J. F. LESTY

**How much water is necessary to leach out the sugar from the mud in the presses?** FRANZ KERCHER. *Centr. Zuckerind.* 37, 597–601(1929).—Expts. under controlled and varied conditions lead to the following conclusions: (1) The amt. of sugar extd. varies directly with the time and inversely with the water pressure. (2) The leaching effect of cold water is 11% higher than that of hot. (3) Leaching is favored by diln. of diffusion liquor, a shorter time of diffusion and lower battery temp. Under the most favorable conditions the leaching of 0.1–1% sugar required water equal to 80% weight of mud. Other conclusions, tables and curves are given.

**Inversion of sucrose by weak acids.** V. ZAFOUK. *Z. Zuckerind. Tschoslovak. Rep.* 53, 33–42(1928).—Under like conditions regarding molar concn. temp. (70°) and H-ion concn., aspartic acid hydrolyzes sucrose more rapidly than does succinic acid. Glutamic acid, on the other hand, has the same rate as succinic acid at  $p_H$  4.5, but this increases with rising  $p_H$ , until at  $p_H$  5.1 it is the same as in the case of aspartic acid. At a still higher  $p_H$ , glutamic acid inverts more rapidly than aspartic acid. At  $p_H$  5.5 succinic acid inverts insignificantly, and at  $p_H$  5.7 aspartic acid also practically ceases to hydrolyze.

**Following up the inversion danger.** G. BRUHNS. *Centr. Zuckerind.* 37, 702–3(1929).—B. recommends the use of Mueller's soln. instead of Fehling's in testing for invert sugar. 173 g. cryst.  $CuSO_4$ , 331 g. anhyd. (or 893 g. crystd.)  $Na_2CO_3$  and 865 g. Rochelle salt are made up to 5 l. The proportion of Rochelle salt can perhaps be reduced. The soln. can be kept for several months if pure salts are used. Mueller's soln. is less affected by sucrose but more sensitive to invert sugar than Fehling's. Fifty cc. of the former (2 months old) plus 10 g. sucrose, boiled for 2 min., yield 4.8 mg. Cu, for 4 min., 6.4 mg. Cu. The same tests with Fehling's yield 37 and 64 mg. Cu, resp. Boiled 2 min. with 50 mg. dextrose M.'s soln. yields 117, F.'s 97 mg. Cu. Qual. tests for invert sugar are made by heating 5 cc. M.'s soln. with 10 cc. thin liquor, 5 cc. thick liquor dild. to 10 cc. or 2–3 g. sugar made up to 10 cc. for 10–15 min. on a water bath.

**Lafeuille crystallizer-pans at Arayat central.** F. LAFEUILLE. *Sugar News* 10, 210–8(1929).—The pan is described, its advantages being enumerated. V. G. LAVA

**The origin and composition of molasses.** JAR DEDERK. *Chem. Listy* 21, 253–61(1927): cf. *C. A.* 22, 182. Crystn. of molasses was followed over 28 days by measuring the  $n_D$ , loss in weight, etc. Twenty-one salts were observed in their ability to promote crystn. in molasses:  $LiCl$ ,  $NaOAc$ ,  $K_2CO_3$ ,  $K_3PO_4$  and  $KOAc$  did not produce crystn. after 16 months. The "crystg. coeffs." served as a measure of the rate of crystn. and were computed from changes in the  $n$  and loss in  $H_2O$ . They are  $MgSO_4$  66,  $K_2Fe(CN)_6$  57,  $Na_2SO_4$  42,  $KBr$  27,  $NaCl$  26,  $KNO_3$  26,  $NaK$  tartrate 26, sucrose 21,  $Na_3PO_4$  20,  $KCl$  19,  $Na$  citrate 19,  $Na_2CO_3$  17,  $(COONa)_2$  14,  $C_6H_5COONa$  13. No regularities appear; the lowering of the  $f_p$  of a 0.5 N sucrose soln. was observed in 0.5 N glycine, 0.5 N  $NaOH$ , 0.25 N  $KOAc$ , 0.25 N  $NaK$  tartrate, 0.5 acetamide, 0.5 betaine. In all cases the actual depression exceeded the theoretical. In electrolyses of sucrose or diluted molasses and various electrolytes, sucrose was found at the anode and never at the cathode—showing sucrose to behave as an anion. The effect of salts upon the acid behavior of sucrose was detd. by measuring the concn. of  $OH$  ions in alk. solns. of salts with and without the addn. of sucrose. 2 N  $KCl$ , 2 N  $LiCl$ , 2 N  $NaOAc$ , 2 N  $NaK$  tartrate and 2 N  $HCOONa$  were tried with 0.22319 N and 0.55798 N  $KOH$ ; the presence of the salts increased the neutralizing effect, i. e., the acid character of sucrose. The greatest effect is produced by  $Cl$  and may be due to salts of inorg. acids; the salts of org. acids have a smaller effect. This agrees with cond. measurements and indicates the existence of complex ions in such mixed solns. In molasses, salts of weak org. acids predominate and their influence upon sucrose is small so that the problem of molasses crystn. does not lie here. The colloids found in sugar-refining liquors hinder but do not prevent crystn. Viscosity measurements were made on solns. of  $NaCl$ ,  $LiCl$ ,  $Na_2SO_4$ ,  $(COONa)_2$ ,  $Na_3PO_4$  and  $MgSO_4$ , solns. of  $MgSO_4$  and  $(COONa)_2$ , which crystallize well, have a viscosity slightly exceeding sucrose, but  $Na_3PO_4$ , which also crystallizes well, has a high viscosity, and  $LiCl$ , which fails to crystallize, has a low one. Viscosity alone cannot be the cause of noncrystn. although it may retard crystn. Solns. of sucrose and salts crystallize slower than solns. of sucrose alone. About  $1/3$  of the salts failed to produce crystals during 2 months. Of these 70% remained unchanged after 16 months while 30% formed crystals. Phase diagrams are drawn in explanation on the basis of mol. compn. Photomicrographs accompany the exptl. data.

**Nitrogenous constituents of molasses and their bearing on its value.** H. CLAASSEN. *Z. Ver. deut. Zucker-Ind.* 78, 371–84(1928).—Rational evaluation of beet molasses for yeast manuf. or foddering purposes should take account of the contents of total, assimila-

ble and amide N. Assimilable N may be detd. by 2 successive yeast fermentations, with addn. of sugar after the first, as described previously (C. A. 21, 1558). The amt. thus detd. is much greater than that actually assimilated in methods of aeration yeast manuf. where large quantities of  $\text{NH}_4$  salts are added, because the yeast assimilates the  $\text{NH}_4$  in preference to other nitrogenous compds., although the latter are a better form of nutriment. To obtain max. yields of bakers' yeast, the molasses worts should contain 2-2.5 pts. of assimilable N per 400 pts. of sugar, although only about half of the former passes into the yeast crop; a more complete utilization of the assimilable N is only possible at the expense of the quality of the yeast. Beet molasses usually contains, per 100 pts. of sugar, about 3.4 pts. of total N and 1.4-1.8 pts. of assimilable N. The necessary excess of the latter may be provided by addn. of an ext. of malt germs, which contains about 1.8% of total soluble N and 1.4% of assimilable N similar in character to that of molasses. B. C. A.

**Electrodialysis of exhaust molasses.** NAOTO KAMEYAMA AND YOZO MAYEDA. *J. Soc. Chem. Ind. Japan* 32, 674-81 (1929); Suppl. Binding 32, 205B (1929).—For the removal of the mineral ingredients, cane molasses was electrodialyzed in a 3-compartment dialyzer, while  $\text{CO}_2$  was passed into the cathode compartment. The cathodic diaphragm was made of parchment paper on which colloidal copper ferrocyanide had been pptd. Seven kinds of anodic membranes were tried. The best result was obtained with a silk membrane which had been soaked with bichromated gelatin and exposed to sunlight. S. OKA

**The size of seed pieces in relation to germination and the relation of irrigation to germination.** H. ATHERTON LEE AND PABLO QUIZON. *Sugar News* 10, 176-85 (1929).—With Uba cane L. finds that when soil moisture is below the optimum: (1) seed pieces larger than three-eyes are desirable; (2) irrigation following planting had very marked effect in increasing germination of the two-eye and three-eye seed pieces, but had very little effect on the total germination of the ten-eye seed pieces; (3) irrigation increased the speed of germination by at least 1 month for all sizes of seed pieces. V. G. L.

**Manufacture of dextrin.** ANON. *Chemist Druggist* 110, 202 (1929).—Addn. of certain metallic salts, e. g.,  $\text{MnCl}_2$  (cf. C. A. 23, 2844), to the starch-HCl mixt. hastens conversion of the dried mixt. to dextrin at a temp. of only about 120-130°. S. W.

**Starch ester.** I. FUKUSHIMA AND Y. TAKAMATSU. *J. Soc. Chem. Ind. Japan* 32, 130-5 (1929); Suppl. Binding 32, 42-4B (1929).—Alkali starch prep'd. by kneading 1 pt. of starch with 5 pts. of NaOH soln. of various concns. was esterified with 5 pts. of  $p\text{-C}_6\text{H}_4\text{CH}_2\text{SO}_2\text{Cl}$  and 30 pts. of  $\text{C}_6\text{H}_6$ . The ratio of combined sulfonic acid to starch was calcd. from the S content of the product detd. by Carius method. Esterification was complete within 24 hrs. at 40° and was independent of the amt. of  $p\text{-C}_6\text{H}_4\text{CH}_2\text{SO}_2\text{Cl}$ . With an increase of the concn. of NaOH, the acid content of the ester increased, but within the range of 12-30 vol.-% the ratio was practically const., i. e., 1 mol. of sulfonic acid to 1 mol. of  $\text{C}_6\text{H}_{10}\text{O}$ . Lower esters of starch showed color reaction with I, but higher esters did not. Sol starch and dextrin produced similar esters, their acid ratio being 1.5 and 1 mol., resp., to 1 mol. of  $\text{C}_6\text{H}_{10}\text{O}$ . Y. TOMOHA

The effect of sugar factory waste water on streams (MATSCHKE) 14. The waste from [sugar refineries] in Pommern (MÖLLER) 14. Sugar beet parasites (RAMBOUSEK) 15. Statistical collections from the laboratory for soil investigation of the sugar factory of Greifswald, Pomerania (ERDENRECHER) 15. Fertilizer constituent test. Phosphoric acid gives profitable increased yields on lowlands at Bacolod-Murcia mill-site (LEE, *et al.*) 15. An investigation of cane molasses distillery slop (NELSON, GREENLEAF) 16. Some organic acids of sugar-cane molasses (NELSON) 10.

**Removing albuminous substances from molasses or other saccharine solutions.** JACOB POBLMANN and JACOBUS R. F. RASSERS. U. S. 1,726,451, Aug. 27. The soln. in non alk. condition is treated with tannin or other suitable non-alk. substance capable of pptg. the "ferment albumins," and the ppt. formed is sepd.

## 29—LEATHER AND GLUE

ALLEN ROGERS

**The relation between tannins and non-tannins in the extracts.** Contributions to a theory of tanning. V. S. SADIKOV. *Biochem. Z.* 210, 206-333 (1929).—The tannins are very sensitive substances which easily change into insol. condensation or oxi-

dation products (tannoids), and the tannins together with the tannoids may form either reversible or irreversible systems. The relation of these phenomena to the process of tanning as well as the methods for investigation is extensively discussed. S. M.

**Tizrah wood and extract.** W. VOGEL. *Collegium* 1929, 68-74.—See C. A. 23, 729. E. H.

**The Bloom gelometer, a modern instrument for testing glue and gelatin.** HANS MENDEL. *Chem.-Ztg.* 53, 591-2(1929).—Cf. C. A. 19, 2280. J. H. M.

**Faulty liming of glue stock.** H. STADLINGER. *Kunstdünger- u. Leim- Ind.* 25, 200-1, 211-2; *Chem. Zentr.* 1928, II, 1170.—S. points out the great losses resulting from the influence of heat and cold on the glue stock. He discusses the advantages of digestion with lime soln. as compared with NaOH, acid or enzymes. He favors a short, energetic liming of the glue stock. Reduction to small size of the glue stock before liming is necessary. G. SCHWACH

**Rubber in the production of leather (CRISPIN) 30.** The analysis of Na sulfide, sulfite and bisulfite (AUERBACH) 7. Apparatus for drying hides (Ger. pat 480,571) 1. Dyes [for leather] (Brit. pat. 306,447) 25.

**CHAUVEL, HÉRVÉ:** Les tanins végétaux et en particulier les écorces tannantes de Madagascar. Paris L. Declume. 180 pp. F. 18.

**Tanning.** REISCHACH & Co. G. M. B. H. Ger. 479,620, Feb. 19, 1928. Hides are tanned with a soln. of bivalent Fe salt and NO, which is free from higher oxides of N. The example mentions  $\text{Fe}_2\text{SO}_4 \cdot 7\text{H}_2\text{O}$  as a suitable salt.

**Tanning agent.** ANDREA CAMINNECI. Ger. 479,909, Jan. 21, 1925. A solid tanning agent is obtained by adding vegetable tanning material to cellulose sulfite lye and pptg. by acids or salts. The mixt. may be halogenated before the pptn. occurs. Thus, a mixt. of cellulose sulfite lye and quebracho ext. is chlorinated and the tanning agent so formed is pptd. with Fe salt soln. Other examples are given.

**Tanning with iron salts.** REISCHACH & Co. GES. Brit. 306,400, Feb. 18, 1928. NO is passed into a soln. of a ferrous salt such as the sulfate, chloride or acetate, in the absence of air and in the presence of the hides or before their introduction into the bath, and after treatment in the soln. for a time the hides are exposed to air or O (which may be under pressure).

**Leather.** ROBERT H. PICKARD, DOROTHY JORDAN-LLOYD and ALBERT F. CAUNCE. Ger. 480,228, Aug. 25, 1925. Skins and hides to be treated with gaseous HCHO are first dehydrated by volatile water-absorbing substances such as acetone.

**Leather treating.** CHEMISCHE FABRIK POTT & Co. Ger. 479,927, Aug. 31, 1926. Leather and hides are soaked in aliphatic, isocyclic, aromatic and hydrogenated aromatic compds. such as condensation products of naphthalene with satd. alcohols contg. 2 or more C atoms.

**Dyeing chrome-tanned leather.** SOC. ANON. POUR L'IND. CHIM. A BALÉ. Brit. 305,949, Feb. 9, 1928. Alumina-chrome-tanned leather is dyed in fast tints by use of Cr compds. of mordant dyes. Alumina-tanned leather is first softened with warm aq. diastase soln., chrome-tanned in a fresh bath, neutralized with borax soln. and dyed (preferably with addn. of  $\text{NH}_4\text{OAc}$  at first and of formic acid later in the dyeing process).

**Glue from chrome leather waste.** CARL STIEPEL. Ger. 480,378, Feb. 4, 1928. The waste is compressed into thin sheets and then treated by known processes. Fibrous material may be added to assist in forming the sheets.

**Glue.** ERNST BUHTZ. Ger. 479,612, April 24, 1927. Glue prep'd. from animal matter is improved by treating it with yeast under conditions ensuring a strong evolution of  $\text{CO}_2$ .

**Gelatin and glue.** J. T. DIXON. Brit. 306,439, Nov. 18, 1927. Gelatin or glue to form sheets, filaments or the like is treated with 30-50% its wt. of a saponified fatty material, such as linseed or castor oil or a saponified, sulfonated, fatty material, to improve its flexibility, strength and transparency. Hardening agents may be added, and by the addn. of 1-2% of PhOH or NaI or KI a binder especially suitable for use in making "splinterless" glass is prep'd.

## 30—RUBBER AND ALLIED SUBSTANCES

C. C. DAVIS

Chemical analysis of gutta-percha, balata and allied gums. S. MINATOYA, K. ISHIGURO AND K. MARUYAMA. *Res. Electrotechn. Lab., Japan* No. 232, 14 pp.(1928).—Chem. analysis is of great importance in research on gutta-percha, balata and allied gums for submarine cable insulation. The authors collected 26 kinds of gutta-percha, 8 kinds of balata and 3 varieties of allied gums with trade names, and analyzed them for moisture, ash, dust, resin and gutta hydrocarbon. The resin, which has the most influence on the elec. and mech. properties, was subdivided into the so-called "fluavile," "spherical albane" and "needle albane." W. OGAWA

The gutta-percha-like substance obtained from Tu-chung. S. MINATOYA AND K. ISHIGURO. *Res. Electrotechn. Lab., Japan* No. 260, 16 pp.(1929).—The characteristics of the gutta-percha-like substance derived from the bark of Tu-chung were investigated with a view to applying it to insulating material for submarine cables. By extn. it was found that the air-dried bark contains moisture 9.88, resinous 14.65 and gutta-like hydrocarbon 6.46%. The elec. and mech. properties of this hydrocarbon are as good as those of gutta-percha. Elementary analysis and the I value showed that this hydrocarbon is a polymer of isoprene or  $(C_5H_8)_n$ . The authors also detd. the change of plasticity with temp., softening point, tensile strength, elongation at break, hardness, elasticity, water absorptive power, resistance to chemicals, elec. puncture voltage and power factor of the hydrocarbon. W. OGAWA

A study of the viscosity of rubber latex. C. M. BLOW. *Trans. Faraday Soc.* **25**, 458-62(1929).—Samples of different latexes were dild. to different degrees and their viscosities detd. as a function of concn. For dild. the serum of the same latex was used, so as not to introduce new variables arising from colloidal changes which might take place if water was added. From the viscosity values of the dild. latexes, the vols. of the dispersed phase were calcd. by the Einstein formula, taking as the viscosity of the dispersion medium that of the original serum. The shape of the concn.-relative viscosity curves is very nearly similar to that of Borrowman (cf. *Rubber Industry* 1929, 243). There is a deviation from the equation of Einstein, but this equation is valid at low concns. In some there was a slight increase of vol., which may have been caused by the presence of an adsorbed, hydrated layer. On dild. with water, the viscosity and content of the dispersion medium changed as a result of the adsorbed layer going into soln., the viscosity of the dild. serum being lower than that of the serum obtained from latex of the same concn. The thickness of the adsorbed layer was 0.10  $\mu$  in the extreme case. The viscosity of a latex depended greatly upon the viscosity of its serum. C. C. DAVIS

Heat effects which accompany the spontaneous increase in density of raw rubber. H. SACHSE. *Gummi-Ztg.* **43**, 2216, 2218(1929).—The heats of swelling of various samples of rubber were measured in a specially designed calorimeter, which is described and illustrated and which employs  $Ph_2O$  as the dilatometer liquid. By assuming that all samples reach practically the same final state of energy, it is possible to obtain the energy difference of the original state and the heat tone of the spontaneous process, which make the rubber more dense, from the difference between the heats of swelling. The samples included (1) crepe which had been stored 10 yrs. at room temp. and had lost its rubbery properties; (2) hot-milled crepe which had been stored several yrs at room temp. and still showed a calendar effect; (3) para rubber; (4) crepe elongated, fixed and stored several days; and (5) the foregoing samples expanded by storage at 40-50° and then at 20°. Crepe (1) required higher temps. for expansion than (2), the expansion of (2) being complete on warming to 40°. Crepe (5) was particularly interesting, for here a neg. heat effect was obtained at first, followed by a pos. effect. The following data give the sample, the heat effect (in cal.) at 0° and the heat effect at 26.55°, resp.: (1), -3.17, -6.22; (1) (expanded), -1.6, -1.62; (2), -2.16, -; (2) (expanded), -1.34, -1.51; (3), -1.93, -; (3), (expanded), +0.70, +1.70; (4), -2.83, -5.52 (fixed and stored 3 months); (5), -, -0.5 to -1.0. The highest observed value of the heat of condensation of crepe which had not been first treated mechanically was approx. 6.4 cal. per g. This represents the extreme case of condensed rubber which is no longer elastic. Milled rubber samples which had been elongated and fixed showed lower values, which correspond to their power of further condensation. To this may also be attributed the more ready expansion on increase of temp., which is complete at 40°, whereas the crepe, which had been stored for 12 yrs. and was completely condensed, expanded only at higher temps. from 60° to 80°. C. C. D.



**The crystal structure of Tjipetir gutta-percha.** (Comparison with frozen rubber.) F. KIRSCHOF. *Kautschuk* 5, 175-83(1929); cf. *C. A.* 23, 1525.—Purified Tjipetir gutta-percha is a particularly good product for studying the cryst. structure of the gutta-percha hydrocarbon. It was dissolved in  $C_6H_6$  at  $80^\circ$  (16% soln.), filtered, let stand several days at  $15^\circ$  and decanted, which left a mass of microscopically small spherulitic dendritic crystals. Cooling the mother liquor to  $10$ – $12^\circ$  deposited further microcrystals of clustered dendritic form. When the 16%  $C_6H_6$  soln. was let stand 14 days at  $15^\circ$  and then cooled to  $0^\circ$ , delicate fibrous or needle crystals were deposited, followed by complete gelation. On warming any of the solns. above a certain temp. range ( $24$ – $5^\circ$ ), a clear soln. was again obtained. The deposit of gutta-percha from  $C_6H_6$  thus depends upon the temp. and the rate of cooling, as with monomol. fusions or 2-phase hydrosols, e. g., Na oleate. The formation of cryst. nuclei also depends upon the concn. Various other details of the crystn. phenomena are described and illustrated by photomicrographs. The viscosity of the solns. varied in direct proportion to the temp. between  $10.5^\circ$  and  $40.5^\circ$ , but below this range flocculation upset the results. This linear relation is probably a resultant of compensation between the decrease in concn. and the increase in micellar friction. The com. pure gutta-percha melted at  $62$ – $4^\circ$  and froze at  $42^\circ$ , the more highly purified spherulitic dendrites at  $66^\circ$  and  $45^\circ$ , resp., and the needle form at  $64$ – $5^\circ$  and  $41$ – $3^\circ$ , resp. The original material probably contained oxidation products. There was not only a temp. hysteresis between the m. p. and f. p. but also a time hysteresis, both of which are also true of frozen rubber (cf. van Rossem, *C. A.* 23, 2320). This time hysteresis was far shorter with solid gutta-percha than in  $C_6H_6$ , and after crystd. gutta-percha had once been fused its subsequent crystn. was more rapid, perhaps because of the presence of cryst. nuclei. The d. of crystd. gutta-percha was distinctly higher than that of fused gutta-percha or of rubber, the d. of dendritic gutta-percha, fused and partially crystd. gutta-percha, fused gutta-percha, frozen rubber and fused rubber being 0.977–0.992, 0.959–0.960, 0.938–0.939, 0.930–0.945 and 0.900–0.910, resp. The results indicate that the hydrocarbon of gutta-percha is different from that of rubber. Gutta-percha may, however, be a *trans* and rubber a *cis* form of the same hydrocarbon, so that in some cases the same derivs. are obtained. C. C. DAVIS

**New American standards for the correct formulation of rubber mixtures according to the conditions prevailing in February, 1929.** WERNER ESCH. *Gummi-Ztg.* 43, 2536, 2586-8(1929).—A review and discussion of the most recent practice. C. C. D.

**Rubber and its fractions.** R. PUMMERER. *Kautschuk* 5, 129-35(1929).—A review and discussion, with new points of view and new data. Detns. of the I no. and of the O no. (with perbenzoic acid) of various sol and gel fractions of alkali-purified latex, Revertex, crepe and smoked sheet showed that, in general, gel-rubber requires more  $ICl_3$  and more perbenzoic acid than sol-rubber (based on the % of the theoretical per double bond per  $C_6H_8$  group), the values for the gel-rubbers running well over 100 and those of the sol-rubbers 100 and below. Gel-rubber is, however, probably more unsatd. than sol-rubber, for no differences in the addn. of  $HCl$  or of  $PhNO$  were found. The evolution of  $HCl$  with  $ICl_3$  is fundamentally different, no  $HCl$  being detected with sol-rubber, whereas with gel-rubber 5% of the halogen consumed is evolved as  $HCl$ , indicating either substitution or cyclicization. By assuming substitution, calcs. show that sol-rubber and gel-rubber have the same no. of double bonds. Other evidence suggests a difference in the configuration (*cis* and *trans*) or in the micelles. By warming, sol-rubber becomes similar to gel-rubber, its viscosity and tenacity increasing and its chem. properties (titers) also approaching those of gel-rubber. The decrease in viscosity found by Staudinger and Bondy (cf. *C. A.* 23, 3372) can be explained by the fact that air was not excluded and, furthermore, the rate of cooling affects the viscosity, sol-rubber in  $C_6H_6$  being more viscous when cooled slowly after heating than when cooled rapidly. This latter fact indicates a micellar structure of rubber solns. The cooling effect is as great as the total heating effect if cooling is slow. The osmotic pressure is primarily an indication of the tendency of rubber to swell, and it is not a measure of the size of the mol. Cryoscopic and osmotic measurements are sometimes contradictory, and in such cases the cryoscopic method may be erroneous because of the *crystn. of complex phases of rubber and solvent*. In expts. on this subject, crystals of  $C_6H_8$  contg. 0.74–0.85% rubber were obtained. This tendency to form rubber- $C_6H_8$  crystals may be utilized for the further purification of rubber. A general discussion follows the paper. C. C. DAVIS

**The optical anisotropy of stretched rubber.** H. ZOCHER WITH H. J. v. FISCHER. *Kautschuk* 5, 173-5(1929).—A Berek calcite compensator was used for measuring the double refraction of stretched rubber, the complete app. including a means for the

uniform bilaterally symmetrical stretching of the rubber at a const. rate, with examn. by the microscope. Various types of rubber, including frozen samples, were examd., the influence of the rate of stretching, the temp., the degree of mastication and the state of vulcanization being detd. and correlated with the accompanying changes in mech. properties. In place of the theory of Hauser and Mark, according to which the appearance of x-ray interferences is due to crystals already present in coherent form, the hypothesis is advanced that the impurities form a coherent whole, out of which a crystallizable substance is expelled by stretching or by racking, which is purified to an extent that it can crystallize and become a discontinuous phase. Simple models can readily be made to illustrate the phenomenon. Among other features, the well-known differences in the "melting point" are easily comprehensible by the aid of this hypothesis. The Joule-Thompson heat effect is explained as a heat of crystn. and of fusion or soln. A general discussion follows the paper. C. C. DAVIS

**Rubber in the production of leather.** CRISPIN. *Gummi-Ztg.* 43, 2534-5(1929).—A general discussion, with particular reference to certain recent patents. C. C. D.  
**The degree of devulcanization and the valuation of reclaimed rubbers.** Answer to H. Loewen. EUGENIO LINDMAYER. *Kautschuk* 5, 183-4(1929).—Further comments (cf. Loewen, *C. A.* 23, 3373). C. C. DAVIS

Meaning and measurement of plasticity (KARRER) 2. Thiazole derivatives [vulcanization accelerators] (Brit. pat. 306,558) 17. Containers lined with rubber (Ger. pat. 481,283) 1.

**Chlorinating rubber.** F. C. DYCHE-TEAGUE. Brit. 305,968, Sept. 13, 1927. Rubber is first "disaggregated" or depolymerized by continued mastication until the "nerve" is completely destroyed, and is then chlorinated. The mastication may be effected in  $\text{CCl}_4$ , accompanied by exposure to ultra-violet rays; prior to mastication the rubber may be exposed to air or  $\text{O}_3$  to effect oxidation.

**Treating rubber with chlorostannic and chlorostannous acids.** H. A. BRUSON (to Goodyear Tire & Rubber Co.). Brit. 306,390, Feb. 18, 1928. Tough balata-like products or ebonite-like products (depending on the time and temp. of heating) are obtained. The corresponding Br acids also may be used.

**Uniting rubber and cellulose derivatives.** C. MACINTOSH & CO., LTD., S. A. BRAZIER and G. F. THOMPSON. Brit. 305,745, Dec. 1, 1927. Mutual solvents of rubber and of the cellulose derivs. are used as bonding agents. Various details are given.

**Ornamental embossing of rubber sheets.** BROADHURST & CO., LTD., and W. J. DEXTER. Brit. 306,276, Feb. 11, 1928. Mech. features.

**Use of sponge rubber and ordinary rubber in forming rubber brushes, etc.** F. A. LERSON and L. A. KOHLER. Brit. 305,735, Nov. 21, 1927. Structural features.

**Sealing containers with rubber latex.** B. DEWEY (to Dewey & ALMY CHEMICAL Co.). Brit. 306,040, Feb. 14, 1928. The rubber particles of a latex are vulcanized while conserving the aq. suspension as described in Brit. 193,451 (*C. A.* 17, 3430) and the water is evapd. after application of the latex as a sealing material. Bentonite or other materials may be added.

**Devulcanizing scrap rubber.** DUNLOP RUBBER CO., LTD., D. F. TWISS and F. THOMAS. Brit. 305,826, Feb. 17, 1928. Scrap rubber is treated at atm. pressure with a hot soln. of caustic alkali in a polyhydric alc. such as glycerol until it can be sheeted.

**Apparatus for testing the strength and elasticity of cords.** M. L. KOCHHEISER and S. A. STEERE (to Goodyear Tire & Rubber Co.). Brit. 306,555, Feb. 23, 1928. Structural features.

**Plastic compositions.** JEAN BAER. Swiss 132,322, Oct. 15, 1927. Elastic rubber-like bodies sol. in  $\text{CS}_2$  are prepd. by the action of  $\text{HCHO}$  on S or polysulfides in the presence of a solvent.

**Plastic compositions.** JEAN BAER. Swiss 132,505-132,508, Oct. 20, 1926. Rubber-like masses are prepd by the action on S or polysulfides of  $\text{C}_2\text{H}_5\text{Br}$  (132,505),  $\text{C}_2\text{H}_5\text{I}$  (132,506),  $\text{CH}_2\text{Cl}_2$  (132,507) or  $\text{CH}_3\text{Br}$  (132,508) in the presence of a solvent. The products are sol. in  $\text{CS}_2$ .

